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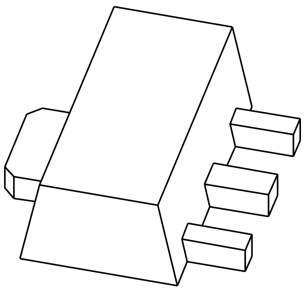
Team Nexperia

DATA SHEET



PBSS5520X
20 V, 5 A
PNP low V_{CEsat} (BISS) transistor

Product data sheet
Supersedes data of 2004 Jun 23

2004 Nov 08

founded by Philips

FEATURES

- High h_{FE} and low V_{CEsat} at high current operation
- High collector current I_C: 5 A
- High efficiency leading to less heat generation.

APPLICATIONS

- Medium power peripheral drivers (e.g. fans and motors)
- Strobe flash units for digital still cameras and mobile phones
- Power switch for LAN and ADSL systems
- Medium power DC-to-DC conversion
- Battery chargers
- Supply line switching.

DESCRIPTION

PNP low V_{CEsat} (BISS) transistor in a SOT89 (SC-62) plastic package.
NPN complement: PBSS4520X.

MARKING

TYPE NUMBER	MARKING CODE[1]
PBSS5520X	*1K

Note

1. * = p: made in Hong Kong.
   * = t: made in Malaysia.
   * = W: made in China.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	UNIT
V_{CEO}	collector-emitter voltage	–20	V
I_C	collector current (DC)	–5	A
I_{CM}	peak collector current	–10	A
R_{CEsat}	equivalent on-resistance	54	mΩ

PINNING

PIN	DESCRIPTION
1	emitter
2	collector
3	base

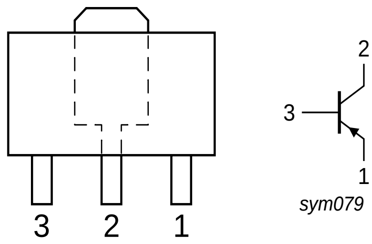


Fig.1 Simplified outline (SOT89) and symbol.

ORDERING INFORMATION

TYPE NUMBER	PACKAGE		
	NAME	DESCRIPTION	VERSION
PBSS5520X	SC-62	plastic surface mounted package; collector pad for good heat transfer; 3 leads	SOT89

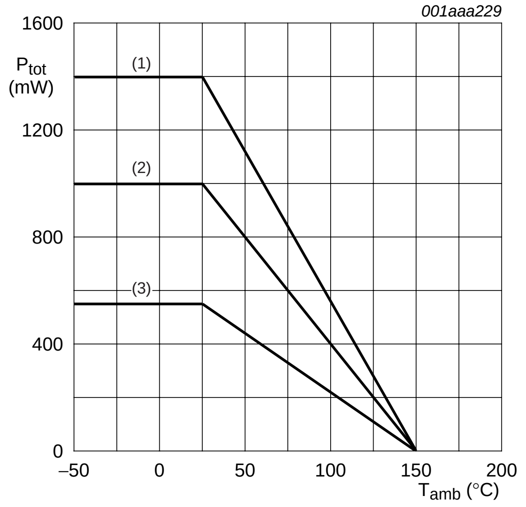
LIMITING VALUES

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)		–	–5	A
I_{CM}	peak collector current	$t_p \leq 1$ ms	–	–10	A
I_{CRP}	repetitive peak collector current	notes 1 and 2	–	–6.5	A
I_B	base current (DC)		–	–1	A
I_{BM}	peak base current	$t_p \leq 1$ ms	–	–2	A
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C			
		notes 1 and 2	–	2.5	W
		note 2	–	0.55	W
		note 3	–	1	W
		note 4	–	1.4	W
		note 5	–	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. Operated under pulsed conditions; pulse width $t_p \leq 10$ ms; duty cycle $\delta \leq 0.2$.
2. Device mounted on a printed-circuit board, single-sided copper, tin-plated, standard footprint.
3. Device mounted on a printed-circuit board, single-sided copper, tin-plated, mounting pad for collector 1 cm^2.
4. Device mounted on a printed-circuit board, single-sided copper, tin-plated, mounting pad for collector 6 cm^2.
5. Device mounted on a 7 cm^2 ceramic printed-circuit board, 1 cm^2 single-sided copper, tin-plated.



