

NTMS10P02R2

Power MOSFET -10 Amps, -20 Volts P-Channel Enhancement-Mode Single SO-8 Package

Features

- Ultra Low $R_{DS(on)}$
- Higher Efficiency Extending Battery Life
- Logic Level Gate Drive
- Miniature SO-8 Surface Mount Package
- Diode Exhibits High Speed, Soft Recovery
- Avalanche Energy Specified
- SO-8 Mounting Information Provided

Applications

- Power Management in Portable and Battery-Powered Products, i.e.: Cellular and Cordless Telephones and PCMCIA Cards

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

| Rating | Symbol | Value | Unit |
|---|-----------------|----------------|--------------------|
| Drain-to-Source Voltage | V_{DSS} | -20 | Vdc |
| Gate-to-Source Voltage - Continuous | V_{GS} | ± 12 | Vdc |
| Thermal Resistance - Junction-to-Ambient (Note 1.) | $R_{\theta JA}$ | 50 | $^\circ\text{C/W}$ |
| Total Power Dissipation @ $T_A = 25^\circ\text{C}$ | P_D | 2.5 | W |
| Continuous Drain Current @ 25°C | I_D | -10 | A |
| Continuous Drain Current @ 70°C | I_D | -8.0 | A |
| Maximum Operating Power Dissipation | P_D | 0.6 | W |
| Maximum Operating Drain Current | I_D | -5.5 | A |
| Pulsed Drain Current (Note 3.) | I_{DM} | -50 | A |
| Thermal Resistance - Junction-to-Ambient (Note 2.) | $R_{\theta JA}$ | 80 | $^\circ\text{C/W}$ |
| Total Power Dissipation @ $T_A = 25^\circ\text{C}$ | P_D | 1.6 | W |
| Continuous Drain Current @ 25°C | I_D | -8.8 | A |
| Continuous Drain Current @ 70°C | I_D | -6.4 | A |
| Maximum Operating Power Dissipation | P_D | 0.4 | W |
| Maximum Operating Drain Current | I_D | -4.5 | A |
| Pulsed Drain Current (Note 3.) | I_{DM} | -44 | A |
| Operating and Storage Temperature Range | T_J, T_{stg} | -55 to +150 | $^\circ\text{C}$ |
| Single Pulse Drain-to-Source Avalanche Energy - Starting $T_J = 25^\circ\text{C}$ ($V_{DD} = -20$ Vdc, $V_{GS} = -4.5$ Vdc, Peak $I_L = 5.0$ Apk, $L = 40$ mH, $R_G = 25 \Omega$) | E_{AS} | 500 | mJ |
| Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds | T_L | 260 | $^\circ\text{C}$ |

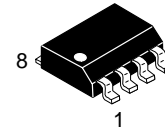
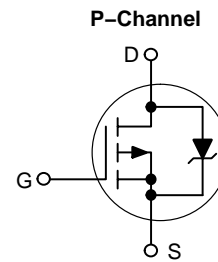
1. Mounted onto a 2" square FR-4 Board (1" sq. Cu 0.06" thick single sided), $t = 10$ seconds.
2. Mounted onto a 2" square FR-4 Board (1" sq. Cu 0.06" thick single sided), $t =$ steady state.
3. Pulse Test: Pulse Width < 300 μs , Duty Cycle < 2%.



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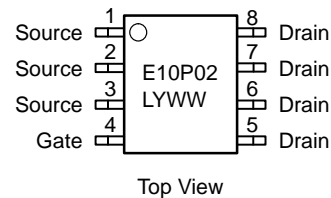
<http://onsemi.com>

**-10 AMPERES
-20 VOLTS
14 m Ω @ $V_{GS} = -4.5$ V**



**SO-8
CASE 751
STYLE 12**

MARKING DIAGRAM & PIN ASSIGNMENT



E10P02 = Device Code
L = Assembly Location
Y = Year
WW = Work Week

ORDERING INFORMATION

| Device | Package | Shipping† |
|-------------|---------|------------------|
| NTMS10P02R2 | SO-8 | 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.

