

MOSFET – Power, Single N-Channel, Logic Level, SO-8FL

30 V, 1.7 mΩ, 159 A

NVMFS4C03N

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
- NVMFS4C03NWF – Wettable Flanks Option for Enhanced Optical Inspection
- AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

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

| Parameter | Symbol | Value | Unit |
|--|--|--------------------------|------------------|
| Drain-to-Source Voltage | V_{DSS} | 30 | V |
| Gate-to-Source Voltage | V_{GS} | ± 20 | V |
| Continuous Drain Current $R_{\theta JC}$ (Notes 2, 3, 4) | Steady State | $T_C = 25^\circ\text{C}$ | I_D 159 A |
| | | $T_C = 25^\circ\text{C}$ | P_D 77 W |
| Power Dissipation $R_{\theta JC}$ (Notes 2, 3) | Steady State | $T_A = 25^\circ\text{C}$ | I_D 34.9 A |
| | | $T_A = 25^\circ\text{C}$ | P_D 3.71 W |
| Continuous Drain Current $R_{\theta JA}$ (Notes 2, 3, 4) | Steady State | $T_A = 25^\circ\text{C}$ | I_D 34.9 A |
| Power Dissipation $R_{\theta JA}$ (Notes 2, 3) | Steady State | $T_A = 25^\circ\text{C}$ | P_D 3.71 W |
| Pulsed Drain Current | $T_A = 25^\circ\text{C}, t_p = 10 \mu\text{s}$ | I_{DM} 900 | A |
| Operating Junction and Storage Temperature | T_J, T_{stg} | -55 to 175 | $^\circ\text{C}$ |
| Source Current (Body Diode) | I_S | 64 | A |
| Single Pulse Drain-to-Source Avalanche Energy ($I_{L(pk)} = 11 \text{ A}$) | E_{AS} | 549 | mJ |
| Lead Temperature for Soldering Purposes (1/8" from case for 10 s) | T_L | 260 | $^\circ\text{C}$ |

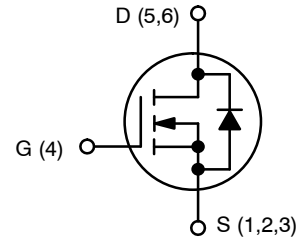
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

THERMAL RESISTANCE MAXIMUM RATINGS (Note 2)

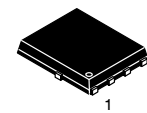
| Parameter | Symbol | Value | Unit |
|---|-----------------|-------|---------------------------|
| Junction-to-Case – Steady State (Note 3) | $R_{\theta JC}$ | 1.95 | $^\circ\text{C}/\text{W}$ |
| Junction-to-Ambient – Steady State (Note 3) | $R_{\theta JA}$ | 40 | |

- The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
- Surface-mounted on FR4 board using a 650 mm², 2 oz. Cu pad.
- Maximum current for pulses as long as 1 second is higher but is dependent on pulse duration and duty cycle.

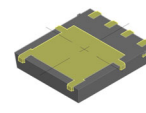
| $V_{(BR)DSS}$ | $R_{DS(on) MAX}$ | $I_D MAX$ |
|---------------|------------------|-----------|
| 30 V | 1.7 mΩ @ 10 V | 159 A |
| | 2.4 mΩ @ 4.5 V | |



N-CHANNEL MOSFET

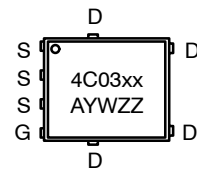


SO-8 FL
CASE 488AA



DFNW5
CASE 507BE

MARKING DIAGRAM



- 4C03N = Specific Device Code for NVMFS4C03N
- 4C03WF = Specific Device Code of NVMFS4C03NWF
- A = Assembly Location
- Y = Year
- W = Work Week
- ZZ = Lot Traceability

ORDERING INFORMATION

| Device | Package | Shipping† |
|-----------------------------------|-------------------|--------------------|
| NVMFS4C03NT1G | SO-8 FL (Pb-Free) | 1500 / Tape & Reel |
| NVMFS4C03NWFT1G, NVMFS4C03NWFET1G | DFNW5 (Pb-Free) | 1500 / Tape & Reel |

DISCONTINUED (Note 1)

| | | |
|-----------------|-------------------|--------------------|
| NVMFS4C03NT3G | SO-8 FL (Pb-Free) | 5000 / Tape & Reel |
| NVMFS4C03NWFT3G | 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 Specifications Brochure, BRD8011/D.

