

# PESDxS2UQ series

Double ESD protection diodes in SOT663 package

Rev. 03 — 11 September 2008

Product data sheet

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NXP Semiconductors

# Double ESD protection diodes in SOT663 package

## PESDxS2UQ series

### FEATURES

- Uni-directional ESD protection of up to two lines
- Max. peak pulse power:  $P_{pp} = 150 \text{ W}$  at  $t_p = 8/20 \mu\text{s}$
- Low clamping voltage:  $V_{(CL)R} = 20 \text{ V}$  at  $I_{pp} = 15 \text{ A}$
- Low reverse leakage current:  $I_{RM} < 1 \text{ nA}$
- ESD protection  $> 30 \text{ kV}$
- IEC 61000-4-2; level 4 (ESD)
- IEC 61000-4-5 (surge);  $I_{pp} = 15 \text{ A}$  at  $t_p = 8/20 \mu\text{s}$ .

### APPLICATIONS

- Computers and peripherals
- Communication systems
- Audio and video equipment
- High speed data lines
- Parallel ports.

### DESCRIPTION

Uni-directional double ESD protection diodes in a SOT663 plastic package. Designed to protect up to two transmission or data lines from ElectroStatic Discharge (ESD) damage.

### MARKING

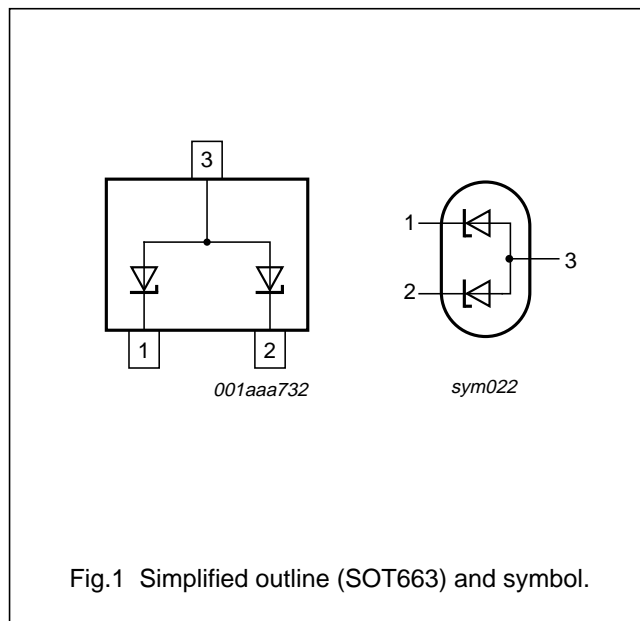
TYPE NUMBER	MARKING CODE
PESD3V3S2UQ	E1
PESD5V0S2UQ	E2
PESD12VS2UQ	E3
PESD15VS2UQ	E4
PESD24VS2UQ	E5

### QUICK REFERENCE DATA

SYMBOL	PARAMETER	VALUE	UNIT
$V_{RWM}$	reverse stand-off voltage	3.3, 5, 12, 15 and 24	V
$C_d$	diode capacitance $V_R = 0 \text{ V};$ $f = 1 \text{ MHz}$	200, 150, 38, 32 and 23	pF
	number of protected lines	2	

### PINNING

PIN	DESCRIPTION
1	cathode 1
2	cathode 2
3	common anode



## Double ESD protection diodes in SOT663 package

## PESDxS2UQ series

### ORDERING INFORMATION

TYPE NUMBER	PACKAGE		
	NAME	DESCRIPTION	VERSION
PESD3V3S2UQ	-	plastic surface mounted package; 3 leads	SOT663
PESD5V0S2UQ			
PESD12VS2UQ			
PESD15VS2UQ			
PESD24VS2UQ			

### LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT			
$P_{pp}$	peak pulse power	8/20 $\mu$ s pulse; notes 1 and 2	-	150	W			
$I_{pp}$	peak pulse current	8/20 $\mu$ s pulse; notes 1 and 2						
	PESD3V3S2UQ					-	15	A
	PESD5V0S2UQ					-	15	A
	PESD12VS2UQ					-	5	A
	PESD15VS2UQ					-	5	A
	PESD24VS2UQ	-	3	A				
$T_j$	junction temperature		-	150	$^{\circ}$ C			
$T_{amb}$	operating ambient temperature		-65	+150	$^{\circ}$ C			
$T_{stg}$	storage temperature		-65	+150	$^{\circ}$ C			

### Notes

1. Non-repetitive current pulse 8/20  $\mu$ s exponential decaying waveform; see Fig.2.
2. Measured across either pins 1 and 3 or pins 2 and 3.

