

MOSFET - Power, Single N-Channel

100 V, 2.8 mΩ, 175 A

NTMFS002N10MCL

Features

- Small Footprint (5x6 mm) for Compact Design
- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Q_G and Capacitance to Minimize Driver Losses
- These Devices are Pb-Free, Halogen Free/BFR Free, Beryllium Free and are RoHS Compliant

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

| Parameter | Symbol | Value | Unit |
|--|--|---------------------------|------------------|
| Drain-to-Source Voltage | V_{DS} | 100 | V |
| Gate-to-Source Voltage | V_{GS} | ± 20 | V |
| Continuous Drain Current $R_{\theta JC}$ (Note 1) | Steady State | $T_C = 25^\circ\text{C}$ | I_D 175 A |
| | | $T_C = 100^\circ\text{C}$ | 123 |
| Power Dissipation $R_{\theta JC}$ (Note 1) | Steady State | $T_C = 25^\circ\text{C}$ | P_D 189 W |
| | | $T_C = 100^\circ\text{C}$ | 94 |
| Continuous Drain Current $R_{\theta JA}$ (Notes 1, 2) | Steady State | $T_A = 25^\circ\text{C}$ | I_D 22 A |
| | | $T_A = 100^\circ\text{C}$ | 15 |
| Power Dissipation $R_{\theta JA}$ (Notes 1, 2) | Steady State | $T_A = 25^\circ\text{C}$ | P_D 3 W |
| | | $T_A = 100^\circ\text{C}$ | 1.5 |
| Pulsed Drain Current | $T_A = 25^\circ\text{C}, t_p = 10 \mu\text{s}$ | I_{DM} 1536 | A |
| Operating Junction and Storage Temperature Range | T_J, T_{stg} | -55 to +175 | $^\circ\text{C}$ |
| Source Current (Body Diode) | I_S | 145 | A |
| Single Pulse Drain-to-Source Avalanche Energy ($I_{L(pk)} = 40 \text{ A}$) | E_{AS} | 328 | mJ |
| Lead Temperature Soldering Reflow for Soldering Purposes (1/8" from case for 10 s) | T_L | 260 | $^\circ\text{C}$ |

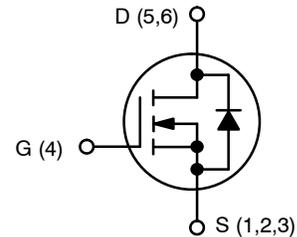
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

THERMAL RESISTANCE RATINGS

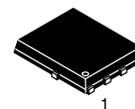
| Parameter | Symbol | Value | Unit |
|---|-----------------|-------|---------------------------|
| Junction-to-Case - Steady State (Note 1) | $R_{\theta JC}$ | 0.79 | $^\circ\text{C}/\text{W}$ |
| Junction-to-Ambient - Steady State (Note 2) | $R_{\theta JA}$ | 50 | |

1. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
2. Surface-mounted on FR4 board using 1 in² pad size, 2 oz. Cu pad.

| $V_{(BR)DSS}$ | $R_{DS(ON) MAX}$ | $I_D MAX$ |
|---------------|------------------|-----------|
| 100 V | 2.8 mΩ @ 10 V | 175 A |
| | 3.8 mΩ @ 4.5 V | |

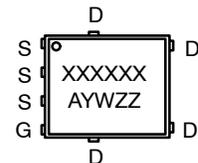


N-CHANNEL MOSFET



DFN5 (SO-8FL) CASE 506EZ

MARKING DIAGRAM



- A = Assembly Location
- Y = Year
- W = Work Week
- ZZ = Lot Traceability

ORDERING INFORMATION

| Device | Package | Shipping† |
|-------------------|----------------|--------------------|
| NTMFS002N10MCLT1G | DFN5 (Pb-Free) | 1500 / 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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ELECTRICAL CHARACTERISTICS ($T_J = 25^\circ\text{C}$ unless otherwise specified)

