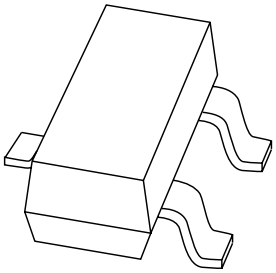
DATA SHEET



PESDxS2UT series
Double ESD protection diodes in SOT23 package

Product data sheet
Supersedes data of 2003 Aug 20

2004 Apr 15

NXP founded by Philips

Double ESD protection diodes in SOT23 package

PESDxS2UT series

FEATURES

- Uni-directional ESD protection of up to two lines
- Max. peak pulse power: P_{pp} = 330 W at t_p = 8/20 μs
- Low clamping voltage: $V_{(CL)R}$ = 20 V at I_{pp} = 18 A
- Ultra-low reverse leakage current: I_{RM} < 700 nA
- ESD protection > 23 kV
- IEC 61000-4-2; level 4 (ESD)
- IEC 61000-4-5 (surge); I_{pp} = 18 A at t_p = 8/20 μs.

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 SOT23 plastic package. Designed to protect up to two transmission or data lines from ElectroStatic Discharge (ESD) damage.

MARKING

TYPE NUMBER	MARKING CODE(1)
PESD3V3S2UT	*U9
PESD5V2S2UT	*U1
PESD12VS2UT	*U2
PESD15VS2UT	*U3
PESD24VS2UT	*U4

Note

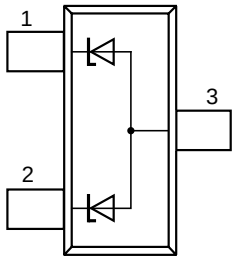
1. * = p : made in Hong Kong.
   * = t : made in Malaysia.
   * = W : made in China.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	VALUE	UNIT
V_{RWM}	reverse stand-off voltage	3.3, 5.2, 12, 15 and 24	V
C_d	diode capacitance V_R = 0 V; f = 1 MHz	207, 152, 38, 32 and 23	pF
	number of protected lines	2	

PINNING

PIN	DESCRIPTION
1	cathode 1
2	cathode 2
3	common anode



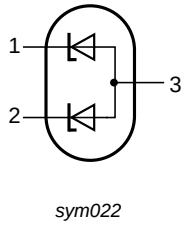


Fig.1 Simplified outline (SOT23) and symbol.

ORDERING INFORMATION

TYPE NUMBER	PACKAGE		
	NAME	DESCRIPTION	VERSION
PESD3V3S2UT	–	plastic surface mounted package; 3 leads	SOT23
PESD5V2S2UT			
PESD12VS2UT			
PESD15VS2UT			
PESD24VS2UT			

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 μs pulse; notes 1 and 2			
	PESD3V3S2UT		–	330	W
	PESD5V2S2UT		–	260	W
	PESD12VS2UT		–	180	W
	PESD15VS2UT		–	160	W
	PESD24VS2UT		–	160	W
I_{pp}	peak pulse current	8/20 μs pulse; notes 1 and 2			
	PESD3V3S2UT		–	18	A
	PESD5V2S2UT		–	15	A
	PESD12VS2UT		–	5	A
	PESD15VS2UT		–	5	A
	PESD24VS2UT		–	3	A
T_j	junction temperature		–	150	°C
T_{amb}	operating ambient temperature		−65	+150	°C
T_{stg}	storage temperature		−65	+150	°C

Notes

1. Non-repetitive current pulse 8/20μ μs exponential decay waveform; see Fig.2.
2. Measured across either pins 1 and 3 or pins 2 and 3.

