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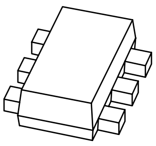


PBSS5220V

20 V, 2 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 Signal (BISS) transistor in a SOT666 Surface Mounted Device (SMD) plastic package.

NPN complement: PBSS4220V.

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)
- Portable applications

1.4 Quick reference data

Table 1. Quick reference data

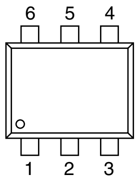
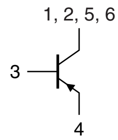
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CEO}	collector-emitter voltage	open base	-	-	–20	V
I_C	collector current		-	-	–2	A
I_{CM}	peak collector current	$t_p \leq 300\ \mu s$	-	-	–4	A
R_{CEsat}	collector-emitter saturation resistance	$I_C = -1$ A; $I_B = -100$ mA [1]	-	140	210	mΩ

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

founded by Philips

2. Pinning information

Table 2. Pinning

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

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PBSS5220V	-	plastic surface mounted package; 6 leads	SOT666

4. Marking

Table 4. Marking codes

Type number	Marking code
PBSS5220V	N7

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		-	–20	V
V_{CEO}	collector-emitter voltage	open base		-	–20	V
V_{EBO}	emitter-base voltage	open collector		-	–5	V
I_C	collector current			-	–2	A
I_{CM}	peak collector current	$t_p \leq 300\ \mu s$		-	–4	A
I_B	base current			-	–0.3	A
I_{BM}	peak base current	$t_p \leq 300\ \mu s$		-	–0.6	A
P_{tot}	total power dissipation	$T_{amb} \leq 25\ °C$	[1][4]	-	0.3	W
			[2][4]	-	0.5	W
			[3][4]	-	0.9	W
T_j	junction temperature			-	150	°C

Table 5. Limiting values *...continued*

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

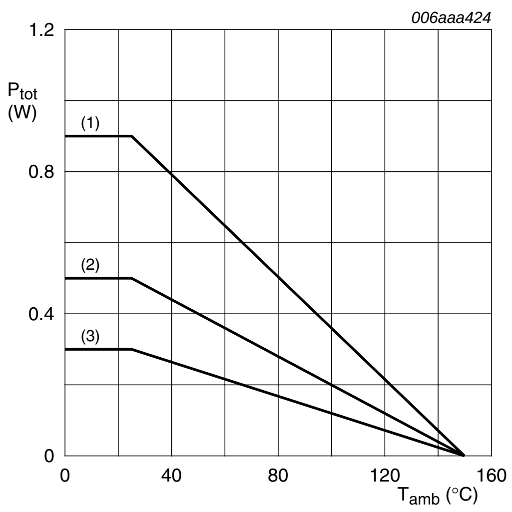
Symbol	Parameter	Conditions	Min	Max	Unit
T_{amb}	ambient temperature		−65	+150	°C
T_{stg}	storage temperature		−65	+150	°C

[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, mounting pad for collector 1 cm^2.

[3] Device mounted on a ceramic PCB, Al_2O_3, standard footprint.

[4] Reflow soldering is the only recommended soldering method.



