



PESD12VS1UJ

Unidirectional ESD protection for transient voltage suppression

14 April 2023

Product data sheet

1. General description

Unidirectional ElectroStatic Discharge (ESD) protection diode in a very small Surface-Mounted Device (SMD) plastic package designed to protect one signal line from the damage caused by ESD and transient overvoltage.

2. Features and benefits

- Transient Voltage Suppression (TVS) protection of one line
- Max. peak pulse power: $P_{PP} = 600 \text{ W}$
- Low clamping voltage: $V_{CL} = 19 \text{ V}$
- Low leakage current: $I_{RM} = 1 \text{ nA}$
- ESD protection up to 30 kV
- IEC 61000-4-2; level 4 (ESD)
- IEC 61000-4-5 (surge); $I_{PP} = 22.5 \text{ A}$

3. Applications

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


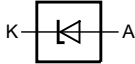
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{RWM}	reverse standoff voltage	$T_{amb} = 25 \text{ }^\circ\text{C}$	-	-	12	V
C_d	diode capacitance	$f = 1 \text{ MHz}; V_R = 0 \text{ V}; T_{amb} = 25 \text{ }^\circ\text{C}$	-	160	180	pF

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode[1]	 SC-90 (SOD323F)	 006aaa152
2	A	anode		

[1] The marking bar indicates the cathode.

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PESD12VS1UJ	SC-90	plastic, surface-mounted package; 2 leads; 1.7 mm x 1.25 mm x 0.7 mm body	SOD323F

7. Marking

Table 4. Marking codes

Type number	Marking code
PESD12VS1UJ	1R

8. Limiting values

Table 5. Limiting values

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

Symbol	Parameter	Conditions		Min	Max	Unit
P_{PPM}	rated peak pulse power	$t_p = 8/20 \mu s$	[1] [2]	-	600	W
I_{PPM}	rated peak pulse current		[1] [2]	-	22.5	A
P_{tot}	total power dissipation	$T_{amb} \leq 25 \text{ }^\circ\text{C}$	[3]	-	420	mW
			[4]	-	720	mW
T_j	junction temperature			-	150	$^\circ\text{C}$
T_{amb}	ambient temperature			-55	150	$^\circ\text{C}$
T_{stg}	storage temperature			-65	150	$^\circ\text{C}$
ESD maximum ratings						
V_{ESD}	electrostatic discharge voltage	IEC 61000-4-2 (contact discharge); $T_{amb} = 25 \text{ }^\circ\text{C}$	[5]	-	30	kV
		IEC 61000-4-2 (air discharge); $T_{amb} = 25 \text{ }^\circ\text{C}$		-	15	kV
		machine model; $T_{amb} = 25 \text{ }^\circ\text{C}$		-	400	V
		MIL-STD-883 (human body model); $T_{amb} = 25 \text{ }^\circ\text{C}$		-	16	kV

- [1] Non-repetitive current pulse 8/20 μs exponential decay waveform according to IEC 61000-4-5.
- [2] Soldering point of cathode tab
- [3] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.
- [4] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode 1 cm²
- [5] Device stressed with ten non-repetitive ESD pulses.

