



PESD11VN-U

In-vehicle network ESD protection diode

15 July 2015

Product data sheet

1. General description

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

2. Features and benefits

- One small SOT323 package to protect one in-vehicle network line
- Low clamping voltage: $V_{CL} = 38 \text{ V}$ at $I_{PP} = 1 \text{ A}$
- ESD protection up to 18 kV; IEC 61000-4-2, level 4
- IEC 61000-4-5 (surge); $I_{PP} = 3 \text{ A}$ at $t_p = 8/20 \mu\text{s}$
- AEC-Q101 qualified

3. Applications

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

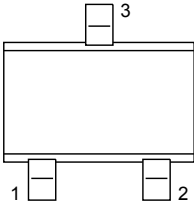
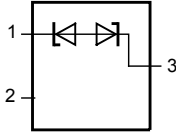
4. Quick reference data

Table 1. Quick reference data

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-----------|--------------------------|---|-----|-----|------|------|
| V_{RWM} | reverse standoff voltage | $T_{amb} = 25 \text{ }^\circ\text{C}$ | - | - | 26.5 | V |
| C_d | diode capacitance | $f = 1 \text{ MHz}; V_R = 0 \text{ V}; T_{amb} = 25 \text{ }^\circ\text{C}$ | - | 8.5 | 11 | pF |

5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|-----|--------|---------------|---|---|
| 1 | K1 | cathode 1 |  <p>SC-70 (SOT323)</p> |  <p>aaa-018783</p> |
| 2 | n.c. | not connected | | |
| 3 | K2 | cathode 2 | | |

6. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|-------------|---------|--|---------|
| | Name | Description | Version |
| PESD1IVN-U | SC-70 | plastic surface-mounted package; 3 leads | SOT323 |

7. Marking

Table 4. Marking codes

| Type number | Marking code [1] |
|-------------|---------------------|
| PESD1IVN-U | 3X% |

[1] % = placeholder for manufacturing site code

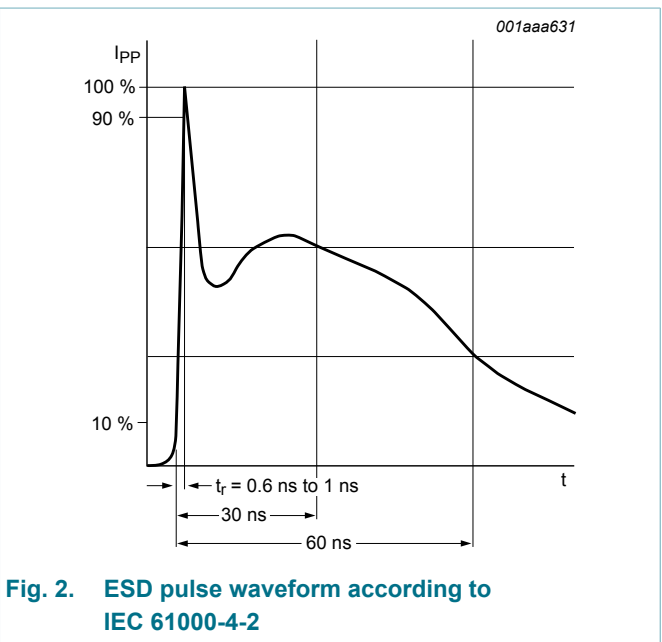
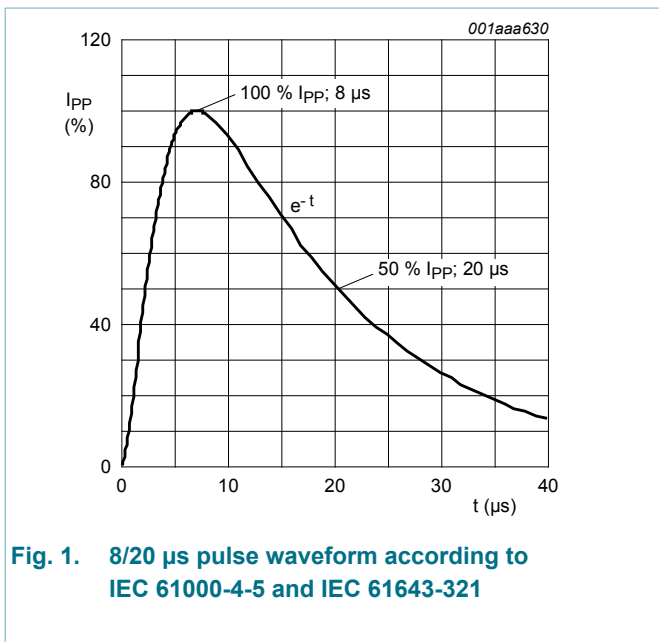
8. Limiting values

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 | $t_p = 8/20 \mu s$ | [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 to 3.
- [3] Device stressed with ten non-repetitive ESD pulses.



