

# NTGD1100L, STGD1100L

## MOSFET – Power, P-Channel, Load Switch with Level-Shift, TSOP-6

8 V,  $\pm 3.3$  A

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 2000 V
- These Devices are Pb-Free and are RoHS Compliant

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

| Rating                                                               |                 |                       | Symbol                               | Value         | Unit |
|----------------------------------------------------------------------|-----------------|-----------------------|--------------------------------------|---------------|------|
| Input Voltage (V <sub>DSS</sub> , P-Ch)                              |                 |                       | V <sub>IN</sub>                      | 8.0           | V    |
| ON/OFF Voltage (V <sub>GS</sub> , N-Ch)                              |                 |                       | V <sub>ON/OFF</sub>                  | 8.0           | V    |
| Continuous Load Current<br>(Note 1)                                  | Steady<br>State | T <sub>A</sub> = 25°C | I <sub>L</sub>                       | ±3.3          | A    |
|                                                                      |                 | T <sub>A</sub> = 85°C |                                      | ±2.4          |      |
| Power Dissipation<br>(Note 1)                                        | Steady<br>State | T <sub>A</sub> = 25°C | P <sub>D</sub>                       | 0.83          | W    |
|                                                                      |                 | T <sub>A</sub> = 85°C |                                      | 0.43          |      |
| Pulsed Load Current                                                  | tp = 10 μs      |                       | I <sub>LM</sub>                      | ±10           | A    |
| Operating Junction and Storage Temperature                           |                 |                       | T <sub>J</sub> ,<br>T <sub>STG</sub> | –55 to<br>150 | °C   |
| Source Current (Body Diode)                                          |                 |                       | I <sub>S</sub>                       | –1.0          | A    |
| ESD Rating, MIL–STD–883D HBM<br>(100 pF, 1.5 kΩ)                     |                 |                       | ESD                                  | 2.0           | kV   |
| Lead Temperature for Soldering Purposes<br>(1/8" from case for 10 s) |                 |                       | T <sub>L</sub>                       | 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. Surface-mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces).

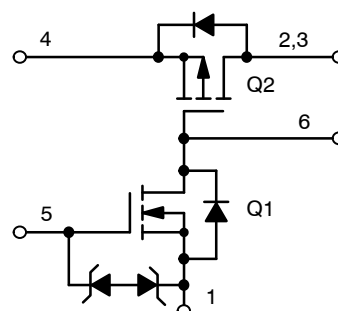


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| $V_{(BR)DSS}$ | $R_{DS(on)}$ TYP       | $I_D$ MAX   |
|---------------|------------------------|-------------|
| 8.0 V         | 40 m $\Omega$ @ -4.5 V | $\pm 3.3$ A |
|               | 55 m $\Omega$ @ -2.5 V |             |
|               | 80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

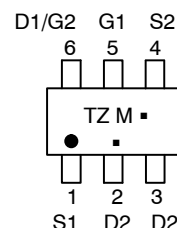
### SIMPLIFIED SCHEMATIC



### 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†          |
|--------------|------------------|--------------------|
| NTGD1100LT1G | TSOP-6 (Pb-Free) | 3000 / Tape & Reel |
| STGD1100LT1G | 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.

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## THERMAL RESISTANCE RATINGS

| Rating                                      | Symbol       | Max | Unit |
|---------------------------------------------|--------------|-----|------|
| Junction-to-Ambient – Steady State (Note 2) | $R_{\mu JA}$ | 150 | °C/W |
| Junction-to-Foot – Steady State (Note 2)    | $R_{\mu JF}$ | 50  |      |

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

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

| Characteristic | Symbol | Test Condition | Min | Typ | Max | Unit |
|----------------|--------|----------------|-----|-----|-----|------|
|----------------|--------|----------------|-----|-----|-----|------|

