

# NTMS4107N

## Power MOSFET

30 V, 18 A, Single N-Channel, SO-8

### Features

- Ultra Low  $R_{DS(on)}$  (at 4.5 V<sub>GS</sub>), Low Gate Resistance and Low Q<sub>G</sub>
- Optimized for Low Side Synchronous Applications
- High Speed Switching Capability
- Pb-Free Package is Available

### Applications

- Notebook Computer Vcore Applications
- Network Applications
- DC-DC Converters

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

| Rating                                                                                                                                                  |                        |                       | Symbol                            | Value          | Unit |
|---------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|-----------------------|-----------------------------------|----------------|------|
| Drain-to-Source Voltage                                                                                                                                 |                        |                       | V <sub>DSS</sub>                  | 30             | V    |
| Gate-to-Source Voltage                                                                                                                                  |                        |                       | V <sub>GS</sub>                   | ± 20           | V    |
| Continuous Drain Current (Note 1)                                                                                                                       | Steady State           | T <sub>A</sub> = 25°C | I <sub>D</sub>                    | 15             | A    |
|                                                                                                                                                         |                        | T <sub>A</sub> = 85°C |                                   | 11             |      |
|                                                                                                                                                         | t ≤ 10 s               | T <sub>A</sub> = 25°C |                                   | 18             |      |
| Power Dissipation (Note 1)                                                                                                                              | Steady State           | T <sub>A</sub> = 25°C | P <sub>D</sub>                    | 1.67           | W    |
|                                                                                                                                                         | t ≤ 10 s               |                       |                                   | 2.5            |      |
| Continuous Drain Current (Note 2)                                                                                                                       | Steady State           | T <sub>A</sub> = 25°C | I <sub>D</sub>                    | 11             | A    |
|                                                                                                                                                         |                        | T <sub>A</sub> = 85°C |                                   | 8.0            |      |
| Power Dissipation (Note 2)                                                                                                                              |                        |                       | T <sub>A</sub> = 25°C             | P <sub>D</sub> | 0.93 |
| Pulsed Drain Current                                                                                                                                    | t <sub>p</sub> = 10 μs |                       | I <sub>DM</sub>                   | 56             | A    |
| Operating Junction and Storage Temperature                                                                                                              |                        |                       | T <sub>J</sub> , T <sub>stg</sub> | -55 to 150     | °C   |
| Continuous Source Current (Body Diode)                                                                                                                  |                        |                       | I <sub>S</sub>                    | 3.0            | A    |
| Single Pulse Drain-to-Source Avalanche Energy (V <sub>DD</sub> = 30 V, V <sub>GS</sub> = 10 V, I <sub>PK</sub> = 32 A, L = 1 mH, R <sub>G</sub> = 25 Ω) |                        |                       | E <sub>AS</sub>                   | 512            | mJ   |
| Lead Temperature for Soldering Purposes (1/8" from case for 10 s)                                                                                       |                        |                       | T <sub>L</sub>                    | 260            | °C   |

### THERMAL RESISTANCE RATINGS

| Rating                                      | Symbol           | Max | Unit |
|---------------------------------------------|------------------|-----|------|
| Junction-to-Ambient – Steady State (Note 1) | R <sub>θJA</sub> | 75  | °C/W |
| Junction-to-Ambient – t ≤ 10 s (Note 1)     | R <sub>θJA</sub> | 50  |      |
| Junction-to-Ambient – Steady State (Note 2) | R <sub>θJA</sub> | 135 |      |

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

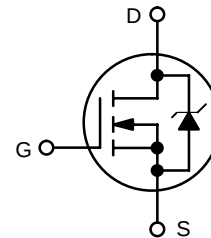
1. Surface-mounted on FR4 board using 1" sq. pad size (Cu area = 1.127" sq. [1 oz] including traces).
2. Surface-mounted on FR4 board using the minimum recommended pad size (Cu area = 0.412" sq.).



