



# PESD5V0S2BT

Low capacitance bidirectional double ESD protection diode

23 August 2018

Product data sheet

## 1. General description

Low capacitance bidirectional double ElectroStatic Discharge (ESD) protection diode in a small SOT23 (TO-236AB) Surface-Mounted Device (SMD) plastic package designed to protect two data lines from the damage caused by ESD and other transients.

## 2. Features and benefits

- Bidirectional ESD protection of two lines
- Low diode capacitance
- Max. peak pulse power:  $P_{PPM} = 130 \text{ W}$  at  $t_p = 8/20 \mu\text{s}$
- Low clamping voltage:  $V_{CL} = 14 \text{ V}$  at  $I_{PPM} = 12 \text{ A}$
- Ultra low leakage current:  $I_{RM} = 5 \text{ nA}$  at  $V_{RWM} = 5 \text{ V}$
- ESD protection up to 30 kV
- IEC 61000-4-2; level 4 (ESD)
- IEC 61000-4-5 (surge);  $I_{PPM} = 12 \text{ A}$  at  $t_p = 8/20 \mu\text{s}$
- AEC-Q101 qualified

## 3. Applications

- Cellular handsets and accessories
- Portable electronics
- Computers and peripherals
- Communication systems
- Audio and video equipment

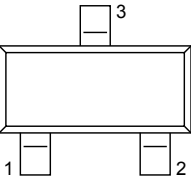
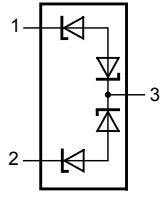
## 4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{RWM}$	reverse standoff voltage	$T_{amb} = 25 \text{ }^\circ\text{C}$	-	-	5	V
$C_d$	diode capacitance	$f = 1 \text{ MHz}; V_R = 0 \text{ V}; T_{amb} = 25 \text{ }^\circ\text{C}$	-	35	45	pF

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K1	cathode 1	 <p>TO-236AB (SOT23)</p>	 <p>sym031</p>
2	K2	cathode 2		
3	K	double cathode		

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PESD5V0S2BT	TO-236AB	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>
PESD5V0S2BT	%G5

