SILICON PLANAR EPITAXIAL TRANSISTORS

N-P-N transistors in TO-39 metal envelopes with the collector connected to the case. These transistors are intended for general industrial applications.

QUICK REFERENCE DATA

			BSX45	BSX46	BSX47	
Collector-emitter voltage (open base)	V_{CEO}	max.	40	60	80	V
Collector current (d.c.)	I_C	max.		1		A
Total power dissipation up to T_{case} = 25 °C	P_{tot}	max.		6,25		W
Junction temperature	T_j	max.		200		°C
Transition frequency at f = 20 MHz I_C = 50 mA; V_{CE} = 10 V	f_T	>		50		MHz

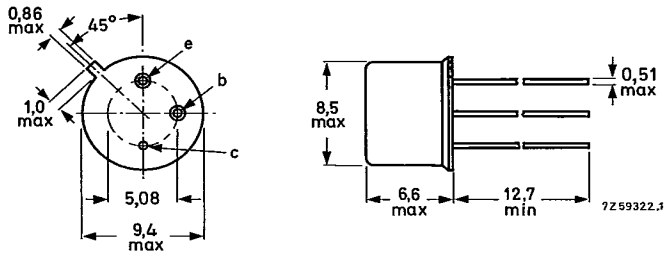
			BSX45–10 BSX46–10 BSX47–10	BSX45–16 BSX46–16
D.C. current gain I_C = 100 mA; V_{CE} = 1 V	h_{FE}	>	63	100
		<	160	250

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-39.

Collector connected to case.



Maximum lead diameter is guaranteed only for 12,7 mm.

Qualification approved to CECC 50 002-273

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RATINGS

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

			BSX45	BSX46	BSX47	
Collector-emitter voltage (open base)	V_{CEO}	max.	40	60	80	V
Collector-emitter voltage (V_{BE} = 0)	V_{CES}	max.	80	100	120	V
Emitter-base voltage (open collector)	V_{EBO}	max.	7	7	7	V
Collector current (d.c.)	I_C	max.		1		A
Base current (d.c.)	I_B	max.		200		mA
Total power dissipation up to T_{case} = 25 °C	P_{tot}	max.		6,25		W
Storage temperature range	T_{stg}			−65 to + 150		°C
Junction temperature	T_j	max.		200		°C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	200	K/W
From junction to case	$R_{th\ j\text{-}c}$	=	28	K/W

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CHARACTERISTICS

T_{amb} = 25 °C unless otherwise specified

			BSX45	BSX46	BSX47	
Collector cut-off currents						
V_{BE} = 0; V_{CE} = 60 V	I_{CES}	<	30	30	–	nA
V_{BE} = 0; V_{CE} = 60 V; T_{amb} = 150 °C	I_{CES}	<	10	10	–	μA
V_{BE} = 0; V_{CE} = 80 V	I_{CES}	<	–	–	30	nA
V_{BE} = 0; V_{CE} = 80 V; T_{amb} = 150 °C	I_{CES}	<	–	–	10	μA
V_{BE} = 0,2 V; V_{CE} = 60 V; T_{amb} = 100 °C	I_{CEX}	<	50	50	–	μA
V_{BE} = 0,2 V; V_{CE} = 80 V; T_{amb} = 100 °C	I_{CEX}	<	–	–	50	μA
Emitter cut-off current						
I_C = 0; V_{EB} = 5 V	I_{EBO}	<	10	10	10	nA
Collector-emitter breakdown voltage						
open base; I_C = 50 mA	$V_{(BR)CEO}$	>	40	60	80	V
V_{BE} = 0; I_C = 100 μA	$V_{(BR)CES}$	>	80	100	120	V
Emitter-base breakdown voltage						
open collector; I_E = 100 μA	$V_{(BR)EBO}$	>	7	7	7	V
Base-emitter voltage						
I_C = 100 mA; V_{CE} = 1 V	V_{BE}	<	1	1	1	V
I_C = 500 mA; V_{CE} = 1 V	V_{BE}	>	0,75	0,75	0,75	V
		<	1,50	1,50	1,50	V
I_C = 1 A; V_{CE} = 1 V	V_{BE}	<	2,00	2,00	2,00	V
Saturation voltage						
I_C = 1000 mA; I_B = 100 mA	V_{CEsat}	<	1,0	1,0	–	V
I_C = 500 mA; I_B = 25 mA	V_{CEsat}	<	–	–	0,9	V
Transition frequency at f = 20 MHz						
I_C = 50 mA; V_{CE} = 10 V	f_T	>	50	50	50	MHz
Collector capacitance at f = 1 MHz						
I_E = I_e = 0; V_{CB} = 10 V	C_c	<	25	20	15	pF
Emitter capacitance at f = 1 MHz						
I_C = I_c = 0; V_{EB} = 0,5 V	C_e	<	80	80	80	pF
Noise figure at f = 1 kHz						
I_C = 100 μA; V_{CE} = 10 V						
R_S = 1 kΩ; B = 200 Hz	F	typ.	3,5	3,5	3,5	dB

