


# PESD2IVN27-U

## ESD protection for In-vehicle networks

**20 December 2017** **Preliminary data sheet**

## 1. General description

ESD protection device in a small SOT323 (SC-70) 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.

## 2. Features and benefits

- Reverse stand-off voltage: $V_{RWM}$ = 27 V
- Low clamping voltage: $V_{CL}$= 36 V at $I_{PPM}$ = 3A
- ESD protection up to 30 kV (IEC 61000-4-2)
- ESD protection up to 30 kV (ISO 10605 - C = 330 pF, R = 330 Ω)
- ISO 7637-3: Pulse a: $V_S$= -150 V / Pulse b: $V_S$ = +100 V
- Ultra low leakage current: $I_{RM}$< 1 nA
- Qualified according to AEC-Q101 / Automotive grade

## 3. Applications

ESD protection for In-vehicle network lines in automotive enviroments

- CAN
- LIN
- FlexRay
- SENT

## 4. Quick reference data

**Table 1. Quick reference data**

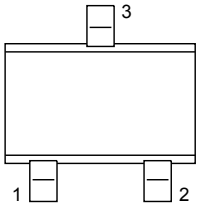
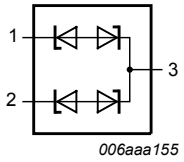
| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $V_{RWM}$ | reverse standoff voltage | $T_{amb}$ = 25 °C | | - | - | 27 | V |
| $I_{PPM}$ | rated peak pulse current | $t_p$ = 8/20 µs | [1] [2] | - | - | 3 | A |
| $V_{CL}$ | clamping voltage | $I_{PPM}$ = 3 A; $t_p$ = 8/20 µs; $T_{amb}$ = 25 °C | [1] [2] | - | 36 | 45 | V |

[1] Device stressed with 8/20 µs exponential decay waveform 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) |  SC-70 (SOT323) |  |
| 2 | K2 | cathode (diode 2) | | |
| 3 | K | common cathode | | |

## 6. Ordering information

**Table 3. Ordering information**

| Type number | Package | | |
|---|---|---|---|
| | Name | Description | Version |
| PESD2IVN27-U | SC-70 | plastic, surface-mounted package; 3 leads; 1.3 mm pitch; 2 mm x 1.25 mm x 0.95 mm body | SOT323 |

## 7. Marking

**Table 4. Marking codes**

| Type number | Marking code |
|---|---|
| PESD2IVN27-U | A9 |


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# 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] | - | 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 | [3] [2] | - | 30 | kV |
| | | ISO 10605: contact discharge C = 330 pF, R = 330 Ω | [3] [2] | - | 30 | kV |
| | | ISO 10605: contact discharge C = 150 pF, R = 330 Ω | [3] [2] | - | 30 | kV |

[1] Device stressed with 8/20 µs exponential decay waveform 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.