[1] % = placeholder for manufacturing site code

## 8. Limiting values

**Table 5. Limiting values**

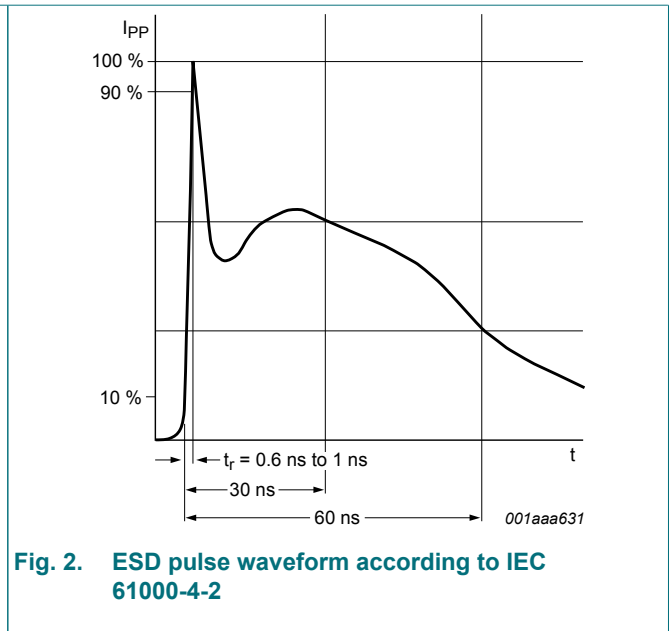
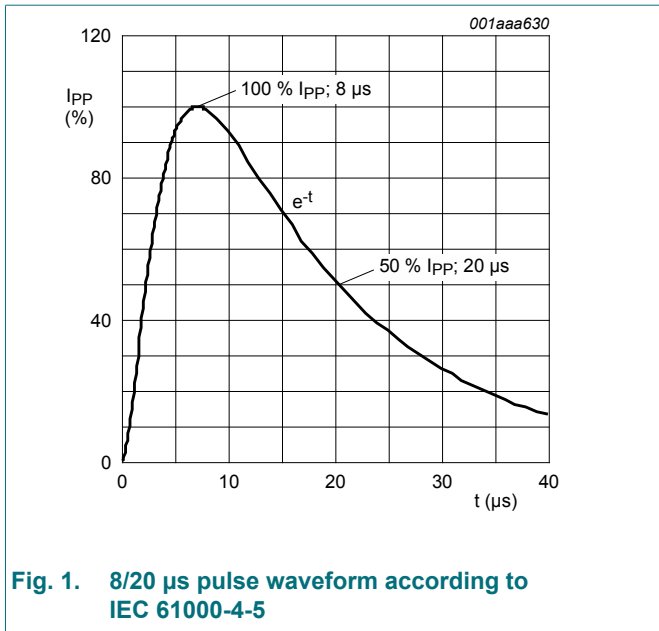
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions		Min	Max	Unit
<b>Per diode</b>						
$P_{PPM}$	rated peak pulse power	$t_p = 8/20 \mu s$	[1] [2]	-	130	W
$I_{PPM}$	rated peak pulse current		[1] [2]	-	12	A
$T_j$	junction temperature			-	150	°C
$T_{amb}$	ambient temperature			-55	150	°C
$T_{stg}$	storage temperature			-65	150	°C
<b>ESD maximum ratings</b>						
$V_{ESD}$	electrostatic discharge voltage	IEC 61000-4-2 (contact discharge)	[3] [2]	-	30	kV
		MIL-STD-883 (human body model)		-	10	kV

[1] Non-repetitive current pulse 8/20  $\mu s$  exponential decay waveform.

[2] Measured from pin 1 to 3 or pin 2 to 3.

[3] Device stressed with ten non-repetitive ESD pulses.

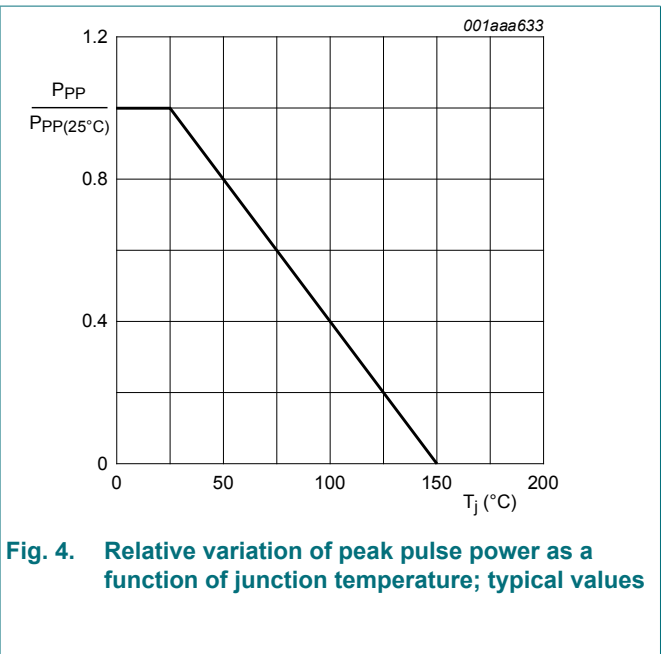
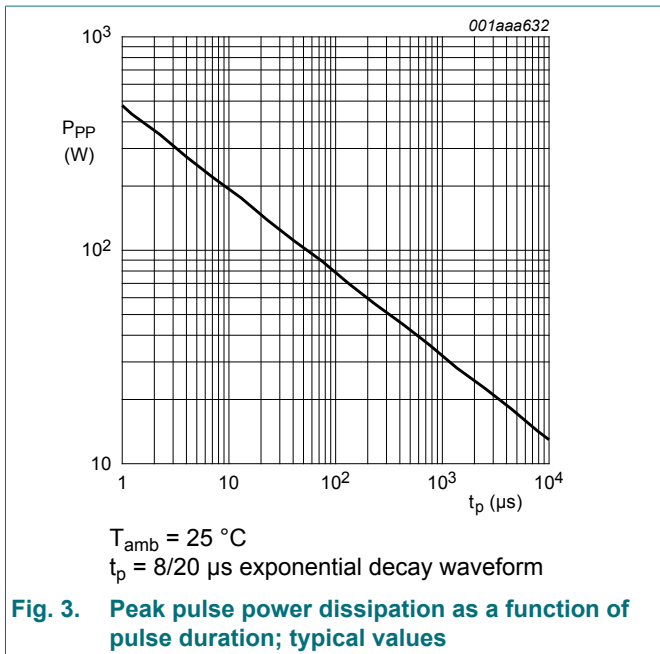


