# NUD4700型LED开路分路器

NUD4700是美国安森美公司推出的一种LED发生开路时提供电流旁路的电子分路器。当LED遇到瞬态和浪涌冲击时易于损坏。在汽车前灯、灯塔、桥梁、飞机和机场跑道等场合，必须维持LED照明的高可靠性。在这些情况下，附加低成本的NUD4700，可保证LED串中有一个LED失效而不引起其它LED熄灭。NUD4700也可以应用于要求电流连续的其它负载。

NUD4700是一种两端器件，外型如图1所示。NUD4700内含一个单向晶闸管和一个控制电路，内部结构如图2所示。该器件的MT2端为正输入电压端，MT1为负输入电压端，采用无铅封装。

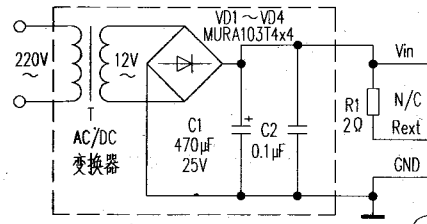
NUD4700的平均导通电流为0.376A，导通态电压是1V，在$V_{MT2}$=5V时的关断态电流典型值是100μA，在$I_{BR}$=1mA时的击穿电压为6.5V±1V，维持电流典型值是6mA，工作温度范围为-40℃~+150℃。

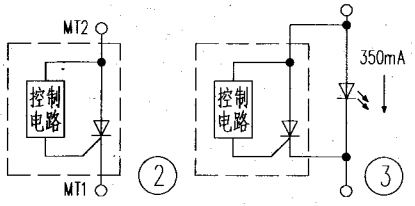
NUD4700可用于1W的LED(通常为$I_F$=350mA，$V_F$=3V)。在应用中，NUD4700的MT2端接LED的阳极，MT1端接LED的阴极，如图3所示。

图4所示为采用LED驱动器NUD4001和LED分路器NUD4700的LED串供电电路。这种供电电路直接利用220V/50Hz的交流市电作为原始电源，采用电源变压器降压，再利用全波桥式整流滤波电路实现AC/DC转换。LED串利用NUD4001(IC1)作为驱动器。

NUD4001是一种大电流LED驱动器，采用SO-8表面贴装封装，输出电流达500mA，输出电压达28V，最小过热电压降仅为1.4V。

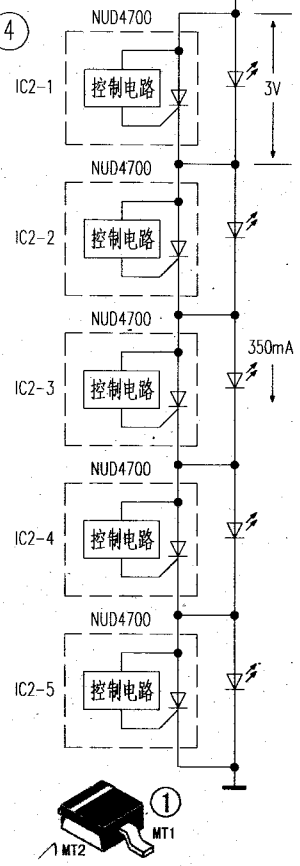
在图4中，LED串的电流$I_{LED}$由NUD4001①脚和③脚之间的电阻R1设定。NUD4007①脚与③脚之间的电压被固定在0.7V，$I_{LED}$=350mA，因此R1值为R1=0.7V/350mA=2Ω。




NUD4001的输入DC电压是17V，每个LED的正向导通压降是3V，LED串的总压降为3V×5=15V，NUD4001上的电压降是17V-15V=2V，NUD4001上的功率耗散为2V×350mA=0.7W。由于每个LED的功耗是3V×350mA=1.05W，LED串的总功耗是1.05W×5=5.25W，所以电源变压器的功率必须大于0.7W+5.25W=5.95W。

如不加NUD4700，由5个LED组成的LED串只要有一个失效(通常为开路)，LED串将会熄灭。加入NUD4700后，若某个LED开路，与其并联NUD4700中的晶闸管将会导通，其它LED因有电流通过仍会照常发光。只要LED完好，NUD4700是不导通的。



# NUD4700

# LED Shunt

The NUD4700 is an electronic shunt which provides a current bypass in the case of a single LED going into open circuit. LEDs are by nature quite fragile when subjected to transients and surge conditions. There are also many cases where high reliability of the LED lighting must be maintained such as headlights, lighthouses, bridges, aircraft, runways and so forth. In these cases the low cost addition of the NUD4700 will provide full assurance that an entire string of LEDs will not extinguish should one LED fail. NUD4700 is also applicable to other loads where circuit continuity is required. This device is designed to be used with 1 W LEDs (nominally 350 mA @ 3 V).

