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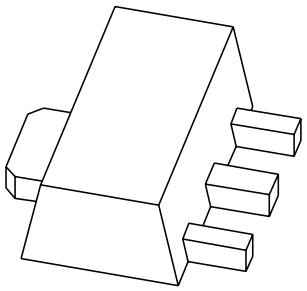
Team Nexperia

DATA SHEET



PBSS4520X

20 V, 5 A

NPN low V_{CEsat} (BISS) transistor

Product data sheet
Supersedes data of 2004 Jun 11

2004 Nov 08

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

PBSS4520X

FEATURES

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

APPLICATIONS

- Medium power peripheral drivers, e.g. fans and motors
- Strobe flash units for DSC and mobile phones
- Inverter applications, e.g. TFT displays
- Power switch for LAN and ADSL systems
- Medium power DC-to-DC conversion
- Battery chargers.

DESCRIPTION

NPN low V_{CEsat} BISS transistor in a SOT89 (SC-62) plastic package.
PNP complement: PBSS5520X.

MARKING

TYPE NUMBER	MARKING CODE(1)
PBSS4520X	*1F

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	44	mΩ

PINNING

PIN	DESCRIPTION
1	emitter
2	collector
3	base

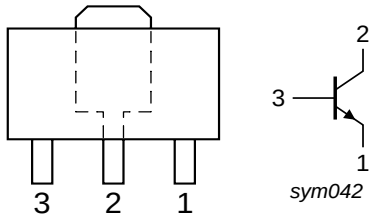


Fig.1 Simplified outline (SOT89) and symbol.

ORDERING INFORMATION

TYPE NUMBER	PACKAGE		
	NAME	DESCRIPTION	VERSION
PBSS4520X	SC-62	plastic surface mounted package; collector pad for good heat transfer; 3 leads	SOT89

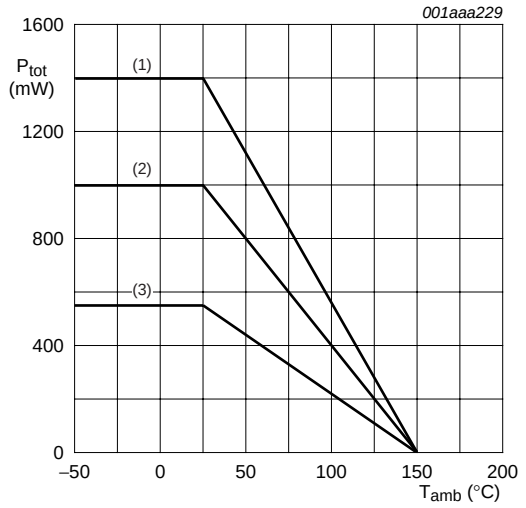
LIMITING VALUES

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_{CRM}	repetitive peak collector current	notes 1 and 2	–	7	A
I_{CM}	peak collector current	$t_p \leq 1$ ms	–	10	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 and standard footprint.
3. Device mounted on a printed-circuit board, single-sided copper, tin-plated and mounting pad for collector 1 cm^2.
4. Device mounted on a printed-circuit board, single-sided copper, tin-plated and 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 and tin-plated. For other mounting conditions, see *"Thermal considerations for SOT89 in the General Part of associated Handbook"*.



(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.

