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Team Nexperia

PESDxL5UF; PESDxL5UV; PESDxL5UY

Low capacitance unidirectional fivefold ESD protection diode arrays

Rev. 02 — 8 January 2008   Product data sheet

1. Product profile

1.1 General description

Low capacitance unidirectional fivefold ElectroStatic Discharge (ESD) protection diode arrays in small Surface-Mounted Device (SMD) plastic packages designed to protect up to five unidirectional signal lines from the damage caused by ESD and other transients.

Table 1.   Product overview

Type number	Package			Package configuration
	NXP	**JEITA**	**JEDEC**	
PESD3V3L5UF	SOT886	-	MO-252	leadless ultra small
PESD5V0L5UF	SOT886	-	MO-252	leadless ultra small
PESD3V3L5UV	SOT666	-	-	ultra small and flat lead
PESD5V0L5UV	SOT666	-	-	ultra small and flat lead
PESD3V3L5UY	SOT363	SC-88	-	very small
PESD5V0L5UY	SOT363	SC-88	-	very small

1.2 Features

- ESD protection of up to five lines
- Low diode capacitance
- Max. peak pulse power: P_{PP} = 25 W
- Low clamping voltage: V_{CL} = 12 V
- Ultra low leakage current: I_{RM} = 5 nA
- ESD protection up to 20 kV
- IEC 61000-4-2; level 4 (ESD)
- IEC 61000-4-5 (surge); I_{PP} = 2.5 A

1.3 Applications

- Computers and peripherals
- Audio and video equipment
- Cellular handsets and accessories
- Communication systems
- Portable electronics
- Subscriber Identity Module (SIM) card protection

1.4 Quick reference data

Table 2.   Quick reference data

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per diode						
V_{RWM}	reverse standoff voltage					
	PESD3V3L5UF PESD3V3L5UV PESD3V3L5UY		-	-	3.3	V
	PESD5V0L5UF PESD5V0L5UV PESD5V0L5UY		-	-	5.0	V
C_d	diode capacitance	f = 1 MHz; V_R = 0 V				
	PESD3V3L5UF PESD3V3L5UV PESD3V3L5UY		-	22	28	pF
	PESD5V0L5UF PESD5V0L5UV PESD5V0L5UY		-	16	19	pF

2. Pinning information

Table 3.   Pinning
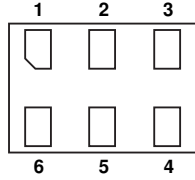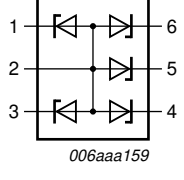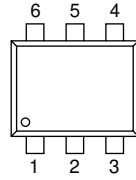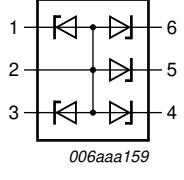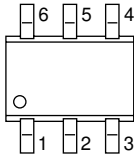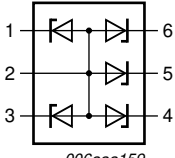
Pin	Description	Simplified outline	Symbol
PESD3V3L5UF; PESD5V0L5UF			
1	cathode (diode 1)		
2	common anode		
3	cathode (diode 2)		
4	cathode (diode 3)		
5	cathode (diode 4)		
6	cathode (diode 5)		
PESD3V3L5UV; PESD5V0L5UV			
1	cathode (diode 1)		
2	common anode		
3	cathode (diode 2)		
4	cathode (diode 3)		
5	cathode (diode 4)		
6	cathode (diode 5)		

Table 3.   Pinning ...continued

Pin	Description	Simplified outline	Symbol
PESD3V3L5UY; PESD5V0L5UY			
1	cathode (diode 1)		
2	common anode		
3	cathode (diode 2)		
4	cathode (diode 3)		
5	cathode (diode 4)		
6	cathode (diode 5)		

3. Ordering information

Table 4.   Ordering information

Type number	Package		
	Name	**Description**	**Version**
PESD3V3L5UF	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body $1 \times 1.45 \times 0.5$ mm	SOT886
PESD5V0L5UF			
PESD3V3L5UV	-	plastic surface-mounted package; 6 leads	SOT666
PESD5V0L5UV			
PESD3V3L5UY	SC-88	plastic surface-mounted package; 6 leads	SOT363
PESD5V0L5UY			

4. Marking

Table 5.   Marking codes

Type number	Marking code[1]
PESD3V3L5UF	A1
PESD5V0L5UF	A2
PESD3V3L5UV	E1
PESD5V0L5UV	E2
PESD3V3L5UY	K3*
PESD5V0L5UY	K4*

[1]   * = -: made in Hong Kong

       * = p: made in Hong Kong

       * = t: made in Malaysia

       * = W: made in China

5. Limiting values

Table 6.   Limiting values
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions		Min	Max	Unit
Per diode						
P_{PP}	peak pulse power	$t_p = 8/20$ μs	[1][2]	-	25	W
I_{PP}	peak pulse current	$t_p = 8/20$ μs	[1][2]	-	2.5	A
Per device						
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.

[2]   Measured from pin 1, 3, 4, 5 or 6 to pin 2.

