

SILICON DARLINGTON POWER TRANSISTORS

NPN epitaxial base transistors in monolithic Darlington circuit for audio output stages and general purpose amplifier and switching applications. TO-220 plastic envelope. PNP complements are BDT64; BDT64A; BDT64B and BDT64C.

QUICK REFERENCE DATA

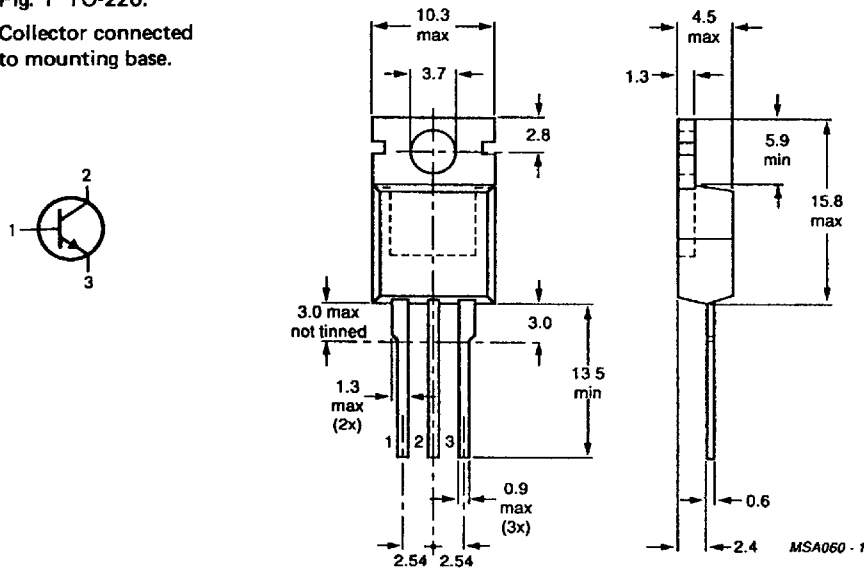
			BDT65	65A	65B	65C
Collector-base voltage (open emitter)	V_{CBO}	max.	60	80	100	120 V
Collector-emitter voltage (open base)	V_{CEO}	max.	60	80	100	120 V
Emitter-base voltage (open collector)	V_{EBO}	max.	5	5	5	5 V
Collector current (d.c.)	I_C	max.	12			A
Total power dissipation up to $T_{mb} = 25^\circ\text{C}$	P_{tot}	max.	125			W
Junction temperature	T_j	max.	150			$^\circ\text{C}$
D.C. current gain $I_C = 5\text{ A}; V_{CE} = 4\text{ V}$	h_{FE}	>	1000			

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-220.

Collector connected to mounting base.



See also chapters Mounting instructions and Accessories.

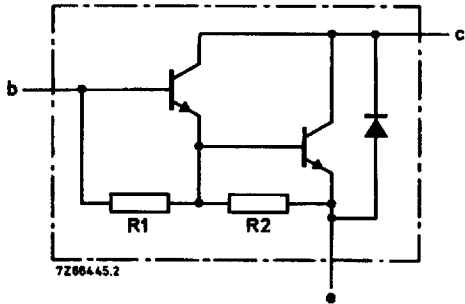


Fig. 2 Circuit diagram. R1 typ. 5 kΩ; R2 typ. 80 Ω.

RATINGS

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

			BDT65	65A	65B	65C
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
Emitter-base voltage (open collector)	V_{EBO}	max.	5	5	5	5 V
Collector current (d.c.)	I_C	max.	12			A
Collector current (peak value)	I_{CM}	max.	20			A
Base current (d.c.)	I_B	max.	500			mA
Total power dissipation up to $T_{mb} = 25\text{ }^{\circ}\text{C}$	P_{tot}	max.	125			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	$R_{th\ j-mb} =$	1	K/W
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CHARACTERISTICS

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

Collector cut-off current

 $V_{CB} = V_{CB0max}; I_E = 0$ $I_{CBO} < 0,4\text{ mA}$ $V_{CB} = \frac{1}{2}V_{CB0max}; I_E = 0; T_j = 150\text{ }^{\circ}\text{C}$ $I_{CBO} < 2\text{ mA}$ $I_B = 0; V_{CE} = \frac{1}{2}V_{CE0max}$ $I_{CEO} < 0,2\text{ mA}$

