



PESD1CAN

CAN bus ESD protection diode in SOT23

Rev. 01 — 25 January 2005

Objective data sheet

1. Product profile

1.1 General description

PESD1CAN in small SOT23 SMD plastic package designed to protect two automotive Control Area Network (CAN) bus lines from the damage caused by ElectroStatic Discharge (ESD) and other transients.

1.2 Features

- Due to the integrated diode structure only one small SOT23 package is needed to protect two CAN bus lines
- Max. peak pulse power: $P_{pp} = 200 \text{ W}$ at $t_p = 8/20 \mu\text{s}$
- Low clamping voltage: $V_{(CL)R} = 40 \text{ V}$ at $I_{pp} = 1 \text{ A}$
- Ultra low leakage current: $I_{RM} < 1 \text{ nA}$
- ESD protection of up to 23 kV
- IEC 61000-4-2, level 4 (ESD)
- IEC 61000-4-5 (surge); $I_{pp} = 3 \text{ A}$ at $t_p = 8/20 \mu\text{s}$
- Small SMD plastic package

1.3 Applications

- CAN bus protection
- Automotive applications

1.4 Quick reference data

Table 1: Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{RWM}	reverse stand-off voltage		-	-	24	V
C_d	diode capacitance	$V_R = 0 \text{ V};$ $f = 1 \text{ MHz}$	-	11	-	pF

2. Pinning information

Table 2: Pinning

Pin	Description	Simplified outline	Symbol
1	cathode 1		
2	cathode 2		
3	double cathode		

3. Ordering information

Table 3: Ordering information

Type number	Package		
	Name	Description	Version
PESD1CAN	-	plastic surface mounted package; 3 leads	SOT23

4. Marking

Table 4: Marking codes

Type number	Marking code ^[1]
PESD1CAN	*AN

[1] * = p: made in Hong Kong

* = t: made in Hong Kong

* = W: made in China

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	8/20 μ s	^[1] ^[2] -	200	W
I_{pp}	peak pulse current	8/20 μ s	^[1] ^[2] -	3	A
T_j	junction temperature		-	150	$^{\circ}$ C
T_{amb}	ambient temperature		-65	+150	$^{\circ}$ C
T_{stg}	storage temperature		-65	+150	$^{\circ}$ C

[1] Non-repetitive current pulse 8/20 μ s exponentially decaying waveform according to IEC61000-4-5; see [Figure 1](#).

[2] Measured from pin 1 to 3 or 2 to 3.

Table 6: ESD maximum ratings

Symbol	Parameter	Conditions	Min	Max	Unit
ESD	electrostatic discharge capability	IEC 61000-4-2 (contact discharge)	[1][2] -	23	kV
		HBM MIL-STD883	-	10	kV

[1] Device stressed with ten non-repetitive ElectroStatic Discharge (ESD) pulses; see [Figure 2](#).

[2] Measured from pin 1 to 3 or 2 to 3.

Table 7: ESD standards compliance

ESD Standard	Conditions
IEC 61000-4-2, level 4 (ESD); see Figure 2	> 15 kV (air); > 8 kV (contact)
HBM MIL-STD883, class 3	> 4 kV

