

NTMD3P03R2

Power MOSFET -3.05 Amps, -30 Volts

Dual P-Channel SO-8

Features

- High Efficiency Components in a Dual SO-8 Package
- High Density Power MOSFET with Low $R_{DS(on)}$
- Miniature SO-8 Surface Mount Package – Saves Board Space
- Diode Exhibits High Speed with Soft Recovery
- I_{DSS} Specified at Elevated Temperature
- Avalanche Energy Specified
- Mounting Information for the SO-8 Package is Provided

Applications

- DC-DC Converters
- Low Voltage Motor Control
- Power Management in Portable and Battery-Powered Products, i.e.: Computers, Printers, PCMCIA Cards, Cellular & Cordless Telephones

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

| Rating | Symbol | Value | Unit |
|---|-----------------|-------------|--------------------|
| Drain-to-Source Voltage | V_{DSS} | -30 | V |
| Gate-to-Source Voltage – Continuous | V_{GS} | ± 20 | V |
| Thermal Resistance – Junction-to-Ambient (Note 1) | $R_{\theta JA}$ | 171 | $^\circ\text{C/W}$ |
| Total Power Dissipation @ $T_A = 25^\circ\text{C}$ | P_D | 0.73 | W |
| Continuous Drain Current @ 25°C | I_D | -2.34 | A |
| Continuous Drain Current @ 70°C | I_D | -1.87 | A |
| Pulsed Drain Current (Note 4) | I_{DM} | -8.0 | A |
| Thermal Resistance – Junction-to-Ambient (Note 2) | $R_{\theta JA}$ | 100 | $^\circ\text{C/W}$ |
| Total Power Dissipation @ $T_A = 25^\circ\text{C}$ | P_D | 1.25 | W |
| Continuous Drain Current @ 25°C | I_D | -3.05 | A |
| Continuous Drain Current @ 70°C | I_D | -2.44 | A |
| Pulsed Drain Current (Note 4) | I_{DM} | -12 | A |
| Thermal Resistance – Junction-to-Ambient (Note 3) | $R_{\theta JA}$ | 62.5 | $^\circ\text{C/W}$ |
| Total Power Dissipation @ $T_A = 25^\circ\text{C}$ | P_D | 2.0 | W |
| Continuous Drain Current @ 25°C | I_D | -3.86 | A |
| Continuous Drain Current @ 70°C | I_D | -3.1 | A |
| Pulsed Drain Current (Note 4) | I_{DM} | -15 | A |
| Operating and Storage Temperature Range | T_J, T_{stg} | -55 to +150 | $^\circ\text{C}$ |
| Single Pulse Drain-to-Source Avalanche Energy – Starting $T_J = 25^\circ\text{C}$ ($V_{DD} = -30\text{ Vdc}$, $V_{GS} = -4.5\text{ Vdc}$, Peak $I_L = -7.5\text{ Apk}$, $L = 5\text{ mH}$, $R_G = 25\ \Omega$) | E_{AS} | 140 | mJ |
| Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds | T_L | 260 | $^\circ\text{C}$ |

1. Minimum FR-4 or G-10 PCB, $t = \text{Steady State}$.
2. Mounted onto a 2" square FR-4 Board (1" sq. 2 oz Cu 0.06" thick single sided), $t = \text{steady state}$.
3. Mounted onto a 2" square FR-4 Board (1" sq. 2 oz Cu 0.06" thick single sided), $t \leq 10\text{ seconds}$.
4. Pulse Test: Pulse Width = 300 μs , Duty Cycle = 2%.

