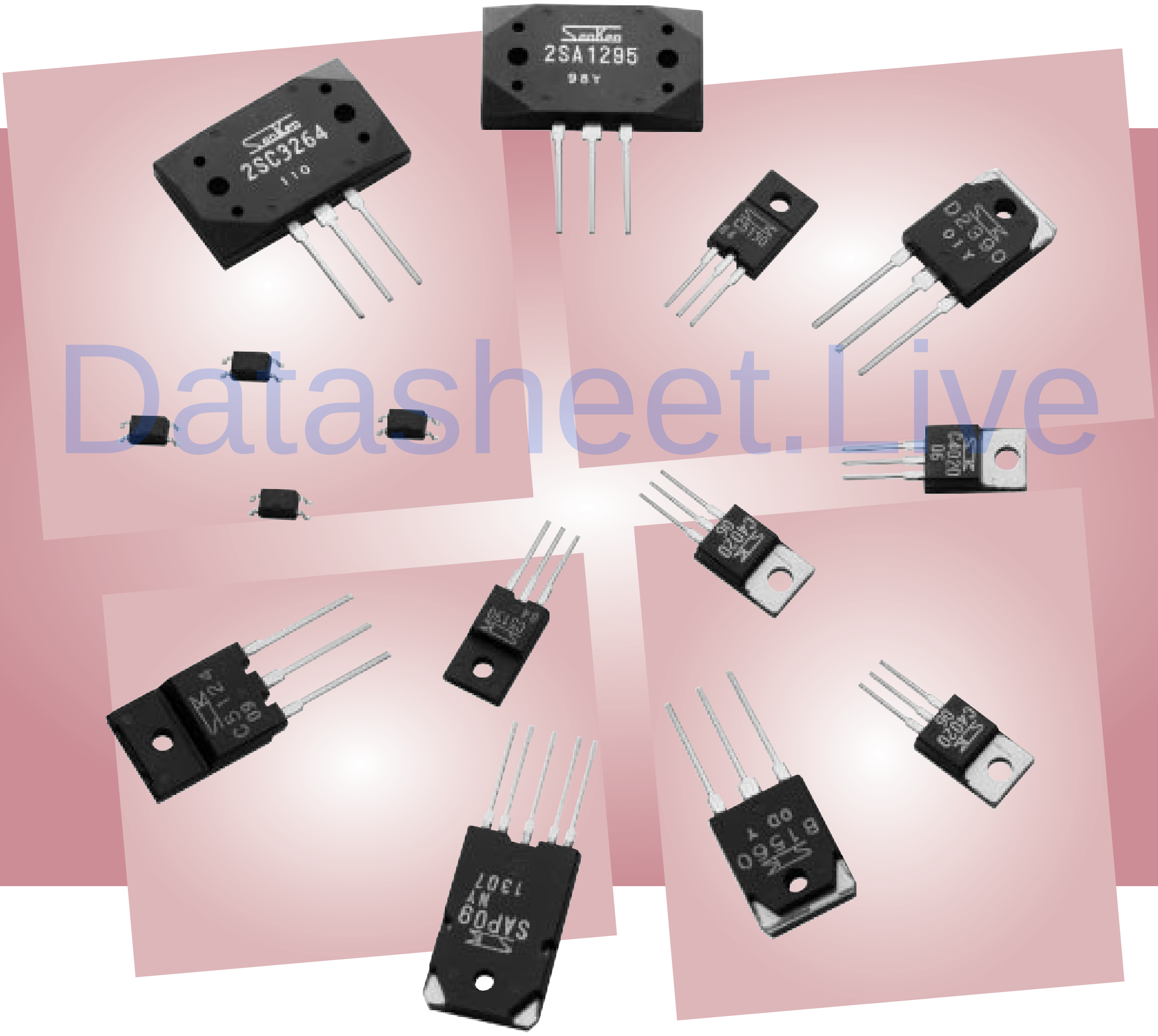
POWER TRANSISTORS



SANKEN ELECTRIC CO.,LTD.

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Transistor Selection Guide

■ V_{CEO}-I_C

Collector–Emitter Voltage V_{CEO}(V)	2	3	4	5	6	7	8	10	12	14	15	16	17	18	25
800		C3678 C4020 C4299 C4304 C4445 C4908		C3679 C4300		C3680 C4301 C5002 C5003		C5124							
600		C5249								C4706					
550		C4517 C4517A C5239		C4518 C4518A C5287				C3927 C4557							
500					C3830 C4907			C3831							
400				C4073 C4418 C4662 C5130		C3832 C3890 C4130 C4546		C4138 C4296	C3833 C4297 C5071		C4139 C4298 C4434			C4140	
380					D2141										
300	C2023 C5333														
250					D2017										
230											A1294 C3263		A1295 C3264		
200	A1668 C4382	D2016		C5271 D2557 D2558							A1493 C3857		A1494 C3858		
180	A1859A C4883A										A1386A A1492 A1673 C3519A C3856 C4388		A1216 C2922		
160											A1215 A1386 C2921 C3519				
150	A1667 A1859 C4381 C4883						B1559 B1587 D2389 D2438	A1186 B1560 B1588 C2837 D2390 D2439	B1570 D2401	A1303 A1860 C3284 C4886	B1647 B1649 D2560 D2562		B1648 D2561		
140								A1695 A1909 C4468 C5101							
120			D2015		D1769 D1785 D2045	C3834 C3835 C4153	A1694 A1908 C4467 C5100	B1259 D2081				B1382 B1420 D2082			B1383 D2083
110					B1659 B1685 B1686 B1687 D2489 D2641 D2642 D2643										
100					B1258										
80		C3852A	A1488A C3851A D2014		A1693 A1725 A1726 A1907 C4466 C4511 C4512 C5099										
60		C3852	A1262 A1488 B1257 C3179 C3851 D1796						A1568 B1351 B1352 C4065						
50		C4495						A2042 C4024	A1567 A1746 C4064		C4131				
40									C5370						

Collector Current I_C(A)

Transistor Selection Guide

■ Transistors for Switch Mode Power Supplies (for AC80 – 130V input)

V_{CBO}(V)	V_{CEO}(V)	I_C(A)	**MT-25** (TO220)	**FM20** (TO220F)	**MT–100** (TO3P)	**FM100** (TO3PF)
250	200	5		C5271		
500	400	5		C4073		
				C4418		
				C4662		
		7	C3832	C3890		
				C4130		
		10			C4138	C4296
		12			C3833	C4297
					C5071	
		15			C4139	C4298
					C4434	
		18			C4140	
600	400	5		C5130		
		7		C4546		
	500	6	C3830	C4907		
		10			C3831	
	600	3		C5249		

■ Transistors for Switch Mode Power Supplies (for AC180 – 280V input)

V_{CBO}(V)	V_{CEO}(V)	I_C(A)	**MT-25** (TO220)	**FM20** (TO220F)	**MT–100** (TO3P)	**FM100** (TO3PF)
900 (1000)	550	3	C5239	C4517(A)		
		5		C4518(A)	C5287	
		10			C3927	C4557
	600	14			C4706	
900	800	3	C4020	C4908		
					C3678	C4299
				C4304		C4445
		5			C3679	C4300
		7			C3680	C4301

Transistor Selection Guide

Transistors for Audio Amplifiers

■Single Transistors

●Single Emitter

Part No.	PC(W)	VCEO(V)	IC(A)	hFE(min)	fT(MHz)	Package
2SA1725/2SC4511	30	80	6	50	20	FM20 (TO220F)
2SA1726/2SC4512	50					MT-25 (TO220)
2SA1693/2SC4466	60					MT-100 (TO3P)
2SA1907/2SC5099	60					FM100 (TO3PF)
2SA1908/2SC5100	75	120	8			
2SA1694/2SC4467	80					MT-100 (TO3P)
2SA1909/2SC5101	80	140	10			FM100 (TO3PF)
2SA1673/2SC4388	85	180	15			
2SA1695/2SC4468	100	140	10			MT-100 (TO3P)
2SA1492/2SC3856	130	180	15			
2SA1493/2SC3857	150	200	15			MT-200 (2-screw mount)
2SA1494/2SC3858	200		17			

●LAPT (Multi emitter for High Frequency)

Part No.	PC(W)	VCEO(V)	IC(A)	hFE(min)	fT(MHz)	Package
2SA1860/2SC4886	80	150	14	50	50	FM100 (TO3PF)
2SA1186/2SC2837	100		10		60	MT-100 (TO3P)
2SA1303/2SC3284	125		14		50	
2SA1386/2SC3519	130	160	15		40	
2SA1386A/2SC3519A	130	180				
2SA1294/2SC3263	130	230			35	
2SA1215/2SC2921	150	160			50	MT-200 (2-screw mount)
2SA1216/2SC2922	200	180	17		40	
2SA1295/2SC3264	200	230			35	

●Transistors with built in temperature compensation diodes for audio amplifier

Part No.	PC(W)	VCEO(V)	IC(A)	hFE(min)	Emitter Resistor(Ω)
SAP09P/SAP09N	80	150	10	5000	0.22
SAP10P/SAP10N	100	150	12	5000	0.22
SAP16P/SAP16N	150	160	15	5000	0.22

Transistor Selection Guide

■ Darlington Transistors

Part No.	P_C(W)	V_{CEO}(V)	I_C(A)	h_{FE}(min)	f_T(MHz)	Package
2SB1686	30	110	6	5000	100	FM20 (TO220F)
2SD2642					60	
2SB1659	50				100	MT-25 (TO220)
2SD2589					60	
2SB1685	60				100	MT-100 (TO3P)
2SD2641					60	
2SB1687	60				100	FM100 (TO3PF)
2SD2643					60	
2SB1587	75	150	8		65	
2SD2438					80	
2SB1559	80		10		65	MT-100 (TO3P)
2SD2389					80	
2SB1588	80		15		50	FM100 (TO3PF)
2SD2439					55	
2SB1649	85	200			45	
2SD2562					70	
2SB1560	100	150	10		50	MT-100 (TO3P)
2SD2390					55	
2SB1647	130		15		45	
2SD2560					70	
2SB1570	150	150	12		50	MT-200 (2-screw mount)
2SD2401					55	
2SB1648	200		17		45	
2SD2561					70	

■ Temperature compensation Transistors and Driver Transistors

Part No.	P_C(W)	V_{CEO}(V)	I_C(A)	h_{FE}(min)	f_T(MHz)	Package	Remarks
2SC4495	25	50	3	500	40	FM20 (TO220F)	Temperature compensation
2SC4883	20	150	2	60	120		Driver, Complement 2SA1859
2SC4883A		180					Driver, Complement 2SA1859A
2SA1859	20	–150	–2	60	60		Driver, Complement 2SC4883
2SA1859A		–180					Driver, Complement 2SC4883A

Reliability

1. Definition of Reliability

The word reliablity is an abstract term which refers to the degree to which equipment or components, such as semiconductor devices, are resistant to failure. Reliability can be and is often measured quantitatively. Reliability is defined as “whether equipment or components (such as a semiconductor device) under given conditions perform the same at the end of a given period as at the beginning.”

2. Reliability Function

In general, there are three types of failure modes in electronic components:

1. Infant failure
2. Random failure
3. Wear-out failure

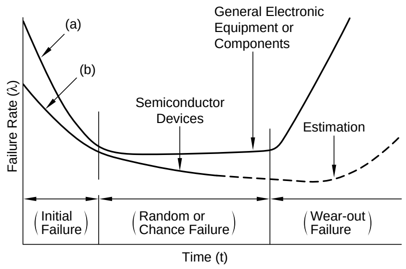


Figure 1 Bath Tub Curve

These three types of failure describe “bathtub curve” shown in Figure 1. Infant failures can be attributed to trouble in the production process and can be eliminated by aging befor shipment to customers, stricter control of the production process and quality control measures. Semiconductor devices such as transistors, unlike electronic equipment, take a considerable amount of time to reach the stage where wear-out failure begins to occur. And, as shown in Figure 1 (b), they also last much longer than electronic equipment. This shows that the longer they are used the more stable they actually become.

The reduction that occurs in random failures can be approximated by Weibull distribution, logarithmic normal distribution, or gamma distribution, but Weibull distribution best expresses the phenomenon that occurs with transistors.

3. Quantitative Expression of Reliability

While there are many ways to quantitatively express reliability, two criteria, failure rate and life span, are generally used to define the reliability of semiconductors such as transistrors.

a) Failure Rate (FR)

Failure rate often refers to instantaneous failures or λ (t). In general of reliability theory, however, the cumulative failure rate, or Reliability Index, is

$$F \cdot R = \frac{r(t)}{N \cdot t} \cdots\cdots (1)$$

Where N = Net quantity used, and
r(t) = Net quantitiy failed after t hours

If we assign t the arbitrary

$$F \cdot R = \frac{r}{N} \times 100 \text{ (\%/1,000 hours)} \cdots\cdots (2)$$

In situations where the cumulative failure rate is small, failure is expressed in units of one Fit, 10^{-9} (failures/hours).

b) Life Span(L)

Life Span can be expressed in terms of average lifespan or as Mean Time Between Failure (MTBF), but assuming that random failure is shown by the Index Distribution [λ (t) = constant], then Life Span or L can be shown by the equation

$$L = \frac{1}{F \cdot R} \text{(hours)} \cdots\cdots (3)$$

4. Applications Considered on Reliability

a) The type and specifications of our transistors and semiconductor devices vary depending on the application that will be required by their intended use. Customer should, therefore, determine which type will best suit their purposes.

b) Note that high temperratures or long soldering periods must be avoided during soldering, as heat can be transmitted through external leads into the interior. This may cause deterioration if the maximum allowable temperature is exceeded.

c) When using the trasistor under pulse operation or inductive load, the Safe Operating Area (SOA) for the current and voltage must not be exceeded (Figure 2).

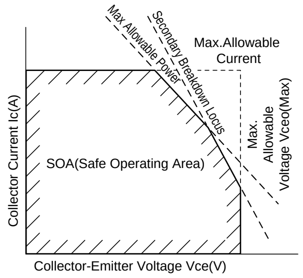


Figure 2 SOA

d) The reliability of transistors and semiconductor devices is greatly affected by the stress of junction temperature. If we accept in general proceed in the form of Arrhenius equation, the relationship between the junction temperature Tj and lifespan L can be expressed with the following empirical formula

$$\ell n\, L = A + \frac{B}{Tj} \cdots\cdots (4)$$

It is, hence, very important to derate the junction temperature to assure a high reliability rate.

5. Reliability Test

Sanken bases its test methods and conditions on the following standards. Tests are conducted under these or stricter conditions, The details of these are shown in Table 1.

- MIL-STD-202F (Test method for electrical and electronic components)
- MIL-STD-750C (Test method for semiconductor equipment)
- JIS C 7021 (Endurance test and environmental test method for individual semiconductor devices)
- JIS C 7022 (Endurance test and environmental test method for integrated circuits of semiconductors)

6. Quality Assurance

To ensure high quality and high reliability, quality control and production process control procedures are executed from the receipt of parts through the entire production process. Our quality assurance system is shown in Figure 3.

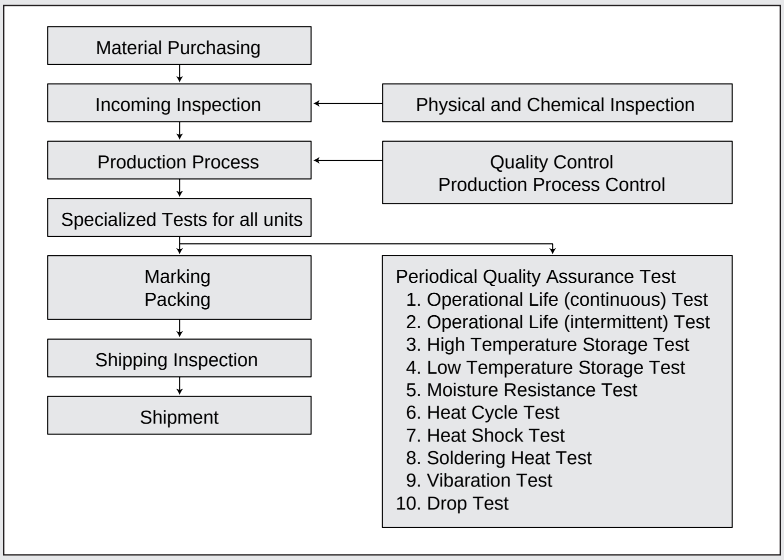
Reliability

Table 1: Test Methods and Conditions

Test	Details of the Testing Method	LTPD(%)
Continuous Operations Test	Collector dissipation with maximum junction temperature is applied continuously at room temperature to judge lifespan and reliability under transistor operating conditions.	*5/1000hrs
Intermittent Operation Test	Power equal to that used in the Continuous Operations Test is applied intermittently to test the transistor’s lifespan and reliability under on and off conditions.	5/1000hrs
High Temperature Storage Test	Confirms the highest storage temperature and operating temperature of transistors.	5/1000hrs
Low Temperature Storage Test	Confirms the lowest storage temperature of transistors.	5/1000hrs
Moisture Resistance Test	Tested at RH=85% and TA=85°C for the effects of the interaction between temperature and humidity, and the effects of surface insulation between electrodes and high temperature/high humidity.	5/1000hrs
Heat Cycle Test	Tested at Tstg min – Room temp. – Tstg max – Room temp. for 10 cycles (one cycle 30 min. –5 min. –30 min. –5 min.) to detect mechanical faults and characteristic changes caused by thermal expansion and shrinkage of the transistor.	5
Heat Shock Test	Tested at 100°C (5 min.), 25°C (within 3 sec.), 0°C (5 min.) for 10 cycles to check for mechanical faults and characteristic changes caused by thermal expansion and shrinkage of transistor.	5
Soldering Heat Test	Tested at 260 ± 5°C, 10 ± 1 sec, by dipping lead wire to 1.5mm from the seating plane in solder bath to check for characteristic changes caused by drastic temperature rises of exterior lead wire.	5
Vibrations Test	Tested at amplitude 1.52mm, vibration frequency 10-55 Hz in directions of X, Y, Z, for 2 hours each (total 6 hours) to check for characteristic changes caused by vibration during operation and transportion.	5
Drop Test	Tested by dropping 10 times from 75 cm height to check for mechanical endurance and characteristic changes caused by shock during handling.	5

* Reliability Standard : 60%

Figure 3 Quality Assurance System



7. Notes Regarding Storage, Characteristic Tests, and Handling

Since reliability can be affected adversely by improper storage environment and handling methods during Characteristic tests, please observe the following cautions.

a) Cautions for Storage

1. Ensure that storage conditions comply with the standard temperature (5 to 35°C) and the standard relative humidity (arround 40 to 75%) and avoid storage locations that experience extreme changes in temperature or humidity.
2. Avod locations where dust or harmful gases are present, and avoid direct sunlight.
3. Reinspect for rust in leads and solderbility that have been stored for a long time.

b) Cautions for Characteristic Tests and Handling

1. When characteristic tests are carried out during inspection testing and other standard test periods, protect the transistor from surges of power from the testing device, shorts between the transistor and the heatsink

c) Silicone Grease

When using a heatsink, please coat the back surface of the transistor and both surfaces of the insulating plate with a thin layer of silicone grease to improve heat transfer between the transistor and the heatsink.

Recommended Silicone Grease
- G-746 (Shin-Etsu Chemical)
- YG6260 (GE Toshiba Silicone)
- SC102 (Dow Corning Toray Silicone)

d) Torque when Tightening Screws

Thermal resistance increases when tightening torque is small, and radiation effects are decreased. When the torque is too high, the screw can cut, the heatsink can be deformed, and/or distortion can arise in the product's frame. To avoid these problems, Table 2 shows the recommended tightening torques for each product type.

Table 2. Screw Tightening Torques

Package	Screw Tightening Torque
MT25 (TO-220)	0.490 to 0.686 N · m (5 to 7kgf · cm)
FM20 (TO-220 Full Mold)	0.490 to 0.686 N · m (5 to 7kgf · cm)
MT100 (TO-3P)	0.686 to 0.822 N · m (7 to 9kgf · cm)
FM100 (TO-3P Full Mold)	0.686 to 0.822 N · m (7 to 9kgf · cm)
MT200 (two-point mount)	0.686 to 0.822 N · m (7 to 9kgf · cm)
2GR (one-point mount)	0.686 to 0.822 N · m (7 to 9kgf · cm)

e) Soldering Temperature

In general, the transistor is subjected to high temperatures when it is mounted on the printed circuit board, whether from flow solder from a solderbath, or, in hand operations from a soldering iron. The testing method and test conditions (JIS-C-7021 standards) for a transistor's heat resistance during soldering are:

At a distance of 1.5mm from the transistor's main body, apply 260°C for 10 seconds, and 350°C for 3 seconds.

However, please stay well within these limits and for as short a time as possible during actual soldering.

Reliability

Temperature Derating in Safe Operating Area

Flange (case) temperature is typically described as 25°C, but it must be derated subject to the operating temperature.
This derating curve is determined by manufacturing conditions of devices, materials used etc. and in case of a silicon transistor, breakdown voltage and DC Current Gain are significantly deteriorated in the temperature range of 260°C to 360°C.
Hence, the collector current must be derated by using the derating curve in Fig.2 where the breakdown point is set at 260°C.

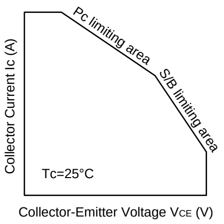


Fig.1 Safe Operating Area

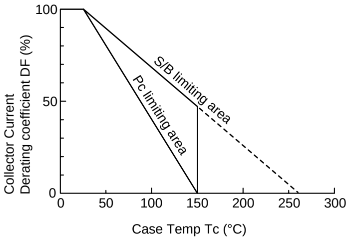


Fig.2 Derating Curve of Safe Operating Area

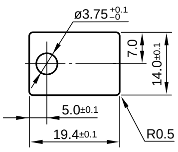
Derating coefficient is obtained from temperature in Fig.2 and it must be applied to the current value of the safe operating area in order to obtain the derated current.

Accessories

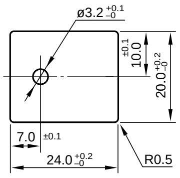
☆ Sanken Transistors do not include accessories. Accessories may be attached at a cost if requested.
☆ Sanken transistor case is a standard size, and can be used with any generally sold accessories.

- Insulater: Mica, with a thickness of 0.06mm, +0.045 –0.005 allowance

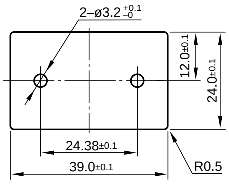
Type Name:Mold(10)Mica



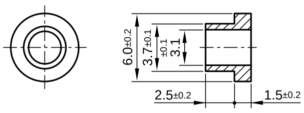
Type Name:Mold(14)Mica



Type Name:Mold(9)Mica



- Insulation Bush for MT-25 (TO220)

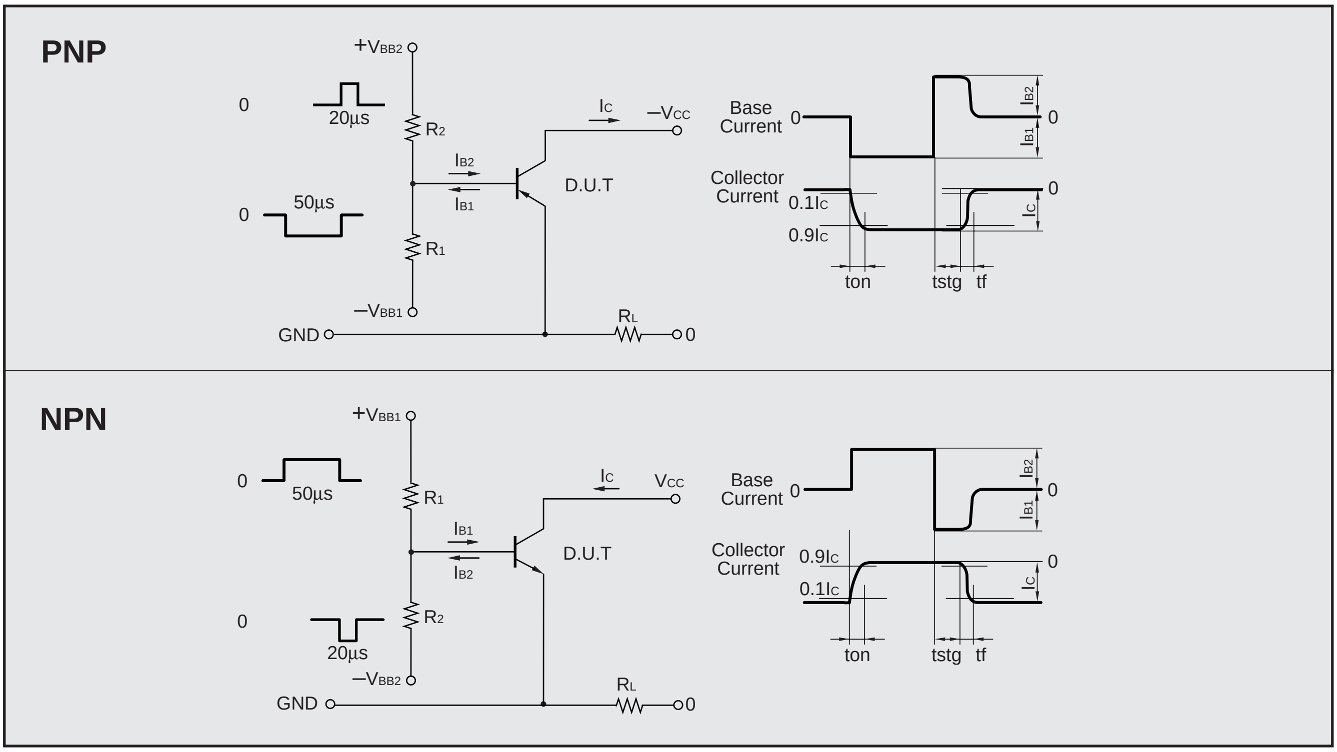


Switching Characteristics

Typical Switching Characteristics (Common Emitter)

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{B2} (V)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	t_r (μs)	t_{stg} (μs)	t_f (μs)

Switching Characteristics Test Circuit/Measurement Wave Forms



Symbols

Symbol	Item	Definition
V_{CBO}	Collector-Base Voltage	DC Voltage between Collector and Base when Emitter is open
V_{CEO}	Collector-Emitter Voltage	Voltage between Collector and Emitter when Base is open and voltage is reversely applied to Collector junction
V_{EBO}	Emitter-Base Voltage	DC voltage between Emitter and Base when Collector is open
I_C	Collector Current	DC current passing through Collector electrode
I_B	Base Current	DC current passing through Base electrode
P_C	Collector Power Dissipation	Power consumed at Collector junction
Tj	Operating Junction Temperature	Maximum allowable temperature value at absolute maximum ratings
Tstg	Storage Temperature	Maximum allowable range of ambient temperature at non-operation
I_{CBO}	Collector Cutoff Current	Collector current when Emitter is open and a specified reverse voltage is applied between Collector and Base
I_{EBO}	Emitter Cutoff Current	Emitter current when Collector is open and a specified reverse voltage is applied between Emitter and Base
$V_{(BR)CEO}$	Collector-Emitter Saturation Voltage	Breakdown voltage between Collector and Emitter when Base is open
h_{FE}	DC Current Gain	Ratio of DC output current and DC input current at a specified voltage and current (Emitter common)
V_{CE}(sat)	Collector-Emitter Saturation Voltage	DC voltage between Collector and Emitter under specified saturation conditions
V_{BE}(sat)	Base-Emitter Saturation Voltage	DC voltage between Base and Emitter under specified saturation conditions
V_{FEC}	Emitter-Collector Diode Forward Voltage	Diode forward voltage between Emitter and Collector when Base is open
f_T	Cut-off Frequency	Frequency at the specified voltage and current where h_{FE} is 1 (0dB)
Cob	Collector Junction capacitance	Junction capacitance between collector and Base at a specified voltage and frequency

- Ta=25°C unless otherwise specified.

LAPT

2SA1186

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC2837)

Application : Audio and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	–150	V
V_{CEO}	–150	V
V_{EBO}	–5	V
I_C	–10	A
I_B	–2	A
P_C	100(Ta=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

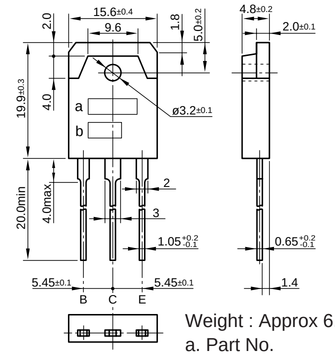
Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=–150V	–100max	μA
I_{EBO}	V_{EB}=–5V	–100max	μA
$V_{(BR)CEO}$	I_C=–25mA	–150min	V
h_{FE}	V_{CE}=–4V, I_C=–3A	50min∗	
V_{CE}(sat)	I_C=–5A, I_B=–0.5A	–2.0max	V
f_T	V_{CE}=–12V, I_E=1A	60typ	MHz
C_{OB}	V_{CB}=–80V, f=1MHz	110typ	pF

∗h_{FE} Rank O(50 to 100), P(70 to 140), Y(90 to 180)

■Typical Switching Characteristics (Common Emitter)

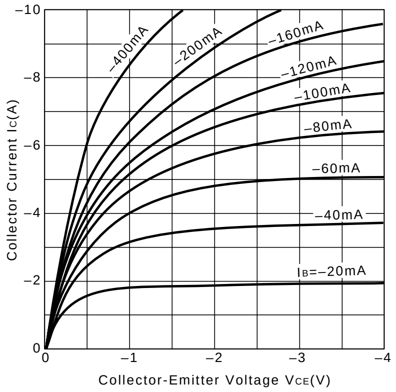
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{B2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (μs)	tstg (μs)	tf (μs)
–60	12	–5	5	–500	500	0.25typ	0.8typ	0.2typ

External Dimensions MT-100(TO3P)

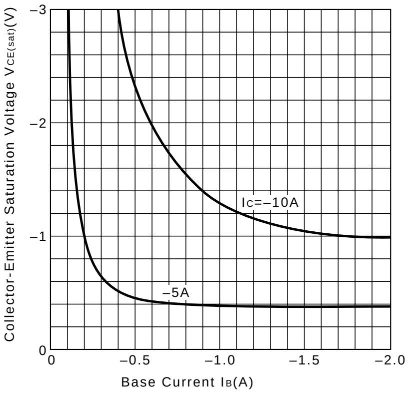


Weight : Approx 6.0g
a. Part No.
b. Lot No.

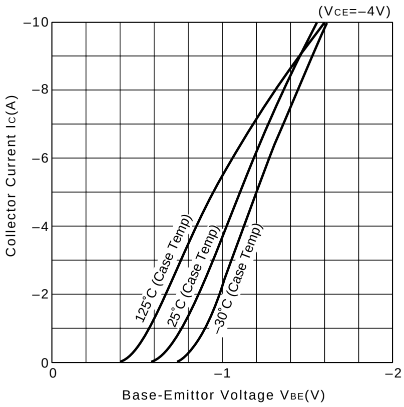
I_C–V_{CE} Characteristics (Typical)



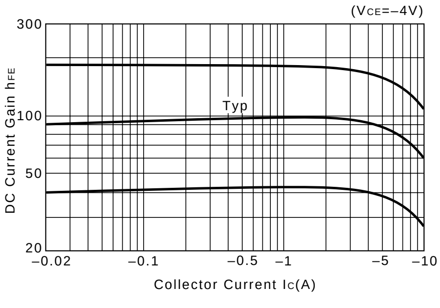
V_{CE}(sat)–I_B Characteristics (Typical)



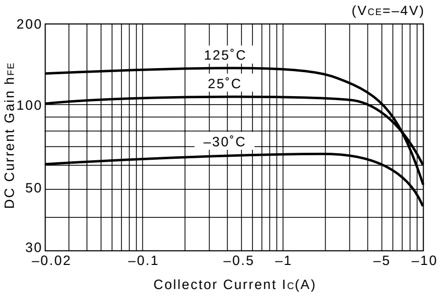
I_C–V_{BE} Temperature Characteristics (Typical)



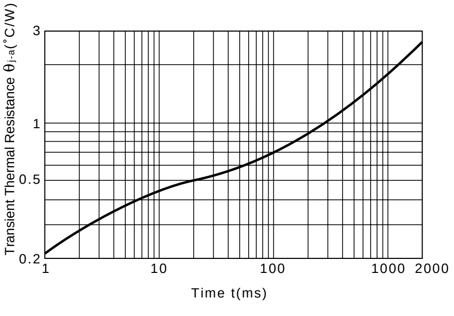
h_{FE}–I_C Characteristics (Typical)



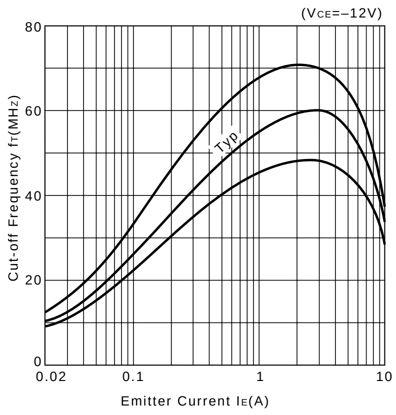
h_{FE}–I_C Temperature Characteristics (Typical)



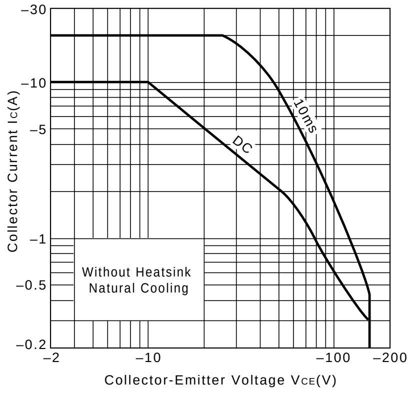
$\theta_{j\text{-}a}$–t Characteristics



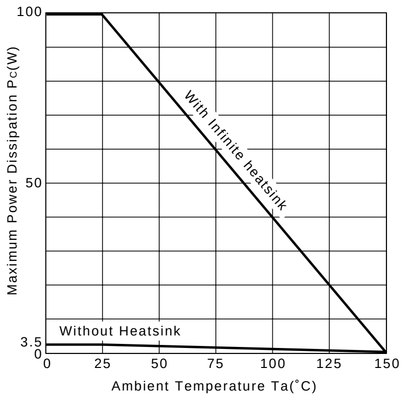
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C–Ta Derating



LAPT 2SA1215

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC2921)

Application : Audio and General Purpose

■**Absolute maximum ratings** (Ta=25°C)

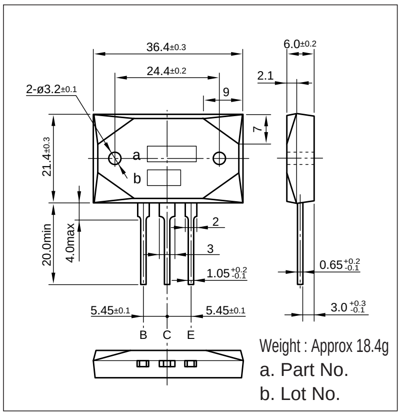
Symbol	Ratings	Unit
VCBO	–160	V
VCEO	–160	V
VEBO	–5	V
IC	–15	A
IB	–4	A
PC	150(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	Ratings	Unit
ICBO	VCB=–160V	–100max	µA
IEBO	VEB=–5V	–100max	µA
V(BR)CEO	IC=–25mA	–160min	V
hFE	VCE=–4V, IC=–5A	50min*	
VCE(sat)	IC=–5A, IB=–0.5A	–2.0max	V
fT	VCE=–12V, IE=2A	50typ	MHz
COB	VCB=–10V, f=1MHz	400typ	pF

*hFE Rank O(50 to 100), P(70 to 140), Y(90 to 180)

External Dimensions MT-200

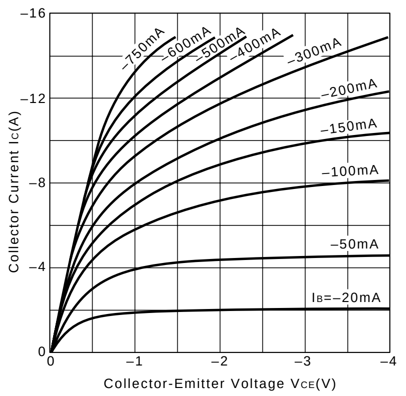


Weight : Approx 18.4g
a. Part No.
b. Lot No.

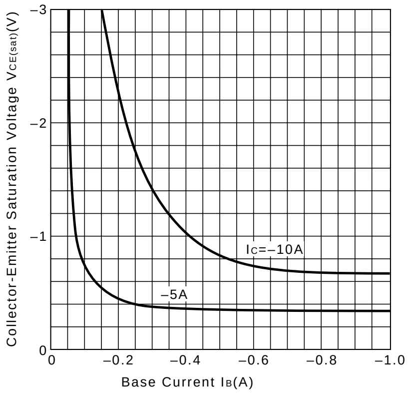
■**Typical Switching Characteristics (Common Emitter)**

VCC (V)	RL (Ω)	IC (A)	VB2 (V)	IB1 (mA)	IB2 (mA)	ton (µs)	tstg (µs)	tf (µs)
–60	12	–5	5	–500	500	0.25typ	0.85typ	0.2typ

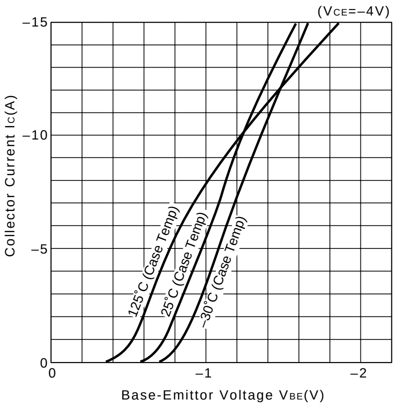
IC–VCE Characteristics (Typical)



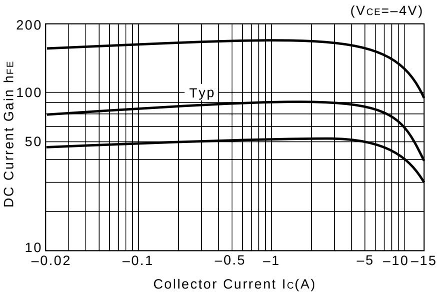
VCE(sat)–IB Characteristics (Typical)



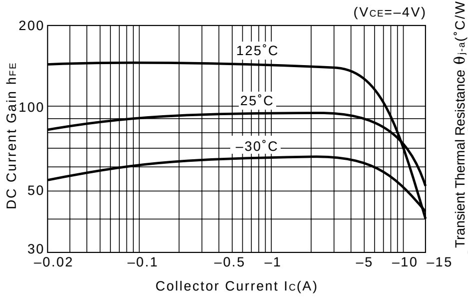
IC–VBE Temperature Characteristics (Typical)



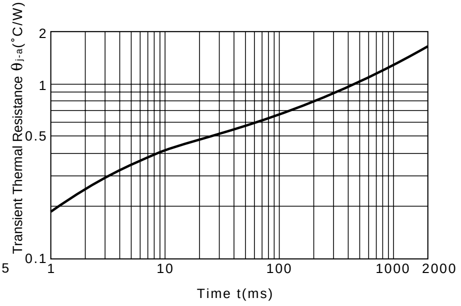
hFE–IC Characteristics (Typical)



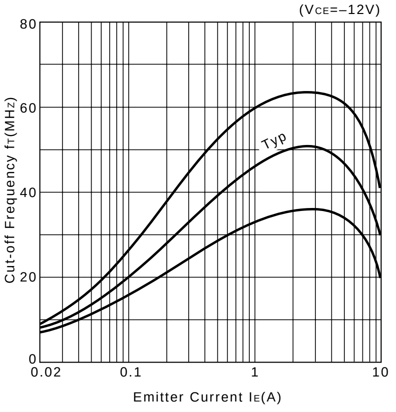
hFE–IC Temperature Characteristics (Typical)



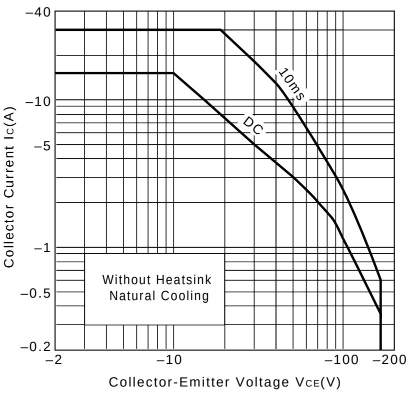
θj-a–t Characteristics



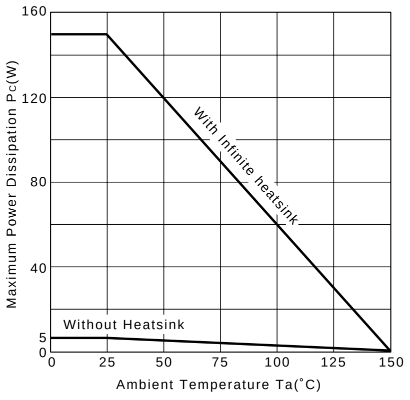
fT–IE Characteristics (Typical)



Safe Operating Area (Single Pulse)



PC–Ta Derating



LAPT 2SA1216

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC2922)

Application : Audio and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	–180	V
V_{CEO}	–180	V
V_{EBO}	–5	V
I_C	–17	A
I_B	–5	A
P_C	200(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

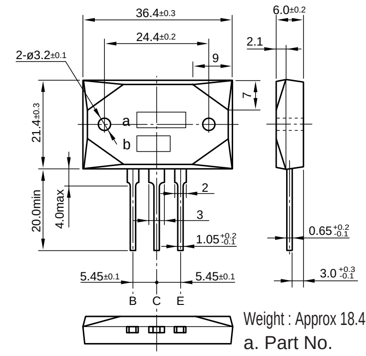
Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=–180V	–100max	μA
I_{EBO}	V_{EB}=–5V	–100max	μA
$V_{(BR)CEO}$	I_C=–25mA	–180min	V
h_{FE}	V_{CE}=–4V, I_C=–8A	30min*	
$V_{CE(sat)}$	I_C=–8A, I_B=–0.8A	–2.0max	V
f_T	V_{CE}=–12V, I_E=2A	40typ	MHz
C_{OB}	V_{CB}=–10V, f=1MHz	500typ	pF

*h_{FE} Rank O(30to60), Y(50to100), P(70to140), G(90to180)

■Typical Switching Characteristics (Common Emitter)

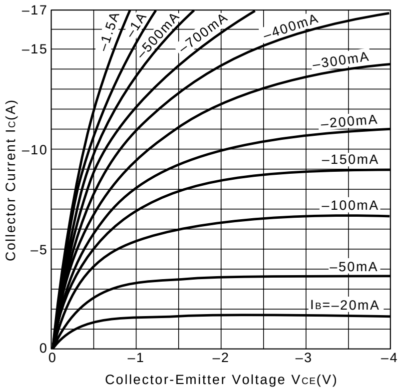
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{B2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
–40	4	–10	5	–1	1	0.3typ	0.7typ	0.2typ

External Dimensions MT-200

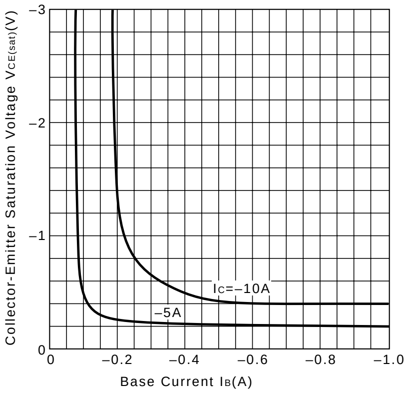


Weight : Approx 18.4g
a. Part No.
b. Lot No.

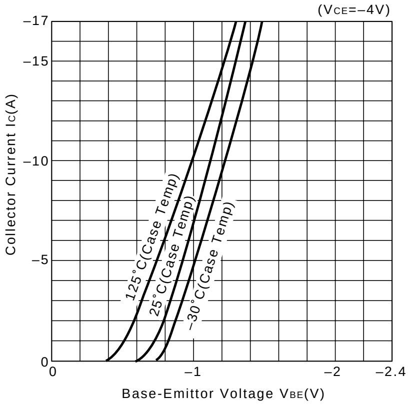
I_C–V_{CE} Characteristics (Typical)



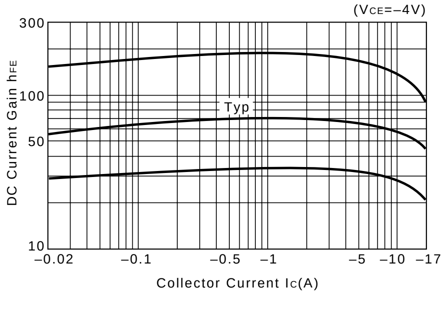
$V_{CE(sat)}$–I_B Characteristics (Typical)



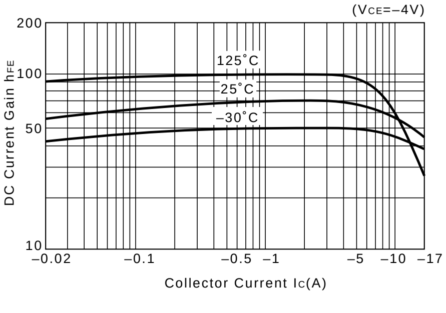
I_C–V_{BE} Temperature Characteristics (Typical)



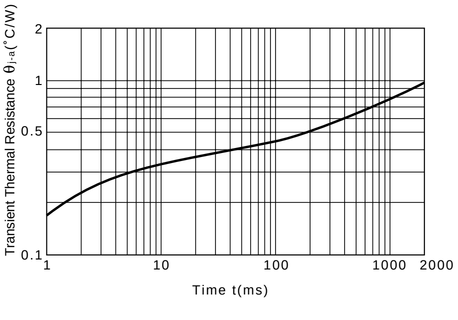
h_{FE}–I_C Characteristics (Typical)



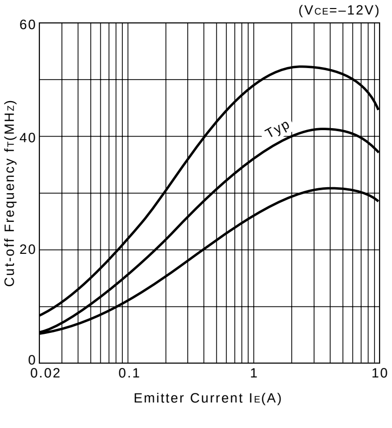
h_{FE}–I_C Temperature Characteristics (Typical)



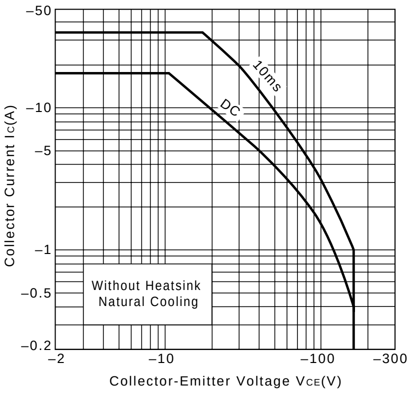
θ_{j-a}–t Characteristics



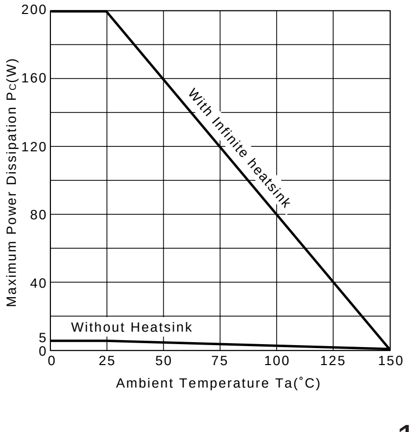
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C–Ta Derating



2SA1262

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC3179)

Application : Audio and General Purpose

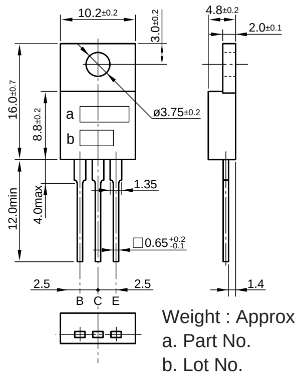
■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	–60	V
V_{CEO}	–60	V
V_{EBO}	–6	V
I_C	–4	A
I_B	–1	A
P_C	30(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=–60V	–100max	μA
I_{EBO}	V_{EB}=–6V	–100max	μA
$V_{(BR)CEO}$	I_C=–25mA	–60min	V
h_{FE}	V_{CE}=–4V, I_C=–1A	40min	
$V_{CE(sat)}$	I_C=–2A, I_B=–0.2A	–0.6max	V
f_T	V_{CE}=–12V, I_E=0.2A	15typ	MHz
C_{OB}	V_{CB}=–10V, f=1MHz	90typ	pF

External Dimensions MT-25(TO220)

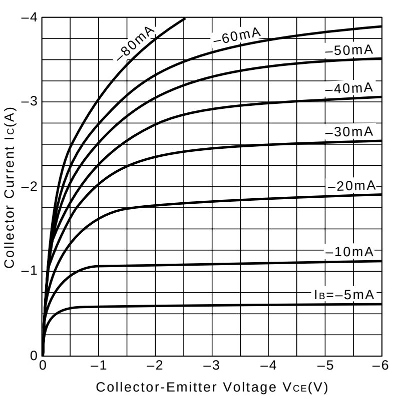


Weight : Approx 2.6g
a. Part No.
b. Lot No.

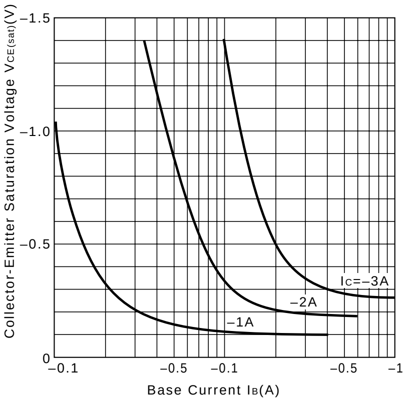
■Typical Switching Characteristics (Common Emitter)

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (μs)	tstg (μs)	tf (μs)
–20	10	–2	–10	5	–200	200	0.25typ	0.75typ	0.25typ

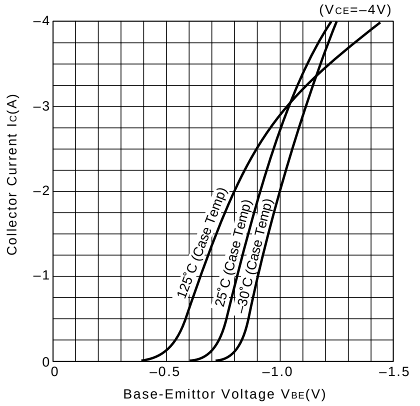
I_C–V_{CE} Characteristics (Typical)



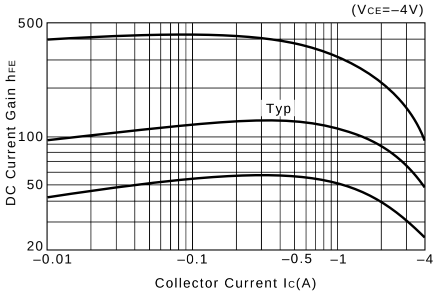
$V_{CE(sat)}$–I_B Characteristics (Typical)



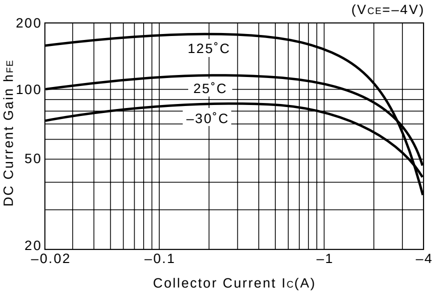
I_C–V_{BE} Temperature Characteristics (Typical)



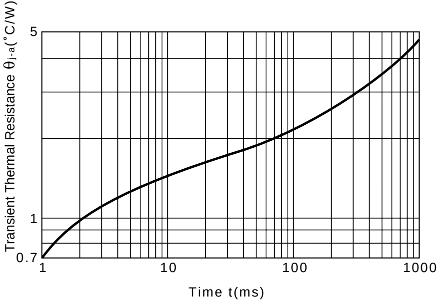
h_{FE}–I_C Characteristics (Typical)



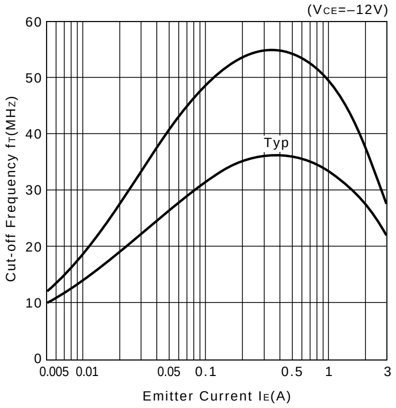
h_{FE}–I_C Temperature Characteristics (Typical)



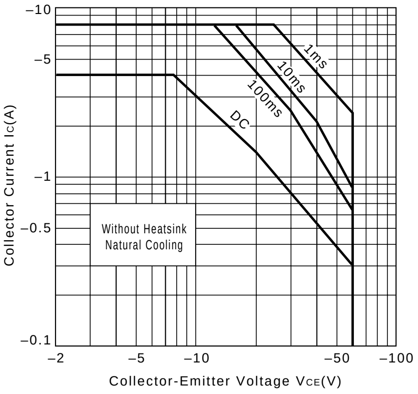
$\theta_{j\text{-}a}$–t Characteristics



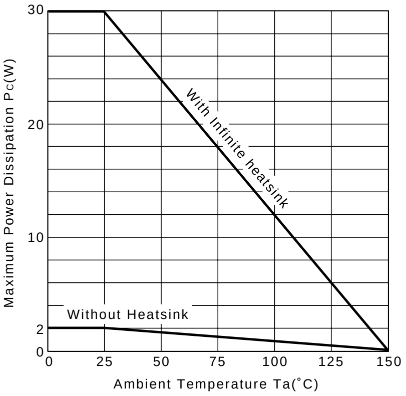
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C–Ta Derating



LAPT 2SA1294

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC3263)

Application : Audio and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	–230	V
V_{CEO}	–230	V
V_{EBO}	–5	V
I_C	–15	A
I_B	–4	A
P_C	130(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

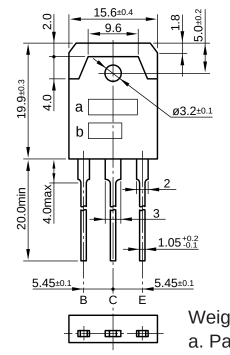
Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=–230V	–100max	μA
I_{EBO}	V_{EB}=–5V	–100max	μA
$V_{(BR)CEO}$	I_C=–25mA	–230min	V
h_{FE}	V_{CE}=–4V, I_C=–5A	50min*	
V_{CE}(sat)	I_C=–5A, I_B=–0.5A	–2.0max	V
f_T	V_{CE}=–12V, I_E=2A	35typ	MHz
C_{OB}	V_{CB}=–10V, f=1MHz	500typ	pF

*h_{FE} Rank O(50 to 100), Y(70 to 140)

■Typical Switching Characteristics (Common Emitter)

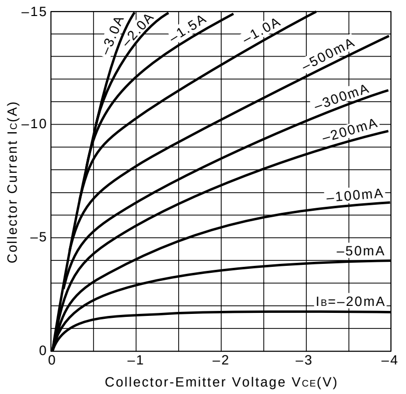
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (μs)	tstg (μs)	tf (μs)
–60	12	–5	–10	5	–500	500	0.35typ	1.50typ	0.30typ

External Dimensions MT-100(TO3P)

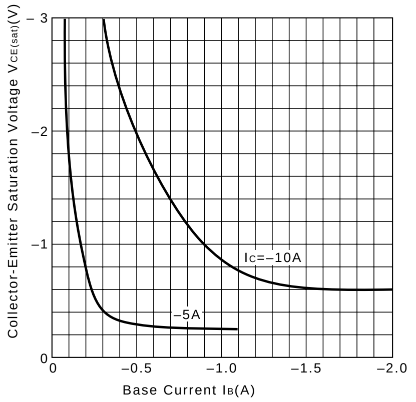


Weight : Approx 6.0g
a. Part No.
b. Lot No.

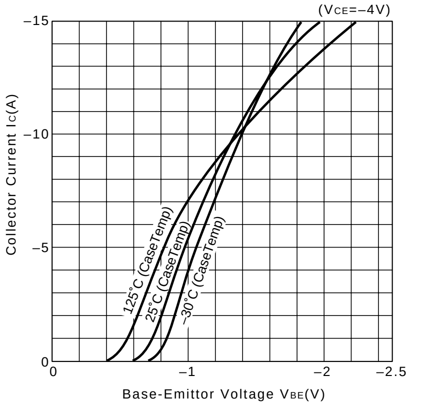
I_C–V_{CE} Characteristics (Typical)



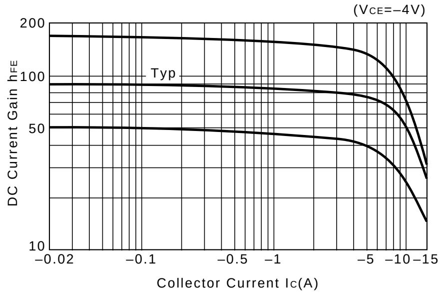
V_{CE}(sat)–I_B Characteristics (Typical)



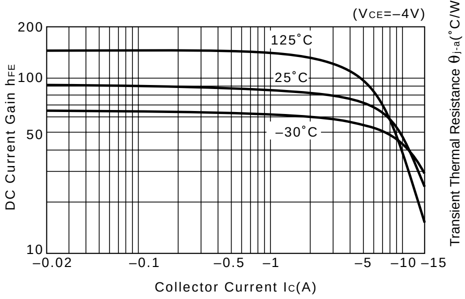
I_C–V_{BE} Temperature Characteristics (Typical)



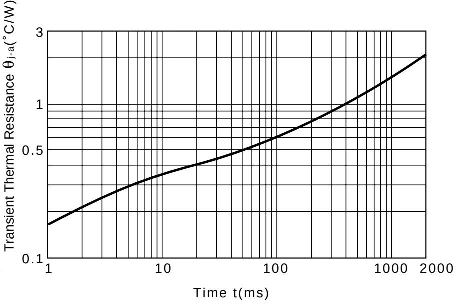
h_{FE}–I_C Characteristics (Typical)



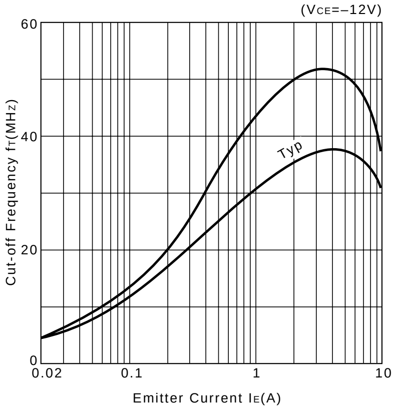
h_{FE}–I_C Temperature Characteristics (Typical)



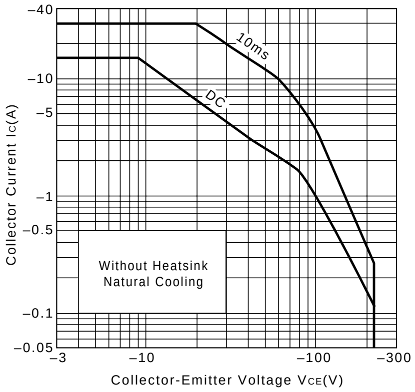
θ_{j-a}–t Characteristics



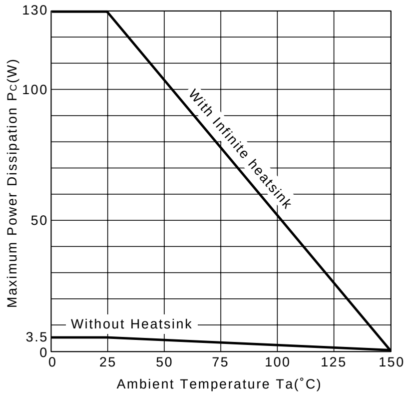
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C–Ta Derating



LAPT 2SA1295

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC3264)

Application : Audio and General

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	–230	V
V_{CEO}	–230	V
V_{EBO}	–5	V
I_C	–17	A
I_B	–5	A
P_C	200(T_C=25°C)	W
T_j	150	°C
T_{stg}	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

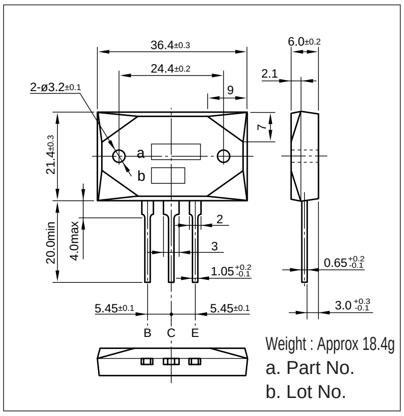
Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=–230V	–100max	μA
I_{EBO}	V_{EB}=–5V	–100max	μA
$V_{(BR)CEO}$	I_C=–25mA	–230min	V
h_{FE}	V_{CE}=–4V, I_C=–5A	50min*	
$V_{CE(sat)}$	I_C=–5A, I_B=–0.5A	–2.0max	V
f_T	V_{CE}=–12V, I_E=2A	35typ	MHz
C_{OB}	V_{CB}=–10V, f=1MHz	500typ	pF

*h_{FE} Rank $\overline{\text{O}}$(50 to 100), Y(70 to 140)

■Typical Switching Characteristics (Common Emitter)

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (μs)	tstg (μs)	tf (μs)
–60	12	–5	–10	5	–500	500	0.35typ	1.50typ	0.30typ

External Dimensions MT-200

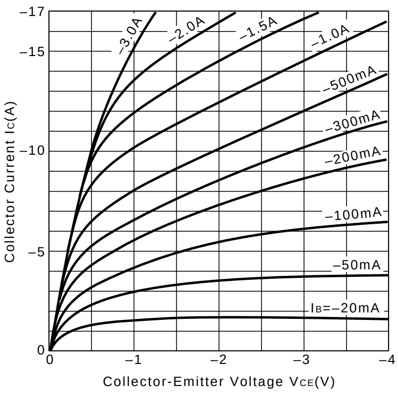


Weight : Approx 18.4g

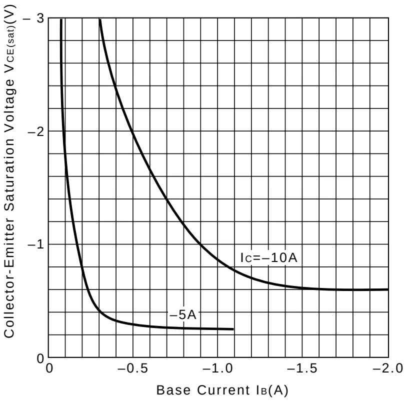
a. Part No.

b. Lot No.

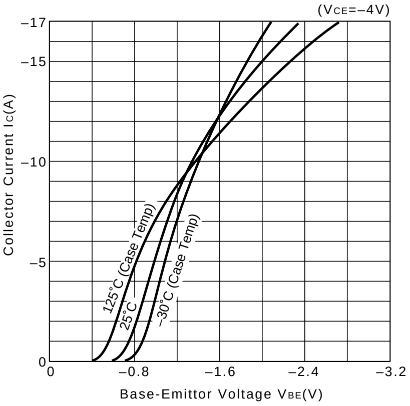
I_C–V_{CE} Characteristics (Typical)



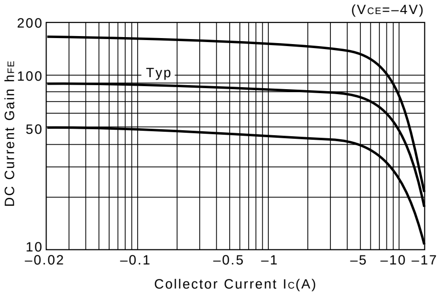
$V_{CE(sat)}$–I_B Characteristics (Typical)



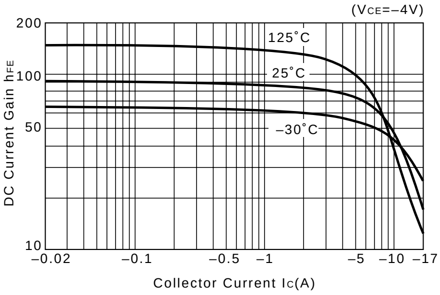
I_C–V_{BE} Temperature Characteristics (Typical)



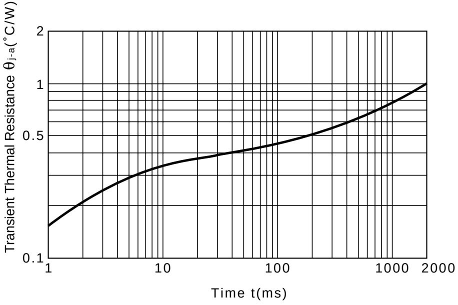
h_{FE}–I_C Characteristics (Typical)



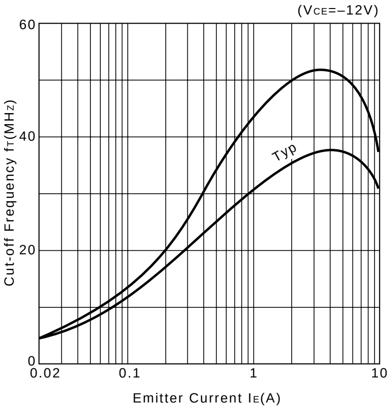
h_{FE}–I_C Temperature Characteristics (Typical)



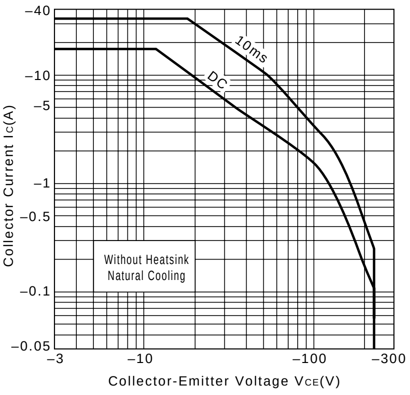
θ_{j-a}–t Characteristics



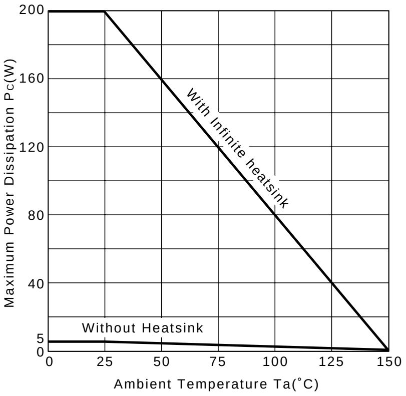
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C–T_a Derating



LAPT

2SA1303

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC3284)

Application : Audio and General Purpose

■**Absolute maximum ratings** (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	–150	V
V_{CEO}	–150	V
V_{EBO}	–5	V
I_C	–14	A
I_B	–3	A
P_C	125(T_C=25°C)	W
T_j	150	°C
T_{stg}	–55 to +150	°C

■**Electrical Characteristics** (Ta=25°C)

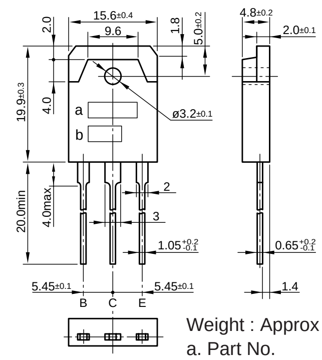
Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=–150V	–100max	µA
I_{EBO}	V_{EB}=–5V	–100max	µA
$V_{(BR)CEO}$	I_C=–25mA	–150min	V
h_{FE}	V_{CE}=–4V, I_C=–5A	50min	
$V_{CE(sat)}$	I_C=–5A, I_B=–0.5A	–2.0max	V
f_T	V_{CE}=–12V, I_E=2A	50typ	MHz
C_{OB}	V_{CB}=–10V, f=1MHz	400typ	pF

∗h_{FE} Rank $\overline{O}$(50 to 100), P(70 to 140), Y(90 to 180)

■**Typical Switching Characteristics (Common Emitter)**

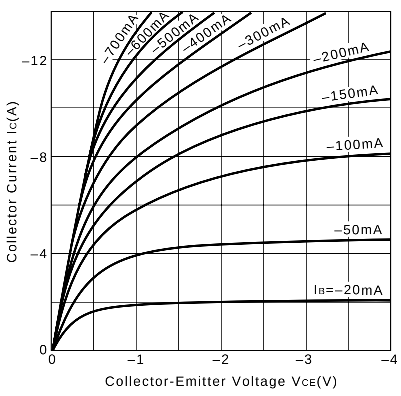
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (µs)	tstg (µs)	tf (µs)
–60	12	–5	–10	5	–500	500	0.25typ	0.85typ	0.2typ

External Dimensions MT-100(TO3P)

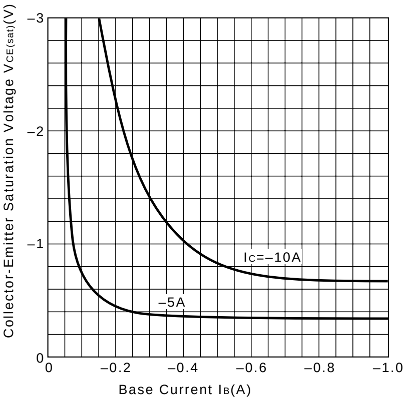


Weight : Approx 6.0g
a. Part No.
b. Lot No.

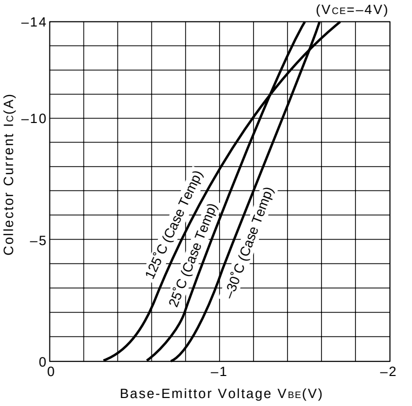
I_C–V_{CE} Characteristics (Typical)



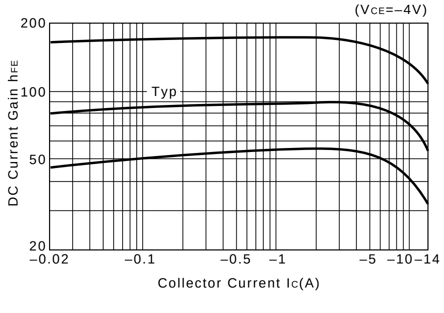
$V_{CE(sat)}$–I_B Characteristics (Typical)



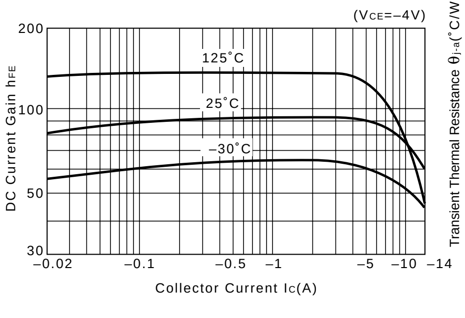
I_C–V_{BE} Temperature Characteristics (Typical)



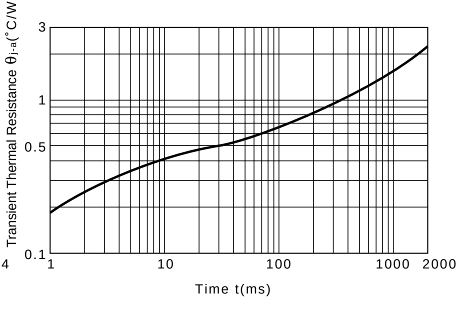
h_{FE}–I_C Characteristics (Typical)



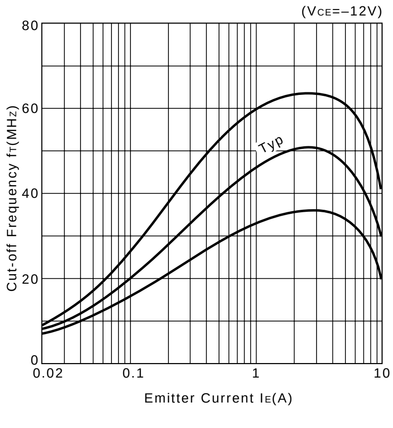
h_{FE}–I_C Temperature Characteristics (Typical)



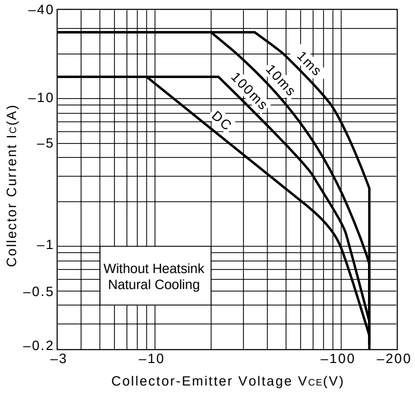
θ_{j-a}–t Characteristics



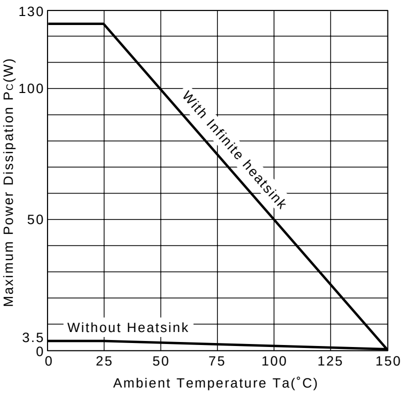
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C–T_a Derating



LAPT 2SA1386/1386A

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC3519/A)

Application : Audio and General Purpose

■**Absolute maximum ratings** (Ta=25°C)

Symbol	Ratings		Unit
	2SA1386	2SA1386A	
V_{CBO}	–160	–180	V
V_{CEO}	–160	–180	V
V_{EBO}	–5		V
I_C	–15		A
I_B	–4		A
P_C	130(T_C=25°C)		W
Tj	150		°C
Tstg	–55 to +150		°C

■**Electrical Characteristics** (Ta=25°C)

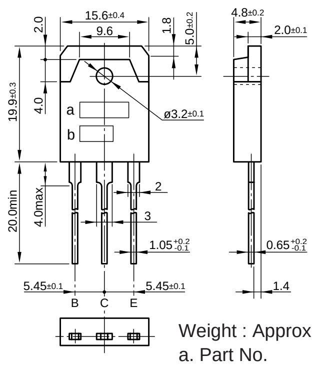
Symbol	Conditions		Ratings		Unit
			2SA1386	2SA1386A	
I_{CBO}			–100max	–100max	μA
		V_{CB}=	–160	–180	V
I_{EBO}	V_{EB}=–5V		–100max		μA
$V_{(BR)CEO}$	I_C=–25mA		–160min	–180min	V
h_{FE}	V_{CE}=–4V, I_C=–5A		50min*		
$V_{CE(sat)}$	I_C=–5A, I_B=–0.5A		–2.0max		V
f_T	V_{CE}=–12V, I_E=2A		40typ		MHz
C_{OB}	V_{CB}=–10V, f=1MHz		500typ		pF

*h_{FE} Rank $\overline{\text{O}}$(50 to 100), P(70 to 140), Y(90 to 180)

■**Typical Switching Characteristics (Common Emitter)**

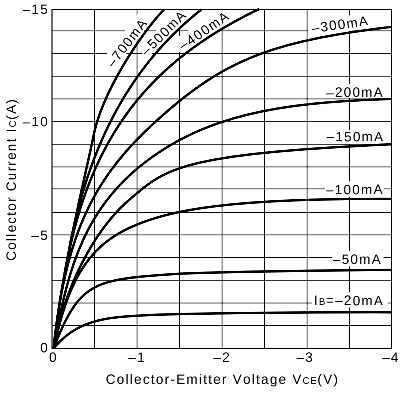
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
–40	4	–10	–10	5	–1	1	0.3typ	0.7typ	0.2typ

External Dimensions MT-100(TO3P)

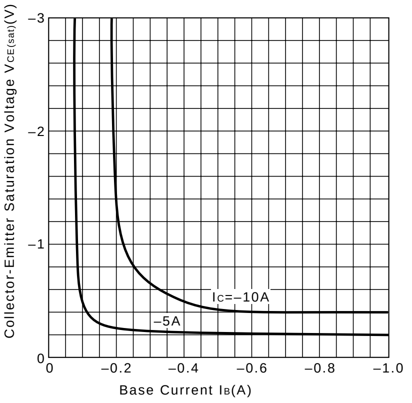


Weight : Approx 6.0g
a. Part No.
b. Lot No.

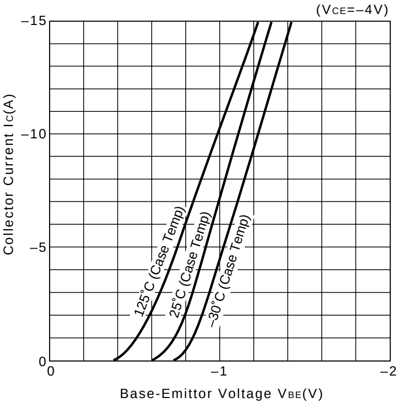
I_C–V_{CE} Characteristics (Typical)



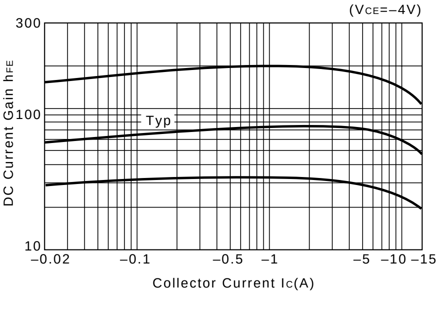
V_{CE}(sat)–I_B Characteristics (Typical)



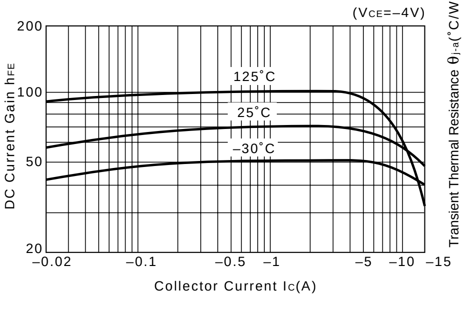
I_C–V_{BE} Temperature Characteristics (Typical)



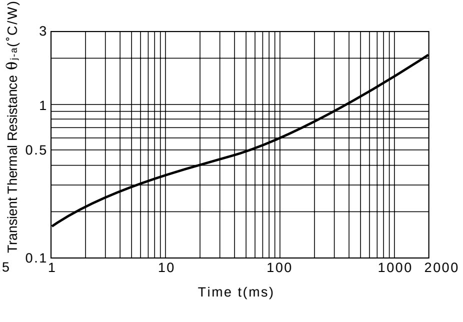
h_{FE}–I_C Characteristics (Typical)



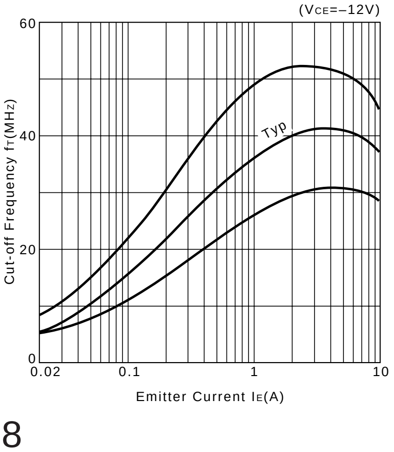
h_{FE}–I_C Temperature Characteristics (Typical)



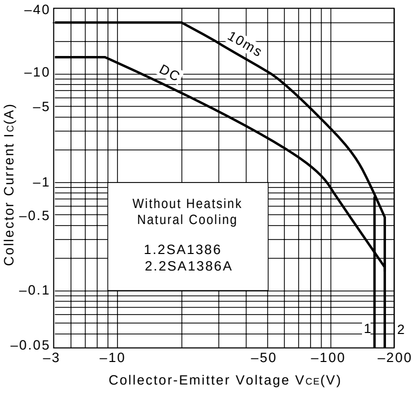
$\theta_{j\text{-}a}$–t Characteristics



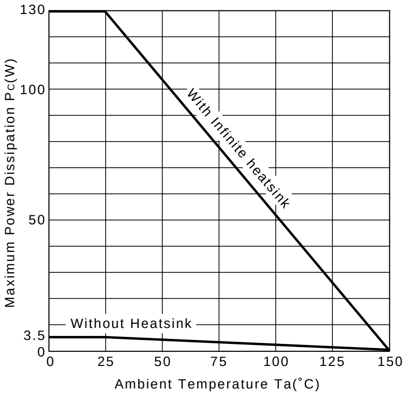
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C–Ta Derating



2SA1488/1488A

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC3851/A)

Application : Audio and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings		Unit
	2SA1488	2SA1488A	
V_{CBO}	–60	–80	V
V_{CEO}	–60	–80	V
V_{EBO}	–6		V
I_C	–4		A
I_B	–1		A
P_C	25(T_C=25°C)		W
Tj	150		°C
Tstg	–55 to +150		°C

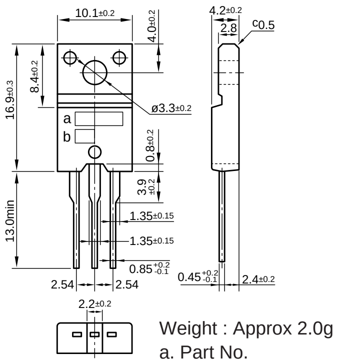
■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings		Unit
		2SA1488	2SA1488A	
I_{CBO}		–100max	–100max	μA
	V_{CB}=	–60	–80	V
I_{EBO}	V_{EB}=–6V	–100max		μA
$V_{(BR)CEO}$	I_C=–25mA	–60min	–80min	V
h_{FE}	V_{CE}=–4V, I_C=–1A	40min		
$V_{CE(sat)}$	I_C=–2A, I_B=–0.2A	–0.5max		V
f_T	V_{CE}=–12V, I_E=0.2A	15typ		MHz
C_{OB}	V_{CB}=–10V, f=1MHz	90typ		pF

■Typical Switching Characteristics (Common Emitter)

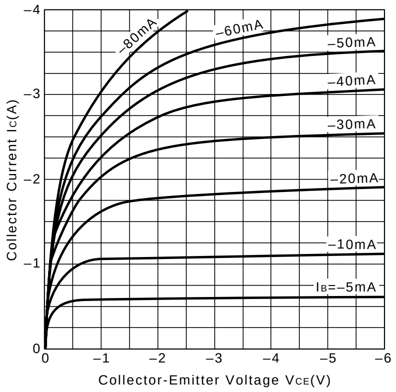
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (μs)	tstg (μs)	tf (μs)
–12	6	–2	–10	5	–200	200	0.25typ	0.75typ	0.25typ

External Dimensions FM20 (TO220F)

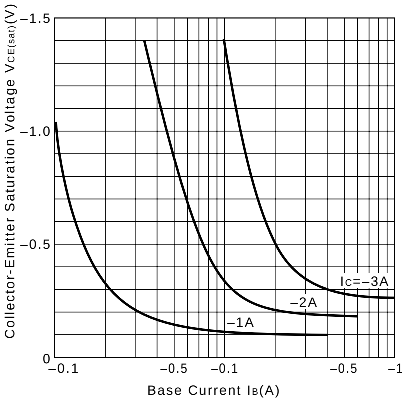


Weight : Approx 2.0g
a. Part No.
b. Lot No.

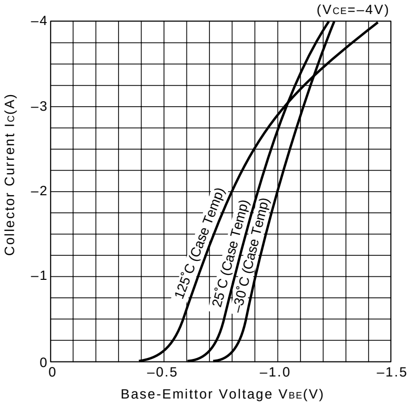
I_C–V_{CE} Characteristics (Typical)



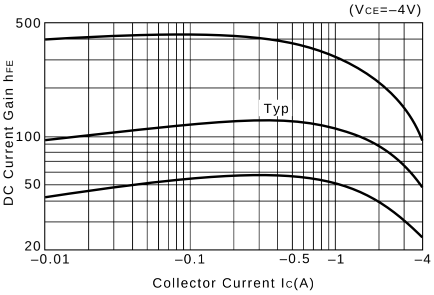
$V_{CE(sat)}$–I_B Characteristics (Typical)



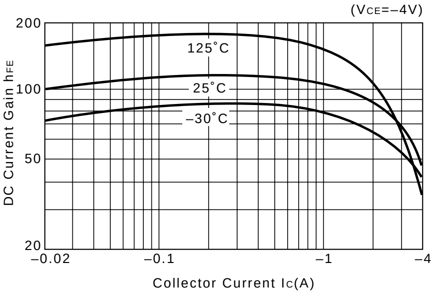
I_C–V_{BE} Temperature Characteristics (Typical)



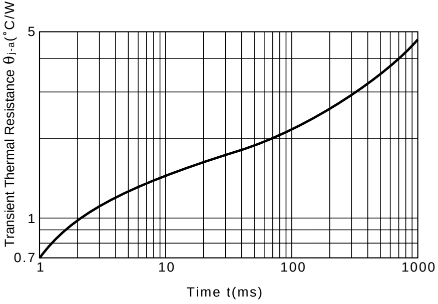
h_{FE}–I_C Characteristics (Typical)



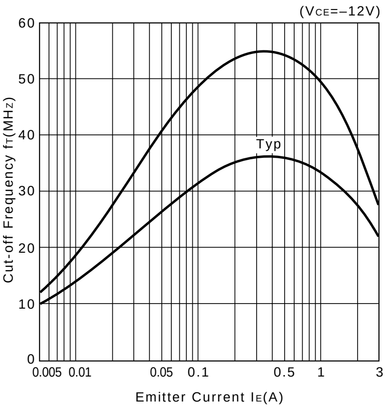
h_{FE}–I_C Temperature Characteristics (Typical)



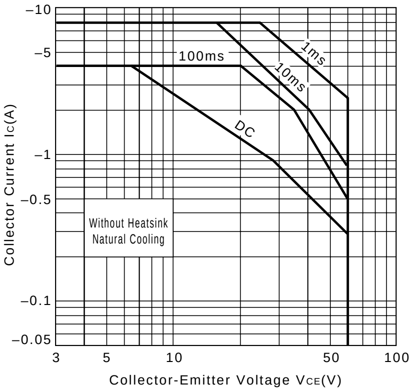
θ_{j-a}–t Characteristics



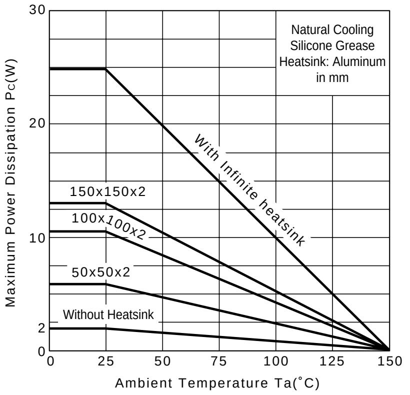
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C–Ta Derating



2SA1492

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC3856)

Application : Audio and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	–180	V
V_{CEO}	–180	V
V_{EBO}	–6	V
I_C	–15	A
I_B	–4	A
P_C	130(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

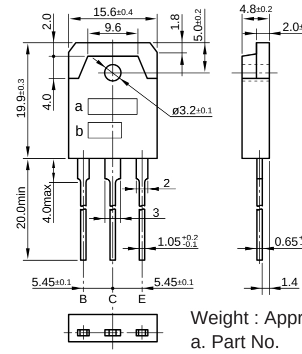
Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=–180V	–100max	μA
I_{EBO}	V_{EB}=–6V	–100max	μA
$V_{(BR)CEO}$	I_C=–50mA	–180min	V
h_{FE}	V_{CE}=–4V, I_C=–3A	50min*	
V_{CE}(sat)	I_C=–5A, I_B=–0.5A	–2.0max	V
f_T	V_{CE}=–12V, I_E=0.5A	20typ	MHz
C_{OB}	V_{CB}=–10V, f=1MHz	500typ	pF

*h_{FE} Rank O(50to100), P(70to140), Y(90to180)

■Typical Switching Characteristics (Common Emitter)

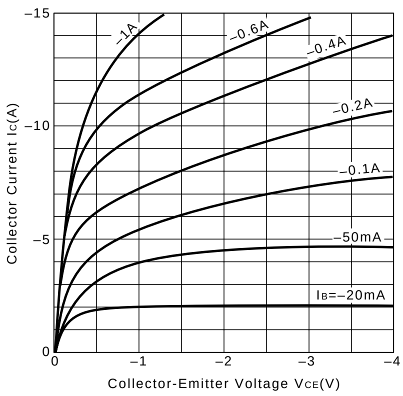
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
–40	4	–10	–10	5	–1	1	0.6typ	0.9typ	0.2typ

External Dimensions MT-100(TO3P)

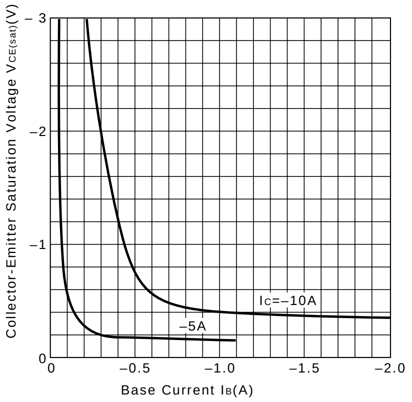


Weight : Approx 6.0g
a. Part No.
b. Lot No.

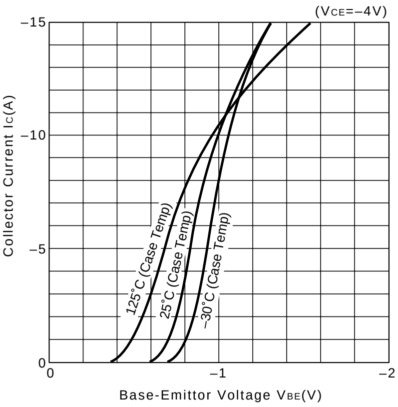
I_C–V_{CE} Characteristics (Typical)



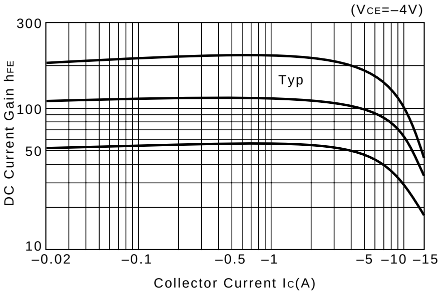
V_{CE}(sat)–I_B Characteristics (Typical)



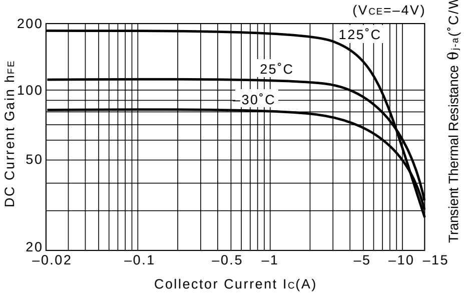
I_C–V_{BE} Temperature Characteristics (Typical)



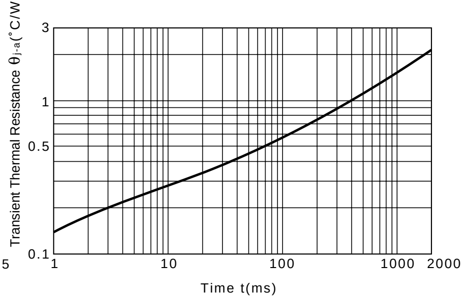
h_{FE}–I_C Characteristics (Typical)



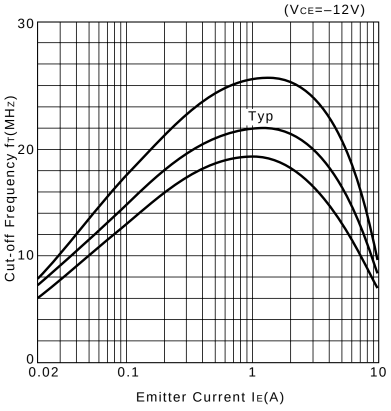
h_{FE}–I_C Temperature Characteristics (Typical)



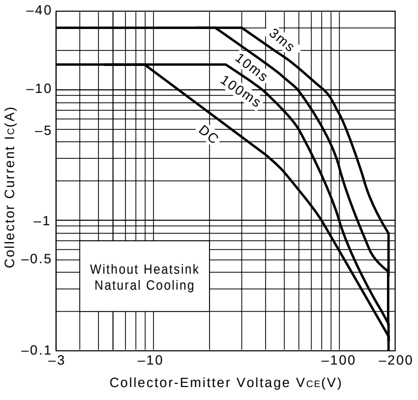
$\theta_{j\text{-}a}$–t Characteristics



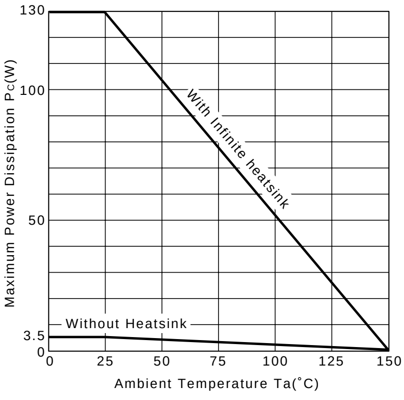
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



Pc–Ta Derating



2SA1493

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC3857)

Application : Audio and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	–200	V
V_{CEO}	–200	V
V_{EBO}	–6	V
I_C	–15	A
I_B	–5	A
P_C	150(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

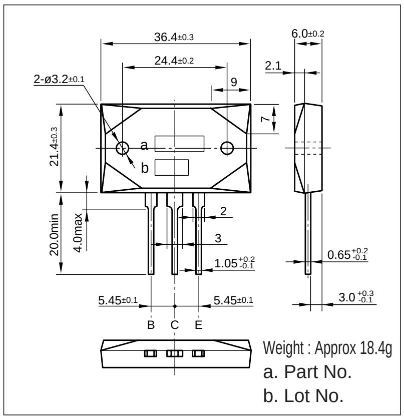
Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=–200V	–100max	μA
I_{EBO}	V_{EB}=–6V	–100max	μA
$V_{(BR)CEO}$	I_C=–50mA	–200min	V
h_{FE}	V_{CE}=–4V, I_C=–5A	50min*	
V_{CE}(sat)	I_C=–10A, I_B=–1A	– 3.0max	V
f_T	V_{CE}=–12V, I_E=0.5A	20typ	MHz
C_{OB}	V_{CB}=–10V, f=1MHz	400typ	pF

*h_{FE} Rank O(50to100), P(70to140), Y(90to180)

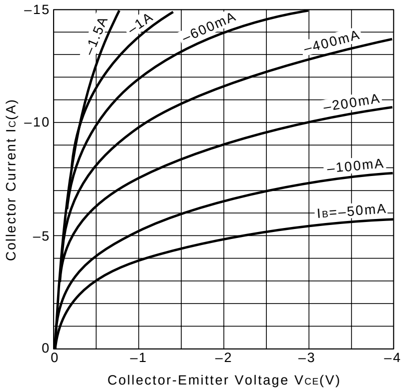
■Typical Switching Characteristics (Common Emitter)

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (μs)	tstg (μs)	tf (μs)
–60	12	–5	–10	5	–500	500	0.3typ	0.9typ	0.2typ

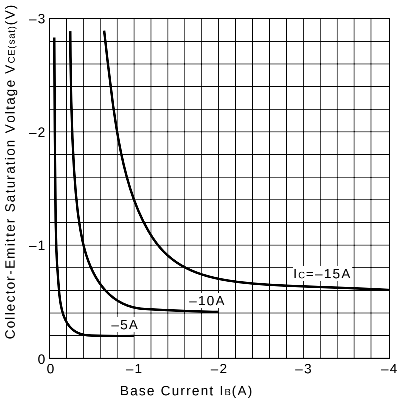
External Dimensions MT-200



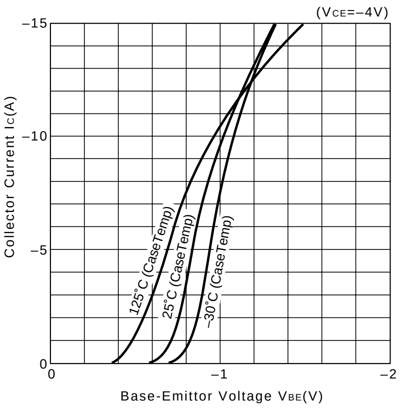
I_C–V_{CE} Characteristics (Typical)



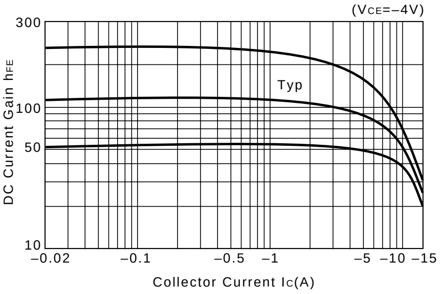
V_{CE}(sat)–I_B Characteristics (Typical)



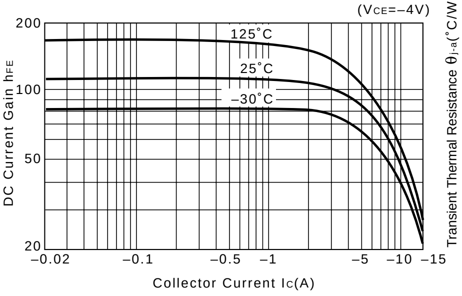
I_C–V_{BE} Temperature Characteristics (Typical)



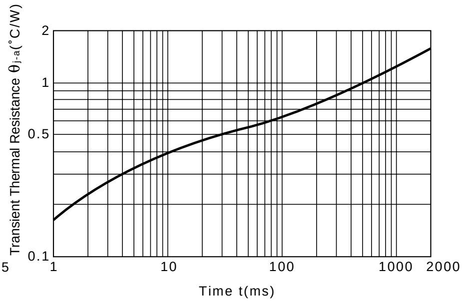
h_{FE}–I_C Characteristics (Typical)



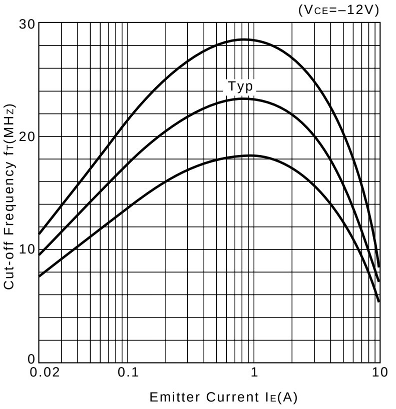
h_{FE}–I_C Temperature Characteristics (Typical)



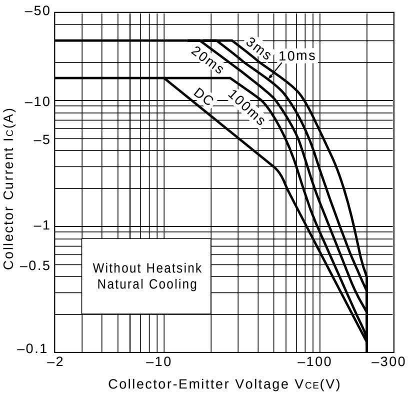
θ_{j-a}–t Characteristics



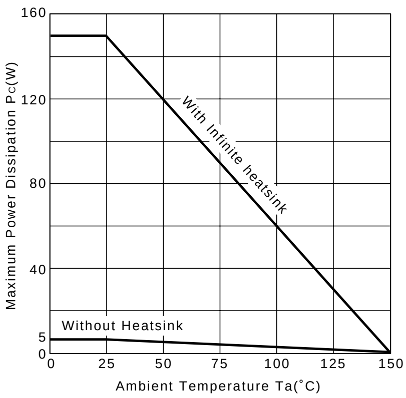
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



Pc–Ta Derating



2SA1494

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC3858)

Application : Audio and General Purpose

■**Absolute maximum ratings** (Ta=25°C)

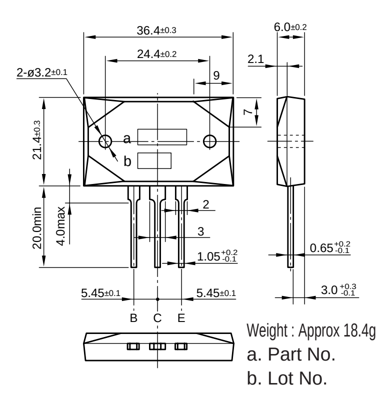
Symbol	Ratings	Unit
V_{CBO}	–200	V
V_{CEO}	–200	V
V_{EBO}	–6	V
I_C	–17	A
I_B	–5	A
P_C	200(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=–200V	–100max	μA
I_{EBO}	V_{EB}=–6V	–100max	μA
$V_{(BR)CEO}$	I_C=–50mA	–200min	V
h_{FE}	V_{CE}=–4V, I_C=–8A	50min*	
$V_{CE(sat)}$	I_C=–10A, I_B=–1A	–2.5max	V
f_T	V_{CE}=–12V, I_E=1A	20typ	MHz
C_{OB}	V_{CB}=–10V, f=1MHz	500typ	pF

*h_{FE} Rank Y(50 to 100), P(70 to 140), G(90 to 180)

External Dimensions MT-200

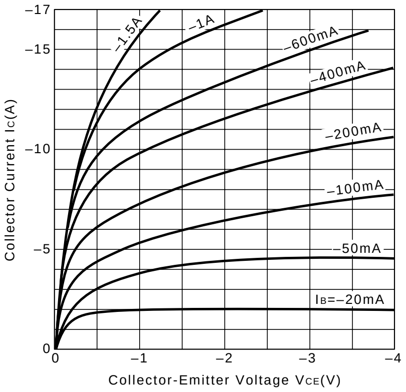


Weight : Approx 18.4g
a. Part No.
b. Lot No.

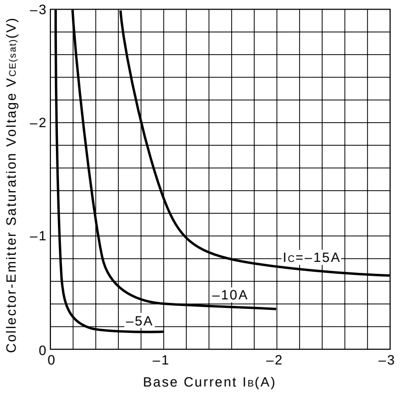
■**Typical Switching Characteristics (Common Emitter)**

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
–40	4	–10	–10	5	–1	1	0.6typ	0.9typ	0.2typ

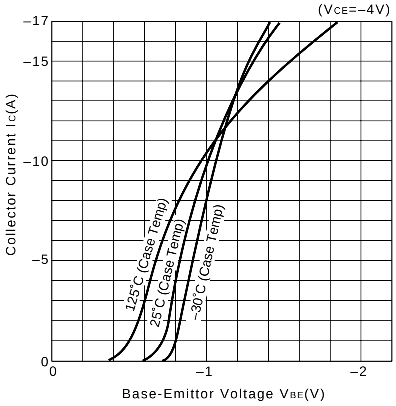
I_C–V_{CE} Characteristics (Typical)



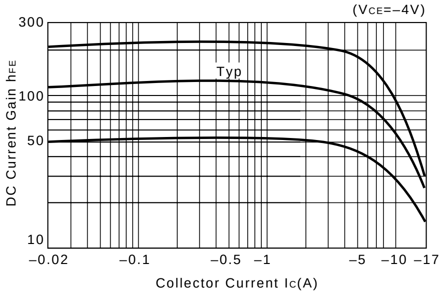
$V_{CE(sat)}$–I_B Characteristics (Typical)



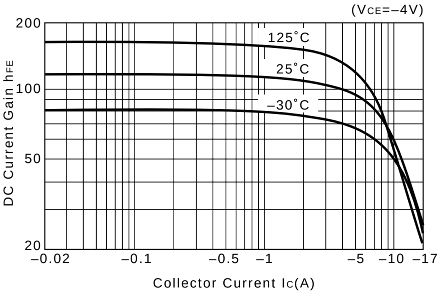
I_C–V_{BE} Temperature Characteristics (Typical)



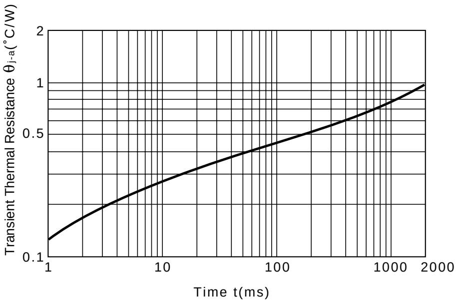
h_{FE}–I_C Characteristics (Typical)



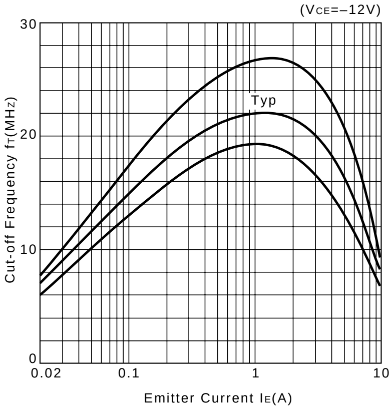
h_{FE}–I_C Temperature Characteristics (Typical)



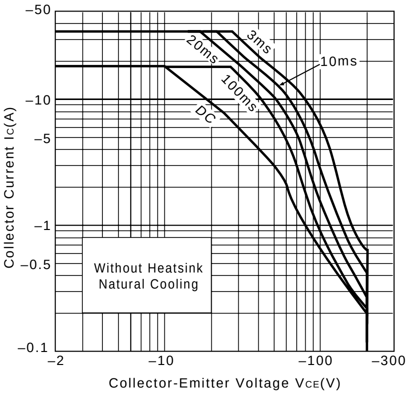
θ_{j-a}–t Characteristics



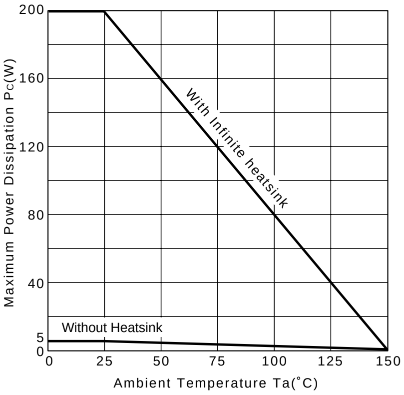
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C–Ta Derating



Low VCE (sat)

2SA1567

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC4064)

Application : DC Motor Driver, Chopper Regulator and General Purpose

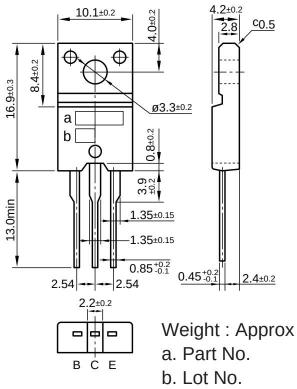
■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	–50	V
V_{CEO}	–50	V
V_{EBO}	–6	V
I_C	–12	A
I_B	–3	A
P_C	35(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=–50V	–100max	µA
I_{EBO}	V_{EB}=–6V	–100max	µA
$V_{(BR)CEO}$	I_C=–25mA	–50min	V
h_{FE}	V_{CE}=–1V, I_C=–6A	50min	
V_{CE}(sat)	I_C=–6A, I_B=–0.3A	–0.35max	V
f_T	V_{CE}=–12V, I_E=0.5A	40typ	MHz
C_{OB}	V_{CB}=–10V, f=1MHz	330typ	pF

External Dimensions FM20 (TO220F)

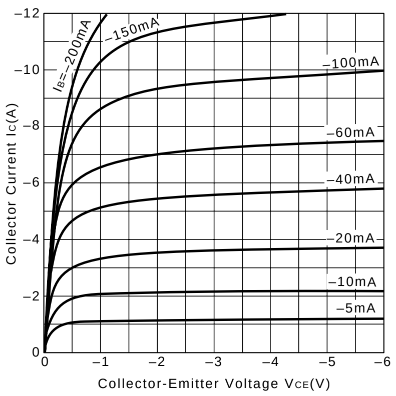


Weight : Approx 2.0g
a. Part No.
b. Lot No.

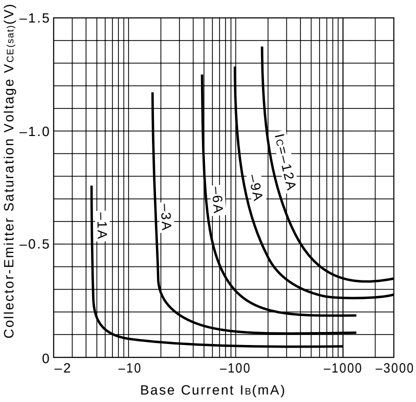
■Typical Switching Characteristics (Common Emitter)

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (µs)	tstg (µs)	tf (µs)
–24	4	–6	–10	5	–120	120	0.4typ	0.4typ	0.2typ

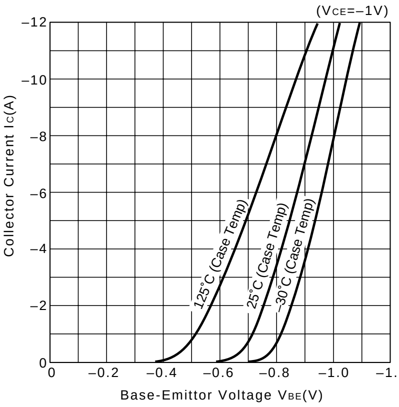
I_C–V_{CE} Characteristics (Typical)



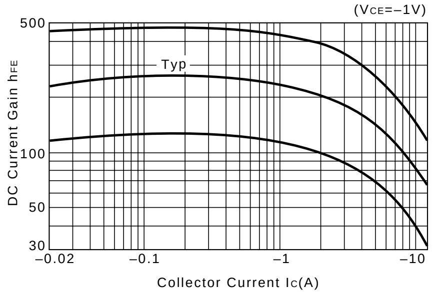
V_{CE}(sat)–I_B Characteristics (Typical)



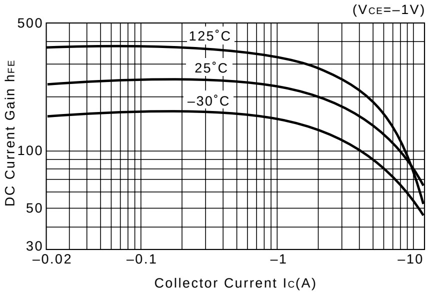
I_C–V_{BE} Temperature Characteristics (Typical)



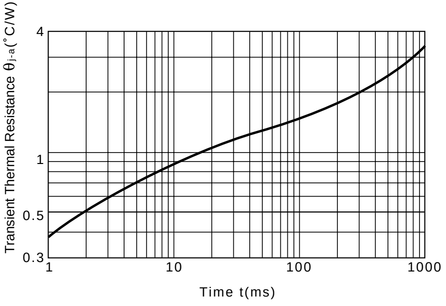
h_{FE}–I_C Characteristics (Typical)



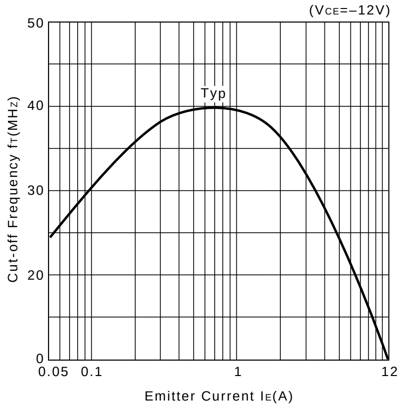
h_{FE}–I_C Temperature Characteristics (Typical)



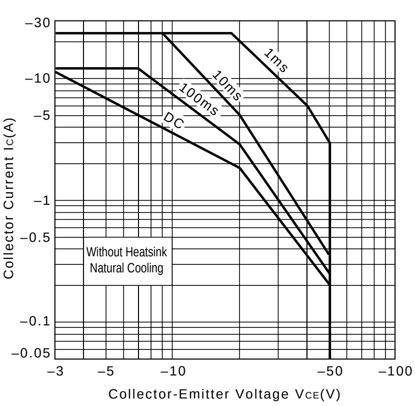
θ_{j-a}–t Characteristics



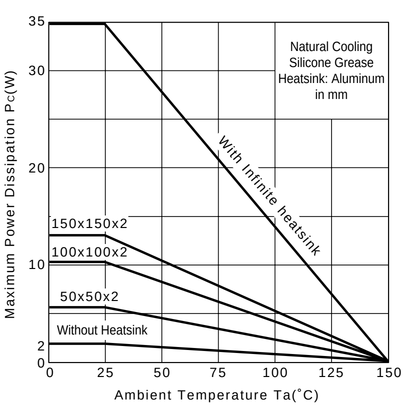
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)

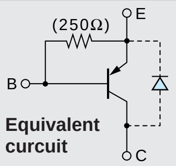


P_C–Ta Derating



Built-in Diode at C–E
Low VCE (sat)

2SA1568



Equivalent curcuit

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC4065)

Application : DC Motor Driver, Chopper Regulator and General Purpose

■**Absolute maximum ratings** (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	–60	V
V_{CEO}	–60	V
V_{EBO}	–6	V
I_C	∓12	A
I_B	–3	A
P_C	35(T_C=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

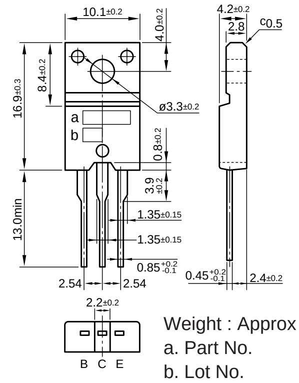
■**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=–60V	–100max	μA
I_{EBO}	V_{EB}=–6V	–60max	mA
$V_{(BR)CEO}$	I_C=–25mA	–60min	V
h_{FE}	V_{CE}=–1V, I_C=–6A	50min	
V_{CE}(sat)	I_C=–6A, I_B=–0.3A	–0.35max	V
V_{FEC}	I_{ECO}=–10A	–2.5max	V
f_T	V_{CE}=–12V, I_E=0.5A	40typ	MHz
C_{OB}	V_{CB}=–10V, f=1MHz	330typ	pF

■**Typical Switching Characteristics (Common Emitter)**

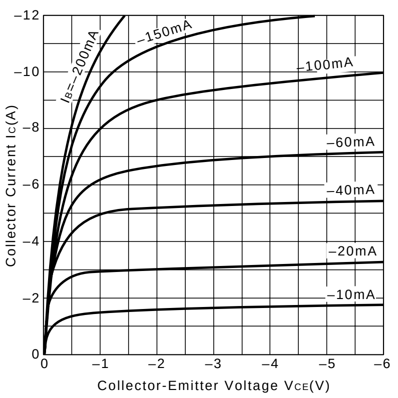
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (μs)	tstg (μs)	tf (μs)
–24	4	–6	–10	5	–120	120	0.4typ	0.4typ	0.2typ

External Dimensions FM20 (TO220F)

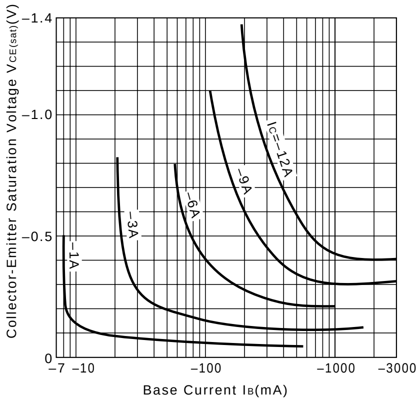


Weight : Approx 2.0g
a. Part No.
b. Lot No.

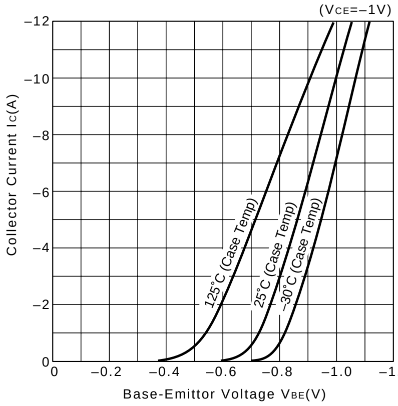
I_C–V_{CE} Characteristics (Typical)



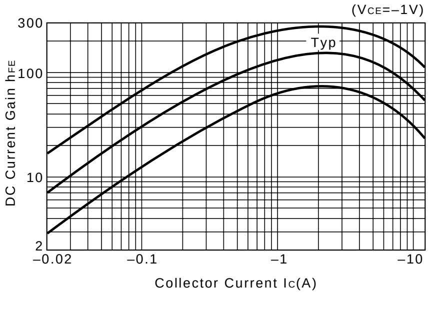
V_{CE}(sat)–I_B Characteristics (Typical)



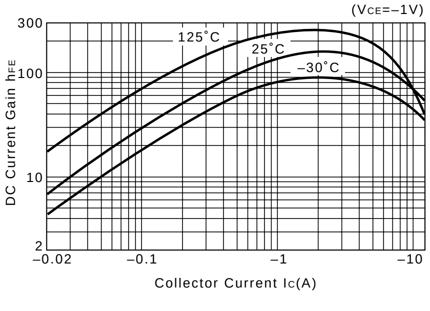
I_C–V_{BE} Temperature Characteristics (Typical)



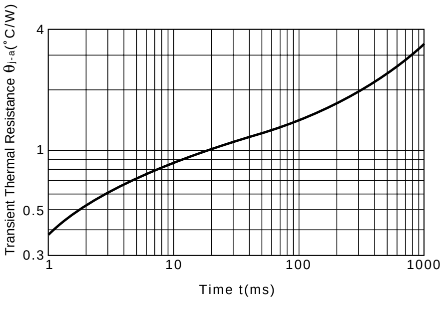
h_{FE}–I_C Characteristics (Typical)



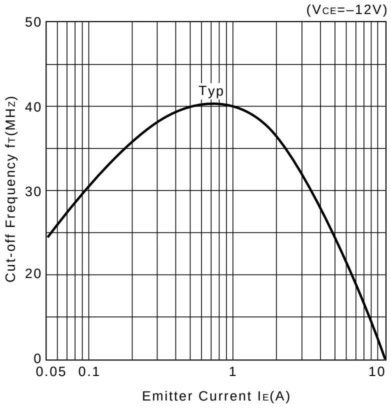
h_{FE}–I_C Temperature Characteristics (Typical)



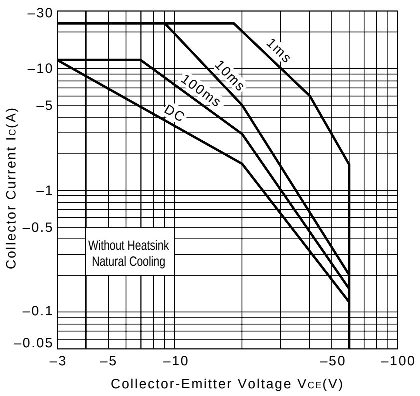
$\theta_{j\text{-}a}$–t Characteristics



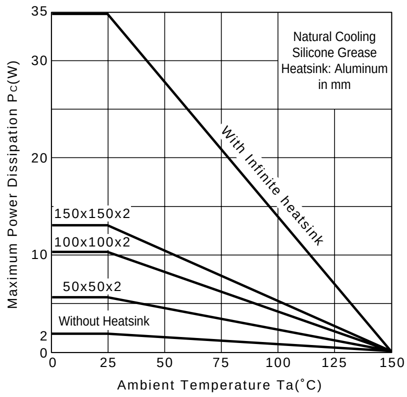
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C–Ta Derating



2SA1667/1668

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC4381/4382)

Application : TV Vertical Output, Audio Output Driver and General Purpose

■**Absolute maximum ratings** (Ta=25°C)

Symbol	Ratings		Unit
	2SA1667	2SA1668	
V_{CBO}	–150	–200	V
V_{CEO}	–150	–200	V
V_{EBO}	–6		V
I_C	–2		A
I_B	–1		A
P_C	25(Tc=25°C)		W
Tj	150		°C
Tstg	–55 to +150		°C

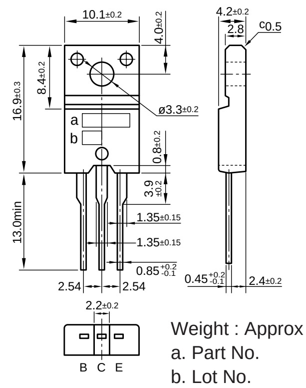
■**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions		Ratings		Unit
			2SA1667	2SA1668	
I_{CBO}			–10max	–10max	μA
		V_{CB}=	–150	–200	V
I_{EBO}	V_{EB}=–6V		–10max		μA
$V_{(BR)CEO}$	I_C=–25mA		–150min	–200min	V
h_{FE}	V_{CE}=–10V, I_C=–0.7A		60min		
$V_{CE(sat)}$	I_C=–0.7A, I_B=–0.07A		–1.0max		V
f_T	V_{CE}=–12V, I_E=0.2A		20typ		MHz
C_{OB}	V_{CB}=–10V, f=1MHz		60typ		pF

■**Typical Switching Characteristics (Common Emitter)**

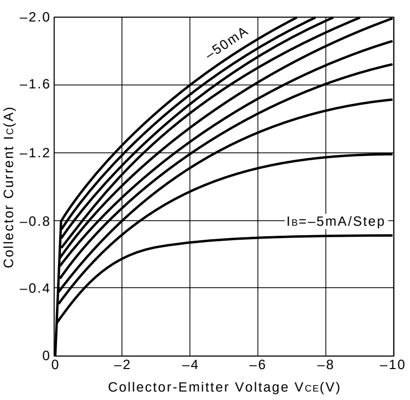
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (μs)	tstg (μs)	tf (μs)
–20	20	–1	–10	5	–100	100	0.4typ	1.5typ	0.5typ

External Dimensions FM20 (TO220F)

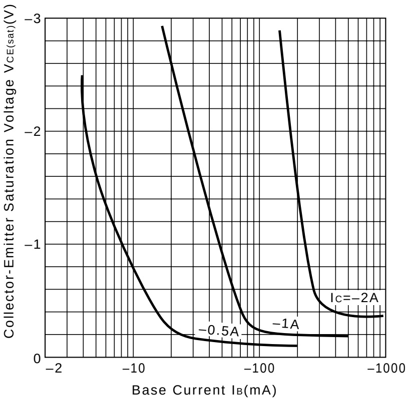


Weight : Approx 2.0g
a. Part No.
b. Lot No.

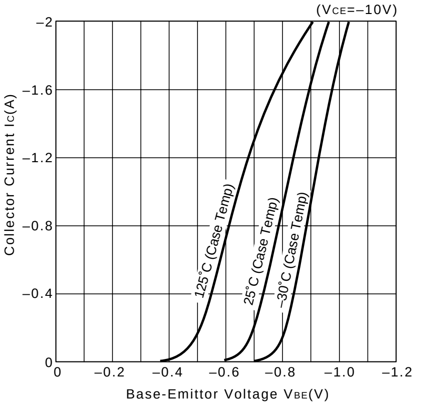
I_C–V_{CE} Characteristics (Typical)



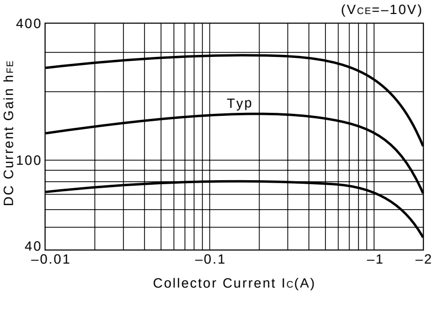
$V_{CE(sat)}$–I_B Characteristics (Typical)



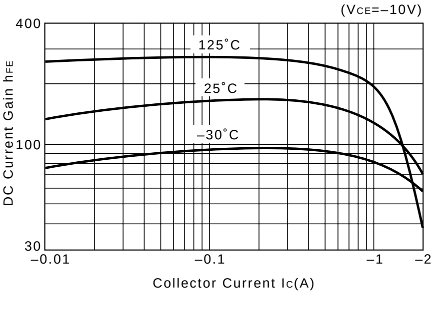
I_C–V_{BE} Temperature Characteristics (Typical)



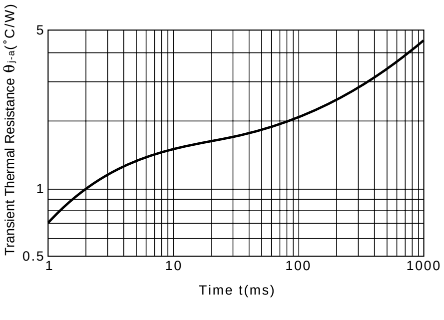
h_{FE}–I_C Characteristics (Typical)



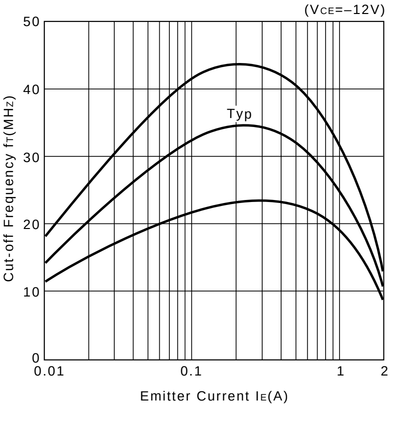
h_{FE}–I_C Temperature Characteristics (Typical)



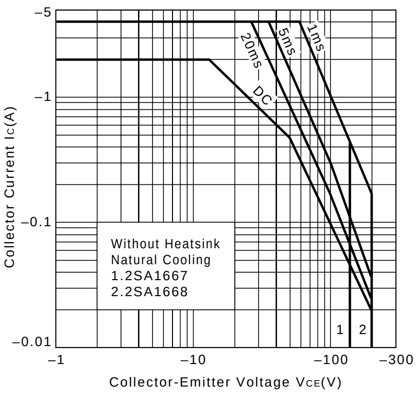
$\theta_{j\text{-}a}$–t Characteristics



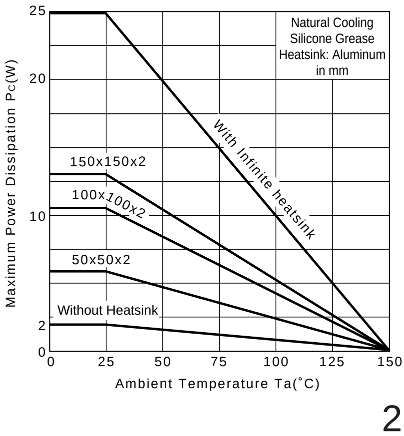
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C–Ta Derating



2SA1673

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC4388)

Application : Audio and General Purpose

■Absolute maximum ratings (Ta=25°C)

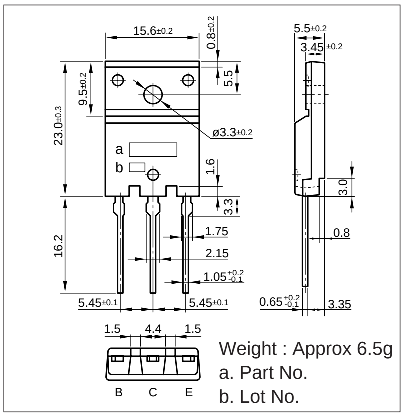
Symbol	Ratings	Unit
V_{CBO}	–180	V
V_{CEO}	–180	V
V_{EBO}	–6	V
I_C	–15	A
I_B	–4	A
P_C	85(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=–180V	–10max	µA
I_{EBO}	V_{EB}=–6V	–10max	µA
$V_{(BR)CEO}$	I_C=–50mA	–180min	V
h_{FE}	V_{CE}=–4V, I_C=–3A	50min*	
$V_{CE(sat)}$	I_C=–5A, I_B=–0.5A	–2.0max	V
f_T	V_{CE}=–12V, I_E=0.5A	20typ	MHz
C_{OB}	V_{CB}=–10V, f=1MHz	500typ	pF

*h_{FE} Rank $\overline{\text{O}}$(50to100), P(70to140), Y(90to180)

External Dimensions FM100(TO3PF)

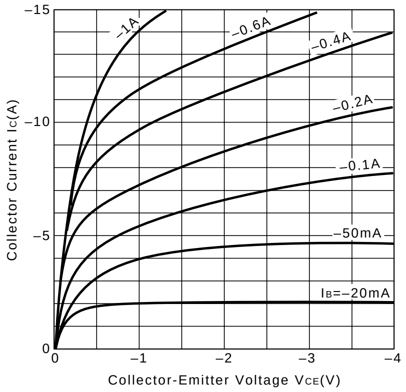


Weight : Approx 6.5g
a. Part No.
b. Lot No.

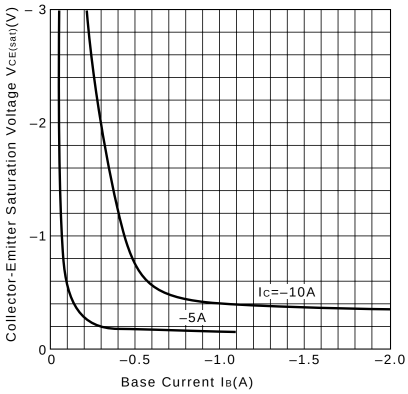
■Typical Switching Characteristics (Common Emitter)

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (µs)	tstg (µs)	tf (µs)
–40	4	–10	–10	5	–1	1	0.6typ	0.9typ	0.2typ

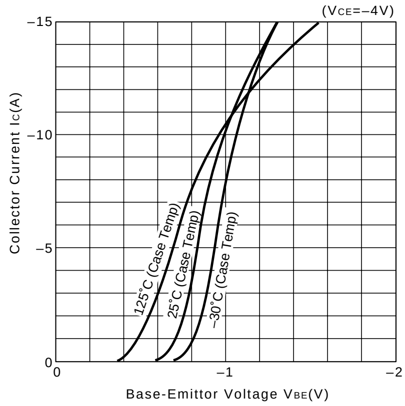
I_C–V_{CE} Characteristics (Typical)



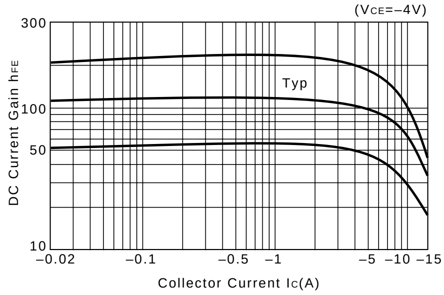
$V_{CE(sat)}$–I_B Characteristics (Typical)



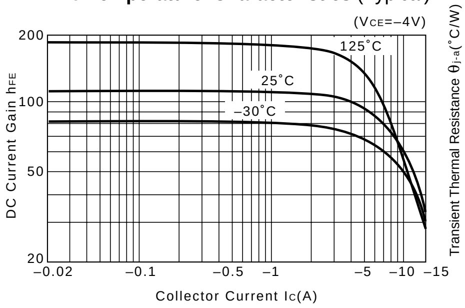
I_C–V_{BE} Temperature Characteristics (Typical)



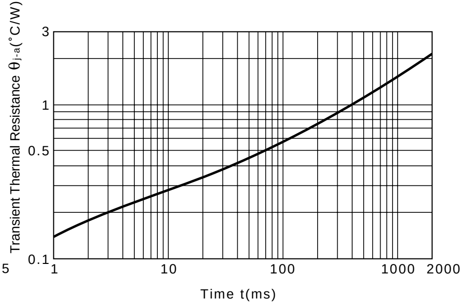
h_{FE}–I_C Characteristics (Typical)



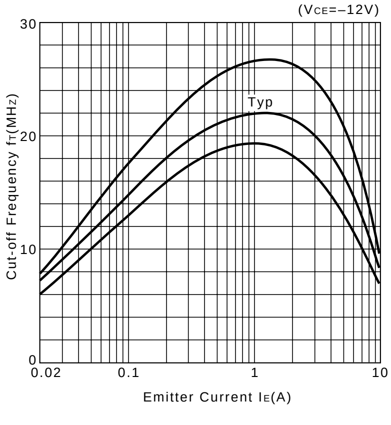
h_{FE}–I_C Temperature Characteristics (Typical)



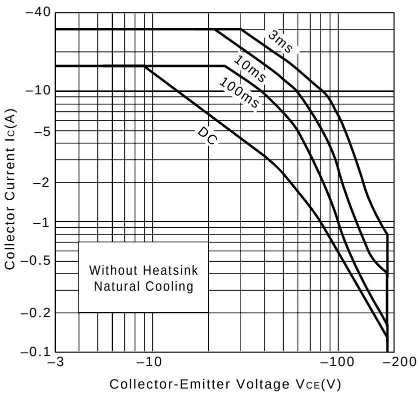
$\theta_{j\text{-}a}$–t Characteristics



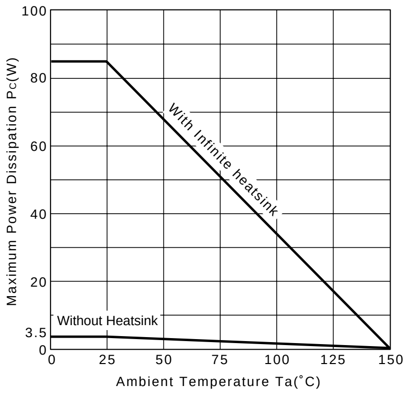
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C–Ta Derating



2SA1693

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC4466)

Application : Audio and General Purpose

■**Absolute maximum ratings** (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	–80	V
V_{CEO}	–80	V
V_{EBO}	–6	V
I_C	–6	A
I_B	–3	A
P_C	60(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■**Electrical Characteristics** (Ta=25°C)

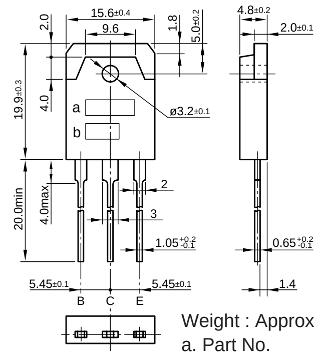
Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=–80V	–10max	μA
I_{EBO}	V_{EB}=–6V	–10max	μA
$V_{(BR)CEO}$	I_C=–50mA	–80min	V
h_{FE}	V_{CE}=–4V, I_C=–2A	50min*	
V_{CE}(sat)	I_C=–2A, I_B=–0.2A	–1.5max	V
f_T	V_{CE}=–12V, I_E=0.5A	20typ	MHz
C_{OB}	V_{CB}=–10V, f=1MHz	150typ	pF

*h_{FE} Rank $\overline{\text{O}}$(50 to 100), P(70 to 140), Y(90 to 180)

■**Typical Switching Characteristics (Common Emitter)**

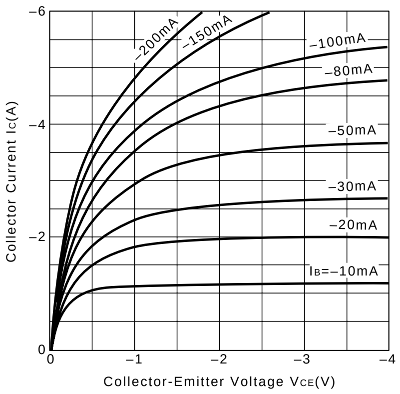
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
–30	10	–3	–10	5	–0.3	0.3	0.18typ	1.10typ	0.21typ

External Dimensions MT-100(TO3P)

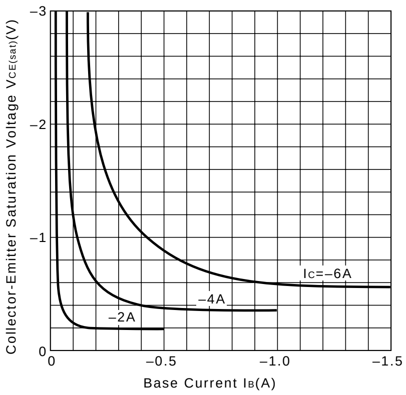


Weight : Approx 6.0g
a. Part No.
b. Lot No.

