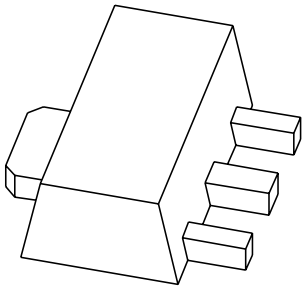
DATA SHEET



BCX51; BCX52; BCX53
PNP medium power transistors

Product specification
Supersedes data of 1997 Jul 04

1999 Apr 19

Philips
Semiconductors

PHILIPS

PNP medium power transistors BCX51; BCX52; BCX53

FEATURES

- High current (max. 1 A)
- Low voltage (max. 80 V).

APPLICATIONS

- Medium power general purposes
- Driver stages of audio amplifiers.

DESCRIPTION

PNP medium power transistor in a SOT89 plastic package. NPN complements: BCX54, BCX55 and BCX56.

MARKING

TYPE NUMBER	MARKING CODE	TYPE NUMBER	MARKING CODE
BCX51	AA	BCX52-16	AM
BCX51-10	AC	BCX53	AH
BCX51-16	AD	BCX53-10	AK
BCX52	AE	BCX53-16	AL
BCX52-10	AG		

PINNING

PIN	DESCRIPTION
1	emitter
2	collector
3	base

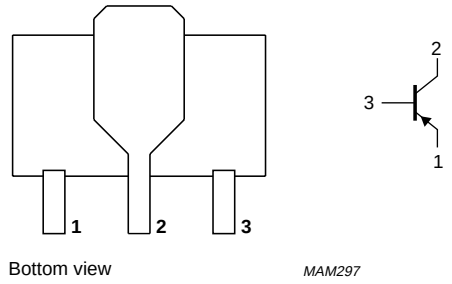


Fig.1 Simplified outline (SOT89) and symbol.

LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter			
	BCX51		–	–45	V
	BCX52		–	–60	V
	BCX53		–	–100	V
V_{CEO}	collector-emitter voltage	open base			
	BCX51		–	–45	V
	BCX52		–	–60	V
	BCX53		–	–80	V
V_{EBO}	emitter-base voltage	open collector	–	–5	V
I_C	collector current (DC)		–	–1	A
I_{CM}	peak collector current		–	–1.5	A
I_{BM}	peak base current		–	–200	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C; note 1	–	1.3	W
T_{stg}	storage temperature		–65	+150	°C
T_j	junction temperature		–	150	°C
T_{amb}	operating ambient temperature		–65	+150	°C

Note

1. Device mounted on a printed-circuit board, single-sided copper, tinplated, mounting pad for collector 6 cm^2. For other mounting conditions, see *"Thermal considerations for SOT89 in the General Part of associated Handbook".*

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j\text{-}a}$	thermal resistance from junction to ambient	note 1	94	K/W
$R_{th\ j\text{-}s}$	thermal resistance from junction to soldering point	note 1	14	K/W

Note

1. Device mounted on a printed-circuit board, single-sided copper, tinplated, mounting pad for collector 6 cm^2. For other mounting conditions, see *"Thermal considerations for SOT89 in the General Part of associated Handbook".*

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{CBO}	collector cut-off current	I_E = 0; V_{CB} = –30 V	–	–	–100	nA
		I_E = 0; V_{CB} = –30 V; T_j = 125 °C	–	–	–10	µA
I_{EBO}	emitter cut-off current	I_C = 0; V_{EB} = –5 V	–	–	–100	nA
h_{FE}	DC current gain	V_{CE} = –2 V; see Fig.2				
		I_C = –5 mA	40	–	–	
		I_C = –150 mA	63	–	250	
		I_C = –500 mA	25	–	–	
	DC current gain	I_C = –150 mA; V_{CE} = –2 V; see Fig.2				
	BCX51-10; BCX52-10; BCX53-10		63	–	160	
	BCX51-16; BCX52-16; BCX53-16		100	–	250	
V_{CEsat}	collector-emitter saturation voltage	I_C = –500 mA; I_B = –50 mA	–	–	–500	mV
V_{BE}	base-emitter voltage	I_C = –500 mA; V_{CE} = –2 V	–	–	–1	V
f_T	transition frequency	I_C = –10 mA; V_{CE} = –5 V; f = 100 MHz	–	50	–	MHz