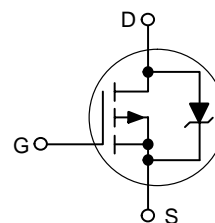


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| V_{DSS} | $R_{DS(on)}$ TYP | I_D MAX |
|-----------|-----------------------|-----------|
| -30 V | 85 m Ω @ -10 V | -3.05 A |

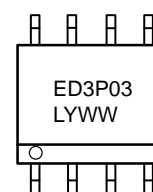
P-Channel



MARKING DIAGRAM

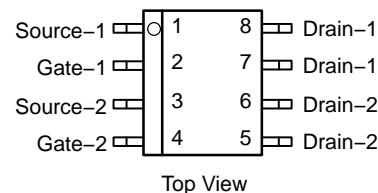


**SO-8
CASE 751
STYLE 11**



ED3P03 = Device Code
L = Assembly Location
Y = Year
WW = Work Week

PIN ASSIGNMENT



Top View

ORDERING INFORMATION

| Device | Package | Shipping† |
|------------|---------|------------------|
| NTMD3P03R2 | 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.

NTMD3P03R2

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted) (Note 5)

| 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} | -30 - | - -30 | - - | Vdc mV/°C |
| Zero Gate Voltage Drain Current (V _{DS} = -24 Vdc, V _{GS} = 0 Vdc, T _J = 25°C) (V _{DS} = -24 Vdc, V _{GS} = 0 Vdc, T _J = 125°C) (V _{DS} = -30 Vdc, V _{GS} = 0 Vdc, T _J = 25°C) | I _{DSS} | - - - | - - - | -1.0 -20 -2.0 | μAdc |
| Gate-Body Leakage Current (V _{GS} = -20 Vdc, V _{DS} = 0 Vdc) | I _{GSS} | - | - | -100 | nAdc |
| Gate-Body Leakage Current (V _{GS} = +20 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)} | -1.0 - | -1.7 3.6 | -2.5 - | Vdc |
| Static Drain-to-Source On-State Resistance (V _{GS} = -10 Vdc, I _D = -3.05 Adc) (V _{GS} = -4.5 Vdc, I _D = -1.5 Adc) | R _{DS(on)} | - - | 0.063 0.090 | 0.085 0.125 | Ω |
| Forward Transconductance (V _{DS} = -15 Vdc, I _D = -3.05 Adc) | g _{FS} | - | 5.0 | - | Mhos |

DYNAMIC CHARACTERISTICS

| | | | | | | |
|------------------------------|--|------------------|---|-----|-----|----|
| Input Capacitance | (V _{DS} = -24 Vdc, V _{GS} = 0 Vdc, f = 1.0 MHz) | C _{iss} | - | 520 | 750 | pF |
| Output Capacitance | | C _{oss} | - | 170 | 325 | |
| Reverse Transfer Capacitance | | C _{rss} | - | 70 | 135 | |

SWITCHING CHARACTERISTICS (Notes 6 and 7)

| | | | | | | |
|---------------------|--|---------------------|---|-----|----|----|
| Turn-On Delay Time | (V _{DD} = -24 Vdc, I _D = -3.05 Adc, V _{GS} = -10 Vdc, R _G = 6.0 Ω) | t _{d(on)} | - | 12 | 22 | ns |
| Rise Time | | t _r | - | 16 | 30 | |
| Turn-Off Delay Time | | t _{d(off)} | - | 45 | 80 | |
| Fall Time | | t _f | - | 45 | 80 | |
| Turn-On Delay Time | (V _{DD} = -24 Vdc, I _D = -1.5 Adc, V _{GS} = -4.5 Vdc, R _G = 6.0 Ω) | t _{d(on)} | - | 16 | - | ns |
| Rise Time | | t _r | - | 42 | - | |
| Turn-Off Delay Time | | t _{d(off)} | - | 32 | - | |
| Fall Time | | t _f | - | 35 | - | |
| Total Gate Charge | (V _{DS} = -24 Vdc, V _{GS} = -10 Vdc, I _D = -3.05 Adc) | Q _{tot} | - | 16 | 25 | nC |
| Gate-Source Charge | | Q _{gs} | - | 2.0 | - | |
| Gate-Drain Charge | | Q _{gd} | - | 4.5 | - | |