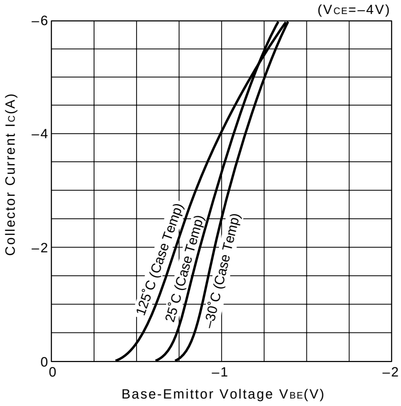
I_C–V_{CE} Characteristics (Typical)



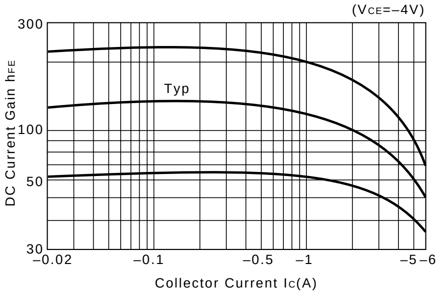
V_{CE}(sat)–I_B Characteristics (Typical)



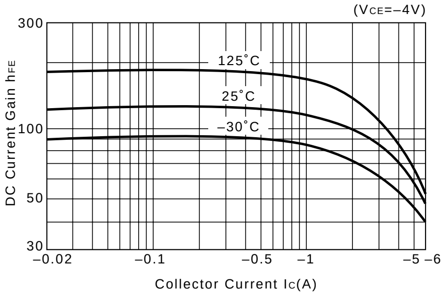
I_C–V_{BE} Temperature Characteristics (Typical)



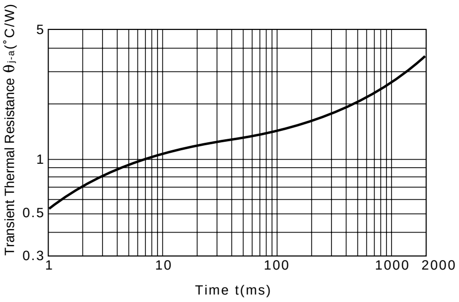
h_{FE}–I_C Characteristics (Typical)



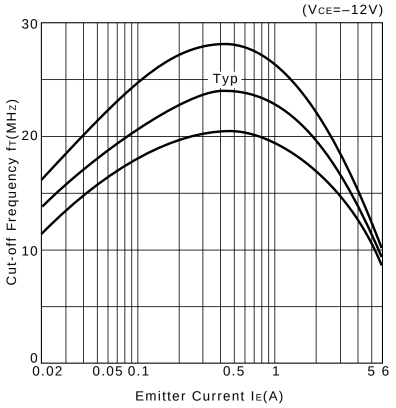
h_{FE}–I_C Temperature Characteristics (Typical)



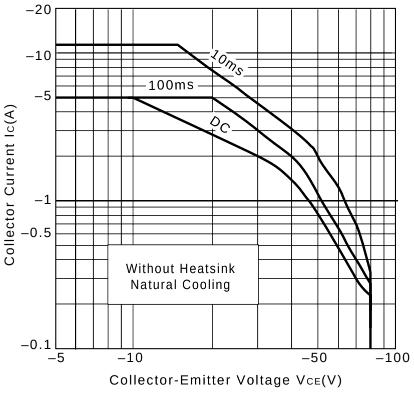
θ_{j-a}–t Characteristics



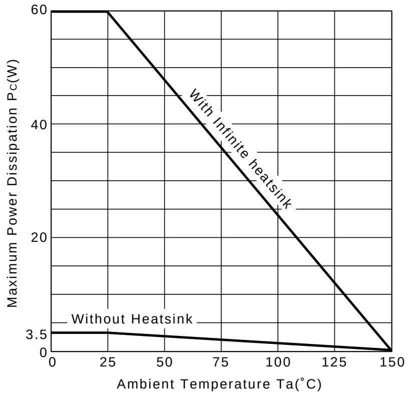
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C–Ta Derating



2SA1694

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC4467)

Application : Audio and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	–120	V
V_{CEO}	–120	V
V_{EBO}	–6	V
I_C	–8	A
I_B	–3	A
P_C	80(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

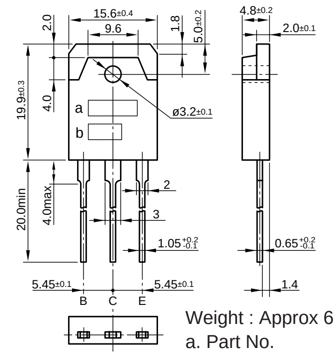
Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=–120V	–10max	µA
I_{EBO}	V_{EB}=–6V	–10max	µA
$V_{(BR)CEO}$	I_C=–50mA	–120min	V
h_{FE}	V_{CE}=–4V, I_C=–3A	50min*	
$V_{CE(sat)}$	I_C=–3A, I_B=–0.3A	–1.5max	V
f_T	V_{CE}=–12V, I_E=0.5A	20typ	MHz
C_{OB}	V_{CB}=–10V, f=1MHz	300typ	pF

*h_{FE} Rank O(50to100), P(70to140), Y(90to180)

■Typical Switching Characteristics (Common Emitter)

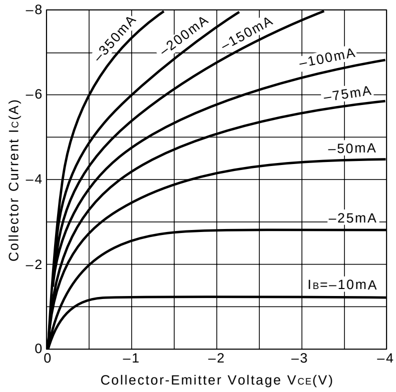
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (µs)	tstg (µs)	tf (µs)
–40	10	–4	–10	5	–0.4	0.4	0.14typ	1.40typ	0.21typ

External Dimensions MT-100(TO3P)

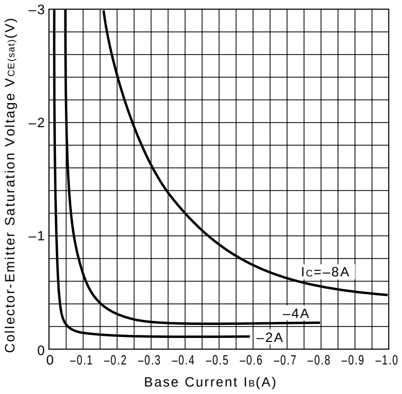


Weight : Approx 6.0g
a. Part No.
b. Lot No.

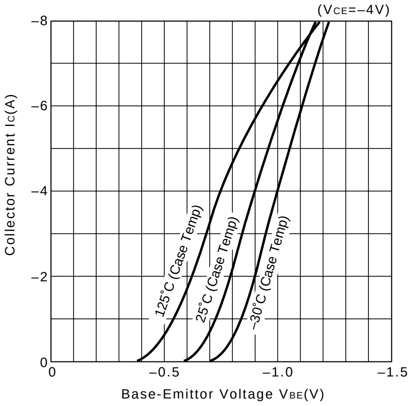
I_C–V_{CE} Characteristics (Typical)



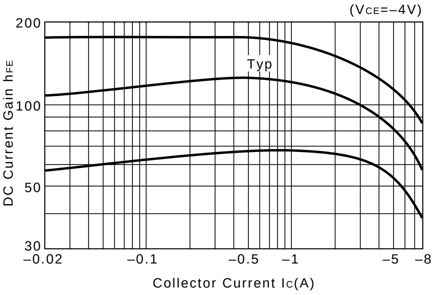
$V_{CE(sat)}$–I_B Characteristics (Typical)



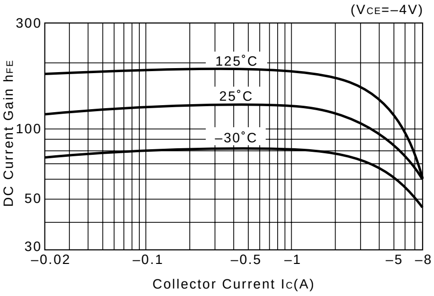
I_C–V_{BE} Temperature Characteristics (Typical)



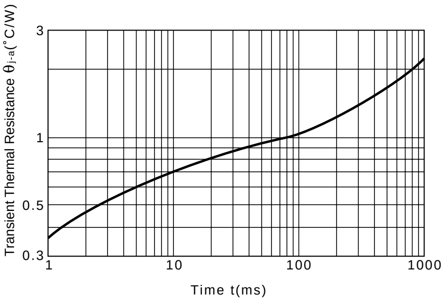
h_{FE}–I_C Characteristics (Typical)



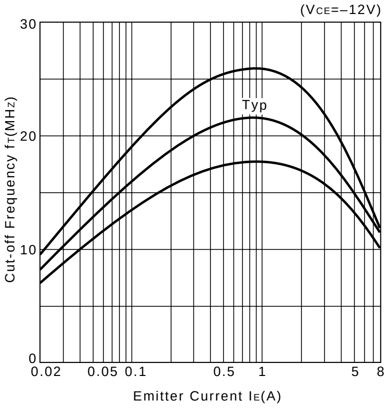
h_{FE}–I_C Temperature Characteristics (Typical)



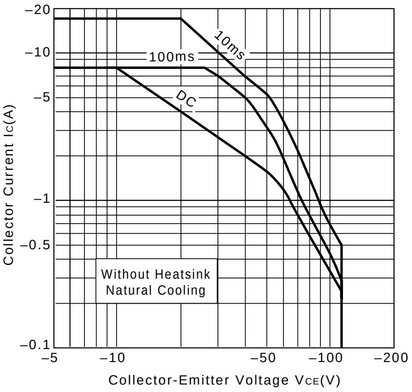
$\theta_{j\text{-}a}$–t Characteristics



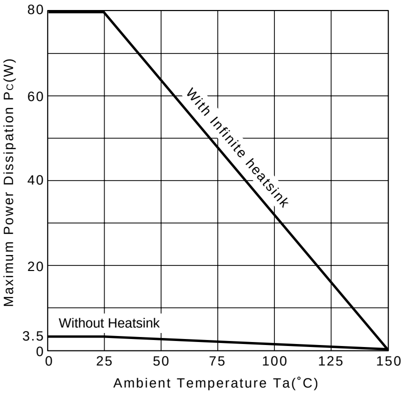
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C–Ta Derating



2SA1695

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC4468)

Application : Audio and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	–140	V
V_{CEO}	–140	V
V_{EBO}	–6	V
I_C	–10	A
I_B	–4	A
P_C	100(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

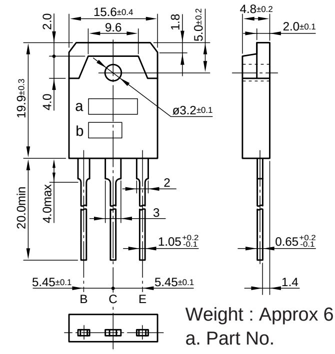
Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=–140V	–10max	μA
I_{EBO}	V_{EB}=–6V	–10max	μA
$V_{(BR)CEO}$	I_C=–50mA	–140min	V
h_{FE}	V_{CE}=–4V, I_C=–3A	50min*	
$V_{CE(sat)}$	I_C=–5A, I_B=–0.5A	–0.5max	V
f_T	V_{CE}=–12V, I_E=0.5A	20typ	MHz
C_{OB}	V_{CB}=–10V, f=1MHz	400typ	pF

*h_{FE} Rank O(50 to 100), P(70 to 140), Y(90 to 180)

■Typical Switching Characteristics (Common Emitter)

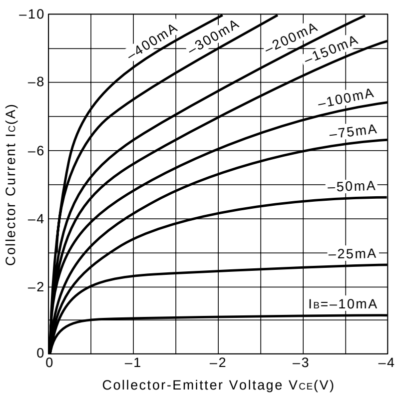
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
–60	12	–5	–10	5	–0.5	0.5	0.17typ	1.86typ	0.27typ

External Dimensions MT-100(TO3P)

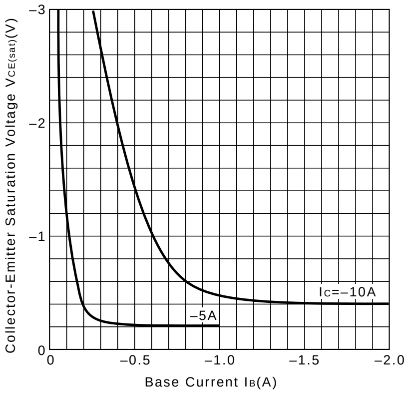


Weight : Approx 6.0g
a. Part No.
b. Lot No.

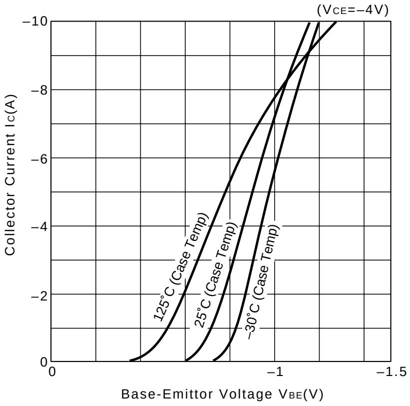
I_C–V_{CE} Characteristics (Typical)



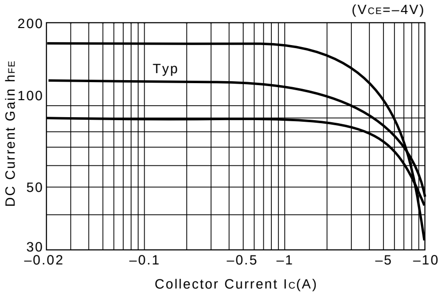
$V_{CE(sat)}$–I_B Characteristics (Typical)



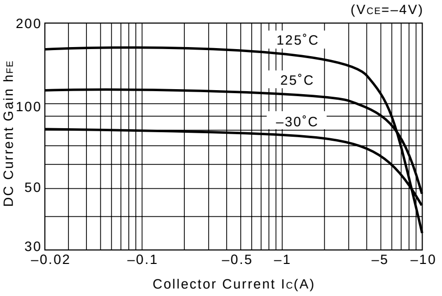
I_C–V_{BE} Temperature Characteristics (Typical)



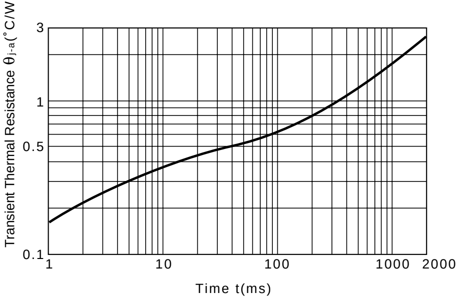
h_{FE}–I_C Characteristics (Typical)



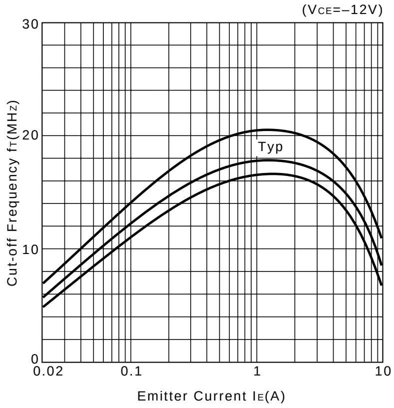
h_{FE}–I_C Temperature Characteristics (Typical)



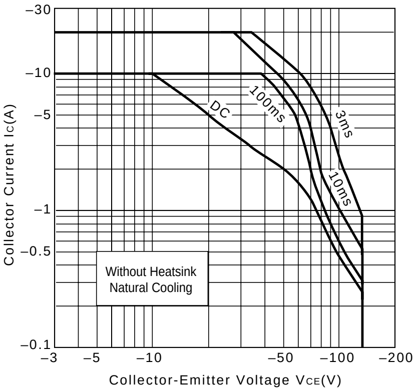
θj-a–t Characteristics



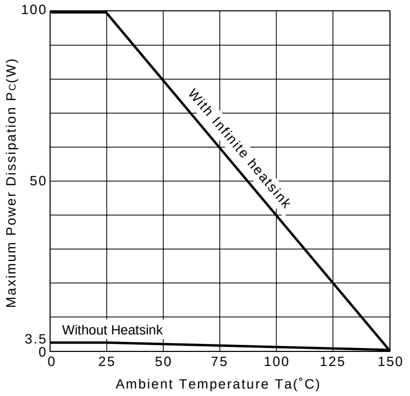
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



Pc–Ta Derating



2SA1725

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC4511)

Application : Audio and General Purpose

■Absolute maximum ratings (Ta=25°C)

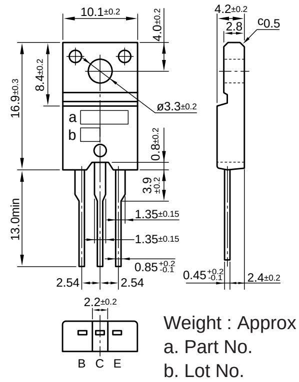
Symbol	Ratings	Unit
V_{CBO}	–80	V
V_{CEO}	–80	V
V_{EBO}	–6	V
I_C	–6	A
I_B	–3	A
P_C	30(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=–80V	–10max	μA
I_{EBO}	V_{EB}=–6V	–10max	μA
$V_{(BR)CEO}$	I_C=–25mA	–80min	V
h_{FE}	V_{CE}=–4V, I_C=–2A	50min*	
$V_{CE(sat)}$	I_C=–2A, I_B=–0.2A	–0.5max	V
f_T	V_{CE}=–12V, I_E=0.5A	20typ	MHz
C_{OB}	V_{CB}=–10V, f=1MHz	150typ	pF

*h_{FE} Rank $\overline{\text{O}}$(50 to 100), P(70 to 140), Y(90 to 180)

External Dimensions FM20(TO220F)

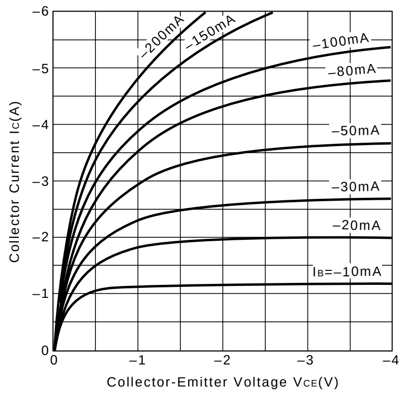


Weight : Approx 2.0g
a. Part No.
b. Lot No.

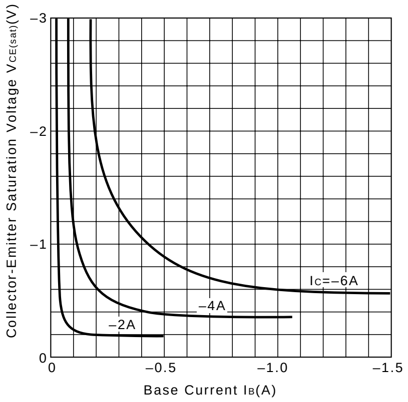
■Typical Switching Characteristics (Common Emitter)

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
–30	10	–3	–10	5	–0.3	0.3	0.18typ	1.10typ	0.21typ

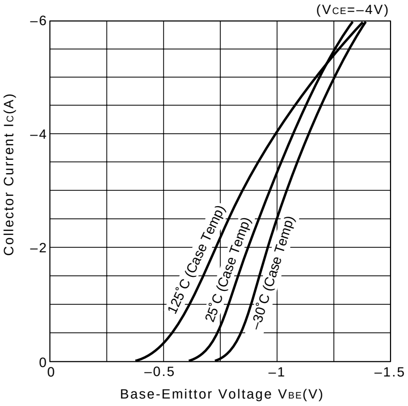
I_C–V_{CE} Characteristics (Typical)



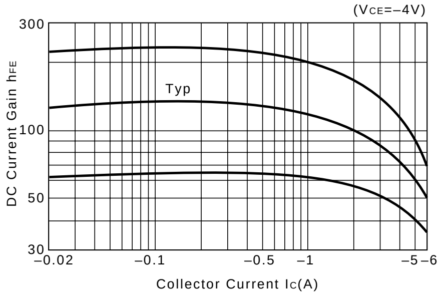
$V_{CE(sat)}$–I_B Characteristics (Typical)



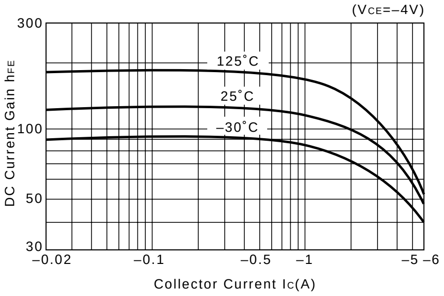
I_C–V_{BE} Temperature Characteristics (Typical)



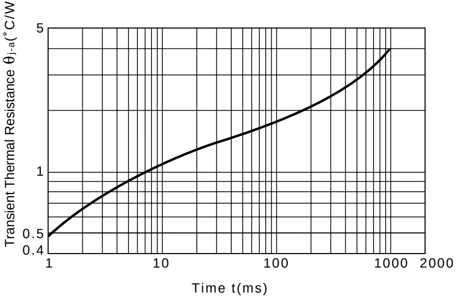
h_{FE}–I_C Characteristics (Typical)



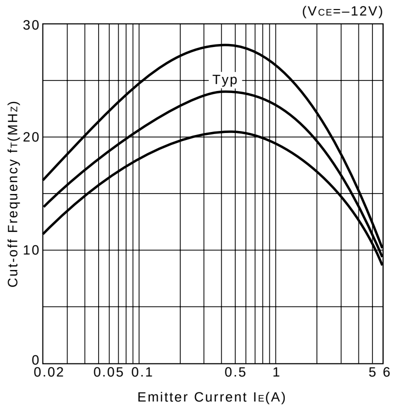
h_{FE}–I_C Temperature Characteristics (Typical)



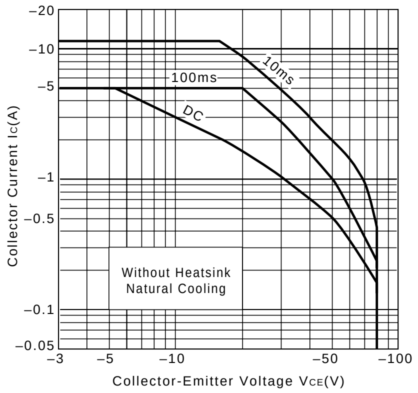
θ_{j-a}–t Characteristics



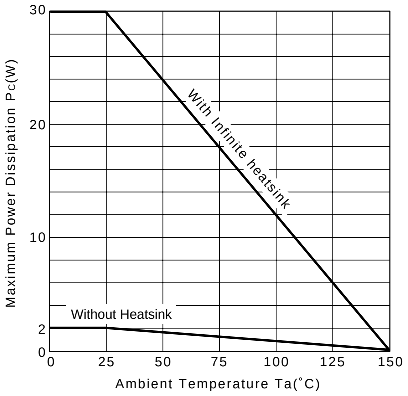
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



Pc–Ta Derating



2SA1726

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC4512)

Application : Audio and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	–80	V
V_{CEO}	–80	V
V_{EBO}	–6	V
I_C	–6	A
I_B	–3	A
P_C	50(T_C=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

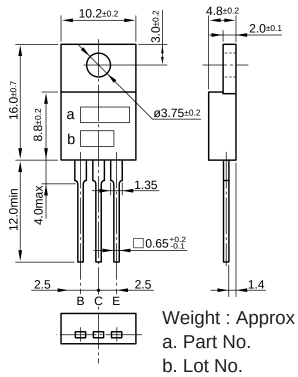
Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=–80V	–10max	μA
I_{EBO}	V_{EB}=–6V	–10max	μA
$V_{(BR)CEO}$	I_C=–25mA	–80min	V
h_{FE}	V_{CE}=–4V, I_C=–2A	50min∗	
V_{CE}(sat)	I_C=–2A, I_B=–0.2A	–0.5max	V
f_T	V_{CE}=–12V, I_E=0.5A	20typ	MHz
C_{OB}	V_{CB}=–10V, f=1MHz	150typ	pF

∗h_{FE} Rank $\overline{\text{O}}$(50 to 100), P(70 to 140), Y(90 to 180)

■Typical Switching Characteristics (Common Emitter)

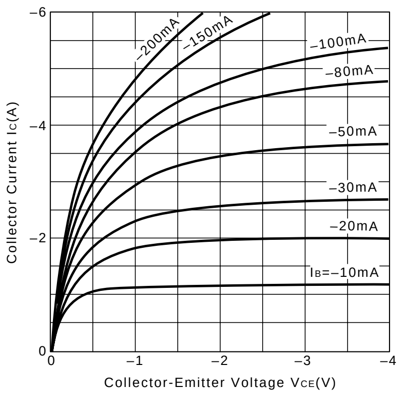
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
–30	10	–3	–10	5	–0.3	0.3	0.18typ	1.10typ	0.21typ

External Dimensions MT-25(TO220)

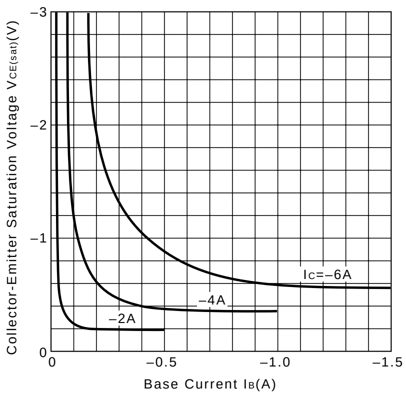


Weight : Approx 2.6g
a. Part No.
b. Lot No.

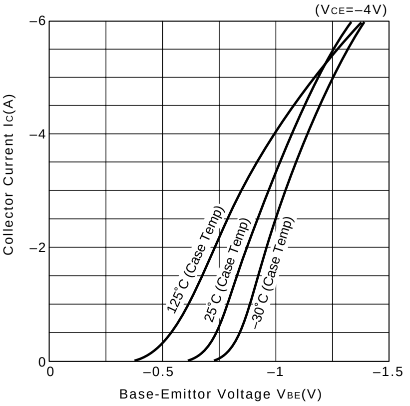
$I_C - V_{CE}$ Characteristics (Typical)



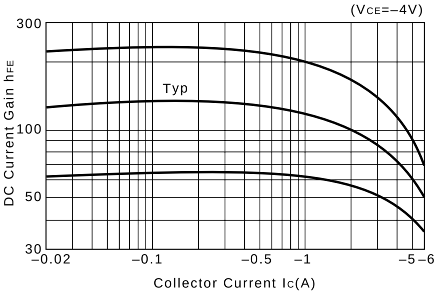
$V_{CE}(sat) - I_B$ Characteristics (Typical)



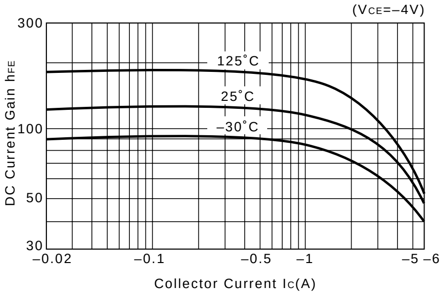
$I_C - V_{BE}$ Temperature Characteristics (Typical)



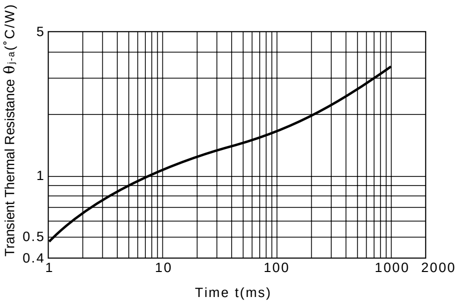
$h_{FE} - I_C$ Characteristics (Typical)



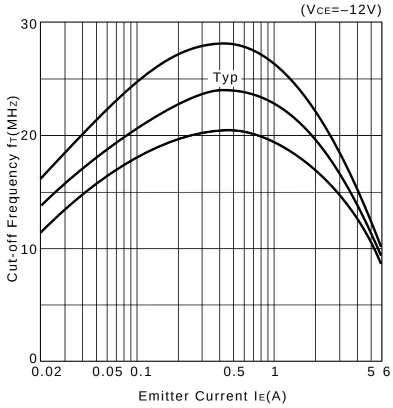
$h_{FE} - I_C$ Temperature Characteristics (Typical)



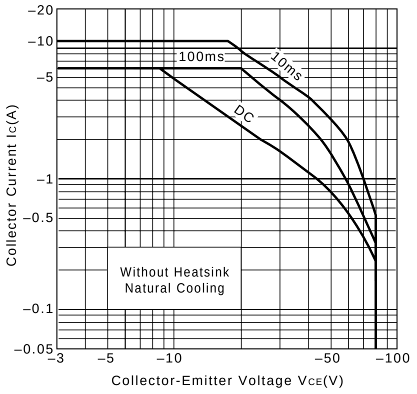
$\theta_{j-a} - t$ Characteristics



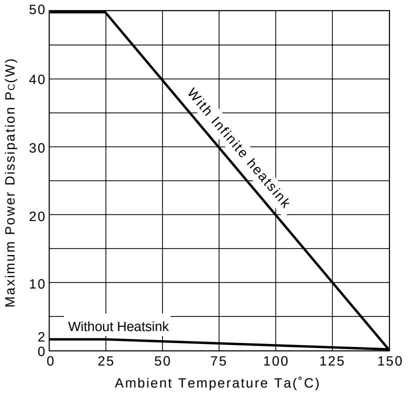
$f_T - I_E$ Characteristics (Typical)



Safe Operating Area (Single Pulse)



$P_C - T_a$ Derating



LOW V_{CE} (sat)

2SA1746

Silicon PNP Epitaxial Planar Transistor

Application : Chopper Regulator, Switch and General Purpose

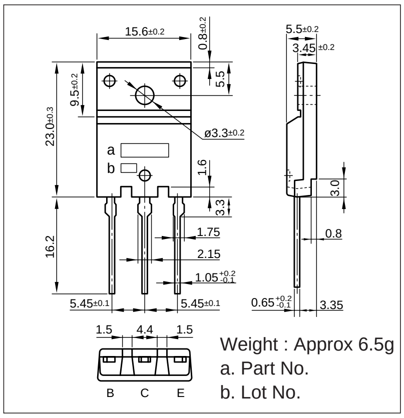
■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	–70	V
V_{CEO}	–50	V
V_{EBO}	–6	V
I_C	–12(Pulse–20)	A
I_B	–4	A
P_C	60(T_C=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=–70V	–10max	μA
I_{EBO}	V_{EB}=–6V	–10max	μA
$V_{(BR)CEO}$	I_C=–25mA	–50min	V
h_{FE}	V_{CE}=–1V, I_C=–5A	50min	
V_{CE}(sat)	I_C=–5A, I_B=–80mA	–0.5max	V
V_{BE}(sat)	I_C=–5A, I_B=–80mA	–1.2max	V
f_T	V_{CE}=–12V, I_E=1A	25typ	MHz
C_{OB}	V_{CB}=–10V, f=1MHz	400typ	pF

External Dimensions FM100(TO3PF)

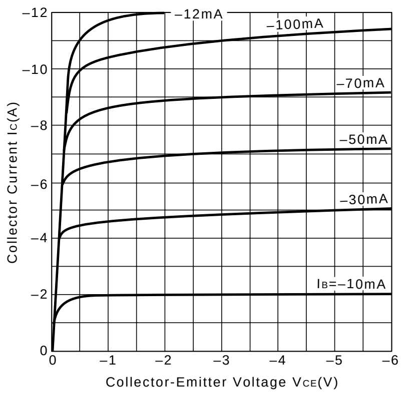


Weight : Approx 6.5g
a. Part No.
b. Lot No.

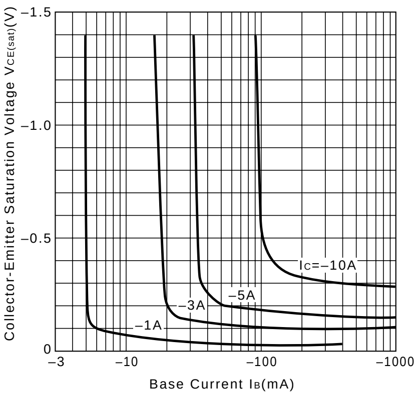
■Typical Switching Characteristics (Common Emitter)

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (μs)	tstg (μs)	tf (μs)
–20	4	–5	–10	5	–80	80	0.5typ	0.6typ	0.3typ

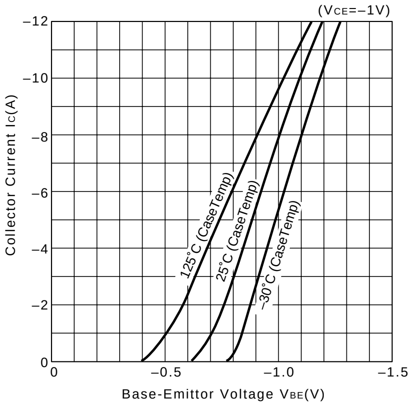
I_C–V_{CE} Characteristics (Typical)



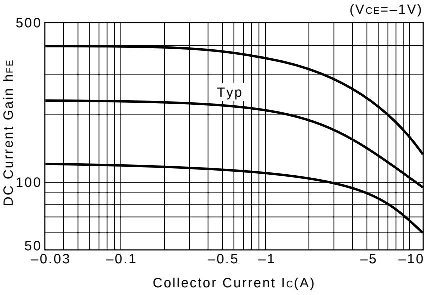
V_{CE}(sat)–I_B Characteristics (Typical)



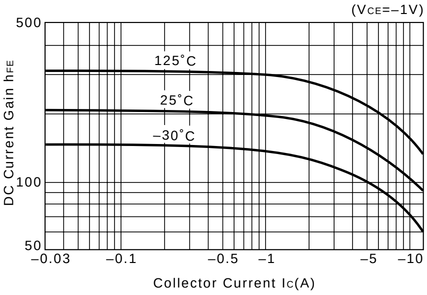
I_C–V_{BE} Temperature Characteristics (Typical)



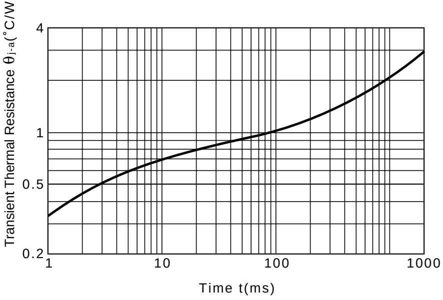
h_{FE}–I_C Characteristics (Typical)



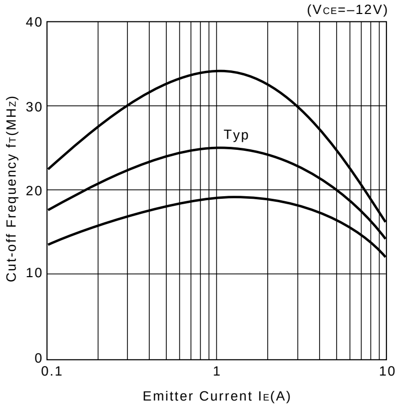
h_{FE}–I_C Temperature Characteristics (Typical)



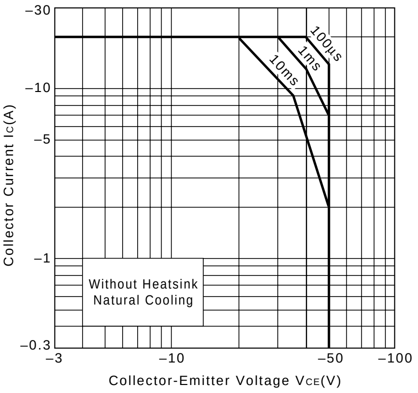
$\theta_{j\text{-}a}$–t Characteristics



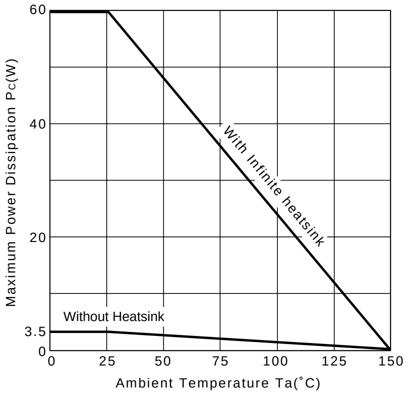
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C–Ta Derating



2SA1859/1859A

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC4883/A)

Application : Audio Output Driver and TV Velocity-modulation

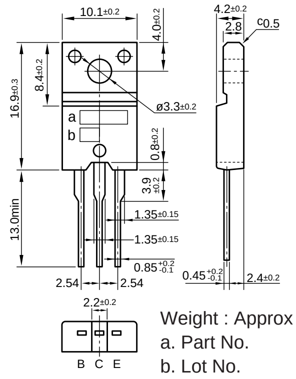
■**Absolute maximum ratings** (Ta=25°C)

Symbol	Ratings		Unit
	2SA1859	2SA1859A	
V_{CBO}	–150	–180	V
V_{CEO}	–150	–180	V
V_{EBO}	–6		V
I_C	–2		A
I_B	–1		A
P_C	20(Tc=25°C)		W
Tj	150		°C
Tstg	–55 to +150		°C

■**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions		Ratings		Unit
			2SA1859	2SA1859A	
I_{CBO}			–10max		μA
		V_{CB}=	–150	–180	V
I_{EBO}	V_{EB}=–6V		–10max		μA
$V_{(BR)CEO}$	I_C=–10mA		–150min	–180min	V
h_{FE}	V_{CE}=–10V, I_C=–0.7A		60 to 240		
$V_{CE(sat)}$	I_C=–0.7A, I_B=–70mA		–1.0max		V
f_T	V_{CE}=–12V, I_E=0.7A		60typ		MHz
C_{OB}	V_{CB}=–10V, f=1MHz		30typ		pF

External Dimensions FM20(TO220F)

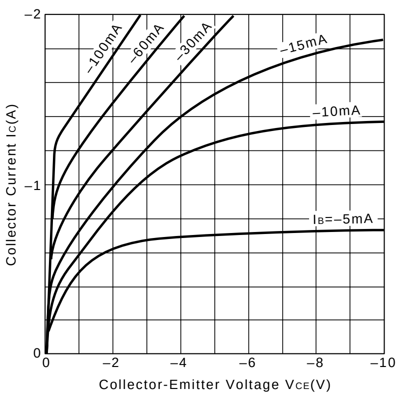


Weight : Approx 6.5g
a. Part No.
b. Lot No.

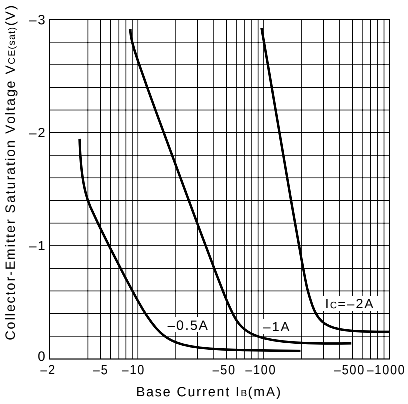
■**Typical Switching Characteristics (Common Emitter)**

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (μs)	tstg (μs)	tf (μs)
–20	20	–1	–10	5	–100	100	0.5typ	1.0typ	0.5typ

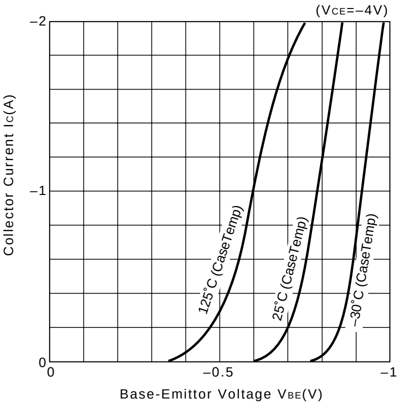
I_C–V_{CE} Characteristics (Typical)



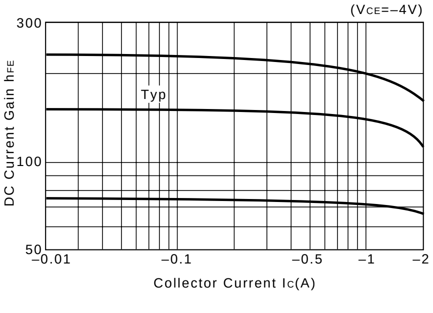
$V_{CE(sat)}$–I_B Characteristics (Typical)



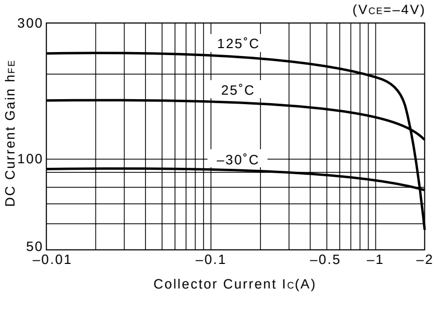
I_C–V_{BE} Temperature Characteristics (Typical)



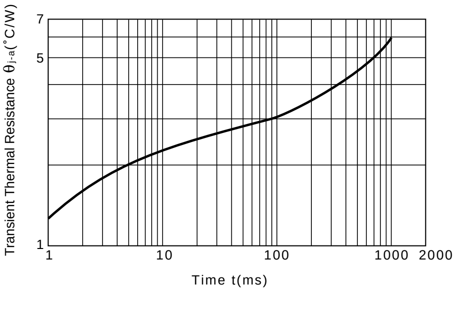
h_{FE}–I_C Characteristics (Typical)



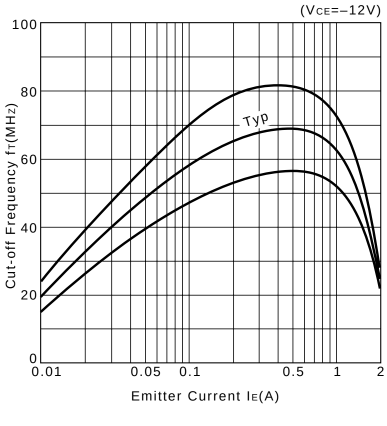
h_{FE}–I_C Temperature Characteristics (Typical)



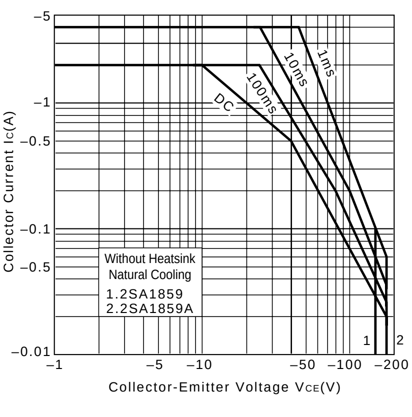
θ_{j-a}–t Characteristics



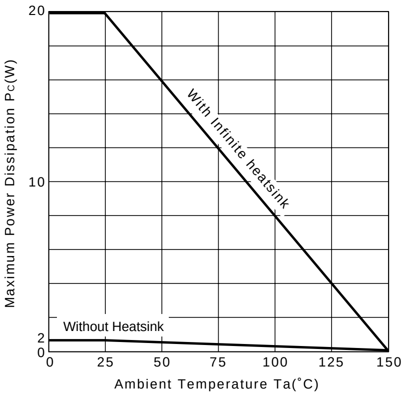
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C–Ta Derating



LAPT 2SA1860

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC4886)

Application : Audio and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	–150	V
V_{CEO}	–150	V
V_{EBO}	–5	V
I_C	–14	A
I_B	–3	A
P_C	80(T_C=25°C)	W
T_j	150	°C
T_{stg}	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

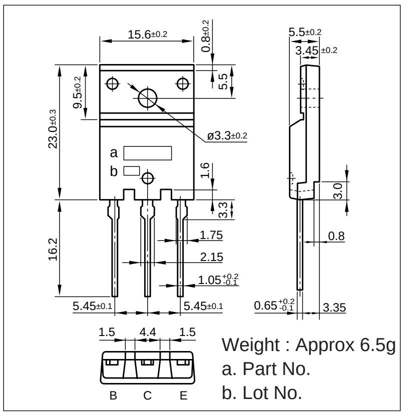
Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=–150V	–100max	µA
I_{EBO}	V_{EB}=–5V	–100max	µA
$V_{(BR)CEO}$	I_C=–25mA	–150min	V
h_{FE}	V_{CE}=–4V, I_C=–5A	50min*	
$V_{CE(sat)}$	I_C=–5A, I_B=–500mA	–2.0max	V
f_T	V_{CE}=–12V, I_E=2A	50typ	MHz
C_{OB}	V_{CB}=–10V, f=1MHz	400typ	pF

*h_{FE} Rank $\overline{O}$(50 to 100), P(70 to 140), Y(90 to 180)

■Typical Switching Characteristics (Common Emitter)

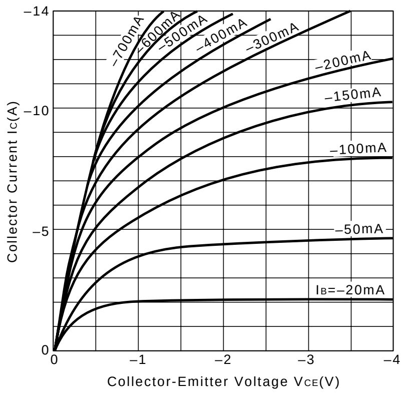
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (µs)	tstg (µs)	tf (µs)
–60	12	–5	–10	5	–500	500	0.25typ	0.85typ	0.2typ

External Dimensions FM100(TO3PF)

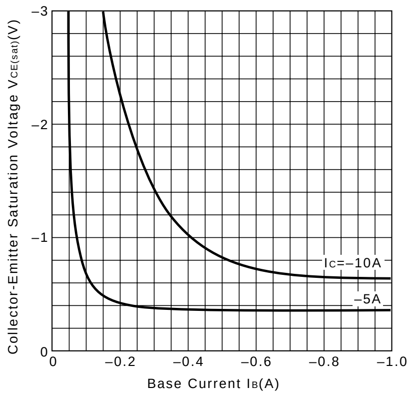


Weight : Approx 6.5g
a. Part No.
b. Lot No.

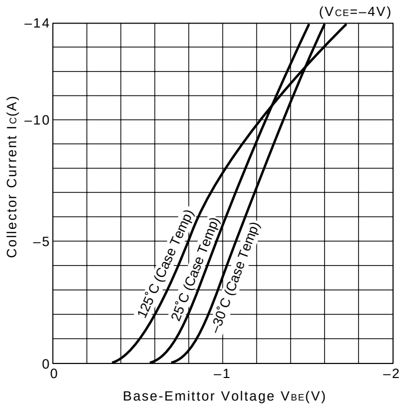
I_C–V_{CE} Characteristics (Typical)



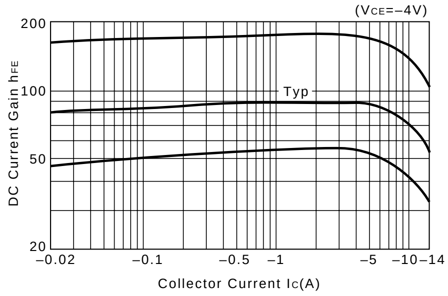
$V_{CE(sat)}$–I_B Characteristics (Typical)



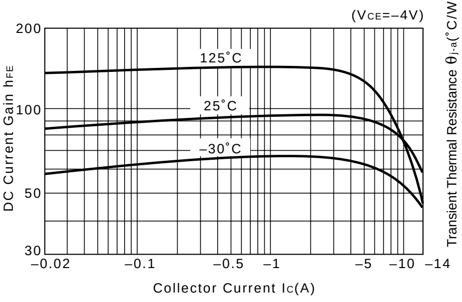
I_C–V_{BE} Temperature Characteristics (Typical)



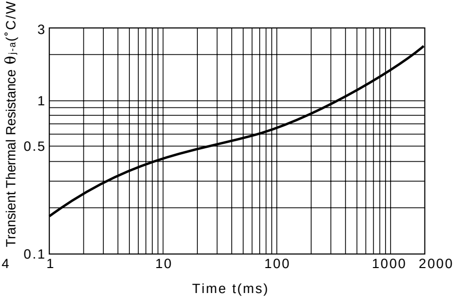
h_{FE}–I_C Characteristics (Typical)



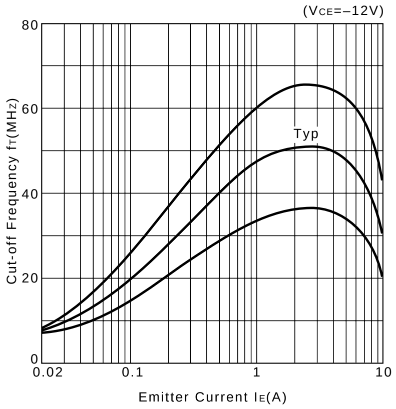
h_{FE}–I_C Temperature Characteristics (Typical)



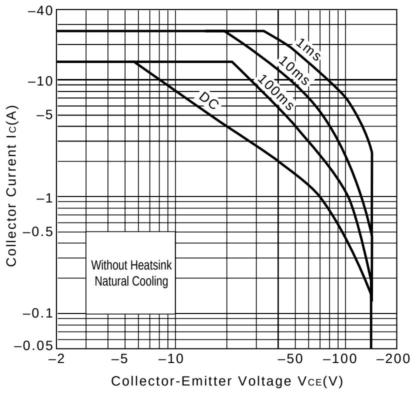
θ_{j-a}–t Characteristics



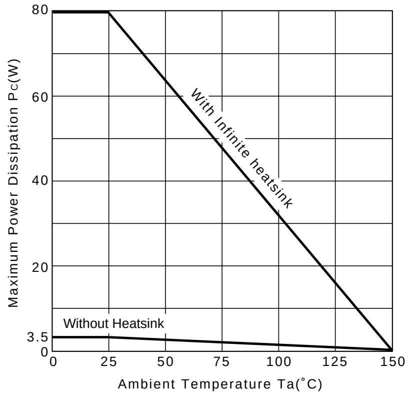
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C–Ta Derating



2SA1907

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC5099)

Application : Audio and General Purpose

■Absolute maximum ratings (Ta=25°C)

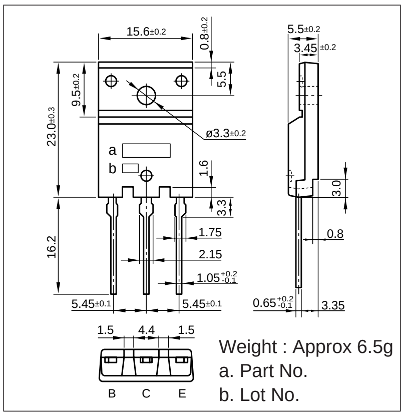
Symbol	Ratings	Unit
V_{CBO}	–80	V
V_{CEO}	–80	V
V_{EBO}	–6	V
I_C	–6	A
I_B	–3	A
P_C	60(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=–80V	–10max	μA
I_{EBO}	V_{EB}=–6V	–10max	μA
$V_{(BR)CEO}$	I_C=–50mA	–80min	V
h_{FE}	V_{CE}=–4V, I_C=–2A	50min*	
$V_{CE(sat)}$	I_C=–12A, I_B=–0.2A	–0.5max	V
f_T	V_{CE}=–12V, I_E=0.5A	20typ	MHz
C_{OB}	V_{CB}=–10V, f=1MHz	150typ	pF

*h_{FE} Rank O(50to100), P(70to140), Y(90to180)

External Dimensions FM100(TO3PF)

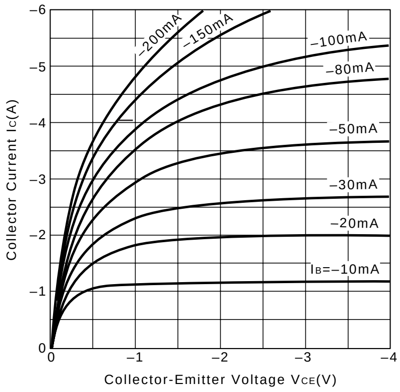


Weight : Approx 6.5g
a. Part No.
b. Lot No.

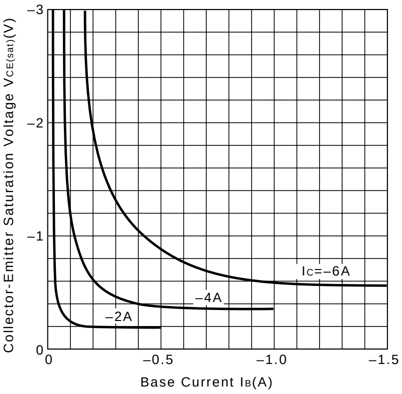
■Typical Switching Characteristics (Common Emitter)

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
–30	10	–3	–10	5	–0.3	0.3	0.18typ	1.10typ	0.21typ

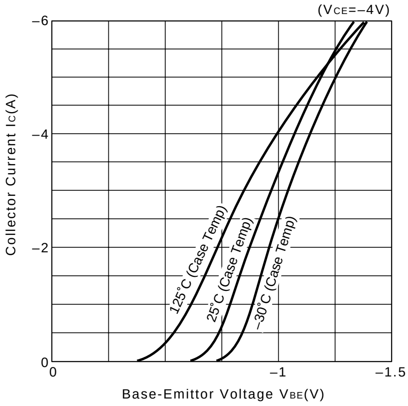
I_C–V_{CE} Characteristics (Typical)



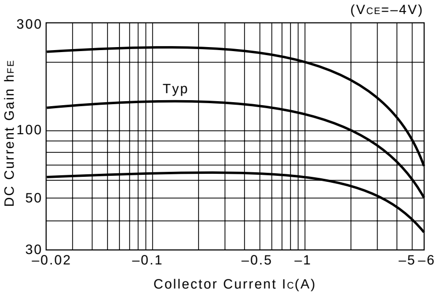
$V_{CE(sat)}$–I_B Characteristics (Typical)



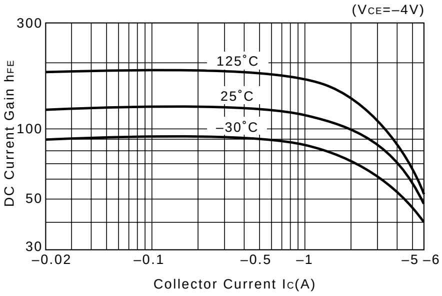
I_C–V_{BE} Temperature Characteristics (Typical)



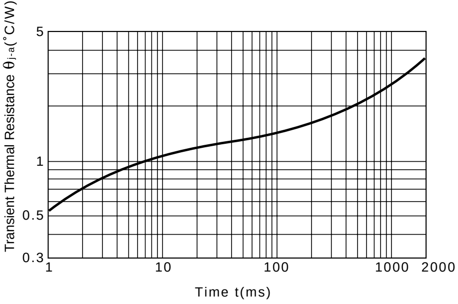
h_{FE}–I_C Characteristics (Typical)



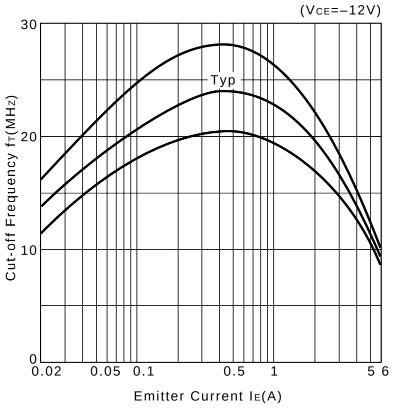
h_{FE}–I_C Temperature Characteristics (Typical)



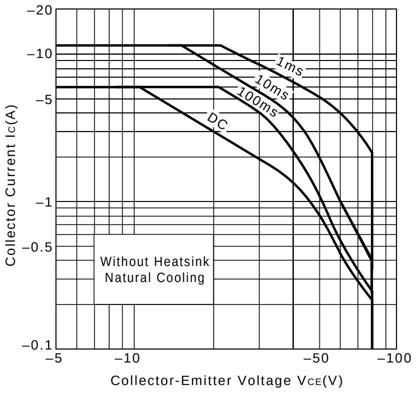
$\theta_{j\text{-}a}$–t Characteristics



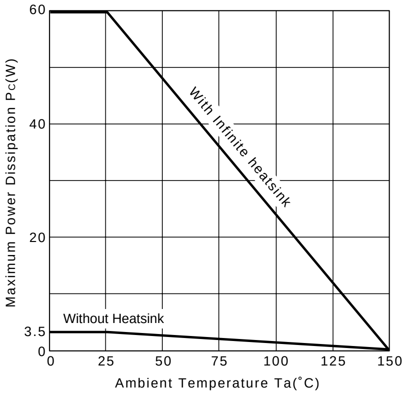
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C–Ta Derating



2SA1908

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC5100)

Application : Audio and General Purpose

■**Absolute maximum ratings** (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	–120	V
V_{CEO}	–120	V
V_{EBO}	–6	V
I_C	–8	A
I_B	–3	A
P_C	75(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■**Electrical Characteristics** (Ta=25°C)

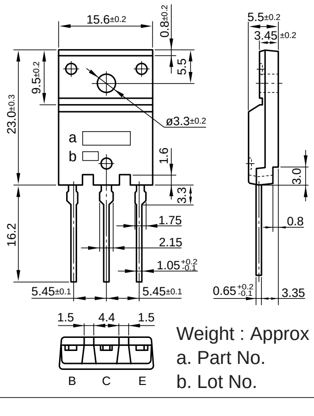
Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=–120V	–10max	μA
I_{EBO}	V_{EB}=–6V	–10max	μA
$V_{(BR)CEO}$	I_C=–50mA	–120min	V
h_{FE}	V_{CE}=–4V, I_C=–3A	50min*	
V_{CE}(sat)	I_C=–3A, I_B=–0.3A	–0.5max	V
f_T	V_{CE}=–12V, I_E=0.5A	20typ	MHz
C_{OB}	V_{CB}=–10V, f=1MHz	300typ	pF

*h_{FE} Rank O(50 to 100), P(70 to 140), Y(90 to 180)

■**Typical Switching Characteristics (Common Emitter)**

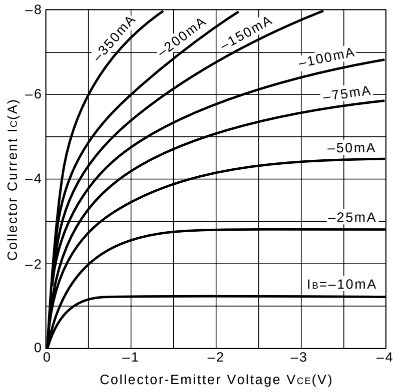
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
–40	10	–4	–10	5	–0.4	0.4	0.14typ	1.40typ	0.21typ

External Dimensions FM100(TO3PF)

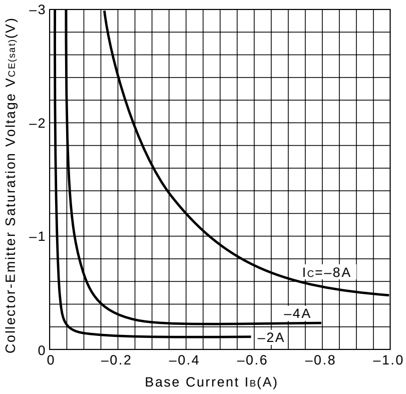


Weight : Approx 6.5g
a. Part No.
b. Lot No.

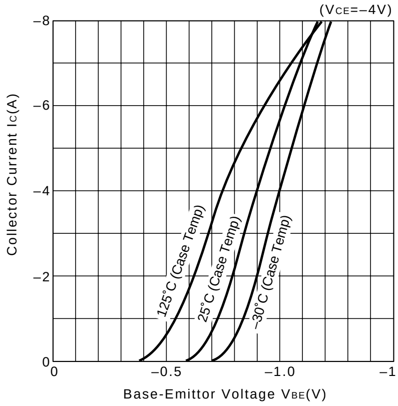
I_C–V_{CE} Characteristics (Typical)



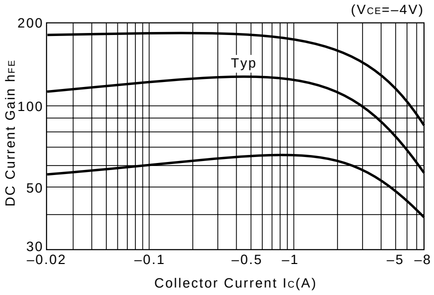
V_{CE}(sat)–I_B Characteristics (Typical)



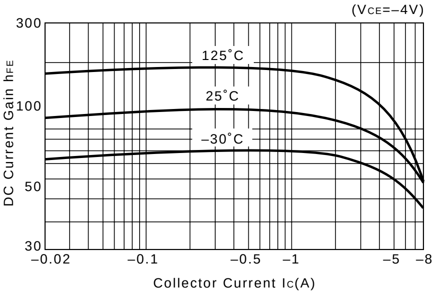
I_C–V_{BE} Temperature Characteristics (Typical)



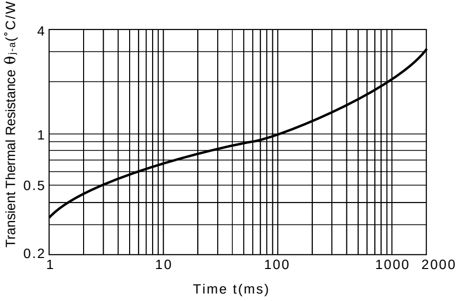
h_{FE}–I_C Characteristics (Typical)



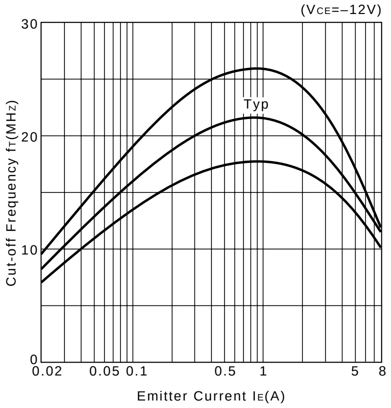
h_{FE}–I_C Temperature Characteristics (Typical)



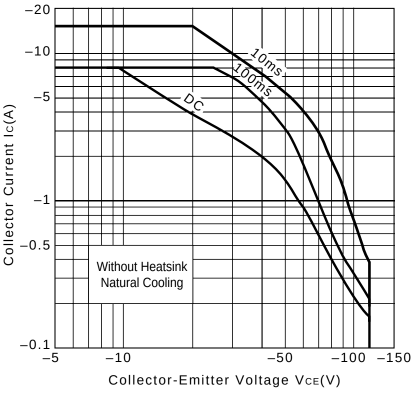
θ_{j-a}–t Characteristics



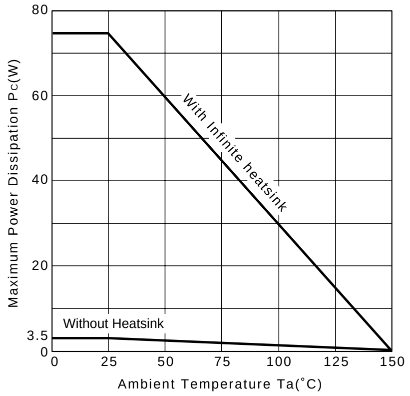
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C–Ta Derating



2SA1909

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SC5101)

Application : Audio and General Purpose

■Absolute maximum ratings (Ta=25°C)

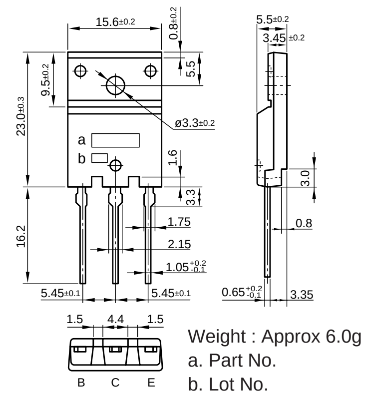
Symbol	Ratings	Unit
V_{CBO}	–140	V
V_{CEO}	–140	V
V_{EBO}	–6	V
I_C	–10	A
I_B	–4	A
P_C	80(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=–140V	–10max	μA
I_{EBO}	V_{EB}=–6V	–10max	μA
$V_{(BR)CEO}$	I_C=–50mA	–140min	V
h_{FE}	V_{CE}=–4V, I_C=–3A	50min*	
$V_{CE(sat)}$	I_C=–5A, I_B=–0.5A	–0.5max	V
f_T	V_{CE}=–12V, I_E=0.5A	20typ	MHz
C_{OB}	V_{CB}=–10V, f=1MHz	400typ	pF

*h_{FE} Rank O(50to100), P(70to140), Y(90to180)

External Dimensions FM100(TO3PF)

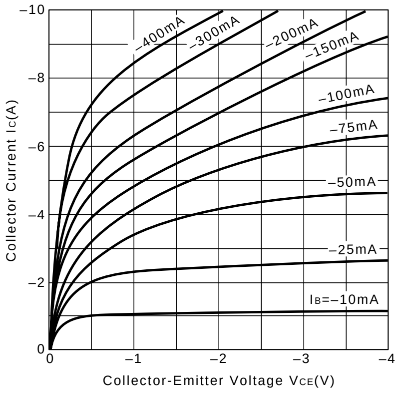


Weight : Approx 6.0g
a. Part No.
b. Lot No.

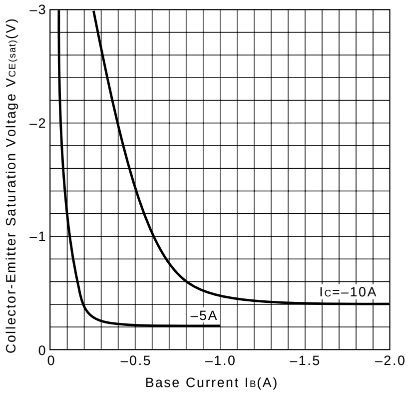
■Typical Switching Characteristics (Common Emitter)

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
–60	12	–5	–10	5	–0.5	0.5	0.17typ	1.86typ	0.27typ

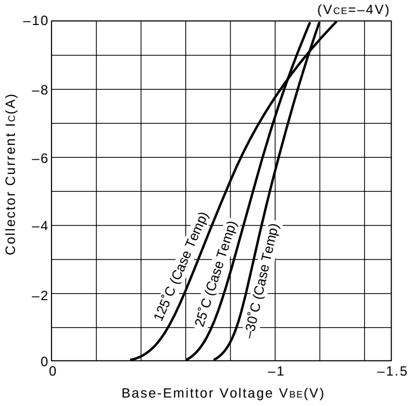
I_C–V_{CE} Characteristics (Typical)



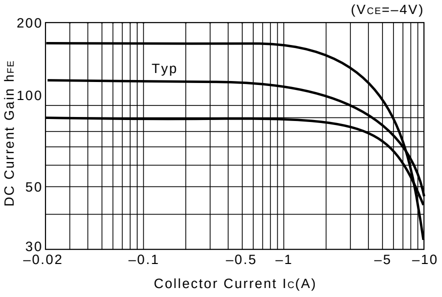
$V_{CE(sat)}$–I_B Characteristics (Typical)



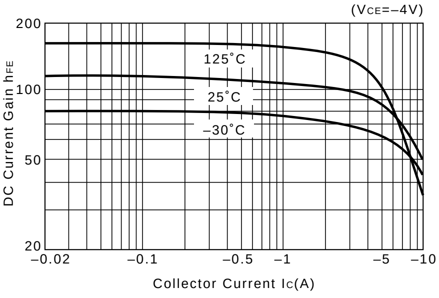
I_C–V_{BE} Temperature Characteristics (Typical)



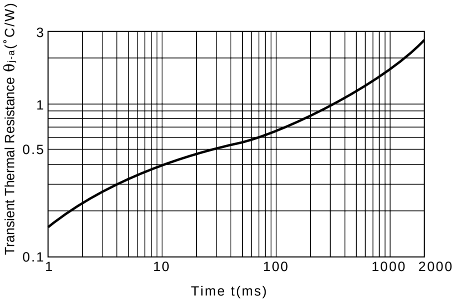
h_{FE}–I_C Characteristics (Typical)



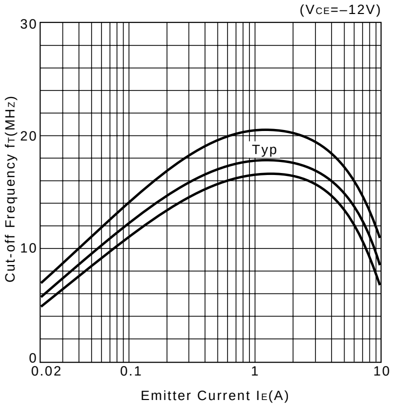
h_{FE}–I_C Temperature Characteristics (Typical)



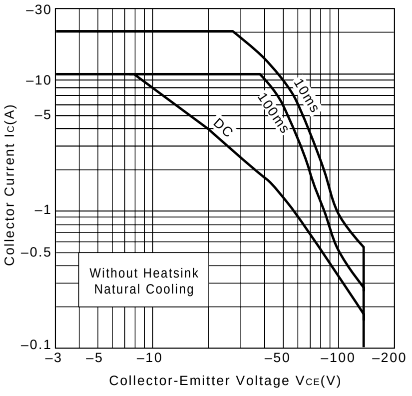
θ_{j-a}–t Characteristics



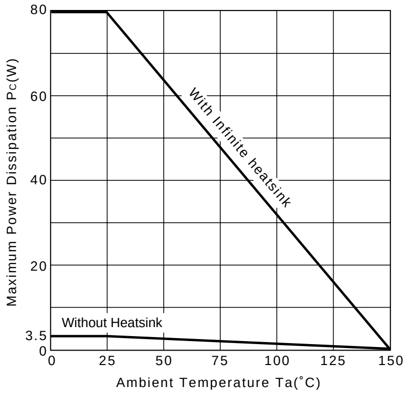
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C–Ta Derating



2SA2042

Silicon PNP Epitaxial Planar Transistor

Application : Audio and General Purpose

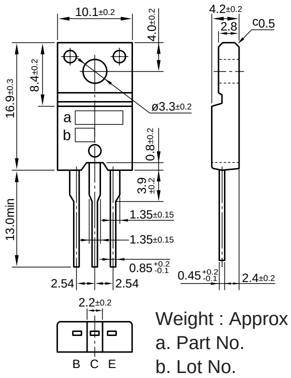
■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	−50	V
V_{CEO}	−50	V
V_{EBO}	−6	V
I_C	−10 (pulse−20)	A
I_B	−3	A
P_C	30(T_C=25°C)	W
T_j	150	°C
T_{stg}	−55 to +150	°C

■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=−50V	−10max	μA
I_{EBO}	V_{EB}=−6V	−10max	μA
$V_{(BR)CEO}$	I_C=−25mA	−50min	V
h_{FE}	V_{CE}=−2V, I_C=−1A	130〜310	
$V_{CE(sat)}$	I_C=−5A, I_B=−0.1A	−0.5max	V
f_T	V_{CE}=−12V, I_E=0.5A	60typ	MHz
C_{OB}	V_{CB}=−10V, f=1MHz	375typ	pF

External Dimensions FM20(TO220F)

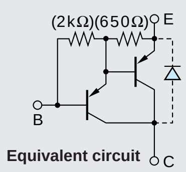


Weight : Approx 6.5g
a. Part No.
b. Lot No.

■Typical Switching Characteristics (Common Emitter)

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (μs)	tstg (μs)	tf (μs)
–20	4	–5	–10	5	–100	100	0.2typ	0.7typ	0.1typ

Darlington 2SB1257



Equivalent circuit

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SD2014)

Application : Driver for Solenoid, Relay and Motor and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	–60	V
V_{CEO}	–60	V
V_{EBO}	–6	V
I_C	–4(Pulse–6)	A
I_B	–1	A
P_C	25(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

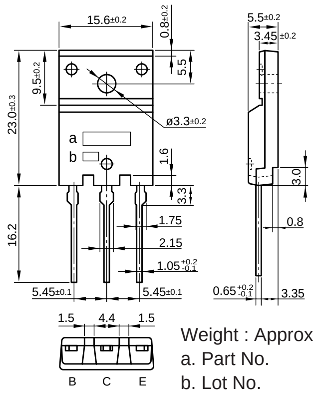
■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=–60V	–10max	μA
I_{EBO}	V_{EB}=–6V	–10max	μA
$V_{(BR)CEO}$	I_C=–10mA	–60min	V
h_{FE}	V_{CE}=–4V, I_C=–3A	2000min	
$V_{CE(sat)}$	I_C=–3A, I_B=–6mA	–1.5max	V
$V_{BE(sat)}$	I_C=–3A, I_B=–6mA	–2max	V
f_T	V_{CE}=–12V, I_E=0.2A	150typ	MHz
C_{OB}	V_{CB}=–10V, f=1MHz	75typ	pF

■Typical Switching Characteristics (Common Emitter)

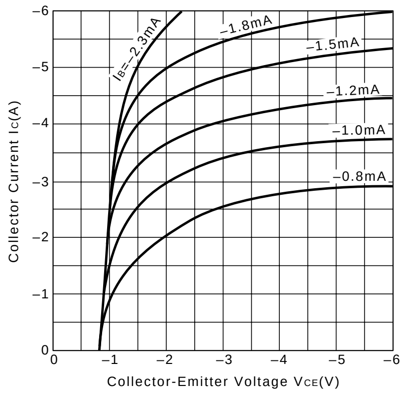
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (μs)	tstg (μs)	tf (μs)
–30	10	–3	–10	5	–10	10	0.4typ	0.8typ	0.6typ

External Dimensions FM20(TO220F)

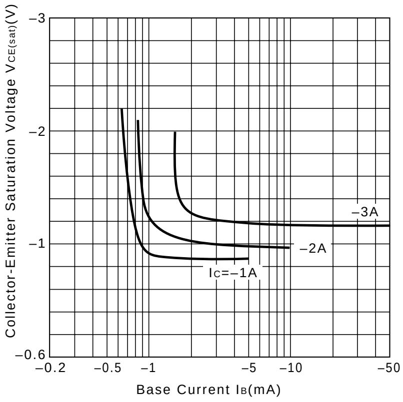


Weight : Approx 2.0g
a. Part No.
b. Lot No.

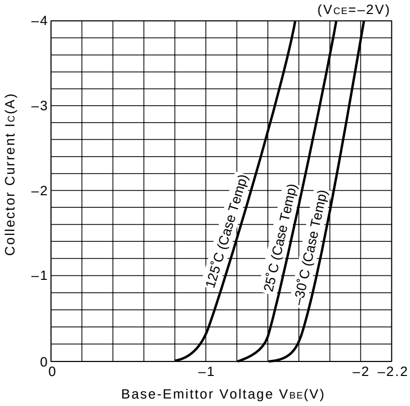
I_C–V_{CE} Characteristics (Typical)



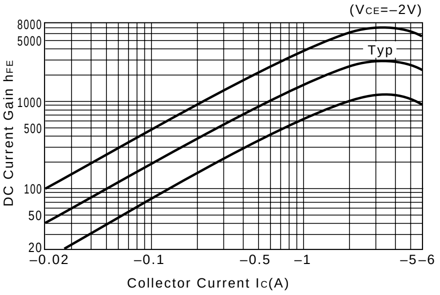
$V_{CE(sat)}$–I_B Characteristics (Typical)



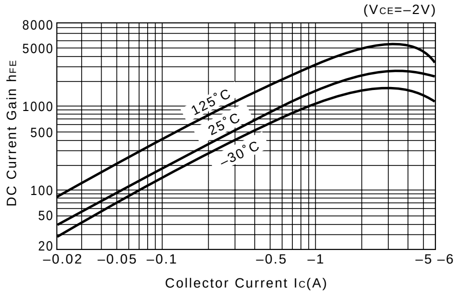
I_C–V_{BE} Temperature Characteristics (Typical)



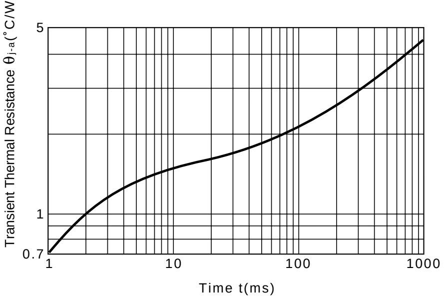
h_{FE}–I_C Characteristics (Typical)



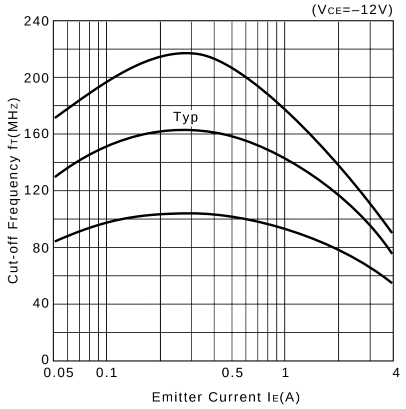
h_{FE}–I_C Temperature Characteristics (Typical)



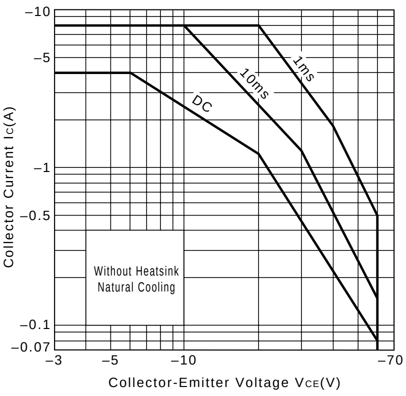
θ_{j-a}–t Characteristics



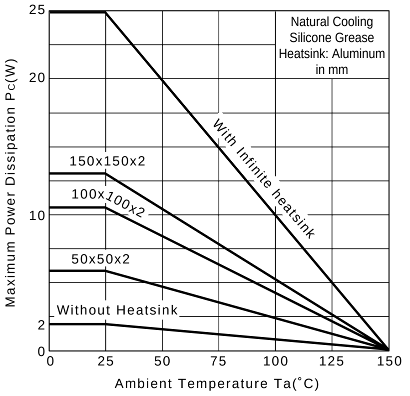
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)

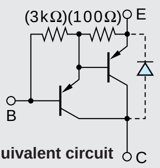


Pc–Ta Derating



Darlington

2SB1258



Equivalent circuit

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SD1785)

Application : Driver for Solenoid, Relay and Motor and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	–100	V
V_{CEO}	–100	V
V_{EBO}	–6	V
I_C	–6(Pulse–10)	A
I_B	–1	A
P_C	30(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

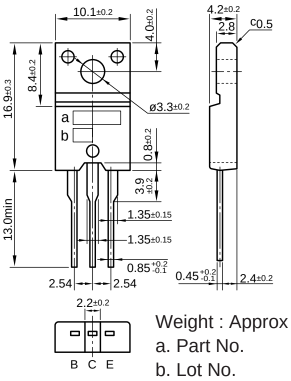
■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=–100V	–10max	µA
I_{EBO}	V_{EB}=–6V	–10max	µA
$V_{(BR)CEO}$	I_C=–10mA	–100min	V
h_{FE}	V_{CE}=–2V, I_C=–3A	1000min	
$V_{CE(sat)}$	I_C=–3A, I_B=–6mA	–1.5max	V
$V_{BE(sat)}$	I_C=–3A, I_B=–6mA	–2max	V
f_T	V_{CE}=–12V, I_E=0.2A	100typ	MHz
C_{OB}	V_{CB}=–10V, f=1MHz	100typ	pF

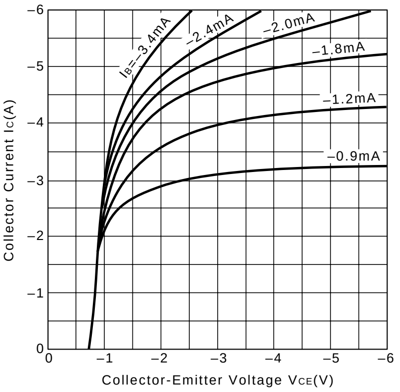
■Typical Switching Characteristics (Common Emitter)

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (µs)	tstg (µs)	tf (µs)
–30	10	–3	–10	5	–6	6	0.6typ	1.6typ	0.5typ

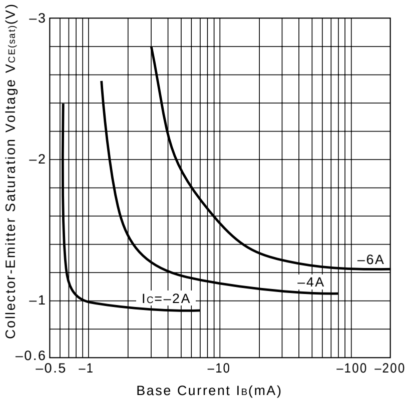
External Dimensions FM20(TO220F)



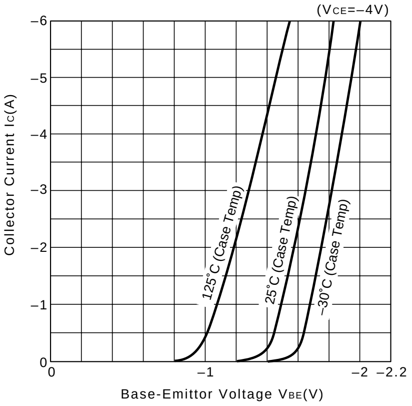
Weight : Approx 2.0g
a. Part No.
b. Lot No.



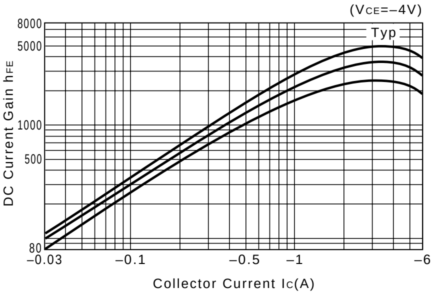
I_C–V_{CE} Characteristics (Typical)



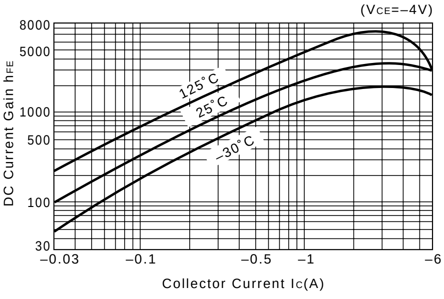
$V_{CE(sat)}$–I_B Characteristics (Typical)



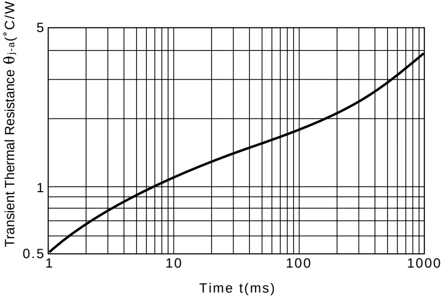
I_C–V_{BE} Temperature Characteristics (Typical)



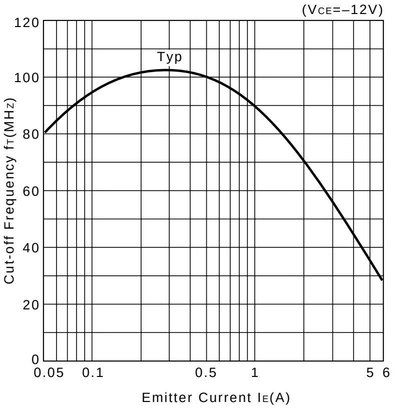
h_{FE}–I_C Characteristics (Typical)



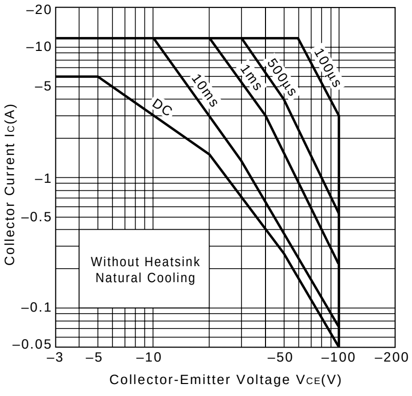
h_{FE}–I_C Temperature Characteristics (Typical)



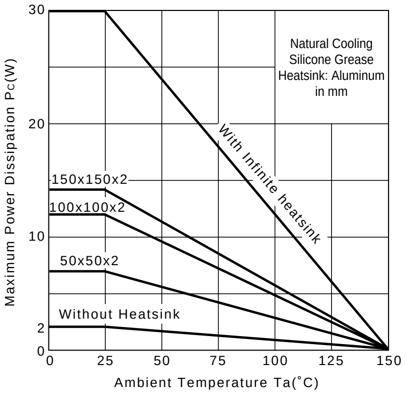
θ_{j-a}–t Characteristics



f_T–I_E Characteristics (Typical)



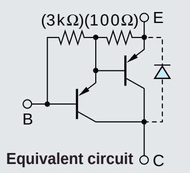
Safe Operating Area (Single Pulse)



Pc–Ta Derating

Darlington

2SB1259



Silicon PNP Epitaxial Planar Transistor (Complement to type 2SD2081)

Application : Driver for Solenoid, Relay and Motor and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	–120	V
V_{CEO}	–120	V
V_{EBO}	–6	V
I_C	–10(Pulse–15)	A
I_B	–1	A
P_C	30(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

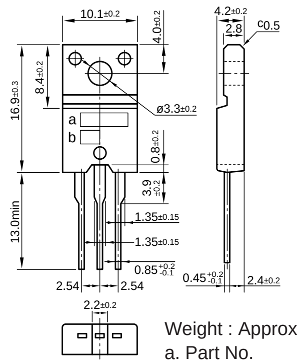
■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=–120V	–10max	μA
I_{EBO}	V_{EB}=–6V	–10max	mA
$V_{(BR)CEO}$	I_C=–10mA	–120min	V
h_{FE}	V_{CE}=–4V, I_C=–5A	2000min	
$V_{CE(sat)}$	I_C=–5A, I_B=–10mA	–1.5max	V
$V_{BE(sat)}$	I_C=–5A, I_B=–10mA	–2.0max	V
f_T	V_{CE}=–12V, I_E=0.2A	100typ	MHz
C_{OB}	V_{CB}=–10V, f=1MHz	145typ	pF

■Typical Switching Characteristics (Common Emitter)

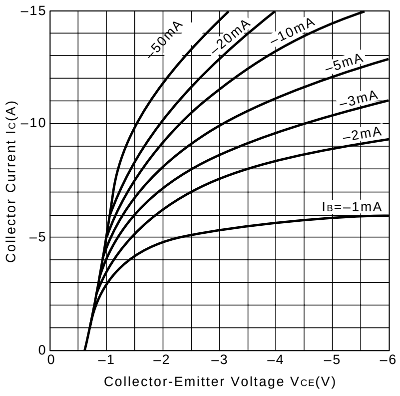
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (μs)	tstg (μs)	tf (μs)
–30	10	–3	–10	5	–6	6	0.6typ	1.6typ	0.5typ

External Dimensions FM20(TO220F)

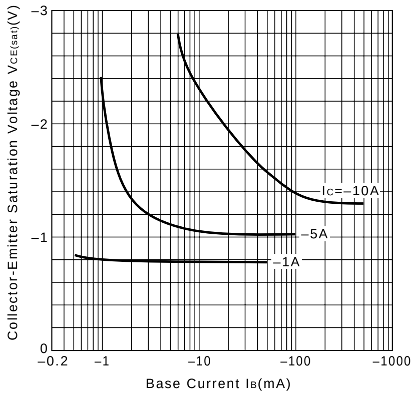


Weight : Approx 2.0g
a. Part No.
b. Lot No.

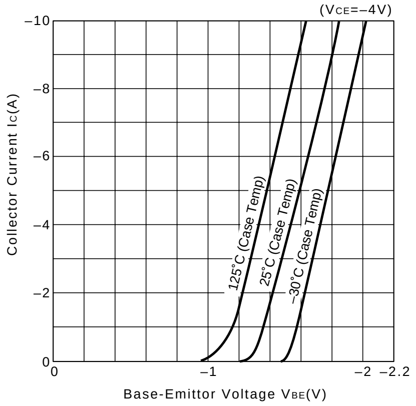
I_C–V_{CE} Characteristics (Typical)



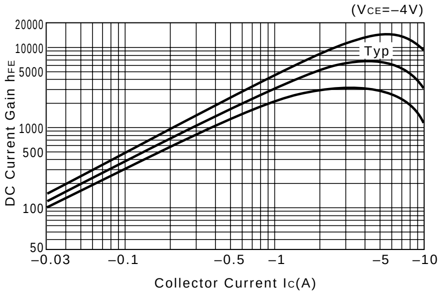
$V_{CE(sat)}$–I_B Characteristics (Typical)



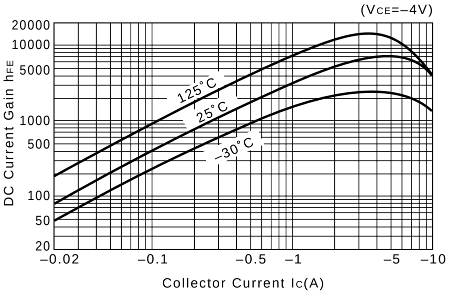
I_C–V_{BE} Temperature Characteristics (Typical)



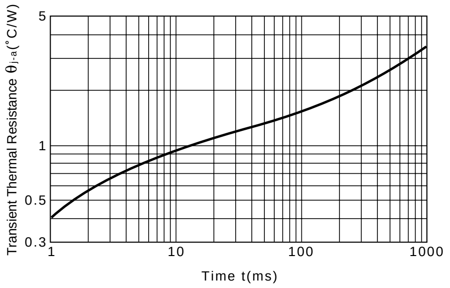
h_{FE}–I_C Characteristics (Typical)



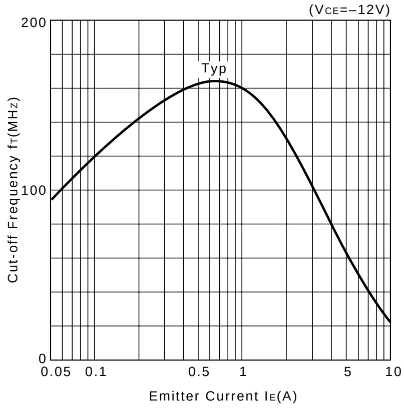
h_{FE}–I_C Temperature Characteristics (Typical)



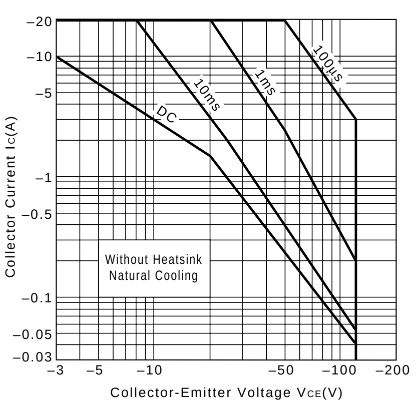
$\theta_{j\text{-}a}$–t Characteristics



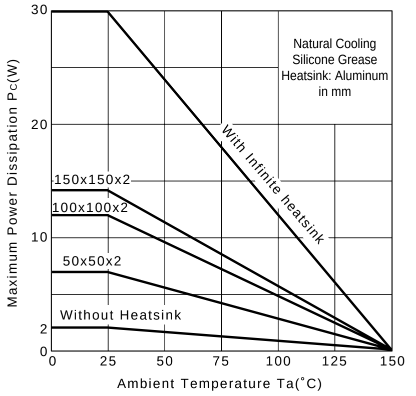
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)

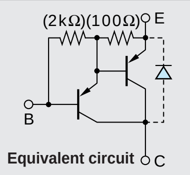


P_C–Ta Derating



Darlington

2SB1351



Silicon PNP Epitaxial Planar Transistor

Application : Driver for Printer Head, Solenoid, Relay, Motor and General Purpose

■**Absolute maximum ratings** (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	–60	V
V_{CEO}	–60	V
V_{EBO}	–6	V
I_C	–12(Pulse–20)	A
I_B	–1	A
P_C	30(T_c=25°C)	W
T_j	150	°C
T_{stg}	–55 to +150	°C

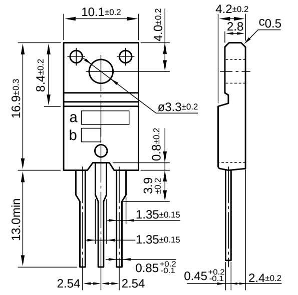
■**Electrical Characteristics** (Ta=25°C)

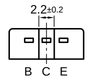
Symbol	Condition	Ratings	Unit
I_{CBO}	V_{CB}=–60V	–10max	μA
I_{EBO}	V_{EB}=–6V	–10max	mA
$V_{(BR)CEO}$	I_C=–10mA	–60min	V
h_{FE}	V_{CE}=–4V, I_C=–10A	2000min	
$V_{CE(sat)}$	I_C=–10A, I_B=–20mA	–1.5max	V
$V_{BE(sat)}$	I_C=–10A, I_B=–20mA	–2.0max	V
f_T	V_{CE}=–12V, I_E=1A	130typ	MHz
C_{OB}	V_{CB}=–10V, f=1MHz	170typ	pF

■**Typical Switching Characteristics (Common Emitter)**

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (μs)	tstg (μs)	tf (μs)
–40	4	–10	–10	5	–20	20	0.7typ	1.5typ	0.6typ

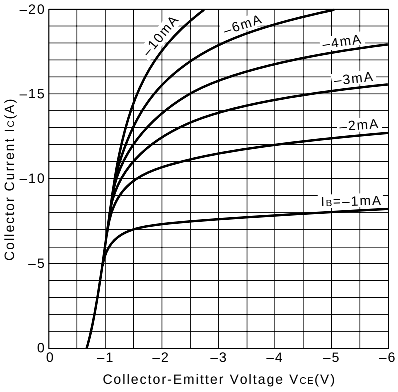
External Dimensions FM20(TO220F)



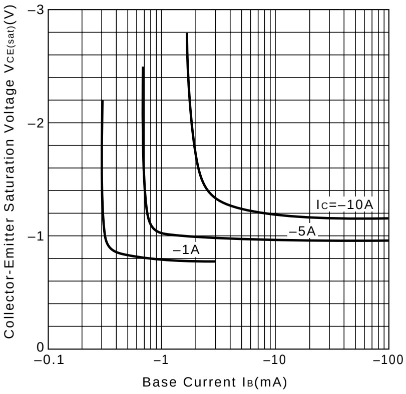


Weight : Approx 2.0g
a. Part No.
b. Lot No.

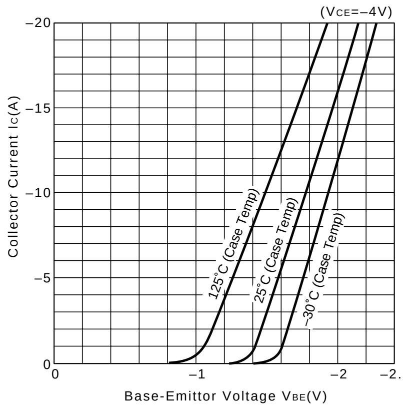
I_C–V_{CE} Characteristics (Typical)



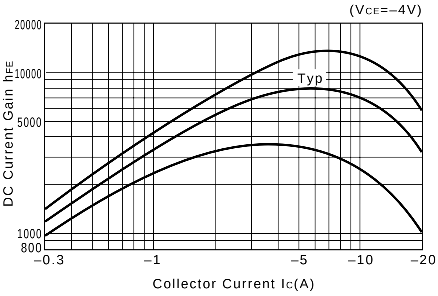
$V_{CE(sat)}$–I_B Characteristics (Typical)



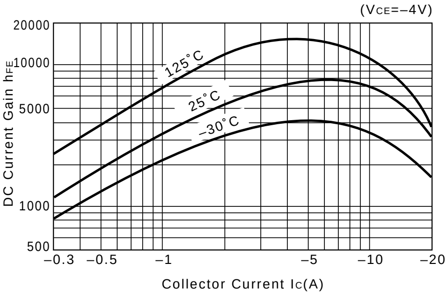
I_C–V_{BE} Temperature Characteristics (Typical)



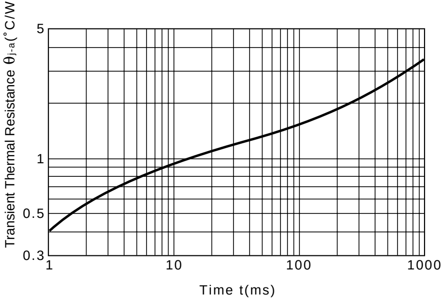
h_{FE}–I_C Characteristics (Typical)



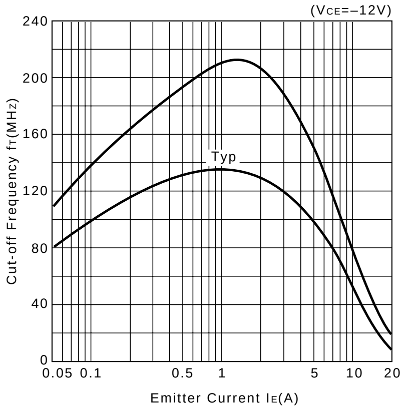
h_{FE}–I_C Temperature Characteristics (Typical)



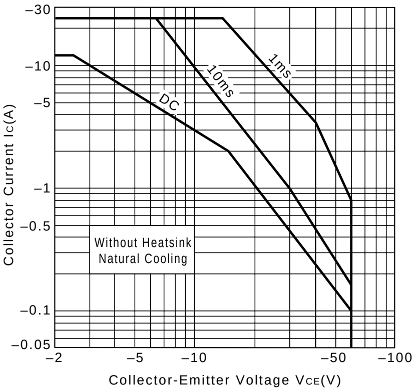
θ_{j-a}–t Characteristics



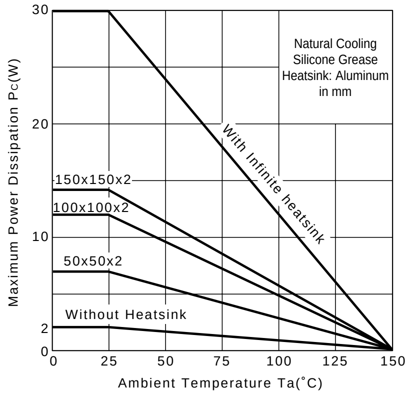
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)

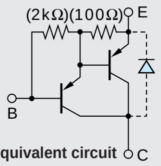


P_C–Ta Derating



Darlington

2SB1352



Equivalent circuit

Silicon PNP Epitaxial Planar Transistor

Application : Driver for Printer Head, Solenoid, Relay, Motor and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	–60	V
V_{CEO}	–60	V
V_{EBO}	–6	V
I_C	–12(Pulse–20)	A
I_B	–1	A
P_C	60(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

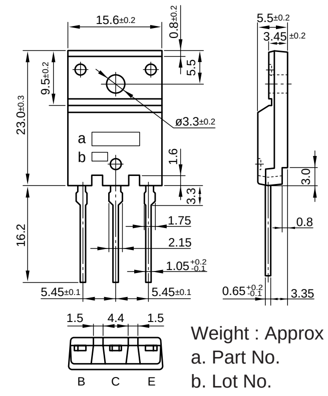
■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=–60V	–10max	μA
I_{EBO}	V_{EB}=–6V	–10max	mA
$V_{(BR)CEO}$	I_C=–10mA	–60min	V
h_{FE}	V_{CE}=–4V, I_C=–10A	2000min	
$V_{CE(sat)}$	I_C=–10A, I_B=–20mA	–1.5max	V
$V_{BE(sat)}$	I_C=–10A, I_B=–20mA	–2.0max	V
f_T	V_{CE}=–12V, I_E=1A	130typ	MHz
C_{OB}	V_{CB}=–10V, f=1MHz	170typ	pF

■Typical Switching Characteristics (Common Emitter)

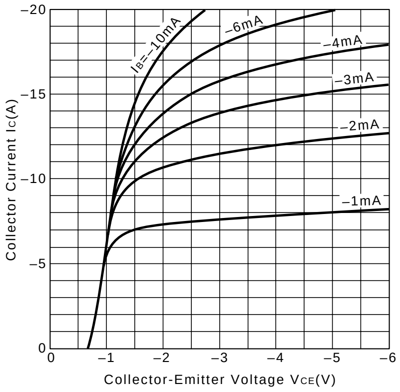
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (μs)	tstg (μs)	tf (μs)
–40	4	–10	–10	5	–20	20	0.7typ	1.5typ	0.6typ

External Dimensions FM100(TO3PF)

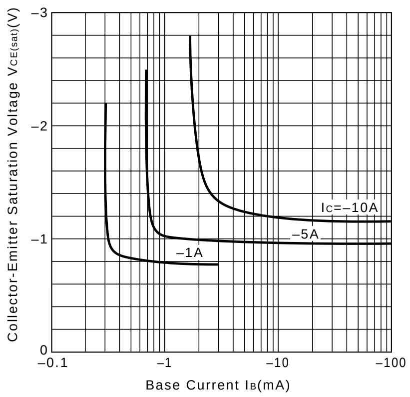


Weight : Approx 6.5g
a. Part No.
b. Lot No.

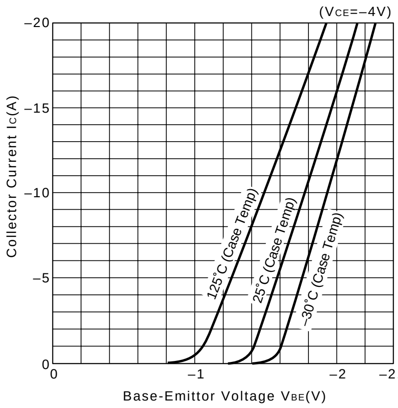
I_C–V_{CE} Characteristics (Typical)



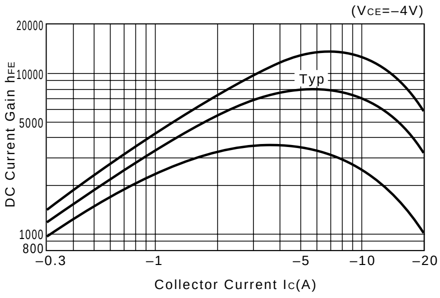
V_{CE}(sat)–I_B Characteristics (Typical)



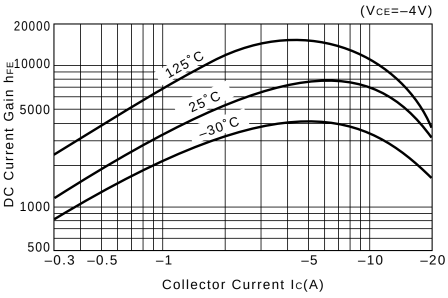
I_C–V_{BE} Temperature Characteristics (Typical)



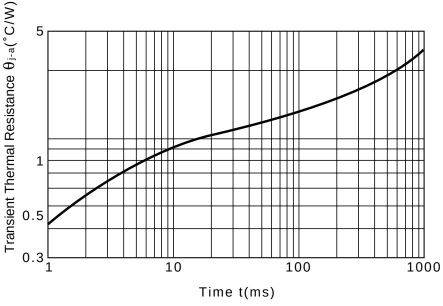
h_{FE}–I_C Characteristics (Typical)



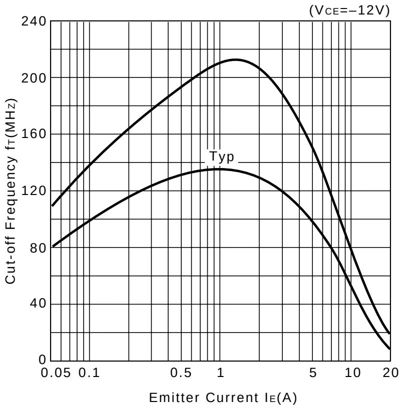
h_{FE}–I_C Temperature Characteristics (Typical)



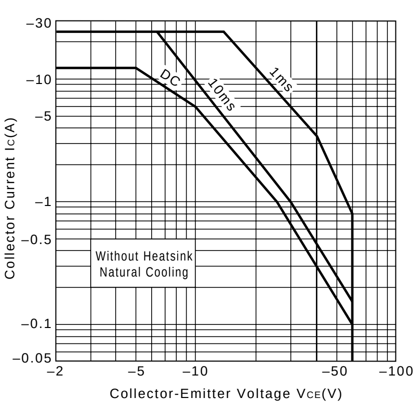
θ_{j-a}–t Characteristics



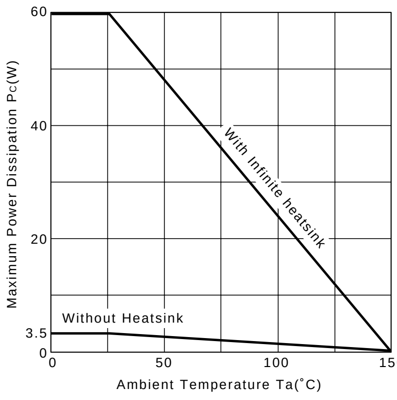
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C–Ta Derating



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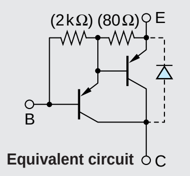


Equivalent circuit

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SD2082)

Application : Chopper Regulator, DC Motor Driver and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	–120	V
V_{CEO}	–120	V
V_{EBO}	–6	V
I_C	–16(Pulse–26)	A
I_B	–1	A
P_C	75(Tc=25°C)	W
T_j	150	°C
T_{stg}	–55 to +150	°C

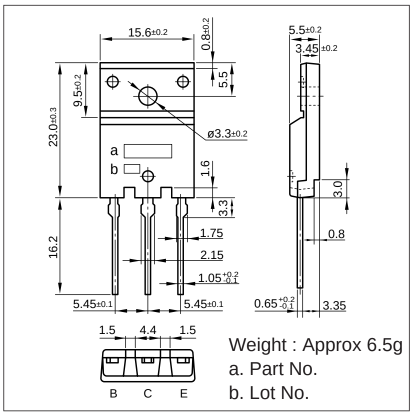
■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=–120V	–10max	µA
I_{EBO}	V_{EB}=–6V	–10max	mA
$V_{(BR)CEO}$	I_C=–10mA	–120min	V
h_{FE}	V_{CE}=–4V, I_C=–8A	2000min	
$V_{CE(sat)}$	I_C=–8A, I_B=–16mA	–1.5max	V
$V_{BE(sat)}$	I_C=–8A, I_B=–16mA	–2.5max	V
f_T	V_{CE}=–12V, I_E=1A	50typ	MHz
C_{OB}	V_{CB}=–10V, f=1MHz	350typ	pF

■Typical Switching Characteristics (Common Emitter)

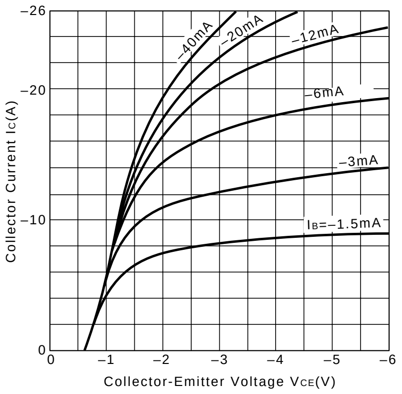
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (µs)	tstg (µs)	tf (µs)
–40	5	–8	–10	5	–16	16	0.8typ	1.8typ	1.0typ

External Dimensions FM100(TO3PF)

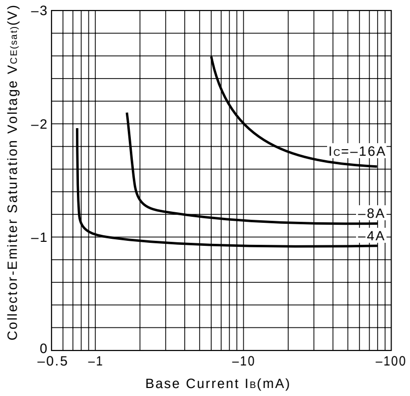


Weight : Approx 6.5g
a. Part No.
b. Lot No.

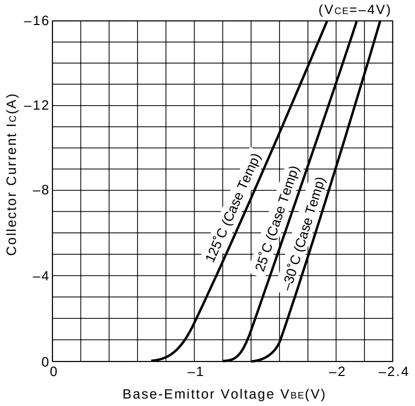
I_C–V_{CE} Characteristics (Typical)



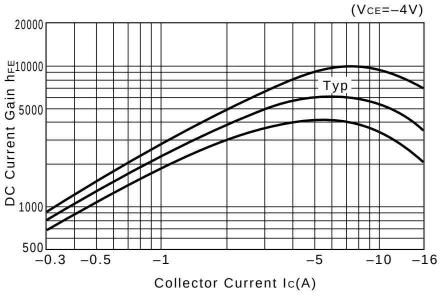
$V_{CE(sat)}$–I_B Characteristics (Typical)



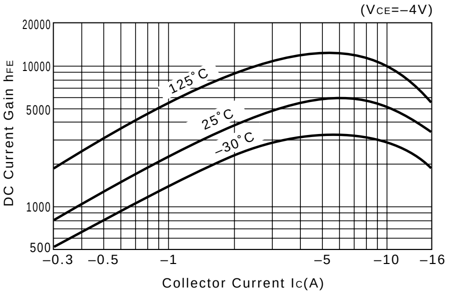
I_C–V_{BE} Temperature Characteristics (Typical)



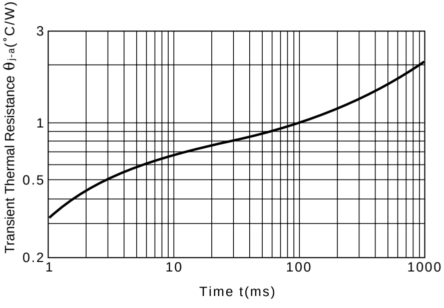
h_{FE}–I_C Characteristics (Typical)



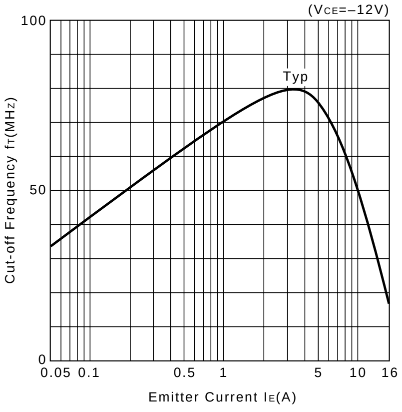
h_{FE}–I_C Temperature Characteristics (Typical)



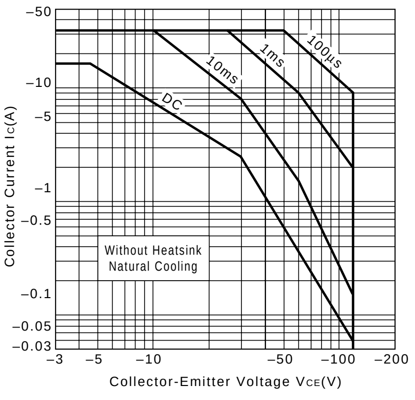
θ_{j-a}–t Characteristics



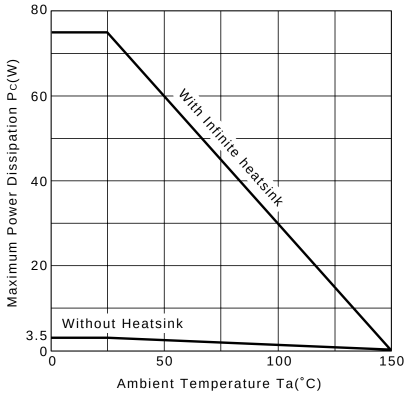
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C–Ta Derating



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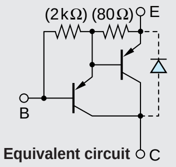


Equivalent circuit

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SD2083)

Application : Chopper Regulator, DC Motor Driver and General Purpose

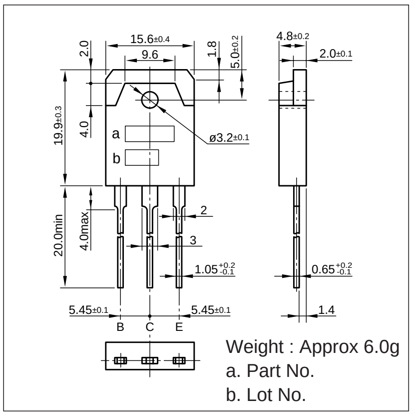
■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	–120	V
V_{CEO}	–120	V
V_{EBO}	–6	V
I_C	–25(Pulse–40)	A
I_B	–2	A
P_C	120(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=–120V	–10max	μA
I_{EBO}	V_{EB}=–6V	–10max	mA
$V_{(BR)CEO}$	I_C=–25mA	–120min	V
h_{FE}	V_{CE}=–4V, I_C=–12A	2000min	
$V_{CE(sat)}$	I_C=–12A, I_B=–24mA	–1.8max	V
$V_{BE(sat)}$	I_C=–12A, I_B=–24mA	–2.5max	V
f_T	V_{CE}=–12V, I_E=1A	50typ	MHz
C_{OB}	V_{CB}=–10V, f=1MHz	230typ	pF

External Dimensions MT-100(TO3P)

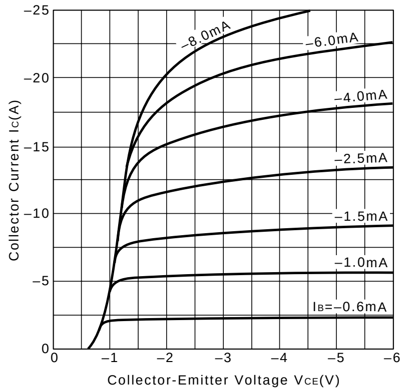


Weight : Approx 6.0g
a. Part No.
b. Lot No.

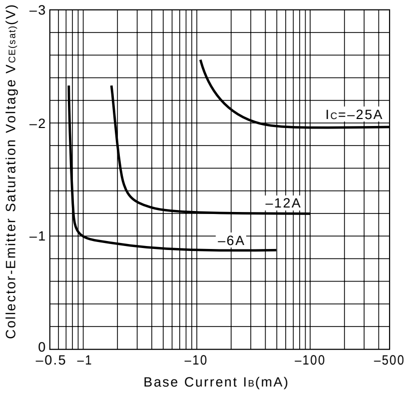
■Typical Switching Characteristics (Common Emitter)

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (μs)	tstg (μs)	tf (μs)
–24	2	–12	–10	5	–24	24	1.0typ	3.0typ	1.0typ

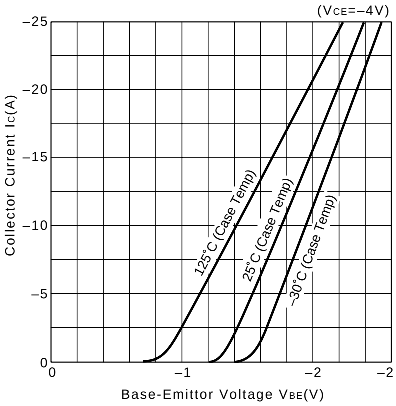
I_C–V_{CE} Characteristics (Typical)



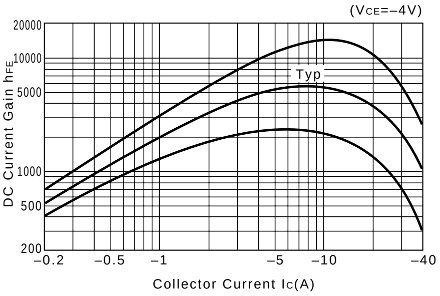
$V_{CE(sat)}$–I_B Characteristics (Typical)



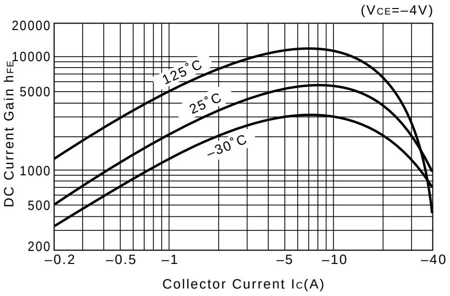
I_C–V_{BE} Temperature Characteristics (Typical)



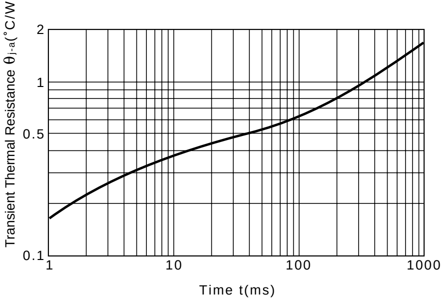
h_{FE}–I_C Characteristics (Typical)



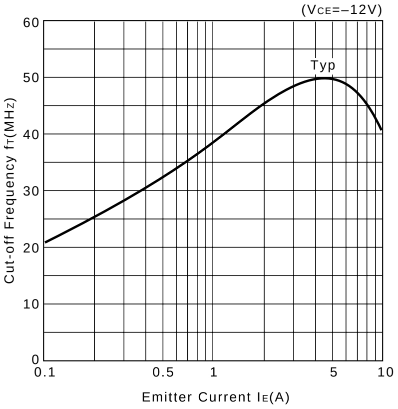
h_{FE}–I_C Temperature Characteristics (Typical)



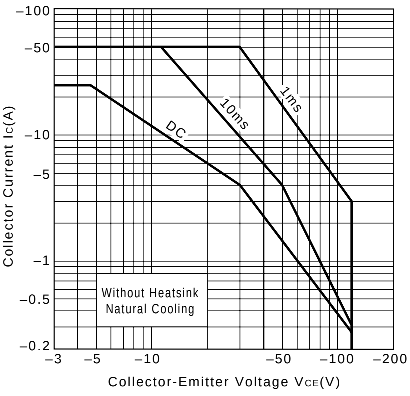
θ_{j-a}–t Characteristics



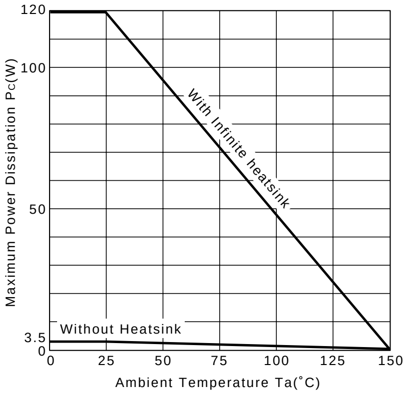
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C–Ta Derating



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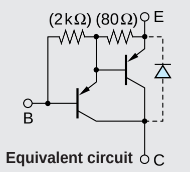


Equivalent circuit

Silicon PNP Epitaxial Planar Transistor

Application : Chopper Regulator, DC Motor Driver and General Purpose

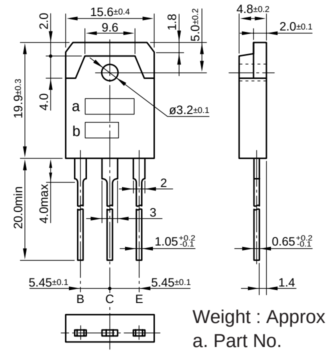
■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	–120	V
V_{CEO}	–120	V
V_{EBO}	–6	V
I_C	–16(Pulse–26)	A
I_B	–1	A
P_C	80(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=–120V	–10max	μA
I_{EBO}	V_{EB}=–6V	–10max	mA
$V_{(BR)CEO}$	I_C=–10mA	–120min	V
h_{FE}	V_{CE}=–4V, I_C=–8A	2000min	
$V_{CE(sat)}$	I_C=–8A, I_B=–16mA	–1.5max	V
$V_{BE(sat)}$	I_C=–8A, I_B=–16mA	–2.5max	V
f_T	V_{CE}=–12V, I_E=1A	50typ	MHz
C_{OB}	V_{CB}=–10V, f=1MHz	350typ	pF

External Dimensions MT-100(TO3P)

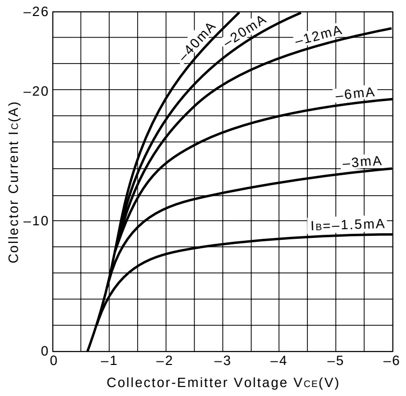


Weight : Approx 6.0g
a. Part No.
b. Lot No.

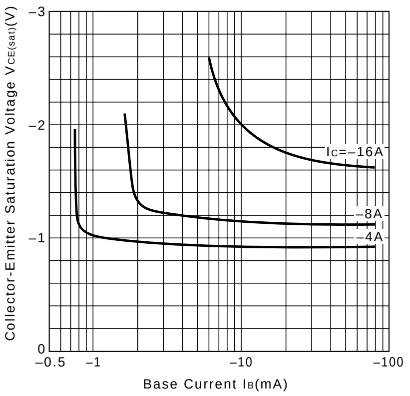
■Typical Switching Characteristics (Common Emitter)

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (μs)	tstg (μs)	tf (μs)
–24	2	–12	–10	5	–24	24	1.0typ	3.0typ	1.0typ

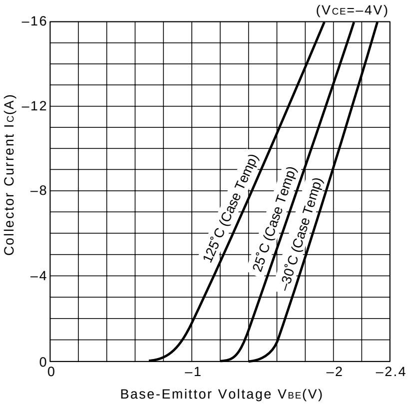
I_C–V_{CE} Characteristics (Typical)



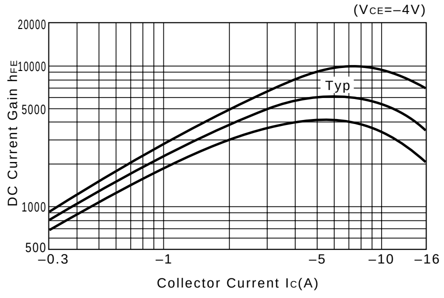
V_{CE}(sat)–I_B Characteristics (Typical)



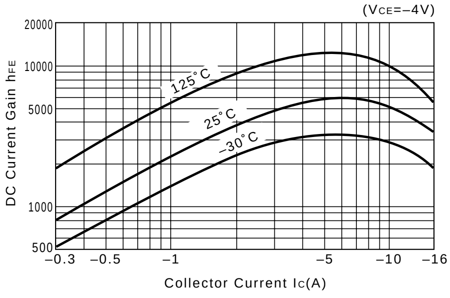
I_C–V_{BE} Temperature Characteristics (Typical)



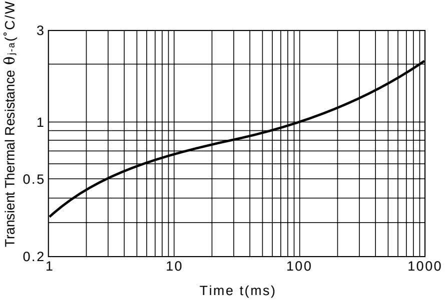
h_{FE}–I_C Characteristics (Typical)



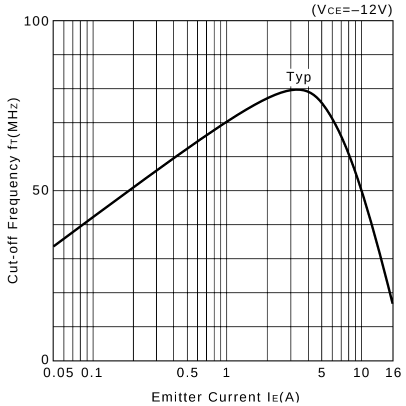
h_{FE}–I_C Temperature Characteristics (Typical)



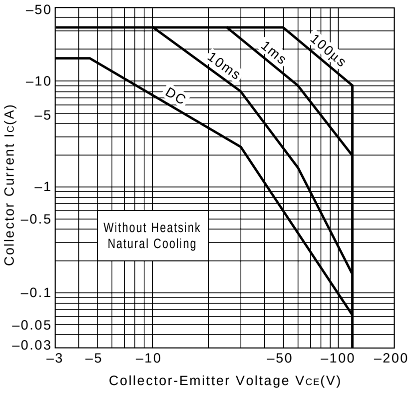
θ_{j-a}–t Characteristics



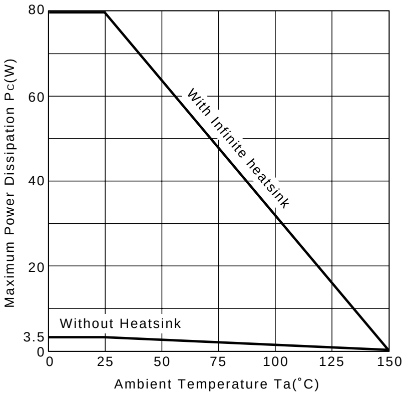
f_T–I_E Characteristics (Typical)



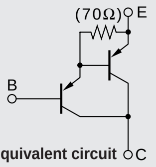
Safe Operating Area (Single Pulse)



P_C–Ta Derating



Darlington 2SB1559



Equivalent circuit

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SD2389)

Application : Audio, Series Regulator and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	–160	V
V_{CEO}	–150	V
V_{EBO}	–5	V
I_C	–8	A
I_B	–1	A
P_C	80(T_C=25°C)	W
T_j	150	°C
T_{stg}	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

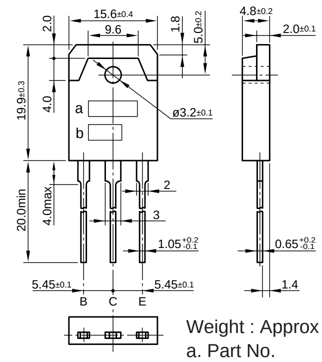
Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=–160V	–100max	μA
I_{EBO}	V_{EB}=–5V	–100max	μA
$V_{(BR)CEO}$	I_C=–30mA	–150min	V
h_{FE}	V_{CE}=–4V, I_C=–6A	5000min*	
$V_{CE(sat)}$	I_C=–6A, I_B=–6mA	–2.5max	V
$V_{BE(sat)}$	I_C=–6A, I_B=–6mA	–3.0max	V
f_T	V_{CE}=–12V, I_E=1A	65typ	MHz
C_{OB}	V_{CB}=–10V, f=1MHz	160typ	pF

*h_{FE} Rank $\overline{O}$(5000 to 12000), P(6500 to 20000), Y(15000 to 30000)

■Typical Switching Characteristics (Common Emitter)

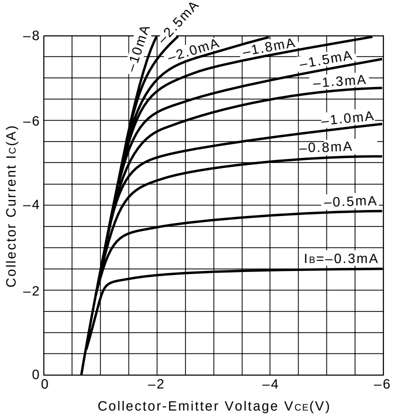
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (μs)	tstg (μs)	tf (μs)
–60	10	–6	–10	5	–6	6	0.7typ	3.6typ	0.9typ

External Dimensions MT-100(TO3P)

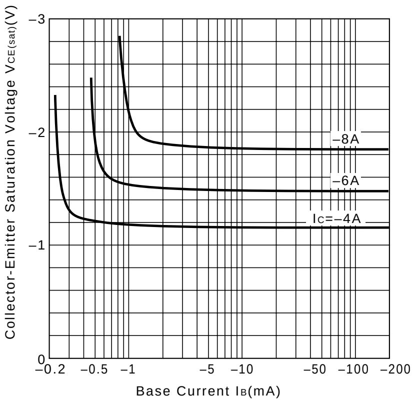


Weight : Approx 6.0g
a. Part No.
b. Lot No.

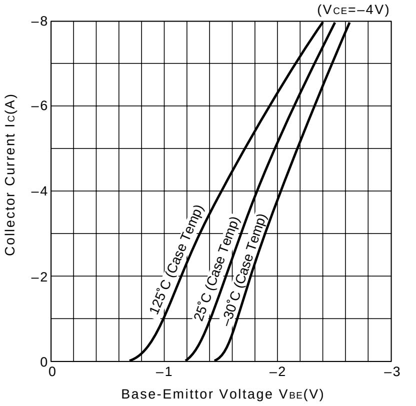
I_C–V_{CE} Characteristics (Typical)



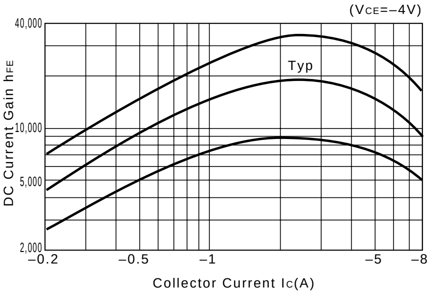
$V_{CE(sat)}$–I_B Characteristics (Typical)



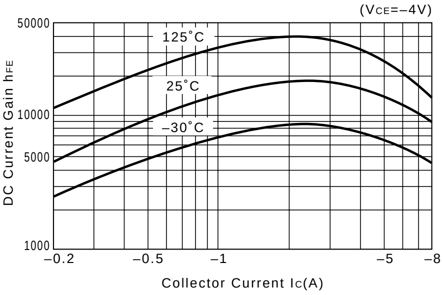
I_C–V_{BE} Temperature Characteristics (Typical)



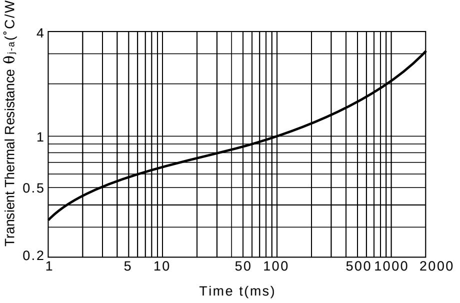
h_{FE}–I_C Characteristics (Typical)



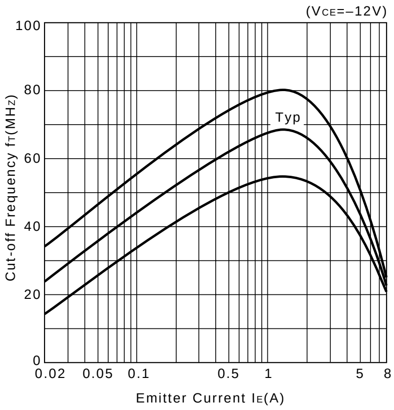
h_{FE}–I_C Temperature Characteristics (Typical)



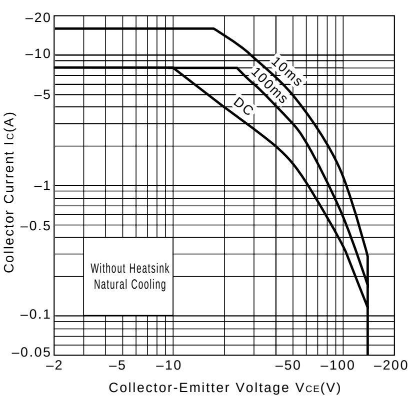
θ_{j-a}–t Characteristics



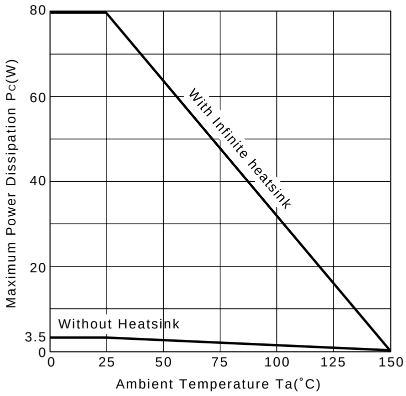
f_T–I_E Characteristics (Typical)



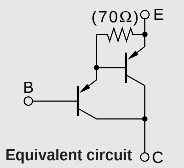
Safe Operating Area (Single Pulse)



P_C–T_a Derating



Darlington 2SB1560



Silicon PNP Epitaxial Planar Transistor (Complement to type 2SD2390)

Application : Audio, Series Regulator and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	–160	V
V_{CEO}	–150	V
V_{EBO}	–5	V
I_C	–10	A
I_B	–1	A
P_C	100(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

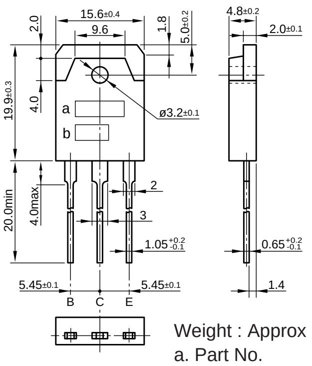
Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=–160V	–100max	μA
I_{EBO}	V_{EB}=–5V	–100max	μA
$V_{(BR)CEO}$	I_C=–30mA	–150min	V
h_{FE}	V_{CE}=–4V, I_C=–7A	5000min*	
V_{CE}(sat)	I_C=–7A, I_B=–7mA	–2.5max	V
V_{BE}(sat)	I_C=–7A, I_B=–7mA	–3.0max	V
fr	V_{CE}=–12V, I_E=2A	50typ	MHz
C_{OB}	V_{CB}=–10V, f=1MHz	230typ	pF

*h_{FE} Rank O(5000to12000), P(6500to20000), Y(15000to30000)

■Typical Switching Characteristics (Common Emitter)

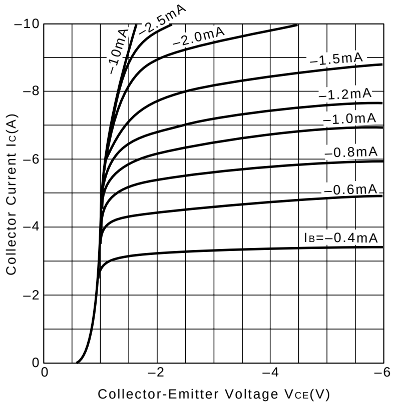
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (μs)	tstg (μs)	tf (μs)
–70	10	–7	–10	5	–7	7	0.8typ	3.0typ	1.2typ

External Dimensions MT-100(TO3P)

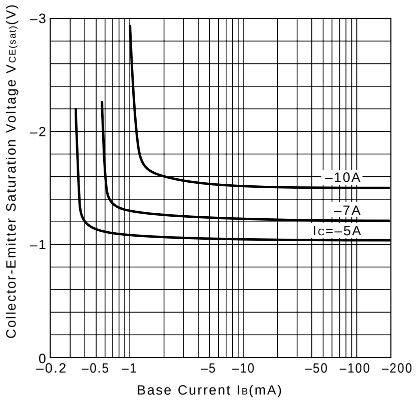


Weight : Approx 6.0g
a. Part No.
b. Lot No.