			BSX45–10 BSX46–10 BSX47–10	BSX45–16 BSX46–16	
D.C. current gain					
I_C = 100 μA; V_{CE} = 1 V	h_{FE}	>	15	25	
		typ.	40	90	
I_C = 100 mA; V_{CE} = 1 V	h_{FE}	>	63	100	
		typ.	100	160	
		<	160	250	
I_C = 500 mA; V_{CE} = 1 V	h_{FE}	>	25	35	
		typ.	40	60	
I_C = 1 A; V_{CE} = 1 V	h_{FE}	typ.	20	30	
Switching times (see Fig. 2)					
I_{Con} = 100 mA; I_{Bon} = $-I_{Boff}$ = 5 mA					
Turn-on time	t_{on}	<		200	ns
Turn-off time	t_{off}	<		850	ns

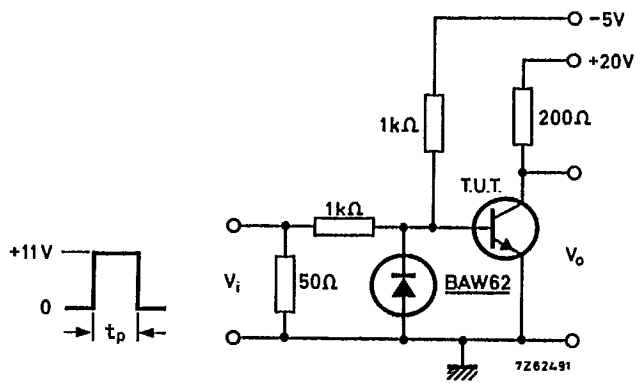

Fig. 2 Switching times test circuit.

Pulse generator:

Pulse duration	t_p	= 10 μs
Rise time	t_r	≤ 15 ns
Fall time	t_f	≤ 15 ns
Source impedance	Z_S	= 50 Ω

Oscilloscope:

