

NZL5V6AXV3T1 Series

Preferred Devices

Zener Voltage Regulators

SC-89 Dual Common Anode Zeners for ESD Protection

These dual monolithic silicon zener diodes are designed for applications requiring ESD protection capability. They are intended for use in voltage and ESD sensitive equipment such as computers, printers, business machines, communication systems, medical equipment and other applications. Their dual junction common anode design protects two separate lines using only one package. These devices are ideal for situations where board space is at a premium.

Specification Features:

- SC-89 Package Allows Either Two Separate Unidirectional Configurations or a Single Bidirectional Configuration
- Standard Zener Breakdown Voltage Ranges
- ESD Rating of Class N (exceeding 16 kV) per the Human Body Model and IEC61000-4-2
- Low Leakage < 5.0 μ A

Mechanical Characteristics:

CASE: Void-free, transfer-molded, thermosetting plastic Epoxy Meets UL94, VO

LEAD FINISH: 100% Matte Sn (Tin)

MOUNTING POSITION: Any

QUALIFIED MAX REFLOW TEMPERATURE: 260°C

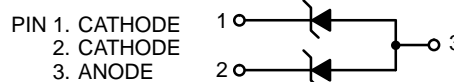
Device Meets MSL 1 Requirements

Use the Device Number to order the 7 inch/3,000 unit reel.



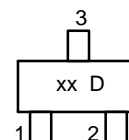
ON Semiconductor®

<http://onsemi.com>



SC-89
CASE 463C
STYLE 4

MARKING DIAGRAM



xx = Device Code
D = Date Code

ORDERING INFORMATION

| Device | Package | Shipping |
|--------------|---------|------------------|
| NZL5V6AXV3T1 | SC-89 | 3000/Tape & Reel |
| NZL6V8AXV3T1 | SC-89 | 3000/Tape & Reel |
| NZL7V5AXV3T1 | SC-89 | 3000/Tape & Reel |

Preferred devices are recommended choices for future use and best overall value.

DEVICE MARKING INFORMATION

See specific marking information in the device marking column of the table on page 2 of this data sheet.

NZL5V6AXV3T1 Series

MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|--|-----------------|-------------|----------------------------|
| Total Power Dissipation on FR-5 Board (Note 1) @ $T_A = 25^\circ\text{C}$ Derate above 25°C | P_D | 240 1.9 | mW mW/ $^\circ\text{C}$ |
| Thermal Resistance Junction to Ambient | $R_{\theta JA}$ | 525 | $^\circ\text{C}/\text{W}$ |
| Junction and Storage Temperature Range | T_J, T_{stg} | -55 to +150 | $^\circ\text{C}$ |
| Lead Solder Temperature - Maximum (10 Second Duration) | T_L | 260 | $^\circ\text{C}$ |

1. FR-5 board with minimum recommended mounting pad.

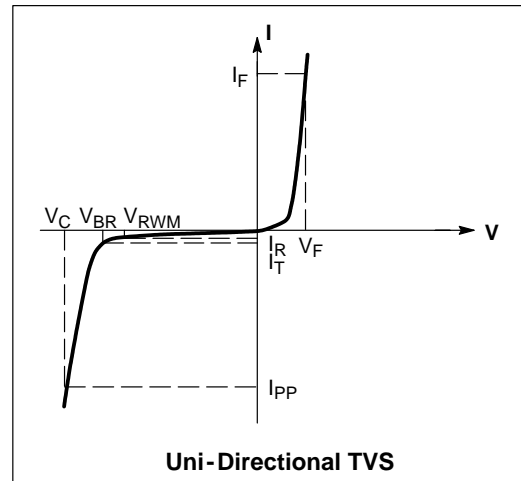
*Other voltages may be available upon request

ELECTRICAL CHARACTERISTICS

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

UNIDIRECTIONAL (Circuit tied to Pins 1 and 3 or 2 and 3)

| Symbol | Parameter |
|-----------------|---|
| V_{RWM} | Working Peak Reverse Voltage |
| I_R | Maximum Reverse Leakage Current @ V_{RWM} |
| V_{BR} | Breakdown Voltage @ I_T |
| I_T | Test Current |
| ΘV_{BR} | Maximum Temperature Coefficient of V_{BR} |
| I_F | Forward Current |
| V_F | Forward Voltage @ I_F |
| Z_{ZT} | Maximum Zener Impedance @ I_{ZT} |
| I_{ZK} | Reverse Current |
| Z_{ZK} | Maximum Zener Impedance @ I_{ZK} |



ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted, $V_F = 0.9\text{ V Max}$ @ $I_F = 10\text{ mA}$ for all types)

UNIDIRECTIONAL (Circuit tied to Pins 1 and 3 or Pins 2 and 3)

| Device | Device Marking | V_{RWM} Volts | I_R @ V_{RWM} μA | Breakdown Voltage | | | Zener Impedance | | | |
|--------------|----------------|--------------------|------------------------------------|-----------------------|-----|------|------------------|---------------------------------|---------------------|-----|
| | | | | V_{BR} (Note 2) (V) | | | @ I_{ZT} mA | Z_{ZT} @ I_{ZT} Ω | Z_{ZK} @ I_{ZK} | |
| | | | | Min | Nom | Max | | | Ω | mA |
| NZL5V6AXV3T1 | L0 | 3.0 | 5.0 | 5.32 | 5.6 | 5.88 | 5.0 | 40 | 200 | 1.0 |
| NZL6V8AXV3T1 | L2 | 4.5 | 1.0 | 6.46 | 6.8 | 7.14 | 5.0 | 15 | 100 | 1.0 |
| NZL7V5AXV3T1 | L3 | 5.0 | 1.0 | 7.12 | 7.5 | 7.88 | 5.0 | 15 | 100 | 1.0 |

2. V_{BR} measured at pulse test current I_T at an ambient temperature of 25°C .

3. Z_{ZT} and Z_{ZK} are measured by dividing the AC voltage drop across the device by the AC current applied. The specified limits are for $I_{Z(AC)} = 0.1 I_{Z(DC)}$, with the AC frequency = 1.0 kHz.

NZL5V6AXV3T1 Series

TYPICAL CHARACTERISTICS

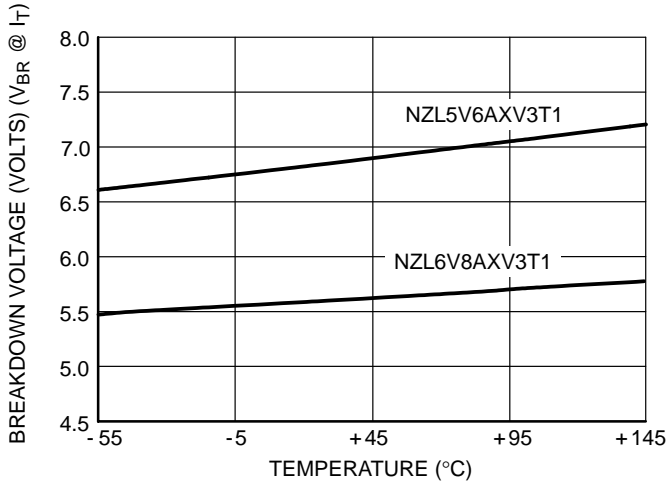


Figure 1. Typical Breakdown Voltage versus Temperature

(Upper curve for each voltage is bidirectional mode, lower curve is unidirectional mode)

