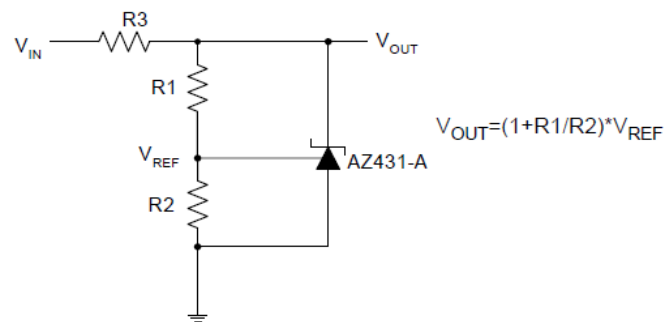
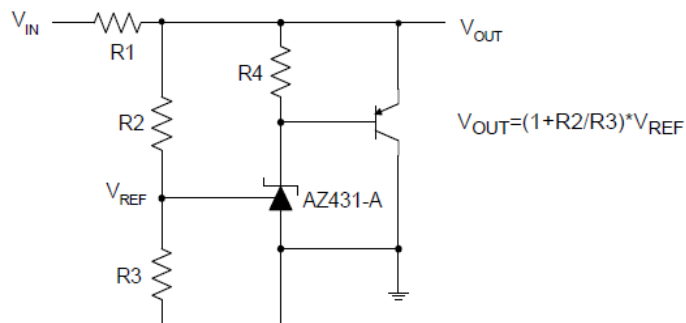


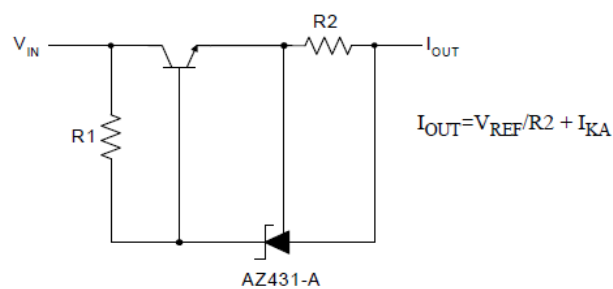
## Typical Applications Circuit



**Shunt Regulator**

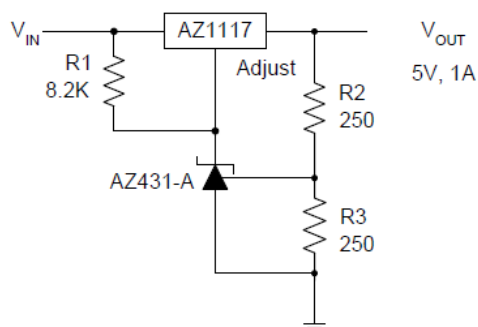


**High Current Shunt Regulator**

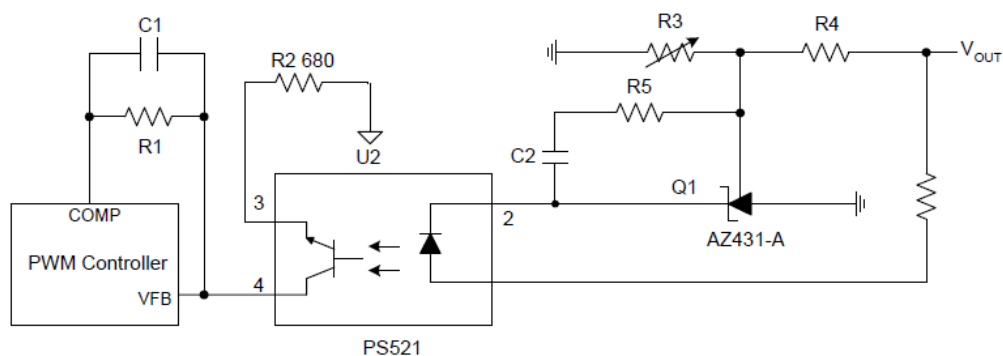


**Current Source or Current Limit**

## Typical Applications Circuit (Cont.)

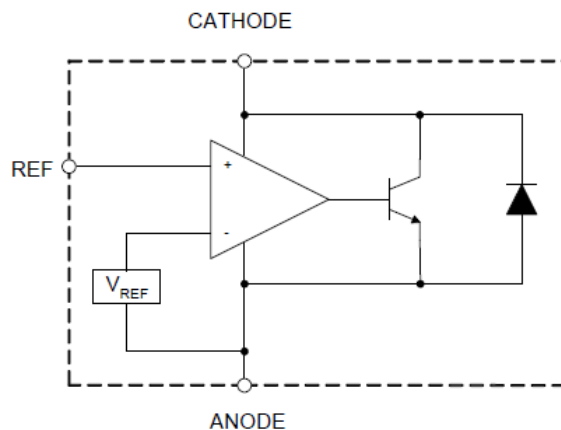


**Precision 5V 1A Regulator**



**PWM Converter with Reference**

## Functional Block Diagram



## Absolute Maximum Ratings (Note 4)

| Symbol        | Parameter                                   |       | Rating            | Unit |
|---------------|---------------------------------------------|-------|-------------------|------|
| $V_{KA}$      | Cathode Voltage                             |       | 40                | V    |
| $I_{KA}$      | Cathode Current Range (Continuous)          |       | -100 to 150       | mA   |
| $I_{REF}$     | Reference Input Current Range               |       | 10                | mA   |
| $P_D$         | Power Dissipation                           |       | Z, R Package: 770 | mW   |
|               |                                             |       | N Package: 370    |      |
| $\theta_{JA}$ | Thermal Resistance<br>(Junction to Ambient) | SOT23 | 380               | °C/W |
|               |                                             | TO92  | 165               |      |
|               |                                             | SOT89 | 165               |      |
| $T_J$         | Junction Temperature                        |       | +150              | °C   |
| $T_{STG}$     | Storage Temperature Range                   |       | -65 to +150       | °C   |
| ESD           | ESD (Human Body Model)                      |       | 2000              | V    |

Note 4: Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "Recommended Operating Conditions" is not implied. Exposure to "Absolute Maximum Ratings" for extended periods may affect device reliability.