ON Semiconductor®

<http://onsemi.com>

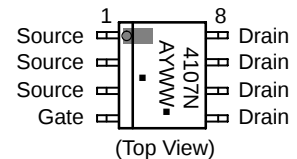
| V <sub>(BR)DSS</sub> | R <sub>DS(on)</sub> TYP | I <sub>D</sub> MAX |
|----------------------|-------------------------|--------------------|
| 30 V                 | 3.4 mΩ @ 10 V           | 18 A               |
|                      | 4.7 mΩ @ 4.5 V          |                    |



### MARKING DIAGRAM/ PIN ASSIGNMENT



SO-8  
CASE 751  
STYLE 12



4107N = Specific Device Code  
A = Assembly Location  
Y = Year  
WW = Work Week  
■ = Pb-Free Package  
(Note: Microdot may be in either location)

### ORDERING INFORMATION

| Device       | Package        | Shipping <sup>†</sup> |
|--------------|----------------|-----------------------|
| NTMS4107NR2  | SO-8           | 2500/Tape & Reel      |
| NTMS4107NR2G | SO-8 (Pb-Free) | 2500/Tape & Reel      |

<sup>†</sup>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.

# NTMS4107N

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

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

### OFF CHARACTERISTICS

|                                                           |                   |                                                     |                           |    |           |                      |
|-----------------------------------------------------------|-------------------|-----------------------------------------------------|---------------------------|----|-----------|----------------------|
| Drain-to-Source Breakdown Voltage                         | $V_{(BR)DSS}$     | $V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$ | 30                        |    |           | V                    |
| Drain-to-Source Breakdown Voltage Temperature Coefficient | $V_{(BR)DSS}/T_J$ |                                                     |                           | 21 |           | mV/ $^\circ\text{C}$ |
| Zero Gate Voltage Drain Current                           | $I_{DSS}$         | $V_{GS} = 0\text{ V}, V_{DS} = 24\text{ V}$         | $T_J = 25^\circ\text{C}$  |    | 1.0       | $\mu\text{A}$        |
|                                                           |                   |                                                     | $T_J = 125^\circ\text{C}$ |    | 10        |                      |
| Gate-to-Source Leakage Current                            | $I_{GSS}$         | $V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$     |                           |    | $\pm 100$ | nA                   |

### ON CHARACTERISTICS (Note 3)

|                                            |                  |                                                 |     |     |     |                      |
|--------------------------------------------|------------------|-------------------------------------------------|-----|-----|-----|----------------------|
| Gate Threshold Voltage                     | $V_{GS(TH)}$     | $V_{GS} = V_{DS}, I_D = 250\text{ }\mu\text{A}$ | 1.0 |     | 2.5 | V                    |
| Negative Threshold Temperature Coefficient | $V_{GS(TH)}/T_J$ |                                                 |     | 7.4 |     | mV/ $^\circ\text{C}$ |
| Drain-to-Source On Resistance              | $R_{DS(on)}$     | $V_{GS} = 4.5\text{ V}, I_D = 14\text{ A}$      |     | 4.7 | 5.5 | m $\Omega$           |
|                                            |                  | $V_{GS} = 10\text{ V}, I_D = 15\text{ A}$       |     | 3.4 | 4.5 |                      |
| Forward Transconductance                   | $g_{FS}$         | $V_{DS} = 15\text{ V}, I_D = 18\text{ A}$       |     | 25  |     | S                    |

