

# PESD5V0U4BF; PESD5V0U4BW

## Ultra low capacitance bidirectional quadruple ESD protection arrays

Rev. 01 — 15 August 2008

Product data sheet

## 1. Product profile

### 1.1 General description

Ultra low capacitance bidirectional quadruple ElectroStatic Discharge (ESD) protection arrays in ultra small Surface-Mounted Device (SMD) plastic packages designed to protect up to four signal lines from the damage caused by ESD and other transients.

Table 1. Product overview

Type number	Package		Package configuration
	NXP	JEDEC	
PESD5V0U4BF	SOT886	MO-252	leadless ultra small
PESD5V0U4BW	SOT665	-	ultra small and flat lead

### 1.2 Features

- Bidirectional ESD protection of up to four lines
- Ultra low diode capacitance:  $C_d = 2.9$  pF
- Ultra low leakage current:  $I_{RM} = 5$  nA
- ESD protection up to 10 kV
- IEC 61000-4-2; level 4 (ESD)
- AEC-Q101 qualified

### 1.3 Applications

- Computers and peripherals
- Audio and video equipment
- Cellular handsets and accessories
- 10/100/1000 Mbit/s Ethernet
- Communication systems
- Portable electronics
- Subscriber Identity Module (SIM) card protection
- FireWire
- High-speed data lines

## 1.4 Quick reference data

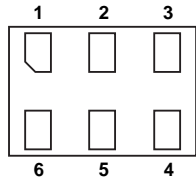
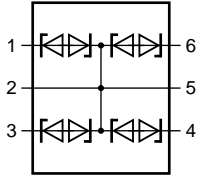
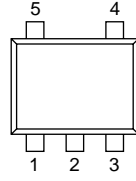
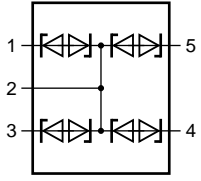
**Table 2. Quick reference data**

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per diode</b>						
$V_{RWM}$	reverse standoff voltage		-	-	5	V
$C_d$	diode capacitance	$f = 1\text{ MHz}; V_R = 0\text{ V}$	-	2.9	3.5	pF

## 2. Pinning information

**Table 3. Pinning**

Pin	Description	Simplified outline	Graphic symbol
<b>PESD5V0U4BF</b>			
1	cathode (diode 1)	 <p>bottom view</p>	 <p>006aab333</p>
2	common cathode		
3	cathode (diode 2)		
4	cathode (diode 3)		
5	common cathode		
6	cathode (diode 4)		
<b>PESD5V0U4BW</b>			
1	cathode (diode 1)		 <p>006aab334</p>
2	common cathode		
3	cathode (diode 2)		
4	cathode (diode 3)		
5	cathode (diode 4)		

## 3. Ordering information

**Table 4. Ordering information**

Type number	Package		Version
	Name	Description	
PESD5V0U4BF	XSON6	plastic extremely thin small outline package; no leads; 6 terminals; body $1 \times 1.45 \times 0.5\text{ mm}$	SOT886
PESD5V0U4BW	-	plastic surface-mounted package; 5 leads	SOT665

## 4. Marking

**Table 5. Marking codes**

Type number	Marking code
PESD5V0U4BF	B1
PESD5V0U4BW	A6

## 5. Limiting values

**Table 6. Limiting values**

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

Symbol	Parameter	Conditions	Min	Max	Unit
<b>Per device</b>					
$T_j$	junction temperature		-	150	°C
$T_{amb}$	ambient temperature		-55	+150	°C
$T_{stg}$	storage temperature		-65	+150	°C

**Table 7. ESD maximum ratings**

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

Symbol	Parameter	Conditions	Min	Max	Unit
<b>Per diode</b>					
$V_{ESD}$	electrostatic discharge voltage		[1]		
	PESD5V0U4BF	IEC 61000-4-2 (contact discharge)	[2]	- 10	kV
	PESD5V0U4BW	IEC 61000-4-2 (contact discharge)	[3]	- 10	kV
	PESD5V0U4BF	MIL-STD-883 (human body model)	[2]	- 8	kV
	PESD5V0U4BW	MIL-STD-883 (human body model)	[3]	- 8	kV

