

SILICON EPITAXIAL POWER TRANSISTORS

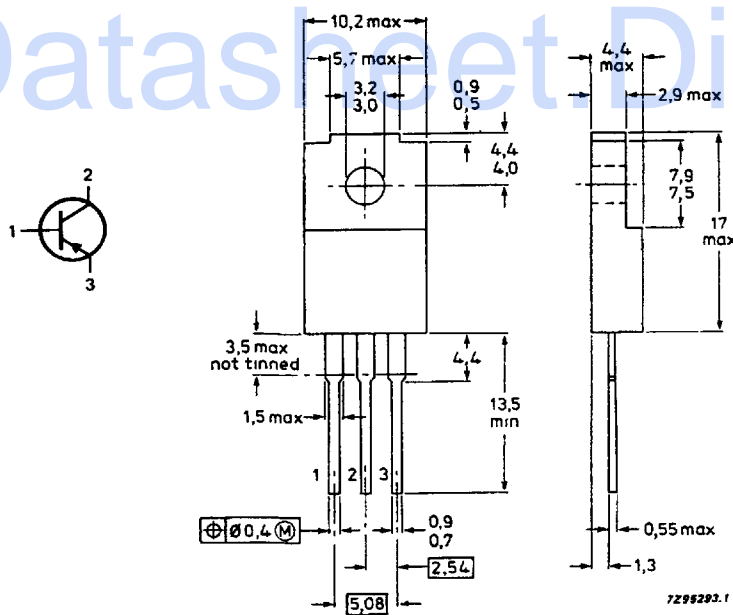
PNP silicon power transistor in a SOT186 envelope with an electrically insulated mounting base, for use in audio output stages and for general purpose amplifier and high-speed switching applications. NPN complements are TIP29F, TIP29AF, TIP29BF, TIP29CF and TIP29DF.

QUICK REFERENCE DATA

		TIP30F	30AF	30BF	30CF	30DF
Collector-base voltage (open emitter)	$-V_{CBO}$ max.	80	100	120	140	160 V
Collector-emitter voltage (open base)	$-V_{CEO}$ max.	40	60	80	100	120 V
Emitter-base voltage (open collector)	$-V_{EBO}$ max.	5	5	5	5	5 V
Collector current d.c.	$-I_C$ max.	3	3	3	3	3 A
peak value	$-I_{CM}$ max.	7	7	7	7	7 A
Total power dissipation up to $T_h = 25^\circ\text{C}$	P_{tot} max.	19	19	19	19	19 W
D.C. current gain $-I_C = 1\text{ A}; -V_{CE} = 4\text{ V}$	h_{FE}	15 to 75				
Transition frequency at $f = 1\text{ MHz}$ $-I_C = 0,2\text{ A}; -V_{CE} = 10\text{ V}$	f_T min.	3			MHz	

Fig.1 SOT186.

Dimensions in mm



RATINGS

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

			TIP30F	30AF	30BF	30CF	30DF	
Collector-base voltage (open emitter)	$-V_{CBO}$	max.	80	100	120	140	160	V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	40	60	80	100	120	V
Emitter-base voltage (open collector)	$-V_{EBO}$	max.			5			V
Collector current d.c.	$-I_C$	max.			3			A
peak value	$-I_{CM}$	max.			7			A
Base current (d.c.)	$-I_B$	max.			0,4			A
Total power dissipation up to $T_h = 25^\circ\text{C}$ (1)	P_{tot}	max.			14			W
up to $T_h = 25^\circ\text{C}$ (2)	P_{tot}	max.			19			W
Storage temperature	T_{stg}				-65 to 150			$^\circ\text{C}$
Junction temperature	T_j	max.			150			$^\circ\text{C}$

THERMAL RESISTANCE

From junction to internal heatsink	$R_{th\ j-mb}$	=			4,17			K/W
From junction to external heatsink (1)	$R_{th\ j-h}$	=			9,17			K/W
From junction to external heatsink (2)	$R_{th\ j-h}$	=			6,67			K/W
From junction to ambient	$R_{th\ j-a}$	=			55			K/W

INSULATION

Voltage allowed between all terminals and external heatsink, peak value (3)	V_{insul}	max.			1000			V
Insulation capacitance between collector and external heatsink	C_{c-h}	typ.			12			pF

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

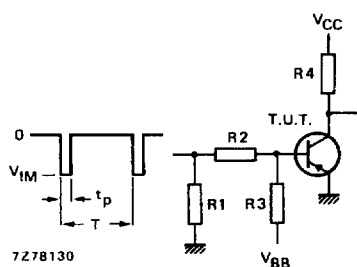
(2) Mounted with heatsink compound and 30 ± 5 newtons pressure on centre of envelope.

