

# DATA SHEET



**PBSS5540X**

40 V, 5 A

PNP low  $V_{CEsat}$  (BISS) transistor

Product data sheet  
Supersedes data of 2004 Jan 15

2004 Nov 04

# 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 <sup>(1)</sup>
PBSS5540X	*1G

**Note**

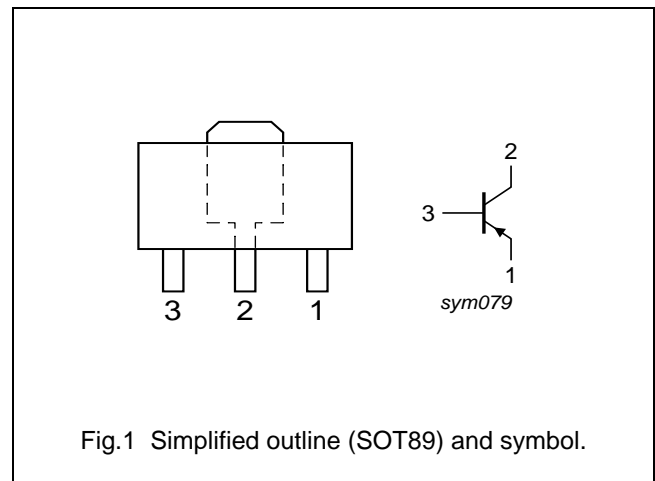
- \* = p: Made in Hong Kong.  
 \* = t: Made in Malaysia.  
 \* = W: Made in China.

**QUICK REFERENCE DATA**

SYMBOL	PARAMETER	MAX.	UNIT
$V_{CEO}$	collector-emitter voltage	-40	V
$I_C$	collector current (DC)	-4	A
$I_{CRP}$	repetitive peak collector current	-5	A
$R_{CEsat}$	equivalent on-resistance	75	m $\Omega$

**PINNING**

PIN	DESCRIPTION
1	emitter
2	collector
3	base



**ORDERING INFORMATION**

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

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PBSS5540X

**LIMITING VALUES**

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

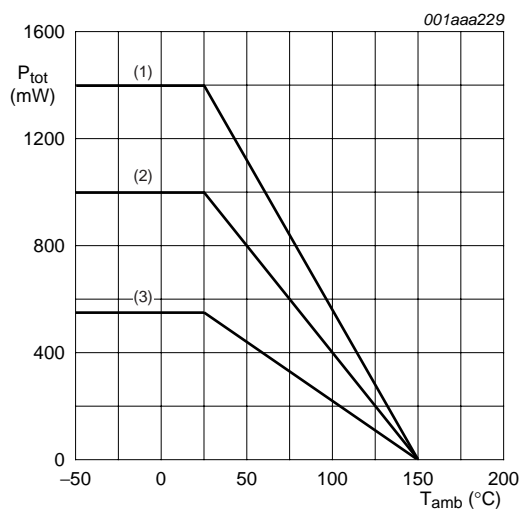
SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{CBO}$	collector-base voltage	open emitter	–	–40	V
$V_{CEO}$	collector-emitter voltage	open base	–	–40	V
$V_{EBO}$	emitter-base voltage	open collector	–	–6	V
$I_{CM}$	peak collector current	$t_p \leq 1$ ms	–	–10	A
$I_{CRP}$	repetitive peak collector current	$t_p \leq 10$ 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	–	2.5	W
		$t_p \leq 10$ ms; $\delta \leq 0.2$ ; note 1	–	0.55	W
		note 1	–	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<sup>2</sup>.
3. Device mounted on a printed-circuit board, single-sided copper, tin-plated and mounting pad for collector 6 cm<sup>2</sup>.
4. Device mounted on a 7 cm<sup>2</sup> ceramic printed-circuit board, 1 cm<sup>2</sup> single-sided copper and tin-plated.