(1) Ceramic PCB, Al_2O_3, standard footprint

(2) FR4 PCB, mounting pad for collector 1 cm^2

(3) FR4 PCB, standard footprint

Fig 1. Power derating curves

6. Thermal characteristics

Table 6. Thermal characteristics

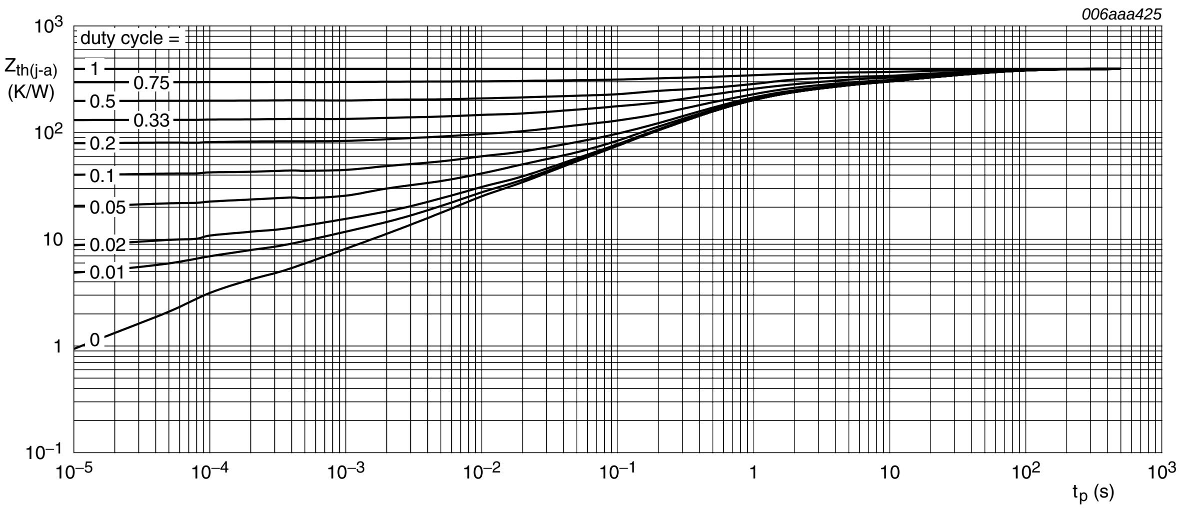
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1][4]	-	-	410	K/W
			[2][4]	-	-	250	K/W
			[3][4]	-	-	140	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	-	80	K/W

[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^2.

[3] Device mounted on a ceramic PCB, Al_2O_3, standard footprint.

[4] Reflow soldering is the only recommended soldering method.



