

# PBSS3540E

40 V, 500 mA PNP low  $V_{CEsat}$  (BISS) transistor

Rev. 02 — 11 December 2009

Product data sheet

## 1. Product profile

### 1.1 General description

PNP low  $V_{CEsat}$  Breakthrough in Small Signal (BISS) transistor in a SOT416 (SC-75) SMD plastic package.

NPN complement: PBSS2540E.

### 1.2 Features

- Low collector-emitter saturation voltage  $V_{CEsat}$
- High collector current capability:  $I_C$  and  $I_{CM}$
- High collector current gain ( $h_{FE}$ ) at high  $I_C$
- High efficiency due to less heat generation
- Smaller required Printed-Circuit Board (PCB) area than for conventional transistors

### 1.3 Applications

- DC-to-DC conversion
- MOSFET gate driving
- Motor control
- Charging circuits
- Low power switches (e.g. motors, fans)

### 1.4 Quick reference data

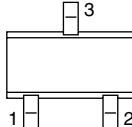
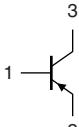
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
$V_{CEO}$	collector-emitter voltage	open base	-	-	-40	V	
$I_C$	collector current (DC)		-	-	-500	mA	
$I_{CM}$	peak collector current		-	-	-1	A	
$R_{CEsat}$	collector-emitter saturation resistance	$I_C = -500$ mA; $I_B = -50$ mA	[1]	-	440	700	$\text{m}\Omega$

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

## 2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Symbol
1	base		
2	emitter		
3	collector		 sym013

## 3. Ordering information

Table 3. Ordering information

Type number	Package			Version
	Name	Description		
PBSS3540E	SC-75	plastic surface mounted package; 3 leads		SOT416

## 4. Marking

Table 4. Marking codes

Type number	Marking code
PBSS3540E	1T

## 5. Limiting values

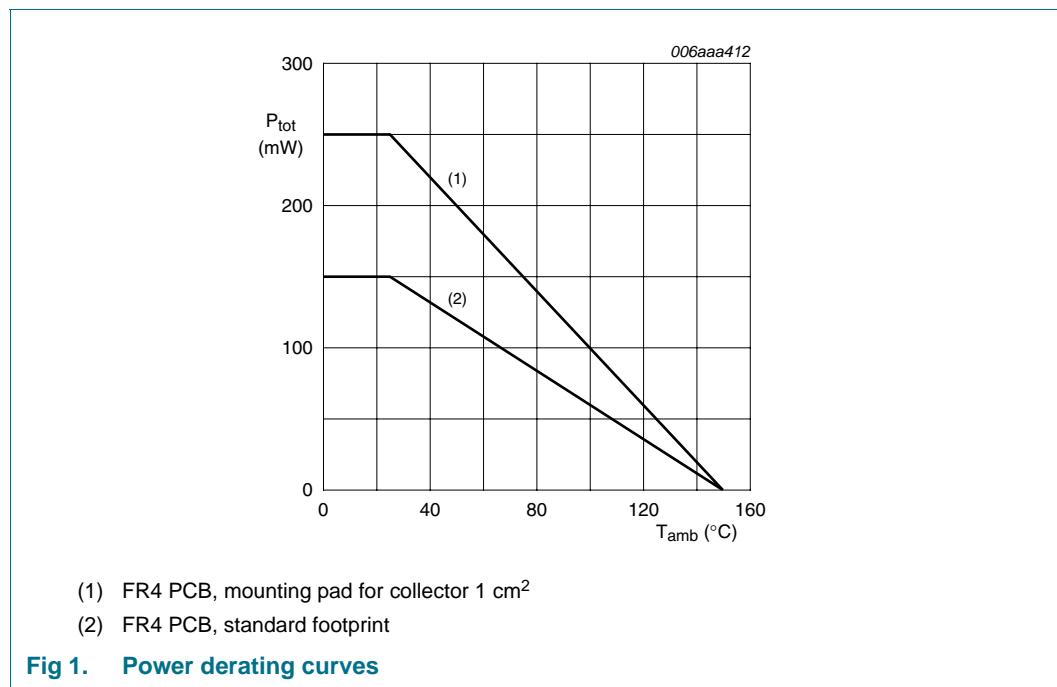
**Table 5. Limiting values**

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
$I_C$	collector current (DC)		-	-500	mA
$I_{CM}$	peak collector current		-	-1	A
$I_{BM}$	peak base current		-	-100	mA
$P_{tot}$	total power dissipation	$T_{amb} \leq 25^\circ\text{C}$	[1]	-	150 mW
			[2]	-	250 mW
$T_j$	junction temperature		-	150	$^\circ\text{C}$
$T_{amb}$	ambient temperature		-65	+150	$^\circ\text{C}$
$T_{stg}$	storage temperature		-65	+150	$^\circ\text{C}$

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1  $\text{cm}^2$ .