# Double ESD protection diodes in SOT663 package

## PESDxS2UQ series

### ESD maximum ratings

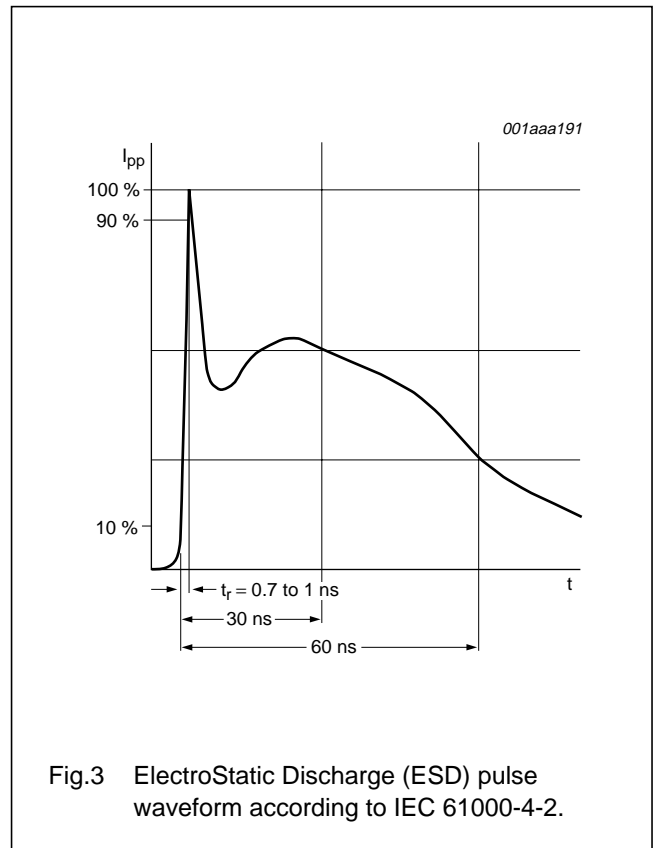
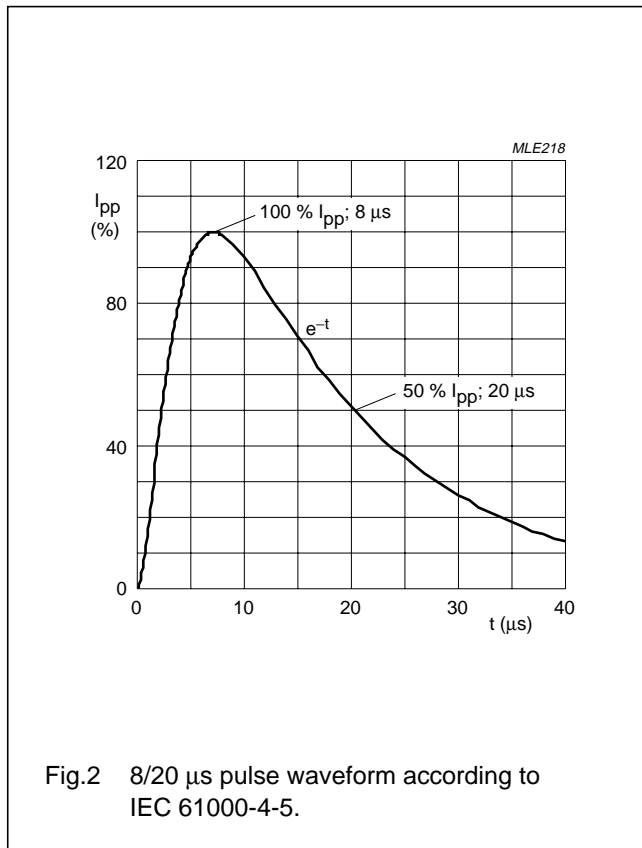
SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
ESD	electrostatic discharge capability	IEC 61000-4-2 (contact discharge); notes 1 and 2		
		PESD3V3S2UQ	30	kV
		PESD5V0S2UQ	30	kV
		PESD12VS2UQ	30	kV
		PESD15VS2UQ	30	kV
		PESD24VS2UQ	23	kV
	HBM MIL-Std 883 PESDxS2UQ series	10	kV	

