

## SILICON EPITAXIAL-BASE POWER TRANSISTORS

N-P-N transistors in a SOT-32 plastic envelope intended for use in television and audio amplifier circuits where high peak powers can occur. P-N-P complements are BD234, BD236 and BD238. Matched pairs can be supplied.

### QUICK REFERENCE DATA

		BD233	BD235	BD237	
Collector-base voltage (open emitter)	$V_{CBO}$	max. 45	60	100	V
Collector-emitter voltage (open base)	$V_{CEO}$	max. 45	60	80	V
Collector-emitter voltage ( $R_{BE} = 1 \text{ k}\Omega$ )	$V_{CER}$	max. 45	60	100	V
Collector current (peak value)	$I_{CM}$	max.	6		A
Total power dissipation up to $T_{mb} = 25 \text{ }^\circ\text{C}$	$P_{tot}$	max.	25		W
Junction temperature	$T_j$	max.	150		$^\circ\text{C}$
D.C. current gain	$h_{FE}$	>	25		
$I_C = 1 \text{ A}; V_{CE} = 2 \text{ V}$					
Transition frequency	$f_T$	>	3		MHz
$I_C = 250 \text{ mA}; V_{CE} = 10 \text{ V}$					

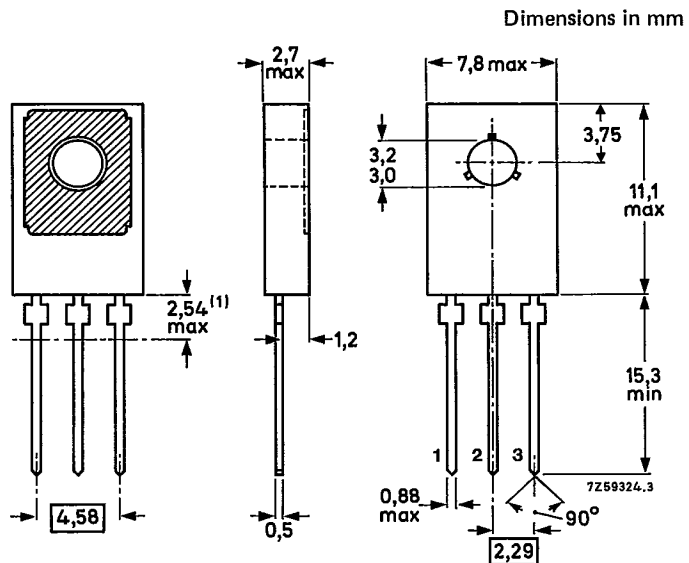
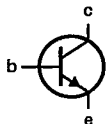
### MECHANICAL DATA

Fig. 1 TO-126 (SOT-32).

Collector connected to metal part of mounting surface

#### Pinning

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



(1) Within this region the cross-section of the leads is uncontrolled.

See also chapters Mounting Instructions and Accessories.

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

			BD233	BD235	BD237	
Collector-base voltage (open emitter)	V <sub>CB0</sub>	max.	45	60	100	V
Collector-emitter voltage (open base)	V <sub>CEO</sub>	max.	45	60	80	V
Collector-emitter voltage (R <sub>BE</sub> = 1 kΩ)	V <sub>CER</sub>	max.	45	60	100	V
Emitter-base voltage (open collector)	V <sub>EBO</sub>	max.	5	5	5	V
Collector current (d.c.)	I <sub>C</sub>	max.		2		A
Collector current (peak value)	I <sub>CM</sub>	max.		6		A
Base current (d.c.)	I <sub>B</sub>	max.		0,5		A
Total power dissipation up to T <sub>mb</sub> = 25 °C	P <sub>tot</sub>	max.		25		W
Storage temperature	T <sub>stg</sub>		-65 to + 150			°C
Junction temperature	T <sub>j</sub>	max.		150		°C
<b>THERMAL RESISTANCE</b>						
From junction to ambient in free air	R <sub>th j-a</sub>	=		100		K/W
From junction to mounting base	R <sub>th j-mb</sub>	=		5		K/W
<b>CHARACTERISTICS</b>						
T <sub>j</sub> = 25 °C unless otherwise specified						
Collector cut-off current						
I <sub>E</sub> = 0; V <sub>CB</sub> = V <sub>CB0max</sub>	I <sub>CBO</sub>	<		50		μA
I <sub>E</sub> = 0; V <sub>CB</sub> = V <sub>CB0max</sub> ; T <sub>j</sub> = 150 °C	I <sub>CBO</sub>	<		1		mA
Emitter cut-off current						
I <sub>C</sub> = 0; V <sub>EB</sub> = 5 V	I <sub>EBO</sub>	<		0,2		mA
Second-breakdown collector current						
V <sub>CE</sub> = 40 V; t <sub>p</sub> = 20 ms	I <sub>(SB)C</sub>	<		0,5		A
Base-emitter voltage*						
I <sub>C</sub> = 1 A; V <sub>CE</sub> = 2 V	V <sub>BE</sub>	<		1,3		V
Saturation voltage*						
I <sub>C</sub> = 1 A; I <sub>B</sub> = 0,1 A	V <sub>CEsat</sub>	<		0,6		V
D.C. current gain*						
I <sub>C</sub> = 150 mA; V <sub>CE</sub> = 2 V	h <sub>FE</sub>			40 to 250		
I <sub>C</sub> = 1 A; V <sub>CE</sub> = 2 V	h <sub>FE</sub>	>		25		
Transition frequency at f = 1 MHz						
I <sub>C</sub> = 250 mA; V <sub>CE</sub> = 10 V	f <sub>T</sub>	>		3		MHz

