

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

## 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                                                                          |                                                            |                            | $V_{GS}$          | $\pm 20$    | V                  |
| Continuous Drain Current $R_{\theta JC}$ (Note 2)                                               | Steady State                                               | $T_C = 25^{\circ}\text{C}$ | $I_D$             | 287         | A                  |
| Power Dissipation $R_{\theta JC}$ (Note 2)                                                      |                                                            |                            | $P_D$             | 250         | W                  |
| Continuous Drain Current $R_{\theta JA}$ (Notes 1, 2)                                           | Steady State                                               | $T_A = 25^{\circ}\text{C}$ | $I_D$             | 33          | A                  |
| Power Dissipation $R_{\theta JA}$ (Notes 1, 2)                                                  |                                                            |                            | $P_D$             | 3.3         | W                  |
| Pulsed Drain Current                                                                            | $T_C = 25^{\circ}\text{C}$ , $t_p = 10\text{ }\mu\text{s}$ |                            | $I_{DM}$          | 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   | $^\circ\text{C/W}$ |
| Junction-to-Ambient - Steady State (Note 2) | $R_{\theta JA}$ | 38    |                    |

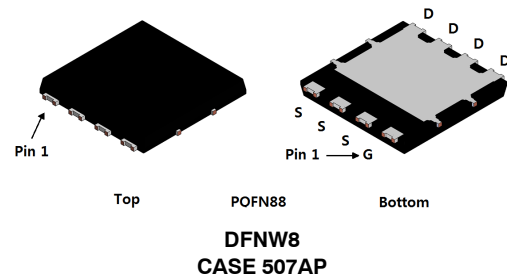
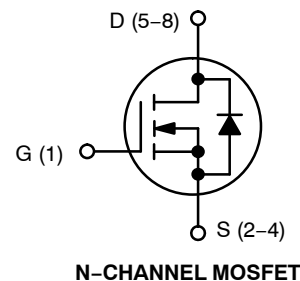
1. Surface-mounted on FR4 board using a 1 in<sup>2</sup> pad size, 1 oz. Cu pad.
2. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.



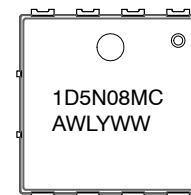
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| $V_{(BR)DSS}$ | $R_{DS(ON)} \text{ MAX}$ | $I_D \text{ MAX}$ |
|---------------|--------------------------|-------------------|
| 80 V          | 1.56 mΩ @ 10 V           | 287 A             |
|               | 4.0 mΩ @ 6 V             |        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



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

### ON CHARACTERISTICS (Note 3)

|                                            |                  |                                                            |     |      |      |                      |
|--------------------------------------------|------------------|------------------------------------------------------------|-----|------|------|----------------------|
| Gate Threshold Voltage                     | $V_{GS(TH)}$     | $V_{GS} = V_{DS}, I_D = 650\text{ }\mu\text{A}$            | 2.0 | 3.0  | 4.0  | V                    |
| Negative Threshold Temperature Coefficient | $V_{GS(TH)}/T_J$ | $I_D = 650\text{ }\mu\text{A}$ , ref to $25^\circ\text{C}$ |     | -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 $\Omega$           |
| Drain-to-Source On Resistance              | $R_{DS(on)}$     | $V_{GS} = 6\text{ V}, I_D = 58\text{ A}$                   |     | 1.75 | 4.0  | m $\Omega$           |
| 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  |      | $\Omega$             |

### 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    |        | V  |

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

|                     |              |                                                                                        |  |    |  |    |
|---------------------|--------------|----------------------------------------------------------------------------------------|--|----|--|----|
| Turn-On Delay Time  | $t_{d(ON)}$  | $V_{GS} = 10\text{ V}, V_{DS} = 40\text{ V}, I_D = 80\text{ A}, R_G = 6\text{ }\Omega$ |  | 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