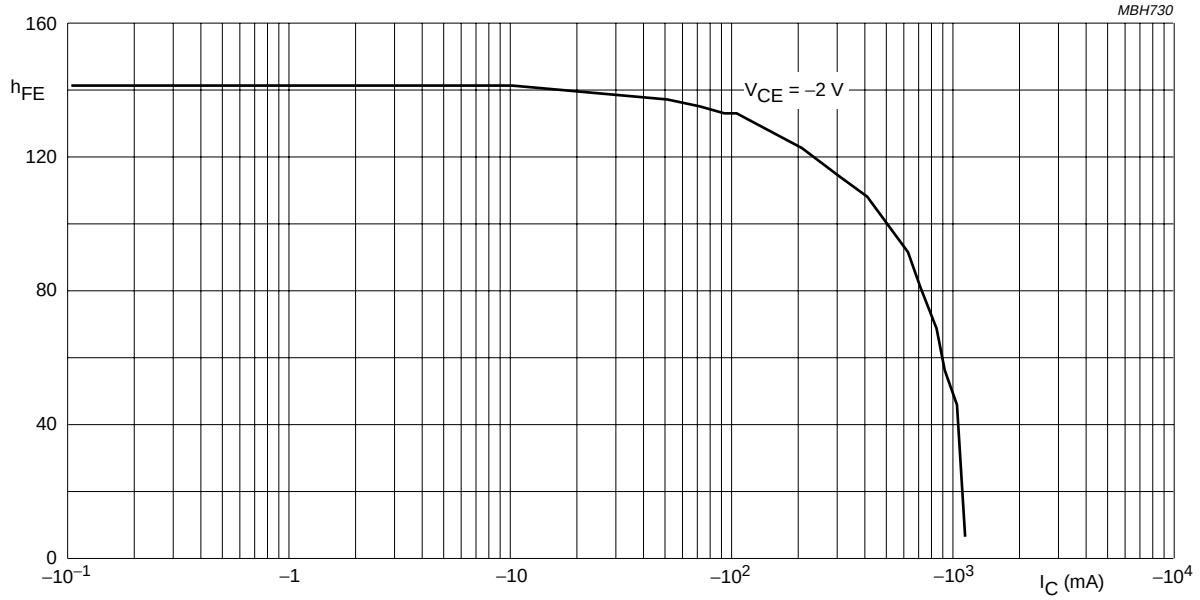
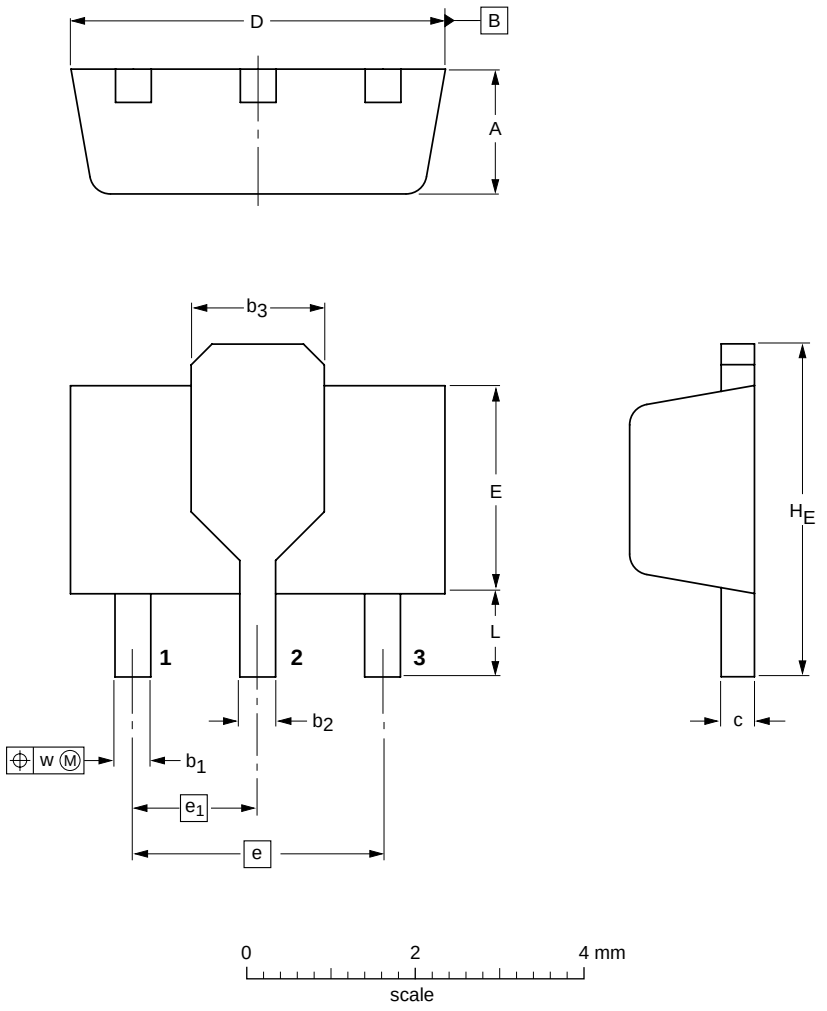


