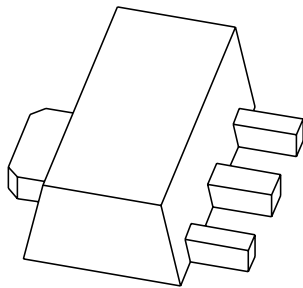


# DATA SHEET



**PBSS4520X**

**20 V, 5 A**

**NPN low  $V_{CEsat}$  (BISS) transistor**

Product specification  
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 <sup>(1)</sup>
PBSS4520X	*1F

**Note**

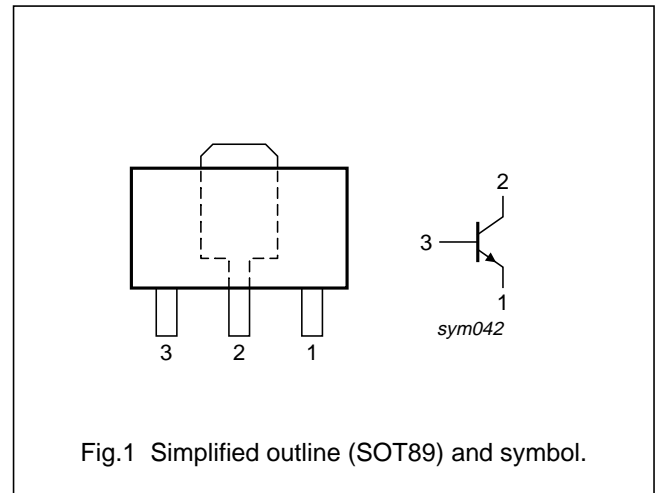
- \* = p: made in Hong Kong  
\* = t: made in Malaysia  
\* = W: made in China.

**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	m $\Omega$

**PINNING**

PIN	DESCRIPTION
1	emitter
2	collector
3	base



**ORDERING INFORMATION**

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

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

PBSS4520X

**LIMITING VALUES**

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

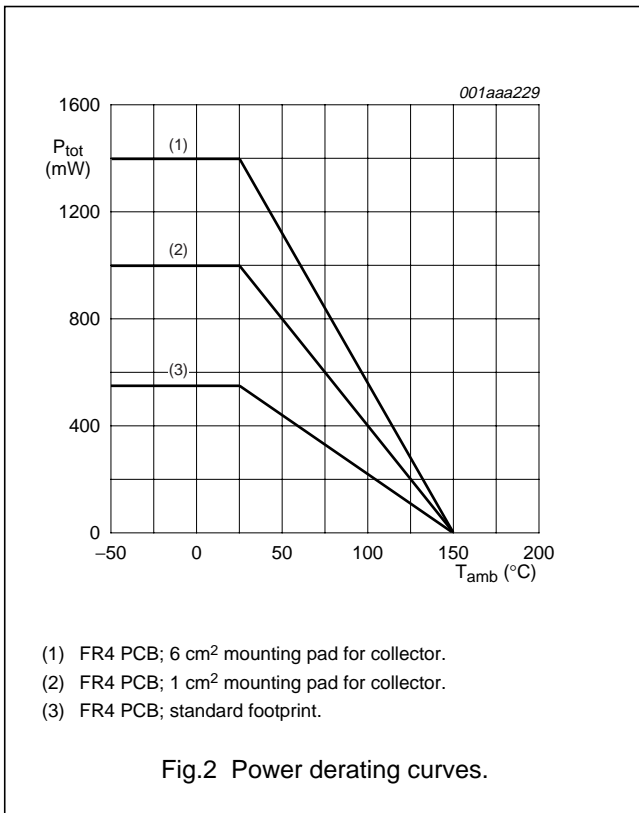
SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{CBO}$	collector-base voltage	open emitter	–	20	V
$V_{CEO}$	collector-emitter voltage	open base	–	20	V
$V_{EBO}$	emitter-base voltage	open collector	–	5	V
$I_C$	collector current (DC)		–	5	A
$I_{CRM}$	repetitive peak collector current	notes 1 and 2	–	7	A
$I_{CM}$	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	–	2.5	W
		notes 1 and 2	–	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. 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<sup>2</sup>.
4. Device mounted on a printed-circuit board, single-sided copper, tin-plated and mounting pad for collector 6 cm<sup>2</sup>.
5. Device mounted on a 7 cm<sup>2</sup> ceramic printed-circuit board, 1 cm<sup>2</sup> single-sided copper and tin-plated. For other mounting conditions, see "Thermal considerations for SOT89 in the General Part of associated Handbook".