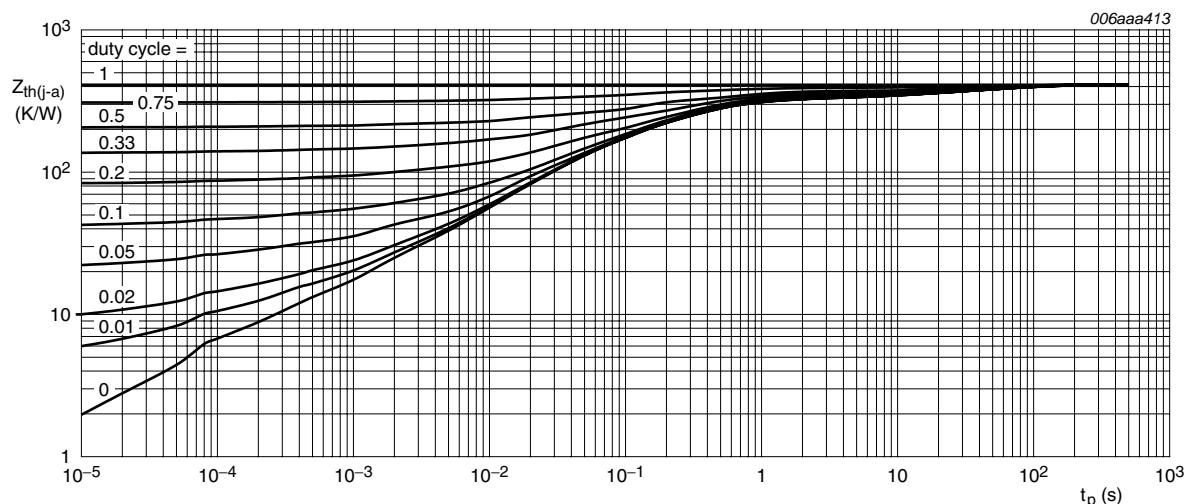
## 6. Thermal characteristics

**Table 6. Thermal characteristics**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1] -	-	833	K/W
			[2] -	-	500	K/W

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 cm<sup>2</sup>.



FR4 PCB, mounting pad for collector 1 cm<sup>2</sup>

**Fig 2. Transient thermal impedance from junction to ambient as a function of pulse time; typical values**

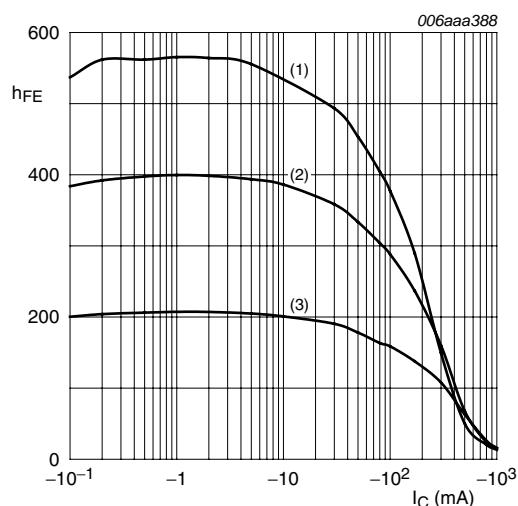
## 7. Characteristics

**Table 7. Characteristics**

$T_{amb} = 25^\circ\text{C}$  unless otherwise specified.

