

SILICON EPITAXIAL POWER TRANSISTORS

NPN silicon epitaxial power transistors, each in a SOT186 envelope with an electrically insulated mounting base.

PNP complements are TIP42F, TIP42AF, TIP42BF and TIP42CF.

QUICK REFERENCE DATA

		TIP41F			
		AF	BF	CF	
Collector-base voltage (open emitter)	V_{CBO}	max. 80	100	120	140 V
Collector-emitter voltage (open base)	V_{CEO}	max. 40	60	80	100 V
DC collector current	I_C	max.		6	A
Peak collector current	I_{CM}	max.		10	A
Total power dissipation up to $T_h = 25^\circ\text{C}$	P_{tot}	max.		32	W
Junction temperature	T_j	max.		150	$^\circ\text{C}$
DC current gain	h_{FE}	min.		15	
$I_C = 3\text{ A}; V_{CE} = 4\text{ V}$		max.		75	

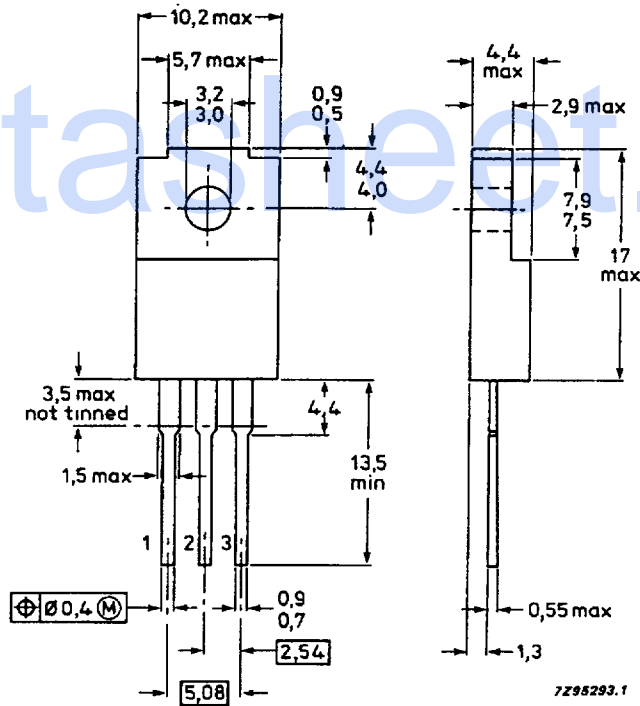
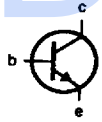
MECHANICAL DATA

Dimensions in mm

Fig.1 SOT186.

Pinning

- 1 = base
- 2 = collector
- 3 = emitter



**TIP41F; 41AF
TIP41BF; 41CF**

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

			TIP41F	AF	BF	CF	
Collector-base voltage (open emitter)	V_{CBO}	max.	80	100	120	140	V
Collector-emitter voltage (open base)	V_{CEO}	max.	40	60	80	100	V
Emitter-base voltage (open collector)	V_{EBO}	max.			5		V
DC collector current	I_C	max.			6		A
Peak collector current	I_{CM}	max.			10		A
DC base current	I_B	max.			3		A
Total power dissipation up to $T_h = 25^\circ\text{C}$ (note 1)	P_{tot}	max.			20		W
up to $T_h = 25^\circ\text{C}$ (note 2)	P_{tot}	max.			32		W
Storage temperature range	T_{stg}				-65 to +150		$^\circ\text{C}$
Junction temperature	T_j	max.			150		$^\circ\text{C}$

THERMAL RESISTANCE

From junction to internal heatsink	R_{thj-mb}	=			1.6		K/W
From junction to external heatsink (note 1)	R_{thj-h}	=			6.3		K/W
From junction to external heatsink (note 2)	R_{thj-h}	=			3.9		K/W

INSULATION

Voltage allowed between all terminals and external heatsink, peak value	V_{insul}	max.			1000		V
Isolation capacitance from collector to external heatsink	C_{th}	typ.			12		pF

CHARACTERISTICS

$T_j = 25^\circ\text{C}$ unless otherwise specified

			TIP41F	AF	BF	CF	
Collector cut-off currents $I_B = 0; V_{CE} = 30\text{ V}$	I_{CEO}	max.	0.2	0.2	-	-	mA
$I_B = 0; V_{CE} = 60\text{ V}$	I_{CEO}	max.	-	-	0.2	0.2	mA
$V_{BE} = 0; V_{CE} = V_{CEOmax}$	I_{CES}	max.			0.4		mA
Emitter cut-off current $I_C = 0; V_{EB} = 5\text{ V}$	I_{EBO}	max.			0.5		mA

Notes

1. Mounted without heatsink compound and 30 ± 5 newtons pressure on centre of envelope.
2. Mounted with heatsink compound and 30 ± 5 newtons pressure on centre of envelope.