\* Measured under pulse conditions: t<sub>p</sub> < 300 μs, δ < 2%.

**CHARACTERISTICS** (continued)

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

D.C. current gain ratio of matched complementary pairs\*

$|I_C| = 150\text{ mA}; |V_{CE}| = 2\text{ V}$

$h_{FE1}/h_{FE2} < 1,6$

Switching times

$I_{Con} = 1\text{ A}; I_{Bon} = -I_{Boff} = 0,1\text{ A}$

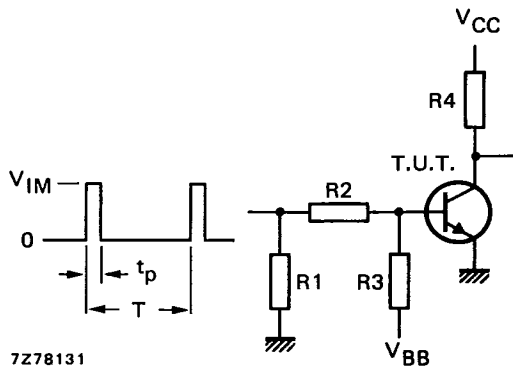
turn-on time

$t_{on}$  typ.  $0,4\text{ }\mu\text{s}$   
<  $1\text{ }\mu\text{s}$

turn-off time

$t_{off}$  typ.  $1,5\text{ }\mu\text{s}$   
<  $3\text{ }\mu\text{s}$

T-33-09



- $V_{IM} = 16\text{ V}$
- $V_{CC} = 20\text{ V}$
- $-V_{BB} = 6,4\text{ V}$
- $R1 = 82\text{ }\Omega$
- $R2 = 82\text{ }\Omega$
- $R3 = 82\text{ }\Omega$
- $R4 = 20\text{ }\Omega$
- $t_r = t_f = 15\text{ ns}$
- $t_p = 10\text{ }\mu\text{s}$
- $T = 500\text{ }\mu\text{s}$

Fig. 2 Test circuit.

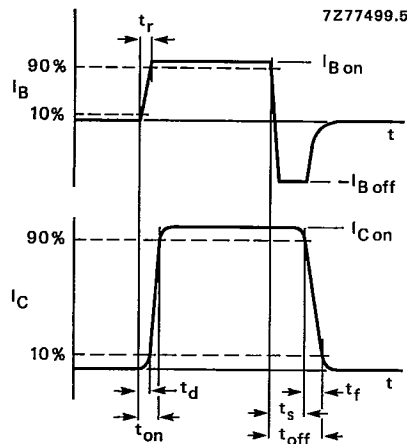


Fig. 3 Switching times waveforms.