BODY-DRAIN DIODE RATINGS (Note 6)

| | | | | | | |
|--------------------------------|--|-----------------|--------|----------------|------------|-----|
| Diode Forward On-Voltage | (I _S = -3.05 Adc, V _{GS} = 0 V) (I _S = -3.05 Adc, V _{GS} = 0 V, T _J = 125°C) | V _{SD} | - - | -0.96 -0.78 | -1.25 - | Vdc |
| Reverse Recovery Time | (I _S = -3.05 Adc, V _{GS} = 0 Vdc, di/dt = 100 A/μs) | t _{rr} | - | 34 | - | ns |
| | | t _a | - | 18 | - | |
| | | t _b | - | 16 | - | |
| Reverse Recovery Stored Charge | | Q _{RR} | - | 0.03 | - | μC |

5. Handling precautions to protect against electrostatic discharge is mandatory.

6. Indicates Pulse Test: Pulse Width = 300 μs max, Duty Cycle = 2%.

7. Switching characteristics are independent of operating junction temperature.

TYPICAL ELECTRICAL CHARACTERISTICS

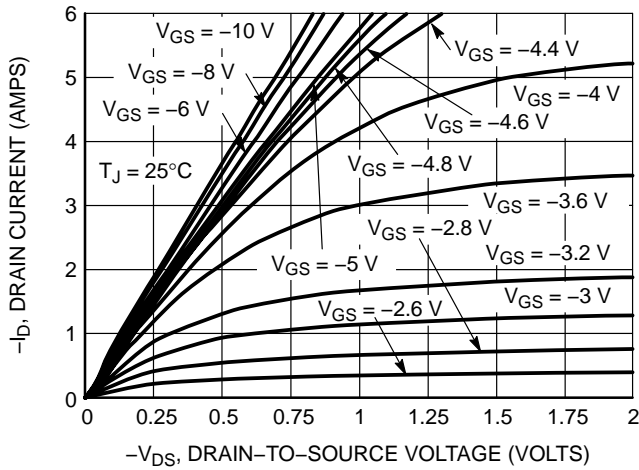


Figure 1. On-Region Characteristics

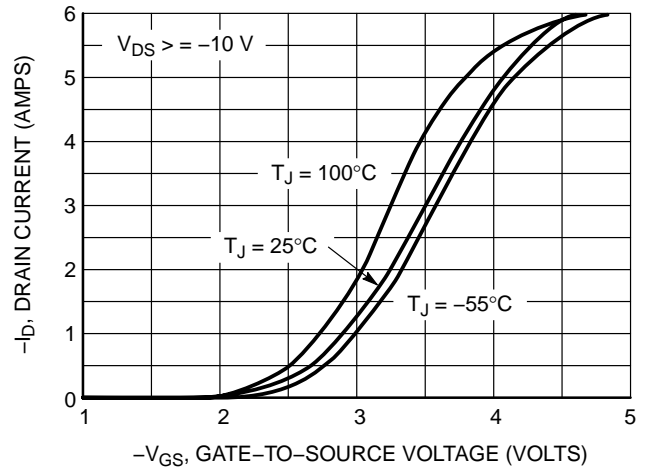


Figure 2. Transfer Characteristics

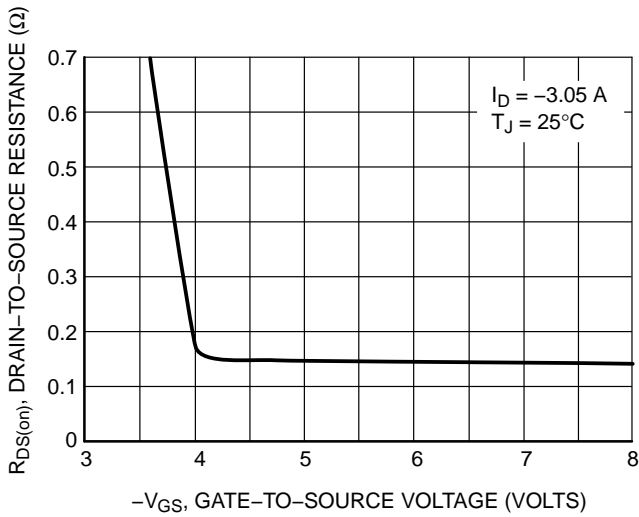