- DISCONTINUED:** These devices are not recommended for new design. Please contact your onsemi representative for information. The most current information on these devices may be available on www.onsemi.com.

NVMFS4C03N

ELECTRICAL CHARACTERISTICS (T_J = 25°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 V, I _D = 250 μA | 30 | | | V |
| Drain-to-Source Breakdown Voltage Temperature Coefficient | V _{(BR)DSS} /T _J | | | 18.2 | | mV/°C |
| Zero Gate Voltage Drain Current | I _{DSS} | V _{GS} = 0 V, V _{DS} = 24 V | T _J = 25 °C | | 1 | μA |
| | | | T _J = 125°C | | 10 | |
| Gate-to-Source Leakage Current | I _{GSS} | V _{DS} = 0 V, V _{GS} = 20 V | | | 100 | nA |

ON CHARACTERISTICS (Note 5)

| | | | | | | |
|--|-------------------------------------|---|-----------------------|-----|-----|-------|
| Gate Threshold Voltage | V _{GS(TH)} | V _{GS} = V _{DS} , I _D = 250 μA | 1.3 | | 2.2 | V |
| Negative Threshold Temperature Coefficient | V _{GS(TH)} /T _J | | | 4.8 | | mV/°C |
| Drain-to-Source On Resistance | R _{DS(on)} | V _{GS} = 10 V | I _D = 30 A | 1.4 | 1.7 | mΩ |
| | | V _{GS} = 4.5 V | I _D = 30 A | 2.0 | 2.4 | |
| Forward Transconductance | g _{FS} | V _{DS} = 3 V, I _D = 30 A | | 136 | | S |
| Gate Resistance | R _G | T _A = 25 °C | | 1.0 | | Ω |

CHARGES AND CAPACITANCES

| | | | | | | |
|------------------------------|---------------------|--|--|------|--|----|
| Input Capacitance | C _{ISS} | V _{GS} = 0 V, f = 1 MHz, V _{DS} = 15 V | | 3071 | | pF |
| Output Capacitance | C _{OSS} | | | 1673 | | |
| Reverse Transfer Capacitance | C _{RSS} | | | 67 | | |
| Total Gate Charge | Q _{G(TOT)} | V _{GS} = 4.5 V, V _{DS} = 15 V; I _D = 30 A | | 20.8 | | nC |
| Threshold Gate Charge | Q _{G(TH)} | | | 4.9 | | |
| Gate-to-Source Charge | Q _{GS} | | | 8.5 | | |
| Gate-to-Drain Charge | Q _{GD} | | | 4.7 | | |
| Total Gate Charge | Q _{G(TOT)} | V _{GS} = 10 V, V _{DS} = 15 V, I _D = 30 A | | 45.2 | | nC |

SWITCHING CHARACTERISTICS (Note 6)

| | | | | | | |
|---------------------|---------------------|---|--|----|--|----|
| Turn-On Delay Time | t _{d(ON)} | V _{GS} = 4.5 V, V _{DS} = 15 V, I _D = 15 A, R _G = 3.0 Ω | | 14 | | ns |
| Rise Time | t _r | | | 32 | | |
| Turn-Off Delay Time | t _{d(OFF)} | | | 27 | | |
| Fall Time | t _f | | | 17 | | |

DRAIN-SOURCE DIODE CHARACTERISTICS

| | | | | | | |
|-------------------------|-----------------|---|------------------------|------|-----|----|
| Forward Diode Voltage | V _{SD} | V _{GS} = 0 V, I _S = 10 A | T _J = 25°C | 0.75 | 1.1 | V |
| | | | T _J = 125°C | 0.6 | | |
| Reverse Recovery Time | t _{RR} | V _{GS} = 0 V, dI _S /dt = 100 A/μs, I _S = 30 A | | 47 | | ns |
| Charge Time | t _a | | | 23 | | |
| Discharge Time | t _b | | | 24 | | |
| Reverse Recovery Charge | Q _{RR} | | | 39 | | |

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.

5. Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%.

6. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

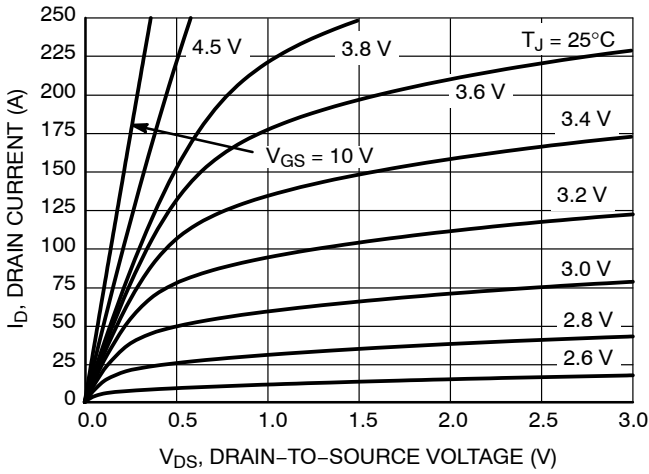


Figure 1. On-Region Characteristics

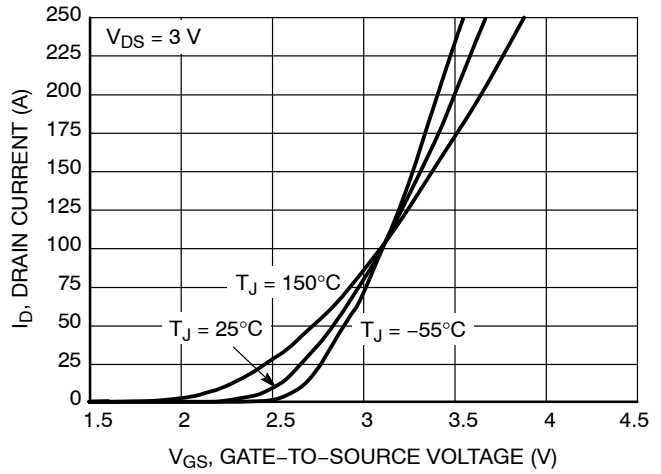


Figure 2. Transfer Characteristics

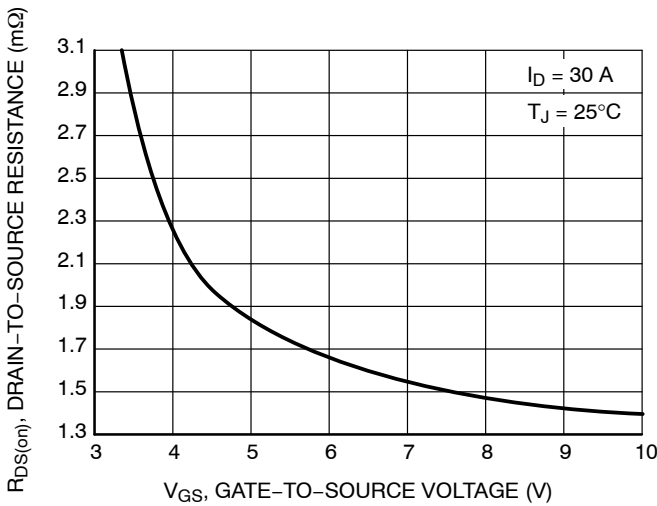


Figure 3. On-Resistance vs. V_{GS}

