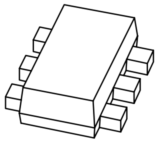


PBSS4160V

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

Rev. 03 — 11 December 2009 — Product data sheet

1. Product profile

1.1 General description

Low V_{CEsat} (BISS) NPN transistor in a SOT666 plastic package.

PNP complement: PBSS5160V.

1.2 Features

- Low collector-emitter saturation voltage V_{CEsat}
- High collector current capability I_C and I_{CM}
- High efficiency, reduces heat generation
- Reduces printed-circuit board area required
- Cost effective replacement for medium power transistor BCP55 and BCX55

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

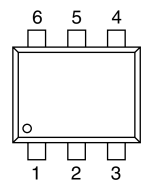
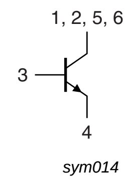
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{CEO}	collector-emitter voltage	open base		-	-	60	V
I_C	collector current (DC)		[1]	-	-	1	A
I_{CM}	peak collector current	t = 1 ms or limited by $T_{j(max)}$		-	-	2	A
R_{CEsat}	equivalent on-resistance	I_C = 1 A; I_B = 100 mA	[2]	-	200	250	mΩ

[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated, 1 cm^2 collector mounting pad.

[2] Pulse test: $t_p \leq 300$ µs; $\delta \leq 0.02$.

2. Pinning information

Table 2. Discrete pinning

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

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PBSS4160V	-	plastic surface mounted package; 6 leads	SOT666

4. Marking

Table 4. Marking codes

Type number	Marking code
PBSS4160V	41

5. Limiting values

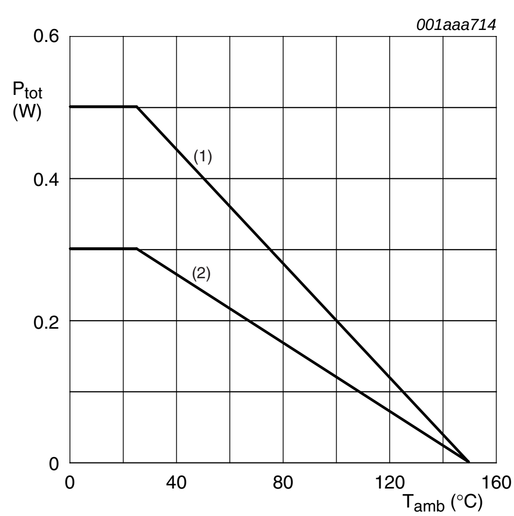
Table 5. Limiting values

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	
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 an FR4 PCB, single-sided copper, tin-plated and standard footprint.

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, 1 cm^2 collector mounting pad.



(1) FR4 PCB; 1 cm^2 collector mounting pad

(2) FR4 PCB; standard footprint

Fig 1. Power derating curves

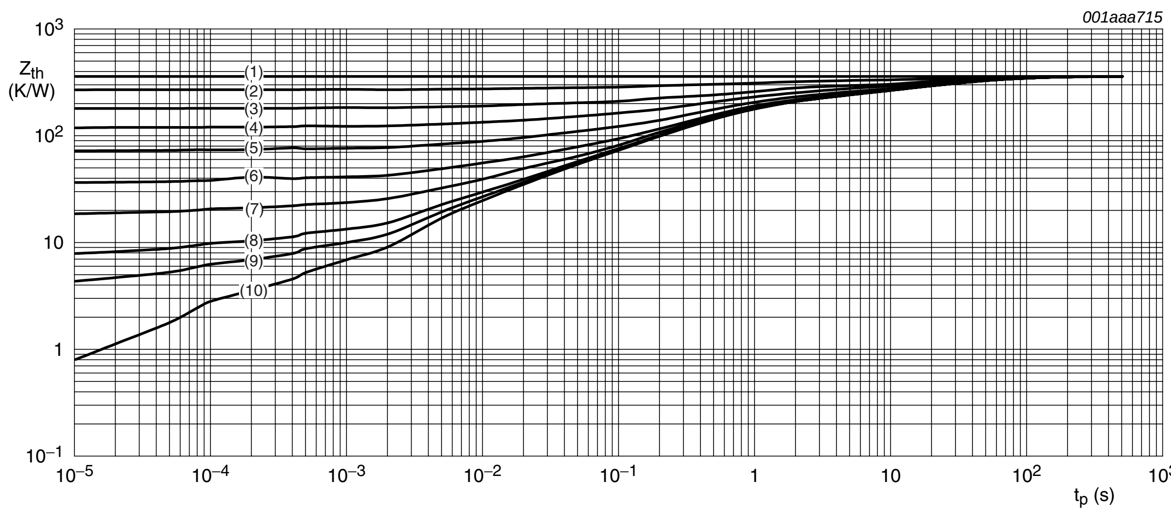
6. Thermal characteristics

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 an FR4 PCB, single-sided copper, tin-plated and standard footprint.