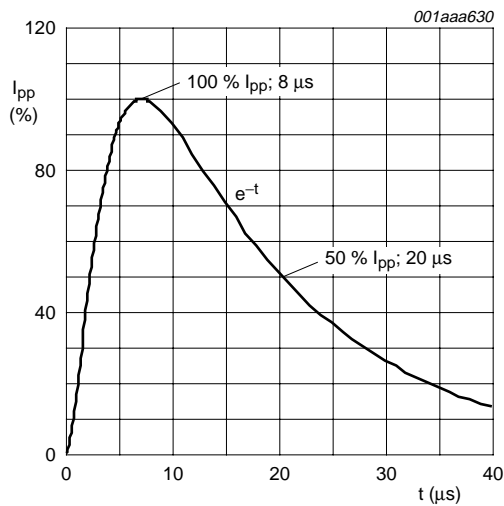


Fig 1. 8/20 μ s pulse waveform according to IEC 61000-4-5

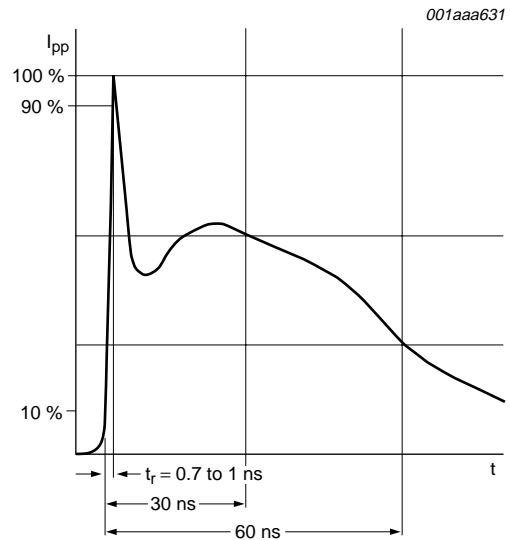


Fig 2. ElectroStatic Discharge (ESD) pulse waveform according to IEC 61000-4-2

6. Characteristics

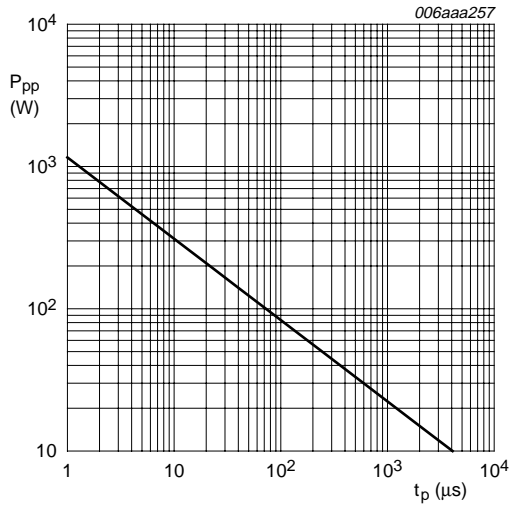
Table 8: Characteristics

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{RWM}	reverse stand-off voltage		-	-	24	V
I_{RM}	reverse leakage current	$V_{RWM} = 24\text{ V}$	-	< 1	50	nA
$V_{(BR)}$	breakdown voltage	$I_R = 5\text{ mA}$	25.4	27.8	30.3	V
C_d	diode capacitance	$V_R = 0\text{ V}$; $f = 1\text{ MHz}$; see Figure 5	-	11	-	pF
$V_{(CL)R}$	clamping voltage	$I_{PP} = 1\text{ A}$	[1][2] -	-	40	V
		$I_{PP} = 3\text{ A}$	[1][2] -	-	70	V
r_{dif}	differential resistance	$I_R = 1\text{ mA}$	-	-	300	Ω

[1] Non-repetitive current pulse 8/20 μs exponentially decaying waveform according to IEC61000-4-5; see [Figure 1](#).

[2] Measured from pin 1 to 3 or 2 to 3.



