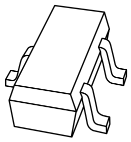


PBSS2515E

15 V, 0.5 A NPN low V_{CEsat} (BISS) transistor

Rev. 02 — 21 April 2009 Product data sheet

1. Product profile

1.1 General description

NPN low V_{CEsat} Breakthrough In Small Signal (BISS) transistor in an ultra small SOT416 (SC-75) Surface-Mounted Device (SMD) plastic package.

PNP complement: PBSS3515E.

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

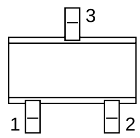
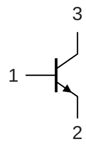
Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{CEO}	collector-emitter voltage	open base		-	-	15	V
I_C	collector current			-	-	0.5	A
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms		-	-	1	A
R_{CEsat}	collector-emitter saturation resistance	$I_C = 500$ mA; $I_B = 50$ mA	[1]	-	300	500	mΩ

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

2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Graphic symbol
1	base		 sym021
2	emitter		
3	collector		

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PBSS2515E	SC-75	plastic surface-mounted package; 3 leads	SOT416

4. Marking

Table 4. Marking codes

Type number	Marking code
PBSS2515E	1Q

5. Limiting values

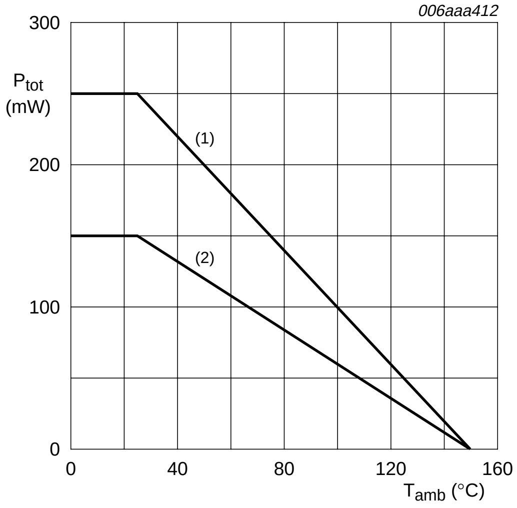
Table 5. Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CBO}	collector-base voltage	open emitter	-	15	V
V_{CEO}	collector-emitter voltage	open base	-	15	V
V_{EBO}	emitter-base voltage	open collector	-	6	V
I_C	collector current		-	0.5	A
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms	-	1	A
I_{BM}	peak base current	single pulse; $t_p \leq 1$ ms	-	100	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C [1]	-	150	mW
		[2]	-	250	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, mounting pad for collector 1 cm^2.



