



# PBSS5320T-Q

20 V, 3 A PNP low V<sub>CEsat</sub> transistor

21 June 2022

Product data sheet

## 1. General description

PNP low V<sub>CEsat</sub> transistor in a small SOT23 (TO-236AB) Surface-Mounted Device (SMD) plastic package.

NPN complement: PBSS4320T

## 2. Features and benefits

- Low collector-emitter saturation voltage V<sub>CEsat</sub> and corresponding low R<sub>CEsat</sub>
- High collector current capability
- High collector current gain
- Improved efficiency due to reduced heat generation
- Qualified according to AEC-Q101 and recommended for use in automotive applications

## 3. Applications

- Power management applications
- Low and medium power DC/DC convertors
- Supply line switching
- Battery chargers
- Linear voltage regulation with low voltage drop-out (LDO).

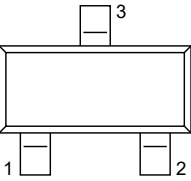
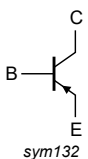
## 4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>CEO</sub>	collector-emitter voltage	open base	-	-	-20	V
I <sub>C</sub>	collector current		-	-	-2	A
I <sub>CRM</sub>	repetitive peak collector current	$\delta \leq 0.25$ ; Operated under pulsed conditions; $t_p \leq 100$ ms	-	-	-3	A
R <sub>CEsat</sub>	collector-emitter saturation resistance	I <sub>C</sub> = -2 A; I <sub>B</sub> = -200 mA; pulsed; $t_p \leq 300$ $\mu$ s; $\delta \leq 0.02$ ; T <sub>amb</sub> = 25 °C	-	75	105	m $\Omega$

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	B	base	 <p style="text-align: center;">SOT23</p>	
2	E	emitter		
3	C	collector		

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
<a href="#">PBSS5320T-Q</a>	SOT23	plastic, surface-mounted package; 3 terminals; 1.9 mm pitch; 2.9 mm x 1.3 mm x 1 mm body	<a href="#">SOT23</a>

## 7. Marking

Table 4. Marking codes

Type number	Marking code[1]
PBSS5320T-Q	ZH%

[1] % = placeholder for manufacturing site code

## 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	-	-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	
$I_{CRM}$	repetitive peak collector current	$\delta \leq 0.25$ ; Operated under pulsed conditions; $t_p \leq 100$ ms	-	-3	A	
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1$ ms	-	-5	A	
$I_B$	base current		-	-0.5	A	
$P_{tot}$	total power dissipation	$T_{amb} \leq 25$ °C	[1]	-	300	mW
			[2]	-	480	mW
			[3]	-	540	mW
			[1] [4]	-	1.2	W
$T_j$	junction temperature		-	150	°C	
$T_{amb}$	ambient temperature		-65	150	°C	

Symbol	Parameter	Conditions	Min	Max	Unit
T <sub>stg</sub>	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<sup>2</sup>.  
 [3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm<sup>2</sup>.  
 [4] Operated under pulsed conditions: pulse width t<sub>p</sub> ≤ 100 ms; duty cycle δ ≤ 0.25.

## 9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
R <sub>th(j-a)</sub>	thermal resistance from junction to ambient	in free air	[1]	-	-	417	K/W
			[2]	-	-	260	K/W
			[3]	-	-	230	K/W
			[1] [4]	-	-	104	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<sup>2</sup>.  
 [3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm<sup>2</sup>.  
 [4] Operated under pulsed conditions: pulse width t<sub>p</sub> ≤ 100 ms; duty cycle δ ≤ 0.25.