Fig.2 DC current gain; typical values.

PACKAGE OUTLINE

Plastic surface mounted package; collector pad for good heat transfer; 3 leads **SOT89**

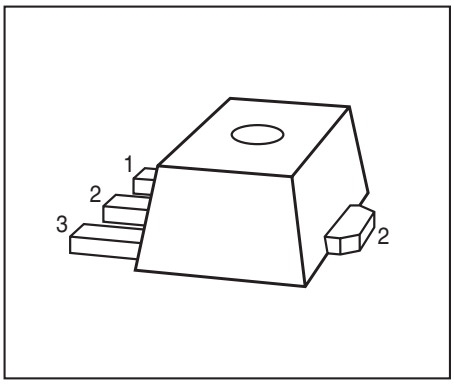


DIMENSIONS (mm are the original dimensions)

UNIT	A	b_1	b_2	b_3	c	D	E	e	e_1	H_E	L min.	w
mm	1.6 1.4	0.48 0.35	0.53 0.40	1.8 1.4	0.44 0.37	4.6 4.4	2.6 2.4	3.0	1.5	4.25 3.75	0.8	0.13

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT89						97-02-28

PNP Silicon AF Transistors



- For AF driver and output stages
- High collector current
- Low collector-emitter saturation voltage
- Complementary types: BCX54...BCX56 (NPN)
- Pb-free (RoHS compliant) package
- Qualified according AEC Q101

AEC Qualified RoHS

Type	Marking	Pin Configuration			Package
BCX51	AA	1=B	2=C	3=E	SOT89
BCX51-16	AD	1=B	2=C	3=E	SOT89
BCX52	AE	1=B	2=C	3=E	SOT89
BCX52-16	AM	1=B	2=C	3=E	SOT89
BCX53	AH	1=B	2=C	3=E	SOT89
BCX53-10	AK	1=B	2=C	3=E	SOT89
BCX53-16	AL	1=B	2=C	3=E	SOT89

Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-emitter voltage	V_{CEO}		V
BCX51		45	
BCX52		60	
BCX53		80	
Collector-base voltage	V_{CBO}		
BCX51		45	
BCX52		60	
BCX53		100	
Emitter-base voltage	V_{EBO}	5	
Collector current	I_C	1	A
Peak collector current, $t_p \leq 10$ ms	I_{CM}	1.5	
Base current	I_B	100	mA
Peak base current	I_{BM}	200	
Total power dissipation $T_S \leq 120$ °C	P_{tot}	2	W
Junction temperature	T_j	150	°C
Storage temperature	T_{stg}	-65 ... 150	

Thermal Resistance

Parameter	Symbol	Value	Unit
Junction - soldering point[1)]	R_{thJS}	≤ 15	K/W

[1]For calculation of R_{thJA} please refer to Application Note AN077 (Thermal Resistance Calculation)

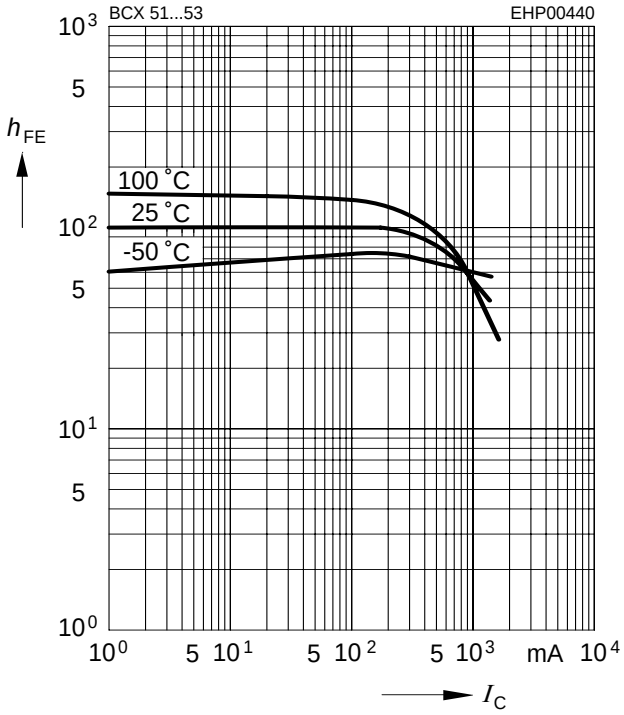
Electrical Characteristics at T_A = 25°C, unless otherwise specified

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC Characteristics					
Collector-emitter breakdown voltage	$V_{(BR)CEO}$				V
I_C = 10 mA, I_B = 0 , BCX51		45	-	-	
I_C = 10 mA, I_B = 0 , BCX52		60	-	-	
I_C = 10 mA, I_B = 0 , BCX53		80	-	-	
Collector-base breakdown voltage	$V_{(BR)CBO}$				
I_C = 100 µA, I_E = 0 , BCX51		45	-	-	
I_C = 100 µA, I_E = 0 , BCX52		60	-	-	
I_C = 100 µA, I_E = 0 , BCX53		100	-	-	
Emitter-base breakdown voltage	$V_{(BR)EBO}$	5	-	-	
I_E = 10 µA, I_C = 0					
Collector-base cutoff current	I_{CBO}				µA
V_{CB} = 30 V, I_E = 0		-	-	0.1	
V_{CB} = 30 V, I_E = 0 , T_A = 150 °C		-	-	20	
DC current gain[1)]	h_{FE}				-
I_C = 5 mA, V_{CE} = 2 V		25	-	-	
I_C = 150 mA, V_{CE} = 2 V, BCX51...BCX53		40	-	250	
I_C = 150 mA, V_{CE} = 2 V, BCX53-10		63	100	160	
I_C = 150 mA, V_{CE} = 2 V, BCX51-16...BCX53-16		100	160	250	
I_C = 500 mA, V_{CE} = 2 V		25	-	-	
Collector-emitter saturation voltage[1)]	V_{CEsat}	-	-	0.5	V
I_C = 500 mA, I_B = 50 mA					
Base-emitter voltage[1)]	$V_{BE(ON)}$	-	-	1	
I_C = 500 mA, V_{CE} = 2 V					
AC Characteristics					
Transition frequency	f_T	-	125	-	MHz
I_C = 50 mA, V_{CE} = 10 V, f = 20 MHz					