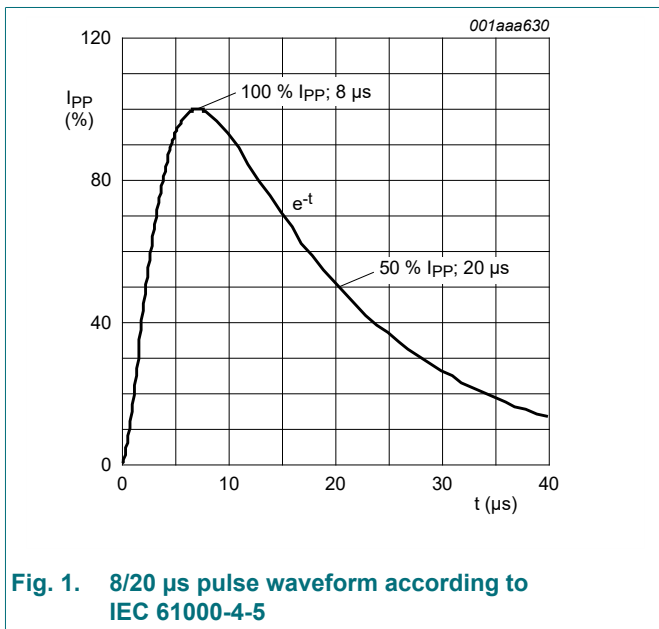


Fig. 1. 8/20 μs pulse waveform according to IEC 61000-4-5

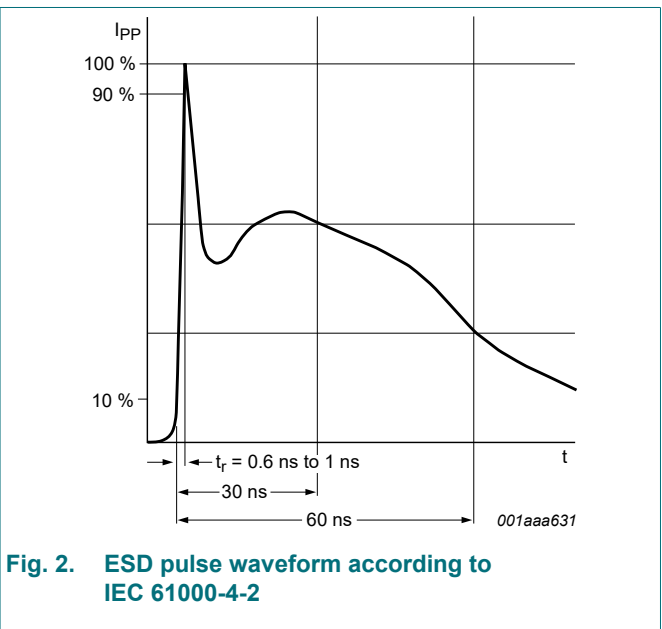


Fig. 2. ESD pulse waveform according to IEC 61000-4-2

9. 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]	-	-	290	K/W
			[2]	-	-	170	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		[3]	-	-	35	K/W

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

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode 1 cm².

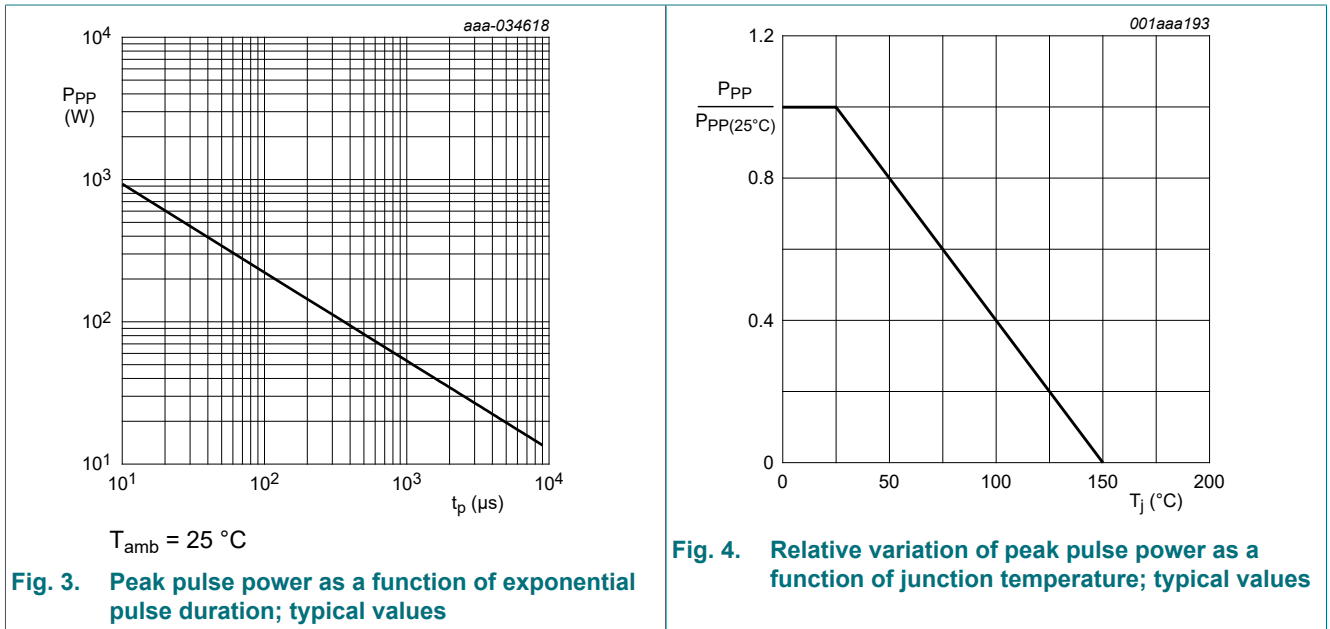
[3] Soldering point of cathode tab.

