290-592



# 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-220 plastic envelope. N-P-N complements are BDT65, BDT65A, BDT65B and BDT65C.

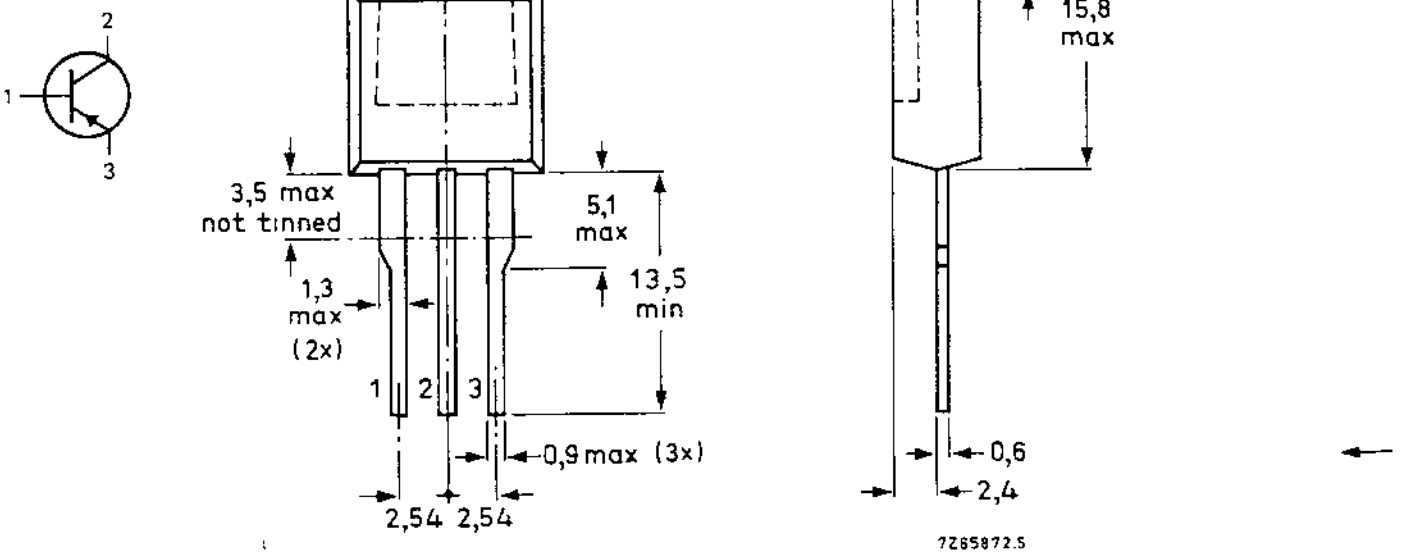
## QUICK REFERENCE DATA

| | | | BDT64 | 64A | 64B | 64C | |
|---|---|---|---|---|---|---|---|
| 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 °C | $P_{tot}$ | max. | | 125 | | | W |
| Junction temperature | $T_j$ | max. | | 150 | | | °C |
| D.C. current gain $-I_C$ = 5 A; $-V_{CE}$ = 4 V | $h_{FE}$ | > | | 1000 | | | |

## MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-220AB.
Collector connected to mounting base.




See also chapters Mounting instructions and Accessories.

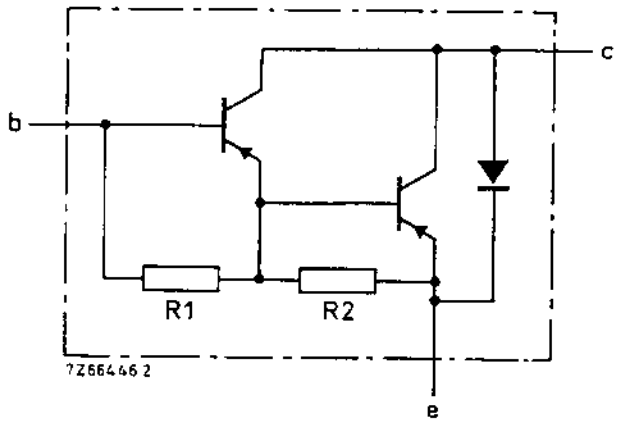



Fig. 2 Circuit diagram. R1 typ. 3 kΩ; R2 typ. 45 Ω.

