

# NUP1105L

## Advance Information 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
- Pb-Free Packages are Available

### Applications

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



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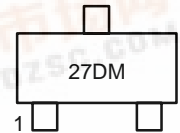
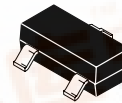
<http://onsemi.com>

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



PIN 1. ANODE  
2. ANODE  
3. CATHODE

### MARKING DIAGRAM



SOT-23  
CASE 318  
STYLE 27

27D = Device Code  
M = Date Code

### ORDERING INFORMATION

Device	Package	Shipping†
NUP1105LT1	SOT-23	3000/Tape & Reel
NUP1105LT1G	SOT-23 (Pb-Free)	3000/Tape & Reel
NUP1105LT3	SOT-23	10000/Tape & Reel
NUP1105LT3G	SOT-23 (Pb-Free)	10000/Tape & Reel

†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 ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)

Symbol	Rating	Value	Unit
PPK	Peak Power Dissipation 8 x 20 $\mu\text{s}$ Double Exponential Waveform (Note 1)	350	W
$T_J$	Operating Junction Temperature Range	-40 to 125	$^\circ\text{C}$
$T_J$	Storage Temperature Range	-55 to 150	$^\circ\text{C}$
$T_L$	Lead Solder Temperature (10 s)	260	$^\circ\text{C}$
ESD	Human Body model (HBM)	16	kV
	Machine Model (MM)	400	V
	IEC 61000-4-2 Specification (Contact)	30	kV

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

1. Nonrepetitive current pulse per Figure 1.

## ELECTRICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
$V_{RWM}$	Reverse Working Voltage	(Note 2)	24			V
$V_{BR}$	Breakdown Voltage	$I_T = 1\text{ mA}$ (Note 3)	25.7		28.4	V
$I_R$	Reverse Leakage Current	$V_{RWM} = 24\text{ V}$		15	100	nA
$V_C$	Clamping Voltage	$I_{PP} = 5\text{ A}$ (8 x 20 $\mu\text{s}$ Waveform) (Note 4)			40	V
$V_C$	Clamping Voltage	$I_{PP} = 8\text{ A}$ (8 x 20 $\mu\text{s}$ Waveform) (Note 4)			44	V
$I_{PP}$	Maximum Peak Pulse Current	8 x 20 $\mu\text{s}$ Waveform (Note 4)			8.0	A
CJ	Capacitance	$V_R = 0\text{ V}$ , $f = 1\text{ MHz}$ (Anode to GND)			60	pF
		$V_R = 0\text{ V}$ , $f = 1\text{ MHz}$ (Anode to Anode)			30	

2. TVS 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.

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## TYPICAL PERFORMANCE CURVES

