

# PBSS5160V

60 V, 1 A PNP low  $V_{CEsat}$  (BISS) transistor

Rev. 03 — 14 December 2009

Product data sheet

## 1. Product profile

### 1.1 General description

PNP low  $V_{CEsat}$  Breakthrough in Small Signals (BISS) transistor in a SOT666 plastic package.

NPN complement: PBSS4160V.

### 1.2 Features

- Low collector-emitter saturation voltage  $V_{CEsat}$
- High collector current capability  $I_C$  and  $I_{CM}$
- High efficiency leading to less heat generation
- Reduces printed-circuit board area required
- Cost effective replacement for medium power transistors BCP52 and BCX52

### 1.3 Applications

- Major application segments
  - ◆ Automotive
  - ◆ Telecom infrastructure
  - ◆ Industrial
- Power management
  - ◆ DC-to-DC conversion
  - ◆ Supply line switching
- Peripheral driver
  - ◆ Driver in low supply voltage applications (e.g. lamps and LEDs)
  - ◆ Inductive load driver (e.g. relays, buzzers and motors)

### 1.4 Quick reference data

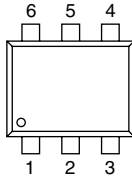
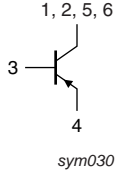
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CEO}$	collector-emitter voltage	open base	-	-	-60	V
$I_C$	collector current (DC)	[1]	-	-	-1	A
$I_{CM}$	peak collector current		-	-	-2	A
$R_{CEsat}$	equivalent on-resistance	$I_C = -1$ A; $I_B = -100$ mA	-	220	330	$m\Omega$

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

## 2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Symbol
1, 2, 5, 6	collector		 sym030
3	base		
4	emitter		

## 3. Ordering information

Table 3. Ordering information

Type number	Package		Version
	Name	Description	
PBSS5160V	-	plastic surface mounted package; 6 leads	SOT666

