SILICON DARLINGTON POWER TRANSISTORS

T-33-29

NPN silicon darlington power transistors in a SOT186 envelope with an electrically insulated mounting base. The devices are designed for audio output stages and general amplifier and switching applications. PNP complements are BDT64F, BDT64AF, BDT64BF and BDT64CF.

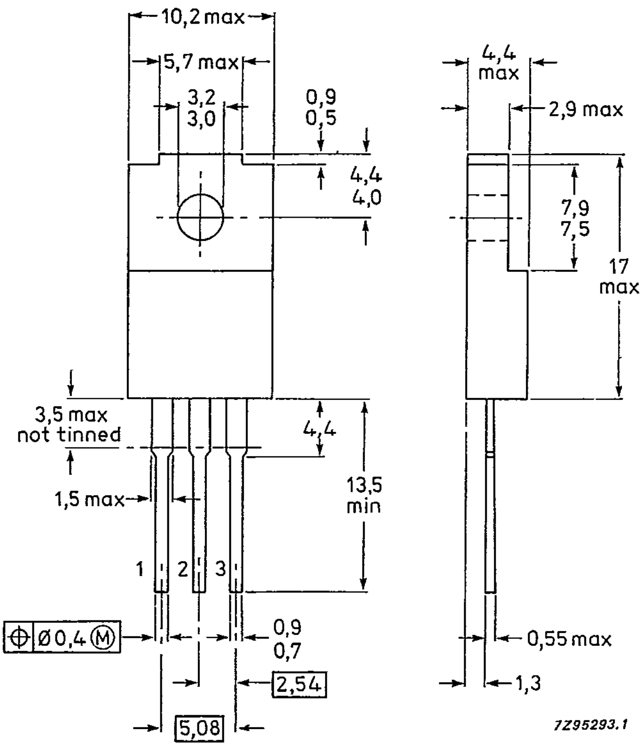
QUICK REFERENCE DATA

			BDT65F	65AF	65BF	65CF	
Collector-base voltage	V_{CBO}	max.	60	80	100	120	V
Collector-emitter voltage	V_{CEO}	max.	60	80	100	120	V
Collector current DC	I_C	max.		12			A
Total power dissipation up to $T_h = 25\ ^oC$	P_{tot}	max.		39			W
Junction temperature	T_j	max.		150			^oC
DC current gain	h_{FE}	min.		1000			

MECHANICAL DATA

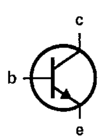
Dimensions in mm

Fig.1 SOT186.



Pinning:

1 = base
2 = collector
3 = emitter



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RATINGS

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

			BDT65F	65AF	65BF	65CF	
Collector-base voltage (open emitter)	V_{CBO}	max.	60	80	100	120	V
Collector-emitter voltage (open base)	V_{CEO}	max.	60	80	100	120	V
Emitter-base voltage (open collector)	V_{EBO}	max.	5.0				V
Collector current DC	I_C	max.	12				A
peak value	I_{CM}	max.	20				A
Base current (DC)	I_B	max.	500				mA
Total power dissipation up to T_h = 25 °C (1)	P_{tot}	max.	22				W
up to T_h = 25 °C (2)	P_{tot}	max.	39				W
Storage temperature	T_{stg}		−65 to 150				°C
Junction temperature	T_j	max.	150				°C

THERMAL RESISTANCE

From junction to internal heatsink	$R_{th\ j\text{-}mb}$	=	0.9	K/W
From junction to internal heatsink (1)	$R_{th\ j\text{-}h}$	=	5.7	K/W
From junction to internal heatsink (2)	$R_{th\ j\text{-}h}$	=	3.2	K/W

INSULATION

Voltage allowed between all terminals and external heatsink, peak value	V_{insul}	max.	1000	V
Insulation capacitance from collector to external heatsink	C_{th}	typ.	12	pF

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

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

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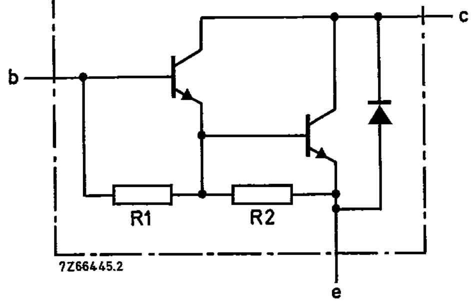


R1 typ. 5 kΩ
R2 typ. 80 Ω

Fig. 2 Circuit diagram.

