PBSS4160V

60 V, 1 A NPN low VCEsat (BISS) transistor

28 December 2022 Product data sheet

1. General description

Low V_{CEsat}(BISS) NPN transistor in a SOT666 ultra small and flat lead Surface-Mounted Device (SMD) plastic package.

PNP complement: PBSS5160V

2. Features and benefits

- 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

3. Applications

- Major application segments:
  - 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)

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		[1]	-	-	1	A
I_{CM}	peak collector current	t = 1 ms or limited by $T_{j(max)}$		-	-	2	A
R_{CEsat}	collector-emitter saturation resistance	I_C = 1 A; I_B = 100 mA; T_{amb} = 25 °C		-	200	250	mΩ

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

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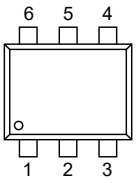
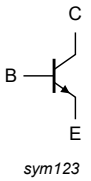
5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	C	collector	 SOT666	 sym123
2	C	collector		
3	B	base		
4	E	emitter		
5	C	collector		
6	C	collector		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PBSS4160V	SOT666	plastic, surface-mounted package; 6 leads; 0.5 mm pitch; 1.6 mm x 1.2 mm x 0.55 mm body	SOT666

7. Marking

Table 4. Marking codes

Type number	Marking code
PBSS4160V	41

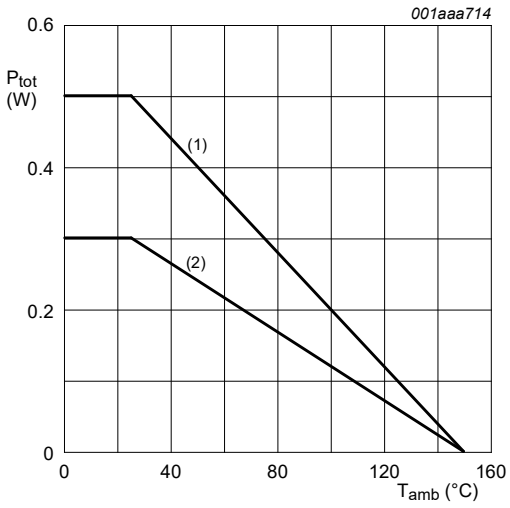
8. Limiting values

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		[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			-	300	mA
I_{BM}	peak base current	pulsed; $t_p \leq 300$ µs; $\delta \leq 0.02$		-	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, mounting pad for collector 1 cm^2.



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

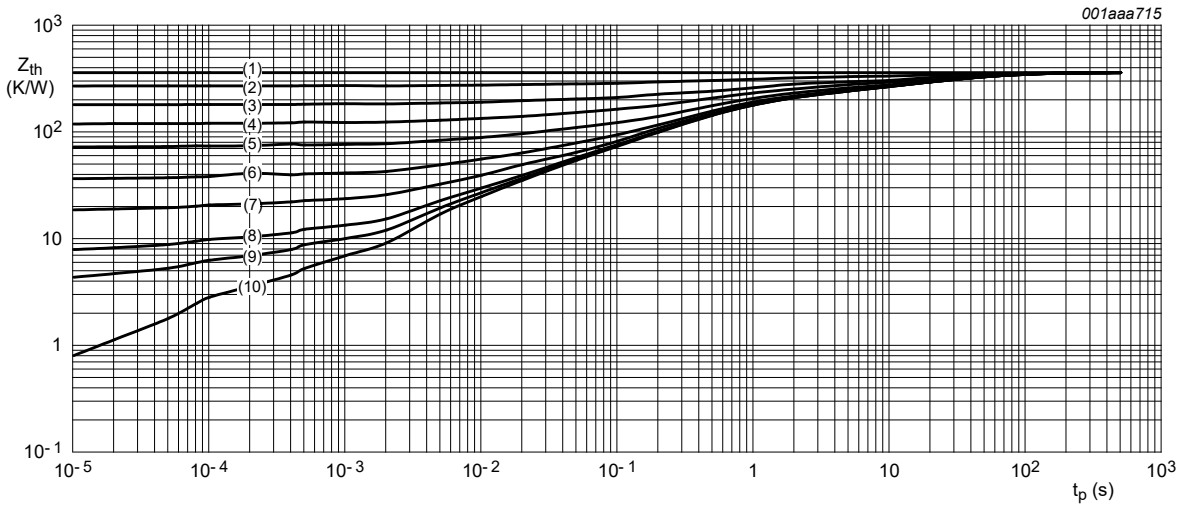
Fig. 1. Power derating curves

9. 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, mounting pad for collector 1 cm^2.



