PESD2USB3UV-T

Automotive infotainment ESD protection diode

9 September 2020 **Product data sheet**

1. General description

Automotive ESD protection device in a small SOT23 (TO-236AB) Surface-Mounted Device (SMD) plastic package designed to protect two automotive In-vehicle network bus lines from the damage caused by ElectroStatic discharge (ESD) and other transients. This product protects especially multimedia applications such as USB, HDMI and others.

2. Features and benefits

- Reverse stand-off voltage: V_{RWM} = 3.3 V
- Low clamping voltage: V_{CL}= 2.6 V at I_{PP} = 8 A
- ESD protection up to 18 kV (IEC 61000-4-2)
- Ultra low capacitance: C_d = 0.83 pF
- ESD protection up to 18 kV (ISO 10605; C = 150 pF; R = 330 Ω)
- High temperature capability: T_j = 175 °C
- Qualified according to AEC-Q101 / Automotive grade

3. Applications

ESD protection for In-vehicle network lines in automotive environments

- Infotainment applications USB2.0, HDMI, DisplayPort, eSATA and LVDS
- Automotive A/V monitors, display and cameras
- SerDes: GMSL, FPD-Link, LVDS

4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{RWM}	reverse standoff voltage	T_{amb} = 25 °C		-	-	3.3	V
I_{PPM}	rated peak pulse current	t_p = 8/20 µs	[1] [2]	-	-	8	A
C_d	diode capacitance	f = 1 MHz; V_R = 0 V; T_{amb} = 25 °C	[2]	-	0.83	1	pF

[1] According to IEC 61000-4-5.
[2] Measured from pin 1 or 2 to pin 3.

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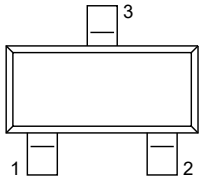
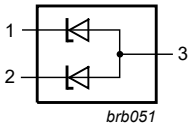
5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K1	cathode (diode 1)	 SOT23	 brb051
2	K2	cathode (diode 2)		
3	CA	common anode		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PESD2USB3UV-T	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]
PESD2USB3UV-T	Q2%

[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 µs	[1] [2]	-	8	A
T_j	junction temperature			-	175	°C
T_{amb}	ambient temperature			-55	175	°C
T_{stg}	storage temperature			-65	175	°C
ESD maximum ratings						
V_{ESD}	electrostatic discharge voltage	IEC 61000-4-2; contact discharge	[2] [3]	-	18	kV
		ISO 10605; contact discharge; C = 150 pF, R = 330 Ω	[2] [3]	-	18	kV
		ISO 10605; contact discharge; C = 330 pF, R = 330 Ω	[2] [3]	-	15	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.