Emitter cut-off current

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

D.C. current gain*

 $I_C = 1\text{ A}; V_{CE} = 4\text{ V}$ $h_{FE} \text{ typ. } 1500$ $I_C = 5\text{ A}; V_{CE} = 4\text{ V}$ $h_{FE} > 1000$ $I_C = 12\text{ A}; V_{CE} = 4\text{ V}$ $h_{FE} \text{ typ. } 1000$

Base-emitter voltage

 $I_C = 5\text{ A}; V_{CE} = 4\text{ V}$ $V_{BE} < 2,5\text{ V}$

Collector-emitter saturation voltage*

 $I_C = 5\text{ A}; I_B = 20\text{ mA}$ $V_{CEsat} < 2\text{ V}$ $I_C = 10\text{ A}; I_B = 100\text{ mA}$ $V_{CEsat} < 3\text{ V}$

Diode, forward voltage

 $I_F = 5\text{ A}$ $V_F < 2\text{ V}$ $I_F = 12\text{ A}$ $V_F \text{ typ. } 2\text{ V}$ Collector capacitance at $f = 1\text{ MHz}$ $V_{CB} = 10\text{ V}; I_E = I_e = 0$ $C_c \text{ typ. } 200\text{ pF}$

Second-breakdown collector current

non-repetitive; without heatsink

 $V_{CE} = 60\text{ V}; t_p = 0,1\text{ s}$ $I_{SB} > 2\text{ A}$

Turn-off breakdown energy with inductive load;

 $-I_{Boff} = 0; I_{CM} = 6,3\text{ A}$ $L = 5\text{ mH}$ (see Fig. 3) $E_{(BR)} > 100\text{ mJ}$

Switching times (see Figs 4 and 5)

 $I_{Con} = 5\text{ A}; I_{Bon} = -I_{Boff} = 20\text{ mA}$

turn-on time

 $t_{on} \text{ typ. } 1\text{ }\mu\text{s}$
 $< 2,5\text{ }\mu\text{s}$

turn-off time

 $t_{off} \text{ typ. } 6,0\text{ }\mu\text{s}$
 $< 10\text{ }\mu\text{s}$

Small-signal current gain

 $I_C = 5\text{ A}; V_{CE} = 3\text{ V}; f = 1\text{ MHz}$ $h_{fe} > 10$ * Measured under pulse conditions $t_p \leq 300\text{ }\mu\text{s}$; $\delta < 2\%$.

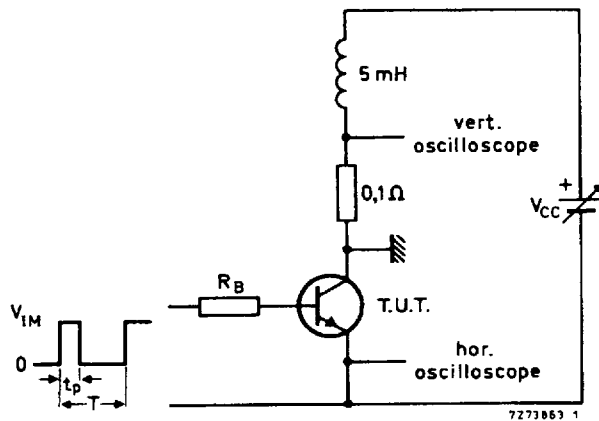


Fig. 3 Test circuit for turn-off
breakdown energy.
 $V_{IM} = 12 \text{ V}$; $R_B = 270 \Omega$;
 $t_p = 1 \text{ ms}$; $\delta = 1\%$.

