

SILICON DARLINGTON POWER TRANSISTORS

P-N-P epitaxial-base transistors in monolithic Darlington circuit for audio and video output applications; SOT-32 plastic envelope. N-P-N complements are BD675, BD677, BD679, BD681 and BD683.

QUICK REFERENCE DATA

		BD676	678	680	682	684
Collector-base voltage (open emitter)	$-V_{CBO}$ max.	45	60	80	100	120 V
Collector-emitter voltage (open base)	$-V_{CEO}$ max.	45	60	80	100	120 V
Collector-current (d.c.)	$-I_C$ max.			4	A	
Total power dissipation up to $T_{mb} = 25^\circ\text{C}$	P_{tot} max.			40	W	
Junction temperature	T_j max.			150	$^\circ\text{C}$	
D.C. current gain				2200		
$-I_C = 0,5\text{ A}; -V_{CE} = 3\text{ V}$	h_{FE} typ.			750		
$-I_C = 1,5\text{ A}; -V_{CE} = 3\text{ V}$	h_{FE}			>		
Cut-off frequency				60	kHz	
$-I_C = 1,5\text{ A}; -V_{CE} = 3\text{ V}$	f_{hfe} typ.					

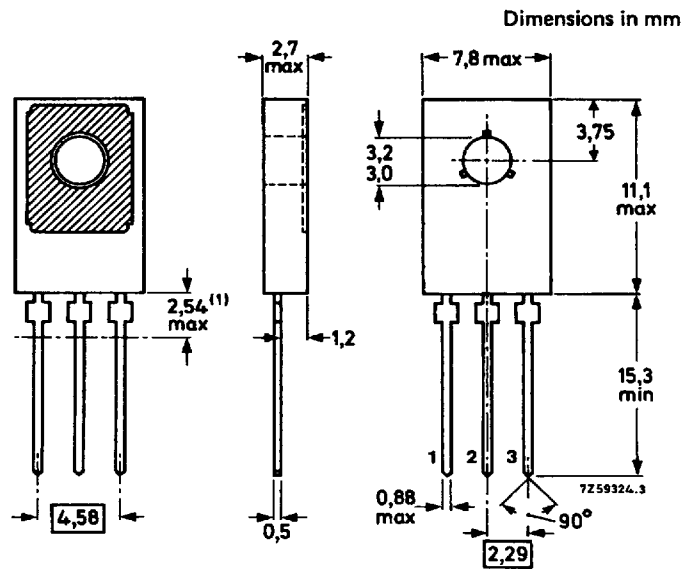
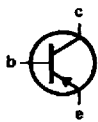
MECHANICAL DATA

Fig. 1 TO-126 (SOT-32).

Collector connected to mounting base.

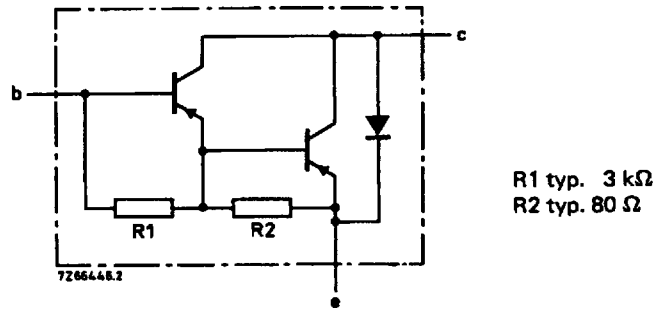
Pinning

- 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.



R1 typ. 3 kΩ
R2 typ. 80 Ω

Fig. 2 Darlington circuit diagram.

RATINGS

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

			BD676	678	680	682	684	
Collector-base voltage (open emitter)	$-V_{CBO}$	max.	45	60	80	100	120	V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	45	60	80	100	120	V
Emitter-base voltage (open collector)	$-V_{EBO}$	max.	5	5	5	5	5	V
Collector current (d.c.)	$-I_C$	max.			4			A
Collector current (peak value)	$-I_{CM}$	max.			6			A
Base current (d.c.)	$-I_B$	max.			100			mA
Total power dissipation up to $T_{mb} = 25^\circ\text{C}$	P_{tot}	max.			40			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 mounting base	$R_{th\ j-mb}$	=		3,12			K/W
From junction to ambient in free air	$R_{th\ j-a}$	=		100			K/W

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified; where $-I_C = 1,5\text{ A}$ for BD676 read $-I_C = 2\text{ A}$.

