

# PESDxS4UD series

Quadruple ESD protection diode arrays in a SOT457 package

Rev. 02 — 21 August 2009

Product data sheet

## 1. Product profile

### 1.1 General description

Quadruple ElectroStatic Discharge (ESD) protection diode arrays in a SOT457 (SC-74) small Surface-Mounted Device (SMD) plastic package designed to protect up to 4 signal lines from the damage caused by ESD and other transients.

### 1.2 Features

- ESD protection of up to 4 lines
- Max. peak pulse power:  $P_{PP} = 200$  W
- Ultra low leakage current:  $I_{RM} = 50$  pA
- Low clamping voltage:  $V_{CL} = 12$  V at  $I_{PP} = 20$  A
- ESD protection up to 30 kV
- IEC 61000-4-2; level 4 (ESD)
- IEC 61000-4-5; (surge);  $I_{PP}$  up to 20 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 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per diode</b>						
$V_{RWM}$	reverse standoff voltage					
	PESD3V3S4UD		-	-	3.3	V
	PESD5V0S4UD		-	-	5	V
	PESD12VS4UD		-	-	12	V
	PESD15VS4UD		-	-	15	V
	PESD24VS4UD		-	-	24	V

**Table 1. Quick reference data ...continued**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
C <sub>d</sub>	diode capacitance	f = 1 MHz; V <sub>R</sub> = 0 V				
	PESD3V3S4UD		-	215	300	pF
	PESD5V0S4UD		-	165	220	pF
	PESD12VS4UD		-	73	100	pF
	PESD15VS4UD		-	60	90	pF
	PESD24VS4UD		-	45	70	pF

## 2. Pinning information

**Table 2. Pinning**

Pin	Description	Simplified outline	Symbol
1	cathode 1		
2	common anode		
3	cathode 2		
4	cathode 3		
5	common anode		
6	cathode 4		

## 3. Ordering information

**Table 3. Ordering information**

Type number	Package		
	Name	Description	Version
PESD3V3S4UD	SC-74	plastic surface-mounted package (TSOP6); 6 leads	SOT457
PESD5V0S4UD			
PESD12VS4UD			
PESD15VS4UD			
PESD24VS4UD			

## 4. Marking

**Table 4. Marking codes**

Type number	Marking code
PESD3V3S4UD	K4
PESD5V0S4UD	K5
PESD12VS4UD	K6
PESD15VS4UD	K7
PESD24VS4UD	K8

## 5. Limiting values

**Table 5. Limiting values**

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

Symbol	Parameter	Conditions	Min	Max	Unit	
P <sub>PP</sub>	peak pulse power	t <sub>p</sub> = 8/20 μs	[1][2]	-	200	W
I <sub>PP</sub>	peak pulse current	t <sub>p</sub> = 8/20 μs	[1][2]			
	PESD3V3S4UD		-	20	A	
	PESD5V0S4UD		-	20	A	
	PESD12VS4UD		-	10	A	
	PESD15VS4UD		-	6	A	
	PESD24VS4UD		-	4	A	
T <sub>j</sub>	junction temperature		-	150	°C	
T <sub>amb</sub>	ambient temperature		-65	+150	°C	
T <sub>stg</sub>	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 or 6 to 2 or 5