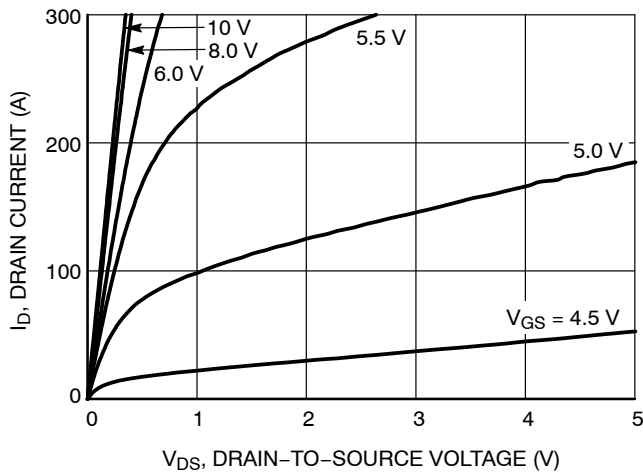


Figure 1. On-Region Characteristics

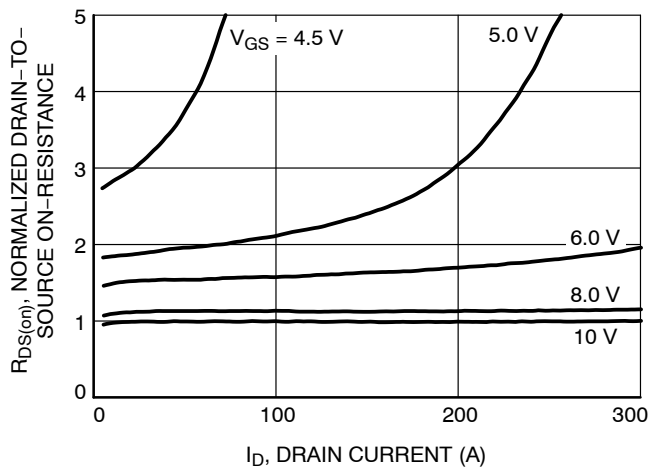


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

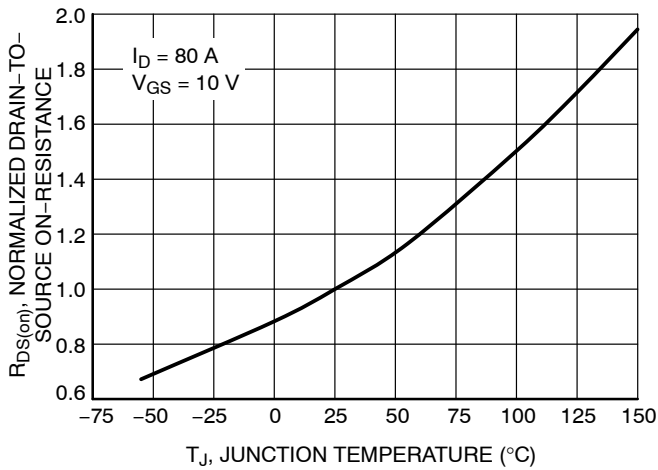


Figure 3. Normalized On Resistance vs. Junction Temperature

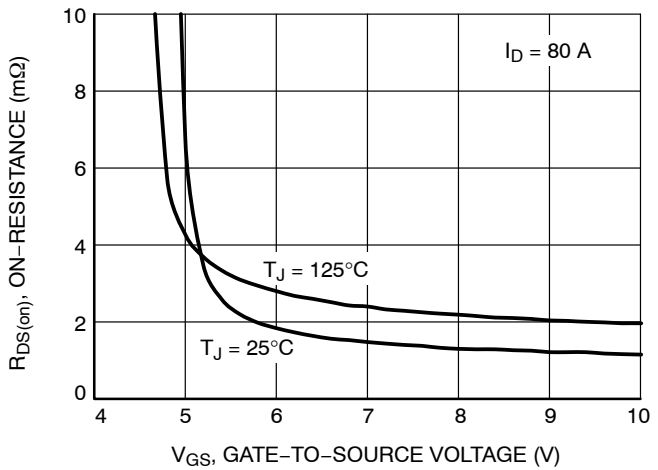


