

# NUP1105LT1G, SZNUP1105LT1G

## ESD Protection Diode

### Single Line CAN/LIN Bus Protector

The NUP1105L has been designed to protect LIN and single line CAN transceivers from ESD and other harmful transient voltage events. This device provides bidirectional protection for the data line with a single SOT-23 package, giving the system designer a low cost option for improving system reliability and meeting stringent EMI requirements.

#### Features

- SOT-23 Package Allows One Separate Bidirectional Configuration
- 350 W Peak Power Dissipation per Line (8 x 20  $\mu$ sec Waveform)
- Low Reverse Leakage Current (< 100 nA)
- IEC Compatibility:
  - IEC 61000-4-2 (ESD): Level 4
  - IEC 61000-4-4 (EFT): 40 A – 5/50 ns
  - IEC 61000-4-5 (Lighting) 8.0 A (8/20  $\mu$ s)
- ISO 7637-1, Nonrepetitive EMI Surge Pulse TBD
- ISO 7637-3, Repetitive Electrical Fast Transient (EFT) TBD
- EMI Surge Pulses
- 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 Devices are Pb-Free and are RoHS Compliant

#### Applications

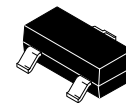
- Automotive Electronics
  - ◆ LIN Bus
  - ◆ Single Line CAN
- Industrial Control Networks
  - ◆ Smart Distribution Systems (SDS<sup>®</sup>)
  - ◆ DeviceNet<sup>™</sup>



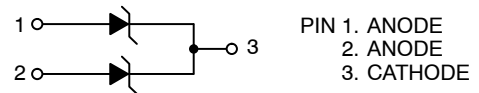
ON Semiconductor<sup>®</sup>

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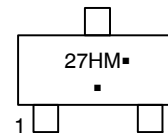
### SOT-23 BIDIRECTIONAL VOLTAGE SUPPRESSOR 350 W PEAK POWER



SOT-23  
CASE 318  
STYLE 27



#### MARKING DIAGRAM



27H = Device Code  
M = Date Code  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

#### ORDERING INFORMATION

| Device        | Package             | Shipping <sup>†</sup>   |
|---------------|---------------------|-------------------------|
| NUP1105LT1G   | SOT-23<br>(Pb-Free) | 3,000 /<br>Tape & Reel  |
| SZNUP1105LT1G | SOT-23<br>(Pb-Free) | 3,000 /<br>Tape & Reel  |
| NUP1105LT3G   | SOT-23<br>(Pb-Free) | 10,000 /<br>Tape & Reel |

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

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## MAXIMUM RATINGS (T<sub>J</sub> = 25°C, unless otherwise specified)

| Symbol         | Rating  | Value           | Unit          |
|----------------|---|-----------------|---------------|
| PPK            | Peak Power Dissipation<br>8 x 20 μs Double Exponential Waveform (Note 1)              | 350             | W             |
| T <sub>J</sub> | Operating Junction Temperature Range  | -55 to 150      | °C            |
| T <sub>J</sub> | Storage Temperature Range   | -55 to 150      | °C            |
| T <sub>L</sub> | Lead Solder Temperature (10 s)  | 260             | °C            |
| ESD            | Human Body model (HBM)<br>Machine Model (MM)<br>IEC 61000-4-2 Specification (Contact) | 16<br>400<br>30 | kV<br>V<br>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.

1. Non-repetitive current pulse per Figure 1.

## ELECTRICAL CHARACTERISTICS (T<sub>J</sub> = 25°C, unless otherwise specified)

| Symbol           | Parameter                  | Test Conditions  | Min  | Typ | Max      | Unit |
|------------------|----------------------------|--|------|-----|----------|------|
| V <sub>RWM</sub> | Reverse Working Voltage    | (Note 2)   | 24   |     |          | V    |
| V <sub>BR</sub>  | Breakdown Voltage          | I <sub>T</sub> = 1 mA (Note 3)   | 25.7 |     | 28.4     | V    |
| I <sub>R</sub>   | Reverse Leakage Current    | V <sub>RWM</sub> = 24 V  |      | 15  | 100      | nA   |
| V <sub>C</sub>   | Clamping Voltage           | I <sub>PP</sub> = 5 A (8 x 20 μs Waveform) (Note 4)  |      |     | 40       | V    |
| V <sub>C</sub>   | Clamping Voltage           | I <sub>PP</sub> = 8 A (8 x 20 μs Waveform) (Note 4)  |      |     | 44       | V    |
| I <sub>PP</sub>  | Maximum Peak Pulse Current | 8 x 20 μs Waveform (Note 4)  |      |     | 8.0      | A    |
| C <sub>J</sub>   | Capacitance                | V <sub>R</sub> = 0 V, f = 1 MHz (Anode to GND)<br>V <sub>R</sub> = 0 V, f = 1 MHz (Anode to Anode) |      |     | 60<br>30 | 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.