40 V, 5 A  
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PBSS5540X



- (1) FR4 PCB; 6 cm<sup>2</sup> mounting pad for collector.
- (2) FR4 PCB; 1 cm<sup>2</sup> mounting pad for collector.
- (3) FR4 PCB; standard footprint.

Fig.2 Power derating curves.

40 V, 5 A  
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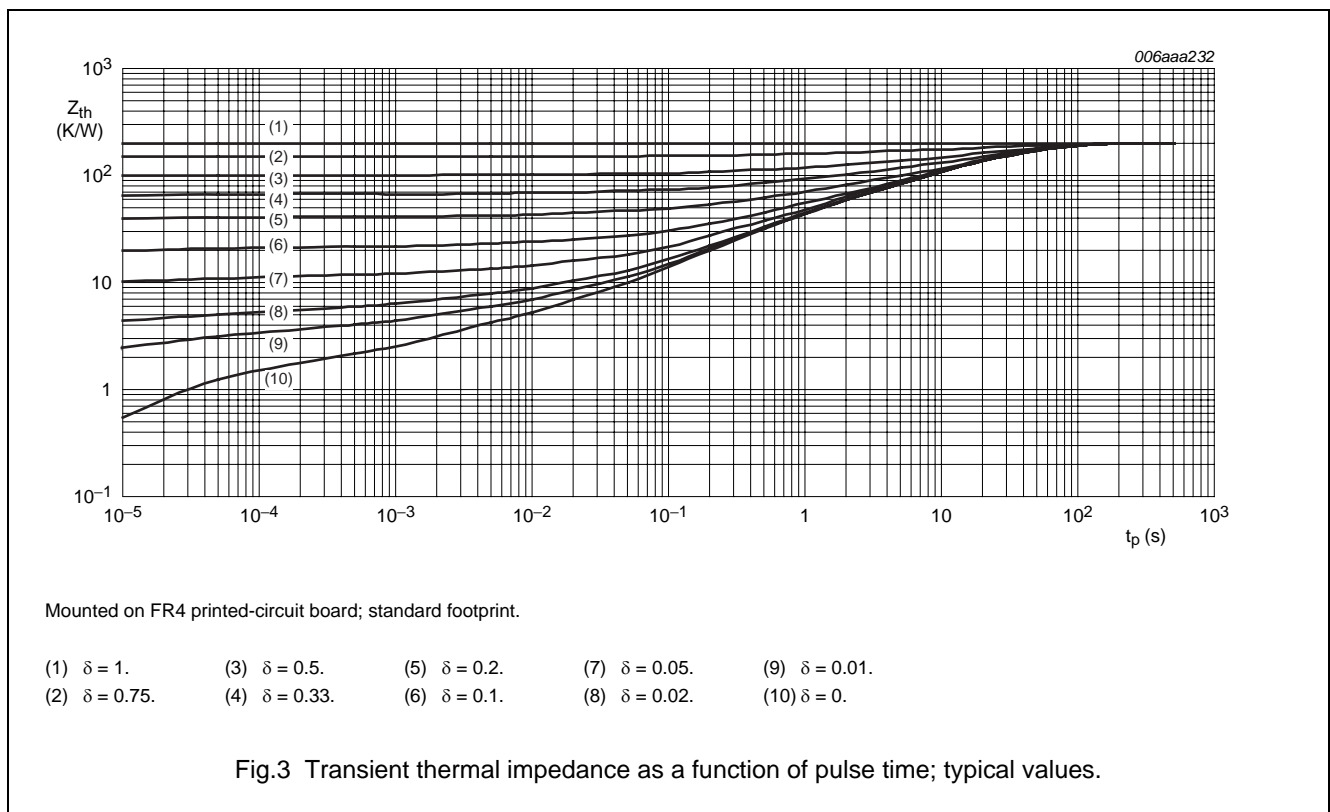
PBSS5540X

