PESD2IVN-U

In-vehicle network ESD protection diode

15 July 2015 Product data sheet

1. General description

ElectroStatic Discharge (ESD) protection diode in a very small SOT323 (SC-70) Surface-Mounted Device (SMD) plastic package designed to protect two automotive in-vehicle network lines from the damage caused by ESD and other transients.

2. Features and benefits

- One very small SOT323 package to protect two in-vehicle network lines
- Low clamping voltage: V_{CL} = 38 V at I_{PP} = 1 A
- Typical diode capacitance matching $\Delta C_d/C_d$ = 0.1 %
- ESD protection up to 18 kV; IEC 61000-4-2, level 4
- IEC 61000-4-5 (surge); I_{PP} = 3 A at t_p = 8/20 µs
- AEC-Q101 qualified

3. Applications

- In-vehicle network ESD protection for CAN, LIN, FlexRay and Single Edge Nibble Transmission (SENT) interfaces
- Generic automotive applications

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		-	-	26.5	V
C_d	diode capacitance	f = 1 MHz; V_R = 0 V; T_{amb} = 25 °C		-	8.5	11	pF

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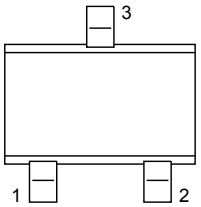
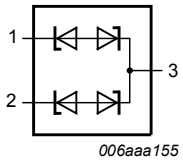
5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode	 SC-70 (SOT323)	
2	K	cathode		
3	CC	common cathode		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PESD2IVN-U	SC-70	plastic surface-mounted package; 3 leads	SOT323

7. Marking

Table 4. Marking codes

Type number	Marking code [1]
PESD2IVN-U	3Y%

[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
P_{PPM}	rated peak pulse power	t_p = 8/20 µs	[1][2]	-	150	W
I_{PPM}	rated peak pulse current		[1][2]	-	3	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]	-	18	kV
		MIL-STD-883 (human body model)	[2][3]	-	10	kV

[1] Non-repetitive current pulse 8/20 µs exponential decay waveform according to IEC 61000-4-5 and IEC 61643-321.
[2] Measured from pin 1 or 2 to 3.
[3] Device stressed with ten non-repetitive ESD pulses.

