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MOSFET - Power, Single N-Channel, Shielded Gate, PowerTrench®

150 V, 22 mΩ, 37.2 A



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NTTFS022N15MC

Features

- Small Footprint (3.3 x 3.3 mm) for Compact Design
- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Capacitance to Minimize Driver Losses
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

Typical Applications

- Primary DC-DC MOSFET
- Synchronous Rectifier in DC-DC and AC-DC
- Motor Drive
- Capable of 175°C Tj Max Rating

MAXIMUM RATINGS (T_J = 25°C unless otherwise noted)

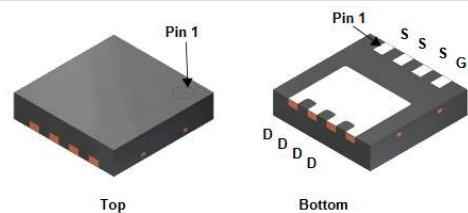
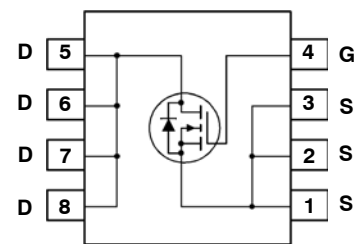
| Parameter | Symbol | Value | Unit |
|---|-----------------------------------|-------------------------|-------------------------|
| Drain-to-Source Voltage | V _{DSS} | 150 | V |
| Gate-to-Source Voltage | V _{GS} | ±20 | V |
| Continuous Drain Current R _{θJC} (Note 5) | Steady State | T _C = 25°C | I _D = 37.2 A |
| | | T _C = 25°C | P _D = 71.4 W |
| | | T _A = 25°C | I _D = 7.4 A |
| | | T _A = 25°C | P _D = 2.8 W |
| | | T _A = 25°C | P _D = 1.2 W |
| Pulsed Drain Current (Note 3) | T _C = 25°C | I _{DM} = 158 A | |
| Operating Junction and Storage Temperature Range | T _J , T _{stg} | -55 to +175 | °C |
| Single Pulse Drain-to-Source Avalanche Energy (I _{L(pk)} = 8 A) (Note 4) | E _{AS} | 96 | mJ |
| Maximum 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 a FR-4 board using 1 in² pad of 2 oz copper.
2. Surface mounted on a FR-4 board using the minimum recommended pad of 2 oz copper.
3. Pulsed ID please refer to Figure 12 SOA graph for more details
4. E_{AS} of 96 mJ is based on starting T_J = 25°C; L = 3 mH, I_{AS} = 8 A, V_{DD} = 150 V, V_{GS} = 10 V.
5. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.

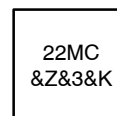
| V _{(BR)DSS} | R _{DS(on)} MAX | I _D MAX |
|----------------------|-------------------------|--------------------|
| 150 V | 22 mΩ @ 10 V | 37.2 A |

N-CHANNEL MOSFET



WDFN8
CASE 483AW

MARKING DIAGRAM



22MC = Specific Device Code
 &Z = Assembly Location
 &3 = 3-Digit Date Code
 &K = Lot Traceability

ORDERING INFORMATION

| Device | Package | Shipping† |
|---------------|-----------------|--------------------|
| NTTFS022N15MC | WDFN8 (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 Specification Brochure, BRD8011/D.

NTTFS022N15MC

THERMAL CHARACTERISTICS

| Parameter | Symbol | Value | Unit |
|--|-----------------|-------|-----------------------------|
| Thermal Resistance Junction-to-Case – Steady State (Note 5) | $R_{\theta JC}$ | 2.1 | $^{\circ}\text{C}/\text{W}$ |
| Thermal Resistance Junction-to-Ambient – Steady State (Notes 1, 5) | $R_{\theta JA}$ | 53 | $^{\circ}\text{C}/\text{W}$ |
| Thermal Resistance Junction-to-Ambient – Steady State (Notes 2, 5) | $R_{\theta JA}$ | 125 | $^{\circ}\text{C}/\text{W}$ |