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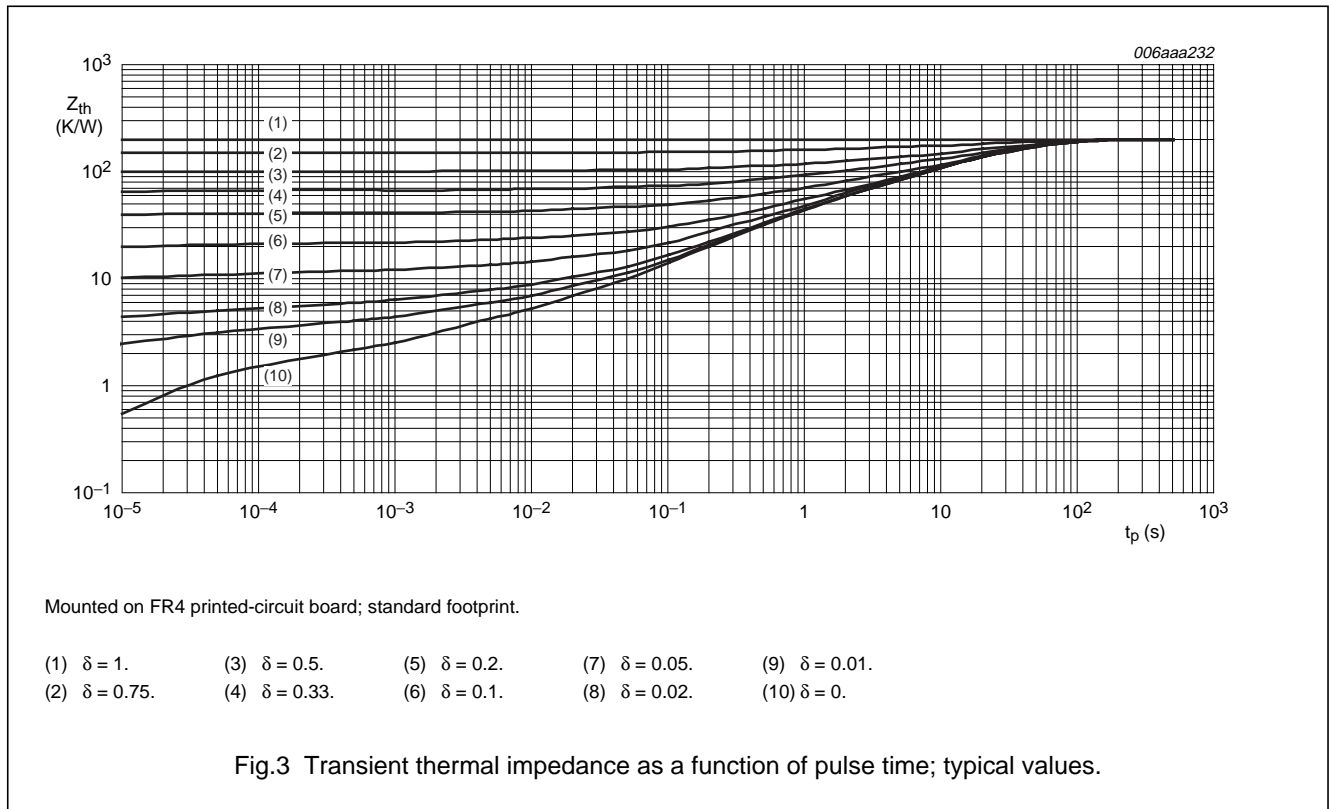
PBSS4520X