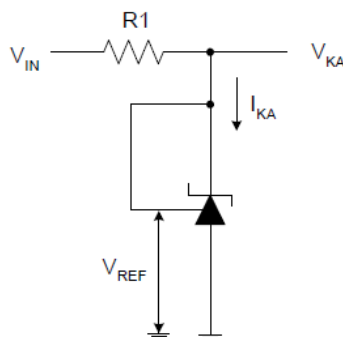
## Recommended Operating Conditions

| Symbol   | Parameter                           | Min       | Max  | Unit |
|----------|-------------------------------------|-----------|------|------|
| $V_{KA}$ | Cathode Voltage                     | $V_{REF}$ | 36   | V    |
| $I_{KA}$ | Cathode Current                     | 1.0       | 100  | mA   |
| $T_A$    | Operating Ambient Temperature Range | -40       | +125 | °C   |

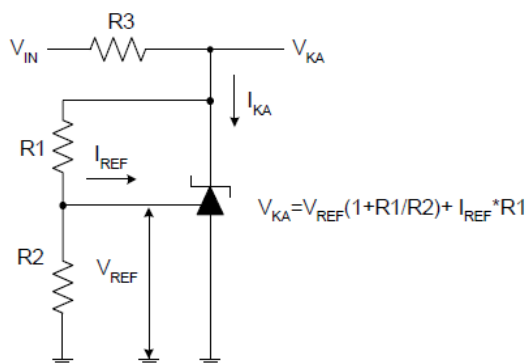
**Electrical Characteristics** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

| Symbol                                 | Test Circuit | Parameter                                                             |      | Conditions                                                                       |                                            | Min   | Typ    | Max   | Unit |
|----------------------------------------|--------------|-----------------------------------------------------------------------|------|----------------------------------------------------------------------------------|--------------------------------------------|-------|--------|-------|------|
| V <sub>REF</sub>                       | 4            | Reference Voltage                                                     | 0.4% | V <sub>KA</sub> = V <sub>REF</sub> , I <sub>KA</sub> = 10mA                      |                                            | 2.490 | 2.500  | 2.510 | V    |
|                                        |              |                                                                       | 0.8% |                                                                                  |                                            | 2.480 | 2.500  | 2.520 |      |
| ΔV <sub>REF</sub>                      | 4            | Deviation of Reference Voltage Over Full Temperature Range            |      | V <sub>KA</sub> = V <sub>REF</sub><br>I <sub>KA</sub> = 10mA                     | 0 to +70°C                                 | —     | 4.5    | 8     | mV   |
|                                        |              |                                                                       |      |                                                                                  | -40 to +85°C                               | —     | 4.5    | 10    |      |
|                                        |              |                                                                       |      |                                                                                  | -40 to +125°C                              | —     | 4.5    | 16    |      |
| $\frac{\Delta V_{REF}}{\Delta V_{KA}}$ | 5            | Ratio of Change in Reference Voltage to the Change in Cathode Voltage |      | I <sub>KA</sub> = 10mA                                                           | ΔV <sub>KA</sub> = 10V to V <sub>REF</sub> | —     | -1.0   | -2.7  | mV/V |
|                                        |              |                                                                       |      |                                                                                  | ΔV <sub>KA</sub> = 36V to 10V              | —     | -0.5   | -2.0  |      |
| I <sub>REF</sub>                       | 5            | Reference Current                                                     |      | I <sub>KA</sub> = 10mA, R1 = 10kΩ, R2 = ∞                                        |                                            | —     | 0.7    | 4     | μA   |
| ΔI <sub>REF</sub>                      | 5            | Deviation of Reference Current Over Full Temperature Range            |      | I <sub>KA</sub> = 10mA, R1 = 10kΩ<br>R2 = ∞, T <sub>A</sub> = -40 to +125°C      |                                            | —     | 0.4    | 1.2   | μA   |
| I <sub>KA</sub> (Min)                  | 4            | Minimum Cathode Current for Regulation                                |      | V <sub>KA</sub> = V <sub>REF</sub>                                               |                                            | —     | 0.4    | 1.0   | mA   |
| I <sub>KA</sub> (Off)                  | 6            | Off-state Cathode Current                                             |      | V <sub>KA</sub> = 36V, V <sub>REF</sub> = 0                                      |                                            | —     | 0.05   | 1.0   | μA   |
| Z <sub>KA</sub>                        | 4            | Dynamic Impedance                                                     |      | V <sub>KA</sub> = V <sub>REF</sub> , I <sub>KA</sub> = 1 to 100mA,<br>f ≤ 1.0kHz |                                            | —     | 0.15   | 0.5   | Ω    |
| θ <sub>JC</sub>                        | —            | Thermal Resistance                                                    |      | SOT23                                                                            |                                            | —     | 135.48 | —     | °C/W |
|                                        | TO92         |                                                                       |      | —                                                                                | 81.63                                      | —     |        |       |      |
|                                        | —            |                                                                       |      | SOT89                                                                            |                                            | —     | 29.80  | —     |      |

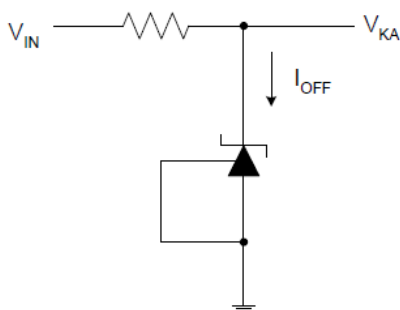
## Electrical Characteristics (Cont.)