## 10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I <sub>CBO</sub>	collector-base cut-off current	V <sub>CB</sub> = -20 V; I <sub>E</sub> = 0 A; T <sub>amb</sub> = 25 °C	-	-	-100	nA
		V <sub>CB</sub> = -20 V; I <sub>E</sub> = 0 A; T <sub>j</sub> = 150 °C	-	-	-50	μA
I <sub>EBO</sub>	emitter-base cut-off current	V <sub>EB</sub> = -5 V; I <sub>C</sub> = 0 A; T <sub>amb</sub> = 25 °C	-	-	-100	nA
h <sub>FE</sub>	DC current gain	V <sub>CE</sub> = -2 V; I <sub>C</sub> = -100 mA; T <sub>amb</sub> = 25 °C	220	-	-	
		V <sub>CE</sub> = -2 V; I <sub>C</sub> = -500 mA; T <sub>amb</sub> = 25 °C	220	-	-	
		V <sub>CE</sub> = -2 V; I <sub>C</sub> = -1 A; pulsed; t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02; T <sub>amb</sub> = 25 °C	200	-	-	
		V <sub>CE</sub> = -2 V; I <sub>C</sub> = -2 A; pulsed; t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02; T <sub>amb</sub> = 25 °C	150	-	-	
		V <sub>CE</sub> = -2 V; I <sub>C</sub> = -3 A; pulsed; t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02; T <sub>amb</sub> = 25 °C	100	-	-	
V <sub>CEsat</sub>	collector-emitter saturation voltage	I <sub>C</sub> = -500 mA; I <sub>B</sub> = -50 mA; T <sub>amb</sub> = 25 °C	-	-	-70	mV
		I <sub>C</sub> = -1 A; I <sub>B</sub> = -50 mA; T <sub>amb</sub> = 25 °C	-	-	-130	mV
		I <sub>C</sub> = -2 A; I <sub>B</sub> = -100 mA; pulsed; t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02; T <sub>amb</sub> = 25 °C	-	-	-230	mV
		I <sub>C</sub> = -2 A; I <sub>B</sub> = -200 mA; pulsed; t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02; T <sub>amb</sub> = 25 °C	-	-	-210	mV
		I <sub>C</sub> = -3 A; I <sub>B</sub> = -300 mA; pulsed; t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02; T <sub>amb</sub> = 25 °C	-	-	-300	mV
R <sub>CEsat</sub>	collector-emitter saturation resistance	I <sub>C</sub> = -2 A; I <sub>B</sub> = -200 mA; pulsed; t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02; T <sub>amb</sub> = 25 °C	-	75	105	mΩ
V <sub>BEsat</sub>	base-emitter saturation voltage	I <sub>C</sub> = -2 A; I <sub>B</sub> = -100 mA; pulsed; t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02; T <sub>amb</sub> = 25 °C	-	-	-1.1	V
		I <sub>C</sub> = -3 A; I <sub>B</sub> = -300 mA; pulsed; t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02; T <sub>amb</sub> = 25 °C	-	-	-1.2	V

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{BEon}$	base-emitter turn-on voltage	$V_{CE} = -2\text{ V}$ ; $I_C = -1\text{ A}$ ; pulsed; $t_p \leq 300\ \mu\text{s}$ ; $\delta \leq 0.02$ ; $T_{amb} = 25\text{ }^\circ\text{C}$	-1.2	-	-	V
$f_T$	transition frequency	$V_{CE} = -5\text{ V}$ ; $I_C = -100\text{ mA}$ ; $f = 100\text{ MHz}$ ; $T_{amb} = 25\text{ }^\circ\text{C}$	100	-	-	MHz
$C_c$	collector capacitance	$V_{CB} = -10\text{ V}$ ; $I_E = 0\text{ A}$ ; $i_e = 0\text{ A}$ ; $f = 1\text{ MHz}$ ; $T_{amb} = 25\text{ }^\circ\text{C}$	-	-	50	pF

