

# NTMFS008N12MC

## Product Preview

### Power MOSFET

120 V, 8.0 mΩ, TBD A, Single N-Channel

#### Features

- Small Footprint (5x6 mm) for Compact Design
- Low  $R_{DS(on)}$  to Minimize Conduction Losses
- Low  $Q_G$  and Capacitance to Minimize Driver Losses
- Soft Body Diode Reduces Voltage Ringing
- These Devices are Pb-Free, Halogen-Free / BFR Free and are RoHS Compliant

#### Typical Applications

- Synchronous Rectification
- AC-DC and DC-DC Power Supplies
- AC-DC Adapters (USB PD) SR
- Load Switch

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

| Parameter                                                                                    |              | Symbol                                         | Value       | Unit             |
|----------------------------------------------------------------------------------------------|--------------|------------------------------------------------|-------------|------------------|
| Drain-to-Source Voltage                                                                      |              | $V_{DSS}$                                      | 120         | V                |
| Gate-to-Source Voltage                                                                       |              | $V_{GS}$                                       | $\pm 20$    | V                |
| Continuous Drain Current $R_{\theta JC}$ (Note 2)                                            | Steady State | $T_C = 25^\circ\text{C}$                       | $I_D$       | TBD              |
|                                                                                              |              | $T_C = 25^\circ\text{C}$                       | $P_D$       | TBD              |
| Power Dissipation $R_{\theta JC}$ (Note 2)                                                   | Steady State | $T_A = 25^\circ\text{C}$                       | $I_D$       | TBD              |
|                                                                                              |              | $T_A = 25^\circ\text{C}$                       | $P_D$       | TBD              |
| Pulsed Drain Current                                                                         |              | $T_A = 25^\circ\text{C}, t_p = 10 \mu\text{s}$ | $I_{DM}$    | TBD              |
| Operating Junction and Storage Temperature Range                                             |              | $T_J, T_{stg}$                                 | -55 to +150 | $^\circ\text{C}$ |
| Source Current (Body Diode)                                                                  |              | $I_S$                                          | TBD         | A                |
| Single Pulse Drain-to-Source Avalanche Energy ( $I_{AV} = \text{TBD A}, L = \text{TBD mH}$ ) |              | $E_{AS}$                                       | TBD         | mJ               |
| Lead Temperature Soldering Reflow for Soldering Purposes (1/8" from case for 10 s)           |              | $T_L$                                          | 300         | $^\circ\text{C}$ |

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)    | $R_{\theta JC}$ | TBD   | $^\circ\text{C}/\text{W}$ |
| Junction-to-Ambient - Steady State (Note 2) | $R_{\theta JA}$ | TBD   |                           |

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

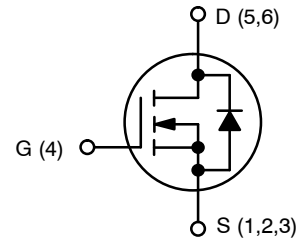
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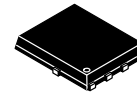
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| $V_{(BR)DSS}$ | $R_{DS(ON)} \text{ MAX}$ | $I_D \text{ MAX}$ |
|---------------|--------------------------|-------------------|
| 120 V         | 8.0 mΩ @ 10 V            | TBD A             |
|               | TBD mΩ @ 6 V             |                   |

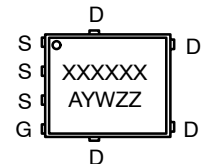


N-CHANNEL MOSFET



SO-8  
FLAT LEAD  
CASE 488AA

#### MARKING DIAGRAM



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

#### ORDERING INFORMATION

| Device        | Package          | Shipping†          |
|---------------|------------------|--------------------|
| NTMFS008N12MC | PQFN56 (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.