10. Characteristics

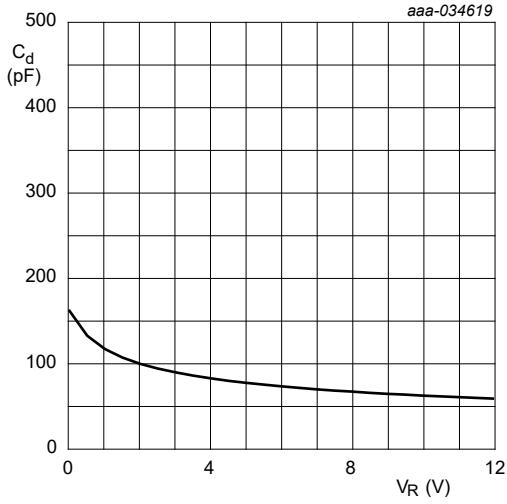
Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{RWM}	reverse standoff voltage	$T_{amb} = 25\text{ }^{\circ}\text{C}$	-	-	12	V
V_{BR}	breakdown voltage	$I_R = 5\text{ mA}; T_{amb} = 25\text{ }^{\circ}\text{C}$	13.3	14.5	15.75	V
I_{RM}	reverse leakage current	$V_{RWM} = 5\text{ V}; T_{amb} = 25\text{ }^{\circ}\text{C}$	-	1	100	nA
C_d	diode capacitance	$f = 1\text{ MHz}; V_R = 0\text{ V}; T_{amb} = 25\text{ }^{\circ}\text{C}$	-	160	180	pF
V_{CL}	clamping voltage	$I_{PP} = 22.5\text{ A}; T_{amb} = 25\text{ }^{\circ}\text{C}$	[1]	-	27	V
		$I_{PP} = 15\text{ A}; T_{amb} = 25\text{ }^{\circ}\text{C}$	[1]	-	23.5	V
		$I_{PP} = 5\text{ A}; T_{amb} = 25\text{ }^{\circ}\text{C}$	[1]	-	19	V
R_{diff}	differential resistance	$I_R = 5\text{ mA}; T_{amb} = 25\text{ }^{\circ}\text{C}$	-	5	100	Ω

[1] Non-repetitive current pulse 8/20 μ s exponential decay waveform according to IEC 61000-4-5.



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

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

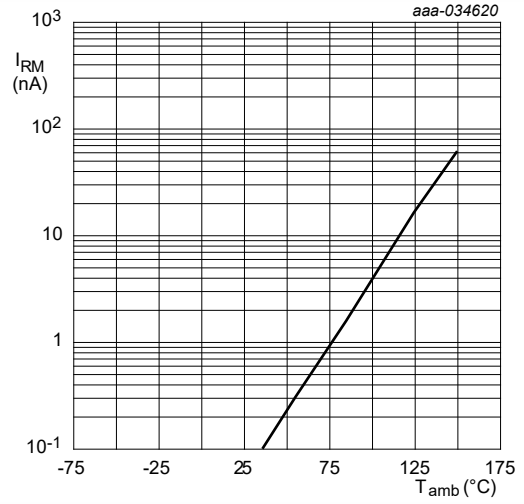


Fig. 6. Reverse leakage current as a function of ambient temperature; typical values

