SILICON EPITAXIAL-BASE POWER TRANSISTORS

PNP transistors in a plastic envelope. With their npn complements BD201, BD203, and BDX77, they are primarily intended for use in hi-fi equipment delivering an output of 15 to 25 W into a 4 Ω or 8 Ω load.

QUICK REFERENCE DATA

			BD202	BD204	BDX78	
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	45	60	80	V
Collector current (DC)	$-I_C$	max.		8		A
Total power dissipation up to T_{mb} = 25 °C	P_{tot}	max.		60		W
Cut-off frequency $-I_C$ = 0.3 A; $-V_{CE}$ = 3 V	f_{hfe}	min.		25		kHz

MECHANICAL DATA

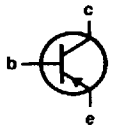
Dimensions in mm

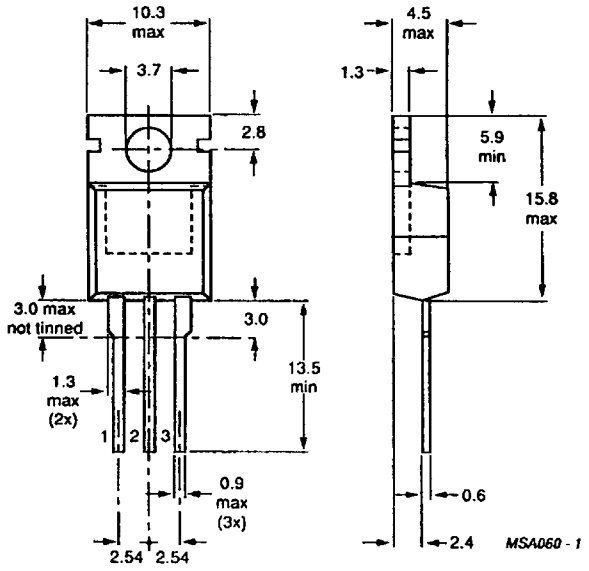
Fig.1 TO-220.

Collector connected to mounting base.

Pinning

1 = base
2 = collector
3 = emitter





See also chapters Mounting Instructions and Accessories.

RATINGS

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

			BD202	BD204	BDX78	
Collector-base voltage (open emitter)	$-V_{CBO}$	max.	60	60	100	V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	45	60	80	V
Emitter-base voltage (open collector)	$-V_{EBO}$	max.	5	5	5	V
Collector current (DC)	$-I_C$	max.		8		A
Collector current (peak value; t_p max. 10 ms)	$-I_{CM}$	max.		12		A
Collector current (non-repetitive peak value, t_p max. 2 ms)	$-I_{CSM}$	max.		25		A
Base current (DC)	$-I_B$	max.		3		A
Total power dissipation up to T_{mb} = 25 °C	P_{tot}	max.		60		W
Storage temperature range	T_{stg}			−65 to + 150		°C
Junction temperature	T_j	max.		150		°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	2.08	K/W
From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	70	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current					
I_B = 0; $-V_{CE}$ = 30 V		$-I_{CEO}$	max.	0.2	mA
I_E = 0; $-V_{CB}$ = 40 V; T_j = 150 °C		$-I_{CBO}$	max.	1	mA
Emitter cut-off current					
I_C = 0; $-V_{EB}$ = 5 V		$-I_{EBO}$	max.	0.5	mA
Collector-emitter breakdown voltage					
I_C = 0.2 A; I_B = 0	BD202	$-V_{(BR)CEO}$	min.	45	V
I_C = 0.2 A; I_B = 0	BD204	$-V_{(BR)CEO}$	min.	60	V
I_C = 0.2 A; I_B = 0	BDX78	$-V_{(BR)CEO}$	min.	80	V
Base-emitter voltage (note 1)					
$-I_C$ = 3 A; $-V_{CE}$ = 2 V		$-V_{BE}$	max.	1.5	V
Knee voltage (note 1)					
$-I_C$ = 3 A; $-I_B$ = value at which $-I_C$ = 3.3 A at $-V_{CE}$ = 2 V		$-V_{CEK}$	typ.	1	V
Saturation voltages (note 1)					
$-I_C$ = 3 A; $-I_B$ = 0.3 A		$-V_{CEsat}$	max.	1	V
$-I_C$ = 6 A; $-I_B$ = 0.6 A		$-V_{CEsat}$	max.	1.5	V
		$-V_{BEsat}$	max.	2	V
DC current gain (note 1)					
$-I_C$ = 3 A; $-V_{CE}$ = 2 V	BD202	h_{FE}	min.	30	
$-I_C$ = 2 A; $-V_{CE}$ = 2 V	BD204	h_{FE}	min.	30	
$-I_C$ = 1 A; $-V_{CE}$ = 2 V	BDX78	h_{FE}	min.	30	