## 4. Marking

Table 4. Marking codes

Type number	Marking code
PBSS5160V	51

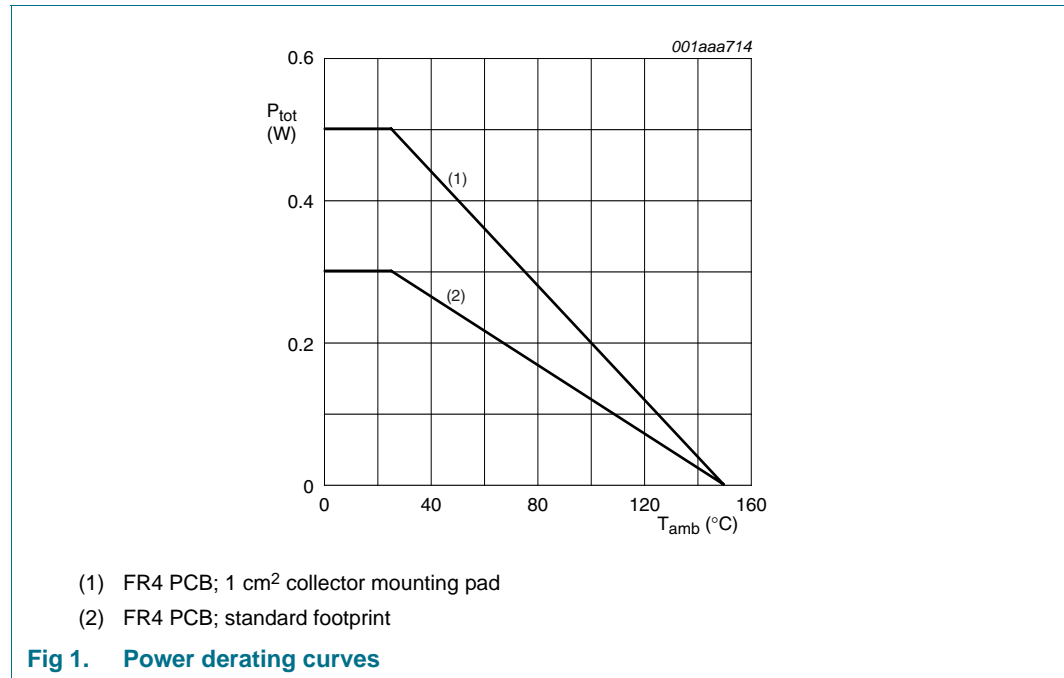
## 5. Limiting values

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	-	-80	V
$V_{CEO}$	collector-emitter voltage	open base	-	-60	V
$V_{EBO}$	emitter-base voltage	open collector	-	-5	V
$I_C$	collector current (DC)		[1] -	-0.9	A
			[2] -	-1	A
$I_{CM}$	peak collector current	$t = 1$ ms or limited by $T_{j(max)}$	-	-2	A
$I_B$	base current (DC)		-	-300	mA
$I_{BM}$	peak base current	$t_p \leq 300$ $\mu$ s; $\delta \leq 0.02$	-	-1	A
$P_{tot}$	total power dissipation	$T_{amb} \leq 25$ °C	[1] -	300	mW
			[2] -	500	mW
$T_j$	junction temperature		-	150	°C
$T_{amb}$	ambient temperature		-65	+150	°C
$T_{stg}$	storage temperature		-65	+150	°C

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

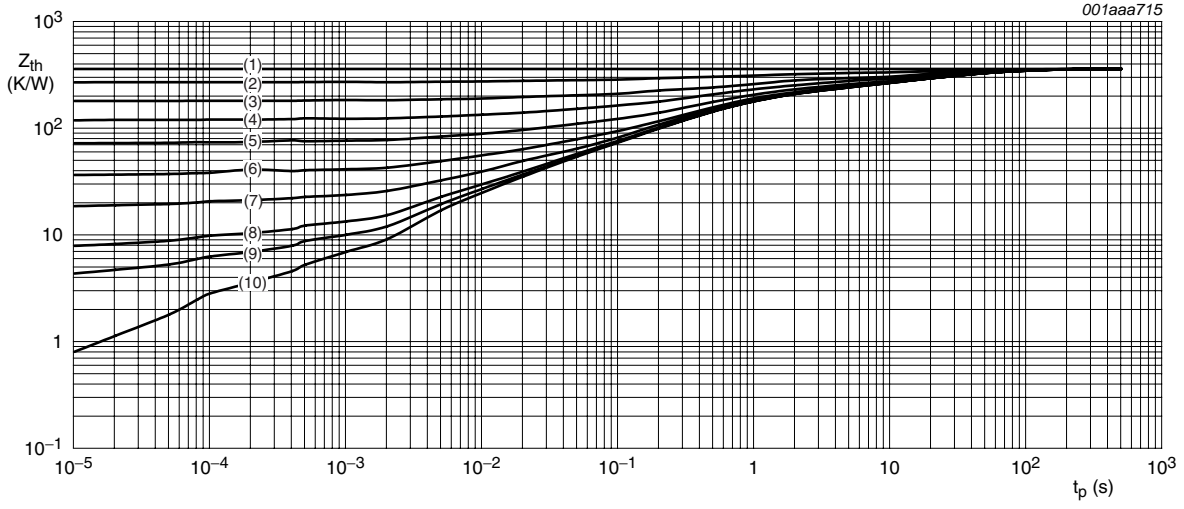


## 6. Thermal characteristics

**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]	-	-	415	K/W
			[2]	-	-	250	K/W

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



Mounted on FR4 PCB; standard footprint

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

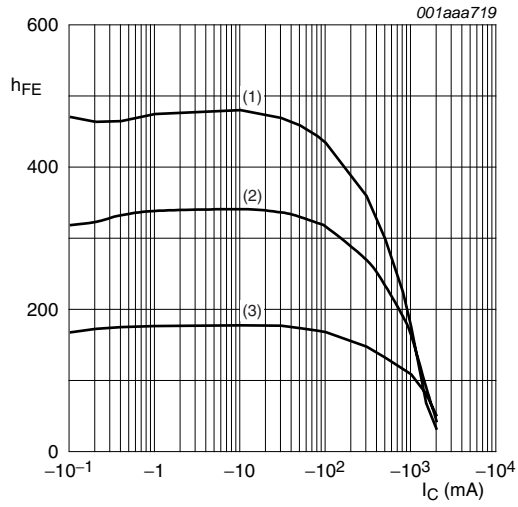
**Fig 2. Transient thermal impedance as a function of pulse time; typical values**

