

# PESD1LIN

LIN bus ESD protection diode

Rev. 02 — 12 November 2008

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

- ESD protection of one automotive LIN bus line
- Asymmetrical diode configuration ensures an optimized ElectroMagnetic Immunity (EMI) of a LIN Electronic Control Unit (ECU)
- Due to the integrated diode structure only one very small SOD323 package is needed
- Max. peak pulse power:  $P_{PP} = 160 \text{ W}$  at  $t_p = 8/20 \mu\text{s}$
- Low clamping voltage:  $V_{CL} = 40 \text{ V}$  at  $I_{PP} = 1 \text{ A}$
- Ultra low leakage current:  $I_{RM} < 1 \text{ nA}$
- ESD protection of up to 23 kV
- IEC 61000-4-2, level 4 (ESD)
- IEC 61000-4-5 (surge);  $I_{PP} = 3 \text{ A}$  at  $t_p = 8/20 \mu\text{s}$

### 1.3 Applications

- LIN bus protection
- Automotive applications

### 1.4 Quick reference data


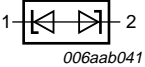
**Table 1. Quick reference data**

$T_{amb} = 25^\circ\text{C}$  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	$V_R = 0 \text{ V};$ $f = 1 \text{ MHz}$	-	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	$t_p = 8/20 \mu s$	[1] -	160	W
$I_{PP}$	peak pulse current	$t_p = 8/20 \mu s$	[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  $\mu s$  exponential decay waveform according to IEC 61000-4-5.

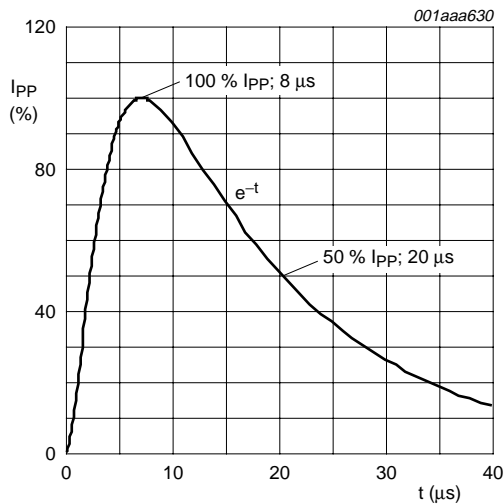
**Table 6. ESD maximum ratings**

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

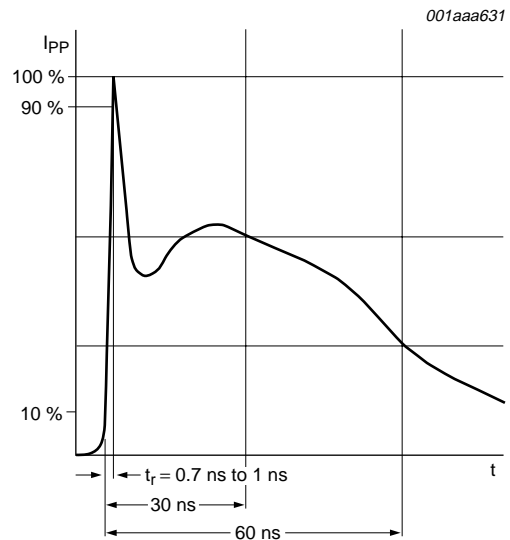
[1] Device stressed with ten non-repetitive ESD pulses.