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

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

OFF CHARACTERISTICS

| | | | | | | |
|---|-------------------|--|-----|----|-----------|------------------------------|
| Drain-to-Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$ | 150 | | | V |
| Drain-to-Source Breakdown Voltage Temperature Coefficient | $V_{(BR)DSS}/T_J$ | $I_D = 250\ \mu\text{A}$, referenced to 25°C | | 75 | | $\text{mV}/^{\circ}\text{C}$ |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{GS} = 0\text{ V}, V_{DS} = 120\text{ V}, T_J = 25^{\circ}\text{C}$ | | | 1 | μA |
| Gate-to-Source Leakage Current | I_{GSS} | $V_{GS} = \pm 20\text{ V}, V_{DS} = 0\text{ V}$ | | | ± 100 | nA |

ON CHARACTERISTICS

| | | | | | | |
|--|------------------|---|-----|------|------|------------------------------|
| Gate Threshold Voltage | $V_{GS(TH)}$ | $V_{GS} = V_{DS}, I_D = 100\ \mu\text{A}$ | 2.5 | | 4.5 | V |
| Gate Threshold Temperature Coefficient | $V_{GS(TH)}/T_J$ | $I_D = 100\ \mu\text{A}$, referenced to 25°C | | -8.4 | | $\text{mV}/^{\circ}\text{C}$ |
| Drain-to-Source On Resistance | $R_{DS(on)}$ | $V_{GS} = 10\text{ V}, I_D = 18\text{ A}$ | | 17.1 | 22 | $\text{m}\Omega$ |
| | | $V_{GS} = 8\text{ V}, I_D = 9\text{ A}$ | | 19 | 25.3 | $\text{m}\Omega$ |
| Forward Transconductance | g_{FS} | $V_{DS} = 10\text{ V}, I_D = 18\text{ A}$ | | 37 | | S |

CHARGES, CAPACITANCES & GATE RESISTANCE

| | | | | | | |
|------------------------------|--------------|---|--|------|-----|----------|
| Input Capacitance | C_{ISS} | $V_{GS} = 0\text{ V}, f = 1\text{ MHz}$ $V_{DS} = 75\text{ V}$ | | 1315 | | pF |
| Output Capacitance | C_{OSS} | | | 380 | | |
| Reverse Transfer Capacitance | C_{RSS} | | | 6 | | |
| Gate-Resistance | R_G | | | 0.6 | 1.2 | Ω |
| Total Gate Charge | $Q_{G(TOT)}$ | $V_{GS} = 10\text{ V}, V_{DS} = 75\text{ V}, I_D = 18\text{ A}$ | | 17 | | nC |
| Threshold Gate Charge | $Q_{G(TH)}$ | | | 4.4 | | |
| Gate-to-Source Charge | Q_{GS} | | | 7.2 | | |
| Gate-to-Drain Charge | Q_{GD} | | | 2.7 | | |
| Plateau Voltage | V_{GP} | | | 5.6 | | |
| Output Charge | Q_{OSS} | $V_{GS} = 0\text{ V}, V_{DD} = 75\text{ V}$ | | 41 | | nC |

RESISTIVE SWITCHING CHARACTERISTICS (Note 6)

| | | | | | | |
|---------------------|--------------|---|--|-----|--|----|
| Turn-On Delay Time | $t_{d(on)}$ | $V_{GS} = 10\text{ V}, V_{DS} = 75\text{ V},$ $I_D = 18\text{ A}, R_G = 6\ \Omega$ | | 14 | | ns |
| Rise Time | t_r | | | 2.8 | | |
| Turn-Off Delay Time | $t_{d(off)}$ | | | 17 | | |
| Fall Time | t_f | | | 2.9 | | |

