PHILIPS INTERNATIONAL 56E D 7110826 0043044 416 PHIN

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

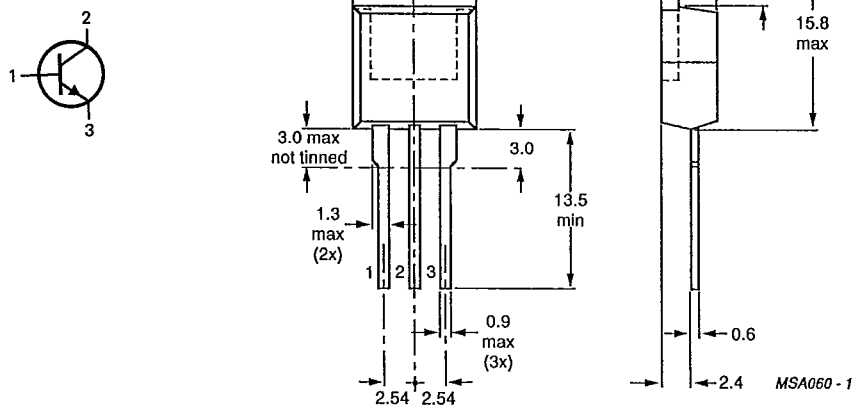
			BD933	935	937	939	941	
Collector-base voltage	V_{CBO}	max.	45	60	100	120	140	V
Collector-emitter voltage	V_{CEO}	max.	45	60	80	100	120	V
Collector current (d.c.)	I_C	max.			3			A
Total power dissipation up to T_{mb} = 25 °C	P_{tot}	max.			30			W
Junction temperature	T_j	max.			150			°C
D.C. current gain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

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-220.

Collector connected to mounting base.



See also chapters Mounting instructions and Accessories.

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RATINGS

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

			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 $T_{mb} = 25\ ^oC$	P_{tot}	max.			30			W
Storage temperature	T_{stg}				−65 to + 150			^oC
Junction temperature	T_j	max.			150			^oC

THERMAL RESISTANCE

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

CHARACTERISTICS

$T_j = 25\ ^oC$ unless otherwise specified

Collector cut-off current				
$I_E = 0$; $V_{CB} = V_{CBOmax}$	I_{CBO}	<	50	μA
$I_E = 0$; $V_{CB} = V_{CBOmax}$; $T_j = 150\ ^oC$	I_{CBO}	<	1	mA
$I_E = 0$; $V_{CE} = V_{CEOmax}$	I_{CEO}	<	0,1	mA
Emitter cut-off current				
$I_C = 0$; $V_{EB} = 5$ V	I_{EBO}	<	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: $t_p \leq 300$ μs; $\delta < 2\%$.

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

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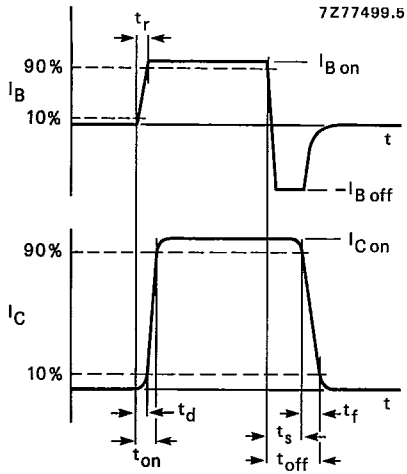

Fig. 2 Switching times waveforms.

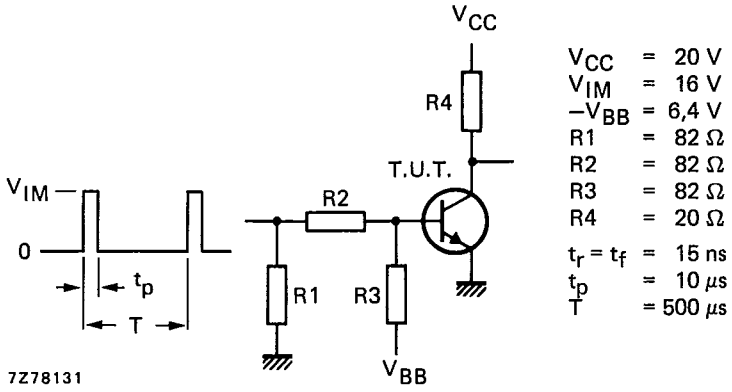

Fig. 3 Switching times test circuit.