(3) Heatsink temperature $T_h = 25^\circ\text{C}$; relative humidity $R_H \leq 75\%$; atmospheric pressure $P_{amb} = 1013$ mbar.

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

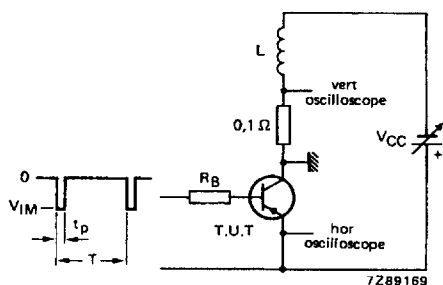
		TIP30F	30AF	30BF	30CF	30DF
Collector cut-off currents						
$-I_B = 0; -V_{CE} = 30\text{ V}$	$-I_{CEO}$	< 0,1	0,1	—	—	— mA
$-I_B = 0; -V_{CE} = 60\text{ V}$	$-I_{CEO}$	< —	—	0,1	0,1	— mA
$-I_B = 0; -V_{CE} = 90\text{ V}$	$-I_{CEO}$	< —	—	—	—	0,1 mA
$-V_{BE} = 0; -V_{CE} = V_{CBOmax}$	$-I_{CES}$	< 0,2	0,2	0,2	0,2	0,2 mA
Emitter-cut-off current						
$-I_C = 0; -V_{EB} = 5\text{ V}$	$-I_{EBO}$	< 0,2	0,2	0,2	0,2	0,2 mA
Collector-emitter breakdown voltages (1)						
$-I_B = 0; -I_C = 30\text{ mA}$	$-V_{(BR)CEO}$	> 40	60	80	100	120 V
D.C. current gain (1)						
$-I_C = 0,2\text{ A}; -V_{CE} = 4\text{ V}$	h_{FE}	>		40		
$-I_C = 1\text{ A}; -V_{CE} = 4\text{ V}$	h_{FE}	>		15 to 75		
Base-emitter voltage (1)+(2)						
$-I_C = 1\text{ A}; -V_{CE} = 4\text{ V}$	$-V_{BE}$	<		1,3		V
Collector-emitter saturation voltage (1)						
$-I_C = 1\text{ A}; -I_B = 0,125\text{ A}$	$-V_{CEsat}$	<		0,7		V
Transition frequency at $f = 1\text{ MHz}$						
$-I_C = 0,2\text{ A}; -V_{CE} = 10\text{ V}$	f_T	>		3		MHz
Small-signal current gain						
$-I_C = 0,2\text{ A}; -V_{CE} = 10\text{ V}$						
at 1 kHz	h_{fe}	>		20		
at 1 MHz	h_{fe}	>		3		
Turn-off breakdown energy with inductive load (see Fig. 3)						
$-I_C = 1,8\text{ A}; L = 20\text{ mH}$	$E_{(BR)}$	>		32		mJ
Switching times (see Fig. 2)						
$-I_C = 1\text{ A}; -I_{Bon} = +I_{Boff} = 0,1\text{ A}$						
turn-on time	t_{on}	typ.		0,3		μs
turn-off time	t_{off}	typ.		1		μs

(1) Measured under pulse conditions: $t_p = 300\ \mu\text{s}$; $\delta = 2\%$.(2) V_{BE} decreases by about 2,3 mV/K with increasing temperature.



- $-V_{CC} = 20 \text{ V}$
- $-V_{IM} = 16 \text{ V}$
- $+V_{BB} = 6,4 \text{ V}$
- $R1 = 82 \Omega$
- $R2 = 82 \Omega$
- $R3 = 82 \Omega$
- $R4 = 20 \Omega$
- $t_r = t_f = 15 \text{ ns}$
- $t_p = 20 \mu\text{s}$
- $T = 500 \mu\text{s}$

Fig. 2 Switching times test circuit.



- $-V_{IM} = 12 \text{ V}$
- $R_B = 270 \Omega$
- $L = 20 \text{ mH}$
- $-I_C = 1,8 \text{ A}$
- $t_p = 1 \text{ ms}$
- $\delta = 1 \%$

Fig. 3 Test circuit for turn-off breakdown energy.