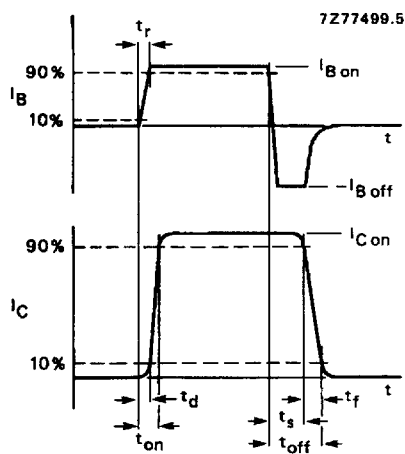
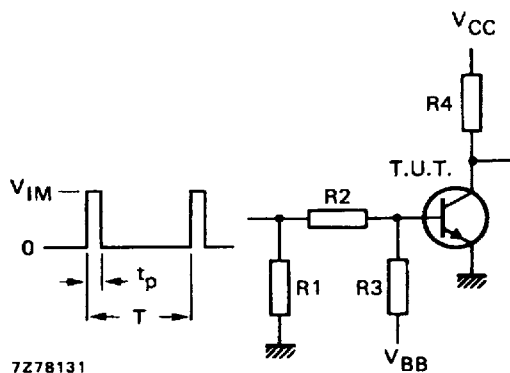


Fig. 4 Switching times waveforms.



$V_{CC} = 30 \text{ V}$
 $V_{IM} = 15 \text{ V}$
 $-V_{BB} = 4 \text{ V}$
 $R_1 = 56 \Omega$
 $R_2 = 410 \Omega$
 $R_3 = 560 \Omega$
 $R_4 = 6 \Omega$
 $t_r = t_f = 15 \text{ ns}$
 $t_p = 10 \mu\text{s}$
 $T = 500 \mu\text{s}$

Fig. 5 Switching times test circuit.

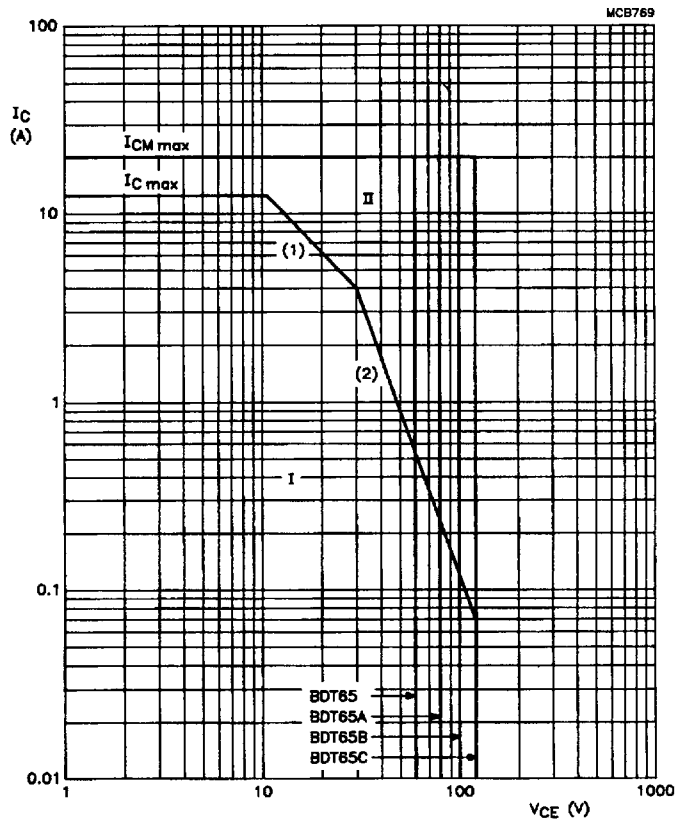


Fig. 6 Safe Operating Area; $T_{mb} = 25^{\circ}\text{C}$.

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.

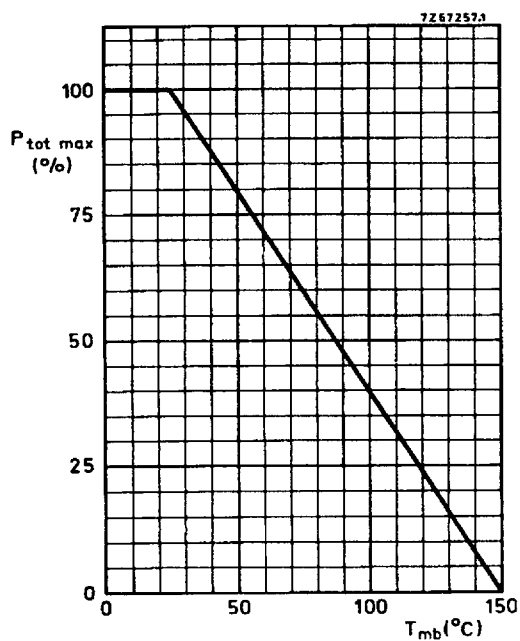


Fig. 7 Power derating curve.