FR4 PCB, standard footprint

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

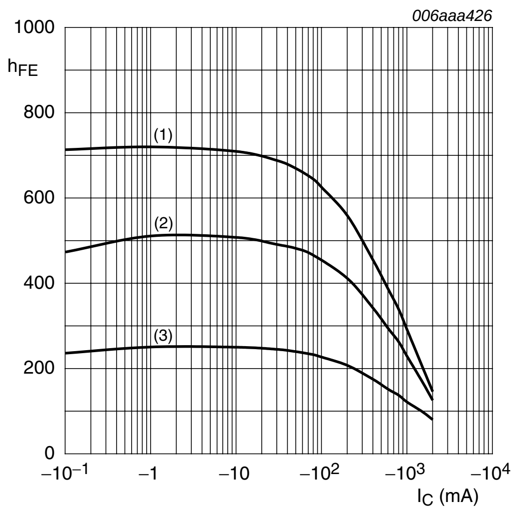
7. Characteristics

Table 7. Characteristics

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

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
I_{CBO}	collector-base cut-off current	V_{CB} = –20 V; I_E = 0 A		-	-	–0.1	μA
		V_{CB} = –20 V; I_E = 0 A; T_j = 150 °C		-	-	–50	μA
I_{CES}	collector-emitter cut-off current	V_{CE} = –20 V; V_{BE} = 0 V		-	-	–0.1	μA
I_{EBO}	emitter-base cut-off current	V_{EB} = –5 V; I_C = 0 A		-	-	–0.1	μA
h_{FE}	DC current gain	V_{CE} = –2 V; I_C = –1 mA		220	495	-	
		V_{CE} = –2 V; I_C = –100 mA		220	440	-	
		V_{CE} = –2 V; I_C = –500 mA	[1]	220	310	-	
		V_{CE} = –2 V; I_C = –1 A	[1]	155	220	-	
		V_{CE} = –2 V; I_C = –2 A	[1]	60	120	-	
V_{CEsat}	collector-emitter saturation voltage	I_C = –100 mA; I_B = –1 mA		-	–50	–80	mV
		I_C = –500 mA; I_B = –50 mA	[1]	-	–75	–115	mV
		I_C = –1 A; I_B = –50 mA	[1]	-	–155	–220	mV
		I_C = –1 A; I_B = –100 mA	[1]	-	–140	–210	mV
		I_C = –2 A; I_B = –100 mA	[1]	-	–305	–455	mV
		I_C = –2 A; I_B = –200 mA	[1]	-	–265	–390	mV
R_{CEsat}	collector-emitter saturation resistance	I_C = –1 A; I_B = –100 mA	[1]	-	140	210	mΩ
V_{BEsat}	base-emitter saturation voltage	I_C = –1 A; I_B = –50 mA	[1]	-	–0.95	–1.1	V
		I_C = –1 A; I_B = –100 mA	[1]	-	–1	–1.1	V
V_{BEon}	base-emitter turn-on voltage	V_{CE} = –5 V; I_C = –1 A		-	–0.8	–1	V
t_d	delay time	I_C = –1 A; I_{Bon} = –50 mA; I_{Boff} = 50 mA		-	8	-	ns
t_r	rise time			-	34	-	ns
t_{on}	turn-on time			-	42	-	ns
t_s	storage time			-	140	-	ns
t_f	fall time			-	45	-	ns
t_{off}	turn-off time			-	185	-	ns
f_T	transition frequency	V_{CE} = –10 V; I_C = –50 mA; f = 100 MHz		150	185	-	MHz
C_c	collector capacitance	V_{CB} = –10 V; I_E = i_e = 0 A; f = 1 MHz		-	15	20	pF

