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
Per diode						
V_{RWM}	reverse standoff voltage					
	PESD3V3S4UD		-	-	3.3	V
	PESD5V0S4UD		-	-	5	V
	PESD12VS4UD		-	-	12	V
	PESD15VS4UD		-	-	15	V
	PESD24VS4UD		-	-	24	V

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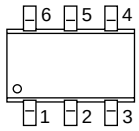
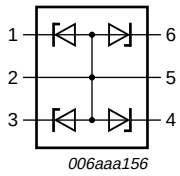
Table 1. Quick reference data *…continued*

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
C_d	diode capacitance	f = 1 MHz; V_R = 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_{PP}	peak pulse power	t_p = 8/20 µs	[1][2]	-	200	W
I_{PP}	peak pulse current	t_p = 8/20 µs	[1][2]			
	PESD3V3S4UD			-	20	A
	PESD5V0S4UD			-	20	A
	PESD12VS4UD			-	10	A
	PESD15VS4UD			-	6	A
	PESD24VS4UD			-	4	A
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 or 6 to 2 or 5

Table 6. ESD maximum ratings

Symbol	Parameter	Conditions		Min	Max	Unit
V_{ESD}	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

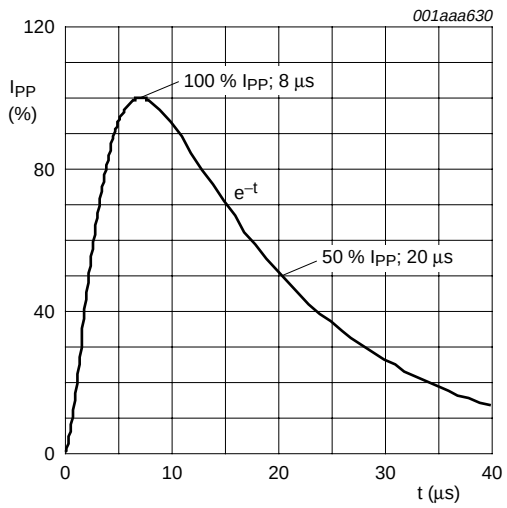


Fig 1. 8/20 µs pulse waveform according to IEC 61000-4-5

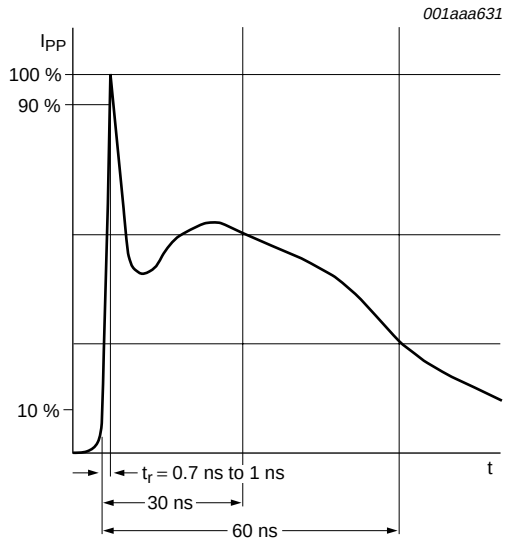


Fig 2. ESD pulse waveform according to IEC 61000-4-2

6. Characteristics

Table 8. Characteristics

T_{amb} = 25 °C unless otherwise specified

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per diode						
V_{RWM}	reverse standoff voltage					
	PESD3V3S4UD		-	-	3.3	V
	PESD5V0S4UD		-	-	5	V
	PESD12VS4UD		-	-	12	V
	PESD15VS4UD		-	-	15	V
	PESD24VS4UD		-	-	24	V
I_{RM}	reverse leakage current					
	PESD3V3S4UD	V_{RWM} = 3.3 V	-	300	800	nA
	PESD5V0S4UD	V_{RWM} = 5 V	-	80	200	nA
	PESD12VS4UD	V_{RWM} = 12 V	-	0.05	15	nA
	PESD15VS4UD	V_{RWM} = 15 V	-	0.05	15	nA
	PESD24VS4UD	V_{RWM} = 24 V	-	0.05	15	nA
V_{BR}	breakdown voltage	I_R = 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