## RATINGS

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

| | | | BDT64 | 64A | 64B | 64C | |
|---|---|---|---|---|---|---|---|
| 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 °C | $P_{tot}$ | max. | | 125 | | | W |
| Storage temperature | $T_{stg}$ | | | −65 to + 150 | | | °C |
| Junction temperature | $T_j$ | max. | | 150 | | | °C |

## THERMAL RESISTANCE

| | | | | |
|---|---|---|---|---|
| From junction to mounting base | $R_{th\ j\text{-}mb}$ | = | 1 | K/W |

## CHARACTERISTICS

$T_j$ = 25 °C unless otherwise specified.

| | | | | |
|---|---|---|---|---|
| Collector cut-off current | | | | |
| $-V_{CB} = -V_{CBOmax}$, $I_E = 0$ | $-I_{CBO}$ | < | 0,4 | mA |
| $I_E = 0$; $-V_{CB} = -½\ V_{CBOmax}$, $T_j$ = 150 °C | $-I_{CBO}$ | < | 2 | mA |
| $I_B = 0$; $-V_{CE} = -½\ V_{CEOmax}$ | $-I_{CEO}$ | < | 0,2 | mA ← |
| Emitter cut-off current | | | | |
| $I_C = 0$; $-V_{EB}$ = 5 V | $-I_{EBO}$ | < | 5 | mA |
| D.C. current gain* | | | | |
| $-I_C$ = 1 A; $-V_{CE}$ = 4 V | $h_{FE}$ | typ. | 1500 | |
| $-I_C$ = 5 A; $-V_{CE}$ = 4 V | $h_{FE}$ | > | 1000 | |
| $-I_C$ = 12 A; $-V_{CE}$ = 4 V | $h_{FE}$ | typ. | 750 | |
| Base-emitter voltage | | | | |
| $-I_C$ = 5 A; $-V_{CE}$ = 4 V | $-V_{BE}$ | < | 2,5 | V |
| Collector-emitter saturation voltage* | | | | |
| $-I_C$ = 5 A; $-I_B$ = 20 mA | $-V_{CEsat}$ | < | 2 | V |
| $-I_C$ = 10 A; $-I_B$ = 100 mA | $-V_{CEsat}$ | < | 3 | V |
| Diode, forward voltage | | | | |
| $I_F$ = 5 A | $V_F$ | < | 2 | V |
| $I_F$ = 12 A | $V_F$ | typ. | 2 | V |
| Collector capacitance at f = 1 MHz | | | | |
| $-V_{CB}$ = 10 V; $I_E = I_e = 0$ | $C_c$ | typ. | 200 | pF |
| Second breakdown collector current | | | | |
| non-repetitive; without heatsink | | | | |
| $-V_{CE}$ = 60 V; $t_p$ = 0,1 s | $-I_{SB}$ | > | 2 | A |
| Switching times (see Figs 3 and 4) | | | | |
| $-I_{Con} = -I_{Boff}$ = 5 A; $-I_{Bon}$ = 20 mA | | | | |
| $-V_{CC}$ = 30 V | | | | |
| turn-on time | $t_{on}$ | typ. | 0,5 | μs |
| | | < | 2 | μs |
| turn-off time | $t_{off}$ | typ. | 2,5 | μs |
| | | < | 5 | μs |
| Small-signal current gain | | | | |
| $-I_C$ = 5 A; $-V_{CE}$ = 3 V; f = 1 MHz | $h_{fe}$ | > | 10 | |

* Measured under pulse conditions: $t_p < 300\ \mu s$; $\delta < 2\%$.

CHARACTERISTICS (continued)

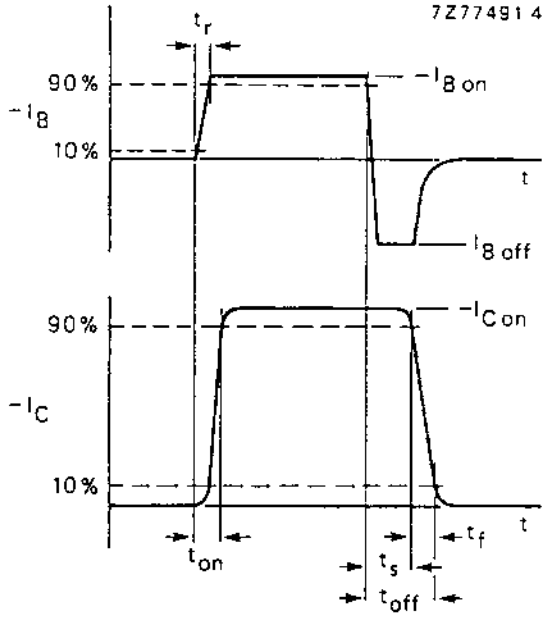
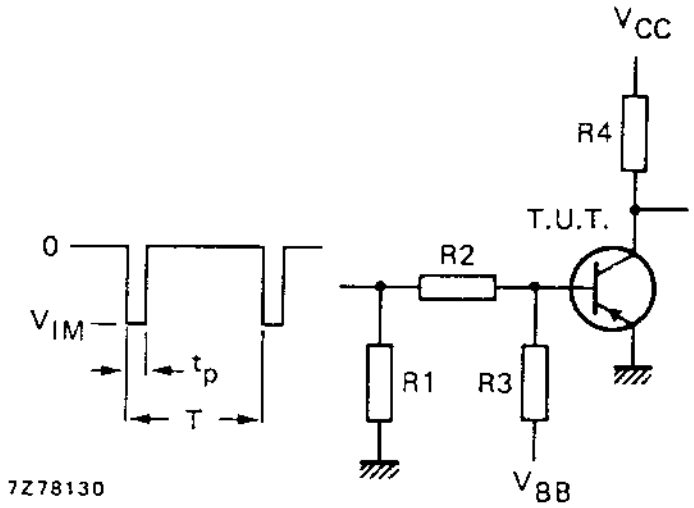