ESD maximum ratings

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
ESD	electrostatic discharge capability	IEC 61000-4-2 (contact discharge); notes 1 and 2		
		PESD3V3S2UT	30	kV
		PESD5V2S2UT	30	kV
		PESD12VS2UT	30	kV
		PESD15VS2UT	30	kV
		PESD24VS2UT	23	kV
		HBM MIL-Std 883		
		PESDxS2UT 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

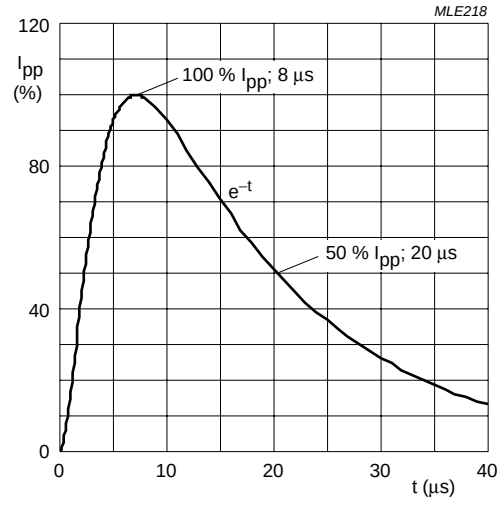


Fig.2 8/20 µs pulse waveform according to IEC 61000-4-5.

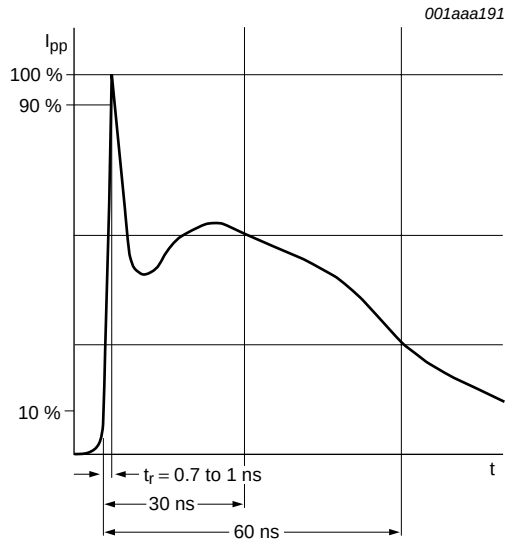


Fig.3 ElectroStatic Discharge (ESD) pulse waveform according to IEC 61000-4-2.

ELECTRICAL CHARACTERISTICS

T_j = 25 °C unless otherwise specified.

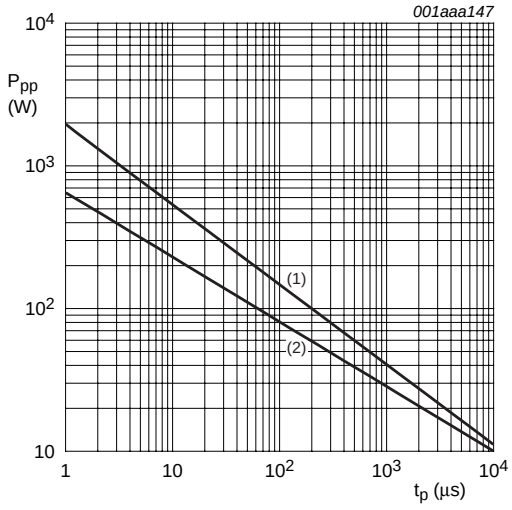
SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{RWM}	reverse stand-off voltage					
	PESD3V3S2UT		–	–	3.3	V
	PESD5V2S2UT		–	–	5.2	V
	PESD12VS2UT		–	–	12	V
	PESD15VS2UT		–	–	15	V
	PESD24VS2UT		–	–	24	V
I_{RM}	reverse leakage current					
	PESD3V3S2UT	V_{RWM} = 3.3 V	–	0.7	2	μA
	PESD5V2S2UT	V_{RWM} = 5.2 V	–	0.15	1	μA
	PESD12VS2UT	V_{RWM} = 12 V	–	<0.02	1	μA
	PESD15VS2UT	V_{RWM} = 15 V	–	<0.02	1	μA
	PESD24VS2UT	V_{RWM} = 24 V	–	<0.02	1	μA
V_{BR}	breakdown voltage	I_Z = 5 mA				
	PESD3V3S2UT		5.2	5.6	6.0	V
	PESD5V2S2UT		6.4	6.8	7.2	V
	PESD12VS2UT		14.7	15.0	15.3	V
	PESD15VS2UT		17.6	18.0	18.4	V
	PESD24VS2UT		26.5	27.0	27.5	V
C_d	diode capacitance	f = 1 MHz; V_R = 0 V				
	PESD3V3S2UT		–	207	300	pF
	PESD5V2S2UT		–	152	200	pF
	PESD12VS2UT		–	38	75	pF
	PESD15VS2UT		–	32	70	pF
	PESD24VS2UT		–	23	50	pF
$V_{(CL)R}$	clamping voltage	notes 1 and 2				
	PESD3V3S2UT	I_{pp} = 1 A	–	–	7	V
		I_{pp} = 18 A	–	–	20	V
	PESD5V2S2UT	I_{pp} = 1 A	–	–	9	V
		I_{pp} = 15 A	–	–	20	V
	PESD12VS2UT	I_{pp} = 1 A	–	–	19	V
		I_{pp} = 5 A	–	–	35	V
	PESD15VS2UT	I_{pp} = 1 A	–	–	23	V
		I_{pp} = 5 A	–	–	40	V
	PESD24VS2UT	I_{pp} = 1 A	–	–	36	V
		I_{pp} = 3 A	–	–	70	V