| Parameter | Symbol | Test Condition | Min | Typ | Max | Unit |
|---|-------------------|---|---------------------------|-----|-----|---------------|
| OFF CHARACTERISTICS | | | | | | |
| Drain-to-Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$ | 100 | | | V |
| Drain-to-Source Breakdown Voltage Temperature Coefficient | $V_{(BR)DSS}/T_J$ | $I_D = 250\ \mu\text{A}, \text{ref to } 25^\circ\text{C}$ | | 70 | | mV/°C |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{GS} = 0\text{ V}, V_{DS} = 100\text{ V}$ | $T_J = 25^\circ\text{C}$ | | 1 | μA |
| | | | $T_J = 125^\circ\text{C}$ | | 100 | |
| Gate-to-Source Leakage Current | I_{GSS} | $V_{DS} = 0\text{ V}, V_{GS} = 20\text{ V}$ | | | 100 | nA |

ON CHARACTERISTICS

| | | | | | | |
|-----------------------------------|------------------|---|---|------|-----|-------|
| Gate Threshold Voltage | $V_{GS(TH)}$ | $V_{GS} = V_{DS}, I_D = 351\ \mu\text{A}$ | 1 | | 3 | V |
| Threshold Temperature Coefficient | $V_{GS(TH)}/T_J$ | $I_D = 250\ \mu\text{A}, \text{ref to } 25^\circ\text{C}$ | | 5.7 | | mV/°C |
| Drain-to-Source On Resistance | $R_{DS(on)}$ | $V_{GS} = 10\text{ V}, I_D = 50\text{ A}$ | | 2.3 | 2.8 | mΩ |
| | | $V_{GS} = 4.5\text{ V}, I_D = 50\text{ A}$ | | 3.0 | 3.8 | |
| Forward Transconductance | g_{FS} | $V_{DS} = 10\text{ V}, I_D = 50\text{ A}$ | | 200 | | S |
| Gate-Resistance | R_G | $T_A = 25^\circ\text{C}$ | | 0.40 | | Ω |

CHARGES & CAPACITANCES

| | | | | | | |
|------------------------------|--------------|--|--|------|--|----|
| Input Capacitance | C_{ISS} | $V_{GS} = 0\text{ V}, f = 1\text{ MHz}, V_{DS} = 50\text{ V}$ | | 7200 | | pF |
| Output Capacitance | C_{OSS} | | | 2400 | | |
| Reverse Transfer Capacitance | C_{RSS} | | | 36 | | |
| Total Gate Charge | $Q_{G(TOT)}$ | $V_{GS} = 4.5\text{ V}, V_{DS} = 50\text{ V}, I_D = 50\text{ A}$ | | 45 | | nC |
| Total Gate Charge | $Q_{G(TOT)}$ | $V_{GS} = 10\text{ V}, V_{DS} = 50\text{ V}, I_D = 50\text{ A}$ | | 97 | | |
| Threshold Gate Charge | $Q_{G(TH)}$ | | | 11 | | |
| Gate-to-Source Charge | Q_{GS} | | | 20 | | |
| Gate-to-Drain Charge | Q_{GD} | | | 10 | | |
| Plateau Voltage | V_{GP} | | | 3 | | |

SWITCHING CHARACTERISTICS (Note 3)

| | | | | | | |
|---------------------|--------------|--|--|-----|--|----|
| Turn-On Delay Time | $t_{d(ON)}$ | $V_{GS} = 10\text{ V}, V_{DS} = 50\text{ V}, I_D = 50\text{ A}, R_G = 6\ \Omega$ | | 24 | | ns |
| Rise Time | t_r | | | 30 | | |
| Turn-Off Delay Time | $t_{d(OFF)}$ | | | 250 | | |
| Fall Time | t_f | | | 105 | | |

DRAIN-SOURCE DIODE CHARACTERISTICS

| | | | | | | | |
|-------------------------|----------|--|---------------------------|----|------|-----|---|
| Forward Diode Voltage | V_{SD} | $V_{GS} = 0\text{ V}, I_S = 50\text{ A}$ | $T_J = 25^\circ\text{C}$ | | 0.83 | 1.3 | V |
| | | | $T_J = 125^\circ\text{C}$ | | 0.71 | | |
| Reverse Recovery Time | t_{RR} | $V_{GS} = 0\text{ V}, di_S/dt = 100\text{ A}/\mu\text{s}, I_S = 31\text{ A}$ | | 73 | | ns | |
| Reverse Recovery Charge | Q_{RR} | | | 93 | | nC | |
| Charge Time | t_a | | | 35 | | ns | |
| Discharge Time | t_b | | | 38 | | ns | |

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.

