IVN Bus Protector

NUPH1128

SOD-323
Bi-Directional
ESD Protection

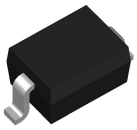
The NUPH1128 is designed to protect both CAN and LIN transceivers from ESD and other harmful transient voltage events. The devices provide bidirectional protection for each data line with a single compact SOD-323 package, giving the system designer a low cost option for improving system reliability and meeting stringent EMI requirements.

Features

- 150 °C $T_{J(max)}$ − Rated for High Temperature, Mission Critical Applications
- ISO 7637-1, Nonrepetitive EMI Surge Pulse 2, 8.0 A (1/50 μs)
- ISO 7637-3, Repetitive Electrical Fast Transient (EFT) EMI Surge Pulses, 50 A (5/50 ns)
- SZ Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

Typical Applications

- In Vehicle Networking (IVN)
- CAN/CAN-FD/LIN Bus Protection



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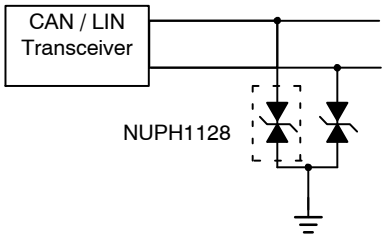


MARKING DIAGRAM

AM = Specific Device Code
M = Date Code

(Note: Microdot may be in either location)

MAXIMUM RATINGS (T_A = 25 °C unless otherwise noted)

Rating	Symbol	Value	Unit
Peak Power Dissipation 8/20 μs Double Exponential Waveform	PPK	90	W
Junction and Storage Temperature Range	T_J, T_{stg}	−55 to +150	°C
Lead Solder Temperature − Maximum (10 Second Duration)	T_L	260	°C
Human Body Model (HBM) Charge Device Model (CDM) IEC 61000-4-2 Contact IEC 61000-4-2 Air ISO 10605 Contact (330 pF / 330 Ω) ISO 10605 Contact (330 pF / 2 kΩ) ISO 10605 Contact (150 pF / 2 kΩ)	ESD	±8 ±1 ±30 ±30 ±12 ±25 ±30	kV
Maximum Peak Pulse Current, 8/20 μs	I_{PP}	3	A

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

ORDERING INFORMATION

Device	Package	Shipping
NUPH1128H1T1G	SOD-323 (Pb-Free)	3000 / Tape & Reel
SZNUPH1128H1T1G		

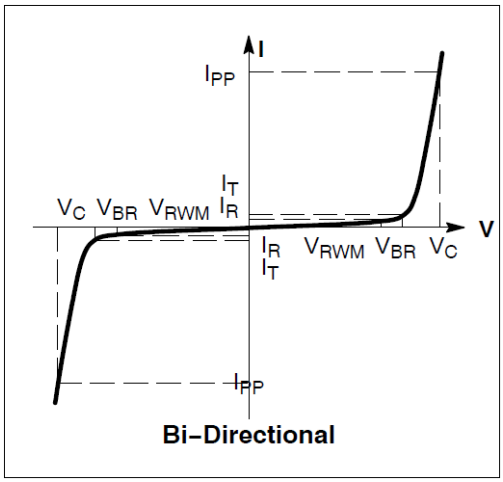
† For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

ELECTRICAL CHARACTERISTICS

(T_A = 25 °C unless otherwise noted)

Symbol	Parameter
I_{PP}	Maximum Reverse Peak Pulse Current
V_C	Clamping Voltage @ I_{PP}
V_{RWM}	Working Peak Reverse Voltage
I_R	Maximum Reverse Leakage Current @ V_{RWM}
V_{BR}	Breakdown Voltage @ I_T
I_T	Test Current

* See Application Note AND8308/D for detailed explanations of data sheet parameters.