### Notes

1. Device stressed with ten non-repetitive ElectroStatic Discharge (ESD) pulses; see Fig.3.
2. Measured across either pins 1 and 3 or pins 2 and 3.

### ESD standards compliance

ESD STANDARD	CONDITIONS
IEC 61000-4-2; level 4 (ESD); see Fig.3	>15 kV (air); > 8 kV (contact)
HBM MIL-Std 883; class 3	>4 kV



## Double ESD protection diodes in SOT663 package

## PESDxS2UQ series

### ELECTRICAL CHARACTERISTICS

$T_j = 25\text{ }^\circ\text{C}$  unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{RWM}$	reverse stand-off voltage					
	PESD3V3S2UQ		–	–	3.3	V
	PESD5V0S2UQ		–	–	5	V
	PESD12VS2UQ		–	–	12	V
	PESD15VS2UQ		–	–	15	V
	PESD24VS2UQ		–	–	24	V
$I_{RM}$	reverse leakage current					
	PESD3V3S2UQ	$V_{RWM} = 3.3\text{ V}$	–	0.55	3	$\mu\text{A}$
	PESD5V0S2UQ	$V_{RWM} = 5\text{ V}$	–	50	300	nA
	PESD12VS2UQ	$V_{RWM} = 12\text{ V}$	–	<1	30	nA
	PESD15VS2UQ	$V_{RWM} = 15\text{ V}$	–	<1	50	nA
	PESD24VS2UQ	$V_{RWM} = 24\text{ V}$	–	<1	50	nA
$V_{BR}$	breakdown voltage	$I_Z = 5\text{ mA}$				
	PESD3V3S2UQ		5.2	5.6	6.0	V
	PESD5V0S2UQ		6.4	6.8	7.2	V
	PESD12VS2UQ		14.7	15.0	15.3	V
	PESD15VS2UQ		17.6	18.0	18.4	V
	PESD24VS2UQ		26.5	27.0	27.5	V
$C_d$	diode capacitance	$f = 1\text{ MHz}; V_R = 0\text{ V}$				
	PESD3V3S2UQ		–	200	275	pF
	PESD5V0S2UQ		–	150	215	pF
	PESD12VS2UQ		–	38	100	pF
	PESD15VS2UQ		–	32	70	pF
	PESD24VS2UQ		–	23	50	pF
$V_{(CL)R}$	clamping voltage	notes 1 and 2				
	PESD3V3S2UQ	$I_{pp} = 1\text{ A}$	–	–	8	V
		$I_{pp} = 15\text{ A}$	–	–	20	V
	PESD5V0S2UQ	$I_{pp} = 1\text{ A}$	–	–	9	V
		$I_{pp} = 15\text{ A}$	–	–	20	V
	PESD12VS2UQ	$I_{pp} = 1\text{ A}$	–	–	19	V
		$I_{pp} = 5\text{ A}$	–	–	35	V
	PESD15VS2UQ	$I_{pp} = 1\text{ A}$	–	–	23	V
		$I_{pp} = 5\text{ A}$	–	–	40	V
	PESD24VS2UQ	$I_{pp} = 1\text{ A}$	–	–	36	V
$I_{pp} = 3\text{ A}$		–	–	70	V	