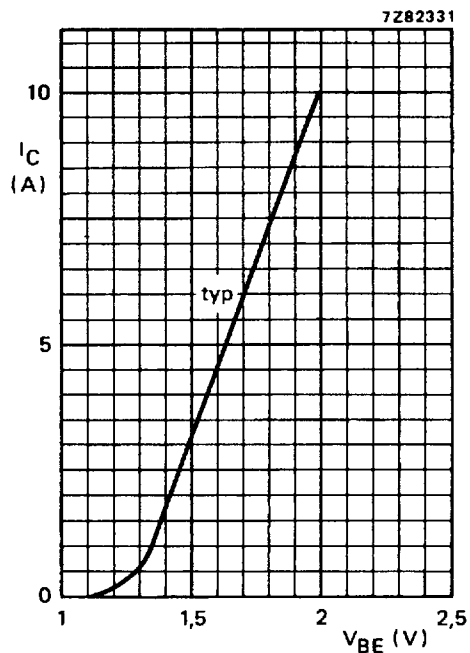


Fig. 8 Base-emitter voltage as a function of collector current. $V_{CE} = 3\ V$; $T_{amb} = 25\ ^\circ C$.

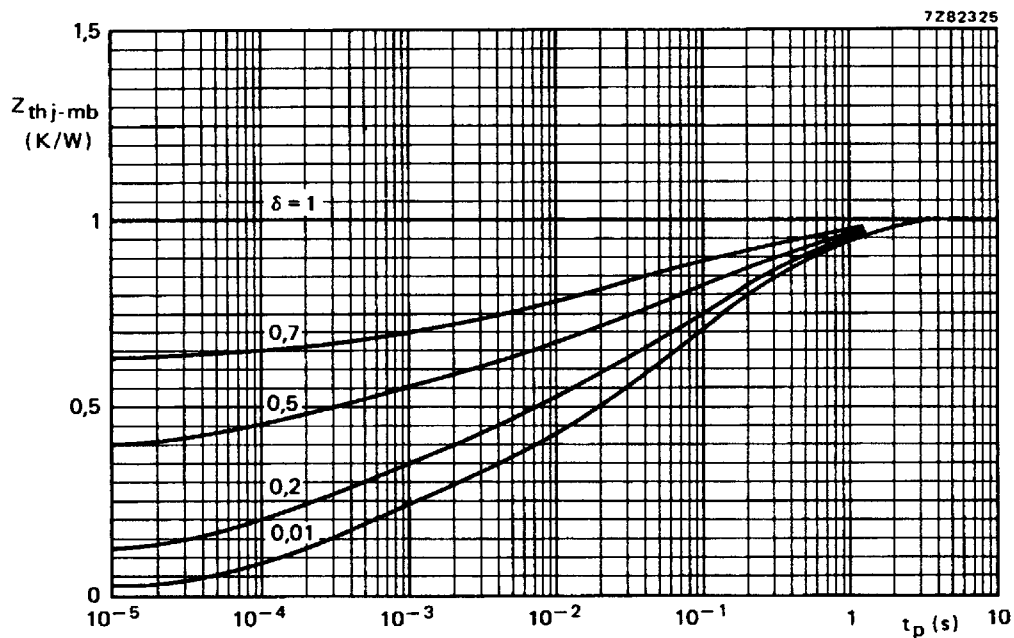
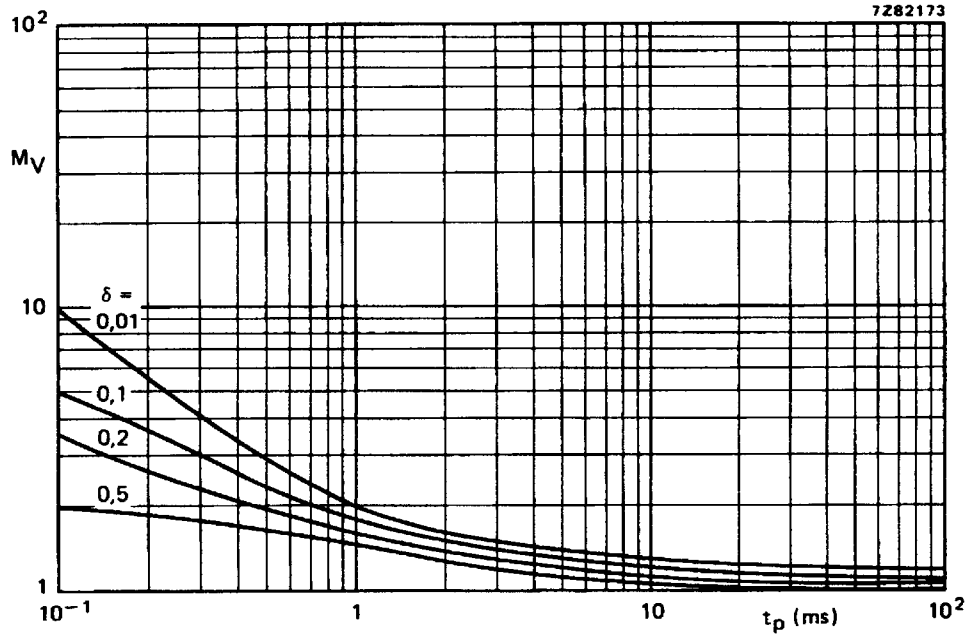