Note

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

Cut-off frequency $-I_C = 0.3$ A; $-V_{CE} = 3$ V	f_{hfe}	min. 25 kHz
Transition frequency at f = 1 MHz $-I_C = 0.3$ A; $-V_{CE} = 3$ V	f_T	min. 7 MHz
DC current gain ratio of matched complementary pairs $-I_C = 1$ A; $-V_{CE} = 2$ V	h_{FE1}/h_{FE2}	max. 2.5
Forward bias second breakdown collector current $V_{CE} = 40$ V; $t_p = 0.1$ s	I_{SB}	min. 1.5 A
Switching times $-I_{Con} = 2$ A; $-I_{Bon} = I_{Boff} = 0.2$ A		
turn-on time	t_{on}	max. 1 μs
turn-off time	t_{off}	max. 2 μs

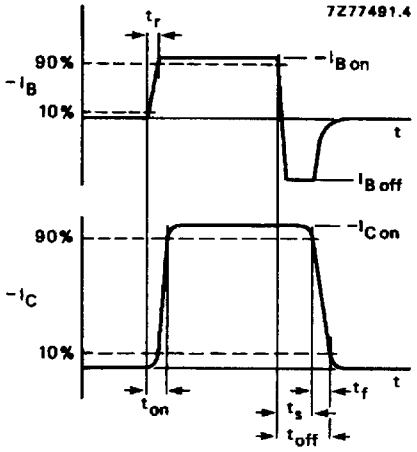


Fig. 2 Switching times waveforms.

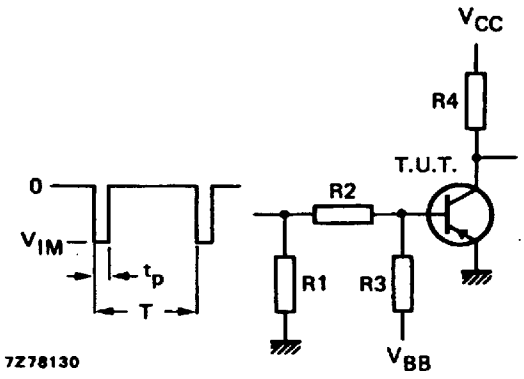
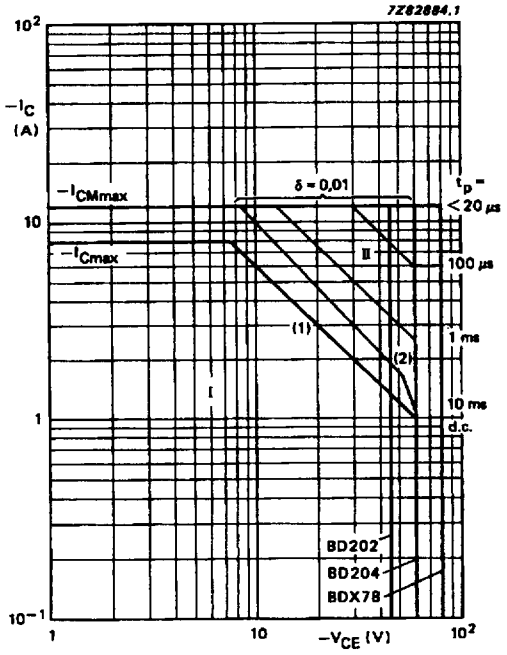


Fig. 3 Switching times test circuit.

$-V_{IM}$	= 15 V	R3	= 22 Ω
$-V_{CC}$	= 20 V	R4	= 10 Ω
$+V_{BB}$	= 4 V	$t_r = t_f$	= 15 ns
R1	= 56 Ω	t_p	= 10 μs
R2	= 33 Ω	T	= 500 μs



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

Fig.4 Safe operating area; T_{mb} = 25 °C.