(1) FR4 PCB; 6 cm^2 mounting pad for collector.
(2) FR4 PCB; 1 cm^2 mounting pad for collector.
(3) FR4 PCB; standard footprint.

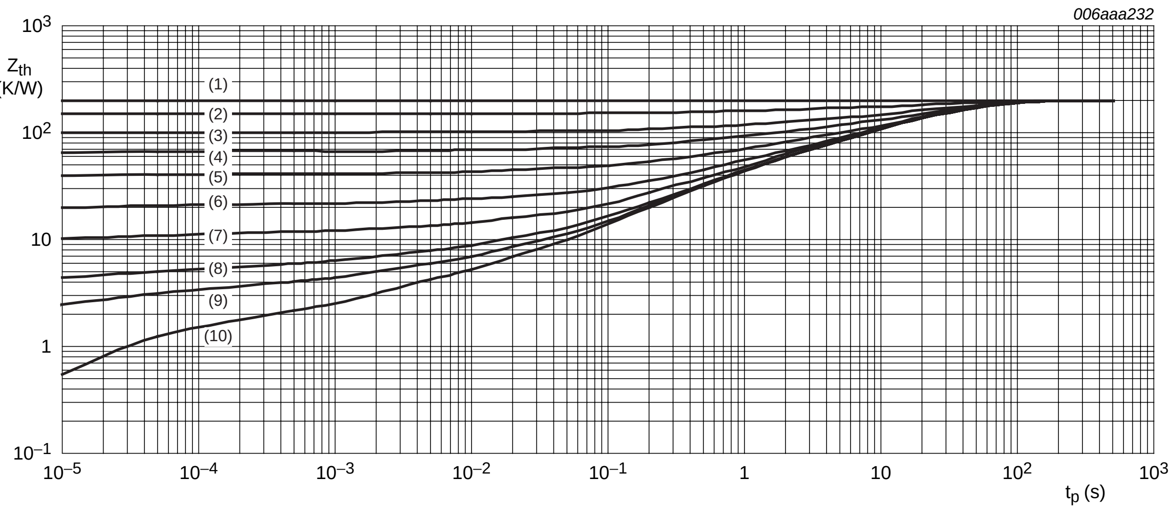
Fig.2 Power derating curves.

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air		
		notes 1 and 2	50	K/W
		note 2	225	K/W
		note 3	125	K/W
		note 4	90	K/W
		note 5	80	K/W
$R_{th(j-s)}$	thermal resistance from junction to soldering point		16	K/W