**Table 6. ESD maximum ratings**

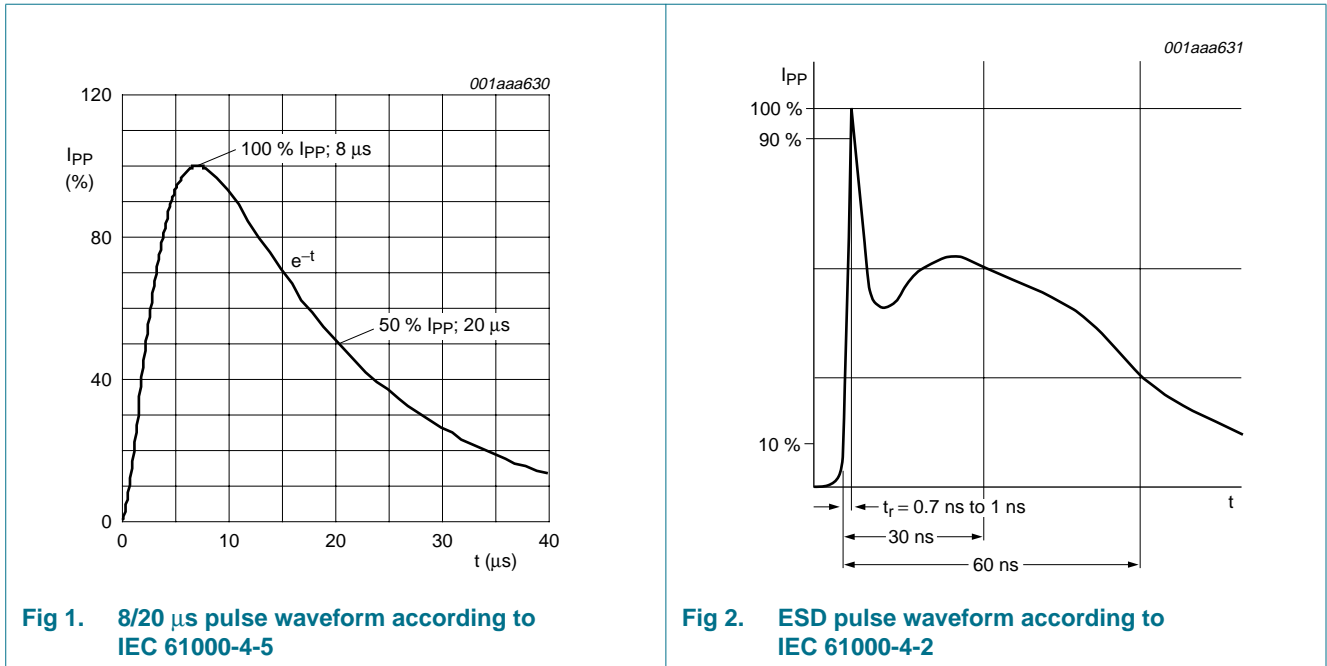
Symbol	Parameter	Conditions	Min	Max	Unit
V <sub>ESD</sub>	electrostatic discharge voltage	IEC 61000-4-2 (contact discharge)	[1][2]		
	PESD3V3S4UD		-	30	kV
	PESD5V0S4UD		-	30	kV
	PESD12VS4UD		-	30	kV
	PESD15VS4UD		-	30	kV
	PESD24VS4UD		-	23	kV
	PESDxS4UD series	HBM MIL-STD-883	-	10	kV

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

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

**Table 7. ESD standards compliance**

Standard	Conditions
IEC 61000-4-2; level 4 (ESD)	> 15 kV (air); > 8 kV (contact)
HBM MIL-STD-883; class 3	> 10 kV



**6. Characteristics**

**Table 8. Characteristics**  
*T<sub>amb</sub> = 25 °C unless otherwise specified*

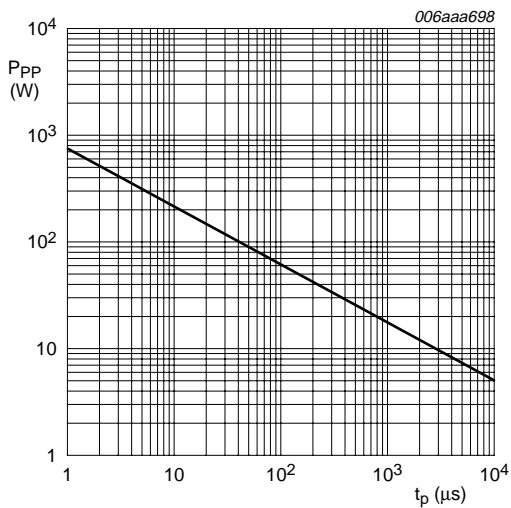
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per diode</b>						
V <sub>RWM</sub>	reverse standoff voltage					
	PESD3V3S4UD		-	-	3.3	V
	PESD5V0S4UD		-	-	5	V
	PESD12VS4UD		-	-	12	V
	PESD15VS4UD		-	-	15	V
PESD24VS4UD		-	-	24	V	
I <sub>RM</sub>	reverse leakage current					
	PESD3V3S4UD	V <sub>RWM</sub> = 3.3 V	-	300	800	nA
	PESD5V0S4UD	V <sub>RWM</sub> = 5 V	-	80	200	nA
	PESD12VS4UD	V <sub>RWM</sub> = 12 V	-	0.05	15	nA
	PESD15VS4UD	V <sub>RWM</sub> = 15 V	-	0.05	15	nA
PESD24VS4UD	V <sub>RWM</sub> = 24 V	-	0.05	15	nA	
V <sub>BR</sub>	breakdown voltage	I <sub>R</sub> = 1 mA				
	PESD3V3S4UD		5.3	5.6	5.9	V
	PESD5V0S4UD		6.4	6.8	7.2	V
	PESD12VS4UD		12.5	14.5	16	V
	PESD15VS4UD		15.5	18	20.5	V
PESD24VS4UD		25.5	27	29	V	