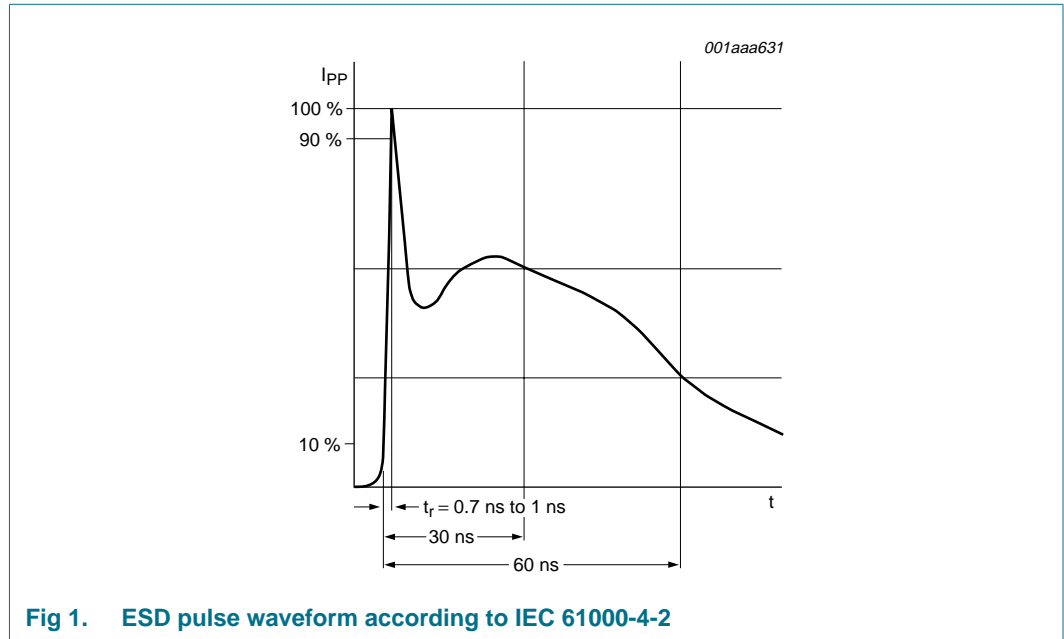
[1] Device stressed with ten non-repetitive ESD pulses.

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

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

**Table 8. ESD standards compliance**

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



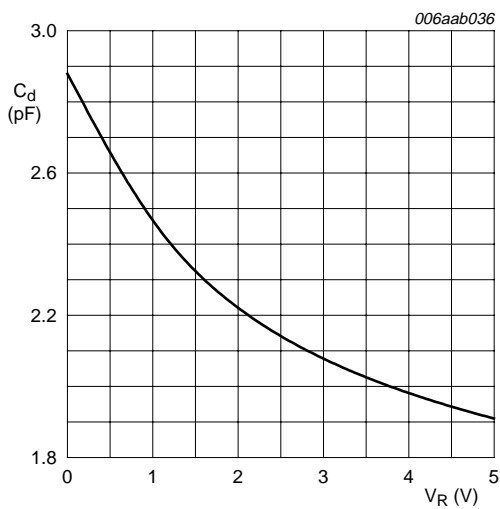
**Fig 1. ESD pulse waveform according to IEC 61000-4-2**