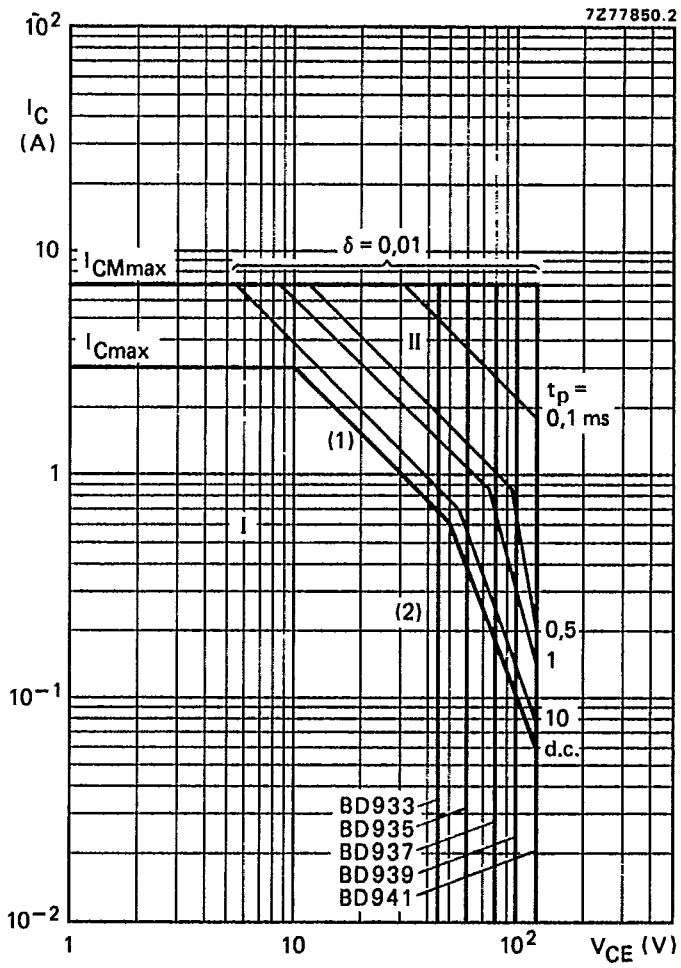

Fig. 4 Safe Operating Area, T_{mb} = 25 °C.

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.

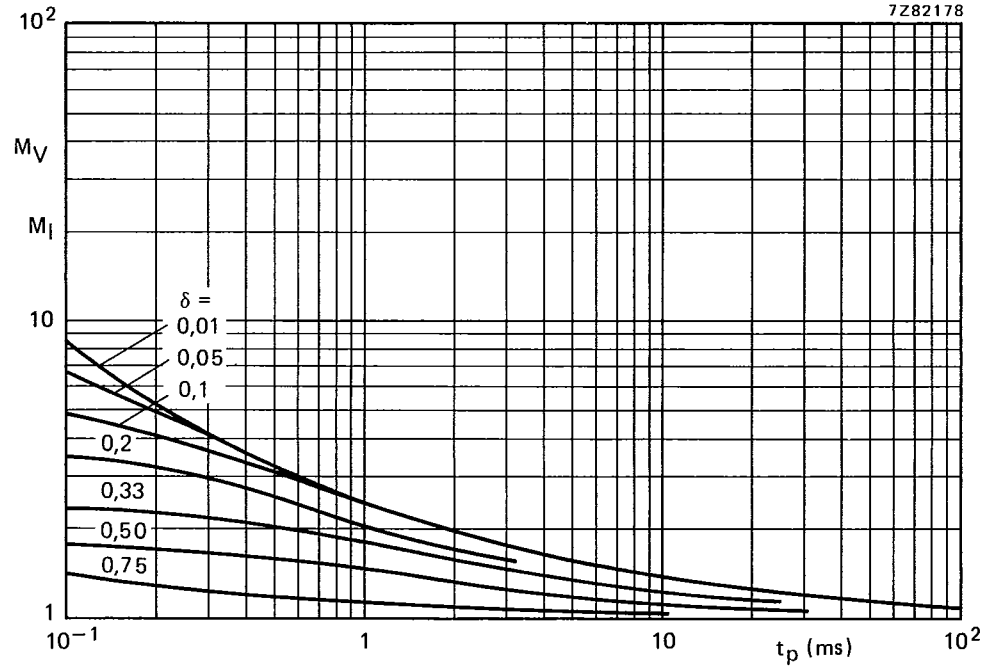

Fig. 5 Second-breakdown voltage multiplying factor at the I_{Cmax} level and second-breakdown current multiplying factor at the V_{CEOmax} level.