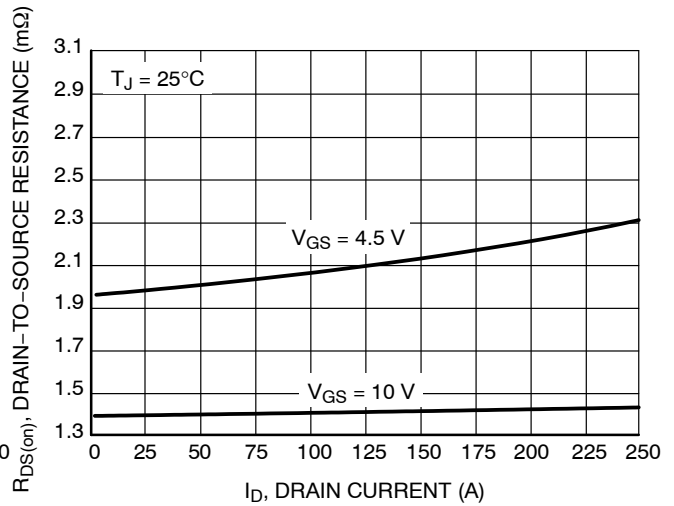


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

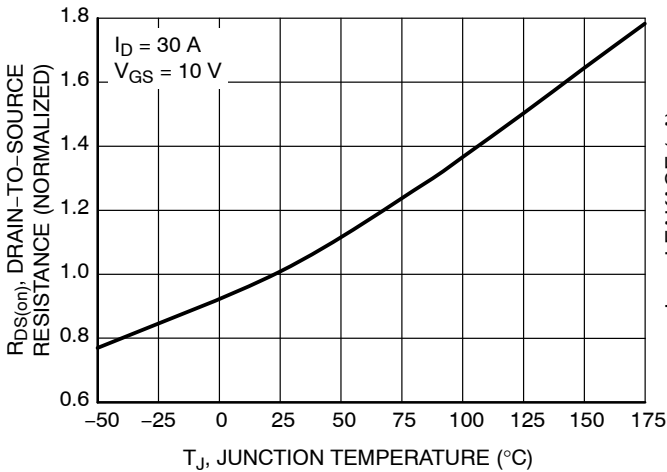


Figure 5. On-Resistance Variation with Temperature

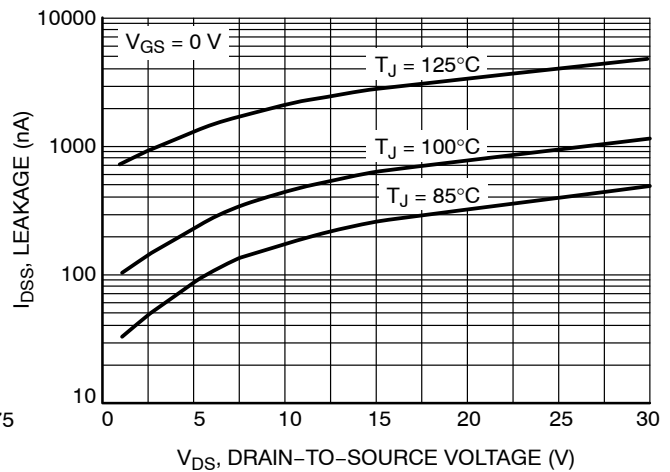


Figure 6. Drain-to-Source Leakage Current vs. Voltage

NVMFS4C03N

TYPICAL CHARACTERISTICS

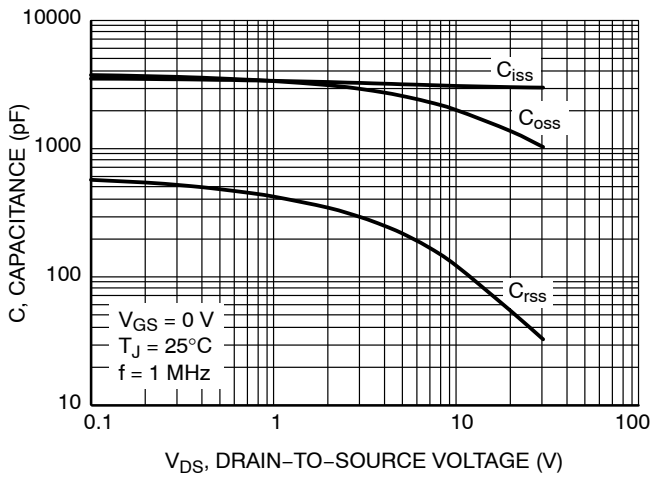


