# PESD1LVDS

## ESD protection for in-vehicle ultra high-speed interfaces

Rev. 3 — 5 July 2016 Product data sheet

## 1. Product profile

### 1.1 General description

The device is designed to protect in-vehicle ultra high-speed interfaces in automotive applications, such as Low-Voltage Differential Signaling (LVDS), High-Definition Multimedia Interface (HDMI) and DisplayPort interfaces against ElectroStatic Discharge (ESD).

The device is housed in an ultra small SOT1165-1 (XSON10) Surface-Mounted Design (SMD) plastic package.

### 1.2 Features and benefits

- System ESD protection for LVDS, HDMI and DisplayPort interfaces
- Line capacitance of only 0.6 pF with ≤ 0.05 pF matching capacitance between signal pairs
- Ultra small XSON10 package with design-friendly ‘pass-thru’ signal routing
- AEC-Q101 qualified

### 1.3 Applications

The devices are designed for high-speed receiver and transmitter port protection:

- Automotive A/V monitors, displays and cameras

### 1.4 Quick reference data

**Table 1. Quick reference data**

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $V_{RWM}$ | reverse standoff voltage | | - | - | 5.5 | V |
| $C_{ch}$ | channel capacitance | f = 1 MHz; $V_{bias}$ = 2.5 V [1] | - | 0.6 | - | pF |

[1] This parameter is guaranteed by design.

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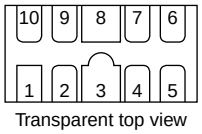
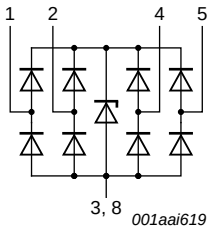
## 2. Pinning information

**Table 2. Pinning**

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|---|---|---|---|---|
| 1 | CH1– | negative channel 1 ESD protection |  Transparent top view **XSON10** |  |
| 2 | CH1+ | positive channel 1 ESD protection | | |
| 3 | GND | ground | | |
| 4 | CH2– | negative channel 2 ESD protection | | |
| 5 | CH2+ | positive channel 2 ESD protection | | |
| 6 | n.c. | not connected | | |
| 7 | n.c. | not connected | | |
| 8 | GND | ground | | |
| 9 | n.c. | not connected | | |
| 10 | n.c. | not connected | | |

## 3. Ordering information

**Table 3. Ordering information**

| Type number | Package | | |
|---|---|---|---|
| | Name | Description | Version |
| PESD1LVDS | XSON10 | plastic extremely thin small outline package; no leads; 10 terminals; body 1 × 2.5 × 0.5 mm | SOT1165-1 |

## 4. Limiting values

**Table 4. Limiting values**

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

| Symbol | Parameter | Conditions | Min | Max | Unit |
|---|---|---|---|---|---|
| $T_{stg}$ | storage temperature | | –55 | +125 | °C |
| $T_{amb}$ | ambient temperature | | –40 | +125 | °C |

**Table 5. ESD maximum ratings**

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

| Symbol | Parameter | Conditions | Min | Max | Unit |
|---|---|---|---|---|---|
| $V_{ESD}$ | electrostatic discharge voltage | IEC 61000-4-2 (contact discharge) [1][2] | - | ±8 | kV |

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

[2] All pins to ground.

