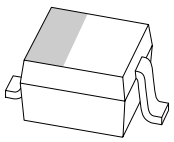


PESD5V0S1UA; PESD12VS1UA

Unidirectional ESD protection for transient voltage suppression

Rev. 01 — 9 February 2009 Product data sheet

1. Product profile

1.1 General description

Unidirectional ElectroStatic Discharge (ESD) protection diodes in a very small Surface-Mounted Device (SMD) plastic package designed to protect one signal line from the damage caused by ESD and transient overvoltage.

Table 1. Product overview

Type number	Package		Configuration
	NXP	JEITA	
PESD5V0S1UA	SOD323	SC-76	single
PESD12VS1UA			

1.2 Features

- Transient Voltage Suppression (TVS) protection of one line
- Max. peak pulse power: P_{PP} = 890 W
- Low clamping voltage: V_{CL} = 19 V
- Low leakage current: I_{RM} = 300 nA
- ESD protection up to 30 kV
- IEC 61000-4-2; level 4 (ESD)
- IEC 61000-4-5 (surge); I_{PP} = 47 A
- AEC-Q101 qualified

1.3 Applications

- Computers and peripherals
- Audio and video equipment
- Cellular handsets and accessories
- Communication systems
- Portable electronics
- Medical and industrial equipment

1.4 Quick reference data

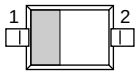
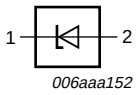
Table 2. Quick reference data

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{RWM}	reverse standoff voltage					
	PESD5V0S1UA		-	-	5	V
	PESD12VS1UA		-	-	12	V
C_d	diode capacitance	f = 1 MHz; V_R = 0 V				
	PESD5V0S1UA		-	480	530	pF
	PESD12VS1UA		-	160	180	pF

2. Pinning information

Table 3. Pinning

Pin	Description		Simplified outline	Graphic symbol
1	cathode	[1]		
2	anode			

006aaa152

[1] The marking bar indicates the cathode.

3. Ordering information

Table 4. Ordering information

Type number	Package		
	Name	Description	Version
PESD5V0S1UA	SC-76	plastic surface-mounted package; 2 leads	SOD323
PESD12VS1UA			

4. Marking

Table 5. Marking codes

Type number	Marking code
PESD5V0S1UA	AV
PESD12VS1UA	AW

5. Limiting values

Table 6. 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 µs	[1][2]			
	PESD5V0S1UA			-	890	W
	PESD12VS1UA			-	600	W
I_{PP}	peak pulse current	t_p = 8/20 µs	[1][2]			
	PESD5V0S1UA			-	47	A
	PESD12VS1UA			-	22.5	A

Table 6. Limiting values *…continued*

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

Symbol	Parameter	Conditions		Min	Max	Unit
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C	[3]	-	360	mW
			[4]	-	500	mW
T_j	junction temperature			-	150	°C
T_{amb}	ambient temperature			–55	+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] Soldering point of cathode tab.

[3] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.

[4] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode 1 cm^2.

Table 7. ESD maximum ratings

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

Symbol	Parameter	Conditions		Min	Max	Unit
V_{ESD}	electrostatic discharge voltage	IEC 61000-4-2 (contact discharge)	[1]	-	30	kV
		machine model		-	400	V
		MIL-STD-883 (human body model)		-	16	kV