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, 1 cm^2 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

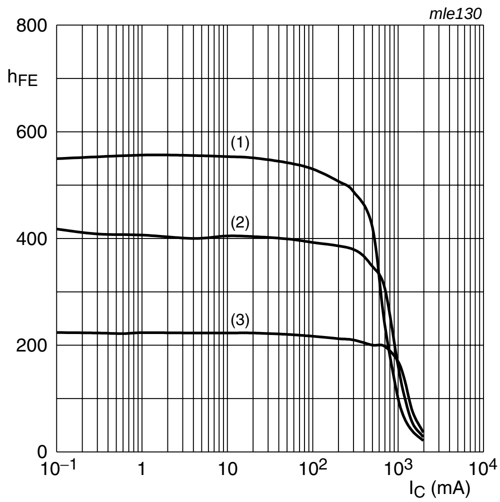
7. Characteristics

Table 7. Characteristics

T_{amb} = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
I_{CBO}	collector-base cut-off current	V_{CB} = 60 V; I_E = 0 A		-	-	100	nA
		V_{CB} = 60 V; I_E = 0 A; T_j = 150 °C		-	-	50	µA
I_{CES}	collector-emitter cut-off current	V_{CE} = 60 V; V_{BE} = 0 V		-	-	100	nA
I_{EBO}	emitter-base cut-off current	V_{EB} = 5 V; I_C = 0 A		-	-	100	nA
h_{FE}	DC current gain	V_{CE} = 5 V; I_C = 1 mA		250	400	-	
		V_{CE} = 5 V; I_C = 500 mA	[1]	200	350	-	
		V_{CE} = 5 V; I_C = 1 A	[1]	100	150	-	
V_{CEsat}	collector-emitter saturation voltage	I_C = 100 mA; I_B = 1 mA		-	90	110	mV
		I_C = 500 mA; I_B = 50 mA		-	110	140	mV
		I_C = 1 A; I_B = 100 mA	[1]	-	200	250	mV
V_{BEsat}	base-emitter saturation voltage	I_C = 1 A; I_B = 50 mA		-	0.95	1.1	V
R_{CEsat}	equivalent on-resistance	I_C = 1 A; I_B = 100 mA	[1]	-	200	250	mΩ
V_{BEon}	base-emitter turn-on voltage	V_{CE} = 5 V; I_C = 1 A		-	0.82	0.9	V
t_d	delay time	V_{CC} = 10 V; I_C = 0.5 A; I_{Bon} = 25 mA; I_{Boff} = −25 mA		-	11	-	ns
t_r	rise time			-	78	-	ns
t_{on}	turn-on time			-	90	-	ns
t_s	storage time			-	340	-	ns
t_f	fall time			-	160	-	ns
t_{off}	turn-off time			-	500	-	ns
f_T	transition frequency	I_C = 50 mA; V_{CE} = 10 V; f = 100 MHz		150	220	-	MHz
C_c	collector capacitance	V_{CB} = 10 V; I_E = I_e = 0 A; f = 1 MHz		-	5.5	10	pF

[1] Pulse test: $t_p \leq 300$ µs; $\delta \leq 0.02$.