Fig. 3 Switching times waveforms.




| | | |
|---|---|---|
| $-V_{IM}$ | = | 15 V |
| $-V_{CC}$ | = | 30 V |
| $V_{BB}$ | = | 4 V |
| R1 | = | 56 Ω |
| R2 | = | 410 Ω |
| R3 | = | 560 Ω |
| R4 | = | 6 Ω |
| $t_r = t_f$ | = | 15 ns |
| $t_p$ | = | 10 μs |
| T | = | 500 μs |

Fig. 4 Switching times test circuit.

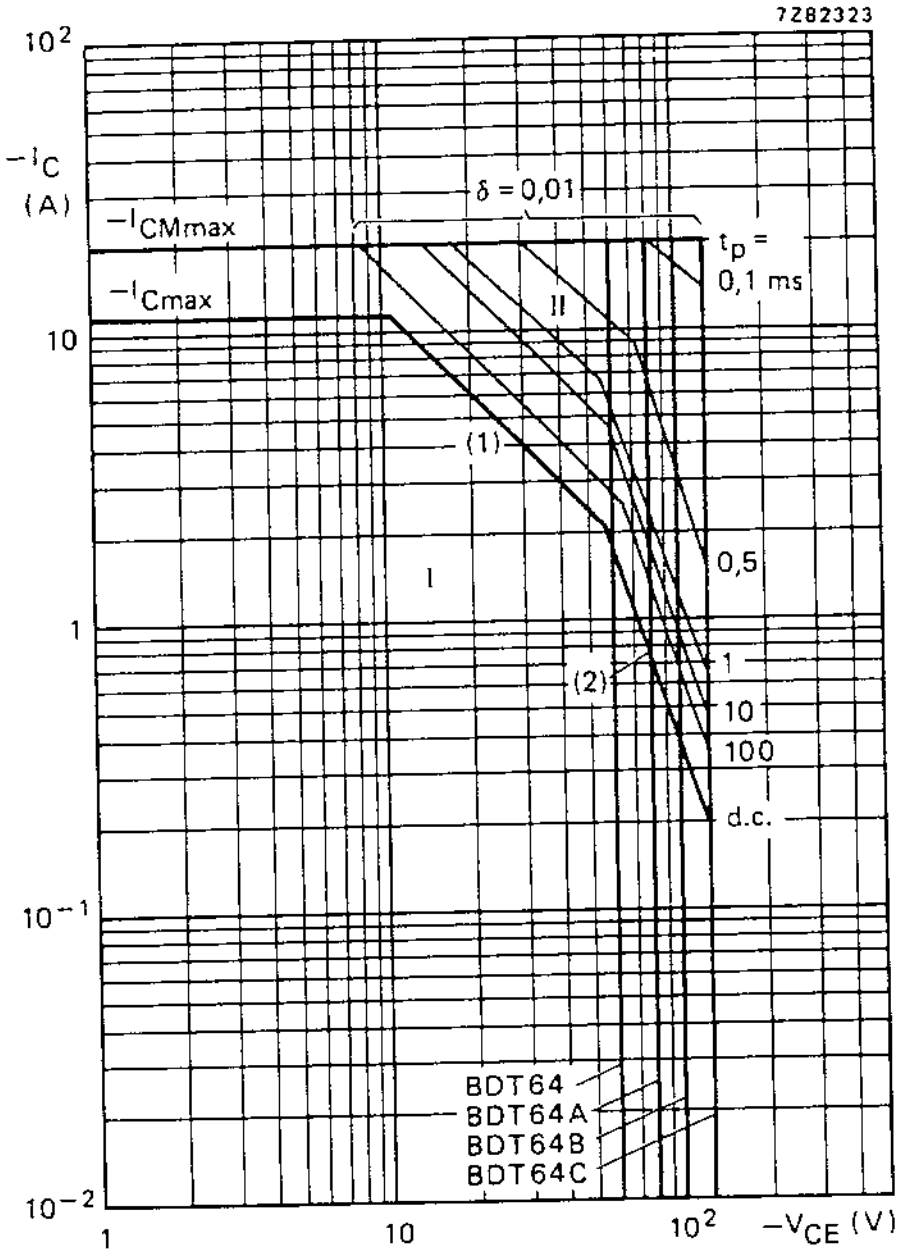



Fig. 5 Safe Operating ARea; $T_{mb}$ = 25 °C.