NTMS10P02R2

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted) (Note 4.)

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

OFF CHARACTERISTICS

| | | | | | |
|---|----------------------|----------|------------|--------------|--------------|
| Drain-to-Source Breakdown Voltage (V _{GS} = 0 Vdc, I _D = -250 μAdc) Temperature Coefficient (Positive) | V _{(BR)DSS} | -20 - | - -12.1 | - - | Vdc mV/°C |
| Zero Gate Voltage Drain Current (V _{DS} = -20 Vdc, V _{GS} = 0 Vdc, T _J = 25°C) (V _{DS} = -20 Vdc, V _{GS} = 0 Vdc, T _J = 70°C) | I _{DSS} | - - | - - | -1.0 -5.0 | μAdc |
| Gate-Body Leakage Current (V _{GS} = -12 Vdc, V _{DS} = 0 Vdc) | I _{GSS} | - | - | -100 | nAdc |
| Gate-Body Leakage Current (V _{GS} = +12 Vdc, V _{DS} = 0 Vdc) | I _{GSS} | - | - | 100 | nAdc |

ON CHARACTERISTICS

| | | | | | |
|---|---------------------|-----------|----------------|----------------|--------------|
| Gate Threshold Voltage (V _{DS} = V _{GS} , I _D = -250 μAdc) Temperature Coefficient (Negative) | V _{GS(th)} | -0.6 - | -0.88 2.8 | -1.20 - | Vdc mV/°C |
| Static Drain-to-Source On-State Resistance (V _{GS} = -4.5 Vdc, I _D = -10 Adc) (V _{GS} = -2.5 Vdc, I _D = -8.8 Adc) | R _{DS(on)} | - - | 0.012 0.017 | 0.014 0.020 | Ω |
| Forward Transconductance (V _{DS} = -10 Vdc, I _D = -10 Adc) | g _{FS} | - | 30 | - | Mhos |

DYNAMIC CHARACTERISTICS

| | | | | | | |
|------------------------------|--|------------------|---|------|------|----|
| Input Capacitance | (V _{DS} = -16 Vdc, V _{GS} = 0 Vdc, f = 1.0 MHz) | C _{iss} | - | 3100 | 3640 | pF |
| Output Capacitance | | C _{OSS} | - | 1100 | 1670 | |
| Reverse Transfer Capacitance | | C _{rSS} | - | 475 | 1010 | |

SWITCHING CHARACTERISTICS (Notes 5. & 6.)

| | | | | | | |
|---------------------|--|---------------------|---|-----|-----|----|
| Turn-On Delay Time | (V _{DD} = -10 Vdc, I _D = -1.0 Adc, V _{GS} = -4.5 Vdc, R _G = 6.0 Ω) | t _{d(on)} | - | 25 | 35 | ns |
| Rise Time | | t _r | - | 40 | 65 | |
| Turn-Off Delay Time | | t _{d(off)} | - | 110 | 190 | |
| Fall Time | | t _f | - | 110 | 190 | |
| Turn-On Delay Time | (V _{DD} = -10 Vdc, I _D = -10 Adc, V _{GS} = -4.5 Vdc, R _G = 6.0 Ω) | t _{d(on)} | - | 25 | - | ns |
| Rise Time | | t _r | - | 100 | - | |
| Turn-Off Delay Time | | t _{d(off)} | - | 100 | - | |
| Fall Time | | t _f | - | 125 | - | |
| Total Gate Charge | (V _{DS} = -10 Vdc, V _{GS} = -4.5 Vdc, I _D = -10 Adc) | Q _{tot} | - | 48 | 70 | nC |
| Gate-Source Charge | | Q _{gs} | - | 6.5 | - | |
| Gate-Drain Charge | | Q _{gd} | - | 17 | - | |

BODY-DRAIN DIODE RATINGS (Note 5.)

