

SILICON EPITAXIAL-BASE POWER TRANSISTORS

NPN transistors in a plastic envelope. With their PNP complements BD202, BD204 and BDX78 they are primarily intended for use in hi-fi equipment delivering an output of 15 to 25 W into a $4\ \Omega$ or $8\ \Omega$ load.

QUICK REFERENCE DATA

			BD201	BD203	BDX77	
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 $T_{mb} = 25\ ^\circ\text{C}$	P_{tot}	max.		60		W
Cut-off frequency $I_C = 0.3\ \text{A}; V_{CE} = 3\ \text{V}$	f_{hfe}	min.		25		kHz

MECHANICAL DATA

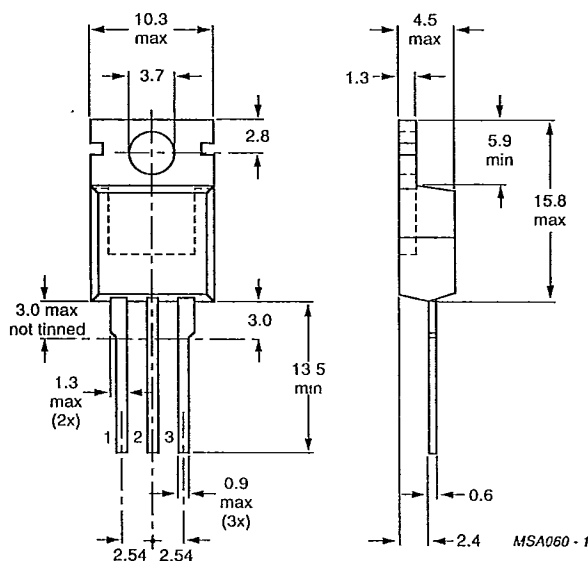
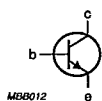
Dimensions in mm

Fig.1 TO-220.

Collector connected
to mounting base.

Pinning

- 1 = base
- 2 = collector
- 3 = emitter



See also chapters Mounting Instructions and Accessories.

BD201
BD203
BDX77

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RATINGS

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

T-33-11

			BD201	BD203	BDX77	
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 $T_{mb} = 25\text{ }^{\circ}\text{C}$	P_{tot}	max.		60		W
Storage temperature range	T_{stg}		-65 to + 150			$^{\circ}\text{C}$
Junction temperature	T_j	max.		150		$^{\circ}\text{C}$

THERMAL RESISTANCE

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

CHARACTERISTICS

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

Collector cut-off current $I_B = 0$; $V_{CE} = 30\text{ V}$	I_{CEO}	max.	0.2	mA
$I_E = 0$; $V_{CB} = 40\text{ V}$; $T_j = 150\text{ }^{\circ}\text{C}$	I_{CBO}	max.	1	mA
Emitter cut-off current $I_C = 0$; $V_{EB} = 5\text{ V}$	I_{EBO}	max.	0.5	mA
Base-emitter voltage * $I_C = 3\text{ A}$; $V_{CE} = 2\text{ V}$	V_{BE}	max.	1.5	V
Knee voltage* $I_C = 3\text{ A}$; $I_B =$ value for which $I_C = 3.3\text{ A}$ at $V_{CE} = 2\text{ V}$	V_{CEK}	typ.	1	V
Saturation voltage* $I_C = 3\text{ A}$; $I_B = 0.3\text{ A}$	V_{CEsat}	max.	1	V
$I_C = 6\text{ A}$; $I_B = 0.6\text{ A}$	V_{CEsat}	max.	1.5	V
	V_{BEsat}	max.	2	V
DC current gain* $I_C = 3\text{ A}$; $V_{CE} = 2\text{ V}$	h_{FE}	min.	30	
$I_C = 2\text{ A}$; $V_{CE} = 2\text{ V}$	h_{FE}	min.	30	
$I_C = 1\text{ A}$; $V_{CE} = 2\text{ V}$	h_{FE}	min.	30	
Cut-off frequency $I_C = 0.3\text{ A}$; $V_{CE} = 3\text{ V}$	f_{hfe}	min.	25	kHz

