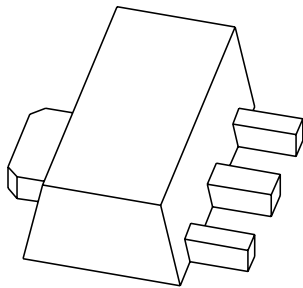


# DATA SHEET



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

**Note**

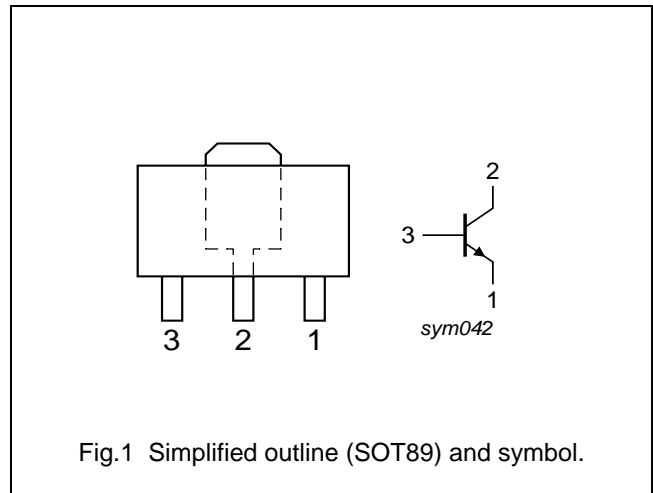
- \* = p: made in Hong Kong  
 \* = t: made in Malaysia  
 \* = W: made in China.