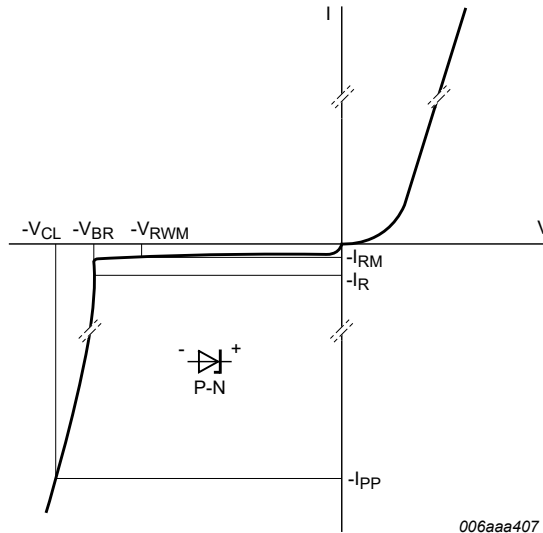


Fig. 7. V-I characteristics for a unidirectional ESD protection diode

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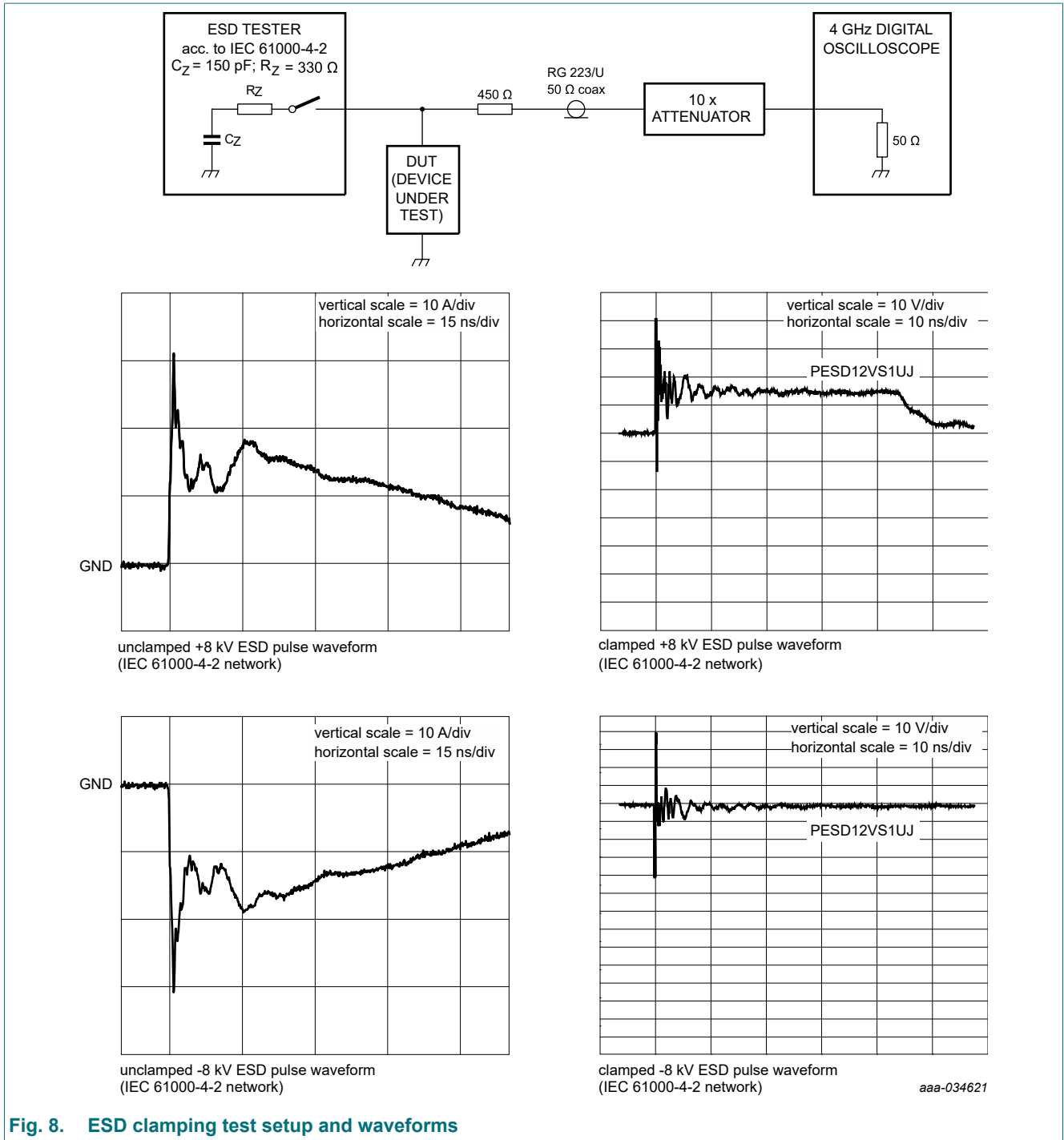


Fig. 8. ESD clamping test setup and waveforms

11. Application information

The device is designed for protection of one unidirectional data or signal line from surge pulses and ESD damage. The device is suitable on lines where the signal polarities are either positive or negative with respect to ground.