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
R_{diff}	differential resistance					
	PESD3V3S2UT	I_R = 1 mA	–	–	400	Ω
	PESD5V2S2UT	I_R = 1 mA	–	–	80	Ω
	PESD12VS2UT	I_R = 1 mA	–	–	200	Ω
	PESD15VS2UT	I_R = 1 mA	–	–	225	Ω
	PESD24VS2UT	I_R = 0.5 mA	–	–	300	Ω

Notes

1. Non-repetitive current pulse 8/20 μs exponential decay waveform; see Fig.2.
2. Measured either across pins 1 and 3 or pins 2 and 3.

GRAPHICAL DATA



(1) PESD3V3S2UT and PESD5V2S2UT.
(2) PESD12VS2UT, PESD15VS2UT, PESD24VS2UT

T_{amb} = 25 °C.
t_p = 8/20 μs exponential decay waveform; see Fig.2.

Fig.4 Peak pulse power dissipation as a function of pulse time; typical values.

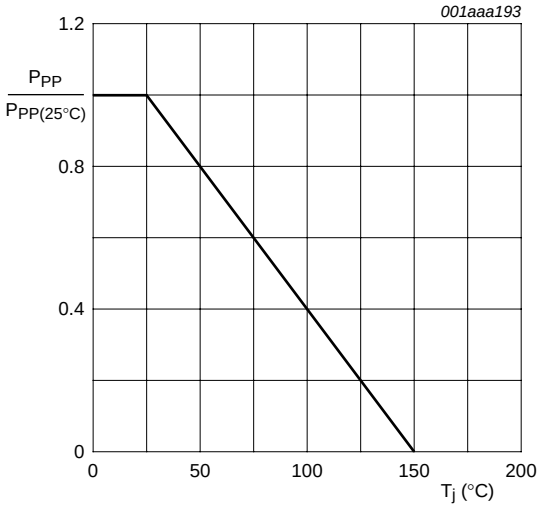
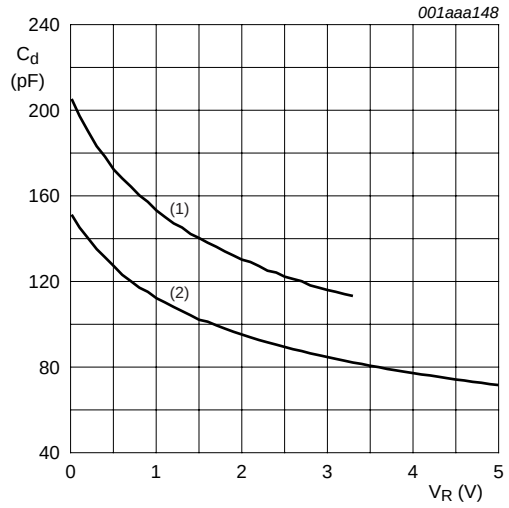