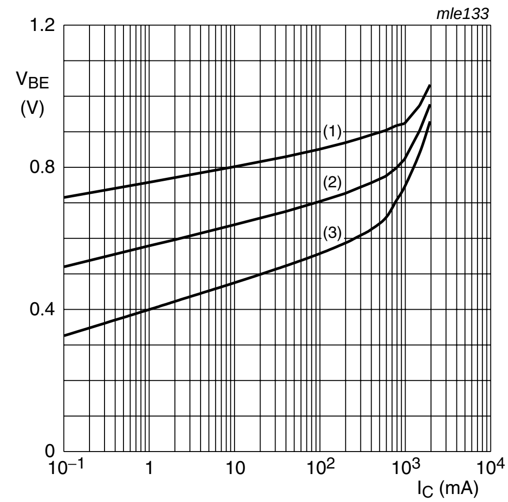
V_{CE} = 5 V

(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



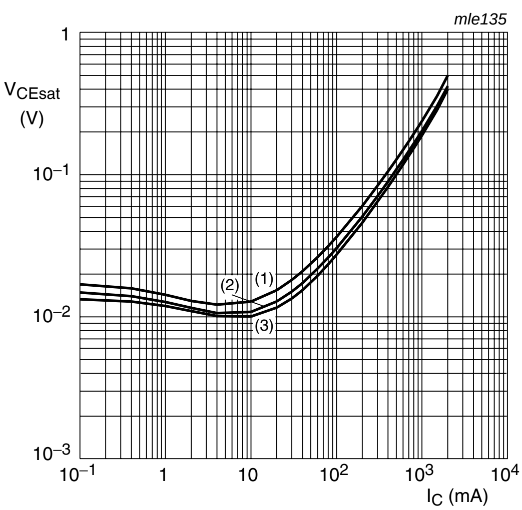
V_{CE} = 5 V

(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



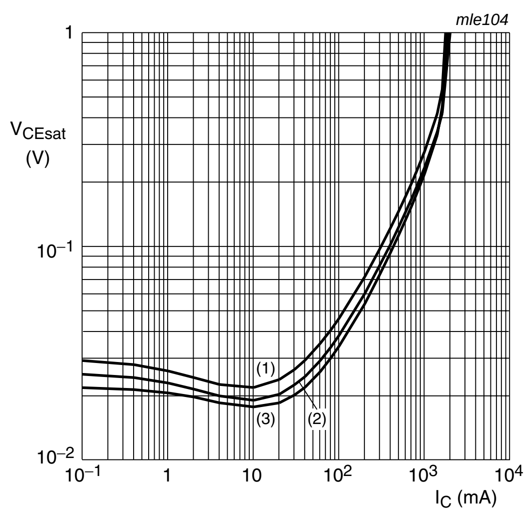
I_C/I_B = 10

(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



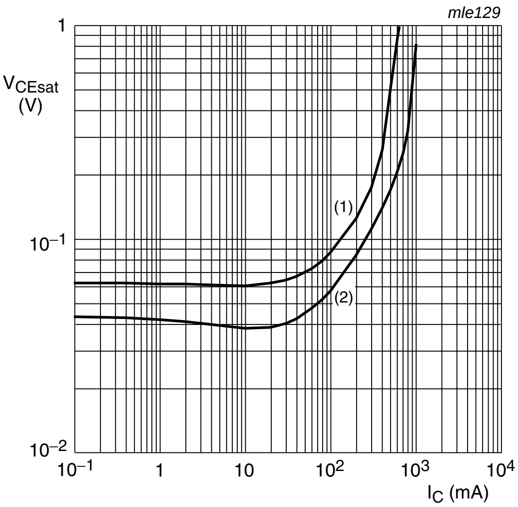
I_C/I_B = 20

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = −55 °C

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

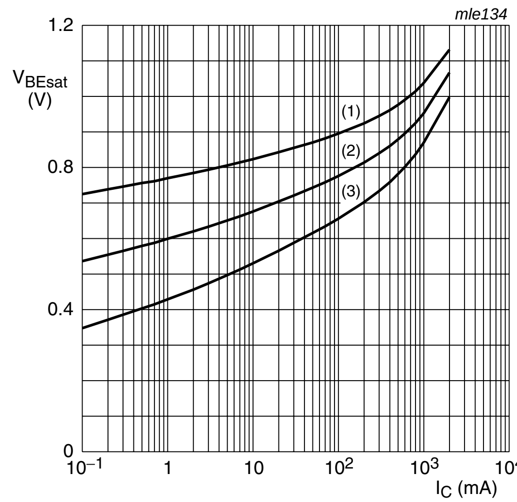


T_{amb} = 25 °C

(1) I_C/I_B = 100

(2) I_C/I_B = 50

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



