

MOSFET - Power, Single N-Channel, DFNW8 80 V, 1.56 mΩ, 287 A



ON Semiconductor®

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NTMTS1D5N08MC

Features

- Small Footprint (8x8 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 and are RoHS Compliant

Typical Applications

- Power Tools, Battery Operated Vacuums
- UAV/Drones, Material Handling
- BMS/Storage, Home Automation

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

| Parameter | | Symbol | Value | Unit | |
|--|--|--------------------------|-------------|------------------|---|
| Drain-to-Source Voltage | | V_{DSS} | 80 | V | |
| Gate-to-Source Voltage | | V_{GS} | ± 20 | V | |
| Continuous Drain Current $R_{\theta JC}$ (Note 2) | Steady State | $T_C = 25^\circ\text{C}$ | I_D | 287 | A |
| | | | P_D | 250 | W |
| Continuous Drain Current $R_{\theta JA}$ (Notes 1, 2) | Steady State | $T_A = 25^\circ\text{C}$ | I_D | 33 | A |
| | | | P_D | 3.3 | W |
| Pulsed Drain Current | $T_C = 25^\circ\text{C}, t_p = 10 \mu\text{s}$ | I_{DM} | 3500 | A | |
| Operating Junction and Storage Temperature Range | | T_J, T_{stg} | -55 to +150 | $^\circ\text{C}$ | |
| Single Pulse Drain-to-Source Avalanche Energy ($I_{L(pk)} = 31 \text{ A}, L = 3 \text{ mH}$) | | E_{AS} | 1441 | mJ | |
| Lead Temperature for Soldering Purposes (1/8" from case for 10 s) | | T_L | 260 | $^\circ\text{C}$ | |

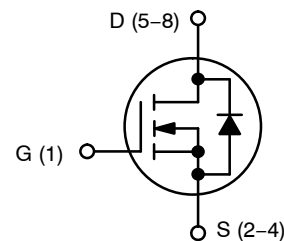
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

THERMAL RESISTANCE MAXIMUM RATINGS

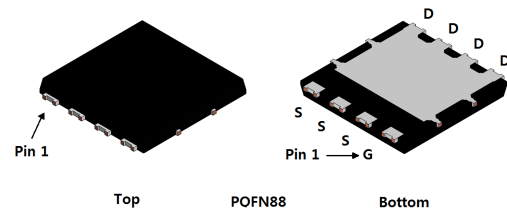
| Parameter | Symbol | Value | Unit |
|---|-----------------|-------|---------------------------|
| Junction-to-Case - Steady State (Note 2) | $R_{\theta JC}$ | 0.5 | $^\circ\text{C}/\text{W}$ |
| Junction-to-Ambient - Steady State (Note 2) | $R_{\theta JA}$ | 38 | $^\circ\text{C}/\text{W}$ |

1. Surface-mounted on FR4 board using a 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.

| $V_{(BR)DSS}$ | $R_{DS(ON)} \text{ MAX}$ | $I_D \text{ MAX}$ |
|---------------|--------------------------|-------------------|
| 80 V | 1.56 mΩ @ 10 V | 287 A |
| | 4.0 mΩ @ 6 V | |

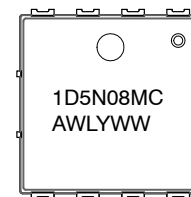


N-CHANNEL MOSFET



DFNW8
CASE 507AP

MARKING DIAGRAM



1D5N08MC = Device Code
A = Assembly Location
WL = 2-digit Wafer Lot Code
Y = Year Code
WW = Work Week Code

ORDERING INFORMATION

See detailed ordering, marking and shipping information in the package dimensions section on page 5 of this data sheet.