### Features

- A Simple Two Terminal Device
- Automatically Resets Itself if the LED Heals Itself or is Replaced
- ON−State Voltage Typically 1 V
- OFF−State Current less than 250 μA
- This is a Pb−Free Device

### Typical Applications

- LEDs where Preventive Maintenance is Non Practical
- LED Headlights
- LEDs with High Reliability Requirements
- Crowbar Protection for Open Circuit Conditions
- Overvoltage Protection for Sensitive Circuits

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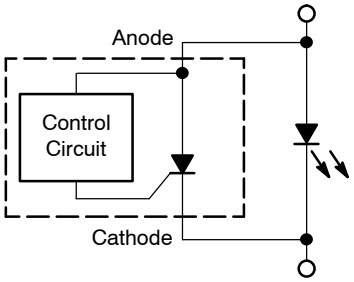
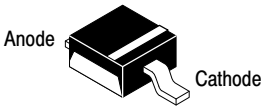
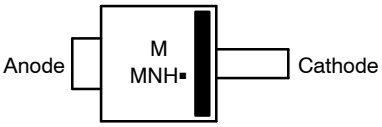



**POWERMITE®**
**CASE 457**
**PLASTIC**

### MARKING DIAGRAM




M = Date Code
MNH = Device Code
▪ = Pb−Free Package

### PIN FUNCTION DESCRIPTION

| Pin | Description |
|---|---|
| Anode | Positive Input Voltage to the Device |
| Cathode | Negative Input Voltage to the Device |

### ORDERING INFORMATION

| Device | Package | Shipping† |
|---|---|---|
| NUD4700SNT1G | POWERMITE (Pb−Free) | 3000/Tape & Reel |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

**MAXIMUM RATINGS** (Maximum ratings are those, that, if exceeded, may cause damage to the device. Electrical Characteristics are not guaranteed over this range)

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Peak Repetitive Off State Voltage (Anode to Cathode) | $V_{DM}$ | −0.3 to 10 | V |
| Average On−State Current, ($T_A$ = 25°C),<br>(Note 1)<br>(Note 2) | $I_{T(AVG)}$ | <br>1.3<br>0.376 | A |
| Thermal Resistance, Junction−to−Air<br>(Note 1)<br>(Note 2) | $Q_{JA}$ | <br>80<br>277 | °C/W |
| Thermal Resistance, Junction−to−Lead | $Q_{JL}$ | 35 | °C/W |
| Power Dissipation ($T_A$ = 25°C)<br>(Note 1)<br>(Note 2) | $P_{MAX}$ | <br>1.56<br>0.45 | W |
| Operating Temperature Range | $T_J$ | −40 to 150 | °C |
| Non−Operating Temperature Range | $T_J$ | 150 | °C |
| Lead Temperature, Soldering (10 Sec) | $T_L$ | 260 | °C |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. Mounted onto a 1“ x 1” square copper pad.
   Normally this device would be mounted on the same copper heat sink and adjacent to the LED. If the LED were to go open, then the NUD4700 shunt would now dissipate the power using the same copper heat sink. Since the NUD4700 has a voltage that is nominally 30% of the LED, then the power dissipation would be easily handled by the same heat sink as the LED.
2. Device mounted on minimum copper pad.

