

SILICON EPITAXIAL BASE POWER TRANSISTORS

T-33-09

N-P-N silicon transistors in a plastic envelope intended for use in output stages of audio and television amplifier circuits where high peak powers can occur.

P-N-P complements are BD934; 936; 938; 940 and 942.

QUICK REFERENCE DATA

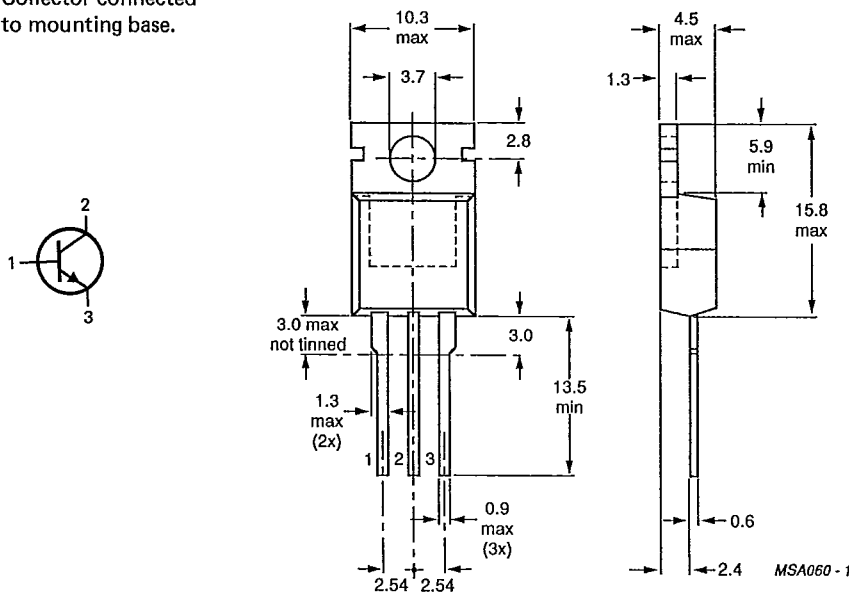
			BD933	935	937	939	941
Collector-base voltage	V_{CBO}	max.	45	60	100	120	140 V
Collector-emitter voltage	V_{CEO}	max.	45	60	80	100	120 V
Collector current (d.c.)	I_C	max.			3		A
Total power dissipation up to $T_{mb} = 25^\circ\text{C}$	P_{tot}	max.			30		W
Junction temperature	T_j	max.			150		$^\circ\text{C}$
D.C. current gain					40 to 250		
$I_C = 150\text{ mA}; V_{CE} = 2\text{ V}$	h_{FE}				25		
$I_C = 1\text{ A}; V_{CE} = 2\text{ V}$	h_{FE}	>					
Transition frequency					3		MHz
$I_C = 250\text{ mA}; V_{CE} = 10\text{ V}$	f_T	>					

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-220.

Collector connected to mounting base.



See also chapters Mounting instructions and Accessories.

BD933; 935
BD937; 939
BD941

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RATINGS

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

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		BD933	935	937	939	941	
Collector-base voltage (open emitter)	V _{CB0}	max.	45	60	100	120	140 V
Collector-emitter voltage (open base)	V _{CE0}	max.	45	60	80	100	120 V
Emitter-base voltage (open collector)	V _{EB0}	max.			5		V
Collector current (d.c.)	I _C	max.			3		A
Collector current (peak value)	I _{CM}	max.			7		A
Base current (d.c.)	I _B	max.			0,5		A
Total power dissipation up to T _{mb} = 25 °C	P _{tot}	max.			30		W
Storage temperature	T _{stg}		-65 to + 150				°C
Junction temperature	T _j	max.			150		°C

