

# MOSFET - Power, Single N-Channel, STD Gate, SO8FL

40 V, 0.45 mΩ, 469 A

NVMFWS0D45N04XM

## Features

- Low RDS(on) to Minimize Conduction Losses
- Low Capacitance to Minimize Driver Losses
- Small Footprint (5 x 6 mm) with Compact Design
- AECQ101 Qualified and PPAP Capable
- These Devices are PbFree, Halogen Free, BFR Free and are RoHS Compliant

## Applications

- Motor Drive
- Battery Protection
- Synchronous Rectification

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

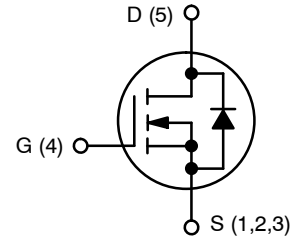
| Parameter                                                | Symbol                                                       | Value       | Unit |
|----------------------------------------------------------|--------------------------------------------------------------|-------------|------|
| Drain-to-Source Voltage                                  | V <sub>DSS</sub>                                             | 40          | V    |
| Gate-to-Source Voltage                                   | DC V <sub>GS</sub>                                           | ±20         | V    |
| Continuous Drain Current                                 | T <sub>C</sub> = 25°C I <sub>D</sub>                         | 469         | A    |
|                                                          |                                                              | 331         |      |
| Power Dissipation                                        | T <sub>C</sub> = 25°C P <sub>D</sub>                         | 180         | W    |
| Pulsed Drain Current                                     | T <sub>C</sub> = 25°C, t <sub>p</sub> = 10 μs I <sub>D</sub> | 900         | A    |
| Operating Junction and Storage Temperature Range         | T <sub>J</sub> , T <sub>stg</sub>                            | -55 to +175 | °C   |
| Source Current (Body Diode)                              | I <sub>S</sub>                                               | 260         | A    |
| Single Pulse Avalanche Energy (I <sub>PK</sub> = 33.5 A) | E <sub>AS</sub>                                              | 1040        | mJ   |
| Lead Temperature for Soldering Purposes                  | T <sub>L</sub>                                               | 260         | °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.

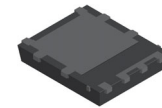
## THERMAL RESISTANCE

| Parameter                                | Symbol           | Value | Unit |
|------------------------------------------|------------------|-------|------|
| Thermal Resistance – Junction-to-Case    | R <sub>θJC</sub> | 0.83  | °C/W |
| Thermal Resistance – Junction-to-Ambient | R <sub>θJA</sub> | 38.5  |      |

| V <sub>(BR)DSS</sub> | R <sub>DS(on)</sub> MAX          | I <sub>D</sub> MAX |
|----------------------|----------------------------------|--------------------|
| 40 V                 | 0.45 mΩ @ V <sub>GS</sub> = 10 V | 469 A              |

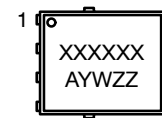


N-CHANNEL MOSFET



DFNW5  
SO8FL WF  
CASE 507BD

## MARKING DIAGRAM



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

## ORDERING INFORMATION

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

# NVMFWS0D45N04XM

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

| Parameter | Symbol | Test Conditions | Min | Typ | Max | Unit |
|-----------|--------|-----------------|-----|-----|-----|------|
|-----------|--------|-----------------|-----|-----|-----|------|

### OFF CHARACTERISTICS

|                                                           |                                        |                                                                     |    |    |     |       |
|-----------------------------------------------------------|----------------------------------------|---------------------------------------------------------------------|----|----|-----|-------|
| Drain-to-Source Breakdown Voltage                         | V <sub>(BR)DSS</sub>                   | V <sub>GS</sub> = 0 V, I <sub>D</sub> = 1 mA, T <sub>J</sub> = 25°C | 40 |    |     | V     |
| Drain-to-Source Breakdown Voltage Temperature Coefficient | ΔV <sub>(BR)DSS</sub> /ΔT <sub>J</sub> | I <sub>D</sub> = 1 mA, Referenced to 25°C                           |    | 15 |     | mV/°C |
| Zero Gate Voltage Drain Current                           | I <sub>DSS</sub>                       | V <sub>DS</sub> = 40 V, T <sub>J</sub> = 25°C                       |    |    | 1   | μA    |
|                                                           |                                        | V <sub>DS</sub> = 40 V, T <sub>J</sub> = 125°C                      |    |    | 75  |       |
| Gate-to-Source Leakage Current                            | I <sub>GSS</sub>                       | V <sub>GS</sub> = 20 V, V <sub>DS</sub> = 0 V                       |    |    | 100 | nA    |