Rise time	t_r	≤ 15 ns
Input impedance	Z_I	≥ 100 kΩ

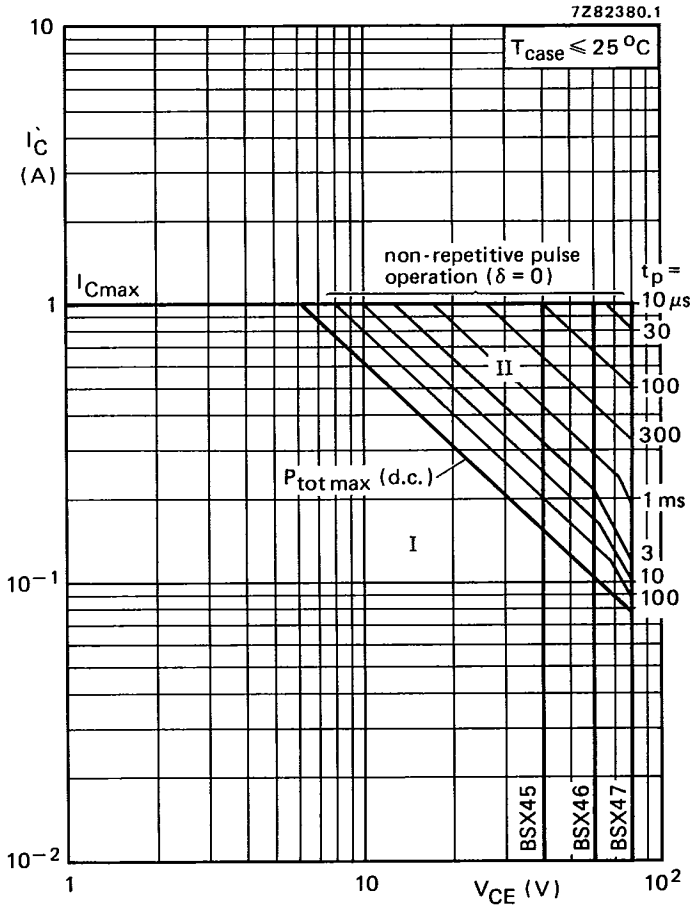

Fig. 3 Safe Operating ARea; $T_{case} \leqslant 25\ ^{o}C$*.

I Region of permissible d.c. operation.
II Permissible extension for non-repetitive pulse operation.

* At case temperatures $> 25\ ^{o}C$ derate constant power portion of boundaries such that:

$$P_{(t_p, o)} = \frac{200 - T_{case}}{Z_{th\,(t_p, o)}}.$$ (For very short forward mode pulse durations, i.e. $t_p < 3\ \mu s$, assume 3 μs values for Z_{th}.)

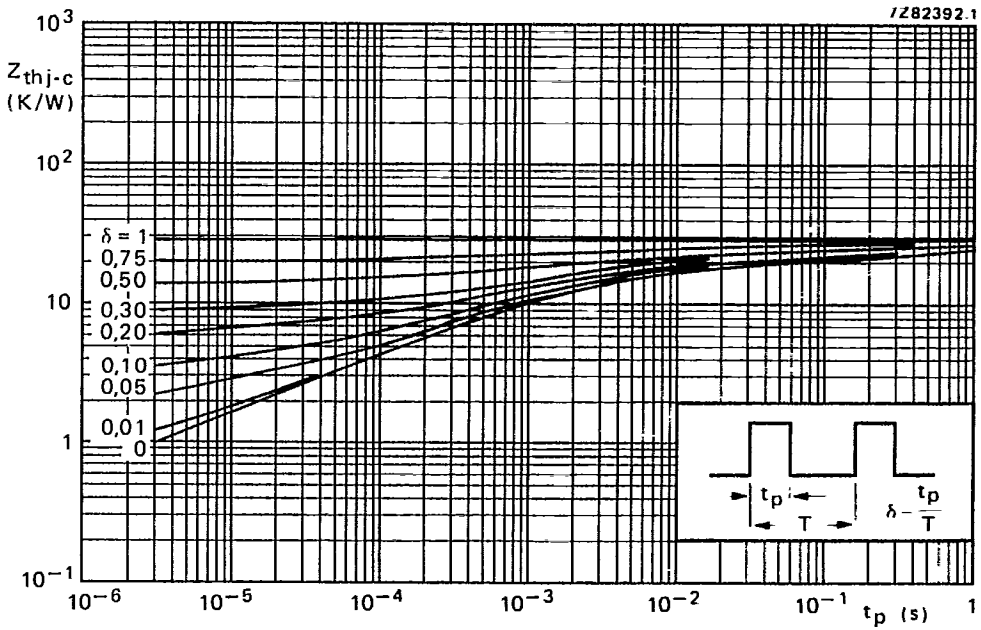

Fig. 4 Thermal impedance versus pulse duration. Stabilization time is 10 s.

