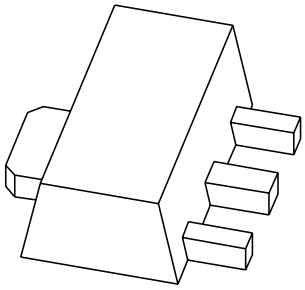
DATA SHEET



PBSS5540X

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

Product specification
Supersedes data of 2004 Jan 15

2004 Nov 04

Philips
Semiconductors

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

PBSS5540X

FEATURES

- Low collector-emitter saturation voltage V_{CEsat}
- High collector current capability: I_C and I_{CM}
- High efficiency leading to less heat generation.

APPLICATIONS

- Supply line switching circuits
- Battery management applications
- DC/DC converter applications
- Strobe flash units
- Medium power driver (e.g. relays, buzzers and motors).

DESCRIPTION

PNP low V_{CEsat} transistor in a medium power SOT89 (SC-62) package.

NPN complement: PBSS4540X.

MARKING

TYPE NUMBER	MARKING CODE(1)
PBSS5540X	*1G

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	–40	V
I_C	collector current (DC)	–4	A
I_{CRP}	repetitive peak collector current	–5	A
R_{CEsat}	equivalent on-resistance	75	mΩ

PINNING

PIN	DESCRIPTION
1	emitter
2	collector
3	base

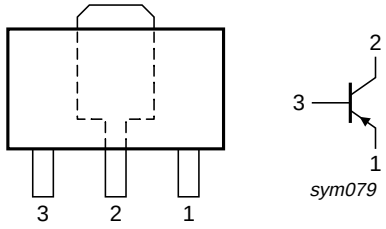


Fig.1 Simplified outline (SOT89) and symbol.

ORDERING INFORMATION

TYPE NUMBER	PACKAGE		
	NAME	DESCRIPTION	VERSION
PBSS5540X	SC-62	plastic surface mounted package; collector pad for good heat transfer; 3 leads	SOT89

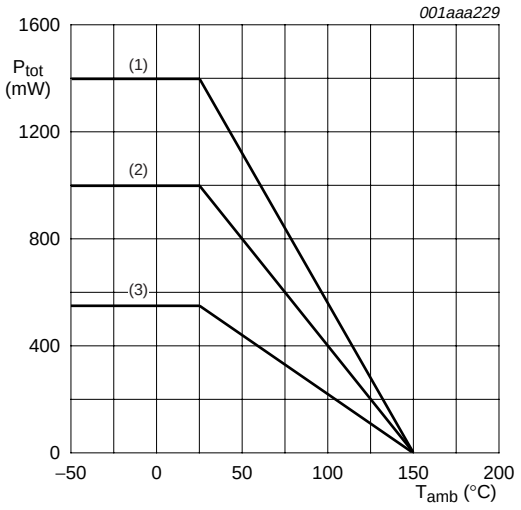
LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	–40	V
V_{CEO}	collector-emitter voltage	open base	–	–40	V
V_{EBO}	emitter-base voltage	open collector	–	–6	V
I_{CM}	peak collector current	$t_p \leq 1$ ms	–	–10	A
I_{CRP}	repetitive peak collector current	$t_p \leq 10$ ms; $\delta \leq 0.2$	–	–5	A
I_C	collector current (DC)		–	–4	A
I_{BM}	peak base current	$t_p \leq 1$ ms	–	–2	A
I_B	base current (DC)		–	–1	A
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C			
		$t_p \leq 10$ ms; $\delta \leq 0.2$; note 1	–	2.5	W
		note 1	–	0.55	W
		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 printed-circuit board, single-sided copper, tin-plated and standard footprint.
2. Device mounted on a printed-circuit board, single-sided copper, tin-plated and mounting pad for collector 1 cm^2.
3. Device mounted on a printed-circuit board, single-sided copper, tin-plated and mounting pad for collector 6 cm^2.
4. Device mounted on a 7 cm^2 ceramic printed-circuit board, 1 cm^2 single-sided copper and 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.

