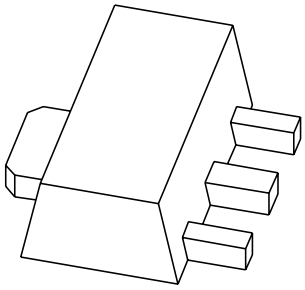
DATA SHEET



PBSS4320X
20 V, 3 A
NPN low V_{CEsat} (BISS) transistor

Product specification
Supersedes data of 2003 Dec 15

2004 Nov 03

Philips
Semiconductors

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20 V, 3 A NPN low V_{CEsat} (BISS) transistor

PBSS4320X

FEATURES

- SOT89 (SC-62) package
- Low collector-emitter saturation voltage V_{CEsat}
- High collector current capability: I_C and I_{CM}
- Higher efficiency leading to less heat generation
- Reduced printed-circuit board requirements.

APPLICATIONS

- Power management
  - DC/DC converters
  - Supply line switching
  - Battery charger
  - LCD backlighting.
- Peripheral drivers
  - Driver in low supply voltage applications (e.g. lamps and LEDs).
  - Inductive load driver (e.g. relays, buzzers and motors).

DESCRIPTION

NPN low V_{CEsat} transistor in a SOT89 plastic package.
PNP complement: PBSS5320X.

MARKING

TYPE NUMBER	MARKING CODE
PBSS4320X	S44

QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	UNIT
V_{CEO}	collector-emitter voltage	20	V
I_C	collector current (DC)	3	A
I_{CM}	peak collector current	5	A
R_{CEsat}	equivalent on-resistance	105	mΩ

PINNING

PIN	DESCRIPTION
1	emitter
2	collector
3	base

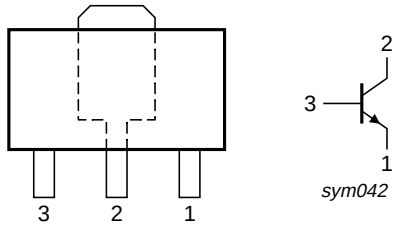


Fig.1 Simplified outline (SOT89) and symbol.

ORDERING INFORMATION

TYPE NUMBER	PACKAGE		
	NAME	DESCRIPTION	VERSION
PBSS4320X	SC-62	plastic surface mounted package; collector pad for good heat transfer; 3 leads	SOT89

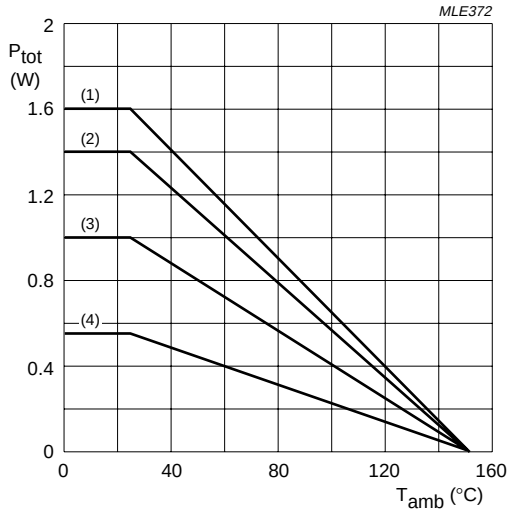
LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 60134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	20	V
V_{CEO}	collector-emitter voltage	open base	–	20	V
V_{EBO}	emitter-base voltage	open collector	–	5	V
I_C	collector current (DC)	note 4	–	3	A
I_{CM}	peak collector current	limited by $T_{j(max)}$	–	5	A
I_B	base current (DC)		–	0.5	A
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C			
		note 1	–	550	mW
		note 2	–	1	W
		note 3	–	1.4	W
		note 4	–	1.6	W
T_{stg}	storage temperature		–65	+150	°C
T_j	junction temperature		–	150	°C
T_{amb}	ambient temperature		–65	+150	°C

Notes

1. Device mounted on a FR4 printed-circuit board; single-sided copper; tin-plated; standard footprint.
2. Device mounted on a FR4 printed-circuit board; single-sided copper; tin-plated; mounting pad for collector 1 cm^2.
3. Device mounted on a FR4 printed-circuit board; single-sided copper; tin-plated; mounting pad for collector 6 cm^2.
4. Device mounted on a ceramic printed-circuit board 7 cm^2, single-sided copper, tin-plated.



