

NTTFS1D2N02P1E

MOSFET - Power, Single N-Channel, Power33 25 V, 1.0 mΩ, 180 A

Features

- Small Footprint 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

Typical Applications

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

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

| Parameter | Symbol | Value | Unit | |
|---|--|--------------------------|------------------|---|
| Drain-to-Source Voltage | V_{DSS} | 25 | V | |
| Gate-to-Source Voltage | V_{GS} | +16/-12 | V | |
| Continuous Drain Current $R_{\theta JC}$ (Note 3) | Steady State | $T_C = 25^\circ\text{C}$ | I_D 180 | A |
| | | $T_C = 85^\circ\text{C}$ | 130 | |
| Power Dissipation $R_{\theta JC}$ (Note 3) | Steady State | $T_C = 25^\circ\text{C}$ | P_D 52 | W |
| Continuous Drain Current $R_{\theta JA}$ (Notes 1, 3) | Steady State | $T_A = 25^\circ\text{C}$ | I_D 41 | A |
| | | $T_A = 85^\circ\text{C}$ | 29 | |
| Power Dissipation $R_{\theta JA}$ (Notes 1, 3) | Steady State | $T_A = 25^\circ\text{C}$ | P_D 2.7 | W |
| Continuous Drain Current $R_{\theta JA}$ (Notes 2, 3) | Steady State | $T_A = 25^\circ\text{C}$ | I_D 23 | A |
| | | $T_A = 85^\circ\text{C}$ | 16 | |
| Power Dissipation $R_{\theta JA}$ (Notes 2, 3) | Steady State | $T_A = 25^\circ\text{C}$ | P_D 0.82 | W |
| Pulsed Drain Current | $T_A = 25^\circ\text{C}, t_p = 10 \mu\text{s}$ | I_{DM} 195 | A | |
| Single Pulse Drain-to-Source Avalanche Energy ($I_{L(pk)} = 63.7 \text{ A}$) (Note 4) | E_{AS} | 202 | mJ | |
| Operating Junction and Storage Temperature Range | T_J, T_{stg} | -55 to +150 | $^\circ\text{C}$ | |
| 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.

1. Surface-mounted on FR4 board using a 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. $R_{\theta CA}$ is determined by the user's board design.
4. 100% UIS tested at $L = 0.1 \text{ mH}$, $I_{AV} = 40 \text{ A}$.

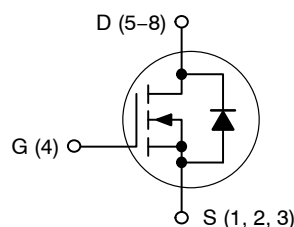


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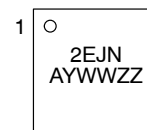
www.onsemi.com

| $V_{(BR)DSS}$ | $R_{DS(ON)} \text{ MAX}$ | $I_D \text{ MAX}$ |
|---------------|--------------------------|-------------------|
| 25 V | 1.0 mΩ @ 10 V | 180 A |
| | 1.2 mΩ @ 4.5 V | |

NMOS



MARKING DIAGRAM



**PQFN8
(Power33)
CASE 483AW**

2EJN = Specific Device Code
A = Assembly Location
Y = Year
WW = Work Week
ZZ = Assembly Lot Code

ORDERING INFORMATION

See detailed ordering and shipping information on page 5 of this data sheet.

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THERMAL RESISTANCE RATINGS

| Parameter | Symbol | Max | Unit |
|---|-----------------|-----|------|
| Junction-to-Case – Steady State (Note 1) | $R_{\theta JC}$ | 2.4 | °C/W |
| Junction-to-Ambient – Steady State (Note 1) | $R_{\theta JA}$ | 47 | |
| Junction-to-Ambient – Steady State (Note 2) | $R_{\theta JA}$ | 152 | |