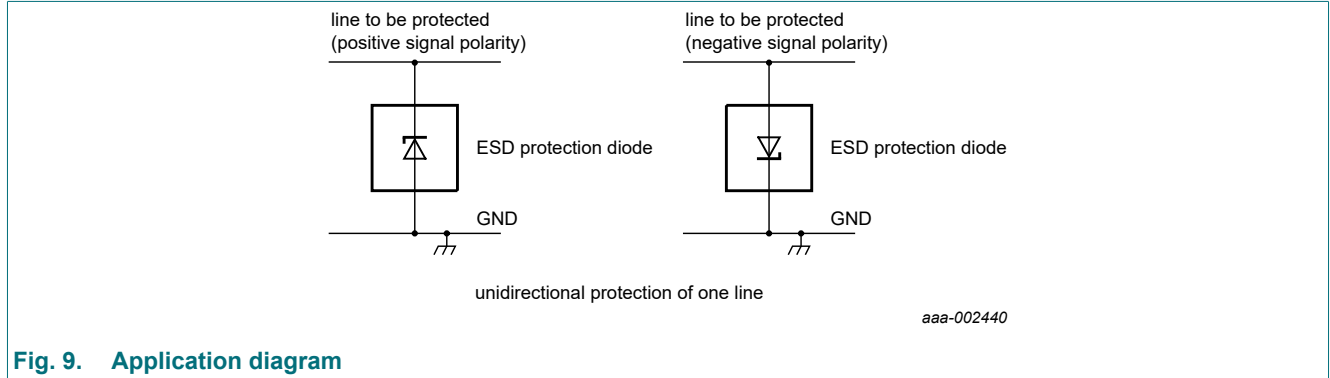


Fig. 9. Application diagram

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.