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.

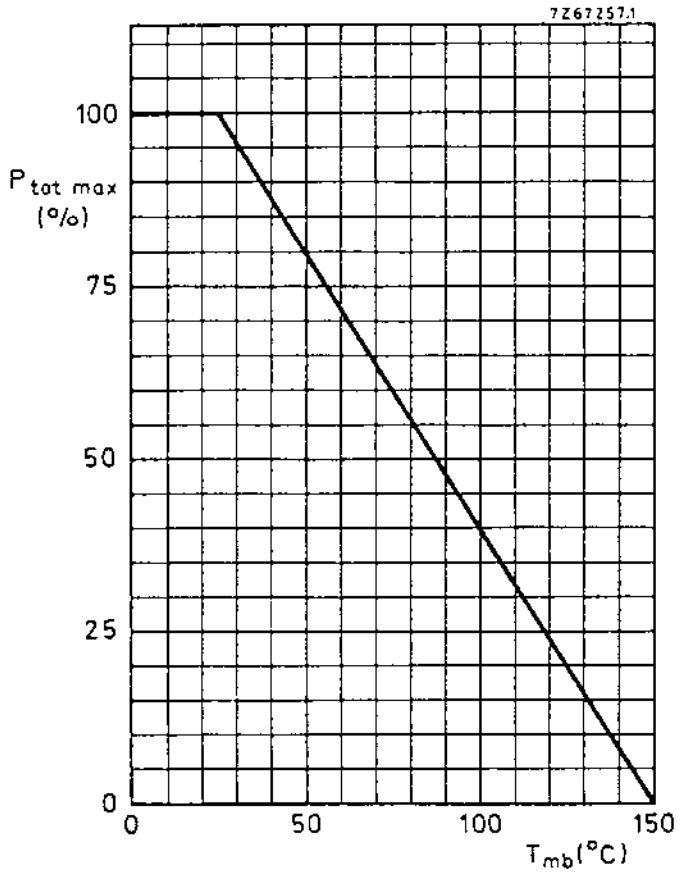



Fig. 6 Power derating curve.

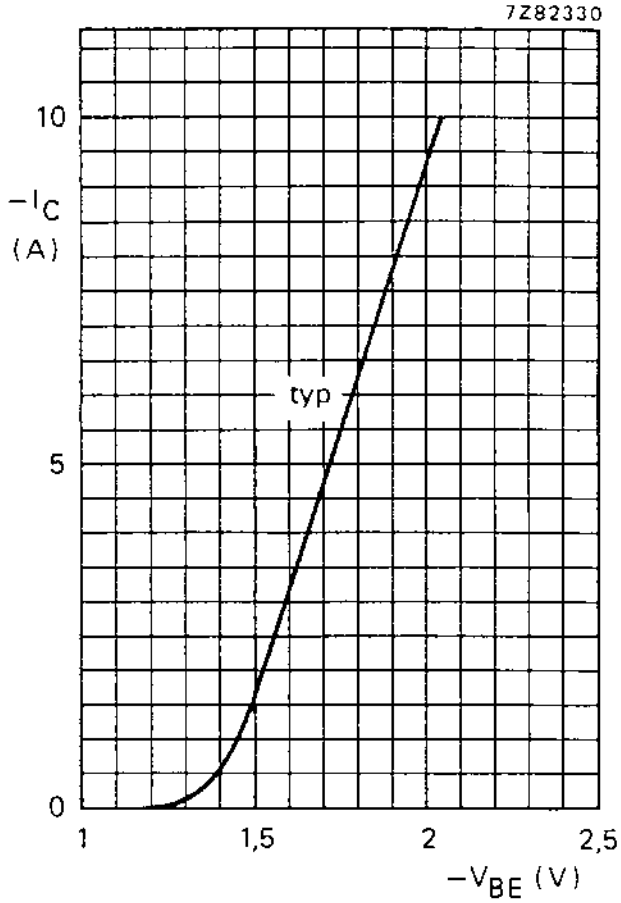



Fig. 7 $-V_{CE}$ = 3 V; $T_{amb}$ = 25 °C.