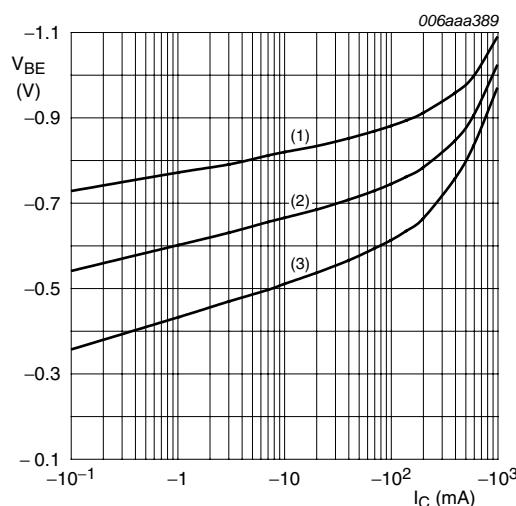
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{CBO}$	collector-base cut-off current	$V_{CB} = -40\text{ V}; I_E = 0\text{ A}$	-	-	-100	nA
		$V_{CB} = -40\text{ V}; I_E = 0\text{ A}; T_j = 150^\circ\text{C}$	-	-	-50	µA
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = -5\text{ V}; I_C = 0\text{ A}$	-	-	-100	nA
$h_{FE}$	DC current gain	$V_{CE} = -2\text{ V}; I_C = -10\text{ mA}$	200	-	-	
		$V_{CE} = -2\text{ V}; I_C = -100\text{ mA}$	[1] 150	-	-	
		$V_{CE} = -2\text{ V}; I_C = -500\text{ mA}$	[1] 40	-	-	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = -10\text{ mA}; I_B = -0.5\text{ mA}$	-	-	-50	mV
		$I_C = -100\text{ mA}; I_B = -5\text{ mA}$	-	-	-130	mV
		$I_C = -200\text{ mA}; I_B = -10\text{ mA}$	-	-	-200	mV
		$I_C = -500\text{ mA}; I_B = -50\text{ mA}$	[1] -	-	-350	mV
$R_{CEsat}$	collector-emitter saturation resistance	$I_C = -500\text{ mA}; I_B = -50\text{ mA}$	[1] -	440	700	mΩ
$V_{BEsat}$	base-emitter saturation voltage	$I_C = -500\text{ mA}; I_B = -50\text{ mA}$	[1] -	-	-1.2	V
$V_{BEon}$	base-emitter turn-on voltage	$V_{CE} = -2\text{ V}; I_C = -100\text{ mA}$	-	-	-1.1	V
$f_T$	transition frequency	$V_{CE} = -5\text{ V}; I_C = -100\text{ mA}; f = 100\text{ MHz}$	100	300	-	MHz
$C_c$	collector capacitance	$V_{CB} = -10\text{ V}; I_E = i_e = 0\text{ A}; f = 1\text{ MHz}$	-	-	10	pF

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



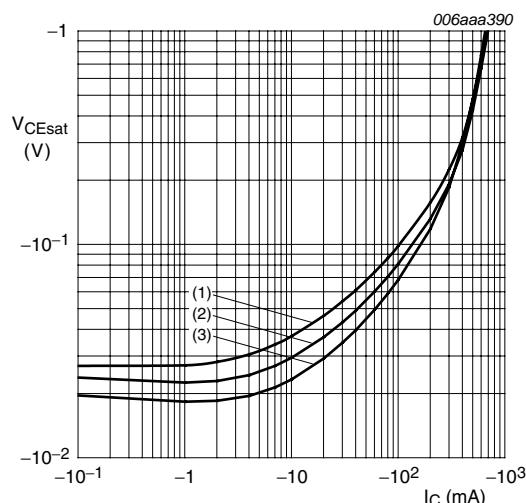
$V_{CE} = -2$  V  
 (1)  $T_{amb} = 100$  °C  
 (2)  $T_{amb} = 25$  °C  
 (3)  $T_{amb} = -55$  °C

**Fig 3. DC current gain as a function of collector current; typical values**



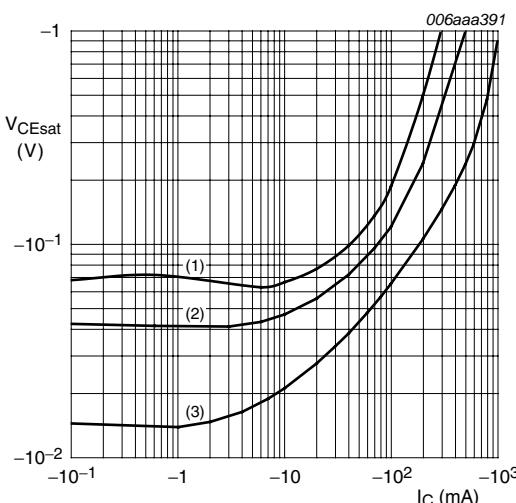
$V_{CE} = -2$  V  
 (1)  $T_{amb} = -55$  °C  
 (2)  $T_{amb} = 25$  °C  
 (3)  $T_{amb} = 100$  °C