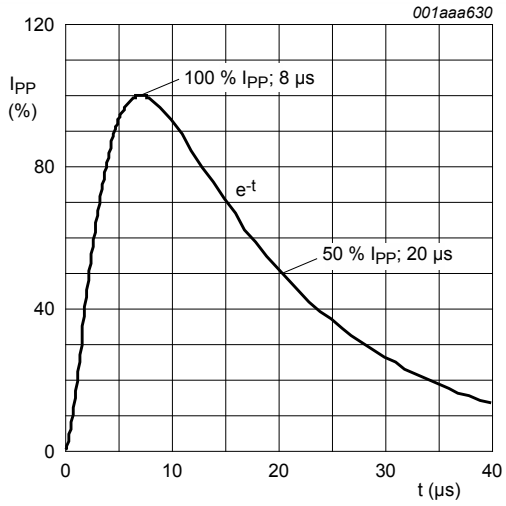



**Fig. 1. 8/20 µs pulse waveform according to IEC 61000-4-5**

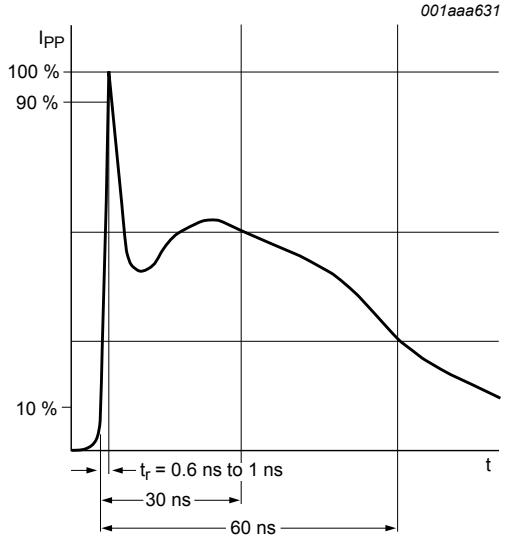



**Fig. 2. ESD pulse waveform according to IEC 61000-4-2**


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# 9. Characteristics

**Table 6. Characteristics**

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $V_{RWM}$ | reverse standoff voltage | $T_{amb}$ = 25 °C | | - | - | 27 | V |
| $V_{BR}$ | breakdown voltage | $I_R$ = 10 mA; $T_{amb}$ = 25 °C | [1] | 28 | 33 | 38 | V |
| $I_{RM}$ | reverse leakage current | $V_{RWM}$ = 27 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] | - | 14 | 17 | pF |
| $V_{CL}$ | clamping voltage | $I_{PPM}$ = 1 A; $t_p$ = 8/20 µs; $T_{amb}$ = 25 °C | [2] [1] | - | 34 | 43 | V |
| | | $I_{PPM}$ = 3 A; $t_p$ = 8/20 µs; $T_{amb}$ = 25 °C | [2] [1] | - | 36 | 45 | V |
| | | $I_{PP}$ = 16 A; $T_p$ = TLP; $T_{amb}$ = 25 °C | [3] [1] | - | 35 | - | V |
| $R_{dyn}$ | dynamic resistance | $I_R$ = 10 A; $T_{amb}$ = 25 °C | [3] [1] | - | 0.2 | - | Ω |

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

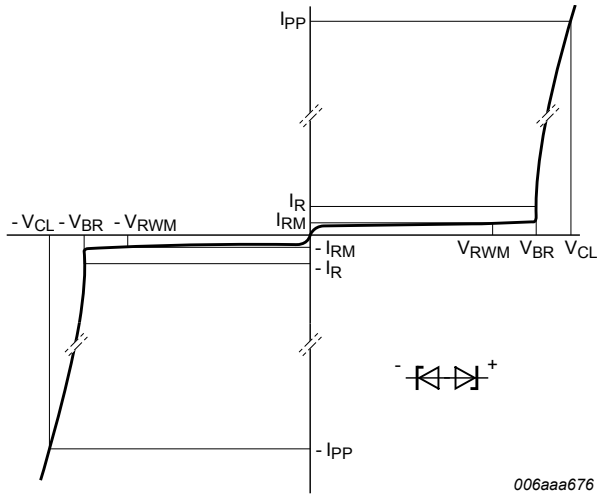



**Fig. 3. V-I characteristics for a bidirectional ESD protection diode**

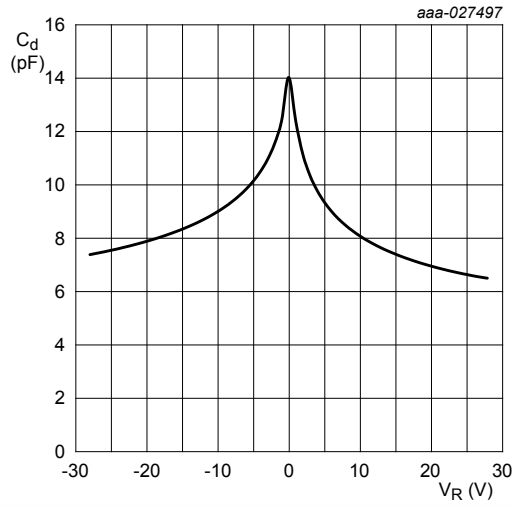
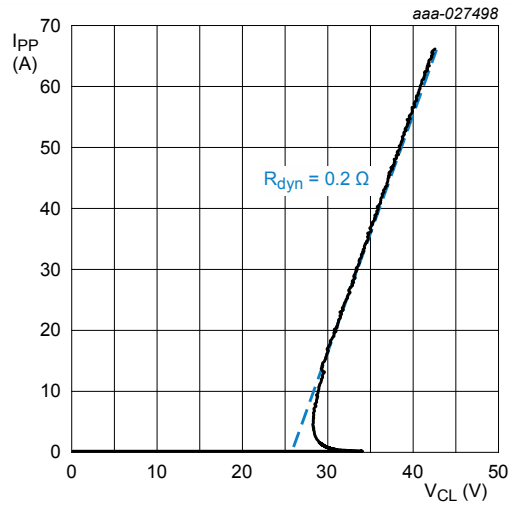