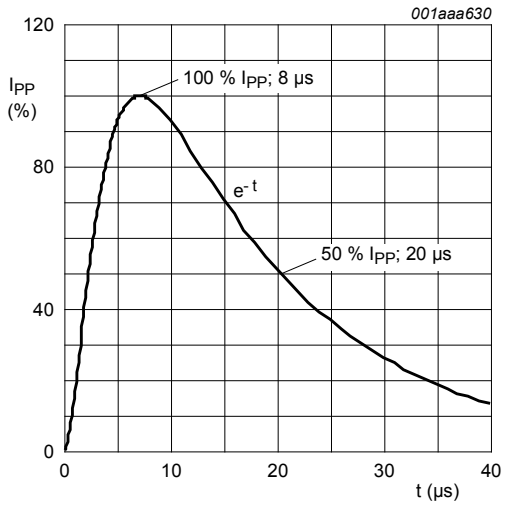


Fig. 1. 8/20 µs pulse waveform according to IEC 61000-4-5 and IEC 61643-321

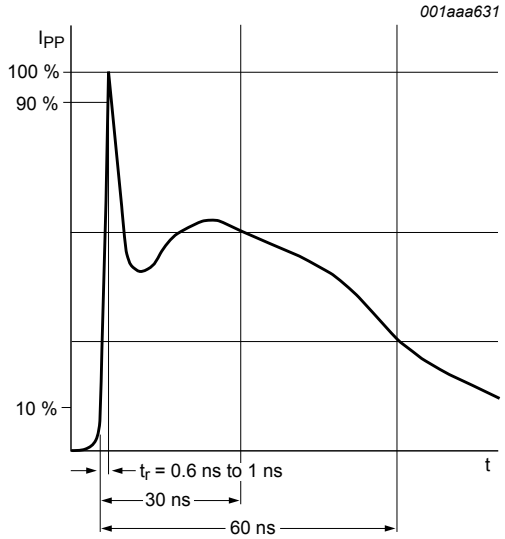


Fig. 2. ESD pulse waveform according to IEC 61000-4-2

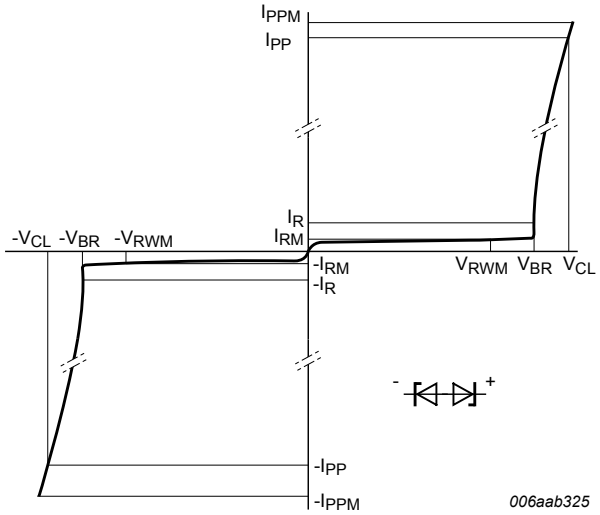


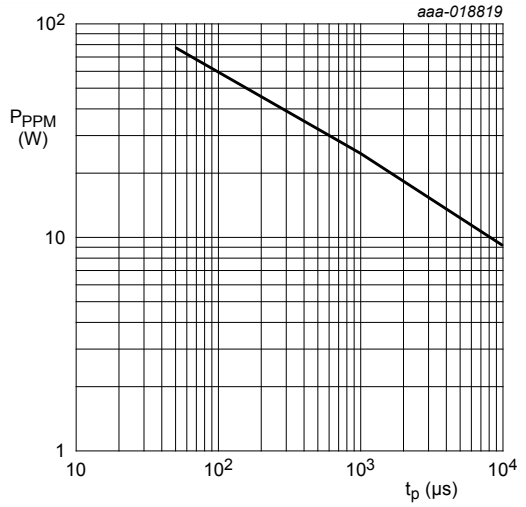
Fig. 3. V-I characteristics for a bidirectional ESD protection diode

9. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{RWM}	reverse standoff voltage	T_{amb} = 25 °C		-	-	26.5	V
I_{RM}	reverse leakage current	V_{RWM} = 26.5 V; T_{amb} = 25 °C		-	1	50	nA
V_{BR}	breakdown voltage	I_R = 5 mA; T_{amb} = 25 °C		28	30	32	V
C_d	diode capacitance	f = 1 MHz; V_R = 0 V; T_{amb} = 25 °C		-	8.5	11	pF
		f = 1 MHz; V_R = 2.5 V; T_{amb} = 25 °C		-	6.6	-	pF
$\Delta C_d/C_d$	diode capacitance matching	f = 1 MHz; V_R = 0 V; T_{amb} = 25 °C		-	0.1	-	%
		f = 1 MHz; V_R = 2.5 V; T_{amb} = 25 °C		-	0.1	-	%
V_{CL}	clamping voltage	I_{PP} = 1 A; T_{amb} = 25 °C	[1][2]	-	-	38	V
		I_{PPM} = 3 A; T_{amb} = 25 °C	[1][2]	-	-	53	V
R_{dyn}	dynamic resistance	I_R = 20 A; T_{amb} = 25 °C	[3]	-	2	-	Ω

[1] Non-repetitive current pulse 8/20 µs exponential decay waveform according to IEC 61000-4-5 and IEC 61643-321.
[2] Measured from pin 1 or 2 to 3.
[3] Non-repetitive current pulse, Transmission line Pulse (TLP), square pulse, ANSI/ESD STM5.5.1-2008.



