PHILIPS INTERNATIONAL 56E D 7110826 0043052 592 PHIN

SILICON EPITAXIAL POWER TRANSISTORS

T-33-07

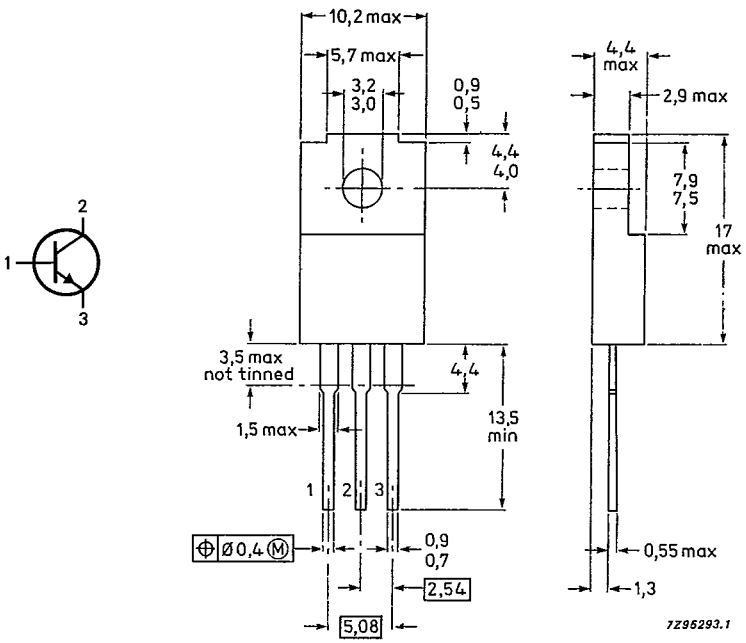
NPN silicon power transistor in a SOT186 envelope with an electrically insulated mounting base, intended for use in audio output stages and for general purpose amplifier applications.

PNP complements are BD934F, BD936F, BD938F, BD940F and BD942F.

QUICK REFERENCE DATA

			BD933F	935F	937F	939F	941F	
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
peak value	I_{CM}	max.			7			A
Total power dissipation up to T_h = 25 °C	P_{tot}	max.			19			W
D.C. current gain I_C = 1 A; V_{CE} = 2 V	h_{FE}	min.			25			
Transition frequency at f = 1 MHz I_C = 250 mA; V_{CE} = 10 V	f_T	min.			3			MHz

Fig.1 SOT186. Dimensions in mm



RATINGS

T-33-07

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

			BD933F	935F	937F	939F	941F	
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
peak value	I_{CM}	max.			7			A
Base current (d.c.)	I_B	max.			0,5			A
Total power dissipation								
up to T_h = 25 °C (1)	P_{tot}	max.			14			W
up to T_h = 25 °C (2)	P_{tot}	max.			19			W
Storage temperature	T_{stg}				−65 to 150			°C
Junction temperature	T_j	max.			150			°C

THERMAL RESISTANCE

From junction to internal heatsink	$R_{th\,j\text{-}mb}$	=	4,17	K/W
From junction to external heatsink (1)	$R_{th\,j\text{-}h}$	=	9,17	K/W
From junction to external heatsink (2)	$R_{th\,j\text{-}h}$	=	6,67	K/W
From junction to ambient	$R_{th\,j\text{-}a}$	=	55	K/W

INSULATION

Voltage allowed between all terminals and external heatsink, peak value (3)	V_{insul}	max.	1000	V
Insulation capacitance between collector and external heatsink	$C_{c\text{-}h}$	typ.	12	pF

(1) Mounted without heatsink compound and 30 ± 5 newtons pressure on centre of envelope.

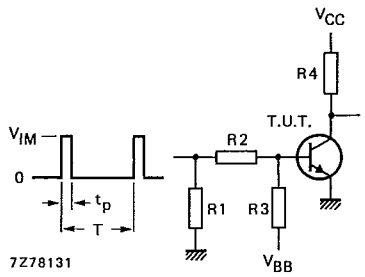
(2) Mounted with heatsink compound and 30 ± 5 newtons pressure on centre of envelope.

(3) Heatsink temperature T_h = 25 °C; relative humidity $R_H \leq 75\%$; atmospheric pressure p_{amb} = 1013 mbar.