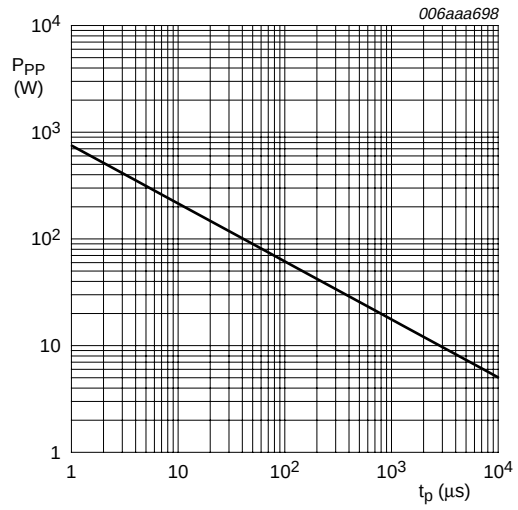
Table 8. Characteristics *...continued*

T_{amb} = 25 °C unless otherwise specified

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
C_d	diode capacitance	f = 1 MHz; V_R = 0 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 A	-	-	8	V
		I_{PP} = 20 A	-	-	12	V
	PESD5V0S4UD	I_{PP} = 1 A	-	-	8	V
		I_{PP} = 20 A	-	-	13	V
	PESD12VS4UD	I_{PP} = 1 A	-	-	17	V
		I_{PP} = 10 A	-	-	24	V
	PESD15VS4UD	I_{PP} = 1 A	-	-	22	V
		I_{PP} = 6 A	-	-	33	V
	PESD24VS4UD	I_{PP} = 1 A	-	-	33	V
		I_{PP} = 4 A	-	-	52	V
r_{dif}	differential resistance	I_R = 5 mA	-	-	25	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 or 6 to 2 or 5



T_{amb} = 25 °C

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

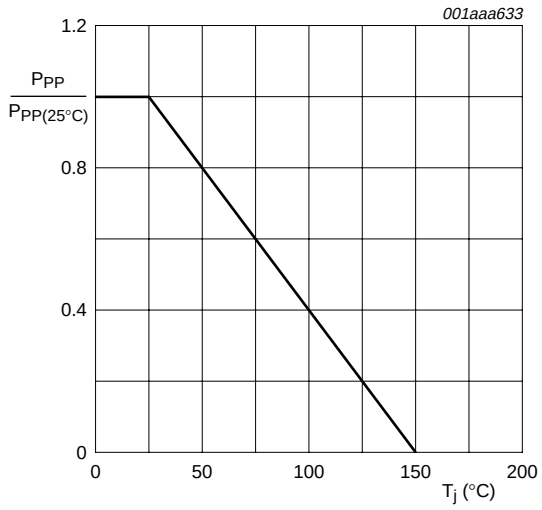
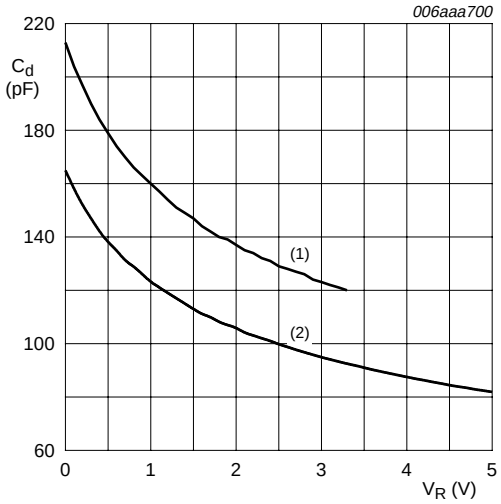


Fig 4. Relative variation of peak pulse power as a function of junction temperature; typical values

