PESD5V0X1BQ; PESD5V0X1BT

Ultra low capacitance bidirectional ESD protection diodes

Rev. 01 — 30 October 2008 Product data sheet

1. Product profile

1.1 General description

Ultra low capacitance bidirectional ElectroStatic Discharge (ESD) protection diodes in small Surface-Mounted Device (SMD) plastic packages designed to protect one signal line from the damage caused by ESD and other transients.

The devices may also be used for unidirectional ESD protection of up to two signal lines.

Table 1. Product overview

Type number	Package		Package configuration
	Nexperia	JEDEC	
PESD5V0X1BQ	SOT663	-	ultra small and flat lead
PESD5V0X1BT	SOT23	TO-236AB	very small

1.2 Features

- Bidirectional ESD protection of one line
- Unidirectional ESD protection of up to two lines
- Ultra low diode capacitance: C_d = 0.9 pF
- Very low leakage current: I_{RM} = 1 nA
- ESD protection up to 9 kV
- IEC 61000-4-2; level 4 (ESD)
- AEC-Q101 qualified

1.3 Applications

- USB interfaces
- Antenna protection
- Radio Frequency (RF) protection
- 10/100/1000 Mbit/s Ethernet
- FireWire
- Asymmetric Digital Subscriber Line (ADSL)
- High-speed data lines
- Subscriber Identity Module (SIM) card protection
- Computers, peripherals and printers
- Cellular handsets and accessories
- Portable electronics
- Communication systems
- Audio and video equipment

1.4 Quick reference data

Table 2. Quick reference data

T_{amb} = 25 °C unless otherwise specified.

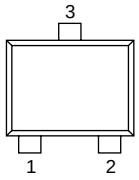
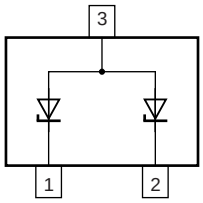
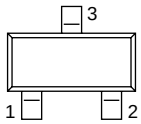
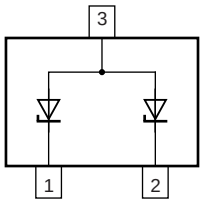
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Per diode							
V_{RWM}	reverse standoff voltage			-	-	5	V
C_d	diode capacitance	f = 1 MHz; V_R = 0 V	[1]	-	0.9	1.3	pF
			[2]	-	2	2.6	pF

[1] Bidirectional configuration: measured from pin 1 to 2 or pin 2 to 1.

[2] Unidirectional configuration: measured from pin 1 to 3 or pin 2 to 3.

2. Pinning information

Table 3. Pinning

Pin	Description	Simplified outline	Graphic symbol
PESD5V0X1BQ			
1	cathode (diode 1)		
2	cathode (diode 2)		
3	common anode		
			006aaa154
PESD5V0X1BT			
1	cathode (diode 1)		
2	cathode (diode 2)		
3	common anode		
			006aaa154

3. Ordering information

Table 4. Ordering information

Type number	Package		
	Name	Description	Version
PESD5V0X1BQ	-	plastic surface-mounted package; 3 leads	SOT663
PESD5V0X1BT	-	plastic surface-mounted package; 3 leads	SOT23

4. Marking

Table 5. Marking codes

Type number	Marking code[1]
PESD5V0X1BQ	E6
PESD5V0X1BT	U3*

[1] * = -: made in Hong Kong
* = p: made in Hong Kong
* = t: made in Malaysia
* = W: made in China

5. Limiting values

Table 6. Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
Per device					
T_j	junction temperature		-	150	°C
T_{amb}	ambient temperature		–55	+150	°C
T_{stg}	storage temperature		–65	+150	°C

Table 7. ESD maximum ratings

T_{amb} = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions		Min	Max	Unit
Per diode						
V_{ESD}	electrostatic discharge voltage	IEC 61000-4-2 (contact discharge)	[1]	-	9	kV
		MIL-STD-883 (human body model)		-	10	kV

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

Table 8. ESD standards compliance

Standard	Conditions
Per diode	
IEC 61000-4-2; level 4 (ESD)	> 8 kV (contact)
MIL-STD-883; class 3 (human body model)	> 4 kV