NTMTS1D5N08MC

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 | $V_{(BR)DSS}$ | $V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$ | 80 | | | V |
| Drain-to-Source Breakdown Voltage Temperature Coefficient | $V_{(BR)DSS}/T_J$ | $I_D = 250\ \mu\text{A}$, ref to 25°C | | 82 | | mV/ $^\circ\text{C}$ |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{GS} = 0\text{ V}, V_{DS} = 80\text{ V}$ | $T_J = 25^\circ\text{C}$ | | 1 | μA |
| | | | $T_J = 125^\circ\text{C}$ | | 250 | |
| Gate-to-Source Leakage Current | I_{GSS} | $V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$ | | | ± 100 | nA |

ON CHARACTERISTICS (Note 3)

| | | | | | | |
|--|------------------|--|-----|------|------|----------------------|
| Gate Threshold Voltage | $V_{GS(TH)}$ | $V_{GS} = V_{DS}, I_D = 650\ \mu\text{A}$ | 2.0 | 3.0 | 4.0 | V |
| Negative Threshold Temperature Coefficient | $V_{GS(TH)}/T_J$ | $I_D = 650\ \mu\text{A}$, ref to 25°C | | -8.3 | | mV/ $^\circ\text{C}$ |
| Drain-to-Source On Resistance | $R_{DS(on)}$ | $V_{GS} = 10\text{ V}, I_D = 80\text{ A}$ | | 1.10 | 1.56 | m Ω |
| Drain-to-Source On Resistance | $R_{DS(on)}$ | $V_{GS} = 6\text{ V}, I_D = 58\text{ A}$ | | 1.75 | 4.0 | m Ω |
| Forward Transconductance | g_{FS} | $V_{DS} = 5\text{ V}, I_D = 80\text{ A}$ | | 219 | | S |
| Gate Resistance | R_G | $T_A = 25^\circ\text{C}$ | | 0.9 | | Ω |

CHARGES, CAPACITANCES & GATE RESISTANCE

| | | | | | | |
|------------------------------|---------------|---|--|------|--------|----|
| Input Capacitance | C_{ISS} | $V_{GS} = 0\text{ V}, f = 1\text{ MHz}, V_{DS} = 40\text{ V}$ | | 7420 | 10,400 | pF |
| Output Capacitance | C_{OSS} | | | 2555 | 3600 | |
| Reverse Transfer Capacitance | C_{RSS} | | | 101 | 175 | |
| Total Gate Charge | $Q_{G(TOT)}$ | $V_{GS} = 10\text{ V}, V_{DS} = 40\text{ V}; I_D = 80\text{ A}$ | | 101 | 140 | nC |
| Threshold Gate Charge | $Q_{G(TH)}$ | | | 20 | 28 | |
| Gate-to-Source Charge | Q_{GS} | | | 32 | | |
| Gate-to-Drain Charge | Q_{GD} | | | 21 | | |
| Output Charge | Q_{OSS} | | | 141 | | |
| Sync Charge | Q_{sync} | | | 82 | | |
| Plateau Voltage | $V_{plateau}$ | | | 5 | | |

SWITCHING CHARACTERISTICS, $V_{GS} = 10\text{ V}$ (Note 3)

| | | | | | | |
|---------------------|--------------|--|--|----|--|----|
| Turn-On Delay Time | $t_{d(ON)}$ | $V_{GS} = 10\text{ V}, V_{DS} = 40\text{ V}, I_D = 80\text{ A}, R_G = 6\ \Omega$ | | 30 | | ns |
| Rise Time | t_r | | | 24 | | |
| Turn-Off Delay Time | $t_{d(OFF)}$ | | | 69 | | |
| Fall Time | t_f | | | 31 | | |

DRAIN-SOURCE DIODE CHARACTERISTICS

| | | | | | | |
|-------------------------|----------|--|--|-----|-----|----|
| Forward Diode Voltage | V_{SD} | $V_{GS} = 0\text{ V}, I_S = 2\text{ A}$ | | 0.7 | 1.2 | V |
| | | $V_{GS} = 0\text{ V}, I_S = 80\text{ A}$ | | 0.8 | 1.3 | |
| Reverse Recovery Time | t_{RR} | $I_F = 40\text{ A}, di/dt = 300\text{ A}/\mu\text{s}$ | | 39 | 62 | ns |
| Reverse Recovery Charge | Q_{RR} | | | 89 | 142 | |
| Reverse Recovery Time | t_{RR} | $I_F = 40\text{ A}, di/dt = 1000\text{ A}/\mu\text{s}$ | | 31 | 50 | nC |
| Reverse Recovery Charge | Q_{RR} | | | 209 | 335 | |

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.

