

# NTGD1100L

## Power MOSFET

### 8 V, ±3.3 A, Load Switch with Level-Shift, P-Channel, TSOP-6

The NTGD1100L integrates a P and N-Channel MOSFET in a single package. This device is particularly suited for portable electronic equipment where low control signals, low battery voltages and high load currents are needed. The P-Channel device is specifically designed as a load switch using ON Semiconductor state-of-the-art trench technology. The N-Channel, with an external resistor (R1), functions as a level-shift to drive the P-Channel. The N-Channel MOSFET has internal ESD protection and can be driven by logic signals as low as 1.5 V. The NTGD1100L operates on supply lines from 1.8 to 8.0 V and can drive loads up to 3.3 A with 8.0 V applied to both  $V_{IN}$  and  $V_{ON/OFF}$

#### Features

- Extremely Low  $R_{DS(on)}$  Load Switch MOSFET
- Level Shift MOSFET is ESD Protected
- Low Profile, Small Footprint Package
- $V_{IN}$  Range 1.8 to 8.0 V
- ON/OFF Range 1.5 to 8.0 V
- ESD Rating of 3000 V
- Pb-Free Package is Available

#### MAXIMUM RATINGS ( $T_J = 25^\circ\text{C}$ unless otherwise noted)

| Rating  |                       | Symbol               | Value                    | Unit             |   |
|---|-----------------------|----------------------|--------------------------|------------------|---|
| Input Voltage ( $V_{DSS}$ , P-Ch)                                 |                       | $V_{IN}$             | 8.0                      | V                |   |
| ON/OFF Voltage ( $V_{GS}$ , N-Ch)                                 |                       | $V_{ON/OFF}$         | 8.0                      | V                |   |
| Continuous Load Current (Note 1)                                  | Steady State          | $I_L$                | $T_A = 25^\circ\text{C}$ | ±3.3             | A |
|   |                       |                      | $T_A = 85^\circ\text{C}$ | ±2.4             |   |
| Power Dissipation (Note 1)  | Steady State          | $P_D$                | $T_A = 25^\circ\text{C}$ | 0.83             | W |
|   |                       |                      | $T_A = 85^\circ\text{C}$ | 0.43             |   |
| Pulsed Load Current   | $tp = 10 \mu\text{s}$ | $I_{LM}$             | ±10                      | A                |   |
| Operating Junction and Storage Temperature                        |                       | $T_J$ ,<br>$T_{STG}$ | -55 to 150               | $^\circ\text{C}$ |   |
| Source Current (Body Diode)                                       |                       | $I_S$                | -1.0                     | A                |   |
| ESD Rating, MIL-STD-883D HBM (100 pF, 1.5 kΩ)                     |                       | ESD                  | 3.0                      | kV               |   |
| Lead Temperature for Soldering Purposes (1/8" from case for 10 s) |                       | $T_L$                | 260                      | $^\circ\text{C}$ |   |

#### THERMAL RESISTANCE RATINGS

| Rating                                      | Symbol          | Max | Unit                      |
|---|-----------------|-----|---------------------------|
| Junction-to-Ambient – Steady State (Note 1) | $R_{\theta JA}$ | 150 | $^\circ\text{C}/\text{W}$ |
| Junction-to-Foot – Steady State (Note 1)    | $R_{\theta JF}$ | 50  |                           |

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. Surface-mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces).

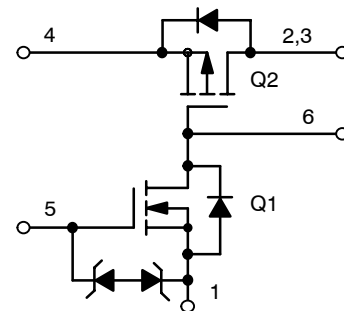


ON Semiconductor®

<http://onsemi.com>

| $V_{(BR)DSS}$ | $R_{DS(on)}$ TYP | $I_D$ MAX |
|---------------|------------------|-----------|
| 8.0 V         | 40 mΩ @ -4.5 V   | ±3.3 A    |
|               | 55 mΩ @ -2.5 V   |           |
|               | 80 mΩ @ -1.8 V   |           |

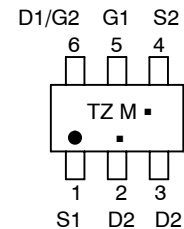
#### SIMPLIFIED SCHEMATIC



#### MARKING DIAGRAM & PIN ASSIGNMENT



1  
TSOP-6  
CASE 318G  
STYLE 11



TZ = Specific Device Code  
M = Date Code\*  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

\*Date Code orientation may vary depending upon manufacturing location.