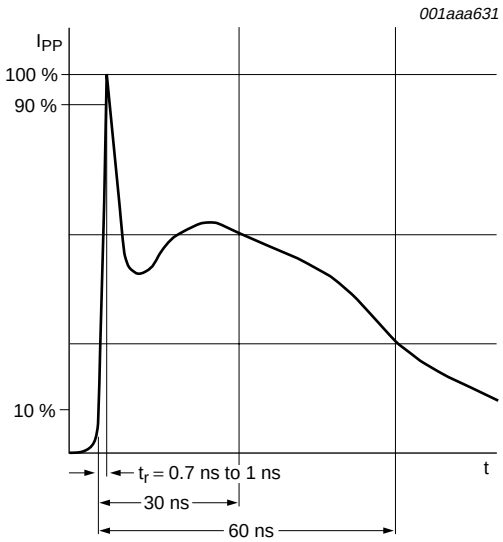


Fig 1. ESD pulse waveform according to IEC 61000-4-2

6. Characteristics

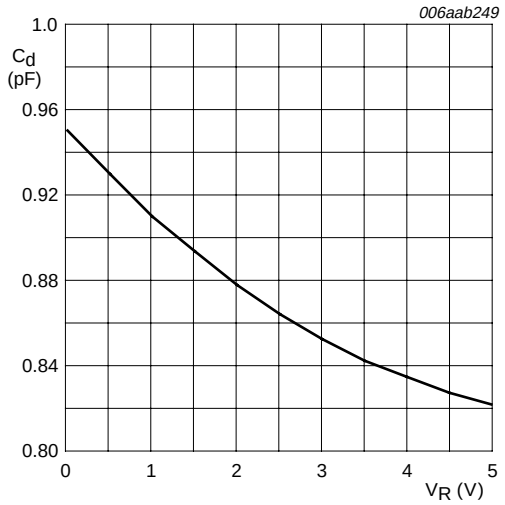
Table 9. Characteristics

T_{amb} = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Per diode							
V_{RWM}	reverse standoff voltage			-	-	5	V
I_{RM}	reverse leakage current	V_{RWM} = 5 V		-	1	100	nA
V_{BR}	breakdown voltage	I_R = 5 mA		5.8	7.5	9.5	V
C_d	diode capacitance	f = 1 MHz					
		V_R = 0 V	[1]	-	0.9	1.3	pF
			[2]	-	2	2.6	pF
		V_R = 5 V	[1]	-	0.8	1.2	pF
			[2]	-	1.7	2.3	pF
r_{dif}	differential resistance	I_R = 1 mA		-	-	100	Ω

[1] Bidirectional configuration: measured from pin 1 to 2 or pin 2 to 1.

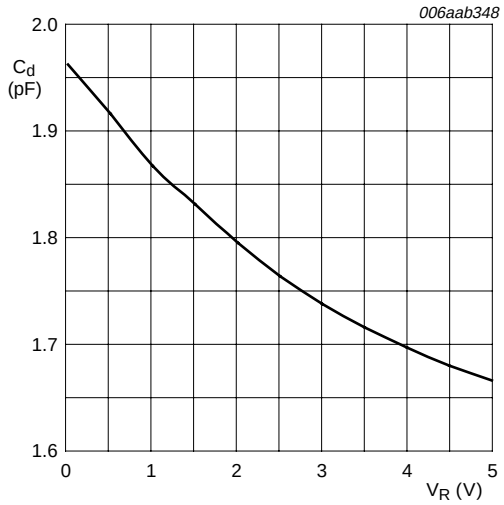
[2] Unidirectional configuration: measured from pin 1 to 3 or pin 2 to 3.



