

MOSFET - Power, Single N-Channel, SO8-FL 25 V, 0.68 mΩ, 365 A



ON Semiconductor®

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NTMFS0D8N02P1E

Features

- Small Footprint (5x6mm) 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 and are RoHS Compliant

Applications

- DC-DC Converters
- Power Load Switch
- Notebook Battery Management

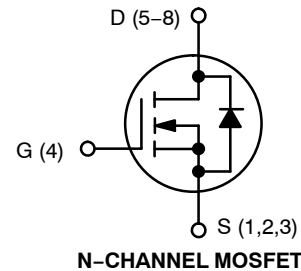
MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ unless otherwise stated)

| Parameter | | Symbol | Value | Unit | |
|---|--|--------------------------|----------------|------------------|---|
| Drain-to-Source Voltage | | V_{DS} | 25 | V | |
| Gate-to-Source Voltage | | V_{GS} | +16/ -12 | V | |
| Continuous Drain Current $R_{\theta JC}$ (Note 1) | Steady State | $T_C = 25^\circ\text{C}$ | I_D | 365 | A |
| | | $T_C = 85^\circ\text{C}$ | | 263 | |
| Power Dissipation $R_{\theta JC}$ (Note 1) | | $T_C = 25^\circ\text{C}$ | P_D | 139 | W |
| Continuous Drain Current $R_{\theta JA}$ (Notes 1, 3) | Steady State | $T_A = 25^\circ\text{C}$ | I_D | 55 | A |
| | | $T_A = 85^\circ\text{C}$ | | 40 | |
| Power Dissipation $R_{\theta JA}$ (Notes 1, 3) | | $T_A = 25^\circ\text{C}$ | P_D | 3.2 | W |
| Continuous Drain Current $R_{\theta JA}$ (Notes 2, 3) | Steady State | $T_A = 25^\circ\text{C}$ | I_D | 30 | A |
| | | $T_A = 85^\circ\text{C}$ | | 21 | |
| Power Dissipation $R_{\theta JA}$ (Notes 2, 3) | | $T_A = 25^\circ\text{C}$ | P_D | 0.93 | W |
| Pulsed Drain Current | $T_A = 25^\circ\text{C}, t_p = 10 \mu\text{s}$ | I_{DM} | 762 | A | |
| Single Pulse Drain-to-Source Avalanche Energy ($I_L = 115.4 A_{pk}, L = 0.1 \text{ mH}$) (Note 4) | | E_{AS} | 666 | mJ | |
| Operating Junction and Storage Temperature Range | | T_J, T_{STG} | -55 to +150 | $^\circ\text{C}$ | |
| Lead Temperature for Soldering Purposes (1/8" from case for 10 s) | | T_L | 260 | $^\circ\text{C}$ | |

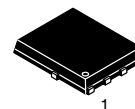
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Surface-mounted on FR4 board using 1 in² pad size, 2 oz Cu pad.
2. Surface-mounted on FR4 board using minimum pad size, 2 oz Cu pad.
3. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted. Actual continuous current will be limited by thermal & electro-mechanical application board design. $R_{\theta JC}$ is determined by the user's board design.
4. 100% UIS tested at $L = 1 \text{ mH}, I_{AS} = 30.7 \text{ A}$.

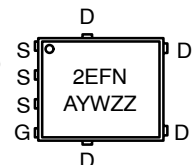
| $V_{(BR)DSS}$ | $R_{DS(ON)} \text{ MAX}$ | $I_D \text{ MAX}$ |
|---------------|--------------------------|-------------------|
| 25 V | 0.68 mΩ @ 10 V | 365 A |
| | 0.80 mΩ @ 4.5 V | |



MARKING DIAGRAMS



SO-8 FLAT LEAD
CASE 488AA
STYLE 1



2EFN = Specific Device Code
A = Assembly Location
Y = Year
W = Work Week
ZZ = Lot Traceability

ORDERING INFORMATION

See detailed ordering, marking and shipping information in the package dimensions section on page 6 of this data sheet.