**Table 6. ESD standards compliance**

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

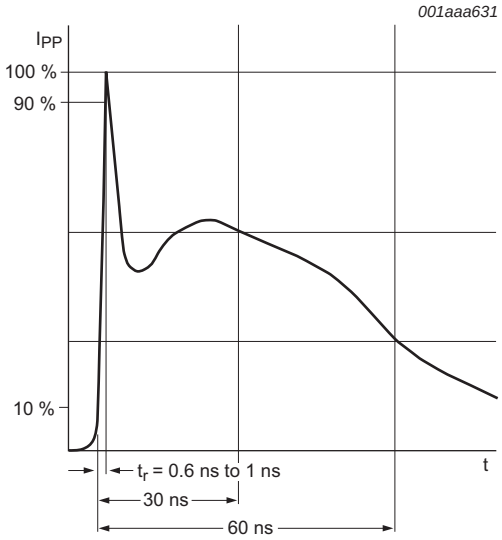



**Fig 1. ESD pulse waveform according to IEC 61000-4-2**

## 5. Characteristics

**Table 7. Characteristics**

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

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $V_{RWM}$ | reverse standoff voltage | | - | - | 5.5 | V |
| $I_{RM}$ | reverse leakage current | per channel; V = 3.0 V | - | - | 1 | µA |
| $V_{BR}$ | breakdown voltage | I = 1 mA | 6 | - | 9 | V |
| $V_F$ | forward voltage | | - | 0.7 | - | V |
| $C_{(I/O-GND)}$ | input/output to ground capacitance | f = 1 MHz; $V_{bias}$ = 2.5 V [1] | - | 0.6 | - | pF |
| $\Delta C_{(I/O-GND)}$ | input/output to ground capacitance variation | f = 1 MHz; $V_{bias}$ = 2.5 V [1] | - | 0.05 | - | pF |
| $C_{ch(mutual)}$ | mutual channel capacitance | f = 1 MHz; $V_{bias}$ = 2.5 V [1][2] | - | 0.07 | - | pF |

[1] This parameter is guaranteed by design.

[2] Between signal pin and pin n.c.