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

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

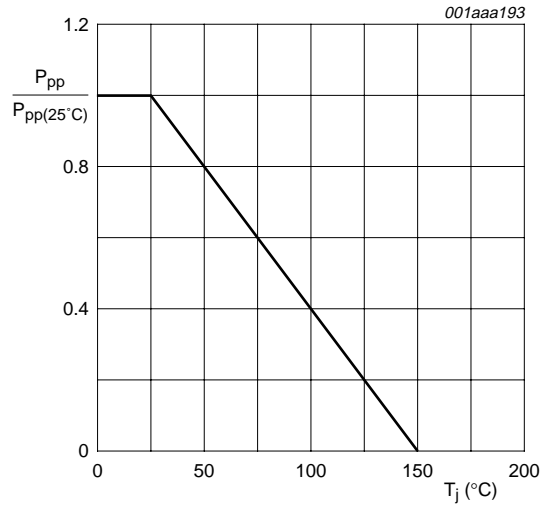
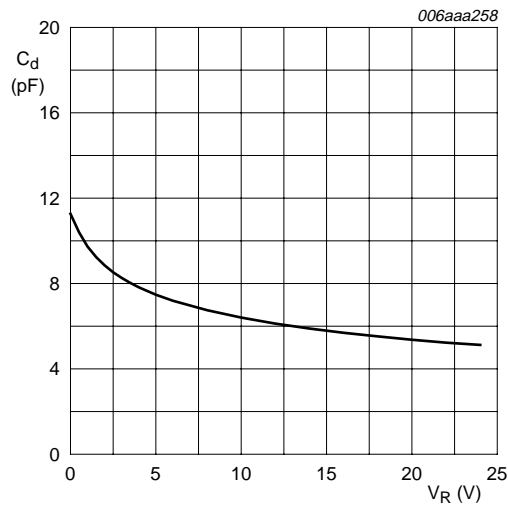


Fig. 4. Relative variation of peak pulse power as a function of junction temperature; typical values