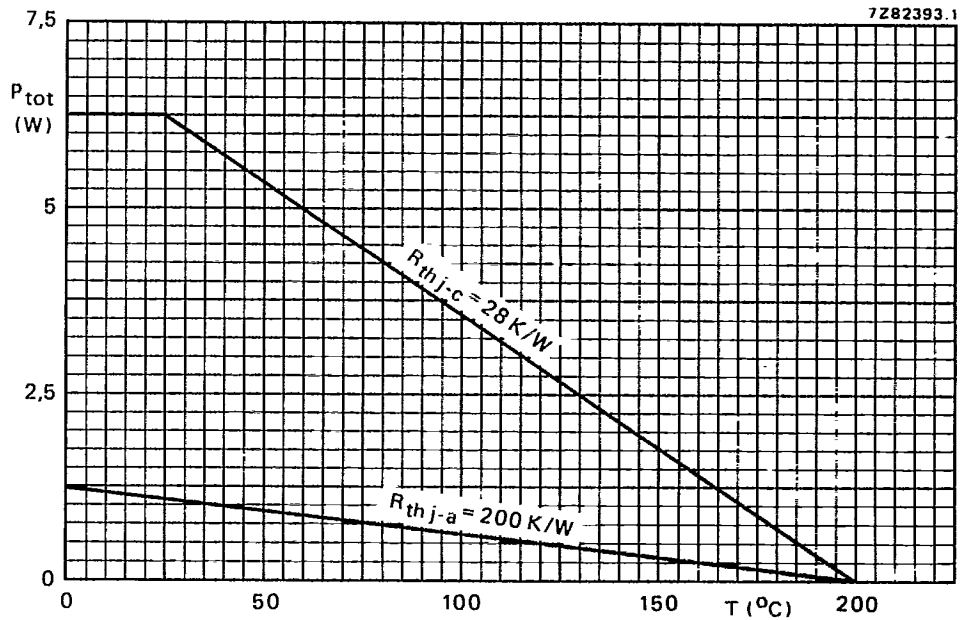

Fig. 5 Maximum permissible power dissipation as a function of temperature.

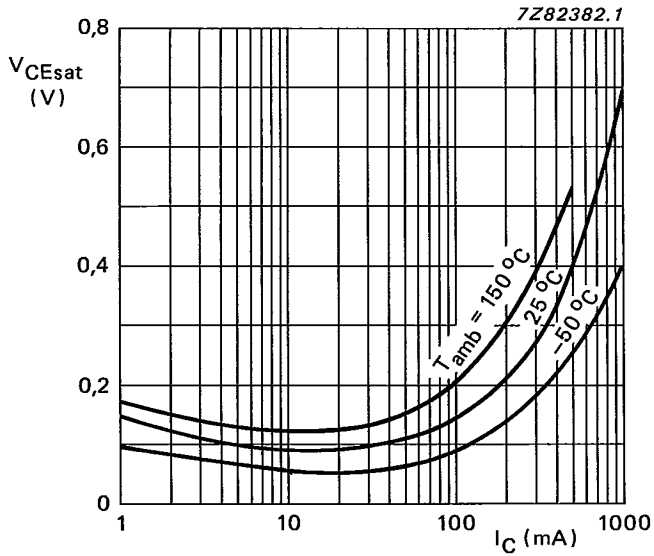

Fig. 6 $I_C/I_B = 10$; —— typical values; at $T_{amb} = 25$ °C.

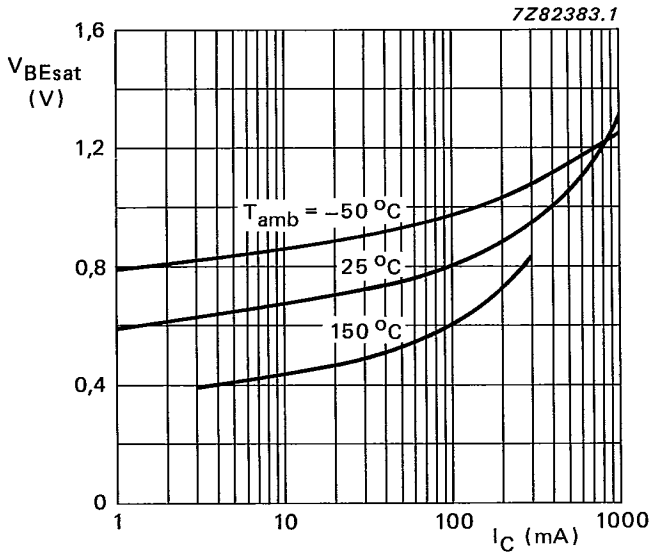

Fig. 7 $I_C/I_B = 10$; —— typical values; at $T_{amb} = 25$ °C.