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

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Transition frequency at $f = 1$ MHz $I_C = 0.3$ A; $V_{CE} = 3$ V f_T min. 7 MHz

DC current gain 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; $T_{amb} = 25$ °C $I_{(SB)}$ min. 1.5 A

Switching times

 $I_{Con} = 2$ A; $I_{Bon} = -I_{Boff} = 0.2$ A

turn-on time

 t_{on} max. 1 μ s

turn-off time

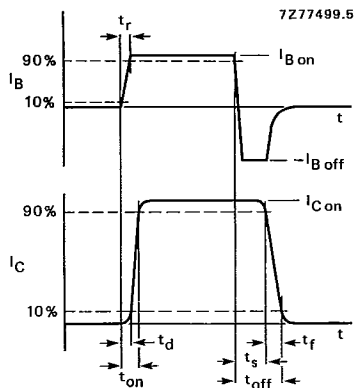
 t_{off} max. 4 μ s

Fig.2 Switching waveforms.

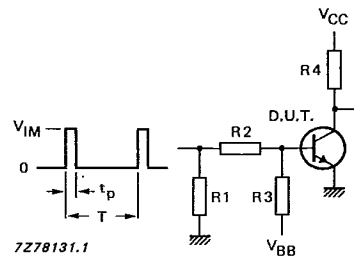


Fig.3 Switching times test circuit.

 $V_{IM} = 15$ V $R3 = 22 \Omega$ $V_{CC} = 20$ V $R4 = 10 \Omega$ $V_{BB} = -4$ V $t_r = t_f \leq 15$ ns $R1 = -$ $t_p = 20 \mu$ s $R2 = 33 \Omega$ $T = 500 \mu$ s

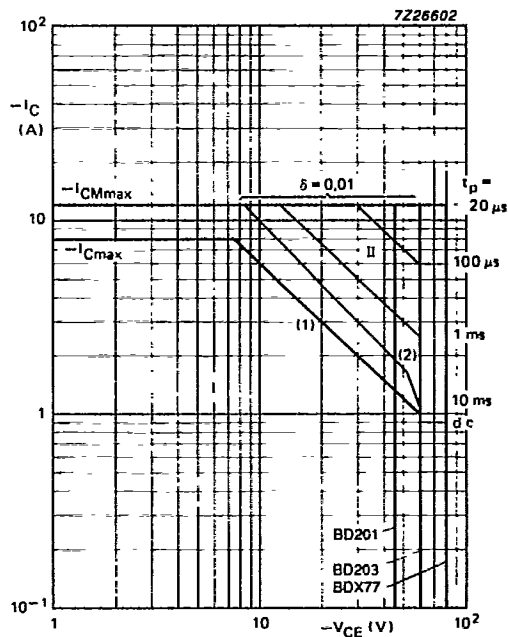


Fig.4 Safe Operating Area; $T_{mb} \leq 25^{\circ}\text{C}$.