**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).

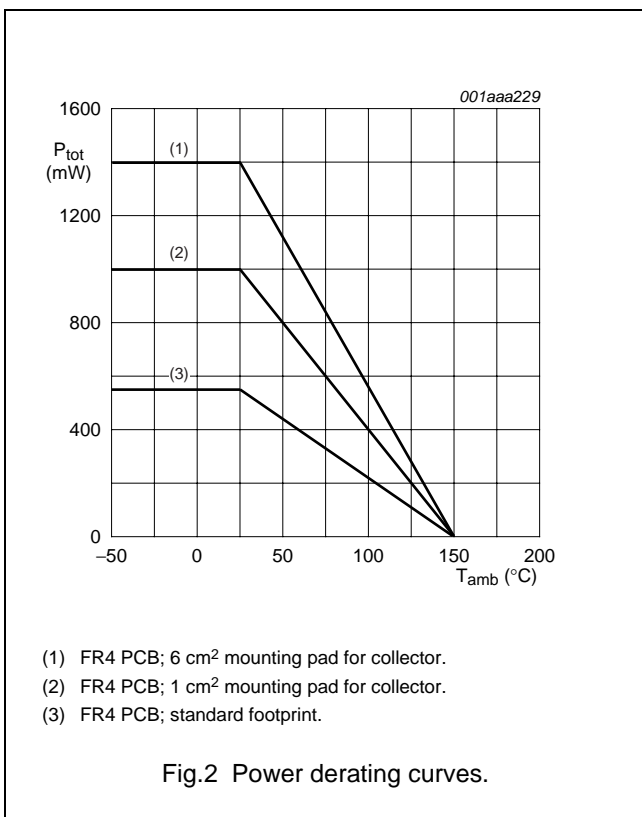
SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{CBO}$	collector-base voltage	open emitter	–	20	V
$V_{CEO}$	collector-emitter voltage	open base	–	20	V
$V_{EBO}$	emitter-base voltage	open collector	–	5	V
$I_C$	collector current (DC)		–	5	A
$I_{CRM}$	repetitive peak collector current	notes 1 and 2	–	7	A
$I_{CM}$	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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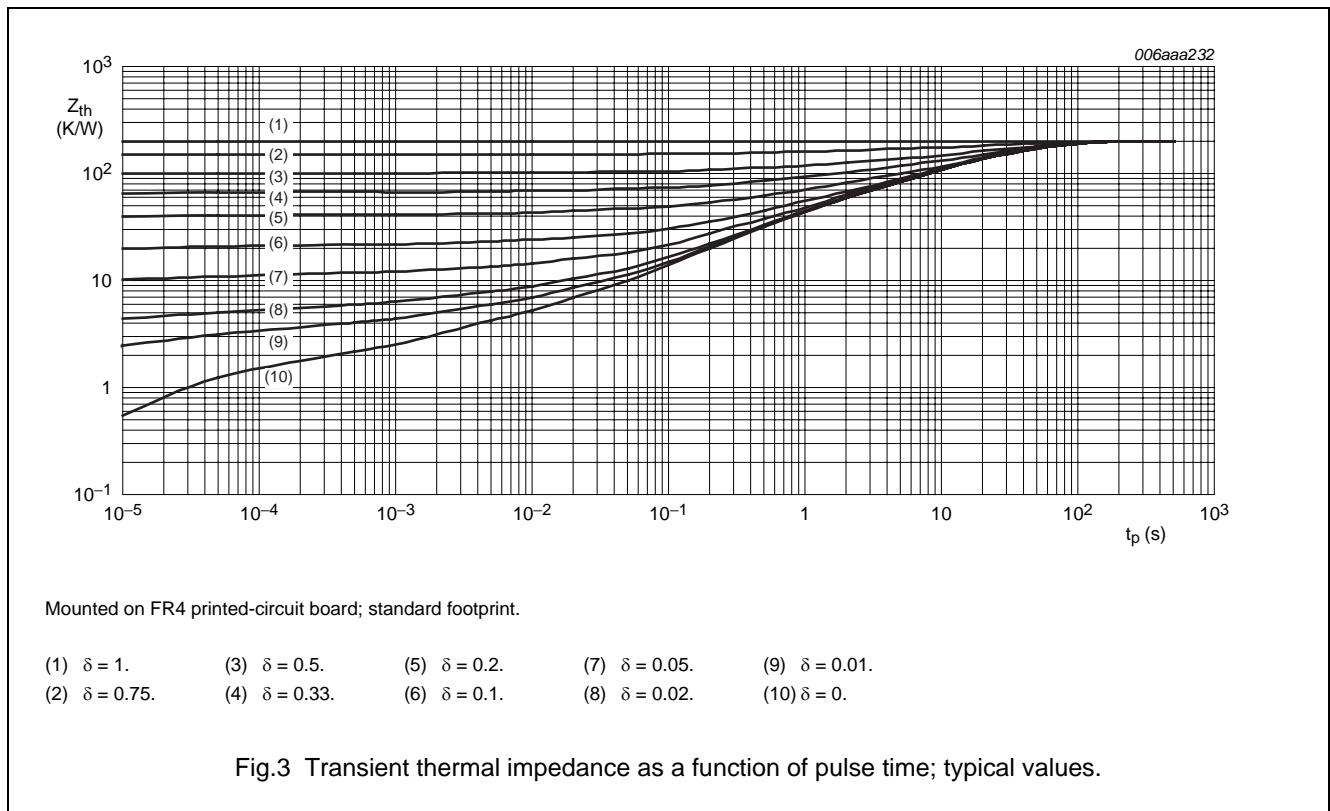
PBSS4520X

**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

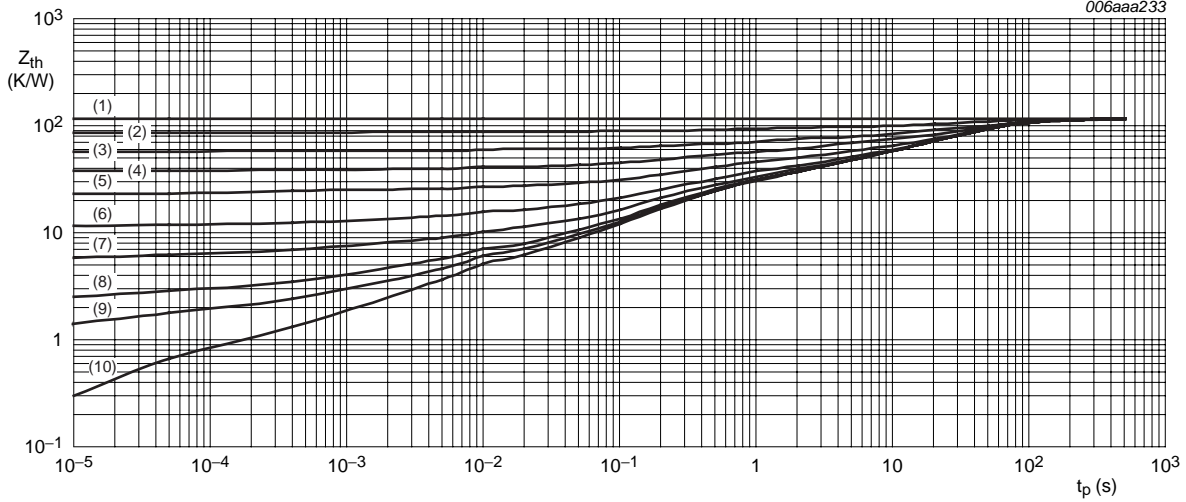
**Notes**

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".