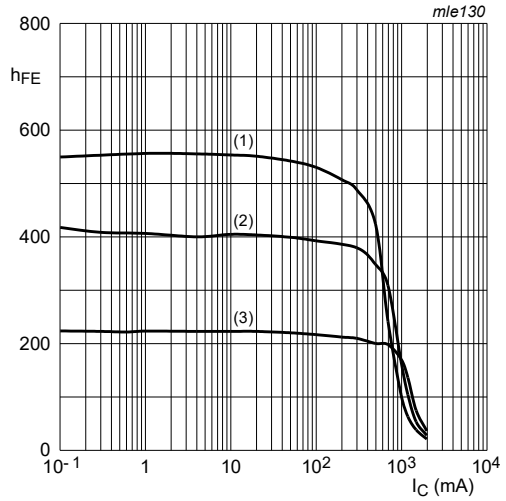
Mounted on FR4 PCB; standard footprint
(1) δ = 1
(2) δ = 0.75
(3) δ = 0.5
(4) δ = 0.33
(5) δ = 0.2
(6) δ = 0.1
(7) δ = 0.05
(8) δ = 0.02
(9) δ = 0.01
(10) δ = 0

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

10. Characteristics

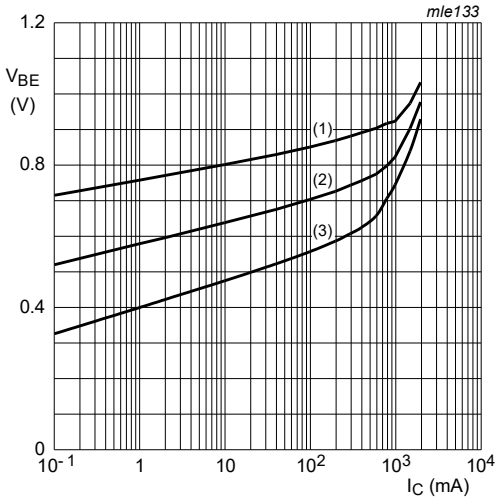
Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
I_{CBO}	collector-base cut-off current	V_{CB} = 60 V; I_E = 0 A; T_{amb} = 25 °C		-	-	100	nA
		V_{CB} = 60 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; T_{amb} = 25 °C		-	-	100	nA
I_{CES}	collector-emitter cut-off current	V_{CE} = 60 V; V_{BE} = 0 V; T_{amb} = 25 °C		-	-	100	nA
h_{FE}	DC current gain	V_{CE} = 5 V; I_C = 1 mA; T_{amb} = 25 °C		250	400	-	
		V_{CE} = 5 V; I_C = 500 mA; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.02; T_{amb} = 25 °C		200	350	-	
		V_{CE} = 5 V; I_C = 1 A; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.02; T_{amb} = 25 °C		100	150	-	
V_{CEsat}	collector-emitter saturation voltage	I_C = 100 mA; I_B = 1 mA; T_{amb} = 25 °C		-	90	110	mV
		I_C = 500 mA; I_B = 50 mA; T_{amb} = 25 °C		-	110	140	mV
		I_C = 1 A; I_B = 100 mA; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.02; T_{amb} = 25 °C		-	200	250	mV
R_{CEsat}	collector-emitter saturation resistance	I_C = 1 A; I_B = 100 mA; T_{amb} = 25 °C		-	200	250	mΩ
V_{BEsat}	base-emitter saturation voltage	I_C = 1 A; I_B = 50 mA; T_{amb} = 25 °C		-	0.95	1.1	V
V_{BEon}	base-emitter turn-on voltage	V_{CE} = 5 V; I_C = 1 A; T_{amb} = 25 °C		-	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; T_{amb} = 25 °C		-	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	V_{CE} = 10 V; I_C = 50 mA; f = 100 MHz; T_{amb} = 25 °C		150	220	-	MHz
C_c	collector capacitance	V_{CB} = 10 V; I_E = 0 A; i_e = 0 A; f = 1 MHz; T_{amb} = 25 °C		-	5.5	10	pF