THERMAL RESISTANCE

From junction to mounting base	R _{th j-mb}	=		4,17		K/W
From junction to ambient in free air	R _{th j-a}	=		70		K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current							
I _E = 0; V _{CB} = V _{CB0max}	I _{CB0}	<		50		μA	
I _E = 0; V _{CB} = V _{CB0max} ; T _j = 150 °C	I _{CB0}	<		1		mA	
I _E = 0; V _{CE} = V _{CE0max}	I _{CE0}	<		0,1		mA	
Emitter cut-off current							
I _C = 0; V _{EB} = 5 V	I _{EB0}	<		0,2		mA	
D.C. current gain *							
I _C = 150 mA; V _{CE} = 2 V	h _{FE}			40 to 250			
I _C = 1 A; V _{CE} = 2 V	h _{FE}	>		25			
Base-emitter voltage **							
I _C = 1 A; V _{CE} = 2 V	V _{BE}	<		1,3		V	
Collector-emitter saturation voltage *							
I _C = 1 A; I _B = 0,1 A	V _{CEsat}	<		0,6		V	
Transition frequency at f = 1 MHz							
I _C = 250 mA; V _{CE} = 10 V	f _T	>		3		MHz	
Switching times							
I _{Con} = 1 A; I _{Bon} = -I _{Boff} = 0,1 A	t _{on}	typ		0,4		μs	
turn-on time		<		1		μs	
Turn-off time	t _{off}	typ.		1,5		μs	
		<		3		μs	
Second-breakdown collector current							
V _{CE} = 40 V; t _p = 0,1 s; non-repetitive	I _(SB)	>		0,75		A	

* Measured under pulse conditions: t_p < 300 μs; δ < 2%.

** V_{BE} decreases by about 2,3 mV/K with increasing temperature.

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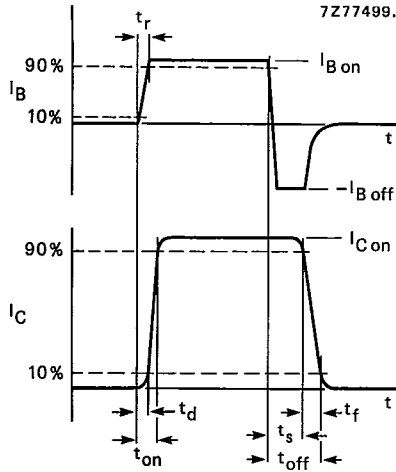


Fig. 2 Switching times waveforms.

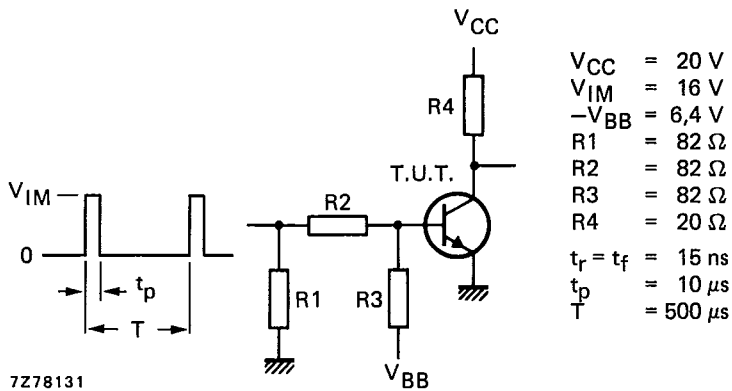


Fig. 3 Switching times test circuit.