[1]Pulse test: t < 300µs; D < 2%

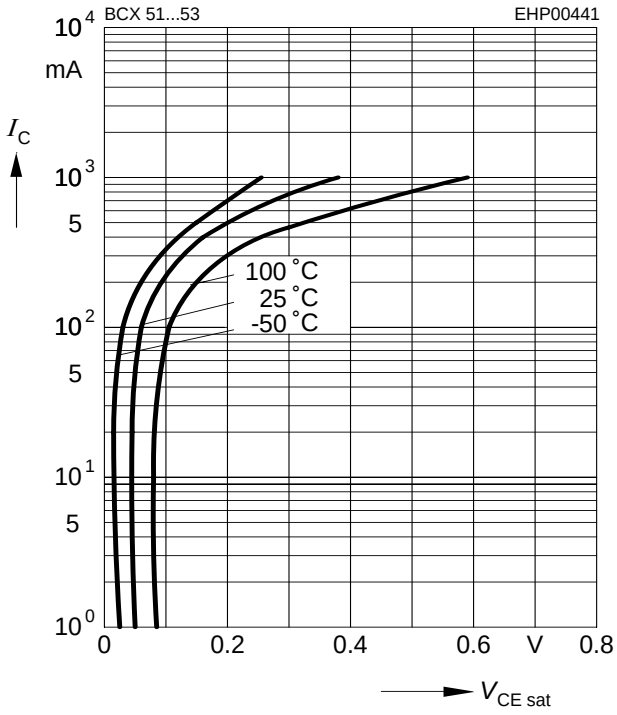
DC current gain $h_{FE} = f(I_C)$

V_{CE} = 2 V



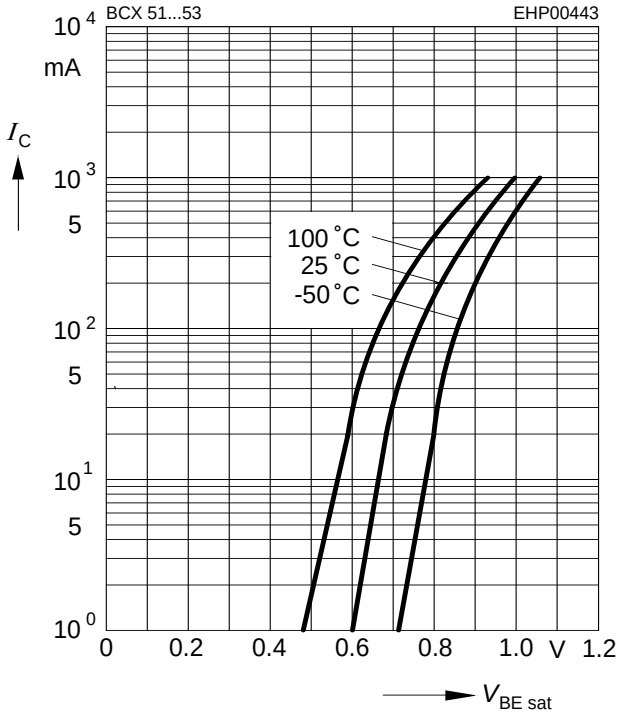
Collector-emitter saturation voltage

$I_C = f(V_{CEsat})$, h_{FE} = 10



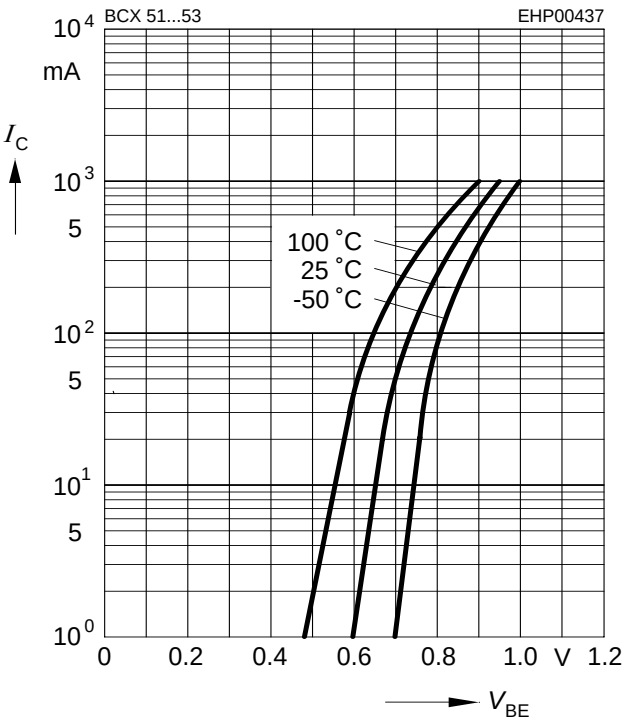