Test Circuit 4 for  $V_{KA} = V_{REF}$



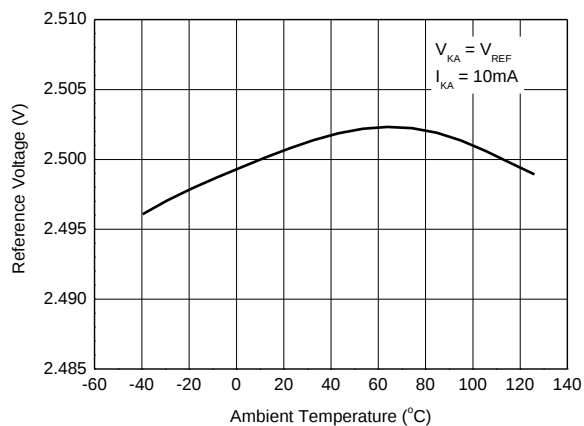
Test Circuit 5 for  $V_{KA} > V_{REF}$



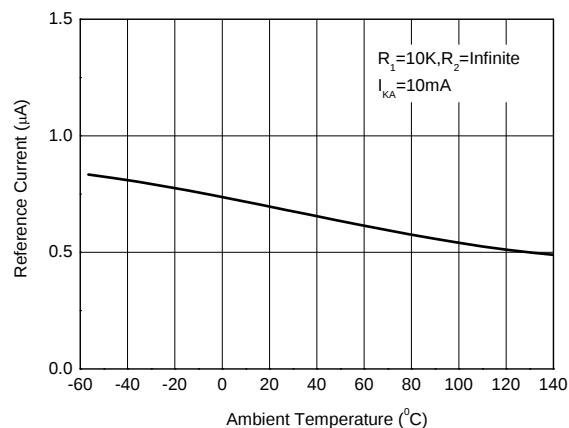
Test Circuit 6 for  $I_{OFF}$

## Performance Characteristics

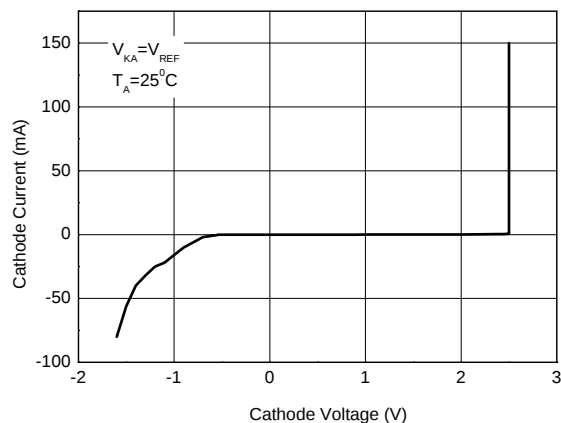
Reference Voltage vs. Ambient Temperature



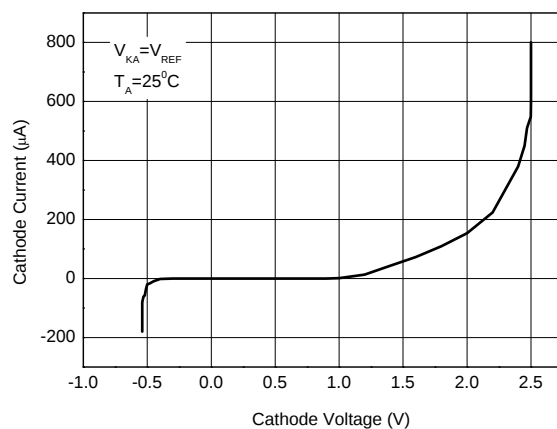
Reference Current vs. Ambient Temperature



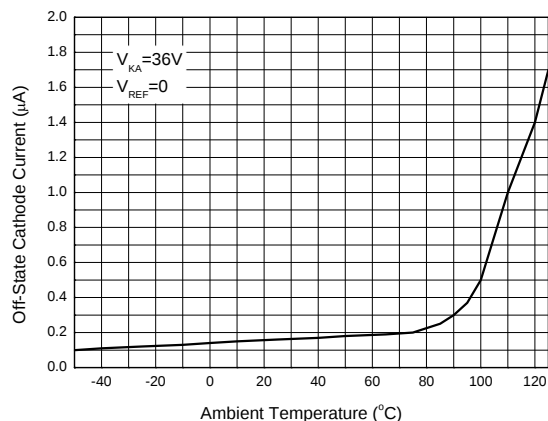
Cathode Current vs. Cathode Voltage



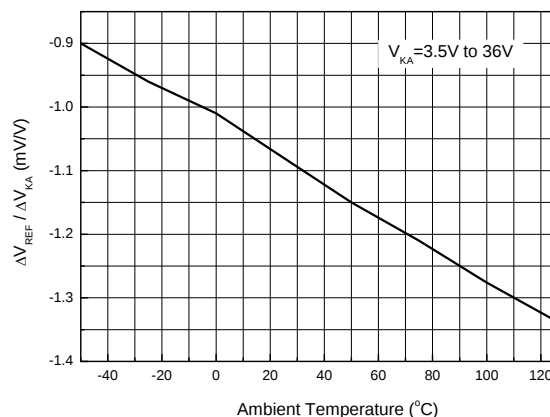
Cathode Current vs. Cathode Voltage



Off-State Cathode Current vs. Ambient Temperature

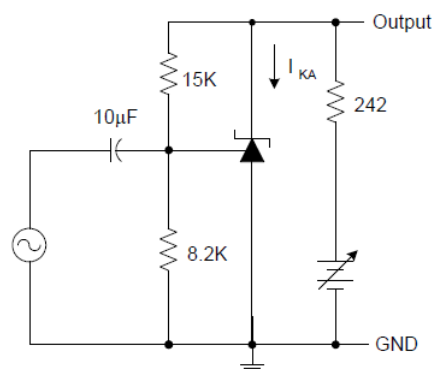
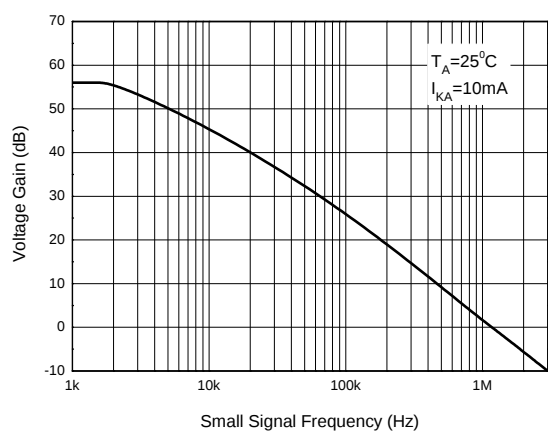