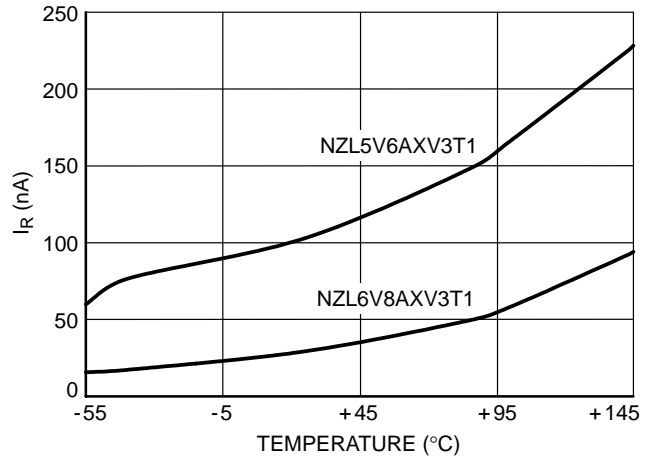


Figure 2. Typical Leakage Current versus Temperature

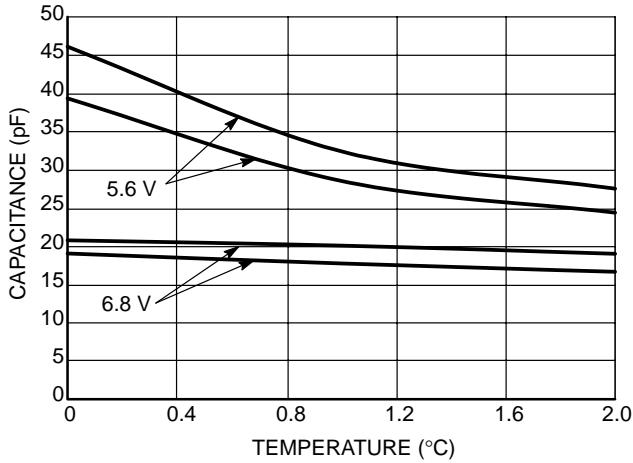


Figure 3. Typical Capacitance versus Bias Voltage

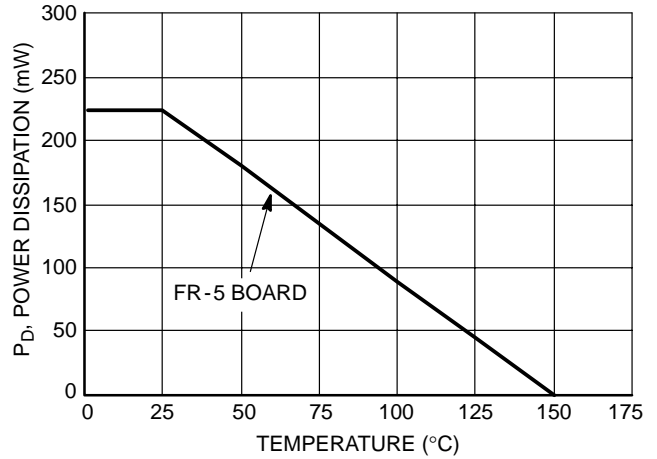


Figure 4. Steady State Power Derating Curve

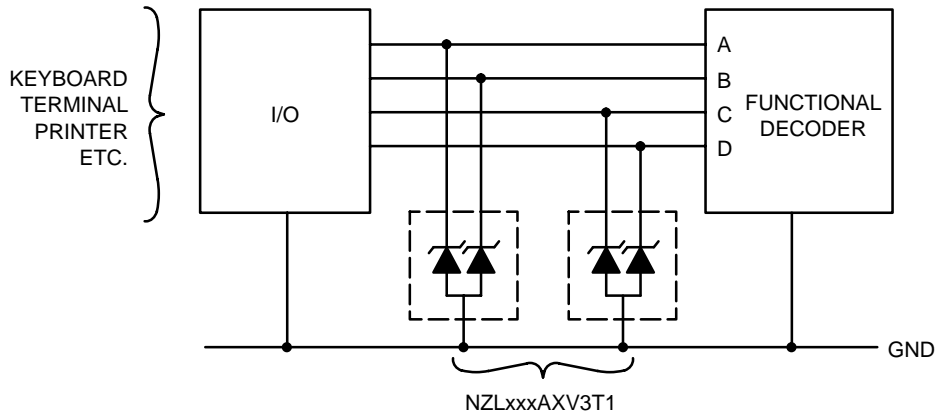
NZL5V6AXV3T1 Series

TYPICAL COMMON ANODE APPLICATIONS

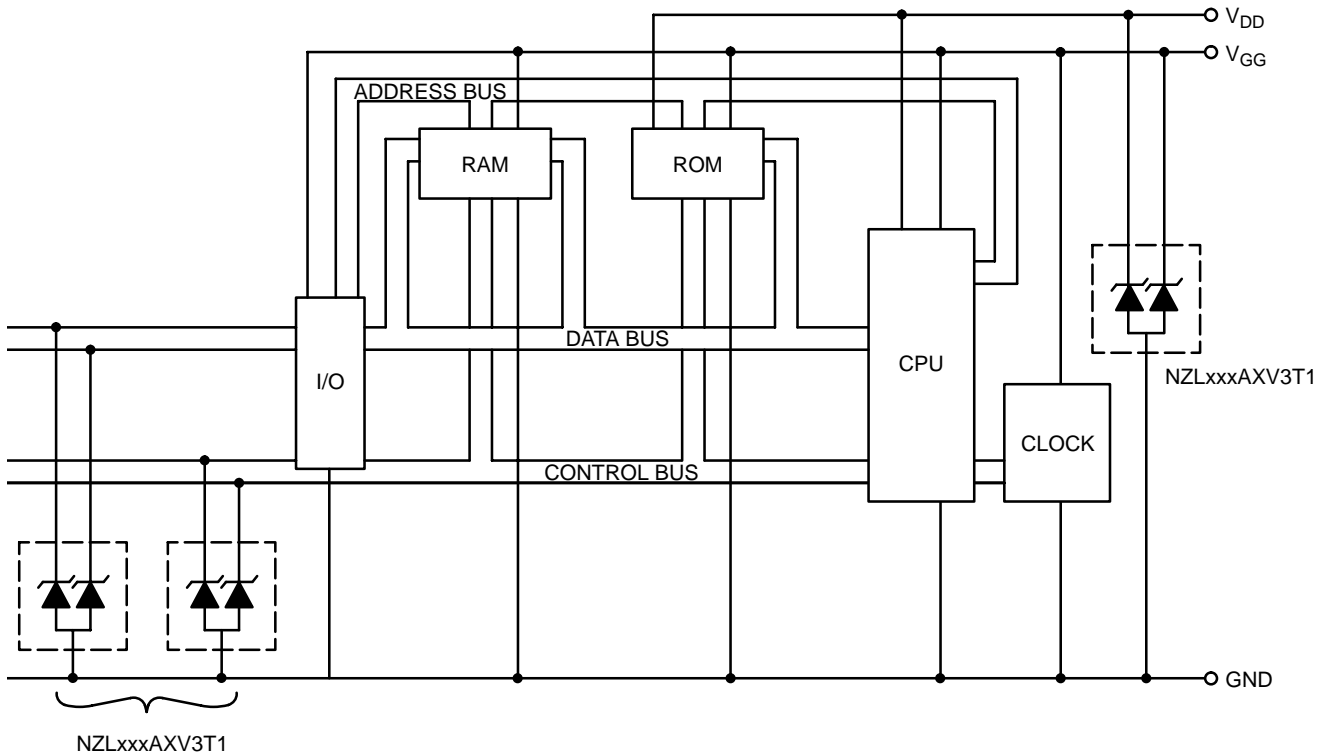
A dual junction common anode design in an SC-89 package protects two separate lines using only one package. This adds flexibility and creativity to PCB design especially