**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

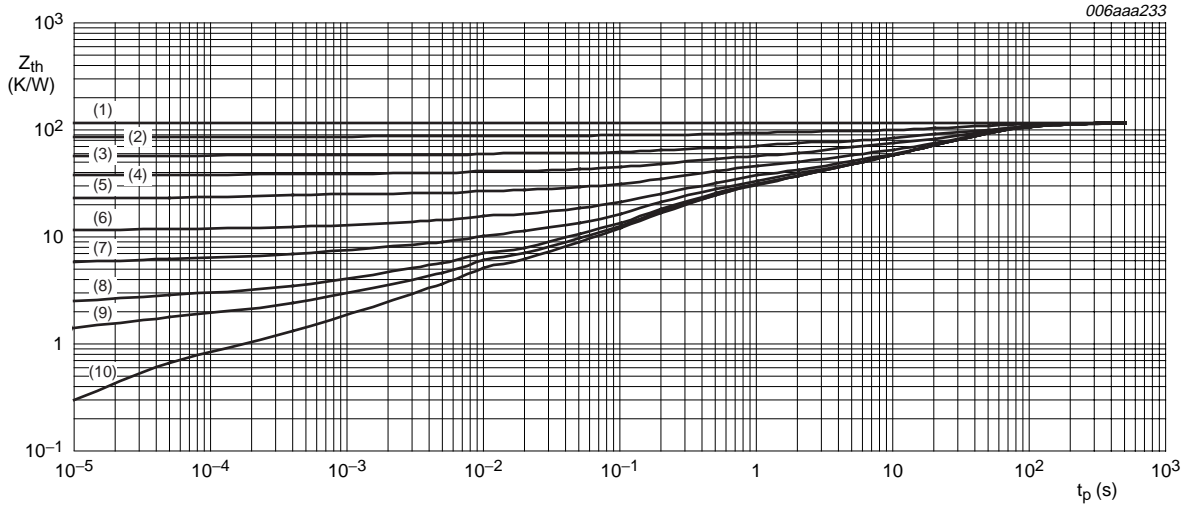
**Notes**

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 and standard footprint.
3. Device mounted on a printed-circuit board, single-sided copper, tin-plated and mounting pad for collector 1 cm<sup>2</sup>.
4. Device mounted on a printed-circuit board, single-sided copper, tin-plated and mounting pad for collector 6 cm<sup>2</sup>.
5. Device mounted on a 7 cm<sup>2</sup> ceramic printed-circuit board, 1 cm<sup>2</sup> single-sided copper and tin-plated. For other mounting conditions, see "Thermal considerations for SOT89 in the General Part of associated Handbook".



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

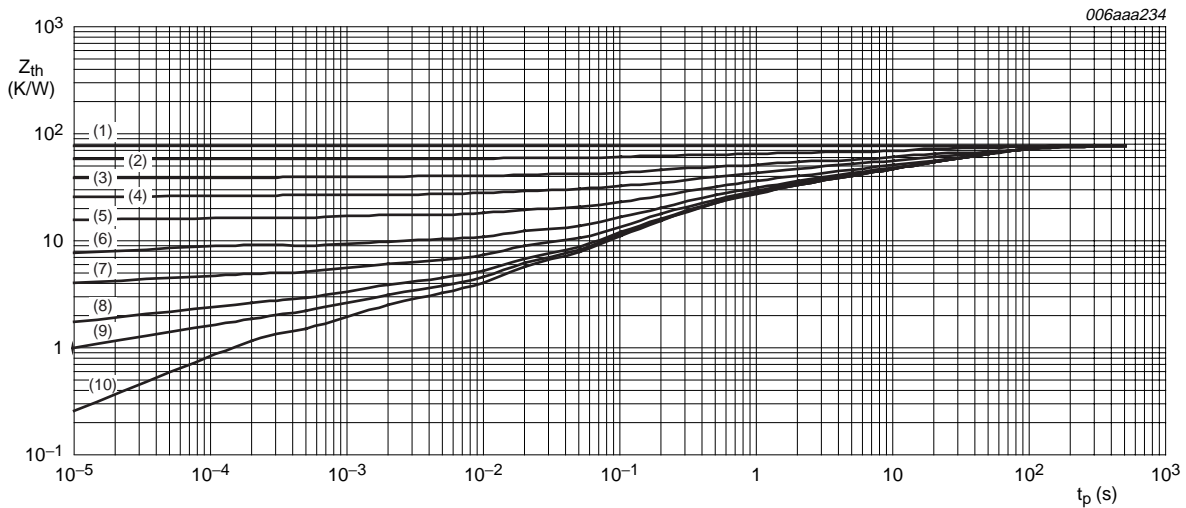
PBSS4520X



Mounted on FR4 printed-circuit board; mounting pad for collector 1 cm<sup>2</sup>.

- |                      |                      |                     |                      |                      |
|----------------------|----------------------|---------------------|----------------------|----------------------|
| (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.4 Transient thermal impedance as a function of pulse time; typical values.



Mounted on FR4 printed-circuit board; mounting pad for collector 6 cm<sup>2</sup>.

- |                      |                      |                     |                      |                      |
|----------------------|----------------------|---------------------|----------------------|----------------------|
| (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.5 Transient thermal impedance as a function of pulse time; typical values.

