

MOSFET – Power, Single N-Channel, Logic Level, SO8FL

40 V, 0.7 mΩ, 349 A

NTMFS0D7N04XL

Features

- Low $R_{DS(on)}$ to Minimize Conduction Loss
- Low Q_{RR} with Soft Recovery to Minimize E_{RR} Loss and Voltage Spike
- Low Q_G and Capacitance to Minimize Driving and Switching Loss
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

Typical Applications

- High Switching Frequency DC-DC Conversion
- Synchronous Rectification

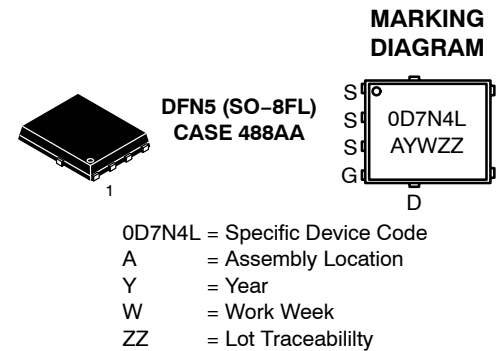
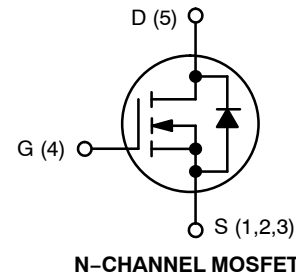
MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise stated)

| Parameter | | Symbol | Value | Unit |
|--|---|-----------------------------------|-------------|------|
| Drain-to-Source Voltage | | V _{DSS} | 40 | V |
| Gate-to-Source Voltage | DC | V _{GS} | ±20 | V |
| Continuous Drain Current (Note 2) | T _C = 25°C | I _D | 349 | A |
| | T _C = 100°C | | 247 | |
| Power Dissipation (Note 2) | T _C = 25°C | P _D | 167 | W |
| | T _C = 100°C | | 83 | |
| Pulsed Drain Current | T _C = 25°C, t _p = 100 μs | I _{DM} | 1667 | A |
| Pulsed Source Current (Body Diode) | | I _{SM} | 1667 | |
| Operating Junction and Storage Temperature Range | | T _J , T _{STG} | −55 to +175 | °C |
| Source Current (Body Diode) | | I _S | 256 | A |
| Single Pulse Avalanche Energy (I _{PK} = 97 A) (Note 3) | | E _{AS} | 470 | 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.

1. Surface-mounted on FR4 board using 1 in² pad size, 1 oz Cu pad.
2. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
3. E_{AS} of 470 mJ is based on started $T_J = 25^\circ\text{C}$, $I_{AS} = 97 \text{ A}$, $V_{DD} = 32 \text{ V}$, $V_{GS} = 10 \text{ V}$, 100% avalanche tested.
4. $R_{\theta JCT}$ Thermal Resistance – Junction to Case Top = 20 $^\circ\text{C}/\text{W}$.

| $V_{(BR)DS}$ | $R_{DS(ON)}$ MAX | I_D MAX |
|--------------|------------------|-----------|
| 40 V | 0.7 mΩ @ 10 V | 349 A |
| | 1.1 mΩ @ 4.5 V | |



ORDERING INFORMATION

See detailed ordering, marking and shipping information on page 6 of this data sheet.

NTMFS0D7N04XL

THERMAL CHARACTERISTICS

| Parameter | Symbol | Value | Unit |
|---|-----------------|-------|------|
| Thermal Resistance, Junction-to-Case | $R_{\theta JC}$ | 0.9 | °C/W |
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 38 | |

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

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|-----------|--------|-----------------|-----|-----|-----|------|
|-----------|--------|-----------------|-----|-----|-----|------|

OFF CHARACTERISTICS

| | | | | | | |
|---|-----------------------------------|--|----|------|-----|---------------|
| Drain-to-Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS} = 0\text{ V}, I_D = 1\text{ mA}$ | 40 | | | V |
| Drain-to-Source Breakdown Voltage Temperature Coefficient | $\Delta V_{(BR)DSS} / \Delta T_J$ | $I_D = 1\text{ mA}$, Referenced to 25°C | | 16.6 | | mV/°C |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS} = 40\text{ V}, T_J = 25^\circ\text{C}$ | | | 10 | μA |
| | | $V_{DS} = 40\text{ V}, T_J = 125^\circ\text{C}$ | | | 100 | |
| Gate-to-Source Leakage Current | I_{GSS} | $V_{GS} = 20\text{ V}, V_{DS} = 0\text{ V}$ | | | 100 | nA |

