NUP2105 Dual Line CAN Bus Protector

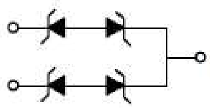
The NUP2105 has been designed to protect the CAN transceiver in high−speed and fault tolerant networks from ESD and other harmful transient voltage events. This device provides bidirectional protection for each data line with a single compact SOT−23 package, giving the system designer a low cost option for improving system reliability and meeting stringent EMI requirements.

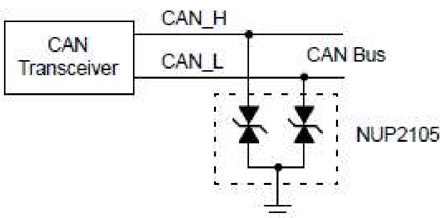
Features

- 350 W Peak Power Dissipation per Line (8 x 20 µsec Waveform)
- Low Reverse Leakage Current (< 100 nA)
- Low Capacitance High−Speed CAN Data Rates
- 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 µs)
- ISO 7637−1, Nonrepetitive EMI Surge Pulse 2, 9.5 A (1 x 50 µs)
- ISO 7637−3, Repetitive Electrical Fast Transient (EFT) EMI Surge Pulses, 50 A (5 x 50 ns)
- Flammability Rating UL 94 V−0
- Pb−Free Packages are Available

Applications

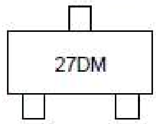
- Industrial Control Networks
  - Smart Distribution Systems (SDS™)
  - DeviceNet™
- Automotive Networks
  - Low and High−Speed CAN
  - Fault Tolerant CAN





SOT−23

MARKING DIAGRAM



27D = Device Code
M = Date Code

NUP2105	SOT−23 (Pb−Free)	3000/Tape & Reel

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

Symbol	Rating	Value	Unit
PPK	Peak Power Dissipation 8 x 20 µs Double Exponential Waveform (Note 1)	350	W
T_J	Operating Junction Temperature Range	−40 to 125	°C
T_J	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 Specification (Contact)	16 400 30	kV V 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. Non−repetitive current pulse per Figure 1.

ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V_{RWM}	Reverse Working Voltage	(Note 2)	24			V
V_{BR}	Breakdown Voltage	I_T = 1 mA (Note 3)	26.2		32	V
I_R	Reverse Leakage Current	V_{RWM} = 24 V		15	100	nA
V_C	Clamping Voltage	I_{PP} = 5 A (8 x 20 µs Waveform) (Note 4)			40	V
V_C	Clamping Voltage	I_{PP} = 8 A (8 x 20 µs Waveform) (Note 4)			44	V
I_{PP}	Maximum Peak Pulse Current	8 x 20 µs Waveform (Note 4)			8.0	A
CJ	Capacitance	V_R = 0 V, f = 1 MHz (Line to GND)			30	pF

2. TVS devices are normally selected according to the working peak reverse voltage (VRWM), which should be equal or greater than the DC or continuous peak operating voltage level.