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

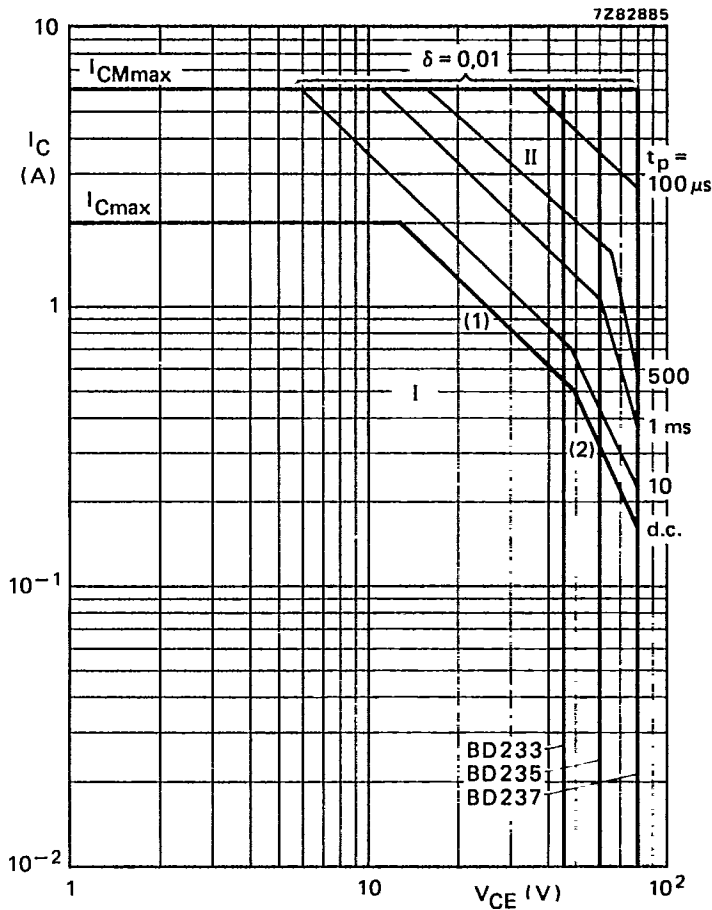


Fig. 4 Safe Operating Area with the transistor forward biased,  $T_{mb} \leq 25^\circ\text{C}$ .

- 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.

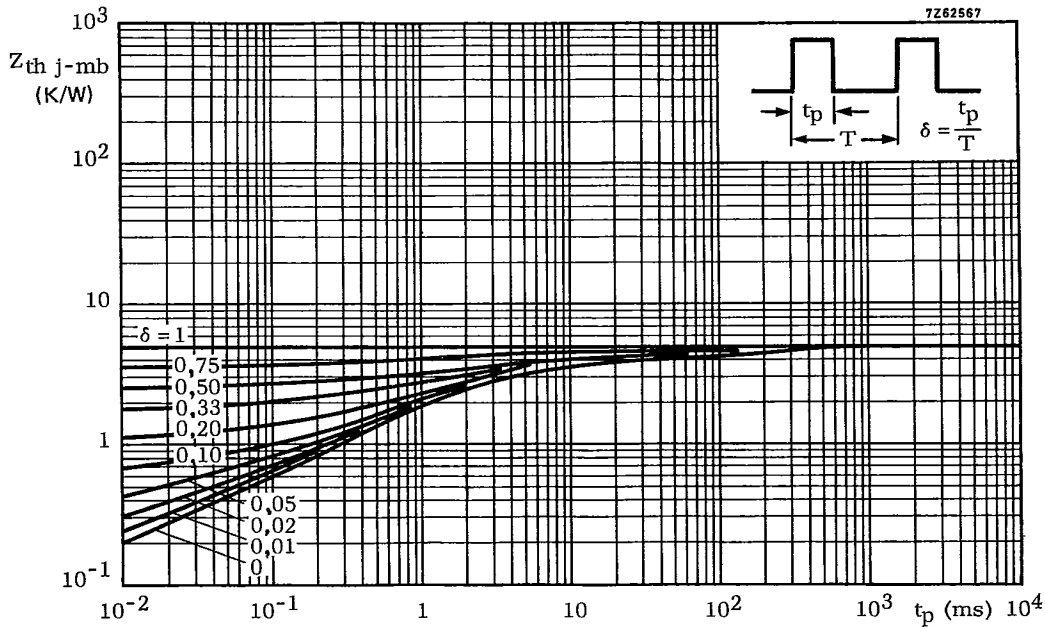
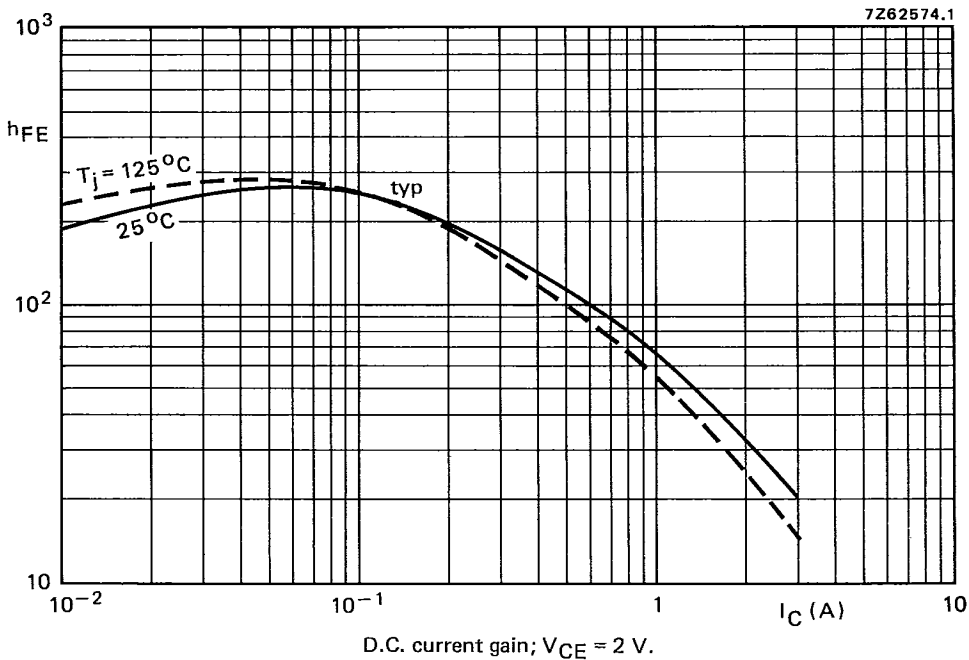