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

(2) FR4 PCB, standard footprint

Fig 1. Power derating curves

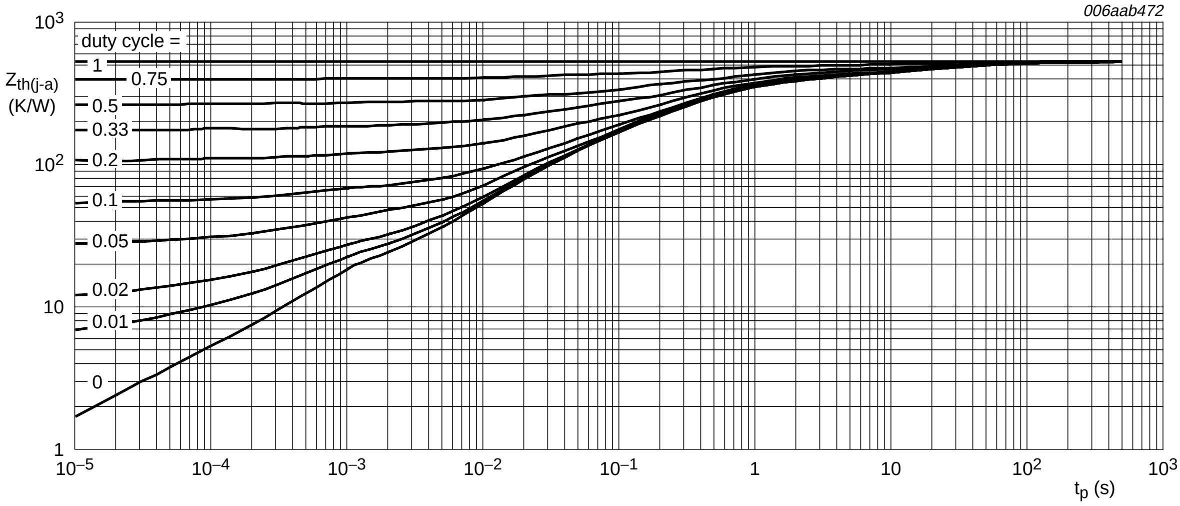
6. Thermal characteristics

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]	-	-	833	K/W
			[2]	-	-	500	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	-	170	K/W

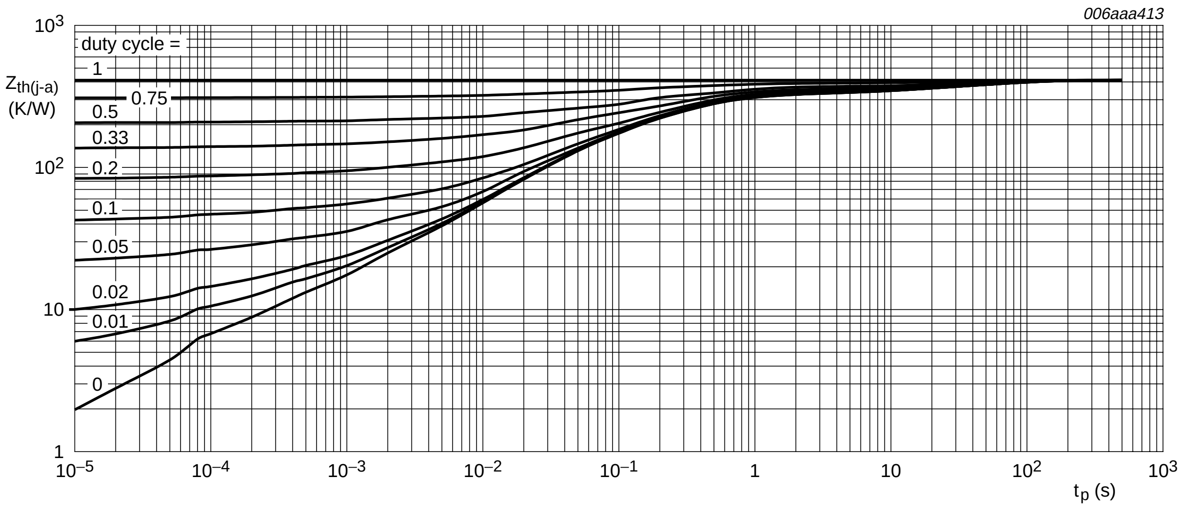
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