ELECTRICAL CHARACTERISTICS (T_J = 25 °C, unless otherwise specified)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V_{RWM}	Reverse Working Voltage	(Note 1)			26.5	V
V_{BR}	Breakdown Voltage	I_T = 1 mA (Note 2)	27.5	31	36.5	V
I_R	Reverse Leakage Current	V_{RWM} = 26.5 V T_A = 150 °C		1 1	100 –	nA μA
V_C	Clamping Voltage ESD	IEC61000-4-2, +/– 8 kV Contact	See Figures 7 and 8			
V_C	Clamping Voltage TLP (See Figures 9 – 10)	I_{PP} = ±8 A (Note 3) I_{PP} = ±16 A (Note 3) I_{PP} = ±20 A (Note 3)		42 44 46		V
V_C	Clamping Voltage Surge	IEC61000-4-5 (8/20 μs) I_{PP} = ±1 A I_{PP} = ±3 A		 37 41	 43 45	V
C_J	Capacitance	V_R = 0 V, f = 1 MHz (Line to GND)		15	18	pF

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

1. Surge protection devices are normally selected according to the working peak reverse voltage (V_{RWM}), which should be equal or greater than the DC or continuous peak operating voltage level.
2. V_{BR} is measured at pulse test current I_T.
3. .ANSI/ESD STM5.5.1 – Electrostatic Discharge Sensitivity Testing using Transmission Line Pulse (TLP) Model. TLP conditions: Z_0 = 50 Ω, tp = 100 ns, t_r = 1 ns, averaging window; t_1 = 70 ns to t_2 = 90 ns.

TYPICAL CHARACTERISTICS

(T_J = 25 °C unless otherwise noted)

