

# NTMFS4108N

## Power MOSFET

30 V, 35 A, Single N-Channel,  
SO-8 Flat Lead Package

### Features

- Thermally and Electrically Enhanced Packaging Compatible with Standard SO-8 Package Footprint
- New Package Provides Capability of Inspection and Probe After Board Mounting
- Ultra Low  $R_{DS(on)}$  (at 4.5 V<sub>GS</sub>), Low Gate Resistance and Low Q<sub>G</sub>
- Optimized for Low Side Synchronous Applications
- High Speed Switching Capability
- These are Pb-Free Devices

### Applications

- Notebook Computer Vcore Applications
- Network Applications
- DC-DC Converters

### MAXIMUM RATINGS (T<sub>J</sub> = 25°C unless otherwise noted)

| Rating                                                                                                                                                  |                        |                       | Symbol                            | Value      | Unit |
|---------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|-----------------------|-----------------------------------|------------|------|
| Drain-to-Source Voltage                                                                                                                                 |                        |                       | V <sub>DSS</sub>                  | 30         | V    |
| Gate-to-Source Voltage                                                                                                                                  |                        |                       | V <sub>GS</sub>                   | ± 20       | V    |
| Continuous Drain Current (Note 1)                                                                                                                       | Steady State           | T <sub>A</sub> = 25°C | I <sub>D</sub>                    | 22         | A    |
|                                                                                                                                                         |                        | T <sub>A</sub> = 85°C |                                   | 16         |      |
|                                                                                                                                                         | t ≤ 10 s               | T <sub>A</sub> = 25°C |                                   | 35         |      |
| Power Dissipation (Note 1)                                                                                                                              | Steady State           | T <sub>A</sub> = 25°C | P <sub>D</sub>                    | 2.7        | W    |
|                                                                                                                                                         | t ≤ 10 s               |                       |                                   | 7.2        |      |
| Continuous Drain Current (Note 2)                                                                                                                       | Steady State           | T <sub>A</sub> = 25°C | I <sub>D</sub>                    | 13.5       | A    |
|                                                                                                                                                         |                        | T <sub>A</sub> = 85°C |                                   | 10         |      |
| Power Dissipation (Note 2)                                                                                                                              |                        | T <sub>A</sub> = 25°C | P <sub>D</sub>                    | 1.1        | W    |
| Power Dissipation R <sub>θJC</sub> (Note 1)                                                                                                             |                        | T <sub>C</sub> = 25°C | P <sub>D</sub>                    | 96.2       | W    |
| Pulsed Drain Current                                                                                                                                    | t <sub>p</sub> = 10 μs |                       | I <sub>DM</sub>                   | 288        | A    |
| Operating Junction and Storage Temperature                                                                                                              |                        |                       | T <sub>J</sub> , T <sub>stg</sub> | -55 to 150 | °C   |
| Continuous Source Current (Body Diode)                                                                                                                  |                        |                       | I <sub>S</sub>                    | 6.0        | A    |
| Single Pulse Drain-to-Source Avalanche Energy (V <sub>DD</sub> = 30 V, V <sub>GS</sub> = 10 V, I <sub>PK</sub> = 30 A, L = 1 mH, R <sub>G</sub> = 25 Ω) |                        |                       | E <sub>AS</sub>                   | 450        | mJ   |
| Lead Temperature for Soldering Purposes (1/8" from case for 10 s)                                                                                       |                        |                       | T <sub>L</sub>                    | 260        | °C   |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

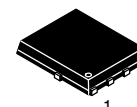
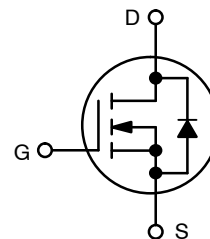
1. Surface-mounted on FR4 board using 1" sq. pad size (Cu area = 650 mm<sup>2</sup> [1 oz] including traces).
2. Surface-mounted on FR4 board using the minimum recommended pad size (Cu area = 50 mm<sup>2</sup>).



