LED Shunt

NUD4700

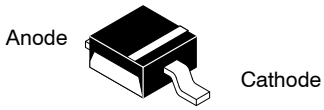
The NUD4700 is an electronic shunt which provides a current bypass in the case of a single LED going into open circuit. LEDs are by nature quite fragile when subjected to transients and surge conditions. There are also many cases where high reliability of the LED lighting must be maintained such as headlights, 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
- Available with White Package
- SZ Prefix (black package only) for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC−Q101 Qualified and PPAP Capable
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant

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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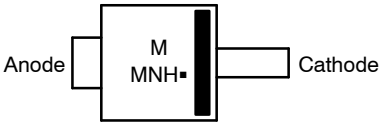
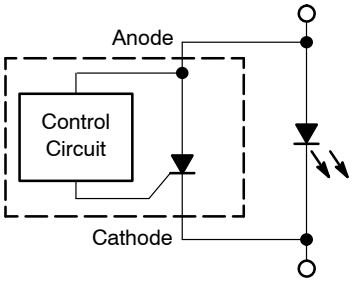
CASE 457

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 (Black)	3000/Tape & Reel
SZNUD4700SNT1G	POWERMITE (Black)	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), (Note 1) (Note 2)	$I_{T(AVG)}$	 1.3 0.376	A
Thermal Resistance, Junction−to−Air (Note 1) (Note 2)	Q_{JA}	 80 277	°C/W
Thermal Resistance, Junction−to−Lead	Q_{JL}	35	°C/W
Power Dissipation (T_A = 25°C) (Note 1) (Note 2)	P_{MAX}	 1.56 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 those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

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 (V_{Anode} = 5 V)	I_{LEAK}	−	100	250	μA
Breakdown Voltage (I_{BR} = 1 mA)	$V_{(BR)}$	5.5	−	7.5	V
Holding Current (V_{Anode} = 10 V, $I_{initial}$ = 100 mA)	I_H	−	6.0	12	mA
Latching Current (V_{Anode} = 10 V)	I_L	−	35	70	mA
On−State Voltage (I_T = 0.350 A) (I_T = 0.750 A) (I_T = 1.0 A)	V_T	− − −	1.0 1.0 1.0	1.2 − −	V
DYNAMIC CHARACTERISTICS					
Critical Rate−of−Rise of Off State Voltage (V_{pk} = Rated $V_{(BR)}$, T_J = 125°C, Exponential Method)	dV/dt	250	−	−	V/μs

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

TYPICAL PERFORMANCE CURVES

(T_A = 25°C UNLESS OTHERWISE NOTED)

