

SILICON DARLINGTON POWER TRANSISTORS

N-P-N epitaxial-base transistors in monolithic Darlington circuit for audio output stages and general purpose amplifier and switching applications. TO-220AB plastic envelope. P-N-P complements are TIP115, TIP116 and TIP117.

QUICK REFERENCE DATA

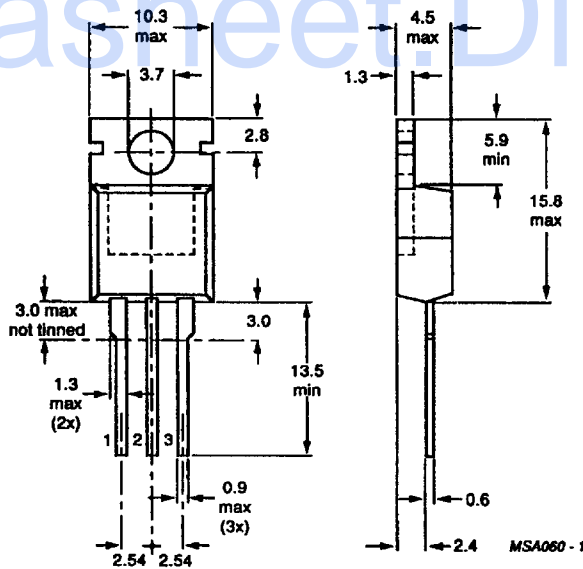
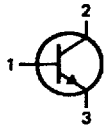
		TIP110			TIP111			TIP112		
Collector-base voltage (open emitter)	V_{CB0}	max.	60	80	100	V				
Collector-emitter voltage (open base)	V_{CE0}	max.	60	80	100	V				
Collector current (d.c.)	I_C	max.		4		A				
Collector current (peak value); $t_p \leq 0,3$ ms	I_{CM}	max.		6		A				
Total power dissipation up to $T_{mb} = 25$ °C	P_{tot}	max.		50		W				
D.C. current gain										
$V_{CE} = 4$ V; $I_C = 2$ 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

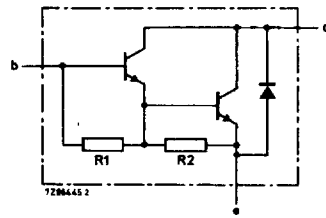


Fig. 2.
R1 typ. 6 kΩ
R2 typ. 100 Ω

RATINGS

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

			TIP110	TIP111	TIP112	
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_{thj-mb}	=		2,5		K/W
From junction to ambient in free air	R_{thj-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

$I_C = 30\text{ mA}; I_B = 0$	TIP110	$V_{CE0sust}$	>	60	V
	TIP111	$V_{CE0sust}$	>	80	V
	TIP112	$V_{CE0sust}$	>	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

$I_C = 2\text{ A}; I_{B on} = -I_{B off} = 8\text{ mA}; V_{CC} = 30\text{ V}$

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

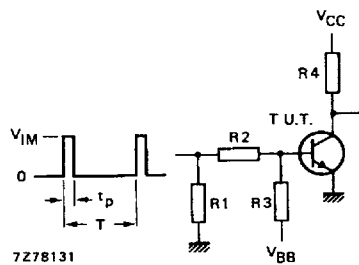


Fig. 3 Switching times test circuit with resistive load.

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

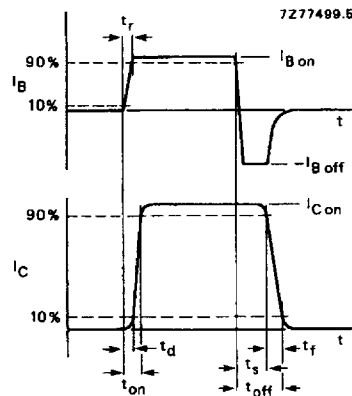


Fig. 4 Switching times waveforms.

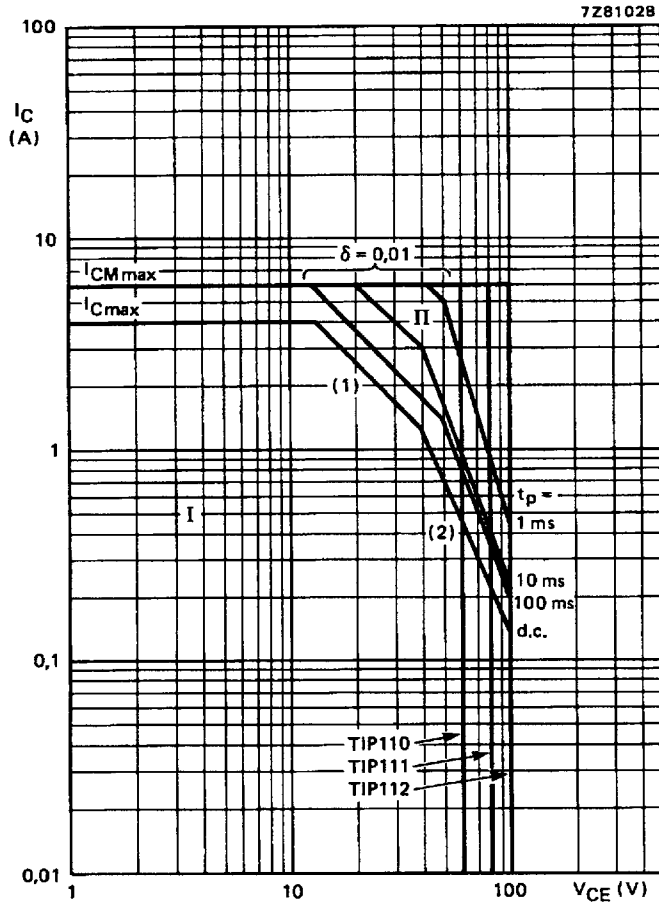


Fig. 5 Safe Operating Area; $T_{mb} = 25\text{ }^{\circ}\text{C}$.