Ratio of Delta Reference Voltage to the Ratio of Delta Cathode Voltage

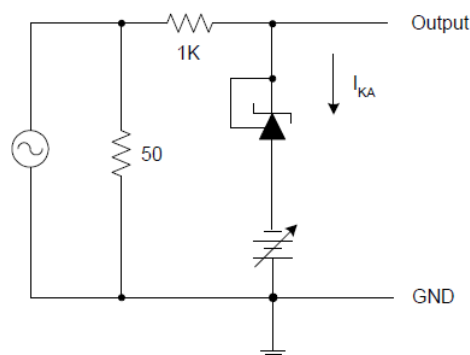
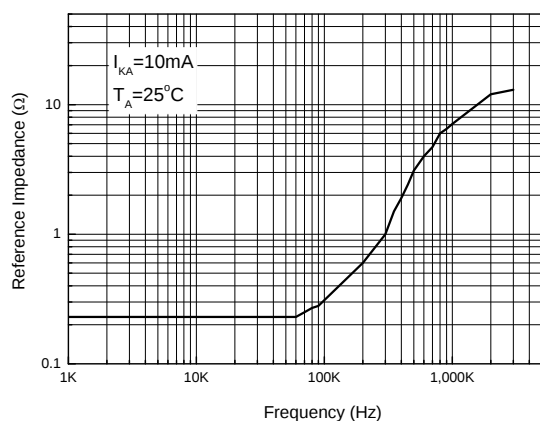


## Performance Characteristics (Cont.)

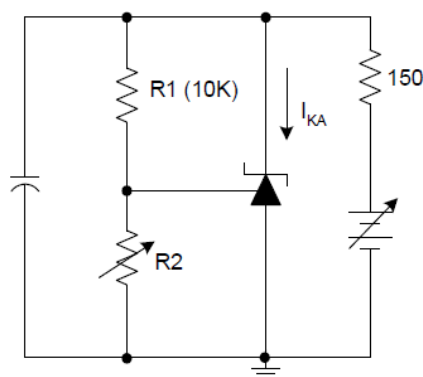
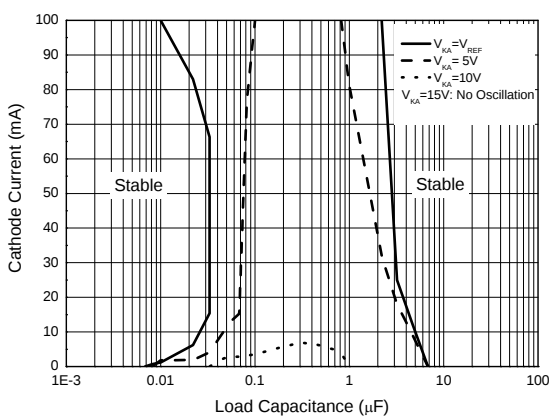
### Small Signal Voltage Gain vs. Frequency



### Reference Impedance vs. Frequency

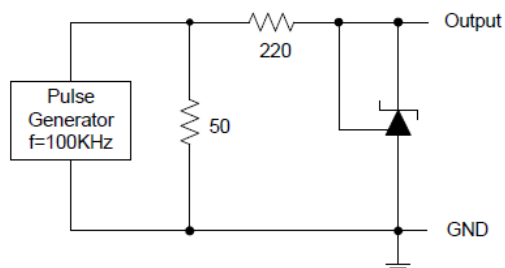
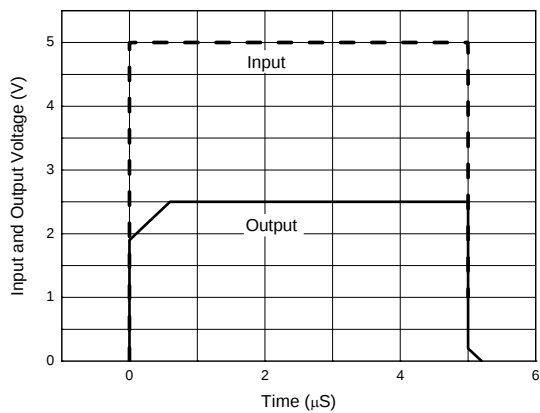


