

SILICON DARLINGTON POWER TRANSISTORS

P-N-P epitaxial-base transistors in monolithic Darlington circuit for audio output stages and general amplifier and switching applications. TO-220AB plastic envelope. N-P-N equivalents are TIP130, TIP131 and TIP132.

QUICK REFERENCE DATA

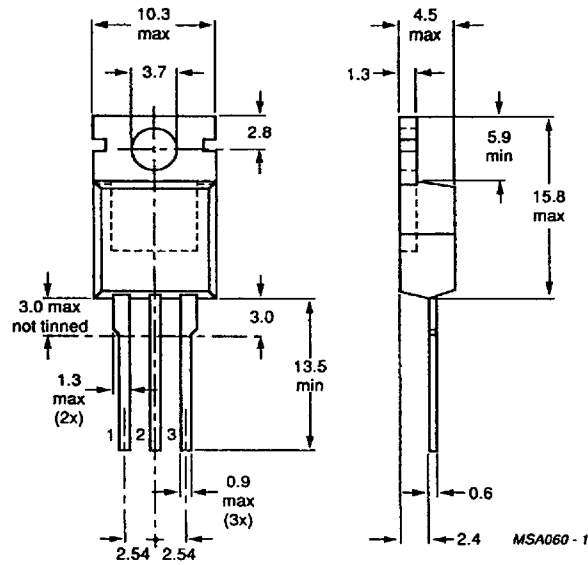
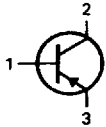
		TIP135 TIP136 TIP137				
Collector-base voltage (open emitter)	$-V_{CB0}$	max.	60	80	100	V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	60	80	100	V
Collector current (d.c.)	$-I_C$	max.		8		A
Collector current (peak value); $t_p \leq 0,3$ ms	$-I_{CM}$	max.		12		A
Total power dissipation up to $T_{mb} = 25^\circ\text{C}$	P_{tot}	max.		70		W
D.C. current gain			1000 to 15 000			
Collector-emitter saturation voltage						
$-V_{CE} = 4$ V; $-I_C = 4$ A	h_{FE}					
$-I_C = 4$ A; $-I_B = 16$ mA	$-V_{CEsat}$	<	2			V

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-220.

Collector connected to mounting base.



CIRCUIT DIAGRAM

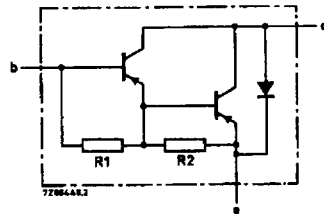


Fig. 2.
R1 typ. 4 kΩ
R2 typ. 60 Ω

RATINGS

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

			TIP135	TIP136	TIP137	
Collector-base voltage ($I_E = 0$)	$-V_{CBO}$	max.	60	80	100	V
Collector-emitter voltage ($I_B = 0$)	$-V_{CEO}$	max.	60	80	100	V
Emitter-base voltage ($I_C = 0$)	$-V_{EBO}$	max.	5	5	5	V
Collector current (d.c.)	$-I_C$	max.	8			A
Collector current (peak value); $t_p < 0,3$ ms	$-I_{CM}$	max.	12			A
Base current (d.c.)	$-I_B$	max.	0,3			A
Total power dissipation up to $T_{mb} = 25$ °C	P_{tot}	max.	70			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}	=	1,79	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
$-V_{CB} = -V_{CB0max}; I_E = 0; T_j = 100\text{ }^\circ\text{C}$	$-I_{CBO}$	<	1	mA
$-V_{CE} = -1/2 V_{CE0max}; I_B = 0$	$-I_{CEO}$	<	0,5	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

$-I_C = 30\text{ mA}; I_B = 0$	TIP135	$-V_{CE0sust}$	>	60	V
	TIP136	$-V_{CE0sust}$	>	80	V
	TIP137	$-V_{CE0sust}$	>	100	V