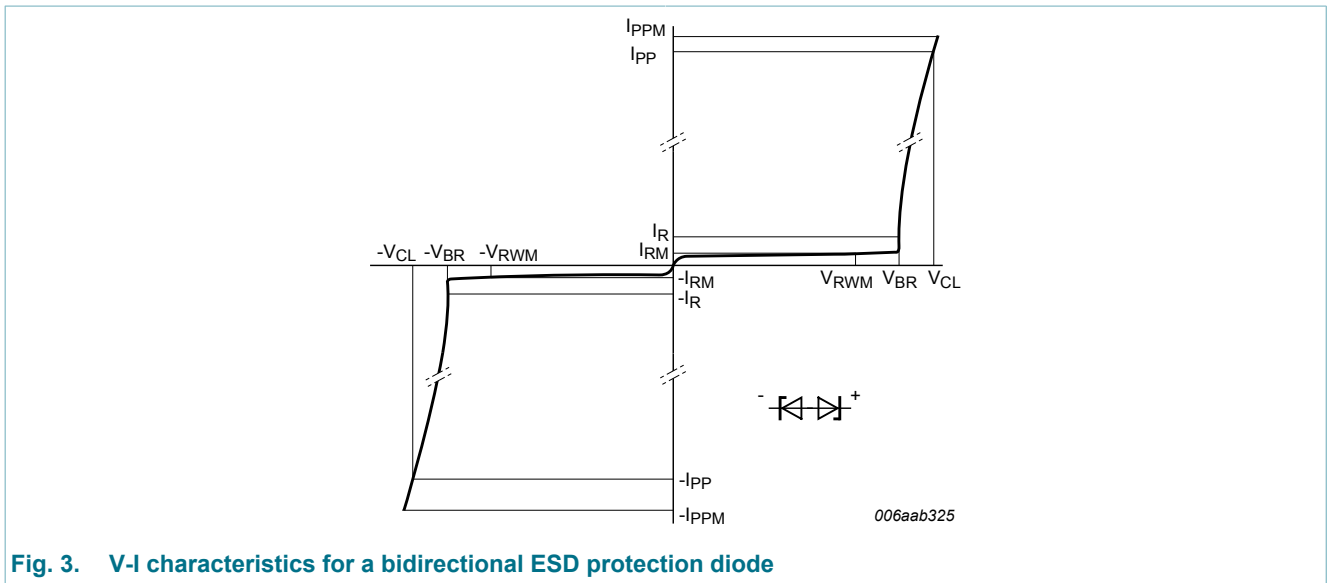


Fig. 3. V-I characteristics for a bidirectional ESD protection diode

9. Characteristics

Table 6. Characteristics

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

[1] Non-repetitive current pulse 8/20 μ s exponential decay waveform according to IEC 61000-4-5 and IEC 61643-321.

[2] Measured from pin 1 to 3.

[3] Non-repetitive current pulse, Transmission line Pulse (TLP), square pulse, ANSI/ESD STM5.5.1-2008.

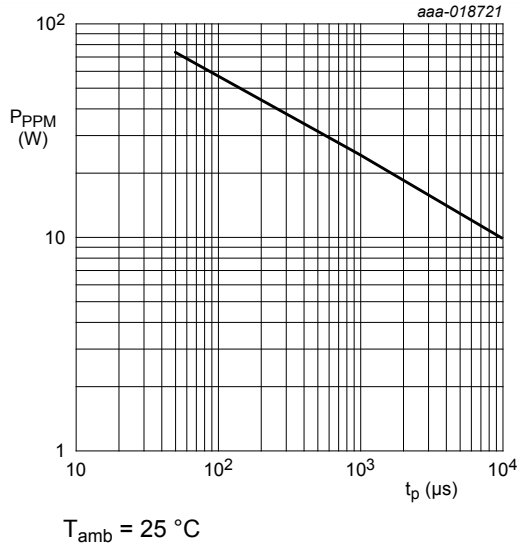


Fig. 4. Rated peak pulse power as a function of square pulse duration; typical values