## 6. Characteristics

**Table 9. Characteristics**

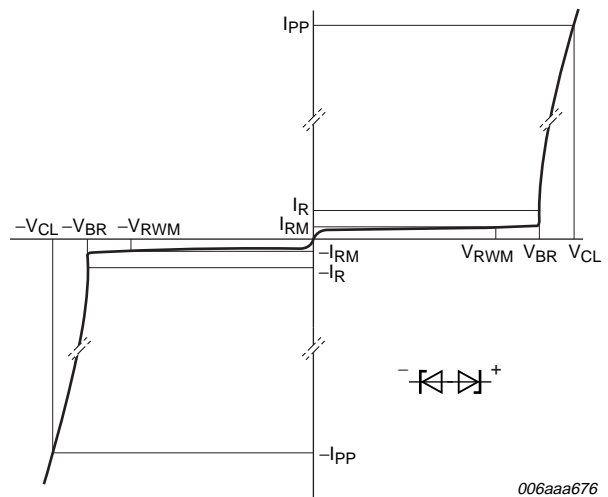
$T_{amb} = 25\text{ }^\circ\text{C}$  unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per diode</b>						
$V_{RWM}$	reverse standoff voltage		-	-	5	V
$I_{RM}$	reverse leakage current	$V_{RWM} = 5\text{ V}$	-	5	100	nA
$V_{BR}$	breakdown voltage	$I_R = 5\text{ mA}$	5.5	6.5	9.5	V
$C_d$	diode capacitance	$f = 1\text{ MHz}$				
		$V_R = 0\text{ V}$	-	2.9	3.5	pF
		$V_R = 5\text{ V}$	-	1.9	-	pF
$r_{dif}$	differential resistance	$I_R = 1\text{ mA}$	-	-	100	$\Omega$