Table 7.   ESD maximum ratings
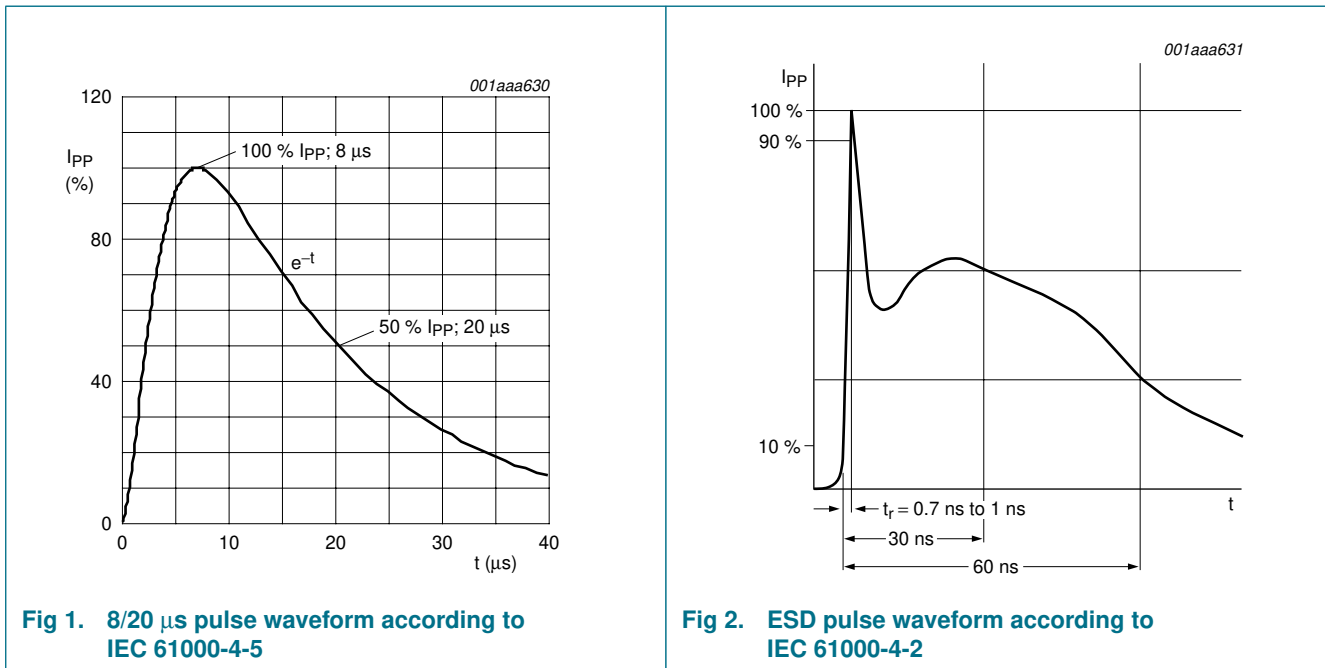*$T_{amb} = 25$ °C unless otherwise specified.*

Symbol	Parameter	Conditions		Min	Max	Unit
Per diode						
V_{ESD}	electrostatic discharge voltage	IEC 61000-4-2 (contact discharge)	[1][2]	-	20	kV
		MIL-STD-883 (human body model)		-	10	kV

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

[2]   Measured from pin 1, 3, 4, 5 or 6 to pin 2.

Table 8.   ESD standards compliance

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

001aaa630

120

I_{PP} (%)

100 % I_{PP}; 8 μs

80

e^{-t}

50 % I_{PP}; 20 μs

40

0

0   10   20   30   40

t (μs)

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

001aaa631

I_{PP}

100 %
90 %

10 %

t_r = 0.7 ns to 1 ns

30 ns

60 ns

t

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

6. Characteristics

Table 9.   Characteristics
T_{amb} = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per diode						
V_{RWM}	reverse standoff voltage					
	PESD3V3L5UF PESD3V3L5UV PESD3V3L5UY		-	-	3.3	V
	PESD5V0L5UF PESD5V0L5UV PESD5V0L5UY		-	-	5.0	V
I_{RM}	reverse leakage current					
	PESD3V3L5UF PESD3V3L5UV PESD3V3L5UY	V_{RWM} = 3.3 V	-	75	300	nA
	PESD5V0L5UF PESD5V0L5UV PESD5V0L5UY	V_{RWM} = 5.0 V	-	5	25	nA
V_{BR}	breakdown voltage	I_R = 1 mA				
	PESD3V3L5UF PESD3V3L5UV PESD3V3L5UY		5.3	5.6	5.9	V
	PESD5V0L5UF PESD5V0L5UV PESD5V0L5UY		6.4	6.8	7.2	V

