



# PBSS4140T-Q

40 V, 1 A NPN low V<sub>CEsat</sub> (BISS) transistor

15 December 2021

Product data sheet

## 1. General description

NPN low V<sub>CEsat</sub> transistor in a small SOT23 plastic package. PNP complement: PBSS5140T-Q.

## 2. Features and benefits

- Low collector-emitter saturation voltage
- High current capabilities
- Improved device reliability due to reduced heat generation
- Qualified according to AEC-Q101 and recommended for use in automotive applications

## 3. Applications

- General purpose switching and muting
- LCD backlighting
- Supply line switching circuits
- Battery driven equipment (mobile phones, video cameras and hand-held devices).

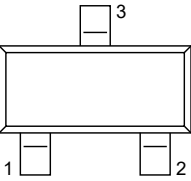
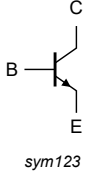
## 4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>CEO</sub>	collector-emitter voltage	open base	-	-	40	V
I <sub>CM</sub>	peak collector current	single pulse; t <sub>p</sub> ≤ 1 ms	-	-	2	A
R <sub>CEsat</sub>	collector-emitter saturation resistance	I <sub>C</sub> = 500 mA; I <sub>B</sub> = 50 mA; pulsed; t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02; T <sub>amb</sub> = 25 °C	-	260	500	mΩ

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	B	base	 <p style="text-align: center;">SOT23</p>	 <p style="text-align: center;">sym123</p>
2	E	emitter		
3	C	collector		

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PBSS4140T-Q	SOT23	plastic, surface-mounted package; 3 terminals; 1.9 mm pitch; 2.9 mm x 1.3 mm x 1 mm body	SOT23

## 7. Marking

Table 4. Marking codes

Type number	Marking code <sup>[1]</sup>
PBSS4140T-Q	ZT%

[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		-	40	V
$V_{CEO}$	collector-emitter voltage	open base		-	40	V
$V_{EBO}$	emitter-base voltage	open collector		-	5	V
$I_C$	collector current			-	1	A
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1$ ms		-	2	A
$I_{BM}$	peak base current			-	1	mA
$P_{tot}$	total power dissipation	$T_{amb} \leq 25$ °C	[1]	-	300	mW
			[2]	-	450	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, 35  $\mu$ m copper, tin-plated and standard footprint.

[2] Device mounted on an FR4 PCB, single-sided, 35  $\mu$ m copper, tin-plated, mounting pad for collector 1 cm<sup>2</sup>.

## 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]	-	-	417	K/W
			[2]	-	-	278	K/W

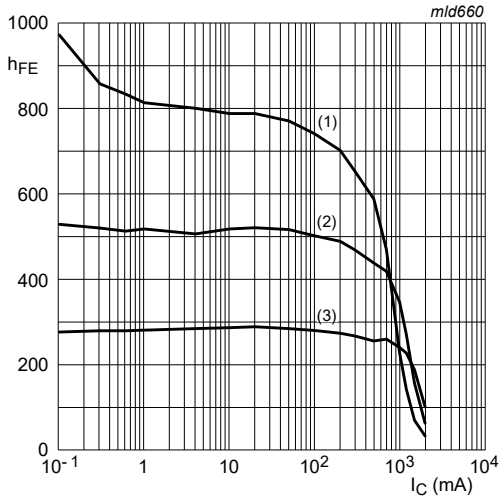
[1] Device mounted on an FR4 PCB, single-sided, 35  $\mu$ m copper, tin-plated and standard footprint.

[2] Device mounted on an FR4 PCB, single-sided, 35  $\mu$ m copper, tin-plated, mounting pad for collector 1 cm<sup>2</sup>.

