PHILIPS INTERNATIONAL 56E D 7110826 0043212 778 PHIN

SILICON DARLINGTON POWER TRANSISTORS

T-33-31

PNP silicon power transistors in a monolithic Darlington circuit and housed in a SOT186 envelope with an electrically insulated mounting base.

They are recommended for applications such as audio output stages and general purpose amplifiers.

NPN complements are BDT61F, BDT61AF, BDT61BF and BDT61CF.

QUICK REFERENCE DATA

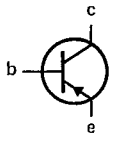
			BDT60F	60AF	60BF	60CF	
Collector-base voltage (open emitter)	$-V_{CBO}$	max.	60	80	100	120	V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	60	80	100	120	V
Collector current							
DC	$-I_C$	max.		4			A
peak value	$-I_{CM}$	max.		6			A
Total power dissipation up to T_h = 25 °C	P_{tot}	max.		25			W
DC current gain							
$-I_C$ = 0.5 A; $-V_{CE}$ = 3 V	h_{FE}	typ.		2000			

MECHANICAL DATA

Dimensions in mm

Pinning:

1 = base
2 = collector
3 = emitter



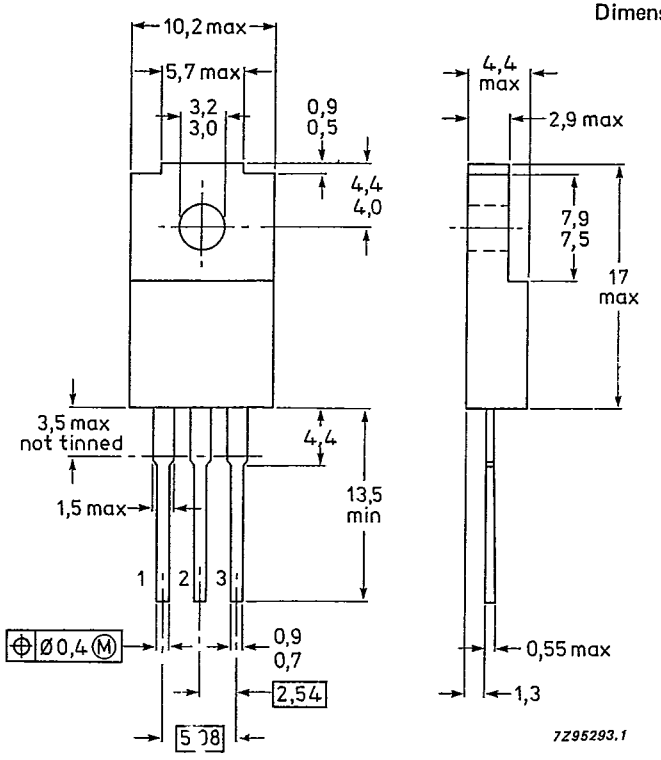
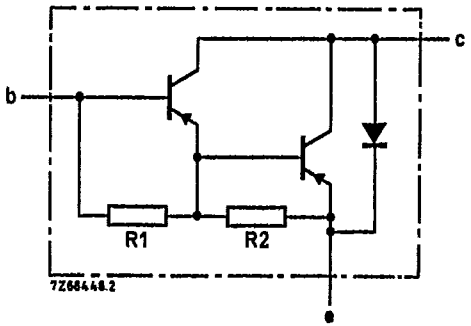


Fig.1 SOT186.

T-33-31



R1 typ. 6 kΩ
R2 typ. 100 Ω

Fig. 2 Circuit diagram.

RATINGS

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

			BDT60F	60AF	60BF	60CF	
Collector-base voltage (open collector)	$-V_{CBO}$	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			V
Collector current							
DC	$-I_C$	max.		4			A
peak value	$-I_{CM}$	max.		6			A
Reverse diode current	I_R	max.		4			A
Base current (DC)	$-I_B$	max.		100			mA
Total power dissipation							
up to T_h = 25 °C*	P_{tot}	max.		17			W
up to T_h = 25 °C**		max.		25			W
Storage temperature range	T_{stg}			−65 to 150			°C
Junction temperature	T_j	max.		150			°C

THERMAL RESISTANCE

From junction to internal heatsink	$R_{th\,j\text{-}mb}$	=	2.7 K/W
From junction to external heatsink*	$R_{th\,j\text{-}h}$	=	5 K/W
From junction to external heatsink**	$R_{th\,j\text{-}h}$	=	7.35 K/W

* Mounted without heatsink compound and 30 ± 5 newtons pressure on centre envelope.
** Mounted with heatsink compound and 30 ± 5 newtons pressure on centre envelope.