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

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

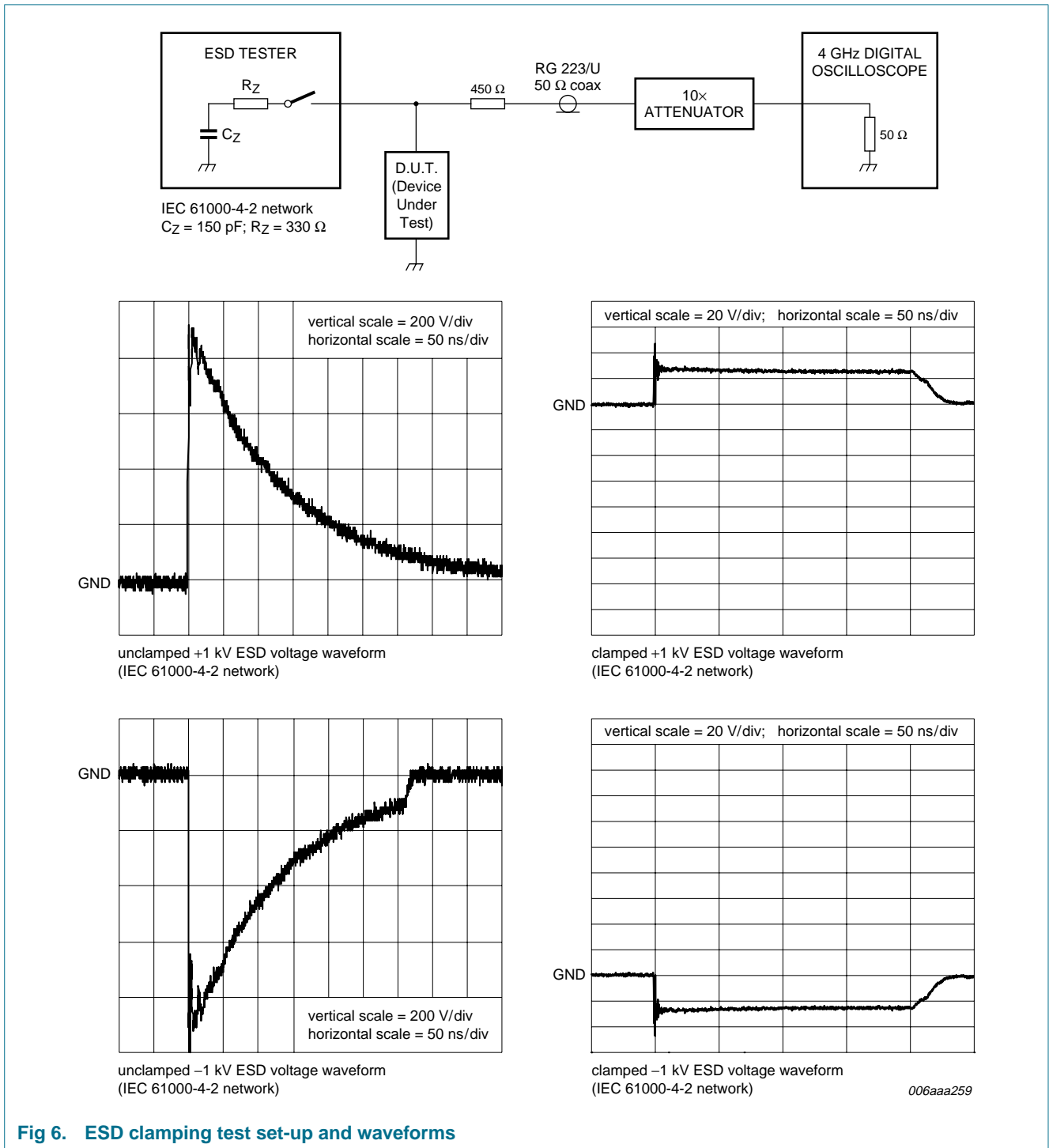


Fig 6. ESD clamping test set-up and waveforms

7. Application information

The PESD1CAN is designed for the protection of two automotive CAN bus lines from the damage caused by ElectroStatic Discharge (ESD) and surge pulses. The PESD1CAN provides a surge capability of up to 200 W per line for a 8/20 μ s waveform.

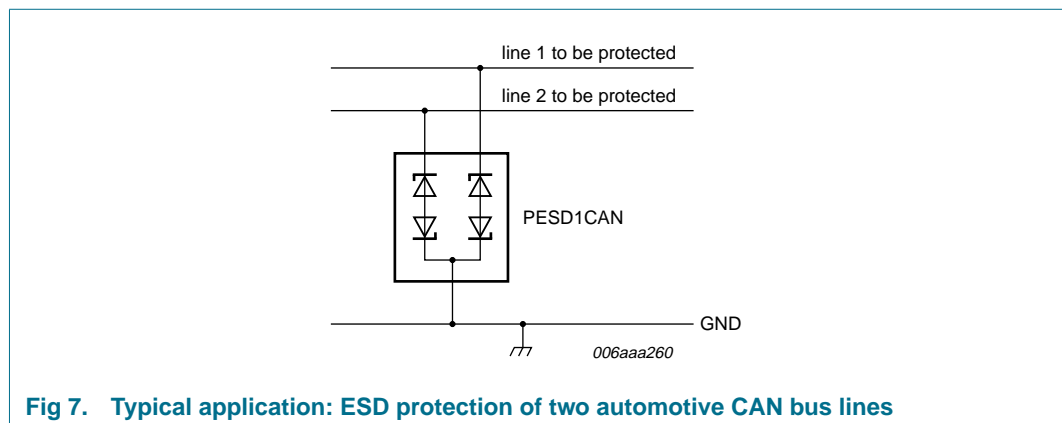


Fig 7. Typical application: ESD protection of two automotive CAN bus lines

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 protection device as close to the input terminal or connector as possible.
2. The path length between the protection device and the protected line should be minimized.
3. Keep parallel signal paths to a minimum.
4. Avoid running protection conductors in parallel with unprotected conductor.
5. Minimize all printed-circuit board 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 printed-circuit boards, use ground vias.

