

## 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

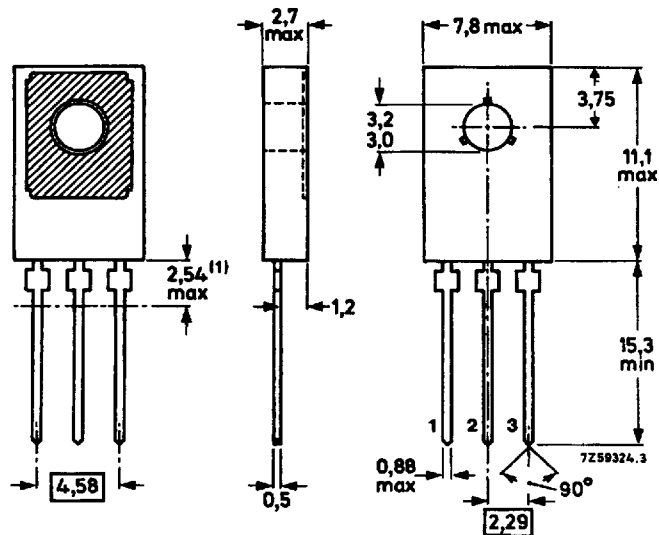
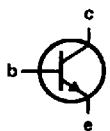
Dimensions in mm

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.

**RATINGS**

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

			BD233	BD235	BD237	
Collector-base voltage (open emitter)	$V_{CB0}$	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
Emitter-base voltage (open collector)	$V_{EBO}$	max.	5	5	5	V
Collector current (d.c.)	$I_C$	max.		2		A
Collector current (peak value)	$I_{CM}$	max.		6		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.		25		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 ambient in free air	$R_{th \text{ j-a}}$	=		100		K/W
From junction to mounting base	$R_{th \text{ j-mb}}$	=		5		K/W

**CHARACTERISTICS**

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

Collector cut-off current						
$I_E = 0; V_{CB} = V_{CB0max}$	$I_{CBO}$	<		50		$\mu\text{A}$
$I_E = 0; V_{CB} = V_{CB0max}; T_j = 150 \text{ }^\circ\text{C}$	$I_{CBO}$	<		1		mA
Emitter cut-off current						
$I_C = 0; V_{EB} = 5 \text{ V}$	$I_{EBO}$	<		0,2		mA
Second-breakdown collector current						
$V_{CE} = 40 \text{ V}; t_p = 20 \text{ ms}$	$I_{(SB)C}$	<		0,5		A
Base-emitter voltage*						
$I_C = 1 \text{ A}; V_{CE} = 2 \text{ V}$	$V_{BE}$	<		1,3		V
Saturation voltage*						
$I_C = 1 \text{ A}; I_B = 0,1 \text{ A}$	$V_{CEsat}$	<		0,6		V
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		
Transition frequency at $f = 1 \text{ MHz}$						
$I_C = 250 \text{ mA}; V_{CE} = 10 \text{ V}$	$f_T$	>		3		MHz

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

**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

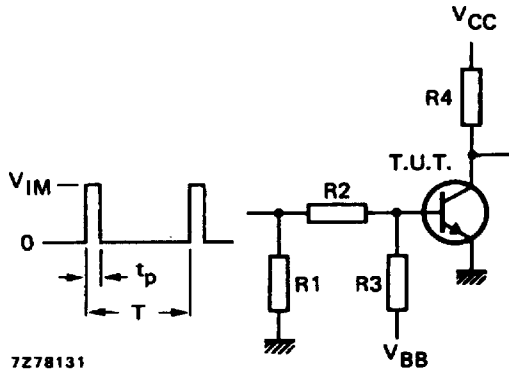
$I_{Con} = 1\text{ A}; I_{Bon} = -I_{Boff} = 0,1\text{ A}$

turn-on time

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

turn-off time

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



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

Fig. 2 Test circuit.

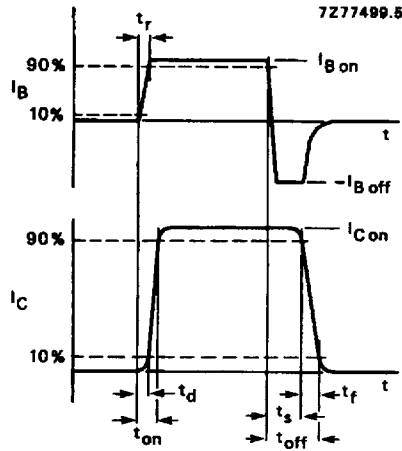


Fig. 3 Switching times waveforms.