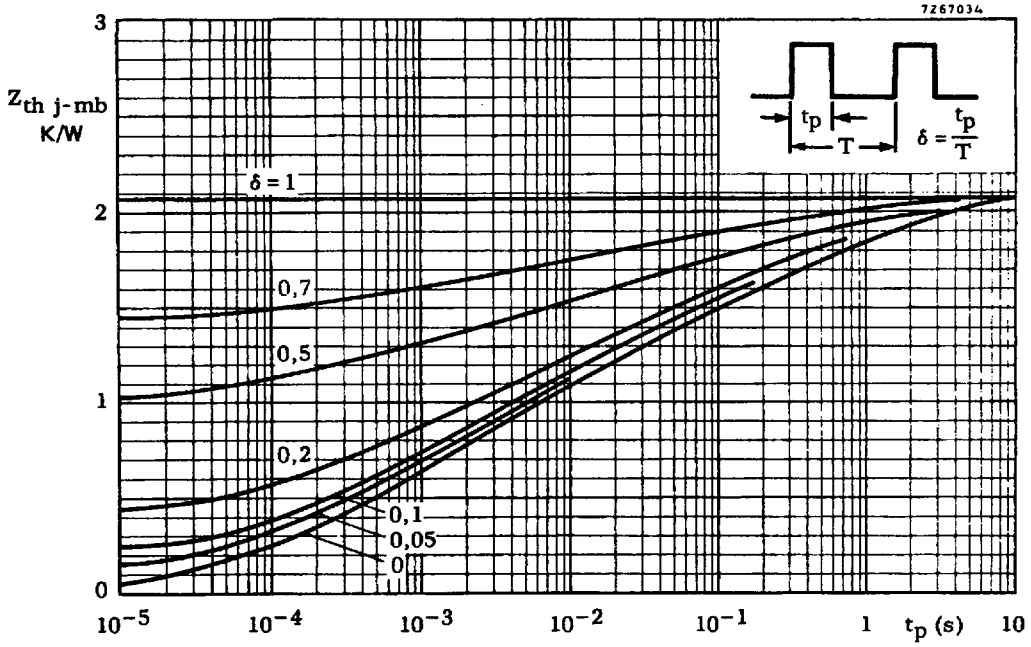


Fig. 5 Pulse power rating chart.

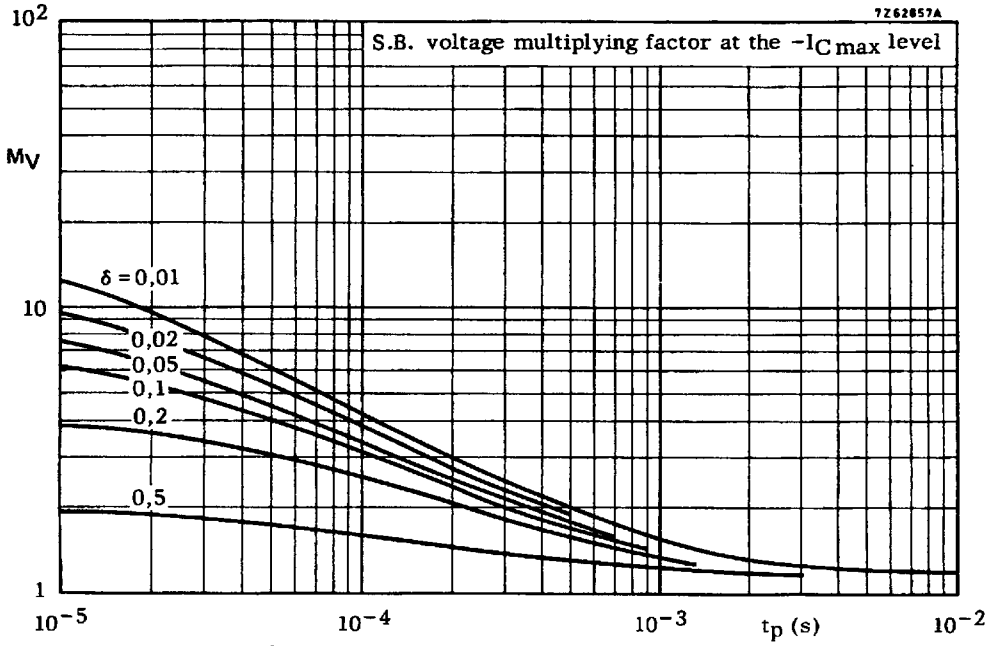


Fig. 6 S.B. voltage multiplying factor at the $-I_{Cmax}$ level.