**ELECTRICAL CHARACTERISTICS** (Unless otherwise noted: $T_A$ = 25°C)

| Characteristics | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Off−State Current<br>($V_{Anode}$ = 5 V) | $I_{LEAK}$ | − | 100 | 250 | μA |
| Breakdown Voltage<br>($I_{BR}$ = 1 mA) | $V_{(BR)}$ | 5.5 | − | 7.5 | V |
| Holding Current<br>($V_{Anode}$ = 10 V, $I_{initial}$ = 100 mA) | $I_H$ | − | 6.0 | 12 | mA |
| Latching Current<br>($V_{Anode}$ = 10 V) | $I_L$ | − | 35 | 70 | mA |
| On−State Voltage ($I_T$ = 0.350 A) | $V_T$ | − | 1.0 | 1.2 | V |
| **DYNAMIC CHARACTERISTICS** | | | | | |
| Critical Rate−of−Rise of Off State Voltage<br>($V_{pk}$ = Rated $V_{(BR)}$, $T_J$ = 125°C, Exponential Method) | dV/dt | 250 | − | − | V/μs |

## TYPICAL PERFORMANCE CURVES

($T_A$ = 25°C unless otherwise noted)

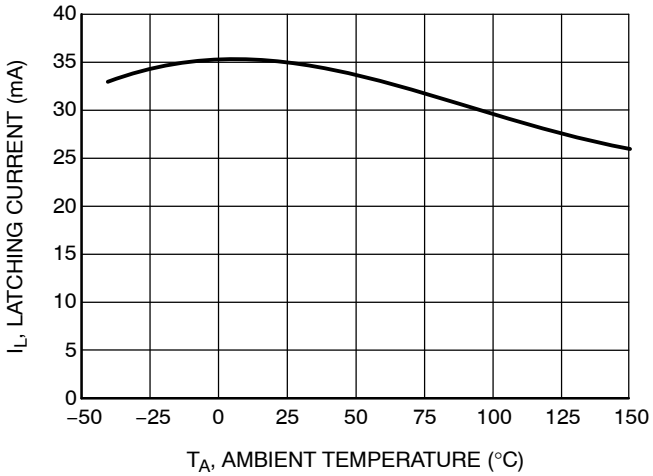



**Figure 1. Latching Current vs Temperature**

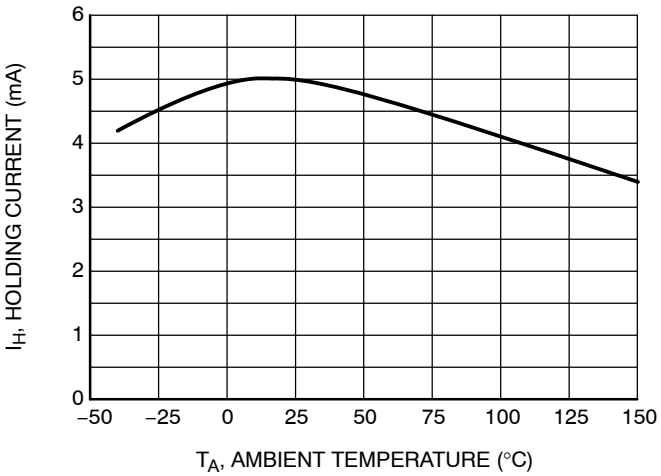



**Figure 2. Holding Current vs Temperature**

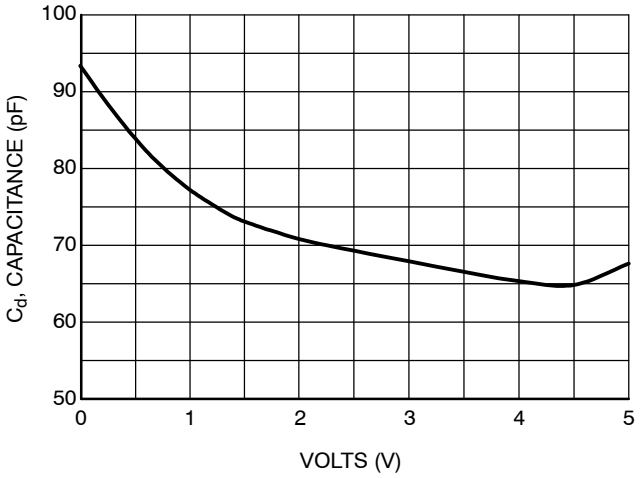



**Figure 3. Capacitance vs Voltage**

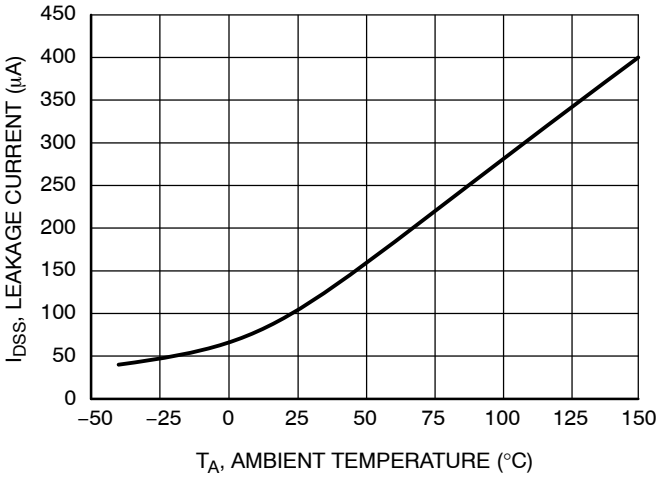