### OFF CHARACTERISTICS

|                                      |           |                                                          |                           |      |           |               |
|--------------------------------------|-----------|----------------------------------------------------------|---------------------------|------|-----------|---------------|
| Q2 Drain-to-Source Breakdown Voltage | $V_{IN}$  | $V_{GS2} = 0\text{ V}, I_{D2} = -250\text{ }\mu\text{A}$ | 8.0                       |      |           | V             |
| Forward Leakage Current              | $I_{FL}$  | $V_{GS1} = 0\text{ V}, V_{DS1} = 8.0\text{ V}$           | $T_J = 25^\circ\text{C}$  |      | 1.0       | $\mu\text{A}$ |
|                                      |           |                                                          | $T_J = 125^\circ\text{C}$ |      | 10        |               |
| Q2 Gate-to-Source Leakage Current    | $I_{GSS}$ | $V_{DS2} = 0\text{ V}, V_{GS2} = \pm 8.0\text{ V}$       |                           |      | $\pm 100$ | nA            |
| Q2 Diode Forward On-Voltage          | $V_{SD}$  | $I_S = -1.0\text{ A}, V_{GS2} = 0\text{ V}$              |                           | -0.7 | -1.0      | V             |

### ON CHARACTERISTICS

|                                  |              |                                                                                |                         |    |     |                  |
|----------------------------------|--------------|--------------------------------------------------------------------------------|-------------------------|----|-----|------------------|
| Voltage ON/OFF                   | $V_{ON/OFF}$ |                                                                                | 1.5                     |    | 8.0 | V                |
| Q1 Gate Threshold Voltage        | $V_{GS1}$    | $V_{GS1} = V_{DS1}, I_D = 50\text{ }\mu\text{A}$                               | 0.6                     |    | 1.2 | V                |
| Input Voltage                    | $V_{IN}$     | $V_{GS2} = V_{DS2}, I_D = 250\text{ }\mu\text{A}$                              | 1.8                     |    | 8.0 | V                |
| Q2 Drain-to-Source On Resistance | $R_{DS(on)}$ | $V_{ON/OFF} = 1.5\text{ V}, I_L = 1.0\text{ A}$                                | $V_{IN} = 4.5\text{ V}$ | 40 | 55  | $\text{m}\Omega$ |
|                                  |              |                                                                                | $V_{IN} = 2.5\text{ V}$ | 55 | 70  |                  |
|                                  |              |                                                                                | $V_{IN} = 1.8\text{ V}$ | 80 | 140 |                  |
| Load Current                     | $I_L$        | $V_{DROP} \leq 0.2\text{ V}, V_{IN} = 5.0\text{ V}, V_{ON/OFF} = 1.5\text{ V}$ | 1.0                     |    |     | A                |
|                                  |              | $V_{DROP} \leq 0.2\text{ V}, V_{IN} = 2.5\text{ V}, V_{ON/OFF} = 1.5\text{ V}$ | 1.0                     |    |     |                  |
|                                  |              | $V_{DROP} \leq 0.2\text{ V}, V_{IN} = 1.8\text{ V}, V_{ON/OFF} = 1.5\text{ V}$ | 1.0                     |    |     |                  |

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.

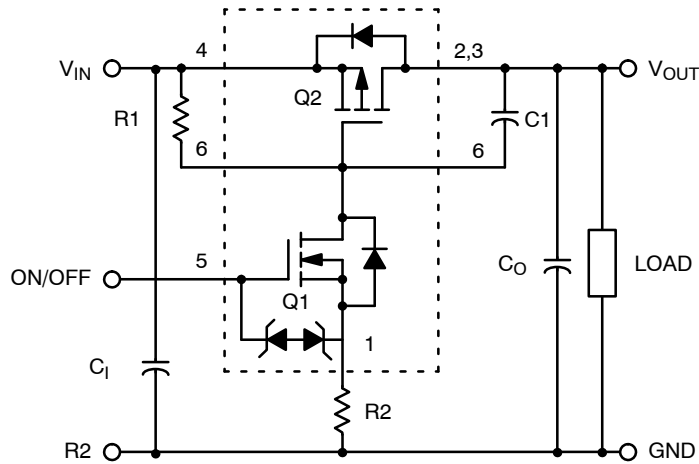


Figure 1. Load Switch Application

| Components | Description                      | Values                                  |
|------------|----------------------------------|-----------------------------------------|
| R1         | Pullup Resistor                  | Typical 10 k $\Omega$ to 1.0 M $\Omega$ |
| R2         | Optional Slew-Rate Control       | Typical 0 to 100 k $\Omega$             |
| C0         | Output Capacitance               | Usually < 1.0 $\mu\text{F}$             |
| C1         | Optional In-Rush Current Control | Typical $\leq 1000\text{ pF}$           |