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

PBSS4520X

**CHARACTERISTICS** $T_{amb} = 25\text{ °C}$  unless otherwise specified.

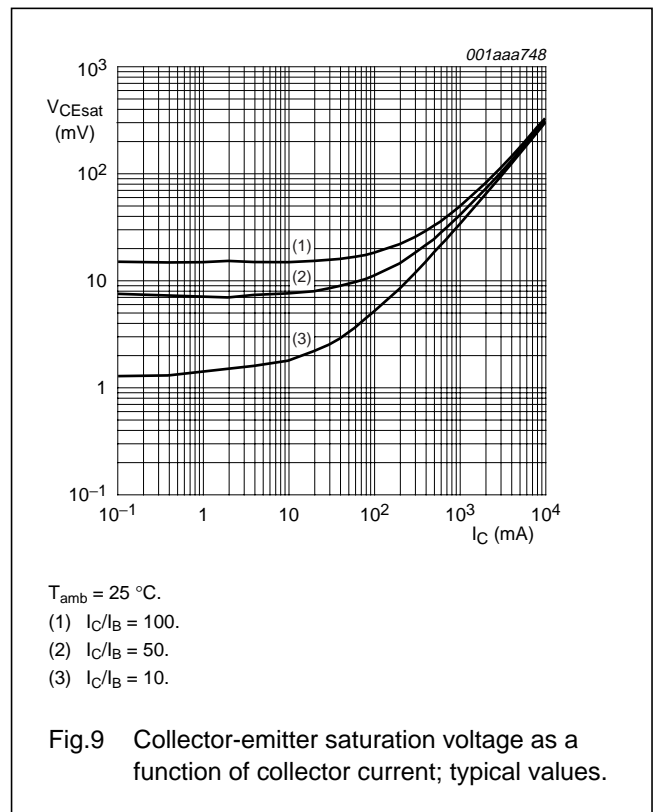
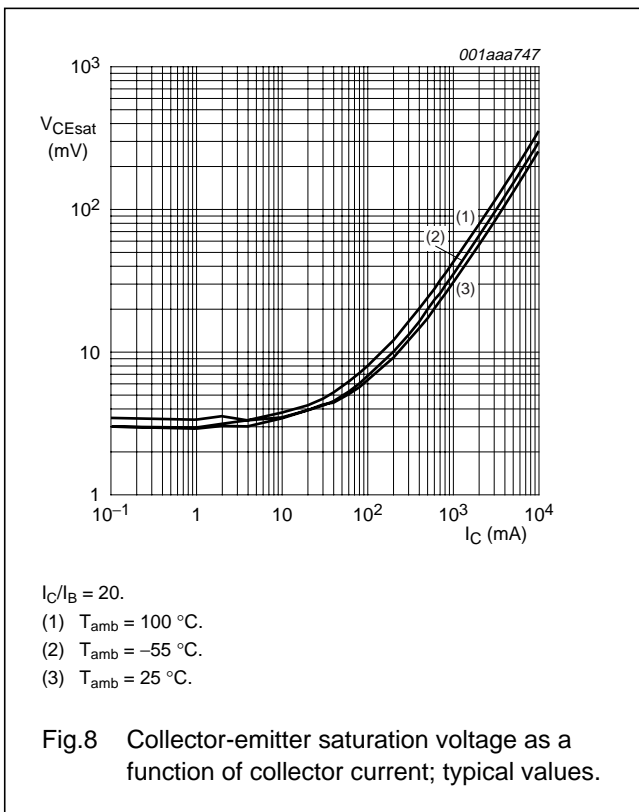
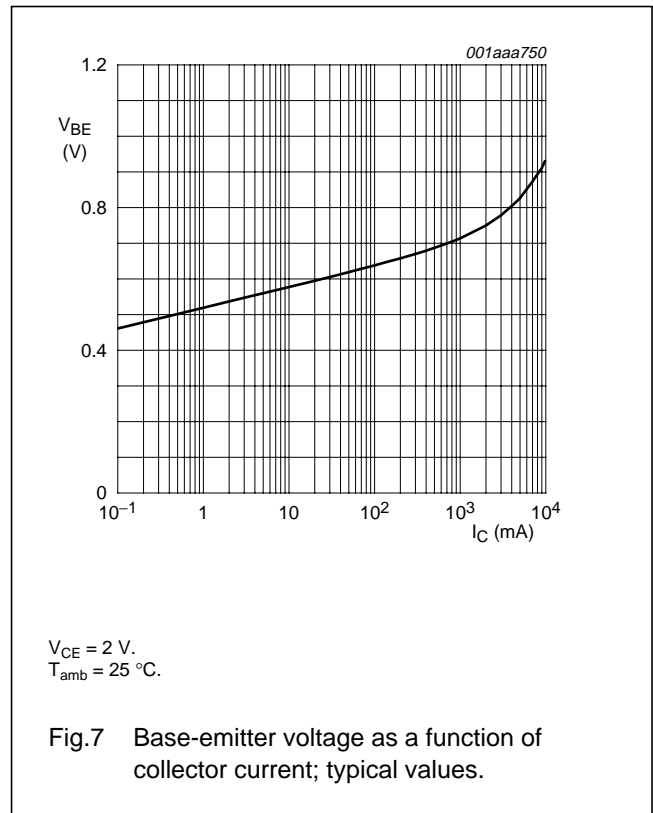
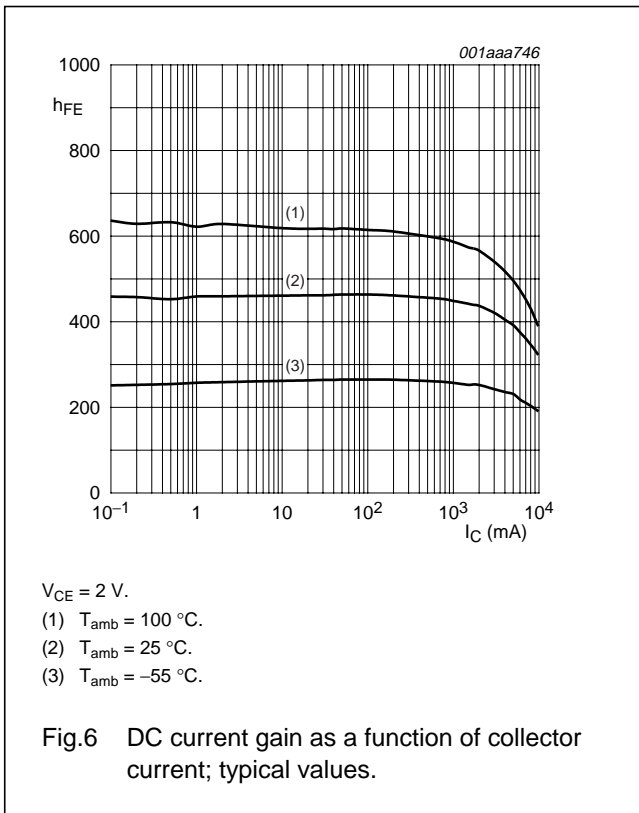
SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$I_{CBO}$	collector-base cut-off current	$V_{CB} = 20\text{ V}; I_E = 0\text{ A}$	–	–	100	nA
		$V_{CB} = 20\text{ V}; I_E = 0\text{ A}; T_j = 150\text{ °C}$	–	–	50	$\mu\text{A}$
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = 5\text{ V}; I_C = 0\text{ A}$	–	–	100	nA
$I_{CES}$	collector-emitter cut-off current	$V_{CE} = 20\text{ V}; V_{BE} = 0\text{ V}$	–	–	100	nA
$h_{FE}$	DC current gain	$V_{CE} = 2\text{ V}$				
		$I_C = 0.5\text{ A}$	300	450	–	
		$I_C = 1\text{ A}; \text{note 1}$	300	440	–	
		$I_C = 2\text{ A}; \text{note 1}$	250	420	–	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = 0.5\text{ A}; I_B = 5\text{ mA}$	–	35	50	mV