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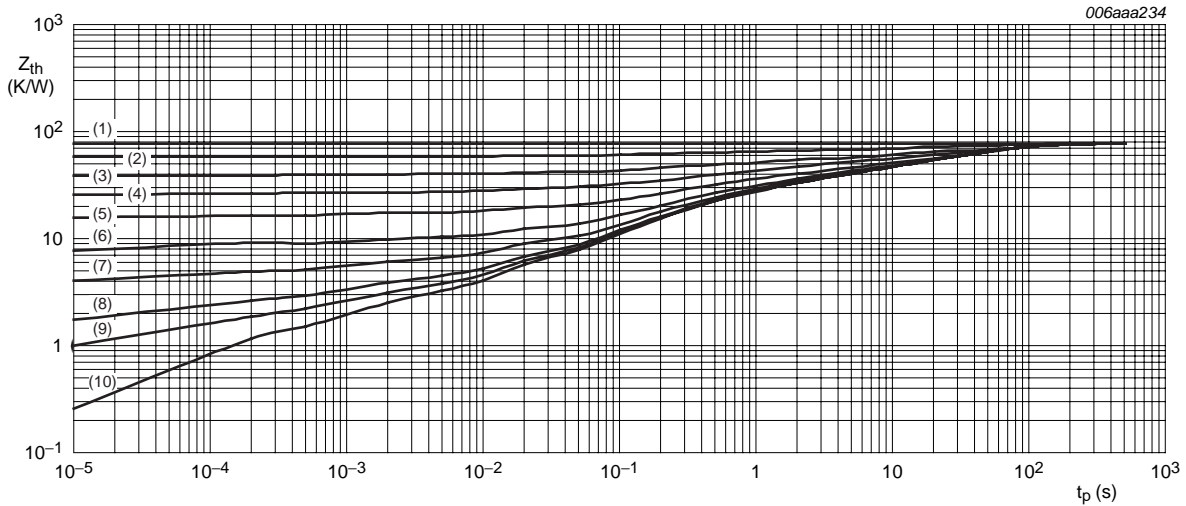
PBSS4520X