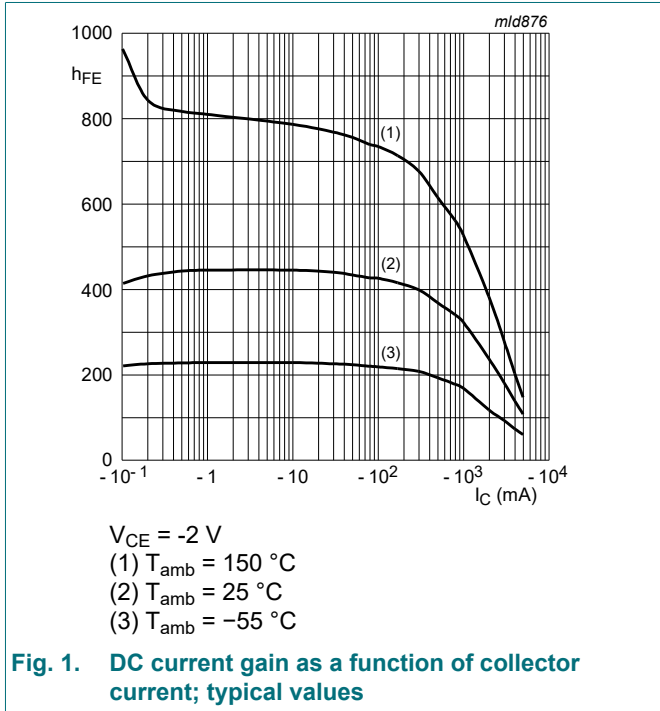


Fig. 1. DC current gain as a function of collector current; typical values

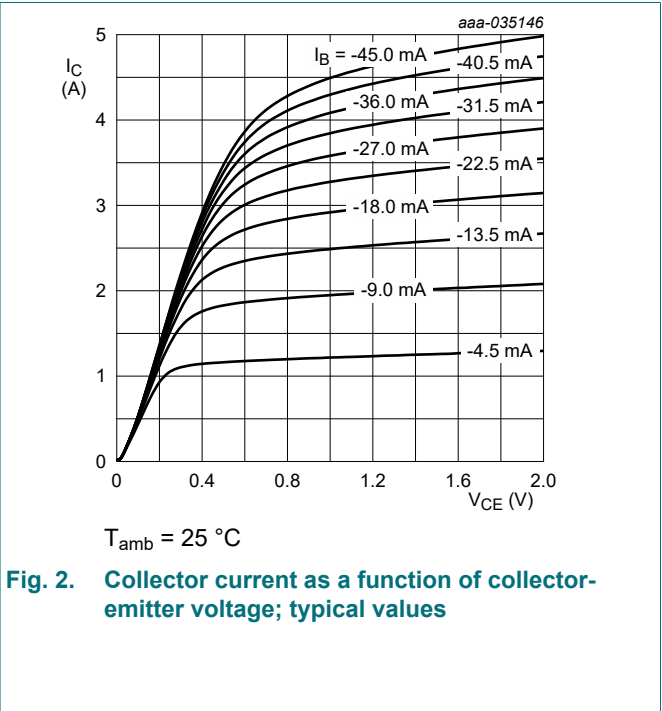


Fig. 2. Collector current as a function of collector-emitter voltage; typical values