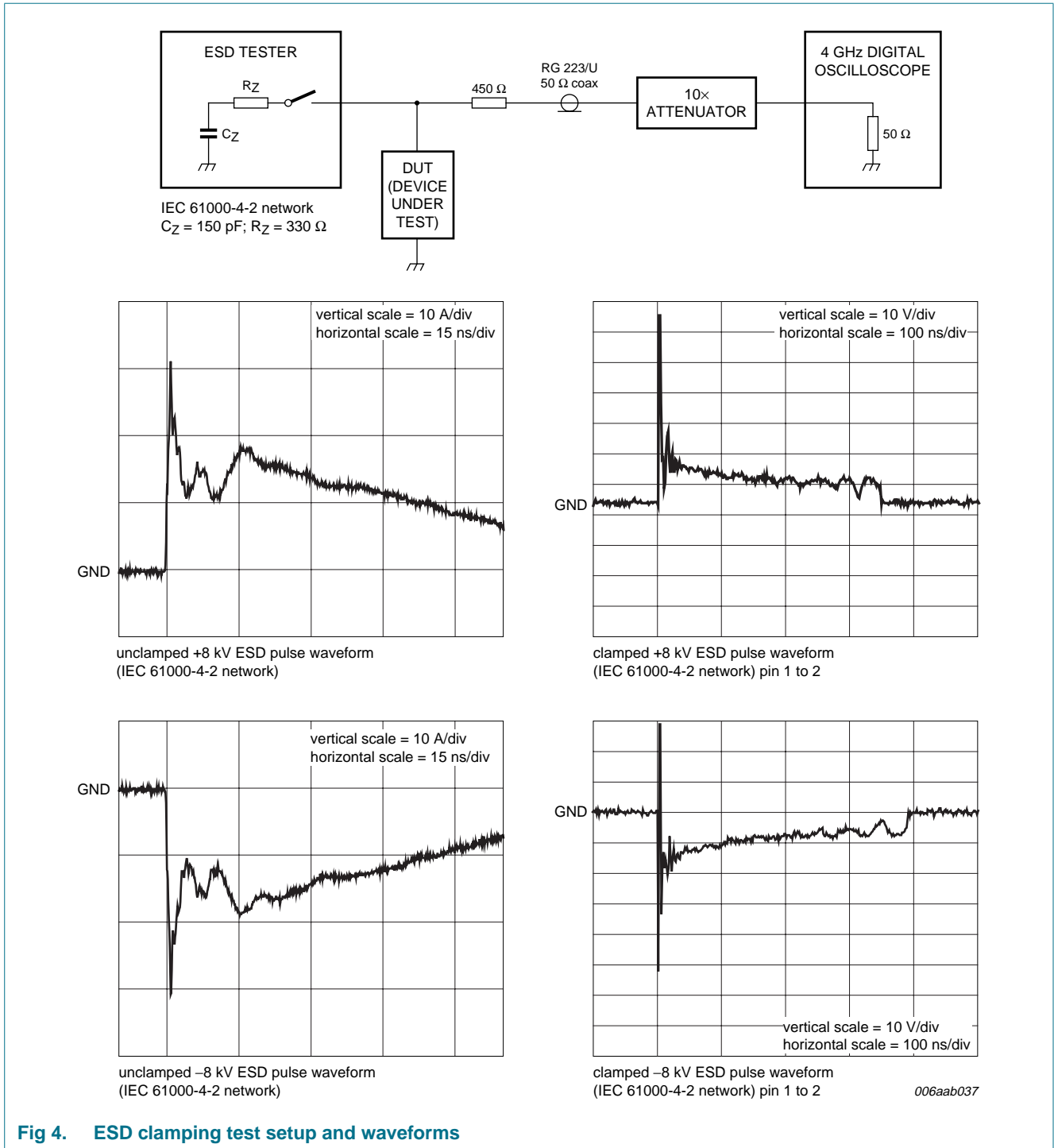


$f = 1\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$

**Fig 2. Diode capacitance as a function of reverse voltage; typical values**



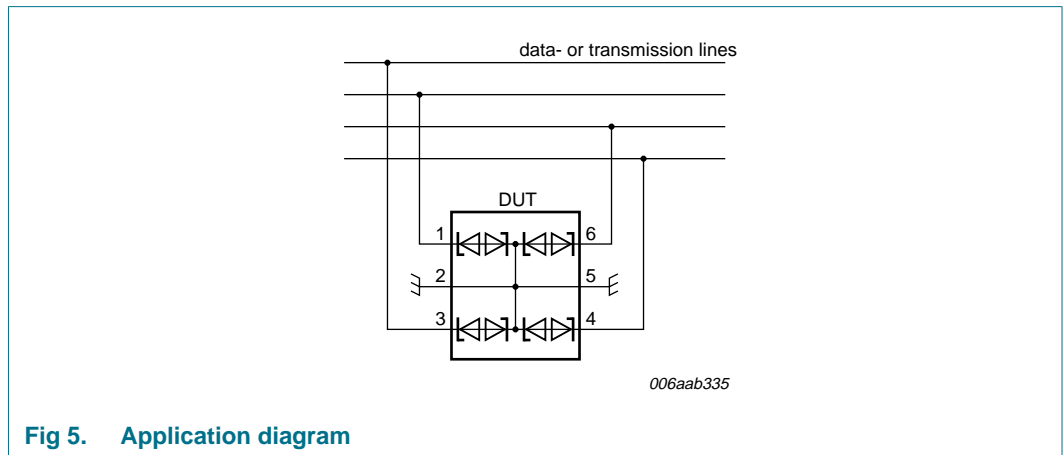
**Fig 3. V-I characteristics for a bidirectional ESD protection diode**



**Fig 4. ESD clamping test setup and waveforms**

## 7. Application information

The PESD5V0U4BF and the PESD5V0U4BW are designed for the protection of up to four bidirectional 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.