ON CHARACTERISTICS

| | | | | | | |
|--|----------------------------------|---|-----|-------|-----|------------|
| Drain-to-Source On Resistance | $R_{DS(on)}$ | $V_{GS} = 10\text{ V}, I_D = 49\text{ A}$ | | 0.58 | 0.7 | m Ω |
| | | $V_{GS} = 6\text{ V}, I_D = 49\text{ A}$ | | 0.66 | 0.9 | |
| | | $V_{GS} = 4.5\text{ V}, I_D = 39\text{ A}$ | | 0.77 | 1.1 | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | $V_{GS} = V_{DS}, I_D = 250\text{ }\mu\text{A}$ | 1.3 | | 2.2 | V |
| Gate Threshold Voltage Temperature Coefficient | $\Delta V_{GS(TH)} / \Delta T_J$ | $V_{GS} = V_{DS}, I_D = 250\text{ }\mu\text{A}$ | | -5.35 | | mV/°C |
| Forward Transconductance | g_{FS} | $V_{DS} = 5\text{ V}, I_D = 49\text{ A}$ | | 245 | | S |

CHARGES, CAPACITANCES & GATE RESISTANCE

| | | | | | | |
|------------------------------|--------------|--|--|------|--|----------|
| Input Capacitance | C_{ISS} | $V_{GS} = 0\text{ V}, V_{DS} = 20\text{ V}, f = 1\text{ MHz}$ | | 7090 | | pF |
| Output Capacitance | C_{OSS} | | | 1860 | | |
| Reverse Transfer Capacitance | C_{RSS} | | | 40 | | |
| Output Charge | Q_{OSS} | $V_{GS} = 0\text{ V}, V_{DS} = 20\text{ V}$ | | 72 | | nC |
| Total Gate Charge | $Q_{G(TOT)}$ | $V_{GS} = 4.5\text{ V}, V_{DD} = 20\text{ V}; I_D = 49\text{ A}$ | | 42 | | |
| | | $V_{GS} = 6\text{ V}, V_{DD} = 20\text{ V}; I_D = 49\text{ A}$ | | 57 | | |
| | | $V_{GS} = 10\text{ V}, V_{DD} = 20\text{ V}; I_D = 49\text{ A}$ | | 96 | | |
| Threshold Gate Charge | $Q_{G(TH)}$ | $V_{GS} = 10\text{ V}, V_{DD} = 20\text{ V}; I_D = 49\text{ A}$ | | 11 | | |
| Gate-to-Source Charge | Q_{GS} | | | 20 | | |
| Gate-to-Drain Charge | Q_{GD} | | | 6 | | |
| Gate Plateau Voltage | V_{GP} | | | 2.89 | | V |
| Gate Resistance | R_G | $f = 1\text{ MHz}$ | | 0.5 | | Ω |

SWITCHING CHARACTERISTICS

| | | | | | | |
|---------------------|--------------|--|--|----|--|----|
| Turn-On Delay Time | $t_{d(ON)}$ | Resistive Load, $V_{GS} = 0/10\text{ V}, V_{DD} = 20\text{ V},$ $I_D = 49\text{ A}, R_G = 2.5\text{ }\Omega$ | | 25 | | ns |
| Rise Time | t_r | | | 7 | | |
| Turn-Off Delay Time | $t_{d(OFF)}$ | | | 64 | | |
| Fall Time | t_f | | | 5 | | |

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

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|-----------|--------|-----------------|-----|-----|-----|------|
|-----------|--------|-----------------|-----|-----|-----|------|

SOURCE-TO-DRAIN DIODE CHARACTERISTICS

| | | | | | | |
|-------------------------|----------|---|--|------|-----|----|
| Forward Diode Voltage | V_{SD} | $V_{GS} = 0\text{ V}, I_S = 49\text{ A}, T_J = 25^\circ\text{C}$ | | 0.8 | 1.2 | V |
| | | $V_{GS} = 0\text{ V}, I_S = 49\text{ A}, T_J = 125^\circ\text{C}$ | | 0.65 | | |
| Reverse Recovery Time | t_{RR} | $V_{GS} = 0\text{ V}, dl/dt = 300\text{ A}/\mu\text{s},$ $I_S = 49\text{ A}, V_{DD} = 20\text{ V}$ | | 39 | | ns |
| Charge Time | t_a | | | 21 | | |
| Discharge Time | t_b | | | 18 | | |
| Reverse Recovery Charge | Q_{RR} | | | 87 | | |

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.