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} | $V_{GS} = 0\text{ V}, V_{DS} = 20\text{ V}$ | $T_J = 25^\circ\text{C}$ | | 10 | μA |
| | | | $T_J = 125^\circ\text{C}$ | | 100 | |
| Gate-to-Source Leakage Current | I_{GSS} | $V_{DS} = 0\text{ V}, V_{GS} = +16/-12\text{ V}$ | | | ± 100 | $\pm\text{nA}$ |

ON CHARACTERISTICS (Note 5)

| | | | | | | |
|-----------------------------------|------------------|--|---------------------|------|-----|------------|
| Gate Threshold Voltage | $V_{GS(TH)}$ | $V_{GS} = V_{DS}, I_D = 934\ \mu\text{A}$ | 1.2 | | 2.0 | V |
| Threshold Temperature Coefficient | $V_{GS(TH)}/T_J$ | $I_D = 934\ \mu\text{A}$, ref to 25°C | | -4.4 | | mV/°C |
| Drain-to-Source On Resistance | $R_{DS(on)}$ | $V_{GS} = 10\text{ V}$ | $I_D = 38\text{ A}$ | 0.86 | 1.0 | m Ω |
| | | $V_{GS} = 4.5\text{ V}$ | $I_D = 35\text{ A}$ | 1.05 | 1.2 | |
| Forward Transconductance | g_{FS} | $V_{DS} = 5\text{ V}, I_D = 38\text{ A}$ | | 224 | | S |
| Gate Resistance | R_G | $T_A = 25^\circ\text{C}$ | | 0.5 | | Ω |

CHARGES & CAPACITANCES

| | | | | | | |
|-----------------------|--------------|--|--|------|--|----|
| Input Capacitance | C_{ISS} | $V_{GS} = 0\text{ V}, f = 1\text{ MHz}, V_{DS} = 13\text{ V}$ | | 4040 | | pF |
| Output Capacitance | C_{OSS} | | | 1100 | | |
| Reverse Capacitance | C_{RSS} | | | 68 | | |
| Total Gate Charge | $Q_{G(TOT)}$ | $V_{GS} = 4.5\text{ V}, V_{DS} = 13\text{ V}; I_D = 38\text{ A}$ | | 24 | | nC |
| Threshold Gate Charge | $Q_{G(TH)}$ | | | 5.2 | | |
| Gate-to-Drain Charge | Q_{GD} | | | 3.9 | | |
| Gate-to-Source Charge | Q_{GS} | | | 9.8 | | |
| Total Gate Charge | $Q_{G(TOT)}$ | $V_{GS} = 10\text{ V}, V_{DS} = 13\text{ V}; I_D = 38\text{ A}$ | | 54 | | |

SWITCHING CHARACTERISTICS, $V_{GS} = 4.5\text{ V}$ (Note 5)

| | | | | | | |
|---------------------|--------------|---|--|------|--|----|
| Turn-On Delay Time | $t_{d(ON)}$ | $V_{GS} = 4.5\text{ V}, V_{DD} = 13\text{ V}, I_D = 38\text{ A}, R_G = 6\ \Omega$ | | 24.6 | | ns |
| Rise Time | t_r | | | 13 | | |
| Turn-Off Delay Time | $t_{d(OFF)}$ | | | 38.5 | | |
| Fall Time | t_f | | | 9.8 | | |

SWITCHING CHARACTERISTICS, $V_{GS} = 10\text{ V}$ (Note 5)

| | | | | | | |
|---------------------|--------------|--|--|------|--|----|
| Turn-On Delay Time | $t_{d(ON)}$ | $V_{GS} = 10\text{ V}, V_{DD} = 13\text{ V}, I_D = 38\text{ A}, R_G = 6\ \Omega$ | | 14.8 | | ns |
| Rise Time | t_r | | | 4.2 | | |
| Turn-Off Delay Time | $t_{d(OFF)}$ | | | 59 | | |
| Fall Time | t_f | | | 7.9 | | |

SOURCE-TO-DRAIN DIODE CHARACTERISTICS

| | | | | | | | |
|-------------------------|----------|--|---------------------------|--|------|-----|----|
| Forward Diode Voltage | V_{SD} | $V_{GS} = 0\text{ V}, I_S = 38\text{ A}$ | $T_J = 25^\circ\text{C}$ | | 0.78 | 1.2 | V |
| | | | $T_J = 125^\circ\text{C}$ | | 0.65 | | |
| Reverse Recovery Time | t_{RR} | $V_{GS} = 0\text{ V}, di/dt = 100\text{ A}/\mu\text{s}, I_S = 38\text{ A}$ | | | 38 | | ns |
| Reverse Recovery Charge | Q_{RR} | | | | 25 | | 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. Switching characteristics are independent of operating junction temperatures.

