

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

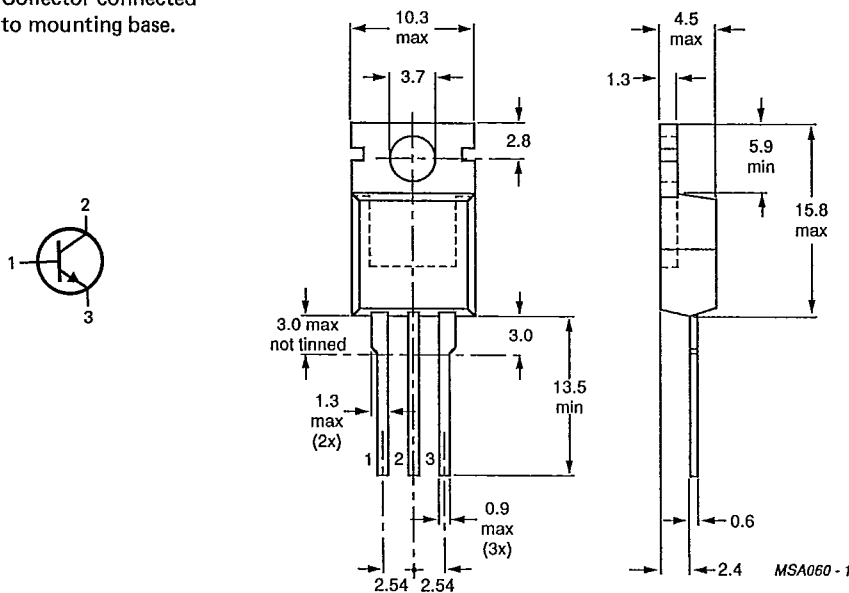
			BD933	935	937	939	941
Collector-base voltage	V_{CBO}	max.	45	60	100	120	140 V
Collector-emitter voltage	V_{CEO}	max.	45	60	80	100	120 V
Collector current (d.c.)	I_C	max.			3		A
Total power dissipation up to $T_{mb} = 25^\circ\text{C}$	P_{tot}	max.			30		W
Junction temperature	T_j	max.			150		$^\circ\text{C}$
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_{CBO}	max.	45	60	100	120	140	V	
Collector-emitter voltage (open base)	V_{CEO}	max.	45	60	80	100	120	V	
Emitter-base voltage (open collector)	V_{EBO}	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 $T_{mb} = 25\text{ }^\circ\text{C}$	P_{tot}	max.			30			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 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

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

Collector cut-off current								
$I_E = 0; V_{CB} = V_{CBOmax}$	I_{CBO}	<		50				μA
$I_E = 0; V_{CB} = V_{CBOmax}; T_j = 150\text{ }^\circ\text{C}$	I_{CBO}	<		1				mA
$I_E = 0; V_{CE} = V_{CEOmax}$	I_{CEO}	<		0,1				mA
Emitter cut-off current								
$I_C = 0; V_{EB} = 5\text{ V}$	I_{EBO}	<		0,2				mA
D.C. current gain *								
$I_C = 150\text{ mA}; V_{CE} = 2\text{ V}$	h_{FE}			40 to 250				
$I_C = 1\text{ A}; V_{CE} = 2\text{ V}$	h_{FE}	>		25				
Base-emitter voltage **								
$I_C = 1\text{ A}; V_{CE} = 2\text{ V}$	V_{BE}	<		1,3				V
Collector-emitter saturation voltage *								
$I_C = 1\text{ A}; I_B = 0,1\text{ A}$	V_{CEsat}	<		0,6				V
Transition frequency at $f = 1\text{ MHz}$								
$I_C = 250\text{ mA}; V_{CE} = 10\text{ V}$	f_T	>		3				MHz
Switching times								
$I_{Con} = 1\text{ A}; I_{Bon} = -I_{Boff} = 0,1\text{ A}$	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								
$V_{CE} = 40\text{ V}; t_p = 0,1\text{ s};$ non-repetitive	$I_{(SB)}$	>		0,75				A

* Measured under pulse conditions: $t_p \leq 300\text{ }\mu\text{s}; \delta < 2\%$.