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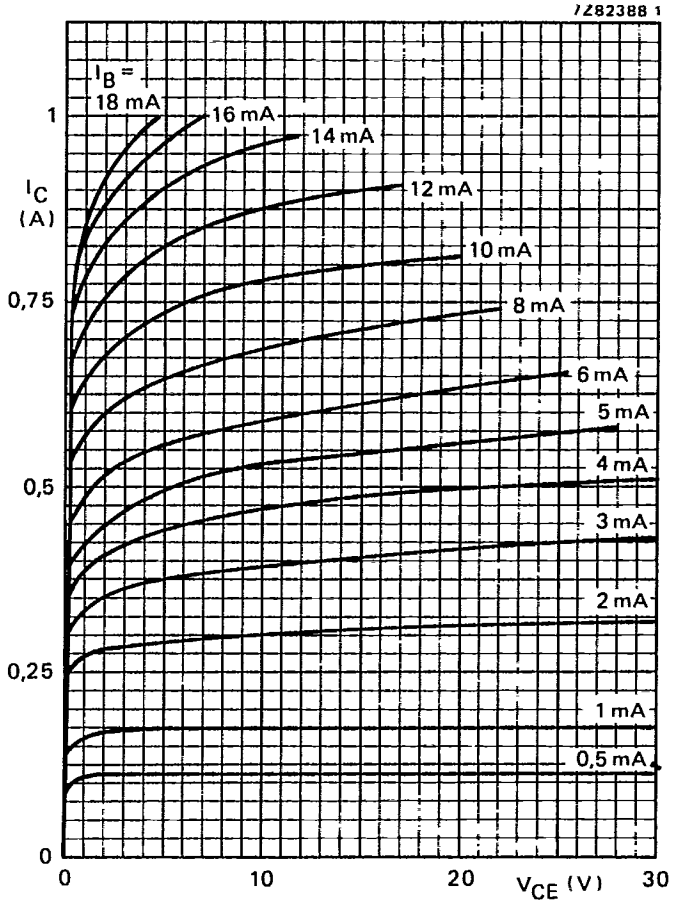

Fig. 8 Typical values; T_j = 25 °C.

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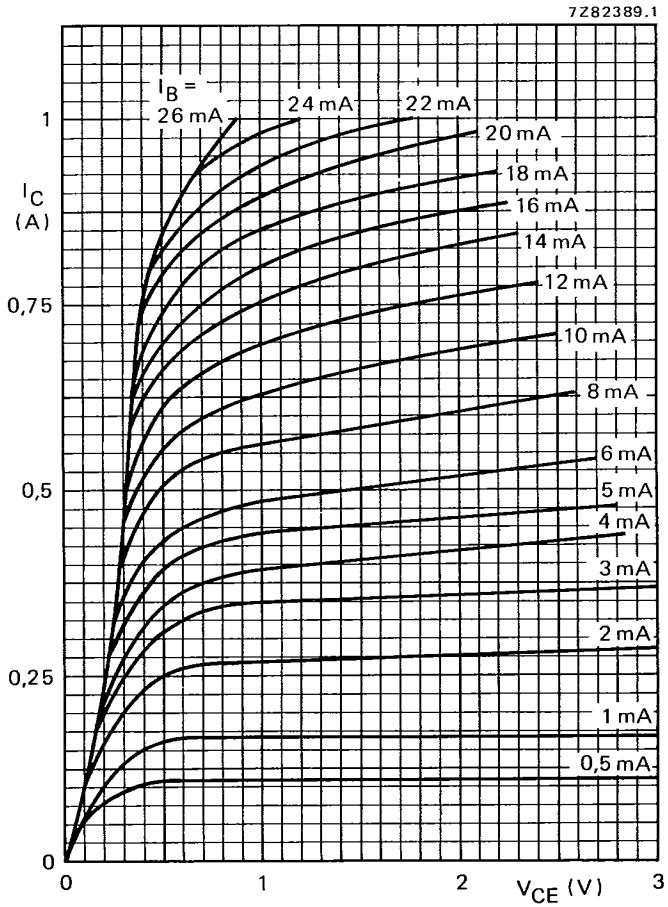

Fig. 9 Typical values; T_j = 25 °C.