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TYPICAL CHARACTERISTICS

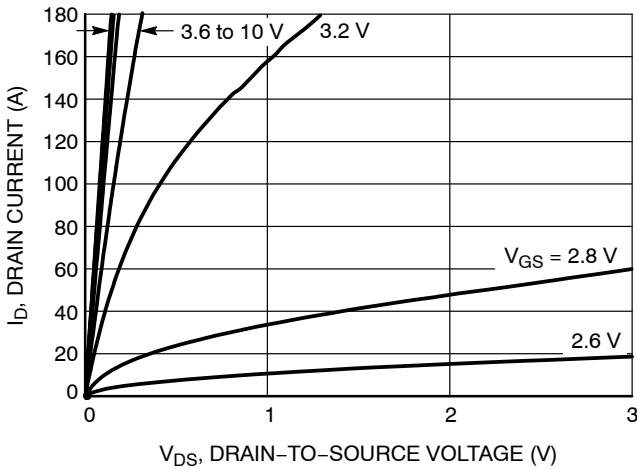


Figure 1. On-Region Characteristics

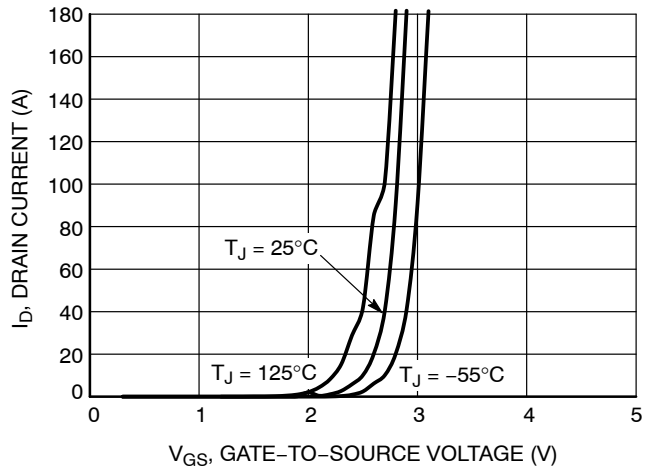


Figure 2. Transfer Characteristics

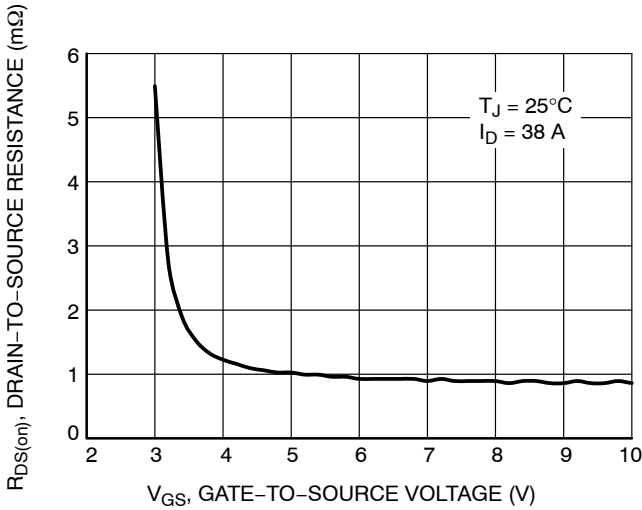


Figure 3. On-Resistance vs. Gate-to-Source Voltage

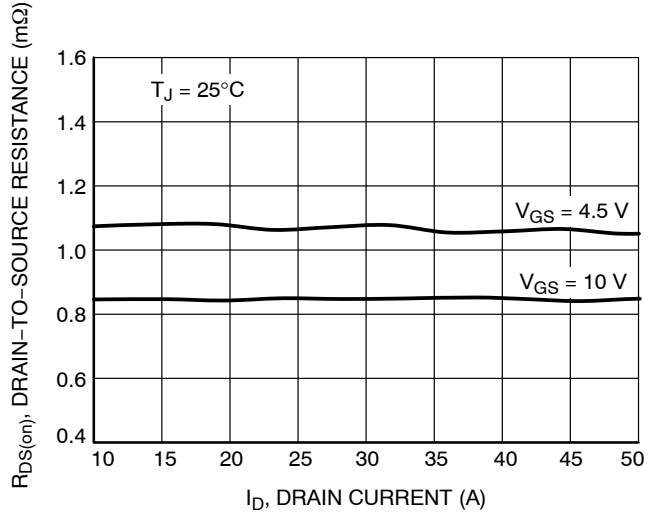


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

