# NTMS4920N

## MOSFET – Power, N-Channel, SO-8
## 30 V, 17 A

### Features

- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Capacitance to Minimize Driver Losses
- Optimized Gate Charge to Minimize Switching Losses
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant

### Applications

- DC−DC Converters
- Points of Loads
- Power Load Switch
- Motor Controls

**MAXIMUM RATINGS** ($T_J$ = 25°C unless otherwise stated)

| Parameter | | | Symbol | Value | Unit |
|---|---|---|---|---|---|
| Drain−to−Source Voltage | | | $V_{DSS}$ | 30 | V |
| Gate−to−Source Voltage | | | $V_{GS}$ | ±20 | V |
| Continuous Drain Current $R_{\theta JA}$ (Note 1) | Steady State | $T_A$ = 25°C | $I_D$ | 14.1 | A |
| | | $T_A$ = 70°C | | 11.3 | |
| Power Dissipation $R_{\theta JA}$ (Note 1) | Steady State | $T_A$ = 25°C | $P_D$ | 1.46 | W |
| Continuous Drain Current $R_{\theta JA}$ (Note 2) | Steady State | $T_A$ = 25°C | $I_D$ | 10.6 | A |
| | | $T_A$ = 70°C | | 8.5 | |
| Power Dissipation $R_{\theta JA}$ (Note 2) | | $T_A$ = 25°C | $P_D$ | 0.82 | W |
| Continuous Drain Current $R_{\theta JA}$, t ≤ 10 s (Note 1) | Steady State | $T_A$ = 25°C | $I_D$ | 17 | A |
| | | $T_A$ = 70°C | | 13.6 | |
| Power Dissipation $R_{\theta JA}$, t ≤ 10 s(Note 1) | Steady State | $T_A$ = 25°C | $P_D$ | 2.12 | W |
| Pulsed Drain Current | $T_A$ = 25°C, $t_p$ = 10 μs | | $I_{DM}$ | 136 | A |
| Operating Junction and Storage Temperature | | | $T_J$, $T_{stg}$ | −55 to 150 | °C |
| Source Current (Body Diode) | | | $I_S$ | 2.1 | A |
| Single Pulse Drain−to−Source Avalanche Energy ($T_J$ = 25°C, $V_{DD}$ = 30 V, $V_{GS}$ = 10 V, $I_L$ = 18 $A_{pk}$, L = 1.0 mH, $R_G$ = 25 Ω) | | | $E_{AS}$ | 162 | mJ |
| Lead Temperature for Soldering Purposes (1/8″ from case for 10 s) | | | $T_L$ | 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.

**THERMAL RESISTANCE MAXIMUM RATINGS**

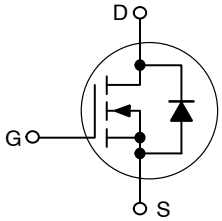
| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Junction−to−Ambient – Steady State (Note 1) | $R_{\theta JA}$ | 85.5 | °C/W |
| Junction−to−Ambient – t ≤ 10 s (Note 1) | $R_{\theta JA}$ | 59 | |
| Junction−to−Foot (Drain) | $R_{\theta JF}$ | 25 | |
| Junction−to−Ambient – Steady State (Note 2) | $R_{\theta JA}$ | 152 | |

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| $V_{(BR)DSS}$ | $R_{DS(ON)}$ MAX | $I_D$ MAX |
|---|---|---|
| 30 V | 4.3 mΩ @ 10 V | 17 A |
| | 5.7 mΩ @ 4.5 V | |

**N−Channel**

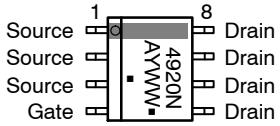





1

**SO−8**
**CASE 751**
**STYLE 12**

**MARKING DIAGRAM/ PIN ASSIGNMENT**




Top View

4920N = 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† |
|---|---|---|
| NTMS4920NR2G | SO−8 (Pb−Free) | 2500/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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1. Surfacemounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces).
2. Surfacemounted on FR4 board using the minimum recommended pad size.