**Figure 4. Leakage Current vs Temperature**

## TYPICAL APPLICATION CIRCUIT

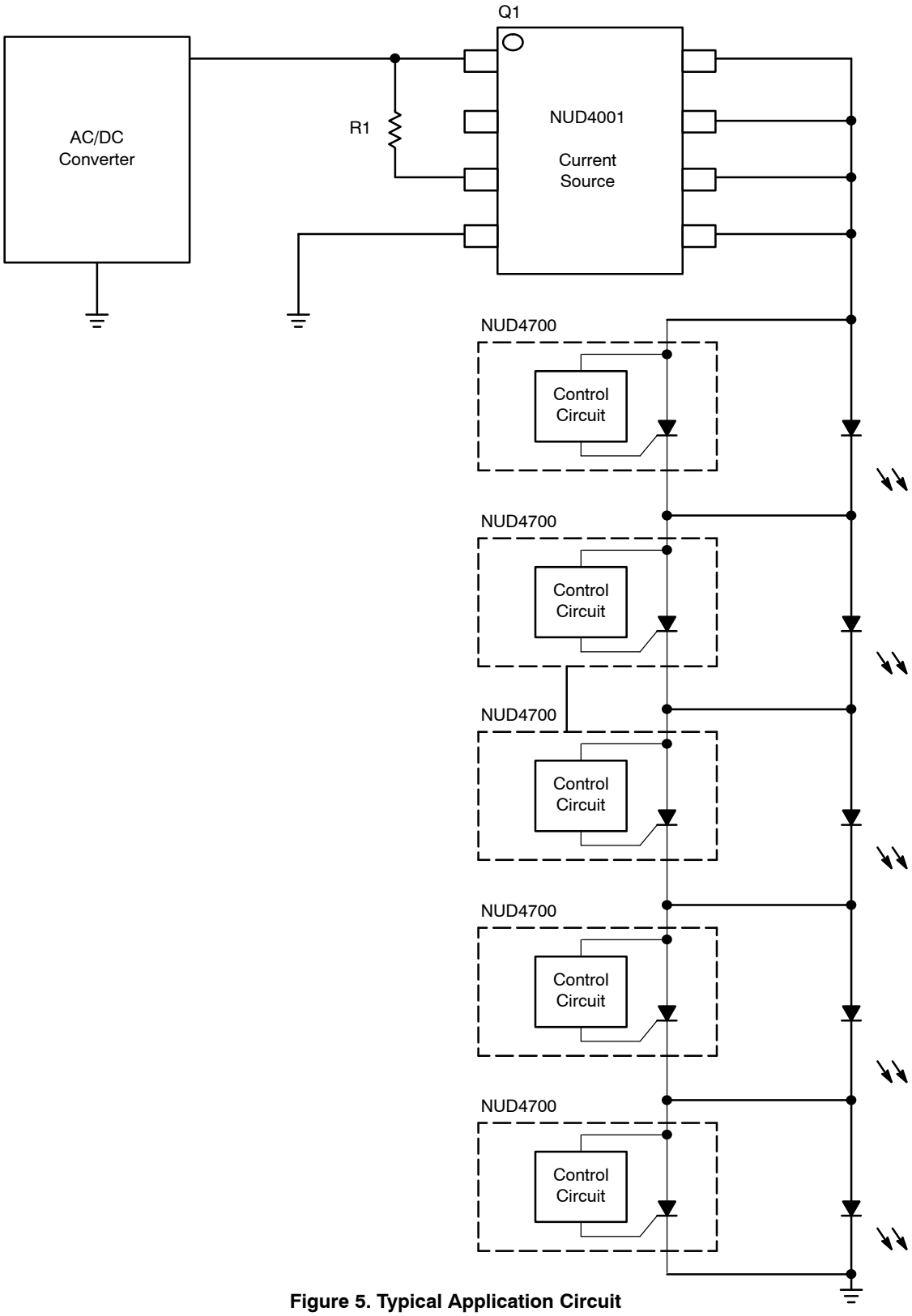



**Figure 5. Typical Application Circuit**

## TYPICAL OPERATION WAVEFORMS

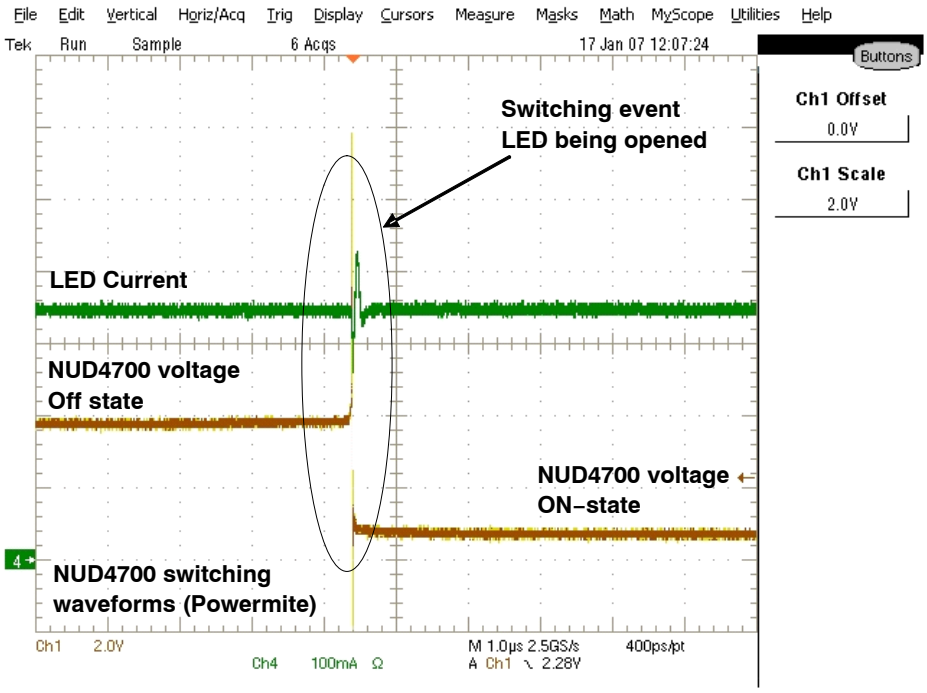



**Figure 6. NUD4700 Switching Waveforms**

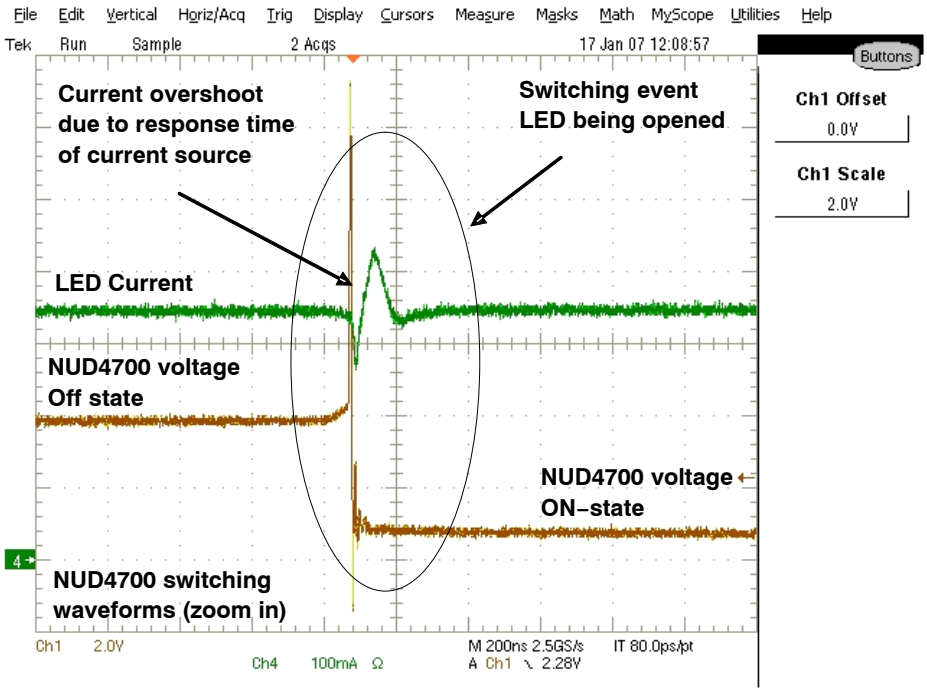
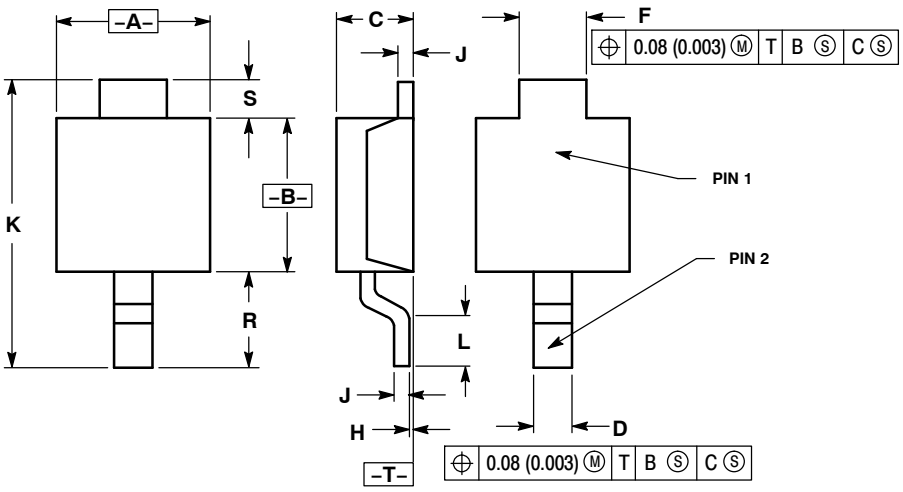



**Figure 7. Zoom in of Figure 6**

## PACKAGE DIMENSIONS

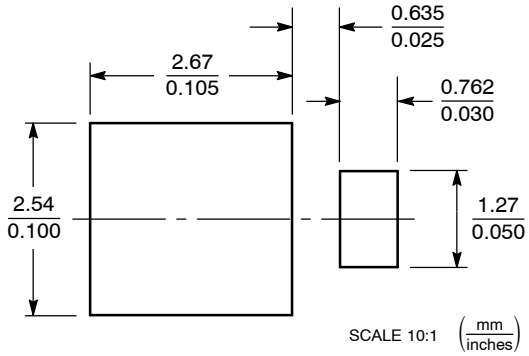
**POWERMITE**
CASE 457−04
ISSUE E




NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.

| | MILLIMETERS | | INCHES | |
|---|---|---|---|---|
| DIM | MIN | MAX | MIN | MAX |
| A | 1.75 | 2.05 | 0.069 | 0.081 |
| B | 1.75 | 2.18 | 0.069 | 0.086 |
| C | 0.85 | 1.15 | 0.033 | 0.045 |
| D | 0.40 | 0.69 | 0.016 | 0.027 |
| F | 0.70 | 1.00 | 0.028 | 0.039 |
| H | −0.05 | +0.10 | −0.002 | +0.004 |
| J | 0.10 | 0.25 | 0.004 | 0.010 |
| K | 3.60 | 3.90 | 0.142 | 0.154 |
| L | 0.50 | 0.80 | 0.020 | 0.031 |
| R | 1.20 | 1.50 | 0.047 | 0.059 |
| S | 0.50 REF | | 0.019 REF | |

### 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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