ON Semiconductor®

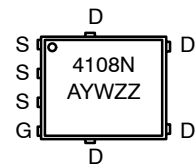
<http://onsemi.com>

| V <sub>(BR)DSS</sub> | R <sub>DS(on)</sub> TYP | I <sub>D</sub> MAX |
|----------------------|-------------------------|--------------------|
| 30 V                 | 1.8 mΩ @ 10 V           | 35 A               |
|                      | 2.7 mΩ @ 4.5 V          |                    |



SO-8 FLAT LEAD  
CASE 488AA  
STYLE 1

### MARKING DIAGRAM



4108N = Specific Device Code  
A = Assembly Location  
Y = Year  
W = Work Week  
ZZ = Lot Traceability

### ORDERING INFORMATION

| Device        | Package           | Shipping†        |
|---------------|-------------------|------------------|
| NTMFS4108NT1G | SO-8 FL (Pb-Free) | 1500 Tape / Reel |
| NTMFS4108NT3G | SO-8 FL (Pb-Free) | 5000 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.

# NTMFS4108N

## THERMAL RESISTANCE RATINGS

| Rating                                       | Symbol          | Max  | Unit |
|----------------------------------------------|-----------------|------|------|
| Junction-to-Case (Drain Terminal)            | $R_{\theta JC}$ | 1.3  | °C/W |
| Junction-to-Ambient – Steady State (Note 3)  | $R_{\theta JA}$ | 45.7 |      |
| Junction-to-Ambient – $t \leq 10$ s (Note 3) | $R_{\theta JA}$ | 17.3 |      |
| Junction-to-Ambient – Steady State (Note 4)  | $R_{\theta JA}$ | 117  |      |

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

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

### OFF CHARACTERISTICS

|                                                           |                   |                                                     |                           |    |     |               |
|-----------------------------------------------------------|-------------------|-----------------------------------------------------|---------------------------|----|-----|---------------|
| Drain-to-Source Breakdown Voltage                         | $V_{(BR)DSS}$     | $V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$ | 30                        |    |     | V             |
| Drain-to-Source Breakdown Voltage Temperature Coefficient | $V_{(BR)DSS}/T_J$ |                                                     |                           | 21 |     | mV/°C         |
| Zero Gate Voltage Drain Current                           | $I_{DSS}$         | $V_{GS} = 0\text{ V}, V_{DS} = 24\text{ V}$         | $T_J = 25^\circ\text{C}$  |    | 1.0 | $\mu\text{A}$ |
|                                                           |                   |                                                     | $T_J = 125^\circ\text{C}$ |    | 25  |               |
| Gate-to-Source Leakage Current                            | $I_{GSS}$         | $V_{DS} = 0\text{ V}, V_{GS} = 20\text{ V}$         |                           |    | 100 | nA            |

### ON CHARACTERISTICS (Note 5)

|                                            |                  |                                                 |     |     |     |            |
|--------------------------------------------|------------------|-------------------------------------------------|-----|-----|-----|------------|
| Gate Threshold Voltage                     | $V_{GS(TH)}$     | $V_{GS} = V_{DS}, I_D = 250\text{ }\mu\text{A}$ | 1.0 |     | 2.5 | V          |
| Negative Threshold Temperature Coefficient | $V_{GS(TH)}/T_J$ |                                                 |     | 7.5 |     | mV/°C      |
| Drain-to-Source On Resistance              | $R_{DS(on)}$     | $V_{GS} = 4.5\text{ V}, I_D = 19\text{ A}$      |     | 2.7 | 3.4 | m $\Omega$ |
|                                            |                  | $V_{GS} = 10\text{ V}, I_D = 21\text{ A}$       |     | 1.8 | 2.2 |            |
| Forward Transconductance                   | $g_{FS}$         | $V_{DS} = 15\text{ V}, I_D = 10\text{ A}$       |     | 25  |     | S          |