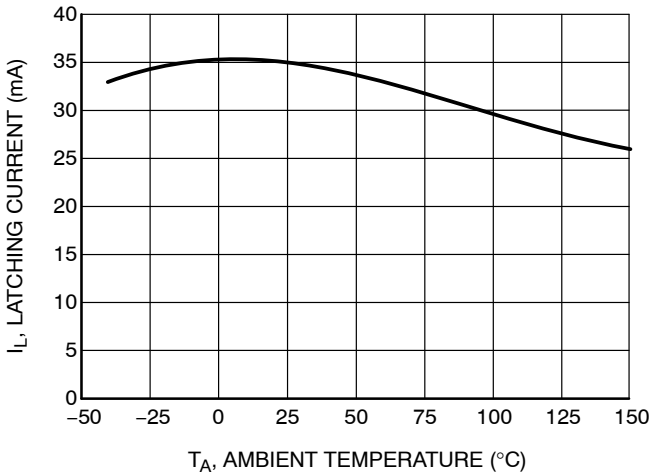


Figure 1. Latching Current vs Temperature

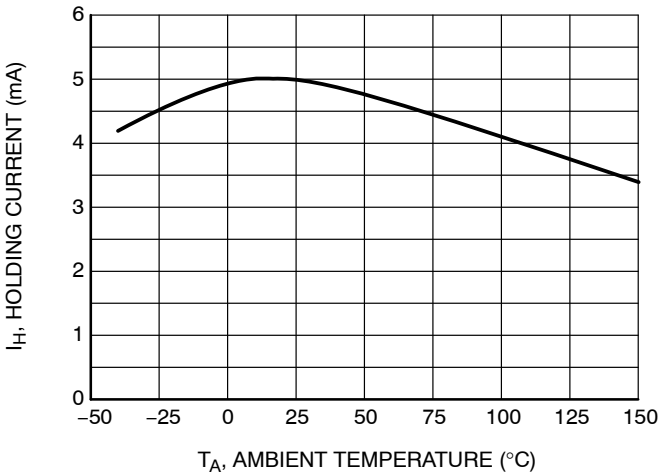


Figure 2. Holding Current vs Temperature

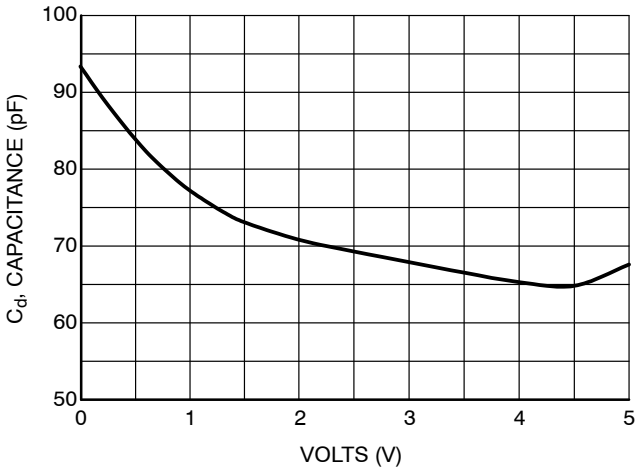


Figure 3. Capacitance vs Voltage

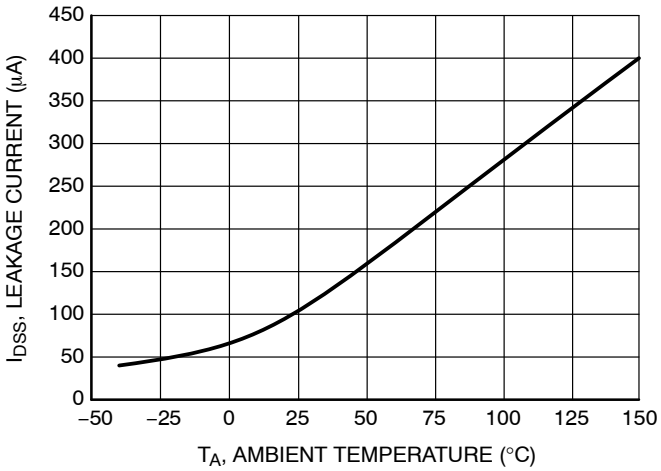