		$I_C = 1\text{ A}; I_B = 10\text{ mA}$	–	50	70	mV
		$I_C = 2.5\text{ A}; I_B = 125\text{ mA}; \text{note 1}$	–	85	120	mV
		$I_C = 4\text{ A}; I_B = 200\text{ mA}; \text{note 1}$	–	130	180	mV
		$I_C = 5\text{ A}; I_B = 500\text{ mA}; \text{note 1}$	–	160	220	mV
$R_{CEsat}$	equivalent on-resistance	$I_C = 5\text{ A}; I_B = 500\text{ mA}; \text{note 1}$	–	32	44	$\text{m}\Omega$
$V_{BEsat}$	base-emitter saturation voltage	$I_C = 4\text{ A}; I_B = 200\text{ mA}; \text{note 1}$	–	0.9	1.05	V
		$I_C = 5\text{ A}; I_B = 500\text{ mA}; \text{note 1}$	–	0.96	1.1	V
$V_{BEon}$	base-emitter turn-on voltage	$V_{CE} = 2\text{ V}; I_C = 2\text{ A}$	–	0.74	0.85	V
$f_T$	transition frequency	$I_C = 100\text{ mA}; V_{CE} = 10\text{ V}; f = 100\text{ MHz}$	100	125	–	MHz
$C_c$	collector capacitance	$V_{CB} = 10\text{ V}; I_E = i_e = 0\text{ A}; f = 1\text{ MHz}$	–	90	110	pF

