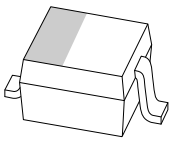


PESD1LIN

LIN-bus ESD protection diode

Rev. 3 — 31 May 2011 Product data sheet

1. Product profile

1.1 General description

PESD1LIN in a very small SOD323 (SC-76) Surface-Mounted Device (SMD) plastic package designed to protect one automotive Local Interconnect Network (LIN) bus line from the damage caused by ElectroStatic Discharge (ESD) and other transients.

1.2 Features and benefits

- ESD protection of one automotive LIN-bus line
- Asymmetrical diode configuration ensures an optimized protection against ElectroMagnetic Interferences (EMI) of a LIN Electronic Control Unit (ECU)
- Max. peak pulse power: P_{PP} = 160 W at t_p = 8/20 μs
- Low clamping voltage: V_{CL} = 40 V at I_{PP} = 1 A
- Ultra low leakage current: I_{RM} < 1 nA
- ESD protection of up to 23 kV
- IEC 61000-4-2, level 4 (ESD)
- IEC 61000-4-5 (surge); I_{PP} = 3 A at t_p = 8/20 μs
- AEC-Q101 qualified

1.3 Applications

- LIN-bus protection
- Automotive applications

1.4 Quick reference data

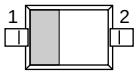
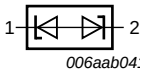
Table 1. Quick reference data

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{RWM}	reverse standoff voltage					
	PESD1LIN (15 V)		-	-	15	V
	PESD1LIN (24 V)		-	-	24	V
C_d	diode capacitance	V_R = 0 V; f = 1 MHz	-	13	17	pF

2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Graphic symbol
1	cathode 1 (15 V)		
2	cathode 2 (24 V)		

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PESD1LIN	SC-76	plastic surface-mounted package; 2 leads	SOD323

4. Marking

Table 4. Marking codes

Type number	Marking code
PESD1LIN	AM

5. Limiting values

Table 5. Limiting values

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

Symbol	Parameter	Conditions		Min	Max	Unit
P_{PP}	peak pulse power	t_p = 8/20 μs	[1]	-	160	W
I_{PP}	peak pulse current	t_p = 8/20 μs	[1]	-	3	A
T_j	junction temperature			-	150	°C
T_{amb}	ambient temperature			−65	+150	°C
T_{stg}	storage temperature			−65	+150	°C

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

Table 6. ESD maximum ratings

Symbol	Parameter	Conditions		Min	Max	Unit
V_{ESD}	electrostatic discharge voltage	IEC 61000-4-2 (contact discharge)	[1]	-	23	kV
		MIL-STD-883 (human body model)		-	10	kV

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

Table 7. ESD standards compliance

Standard	Conditions
IEC 61000-4-2; level 4 (ESD)	> 15 kV (air); > 8 kV (contact)
MIL-STD-883; class 3 (human body model)	> 4 kV