Figure 3. On-Resistance vs. Gate-to-Source Voltage

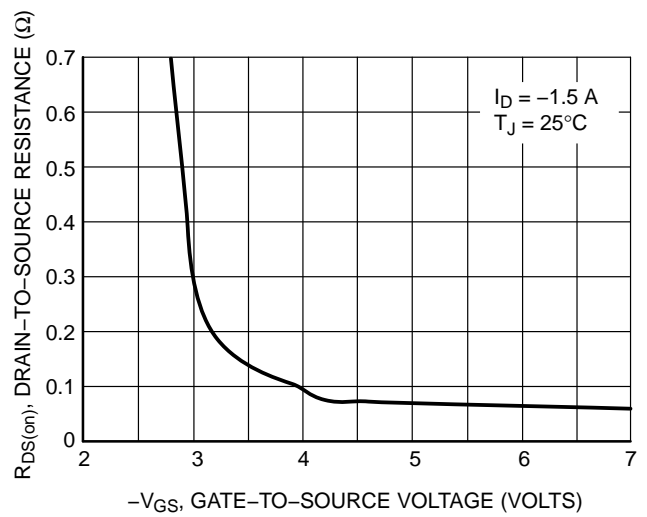


Figure 4. On-Resistance vs. Gate-to-Source Voltage

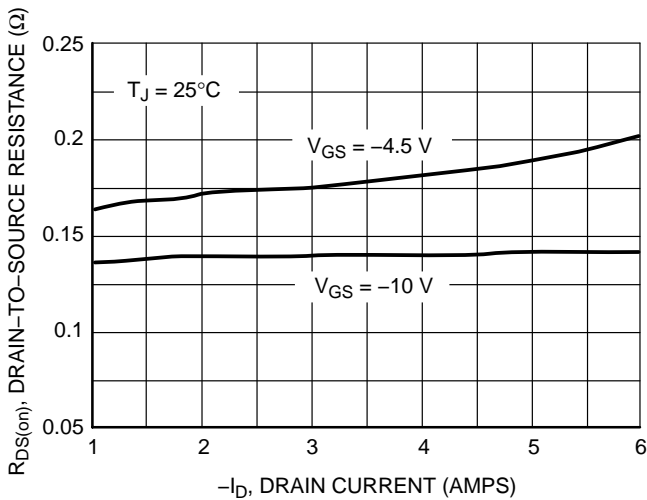


Figure 5. On-Resistance vs. Drain Current and Gate Voltage

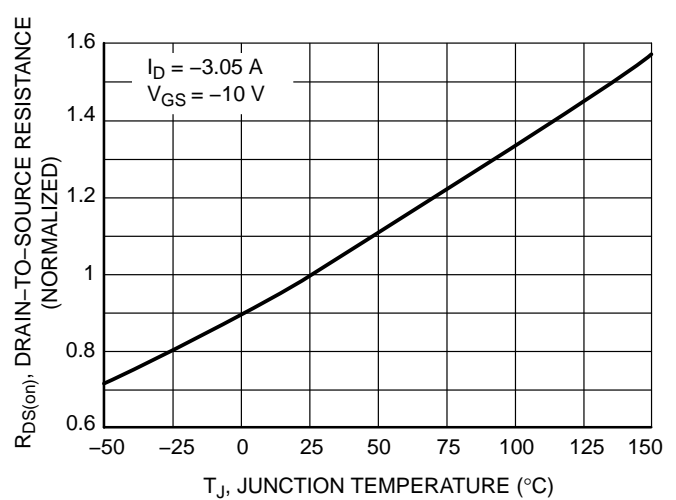


Figure 6. On Resistance Variation with Temperature

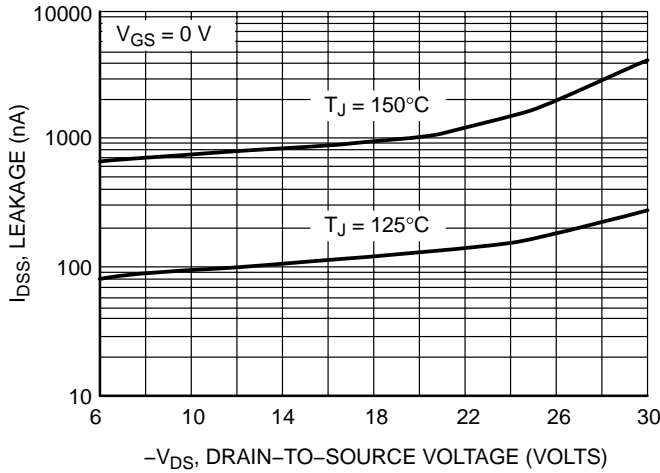


Figure 7. Drain-to-Source Leakage Current vs. Voltage

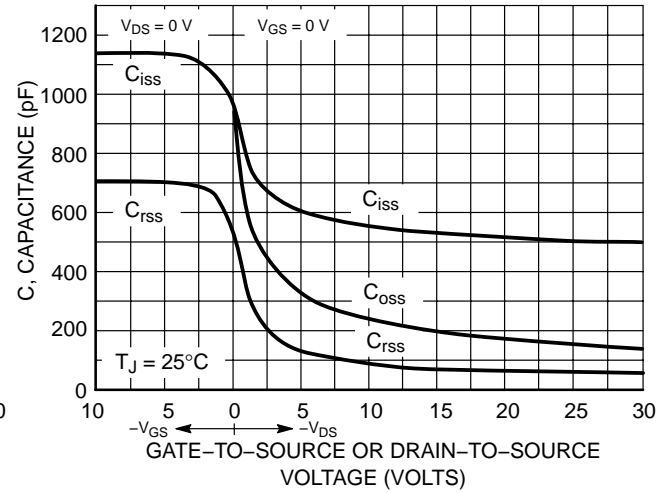


Figure 8. Capacitance Variation