Notes

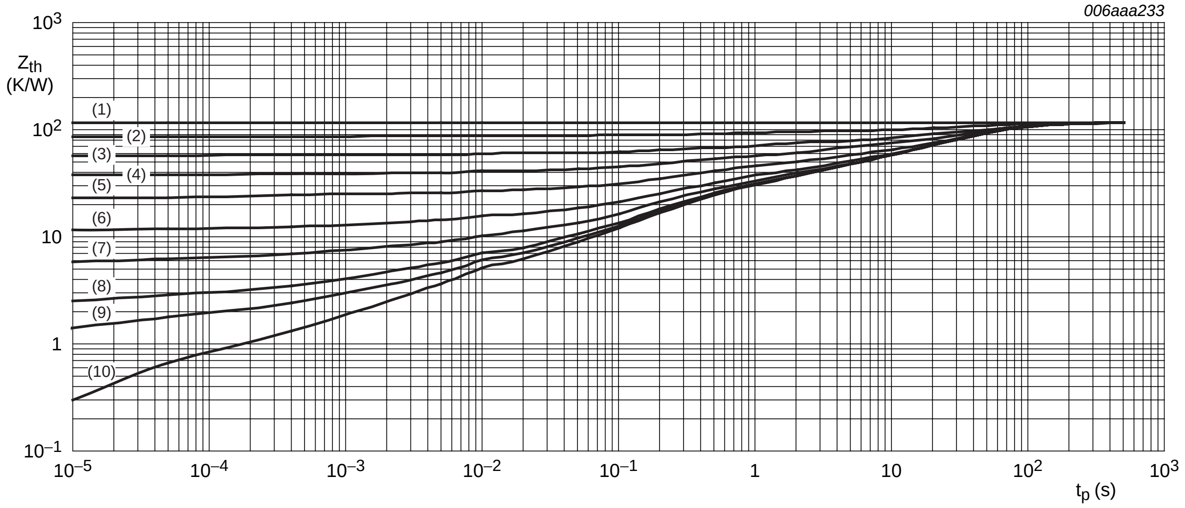
1. Operated under pulsed conditions; pulse width $t_p \leq 10$ ms; duty cycle $\delta \leq 0.2$.
2. Device mounted on a printed-circuit board, single-sided copper, tin-plated, standard footprint.
3. Device mounted on a printed-circuit board, single-sided copper, tin-plated, mounting pad for collector 1 cm^2.
4. Device mounted on a printed-circuit board, single-sided copper, tin-plated, mounting pad for collector 6 cm^2.
5. Device mounted on a 7 cm^2 ceramic printed-circuit board, 1 cm^2 single-sided copper, tin-plated.



Mounted on FR4 printed-circuit board; standard footprint.

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

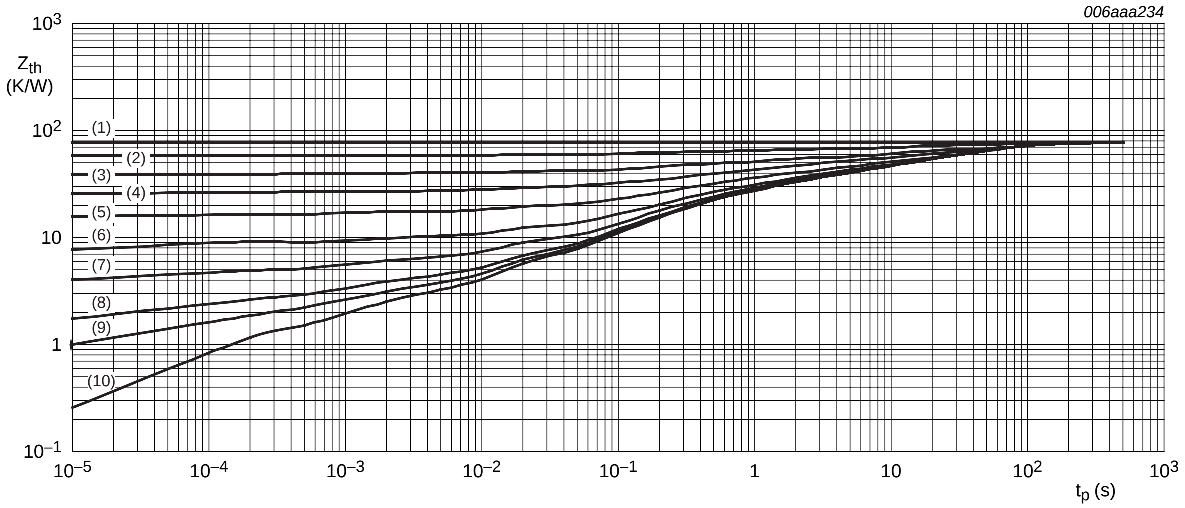
Fig.3 Transient thermal impedance as a function of pulse time; typical values.