### Stability Boundary Conditions vs. Load Capacitance

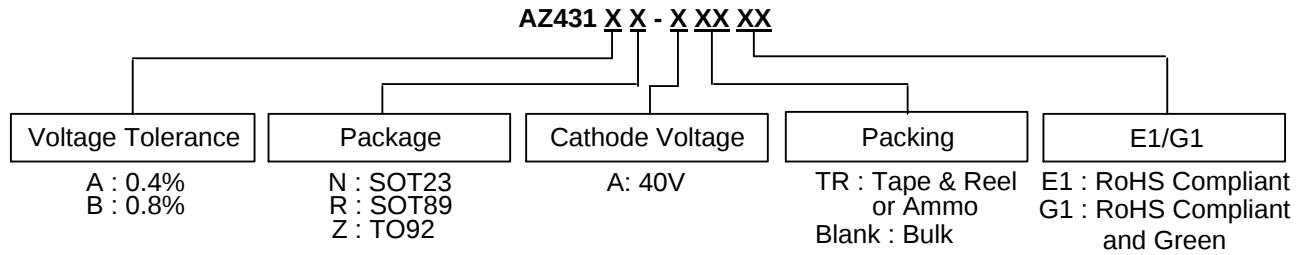


## Performance Characteristics (Cont.)

### Pulse Response of Input and Output Voltage



## Ordering Information

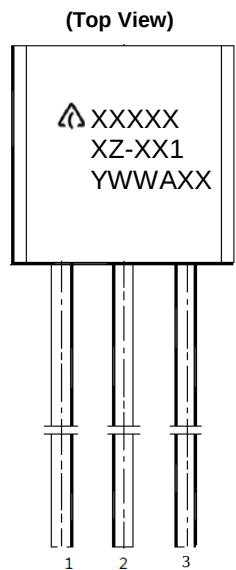


|                                                                                                      | Part Number   | Voltage Tolerance | Package (Note 6) | RoHS Compliant Lead Free / Green | Marking ID  | Packing     | Quantity | Status (Note 5) | Alternative   |
|------------------------------------------------------------------------------------------------------|---------------|-------------------|------------------|----------------------------------|-------------|-------------|----------|-----------------|---------------|
| <br>Lead-Free       | AZ431AN-ATRE1 | 0.4%              | SOT23            | Lead Free                        | EA1         | Tape & Reel | 3000     | NRND            | AZ431AN-ATRG1 |
|                                                                                                      | AZ431BN-ATRE1 | 0.8%              |                  | Lead Free                        | EA2         | Tape & Reel | 3000     | NRND            | AZ431BN-ATRG1 |
|                                                                                                      | AZ431AN-ATRG1 | 0.4%              |                  | Green                            | GA1         | Tape & Reel | 3000     | In Production   | —             |
|                                                                                                      | AZ431BN-ATRG1 | 0.8%              |                  | Green                            | GA2         | Tape & Reel | 3000     | In Production   | —             |
| <br>Lead-free Green | AZ431AK-ATRE1 | 0.4%              | SOT25            | Lead Free                        | E3A         | Tape & Reel | 3000     | End of Life     | None          |
|                                                                                                      | AZ431BK-ATRE1 | 0.8%              |                  | Lead Free                        | E3B         | Tape & Reel | 3000     | End of Life     | None          |
|                                                                                                      | AZ431AK-ATRG1 | 0.4%              |                  | Green                            | G3A         | Tape & Reel | 3000     | End of Life     | None          |
|                                                                                                      | AZ431BK-ATRG1 | 0.8%              |                  | Green                            | G3B         | Tape & Reel | 3000     | End of Life     | None          |
| <br>Lead-Free     | AZ431AZ-AE1   | 0.4%              | TO92             | Lead Free                        | AZ431AZ-AE1 | Bulk        | 1000     | In Production   | —             |
|                                                                                                      | AZ431AZ-ATRE1 | 0.4%              |                  | Lead Free                        | AZ431AZ-AE1 | Ammo        | 2000     | In Production   | —             |
|                                                                                                      | AZ431BZ-AE1   | 0.8%              |                  | Lead Free                        | AZ431BZ-AE1 | Bulk        | 1000     | In Production   | —             |
|                                                                                                      | AZ431BZ-ATRE1 | 0.8%              |                  | Lead Free                        | AZ431BZ-AE1 | Ammo        | 2000     | In Production   | —             |
|                                                                                                      | AZ431AZ-AG1   | 0.4%              |                  | Green                            | AZ431AZ-AG1 | Bulk        | 1000     | End of Life     | AZ431AZ-ATRG1 |
|                                                                                                      | AZ431AZ-ATRG1 | 0.4%              |                  | Green                            | AZ431AZ-AG1 | Ammo        | 2000     | In Production   | —             |
|                                                                                                      | AZ431BZ-AG1   | 0.8%              |                  | Green                            | AZ431BZ-AG1 | Bulk        | 1000     | End of Life     | AZ431BZ-ATRG1 |
|                                                                                                      | AZ431BZ-ATRG1 | 0.8%              |                  | Green                            | AZ431BZ-AG1 | Ammo        | 2000     | In Production   | —             |
| <br>Lead-Free     | AZ431AR-ATRE1 | 0.4%              | SOT89            | Lead Free                        | E43A        | Tape & Reel | 1000     | NRND            | None          |
|                                                                                                      | AZ431BR-ATRE1 | 0.8%              |                  | Lead Free                        | E43B        | Tape & Reel | 1000     | NRND            | None          |
|                                                                                                      | AZ431AR-ATRG1 | 0.4%              |                  | Green                            | G43A        | Tape & Reel | 1000     | End of Life     | None          |
|                                                                                                      | AZ431BR-ATRG1 | 0.8%              |                  | Green                            | G43B        | Tape & Reel | 1000     | End of Life     | None          |

- Notes:
- All variants with SOT25 package are End of Life without alternatives.  
NRND: Not Recommended for New Design.
  - For packaging details, go to our website at: <https://www.diodes.com/design/support/packaging/diodes-packaging/>.

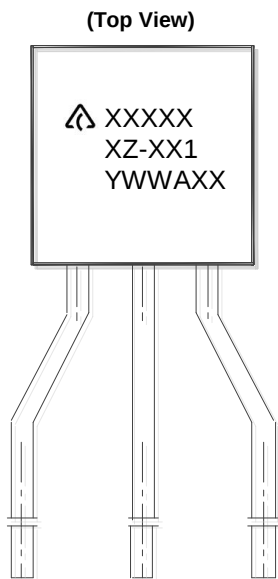
## Marking Information

### (1) TO92 (Bulk Packing)



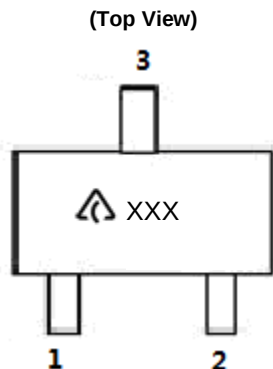
First and Second Lines: Logo and Marking ID  
(See Ordering Information)  
Third Line: Date Code  
Y: Year  
WW: Work Week of Molding  
A: Assembly House Code  
XX: 7th and 8th Digits of Batch Number