## 10. Characteristics

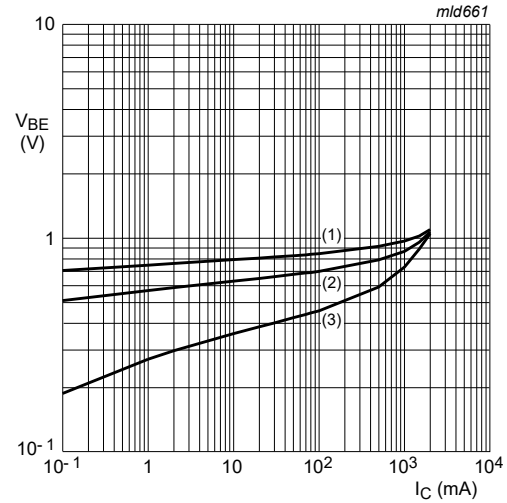
Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)CBO}$	collector-base breakdown voltage	$I_C = 100 \mu\text{A}; I_E = 0 \text{ A}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	40	-	-	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	$I_C = 2 \text{ mA}; I_B = 0 \text{ A}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	40	-	-	V
$V_{(BR)EBO}$	emitter-base breakdown voltage (collector open)	$I_E = 100 \mu\text{A}; I_C = 0 \text{ A}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	5	-	-	V
$I_{CBO}$	collector-base cut-off current	$V_{CB} = 40 \text{ V}; I_E = 0 \text{ A}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	100	nA
		$V_{CB} = 40 \text{ V}; I_E = 0 \text{ A}; T_{\text{amb}} = 150 \text{ }^\circ\text{C}$	-	-	50	$\mu\text{A}$
$I_{CES}$	collector-emitter cut-off current	$V_{CE} = 30 \text{ V}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	100	nA
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = 5 \text{ V}; I_C = 0 \text{ A}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	100	nA
$h_{FE}$	DC current gain	$V_{CE} = 5 \text{ V}; I_C = 1 \text{ mA}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	300	-	-	
		$V_{CE} = 5 \text{ V}; I_C = 500 \text{ mA}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	300	-	900	
		$V_{CE} = 5 \text{ V}; I_C = 1 \text{ A}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	200	-	-	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = 100 \text{ mA}; I_B = 1 \text{ mA}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	200	mV
		$I_C = 500 \text{ mA}; I_B = 50 \text{ mA}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	250	mV
		$I_C = 1 \text{ A}; I_B = 100 \text{ mA}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	500	mV
$R_{CEsat}$	collector-emitter saturation resistance	$I_C = 500 \text{ mA}; I_B = 50 \text{ mA}; \text{pulsed}; t_p \leq 300 \mu\text{s}; \delta \leq 0.02; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	260	500	m $\Omega$
$V_{BEsat}$	base-emitter saturation voltage	$I_C = 1 \text{ A}; I_B = 100 \text{ mA}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	1.2	V
$V_{BEon}$	base-emitter turn-on voltage	$V_{CE} = 5 \text{ V}; I_C = 1 \text{ A}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	1.1	V
$f_T$	transition frequency	$V_{CE} = 10 \text{ V}; I_C = 50 \text{ mA}; f = 100 \text{ MHz}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	150	-	-	MHz
$C_c$	collector capacitance	$V_{CB} = 10 \text{ V}; I_E = 0 \text{ A}; i_e = 0 \text{ A}; f = 1 \text{ MHz}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	10	pF



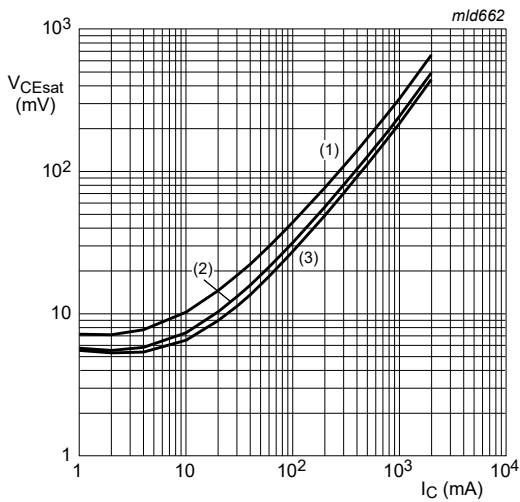
$V_{CE} = 5\text{ V}$   
 (1)  $T_{amb} = 150\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -55\text{ °C}$