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

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

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

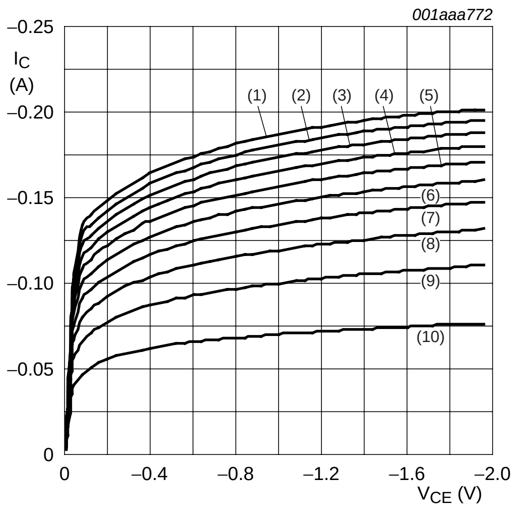
CHARACTERISTICS

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_{EBO}	emitter-base cut-off current	V_{EB} = –5 V; I_C = 0 A	–	–	–100	nA
I_{CES}	collector-emitter cut-off current	V_{CE} = –20 V; V_{BE} = 0 V	–	–	–100	nA
h_{FE}	DC current gain	V_{CE} = –2 V				
		I_C = –0.5 A; note 1	300	430	–	
		I_C = –1 A; note 1	275	400	–	
		I_C = –2 A; note 1	250	360	–	
		I_C = –5 A; note 1	150	260	–	
V_{CEsat}	collector-emitter saturation voltage	I_C = –0.5 A; I_B = –5 mA	–	–45	–70	mV
		I_C = –1 A; I_B = –10 mA	–	–70	–110	mV
		I_C = –2.5 A; I_B = –125 mA; note 1	–	–100	–150	mV
		I_C = –4 A; I_B = –200 mA; note 1	–	–150	–230	mV
		I_C = –5 A; I_B = –500 mA; note 1	–	–170	–270	mV
R_{CEsat}	equivalent on-resistance	I_C = –5 A; I_B = –500 mA; note 1	–	34	54	mΩ
V_{BEsat}	base-emitter saturation voltage	I_C = –4 A; I_B = –200 mA; note 1	–	–0.9	–1.05	V
		I_C = –5 A; I_B = –500 mA; note 1	–	–0.96	–1.1	V
V_{BEon}	base-emitter turn-on voltage	V_{CE} = –2 V; I_C = –2 A	–	–0.74	–0.85	V
f_T	transition frequency	I_C = –100 mA; V_{CE} = –10 V; f = 100 MHz	80	100	–	MHz
C_c	collector capacitance	V_{CB} = –10 V; I_E = i_e = 0 A; f = 1 MHz	–	130	150	pF

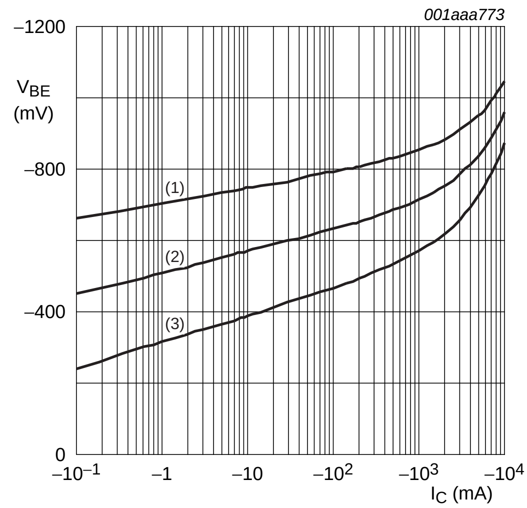
Note

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



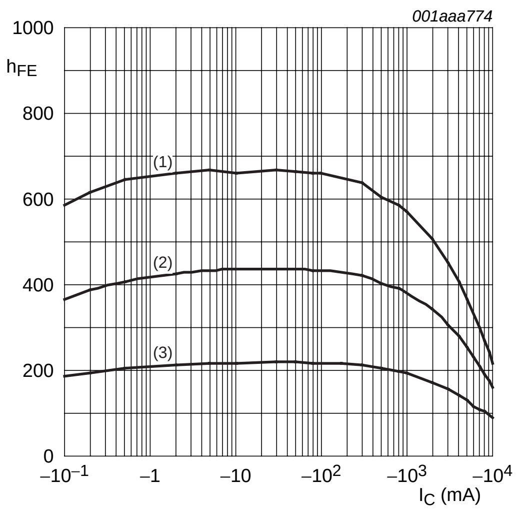
(1) I_B = –64 mA.
(2) I_B = –57.6 mA.
(3) I_B = –51.2 mA.
(4) I_B = –44.8 mA.
(5) I_B = –38.4 mA.
(6) I_B = –32 mA.
(7) I_B = –25.6 mA.
(8) I_B = –19.2 mA.
(9) I_B = –12.8 mA.
(10) I_B = –6.4 mA.