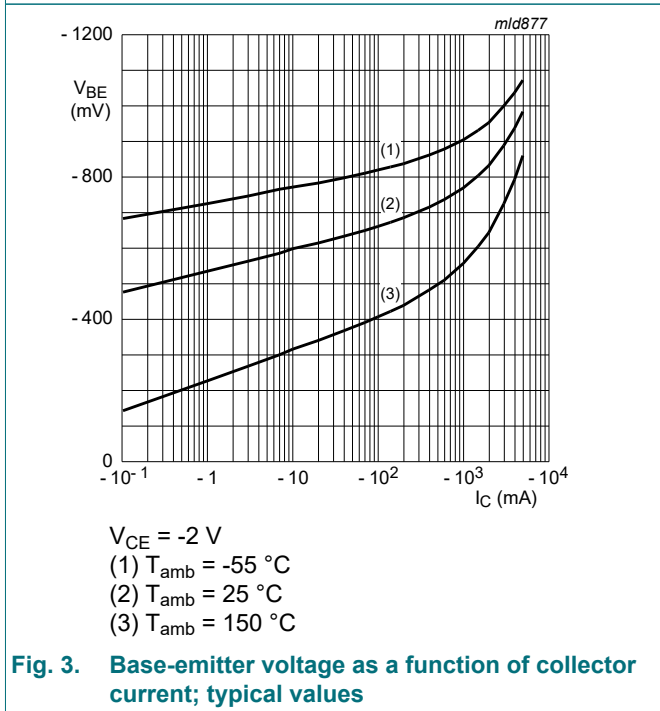


Fig. 3. Base-emitter voltage as a function of collector current; typical values

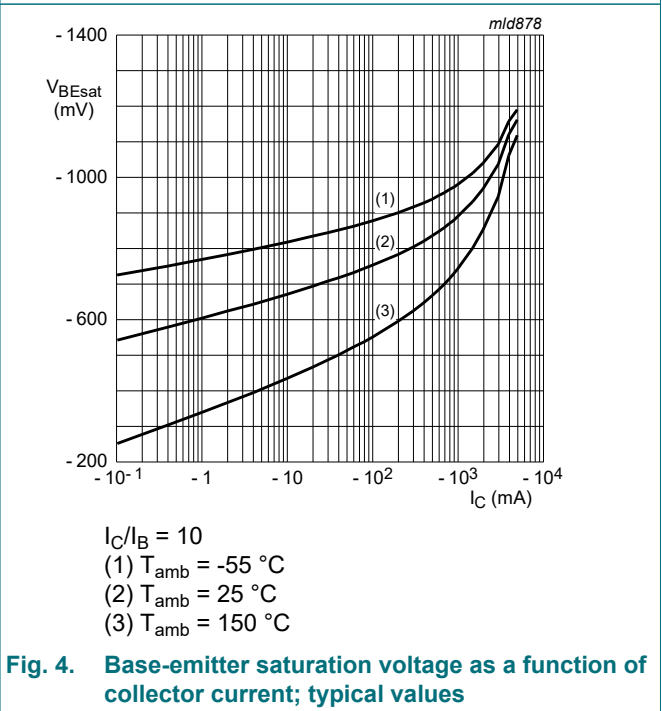
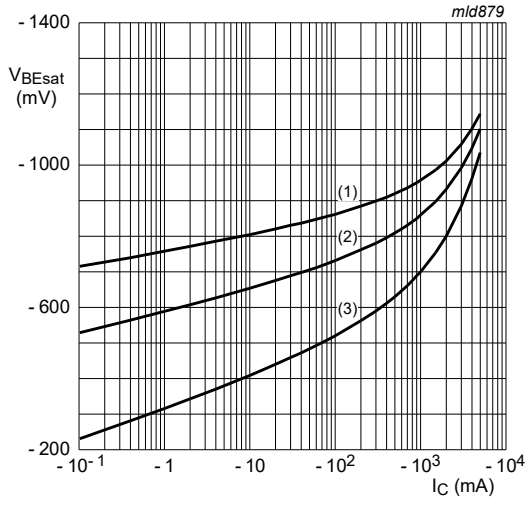
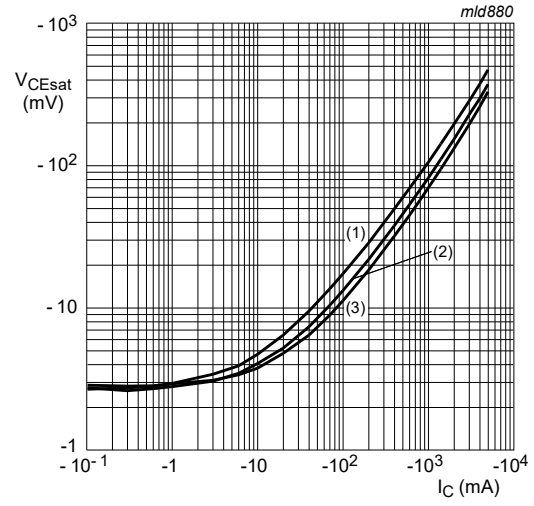


Fig. 4. Base-emitter saturation voltage as a function of collector current; typical values



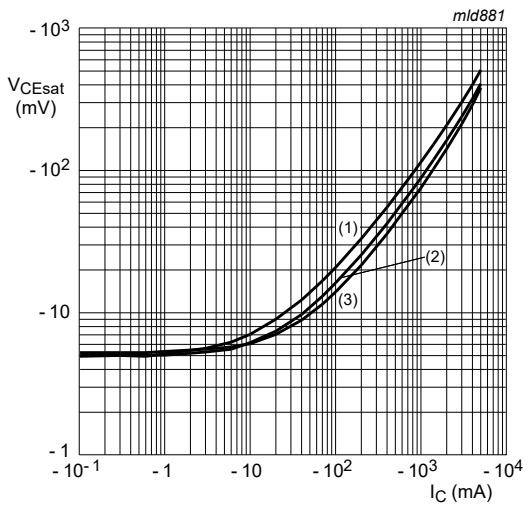
$I_C/I_B = 20$   
 (1)  $T_{amb} = -55\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = 150\text{ °C}$