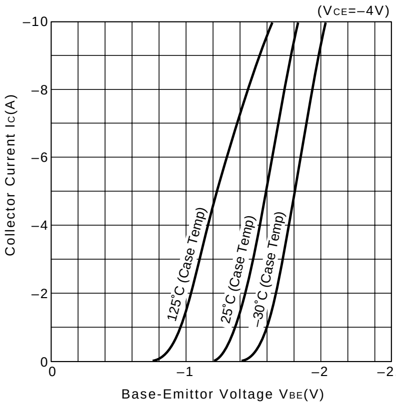
I_C–V_{CE} Characteristics (Typical)



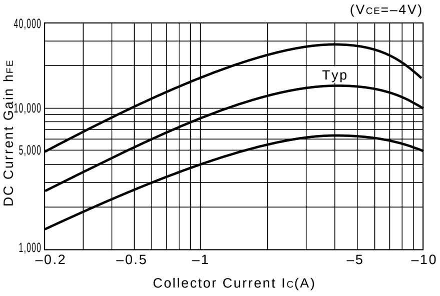
V_{CE}(sat)–I_B Characteristics (Typical)



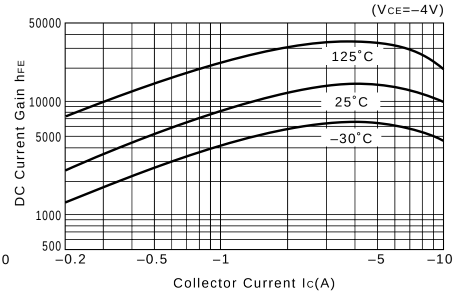
I_C–V_{BE} Temperature Characteristics (Typical)



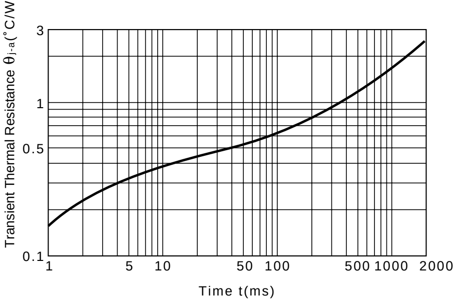
h_{FE}–I_C Characteristics (Typical)



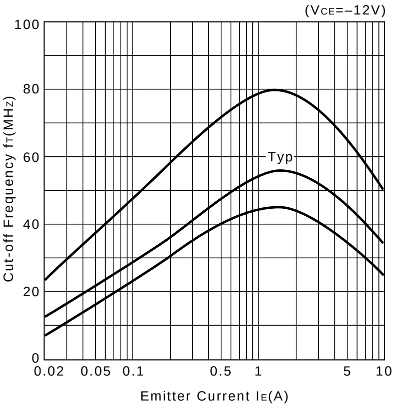
h_{FE}–I_C Temperature Characteristics (Typical)



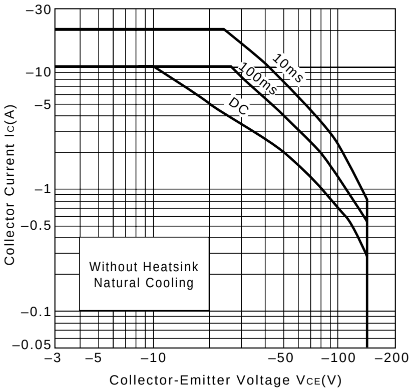
θj-a–t Characteristics



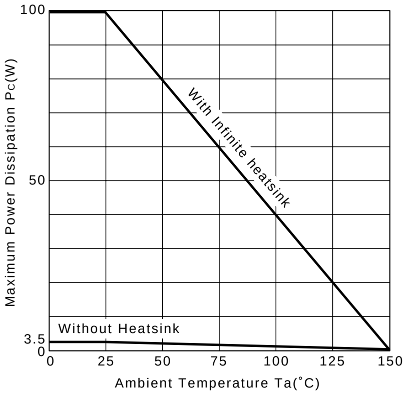
f_T–I_E Characteristics (Typical)



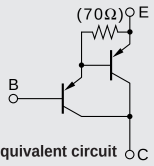
Safe Operating Area (Single Pulse)



Pc–Ta Derating



Darlington 2SB1570



Equivalent circuit

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SD2401)

Application : Audio, Series Regulator and General Purpose

■**Absolute maximum ratings** (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	–160	V
V_{CEO}	–150	V
V_{EBO}	–5	V
I_C	–12	A
I_B	–1	A
P_C	150(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■**Electrical Characteristics** (Ta=25°C)

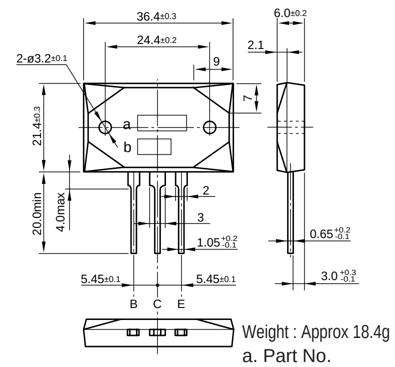
Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=–160V	–100max	µA
I_{EBO}	V_{EB}=–5V	–100max	µA
$V_{(BR)CEO}$	I_C=–30mA	–150min	V
h_{FE}	V_{CE}=–4V, I_C=–7A	5000min*	
$V_{CE(sat)}$	I_C=–7A, I_B=–7mA	–2.5max	V
$V_{BE(sat)}$	I_C=–7A, I_B=–7mA	–3.0max	V
f_T	V_{CE}=–12V, I_E=2A	50typ	MHz
C_{OB}	V_{CB}=–10V, f=1MHz	230typ	pF

*h_{FE} Rank O(5000 to 12000), P(6500 to 20000), Y(15000 to 30000)

■**Typical Switching Characteristics (Common Emitter)**

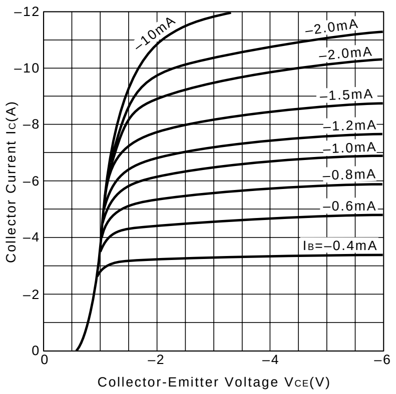
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (µs)	tstg (µs)	tf (µs)
–70	10	–7	–10	5	–7	7	0.8typ	3.0typ	1.2typ

External Dimensions MT-200

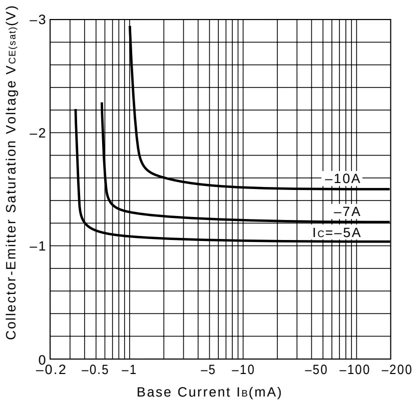


Weight : Approx 18.4g
a. Part No.
b. Lot No.

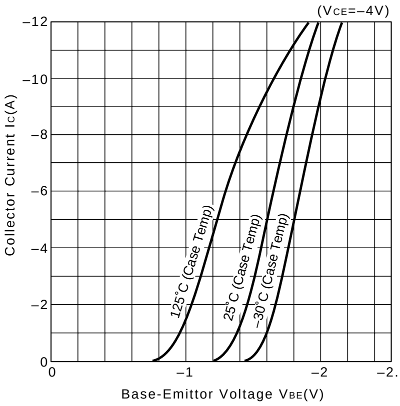
I_C–V_{CE} Characteristics (Typical)



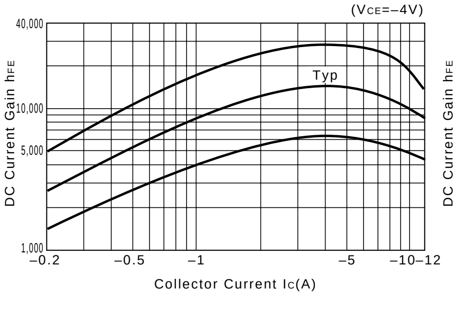
$V_{CE(sat)}$–I_B Characteristics (Typical)



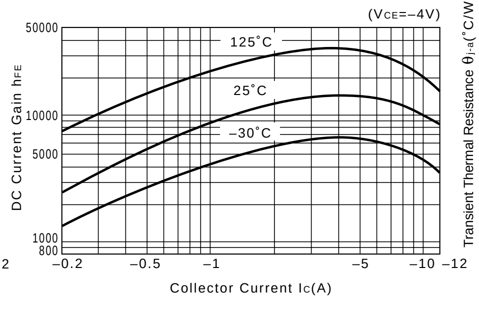
I_C–V_{BE} Temperature Characteristics (Typical)



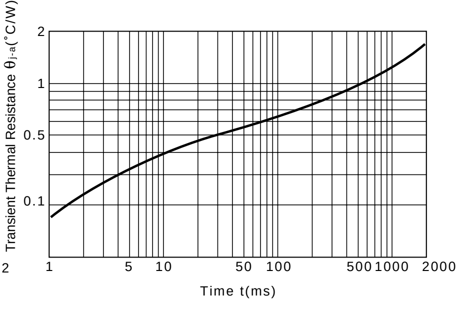
h_{FE}–I_C Characteristics (Typical)



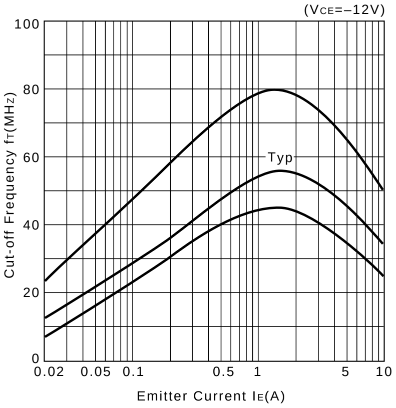
h_{FE}–I_C Temperature Characteristics (Typical)



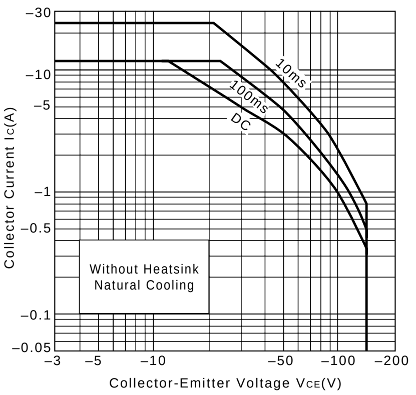
$\theta_{j\text{-}a}$–t Characteristics



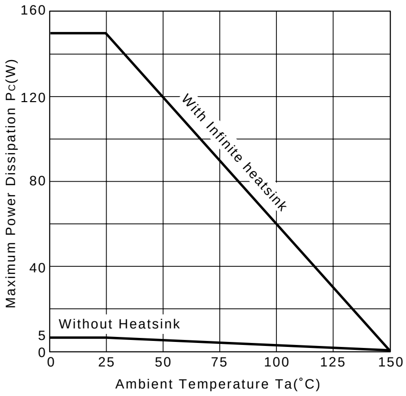
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C–Ta Derating



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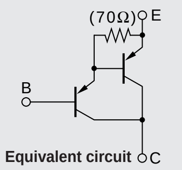


Equivalent circuit

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SD2438)

Application : Audio, Series Regulator and General Purpose

■Absolute maximum ratings (Ta=25°C)

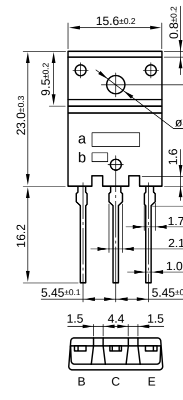
Symbol	Ratings	Unit
V_{CBO}	–160	V
V_{CEO}	–150	V
V_{EBO}	–5	V
I_C	–8	A
I_B	–1	A
P_C	75(Tc=25°C)	W
T_j	150	°C
T_{stg}	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=–160V	–100max	μA
I_{EBO}	V_{EB}=–5V	–100max	μA
$V_{(BR)CEO}$	I_C=–30mA	–150min	V
h_{FE}	V_{CE}=–4V, I_C=–6A	5000min*	
$V_{CE(sat)}$	I_C=–6A, I_B=–6mA	–2.5max	V
$V_{BE(sat)}$	I_C=–6A, I_B=–6mA	–3.0max	V
f_T	V_{CE}=–12V, I_E=1A	65typ	MHz
C_{OB}	V_{CB}=–10V, f=1MHz	160typ	pF

*h_{FE} Rank $\overline{\text{O}}$(5000 to 12000), P(6500 to 20000), Y(15000 to 30000)

External Dimensions FM100(TO3PF)

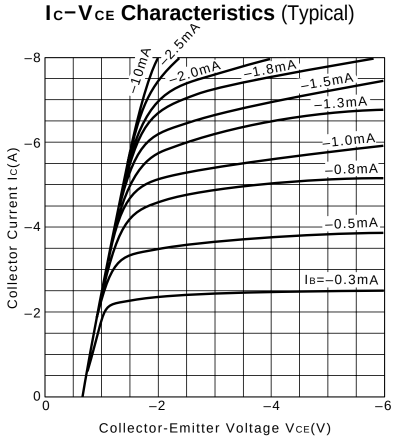


Weight : Approx 6.5g
a. Part No.
b. Lot No.

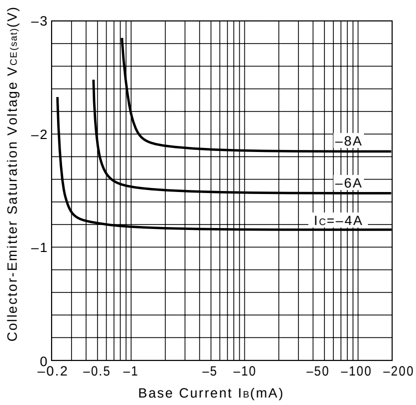
■Typical Switching Characteristics (Common Emitter)

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (μs)	tstg (μs)	tf (μs)
–60	10	–6	–10	5	–6	6	0.7typ	3.6typ	0.9typ

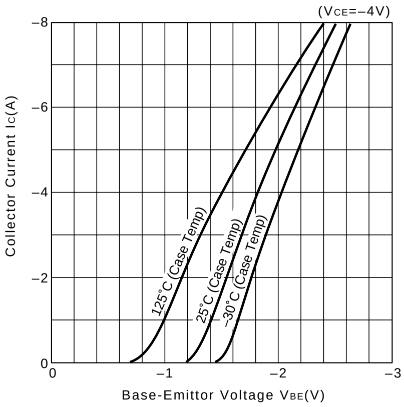
I_C–V_{CE} Characteristics (Typical)



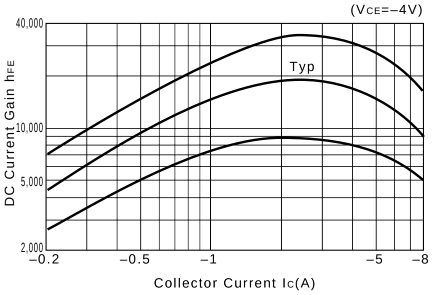
$V_{CE(sat)}$–I_B Characteristics (Typical)



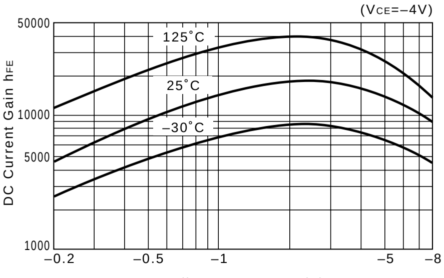
I_C–V_{BE} Temperature Characteristics (Typical)



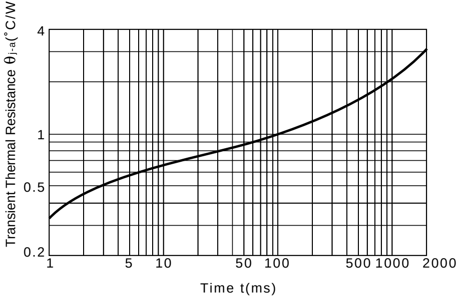
h_{FE}–I_C Characteristics (Typical)



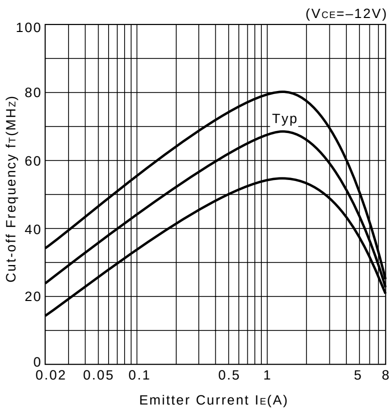
h_{FE}–I_C Temperature Characteristics (Typical)



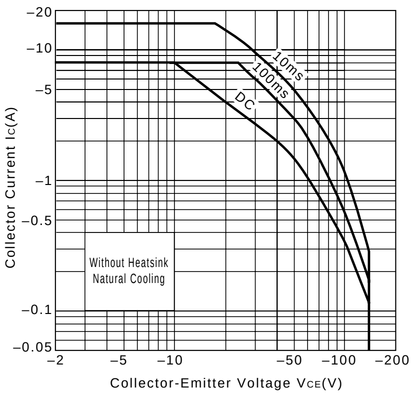
θ_{j-a}–t Characteristics



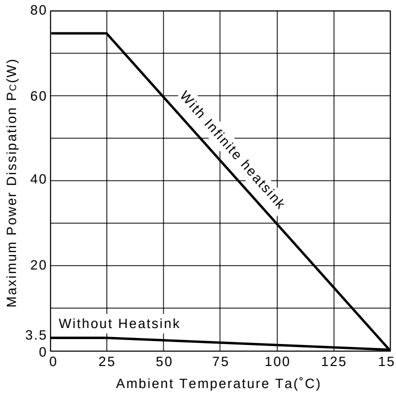
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C–T_a Derating



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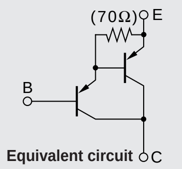


Equivalent circuit

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SD2439)

Application : Audio, Series Regulator and General Purpose

■**Absolute maximum ratings** (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	–160	V
V_{CEO}	–150	V
V_{EBO}	–5	V
I_C	–10	A
I_B	–1	A
P_C	80(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■**Electrical Characteristics** (Ta=25°C)

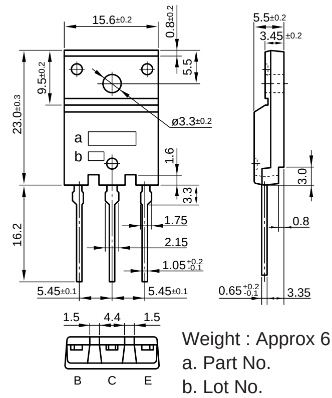
Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=–160V	–100max	µA
I_{EBO}	V_{EB}=–5V	–100max	µA
$V_{(BR)CEO}$	I_C=–30mA	–150min	V
h_{FE}	V_{CE}=–4V, I_C=–7A	5000min*	
$V_{CE(sat)}$	I_C=–7A, I_B=–7mA	–2.5max	V
$V_{BE(sat)}$	I_C=–7A, I_B=–7mA	–3.0max	V
f_T	V_{CE}=–12V, I_E=2A	50typ	MHz
C_{OB}	V_{CB}=–10V, f=1MHz	230typ	pF

*h_{FE} Rank O(5000to12000), P(6500to20000), Y(15000to30000)

■**Typical Switching Characteristics (Common Emitter)**

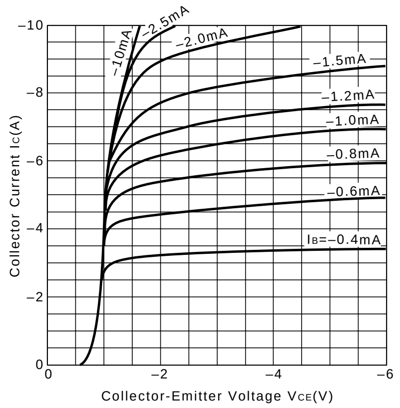
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (µs)	tstg (µs)	tf (µs)
–70	10	–7	–10	5	–7	7	0.8typ	3.0typ	1.2typ

External Dimensions FM100(TO3PF)

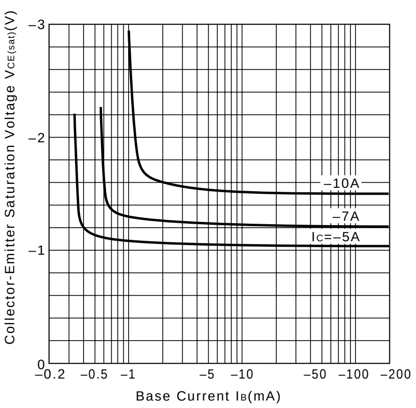


Weight : Approx 6.5g
a. Part No.
b. Lot No.

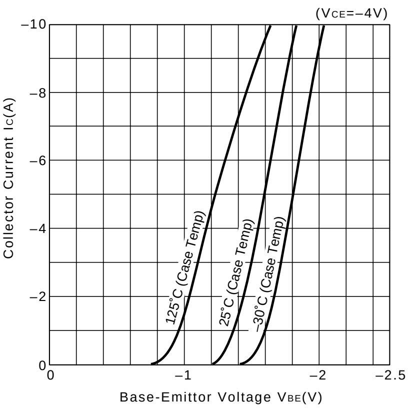
I_C–V_{CE} Characteristics (Typical)



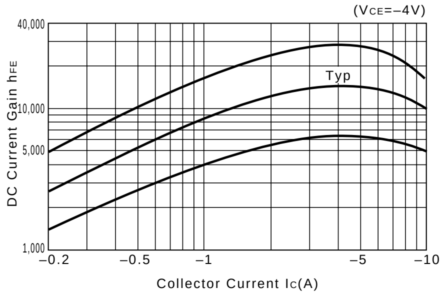
$V_{CE(sat)}$–I_B Characteristics (Typical)



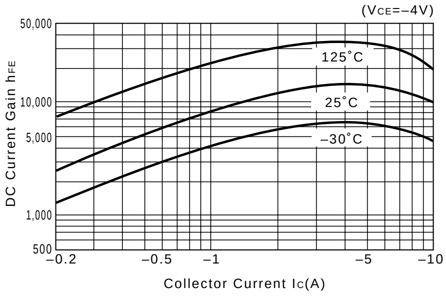
I_C–V_{BE} Temperature Characteristics (Typical)



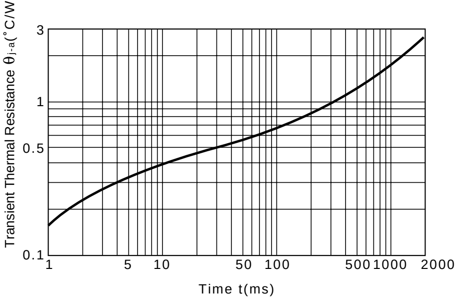
h_{FE}–I_C Characteristics (Typical)



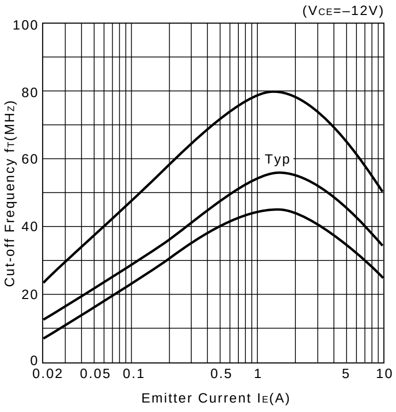
h_{FE}–I_C Temperature Characteristics (Typical)



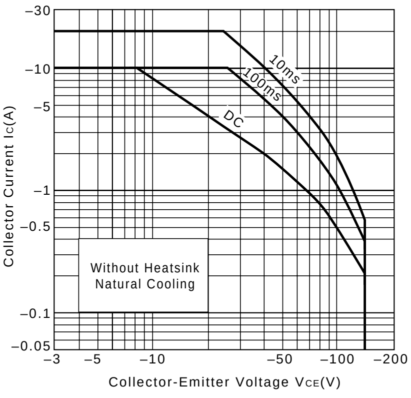
θ_{j-a}–t Characteristics



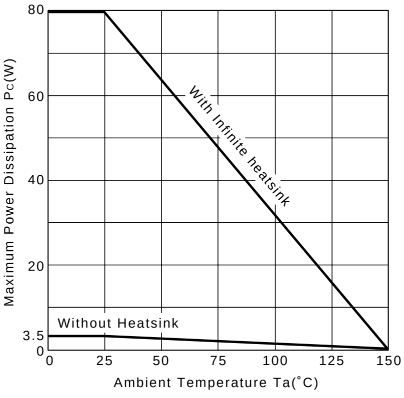
f_T–I_E Characteristics (Typical)



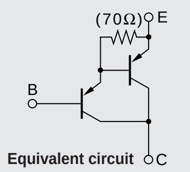
Safe Operating Area (Single Pulse)



P_C–Ta Derating



Darlington 2SB1647



Equivalent circuit

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SD2560)

Application : Audio, Series Regulator and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	–150	V
V_{CEO}	–150	V
V_{EBO}	–5	V
I_C	–15	A
I_B	–1	A
P_C	130(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

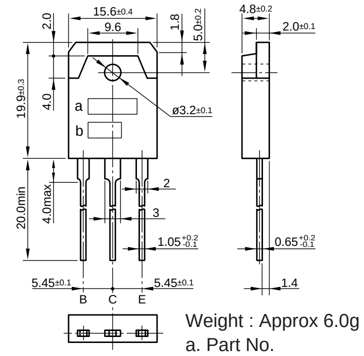
Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=–150V	–100max	μA
I_{EBO}	V_{EB}=–5V	–100max	μA
$V_{(BR)CEO}$	I_C=–30mA	–150min	V
h_{FE}	V_{CE}=–4V, I_C=–10A	5000min*	
V_{CE}(sat)	I_C=–10A, I_B=–10mA	–2.5max	V
V_{BE}(sat)	I_C=–10A, I_B=–10mA	–3.0max	V
f_T	V_{CE}=–12V, I_E=2A	45typ	MHz
C_{OB}	V_{CB}=–10V, f=1MHz	320typ	pF

*h_{FE} Rank Ō(5000 to 12000), P(6500 to 20000), Y(15000 to 30000)

■Typical Switching Characteristics (Common Emitter)

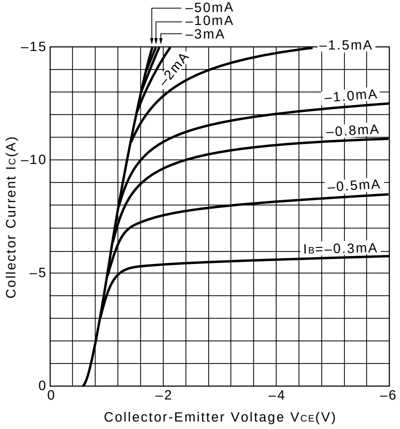
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (μs)	tstg (μs)	tf (μs)
–40	4	10	–10	5	–10	10	0.7typ	1.6typ	1.1typ

External Dimensions MT-100(TO3P)

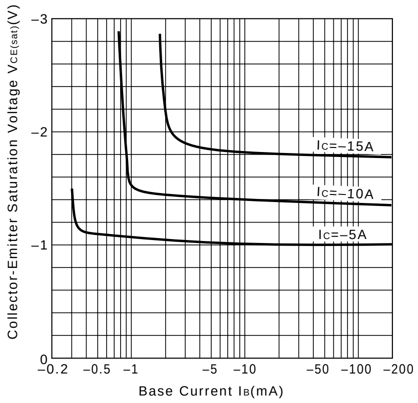


Weight : Approx 6.0g
a. Part No.
b. Lot No.

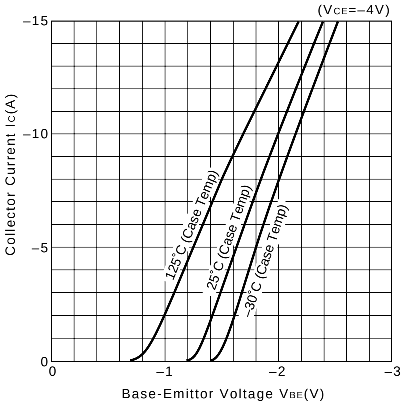
I_C–V_{CE} Characteristics (Typical)



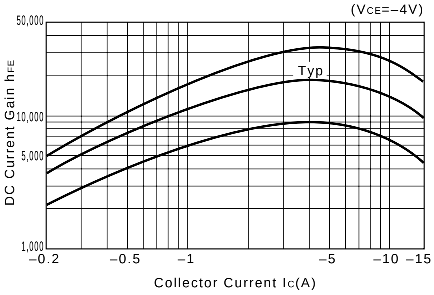
V_{CE}(sat)–I_B Characteristics (Typical)



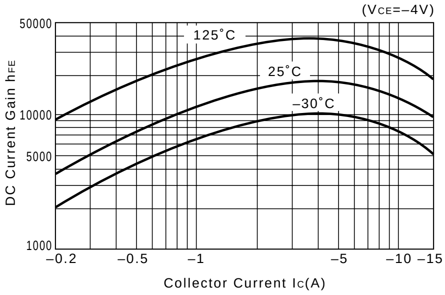
I_C–V_{BE} Temperature Characteristics (Typical)



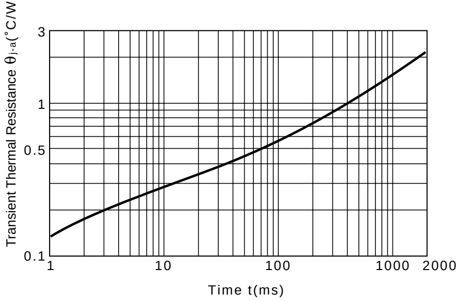
h_{FE}–I_C Characteristics (Typical)



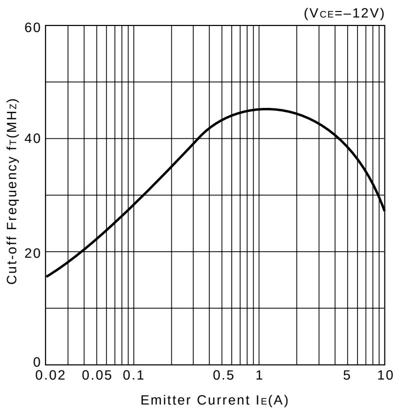
h_{FE}–I_C Temperature Characteristics (Typical)



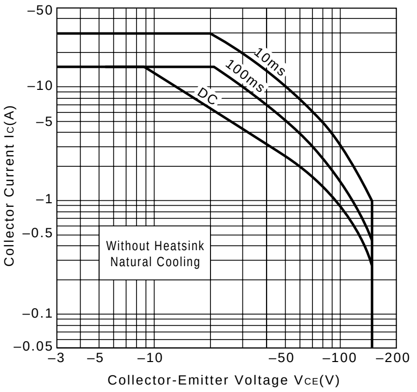
θj-a–t Characteristics



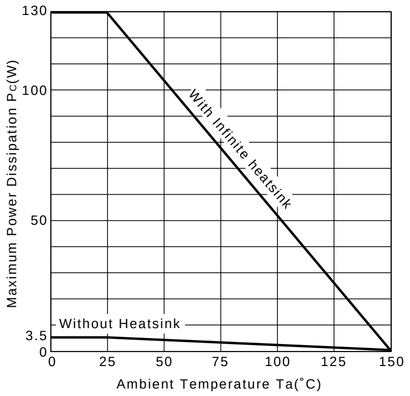
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C–Ta Derating



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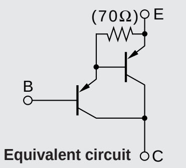


Silicon PNP Epitaxial Planar Transistor (Complement to type 2SD2561)

Application : Audio, Series Regulator and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	–150	V
V_{CEO}	–150	V
V_{EBO}	–5	V
I_C	–17	A
I_B	–1	A
P_C	200(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

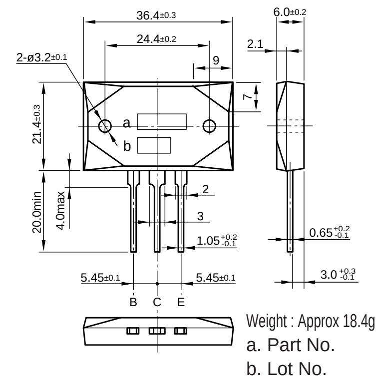
Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=–150V	–100max	μA
I_{EBO}	V_{EB}=–5V	–100max	μA
$V_{(BR)CEO}$	I_C=–30mA	–150min	V
h_{FE}	V_{CE}=–4V, I_C=–10A	5000min*	
V_{CE}(sat)	I_C=–10A, I_B=–10mA	–2.5max	V
V_{BE}(sat)	I_C=–10A, I_B=–10mA	–3.0max	V
f_T	V_{CE}=–12V, I_E=2A	45typ	MHz
C_{OB}	V_{CB}=–10V, f=1MHz	320typ	pF

*h_{FE} Rank $\overline{O}$(5000 to 12000), P(6500 to 20000), Y(15000 to 30000)

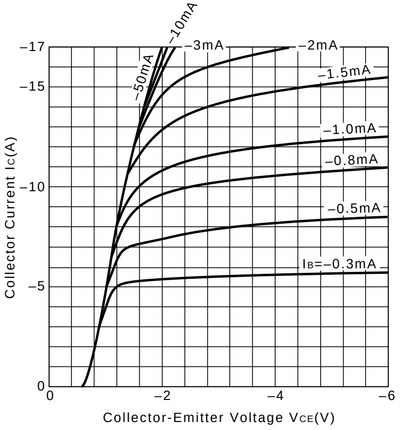
■Typical Switching Characteristics (Common Emitter)

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (μs)	tstg (μs)	tf (μs)
–40	4	–10	–10	5	–10	10	0.7typ	1.6typ	1.1typ

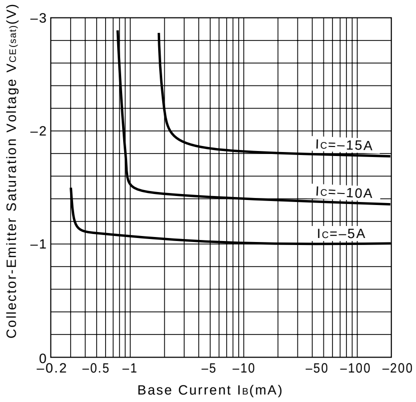
External Dimensions MT-200



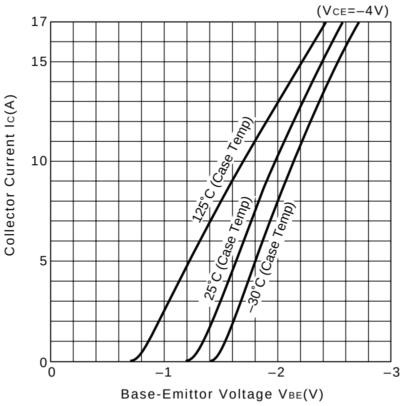
I_C–V_{CE} Characteristics (Typical)



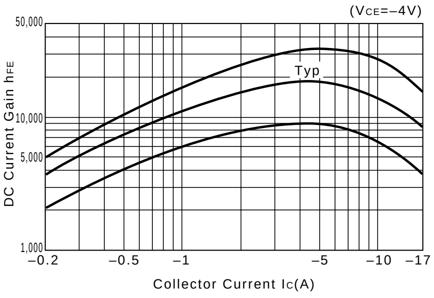
V_{CE}(sat)–I_B Characteristics (Typical)



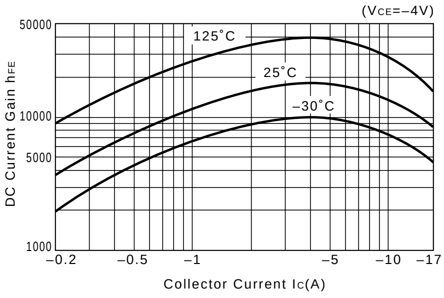
I_C–V_{BE} Temperature Characteristics (Typical)



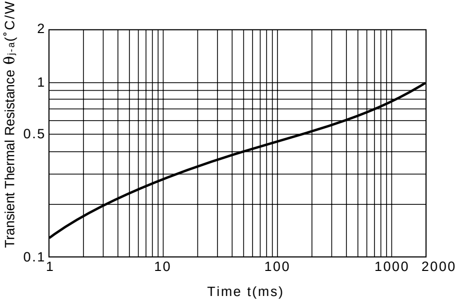
h_{FE}–I_C Characteristics (Typical)



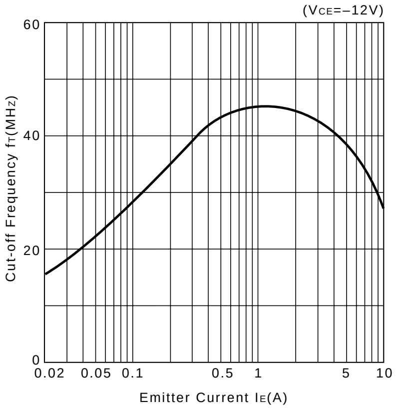
h_{FE}–I_C Temperature Characteristics (Typical)



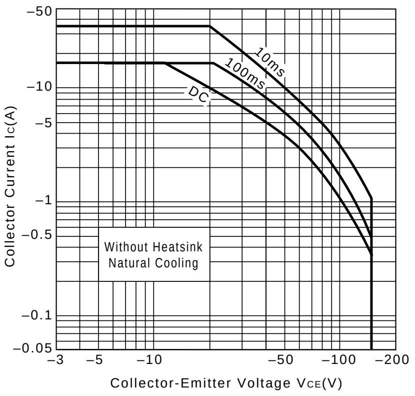
θ_{j-a}–t Characteristics



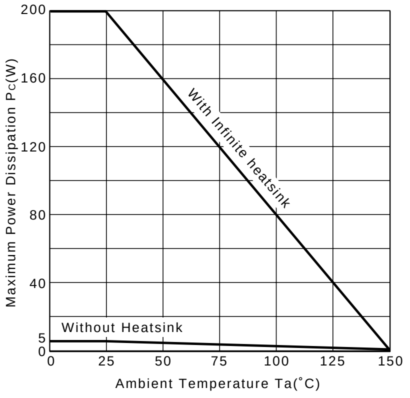
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



Pc–Ta Derating



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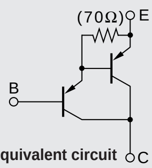


Equivalent circuit

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SD2561)

Application : Audio, Series Regulator and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	–150	V
V_{CEO}	–150	V
V_{EBO}	–5	V
I_C	–15	A
I_B	–1	A
P_C	85(Tc=25°C)	W
T_j	150	°C
T_{stg}	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

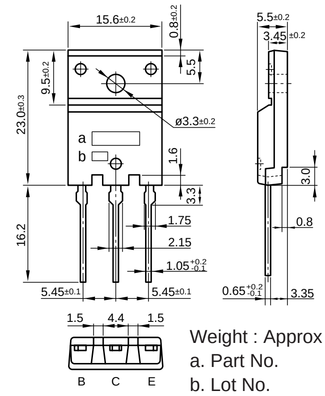
Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=–150V	–100max	µA
I_{EBO}	V_{EB}=–5V	–100max	µA
$V_{(BR)CEO}$	I_C=–30mA	–150min	V
h_{FE}	V_{CE}=–4V, I_C=–10A	5000min*	
V_{CE}(sat)	I_C=–10A, I_B=–10mA	–2.5max	V
V_{BE}(sat)	I_C=–10A, I_B=–10mA	–3.0max	V
f_T	V_{CE}=–12V, I_E=2A	45typ	MHz
C_{OB}	V_{CB}=–10V, f=1MHz	320typ	pF

*h_{FE} Rank O(5000 to 12000), P(6500 to 20000), Y(15000 to 30000)

■Typical Switching Characteristics (Common Emitter)

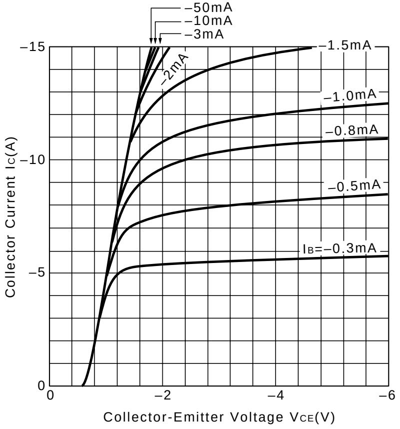
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (µs)	tstg (µs)	tf (µs)
–40	4	–10	–10	5	–10	10	0.7typ	1.6typ	1.1typ

External Dimensions FM100(TO3PF)

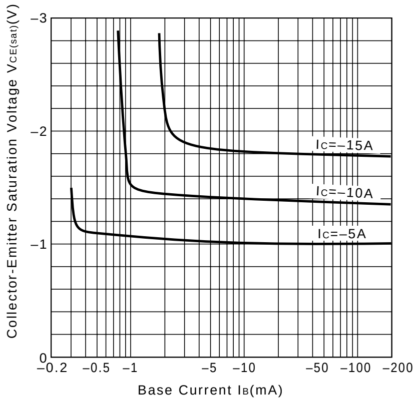


Weight : Approx 6.5g
a. Part No.
b. Lot No.

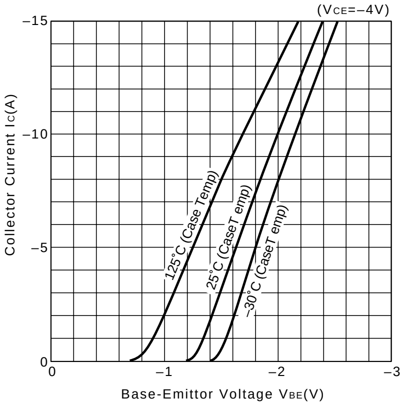
I_C–V_{CE} Characteristics (Typical)



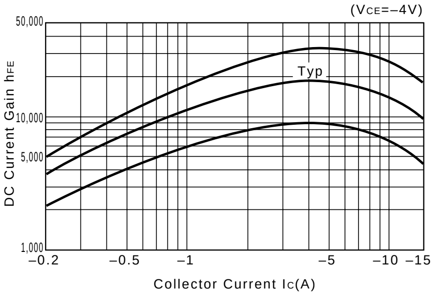
V_{CE}(sat)–I_B Characteristics (Typical)



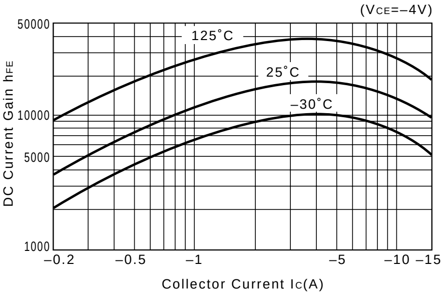
I_C–V_{BE} Temperature Characteristics (Typical)



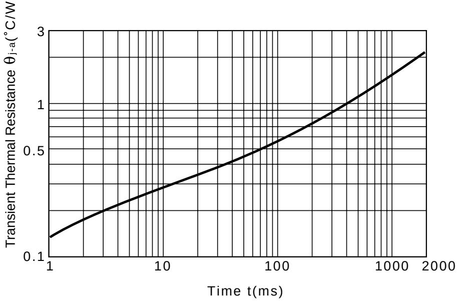
h_{FE}–I_C Characteristics (Typical)



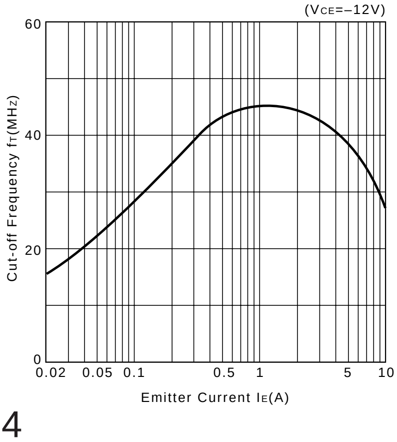
h_{FE}–I_C Temperature Characteristics (Typical)



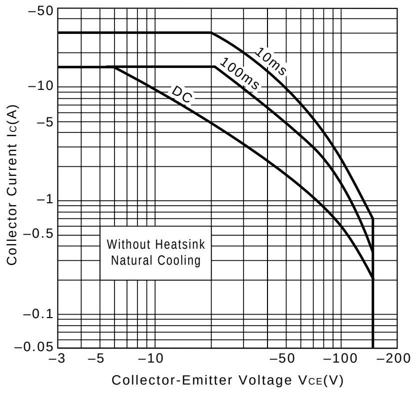
θ_{j-a}–t Characteristics



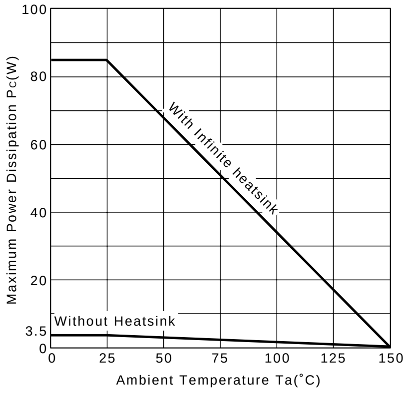
f_T–I_E Characteristics (Typical)



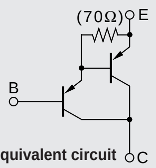
Safe Operating Area (Single Pulse)



Pc–Ta Derating



Darlington 2SB1659



Equivalent circuit

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SD2589)

Application : Audio, Series Regulator and General Purpose

■Absolute maximum ratings (Ta=25°C)

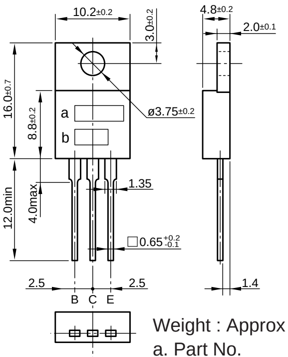
Symbol	Ratings	Unit
V_{CBO}	–110	V
V_{CEO}	–110	V
V_{EBO}	–5	V
I_C	–6	A
I_B	–1	A
P_C	50(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=–110V	–100max	μA
I_{EBO}	V_{EB}=–5V	–100max	μA
$V_{(BR)CEO}$	I_C=–30mA	–110min	V
h_{FE}	V_{CE}=–4V, I_C=–5A	5000min*	
$V_{CE(sat)}$	I_C=–5A, I_B=–5mA	–2.5max	V
$V_{BE(sat)}$	I_C=–5A, I_B=–5mA	–3.0max	V
f_T	V_{CE}=–12V, I_E=0.5A	100typ	MHz
C_{OB}	V_{CB}=–10V, f=1MHz	110typ	pF

*h_{FE} Rank O(5000 to 12000), P(6500 to 20000), Y(15000 to 30000)

External Dimensions MT-25(TO220)

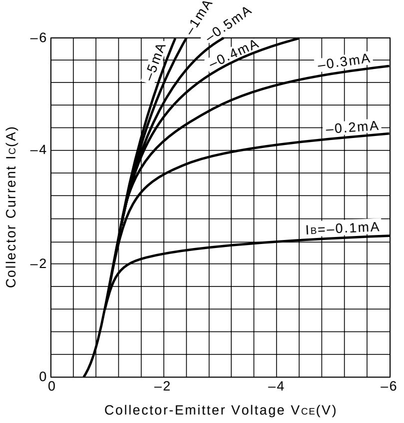


Weight : Approx 2.0g
a. Part No.
b. Lot No.

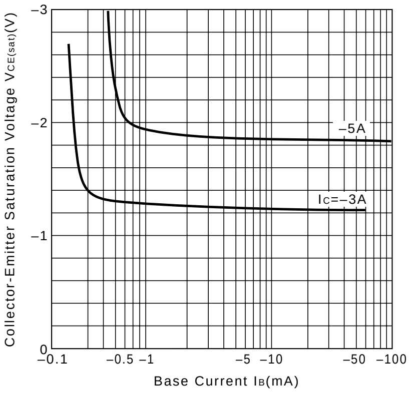
■Typical Switching Characteristics (Common Emitter)

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (μs)	tstg (μs)	tf (μs)
–30	6	–5	–10	5	–5	5	1.1typ	3.2typ	1.1typ

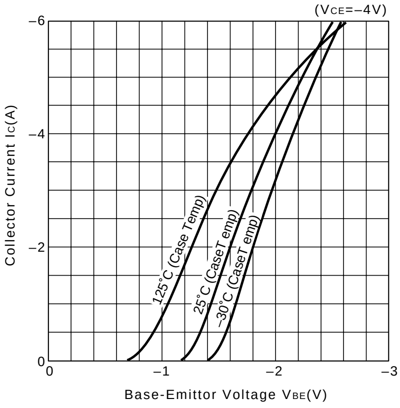
I_C–V_{CE} Characteristics (Typical)



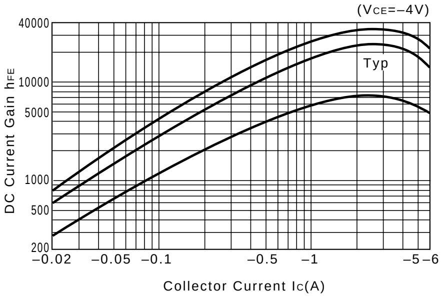
$V_{CE(sat)}$–I_B Characteristics (Typical)



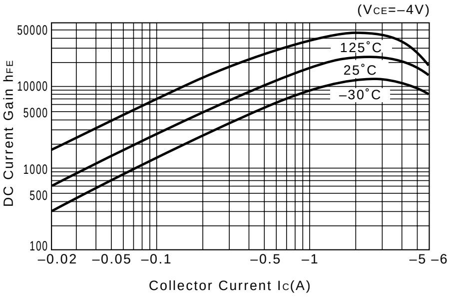
I_C–V_{BE} Temperature Characteristics (Typical)



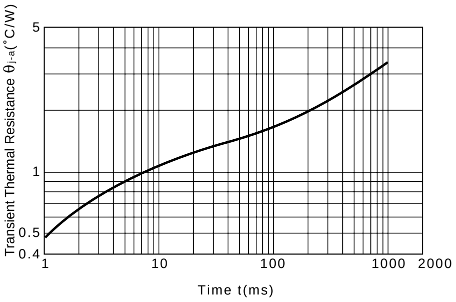
h_{FE}–I_C Characteristics (Typical)



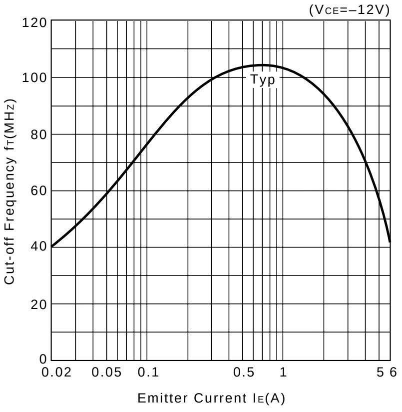
h_{FE}–I_C Temperature Characteristics (Typical)



$\theta_{j\text{-}a}$–t Characteristics

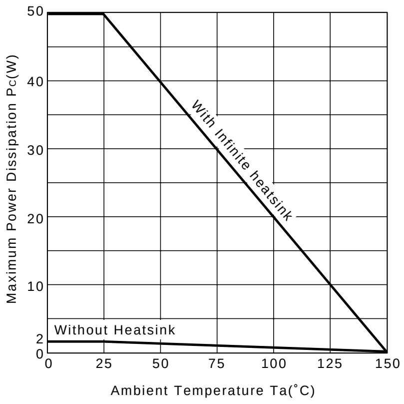


f_T–I_E Characteristics (Typical)

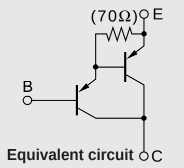


Safe Operating Area (Single Pulse)

P_C–Ta Derating



Darlington 2SB1685



Equivalent circuit

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SD2641)

Application : Audio, Series Regulator and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	–110	V
V_{CEO}	–110	V
V_{EBO}	–5	V
I_C	–6	A
I_B	–1	A
P_C	60(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

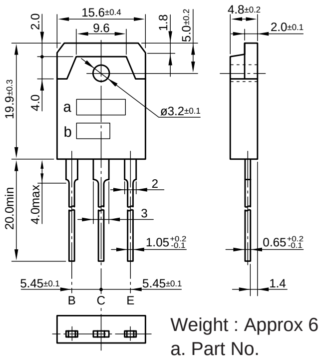
Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=–110V	–100max	μA
I_{EBO}	V_{EB}=–5V	–100max	μA
$V_{(BR)CEO}$	I_C=–30mA	–110min	V
h_{FE}	V_{CE}=–4V, I_C=–5A	5000min*	
$V_{CE(sat)}$	I_C=–5A, I_B=–5mA	–2.5max	V
$V_{BE(sat)}$	I_C=–5A, I_B=–5mA	–3.0max	V
f_T	V_{CE}=–12V, I_E=0.5A	100typ	MHz
C_{OB}	V_{CB}=–10V, f=1MHz	110typ	pF

*h_{FE} Rank O(5000to12000), P(6500to20000), Y(15000to30000)

■Typical Switching Characteristics (Common Emitter)

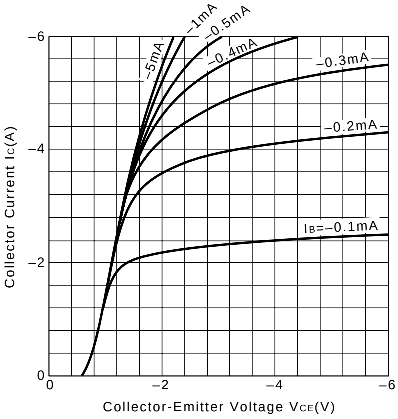
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (μs)	tstg (μs)	tf (μs)
–30	6	–5	–10	5	–5	5	1.1typ	3.2typ	1.1typ

External Dimensions MT-100(TO3P)

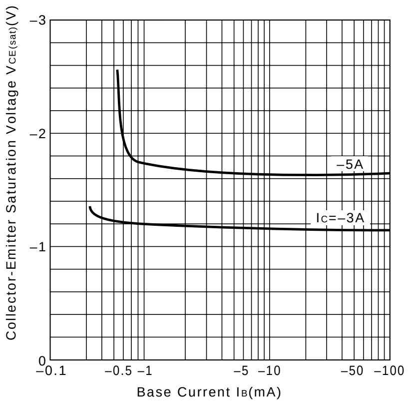


Weight : Approx 6.0g
a. Part No.
b. Lot No.

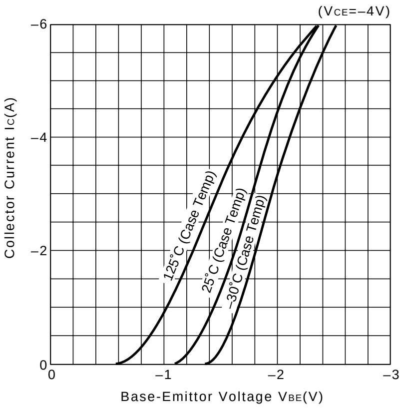
I_C–V_{CE} Characteristics (Typical)



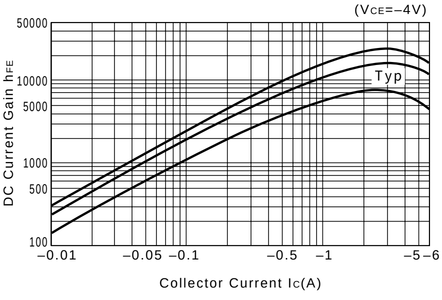
$V_{CE(sat)}$–I_B Characteristics (Typical)



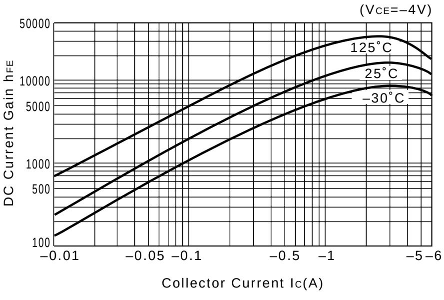
I_C–V_{BE} Temperature Characteristics (Typical)



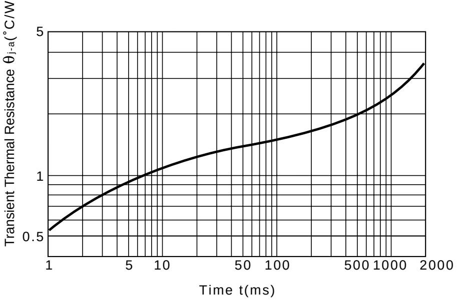
h_{FE}–I_C Characteristics (Typical)



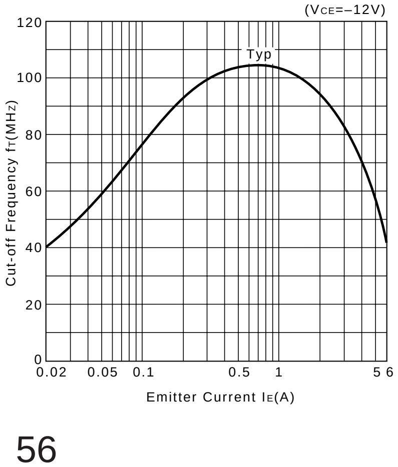
h_{FE}–I_C Temperature Characteristics (Typical)



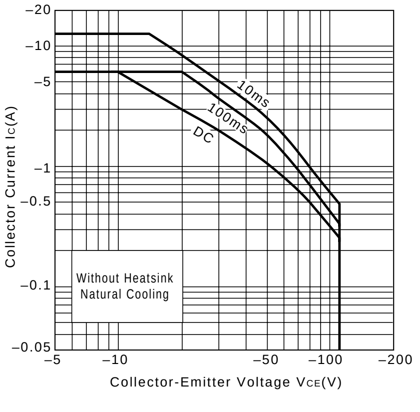
$\theta_{j\text{-}a}$–t Characteristics



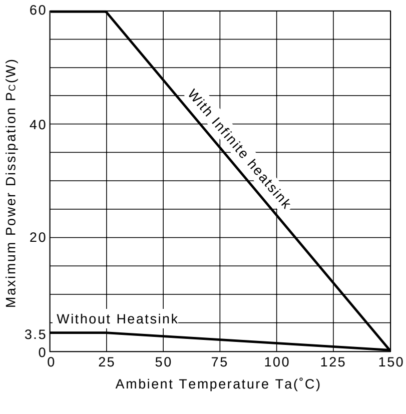
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)

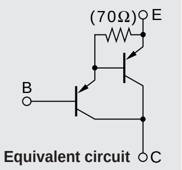


P_C–Ta Derating



Darlington

2SB1686



Equivalent circuit

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SD2642)

Application : Audio, Series Regulator and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	–110	V
V_{CEO}	–110	V
V_{EBO}	–5	V
I_C	–6	A
I_B	–1	A
P_C	30(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

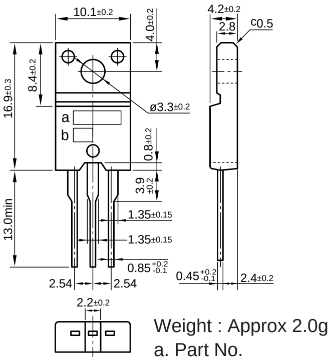
Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=–110V	–100max	μA
I_{EBO}	V_{EB}=–5V	–100max	μA
$V_{(BR)CEO}$	I_C=–30mA	–110min	V
h_{FE}	V_{CE}=–4V, I_C=–5A	5000min*	
$V_{CE(sat)}$	I_C=–5A, I_B=–5mA	–2.5max	V
$V_{BE(sat)}$	I_C=–5A, I_B=–5mA	–3.0max	V
f_T	V_{CE}=–12V, I_E=0.5A	100typ	MHz
C_{OB}	V_{CB}=–10V, f=1MHz	110typ	pF

*h_{FE} Rank O(5000 to 12000), P(6500 to 20000), Y(15000 to 30000)

■Typical Switching Characteristics (Common Emitter)

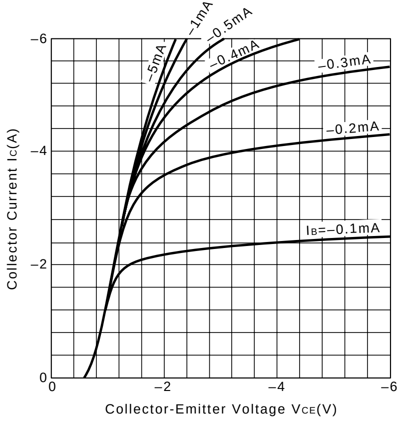
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (μs)	tstg (μs)	tf (μs)
–30	6	–5	–10	5	–5	5	1.1typ	3.2typ	1.1typ

External Dimensions FM20(TO220F)

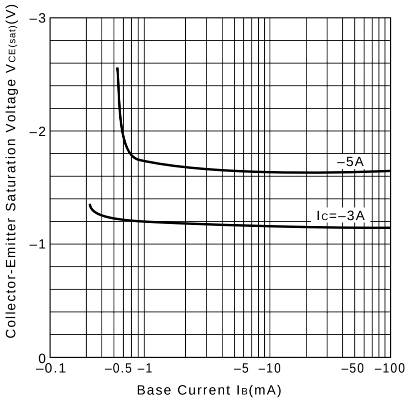


Weight : Approx 2.0g
a. Part No.
b. Lot No.

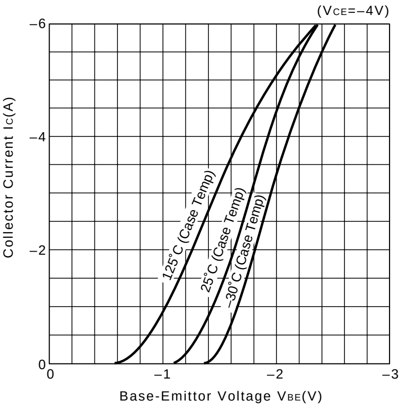
I_C–V_{CE} Characteristics (Typical)



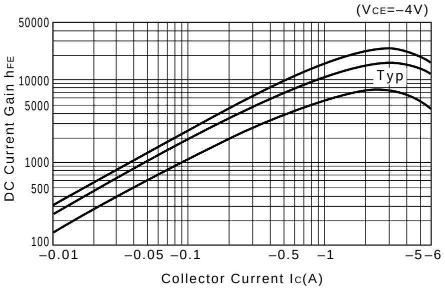
$V_{CE(sat)}$–I_B Characteristics (Typical)



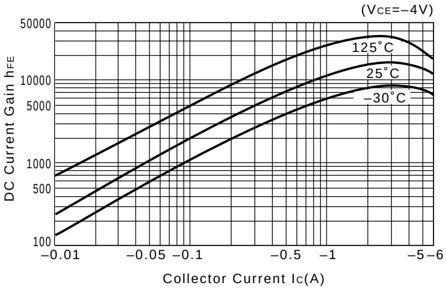
I_C–V_{BE} Temperature Characteristics (Typical)



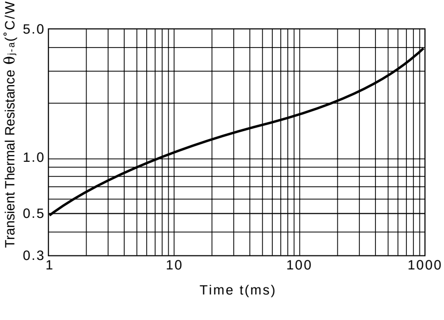
h_{FE}–I_C Characteristics (Typical)



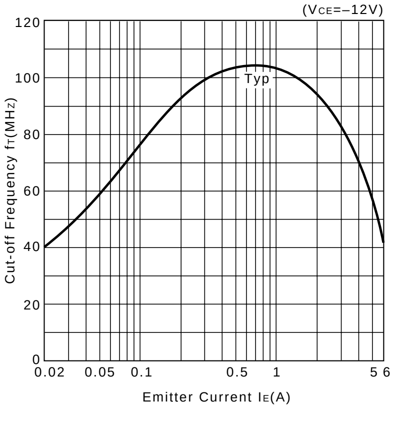
h_{FE}–I_C Temperature Characteristics (Typical)



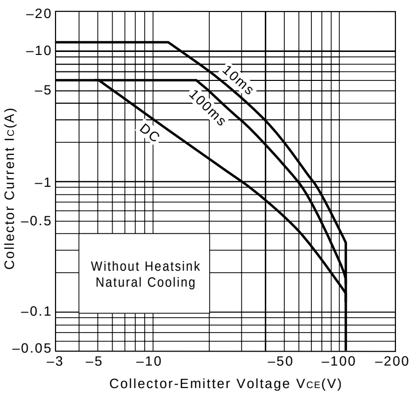
$\theta_{j\text{-}a}$–t Characteristics



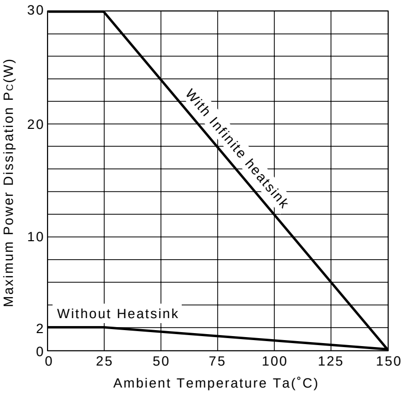
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)

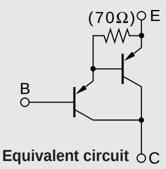


P_C–Ta Derating



Darlington

2SB1687



Equivalent circuit

Silicon PNP Epitaxial Planar Transistor (Complement to type 2SD2643)

Application : Audio, Series Regulator and General Purpose

■Absolute maximum ratings (Ta=25°C)

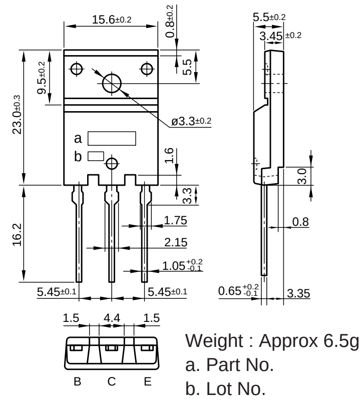
Symbol	Ratings	Unit
V_{CBO}	–110	V
V_{CEO}	–110	V
V_{EBO}	–5	V
I_C	–6	A
I_B	–1	A
P_C	60(Tc=25°C)	W
T_j	150	°C
T_{stg}	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=–110V	–100max	μA
I_{EBO}	V_{EB}=–5V	–100max	μA
$V_{(BR)CEO}$	I_C=–30mA	–110min	V
h_{FE}	V_{CE}=–4V, I_C=–5A	5000min*	
$V_{CE(sat)}$	I_C=–5A, I_B=–5mA	–2.5max	V
$V_{BE(sat)}$	I_C=–5A, I_B=–5mA	–3.0max	V
f_T	V_{CE}=–12V, I_E=0.5A	–100typ	MHz
C_{OB}	V_{CB}=–10V, f=1MHz	–110typ	pF

*h_{FE} Rank O(5000to12000), P(6500to20000), Y(15000to30000)

External Dimensions FM100(TO3P)

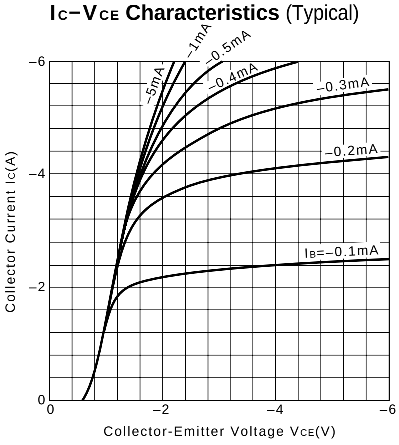


Weight : Approx 6.5g
a. Part No.
b. Lot No.

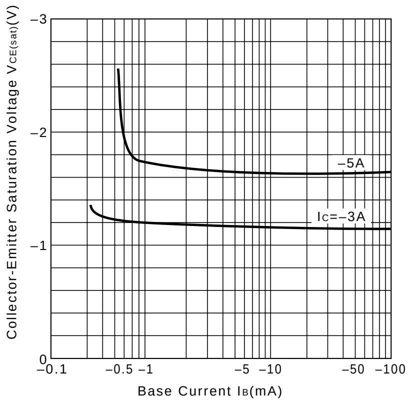
■Typical Switching Characteristics (Common Emitter)

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (μs)	tstg (μs)	tf (μs)
–30	6	–5	–10	5	–5	5	1.1typ	3.2typ	1.1typ

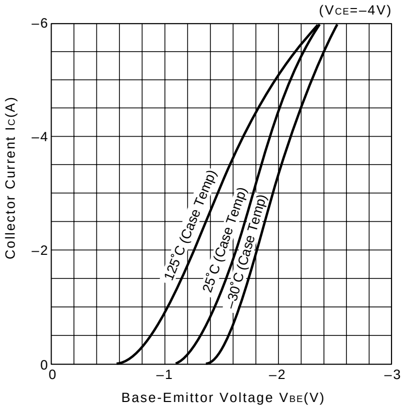
I_C–V_{CE} Characteristics (Typical)



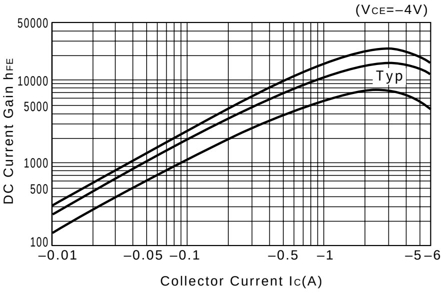
$V_{CE(sat)}$–I_B Characteristics (Typical)



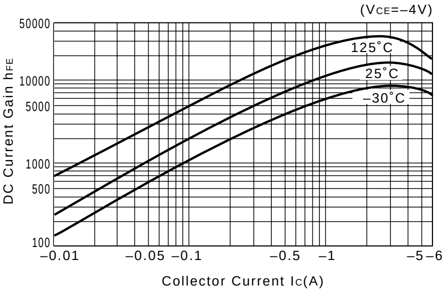
I_C–V_{BE} Temperature Characteristics (Typical)



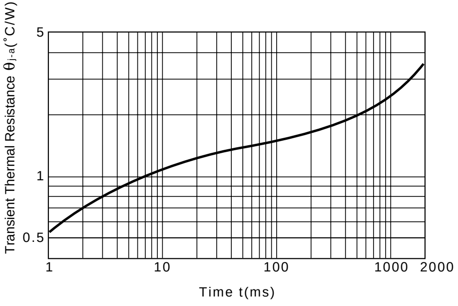
h_{FE}–I_C Characteristics (Typical)



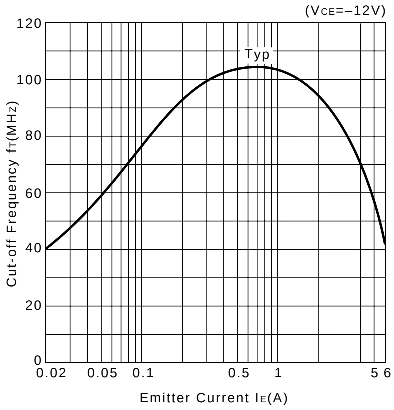
h_{FE}–I_C Temperature Characteristics (Typical)



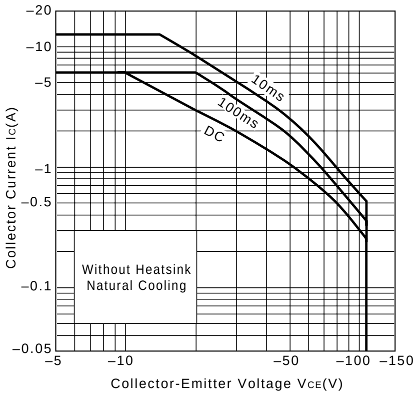
θ_{j-a}–t Characteristics



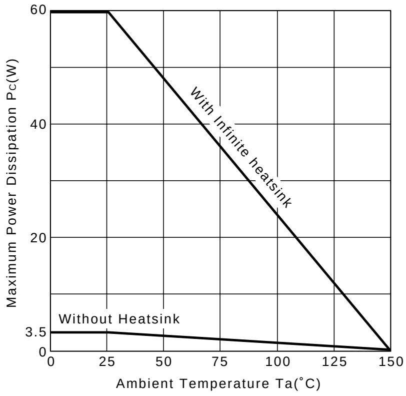
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C–T_a Derating



2SC2023

Silicon NPN Triple Diffused Planar Transistor

Application : Series Regulator, Switch, and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	300	V
V_{CEO}	300	V
V_{EBO}	6	V
I_C	2	A
I_B	0.2	A
P_C	40(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

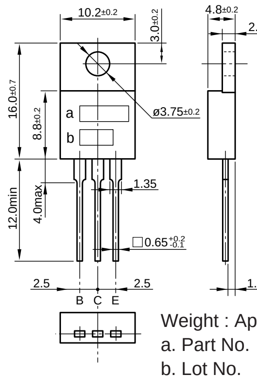
■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=300V	1.0max	mA
I_{EBO}	V_{EB}=6V	1.0max	mA
$V_{(BR)CEO}$	I_C=25mA	300min	V
h_{FE}	V_{CE}=4V, I_C=0.5A	30min	
$V_{CE(sat)}$	I_C=1.0A, I_B=0.2A	1.0max	V
f_T	V_{CE}=12A, I_E=–0.2A	10typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	75typ	pF

■Typical Switching Characteristics (Common Emitter)

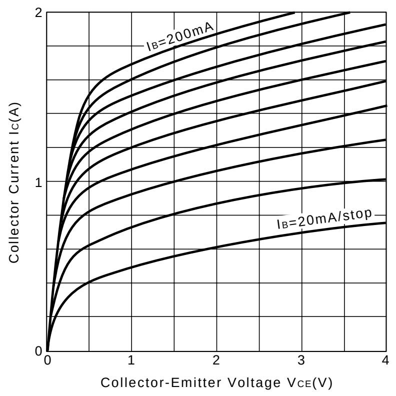
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{B2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (μs)	tstg (μs)	tf (μs)
100	100	1.0	–5	100	–200	0.3typ	4.0typ	1.0typ

External Dimensions MT-25(TO220)

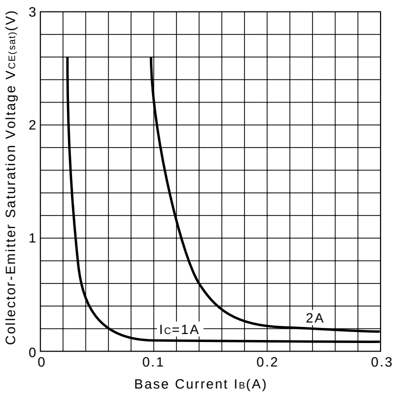


Weight : Approx 2.6g
a. Part No.
b. Lot No.

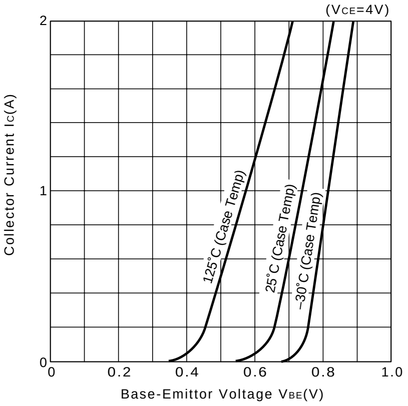
I_C–V_{CE} Characteristics (Typical)



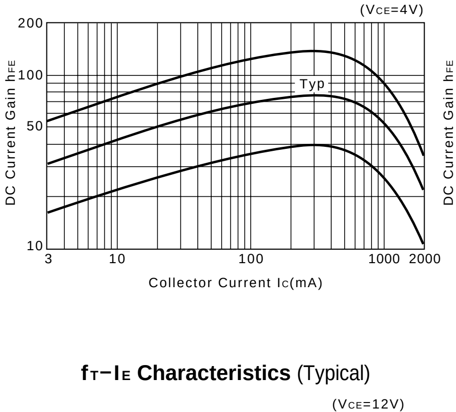
$V_{CE(sat)}$–I_B Characteristics (Typical)



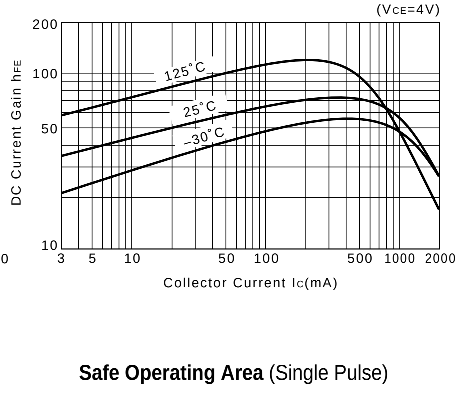
I_C–V_{BE} Temperature Characteristics (Typical)



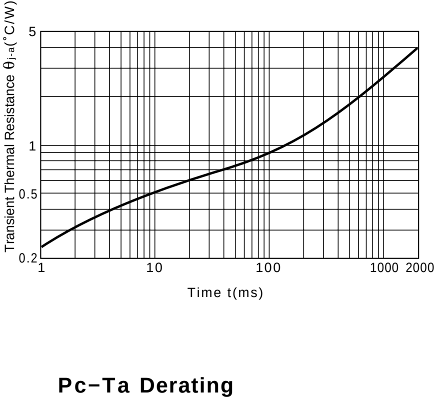
h_{FE}–I_C Characteristics (Typical)



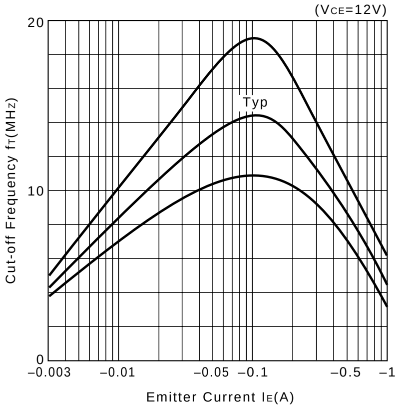
h_{FE}–I_C Temperature Characteristics (Typical)



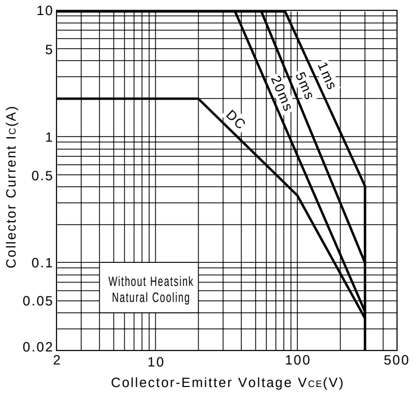
θ_{j-a}–t Characteristics



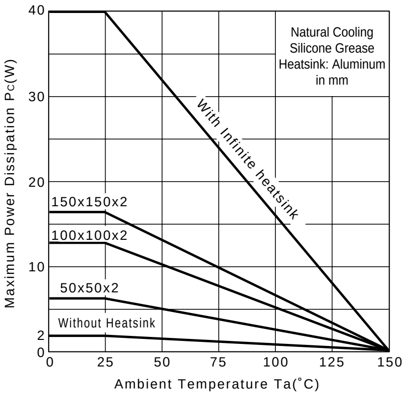
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C–Ta Derating



LAPT 2SC2837

Silicon NPN Epitaxial Planar Transistor (Complement to type 2SA1186)

Application : Audio and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	150	V
V_{CEO}	150	V
V_{EBO}	5	V
I_C	10	A
I_B	2	A
P_C	100(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

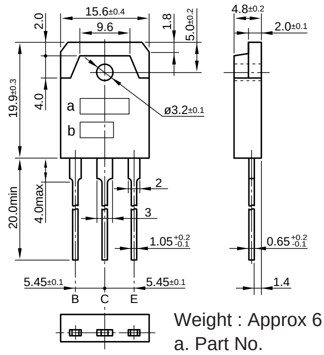
Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=150V	100max	µA
I_{EBO}	V_{EB}=5V	100max	µA
$V_{(BR)CEO}$	I_C=25mA	150min	V
h_{FE}	V_{CE}=4V, I_C=3V	50min∗	
V_{CE}(sat)	I_C=5A, I_B=0.5A	2.0max	V
f_T	V_{CE}=12V, I_E=–1A	70typ	MHz
C_{OB}	V_{CB}=80V, f=1MHz	60typ	pF

∗h_{FE} Rank O(50 to 100), P(70 to 140), Y(90 to 180)

■Typical Switching Characteristics (Common Emitter)

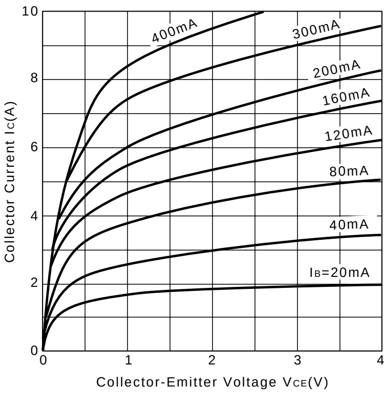
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{B2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (µs)	tstg (µs)	tf (µs)
60	12	5	–5	500	–500	0.2typ	1.4typ	0.35typ

External Dimensions MT-100(TO3P)

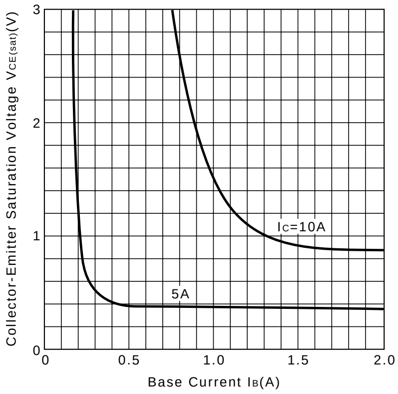


Weight : Approx 6.0g
a. Part No.
b. Lot No.

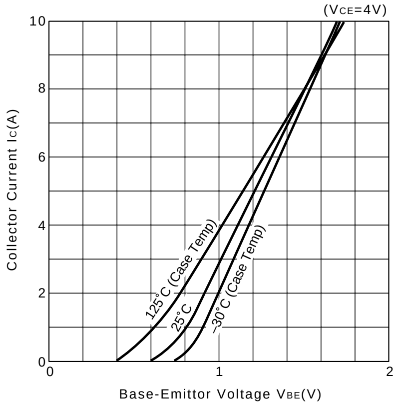
Ic−Vce Characteristics (Typical)



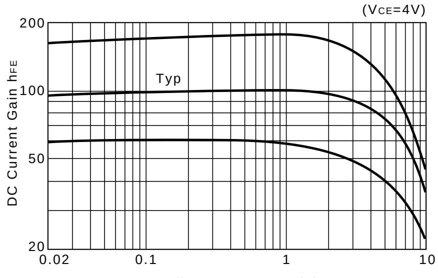
Vce(sat)−Ib Characteristics (Typical)



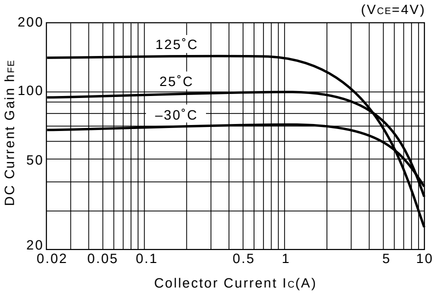
Ic−Vbe Temperature Characteristics (Typical)



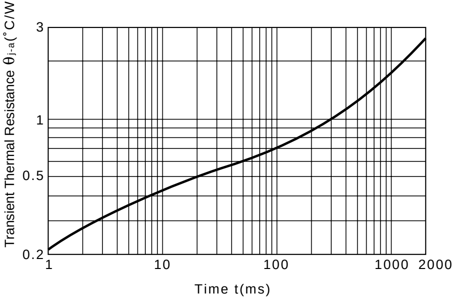
hfe−Ic Characteristics (Typical)



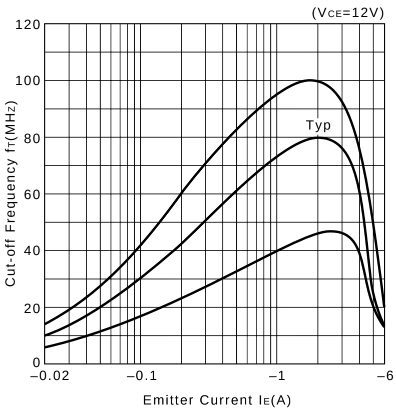
hfe−Ic Temperature Characteristics (Typical)



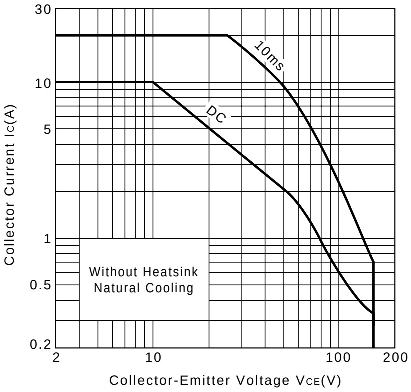
θj-a−t Characteristics



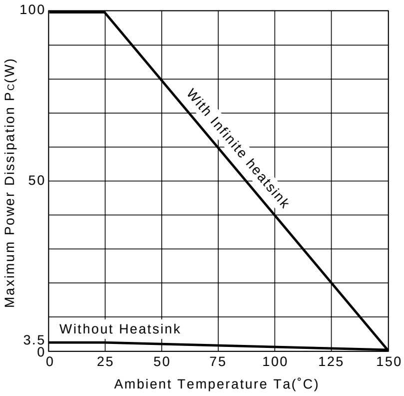
fT−Ie Characteristics (Typical)



Safe Operating Area (Single Pulse)



Pc−Ta Derating



LAPT 2SC2921

Silicon NPN Epitaxial Planar Transistor (Complement to type 2SA1215)

Application : Audio and General Purpose

■Absolute maximum ratings (Ta=25°C)

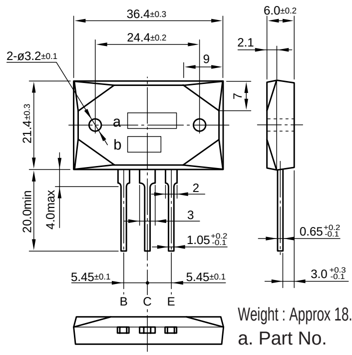
Symbol	Ratings	Unit
V_{CBO}	160	V
V_{CEO}	160	V
V_{EBO}	5	V
I_C	15	A
I_B	4	A
P_C	150(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=160V	100max	μA
I_{EBO}	V_{EB}=5V	100max	μA
$V_{(BR)CEO}$	I_C=25mA	160min	V
h_{FE}	V_{CE}=4V, I_C=5A	50min*	
$V_{CE(sat)}$	I_C=5A, I_B=0.5A	2.0max	V
f_T	V_{CE}=12V, I_E=–2A	60typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	200typ	pF

*h_{FE} Rank O(50 to 100), P(70 to 140), Y(90 to 180)

External Dimensions MT-200

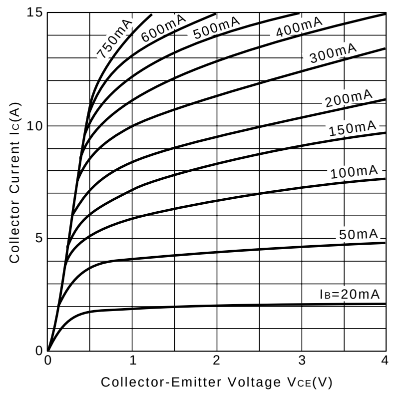


Weight : Approx 18.4g
a. Part No.
b. Lot No.

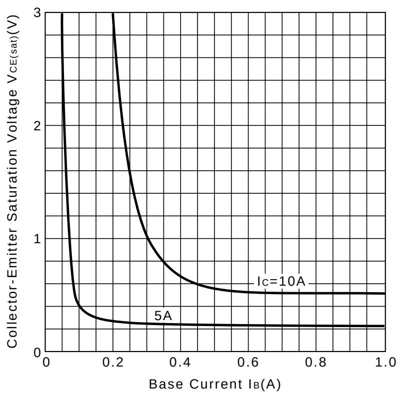
■Typical Switching Characteristics (Common Emitter)

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{B2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (μs)	tstg (μs)	tf (μs)
60	12	5	–5	500	–500	0.2typ	1.5typ	0.35typ

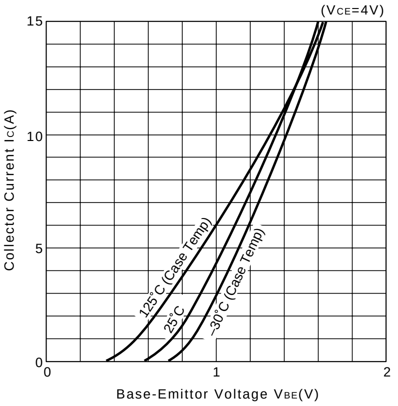
I_C–V_{CE} Characteristics (Typical)



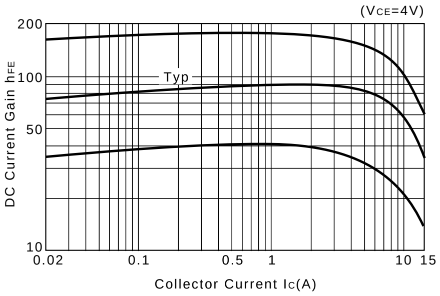
$V_{CE(sat)}$–I_B Characteristics (Typical)



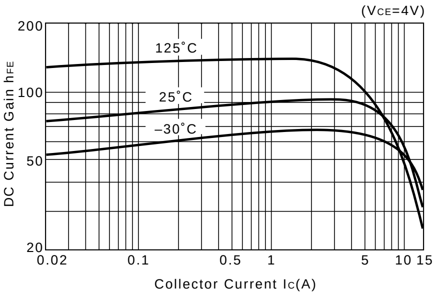
I_C–V_{BE} Temperature Characteristics (Typical)



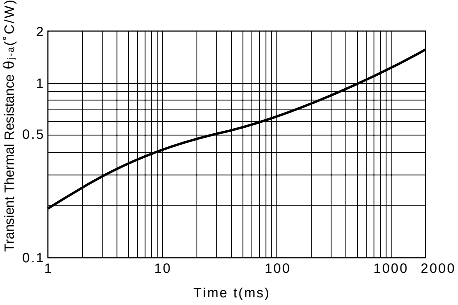
h_{FE}–I_C Characteristics (Typical)



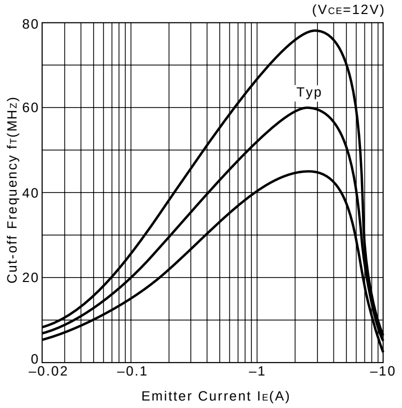
h_{FE}–I_C Temperature Characteristics (Typical)



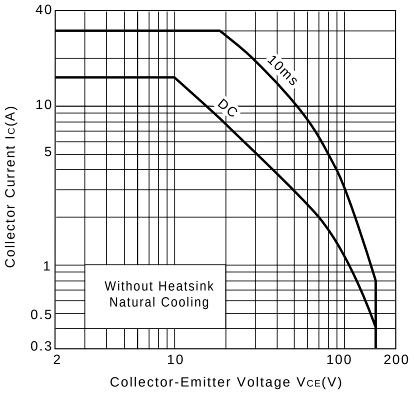
θ_{j-a}–t Characteristics



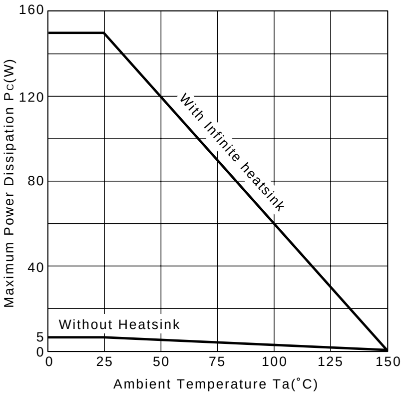
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



Pc–Ta Derating



LAPT

2SC2922

Silicon NPN Epitaxial Planar Transistor (Complement to type 2SA1216)

Application : Audio and General Purpose

■**Absolute maximum ratings** (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	180	V
V_{CEO}	180	V
V_{EBO}	5	V
I_C	17	A
I_B	5	A
P_C	200(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■**Electrical Characteristics** (Ta=25°C)

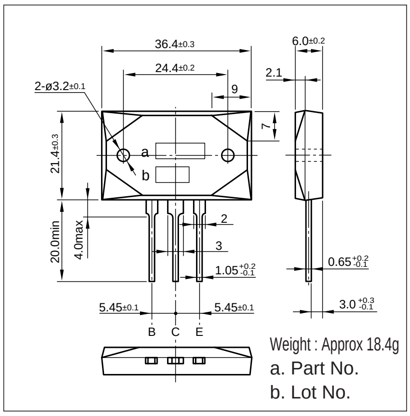
Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=180V	100max	μA
I_{EBO}	V_{EB}=5V	100max	μA
$V_{(BR)CEO}$	I_C=25mA	180min	V
h_{FE}	V_{CE}=4V, I_C=8V	30min∗	
V_{CE}(sat)	I_C=8A, I_B=0.8A	2.0max	V
f_T	V_{CE}=12V, I_E=–2A	50typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	250typ	pF

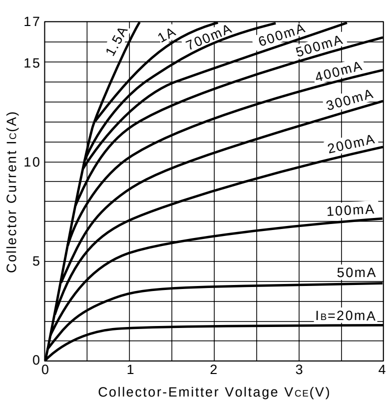
∗h_{FE} Rank O(30 to 60), Y(50 to 100), P(70 to 140), G(90 to 180)

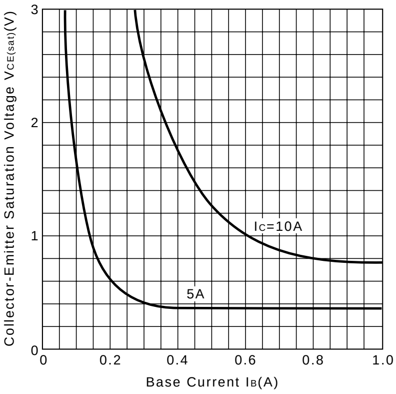
■**Typical Switching Characteristics (Common Emitter)**

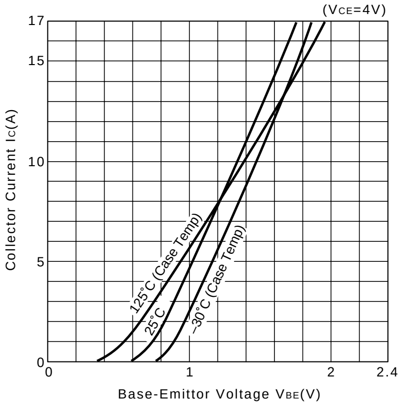
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{B2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
40	4	10	–5	1	–1	0.2typ	1.3typ	0.45typ

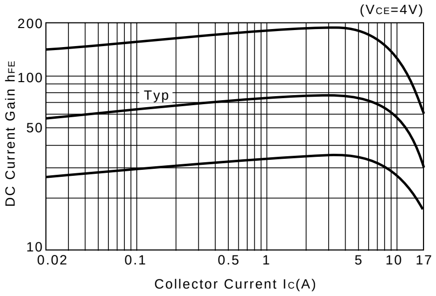
External Dimensions MT-200

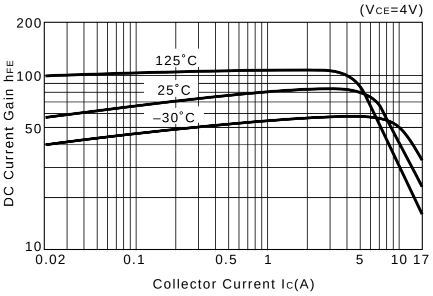


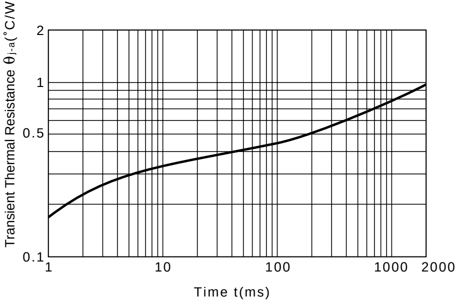

I_C−V_{CE} Characteristics (Typical)

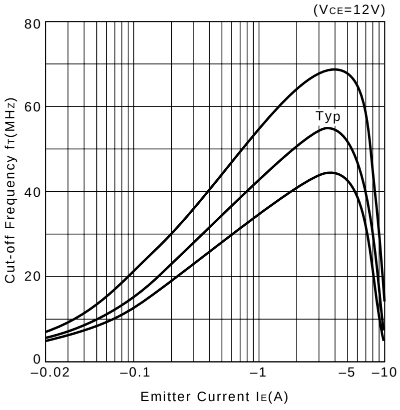

V_{CE}(sat)−I_B Characteristics (Typical)

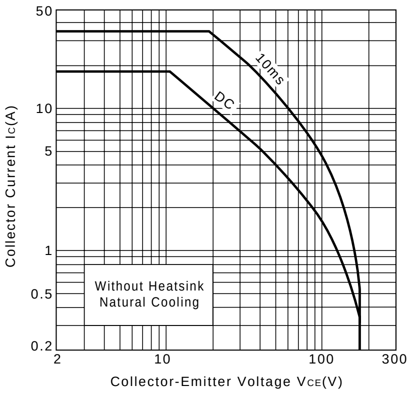

I_C−V_{BE} Temperature Characteristics (Typical)

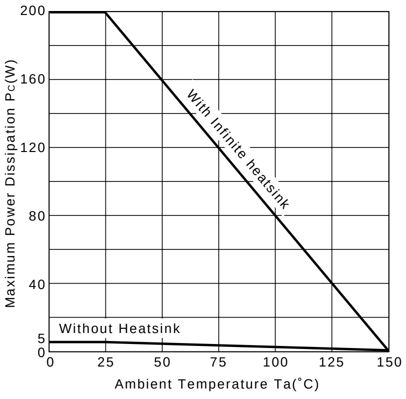

h_{FE}−I_C Characteristics (Typical)


h_{FE}−I_C Temperature Characteristics (Typical)


θ$_{j-a}$−t Characteristics


f_T−I_E Characteristics (Typical)


Safe Operating Area (Single Pulse)


P_C−Ta Derating

2SC3179

Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SA1262)

Application : Audio and General Purpose

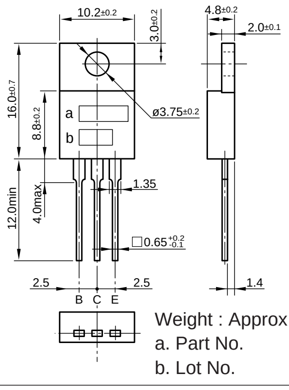
■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	80	V
V_{CEO}	60	V
V_{EBO}	6	V
I_C	4	A
I_B	1	A
P_C	30(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=80V	100max	µA
I_{EBO}	V_{EB}=6V	100max	µA
$V_{(BR)CEO}$	I_C=25mA	60min	V
h_{FE}	V_{CE}=4V, I_C=1V	40min	
$V_{CE(sat)}$	I_C=2A, I_B=0.2A	0.6max	V
f_T	V_{CE}=12V, I_E=–0.2A	15typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	60typ	pF

External Dimensions MT-25(TO220)

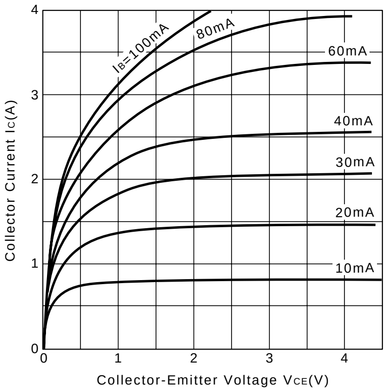


Weight : Approx 2.6g
a. Part No.
b. Lot No.

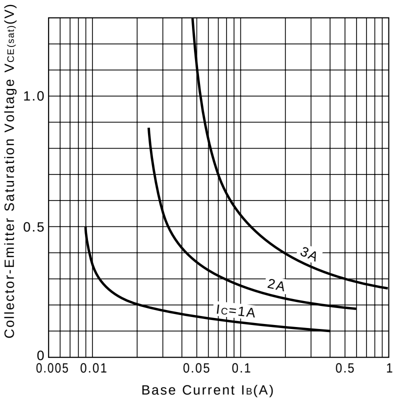
■Typical Switching Characteristics (Common Emitter)

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (µs)	tstg (µs)	tf (µs)
20	10	2	10	–5	200	–200	0.2typ	1.9typ	0.29typ

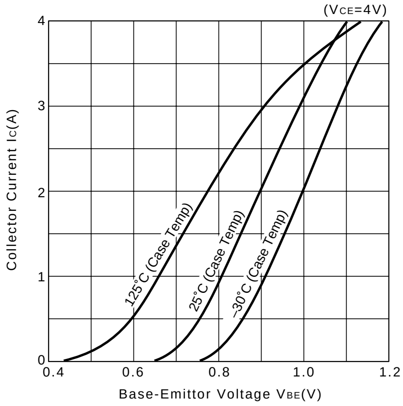
I_C–V_{CE} Characteristics (Typical)



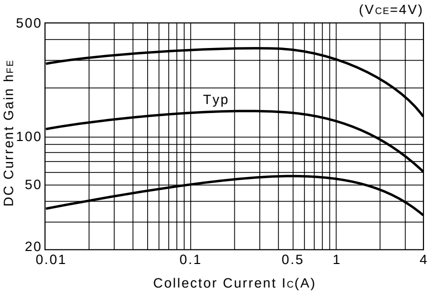
$V_{CE(sat)}$–I_B Characteristics (Typical)



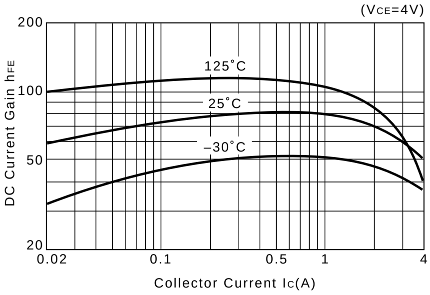
I_C–V_{BE} Temperature Characteristics (Typical)



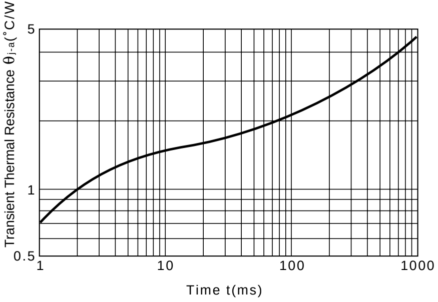
h_{FE}–I_C Characteristics (Typical)



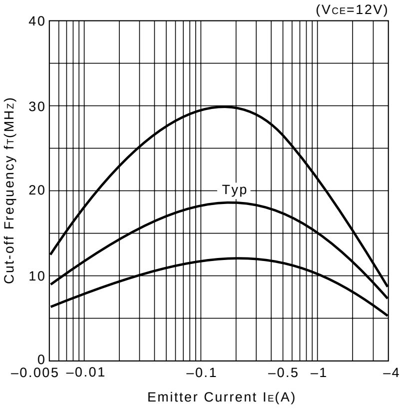
h_{FE}–I_C Temperature Characteristics (Typical)



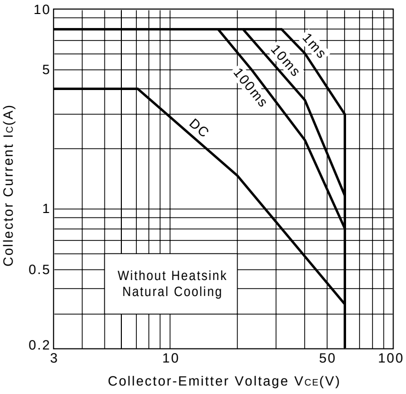
θj-a–t Characteristics



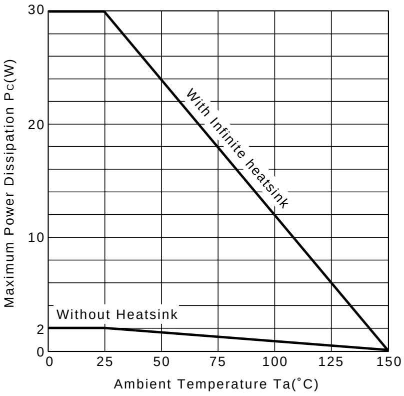
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



Pc–Ta Derating



LAPT 2SC3263

Silicon NPN Epitaxial Planar Transistor (Complement to type 2SA1294)

Application : Audio and General Purpose

■**Absolute maximum ratings** (Ta=25°C)

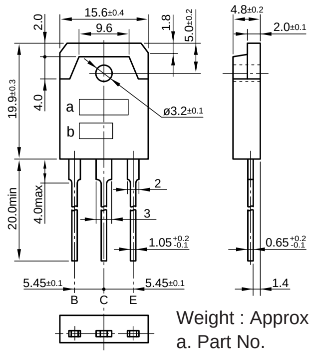
Symbol	Ratings	Unit
V_{CBO}	230	V
V_{CEO}	230	V
V_{EBO}	5	V
I_C	15	A
I_B	4	A
P_C	130(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=230V	100max	μA
I_{EBO}	V_{EB}=5V	100max	μA
$V_{(BR)CEO}$	I_C=25mA	230min	V
h_{FE}	V_{CE}=4V, I_C=5A	50min*	
$V_{CE}(sat)$	I_C=5A, I_B=0.5A	2.0max	V
f_T	V_{CE}=12V, I_E=–2A	60typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	250typ	pF

*h_{FE} Rank O(50 to 100), Y(70 to 140)

External Dimensions MT-100(TO3P)

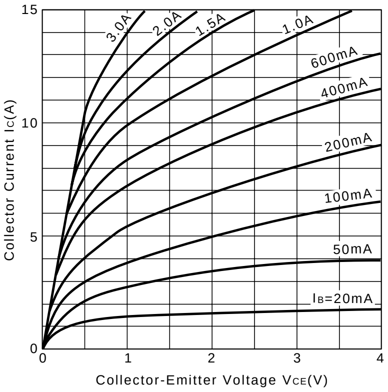


Weight : Approx 6.0g
a. Part No.
b. Lot No.

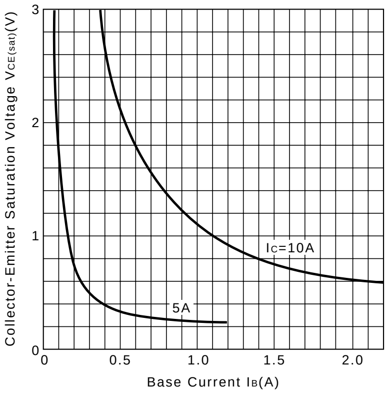
■**Typical Switching Characteristics (Common Emitter)**

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (μs)	tstg (μs)	tf (μs)
60	12	5	10	–5	500	–500	0.30typ	2.40typ	0.50typ

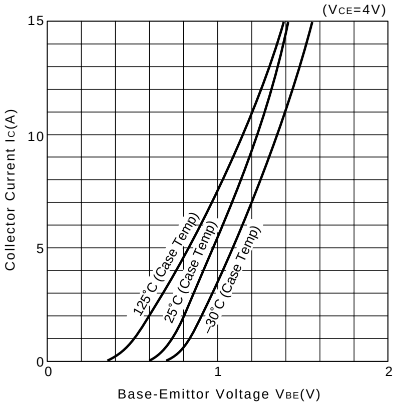
I_C–V_{CE} Characteristics (Typical)



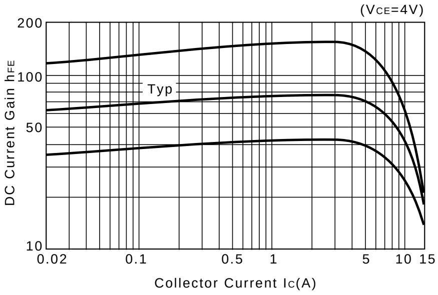
$V_{CE}(sat)$–I_B Characteristics (Typical)



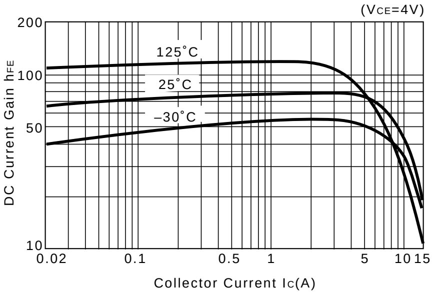
I_C–V_{BE} Temperature Characteristics (Typical)



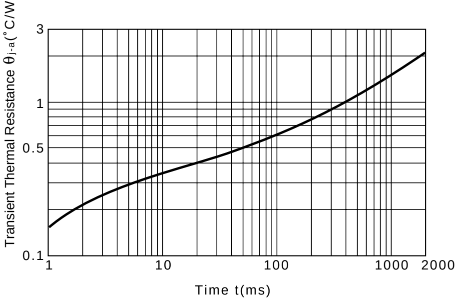
h_{FE}–I_C Characteristics (Typical)



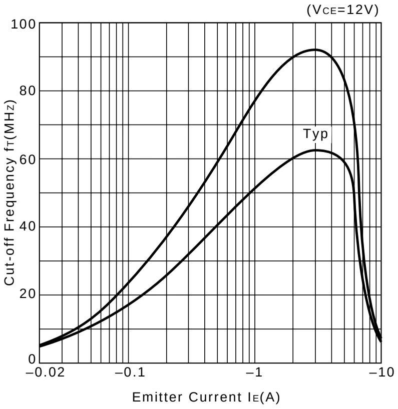
h_{FE}–I_C Temperature Characteristics (Typical)



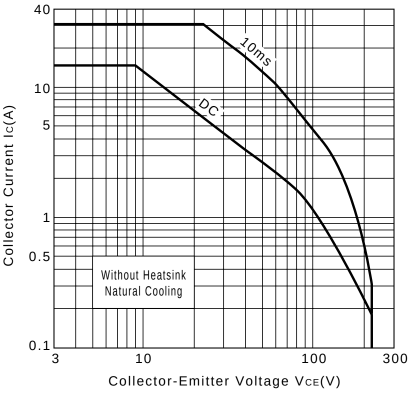
θ_{j-a}–t Characteristics



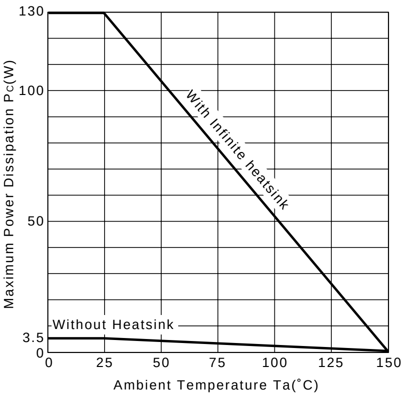
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C–Ta Derating



LAPT 2SC3264

Silicon NPN Epitaxial Planar Transistor (Complement to type 2SA1295)

Application : Audio and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	230	V
V_{CEO}	230	V
V_{EBO}	5	V
I_C	17	A
I_B	5	A
P_C	200(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

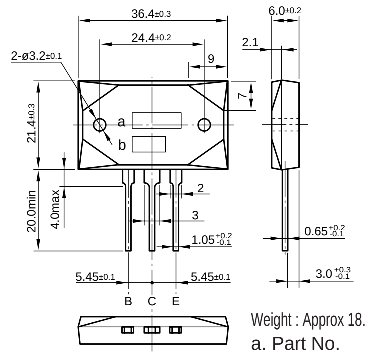
Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=230V	100max	μA
I_{EBO}	V_{EB}=5V	100max	μA
$V_{(BR)CEO}$	I_C=25mA	230min	V
h_{FE}	V_{CE}=4V, I_C=5A	50min*	
V_{CE}(sat)	I_C=5A, I_B=0.5A	2.0max	V
f_T	V_{CE}=12V, I_E=–2A	60typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	250typ	pF

*h_{FE} Rank $\overline{\text{O}}$(50 to 100), Y(70 to 140)

■Typical Switching Characteristics (Common Emitter)

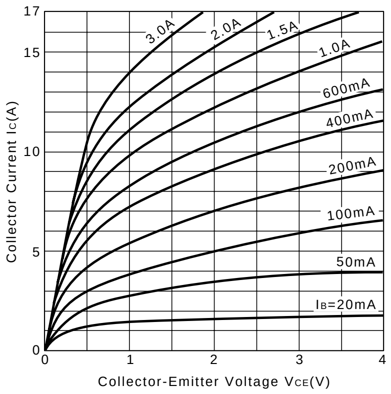
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
60	12	5	10	–5	0.5	–0.5	0.30typ	2.40typ	0.50typ

External Dimensions MT-200

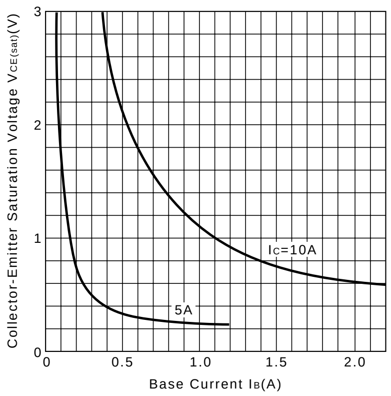


Weight : Approx 18.4g
a. Part No.
b. Lot No.

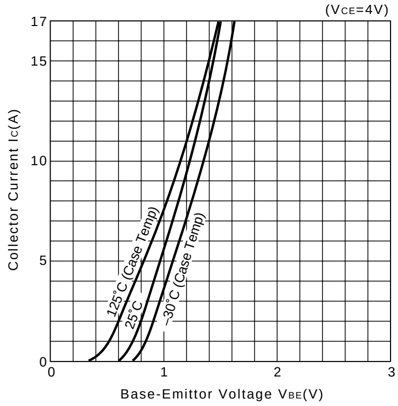
I_C–V_{CE} Characteristics (Typical)



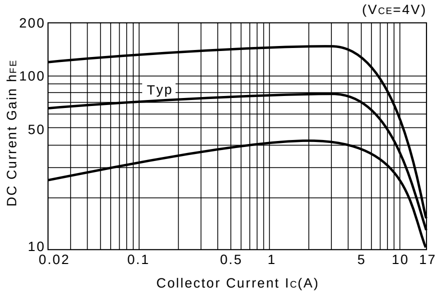
V_{CE}(sat)–I_B Characteristics (Typical)



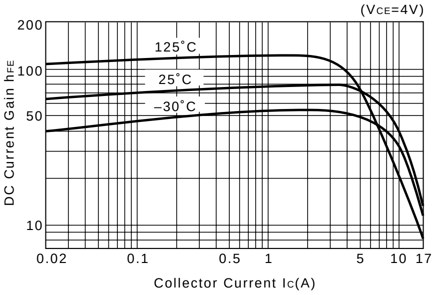
I_C–V_{BE} Temperature Characteristics (Typical)



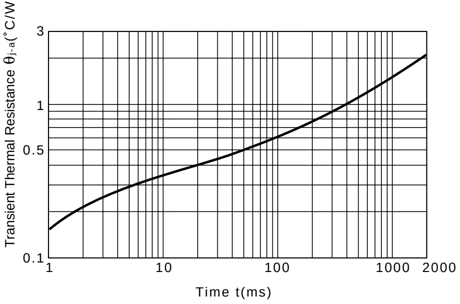
h_{FE}–I_C Characteristics (Typical)



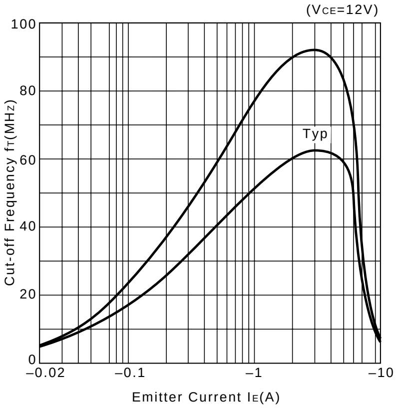
h_{FE}–I_C Temperature Characteristics (Typical)



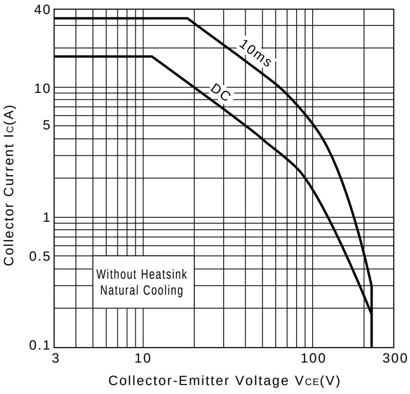
$\theta_{j\text{-}a}$–t Characteristics



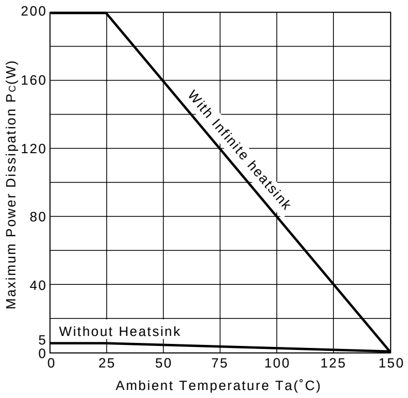
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



Pc–Ta Derating



LAPT

2SC3284

Silicon NPN Epitaxial Planar Transistor (Complement to type 2SA1303)

Application : Audio and General Purpose

■**Absolute maximum ratings** (Ta=25°C)

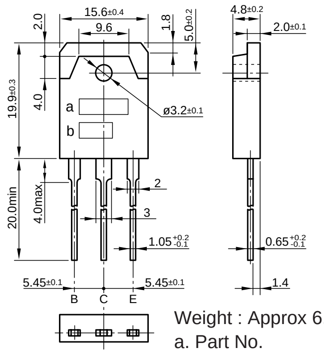
Symbol	Ratings	Unit
V_{CBO}	150	V
V_{CEO}	150	V
V_{EBO}	5	V
I_C	14	A
I_B	3	A
P_C	125(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=150V	100max	µA
I_{EBO}	V_{EB}=5V	100max	µA
$V_{(BR)CEO}$	I_C=25mA	150min	V
h_{FE}	V_{CE}=4V, I_C=5A	50min*	
$V_{CE(sat)}$	I_C=5A, I_B=0.5A	2.0max	V
f_T	V_{CE}=12V, I_E=–2A	60typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	200typ	pF

*h_{FE} Rank O(50 to 100), P(70 to 140), Y(90 to 180)

External Dimensions MT-100(TO3P)

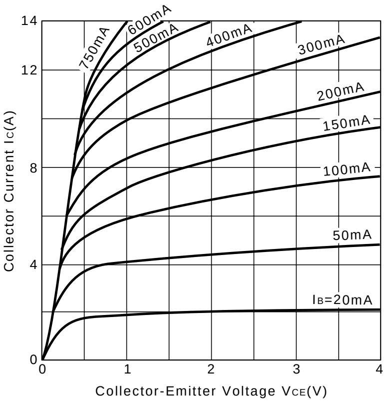


Weight : Approx 6.0g
a. Part No.
b. Lot No.

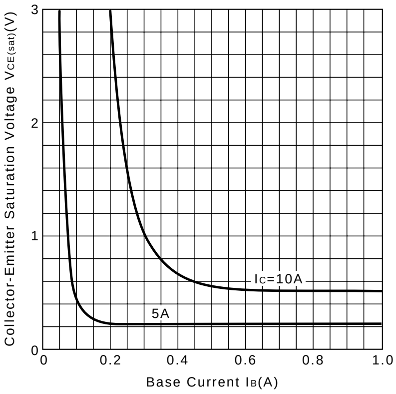
■**Typical Switching Characteristics (Common Emitter)**

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (µs)	tstg (µs)	tf (µs)
60	12	5	10	–5	0.5	–0.5	0.2typ	1.5typ	0.35typ

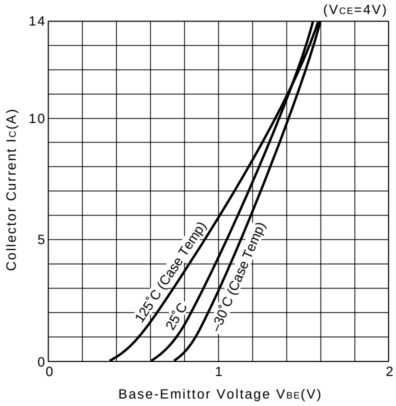
I_C–V_{CE} Characteristics (Typical)



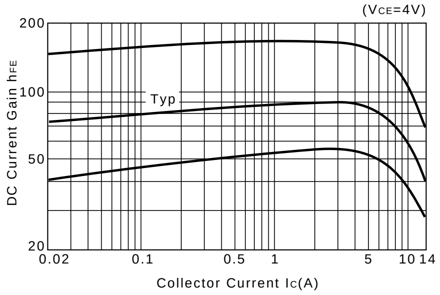
$V_{CE(sat)}$–I_B Characteristics (Typical)



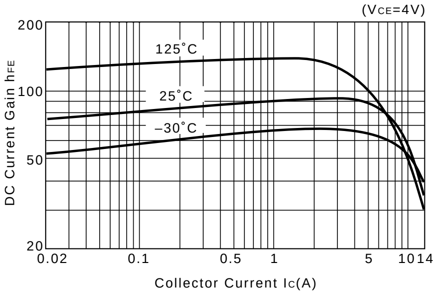
I_C–V_{BE} Temperature Characteristics (Typical)



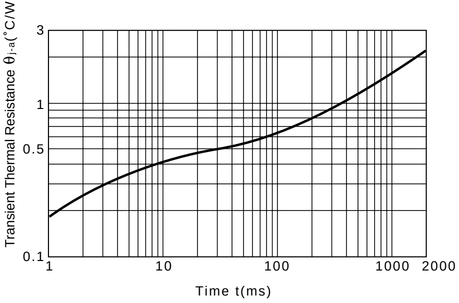
h_{FE}–I_C Characteristics (Typical)



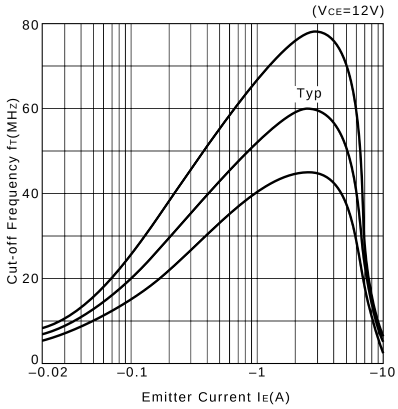
h_{FE}–I_C Temperature Characteristics (Typical)



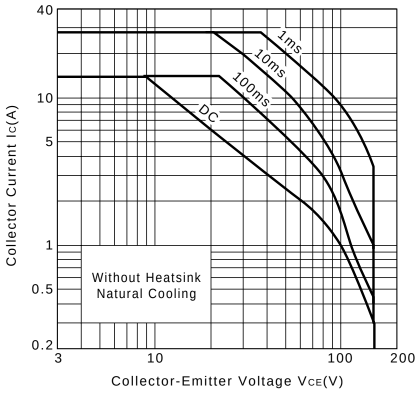
θ_{j-a}–t Characteristics



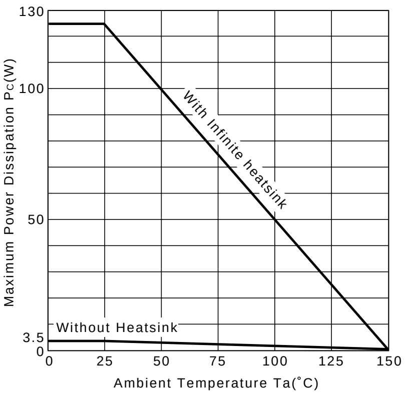
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C–Ta Derating



LAPT 2SC3519/3519A

Silicon NPN Epitaxial Planar Transistor (Complement to type 2SA1386/A)

Application : Audio and General Purpose

■**Absolute maximum ratings** (Ta=25°C)

Symbol	Ratings		Unit
	2SC3519	2SC3519A	
V_{CBO}	160	180	V
V_{CEO}	160	180	V
V_{EBO}	5		V
I_C	15		A
I_B	4		A
P_C	130(Tc=25°C)		W
Tj	150		°C
Tstg	–55 to +150		°C

■**Electrical Characteristics** (Ta=25°C)

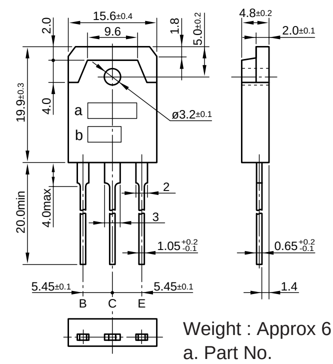
Symbol	Conditions	Ratings		Unit
		2SC3519	2SC3519A	
I_{CBO}		100max		µA
	V_{CB}=	160	180	V
I_{EBO}	V_{EB}=5V	100max		µA
$V_{(BR)CEO}$	I_C=25mA	160min	180min	V
h_{FE}	V_{CE}=4V, I_C=5A	50min*		
$V_{CE(sat)}$	I_C=5A, I_B=0.5A	2.0max		V
f_T	V_{CE}=12V, I_E=–2A	50typ		MHz
C_{OB}	V_{CB}=10V, f=1MHz	250typ		pF

*h_{FE} Rank O(50 to 100), P(70 to 140), Y(90 to 180)

■**Typical Switching Characteristics (Common Emitter)**

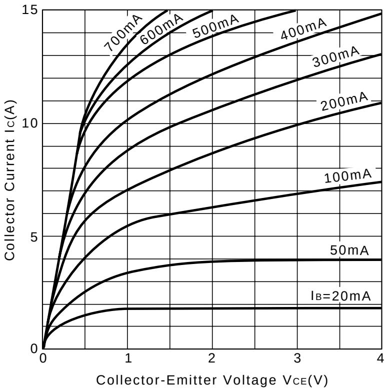
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (µs)	tstg (µs)	tf (µs)
40	4	10	10	–5	1	–1	0.2typ	1.3typ	0.45typ

External Dimensions MT-100(TO3P)

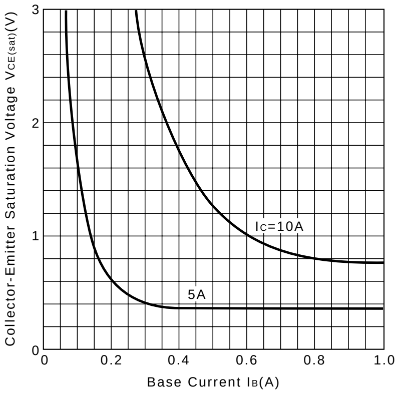


Weight : Approx 6.0g
a. Part No.
b. Lot No.

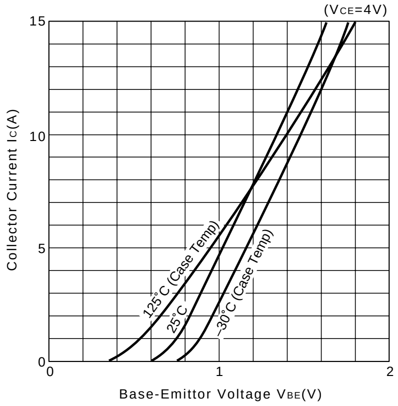
I_C–V_{CE} Characteristics (Typical)



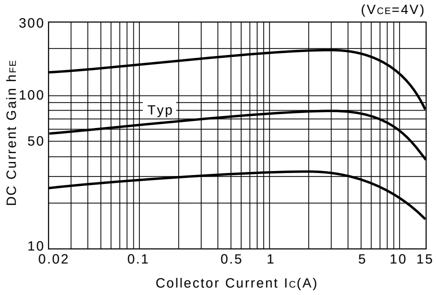
$V_{CE(sat)}$–I_B Characteristics (Typical)



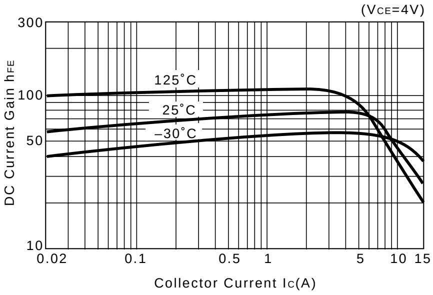
I_C–V_{BE} Temperature Characteristics (Typical)



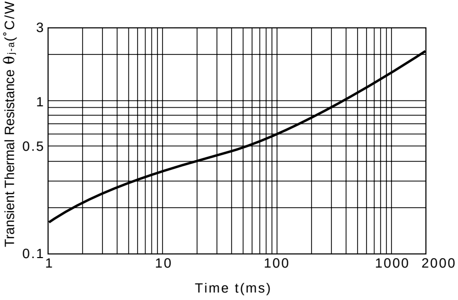
h_{FE}–I_C Characteristics (Typical)



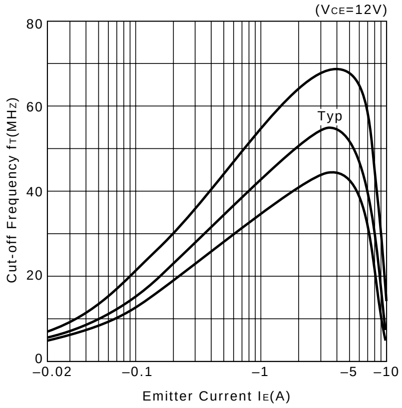
h_{FE}–I_C Temperature Characteristics (Typical)



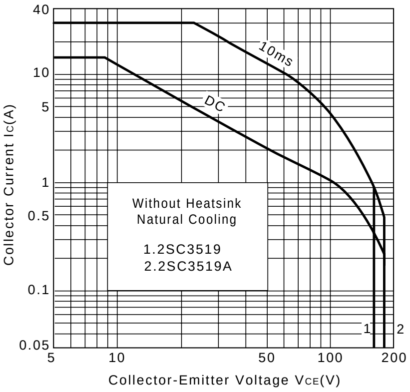
θ_{j-a}–t Characteristics



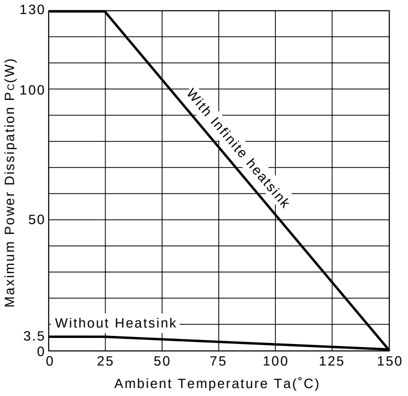
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C–Ta Derating



2SC3678

Silicon NPN Triple Diffused Planar Transistor (High Voltage Switching Transistor)

Application : Switching Regulator and General Purpose

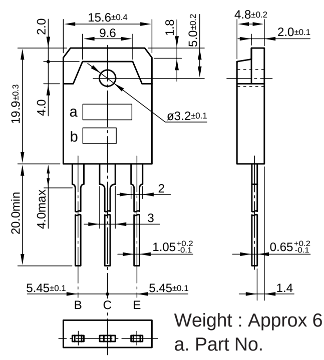
■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	900	V
V_{CEO}	800	V
V_{EBO}	7	V
I_C	3(Pulse6)	A
I_B	1.5	A
P_C	80(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=800V	100max	μA
I_{EBO}	V_{EB}=7V	100max	μA
$V_{(BR)CEO}$	I_C=10mA	800min	V
h_{FE}	V_{CE}=4V, I_C=1A	10to30	
V_{CE}(sat)	I_C=1A, I_B=0.2A	0.5max	V
V_{BE}(sat)	I_C=1A, I_B=0.2A	1.2max	V
f_T	V_{CE}=12V, I_E=–0.3A	6typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	50typ	pF

External Dimensions MT-100(TO3P)

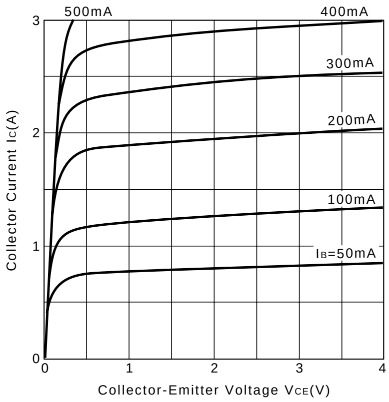


Weight : Approx 6.0g
a. Part No.
b. Lot No.