### CHARGES, CAPACITANCES AND GATE RESISTANCE

|                              |              |                                                                  |  |      |  |          |
|------------------------------|--------------|------------------------------------------------------------------|--|------|--|----------|
| Input Capacitance            | $C_{ISS}$    | $V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}, V_{DS} = 15\text{ V}$  |  | 6000 |  | pF       |
| Output Capacitance           | $C_{OSS}$    |                                                                  |  | 1030 |  |          |
| Reverse Transfer Capacitance | $C_{RSS}$    |                                                                  |  | 550  |  |          |
| Total Gate Charge            | $Q_{G(TOT)}$ | $V_{GS} = 4.5\text{ V}, V_{DS} = 15\text{ V}, I_D = 18\text{ A}$ |  | 45   |  | nC       |
| Threshold Gate Charge        | $Q_{G(TH)}$  |                                                                  |  | 6.5  |  |          |
| Gate-to-Source Charge        | $Q_{GS}$     |                                                                  |  | 16.3 |  |          |
| Gate-to-Drain Charge         | $Q_{GD}$     |                                                                  |  | 19.3 |  |          |
| Gate Resistance              | $R_G$        |                                                                  |  | 0.60 |  | $\Omega$ |

### SWITCHING CHARACTERISTICS (Note 4)

|                     |              |                                                                                           |  |     |  |    |
|---------------------|--------------|-------------------------------------------------------------------------------------------|--|-----|--|----|
| Turn-On Delay Time  | $t_{d(ON)}$  | $V_{GS} = 10\text{ V}, V_{DS} = 15\text{ V}, I_D = 1.0\text{ A}, R_G = 6.0\text{ }\Omega$ |  | 9.0 |  | ns |
| Rise Time           | $t_r$        |                                                                                           |  | 10  |  |    |
| Turn-Off Delay Time | $t_{d(OFF)}$ |                                                                                           |  | 94  |  |    |
| Fall Time           | $t_f$        |                                                                                           |  | 38  |  |    |

### DRAIN-SOURCE DIODE CHARACTERISTICS

|                         |          |                                                                               |                           |    |     |     |    |
|-------------------------|----------|-------------------------------------------------------------------------------|---------------------------|----|-----|-----|----|
| Forward Diode Voltage   | $V_{SD}$ | $V_{GS} = 0\text{ V}, I_S = 3.0\text{ A}$                                     | $T_J = 25^\circ\text{C}$  |    | 0.8 | 1.1 | V  |
|                         |          |                                                                               | $T_J = 125^\circ\text{C}$ |    | 0.6 |     |    |
| Reverse Recovery Time   | $t_{RR}$ | $V_{GS} = 0\text{ V}, dI_S/dt = 100\text{ A}/\mu\text{s}, I_S = 3.0\text{ A}$ |                           | 41 |     |     | ns |
| Charge Time             | $t_a$    |                                                                               |                           | 20 |     |     |    |
| Discharge Time          | $t_b$    |                                                                               |                           | 21 |     |     |    |
| Reverse Recovery Charge | $Q_{RR}$ |                                                                               |                           | 48 |     |     | nC |