# NTGD1100L, STGD1100L

## TYPICAL CHARACTERISTICS

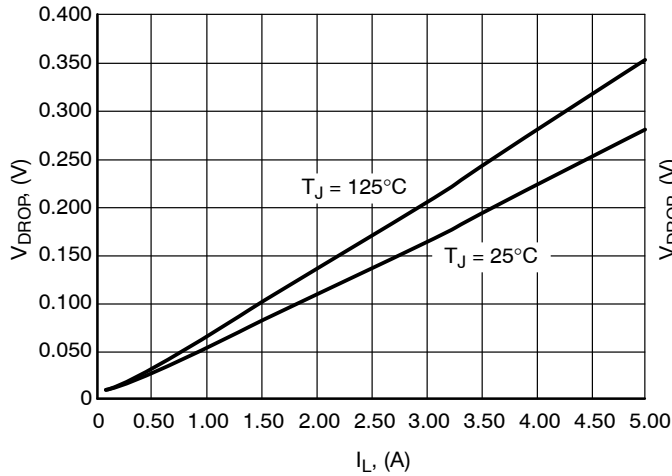


Figure 2.  $V_{DROP}$  vs.  $I_L$  @  $V_{IN} = 2.5$  V

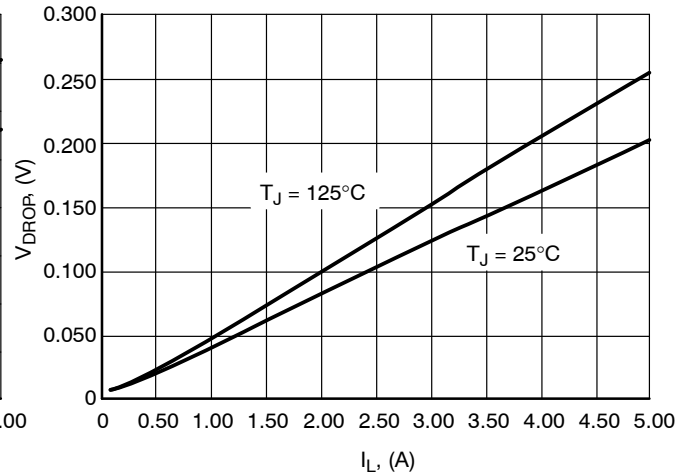


Figure 3.  $V_{DROP}$  vs.  $I_L$  @  $V_{IN} = 4.5$  V

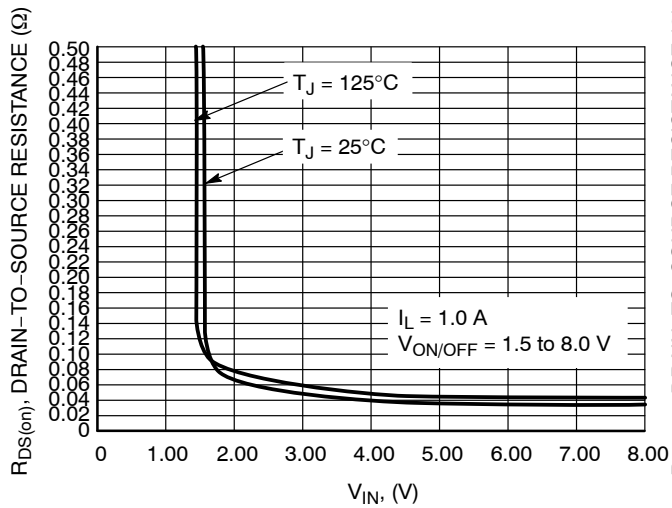