Table 9.   Characteristics *…continued*
$T_{amb} = 25\,°C$ unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
C_d	diode capacitance	$f = 1$ MHz; $V_R = 0$ V				
	PESD3V3L5UF PESD3V3L5UV PESD3V3L5UY		-	22	28	pF
	PESD5V0L5UF PESD5V0L5UV PESD5V0L5UY		-	16	19	pF
V_{CL}	clamping voltage	[1][2]				
	PESD3V3L5UF PESD3V3L5UV PESD3V3L5UY	$I_{PP} = 1$ A	-	-	10	V
	PESD3V3L5UF PESD3V3L5UV PESD3V3L5UY	$I_{PP} = 2.5$ A	-	-	12	V
	PESD5V0L5UF PESD5V0L5UV PESD5V0L5UY	$I_{PP} = 1$ A	-	-	10	V
	PESD5V0L5UF PESD5V0L5UV PESD5V0L5UY	$I_{PP} = 2.5$ A	-	-	12	V
r_{dif}	differential resistance	$I_R = 1$ mA				
	PESD3V3L5UF PESD3V3L5UV PESD3V3L5UY		-	-	200	Ω
	PESD5V0L5UF PESD5V0L5UV PESD5V0L5UY		-	-	100	Ω

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

[2]   Measured from pin 1, 3, 4, 5 or 6 to pin 2.

006aab139
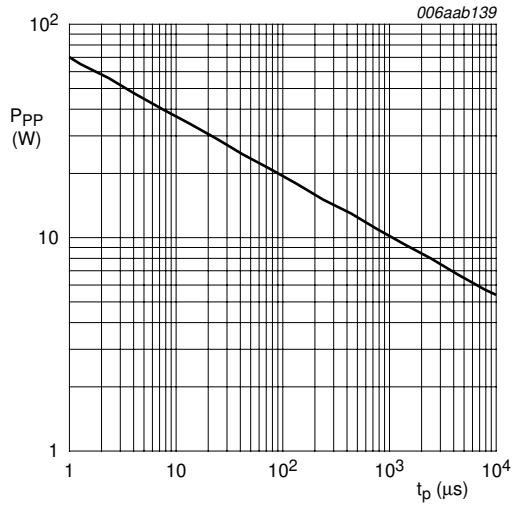
T_{amb} = 25 °C

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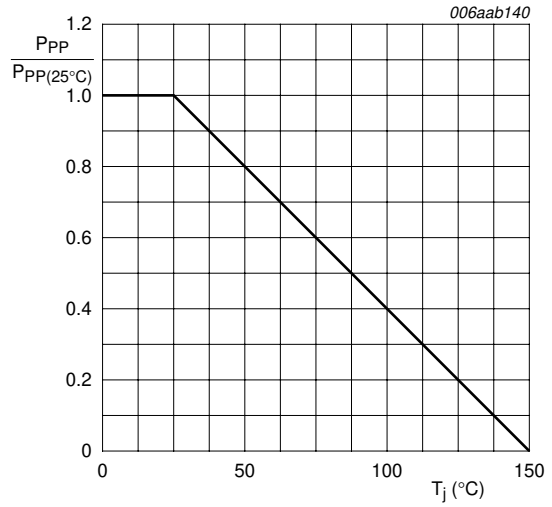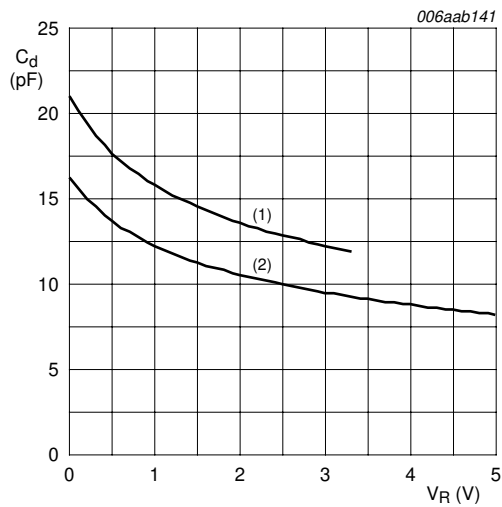

006aab140

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

006aab141

f = 1 MHz; T_{amb} = 25 °C

(1)   PESD3V3L5UF; PESD3V3L5UV; PESD3V3L5UY

(2)   PESD5V0L5UF; PESD5V0L5UV; PESD5V0L5UY

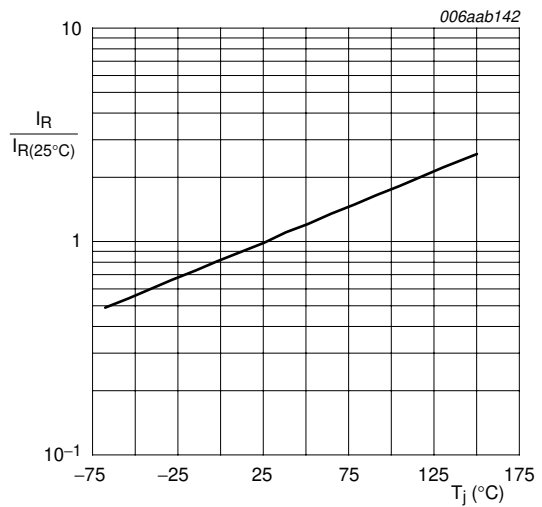**Fig 5.** Diode capacitance as a function of reverse voltage; typical values