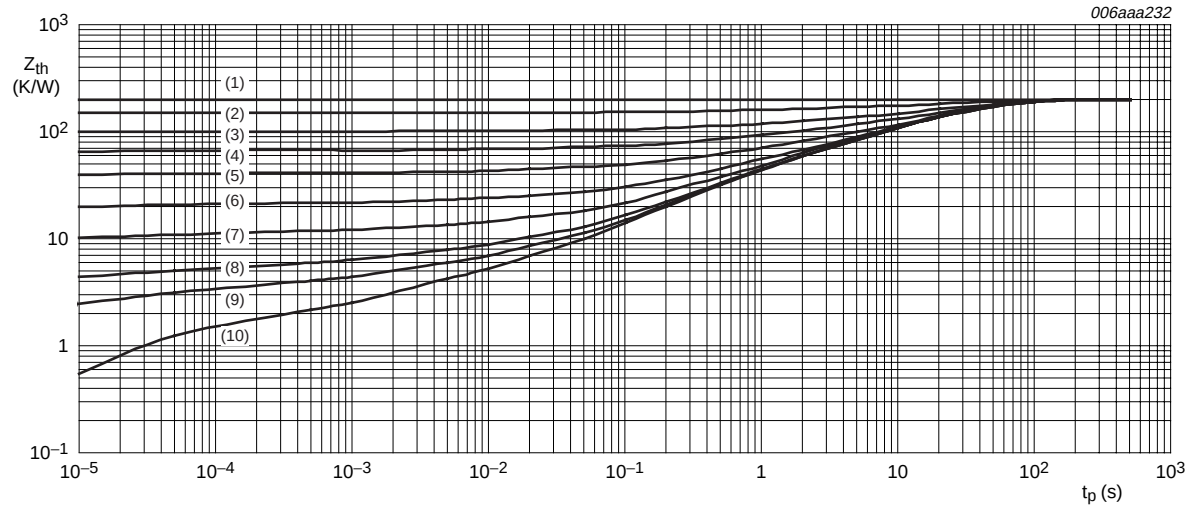
Fig.2 Power derating curves.

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

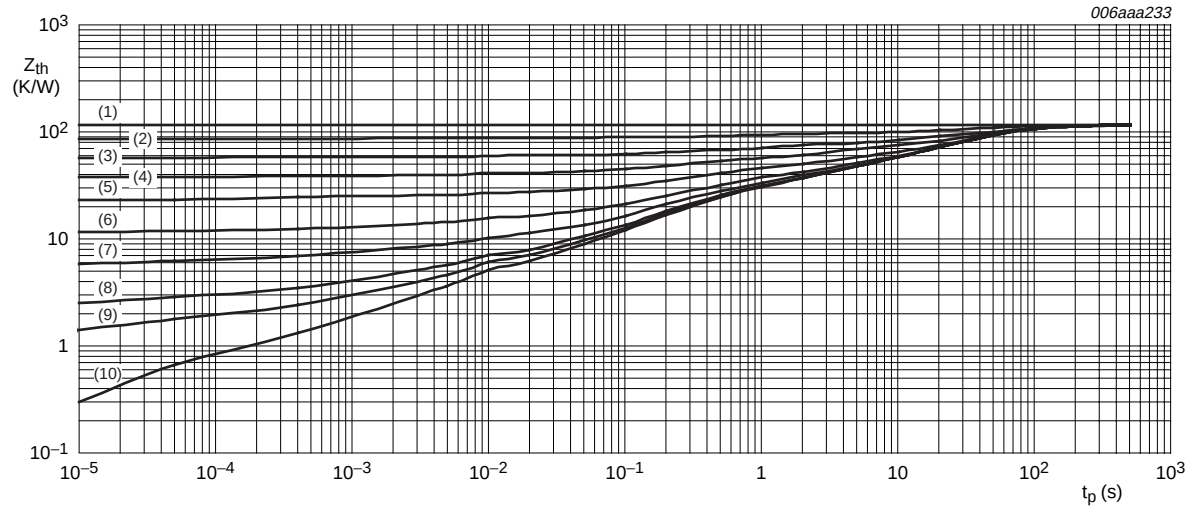
1. Pulse test: $t_p \leq 10$ ms; $\delta \leq 0.2$.
2. Device mounted on a printed-circuit board, single-sided copper, tin-plated and standard footprint.
3. Device mounted on a printed-circuit board, single-sided copper, tin-plated and mounting pad for collector 1 cm^2.
4. Device mounted on a printed-circuit 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.



Mounted on FR4 printed-circuit board; standard footprint.