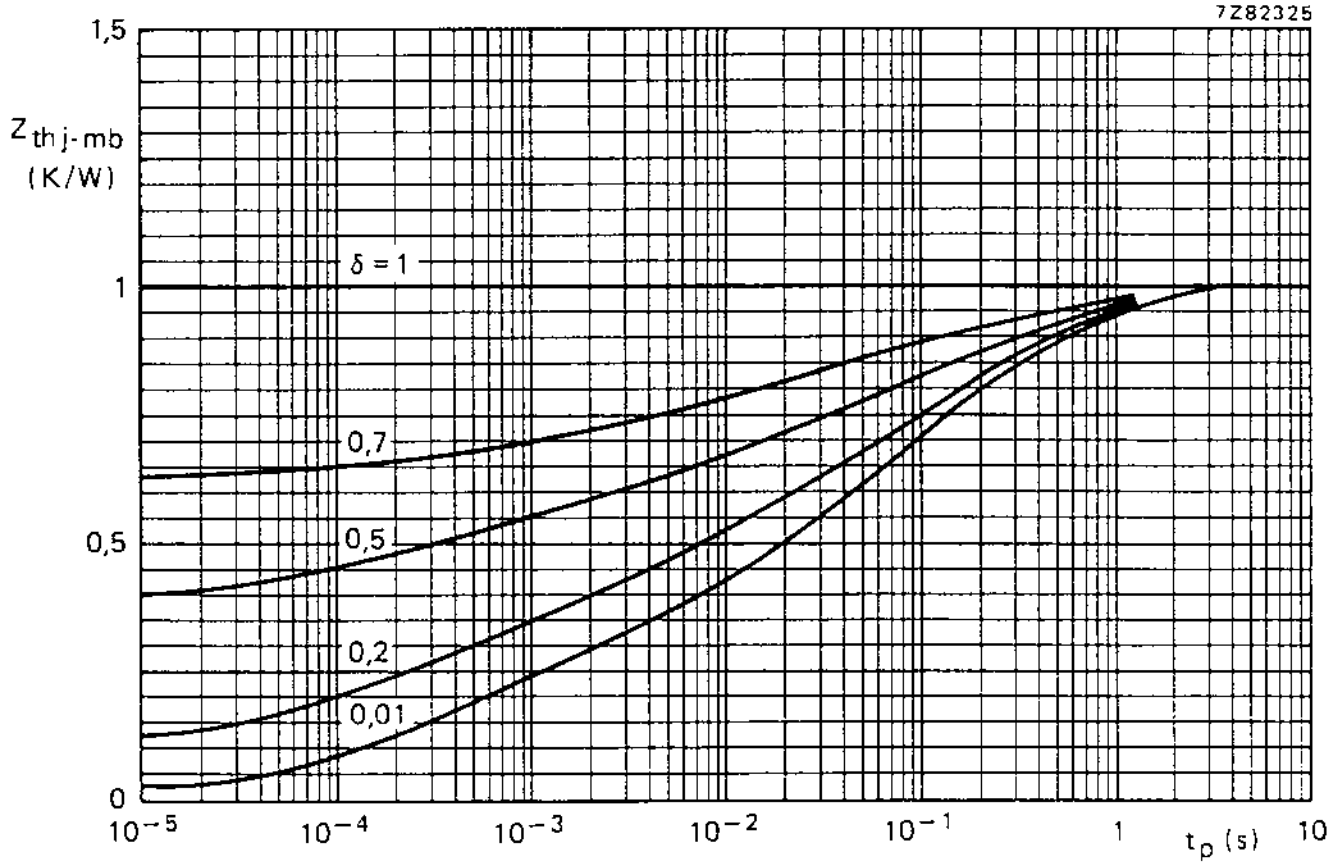



Fig. 8 Pulse power rating chart.

