

ALPHANUMERIC INDEX — CROSS-REFERENCE (Continued)

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TIP29A	TIP29A		3-1071	TIP49	TIP49		3-1087
TIP29B	TIP29B		3-1071	TIP50	TIP50		3-1087
TIP29C	TIP29C		3-1071	TIP510		MJ15011	3-716
TIP29D		MJE15030	3-972	TIP511		MJ15011	3-716
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TIP30B	TIP30B		3-1071	TIP519		MJ15012	3-716
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TIP31A	TIP31A		3-1073	TIP525		MJ15011	3-716
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TIP31D		MJE15030	3-972	TIP528		MJ15012	3-716
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*Consult Motorola if a direct replacement is necessary.

TABLE 4 — PLASTIC TO-218 (continued)

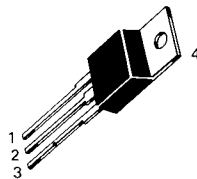
I _C Cont Amps Max	V _{CEO(sus)} Volts Min	Device Type		h _{FE} Min/Max	@ I _C Amp	Resistive Switching			f _T MHz Min	P _D (Case) Watts @ 25°C
		NPN	PNP			t _s μs Max	t _f μs Max	@ I _C Amp		
		15	400			BUV48† MJH13090 MJH16110		8 min 8 min 6/20		
	450	BUV48A† MJH16010 MJH16012		8 min 5 min 7 min	8 15 15	2 1.2 0.9	0.4 0.2 0.15	10 10 10		150 150 150
	500	BUT51P##† MJH16010A		40 min 5 min	5 15	1.1 3	0.16 0.4	10 10		125 150
16	100	MJE4340	MJE4350	15 min	8	1.2 typ	1.2 typ	8	1	125
	120	MJE4341	MJE4351	15 min	8	1.2 typ	1.2 typ	8	1	125
	140	MJE4342	MJE4352	15 min	8	1.2 typ	1.2 typ	8	1	125
	160	MJE4343	MJE4353	15 min	8	1.2 typ	1.2 typ	8	1	125
20	60	MJH6282##	MJH6285##	750/18k	10				4#	125
	80	MJH6283##	MJH6286##	750/18k	10				4#	125
	100	MJH6284##	MJH6287##	750/18k	10				4#	125
25	40	TIP35	TIP36	10/75	15	0.6 typ	0.3 typ	10	3	125
	45	BD249†	BD250†	10 min	15				3	125
	60	BD249A† TIP35A	BD250A† TIP36A	10 min 10/75	15 15	0.6 typ	0.3 typ	10	3 3	125 125
	80	BD249B† TIP35B	BD250B† TIP36B	10 min 10/75	15 15	0.6 typ	0.3 typ	10	3 3	125 125
	100	BD249C† TIP35C	BD250C† TIP36C	10 min 10/75	15 15	0.6 typ	0.3 typ	10	3 3	125 125

I_{hfe1} @ 1 MHz, ## Darlington

† These devices supplied in Case 340D-01. Consult Motorola for details.

TABLE 5 — PLASTIC TO-220

STYLE 1:
PIN 1. BASE
2. COLLECTOR
3. EMITTER
4. COLLECTOR



CASE 221A-04 (TO-220AB)

I _C Cont Amps Max	V _{CEO(sus)} Volts Min	Device Type		h _{FE} Min/Max	@ I _C Amp	Resistive Switching			f _T MHz Min	P _D (Case) Watts @ 25°C
		NPN	PNP			t _s μs Max	t _f μs Max	@ I _C Amp		
		0.5	350			MJE2360T MJE2361T		15 min 40 min		
1	40	TIP29	TIP30	15/75	1	0.6 typ	0.3 typ	1	3	30
	60	TIP29A	TIP30A	15/75	1	0.6 typ	0.3 typ	1	3	30
	80	TIP29B	TIP30B	15/75	1	0.6 typ	0.3 typ	1	3	30
	100	TIP29C	TIP30C	15/75	1	0.6 typ	0.3 typ	1	3	30
	250	TIP47		30/150	0.3	2 typ	0.18 typ	0.3	10	40
	300	TIP48		30/150	0.3	2 typ	0.18 typ	0.3	10	40
	350	TIP49		30/150	0.3	2 typ	0.18 typ	0.3	10	40
	400	TIP50		30/150	0.3	2 typ	0.18 typ	0.3	10	40

(continued)

NPN
TIP29
TIP29A
TIP29B
TIP29C

PNP
TIP30
TIP30A
TIP30B
TIP30C

**COMPLEMENTARY SILICON PLASTIC
POWER TRANSISTORS**

... designed for use in general purpose amplifier and switching applications. Compact TO-220 AB package. TO-66 leadform also available.