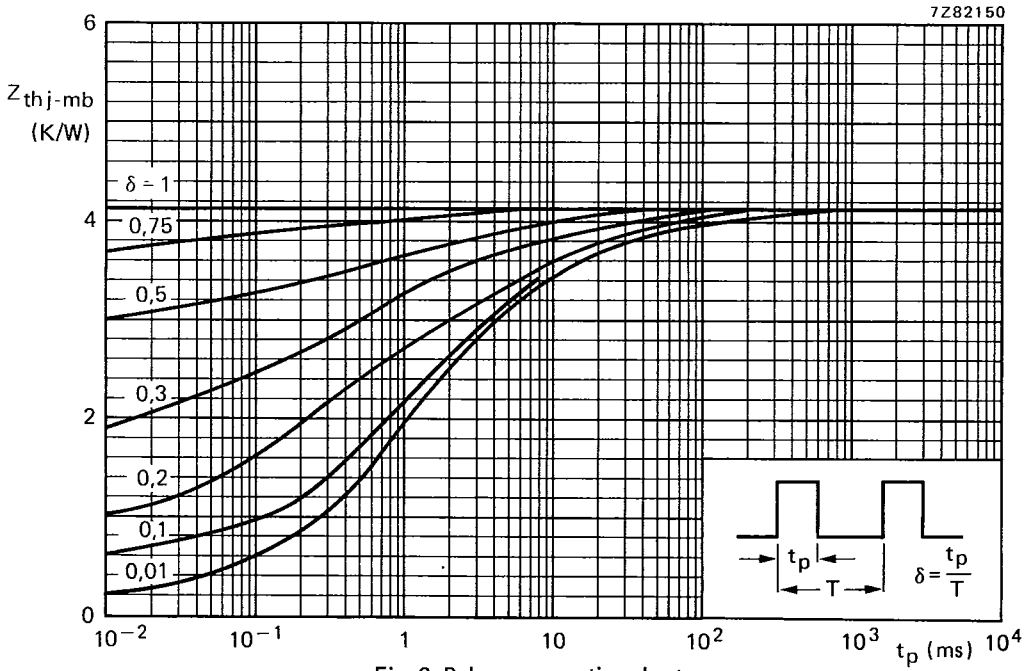

Fig. 6 Pulse power rating chart.

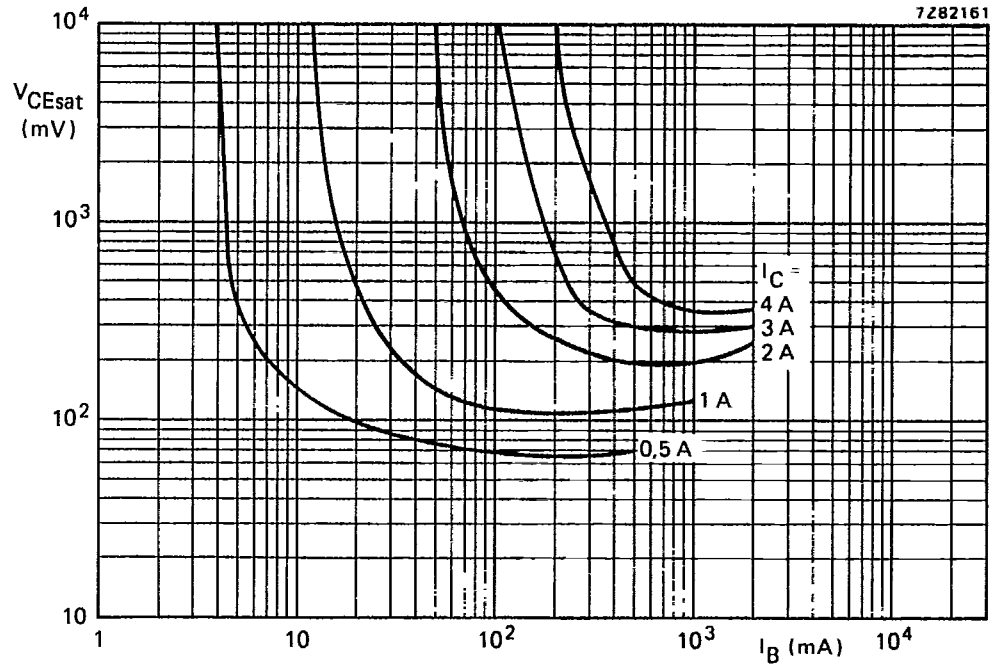

Fig. 7 Typical collector-emitter saturation voltage as a function of base current with collector current as a parameter.