**ELECTRICAL CHARACTERISTICS** ($T_J$ = 25°C unless otherwise specified)

| Parameter | Symbol | Test Condition | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | | |
| Drain−to−Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS}$ = 0 V, $I_D$ = 250 μA | | 30 | | | V |
| Drain−to−Source Breakdown Voltage Temperature Coefficient | $V_{(BR)DSS}/T_J$ | | | | 12.2 | | mV/°C |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{GS}$ = 0 V, $V_{DS}$ = 24 V | $T_J$ = 25°C | | | 1.0 | μA |
| | | | $T_J$ = 125°C | | | 10 | |
| Gate−to−Source Leakage Current | $I_{GSS}$ | $V_{DS}$ = 0 V, $V_{GS}$ = ±20 V | | | | ±100 | nA |
| **ON CHARACTERISTICS** (Note 3) | | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | $V_{GS}$ = $V_{DS}$, $I_D$ = 250 μA | | 1.0 | | 2.5 | V |
| Negative Threshold Temperature Coefficient | $V_{GS(TH)}/T_J$ | | | | 5.4 | | mV/°C |
| Drain−to−Source On Resistance | $R_{DS(on)}$ | $V_{GS}$ = 10 V, $I_D$ = 7.5 A | | | 3.6 | 4.3 | mΩ |
| | | $V_{GS}$ = 4.5 V, $I_D$ = 6.5 A | | | 4.6 | 5.7 | |
| Forward Transconductance | $g_{FS}$ | $V_{DS}$ = 1.5 V, $I_D$ = 7.5 A | | | 30.8 | | S |
| **CHARGES, CAPACITANCES AND GATE RESISTANCE** | | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{GS}$ = 0 V, f = 1.0 MHz, $V_{DS}$ = 25 V | | | 4068 | | pF |
| Output Capacitance | $C_{oss}$ | | | | 1170 | | |
| Reverse Transfer Capacitance | $C_{rss}$ | | | | 41 | | |
| Total Gate Charge | $Q_{G(TOT)}$ | $V_{GS}$ = 4.5 V, $V_{DS}$ = 15 V, $I_D$ = 7.5 A | | | 26.3 | | nC |
| Threshold Gate Charge | $Q_{G(TH)}$ | | | | 6.4 | | |
| Gate−to−Source Charge | $Q_{GS}$ | | | | 10.4 | | |
| Gate−to−Drain Charge | $Q_{GD}$ | | | | 3.8 | | |
| Total Gate Charge | $Q_{G(TOT)}$ | $V_{GS}$ = 10 V, $V_{DS}$ = 15 V, $I_D$ = 7.5 A | | | 58.9 | | nC |
| **SWITCHING CHARACTERISTICS** (Note 4) | | | | | | | |
| Turn−On Delay Time | $t_{d(on)}$ | $V_{GS}$ = 10 V, $V_{DS}$ = 15 V, $I_D$ = 1.0 A, $R_G$ = 6.0 Ω | | | 15.3 | | ns |
| Rise Time | $t_r$ | | | | 4.7 | | |
| Turn−Off Delay Time | $t_{d(off)}$ | | | | 68.6 | | |
| Fall Time | $t_f$ | | | | 42.2 | | |
| **DRAIN−SOURCE DIODE CHARACTERISTICS** | | | | | | | |
| Forward Diode Voltage | $V_{SD}$ | $V_{GS}$ = 0 V, $I_S$ = 2.0 A | $T_J$ = 25°C | | 0.7 | 1.0 | V |
| | | | $T_J$ = 125°C | | 0.53 | | |
| Reverse Recovery Time | $t_{RR}$ | $V_{GS}$ = 0 V, $d_{IS}/d_t$ = 100 A/μs, $I_S$ = 2.0 A | | | 50.3 | | ns |
| Charge Time | $t_a$ | | | | 25.7 | | |
| Discharge Time | $t_b$ | | | | 24.6 | | |
| Reverse Recovery Charge | $Q_{RR}$ | | | | 65 | | nC |
| **PACKAGE PARASITIC VALUES** | | | | | | | |
| Source Inductance | $L_S$ | $T_A$ = 25°C | | | 0.66 | | nH |
| Drain Inductance | $L_D$ | | | | 0.2 | | |
| Gate Inductance | $L_G$ | | | | 1.5 | | |
| Gate Resistance | $R_G$ | | | | 0.4 | 1.0 | Ω |

3. Pulse Test: pulse width = 300 μs, duty cycle ≤ 2%.
4. Switching characteristics are independent of operating junction temperatures.