**Fig. 4. Diode capacitance as a function of reverse voltage; typical values**

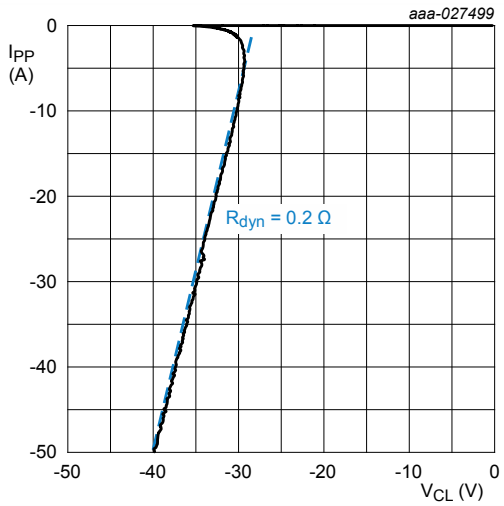

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$t_p$ = 100 ns; Transmission Line Pulse (TLP)

**Fig. 5. Positive clamping voltage (TLP); typical values**




$t_p$ = 100 ns; Transmission Line Pulse (TLP)

**Fig. 6. Negative clamping voltage (TLP); typical values**

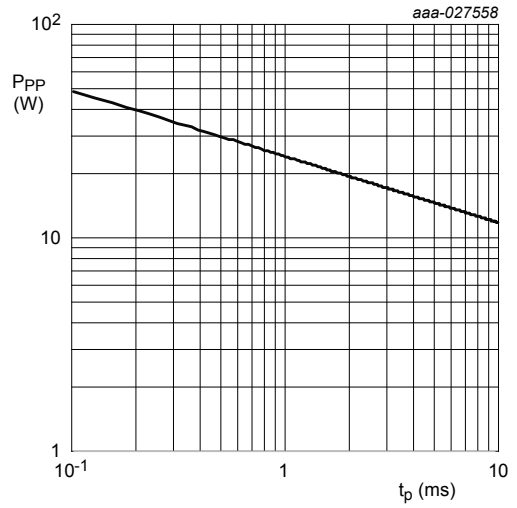



**Fig. 7. Peak pulse power as a function of exponential pulse duration; typical values**

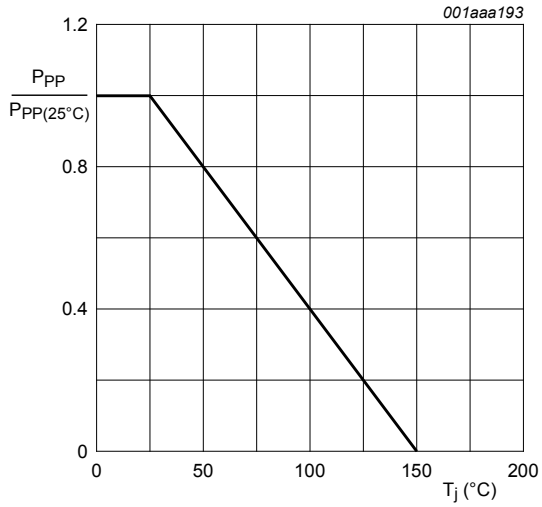