006aab142

Fig 6. Relative variation of reverse current as a function of junction temperature; typical values
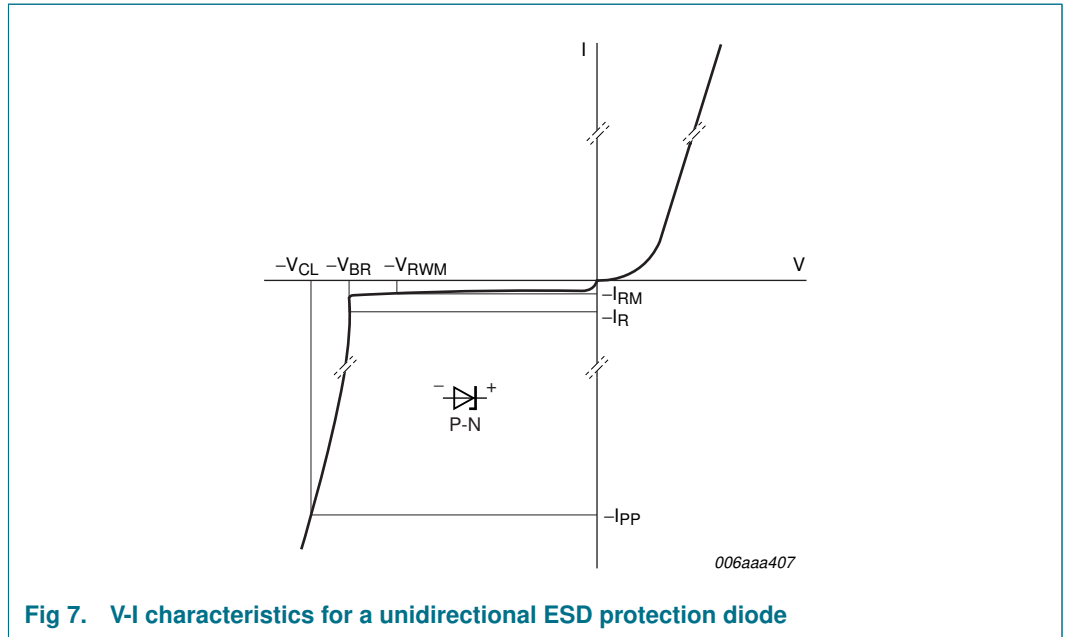
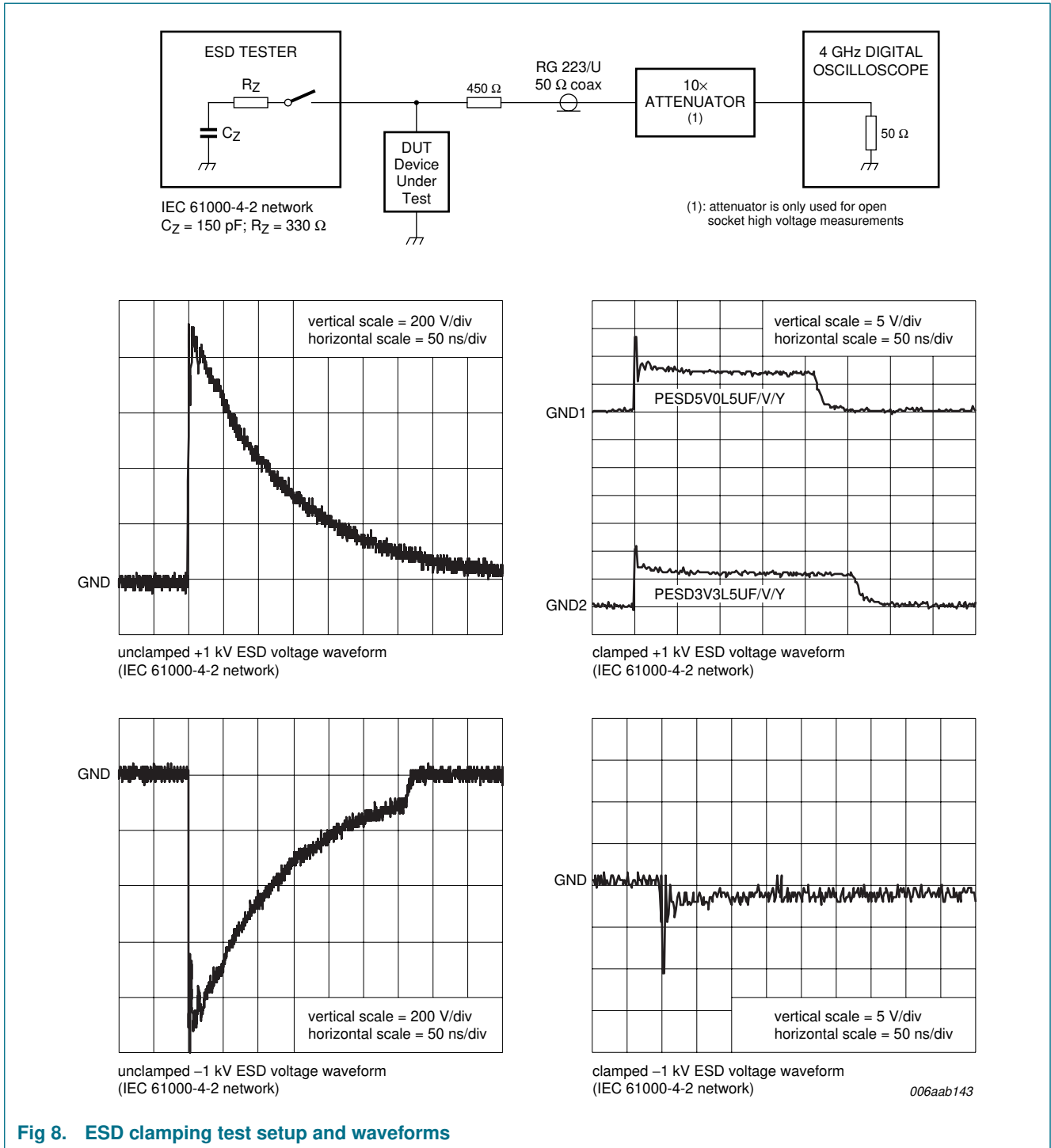**Fig 7. V-I characteristics for a unidirectional ESD protection diode**