DRAIN-SOURCE DIODE CHARACTERISTICS

| | | | | | | |
|-------------------------|----------|---|--|------|-----|----|
| Forward Diode Voltage | V_{SD} | $V_{GS} = 0\text{ V}, I_S = 18\text{ A}, T_J = 25^{\circ}\text{C}$ | | 0.86 | 1.2 | V |
| Reverse Recovery Time | t_{RR} | $V_{GS} = 0\text{ V}, V_{DD} = 75\text{ V}$ $di_S/dt = 300\text{ A}/\mu\text{s}, I_S = 18\text{ A}$ | | 45 | | ns |
| Reverse Recovery Charge | Q_{RR} | | | 155 | | nC |
| Reverse Recovery Time | t_{RR} | $V_{GS} = 0\text{ V}, V_{DD} = 75\text{ V}$ $di_S/dt = 1000\text{ A}/\mu\text{s}, I_S = 18\text{ A}$ | | 28 | | ns |
| Reverse Recovery Charge | Q_{RR} | | | 242 | | 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.

6. Switching characteristics are independent of operating junction temperature

NTTFS022N15MC

TYPICAL CHARACTERISTICS

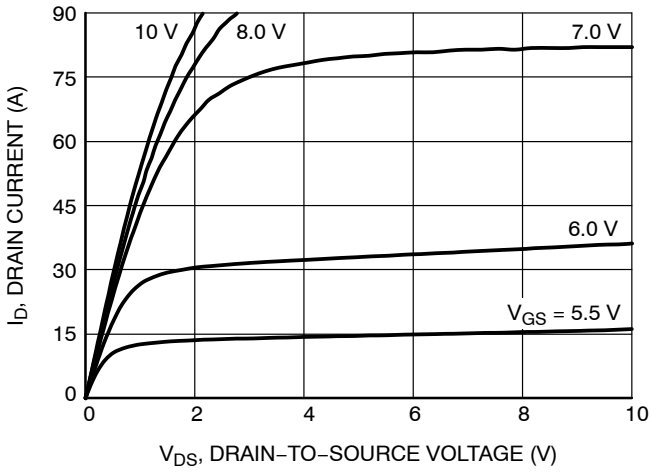


Figure 1. On-Region Characteristics

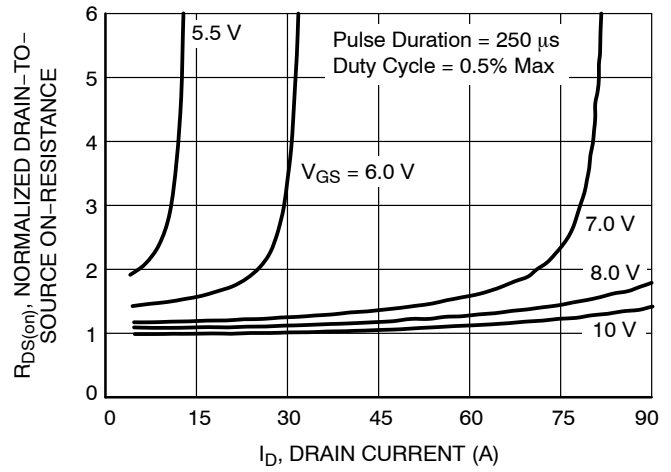


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

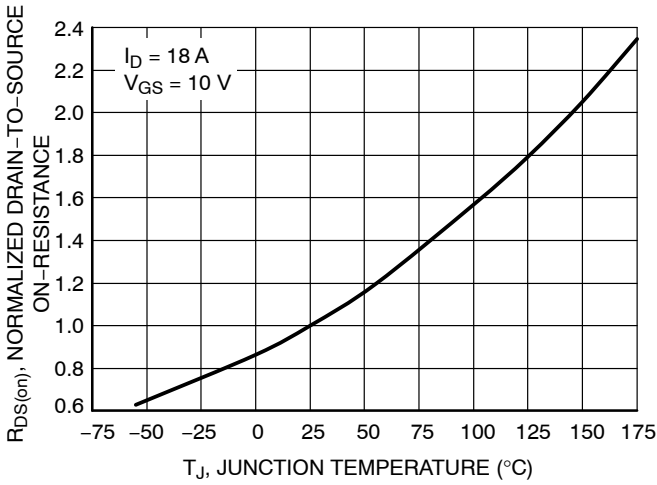


Figure 3. Normalized On-Resistance vs. Junction Temperature

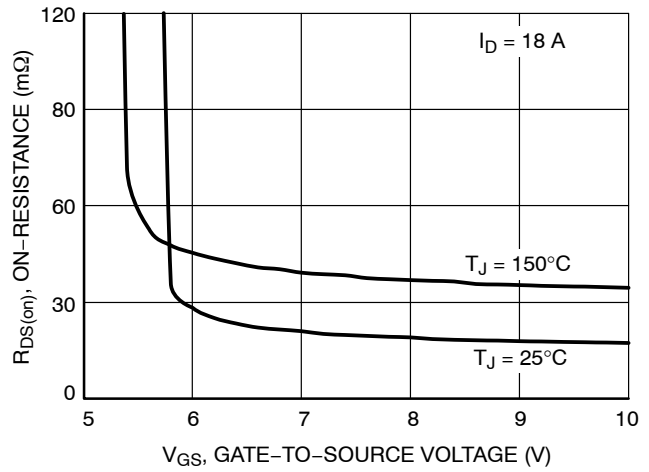


Figure 4. On-Resistance vs. Gate-to-Source Voltage

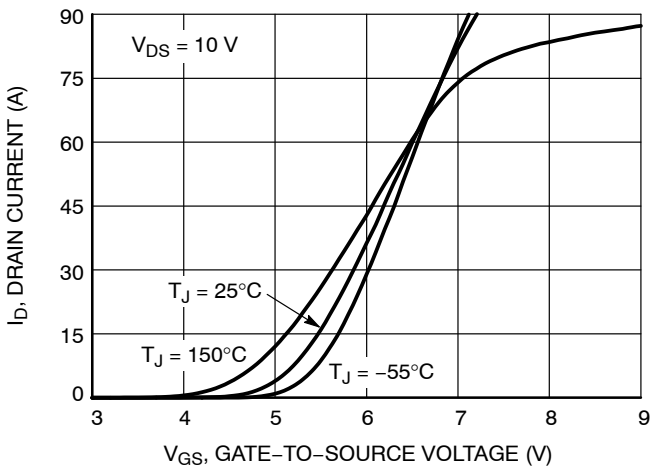


Figure 5. Transfer Characteristics

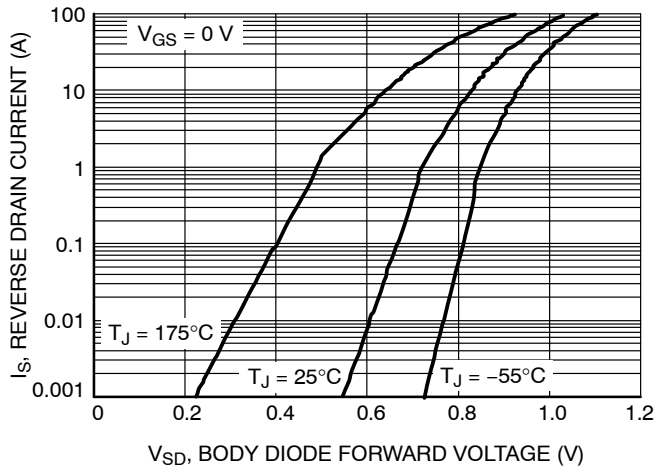


Figure 6. Source-to-Drain Diode Forward Voltage vs. Source Current