**Fig. 8. Relative variation of peak pulse power as a function of junction temperature; typical values**


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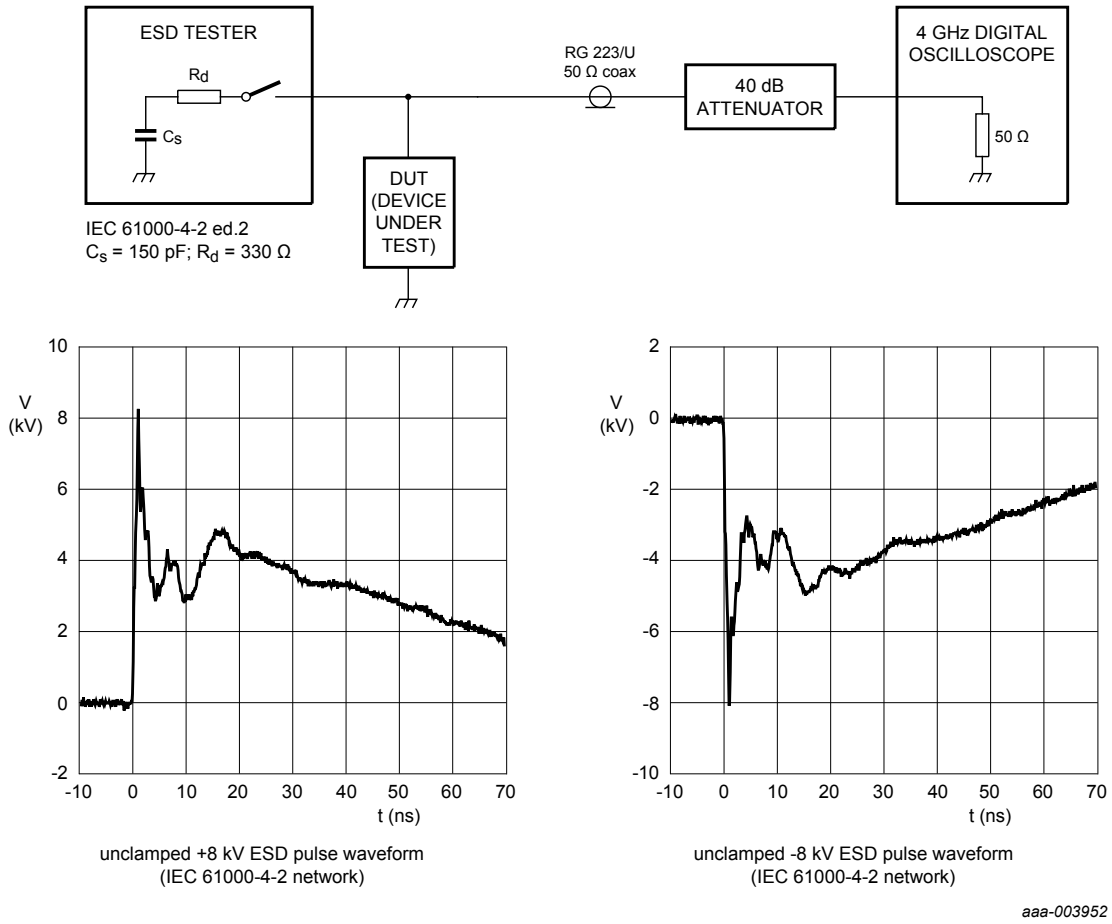



**Fig. 9. ESD clamping test setup and waveforms**

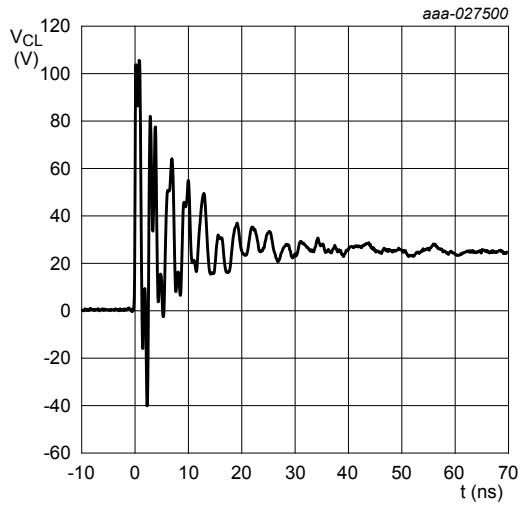



**Fig. 10. Clamped +8 kV pulse waveform (IEC 61000-4-2 network)**

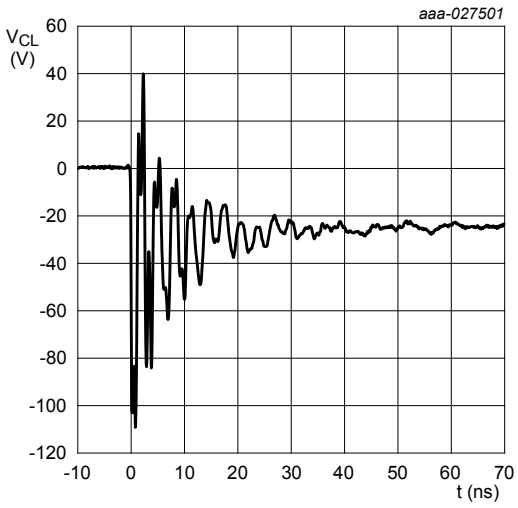



**Fig. 11. Clamped -8 kV pulse waveform (IEC 61000-4-2 network)**


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## 10. Application information

The PESD2IVN27-U is designed for the protection of two automotive IVN bus line from the damage caused by ESD and surge pulses.