**Table 8. Characteristics ...continued**  
 $T_{amb} = 25^{\circ}\text{C}$  unless otherwise specified

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$C_d$	diode capacitance	$f = 1\text{ MHz}; V_R = 0\text{ V}$				
	PESD3V3S4UD		-	215	300	pF
	PESD5V0S4UD		-	165	220	pF
	PESD12VS4UD		-	73	100	pF
	PESD15VS4UD		-	60	90	pF
	PESD24VS4UD		-	45	70	pF
$V_{CL}$	clamping voltage			[1][2]		
	PESD3V3S4UD	$I_{PP} = 1\text{ A}$	-	-	8	V
		$I_{PP} = 20\text{ A}$	-	-	12	V
	PESD5V0S4UD	$I_{PP} = 1\text{ A}$	-	-	8	V
		$I_{PP} = 20\text{ A}$	-	-	13	V
	PESD12VS4UD	$I_{PP} = 1\text{ A}$	-	-	17	V
		$I_{PP} = 10\text{ A}$	-	-	24	V
	PESD15VS4UD	$I_{PP} = 1\text{ A}$	-	-	22	V
		$I_{PP} = 6\text{ A}$	-	-	33	V
	PESD24VS4UD	$I_{PP} = 1\text{ A}$	-	-	33	V
$I_{PP} = 4\text{ A}$		-	-	52	V	
$r_{dif}$	differential resistance	$I_R = 5\text{ mA}$	-	-	25	$\Omega$

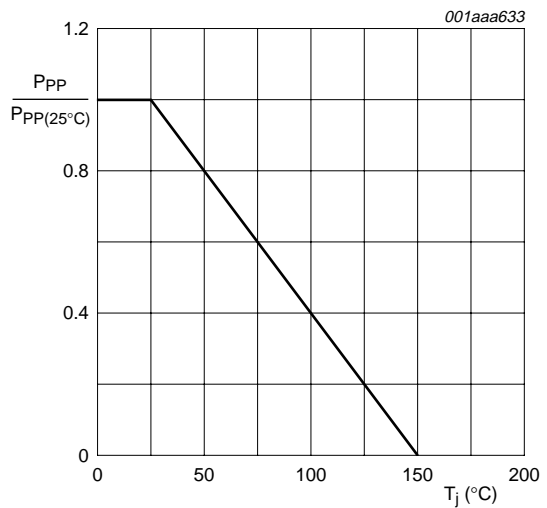
[1] Non-repetitive current pulse 8/20  $\mu\text{s}$  exponential decay waveform according to IEC 61000-4-5.