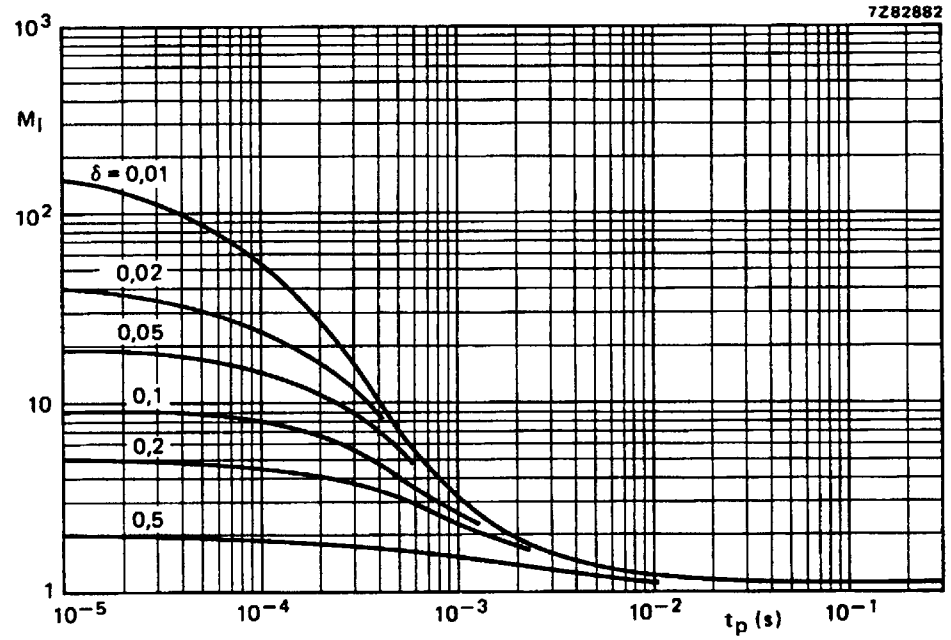


Fig. 7 S.B. current multiplying factor at the $-V_{CEOmax}$ level.

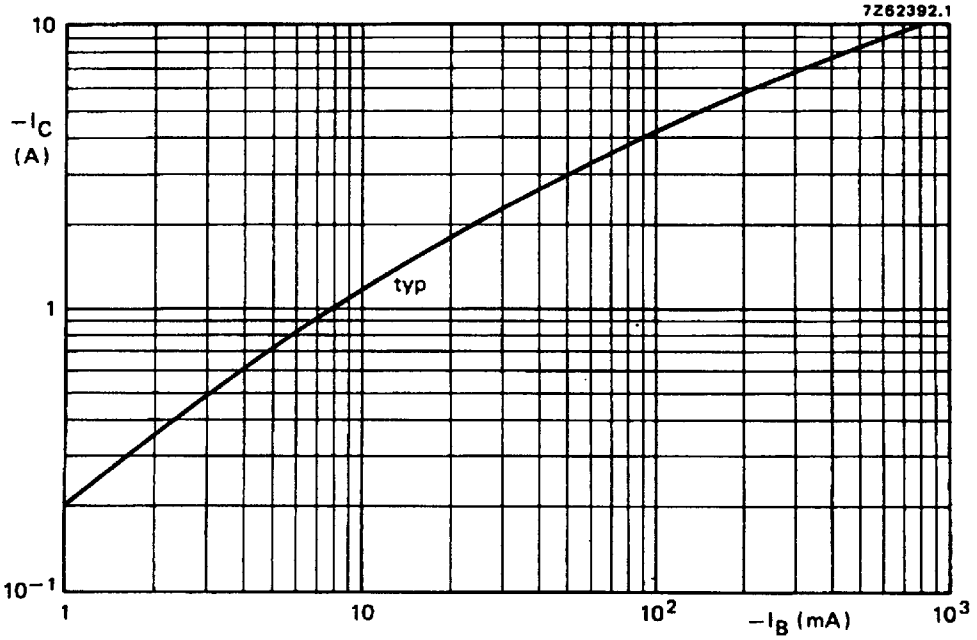


Fig. 8 Typical collector current as a function of base current. $-V_{CE} = 2$ V; $T_j = 25$ °C.