### 9. Characteristics

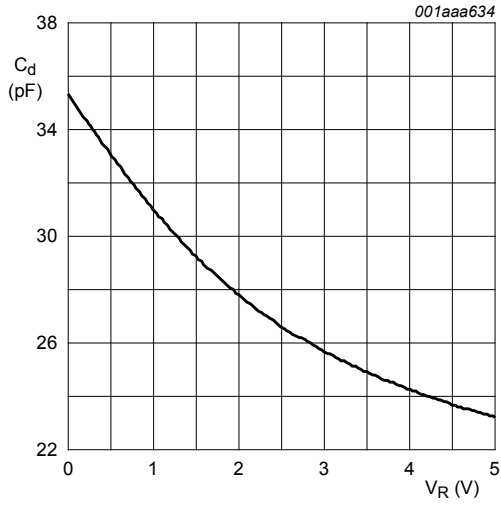
Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{RWM}$	reverse standoff voltage	$T_{amb} = 25\text{ }^{\circ}\text{C}$	-	-	5	V
$V_{BR}$	breakdown voltage	$I_R = 1\text{ mA}; T_{amb} = 25\text{ }^{\circ}\text{C}$	5.5	-	9.5	V
$I_{RM}$	reverse leakage current	$V_{RWM} = 5\text{ V}; T_{amb} = 25\text{ }^{\circ}\text{C}$	-	5	100	nA
$C_d$	diode capacitance	$f = 1\text{ MHz}; V_R = 0\text{ V}; T_{amb} = 25\text{ }^{\circ}\text{C}$	-	35	45	pF
$V_{CL}$	clamping voltage	$I_{PP} = 1\text{ A}; T_{amb} = 25\text{ }^{\circ}\text{C}$	[1] [2]	-	10	V
		$I_{PPM} = 12\text{ A}; T_{amb} = 25\text{ }^{\circ}\text{C}$	[1] [2]	-	14	V
$r_{dif}$	differential resistance	$I_R = 1\text{ mA}; T_{amb} = 25\text{ }^{\circ}\text{C}$	-	-	50	$\Omega$

- [1] Non-repetitive current pulse 8/20  $\mu\text{s}$  exponential decay waveform.
- [2] Measured from pin 1 to 3 or pin 2 to 3.