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

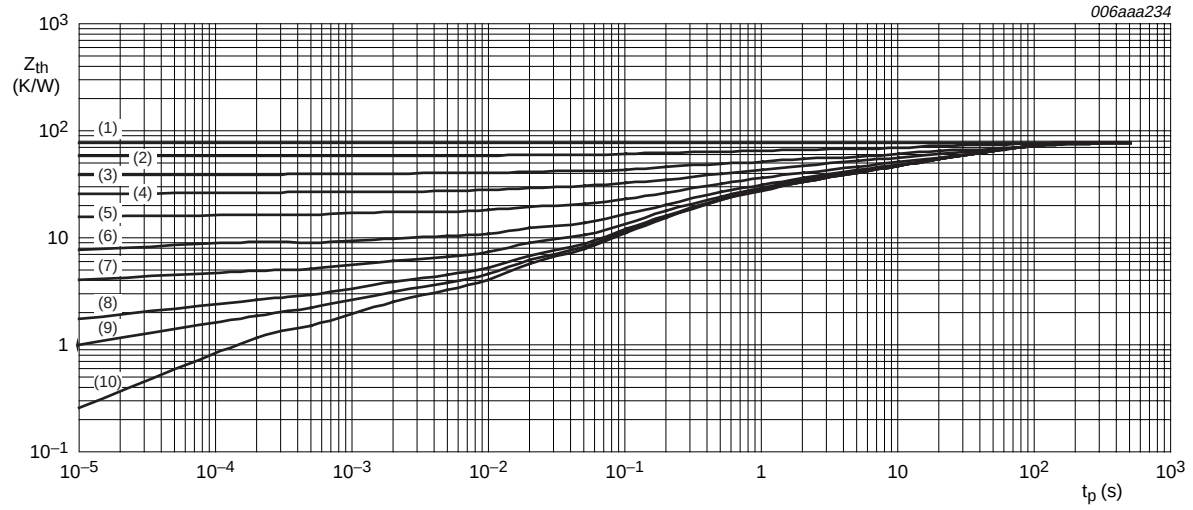
Fig.3 Transient thermal impedance as a function of pulse time; typical values.



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

(1) δ = 1. (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.

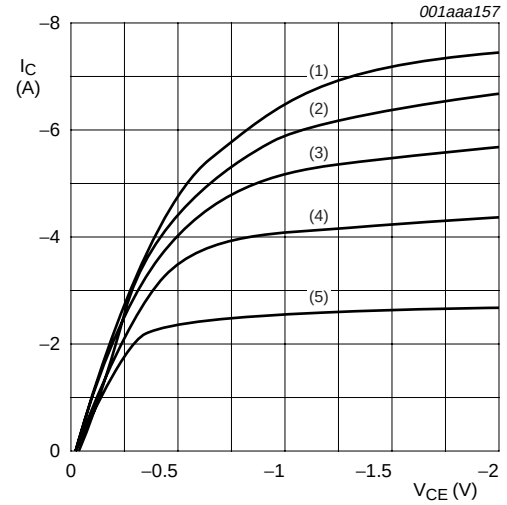
CHARACTERISTICS

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{CBO}	collector-base cut-off current	V_{CB} = –30 V; I_E = 0 A	–	–	–100	nA
		V_{CB} = –30 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
h_{FE}	DC current gain	V_{CE} = –2 V; I_C = –0.5 A	250	–	–	
		V_{CE} = –2 V; I_C = –1 A; note 1	200	–	–	
		V_{CE} = –2 V; I_C = –2 A; note 1	150	–	–	
		V_{CE} = –2 V; I_C = –5 A; note 1	50	–	–	
V_{CEsat}	collector-emitter saturation voltage	I_C = –0.5 A; I_B = –5 mA	–	–	120	mV
		I_C = –1 A; I_B = –10 mA	–	–	170	mV
		I_C = –2 A; I_B = –200 mA	–	–	160	mV
		I_C = –4 A; I_B = –200 mA; note 1	–	–	340	mV
		I_C = –5 A; I_B = –500 mA; note 1	–	–	375	mV
R_{CEsat}	equivalent on-resistance	I_C = –5 A; I_B = –500 mA; note 1	–	45	75	mΩ
V_{BEsat}	base-emitter saturation voltage	I_C = –4 A; I_B = –200 mA; note 1	–	–	–1.1	V
		I_C = –5 A; I_B = –500 mA; note 1	–	–	–1.2	V
V_{BEon}	base-emitter turn-on voltage	V_{CE} = –2 V; I_C = –2 A	–	–	–1.0	V
f_T	transition frequency	V_{CE} = –10 V; I_C = –0.1 A; f = 100 MHz	60	–	–	MHz
C_c	collector capacitance	V_{CB} = –10 V; I_E = i_e = 0 A; f = 1 MHz	–	–	105	pF