2. Surge protection devices are normally selected according to the working peak reverse voltage (V<sub>RWM</sub>), which should be equal or greater than the DC or continuous peak operating voltage level.
3. V<sub>BR</sub> is measured at pulse test current I<sub>T</sub>.
4. Pulse waveform per Figure 1.
5. Include SZ-prefix devices where applicable.

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## TYPICAL PERFORMANCE CURVES

( $T_J = 25^\circ\text{C}$  unless otherwise noted)

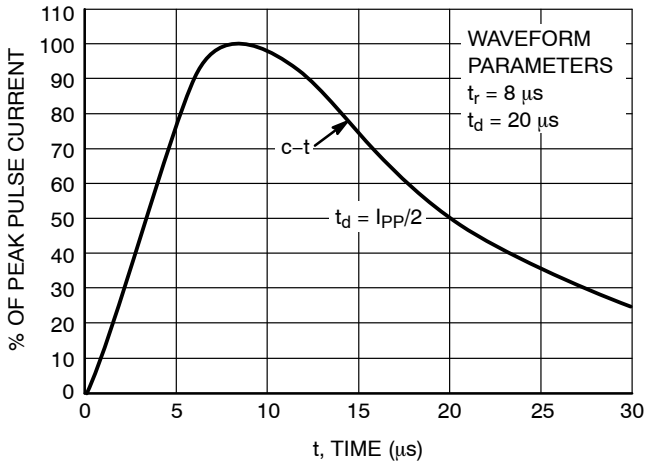


Figure 1. Pulse Waveform,  $8 \times 20 \mu\text{s}$

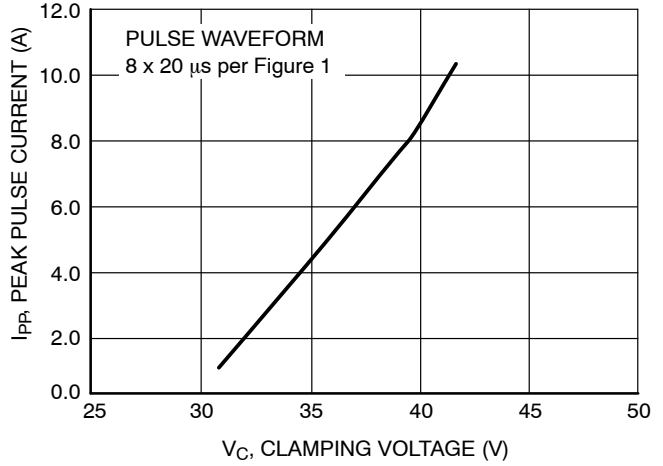


Figure 2. Clamping Voltage vs Peak Pulse Current

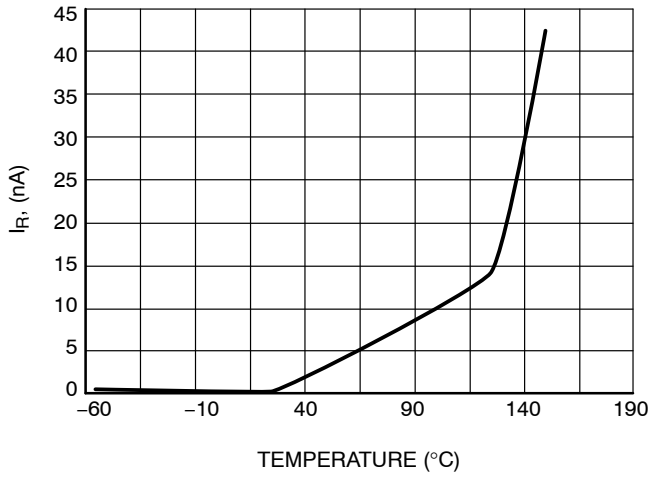


Figure 3. Typical Leakage vs. Temperature

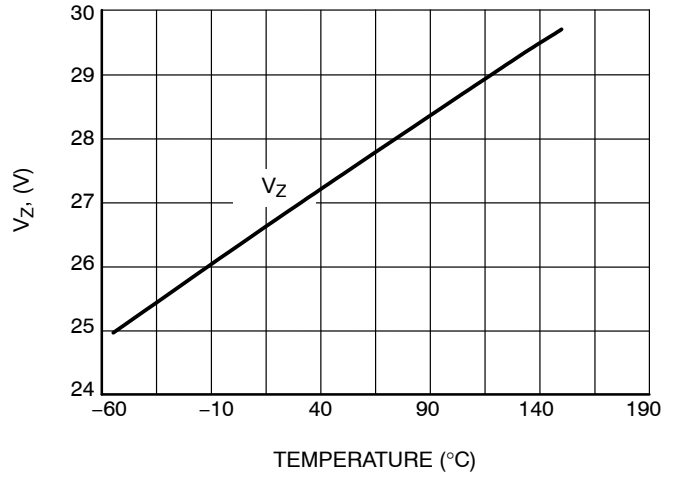


Figure 4. Typical  $V_Z$  @ 1.0 mA vs. Temperature

