



PESD48VV2BT

ESD protection for 48V lines

2 May 2022

Product data sheet

1. General description

ESD protection device in a small SOT23 (TO-236AB) Surface-Mounted Device (SMD) plastic package designed to protect two lines from the damage caused by electrostatic discharge (ESD) and other transients.

2. Features and benefits

- Reverse stand-off voltage: $V_{RWM} = 48\text{ V}$
- Low clamping voltage: $V_{CL} = 67\text{ V}$ at $I_{PPM} = 3.5\text{ A}$
- Typical diode capacitance matching: $\Delta C_d/C_d = 0.5\%$
- Low capacitance for improved signal integrity: $C_{d\text{ typ}} = 7.1\text{ pF}$
- ESD protection up to 30 kV (IEC 61000-4-2; ISO 10605; $C = 330\text{ pF}$, $R = 330\ \Omega$)
- Low leakage current: $I_{RM} < 1\text{ nA}$

3. Applications

ESD protection for

- 48 V lines
- USB Type-C, CC and SBU lines in combination with 48 V Extended Power Range (EPR)

4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{RWM}	reverse standoff voltage	$T_{\text{amb}} = 25\text{ }^\circ\text{C}$		-	-	48	V
I_{PPM}	rated peak pulse current	$t_p = 8/20\ \mu\text{s}$	[1] [2]	-	-	3.5	A
V_{CL}	clamping voltage	$I_{PPM} = 3.5\text{ A}$; $t_p = 8/20\ \mu\text{s}$; $T_{\text{amb}} = 25\text{ }^\circ\text{C}$	[3] [2]	-	67	-	V

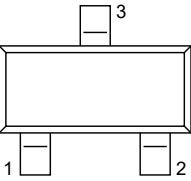
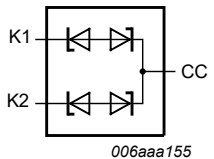
[1] According to IEC 61000-4-5.

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

[3] Device stressed with 8/20 μs exponential decay waveform according to IEC 61000-4-5.

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K1	cathode (diode 1)	 <p style="text-align: center;">SOT23</p>	
2	K2	cathode (diode 2)		
3	K	common cathode		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PESD48VV2BT	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 ^[1]
PESD48VV2BT	T4%

[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
I_{PPM}	rated peak pulse current	$t_p = 8/20 \mu s$	[1] [2]	-	3.5	A
T_j	junction temperature			-	150	°C
T_{amb}	ambient temperature			-55	150	°C
T_{stg}	storage temperature			-65	150	°C
ESD maximum ratings						
V_{ESD}	electrostatic discharge voltage	IEC 61000-4-2; contact discharge	[2] [3]	-	30	kV
		ISO 10605; contact discharge; C = 330 pF, R = 330 Ω	[2] [3]	-	30	kV
		ISO 10605; contact discharge; C = 150 pF, R = 330 Ω	[2] [3]	-	30	kV

- [1] According to IEC 61000-4-5.
- [2] Measured from pin 1 or 2 to pin 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	$T_{amb} = 25\text{ }^{\circ}\text{C}$		-	-	48	V
V_{BR}	breakdown voltage	$I_R = 10\text{ mA}; T_{amb} = 25\text{ }^{\circ}\text{C}$	[1]	56	64	76	V
I_{RM}	reverse leakage current	$V_{RWM} = 48\text{ V}; T_{amb} = 25\text{ }^{\circ}\text{C}$	[1]	-	1	50	nA
C_d	diode capacitance	$f = 1\text{ MHz}; V_R = 0\text{ V}; T_{amb} = 25\text{ }^{\circ}\text{C}$	[1]	-	7.1	8.6	pF
$\Delta C_d/C_d$	diode capacitance matching		[2]	-	0.5	-	%
		$f = 1\text{ MHz}; V_R = 2.5\text{ V}; T_{amb} = 25\text{ }^{\circ}\text{C}$	[2]	-	0.5	-	%
V_{CL}	clamping voltage	$I_{PP} = 1\text{ A}; t_p = 8/20\text{ }\mu\text{s}; T_{amb} = 25\text{ }^{\circ}\text{C}$	[3] [1]	-	61	-	V
		$I_{PPM} = 3.5\text{ A}; t_p = 8/20\text{ }\mu\text{s}; T_{amb} = 25\text{ }^{\circ}\text{C}$	[3] [1]	-	67	-	V
		$I_{PP} = 16\text{ A}; t_p = 100\text{ ns}; \text{TLP}; T_{amb} = 25\text{ }^{\circ}\text{C}$	[4] [1]	-	64	-	V
R_{dyn}	dynamic resistance	$I_R = 10\text{ A}; t_p = 100\text{ ns}; \text{TLP}; T_{amb} = 25\text{ }^{\circ}\text{C}$	[4] [1]	-	0.55	-	Ω