Fig.6 Collector current as a function of collector-emitter voltage; typical values.



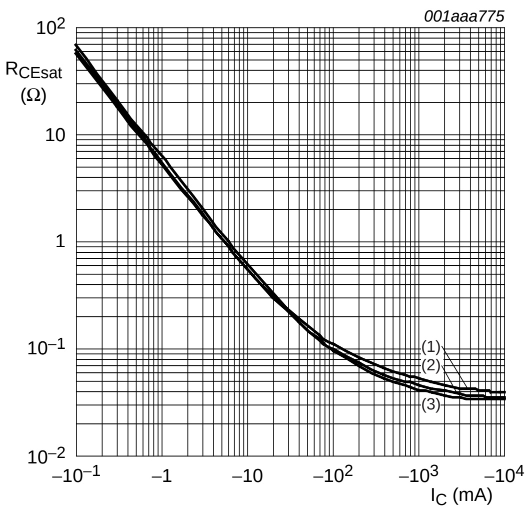
V_{CE} = –2 V.
(1) T_{amb} = –55 °C.
(2) T_{amb} = 25 °C.
(3) T_{amb} = 100 °C.

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



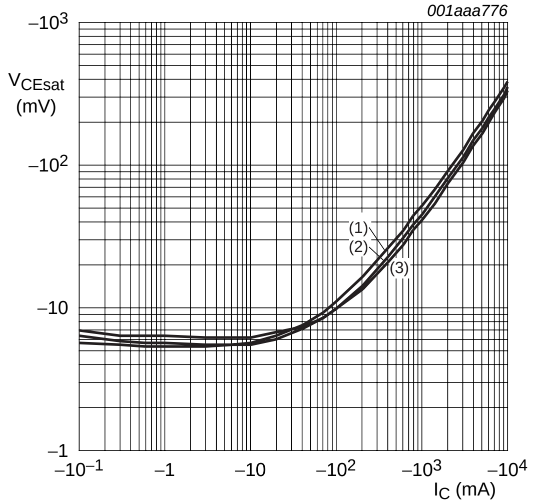
V_{CE} = –2 V.
(1) T_{amb} = 100 °C.
(2) T_{amb} = 25 °C.
(3) T_{amb} = –55 °C.

Fig.8 DC current gain as a function of collector current; typical values.



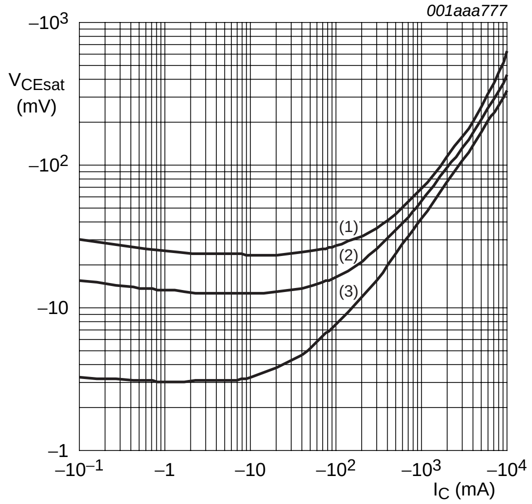
I_C/I_B = 20.
(1) T_{amb} = 100 °C.
(2) T_{amb} = 25 °C.
(3) T_{amb} = –55 °C.

Fig.9 Equivalent on-resistance as a function of collector current; typical values.