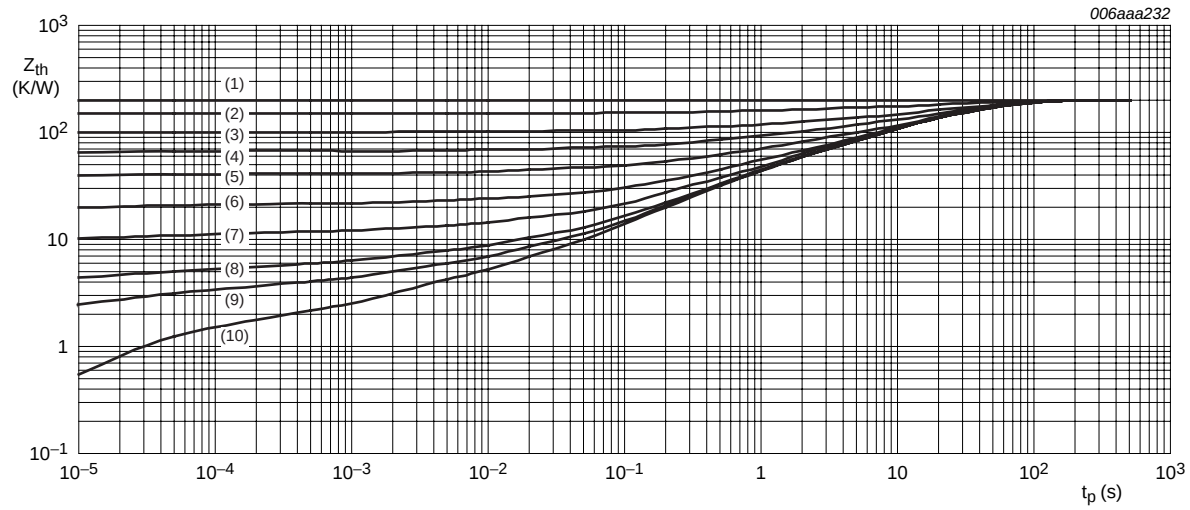
Fig.2 Power derating curves.

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

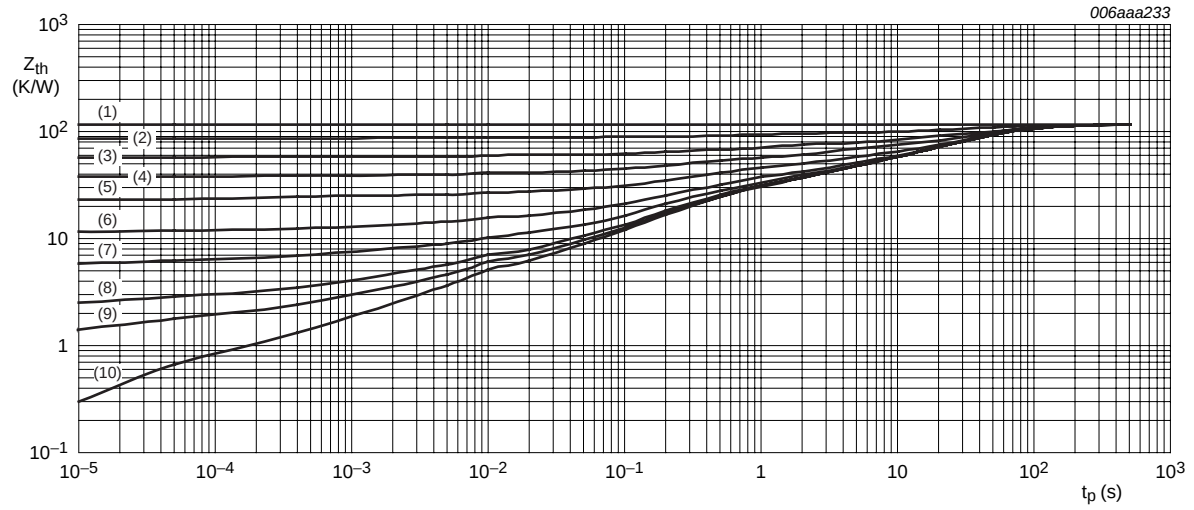
1. Operated under pulsed conditions: pulse width $t_p \leq 10$ ms; duty cycle δ Š≤ 0.2.
2. Device mounted on a printed-circuit board, single-sided copper, tin-plated and standard footprint.
3. Device mounted on a printed-circuit board, single-sided copper, tin-plated and mounting pad for collector 1 cm^2.
4. Device mounted on a printed-circuit board, single-sided copper, tin-plated and 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 and tin-plated. For other mounting conditions, see *"Thermal considerations for SOT89 in the General Part of associated Handbook"*.



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.