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

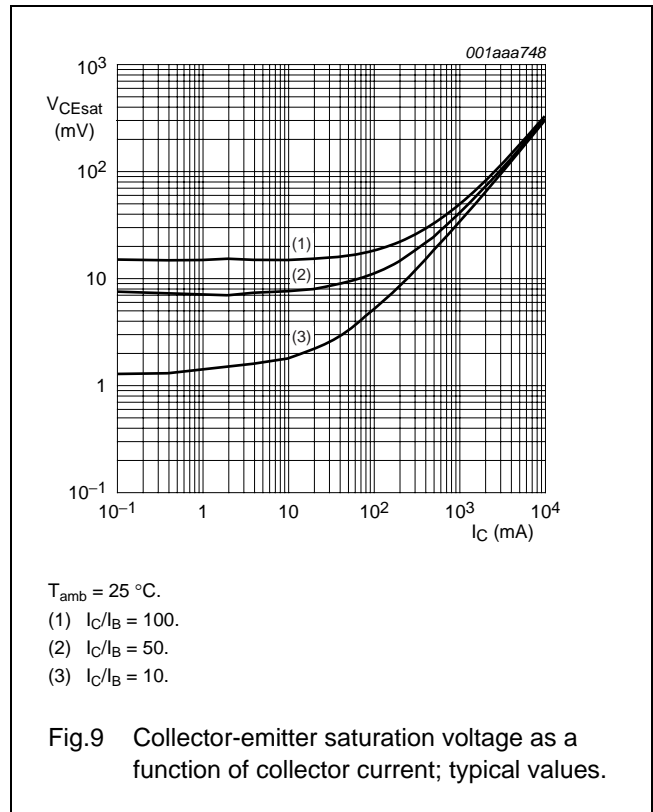
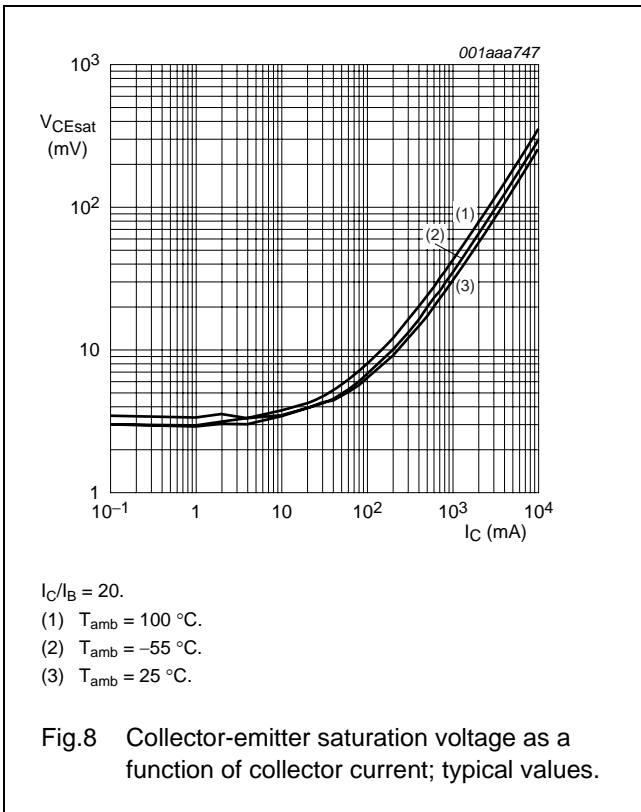
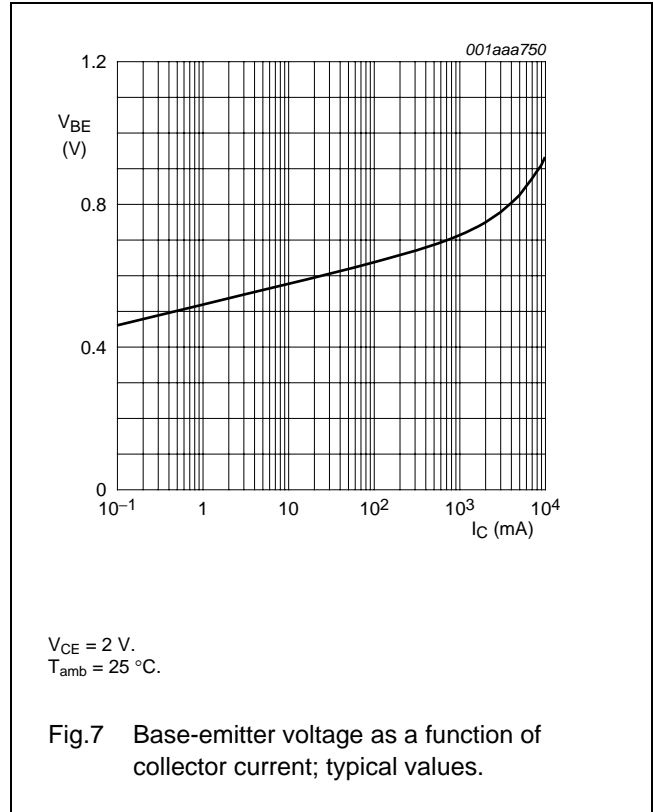
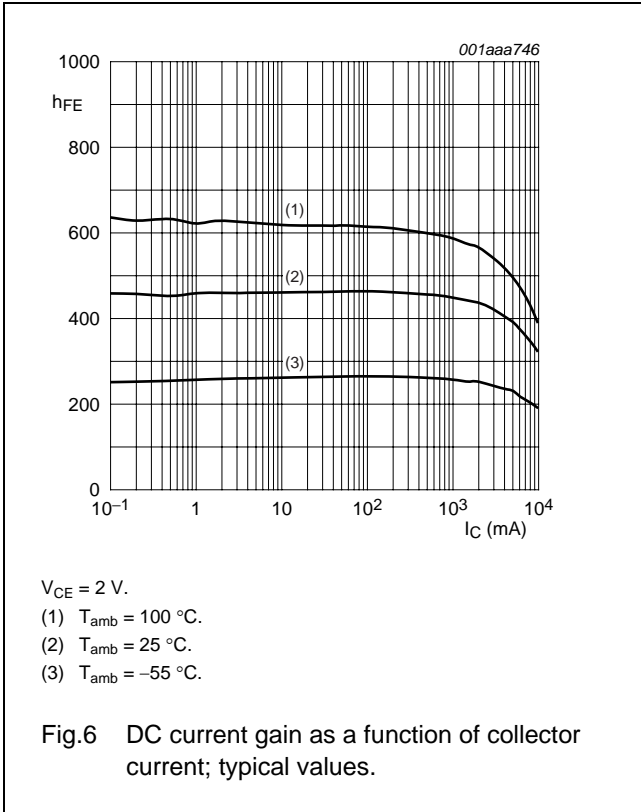
SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$I_{CBO}$	collector-base cut-off current	$V_{CB} = 20\text{ V}; I_E = 0\text{ A}$	–	–	100	nA
		$V_{CB} = 20\text{ V}; I_E = 0\text{ A}; T_j = 150\text{ °C}$	–	–	50	$\mu\text{A}$