Figure 7. Capacitance Variation

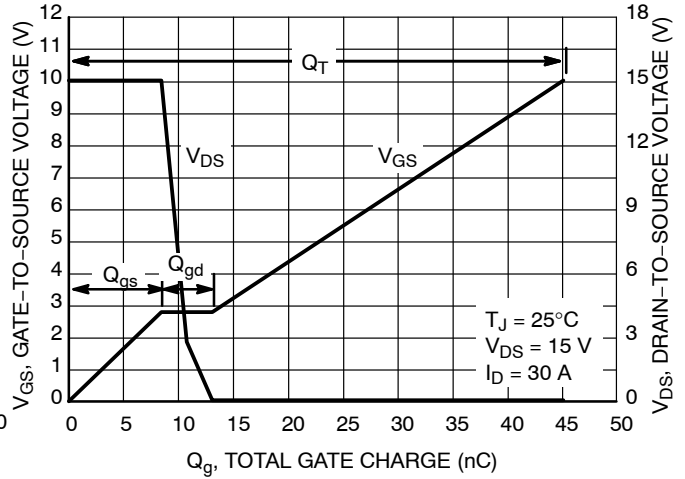


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

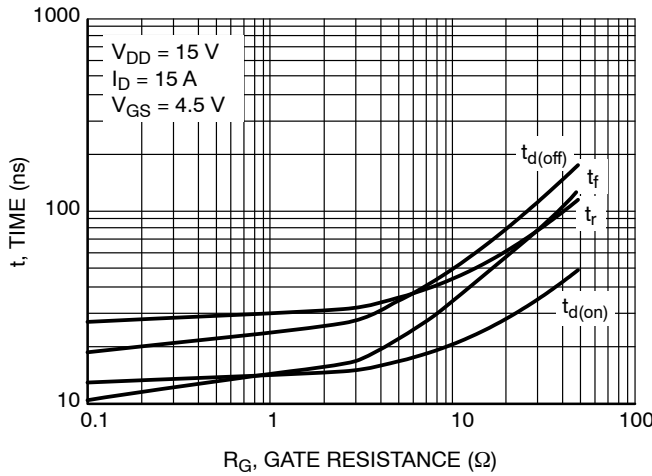


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

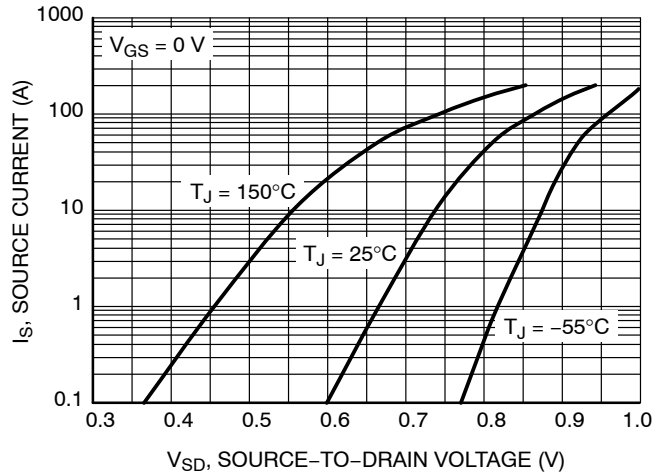


Figure 10. Diode Forward Voltage vs. Current

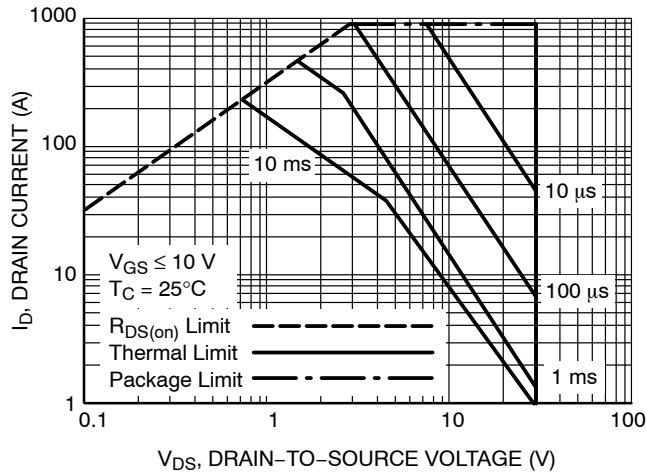