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

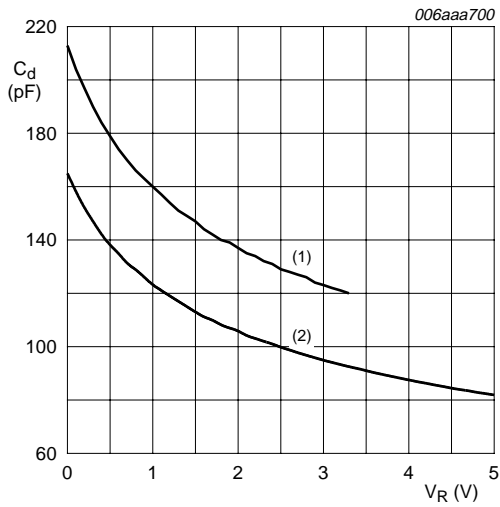


$T_{amb} = 25^{\circ}\text{C}$

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

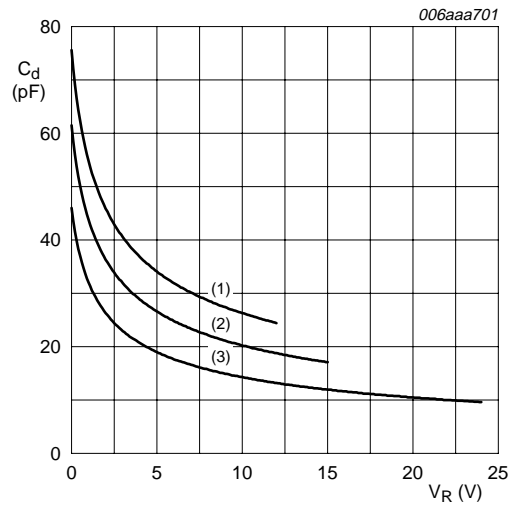


**Fig 4. Relative variation of peak pulse power as a function of junction temperature; typical values**



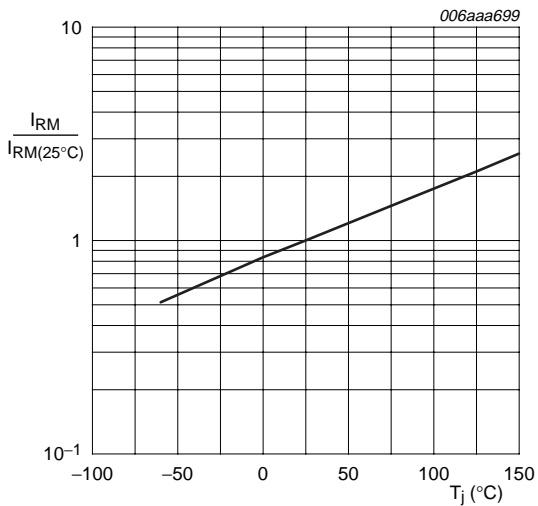
$f = 1 \text{ MHz}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$   
 (1) PESD3V3S4UD  
 (2) PESD5V0S4UD

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



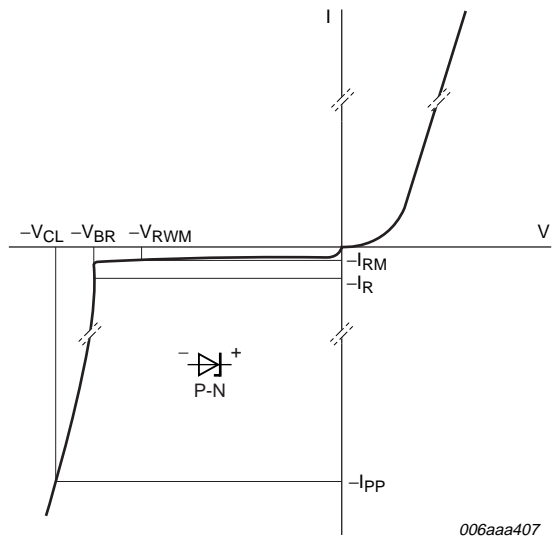
$f = 1 \text{ MHz}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$   
 (1) PESD12VS4UD  
 (2) PESD15VS4UD  
 (3) PESD24VS4UD