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THERMAL RESISTANCE MAXIMUM RATINGS

| Parameter | Symbol | Value | Unit |
|---|-----------------|-------|------|
| Junction-to-Case – Steady State (Note 1) | $R_{\theta JC}$ | 0.9 | °C/W |
| Junction-to-Ambient – Steady State (Note 1) | $R_{\theta JA}$ | 39 | |
| Junction-to-Ambient – Steady State (Note 2) | $R_{\theta JA}$ | 135 | °C/W |

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 | $V_{(BR)DSS}$ | $V_{GS} = 0\text{ V}, I_D = 1\text{ mA}$ | 25 | | | V |
| Drain-to-Source Breakdown Voltage Temperature Coefficient | $V_{(BR)DSS}/T_J$ | $I_D = 1\text{ mA}$, ref to 25°C | | 16 | | mV/°C |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{GS} = 0\text{ V}, V_{DS} = 20\text{ V}$ | $T_J = 25^\circ\text{C}$ | | 1 | μA |
| | | | $T_J = 125^\circ\text{C}$ | | 250 | |
| Gate-to-Source Leakage Current | I_{GSS} | $V_{DS} = 0\text{ V}, V_{GS} = +16\text{ V}/-12\text{ V}$ | | | ± 100 | nA |

ON CHARACTERISTICS (Note 5)

| | | | | | | |
|-----------------------------------|------------------|---|--|------|------|------------|
| Gate Threshold Voltage | $V_{GS(TH)}$ | $V_{GS} = V_{DS}, I_D = 2\text{ mA}$ | 1.2 | | 2.0 | V |
| Threshold Temperature Coefficient | $V_{GS(TH)}/T_J$ | $I_D = 2\text{ mA}$, ref to 25°C | | -4.4 | | mV/°C |
| Drain-to-Source On Resistance | $R_{DS(on)}$ | $V_{GS} = 10\text{ V}, I_D = 46\text{ A}$ | | 0.44 | 0.68 | m Ω |
| | | | $V_{GS} = 4.5\text{ V}, I_D = 43\text{ A}$ | | 0.54 | |
| Forward Transconductance | g_{FS} | $V_{DS} = 5\text{ V}, I_D = 46\text{ A}$ | | 307 | | S |
| Gate Resistance | R_G | $T_A = 25^\circ\text{C}$ | | 0.48 | | Ω |

CHARGES AND CAPACITANCES

| | | | | | | |
|------------------------------|--------------|--|--|------|--|----|
| Input Capacitance | C_{ISS} | $V_{GS} = 0\text{ V}, V_{DS} = 13\text{ V}, f = 1\text{ MHz}$ | | 8600 | | pF |
| Output Capacitance | C_{OSS} | | | 2285 | | |
| Reverse Transfer Capacitance | C_{RSS} | | | 129 | | |
| Total Gate Charge | $Q_{G(TOT)}$ | $V_{GS} = 4.5\text{ V}, V_{DS} = 13\text{ V}; I_D = 46\text{ A}$ | | 52 | | nC |
| Threshold Gate Charge | $Q_{G(TH)}$ | | | 10 | | |
| Gate-to-Source Charge | Q_{GS} | | | 21 | | |
| Gate-to-Drain Charge | Q_{GD} | | | 9 | | |
| Total Gate Charge | $Q_{G(TOT)}$ | $V_{GS} = 10\text{ V}, V_{DS} = 13\text{ V}; I_D = 46\text{ A}$ | | 116 | | nC |

SWITCHING CHARACTERISTICS, $V_{GS} = 4.5\text{ V}$ (Note 6)

| | | | | | | |
|---------------------|--------------|---|--|----|--|----|
| Turn-On Delay Time | $t_{d(ON)}$ | $V_{GS} = 4.5\text{ V}, V_{DS} = 13\text{ V}, I_D = 46\text{ A}, R_G = 6.0\ \Omega$ | | 45 | | ns |
| Rise Time | t_r | | | 24 | | |
| Turn-Off Delay Time | $t_{d(OFF)}$ | | | 68 | | |
| Fall Time | t_f | | | 20 | | |