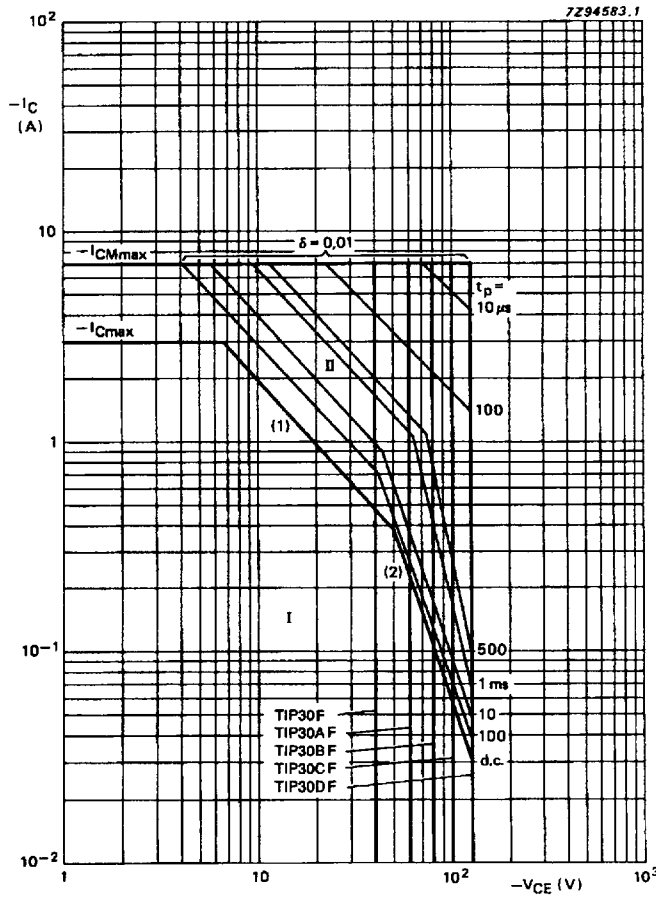


Fig. 4 Safe Operating Area, $T_{amb} = 25\text{ }^{\circ}\text{C}$.

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

Mounted *with* heatsink compound and 30 ± 5 Newton pressure on the centre of the envelope.

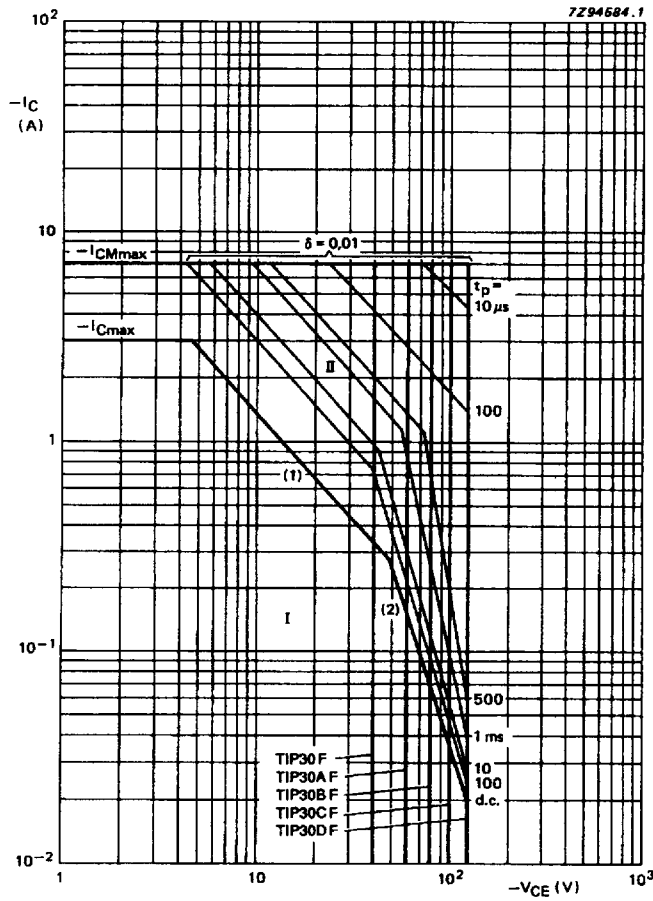


Fig. 5 Safe Operating Area, $T_{amb} = 25^{\circ}\text{C}$.

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

Mounted *without* heatsink compound and 30 ± 5 Newton pressure on the centre of the envelope.

