

SILICON DARLINGTON POWER TRANSISTORS

P-N-P epitaxial-base transistors in monolithic Darlington circuit for audio output stages and general purpose amplifier and switching applications. TO-220AB plastic envelope. N-P-N complements are TIP110, TIP111 and TIP112.

QUICK REFERENCE DATA

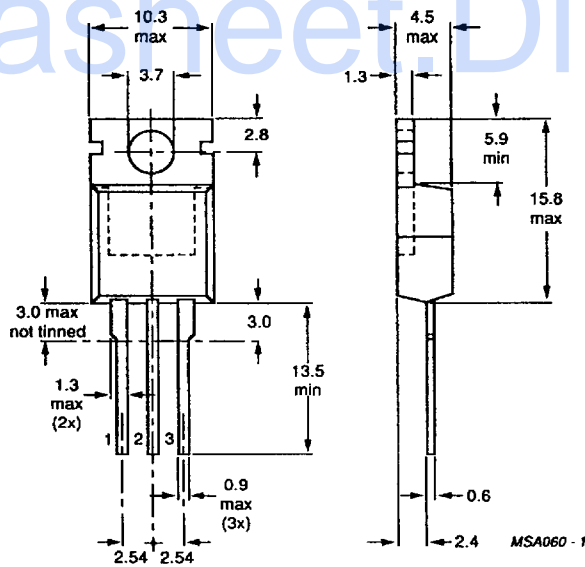
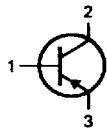
			TIP115	TIP116	TIP117	
Collector-base voltage (open emitter)	$-V_{CB0}$	max.	60	80	100	V
Collector-emitter voltage (open base)	$-V_{CE0}$	max.	60	80	100	V
Collector current (d.c.)	$-I_C$	max.		4		A
Collector current (peak value); $t_p \leq 0,3$ ms	$-I_{CM}$	max.		6		A
Total power dissipation up to $T_{mb} = 25$ °C	P_{tot}	max.		50		W
D.C. current gain						
$-V_{CE} = 4$ V; $-I_B = 2$ A	h_{FE}	>		500		
Collector-emitter saturation voltage						
$-I_C = 2$ A; $-I_B = 8$ mA	$-V_{CEsat}$	<		2,5		V

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-220.

Collector connected to mounting base.



CIRCUIT DIAGRAM

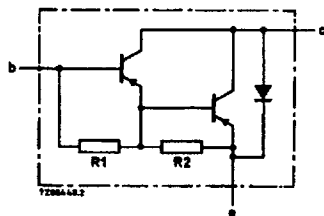


Fig. 2.
R1 typ. 6 kΩ
R2 typ. 100 Ω

RATINGS

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

			TIP115	TIP116	TIP117	
Collector-base voltage (open emitter)	$-V_{CBO}$	max.	60	80	100	V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	60	80	100	V
Emitter-base voltage (open collector)	$-V_{EBO}$	max.	5	5	5	V
Collector current (d.c.)	$-I_C$	max.		4		A
Collector current (peak value); $t_p \leq 0,3$ ms	$-I_{CM}$	max.		6		A
Base current (d.c.)	$-I_B$	max.		50		mA
Total power dissipation up to $T_{mb} = 25$ °C	P_{tot}	max.		50		W
Total power dissipation in free air	P_{tot}	max.		2		W
Storage temperature	T_{stg}		-65 to + 150			°C
Junction temperature	T_j	max.		150		°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th j-mb}$	=		2,5		K/W
From junction to ambient in free air	$R_{th j-a}$	=		62,5		K/W

CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$ unless otherwise specified

Collector cut-off currents

$-V_{CB} = -V_{CB0max}; I_E = 0$	$-I_{CBO} <$	0,2	mA
$-V_{CE} = 1/2 V_{CE0max}; I_B = 0$	$-I_{CEO} <$	0,2	mA