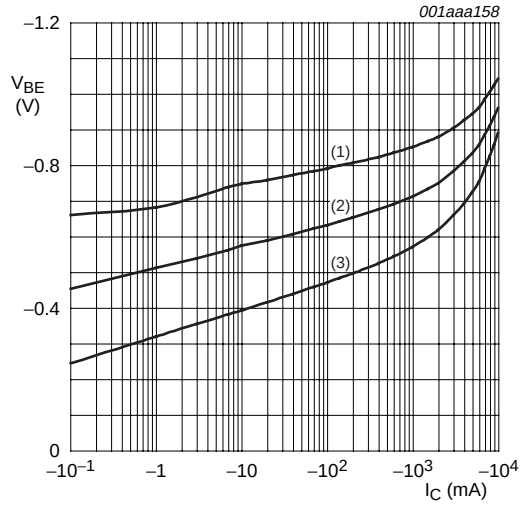
Note

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



(1) I_{B1} = −11 mA. (4) I_{B4} = −44 mA.
(2) I_{B2} = −22 mA. (5) I_{B5} = −55 mA.
(3) I_{B3} = −33 mA.

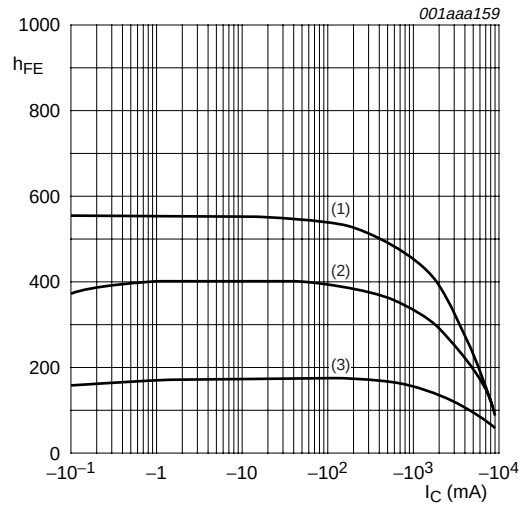
Fig.6 Collector current as a function of collector-emitter voltage; typical values.



V_{CE} = −2 V.

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

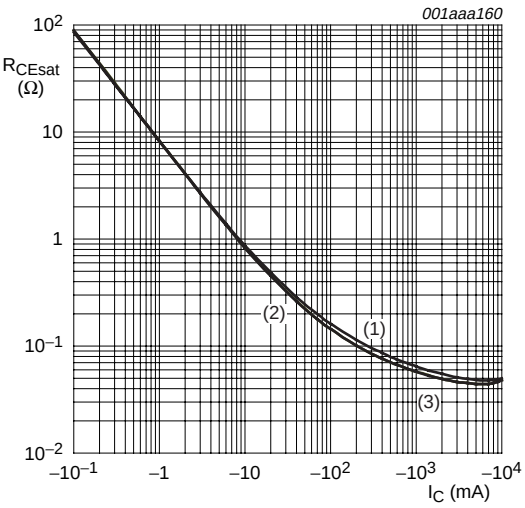
Fig.7 Base-emitter voltage as a function of collector current; typical values.



V_{CE} = −2 V.

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

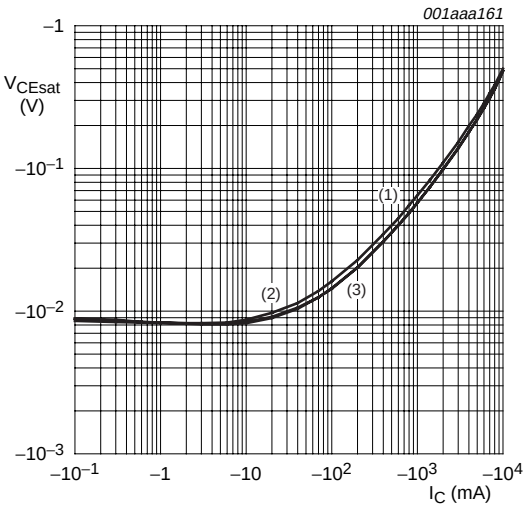
Fig.8 DC current gain as a function of collector current; typical values.