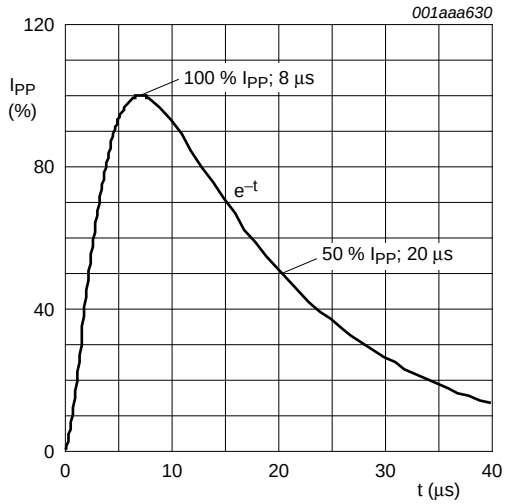


Fig 1. 8/20 µs pulse waveform according to IEC 61000-4-5

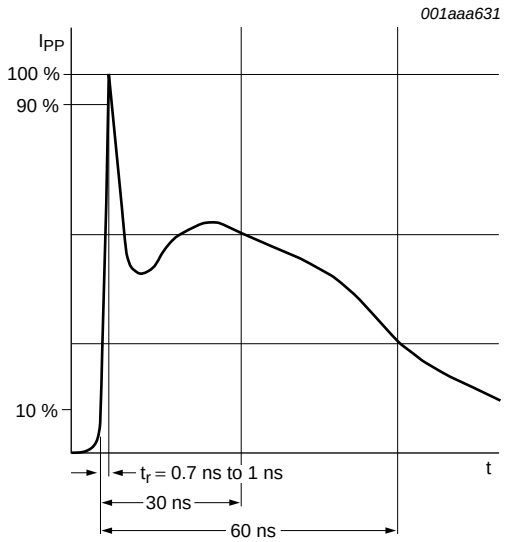


Fig 2. ESD pulse waveform according to IEC 61000-4-2

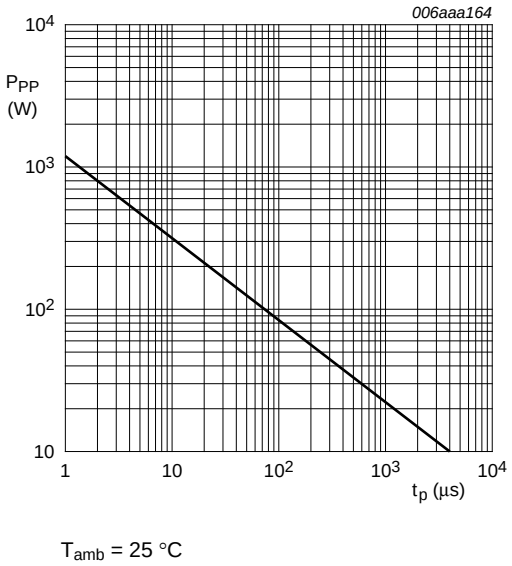
6. Characteristics

Table 8. Characteristics

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{RWM}	reverse standoff voltage					
	PESD1LIN (15 V)		-	-	15	V
	PESD1LIN (24 V)		-	-	24	V
I_{RM}	reverse leakage current					
	PESD1LIN (15 V)	V_{RWM} = 15 V	-	< 1	50	nA
	PESD1LIN (24 V)	V_{RWM} = 24 V	-	< 1	50	nA
V_{BR}	breakdown voltage	I_R = 5 mA				
	PESD1LIN (15 V)		17.1	18.9	20.3	V
	PESD1LIN (24 V)		25.4	27.8	30.3	V
C_d	diode capacitance	V_R = 0 V; f = 1 MHz	-	13	17	pF
V_{CL}	clamping voltage	[1]				
	PESD1LIN (15 V)	I_{PP} = 1 A	-	-	25	V
		I_{PP} = 5 A	-	-	44	V
	PESD1LIN (24 V)	I_{PP} = 1 A	-	-	40	V
		I_{PP} = 3 A	-	-	70	V
r_{dif}	differential resistance					
	PESD1LIN (15 V)	I_R = 1 mA	-	-	225	Ω
	PESD1LIN (24 V)	I_R = 1 mA	-	-	300	Ω

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



T_{amb} = 25 °C

Fig 3. Peak pulse power as a function of exponential pulse duration; typical values

