

# 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

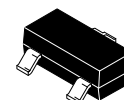
- Automotive Electronics
  - ♦ LIN Bus
  - ♦ Single Line CAN
- Industrial Control Networks
  - ♦ Smart Distribution Systems (SDS<sup>®</sup>)
  - ♦ DeviceNet<sup>™</sup>



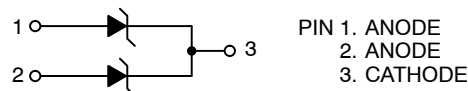
ON Semiconductor<sup>®</sup>

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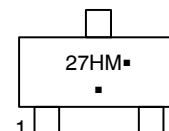
### SOT-23 BIDIRECTIONAL VOLTAGE SUPPRESSOR 350 W PEAK POWER



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.

# NUP1105LT1G, SZNUP1105LT1G

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

| Symbol         | Rating                                                                                | Value           | Unit          |
|----------------|---------------------------------------------------------------------------------------|-----------------|---------------|
| PPK            | Peak Power Dissipation<br>8 x 20 $\mu$ s 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 $\mu$ s Waveform) (Note 4)                                           |      |     | 40       | V    |
| V <sub>C</sub>   | Clamping Voltage           | I <sub>PP</sub> = 8 A (8 x 20 $\mu$ s Waveform) (Note 4)                                           |      |     | 44       | V    |
| I <sub>PP</sub>  | Maximum Peak Pulse Current | 8 x 20 $\mu$ s Waveform (Note 4)                                                                   |      |     | 8.0      | A    |
| CJ               | 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.