when board space is at a premium. Two simplified examples of TVS applications are illustrated below.

Computer Interface Protection



Microprocessor Protection

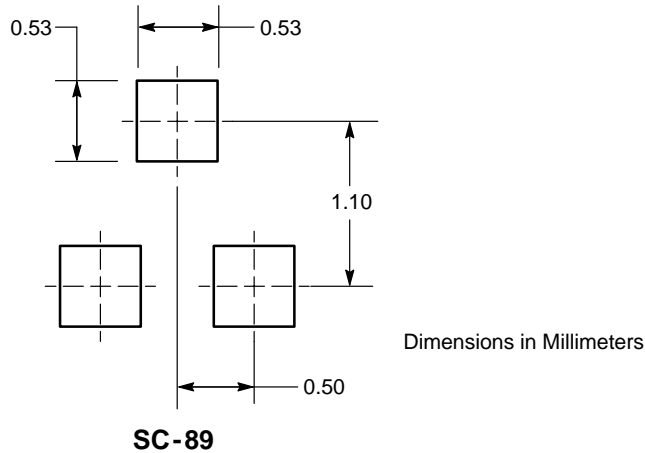


INFORMATION FOR USING THE SC-89 SURFACE MOUNT PACKAGE

MINIMUM RECOMMENDED FOOTPRINT FOR SURFACE MOUNTED APPLICATIONS

Surface mount board layout is a critical portion of the total design. The footprint for the semiconductor packages must be the correct size to insure proper solder connection

interface between the board and the package. With the correct pad geometry, the packages will self align when subjected to a solder reflow process.