(1) Ceramic PCB; 7 cm^2 mounting pad for collector.
(2) FR4 PCB; 6 cm^2 copper mounting pad for collector.
(3) FR4 PCB; 1 cm^2 copper mounting pad for collector.
(4) Standard footprint.

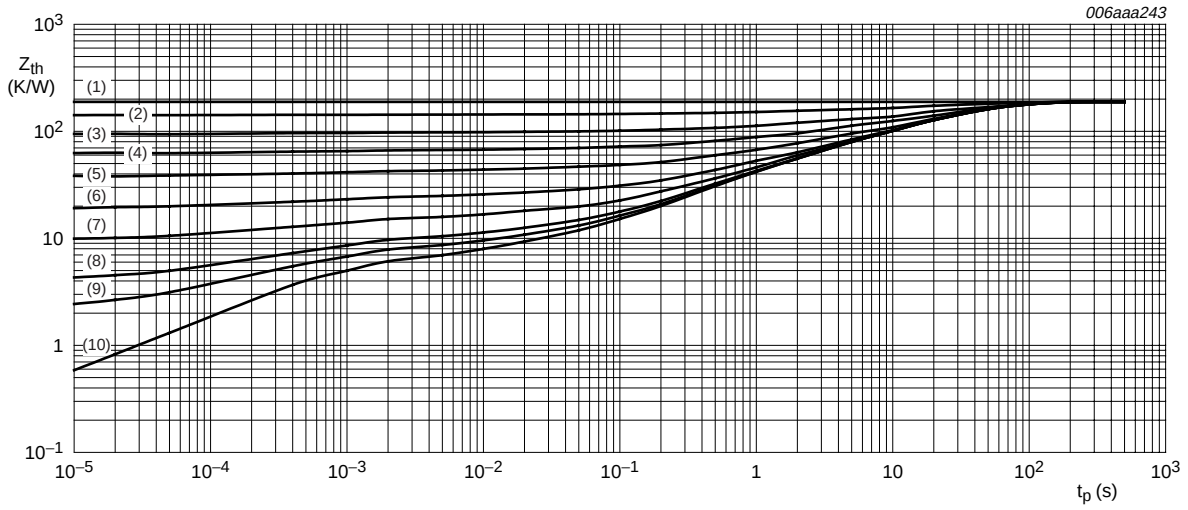
Fig.2 Power derating curves.

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air		
		note 1	225	K/W
		note 2	125	K/W
		note 3	90	K/W
		note 4	80	K/W
$R_{th(j-s)}$	thermal resistance from junction to soldering point		16	K/W