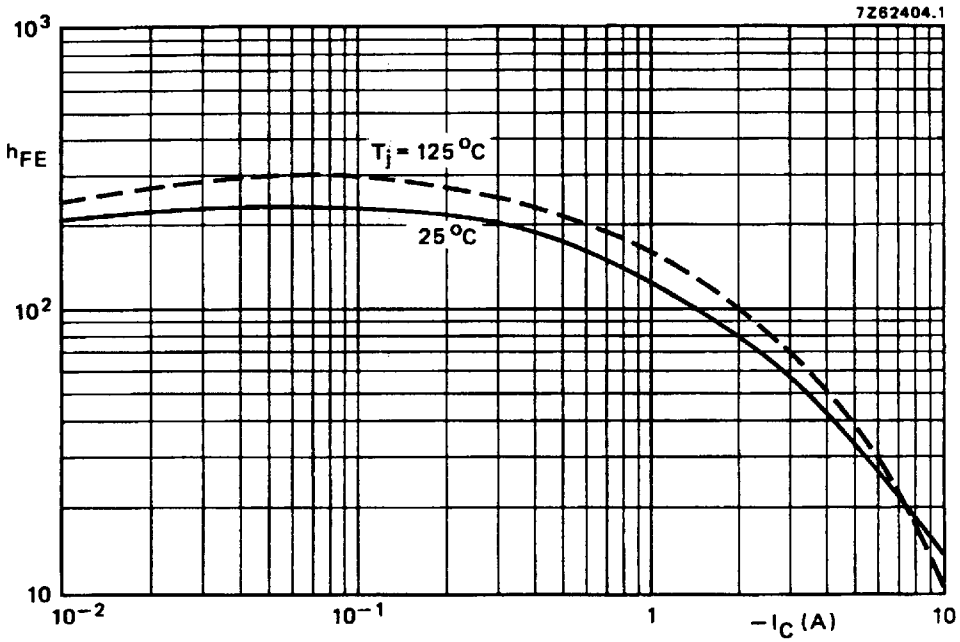


Fig. 9 Typical forward current transfer ratio at $-V_{CE}$ = 2 V.