## 7. Characteristics

**Table 7. Characteristics**
 $T_{amb} = 25\text{ °C}$  unless otherwise specified.

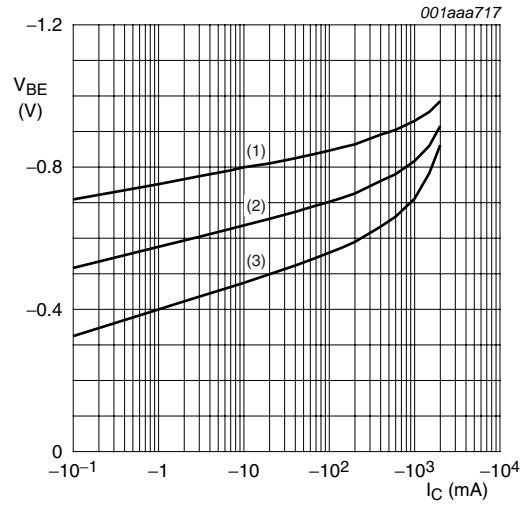
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{CBO}$	collector-base cut-off current	$V_{CB} = -60\text{ V}; I_E = 0\text{ A}$	-	-	-100	nA
		$V_{CB} = -60\text{ V}; I_E = 0\text{ A}; T_j = 150\text{ °C}$	-	-	-50	$\mu\text{A}$
$I_{CES}$	collector-emitter cut-off current	$V_{CE} = -60\text{ V}; V_{BE} = 0\text{ V}$	-	-	-100	nA
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = -5\text{ V}; I_C = 0\text{ A}$	-	-	-100	nA
$h_{FE}$	DC current gain	$V_{CE} = -5\text{ V}; I_C = -1\text{ mA}$	200	350	-	
		$V_{CE} = -5\text{ V}; I_C = -500\text{ mA}$	[1] 150	250	-	
		$V_{CE} = -5\text{ V}; I_C = -1\text{ A}$	[1] 100	160	-	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = -100\text{ mA}; I_B = -1\text{ mA}$	-	-110	-160	mV
		$I_C = -500\text{ mA}; I_B = -50\text{ mA}$	-	-120	-175	mV
		$I_C = -1\text{ A}; I_B = -100\text{ mA}$	[1] -	-220	-330	mV
$V_{BEsat}$	base-emitter saturation voltage	$I_C = -1\text{ A}; I_B = -50\text{ mA}$	-	-0.95	-1.1	V
$R_{CEsat}$	equivalent on-resistance	$I_C = -1\text{ A}; I_B = -100\text{ mA}$	[1] -	220	330	$\text{m}\Omega$
$V_{BEon}$	base-emitter turn-on voltage	$I_C = -1\text{ A}; V_{CE} = -5\text{ V}$	-	-0.82	-0.9	V
$t_d$	delay time	$V_{CC} = -10\text{ V}; I_C = -0.5\text{ A}; I_{Bon} = -0.025\text{ A}; I_{Boff} = 0.025\text{ A}$	-	11	-	ns
$t_r$	rise time		-	30	-	ns
$t_{on}$	turn-on time		-	41	-	ns
$t_s$	storage time		-	205	-	ns
$t_f$	fall time		-	55	-	ns
$t_{off}$	turn-off time		-	260	-	ns
$f_T$	transition frequency	$I_C = -50\text{ mA}; V_{CE} = -10\text{ V}; f = 100\text{ MHz}$	150	220	-	MHz
$C_c$	collector capacitance	$I_E = i_e = 0\text{ A}; V_{CB} = -10\text{ V}; f = 1\text{ MHz}$	-	9	15	pF

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



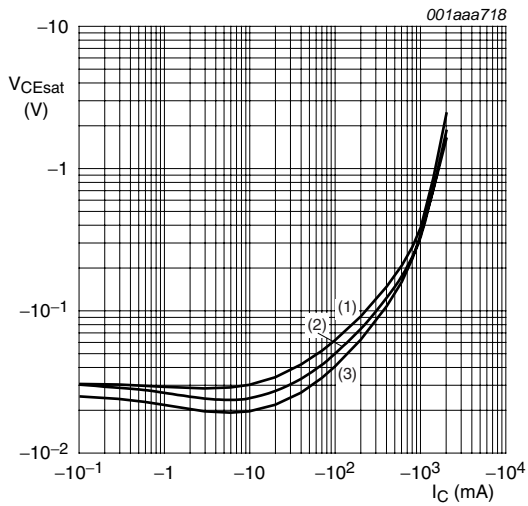
- $V_{CE} = -5\text{ V}$
- (1)  $T_{amb} = 100\text{ }^\circ\text{C}$
  - (2)  $T_{amb} = 25\text{ }^\circ\text{C}$
  - (3)  $T_{amb} = -55\text{ }^\circ\text{C}$