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

Table 8. 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

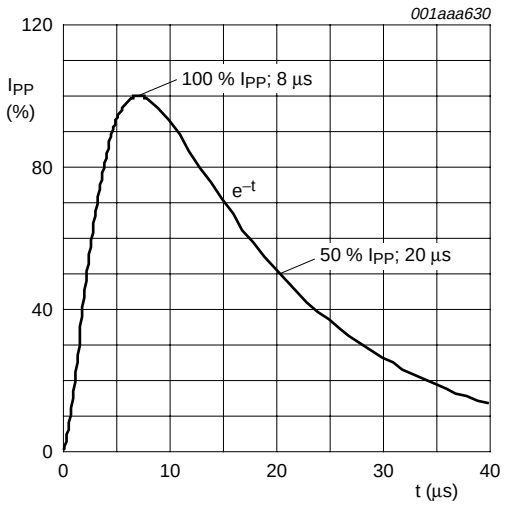


Fig 1. 8/20 µs pulse waveform according to IEC 61000-4-5

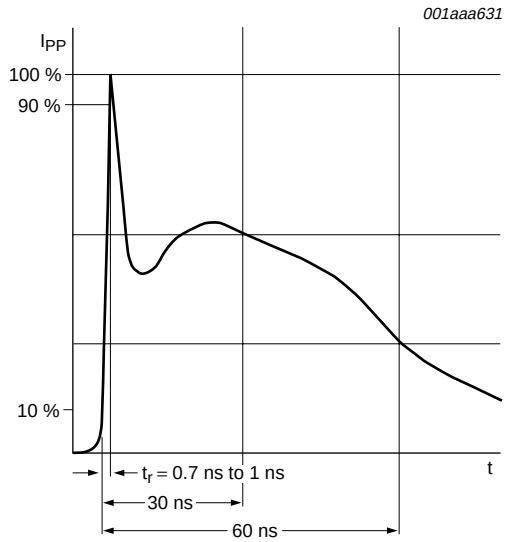


Fig 2. ESD pulse waveform according to IEC 61000-4-2

6. Thermal characteristics

Table 9. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	345	K/W
			[2]	-	-	250	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		[3]	-	-	90	K/W

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode 1 cm^2.

[3] Soldering point of cathode tab.

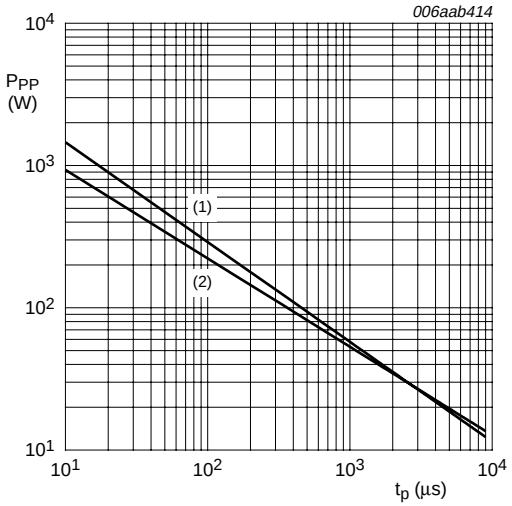
7. Characteristics

Table 10. Characteristics

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{RWM}	reverse standoff voltage					
	PESD5V0S1UA		-	-	5	V
	PESD12VS1UA		-	-	12	V
I_{RM}	reverse leakage current					
	PESD5V0S1UA	V_{RWM} = 5 V	-	0.3	4	µA
	PESD12VS1UA	V_{RWM} = 12 V	-	< 1	100	nA
V_{BR}	breakdown voltage	I_R = 5 mA				
	PESD5V0S1UA		6.2	6.8	7.3	V
	PESD12VS1UA		13.3	14.5	15.75	V
C_d	diode capacitance	f = 1 MHz; V_R = 0 V				
	PESD5V0S1UA		-	480	530	pF
	PESD12VS1UA		-	160	180	pF
V_{CL}	clamping voltage	[1]				
	PESD5V0S1UA	I_{PP} = 47 A	-	-	19	V
		I_{PP} = 25 A	-	-	13.5	V
		I_{PP} = 5 A	-	-	9.8	V
	PESD12VS1UA	I_{PP} = 22.5 A	-	-	27	V
		I_{PP} = 15 A	-	-	23.5	V
		I_{PP} = 5 A	-	-	19	V
r_{dif}	differential resistance	I_R = 5 mA				
	PESD5V0S1UA		-	2	100	Ω
	PESD12VS1UA		-	5	100	Ω