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



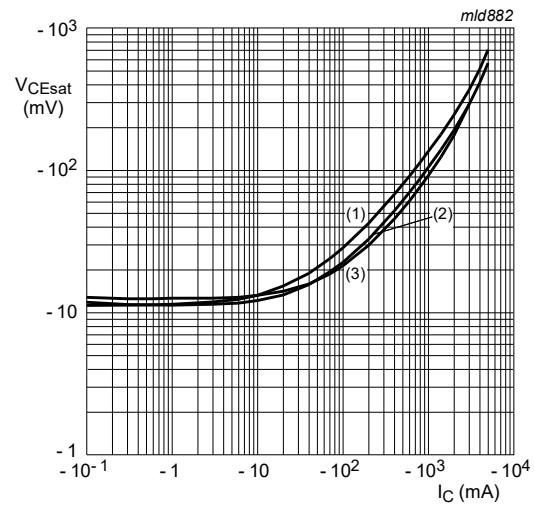
$I_C/I_B = 10$   
 (1)  $T_{amb} = 150\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -55\text{ °C}$

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



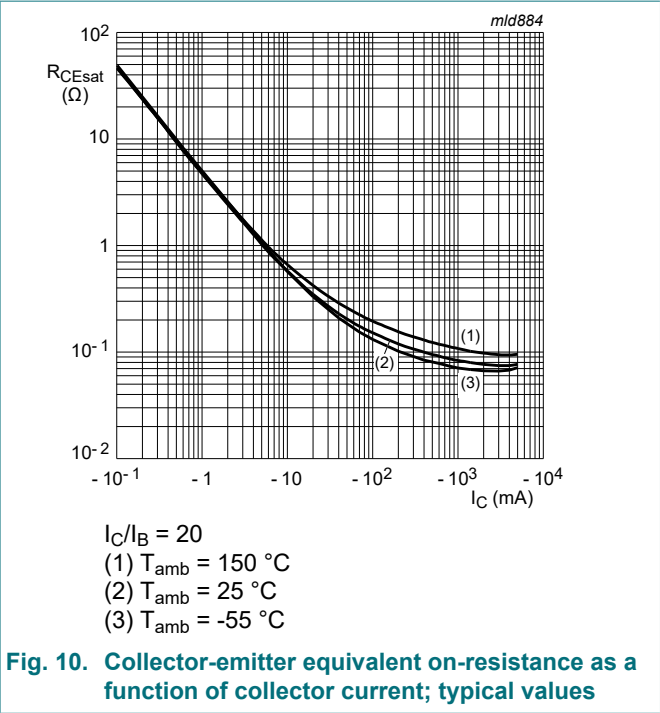
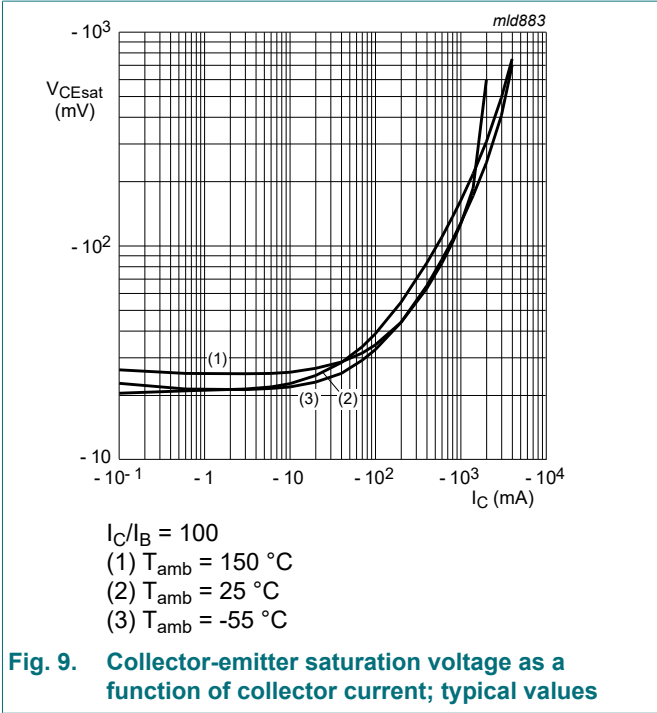
$I_C/I_B = 20$   
 (1)  $T_{amb} = 150\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -55\text{ °C}$

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



$I_C/I_B = 50$   
 (1)  $T_{amb} = 150\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -55\text{ °C}$