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

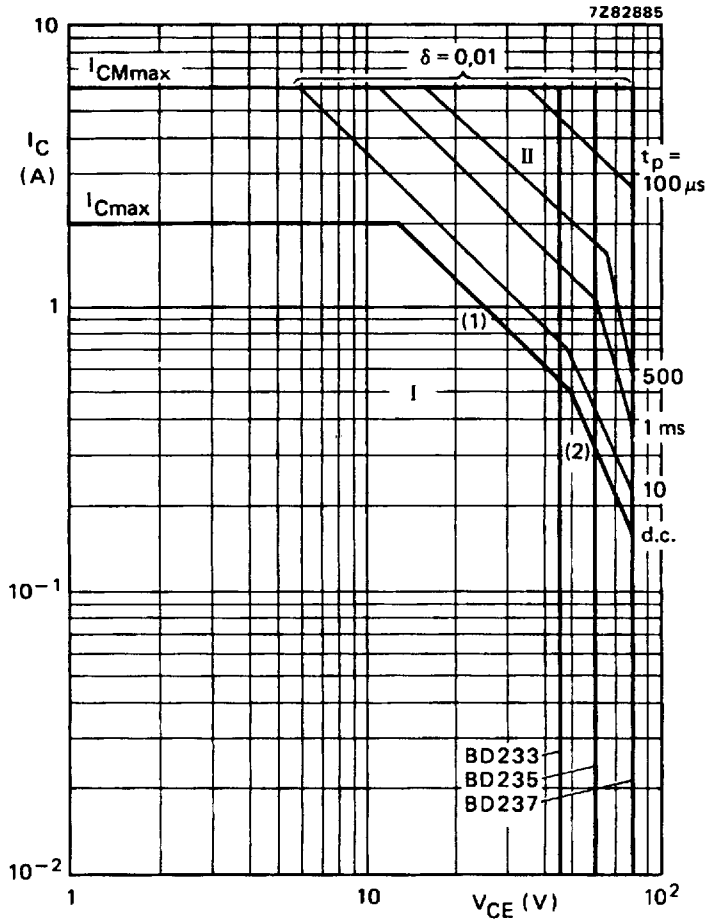


Fig. 4 Safe Operating Area with the transistor forward biased,  $T_{mb} \leq 25^\circ C$ .

- 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.