SWITCHING CHARACTERISTICS, $V_{GS} = 10\text{ V}$ (Note 6)

| | | | | | | |
|---------------------|--------------|--|--|-----|--|----|
| Turn-On Delay Time | $t_{d(ON)}$ | $V_{GS} = 10\text{ V}, V_{DS} = 13\text{ V}, I_D = 46\text{ A}, R_G = 6.0\ \Omega$ | | 23 | | ns |
| Rise Time | t_r | | | 6.8 | | |
| Turn-Off Delay Time | $t_{d(OFF)}$ | | | 123 | | |
| Fall Time | t_f | | | 19 | | |

DRAIN-SOURCE DIODE CHARACTERISTICS

| | | | | | | | |
|-----------------------|----------|--|---------------------------|--|------|-----|---|
| Forward Diode Voltage | V_{SD} | $V_{GS} = 0\text{ V}, I_S = 46\text{ A}$ | $T_J = 25^\circ\text{C}$ | | 0.77 | 1.2 | V |
| | | | $T_J = 125^\circ\text{C}$ | | 0.62 | | |

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

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

DRAIN-SOURCE DIODE CHARACTERISTICS

| | | | | | | |
|-------------------------|----------|---|--|----|--|----|
| Reverse Recovery Time | t_{RR} | $V_{GS} = 0\text{ V}$, $dI_S/dt = 100\text{ A}/\mu\text{s}$, $I_S = 46\text{ A}$ | | 64 | | ns |
| Reverse Recovery Charge | Q_{RR} | | | 87 | | nC |

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.