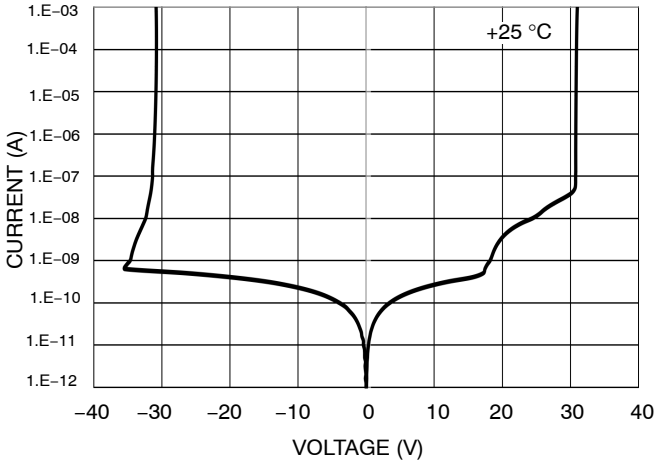


Figure 1. IV Characteristics

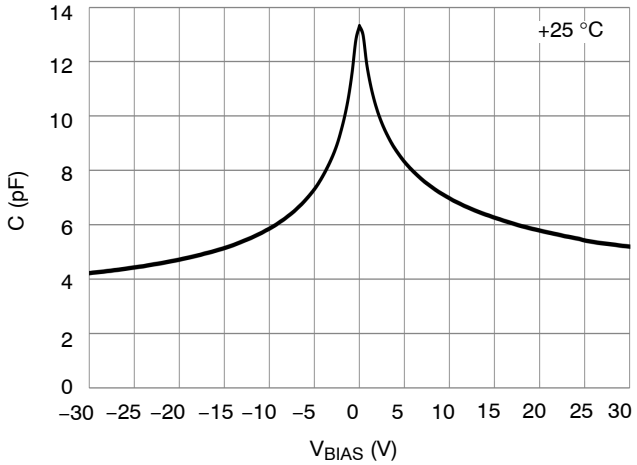


Figure 2. CV Characteristics

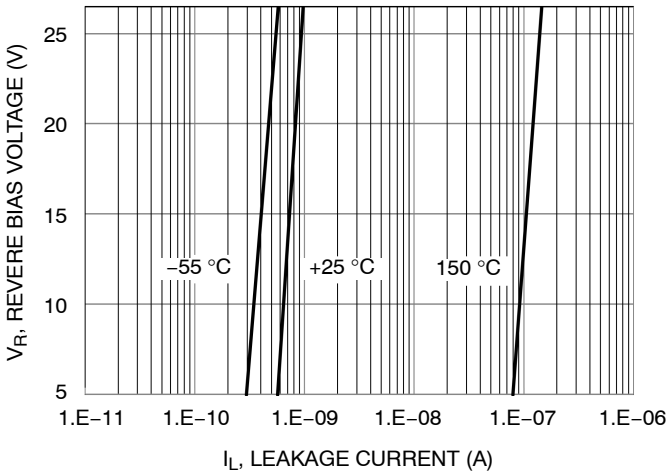


Figure 3. I_R vs. Temperature Characteristics

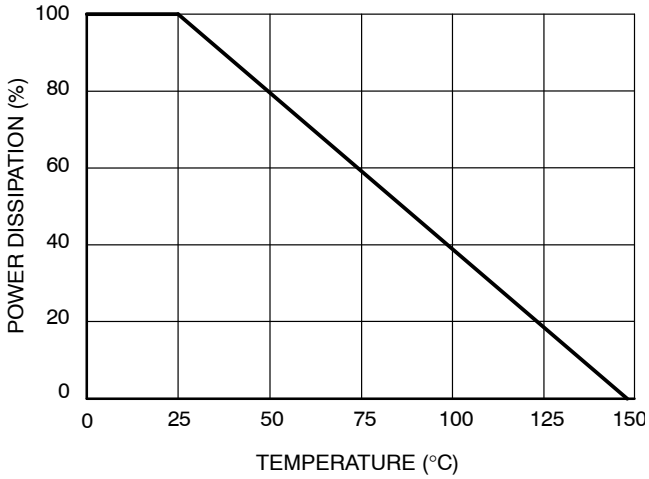


Figure 4. Steady State Power Derating

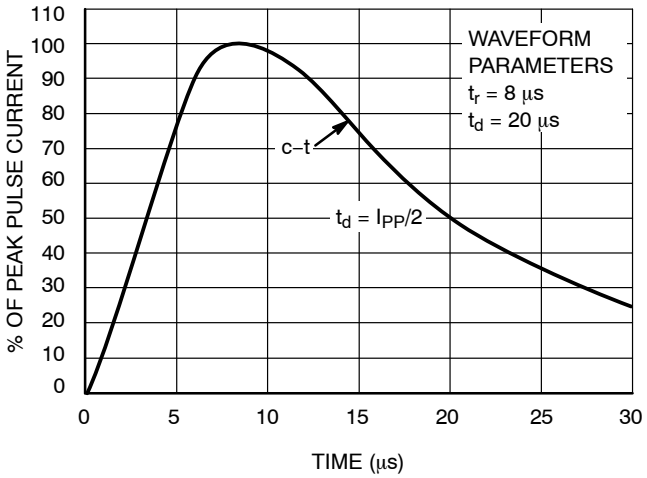


Figure 5. Pulse Waveform (8/20 μs)

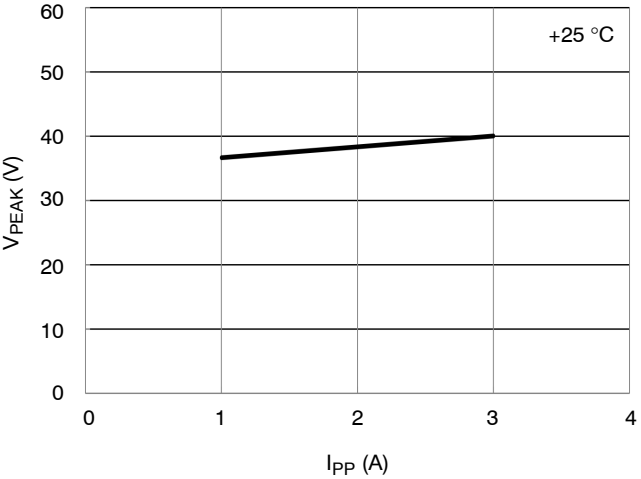


Figure 6. Clamping Voltage vs. Peak Pulse Current (8/20 μs)

TYPICAL CHARACTERISTICS

(T_J = 25 °C unless otherwise noted)