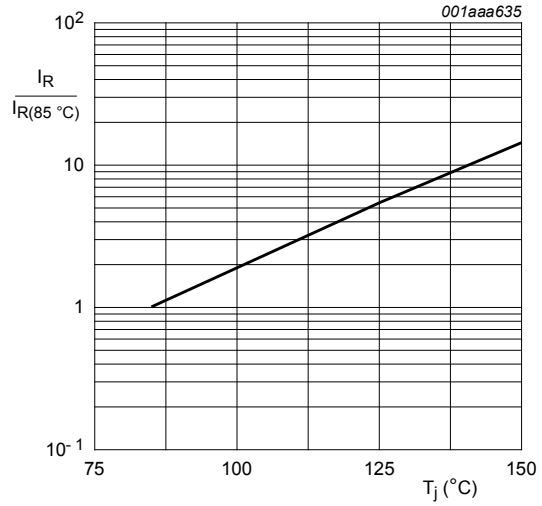


Low capacitance bidirectional double ESD protection diode



$T_{amb} = 25\text{ }^\circ\text{C}$  ;  $f = 1\text{ MHz}$

**Fig. 5. Diode capacitance as a function of reverse voltage; typical values**



$I_R < 1\text{ nA}$  measured at  $T_{amb} = 25\text{ }^\circ\text{C}$

**Fig. 6. Relative variation of reverse current as a function of junction temperature; typical values**

Low capacitance bidirectional double ESD protection diode

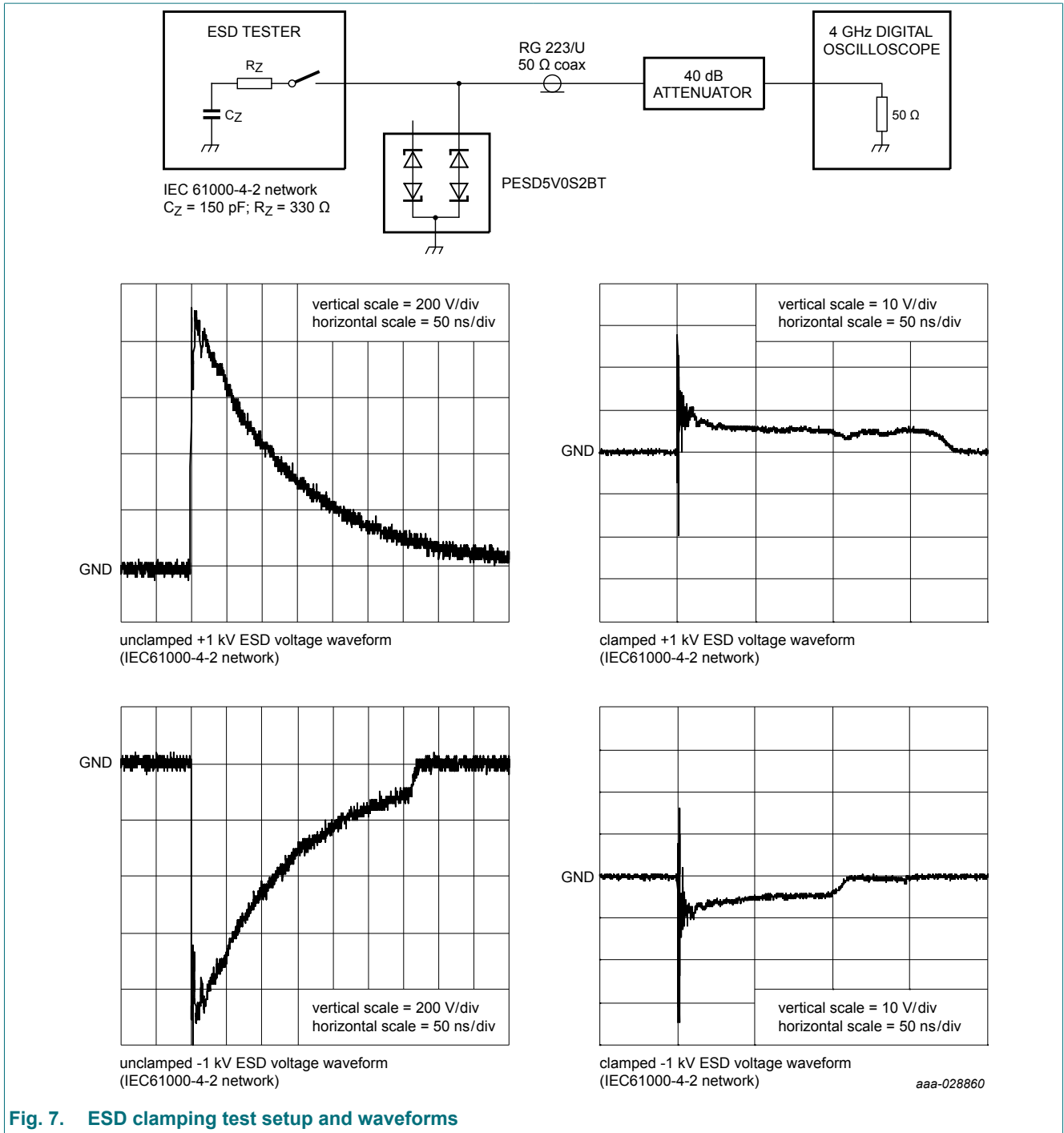
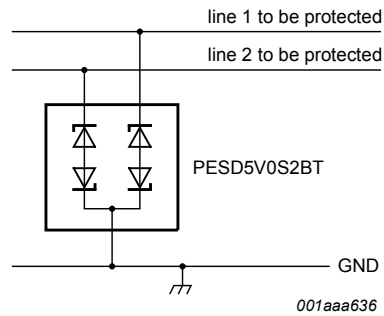