bidirectional configuration

f = 1 MHz; T_{amb} = 25 °C

Fig 2. Diode capacitance as a function of reverse voltage; typical values



unidirectional configuration

f = 1 MHz; T_{amb} = 25 °C

Fig 3. Diode capacitance as a function of reverse voltage; typical values

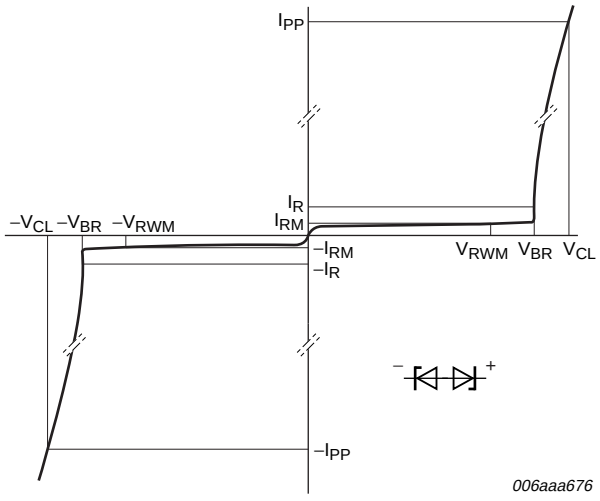


Fig 4. V-I characteristics for a bidirectional ESD protection diode

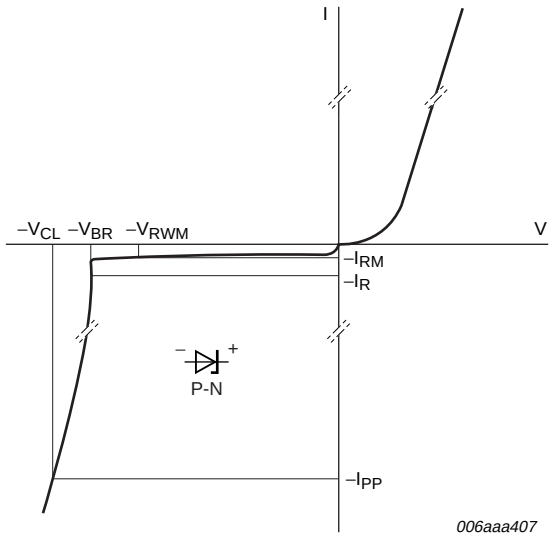


Fig 5. V-I characteristics for a unidirectional ESD protection diode

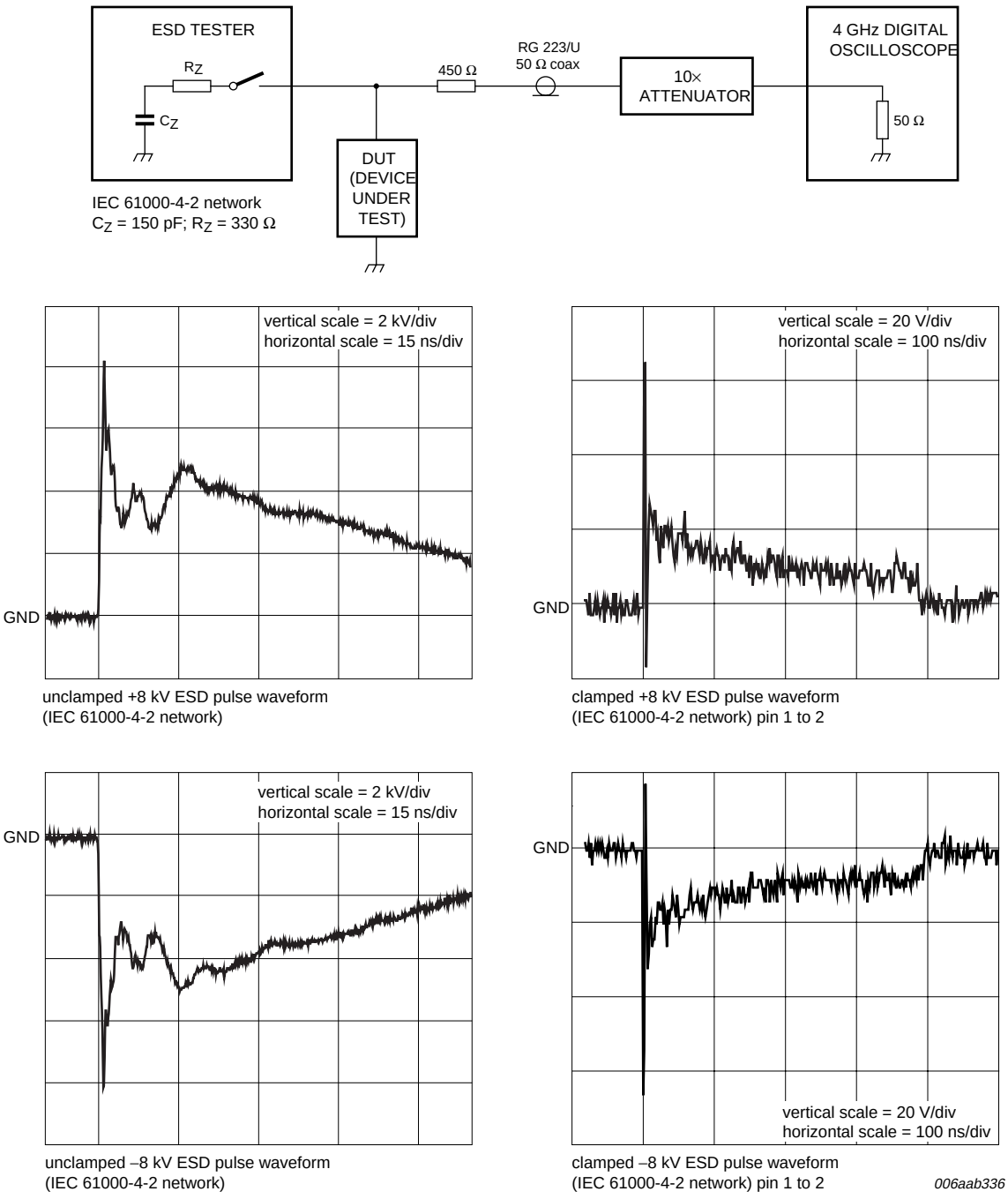


Fig 6. ESD clamping test setup and waveforms

7. Application information

PESD5V0X1BQ and PESD5V0X1BT are designed for the protection of one bidirectional data or signal line from the damage caused by ESD. The devices may be used on lines where the signal polarities are both, positive and negative with respect to ground.