**Fig 4. Base-emitter voltage as a function of collector current; typical values**



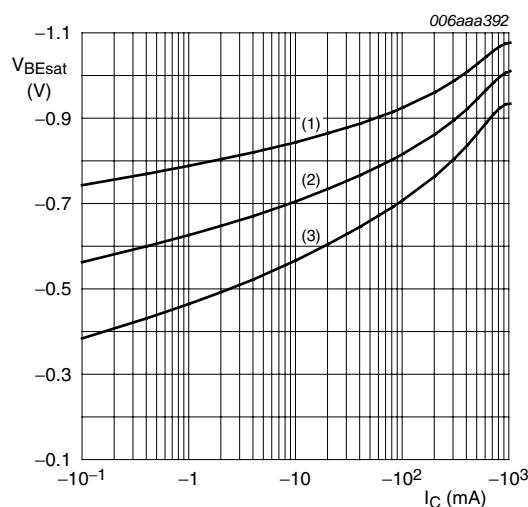
$I_C/I_B = 20$   
 (1)  $T_{amb} = 100$  °C  
 (2)  $T_{amb} = 25$  °C  
 (3)  $T_{amb} = -55$  °C

**Fig 5. Collector-emitter saturation voltage as a function of collector current; typical values**



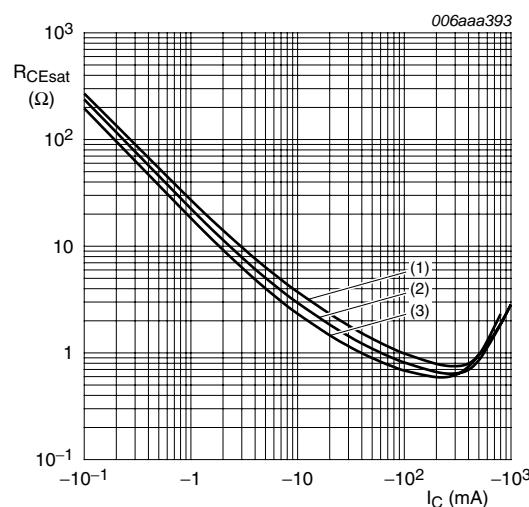
$T_{amb} = 25$  °C  
 (1)  $I_C/I_B = 100$   
 (2)  $I_C/I_B = 50$   
 (3)  $I_C/I_B = 10$

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



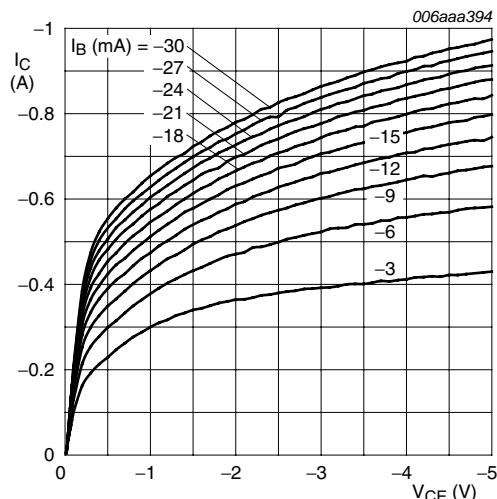
$I_C/I_B = 20$   
 (1)  $T_{amb} = -55^{\circ}C$   
 (2)  $T_{amb} = 25^{\circ}C$   
 (3)  $T_{amb} = 100^{\circ}C$

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



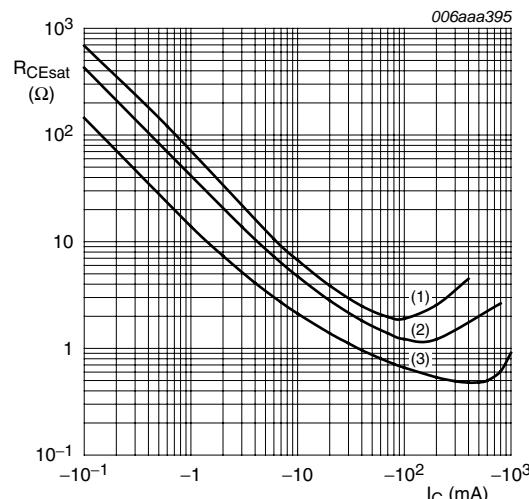
$I_C/I_B = 20$   
 (1)  $T_{amb} = 100^{\circ}C$   
 (2)  $T_{amb} = 25^{\circ}C$   
 (3)  $T_{amb} = -55^{\circ}C$