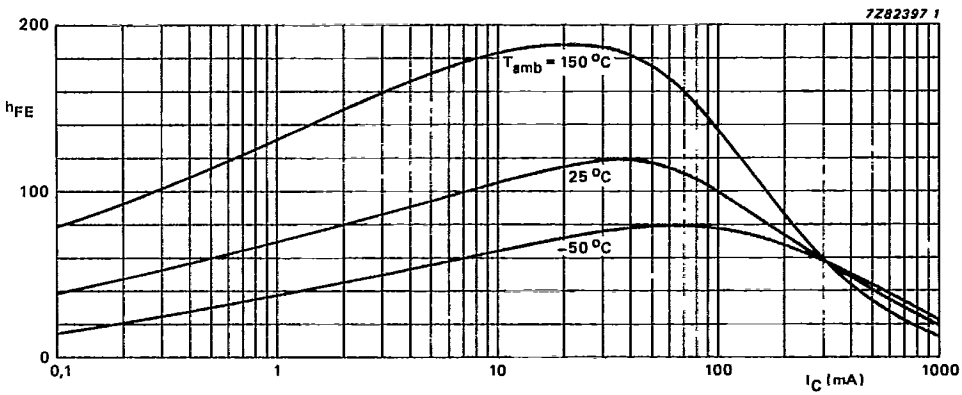

Fig. 10 V_{CE} = 1 V; ——typical values; T_{amb} = 25 °C; Group–10.

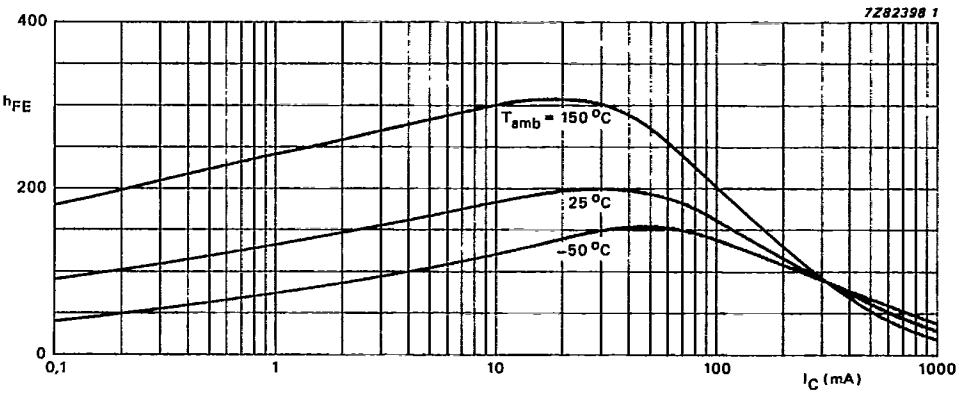

Fig. 11 V_{CE} = 1 V; ——typical values; T_{amb} = 25 °C; Group–16.