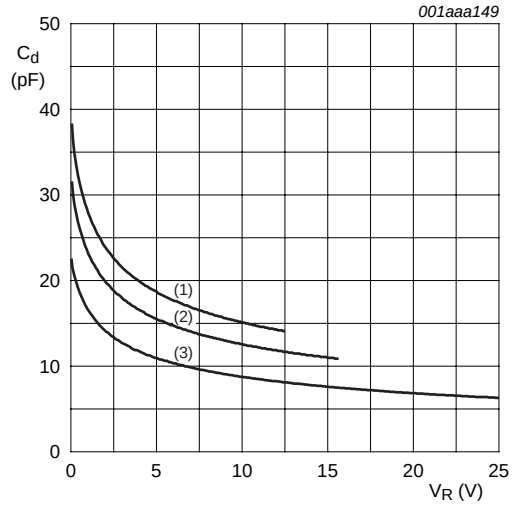
Fig.5 Relative variation of peak pulse power as a function of junction temperature; typical values.



(1) PESD3V3S2UT; V_{RWM} = 3.3 V.
(2) PESD5V2S2UT; V_{RWM} = 5 V.

T_{amb} = 25 °C; f = 1 MHz.

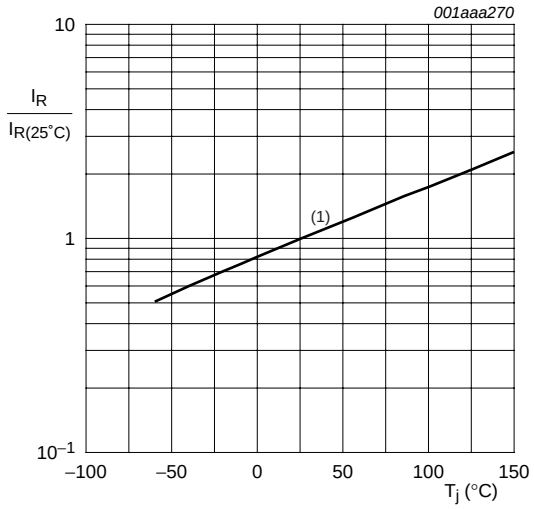
Fig.6 Diode capacitance as a function of reverse voltage; typical values.



(1) PESD12VS2UT; V_{RWM} = 12 V.
(2) PESD15VS2UT; V_{RWM} = 15 V.
(3) PESD24VS2UT; V_{RWM} = 24 V.

T_{amb} = 25 °C; f = 1 MHz.

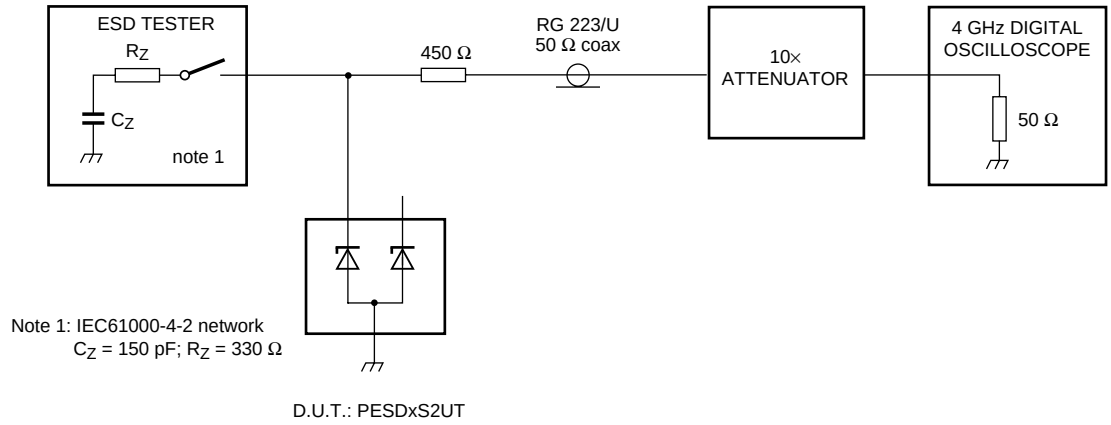
Fig.7 Diode capacitance as a function of reverse voltage; typical values.