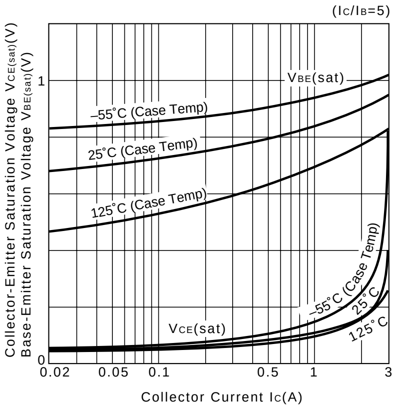
■Typical Switching Characteristics (Common Emitter)

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
250	250	1	10	–5	0.15	–0.5	1max	5max	1max

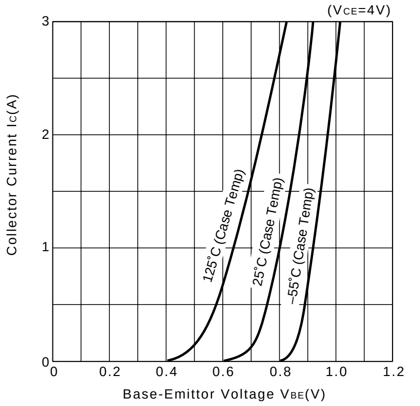
I_C–V_{CE} Characteristics (Typical)



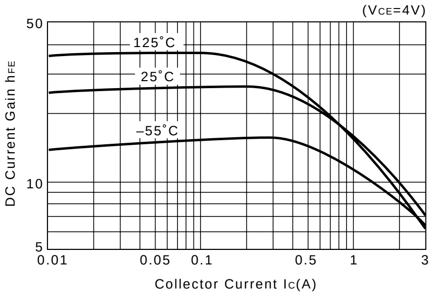
V_{CE}(sat),V_{BE}(sat)–I_C Temperature Characteristics (Typical)



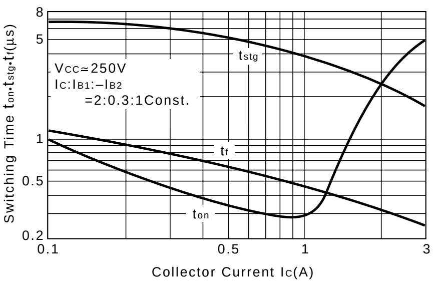
I_C–V_{BE} Temperature Characteristics (Typical)



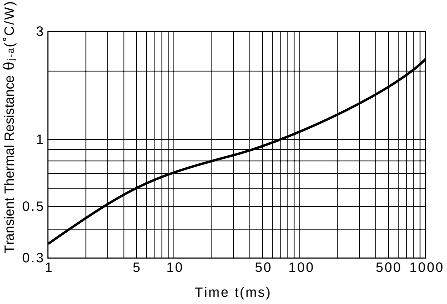
h_{FE}–I_C Characteristics (Typical)



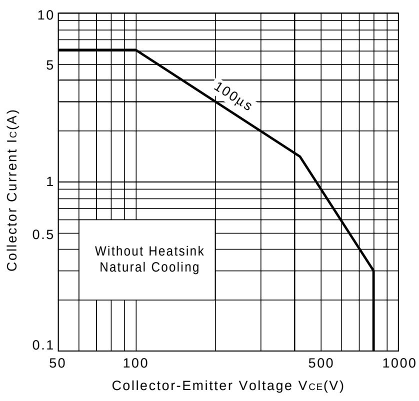
t_{on}•t_{stg}•t_f–I_C Characteristics (Typical)



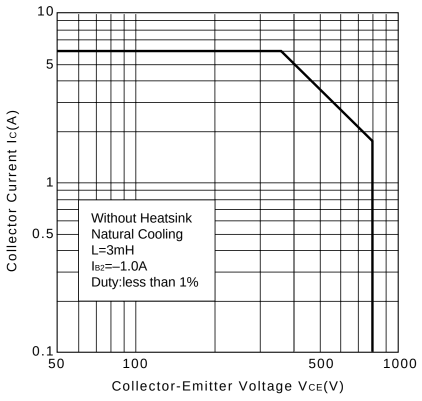
θj-a–t Characteristics



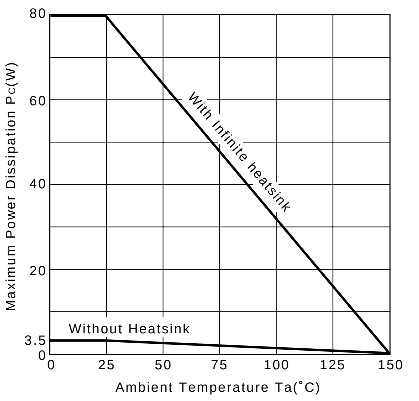
Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



P_C–Ta Derating



2SC3679

Silicon NPN Triple Diffused Planar Transistor (High Voltage Switching Transistor)

Application : Switching Regulator and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	900	V
V_{CEO}	800	V
V_{EBO}	7	V
I_C	5(Pulse10)	A
I_B	2.5	A
P_C	100(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

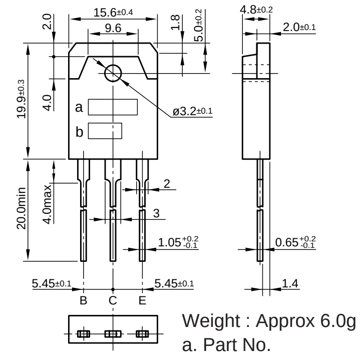
■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=800V	100max	μA
I_{EBO}	V_{EB}=7V	100max	μA
$V_{(BR)CEO}$	I_C=10mA	800min	V
h_{FE}	V_{CE}=4V, I_C=2A	10to30	
V_{CE}(sat)	I_C=2A, I_B=0.4A	0.5max	V
V_{BE}(sat)	I_C=2A, I_B=0.4A	1.2max	V
f_T	V_{CE}=12V, I_E=–0.5A	6typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	75typ	pF

■Typical Switching Characteristics (Common Emitter)

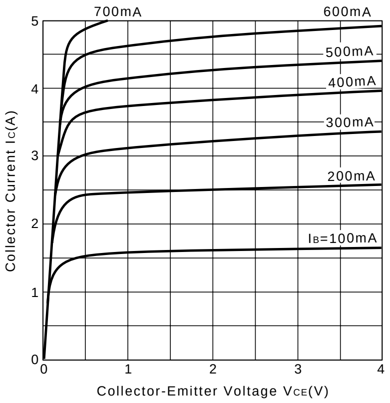
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
250	125	2	10	–5	0.3	–1	1max	5max	1max

External Dimensions MT-100(TO3P)

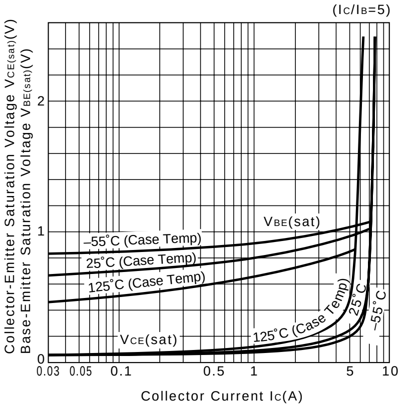


Weight : Approx 6.0g
a. Part No.
b. Lot No.

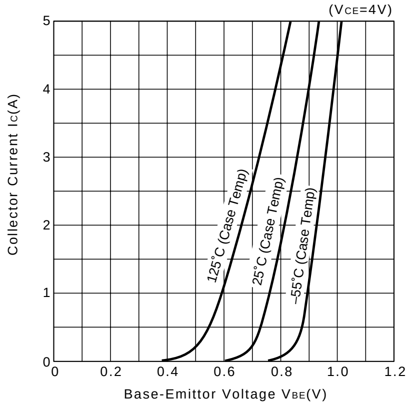
I_C–V_{CE} Characteristics (Typical)



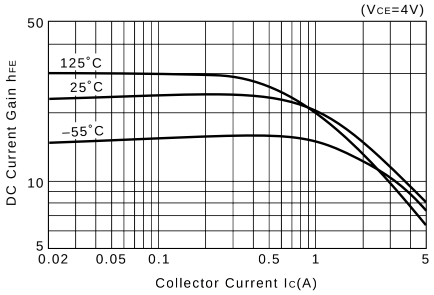
V_{CE}(sat),V_{BE}(sat)–I_C Temperature Characteristics (Typical)



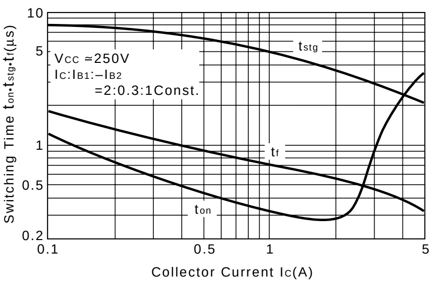
I_C–V_{BE} Temperature Characteristics (Typical)



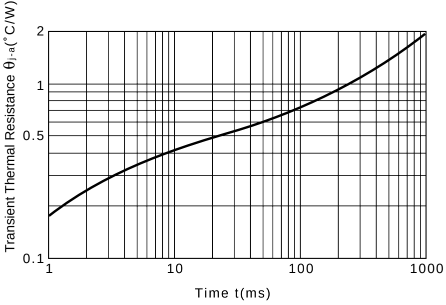
h_{FE}–I_C Characteristics (Typical)



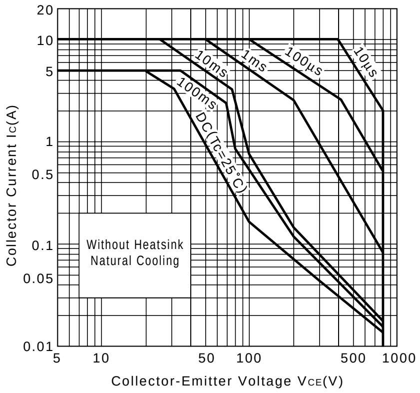
t_{on}•t_{stg}•t_f–I_C Characteristics (Typical)



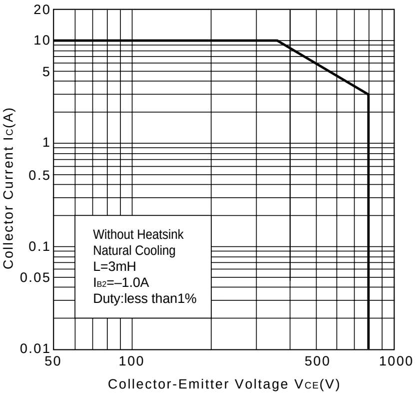
θ_{j-a}–t Characteristics



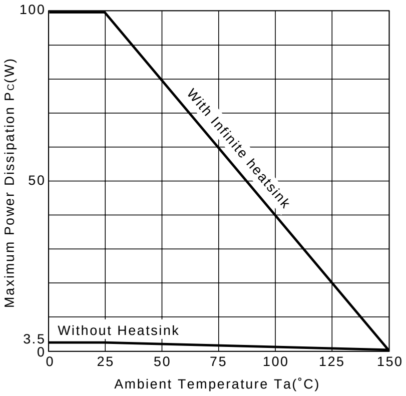
Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



P_C–Ta Derating



2SC3680

Silicon NPN Triple Diffused Planar Transistor (High Voltage Switching Transistor)

Application : Switching Regulator and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	900	V
V_{CEO}	800	V
V_{EBO}	7	V
I_C	7(Pulse14)	A
I_B	3.5	A
P_C	120(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

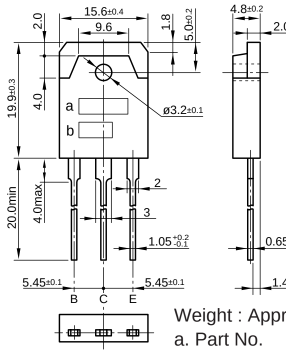
■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=800V	100max	μA
I_{EBO}	V_{EB}=7V	100max	μA
$V_{(BR)CEO}$	I_C=10mA	800min	V
h_{FE}	V_{CE}=4V, I_C=3A	10to30	
V_{CE}(sat)	I_C=3A, I_B=0.6A	0.5max	V
V_{BE}(sat)	I_C=3A, I_B=0.6A	1.2max	V
f_T	V_{CE}=12V, I_E=–2A	6typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	105typ	pF

■Typical Switching Characteristics (Common Emitter)

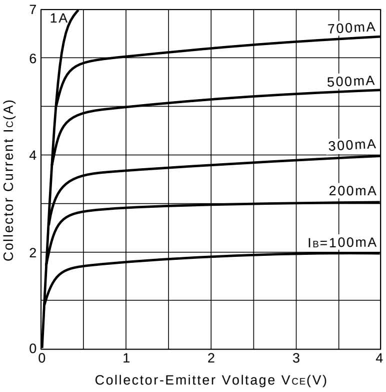
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
250	83	3	10	–5	0.45	–1.5	1max	5max	1max

External Dimensions MT-100(TO3P)

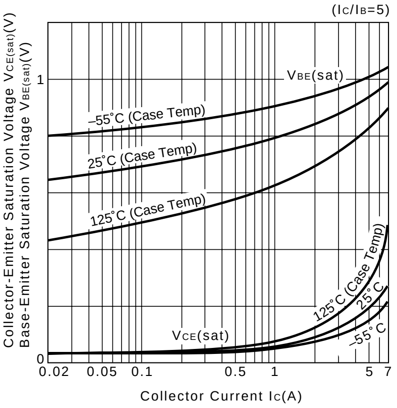


Weight : Approx 6.0g
a. Part No.
b. Lot No.

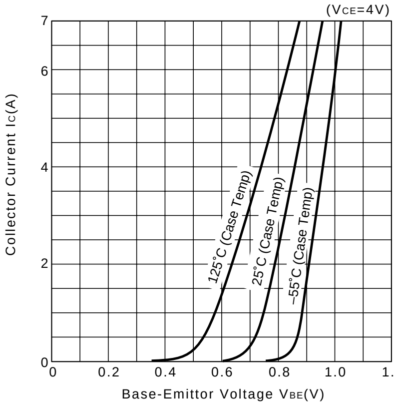
I_C–V_{CE} Characteristics (Typical)



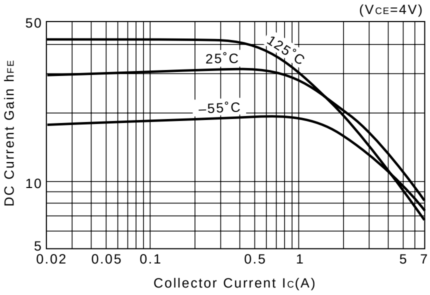
V_{CE}(sat),V_{BE}(sat)–I_C Temperature Characteristics (Typical)



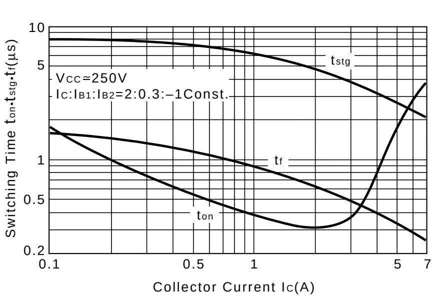
I_C–V_{BE} Temperature Characteristics (Typical)



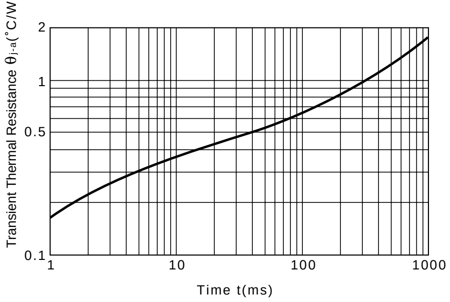
h_{FE}–I_C Characteristics (Typical)



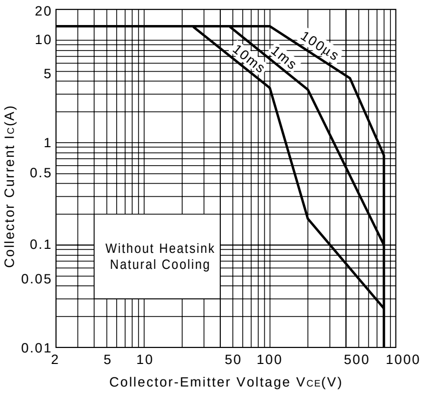
t_{on}•t_{stg}•t_f–I_C Characteristics (Typical)



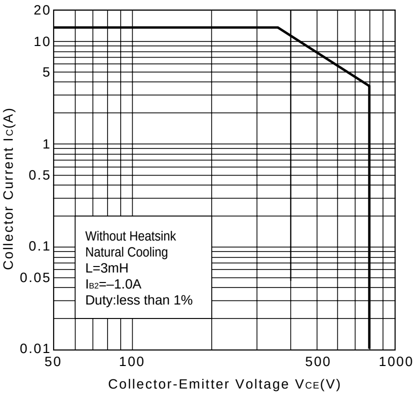
θ_{j-a}–t Characteristics



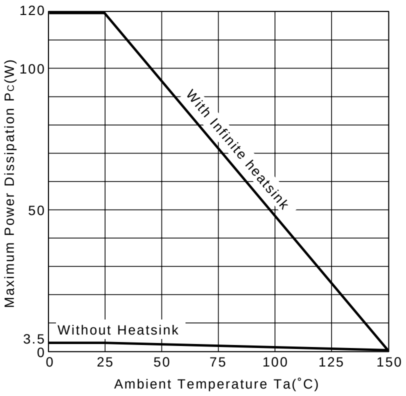
Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



P_C–Ta Derating



2SC3830

Silicon NPN Triple Diffused Planar Transistor (High Voltage and High Speed Switching Transistor)

Application : Switching Regulator and General Purpose

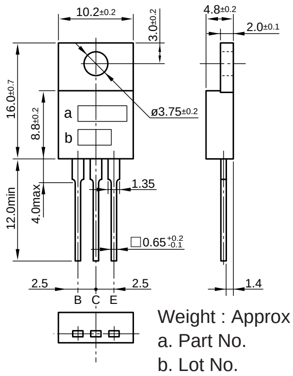
■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	600	V
V_{CEO}	500	V
V_{EBO}	10	V
I_C	6(Pulse12)	A
I_B	2	A
P_C	50(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=600V	1max	mA
I_{EBO}	V_{EB}=10V	100max	µA
$V_{(BR)CEO}$	I_C=25mA	500min	V
h_{FE}	V_{CE}=4V, I_C=2A	10 to 30	
$V_{CE(sat)}$	I_C=2A, I_B=0.4A	0.5max	V
$V_{BE(sat)}$	I_C=2A, I_B=0.4A	1.3max	V
f_T	V_{CE}=12V, I_E=–0.5A	8typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	45typ	pF

External Dimensions MT-25(TO220)

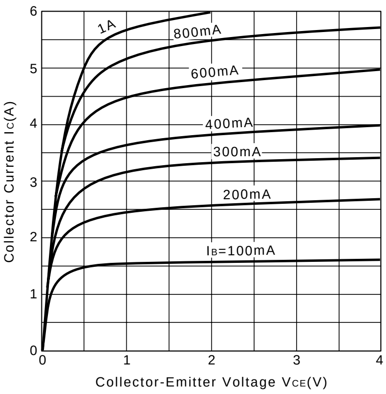


Weight : Approx 2.6g
a. Part No.
b. Lot No.

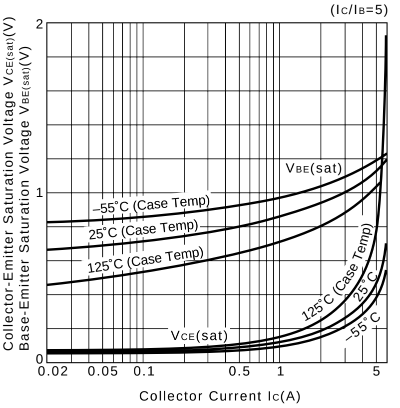
■Typical Switching Characteristics (Common Emitter)

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (µs)	tstg (µs)	tf (µs)
200	100	2	10	–5	0.2	–0.4	1max	4.5max	0.5max

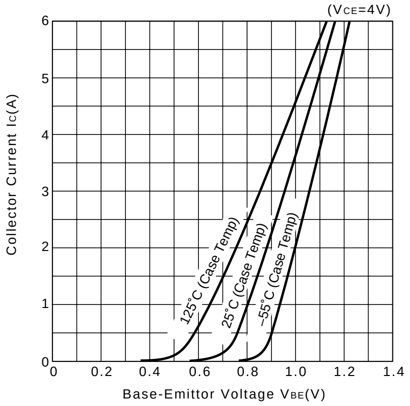
I_C–V_{CE} Characteristics (Typical)



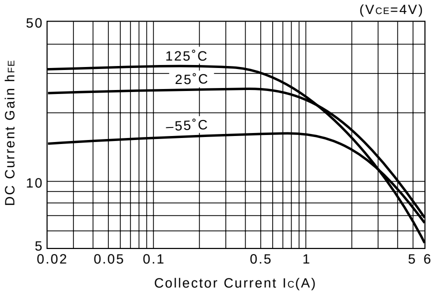
$V_{CE(sat)}$,$V_{BE(sat)}$–I_C Temperature Characteristics (Typical)



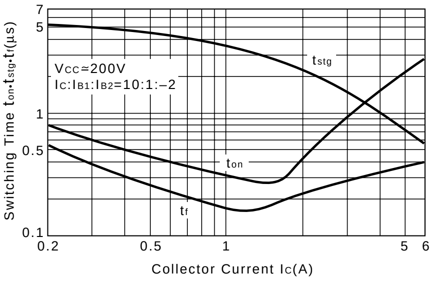
I_C–V_{BE} Temperature Characteristics (Typical)



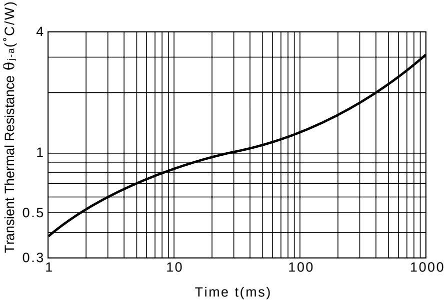
h_{FE}–I_C Characteristics (Typical)



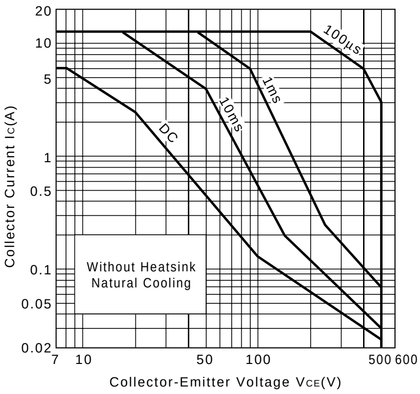
t_{on}•t_{stg}•t_f–I_C Characteristics (Typical)



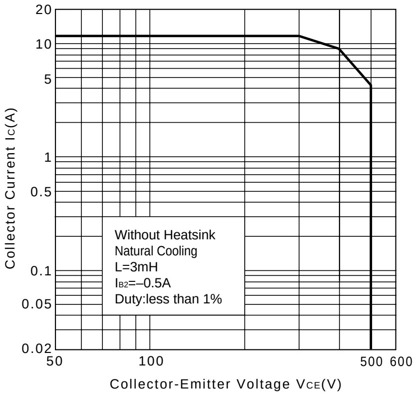
θ_{j-a}–t Characteristics



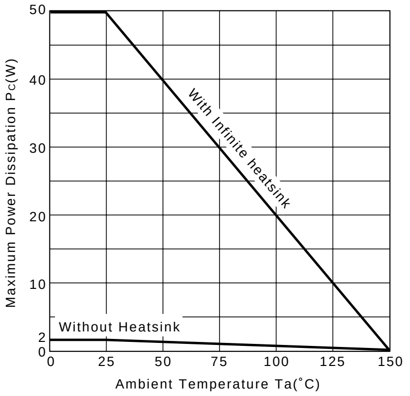
Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



P_C–Ta Derating



2SC3831

Silicon NPN Triple Diffused Planar Transistor (High Voltage and High Speed Switching Transistor)

Application : Switching Regulator and General Purpose

■**Absolute maximum ratings** (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	600	V
V_{CEO}	500	V
V_{EBO}	10	V
I_C	10(Pulse20)	A
I_B	4	A
P_C	100(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

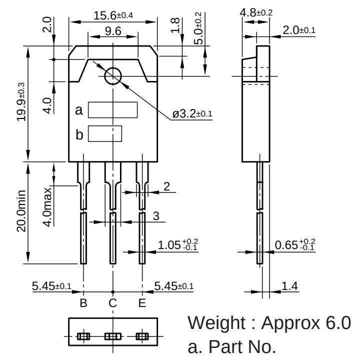
■**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=600V	1max	mA
I_{EBO}	V_{EB}=10V	100max	μA
$V_{(BR)CEO}$	I_C=25mA	500min	V
h_{FE}	V_{CE}=4V, I_C=5A	10 to 30	
V_{CE}(sat)	I_C=5A, I_B=1A	0.5max	V
V_{BE}(sat)	I_C=5A, I_B=1A	1.3max	V
f_T	V_{CE}=12V, I_E=–1A	8typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	105typ	pF

■**Typical Switching Characteristics (Common Emitter)**

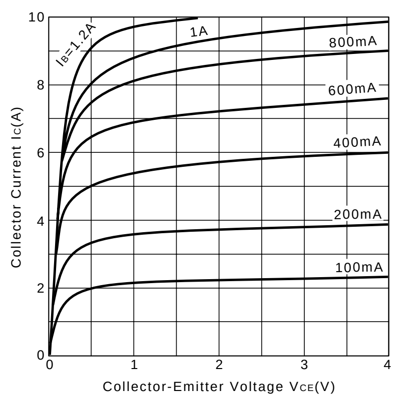
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
200	40	5	10	–5	0.5	–1.0	1max	4.5max	0.5max

External Dimensions MT-100(TO3P)

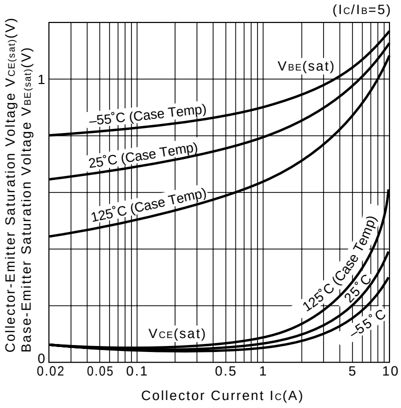


Weight : Approx 6.0g
a. Part No.
b. Lot No.

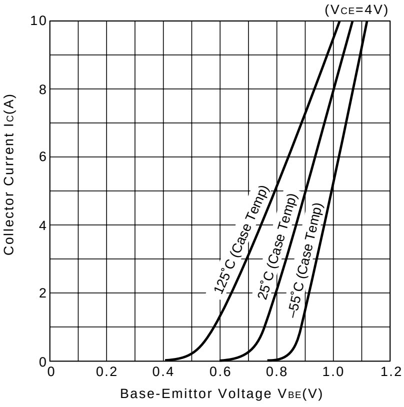
I_C–V_{CE} Characteristics (Typical)



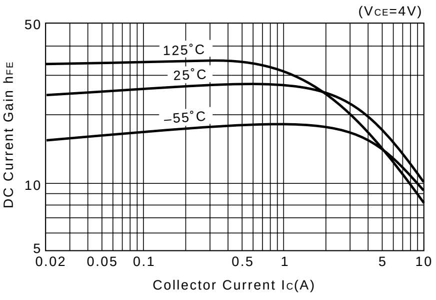
V_{CE}(sat),V_{BE}(sat)–I_C Temperature Characteristics (Typical)



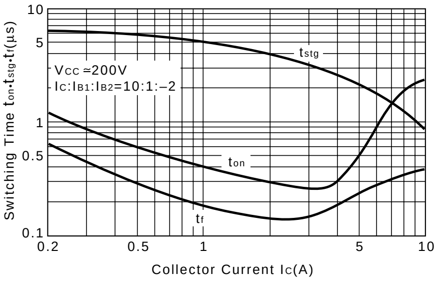
I_C–V_{BE} Temperature Characteristics (Typical)



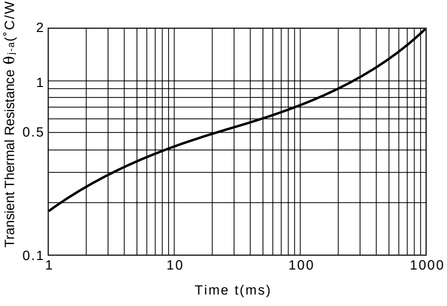
h_{FE}–I_C Characteristics (Typical)



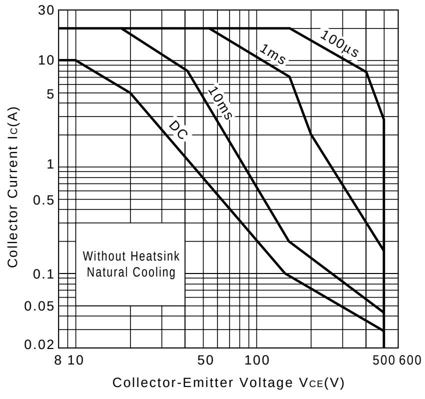
t_{on}•t_{stg}•t_f–I_C Characteristics (Typical)



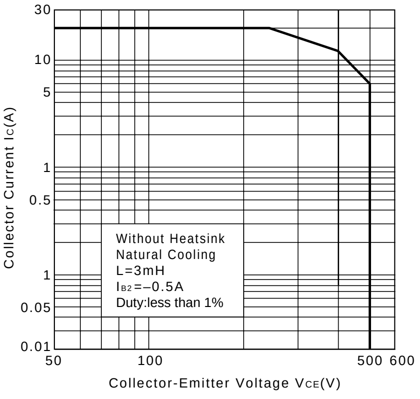
θ_{j-a}–t Characteristics



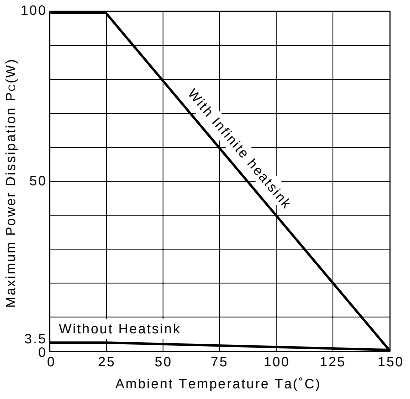
Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



P_C–Ta Derating



2SC3832

Silicon NPN Triple Diffused Planar Transistor (High Voltage and High Speed Switching Transistor)

Application : Switching Regulator and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	500	V
V_{CEO}	400	V
V_{EBO}	10	V
I_C	7(Pulse14)	A
I_B	2	A
P_C	50(T_C=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

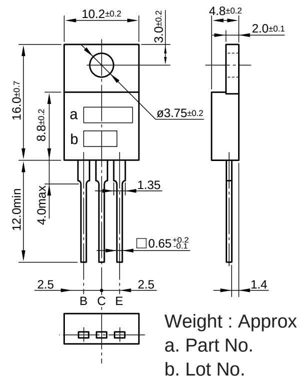
■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=500V	100max	μA
I_{EBO}	V_{EB}=10V	100max	μA
$V_{(BR)CEO}$	I_C=25mA	400min	V
h_{FE}	V_{CE}=4V, I_C=3A	10to30	
V_{CE}(sat)	I_C=3A, I_B=0.6A	0.5max	V
V_{BE}(sat)	I_C=3A, I_B=0.6A	1.3max	V
f_T	V_{CE}=12V, I_E=–0.5A	10typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	50typ	pF

■Typical Switching Characteristics (Common Emitter)

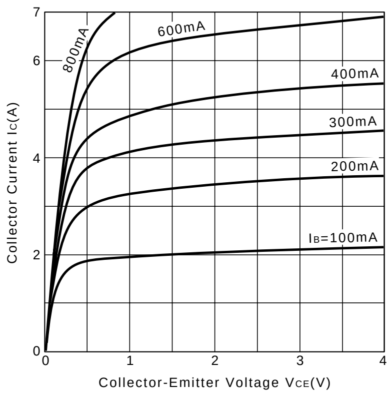
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
200	66.7	3	10	–5	0.3	–0.6	1max	3max	0.5max

External Dimensions MT-25(TO220)

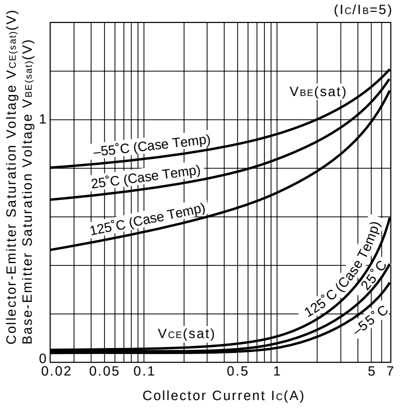


Weight : Approx 2.6g
a. Part No.
b. Lot No.

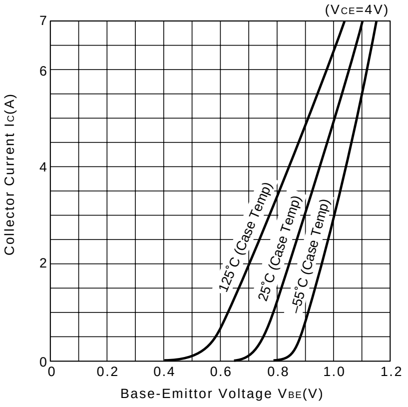
I_C−V_{CE} Characteristics (Typical)



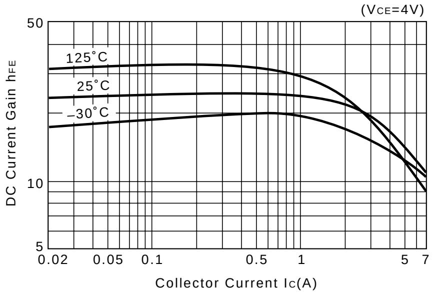
V_{CE}(sat),V_{BE}(sat)−I_C Temperature Characteristics (Typical)



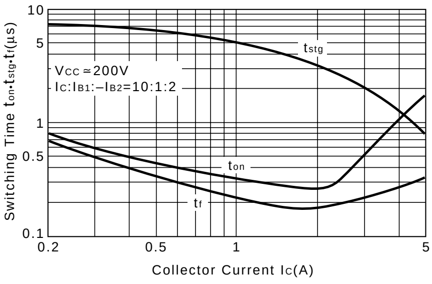
I_C−V_{BE} Temperature Characteristics (Typical)



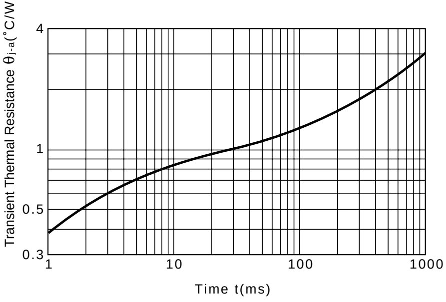
h_{FE}−I_C Characteristics (Typical)



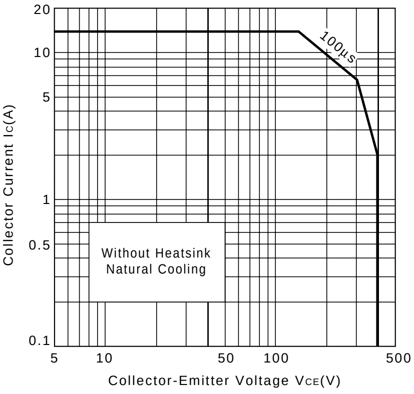
t_{on}•t_{stg}•t_f−I_C Characteristics (Typical)



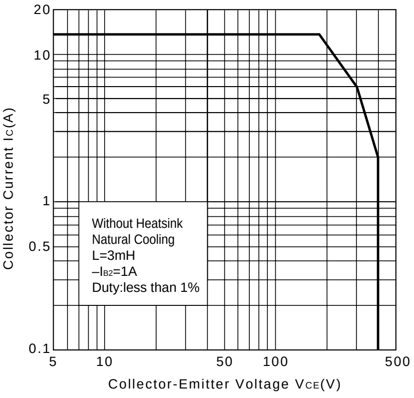
θ_{j-a}−t Characteristics



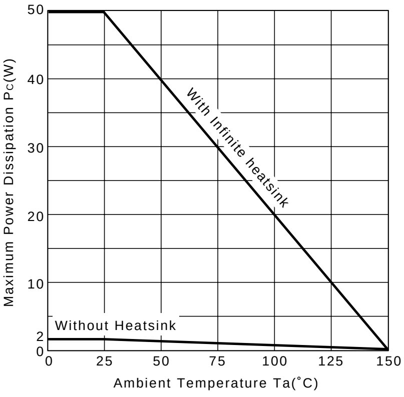
Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



P_C−Ta Derating



2SC3833

Silicon NPN Triple Diffused Planar Transistor (High Voltage and High Speed Switching Transistor)

Application : Switching Regulator and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
VCBO	500	V
VCEO	400	V
VEBO	10	V
IC	12(Pulse24)	A
IB	4	A
PC	100(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

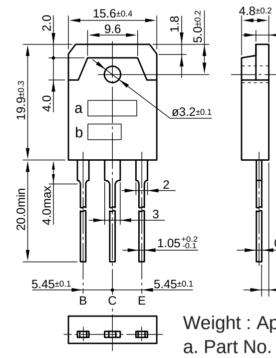
■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
ICBO	VCB=500V	100max	μA
IEBO	VEB=10V	100max	μA
V(BR)CEO	IC=25mA	400min	V
hFE	VCE=4V, IC=7A	10to30	
VCE(sat)	IC=7A, IB=1.4A	0.5max	V
VBE(sat)	IC=7A, IB=1.4A	1.3max	V
fT	VCE=12V, IE=–1A	10typ	MHz
COB	VCB=10V, f=1MHz	105typ	pF

■Typical Switching Characteristics (Common Emitter)

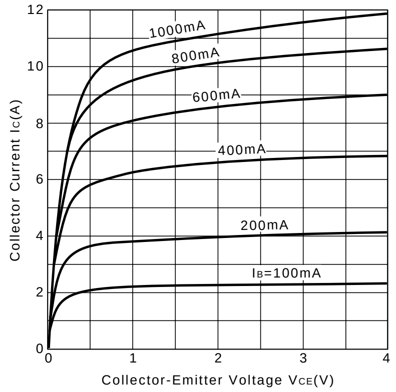
VCC (V)	RL (Ω)	IC (A)	VBB1 (V)	VBB2 (V)	IB1 (A)	IB2 (A)	ton (μs)	tstg (μs)	tf (μs)
200	28.5	7	10	–5	0.7	–1.4	1.0max	3.0max	0.5max

External Dimensions MT-100(TO3P)

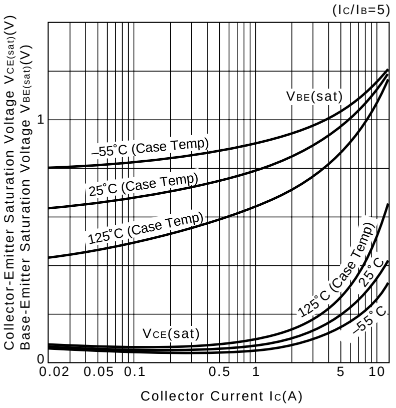


Weight : Approx 6.0g
a. Part No.
b. Lot No.

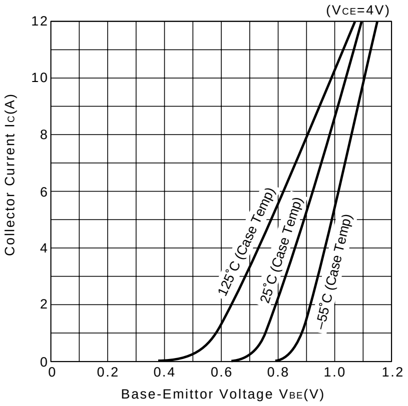
IC–VCE Characteristics (Typical)



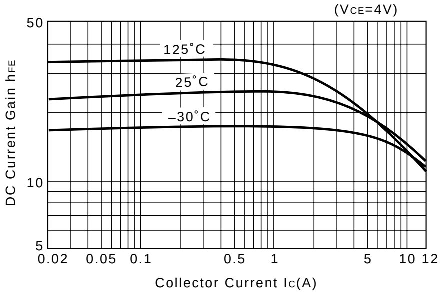
VCE(sat),VBE(sat)–IC Temperature Characteristics (Typical)



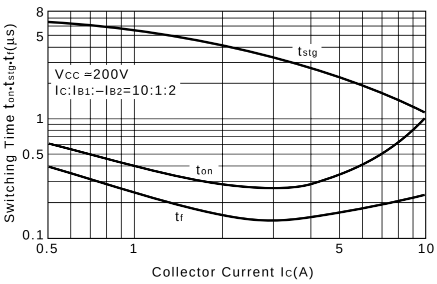
IC–VBE Temperature Characteristics (Typical)



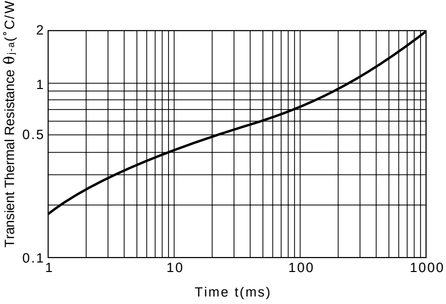
hFE–IC Characteristics (Typical)



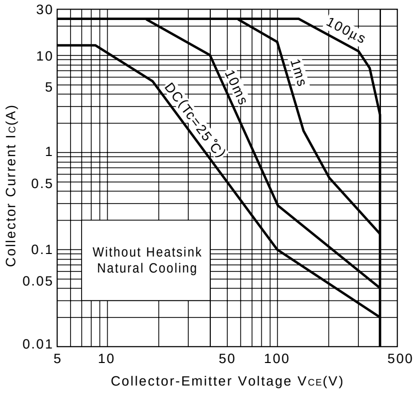
ton•tstg•tf–IC Characteristics (Typical)



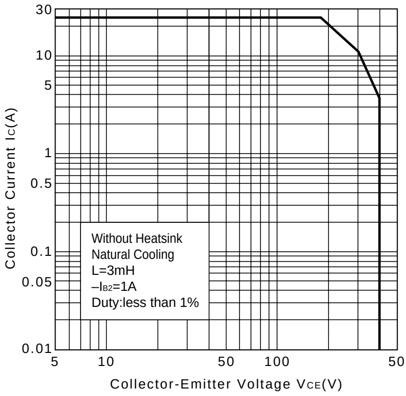
θj-a–t Characteristics



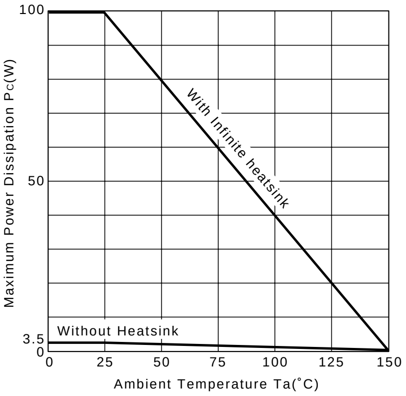
Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



PC–Ta Derating



2SC3834

Silicon NPN Triple Diffused Planar Transistor (Switching Transistor)

Application : Humidifier, DC-DC Converter, and General Purpose

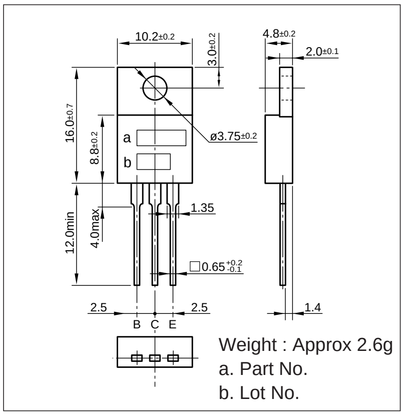
■**Absolute maximum ratings** (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	200	V
V_{CEO}	120	V
V_{EBO}	8	V
I_C	7(Pulse14)	A
I_B	3	A
P_C	50(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=200V	100max	µA
I_{EBO}	V_{EB}=8V	100max	µA
$V_{(BR)CEO}$	I_C=50mA	120min	V
h_{FE}	V_{CE}=4V, I_C=3A	70to220	
V_{CE}(sat)	I_C=3A, I_B=0.3A	0.5max	V
V_{BE}(sat)	I_C=3A, I_B=0.3A	1.2max	V
f_T	V_{CE}=12V, I_E=–0.5A	30typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	110typ	pF

External Dimensions MT-25(TO220)

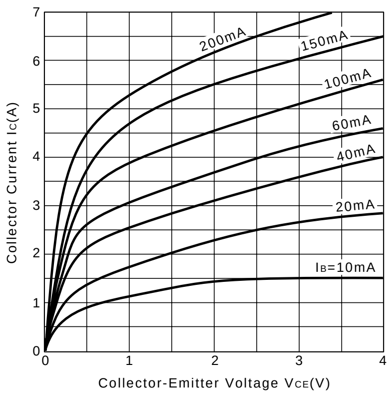


Weight : Approx 2.6g
a. Part No.
b. Lot No.

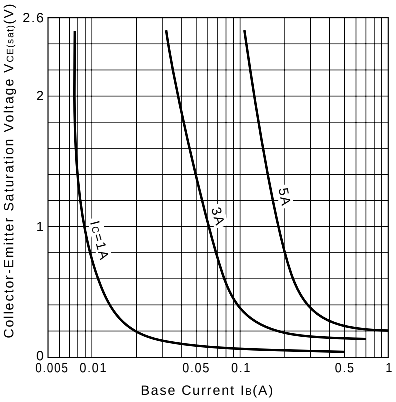
■**Typical Switching Characteristics (Common Emitter)**

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (µs)	tstg (µs)	tf (µs)
50	16.7	3	10	–5	0.3	–0.6	0.5max	3.0max	0.5max

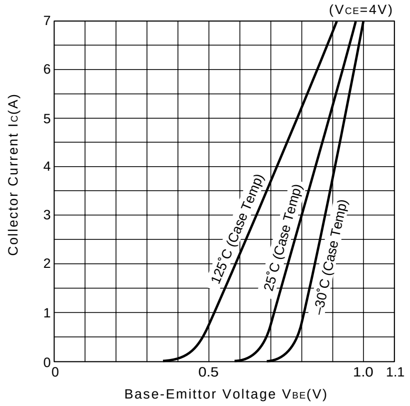
I_C−V_{CE} Characteristics (Typical)



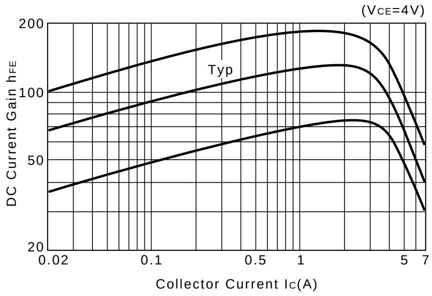
$V_{CE(sat)}$−I_B Characteristics (Typical)



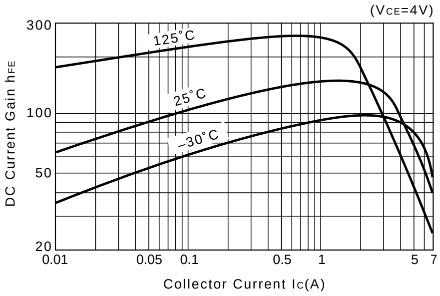
I_C−V_{BE} Temperature Characteristics (Typical)



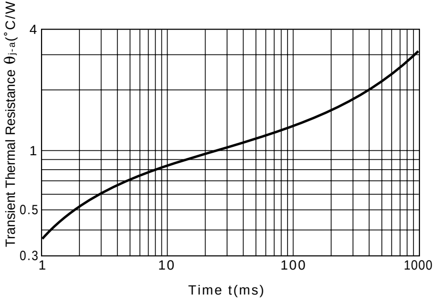
h_{FE}−I_C Characteristics (Typical)



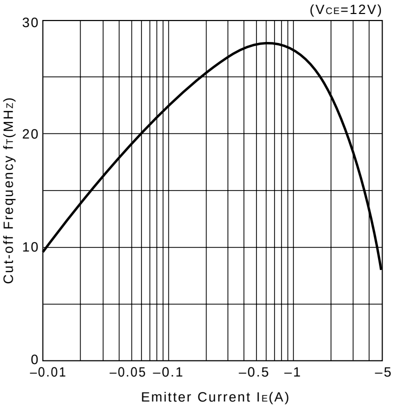
h_{FE}−I_C Temperature Characteristics (Typical)



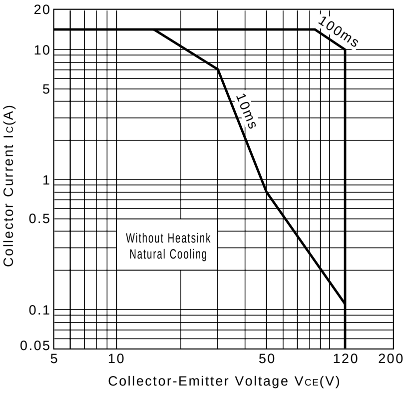
θ_{j-a}−t Characteristics



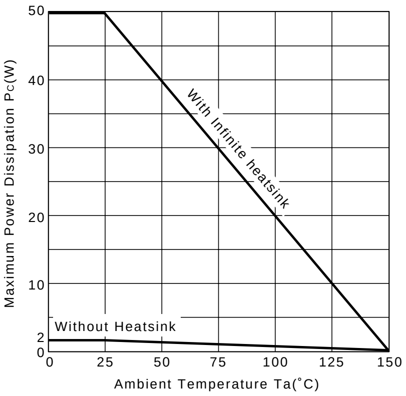
f_T−I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



Pc−Ta Derating



2SC3835

Silicon NPN Triple Diffused Planar Transistor (Switching Transistor)

Application : Humidifier, DC-DC Converter, and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	200	V
V_{CEO}	120	V
V_{EBO}	8	V
I_C	7(Pulse14)	A
I_B	3	A
P_C	70(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

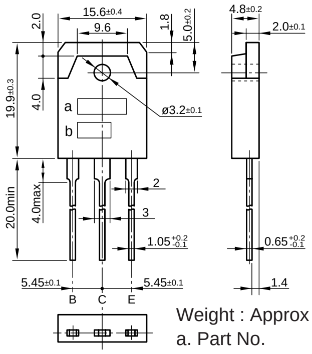
■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=200V	100max	μA
I_{EBO}	V_{EB}=8V	100max	μA
$V_{(BR)CEO}$	I_C=50mA	120min	V
h_{FE}	V_{CE}=4V, I_C=3A	70 to 220	
$V_{CE(sat)}$	I_C=3A, I_B=0.3A	0.5max	V
$V_{BE(sat)}$	I_C=3A, I_B=0.3A	1.2max	V
f_T	V_{CE}=12V, I_E=–0.5A	30typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	110typ	pF

■Typical Switching Characteristics (Common Emitter)

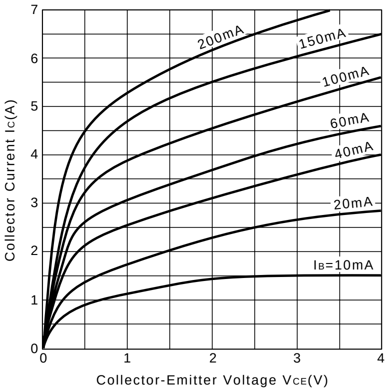
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
50	16.7	3	10	–5	0.3	–0.6	0.5max	3.0max	0.5max

External Dimensions MT-100(TO3P)

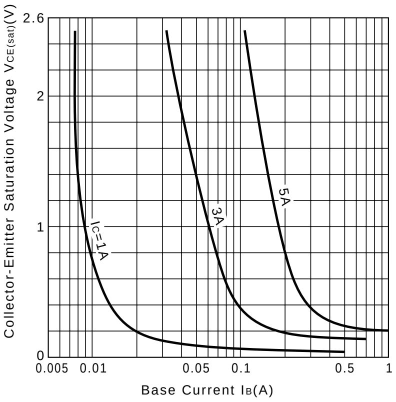


Weight : Approx 6.0g
a. Part No.
b. Lot No.

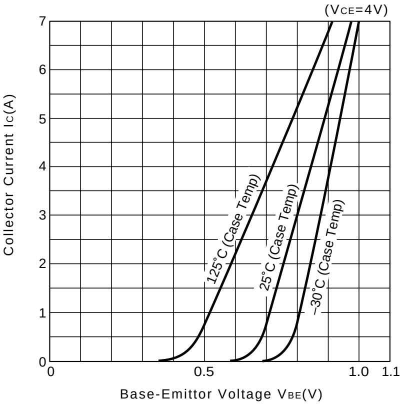
I_C−V_{CE} Characteristics (Typical)



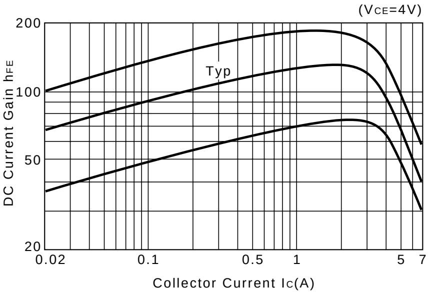
$V_{CE(sat)}$−I_B Characteristics (Typical)



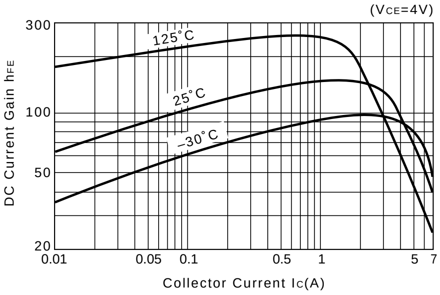
I_C−V_{BE} Temperature Characteristics (Typical)



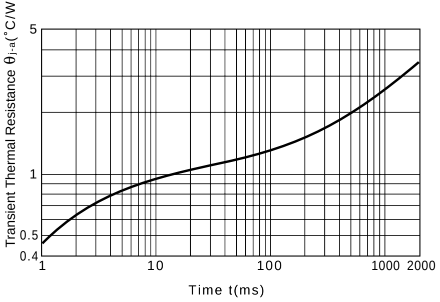
h_{FE}−I_C Characteristics (Typical)



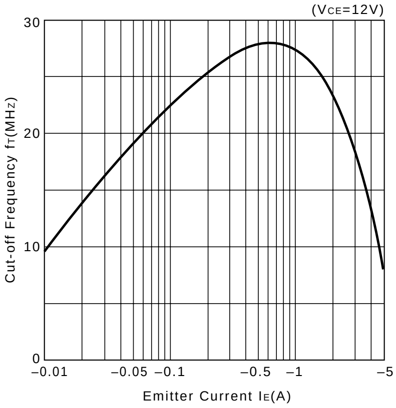
h_{FE}−I_C Temperature Characteristics (Typical)



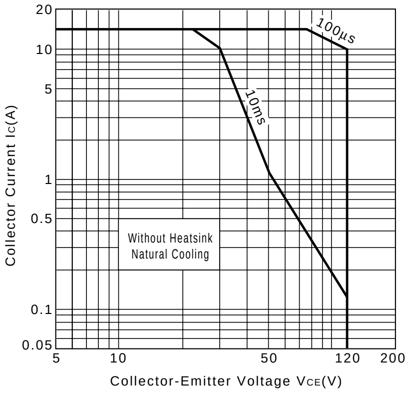
θ_{j-a}−t Characteristics



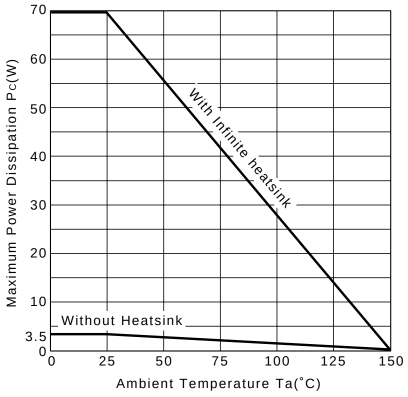
f_T−I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C−Ta Derating



2SC3851/3851A

Silicon NPN Epitaxial Planar Transistor (Complement to type 2SA1488/A)

Application : Audio and PPC High Voltage Power Supply, and General Purpose

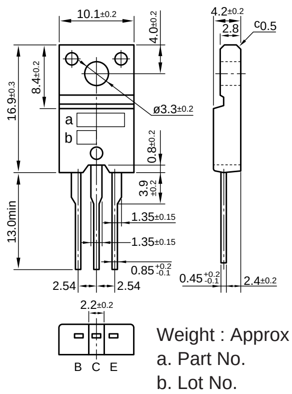
■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings 2SC3851	Ratings 2SC3851A	Unit
V_{CBO}	80	100	V
V_{CEO}	60	80	V
V_{EBO}	6		V
I_C	4		A
I_B	1		A
P_C	25(Tc=25°C)		W
Tj	150		°C
Tstg	–55 to +150		°C

■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings 2SC3851	Ratings 2SC3851A	Unit
I_{CBO}		100max		μA
	V_{CB}=	80	100	V
I_{EBO}	V_{EB}=6V	100max		μA
$V_{(BR)CEO}$	I_C=25mA	60min	80min	V
h_{FE}	V_{CE}=4V, I_C=1A	40 to 320		
$V_{CE(sat)}$	I_C=2A, I_B=0.2A	0.5max		V
f_T	V_{CE}=12V, I_E=–0.2A	15typ		MHz
C_{OB}	V_{CB}=10V, f=1MHz	60typ		pF

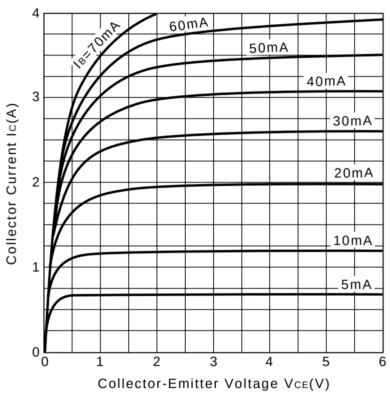
External Dimensions FM20(TO220F)



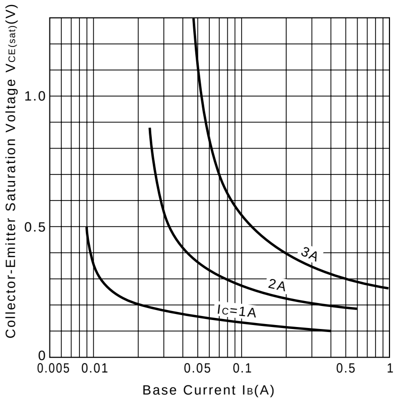
Weight : Approx 2.0g
a. Part No.
b. Lot No.

■Typical Switching Characteristics (Common Emitter)

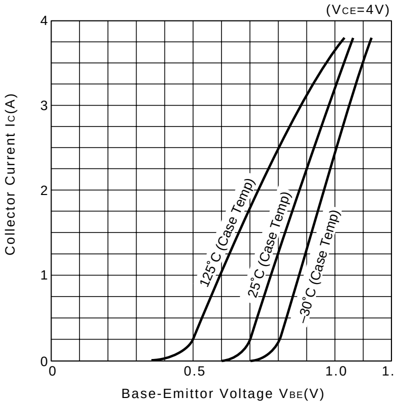
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (μs)	tstg (μs)	tf (μs)
12	6	2	10	–5	200	–200	0.2typ	1typ	0.3typ



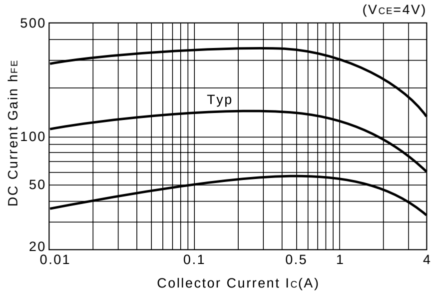
I_C–V_{CE} Characteristics (Typical)



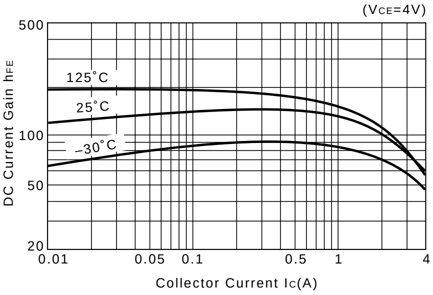
$V_{CE(sat)}$–I_B Characteristics (Typical)



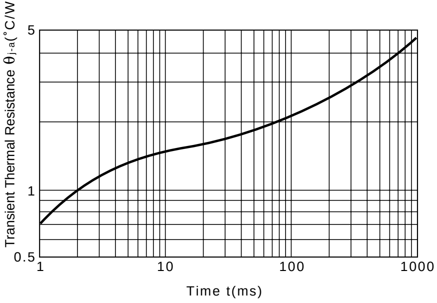
I_C–V_{BE} Temperature Characteristics (Typical)



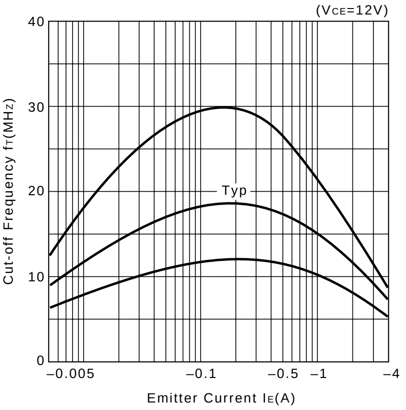
h_{FE}–I_C Characteristics (Typical)



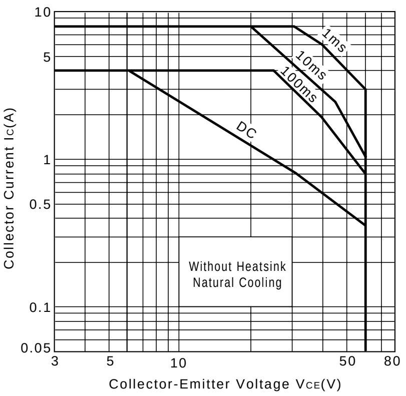
h_{FE}–I_C Temperature Characteristics (Typical)



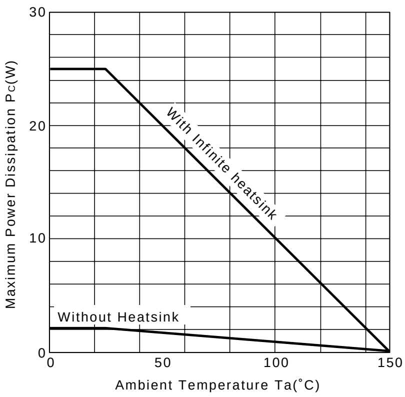
θ_{j-a}–t Characteristics



f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C–Ta Derating

High h_{FE}
Low V_{CE} (sat)

2SC3852/3852A

Silicon NPN Epitaxial Planar Transistor

Application : Driver for Solenoid and Motor, Series Regulator and General Purpose

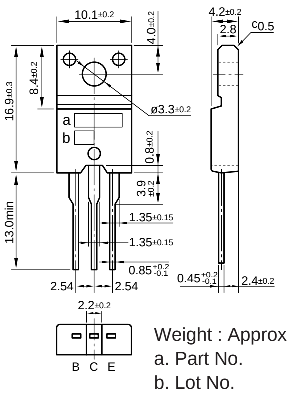
■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings		Unit
	2SC3852	2SC3852A	
V_{CBO}	80	100	V
V_{CEO}	60	80	V
V_{EBO}	6		V
I_C	3		A
I_B	1		A
P_C	25(Tc=25°C)		W
Tj	150		°C
Tstg	–55 to +150		°C

■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings		Unit
		2SC3852	2SC3852A	
I_{CBO}		10max		μA
	V_{CB}=	80	100	V
I_{EBO}	V_{EB}=6V	100max		μA
$V_{(BR)CEO}$	I_C=25mA	60min	80min	V
h_{FE}	V_{CE}=4V, I_C=0.5A	500min		
$V_{CE(sat)}$	I_C=2A, I_B=50mA	0.5max		V
f_T	V_{CE}=12V, I_E=–0.2A	15typ		MHz
C_{OB}	V_{CB}=10V, f=1MHz	50typ		pF

External Dimensions FM20(TO220F)

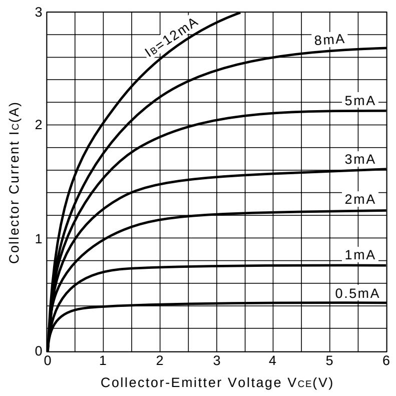


Weight : Approx 2.0g
a. Part No.
b. Lot No.

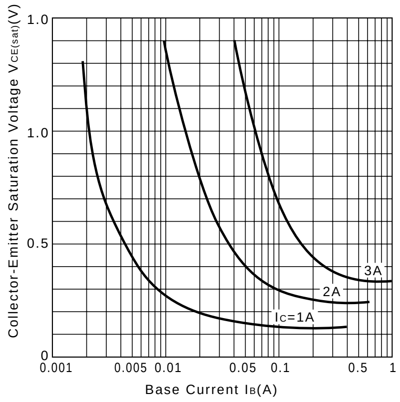
■Typical Switching Characteristics (Common Emitter)

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (μs)	tstg (μs)	tf (μs)
20	20	1.0	10	–5	15	–30	0.8typ	3.0typ	1.2typ

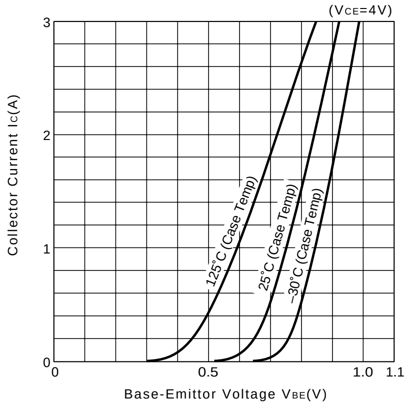
I_C–V_{CE} Characteristics (Typical)



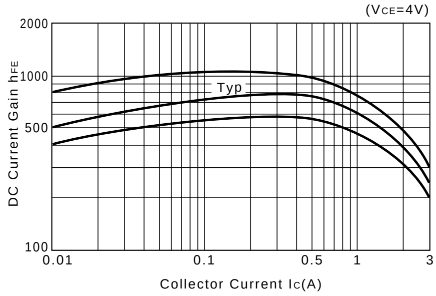
$V_{CE(sat)}$–I_B Characteristics (Typical)



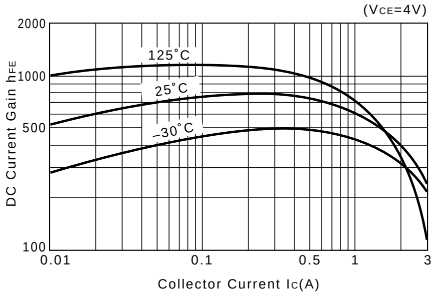
I_C–V_{BE} Temperature Characteristics (Typical)



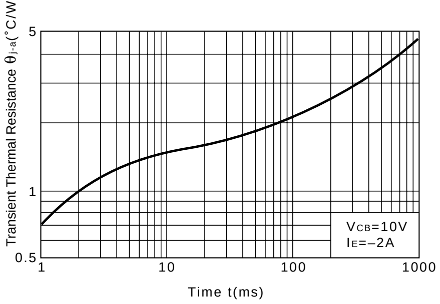
h_{FE}–I_C Characteristics (Typical)



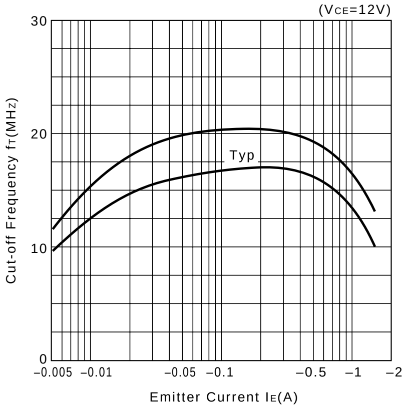
h_{FE}–I_C Temperature Characteristics (Typical)



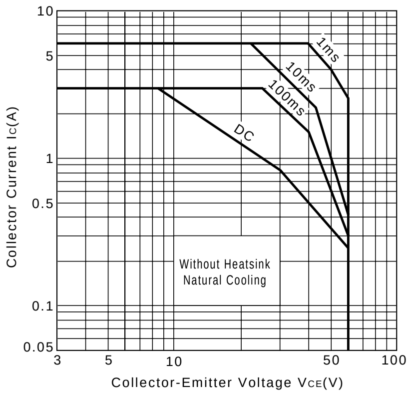
$\theta_{j\text{-}a}$–t Characteristics



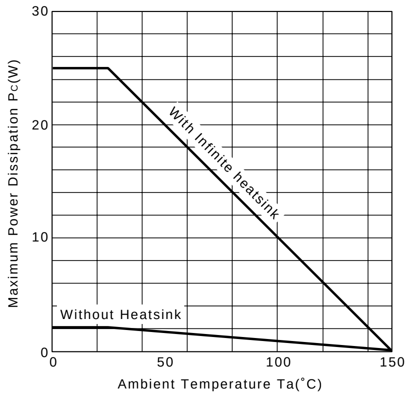
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C–Ta Derating



2SC3856

Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SA1492)

Application : Audio and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	200	V
V_{CEO}	180	V
V_{EBO}	6	V
I_C	15	A
I_B	4	A
P_C	130(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

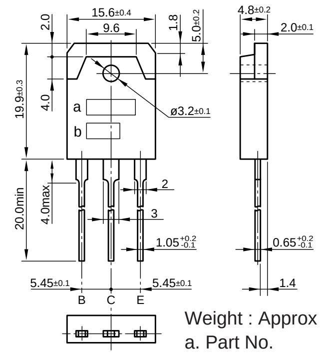
Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=200V	100max	μA
I_{EBO}	V_{EB}=6V	100max	μA
$V_{(BR)CEO}$	I_C=50mA	180min	V
h_{FE}	V_{CE}=4V, I_C=3A	50min*	
$V_{CE(sat)}$	I_C=5A, I_B=0.5A	2.0max	V
f_T	V_{CE}=12V, I_E=–0.5A	20typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	300typ	pF

*h_{FE} Rank O(50 to 100), P(70 to 140), Y(90 to 180)

■Typical Switching Characteristics (Common Emitter)

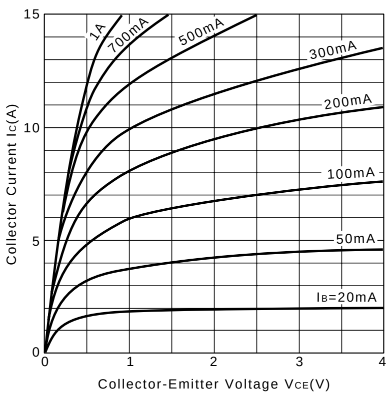
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
40	4	10	10	–5	1	–1	0.5typ	1.8typ	0.6typ

External Dimensions MT-100(TO3P)

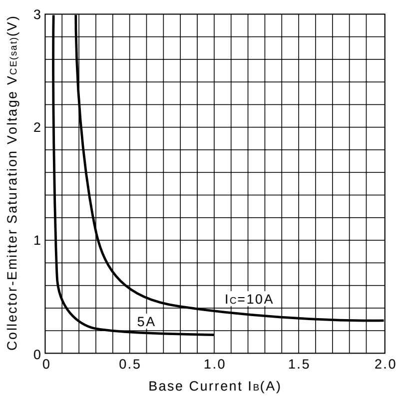


Weight : Approx 6.0g
a. Part No.
b. Lot No.

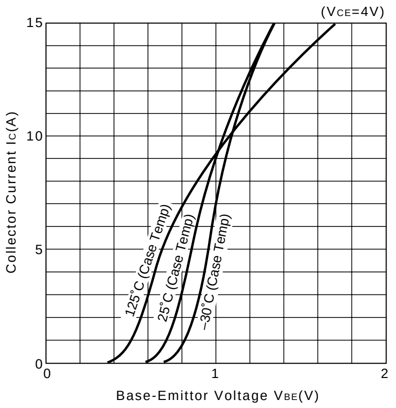
I_C−V_{CE} Characteristics (Typical)



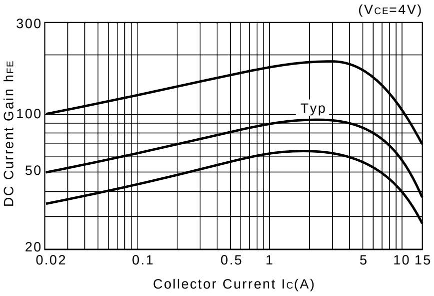
$V_{CE(sat)}$−I_B Characteristics (Typical)



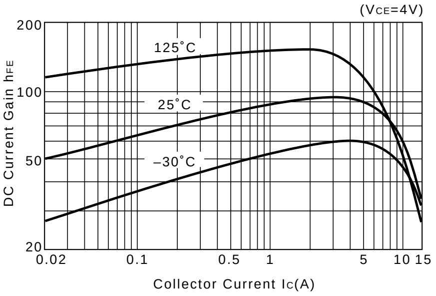
I_C−V_{BE} Temperature Characteristics (Typical)



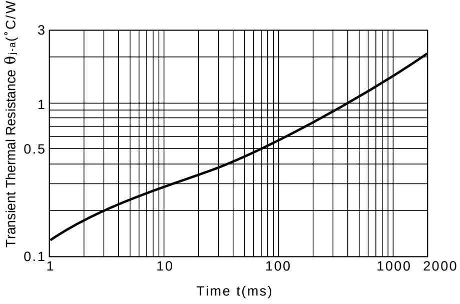
h_{FE}−I_C Characteristics (Typical)



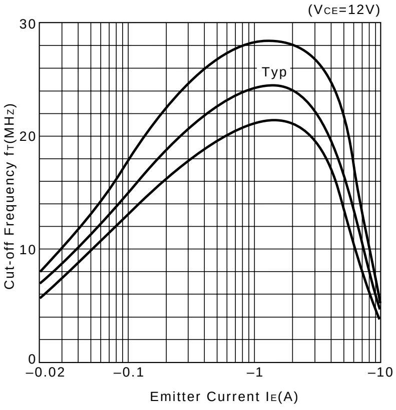
h_{FE}−I_C Temperature Characteristics (Typical)



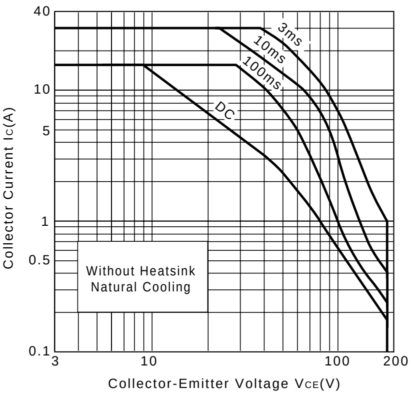
θ_{j-a}−t Characteristics



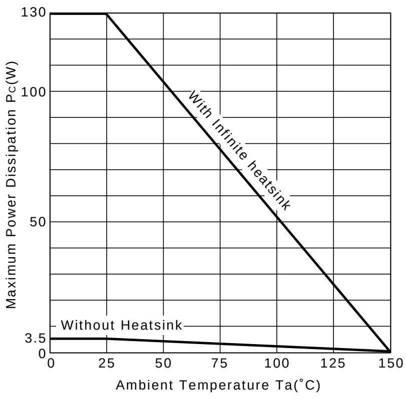
f_T−I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C−Ta Derating



2SC3857

Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SA1493)

Application : Audio and General Purpose

■Absolute maximum ratings (Ta=25°C)

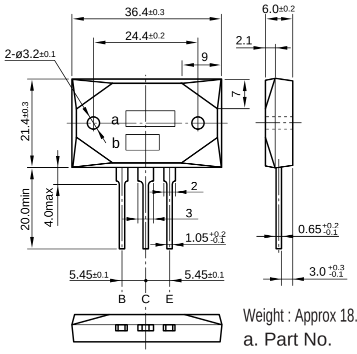
Symbol	Ratings	Unit
V_{CBO}	200	V
V_{CEO}	200	V
V_{EBO}	6	V
I_C	15	A
I_B	5	A
P_C	150(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=200V	100max	µA
I_{EBO}	V_{EB}=6V	100max	µA
$V_{(BR)CEO}$	I_C=50mA	200min	V
h_{FE}	V_{CE}=4V, I_C=5A	50min*	
V_{CE}(sat)	I_C=10A, I_B=1A	3.0max	V
f_T	V_{CE}=12V, I_E=–0.5A	20typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	250typ	pF

*h_{FE} Rank O(50 to 100), P(70 to 140), Y(90 to 180)

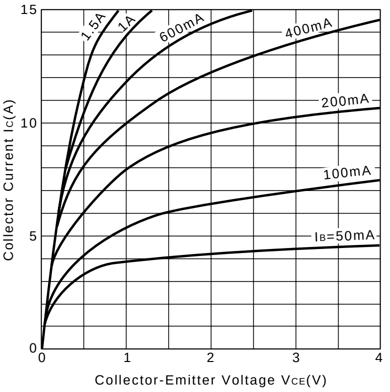
External Dimensions MT-200

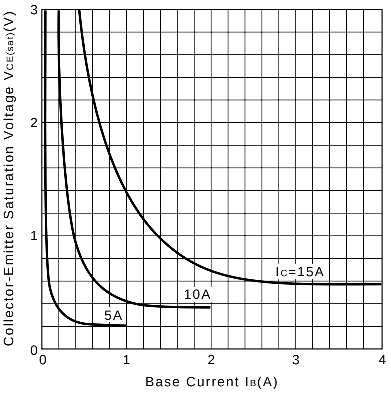


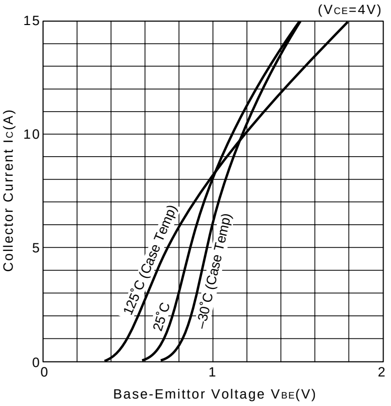
Weight : Approx 18.4g
a. Part No.
b. Lot No.

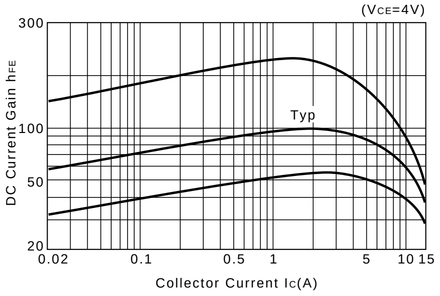
■Typical Switching Characteristics (Common Emitter)

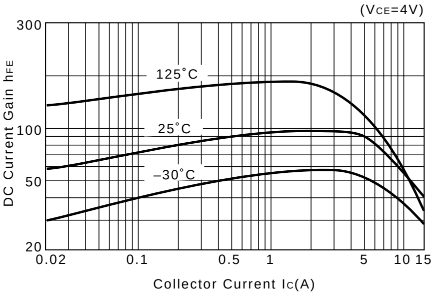
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (µs)	tstg (µs)	tf (µs)
60	12	5	10	–5	0.5	–0.5	0.3typ	2.4typ	0.4typ

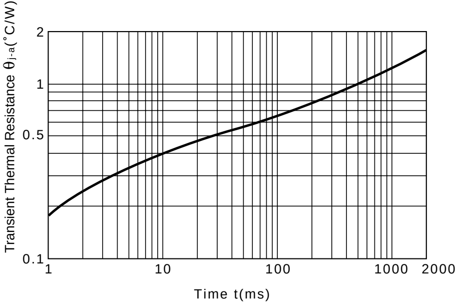

I_C–V_{CE} Characteristics (Typical)

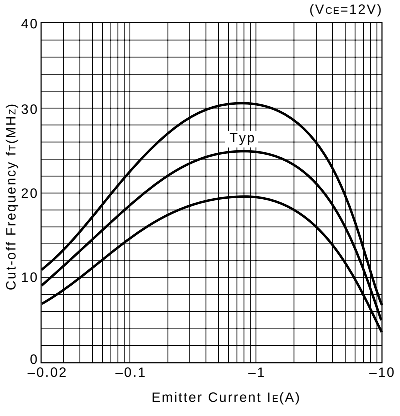

V_{CE}(sat)–I_B Characteristics (Typical)

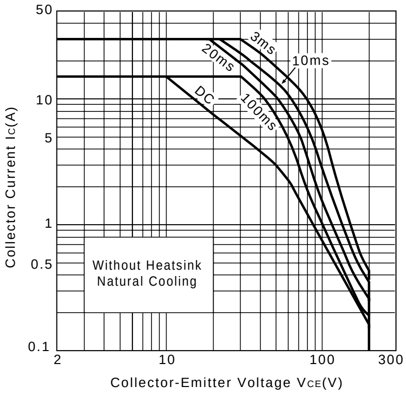

I_C–V_{BE} Temperature Characteristics (Typical)

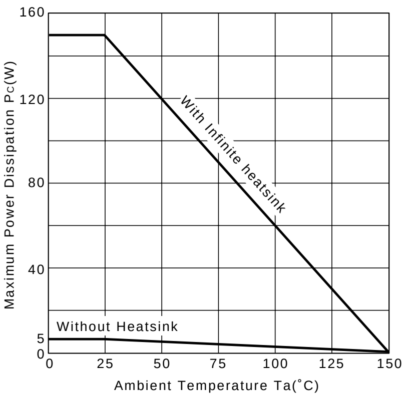

h_{FE}–I_C Characteristics (Typical)


h_{FE}–I_C Temperature Characteristics (Typical)


θ_{j-a}–t Characteristics


f_T–I_E Characteristics (Typical)


Safe Operating Area (Single Pulse)


P_C–Ta Derating

2SC3858

Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SA1494)

Application : Audio and General Purpose

■Absolute maximum ratings (Ta=25°C)

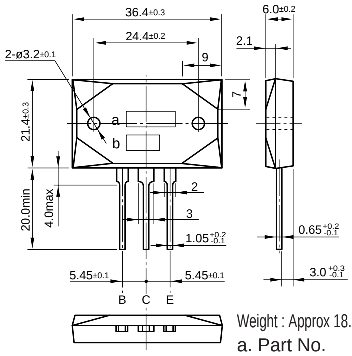
Symbol	Ratings	Unit
V_{CBO}	200	V
V_{CEO}	200	V
V_{EBO}	6	V
I_C	17	A
I_B	5	A
P_C	200(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=200V	100max	μA
I_{EBO}	V_{EB}=6V	100max	μA
$V_{(BR)CEO}$	I_C=50mA	200min	V
h_{FE}	V_{CE}=4V, I_C=8A	50min*	
$V_{CE(sat)}$	I_C=10A, I_B=1A	2.5max	V
f_T	V_{CE}=12V, I_E=–1A	20typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	300typ	pF

*h_{FE} Rank Y(50 to 100), P(70 to 140), G(90 to 180)

External Dimensions MT-200



Weight : Approx 18.4g

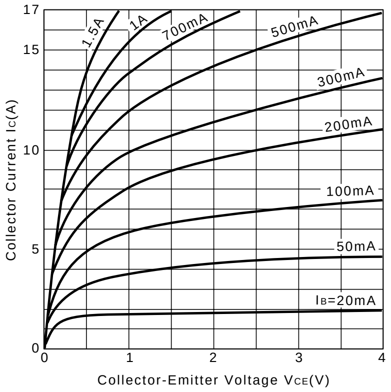
a. Part No.

b. Lot No.

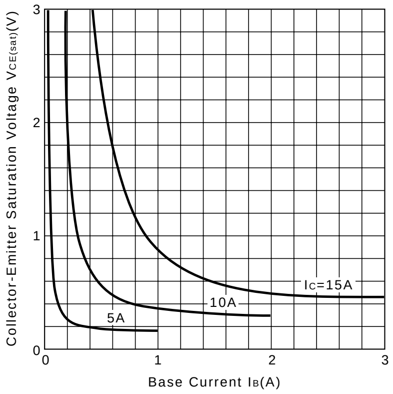
■Typical Switching Characteristics (Common Emitter)

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
40	4	10	10	–5	1	–1	0.5typ	1.8typ	0.6typ

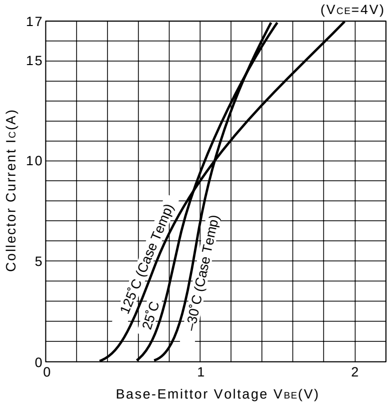
I_C–V_{CE} Characteristics (Typical)



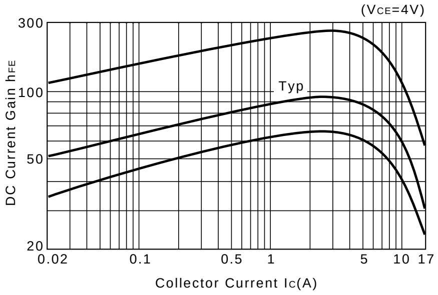
$V_{CE(sat)}$–I_B Characteristics (Typical)



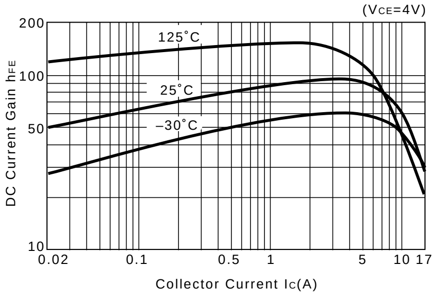
I_C–V_{BE} Temperature Characteristics (Typical)



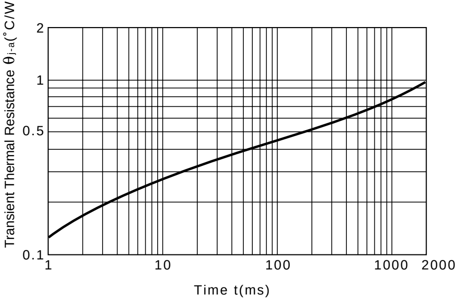
h_{FE}–I_C Characteristics (Typical)



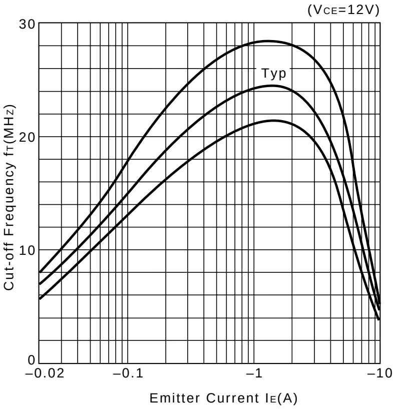
h_{FE}–I_C Temperature Characteristics (Typical)



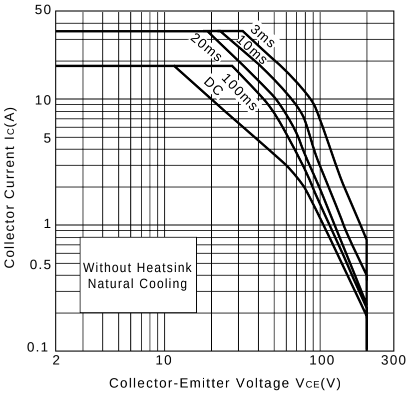
$\theta_{j\text{-}a}$–t Characteristics



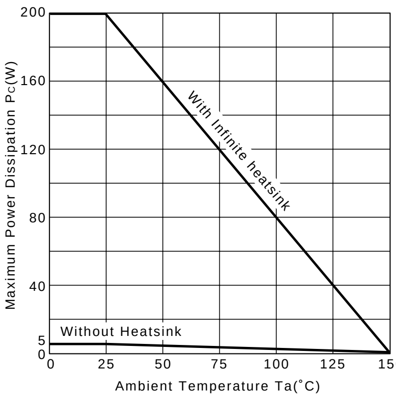
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C–T_a Derating



2SC3890

Silicon NPN Triple Diffused Planar Transistor (High Voltage and High Speed Switchihg Transistor)

Application : Switching Regulator and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	500	V
V_{CEO}	400	V
V_{EBO}	10	V
I_C	7(Pulse14)	A
I_B	2	A
P_C	30(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

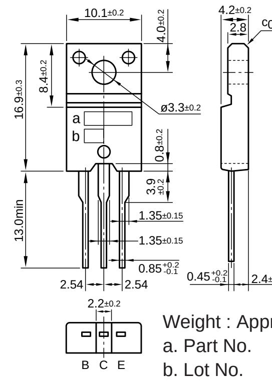
■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=500V	100max	µA
I_{EBO}	V_{EB}=10V	100max	µA
$V_{(BR)CEO}$	I_C=25mA	400min	V
h_{FE}	V_{CE}=4V, I_C=3A	10 to 30	
$V_{CE(sat)}$	I_C=3A, I_B=0.6A	0.5max	V
$V_{BE(sat)}$	I_C=3A, I_B=0.6A	1.3max	V
f_T	V_{CE}=12V, I_E=–0.5A	10typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	50typ	pF

■Typical Switching Characteristics (Common Emitter)

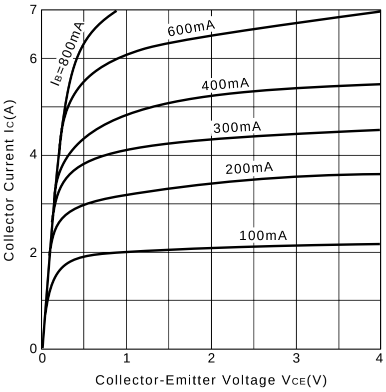
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (µs)	tstg (µs)	tf (µs)
200	66	3	10	–5	0.3	–0.6	1max	3max	0.5max

External Dimensions FM20(TO220F)

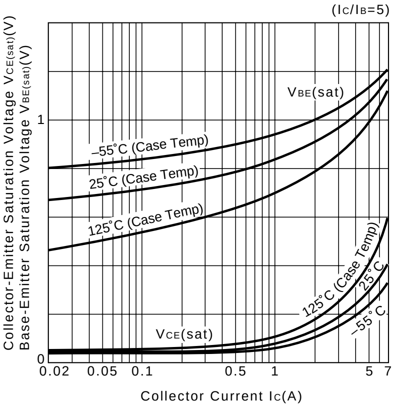


Weight : Approx 2.0g
a. Part No.
b. Lot No.

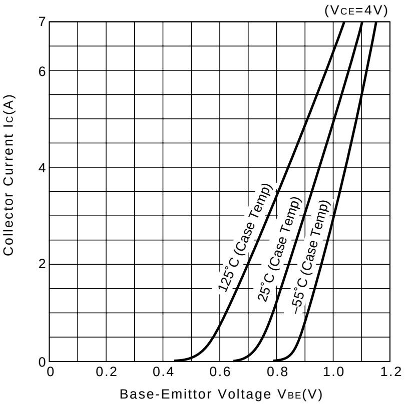
I_C–V_{CE} Characteristics (Typical)



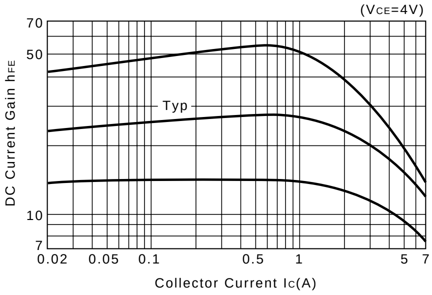
$V_{CE(sat)}$, $V_{BE(sat)}$–I_C Temperature Characteristics (Typical)



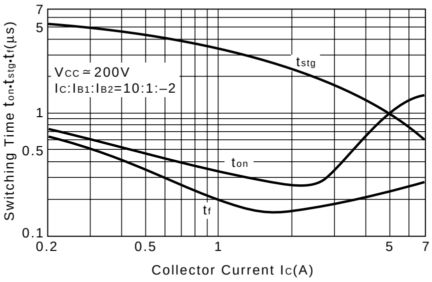
I_C–V_{BE} Temperature Characteristics (Typical)



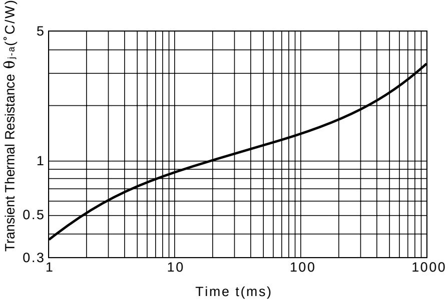
h_{FE}–I_C Characteristics (Typical)



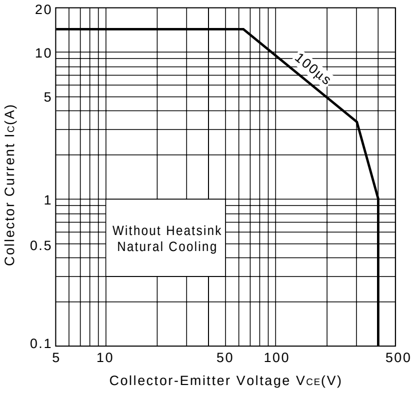
t_{on}•t_{stg}•t_f–I_C Characteristics (Typical)



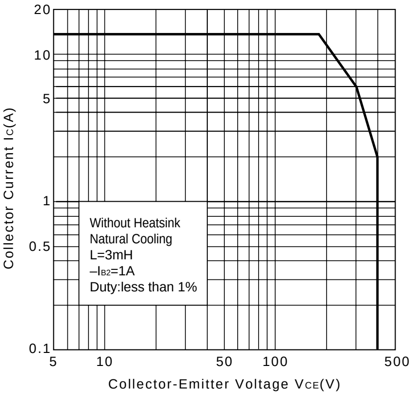
θ_{j-a}–t Characteristics



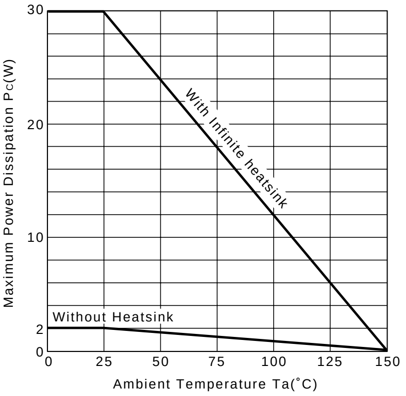
Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



P_C–Ta Derating



2SC3927

Silicon NPN Triple Diffused Planar Transistor (High Voltage Switchihg Transistor)

Application : Switching Regulator and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	900	V
V_{CEO}	550	V
V_{EBO}	7	V
I_C	10(Pulse15)	A
I_B	5	A
P_C	120(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

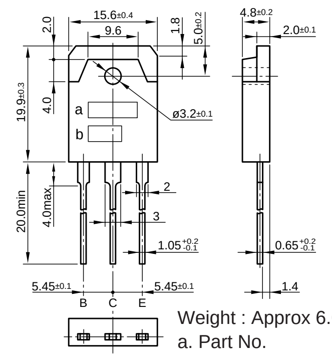
■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=800V	100max	μA
I_{EBO}	V_{EB}=7V	100max	μA
$V_{(BR)CEO}$	I_C=10mA	550min	V
h_{FE}	V_{CE}=4V, I_C=5A	10to28	
V_{CE}(sat)	I_C=5A, I_B=1A	0.5max	V
V_{BE}(sat)	I_C=5A, I_B=1A	1.2max	V
f_T	V_{CE}=12V, I_E=–1A	6typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	105typ	pF

■Typical Switching Characteristics (Common Emitter)

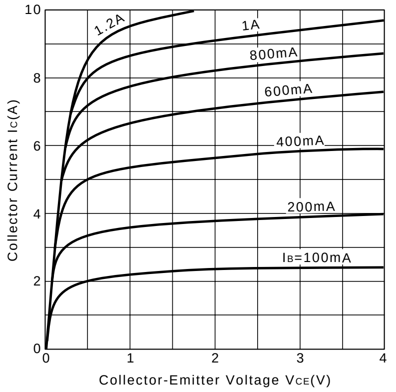
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
250	50	5	10	–5	0.75	–1.5	1max	5max	0.5max

External Dimensions MT-100(TO3P)

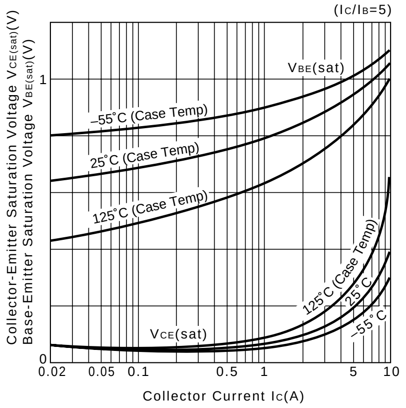


Weight : Approx 6.0g
a. Part No.
b. Lot No.

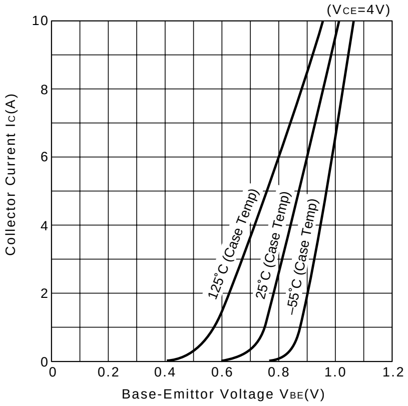
I_C−V_{CE} Characteristics (Typical)



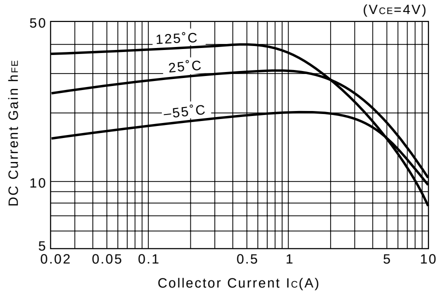
V_{CE}(sat),V_{BE}(sat)−I_C Temperature Characteristics (Typical)



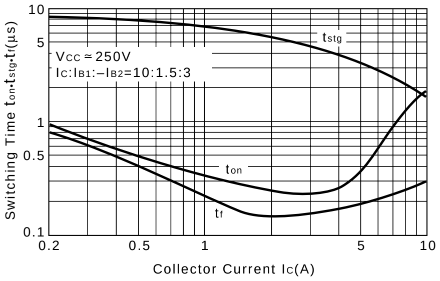
I_C−V_{BE} Temperature Characteristics (Typical)



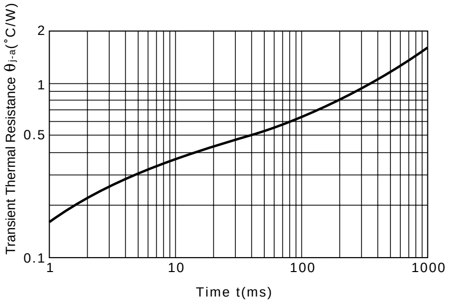
h_{FE}−I_C Characteristics (Typical)



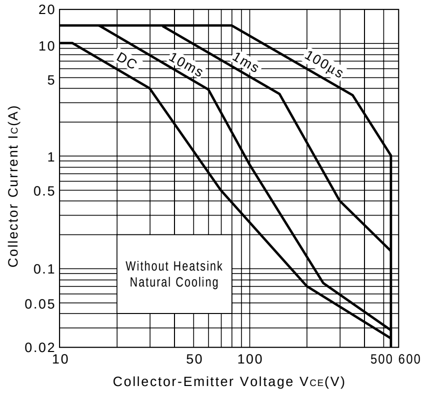
t_{on}•t_{stg}•t_f−I_C Characteristics (Typical)



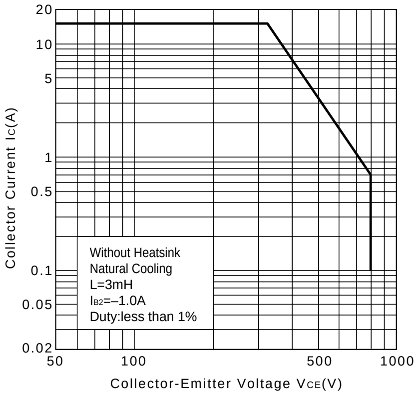
θ_{j-a}−t Characteristics



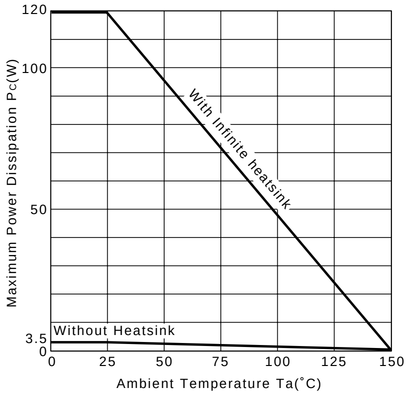
Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



P_C−Ta Derating



2SC4020

Silicon NPN Triple Diffused Planar Transistor (High Voltage Switchihg Transistor)

Application : Switching Regulator and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	900	V
V_{CEO}	800	V
V_{EBO}	7	V
I_C	3(Pulse6)	A
I_B	1.5	A
P_C	50(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

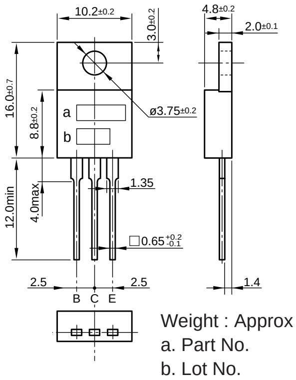
■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=800V	100max	μA
I_{EBO}	V_{EB}=7V	100max	μA
$V_{(BR)CEO}$	I_C=10mA	800min	V
h_{FE}	V_{CE}=4V, I_C=0.7A	10to30	
$V_{CE(sat)}$	I_C=0.7A, I_B=0.14A	0.5max	V
$V_{BE(sat)}$	I_C=0.7A, I_B=0.14A	1.2max	V
f_T	V_{CE}=12V, I_E=–0.3A	6typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	40typ	pF

■Typical Switching Characteristics (Common Emitter)

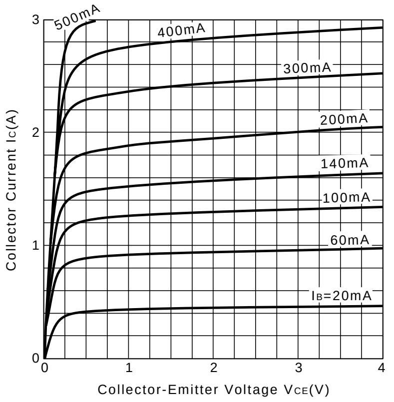
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
250	357	0.7	10	–5	0.1	–0.35	1max	5max	1max

External Dimensions MT-25(TO220)

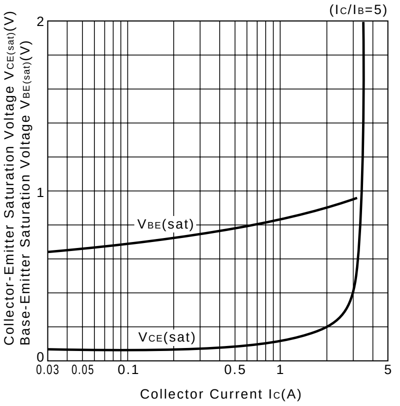


Weight : Approx 2.6g
a. Part No.
b. Lot No.

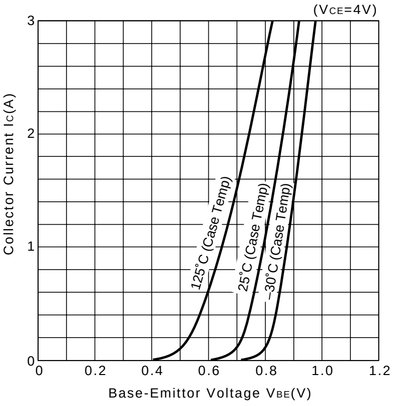
Ic–Vce Characteristics (Typical)



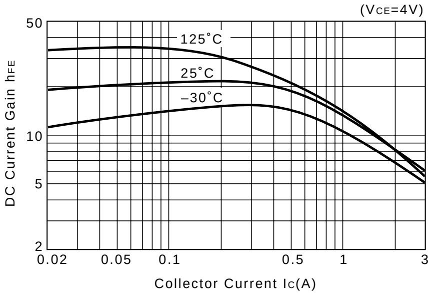
Vce(sat),Vbe(sat)–Ic Temperature Characteristics (Typical)



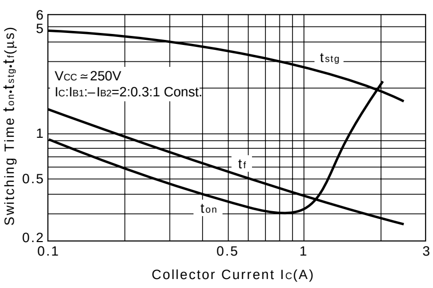
Ic–Vbe Temperature Characteristics (Typical)



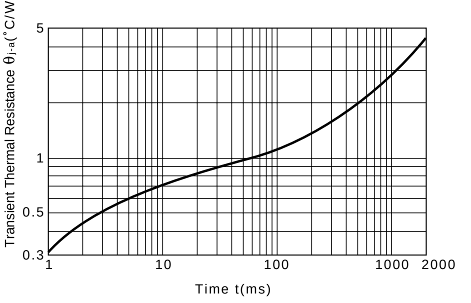
hFE–Ic Characteristics (Typical)



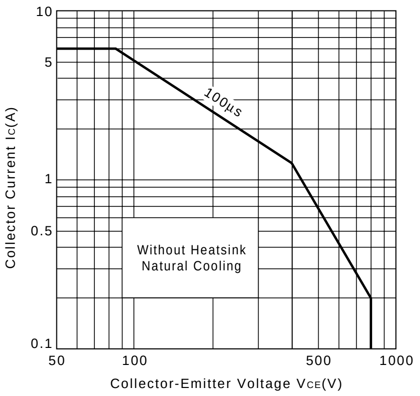
ton•tstg•tf–Ic Characteristics (Typical)



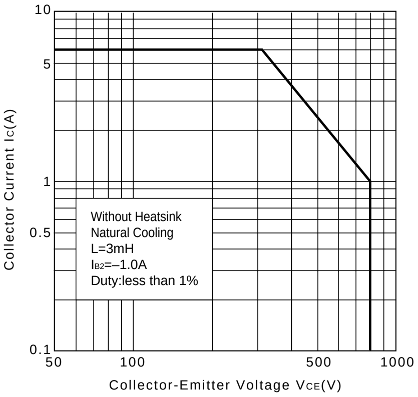
θj-a–t Characteristics



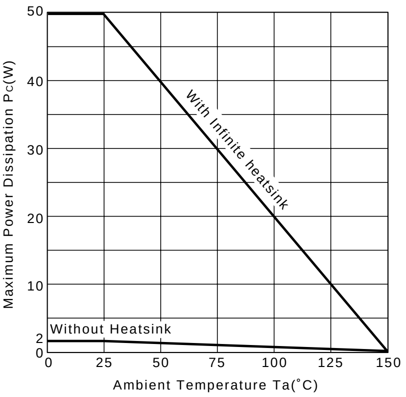
Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



Pc–Ta Derating



High h_{FE} Low V_{CE} (sat) 2SC4024

Silicon NPN Epitaxial Planar Transistor

Application : DC-DC Converter, Emergency Lighting Inverter and General Purpose

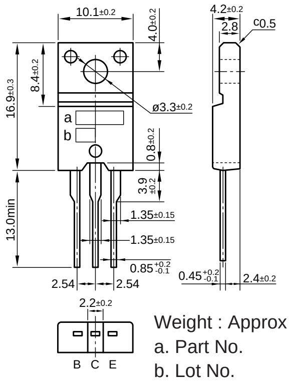
■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	100	V
V_{CEO}	50	V
V_{EBO}	15	V
I_C	10	A
I_B	3	A
P_C	35(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=100V	10max	μA
I_{EBO}	V_{EB}=15V	10max	μA
$V_{(BR)CEO}$	I_C=25mA	50min	V
h_{FE}	V_{CE}=4V, I_C=1A	300to1600	
V_{CE}(sat)	I_C=5A, I_B=0.1A	0.5max	V
f_T	V_{CE}=12V, I_E=–0.5A	24typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	150typ	pF

External Dimensions FM20(TO220F)

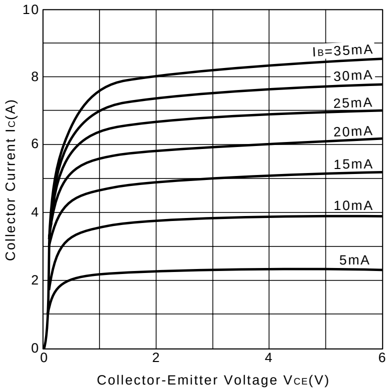


Weight : Approx 2.0g
a. Part No.
b. Lot No.

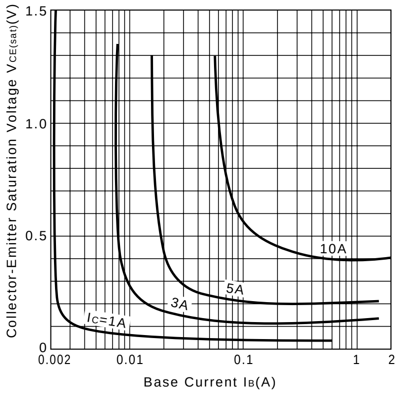
■Typical Switching Characteristics (Common Emitter)

V_{CC} (V)	R_L (Ω)	I_C (A)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
20	4	5	0.1	–0.1	0.5typ	2.0typ	0.5typ

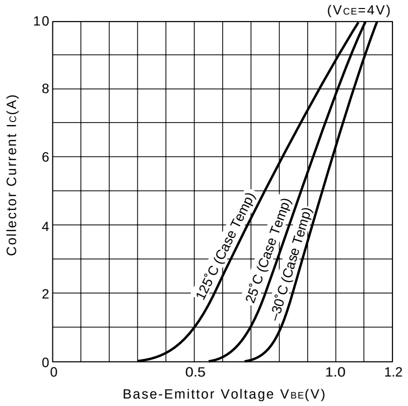
I_C–V_{CE} Characteristics (Typical)



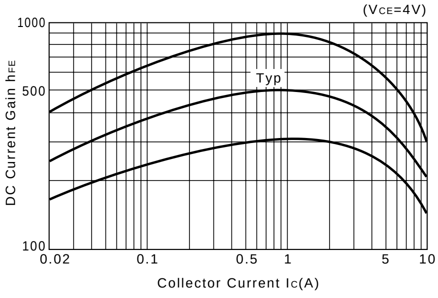
V_{CE}(sat)–I_B Characteristics (Typical)



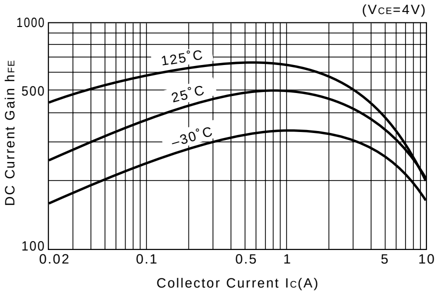
I_C–V_{BE} Temperature Characteristics (Typical)



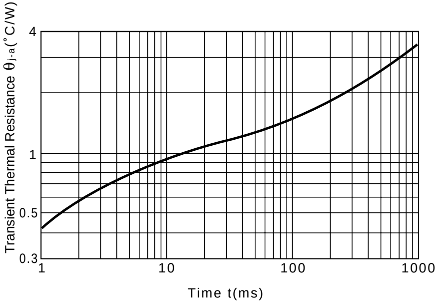
h_{FE}–I_C Characteristics (Typical)



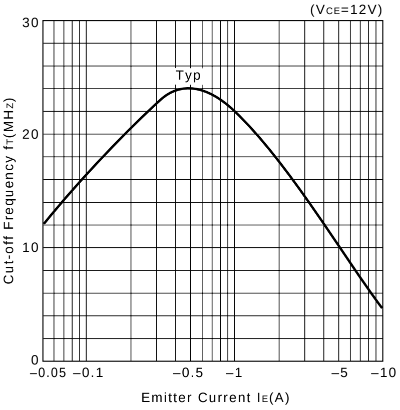
h_{FE}–I_C Temperature Characteristics (Typical)



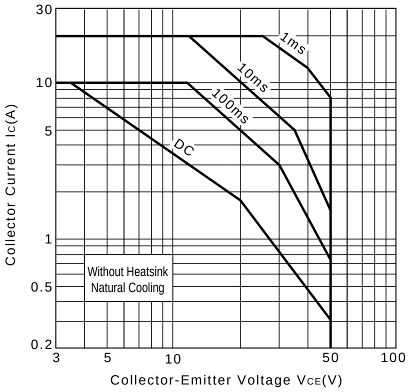
$\theta_{j\text{-}a}$–t Characteristics



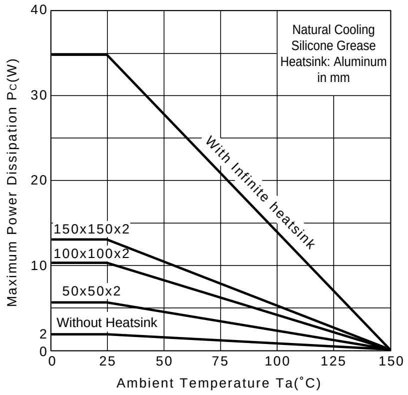
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



Pc–Ta Derating



LOW V_{CE} (sat) 2SC4064

Silicon NPN Epitaxial Planar Transistor (Complement to type 2SA1567)

Application : DC Motor Driver and General Purpose

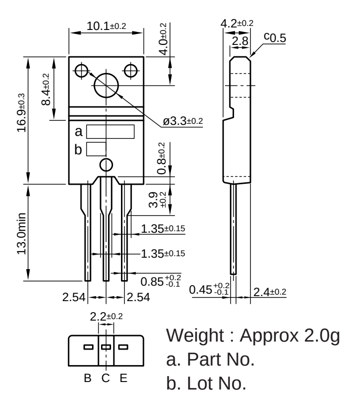
■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	50	V
V_{CEO}	50	V
V_{EBO}	6	V
I_C	12	A
I_B	3	A
P_C	35(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=50V	100max	μA
I_{EBO}	V_{EB}=6V	10max	μA
$V_{(BR)CEO}$	I_C=25mA	50min	V
h_{FE}	V_{CE}=1V, I_C=6A	50min	
V_{CE}(sat)	I_C=6A, I_B=0.3A	0.35max	V
f_T	V_{CE}=12V, I_E=–0.5A	40typ	MHz
C_{OB}	V_{CB}=12V, f=1MHz	180typ	pF

External Dimensions FM20(TO220F)

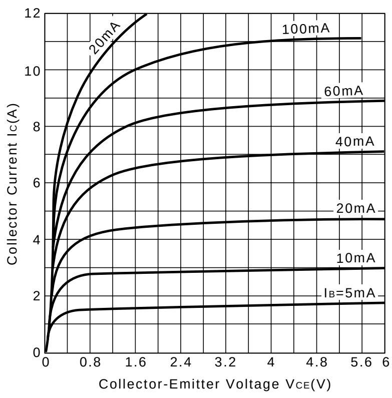


Weight : Approx 2.0g
a. Part No.
b. Lot No.

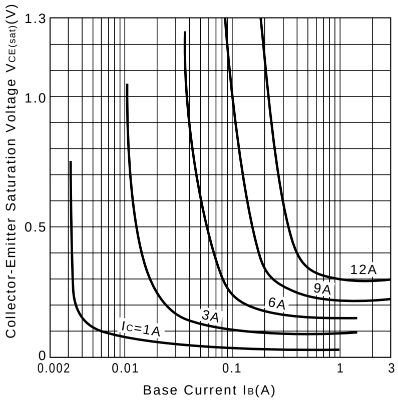
■Typical Switching Characteristics (Common Emitter)

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
24	4	6	10	–5	0.12	–0.12	0.6typ	1.4typ	0.4typ

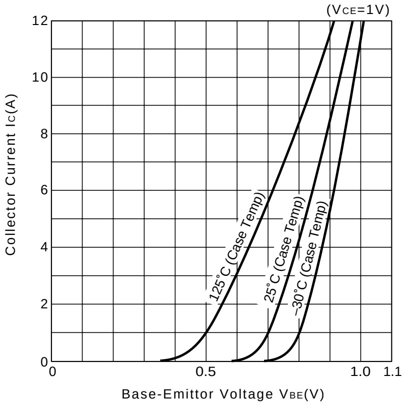
I_C–V_{CE} Characteristics (Typical)



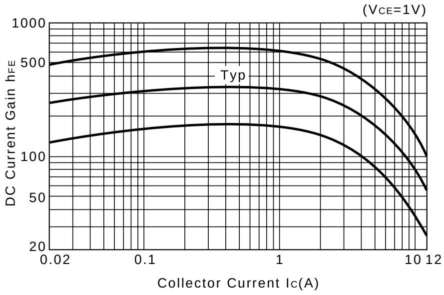
V_{CE}(sat)–I_B Characteristics (Typical)



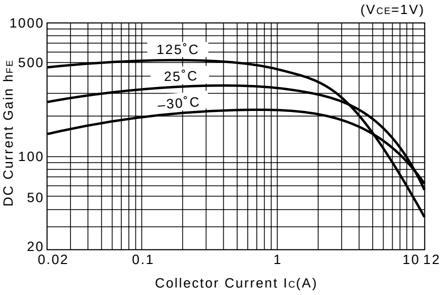
I_C–V_{BE} Temperature Characteristics (Typical)



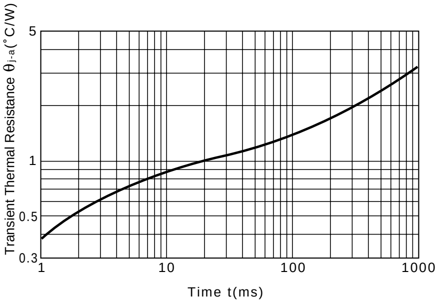
h_{FE}–I_C Characteristics (Typical)



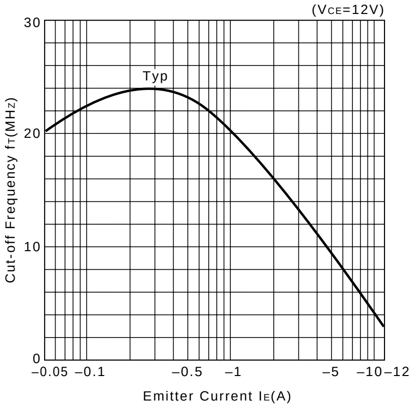
h_{FE}–I_C Temperature Characteristics (Typical)



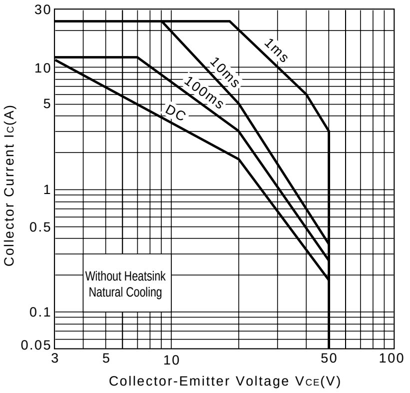
θ_{j-a}–t Characteristics



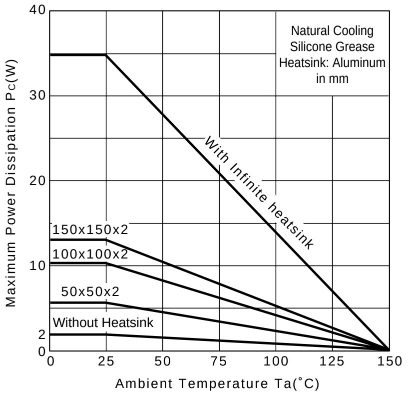
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



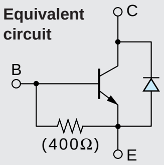
P_C–Ta Derating



Built-in Diode at C–E
Low V_{CE} (sat)

2SC4065

Equivalent circuit



Silicon NPN Epitaxial Planar Transistor (Complement to type 2SA1568)

Application : DC Motor Driver and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	60	V
V_{CEO}	60	V
V_{EBO}	6	V
I_C	±12	A
I_B	3	A
P_C	35(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

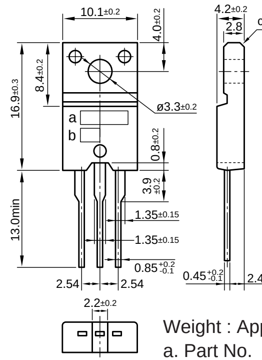
■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=60V	100max	μA
I_{EBO}	V_{EB}=6V	60max	mA
$V_{(BR)CEO}$	I_C=25mA	60min	V
h_{FE}	V_{CE}=1V, I_C=6A	50min	
V_{CE}(sat)	I_C=6A, I_B=1.3A	0.35max	V
V_{FEC}	V_{ECO}=10A	2.5max	V
f_T	V_{CE}=12V, I_E=–0.5A	24typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	180typ	PF

■Typical Switching Characteristics (Common Emitter)

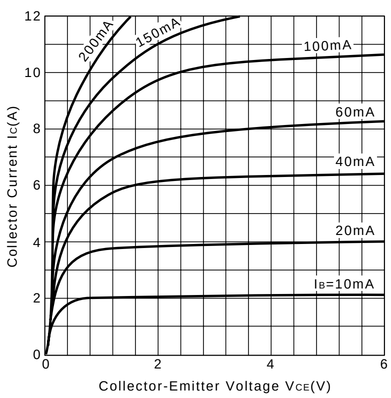
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
24	4	6	10	–5	0.12	–0.12	0.6typ	1.4typ	0.4typ

External Dimensions FM20(TO220F)

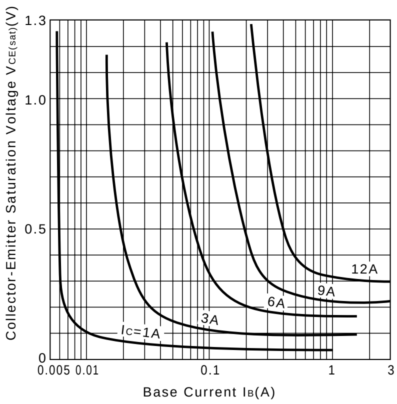


Weight : Approx 2.0g
a. Part No.
b. Lot No.

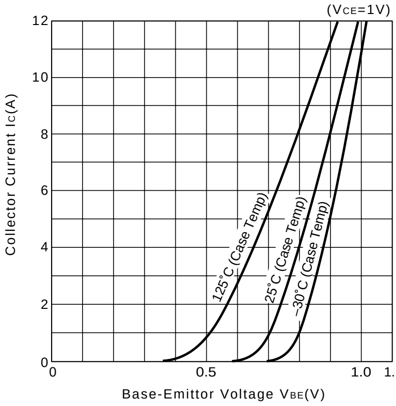
I_C–V_{CE} Characteristics (Typical)



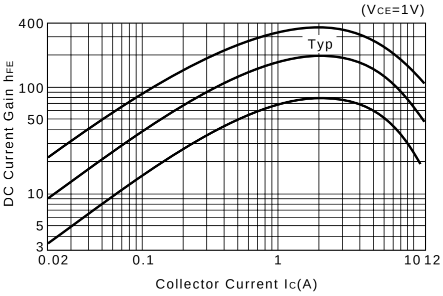
V_{CE}(sat)–I_B Characteristics (Typical)



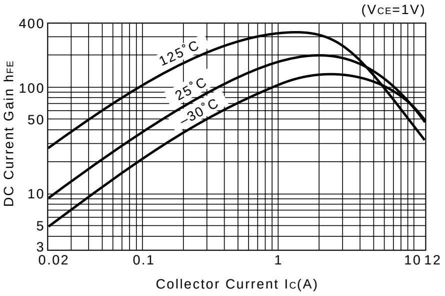
I_C–V_{BE} Temperature Characteristics (Typical)



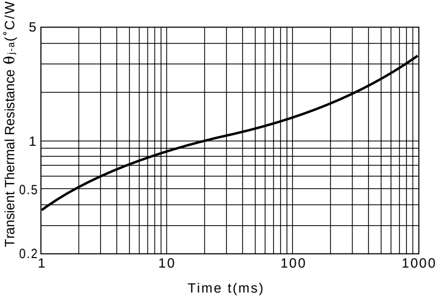
h_{FE}–I_C Characteristics (Typical)



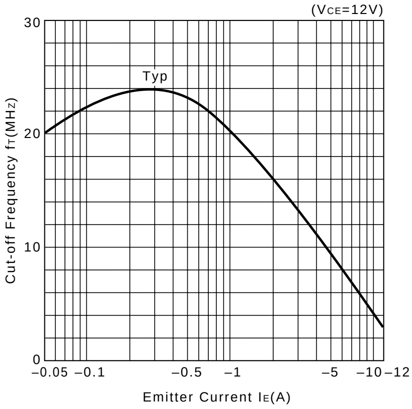
h_{FE}–I_C Temperature Characteristics (Typical)



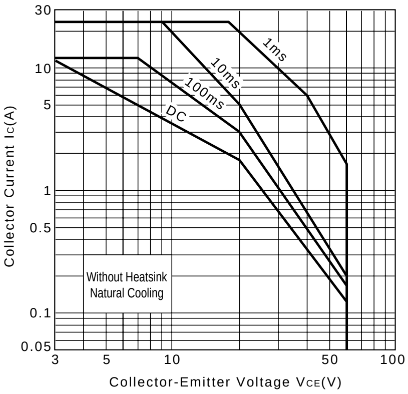
θ_{j-a}–t Characteristics



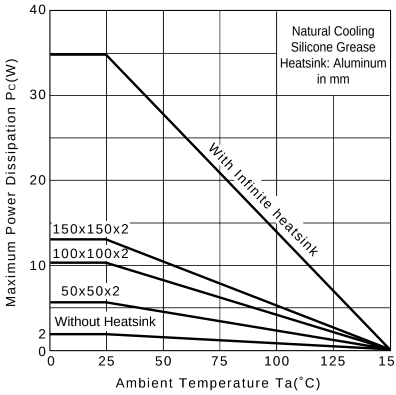
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C–Ta Derating



2SC4073

Silicon NPN Triple Diffused Planar Transistor (High Voltage and High Speed Switchihg Transistor) **Application :** Switching Regulator and General Purpose

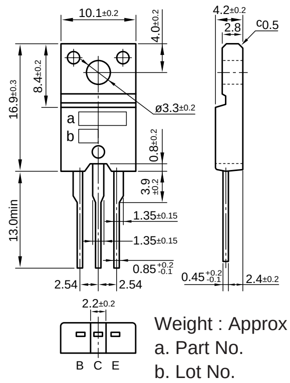
■**Absolute maximum ratings** (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	500	V
V_{CEO}	400	V
V_{EBO}	10	V
I_C	5(Pulse10)	A
I_B	2	A
P_C	30(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=500V	100max	μA
I_{EBO}	V_{EB}=10V	100max	μA
$V_{(BR)CEO}$	I_C=25mA	400min	V
h_{FE}	V_{CE}=4V, I_C=2A	10to30	
V_{CE}(sat)	I_C=2A, I_B=0.4A	0.5max	V
V_{BE}(sat)	I_C=2A, I_B=0.4A	1.3max	V
f_T	V_{CE}=12V, I_E=–0.3A	10typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	30typ	pF

External Dimensions FM20(TO220F)

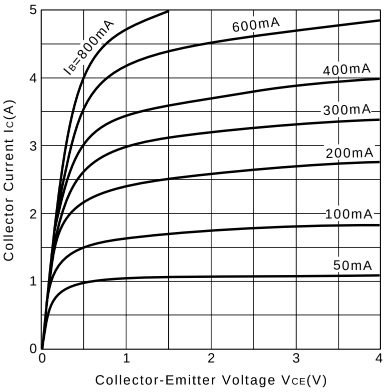


Weight : Approx 2.0g
a. Part No.
b. Lot No.

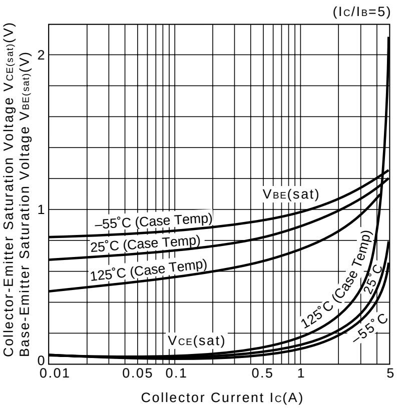
■**Typical Switching Characteristics (Common Emitter)**

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
200	100	2	10	–5	0.2	–0.4	1max	3max	0.5max

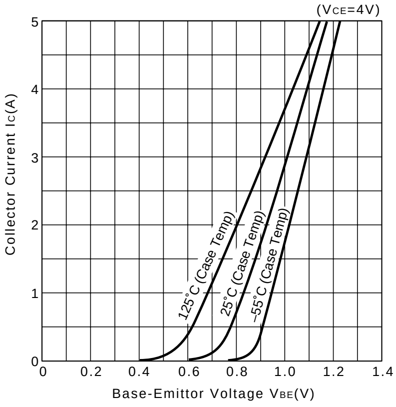
I_C−V_{CE} Characteristics (Typical)



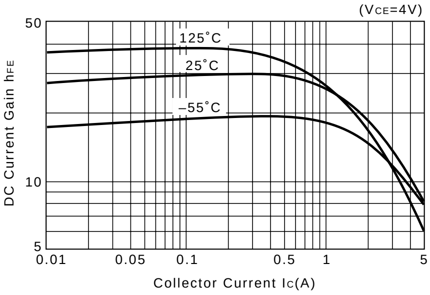
V_{CE}(sat),V_{BE}(sat)−I_C Temperature Characteristics (Typical)



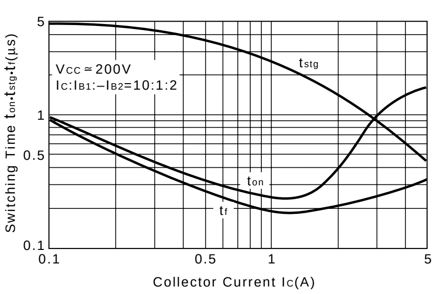
I_C−V_{BE} Temperature Characteristics (Typical)



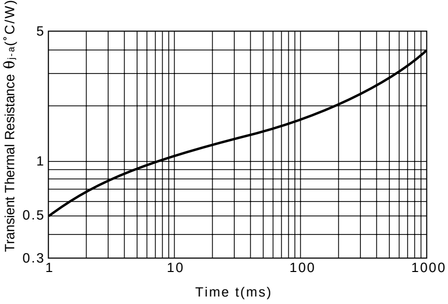
h_{FE}−I_C Characteristics (Typical)



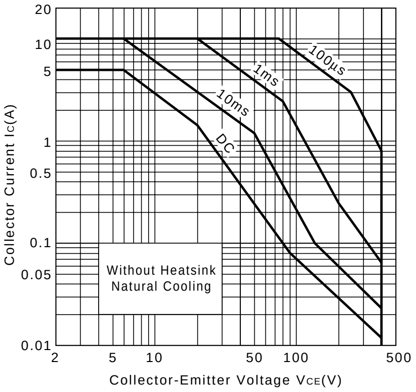
t_{on}•t_{stg}•t_f−I_C Characteristics (Typical)



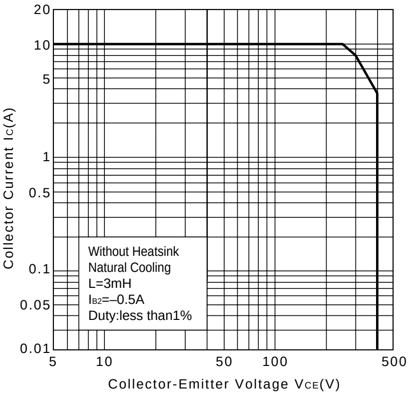
$θ_{j-a}$−t Characteristics



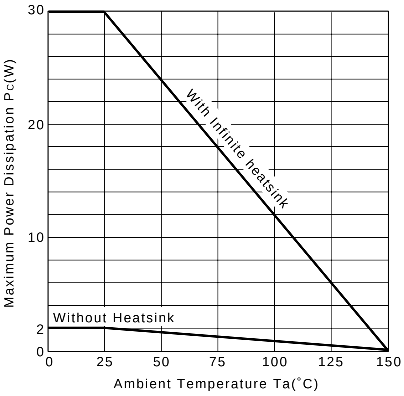
Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



P_C−Ta Derating



2SC4130

Silicon NPN Epitaxial Planar Transistor (High Voltage and High Speed Switchihg Transistor)

Application : Switching Regulator and General Purpose

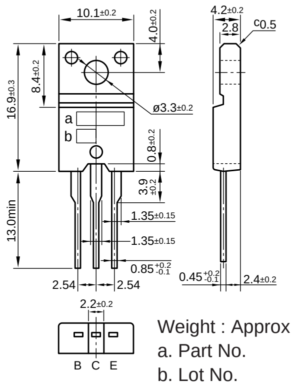
■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	500	V
V_{CEO}	400	V
V_{EBO}	10	V
I_C	7(Pulse14)	A
I_B	2	A
P_C	30(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=500V	100max	μA
I_{EBO}	V_{EB}=10V	100max	μA
$V_{(BR)CEO}$	I_C=25mA	400min	V
h_{FE}	V_{CE}=4V, I_C=3A	10to30	
$V_{CE(sat)}$	I_C=3A, I_B=0.6A	0.5max	V
$V_{BE(sat)}$	I_C=3A, I_B=0.6A	1.3max	V
f_T	V_{CE}=12V, I_E=–0.5A	15typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	50typ	pF

External Dimensions FM20(TO220F)

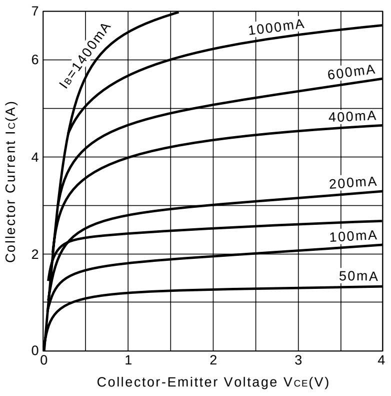


Weight : Approx 2.0g
a. Part No.
b. Lot No.