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

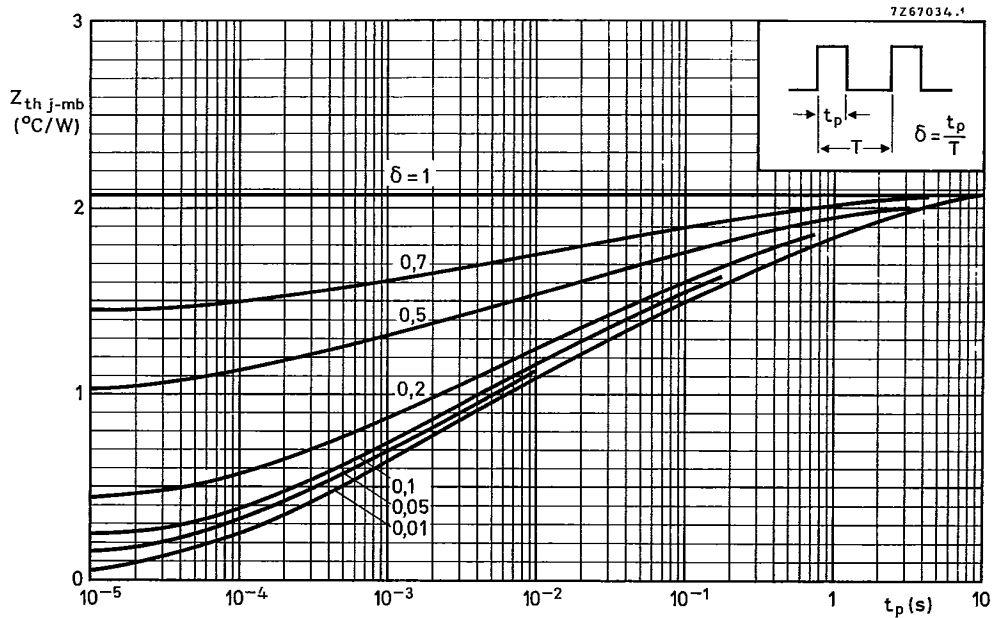
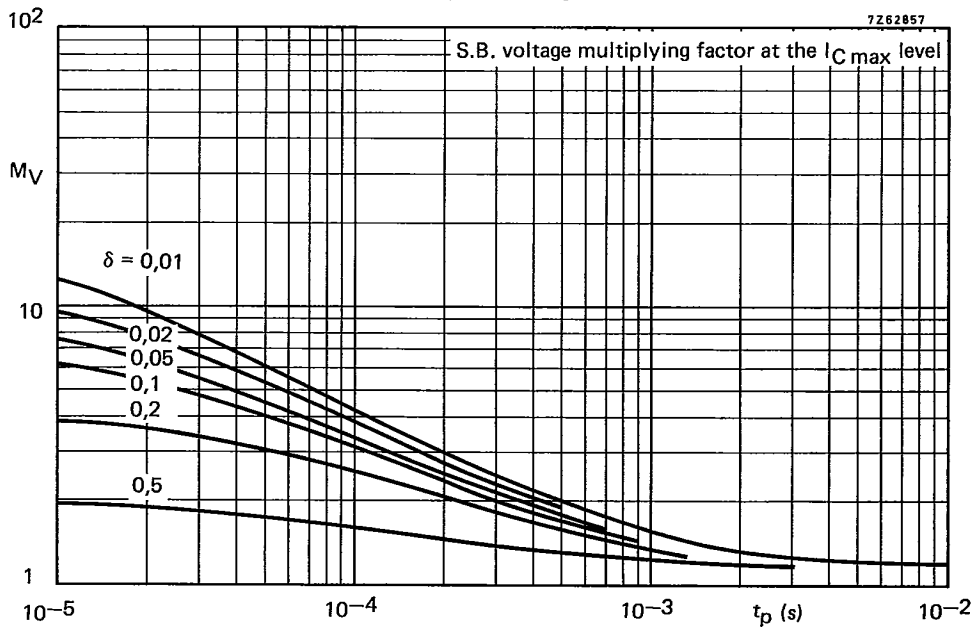


Fig.5 Pulse power rating chart.

Fig.6 S.B. voltage multiplying factor at the $I_{C\ max}$ level.