3. Pulse Test: Pulse Width  $\leq 300\text{ }\mu\text{s}$ , Duty Cycle  $\leq 2\%$ .

4. Switching characteristics are independent of operating junction temperatures.

TYPICAL PERFORMANCE CURVES

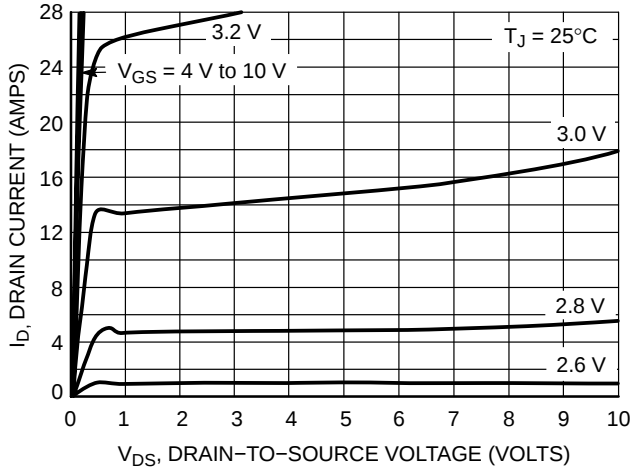


Figure 1. On-Region Characteristics

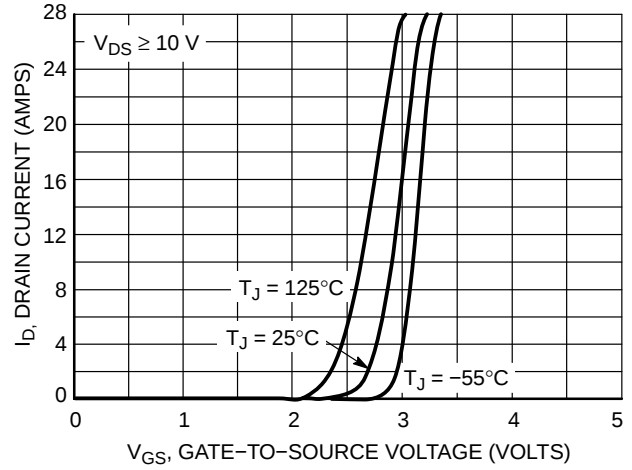


Figure 2. Transfer Characteristics

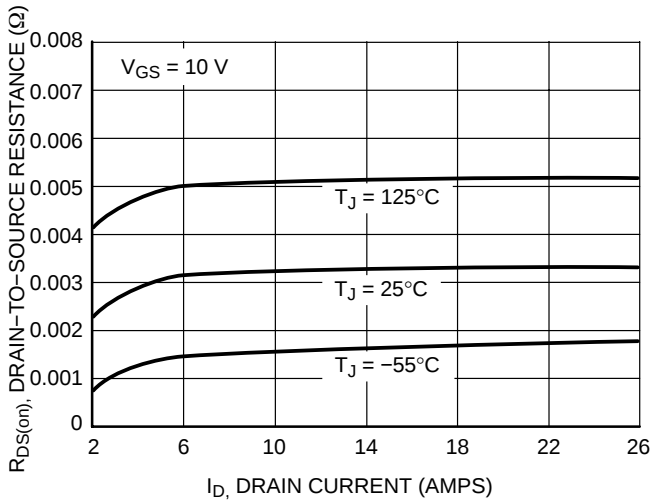