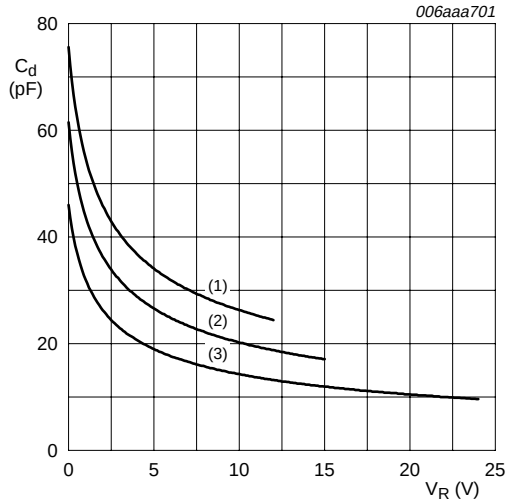


f = 1 MHz; T_{amb} = 25 °C

(1) PESD3V3S4UD

(2) PESD5V0S4UD

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



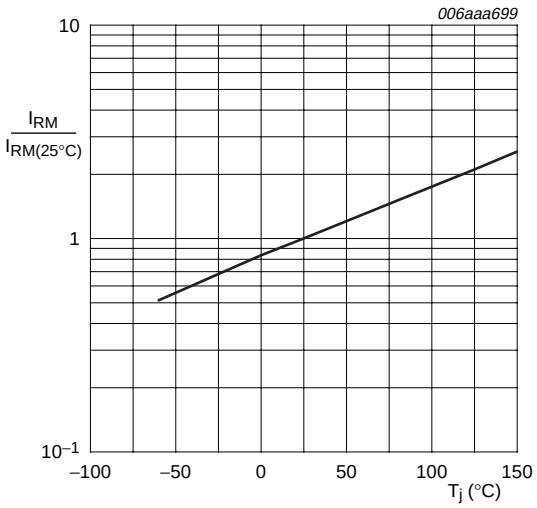
f = 1 MHz; T_{amb} = 25 °C

(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

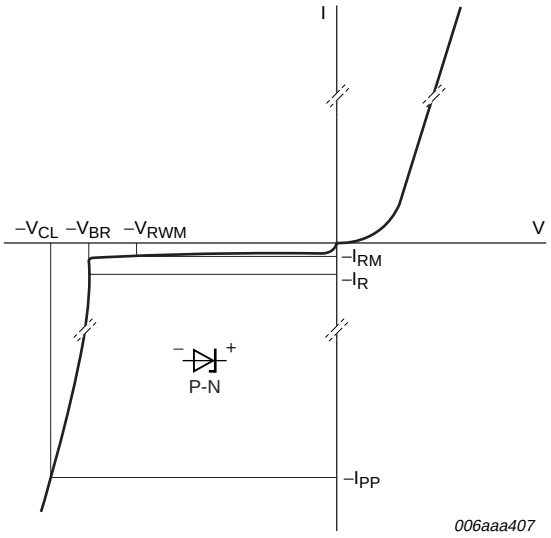


Fig 8. V-I characteristics for a unidirectional ESD protection diode

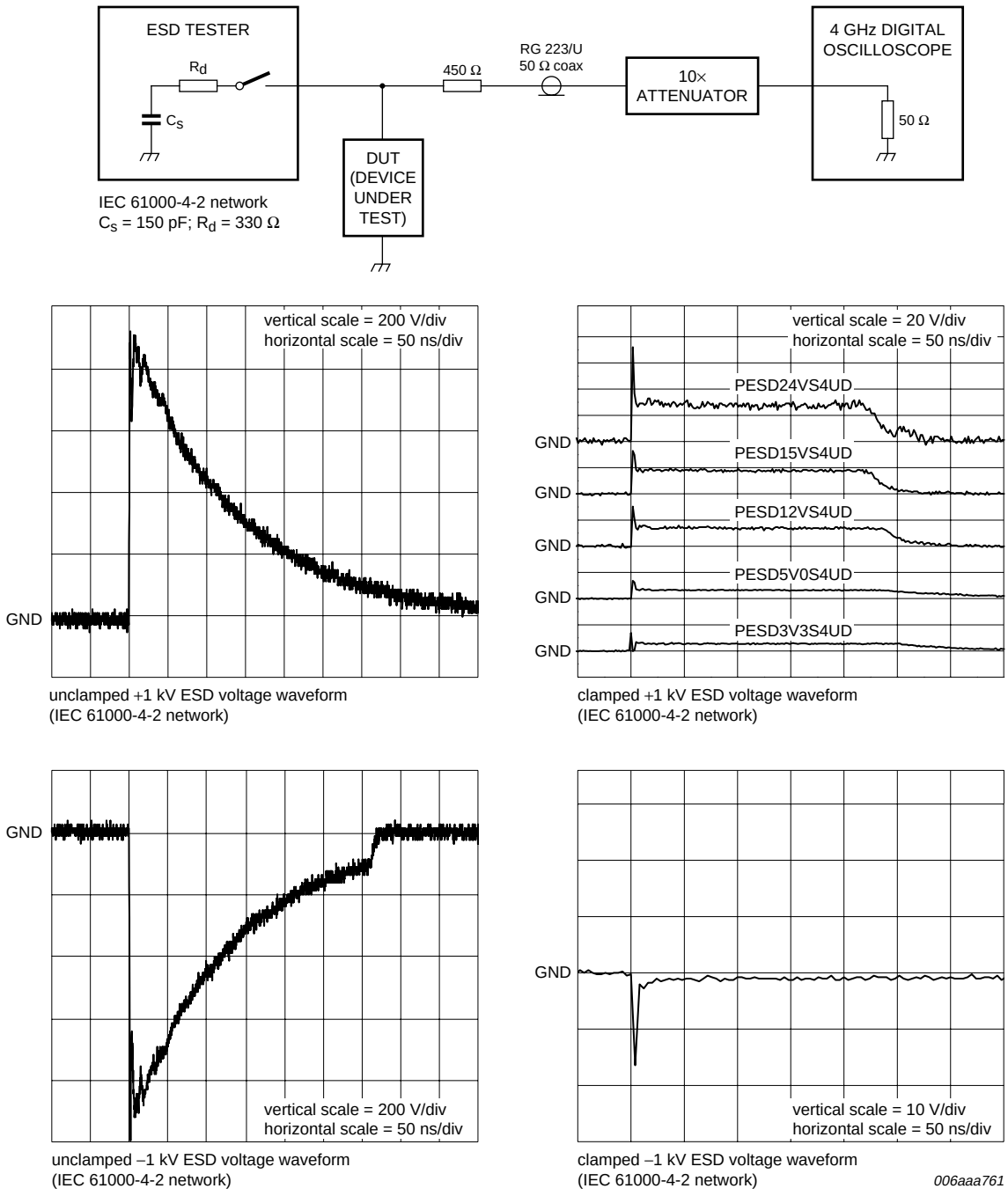


Fig 9. ESD clamping test setup and waveforms

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 µs waveform.

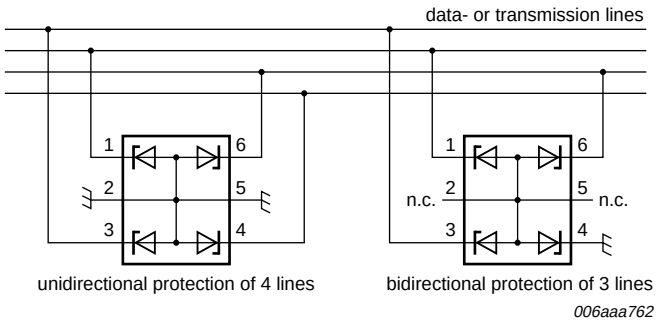


Fig 10. Application diagram

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

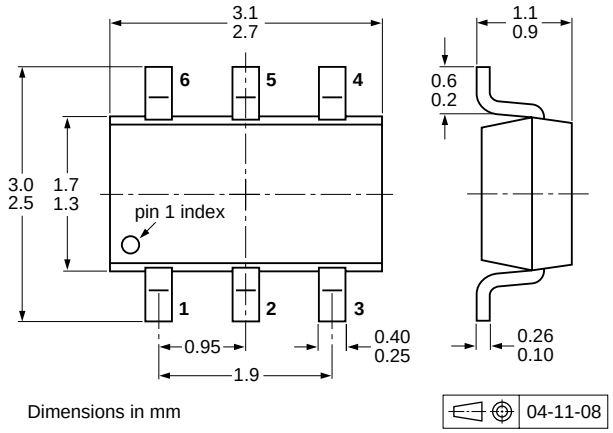


Fig 11. Package outline SOT457 (SC-74)

9. Packing information

Table 9. Packing methods

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

Type number	Package	Description		Packing quantity	
				3000	10000
PESD3V3S4UD	SOT457	4 mm pitch, 8 mm tape and reel; T1	[2]	-115	-135
		4 mm pitch, 8 mm tape and reel; T2	[3]	-125	-165
PESD5V0S4UD	SOT457	4 mm pitch, 8 mm tape and reel; T1	[2]	-115	-135
		4 mm pitch, 8 mm tape and reel; T2	[3]	-125	-165
PESD12VS4UD	SOT457	4 mm pitch, 8 mm tape and reel; T1	[2]	-115	-135
		4 mm pitch, 8 mm tape and reel; T2	[3]	-125	-165
PESD15VS4UD	SOT457	4 mm pitch, 8 mm tape and reel; T1	[2]	-115	-135
		4 mm pitch, 8 mm tape and reel; T2	[3]	-125	-165
PESD24VS4UD	SOT457	4 mm pitch, 8 mm tape and reel; T1	[2]	-115	-135
		4 mm pitch, 8 mm tape and reel; T2	[3]	-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:	• 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.			
PESDXS4UD_SER_1	20060704	Product data sheet	-	-

11. Legal information

11.1 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.nexperia.com.

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12. Contact information

For more information, please visit: **http://www.nexperia.com**

For sales office addresses, please send an email to: **salesaddresses@nexperia.com**

13. Contents

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