Notes

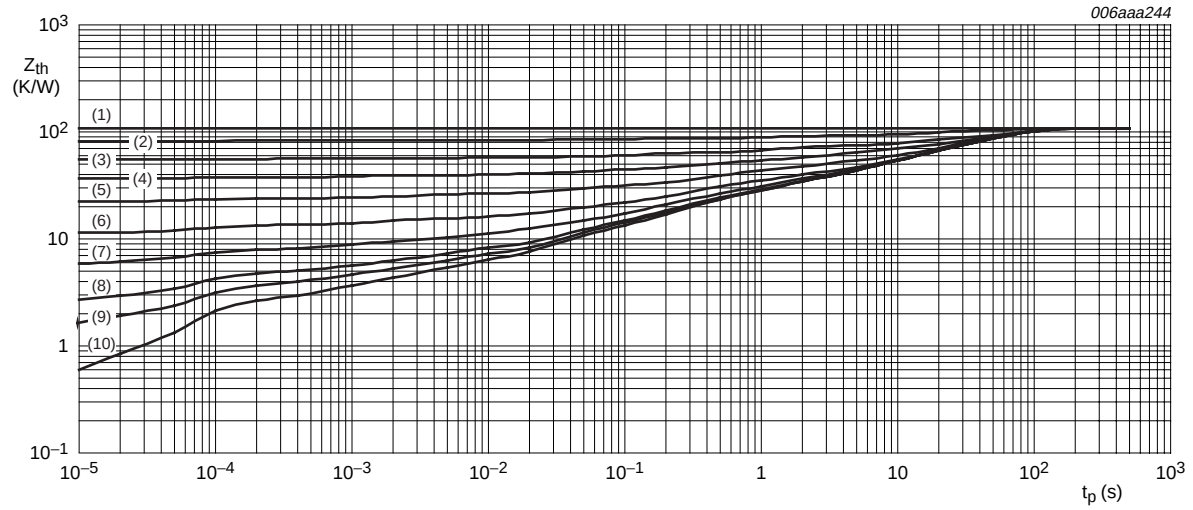
1. Device mounted on a FR4 printed-circuit board; single-sided copper; tin-plated; standard footprint.
2. Device mounted on a FR4 printed-circuit board; single-sided copper; tin-plated; mounting pad for collector 1 cm^2.
3. Device mounted on a FR4 printed-circuit board; single-sided copper; tin-plated; mounting pad for collector 6 cm^2.
4. Device mounted on a ceramic printed-circuit board 7 cm^2, single-sided copper, tin-plated.



Mounted on FR4 printed-circuit board; standard footprint.

(1) δ = 1. (3) δ = 0.5. (5) δ = 0.2. (7) δ = 0.05. (9) δ = 0.01.
(2) δ = 0.75. (4) δ = 0.33. (6) δ = 0.1. (8) δ = 0.02. (10) δ = 0.

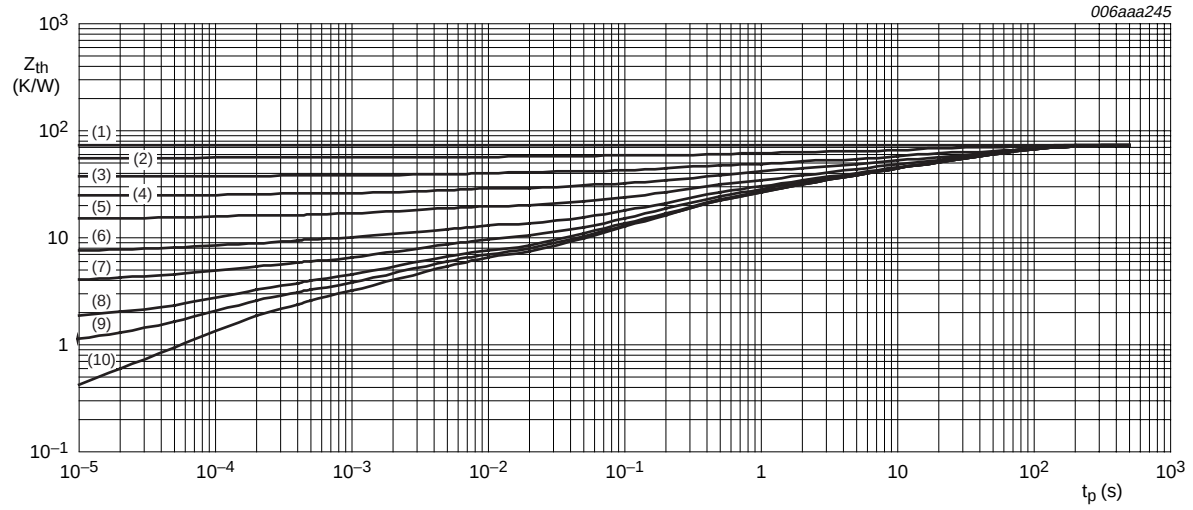
Fig.3 Transient thermal impedance as a function of pulse time; typical values.