3. Switching characteristics are independent of operating junction temperatures

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TYPICAL CHARACTERISTICS

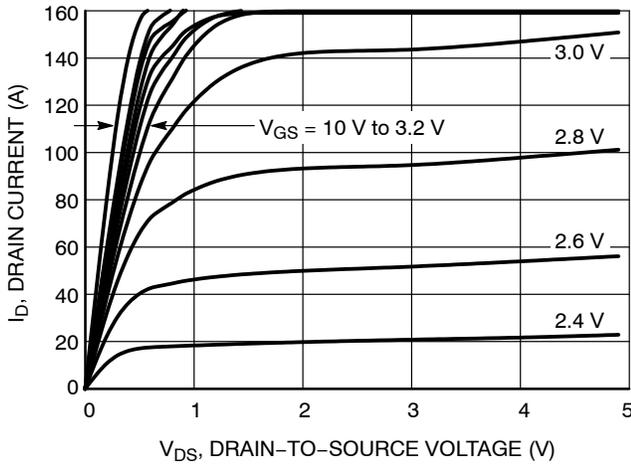


Figure 1. On-Region Characteristics

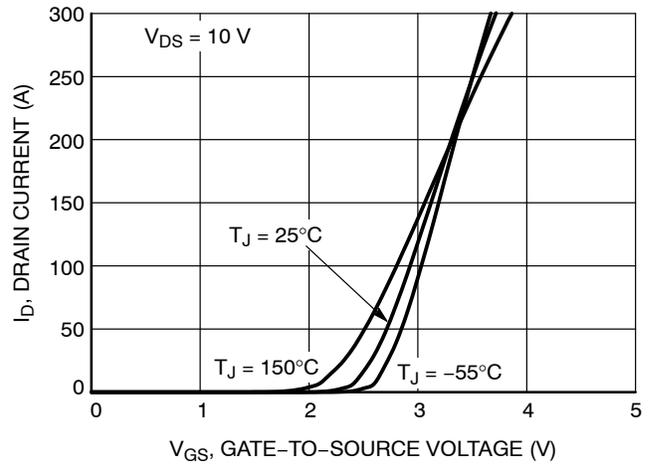


Figure 2. Transfer Characteristics

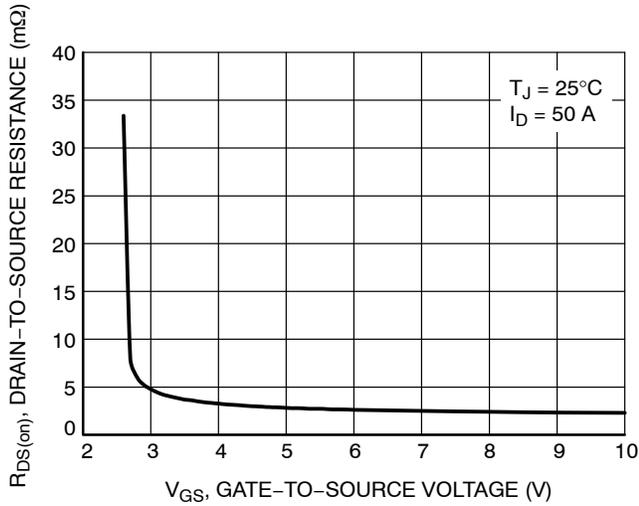


Figure 3. On-Resistance vs. Gate-to-Source Voltage