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



FR4 PCB, standard footprint

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



FR4 PCB, mounting pad for collector 1 cm^2

Fig 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

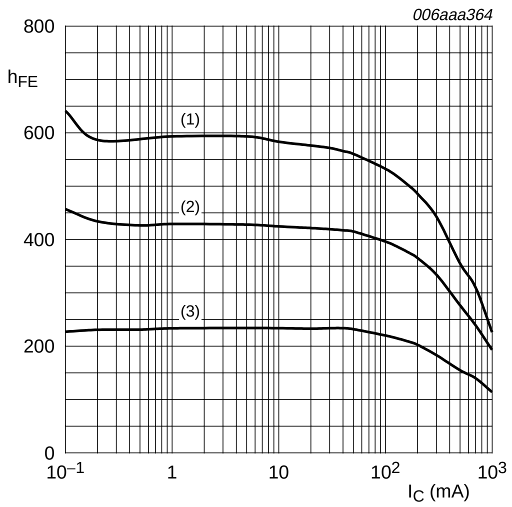
7. Characteristics

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} = 15 V; I_E = 0 A		-	-	100	nA
		V_{CB} = 15 V; I_E = 0 A; T_j = 150 °C		-	-	50	µA
I_{EBO}	emitter-base cut-off current	V_{EB} = 5 V; I_C = 0 A		-	-	100	nA
h_{FE}	DC current gain	V_{CE} = 2 V; I_C = 10 mA		200	-	-	
		V_{CE} = 2 V; I_C = 100 mA	[1]	150	-	-	
		V_{CE} = 2 V; I_C = 500 mA	[1]	90	-	-	
V_{CEsat}	collector-emitter saturation voltage	I_C = 10 mA; I_B = 0.5 mA		-	-	25	mV
		I_C = 200 mA; I_B = 10 mA		-	-	150	mV
		I_C = 500 mA; I_B = 50 mA	[1]	-	-	250	mV
R_{CEsat}	collector-emitter saturation resistance	I_C = 500 mA; I_B = 50 mA	[1]	-	300	500	mΩ
V_{BEsat}	base-emitter saturation voltage	I_C = 500 mA; I_B = 50 mA	[1]	-	-	1.1	V
V_{BEon}	base-emitter turn-on voltage	V_{CE} = 2 V; I_C = 100 mA	[1]	-	-	0.9	V
t_d	delay time	V_{CC} = 11 V; I_C = 250 mA; I_{Bon} = 12.5 mA; I_{Boff} = –12.5 mA		-	10	-	ns
t_r	rise time			-	15	-	ns
t_{on}	turn-on time			-	25	-	ns
t_s	storage time			-	215	-	ns
t_f	fall time			-	34	-	ns
t_{off}	turn-off time			-	249	-	ns
f_T	transition frequency	V_{CE} = 5 V; I_C = 100 mA; f = 100 MHz		250	420	-	MHz
C_c	collector capacitance	V_{CB} = 10 V; I_E = i_e = 0 A; f = 1 MHz		-	4.4	6	pF