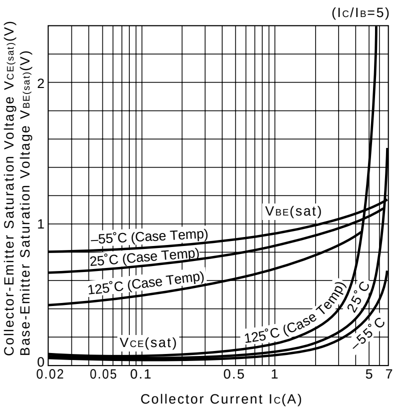
■Typical Switching Characteristics (Common Emitter)

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
200	67	3	10	–5	0.3	–0.6	1max	2.2max	0.5max

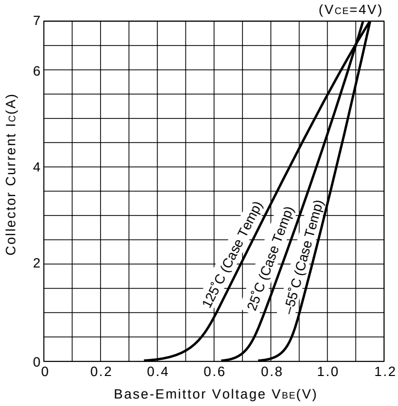
I_C–V_{CE} Characteristics (Typical)



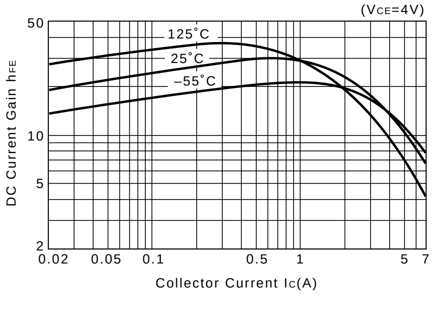
V_{CE}(sat),V_{BE}(sat)–I_C Temperature Characteristics (Typical)



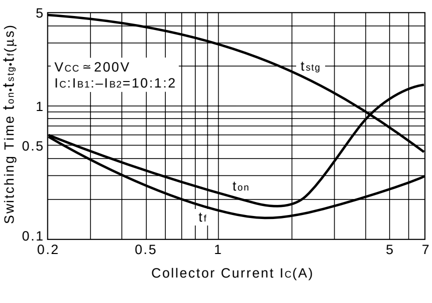
I_C–V_{BE} Temperature Characteristics (Typical)



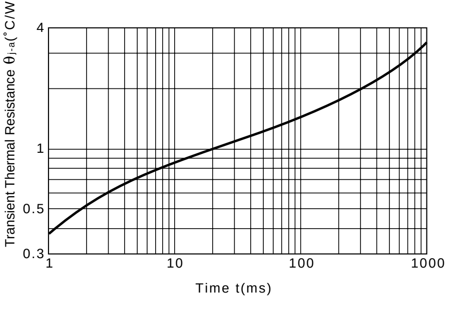
h_{FE}–I_C Characteristics (Typical)



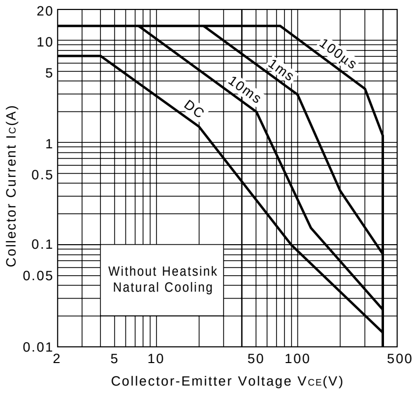
t_{on}•t_{stg}•t_f–I_C Characteristics (Typical)



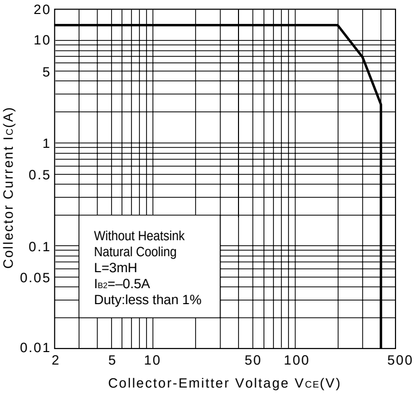
θ_{j-a}–t Characteristics



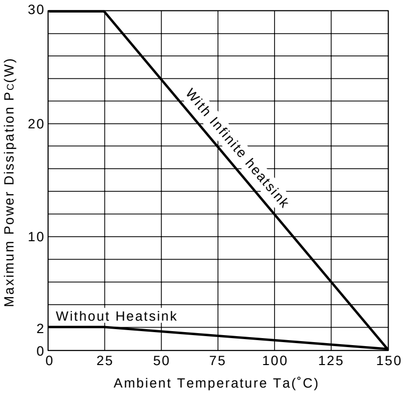
Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



P_C–Ta Derating



LOW V_{CE} (sat) 2SC4131

Silicon NPN Epitaxial Planar Transistor

Application : DC-DC Converter, Emergency Lighting Inverter and General Purpose

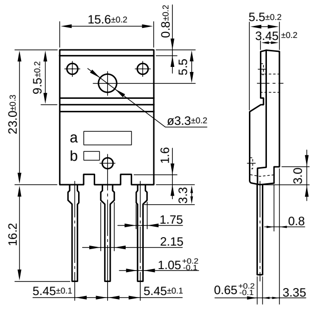
■**Absolute maximum ratings** (Ta=25°C)

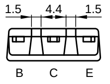
Symbol	Ratings	Unit
V_{CBO}	100	V
V_{CEO}	50	V
V_{EBO}	15	V
I_C	15(Pulse25)	A
I_B	4	A
P_C	60(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=100V	10max	μA
I_{EBO}	V_{EB}=15V	10max	μA
$V_{(BR)CEO}$	I_C=25mA	50min	V
h_{FE}	V_{CE}=1V, I_C=5A	60to360	
V_{CE}(sat)	I_C=5A, I_B=80mA	0.5max	V
V_{BE}(sat)	I_C=5A, I_B=80mA	1.2max	V
f_T	V_{CE}=12V, I_E=–1A	18typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	210typ	pF

External Dimensions FM100(TO3PF)



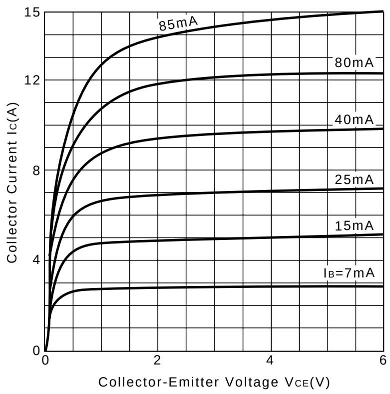


Weight : Approx 2.0g
a. Part No.
b. Lot No.

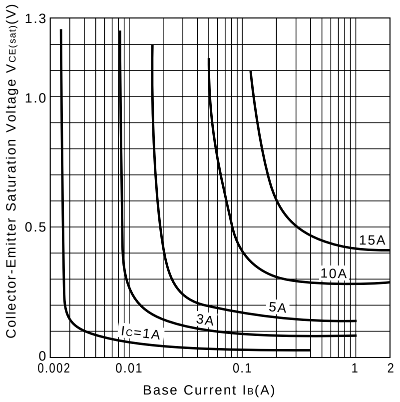
■**Typical Switching Characteristics (Common Emitter)**

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
20	4	5	10	–5	0.08	–0.08	0.5typ	2.0typ	0.4typ

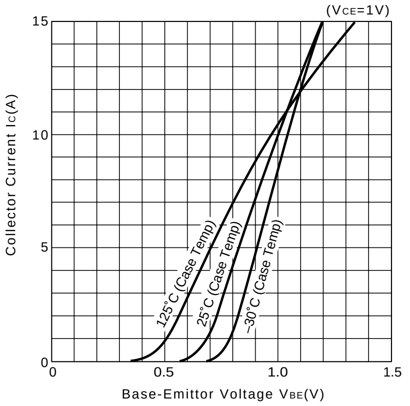
I_C–V_{CE} Characteristics (Typical)



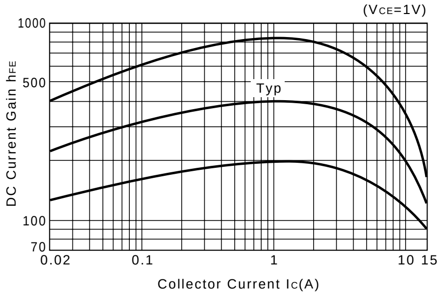
V_{CE}(sat)–I_B Characteristics (Typical)



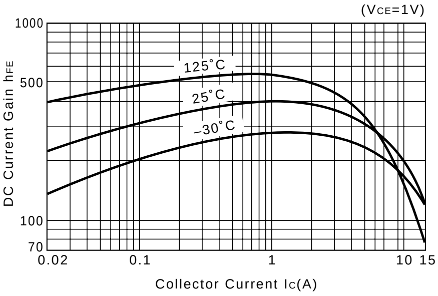
I_C–V_{BE} Temperature Characteristics (Typical)



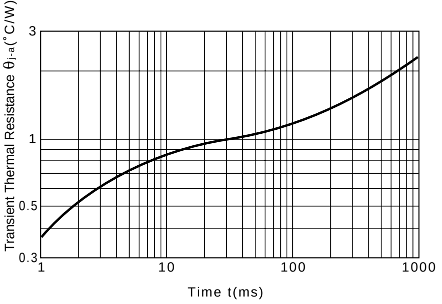
h_{FE}–I_C Characteristics (Typical)



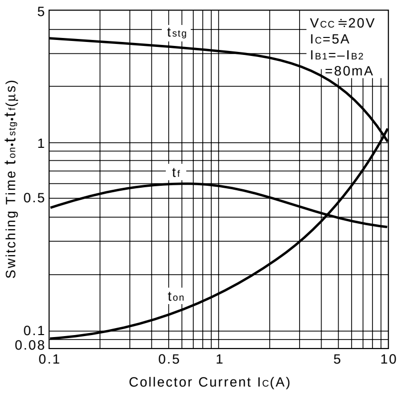
h_{FE}–I_C Temperature Characteristics (Typical)



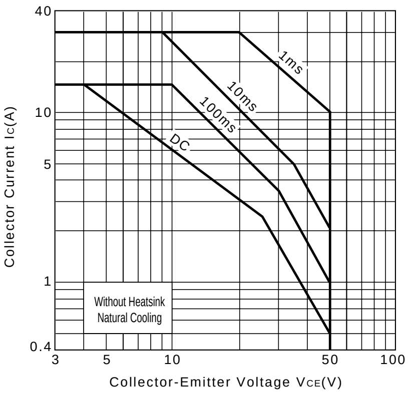
θ_{j-a}–t Characteristics



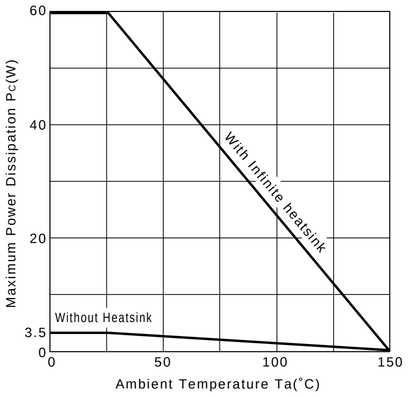
t_{on}•t_{stg}•t_f–I_C Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C–Ta Derating



2SC4138

Silicon NPN Triple Diffused Planar Transistor (High Voltage and High Speed Switchihg Transistor)

Application : Switching Regulator and General Purpose

■**Absolute maximum ratings** (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	500	V
V_{CEO}	400	V
V_{EBO}	10	V
I_C	10(Pulse20)	A
I_B	4	A
P_C	80(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

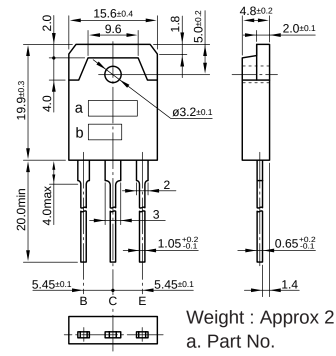
■**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=500V	100max	μA
I_{EBO}	V_{EB}=10V	100max	μA
$V_{(BR)CEO}$	I_C=25mA	400min	V
h_{FE}	V_{CE}=4V, I_C=6A	10 to 30	
V_{CE}(sat)	I_C=6A, I_B=1.2A	0.5max	V
V_{BE}(sat)	I_C=6A, I_B=1.2A	1.3max	V
f_T	V_{CE}=12V, I_E=–0.7A	10typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	85typ	pF

■**Typical Switching Characteristics (Common Emitter)**

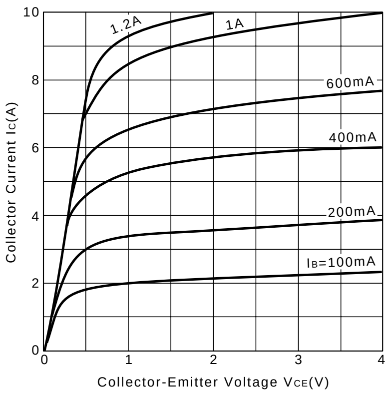
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
200	33.3	6	10	–5	0.6	–1.2	1max	3max	0.5max

External Dimensions MT-100(TO3P)

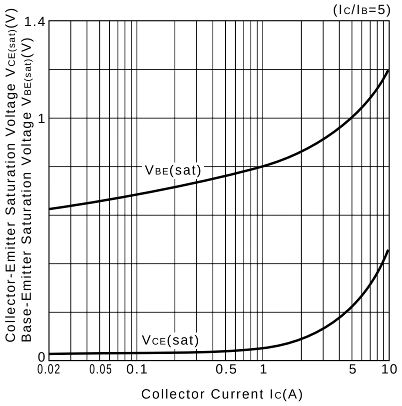


Weight : Approx 2.0g
a. Part No.
b. Lot No.

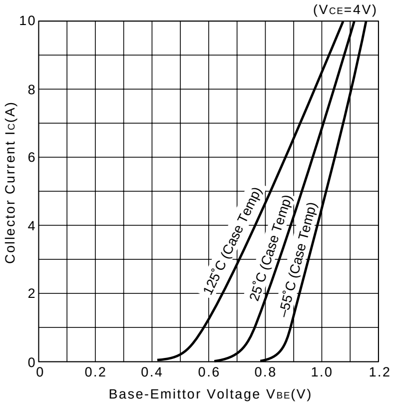
I_C–V_{CE} Characteristics (Typical)



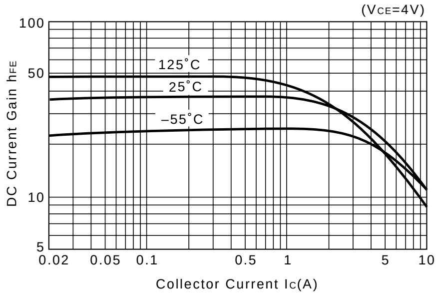
V_{CE}(sat), V_{BE}(sat)–I_C Temperature Characteristics (Typical)



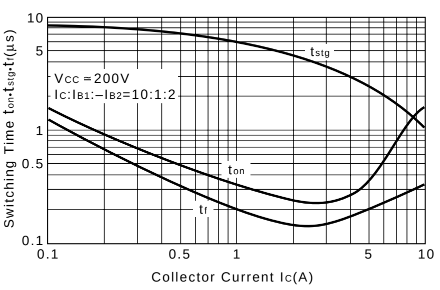
I_C–V_{BE} Temperature Characteristics (Typical)



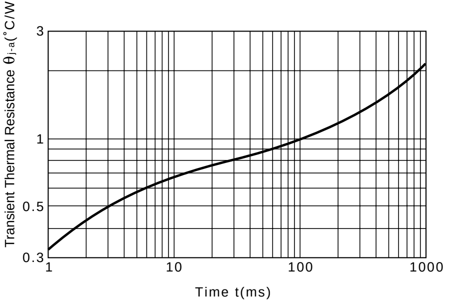
h_{FE}–I_C Characteristics (Typical)



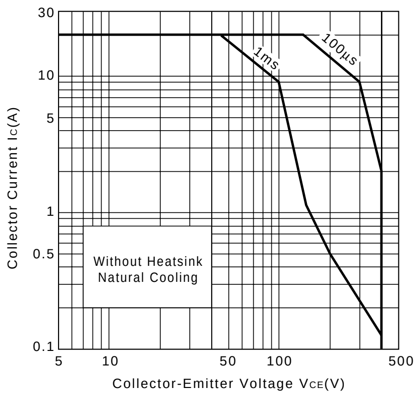
t_{on}•t_{stg}•t_f–I_C Characteristics (Typical)



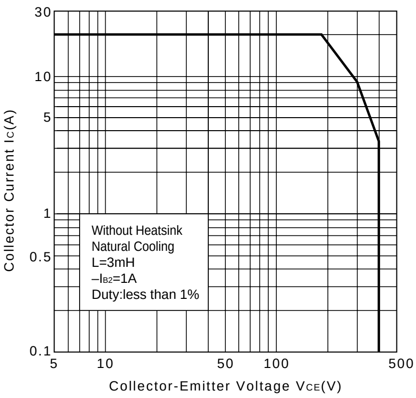
$\theta_{j\text{-}a}$–t Characteristics



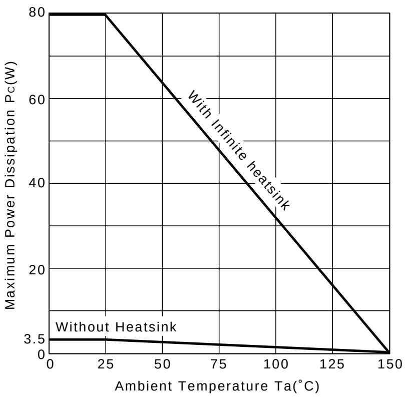
Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



P_C–Ta Derating



2SC4139

Silicon NPN Triple Diffused Planar Transistor (High Voltage and High Speed Switchihg Transistor) **Application :** Switching Regulator and General Purpose

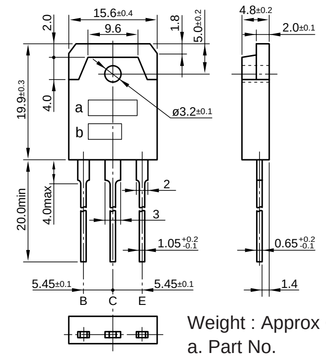
■**Absolute maximum ratings** (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	500	V
V_{CEO}	400	V
V_{EBO}	10	V
I_C	15(Pulse30)	A
I_B	5	A
P_C	120(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=500V	100max	μA
I_{EBO}	V_{EB}=10V	100max	μA
$V_{(BR)CEO}$	I_C=25mA	400min	V
h_{FE}	V_{CE}=4V, I_C=8A	10 to 30	
$V_{CE(sat)}$	I_C=8A, I_B=1.6A	0.5max	V
$V_{BE(sat)}$	I_C=8A, I_B=1.6A	1.3max	V
f_T	V_{CE}=12V, I_E=–1.5A	10typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	85typ	pF

External Dimensions MT-100(TO3P)

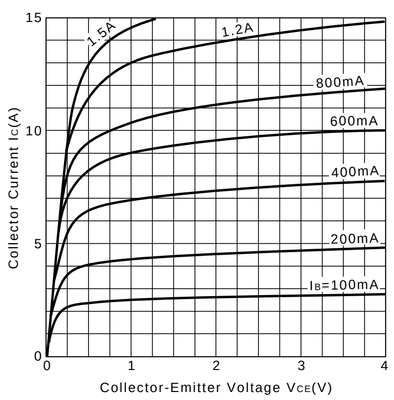


Weight : Approx 6.0g
a. Part No.
b. Lot No.

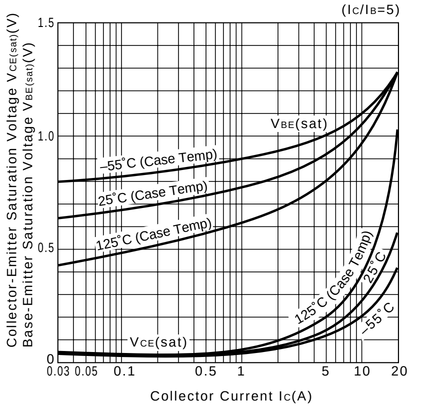
■**Typical Switching Characteristics (Common Emitter)**

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
200	25	8	10	–5	0.8	–1.6	1max	3max	0.5max

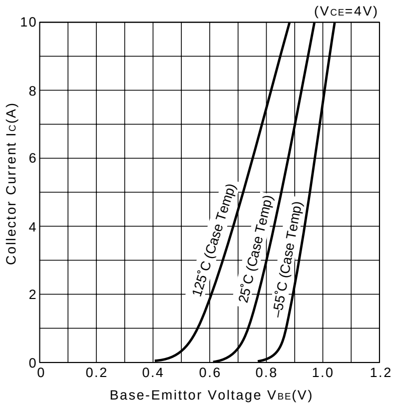
I_C–V_{CE} Characteristics (Typical)



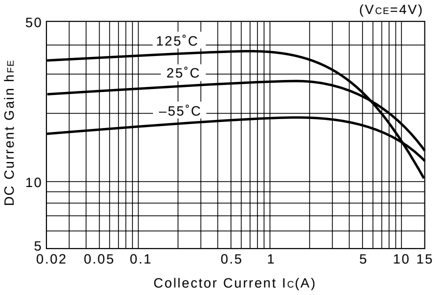
$V_{CE}(sat)$,$V_{BE}(sat)$–I_C Temperature Characteristics (Typical)



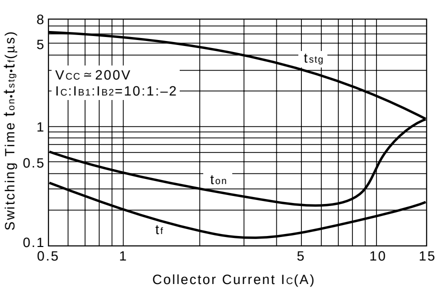
I_C–V_{BE} Temperature Characteristics (Typical)



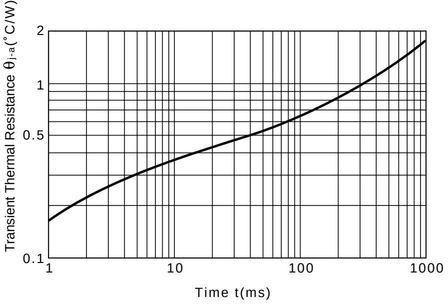
h_{FE}–I_C Characteristics (Typical)



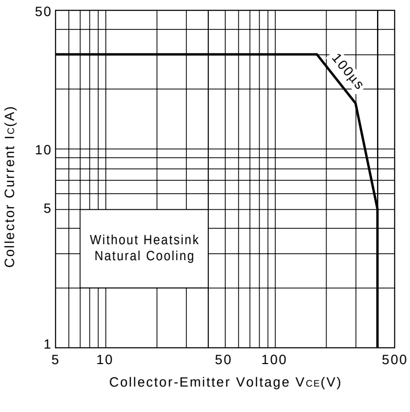
t_{on}•t_{stg}•t_f–I_C Characteristics (Typical)



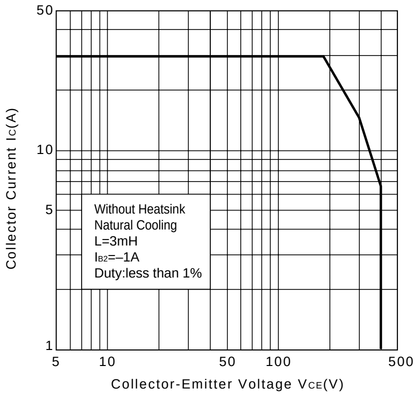
θ_{j-a}–t Characteristics



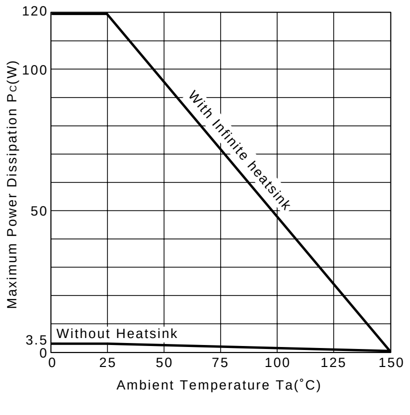
Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



P_C–Ta Derating



2SC4140

Silicon NPN Triple Diffused Planar Transistor (High Voltage and High Speed Switchihg Transistor) **Application :** Switching Regulator and General Purpose

■**Absolute maximum ratings** (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	500	V
V_{CEO}	400	V
V_{EBO}	10	V
I_C	18(Pulse36)	A
I_B	6	A
P_C	130(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

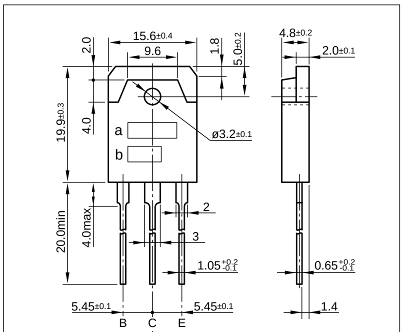
■**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=500V	100max	μA
I_{EBO}	V_{EB}=10V	100max	μA
$V_{(BR)CEO}$	I_C=25mA	400min	V
h_{FE}	V_{CE}=4V, I_C=10A	10to30	
V_{CE}(sat)	I_C=10A, I_B=2A	0.5max	V
V_{BE}(sat)	I_C=10A, I_B=2A	1.3max	V
f_T	V_{CE}=12V, I_E=–2.0A	10typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	165typ	pF

■**Typical Switching Characteristics (Common Emitter)**

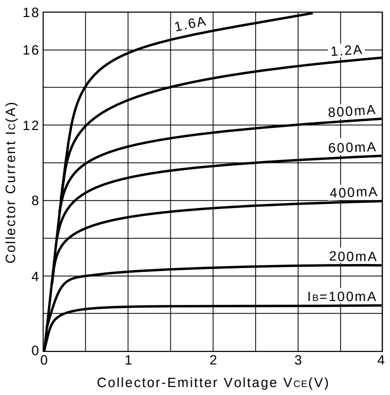
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
200	20	10	10	–5	1	–2	1max	3max	0.5max

External Dimensions MT-100(TO3P)

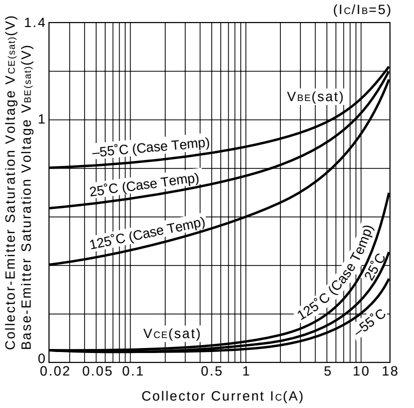


Weight : Approx 6.0g
a. Part No.
b. Lot No.

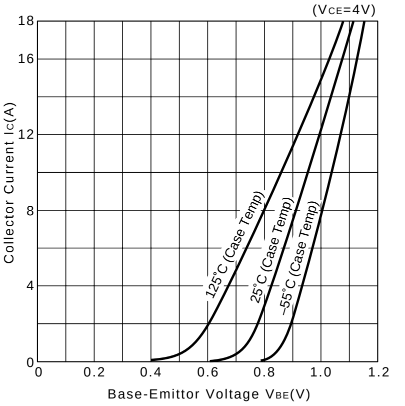
I_C-V_{CE} Characteristics (Typical)



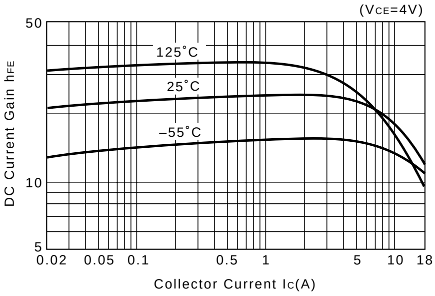
V_{CE}(sat),V_{BE}(sat)$-I_C$ Temperature Characteristics (Typical)



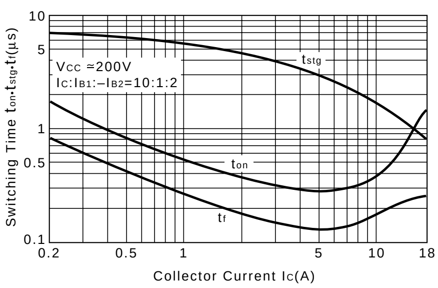
I_C-V_{BE} Temperature Characteristics (Typical)



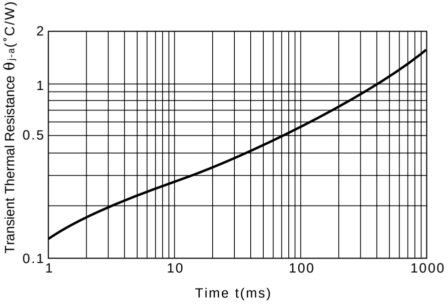
$h_{FE}-I_C$ Characteristics (Typical)



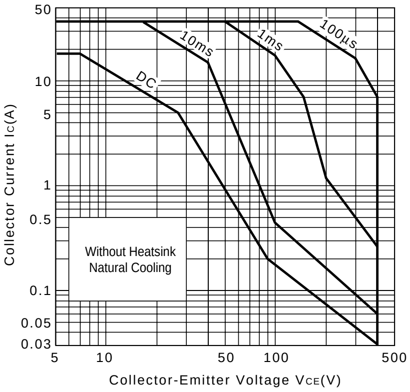
$t_{on}\bullet t_{stg}\bullet t_f-I_C$ Characteristics (Typical)



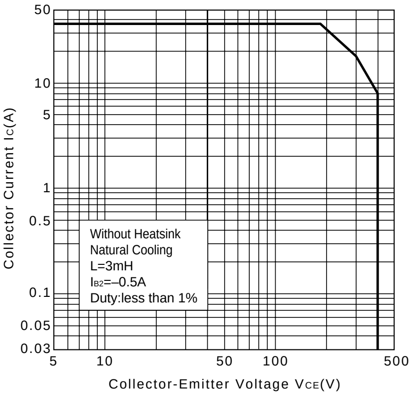
$\theta_{j-a}-t$ Characteristics



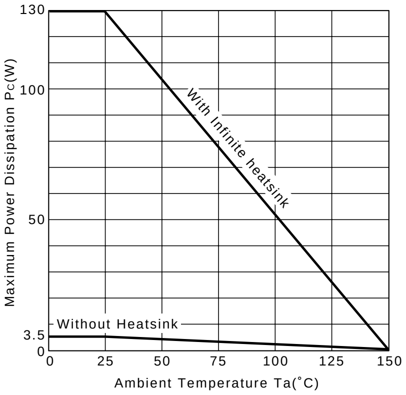
Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



P_C-T_a Derating



2SC4153

Silicon NPN Triple Diffused Planar Transistor (Switchihg Transistor)

Application : Humidifier, DC-DC Converter, and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	200	V
V_{CEO}	120	V
V_{EBO}	8	V
I_C	7(Pulse14)	A
I_B	3	A
P_C	30(T_C=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

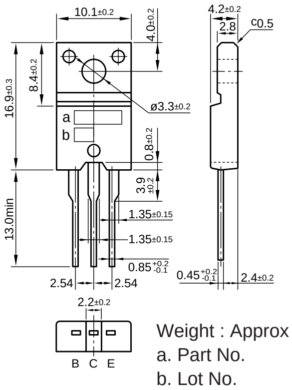
■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=200V	100max	μA
I_{EBO}	V_{EB}=8V	100max	μA
$V_{(BR)CEO}$	I_C=50mA	120min	V
h_{FE}	V_{CE}=4V, I_C=3A	70to220	
V_{CE}(sat)	I_C=3A, I_B=0.3A	0.5max	V
V_{BE}(sat)	I_C=3A, I_B=0.3A	1.2max	V
f_T	V_{CE}=12V, I_E=–0.5A	30typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	110typ	pF

■Typical Switching Characteristics (Common Emitter)

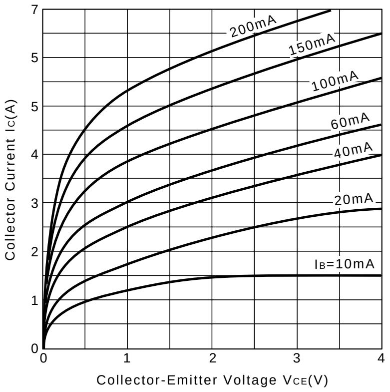
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
50	16.7	3	10	–5	0.3	–0.6	0.5max	3max	0.5max

External Dimensions FM20(TO220F)

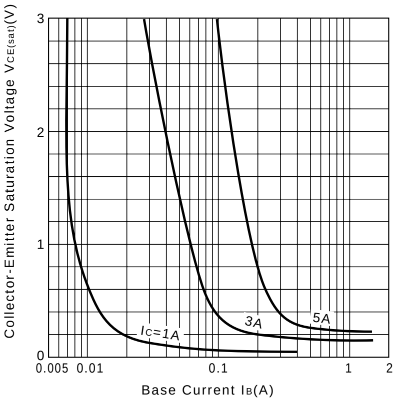


Weight : Approx 2.0g
a. Part No.
b. Lot No.

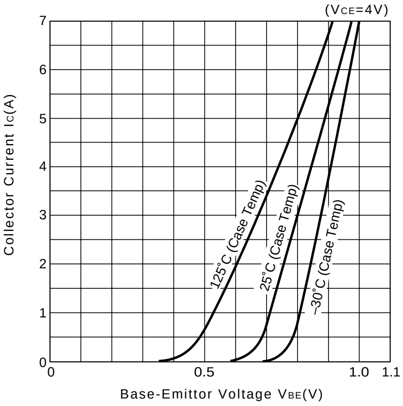
I_C–V_{CE} Characteristics (Typical)



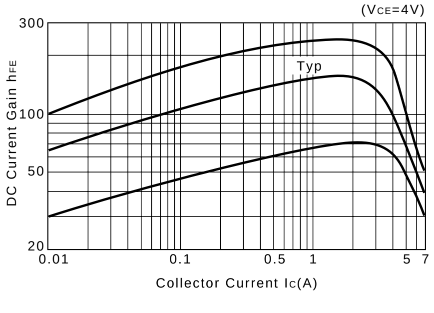
V_{CE}(sat)–I_B Characteristics (Typical)



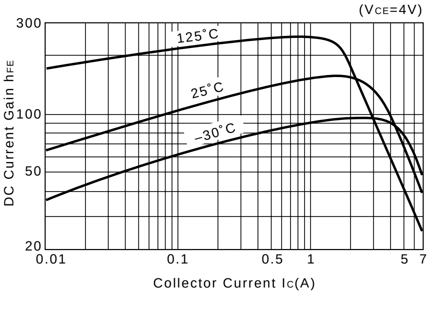
I_C–V_{BE} Temperature Characteristics (Typical)



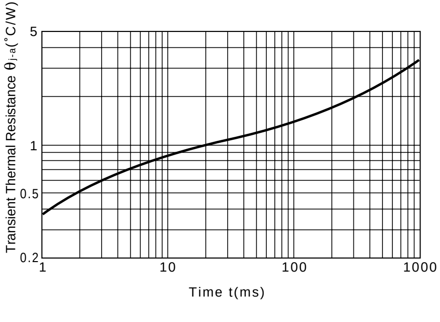
h_{FE}–I_C Characteristics (Typical)



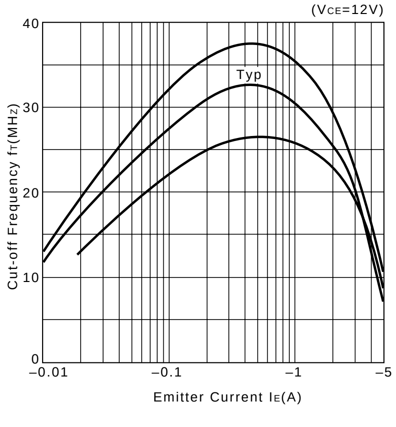
h_{FE}–I_C Temperature Characteristics (Typical)



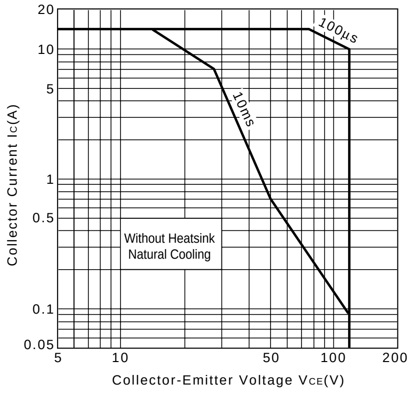
θ_{j-a}–t Characteristics



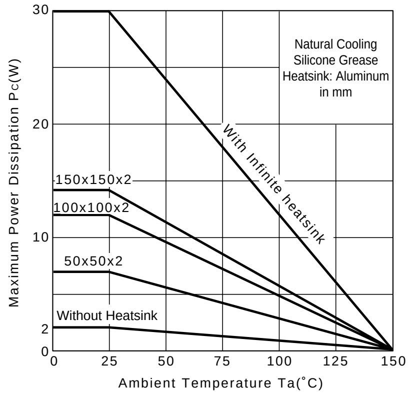
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C–T_a Derating



2SC4296

Silicon NPN Triple Diffused Planar Transistor (High Voltage and High Speed Switchihg Transistor) **Application :** Switching Regulator and General Purpose

■**Absolute maximum ratings** (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	500	V
V_{CEO}	400	V
V_{EBO}	10	V
I_C	10(Pulse20)	A
I_B	4	A
P_C	75(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

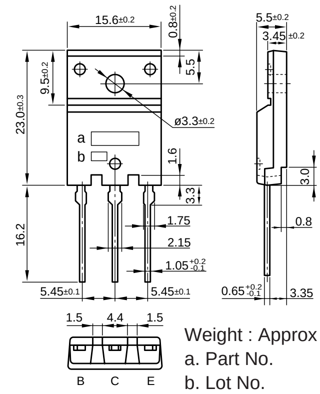
■**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=500V	100max	μA
I_{EBO}	V_{EB}=10V	100max	μA
$V_{(BR)CEO}$	I_C=25mA	400min	V
h_{FE}	V_{CE}=4V, I_C=6A	10to30	
V_{CE}(sat)	I_C=6A, I_B=1.2A	0.5max	V
V_{BE}(sat)	I_C=6A, I_B=1.2A	1.3max	V
f_T	V_{CE}=12V, I_E=–0.7A	10typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	85typ	pF

■**Typical Switching Characteristics (Common Emitter)**

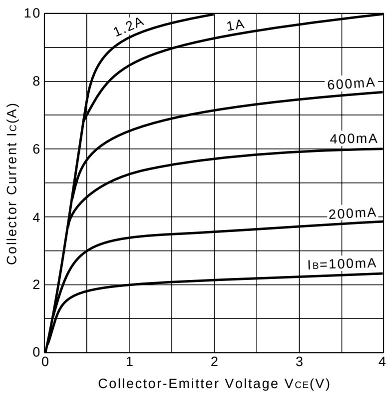
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
200	33	6	10	–5	0.6	–1.2	1max	3max	0.5max

External Dimensions FM100(TO3PF)

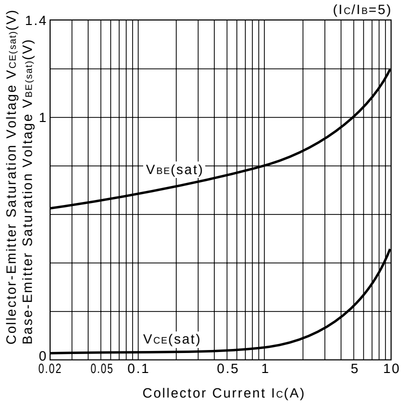


Weight : Approx 6.5g
a. Part No.
b. Lot No.

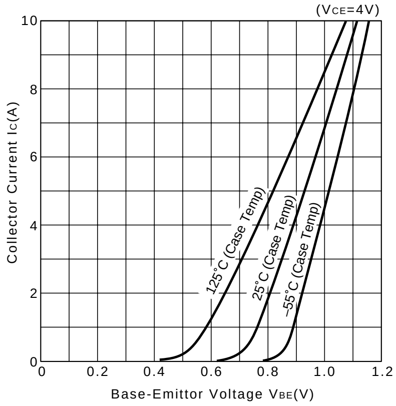
I_C–V_{CE} Characteristics (Typical)



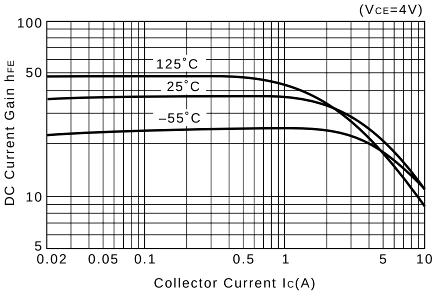
V_{CE}(sat),V_{BE}(sat)–I_C Temperature Characteristics (Typical)



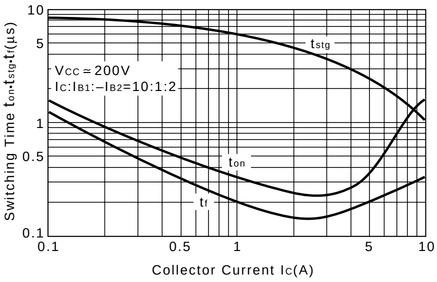
I_C–V_{BE} Temperature Characteristics (Typical)



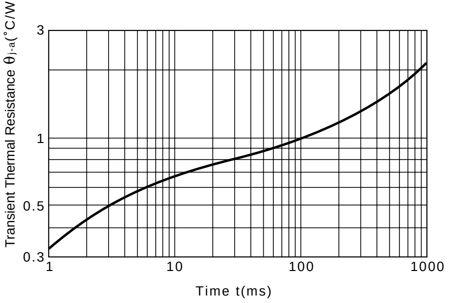
h_{FE}–I_C Characteristics (Typical)



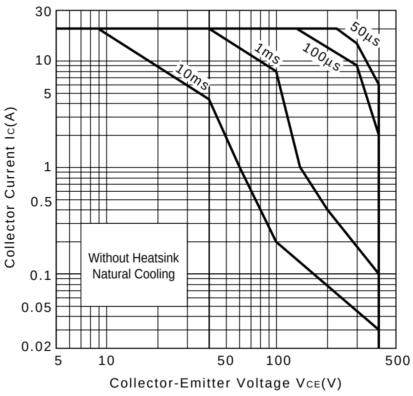
t_{on}•t_{stg}•t_f–I_C Characteristics (Typical)



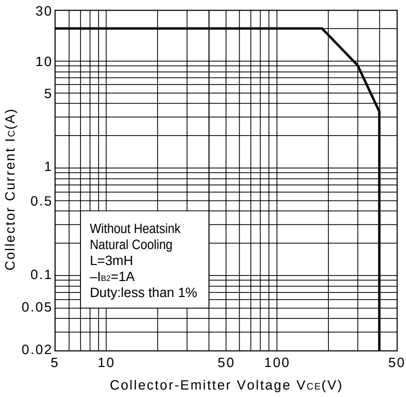
$\theta_{j\text{-}a}$–t Characteristics



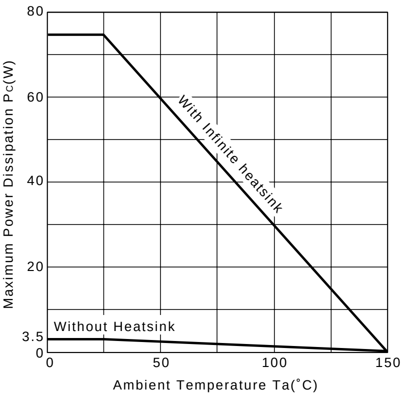
Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



P_C–Ta Derating



2SC4297

Silicon NPN Triple Diffused Planar Transistor (High Voltage and High Speed Switchihg Transistor) **Application :** Switching Regulator and General Purpose

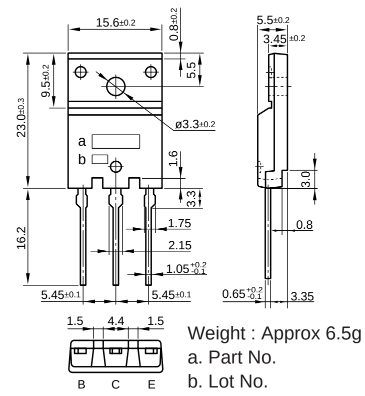
■**Absolute maximum ratings** (Ta=25°C)

Symbol	Ratings	Unit
VCBO	500	V
VCEO	400	V
VEBO	10	V
IC	12(Pulse24)	A
IB	4	A
PC	75(TC=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	Ratings	Unit
ICBO	VCB=500V	100max	μA
IEBO	VEB=10V	100max	μA
V(BR)CEO	IC=25mA	400min	V
hFE	VCE=4V, IC=7A	10 to 30	
VCE(sat)	IC=7A, IB=1.4A	0.5max	V
VBE(sat)	IC=7A, IB=1.4A	1.3max	V
fT	VCE=12V, IE=–1A	10typ	MHz
COB	VCB=10V, f=1MHz	105typ	pF

External Dimensions FM100(TO3PF)

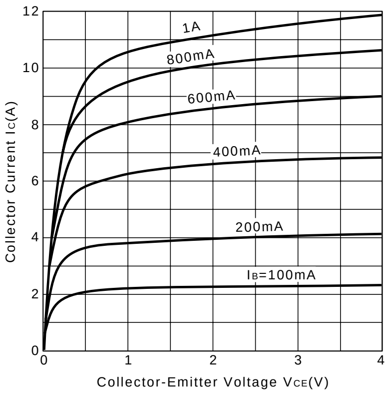


Weight : Approx 6.5g
a. Part No.
b. Lot No.

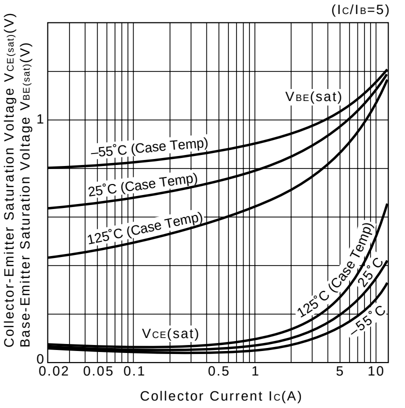
■**Typical Switching Characteristics (Common Emitter)**

VCC (V)	RL (Ω)	IC (A)	VBB1 (V)	VBB2 (V)	IB1 (A)	IB2 (A)	ton (μs)	tstg (μs)	tf (μs)
200	28.5	7	10	–5	0.7	–1.4	1max	3max	0.5max

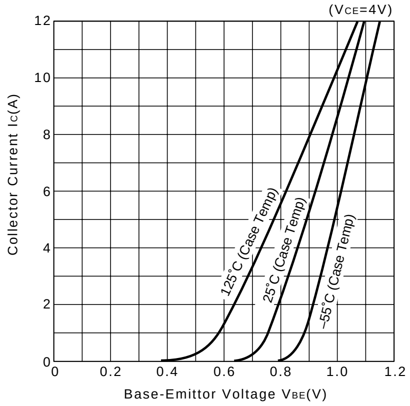
IC–VCE Characteristics (Typical)



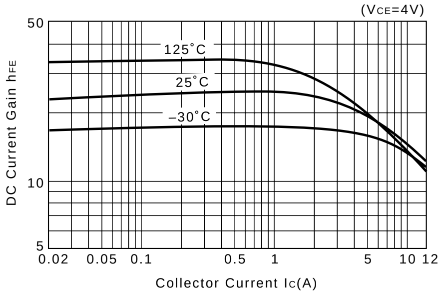
VCE(sat),VBE(sat)–IC Temperature Characteristics (Typical)



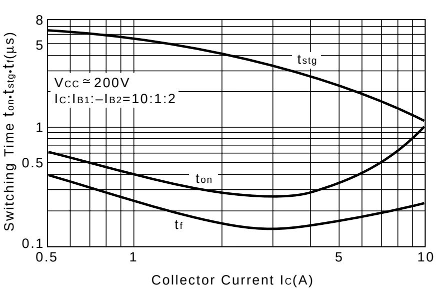
IC–VBE Temperature Characteristics (Typical)



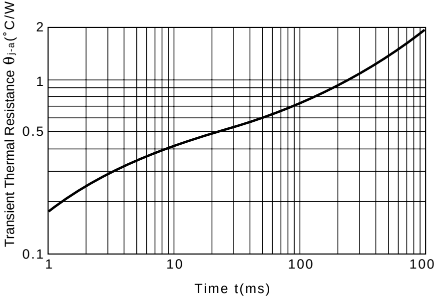
hFE–IC Characteristics (Typical)



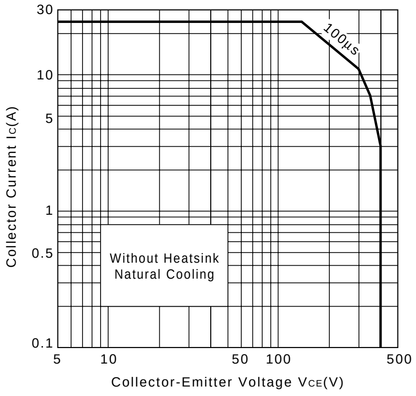
ton•tstg•tf–IC Characteristics (Typical)



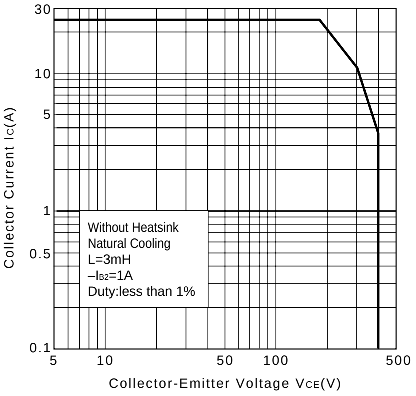
θj-a–t Characteristics



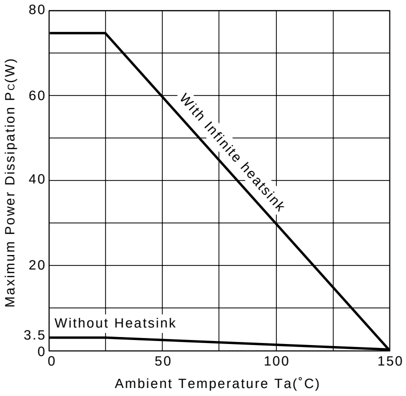
Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



PC–Ta Derating



2SC4298

Silicon NPN Triple Diffused Planar Transistor (High Voltage and High Speed Switchihg Transistor) **Application :** Switching Regulator and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	500	V
V_{CEO}	400	V
V_{EBO}	10	V
I_C	15(Pulse30)	A
I_B	5	A
P_C	80(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

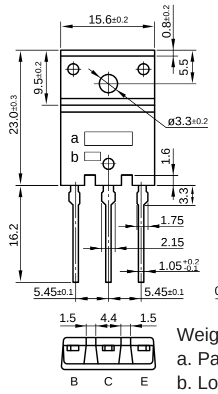
■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=500V	100max	μA
I_{EBO}	V_{EB}=10V	100max	μA
$V_{(BR)CEO}$	I_C=25mA	400min	V
h_{FE}	V_{CE}=4V, I_C=8A	10to30	
V_{CE}(sat)	I_C=8A, I_B=1.6A	0.5max	V
V_{BE}(sat)	I_C=8A, I_B=1.6A	1.3max	V
f_T	V_{CE}=12V, I_E=–1.5A	10typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	85typ	pF

■Typical Switching Characteristics (Common Emitter)

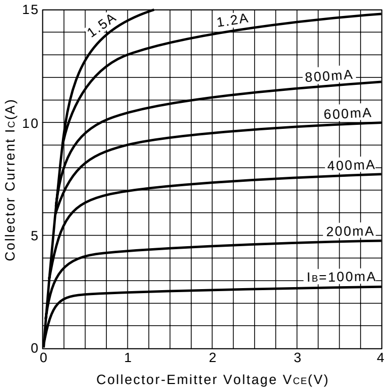
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
200	25	8	10	–5	0.8	–1.6	1max	3max	0.5max

External Dimensions FM100(TO3PF)

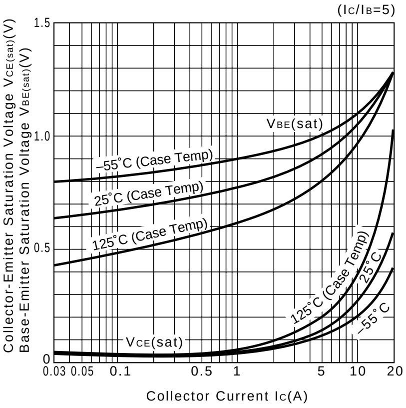


Weight : Approx 6.5g
a. Part No.
b. Lot No.

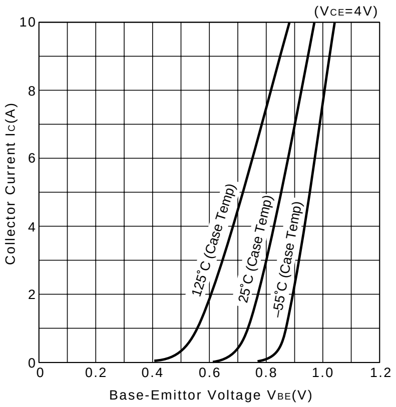
I_C–V_{CE} Characteristics (Typical)



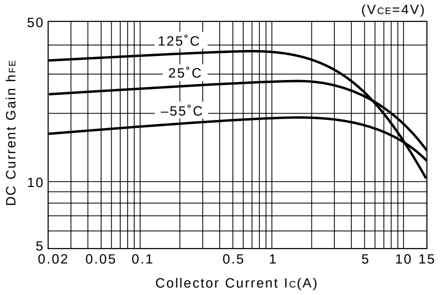
V_{CE}(sat),V_{BE}(sat)–I_C Temperature Characteristics (Typical)



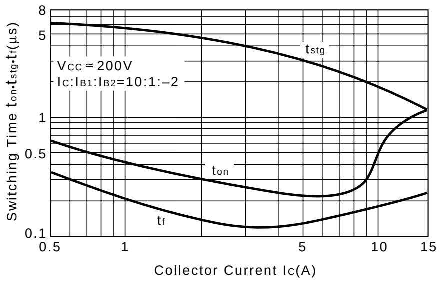
I_C–V_{BE} Temperature Characteristics (Typical)



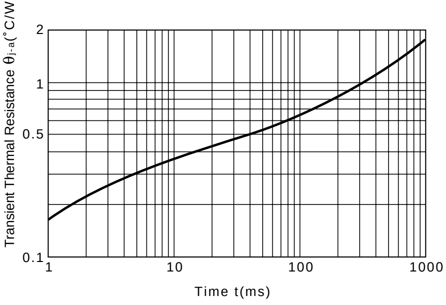
h_{FE}–I_C Characteristics (Typical)



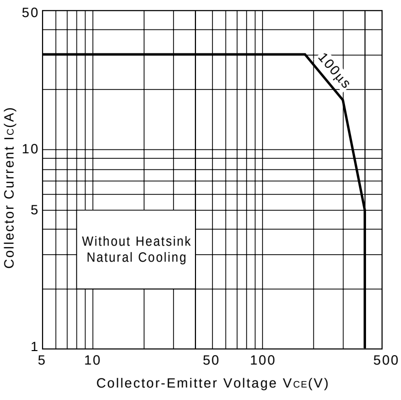
t_{on}•t_{stg}•t_f–I_C Characteristics (Typical)



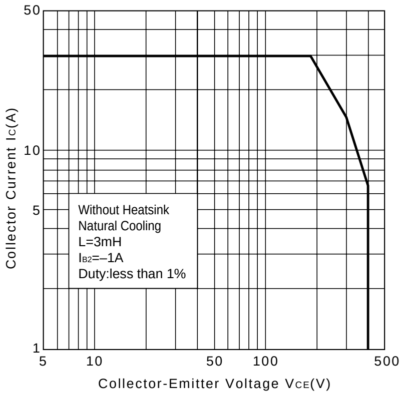
θ_{j-a}–t Characteristics



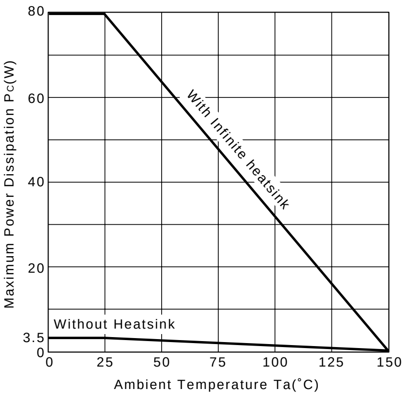
Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



P_C–Ta Derating



2SC4299

Silicon NPN Triple Diffused Planar Transistor (High Voltage Switchihg Transistor)

Application : Switching Regulator and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	900	V
V_{CEO}	800	V
V_{EBO}	7	V
I_C	3(Pulse6)	A
I_B	1.5	A
P_C	70(T_C=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

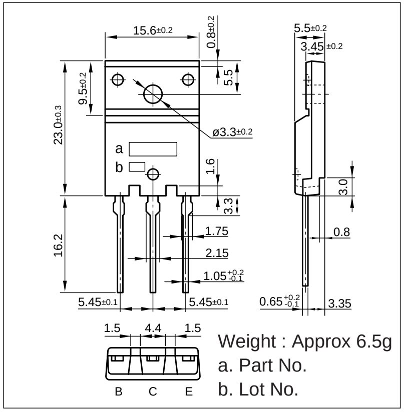
■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=800V	100max	μA
I_{EBO}	V_{EB}=7V	100max	μA
$V_{(BR)CEO}$	I_C=10mA	800min	V
h_{FE}	V_{CE}=4V, I_C=1A	10 to 30	
V_{CE}(sat)	I_C=1A, I_B=0.2A	0.5max	V
V_{BE}(sat)	I_C=1A, I_B=0.2A	1.2max	V
f_T	V_{CE}=12V, I_E=–0.3A	6typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	50typ	pF

■Typical Switching Characteristics (Common Emitter)

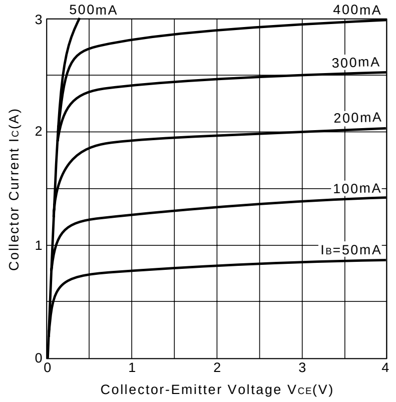
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
250	250	1	10	–5	0.15	–0.5	1max	5max	1max

External Dimensions FM100(TO3PF)

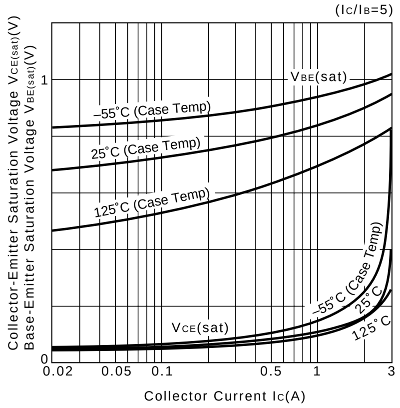


Weight : Approx 6.5g
a. Part No.
b. Lot No.

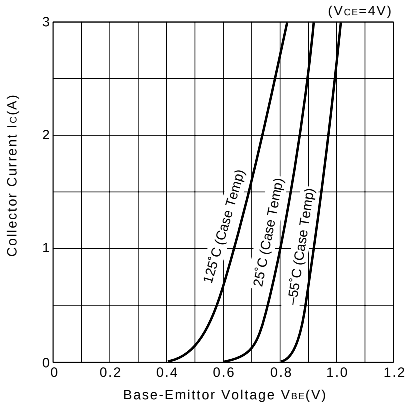
I_C−V_{CE} Characteristics (Typical)



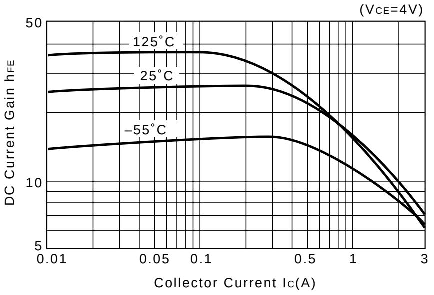
V_{CE}(sat),V_{BE}(sat)−I_C Temperature Characteristics (Typical)



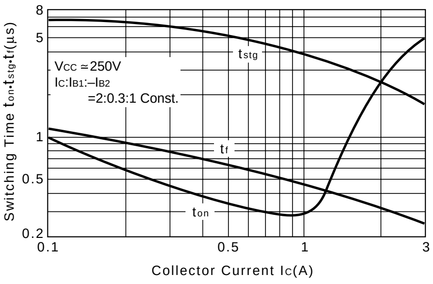
I_C−V_{BE} Temperature Characteristics (Typical)



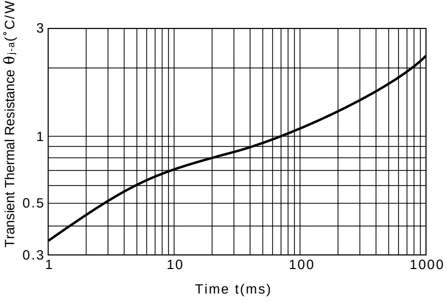
h_{FE}−I_C Characteristics (Typical)



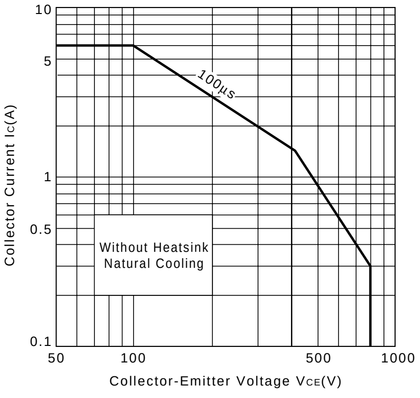
t_{on}•t_{stg}•t_f−I_C Characteristics (Typical)



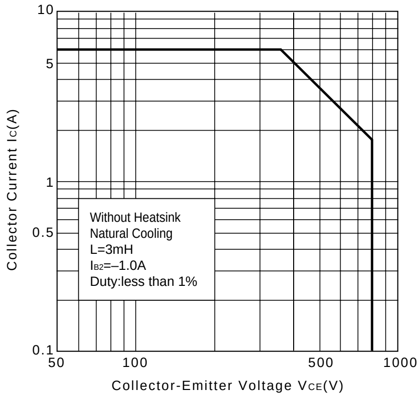
θ_{j-a}−t Characteristics



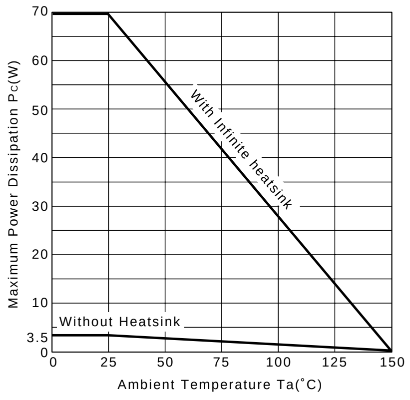
Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



P_C−Ta Derating



2SC4300

Silicon NPN Triple Diffused Planar Transistor (High Voltage Switchihg Transistor)

Application : Switching Regulator and General Purpose

■**Absolute maximum ratings** (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	900	V
V_{CEO}	800	V
V_{EBO}	7	V
I_C	5(Pulse10)	A
I_B	2.5	A
P_C	75(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

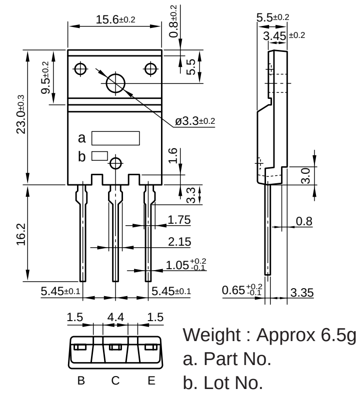
■**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=800V	100max	μA
I_{EBO}	V_{EB}=7V	100max	μA
$V_{(BR)CEO}$	I_C=10mA	800min	V
h_{FE}	V_{CE}=4V, I_C=2A	10to30	
$V_{CE(sat)}$	I_C=2A, I_B=0.4A	0.5max	V
$V_{BE(sat)}$	I_C=2A, I_B=0.4A	1.2max	V
f_T	V_{CE}=12V, I_E=–0.5A	6typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	75typ	pF

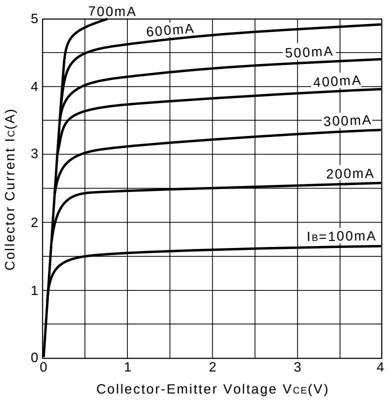
■**Typical Switching Characteristics (Common Emitter)**

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
250	125	2	10	–5	0.3	–1	1max	5max	1max

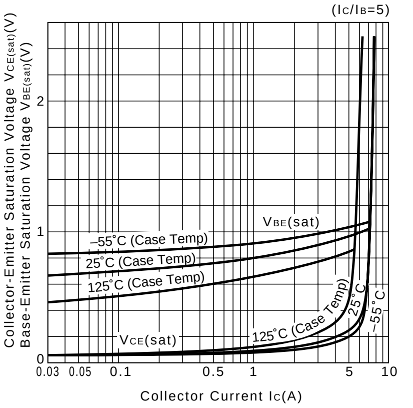
External Dimensions FM100(TO3PF)



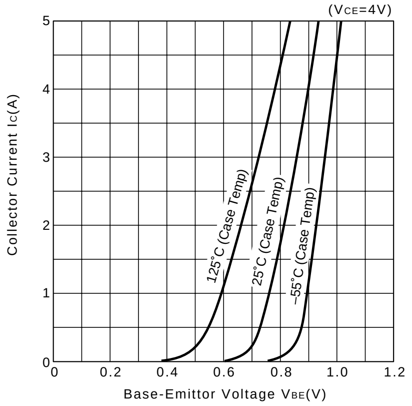
Weight : Approx 6.5g
a. Part No.
b. Lot No.



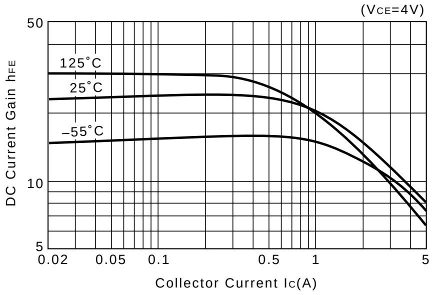
I_C–V_{CE} Characteristics (Typical)



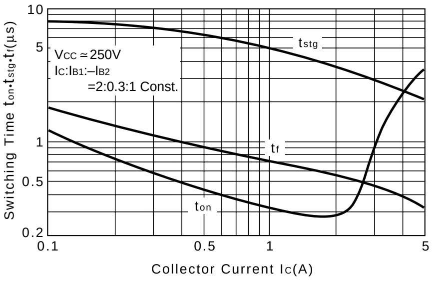
V_{CE}(sat),V_{BE}(sat)–I_C Temperature Characteristics (Typical)



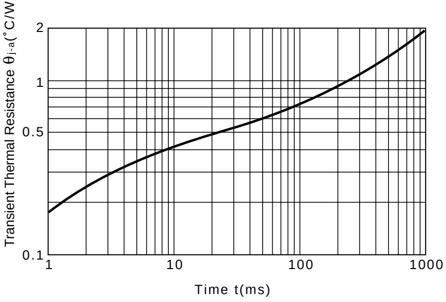
I_C–V_{BE} Temperature Characteristics (Typical)



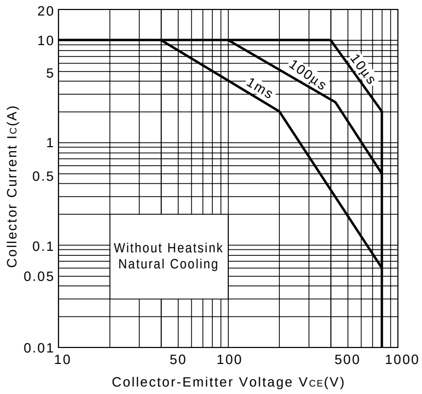
h_{FE}–I_C Characteristics (Typical)



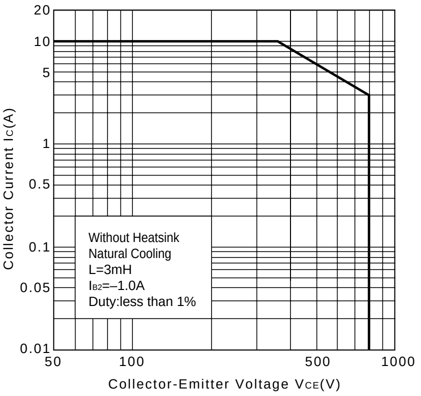
t_{on}•t_{stg}•t_f–I_C Characteristics (Typical)



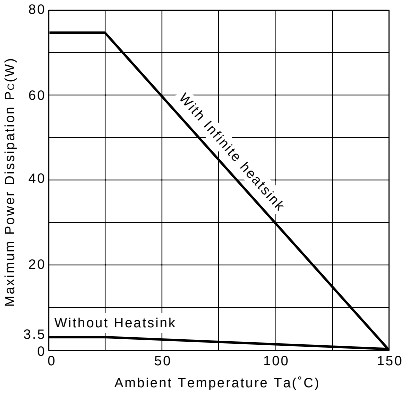
θ_{j-a}–t Characteristics



Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



P_C–Ta Derating

2SC4301

Silicon NPN Triple Diffused Planar Transistor (High Voltage Switchihg Transistor) **Application :** Switching Regulator, Lighting Inverter and General Purpose

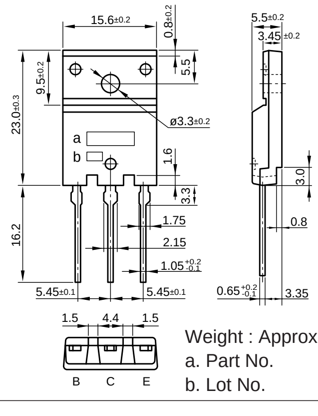
■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	900	V
V_{CEO}	800	V
V_{EBO}	7	V
I_C	7(Pulse14)	A
I_B	3.5	A
P_C	80(Tc=25°C)	W
T_j	150	°C
T_{stg}	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=800V	100max	μA
I_{EBO}	V_{EB}=7V	100max	μA
$V_{(BR)CEO}$	I_C=10mA	800min	V
h_{FE}	V_{CE}=4V, I_C=3A	10 to 30	
V_{CE}(sat)	I_C=3A, I_B=0.6A	0.5max	V
V_{BE}(sat)	I_C=3A, I_B=0.6A	1.2max	V
f_T	V_{CE}=12V, I_E=–1A	6typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	105typ	pF

External Dimensions FM100(TO3PF)

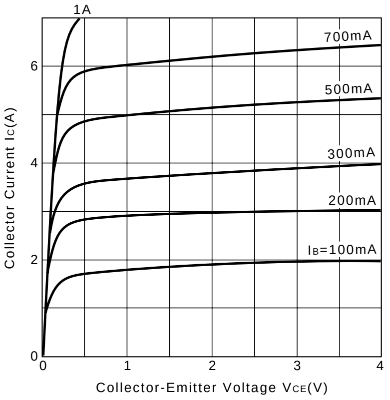


Weight : Approx 6.5g
a. Part No.
b. Lot No.

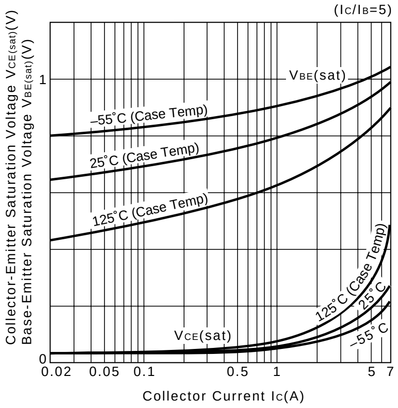
■Typical Switching Characteristics (Common Emitter)

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
250	83	3	10	–5	0.45	–1.5	1max	5max	1max

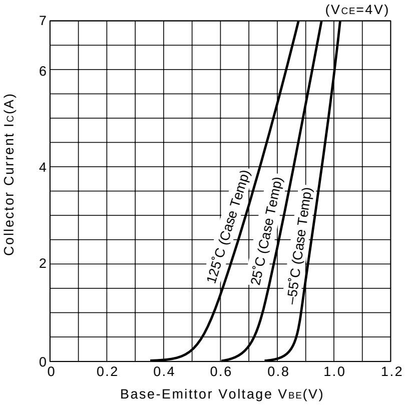
I_C–V_{CE} Characteristics (Typical)



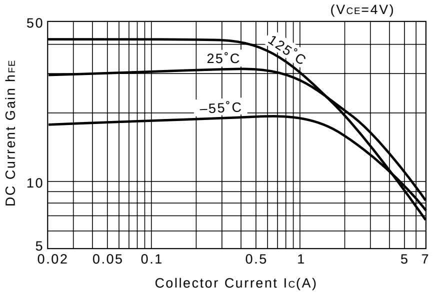
V_{CE}(sat),V_{BE}(sat)–I_C Temperature Characteristics (Typical)



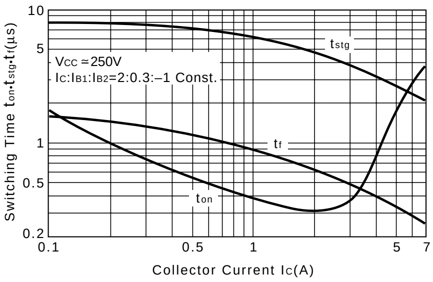
I_C–V_{BE} Temperature Characteristics (Typical)



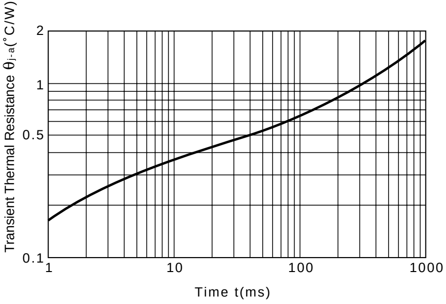
h_{FE}–I_C Characteristics (Typical)



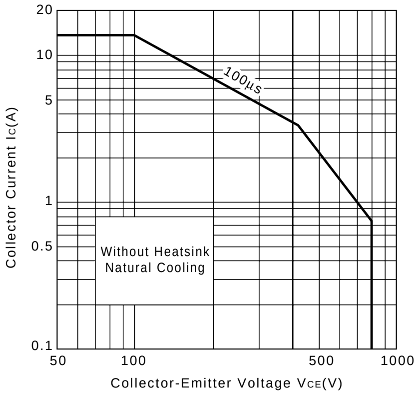
t_{on}•t_{stg}•t_f–I_C Characteristics (Typical)



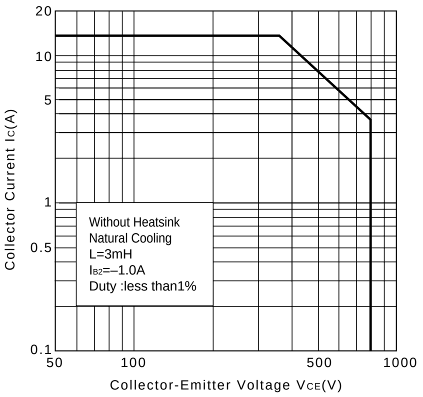
$\theta_{j\text{-}a}$–t Characteristics



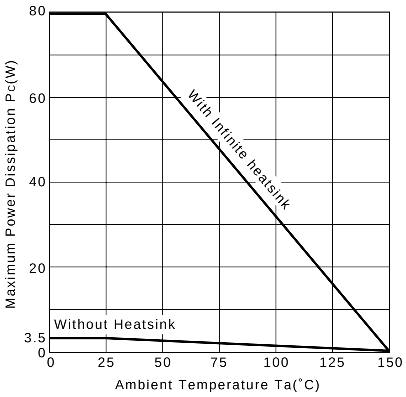
Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



P_C–T_a Derating



2SC4304

Silicon NPN Triple Diffused Planar Transistor (High Voltage High Speed Switchihg Transistor)

Application : Switching Regulator and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	900	V
V_{CEO}	800	V
V_{EBO}	7	V
I_C	3(Pulse6)	A
I_B	1.5	A
P_C	35(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

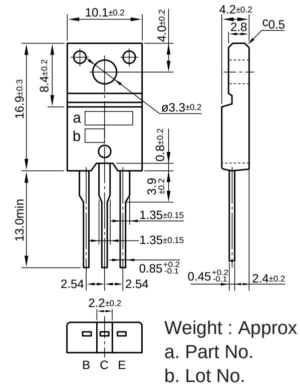
■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=800V	100max	μA
I_{EBO}	V_{EB}=7V	100max	μA
$V_{(BR)CEO}$	I_C=10mA	800min	V
h_{FE}	V_{CE}=4V, I_C=0.7A	10to30	
V_{CE}(sat)	I_C=0.7A, I_B=0.14A	0.5max	V
V_{BE}(sat)	I_C=0.7A, I_B=0.14A	1.2max	V
f_T	V_{CE}=12V, I_E=–0.3A	15typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	50typ	pF

■Typical Switching Characteristics (Common Emitter)

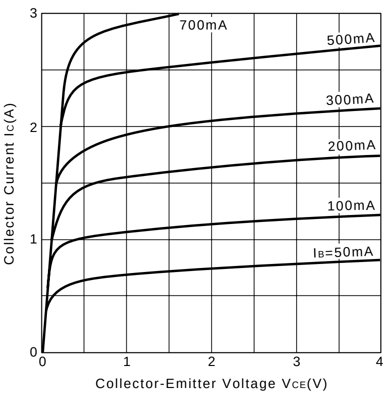
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
250	357	0.7	10	–5	0.1	–0.35	0.7max	4.0max	0.7max

External Dimensions FM20(TO220F)

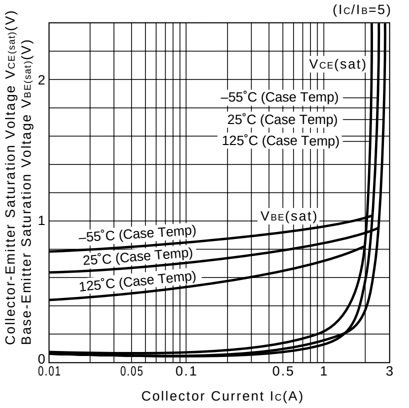


Weight : Approx 2.0g
a. Part No.
b. Lot No.

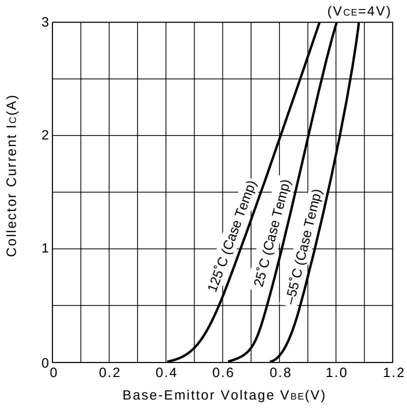
I_C–V_{CE} Characteristics (Typical)



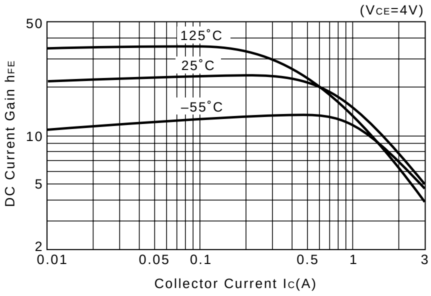
V_{CE}(sat),V_{BE}(sat)–I_C Temperature Characteristics (Typical)



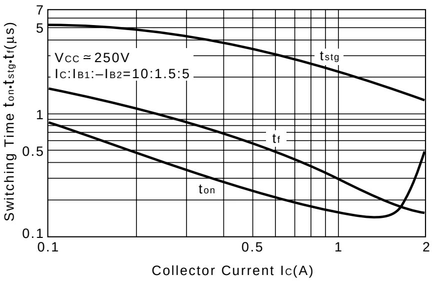
I_C–V_{BE} Temperature Characteristics (Typical)



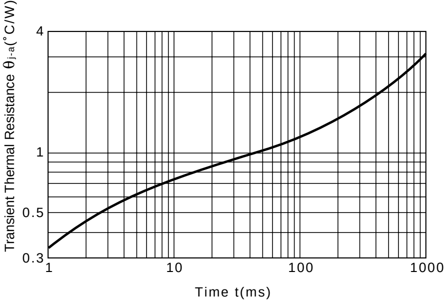
h_{FE}–I_C Characteristics (Typical)



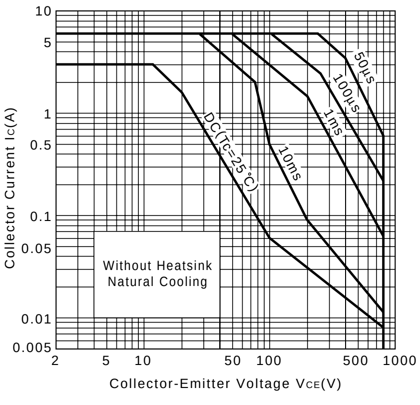
t_{on}•t_{stg}•t_f–I_C Characteristics (Typical)



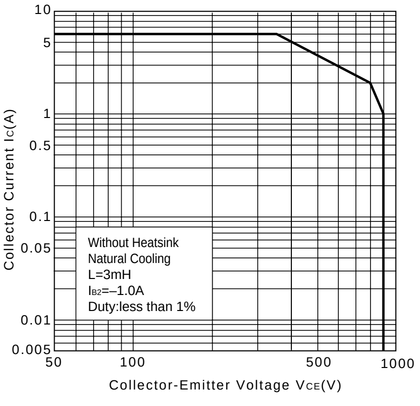
$\theta_{j\text{-}a}$–t Characteristics



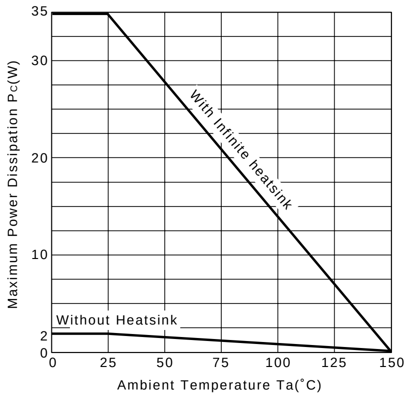
Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



P_C–Ta Derating



2SC4381/4382

Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SA1667/1668) **Application :** TV Vertical Output, Audio Output Driver and General Purpose

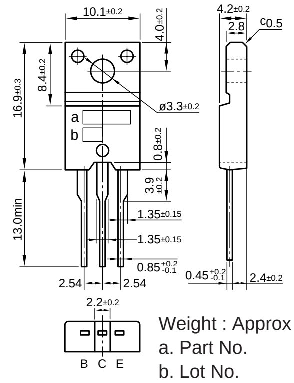
■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings		Unit
	2SC4381	2SC4382	
V_{CBO}	150	200	V
V_{CEO}	150	200	V
V_{EBO}	6		V
I_C	2		A
I_B	1		A
P_C	25(Tc=25°C)		W
T_j	150		°C
T_{stg}	–55 to +150		°C

■Electrical Characteristics (Ta=25°C)

Symbol	Conditions		Ratings		Unit
			2SC4381	2SC4382	
I_{CBO}			10max		μA
		V_{CB}=	150	200	V
I_{EBO}	V_{EB}=6V		10max		μA
$V_{(BR)CEO}$	I_C=25mA		150min	200min	V
h_{FE}	V_{CE}=10V, I_C=0.7A		60min		
$V_{CE(sat)}$	I_C=0.7A, I_B=0.07A		1.0max		V
f_T	V_{CE}=12V, I_E=–0.2A		15typ		MHz
C_{OB}	V_{CB}=10V, f=1MHz		35typ		pF

External Dimensions FM20(TO220F)

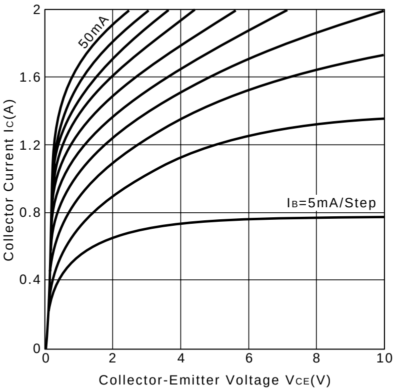


Weight : Approx 2.0g
a. Part No.
b. Lot No.

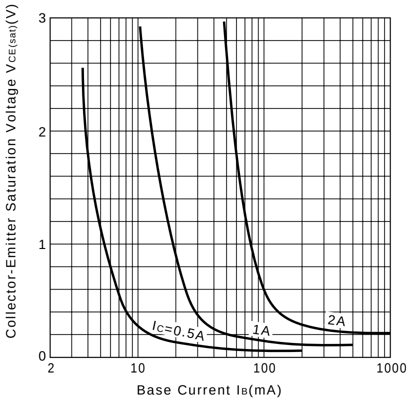
■Typical Switching Characteristics (Common Emitter)

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (μs)	tstg (μs)	tf (μs)
20	20	1	10	–5	100	–100	1.0typ	3.0typ	1.5typ

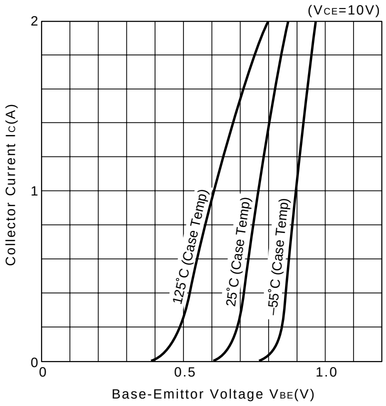
I_C–V_{CE} Characteristics (Typical)



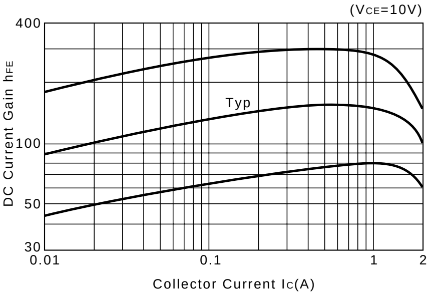
$V_{CE(sat)}$–I_B Characteristics (Typical)



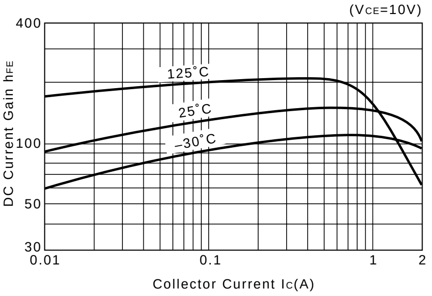
I_C–V_{BE} Temperature Characteristics (Typical)



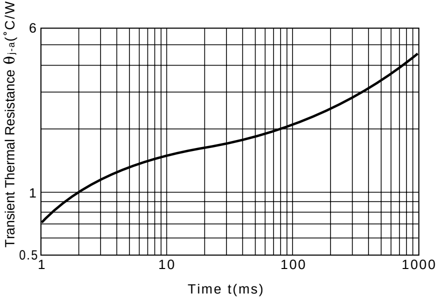
h_{FE}–I_C Characteristics (Typical)



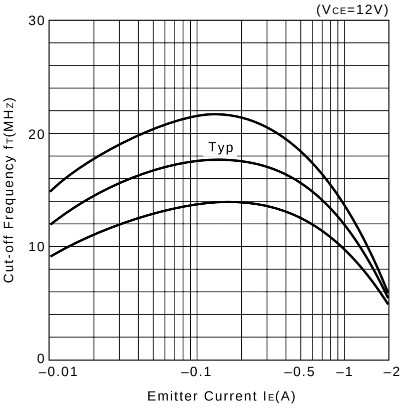
h_{FE}–I_C Temperature Characteristics (Typical)



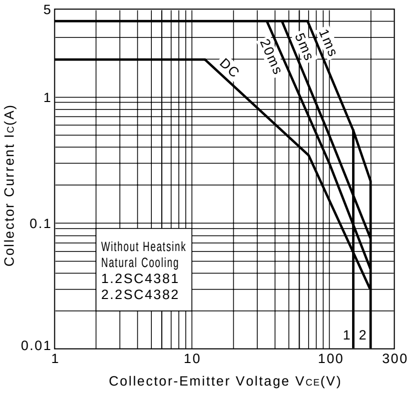
θ_{j-a}–t Characteristics



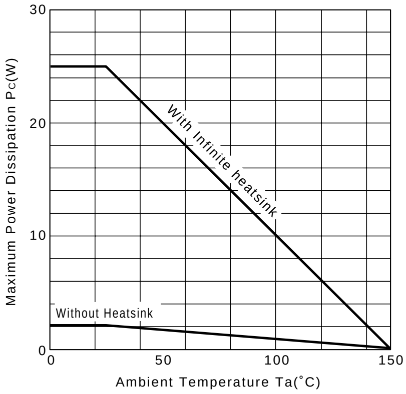
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C–Ta Derating



2SC4388

Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SA1673)

Application : Audio and General Purpose

■Absolute maximum ratings (Ta=25°C)

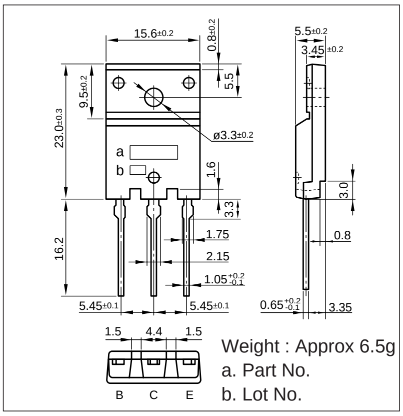
Symbol	Ratings	Unit
V_{CBO}	200	V
V_{CEO}	180	V
V_{EBO}	6	V
I_C	15	A
I_B	4	A
P_C	85(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=200V	10max	μA
I_{EBO}	V_{EB}=6V	10max	μA
$V_{(BR)CEO}$	I_C=50mA	180min	V
h_{FE}	V_{CE}=4V, I_C=3A	50min*	
V_{CE}(sat)	I_C=5A, I_B=0.5A	2.0max	V
f_T	V_{CE}=12V, I_E=–0.5A	20typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	300typ	pF

*h_{FE} Rank O(50 to 100), P(70 to 140), Y(90 to 180)

External Dimensions FM100(TO3PF)

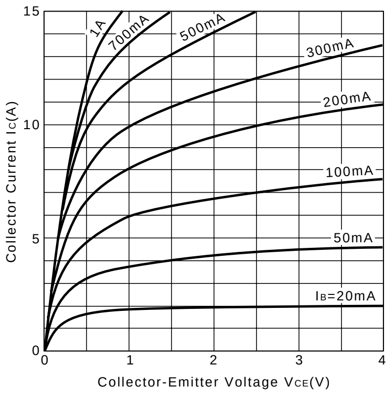


Weight : Approx 6.5g
a. Part No.
b. Lot No.

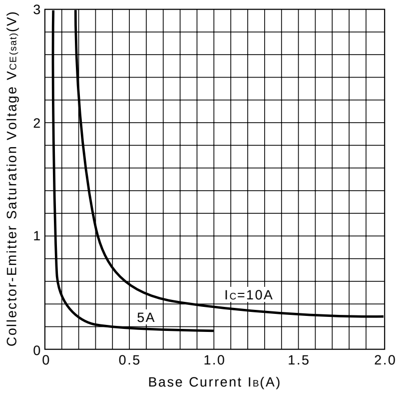
■Typical Switching Characteristics (Common Emitter)

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
40	4	10	10	–5	1	–1	0.5max	1.8max	0.6max

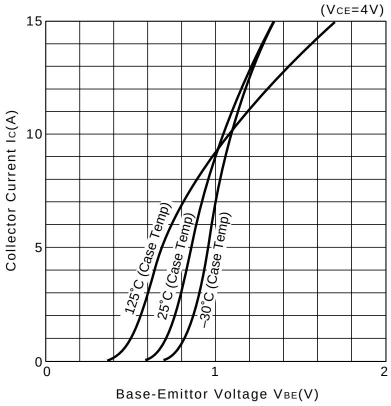
I_C–V_{CE} Characteristics (Typical)



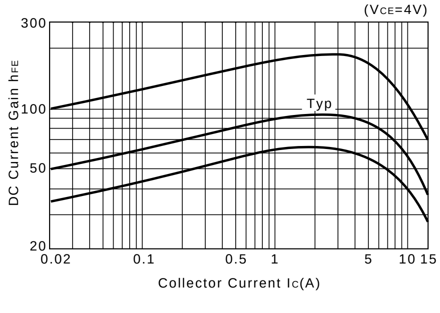
V_{CE}(sat)–I_B Characteristics (Typical)



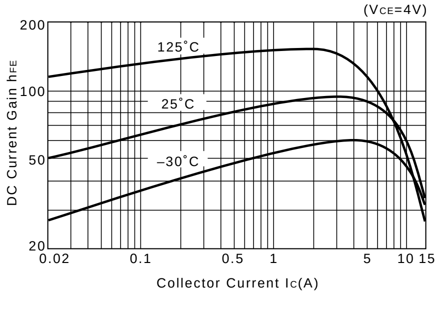
I_C–V_{BE} Temperature Characteristics (Typical)



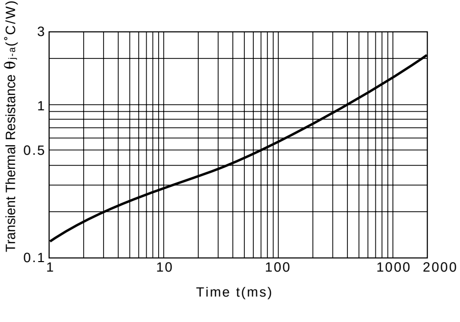
h_{FE}–I_C Characteristics (Typical)



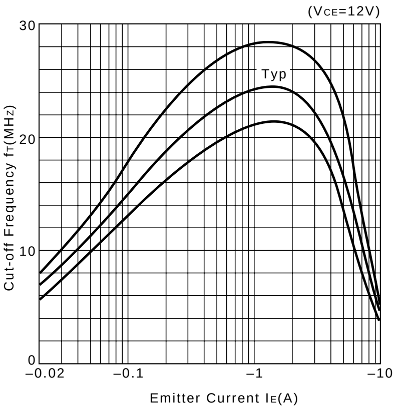
h_{FE}–I_C Temperature Characteristics (Typical)



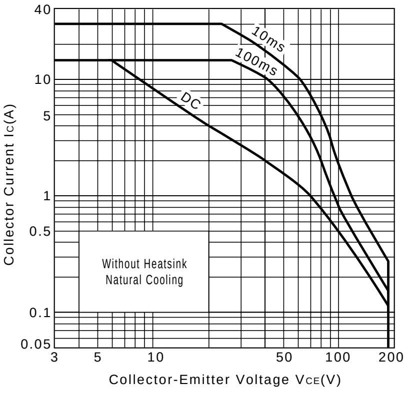
$\theta_{j\text{-}a}$–t Characteristics



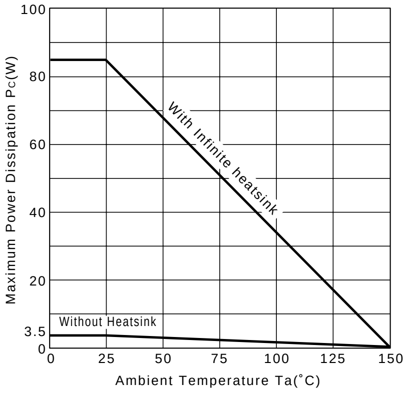
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



Pc–Ta Derating



2SC4418

Silicon NPN Triple Diffused Planar Transistor (High Voltage and High Speed Switchihg Transistor) **Application :** Switching Regulator and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	500	V
V_{CEO}	400	V
V_{EBO}	10	V
I_C	5(Pulse10)	A
I_B	2	A
P_C	30(T_C=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

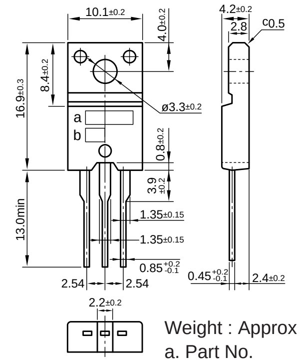
■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=500V	100max	μA
I_{EBO}	V_{EB}=10V	100max	μA
$V_{(BR)CEO}$	I_C=25mA	400min	V
h_{FE}	V_{CE}=4V, I_C=1.5A	10to30	
V_{CE}(sat)	I_C=1.5A, I_B=0.3A	0.5max	V
V_{BE}(sat)	I_C=1.5A, I_B=0.3A	1.3max	V
f_T	V_{CE}=12V, I_E=–0.3A	20typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	30typ	pF

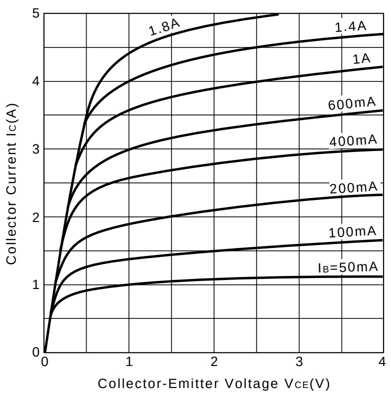
■Typical Switching Characteristics (Common Emitter)

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
200	133	1.5	10	–5	0.15	–0.3	1max	2.5max	0.5max

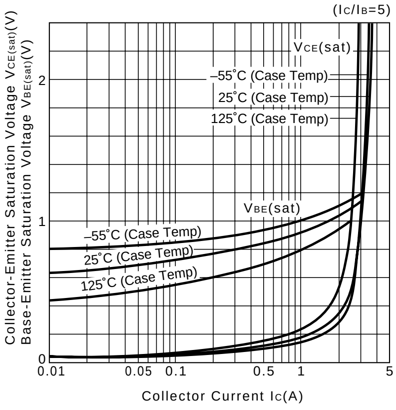
External Dimensions FM20(TO220F)



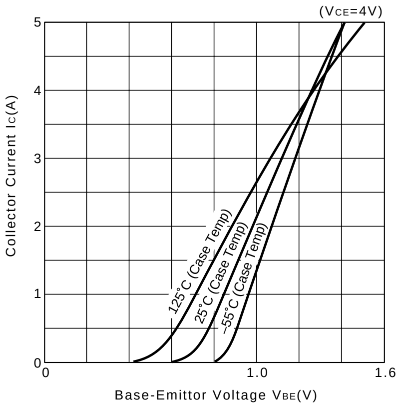
Weight : Approx 2.0g
a. Part No.
b. Lot No.



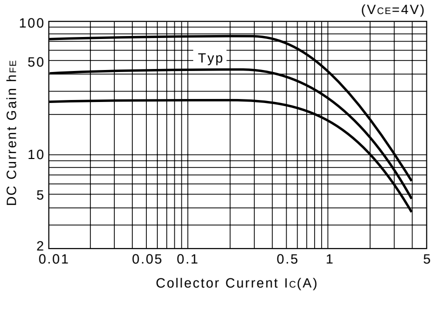
I_C−V_{CE} Characteristics (Typical)



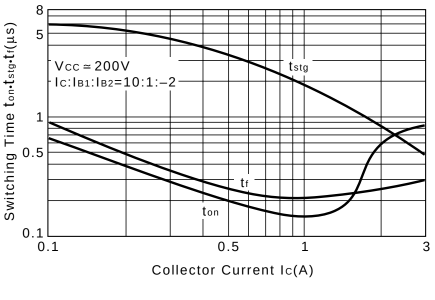
V_{CE}(sat),V_{BE}(sat)−I_C Temperature Characteristics (Typical)



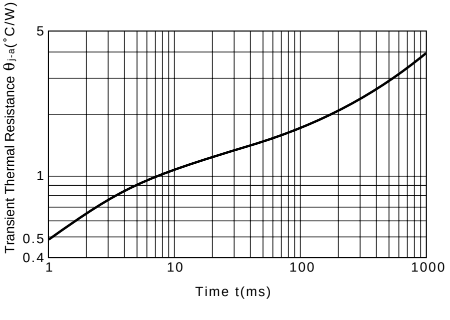
I_C−V_{BE} Temperature Characteristics (Typical)



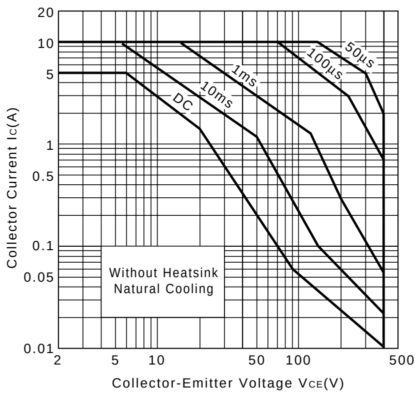
h_{FE}−I_C Characteristics (Typical)



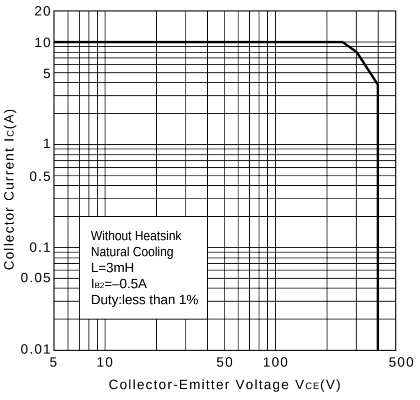
t_{on}•t_{stg}•t_f−I_C Characteristics (Typical)



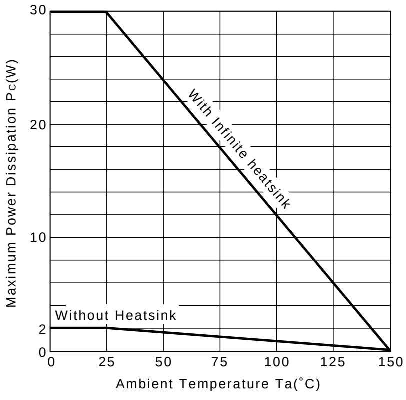
θ_{j-a}−t Characteristics



Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



P_C−Ta Derating

2SC4434

Silicon NPN Triple Diffused Planar Transistor (High Voltage and High Speed Switchihg Transistor)

Application : Switching Regulator, Lighting Inverter, and General Purpose

■**Absolute maximum ratings** (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	500	V
V_{CEO}	400	V
V_{EBO}	10	V
I_C	15(Pulse30)	A
I_B	5	A
P_C	120(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

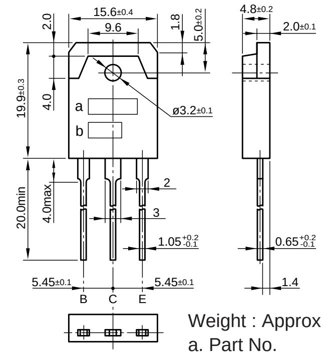
■**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=500V	100max	μA
I_{EBO}	V_{EB}=10V	100max	μA
$V_{(BR)CEO}$	I_C=25mA	400min	V
h_{FE}	V_{CE}=4V, I_C=8A	10to25	
V_{CE}(sat)	I_C=8A, I_B=1.6A	0.7max	V
V_{BE}(sat)	I_C=8A, I_B=1.6A	1.3max	V
f_T	V_{CE}=12V, I_E=–1.5A	10typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	135typ	pF

■**Typical Switching Characteristics (Common Emitter)**

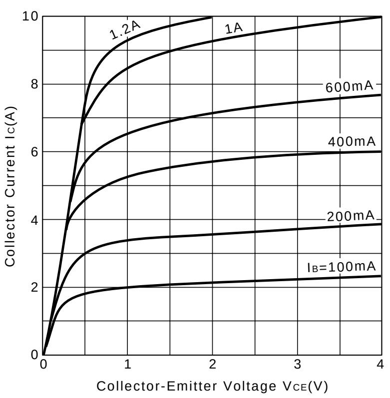
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
200	25	8	10	–5	1.6	–3.2	0.5max	2.0max	0.15max

External Dimensions MT-100(TO3P)

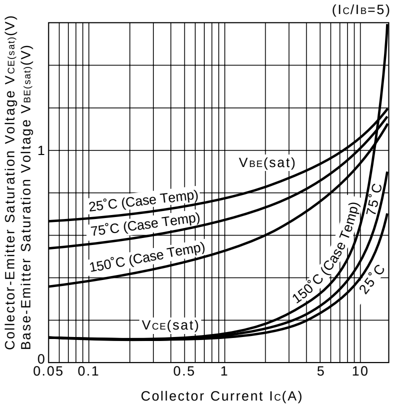


Weight : Approx 6.0g
a. Part No.
b. Lot No.

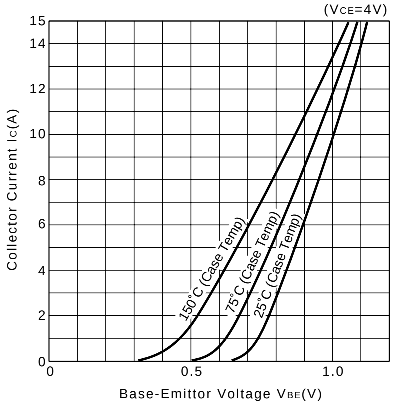
I_C−V_{CE} Characteristics (Typical)



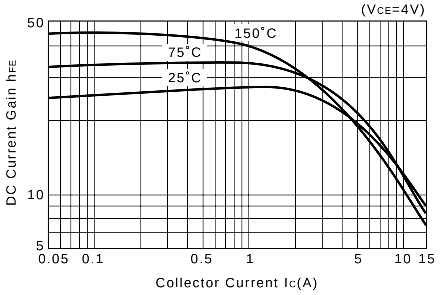
V_{CE}(sat),V_{BE}(sat)−I_C Temperature Characteristics (Typical)



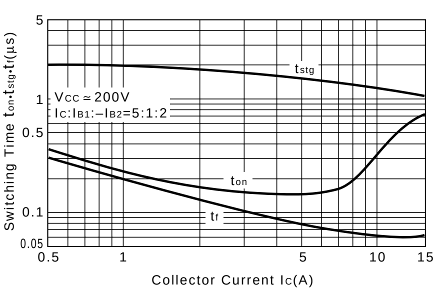
I_C−V_{BE} Temperature Characteristics (Typical)



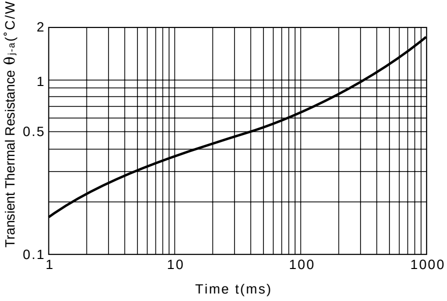
h_{FE}−I_C Temperature Characteristics (Typical)



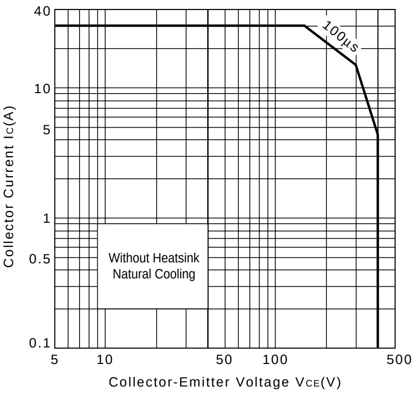
t_{on}•t_{stg}•t_f−I_C Characteristics (Typical)



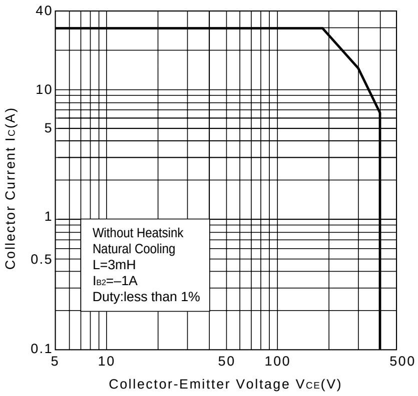
θ$_{j-a}$−t Characteristics



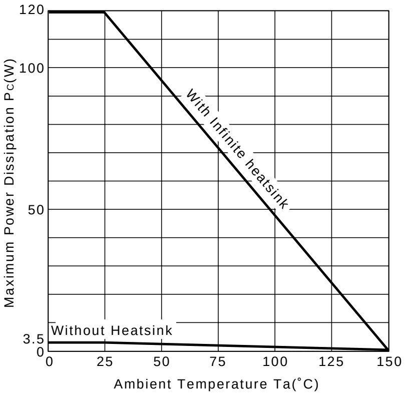
Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



P_C−Ta Derating



2SC4445

Silicon NPN Triple Diffused Planar Transistor (High Voltage and High Speed Switchihg Transistor) **Application :** Switching Regulator and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	900	V
V_{CEO}	800	V
V_{EBO}	7	V
I_C	3(Pulse6)	A
I_B	1.5	A
P_C	60(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

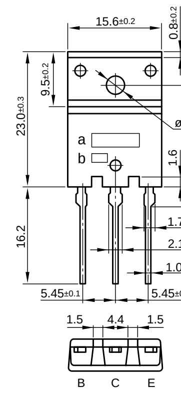
■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=800V	100max	µA
I_{EBO}	V_{EB}=7V	100max	µA
$V_{(BR)CEO}$	I_C=10mA	800min	V
h_{FE}	V_{CE}=4V, I_C=0.7A	10to30	
V_{CE}(sat)	I_C=0.7A, I_B=0.14A	0.5max	V
V_{BE}(sat)	I_C=0.7A, I_B=0.14A	1.2max	V
f_T	V_{CE}=12V, I_E=–0.3A	15typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	50typ	pF

■Typical Switching Characteristics (Common Emitter)

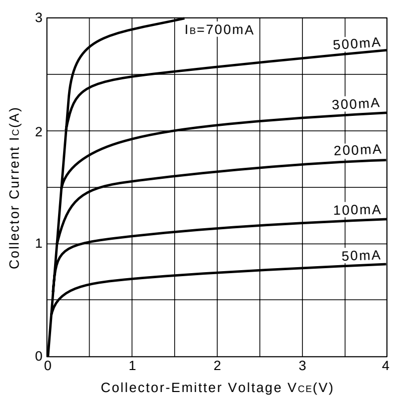
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (µs)	tstg (µs)	tf (µs)
250	357	0.7	10	–5	0.1	–0.35	0.7max	4max	0.7max

External Dimensions FM100(TO3PF)

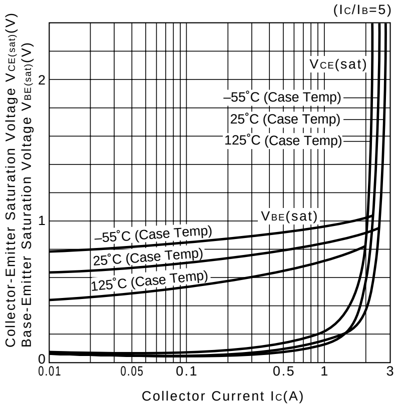


Weight : Approx 6.5g
a. Part No.
b. Lot No.

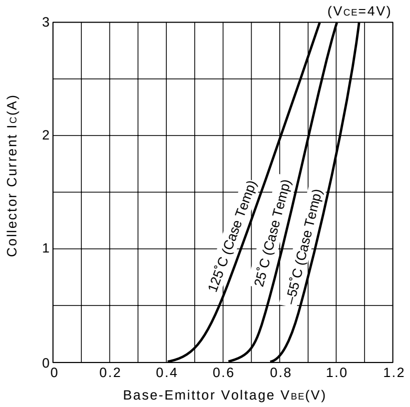
I_C–V_{CE} Characteristics (Typical)



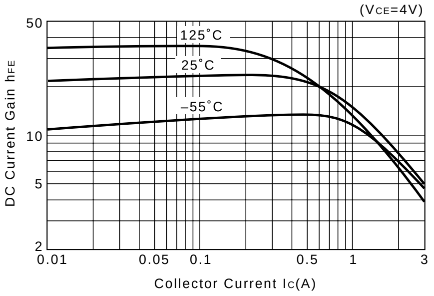
V_{CE}(sat),V_{BE}(sat)–I_C Temperature Characteristics (Typical)



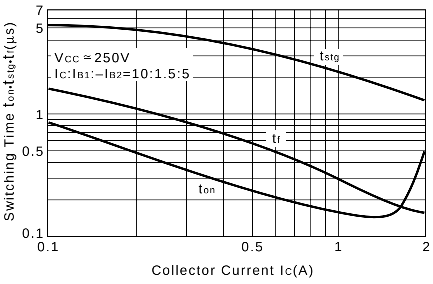
I_C–V_{BE} Temperature Characteristics (Typical)



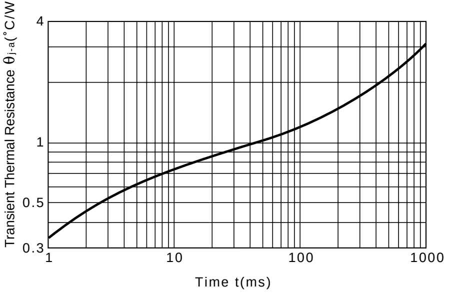
h_{FE}–I_C Temperature Characteristics (Typical)



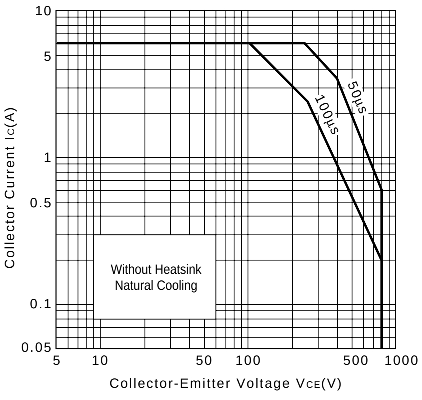
t_{on}•t_{stg}•t_f–I_C Characteristics (Typical)



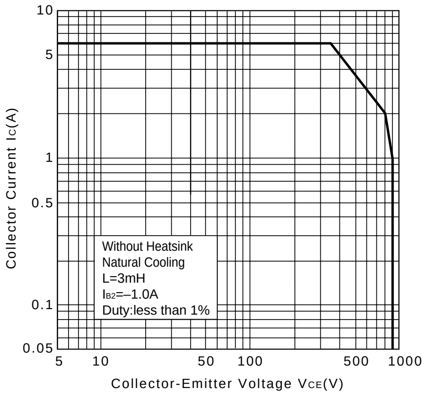
θ_{j-a}–t Characteristics



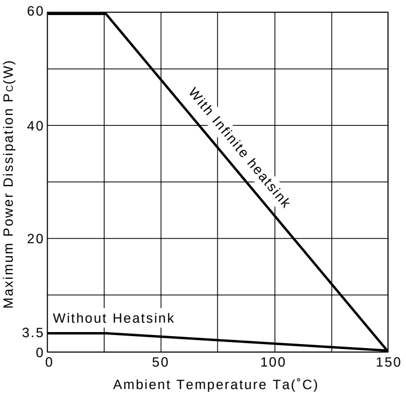
Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



P_C–Ta Derating



2SC4466

Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SA1693)

Application : Audio and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	120	V
V_{CEO}	80	V
V_{EBO}	6	V
I_C	6	A
I_B	3	A
P_C	60(T_C=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

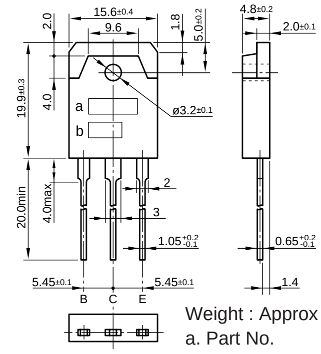
Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=120V	10max	μA
I_{EBO}	V_{EB}=6V	10max	μA
$V_{(BR)CEO}$	I_C=50mA	80min	V
h_{FE}	V_{CE}=4V, I_C=2A	50min*	
V_{CE}(sat)	I_C=2A, I_B=0.2A	1.5max	V
f_T	V_{CE}=12V, I_E=–0.5A	20typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	110typ	pF

*h_{FE} Rank Ō(50to100), P(70to140), Y(90to180)

■Typical Switching Characteristics (Common Emitter)

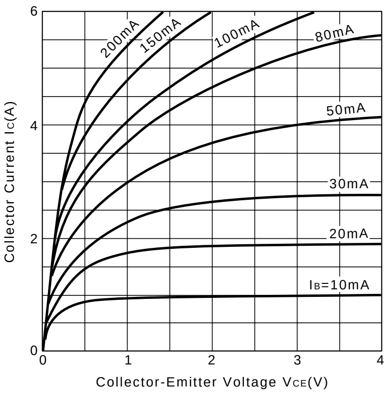
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
30	10	3	10	–5	0.3	–0.3	0.16typ	2.60typ	0.34typ

External Dimensions MT-100(TO3P)

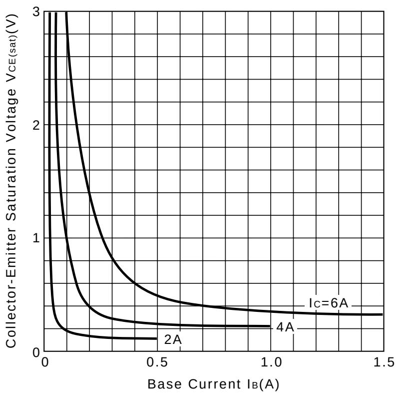


Weight : Approx 6.0g
a. Part No.
b. Lot No.

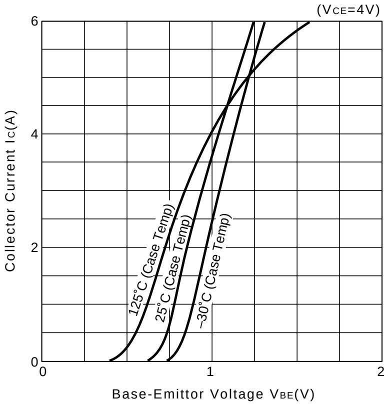
I_C−V_{CE} Characteristics (Typical)



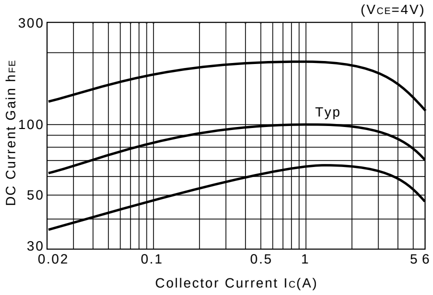
V_{CE}(sat)−I_B Characteristics (Typical)



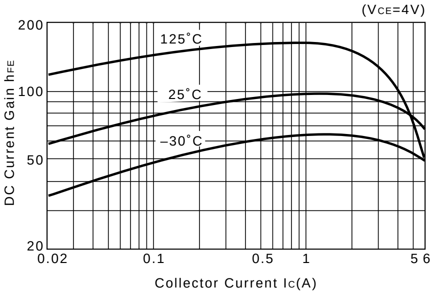
I_C−V_{BE} Temperature Characteristics (Typical)



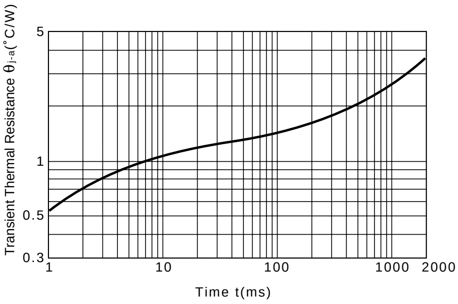
h_{FE}−I_C Characteristics (Typical)



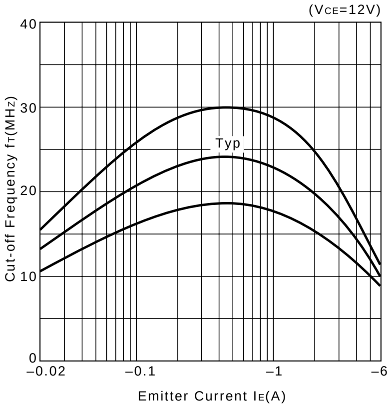
h_{FE}−I_C Temperature Characteristics (Typical)



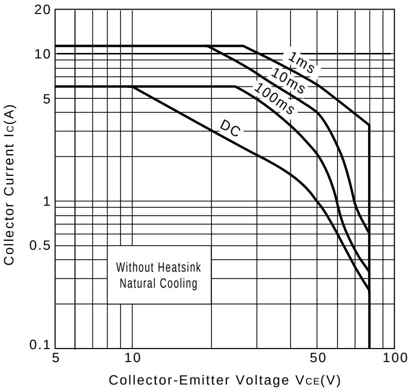
θ_{j-a}−t Characteristics



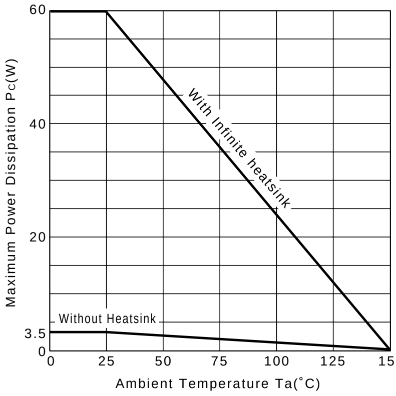
f_T−I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C−Ta Derating



2SC4467

Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SA1694)

Application : Audio and General Purpose

■Absolute maximum ratings (Ta=25°C)

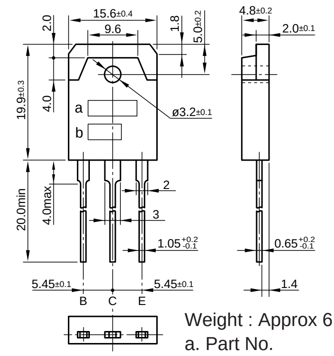
Symbol	Ratings	Unit
V_{CBO}	160	V
V_{CEO}	120	V
V_{EBO}	6	V
I_C	8	A
I_B	3	A
P_C	80(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=160V	10max	µA
I_{EBO}	V_{EB}=6V	10max	µA
$V_{(BR)CEO}$	I_C=50mA	120min	V
h_{FE}	V_{CE}=4V, I_C=3A	50min∗	
$V_{CE(sat)}$	I_C=3A, I_B=0.3A	1.5max	V
f_T	V_{CE}=12V, I_E=–0.5A	20typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	200typ	pF

∗h_{FE} Rank O(50to100), P(70to140), Y(90to180)

External Dimensions MT-100(TO3P)

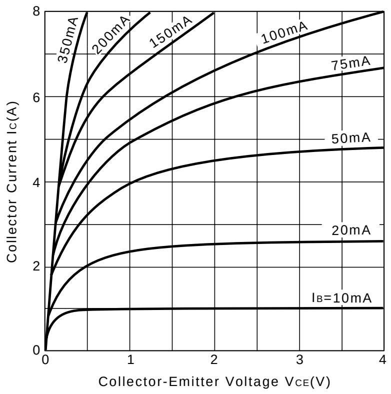


Weight : Approx 6.0g
a. Part No.
b. Lot No.

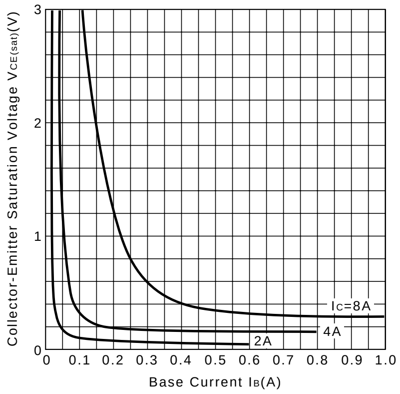
■Typical Switching Characteristics (Common Emitter)

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (µs)	tstg (µs)	tf (µs)
40	10	4	10	–5	0.4	–0.4	0.13typ	3.50typ	0.32typ

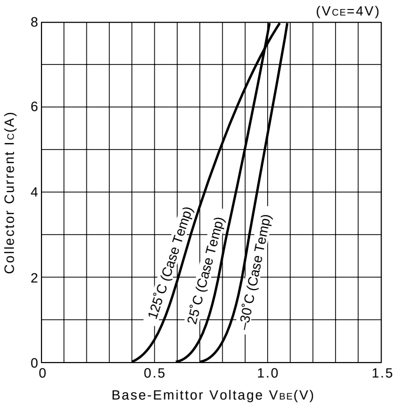
I_C–V_{CE} Characteristics (Typical)



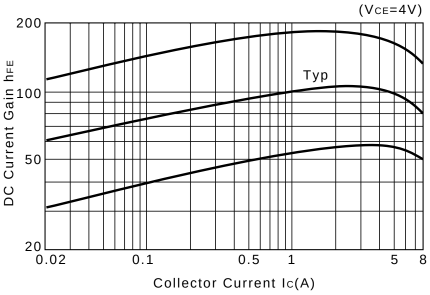
$V_{CE(sat)}$–I_B Characteristics (Typical)



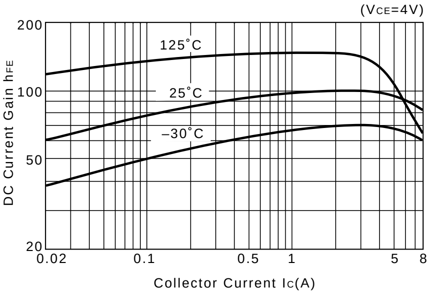
I_C–V_{BE} Temperature Characteristics (Typical)



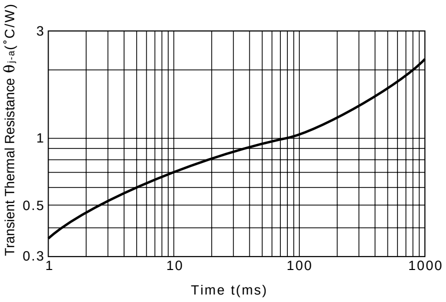
h_{FE}–I_C Characteristics (Typical)



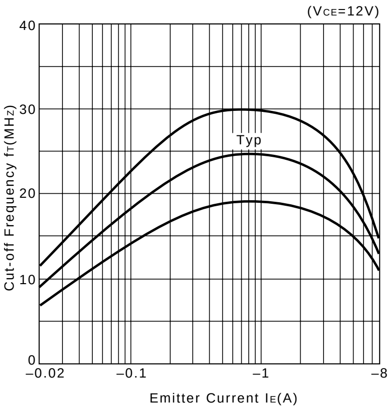
h_{FE}–I_C Temperature Characteristics (Typical)



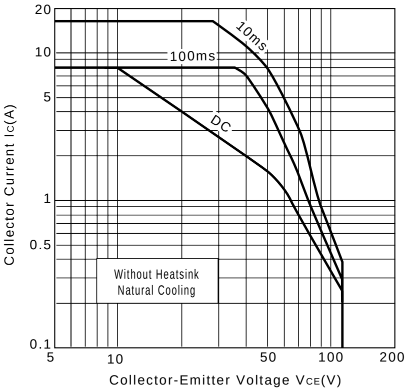
θ_{j-a}–t Characteristics



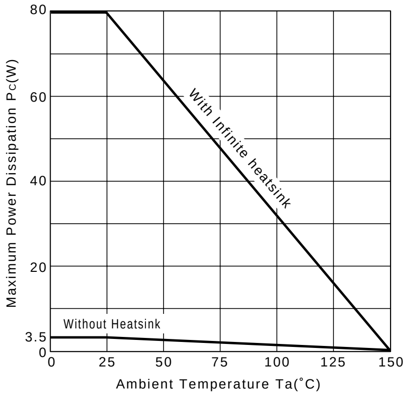
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



Pc–Ta Derating



2SC4468

Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SA1695)

Application : Audio and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	200	V
V_{CEO}	140	V
V_{EBO}	6	V
I_C	10	A
I_B	4	A
P_C	100(T_C=25°C)	W
T_j	150	°C
T_{stg}	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

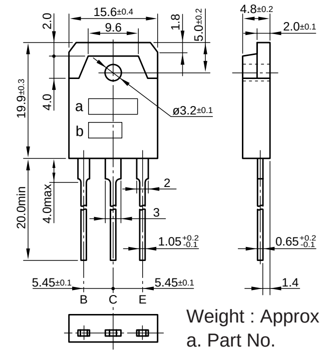
Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=200V	10max	μA
I_{EBO}	V_{EB}=6V	10max	μA
$V_{(BR)CEO}$	I_C=50mA	140min	V
h_{FE}	V_{CE}=4V, I_C=3A	50min∗	
$V_{CE(sat)}$	I_C=5A, I_B=0.5A	0.5max	V
f_T	V_{CE}=12V, I_E=–0.5A	20typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	250typ	pF

∗h_{FE} Rank $\overline{O}$(50to100), P(70to140), Y(90to180)

■Typical Switching Characteristics (Common Emitter)

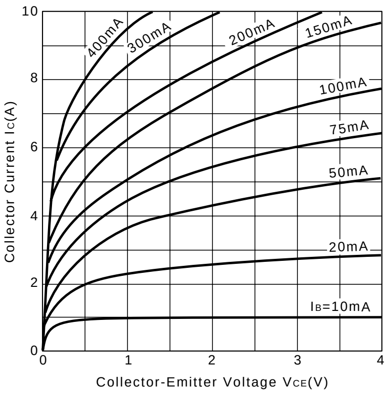
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
60	12	5	10	–5	0.5	–0.5	0.24typ	4.32typ	0.40typ

External Dimensions MT-100(TO3P)

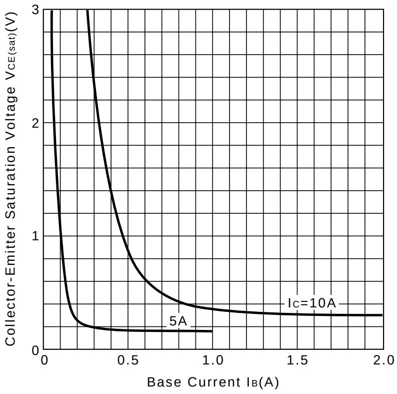


Weight : Approx 6.0g
a. Part No.
b. Lot No.