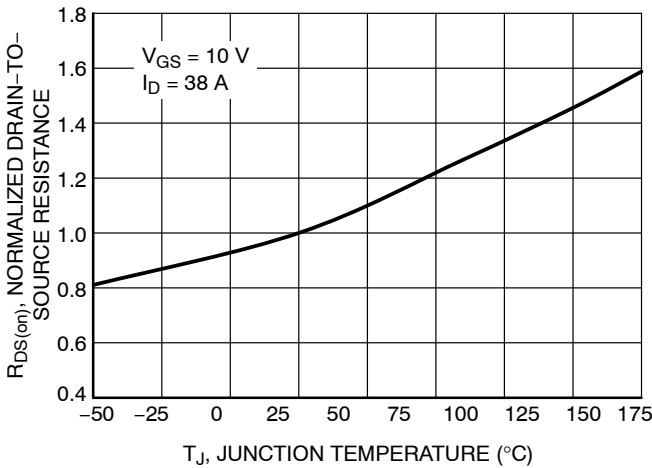


Figure 5. On-Resistance Variation with Temperature

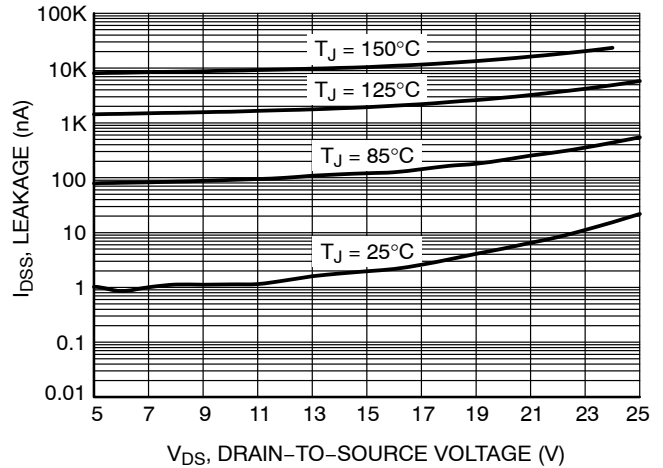


Figure 6. Drain-to-Source Leakage Current vs. Voltage

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TYPICAL CHARACTERISTICS

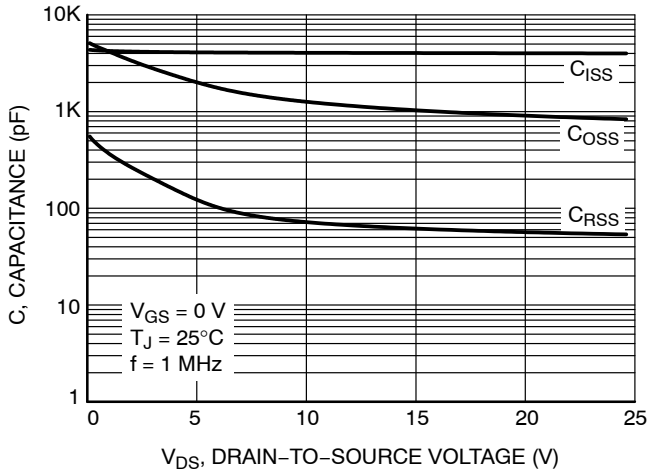


Figure 7. Capacitance Variation

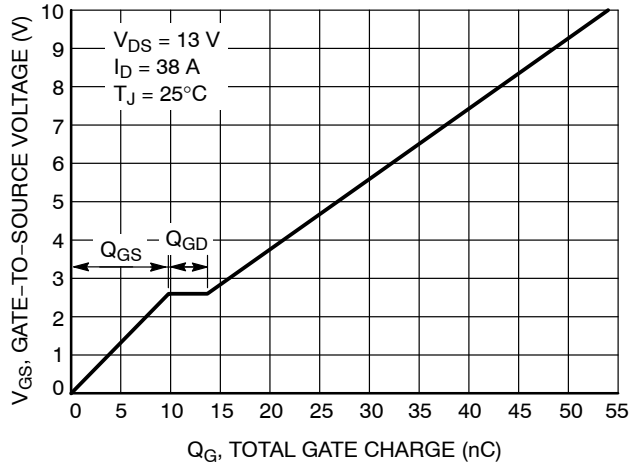


Figure 8. Gate-to-Source vs. Total Charge