12. Package outline

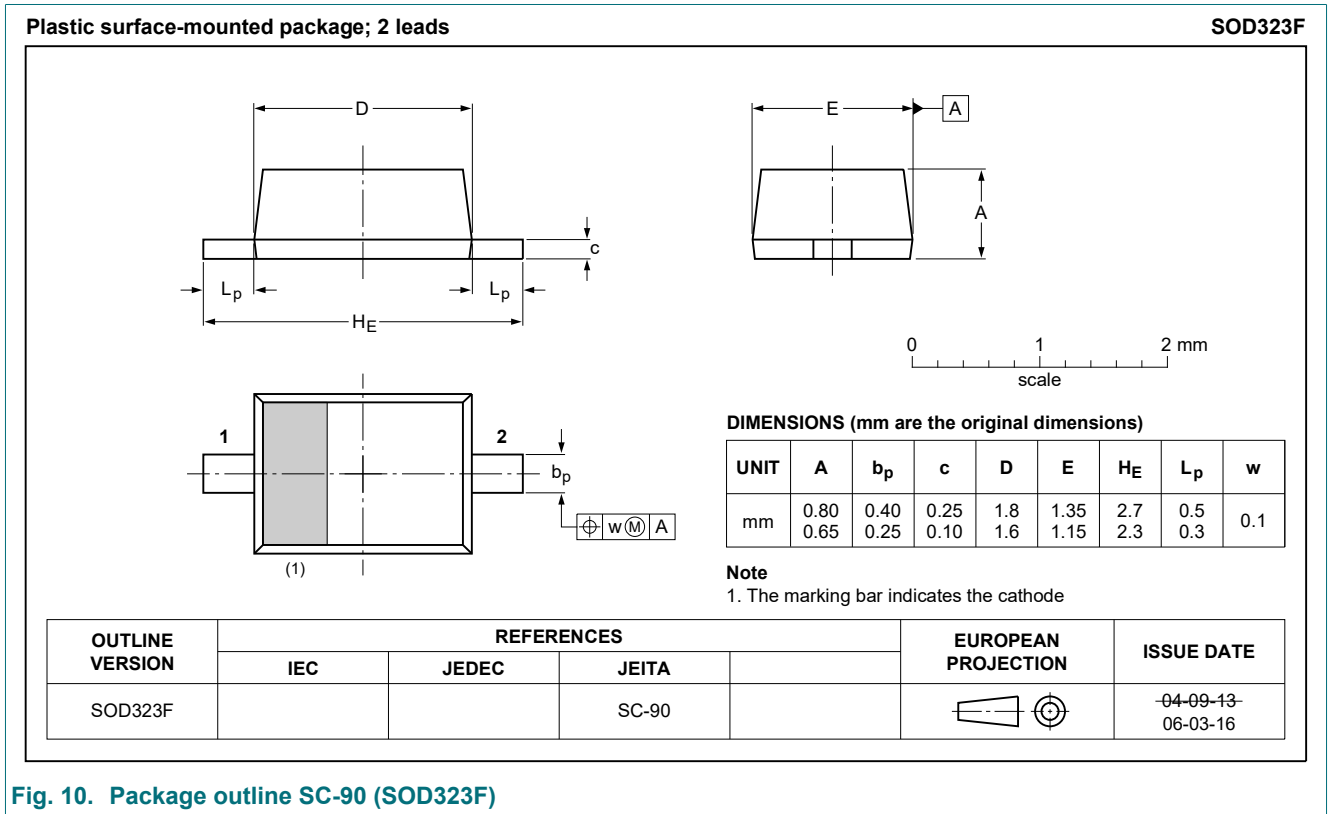


Fig. 10. Package outline SC-90 (SOD323F)

13. Soldering

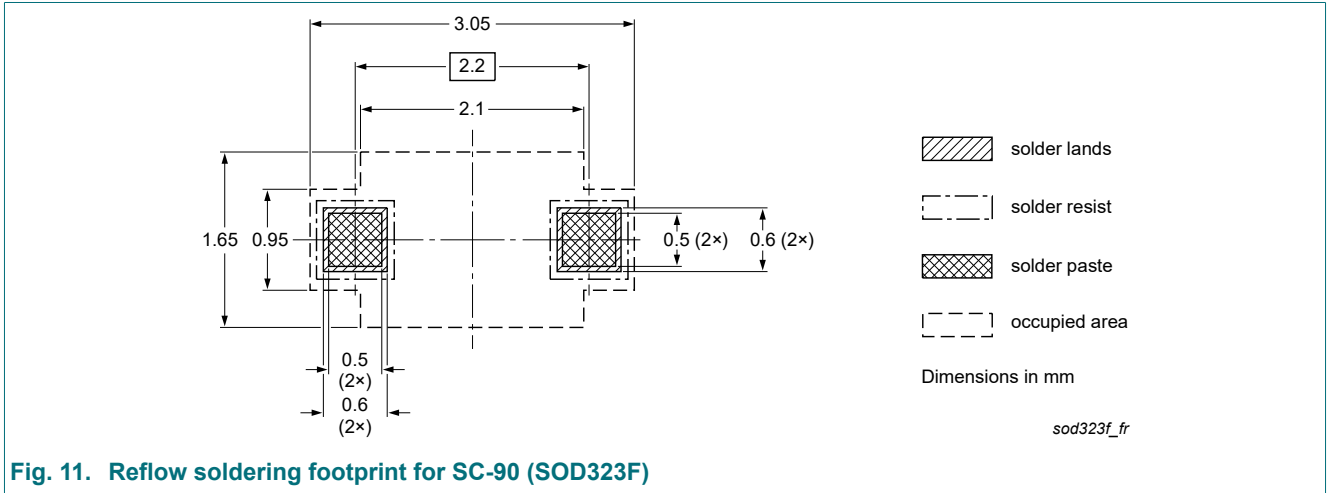


Fig. 11. Reflow soldering footprint for SC-90 (SOD323F)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PESD12VS1UJ v.2	20230414	Product data sheet	-	PESD5V0S1UJ_ PESD12VS1UJ_1
Modifications:	<ul style="list-style-type: none"> The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia Family data sheet reduced to single type data sheet Product changed to non-automotive qualification. Please refer to nexperia.com for automotive (-Q) product alternative(s). 			
PESD5V0S1UJ_ PESD12VS1UJ_1	20090603	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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