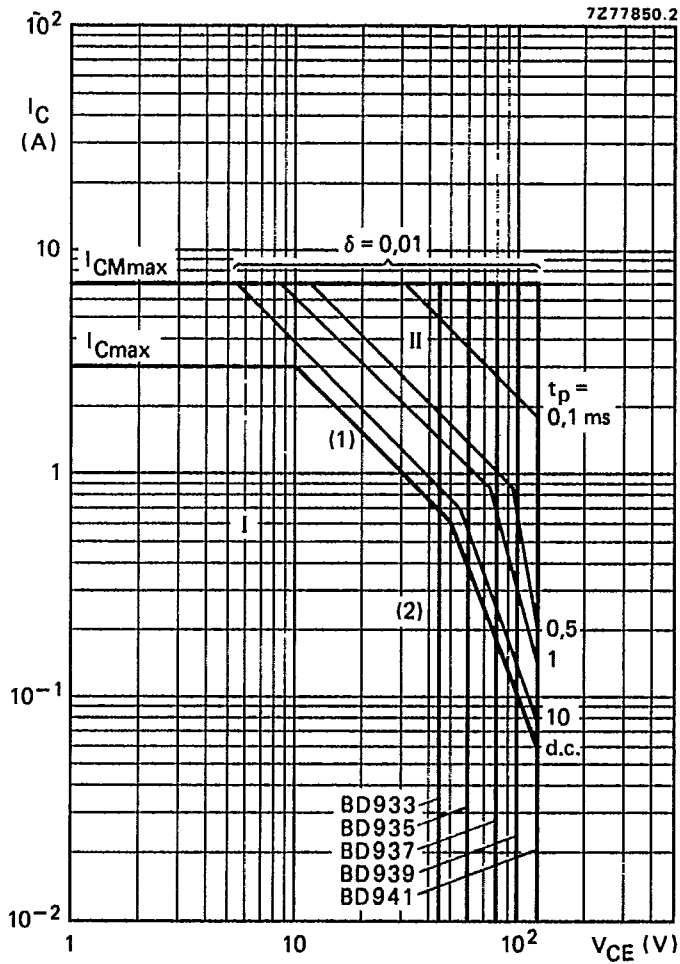


Fig. 4 Safe Operating Area, $T_{mb} = 25 \text{ }^\circ\text{C}$.

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

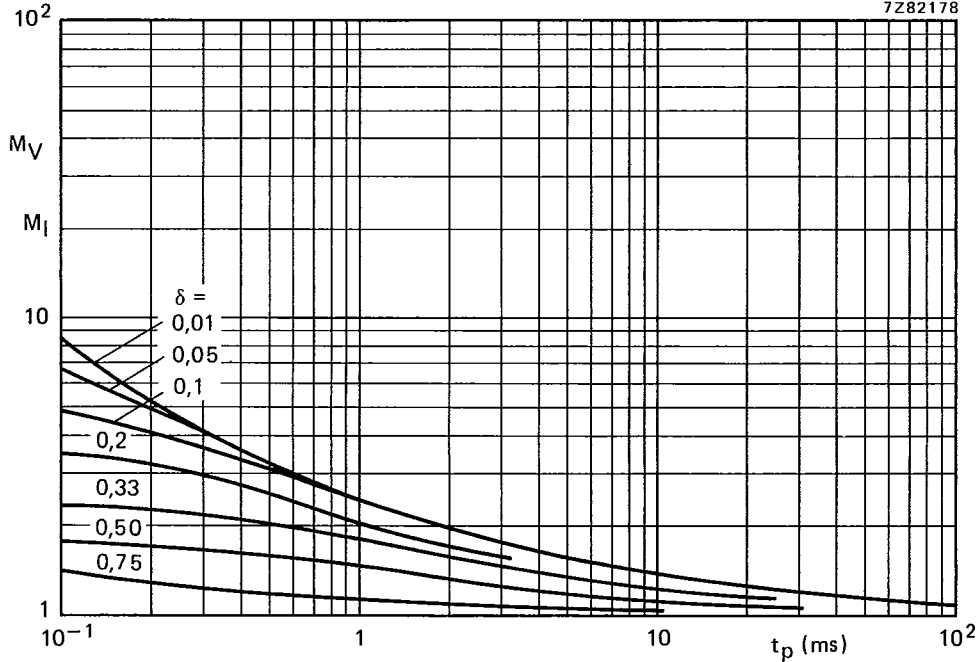


Fig. 5 Second-breakdown voltage multiplying factor at the I_{Cmax} level and second-breakdown current multiplying factor at the V_{CE0max} level.