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

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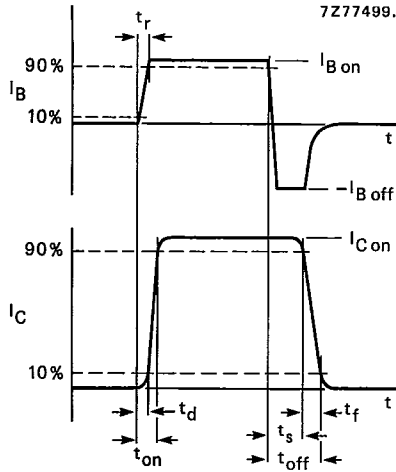


Fig. 2 Switching times waveforms.

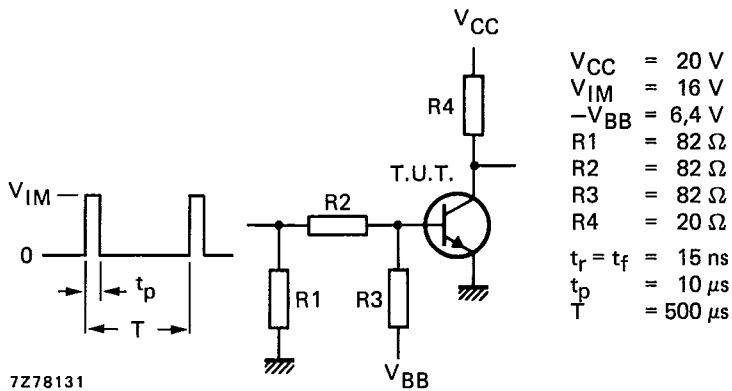


Fig. 3 Switching times test circuit.

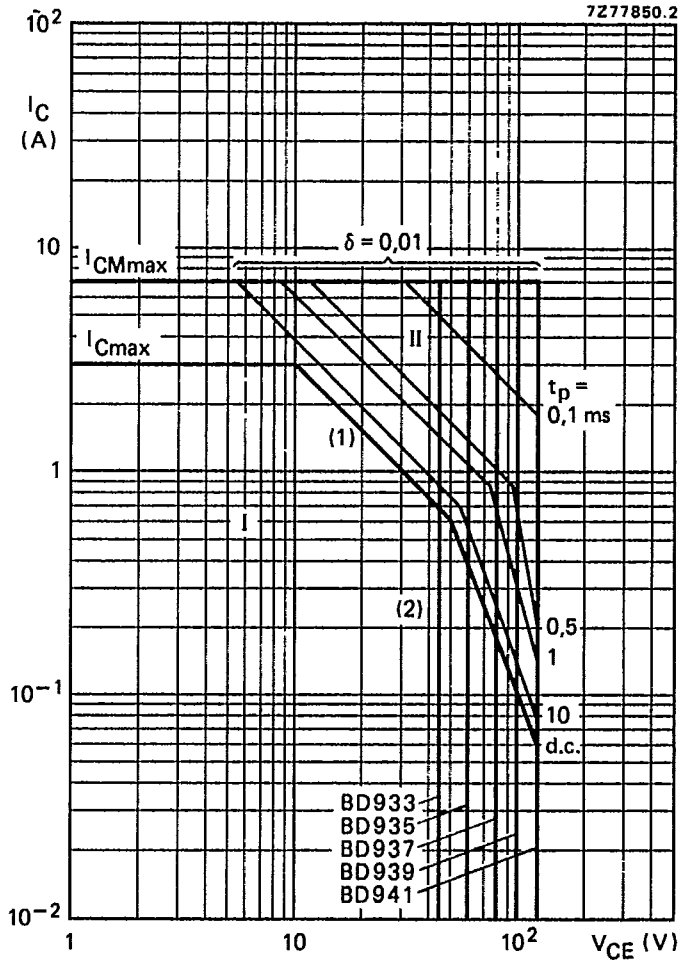


Fig. 4 Safe Operating Area, $T_{mb} = 25 \text{ }^\circ\text{C}$.