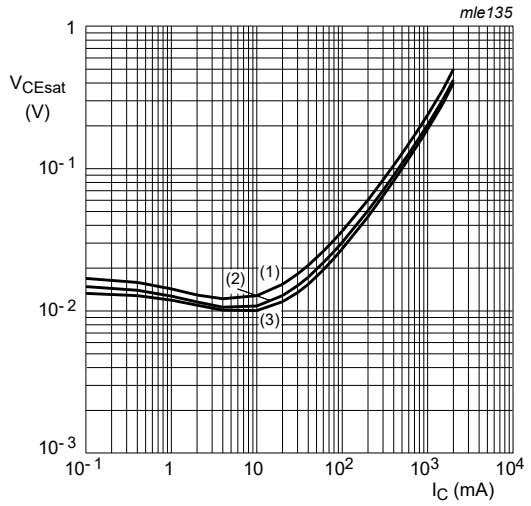
V_{CE} = 5 V
(1) T_{amb} = 100 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = −55 °C

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



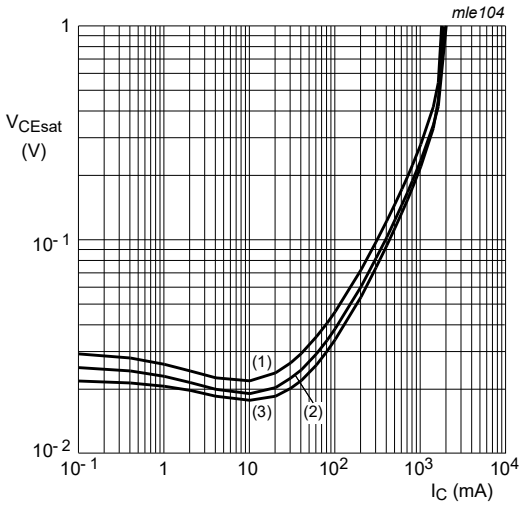
V_{CE} = 5 V
(1) T_{amb} = −55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 100 °C

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



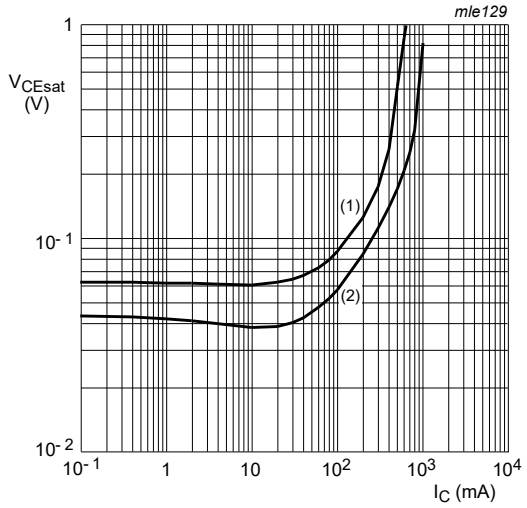
I_C/I_B = 10
(1) T_{amb} = 100 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = −55 °C

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



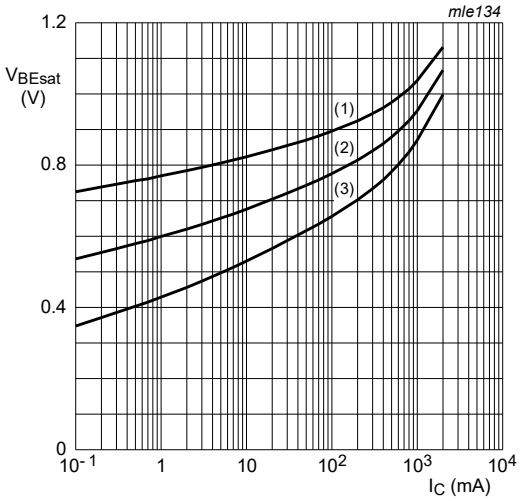
I_C/I_B = 20
(1) T_{amb} = 100 °C
(2) T_{amb}= 25 °C
(3) T_{amb} = −55 °C

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



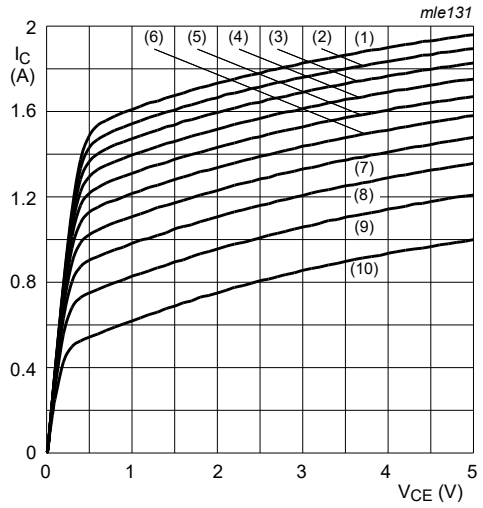
T_{amb} = 25 °C
(1) I_C/I_B = 100
(2) I_C/I_B = 50