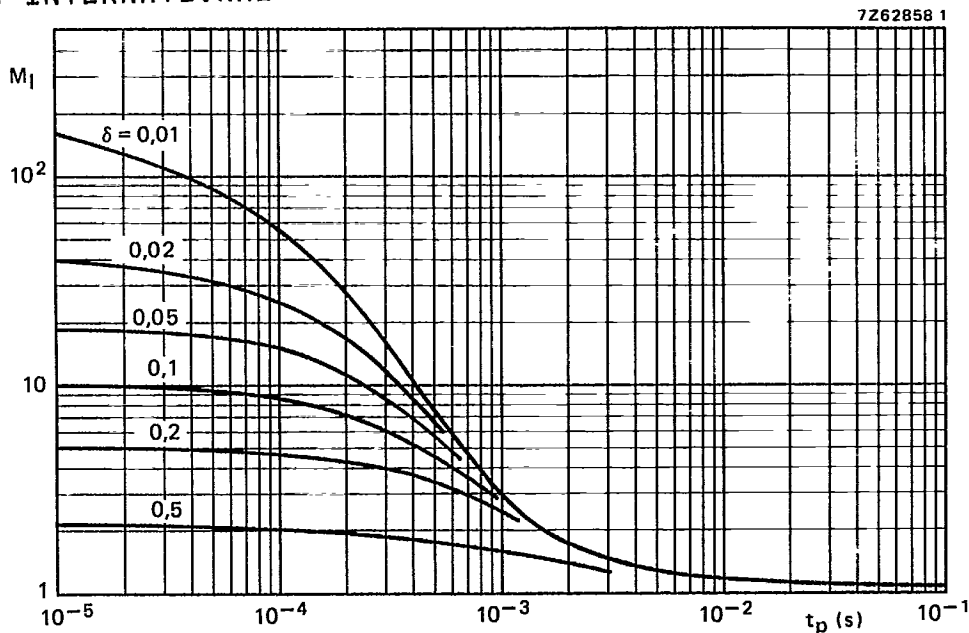


Fig.7 S.B. current multiplying factor at the V_{CE0max} level.

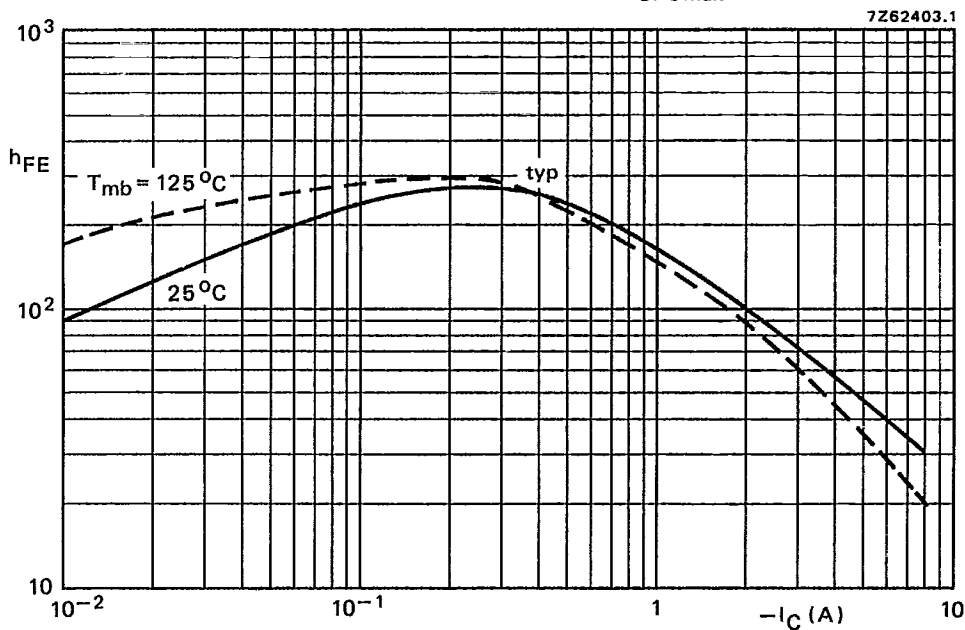


Fig.8 DC current gain. $V_{CE} = 2$ V.