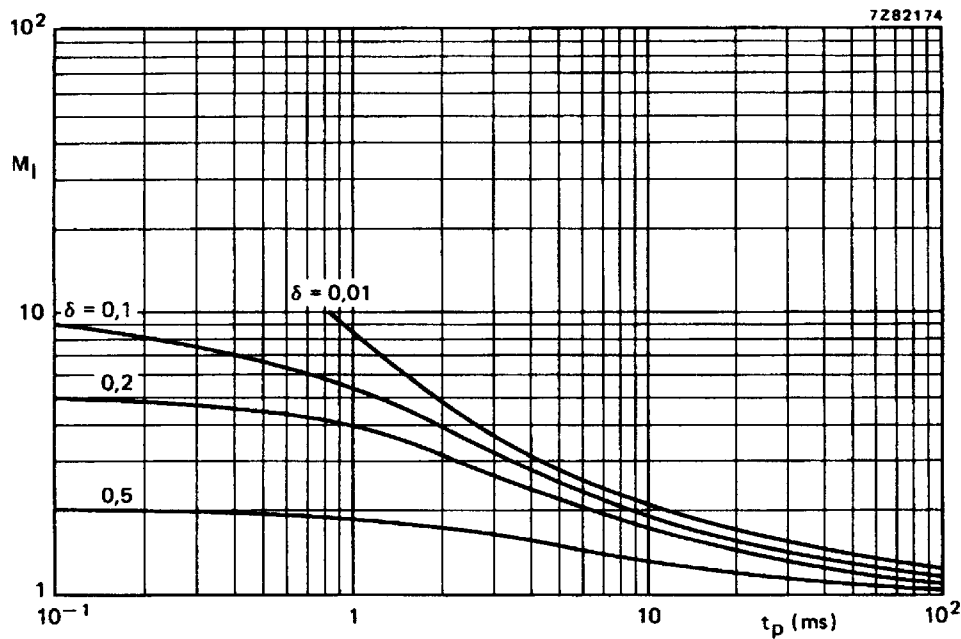


Fig. 9 Pulse power rating chart.

Fig. 10 S.B. voltage multiplying factor at the I_{Cmax} level.Fig. 11 S.B. current multiplying factor at the V_{CEQmax} level.