Figure 3. On-Resistance vs. Drain Current and Temperature

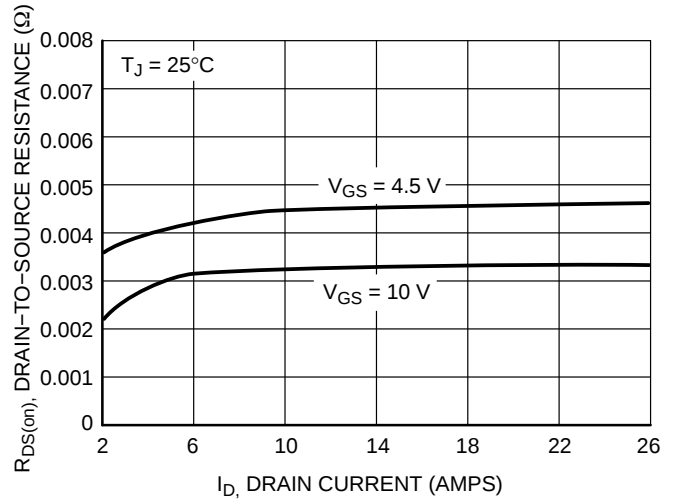


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

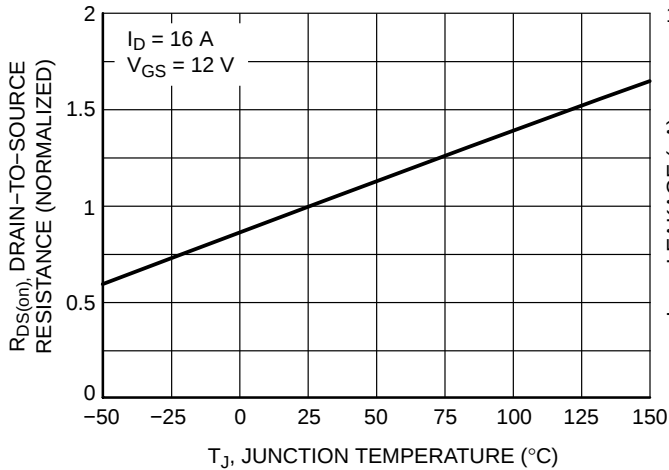


Figure 5. On-Resistance Variation with Temperature

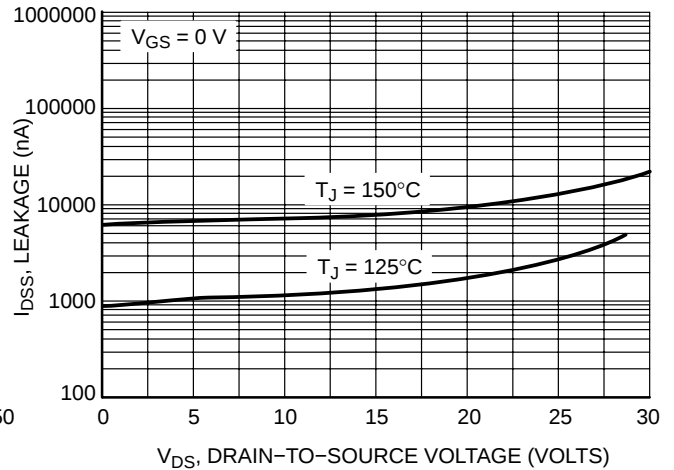


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL PERFORMANCE CURVES

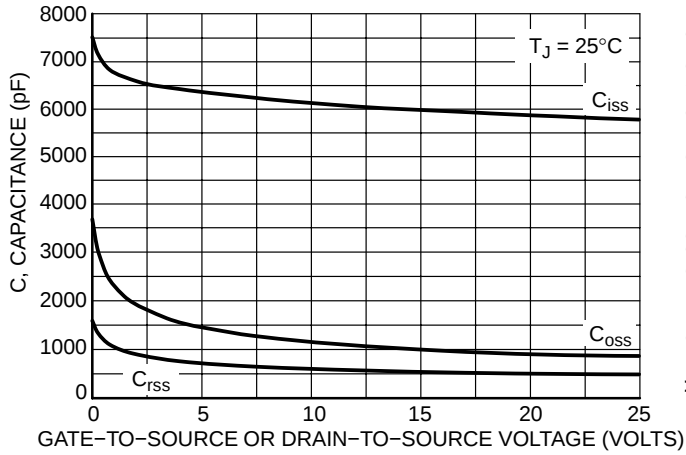