#### ORDERING INFORMATION

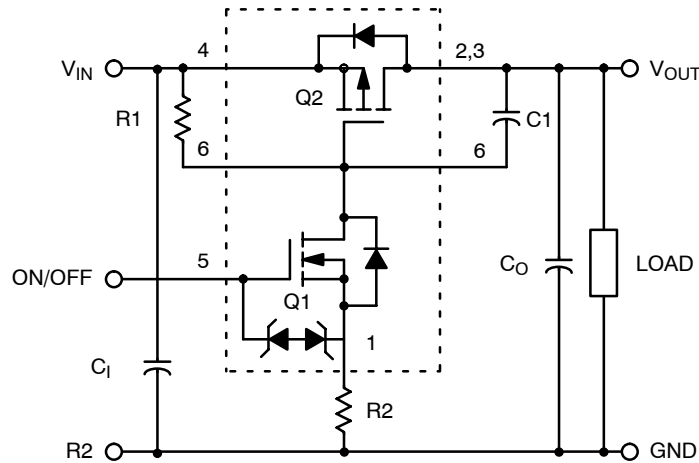
| Device       | Package          | Shipping†        |
|--------------|------------------|------------------|
| NTGD1100LT1  | TSOP-6           | 3000/Tape & Reel |
| NTGD1100LT1G | TSOP-6 (Pb-Free) | 3000/Tape & Reel |

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

# NTGD1100L

## ELECTRICAL CHARACTERISTICS (T<sub>J</sub> = 25°C unless otherwise noted)

| Characteristic                       | Symbol              | Test Condition   | Min  | Typ  | Max  | Unit |    |
|--------------------------------------|---------------------|--|--|------|------|------|----|
| <b>OFF CHARACTERISTICS</b>           |                     |  |  |      |      |      |    |
| Q2 Drain-to-Source Breakdown Voltage | V <sub>IN</sub>     | V <sub>GS2</sub> = 0 V, I <sub>D2</sub> = 250 μA                                   | 8.0  |      |      | V    |    |
| Forward Leakage Current              | I <sub>FL</sub>     | V <sub>GS2</sub> = 0 V,<br>V <sub>DS2</sub> = 8.0 V                                | T <sub>J</sub> = 25°C  |      | 1.0  | μA   |    |
|                                      |                     |  | T <sub>J</sub> = 125°C   |      | 10   |      |    |
| Q1 Gate-to-Source Leakage Current    | I <sub>GSS</sub>    | V <sub>DS1</sub> = 0 V, V <sub>GS1</sub> = ±8.0 V                                  |  |      | ±100 | nA   |    |
| Q1 Diode Forward On-Voltage          | V <sub>SD</sub>     | I <sub>S</sub> = -1.0 A, V <sub>GS1</sub> = 0 V                                    |  | -0.7 | -1.0 | V    |    |
| <b>ON CHARACTERISTICS</b>            |                     |  |  |      |      |      |    |
| Voltage ON/OFF                       | V <sub>ON/OFF</sub> |  | 1.5  |      | 8.0  | V    |    |
| Q1 Gate Threshold Voltage            | V <sub>GS1</sub>    | V <sub>GS1</sub> = V <sub>DS1</sub> , I <sub>D</sub> = 50 μA                       | 0.6  |      | 1.2  | V    |    |
| Input Voltage                        | V <sub>IN</sub>     | V <sub>GS2</sub> = V <sub>DS2</sub> , I <sub>D</sub> = 250 μA                      | 1.8  |      | 8.0  | V    |    |
| Q2 Drain-to-Source On Resistance     | R <sub>DS(on)</sub> | V <sub>ON/OFF</sub> = 1.5 V,<br>I <sub>L</sub> = 1.0 A                             | V <sub>IN</sub> = 4.5 V  |      | 40   | 55   | mΩ |
|                                      |                     |  | V <sub>IN</sub> = 2.5 V  |      | 55   | 70   |    |
|                                      |                     |  | V <sub>IN</sub> = 1.8 V  |      | 80   | 140  |    |
| Load Current                         | I <sub>L</sub>      | V <sub>DROP</sub> ≤ 0.2 V, V <sub>IN</sub> = 5.0 V,<br>V <sub>ON/OFF</sub> = 1.5 V |  | 1.0  |      | A    |    |
|                                      |                     |  | V <sub>DROP</sub> ≤ 0.2 V, V <sub>IN</sub> = 2.5 V,<br>V <sub>ON/OFF</sub> = 1.5 V |      | 1.0  |      |    |
|                                      |                     |  | V <sub>DROP</sub> ≤ 0.2 V, V <sub>IN</sub> = 1.8 V,<br>V <sub>ON/OFF</sub> = 1.5 V |      | 1.0  |      |    |