T_{amb} = 25 °C

Fig. 4. Rated peak pulse power as a function of square pulse duration; typical values

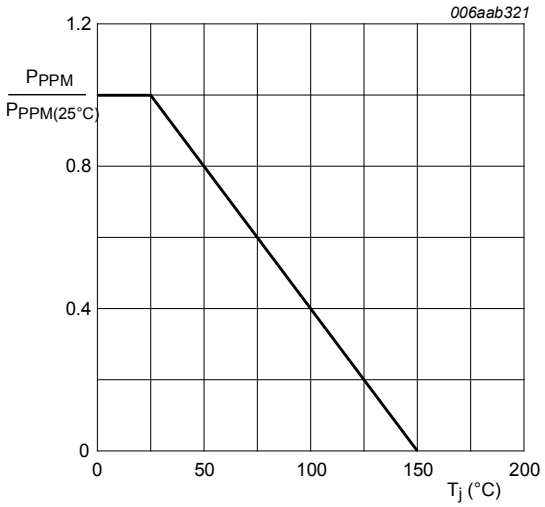
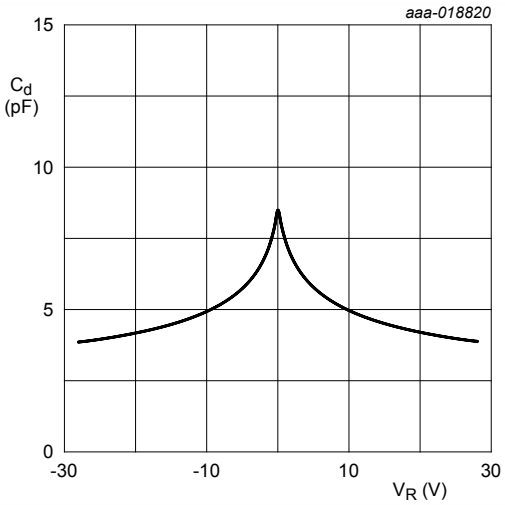


Fig. 5. Relative variation of rated peak pulse power as a function of junction temperature; typical values