# Double ESD protection diodes in SOT663 package

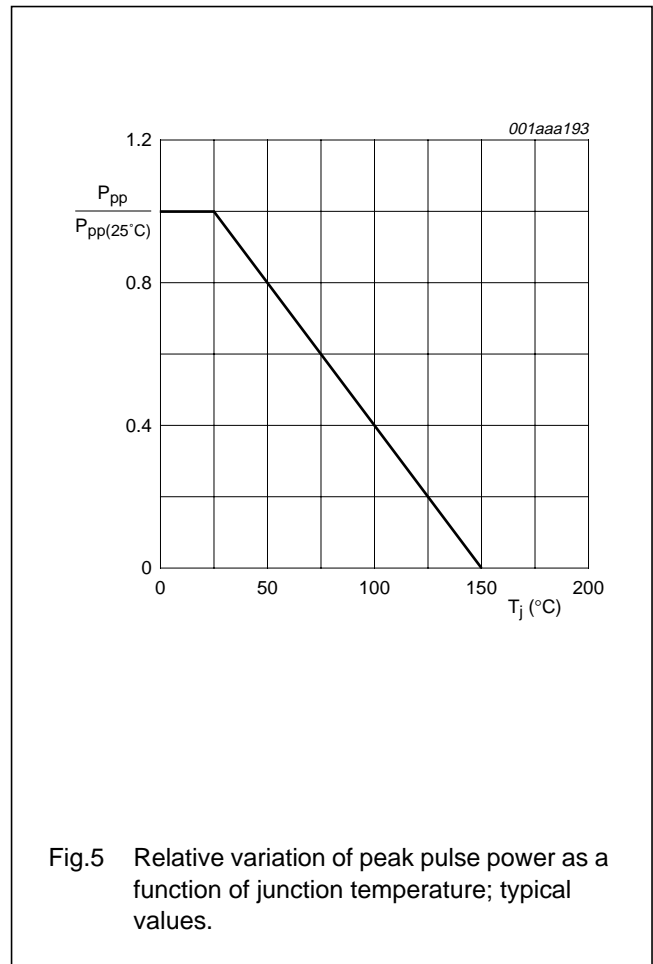
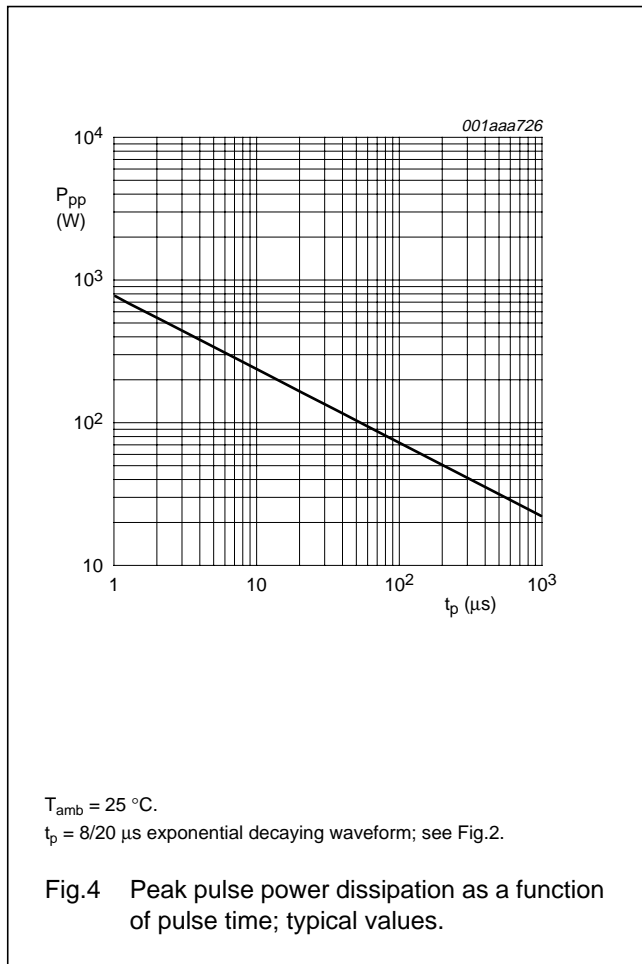
## PESDxS2UQ series