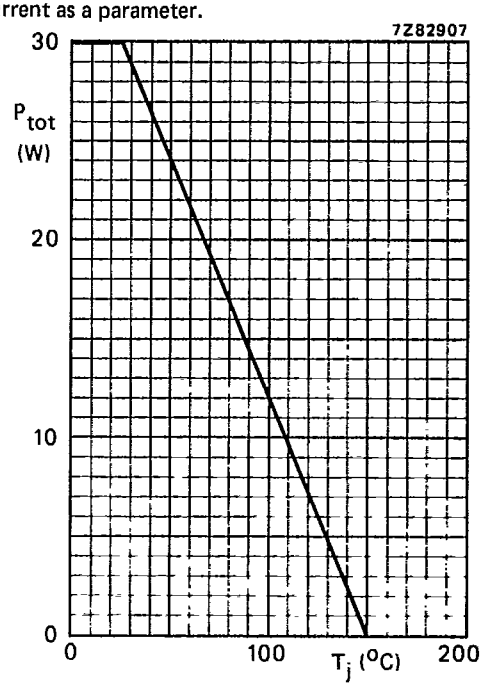

Fig. 8 Power derating curve.

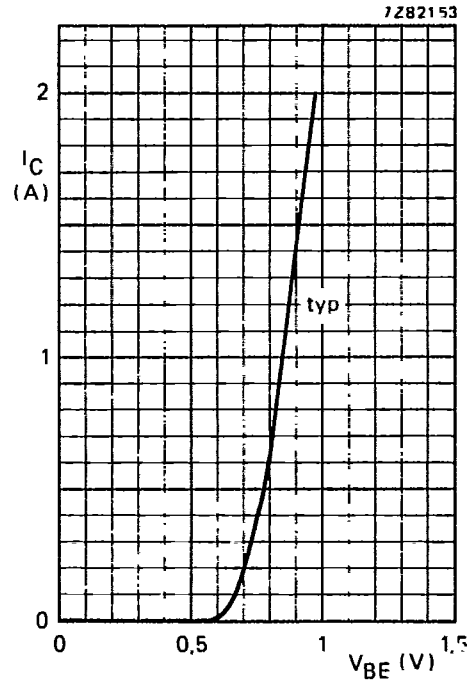

Fig. 9 V_{CE} = 2 V; T_j = 25 °C.

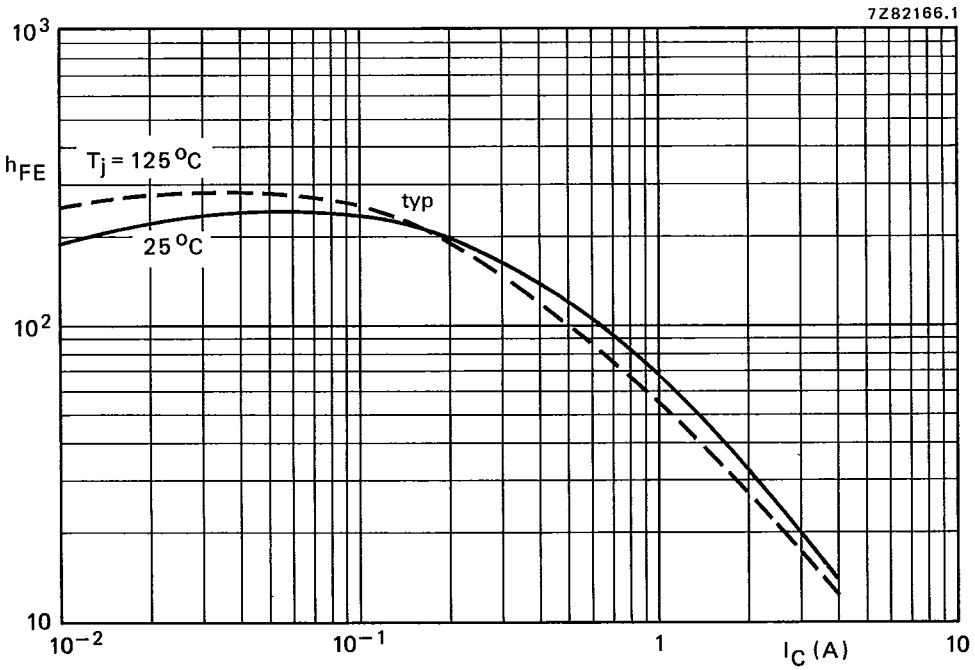

Fig. 10 Typical static forward current transfer ratio as a function of the collector current. V_{CE} = 2 V