I_C/I_B = 20.

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

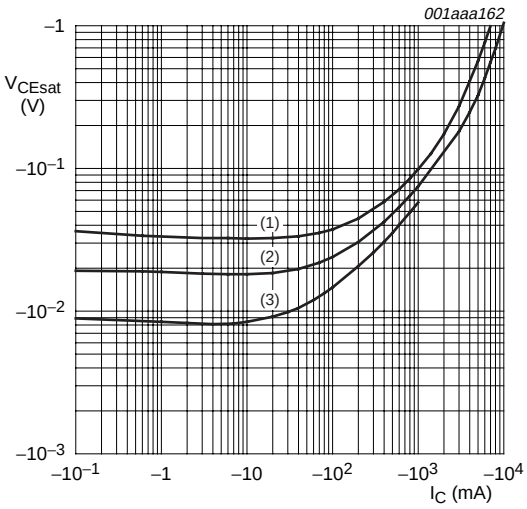
Fig.9 Equivalent on-resistance as a function of collector current; typical values.



I_C/I_B = 20.

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

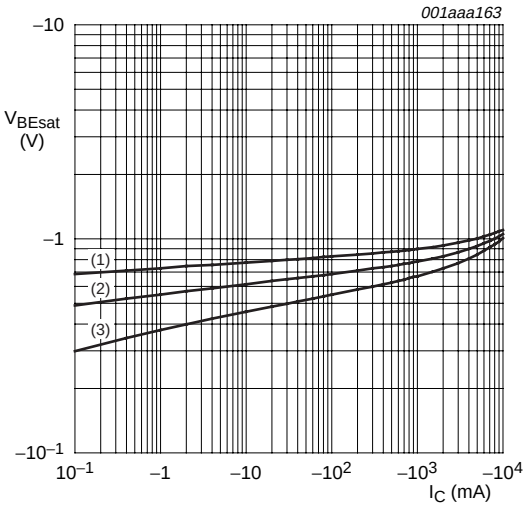
Fig.10 Collector-emitter saturation voltage as a function of collector current; typical values.



T_{amb} = 25 °C.

(1) I_C/I_B = 100. (2) I_C/I_B = 50. (3) I_C/I_B = 10.

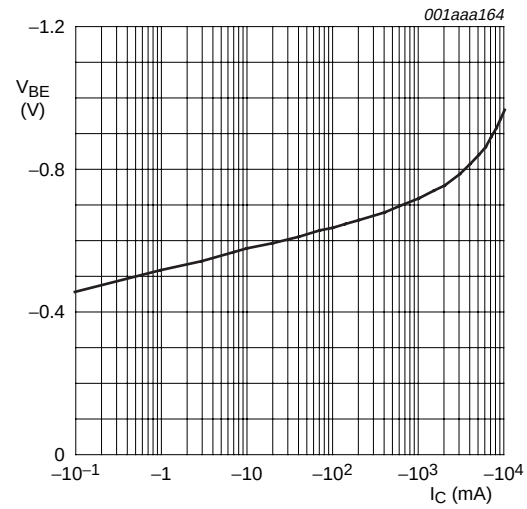
Fig.11 Collector-emitter saturation voltage as a function of collector current; typical values.



I_C/I_B = 20.

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

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



T_{amb} = 25 °C.

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

Reference mounting conditions

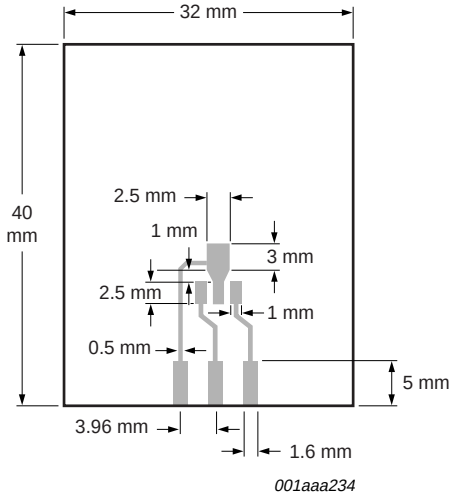


Fig.14 FR4, standard footprint.