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



T_{amb} = 25 °C

(1) PESD5V0S1UA

(2) PESD12VS1UA

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

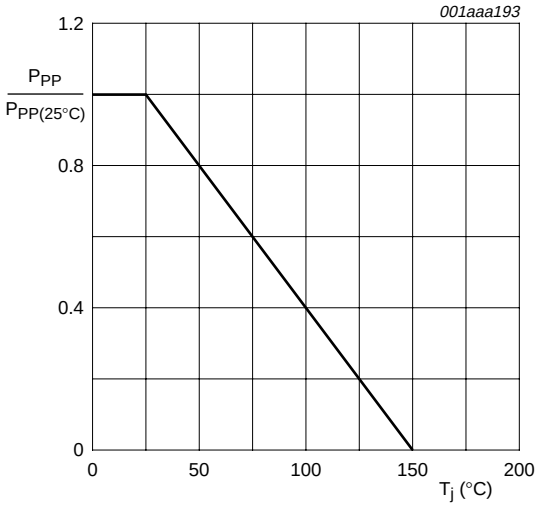
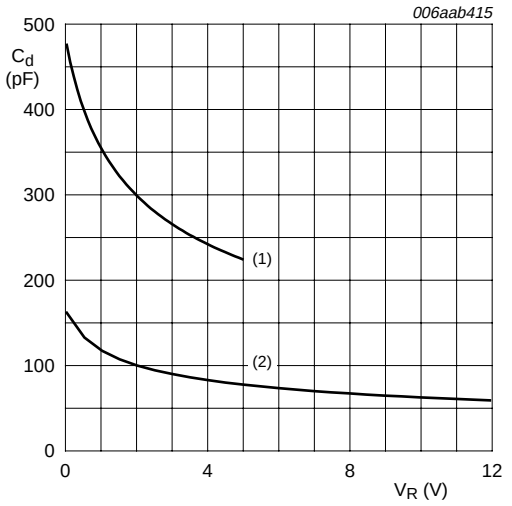


Fig 4. Relative variation of peak pulse power as a function of junction temperature; typical values

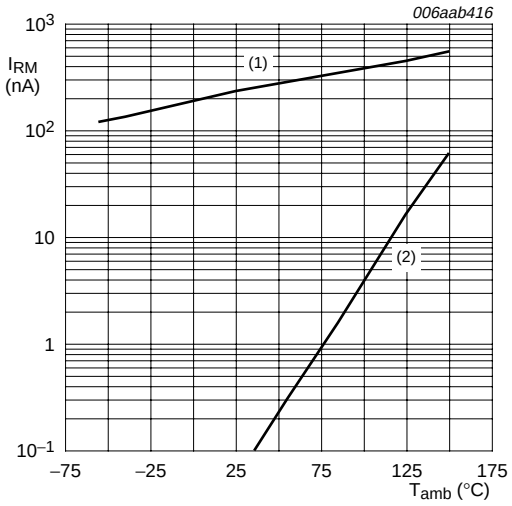


f = 1 MHz; T_{amb} = 25 °C

(1) PESD5V0S1UA

(2) PESD12VS1UA

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



(1) PESD5V0S1UA

(2) PESD12VS1UA

Fig 6. Reverse leakage current as a function of ambient temperature; typical values