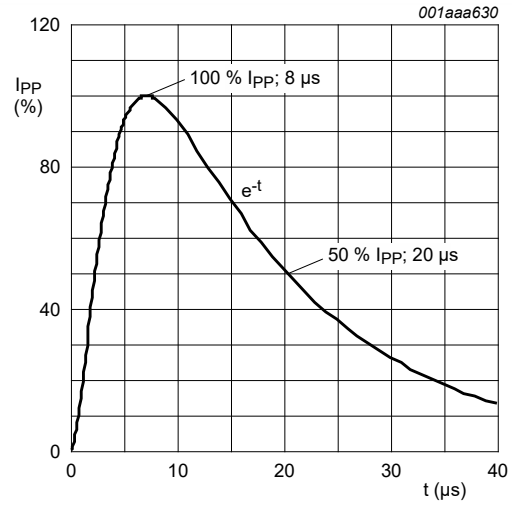


Fig. 1. 8/20 µs pulse waveform according to IEC 61000-4-5

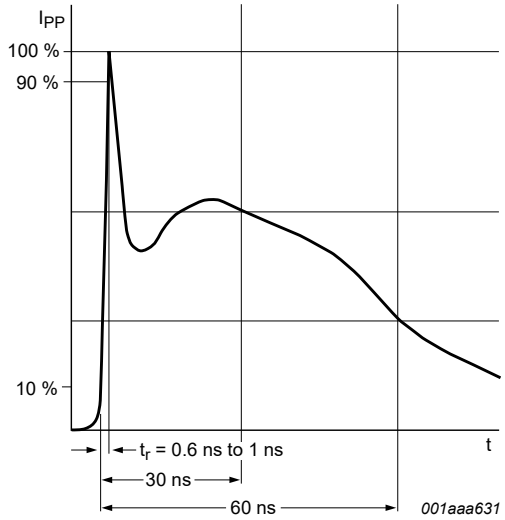


Fig. 2. ESD pulse waveform according to IEC 61000-4-2

9. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{RWM}	reverse standoff voltage	T_{amb} = 25 °C		-	-	3.3	V
V_{BR}	breakdown voltage	I_R = 1 mA; T_{amb} = 25 °C	[1]	4.2	6.7	8	V
I_{RM}	reverse leakage current	V_{RWM} = 3.3 V; T_{amb} = 25 °C	[1]	-	1	50	nA
C_d	diode capacitance	f = 1 MHz; V_R = 0 V; T_{amb} = 25 °C	[1]	-	0.83	1	pF
$\Delta C_d/C_d$	diode capacitance matching		[2]	-	0.5	-	%
V_{CL}	clamping voltage	I_{PP} = 8 A; t_p = TLP; T_{amb} = 25 °C	[3] [1]	-	2.6	-	V
		I_{PP} = 16 A; t_p = TLP; T_{amb} = 25 °C	[3] [1]	-	3.7	-	V
R_{dyn}	dynamic resistance	I_R = 10 A; T_{amb} = 25 °C	[3] [1]	-	0.14	-	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] Non-repetitive current pulse, Transmission Line Pulse (TLP); square pulse; ANSI / ESD STM5.5.1-2008

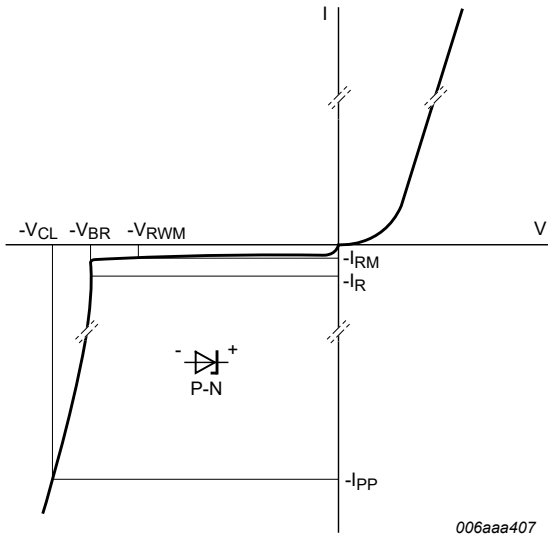


Fig. 3. V-I characteristics for a unidirectional ESD protection diode

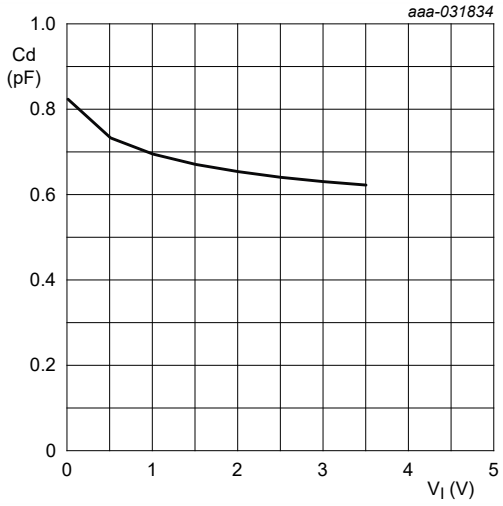
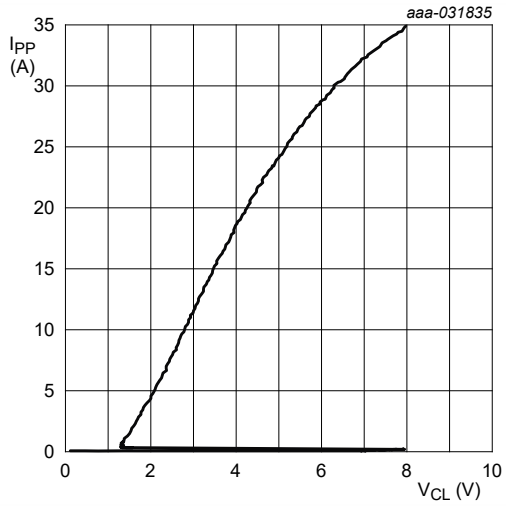
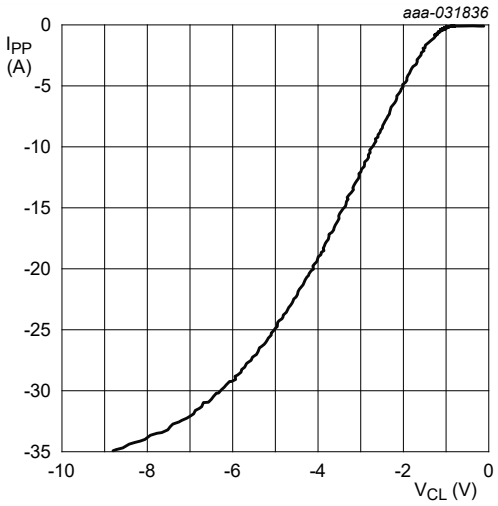