Figure 4. On-Resistance vs. Gate-to-Source Voltage

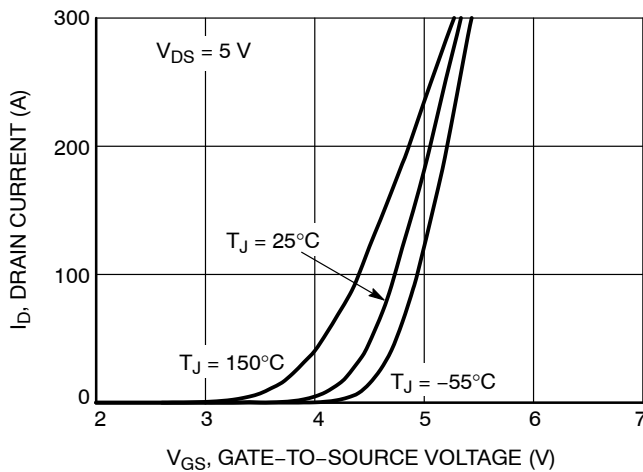


Figure 5. Transfer Characteristics

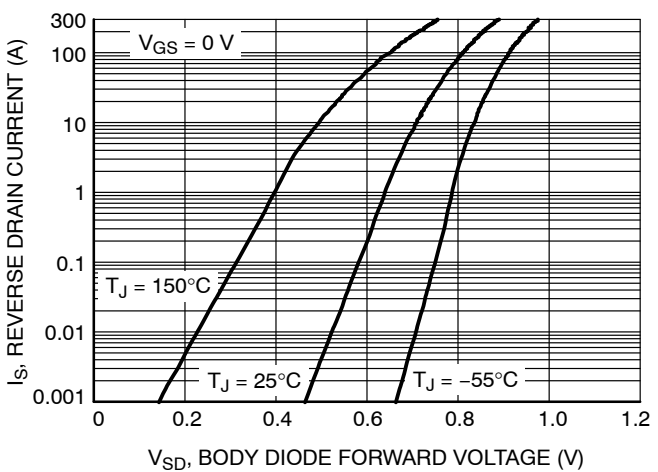


Figure 6. Source-to-Drain Diode Forward Voltage vs. Source Current

TYPICAL CHARACTERISTICS

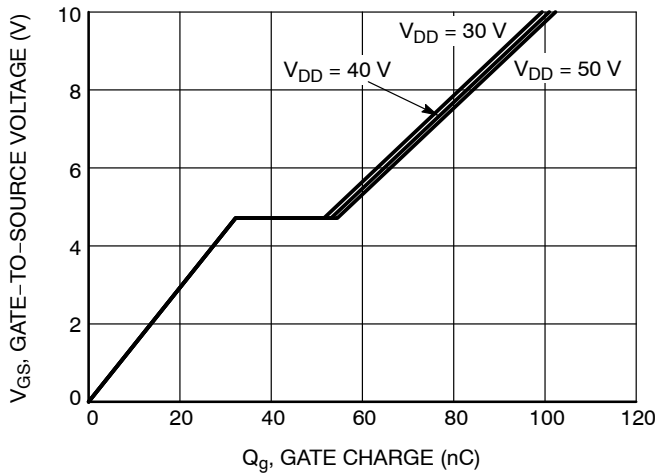


Figure 7. Gate Charge Characteristics