## TYPICAL PERFORMANCE CURVES

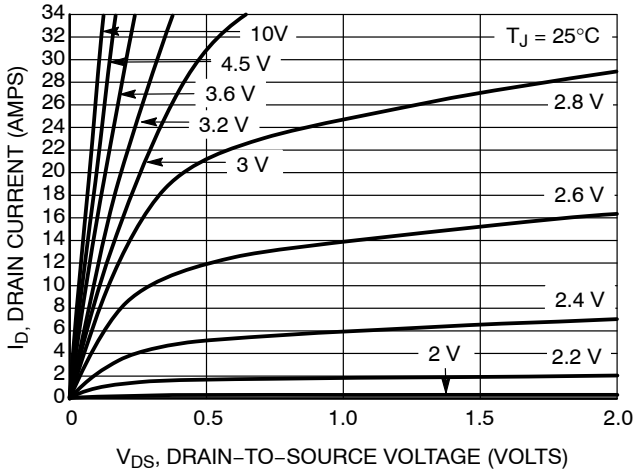



**Figure 1. On−Region Characteristics**

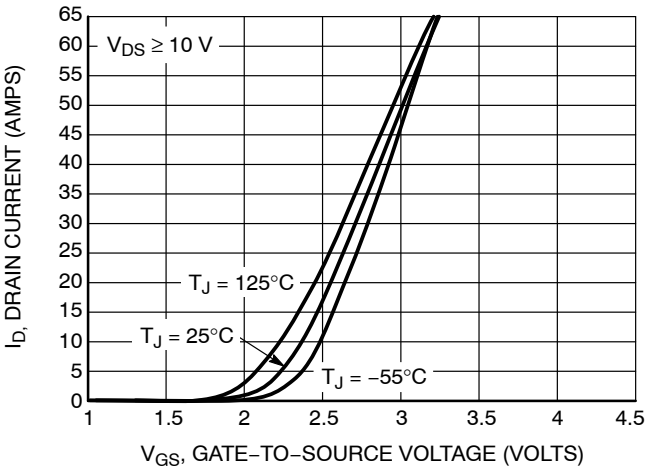



**Figure 2. Transfer Characteristics**

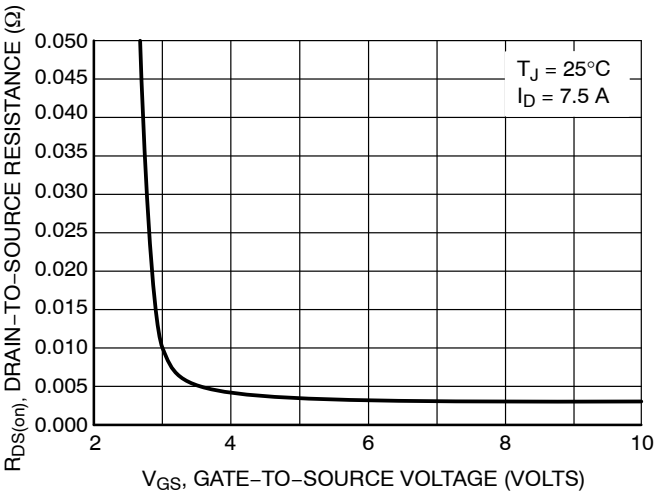



**Figure 3. On−Resistance vs. Gate−to−Source Voltage**

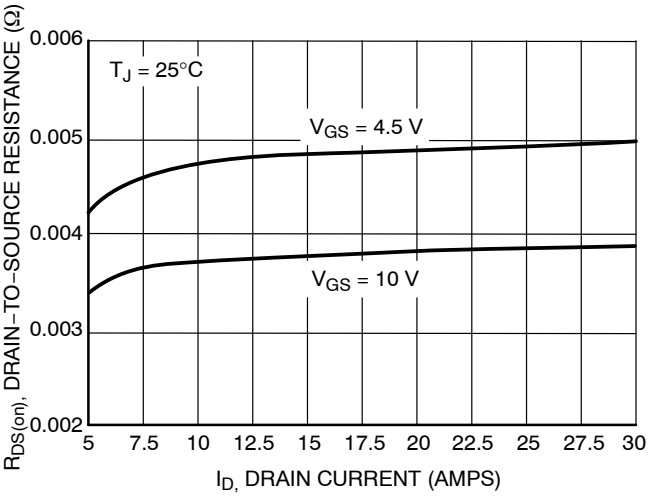



**Figure 4. On−Resistance vs. Drain Current and Gate Voltage**

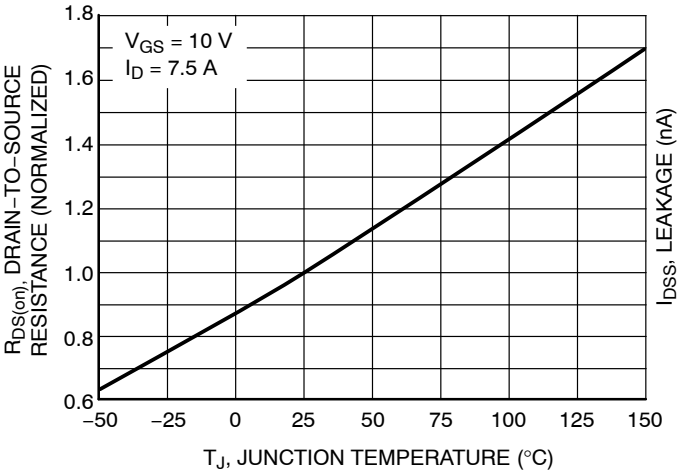