| | | | | | | |
|--------------------------------|--|-----------------|--------|----------------|-----------|-----|
| Diode Forward On-Voltage | (I _S = -2.1 Adc, V _{GS} = 0 Vdc) (I _S = -2.1 Adc, V _{GS} = 0 Vdc, T _J = 125°C) | V _{SD} | - - | -0.72 -0.60 | -1.2 - | Vdc |
| Diode Forward On-Voltage | (I _S = -10 Adc, V _{GS} = 0 Vdc) (I _S = -10 Adc, V _{GS} = 0 Vdc, T _J = 125°C) | V _{SD} | - - | -0.90 -0.75 | - - | Vdc |
| Reverse Recovery Time | (I _S = -2.1 Adc, V _{GS} = 0 Vdc, di _S /dt = 100 A/μs) | t _{rr} | - | 65 | 100 | ns |
| | | t _a | - | 25 | - | |
| | | t _b | - | 40 | - | |
| Reverse Recovery Stored Charge | | Q _{RR} | - | 0.075 | - | μC |

4. Handling precautions to protect against electrostatic discharge is mandatory.
5. Indicates Pulse Test: Pulse Width = 300 μs max, Duty Cycle = 2%.
6. Switching characteristics are independent of operating junction temperature.

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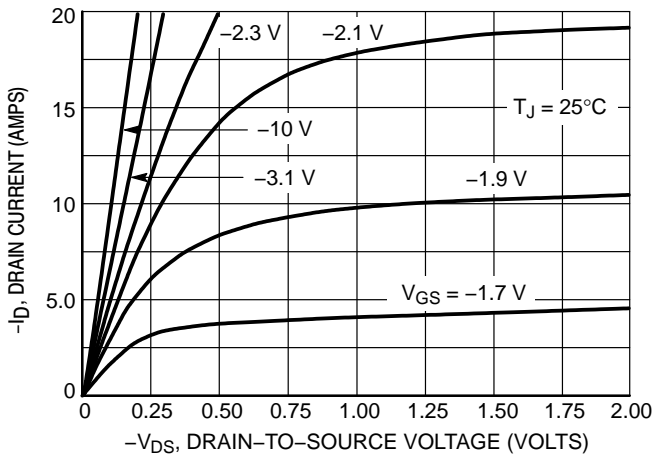