**Figure 1. Load Switch Application**

| Components | Description                      | Values                  |
|------------|----------------------------------|-------------------------|
| R1         | Pullup Resistor                  | Typical 10 kΩ to 1.0 MΩ |
| R2         | Optional Slew-Rate Control       | Typical 0 to 100 kΩ     |
| C0         | Output Capacitance               | Usually < 1.0 μF        |
| C1         | Optional In-Rush Current Control | Typical ≤ 1000 pF       |

# NTGD1100L

## TYPICAL CHARACTERISTICS

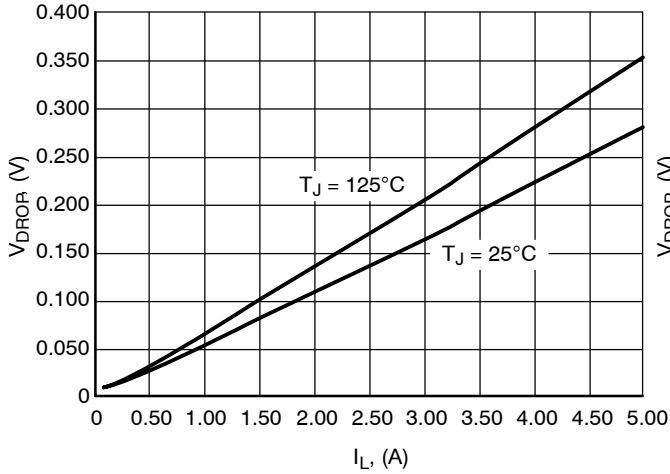