- [1] Measured from pin 1 or 2 to pin 3.
- [2] ΔC_d is the difference of the capacitance measured between pin 1 and pin 3 and the capacitance measured between pin 2 and pin 3.
- [3] Device stressed with 8/20 μs exponential decay waveform according to IEC 61000-4-5.
- [4] Non-repetitive current pulse, Transmission Line Pulse (TLP); square pulse; ANSI / ESD STM5.5.1-2008

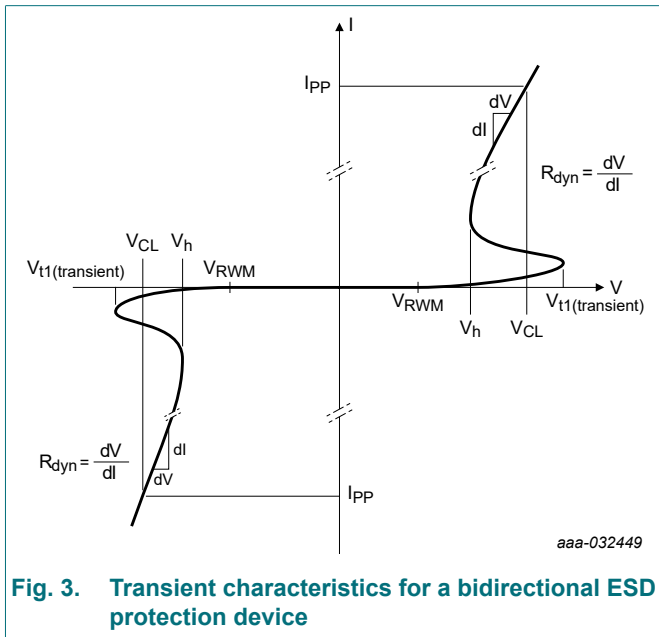


Fig. 3. Transient characteristics for a bidirectional ESD protection device

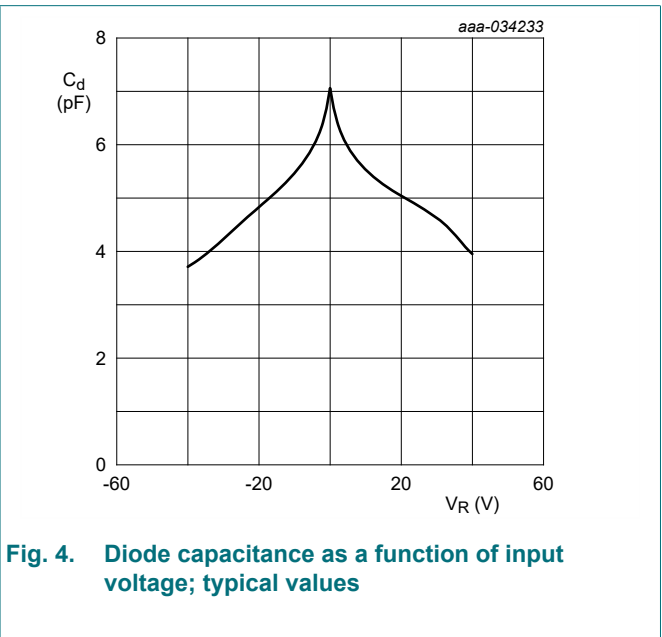
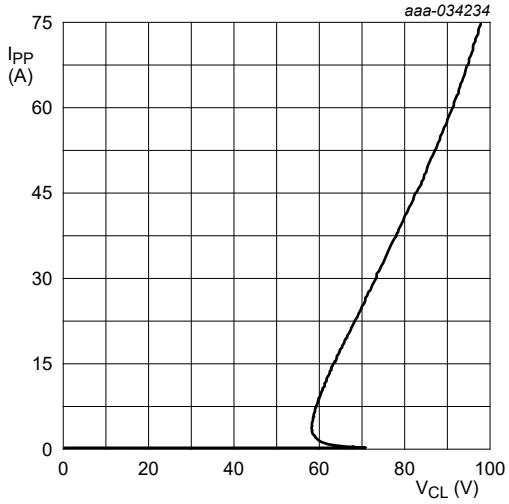
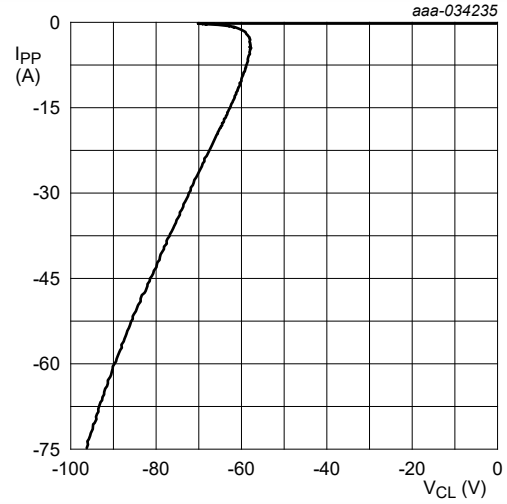