Figure 1. On-Region Characteristics

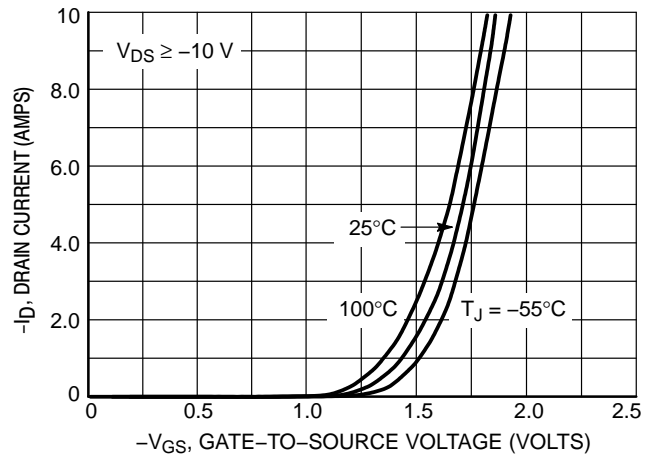


Figure 2. Transfer Characteristics

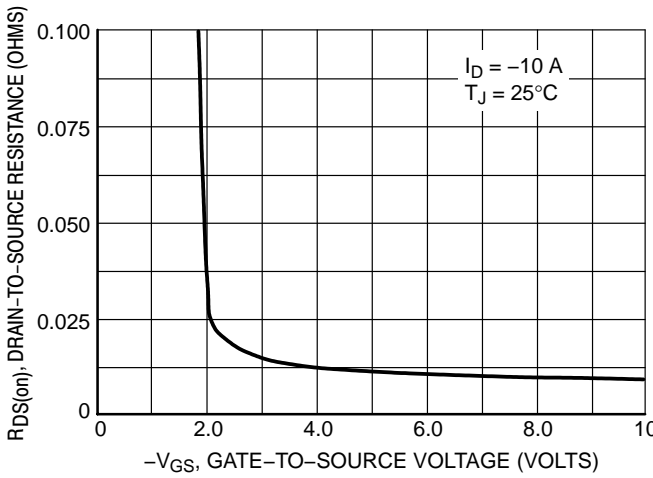


Figure 3. On-Resistance versus Gate-To-Source Voltage

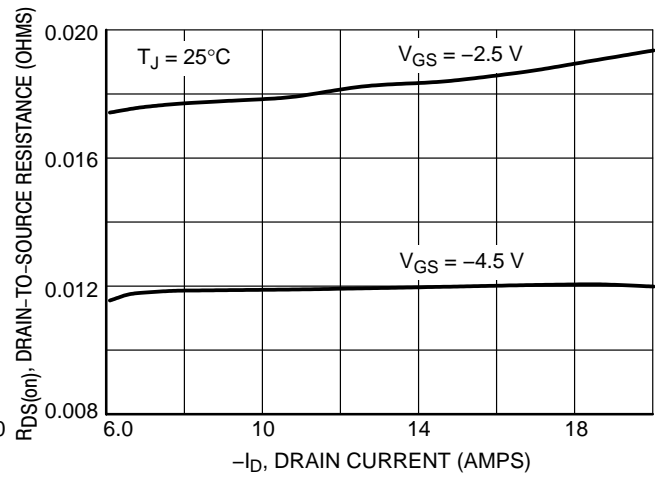


Figure 4. On-Resistance versus Drain Current and Gate Voltage

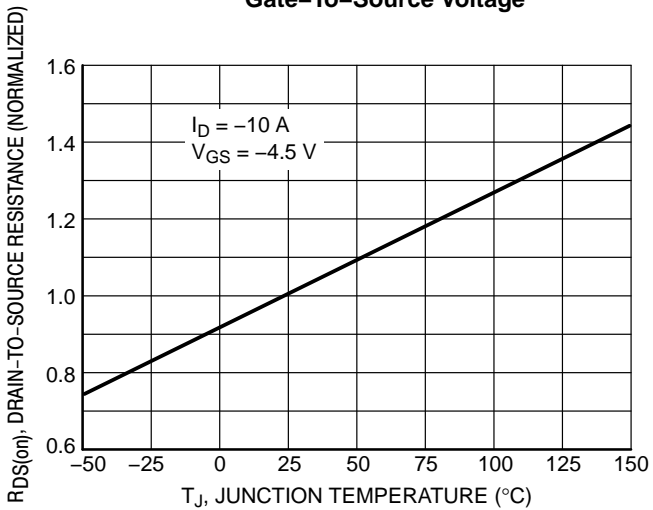


Figure 5. On-Resistance Variation with Temperature

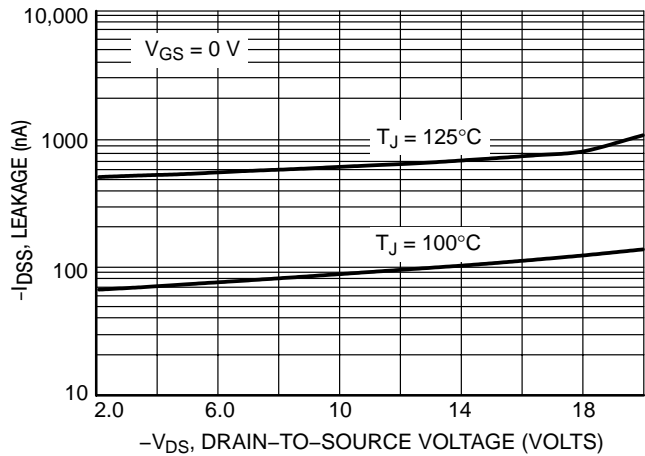


Figure 6. Drain-To-Source Leakage Current versus Voltage

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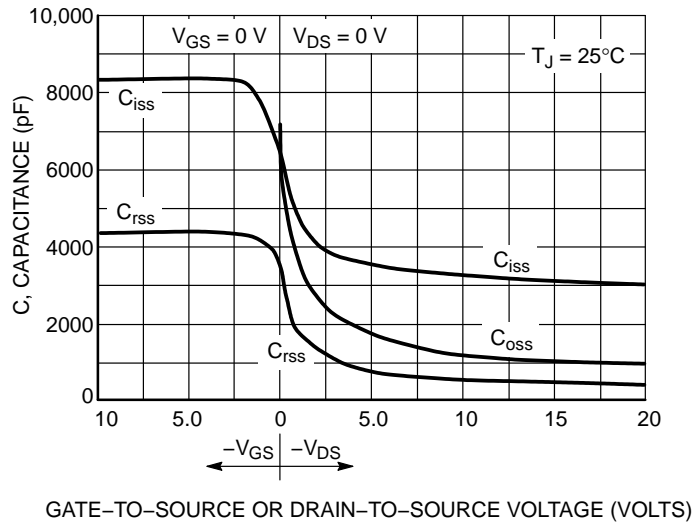