Figure 2.  $V_{DROP}$  vs.  $I_L$  @  $V_{IN} = 2.5\text{ V}$

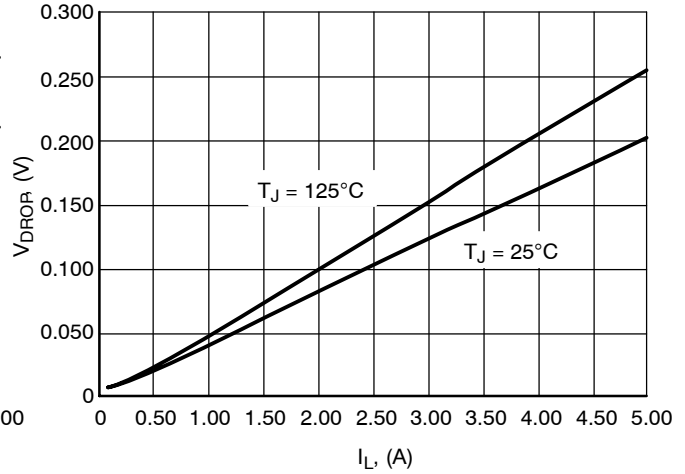


Figure 3.  $V_{DROP}$  vs.  $I_L$  @  $V_{IN} = 4.5\text{ V}$

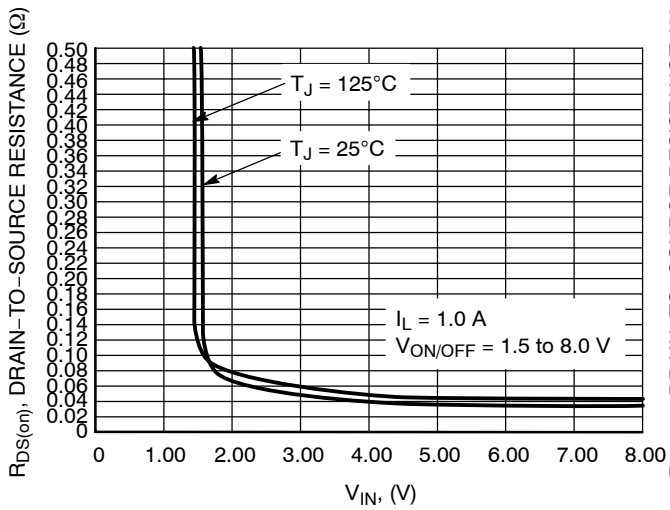


Figure 4. On Resistance vs. Input Voltage

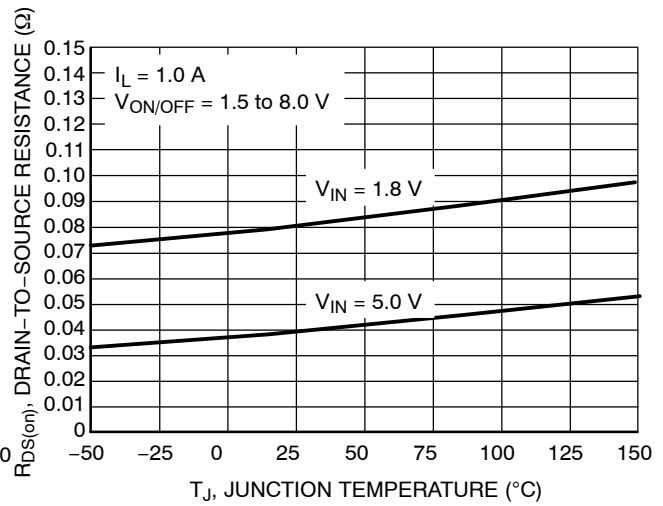


Figure 5. On Resistance Variation with Temperature

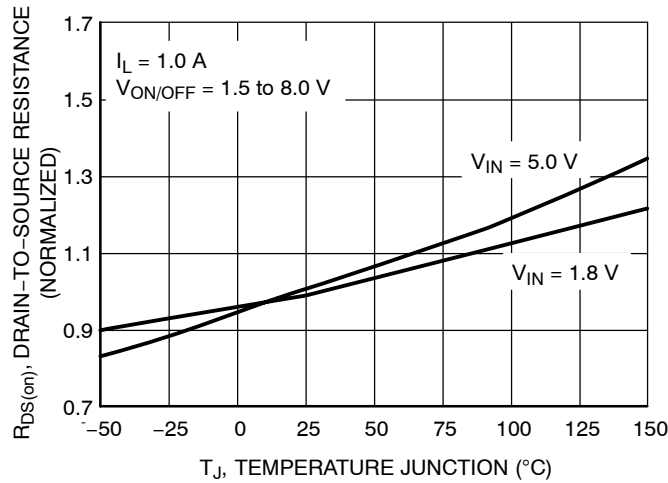
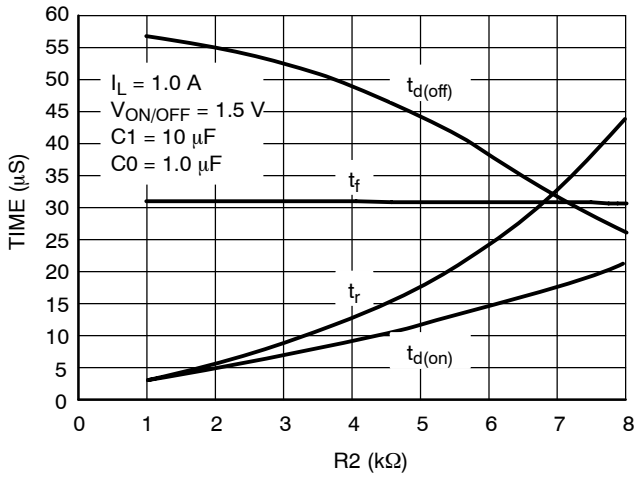


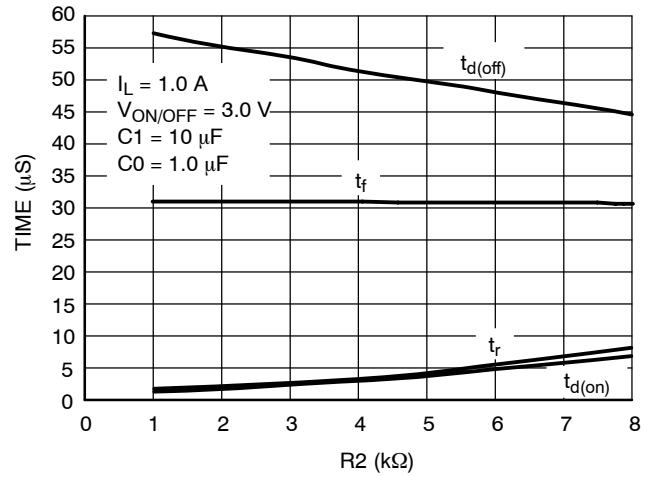
Figure 6. Normalized On Resistance Variation with Temperature