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



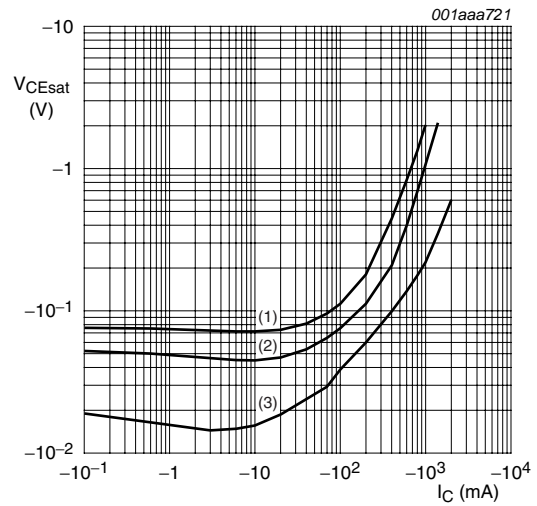
- $V_{CE} = -5\text{ V}$
- (1)  $T_{amb} = -55\text{ }^\circ\text{C}$
  - (2)  $T_{amb} = 25\text{ }^\circ\text{C}$
  - (3)  $T_{amb} = 100\text{ }^\circ\text{C}$

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



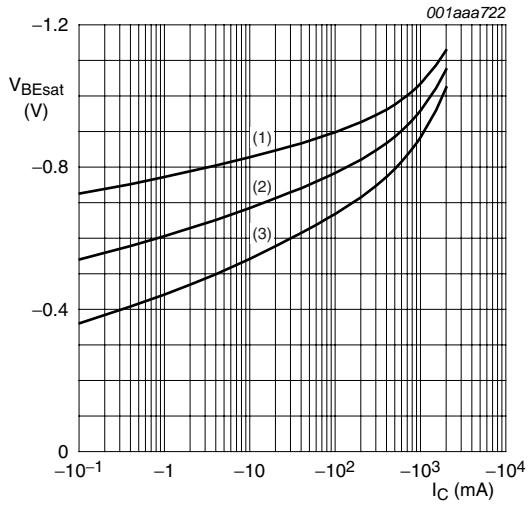
- $I_C/I_B = 20$
- (1)  $T_{amb} = 100\text{ }^\circ\text{C}$
  - (2)  $T_{amb} = 25\text{ }^\circ\text{C}$
  - (3)  $T_{amb} = -55\text{ }^\circ\text{C}$

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



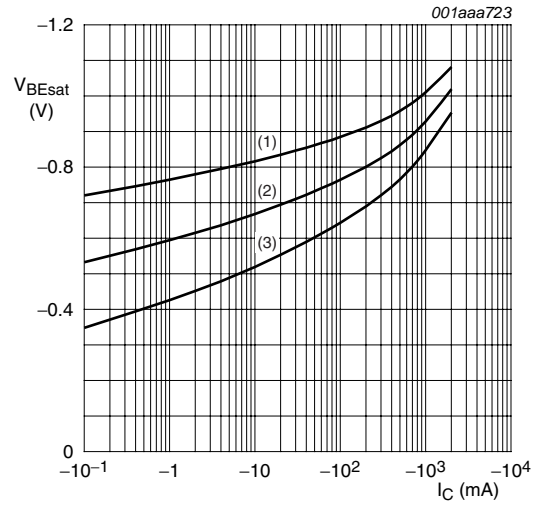
- $T_{amb} = 25\text{ }^\circ\text{C}$
- (1)  $I_C/I_B = 100$
  - (2)  $I_C/I_B = 50$
  - (3)  $I_C/I_B = 10$

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



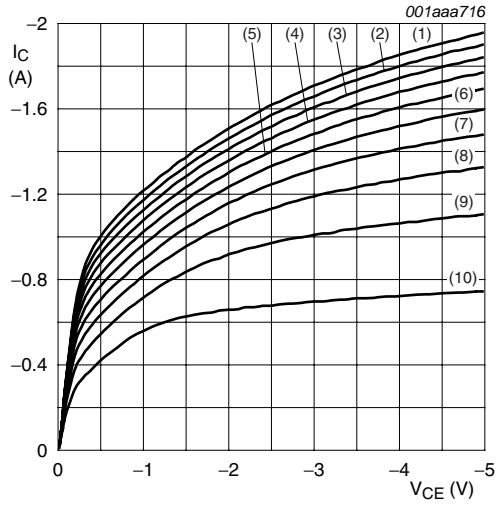
- $I_C/I_B = 10$
- (1)  $T_{amb} = -55\text{ °C}$
  - (2)  $T_{amb} = 25\text{ °C}$
  - (3)  $T_{amb} = 100\text{ °C}$