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

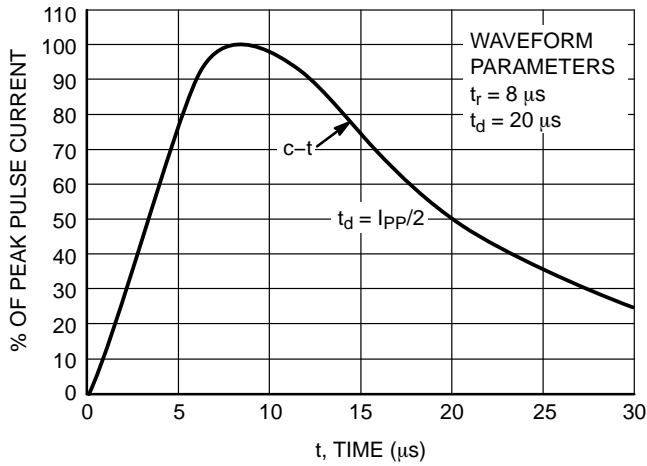


Figure 1. Pulse Waveform,  $8 \times 20 \mu\text{s}$

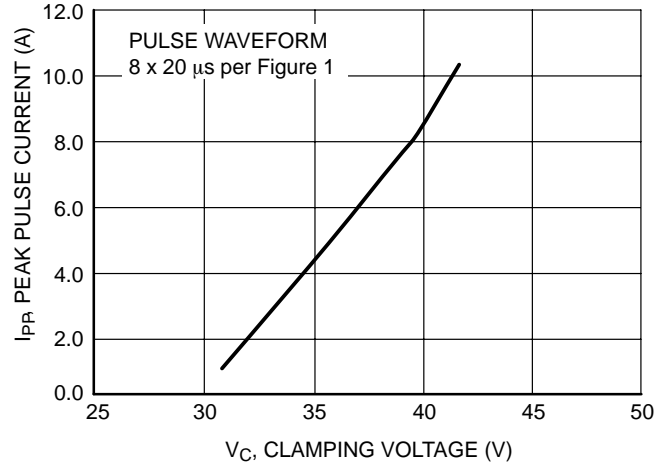


Figure 2. Clamping Voltage vs Peak Pulse Current

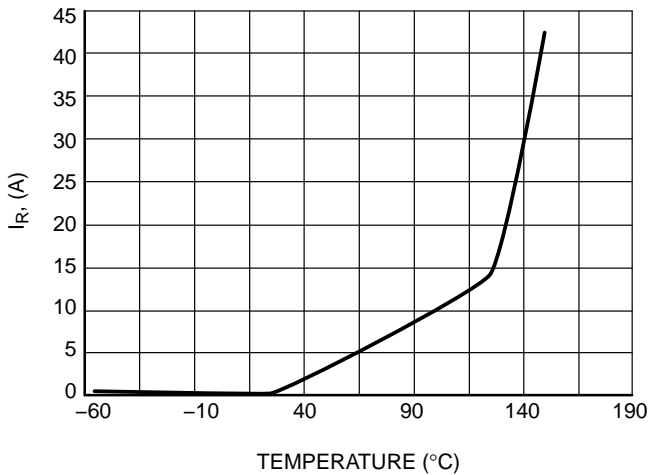


Figure 3. Typical Leakage vs. Temperature

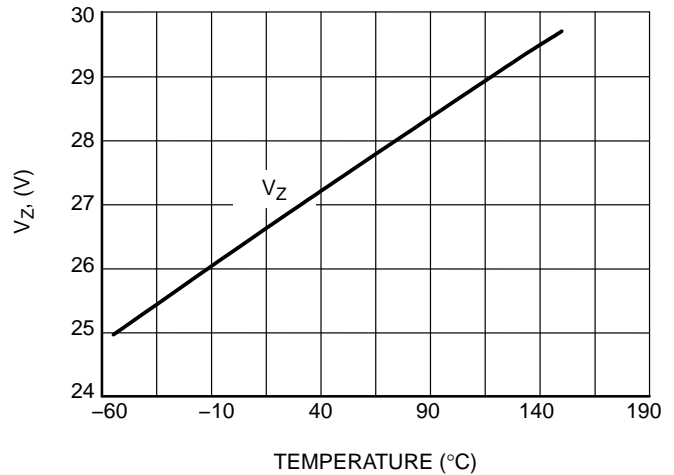


Figure 4. Typical  $V_Z$  @ 1.0 mA vs. Temperature

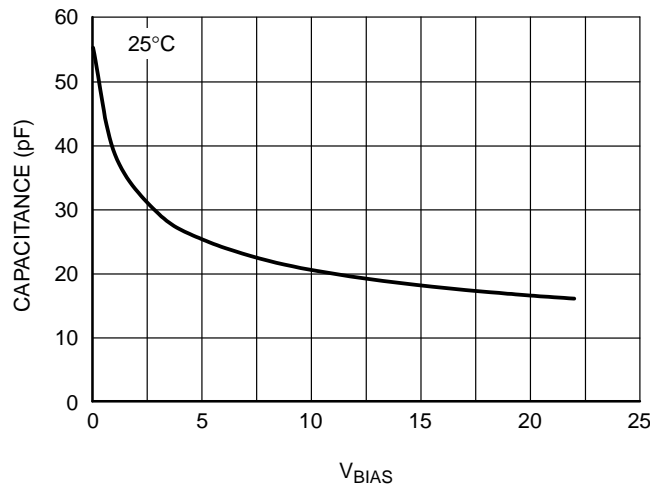
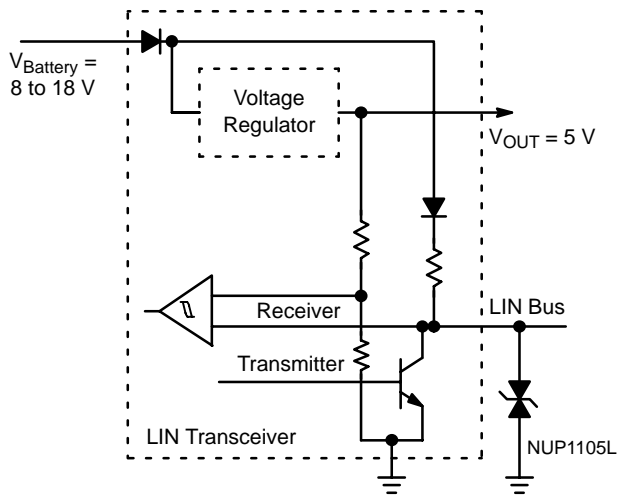


Figure 5. Capacitance vs.  $V_{BIAS}$

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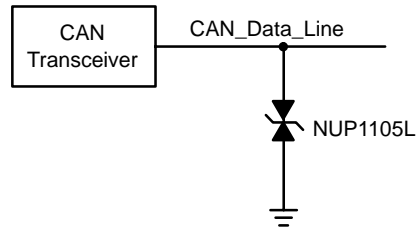
## APPLICATIONS SECTION

The NUP1105L provides a transient voltage suppression solution for the LIN data communication bus. The NUP1105L is a dual bidirectional TVS 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.

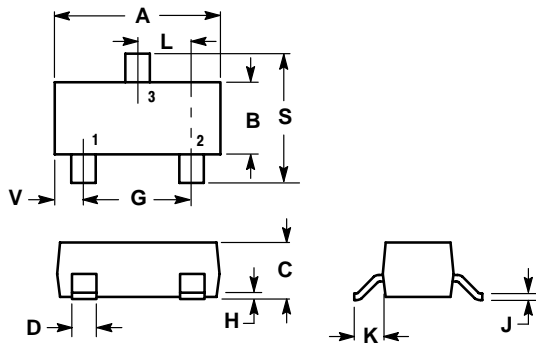