Fig 8. **ESD clamping test setup and waveforms**

7. Application information

The devices are designed for the protection of up to five unidirectional data or signal lines from the damage caused by ESD and surge pulses. The devices may be used on lines where the signal polarities are both, positive and negative with respect to ground. The devices provide a surge capability of 25 W per line for an 8/20 µs waveform each.
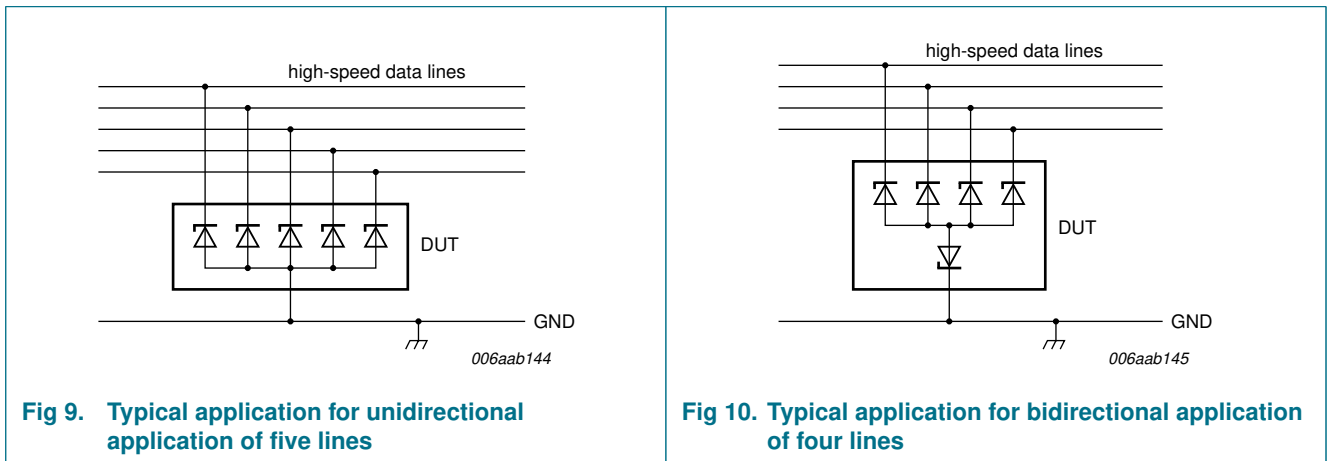