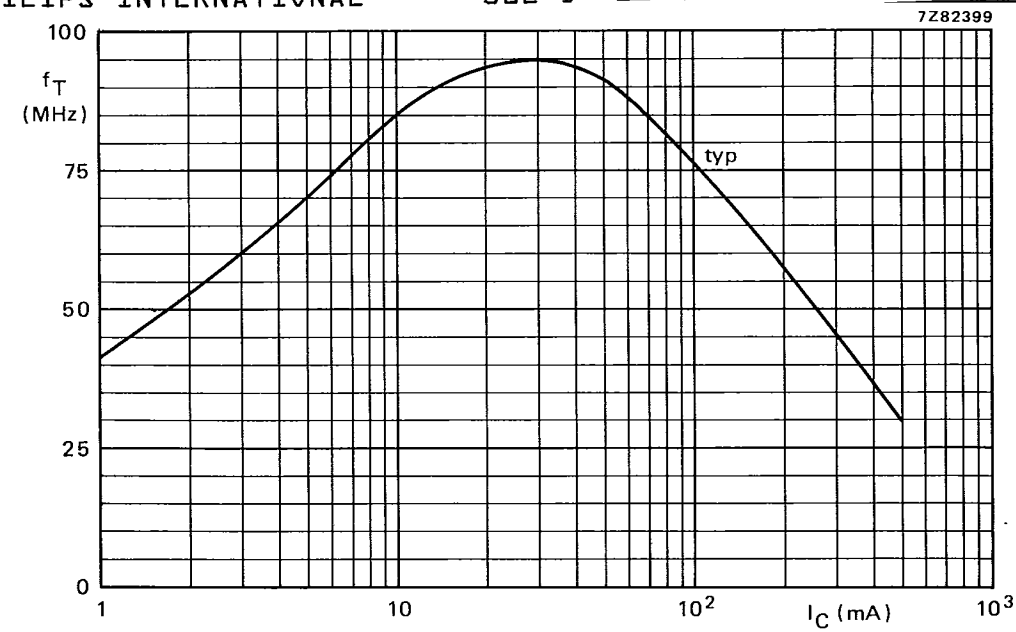

Fig. 12 V_{CE} = 10 V; f = 20 MHz; T_j = 25 °C.

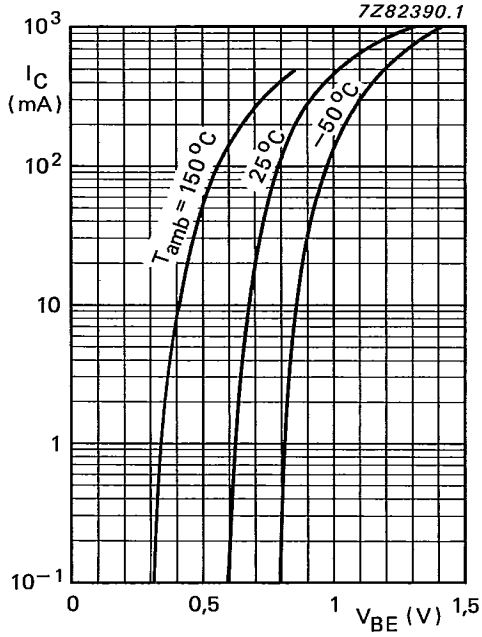

Fig.13 V_{CE} = 1 V; —— typical values; T_{amb} = 25 °C.

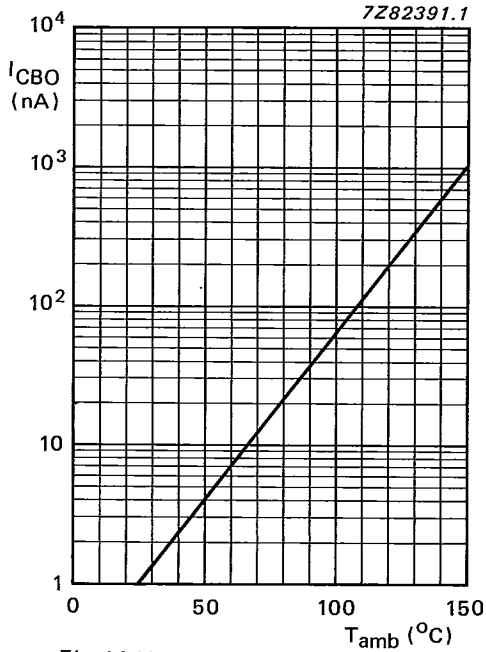

Fig. 14 V_{CBO} = 60 V for **BSX45** and **BSX46**; V_{CBO} = 80 V for **BSX47**; typical values.