TYPICAL CHARACTERISTICS

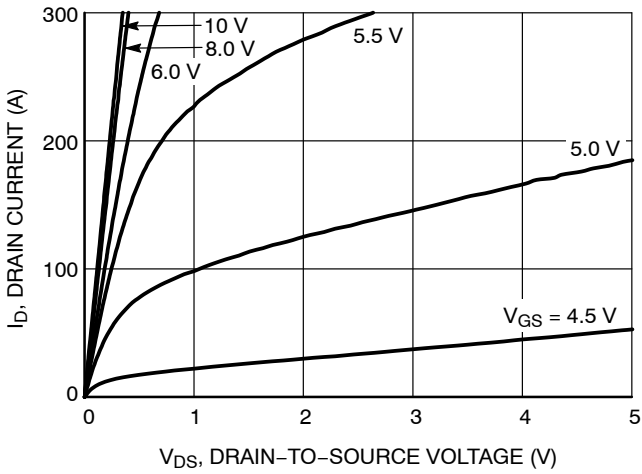


Figure 1. On-Region Characteristics

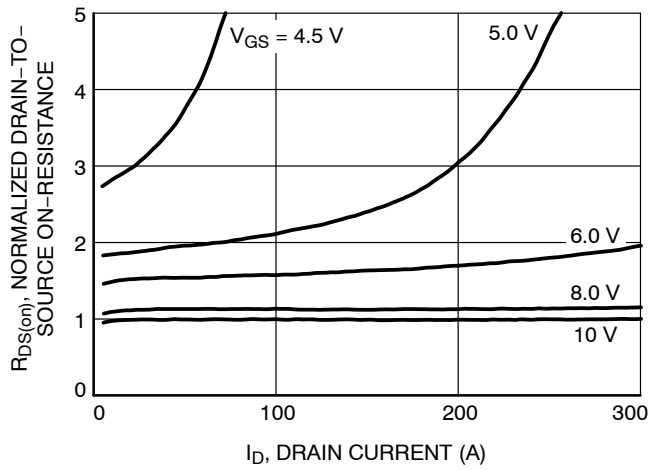


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

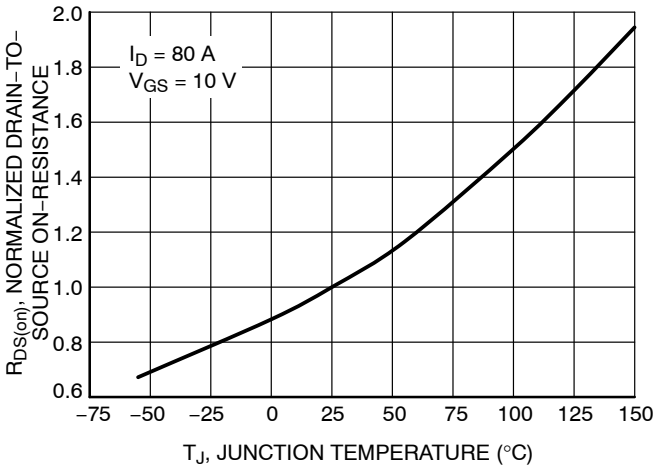


Figure 3. Normalized On Resistance vs. Junction Temperature

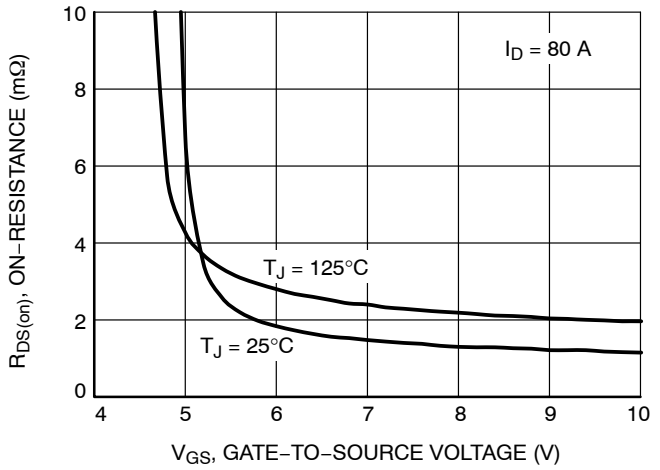


Figure 4. On-Resistance vs. Gate-to-Source Voltage