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



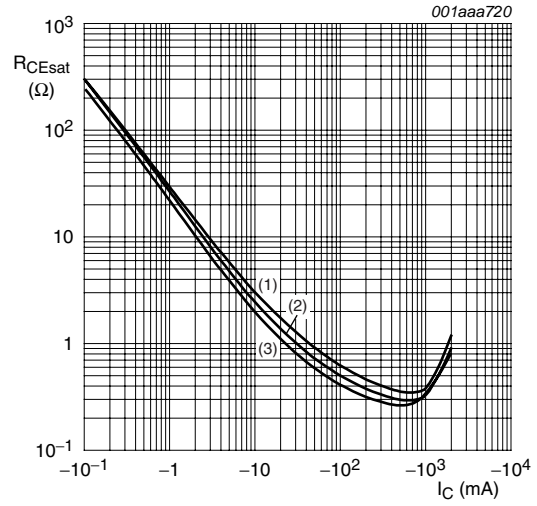
- $I_C/I_B = 20$
- (1)  $T_{amb} = -55\text{ °C}$
  - (2)  $T_{amb} = 25\text{ °C}$
  - (3)  $T_{amb} = 100\text{ °C}$

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



- $T_{amb} = 25\text{ }^{\circ}\text{C}$
- (1)  $I_B = -40\text{ mA}$
  - (2)  $I_B = -36\text{ mA}$
  - (3)  $I_B = -32\text{ mA}$
  - (4)  $I_B = -28\text{ mA}$
  - (5)  $I_B = -24\text{ mA}$
  - (6)  $I_B = -20\text{ mA}$
  - (7)  $I_B = -16\text{ mA}$
  - (8)  $I_B = -12\text{ mA}$
  - (9)  $I_B = -8\text{ mA}$
  - (10)  $I_B = -4\text{ mA}$