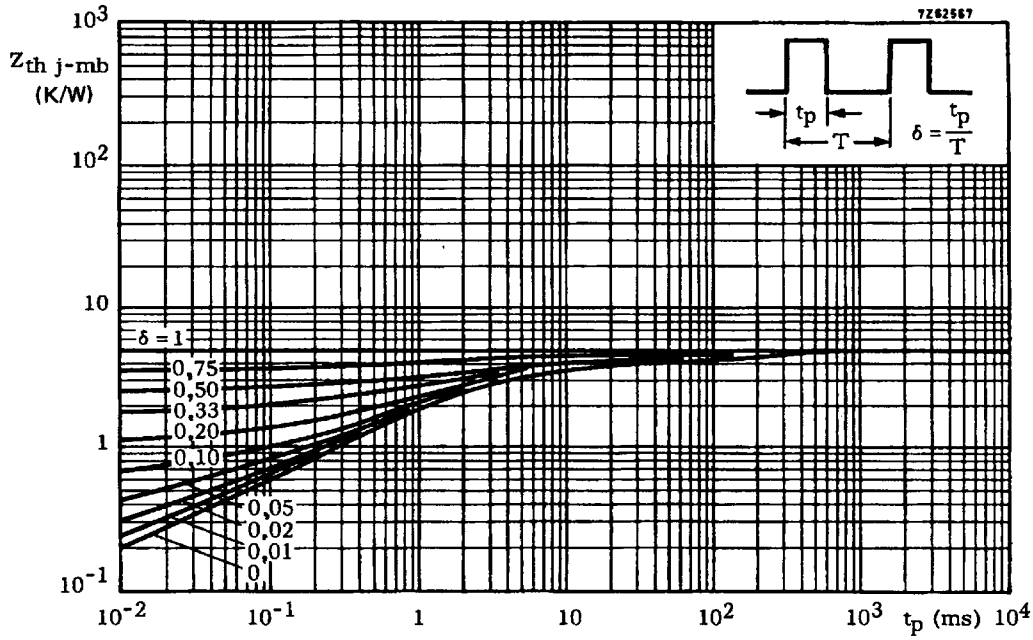
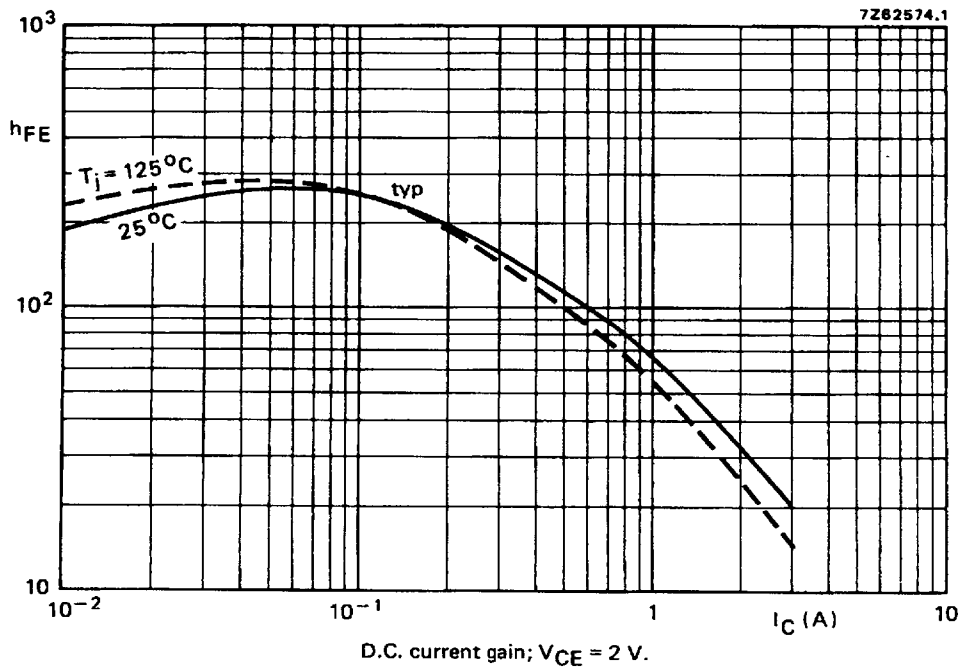


Fig. 5 Pulse power rating chart.



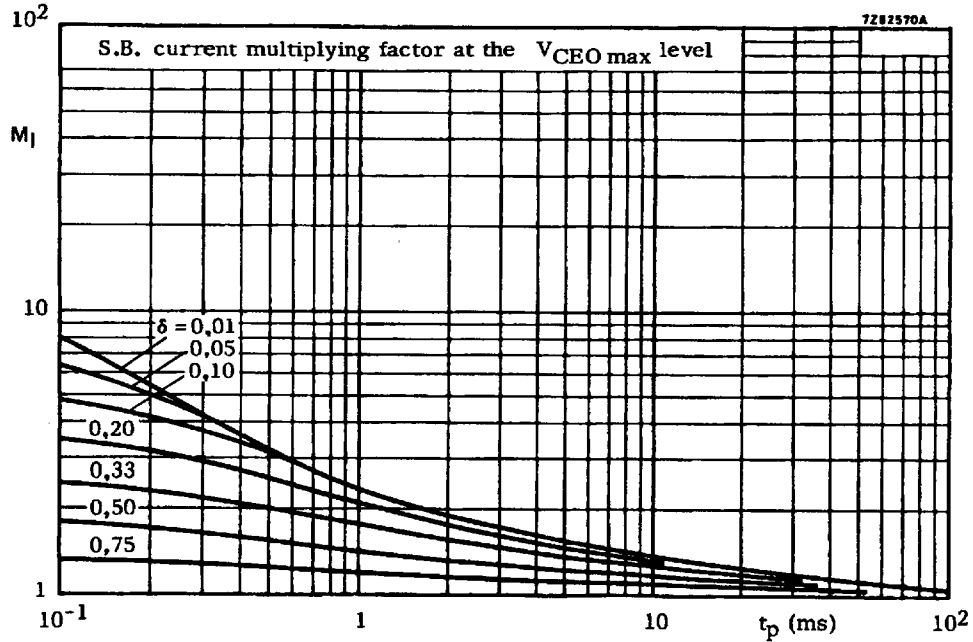


Fig. 7 S.B. current multiplying factor at the  $V_{CE0max}$  level.

