

ESD Protection Diode

Dual Line Automotive Bus Protector

NUP2125, SZNUP2125

The SZ/NUP2125 has been designed to protect both CAN and LIN transceivers from ESD and other harmful transient voltage events. This device provides bidirectional protection for each data line with a single compact SC-70 (SOT-323) package, giving the system designer a low cost option for improving system reliability and meeting stringent EMI requirements.

Features

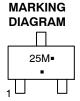
- 200 W Peak Power Dissipation per Line (8/20 μs Waveform)
- Diode Capacitance Matching
- Low Reverse Leakage Current (< 100 nA)
- IEC Compatibility: IEC 61000-4-2 (ESD): Level 4
 - IEC 61000-4-4 (EFT): 50 A 5/50 ns
 - IEC 61000-4-5 (Lighting) 3.0 A (8/20 μs)
- ISO 7637–1, Nonrepetitive EMI Surge Pulse 2, 8.0 A (1/50 μs)
- ISO 7637–3, Repetitive Electrical Fast Transient (EFT) EMI Surge Pulses, 50 A (5/50 ns)
- Flammability Rating UL 94 V-0
- SZ Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- These are Pb-Free Devices

Applications

- Automotive Networks
 - CAN / CAN-FD
 - Low and High-Speed CAN
 - Fault Tolerant CAN
 - LIN



SC-70 CASE 419

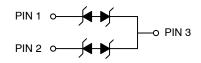


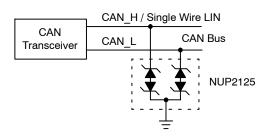
25 = Specific Device Code

M = Date Code

= Pb-Free Package

(Note: Microdot may be in either location)





ORDERING INFORMATION

See detailed ordering and shipping information on page 2 of this data sheet.

NUP2125, SZNUP2125

MAXIMUM RATINGS (T_J = 25°C, unless otherwise specified)

Symbol	Rating	Value	Unit
PPK	Peak Power Dissipation, 8/20 μs Double Exponential Waveform (Note 1)	200	W
T_J	Operating Junction Temperature Range	-55 to 150	°C
TJ	Storage Temperature Range	-55 to 150	°C
T _L	Lead Solder Temperature (10 s)	260	°C
ESD	Human Body Model (HBM) Machine Model (MM) IEC 61000–4–2 Contact IEC 61000–4–2 Air ISO 10605 150 pF / 2 k Ω Contact ISO 10605 330 pF / 2 k Ω Contact	±8.0 ±1.6 ±30 ±30 ±30 ±30	kV kV kV kV kV

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.

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

Symbol	Parameter	Test Conditions	Min	Тур	Max	Unit
V _{RWM}	Reverse Working Voltage	(Note 2)	24	-	-	V
V_{BR}	Breakdown Voltage	I _T = 1 mA (Note 3)	27	28.5	32	V
I _R	Reverse Leakage Current	V _{RWM} = 24 V	-	15	100	nA
V _C	Clamping Voltage	I _{PP} = 1 A (8/20 μs Waveform) (Note 4)	-	33.4	36.6	V
V _C	Clamping Voltage	I _{PP} = 3 A (8/20 μs Waveform) (Note 4)	-	44	50	V
I _{PP}	Maximum Peak Pulse Current	8/20 μs Waveform (Note 4)	-	_	3.0	Α
CJ	Capacitance	V _R = 0 V, f = 1 MHz (Line to GND)	-	7.0	10	pF
		V _R = 5 V, f = 1 MHz (Line to GND)	-	4.5	6.0	pF
		$V_R = 5 \text{ V, f} = 1 \text{ MHz}$ (Line to GND), $T_A = +150^{\circ}\text{C}$	-	5.0	-	pF
ΔC	Diode Capacitance Matching	V _R = 0 V, 5 MHz (Note 5)	-	0.26	2	%

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.

ORDERING INFORMATION

Device	Package	Shipping [†]	
NUP2125WTT1G		3000 / Tape & Reel	
SZNUP2125WTT1G*	SC-70		
NUP2125WTT3G	(Pb-Free)	10000 / Tana % Dool	
SZNUP2125WTT3G*		10000 / Tape & Reel	

[†]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.

^{1.} Non-repetitive current pulse per Figure 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.

^{3.} V_{BR} is measured at pulse test current I_T.

^{4.} Pulse waveform per Figure 1.

ΔC is the percentage difference between C_J of lines 1 and 2 measured according to the test conditions given in the electrical characteristics table.

^{*}SZ Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable.

NUP2125, SZNUP2125

TYPICAL PERFORMANCE CURVES

(T_J = 25°C UNLESS OTHERWISE NOTED)

3.5

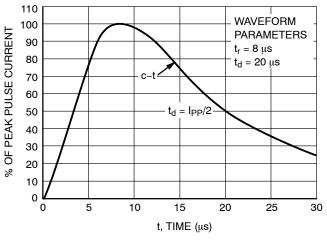
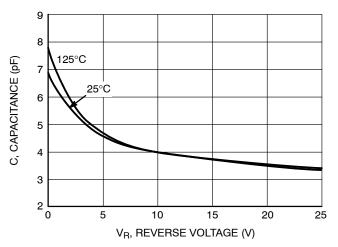