**Figure 5. On−Resistance Variation with Temperature**

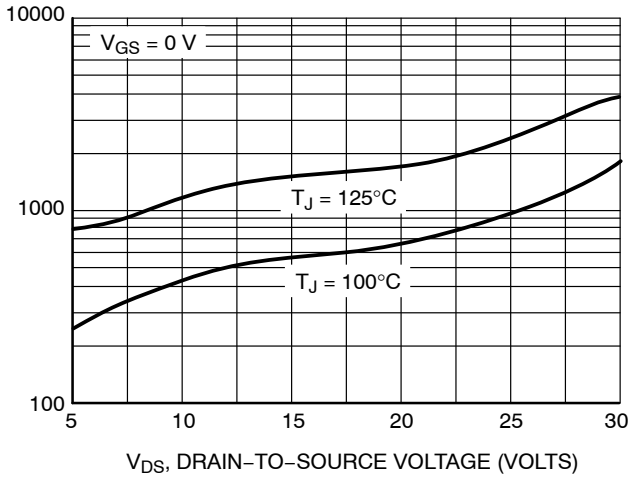



**Figure 6. Drain−to−Source Leakage Current vs. Voltage**

## TYPICAL PERFORMANCE CURVES

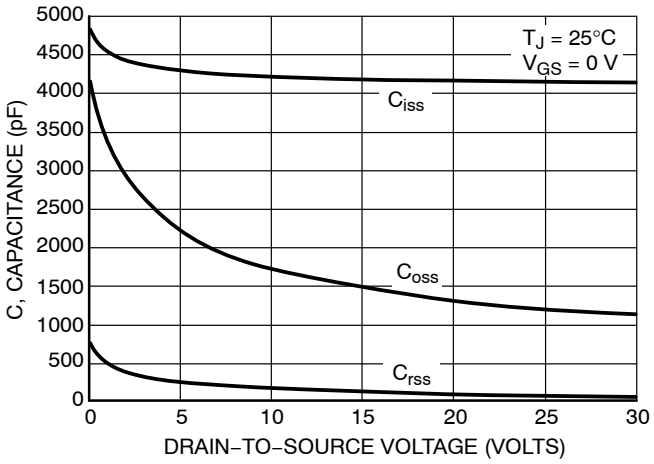



**Figure 7. Capacitance Variation**

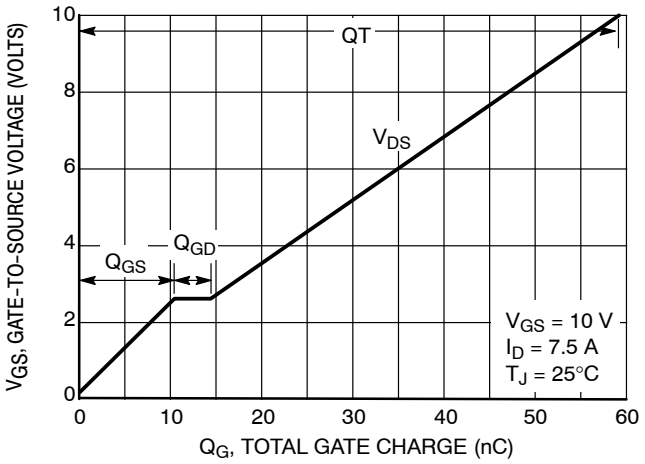



**Figure 8. Gate−To−Source and Drain−To−Source Voltage vs. Total Charge**

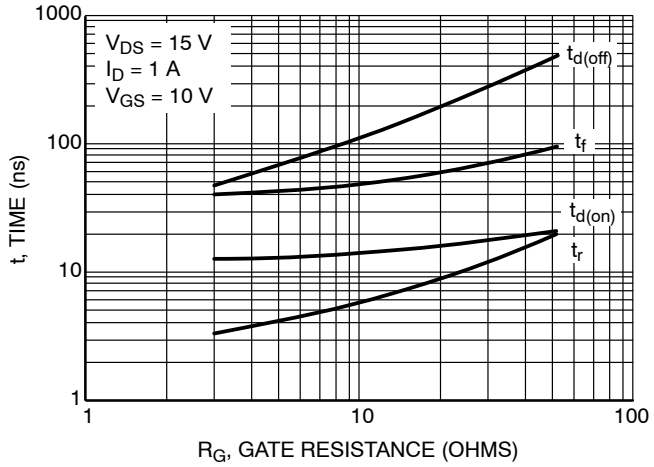