Fig. 7. ESD clamping test setup and waveforms

## 10. Application information

The PESD5V0S2BT is designed for the bidirectional protection of two lines from the damage caused by ElectroStatic Discharge (ESD) and surge pulses. The PESD5V0S2BT may be used on line where the signal polarities are both, positive and negative with respect to ground. The PESD5V0S2BT provides a surge capability of 130 W per line for an 8/20  $\mu$ s waveform.



**Fig. 8. Typical application for bidirectional protection of two lines line**

### Circuit board layout and protection device placement

Circuit board layout is critical for the suppression of ESD, Electrical Fast Transient (EFT) and surge transients. The following guidelines are recommended:

1. Place the PESD5V0S2BT as close to the input terminal or connector as possible.
2. Minimize the path length between the PESD5V0S2BT and the protected line.
3. Keep parallel signal paths to a minimum.
4. Avoid running protected conductors in parallel with unprotected conductors.
5. Minimize all Printed-Circuit Board (PCB) conductive loops including power and ground loops.
6. Minimize the length of the transient return path to ground.
7. Avoid using shared transient return paths to a common ground point.
8. Use ground planes whenever possible. For multilayer PCBs, use ground vias.

## 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

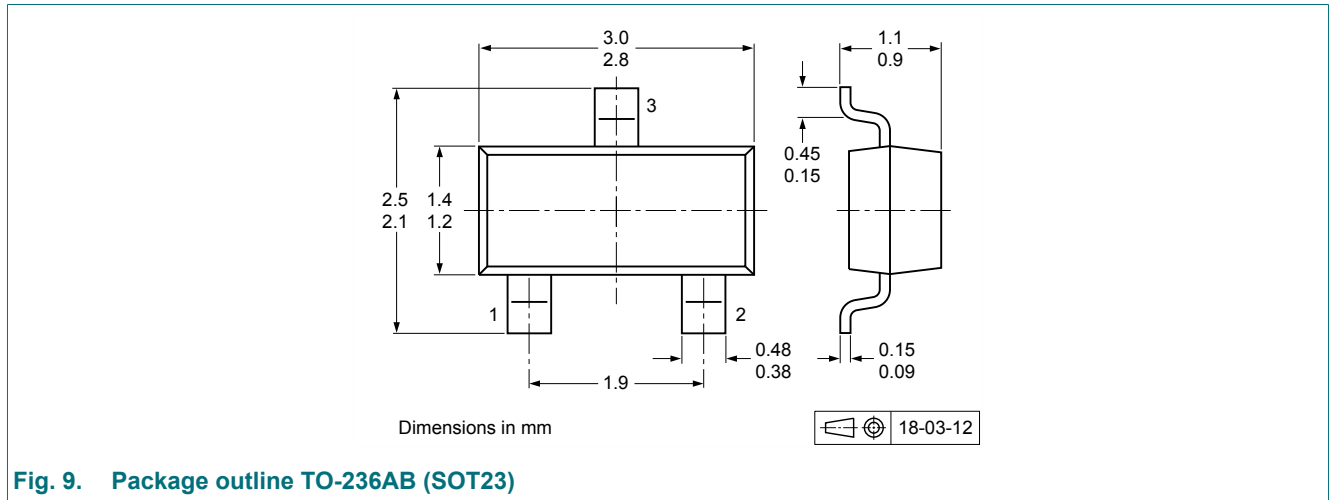


Fig. 9. Package outline TO-236AB (SOT23)