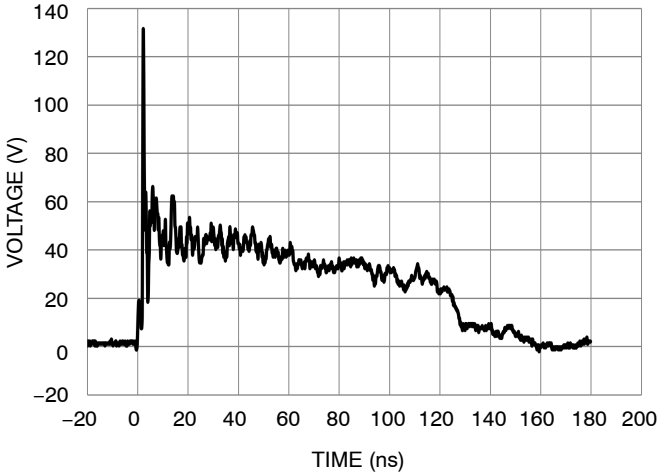


Figure 7. IEC61000-4-2 +8 kV Contact

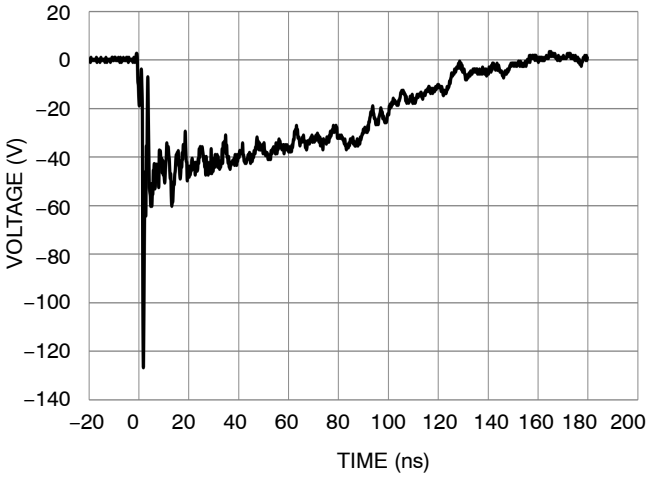


Figure 8. IEC61000-4-2 −8 kV Contact

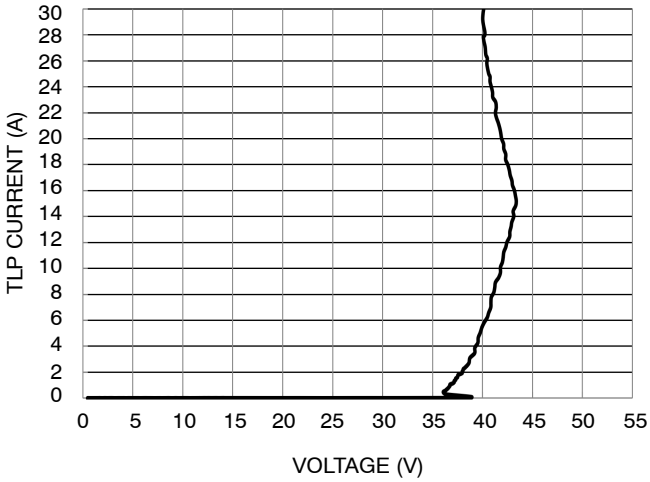


Figure 9. Positive TLP IV Curve

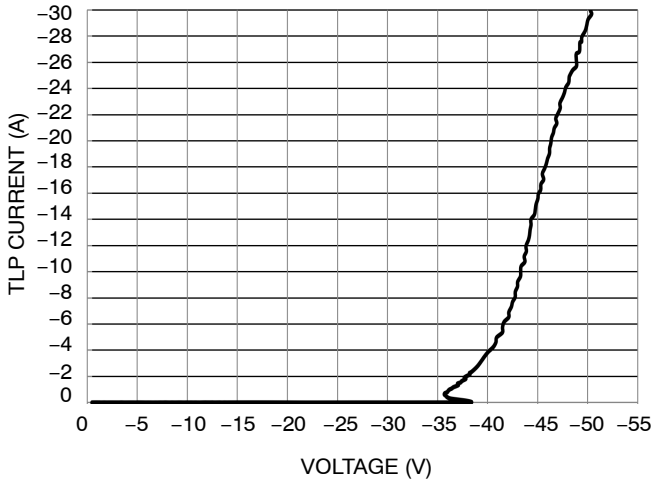


Figure 10. Negative TLP IV Curve

The following is taken from Application Note AND8308/D – Interpretation of Data Sheet Parameters for ESD Devices.

ESD Voltage Clamping

For sensitive circuit elements it is important to limit the voltage that an IC will be exposed to during an ESD event to as low a voltage as possible. The ESD clamping voltage is the voltage drop across the ESD protection diode during an ESD event per the IEC61000-4-2 waveform. Since the IEC61000-4-2 was written as a pass/fail spec for larger systems such as cell phones or laptop computers it is not clearly defined in the spec how to specify a clamping voltage at the device level. **onsemi** has developed a way to examine the entire voltage waveform across the ESD protection diode over the time domain of an ESD pulse in the form of an oscilloscope screenshot, which can be found on the data sheets for all ESD protection diodes. For more information on how creates these screenshots and how to interpret them please refer to AND8307/D.