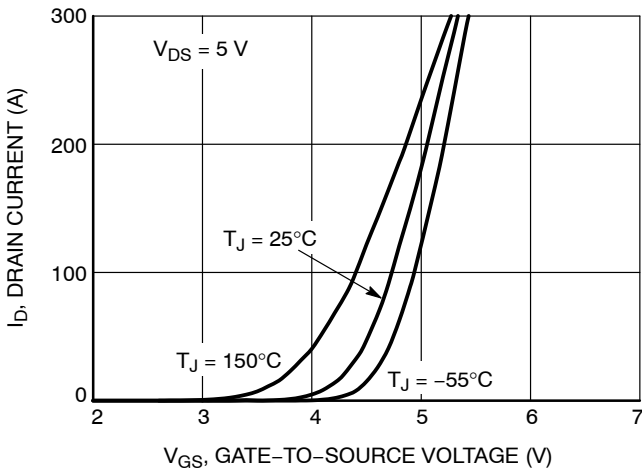


Figure 5. Transfer Characteristics

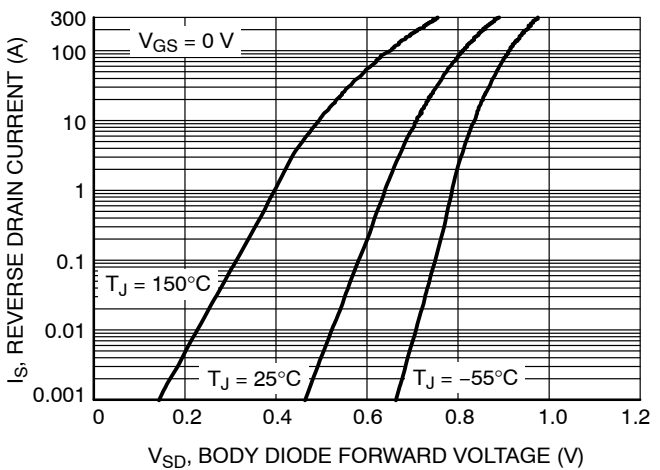


Figure 6. Source-to-Drain Diode Forward Voltage vs. Source Current

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TYPICAL CHARACTERISTICS

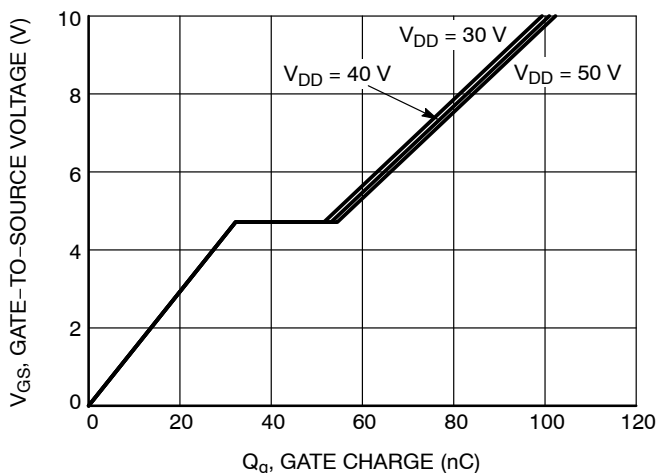


Figure 7. Gate Charge Characteristics

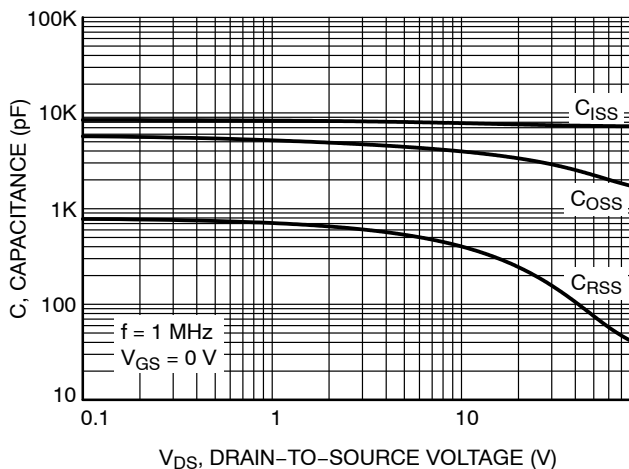