**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

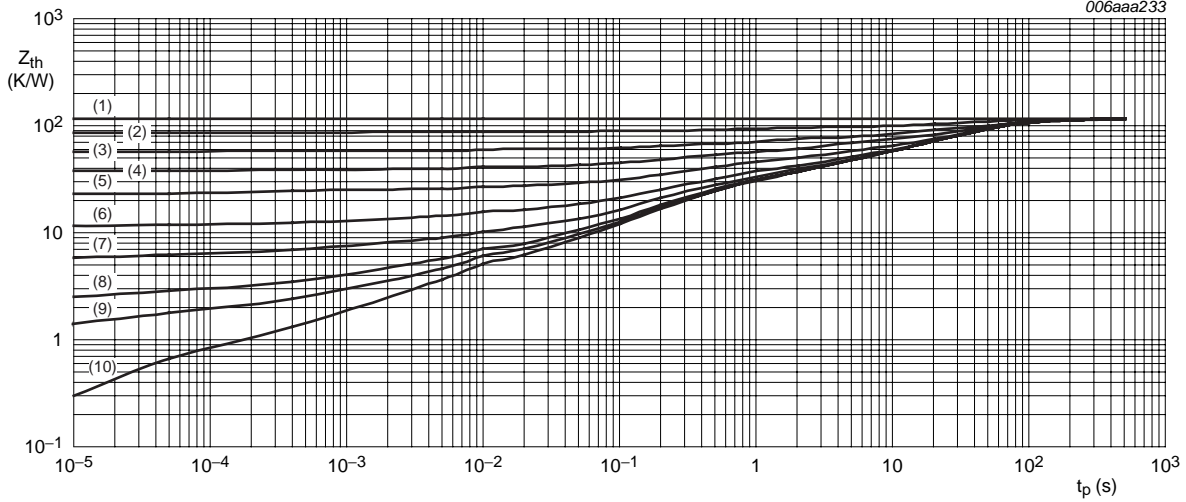
**Notes**

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<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.



40 V, 5 A  
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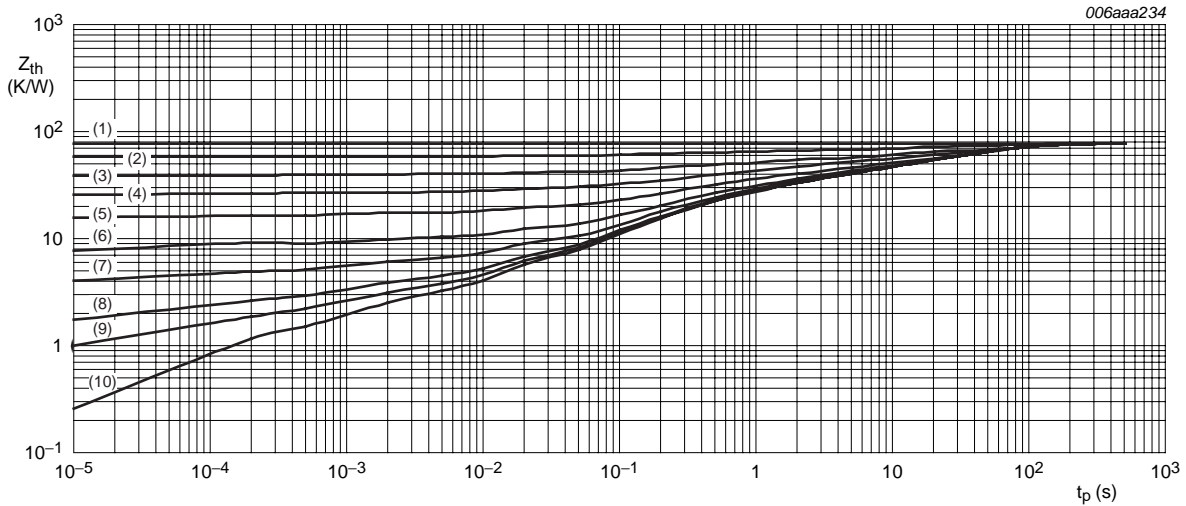
PBSS5540X



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.