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$R_{diff}$	differential resistance					
	PESD3V3S2UQ	$I_R = 5 \text{ mA}$	–	–	40	$\Omega$
	PESD5V0S2UQ	$I_R = 5 \text{ mA}$	–	–	15	$\Omega$
	PESD12VS2UQ	$I_R = 5 \text{ mA}$	–	–	15	$\Omega$
	PESD15VS2UQ	$I_R = 1 \text{ mA}$	–	–	225	$\Omega$
	PESD24VS2UQ	$I_R = 0.5 \text{ mA}$	–	–	300	$\Omega$

**Notes**

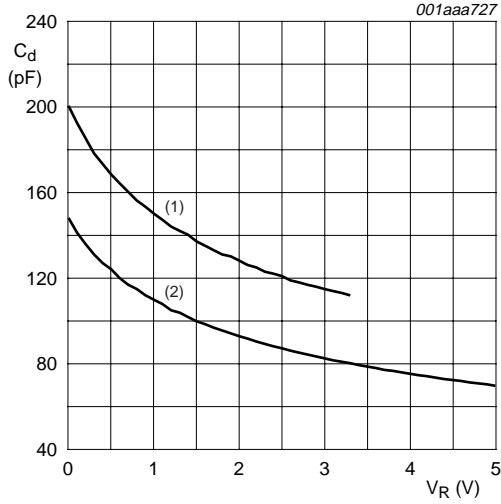
1. Non-repetitive current pulse 8/20  $\mu\text{s}$  exponential decay waveform; see Fig.2.
2. Measured either across pins 1 and 3 or pins 2 and 3.

**GRAPHICAL DATA**



# Double ESD protection diodes in SOT663 package

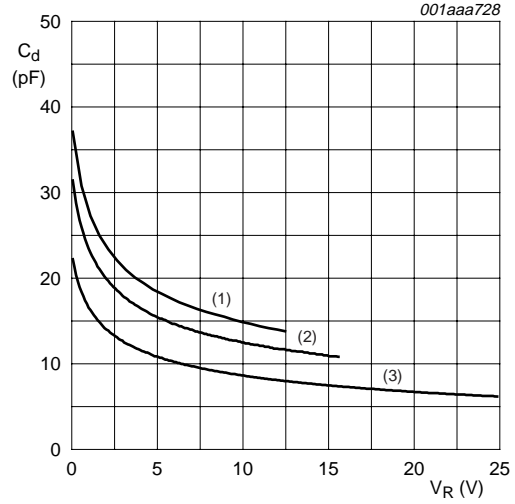
## PESDxS2UQ series



- (1) PESD3V3S2UQ;  $V_{RWM} = 3.3$  V.
- (2) PESD5V0S2UQ;  $V_{RWM} = 5$  V.

$T_{amb} = 25$  °C;  $f = 1$  MHz.

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



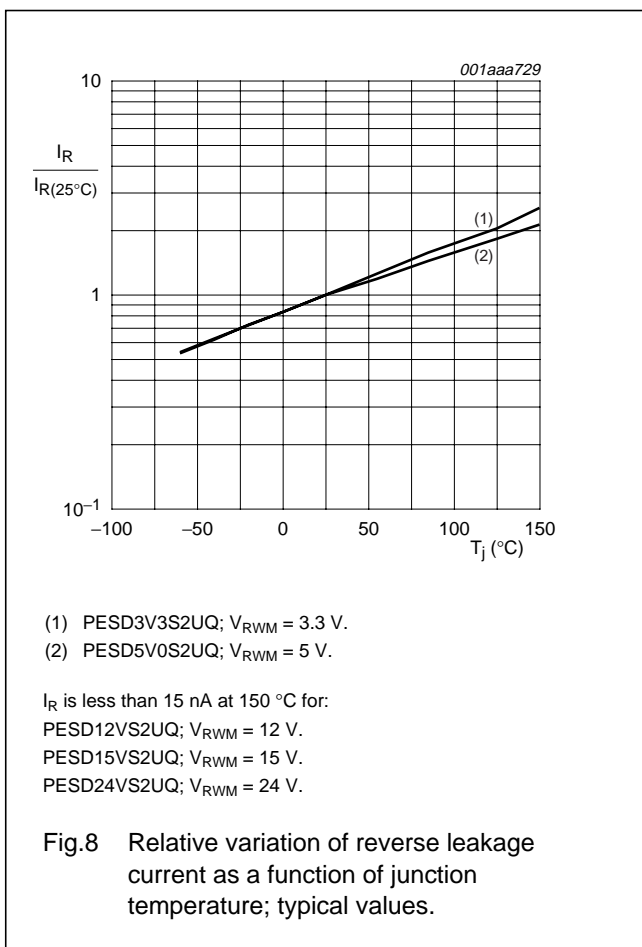
- (1) PESD12VS2UQ;  $V_{RWM} = 12$  V.
- (2) PESD15VS2UQ;  $V_{RWM} = 15$  V.
- (3) PESD24VS2UQ;  $V_{RWM} = 24$  V.