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TYPICAL CHARACTERISTICS

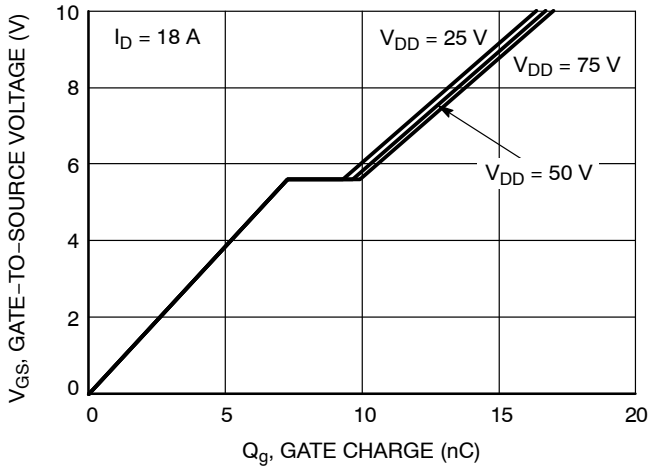


Figure 7. Gate Charge Characteristics

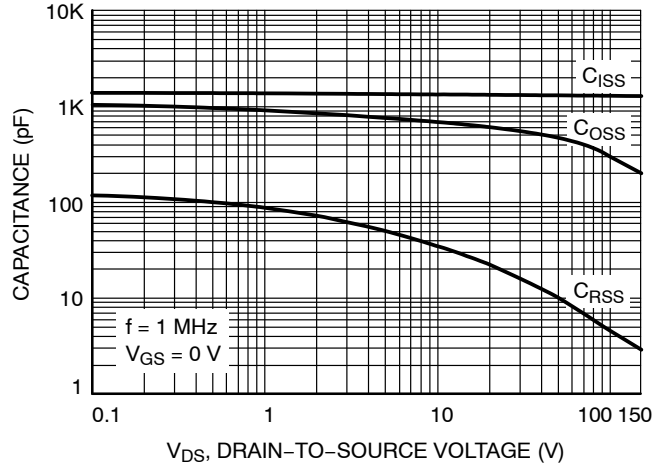


Figure 8. Capacitance vs. Drain-to-Source Voltage

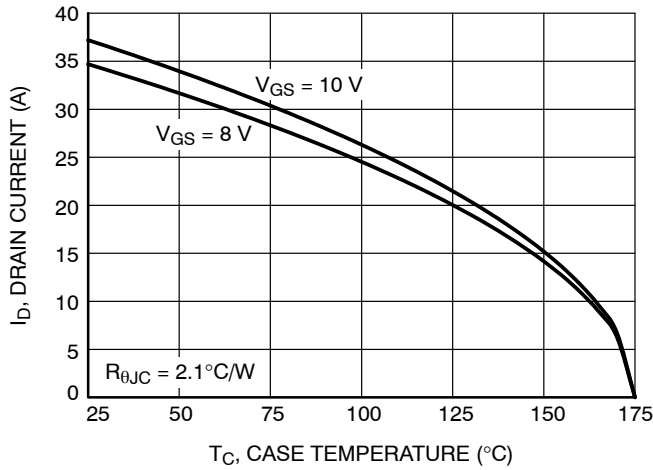


Figure 9. Drain Current vs. Case Temperature

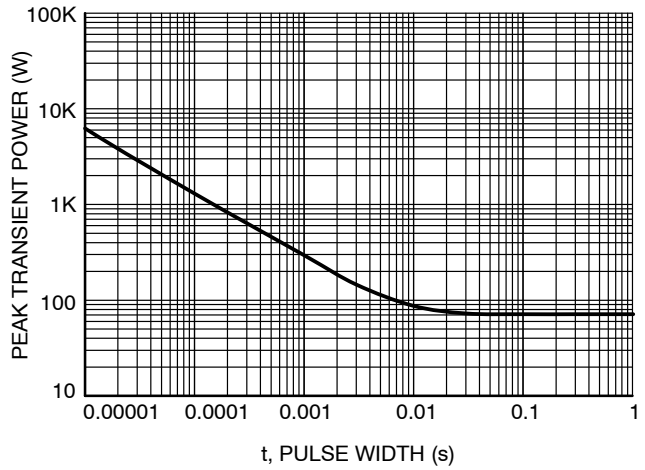


Figure 10. Peak Power

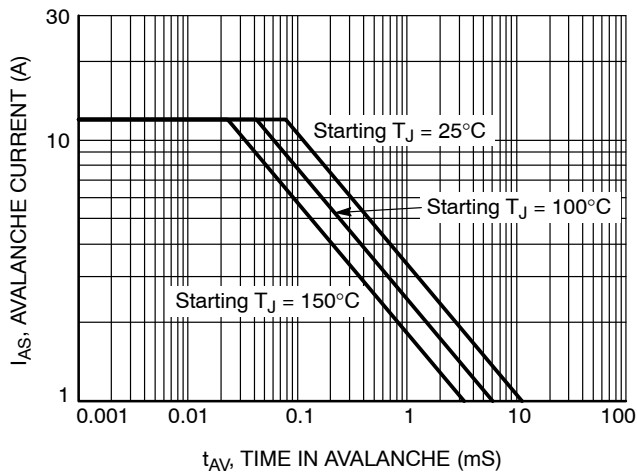


Figure 11. Unclamped Inductive Switching Capability

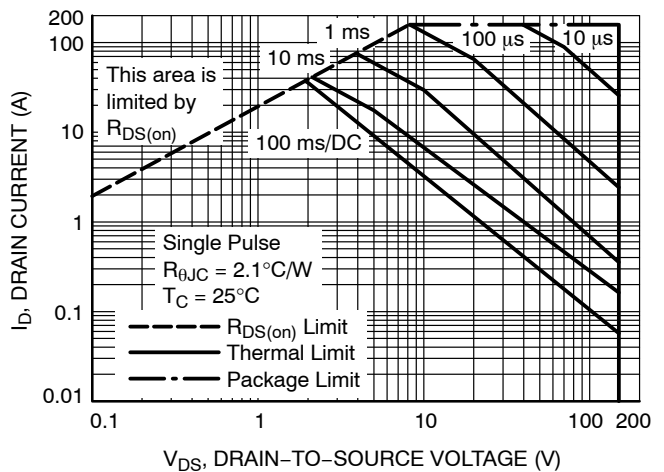


Figure 12. Forward Bias Safe Operating Area

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TYPICAL CHARACTERISTICS

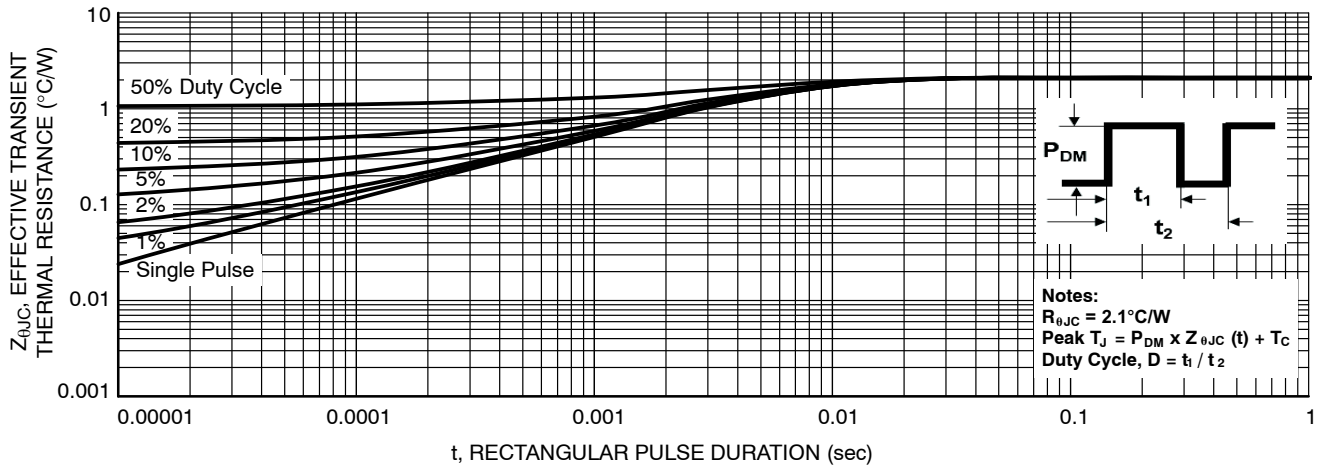