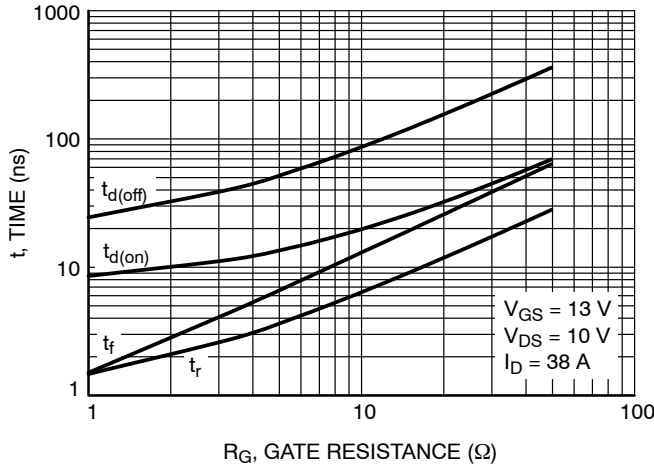


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

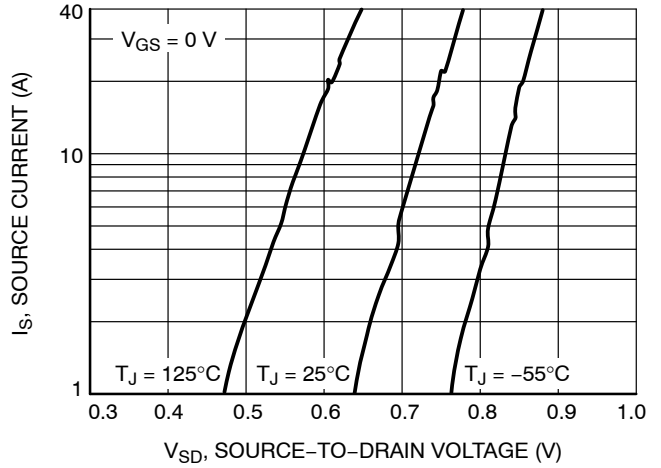


Figure 10. Diode Forward Voltage vs. Current

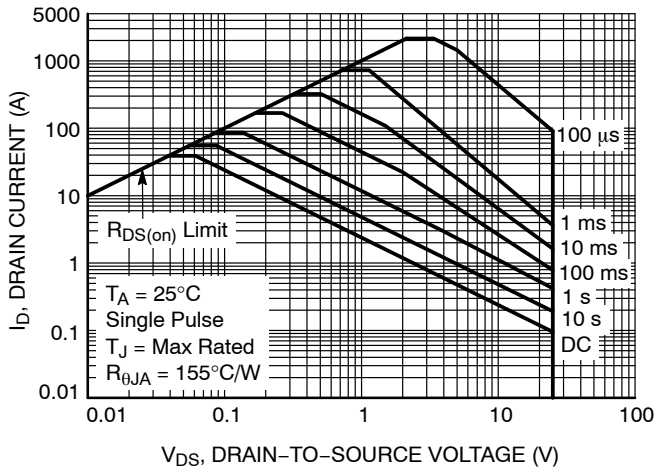


Figure 11. Maximum Rated Forward Biased Safe Operating Area

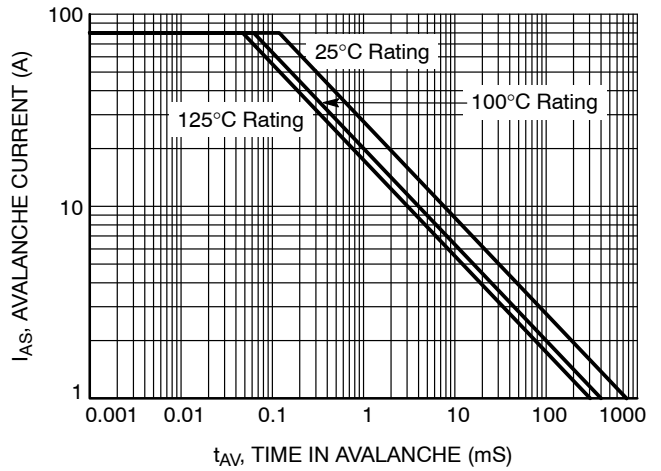


Figure 12. Maximum Drain Current vs. Time in Avalanche