Emitter cut-off current

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

$-I_C = 30\text{ mA}; I_B = 0$	TIP115 $-V_{CE0sust} >$	60	V
	TIP116 $-V_{CE0sust} >$	80	V
	TIP117 $-V_{CE0sust} >$	100	V

D.C. current gain

$-V_{CE} = 4\text{ V}; -I_C = 1\text{ A}$	$h_{FE} >$	1000
$-V_{CE} = 4\text{ V}; -I_C = 2\text{ A}$	$h_{FE} >$	500

Base-emitter voltage

$-V_{CE} = 4\text{ V}; -I_C = 2\text{ A}$	$-V_{BE} <$	2,8	V
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Collector-emitter saturation voltage

$-I_C = 2\text{ A}; -I_B = 8\text{ mA}$	$-V_{CEsat} <$	2,5	V
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Switching times

$-I_C = 2\text{ A}; -I_{Bon} = +I_{Boff} = 8\text{ mA};$
 $-V_{CC} = 30\text{ V}$

turn-on time	t_{on}	typ.	2,6	μs
turn-off time	t_{off}	typ.	4,5	μs

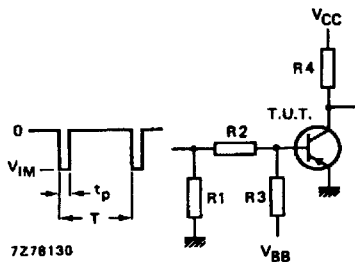


Fig. 3 Switching times test circuit.

$-V_{IM} = 12\text{ V}$ $R1 = 56\ \Omega$ $t_r = t_f = 15\text{ ns}$
 $-V_{CC} = 30\text{ V}$ $R2 = 750\ \Omega$ $t_p = 10\ \mu\text{s}$
 $+V_{BB} = 5\text{ V}$ $R3 = 910\ \Omega$ $T = 500\ \mu\text{s}$
 $R4 = 15\ \Omega$

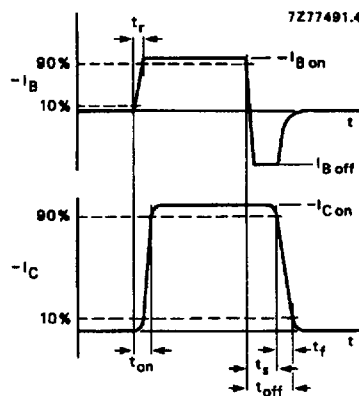


Fig. 4 Switching times waveforms.