f = 1 MHz; T_{amb} = 25 °C

Fig. 6. Diode capacitance as a function of reverse voltage; typical values

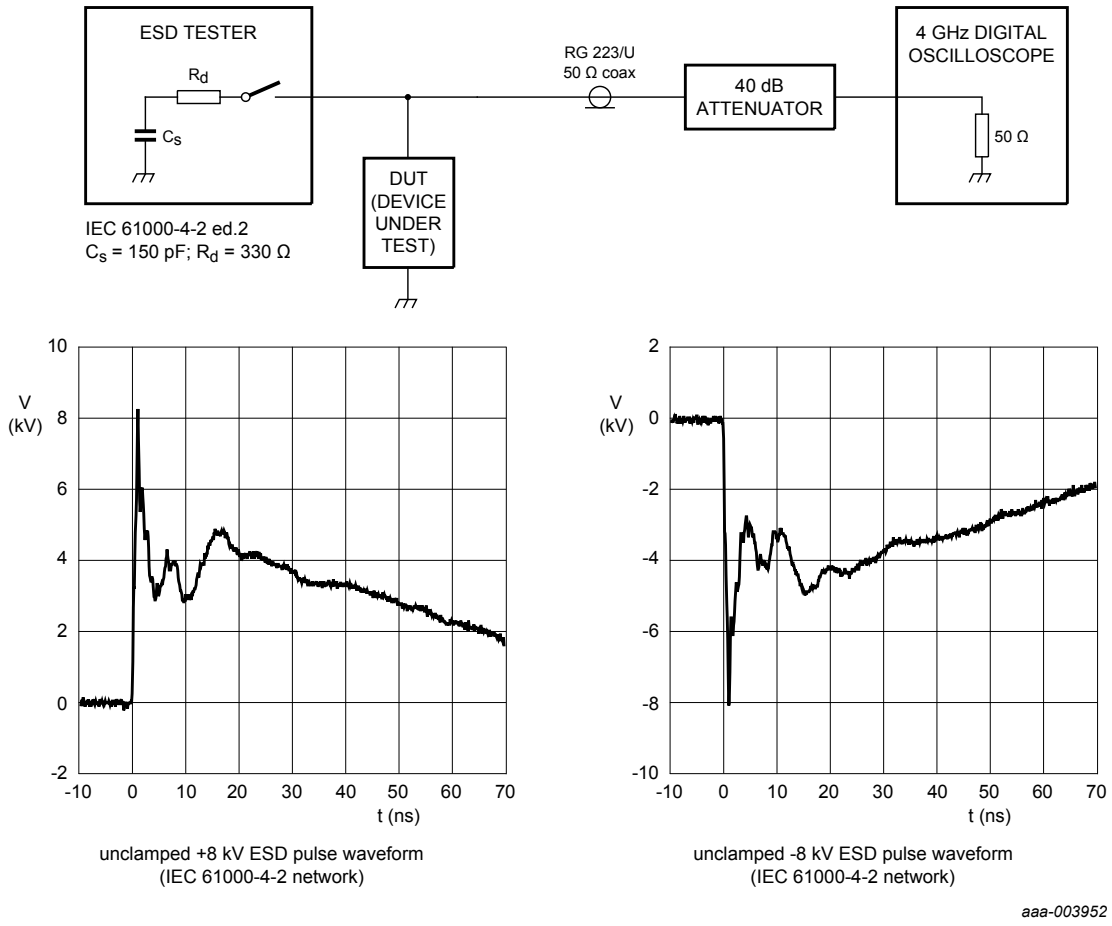


Fig. 7. ESD clamping test setup and waveforms

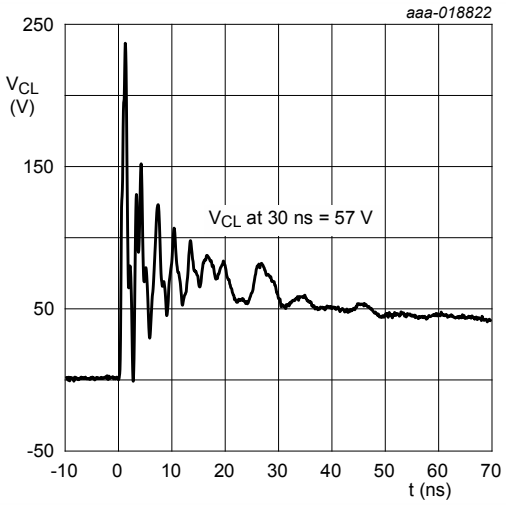


Fig. 8. Clamped +8 kV pulse waveform (IEC 61000-4-2 network)

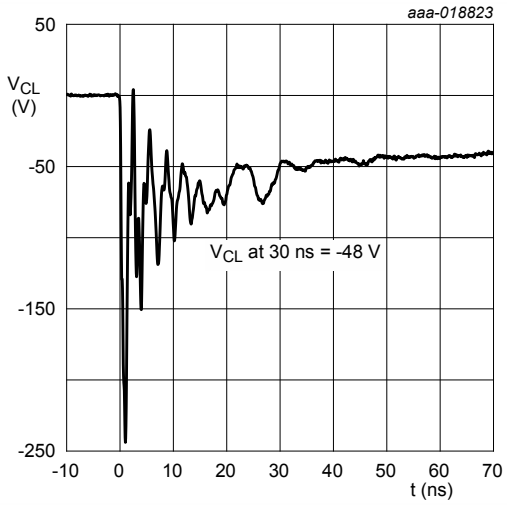


Fig. 9. Clamped -8 kV pulse waveform (IEC 61000-4-2 network)

10. Application information

The device is designed for the protection of two automotive in-vehicle network bus lines from surge pulses and ESD damage. The device provides a surge capability of up to 3 A for an 8/20 µs waveform.

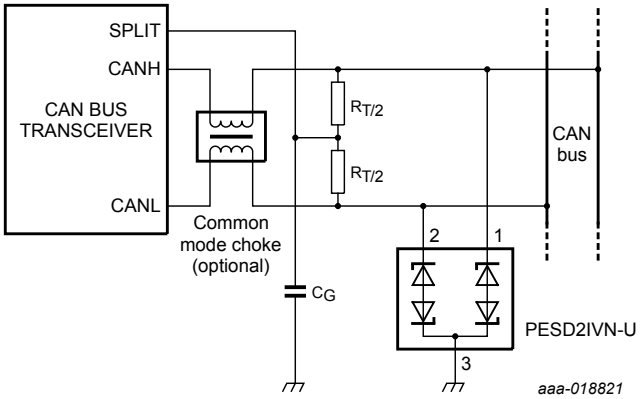


Fig. 10. Typical application: ESD protection of one automotive CAN bus line

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 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