- 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.

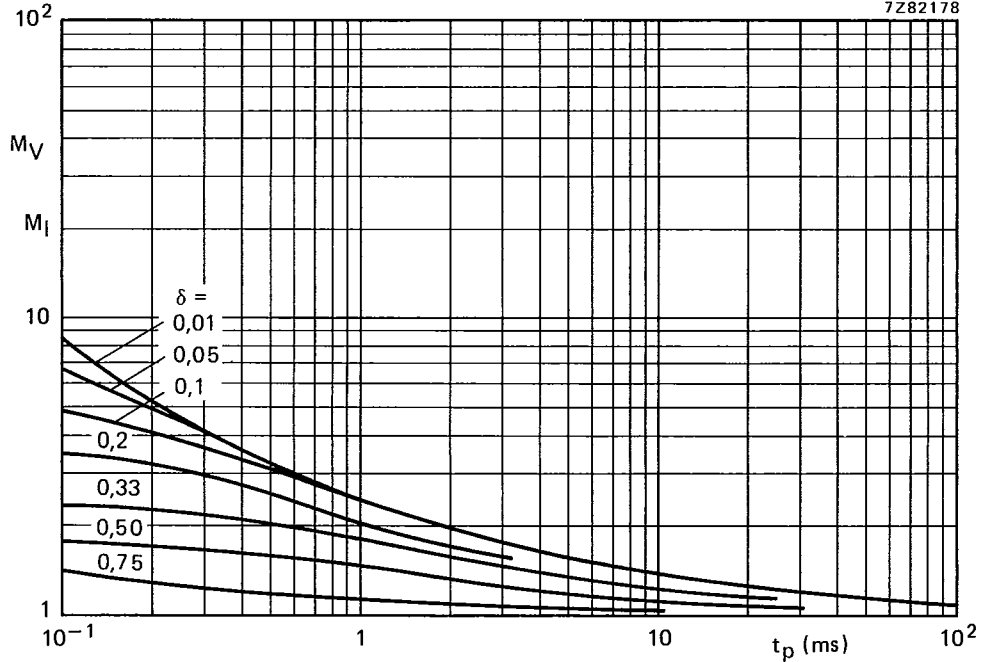


Fig. 5 Second-breakdown voltage multiplying factor at the I_{Cmax} level and second-breakdown current multiplying factor at the V_{CE0max} level.