Collector cut-off current

$I_E = 0; -V_{CB} = -V_{CB0max}$ $-I_{CBO} < 0,2\text{ mA}$

$I_E = 0; -V_{CB} = -0,6 V_{CB0max}; T_{mb} = 150\text{ }^\circ\text{C}$ $-I_{CBO} < 1\text{ mA}$

$I_B = 0; -V_{CE} = -\frac{1}{2} V_{CE0max}$ $-I_{CEO} < 0,2\text{ mA}$

Emitter cut-off current

$I_C = 0; -V_{EB} = 5\text{ V}$ $-I_{EBO} < 5\text{ mA}$

D.C. current gain (note 1)

$-I_C = 0,5\text{ A}; -V_{CE} = 3\text{ V}$ h_{FE} typ. 2200

$-I_C = 1,5\text{ A}; -V_{CE} = 3\text{ V}^*$ $h_{FE} > 750$

$-I_C = 4\text{ A}; -V_{CE} = 3\text{ V}$ h_{FE} typ. 650

Base-emitter voltage (notes 1 and 2)

$-I_C = 1,5\text{ A}; -V_{CE} = 3\text{ V}^*$ $-V_{BE} < 2,5\text{ V}$

Collector-emitter saturation voltage (note 1)

$-I_C = 1,5\text{ A}; -I_B = 6\text{ mA}^*$ $-V_{CEsat} < 2,5\text{ V}$

Small-signal current gain

$-I_C = 1,5\text{ A}; -V_{CE} = 3\text{ V}; f = 1\text{ MHz}^*$ $h_{fe} > 10$

Cut-off frequency

$-I_C = 1,5\text{ A}; -V_{CE} = 3\text{ V}^*$ f_{hfe} typ. 60 kHz

D.C. current gain ratio of matched complementary pairs

$-I_C = 1,5\text{ A}; -V_{CE} = 3\text{ V}$ $h_{FE1}/h_{FE2} < 2,5$

Diode, forward voltage

$I_F = 1,5\text{ A}^*$ V_F typ. 1,5 V

Switching times (see Figs 3 and 4)

$-I_{Con} = 1,5\text{ A}; -I_{Bon} = I_{Boff} = 6\text{ mA}$

turn-on time t_{on} typ. 0,3 μs
< 1,5 μs

turn-off time t_{off} typ. 1,5 μs
< 5 μs

Second-breakdown collector current

$-V_{CE} = 50\text{ V}; t_p = 20\text{ ms}$ $-I_{(SB)} > 0,8\text{ A}$

for BD676 $-V_{CE} = 40\text{ V}$ $-I_{(SB)} > 1\text{ A}$

* for BD676 condition $-I_C$ or $-I_F = 2\text{ A}$.

Notes

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

2. V_{BE} decreases by about 3,6 mV/K with increasing temperature.

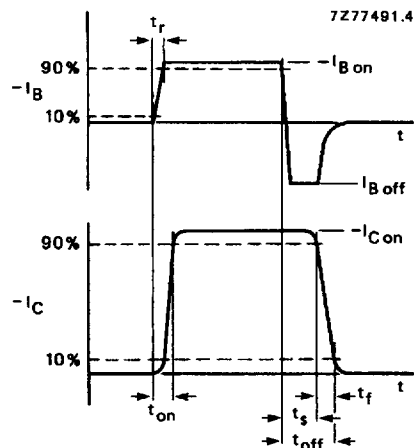


Fig. 3 Switching times waveform.