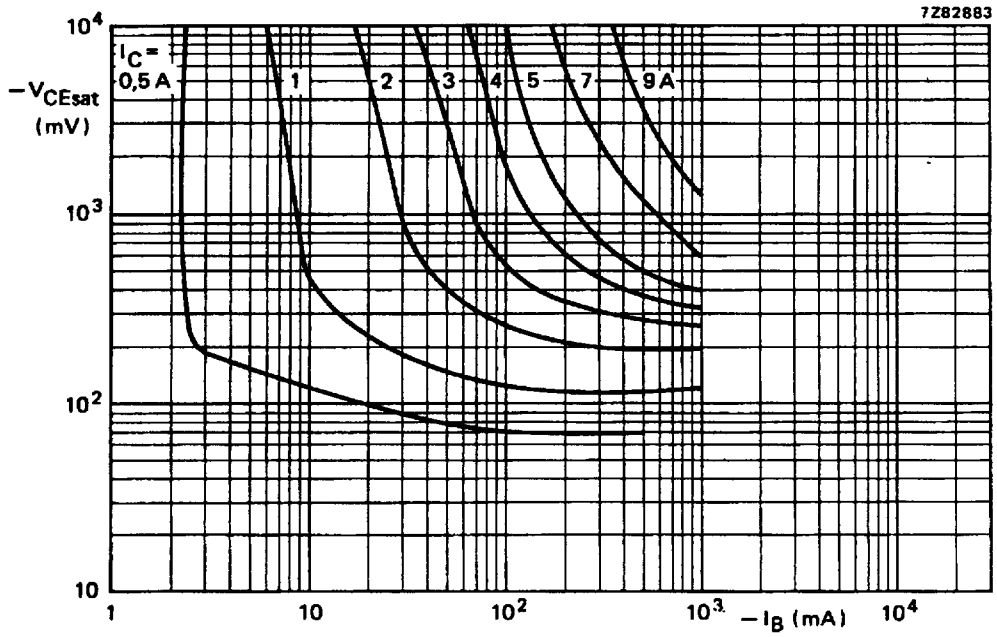


Fig. 10 Typical collector-emitter saturation voltage. T_j = 25 °C.

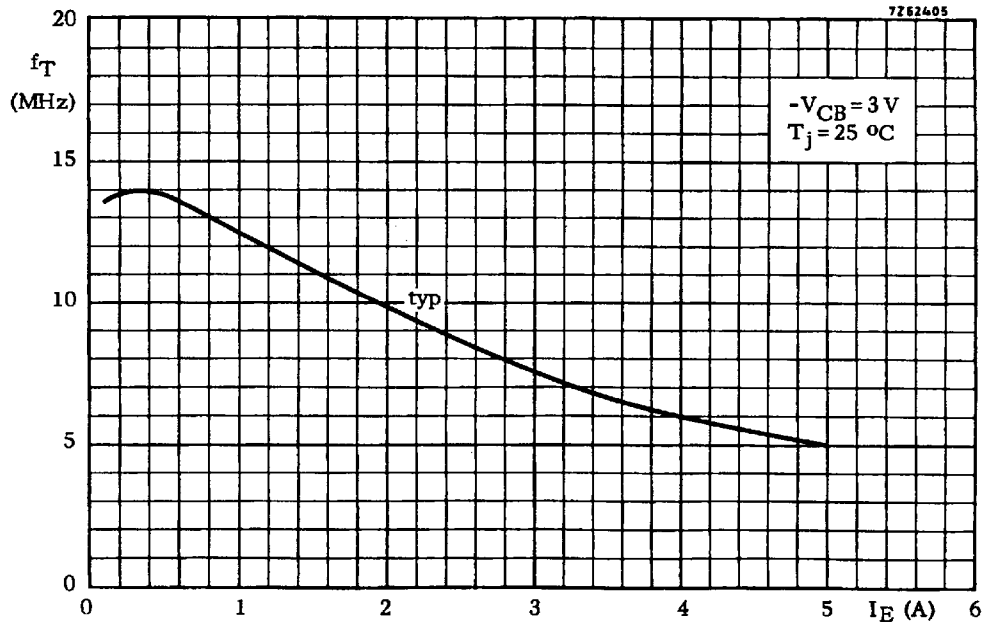


Fig. 11 Typical transition frequency.

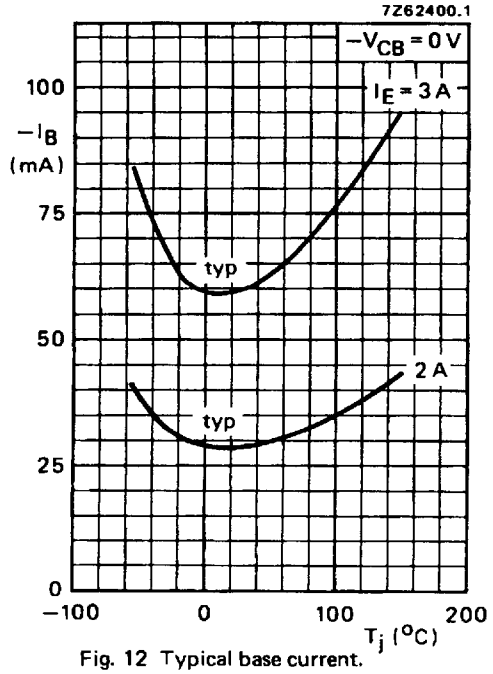


Fig. 12 Typical base current.