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



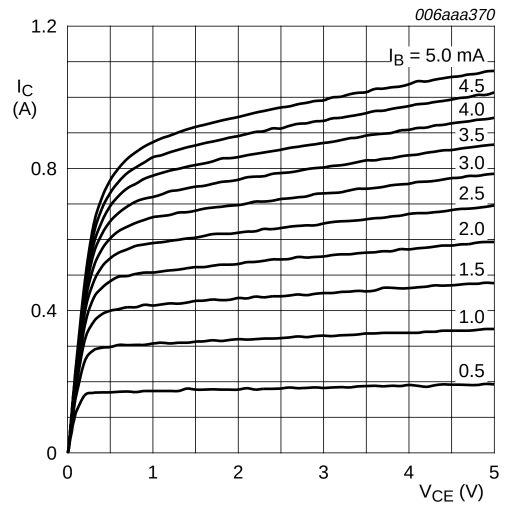
V_{CE} = 2 V

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

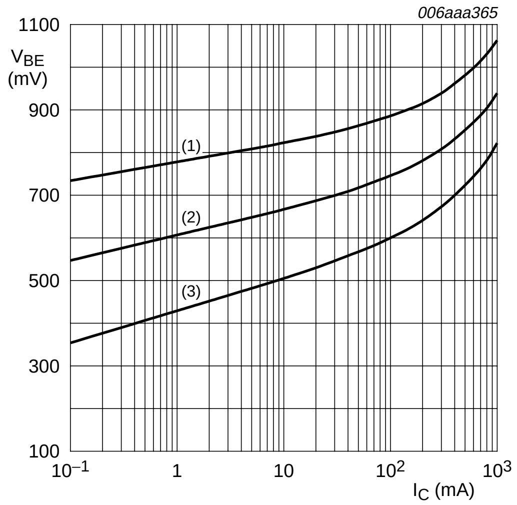
(3) T_{amb} = −55 °C

Fig 4. DC current gain as a function of collector current; typical values



T_{amb} = 25 °C

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



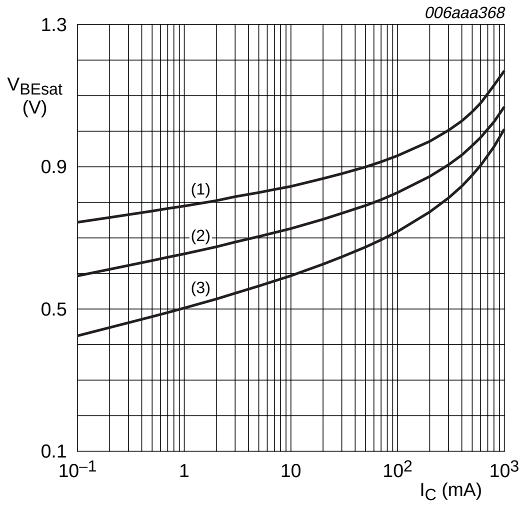
V_{CE} = 2 V

(1) T_{amb} = −55 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = 100 °C

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



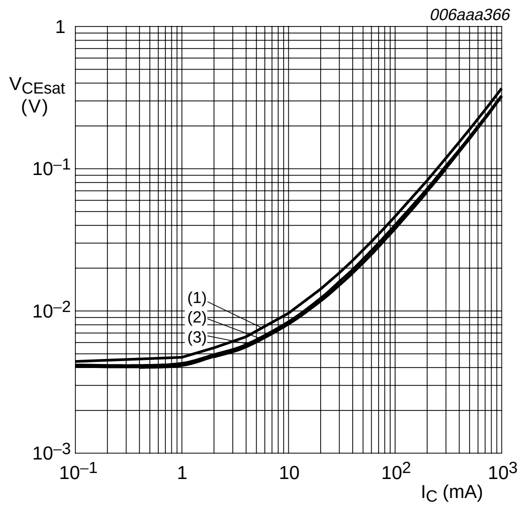
I_C/I_B = 20

(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



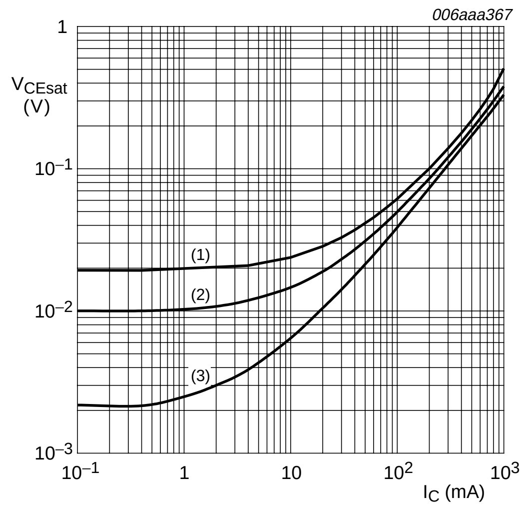
$I_C/I_B = 20$