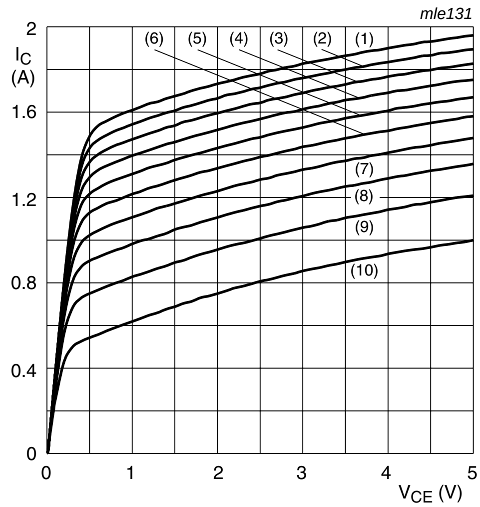
I_C/I_B = 20

(1) T_{amb} = −55 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = 100 °C

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



T_{amb} = 25 °C

(1) I_B = 60 mA

(2) I_B = 54 mA

(3) I_B = 48 mA

(4) I_B = 42 mA

(5) I_B = 36 mA

(6) I_B = 30 mA

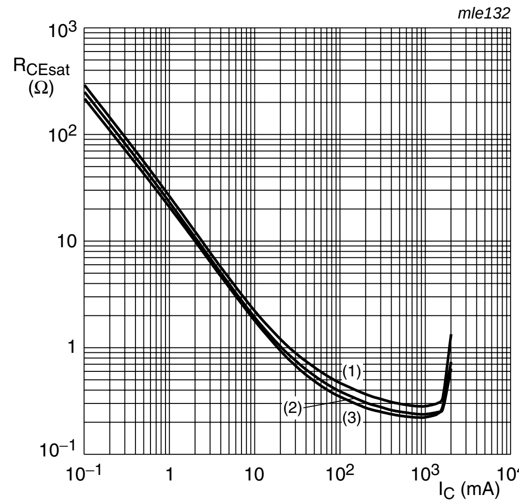
(7) I_B = 24 mA

(8) I_B = 18 mA

(9) I_B = 12 mA

(10) I_B = 6 mA

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



I_C/I_B = 20

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = −55 °C

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

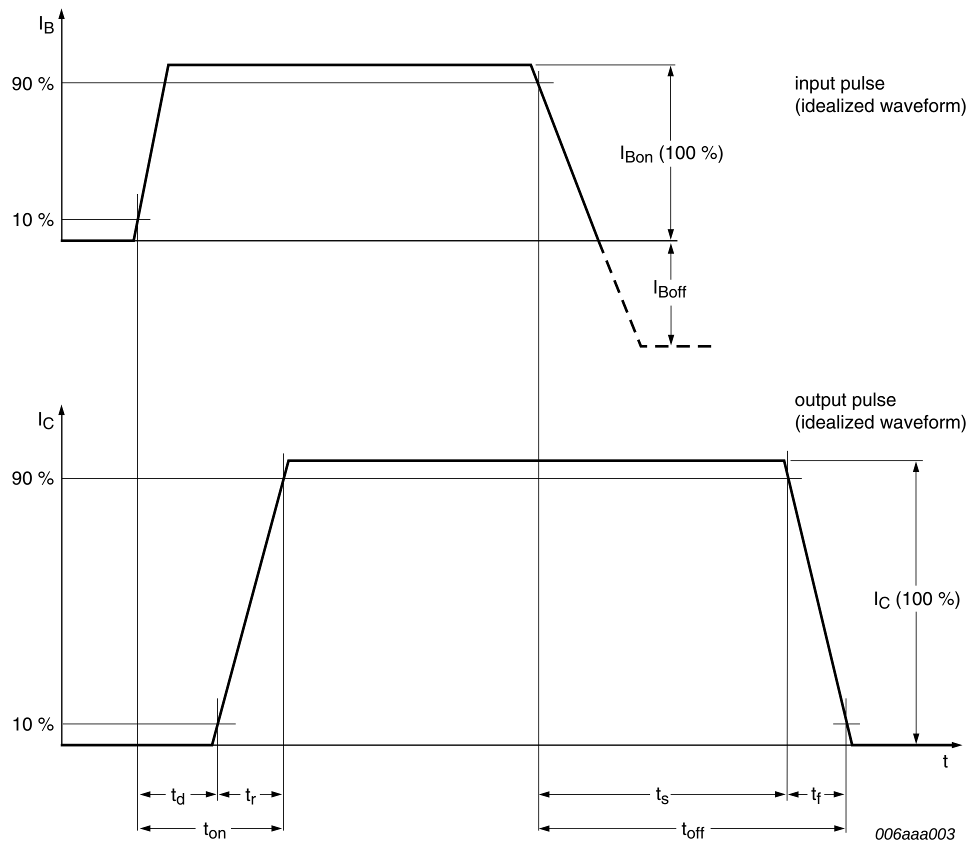
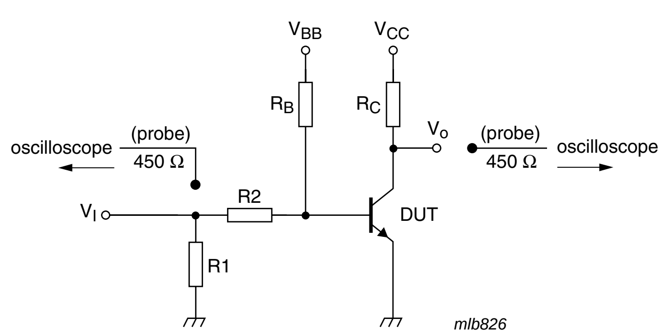