Fig. 4. Diode capacitance as a function of input voltage; typical values



Transmission Line Pulse (TLP);
 $t_p = 100 \text{ ns}$; $t_r = 1 \text{ ns}$

Fig. 5. Dynamic resistance with positive clamping; typical values



Transmission Line Pulse (TLP);
 $t_p = 100 \text{ ns}$; $t_r = 1 \text{ ns}$

Fig. 6. Dynamic resistance with negative clamping; typical values

10. Application information

The device is designed for the protection of two lines from the damage caused by ESD and surge pulses.

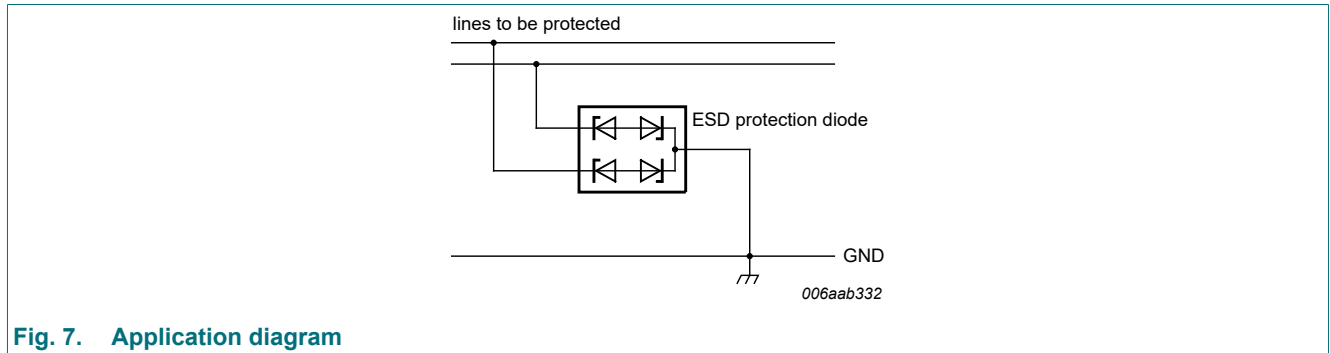


Fig. 7. Application diagram

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 device as close to the input terminal or connector as possible.
2. Minimize the path length between the device 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. Package outline