(1) $T_{amb} = 100$ °C

(2) $T_{amb} = 25$ °C

(3) $T_{amb} = -55$ °C

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



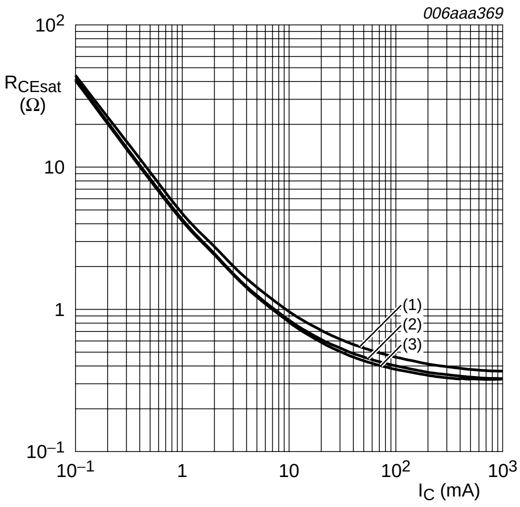
$T_{amb} = 25$ °C

(1) $I_C/I_B = 100$

(2) $I_C/I_B = 50$

(3) $I_C/I_B = 10$

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



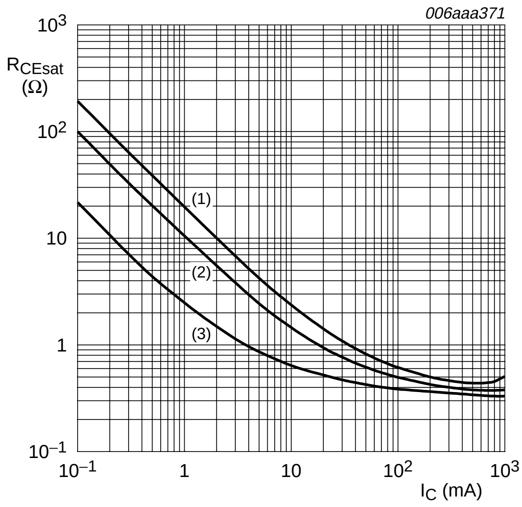
$I_C/I_B = 20$

(1) $T_{amb} = 100$ °C

(2) $T_{amb} = 25$ °C

(3) $T_{amb} = -55$ °C

Fig 10. Collector-emitter saturation resistance 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 11. Collector-emitter saturation resistance as a function of collector current; typical values

8. Test information

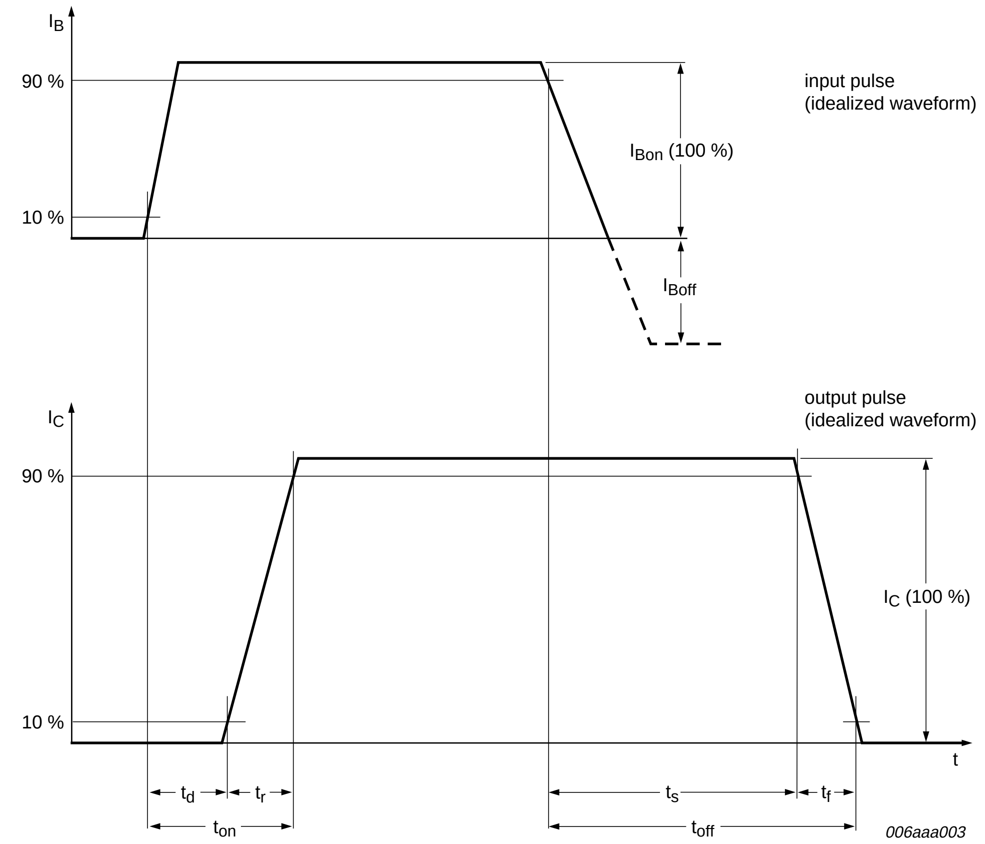
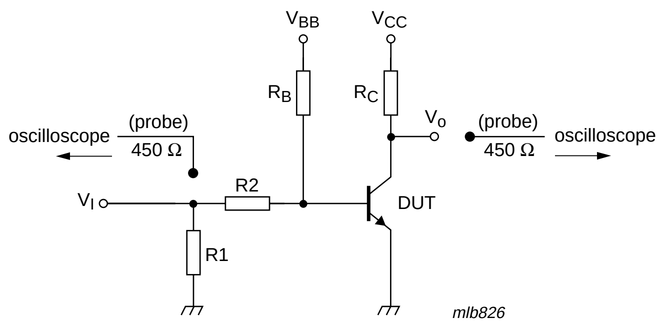