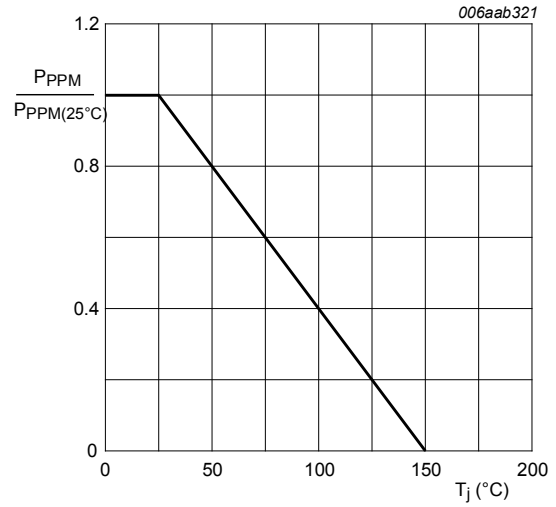


Fig. 5. Relative variation of rated peak pulse power as a function of junction temperature; typical values

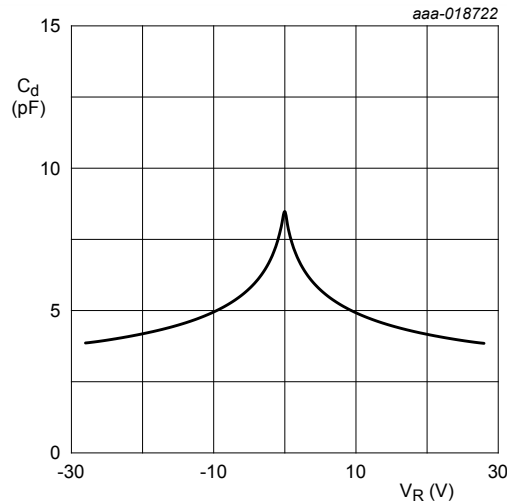


Fig. 6. Diode capacitance as a function of reverse voltage; typical values