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

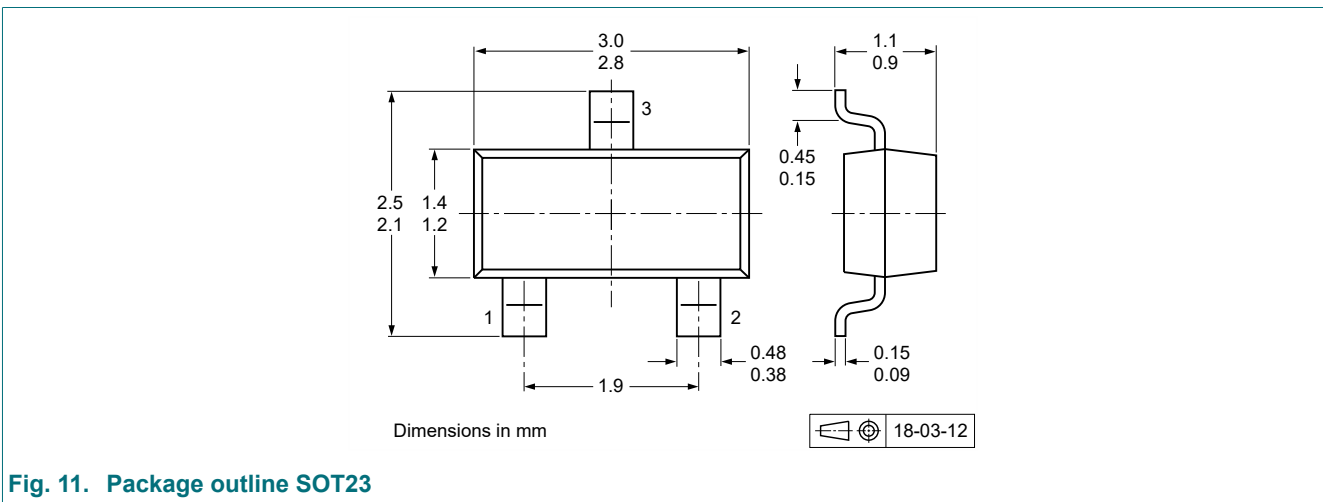


## 11. Test information

### Quality information

This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard Q101 - *Stress test qualification for discrete semiconductors*, and is suitable for use in automotive applications.