### (2) TO92 (Ammo Packing)



First and Second Lines: Logo and Marking ID  
(See Ordering Information)  
Third Line: Date Code  
Y: Year  
WW: Work Week of Molding  
A: Assembly House Code  
XX: 7th and 8th Digits of Batch Number

### (3) SOT23



 : Logo  
XXX: Marking ID  
(See Ordering Information)

## Marking Information (Cont.)

### (4) SOT89

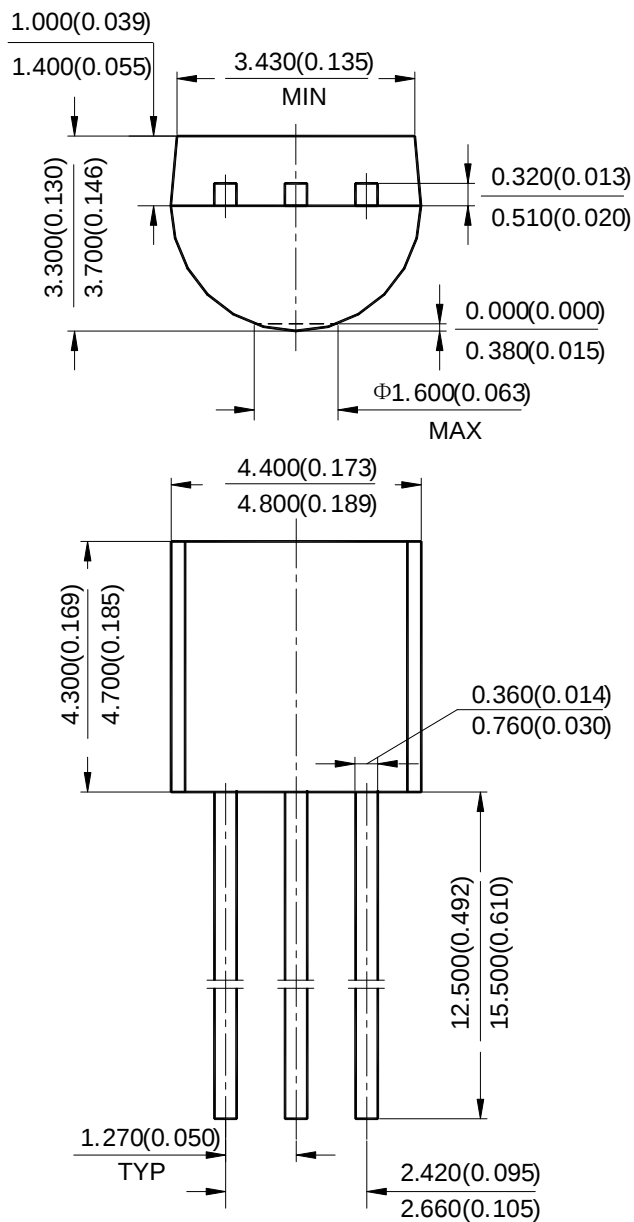
(Top View)



 : Logo  
XXXX: Marking ID  
(See Ordering Information)

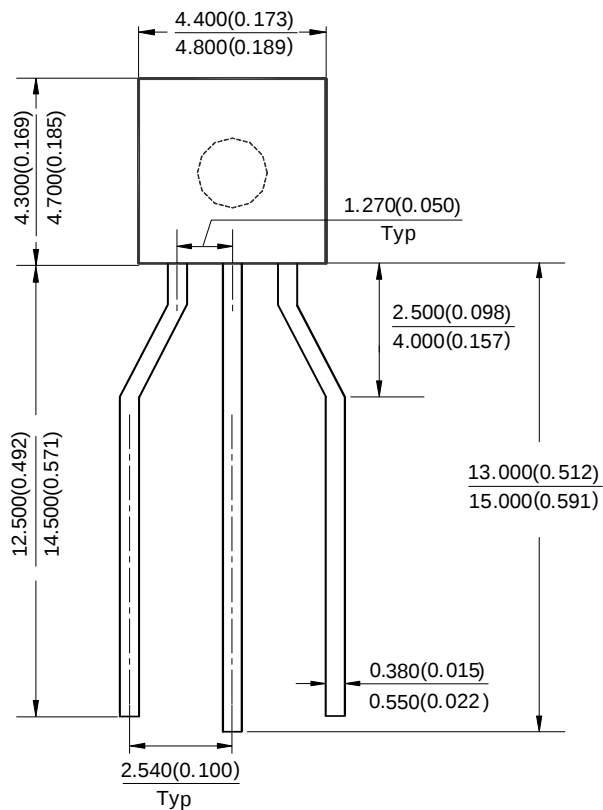
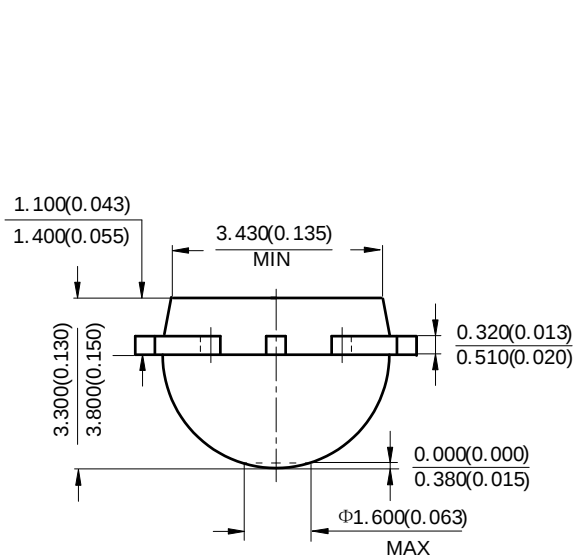
**Package Outline Dimensions** (All dimensions in mm.)