# NTGD1100L

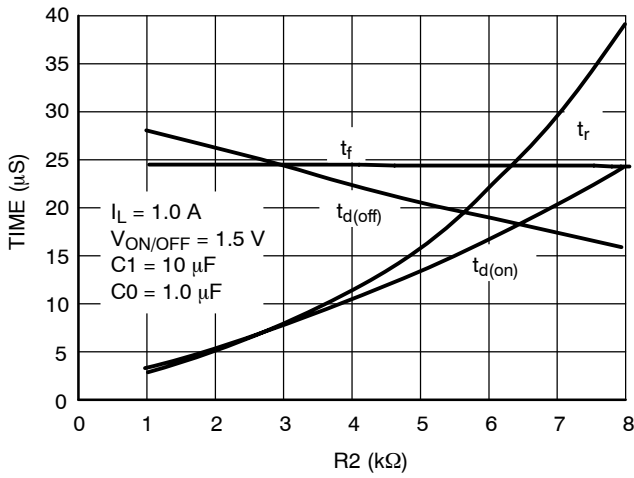
## TYPICAL CHARACTERISTICS



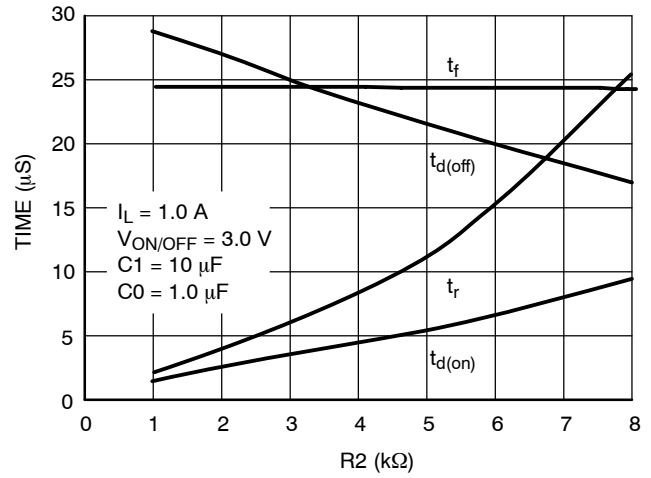
**Figure 7. Switching Variation R2 @  
V<sub>IN</sub> = 4.5 V, R1 = 20 kΩ**



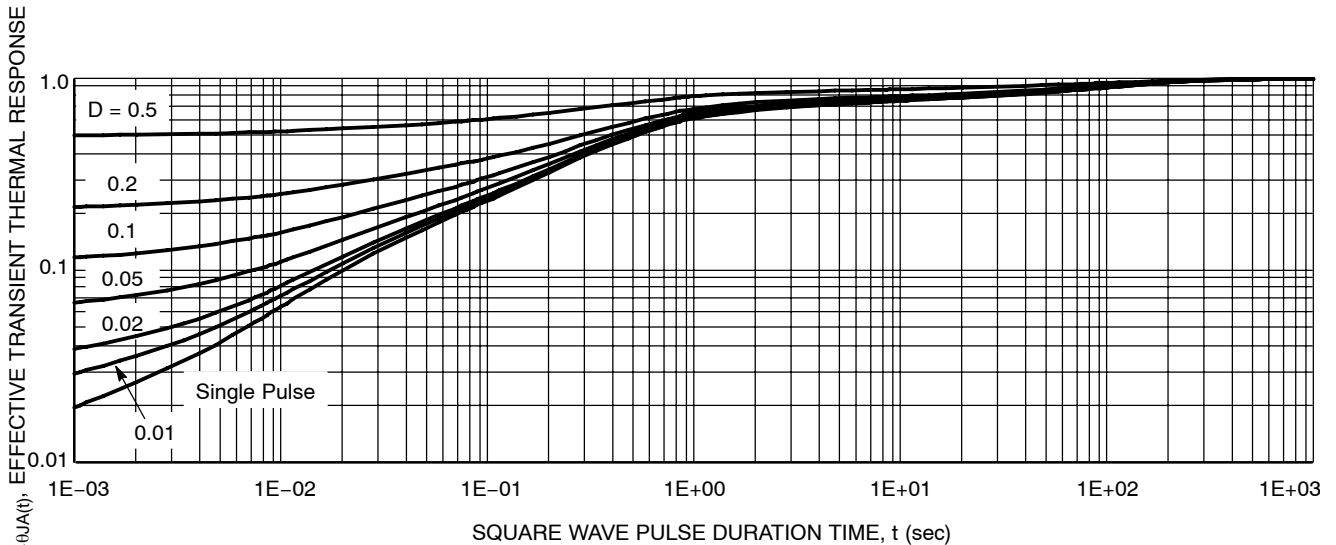
**Figure 8. Switching Variation R2 @  
V<sub>IN</sub> = 4.5 V, R1 = 20 kΩ**