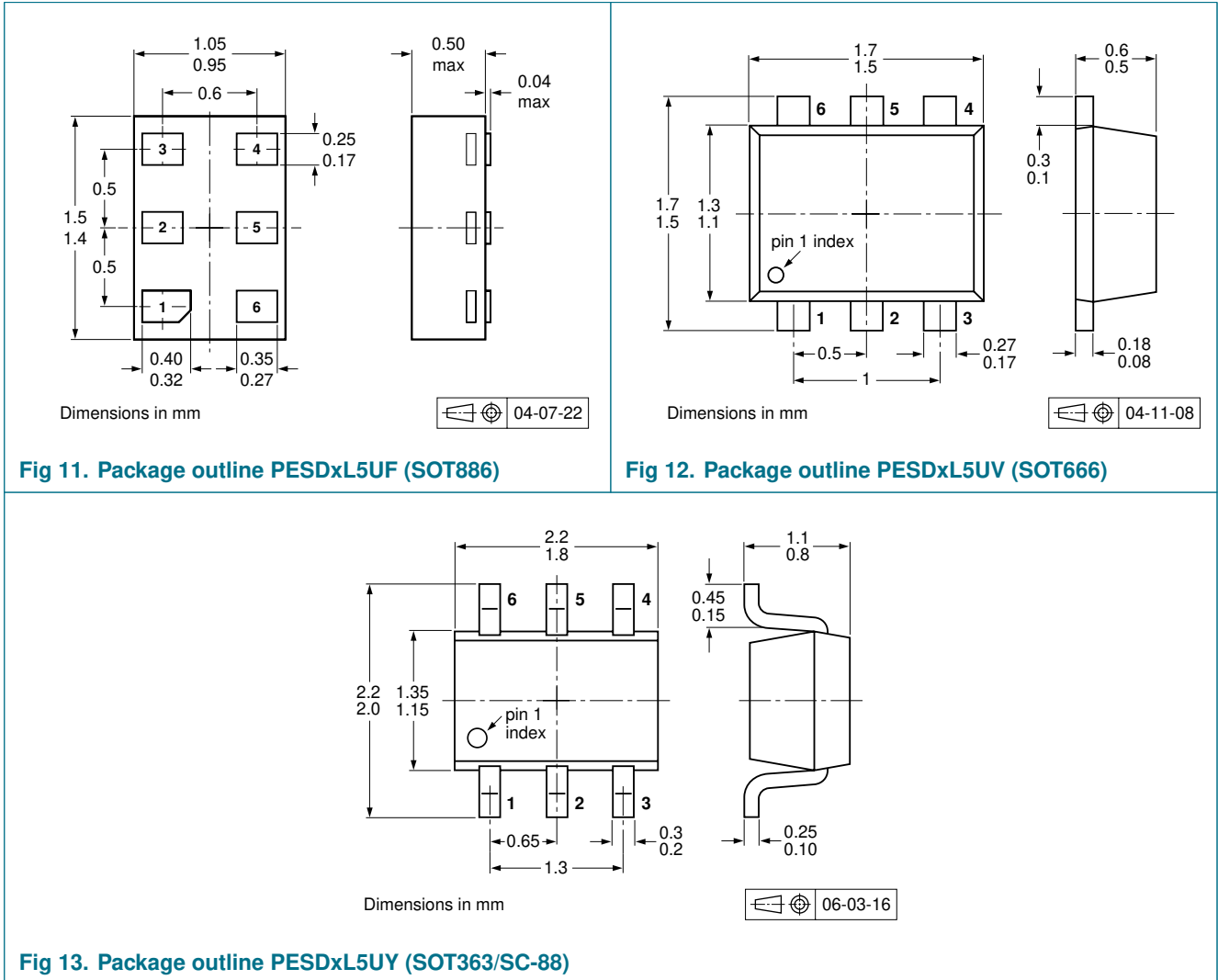**Fig 9. Typical application for unidirectional application of five lines**

Fig 10. Typical application for bidirectional application of four lines

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. The path length between the device and the protected line should be minimized.
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. Ground planes should be used whenever possible. For multilayer PCBs, use ground vias.

8. Package outline

Fig 11. **Package outline PESDxL5UF (SOT886)**

Fig 12. **Package outline PESDxL5UV (SOT666)**

Fig 13. **Package outline PESDxL5UY (SOT363/SC-88)**

9. Packing information

Table 10. Packing methods
The indicated -xxx are the last three digits of the 12NC ordering code.[1]

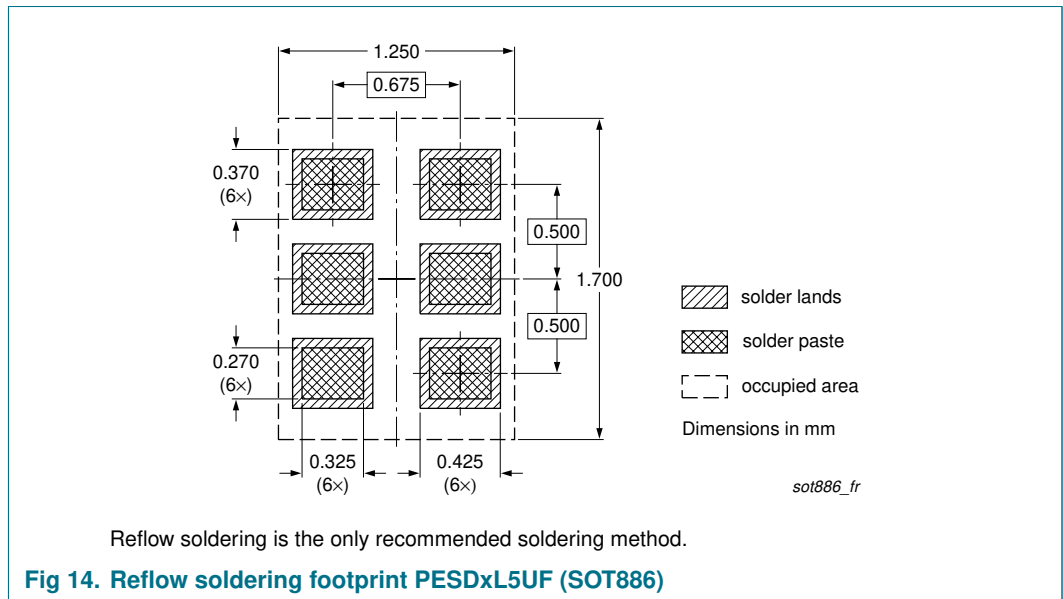| Type number	Package	Description		Packing quantity				
				3000	**4000**	**5000**	**8000**	**10000**
PESD3V3L5UF	SOT886	4 mm pitch, 8 mm tape and reel; T1	[2]	-	-	-115	-	-
		4 mm pitch, 8 mm tape and reel; T4	[3]	-	-	-132	-	-
PESD5V0L5UF	SOT886	4 mm pitch, 8 mm tape and reel; T1	[2]	-	-	-115	-	-
		4 mm pitch, 8 mm tape and reel; T4	[3]	-	-	-132	-	-
PESD3V3L5UV	SOT666	2 mm pitch, 8 mm tape and reel		-	-	-	-315	-
		4 mm pitch, 8 mm tape and reel		-	-115	-	-	-
PESD5V0L5UV	SOT666	2 mm pitch, 8 mm tape and reel		-	-	-	-315	-
		4 mm pitch, 8 mm tape and reel		-	-115	-	-	-
PESD3V3L5UY	SOT363	4 mm pitch, 8 mm tape and reel; T1	[2]	-115	-	-	-	-135
		4 mm pitch, 8 mm tape and reel; T2	[4]	-125	-	-	-	-165
PESD5V0L5UY	SOT363	4 mm pitch, 8 mm tape and reel; T1	[2]	-115	-	-	-	-135
		4 mm pitch, 8 mm tape and reel; T2	[4]	-125	-	-	-	-165