Fig. 4. Relative capacitance as a function of reverse standoff voltage; typical values



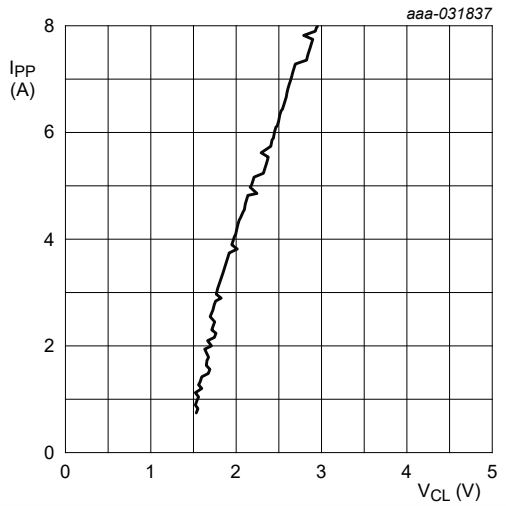
t_p = 100 ns; rise time = 1 ns; Transmission Line Pulse (TLP)

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



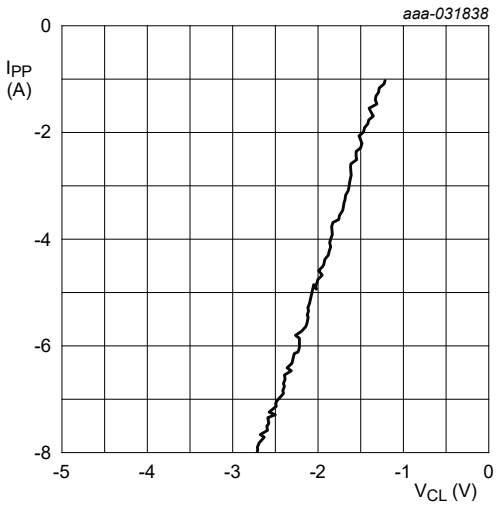
t_p = 100 ns; rise time = 1 ns; Transmission Line Pulse (TLP)