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TYPICAL CHARACTERISTICS

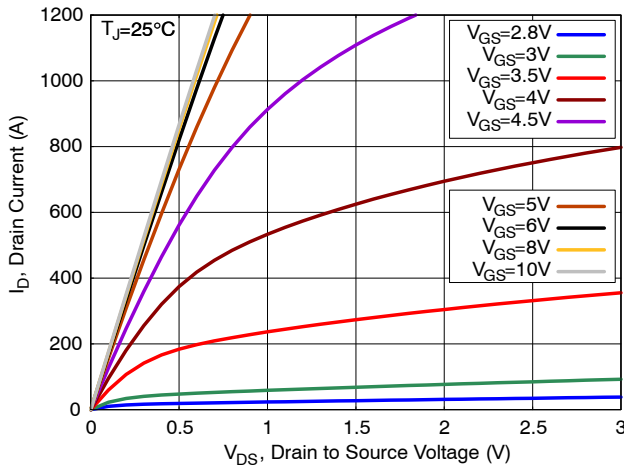


Figure 1. On-Region Characteristics

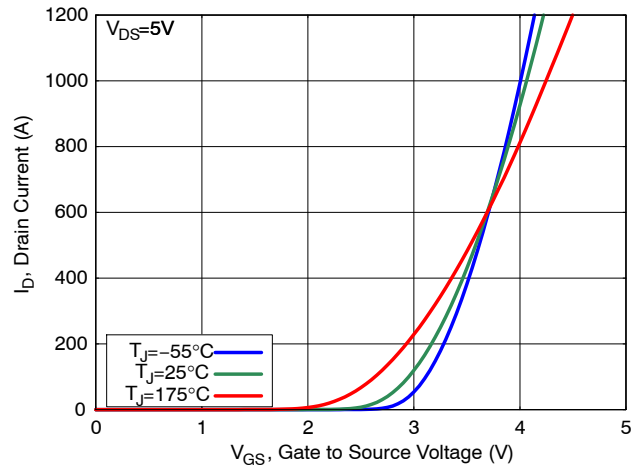


Figure 2. Transfer Characteristics

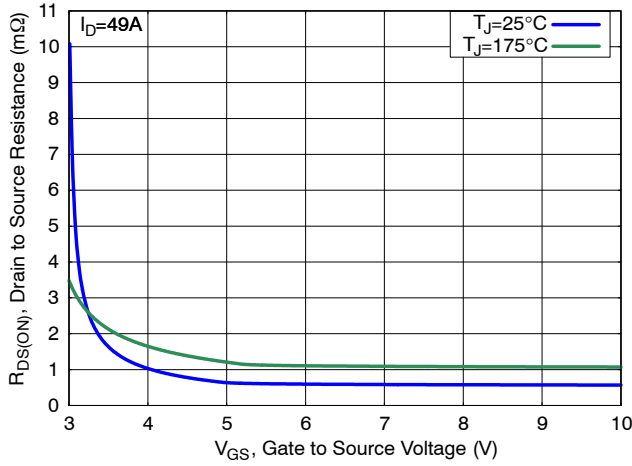


Figure 3. On-Resistance vs. Gate Voltage

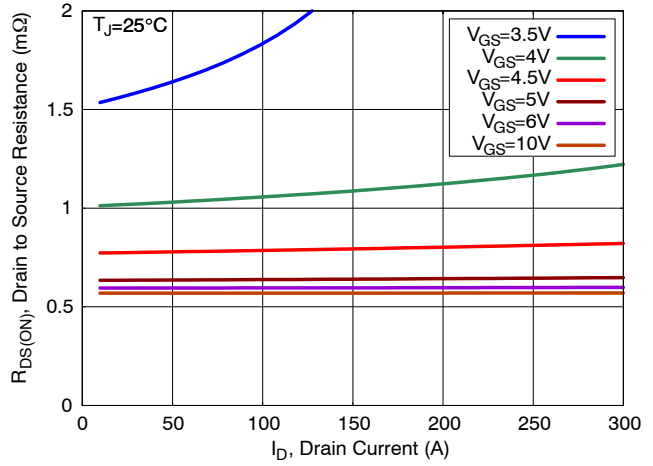