$T_{amb} = 25$  °C;  $f = 1$  MHz.

Fig.7 Diode capacitance as a function of reverse voltage; typical values.

Double ESD protection diodes  
in SOT663 package

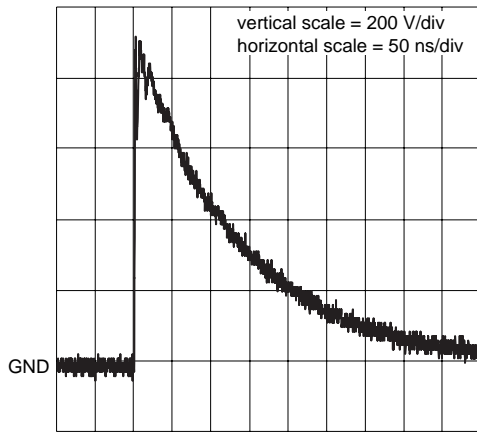
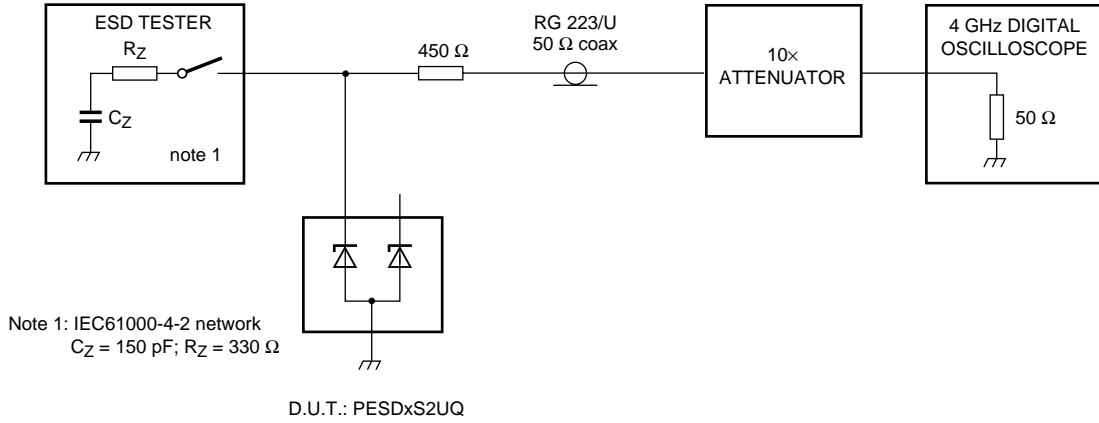
PESDxS2UQ series