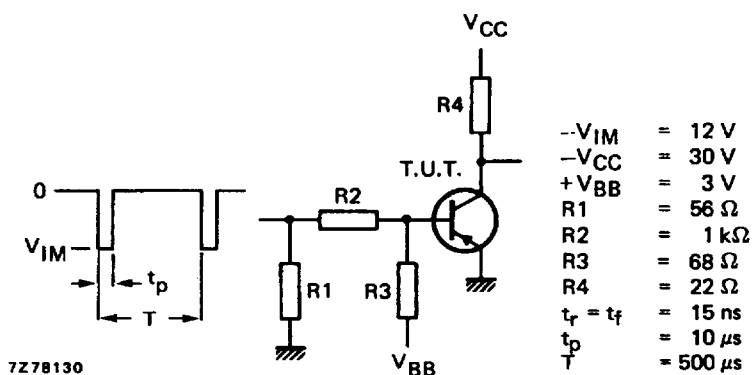


Fig. 4 Switching times test circuits.

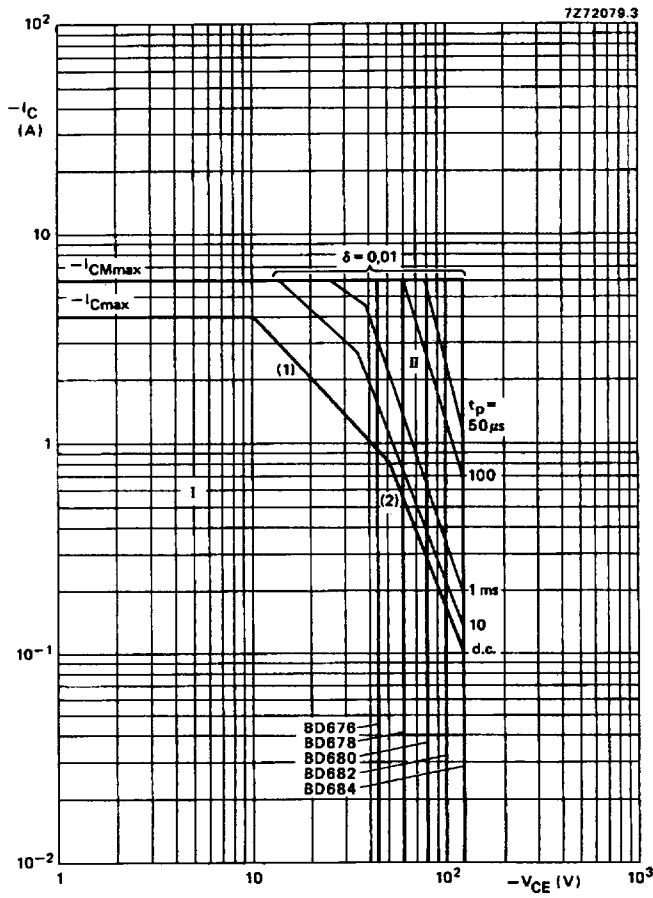


Fig. 5 Safe Operating Area, $T_{mb} = 25\text{ }^\circ\text{C}$.

- I Region of permissible d.c. operation.
- II Permissible extension for repetitive pulse operation.
- (1) P_{tot} max line.
- (2) Second-breakdown limits.