Fig 11. BISS transistor switching time definition

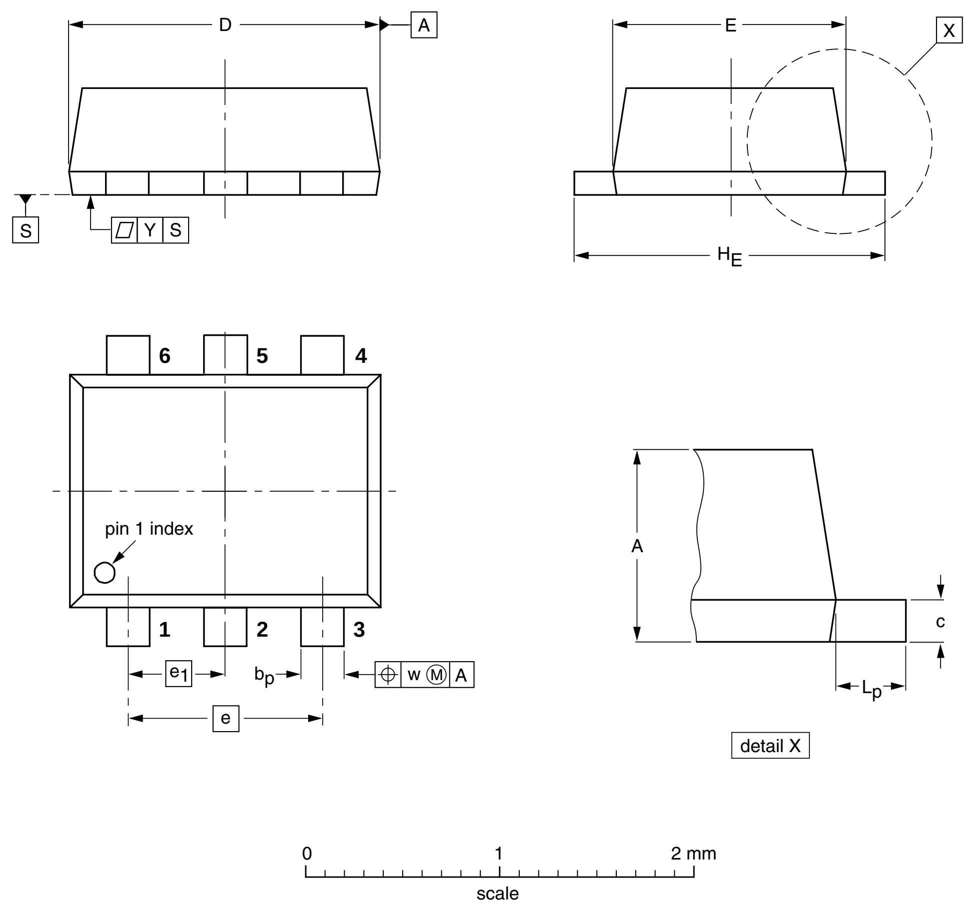


V_{CC} = 10 V; I_C = 0.5 A; I_{Bon} = 25 mA; I_{Boff} = −25 mA

Fig 12. Test circuit for switching times

8. Package outline

Plastic surface-mounted package; 6 leads **SOT666**



DIMENSIONS (mm are the original dimensions)

UNIT	A	b_p	c	D	E	e	e_1	H_E	L_p	w	y
mm	0.6 0.5	0.27 0.17	0.18 0.08	1.7 1.5	1.3 1.1	1.0	0.5	1.7 1.5	0.3 0.1	0.1	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT666						~~04-11-08~~ 06-03-16

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.[1]

Type number	Package	Description	Packing quantity
			4000
PBSS4160V	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
PBSS4160V_3	20091211	Product data sheet	-	PBSS4160V_2
Modifications:	• 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. • Table 2 "Discrete pinning": updated • Figure 13 "Package outline SOT666": updated			
PBSS4160V_2	20050131	Product data sheet	-	PBSS4160V_1
PBSS4160V_1	20040423	Objective data sheet	-	-

11. Legal information

11.1 Data sheet status

Document status[1][2]	Product status[3]	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".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nxp.com.

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13. Contents

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