**Note**

1. Pulse test:  $t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02$ .

20 V, 5 A  
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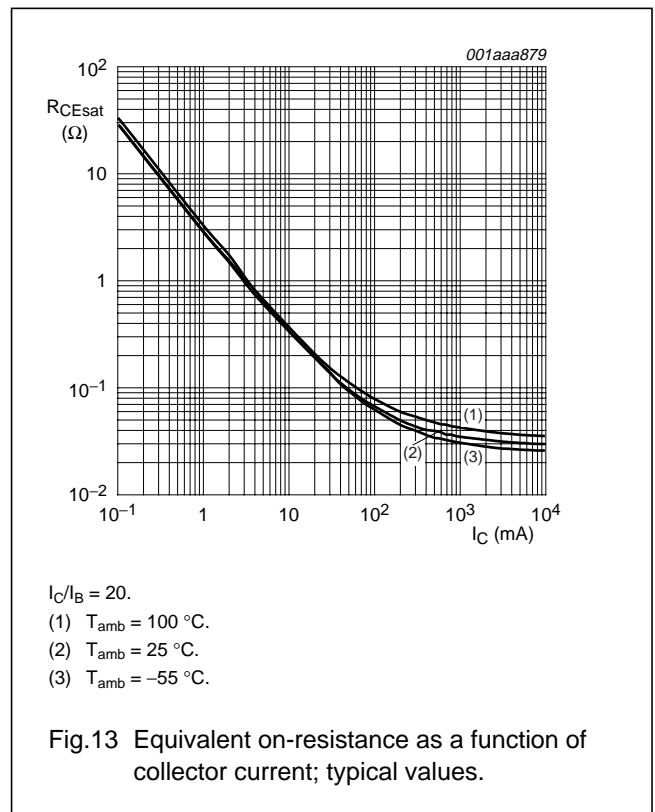
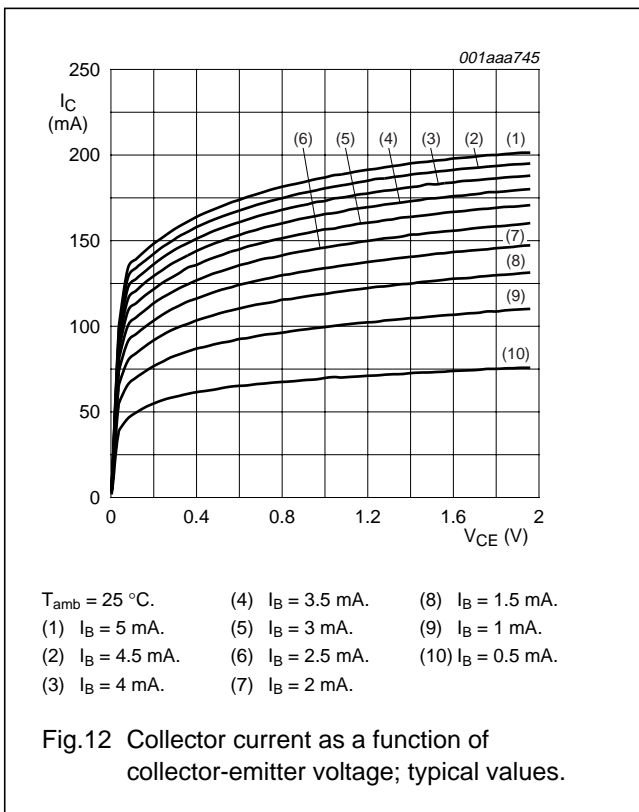
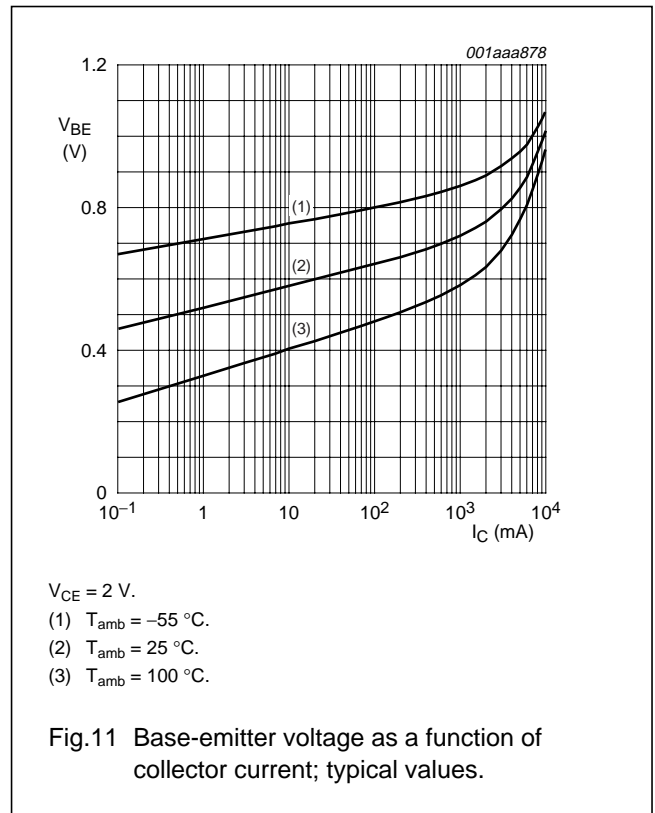
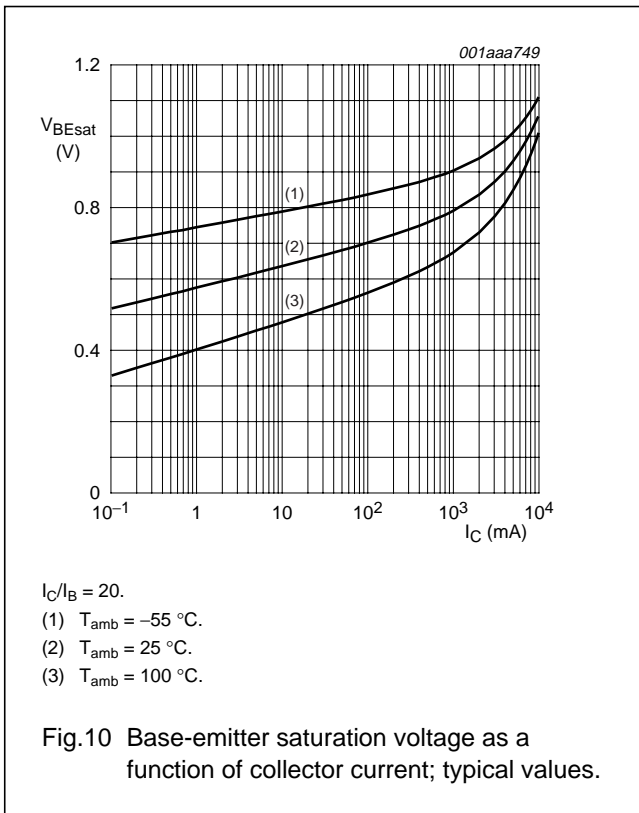
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20 V, 5 A  