TYPICAL PERFORMANCE CURVES

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

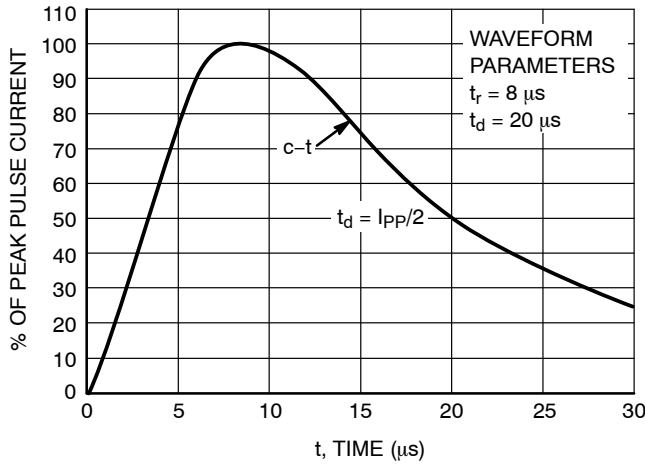


Figure 1. Pulse Waveform,  $8 \times 20 \mu\text{s}$

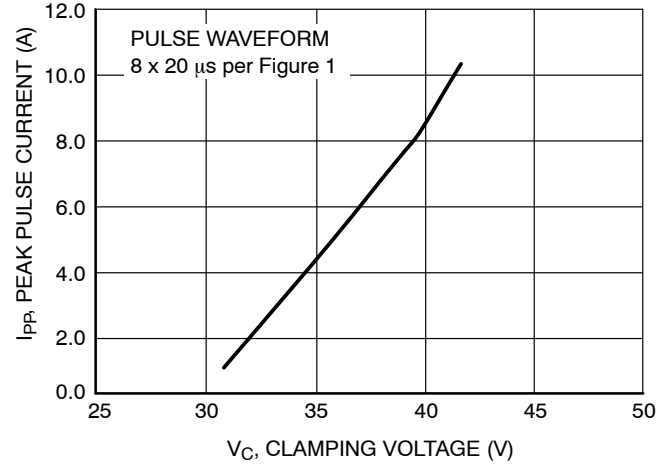


Figure 2. Clamping Voltage vs Peak Pulse Current

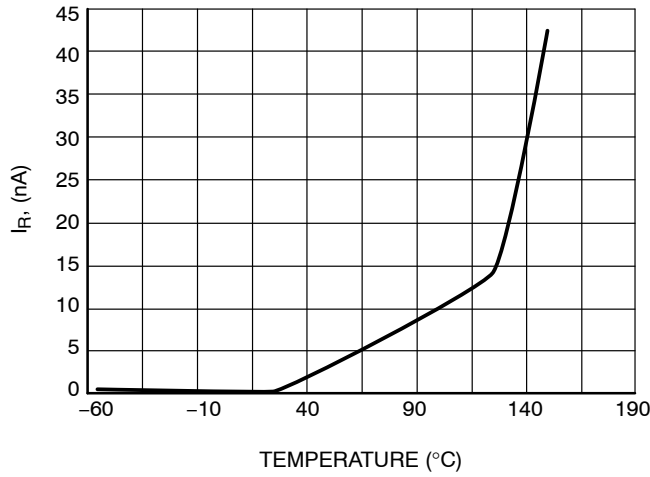


Figure 3. Typical Leakage vs. Temperature

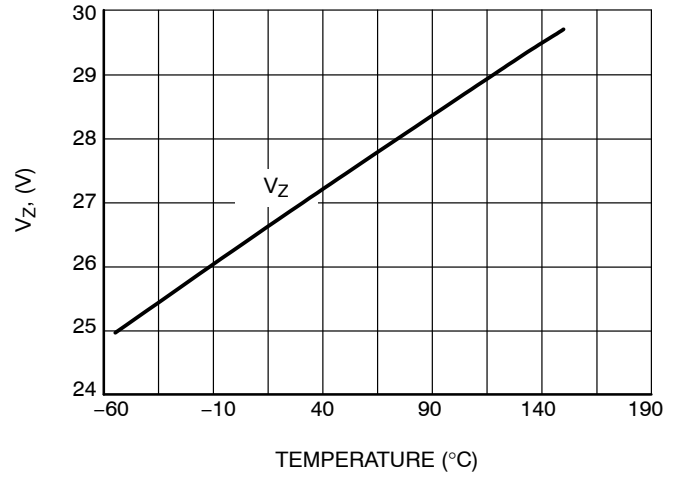


Figure 4. Typical  $V_Z$  @ 1.0 mA vs. Temperature

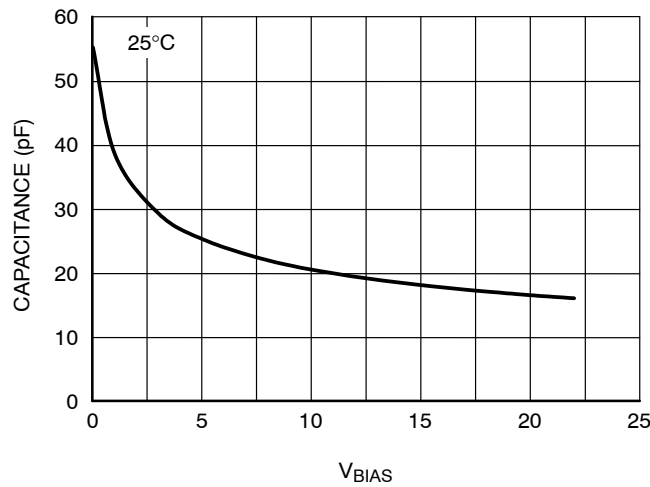
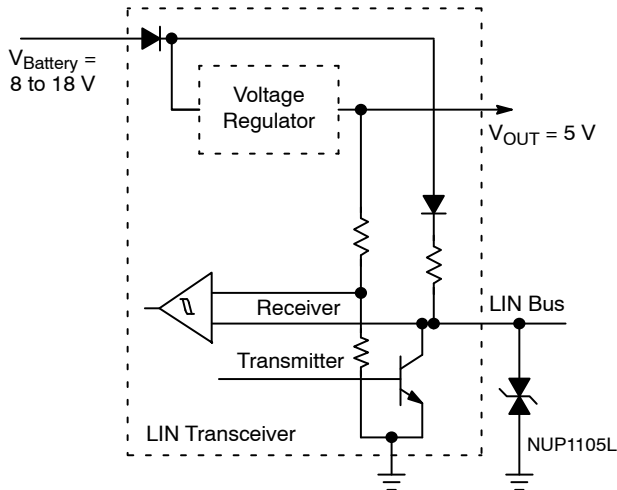