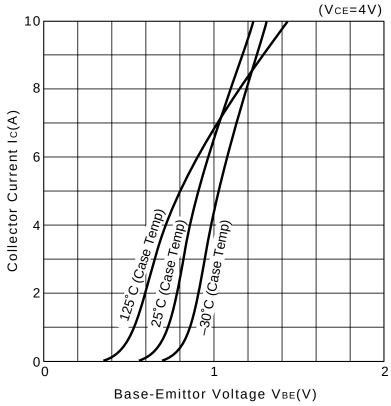
I_C–V_{CE} Characteristics (Typical)



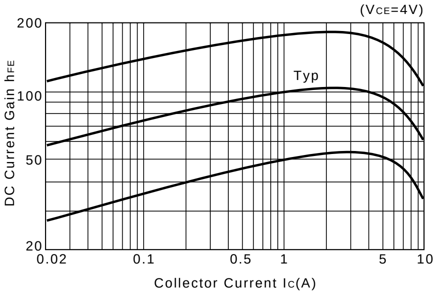
$V_{CE(sat)}$–I_B Characteristics (Typical)



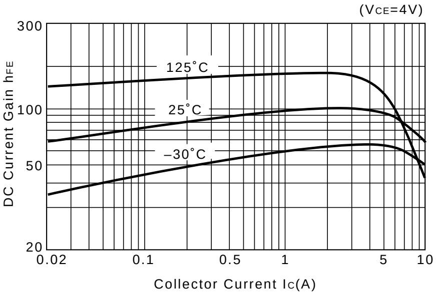
I_C–V_{BE} Temperature Characteristics (Typical)



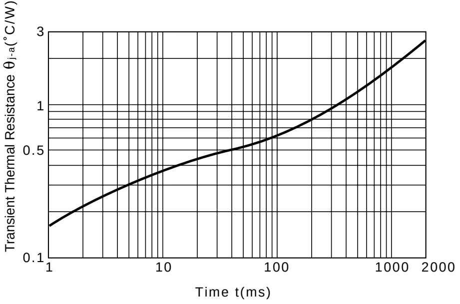
h_{FE}–I_C Characteristics (Typical)



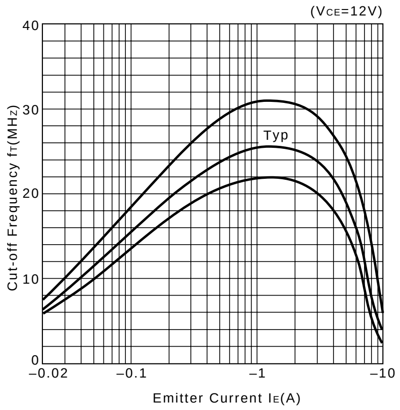
h_{FE}–I_C Temperature Characteristics (Typical)



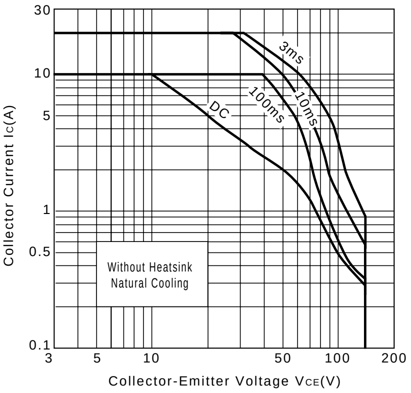
$\theta_{j\text{-}a}$–t Characteristics



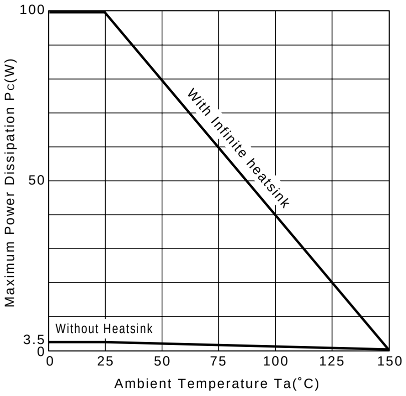
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C–T_a Derating



High hFE
LOW VCE (sat)

2SC4495

Silicon NPN Triple Diffused Planar Transistor

Application : Audio Temperature Compensation and General Purpose

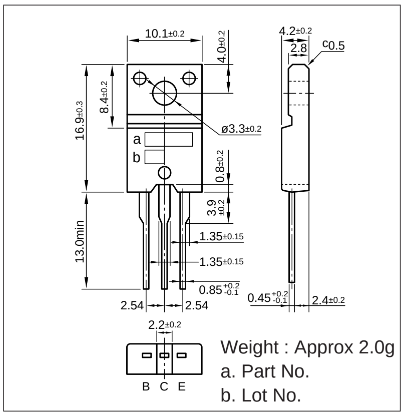
■**Absolute maximum ratings** (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	80	V
V_{CEO}	50	V
V_{EBO}	6	V
I_C	3	A
I_B	1	A
P_C	25(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=80V	10max	μA
I_{EBO}	V_{EB}=6V	10max	μA
$V_{(BR)CEO}$	I_C=25mA	50min	V
h_{FE}	V_{CE}=4V, I_C=0.5A	500min	
V_{CE}(sat)	I_C=1A, I_B=20mA	0.5max	V
f_T	V_{CE}=12V, I_E=–0.1A	40typ	MHz
C_{OB}	V_{CB}=10V,f=1MHz	30typ	pF

External Dimensions FM20(TO220F)

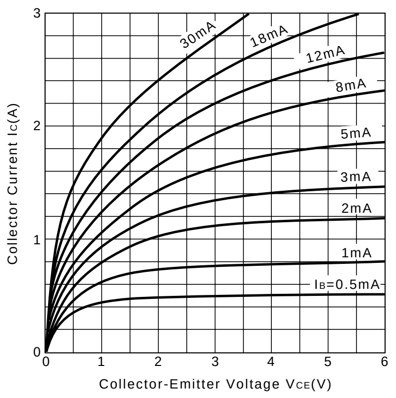


Weight : Approx 2.0g
a. Part No.
b. Lot No.

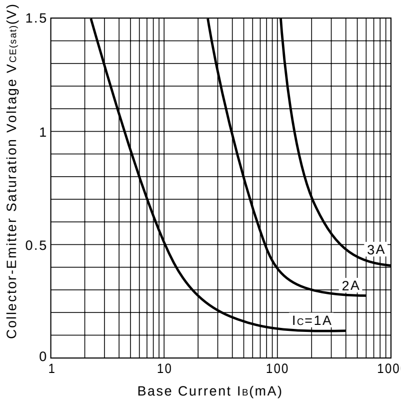
■**Typical Switching Characteristics (Common Emitter)**

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (μs)	tstg (μs)	tf (μs)
20	20	1	10	–5	15	–30	0.45typ	1.60typ	0.85typ

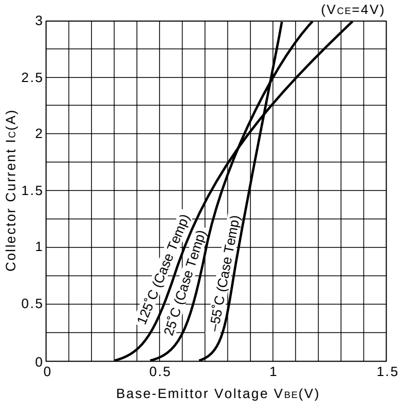
I_C–V_{CE} Characteristics (Typical)



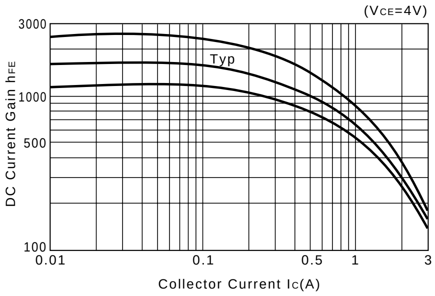
$V_{CE(sat)}$–I_B Characteristics (Typical)



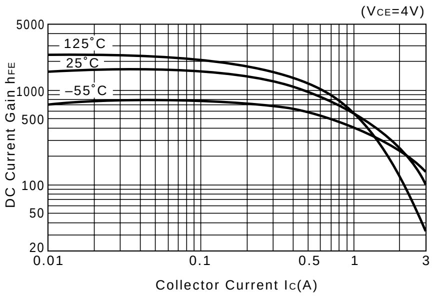
I_C–V_{BE} Temperature Characteristics (Typical)



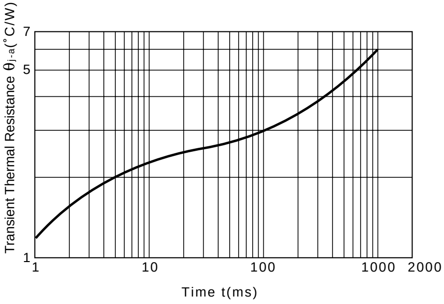
h_{FE}–I_C Characteristics (Typical)



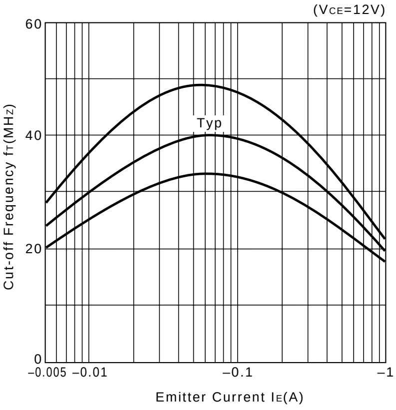
h_{FE}–I_C Temperature Characteristics (Typical)



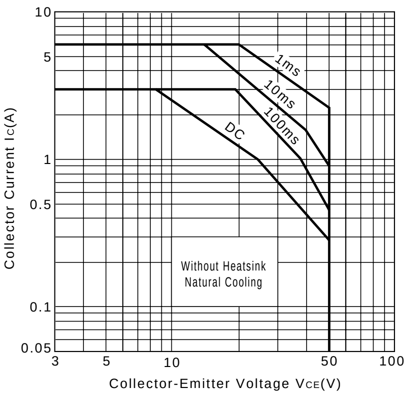
$\theta_{j\text{-}a}$–t Characteristics



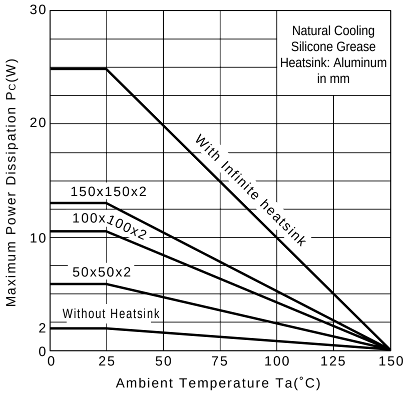
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C–Ta Derating



2SC4511

Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SA1725)

Application : Audio and General Purpose

■**Absolute maximum ratings** (Ta=25°C)

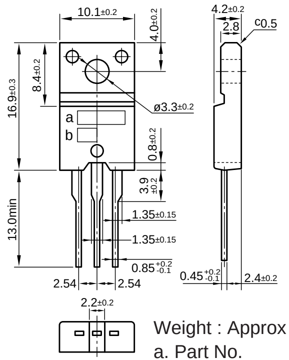
Symbol	Ratings	Unit
V_{CBO}	120	V
V_{CEO}	80	V
V_{EBO}	6	V
I_C	6	A
I_B	3	A
P_C	30(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=120V	10max	μA
I_{EBO}	V_{EB}=6V	10max	μA
$V_{(BR)CEO}$	I_C=25mA	80min	V
h_{FE}	V_{CE}=4V, I_C=2A	50min*	
V_{CE}(sat)	I_C=2A, I_B=0.2A	0.5max	V
f_T	V_{CE}=12V, I_E=–0.5A	20typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	110typ	pF

*h_{FE} Rank O(50to100), P(70to140), Y(90to180)

External Dimensions FM20(TO220F)

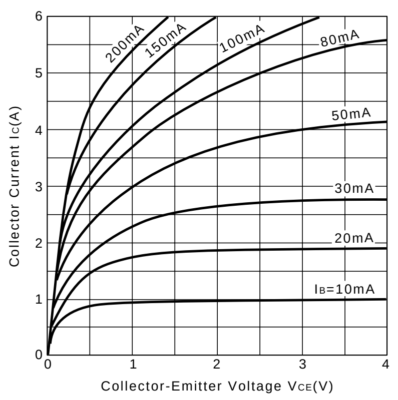


Weight : Approx 2.0g
a. Part No.
b. Lot No.

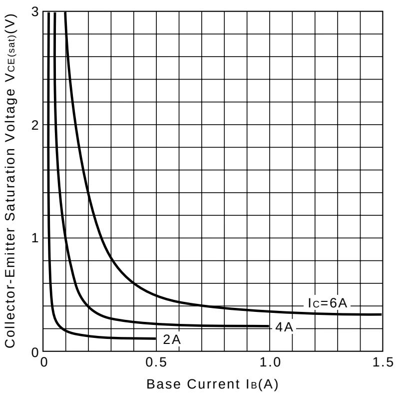
■**Typical Switching Characteristics (Common Emitter)**

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
30	10	3	10	–5	0.3	–0.3	0.16typ	2.60typ	0.34typ

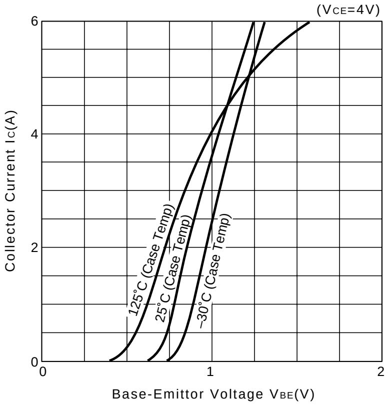
I_C–V_{CE} Characteristics (Typical)



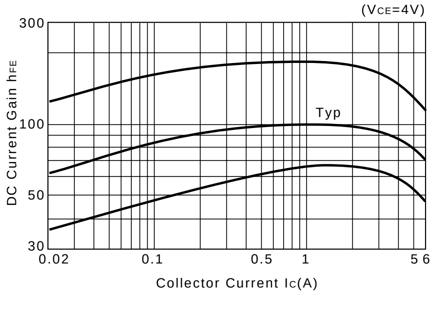
V_{CE}(sat)–I_B Characteristics (Typical)



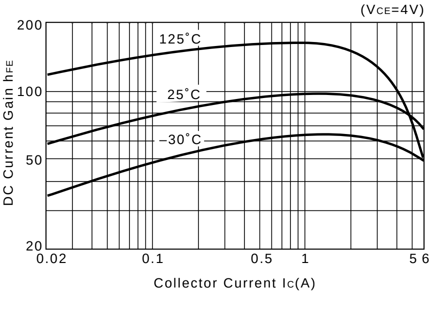
I_C–V_{BE} Temperature Characteristics (Typical)



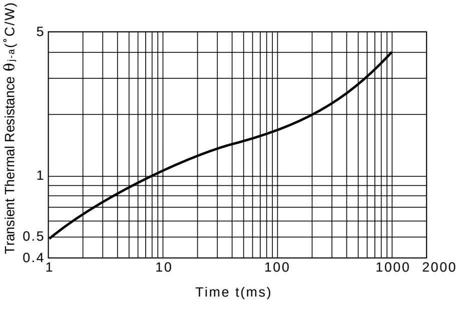
h_{FE}–I_C Characteristics (Typical)



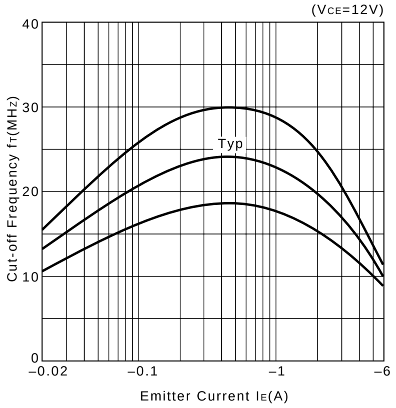
h_{FE}–I_C Temperature Characteristics (Typical)



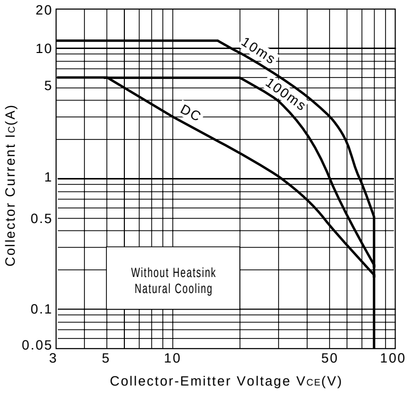
θ$_{j-a}$–t Characteristics



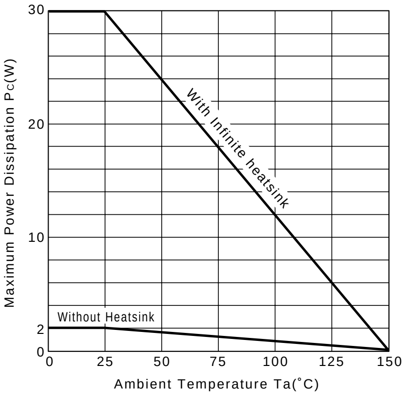
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C–Ta Derating



2SC4512

Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SA1726)

Application : Audio and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	120	V
V_{CEO}	80	V
V_{EBO}	6	V
I_C	6	A
I_B	3	A
P_C	50(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

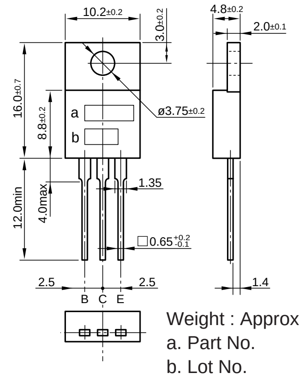
Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=120V	10max	µA
I_{EBO}	V_{EB}=6V	10max	µA
$V_{(BR)CEO}$	I_C=25mA	80min	V
h_{FE}	V_{CE}=4V, I_C=2A	50min	
$V_{CE(sat)}$	I_C=5A, I_B=0.2A	0.5max	V
f_T	V_{CE}=12V, I_E=–0.5A	20typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	110typ	pF

*h_{FE} Rank $\overline{\text{O}}$(50to100), P(70to140), Y(90to180)

■Typical Switching Characteristics (Common Emitter)

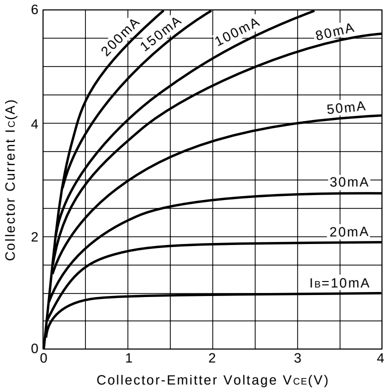
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (µs)	tstg (µs)	tf (µs)
30	10	3	10	–5	0.3	–0.3	0.16typ	2.60typ	0.34typ

External Dimensions MT-25(TO220)

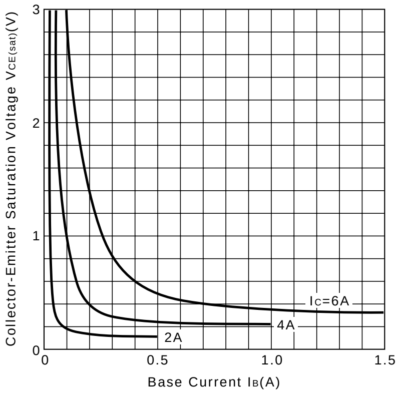


Weight : Approx 2.6g
a. Part No.
b. Lot No.

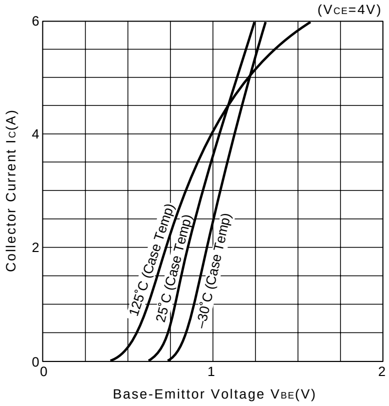
I_C−V_{CE} Characteristics (Typical)



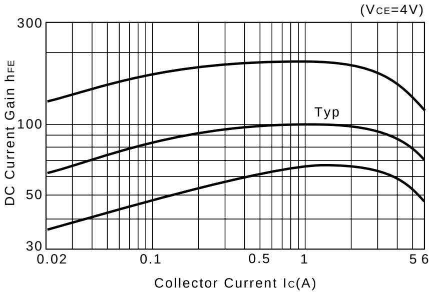
$V_{CE(sat)}$−I_B Characteristics (Typical)



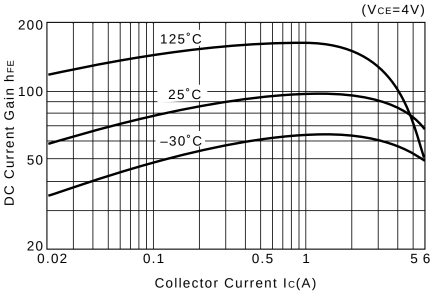
I_C−V_{BE} Temperature Characteristics (Typical)



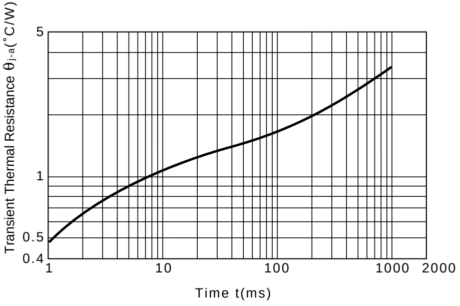
h_{FE}−I_C Characteristics (Typical)



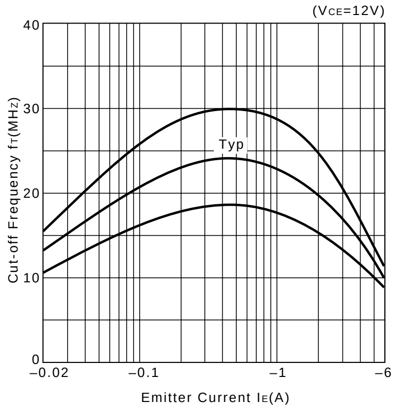
h_{FE}−I_C Temperature Characteristics (Typical)



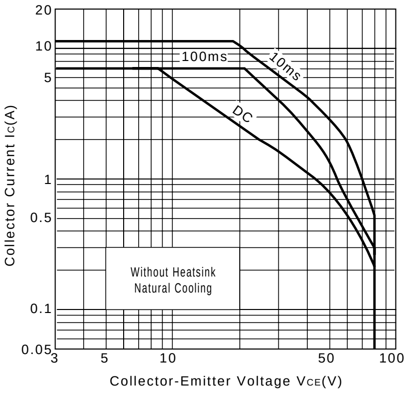
θ_{j-a}−t Characteristics



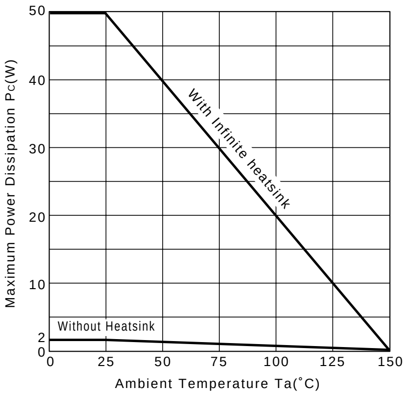
f_T−I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C−Ta Derating



2SC4517/4517A

Silicon NPN Triple Diffused Planar Transistor (High Voltage Switchihg Transistor)

Application : Switching Regulator and General Purpose

■**Absolute maximum ratings** (Ta=25°C)

Symbol	Ratings 2SC4517	Ratings 2SC4517A	Unit
V_{CBO}	900	1000	V
V_{CEO}	550		V
V_{EBO}	7		V
I_C	3(Pulse6)		A
I_B	1.5		A
P_C	30(Tc=25°C)		W
Tj	150		°C
Tstg	–55 to +150		°C

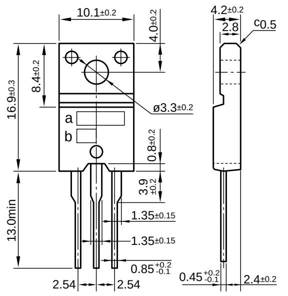
■**Electrical Characteristics** (Ta=25°C)

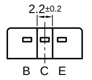
Symbol	Conditions	Ratings 2SC4517	Ratings 2SC4517A	Unit
I_{CBO}	V_{CB}=800V	100max		μA
I_{EBO}	V_{EB}=7V	100max		μA
$V_{(BR)CEO}$	I_C=10mA	550min		V
h_{FE}	V_{CE}=4V, I_C=1A	10to30		
$V_{CE(sat)}$	I_C=1A, I_B=0.2A	0.5max		V
$V_{BE(sat)}$	I_C=1A, I_B=0.2A	1.2max		V
f_T	V_{CE}=12V, I_E=–0.25A	6typ		MHz
C_{OB}	V_{CB}=10V, f=1MHz	35typ		pF

■**Typical Switching Characteristics (Common Emitter)**

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
250	250	1	10	–5	0.15	–0.45	0.7max	4max	0.5max

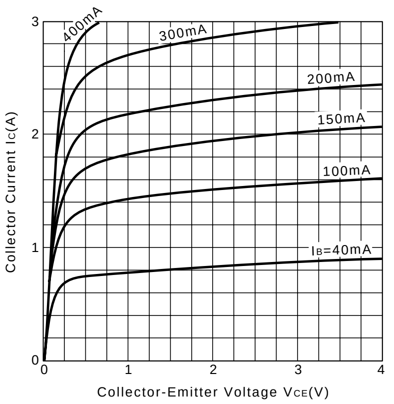
External Dimensions FM20(TO220F)



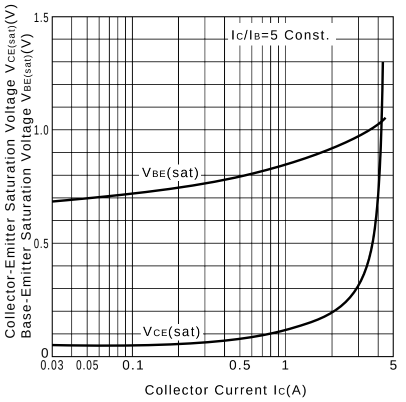


Weight : Approx 2.0g
a. Part No.
b. Lot No.

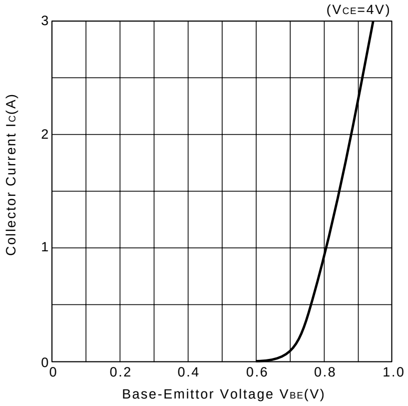
I_C–V_{CE} Characteristics (Typical)



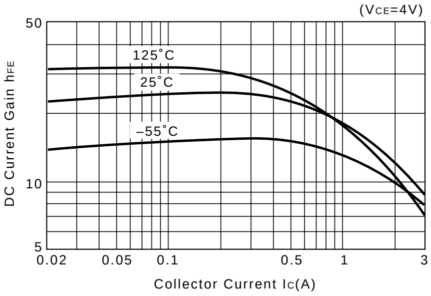
V_{CE}(sat),V_{BE}(sat)–I_C Temperature Characteristics (Typical)



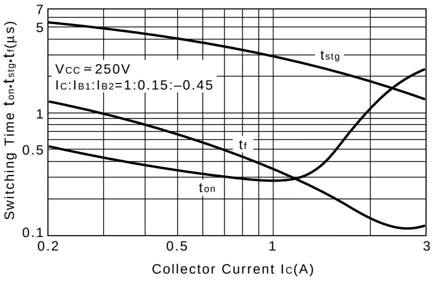
I_C–V_{BE} Temperature Characteristics (Typical)



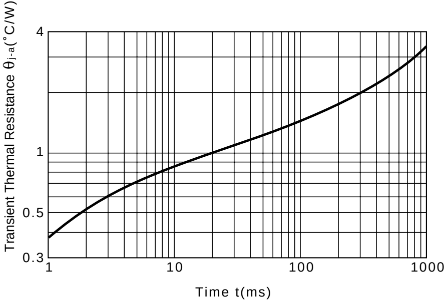
h_{FE}–I_C Temperature Characteristics (Typical)



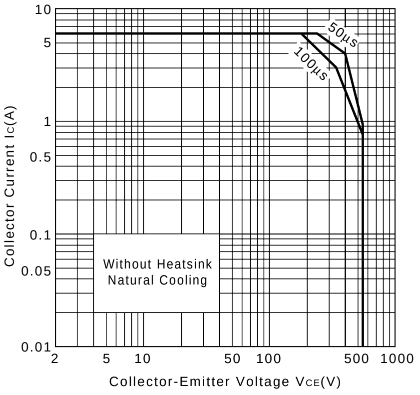
t_{on}•t_{stg}•t_f–I_C Characteristics (Typical)



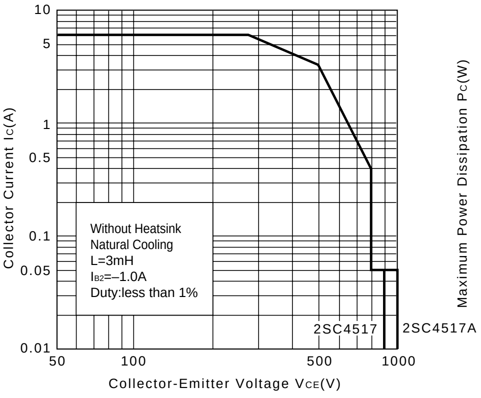
θ_{j-a}–t Characteristics



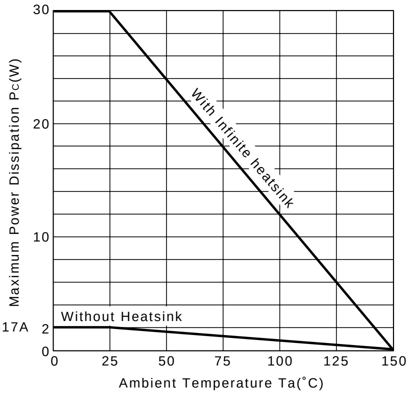
Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



Pc–Ta Derating



2SC4518/4518A

Silicon NPN Triple Diffused Planar Transistor (High Voltage Switchihg Transistor) **Application :** Switching Regulator, Lighting Inverter and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings		Unit
	2SC4518	2SC4518A	
V_{CBO}	900	1000	V
V_{CEO}	550		V
V_{EBO}	7		V
I_C	5(Pulse10)		A
I_B	2.5		A
P_C	35(Tc=25°C)		W
Tj	150		°C
Tstg	–55 to +150		°C

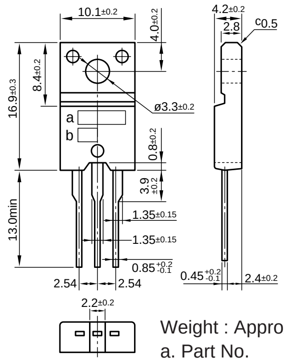
■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings		Unit
		2SC4518	2SC4518A	
I_{CBO}	V_{CB}=800V	100max		μA
I_{EBO}	V_{EB}=7V	100max		μA
$V_{(BR)CEO}$	I_C=10mA	550min		V
h_{FE}	V_{CE}=4V, I_C=1.8A	10to25		
$V_{CE(sat)}$	I_C=1.8A, I_B=0.36A	0.5max		V
$V_{BE(sat)}$	I_C=1.8A, I_B=0.36A	1.2max		V
f_T	V_{CE}=12V, I_E=–0.35A	6typ		MHz
C_{OB}	V_{CB}=10V, f=1MHz	50typ		pF

■Typical Switching Characteristics (Common Emitter)

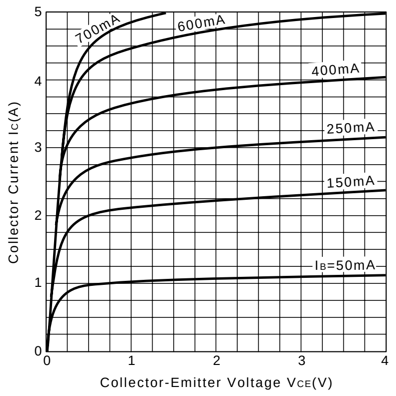
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
250	139	1.8	10	–5	0.27	–0.9	0.7max	4max	0.5max

External Dimensions FM20(TO220F)

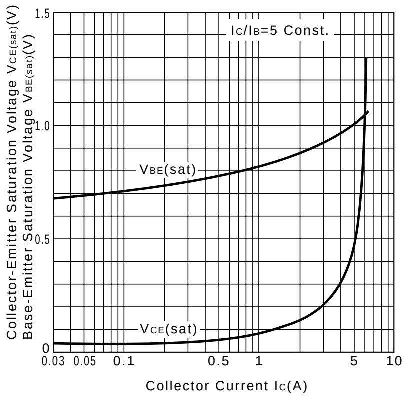


Weight : Approx 2.0g
a. Part No.
b. Lot No.

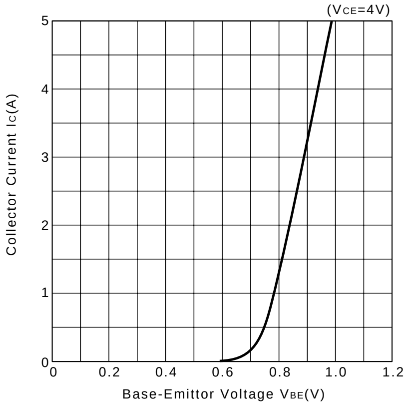
I_C–V_{CE} Characteristics (Typical)



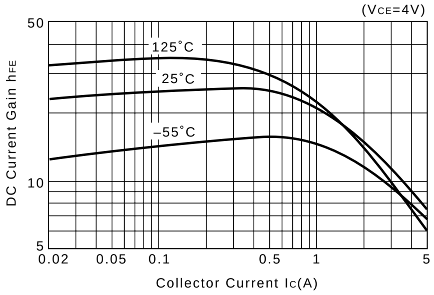
V_{CE}(sat),V_{BE}(sat)–I_C Temperature Characteristics (Typical)



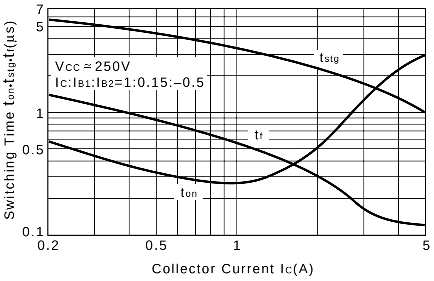
I_C–V_{BE} Temperature Characteristics (Typical)



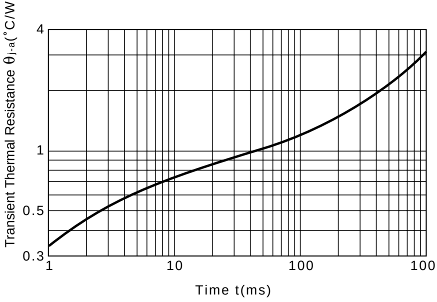
h_{FE}–I_C Temperature Characteristics (Typical)



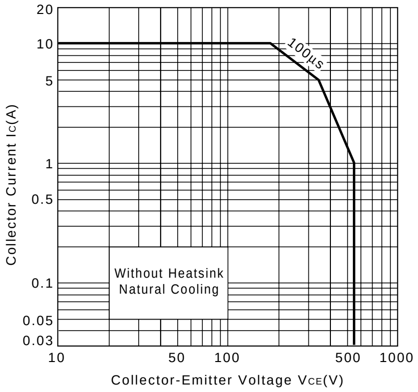
t_{on}•t_{stg}•t_f–I_C Characteristics (Typical)



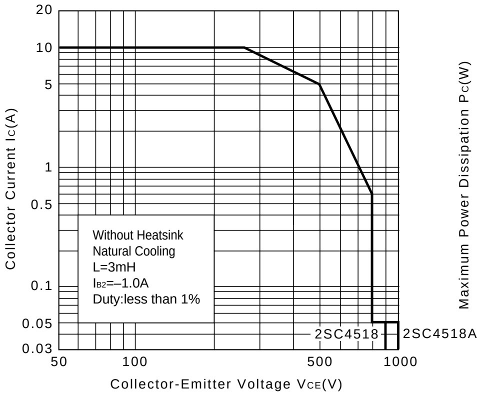
θ_{j-a}–t Characteristics



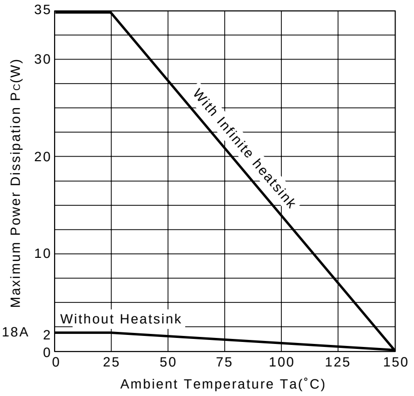
Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



P_C–Ta Derating



2SC4546

Silicon NPN Triple Diffused Planar Transistor (High Voltage and Ultra-high Speed Switchihg Transistor) **Application :** Switching Regulator, Lighting Inverter and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	600	V
V_{CEO}	400	V
V_{EBO}	7	V
I_C	7(Pulse14)	A
I_B	2	A
P_C	30(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

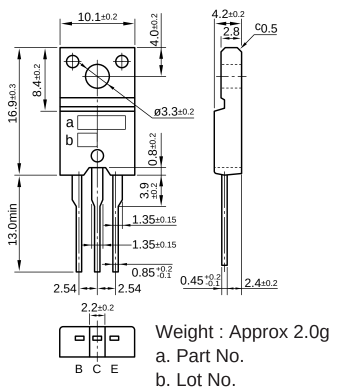
■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=600V	100max	μA
I_{EBO}	V_{EB}=7V	100max	μA
$V_{(BR)CEO}$	I_C=25mA	400min	V
h_{FE}	V_{CE}=4V, I_C=3A	10to25	
$V_{CE(sat)}$	I_C=3A, I_B=0.6A	0.7max	V
$V_{BE(sat)}$	I_C=3A, I_B=0.6A	1.3max	V
f_T	V_{CE}=12V, I_E=–0.5A	10typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	55typ	pF

■Typical Switching Characteristics (Common Emitter)

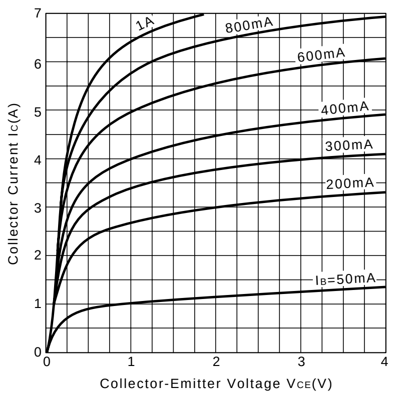
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
200	67	3	10	–5	0.6	–1.2	0.5max	2max	0.15max

External Dimensions FM20(TO220F)

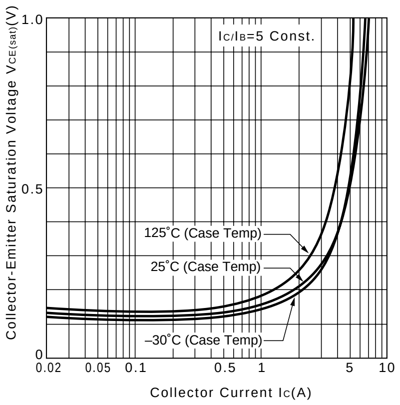


Weight : Approx 2.0g
a. Part No.
b. Lot No.

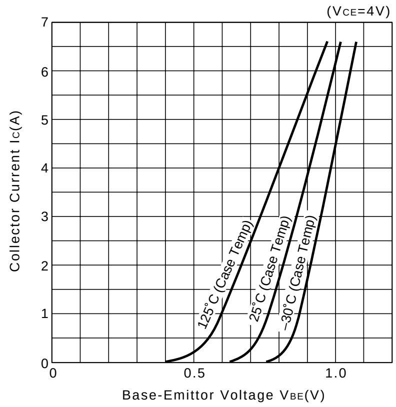
I_C–V_{CE} Characteristics (Typical)



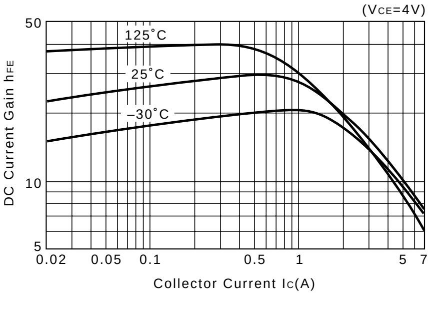
$V_{CE(sat)}$–I_C Characteristics (Typical)



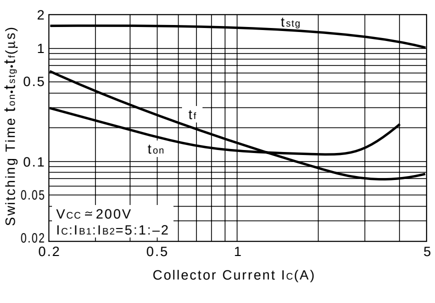
I_C–V_{BE} Temperature Characteristics (Typical)



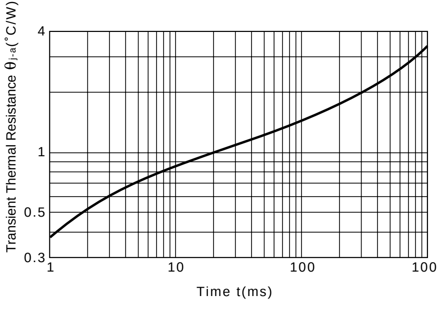
h_{FE}–I_C Temperature Characteristics (Typical)



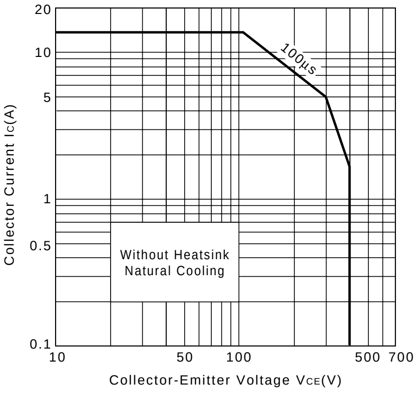
t_{on}•t_{stg}•t_f–I_C Characteristics (Typical)



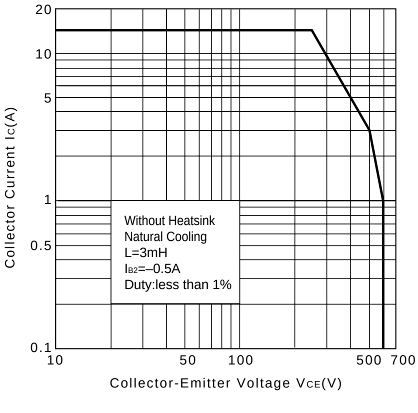
θ_{j-a}–t Characteristics



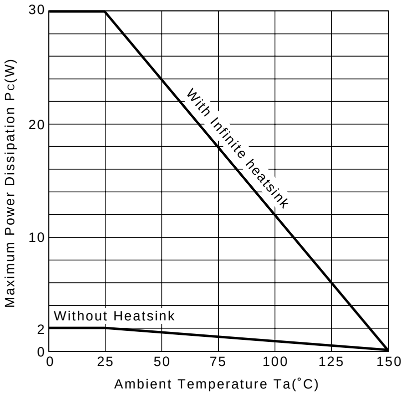
Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



P_C–Ta Derating



2SC4557

Silicon NPN Triple Diffused Planar Transistor (High Voltage Switchihg Transistor)

Application : Switching Regulator and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	900	V
V_{CEO}	550	V
V_{EBO}	7	V
I_C	10(Pulse20)	A
I_B	5	A
P_C	80(T_C=25°C)	W
T_j	150	°C
T_{stg}	–55 to +150	°C

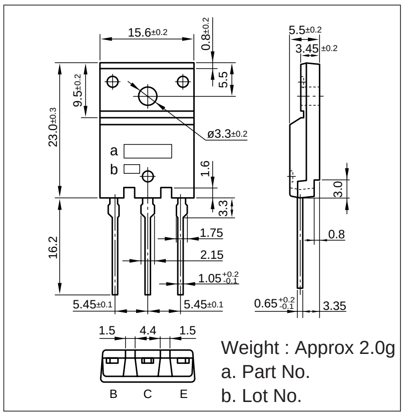
■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=800V	100max	μA
I_{EBO}	V_{EB}=7V	100max	μA
$V_{(BR)CEO}$	I_C=10mA	550min	V
h_{FE}	V_{CE}=4V, I_C=5A	10to28	
$V_{CE(sat)}$	I_C=5A, I_B=1A	0.5max	V
$V_{BE(sat)}$	I_C=5A, I_B=1A	1.2max	V
f_T	V_{CE}=12V, I_E=–1A	6typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	105typ	pF

■Typical Switching Characteristics (Common Emitter)

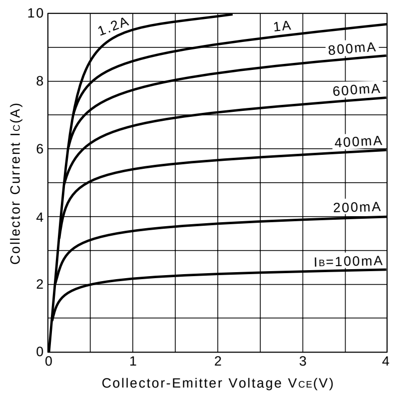
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
250	50	5	10	–5	0.75	–1.5	1max	5max	0.5max

External Dimensions FM100(TO3PF)

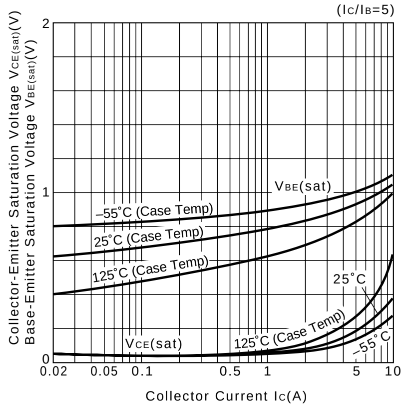


Weight : Approx 2.0g
a. Part No.
b. Lot No.

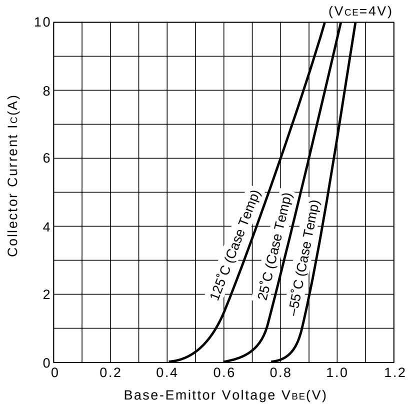
I_C–V_{CE} Characteristics (Typical)



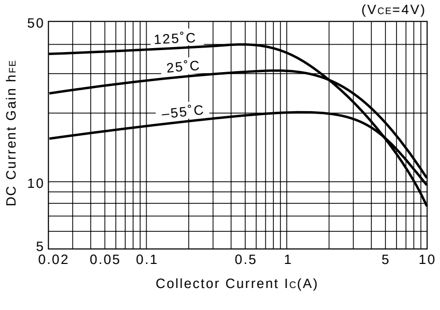
V_{CE}(sat),V_{BE}(sat)–I_C Temperature Characteristics (Typical)



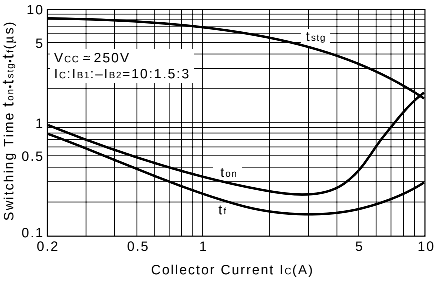
I_C–V_{BE} Temperature Characteristics (Typical)



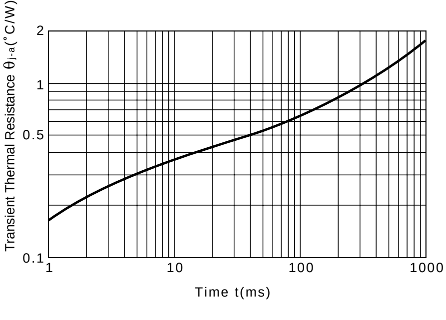
h_{FE}–I_C Temperature Characteristics (Typical)



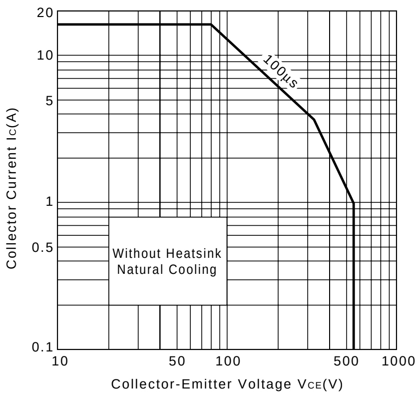
t_{on}•t_{stg}•t_f–I_C Characteristics (Typical)



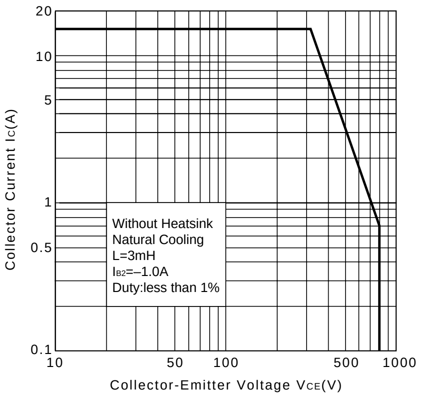
$\theta_{j\text{-}a}$–t Characteristics



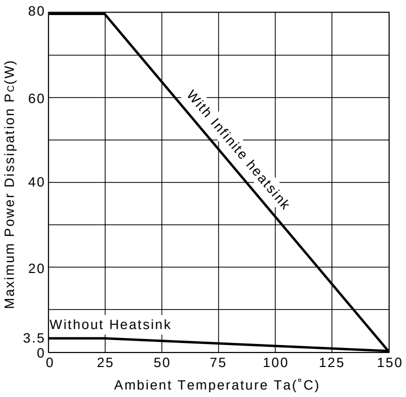
Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



P_C–T_a Derating



2SC4662

Silicon NPN Triple Diffused Planar Transistor (High Voltage and High Speed Switchihg Transistor) **Application :** Switching Regulator and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	500	V
V_{CEO}	400	V
V_{EBO}	10	V
I_C	5(Pulse10)	A
I_B	2	A
P_C	30(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

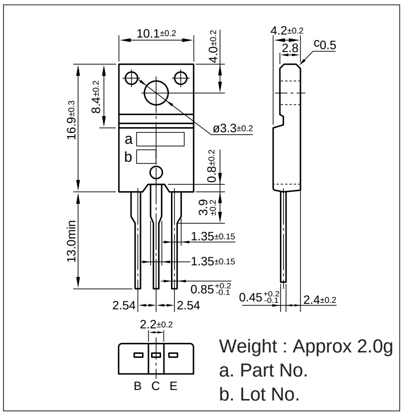
■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=500V	100max	µA
I_{EBO}	V_{EB}=10V	100max	µA
$V_{(BR)CEO}$	I_C=25mA	400min	V
h_{FE}	V_{CE}=4V, I_C=1.5A	10 to 30	
$V_{CE(sat)}$	I_C=1.5A, I_B=0.3A	0.5max	V
$V_{BE(sat)}$	I_C=1.5A, I_B=0.3A	1.3max	V
f_T	V_{CE}=12V, I_E=–0.3A	20typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	30typ	pF

■Typical Switching Characteristics (Common Emitter)

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (µs)	tstg (µs)	tf (µs)
200	133	1.5	10	–5	0.15	–0.3	1max	2.5max	0.5max

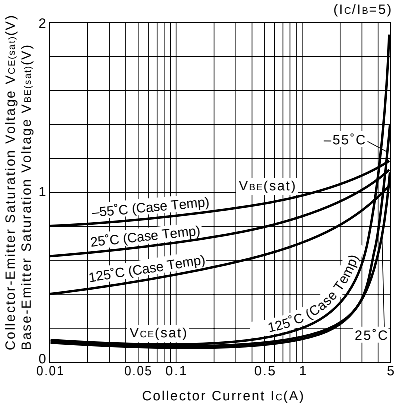
External Dimensions FM20(TO220F)



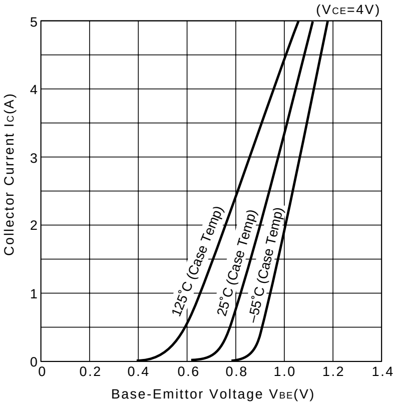
Weight : Approx 2.0g
a. Part No.
b. Lot No.

I_C–V_{CE} Characteristics (Typical)

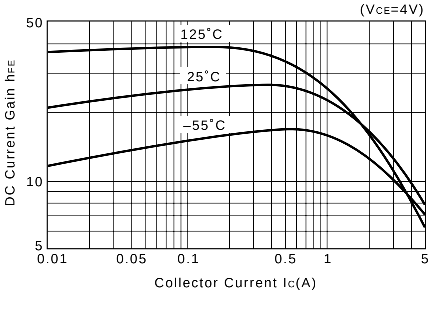
V_{CE}(sat),V_{BE}(sat)–I_C Temperature Characteristics (Typical)



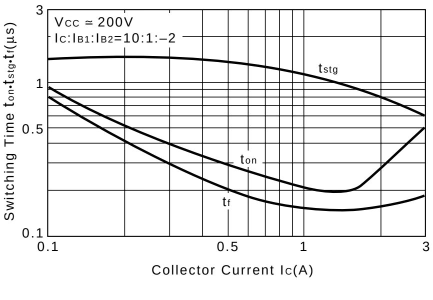
I_C–V_{BE} Temperature Characteristics (Typical)



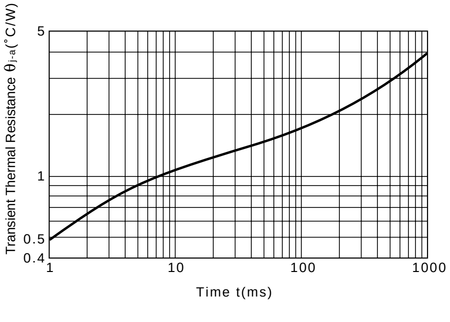
h_{FE}–I_C Temperature Characteristics (Typical)



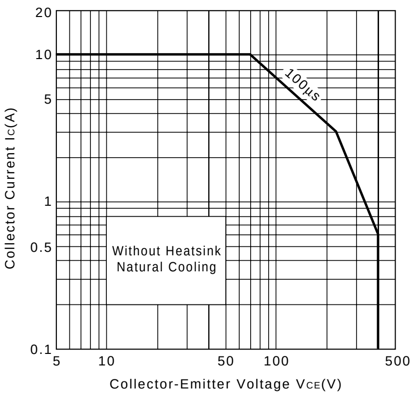
t_{on}•t_{stg}•t_f–I_C Characteristics (Typical)



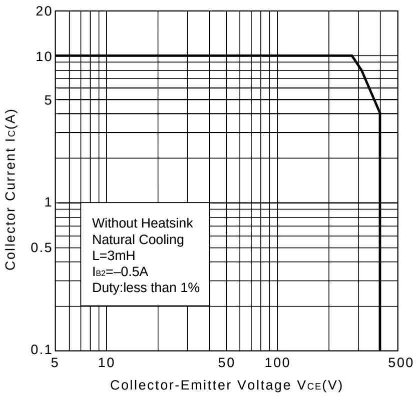
θj-a–t Characteristics



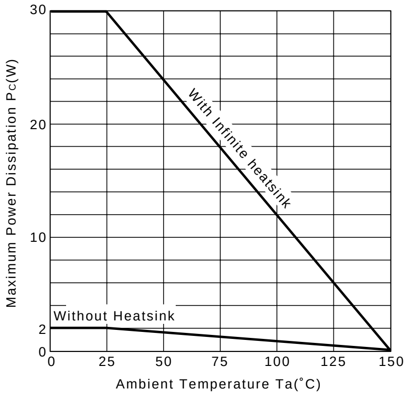
Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



P_C–T_a Derating



2SC4706

Silicon NPN Triple Diffused Planar Transistor (High Voltage Switchihg Transistor)

Application : Switching Regulator and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	900	V
V_{CEO}	600	V
V_{EBO}	7	V
I_C	14(Pulse28)	A
I_B	7	A
P_C	130(T_C=25°C)	W
Tj	150	°C
Tstg	–55to+150	°C

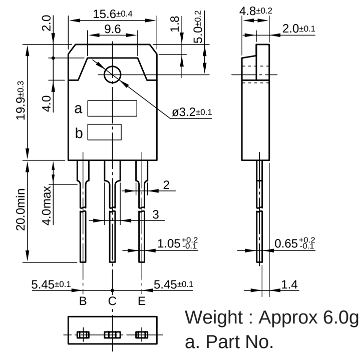
■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=800V	100max	µA
I_{EBO}	V_{EB}=7V	100max	µA
$V_{(BR)CEO}$	I_C=10mA	600min	V
h_{FE}	V_{CE}=4V, I_C=7A	10to25	
V_{CE}(sat)	I_C=7A, I_B=1.4A	0.5max	V
V_{BE}(sat)	I_C=7A, I_B=1.4A	1.2max	V
f_T	V_{CE}=12V, I_E=–1.5A	6typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	160typ	pF

■Typical Switching Characteristics (Common Emitter)

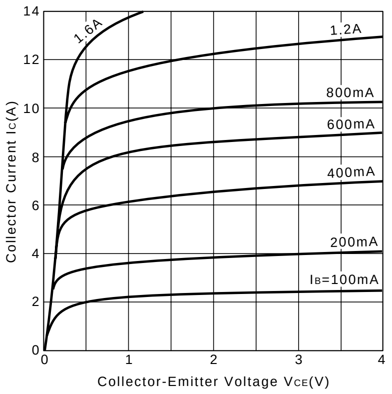
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (µs)	tstg (µs)	tf (µs)
250	35.7	7	10	–5	1.05	–3.5	1max	5max	0.7max

External Dimensions MT-100(TO3P)

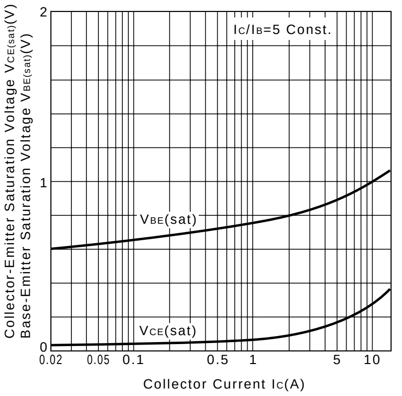


Weight : Approx 6.0g
a. Part No.
b. Lot No.

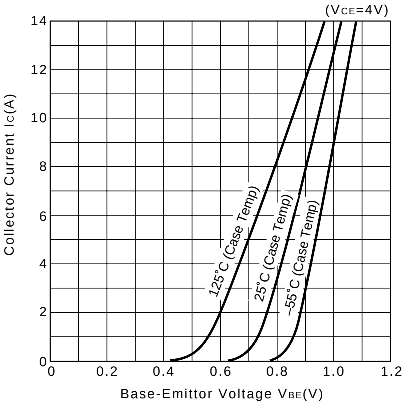
I_C-V_{CE} Characteristics (Typical)



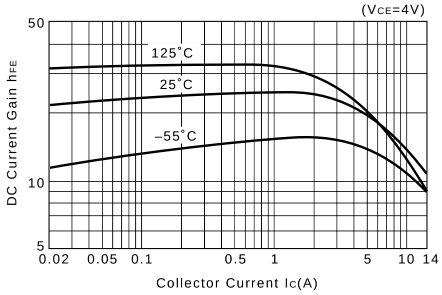
V_{CE}(sat),V_{BE}(sat)$-I_C$ Temperature Characteristics (Typical)



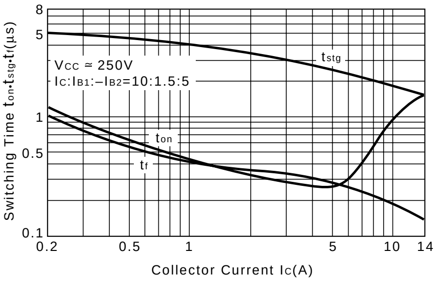
I_C-V_{BE} Temperature Characteristics (Typical)



$h_{FE}-I_C$ Temperature Characteristics (Typical)

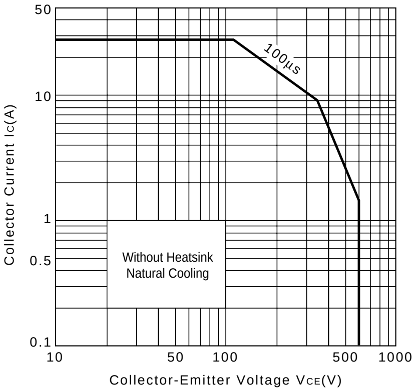


t_{on}•t_{stg}•t_f-I_C Characteristics (Typical)

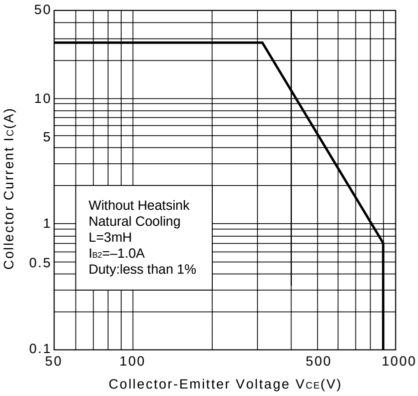


$\theta_{j-a}-t$ Characteristics

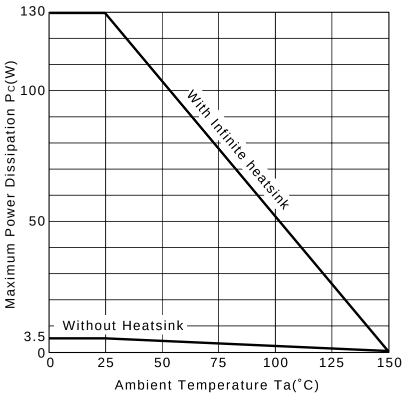
Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



P_C-T_a Derating



2SC4883/4883A

Silicon NPN Epitaxial Planar Transistor (Complement to type 2SA1859/A)

Application : Audio Output Driver and TV Velocity-modulation

■**Absolute maximum ratings** (Ta=25°C)

Symbol	Ratings		Unit
	2SC4883	2SC4883A	
V_{CBO}	150	180	V
V_{CEO}	150	180	V
V_{EBO}	6		V
I_C	2		A
I_B	1		A
P_C	20(Tc=25°C)		W
Tj	150		°C
Tstg	–55 to +150		°C

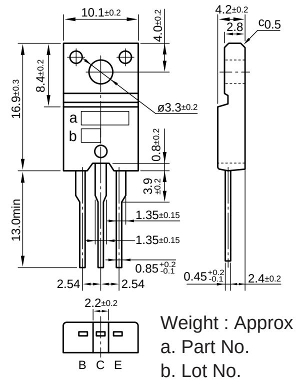
■**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	Ratings		Unit
		2SC4883	2SC4883A	
I_{CBO}		10max		μA
	V_{CB}=	150	180	V
I_{EBO}	V_{EB}=6V	10max		μA
$V_{(BR)CEO}$	I_C=10mA	150min	180min	V
h_{FE}	V_{CE}=10V, I_C=0.7A	60 to 240		
$V_{CE(sat)}$	I_C=0.7A, I_B=70mA	1.0max		V
f_T	V_{CE}=12V, I_E=–0.7A	120typ		MHz
C_{OB}	V_{CB}=10V, f=1MHz	30typ		pF

■**Typical Switching Characteristics (Common Emitter)**

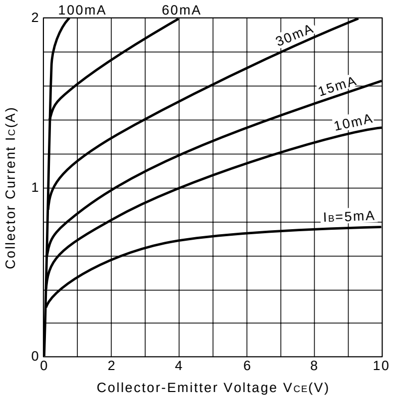
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (μs)	tstg (μs)	tf (μs)
20	20	1	10	–5	100	–100	0.5typ	1.5typ	0.5typ

External Dimensions FM20(TO220F)

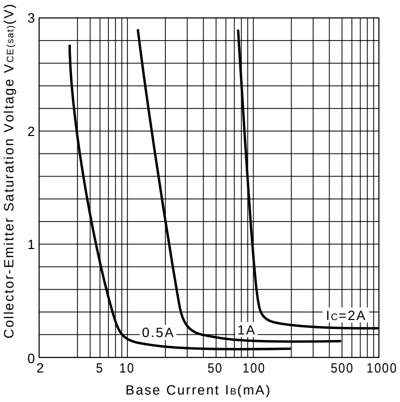


Weight : Approx 2.0g
a. Part No.
b. Lot No.

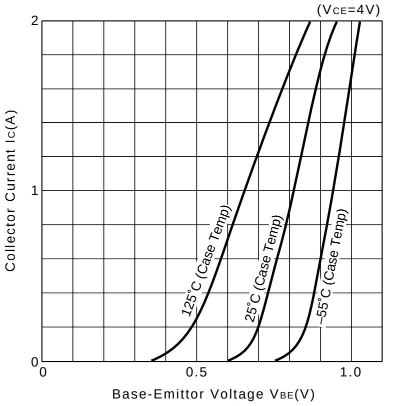
I_C−V_{CE} Characteristics (Typical)



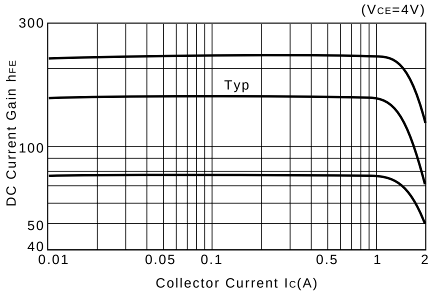
$V_{CE(sat)}$−I_B Characteristics (Typical)



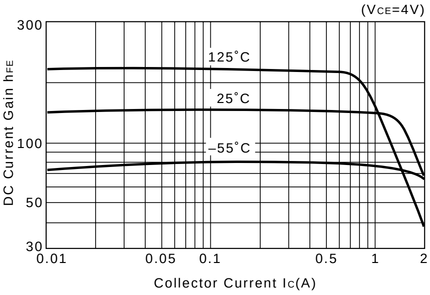
I_C−V_{BE} Temperature Characteristics (Typical)



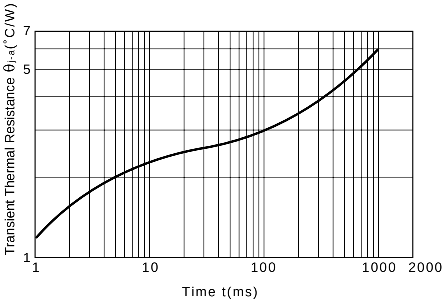
h_{FE}−I_C Characteristics (Typical)



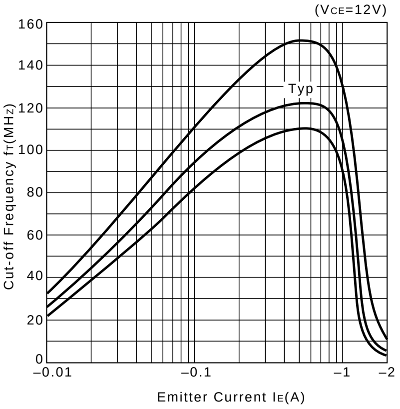
h_{FE}−I_C Temperature Characteristics (Typical)



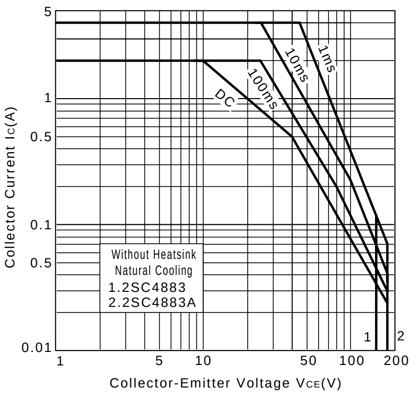
θ_{j-a}−t Characteristics



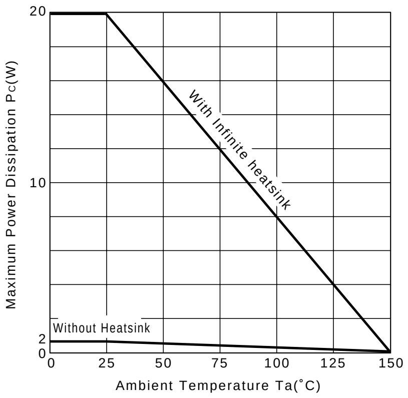
f_T−I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C−Ta Derating



LAPT

2SC4886

Silicon NPN Epitaxial Planar Transistor (Complement to type 2SA1860)

Application : Audio and General Purpose

■Absolute maximum ratings (Ta=25°C)

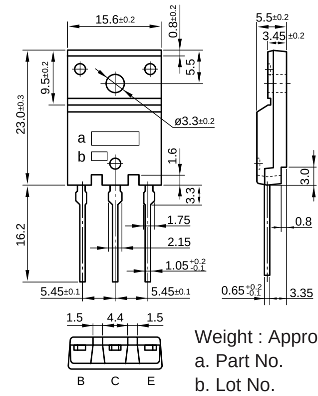
Symbol	Ratings	Unit
V_{CBO}	150	V
V_{CEO}	150	V
V_{EBO}	5	V
I_C	14	A
I_B	3	A
P_C	80(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=150V	100max	μA
I_{EBO}	V_{EB}=5V	100max	μA
$V_{(BR)CEO}$	I_C=25mA	150min	V
h_{FE}	V_{CE}=4V, I_C=5A	50min*	
$V_{CE(sat)}$	I_C=5A, I_B=500mA	2.0max	V
f_T	V_{CE}=12V, I_E=–2A	60typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	200typ	pF

*h_{FE} Rank O(50 to 100), P(70 to 140), Y(90 to 180)

External Dimensions FM100(TO3PF)

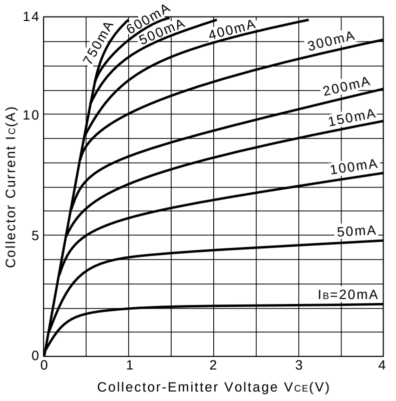


Weight : Approx 6.5g
a. Part No.
b. Lot No.

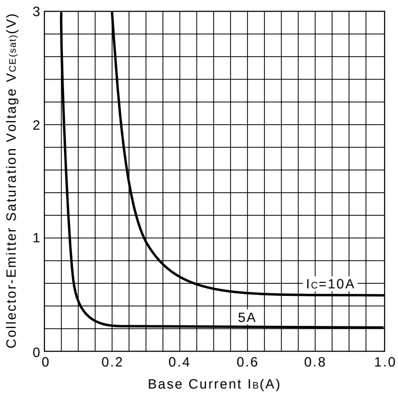
■Typical Switching Characteristics (Common Emitter)

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
60	12	5	10	–5	0.5	–0.5	0.26typ	1.5typ	0.35typ

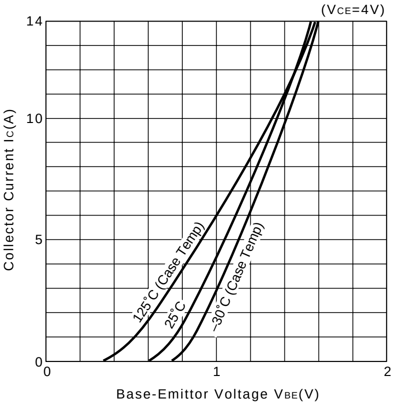
I_C–V_{CE} Characteristics (Typical)



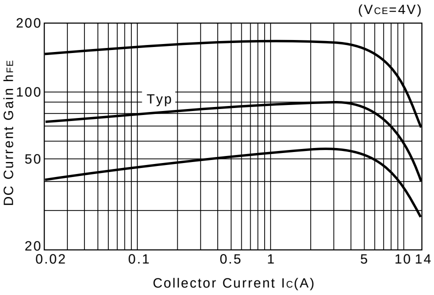
$V_{CE(sat)}$–I_B Characteristics (Typical)



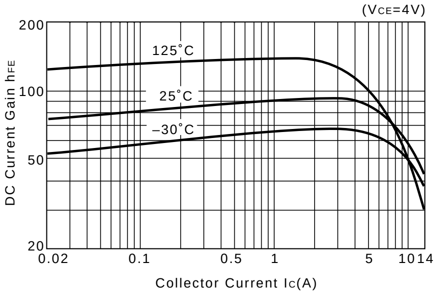
I_C–V_{BE} Temperature Characteristics (Typical)



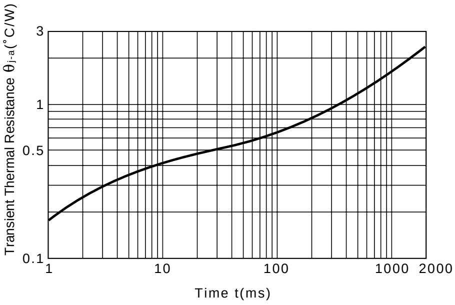
h_{FE}–I_C Characteristics (Typical)



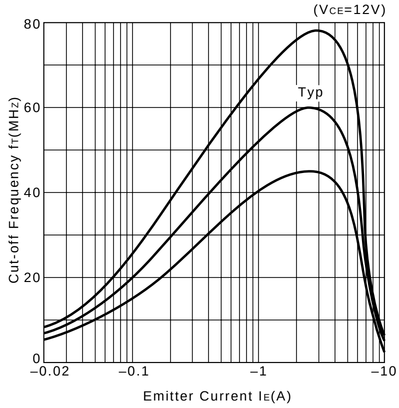
h_{FE}–I_C Temperature Characteristics (Typical)



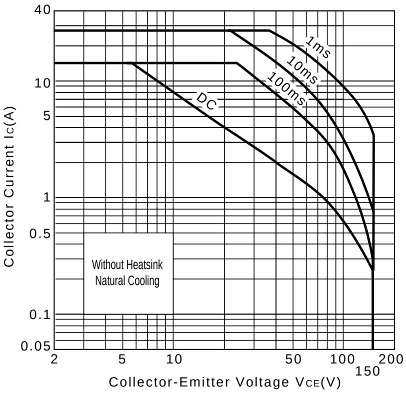
θ_{j-a}–t Characteristics



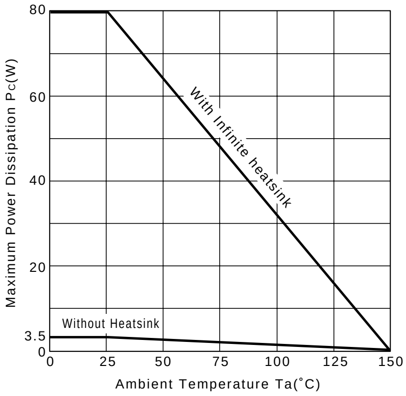
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C–Ta Derating



2SC4907

Silicon NPN Triple Diffused Planar Transistor (High Voltage and High Speed Switchihg Transistor) **Application :** Switching Regulator and General Purpose

■**Absolute maximum ratings** (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	600	V
V_{CEO}	500	V
V_{EBO}	10	V
I_C	6(Pulse12)	A
I_B	2	A
P_C	30(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

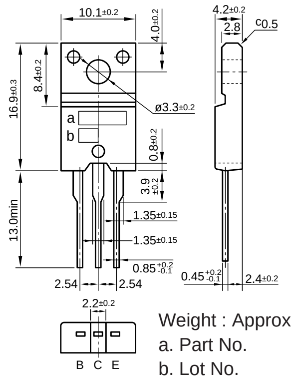
■**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=600V	1max	mA
I_{EBO}	V_{EB}=10V	100max	µA
$V_{(BR)CEO}$	I_C=25mA	500min	V
h_{FE}	V_{CE}=4V, I_C=2A	10to30	
V_{CE}(sat)	I_C=2A, I_B=0.4A	0.5max	V
V_{BE}(sat)	I_C=2A, I_B=0.4A	1.3max	V
f_T	V_{CE}=12V, I_E=–0.5A	8typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	45typ	pF

■**Typical Switching Characteristics (Common Emitter)**

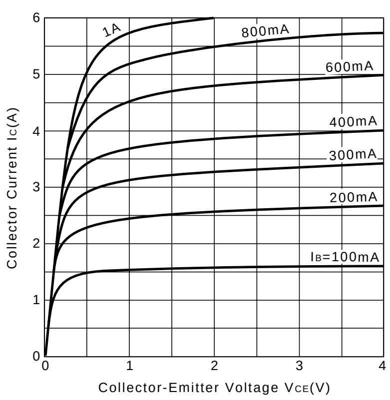
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (µs)	tstg (µs)	tf (µs)
200	100	2	10	–5	0.2	–0.4	1max	4.5max	0.5max

External Dimensions FM20(TO220F)

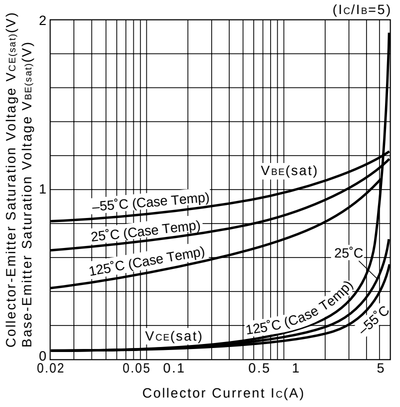


Weight : Approx 2.0g
a. Part No.
b. Lot No.

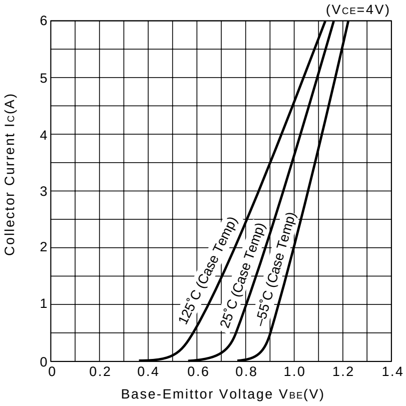
I_C−V_{CE} Characteristics (Typical)



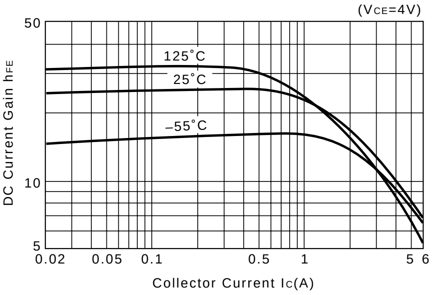
V_{CE}(sat),V_{BE}(sat)−I_C Temperature Characteristics (Typical)



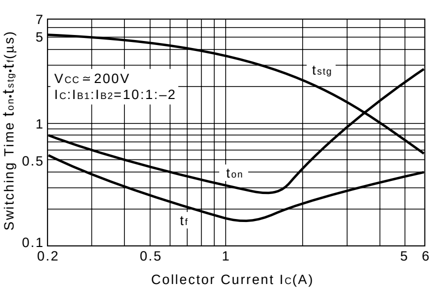
I_C−V_{BE} Temperature Characteristics (Typical)



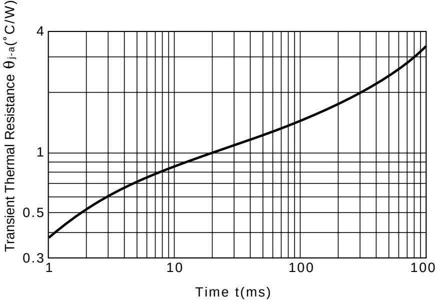
h_{FE}−I_C Characteristics (Typical)



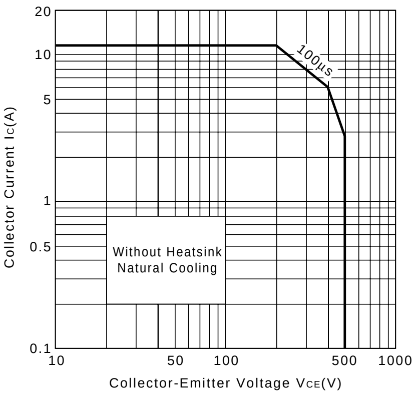
t_{on}•t_{stg}•t_f−I_C Characteristics (Typical)



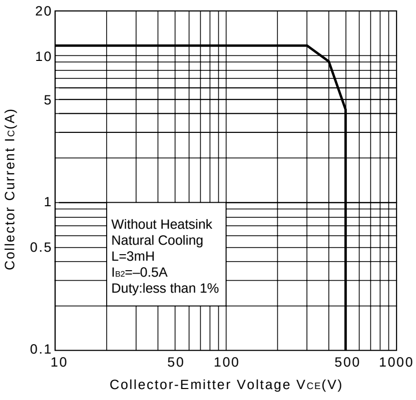
$\theta_{j\text{-}a}$−t Characteristics



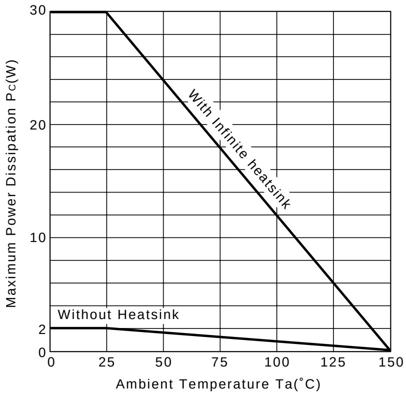
Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



P_C−Ta Derating



2SC4908

Silicon NPN Triple Diffused Planar Transistor (High Voltage Switchihg Transistor)

Application : Switching Regulator and General Purpose

■**Absolute maximum ratings** (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	900	V
V_{CEO}	800	V
V_{EBO}	7	V
I_C	3(Pulse6)	A
I_B	1.5	A
P_C	35(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

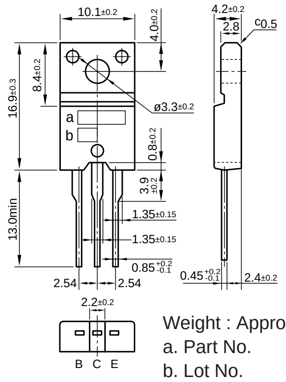
■**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=800V	100max	μA
I_{EBO}	V_{EB}=7V	100max	μA
$V_{(BR)CEO}$	I_C=10mA	800min	V
h_{FE}	V_{CE}=4V, I_C=0.7A	10 to 30	
V_{CE}(sat)	I_C=0.7A, I_B=0.14A	0.5max	V
V_{BE}(sat)	I_C=0.7A, I_B=0.14A	1.2max	V
f_T	V_{CE}=12V, I_E=–0.3A	6typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	40typ	pF

■**Typical Switching Characteristics (Common Emitter)**

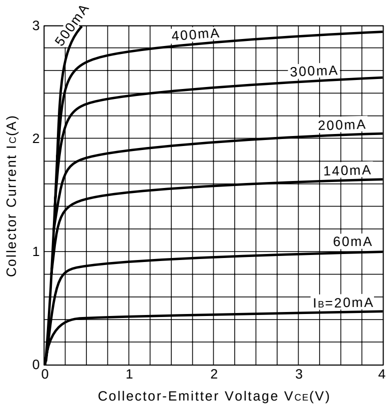
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
250	357	0.7	10	–5	0.1	–0.35	1max	5max	1max

External Dimensions FM20(TO220F)

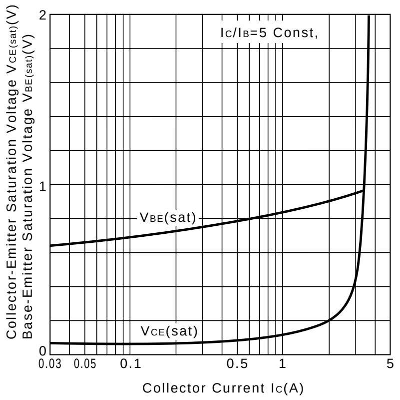


Weight : Approx 2.0g
a. Part No.
b. Lot No.

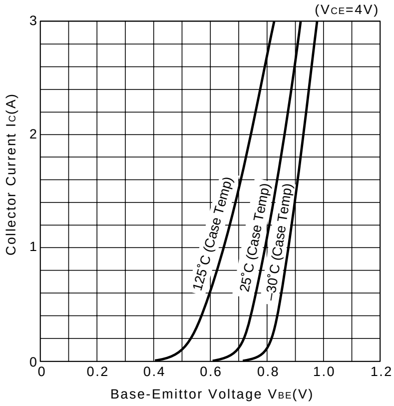
I_C−V_{CE} Characteristics (Typical)



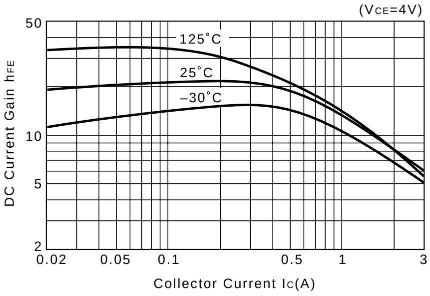
V_{CE}(sat),V_{BE}(sat)−I_C Temperature Characteristics (Typical)



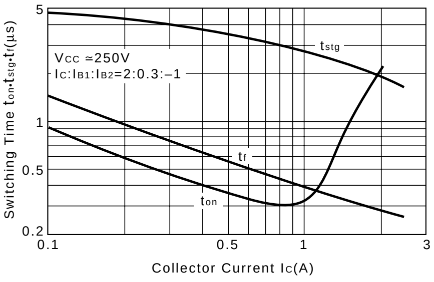
I_C−V_{BE} Temperature Characteristics (Typical)



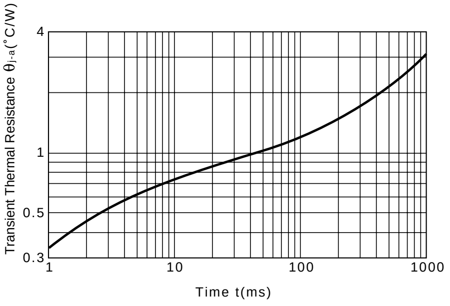
h_{FE}−I_C Characteristics (Typical)



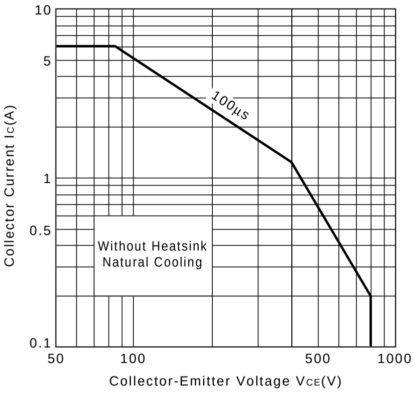
t_{on}•t_{stg}•t_f−I_C Characteristics (Typical)



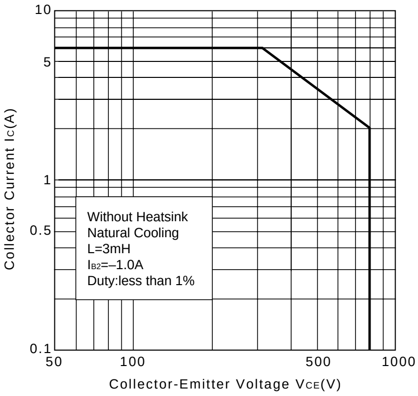
θ_{j-a}−t Characteristics



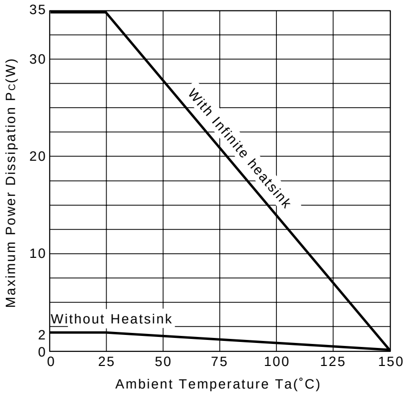
Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



P_C−Ta Derating



2SC5002

Silicon NPN Triple Diffused Planar Transistor (High Voltage Switchihg Transistor)

Application : Display Horizontal Deflection Output, Switching Regulator and General Purpose

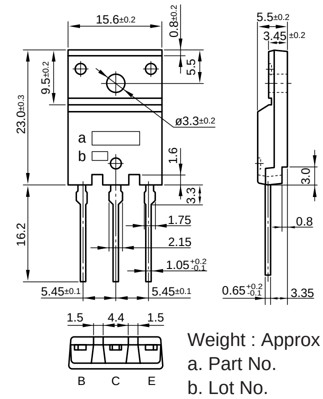
■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	1500	V
V_{CEO}	800	V
V_{EBO}	6	V
I_C	7(Pulse14)	A
I_B	3.5	A
P_C	80(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO1}	V_{CB}=1200V	100max	μA
I_{CBO2}	V_{CB}=1500V	1max	mA
I_{EBO}	V_{EB}=6V	100max	μA
$V_{(BR)CEO}$	I_C=10mA	800min	V
h_{FE1}	V_{CE}=5V, I_C=1A	8min	
h_{FE2}	V_{CE}=5V, I_C=5A	4to9	
$V_{CE(sat)}$	I_C=5A, I_B=1.2A	5max	V
$V_{BE(sat)}$	I_C=5A, I_B=1.2A	1.5max	V
f_T	V_{CE}=12V, I_E=–0.5A	4typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	100typ	pF

External Dimensions FM100(TO3PF)

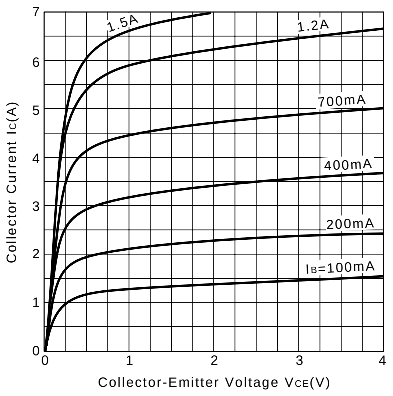


Weight : Approx 6.5g
a. Part No.
b. Lot No.

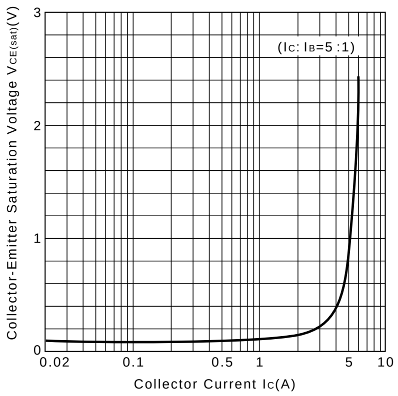
■Typical Switching Characteristics (Common Emitter)

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	tstg (μs)	tf (μs)
200	50	4	10	–5	0.8	–1.6	4.0max	0.2max

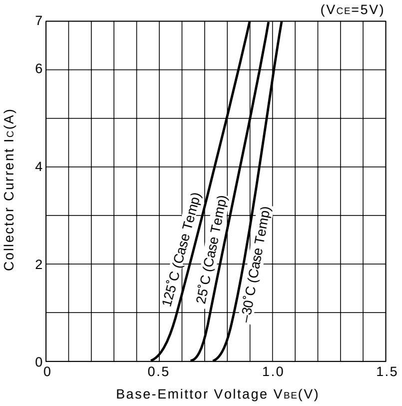
I_C–V_{CE} Characteristics (Typical)



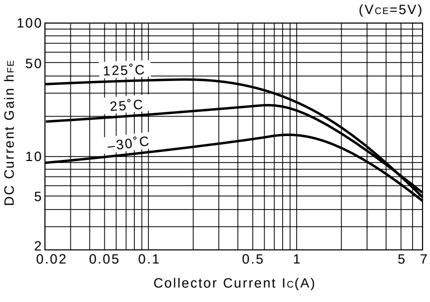
$V_{CE(sat)}$–I_C Characteristics (Typical)



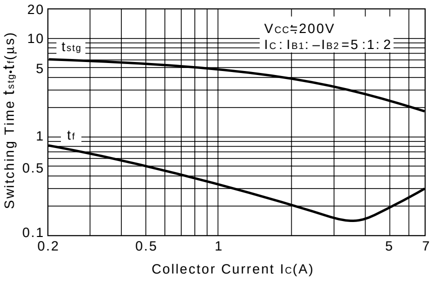
I_C–V_{BE} Temperature Characteristics (Typical)



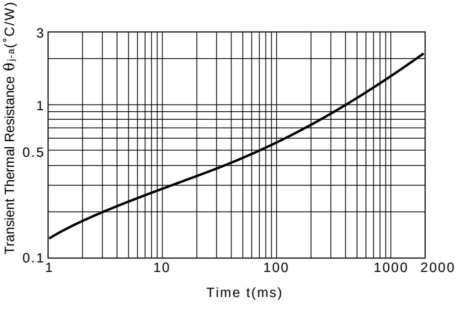
h_{FE}–I_C Characteristics (Typical)



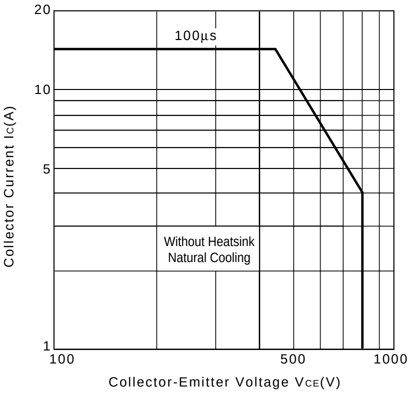
t_{stg}•t_f–I_C Characteristics (Typical)



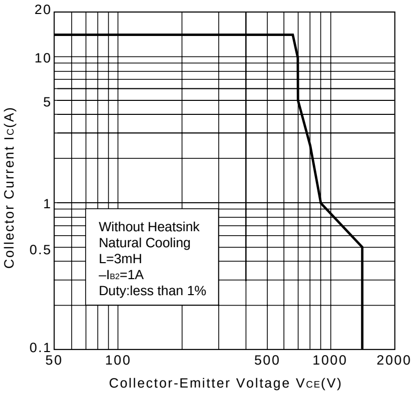
θ_{j-a}–t Characteristics



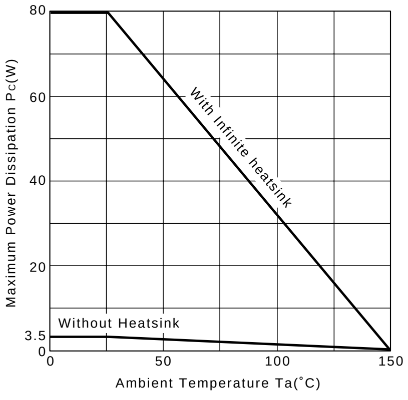
Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area

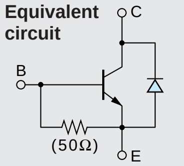


P_C–Ta Derating



Built-in Damper Diode 2SC5003

Equivalent circuit



Silicon NPN Triple Diffused Planar Transistor (High Voltage Switchihg Transistor)

Application : Display Horizontal Deflection Output, Switching Regulator and General Purpose

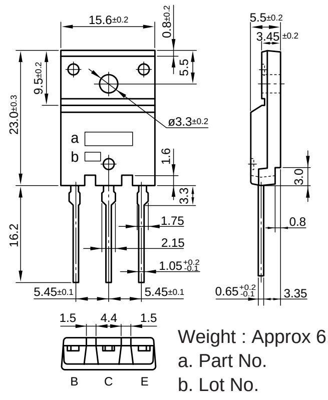
■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	1500	V
V_{CEO}	800	V
V_{EBO}	6	V
I_C	7(Pulse14)	A
I_B	3.5	A
P_C	80(T_C=25°C)	W
T_j	150	°C
T_{stg}	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO1}	V_{CB}=1200V	100max	µA
I_{CBO2}	V_{CB}=1500V	1max	mA
I_{CEO}	V_{CE}=800V	1max	mA
V_{EBO}	I_{EB}=300mA	6min	V
h_{FE1}	V_{CE}=5V, I_C=1A	8min	
h_{FE2}	V_{CE}=5V, I_C=5A	4to9	
$V_{CE(sat)}$	I_C=5A, I_B=1.2A	5max	V
$V_{BE(sat)}$	I_C=5A, I_B=1.2A	1.5max	V
V_{FEC}	I_{EC}=7A	2.0max	V
f_T	V_{CE}=12V, I_E=–0.5A	4typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	100typ	pF

External Dimensions FM100(TO3PF)

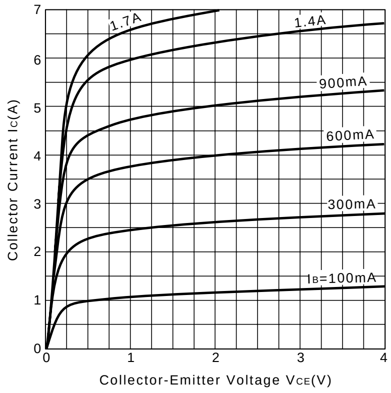


Weight : Approx 6.5g
a. Part No.
b. Lot No.

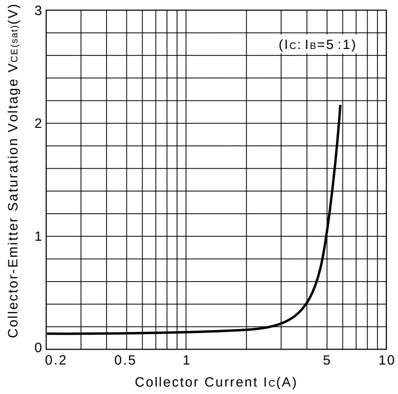
■Typical Switching Characteristics (Common Emitter)

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	tstg (µs)	tf (µs)
200	50	4	10	–5	0.8	–1.6	4.0max	0.2max

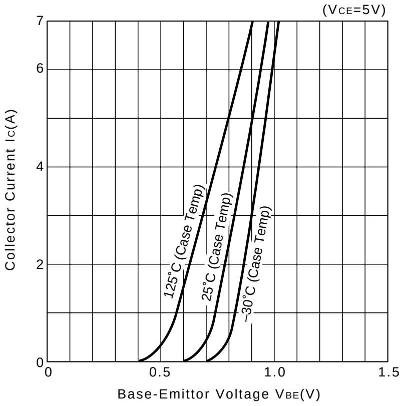
I_C−V_{CE} Characteristics (Typical)



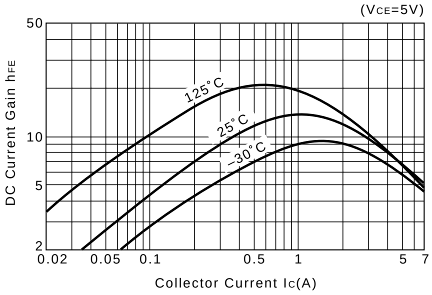
$V_{CE(sat)}$−I_C Characteristics (Typical)



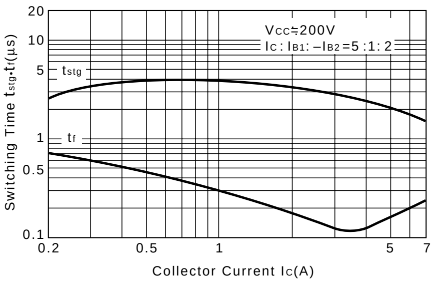
I_C−V_{BE} Temperature Characteristics (Typical)



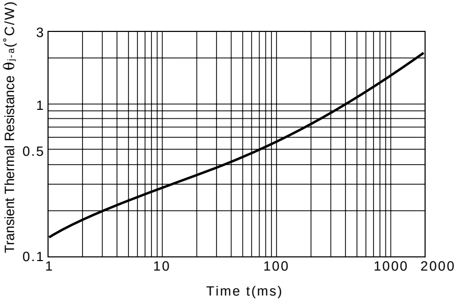
h_{FE}−I_C Characteristics (Typical)



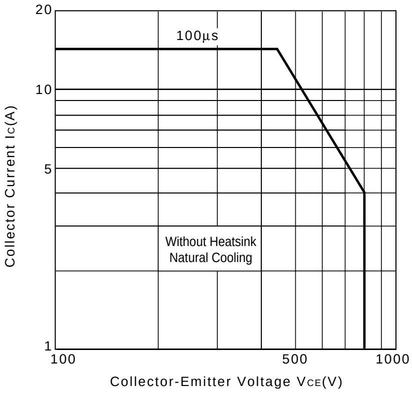
t_{stg}•t_f−I_C Characteristics (Typical)



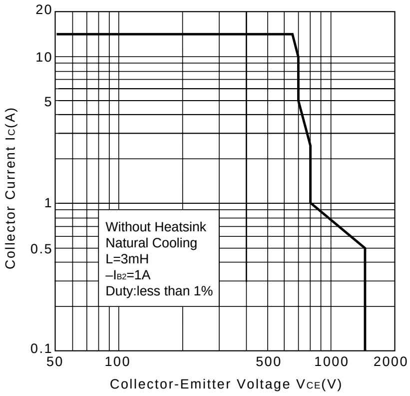
θ_{j-a}−t Characteristics



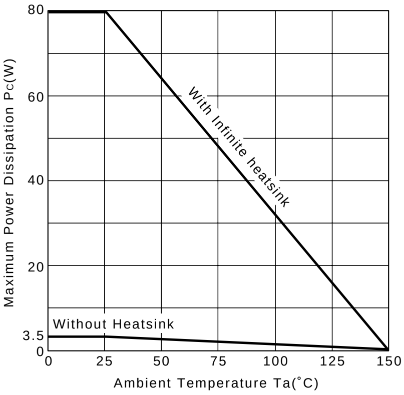
Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



P_C−T_a Derating



2SC5071

Silicon NPN Triple Diffused Planar Transistor (High Voltage and High Speed Switchihg Transistor) **Application :** Switching Regulator and General Purpose

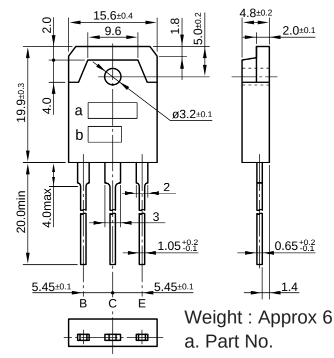
■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	500	V
V_{CEO}	400	V
V_{EBO}	10	V
I_C	12(Pulse24)	A
I_B	4	A
P_C	100(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=500V	100max	μA
I_{EBO}	V_{EB}=10V	100max	μA
$V_{(BR)CEO}$	I_C=25mA	400min	V
h_{FE}	V_{CE}=4V, I_C=7A	10to30	
$V_{CE(sat)}$	I_C=7A, I_B=1.4A	0.5max	V
$V_{BE(sat)}$	I_C=7A, I_B=1.4A	1.3max	V
f_T	V_{CE}=12V, I_E=–1A	10typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	105typ	pF

External Dimensions MT-100(TO3P)

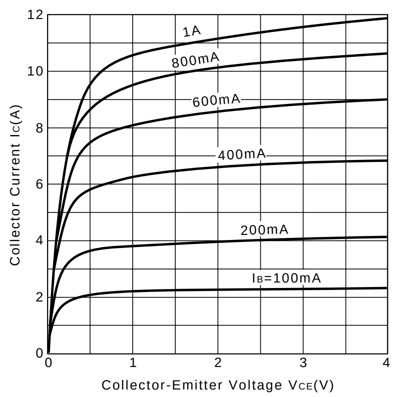


Weight : Approx 6.0g
a. Part No.
b. Lot No.

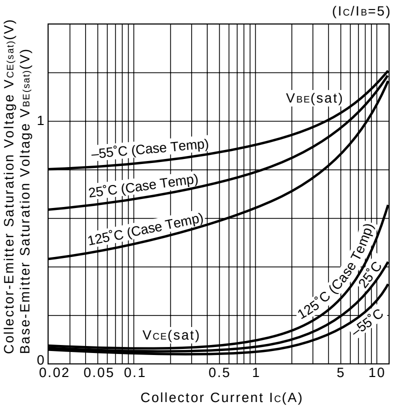
■Typical Switching Characteristics (Common Emitter)

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
200	28.5	7	10	–5	0.7	–1.4	1.0max	3.0max	0.5max

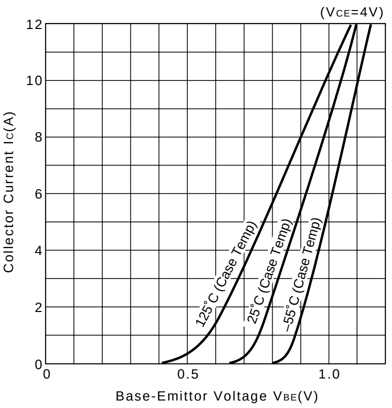
I_C–V_{CE} Characteristics (Typical)



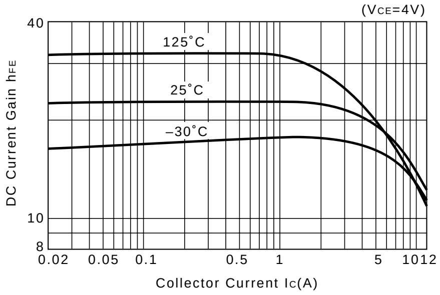
$V_{CE}(sat)$,$V_{BE}(sat)$–I_C Temperature Characteristics (Typical)



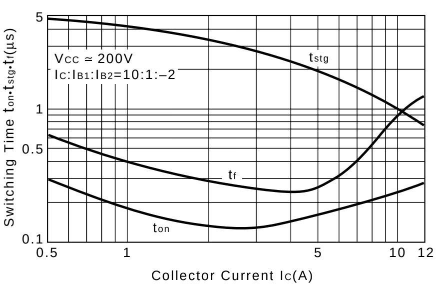
I_C–V_{BE} Temperature Characteristics (Typical)



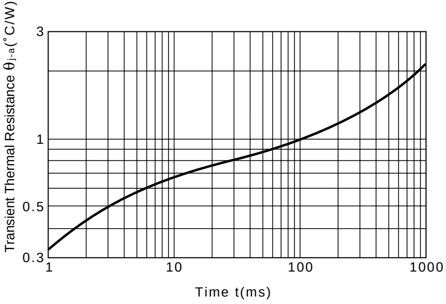
h_{FE}–I_C Characteristics (Typical)



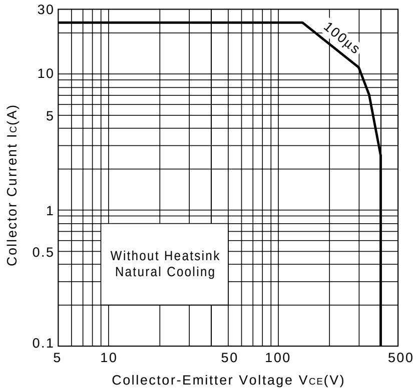
t_{on}•t_{stg}•t_f–I_C Characteristics (Typical)



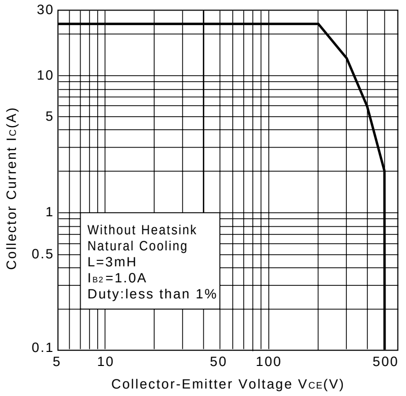
θ_{j-a}–t Characteristics



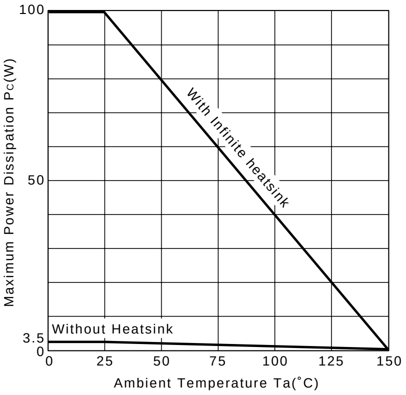
Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



P_C–Ta Derating



2SC5099

Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SA1907)

Application : Audio and General Purpose

■Absolute maximum ratings (Ta=25°C)

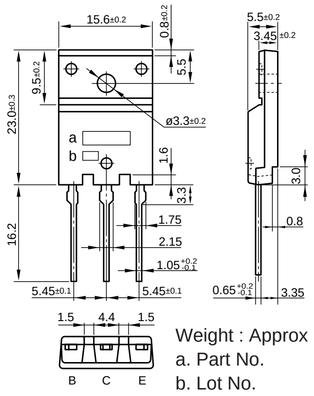
Symbol	Ratings	Unit
V_{CBO}	120	V
V_{CEO}	80	V
V_{EBO}	6	V
I_C	6	A
I_B	3	A
P_C	60(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=120V	10max	μA
I_{EBO}	V_{EB}=6V	10max	μA
$V_{(BR)CEO}$	I_C=50mA	80min	V
h_{FE}	V_{CE}=4V, I_C=2A	50min*	
$V_{CE(sat)}$	I_C=2A, I_B=0.2A	0.5max	V
f_T	V_{CE}=12V, I_E=–0.5A	20typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	110typ	pF

*h_{FE} Rank O(50to100), P(70to140), Y(90to180)

External Dimensions FM100(TO3PF)

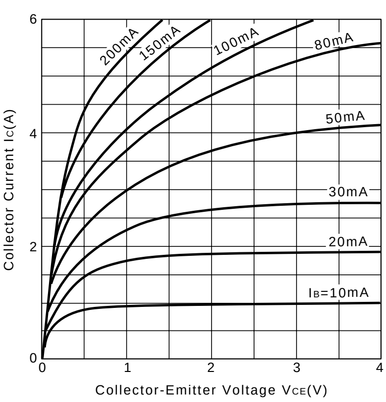


Weight : Approx 6.5g
a. Part No.
b. Lot No.

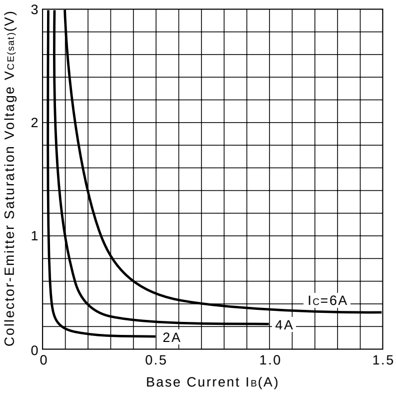
■Typical Switching Characteristics (Common Emitter)

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
30	10	3	10	–5	0.3	–0.3	0.16typ	2.60typ	0.34typ

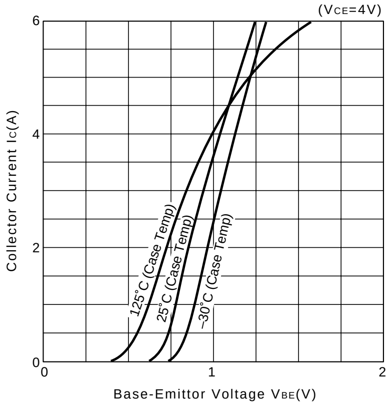
I_C–V_{CE} Characteristics (Typical)



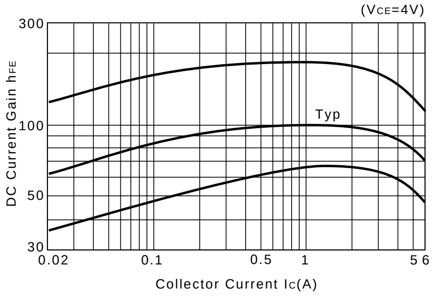
$V_{CE(sat)}$–I_B Characteristics (Typical)



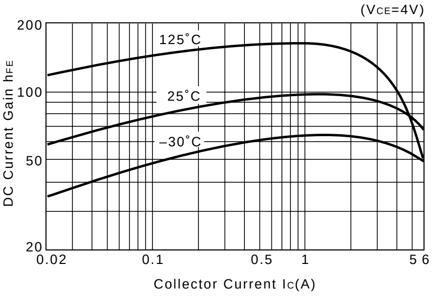
I_C–V_{BE} Temperature Characteristics (Typical)



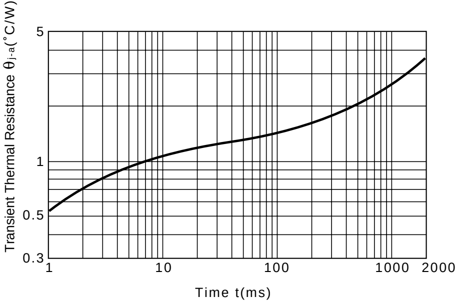
h_{FE}–I_C Characteristics (Typical)



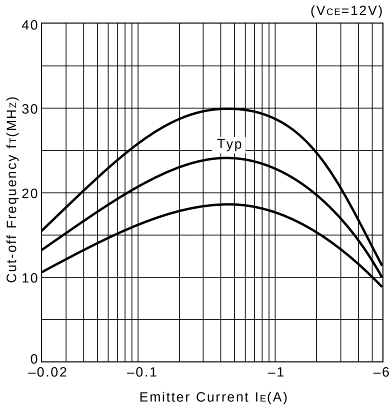
h_{FE}–I_C Temperature Characteristics (Typical)



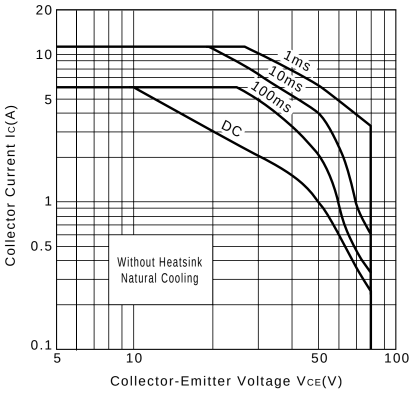
θ_{j-a}–t Characteristics



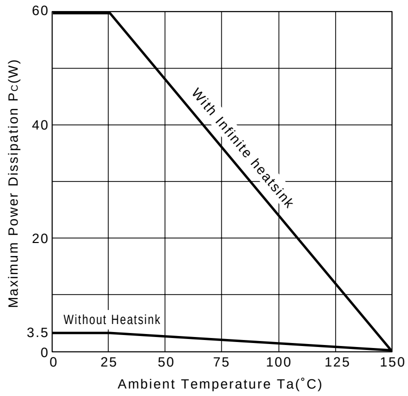
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C–Ta Derating



2SC5100

Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SA1908)

Application : Audio and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	160	V
V_{CEO}	120	V
V_{EBO}	6	V
I_C	8	A
I_B	3	A
P_C	75(T_C=25°C)	W
T_j	150	°C
T_{stg}	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

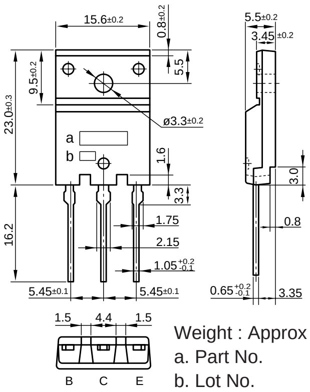
Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=160V	10max	μA
I_{EBO}	V_{EB}=6V	10max	μA
$V_{(BR)CEO}$	I_C=50mA	120min	V
h_{FE}	V_{CE}=4V, I_C=3A	50min*	
V_{CE}(sat)	I_C=3A, I_B=0.3A	0.5max	V
f_T	V_{CE}=12V, I_E=–0.5A	20typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	200typ	pF

*h_{FE} Rank $\overline{O}$(50to100), P(70to140), Y(90to180)

■Typical Switching Characteristics (Common Emitter)

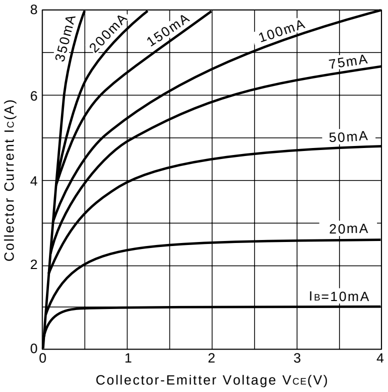
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
40	10	4	10	–5	0.4	–0.4	0.13typ	3.50typ	0.32typ

External Dimensions FM100(TO3PF)

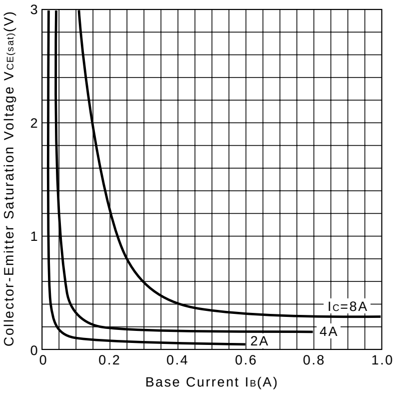


Weight : Approx 6.5g
a. Part No.
b. Lot No.

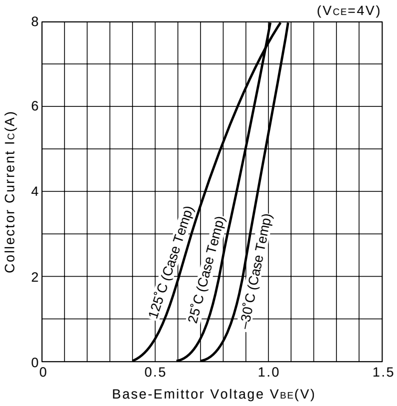
I_C–V_{CE} Characteristics (Typical)



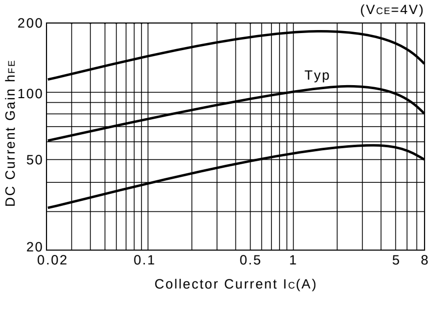
V_{CE}(sat)–I_B Characteristics (Typical)



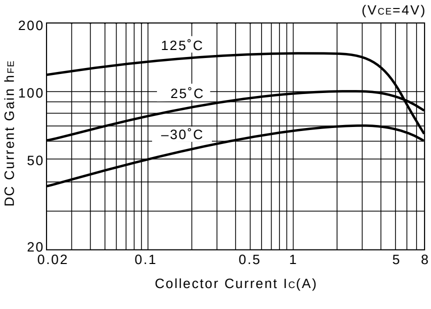
I_C–V_{BE} Temperature Characteristics (Typical)



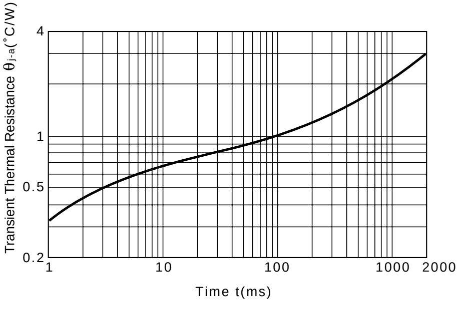
h_{FE}–I_C Characteristics (Typical)



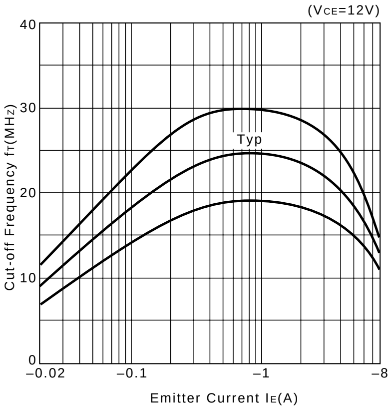
h_{FE}–I_C Temperature Characteristics (Typical)



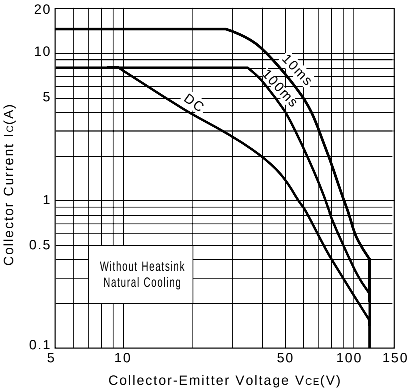
$\theta_{j\text{-}a}$–t Characteristics



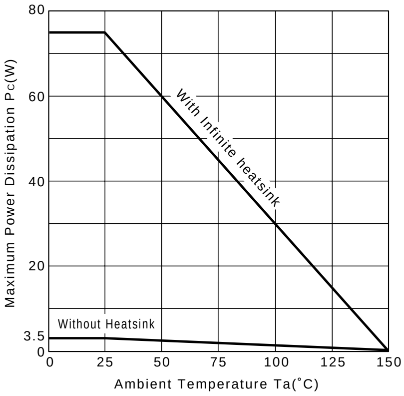
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C–Ta Derating



2SC5101

Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SA1909)

Application : Audio and General Purpose

■Absolute maximum ratings (Ta=25°C)

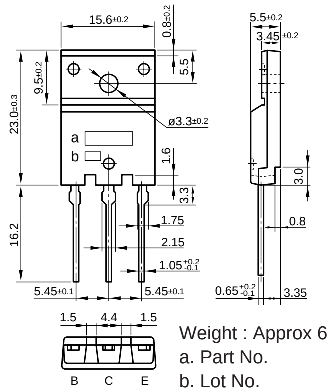
Symbol	Ratings	Unit
V_{CBO}	200	V
V_{CEO}	140	V
V_{EBO}	6	V
I_C	10	A
I_B	4	A
P_C	80(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=200V	10max	μA
I_{EBO}	V_{EB}=6V	10max	μA
$V_{(BR)CEO}$	I_C=50mA	140min	V
h_{FE}	V_{CE}=4V, I_C=3A	50min*	
V_{CE}(sat)	I_C=5A, I_B=0.5A	0.5max	V
f_T	V_{CE}=12V, I_E=–0.5A	20typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	250typ	pF

*h_{FE} Rank $\overline{\text{O}}$(50 to 100), P(70 to 140), Y(90 to 180)

External Dimensions FM100(TO3PF)

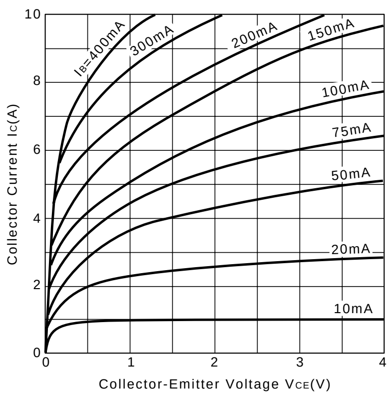


Weight : Approx 6.5g
a. Part No.
b. Lot No.

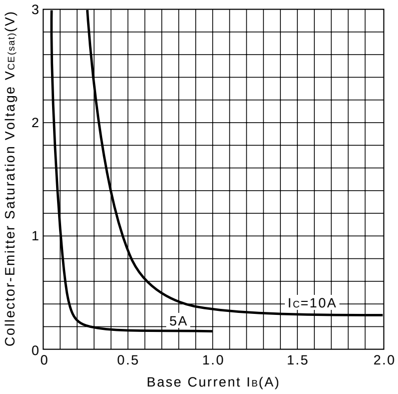
■Typical Switching Characteristics (Common Emitter)

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
60	12	5	10	–5	0.5	–0.5	0.24typ	4.32typ	0.40typ

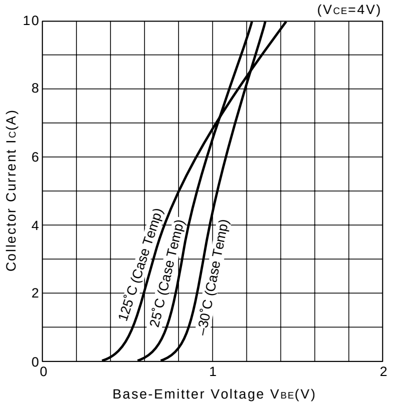
I_C–V_{CE} Characteristics (Typical)



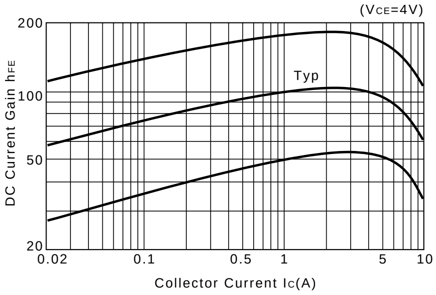
$V_{CE(sat)}$–I_B Characteristics (Typical)



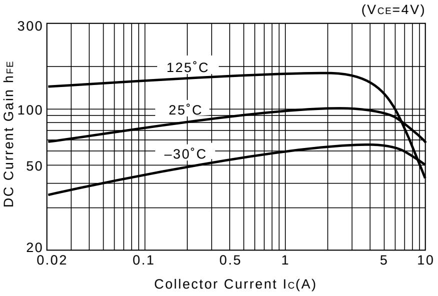
I_C–V_{BE} Temperature Characteristics (Typical)



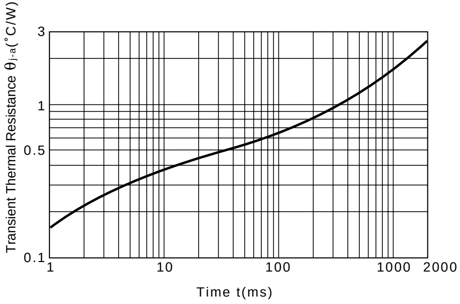
h_{FE}–I_C Characteristics (Typical)



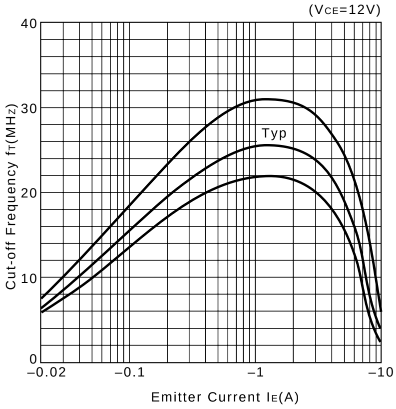
h_{FE}–I_C Temperature Characteristics (Typical)



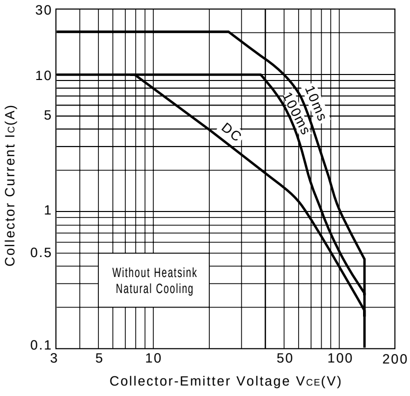
θ_{j-a}–t Characteristics



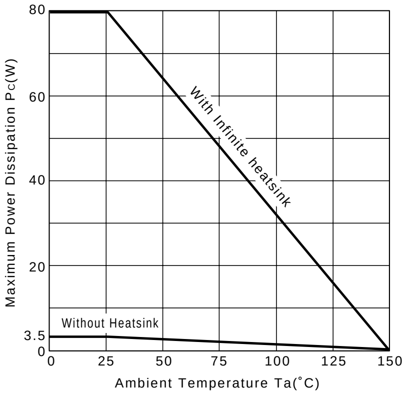
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C–Ta Derating



2SC5124

Silicon NPN Triple Diffused Planar Transistor (High Voltage Switchihg Transistor)

Application : Display Horizontal Deflection Output, Switching Regulator and General Purpose

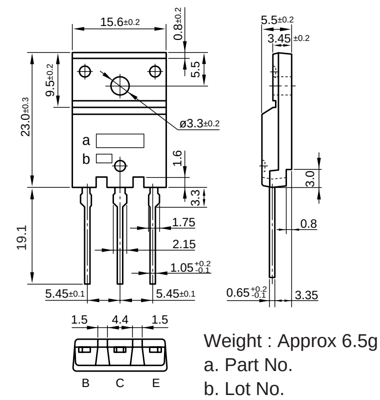
■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	1500	V
V_{CEO}	800	V
V_{EBO}	6	V
I_C	10(Pulse20)	A
I_B	5	A
P_C	100(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO1}	V_{CB}=1200V	100max	µA
I_{CBO2}	V_{CB}=1500V	1max	mA
I_{EBO}	V_{EB}=6V	100max	µA
$V_{(BR)CEO}$	I_C=10mA	800min	V
h_{FE1}	V_{CE}=5V, I_C=1A	8min	
h_{FE2}	V_{CE}=5V, I_C=8A	4to9	
$V_{CE(sat)}$	I_C=8A, I_B=2A	5max	V
$V_{BE(sat)}$	I_C=8A, I_B=2A	1.5max	V
f_T	V_{CE}=12V, I_E=–1A	3typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	130typ	pF

External Dimensions FM100(TO3PF)

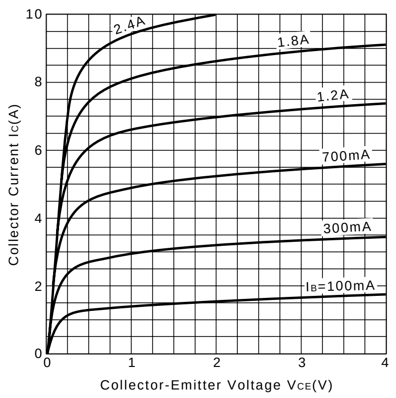


Weight : Approx 6.5g
a. Part No.
b. Lot No.

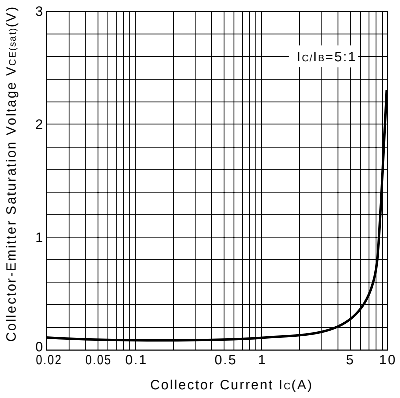
■Typical Switching Characteristics (Common Emitter)

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (µs)	tstg (µs)	tf (µs)
200	33.3	6	10	–5	1.2	–2.4	0.1typ	4.0typ	0.2typ

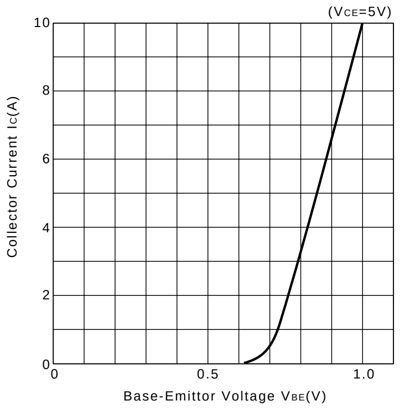
I_C–V_{CE} Characteristics (Typical)



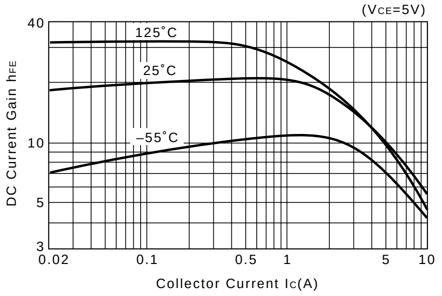
V_{CE}(sat)–I_C Characteristics (Typical)



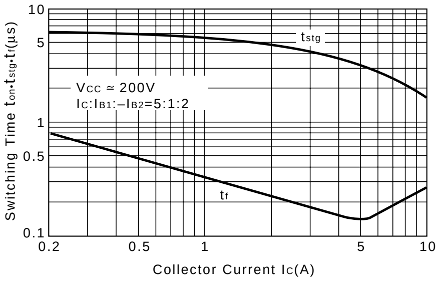
I_C–V_{BE} Temperature Characteristics (Typical)



h_{FE}–I_C Characteristics (Typical)

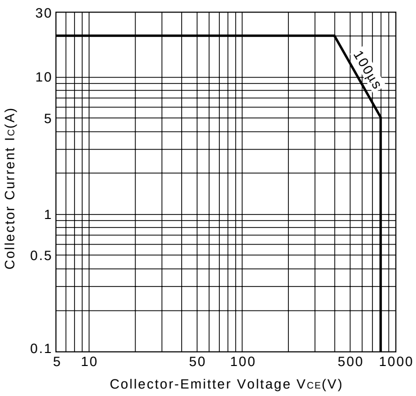


t_{stg}•t_f–I_C Characteristics (Typical)

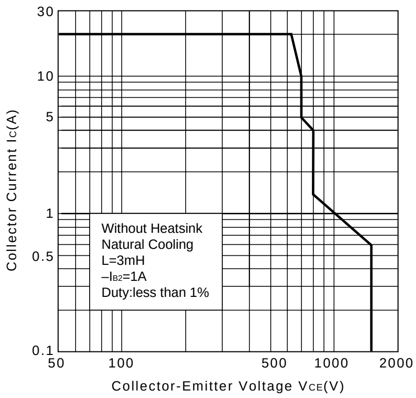


θj-a–t Characteristics

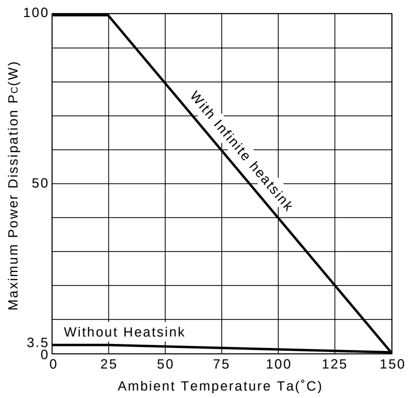
Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



Pc–Ta Derating



2SC5130

Silicon NPN Triple Diffused Planar Transistor (High Voltage and High Speed Switchihg Transistor)

Application : Switching Regulator and General Purpose

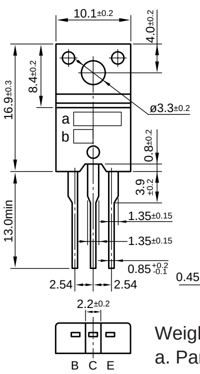
■**Absolute maximum ratings** (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	600	V
V_{CEO}	400	V
V_{EBO}	10	V
I_C	5(Pulse10)	A
I_B	2	A
P_C	30(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=500V	100max	μA
I_{EBO}	V_{EB}=10V	10max	μA
$V_{(BR)CEO}$	I_C=25mA	400min	V
h_{FE}	V_{CE}=4V, I_C=1.5A	10to30	
$V_{CE(sat)}$	I_C=1.5A, I_B=0.3A	0.5max	V
$V_{BE(sat)}$	I_C=1.5A, I_B=0.3A	1.3max	V
f_T	V_{CE}=12V, I_E=–0.3A	20typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	30typ	pF

External Dimensions FM20(TO220F)

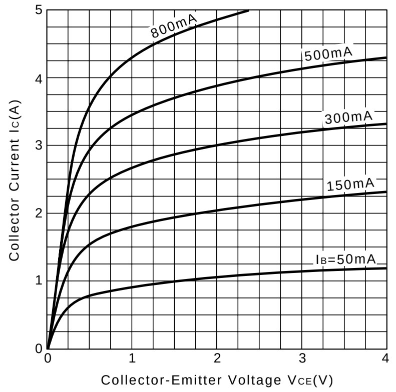


Weight : Approx 2.0g
a. Part No.
b. Lot No.