- 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.

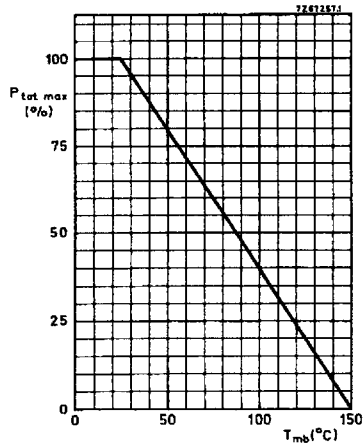


Fig. 6 Power derating curve.

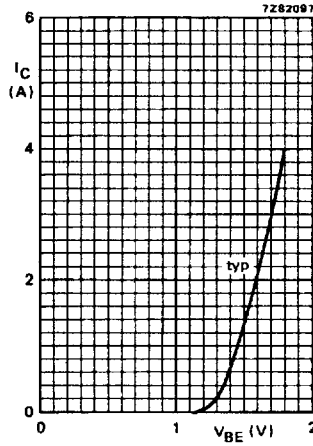


Fig. 7 $V_{CE} = 4\ V; T_j = 25\ ^\circ C$.

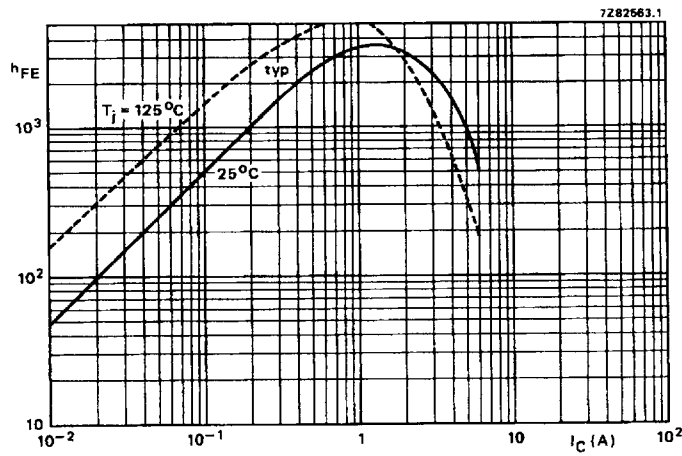


Fig. 8 Typical d.c. current gain; $V_{CE} = 4\ V$.

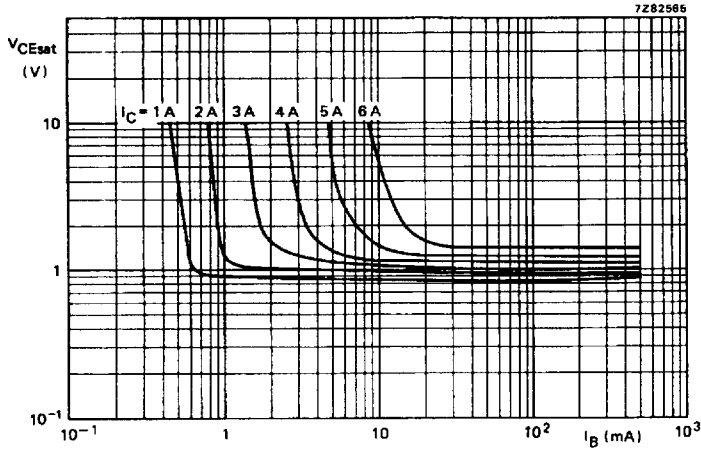


Fig. 9 Typical values; $T_j = 25^\circ C$.

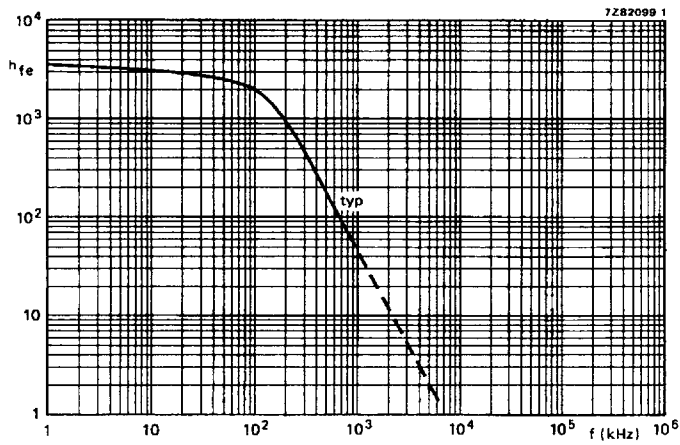


Fig. 10 Small-signal current gain; $I_C = 1.5 A$; $V_{CE} = 4 V$; $T_j = 25^\circ C$.