PESD5V0X1BQ and PESD5V0X1BT may also be used for the protection of two unidirectional data or signal lines, which have positive signal polarities with respect to ground.

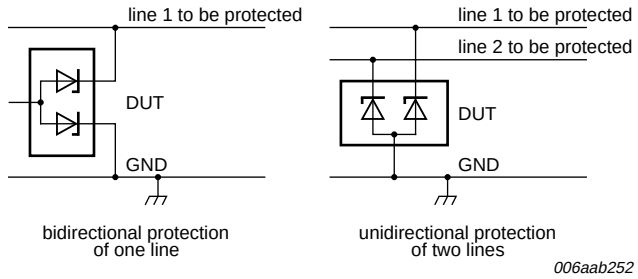


Fig 7. Application diagram

Circuit board layout and protection device placement

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

1. Place the device as close to the input terminal or connector as possible.
2. The path length between the device and the protected line should be minimized.
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. Ground planes should be used whenever possible. For multilayer PCBs, use ground vias.

8. Test information

8.1 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.

9. Package outline

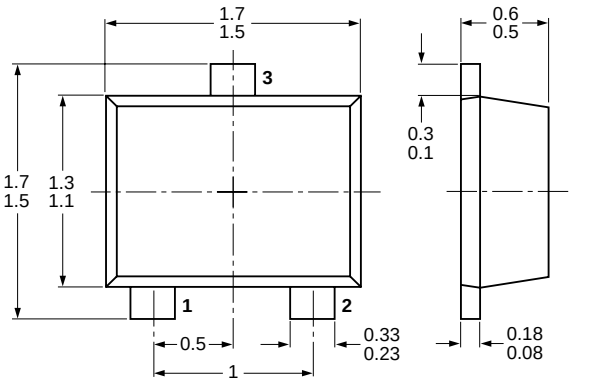


Fig 8. Package outline PESD5V0X1BQ (SOT663)