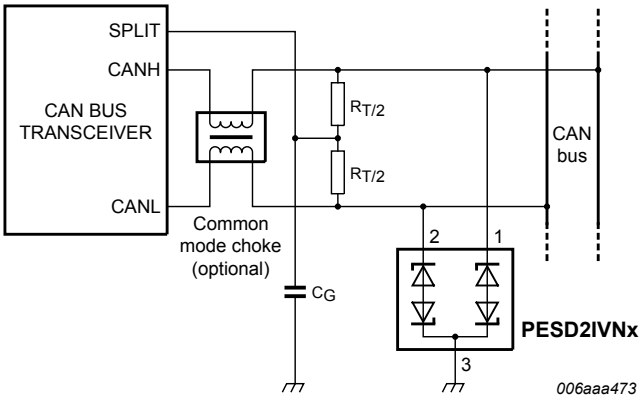



**Fig. 12. Typical application: ESD protection of two automotive CAN bus line**

**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:

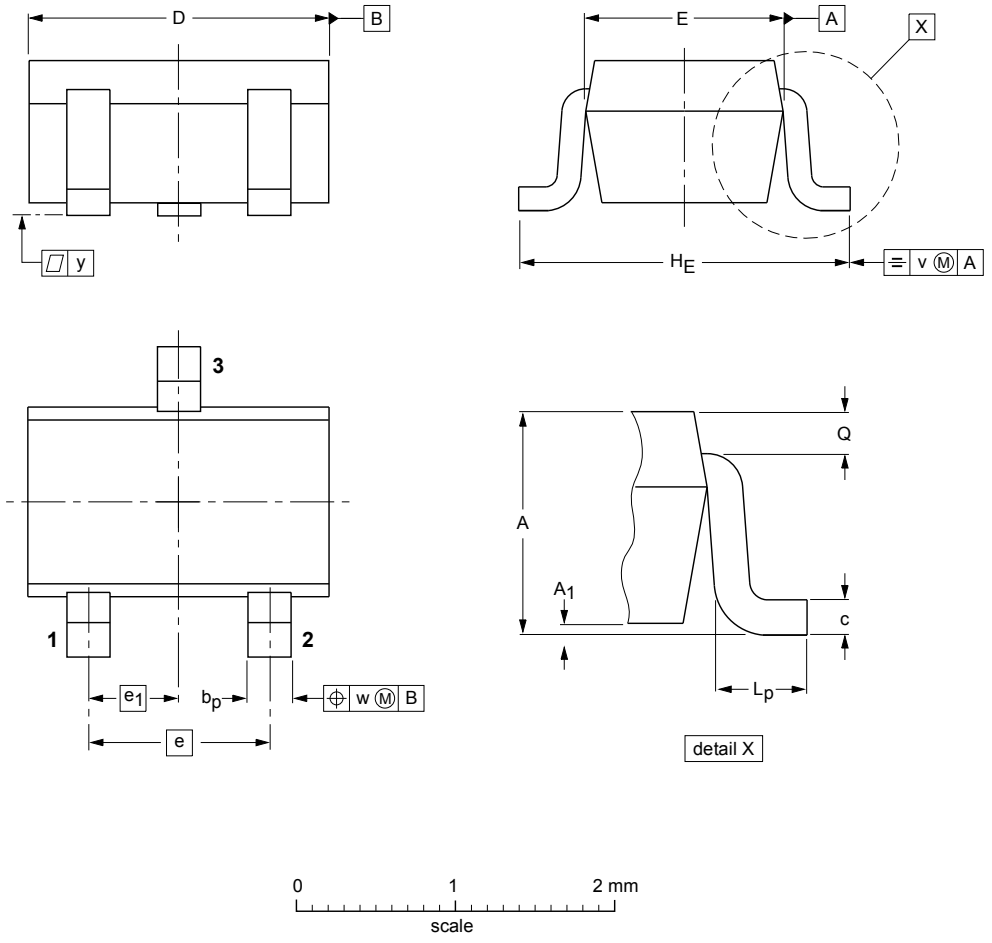
1. Place the device as close to the input terminal or connector as possible.
2. Minimize the path length between the device and the protected line.
3. Keep parallel signal paths to a minimum.
4. Avoid running protected conductors in parallel with unprotected conductors.
5. Minimize all Printed-Circuit 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.