### ON CHARACTERISTICS

|                                                |                                       |                                                                                    |     |      |      |       |
|------------------------------------------------|---------------------------------------|------------------------------------------------------------------------------------|-----|------|------|-------|
| Drain-to-Source On Resistance                  | R <sub>DS(on)</sub>                   | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 50 A, T <sub>J</sub> = 25°C               |     | 0.39 | 0.45 | mΩ    |
| Gate Threshold Voltage                         | V <sub>GS(th)</sub>                   | V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 290 μA, T <sub>J</sub> = 25°C | 2.5 |      | 3.5  | V     |
| Gate Threshold Voltage Temperature Coefficient | ΔV <sub>GS(th)</sub> /ΔT <sub>J</sub> | V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 290 μA                        |     | -7   |      | mV/°C |
| Forward Transconductance                       | g <sub>FS</sub>                       | V <sub>DS</sub> = 5 V, I <sub>D</sub> = 50 A                                       |     | 278  |      | S     |

### CHARGES, CAPACITANCES & GATE RESISTANCE

|                              |                     |                                                                          |  |      |  |    |
|------------------------------|---------------------|--------------------------------------------------------------------------|--|------|--|----|
| Input Capacitance            | C <sub>ISS</sub>    | V <sub>DS</sub> = 25 V, V <sub>GS</sub> = 0 V, f = 1 MHz                 |  | 7374 |  | pF |
| Output Capacitance           | C <sub>OSS</sub>    |                                                                          |  | 4696 |  |    |
| Reverse Transfer Capacitance | C <sub>RSS</sub>    |                                                                          |  | 65   |  |    |
| Total Gate Charge            | Q <sub>G(tot)</sub> | V <sub>DD</sub> = 32 V, I <sub>D</sub> = 50 A,<br>V <sub>GS</sub> = 10 V |  | 115  |  | nC |
| Threshold Gate Charge        | Q <sub>G(th)</sub>  |                                                                          |  | 22   |  |    |
| Gate-to-Source Charge        | Q <sub>GS</sub>     |                                                                          |  | 32   |  |    |
| Gate-to-Drain Charge         | Q <sub>GD</sub>     |                                                                          |  | 22   |  |    |
| Gate Resistance              | R <sub>G</sub>      | f = 1 MHz                                                                |  | 0.53 |  | Ω  |

### SWITCHING CHARACTERISTICS

|                     |                     |                                                                                                                    |  |    |  |    |
|---------------------|---------------------|--------------------------------------------------------------------------------------------------------------------|--|----|--|----|
| Turn-On Delay Time  | t <sub>d(on)</sub>  | Resistive Load<br>V <sub>GS</sub> = 0/10 V, V <sub>DD</sub> = 32 V,<br>I <sub>D</sub> = 50 A, R <sub>G</sub> = 0 Ω |  | 11 |  | ns |
| Turn-Off Delay Time | t <sub>d(off)</sub> |                                                                                                                    |  | 46 |  |    |
| Rise Time           | t <sub>r</sub>      |                                                                                                                    |  | 17 |  |    |
| Fall Time           | t <sub>f</sub>      |                                                                                                                    |  | 5  |  |    |