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



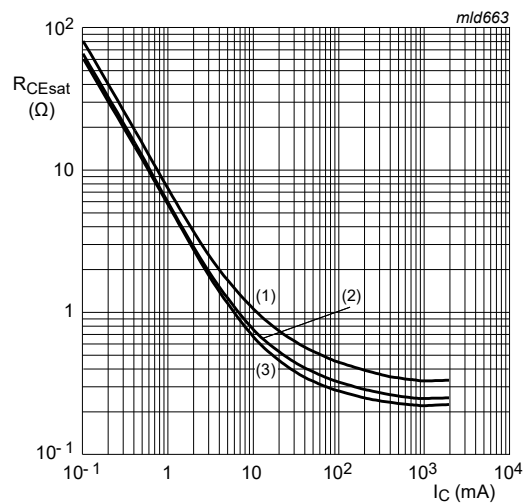
$V_{CE} = 5\text{ V}$   
 (1)  $T_{amb} = -55\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = 150\text{ °C}$

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



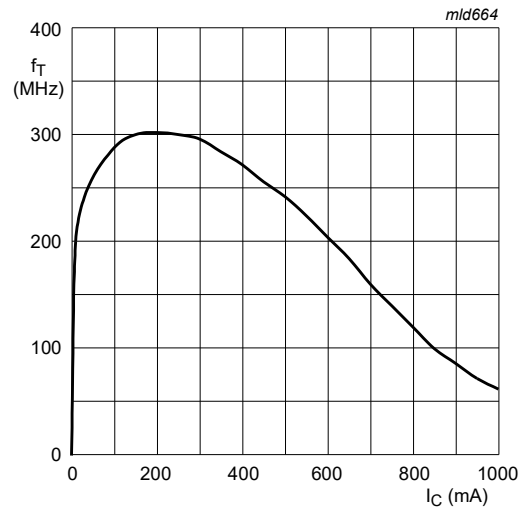
$I_C/I_B = 10$   
 (1)  $T_{amb} = 150\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -55\text{ °C}$

**Fig. 3. Collector-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. 4. Equivalent on-resistance as a function of collector current; typical values**