**Figure 7. High-Speed and Fault Tolerant CAN TVS Protection Circuit**

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## PACKAGE DIMENSIONS

SOT-23 (TO-236)  
CASE 318-08  
ISSUE AK

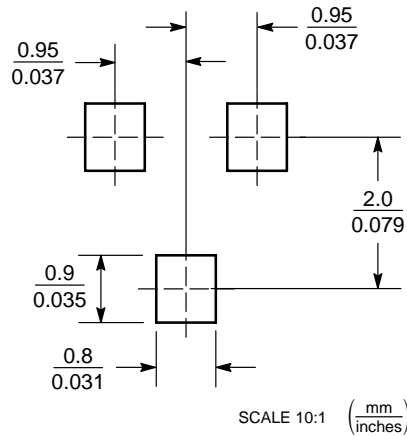


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
  2. CONTROLLING DIMENSION: INCH.
  3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
  4. 318-01 THRU -07 AND -09 OBSOLETE, NEW STANDARD 318-08.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.1102	0.1197	2.80	3.04
B	0.0472	0.0551	1.20	1.40
C	0.0350	0.0440	0.89	1.11
D	0.0150	0.0200	0.37	0.50
G	0.0701	0.0807	1.78	2.04
H	0.0005	0.0040	0.013	0.100
J	0.0034	0.0070	0.085	0.177
K	0.0140	0.0285	0.35	0.69
L	0.0350	0.0401	0.89	1.02
S	0.0830	0.1039	2.10	2.64
V	0.0177	0.0236	0.45	0.60

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


### SOLDERING 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.

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