CHARACTERISTICS

T_h = 25 °C unless otherwise specified

Collector cut-off currents			
I_E = 0; V_{CB} = V_{CBOmax}	I_{CBO}	<	0,1 mA
I_E = 0; V_{CB} = V_{CBOmax}; T_h = 150 °C	I_{CBO}	<	3 mA
I_E = 0; V_{CE} = V_{CEOmax}	I_{CEO}	<	0,5 mA
Emitter cut-off current			
I_C = 0; V_{EB} = 5 V	I_{EBO}	<	1 mA
D.C. current gain (1)			
I_C = 1 A; V_{CE} = 2 V	h_{FE}	>	25
I_C = 150 mA; V_{CE} = 2 V	h_{FE}	40 to 250	
Base-emitter voltage (1)+(2)			
I_C = 1 A; V_{CE} = 2 V	V_{BE}	<	1,3 V
Collector-emitter saturation voltage (1)			
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
Second-breakdown collector current			
V_{CE} = 40 V; t_p = 1 s; non-repetitive, without heatsink	I_{SB}	>	475 mA
Switching times			
I_C = 1 A; I_{Bon} = $-I_{Boff}$ = 0,1 A			
turn-on time	t_{on}	typ.	0,4 μs
		<	1 μs
turn-off time	t_{off}	typ.	1,5 μs
		<	3 μs



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

Fig. 2 Switching times test circuit.

(1) Measured under pulse conditions: t_p = 300 μs; δ = 0,02.
(2) V_{BE} decreases by about 2,3 mV/K with increasing temperature.

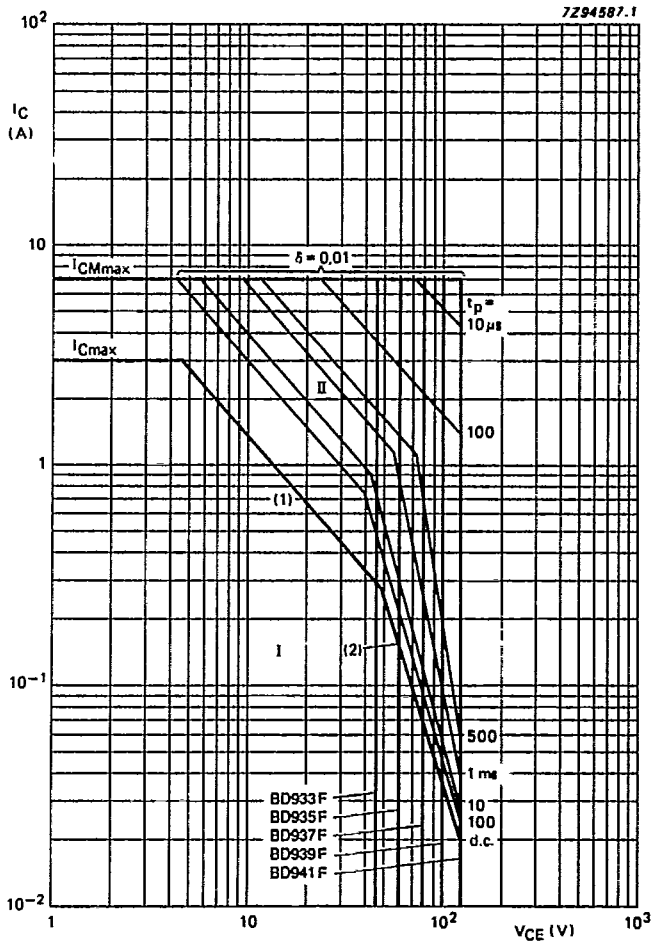


Fig. 4 Safe Operating Area, T_{amb} = 25 °C.

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.

Mounted *without* heatsink compound and 30 ± 5 Newton pressure on the centre of the envelope.

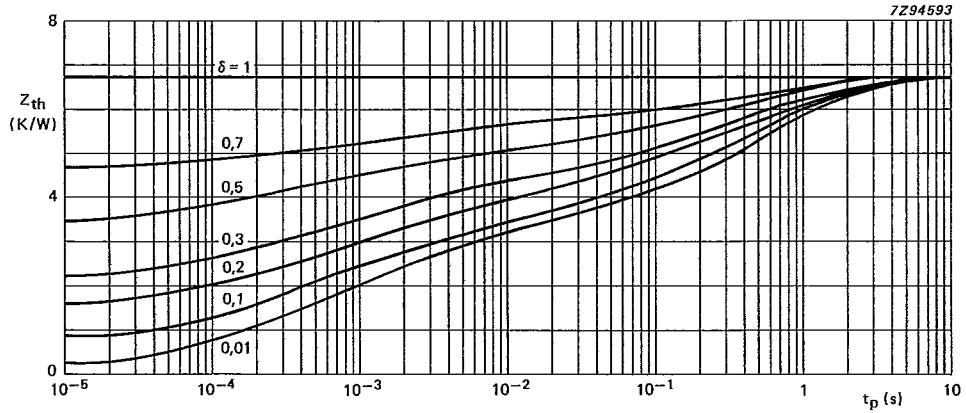


Fig. 5 Pulse power rating chart; mounted *with* heatsink compound and 30 ± 5 Newton pressure on the envelope.