Figure 4. On-Resistance vs. Drain Current

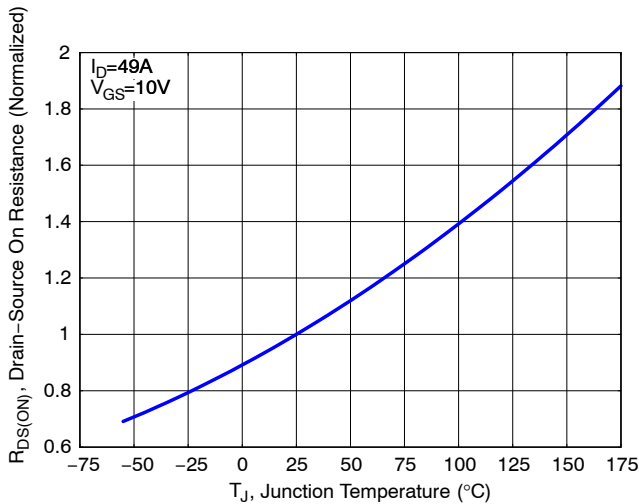


Figure 5. Normalized ON Resistance vs. Junction Temperature

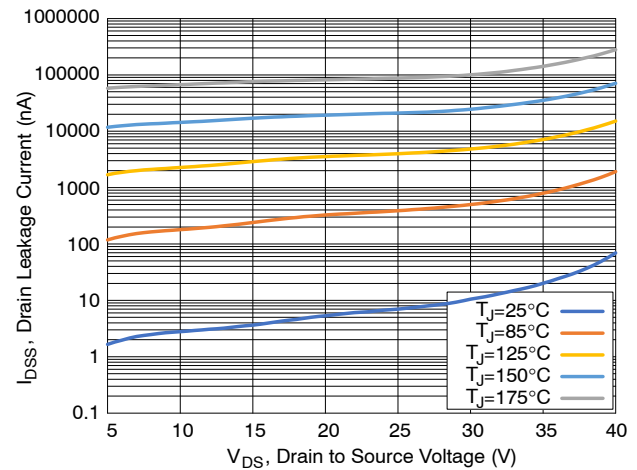


Figure 6. Drain Leakage Current vs. Drain Voltage

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TYPICAL CHARACTERISTICS (CONTINUED)