Mounted on FR4 printed-circuit board; mounting pad for collector 1 cm^2.

(1) δ = 1. (3) δ = 0.5. (5) δ = 0.2. (7) δ = 0.05. (9) δ = 0.01.
(2) δ = 0.75. (4) δ = 0.33. (6) δ = 0.1. (8) δ = 0.02. (10) δ = 0.

Fig.4 Transient thermal impedance as a function of pulse time; typical values.



Mounted on FR4 printed-circuit board; mounting pad for collector 6 cm^2.

(1) δ = 1. (3) δ = 0.5. (5) δ = 0.2. (7) δ = 0.05. (9) δ = 0.01.
(2) δ = 0.75. (4) δ = 0.33. (6) δ = 0.1. (8) δ = 0.02. (10) δ = 0.

Fig.5 Transient thermal impedance as a function of pulse time; typical values.

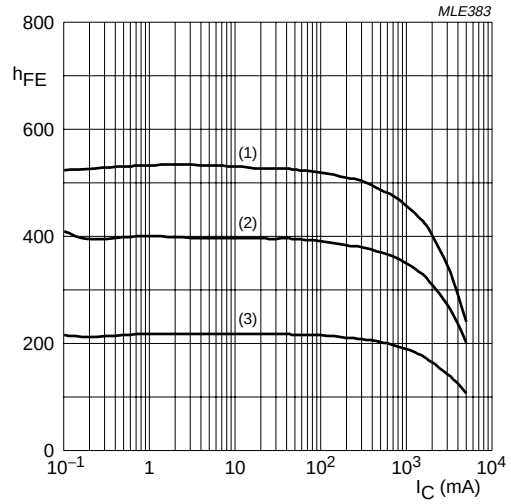
CHARACTERISTICS

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{CBO}	collector-base cut-off current	V_{CB} = 20 V; I_E = 0 A	–	–	100	nA
		V_{CB} = 20 V; I_E = 0 A; T_j = 150 °C	–	–	50	µA
I_{CES}	collector-emitter cut-off current	V_{CE} = 20 V; V_{BE} = 0 V	–	–	100	nA
I_{EBO}	emitter-base cut-off current	V_{EB} = 5 V; I_C = 0 A	–	–	100	nA
h_{FE}	DC current gain	V_{CE} = 2 V				
		I_C = 0.1 A	220	–	–	
		I_C = 0.5 A	220	–	–	
		I_C = 1 A; note 1	220	–	–	
		I_C = 2 A; note 1	200	–	–	
		I_C = 3 A; note 1	150	–	–	
V_{CEsat}	collector-emitter saturation voltage	I_C = 0.5 A; I_B = 50 mA	–	–	70	mV
		I_C = 1 A; I_B = 50 mA	–	–	120	mV
		I_C = 2 A; I_B = 100 mA	–	–	240	mV
		I_C = 3 A; I_B = 300 mA; note 1	–	–	310	mV
R_{CEsat}	equivalent on-resistance	I_C = 3 A; I_B = 300 mA; note 1	–	85	105	mΩ
V_{BEsat}	base-emitter saturation voltage	I_C = 2 A; I_B = 100 mA	–	1.1	–	V
		I_C = 3 A; I_B = 300 mA; note 1	–	–	1.2	V
V_{BEon}	base-emitter turn-on voltage	V_{CE} = 2 V; I_C = 1 A	1.1	–	–	V
f_T	transition frequency	I_C = 100 mA; V_{CE} = 5 V; f = 100 MHz	100	–	–	MHz
C_c	collector capacitance	V_{CB} = 10 V; I_E = i_e = 0 A; f = 1 MHz	–	–	35	pF