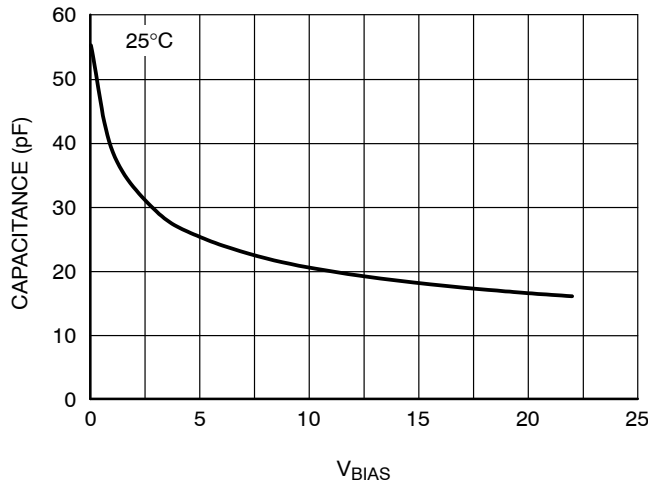


Figure 5. Capacitance vs.  $V_{BIAS}$

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## APPLICATIONS SECTION

The NUP1105L provides a surge protection solution for the LIN data communication bus. The NUP1105L is a dual bidirectional surge protection device in a compact SOT-23 package. This device is based on Zener technology that optimizes the active area of a PN junction to provide robust protection against transient EMI surge voltage and ESD. The NUP1105L has been tested to EMI and ESD levels that exceed the specifications of popular high speed LIN networks.

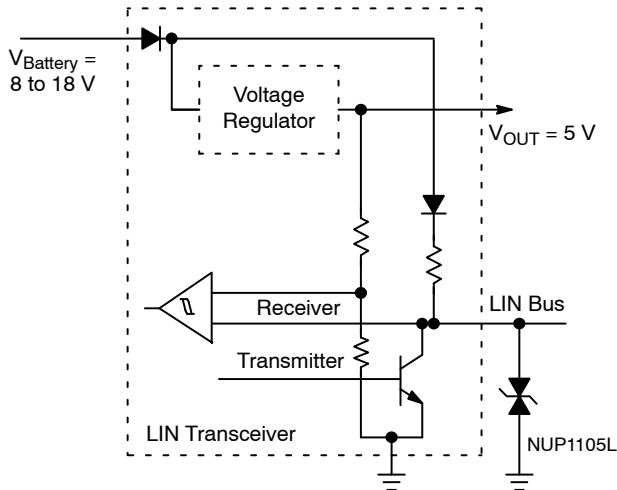


Figure 6. LIN Transceiver

The NUP1105L device can be used to provide transient voltage suppression for a single data line CAN system. Figure 7 provides an example of a single data line CAN protection circuit.