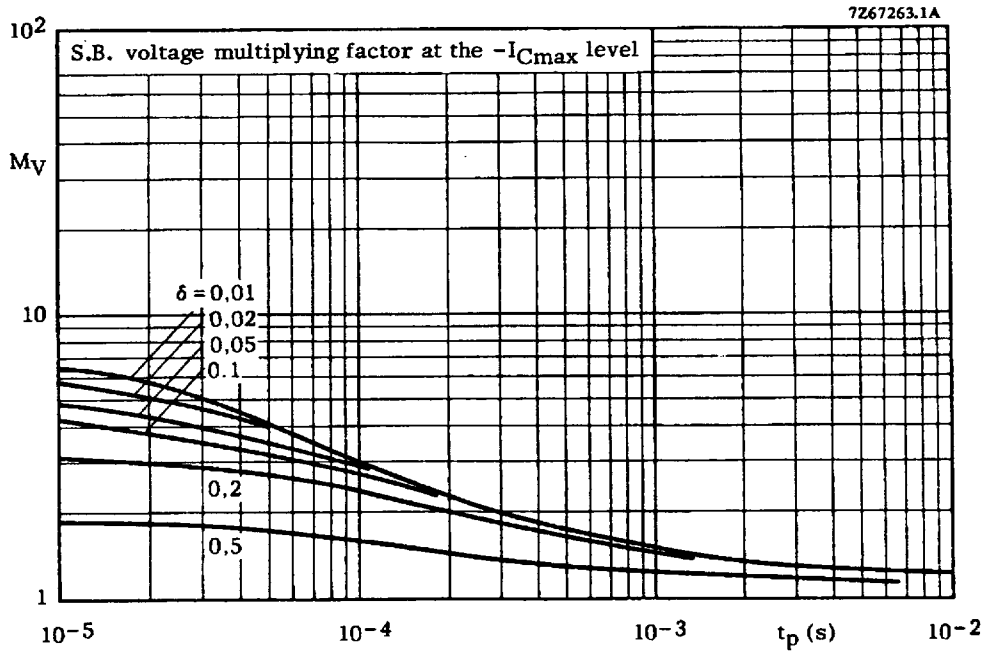


Fig. 6 S.B. voltage multiplying factor at the $-I_{Cmax}$ level.

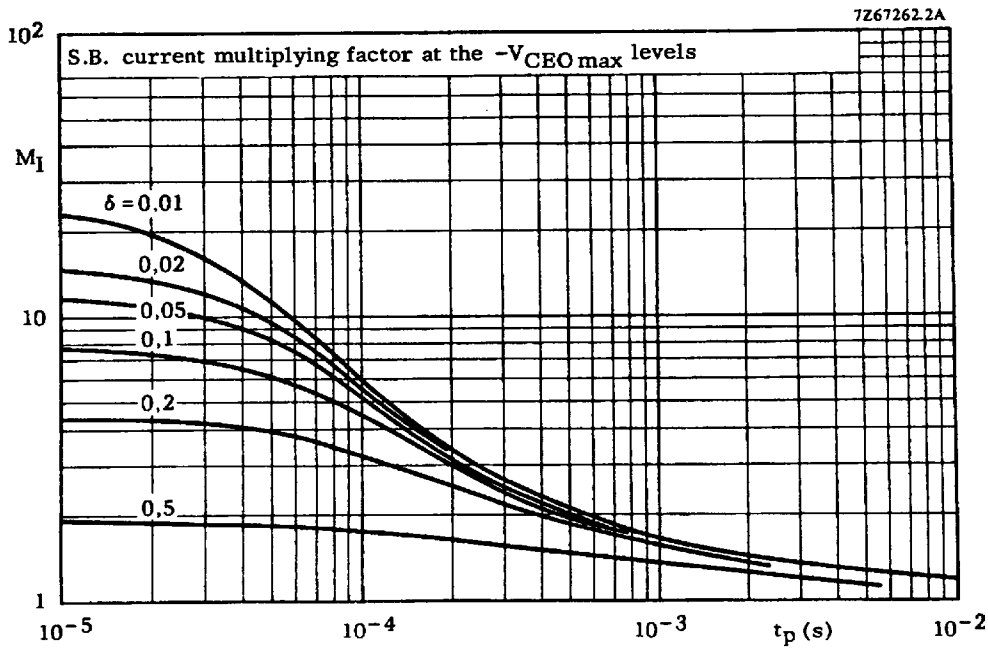


Fig. 7 S.B. current multiplying factor at the $-V_{CEOmax}$ levels.