Figure 1. Pulse Waveform, 8/20 μs

Figure 2. Clamping Voltage vs Peak Pulse Current



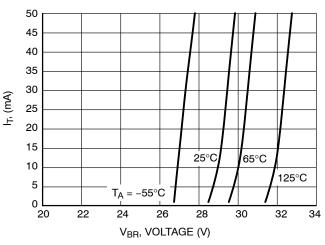
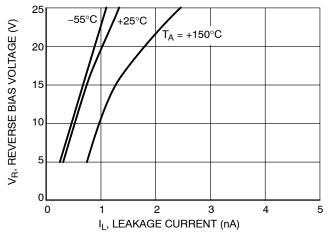


Figure 3. Typical Junction Capacitance vs
Reverse Voltage

Figure 4. V_{BR} versus I_T Characteristics



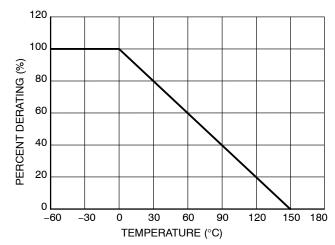


Figure 5. I_R versus Temperature Characteristics

Figure 6. Temperature Power Dissipation Derating

NUP2125, SZNUP2125

Surge Protection Diode Circuit

Surge protection diodes provide protection to a transceiver by clamping a surge voltage to a safe level. Surge protection diodes have high impedance below and low impedance above their breakdown voltage. A surge protection Zener diode has its junction optimized to absorb the high peak energy of a transient event, while a standard Zener diode is designed and specified to clamp a steady state voltage.

Figure 7 provides an example of a dual bidirectional surge protection diode array that can be used for protection with the high-speed CAN network. The bidirectional array is created from four identical Zener TVS diodes. The clamping voltage of the composite device is equal to the

breakdown voltage of the diode that is reversed biased, plus the diode drop of the second diode that is forwarded biased.

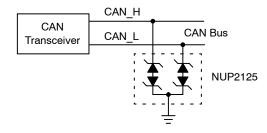


Figure 7. High-Speed and Fault Tolerant CAN Surge Protection Circuit





SC-70 (SOT-323) **CASE 419** ISSUE R

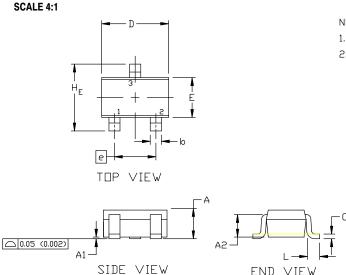
END VIEW

DATE 11 OCT 2022

NOTES:

- 1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1982.
- 2. CONTROLLING DIMENSION: INCH

	MILLIMETERS			INCHES		
DIM	MIN.	N□M.	MAX.	MIN.	N□M.	MAX.
Α	0.80	0.90	1.00	0.032	0.035	0.040
A1	0.00	0.05	0.10	0.000	0.002	0.004
A2	0.70 REF			0.028 BSC		
b	0.30	0.35	0.40	0.012	0.014	0.016
С	0.10	0.18	0.25	0.004	0.007	0.010
D	1.80	2.00	2.20	0.071	0.080	0.087
E	1.15	1.24	1.35	0.045	0.049	0.053
е	1.20	1.30	1.40	0.047	0.051	0.055
e1	0.65 BSC			0.026 BSC		
L	0.20	0.38	0.56	0.008	0.015	0.022
HE	2.00	2.10	2.40	0.079	0.083	0.095



GENERIC MARKING DIAGRAM

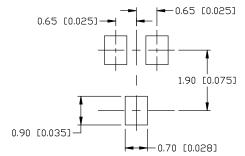


= Specific Device Code XX

Μ = Date Code

= Pb-Free Package

*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.



For additional information on our Pb-Free strategy and soldering details, please download the ID Semiconductor Soldering and Mounting Techniques Reference Manual, SDLDERRM/D.

SOLDERING FOOTPRINT

STYLE 1: CANCELLED	STYLE 2: PIN 1. ANODE 2. N.C. 3. CATHODE	STYLE 3: PIN 1. BASE 2. EMITTER 3. COLLECTOR	STYLE 4: PIN 1. CATHODE 2. CATHODE 3. ANODE	STYLE 5: PIN 1. ANODE 2. ANODE 3. CATHODE	
STYLE 6: PIN 1. EMITTER	STYLE 7: PIN 1. BASE	STYLE 8: PIN 1. GATE	STYLE 9: PIN 1. ANODE	STYLE 10: PIN 1. CATHODE	STYLE 11: PIN 1. CATHODE
2. BASE	2. EMITTER	2. SOURCE	2. CATHODE	2. ANODE	2. CATHODE
COLLECTOR	COLLECTOR	3. DRAIN	CATHODE-ANODE	3. ANODE-CATHODE	CATHODE

DOCUMENT NUMBER:	98ASB42819B	Electronic versions are uncontrolled except when accessed directly from the Document Repositor, Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.			
DESCRIPTION:	SC-70 (SOT-323)		PAGE 1 OF 1		

onsemi and ONSEMI are trademarks of Semiconductor Components Industries, LLC dba onsemi or its subsidiaries in the United States and/or other countries. onsemi reserves the right to make changes without further notice to any products herein. onsemi makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. **onsemi** does not convey any license under its patent rights nor the rights of others.

onsemi, ONSEMI., and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "onsemi" or its affiliates and/or subsidiaries in the United States and/or other countries. onsemi owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of onsemi's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. onsemi reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and onsemi makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does onsemi assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems. or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

ADDITIONAL INFORMATION

TECHNICAL PUBLICATIONS:

 $\textbf{Technical Library:} \ \underline{www.onsemi.com/design/resources/technical-documentation}$

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