### SOURCE-TO-DRAIN DIODE CHARACTERISTICS

|                         |                 |                                                                                           |  |      |     |    |
|-------------------------|-----------------|-------------------------------------------------------------------------------------------|--|------|-----|----|
| Forward Diode Voltage   | V <sub>SD</sub> | V <sub>GS</sub> = 0 V, I <sub>S</sub> = 50 A, T <sub>J</sub> = 25°C                       |  | 0.77 | 1.2 | V  |
|                         |                 | V <sub>GS</sub> = 0 V, I <sub>S</sub> = 50 A, T <sub>J</sub> = 125°C                      |  | 0.61 |     |    |
| Reverse Recovery Time   | t <sub>RR</sub> | V <sub>GS</sub> = 0 V, I <sub>S</sub> = 50 A,<br>di/dt = 100 A/μs, V <sub>DD</sub> = 32 V |  | 89   |     | ns |
| Charge Time             | T <sub>A</sub>  |                                                                                           |  | 49   |     |    |
| Discharge Time          | T <sub>B</sub>  |                                                                                           |  | 40   |     |    |
| Reverse Recovery Charge | Q <sub>RR</sub> |                                                                                           |  | 267  |     | 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.

TYPICAL CHARACTERISTICS

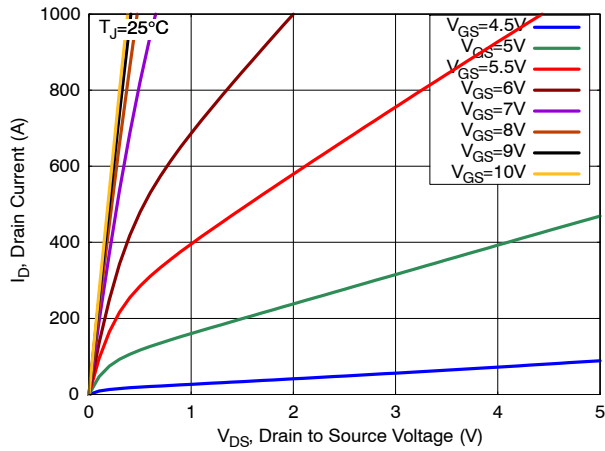


Figure 1. On-Region Characteristics

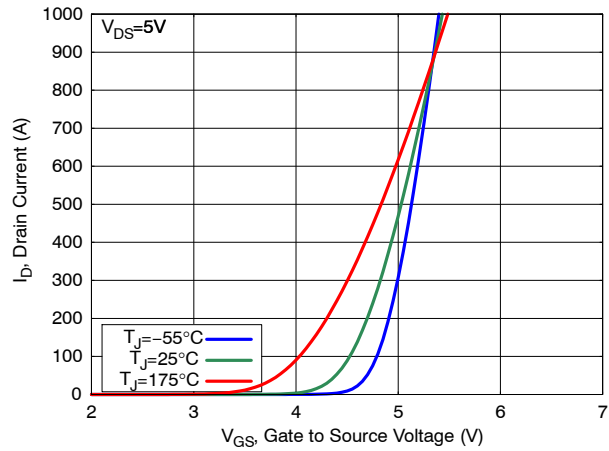


Figure 2. Transfer Characteristics

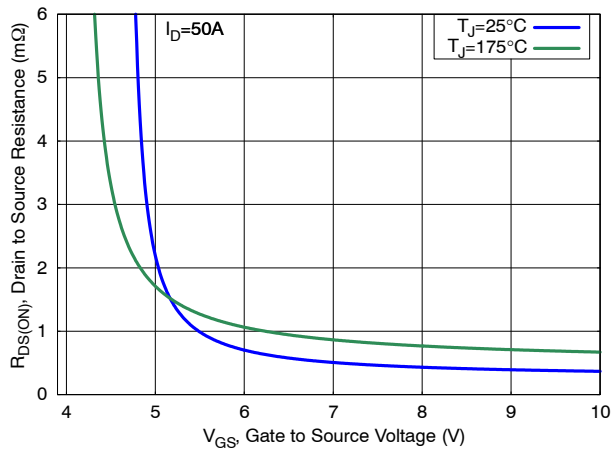


Figure 3. On-Resistance vs. Gate Voltage

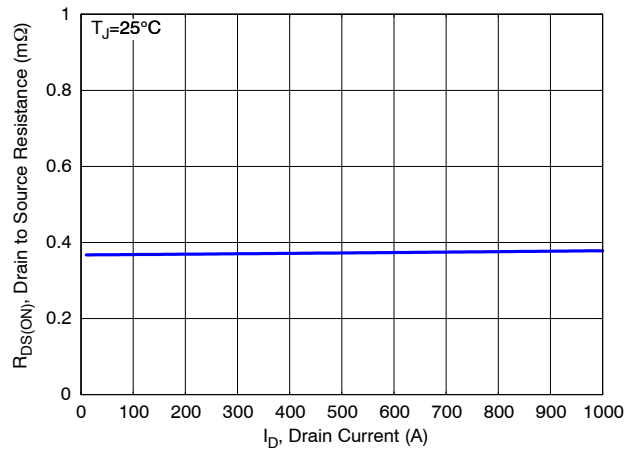


Figure 4. On-Resistance vs. Drain Current

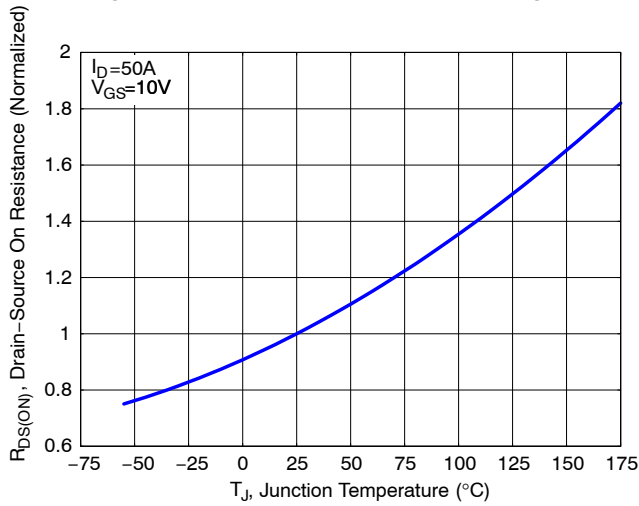


Figure 5. Normalized On-Resistance vs. Junction Temperature

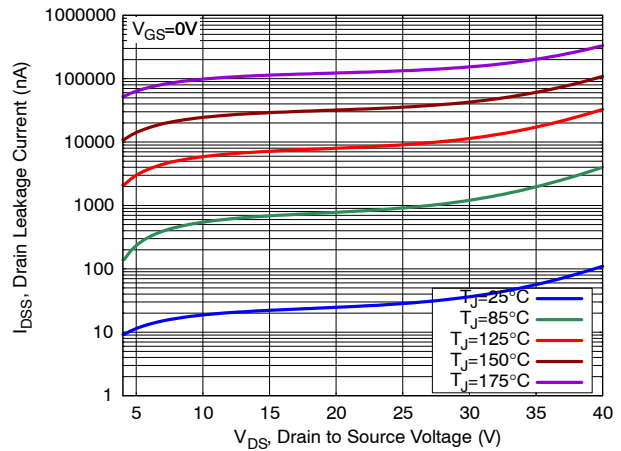


Figure 6. Drain Leakage Current vs. Drain Voltage