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



$T_{amb} = 25^{\circ}C$

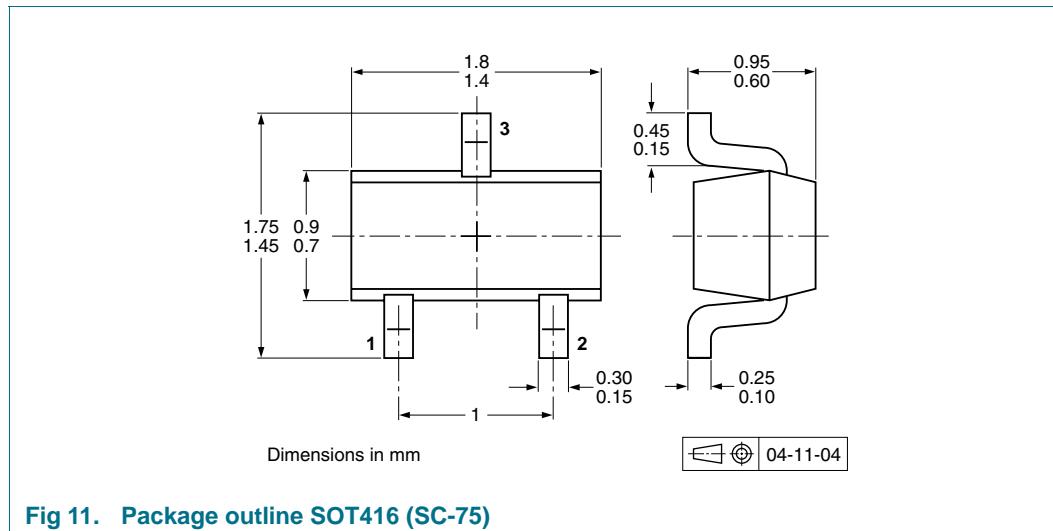
**Fig 9. Collector current as a function of collector-emitter voltage; typical values**



$T_{amb} = 25^{\circ}C$   
 (1)  $I_C/I_B = 100$   
 (2)  $I_C/I_B = 50$   
 (3)  $I_C/I_B = 10$

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

## 8. Package outline



## 9. Packing information

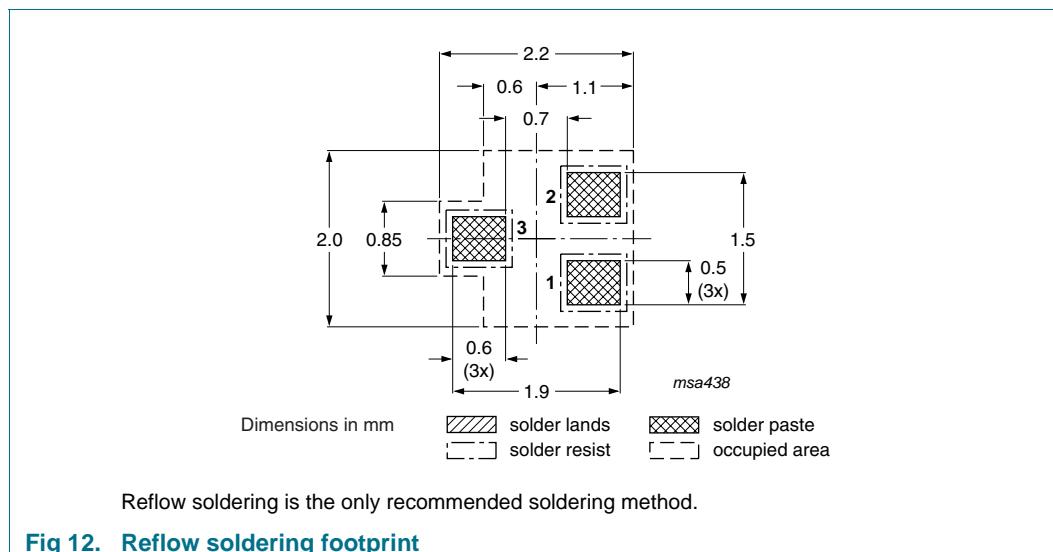
**Table 8. Packing methods**

The indicated -xxx are the last three digits of the 12NC ordering code.[\[1\]](#)

Type number	Package	Description	Packing quantity	
			3000	10000
PBSS3540E	SOT416	4 mm pitch, 8 mm tape and reel	-115	-135

[1] For further information and the availability of packing methods, see [Section 13](#).

## 10. Soldering



## 11. Revision history

**Table 9. Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
PBSS3540E_2	20091211	Product data sheet	-	PBSS3540E_1
Modifications:	<ul style="list-style-type: none"><li>• 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.</li><li>• <a href="#">Figure 4 “Base-emitter voltage as a function of collector current; typical values”</a>: updated</li><li>• <a href="#">Figure 12 “Reflow soldering footprint”</a>: updated</li></ul>			
PBSS3540E_1	20050503	Product data sheet	-	-

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Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
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[2] The term 'short data sheet' is explained in section "Definitions".

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