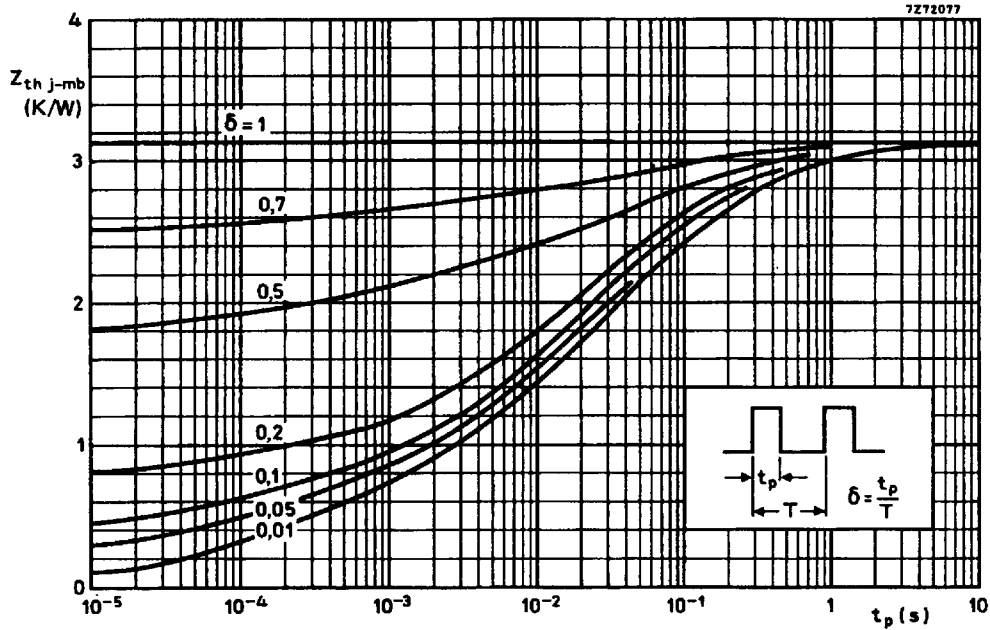


Fig. 8 Pulse power rating chart.

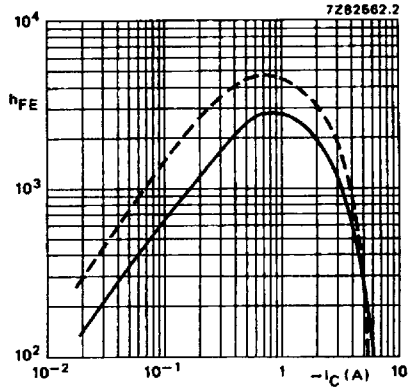


Fig. 9 D.C. current gain. $-V_{CE} = 3 \text{ V}$;
 — $T_j = 25 \text{ }^\circ\text{C}$;
 - - - $T_j = 125 \text{ }^\circ\text{C}$.

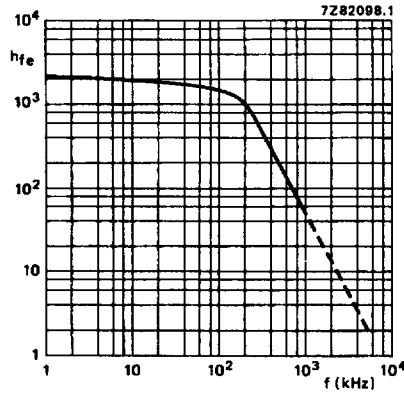


Fig. 10 Typical values small signal current gain. $-I_C = 1,5 \text{ A}$;
 $-V_{CE} = 3 \text{ V}$.

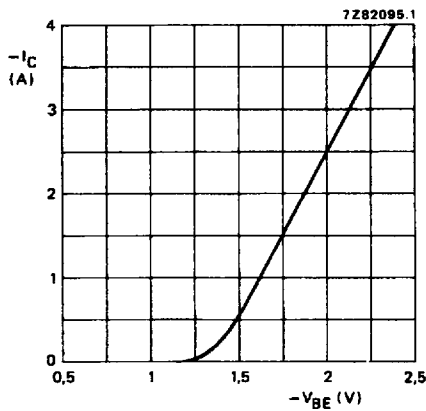


Fig. 11 Typical values; $-V_{CE} = 3 \text{ V}$
 $T_j = 25 \text{ }^\circ\text{C}$.

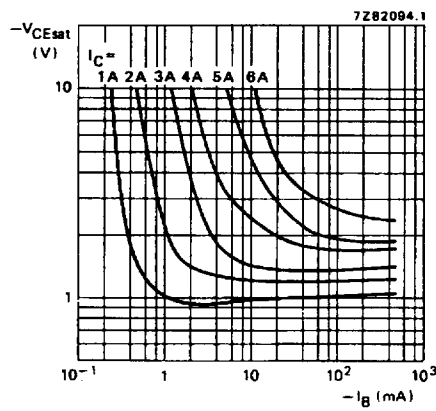


Fig. 12 Typical values collector-emitter saturation voltage as a function of base current. $T_{mb} = 25 \text{ }^\circ\text{C}$.