INSULATION

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

CHARACTERISTICS

T_h = 25 °C unless otherwise specified

Collector cut-off currents			
$-I_E = 0$; $-V_{CB} = 30$ V	$-I_{CBO}$	max.	0.2 mA
$-I_E = 0$; $-V_{CB} = -½ V_{CBO\ max}$; T_j = 150 °C	$-I_{CBO}$	max.	1 mA
$-I_B = 0$; $-V_{CE} = -½ V_{CEO\ max}$	$-I_{CEO}$	max.	0.2 mA
Emitter cut-off current			
$-I_C = 0$; $-V_{EB} = 5$ V	$-I_{EBO}$	max.	5 mA
Forward bias second breakdown collector current V_{CE} = 50 V t_p = 0.1 s; non-repetitive	$-I_{(SB)}$	min.	0.5 A
DC current gain*			
$-I_C = 0.5$ A; $-V_{CE} = 3$ V	h_{FE}	typ.	2000
$-I_C = 1.5$ A; $-V_{CE} = 3$ V	h_{FE}	min.	750
$-I_C = 4$ A; $-V_{CE} = 3$ V	h_{FE}	typ.	250
Base-emitter voltage*	$-V_{BE}$	max.	2.5 V
Collector-emitter saturation voltage*			
$-I_C = 1.5$ A; $-I_B = 6$ mA	$-V_{CEsat}$	max.	2.5 V
Cut-off frequency			
$-I_C = 1.5$ A; $-V_{CE} = 3$ V	f_{hfe}	min.	25 KHz
Small-signal current gain at f = 1 MHz			
$-I_C = 1.5$ A; $-V_{CE} = 3$ V	h_{fe}	min.	10
Diode forward voltage			
$I_F = 1.5$ A	V_F	max.	2 V
$I_F = 4$ A	V_F	typ.	2.1 V

* Measured under pulse conditions: t_p max. 300 μs; δ max. 2%.

CHARACTERISTICS (continued)

Switching times (see Fig. 3)

$-I_{C\,on} = 1.5$ A; $-I_{B\,on} = +I_{B\,off} = 6$ A

turn-on time	t_{on}	typ.	0.3 μs
		max.	1.5 μs
turn-off time	t_{off}	typ.	1.5 μs
		max.	5 μs

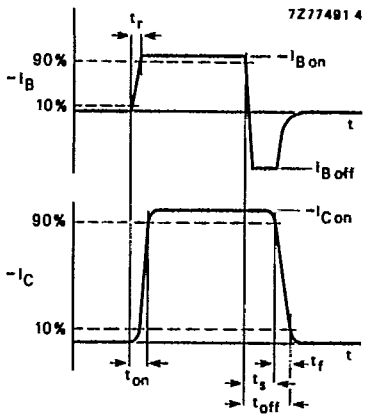
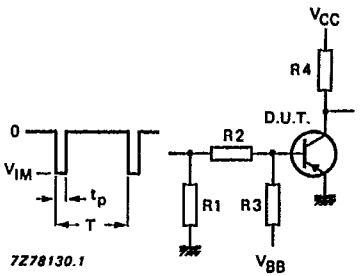


Fig. 3 Switching times waveforms.



$-V_{CC}$	=	30 V
$-V_{IM}$	=	12 V
$+V_{BB}$	=	3 V
R1	=	56 Ω
R2	=	1 kΩ
R3	=	680 Ω
R4	=	22 Ω
$t_r = t_f$	=	15 ns
t_p	=	10 μs
T	=	500 μs

Fig. 4 Switching times test circuit.

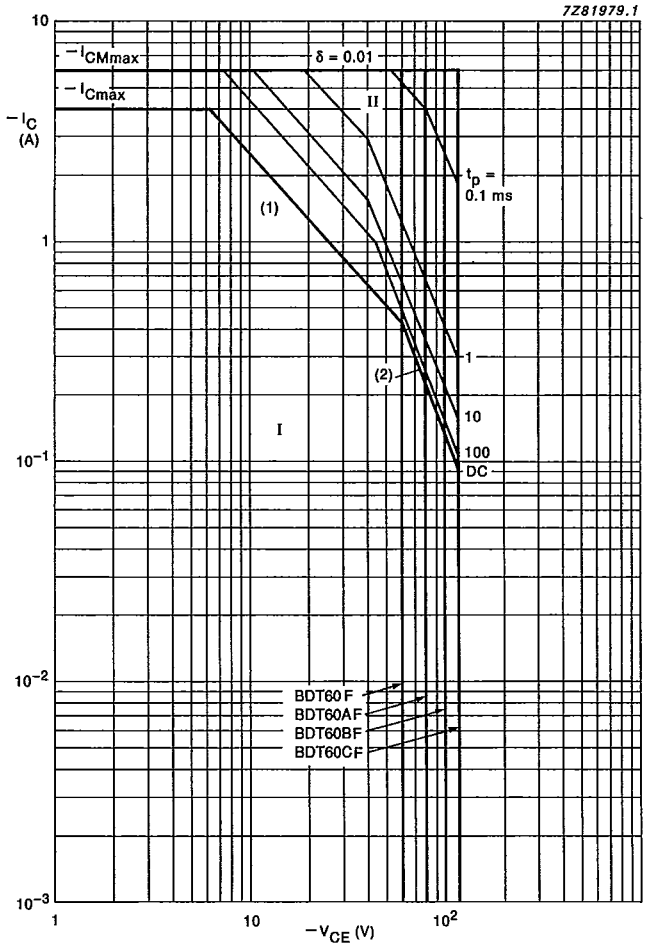


Fig. 5 Safe Operating Area, T_h = 25 °C.