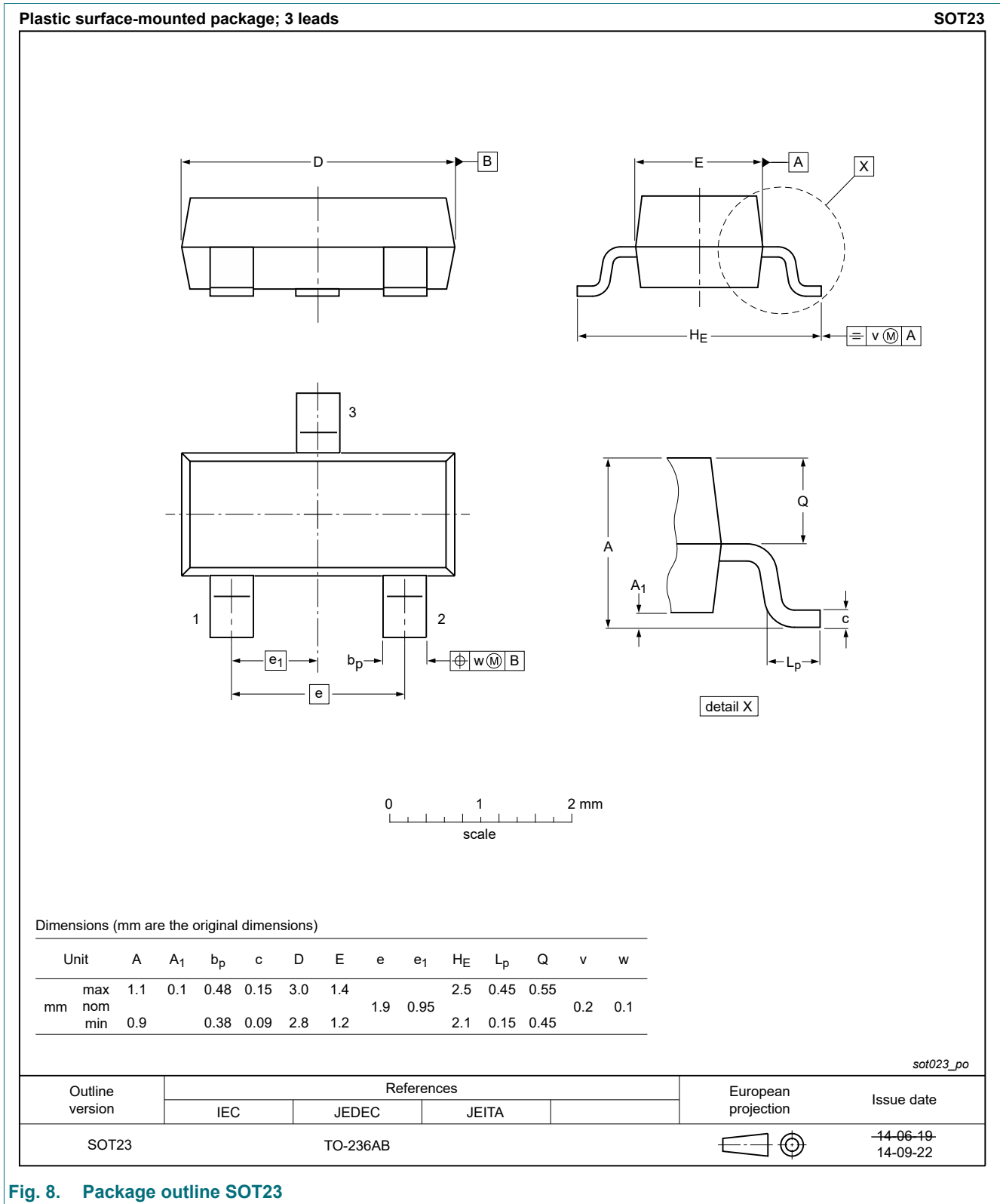


Fig. 8. Package outline SOT23

12. Soldering

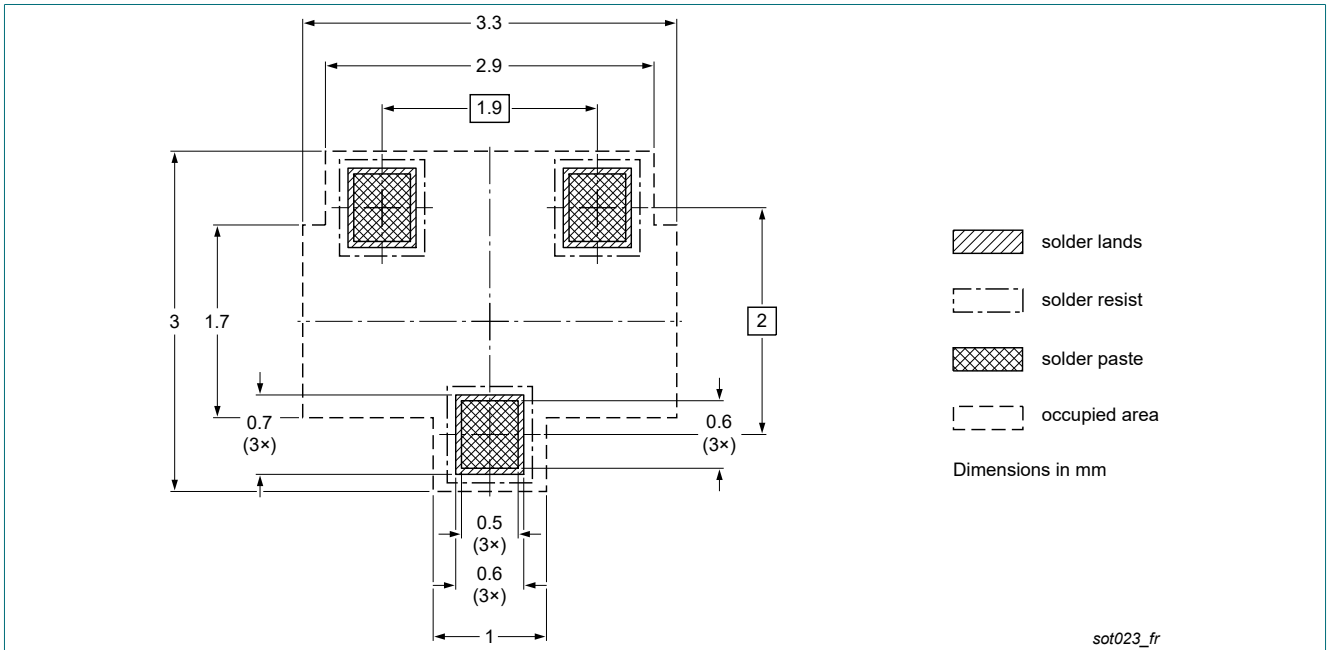


Fig. 9. Reflow soldering footprint for SOT23

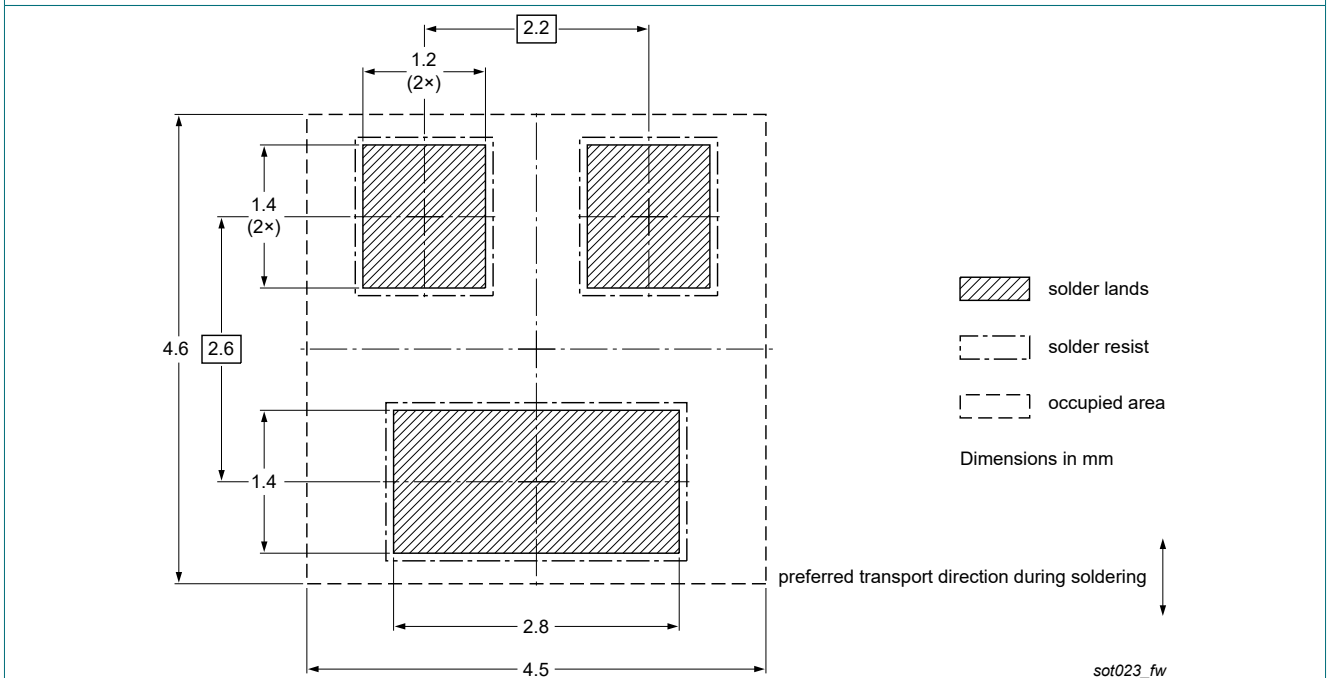


Fig. 10. Wave soldering footprint for SOT23

13. Revision history

Table 7. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PESD48VV2BT v.1	20220502	Product data sheet	-	-

14. 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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