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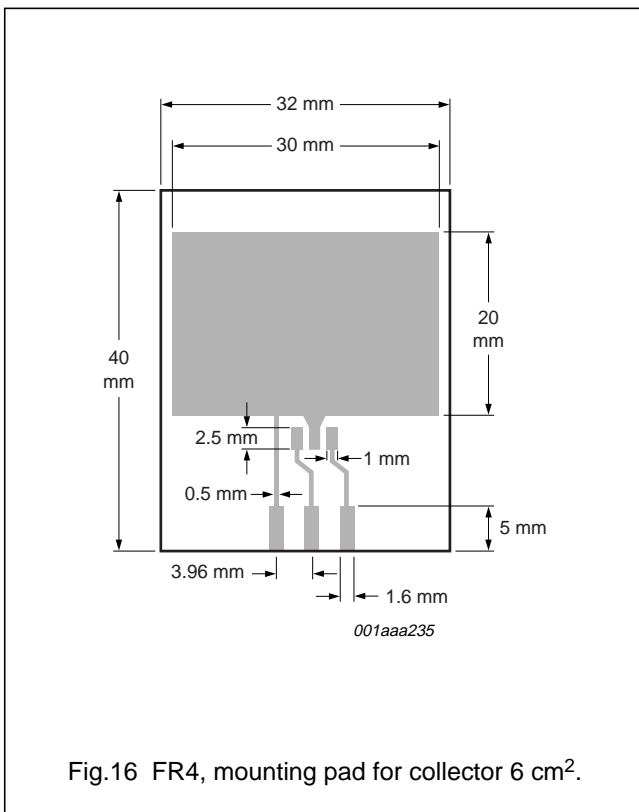
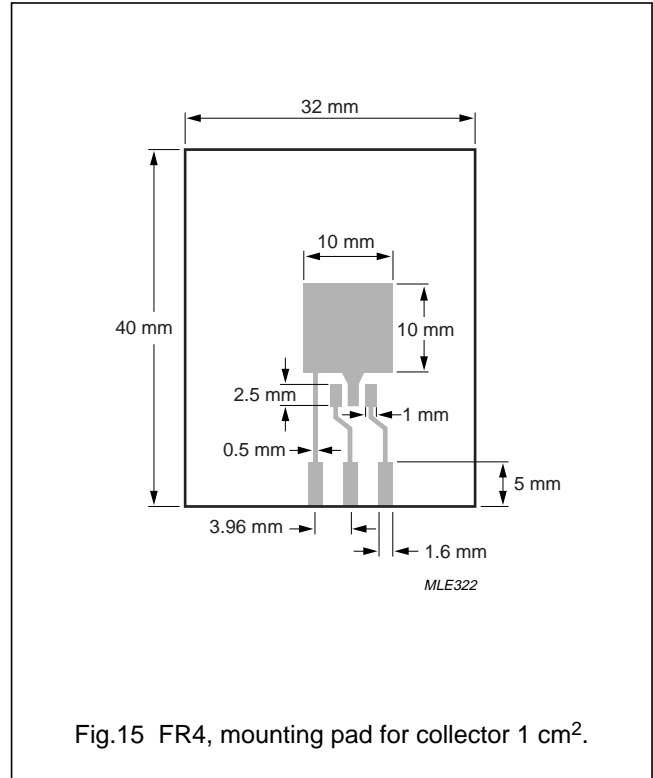
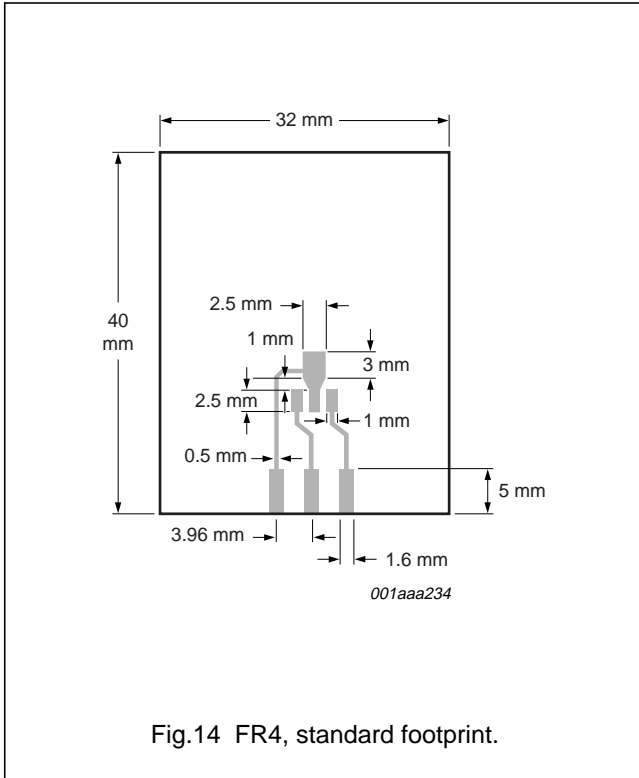
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20 V, 5 A  
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Reference mounting conditions