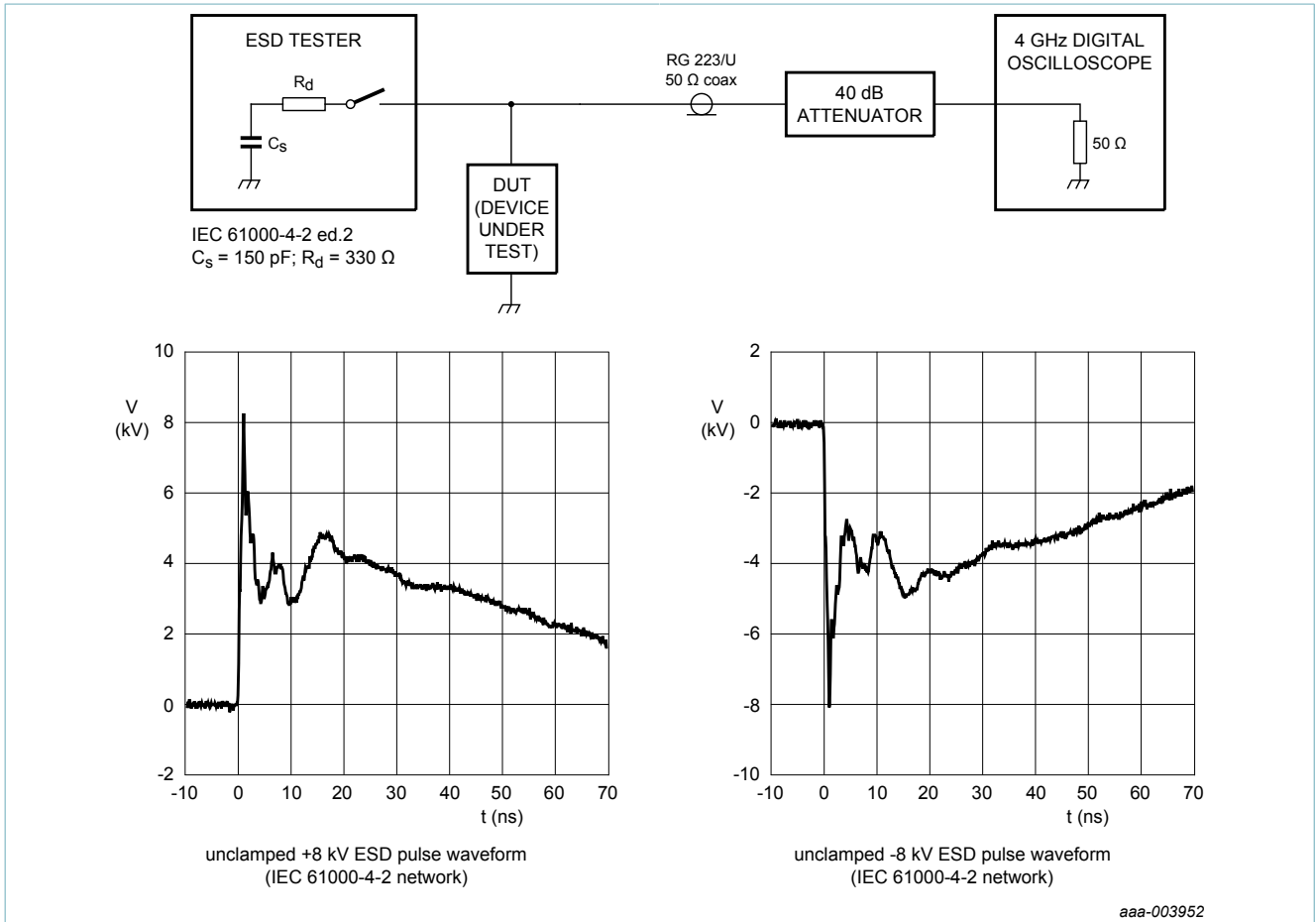


Fig. 7. ESD clamping test setup and waveforms

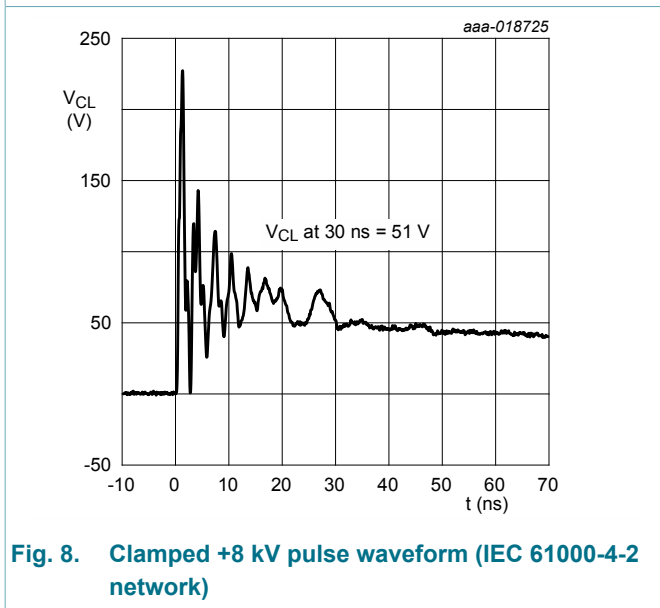


Fig. 8. Clamped +8 kV pulse waveform (IEC 61000-4-2 network)

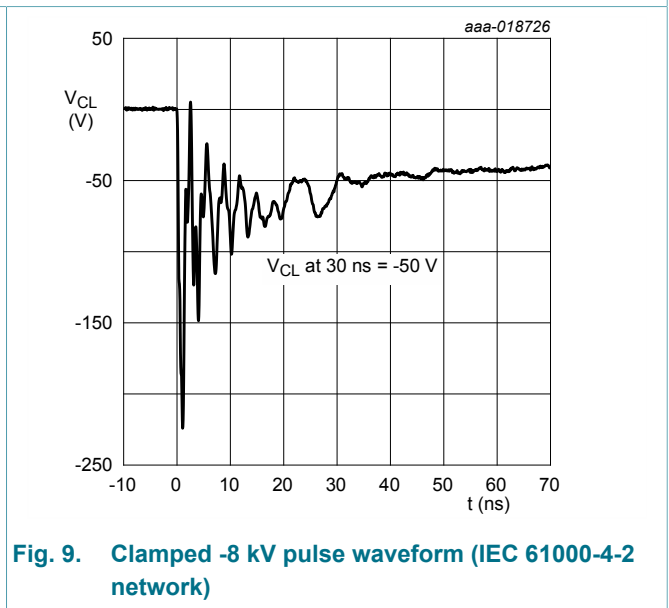


Fig. 9. Clamped -8 kV pulse waveform (IEC 61000-4-2 network)