DC current gain (note 1)
 $I_C = 0.3 \text{ A}; V_{CE} = 4 \text{ V}$
 $I_C = 3 \text{ A}; V_{CE} = 4 \text{ V}$

h_{FE}	min.	30
h_{FE}	min.	15
h_{FE}	max.	75

Base-emitter voltage (note 2)
 $I_C = 6 \text{ A}; V_{CE} = 4 \text{ V}$

V_{BE}	max.	2	V
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Collector-emitter saturation voltage (note 1)
 $I_C = 6 \text{ A}; I_B = 0.6 \text{ A}$

V_{CEsat}	max.	1.5	V
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Collector-emitter breakdown voltage (note 1)
 $I_C = 30 \text{ mA}; I_B = 0$

		TIP41F	AF	BF	CF
$V_{(BR)CEO}$	max.	40	60	80	100 V

Small-signal current transfer ratio
 $I_C = 0.5 \text{ A}; V_{CE} = 10 \text{ V}; f = 1 \text{ kHz}$

$ h_{fe} $	min.	20
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Transition frequency
 $I_C = 0.5 \text{ A}; V_{CE} = 10 \text{ V}; f = 1 \text{ kHz}$

f_T	min.	3	MHz
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Turn-off breakdown energy with inductive load (Fig.4)
 $I_{Boff} = 0; I_{CC} = 2.5 \text{ V}$

$E_{(BR)}$	min.	62.5	mJ
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Switching times (Figs 2 and 3)
 (between 10% and 90% levels)
 $I_{Con} = 6 \text{ A}; I_{Bon} = -I_{Boff} = 0.6 \text{ A}$
 turn-on time
 turn-off time

t_{on}	typ.	0.6	μs
t_{off}	typ.	1	μs

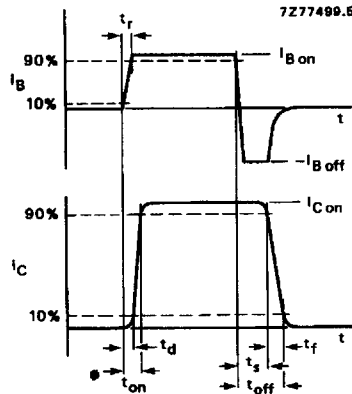


Fig.2 Switching times waveform.

Notes

- 1. Measured under pulse conditions: t_p max. 300 μs ; δ max. 2%.
- 2. V_{BE} decreases by about 2.3 mV/K with increasing temperature.

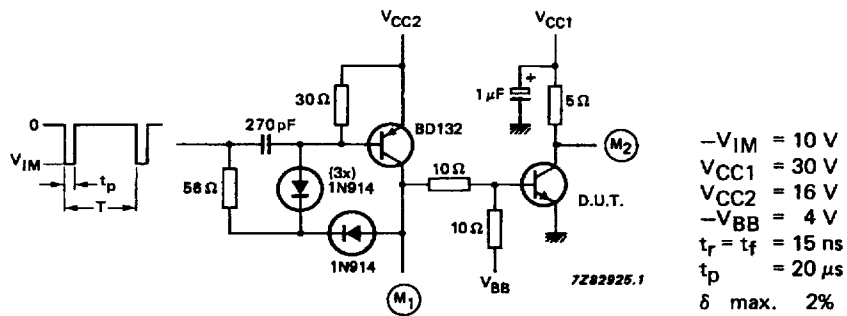


Fig.3 Switching times test circuit.
Adjust V_{CC2} to give $M_1 = 14 \text{ V}$.

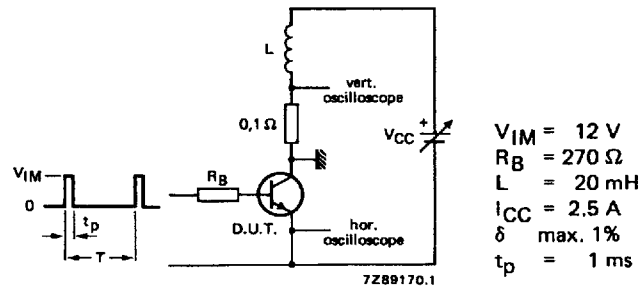
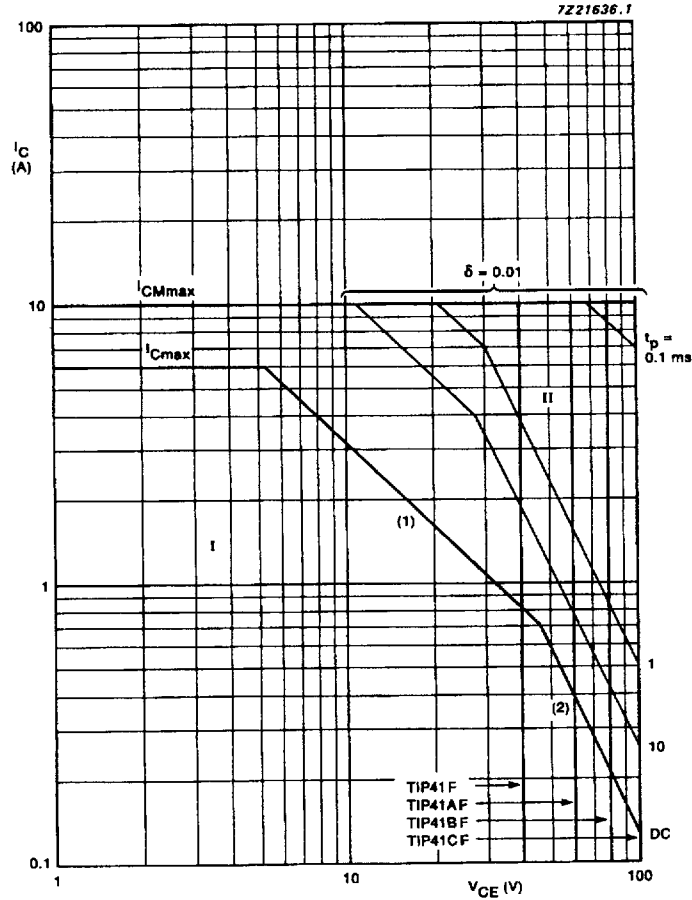