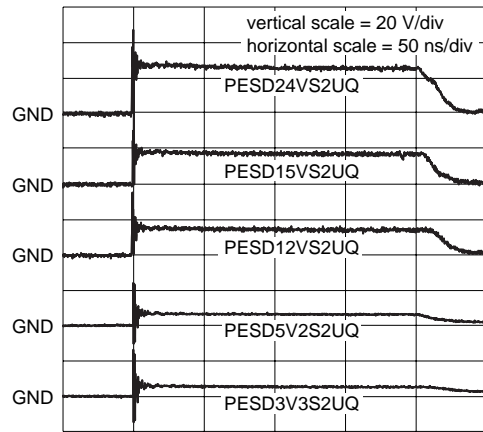


# Double ESD protection diodes in SOT663 package

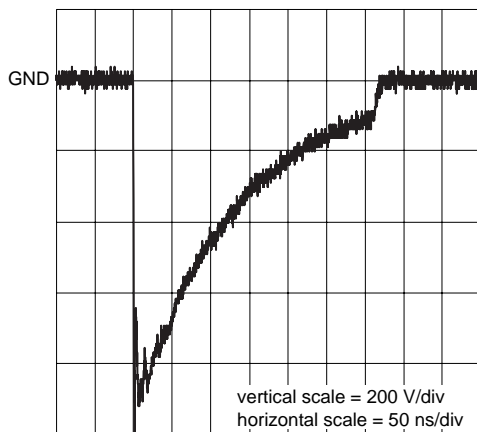
## PESDxS2UQ series



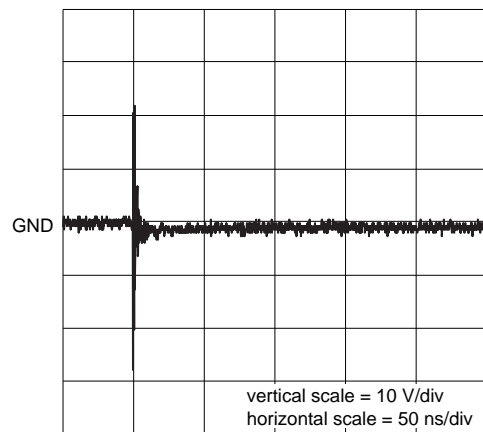
unclamped +1 kV ESD voltage waveform  
 (IEC61000-4-2 network)



clamped +1 kV ESD voltage waveform  
 (IEC61000-4-2 network)



unclamped -1 kV ESD voltage waveform  
 (IEC61000-4-2 network)



clamped -1 kV ESD voltage waveform  
 (IEC61000-4-2 network)

001aaa731

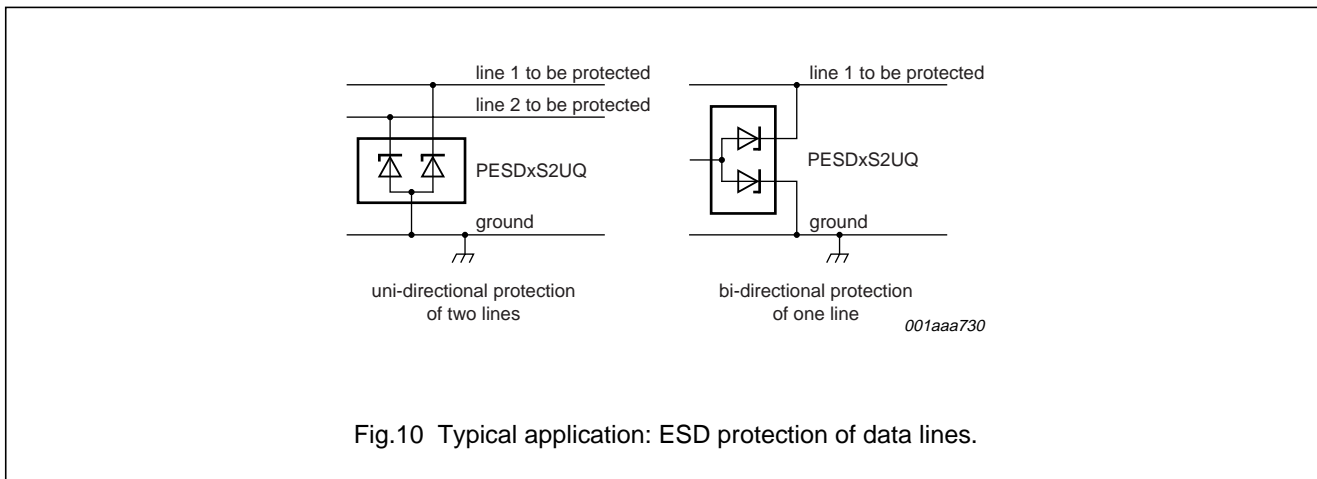
Fig.9 ESD clamping test set-up and waveforms.