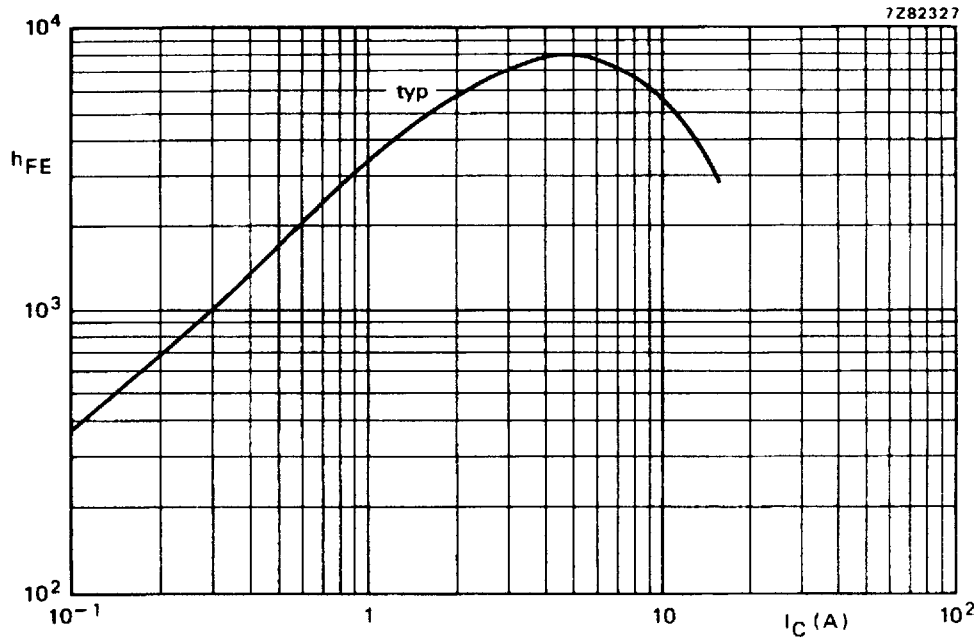


Fig. 12 Typical d.c. current gain as a function of collector current; $V_{CE} = 3$ V; $T_j = 25$ °C.

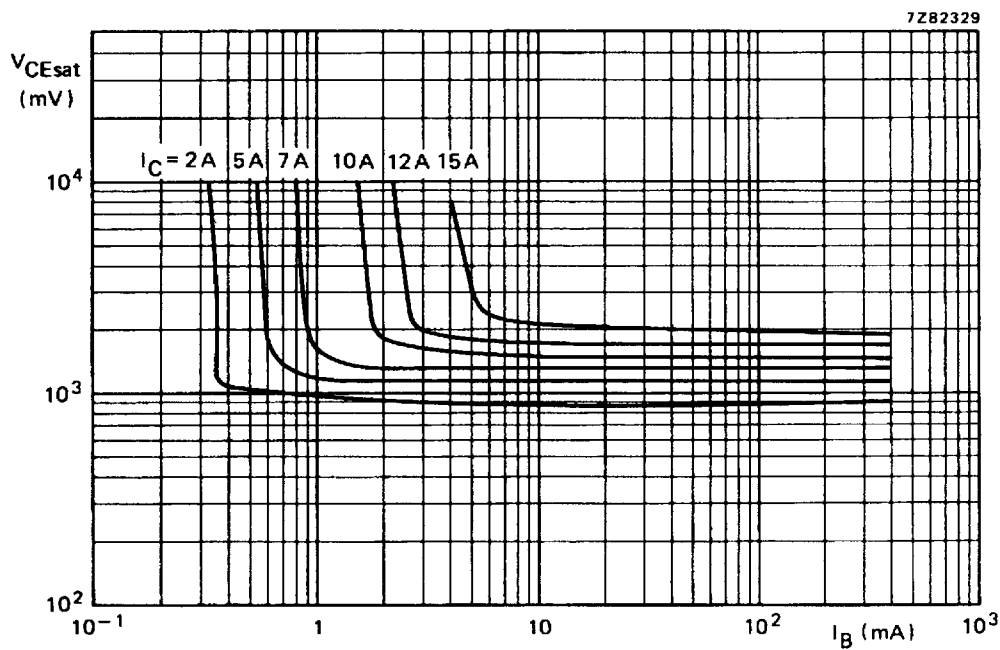


Fig. 13 Typical collector-emitter saturation voltages.