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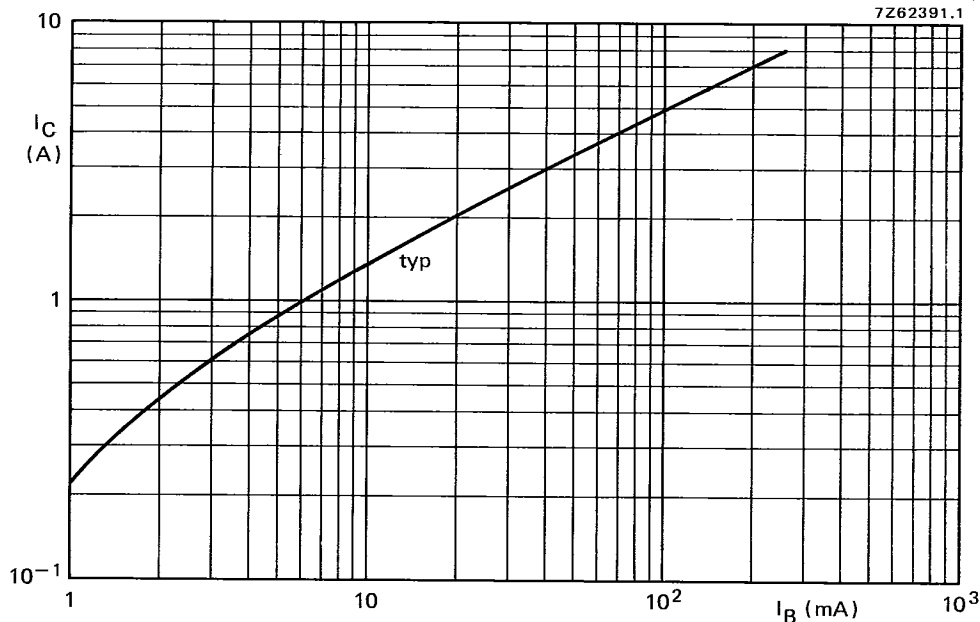
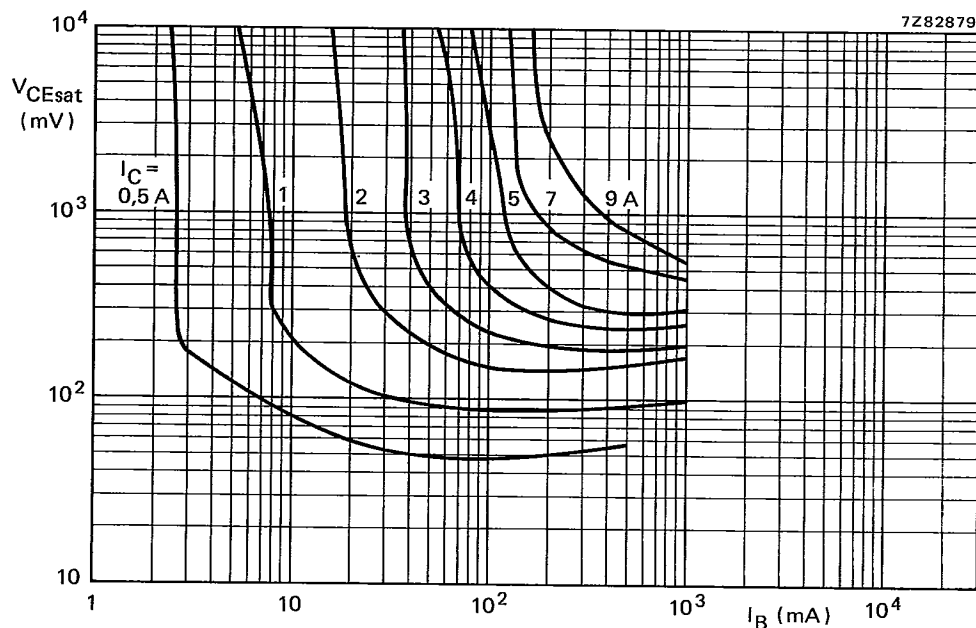
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Fig.9 Collector current as a function of base current. $V_{CE} = 2$ V; $T_j = 25$ °C.Fig.10 Typical collector-emitter saturation voltage. $T_j = 25$ °C.