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = 5\text{ V}; I_C = 0\text{ A}$	–	–	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	–	
		$I_C = 1\text{ A};$ note 1	300	440	–	
		$I_C = 2\text{ A};$ 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
		$I_C = 2.5\text{ A}; I_B = 125\text{ mA};$ note 1	–	85	120	mV
		$I_C = 4\text{ A}; I_B = 200\text{ mA};$ note 1	–	130	180	mV
		$I_C = 5\text{ A}; I_B = 500\text{ mA};$ note 1	–	160	220	mV
$R_{CEsat}$	equivalent on-resistance	$I_C = 5\text{ A}; I_B = 500\text{ mA};$ note 1	–	32	44	$\text{m}\Omega$
$V_{BEsat}$	base-emitter saturation voltage	$I_C = 4\text{ A}; I_B = 200\text{ mA};$ note 1	–	0.9	1.05	V
		$I_C = 5\text{ A}; I_B = 500\text{ mA};$ 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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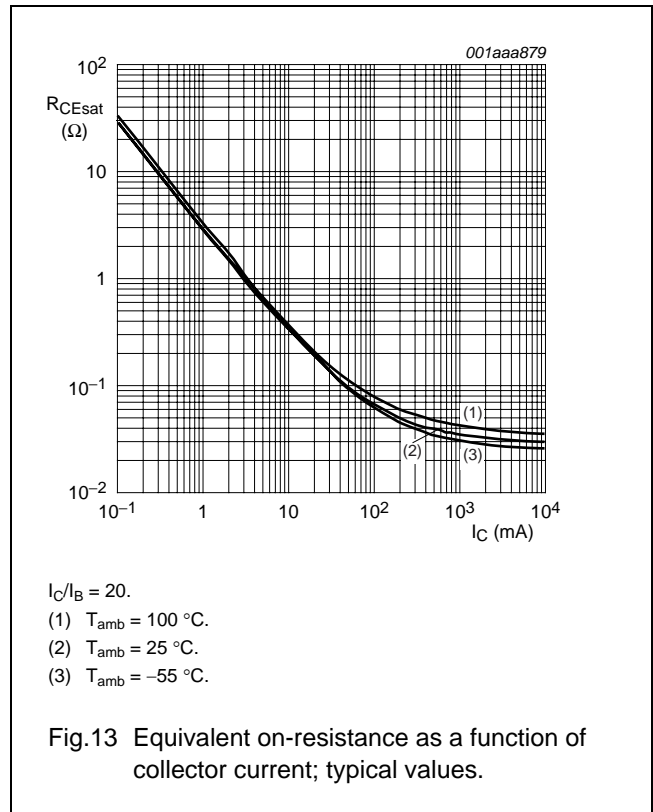