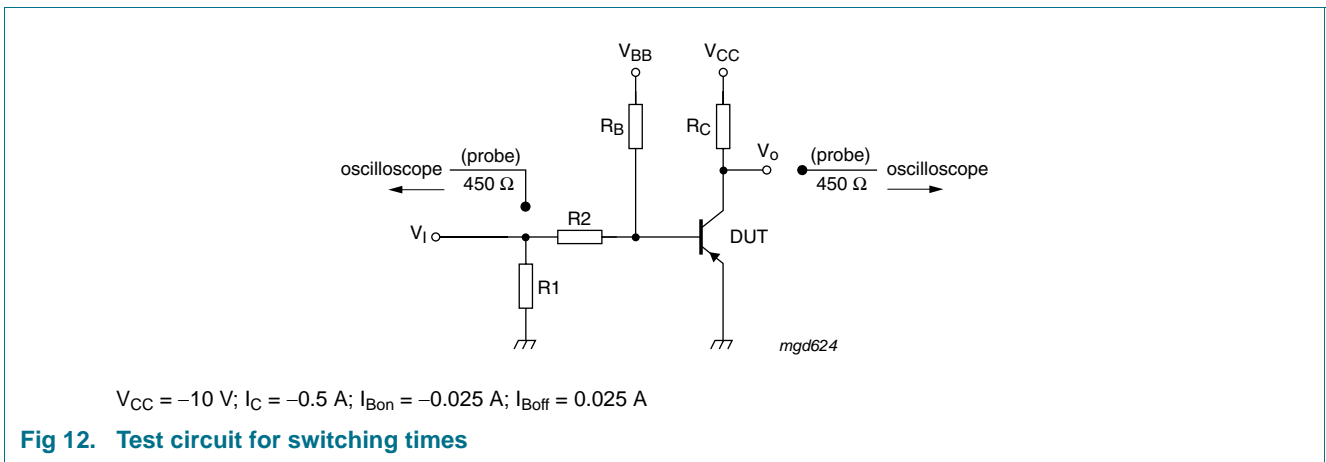
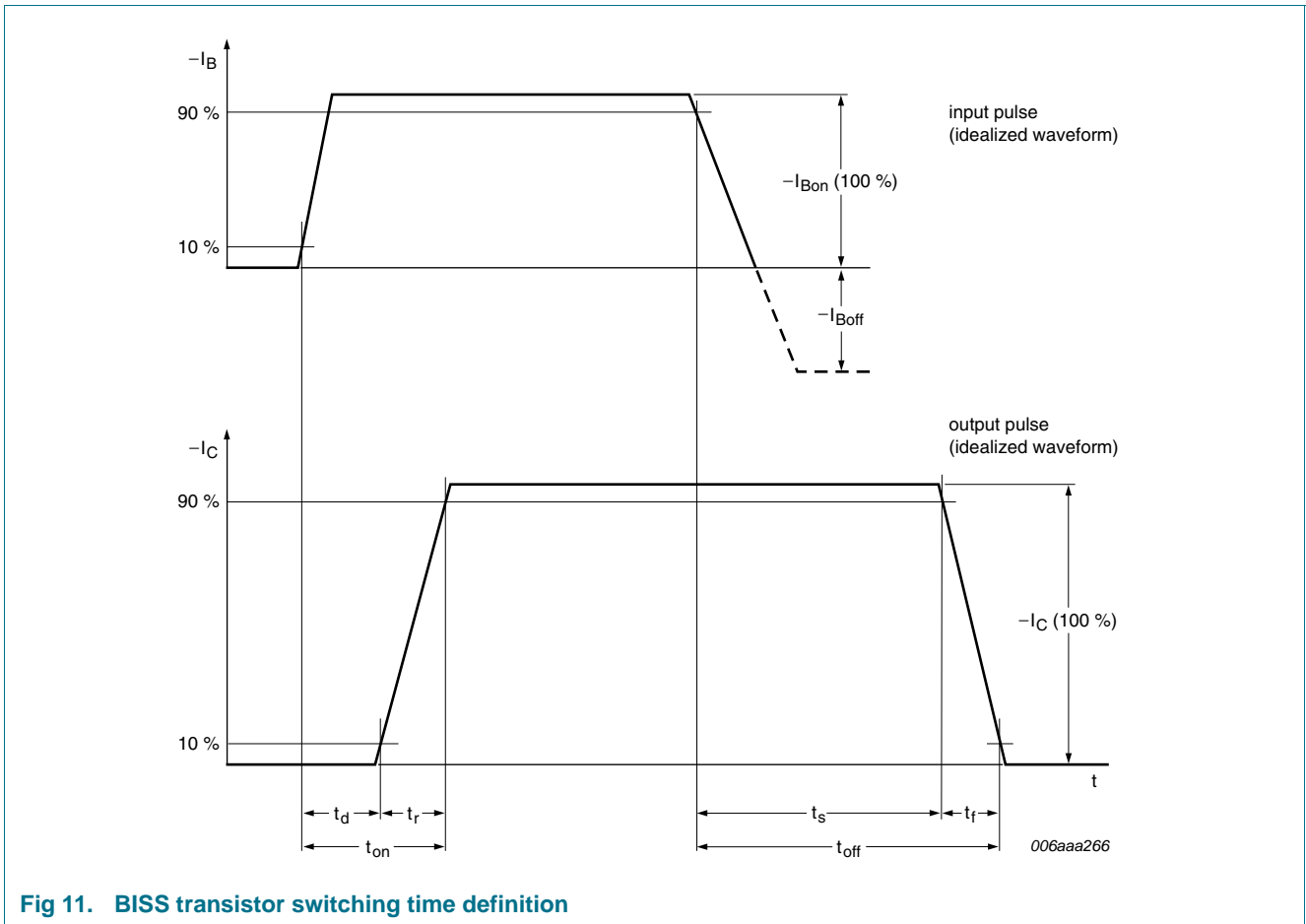
**Fig 9. Collector current as a function of collector-emitter voltage; typical values**