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.

T-33-31

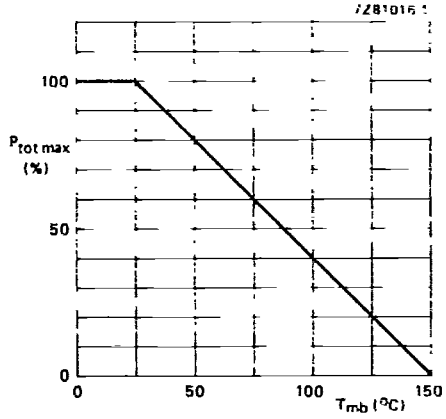


Fig. 6 Total power dissipation.

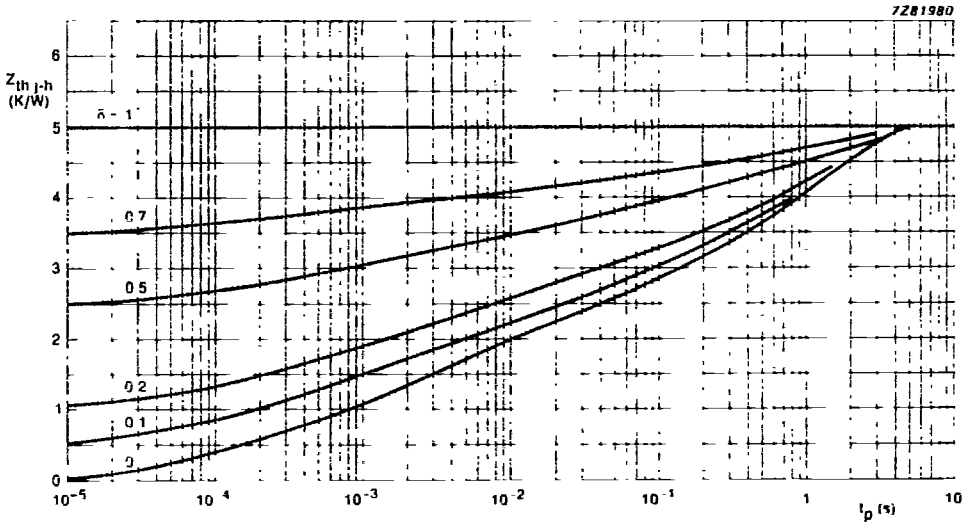


Fig. 7 Pulse power rating chart.

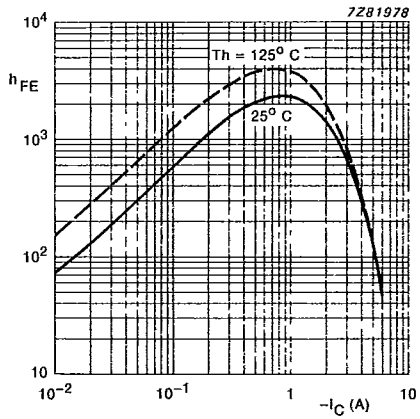


Fig. 8 DC current gain; $-V_{CE}$ = 3 V; typical values.

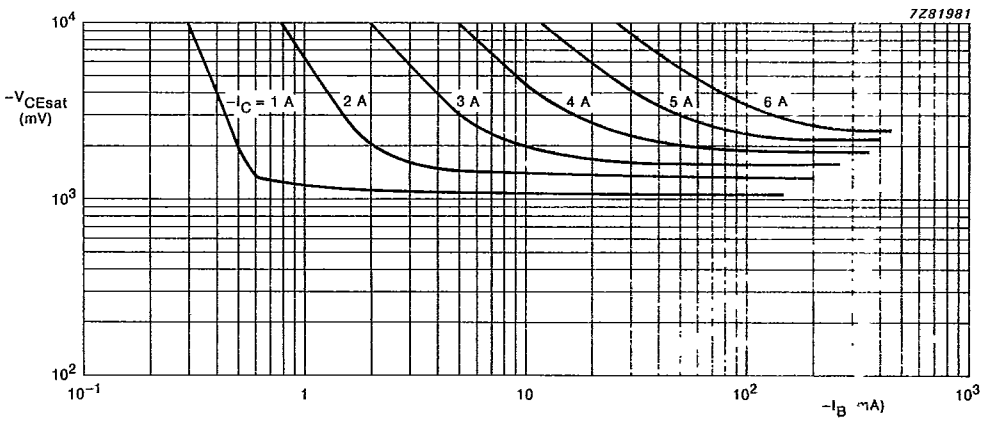


Fig. 9 Collector-emitter saturation voltage; T_h = 25 °C; typical values.