Fig. 5 Pulse power rating chart.



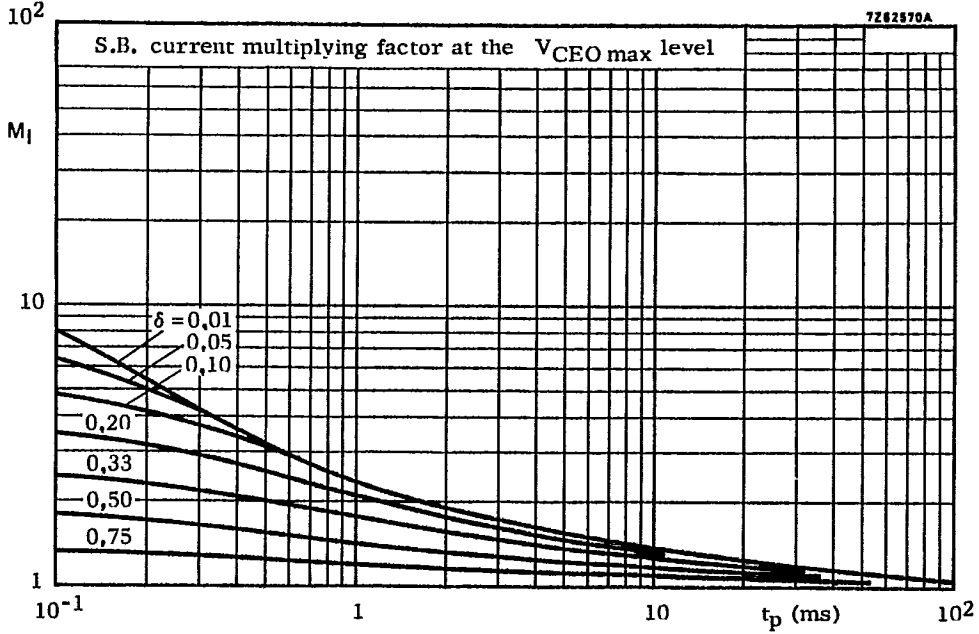


Fig. 7 S.B. current multiplying factor at the  $V_{CE0 \max}$  level.