SC-89 POWER DISSIPATION

The power dissipation of the SC-89 is a function of the drain pad size. This can vary from the minimum pad size for soldering to a pad size given for maximum power dissipation. Power dissipation for a surface mount device is determined by $T_{J(max)}$, the maximum rated junction temperature of the die, $R_{\theta JA}$, the thermal resistance from the device junction to ambient, and the operating temperature, T_A . Using the values provided on the data sheet for the SC-89 package, P_D can be calculated as follows:

$$P_D = \frac{T_{J(max)} - T_A}{R_{\theta JA}}$$

The values for the equation are found in the maximum ratings table on the data sheet. Substituting these values into the equation for an ambient temperature T_A of 25°C, one can calculate the power dissipation of the device which in this case is 240 milliwatts.

$$P_D = \frac{150^\circ\text{C} - 25^\circ\text{C}}{525^\circ\text{C/W}} = 240 \text{ milliwatts}$$

The 525 °C/W for the SC-89 package assumes the use of the recommended footprint on a glass epoxy printed circuit board to achieve a power dissipation of TBD milliwatts. There are other alternatives to achieving higher power dissipation from the SC-89 package. Another alternative would be to use a ceramic substrate or an aluminum core board such as Thermal Clad[®]. Using a board material such as Thermal Clad, an aluminum core board, the power dissipation can be doubled using the same footprint.

SOLDERING PRECAUTIONS

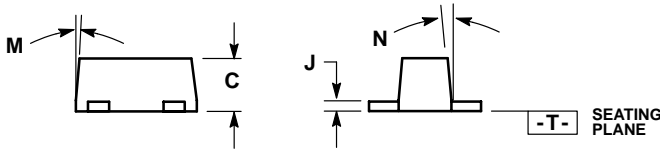
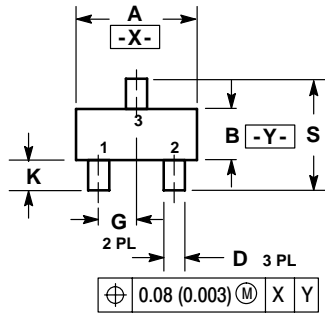
The melting temperature of solder is higher than the rated temperature of the device. When the entire device is heated to a high temperature, failure to complete soldering within a short time could result in device failure. Therefore, the following items should always be observed in order to minimize the thermal stress to which the devices are subjected.

- Always preheat the device.
- The delta temperature between the preheat and soldering should be 100°C or less.*
- When preheating and soldering, the temperature of the leads and the case must not exceed the maximum temperature ratings as shown on the data sheet. When using infrared heating with the reflow soldering method, the difference shall be a maximum of 10°C.
- The soldering temperature and time shall not exceed 260°C for more than 10 seconds.
- When shifting from preheating to soldering, the maximum temperature gradient shall be 5°C or less.
- After soldering has been completed, the device should be allowed to cool naturally for at least three minutes. Gradual cooling should be used as the use of forced cooling will increase the temperature gradient and result in latent failure due to mechanical stress.
- Mechanical stress or shock should not be applied during cooling.

* Soldering a device without preheating can cause excessive thermal shock and stress which can result in damage to the device.

NZL5V6AXV3T1 Series

SC-89, 3-LEAD
CASE 463C-02
ISSUE B



NOTES:


1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETERS
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. 463C-01 OBSOLETE, NEW STANDARD 463C-02.

| DIM | MILLIMETERS | | | INCHES | | |
|-----|-------------|------|------|-----------|-------|-------|
| | MIN | NOM | MIN | MIN | NOM | MAX |
| A | 1.50 | 1.60 | 1.70 | 0.059 | 0.063 | 0.067 |
| B | 0.75 | 0.85 | 0.95 | 0.030 | 0.034 | 0.040 |
| C | 0.60 | 0.70 | 0.80 | 0.024 | 0.028 | 0.031 |
| D | 0.23 | 0.28 | 0.33 | 0.009 | 0.011 | 0.013 |
| G | 0.50 BSC | | | 0.020 BSC | | |
| H | 0.53 REF | | | 0.021 REF | | |
| J | 0.10 | 0.15 | 0.20 | 0.004 | 0.006 | 0.008 |
| K | 0.30 | 0.40 | 0.50 | 0.012 | 0.016 | 0.020 |
| L | 1.10 REF | | | 0.043 REF | | |
| M | --- | --- | 10 ° | --- | --- | 10 ° |
| N | --- | --- | 10 ° | --- | --- | 10 ° |
| S | 1.50 | 1.60 | 1.70 | 0.059 | 0.063 | 0.067 |

STYLE 4:

1. CATHODE
2. CATHODE
3. ANODE

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