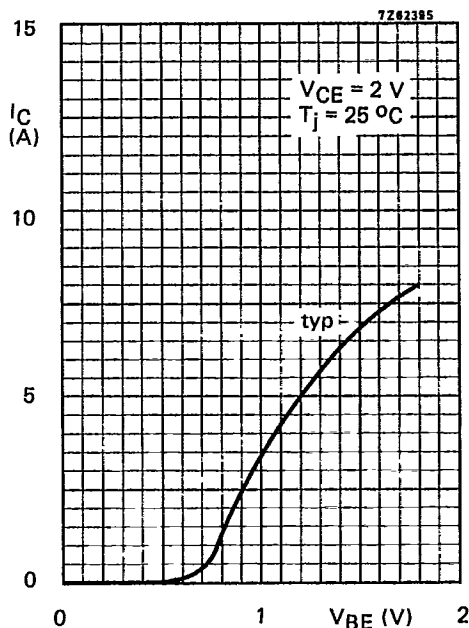


Fig.11.

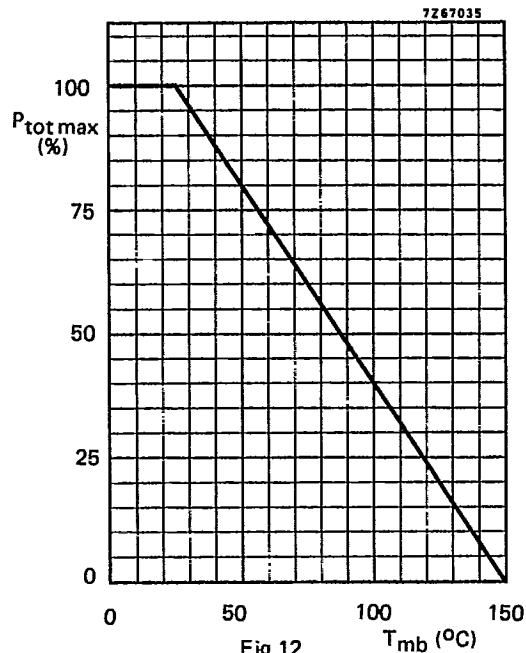


Fig.12.

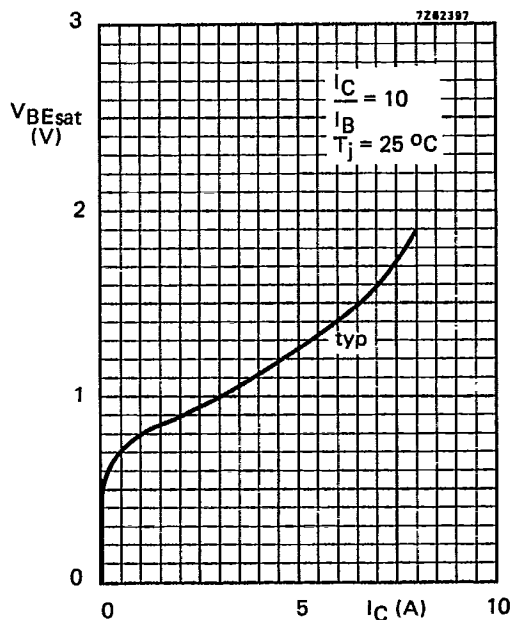


Fig.13.