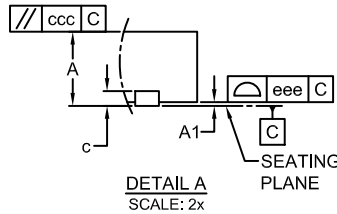
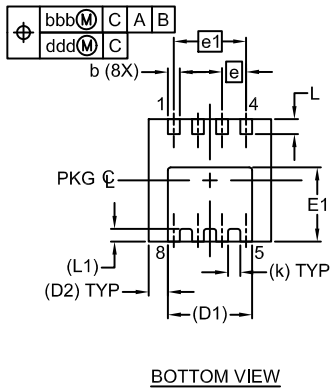
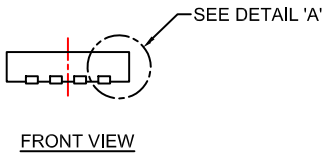
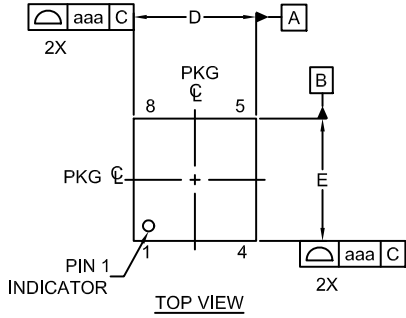


Figure 13. Transient Thermal Impedance

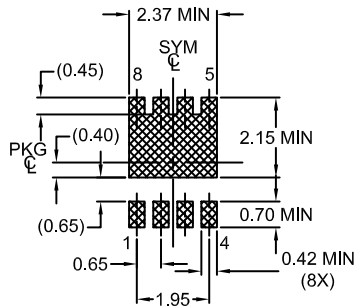
NTTFS022N15MC

PACKAGE DIMENSIONS

WDFN8 3.3X3.3, 0.65P
CASE 483AW
ISSUE A



LAND PATTERN RECOMMENDATION*



NOTES:

1. CONTROLLING DIMENSION: MILLIMETERS.
2. COPLANARITY APPLIES TO THE EXPOSED PADS AS WELL AS THE TERMINALS.
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.
4. SEATING PLANE IS DEFINED BY THE TERMINALS. 'A1' IS DEFINED AS THE DISTANCE FROM THE SEATING PLANE TO THE LOWEST POINT ON THE PACKAGE BODY.

| DIM | MILLIMETERS | | |
|-----|-------------|------|------|
| | MIN | NOM | MAX |
| A | 0.70 | 0.75 | 0.80 |
| A1 | - | - | 0.05 |
| b | 0.27 | 0.32 | 0.37 |
| c | 0.15 | 0.20 | 0.25 |
| D | 3.20 | 3.30 | 3.40 |
| D1 | 2.27 REF | | |
| D2 | 0.52 REF | | |
| E | 3.20 | 3.30 | 3.40 |
| E1 | 1.85 | 1.95 | 2.05 |
| e | 0.65 BSC | | |
| e1 | 1.95 BSC | | |
| k | 0.33 REF | | |
| L | 0.30 | 0.40 | 0.50 |
| L1 | 0.34 REF | | |
| aaa | 0.10 | | |
| bbb | 0.10 | | |
| ccc | 0.10 | | |
| ddd | 0.05 | | |
| eee | 0.05 | | |

*FOR ADDITIONAL INFORMATION ON OUR PB-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ON SEMICONDUCTOR SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDDRRM/D.

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