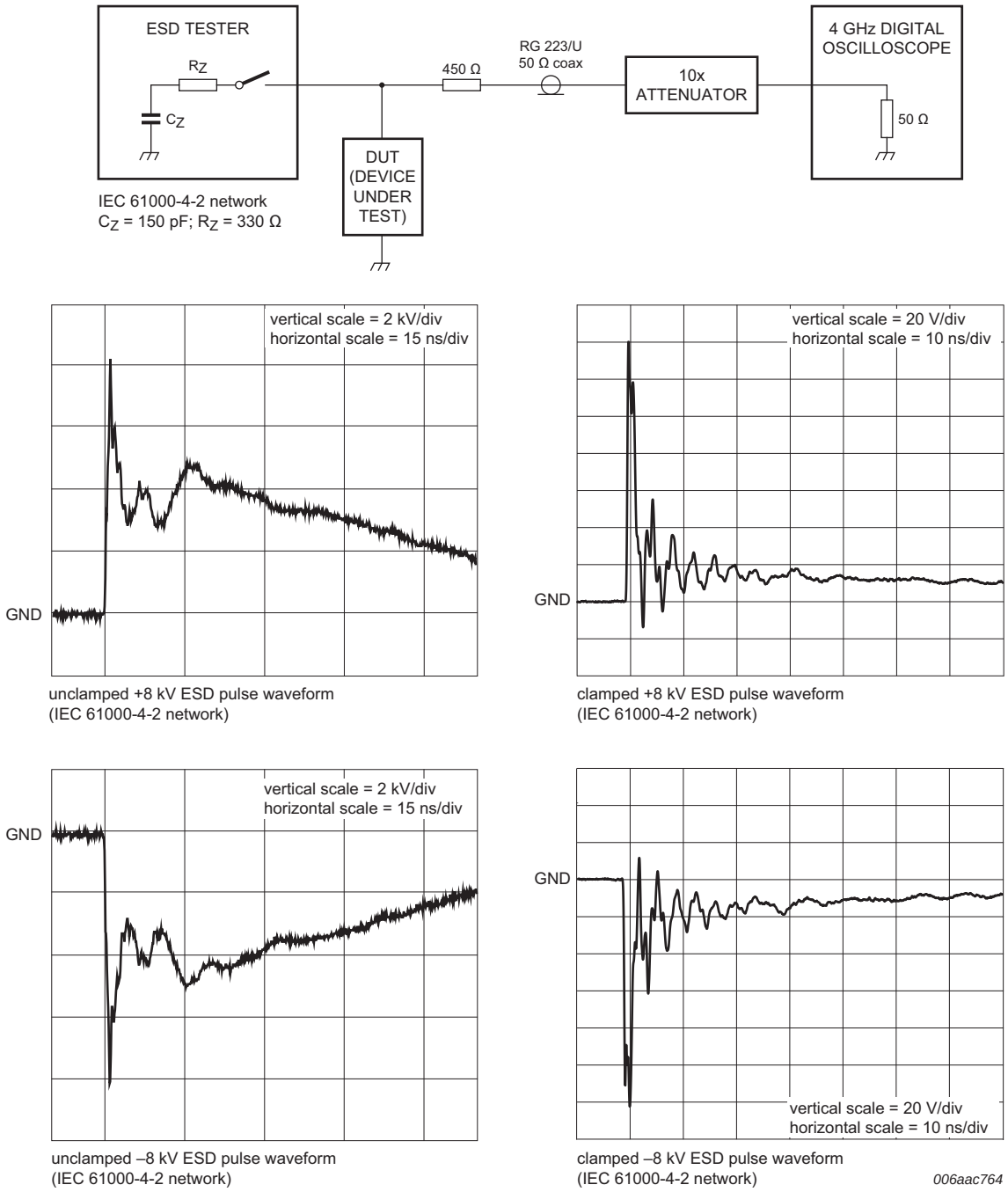



**Fig 2. ESD clamping test setup and waveforms**

# 6. Application information

The devices are designed to provide high-level ESD protection for high-speed serial data buses such as LVDS, HDMI and DisplayPort data lines.

When designing the Printed-Circuit Board (PCB), careful consideration should be given to impedance matching, and signal coupling.

Basic application diagrams for the ESD protection of an HDMI interface are shown in Figure 3.