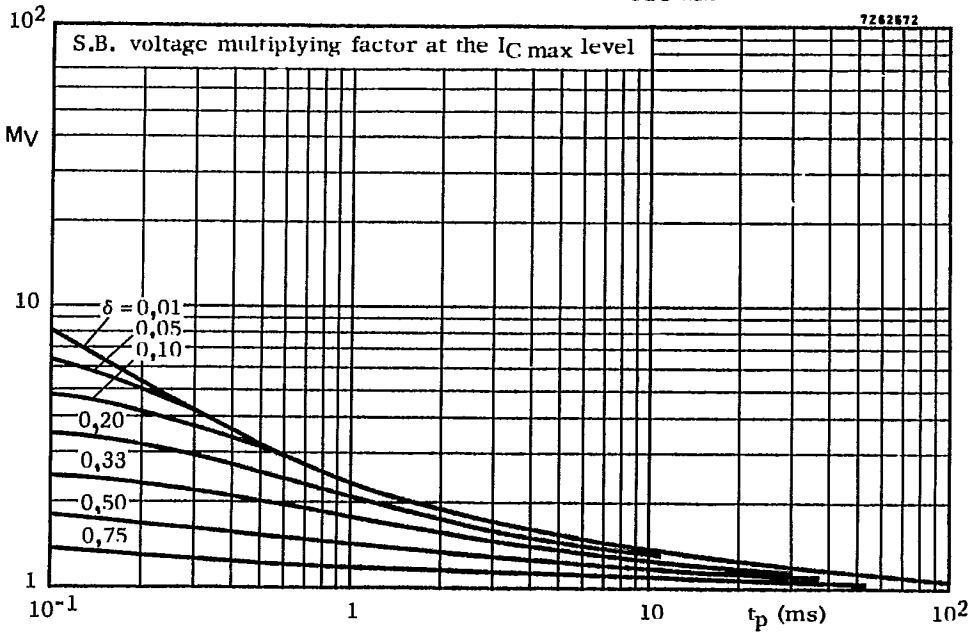


Fig. 8 S.B. voltage multiplying factor at the  $I_{C \max}$  level.

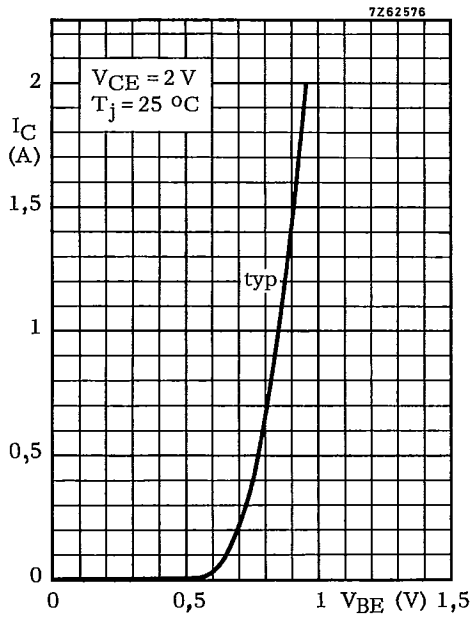


Fig. 9.

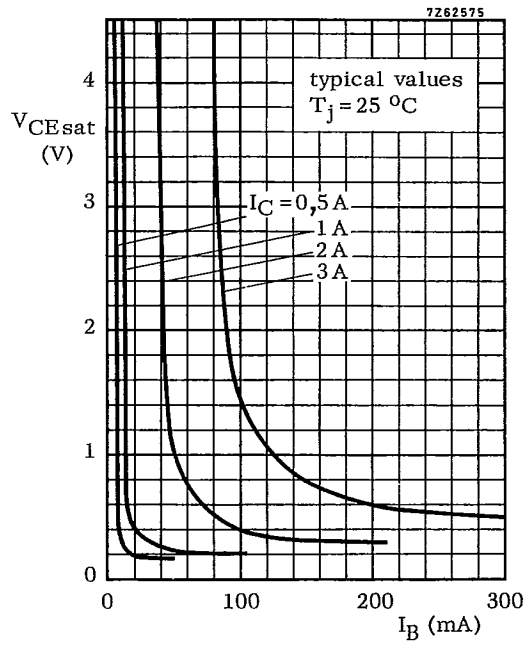


Fig. 10.