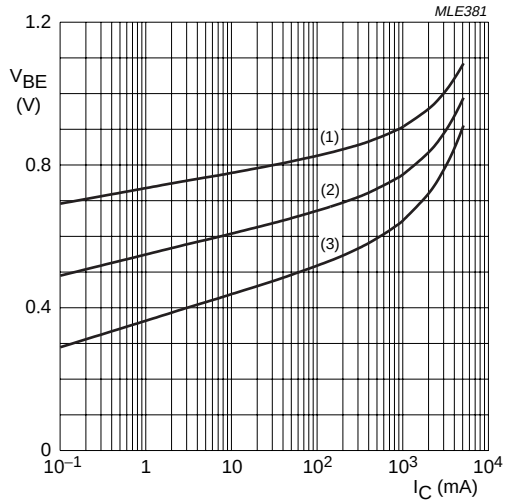
Note

1. Pulse test: $t_p \leq 300$ µs; $\delta \leq 0.02$.



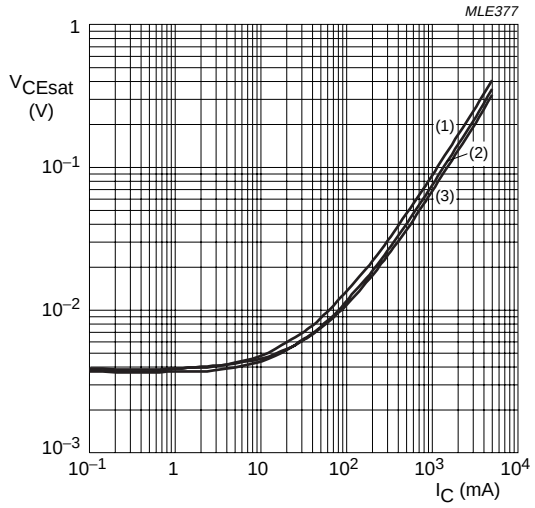
V_{CE} = 2 V.
(1) T_{amb} = 100 °C.
(2) T_{amb} = 25 °C.
(3) T_{amb} = –55 °C.

Fig.6 DC current gain as a function of collector current; typical values.



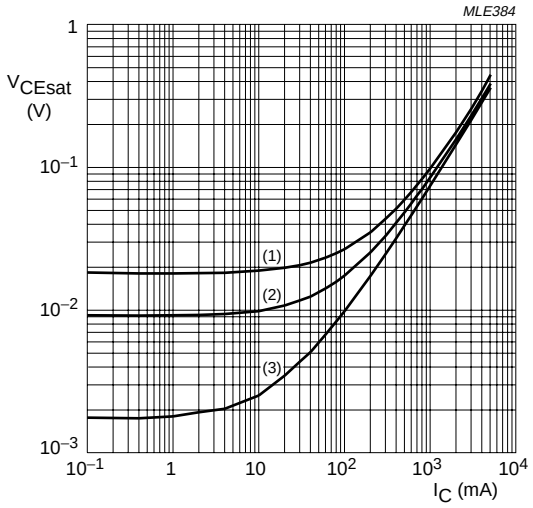
V_{CE} = 2 V.
(1) T_{amb} = –55 °C.
(2) T_{amb} = 25 °C.
(3) T_{amb} = 100 °C.

Fig.7 Base-emitter voltage as a function of collector current; typical values.