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



IEC 61000-4-5; t_p = 8/20 µs; positive pulse

Fig. 7. Dynamic resistance with positive clamping; typical values



IEC 61000-4-5; t_p = 8/20 µs; positive pulse

Fig. 8. Dynamic resistance with negative clamping; typical values

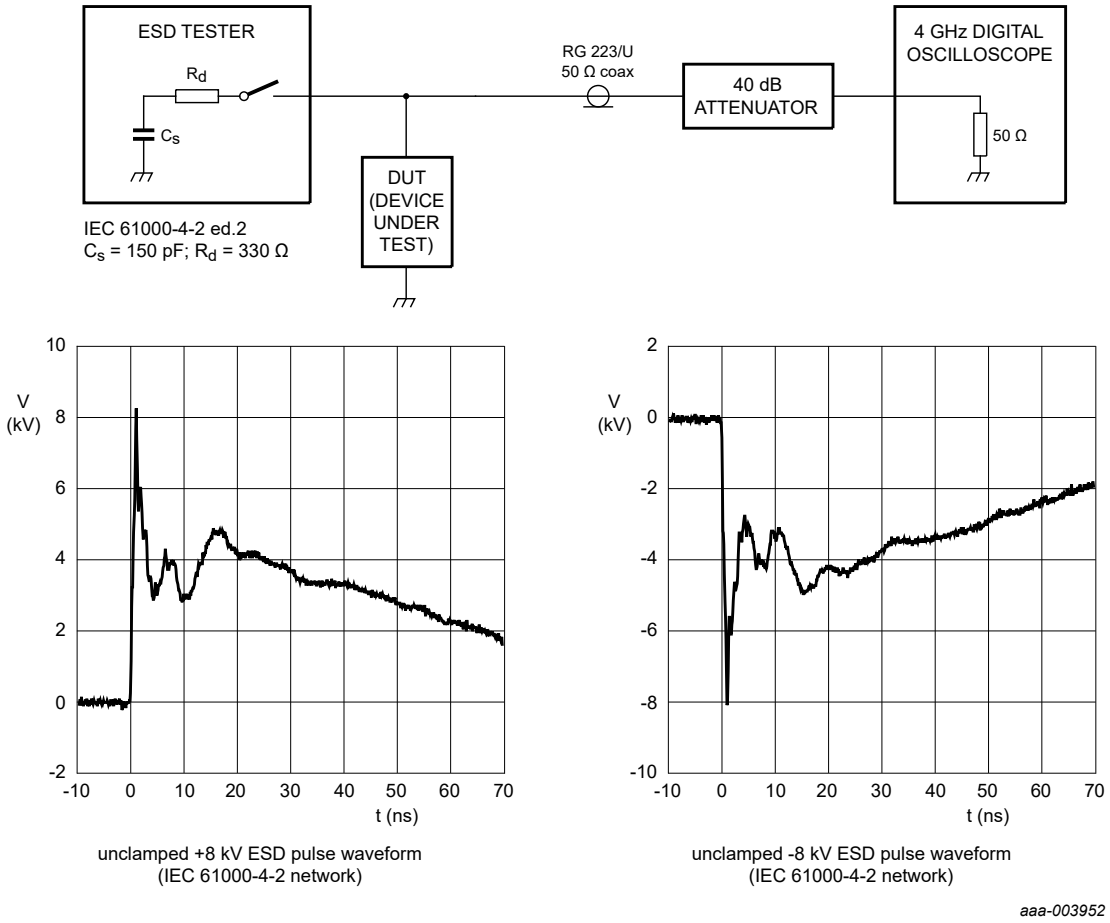


Fig. 9. ESD clamping test setup and waveforms

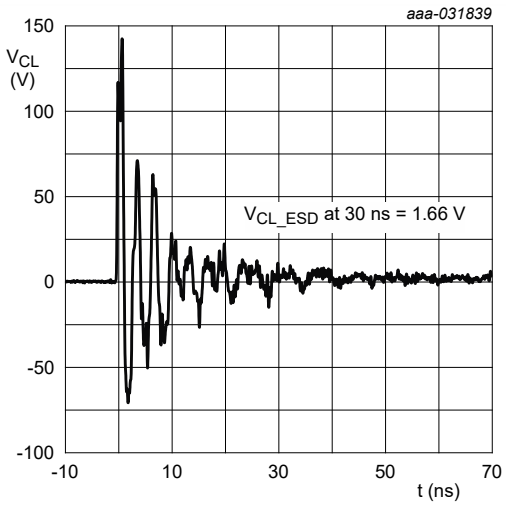


Fig. 10. Clamped +8 kV pulse waveform (IEC 61000-4-2 network)

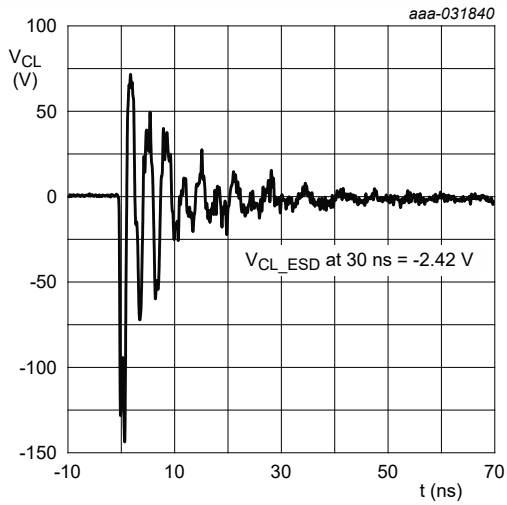


Fig. 11. Clamped -8 kV pulse waveform (IEC 61000-4-2 network)

10. Application information

The device is designed to provide high-level ESD protection for high-speed serial data buses such as USB, HDMI, DisplayPort, eSATA and LVDS data lines.