5. Pulse Test: pulse width $\leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$.

6. Switching characteristics are independent of operating junction temperatures.

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TYPICAL CHARACTERISTICS

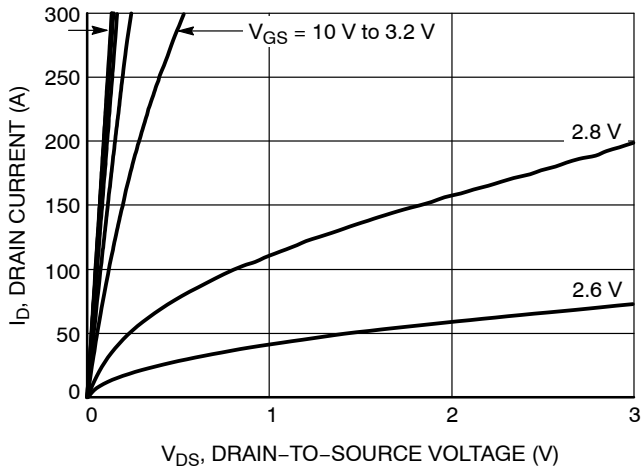


Figure 1. On-Region Characteristics

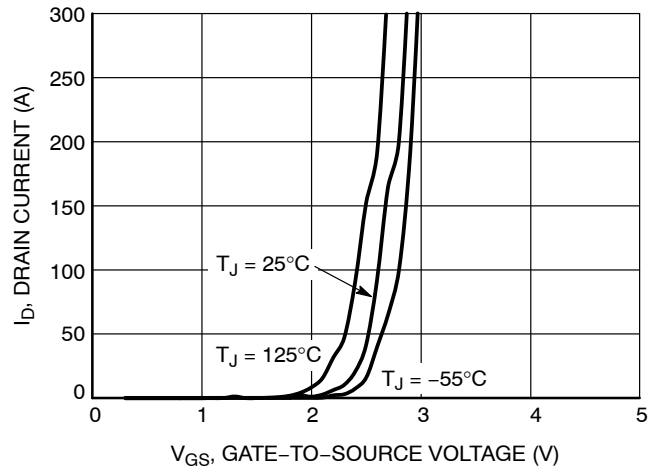


Figure 2. Transfer Characteristics

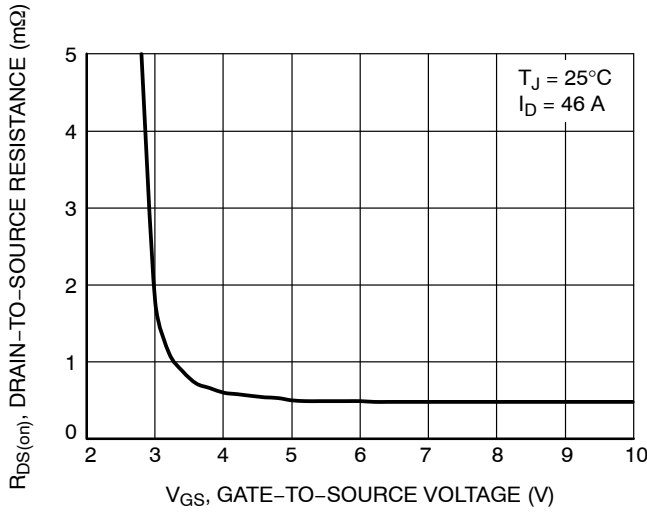


Figure 3. On-Resistance vs. Gate-to-Source Voltage

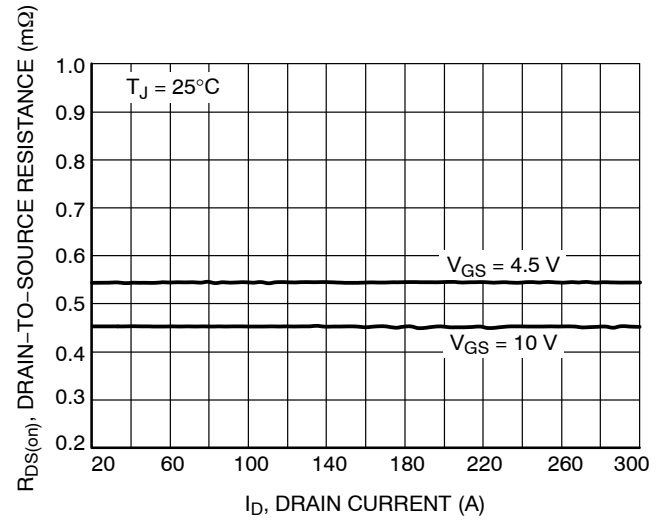


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