**Fig 5. 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:

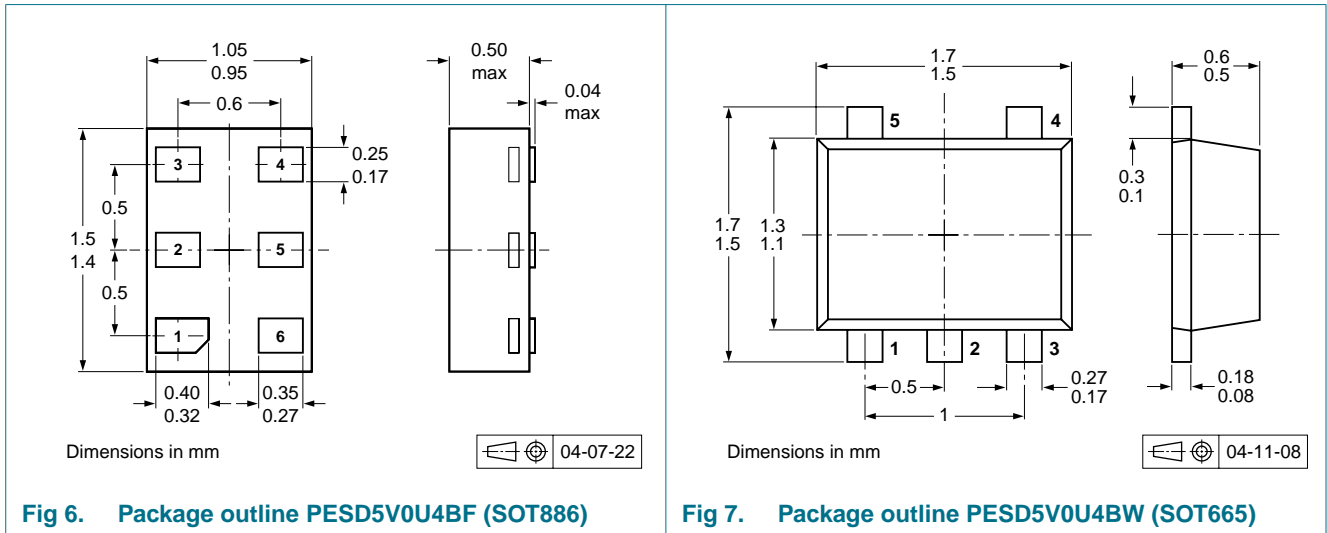
1. Place the device as close to the input terminal or connector as possible.
2. The path length between the device and the protected line should be minimized.
3. Keep parallel signal paths to a minimum.
4. Avoid running protected conductors in parallel with unprotected conductors.
5. Minimize all Printed-Circuit 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. Test information

### 8.1 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.

## 9. Package outline



## 10. Packing information

**Table 10. Packing methods**

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

Type number	Package	Description	Packing quantity			
			4000	5000	8000	
PESD5V0U4BF	SOT886	4 mm pitch, 8 mm tape and reel; T1	[2]	-	-115	-
		4 mm pitch, 8 mm tape and reel; T4	[3]	-	-132	-
PESD5V0U4BW	SOT665	2 mm pitch, 8 mm tape and reel	-	-	-	-315
		4 mm pitch, 8 mm tape and reel	-115	-	-	-