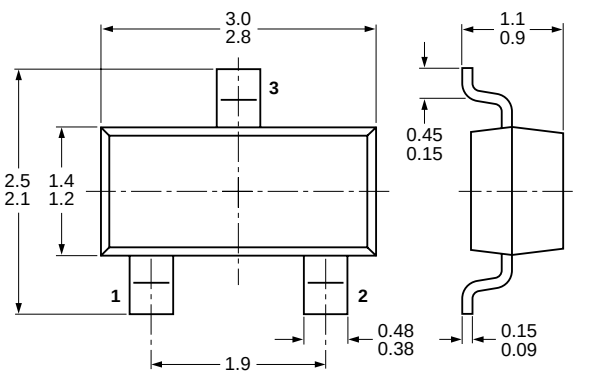


Fig 9. Package outline PESD5V0X1BT (SOT23/TO-236AB)

10. Packing information

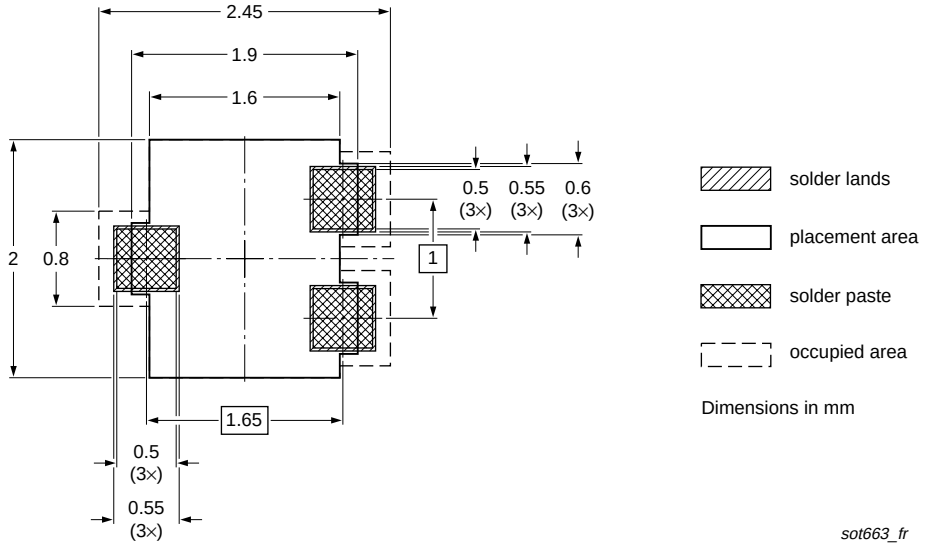
Table 10. Packing methods

The indicated -xxx are the last three digits of the 12NC ordering code.[1]

Type number	Package	Description	Packing quantity			
			3000	4000	8000	10000
PESD5V0X1BQ	SOT663	2 mm pitch, 8 mm tape and reel	-	-	-315	-
		4 mm pitch, 8 mm tape and reel	-	-115	-	-
PESD5V0X1BT	SOT23	4 mm pitch, 8 mm tape and reel	-215	-	-	-235

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

11. Soldering



Reflow soldering is the only recommended soldering method.

Fig 10. Reflow soldering footprint PESD5V0X1BQ (SOT663)