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



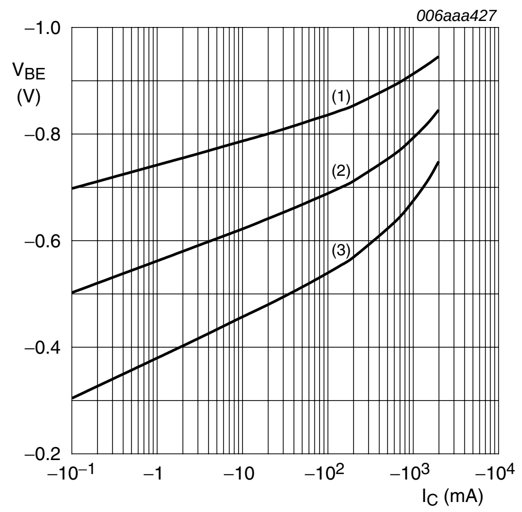
$V_{CE} = -2$ V

(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



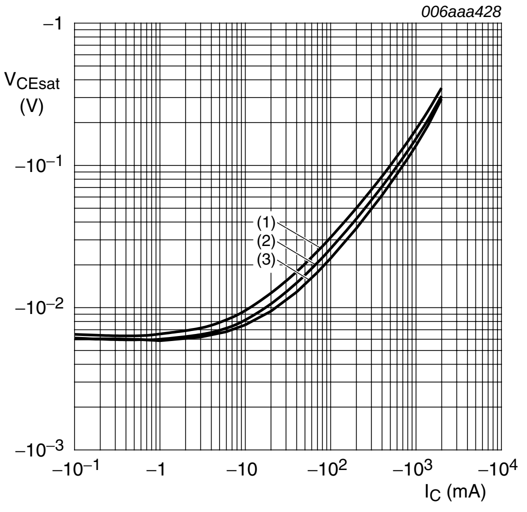
$V_{CE} = -5$ V

(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



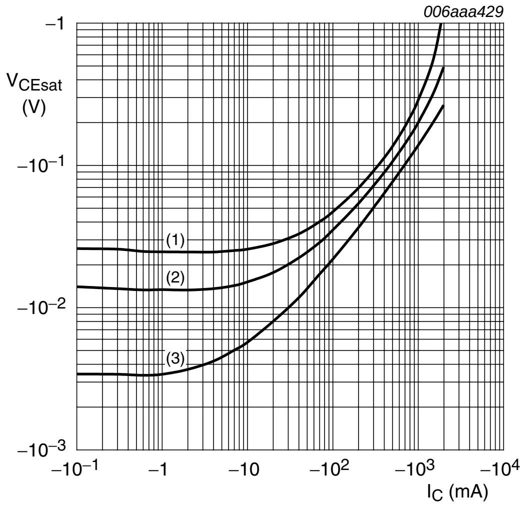
$I_C/I_B = 20$

(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



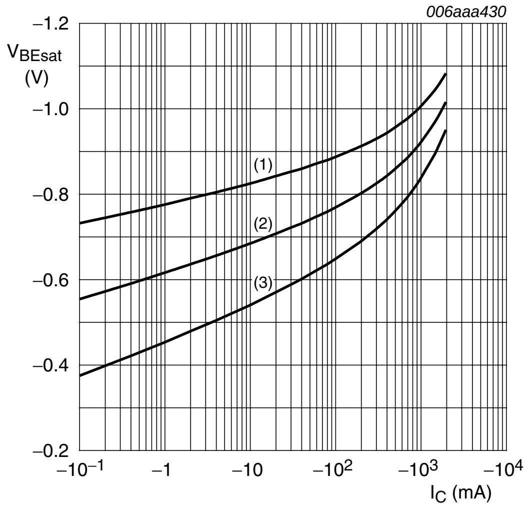
$T_{amb} = 25$ °C

(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



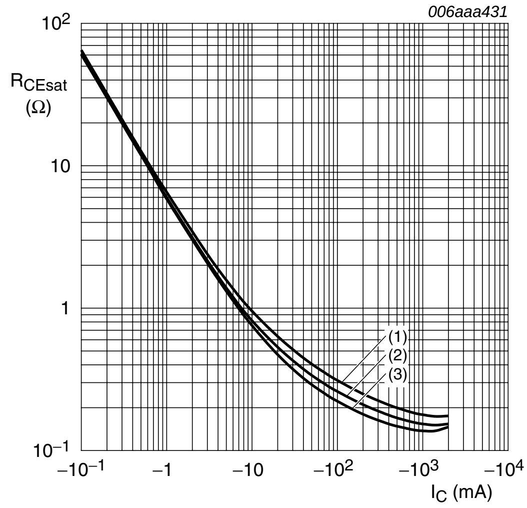
$I_C/I_B = 20$

(1) $T_{amb} = -55$ °C

(2) $T_{amb} = 25$ °C

(3) $T_{amb} = 100$ °C

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



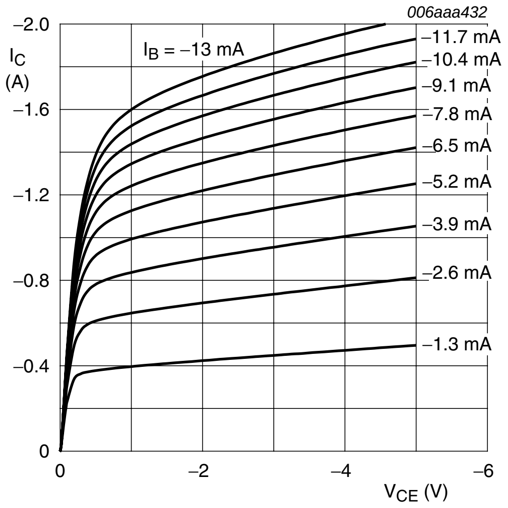
$I_C/I_B = 20$

(1) $T_{amb} = 100$ °C

(2) $T_{amb} = 25$ °C

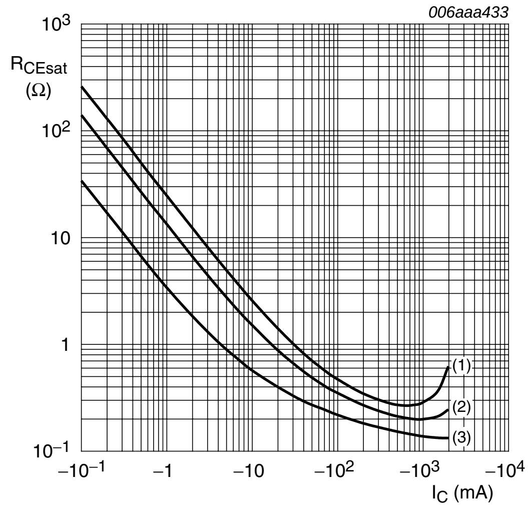
(3) $T_{amb} = -55$ °C

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



$T_{amb} = 25$ °C

Fig 9. Collector current as a function of collector-emitter voltage; 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 10. Collector-emitter saturation resistance as a function of collector current; typical values