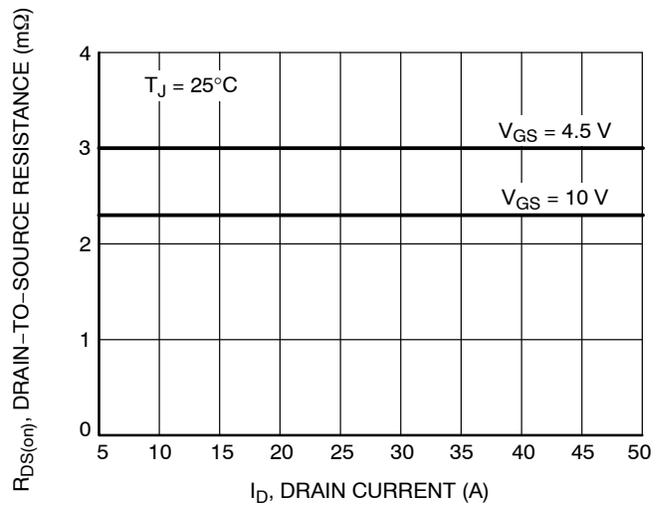


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

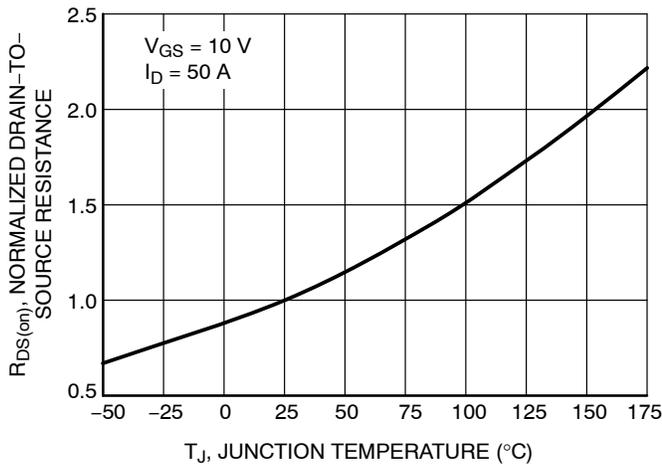


Figure 5. On-Resistance Variation with Temperature

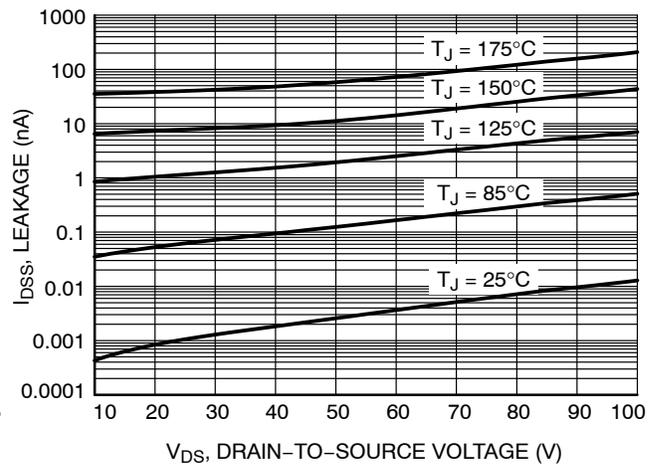


Figure 6. Drain-to-Source Leakage Current vs. Voltage

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TYPICAL CHARACTERISTICS

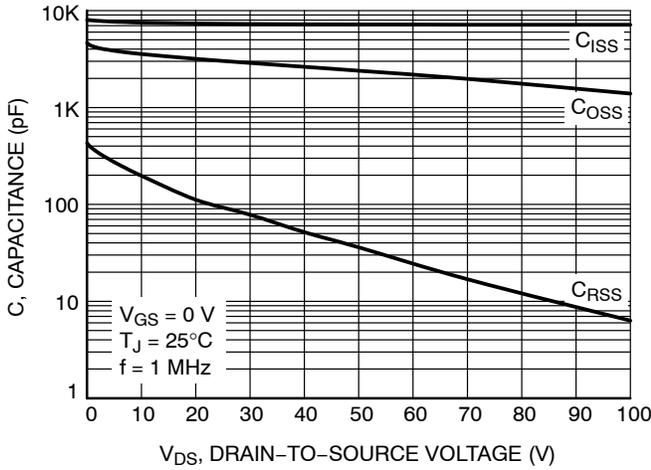