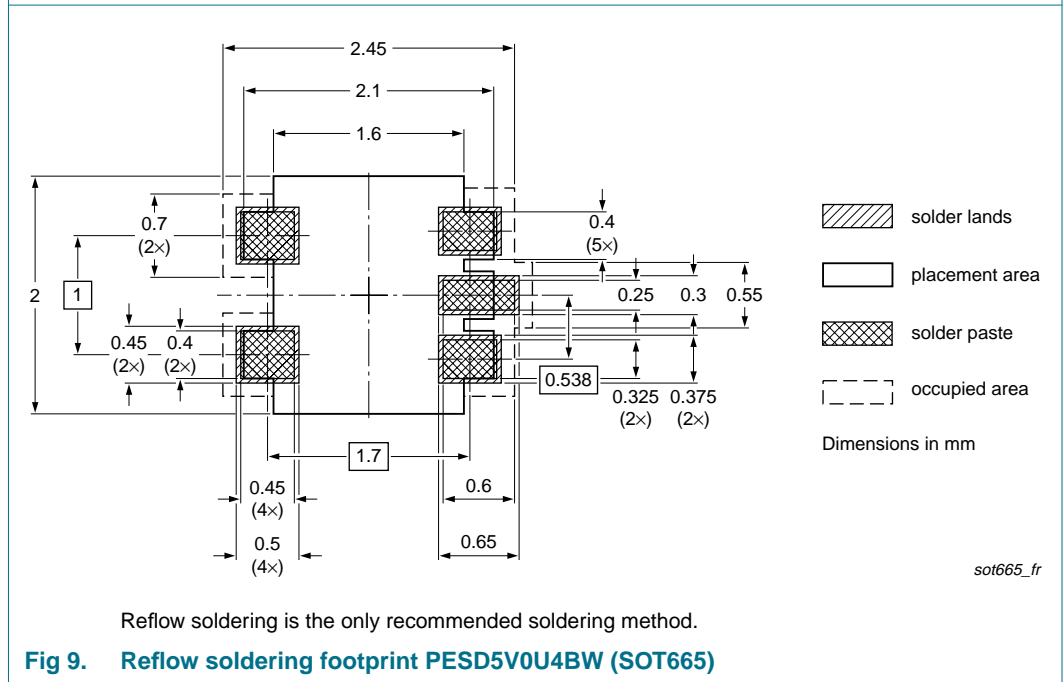
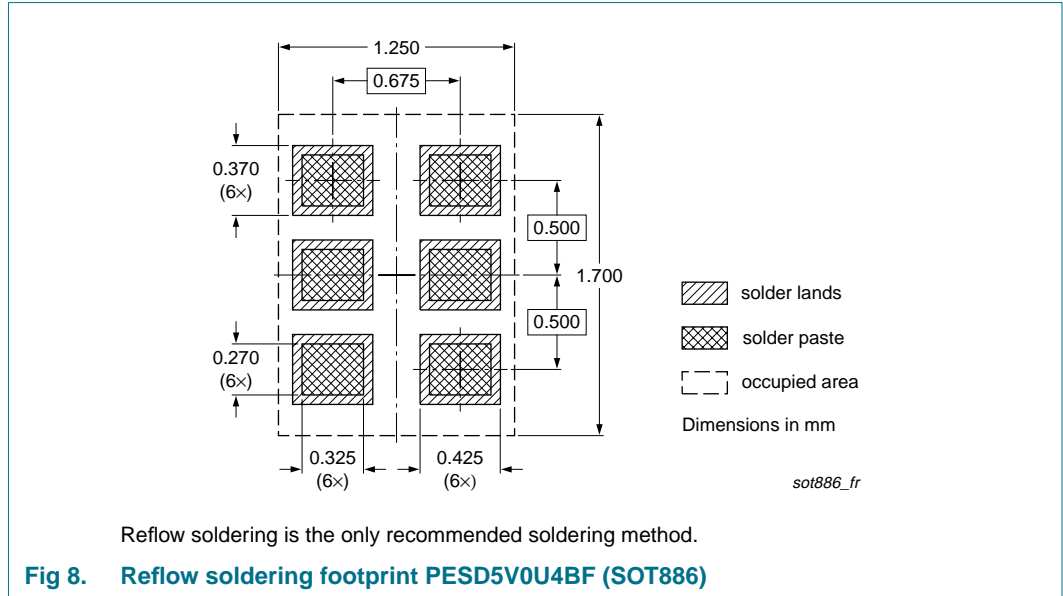
[1] For further information and the availability of packing methods, see [Section 14](#).

[2] T1: normal taping

[3] T4: 90° rotated reverse taping



## 11. Soldering



## 12. Revision history

**Table 11. Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
PESD5V0U4BF_PESD5V0U4BW_1	20080815	Product data sheet	-	-

## 13. Legal information

### 13.1 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.
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[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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