Fig.4 Test circuit for turn-off breakdown energy.



- I Region of permissible DC operation.
- II Permissible extension for repetitive pulse operation.
- (1) $P_{tot\ max}$ and $P_{peak\ max}$ lines.
- (2) Second-breakdown limits.

Fig.5 Safe Operating Area, $T_{mb} = 25\ ^\circ\text{C}$.

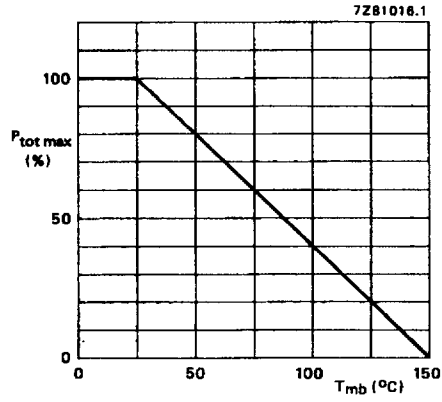


Fig.6 Total power dissipation.

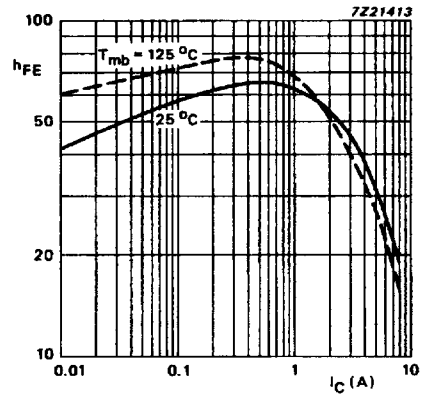


Fig.7 DC current gain; $V_{CE} = 4$ V; typical values.

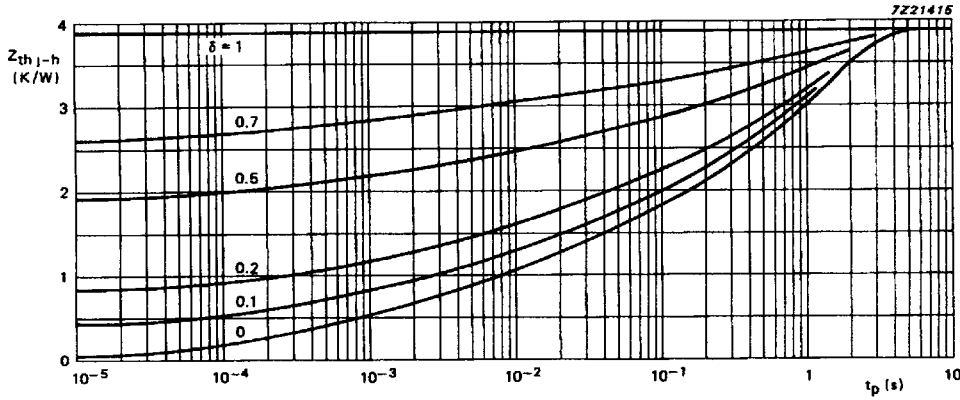


Fig.8 Pulse power rating chart.

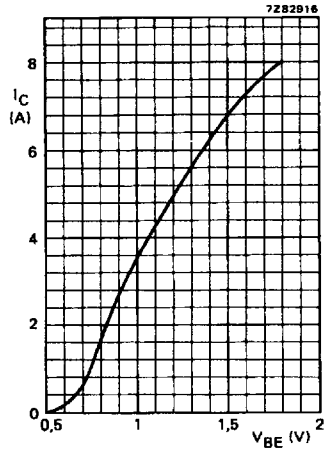


Fig.9 Typical collector current.
 $V_{CE} = 4\text{ V}; T_j = 25\text{ }^\circ\text{C}.$