Figure 4. On Resistance vs. Input Voltage

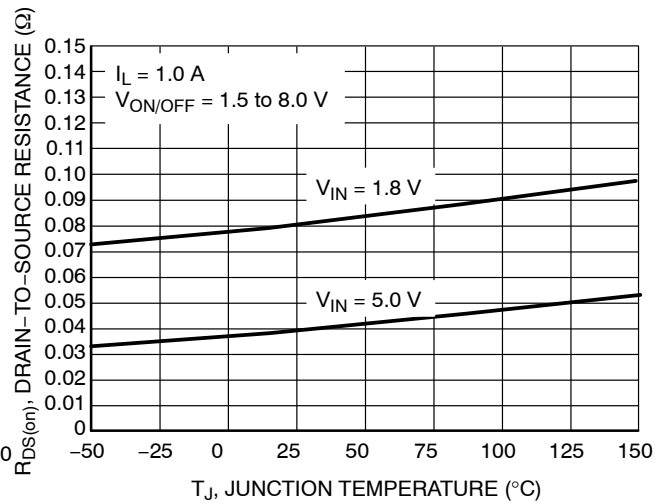


Figure 5. On Resistance Variation with Temperature

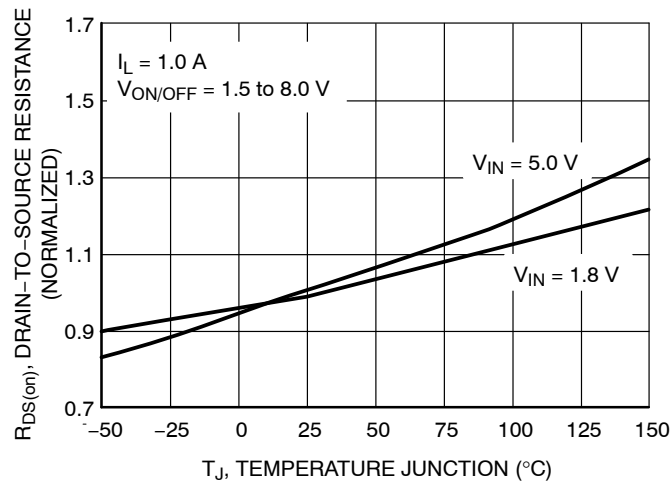
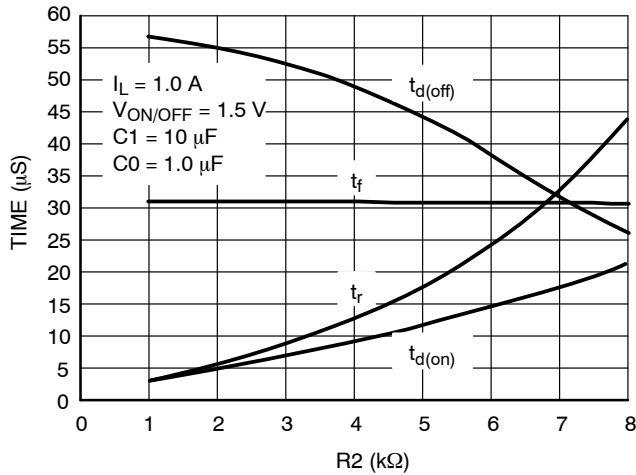


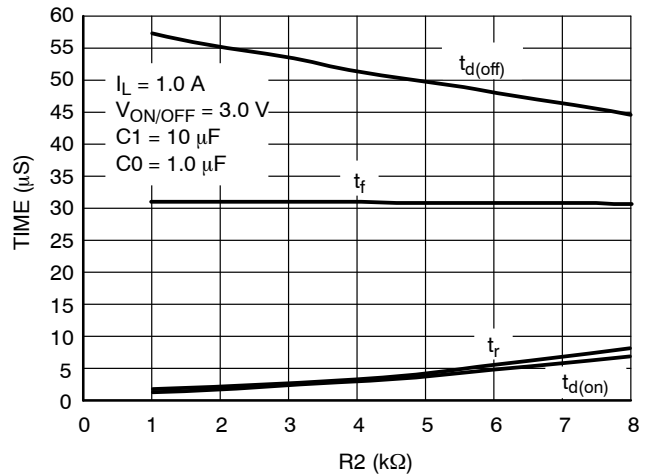
Figure 6. Normalized On Resistance Variation with Temperature