Figure 4. Leakage Current vs Temperature

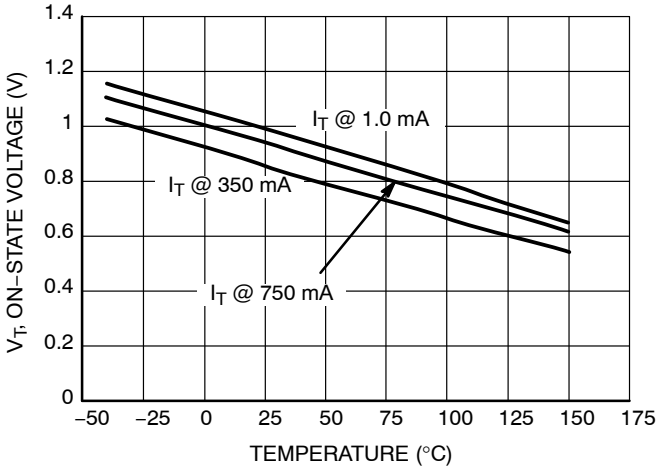


Figure 5. On−State Voltage vs. Temperature

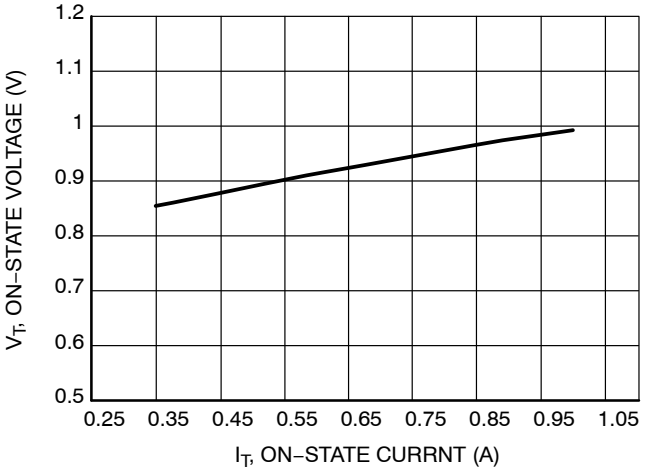


Figure 6. On−State Voltage vs. On−State Current (I_T) at 25°C

TYPICAL APPLICATION CIRCUIT