TYPICAL CHARACTERISTICS

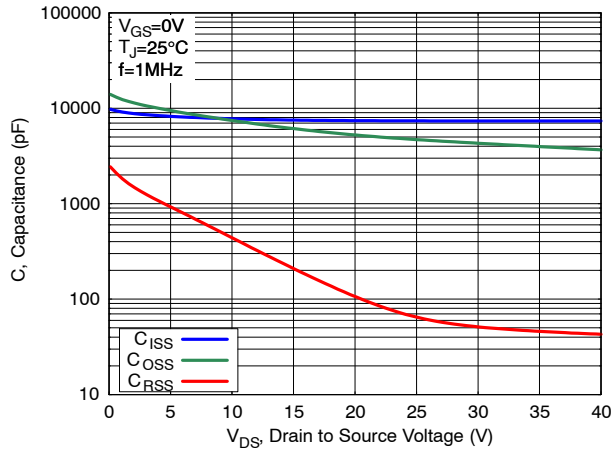


Figure 7. Capacitance Characteristics

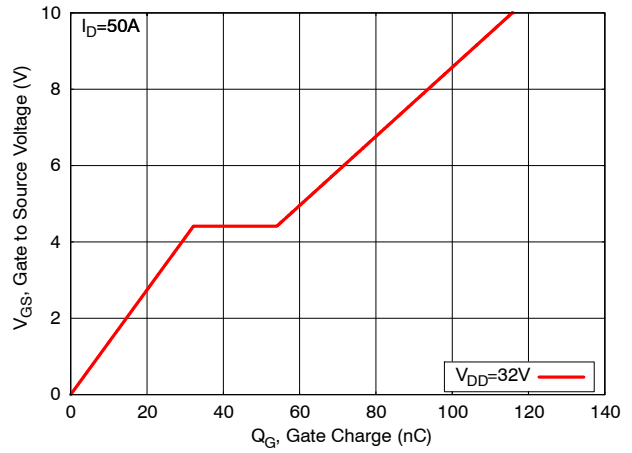


Figure 8. Gate Charge Characteristics

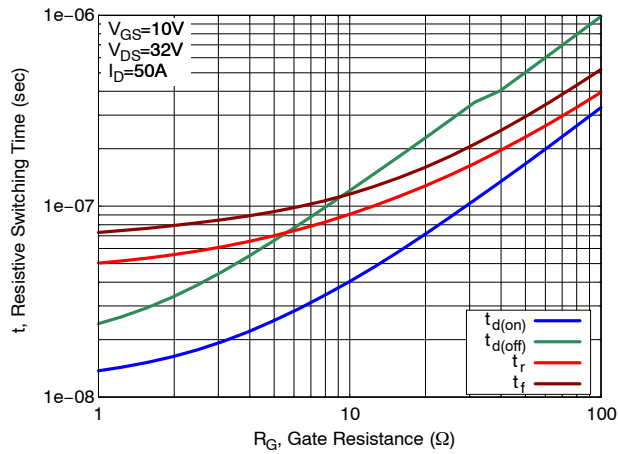


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

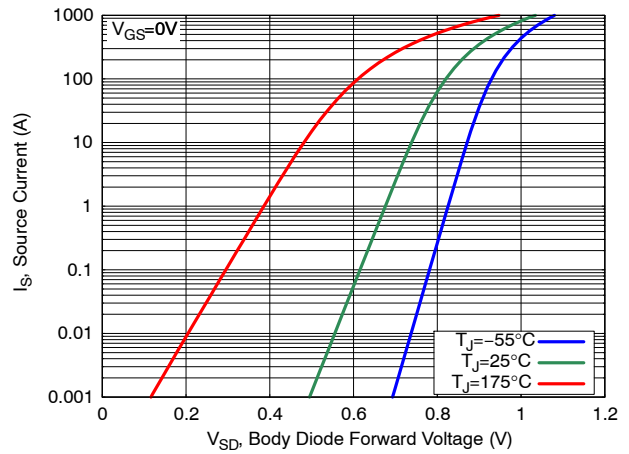


Figure 10. Diode Forward Characteristics

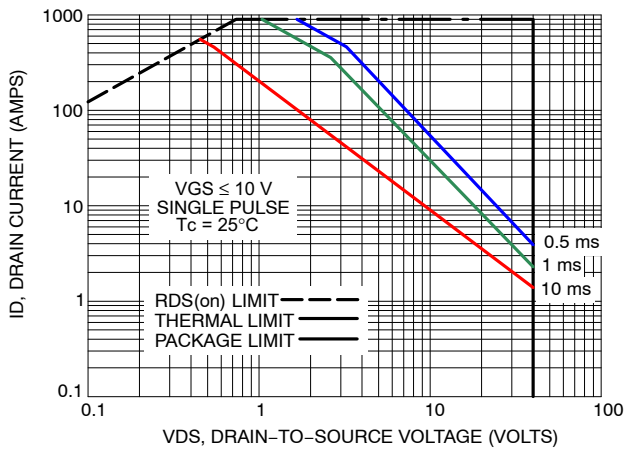


Figure 11. Maximum Rated Forward Biased Safe Operating Area

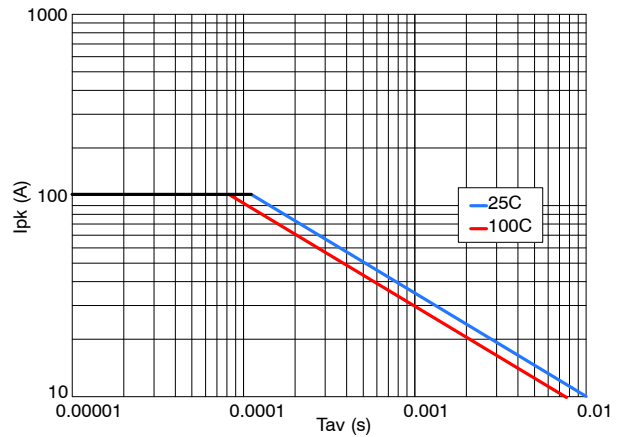


Figure 12. UIS

TYPICAL CHARACTERISTICS

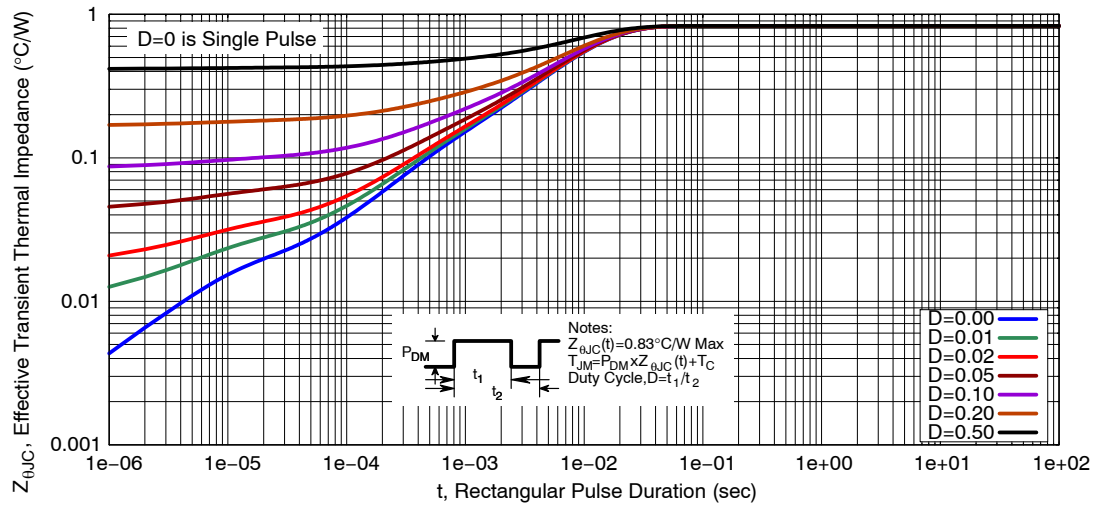
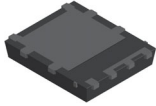