**Figure 9. Switching Variation R2 @  
V<sub>IN</sub> = 2.5 V, R1 = 20 kΩ**



**Figure 10. Switching Variation R2 @  
V<sub>IN</sub> = 2.5 V, R1 = 20 kΩ**

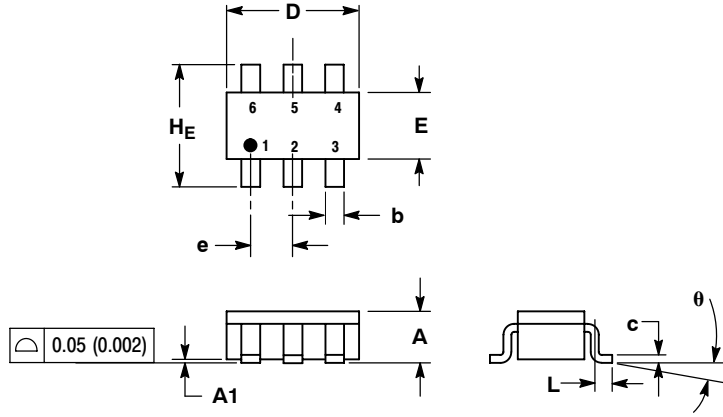


**Figure 11. FET Thermal Response Normalized to R<sub>θJA</sub> at Steady State (1 inch Pad)**

# NTGD1100L

## PACKAGE DIMENSIONS

TSOP-6  
CASE 318G-02  
ISSUE P



### NOTES:

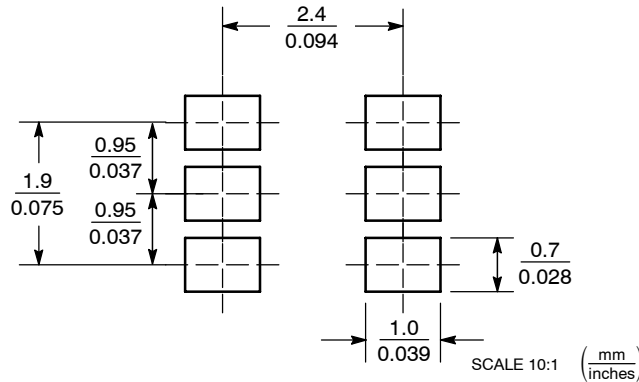
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS A AND B DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

| DIM            | MILLIMETERS |      |      | INCHES |       |       |
|----------------|-------------|------|------|--------|-------|-------|
|                | MIN         | NOM  | MAX  | MIN    | NOM   | MAX   |
| A              | 0.90        | 1.00 | 1.10 | 0.035  | 0.039 | 0.043 |
| A1             | 0.01        | 0.06 | 0.10 | 0.001  | 0.002 | 0.004 |
| b              | 0.25        | 0.38 | 0.50 | 0.010  | 0.014 | 0.020 |
| c              | 0.10        | 0.18 | 0.26 | 0.004  | 0.007 | 0.010 |
| D              | 2.90        | 3.00 | 3.10 | 0.114  | 0.118 | 0.122 |
| E              | 1.30        | 1.50 | 1.70 | 0.051  | 0.059 | 0.067 |
| e              | 0.85        | 0.95 | 1.05 | 0.034  | 0.037 | 0.041 |
| L              | 0.20        | 0.40 | 0.60 | 0.008  | 0.016 | 0.024 |
| H <sub>E</sub> | 2.50        | 2.75 | 3.00 | 0.099  | 0.108 | 0.118 |
| θ              | 0°          | -    | 10°  | 0°     | -     | 10°   |

### STYLE 11:

- PIN 1. SOURCE 1
- DRAIN 2
- DRAIN 2
- SOURCE 2
- GATE 1
- DRAIN 1/GATE 2

### 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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