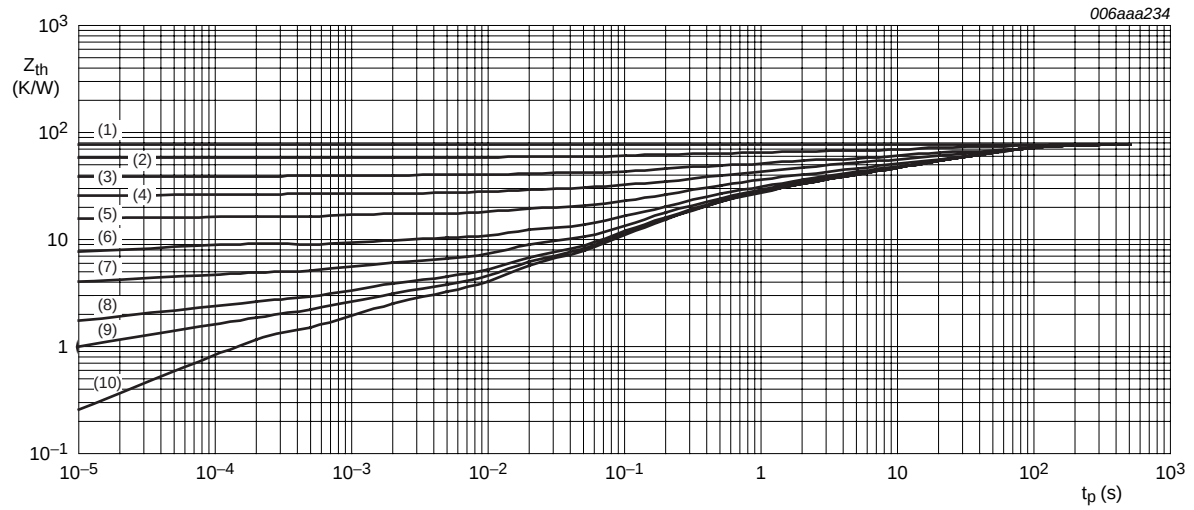
Fig.3 Transient thermal impedance as a function of pulse time; typical values.



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.

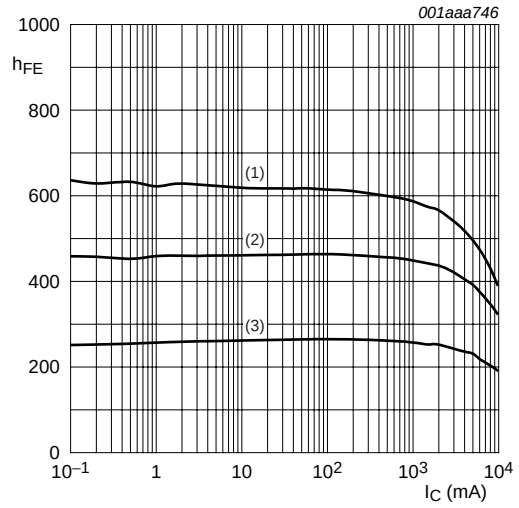
CHARACTERISTICS

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_{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	300	450	–	
		I_C = 1 A; note 1	300	440	–	
		I_C = 2 A; note 1	250	420	–	
		I_C = 5 A; note 1	200	380	–	
V_{CEsat}	collector-emitter saturation voltage	I_C = 0.5 A; I_B = 5 mA	–	35	50	mV
		I_C = 1 A; I_B = 10 mA	–	50	70	mV
		I_C = 2.5 A; I_B = 125 mA; note 1	–	85	120	mV
		I_C = 4 A; I_B = 200 mA; note 1	–	130	180	mV
		I_C = 5 A; I_B = 500 mA; note 1	–	160	220	mV
R_{CEsat}	equivalent on-resistance	I_C = 5 A; I_B = 500 mA; note 1	–	32	44	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	100	125	–	MHz
C_c	collector capacitance	V_{CB} = 10 V; I_E = i_e = 0 A; f = 1 MHz	–	90	110	pF