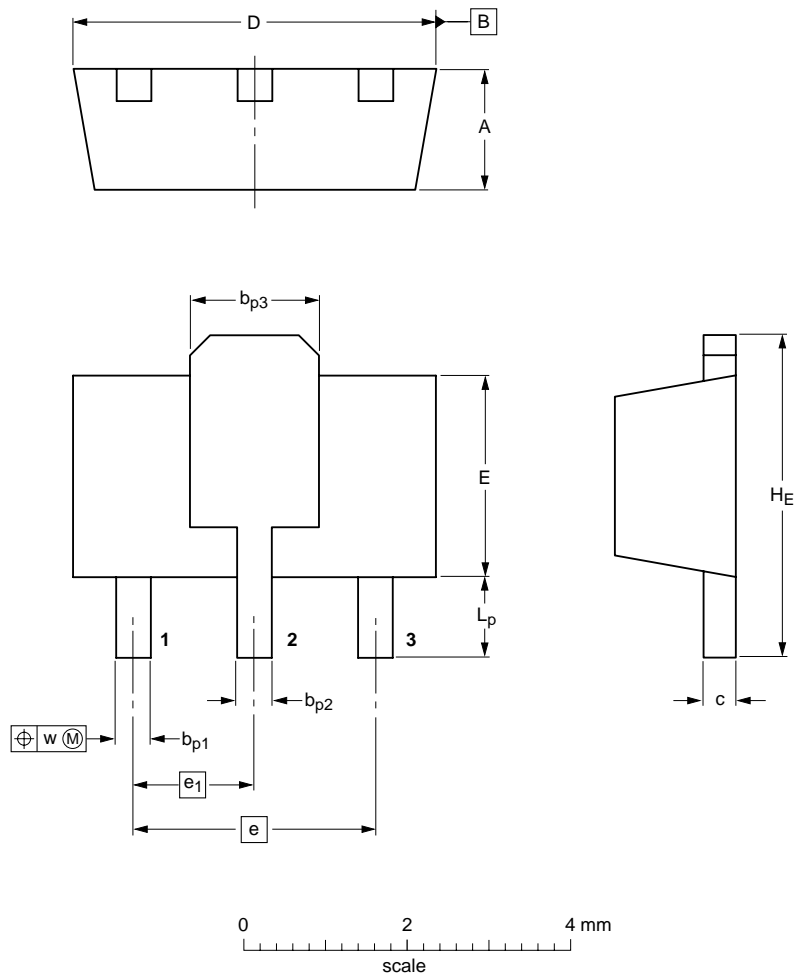
20 V, 5 A  
NPN low  $V_{CEsat}$  (BISS) transistor

PBSS4520X

PACKAGE OUTLINE

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

SOT89



DIMENSIONS (mm are the original dimensions)

UNIT	A	bp1	bp2	bp3	c	D	E	e	e1	HE	Lp	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

20 V, 5 A  
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PBSS4520X

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