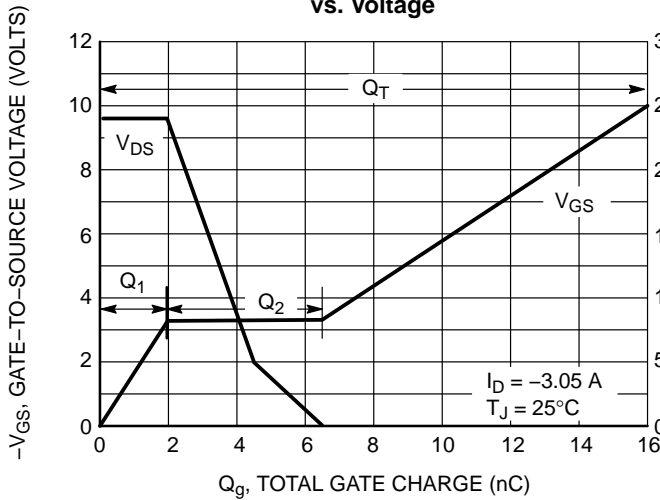


Figure 9. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

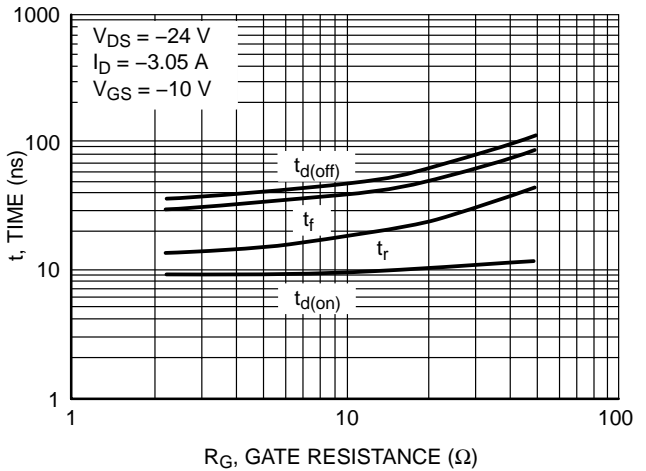


Figure 10. Resistive Switching Time Variation vs. Gate Resistance

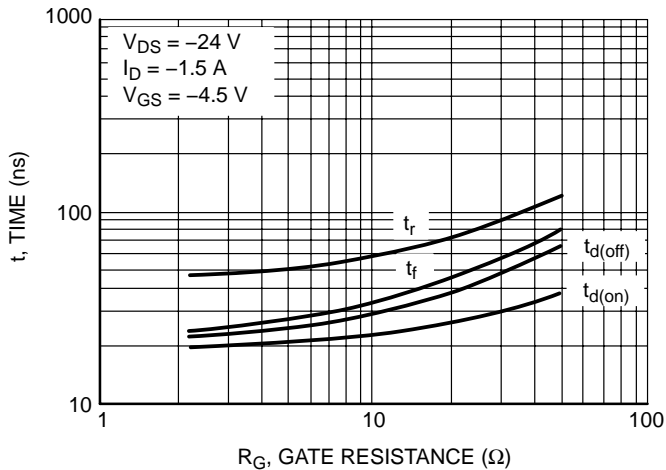


Figure 11. Resistive Switching Time Variation vs. Gate Resistance

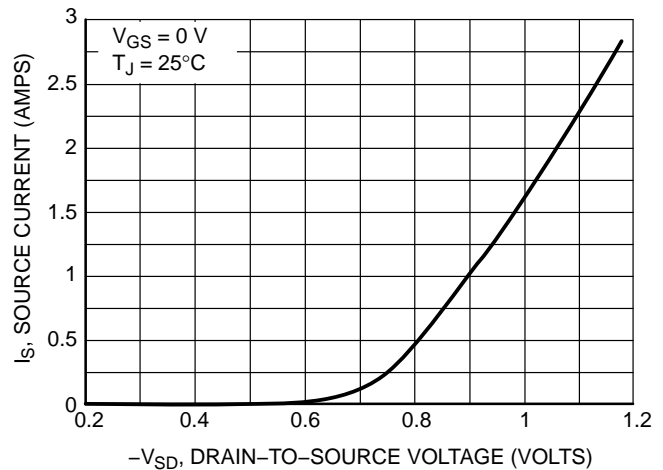


Figure 12. Diode Forward Voltage vs. Current

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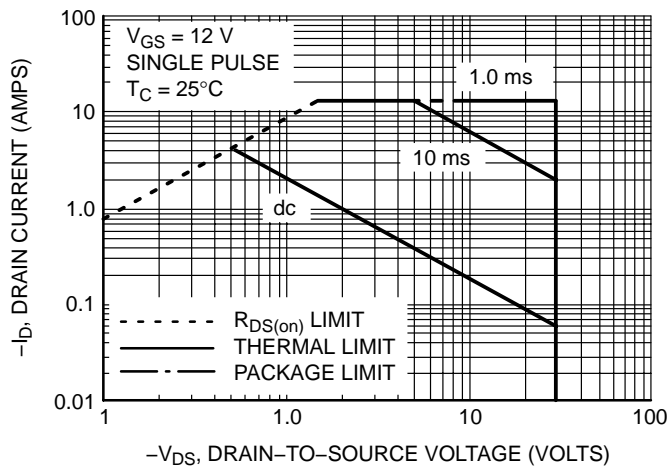