**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  $\mu$ s pulse waveform according to IEC 61000-4-5**



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

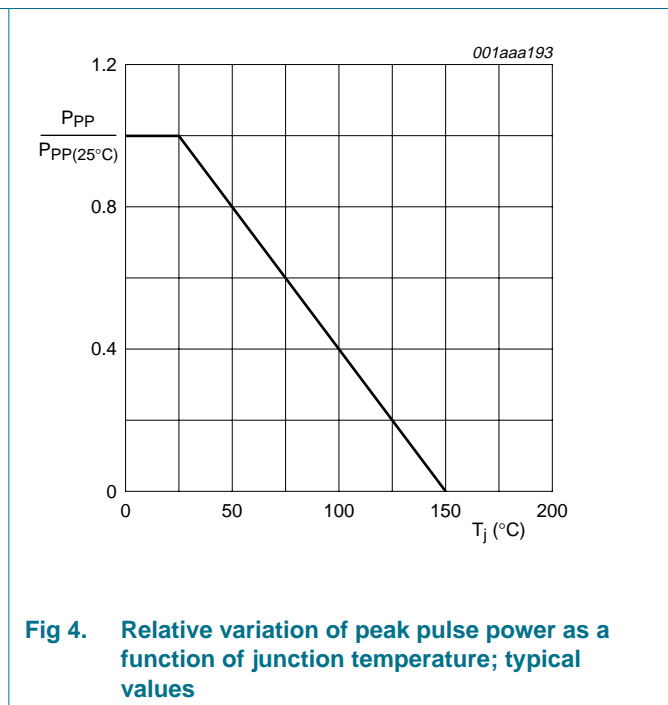
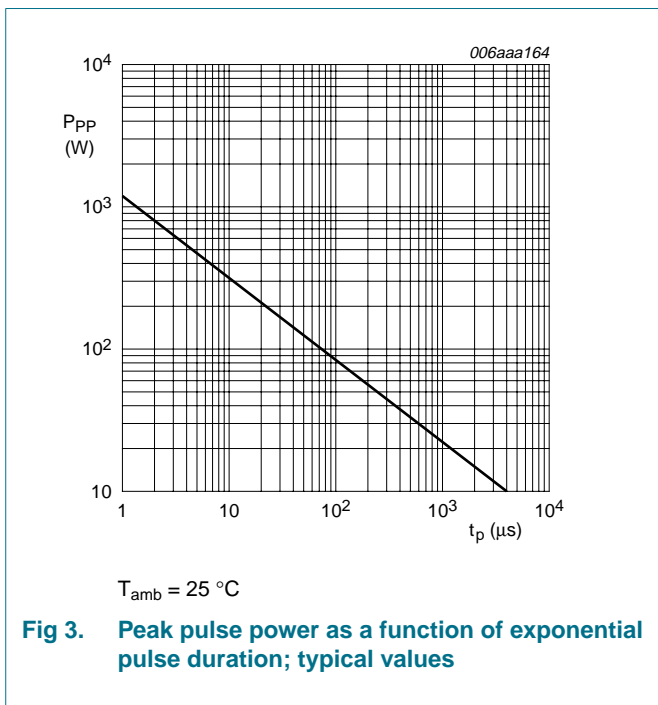
## 6. Characteristics

**Table 8. Characteristics**

$T_{amb} = 25\text{ }^{\circ}\text{C}$  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)	$V_{RWM} = 15\text{ V}$	-	< 1	50	nA
	PESD1LIN (24 V)	$V_{RWM} = 24\text{ V}$	-	< 1	50	nA
$V_{BR}$	breakdown voltage	$I_R = 5\text{ mA}$				
	PESD1LIN (15 V)		17.1	18.9	20.3	V
	PESD1LIN (24 V)		25.4	27.8	30.3	V
$C_d$	diode capacitance	$V_R = 0\text{ V}; f = 1\text{ MHz}$	-	13	17	pF
$V_{CL}$	clamping voltage		[1]			
	PESD1LIN (15 V)	$I_{PP} = 1\text{ A}$	-	-	25	V
		$I_{PP} = 5\text{ A}$	-	-	44	V
	PESD1LIN (24 V)	$I_{PP} = 1\text{ A}$	-	-	40	V
		$I_{PP} = 3\text{ A}$	-	-	70	V
$r_{dif}$	differential resistance					
	PESD1LIN (15 V)	$I_R = 1\text{ mA}$	-	-	225	$\Omega$
	PESD1LIN (24 V)	$I_R = 1\text{ mA}$	-	-	300	$\Omega$

[1] Non-repetitive current pulse 8/20  $\mu\text{s}$  exponential decay waveform according to IEC 61000-4-5.