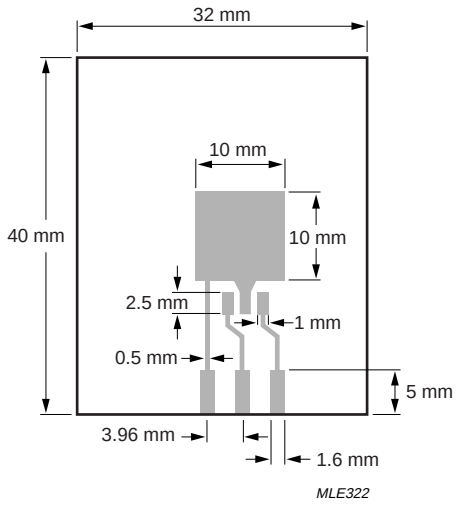


Fig.15 FR4, mounting pad for collector 1 cm^2.

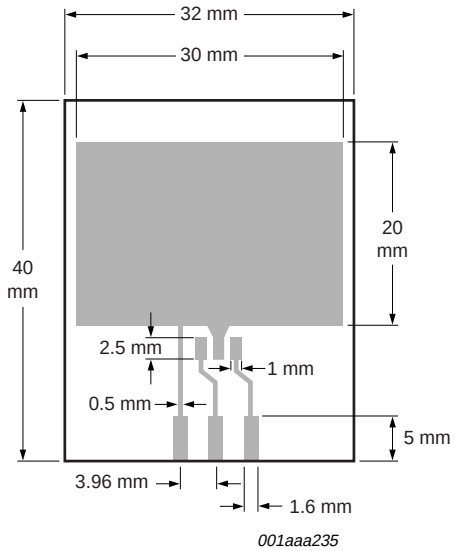
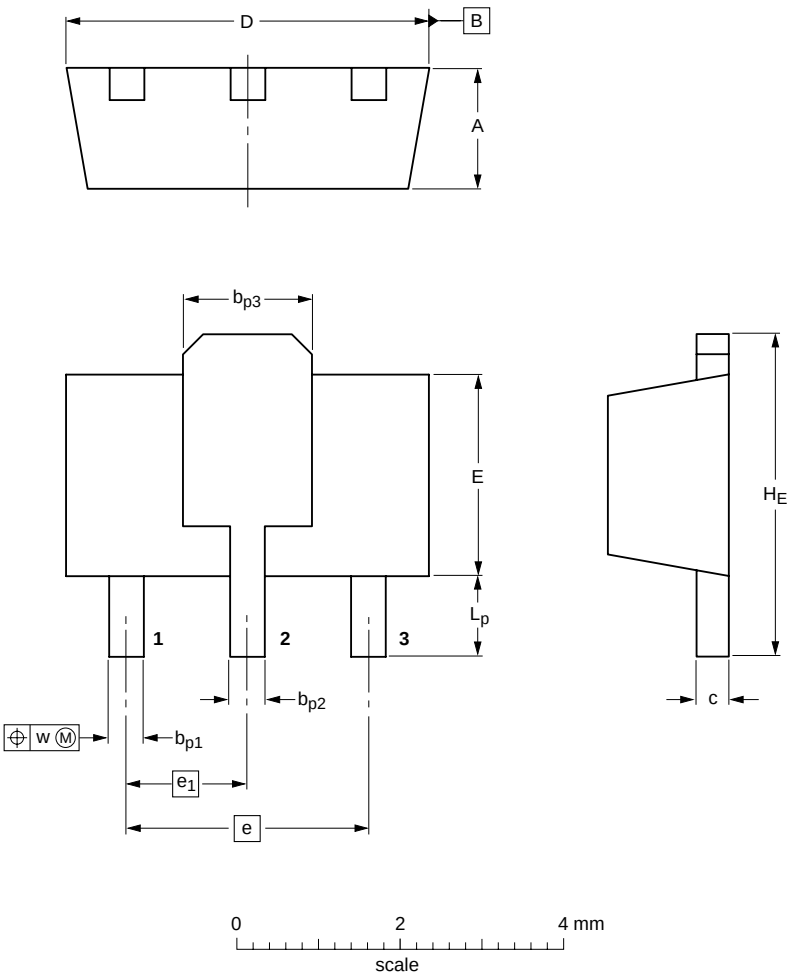


Fig.16 FR4, mounting pad for collector 6 cm^2.

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			~~99-09-13~~ 04-08-03

DATA SHEET STATUS

LEVEL	DATA SHEET STATUS(1)	PRODUCT STATUS(2)(3)	DEFINITION
I	Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
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3. For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

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