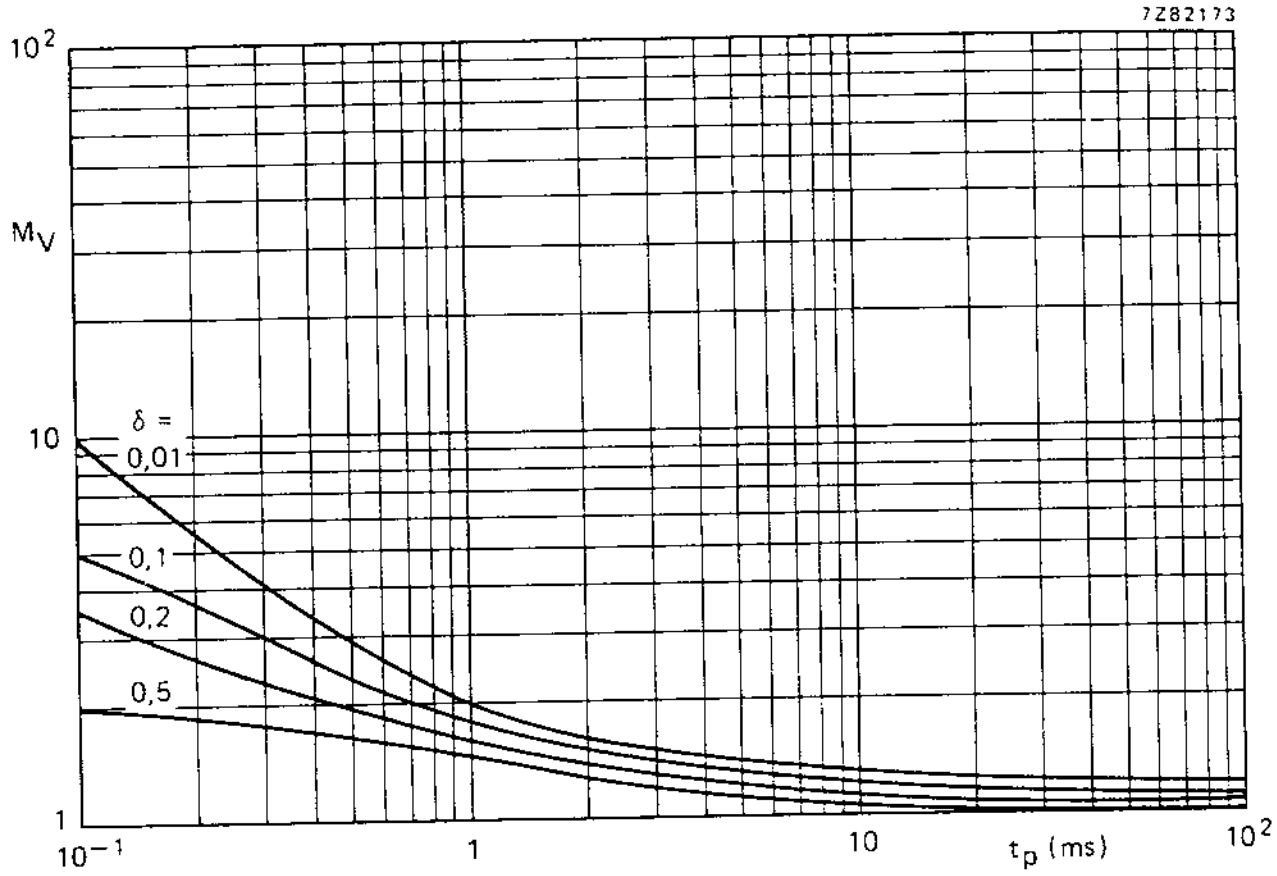



Fig. 9 S.B. voltage multiplying factor at the $I_{Cmax}$ level.