Figure 11. Maximum Rated Forward Biased Safe Operating Area

NVMFS4C03N

TYPICAL CHARACTERISTICS

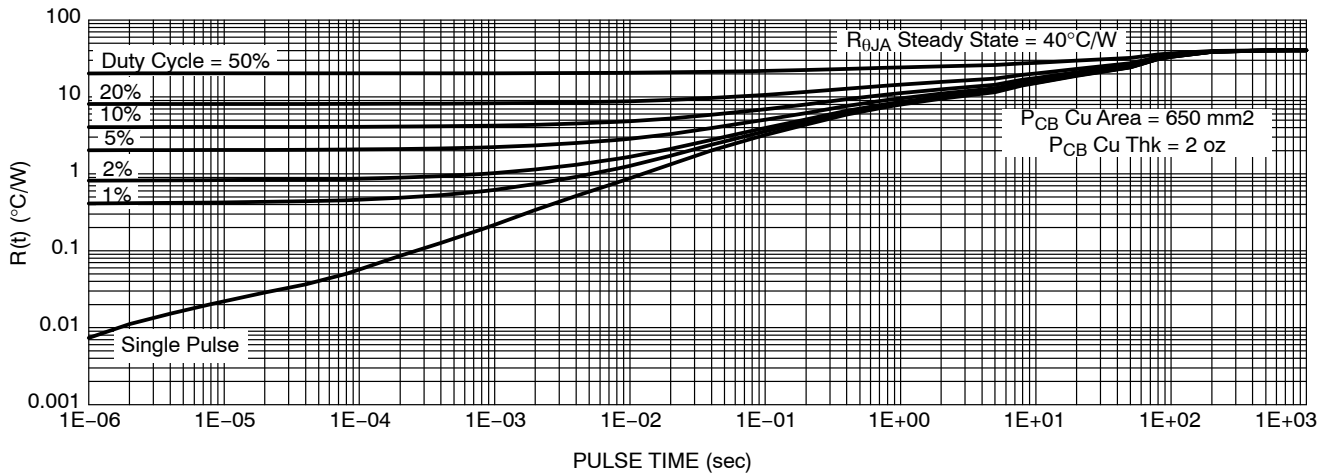


Figure 12. Thermal Impedance (Junction-to-Ambient)

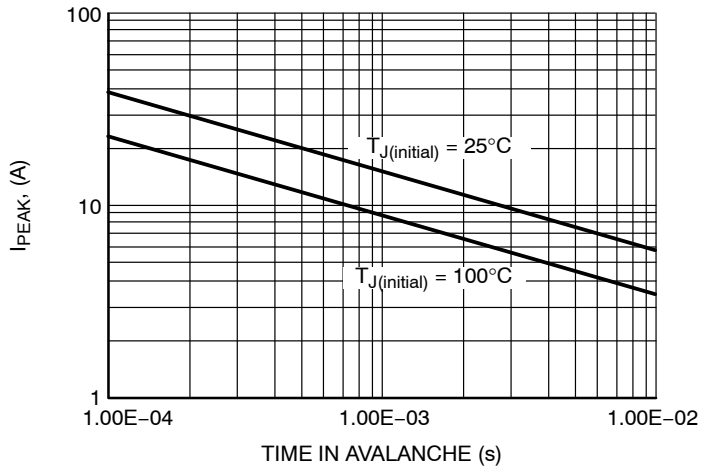


Figure 13. Avalanche Characteristics

MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS



1
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.