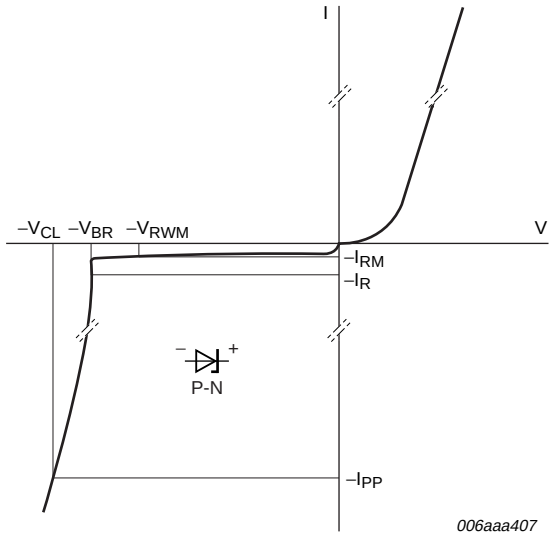


Fig 7. V-I characteristics for a unidirectional ESD protection diode

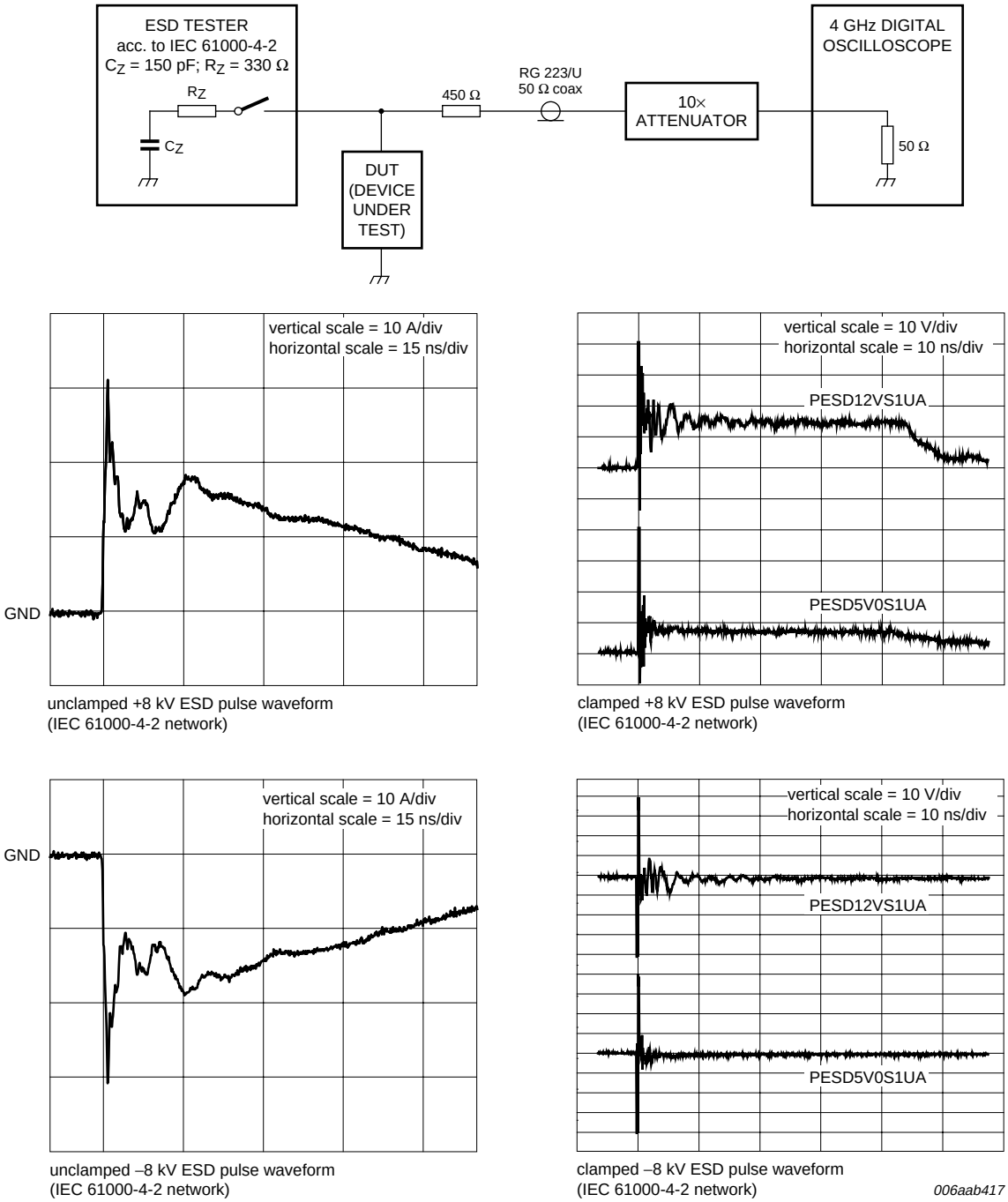


Fig 8. ESD clamping test setup and waveforms

8. Application information

PESD5V0S1UA and PESD12VS1UA are designed for the protection of one unidirectional data or signal line from the damage caused by ESD and transient overvoltage.
The devices may be used on lines where the signal polarities are either positive or negative with respect to ground.

The PESD5V0S1UA provides a surge capability of 890 W and the PESD12VS1UA provides a surge capability of 600 W per line for an 8/20 μs waveform.

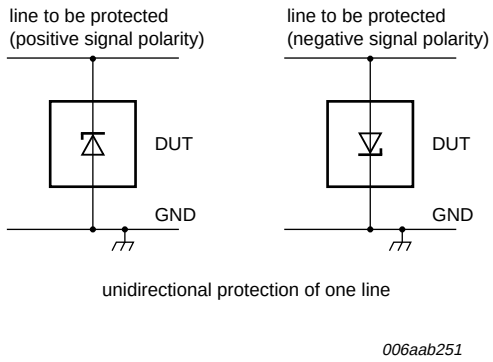


Fig 9. Application diagram

Circuit board layout and protection device placement

Circuit board layout is critical for the suppression of ESD and Electrical Fast Transient (EFT). 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.

9. Test information

9.1 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.