## 13. Soldering

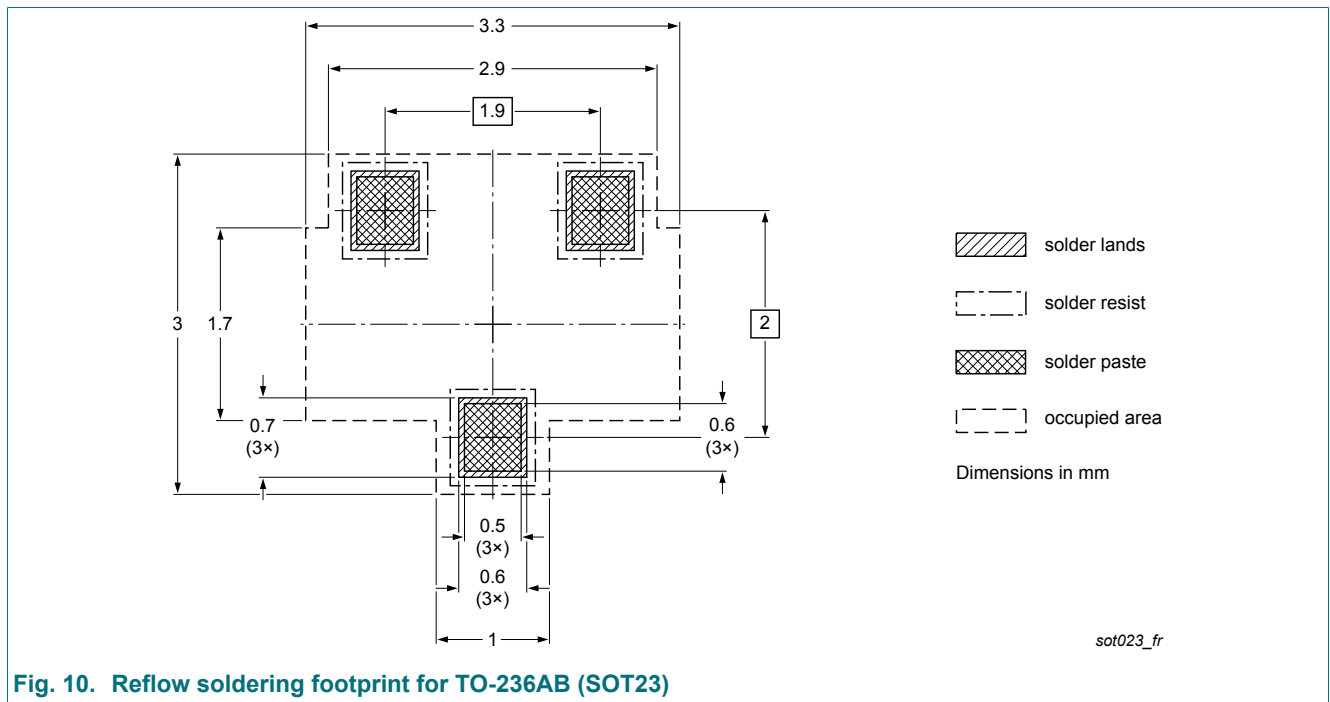


Fig. 10. Reflow soldering footprint for TO-236AB (SOT23)