D.C. current gain

$-V_{CE} = 4\text{ V}; -I_C = 1\text{ A}$	h_{FE}	>	500	
$-V_{CE} = 4\text{ V}; -I_C = 4\text{ A}$	h_{FE}		1000 to 15 000	

Base-emitter voltage

$-V_{CE} = 4\text{ V}; -I_C = 4\text{ A}$	$-V_{BE}$	<	2,5	V
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Collector-emitter saturation voltage

$-I_C = 4\text{ A}; -I_B = 16\text{ mA}$	$-V_{CEsat}$	<	2	V
$-I_C = 6\text{ A}; -I_B = 30\text{ mA}$	$-V_{CEsat}$	<	3	V

Collector-base capacitance

$-V_{CB} = 10\text{ V}; I_E = 0$	C_{ob}	<	200	pF
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Switching times

$-I_C = 3\text{ A}; -I_{Bon} = + I_{Boff} = 12\text{ mA}$

$-V_{CC} = 10\text{ V}$

turn-on time	t_{on}	typ.	0,5	μs
turn-off time	t_{off}	typ.	2,5	μs

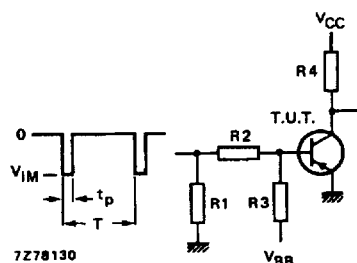


Fig. 3 Switching times test circuit.

$-V_{IM} = 10\text{ V}$	$R1 = 56\ \Omega$	$t_r = t_f = 15\text{ ns}$
$-V_{CC} = 10\text{ V}$	$R2 = 410\ \Omega$	$t_p = 10\ \mu\text{s}$
$+V_{BB} = 4\text{ V}$	$R3 = 560\ \Omega$	$T = 500\ \mu\text{s}$
	$R4 = 3\ \Omega$	

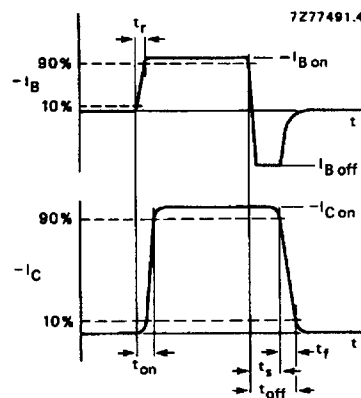


Fig. 4 Switching times waveforms.

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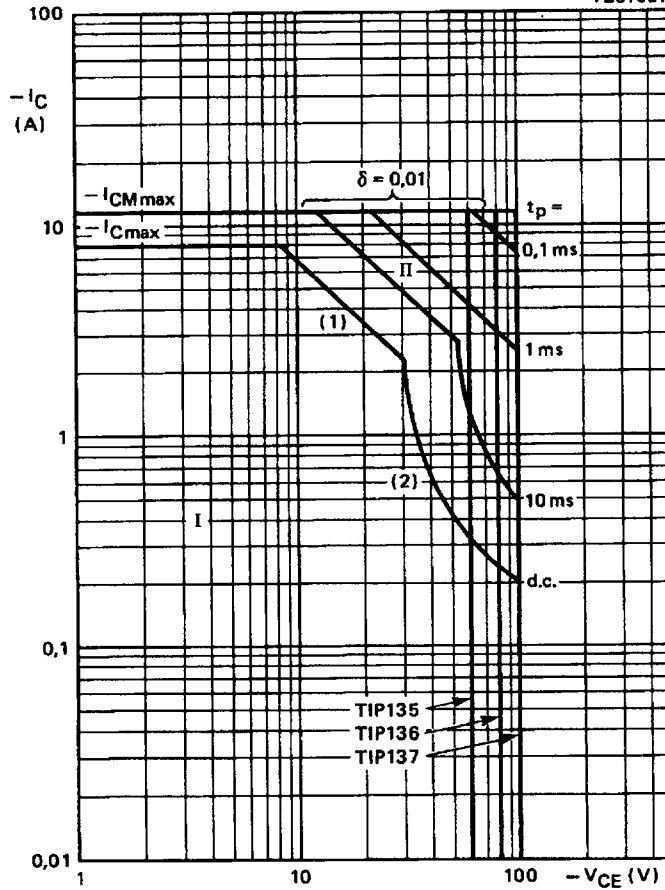


Fig. 5 Safe Operating Area; $T_{mb} = 25^{\circ}\text{C}$.