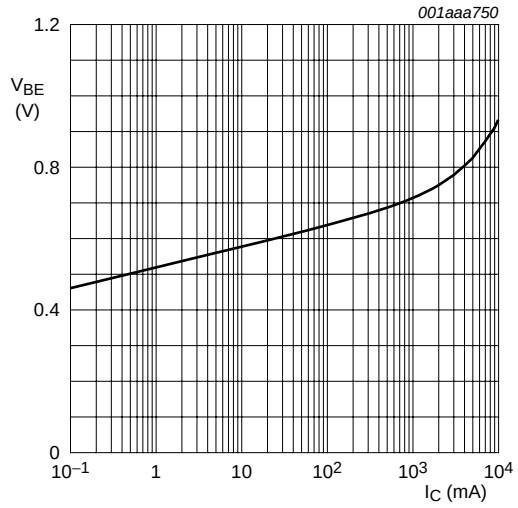
Note

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



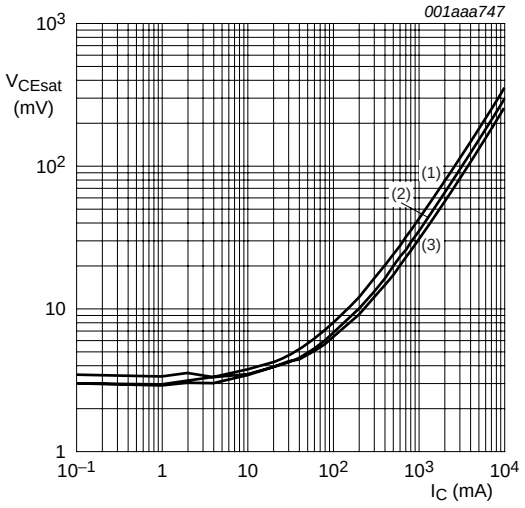
V_{CE} = 2 V.
(1) T_{amb} = 100 °C.
(2) T_{amb} = 25 °C.
(3) T_{amb} = −55 °C.

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



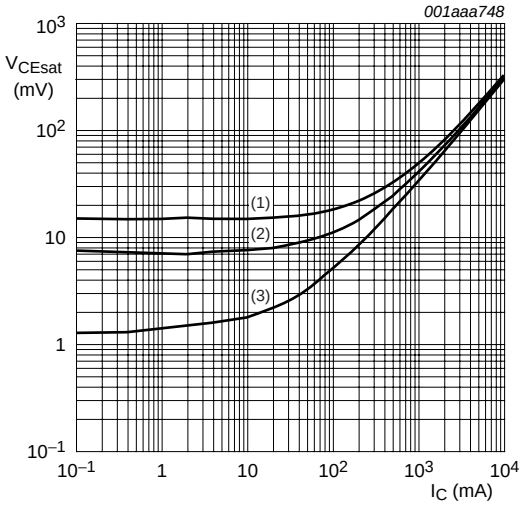
V_{CE} = 2 V.
T_{amb} = 25 °C.

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



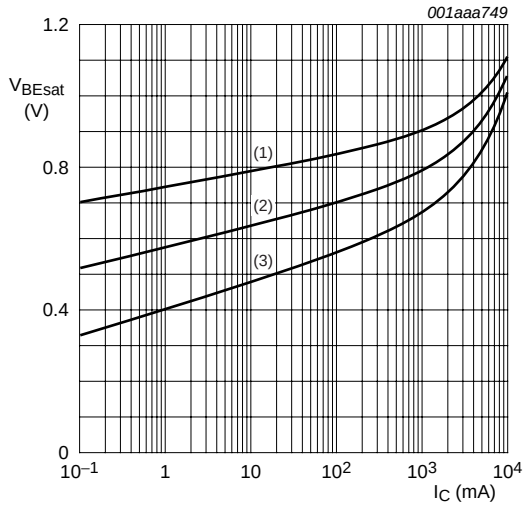
I_C/I_B = 20.
(1) T_{amb} = 100 °C.
(2) T_{amb} = −55 °C.
(3) T_{amb} = 25 °C.

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



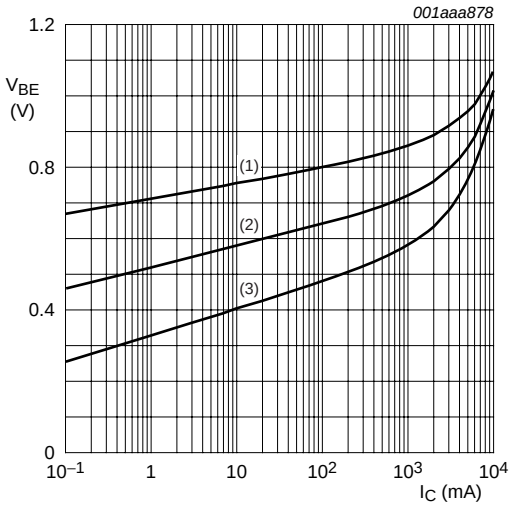
T_{amb} = 25 °C.
(1) I_C/I_B = 100.
(2) I_C/I_B = 50.
(3) I_C/I_B = 10.