10. Package outline

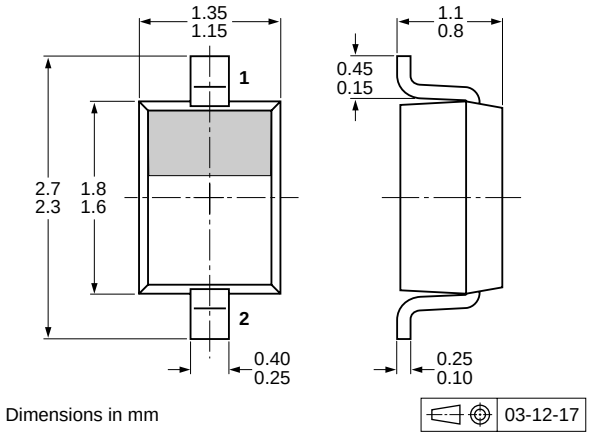


Fig 10. Package outline PESDxS1UA (SOD323/SC-76)

11. Packing information

Table 11. Packing methods

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

Type number	Package	Description	Packing quantity	
			3000	10000
PESD5V0S1UA	SOD323	4 mm pitch, 8 mm tape and reel	-115	-135
PESD12VS1UA				

[1] For further information and the availability of packing methods, see Section 15.

12. Soldering

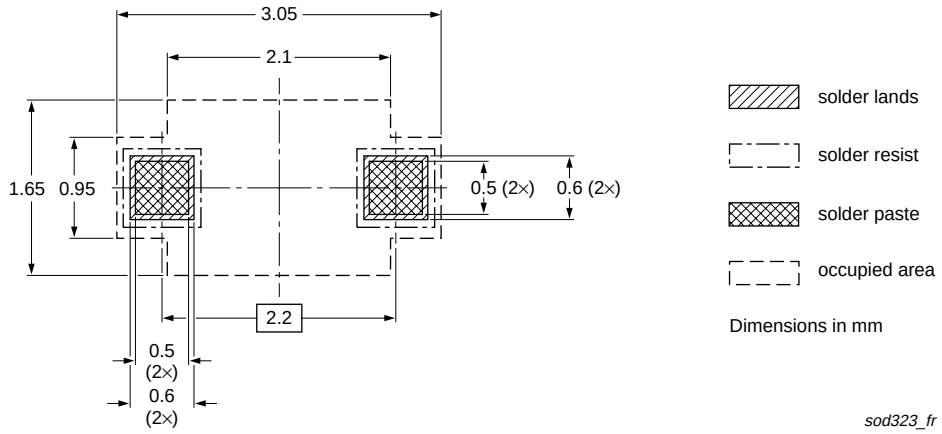


Fig 11. Reflow soldering footprint PESDxS1UA (SOD323/SC-76)

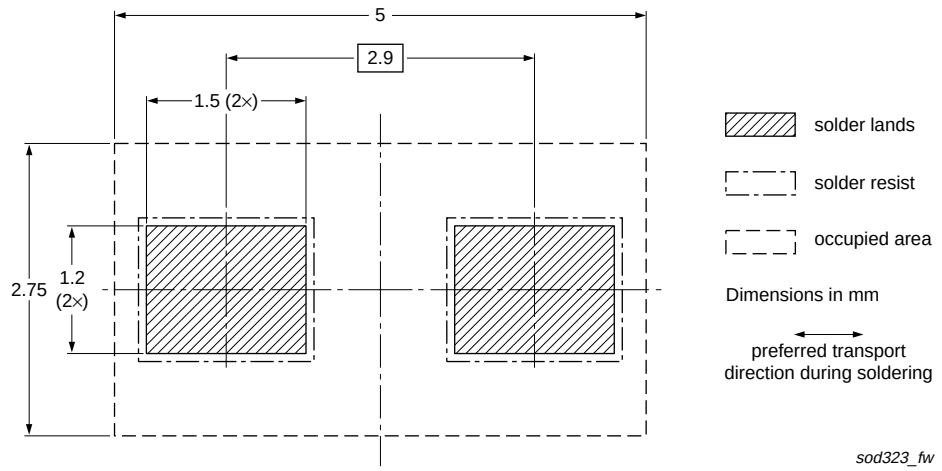


Fig 12. Wave soldering footprint PESDxS1UA (SOD323/SC-76)

13. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PESD5V0S1UA_PESD12VS1UA_1	20090209	Product data sheet	-	-

14. Legal information

14.1 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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16. Contents

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