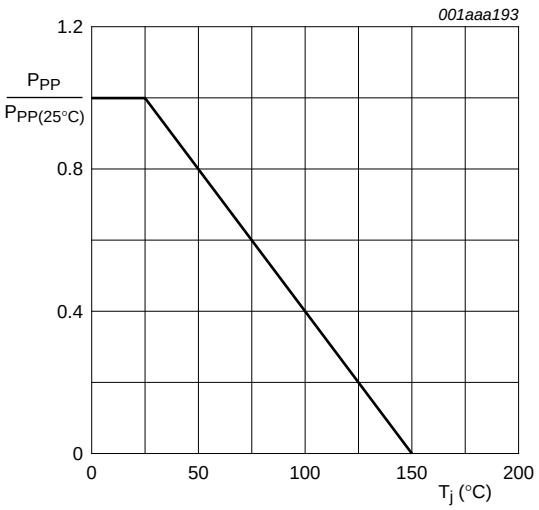
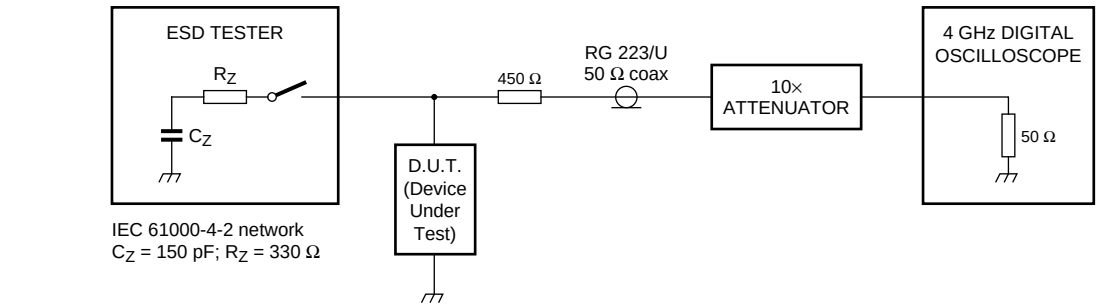
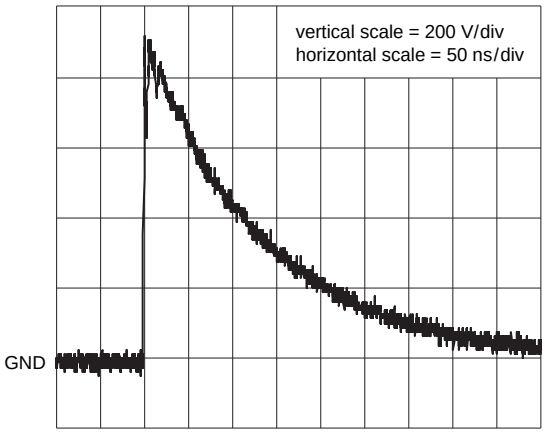
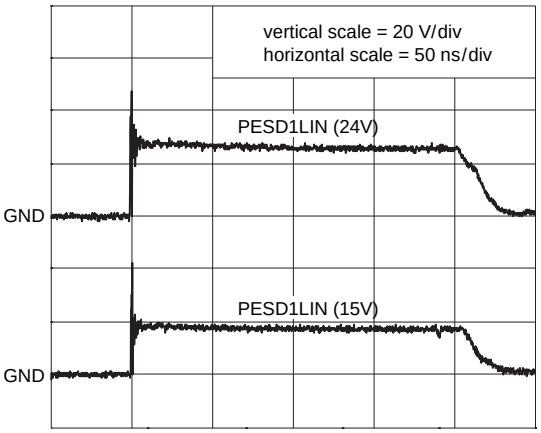


Fig 4. Relative variation of peak pulse power as a function of junction temperature; typical values