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

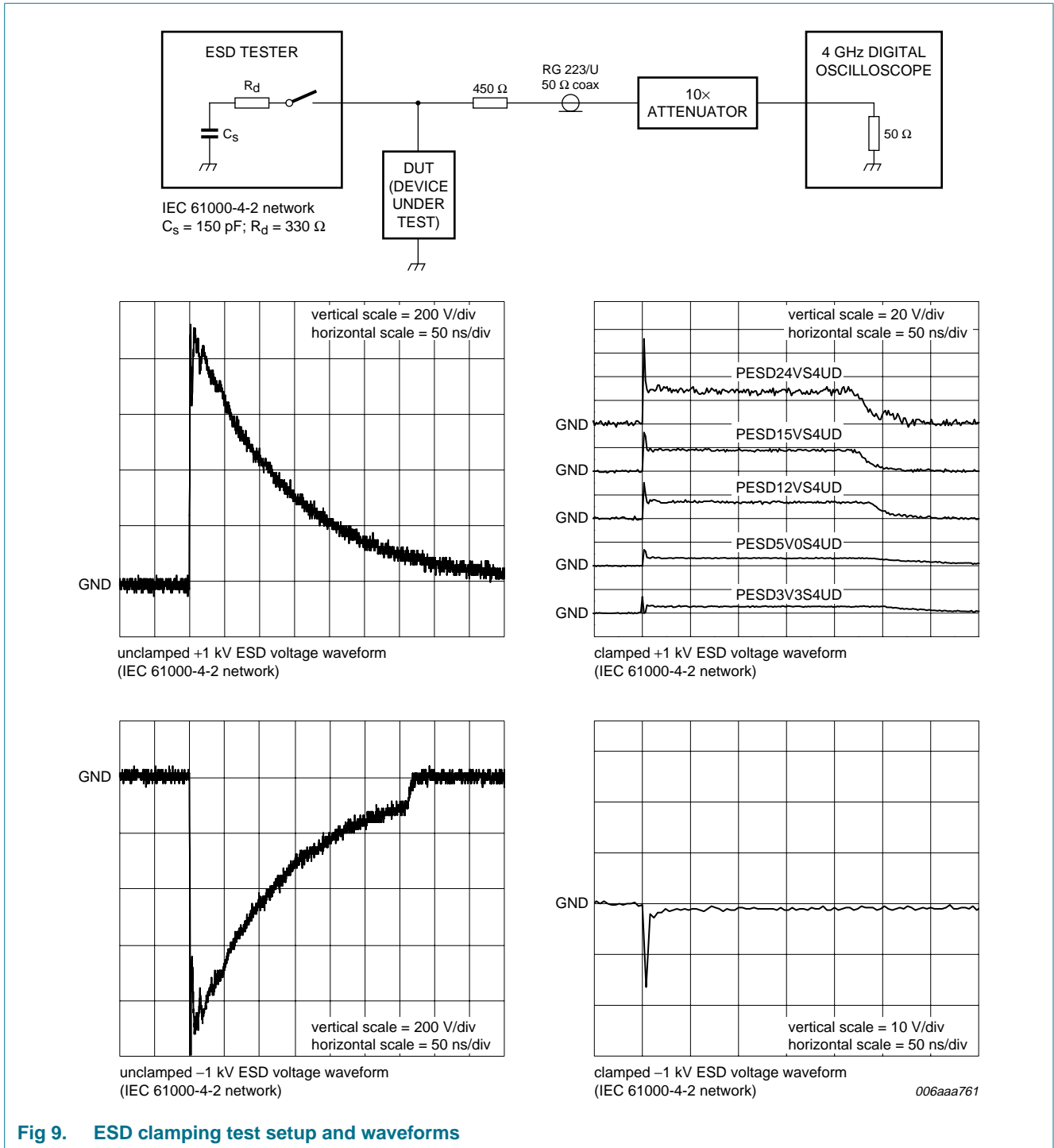


PESD3V3S4UD  
 PESD5V0S4UD  
 $I_R$  is less than 5 nA at 150 °C  
 PESD12VS4UD  
 PESD15VS4UD  
 PESD24VS4UD

**Fig 7. Relative variation of reverse leakage current as a function of junction temperature; typical values**



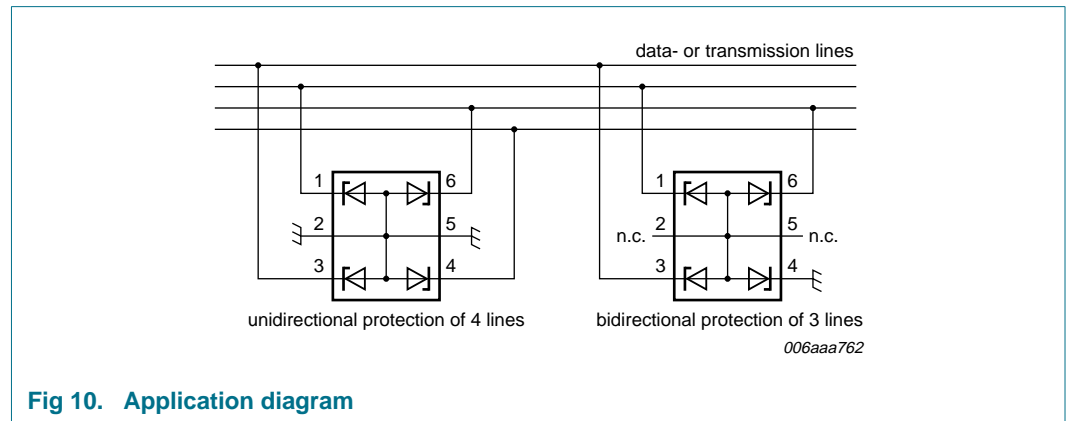
**Fig 8. V-I characteristics for a unidirectional ESD protection diode**



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

## 7. Application information

The PESDxS4UD series is designed for protection of up to 4 unidirectional data lines from the damage caused by ESD and surge pulses. The PESDxS4UD series may be used on lines where the signal polarities are above or below ground. The PESDxS4UD series provides a surge capability of 200 W per line for an 8/20  $\mu$ s waveform.