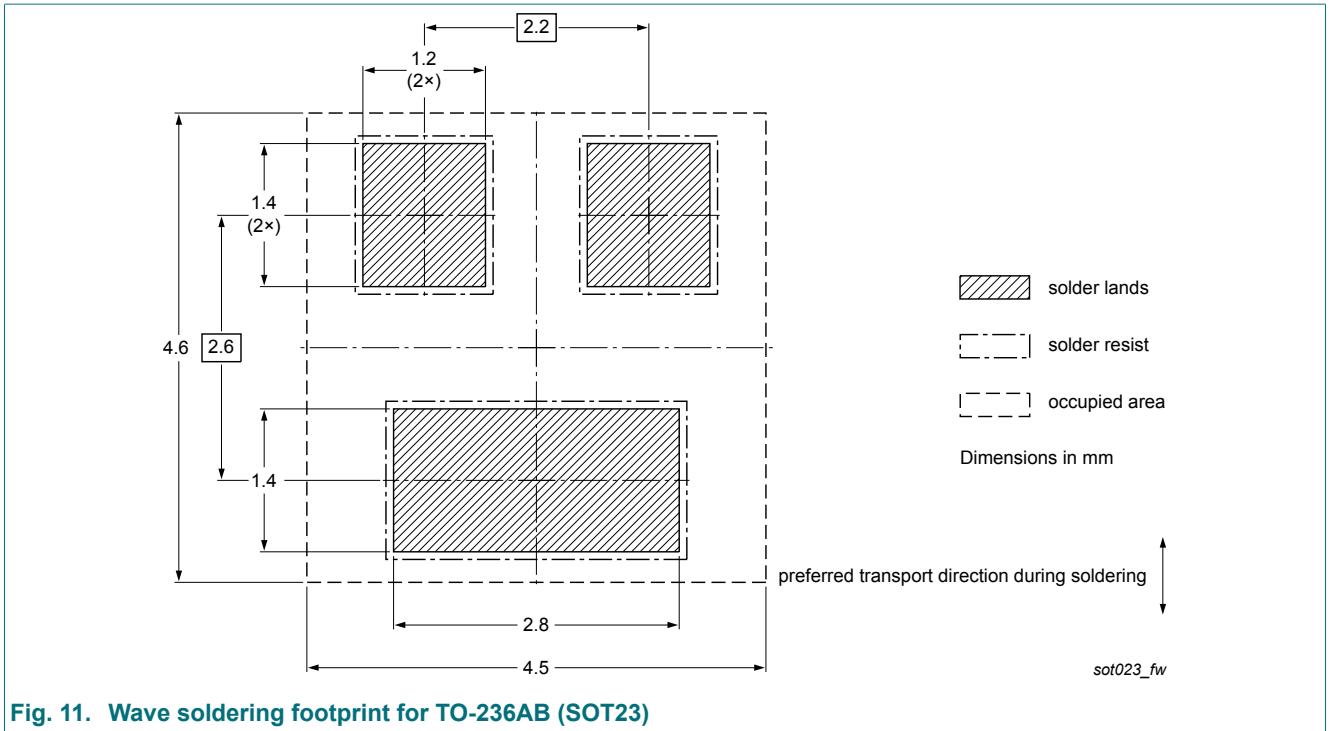


Fig. 11. Wave soldering footprint for TO-236AB (SOT23)

## 14. Revision history

Table 7. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PESD5V0S2BT_v.4	20180823	Product data sheet	-	PESD5V0S2BT_v.3
Modifications	<ul style="list-style-type: none"> <li>AEC-Q101 qualification added.</li> <li>Limiting values; T<sub>amb</sub> updated to -55°C.</li> <li>Application information: updated.</li> <li>The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.</li> <li>Legal texts have been adapted to the new company name where appropriate.</li> </ul>			
PESD5V0S2BT_v.3	20090209	Product data sheet	-	PESD5V0S2BT_v.2
PESD5V0S2BT_v.2	20040527	Product data sheet	-	PESD5V0S2BT_v.1
PESD5V0S2BT_v.1	20040517	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".
- [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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