10. Application information

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

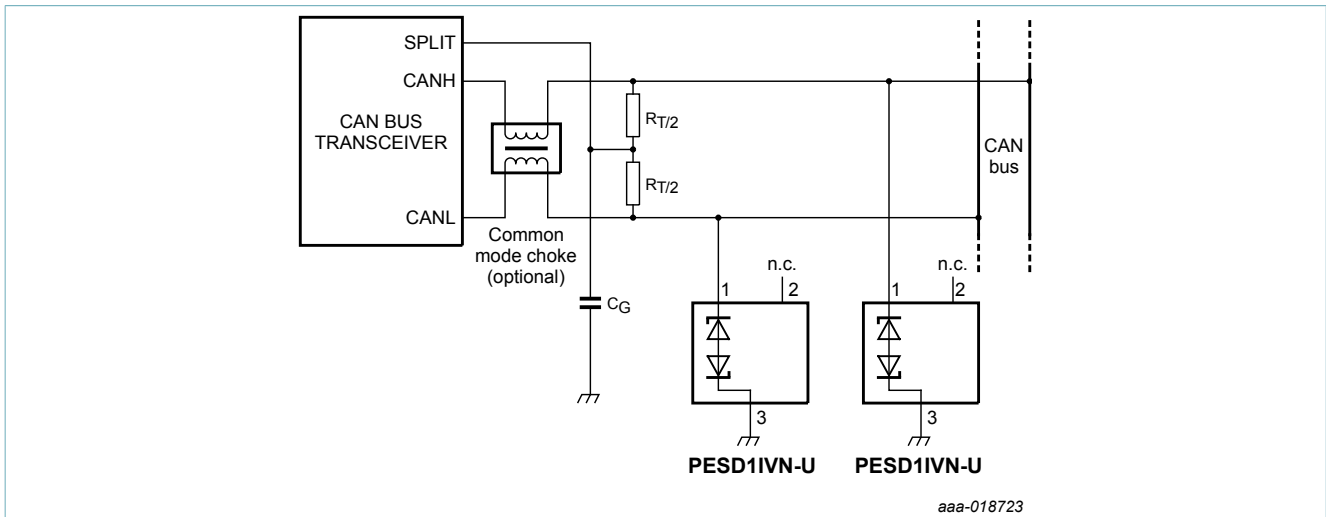


Fig. 10. Typical application: ESD protection of one automotive CAN bus line

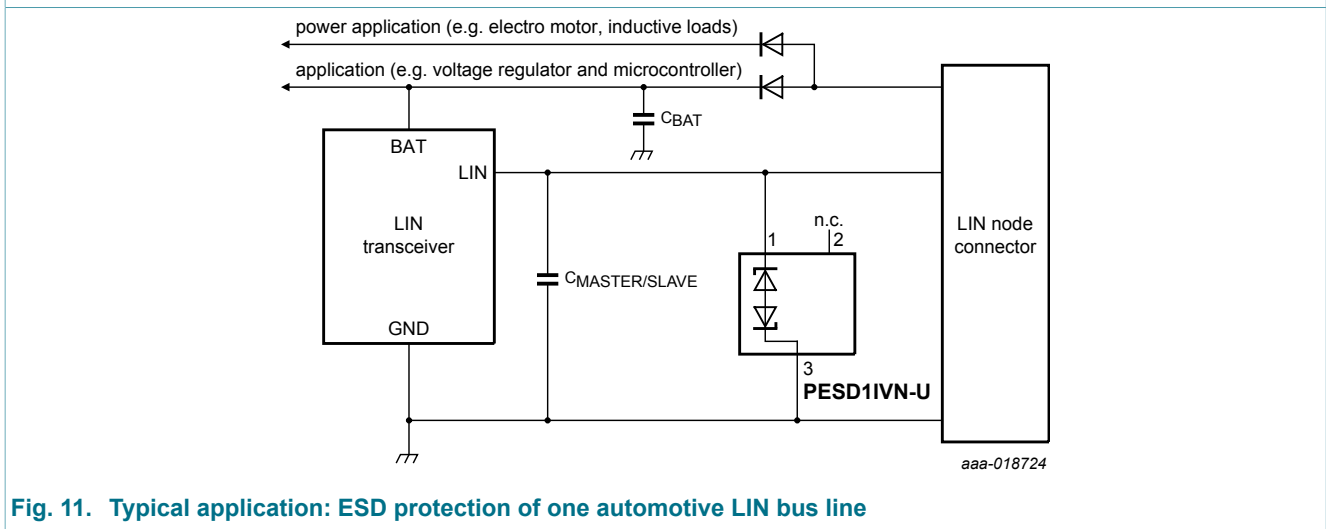