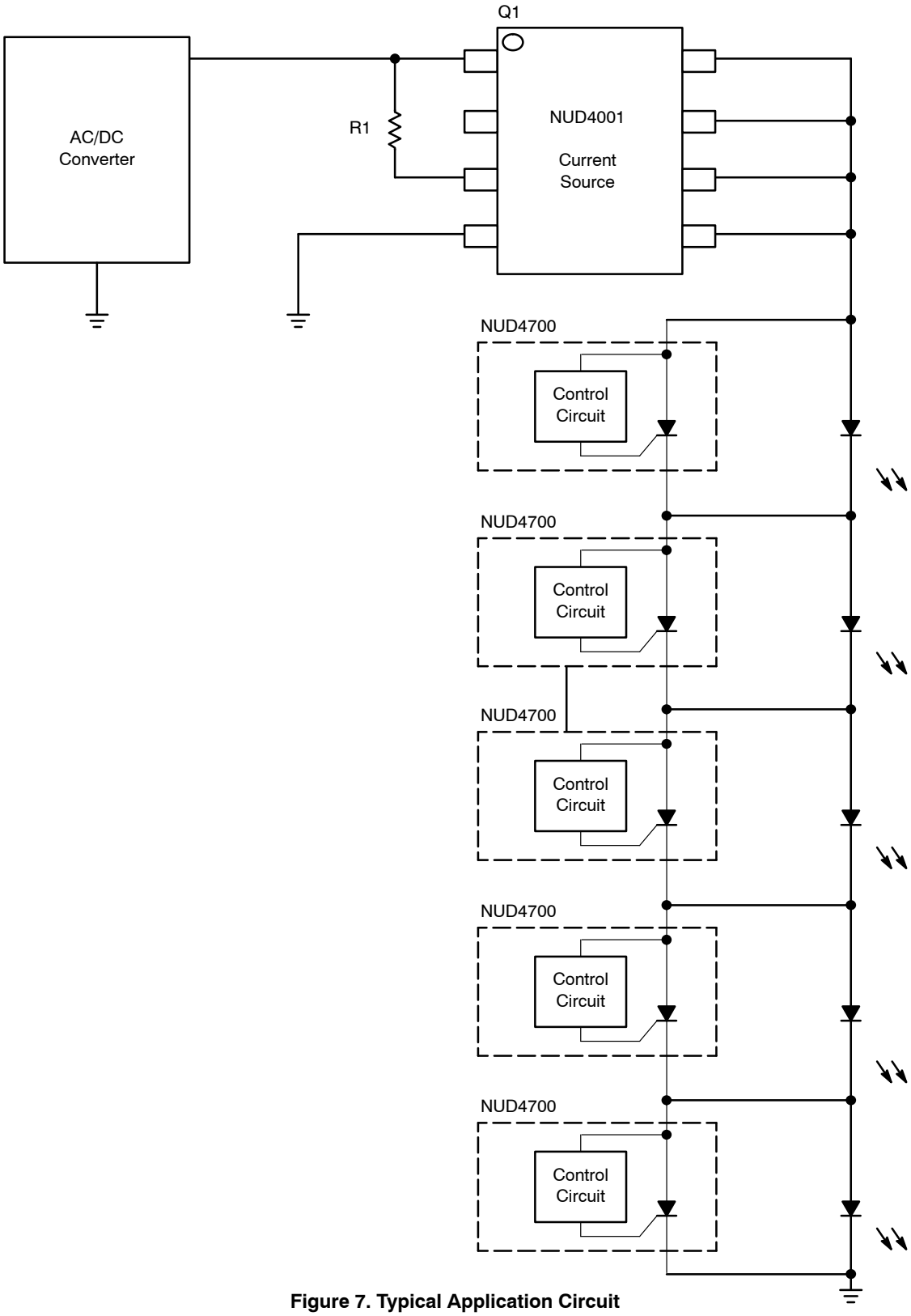


Figure 7. Typical Application Circuit

TYPICAL OPERATION WAVEFORMS

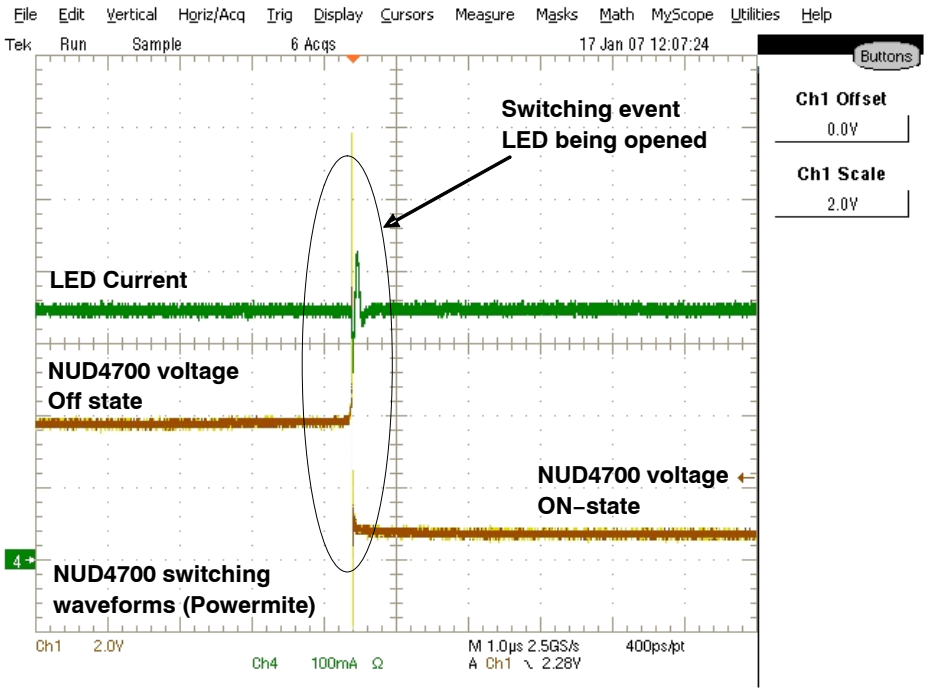


Figure 8. NUD4700 Switching Waveforms

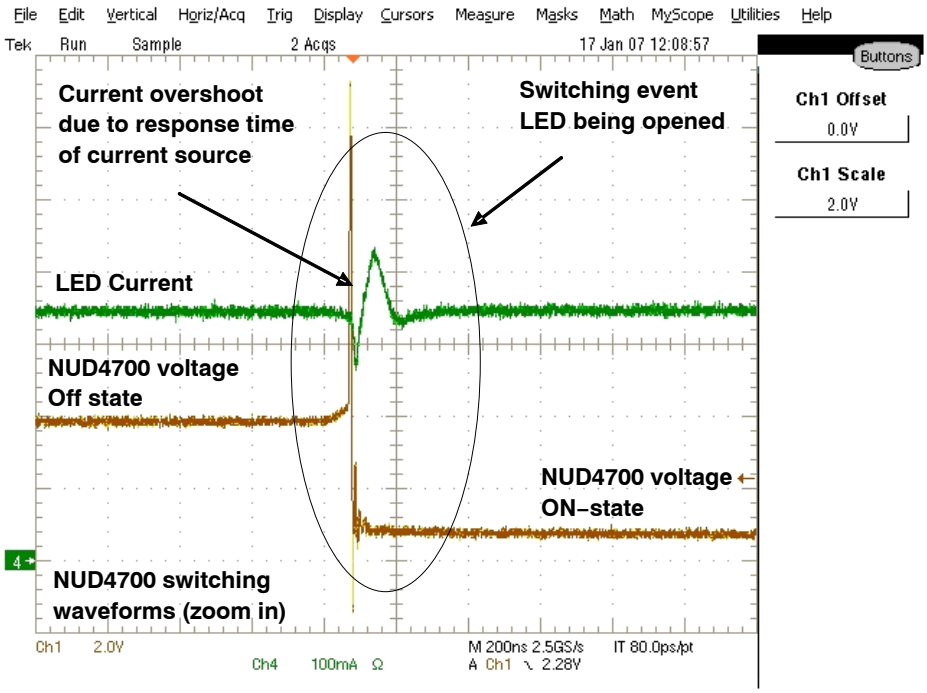
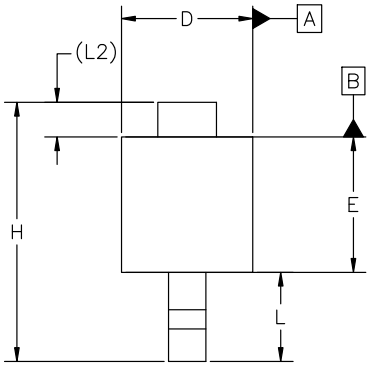