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TYPICAL CHARACTERISTICS

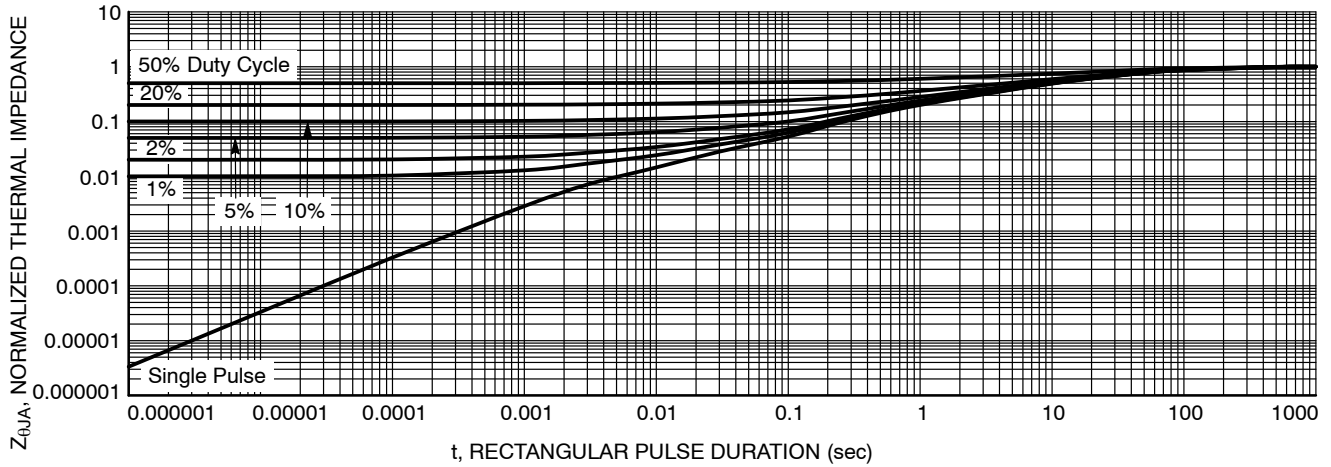



Figure 13. transient Thermal impedance

ORDERING INFORMATION

| Device | Marking | Package | Shipping† |
|----------------|---------|----------------------|--------------------|
| NTTFS1D2N02P1E | 2EJN | Power33 (Pb-Free) | 3000 / 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.

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