Fig. 11. Typical application: ESD protection of one automotive LIN bus line

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 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

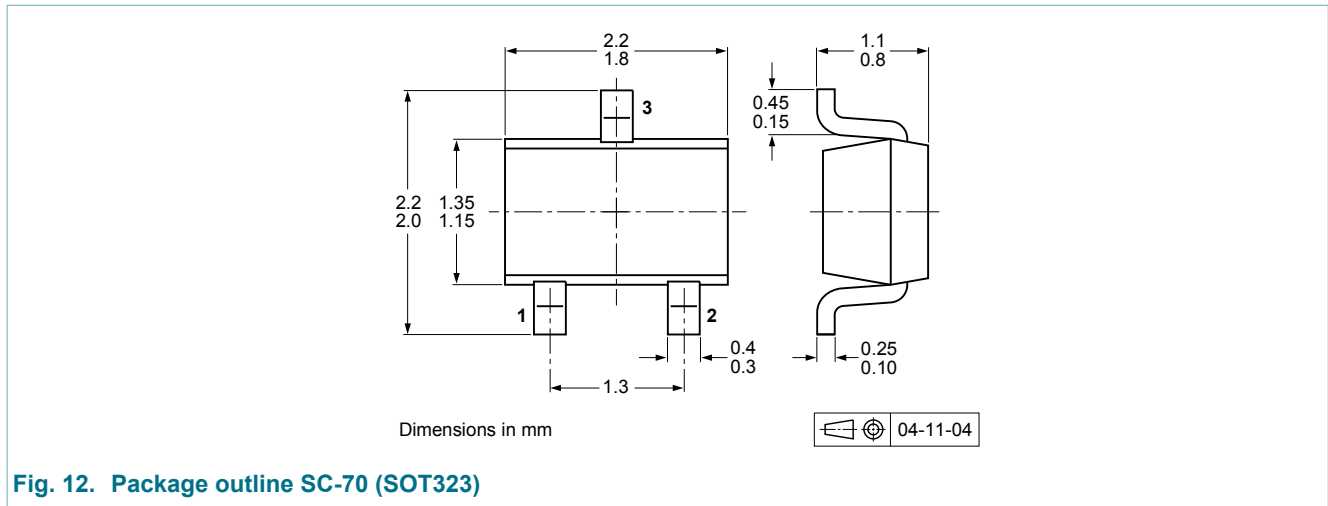


Fig. 12. Package outline SC-70 (SOT323)