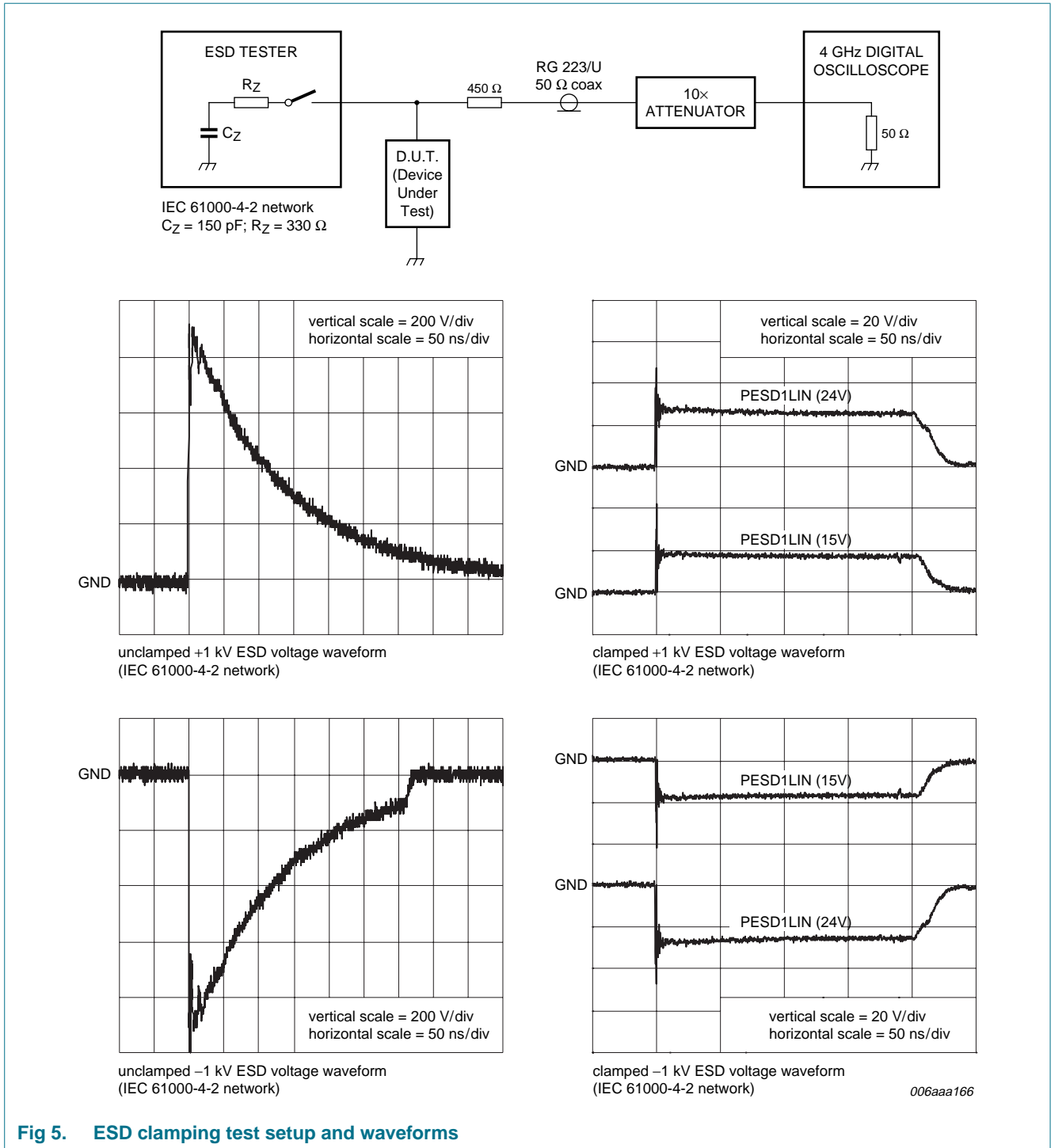
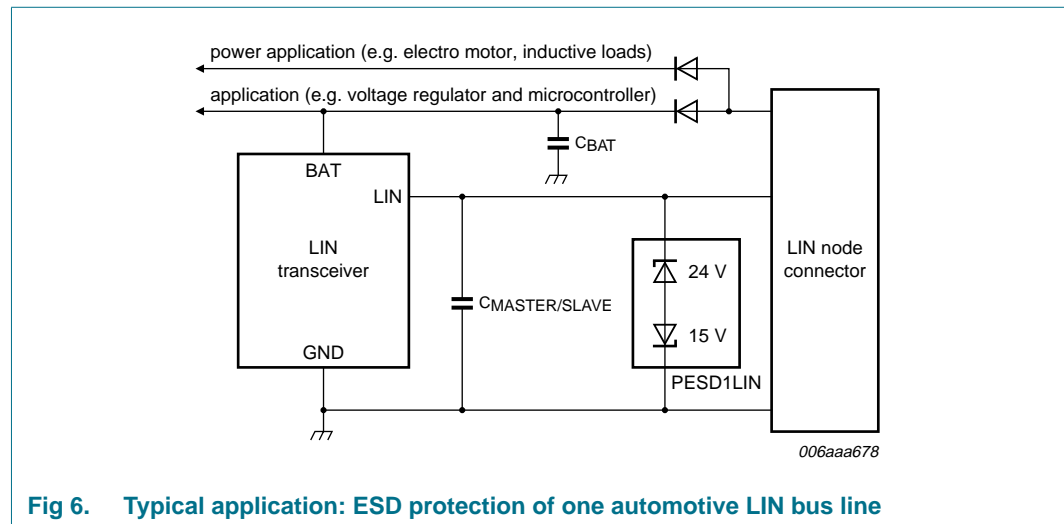