Figure 7. Capacitance Variation

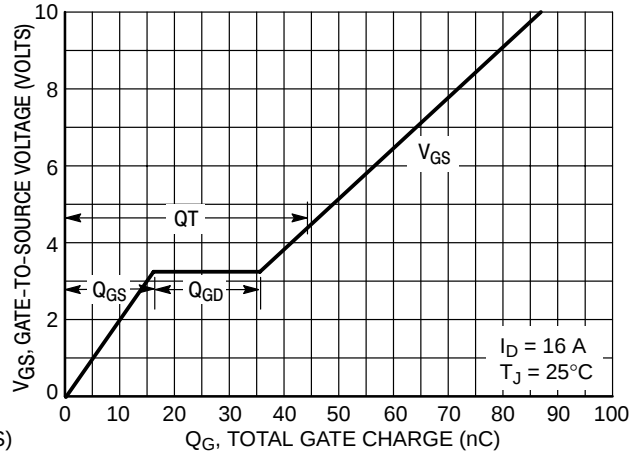


Figure 8. Gate-To-Source and Drain-To-Source Voltage vs. Total Charge

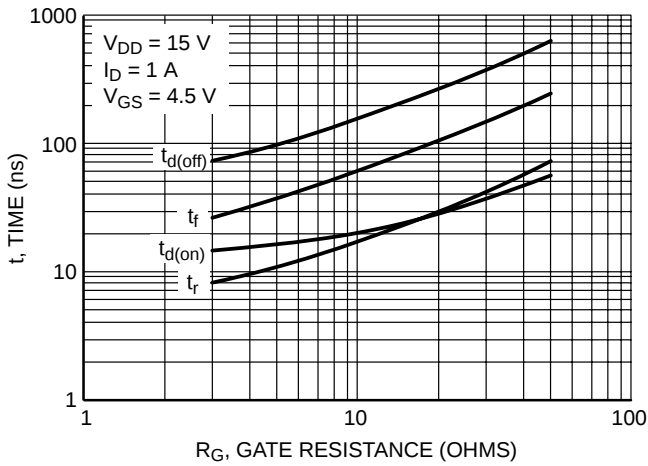


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

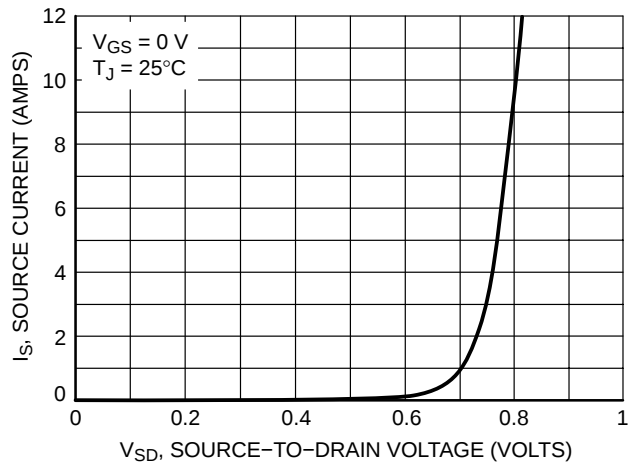


Figure 10. Diode Forward Voltage vs. Current

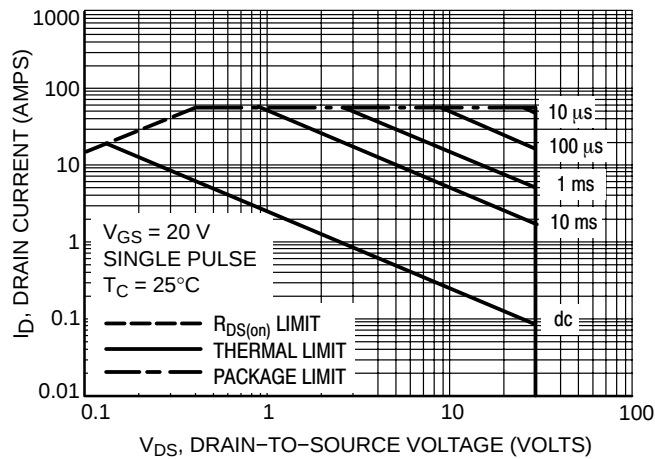
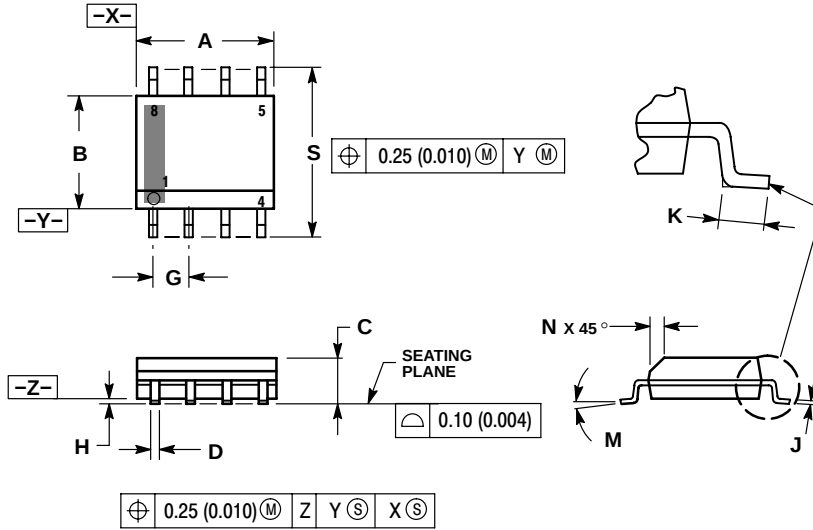