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current				
$I_E = 0$; $V_{CB} = V_{CBOmax}$	I_{CBO}	max.	0.4	mA
$I_E = 0$; $T_j = 150$ °C; $V_{CB} = 1/2\ V_{CBOmax}$	I_{CBO}	max.	2.0	mA
$I_B = 0$; $V_{CE} = 1/2\ V_{CEOmax}$	I_{CEO}	max.	1.0	mA
Emitter cut-off current				
$I_C = 0$; $V_{EB} = 5$ V	I_{EBO}	max.	5.0	mA
DC current gain (3)				
$I_C = 1$ A; $V_{CE} = 4$ V	h_{FE}	typ.	1500	
$I_C = 5$ A; $V_{CE} = 4$ V	h_{FE}	min.	1000	
$I_C = 12$ A; $V_{CE} = 4$ V	h_{FE}	typ.	1500	
Base-emitter voltage				
$I_C = 5$ A; $V_{CE} = 4$ V	V_{BE}	max.	2.5	V
Collector-emitter saturation voltage (3)				
$I_C = 5$ A; $I_B = 20$ mA	V_{CEsat}	max.	2.0	V
$I_C = 10$ A; $I_B = 100$ mA	V_{CEsat}	max.	3.0	V
Diode, forward voltage				
$I_F = 5$ A	V_F	max.	2.0	V
Collector capacitance at f = 1 MHz				
$V_{CB} = 10$ V; $I_E = I_C = 0$	C_c	typ.	200	pF
Second-breakdown collector current non-repetitive; without heatsink				
$V_{CE} = 60$ V; $t_p = 0.1$ s	$I_{(SB)}$	min.	0.65	A
Turn-off breakdown energy with inductive load;				
$-I_{Boff} = 0$; $I_{CM} = 6.3$ A; L = 5 mH	$E_{(BR)}$	min.	100	mJ
Switching times				
$I_{Con} = 5$ A; $I_{Bon} = -I_{Boff} = 20$ mA				
Turn-on time	t_{on}	typ.	1.0	μs
		max.	2.5	μs
Turn-off time	t_{off}	typ.	6.0	μs
		max.	10	μs
Small-signal current gain at f = 1 MHz				
$I_C = 5$ A; $V_{CE} = 3$ V	h_{fe}	min.	10	

(3) Measured under pulse conditions; $t_p \leqslant 300\ \mu s$; $\delta < 2\%$.

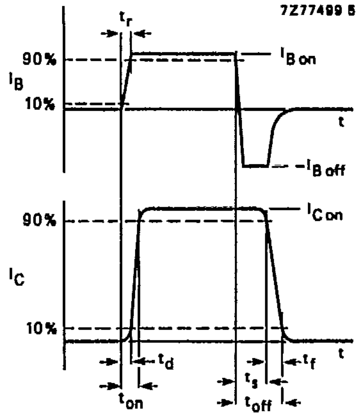
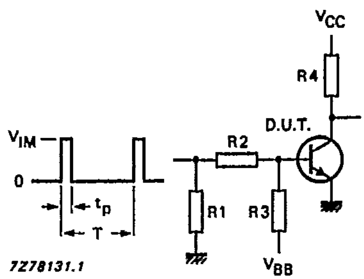


Fig. 3 Switching times waveforms.



V_{IM}	= 15 V
V_{CC}	= 30 V
$-V_{BB}$	= 4 V
R1	= 56 Ω
R2	= 410 Ω
R3	= 560 Ω
R4	= 6 Ω
$t_r = t_f$	= 15 ns
t_p	= 10 μs
T	= 500 μs

Fig. 4 Switching times test circuit.

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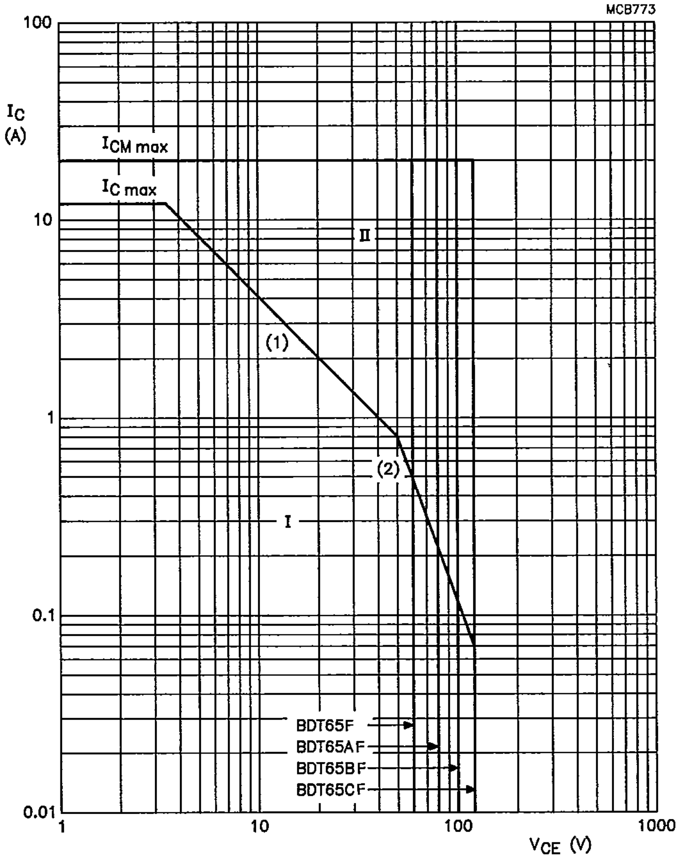

Fig. 5 Safe Operating Area; $T_h = 25\ ^{o}C$.