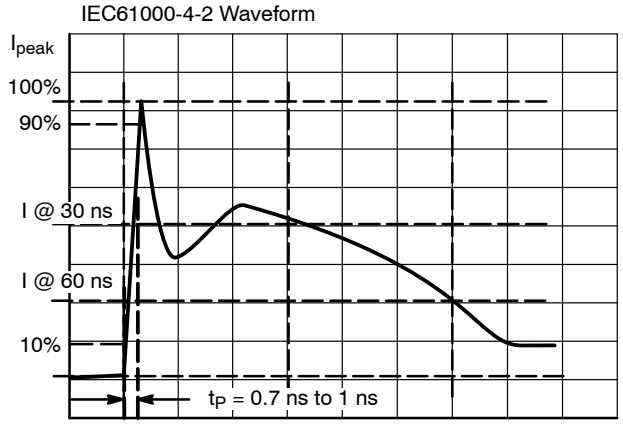


Figure 11. IEC61000-4-2 Current Waveform

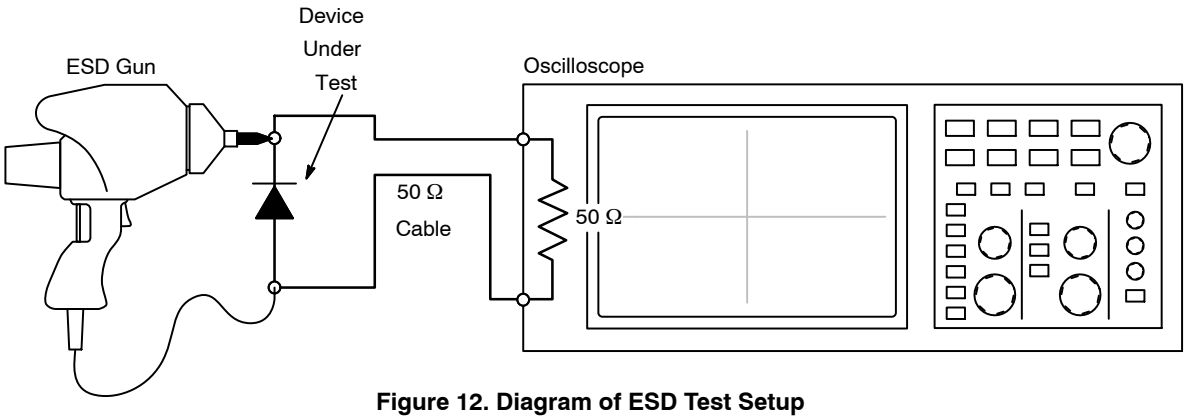


Figure 12. Diagram of ESD Test Setup

The following is taken from Application Note AND9006/D – Using Transmission Line Pulse Measurements to Understand Protection Product Characteristics

Transmission Line Pulse (TLP) Measurement

TLP provides current versus voltage (I-V) curves in which each data point is obtained from a 100 ns long rectangular pulse from a charged transmission line. A simplified schematic of a typical TLP system is shown in Figure 13. TLP I-V curves of ESD protection devices accurately demonstrate the product's ESD capability because the 10s of amps current levels and under 100 ns time scale match those of an ESD event. This is illustrated in Figure 14 where an 8 kV IEC 61000-4-2 current waveform is compared with TLP current pulses at 8 A and 16 A. A TLP I-V curve shows the voltage at which the device turns on as well as how well the device clamps voltage over a range of current levels.