Figure 7. Capacitance Variation

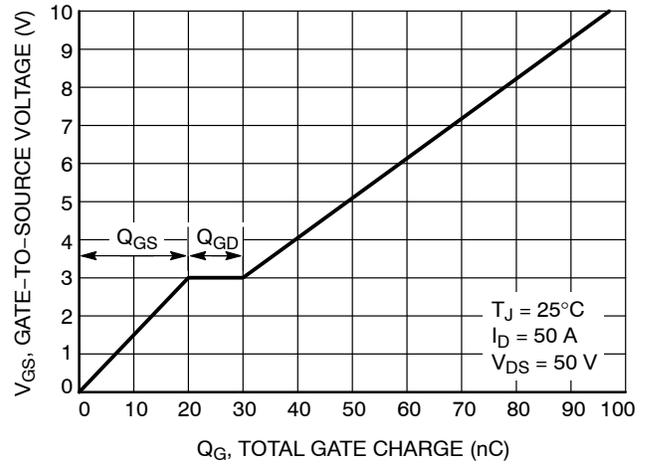


Figure 8. Gate-to-Source Voltage vs. Total Charge

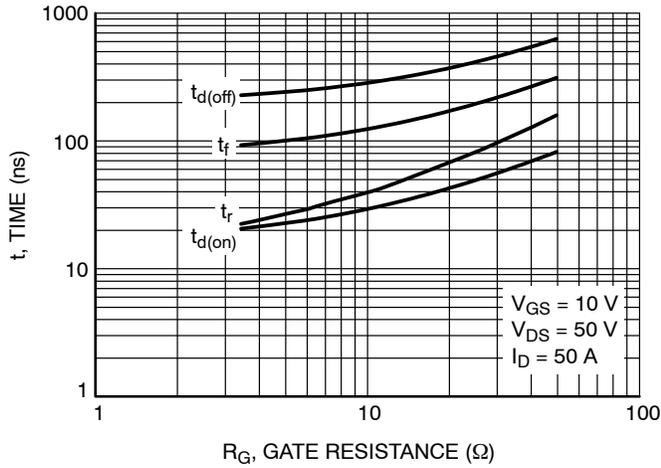


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

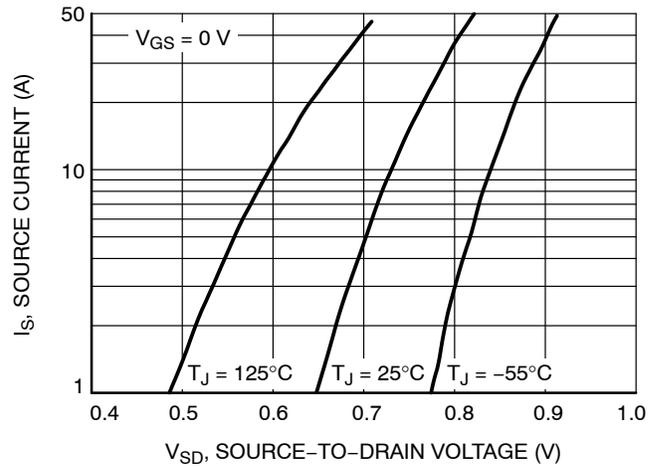


Figure 10. Diode Forward Voltage vs. Current

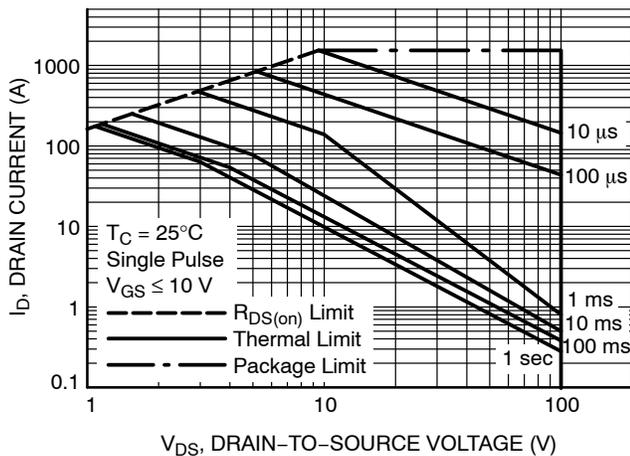


Figure 11. Maximum Rated Forward Biased Safe Operating Area