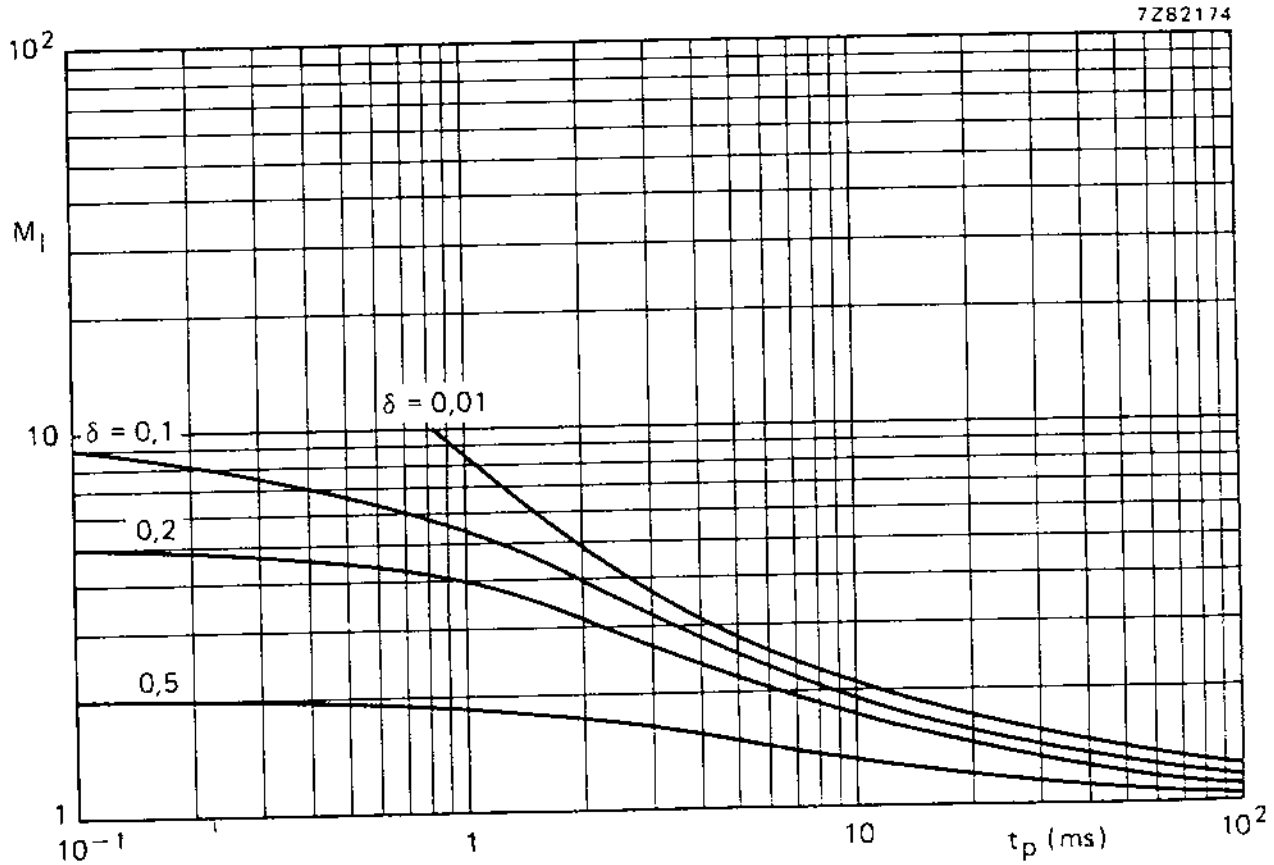



Fig. 10 S.B. current multiplying factor at the $V_{CEOmax}$ level.