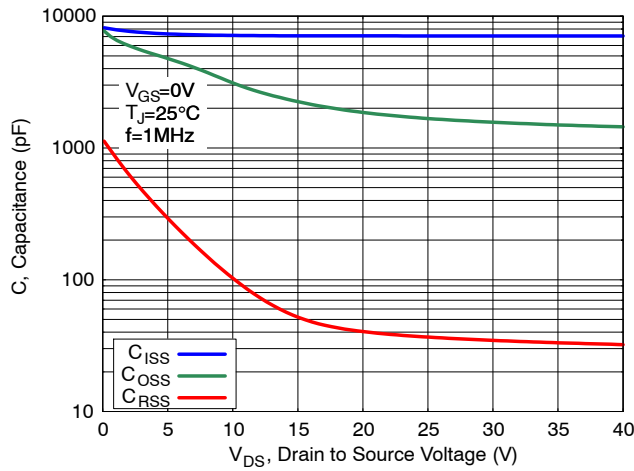


Figure 7. Capacitance Characteristics

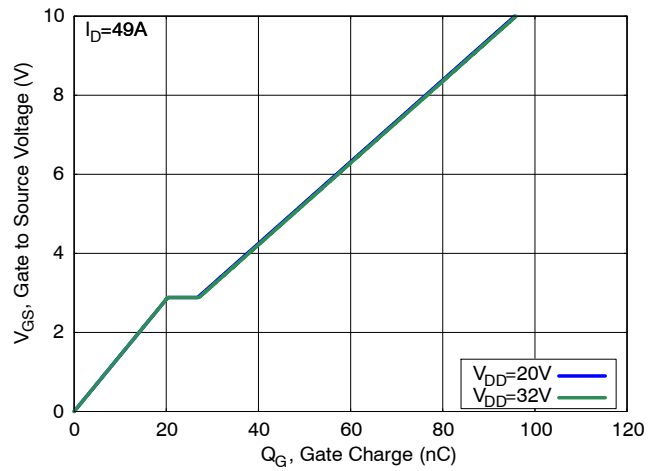


Figure 8. Gate Charge Characteristics

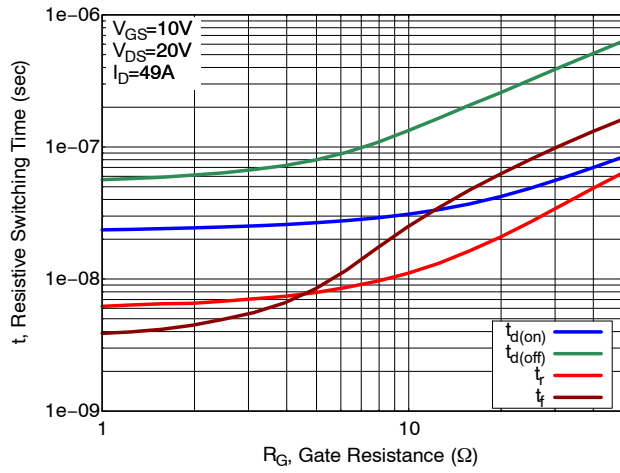


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

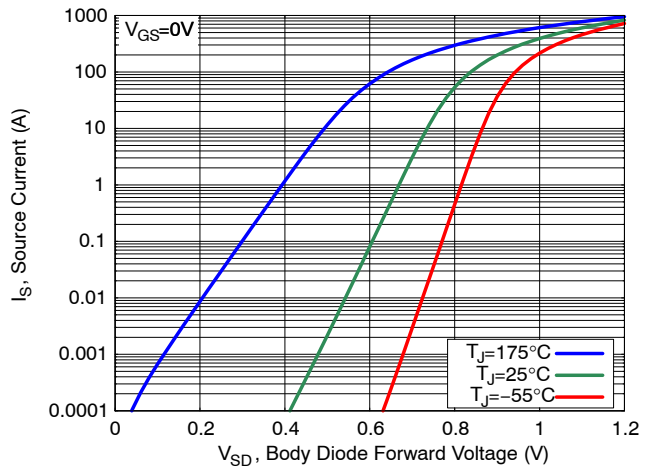


Figure 10. Diode Forward Characteristics

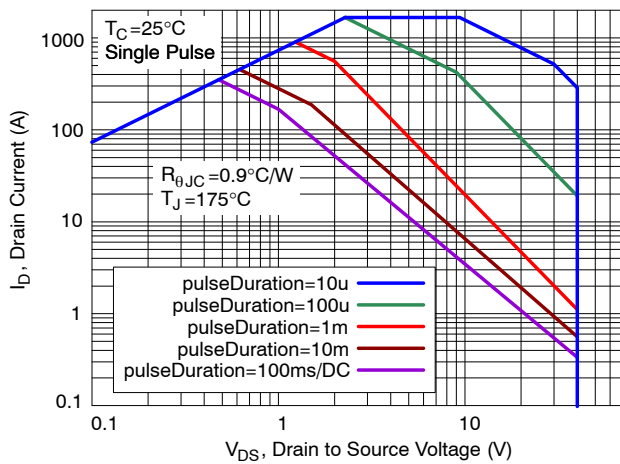


Figure 11. Safe Operating Area (SOA)

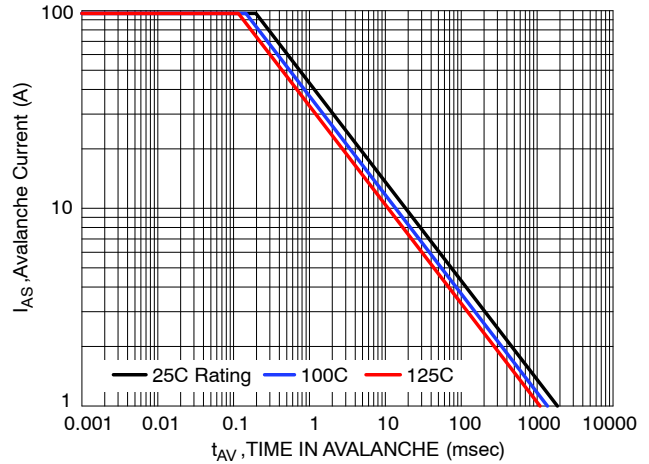


Figure 12. Avalanche Current vs. Pulse Time (UIS)