$V_{CE} = 10 \text{ V}$

Fig. 5. Transition frequency as a function of collector current

## 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

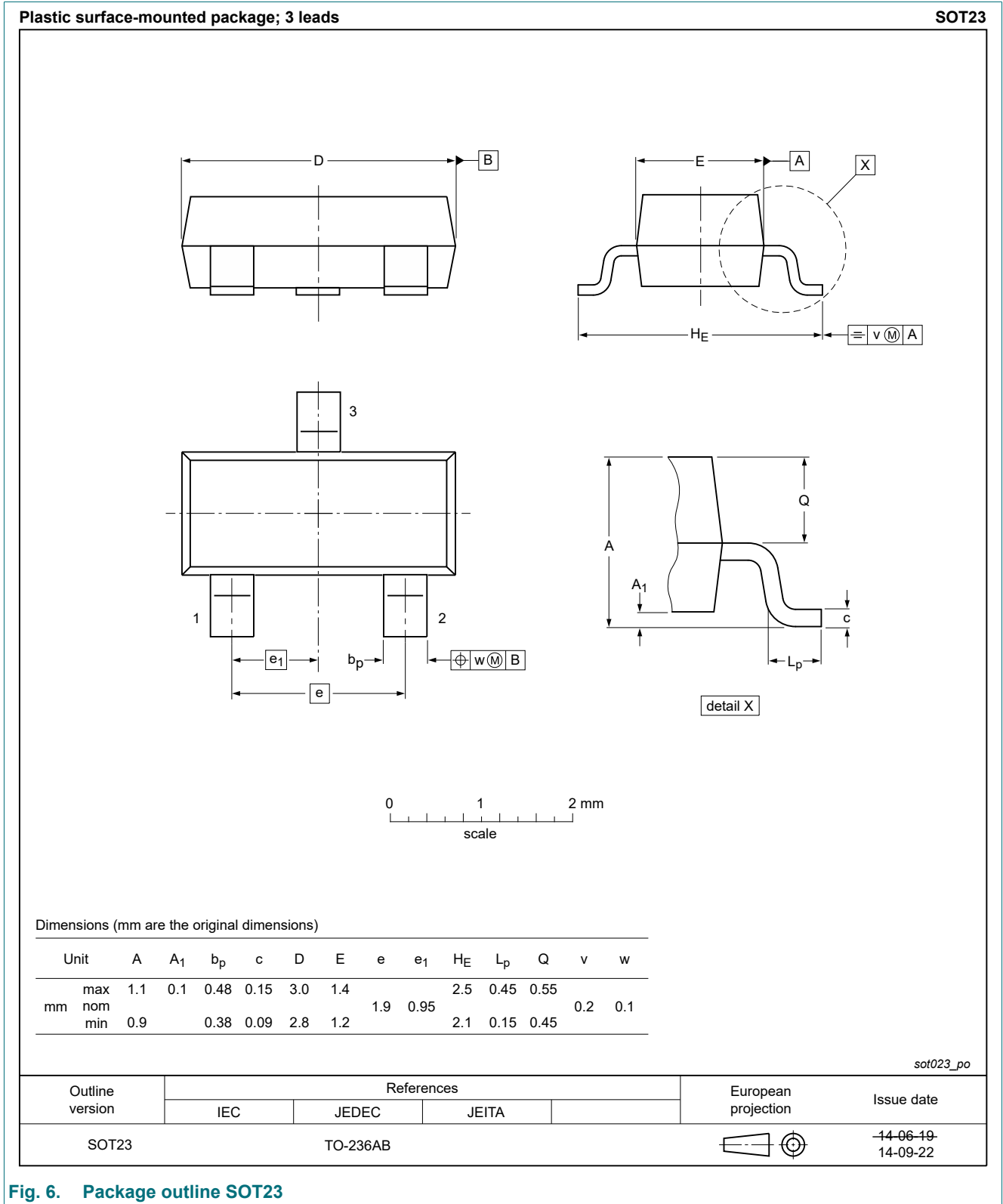


Fig. 6. Package outline SOT23

### 13. Soldering

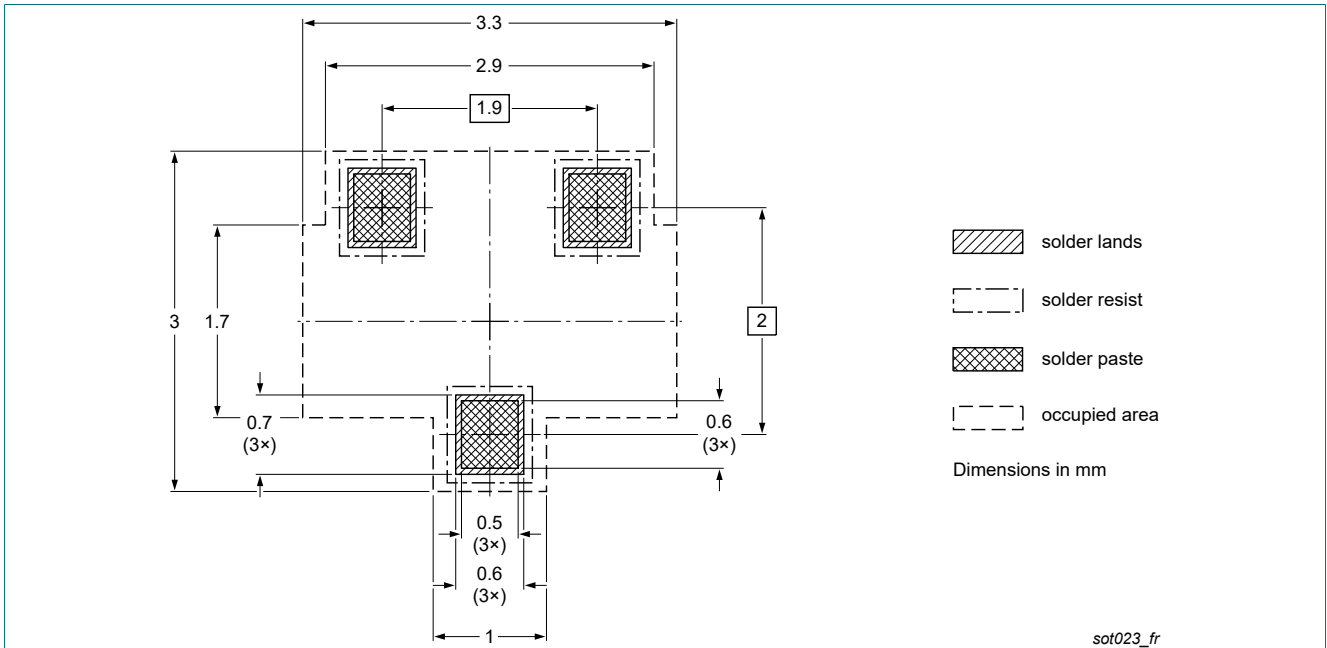


Fig. 7. Reflow soldering footprint for SOT23

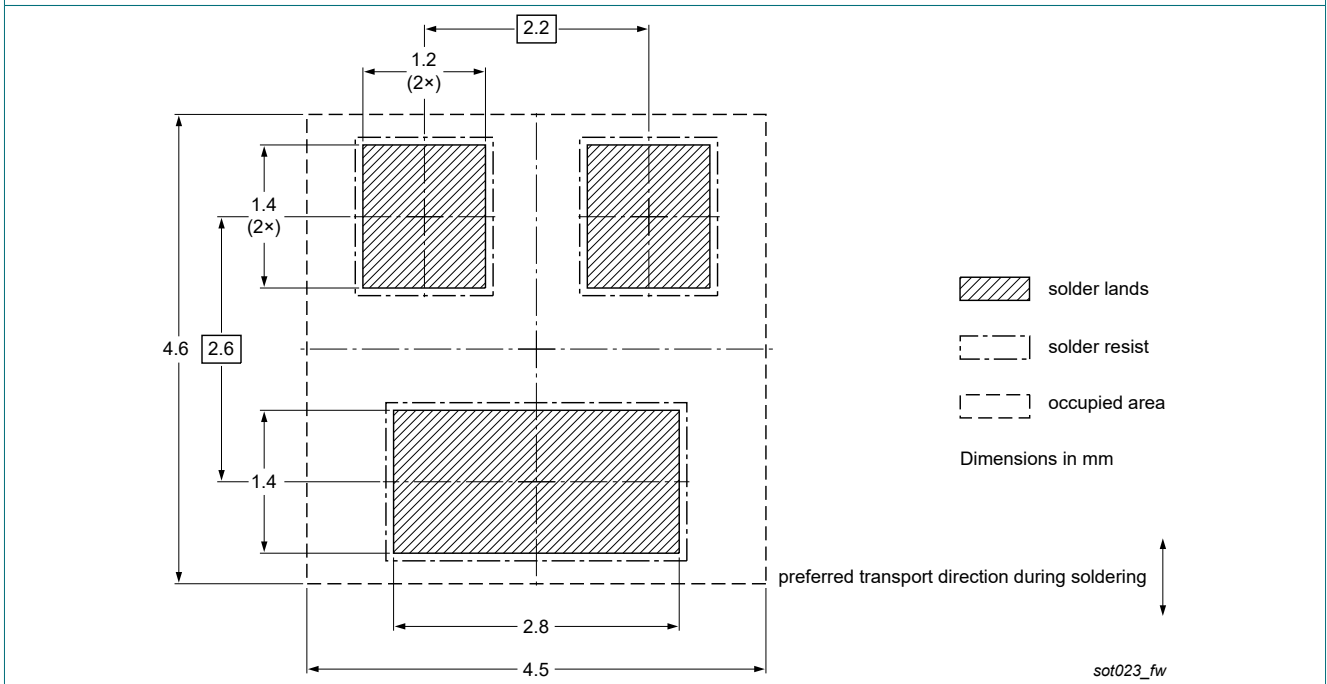


Fig. 8. Wave soldering footprint for SOT23



## 14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PBSS4140T-Q v.1	20211215	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.

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- [2] The term 'short data sheet' is explained in section "Definitions".
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