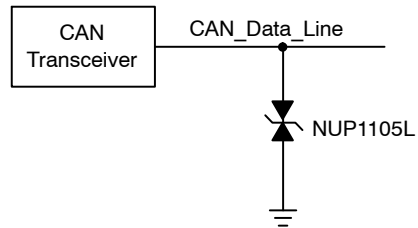


Figure 7. High-Speed and Fault Tolerant CAN Surge Protection Circuit

# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

ON Semiconductor®



**SOT-23 (TO-236)**  
CASE 318-08  
ISSUE AS

DATE 30 JAN 2018

SCALE 4:1



**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

| DIM | MILLIMETERS |      |      | INCHES |       |       |
|-----|-------------|------|------|--------|-------|-------|
|     | MIN         | NOM  | MAX  | MIN    | NOM   | MAX   |
| A   | 0.89        | 1.00 | 1.11 | 0.035  | 0.039 | 0.044 |
| A1  | 0.01        | 0.06 | 0.10 | 0.000  | 0.002 | 0.004 |
| b   | 0.37        | 0.44 | 0.50 | 0.015  | 0.017 | 0.020 |
| c   | 0.08        | 0.14 | 0.20 | 0.003  | 0.006 | 0.008 |
| D   | 2.80        | 2.90 | 3.04 | 0.110  | 0.114 | 0.120 |
| E   | 1.20        | 1.30 | 1.40 | 0.047  | 0.051 | 0.055 |
| e   | 1.78        | 1.90 | 2.04 | 0.070  | 0.075 | 0.080 |
| L   | 0.30        | 0.43 | 0.55 | 0.012  | 0.017 | 0.022 |
| L1  | 0.35        | 0.54 | 0.69 | 0.014  | 0.021 | 0.027 |
| HE  | 2.10        | 2.40 | 2.64 | 0.083  | 0.094 | 0.104 |
| T   | 0°          | ---  | 10°  | 0°     | ---   | 10°   |

**RECOMMENDED SOLDERING FOOTPRINT**



**GENERIC MARKING DIAGRAM\***



XXX = Specific Device Code  
M = 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.

STYLE 1 THRU 5:  
CANCELLED

STYLE 6:  
PIN 1. BASE  
2. EMITTER  
3. COLLECTOR

STYLE 7:  
PIN 1. EMITTER  
2. BASE  
3. COLLECTOR

STYLE 8:  
PIN 1. ANODE  
2. NO CONNECTION  
3. CATHODE

STYLE 9:  
PIN 1. ANODE  
2. ANODE  
3. CATHODE

STYLE 10:  
PIN 1. DRAIN  
2. SOURCE  
3. GATE

STYLE 11:  
PIN 1. ANODE  
2. CATHODE  
3. CATHODE-ANODE

STYLE 12:  
PIN 1. CATHODE  
2. CATHODE  
3. ANODE

STYLE 13:  
PIN 1. SOURCE  
2. DRAIN  
3. GATE

STYLE 14:  
PIN 1. CATHODE  
2. GATE  
3. ANODE

STYLE 15:  
PIN 1. GATE  
2. CATHODE  
3. ANODE

STYLE 16:  
PIN 1. ANODE  
2. CATHODE  
3. CATHODE

STYLE 17:  
PIN 1. NO CONNECTION  
2. ANODE  
3. CATHODE

STYLE 18:  
PIN 1. NO CONNECTION  
2. CATHODE  
3. ANODE

STYLE 19:  
PIN 1. CATHODE  
2. ANODE  
3. CATHODE-ANODE

STYLE 20:  
PIN 1. CATHODE  
2. ANODE  
3. GATE

STYLE 21:  
PIN 1. GATE  
2. SOURCE  
3. DRAIN

STYLE 22:  
PIN 1. RETURN  
2. OUTPUT  
3. INPUT

STYLE 23:  
PIN 1. ANODE  
2. ANODE  
3. CATHODE

STYLE 24:  
PIN 1. GATE  
2. DRAIN  
3. SOURCE

STYLE 25:  
PIN 1. ANODE  
2. CATHODE  
3. GATE

STYLE 26:  
PIN 1. CATHODE  
2. ANODE  
3. NO CONNECTION

STYLE 27:  
PIN 1. CATHODE  
2. CATHODE  
3. CATHODE

STYLE 28:  
PIN 1. ANODE  
2. ANODE  
3. ANODE

|                         |                        |  |
|-------------------------|------------------------|--|
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