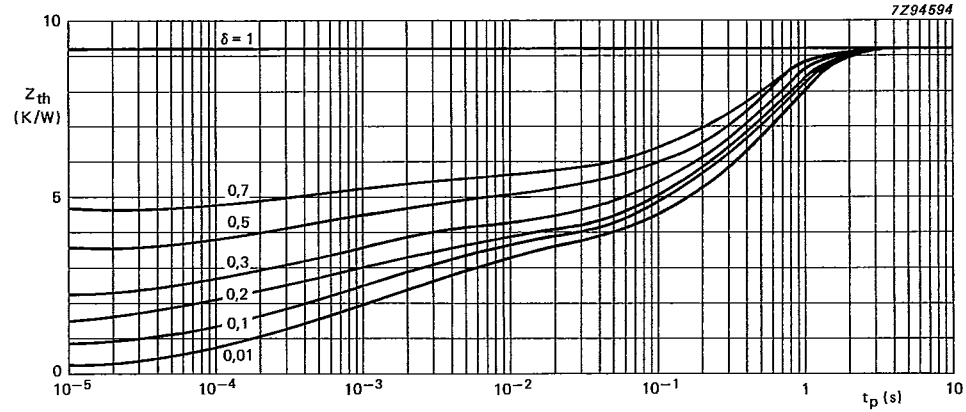


Fig. 6 Pulse power rating chart; mounted *without* heatsink compound and 30 ± 5 Newton pressure on the envelope.

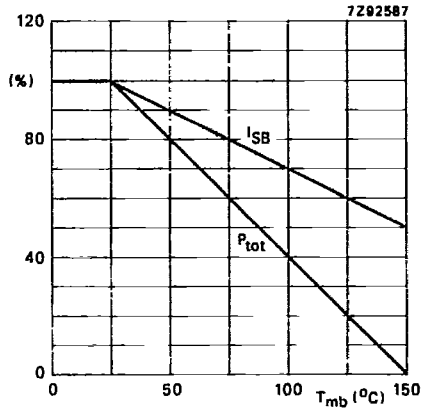


Fig. 7 Total power dissipation and second-breakdown current derating curve.

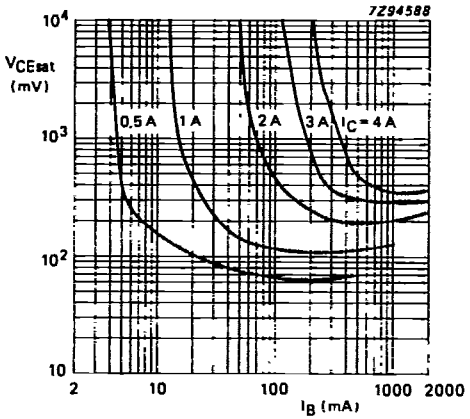


Fig. 8 Collector-emitter saturation voltage; typical values.

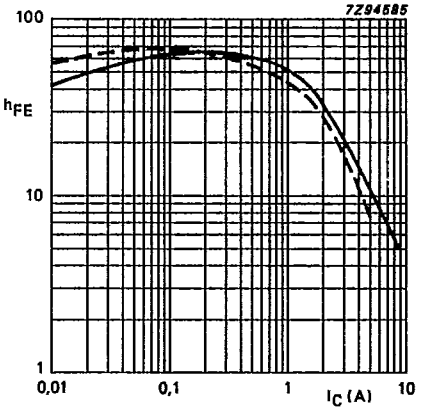


Fig. 9 D.C. current gain; V_{CE} = 2 V; typical values;
——— T_j = 25 °C; – – – – T_j = 125 °C.

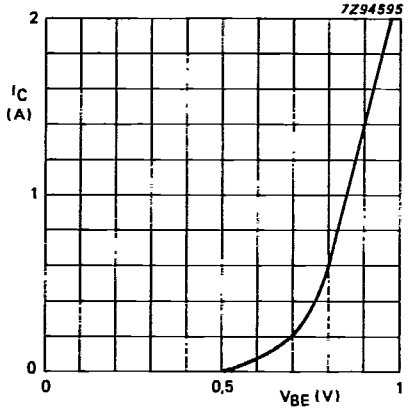


Fig. 10 V_{CE} = 2 V; typical values.