8. Test information

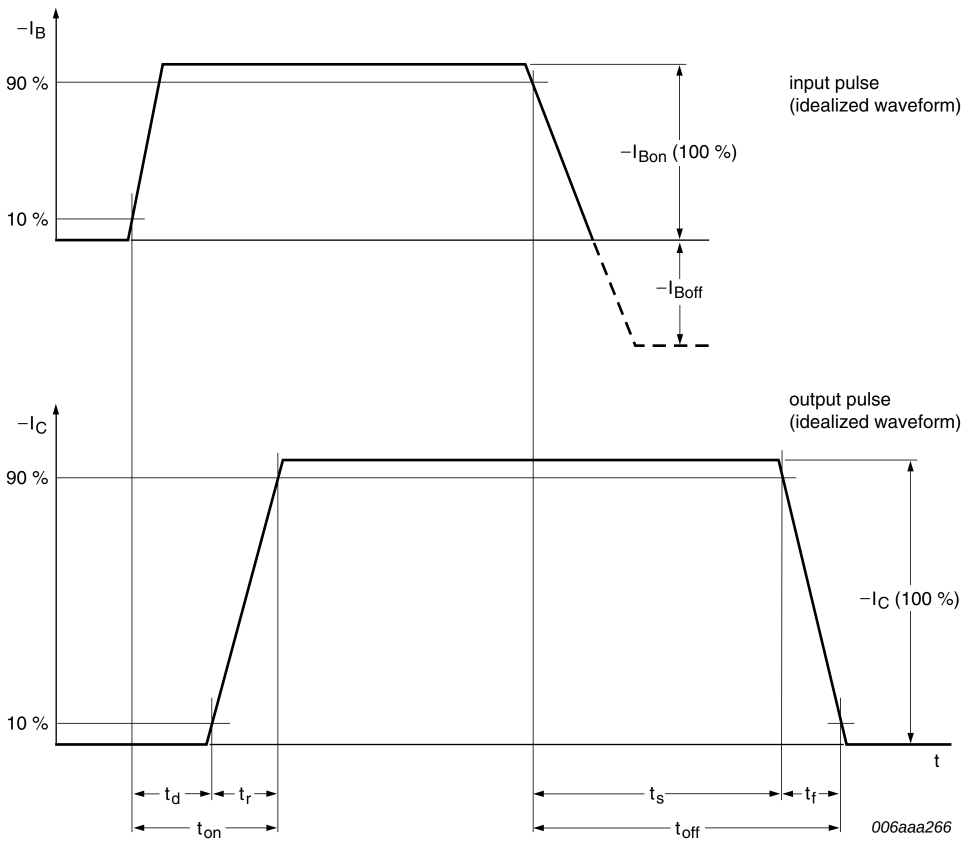
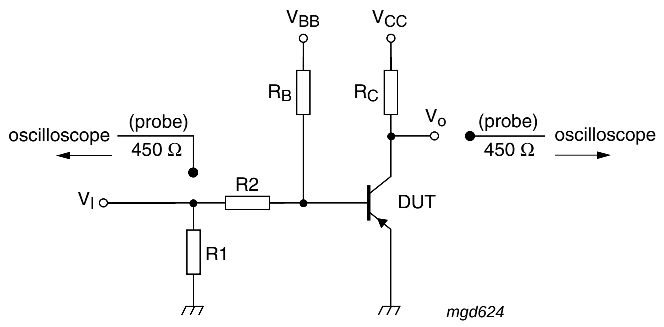