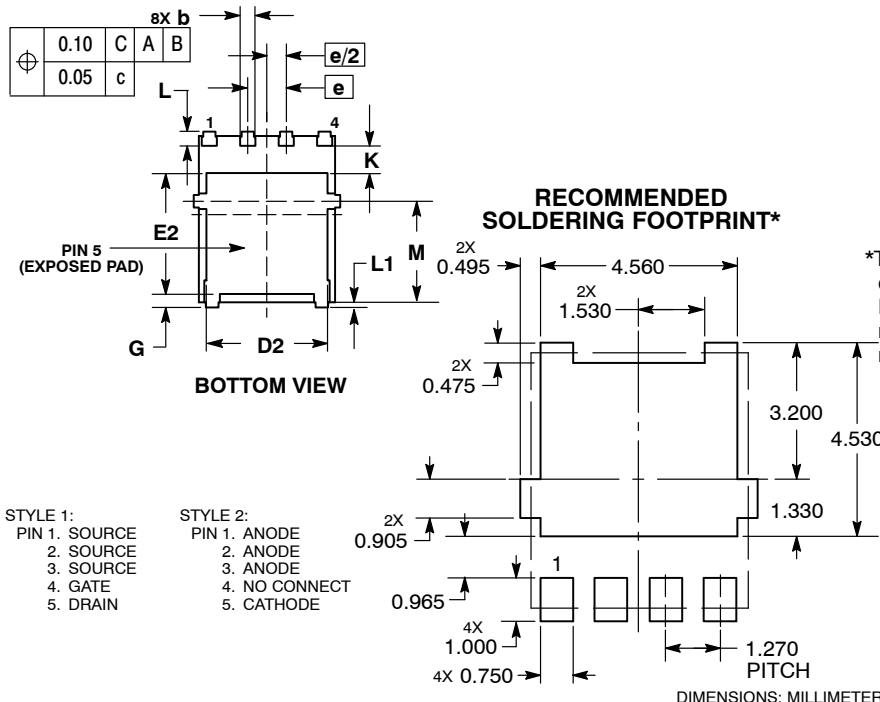
| DIM | MILLIMETERS | | |
|-----|-------------|-------|------|
| | MIN | NOM | MAX |
| A | 0.90 | 1.00 | 1.10 |
| A1 | 0.00 | --- | 0.05 |
| b | 0.33 | 0.41 | 0.51 |
| c | 0.23 | 0.28 | 0.33 |
| D | 5.00 | 5.15 | 5.30 |
| D1 | 4.70 | 4.90 | 5.10 |
| D2 | 3.80 | 4.00 | 4.20 |
| E | 6.00 | 6.15 | 6.30 |
| 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 |
| θ | 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.



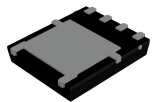
- STYLE 1:
PIN 1. SOURCE
2. SOURCE
3. SOURCE
4. GATE
5. DRAIN
- STYLE 2:
PIN 1. ANODE
2. ANODE
3. ANODE
4. NO CONNECT
5. CATHODE

DIMENSIONS: MILLIMETERS

*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. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red. |
| DESCRIPTION: | DFN5 5x6, 1.27P (SO-8FL) | PAGE 1 OF 1 |

onsemi and ONSEMI are trademarks of Semiconductor Components Industries, LLC dba onsemi or its subsidiaries in the United States and/or other countries. onsemi reserves the right to make changes without further notice to any products herein. onsemi makes no warranty, representation or guarantee regarding the 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. onsemi does not convey any license under its patent rights nor the rights of others.

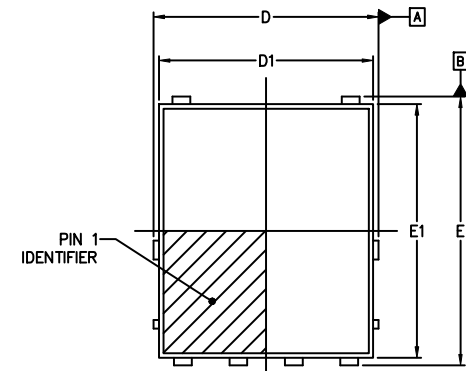


DFNW5 4.90x5.90x1.00, 1.27P
CASE 507BE
ISSUE A

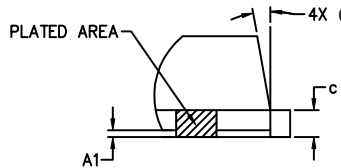
DATE 15 JUL 2024

NOTES:

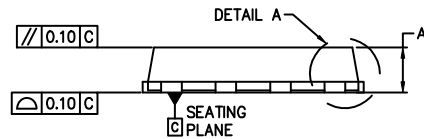
1. DIMENSIONING AND TOLERANCING CONFORM TO ASME Y14.5M-2018.
2. ALL DIMENSIONS ARE IN MILLIMETERS.
3. DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.
4. THIS PACKAGE CONTAINS WETTABLE FLANK DESIGN FEATURES TO AID IN FILLET FORMATION ON THE LEADS DURING MOUNTING.



TOP VIEW



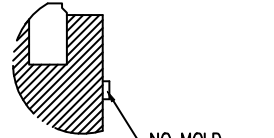
DETAIL "A"
SCALE 2:1



SIDE VIEW

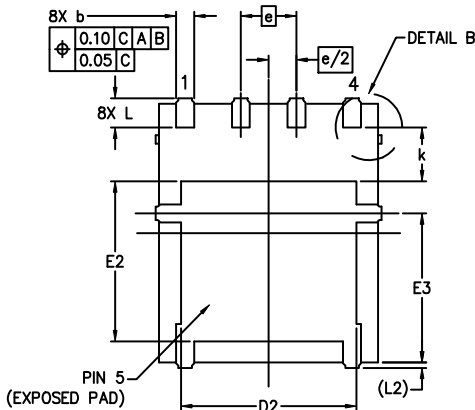


ALTERNATE CONSTRUCTION



DETAIL "B"
SCALE 2:1

| DIM | MILLIMETERS | | |
|-----|-------------|------|------|
| | MIN | NOM | MAX |
| A | 0.90 | 1.00 | 1.10 |
| A1 | 0.00 | 0.25 | 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 |
| E3 | 3.00 | 3.40 | 3.80 |
| e | 1.27 BSC | | |
| k | 1.20 | 1.35 | 1.50 |
| L | 0.51 | 0.57 | 0.71 |
| L2 | 0.15 REF. | | |
| θ | 0° | 6° | 12° |

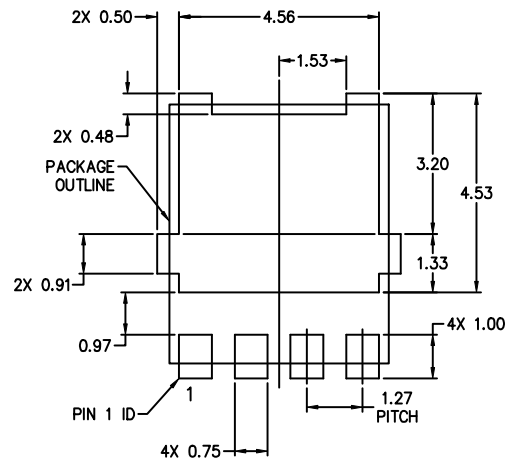


BOTTOM VIEW

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.



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

| | | |
|------------------|-----------------------------|--|
| DOCUMENT NUMBER: | 98AON33319H | Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red. |
| DESCRIPTION: | DFNW5 4.90x5.90x1.00, 1.27P | PAGE 1 OF 1 |

onsemi and Onsemi are trademarks of Semiconductor Components Industries, LLC dba onsemi or its subsidiaries in the United States and/or other countries. onsemi reserves the right to make changes without further notice to any products herein. onsemi makes no warranty, representation or guarantee regarding the 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. onsemi 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. **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.

ADDITIONAL INFORMATION

TECHNICAL PUBLICATIONS:

Technical Library: www.onsemi.com/design/resources/technical-documentation
onsemi Website: www.onsemi.com

ONLINE SUPPORT: www.onsemi.com/support

For additional information, please contact your local Sales Representative at www.onsemi.com/support/sales