**Fig 10. Application diagram**

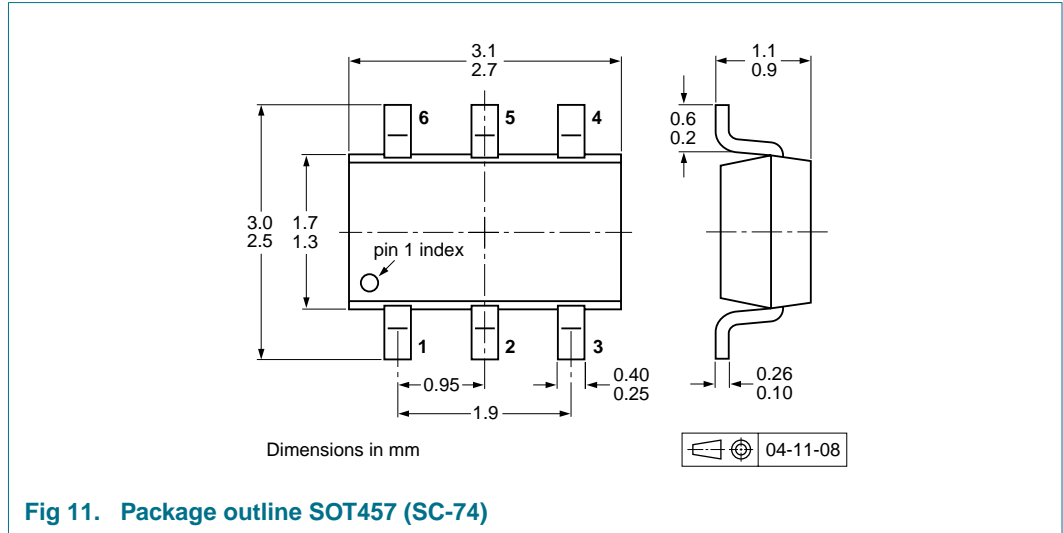
### Circuit board layout and protection device placement

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 PESDxS4UD as close to the input terminal or connector as possible.
2. The path length between the PESDxS4UD 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



## 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
PESD3V3S4UD	SOT457	4 mm pitch, 8 mm tape and reel; T1 <a href="#">[2]</a>	-115	-135
		4 mm pitch, 8 mm tape and reel; T2 <a href="#">[3]</a>	-125	-165
PESD5V0S4UD	SOT457	4 mm pitch, 8 mm tape and reel; T1 <a href="#">[2]</a>	-115	-135
		4 mm pitch, 8 mm tape and reel; T2 <a href="#">[3]</a>	-125	-165
PESD12VS4UD	SOT457	4 mm pitch, 8 mm tape and reel; T1 <a href="#">[2]</a>	-115	-135
		4 mm pitch, 8 mm tape and reel; T2 <a href="#">[3]</a>	-125	-165
PESD15VS4UD	SOT457	4 mm pitch, 8 mm tape and reel; T1 <a href="#">[2]</a>	-115	-135
		4 mm pitch, 8 mm tape and reel; T2 <a href="#">[3]</a>	-125	-165
PESD24VS4UD	SOT457	4 mm pitch, 8 mm tape and reel; T1 <a href="#">[2]</a>	-115	-135
		4 mm pitch, 8 mm tape and reel; T2 <a href="#">[3]</a>	-125	-165

[1] For further information and the availability of packing methods, see [Section 12](#).

[2] T1: normal taping

[3] T2: reverse taping

## 10. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PESDXS4UD_SER_2	20090821	Product data sheet	-	PESDXS4UD_SER_1
Modifications:	<ul style="list-style-type: none"><li>This data sheet was changed to reflect the new company name NXP Semiconductors, including new legal definitions and disclaimers. No changes were made to the technical content.</li></ul>			
PESDXS4UD_SER_1	20060704	Product data sheet	-	-

## 11. Legal information

### 11.1 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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