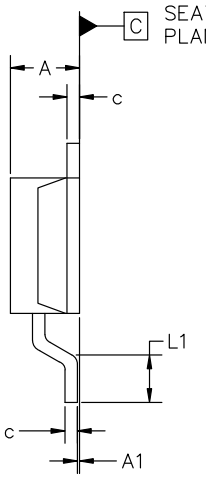
Figure 9. Zoom in of Figure 8

POWERMITE 1.90x1.96x1.00
CASE 457
ISSUE H

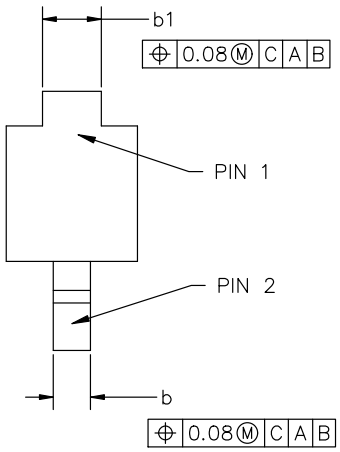
DATE 16 MAY 2025



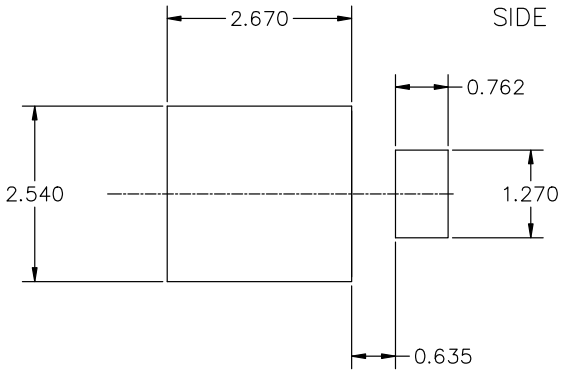
TOP VIEW



SIDE VIEW



BOTTOM VIEW



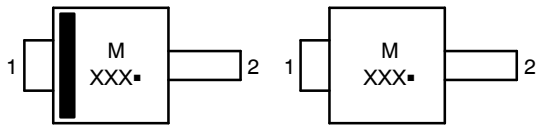
RECOMMENDED MOUNTING FOOTPRINT

*For additional information on our Pb−Free Strategy and Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

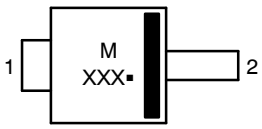
MILLIMETERS			
DIM	MIN	NOM	MAX
A	0.85	1.00	1.15
A1	0.00	0.05	0.10
b	0.40	0.55	0.69
b1	0.70	0.85	1.00
c	0.10	0.18	0.25
D	1.75	1.90	2.05
E	1.75	1.96	2.18
H	3.60	3.75	3.90
L	1.20	1.35	1.50
L1	0.50	0.65	0.80
L2	0.50 REF		

NOTES:
1. DIMENSIONING AND TOLERANCING AS PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION D & E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.

GENERIC MARKING DIAGRAMS*



STYLE 1 **STYLE 2**



STYLE 3

XXX = Specific Device Code
M = Date Code
▪ = Pb−Free Package

STYLE 1:
PIN 1. CATHODE
2. ANODE

STYLE 2:
PIN 1. ANODE OR CATHODE
2. CATHODE OR ANODE
(BI−DIRECTIONAL)

STYLE 3:
PIN 1. ANODE
2. CATHODE

*This information is generic. Please refer to device data sheet for actual part marking. Pb−Free indicator, “G” or microdot “▪”, may or may not be present. Some products may not follow the Generic Marking.

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DESCRIPTION:	**POWERMITE 1.90x1.96x1.00**		**PAGE 1 OF 1**

ADDITIONAL INFORMATION

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