Figure 5. Capacitance vs.  $V_{BIAS}$

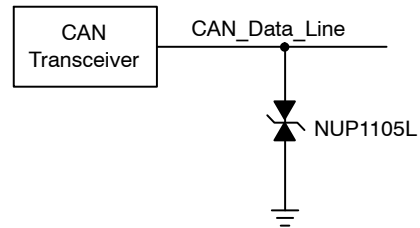
## APPLICATIONS SECTION

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



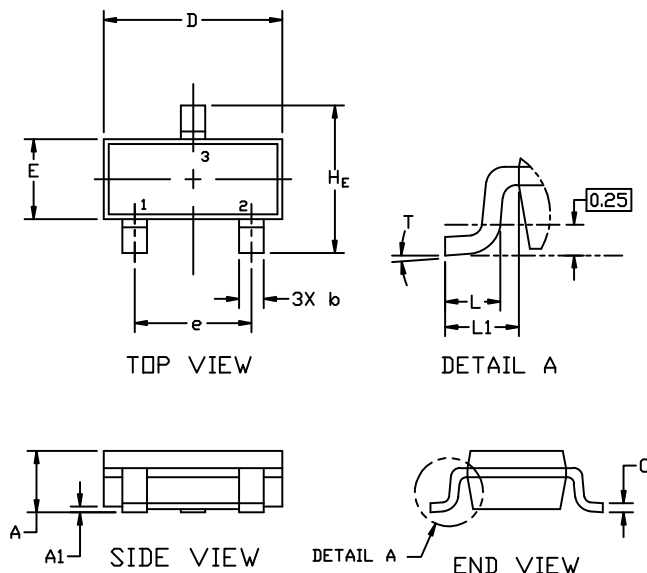
SCALE 4:1

## SOT-23 (TO-236)

CASE 318

ISSUE AT

DATE 01 MAR 2023

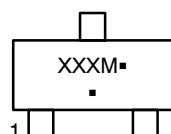


### NOTES:

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.

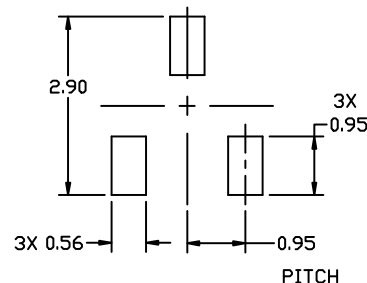
| DIM            | MILLIMETERS |      |      | INCHES |       |       |
|----------------|-------------|------|------|--------|-------|-------|
|                | MIN.        | NOM. | MAX. | MIN.   | NOM.  | MAX.  |
| A              | 0.89        | 1.00 | 1.11 | 0.035  | 0.039 | 0.044 |
| A1             | 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 |
| H <sub>E</sub> | 2.10        | 2.40 | 2.64 | 0.083  | 0.094 | 0.104 |
| T              | 0°          | ---  | 10°  | 0°     | ---   | 10°   |

### 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. Some products may not follow the Generic Marking.



### 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.

## STYLES ON PAGE 2

|                  |                 |                                                                                                                                                                                  |
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# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS



### SOT-23 (TO-236) CASE 318 ISSUE AT

DATE 01 MAR 2023

|                                                         |                                                       |                                                             |                                                             |                                                             |                                                             |
|---------------------------------------------------------|-------------------------------------------------------|-------------------------------------------------------------|-------------------------------------------------------------|-------------------------------------------------------------|-------------------------------------------------------------|
| STYLE 1 THRU 5:<br>CANCELLED                            | STYLE 6:<br>PIN 1. BASE<br>2. EMITTER<br>3. COLLECTOR | STYLE 7:<br>PIN 1. EMITTER<br>2. BASE<br>3. COLLECTOR       | STYLE 8:<br>PIN 1. ANODE<br>2. NO CONNECTION<br>3. CATHODE  |                                                             |                                                             |
| STYLE 9:<br>PIN 1. ANODE<br>2. ANODE<br>3. CATHODE      | STYLE 10:<br>PIN 1. DRAIN<br>2. SOURCE<br>3. GATE     | STYLE 11:<br>PIN 1. ANODE<br>2. CATHODE<br>3. CATHODE-ANODE | STYLE 12:<br>PIN 1. CATHODE<br>2. CATHODE<br>3. ANODE       | STYLE 13:<br>PIN 1. SOURCE<br>2. DRAIN<br>3. GATE           | STYLE 14:<br>PIN 1. CATHODE<br>2. GATE<br>3. ANODE          |
| STYLE 15:<br>PIN 1. GATE<br>2. CATHODE<br>3. ANODE      | STYLE 16:<br>PIN 1. ANODE<br>2. CATHODE<br>3. CATHODE | STYLE 17:<br>PIN 1. NO CONNECTION<br>2. ANODE<br>3. CATHODE | STYLE 18:<br>PIN 1. NO CONNECTION<br>2. CATHODE<br>3. ANODE | STYLE 19:<br>PIN 1. CATHODE<br>2. ANODE<br>3. CATHODE-ANODE | STYLE 20:<br>PIN 1. CATHODE<br>2. ANODE<br>3. GATE          |
| STYLE 21:<br>PIN 1. GATE<br>2. SOURCE<br>3. DRAIN       | STYLE 22:<br>PIN 1. RETURN<br>2. OUTPUT<br>3. INPUT   | STYLE 23:<br>PIN 1. ANODE<br>2. ANODE<br>3. CATHODE         | STYLE 24:<br>PIN 1. GATE<br>2. DRAIN<br>3. SOURCE           | STYLE 25:<br>PIN 1. ANODE<br>2. CATHODE<br>3. GATE          | STYLE 26:<br>PIN 1. CATHODE<br>2. ANODE<br>3. NO CONNECTION |
| STYLE 27:<br>PIN 1. CATHODE<br>2. CATHODE<br>3. CATHODE | STYLE 28:<br>PIN 1. ANODE<br>2. ANODE<br>3. ANODE     |                                                             |                                                             |                                                             |                                                             |

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