3. VBR is measured at pulse test current IT.

4. Pulse waveform per Figure 1.

TYPICAL PERFORMANCE CURVES

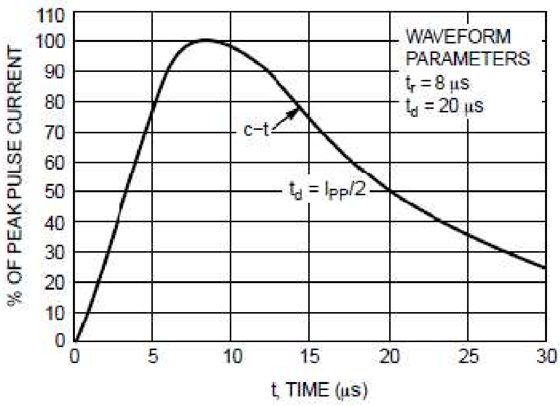


Figure 1. Pulse Waveform, 8 × 20 μs

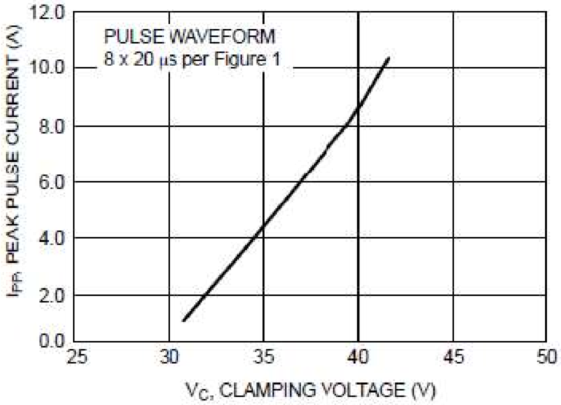


Figure 2. Clamping Voltage vs Peak Pulse Current

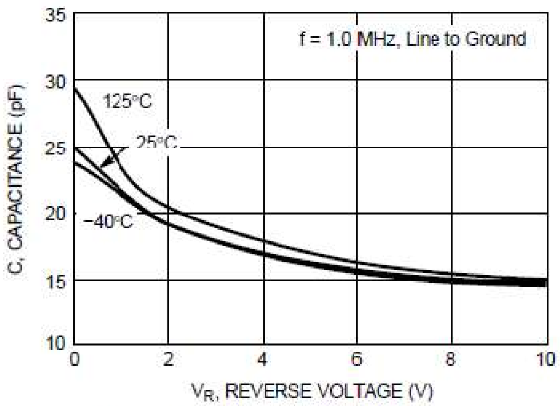


Figure 3. Typical Junction Capacitance vs Reverse Voltage

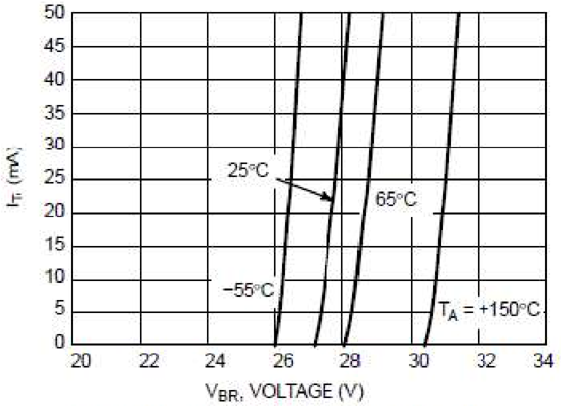


Figure 4. V_{BR} versus I_T Characteristics of the NUP2105

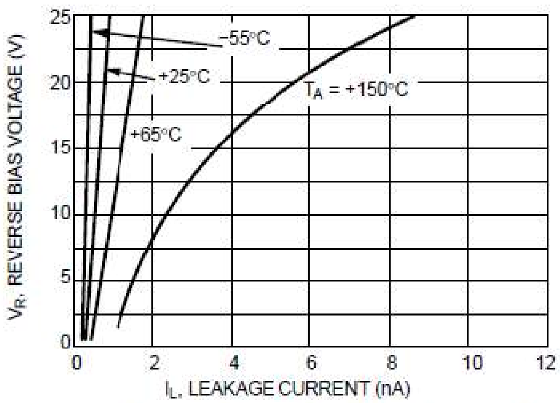


Figure 5. I_R versus Temperature Characteristics of the NUP2105

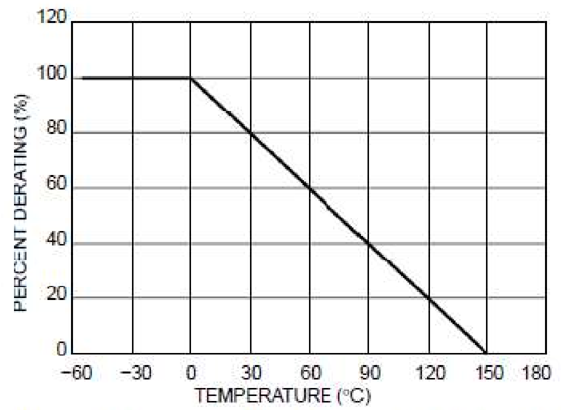


Figure 6. Temperature Power Dissipation Derating of

TVS Diode Protection Circuit

TVS diodes provide protection to a transceiver by clamping a surge voltage to a safe level. TVS diodes have high impedance below and low impedance above their breakdown voltage. A TVS 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 TVS 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.

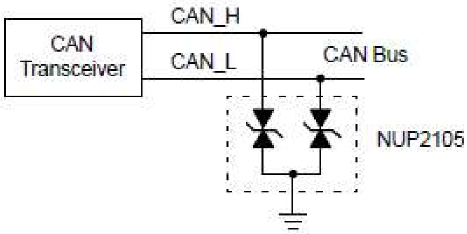
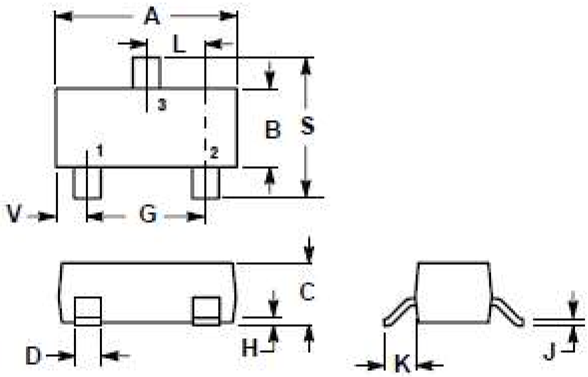


Figure 7. High−Speed and Fault Tolerant CAN TVS Protection Circuit

PACKAGE DIMENSIONS

SOT−23



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.

	INCHES		MILLIMETERS	
DIM	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