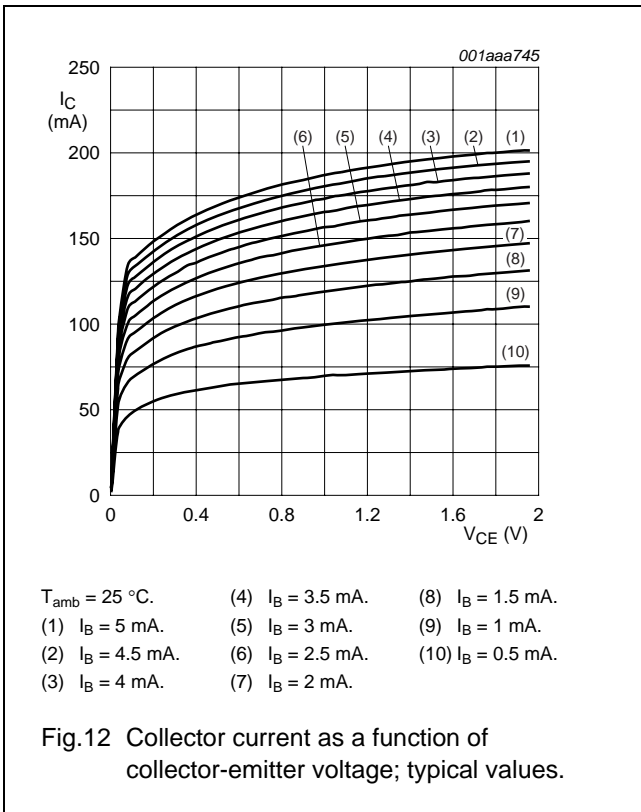
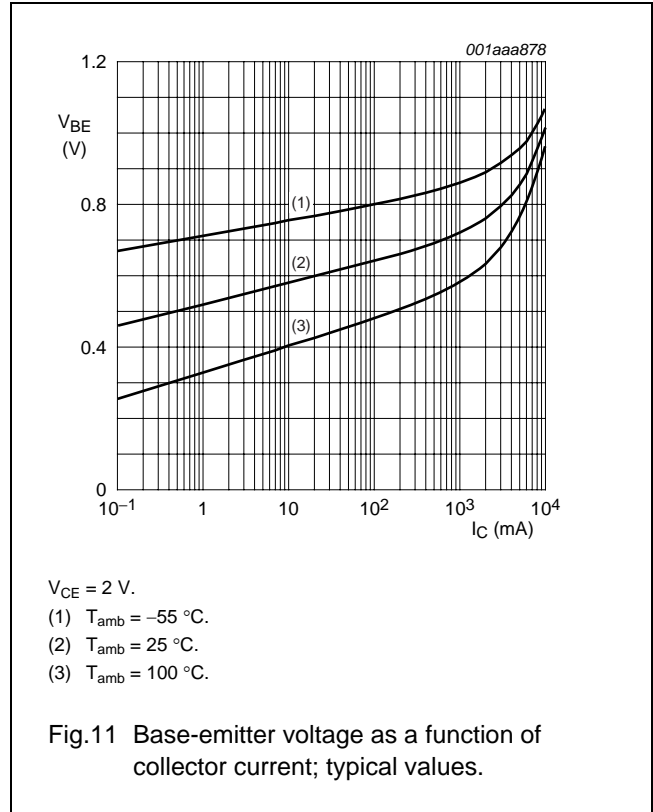
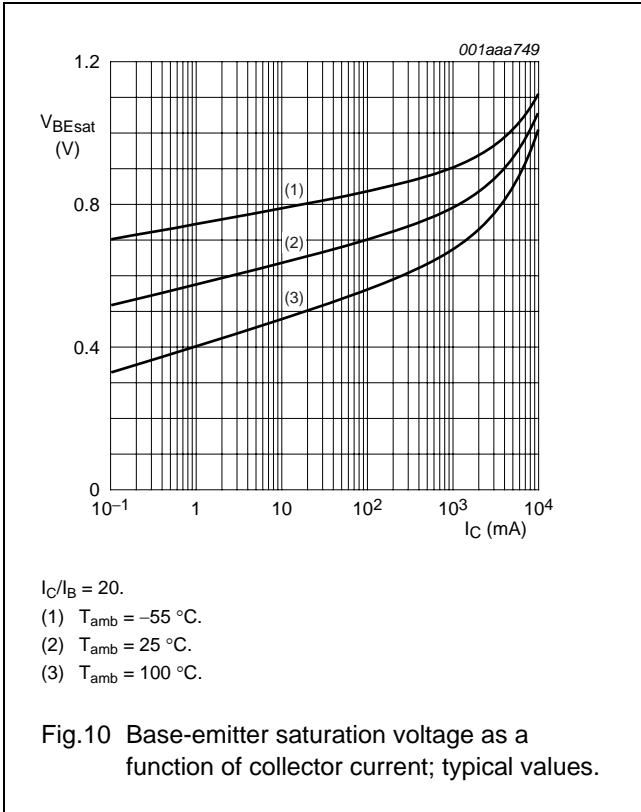
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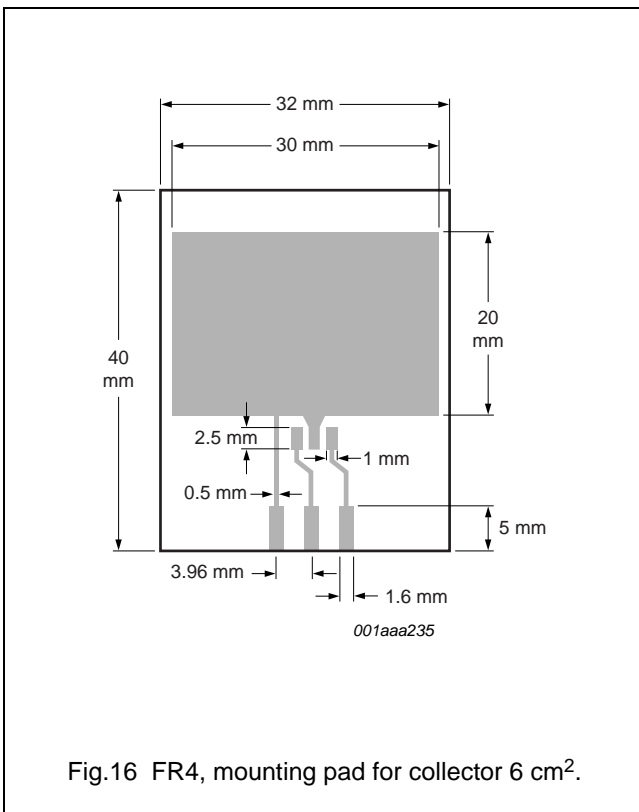
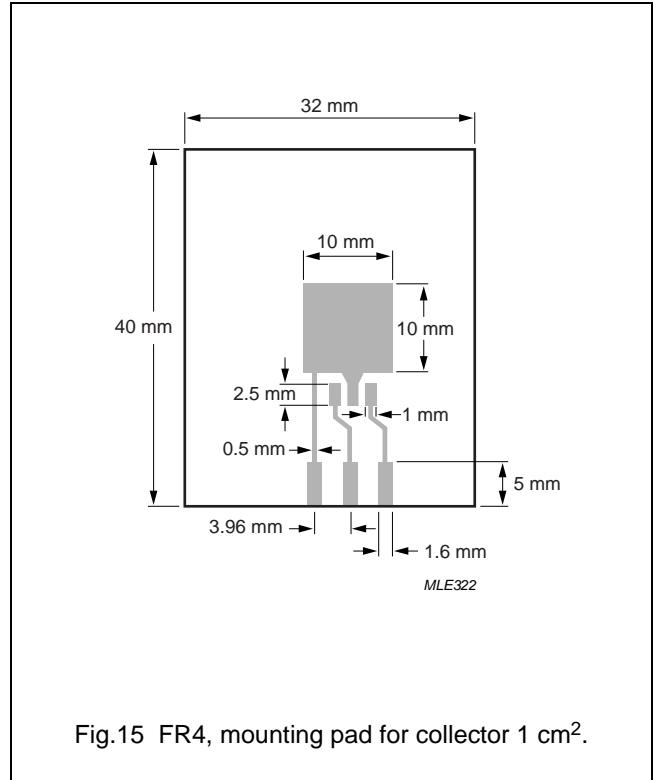
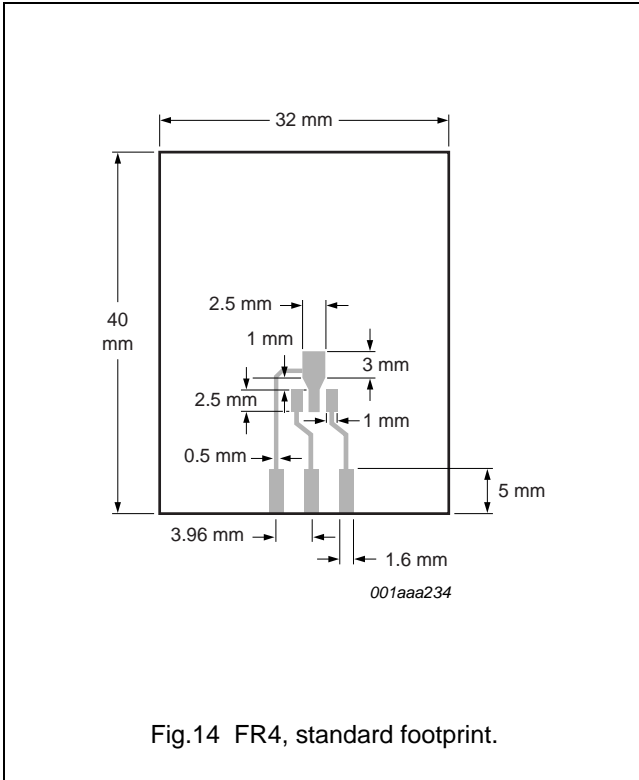
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Reference mounting conditions