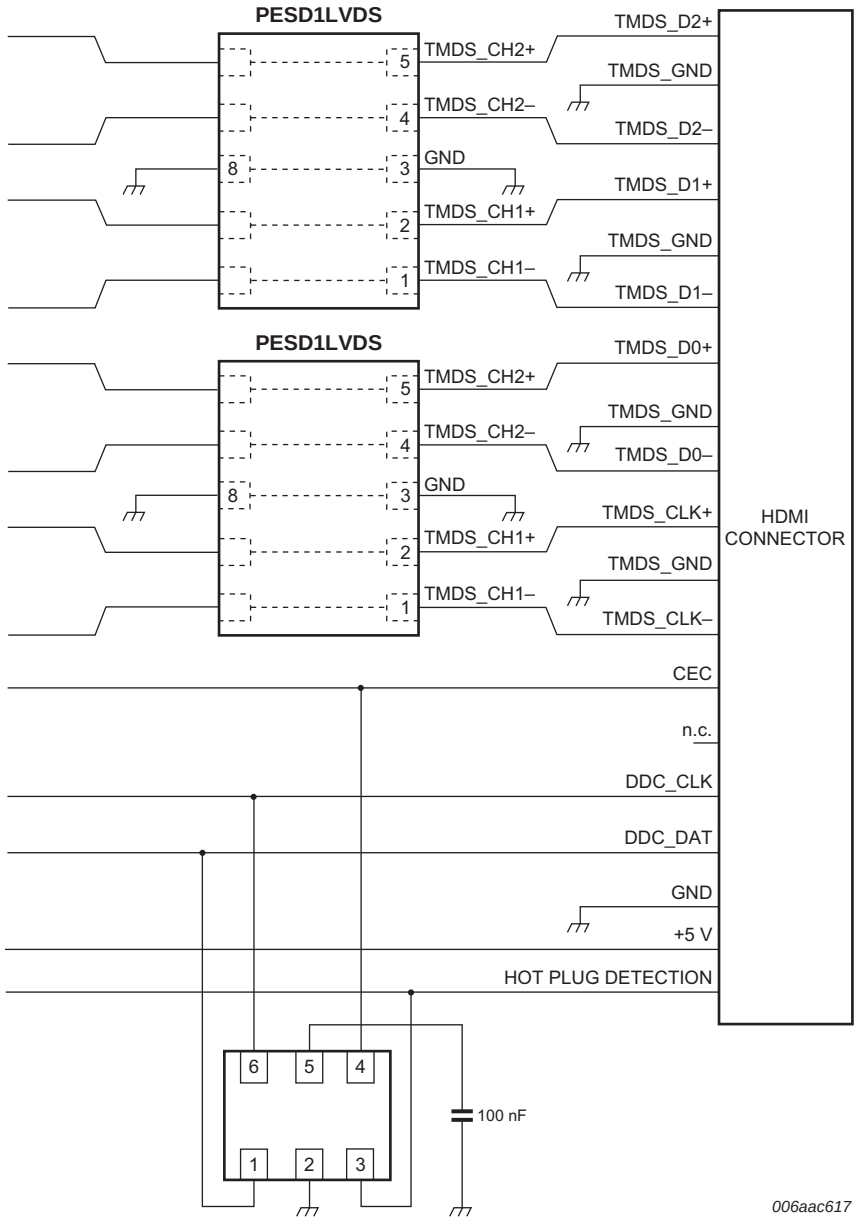



**Fig 3. Application diagram of HDMI ESD protection**

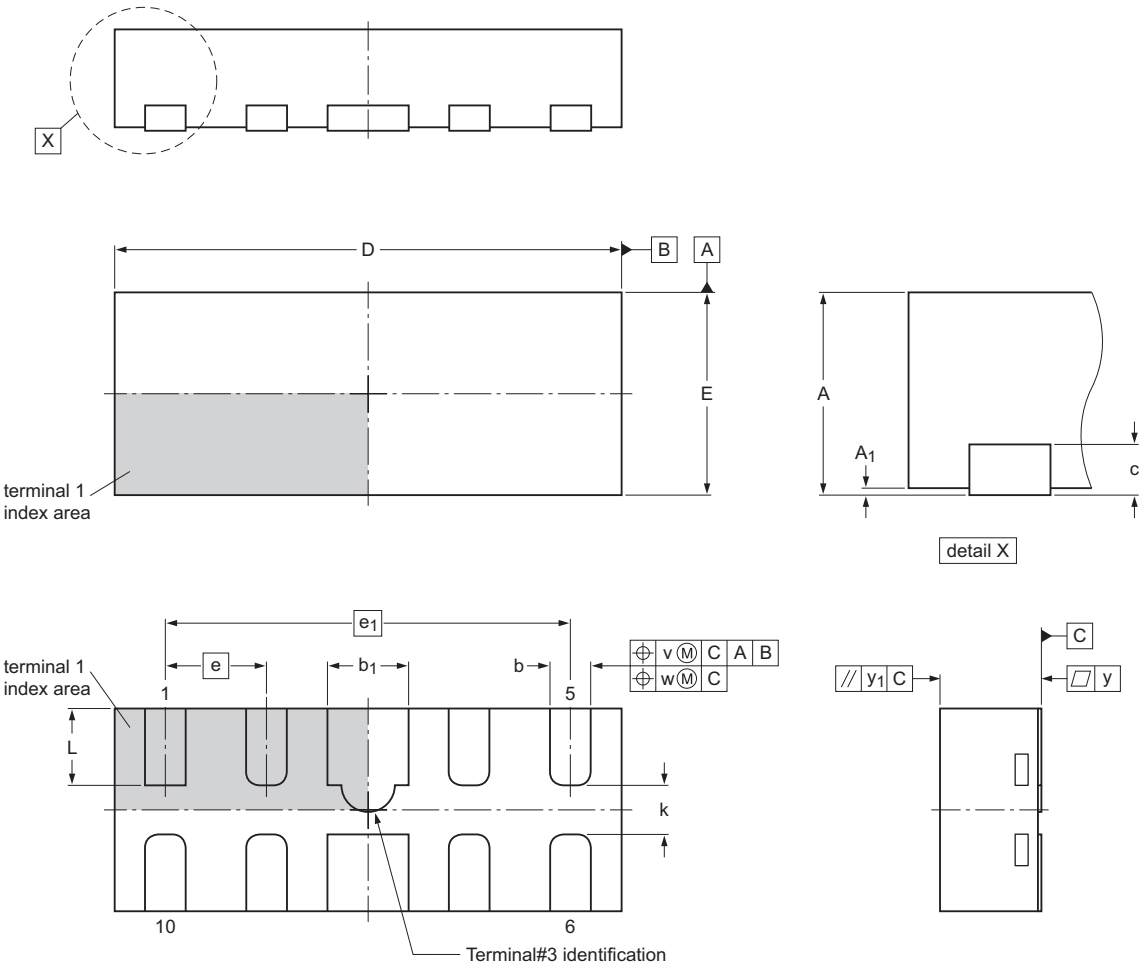
# 7. Test information

## 7.1 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.

# 8. Package outline

**DFN2510-10: plastic, extremely thin small outline package; no leads; 10 terminals; body 1 x 2.5 x 0.5 mm** **SOT1165-1**




Dimensions

| Unit | | A | $A_1$ | b | $b_1$ | c | $D^{(1)}$ | $E^{(1)}$ | e | $e_1$ | k | L | v | w | y | $y_1$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | max | 0.5 | 0.05 | 0.25 | 0.45 | | 2.6 | 1.1 | | | | 0.43 | | | | |
| mm | nom | | | 0.20 | 0.40 | 0.127 | 2.5 | 1.0 | 0.5 | 2 | | 0.38 | 0.1 | 0.05 | 0.05 | 0.05 |
| | min | | 0.00 | 0.15 | 0.35 | | 2.4 | 0.9 | | | 0.2 | 0.33 | | | | |

Note
1. Plastic or metal protrusions of 0.075 mm maximum per side are not included.