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

[2] T1: normal taping

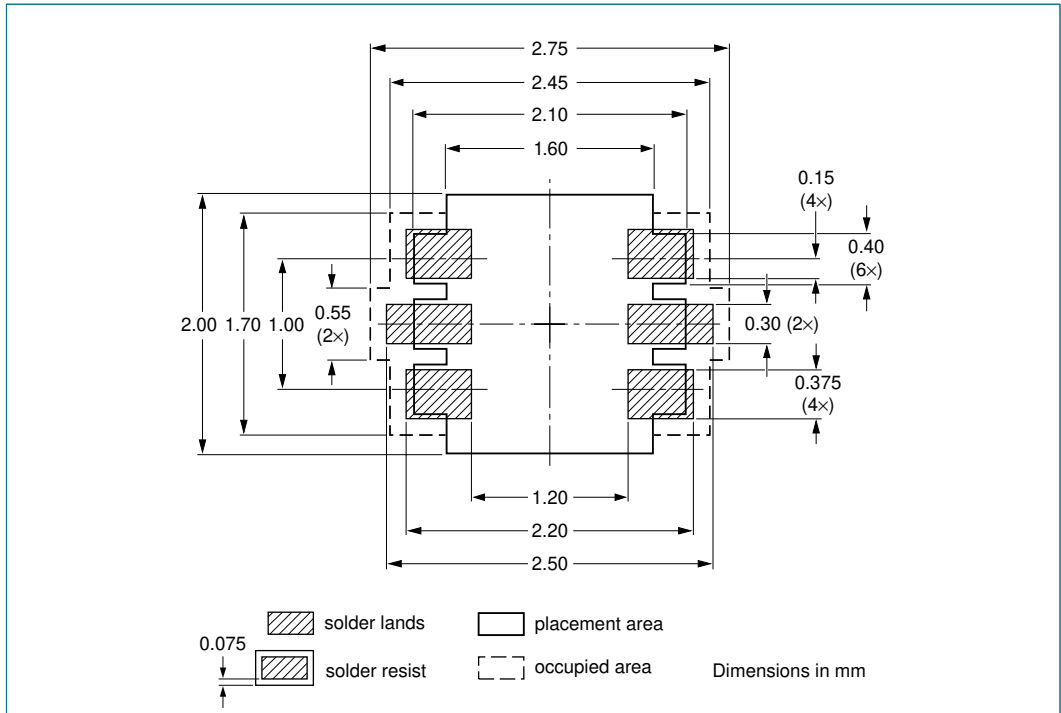[3] T4: 90° rotated reverse taping

[4] T2: reverse taping

10. Soldering

Reflow soldering is the only recommended soldering method.

Fig 14. Reflow soldering footprint PESDxL5UF (SOT886)

Reflow soldering is the only recommended soldering method.

Fig 15. Reflow soldering footprint PESDxL5UV (SOT666)