Figure 13. Maximum Rated Forward Biased Safe Operating Area

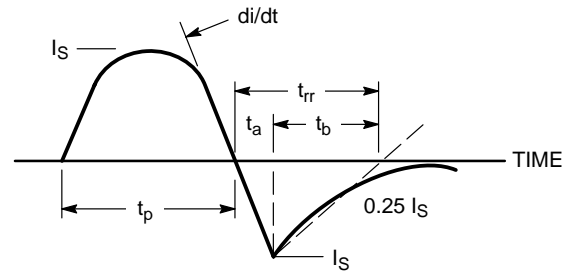


Figure 14. Diode Reverse Recovery Waveform

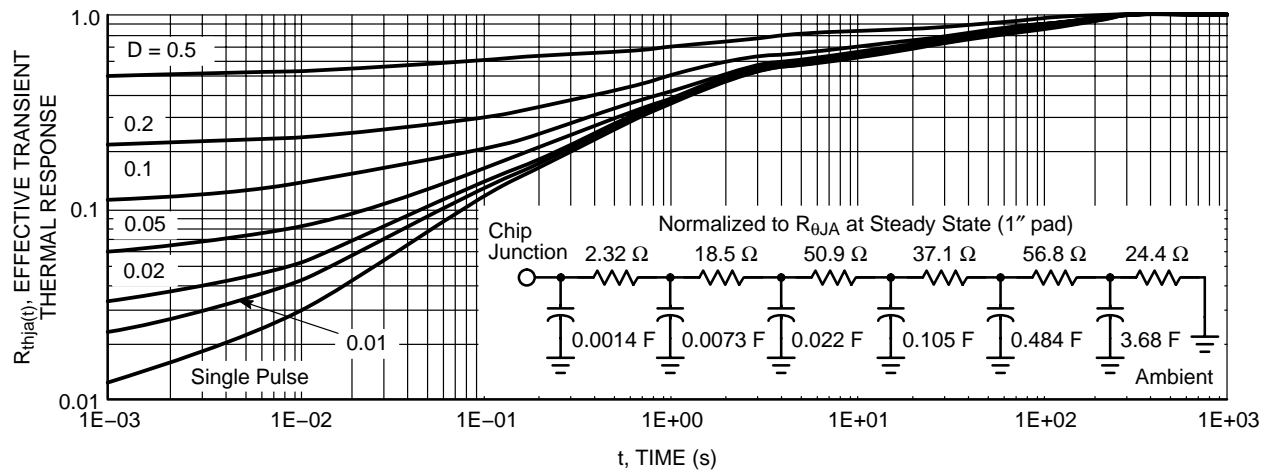
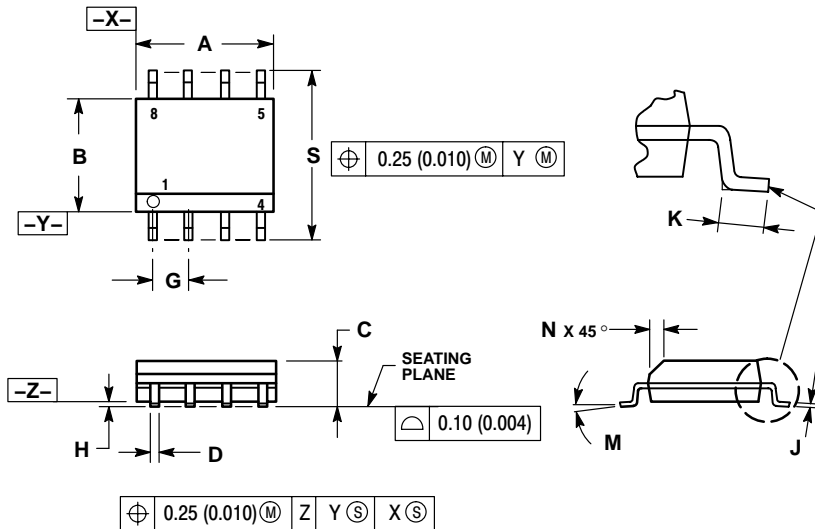


Figure 15. FET Thermal Response

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PACKAGE DIMENSIONS

SO-8
CASE 751-07
ISSUE AB



NOTES:

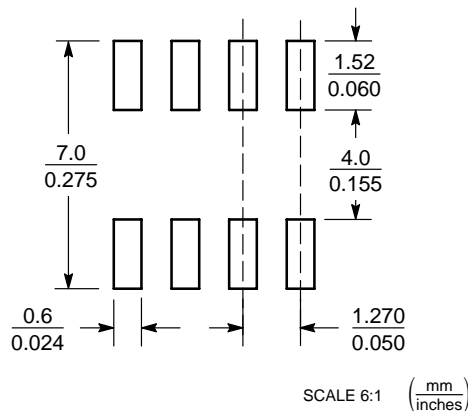
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL 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 11:

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

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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