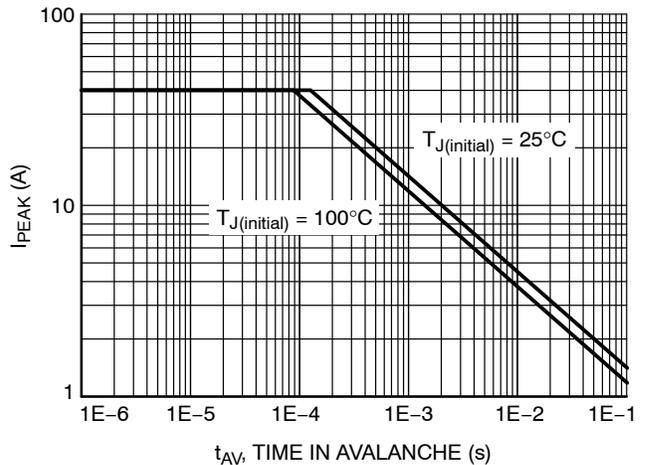


Figure 12. Maximum Drain Current vs. Time in Avalanche

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TYPICAL CHARACTERISTICS

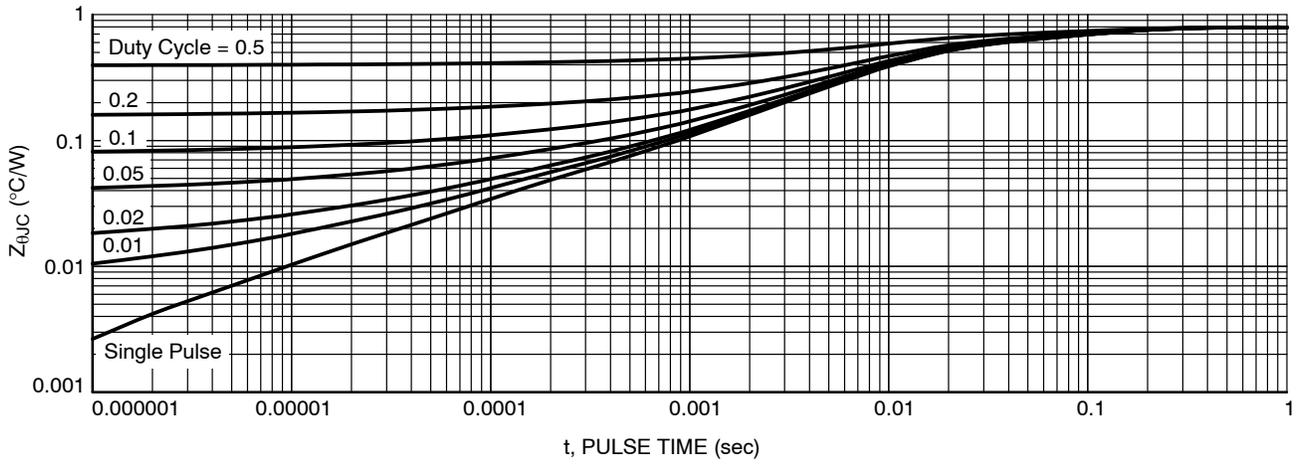
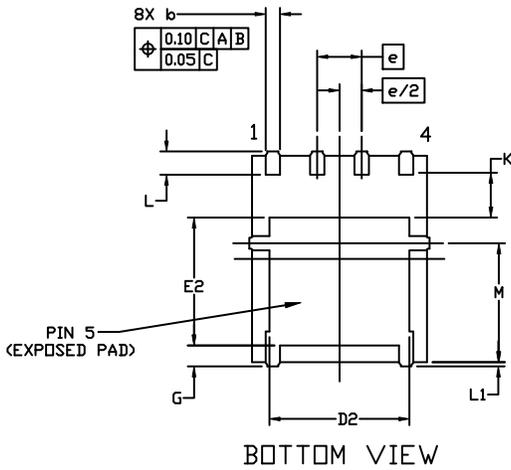
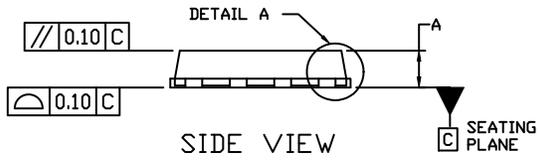
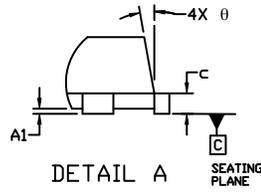
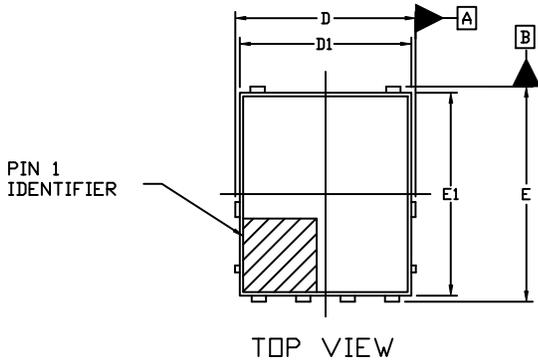