Fig 5. ESD clamping test setup and waveforms

## 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  $\mu$ s waveform.



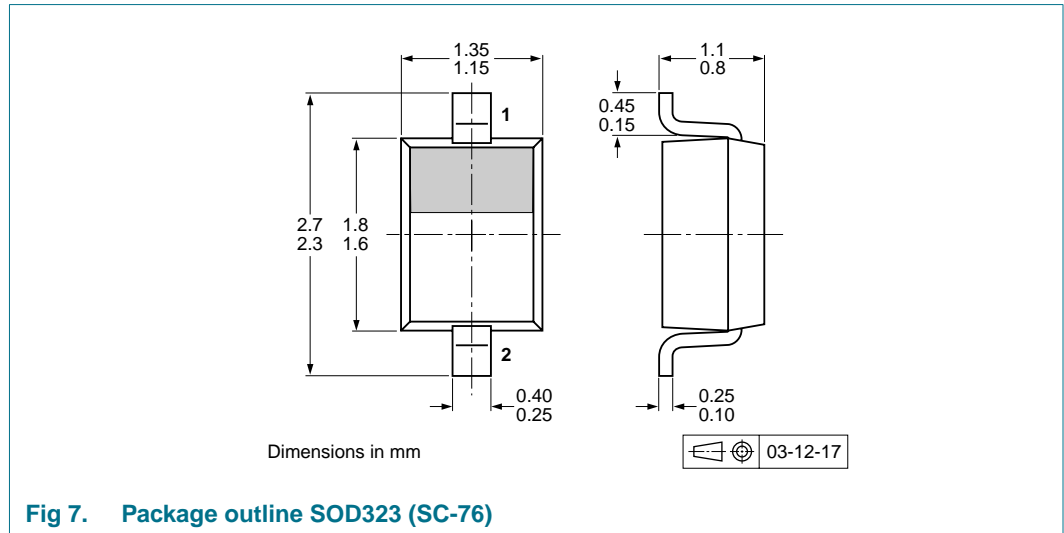
**Fig 6. Typical application: ESD protection of one automotive LIN bus line**