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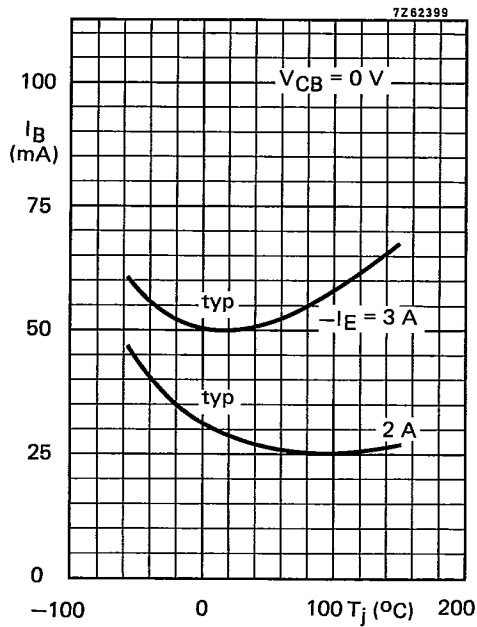


Fig.14.

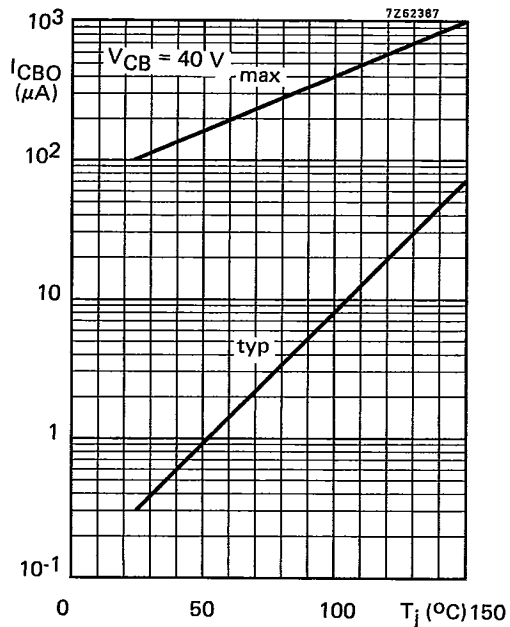


Fig.15.

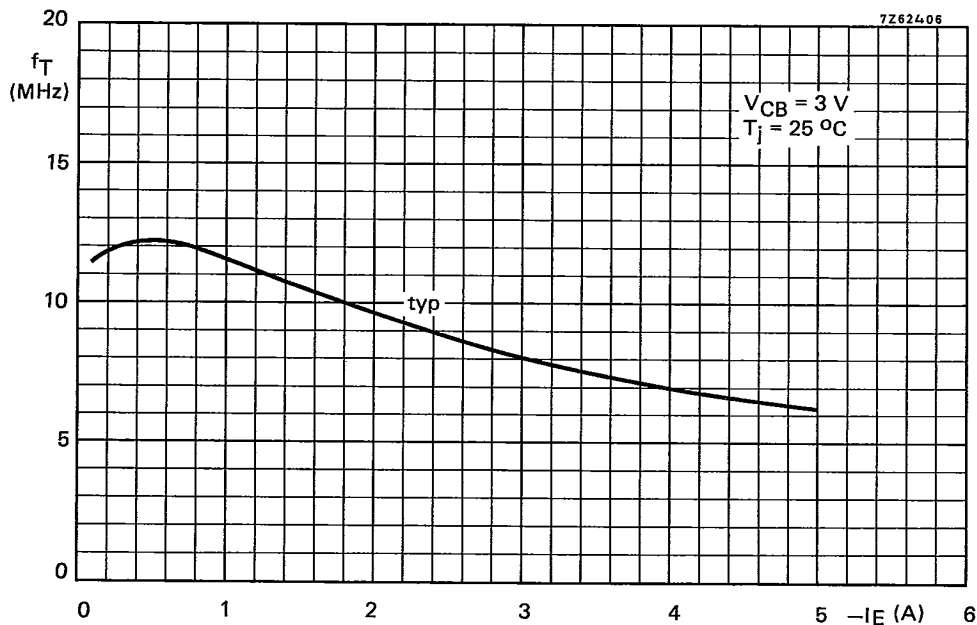


Fig.16.