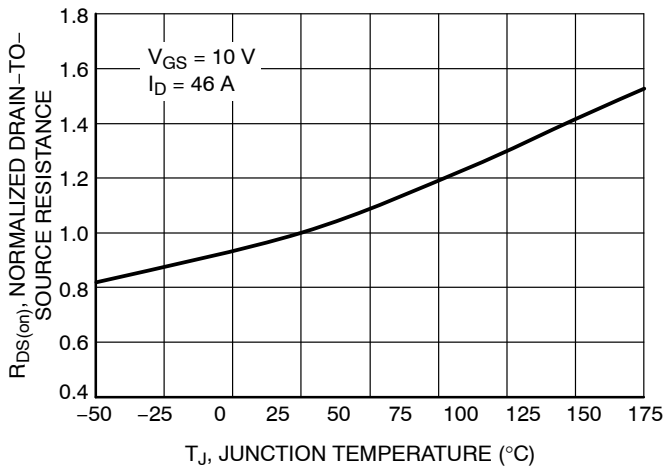


Figure 5. On-Resistance Variation with Temperature

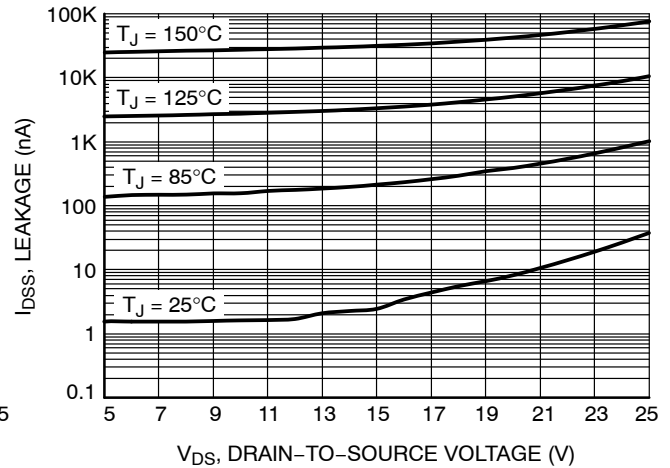


Figure 6. Drain-to-Source Leakage Current vs. Voltage

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TYPICAL CHARACTERISTICS

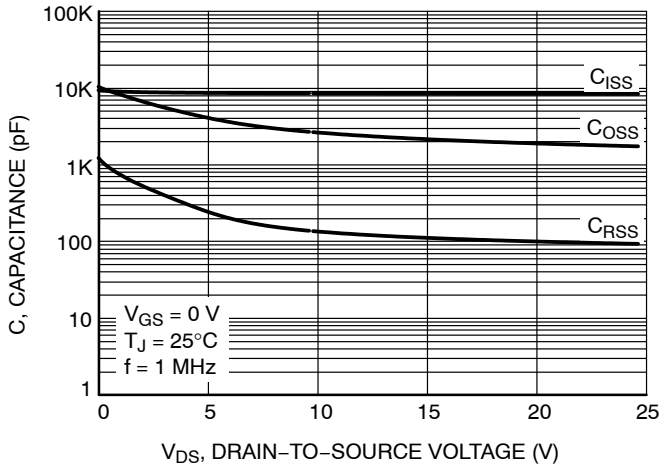


Figure 7. Capacitance Variation

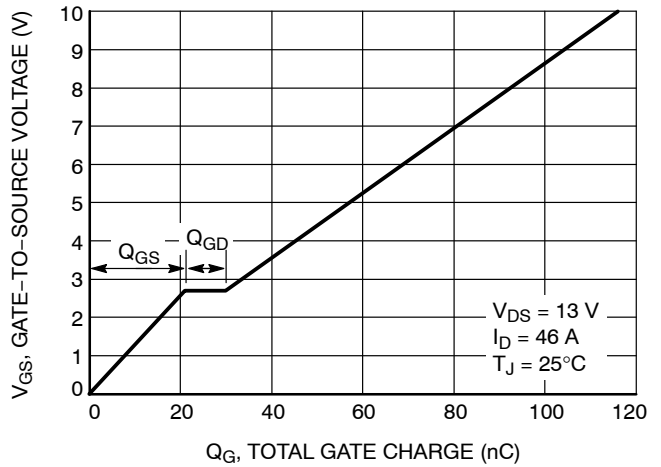


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

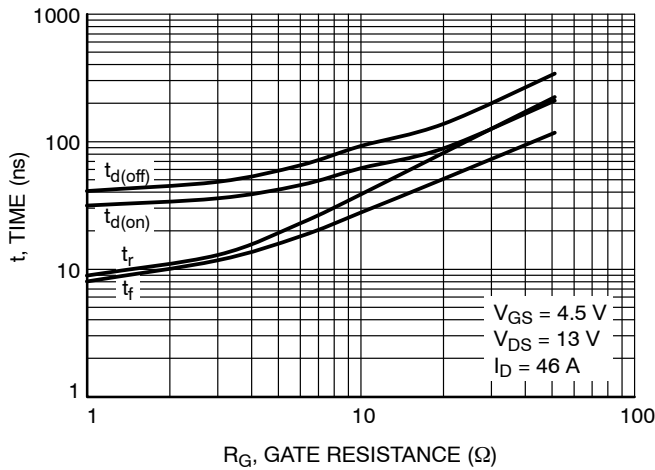


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

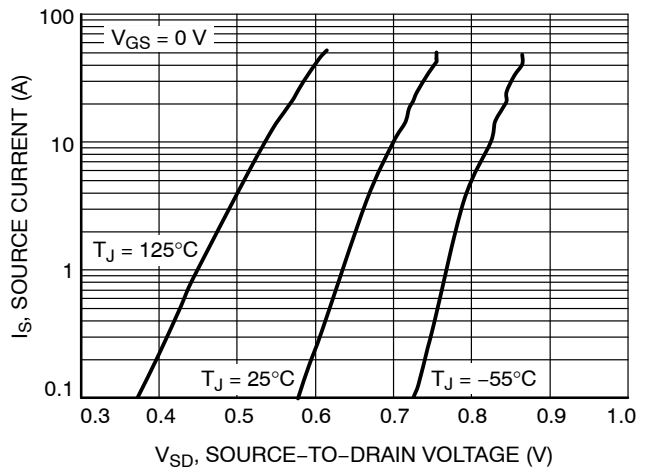