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PBSS5540X

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

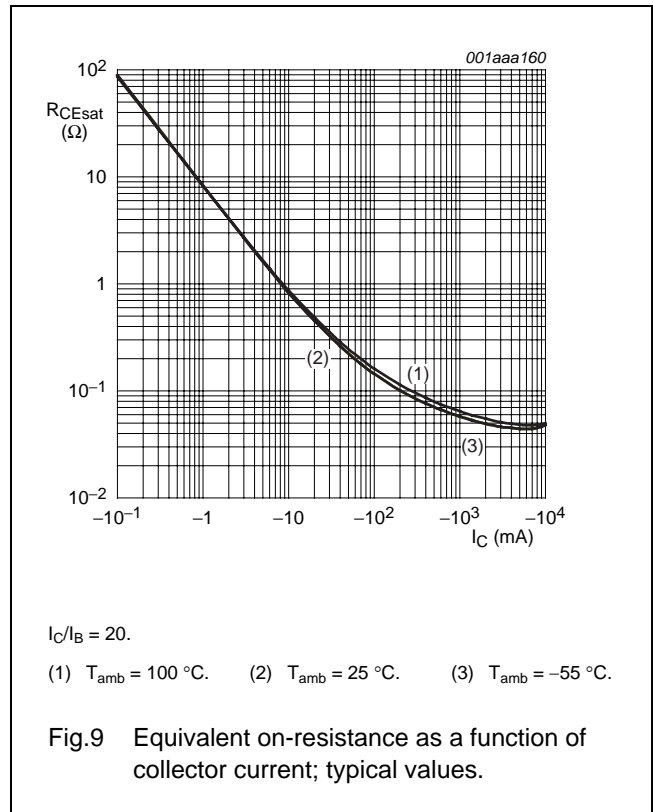
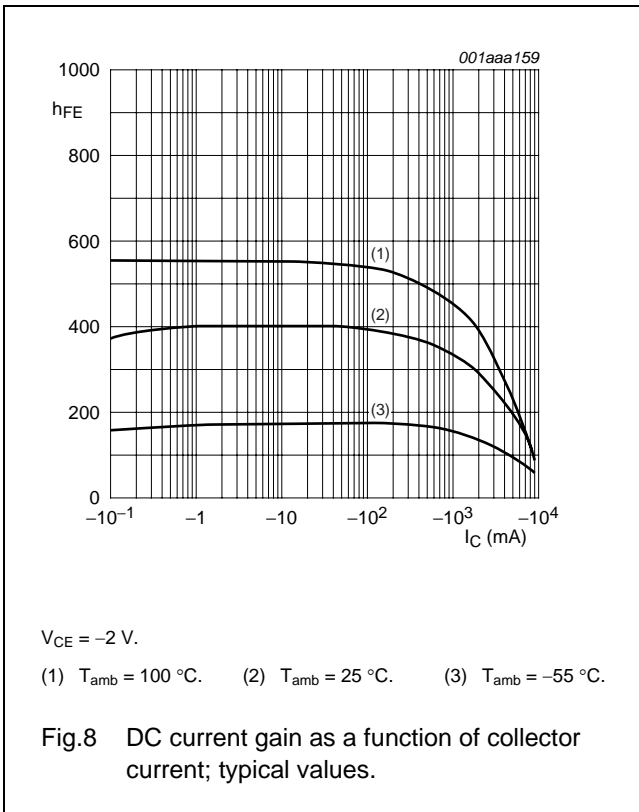
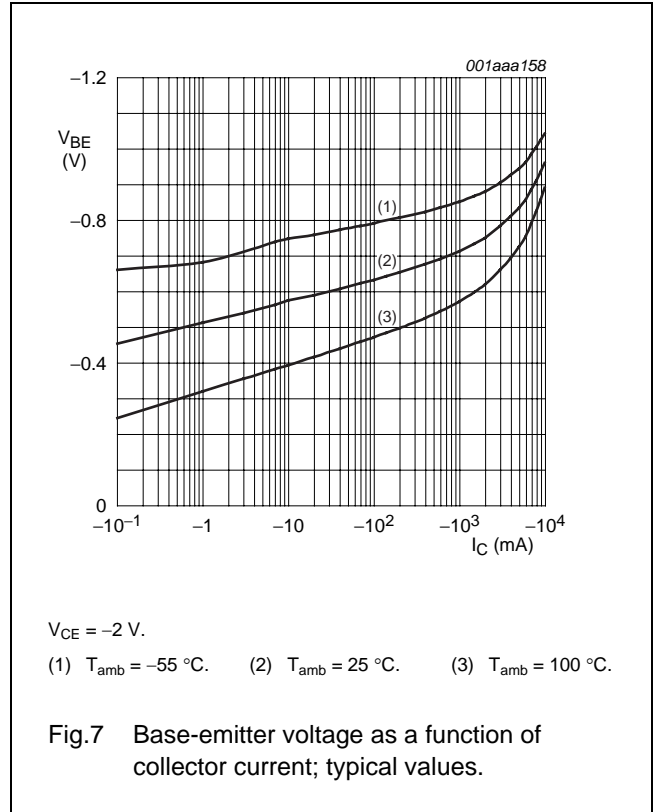
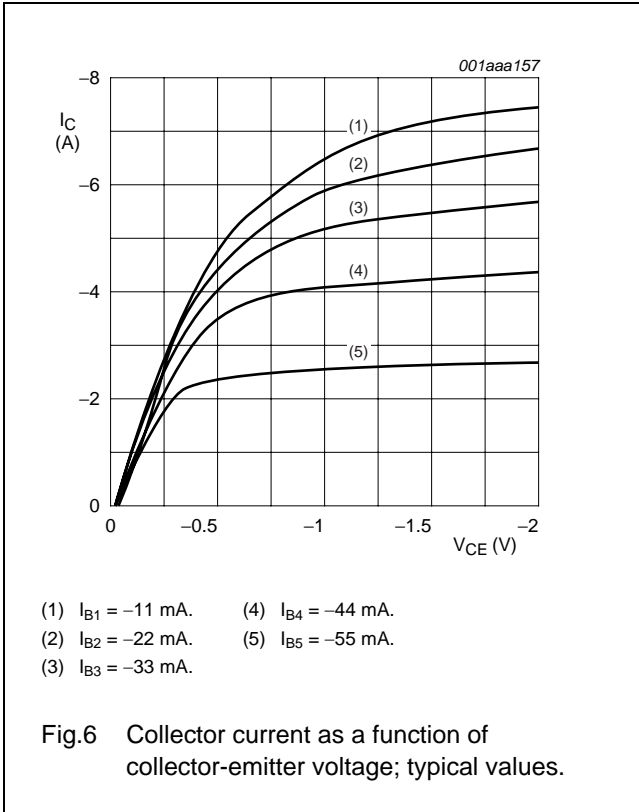
SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$I_{CBO}$	collector-base cut-off current	$V_{CB} = -30\text{ V}; I_E = 0\text{ A}$	–	–	–100	nA
		$V_{CB} = -30\text{ V}; I_E = 0\text{ A}; T_j = 150\text{ °C}$	–	–	–50	$\mu\text{A}$
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = -5\text{ V}; I_C = 0\text{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