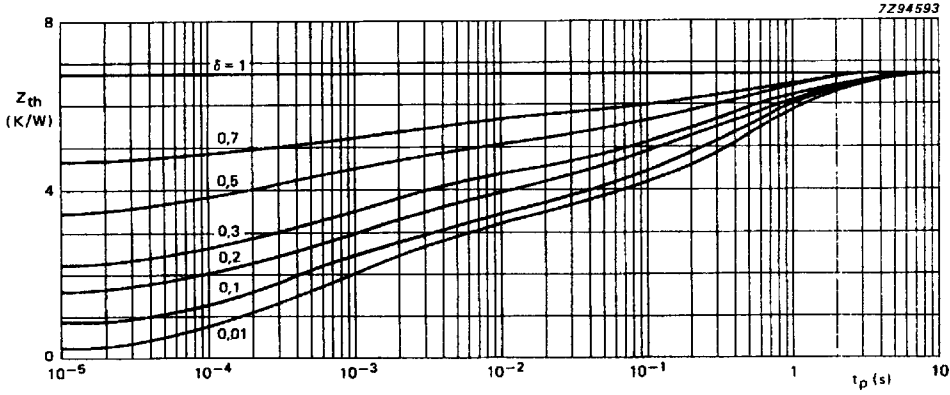


Fig. 6 Pulse power rating chart; mounted *with* heatsink compound and 30 ± 5 Newton pressure on the envelope.

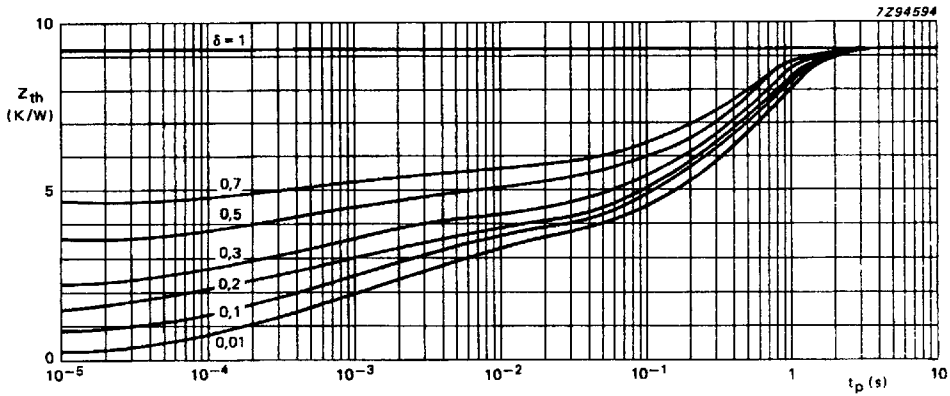


Fig. 7 Pulse power rating chart; mounted *without* heatsink compound and 30 ± 5 Newton pressure on the envelope.

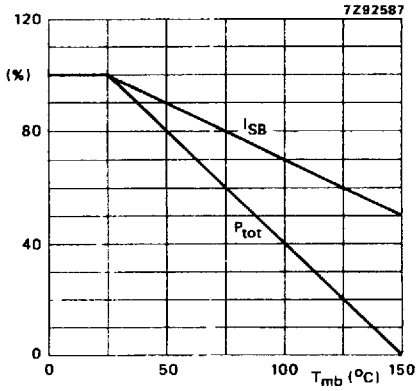


Fig. 8 Total power dissipation and second-breakdown current derating curve.

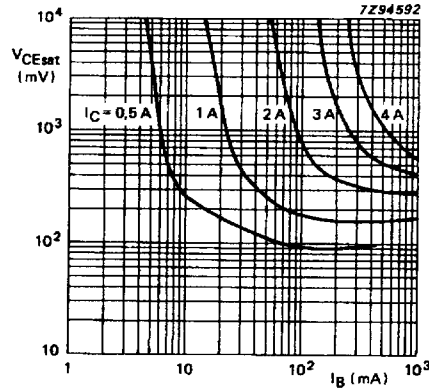


Fig. 9 Collector-emitter saturation voltage; typical values.

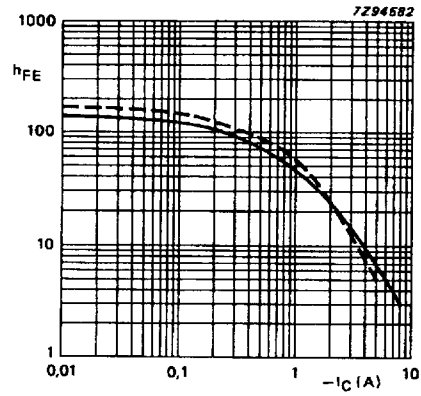


Fig. 10 D.C. current gain; $-V_{CE} = 4 \text{ V}$; typical values;
 — $T_j = 25 \text{ }^\circ\text{C}$; - - - $T_j = 125 \text{ }^\circ\text{C}$.