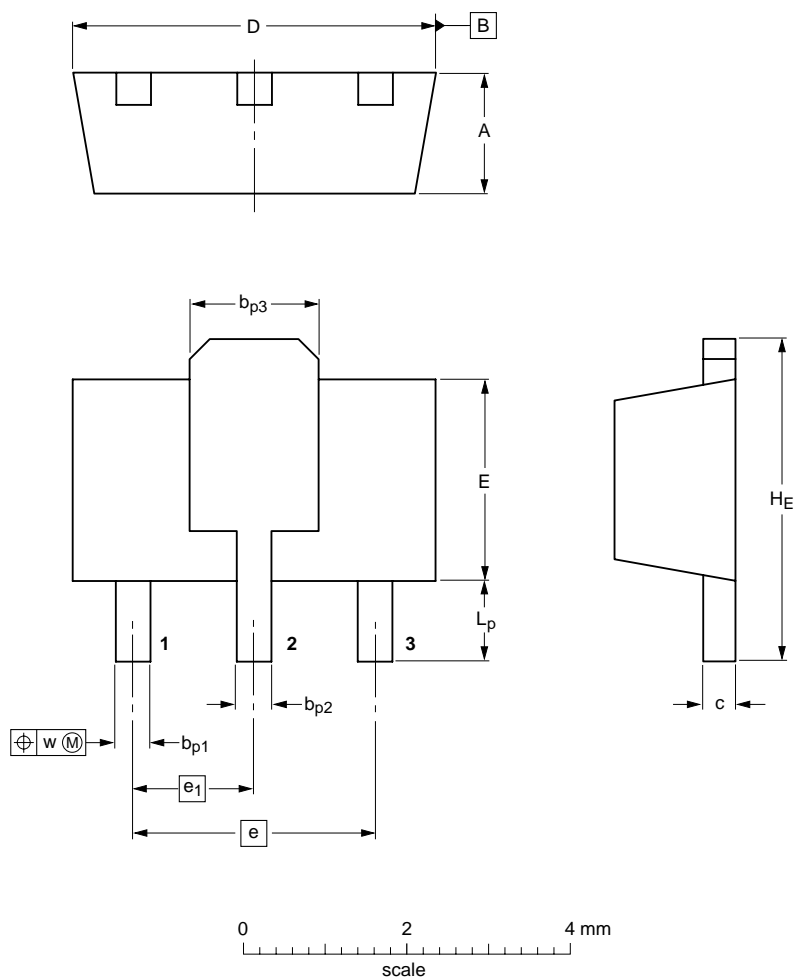
20 V, 5 A  
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PACKAGE OUTLINE

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

SOT89



DIMENSIONS (mm are the original dimensions)

UNIT	A	b <sub>p1</sub>	b <sub>p2</sub>	b <sub>p3</sub>	c	D	E	e	e <sub>1</sub>	H <sub>E</sub>	L <sub>p</sub>	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

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**DATA SHEET STATUS**

DOCUMENT STATUS <sup>(1)</sup>	PRODUCT STATUS <sup>(2)</sup>	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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## **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**

For additional information please visit: <http://www.nxp.com>

For sales offices addresses send e-mail to: [salesaddresses@nxp.com](mailto:salesaddresses@nxp.com)

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