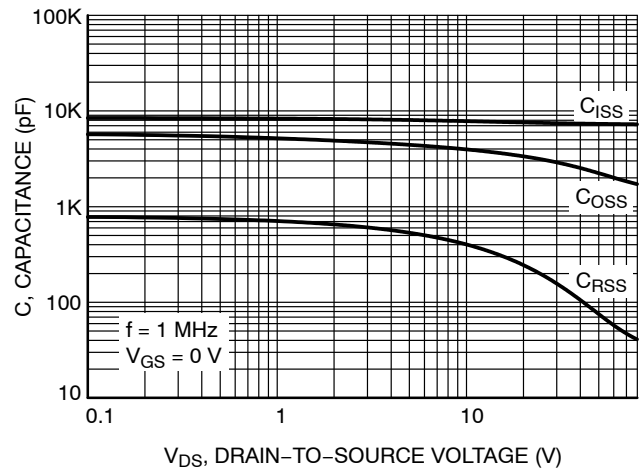


Figure 8. Capacitance vs. Drain-to-Source Voltage

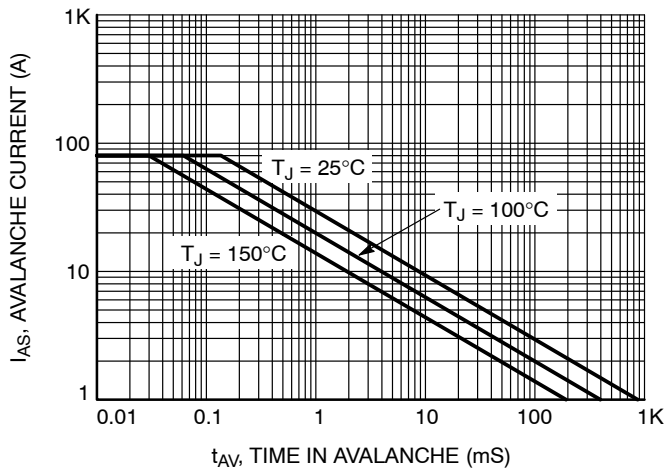


Figure 9. Unclamped Inductive Switching Capability

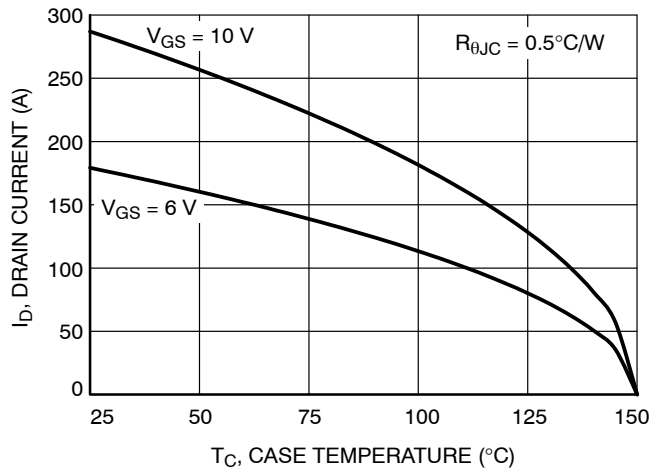


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