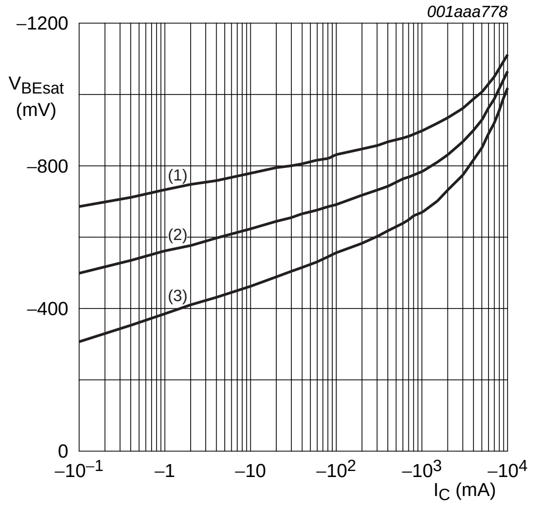
I_C/I_B = 20.
(1) T_{amb} = 100 °C.
(2) T_{amb} = 25 °C.
(3) T_{amb} = −55 °C.

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



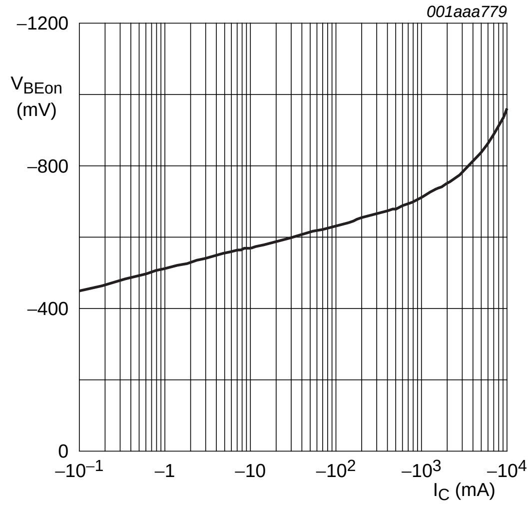
T_{amb} = 25 °C.
(1) I_C/I_B = 100.
(2) I_C/I_B = 50.
(3) I_C/I_B = 10.

Fig.11 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} = 150 °C.

Fig.12 Base-emitter saturation voltage as a function of collector current; typical values.



T_{amb} = 25 °C; V_{CE} = −2 V.

Fig.13 Base-emitter turn-on voltage as a function of collector current; typical values.

Reference mounting conditions

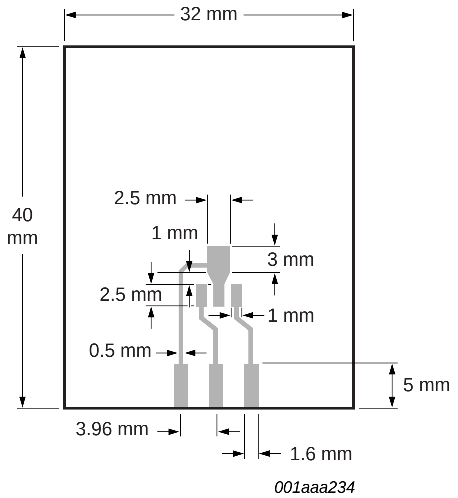


Fig.14 FR4, standard footprint.

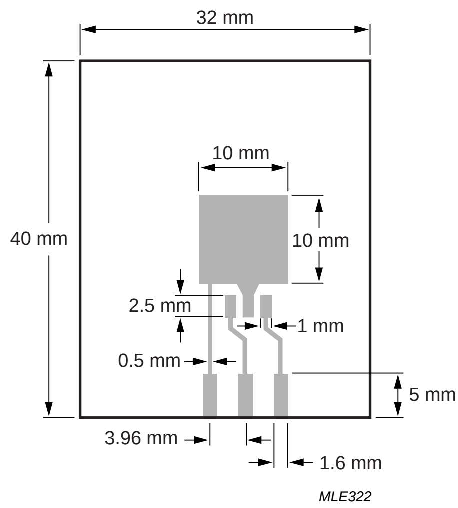


Fig.15 FR4, mounting pad for collector 1 cm^2.