# NTGD1100L, STGD1100L

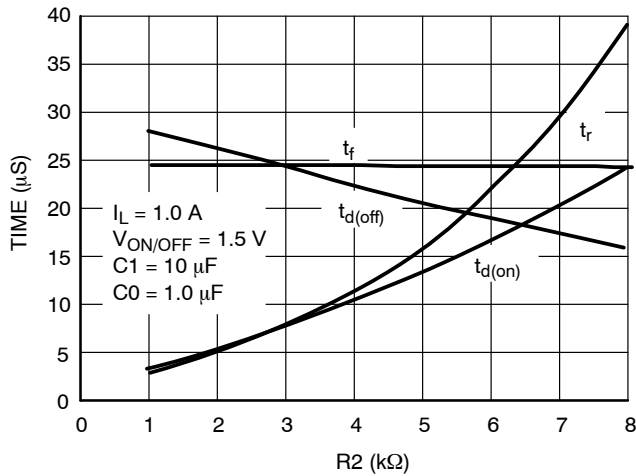
## TYPICAL CHARACTERISTICS



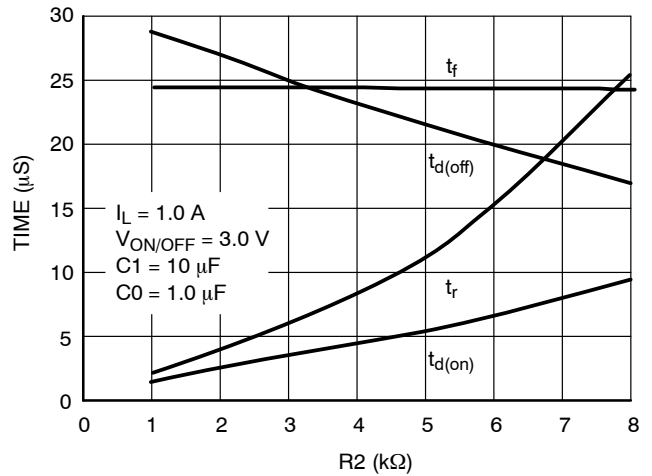
**Figure 7. Switching Variation R2 @**  
 **$V_{IN} = 4.5\text{ V}$ ,  $R_1 = 20\text{ k}\Omega$**



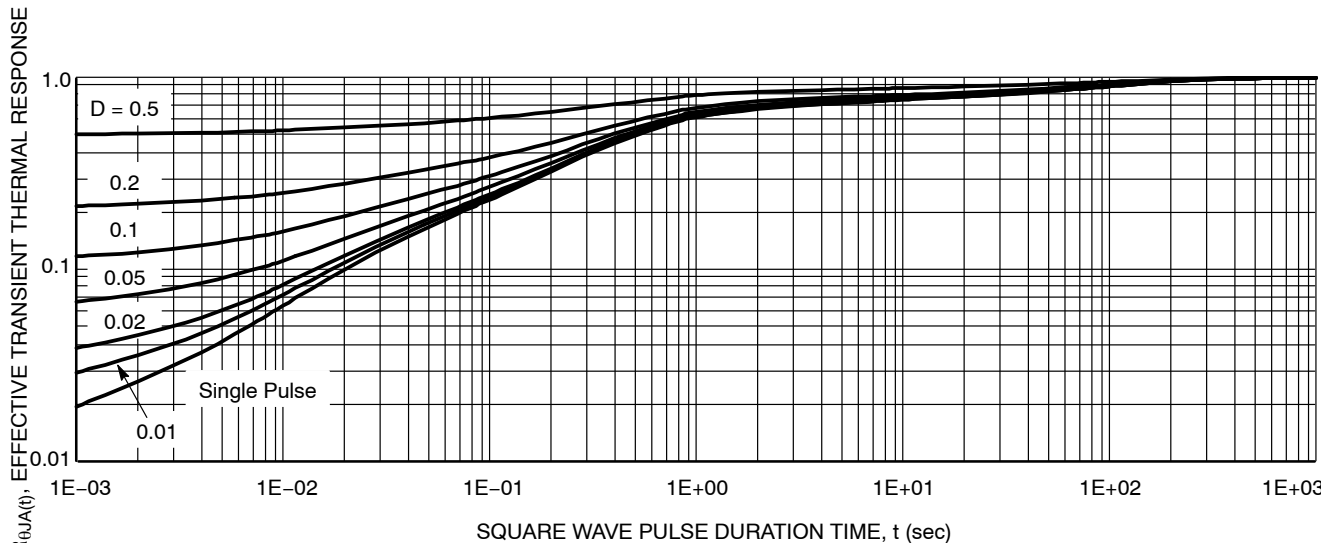
**Figure 8. Switching Variation R2 @**  
 **$V_{IN} = 4.5\text{ V}$ ,  $R_1 = 20\text{ k}\Omega$**