Base-emitter saturation voltage

$I_C = f(V_{BEsat})$, h_{FE} = 10



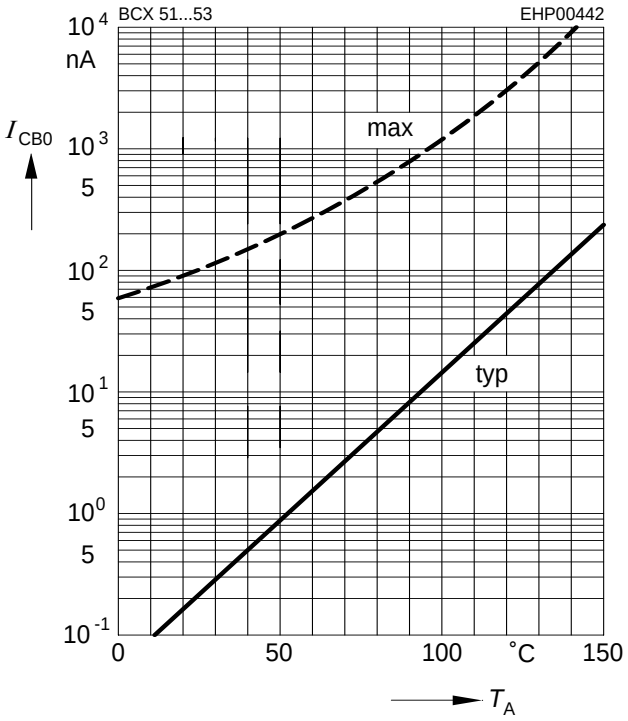
Collector current $I_C = f(V_{BE})$

V_{CE} = 2V



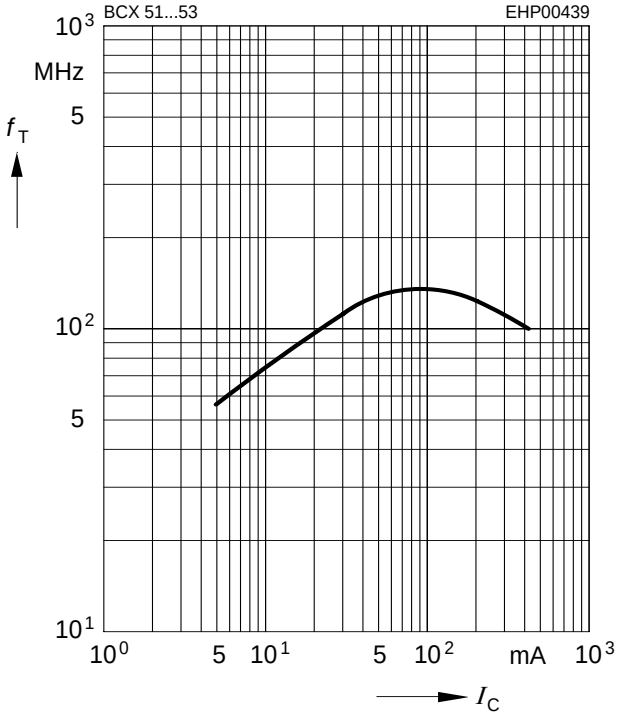
Collector cutoff current I_{CBO} = $f(T_A)$