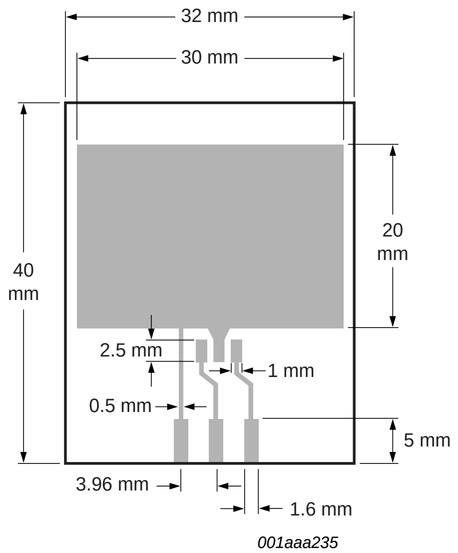
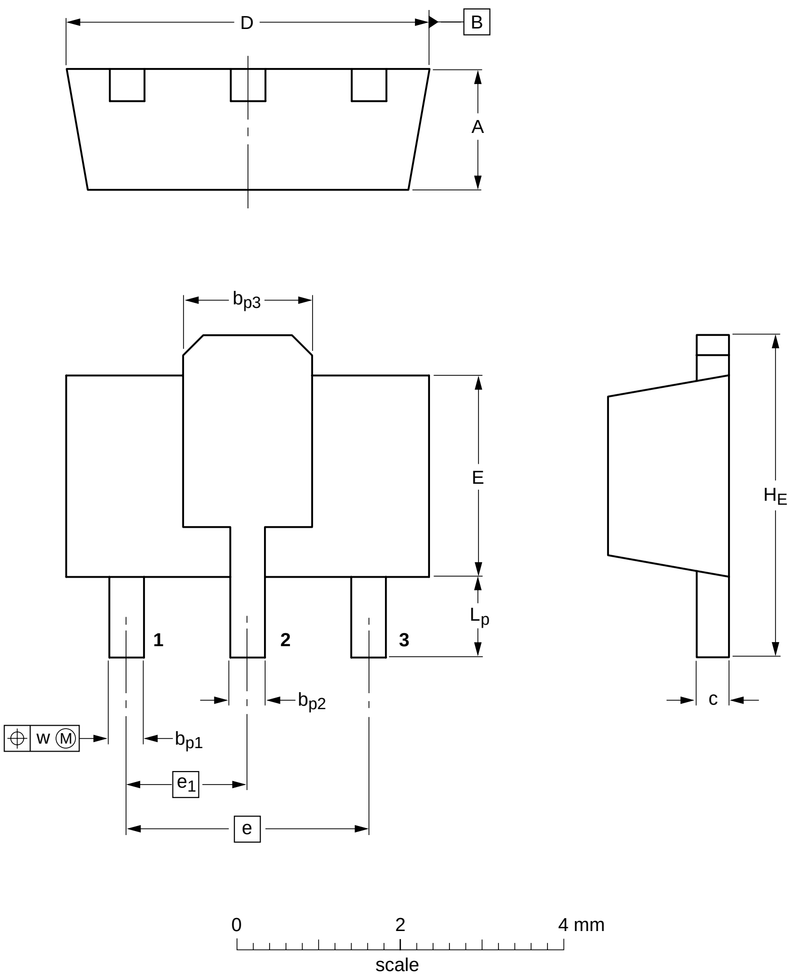


Fig.16 FR4, mounting pad for collector 6 cm^2.

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			~~04-08-03~~ 06-03-16

DATA SHEET STATUS

DOCUMENT STATUS[1]	PRODUCT STATUS[2]	DEFINITION
Objective data sheet	Development	This document contains data from the objective specification for product development.
Preliminary data sheet	Qualification	This document contains data from the preliminary specification.
Product data sheet	Production	This document contains the product specification.

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NXP Semiconductors

Customer notification

This data sheet was changed to reflect the new company name NXP Semiconductors, including new legal definitions and disclaimers. No changes were made to the technical content, except for package outline drawings which were updated to the latest version.

Contact information

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