1 AMPERE
POWER TRANSISTORS
COMPLEMENTARY SILICON
40-60-80-100 VOLTS
30 WATTS

MAXIMUM RATINGS

Rating	Symbol	TIP29 TIP30	TIP29A TIP30A	TIP29B TIP30B	TIP29C TIP30C	Unit
Collector-Emitter Voltage	V_{CE0}	40	60	80	100	Vdc
Collector-Base Voltage	V_{CB}	40	60	80	100	Vdc
Emitter-Base Voltage	V_{EB}	5.0				Vdc
Collector Current - Continuous	I_C	1.0				Adc
Peak		3.0				Adc
Base Current	I_B	0.4				Adc
Total Power Dissipation @ $T_C = 25^\circ C$ Derate above $25^\circ C$	P_D	30				Watts
		0.24				W/ $^\circ C$
Total Power Dissipation @ $T_A = 25^\circ C$ Derate above $25^\circ C$	P_D	2.0				Watts
		0.016				W/ $^\circ C$
Unclamped Inductive Load Energy (See Note 3)	E	32				mJ
Operating and Storage Junction Temperature Range	T_J, T_{stg}	-65 to +150				$^\circ C$

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	4.167	$^\circ C/W$
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	62.5	$^\circ C/W$

ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ C$ unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector-Emitter Sustaining Voltage (1) ($I_C = 30$ mA, $I_B = 0$)	TIP29, TIP30 TIP29A, TIP30A TIP29B, TIP30B TIP29C, TIP30C	$V_{CE0(sus)}$	40 60 80 100	Vdc
Collector Cutoff Current ($V_{CE} = 30$ Vdc, $I_B = 0$)	TIP29, TIP29A, TIP30, TIP30A ($V_{CE} = 60$ Vdc, $I_B = 0$)	I_{CEO}	— 0.3	mAdc
Collector Cutoff Current ($V_{CE} = 40$ Vdc, $V_{EB} = 0$)	TIP29, TIP30	I_{CES}	—	μ Adc
($V_{CE} = 60$ Vdc, $V_{EB} = 0$)	TIP29A, TIP30A		—	200
($V_{CE} = 80$ Vdc, $V_{EB} = 0$)	TIP29B, TIP30B		—	200
($V_{CE} = 100$ Vdc, $V_{EB} = 0$)	TIP29C, TIP30C		—	200
Emitter Cutoff Current ($V_{BE} = 5.0$ Vdc, $I_C = 0$)		I_{EBO}	—	1.0

ON CHARACTERISTICS (1)

DC Current Gain ($I_C = 0.2$ Adc, $V_{CE} = 4.0$ Vdc) ($I_C = 1.0$ Adc, $V_{CE} = 4.0$ Vdc)	h_{FE}	40 15	— 75	—
Collector-Emitter Saturation Voltage ($I_C = 1.0$ Adc, $I_B = 125$ mA)	$V_{CE(sat)}$	—	0.7	Vdc
Base-Emitter On Voltage ($I_C = 1.0$ Adc, $V_{CE} = 4.0$ Vdc)	$V_{BE(on)}$	—	1.3	Vdc

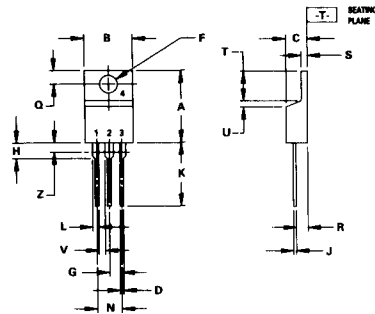
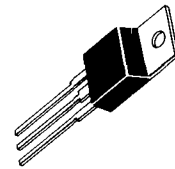
DYNAMIC CHARACTERISTICS

Current Gain - Bandwidth Product (2) ($I_C = 200$ mA, $V_{CE} = 10$ Vdc, $f_{test} = 1$ MHz)	f_T	3.0	—	MHz
Small-Signal Current Gain ($I_C = 0.2$ Adc, $V_{CE} = 10$ Vdc, $f = 1$ kHz)	h_{fe}	20	—	—

(1) Pulse Test: Pulse Width < 300 μ s, Duty Cycle < 2.0%.

(2) $f_T = h_{FE} \cdot f_{test}$

(3) This rating based on testing with $L_C = 20$ mH, $R_{BE} = 100 \Omega$, $V_{CC} = 10$ V, $I_C = 1.8$ A, P.R.F. = 10 Hz.