Figure 11. Maximum Rated Forward Biased Safe Operating Area

# NTMS4107N

## PACKAGE DIMENSIONS

SO-8  
CASE 751-07  
ISSUE AG



### NOTES:

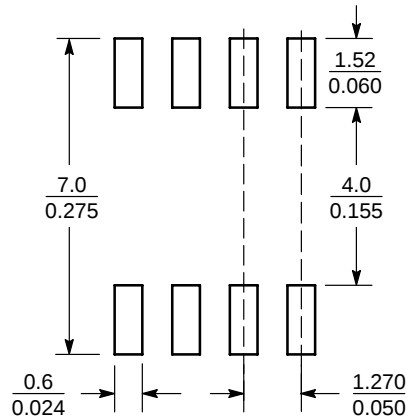
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. 751-01 THRU 751-06 ARE OBSOLETE. NEW STANDARD IS 751-07.

| DIM | MILLIMETERS |      | INCHES    |       |
|-----|-------------|------|-----------|-------|
|     | MIN         | MAX  | MIN       | MAX   |
| A   | 4.80        | 5.00 | 0.189     | 0.197 |
| B   | 3.80        | 4.00 | 0.150     | 0.157 |
| C   | 1.35        | 1.75 | 0.053     | 0.069 |
| D   | 0.33        | 0.51 | 0.013     | 0.020 |
| G   | 1.27 BSC    |      | 0.050 BSC |       |
| H   | 0.10        | 0.25 | 0.004     | 0.010 |
| J   | 0.19        | 0.25 | 0.007     | 0.010 |
| K   | 0.40        | 1.27 | 0.016     | 0.050 |
| M   | 0°          | 8°   | 0°        | 8°    |
| N   | 0.25        | 0.50 | 0.010     | 0.020 |
| S   | 5.80        | 6.20 | 0.228     | 0.244 |

### STYLE 12:

- PIN 1: SOURCE  
2: SOURCE  
3: SOURCE  
4: GATE  
5: DRAIN  
6: DRAIN  
7: DRAIN  
8: DRAIN

## SOLDERING FOOTPRINT\*



SCALE 6:1 (mm/inches)

\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

**ON Semiconductor** and  are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

## PUBLICATION ORDERING INFORMATION

### LITERATURE FULFILLMENT:

Literature Distribution Center for ON Semiconductor  
P.O. Box 61312, Phoenix, Arizona 85082-1312 USA  
**Phone:** 480-829-7710 or 800-344-3860 Toll Free USA/Canada  
**Fax:** 480-829-7709 or 800-344-3867 Toll Free USA/Canada  
**Email:** [orderlit@onsemi.com](mailto:orderlit@onsemi.com)

**N. American Technical Support:** 800-282-9855 Toll Free  
USA/Canada

**Japan:** ON Semiconductor, Japan Customer Focus Center  
2-9-1 Kamimeguro, Meguro-ku, Tokyo, Japan 153-0051  
**Phone:** 81-3-5773-3850

**ON Semiconductor Website:** <http://onsemi.com>

**Order Literature:** <http://www.onsemi.com/litorder>

For additional information, please contact your  
local Sales Representative.