### 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. Package outline



## 9. Packing information

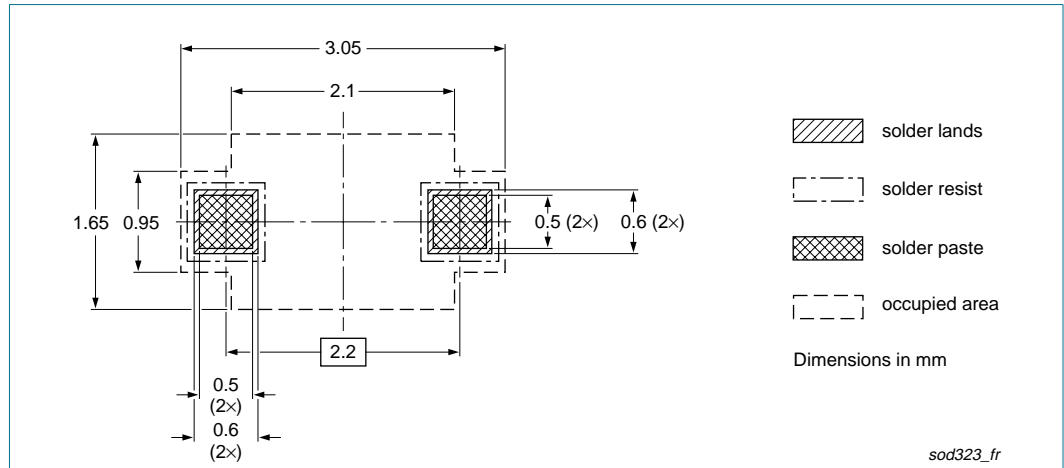
**Table 9. Packing methods**

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

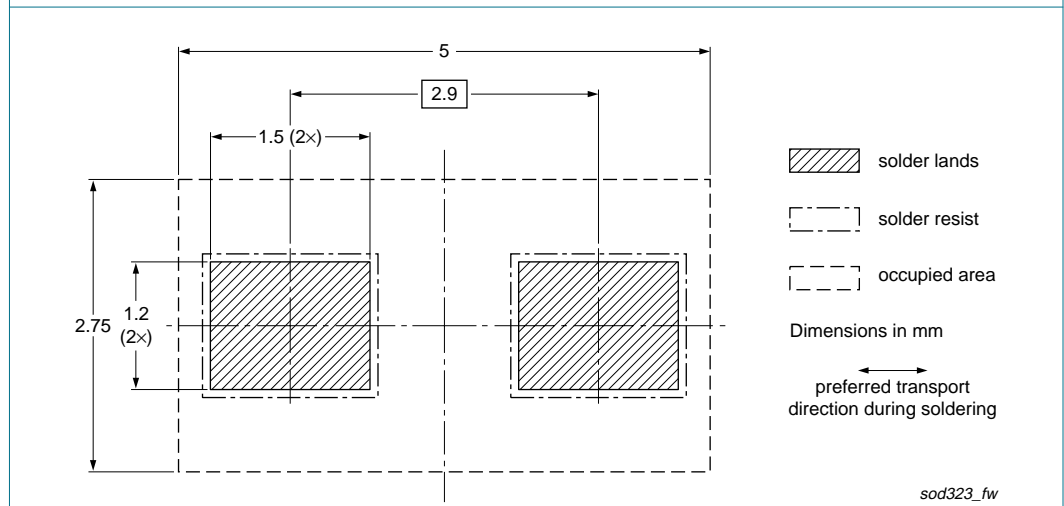
Type number	Package	Description	Packing quantity	
			3000	10000
PESD1LIN	SOD323	4 mm pitch, 8 mm tape and reel	-115	-135

[1] For further information and the availability of packing methods, see [Section 13](#).

### 10. Soldering



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



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



## 11. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PESD1LIN_2	20081112	Product data sheet	-	PESD1LIN_1
Modifications:		<ul style="list-style-type: none"><li>• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li><li>• Legal texts have been adapted to the new company name where appropriate.</li><li>• <a href="#">Table 6</a>: ESD electrostatic discharge capability redefined to <math>V_{ESD}</math> electrostatic discharge voltage</li><li>• <a href="#">Figure 6</a>: enhanced</li><li>• <a href="#">Figure 7</a>: superseded by minimized package outline drawing</li><li>• <a href="#">Section 10 "Soldering"</a>: added</li><li>• <a href="#">Section 12 "Legal information"</a>: updated</li></ul>		
PESD1LIN_1	20041026	Product data sheet	-	-

## 12. Legal information

### 12.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	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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