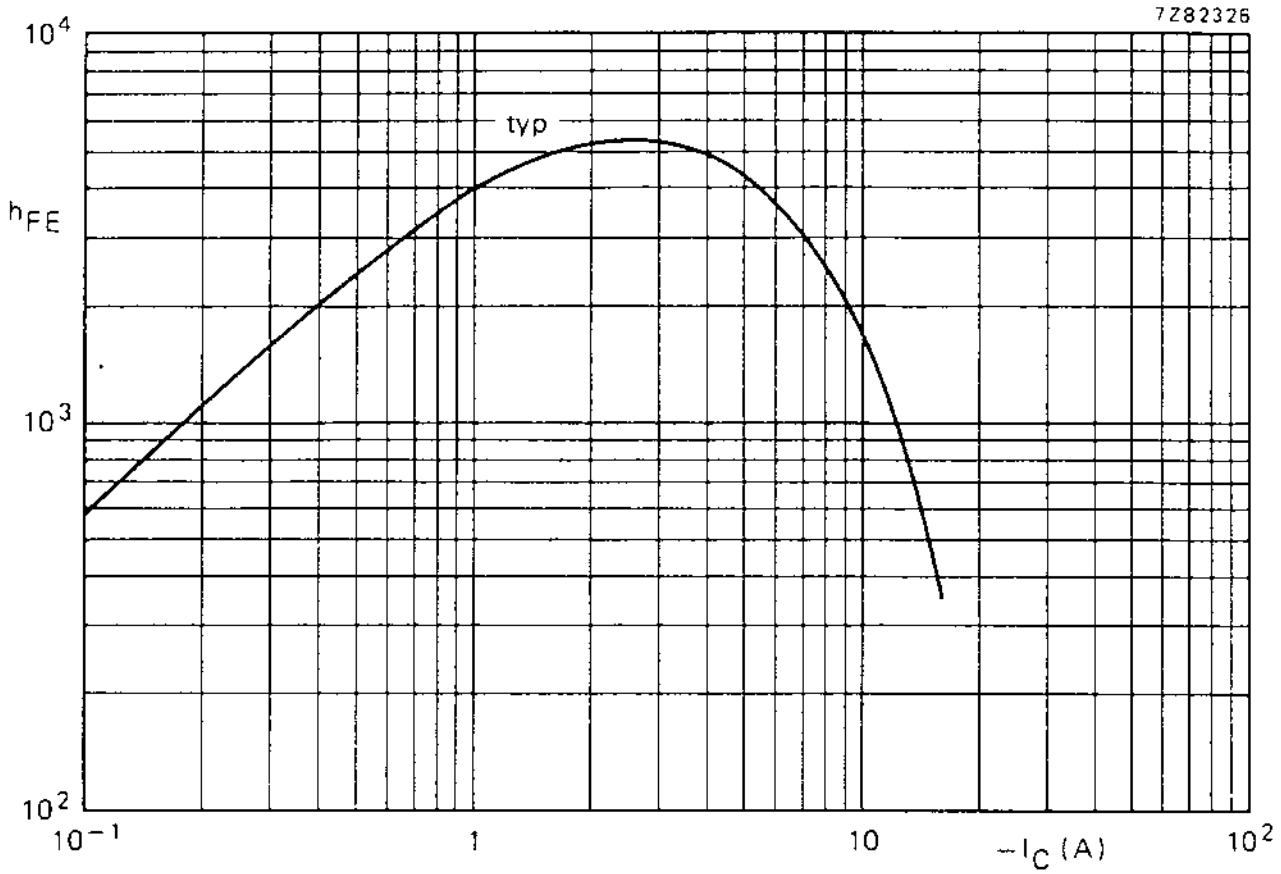



Fig. 11 D.C. current gain. $-V_{CE} = 3$ V; $T_j = 25$ °C.

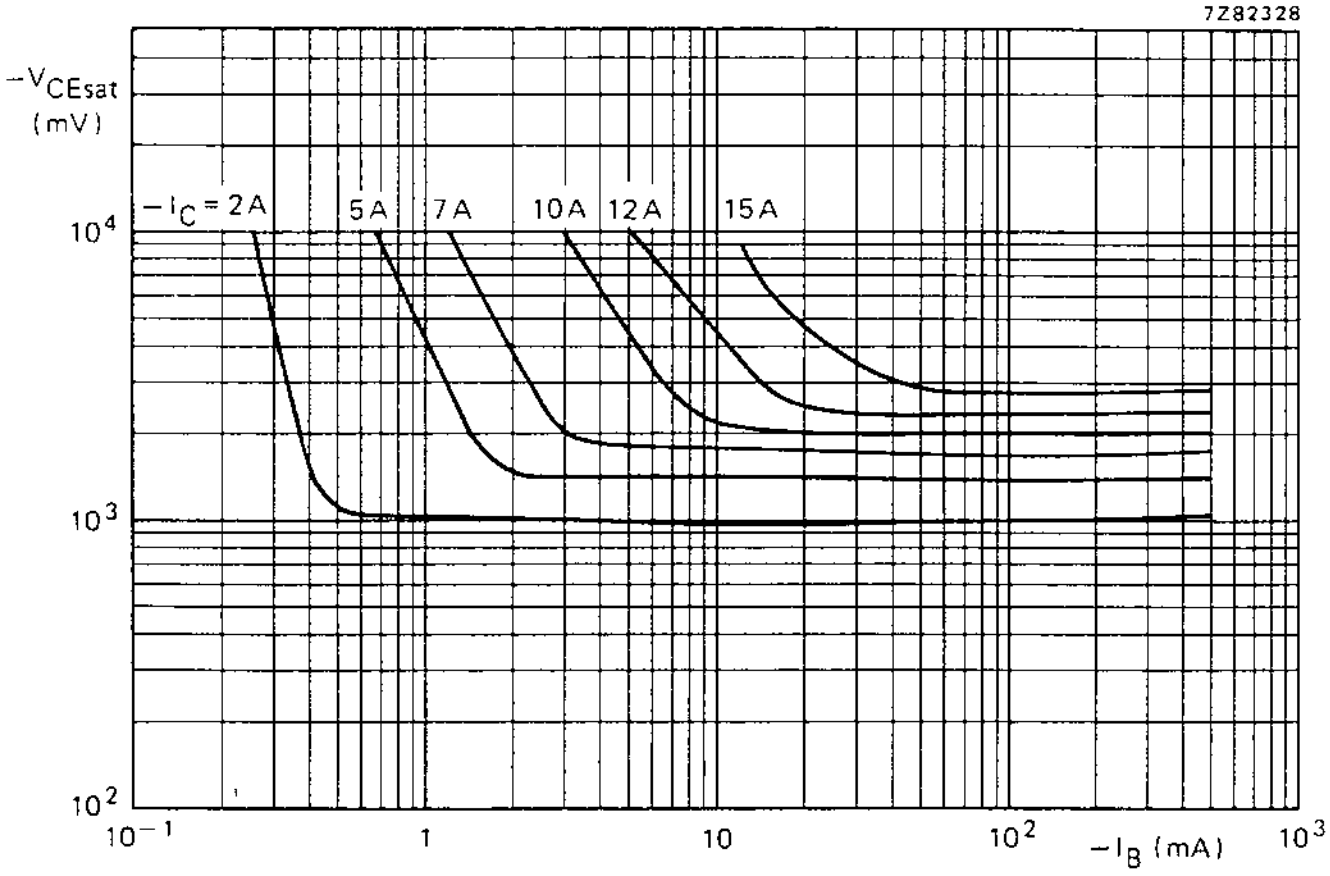



Fig. 12 Typical collector-emitter saturation voltages.