V_{CBO} = 30 V

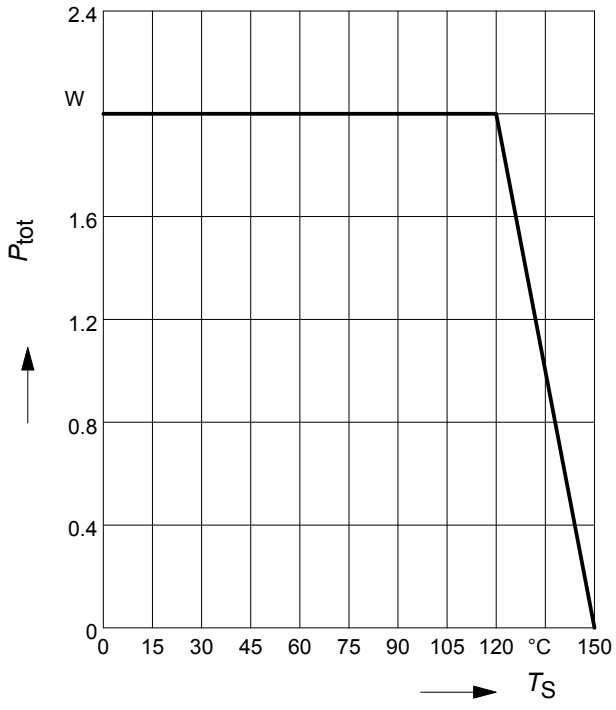


Transition frequency f_T = $f(I_C)$

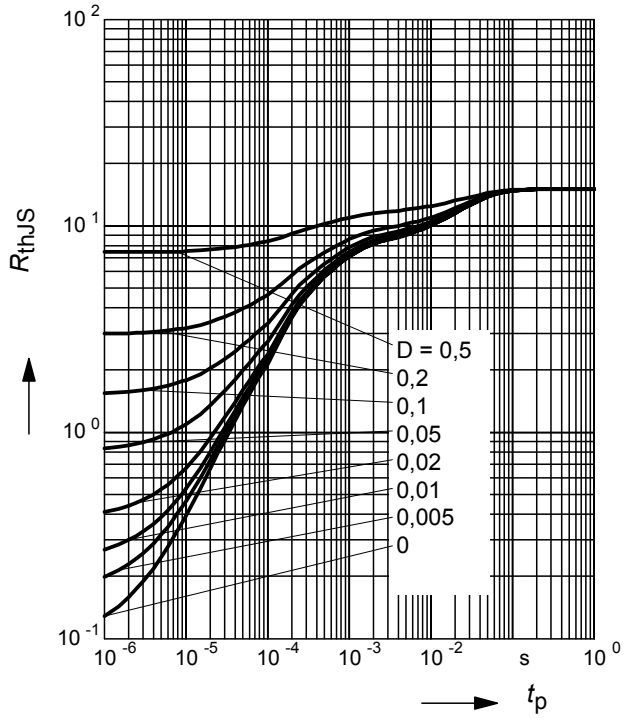
V_{CE} = 10 V



Total power dissipation P_{tot} = $f(T_S)$

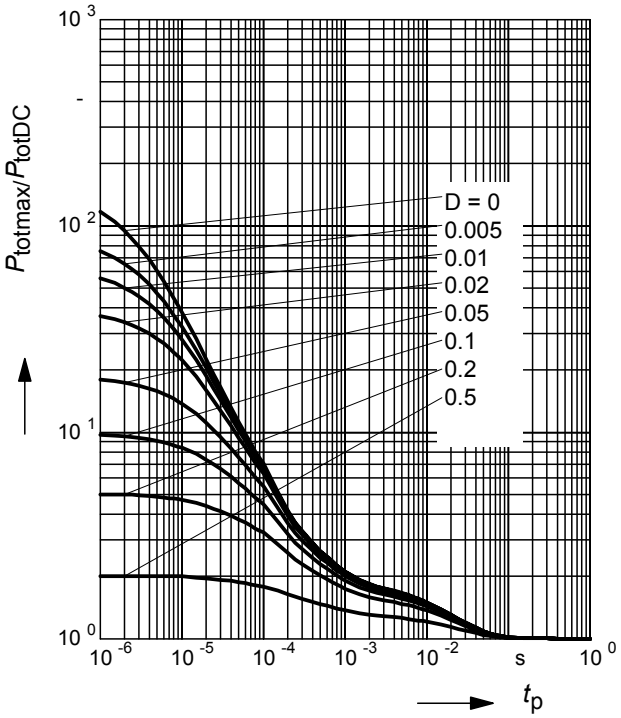


Permissible Pulse Load R_{thJS} = $f(t_p)$

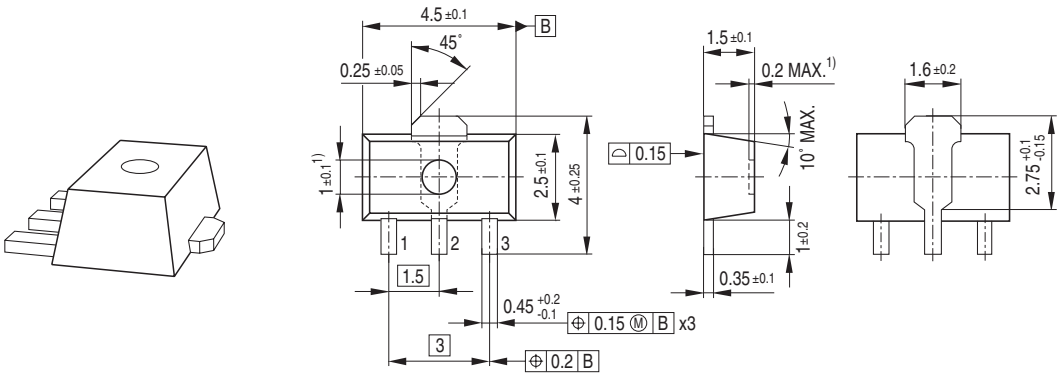


Permissible Pulse Load

$P_{totmax}/P_{totDC} = f(t_p)$

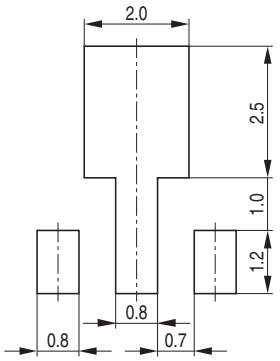


Package Outline

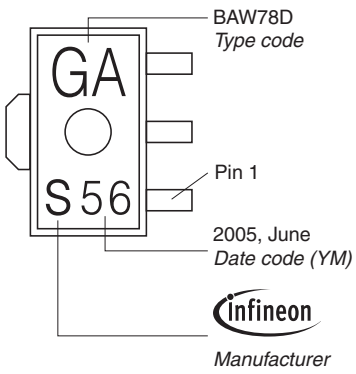


1) Ejector pin markings possible

Foot Print



Marking Layout (Example)



Standard Packing

Reel ø180 mm = 1.000 Pieces/Reel
Reel ø330 mm = 4.000 Pieces/Reel