Figure 8. Capacitance vs. Drain-to-Source Voltage

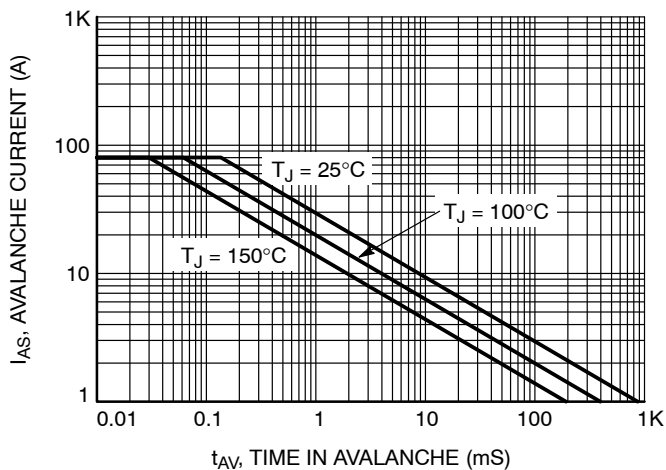


Figure 9. Unclamped Inductive Switching Capability

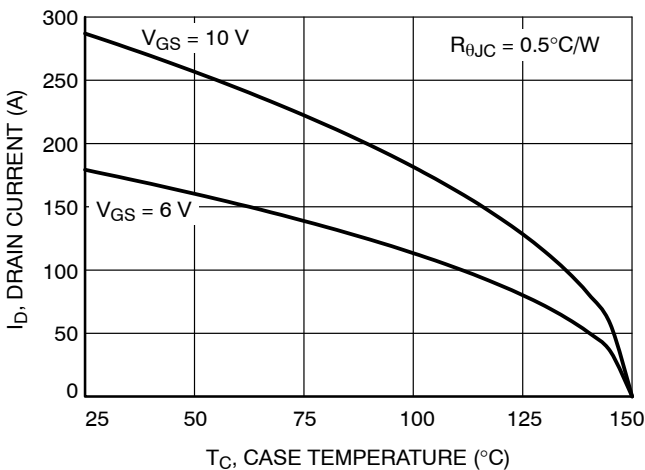


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

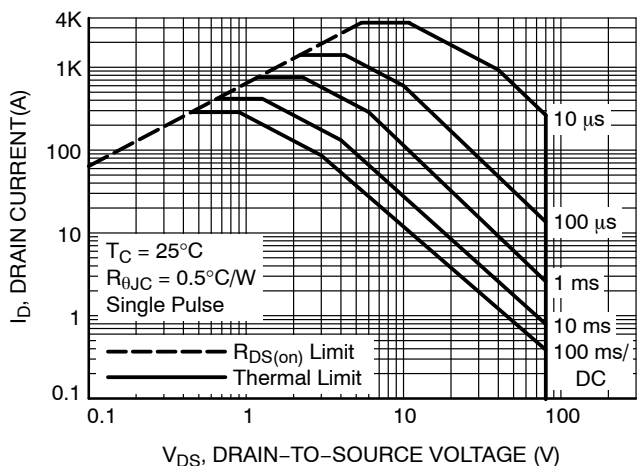


Figure 11. Forward Biased Safe Operating Area

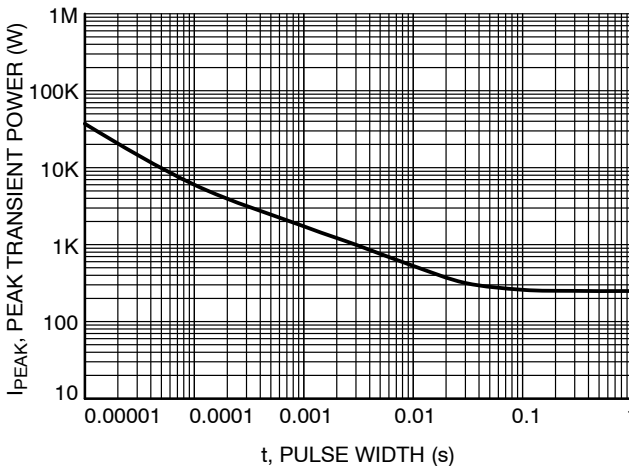


Figure 12. Single Pulse Maximum Power Dissipation