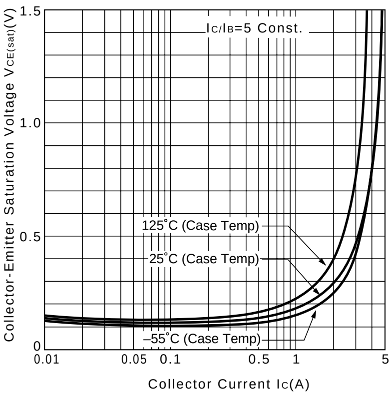
■**Typical Switching Characteristics (Common Emitter)**

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
200	133	1.5	10	–5	0.15	–0.3	1max	2max	0.3max

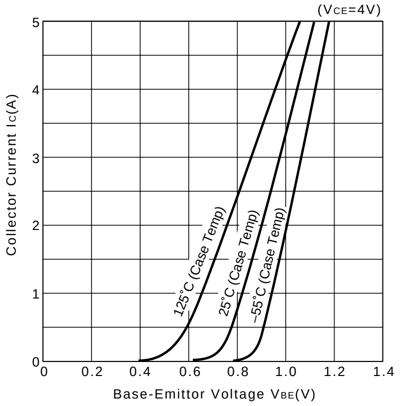
I_C–V_{CE} Characteristics (Typical)



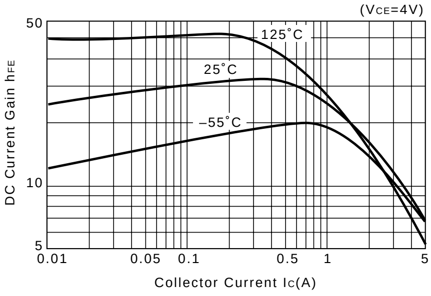
$V_{CE(sat)}$–I_C Characteristics (Typical)



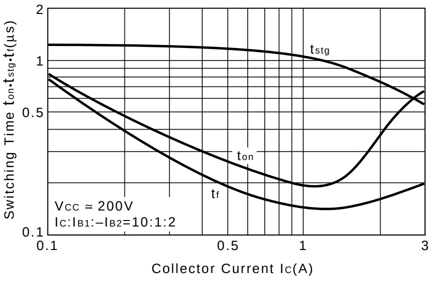
I_C–V_{BE} Temperature Characteristics (Typical)



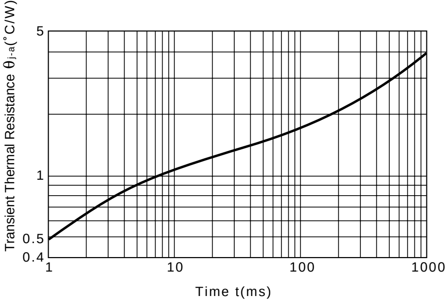
h_{FE}–I_C Characteristics (Typical)



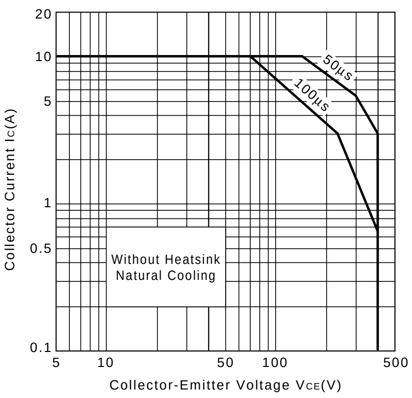
t_{on}•t_{stg}•t_f–I_C Characteristics (Typical)



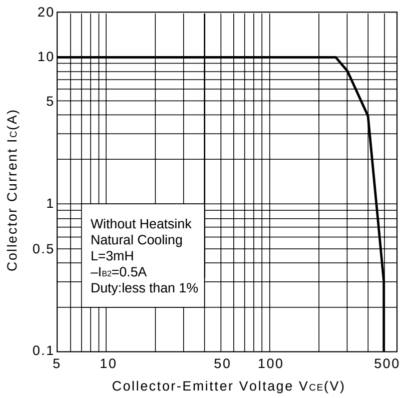
$\theta_{j\text{-}a}$–t Characteristics



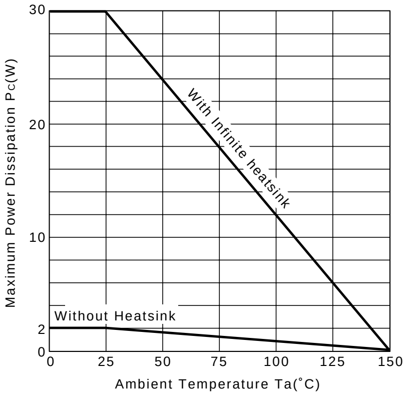
Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



P_C–Ta Derating



2SC5239

Silicon NPN Triple Diffused Planar Transistor (High Voltage Switchihg Transistor)

Application : Switching Regulator and General Purpose

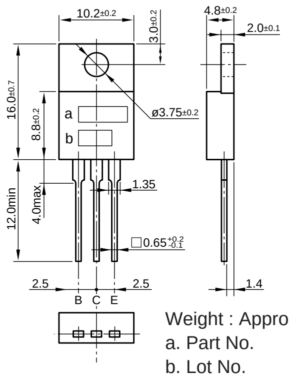
■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	900	V
V_{CEO}	550	V
V_{EBO}	7	V
I_C	3(Pulse6)	A
I_B	1.5	A
P_C	50(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=800V	100max	μA
I_{EBO}	V_{EB}=7V	100max	μA
$V_{(BR)CEO}$	I_C=10mA	550min	V
h_{FE}	V_{CE}=4V, I_C=1A	10 to 30	
V_{CE}(sat)	I_C=1A, I_B=0.2A	0.5max	V
V_{BE}(sat)	I_C=1A, I_B=0.2A	1.2max	V
f_T	V_{CE}=12V, I_E=–0.25A	6typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	35typ	pF

External Dimensions MT-25(TO220)

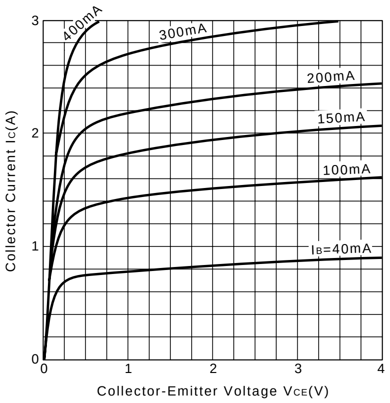


Weight : Approx 2.6g
a. Part No.
b. Lot No.

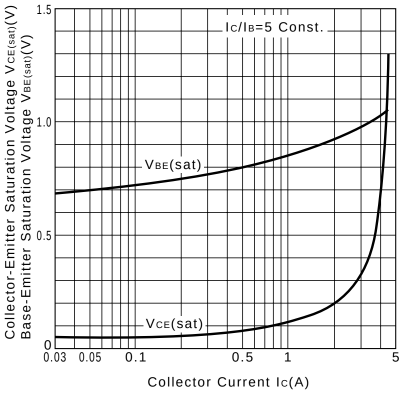
■Typical Switching Characteristics (Common Emitter)

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
250	250	1	10	–5	0.15	–0.45	0.7max	4.0max	0.5max

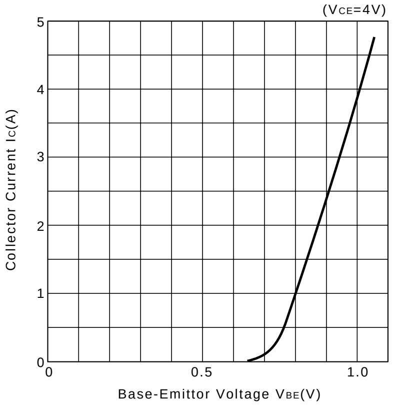
I_C–V_{CE} Characteristics (Typical)



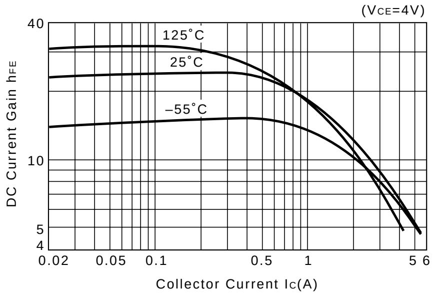
V_{CE}(sat),V_{BE}(sat)–I_C Temperature Characteristics (Typical)



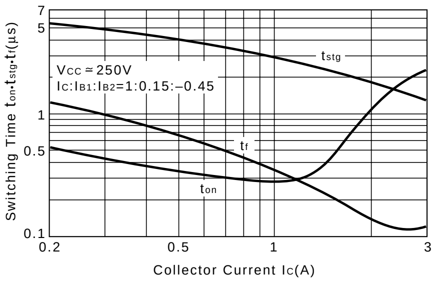
I_C–V_{BE} Temperature Characteristics (Typical)



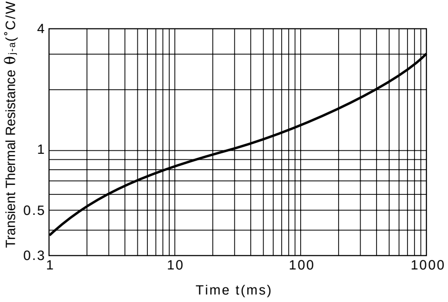
h_{FE}–I_C Characteristics (Typical)



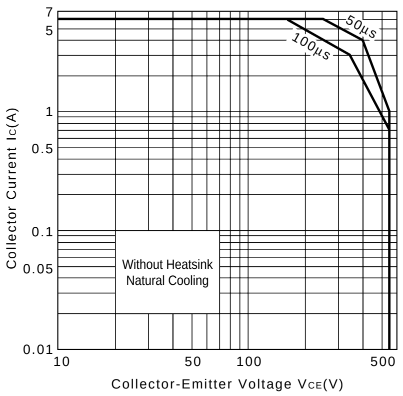
t_{on}•t_{stg}•t_f–I_C Characteristics (Typical)



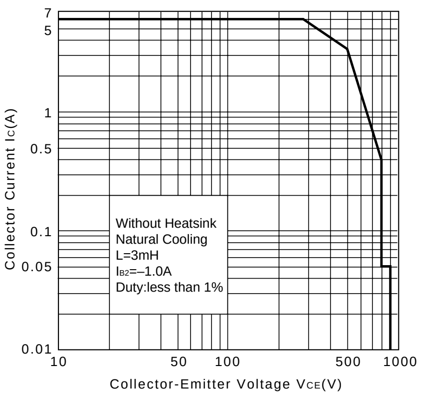
$\theta_{j\text{-}a}$–t Characteristics



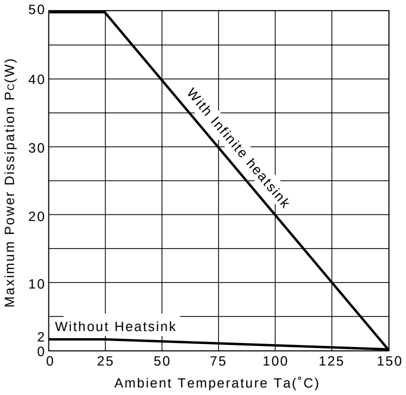
Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



P_C–Ta Derating



2SC5249

Silicon NPN Triple Diffused Planar Transistor (High Voltage Switchihg Transistor)

Application : Switching Regulator and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	600	V
V_{CEO}	600	V
V_{EBO}	7	V
I_C	3(Pulse6)	A
I_B	1.5	A
P_C	35(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

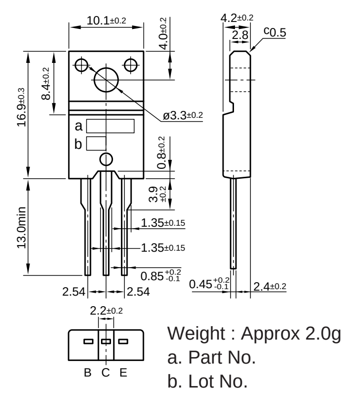
■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=600V	100max	μA
I_{EBO}	V_{EB}=7V	100max	μA
$V_{(BR)CEO}$	I_C=10mA	600min	V
h_{FE}	V_{CE}=4V, I_C=1A	20 to 40	
V_{CE}(sat)	I_C=1A, I_B=0.2A	0.5max	V
V_{BE}(sat)	I_C=1A, I_B=0.2A	1.2max	V
f_T	V_{CE}=12V, I_E=–0.3A	6typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	50typ	pF

■Typical Switching Characteristics (Common Emitter)

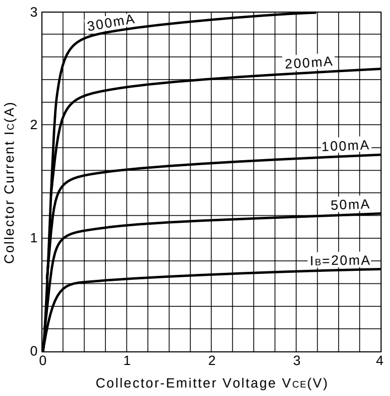
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
200	200	1	10	–5	0.1	–0.1	1.0max	19max	1.0max

External Dimensions FM20(TO220F)

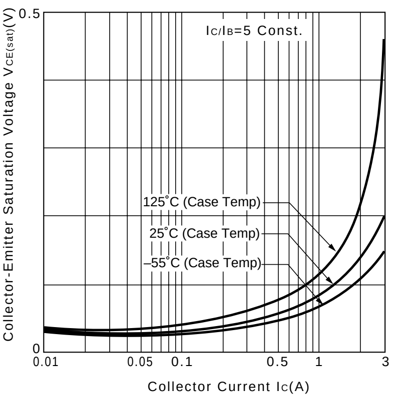


Weight : Approx 2.0g
a. Part No.
b. Lot No.

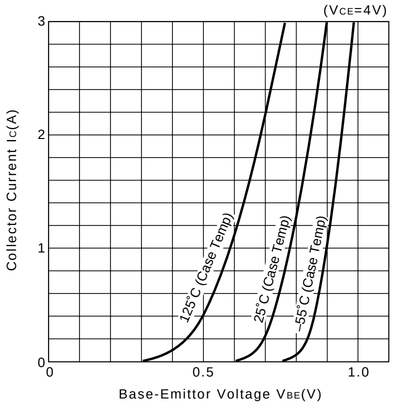
I_C−V_{CE} Characteristics (Typical)



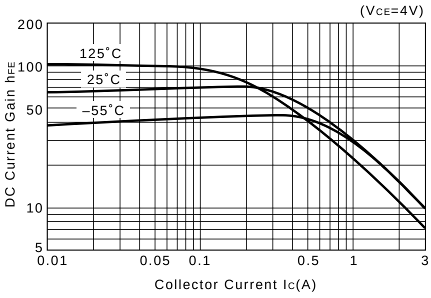
V_{CE}(sat)−I_C Characteristics (Typical)



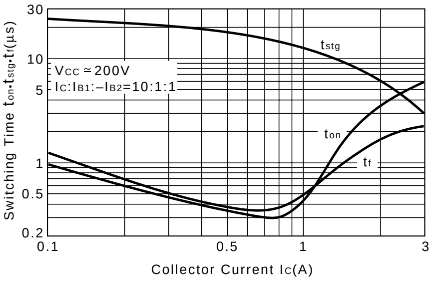
I_C−V_{BE} Temperature Characteristics (Typical)



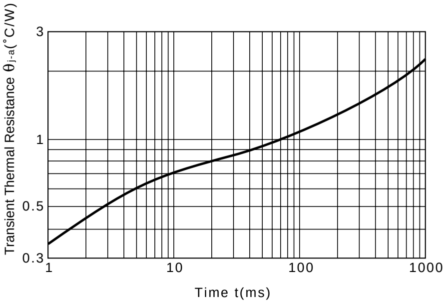
h_{FE}−I_C Characteristics (Typical)



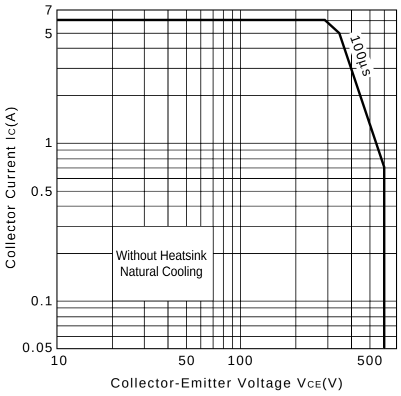
t_{on}•t_{stg}•t_f−I_C Characteristics (Typical)



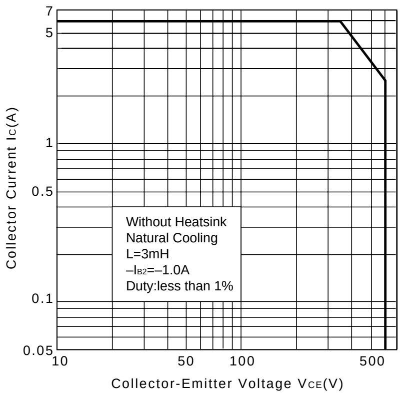
$\theta_{j\text{-}a}$−t Characteristics



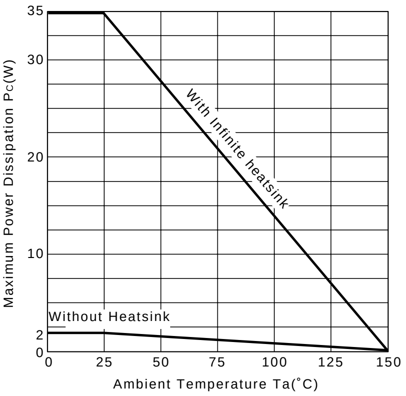
Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



P_C−Ta Derating



2SC5271

Silicon NPN Triple Diffused Planar Transistor

Application : Resonant Switching Regulator and General Purpose

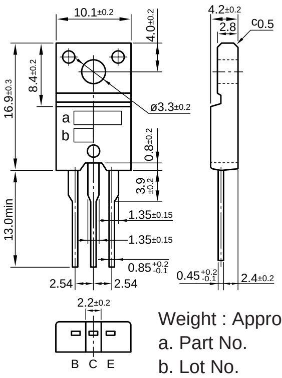
■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	300	V
V_{CEO}	200	V
V_{EBO}	7	V
I_C	5(Pulse10)	A
I_B	2	A
P_C	30(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=300V	100max	μA
I_{EBO}	V_{EB}=7V	100max	μA
$V_{(BR)CEO}$	I_C=10mA	200min	V
h_{FE1}	V_{CE}=2V, I_C=2.5A	10 to 30	
h_{FE2}	V_{CE}=2V, I_C=1mA	15min	
V_{CE}(sat)	I_C=2.5A, I_B=0.5A	1.0max	V
V_{BE}(sat)	I_C=2.5A, I_B=0.5A	1.5max	V
f_T	V_{CE}=12V, I_E=–0.5A	10typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	45typ	pF

External Dimensions FM20(TO220F)



Weight : Approx 2.0g
a. Part No.
b. Lot No.

■Typical Switching Characteristics (Common Emitter)

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
150	60	2.5	10	–5	0.5	–1.0	0.3max	1.0max	0.1max

2SC5287

Silicon NPN Triple Diffused Planar Transistor (High Voltage Switchihg Transistor)

Application : Switching Regulator and General Purpose

■**Absolute maximum ratings** (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	900	V
V_{CEO}	550	V
V_{EBO}	7	V
I_C	5(Pulse10)	A
I_B	2.5	A
P_C	80(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

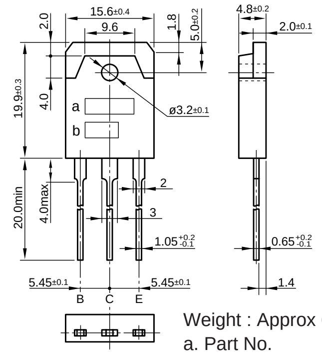
■**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=800V	100max	μA
I_{EBO}	V_{EB}=7V	100max	μA
$V_{(BR)CEO}$	I_C=10mA	550min	V
h_{FE}	V_{CE}=4V, I_C=1.8A	10to25	
V_{CE}(sat)	I_C=1.8A, I_B=0.36A	0.5max	V
V_{BE}(sat)	I_C=1.8A, I_B=0.36A	1.2max	V
f_T	V_{CE}=12V, I_E=–0.35A	6typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	50typ	pF

■**Typical Switching Characteristics (Common Emitter)**

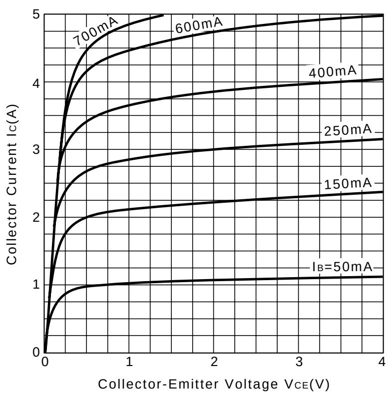
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (A)	I_{B2} (A)	ton (μs)	tstg (μs)	tf (μs)
250	139	1.8	10	–5	0.27	–0.9	0.7max	4.0max	0.5max

External Dimensions MT-100(TO3P)

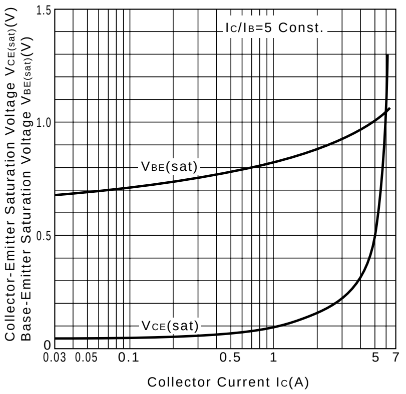


Weight : Approx 6.0g
a. Part No.
b. Lot No.

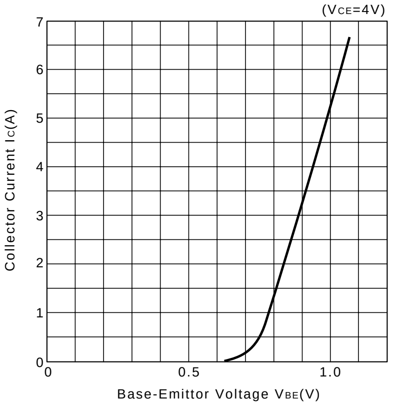
Ic–Vce Characteristics (Typical)



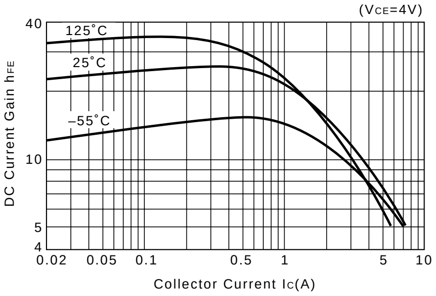
Vce(sat),Vbe(sat)–Ic Temperature Characteristics (Typical)



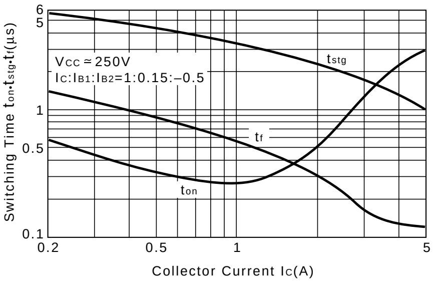
Ic–Vbe Temperature Characteristics (Typical)



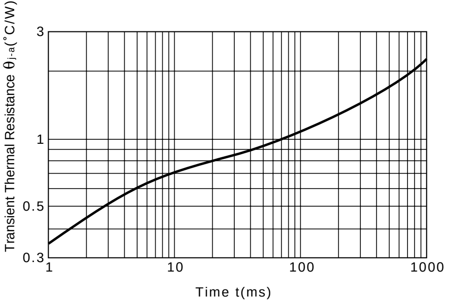
hfe–Ic Characteristics (Typical)



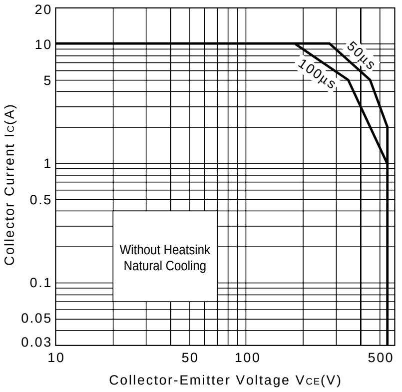
ton•tstg•tf–Ic Characteristics (Typical)



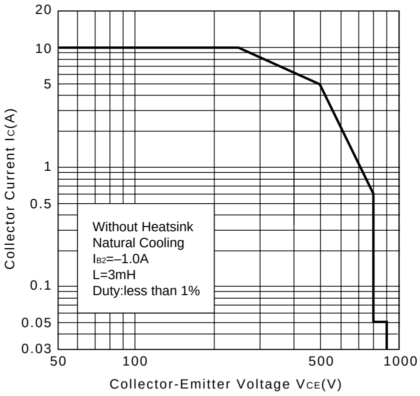
θj-a–t Characteristics



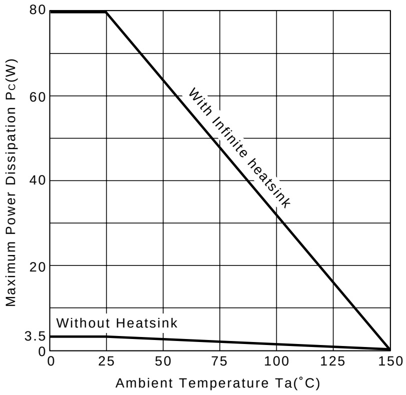
Safe Operating Area (Single Pulse)



Reverse Bias Safe Operating Area



Pc–Ta Derating



2SC5333

Silicon NPN Triple Diffused Planar Transistor

Application : Series Regulator, Switch, and General Purpose

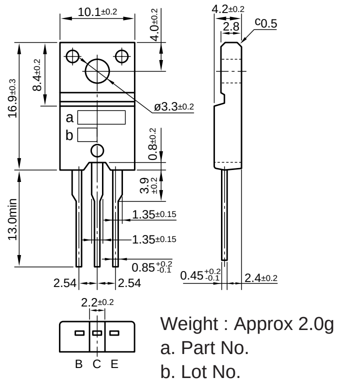
■**Absolute maximum ratings** (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	300	V
V_{CEO}	300	V
V_{EBO}	6	V
I_C	2	A
I_B	0.2	A
P_C	35(Tc=25°C)	W
T_j	150	°C
T_{stg}	–55to+150	°C

■**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=300V	1.0max	mA
I_{EBO}	V_{EB}=6V	1.0max	mA
$V_{(BR)CEO}$	I_C=25mA	300min	V
h_{FE}	V_{CE}=4V, I_C=0.5A	30min	
$V_{CE(sat)}$	I_C=1.0A, I_B=0.2A	1.0max	V
f_T	V_{CE}=12V, I_E=–0.2A	10typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	75typ	pF

External Dimensions FM20(TO220F)

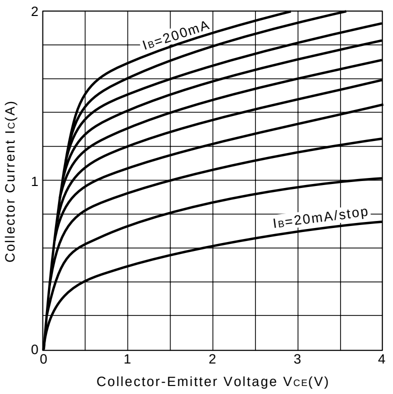


Weight : Approx 2.0g
a. Part No.
b. Lot No.

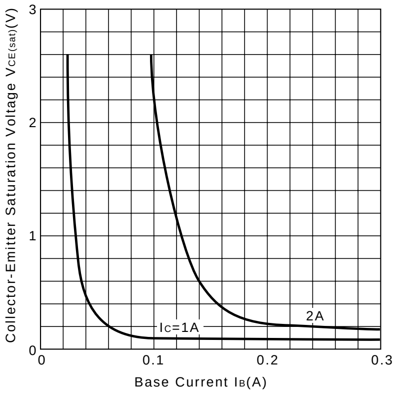
■**Typical Switching Characteristics (Common Emitter)**

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{B2} (V)	I_{B1} (A)	I_{B2} (A)	ton (µs)	tstg (µs)	tf (µs)
100	100	1.0	–5	0.1	–0.2	0.3typ	4.0typ	1.0typ

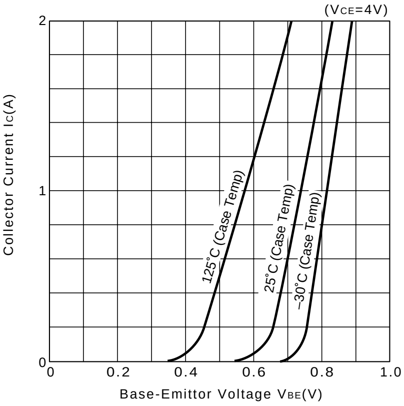
I_C−V_{CE} Characteristics (Typical)



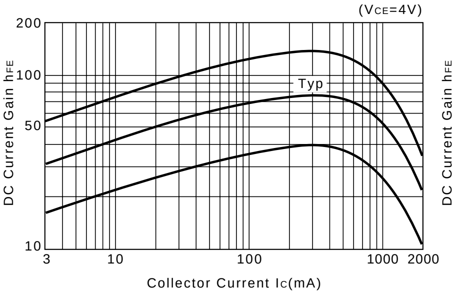
$V_{CE(sat)}$−I_B Characteristics (Typical)



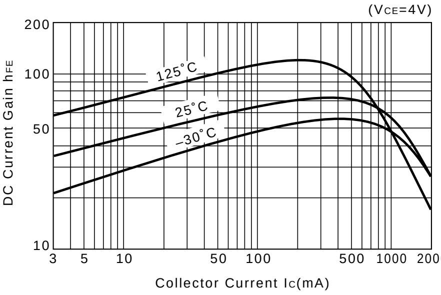
I_C−V_{BE} Temperature Characteristics (Typical)



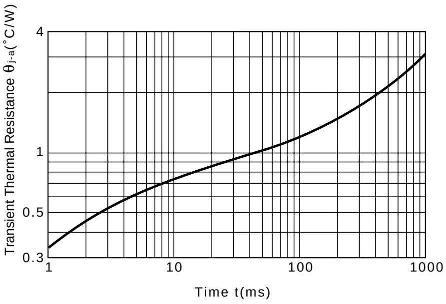
h_{FE}−I_C Characteristics (Typical)



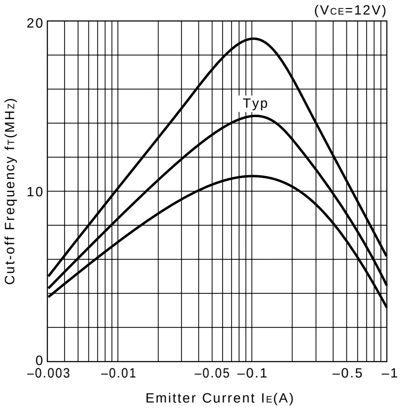
h_{FE}−I_C Temperature Characteristics (Typical)



θ_{j-a}−t Characteristics

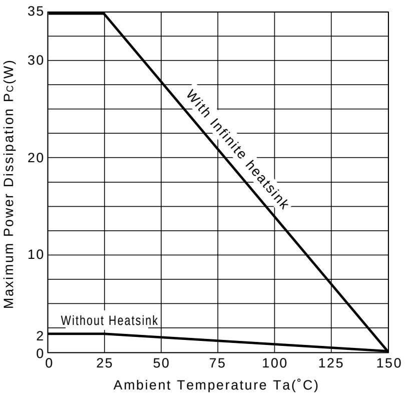


f_T−I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)

Pc−Ta Derating



2SC5370

Silicon NPN Epitaxial Planar Transistor

Application : Emergency Lighting Inverter and General Purpose

■**Absolute maximum ratings** (Ta=25°C)

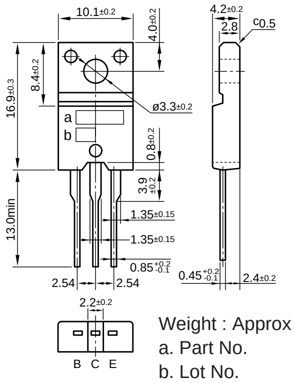
Symbol	Ratings	Unit
V_{CBO}	60	V
V_{CEO}	40	V
V_{EBO}	7	V
I_C	12	A
I_B	3	A
P_C	30(T_C=25°C)	W
T_j	150	°C
T_{stg}	–55to+150	°C

■**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=60V	10max	μA
I_{EBO}	V_{EB}=7V	10max	μA
$V_{(BR)CEO}$	I_C=25mA	40min	V
h_{FE}	V_{CE}=2V, I_C=6A	70min∗	
$V_{CE(sat)}$	I_C=6A, I_B=0.3A	0.3max	V
$V_{BE(sat)}$	I_C=6A, I_B=0.3A	1.2max	V
f_T	V_{CE}=12V, I_E=–3A	90typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	120typ	pF

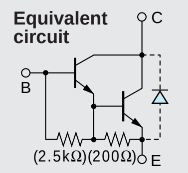
∗h_{FE} Rank $\overline{\text{O}}$(70to140), Y(120to240), G(200to400)

External Dimensions FM20(TO220F)



Weight : Approx 2.0g
a. Part No.
b. Lot No.

Darlington 2SD1769



Silicon NPN Triple Diffused Planar Transistor

Application : Driver for Solenoid, Relay and Motor, Series Regulator, and General Purpose

■**Absolute maximum ratings** (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	120	V
V_{CEO}	120	V
V_{EBO}	6	V
I_C	6(Pulse10)	A
I_B	1	A
P_C	50(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

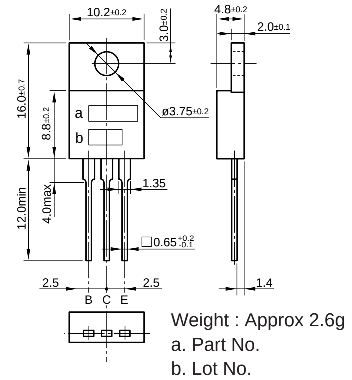
■**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=120V	10max	μA
I_{EBO}	V_{EB}=6V	20max	mA
$V_{(BR)CEO}$	I_C=10mA	120min	V
h_{FE}	V_{CE}=2V, I_C=3A	2000min	
$V_{CE(sat)}$	I_C=3A, I_B=3mA	1.5max	V
$V_{BE(sat)}$	I_C=3A, I_B=3mA	2.0max	V
f_T	V_{CE}=12V, I_E=–0.2A	100typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	typ	pF

■**Typical Switching Characteristics (Common Emitter)**

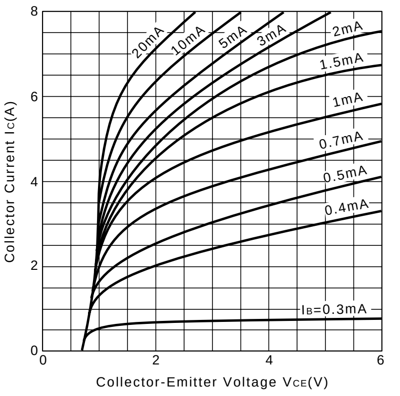
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (μs)	tstg (μs)	tf (μs)
30	10	3	10	–1.5	3	–3	0.5typ	5.5typ	1.5typ

External Dimensions MT-25(TO220)

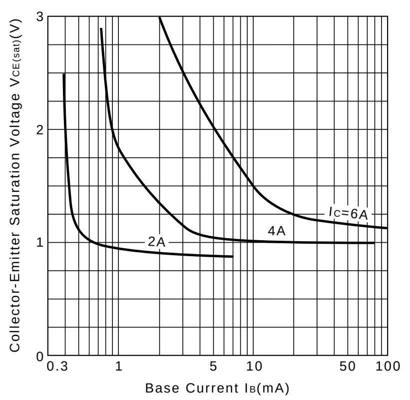


Weight : Approx 2.6g
a. Part No.
b. Lot No.

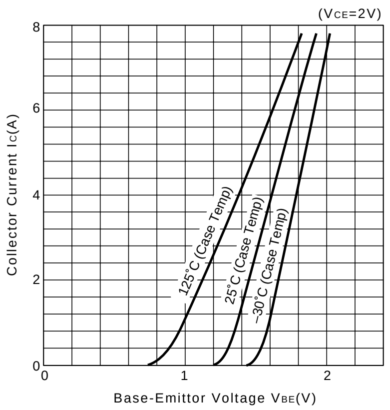
I_C–V_{CE} Characteristics (Typical)



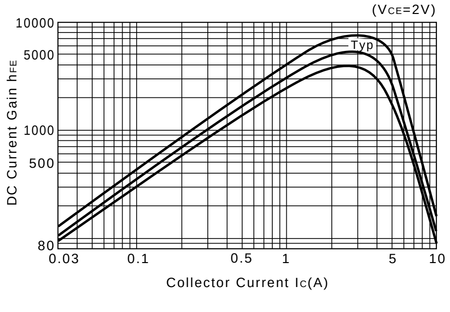
$V_{CE(sat)}$–I_B Characteristics (Typical)



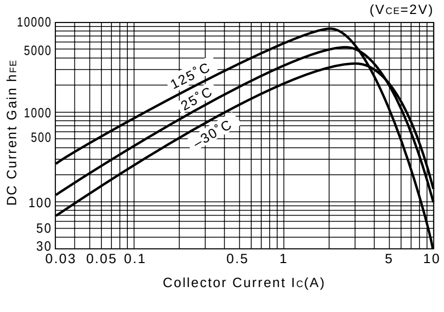
I_C–V_{BE} Temperature Characteristics (Typical)



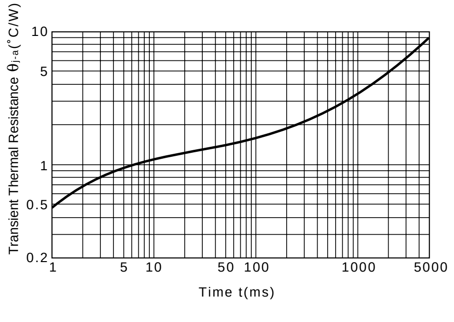
h_{FE}–I_C Characteristics (Typical)



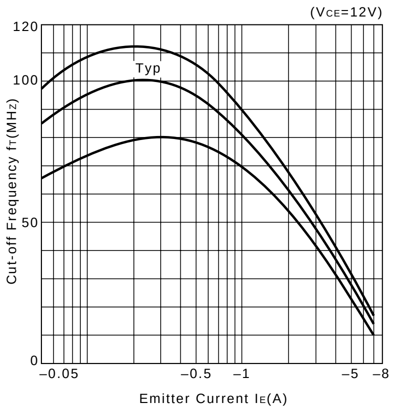
h_{FE}–I_C Temperature Characteristics (Typical)



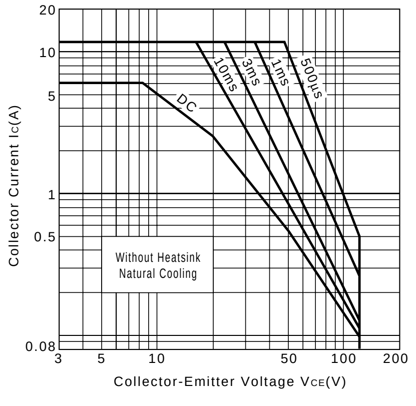
θ_{j-a}–t Characteristics



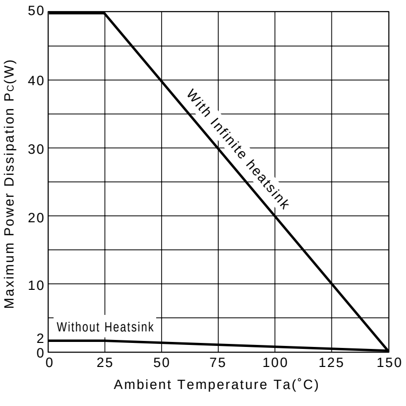
f_T–I_E Characteristics (Typical)



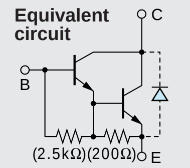
Safe Operating Area (Single Pulse)



P_C–Ta Derating



Darlington 2SD1785



Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SB1258)

Application : Driver for Solenoid, Relay and Motor, Series Regulator, and General Purpose

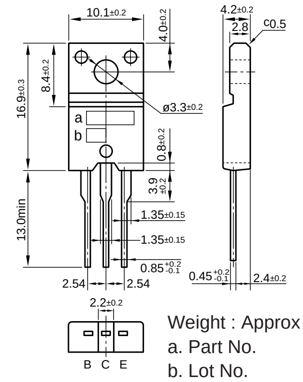
■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	120	V
V_{CEO}	120	V
V_{EBO}	6	V
I_C	6(Pulse10)	A
I_B	1	A
P_C	30(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=120V	10max	μA
I_{EBO}	V_{EB}=6V	10max	mA
$V_{(BR)CEO}$	I_C=10mA	120min	V
h_{FE}	V_{CE}=2V, I_C=3A	2000min	
$V_{CE(sat)}$	I_C=2A, I_B=3mA	1.5max	V
f_T	V_{CE}=12V, I_E=–0.1A	100typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	70typ	pF

External Dimensions FM20(TO220F)

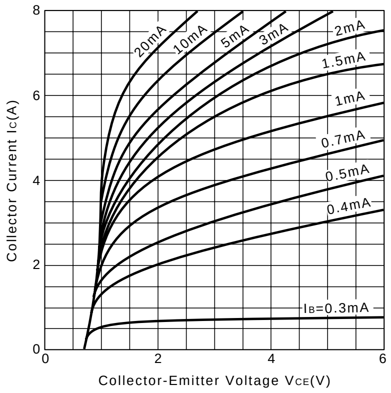


Weight : Approx 2.0g
a. Part No.
b. Lot No.

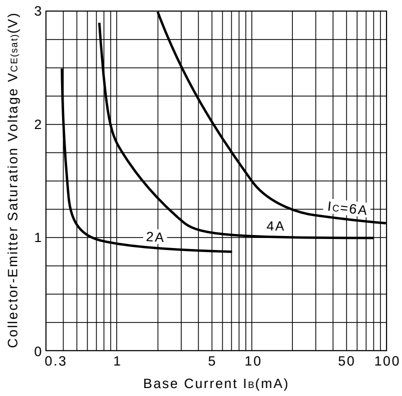
■Typical Switching Characteristics (Common Emitter)

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (μs)	tstg (μs)	tf (μs)
30	10	3	10	–1.5	3	–3	0.5typ	5.5typ	1.5typ

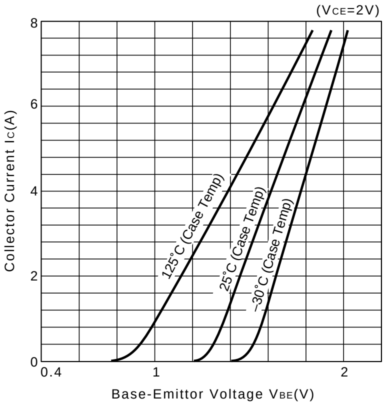
I_C–V_{CE} Characteristics (Typical)



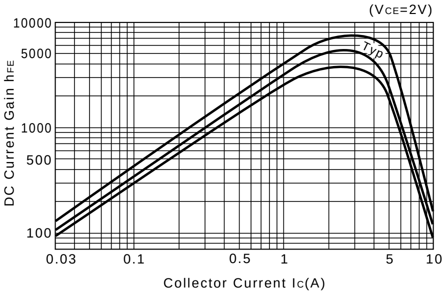
$V_{CE(sat)}$–I_B Characteristics (Typical)



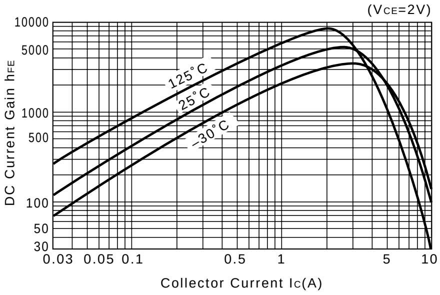
I_C–V_{BE} Temperature Characteristics (Typical)



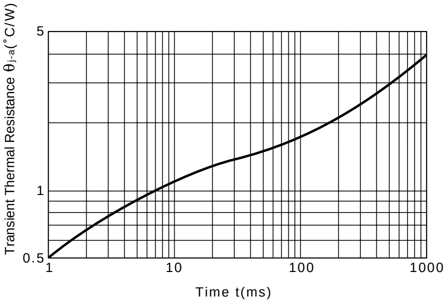
h_{FE}–I_C Characteristics (Typical)



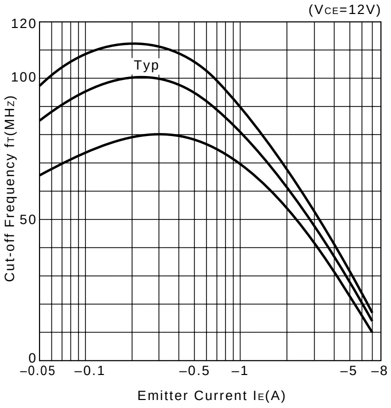
h_{FE}–I_C Temperature Characteristics (Typical)



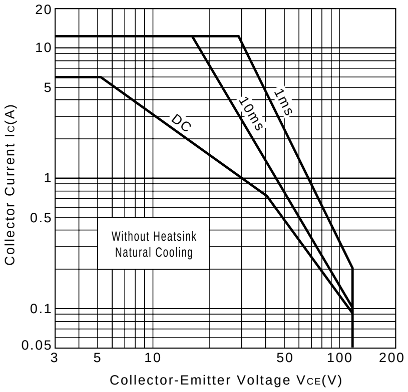
θ_{j-a}–t Characteristics



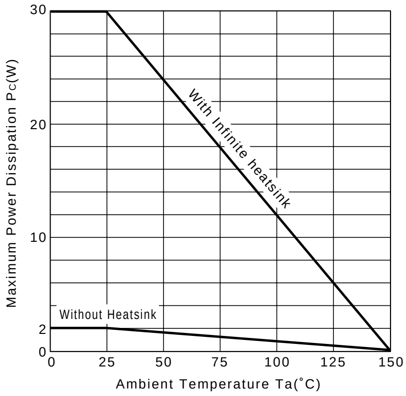
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



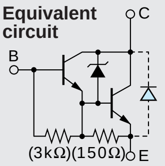
P_C–Ta Derating



Built-in Avalanche Diode for Surge Absorbing Darlington

2SD1796

Equivalent circuit



Silicon NPN Triple Diffused Planar Transistor

Application : Driver for Solenoid, Relay and Motor and General Purpose

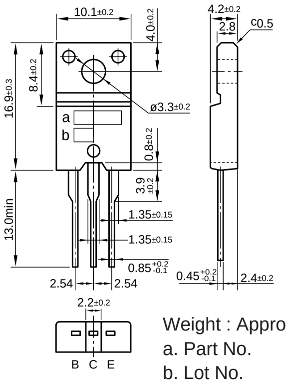
■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	60±10	V
V_{CEO}	60±10	V
V_{EBO}	6	V
I_C	4	A
I_B	0.5	A
P_C	25(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=50V	10max	µA
I_{EBO}	V_{EB}=6V	10max	mA
$V_{(BR)CEO}$	I_C=10mA	60±10	V
h_{FE}	V_{CE}=4V, I_C=3A	2000min	
$V_{CE(sat)}$	I_C=3A, I_B=10mA	1.5max	V
f_T	V_{CE}=12V, I_E=–0.2A	60typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	45 typ	pF

External Dimensions FM20(TO220F)

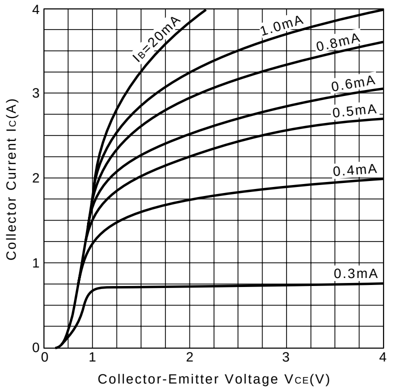


Weight : Approx 2.0g
a. Part No.
b. Lot No.

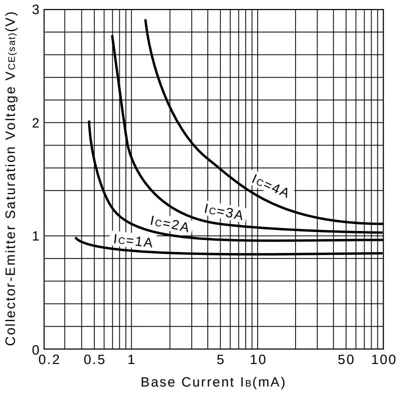
■Typical Switching Characteristics (Common Emitter)

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (µs)	tstg (µs)	tf (µs)
30	10	3	10	–5	10	–10	1.0typ	4.0typ	1.5typ

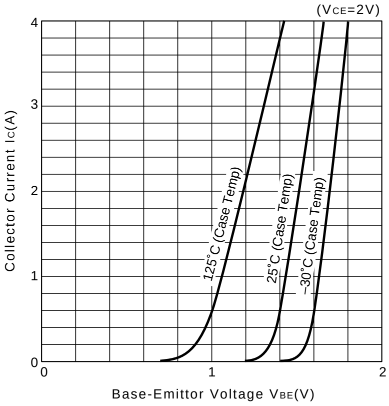
I_C–V_{CE} Characteristics (Typical)



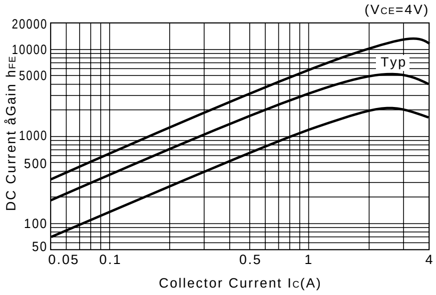
$V_{CE(sat)}$–I_B Characteristics (Typical)



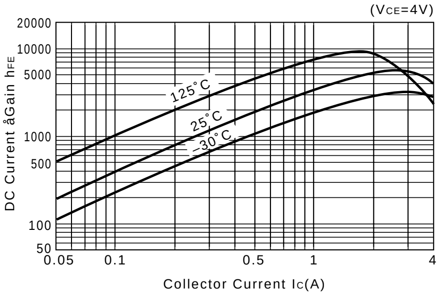
I_C–V_{BE} Temperature Characteristics (Typical)



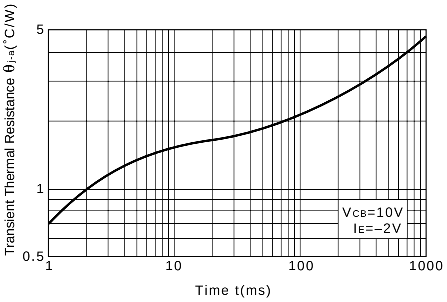
h_{FE}–I_C Characteristics (Typical)



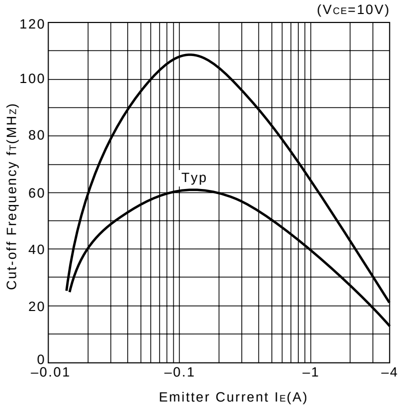
h_{FE}–I_C Temperature Characteristics (Typical)



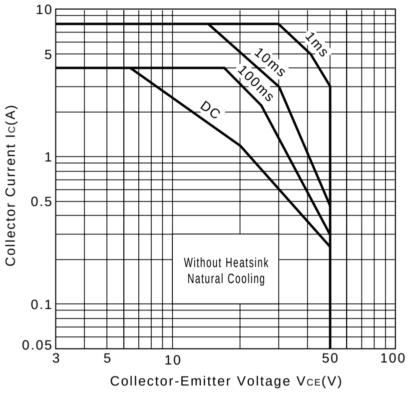
θ_{j-a}–t Characteristics



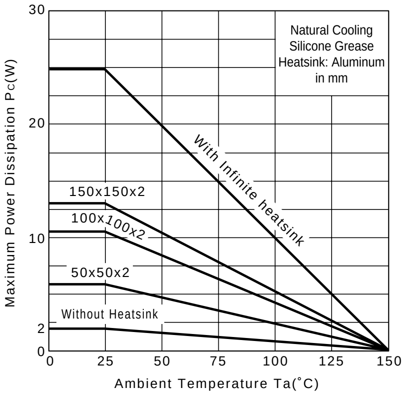
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)

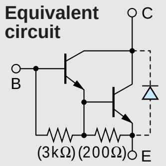


P_C–Ta Derating



Darlington 2SD2014

Equivalent circuit



Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SB1257)

Application : Driver for Solenoid, Relay and Motor, Series Regulator, and General Purpose

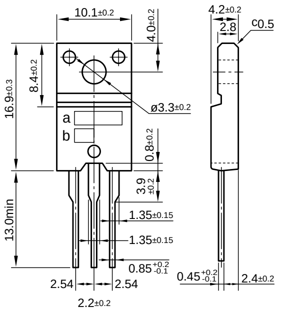
■**Absolute maximum ratings** (Ta=25°C)

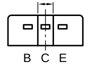
Symbol	Ratings	Unit
V_{CBO}	120	V
V_{CEO}	80	V
V_{EBO}	6	V
I_C	4	A
I_B	0.5	A
P_C	25(T_c=25°C)	W
T_j	150	°C
Tstg	–55 to +150	°C

■**Electrical Characteristics** (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=120V	10max	μA
I_{EBO}	V_{EB}=6V	10max	mA
$V_{(BR)CEO}$	I_C=10mA	80min	V
h_{FE}	V_{CE}=2V, I_C=3A	2000min	
V_{CE}(sat)	I_C=3A, I_B=3mA	1.5max	V
V_{BE}(sat)	I_C=3A, I_B=3mA	2.0max	V
f_T	V_{CE}=12V, I_E=–0.1A	75typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	45typ	pF

External Dimensions FM20(TO220F)



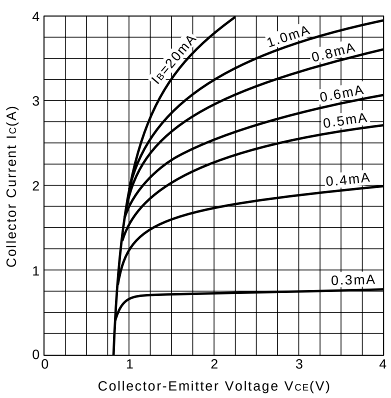


Weight : Approx 2.0g
a. Part No.
b. Lot No.

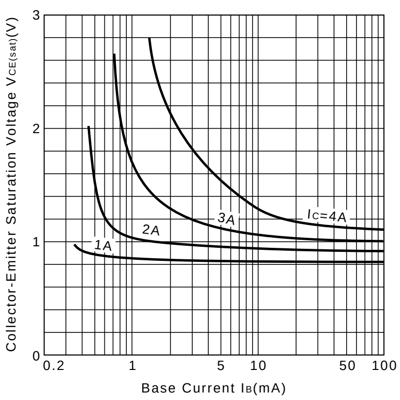
■**Typical Switching Characteristics (Common Emitter)**

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (μs)	tstg (μs)	tf (μs)
30	10	3	10	–5	10	–10	1.0typ	4.0typ	1.5typ

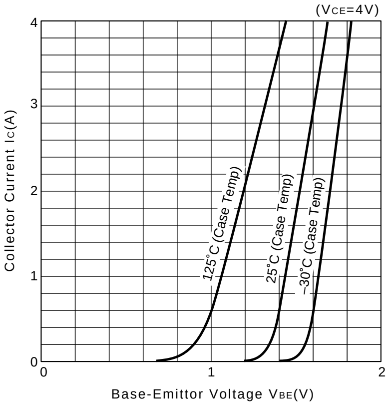
I_C–V_{CE} Characteristics (Typical)



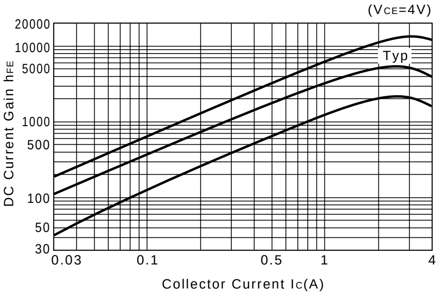
V_{CE}(sat)–I_B Characteristics (Typical)



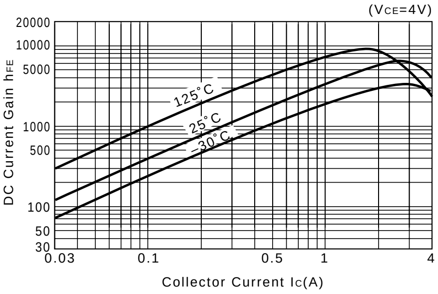
I_C–V_{BE} Temperature Characteristics (Typical)



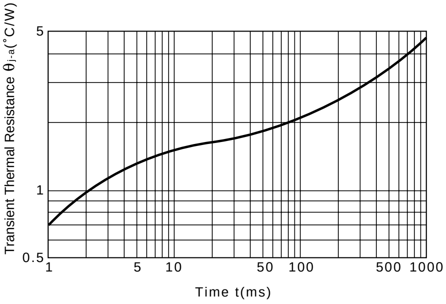
h_{FE}–I_C Characteristics (Typical)



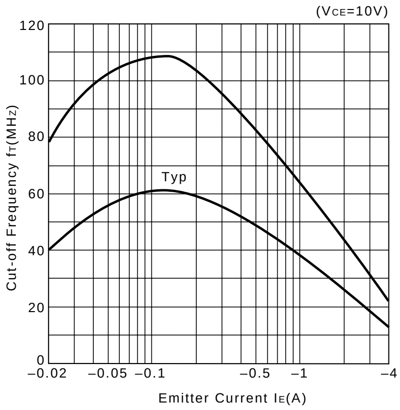
h_{FE}–I_C Temperature Characteristics (Typical)



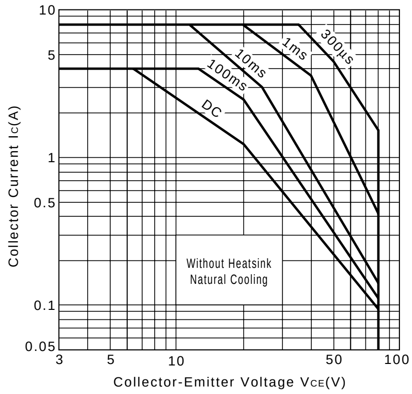
θ_{j-a}–t Characteristics



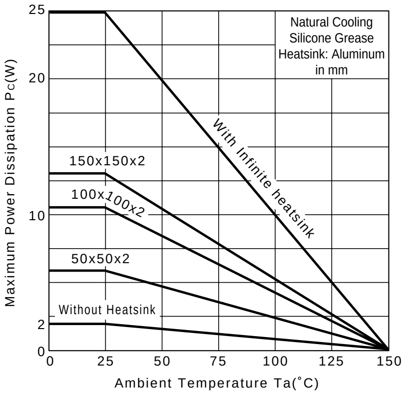
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)

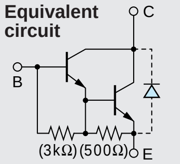


P_C–Ta Derating



Darlington 2SD2015

Equivalent circuit



Silicon NPN Triple Diffused Planar Transistor

Application : Driver for Solenoid, Relay and Motor and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	150	V
V_{CEO}	120	V
V_{EBO}	6	V
I_C	4	A
I_B	0.5	A
P_C	25(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

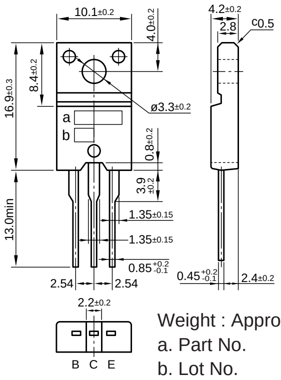
■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=150V	10max	µA
I_{EBO}	V_{EB}=6V	10max	mA
$V_{(BR)CEO}$	I_C=10mA	120min	V
h_{FE}	V_{CE}=2V, I_C=2A	2000min	
$V_{CE(sat)}$	I_C=2A, I_B=2mA	1.5max	V
$V_{BE(sat)}$	I_C=2A, I_B=2mA	2.0max	V
f_T	V_{CE}=12V, I_E=–0.1A	40typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	40typ	pF

■Typical Switching Characteristics (Common Emitter)

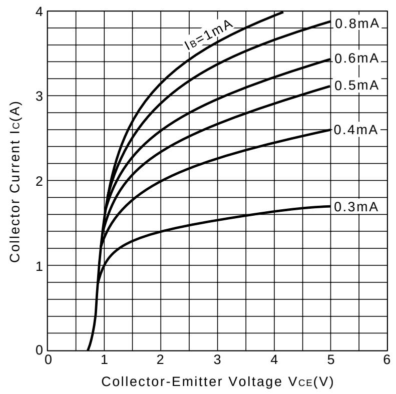
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (µs)	tstg (µs)	tf (µs)
40	20	2	10	–5	10	–10	0.6typ	5.0typ	2.0typ

External Dimensions FM20(TO220F)

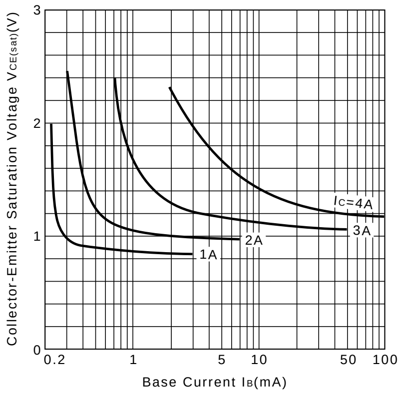


Weight : Approx 2.0g
a. Part No.
b. Lot No.

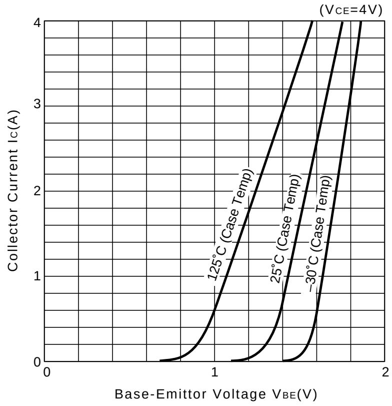
I_C–V_{CE} Characteristics (Typical)



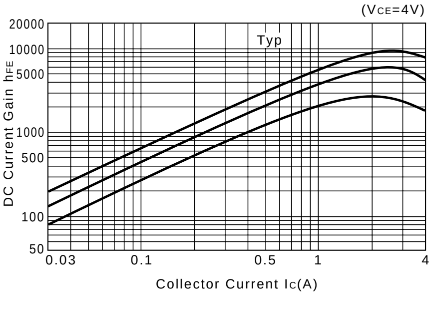
$V_{CE(sat)}$–I_B Characteristics (Typical)



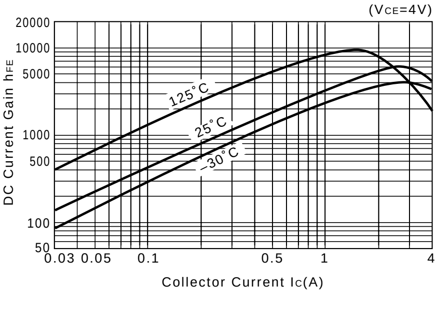
I_C–V_{BE} Temperature Characteristics (Typical)



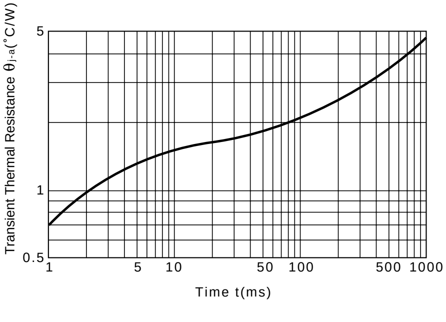
h_{FE}–I_C Characteristics (Typical)



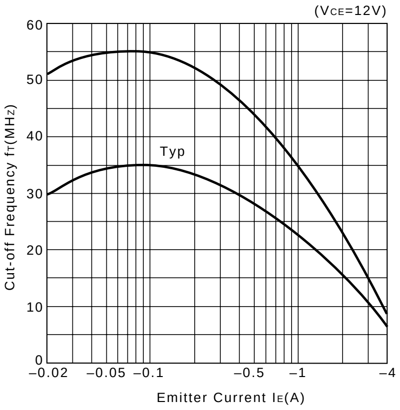
h_{FE}–I_C Temperature Characteristics (Typical)



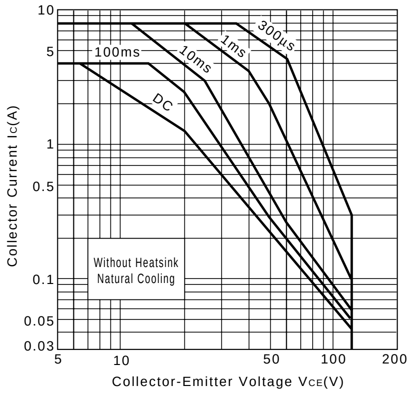
θ_{j-a}–t Characteristics



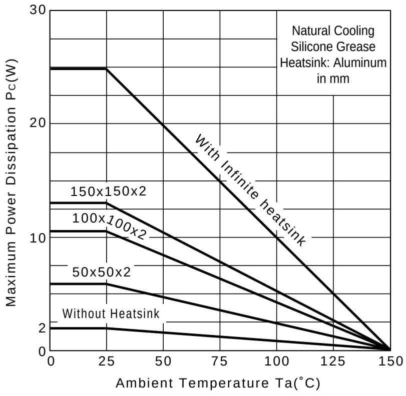
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C–Ta Derating



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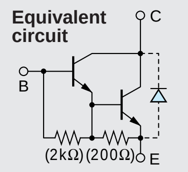


Silicon NPN Triple Diffused Planar Transistor

Application : Igniter, Relay and General Purpose

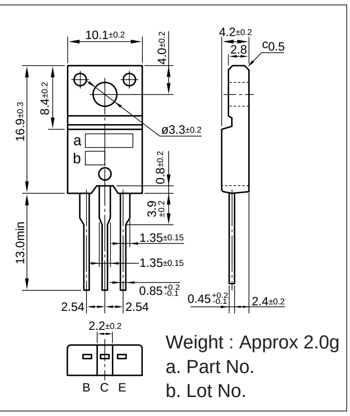
■**Absolute maximum ratings** (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	200	V
V_{CEO}	200	V
V_{EBO}	6	V
I_C	3	A
I_B	0.5	A
P_C	25(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■**Electrical Characteristics** (Ta=25°C)

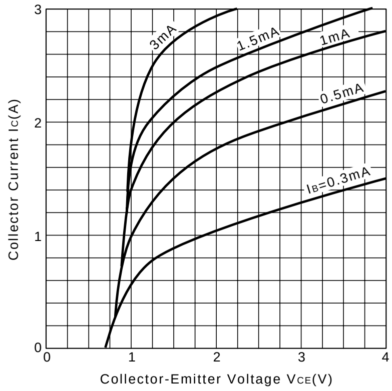
Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=200V	10max	μA
I_{EBO}	V_{EB}=6V	10max	mA
$V_{(BR)CEO}$	I_C=10mA	200min	V
h_{FE}	V_{CE}=4V, I_C=1A	1000 to 15000	
$V_{CE(sat)}$	I_C=1A, I_B=1.5mA	1.5max	V
$V_{BE(sat)}$	I_C=1A, I_B=1.5mA	2.0max	V
f_T	V_{CE}=12V, I_E=–0.1A	90typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	40typ	pF

External Dimensions FM20(TO220F)

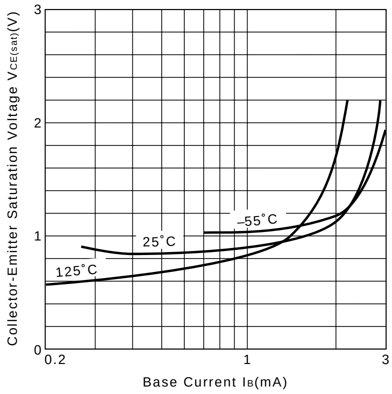


Weight : Approx 2.0g
a. Part No.
b. Lot No.

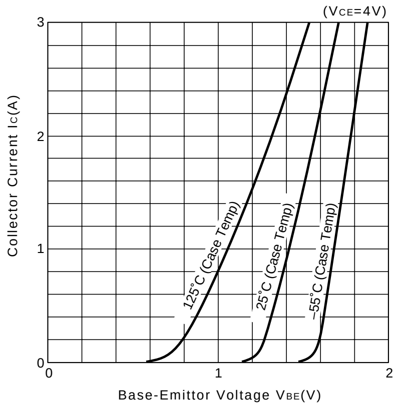
$I_C - V_{CE}$ Characteristics (Typical)



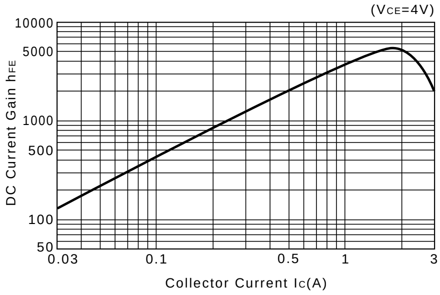
$V_{CE(sat)} - I_B$ Characteristics (Typical)



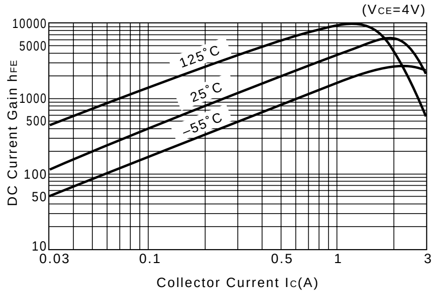
$I_C - V_{BE}$ Temperature Characteristics (Typical)



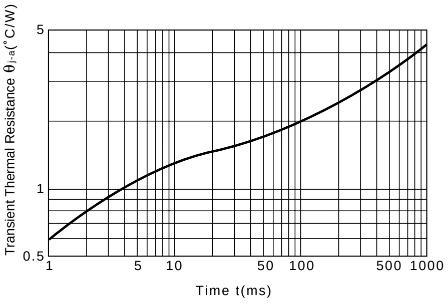
$h_{FE} - I_C$ Characteristics (Typical)



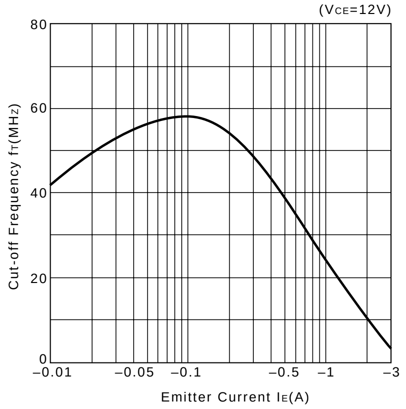
$h_{FE} - I_C$ Temperature Characteristics (Typical)



$\theta_{j-a} - t$ Characteristics

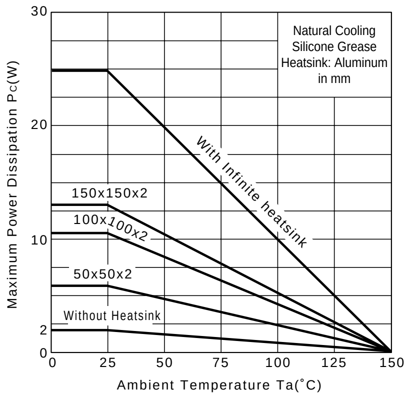


$f_T - I_E$ Characteristics (Typical)



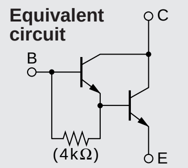
Safe Operating Area (Single Pulse)

$P_C - T_a$ Derating



Darlington 2SD2017

Equivalent circuit



Silicon NPN Triple Diffused Planar Transistor

Application : Driver for Solenoid, Relay and Motor and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	300	V
V_{CEO}	250	V
V_{EBO}	20	V
I_C	6	A
I_B	1	A
P_C	35(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

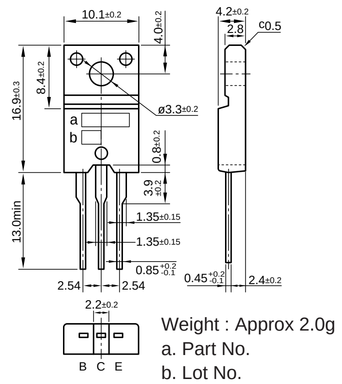
■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=300V	100max	μA
I_{EBO}	V_{EB}=20V	10max	mA
$V_{(BR)CEO}$	I_C=25mA	250min	V
h_{FE}	V_{CE}=2V, I_C=2A	2000min	
$V_{CE(sat)}$	I_C=2A, I_B=2mA	1.5max	V
$V_{BE(sat)}$	I_C=2A, I_B=2mA	2.0max	V
f_T	V_{CE}=12V, I_E=–1A	20typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	65typ	pF

■Typical Switching Characteristics (Common Emitter)

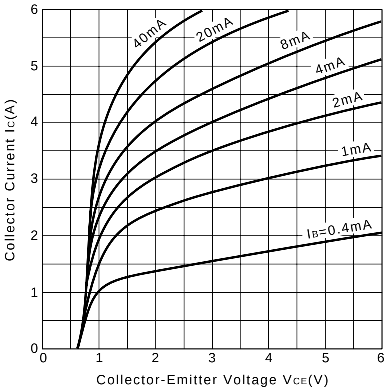
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (μs)	tstg (μs)	tf (μs)
100	50	2	10	–5	5	–10	0.6typ	16.0typ	3.0typ

External Dimensions FM20(TO220F)

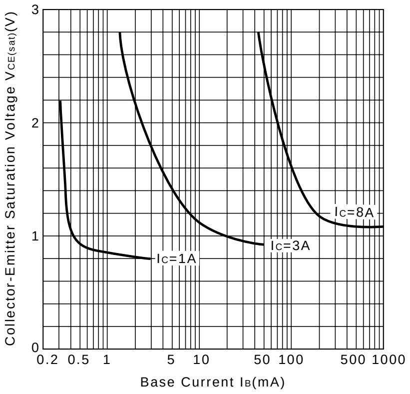


Weight : Approx 2.0g
a. Part No.
b. Lot No.

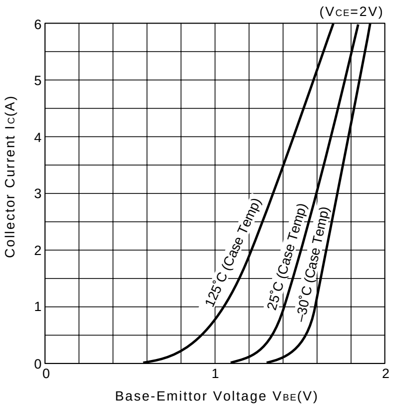
I_C–V_{CE} Characteristics (Typical)



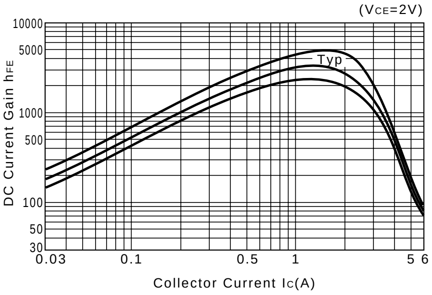
$V_{CE(sat)}$–I_B Characteristics (Typical)



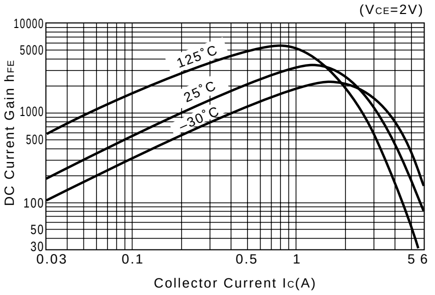
I_C–V_{BE} Temperature Characteristics (Typical)



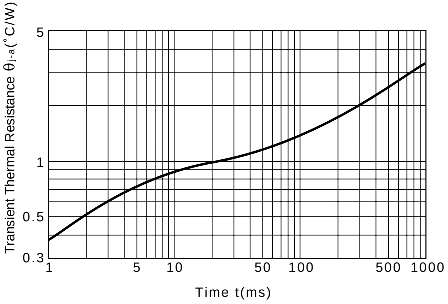
h_{FE}–I_C Characteristics (Typical)



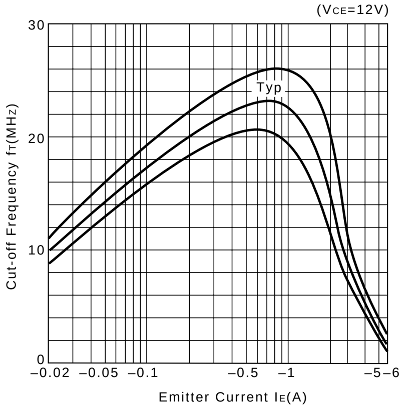
h_{FE}–I_C Temperature Characteristics (Typical)



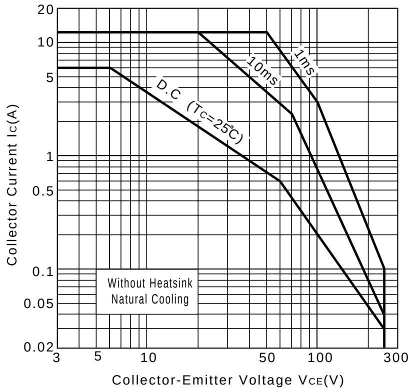
$\theta_{j\text{-}a}$–t Characteristics



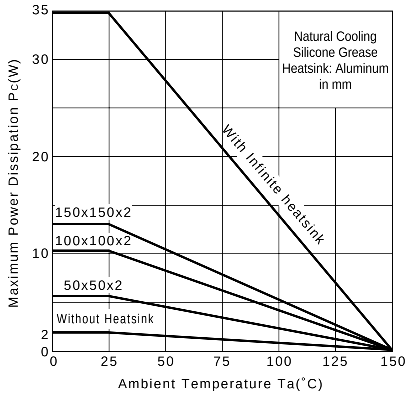
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



Pc–Ta Derating



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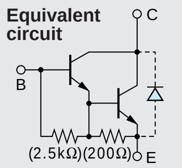
Equivalent circuit



Silicon NPN Triple Diffused Planar Transistor

Application : Driver for Solenoid, Motor and General Purpose

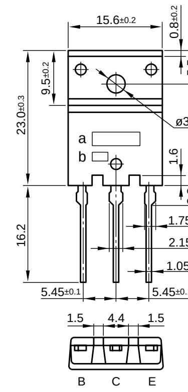
■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	120	V
V_{CEO}	120	V
•V_{EBO}	6	V
I_C	6(Pulse10)	A
I_B	1	A
P_C	50(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=120V	10max	μA
I_{EBO}	V_{EB}=6V	10max	mA
$V_{(BR)CEO}$	I_C=10mA	120min	V
h_{FE}	V_{CE}=2V, I_C=3A	2000min	
$V_{CE(sat)}$	I_C=3A, I_B=3mA	1.5max	V
$V_{BE(sat)}$	I_C=3A, I_B=3mA	2.0max	V
f_T	V_{CE}=12V, I_E=–1A	50typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	70typ	pF

External Dimensions FM100(TO3PF)

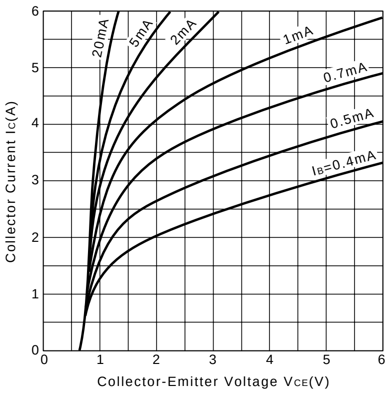


Weight : Approx 2.0g
a. Part No.
b. Lot No.

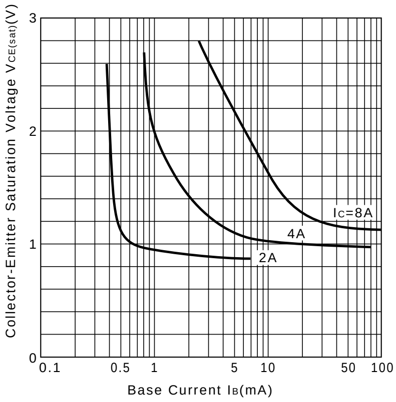
■Typical Switching Characteristics (Common Emitter)

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (μs)	tstg (μs)	tf (μs)
30	10	3	10	–5	3	–3	0.5typ	5.5typ	1.5typ

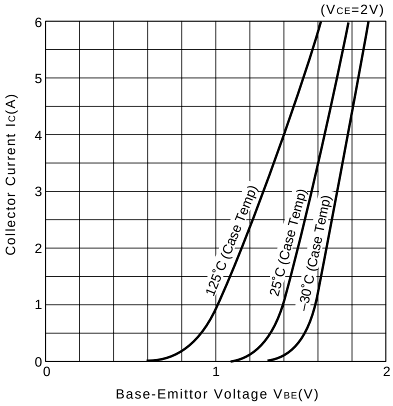
I_C–V_{CE} Characteristics (Typical)



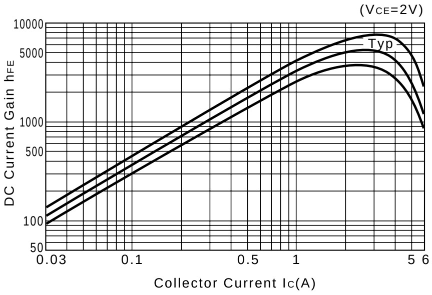
$V_{CE(sat)}$–I_B Characteristics (Typical)



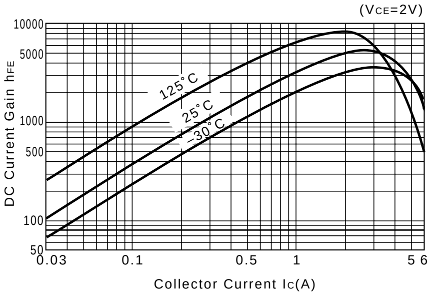
I_C–V_{BE} Temperature Characteristics (Typical)



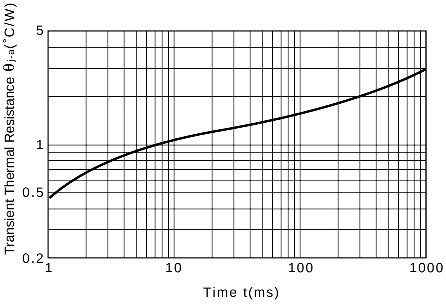
h_{FE}–I_C Characteristics (Typical)



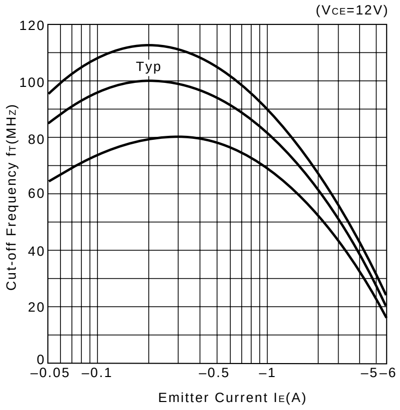
h_{FE}–I_C Temperature Characteristics (Typical)



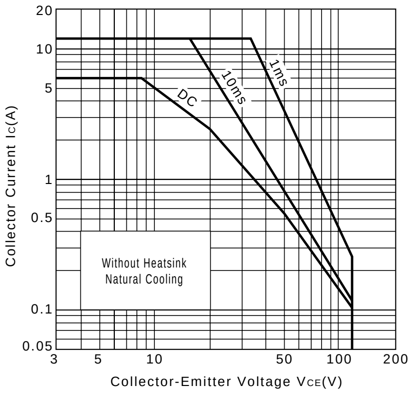
θ_{j-a}–t Characteristics



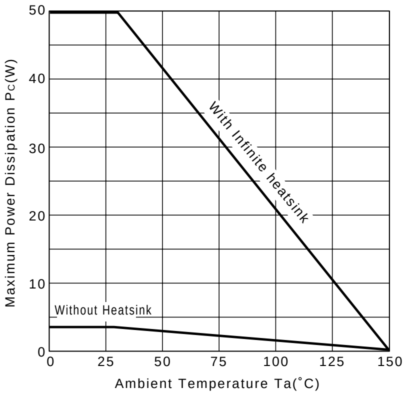
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C–Ta Derating



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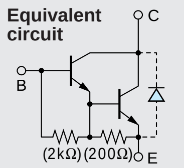


Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SB1259)

Application : Driver for Solenoid, Motor and General Purpose

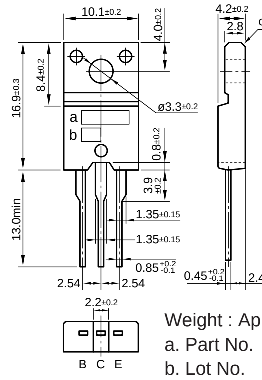
■**Absolute maximum ratings** (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	120	V
V_{CEO}	120	V
V_{EBO}	6	V
I_C	10(Pulse15)	A
I_B	1	A
P_C	30(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■**Electrical Characteristics** (Ta=25°C)

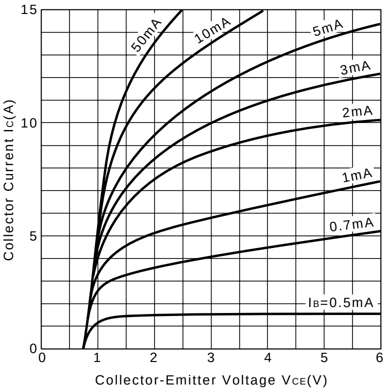
Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=120V	10max	μA
I_{EBO}	V_{EB}=6V	10max	mA
$V_{(BR)CEO}$	I_C=10mA	120min	V
h_{FE}	V_{CE}=4V, I_C=5A	2000min	
V_{CE}(sat)	I_C=5A, I_B=5mA	1.5max	V
V_{BE}(sat)	I_C=5A, I_B=5mA	2.0max	V
f_T	V_{CE}=12V, I_E=–0.5A	60typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	95typ	pF

External Dimensions FM20(TO220F)

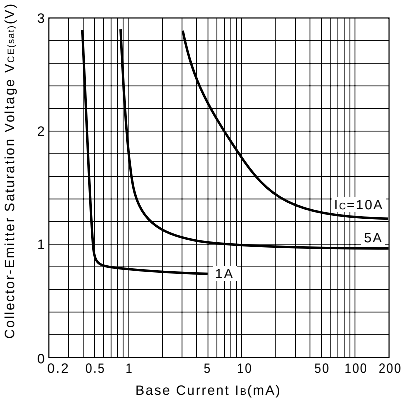


Weight : Approx 2.0g
a. Part No.
b. Lot No.

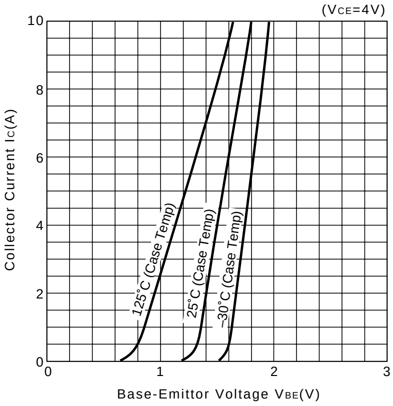
I_C−V_{CE} Characteristics (Typical)



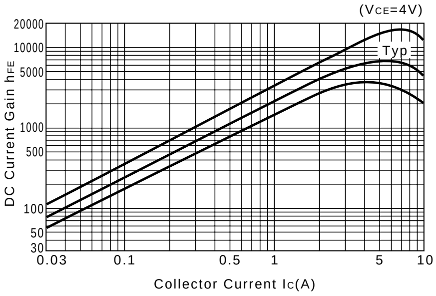
V_{CE}(sat)−I_B Characteristics (Typical)



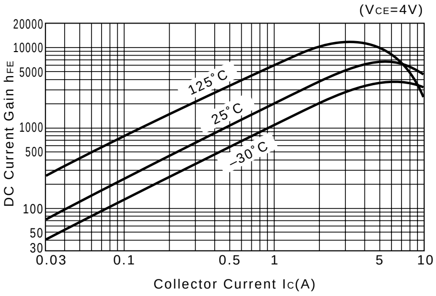
I_C−V_{BE} Temperature Characteristics (Typical)



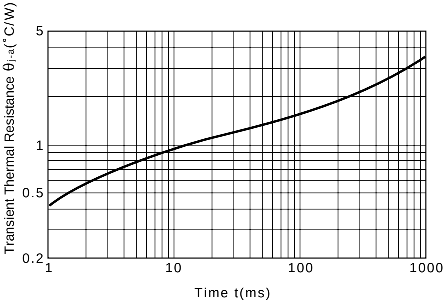
h_{FE}−I_C Characteristics (Typical)



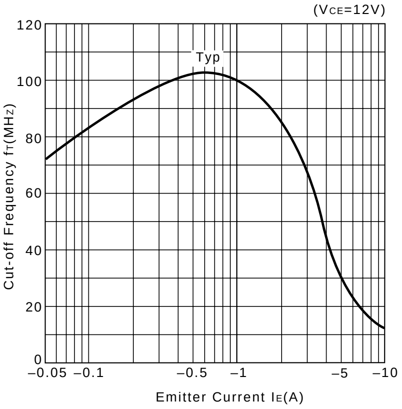
h_{FE}−I_C Temperature Characteristics (Typical)



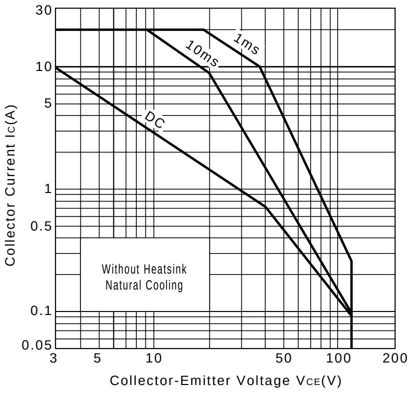
θ_{j-a}−t Characteristics



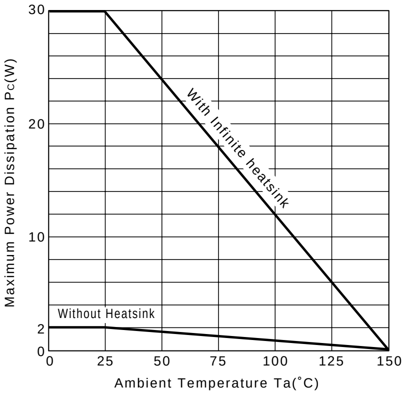
f_T−I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C−Ta Derating



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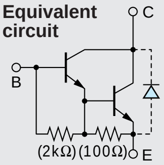
2SD2082

Equivalent circuit



Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SB1382)

Application : Driver for Solenoid, Motor and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
VCBO	120	V
VCEO	120	V
VEBO	6	V
IC	16(Pulse26)	A
IB	1	A
PC	75(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

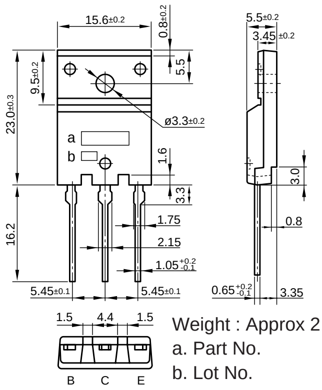
■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
ICBO	VCB=120V	10max	μA
IEBO	VEB=6V	10max	mA
V(BR)CEO	IC=10mA	120min	V
hFE	VCE=4V, IC=8A	2000min	
VCE(sat)	IC=8A, IB=16mA	1.5max	V
VBE(sat)	IC=8A, IB=16mA	2.5max	V
fT	VCE=12V, IE=–1A	20typ	MHz
COB	VCB=10V, f=1MHz	210typ	pF

■Typical Switching Characteristics (Common Emitter)

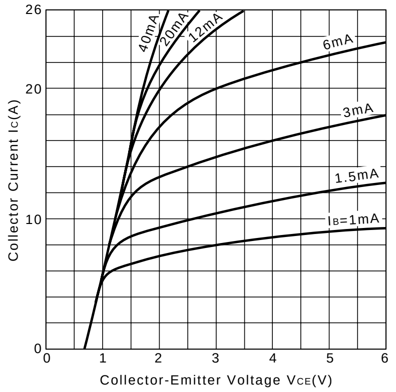
VCC (V)	RL (Ω)	IC (A)	VBB1 (V)	VBB2 (V)	IB1 (mA)	IB2 (mA)	ton (μs)	tstg (μs)	tf (μs)
40	5	8	10	–5	16	–16	0.6typ	7.0typ	1.5typ

External Dimensions FM100(TO3PF)

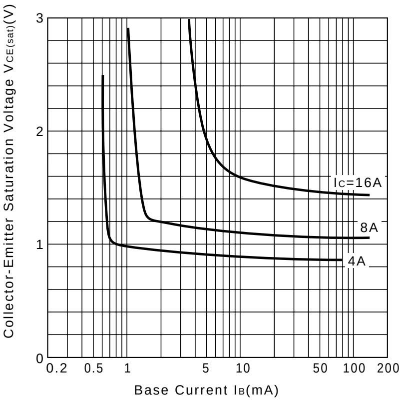


Weight : Approx 2.0g
a. Part No.
b. Lot No.

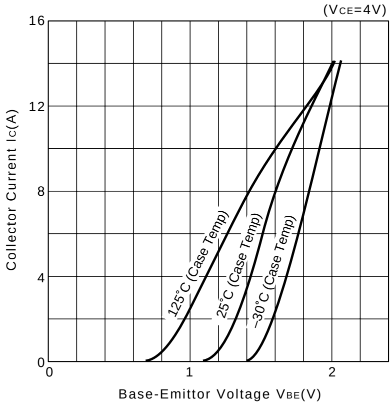
IC–VCE Characteristics (Typical)



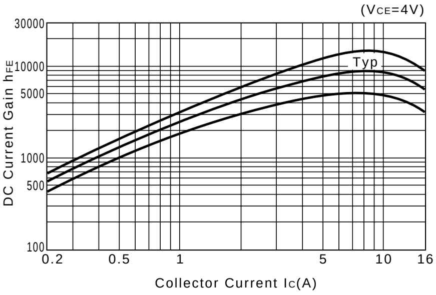
VCE(sat)–IB Characteristics (Typical)



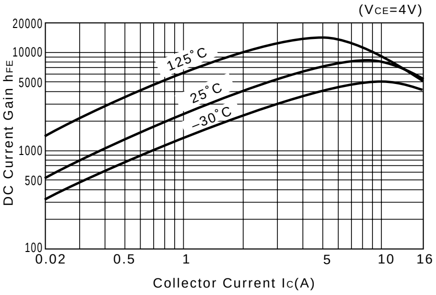
IC–VBE Temperature Characteristics (Typical)



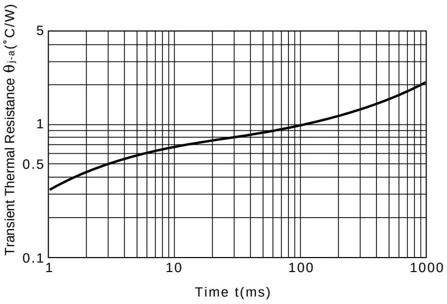
hFE–IC Characteristics (Typical)



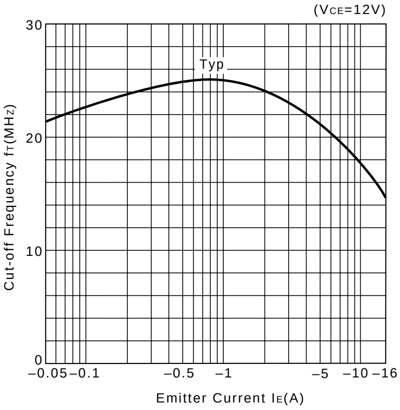
hFE–IC Temperature Characteristics (Typical)



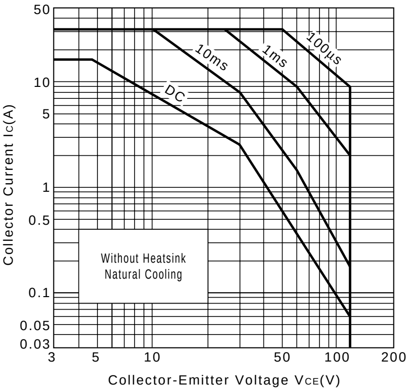
θj-a–t Characteristics



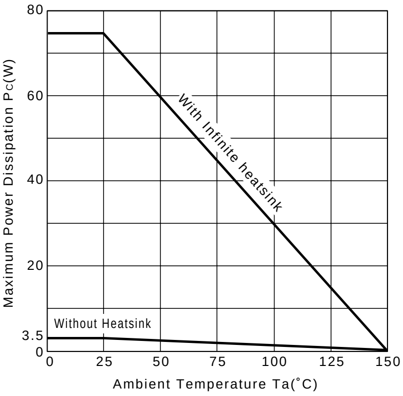
fT–IE Characteristics (Typical)



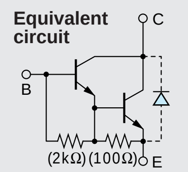
Safe Operating Area (Single Pulse)



PC–Ta Derating



Darlington 2SD2083



Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SB1383)

Application : Driver for Solenoid, Motor and General Purpose

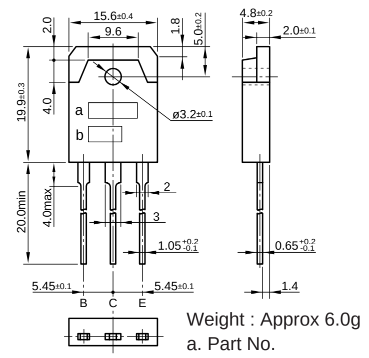
■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	120	V
V_{CEO}	120	V
V_{EBO}	6	V
I_C	25(Pulse40)	A
I_B	2	A
P_C	120(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=120V	10max	μA
I_{EBO}	V_{EB}=6V	10max	mA
$V_{(BR)CEO}$	I_C=25mA	120min	V
h_{FE}	V_{CE}=4V, I_C=12A	2000min	
$V_{CE(sat)}$	I_C=12A, I_B=24mA	1.8max	V
$V_{BE(sat)}$	I_C=12A, I_B=24mA	2.5max	V
f_T	V_{CE}=12V, I_E=–1A	20typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	340typ	pF

External Dimensions MT-100(TO3P)

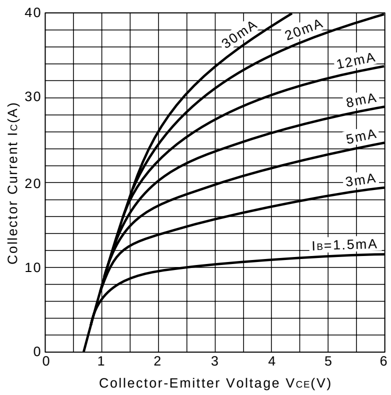


Weight : Approx 6.0g
a. Part No.
b. Lot No.

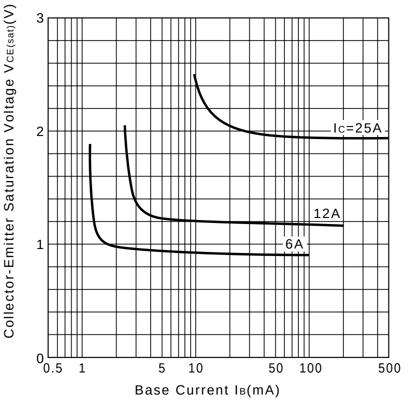
■Typical Switching Characteristics (Common Emitter)

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (μs)	tstg (μs)	tf (μs)
24	2	12	10	–5	24	–24	1.0typ	6.0typ	1.0typ

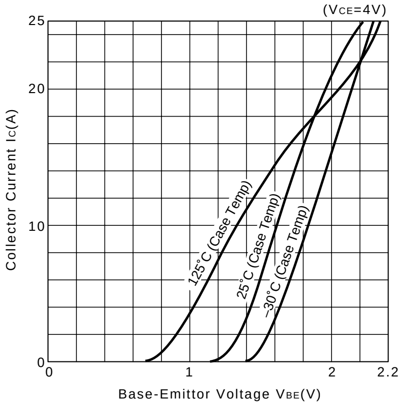
I_C–V_{CE} Characteristics (Typical)



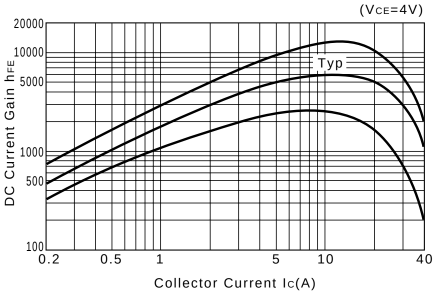
V_{CE}(sat)–I_B Characteristics (Typical)



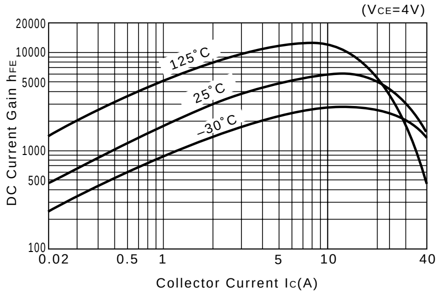
I_C–V_{BE} Temperature Characteristics (Typical)



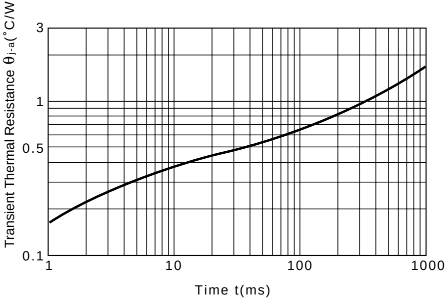
h_{FE}–I_C Characteristics (Typical)



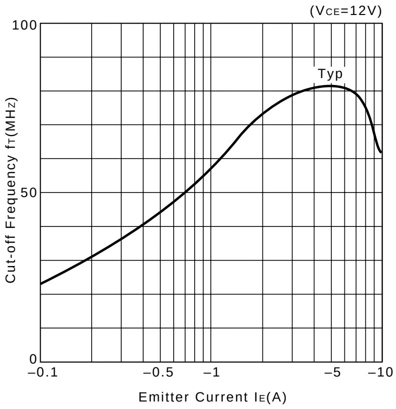
h_{FE}–I_C Temperature Characteristics (Typical)



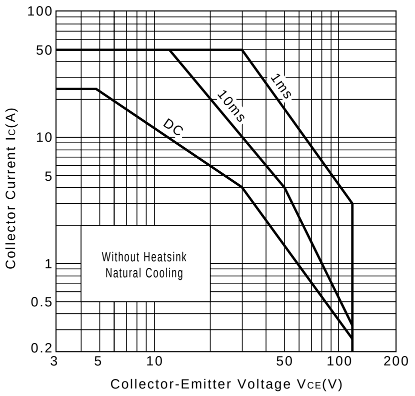
$θ_{j-a}$–t Characteristics



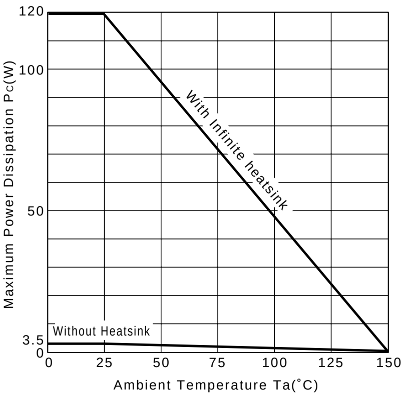
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



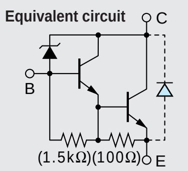
Pc–Ta Derating



Built-in Avalanche Diode for Surge Absorbing Darlington

2SD2141

Equivalent circuit



Silicon NPN Triple Diffused Planar Transistor

Application : Ignitor, Driver for Solenoid and Motor, and General Purpose

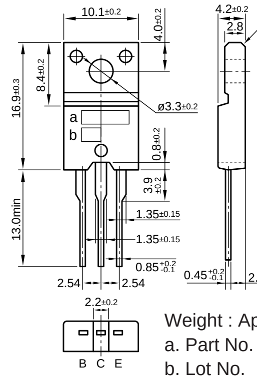
■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	380±50	V
V_{CEO}	380±50	V
V_{EBO}	6	V
I_C	6(Pulse10)	A
I_B	1	A
P_C	35(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

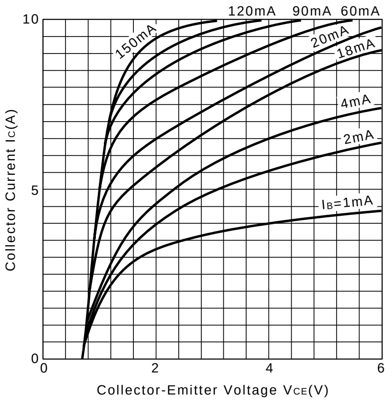
Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=330V	10max	μA
I_{EBO}	V_{EB}=6V	20max	mA
$V_{(BR)CEO}$	I_C=25mA	330to430	V
h_{FE}	V_{CE}=2V, I_C=3A	1500min	
$V_{CE(sat)}$	I_C=4A, I_B=20mA	1.5max	V
f_T	V_{CE}=12V, I_E=–0.5A	20typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	95typ	pF

External Dimensions FM20(TO220F)

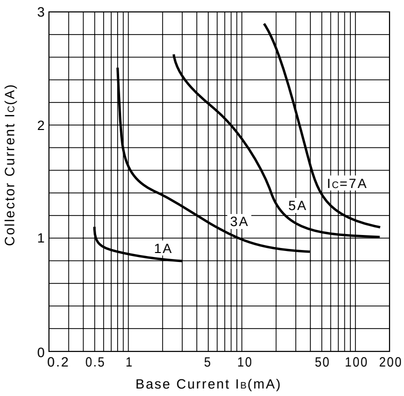


Weight : Approx 2.0g
a. Part No.
b. Lot No.

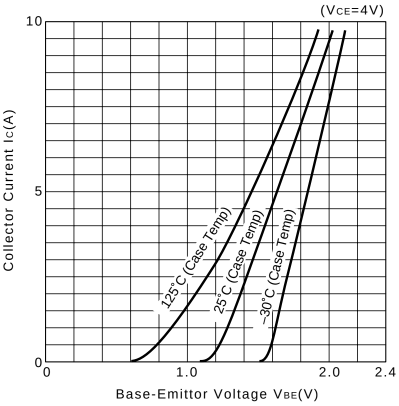
I_C–V_{CE} Characteristics (Typical)



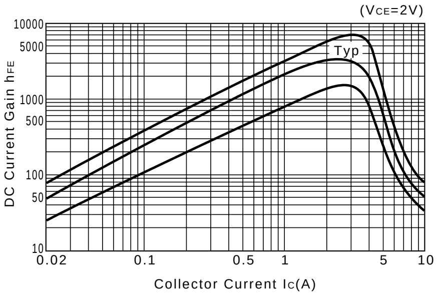
$V_{CE(sat)}$–I_B Characteristics (Typical)



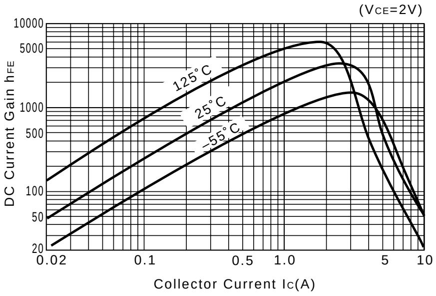
I_C–V_{BE} Temperature Characteristics (Typical)



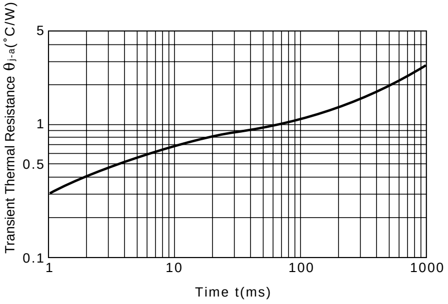
h_{FE}–I_C Characteristics (Typical)



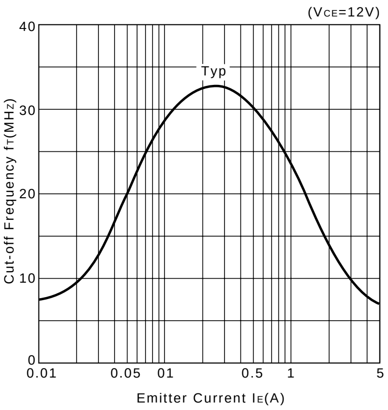
h_{FE}–I_C Temperature Characteristics (Typical)



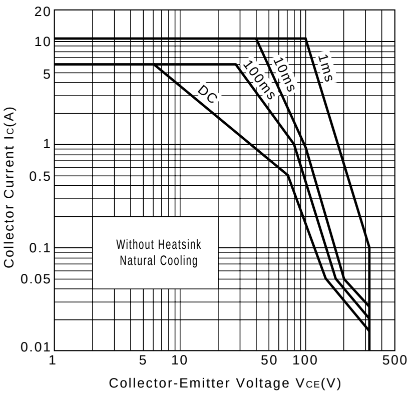
θ_{j-a}–t Characteristics



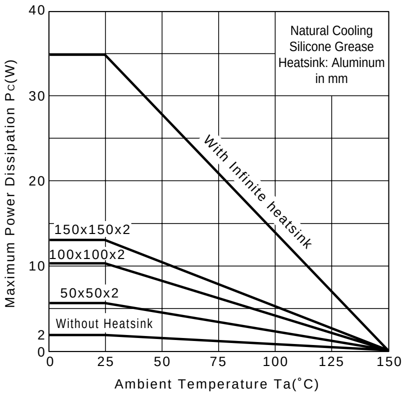
f_T–I_E Characteristics (Typical)



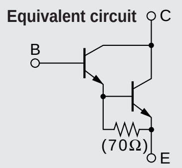
Safe Operating Area (Single Pulse)



P_C–Ta Derating



Darlington 2SD2389



Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SB1559)

Application : Audio, Series Regulator and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	160	V
V_{CEO}	150	V
V_{EBO}	5	V
I_C	8	A
I_B	1	A
P_C	80(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

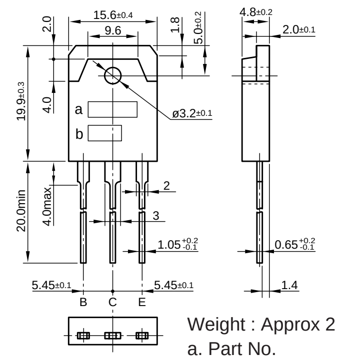
Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=160V	100max	µA
I_{EBO}	V_{EB}=5V	100max	µA
$V_{(BR)CEO}$	I_C=30mA	150min	V
h_{FE}	V_{CE}=4V, I_C=6A	5000min*	
$V_{CE(sat)}$	I_C=6A, I_B=6mA	2.5max	V
$V_{BE(sat)}$	I_C=6A, I_B=6mA	3.0max	V
f_T	V_{CE}=12V, I_E=–1A	80typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	85typ	pF

*h_{FE} Rank O(5000 to 12000), P(6500 to 20000), Y(15000 to 30000)

■Typical Switching Characteristics (Common Emitter)

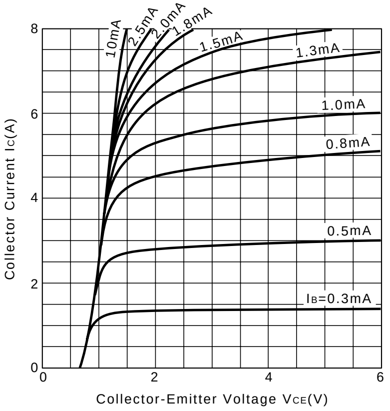
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (µs)	tstg (µs)	tf (µs)
60	10	6	10	–5	6	–6	0.6typ	10.0typ	0.9typ

External Dimensions MT-100(TO3P)

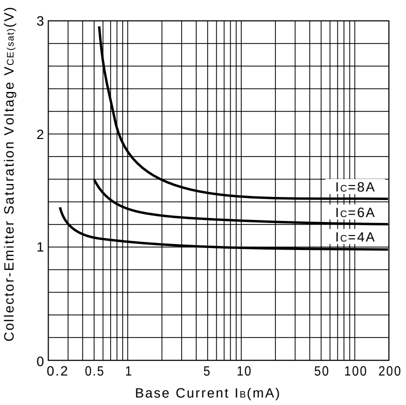


Weight : Approx 2.0g
a. Part No.
b. Lot No.

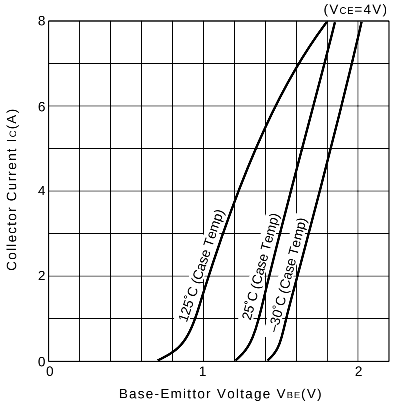
I_C–V_{CE} Characteristics (Typical)



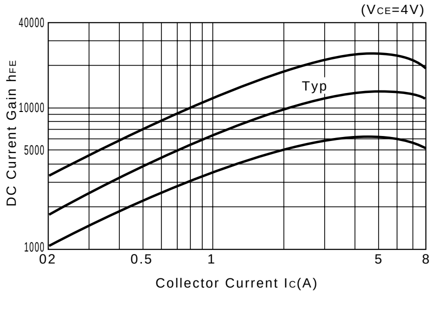
$V_{CE(sat)}$–I_B Characteristics (Typical)



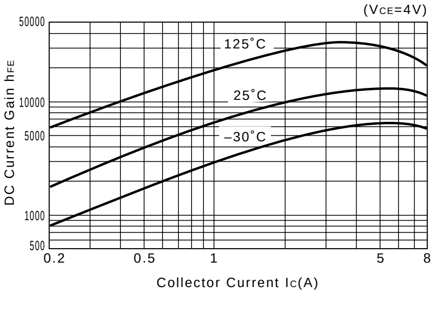
I_C–V_{BE} Temperature Characteristics (Typical)



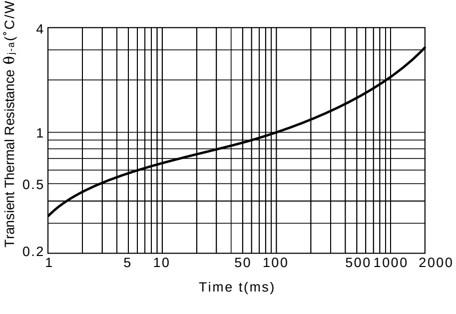
h_{FE}–I_C Characteristics (Typical)



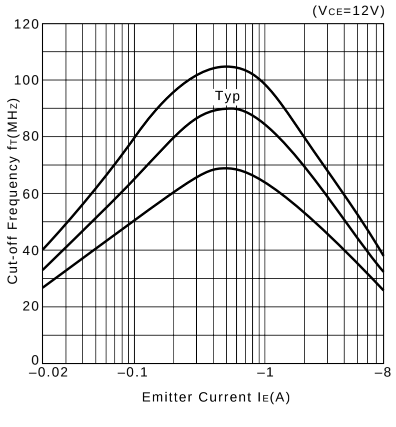
h_{FE}–I_C Temperature Characteristics (Typical)



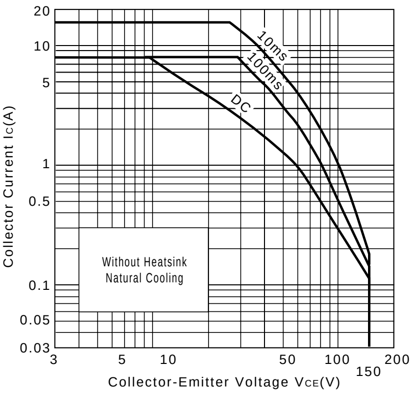
θ_{j-a}–t Characteristics



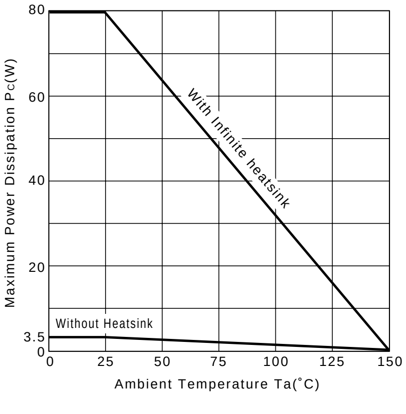
f_T–I_E Characteristics (Typical)



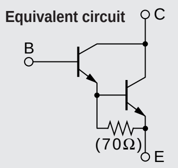
Safe Operating Area (Single Pulse)



Pc–Ta Derating



Darlington 2SD2390



Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SB1560)

Application : Audio, Series Regulator and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	160	V
V_{CEO}	150	V
V_{EBO}	5	V
I_C	10	A
I_B	1	A
P_C	100(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

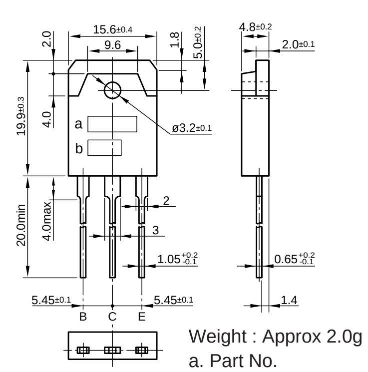
Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=160V	100max	μA
I_{EBO}	V_{EB}=5V	100max	μA
$V_{(BR)CEO}$	I_C=30mA	150min	V
h_{FE}	V_{CE}=4V, I_C=7A	5000min*	
$V_{CE(sat)}$	I_C=7A, I_B=7mA	2.5max	V
$V_{BE(sat)}$	I_C=7A, I_B=7mA	3.0max	V
f_T	V_{CE}=12V, I_E=–2A	55typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	95typ	pF

*h_{FE} Rank O(5000 to 12000), P(6500 to 20000), Y(15000 to 30000)

■Typical Switching Characteristics (Common Emitter)

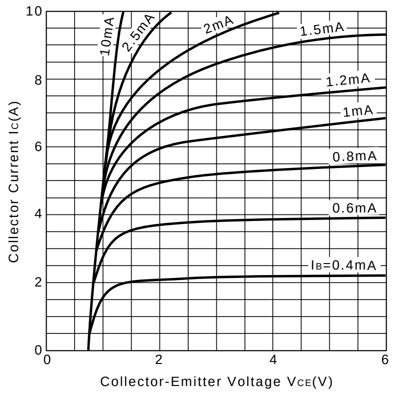
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (μs)	tstg (μs)	tf (μs)
70	10	7	10	–5	7	–7	0.5typ	10.0typ	1.1typ

External Dimensions MT-100(TO3P)

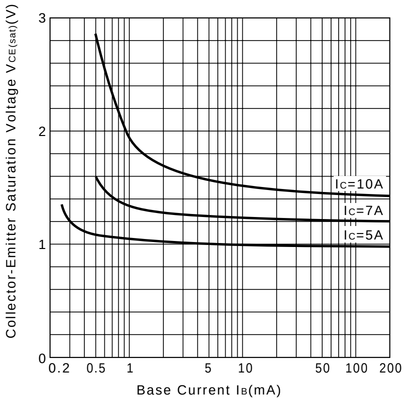


Weight : Approx 2.0g
a. Part No.
b. Lot No.

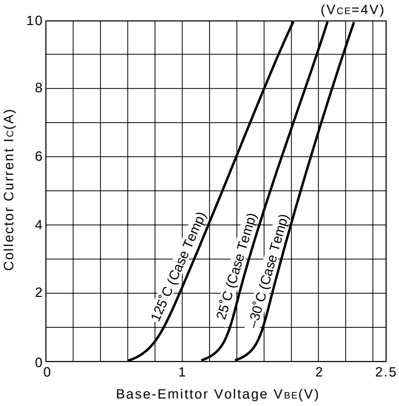
I_C–V_{CE} Characteristics (Typical)



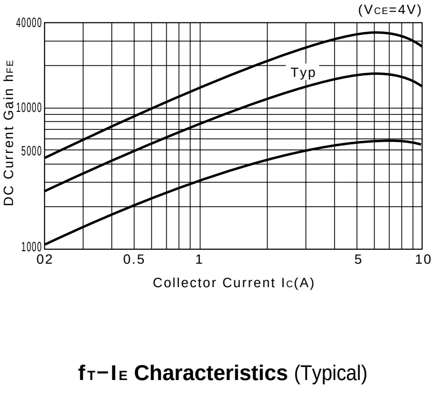
$V_{CE(sat)}$–I_B Characteristics (Typical)



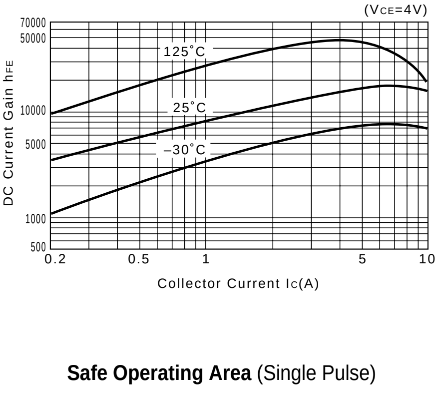
I_C–V_{BE} Temperature Characteristics (Typical)



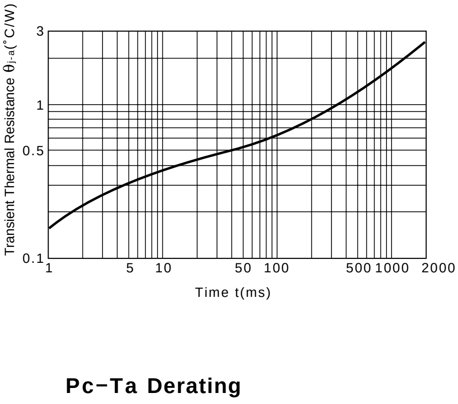
h_{FE}–I_C Characteristics (Typical)



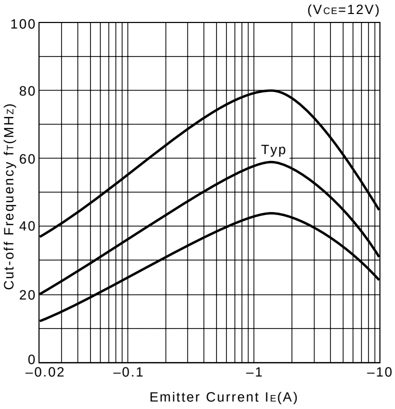
h_{FE}–I_C Temperature Characteristics (Typical)



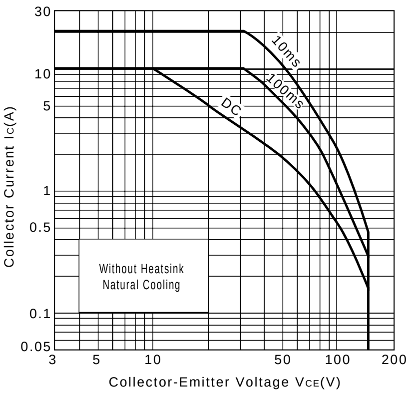
$\theta_{j\text{-}a}$–t Characteristics



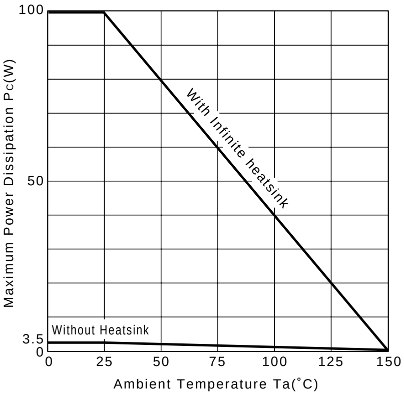
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)

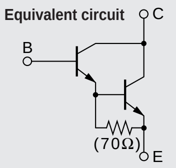


P_C–Ta Derating



Darlington 2SD2401

Equivalent circuit



Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SB1570)

Application : Audio, Series Regulator and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	160	V
V_{CEO}	150	V
V_{EBO}	5	V
I_C	12	A
I_B	1	A
P_C	150(T_c=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

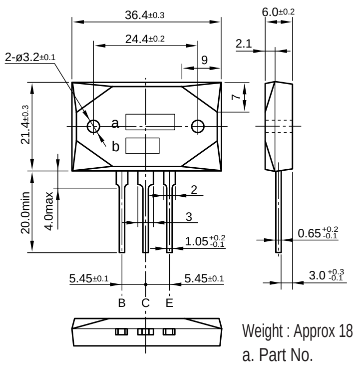
Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=160V	100max	μA
I_{EBO}	V_{EB}=5V	100max	μA
$V_{(BR)CEO}$	I_C=30mA	150min	V
h_{FE}	V_{CE}=4V, I_C=7A	5000min∗	
V_{CE}(sat)	I_C=7A, I_B=7mA	2.5max	V
V_{BE}(sat)	I_C=7A, I_B=7mA	3.0max	V
f_T	V_{CE}=12V, I_E=–2A	55typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	95typ	pF

∗h_{FE} Rank $\overline{O}$(5000 to 12000), P(6500 to 20000), Y(15000 to 30000)

■Typical Switching Characteristics (Common Emitter)

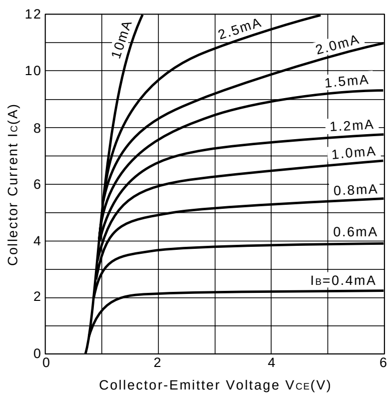
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (μs)	tstg (μs)	tf (μs)
70	10	7	10	–5	7	–7	0.5typ	10.0typ	1.1typ

External Dimensions MT-200

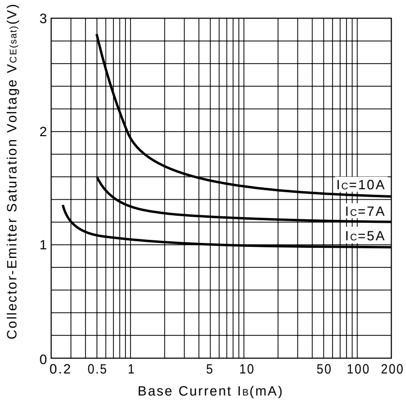


Weight : Approx 18.4g
a. Part No.
b. Lot No.

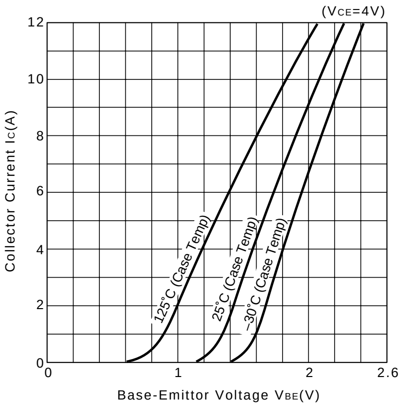
I_C−V_{CE} Characteristics (Typical)



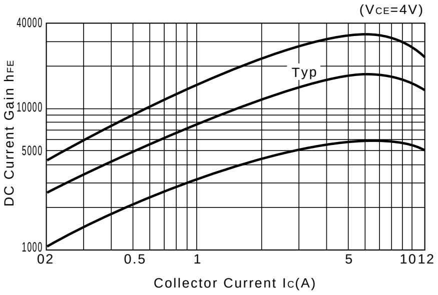
V_{CE}(sat)−I_B Characteristics (Typical)



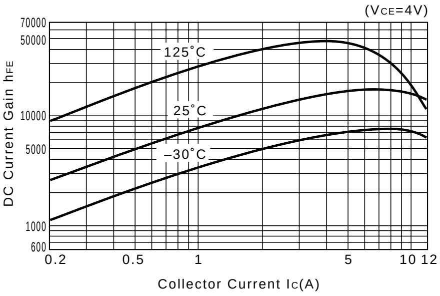
I_C−V_{BE} Temperature Characteristics (Typical)



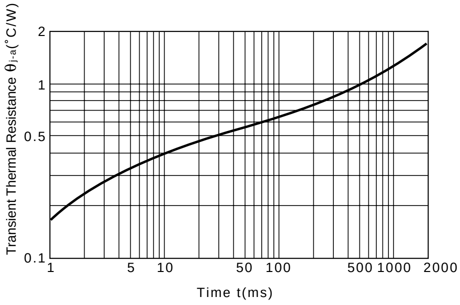
h_{FE}−I_C Characteristics (Typical)



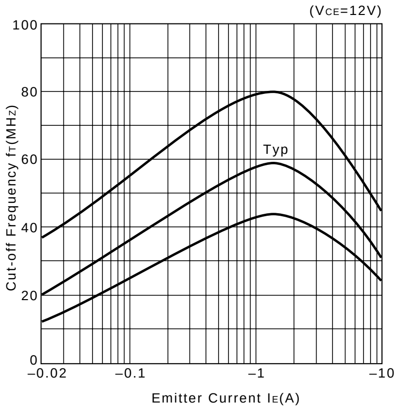
h_{FE}−I_C Temperature Characteristics (Typical)



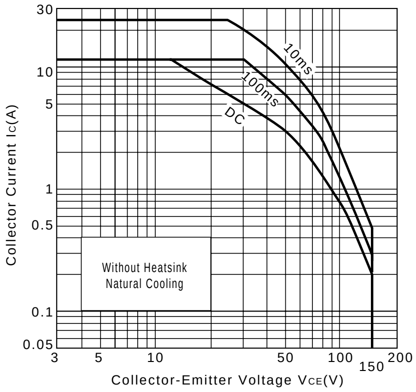
θ_{j-a}−t Characteristics



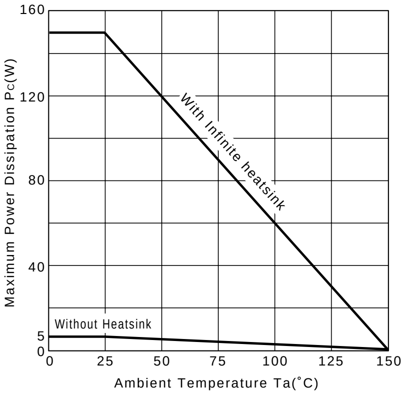
f_T−I_E Characteristics (Typical)



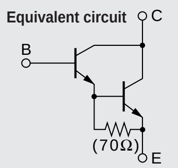
Safe Operating Area (Single Pulse)



P_C−Ta Derating



Darlington 2SD2438



Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SB1587)

Application : Audio, Series Regulator and General Purpose

■Absolute maximum ratings (Ta=25°C)

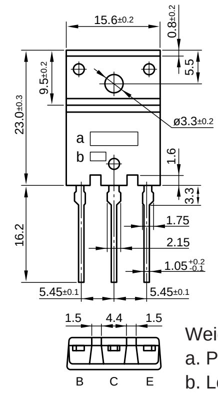
Symbol	Ratings	Unit
V_{CBO}	160	V
V_{CEO}	150	V
V_{EBO}	5	V
I_C	8	A
I_B	1	A
P_C	75(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=160V	100max	µA
I_{EBO}	V_{EB}=5V	100max	µA
$V_{(BR)CEO}$	I_C=30mA	150min	V
h_{FE}	V_{CE}=4V, I_C=6A	5000min*	
V_{CE}(sat)	I_C=6A, I_B=6mA	2.5max	V
V_{BE}(sat)	I_C=6A, I_B=6mA	3.0max	V
f_T	V_{CE}=12V, I_E=–1A	80typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	85typ	pF

*h_{FE} Rank $\overline{\text{O}}$(5000 to 12000), P(6500 to 20000), Y(15000 to 30000)

External Dimensions FM100(TO3PF)



Weight : Approx 6.5g

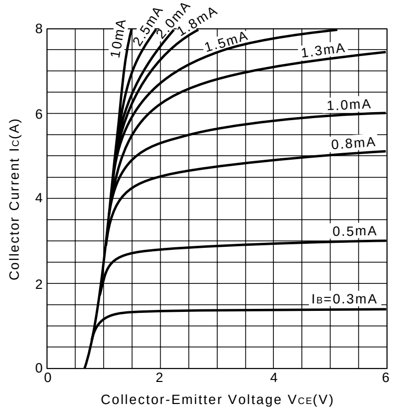
a. Part No.

b. Lot No.