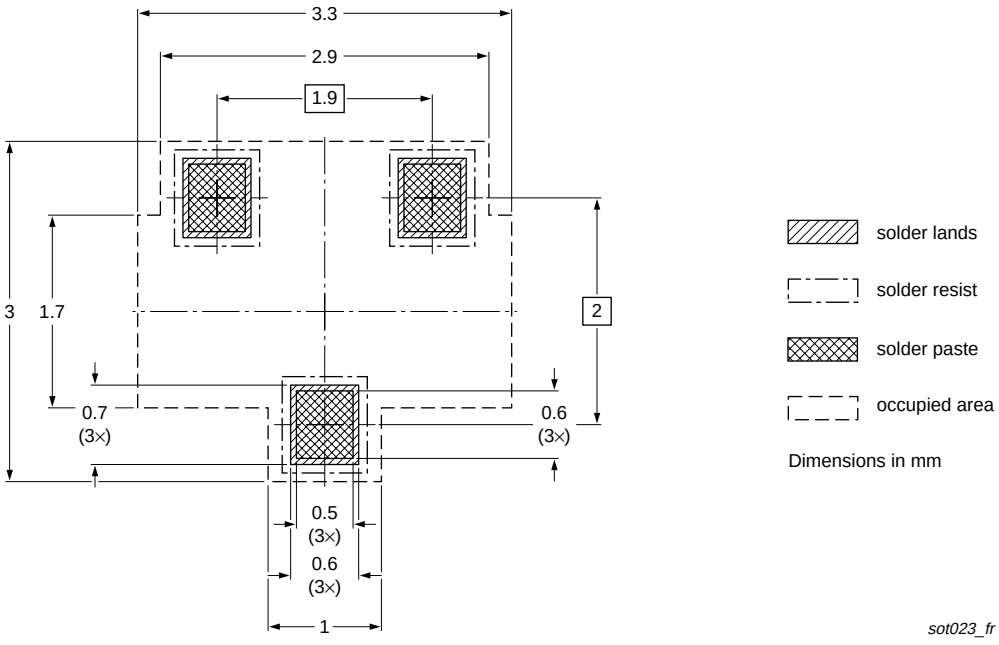


Fig 11. Reflow soldering footprint PESD5V0X1BT (SOT23/TO-236AB)

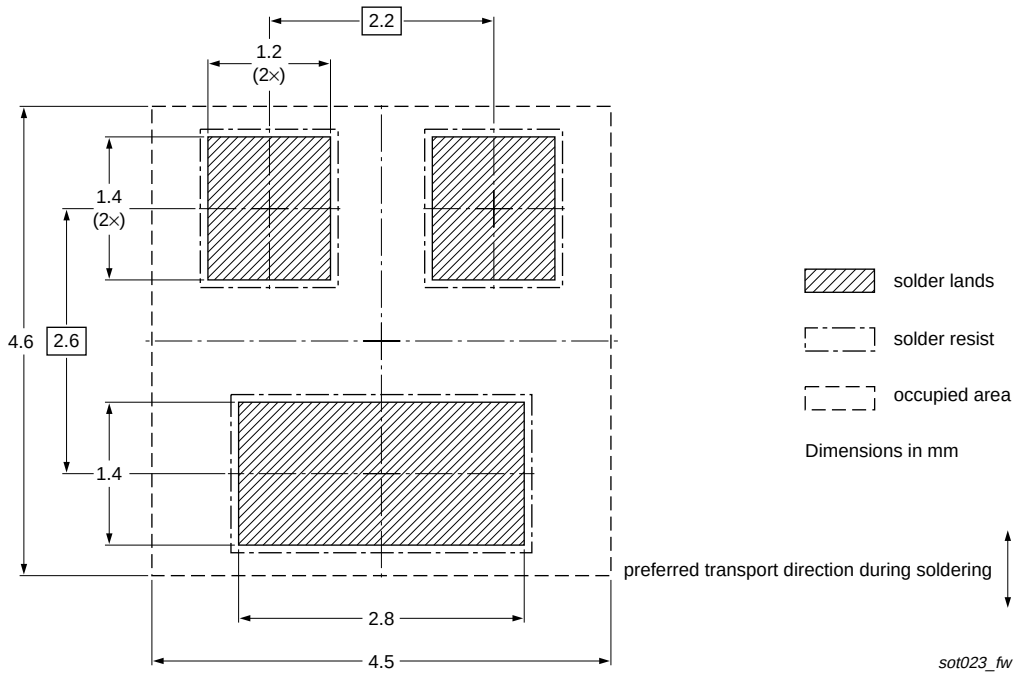


Fig 12. Wave soldering footprint PESD5V0X1BT (SOT23/TO-236AB)

12. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PESD5V0X1BQ_PESD5V0X1BT_1	20081030	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.nexperia.com.

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