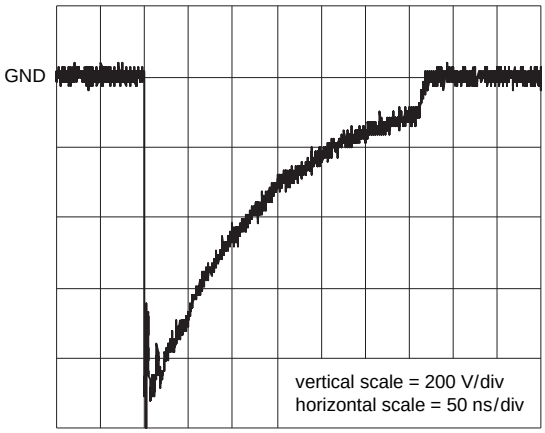




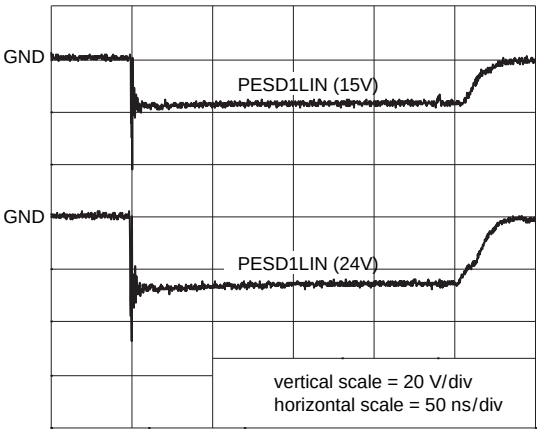
unclamped +1 kV ESD voltage waveform
(IEC 61000-4-2 network)



clamped +1 kV ESD voltage waveform
(IEC 61000-4-2 network)



unclamped –1 kV ESD voltage waveform
(IEC 61000-4-2 network)



clamped –1 kV ESD voltage waveform
(IEC 61000-4-2 network)

006aaa166

Fig 5. ESD clamping test setup and waveforms

7. Application information

The PESD1LIN is designed for the protection of one LIN-bus signal line from the damage caused by ESD and surge pulses. The PESD1LIN provides a surge capability of up to 160 W per line for a 8/20 μs waveform.

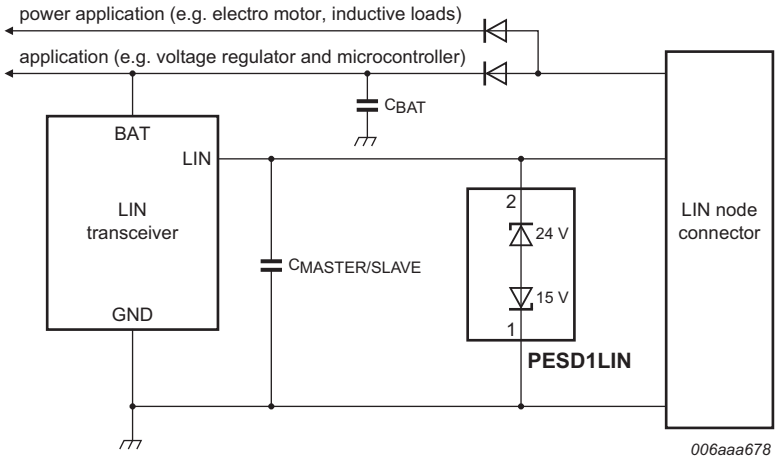


Fig 6. Typical application: ESD protection of one automotive LIN-bus line

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 PESD1LIN as close to the input terminal or connector as possible.
2. The path length between the PESD1LIN and the protected line should be minimized.
3. Keep parallel signal paths to a minimum.
4. Avoid running protection conductors in parallel with unprotected conductor.
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

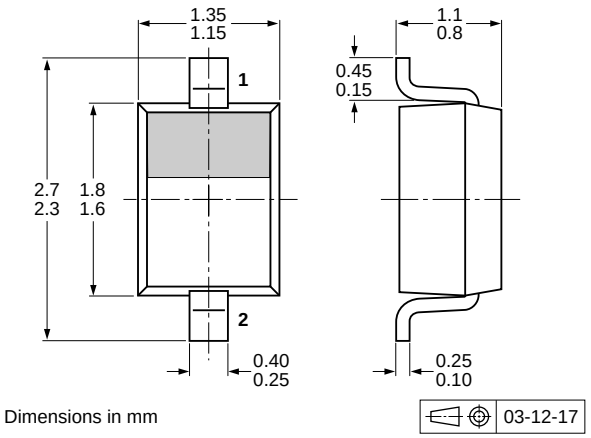


Fig 7. Package outline SOD323 (SC-76)