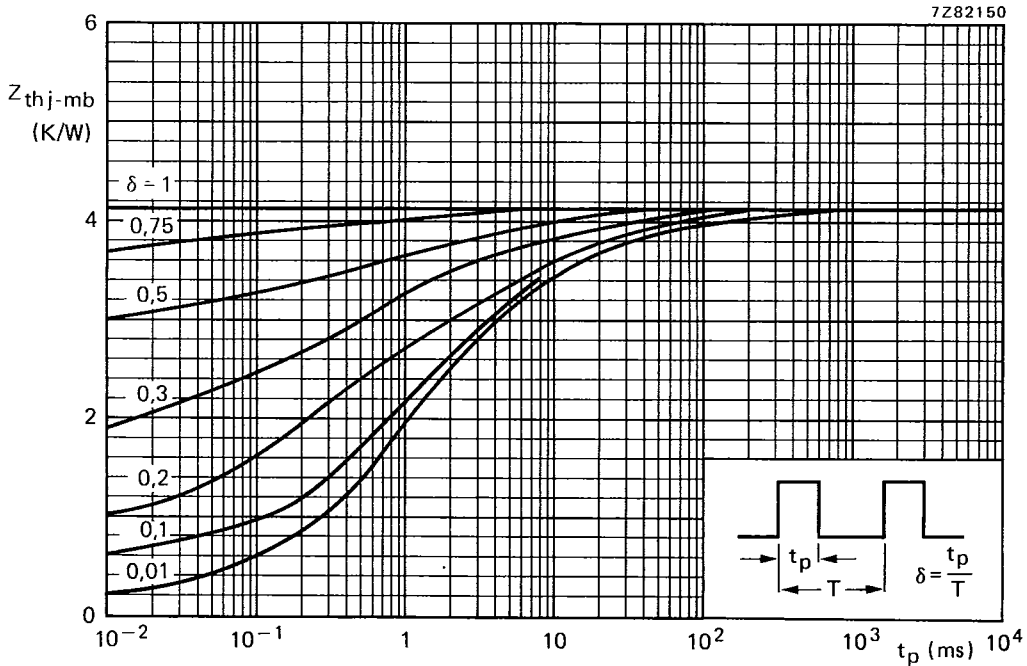


Fig. 6 Pulse power rating chart.

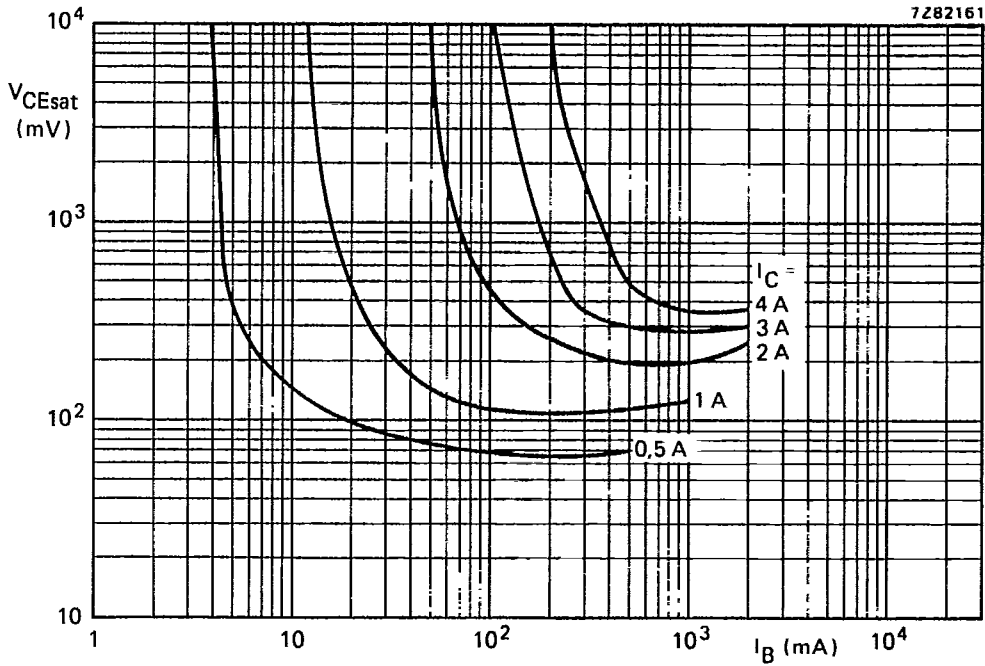


Fig. 7 Typical collector-emitter saturation voltage as a function of base current with collector current as a parameter.