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TYPICAL CHARACTERISTICS (CONTINUED)

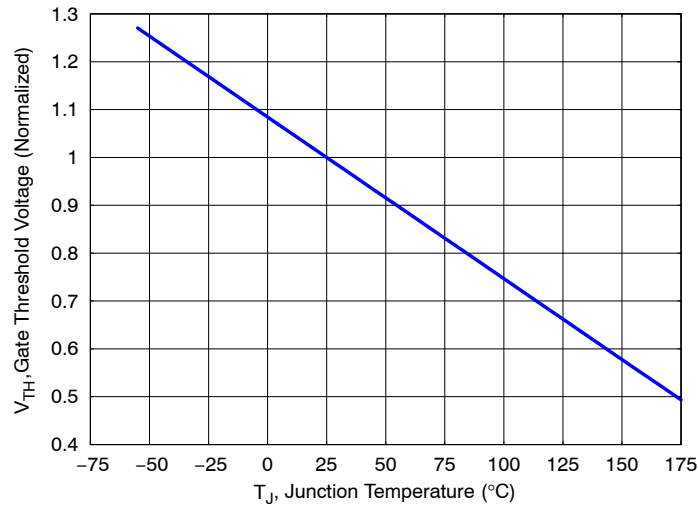


Figure 13. Gate Threshold Voltage vs. Junction Temperature

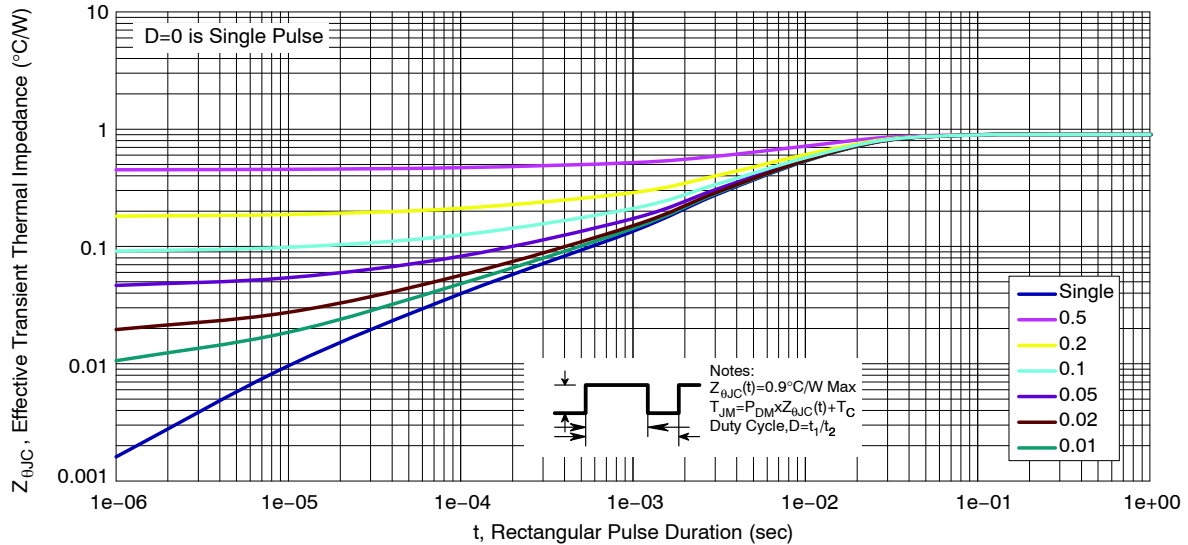
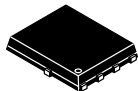


Figure 14. Thermal Characteristics

DEVICE ORDERING INFORMATION

| Device | Marking | Package | Shipping [†] |
|------------------|---------|-------------------|-----------------------|
| NTMFS0D7N04XLT1G | 0D7N4L | DFN5 (Pb-Free) | 1500 / Tape & Reel |