**Note**

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

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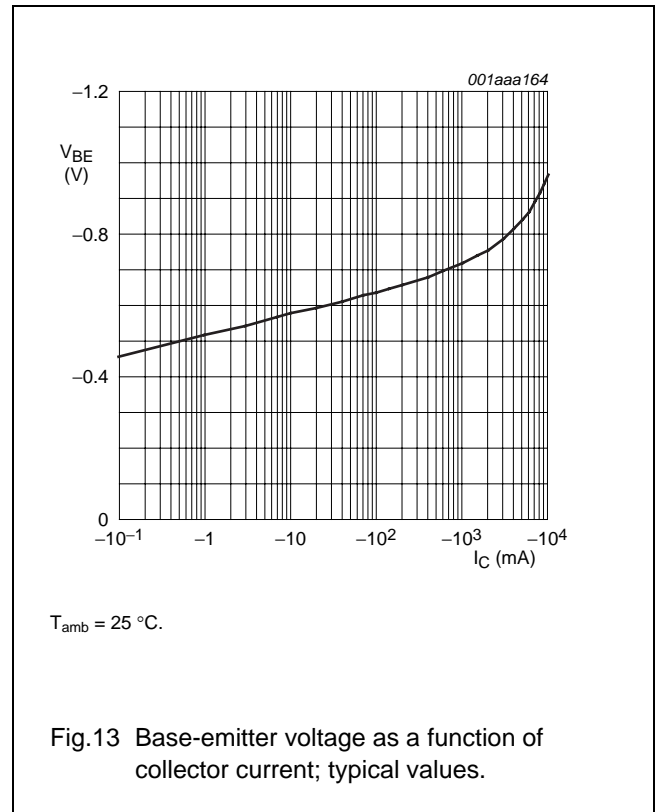