Figure 7. Capacitance Variation

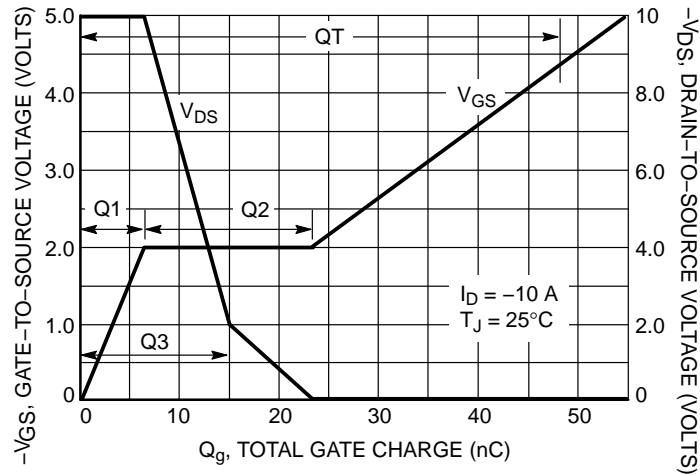


Figure 8. Gate-To-Source and Drain-To-Source Voltage versus Total Charge

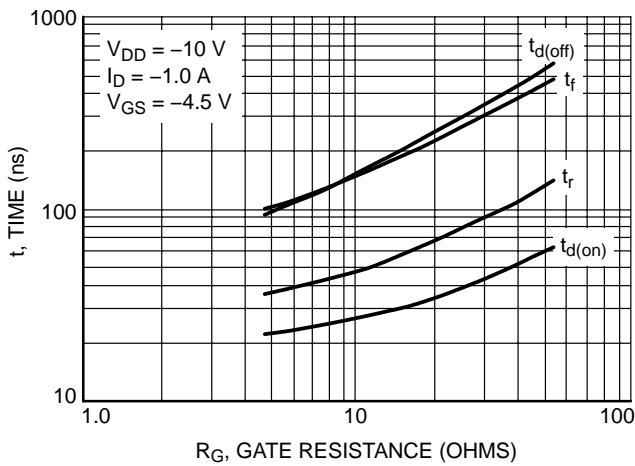


Figure 9. Resistive Switching Time Variation versus Gate Resistance

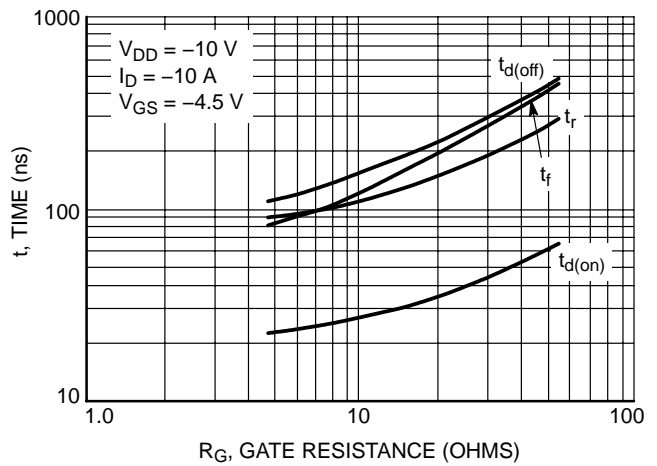


Figure 10. Resistive Switching Time Variation versus Gate Resistance

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DRAIN-TO-SOURCE DIODE CHARACTERISTICS