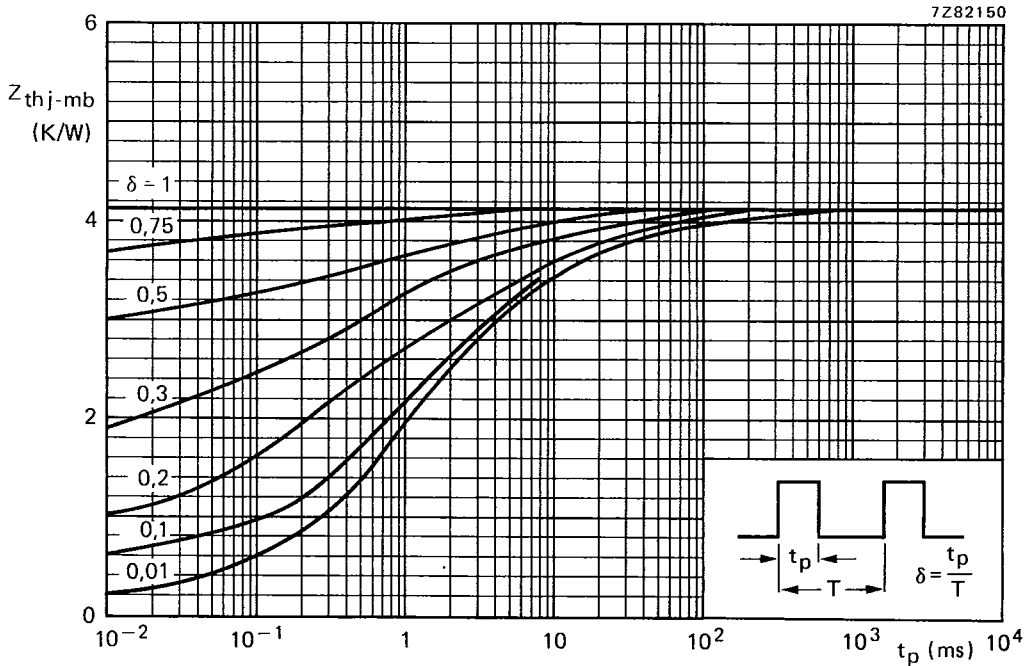


Fig. 6 Pulse power rating chart.

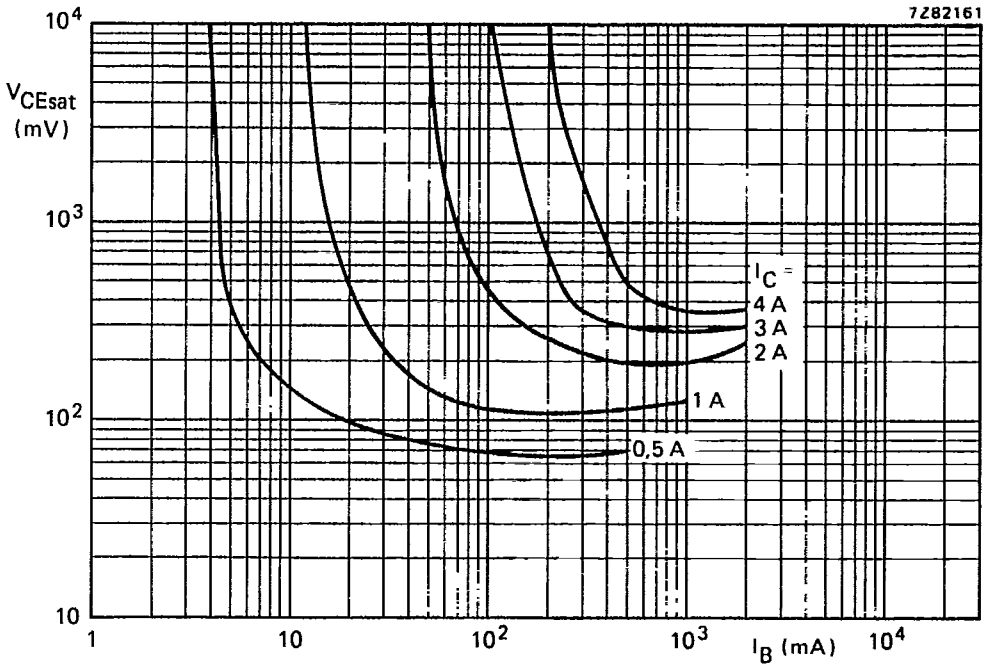


Fig. 7 Typical collector-emitter saturation voltage as a function of base current with collector current as a parameter.

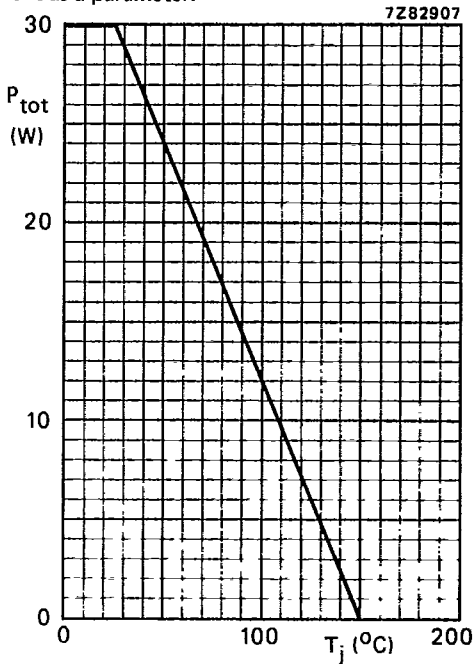


Fig. 8 Power derating curve.