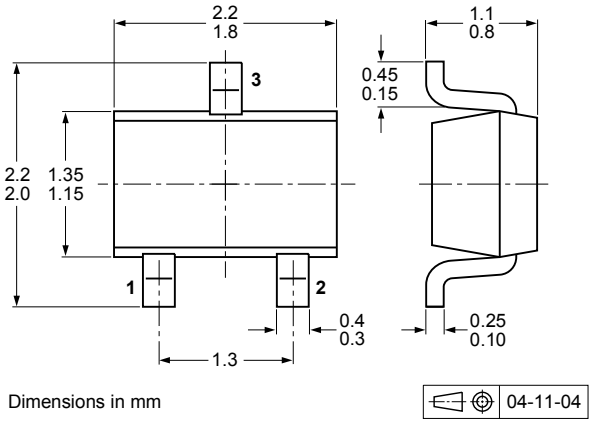


Fig. 11. Package outline SC-70 (SOT323)

12. Soldering

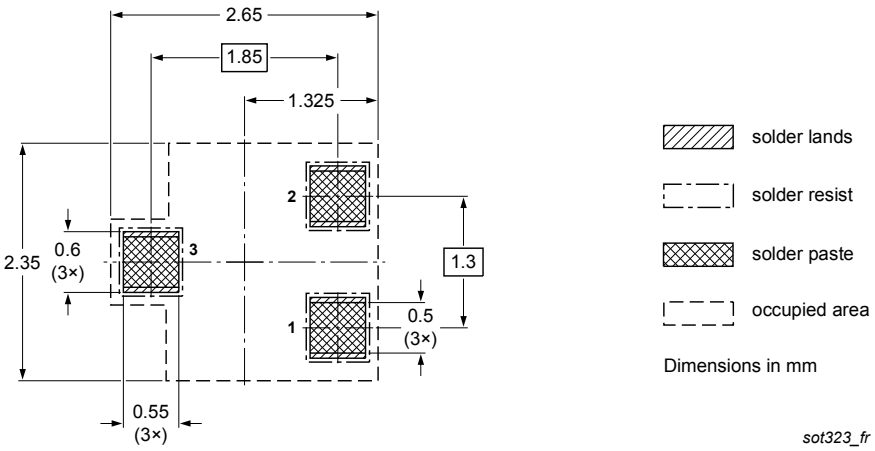


Fig. 12. Reflow soldering footprint for SC-70 (SOT323)

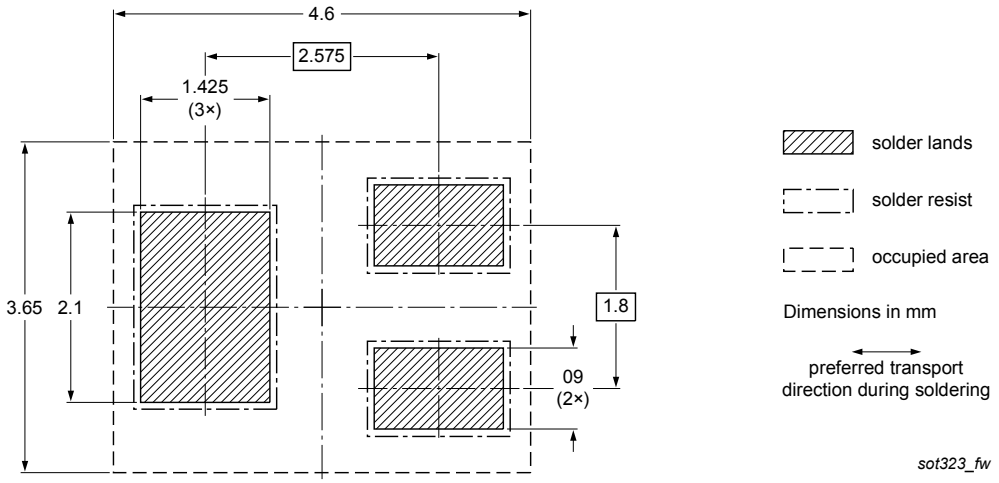


Fig. 13. Wave soldering footprint for SC-70 (SOT323)

13. Revision history

Table 7. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PESD2IVN-U v.1	20150715	Product data sheet	-	-

14. Legal information

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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.
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