### CHARGES, CAPACITANCES AND GATE RESISTANCE

|                              |              |                                                                  |  |      |  |          |
|------------------------------|--------------|------------------------------------------------------------------|--|------|--|----------|
| Input Capacitance            | $C_{ISS}$    | $V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}, V_{DS} = 15\text{ V}$  |  | 6000 |  | pF       |
| Output Capacitance           | $C_{OSS}$    |                                                                  |  | 1200 |  |          |
| Reverse Transfer Capacitance | $C_{RSS}$    |                                                                  |  | 700  |  |          |
| Total Gate Charge            | $Q_{G(TOT)}$ | $V_{GS} = 4.5\text{ V}, V_{DS} = 24\text{ V}, I_D = 21\text{ A}$ |  | 54   |  | nC       |
| Threshold Gate Charge        | $Q_{G(TH)}$  |                                                                  |  | 11   |  |          |
| Gate-to-Source Charge        | $Q_{GS}$     |                                                                  |  | 16   |  |          |
| Gate-to-Drain Charge         | $Q_{GD}$     |                                                                  |  | 23   |  |          |
| Gate Resistance              | $R_G$        |                                                                  |  | 0.7  |  | $\Omega$ |

### SWITCHING CHARACTERISTICS, $V_{GS} = 10\text{ V}$ (Note 6)

|                     |              |                                                                                            |  |     |  |    |
|---------------------|--------------|--------------------------------------------------------------------------------------------|--|-----|--|----|
| Turn-On Delay Time  | $t_{d(ON)}$  | $V_{GS} = 4.5\text{ V}, V_{DS} = 15\text{ V}, I_D = 1.0\text{ A}, R_G = 6.0\text{ }\Omega$ |  | 45  |  | ns |
| Rise Time           | $t_r$        |                                                                                            |  | 60  |  |    |
| Turn-Off Delay Time | $t_{d(OFF)}$ |                                                                                            |  | 70  |  |    |
| Fall Time           | $t_f$        |                                                                                            |  | 140 |  |    |

### DRAIN-SOURCE DIODE CHARACTERISTICS

|                         |          |                                                                               |                           |    |      |     |   |
|-------------------------|----------|-------------------------------------------------------------------------------|---------------------------|----|------|-----|---|
| Forward Diode Voltage   | $V_{SD}$ | $V_{GS} = 0\text{ V}, I_S = 6.0\text{ A}$                                     | $T_J = 25^\circ\text{C}$  |    | 0.72 | 1.1 | V |
|                         |          |                                                                               | $T_J = 125^\circ\text{C}$ |    | 0.65 |     |   |
| Reverse Recovery Time   | $t_{RR}$ | $V_{GS} = 0\text{ V}, dI_S/dt = 100\text{ A}/\mu\text{s}, I_S = 6.0\text{ A}$ |                           | 41 |      | ns  |   |
| Charge Time             | $t_a$    |                                                                               |                           | 20 |      |     |   |
| Discharge Time          | $t_b$    |                                                                               |                           | 21 |      |     |   |
| Reverse Recovery Charge | $Q_{RR}$ |                                                                               |                           | 45 |      | nC  |   |

- Surface-mounted on FR4 board using 1" sq. pad size (Cu area = 650 mm<sup>2</sup> [1 oz] including traces).
- Surface-mounted on FR4 board using the minimum recommended pad size (Cu area = 50 mm<sup>2</sup>).
- Pulse Test: Pulse Width  $\leq 300\text{ }\mu\text{s}$ , Duty Cycle  $\leq 2\%$ .
- Switching characteristics are independent of operating junction temperatures.