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# 11. Package outline

**Plastic surface-mounted package; 3 leads** **SOT323**




**DIMENSIONS (mm are the original dimensions)**

| UNIT | A | $A_1$ max | $b_p$ | c | D | E | e | $e_1$ | $H_E$ | $L_p$ | Q | v | w |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 1.1<br>0.8 | 0.1 | 0.4<br>0.3 | 0.25<br>0.10 | 2.2<br>1.8 | 1.35<br>1.15 | 1.3 | 0.65 | 2.2<br>2.0 | 0.45<br>0.15 | 0.23<br>0.13 | 0.2 | 0.2 |

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT323 | | | SC-70 | | | ~~04-11-04~~<br>06-03-16 |

**Fig. 13. Package outline SC-70 (SOT323)**


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## 12. Soldering

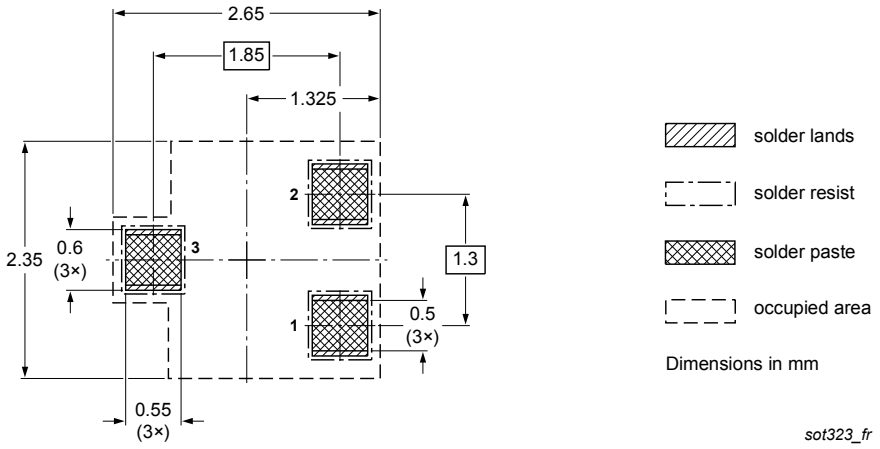



**Fig. 14. Reflow soldering footprint for SC-70 (SOT323)**

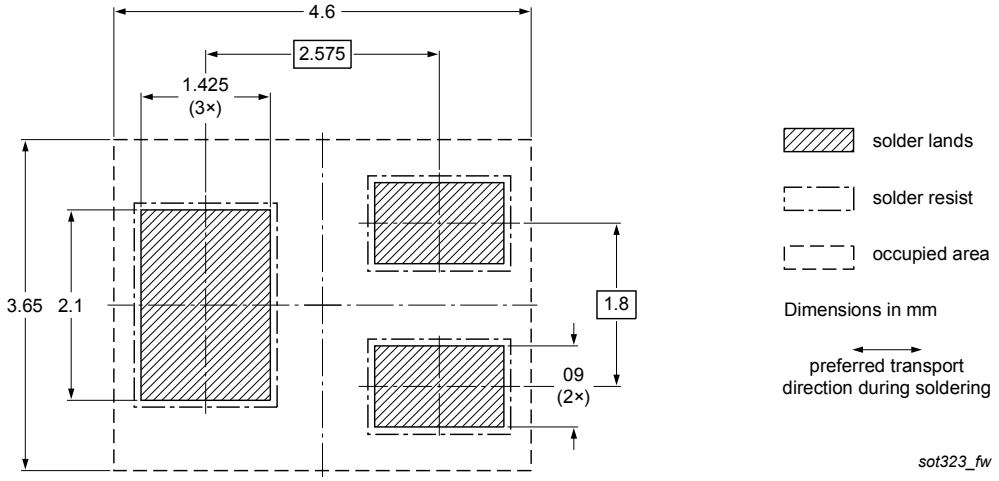



**Fig. 15. Wave soldering footprint for SC-70 (SOT323)**


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# 13. Revision history

**Table 7. Revision history**

| Data sheet ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| PESD2IVN27-U v.1 | 20171220 | Preliminary data sheet | - | - |


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|---|---|---|
| Objective [short] data sheet | Development | This document contains data from the objective specification for product development. |
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