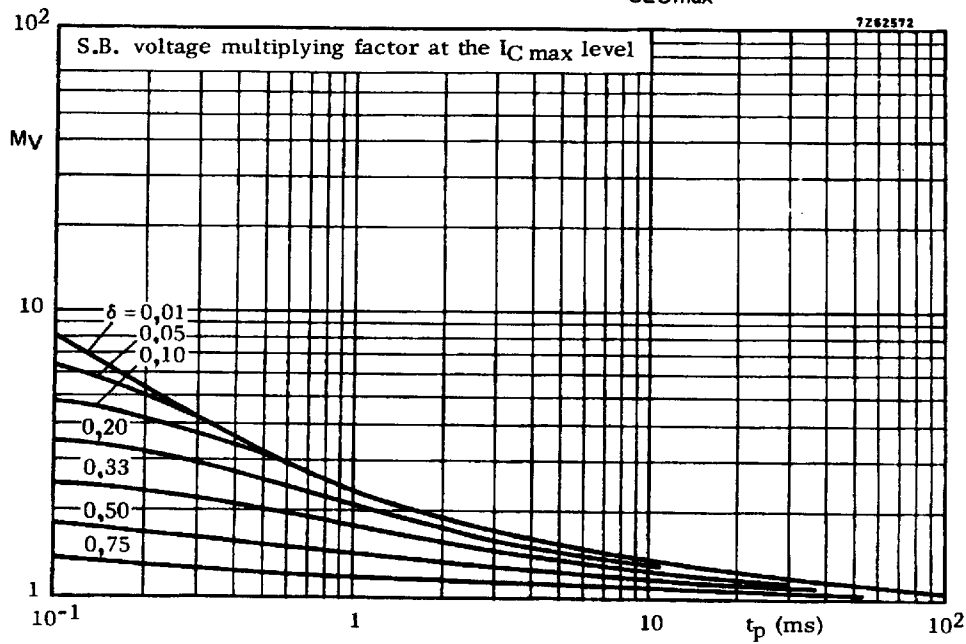


Fig. 8 S.B. voltage multiplying factor at the  $I_{Cmax}$  level.

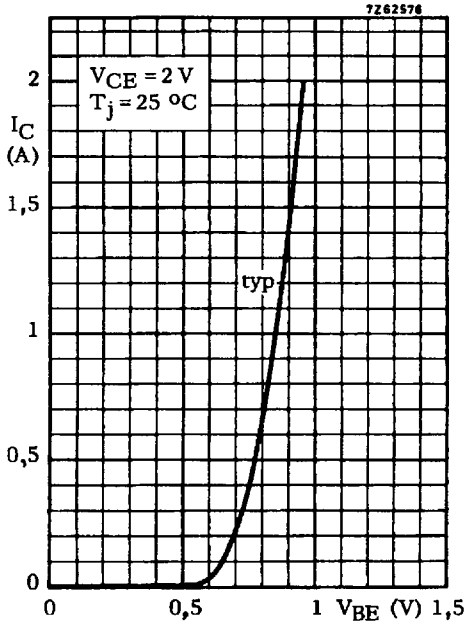


Fig. 9.

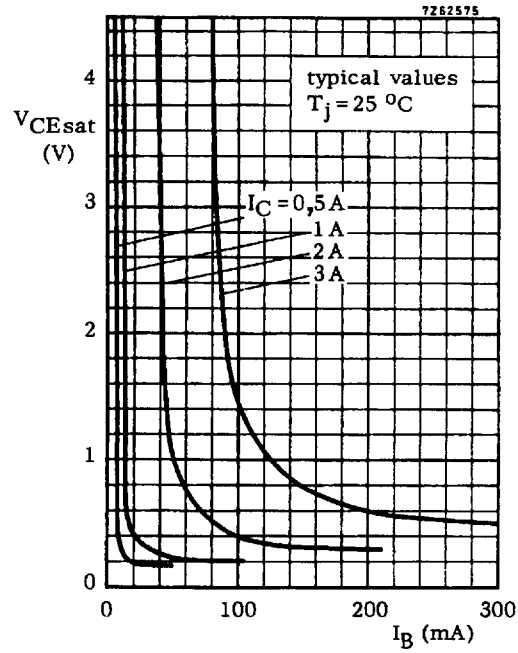


Fig. 10.