# NTMFS008N12MC

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

| Parameter                                                 | Symbol            | Test Condition                                       | Min                       | Typ | Max       | Unit                 |
|-----------------------------------------------------------|-------------------|------------------------------------------------------|---------------------------|-----|-----------|----------------------|
| <b>OFF CHARACTERISTICS</b>                                |                   |                                                      |                           |     |           |                      |
| Drain-to-Source Breakdown Voltage                         | $V_{(BR)DSS}$     | $V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$        | 120                       |     |           | V                    |
| Drain-to-Source Breakdown Voltage Temperature Coefficient | $V_{(BR)DSS}/T_J$ | $I_D = 250\ \mu\text{A}$ , ref to $25^\circ\text{C}$ |                           | TBD |           | mV/ $^\circ\text{C}$ |
| Zero Gate Voltage Drain Current                           | $I_{DSS}$         | $V_{GS} = 0\text{ V}, V_{DS} = \text{TBD V}$         | $T_J = 25^\circ\text{C}$  |     | 1         | $\mu\text{A}$        |
|                                                           |                   |                                                      | $T_J = 125^\circ\text{C}$ |     | 100       |                      |
| 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                     | $V_{GS(TH)}$     | $V_{GS} = V_{DS}, I_D = \text{TBD}\ \mu\text{A}$     | 2.0 |     | 4.0 | V                    |
| Negative Threshold Temperature Coefficient | $V_{GS(TH)}/T_J$ | $I_D = 250\ \mu\text{A}$ , ref to $25^\circ\text{C}$ |     | TBD |     | mV/ $^\circ\text{C}$ |
| Drain-to-Source On Resistance              | $R_{DS(on)}$     | $V_{GS} = 10\text{ V}, I_D = \text{TBD A}$           |     | TBD | 8.0 | m $\Omega$           |
|                                            |                  | $V_{GS} = 6\text{ V}, I_D = \text{TBD A}$            |     | TBD | TBD |                      |
| Forward Transconductance                   | $g_{FS}$         | $V_{DS} = \text{TBD V}, I_D = \text{TBD A}$          |     | TBD |     | S                    |
| Gate Resistance                            | $R_G$            | $T_A = 25^\circ\text{C}$                             |     | TBD |     | $\Omega$             |

## CHARGES & CAPACITANCES

|                              |                   |                                                                  |  |      |  |    |
|------------------------------|-------------------|------------------------------------------------------------------|--|------|--|----|
| Input Capacitance            | $C_{ISS}$         | $V_{GS} = 0\text{ V}, f = 1\text{ MHz}, V_{DS} = 60\text{ V}$    |  | 2086 |  | pF |
| Output Capacitance           | $C_{OSS}$         |                                                                  |  | 1049 |  |    |
| Reverse Transfer Capacitance | $C_{RSS}$         |                                                                  |  | 22   |  |    |
| Total Gate Charge            | $Q_G(\text{TOT})$ | $V_{GS} = 10\text{ V}, V_{DS} = 60\text{ V}, I_D = \text{TBD A}$ |  | 34   |  | nC |
| Total Gate Charge            | $Q_G(\text{TOT})$ | $V_{GS} = 6\text{ V}, V_{DS} = 60\text{ V}, I_D = \text{TBD A}$  |  | TBD  |  |    |
| Gate-to-Source Charge        | $Q_{GS}$          |                                                                  |  | 11   |  |    |
| Gate-to-Drain Charge         | $Q_{GD}$          |                                                                  |  | 8    |  |    |
| Plateau Voltage              | $V_{GP}$          |                                                                  |  | TBD  |  | V  |

## SWITCHING CHARACTERISTICS (Note 3)

|                     |              |                                                                                            |  |     |  |    |
|---------------------|--------------|--------------------------------------------------------------------------------------------|--|-----|--|----|
| Turn-On Delay Time  | $t_{d(ON)}$  | $V_{GS} = 10\text{ V}, V_{DS} = 60\text{ V}, I_D = \text{TBD A}, R_G = \text{TBD}\ \Omega$ |  | TBD |  | ns |
| Rise Time           | $t_r$        |                                                                                            |  | TBD |  |    |
| Turn-Off Delay Time | $t_{d(OFF)}$ |                                                                                            |  | TBD |  |    |
| Fall Time           | $t_f$        |                                                                                            |  | TBD |  |    |