(1) Package Type: TO92 (Bulk Packing)



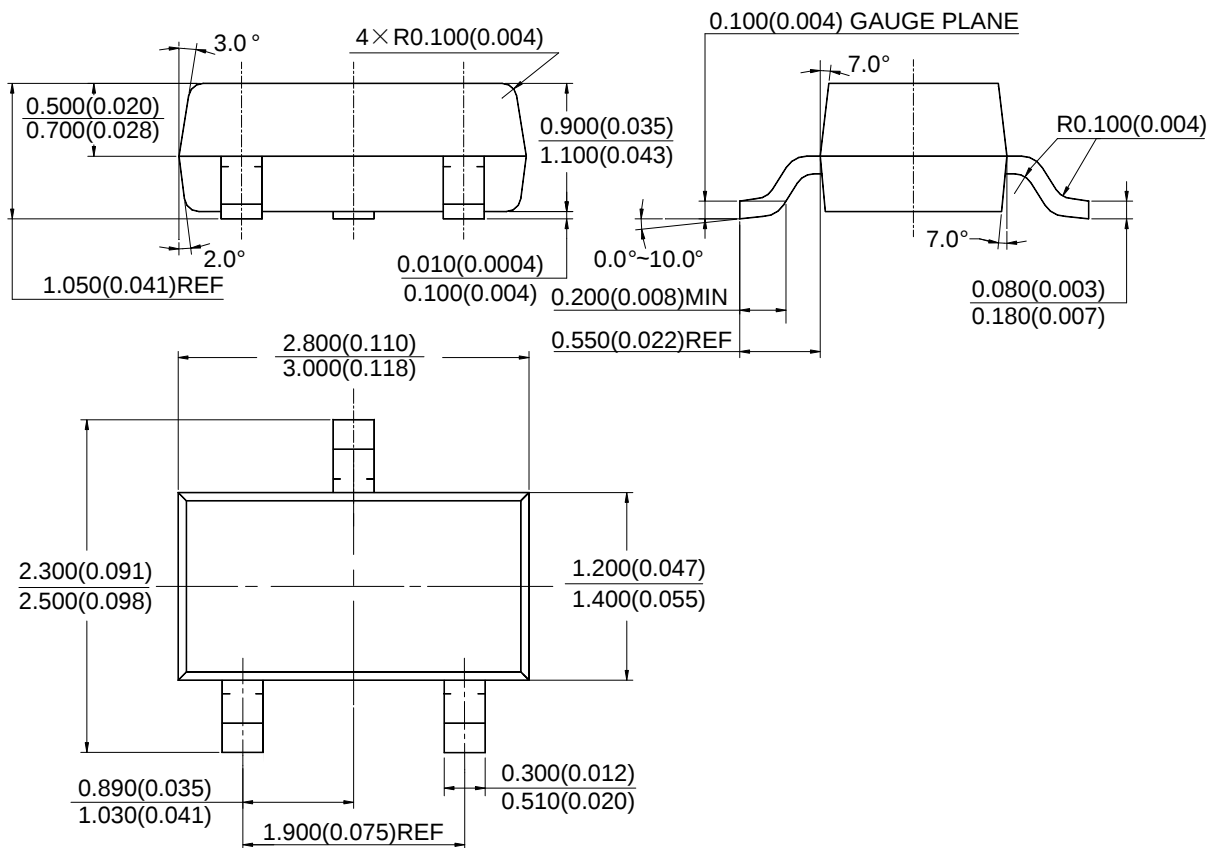
**Package Outline Dimensions** (Cont. All dimensions in mm.)

(2) Package Type: TO92 ( Ammo Packing)



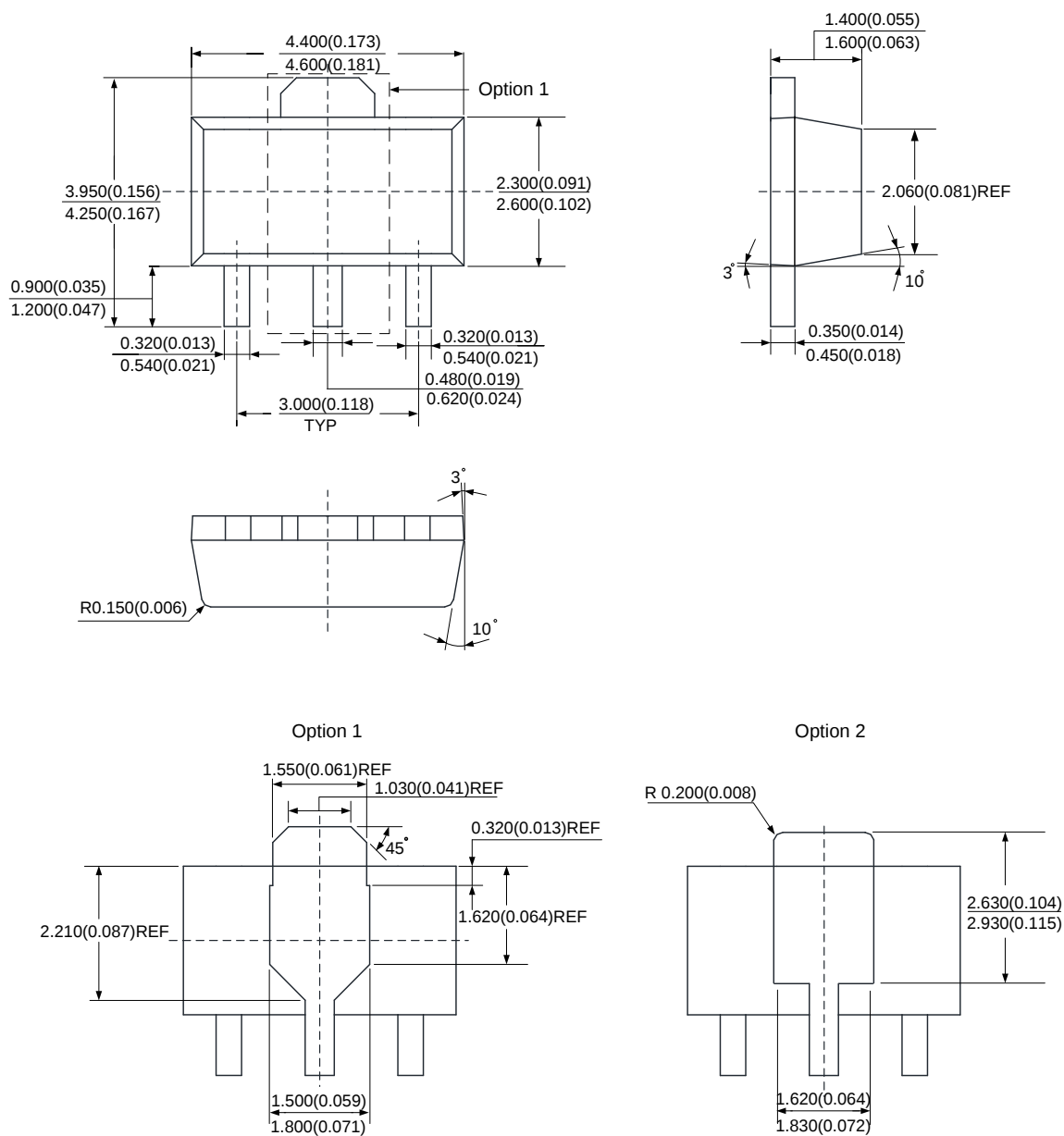
**Package Outline Dimensions** (Cont. All dimensions in mm.)