# Double ESD protection diodes in SOT663 package

## PESDxS2UQ series

### APPLICATION INFORMATION

The PESDxS2UQ series is designed for uni-directional protection for up to two data lines against damage caused by ElectroStatic Discharge (ESD) and surge pulses. The PESDxS2UQ series may be used on lines where the signal polarities are below ground. PESDxS2UQ series provide a surge capability of up to 150 W ( $P_{pp}$ ) per line for an 8/20  $\mu$ s waveform.



### 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:

- Place the PESDxS2UQ as close as possible to the input terminal or connector.
- The path length between the PESDxS2UQ and the protected line should be minimized.
- Keep parallel signal paths to a minimum.
- Avoid running protected conductors in parallel with unprotected conductors.
- Minimize all printed-circuit board conductive loops including power and ground loops.
- Minimize the length of transient return paths to ground.
- Avoid using shared return paths to a common ground point.
- Ground planes should be used whenever possible. For multilayer printed-circuit boards use ground vias.

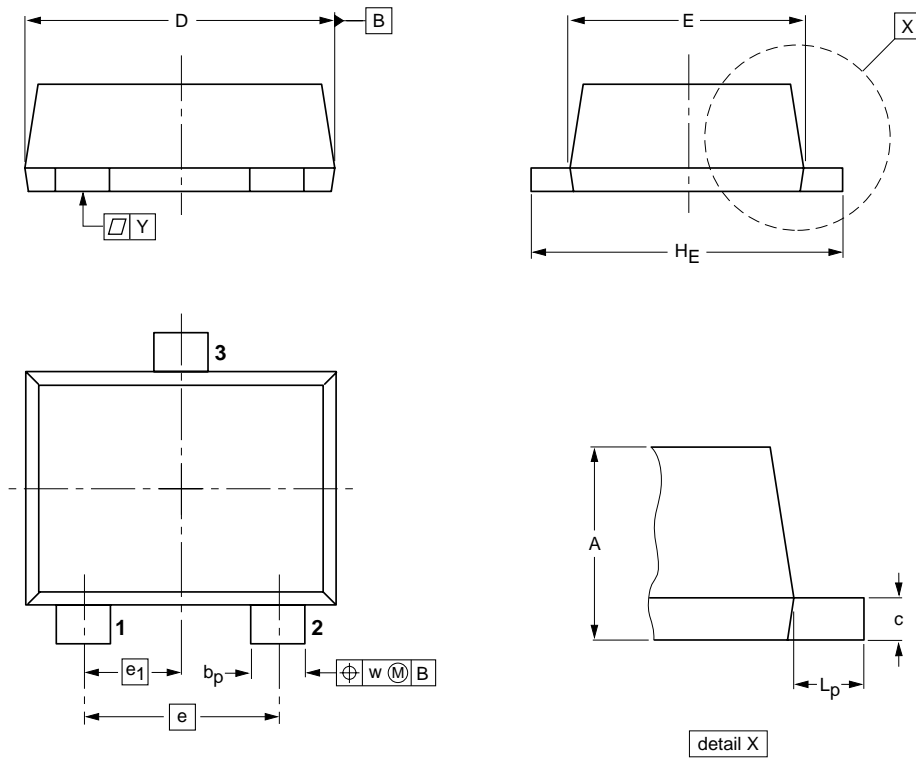
# Double ESD protection diodes in SOT663 package

## PESDxS2UQ series

### PACKAGE OUTLINE

Plastic surface mounted package; 3 leads

SOT663



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

UNIT	A	b <sub>p</sub>	c	D	E	e	e <sub>1</sub>	H <sub>E</sub>	L <sub>p</sub>	w	y
mm	0.6 0.5	0.33 0.23	0.18 0.08	1.7 1.5	1.3 1.1	1.0	0.5	1.7 1.5	0.3 0.1	0.1	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT663						01-12-04 02-05-21

## Legal information

### 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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## Revision history

**Table 1. Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
PESDXS2UQ_SER_N_3	20080911	Product data sheet	-	PESDXS2UQ_SERIES_2
Modifications:	• Asterisks and note 1 removed in Marking Table			
PESDXS2UQ_SERIES_2	20040427	Product specification	-	PESDXS2UQ_SERIES_1
PESDXS2UQ_SERIES_1	20031215	Product specification	-	-

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