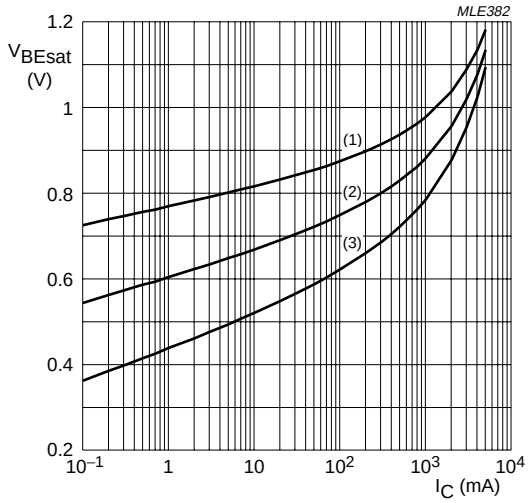
I_C/I_B = 20.
(1) T_{amb} = 100 °C.
(2) T_{amb} = 25 °C.
(3) T_{amb} = –55 °C.

Fig.8 Collector-emitter saturation voltage as a function of collector current; typical values.



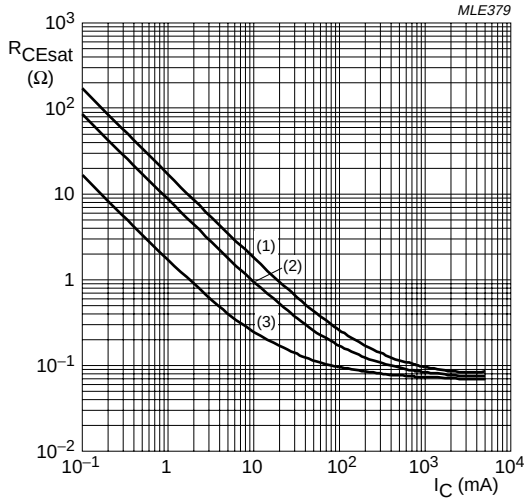
T_{amb} = 25 °C.
(1) I_C/I_B = 100.
(2) I_C/I_B = 50.
(3) I_C/I_B = 10.

Fig.9 Collector-emitter saturation voltage as a function of collector current; typical values.



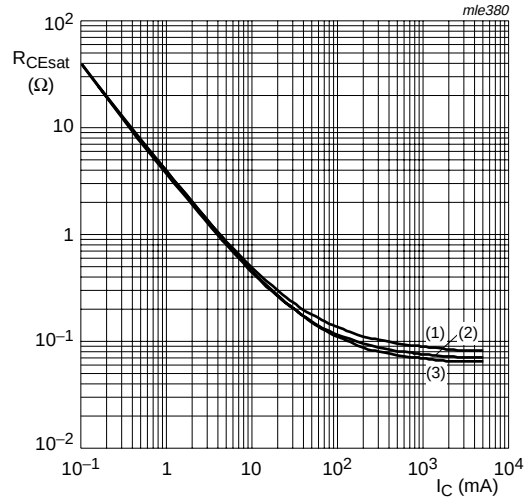
I_C/I_B = 20.
(1) T_{amb} = –55 °C.
(2) T_{amb} = 25 °C.
(3) T_{amb} = 100 °C.

Fig.10 Base-emitter saturation voltage as a function of collector current; typical values.



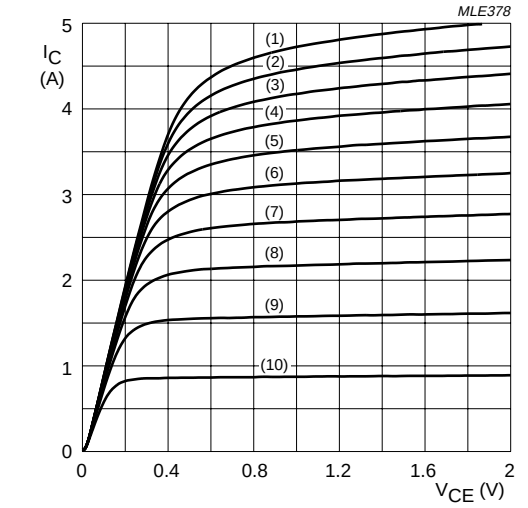
T_{amb} = 25 °C.
(1) I_C/I_B = 100. (2) I_C/I_B = 50. (3) I_C/I_B = 10.