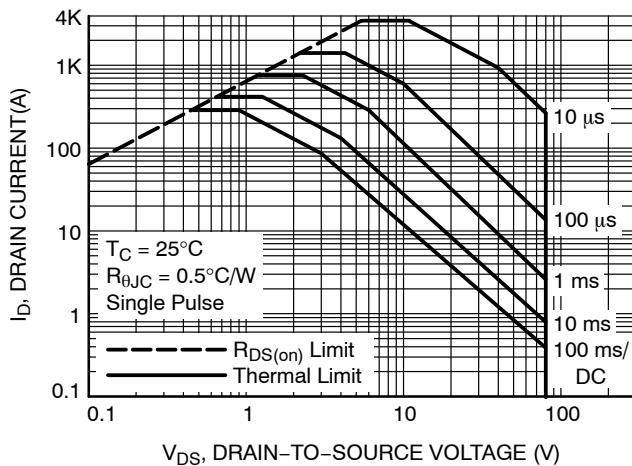


Figure 11. Forward Biased Safe Operating Area

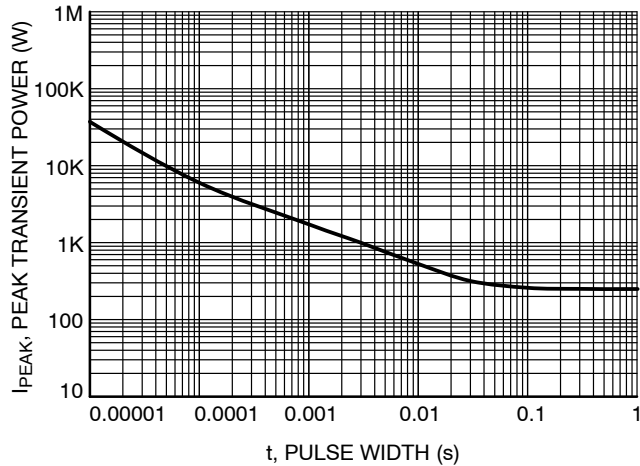


Figure 12. Single Pulse Maximum Power Dissipation

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## TYPICAL CHARACTERISTICS

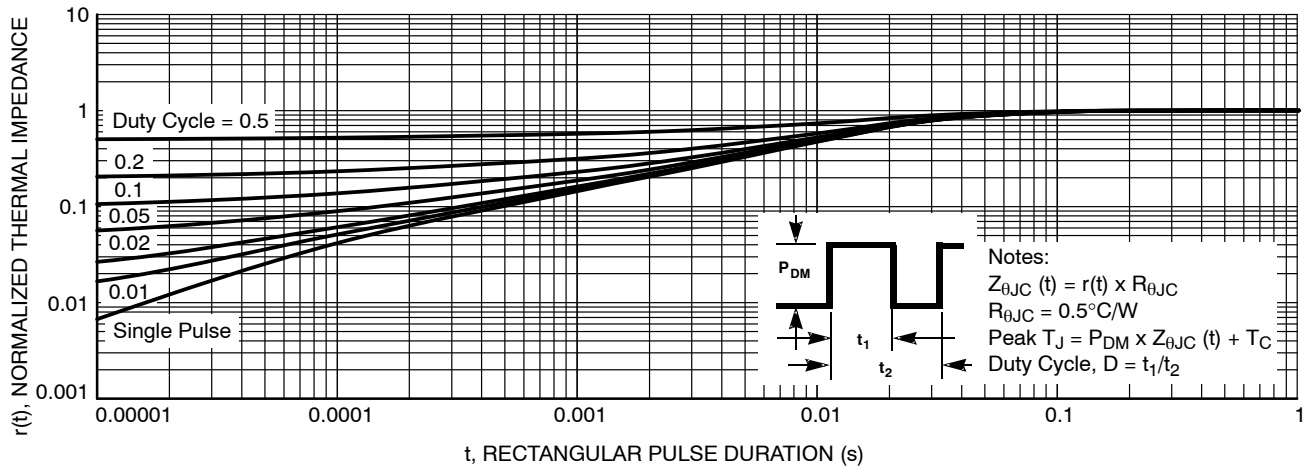
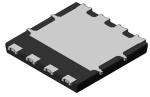