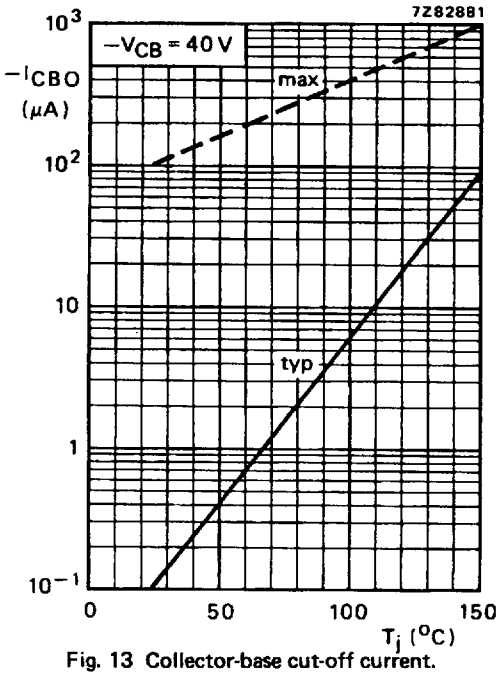


Fig. 13 Collector-base cut-off current.

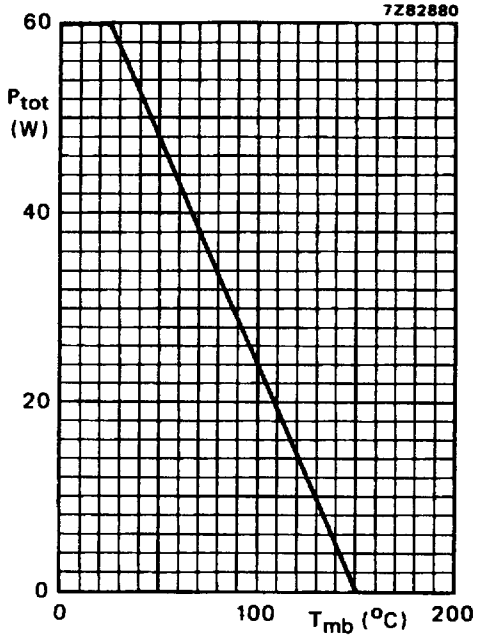


Fig. 14 Total power dissipation.

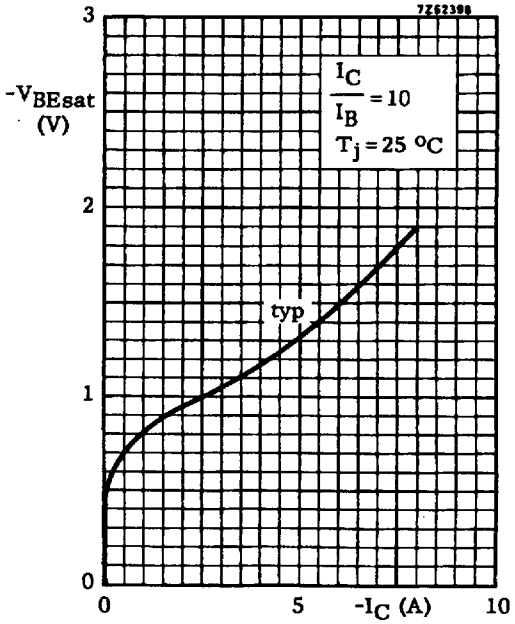


Fig. 15 Base-emitter saturation voltage.

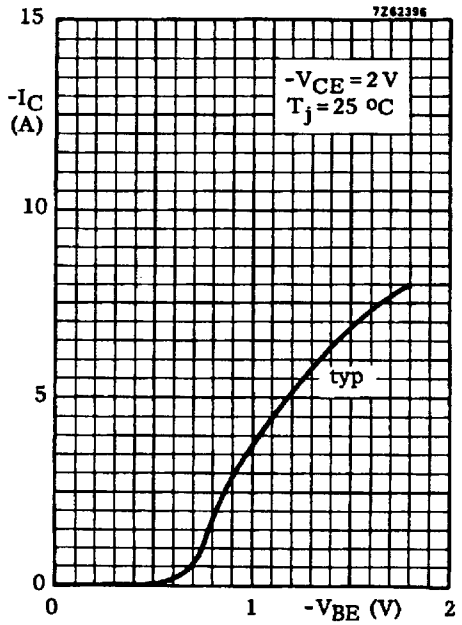


Fig. 16 Typical collector current.