**Figure 9. Switching Variation R2 @**  
 **$V_{IN} = 2.5\text{ V}$ ,  $R_1 = 20\text{ k}\Omega$**



**Figure 10. Switching Variation R2 @**  
 **$V_{IN} = 2.5\text{ V}$ ,  $R_1 = 20\text{ k}\Omega$**

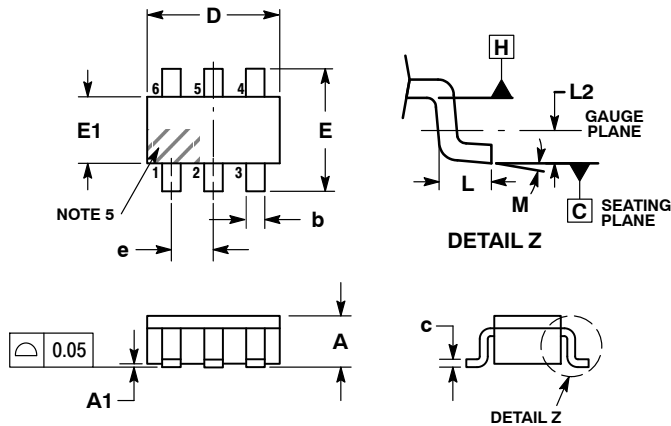


**Figure 11. FET Thermal Response Normalized to  $R_{\theta JA}$  at Steady State (1 inch Pad)**

# NTGD1100L, STGD1100L

## PACKAGE DIMENSIONS

### TSOP-6 CASE 318G-02 ISSUE V



#### NOTES:

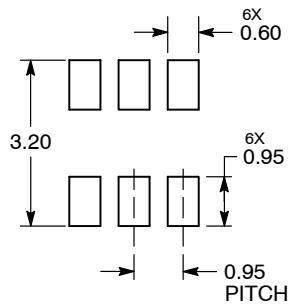
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.15 PER SIDE. DIMENSIONS D AND E1 ARE DETERMINED AT DATUM H.
5. PIN ONE INDICATOR MUST BE LOCATED IN THE INDICATED ZONE.

| DIM | MILLIMETERS |      |      |
|-----|-------------|------|------|
|     | MIN         | NOM  | MAX  |
| A   | 0.90        | 1.00 | 1.10 |
| A1  | 0.01        | 0.06 | 0.10 |
| b   | 0.25        | 0.38 | 0.50 |
| c   | 0.10        | 0.18 | 0.26 |
| D   | 2.90        | 3.00 | 3.10 |
| E   | 2.50        | 2.75 | 3.00 |
| E1  | 1.30        | 1.50 | 1.70 |
| e   | 0.85        | 0.95 | 1.05 |
| L   | 0.20        | 0.40 | 0.60 |
| L2  | 0.25 BSC    |      |      |
| M   | -           |      |      |

#### STYLE 11:

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

### RECOMMENDED SOLDERING FOOTPRINT\*



DIMENSIONS: MILLIMETERS

\*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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NTGD1100L/D



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