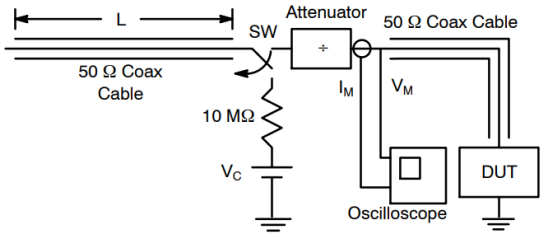


Figure 13. Basic TLP System

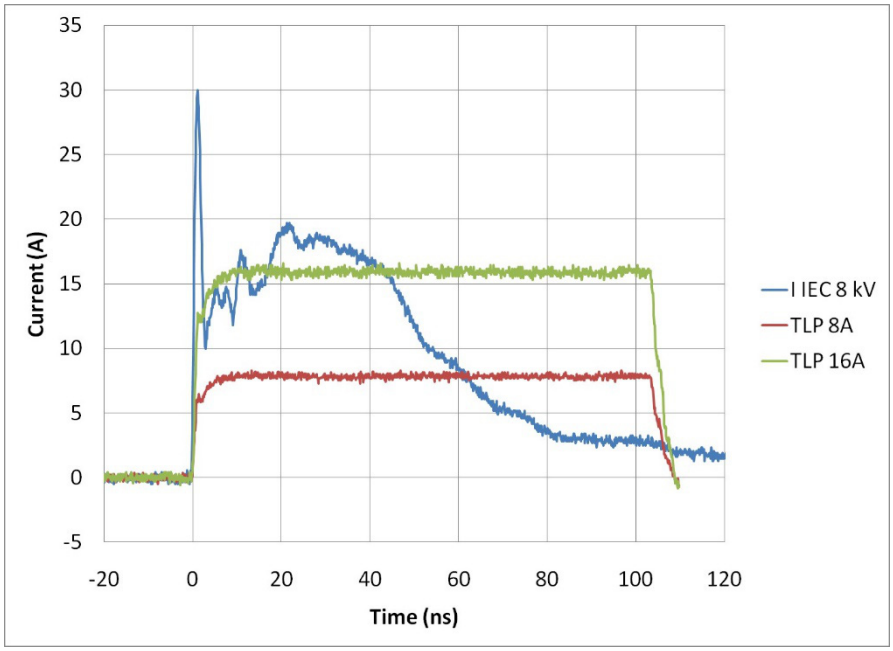
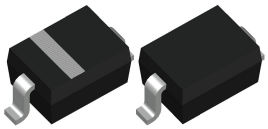


Figure 14. Comparison Between 8 kV IEC 61000-4-2 and 8 A and 16 A TLP Waveforms

REVISION HISTORY

Revision	Description of Changes	Date
0	Initial Datasheet Release.	8/11/2026

PACKAGE DIMENSIONS



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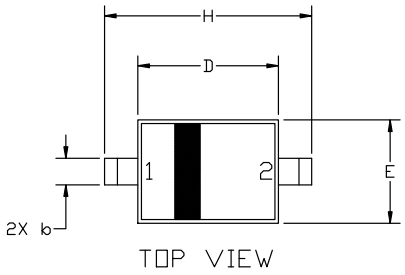
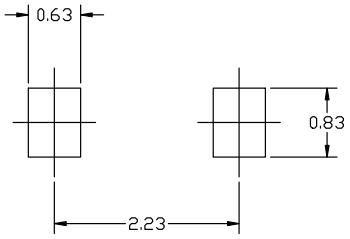
CASE 477
ISSUE K



NOTES:

1. DIMENSIONING AND TOLERANCING AS PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. LEAD THICKNESS SPECIFIED PER L/F DRAWING WITH SOLDER PLATING.
4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.
5. DIMENSION L IS MEASURE FROM END OF RADIUS.

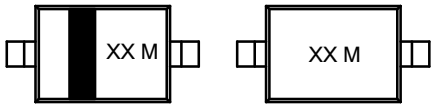
DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.80	0.90	1.00
A1	0.00	0.05	0.10
A2	0.75	0.85	0.95
A3	0.15 (REF)		
b	0.25	0.32	0.4
c	0.09	0.12	0.18
D	1.60	1.70	1.80
E	1.15	1.25	1.35
H	2.30	2.50	2.70
L	0.08	---	---
L1	0.40 (REF)		



RECOMMENDED MOUNTING FOOTPRINT

*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference manual, SOLDERRM/D.

GENERIC MARKING DIAGRAM*



STYLE 1 STYLE 2

XX = Specific Device Code
M = Date Code

*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, “G” or microdot “▪”, may or may not be present. Some products may not follow the Generic Marking.

STYLE 1:
PIN 1. CATHODE (POLARITY BAND)
2. ANODE

STYLE 2:
NO POLARITY

ADDITIONAL INFORMATION

TECHNICAL PUBLICATIONS:
Technical Library: www.onsemi.com/design/resources/technical−documentation
onsemi Website: www.onsemi.com

ONLINE SUPPORT: www.onsemi.com/support
For additional information, please contact your local Sales Representative at www.onsemi.com/support/sales