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



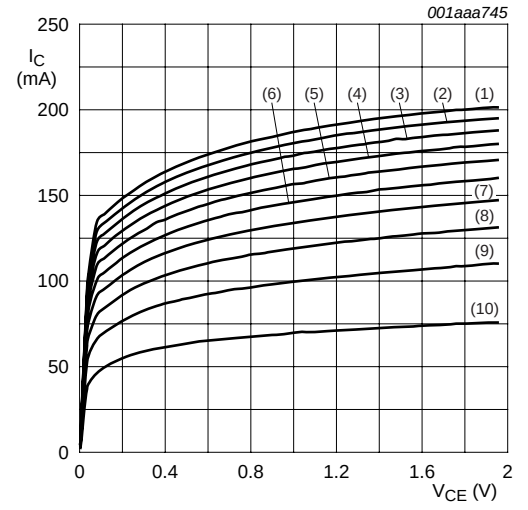
I_C/I_B = 20.
(1) T_{amb} = −55 °C.
(2) T_{amb} = 25 °C.
(3) T_{amb} = 100 °C.

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



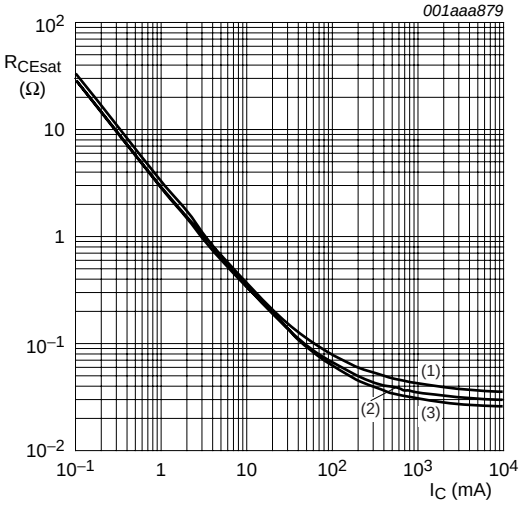
V_{CE} = 2 V.
(1) T_{amb} = −55 °C.
(2) T_{amb} = 25 °C.
(3) T_{amb} = 100 °C.

Fig.11 Base-emitter voltage as a function of collector current; typical values.



T_{amb} = 25 °C.
(1) I_B = 5 mA.
(2) I_B = 4.5 mA.
(3) I_B = 4 mA.
(4) I_B = 3.5 mA.
(5) I_B = 3 mA.
(6) I_B = 2.5 mA.
(7) I_B = 2 mA.
(8) I_B = 1.5 mA.
(9) I_B = 1 mA.
(10) I_B = 0.5 mA.

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



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

Fig.13 Equivalent on-resistance as a function of collector current; typical values.

Reference mounting conditions

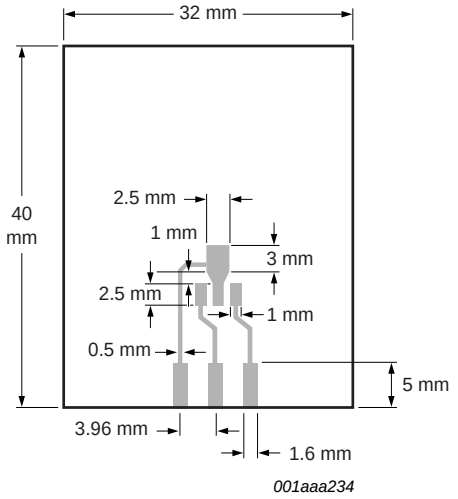


Fig.14 FR4, standard footprint.