## 12. Package outline



### 13. Soldering

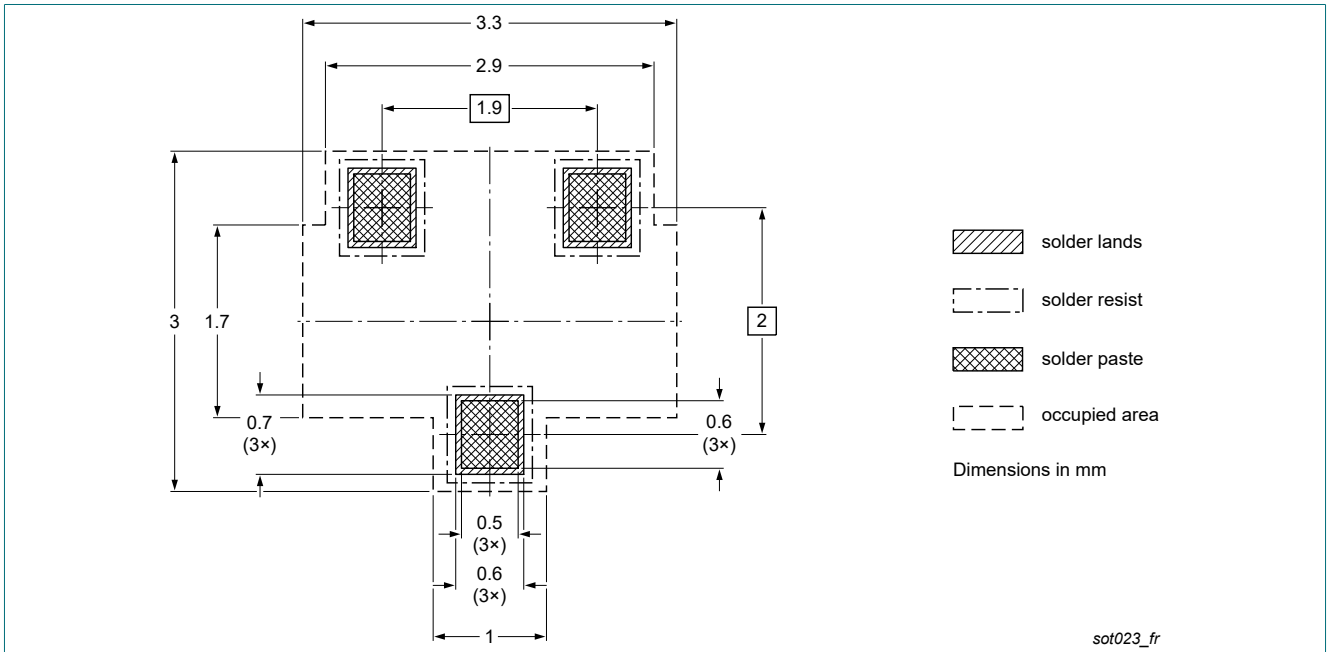


Fig. 12. Reflow soldering footprint for SOT23

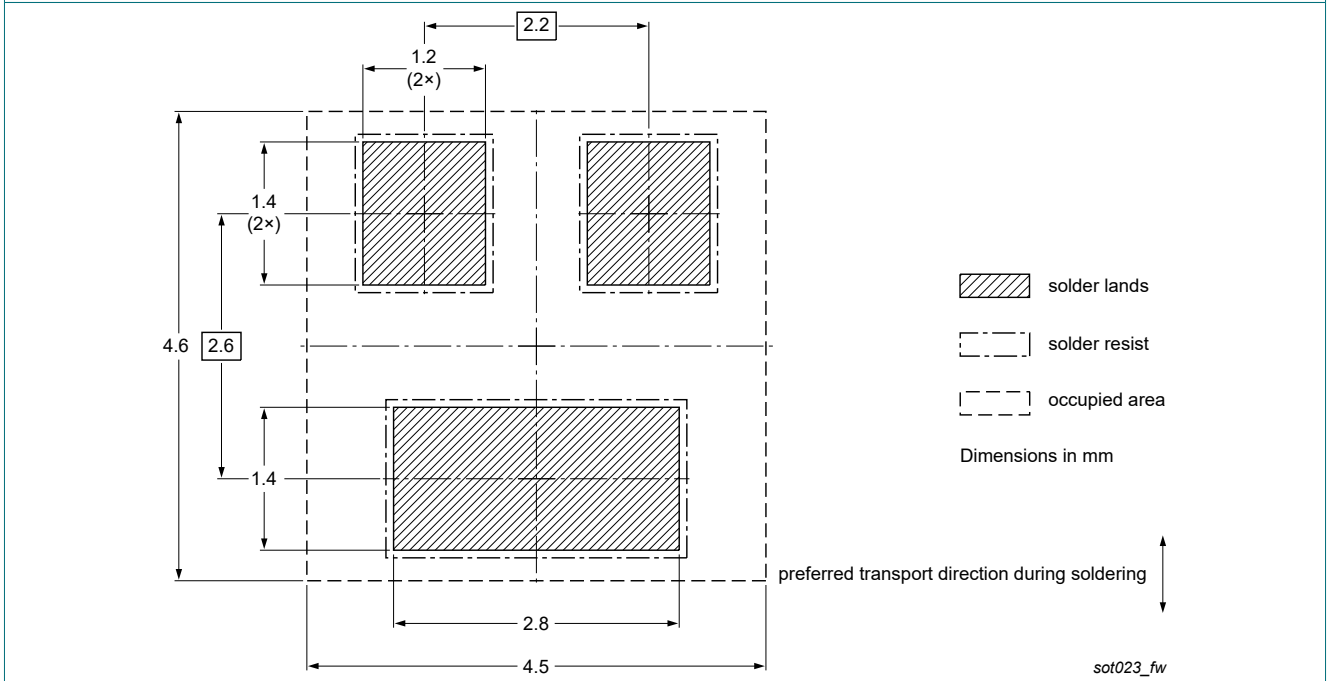


Fig. 13. Wave soldering footprint for SOT23

## 14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PBSS5320T-Q v.2	20220621	Product data sheet	-	PBSS5320T-Q v.1
Modifications:	• Characteristics: Figure 2 added			
PBSS5320T-Q v.1	20220505	Product 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".
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