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TYPICAL CHARACTERISTICS

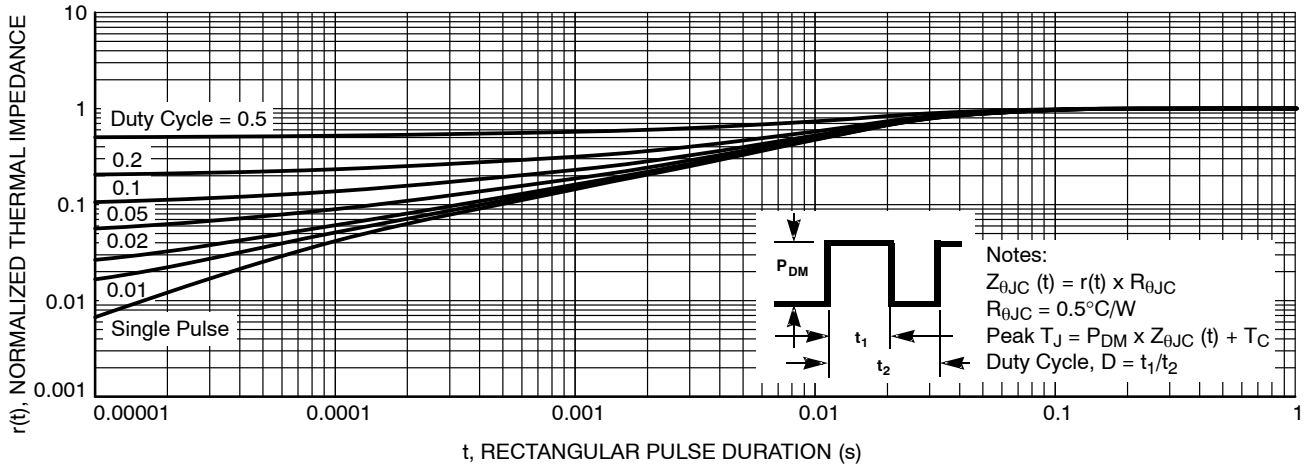


Figure 13. Transient Thermal Impedance

DEVICE ORDERING INFORMATION

| Device | Marking | Package | Shipping† |
|---------------|-------------------|--------------------|--------------------|
| NTMTS1D5N08MC | NTMTS 1D5N08MC | DFNW8 (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.