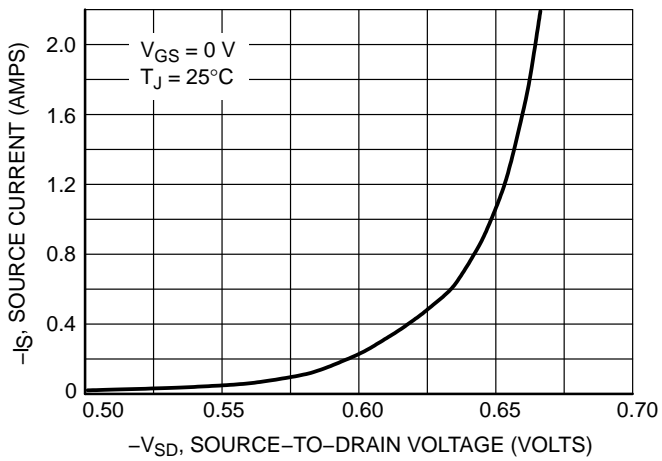


Figure 11. Diode Forward Voltage versus Current

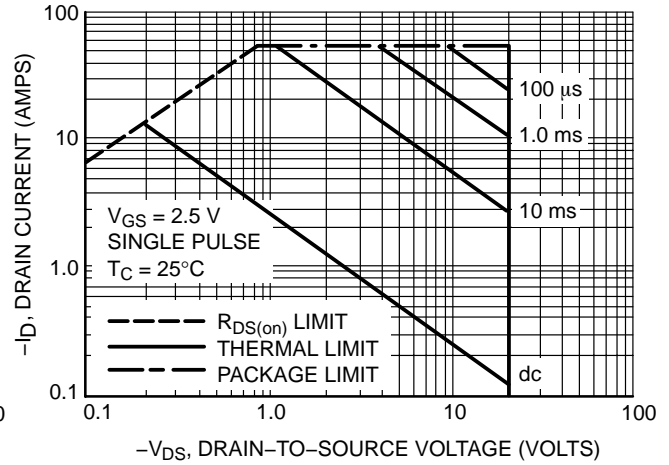


Figure 12. Maximum Rated Forward Biased Safe Operating Area

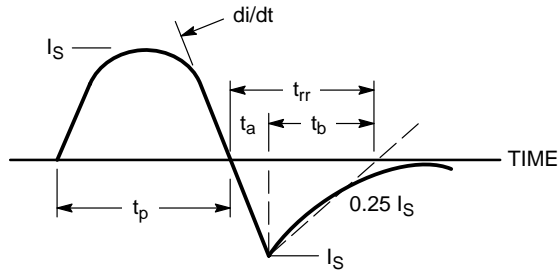


Figure 13. Diode Reverse Recovery Waveform

TYPICAL ELECTRICAL CHARACTERISTICS

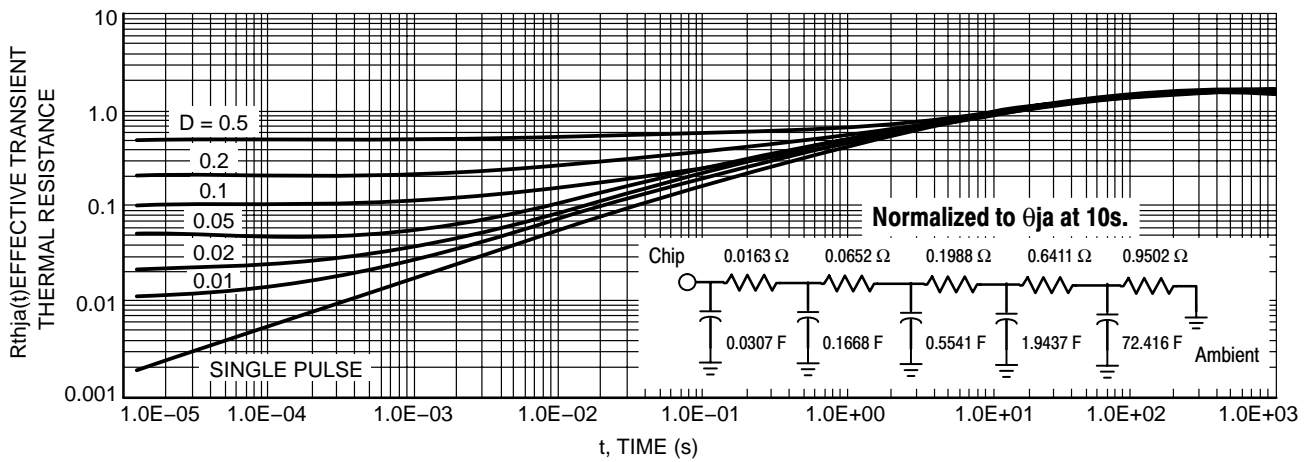
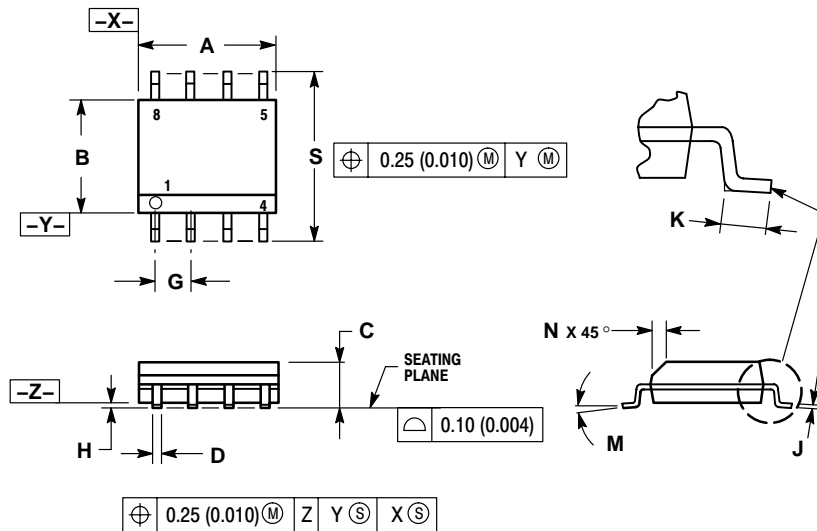


Figure 14. Thermal Response

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PACKAGE DIMENSIONS

SO-8
CASE 751-07
ISSUE AA



NOTES:

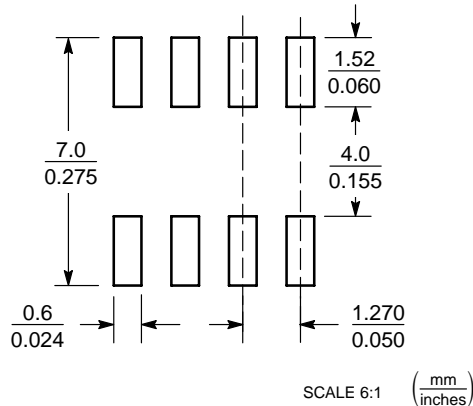
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL 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:

1. SOURCE
2. SOURCE
3. SOURCE
4. GATE
5. DRAIN
6. DRAIN
7. DRAIN
8. DRAIN

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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