TYPICAL PERFORMANCE CURVES

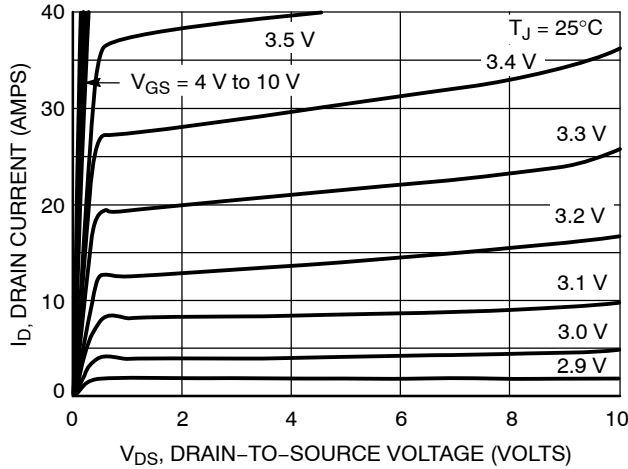


Figure 1. On-Region Characteristics

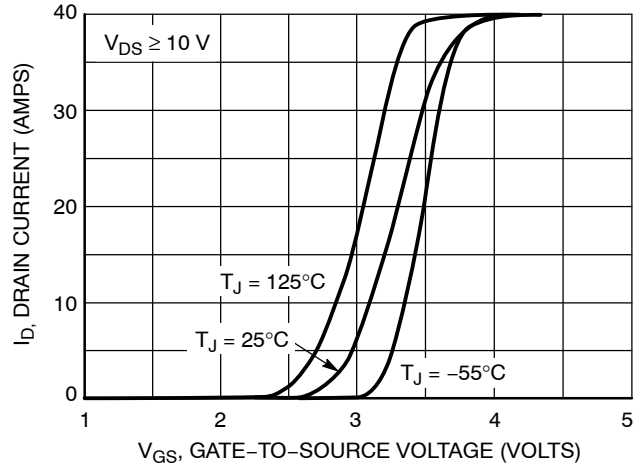


Figure 2. Transfer Characteristics

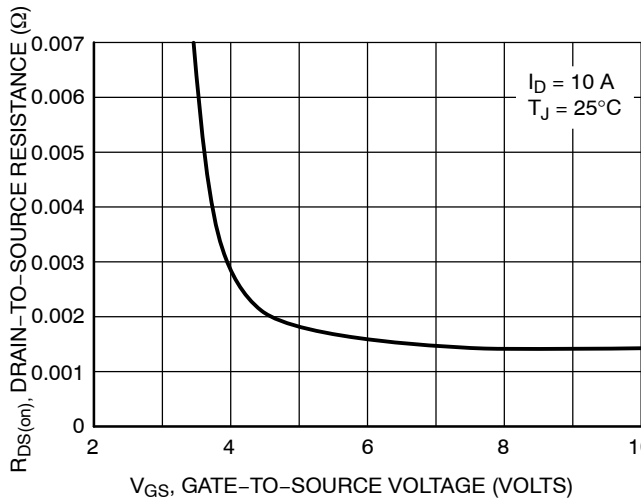


Figure 3. On-Resistance vs. Gate-to-Source Voltage

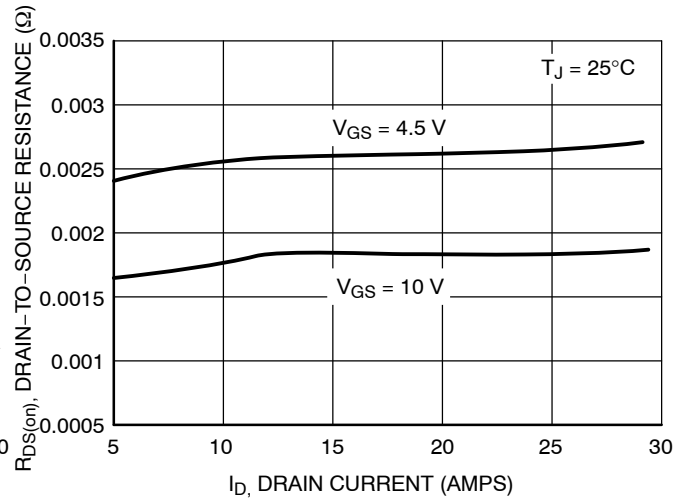


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

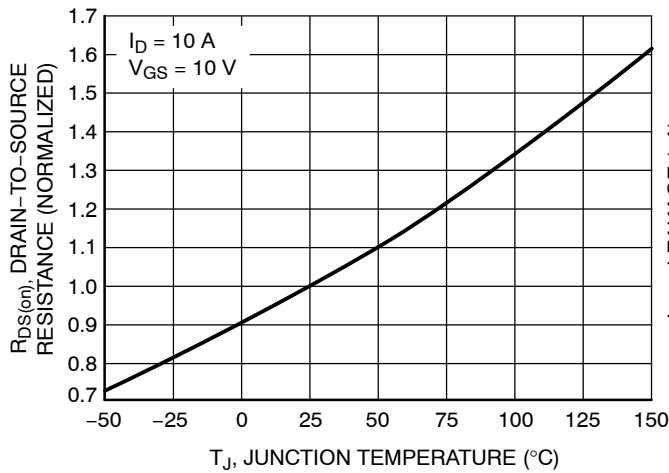


Figure 5. On-Resistance Variation with Temperature

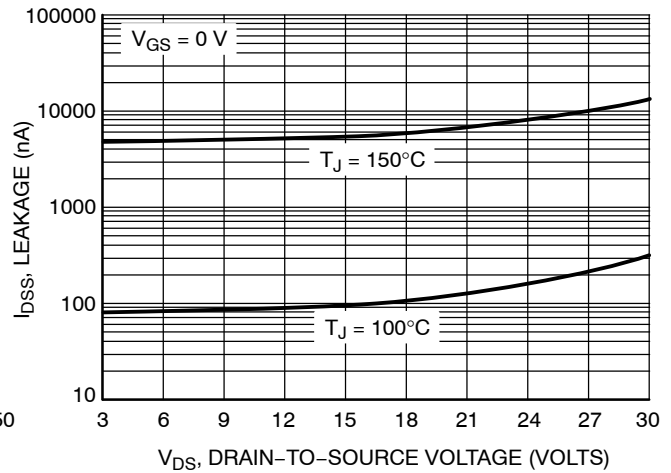


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL PERFORMANCE CURVES

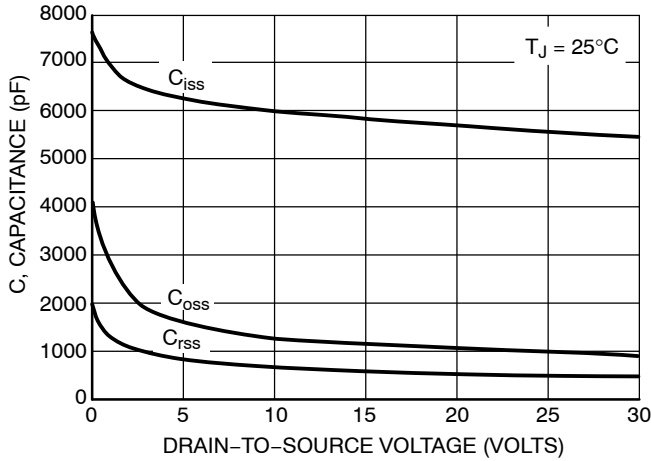


Figure 7. Capacitance Variation

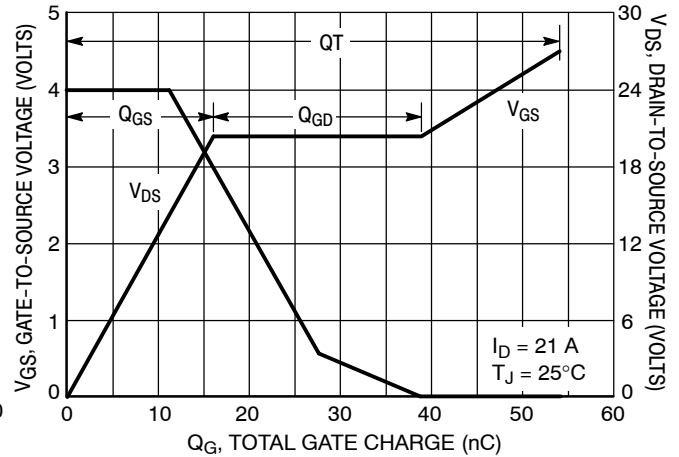


Figure 8. Gate-To-Source and Drain-To-Source Voltage vs. Total Charge

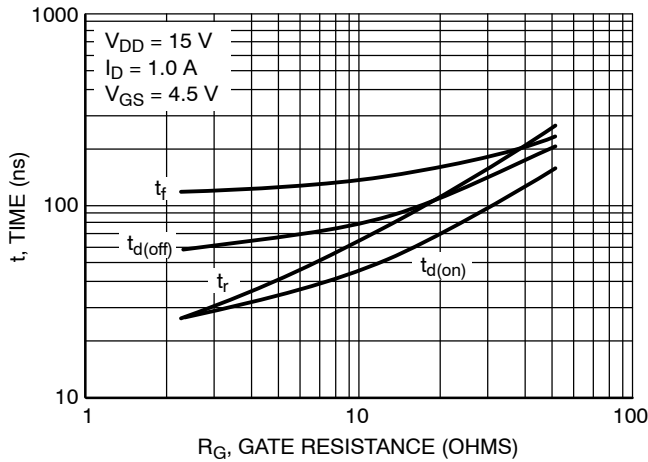


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