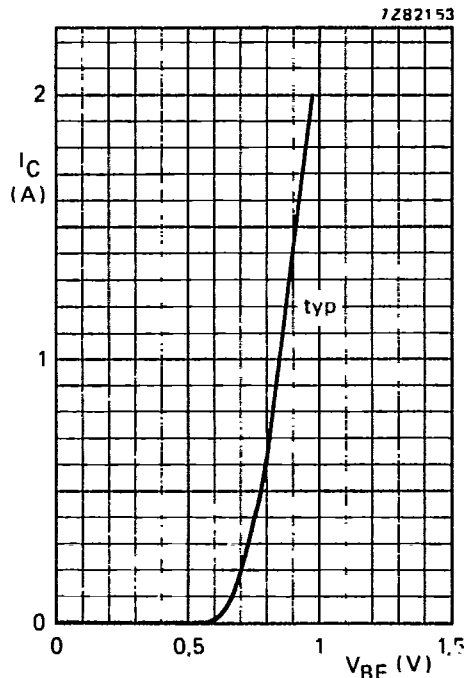


Fig. 9 $V_{CE} = 2$ V; $T_j = 25^{\circ}C$.

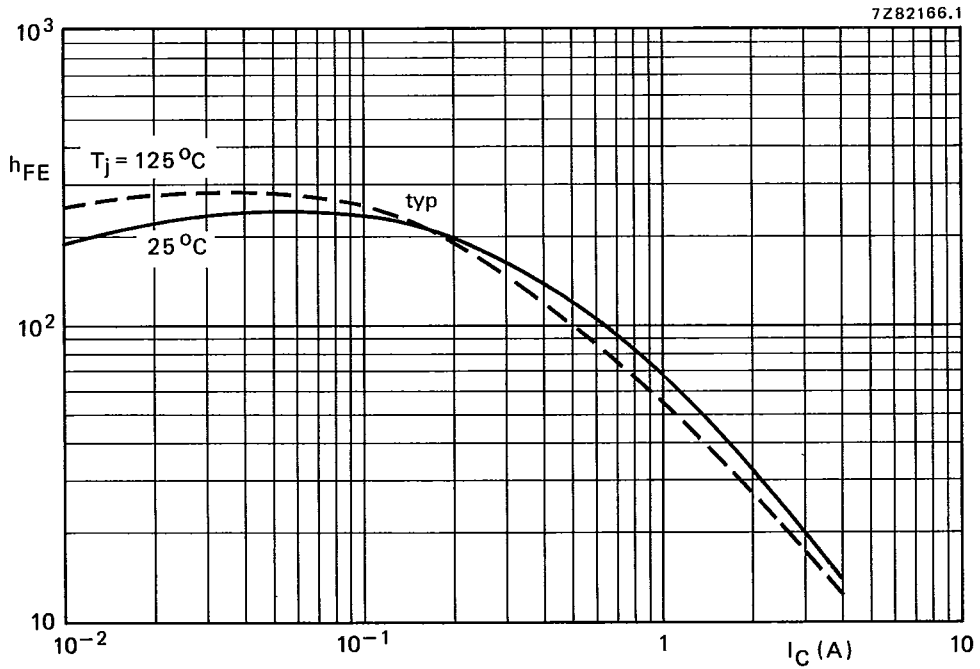


Fig. 10 Typical static forward current transfer ratio as a function of the collector current. $V_{CE} = 2$ V