NOTES:

- DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
- CONTROLLING DIMENSION: INCH.
- DIM Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	14.49	15.75	0.570	0.620
B	9.90	10.28	0.390	0.405
C	4.07	4.82	0.160	0.190
D	0.64	0.88	0.025	0.035
F	3.61	3.73	0.142	0.147
G	2.42	2.66	0.095	0.105
H	2.80	3.33	0.110	0.135
J	0.46	0.71	0.018	0.028
K	12.70	14.27	0.500	0.562
L	1.15	1.39	0.045	0.055
N	4.83	5.33	0.190	0.210
Q	2.54	3.06	0.100	0.120
R	2.04	2.79	0.080	0.110
S	1.15	1.39	0.045	0.055
T	5.97	6.47	0.235	0.255
U	0.00	1.27	0.000	0.050
V	1.15	—	0.045	—
Z	—	2.04	—	0.080

STYLE 1:

- PIN 1: BASE
- COLLECTOR
- EMITTER
- COLLECTOR

CASE 221A-04
TO-220AB

TIP29, TIP29A, TIP29B, TIP29C, NPN, TIP30, TIP30A, TIP30B, TIP30C, PNP

FIGURE 1 – DC CURRENT GAIN

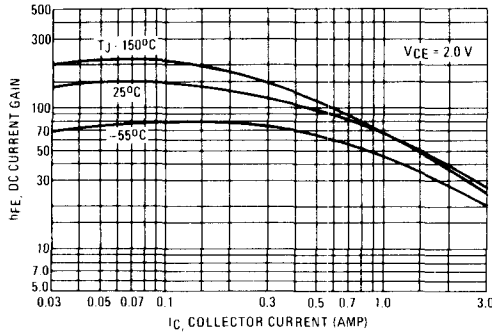


FIGURE 2 – TURN-OFF TIME

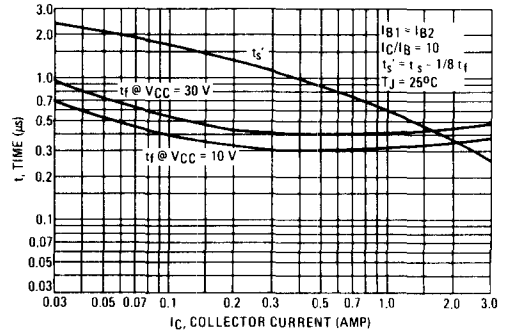


FIGURE 3 – SWITCHING TIME EQUIVALENT CIRCUIT

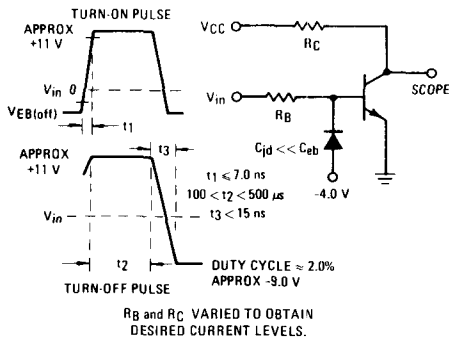


FIGURE 4 – TURN-ON TIME

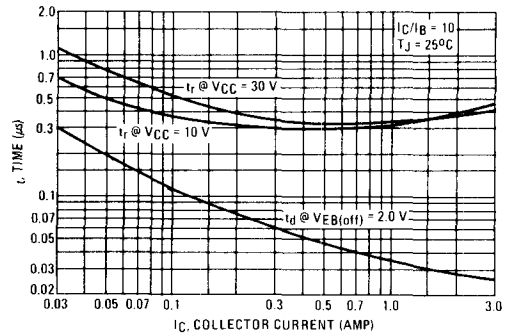
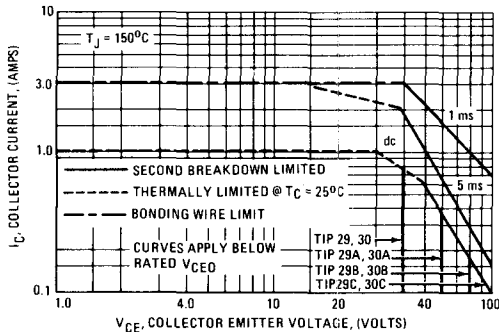


FIGURE 5 – ACTIVE REGION SAFE OPERATING AREA



There are two limitations on the power handling ability of a transistor: average junction temperature and second breakdown. Safe operating area curves indicate I_C - V_{CE} operation; i.e., the transistor must not be subjected to greater dissipation than the curves indicate.

The data of Figure 5 is based on $T_{J(pk)} = 150^\circ\text{C}$; T_C is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(pk)} < 150^\circ\text{C}$. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.