12. Soldering

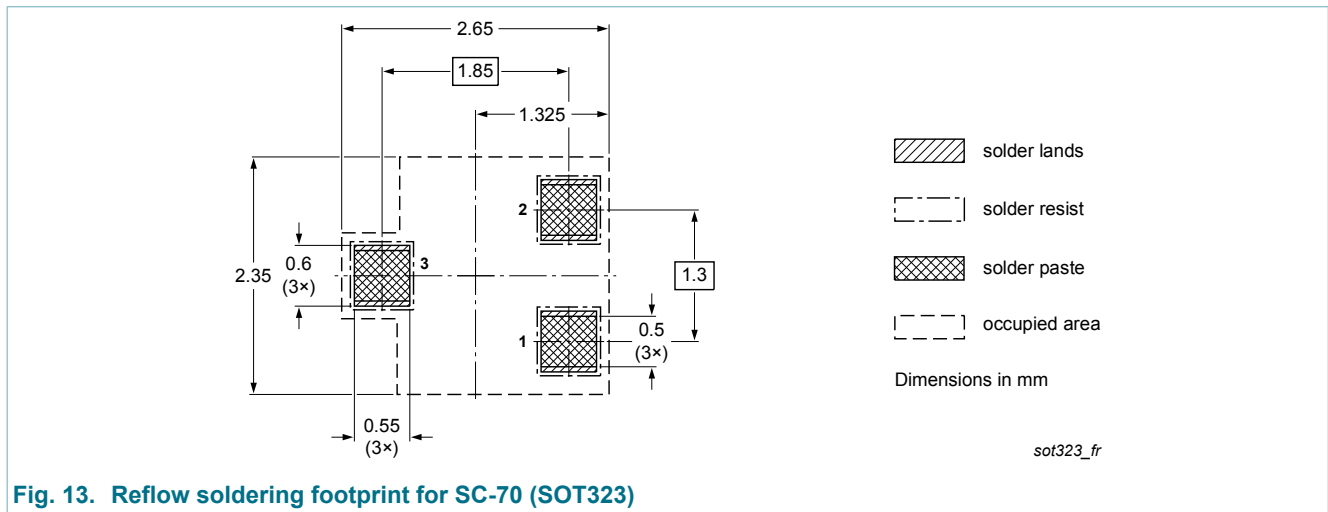
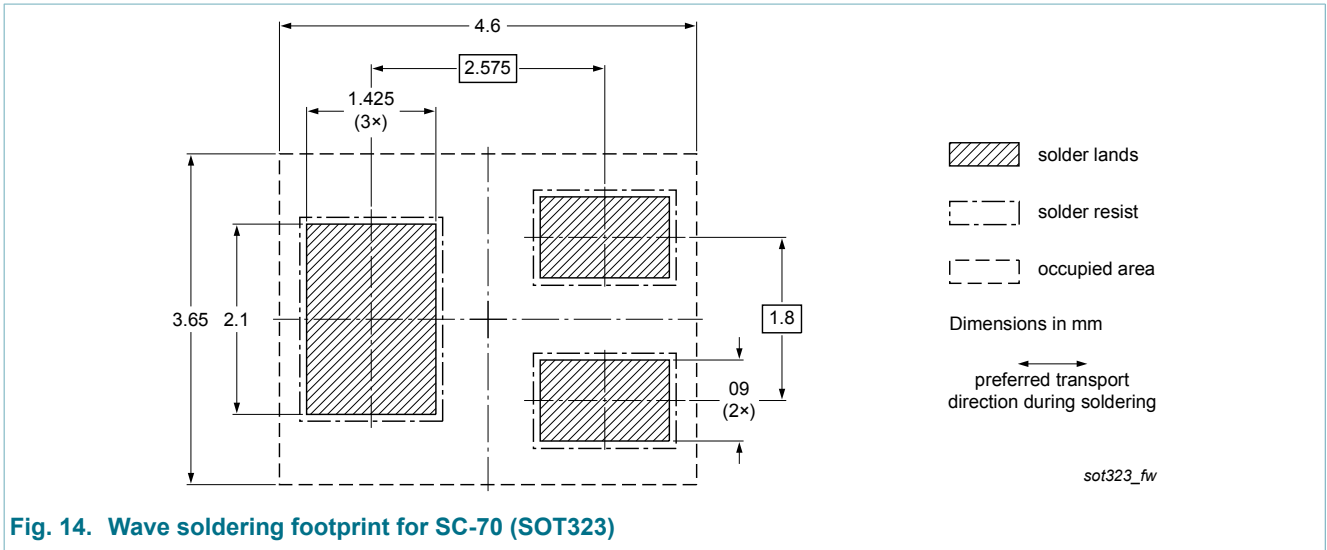


Fig. 13. Reflow soldering footprint for SC-70 (SOT323)



13. Revision history

Table 7. Revision history

| Data sheet ID | Release date | Data sheet status | Change notice | Supersedes |
|----------------|--------------|--------------------|---------------|------------|
| PESD1IVN-U v.1 | 20150715 | Product data sheet | - | - |

14. Legal information

14.1 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. |

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