10. Packing information

Table 9. Packing methods

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

Type number	Package	Description	Packing quantity	
			3000	10000
PESD1LIN	SOD323	4 mm pitch, 8 mm tape and reel	-115	-135

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

11. Soldering

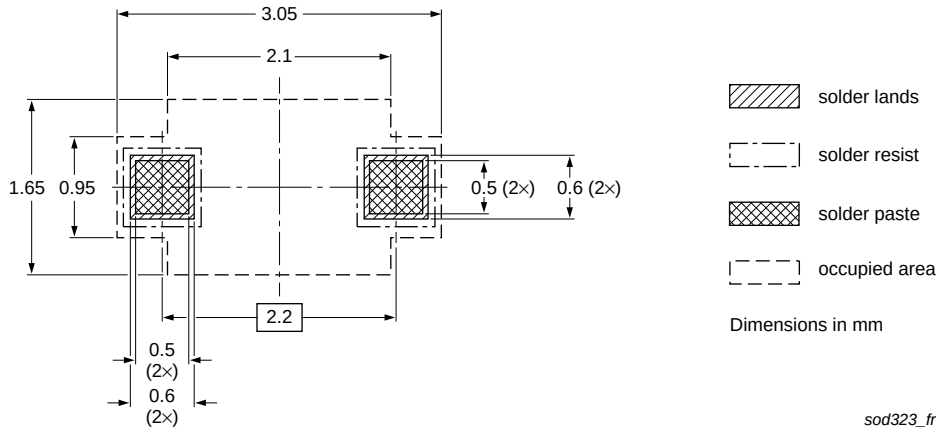


Fig 8. Reflow soldering footprint SOD323 (SC-76)

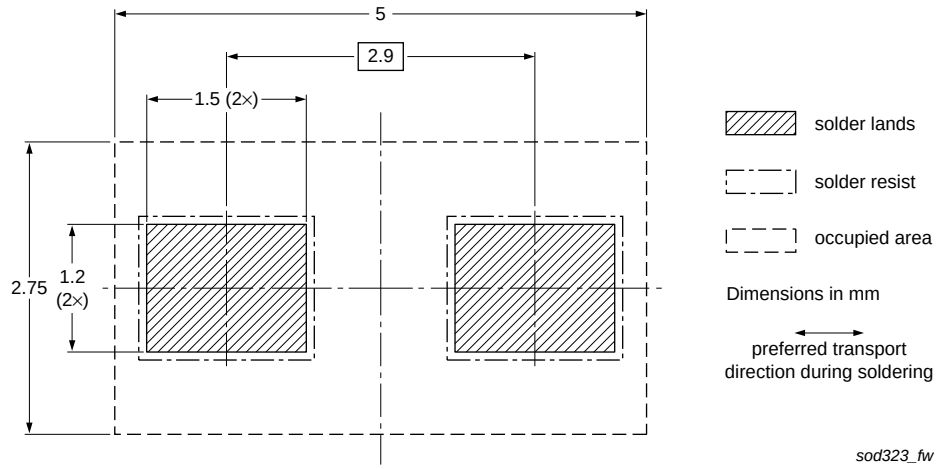


Fig 9. Wave soldering footprint SOD323 (SC-76)

12. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PESD1LIN v.3	20110531	Product data sheet	-	PESD1LIN v.2
Modifications:	• Section 1.2 “Features and benefits”: updated. • Figure 6: updated. • Section 8 “Test information”: added. • Section 13 “Legal information”: updated.			
PESD1LIN v.2	20081112	Product data sheet	-	PESD1LIN v.1
PESD1LIN v.1	20041026	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.nxp.com.

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