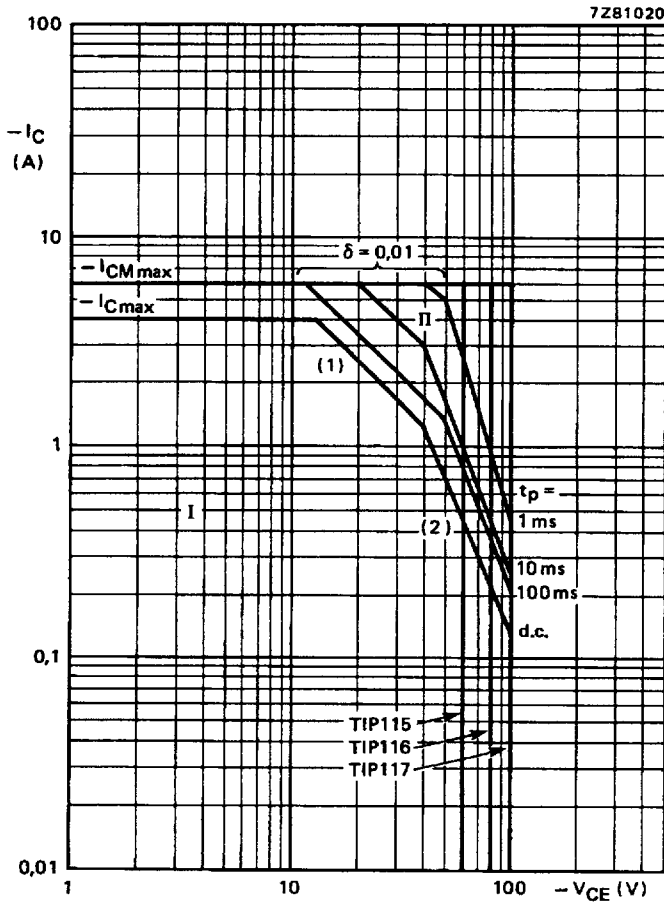


Fig. 5 Safe Operating Area; $T_{mb} = 25\text{ }^{\circ}\text{C}$.

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

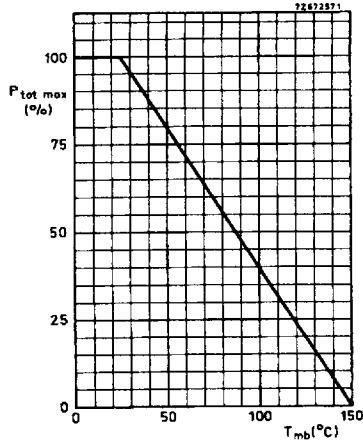


Fig. 6 Power derating curve.

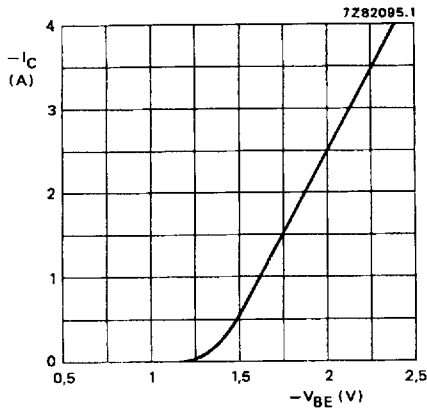


Fig. 7 $-V_{CE} = 4 \text{ V}$; $T_j = 25 \text{ }^\circ\text{C}$; typical values.

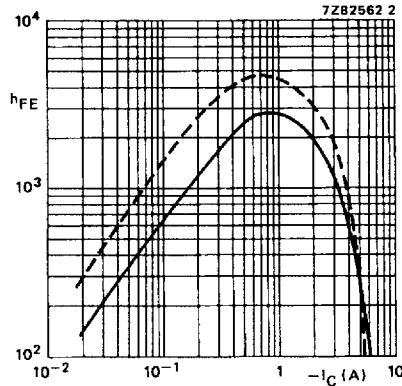


Fig. 8 Typical d.c. current gain; $-V_{CE} = 4 \text{ V}$;
— $T_j = 25 \text{ }^\circ\text{C}$; - - - - $T_j = 125 \text{ }^\circ\text{C}$.

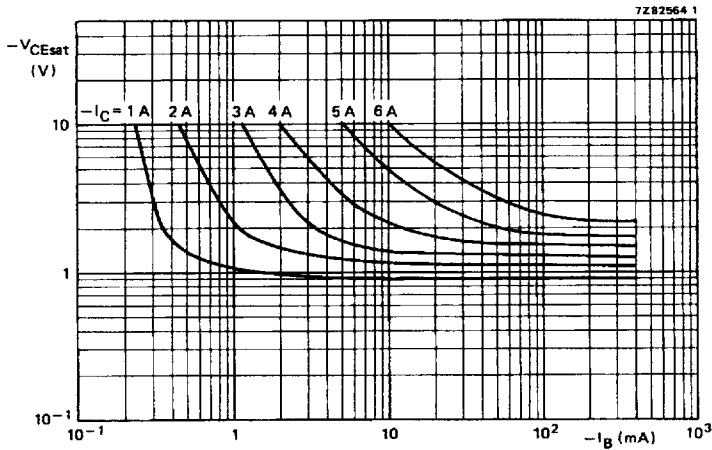


Fig. 9 Typical collector-emitter saturation voltage at $T_j = 25 \text{ }^\circ\text{C}$.