MECHANICAL CASE OUTLINE

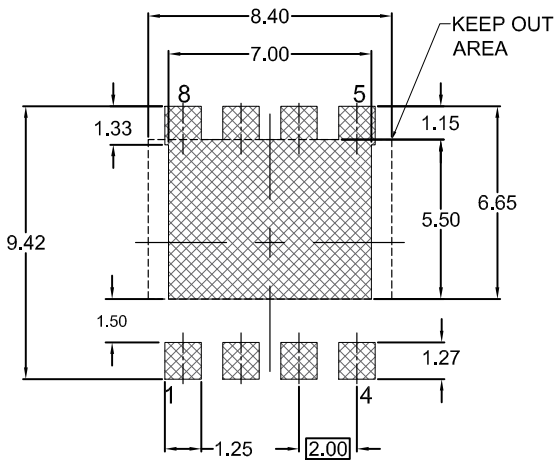
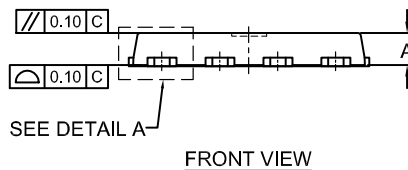
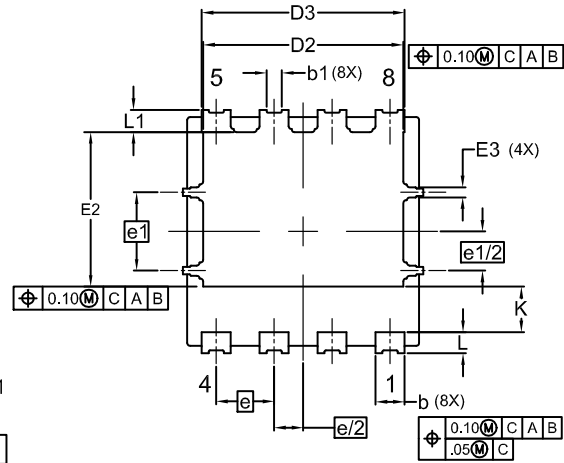
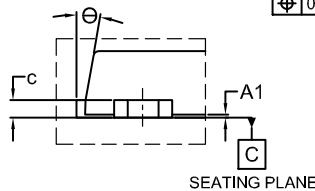
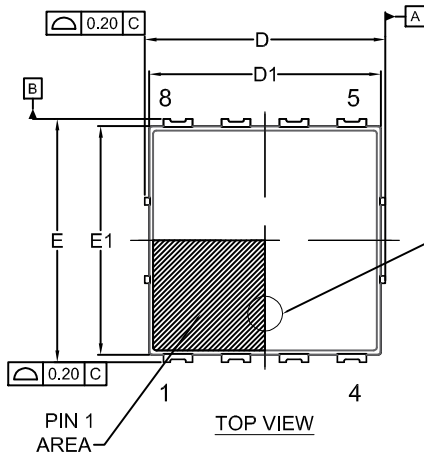
PACKAGE DIMENSIONS

ON Semiconductor®



TDFNW8 8.3x8.4, 2.0P, SINGLE COOL CASE 507AP ISSUE D

DATE 29 MAR 2021



RECOMMENDED LAND PATTERN*

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

DETAIL A
SCALE: 2X

BOTTOM VIEW

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS
3. COPLANARITY APPLIES TO THE EXPOSED PADS AS WELL AS THE TERMINALS.
4. DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.
5. 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.

GENERIC MARKING DIAGRAM*



XXXX = Specific Device Code
A = Assembly Location
WL = Wafer Lot Code
Y = Year Code
WW = Work Week Code

*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.

| DIM | MILLIMETERS | | |
|------|-------------|------|------|
| | MIN. | NOM. | MAX. |
| A | 1.00 | 1.10 | 1.20 |
| A1 | 0.00 | — | 0.05 |
| b | 0.90 | 1.00 | 1.10 |
| b1 | 0.35 | 0.45 | 0.55 |
| c | 0.23 | 0.28 | 0.33 |
| D | 8.20 | 8.30 | 8.40 |
| D1 | 7.90 | 8.00 | 8.10 |
| D2 | 6.80 | 6.90 | 7.00 |
| D3 | 6.90 | 7.00 | 7.10 |
| E | 8.30 | 8.40 | 8.50 |
| E1 | 7.80 | 7.90 | 8.00 |
| E2 | 5.24 | 5.34 | 5.44 |
| E3 | 0.25 | 0.35 | 0.45 |
| e | 2.00 BSC | | |
| e/2 | 1.00 BSC | | |
| e1 | 2.70 BSC | | |
| e1/2 | 1.35 BSC | | |
| K | 1.50 | 1.57 | 1.70 |
| L | 0.64 | 0.74 | 0.84 |
| L1 | 0.67 | 0.77 | 0.87 |
| Θ | 0° | — | 12° |

| | | |
|-------------------------|--|---|
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| DESCRIPTION: | TDFNW8 8.3x8.4, 2.0P, SINGLE COOL | PAGE 1 OF 1 |

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