Figure 13. Transient Thermal Impedance

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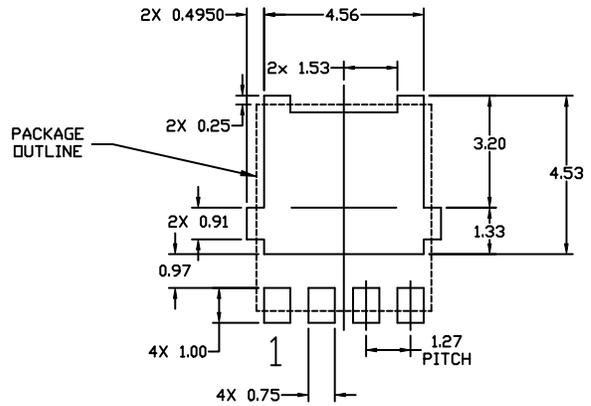
PACKAGE DIMENSIONS

DFN5 5x6, 1.27P (SO-8FL)
CASE 506EZ
ISSUE A



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
 2. CONTROLLING DIMENSION: MILLIMETERS
 3. DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

| MILLIMETERS | | | |
|-------------|-----------|-------|------|
| DIM | MIN. | NOM. | MAX. |
| A | 0.90 | 1.00 | 1.10 |
| A1 | 0.00 | --- | 0.05 |
| b | 0.33 | 0.41 | 0.51 |
| c | 0.23 | 0.28 | 0.33 |
| D | 5.00 | 5.15 | 5.30 |
| D1 | 4.70 | 4.90 | 5.10 |
| D2 | 3.80 | 4.00 | 4.20 |
| E | 6.00 | 6.15 | 6.30 |
| E1 | 5.70 | 5.90 | 6.10 |
| E2 | 3.45 | 3.80 | 3.85 |
| e | 1.27 BSC | | |
| G | 0.51 | 0.575 | 0.71 |
| k | 1.10 | 1.20 | 1.40 |
| L | 0.51 | 0.575 | 0.71 |
| L1 | 0.125 REF | | |
| M | 3.00 | 3.40 | 3.80 |
| θ | 0° | --- | 12° |



RECOMMENDED MOUNTING FOOTPRINT

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

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