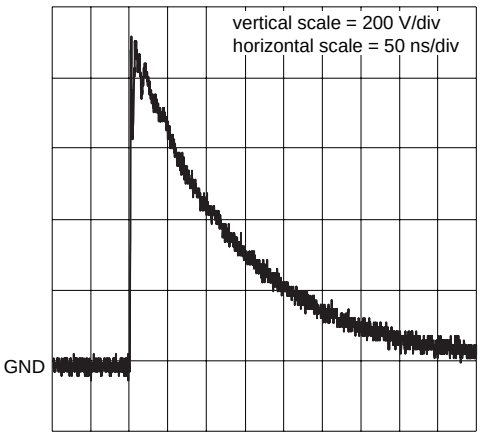


(1) PESD3V3S2UT; V_{RWM} = 3.3 V.
PESD5V2S2UT; V_{RWM} = 5 V.

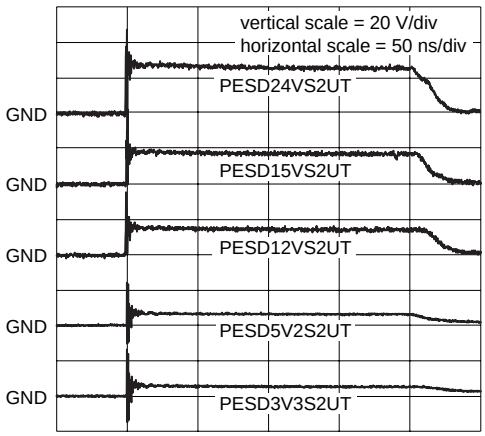
I_R is less than 10 nA at 150 °C for:
PESD12V52UT; V_{RWM} = 12 V.
PESD15VS2UT; V_{RWM} = 15 V.
PESD24VS2UT; V_{RWM} = 24 V.

Fig.8 Relative variation of reverse leakage current as a function of junction temperature; typical values.

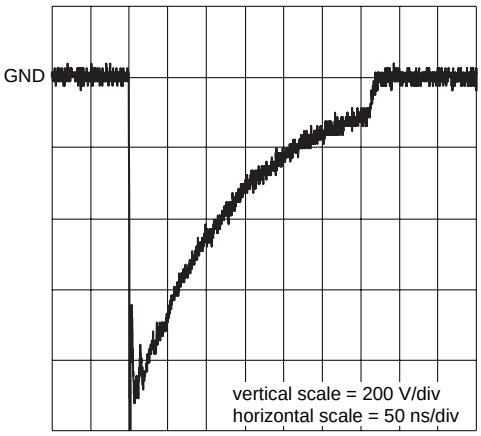




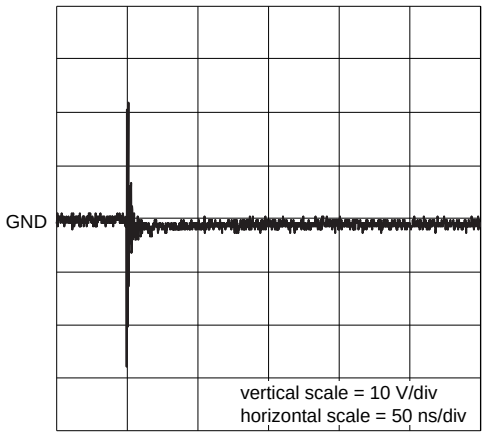
unclamped +1 kV ESD voltage waveform (IEC61000-4-2 network)



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)

001aaa492

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

APPLICATION INFORMATION

The PESDxS2UT series is designed for uni-directional protection for up to two lines against damage caused by ElectroStatic Discharge (ESD) and surge pulses. The PESDxS2UT series may be used on lines where the signal polarities are below ground. PESDxS2UT series provide a surge capability of up to 330 W (P_{pp}) per line for an 8/20 μs waveform.