(3) Package Type: SOT23



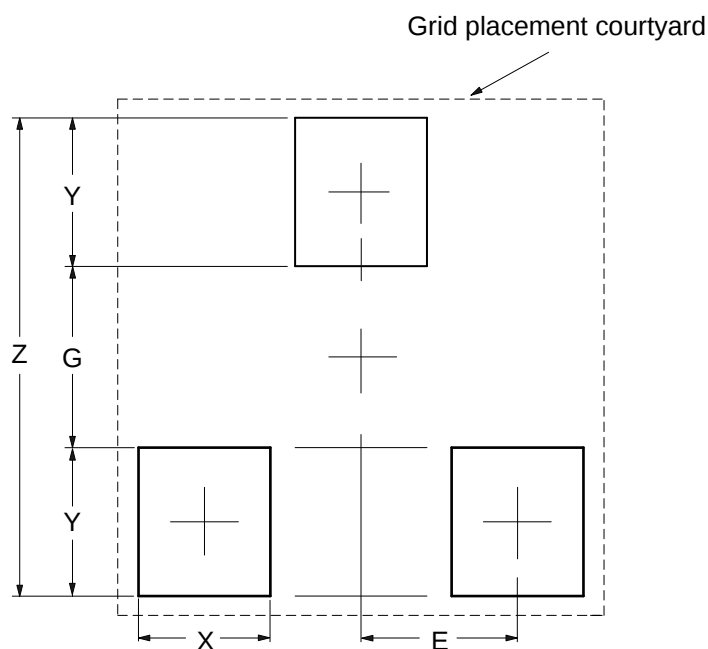
**Package Outline Dimensions** (Cont. All dimensions in mm.)

**(4) Package Type: SOT89**



## Suggested Pad Layout

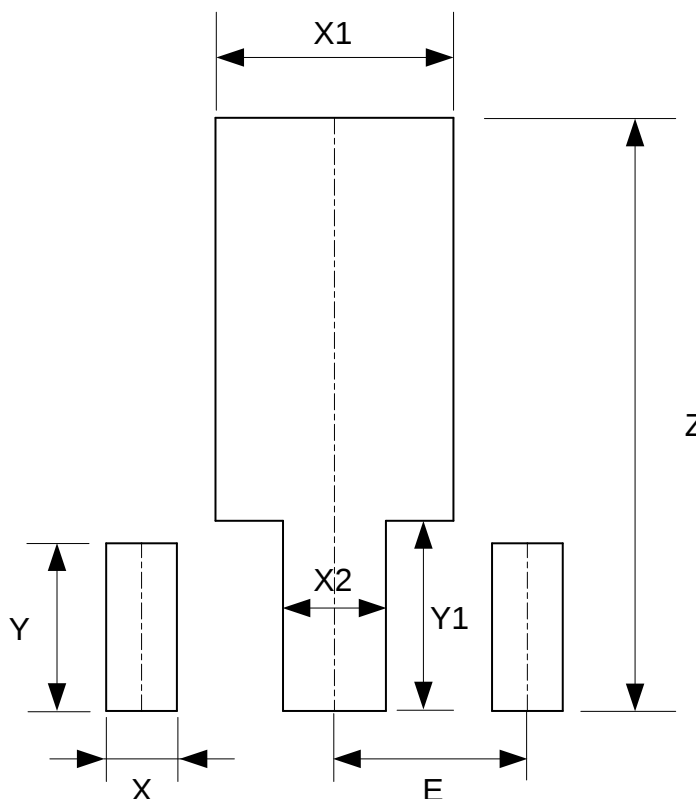
(1) Package Type: SOT23



| Dimensions | Z<br>(mm)/(inch) | G<br>(mm)/(inch) | X<br>(mm)/(inch) | Y<br>(mm)/(inch) | E<br>(mm)/(inch) |
|------------|------------------|------------------|------------------|------------------|------------------|
| Value      | 2.900/0.114      | 1.100/0.043      | 0.800/0.031      | 0.900/0.035      | 0.950/0.037      |

## Suggested Pad Layout (Cont.)

(2) Package Type: SOT89



| Dimensions | Z<br>(mm)/(inch) | X<br>(mm)/(inch) | X1<br>(mm)/(inch) | X2<br>(mm)/(inch) | Y<br>(mm)/(inch) | Y1<br>(mm)/(inch) | E<br>(mm)/(inch) |
|------------|------------------|------------------|-------------------|-------------------|------------------|-------------------|------------------|
| Value      | 4.600/0.181      | 0.550/0.022      | 1.850/0.073       | 0.800/0.031       | 1.300/0.051      | 1.475/0.058       | 1.500/0.059      |

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