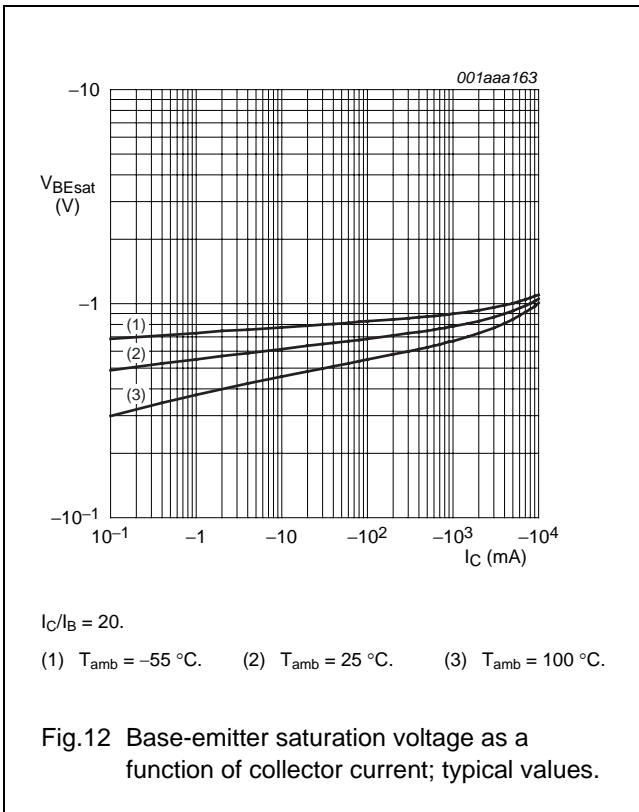
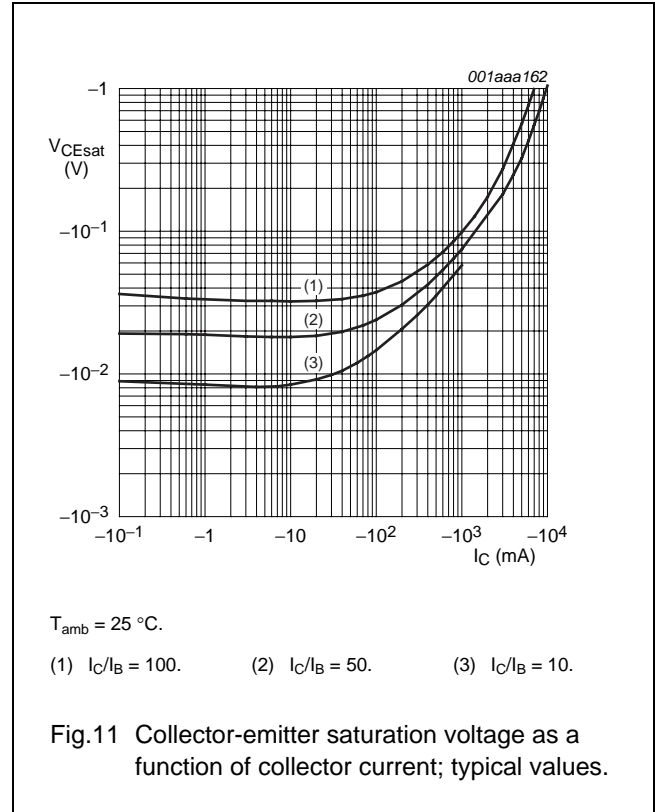
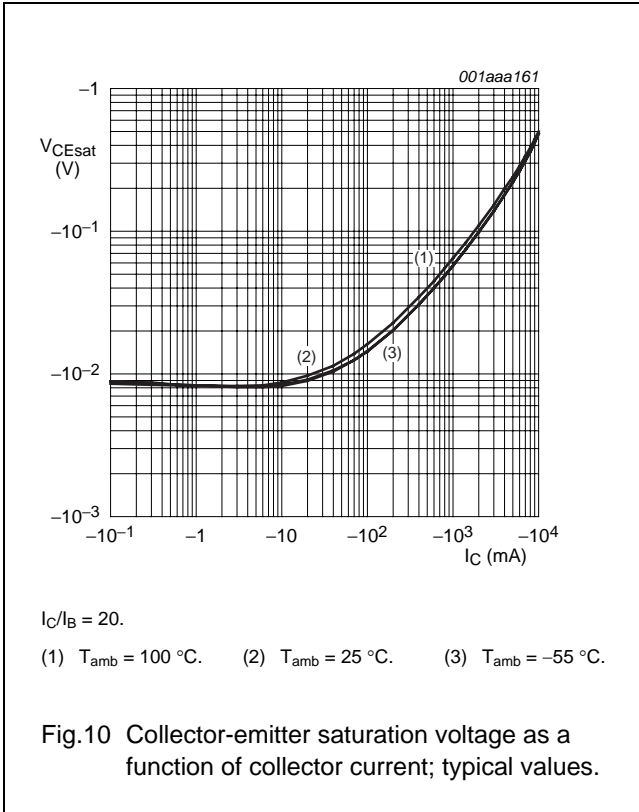
PBSS5540X