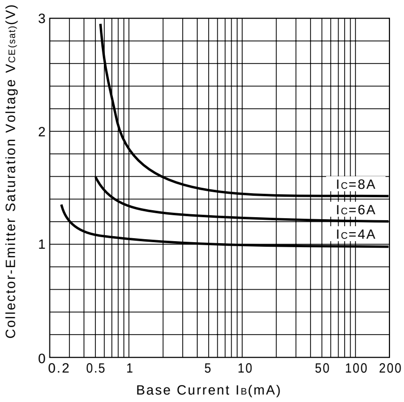
■Typical Switching Characteristics (Common Emitter)

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (µs)	tstg (µs)	tf (µs)
60	10	6	10	–2	6	–6	0.6typ	10.0typ	0.9typ

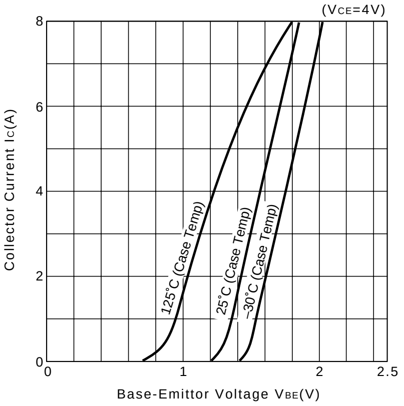
I_C–V_{CE} Characteristics (Typical)



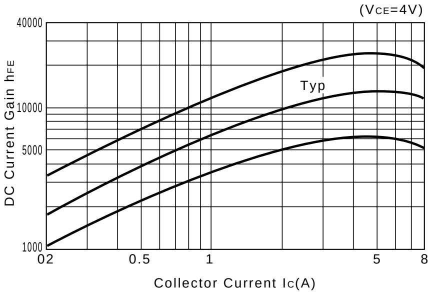
$V_{CE(sat)}$–I_B Characteristics (Typical)



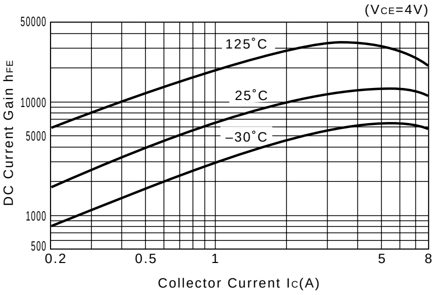
I_C–V_{BE} Temperature Characteristics (Typical)



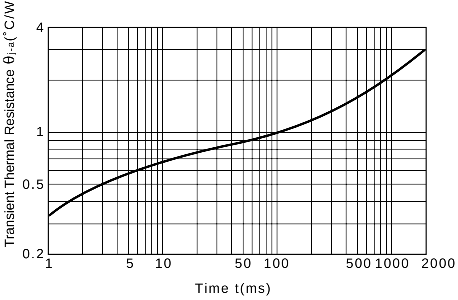
h_{FE}–I_C Characteristics (Typical)



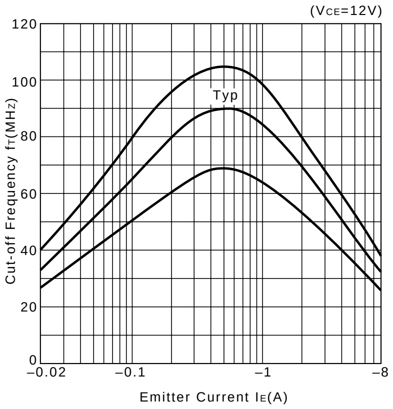
h_{FE}–I_C Temperature Characteristics (Typical)



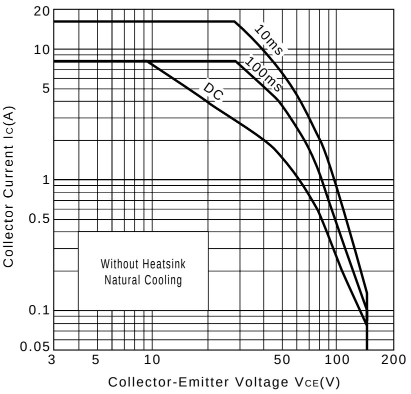
$\theta_{j\text{-}a}$–t Characteristics



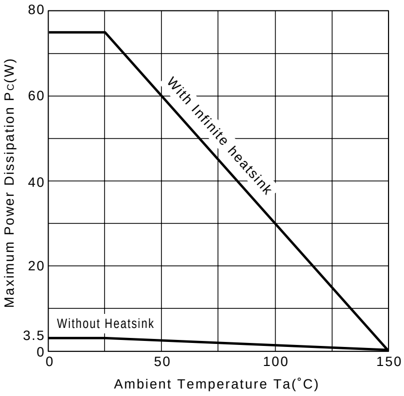
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)

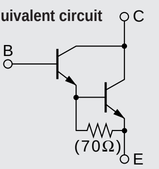


P_C–Ta Derating



Darlington 2SD2439

Equivalent circuit



Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SB1588)

Application : Audio, Series Regulator and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	160	V
V_{CEO}	150	V
V_{EBO}	5	V
I_C	10	A
I_B	1	A
P_C	80(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

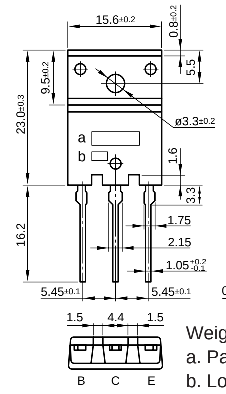
Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=160V	100max	μA
I_{EBO}	V_{EB}=5V	100max	μA
$V_{(BR)CEO}$	I_C=30mA	150min	V
h_{FE}	V_{CE}=4V, I_C=7A	5000min*	
$V_{CE(sat)}$	I_C=7A, I_B=7mA	2.5max	V
$V_{BE(sat)}$	I_C=7A, I_B=7mA	3.0max	V
f_T	V_{CE}=12V, I_E=–2A	55typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	95typ	pF

*h_{FE} Rank O(5000to12000), P(6500to20000), Y(15000to30000)

■Typical Switching Characteristics (Common Emitter)

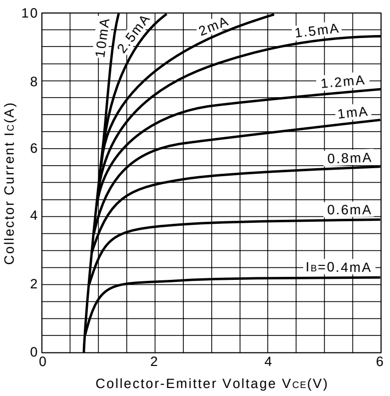
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (μs)	tstg (μs)	tf (μs)
70	10	7	10	–5	7	–7	0.5typ	10.0typ	1.1typ

External Dimensions FM100(TO3PF)

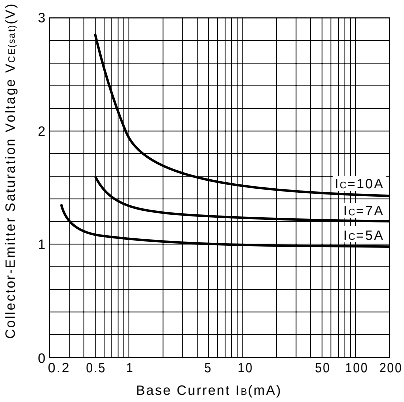


Weight : Approx 6.5g
a. Part No.
b. Lot No.

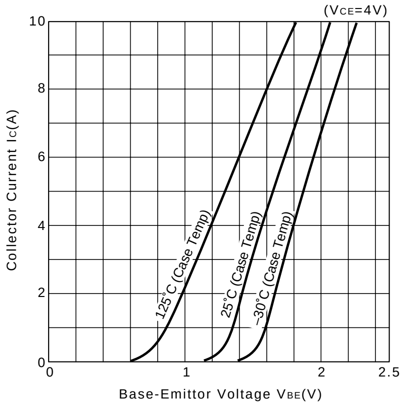
I_C–V_{CE} Characteristics (Typical)



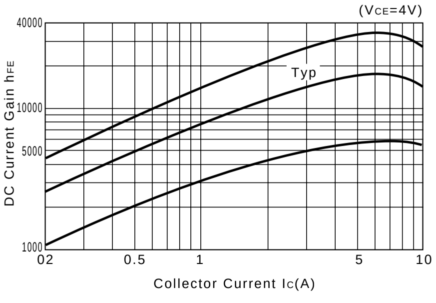
$V_{CE(sat)}$–I_B Characteristics (Typical)



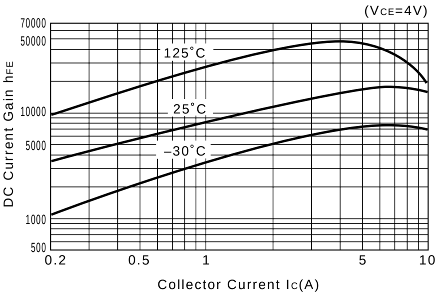
I_C–V_{BE} Temperature Characteristics (Typical)



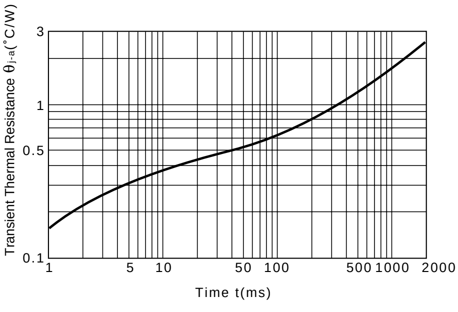
h_{FE}–I_C Characteristics (Typical)



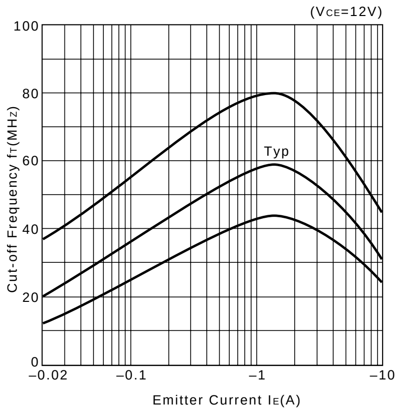
h_{FE}–I_C Temperature Characteristics (Typical)



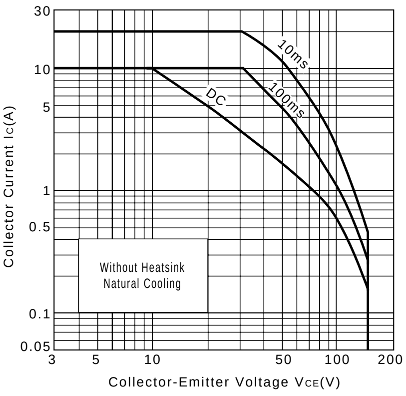
$\theta_{j\text{-}a}$–t Characteristics



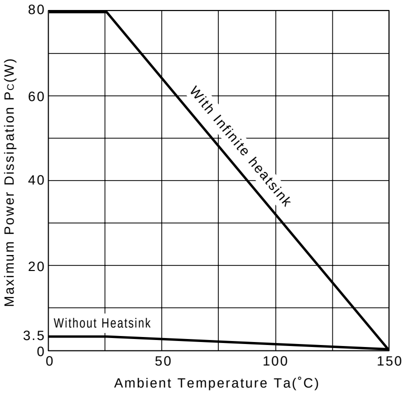
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)

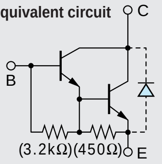


P_C–Ta Derating



Darlington 2SD2557

Equivalent circuit



Silicon NPN Triple Diffused Planar Transistor

Application : Series Regulator and General Purpose

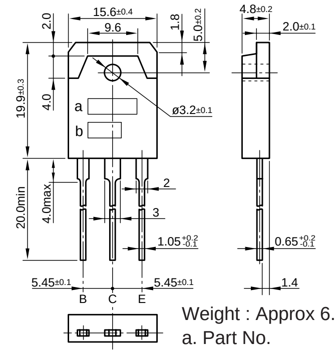
■**Absolute maximum ratings** (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	200	V
V_{CEO}	200	V
V_{EBO}	6	V
I_C	5	A
I_B	2	A
P_C	70(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■**Electrical Characteristics** (Ta=25°C)

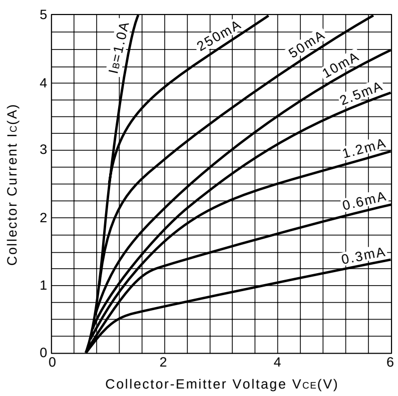
Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=200V	100max	μA
I_{EBO}	V_{EB}=6V	5max	mA
$V_{(BR)CEO}$	I_C=10mA	200min	V
h_{FE}	V_{CE}=5V, I_C=1A	1500to6500	
$V_{CE(sat)}$	I_C=1A, I_B=5mA	1.5max	V
f_T	V_{CE}=10V, I_E=–0.5A	15typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	110typ	pF

External Dimensions MT-100(TO3P)

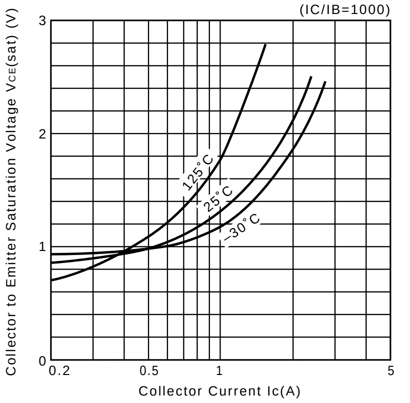


Weight : Approx 6.0g
a. Part No.
b. Lot No.

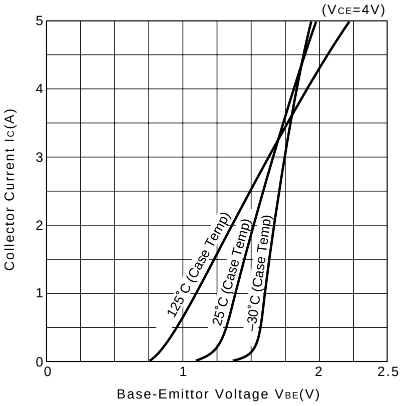
I_C–V_{CE} Characteristics (Typical)



$V_{CE(sat)}$–I_C Temperature Characteristics (Typical)

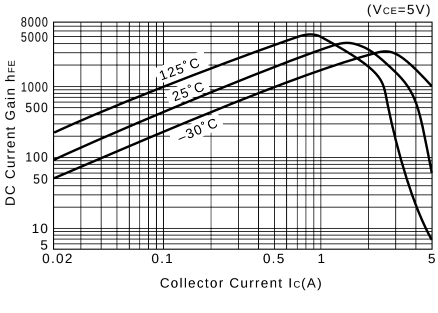


I_C–V_{BE} Temperature Characteristics (Typical)

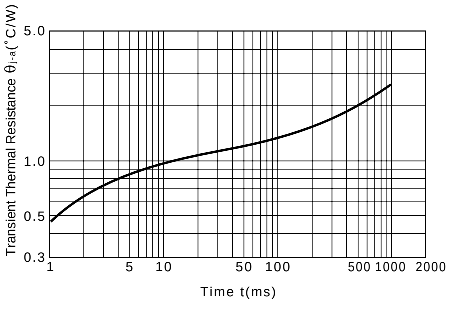


h_{FE}–I_C Characteristics (Typical)

h_{FE}–I_C Temperature Characteristics (Typical)

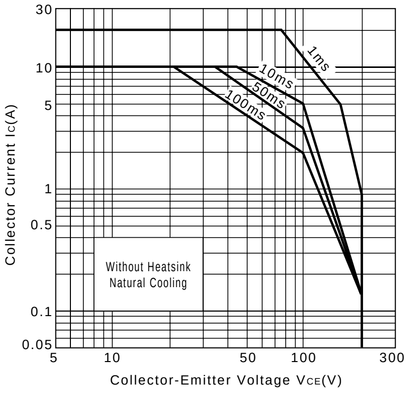


θ_{j-a}–t Characteristics

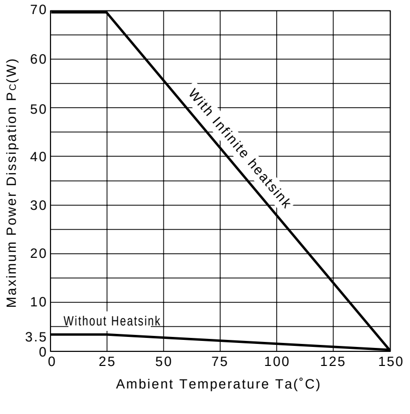


f_T–I_E Characteristics (Typical)

Safe Operating Area (Single Pulse)

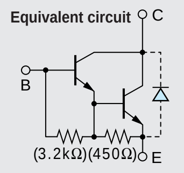


P_C–Ta Derating



Darlington

2SD2558



Silicon NPN Triple Diffused Planar Transistor

Application : Series Regulator and General Purpose

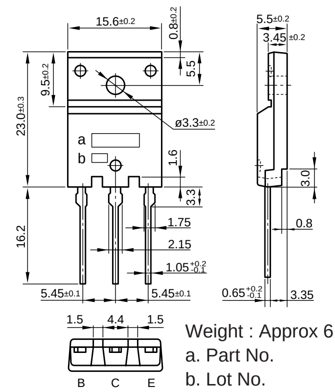
■**Absolute maximum ratings** (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	200	V
V_{CEO}	200	V
V_{EBO}	6	V
I_C	5	A
I_B	2	A
P_C	60(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■**Electrical Characteristics** (Ta=25°C)

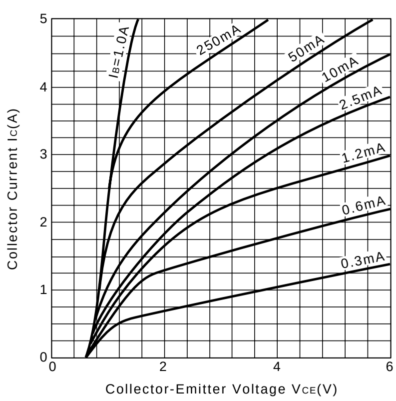
Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=200V	100max	μA
I_{EBO}	V_{EB}=6V	5max	mA
$V_{(BR)CEO}$	I_C=10mA	200min	V
h_{FE}	V_{CE}=5V, I_C=1A	1500to6500	
$V_{CE(sat)}$	I_C=1A, I_B=5mA	1.5max	V
f_T	V_{CE}=10V, I_E=–0.5A	15typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	110typ	pF

External Dimensions FM100(TO3PF)

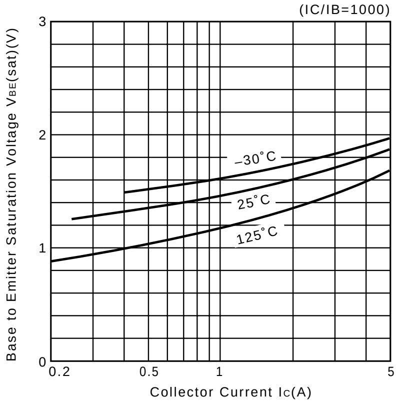


Weight : Approx 6.5g
a. Part No.
b. Lot No.

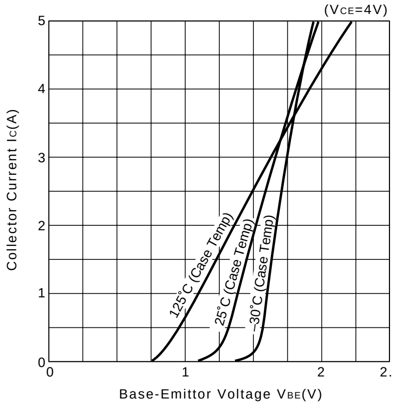
IC–VCE Characteristics (Typical)



VBE(sat)–IC Temperature Characteristics (Typical)

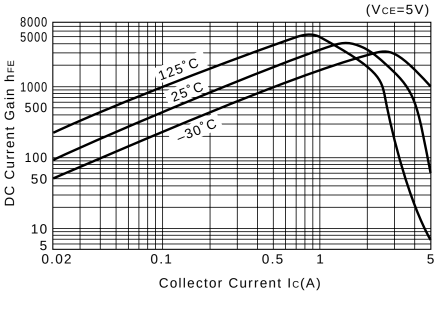


IC–VBE Temperature Characteristics (Typical)

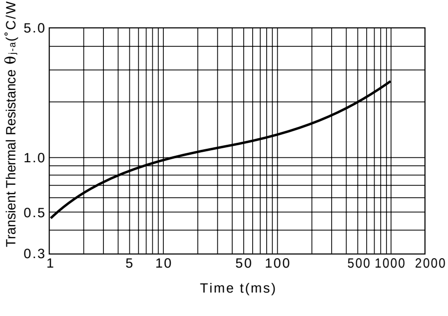


hFE–IC Characteristics (Typical)

hFE–IC Temperature Characteristics (Typical)

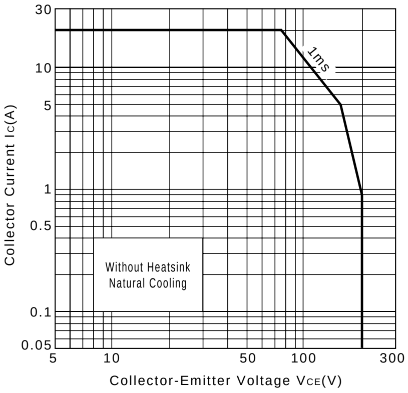


θj-a–t Characteristics

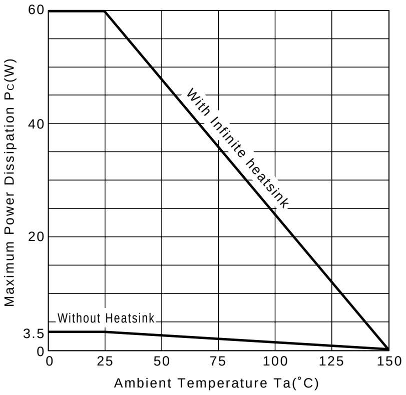


fT–IE Characteristics (Typical)

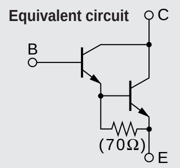
Safe Operating Area (Single Pulse)



Pc–Ta Derating



Darlington 2SD2560



Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SB1647)

Application : Audio, Series Regulator and General Purpose

■Absolute maximum ratings (Ta=25°C)

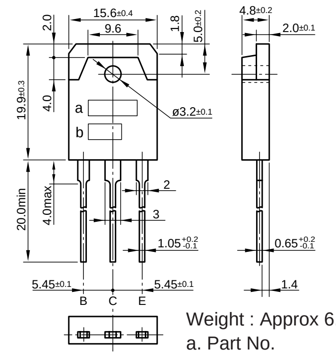
Symbol	Ratings	Unit
V_{CBO}	150	V
V_{CEO}	150	V
V_{EBO}	5	V
I_C	15	A
I_B	1	A
P_C	130(Tc=25°C)	W
Tj	150	°C
Tstg	–55to+150	°C

■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=150V	100max	μA
I_{EBO}	V_{EB}=5V	100max	μA
$V_{(BR)CEO}$	I_C=30mA	150min	V
h_{FE}	V_{CE}=4V, I_C=10A	5000min∗	
$V_{CE(sat)}$	I_C=10A, I_B=10mA	2.5max	V
$V_{BE(sat)}$	I_C=10A, I_B=10mA	3.0max	V
f_T	V_{CE}=12V, I_E=–2A	70typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	120typ	pF

∗h_{FE} Rank O(5000 to 12000), P(6500 to 20000), Y(15000 to 30000)

External Dimensions MT-100(TO3P)

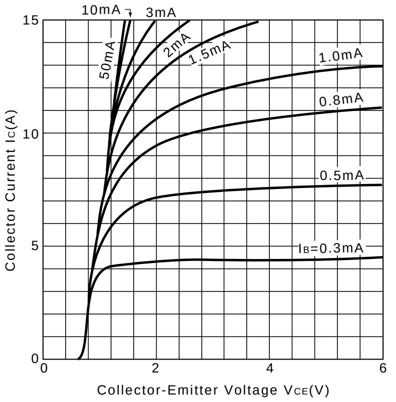


Weight : Approx 6.0g
a. Part No.
b. Lot No.

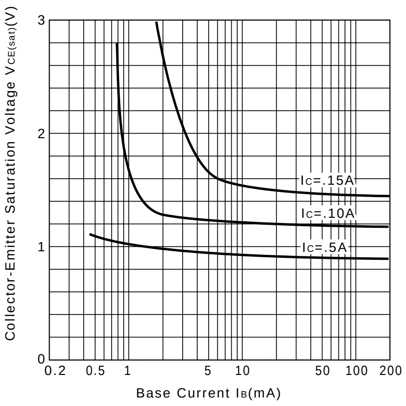
■Typical Switching Characteristics (Common Emitter)

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (μs)	tstg (μs)	tf (μs)
40	4	10	10	–5	10	–10	0.8typ	4.0typ	1.2typ

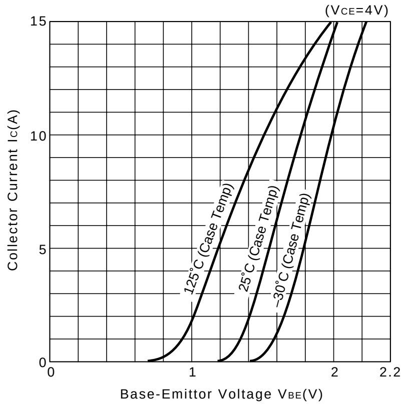
I_C–V_{CE} Characteristics (Typical)



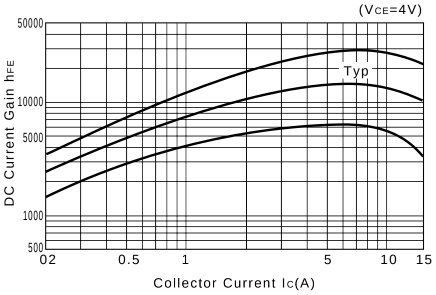
$V_{CE(sat)}$–I_B Characteristics (Typical)



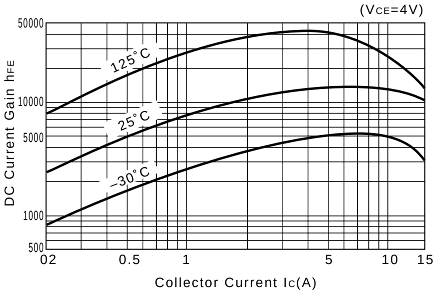
I_C–V_{BE} Temperature Characteristics (Typical)



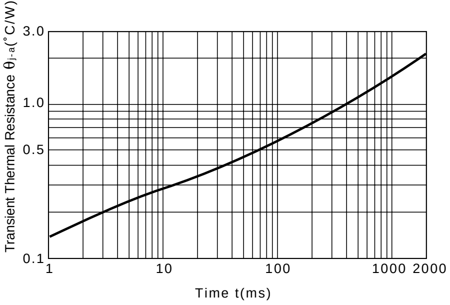
h_{FE}–I_C Characteristics (Typical)



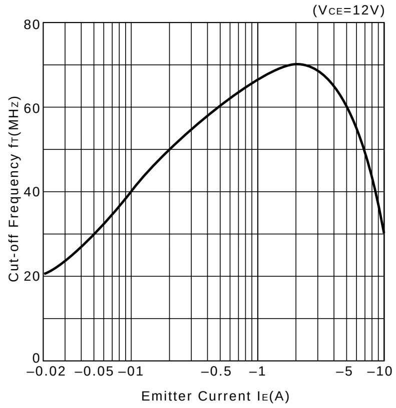
h_{FE}–I_C Temperature Characteristics (Typical)



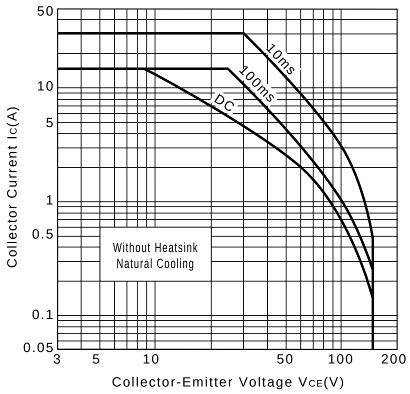
θ_{j-a}–t Characteristics



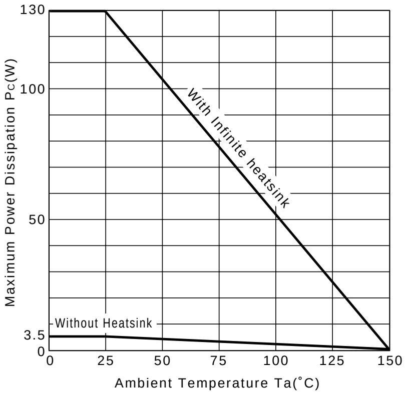
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)

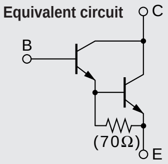


P_C–Ta Derating



Darlington 2SD2561

Equivalent circuit



Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SB1648)

Application : Audio, Series Regulator and General Purpose

■Absolute maximum ratings (Ta=25°C)

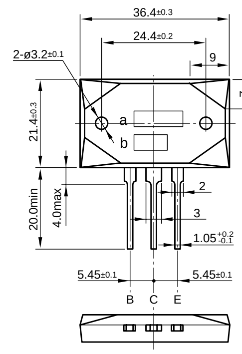
Symbol	Ratings	Unit
V_{CBO}	150	V
V_{CEO}	150	V
V_{EBO}	5	V
I_C	17	A
I_B	1	A
P_C	200(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=150V	100max	μA
I_{EBO}	V_{EB}=5V	100max	μA
$V_{(BR)CEO}$	I_C=30mA	150min	V
h_{FE}	V_{CE}=4V, I_C=10A	5000min*	
$V_{CE(sat)}$	I_C=10A, I_B=10mA	2.5max	V
$V_{BE(sat)}$	I_C=10A, I_B=10mA	3.0max	V
f_T	V_{CE}=12V, I_E=–2A	70typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	120typ	pF

*h_{FE} Rank O(5000 to 12000), P(6500 to 20000), Y(15000 to 30000)

External Dimensions MT-200

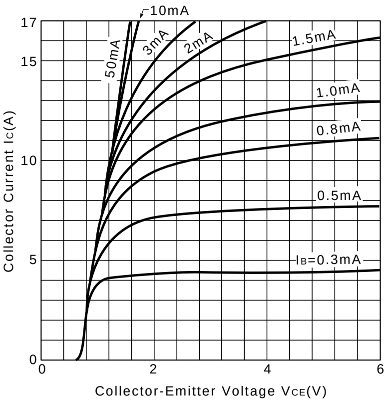


Weight : Approx 18.4g
a. Part No.
b. Lot No.

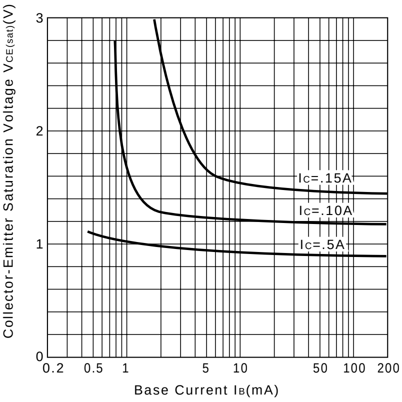
■Typical Switching Characteristics (Common Emitter)

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (μs)	tstg (μs)	tf (μs)
40	4	10	10	–5	10	–10	0.8typ	4.0typ	1.2typ

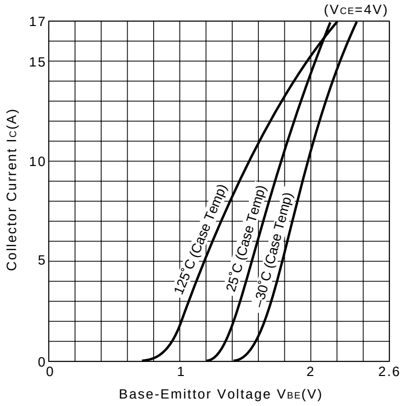
I_C–V_{CE} Characteristics (Typical)



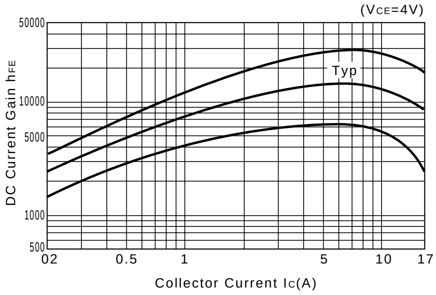
$V_{CE(sat)}$–I_B Characteristics (Typical)



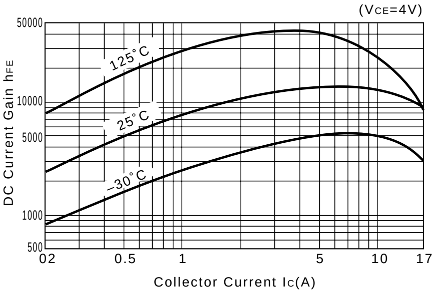
I_C–V_{BE} Temperature Characteristics (Typical)



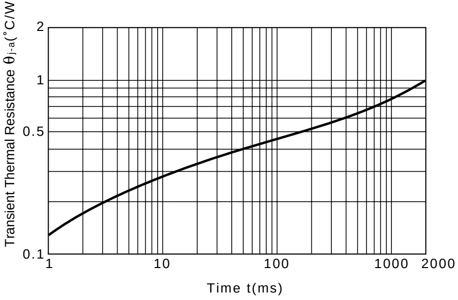
h_{FE}–I_C Characteristics (Typical)



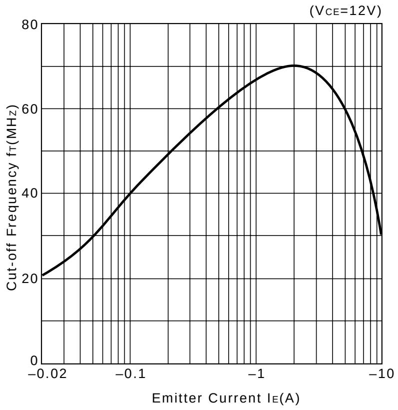
h_{FE}–I_C Temperature Characteristics (Typical)



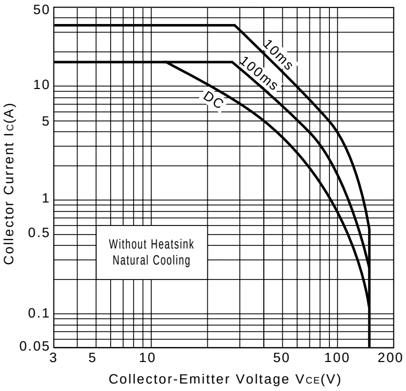
$\theta_{j\text{-}a}$–t Characteristics



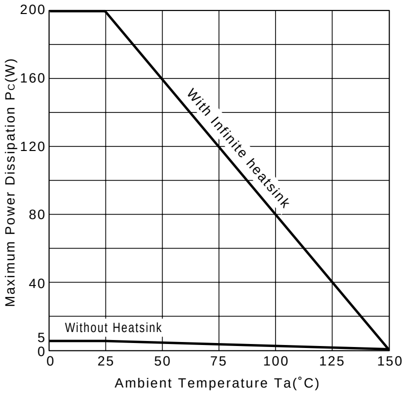
f_T–I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)

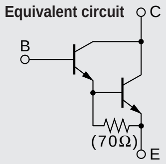


P_C–Ta Derating



Darlington # 2SD2562

Equivalent circuit



Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SB1649)

Application : Audio, Series Regulator and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	150	V
V_{CEO}	150	V
V_{EBO}	5	V
I_C	15	A
I_B	1	A
P_C	85(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

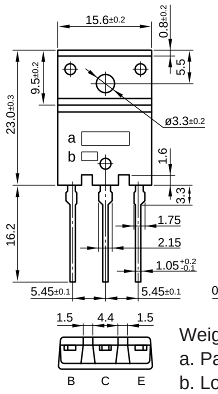
Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=150V	100max	µA
I_{EBO}	V_{EB}=5V	100max	µA
$V_{(BR)CEO}$	I_C=30mA	150min	V
h_{FE}	V_{CE}=4V, I_C=10A	5000min*	
$V_{CE(sat)}$	I_C=10A, I_B=10mA	2.5max	V
$V_{BE(sat)}$	I_C=10A, I_B=10mA	3.0max	V
f_T	V_{CE}=12V, I_E=–2A	70typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	120typ	pF

*h_{FE} Rank O(5000 to 12000), P(6500 to 20000), Y(15000 to 30000)

■Typical Switching Characteristics (Common Emitter)

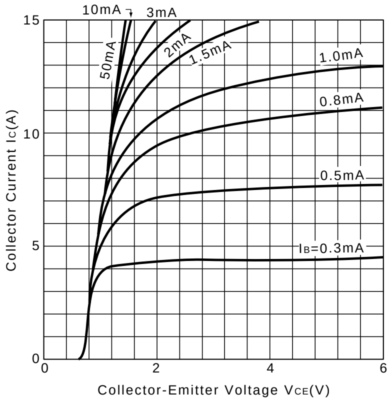
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (µs)	tstg (µs)	tf (µs)
40	4	10	10	–5	10	–10	0.8typ	4.0typ	1.2typ

External Dimensions FM100(TO3PF)

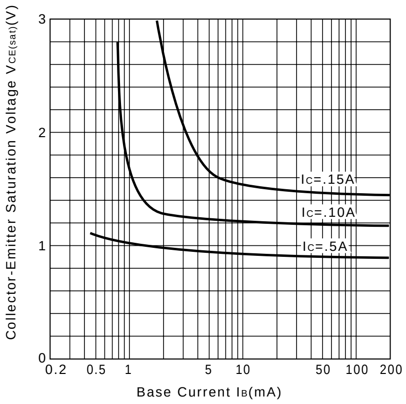


Weight : Approx 6.5g
a. Part No.
b. Lot No.

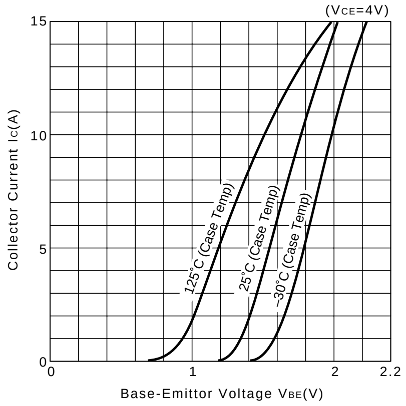
I_C−V_{CE} Characteristics (Typical)



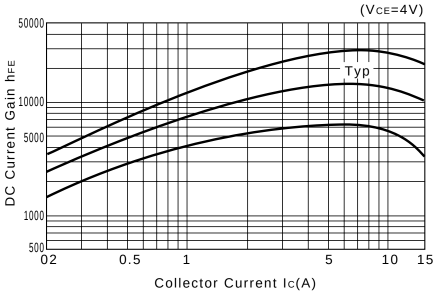
$V_{CE(sat)}$−I_B Characteristics (Typical)



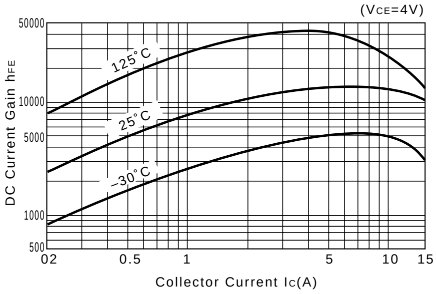
I_C−V_{BE} Temperature Characteristics (Typical)



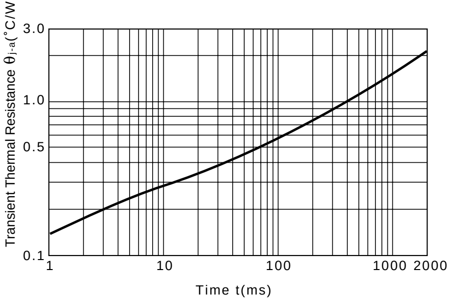
h_{FE}−I_C Characteristics (Typical)



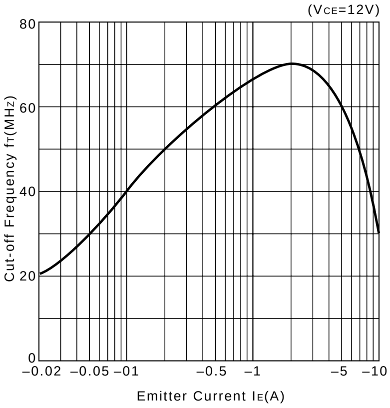
h_{FE}−I_C Temperature Characteristics (Typical)



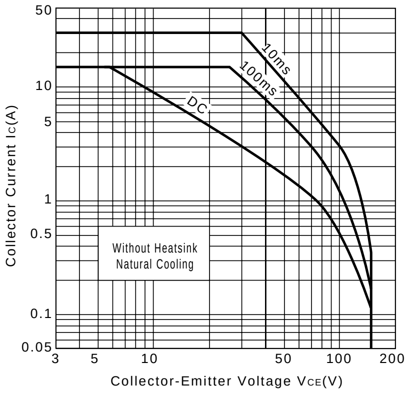
θ_{j-a}−t Characteristics



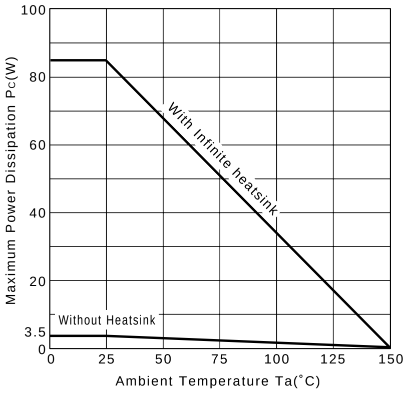
f_T−I_E Characteristics (Typical)



Safe Operating Area (Single Pulse)



P_C−Ta Derating



Darlington 2SD2589

Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SB1659)

Application : Audio, Series Regulator and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	110	V
V_{CEO}	110	V
V_{EBO}	5	V
I_C	6	A
I_B	1	A
P_C	50(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

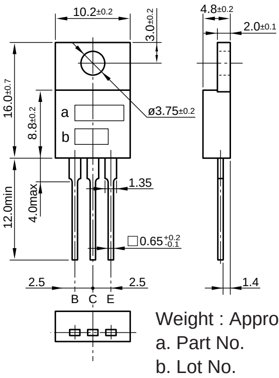
Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=110V	100max	µA
I_{EBO}	V_{EB}=5V	100max	µA
$V_{(BR)CEO}$	I_C=30mA	110min	V
h_{FE}	V_{CE}=4V, I_C=5A	5000min*	
$V_{CE(sat)}$	I_C=5A, I_B=5mA	2.5max	V
$V_{BE(sat)}$	I_C=5A, I_B=5mA	3.0max	V
f_T	V_{CE}=12V, I_E=–0.5A	60typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	55typ	pF

*h_{FE} Rank O(5000to12000), P(6500to20000), Y(15000to30000)

■Typical Switching Characteristics (Common Emitter)

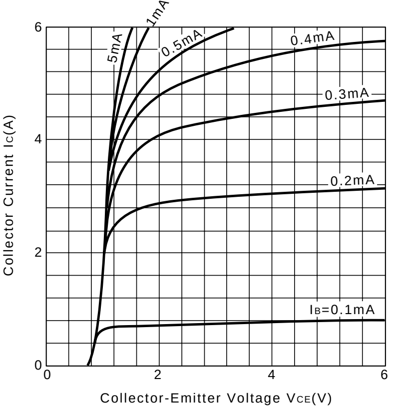
V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (µs)	tstg (µs)	tf (µs)
30	6	5	10	–5	5	–5	0.8typ	6.2typ	1.1typ

External Dimensions FM-25(TO220)

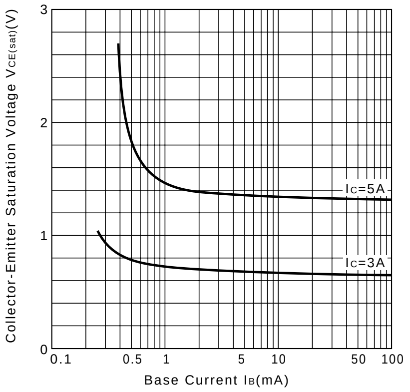


Weight : Approx 2.6g
a. Part No.
b. Lot No.

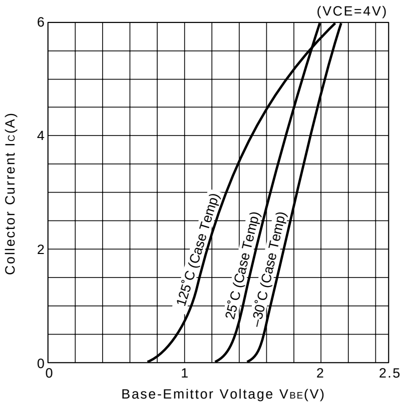
I_C–V_{CE} Characteristics (Typical)



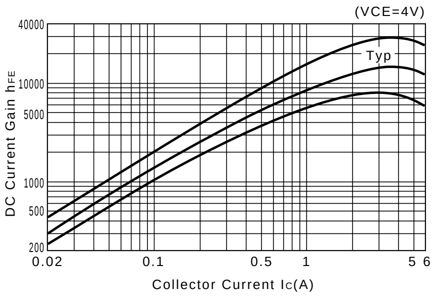
$V_{CE(sat)}$–I_B Characteristics (Typical)



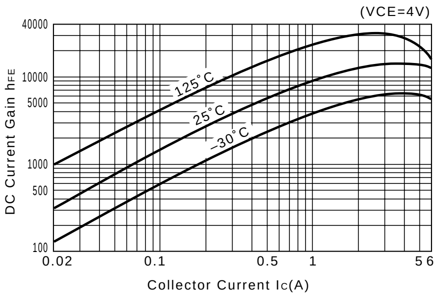
I_C–V_{BE} Temperature Characteristics (Typical)



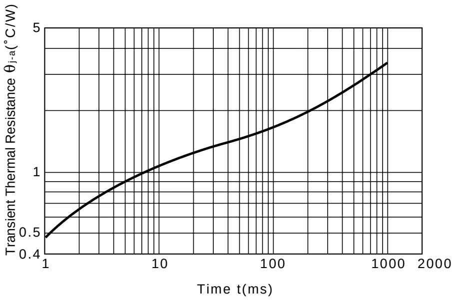
h_{FE}–I_C Characteristics (Typical)



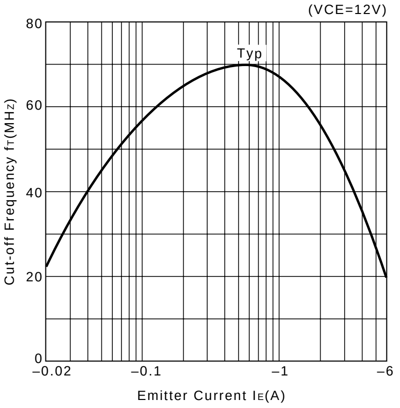
h_{FE}–I_C Temperature Characteristics (Typical)



θ_{j-a}–t Characteristics

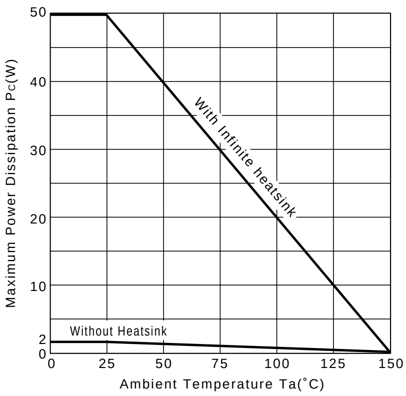


f_T–I_E Characteristics (Typical)



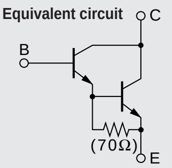
Safe Operating Area (Single Pulse)

P_C–Ta Derating



Darlington 2SD2641

Equivalent circuit



Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SB1685)

Application : Audio, Series Regulator and General Purpose

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
VCBO	110	V
VCEO	110	V
VEBO	5	V
IC	6	A
IB	1	A
PC	60(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

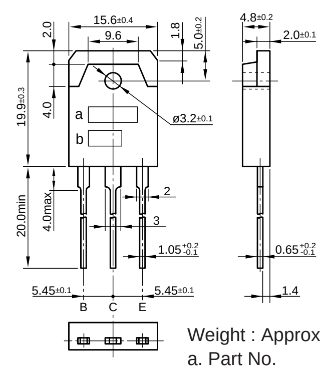
Symbol	Conditions	Ratings	Unit
ICBO	VCB=110V	100max	μA
IEBO	VEB=5V	100max	μA
V(BR)CEO	IC=30mA	110min	V
hFE	VCE=4V, IC=5A	5000min*	
VCE(sat)	IC=5A, IB=5mA	2.5max	V
VBE(sat)	IC=5A, IB=5mA	3.0max	V
fT	VCE=12V, IE=–2A	60typ	MHz
COB	VCB=10V, f=1MHz	55typ	pF

*hFE Rank O(5000 to 12000), P(6500 to 20000), Y(15000 to 30000)

■Typical Switching Characteristics (Common Emitter)

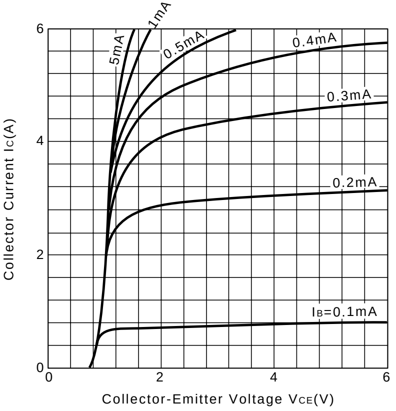
VCC (V)	RL (Ω)	IC (A)	VBB1 (V)	VBB2 (V)	IB1 (mA)	IB2 (mA)	ton (μs)	tstg (μs)	tf (μs)
30	6	5	10	–5	5	–5	0.8typ	6.2typ	1.1typ

External Dimensions MT-100(TO3P)

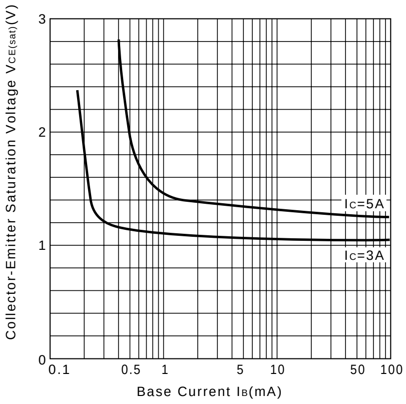


Weight : Approx 6.0g
a. Part No.
b. Lot No.

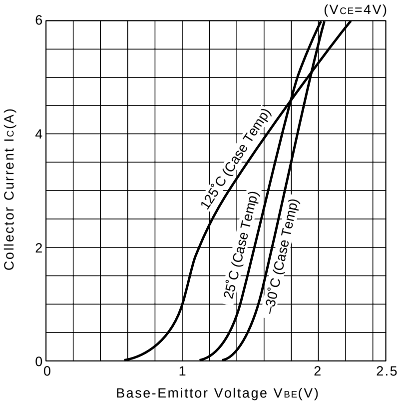
IC−VCE Characteristics (Typical)



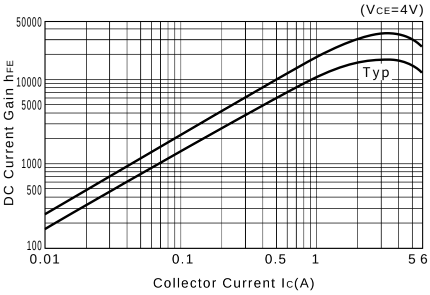
VCE(sat)−IB Characteristics (Typical)



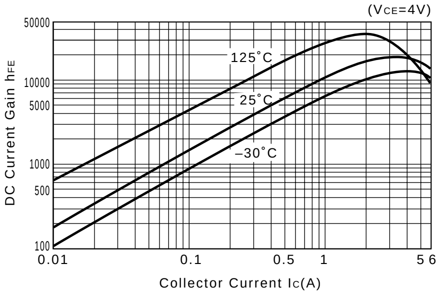
IC−VBE Temperature Characteristics (Typical)



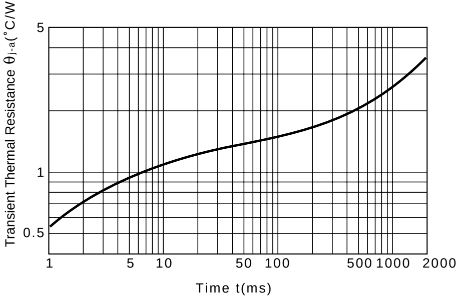
hFE−IC Characteristics (Typical)



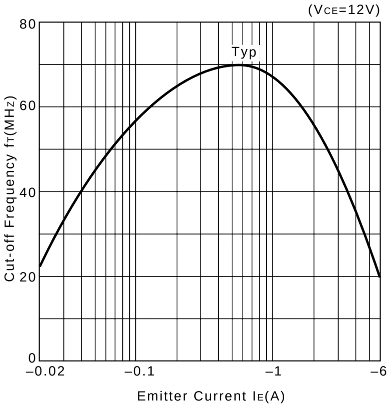
hFE−IC Temperature Characteristics (Typical)



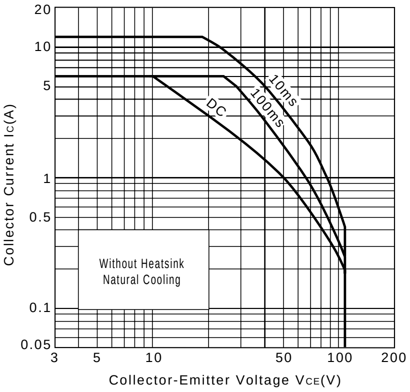
θj-a−t Characteristics



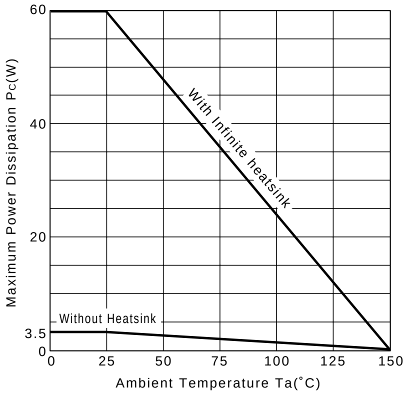
fT−IE Characteristics (Typical)



Safe Operating Area (Single Pulse)

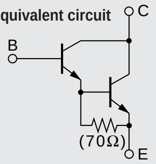


Pc−Ta Derating



Darlington 2SD2642

Equivalent circuit



Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SB1687)

Application : Audio, Series Regulator and General Purpose

■**Absolute maximum ratings** (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	110	V
V_{CEO}	110	V
V_{EBO}	5	V
I_C	6	A
I_B	1	A
P_C	30(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■**Electrical Characteristics** (Ta=25°C)

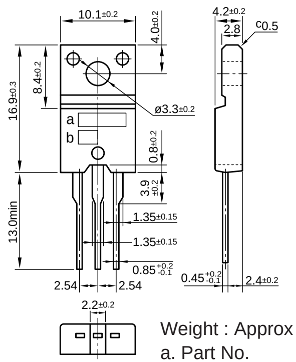
Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=110V	100max	μA
I_{EBO}	V_{EB}=5V	100max	μA
$V_{(BR)CEO}$	I_C=30mA	110min	V
h_{FE}	V_{CE}=4V, I_C=5A	5000min*	
$V_{CE(sat)}$	I_C=5A, I_B=5mA	2.5max	V
$V_{BE(sat)}$	I_C=5A, I_B=5mA	3.0max	V
f_T	V_{CE}=12V, I_E=–0.5A	60typ	MHz
C_{OB}	V_{CB}=10V, f=1MHz	55typ	pF

*h_{FE} Rank O̅(5000 to 12000), P(6500 to 20000), Y(15000 to 30000)

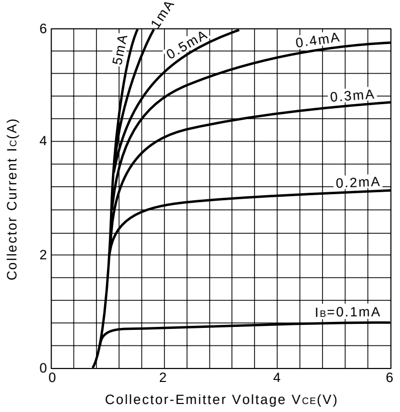
■**Typical Switching Characteristics (Common Emitter)**

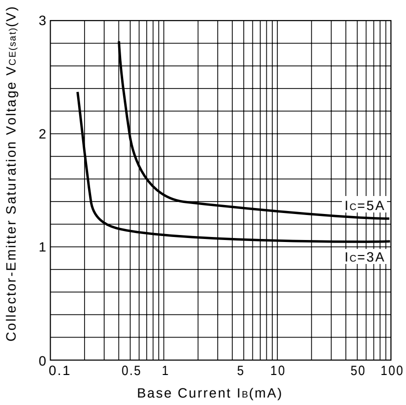
Vcc (V)	RL (Ω)	Ic (A)	VBB1 (V)	VBB2 (V)	IB1 (mA)	IB2 (mA)	ton (μs)	tstg (μs)	tf (μs)
30	6	5	10	–5	5	–5	0.8typ	6.2typ	1.1typ

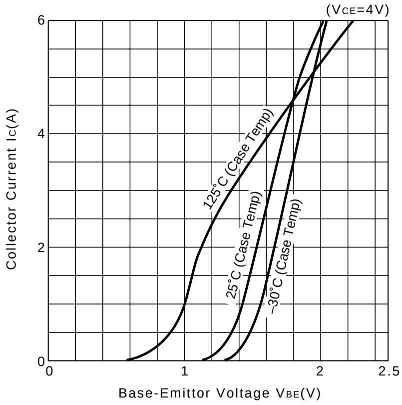
External Dimensions FM20(TO220F)

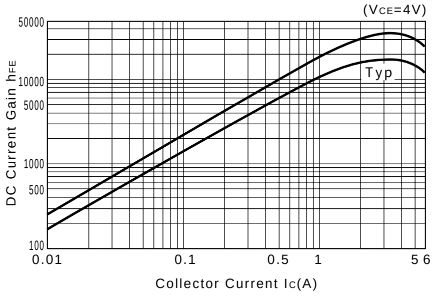


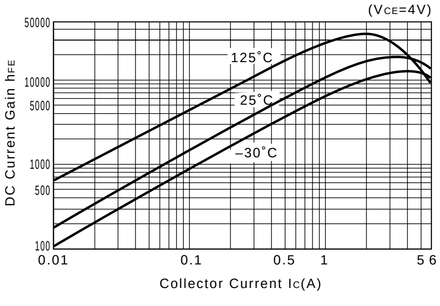
Weight : Approx 2.0g
a. Part No.
b. Lot No.

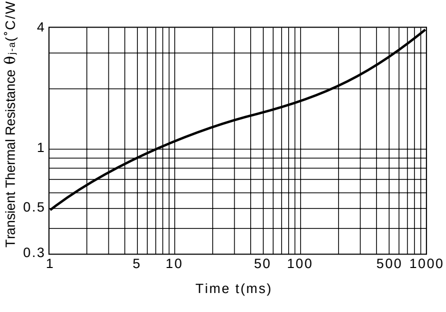

I_C–V_{CE} Characteristics (Typical)

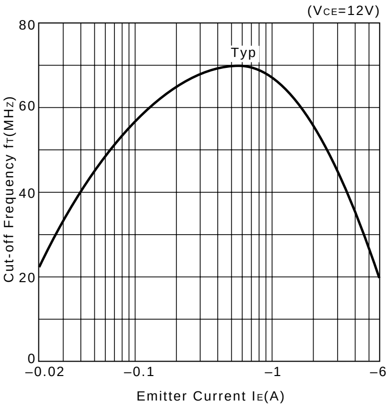

$V_{CE(sat)}$–I_B Characteristics (Typical)

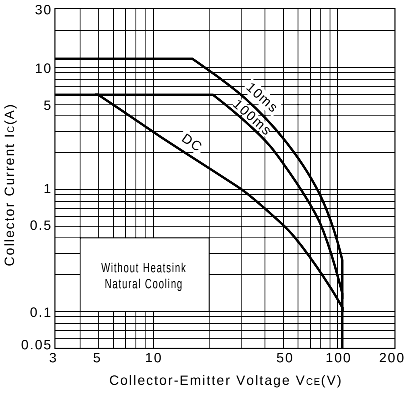

I_C–V_{BE} Temperature Characteristics (Typical)

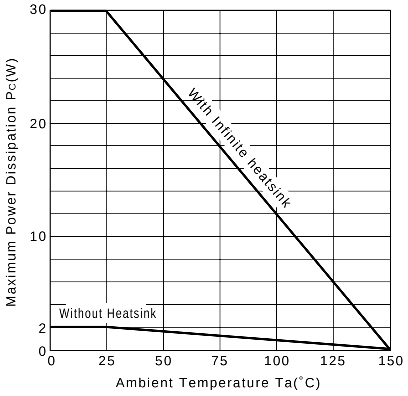

h_{FE}–I_C Characteristics (Typical)


h_{FE}–I_C Temperature Characteristics (Typical)


θ_{j-a}–t Characteristics

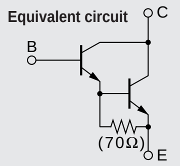

f_T–I_E Characteristics (Typical)


Safe Operating Area (Single Pulse)


P_C–Ta Derating

Darlington 2SD2643

Equivalent circuit



Silicon NPN Triple Diffused Planar Transistor (Complement to type 2SB1687)

Application : Audio, Series Regulator and General Purpose

■Absolute maximum ratings (Ta=25°C)

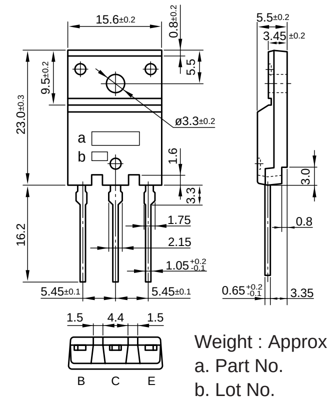
Symbol	Ratings	Unit
V_{CBO}	110	V
V_{CEO}	110	V
V_{EBO}	5	V
I_C	6	A
I_B	1	A
P_C	60(Tc=25°C)	W
Tj	150	°C
Tstg	–55 to +150	°C

■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=110V	100max	μA
I_{EBO}	V_{EB}=5V	100max	μA
$V_{(BR)CEO}$	I_C=30mA	110min	V
h_{FE}	V_{CE}=4V, I_C=5A	5000min∗	
$V_{CE(sat)}$	I_C=5A, I_B=5mA	2.5max	V
$V_{BE(sat)}$	I_C=5A, I_B=5mA	3.0max	V
f_T	V_{CE}=12V, I_E=–0.5A	60typ	MHz
COB	V_{CB}=10V, f=1MHz	55typ	pF

∗h_{FE} Rank Ō(5000 to 12000), P(6500 to 20000), Y(15000 to 30000)

External Dimensions FM100(TO3PF)

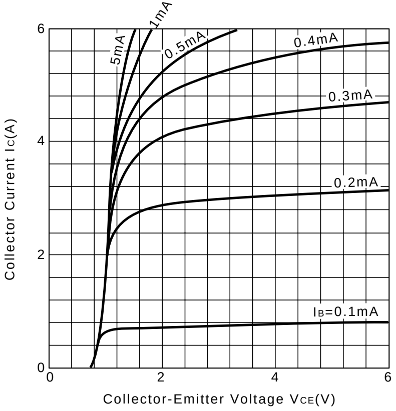


Weight : Approx 6.5g
a. Part No.
b. Lot No.

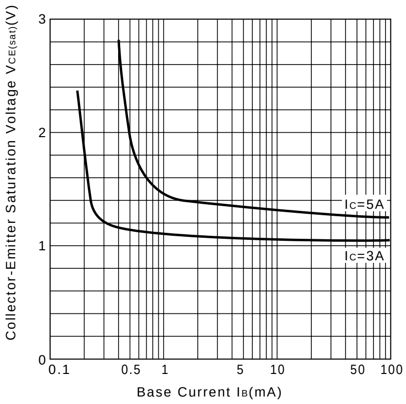
■Typical Switching Characteristics (Common Emitter)

V_{CC} (V)	R_L (Ω)	I_C (A)	V_{BB1} (V)	V_{BB2} (V)	I_{B1} (mA)	I_{B2} (mA)	ton (μs)	tstg (μs)	tf (μs)
30	6	5	10	–5	5	–5	0.8typ	6.2typ	1.1typ

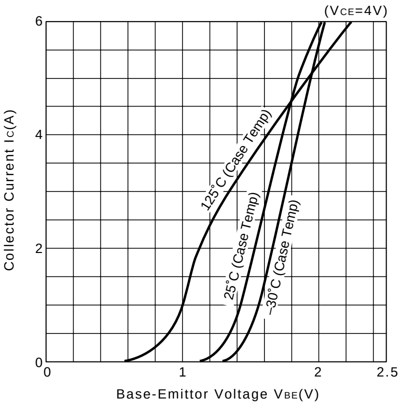
I_C–V_{CE} Characteristics (Typical)



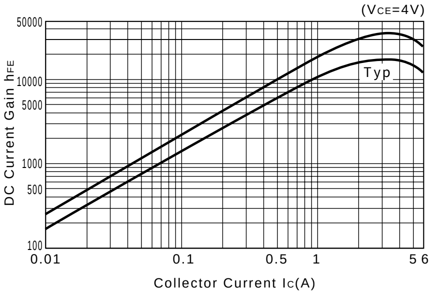
$V_{CE(sat)}$–I_B Characteristics (Typical)



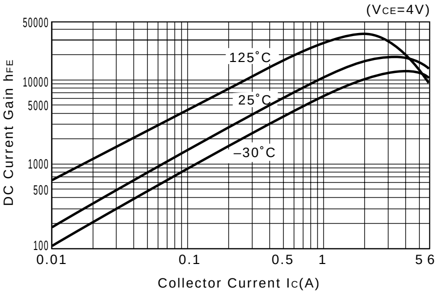
I_C–V_{BE} Temperature Characteristics (Typical)



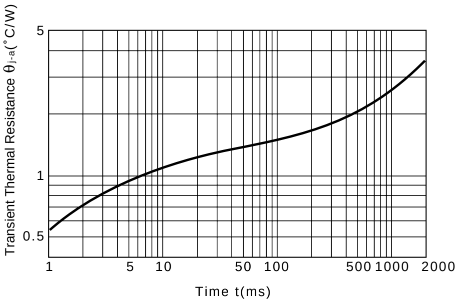
h_{FE}–I_C Characteristics (Typical)



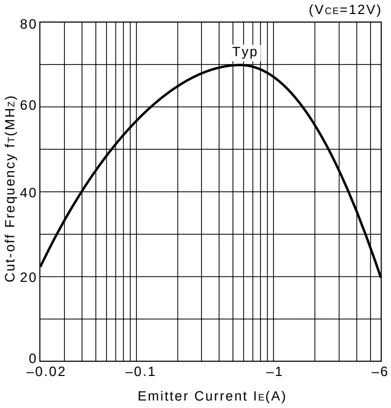
h_{FE}–I_C Temperature Characteristics (Typical)



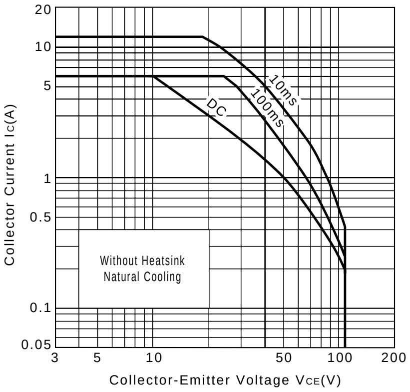
θj-a–t Characteristics



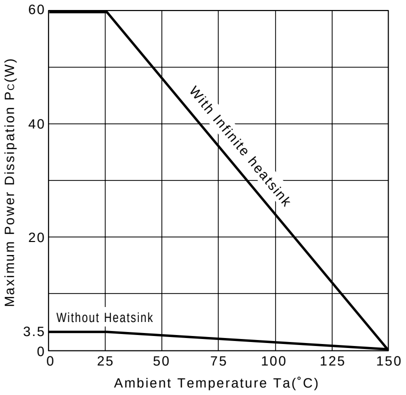
f_T–I_E Characteristics (Typical)



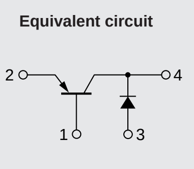
Safe Operating Area (Single Pulse)



P_C–Ta Derating



SAH02


Equivalent circuit

Silicon PNP Epitaxial Planar Transistor with Shottky Barrier Diode

Application : Chopper Regulator

■**Absolute maximum ratings** (Ta=25°C)

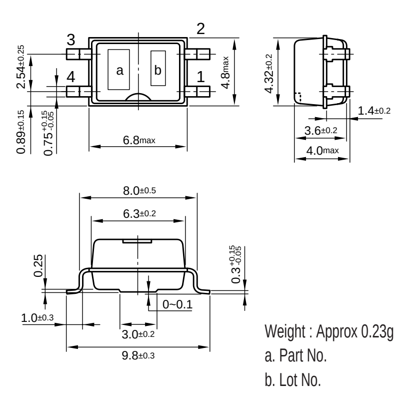
Symbol	Ratings	Unit
V_{CBO}	–30	V
V_{CEO}	–30	V
V_{EBO}	–10	V
I_C	–3	A
I_B	–0.5	A
P_C	800(Ta=25°C)	mW
Tj	125	°C
Tstg	–40 to +125	°C

■**Electrical Characteristics** (Ta=25°C)

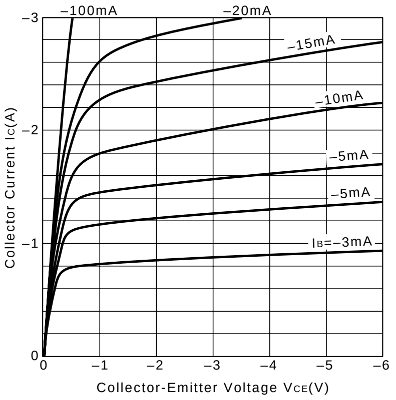
Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=–30V	–10max	μA
I_{EBO}	V_{EB}=–10V	–10max	μA
$V_{(BR)CEO}$	I_C=–10mA	–30min	V
h_{FE1}	V_{CE}=–2V, I_C=–1A	100min	
h_{FE2}	V_{CE}=–2V, I_C=–0.5A	150min	
$V_{CE(sat)}$	I_C=–0.5A, I_B=–20mA	–0.3max	V
f_T	V_{CE}=–12V, I_E=0.3A	100typ	MHz
C_{OB}	V_{CB}=–10V, f=1MHz	45typ	pF

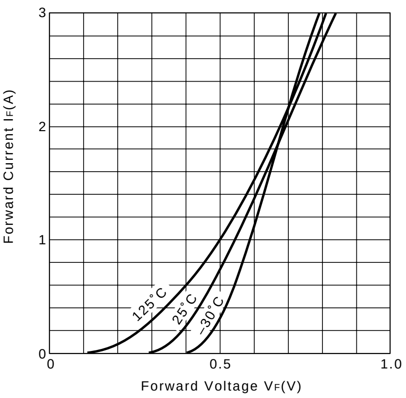
V_R	I_R=100μA	30 min	V
V_F	I_F=0.5A	0.55 max	V
t r r	I_F=±100mA	15 typ	ns

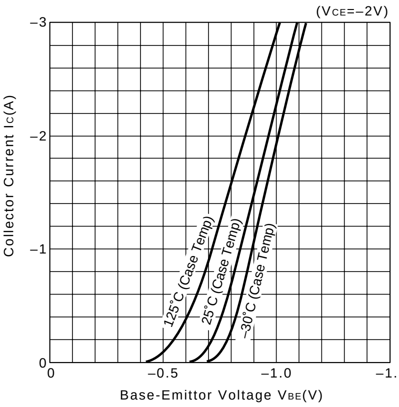
External Dimensions PS Pack

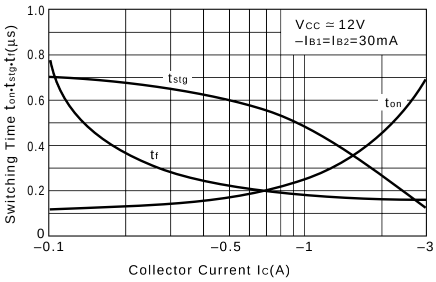


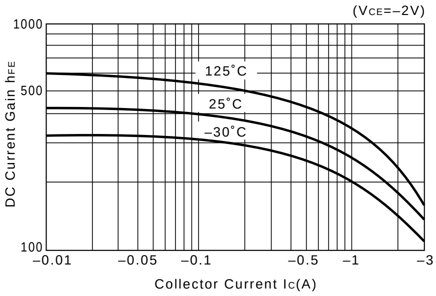
Weight : Approx 0.23g
a. Part No.
b. Lot No.

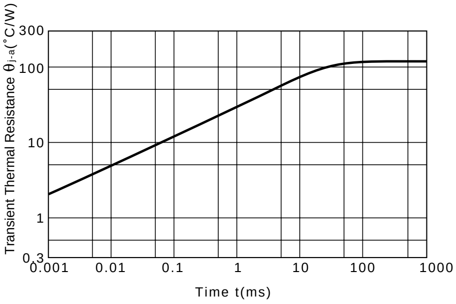

Ic–Vce Characteristics (Typical)

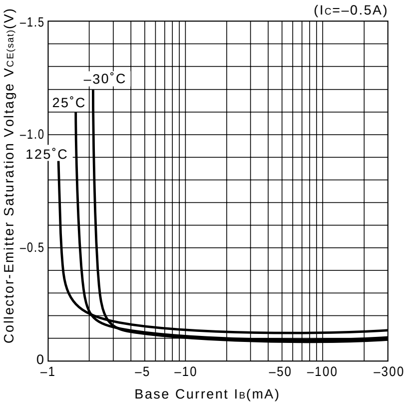

Diode If–Vf Characteristics

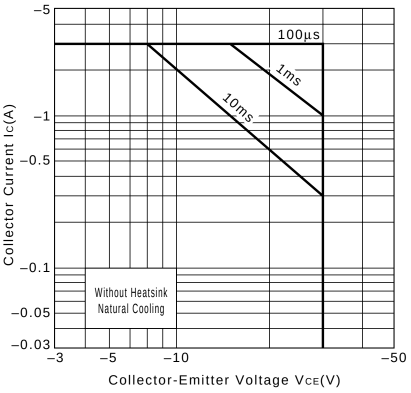

Ic–Vbe Temperature Characteristics (Typical)

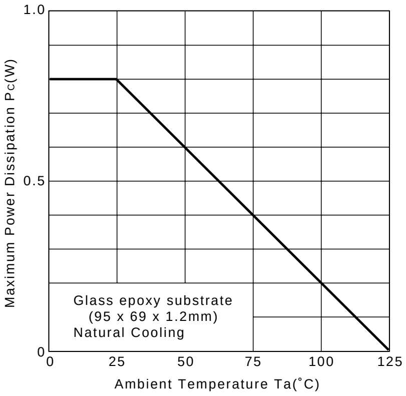

ton•tstg•tf–Ic Characteristics (Typical)


hfe–Ic Temperature Characteristics (Typical)

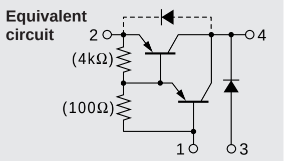

θj-a–t Characteristics


Vce(sat)–Ib Temperature Characteristics (Typical)


Safe Operating Area (Single Pulse)


Pc–Ta Derating

SAH03



Silicon PNP Epitaxial Planar Transistor with Fast-Recovery Rectifier Diode

Application : Voltage change switch for motor

■Absolute maximum ratings (Ta=25°C)

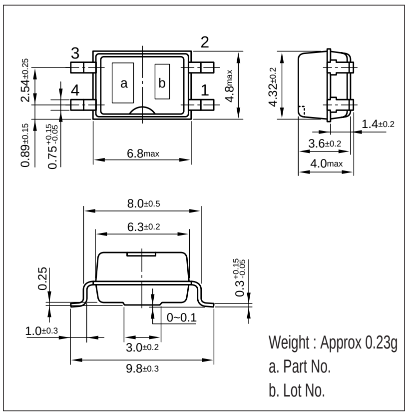
Symbol	Ratings	Unit
V_{CBO}	–60	V
V_{CEO}	–60	V
V_{EBO}	–6	V
I_C	–1.2	A
I_B	–0.1	A
P_C	1.0(Ta=25°C)	W
Tj	150	°C
Tstg	–40to+150	°C

■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings	Unit
I_{CBO}	V_{CB}=–60V	–10max	μA
I_{EBO}	V_{EB}=–6V	–3max	mA
$V_{(BR)CEO}$	I_C=–10mA	–60min	V
h_{FE}	V_{CE}=–4V, I_C=–1A	2000 to 12000	
$V_{CE(sat)}$	I_C=–1A, I_B=–2mA	–1.4max	V
f_T	V_{CE}=–12V, I_E=0.1A	100typ	MHz
C_{OB}	V_{CB}=–10V, f=1MHz	30typ	pF

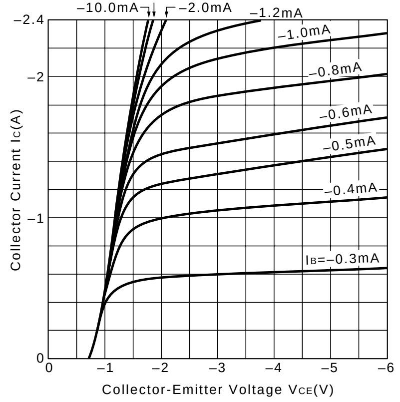
V_R	I_R=100μA	100 min	V
V_F	I_F=0.5A	1.5 max	V
t r r	I_F=±100mA	100 typ	ns

External Dimensions PS Pack

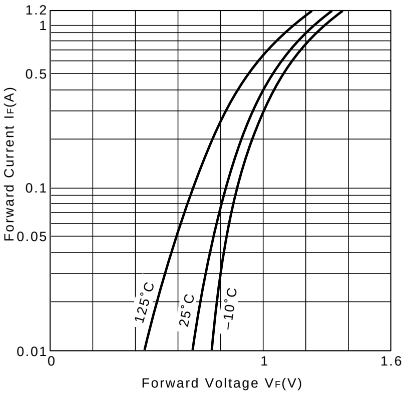


Weight : Approx 0.23g
a. Part No.
b. Lot No.

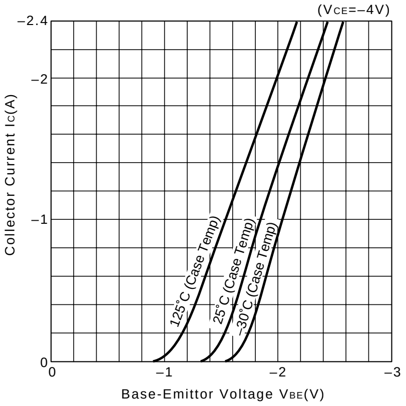
I_C–V_{CE} Characteristics (Typical)



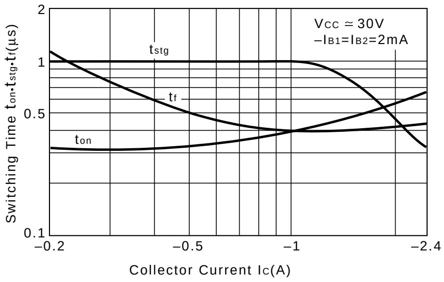
Diode I_F–V_F Characteristics



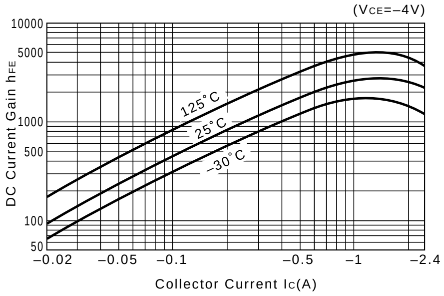
I_C–V_{BE} Temperature Characteristics (Typical)



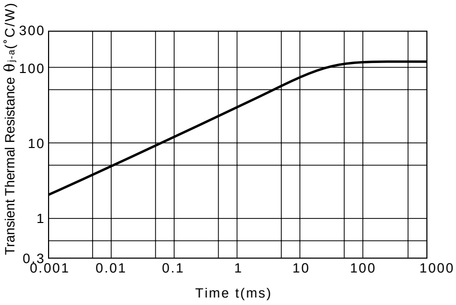
t_{on}•t_{stg}•t_f–I_C Characteristics (Typical)



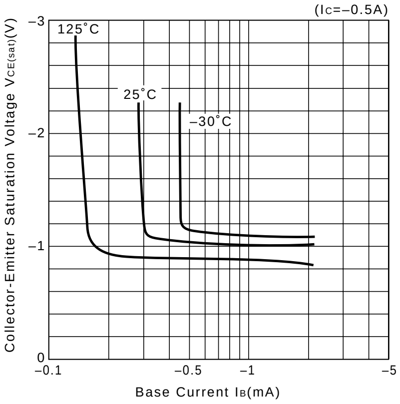
h_{FE}–I_C Temperature Characteristics (Typical)



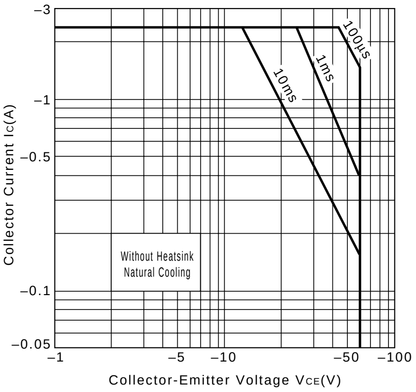
θ_{j-a}–t Characteristics



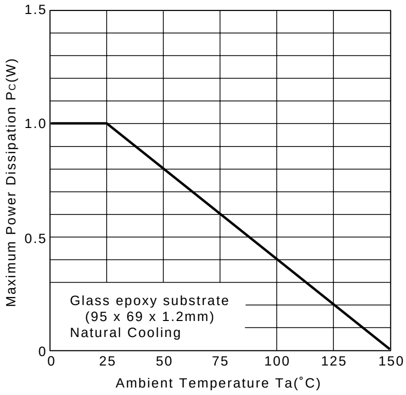
$V_{CE(sat)}$–I_B Temperature Characteristics (Typical)



Safe Operating Area (Single Pulse)

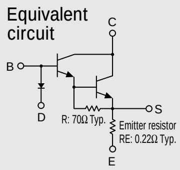


P_C–Ta Derating



Built-in temperature compensation diodes
Built-in emitter resistor
Darlington

SAP09N



(Complement to type SAP09P)

Application: Audio

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	150	V
V_{CEO}	150	V
V_{EBO}	5	V
I_C	10	A
I_B	1	A
P_C	80 (Tc=25°C)	W
Di I_F	10	mA
Tj	150	°C
Tstg	–40 to +150	°C

■Electrical Characteristics

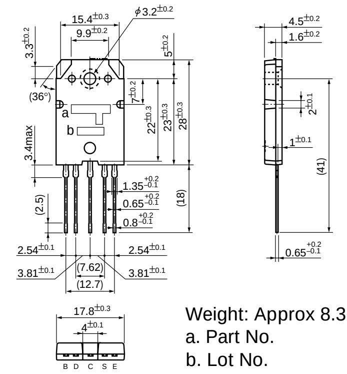
(Ta=25°C)

Symbol	Conditions	Ratings			Unit
		min	typ	max	
I_{CBO}	V_{CB}=150V			100	μA
I_{EBO}	V_{EB}=5V			100	μA
V_{CEO}	I_C=30mA	150			V
h_{FE} ✻	V_{CE}=4V, I_C=6A	5000		20000	
$V_{CE(sat)}$	I_C=6A, I_B=6mA			2.0	V
$V_{BE(sat)}$	I_C=6A, I_B=6mA			2.5	V
V_{BE}	V_{CE}=20V, I_C=40mA		1220		mV
Di V_F	I_F=2.5mA		705		mV
R_E	I_E=1A	0.176	0.22	0.264	Ω

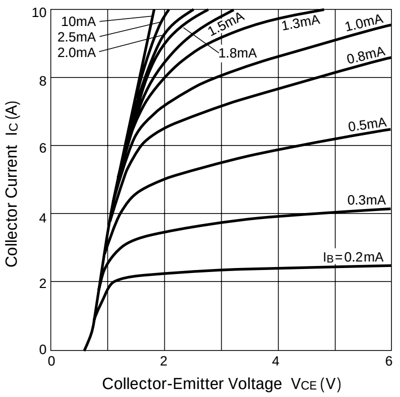
✻h_{FE} Rank $\overline{O}$ (5000 to 12000), Y (8000 to 20000)

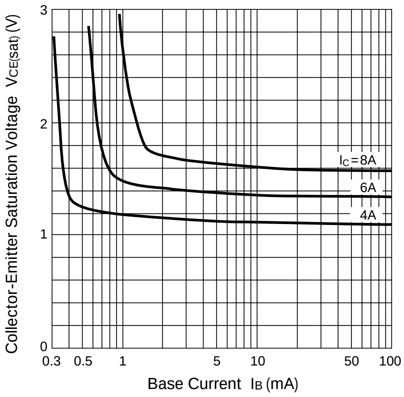
External Dimensions

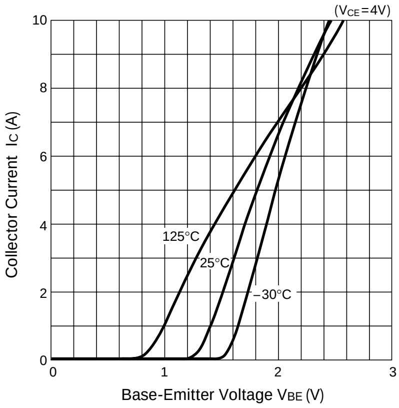
(Unit: mm)

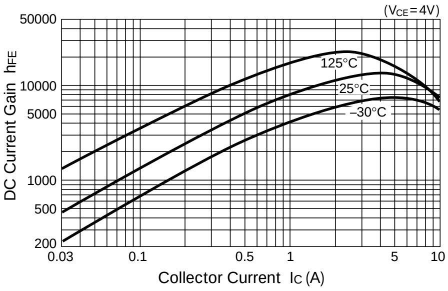


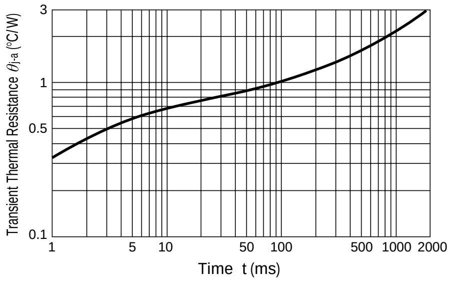
Weight: Approx 8.3g
a. Part No.
b. Lot No.

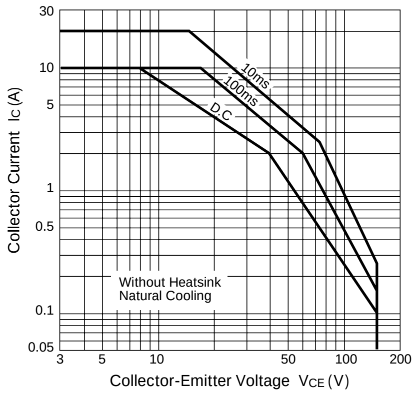

I_C–V_{CE} Characteristics (Typical)

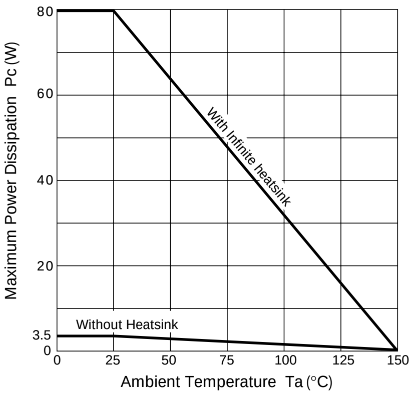

$V_{CE(sat)}$–I_B Characteristics (Typical)


I_C–V_{BE} Temperature Characteristics


h_{FE}–I_C Characteristics (Typical)


θ_{j-a}–t Characteristics

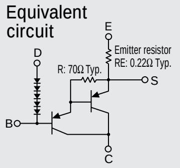

Safe Operating Area (Single Pulse)


P_C–Ta Derating

Built-in temperature compensation diodes
Built-in emitter resistor
Darlington

SAP09P

Equivalent circuit



(Complement to type SAP09N)

Application: Audio

■Absolute maximum ratings (Ta=25°C)

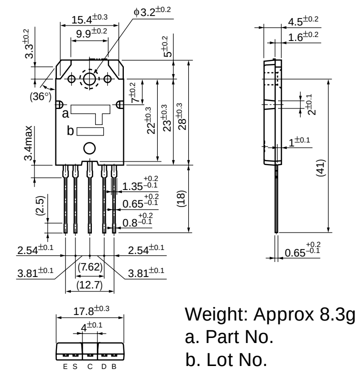
Symbol	Ratings	Unit
V_{CBO}	150	V
V_{CEO}	–150	V
V_{EBO}	–5	V
I_C	–10	A
I_B	–1	A
P_C	80(Tc=25°C)	W
Di I_F	10	mA
Tj	150	°C
Tstg	–40 to +150	°C

■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings			Unit
		min	typ	max	
I_{CBO}	V_{CE}=–150V			–100	μA
I_{EBO}	V_{EB}=–5V			–100	μA
V_{CEO}	I_C=–30mA	–150			V
h_{FE}*	V_{CE}=–4V, I_C=–6A	5000		20000	
$V_{CE(sat)}$	I_C=–6A, I_B=–6mA			–2.0	V
$V_{BE(sat)}$	I_C=–6A, I_B=–6mA			–2.5	V
V_{BE}	V_{CE}=–20V, I_C=–40mA		1230		mV
Di V_F	I_F=2.5mA		1580		mV
R_E	I_E=1A	0.176	0.22	0.264	Ω

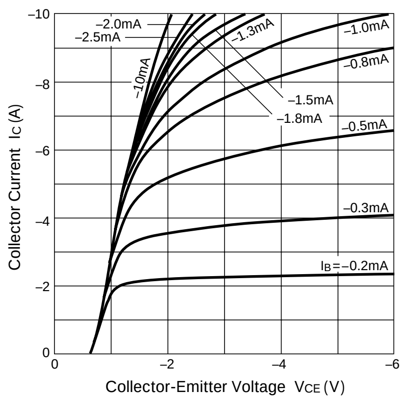
*h_{FE} Rank Ō (5000 to 12000), Y (8000 to 20000)

External Dimensions (Unit: mm)

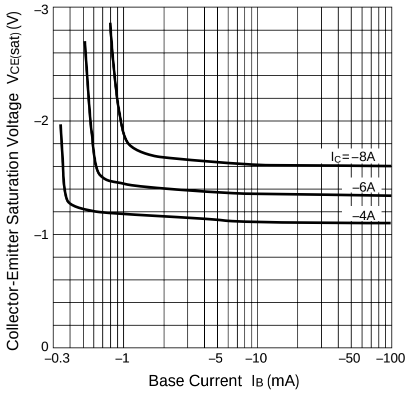


Weight: Approx 8.3g
a. Part No.
b. Lot No.

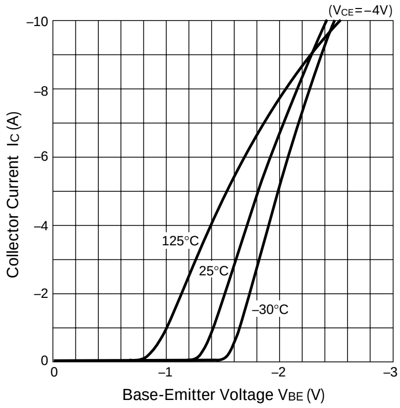
I_C–V_{CE} Characteristics (Typical)



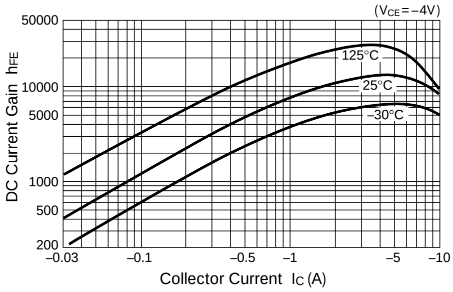
$V_{CE(sat)}$–I_B Characteristics (Typical)



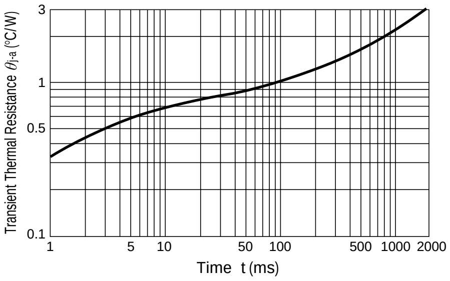
I_C–V_{BE} Temperature Characteristics (Typical)



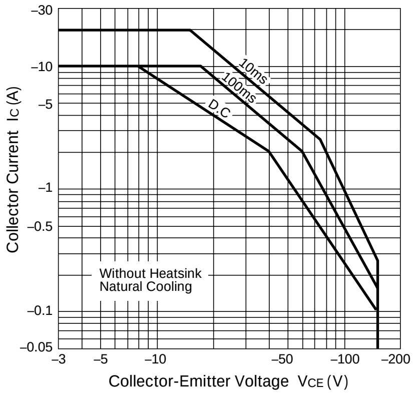
h_{FE}–I_C Characteristics (Typical)



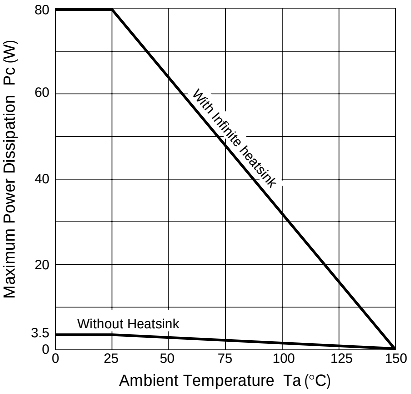
θ_{j-a}–t Characteristics



Safe Operating Area (Single Pulse)



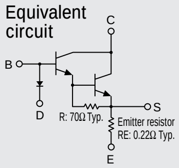
P_C–Ta Derating



Built-in temperature compensation diodes
Built-in emitter resistor
Darlington

SAP10N

Equivalent circuit



(Complement to type SAP10P)

Application: Audio

■Absolute maximum ratings (Ta=25°C)

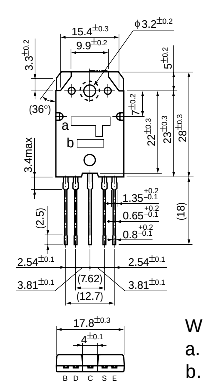
Symbol	Ratings	Unit
V_{CBO}	150	V
V_{CEO}	150	V
V_{EBO}	5	V
I_C	12	A
I_B	1	A
P_C	100(Tc=25°C)	W
Di I_F	10	mA
Tj	150	°C
Tstg	–40 to +150	°C

■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings			Unit
		min	typ	max	
I_{CBO}	V_{CB}=150V			100	μA
I_{EBO}	V_{EB}=5V			100	μA
V_{CEO}	I_C=30mA	150			V
h_{FE} ✻	V_{CE}=4V, I_C=7A	5000		20000	
$V_{CE(sat)}$	I_C=7A, I_B=7mA			2.0	V
$V_{BE(sat)}$	I_C=7A, I_B=7mA			2.5	V
V_{BE}	V_{CE}=20V, I_C=40mA		1200		mV
Di V_F	I_F=2.5mA		705		mV
R_E	I_E=1A	0.176	0.22	0.264	Ω

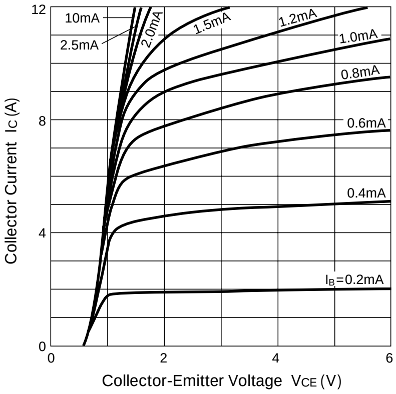
✻h_{FE} Rank O (5000 to 12000), Y (8000 to 20000)

External Dimensions (Unit: mm)

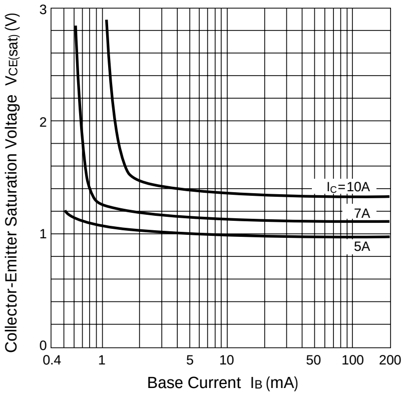


Weight: Approx 8.3g
a. Part No.
b. Lot No.

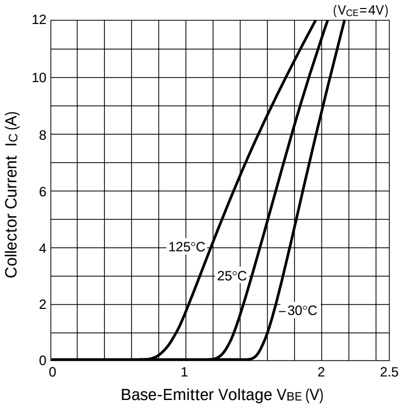
I_C–V_{CE} Characteristics (Typical)



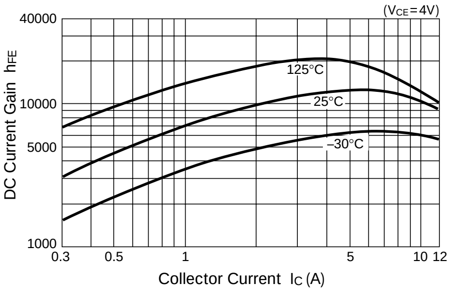
$V_{CE(sat)}$–I_B Characteristics (Typical)



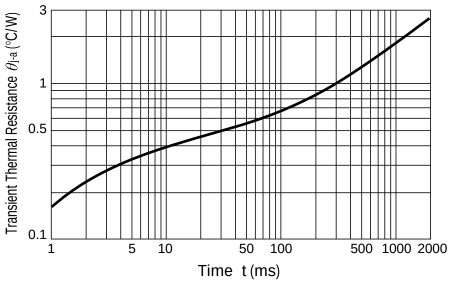
I_C–V_{BE} Temperature Characteristics (Typical)



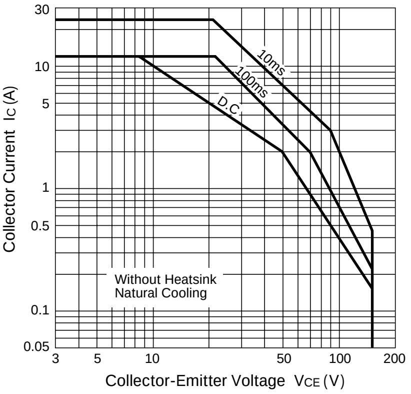
h_{FE}–I_C Characteristics (Typical)



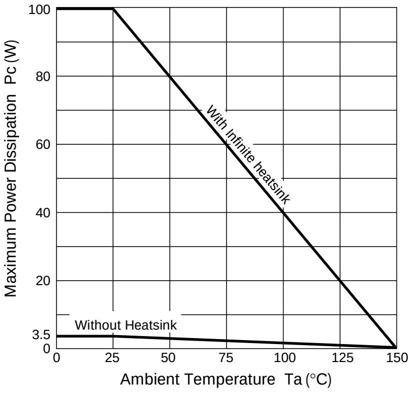
$\theta_{j\text{-}a}$–t Characteristics



Safe Operating Area (Single Pulse)



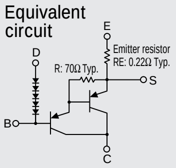
P_C–Ta Derating



Built-in temperature compensation diodes
Built-in emitter resistor
Darlington

SAP10P

Equivalent circuit



(Complement to type SAP10N)

Application: Audio

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	–150	V
V_{CEO}	–150	V
V_{EBO}	–5	V
I_C	–12	A
I_B	–1	A
P_C	100 (Tc=25°C)	W
Di I_F	10	mA
Tj	150	°C
Tstg	–40 to +150	°C

■Electrical Characteristics

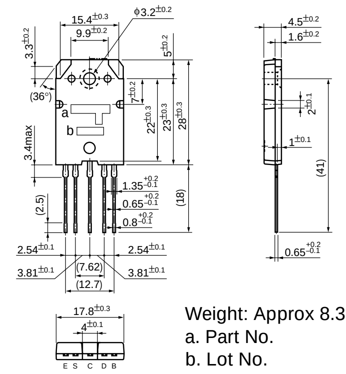
(Ta=25°C)

Symbol	Conditions	Ratings			Unit
		min	typ	max	
I_{CBO}	V_{CB}=–150V			–100	μA
I_{EBO}	V_{EB}=–5V			–100	μA
V_{CEO}	I_C=–30mA	–150			V
h_{FE} *	V_{CE}=–4V, I_C=–7A	5000		20000	
$V_{CE(sat)}$	I_C=–7A, I_B=–7mA			–2.0	V
$V_{BE(sat)}$	I_C=–7A, I_B=–7mA			–2.5	V
V_{BE}	V_{CE}=–20V, I_C=–40mA		1210		mV
Di V_F	I_F=2.5mA		1540		mV
R_E	I_E=1A	0.176	0.22	0.264	Ω

*h_{FE} Rank $\bar{O}$ (5000 to 12000), Y (8000 to 20000)

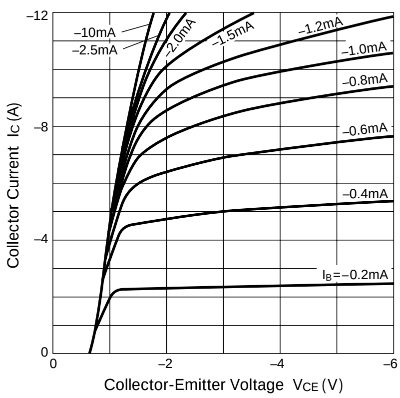
External Dimensions

(Unit: mm)

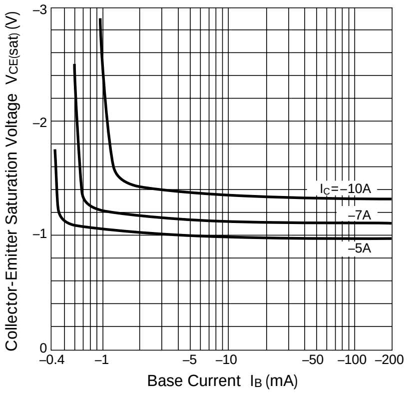


Weight: Approx 8.3g
a. Part No.
b. Lot No.

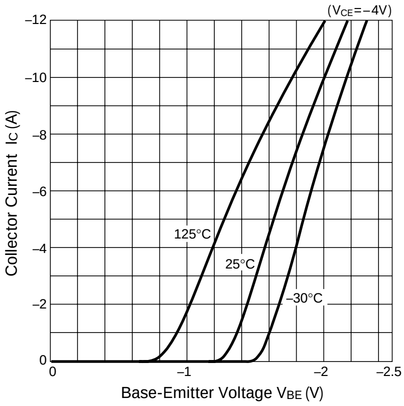
I_C–V_{CE} Characteristics (Typical)



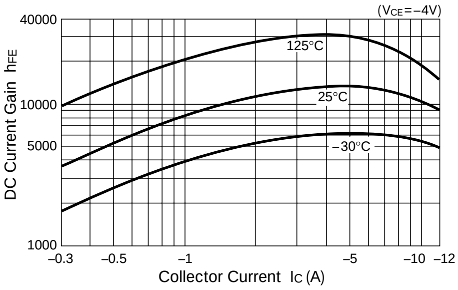
$V_{CE(sat)}$–I_B Characteristics (Typical)



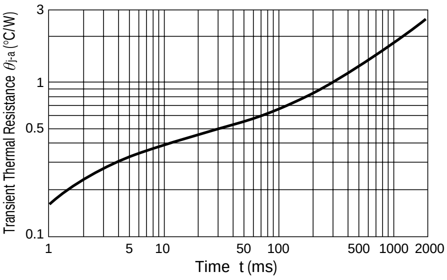
I_C–V_{BE} Temperature Characteristics (Typical)



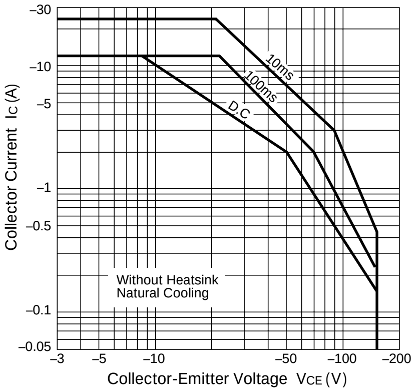
h_{FE}–I_C Characteristics (Typical)



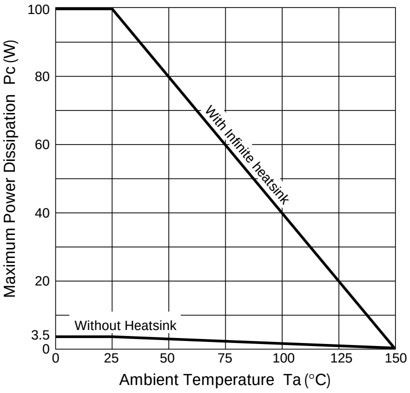
$\theta_{j\text{-}a}$–t Characteristics



Safe Operating Area (Single Pulse)

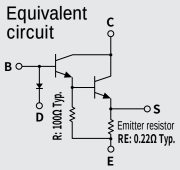


P_C–Ta Derating



Built-in temperature compensation diodes Built-in emitter resistor Darlington

SAP16N


Equivalent circuit

(Complement to type SAP16P)

Application: Audio

■Absolute maximum ratings (Ta=25°C)

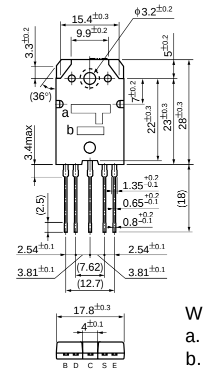
Symbol	Ratings	Unit
V_{CBO}	160	V
V_{CEO}	160	V
V_{EBO}	5	V
I_C	15	A
I_B	1	A
P_C	150(Tc=25°C)	W
Di I_F	10	mA
Tj	150	°C
Tstg	–40 to +150	°C

■Electrical Characteristics (Ta=25°C)

Symbol	Conditions	Ratings			Unit
		min	typ	max	
I_{CBO}	V_{CB}=160V			100	µA
I_{EBO}	V_{EB}=5V			100	µA
V_{CEO}	I_C=30mA	160			V
h_{FE} ✻	V_{CE}=4V, I_C=10A	5000		20000	
$V_{CE(sat)}$	I_C=10A, I_B=10mA			2.0	V
$V_{BE(sat)}$	I_C=10A, I_B=10mA			2.5	V
V_{BE}	V_{CE}=20V, I_C=40mA		1190		mV
Di V_F	I_F=2.5mA		705		mV
R_E	I_E=1A	0.176	0.22	0.264	Ω
R_{EB}		90	100	110	Ω

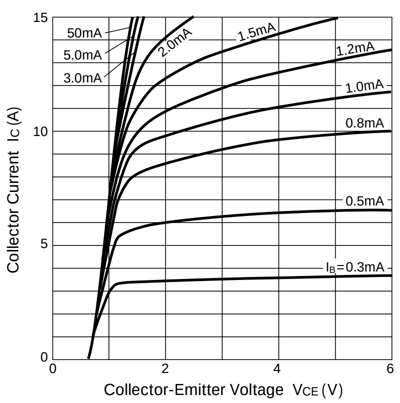
✻h_{FE} Rank $\overline{\text{O}}$ (5000 to 12000), Y(8000 to 20000)

External Dimensions (Unit: mm)

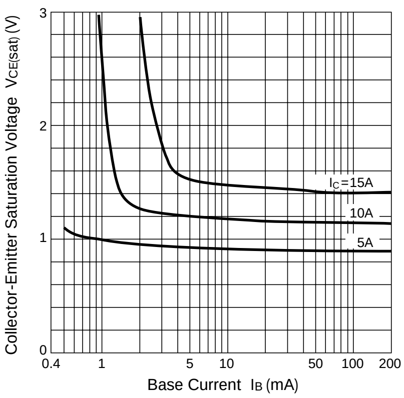


Weight: Approx 8.3g
a. Part No.
b. Lot No.

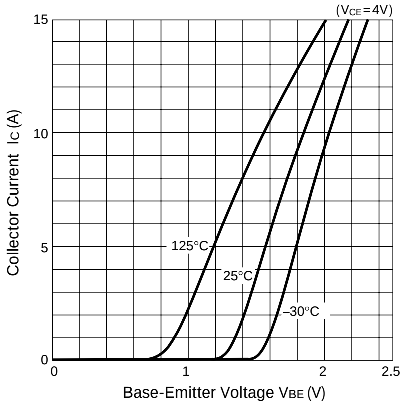
I_C–V_{CE} Characteristics (Typical)



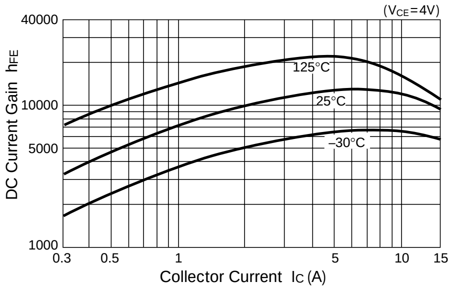
$V_{CE(sat)}$–I_B Characteristics (Typical)



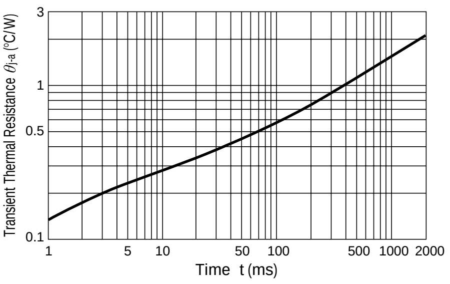
I_C–V_{BE} Temperature Characteristics (Typical)



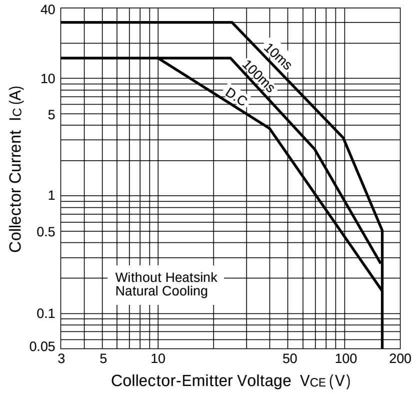
h_{FE}–I_C Characteristics (Typical)



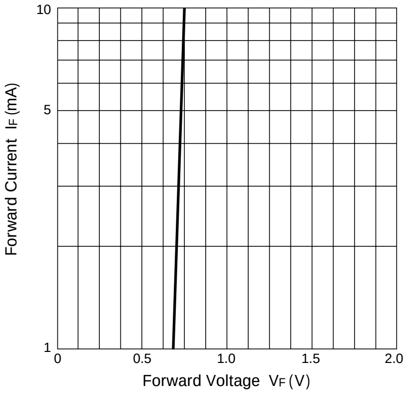
$\theta_{j\text{-}a}$–t Characteristics



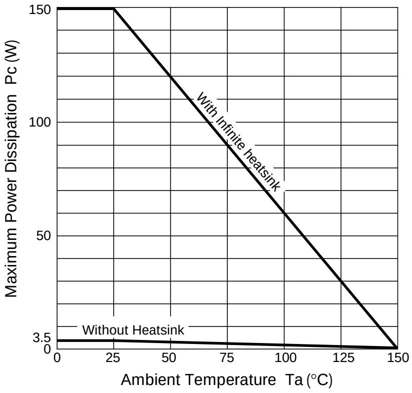
Safe Operating Area (Single Pulse)



Di I_F–V_F Characteristics (Typical)

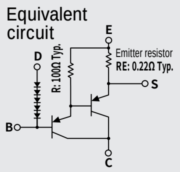


P_C–Ta Derating



Built-in temperature compensation diodes Built-in emitter resistor Darlington

SAP16P


Equivalent circuit

(Complement to type SAP16N)

Application: Audio

■Absolute maximum ratings (Ta=25°C)

Symbol	Ratings	Unit
V_{CBO}	–160	V
V_{CEO}	–160	V
V_{EBO}	–5	V
I_C	–15	A
I_B	–1	A
P_C	150 (Tc=25°C)	W
Di I_F	10	mA
Tj	150	°C
Tstg	–40 to +150	°C

■Electrical Characteristics

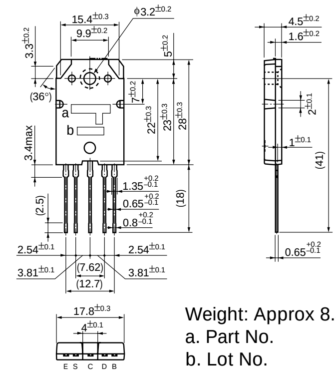
(Ta=25°C)

Symbol	Conditions	Ratings			Unit
		min	typ	max	
I_{CBO}	$V_{CB}=-160V$			–100	μA
I_{EBO}	$V_{EB}=-5V$			–100	μA
V_{CEO}	$I_C=-30mA$	–160			V
h_{FE} ✻	$V_{CE}=-4V$, $I_C=-10A$	5000		20000	
$V_{CE(sat)}$	$I_C=-10A$, $I_B=-10mA$			–2.0	V
$V_{BE(sat)}$	$I_C=-10A$, $I_B=-10mA$			–2.5	V
V_{BE}	$V_{CE}=-20V$, $I_C=-40mA$		1200		mV
Di V_F	$I_F=2.5mA$		1540		mV
R_E	$I_E=1A$	0.176	0.22	0.264	Ω
R_{EB}		90	100	110	Ω

✻h_{FE} Rank $\bar{O}$ (5000 to 12000), Y (8000 to 20000)

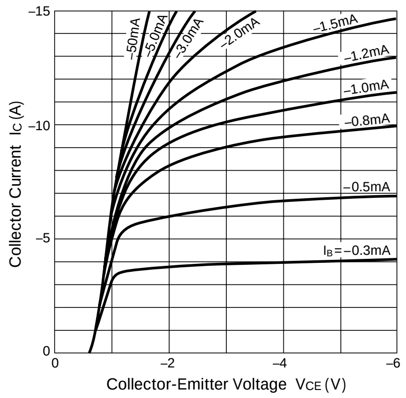
External Dimensions

(Unit: mm)

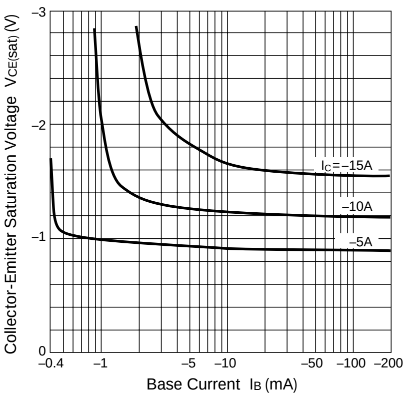


Weight: Approx 8.3g
a. Part No.
b. Lot No.

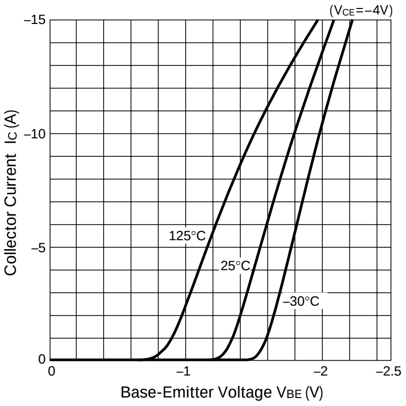
I_C–V_{CE} Characteristics (Typical)



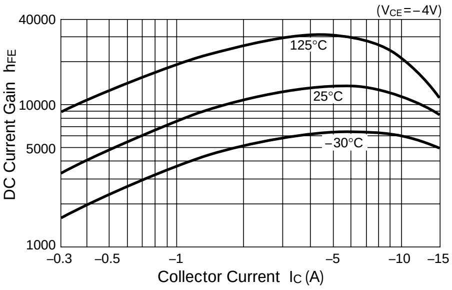
$V_{CE(sat)}$–I_B Characteristics (Typical)



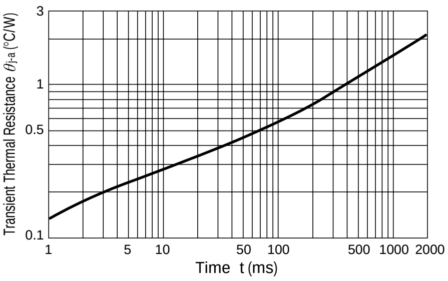
I_C–V_{BE} Temperature Characteristics (Typical)



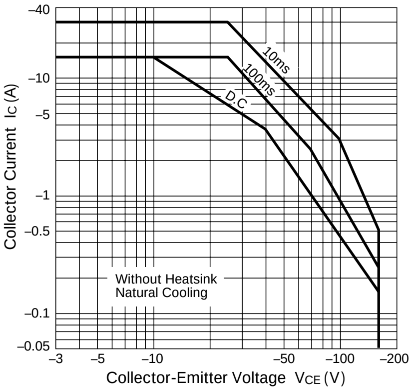
h_{FE}–I_C Characteristics (Typical)



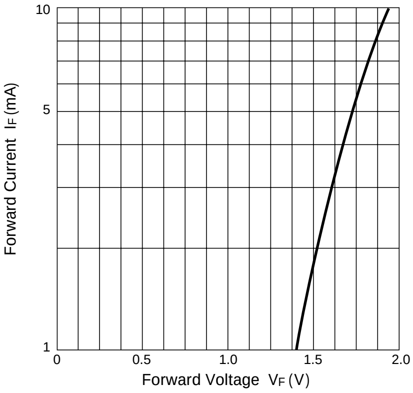
θ_{j-a}–t Characteristics



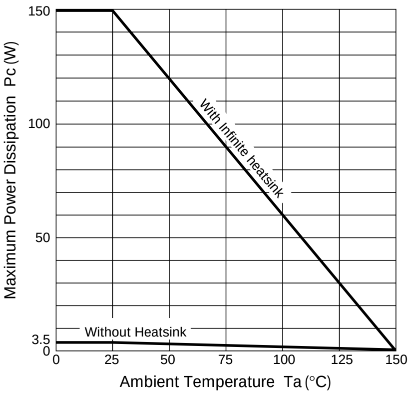
Safe Operating Area (Single Pulse)



Di I_F–V_F Characteristics (Typical)



P_C–Ta Derating



SAP Series
Application Information

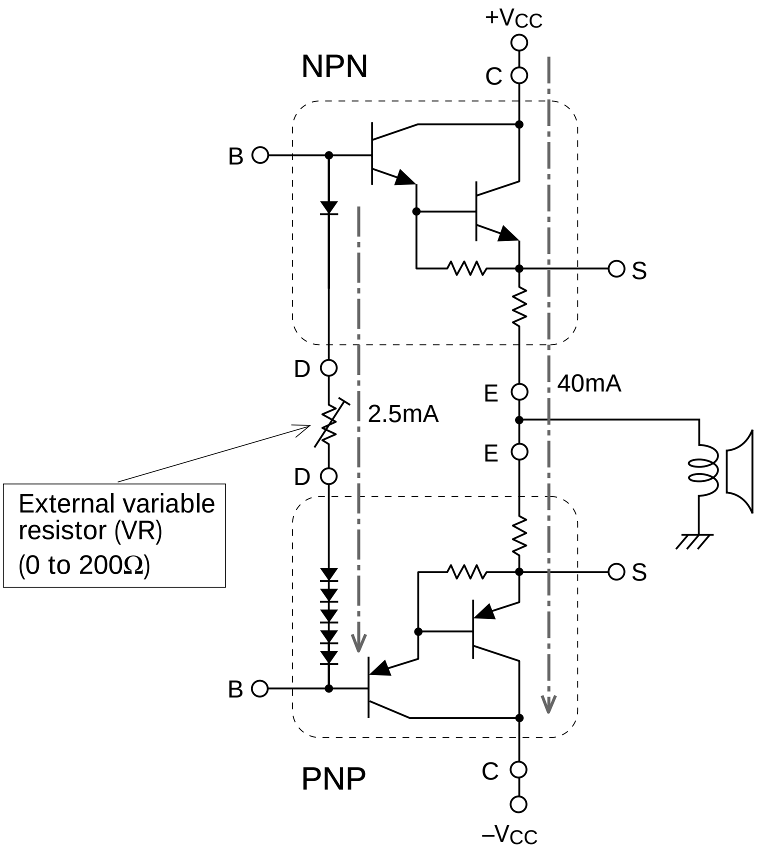
1. Recommended Operating Conditions

①Add a variable resistor (VR) between diode terminals to adjust the idling current. The resistor having 0 to 200Ω is to be used.
②Adjust the forward current flowing over the diodes at 2.5mA.
③Adjust the idling current at 40mA with the external variable resistor.

Both the temperature coefficients for the transistor and the diodes are matched under the above conditions. Both the PNP and the NPN are Darlington transistors, so the temperature change ratio of the total four V_{BE} of the transistors is subject to the compensation. One PN junction diode in the NPN and five Schottky barrier diodes in the PNP are built-in, and the total six diodes are operating as the temperature compensation.

The temperature coefficient of the total diodes (its variable value) becomes smaller with a larger forward current (approximately —0.2mV/℃ to 1mA), and the coefficient of the total transistors (its variable value) also becomes smaller with a larger idling current (approximately —0.1mV/℃ to 10mA), but the both variable values are small.

Thus, the distortion of the temperature coefficient caused by the different current is small, so the thermal runaway may not be occurred due to the changes of the recommended ratings; however, the actual operation is to be confirmed by using an experimental equipment or board.



2. External Variable Resistor

Total forward voltage (at I_F =2.5mA) of the diodes is designed to be equal or less than that of total V_{BE} (at I_C = 40mA) of the transistor, thus the idling current is required to be adjusted at 40mA with an additional external variable resistor.

The relations are shown as below:

Total V_F of Diode ≦ Total V_{BE} of Transistor + Total V_{RE} of Emitter Resistor
ΔV=0 to 500mV

The V_{BE} of the transistor is dependent to the h_{FE}, and the V_{BE} is lower with higher h_{FE} and vice versa. The h_{FE} for both the PNP and the NPN varies between 5k and 20k; thus the V_{BE} is the lowest with the combination of maximum h_{FE} (20k) each and it is the highest with the combination of minimum h_{FE} (5k) each.

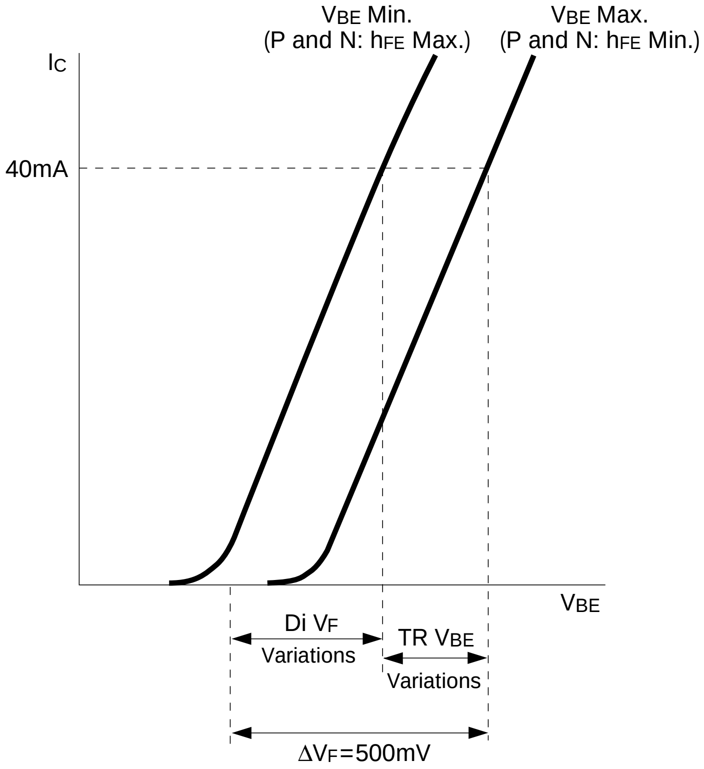
Presuming the voltage difference between the V_F of the diodes and the V_{BE} of the transistors (including the total voltage drops of the two emitter resistors) as ΔV.

Minimum V_{BE} – Maximum V_F variations of the diodes = 0
Maximum V_{BE} – Minimum V_F variations of the diodes = 500mV

The current flowing over the diodes and the VR is adjusted at 2.5mA; therefore

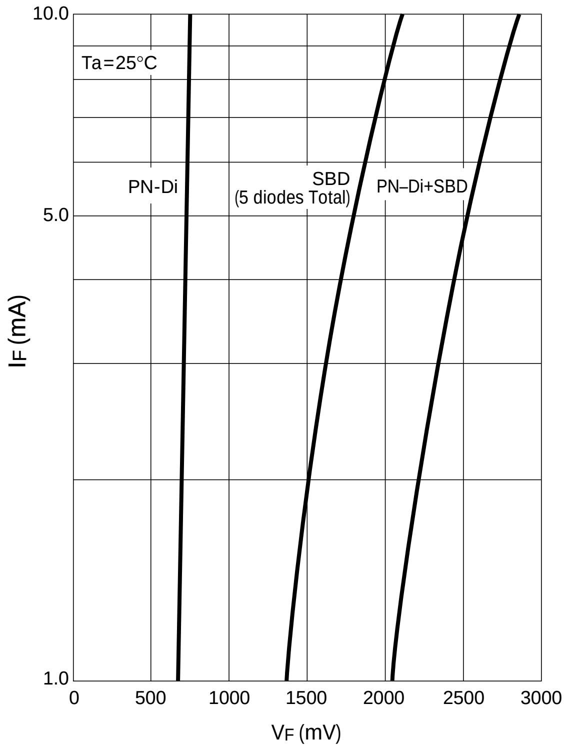
500mV ÷ 2.5mA = 200Ω

Consequently, the applicable VR value is to be 0 to 200‰



3. Characteristics of the temperature compensation diodes

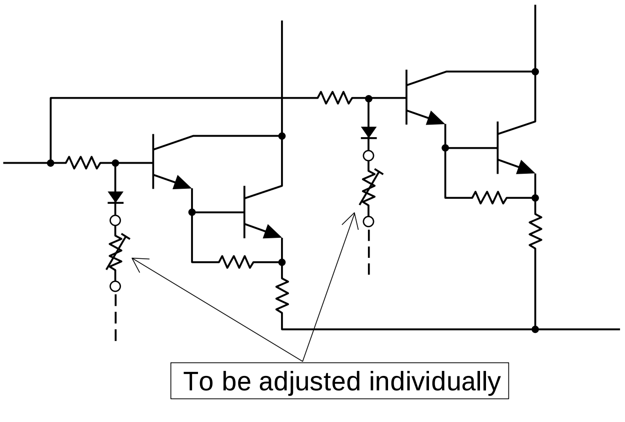
The several temperature compensation diodes are connected in series, so the forward voltage is varied with small current fluctuations. Therefore, in case the forward current flowing over the diodes is set at 2.5mA and over, the forward voltage rises, and in the worst combinations, the idling current reaches to 40mA and over with minimum VR of 0Ω. On the contrary, in case the forward current is set at 2.5mA or below, the idling current may not reach to 40mA with maximum VR of 200Ω.



$I_F - V_F$ Characteristics

4. Parallel push-pull application

Adjustments of the idling current are required by each the resistor in parallel push-pull applications. One side adjustment will cause the idling current to be unstable (seesaw operation) because of the different h_{FE}.



5. Destruction capacity of the built-in emitter resistor

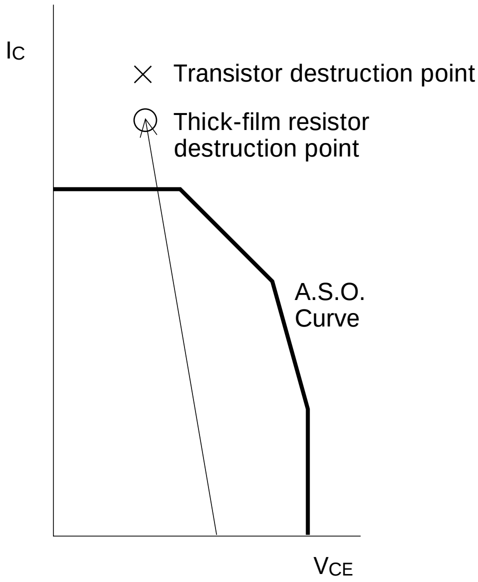
A thick-film resistor is used for the built-in resistor. The thick-film resistor has weaker destruction point in the Pc area (especially for large current flowing area) than that of the transistor chip itself. There is less concern, however, as this is subject to the area beyond an Are of Safe Operation (A.S.O.).

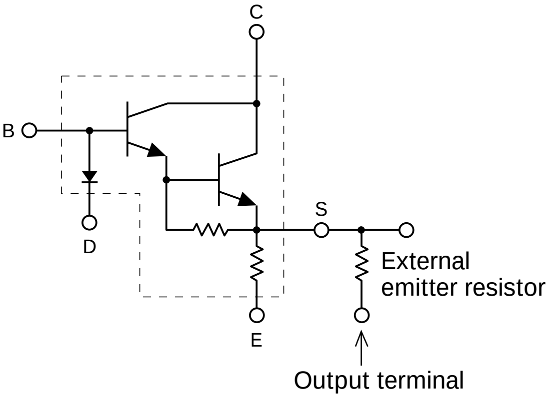
However, under the evaluation like a short circuit test in which the current exceeds the guaranteed value, it may cause the emitter resistor to be destroyed before the transistor itself is destroyed.

Consequently, the current value (or time) that operates the protection circuit is to be set at lower than that of discrete device configurations. In the application of car audio amplifiers, the same manners as the above need to be considered because the large current is flowed at low impedance.

In addition, once the transistor falls into thermal runaway due to a soldering failure to the external VR added between diodes or other failure manners, as the worst case, there may cause a resin crack or smoke emissions by flare up. Flame retardant molding resin is used, and the material of the product is conformed to the most sever standard UL94V0. However it is recommended that the careful consideration be given to a protection circuit, and the protection circuits should be provided appropriately in due course.

If the operating conditions are not to be matched to the ratings, it is also recommended that the E (Emitter resistor) terminal should be opened and the external emitter resistor should be added to the S (Sensing) terminal shown as below.





MEMO

Discontinued Parts Guide

Discontinued Parts	Replace ment Parts
2SA744to745	2SA1694to1695
2SA746to747	2SA1695
2SA764to765	2SA1725to1726
2SA807to808	2SA1693to1694
2SA878	–
2SA892	2SB1351
2SA907to909	2SA1215to1216,1295
2SA971	–
2SA980to982	2SA1694
2SA1067	–
2SA1068	–
2SA1102	2SA1693
2SA1103	2SA1694
2SA1104	2SA1694
2SA1105	2SA1695
2SA1106	2SA1695
2SA1116	2SA1493
2SA1117	2SA1494
2SA1135	2SA1693
2SA1169	2SA1493
2SA1170	2SA1494
2SA1187	–
2SA1205	2SA1746
2SA1355	2SA1262,1488
2SB622	–
2SB711to712	2SB1259,1351
2SB1005	2SB1257
2SB1476	2SB1624
2SB1586	2SB1625
2SC1107	2SC3179,3851
2SC1108	2SC3851A
2SC1109	2SC3179,3851
2SC1110	2SC3851A
2SC1111to1112	2SC4467to4468
2SC1113	2SC4511to4512
2SC1114	–
2SC1115to1116	2SC4468
2SC1402to1403	2SC4467to4468
2SC1436	–
2SC1437	–
2SC1440to1441	–
2SC1442to1443	–
2SC1444to1445	2SC4511to4512
2SC1454	–
2SC1477	–
2SC1504	2SC2023
2SC1577to1578	2SC3833,3831
2SC1579to1580	2SC4706
2SC1584to1585	2SC2921-2922,3264
2SC1618to1619	2SC4466-4467
2SC1629	2SD2045
2SC1664	2SC4558
2SC1768	–
2SC1777	–
2SC1783	–
2SC1786	–
2SC1828	2SC3832,3830

Discontinued Parts	Replacement Parts
2SC1829	–
2SC1830	2SD2082,2083
2SC1831	–
2SC1832	–
2SC1888to1889	2SC3852,3852A
2SC2022	2SC2023
2SC2147	–
2SC2198	2SC4024
2SC2199	2SC4131
2SC2256	–
2SC2260to2262	2SC4467
2SC2302	2SC3832
2SC2303	2SC3833
2SC2304	2SC3833
2SC2305	–
2SC2306	2SC4140
2SC2307	2SC3833
2SC2317	2SD2016
2SC2354	2SC2023
2SC2364	–
2SC2365	2SC3831
2SC2491	2SC4024
2SC2492	–
2SC2493	–
2SC2577	2SC4466
2SC2578	2SC4467
2SC2579	2SC4467
2SC2580	2SC4468
2SC2581	2SC4468
2SC2607	2SC3857
2SC2608	2SC3858
2SC2665	2SC4466
2SC2723	2SC4140
2SC2761	–
2SC2773	2SC3857
2SC2774	2SC3858
2SC2809	–
2SC2810A	2SC4820
2SC2825	2SD2045
2SC2838	–
2SC2900	–
2SC3409	2SC3679
2SC3520	2SC4140
2SC3706	–
2SC3909	2SC3680
2SC4023	2SC5124
2SC4199,4199A	2SC5124
2SC4302	2SC4301
2SC4303,4303A	2SC5002
2SC4494	2SC4495
2SC4756	2SC5002
2SD15to18	2SC4468
2SD80to84	2SC4466,4467
2SD90to94	2SC3179,3851,3851A
2SD163to166	2SC4468
2SD201to203	2SC4466to4467
2SD211to214	2SC4468

Discontinued Parts	Replacement Parts
2SD219to221	2SC3179,3851,3851A
2SD219Fto221F	2SC3179,3851,3851A
2SD222to224	2SC3179,3851,3851A
2SD236to238	2SC3179,3851,3851A
2SD241to244	2SC3179,3851,3851A
2SD256to259	2SC3179,3851,3851A
2SD419to421	2SD1769,1785
2SD556to557	2SC4468
2SD593to594	2SC4020
2SD605	–
2SD606	–
2SD614to615	2SD1769,1785
2SD617	2SD2082
2SD721	2SD2081
2SD722	2SD2081
2SD807	2SC3679
2SD810	2SC4024
2SD971	–
2SD972	2SD1796
2SD1031	2SD1769,1785
2SD1170	2SD2045
2SD1532	2SD2015
2SD2231	2SD2493
2SD2437	2SD2494

Repair Parts	Replacement Parts
2SA768to769	2SA1262,1488,1488A
2SA770to771	2SA1725,1726
2SA957to958	2SA1667,1668
2SA1489	2SA1693
2SA1490	2SA1694
2SA1491	2SA1695
2SA1643	2SA1725
2SA1670	2SA1907
2SA1671	2SA1908
2SA1672	2SA1909
2SB1624	2SB1685
2SB1625	2SB1687
2SB1626	2SB1686
2SC1826to1827	2SC3179,3851,3851A
2SC1983to1984	2SC3852,3852A
2SC1985to1986	2SC4511,4512
2SC2167to2168	2SC4381,4382
2SC2315to2316	2SC4558
2SC2810	2SC3890
2SC3300	2SC4131
2SC3853	2SC4466
2SC3854	2SC4467
2SC3855	2SC4468
2SC4385	2SC5099
2SC4386	2SC5100
2SC4387	2SC5101
2SC4503	2SD2083
2SC4558	2SD2495
2SC4820	2SC4518
2SD2493	2SD2641
2SD2494	2SD2643
2SD2495	2SD2642

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