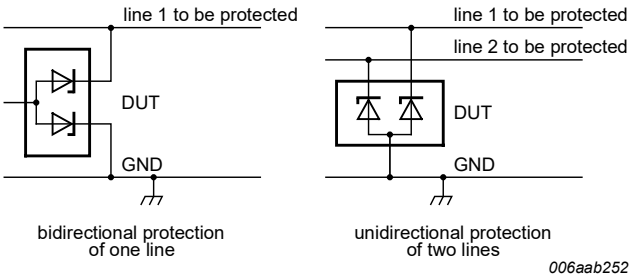


Fig. 12. Application diagram

Note: When designing the PCB, give careful consideration to impedance matching and signal coupling. Do not connect the signal lines to unlimited current sources like, for example, a battery.

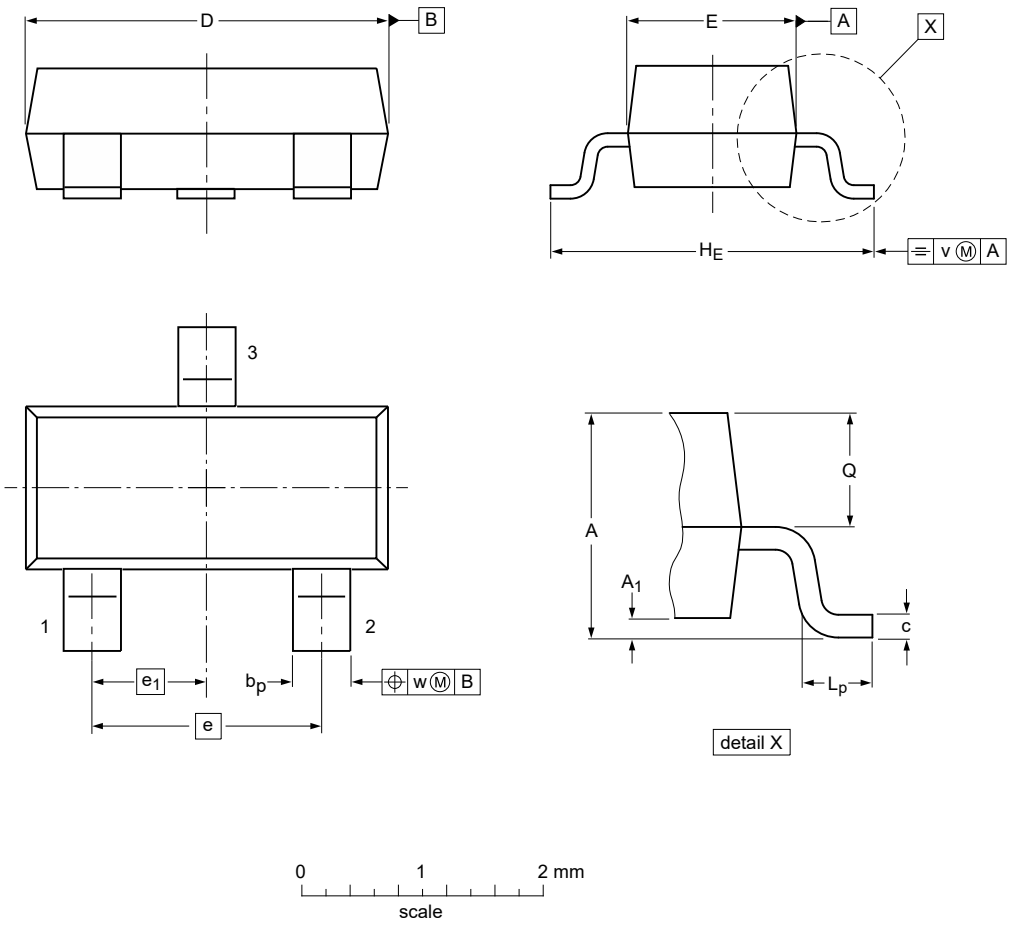
11. Test information

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

Plastic surface-mounted package; 3 leads **SOT23**



Dimensions (mm are the original dimensions)

Unit		A	A_1	b_p	c	D	E	e	e_1	H_E	L_p	Q	v	w
mm	max	1.1	0.1	0.48	0.15	3.0	1.4			2.5	0.45	0.55		
	nom							1.9	0.95				0.2	0.1
	min	0.9		0.38	0.09	2.8	1.2			2.1	0.15	0.45		

sot023_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT23		TO-236AB				~~14-06-19~~ 14-09-22