Fig.11 Equivalent on-resistance as a function of collector current; typical values.



I_C/I_B = 20.
(1) T_{amb} = 100 °C. (2) T_{amb} = 25 °C. (3) T_{amb} = –55 °C.

Fig.12 Equivalent on-resistance as a function of collector current; typical values.

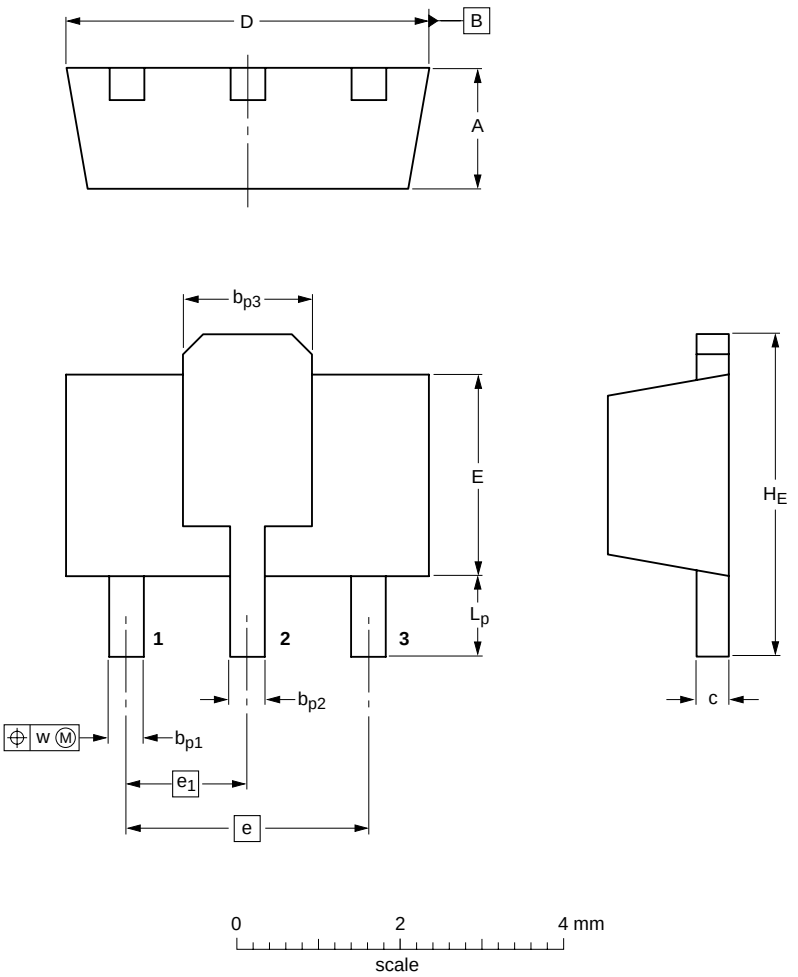


T_{amb} = 25 °C.
(1) I_B = 25 mA. (5) I_B = 15 mA. (9) I_B = 5 mA.
(2) I_B = 22.5 mA. (6) I_B = 12.5 mA. (10) I_B = 2.5 mA.
(3) I_B = 20 mA. (7) I_B = 10 mA.
(4) I_B = 17.5 mA. (8) I_B = 7.5 mA.

Fig.13 Collector current as a function of collector-emitter voltage; 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_{p1}	b_{p2}	b_{p3}	c	D	E	e	e_1	H_E	L_p	w
mm	1.6 1.4	0.48 0.35	0.53 0.40	1.8 1.4	0.44 0.23	4.6 4.4	2.6 2.4	3.0	1.5	4.25 3.75	1.2 0.8	0.13

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT89		TO-243	SC-62			~~99-09-13~~ 04-08-03

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Printed in The Netherlands R75/03/pp12 Date of release: 2004 Nov 03 Document order number: 9397 750 13881

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