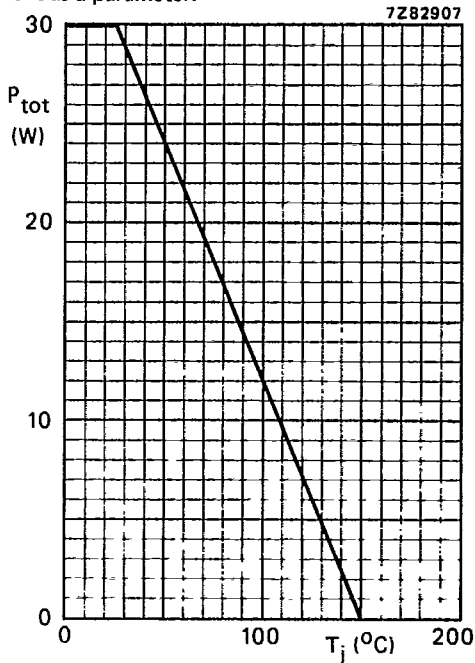


Fig. 8 Power derating curve.

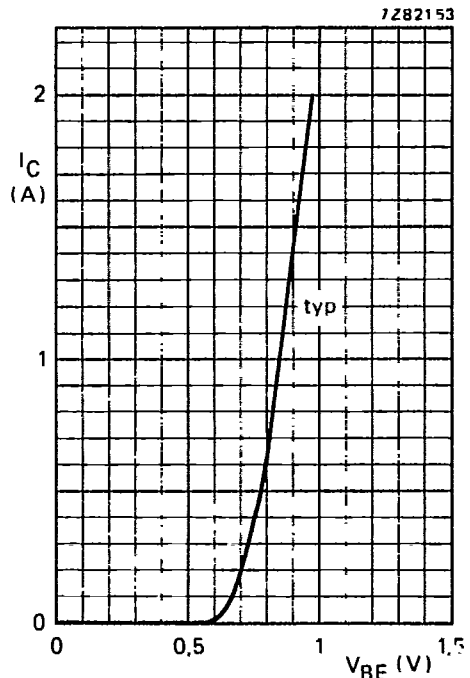


Fig. 9 $V_{CE} = 2$ V; $T_j = 25$ °C.

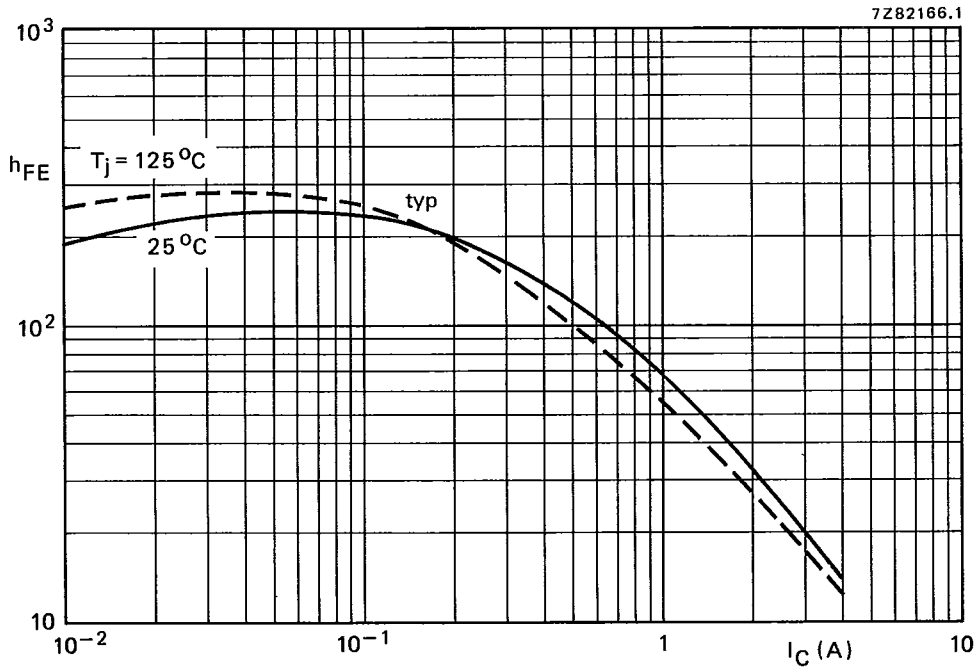


Fig. 10 Typical static forward current transfer ratio as a function of the collector current. $V_{CE} = 2\text{ V}$