Fig 12. BISS transistor switching time definition



V_{CC} = 11 V; I_C = 250 mA; I_{Bon} = 12.5 mA; I_{Boff} = –12.5 mA

Fig 13. Test circuit for switching times

9. Package outline

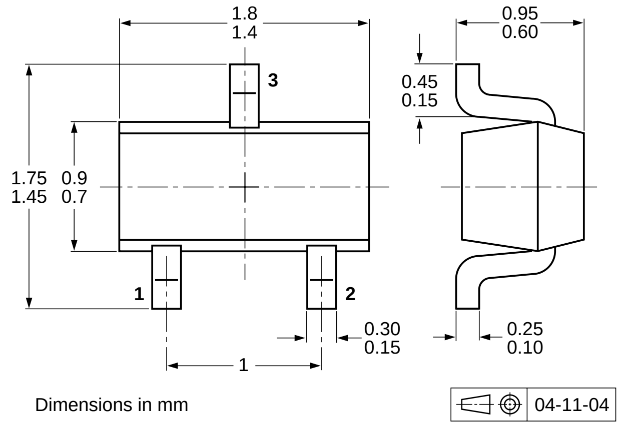


Fig 14. Package outline SOT416 (SC-75)

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	
			3000	10000
PBSS2515E	SOT416	4 mm pitch, 8 mm tape and reel	-115	-135

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

11. Soldering

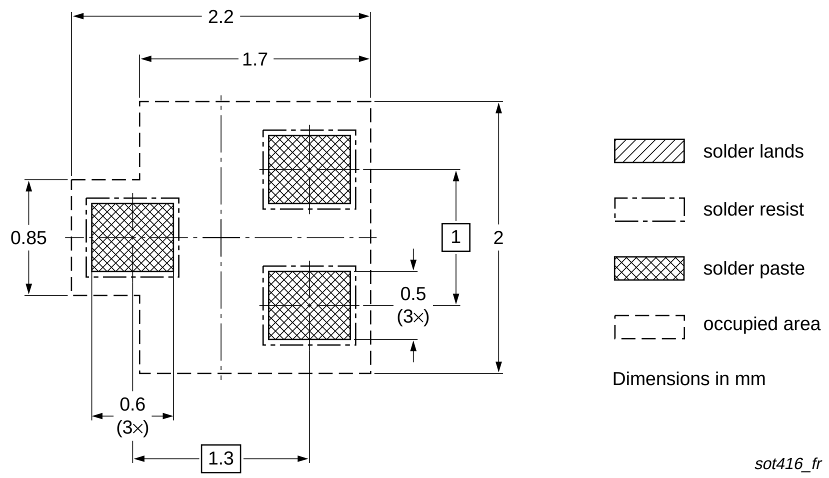


Fig 15. Reflow soldering footprint SOT416 (SC-75)

12. Revision history

Table 9. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PBSS2515E_2	20090421	Product data sheet	-	PBSS2515E_1
Modifications:	• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors. • Legal texts have been adapted to the new company name where appropriate. • Figure 2: added • Table 6 “Thermal characteristics”: enhanced • Table 7 “Characteristics”: switching times added • Figure 8 and 9: amended • Section 13 “Legal information”: updated			
PBSS2515E_1	20050418	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".

[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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15. Contents

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