## DRAIN-SOURCE DIODE CHARACTERISTICS

|                         |          |                                                                                |                           |     |     |    |
|-------------------------|----------|--------------------------------------------------------------------------------|---------------------------|-----|-----|----|
| Forward Diode Voltage   | $V_{SD}$ | $V_{GS} = 0\text{ V}, I_S = \text{TBD A}$                                      | $T_J = 25^\circ\text{C}$  |     | 0.9 | V  |
|                         |          |                                                                                | $T_J = 125^\circ\text{C}$ |     | TBD |    |
| Reverse Recovery Time   | $t_{RR}$ | $V_{GS} = 0\text{ V}, di_S/dt = 300\text{ A}/\mu\text{s}, I_S = \text{TBD A}$  |                           | TBD |     | ns |
| Reverse Recovery Charge | $Q_{RR}$ |                                                                                |                           | TBD |     | nC |
| Reverse Recovery Time   | $t_{RR}$ | $V_{GS} = 0\text{ V}, di_S/dt = 1000\text{ A}/\mu\text{s}, I_S = \text{TBD A}$ |                           | TBD |     | ns |
| Reverse Recovery Charge | $Q_{RR}$ |                                                                                |                           | TBD |     | nC |

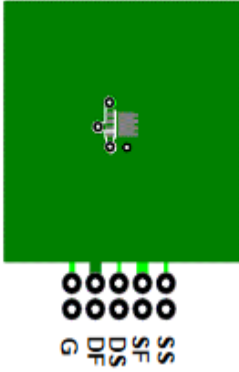
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

3. Switching characteristics are independent of operating junction temperatures.

# NTMFS008N12MC

## NOTES:

4.  $R_{\theta JA}$  is determined with the device mounted on a 1 in<sup>2</sup> pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material.  $R_{\theta JC}$  is guaranteed by design while  $R_{\theta CA}$  is determined by the user's board design.



a. 53°C/W when mounted on a 1 in<sup>2</sup> pad of 2 oz copper.



b. 125°C/W when mounted on a minimum pad of 2 oz copper.

5. Pulse Test: Pulse Width < TBD. Duty cycle < TBD.  
6.  $E_{AS}$  of TBD is based on started  $T_J = 25^\circ\text{C}$ ,  $L = \text{TBD}$ ,  $I_{AS} = \text{TBD}$ ,  $V_{DD} = \text{TBD}$ ,  $V_{GS} = \text{TBD}$ . 100% test at  $L = \text{TBD}$ ,  $I_{AS} = \text{TBD}$ .  
7. As an N-ch device, the negative  $V_{GS}$  rating is for low duty cycle pulse occurrence only. No continuous rating is implied.