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



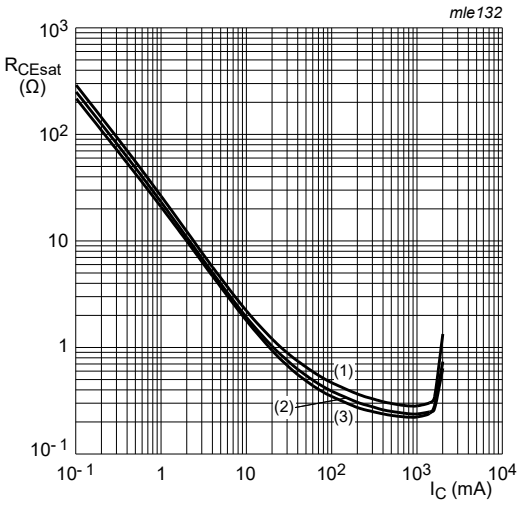
I_C/I_B = 20
(1) T_{amb} = −55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 100 °C

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

11. Test information

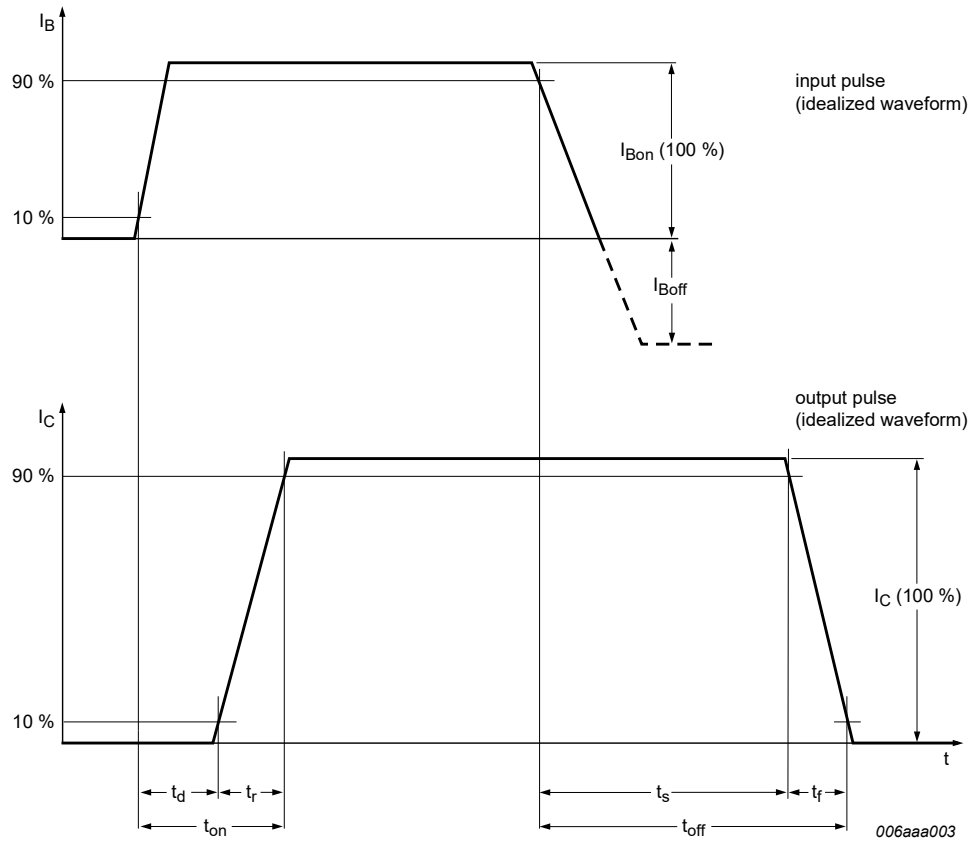


Fig. 11. Switching time definition

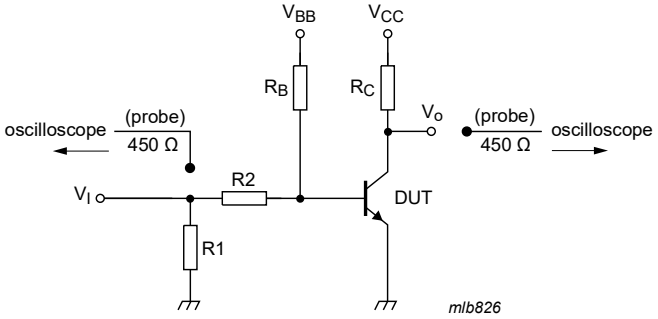


Fig. 12. Test circuit for switching times

12. Package outline

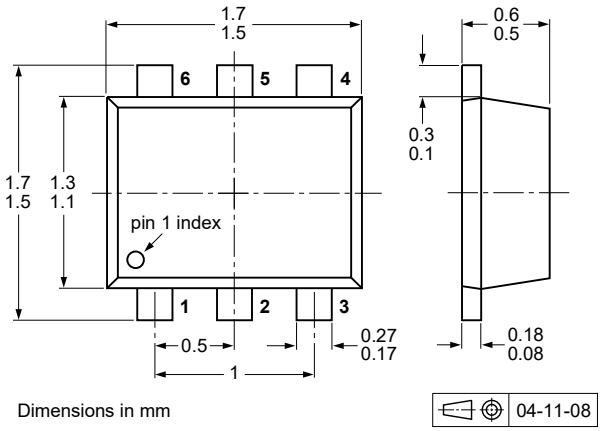


Fig. 13. Package outline SOT666

13. Soldering

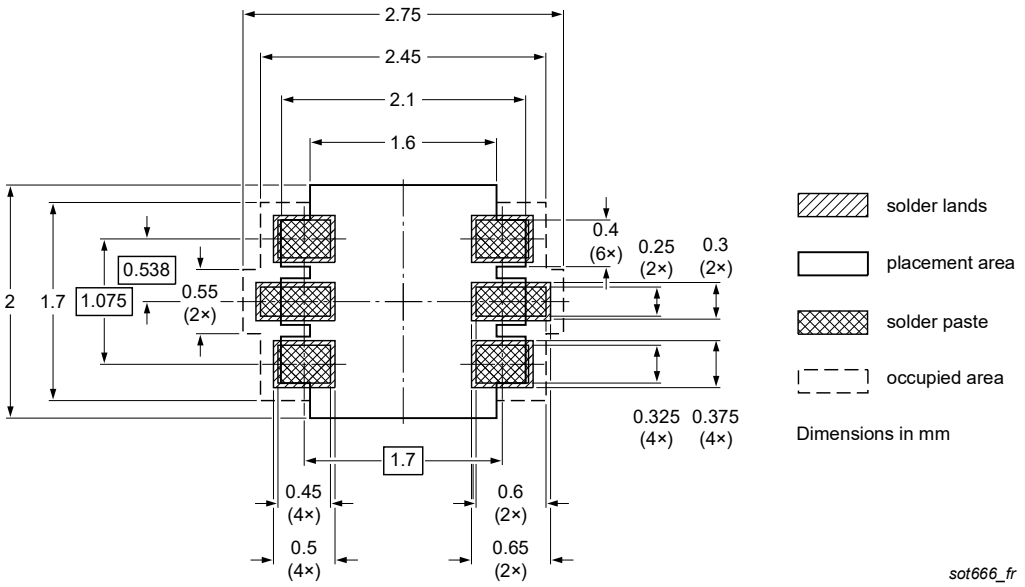


Fig. 14. Reflow soldering footprint for SOT666

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PBSS4160V v.4	20221228	Product data sheet	-	PBSS4160V_3
Modifications:	• The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia. • Legal texts have been adapted to the new company name where appropriate. • Packing information removed. • Product(s) changed to non-automotive qualification.			
PBSS4160V_3	20091211	Product data sheet	-	PBSS4160V_2
PBSS4160V_2	20050131	Product data sheet	-	PBSS4160V_1
PBSS4160V_1	20040423	Objective data sheet	-	-

15. Legal information

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 https://www.nexperia.com.

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Contents

1. General description....1
2. Features and benefits....1
3. Applications....1
4. Quick reference data....1
5. Pinning information....2
6. Ordering information....2
7. Marking....2
8. Limiting values....3
9. Thermal characteristics....4
10. Characteristics....5
11. Test information....8
12. Package outline....9
13. Soldering....9
14. Revision history....10
15. Legal information....11

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