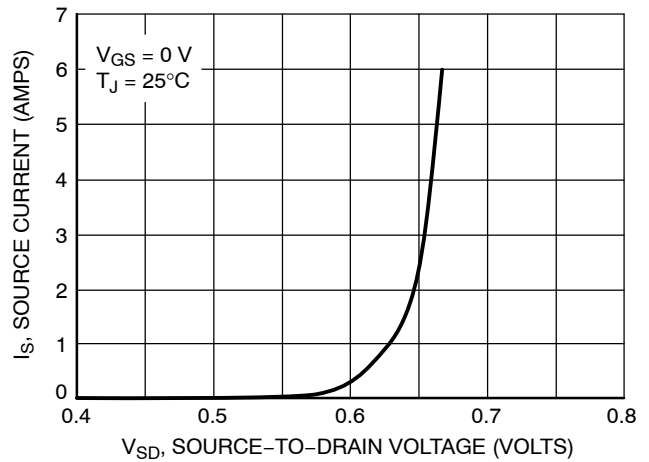


Figure 10. Diode Forward Voltage vs. Current

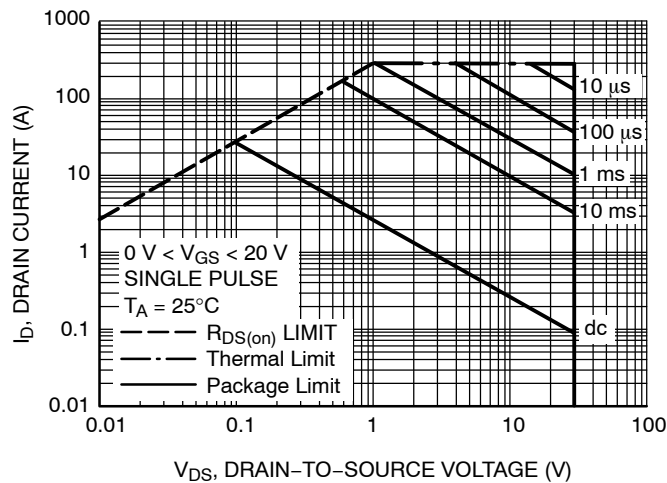


Figure 11. Maximum Rated Forward Biased Safe Operating Area

# NTMFS4108N

## TYPICAL PERFORMANCE CURVES

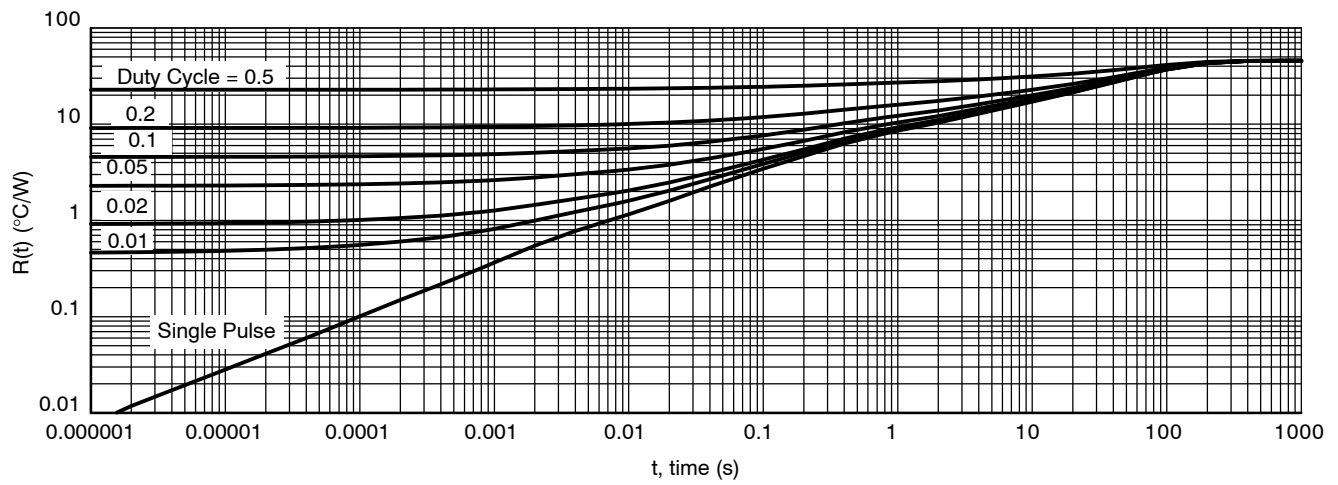


Figure 12. FET Thermal Response

# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

ON Semiconductor®



SCALE 2:1

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

DATE 25 JUN 2018



### 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 |
| theta | 0°          | ---   | 12°  |

### GENERIC MARKING DIAGRAM\*



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

\*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.



STYLE 1:  
PIN 1. SOURCE  
2. SOURCE  
3. SOURCE  
4. GATE  
5. DRAIN

STYLE 2:  
PIN 1. ANODE  
2. ANODE  
3. ANODE  
4. NO CONNECT  
5. CATHODE

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

|                  |                          |                                                                                                                                                                                     |
|------------------|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DOCUMENT NUMBER: | 98AON14036D              | Electronic versions are uncontrolled except when accessed directly from the Document Repository.<br>Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red. |
| DESCRIPTION:     | DFN5 5x6, 1.27P (SO-8FL) | PAGE 1 OF 1                                                                                                                                                                         |

ON Semiconductor and ON are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. ON Semiconductor does not convey any license under its patent rights nor the rights of others.

**onsemi**, **Onsemi**, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi**'s product/patent coverage may be accessed at [www.onsemi.com/site/pdf/Patent-Marking.pdf](http://www.onsemi.com/site/pdf/Patent-Marking.pdf). **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

## PUBLICATION ORDERING INFORMATION

### LITERATURE FULFILLMENT:

Email Requests to: [orderlit@onsemi.com](mailto:orderlit@onsemi.com)

**onsemi Website:** [www.onsemi.com](http://www.onsemi.com)

### TECHNICAL SUPPORT

**North American Technical Support:**

Voice Mail: 1 800-282-9855 Toll Free USA/Canada

Phone: 011 421 33 790 2910

**Europe, Middle East and Africa Technical Support:**

Phone: 00421 33 790 2910

For additional information, please contact your local Sales Representative