Figure 13. Transient Thermal Response

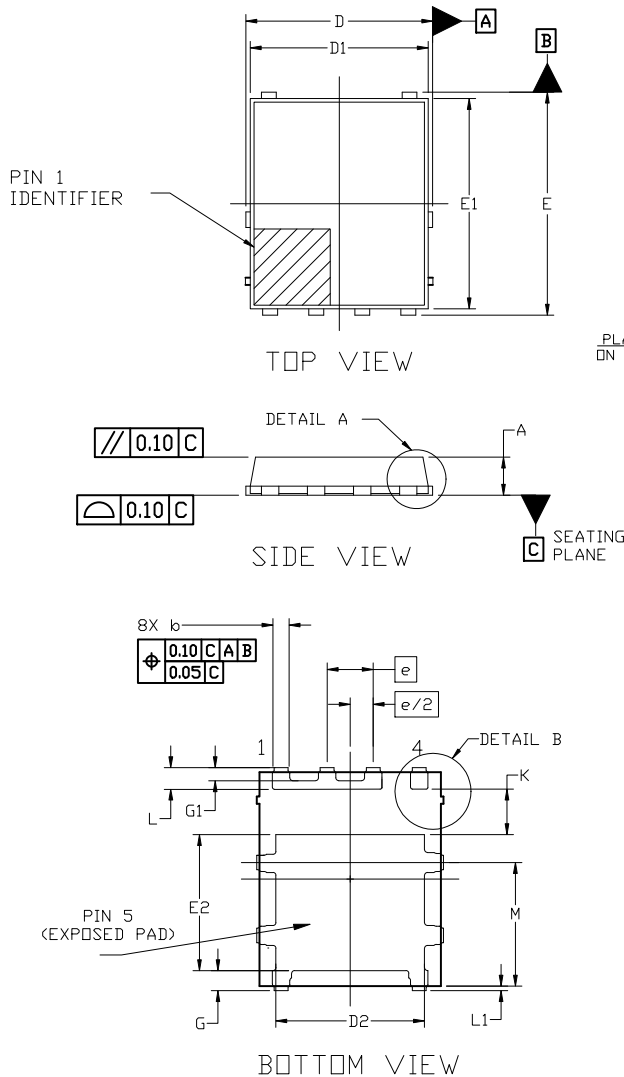
DEVICE ORDERING INFORMATION

| Device             | Marking | Package            | Shipping <sup>†</sup> |
|--------------------|---------|--------------------|-----------------------|
| NVMFWS0D45N04XMT1G | 045N4W  | DFNW5<br>(Pb-Free) | 1500 / Tape & Reel    |

<sup>†</sup>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.

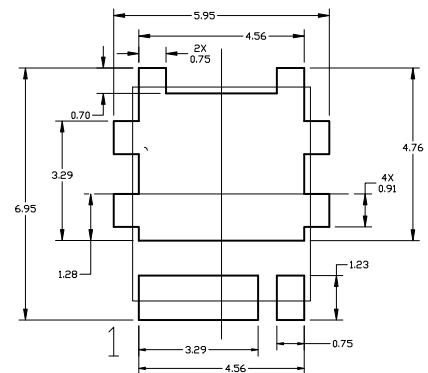
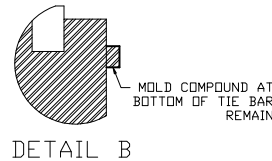
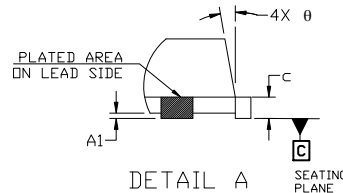

**DFNW5 5x6, FULL-CUT SO8FL WF**  
**CASE 507BD**  
**ISSUE O**

DATE 13 APR 2021

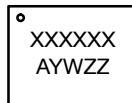

**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: 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.

| MILLIMETERS |           |      |      |
|-------------|-----------|------|------|
| DIM         | 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          | 4.80      | 5.00 | 5.20 |
| D2          | 3.90      | 4.10 | 4.30 |
| E           | 6.00      | 6.15 | 6.30 |
| E1          | 5.70      | 5.90 | 6.10 |
| E2          | 3.55      | 3.75 | 3.95 |
| e           | 1.27 BSC  |      |      |
| G           | 0.50      | 0.55 | 0.70 |
| G1          | 0.26      | 0.36 | 0.46 |
| k           | 1.10      | 1.25 | 1.40 |
| L           | 0.50      | 0.60 | 0.70 |
| L1          | 0.150 REF |      |      |
| M           | 3.00      | 3.40 | 3.80 |
| θ           | 0°        | ---  | 12°  |


**RECOMMENDED**  
**MOUNTING FOOTPRINT**

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

**GENERIC**  
**MARKING DIAGRAM\***


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

\*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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| <b>DESCRIPTION:</b>     | <b>DFNW5 5x6, FULL-CUT SO8FL WF</b> | <b>PAGE 1 OF 1</b>                                                                                                                                                               |

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