- 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.

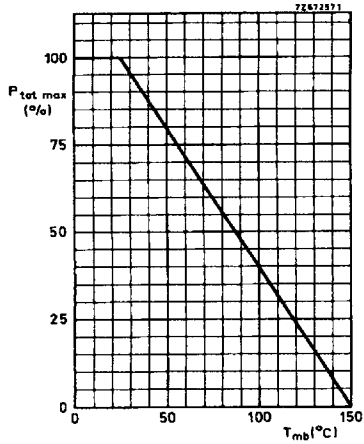


Fig. 6 Power derating curve.

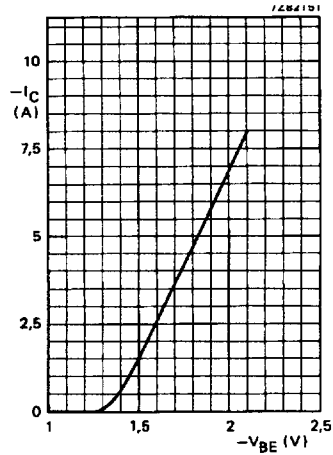


Fig. 7 Typical values;
 $-V_{CE} = 4 \text{ V}; T_j = 25 \text{ }^\circ\text{C}.$

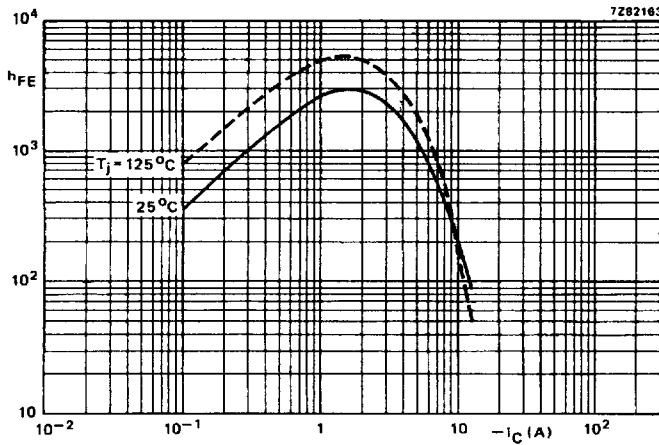


Fig. 8 Typical d.c. current gain at $-V_{CE} = 4 \text{ V}.$

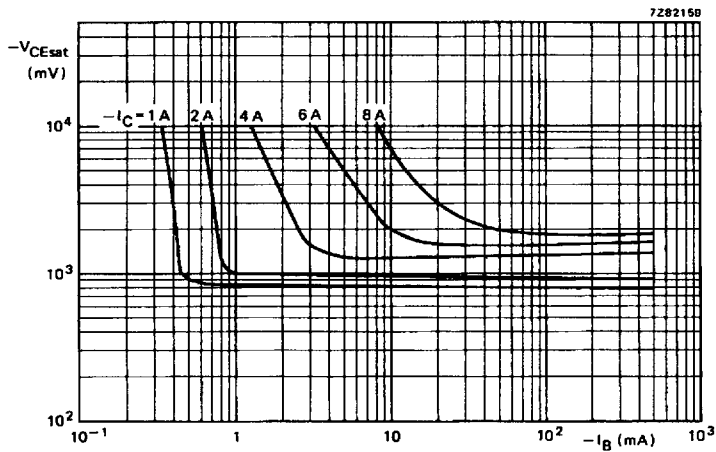


Fig. 9 Typical collector-emitter saturation voltage; $T_j = 25 \text{ }^\circ\text{C}.$