Figure 13. Transient Thermal Impedance

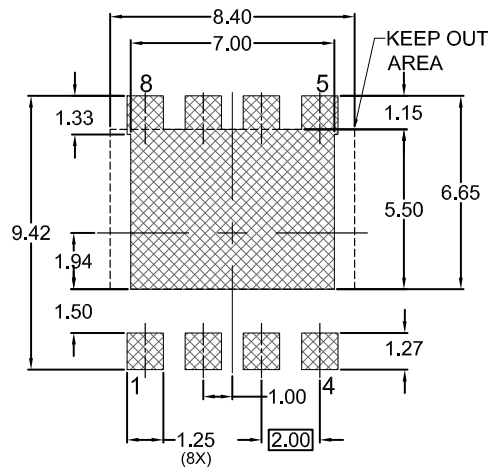
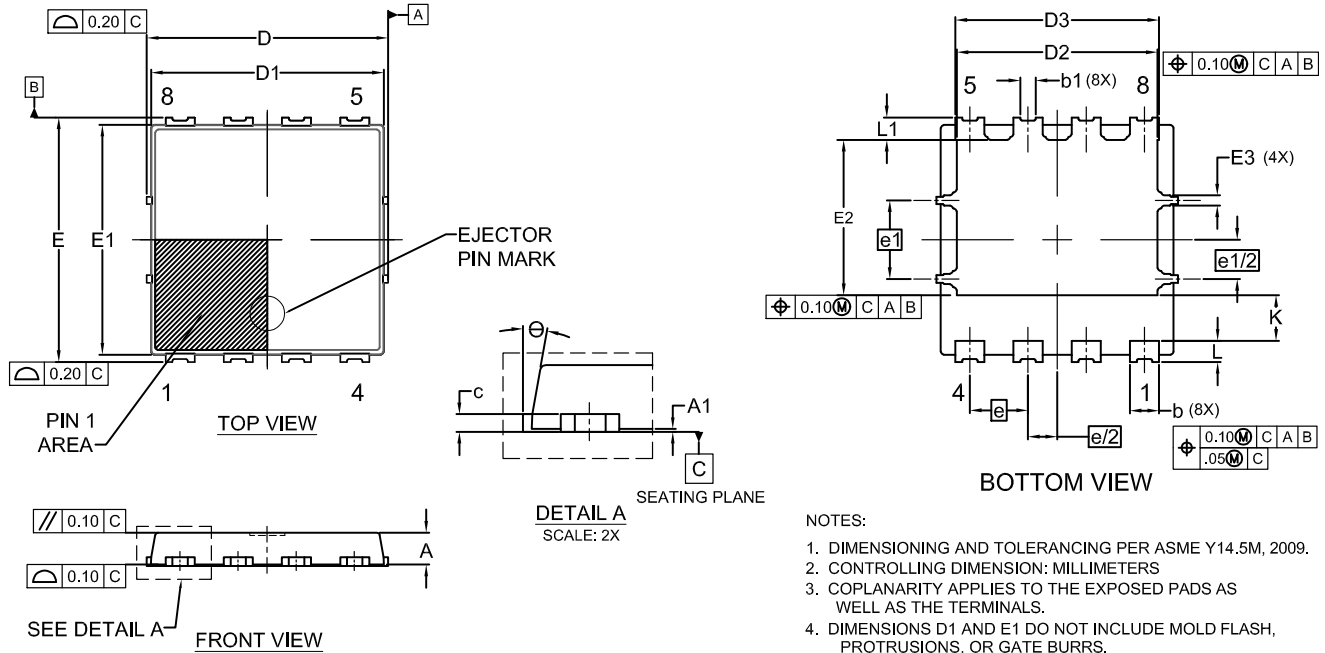
### DEVICE ORDERING INFORMATION

| Device        | Marking           | Package            | Shipping†          |
|---------------|-------------------|--------------------|--------------------|
| NTMTS1D5N08MC | NTMTS<br>1D5N08MC | DFNW8<br>(Pb-Free) | 3000 / Tape & Reel |

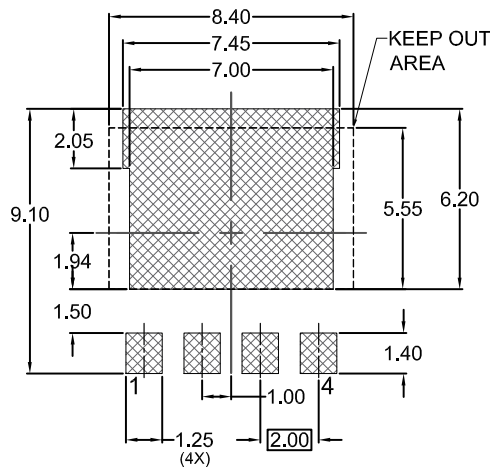
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.


**TDFNW8 8.30x8.40x1.10, 2.00P**  
**CASE 507AP**  
**ISSUE E**

DATE 08 MAY 2024



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



| 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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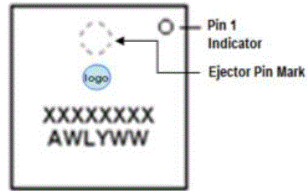
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**TDFNW8 8.30x8.40x1.10, 2.00P**  
**CASE 507AP**  
**ISSUE E**

DATE 08 MAY 2024

**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.

|                         |                                     |                                                                                                                                                                                     |
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