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

**Fig 10. Equivalent on-resistance as a function of collector current; typical values**





## 8. Package outline

Plastic surface-mounted package; 6 leads

SOT666

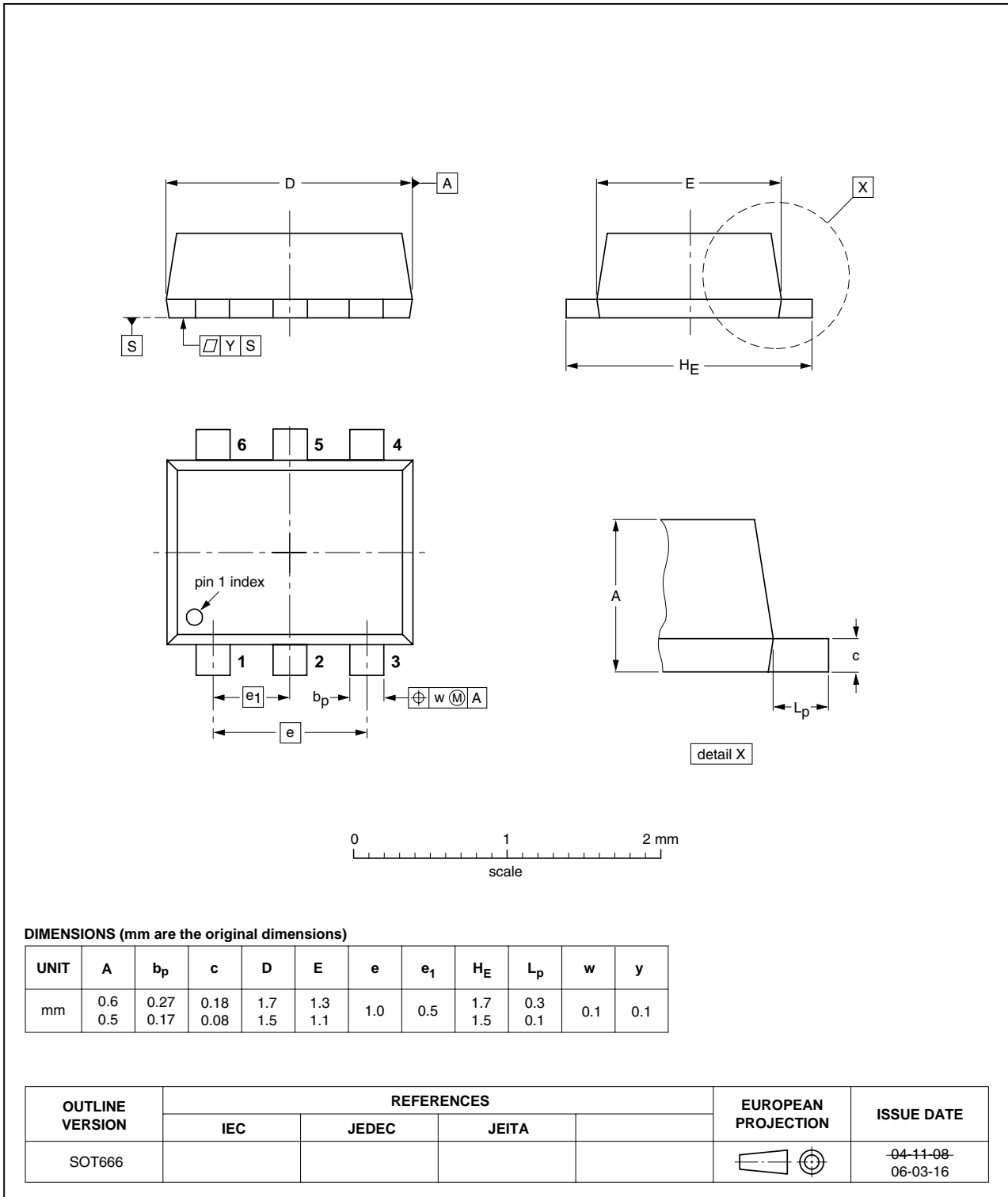


Fig 13. Package outline SOT666

## 9. Packing information

**Table 8. Packing methods**

The indicated -xxx are the last three digits of the 12NC ordering code.<sup>[1]</sup>

Type number	Package	Description	Packing quantity
			<b>3000</b>
PBSS5160V	SOT666	4 mm pitch, 8 mm tape and reel	-115

[1] For further information and the availability of packing methods, see [Section 12](#).

## 10. Revision history

Table 9. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PBSS5160V_3	20091214	Product data sheet	-	PBSS5160V_2
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 13 "Package outline SOT666"</a>: updated</li></ul>		
PBSS5160V_2	20050404	Product data sheet	-	PBSS5160V_1
PBSS5160V_1	20040420	Objective data sheet	-	-

## 11. Legal information

### 11.1 Data sheet status

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.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

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