8. Package outline

Plastic surface mounted package; 3 leads

SOT23

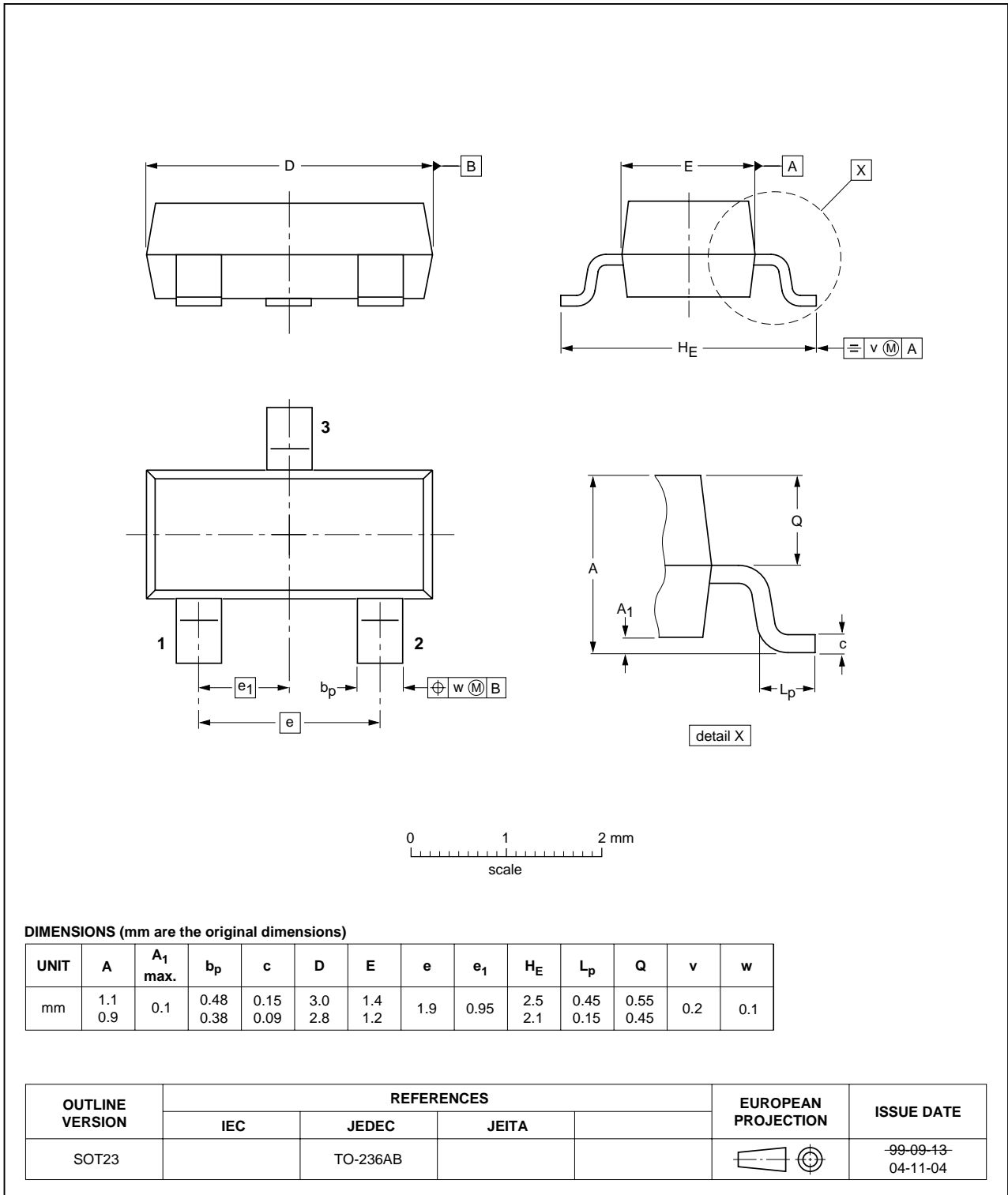


Fig 8. Package outline SOT23 (TO-236AB)

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
PESD1CAN	SOT23	4 mm pitch, 8 mm tape and reel	-215	-235

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



10. Revision history

Table 10: Revision history

Document ID	Release date	Data sheet status	Change notice	Doc. number	Supersedes
PESD1CAN_1	20050125	Objective data sheet	-	9397 750 14197	-

11. Data sheet status

Level	Data sheet status ^[1]	Product status ^[2] ^[3]	Definition
I	Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
II	Preliminary data	Qualification	This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product.
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[3] For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

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Limiting values definition — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

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