Figure 10. Diode Forward Voltage vs. Current

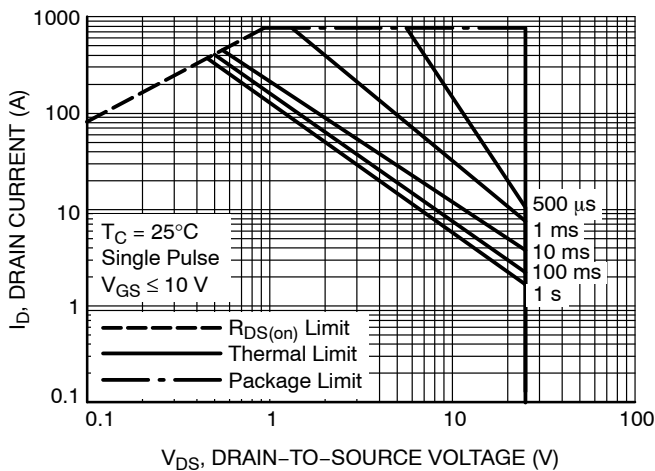


Figure 11. Safe Operating Area

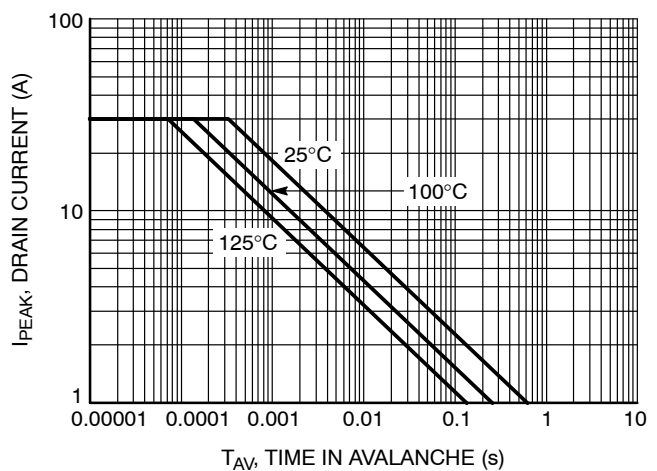


Figure 12. Maximum Drain Current vs. Time in Avalanche

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TYPICAL CHARACTERISTICS

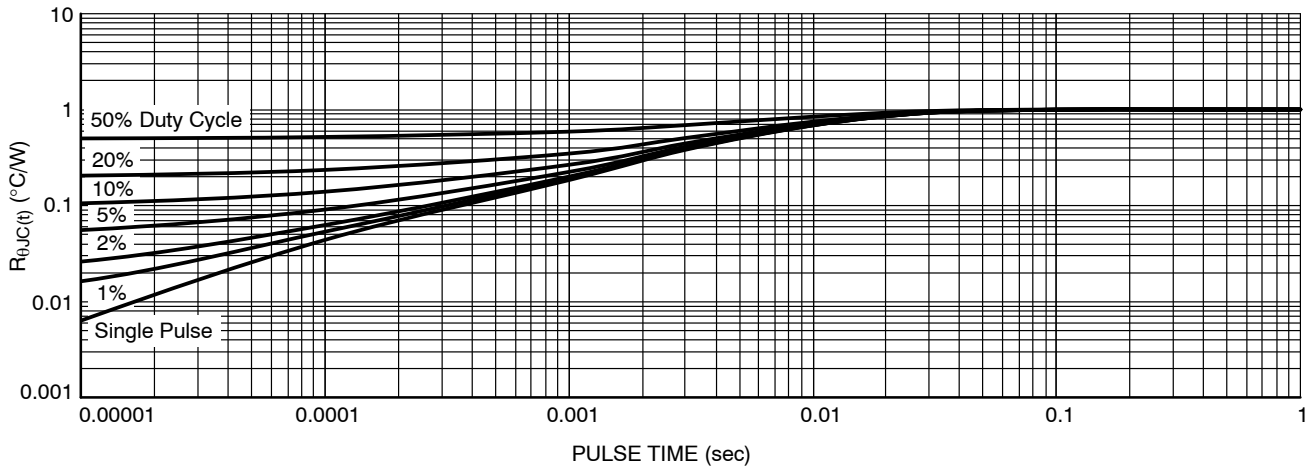


Figure 13. Thermal Response

DEVICE ORDERING INFORMATION

| Device | Marking | Package | Shipping† |
|-------------------|---------|-------------------|--------------------|
| NTMFS0D8N02P1ET1G | 2EFN | 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.