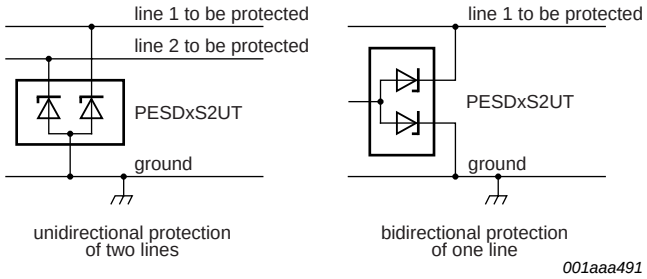


Fig.10 Typical application: ESD protection of data lines.

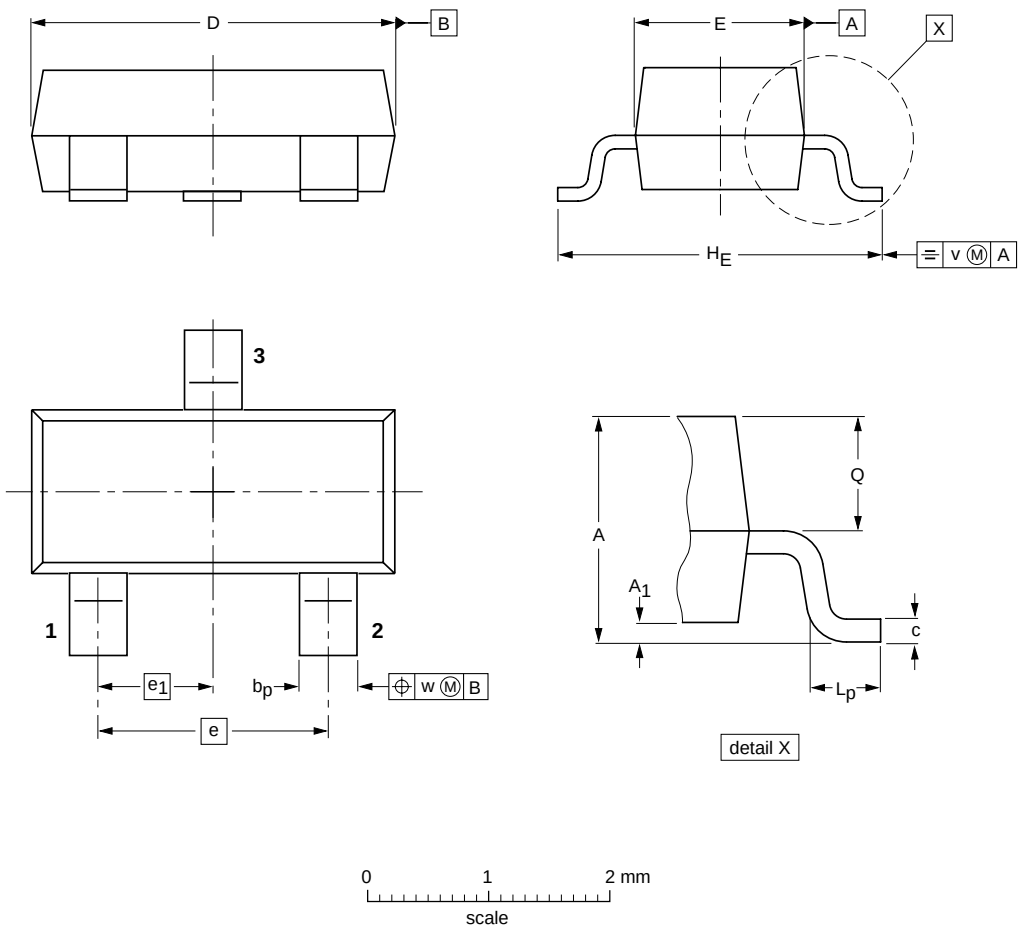
Circuit board layout and protection device placement

Circuit board layout is critical for the suppression of ESD, Electrical Fast Transient (EFT) and surge transients. The following guidelines are recommended:

- Place the PESDxS2UT as close as possible to the input terminal or connector.
- The path length between the PESDxS2UT 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.