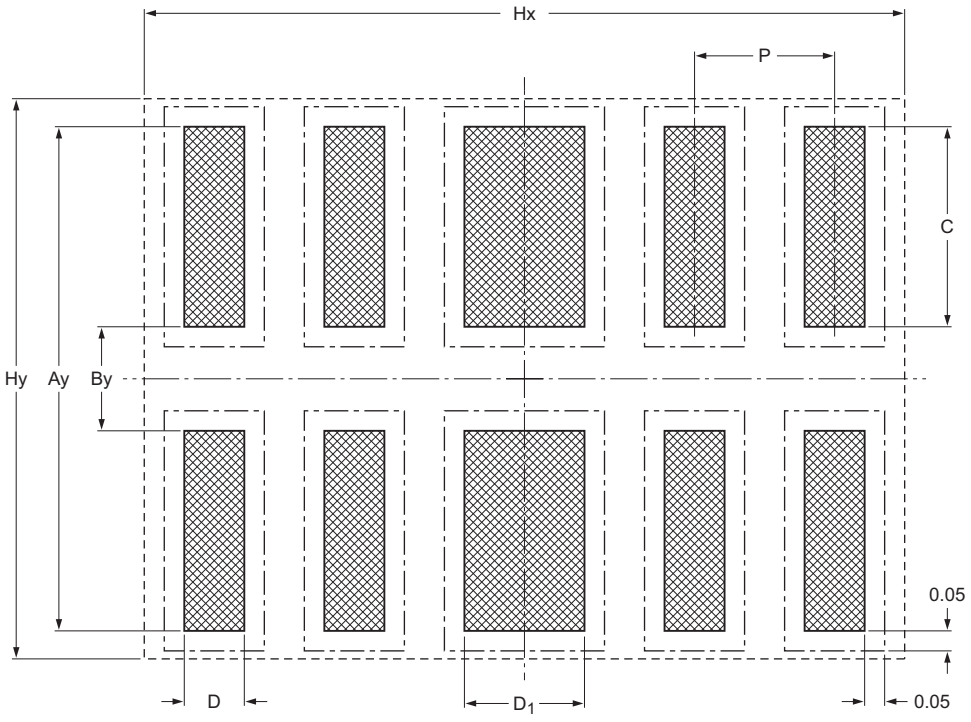
*sot1165-1_po*

| Outline version | References | | | | European projection | Issue date |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT1165-1 | - - - | - - - | - - - | | | ~~13-01-09~~ 13-02-18 |

**Fig 4. Package outline SOT1165-1 (XSON10)**

# 9. Soldering

**Footprint information for reflow soldering of DFN2510-10 package** **SOT1165-1**




Generic footprint pattern
Refer to the package outline drawing for actual layout

solder land

solder paste deposit

solder land plus solder paste

occupied area

solder resist

Dimensions in mm

| P | Ay | By | C | D | $D_1$ | Hx | Hy |
|---|---|---|---|---|---|---|---|
| 0.500 | 1.3 | 0.25 | 0.525 | 0.20 | 0.40 | 2.45 | 1.6 |

Remark:
Stencil of 75 µm is recommended.
A stencil of 75 µm gives an aspect ratio of 0.77
With a stencil of 100 µm one will obtain an aspect ratio of 0.58

*sot1165-1_fr*

Reflow soldering is the only recommended soldering method.

**Fig 5. Reflow soldering footprint SOT1165-1 (XSON10)**

# 10. Revision history

**Table 8. Revision history**

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| PESD1LVDS v.3 | 20160705 | Product data sheet | - | PESD1LVDS v.2 |
| Modifications: | • Table 4 “Limiting values”: updated maximum ambient temperature $T_{amb}$ from +85 °C to +125 °C | | | |
| PESD1LVDS v.2 | 20130123 | Product data sheet | - | PESD1LVDS v.1 |
| PESD1LVDS v.1 | 20111010 | Product data sheet | - | - |

# 11. Legal information

## 11.1 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".

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# 13. Contents





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**Date of release: 05 July 2016**