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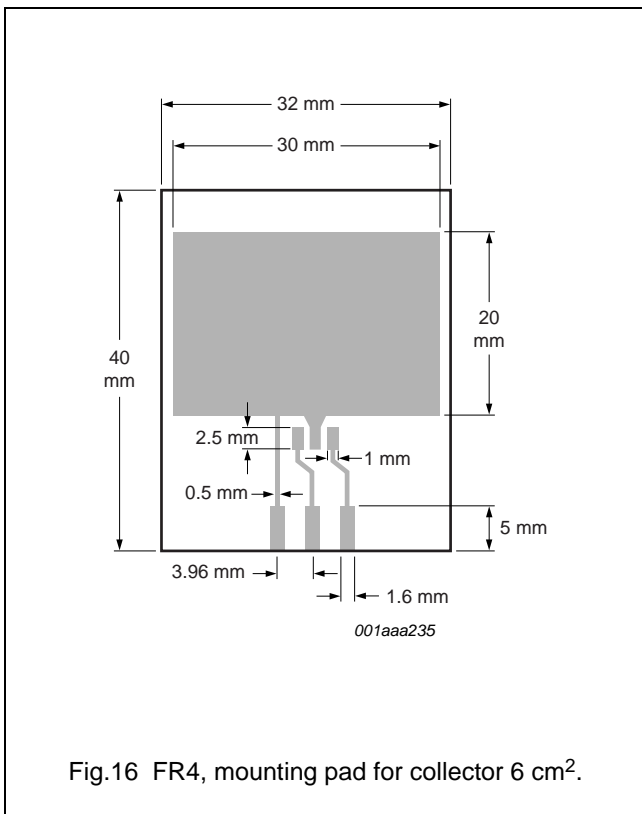
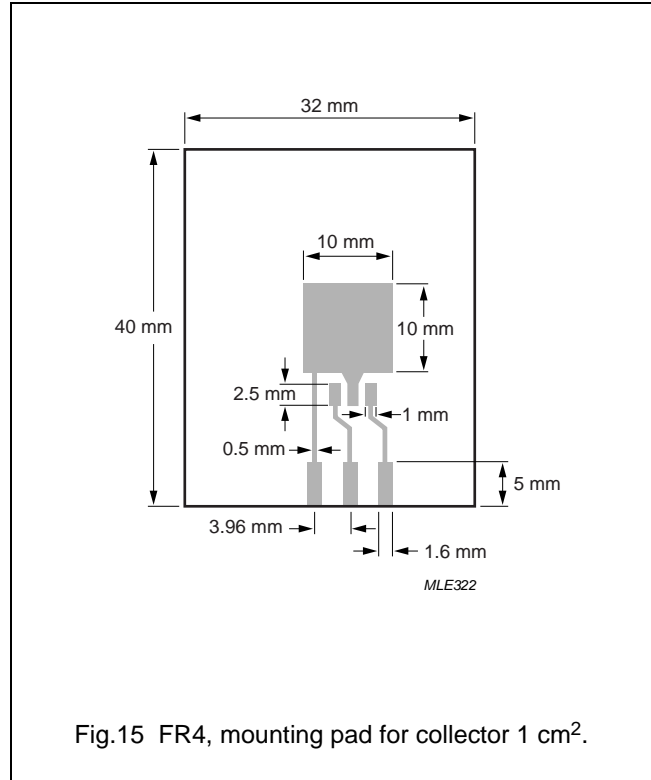
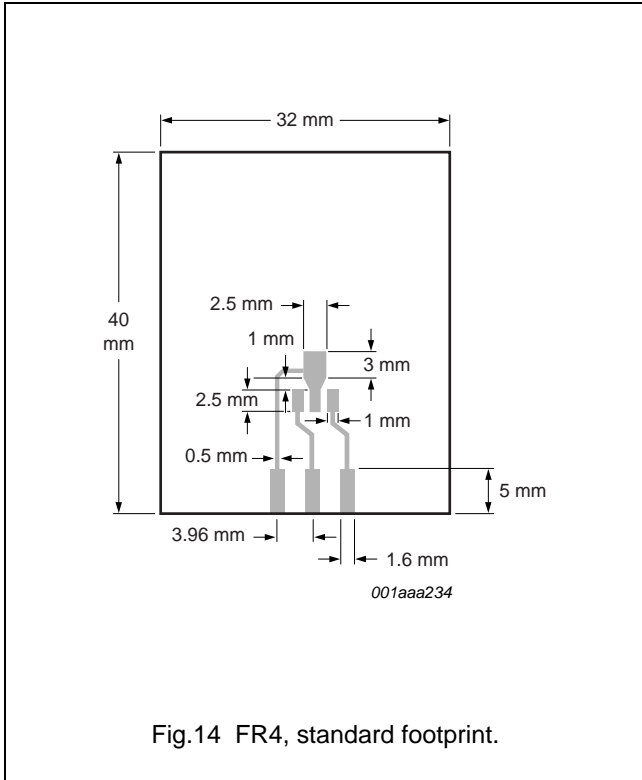
PBSS5540X



40 V, 5 A  
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PBSS5540X

Reference mounting conditions



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PBSS5540X

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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PBSS5540X

## 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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## **Contact information**

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