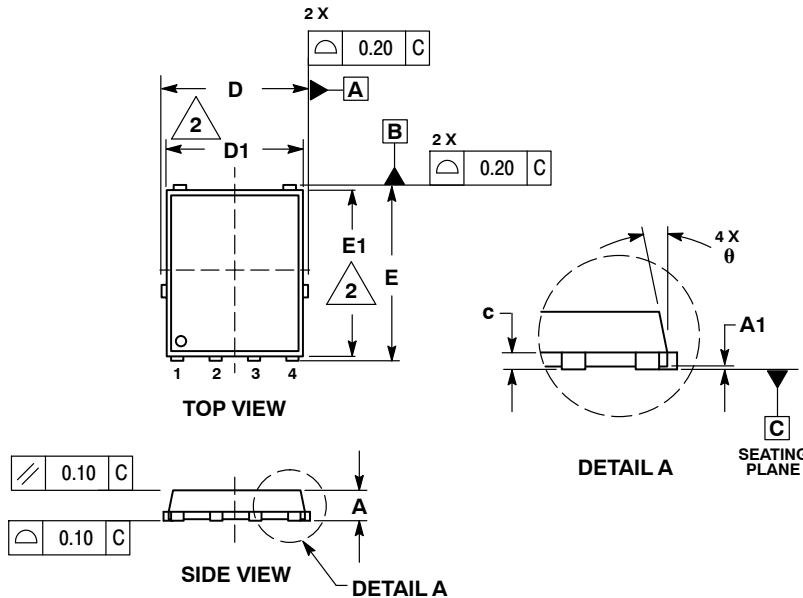
[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.



SCALE 2:1

DFN5 5x6, 1.27P
(SO-8FL)
CASE 488AA
ISSUE N

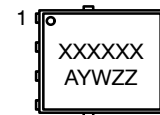
DATE 25 JUN 2018



NOTES:

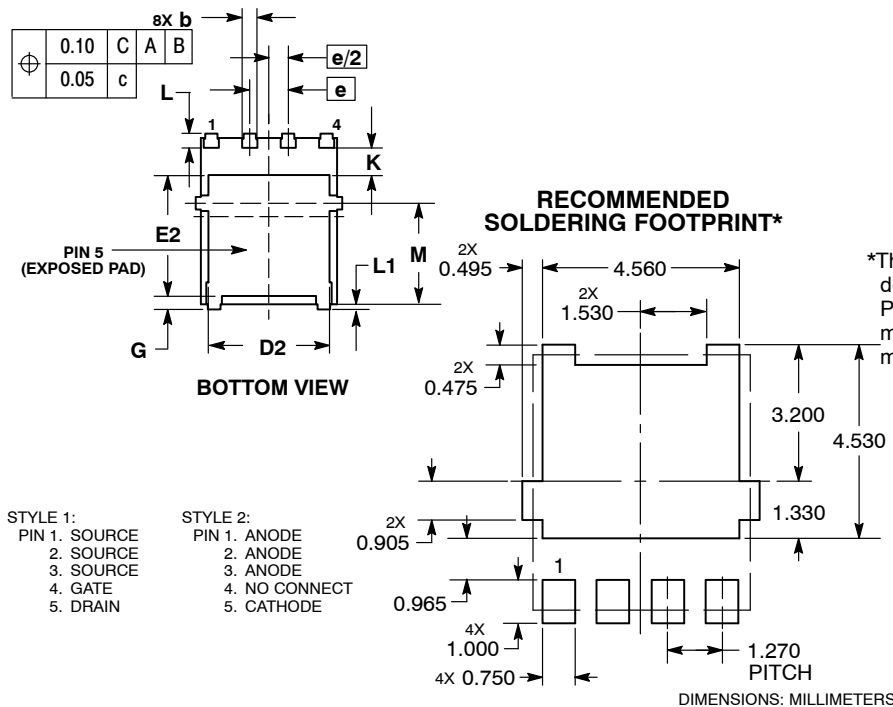
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION D1 AND E1 DO NOT INCLUDE MOLD FLASH PROTRUSIONS OR GATE BURRS.

| DIM | MILLIMETERS | | |
|-----|-------------|-------|------|
| | 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 | 3.65 | 3.85 |
| e | 1.27 BSC | | |
| G | 0.51 | 0.575 | 0.71 |
| K | 1.20 | 1.35 | 1.50 |
| L | 0.51 | 0.575 | 0.71 |
| L1 | 0.125 REF | | |
| M | 3.00 | 3.40 | 3.80 |
| θ | 0° | --- | 12° |

GENERIC
MARKING DIAGRAM*


XXXXXX = Specific Device Code
A = Assembly Location
Y = Year
W = Work Week
ZZ = Lot Traceability

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.



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

| | | |
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| DESCRIPTION: | DFN5 5x6, 1.27P (SO-8FL) | PAGE 1 OF 1 |

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