PACKAGE OUTLINE

Plastic surface-mounted package; 3 leads **SOT23**



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1 max.	b_p	c	D	E	e	e_1	H_E	L_p	Q	v	w
mm	1.1 0.9	0.1	0.48 0.38	0.15 0.09	3.0 2.8	1.4 1.2	1.9	0.95	2.5 2.1	0.45 0.15	0.55 0.45	0.2	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT23		TO-236AB				~~04-11-04~~ 06-03-16

DATA SHEET STATUS

DOCUMENT STATUS[1]	PRODUCT STATUS[2]	DEFINITION
Objective data sheet	Development	This document contains data from the objective specification for product development.
Preliminary data sheet	Qualification	This document contains data from the preliminary specification.
Product data sheet	Production	This document contains the product specification.

Notes

1. Please consult the most recently issued document before initiating or completing a design.
2. 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.

DISCLAIMERS

General — Information in this document is believed to be accurate and reliable. However, NXP Semiconductors does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information.

Right to make changes — NXP Semiconductors reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.

Suitability for use — NXP Semiconductors products are not designed, authorized or warranted to be suitable for use in medical, military, aircraft, space or life support equipment, nor in applications where failure or malfunction of an NXP Semiconductors product can reasonably be expected to result in personal injury, death or severe property or environmental damage. NXP Semiconductors accepts no liability for inclusion and/or use of NXP Semiconductors products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

Applications — Applications that are described herein for any of these products are for illustrative purposes only. NXP Semiconductors makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

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

Terms and conditions of sale — NXP Semiconductors products are sold subject to the general terms and conditions of commercial sale, as published at http://www.nxp.com/profile/terms, including those pertaining to warranty, intellectual property rights infringement and limitation of liability, unless explicitly otherwise agreed to in writing by NXP Semiconductors. In case of any inconsistency or conflict between information in this document and such terms and conditions, the latter will prevail.

No offer to sell or license — Nothing in this document may be interpreted or construed as an offer to sell products that is open for acceptance or the grant, conveyance or implication of any license under any copyrights, patents or other industrial or intellectual property rights.

Export control — This document as well as the item(s) described herein may be subject to export control regulations. Export might require a prior authorization from national authorities.

Quick reference data — The Quick reference data is an extract of the product data given in the Limiting values and Characteristics sections of this document, and as such is not complete, exhaustive or legally binding.

NXP Semiconductors

Customer notification

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, except for package outline drawings which were updated to the latest version.

Contact information

For additional information please visit: **http://www.nxp.com**
For sales offices addresses send e-mail to: **salesaddresses@nxp.com**

© NXP B.V. 2009

All rights are reserved. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner.

The information presented in this document does not form part of any quotation or contract, is believed to be accurate and reliable and may be changed without notice. No liability will be accepted by the publisher for any consequence of its use. Publication thereof does not convey nor imply any license under patent- or other industrial or intellectual property rights.

Printed in The Netherlands R76/03/pp13 Date of release: 2004 Apr 15 Document order number: 9397 750 12823

founded by

PHILIPS

Unikeyic Electronics

Global Electronic Components Distributor

Click to view pricing, inventory, delivery, and lifecycle information:

nexperia:

BC846,215 BCX52-16TF PTVS12VS1UR,115 PMP4501QASZ 74AHC594PW,118 74ALVC541PW,118 74HC164PW,118 BZX84-B16,215 NX3020NAKS,115 PMBT2907A,215 BZV55-C24,115 BZX84-B5V6-QR BAT854SW,115 PDTD113ET,215 74HC1G02GW,125 MM3Z12VT1GX BUK9Y107-80EX PMDT290UNE,115 74CBTLV3257PW,118 74LVC1G3157GV BAV170QAZ BSS138PS,115 BZV49-C10,115 PDTA124ET,215 TL431QDBZR,215 BAT54C,235 NXB0106PW-Q100J PBSS4140T PSMN014-60HSX BAV99S-QF