Fig 16. Reflow soldering footprint PESDxL5UY (SOT363/SC-88)
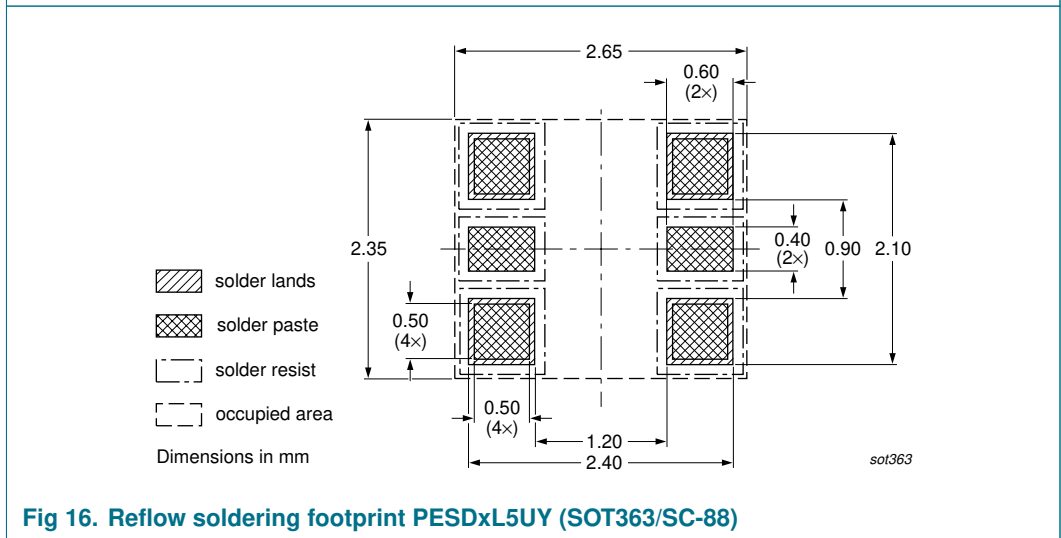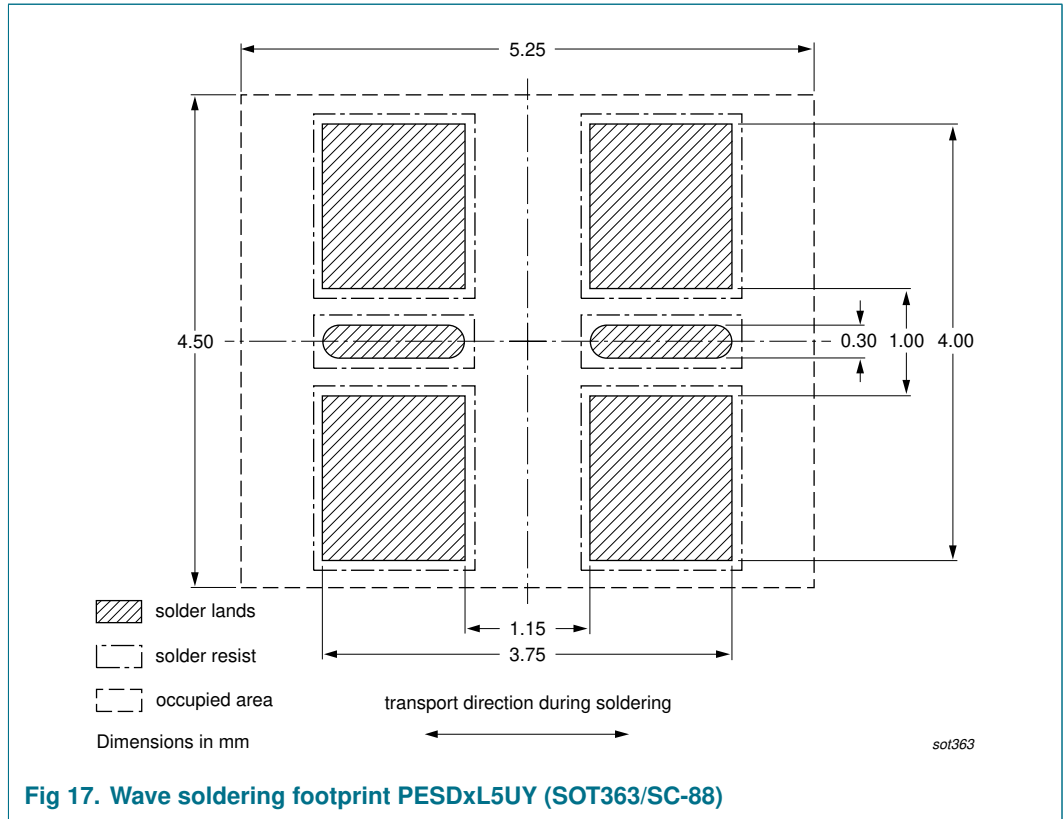
Fig 17. Wave soldering footprint PESDxL5UY (SOT363/SC-88)

11. Revision history

Table 11.   Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PESDXL5UF_V_Y_2	20080108	Product data sheet	-	PESD3V3L5UV_ PESD5V0L5UV_1 PESD3V3L5UY_ PESD5V0L5UY_1
Modifications:		• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors. • Legal texts have been adapted to the new company name where appropriate. • Type numbers PESD3V3L5UF and PESD5V0L5UF added • Table 1 "Product overview": added • Section 4 "Marking": marking code for PESD3V3L5UV amended • Section 4 "Marking": marking code for PESD5V0L5UV amended • Section 4 "Marking": marking code for PESD3V3L5UY amended • Section 4 "Marking": marking code for PESD5V0L5UY amended • Figure 7: added • Section 9 "Packing information": added • Section 10 "Soldering": added • Section 12 "Legal information": updated		
PESD3V3L5UV_PESD5V0L5UV_1	20040323	Product specification	-	-
PESD3V3L5UY_PESD5V0L5UY_1	20040323	Product specification	-	-

12. Legal information

12.1 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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14. Contents