# NTMFS008N12MC

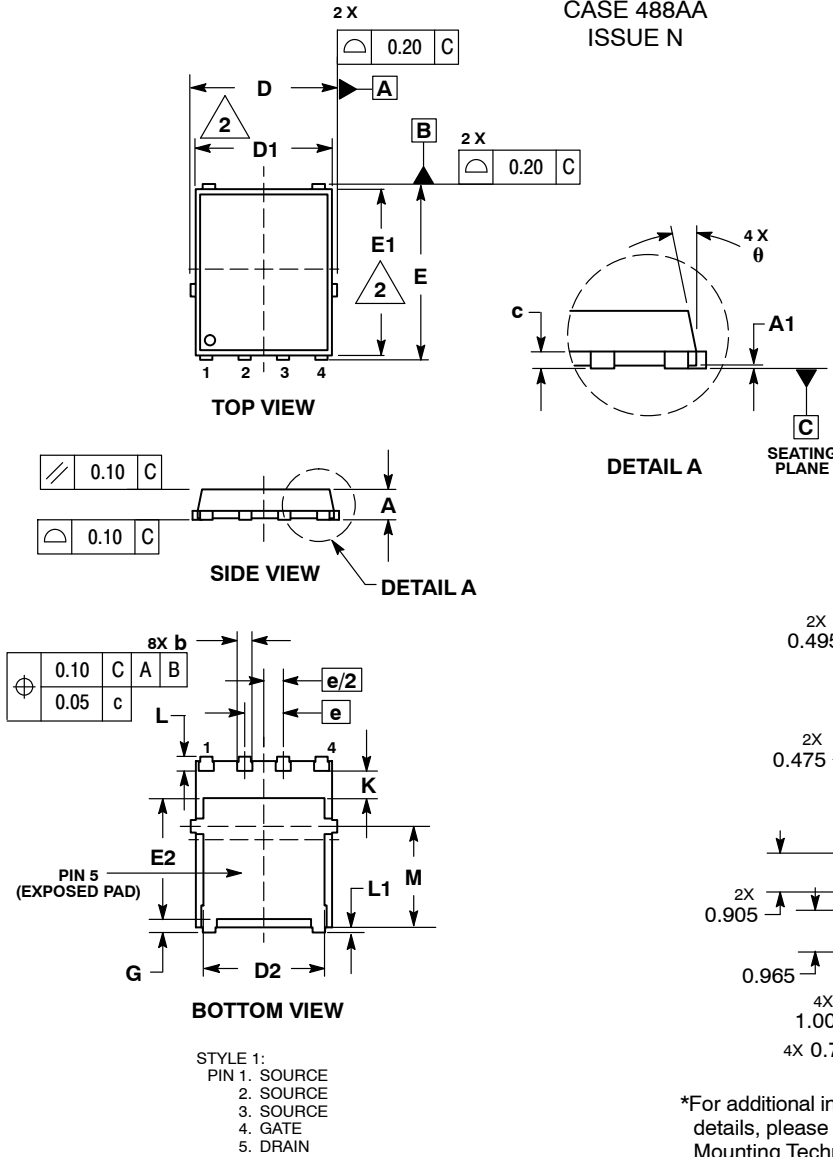
## PACKAGE DIMENSIONS

DFN5 5x6, 1.27P  
(SO-8FL)  
CASE 488AA  
ISSUE N

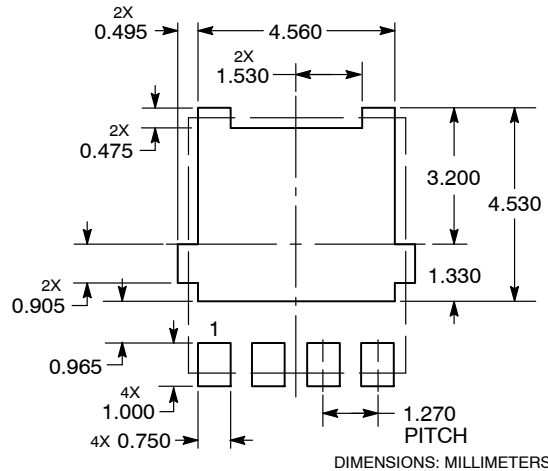
NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION D1 AND E1 DO NOT INCLUDE MOLD FLASH PROTRUSIONS OR GATE BURRS.

| DIM | MILLIMETERS |       |      |
|-----|-------------|-------|------|
|     | MIN         | NOM   | MAX  |
| A   | 0.90        | 1.00  | 1.10 |
| A1  | 0.00        | ---   | 0.05 |
| b   | 0.33        | 0.41  | 0.51 |
| c   | 0.23        | 0.28  | 0.33 |
| D   | 5.00        | 5.15  | 5.30 |
| D1  | 4.70        | 4.90  | 5.10 |
| D2  | 3.80        | 4.00  | 4.20 |
| E   | 6.00        | 6.15  | 6.30 |
| E1  | 5.70        | 5.90  | 6.10 |
| E2  | 3.45        | 3.65  | 3.85 |
| e   | 1.27 BSC    |       |      |
| G   | 0.51        | 0.575 | 0.71 |
| K   | 1.20        | 1.35  | 1.50 |
| L   | 0.51        | 0.575 | 0.71 |
| L1  | 0.125 REF   |       |      |
| M   | 3.00        | 3.40  | 3.80 |
| θ   | 0 °         | ---   | 12 ° |



### RECOMMENDED SOLDERING FOOTPRINT\*



\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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