Fig 11. BISS transistor switching time definition



$I_C = -1$ A; $I_{Bon} = -50$ mA; $I_{Boff} = 50$ mA; R1 = open; R2 = 45 Ω; $R_B = 145$ Ω; $R_C = 10$ Ω

Fig 12. Test circuit for switching times

9. Package outline

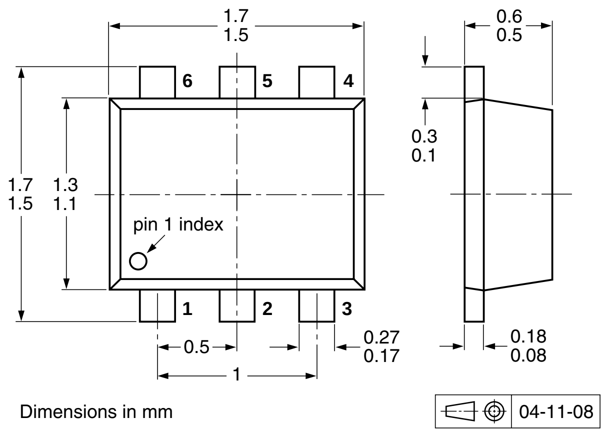


Fig 13. Package outline SOT666

10. Packing information

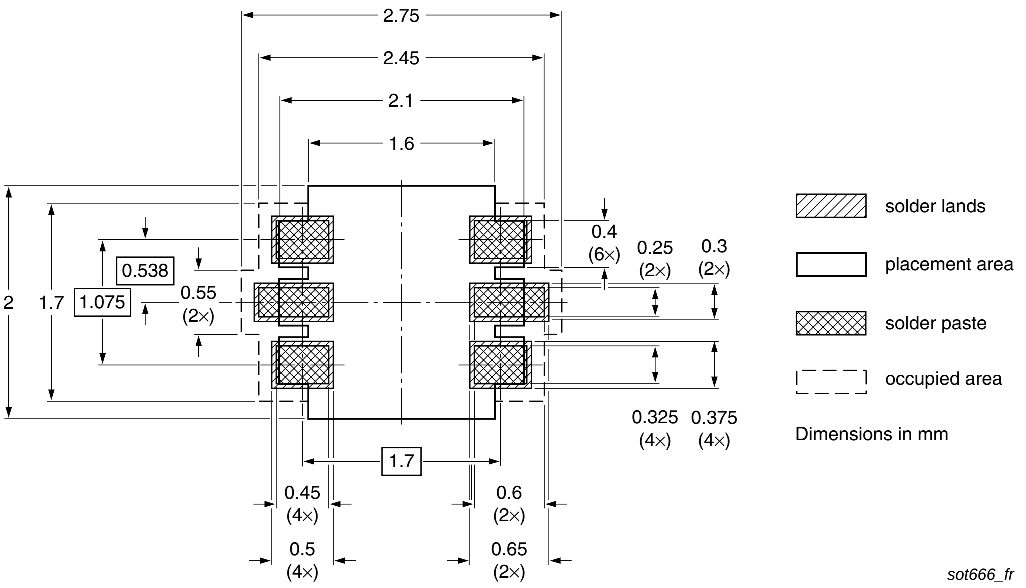
Table 8. Packing methods

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

Type number	Package	Description	Packing quantity	
			4000	**8000**
PBSS5220V	SOT666	2 mm pitch, 8 mm tape and reel	-	-315
		4 mm pitch, 8 mm tape and reel	-115	-

[1] For further information and the availability of packing methods, see Section 14.

11. Soldering



Reflow soldering is the only recommended soldering method.

Fig 14. Reflow soldering footprint

12. Revision history

Table 9. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PBSS5220V_3	20091214	Product data sheet	-	PBSS5220V_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. • Figure 14 “Reflow soldering footprint”: updated			
PBSS5220V_2	20060208	Product data sheet	-	PBSS5220V_1
PBSS5220V_1	20050613	Product data sheet	-	-

13. Legal information

13.1 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”.

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15. Contents

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