**Figure 9. Resistive Switching Time Variation vs. Gate Resistance**

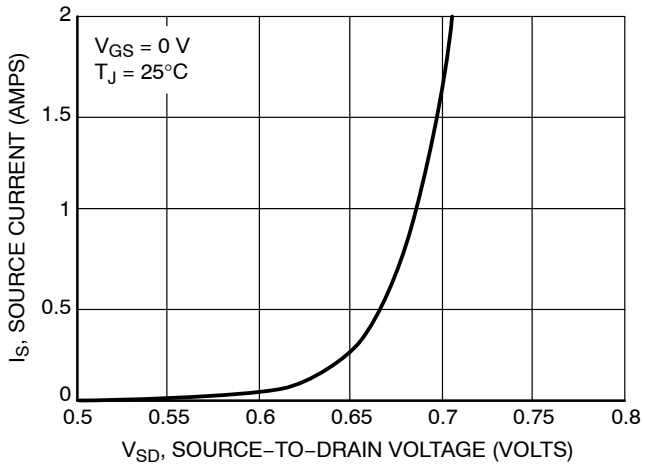



**Figure 10. Diode Forward Voltage vs. Current**

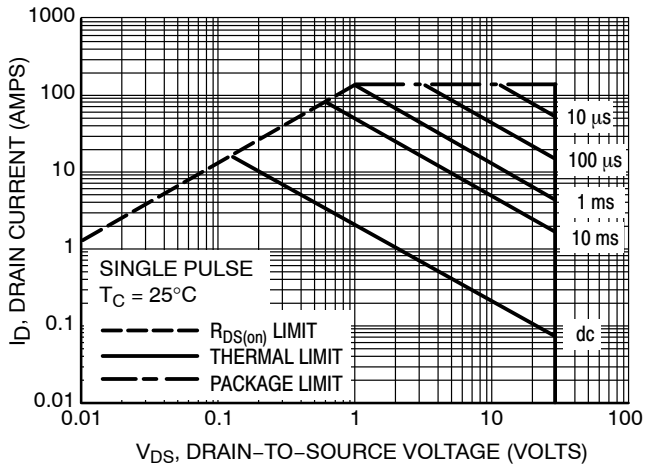



**Figure 11. Maximum Rated Forward Biased Safe Operating Area**

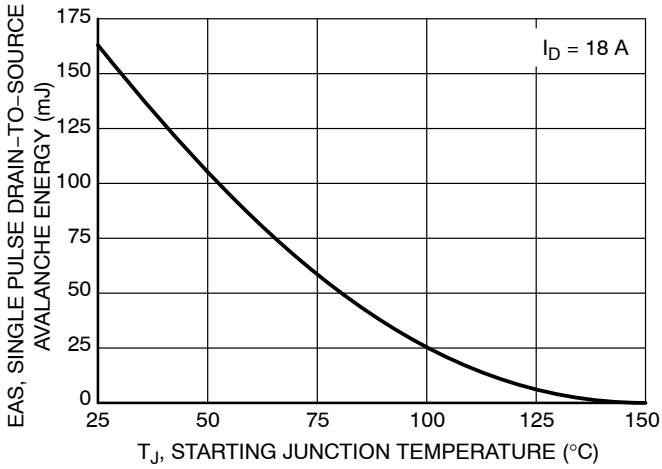
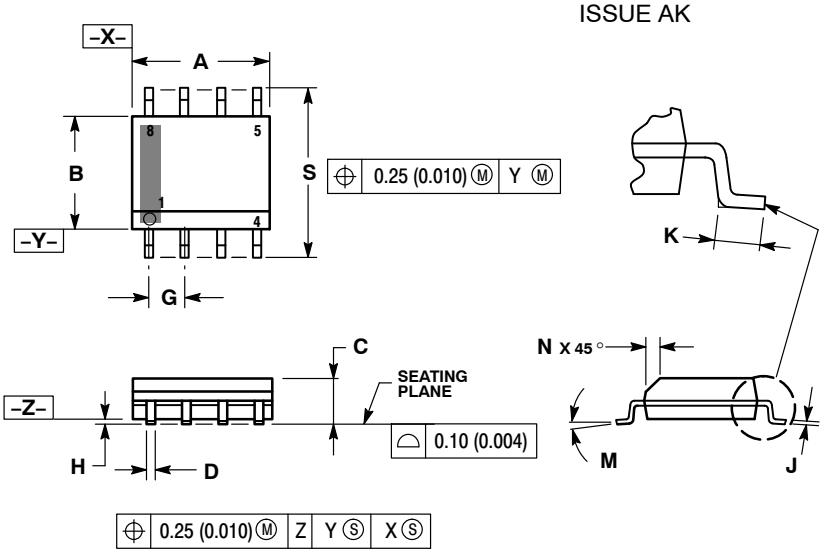



**Figure 12. Maximum Avalanche Energy vs. Starting Junction Temperature**

## PACKAGE DIMENSIONS

**SOIC−8**
CASE 751−07
ISSUE AK

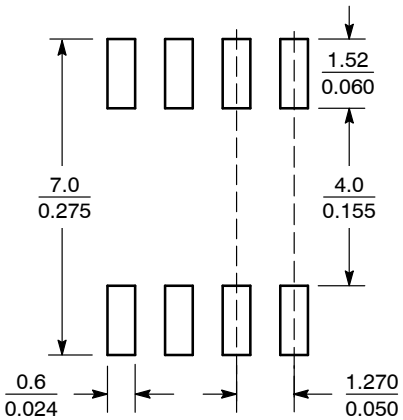



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005)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

| | MILLIMETERS | | INCHES | |
|---|---|---|---|---|
| DIM | 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.

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