Fig. 13. Package outline SOT23

13. Soldering

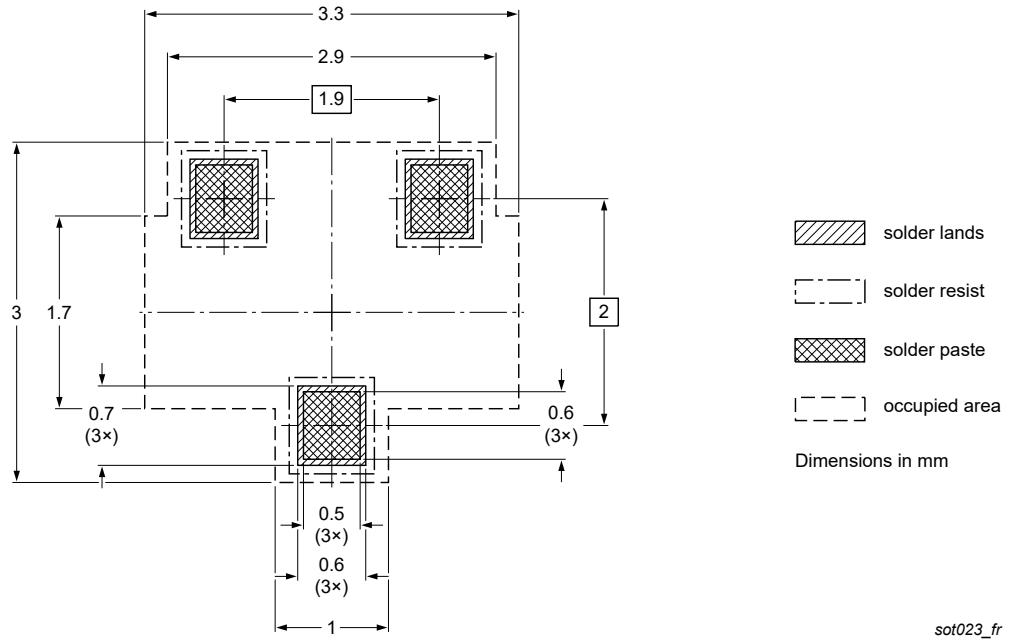


Fig. 14. Reflow soldering footprint for SOT23

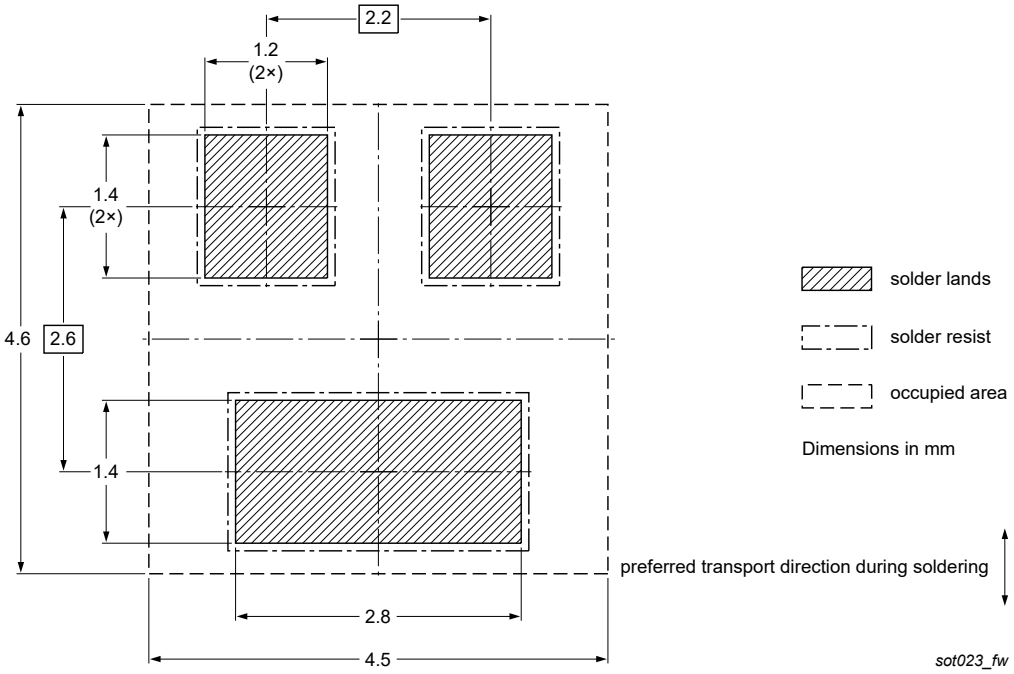


Fig. 15. Wave soldering footprint for SOT23

14. Revision history

Table 7. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PESD2USB3UV-T v.1	20200909	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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