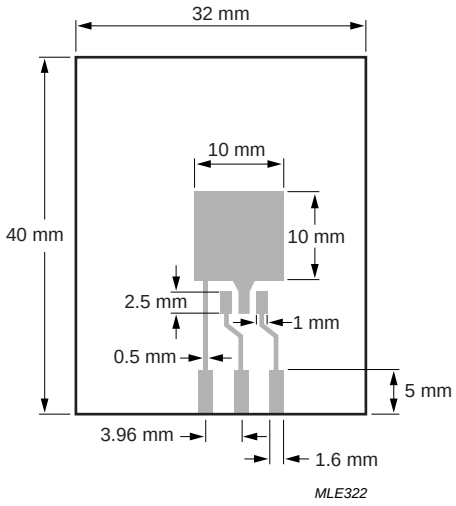


Fig.15 FR4, mounting pad for collector 1 cm^2.

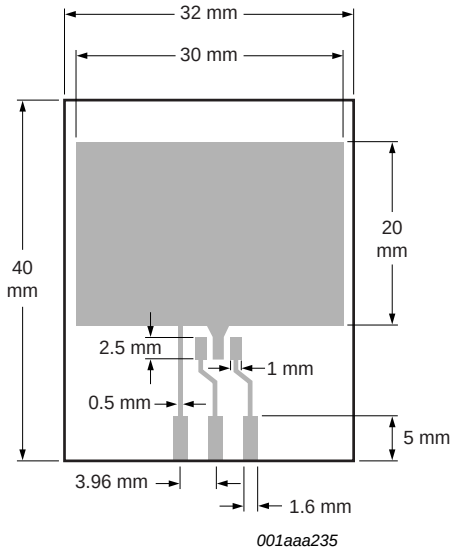
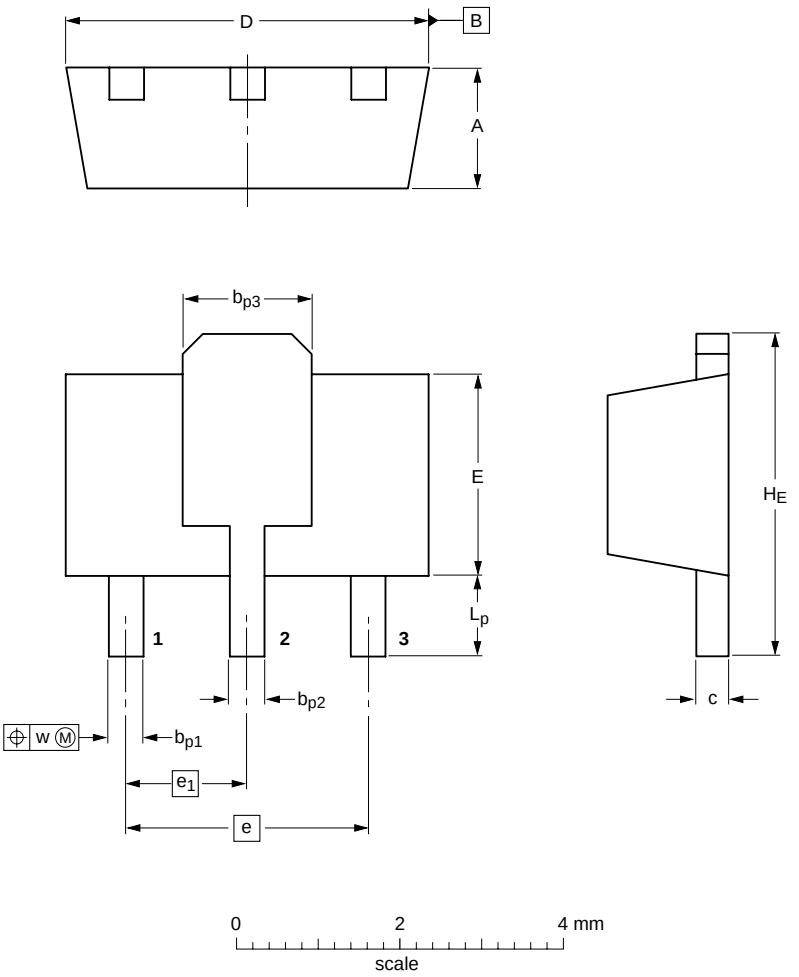


Fig.16 FR4, mounting pad for collector 6 cm^2.

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.

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