I Region of permissible DC operation.

II Permissible extension for repetitive pulse operation.

(1) $P_{tot\ max}$ and $P_{peak\ max}$ lines.

(2) Second-breakdown limits.

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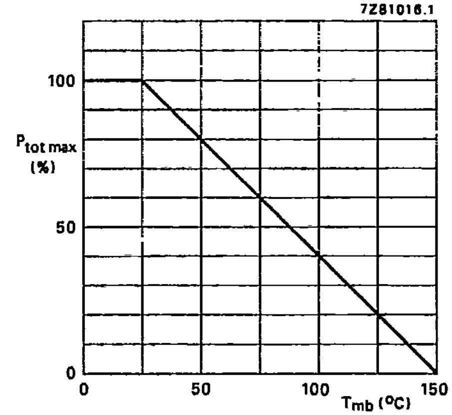

Fig. 6 Power derating curve.

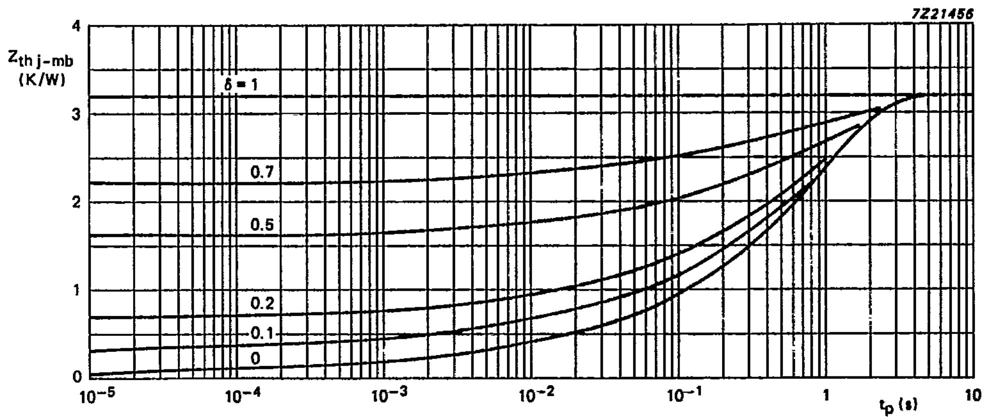

Fig. 7 Pulse power rating chart.

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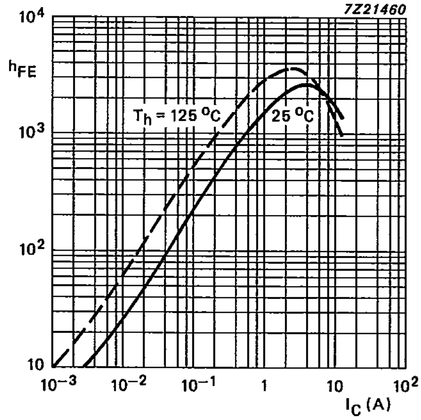

Fig. 8 Typical DC current gain as a function of collector current; V_{CE} = 4 V.

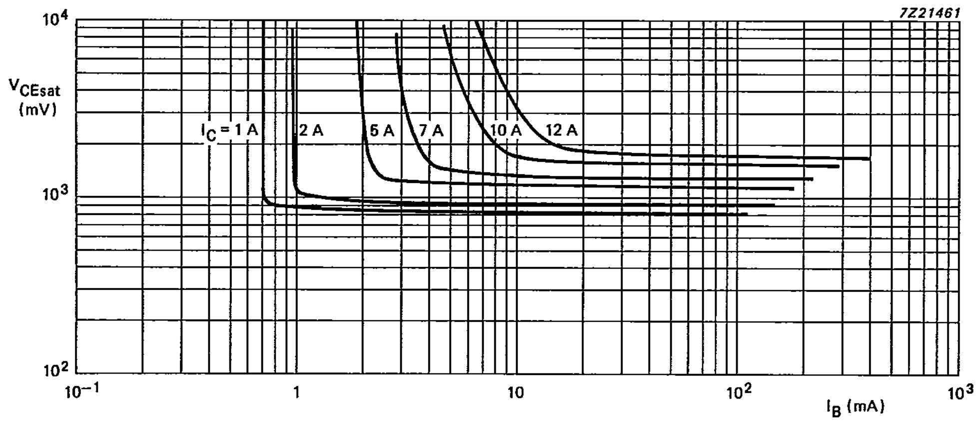

Fig. 9 Typical collector-emitter saturation voltages; T_{mb} = 25 °C.