

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

40 V, 0.6 mΩ, 384 A

NVMFWS0D63N04XM

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

| Parameter                                                            | Symbol                            | Value                                            | Unit |
|----------------------------------------------------------------------|-----------------------------------|--------------------------------------------------|------|
| Drain-to-Source Voltage                                              | V <sub>DSS</sub>                  | 40                                               | V    |
| Gate-to-Source Voltage                                               | V <sub>GS</sub>                   | ±20                                              | V    |
| Continuous Drain Current                                             | I <sub>D</sub>                    | T <sub>C</sub> = 25°C                            | 384  |
|                                                                      |                                   | T <sub>C</sub> = 100°C                           | 271  |
| Power Dissipation                                                    | P <sub>D</sub>                    | T <sub>C</sub> = 25°C                            | 157  |
| Continuous Drain Current<br>R <sub>θJA</sub>                         | I <sub>D</sub>                    | T <sub>C</sub> = 25°C                            | 60   |
|                                                                      |                                   | T <sub>C</sub> = 100°C                           | 42   |
| Pulsed Drain Current                                                 | I <sub>DM</sub>                   | T <sub>C</sub> = 25°C,<br>t <sub>p</sub> = 10 μs | 900  |
| 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>                    | 131                                              | A    |
| Single Pulse Avalanche Energy                                        | E <sub>AS</sub>                   | I <sub>PK</sub> = 26.5 A                         | 585  |
| Lead Temperature for Soldering Purposes<br>(1/8" from case for 10 s) | 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.

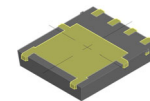
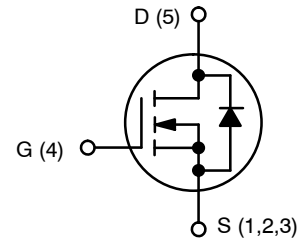
## THERMAL CHARACTERISTICS

| Parameter                                               | Symbol           | Value | Unit |
|---------------------------------------------------------|------------------|-------|------|
| Thermal Resistance, Junction-to-Case<br>(Note 2)        | R <sub>θJC</sub> | 0.95  | °C/W |
| Thermal Resistance, Junction-to-Ambient<br>(Notes 1, 2) | R <sub>θJA</sub> | 39    |      |

- Surface mounted on FR4 board using 650 mm<sup>2</sup>, 2 oz Cu pad.
- The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.

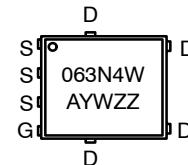
| V <sub>(BR)DSS</sub> | R <sub>DS(on)</sub> MAX         | I <sub>D</sub> MAX |
|----------------------|---------------------------------|--------------------|
| 40 V                 | 0.6 mΩ @ V <sub>GS</sub> = 10 V | 384 A              |

## N-CHANNEL MOSFET



DFNW5 (SO-8FL)  
CASE 507BA

## MARKING DIAGRAM



063N4W = Specific Device Code  
A = Assembly Location  
Y = Year  
W = Work Week  
ZZ = Lot Traceability

## ORDERING INFORMATION

See detailed ordering, marking and shipping information on page 5 of this data sheet.

# NVMFWS0D63N04XM

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

| Parameter | Symbol | Test Condition | 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                       |    |    | 10  | μA    |
|                                                           |                                        | V <sub>DS</sub> = 40 V, T <sub>J</sub> = 125°C                      |    |    | 100 |       |
| 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> = 30 A, T <sub>J</sub> = 25°C               |     | 0.54  | 0.6 | mΩ    |
| Gate Threshold Voltage                         | V <sub>GS(TH)</sub>                   | V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 230 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> = 230 μA                        |     | -7.24 |     | mV/°C |
| Forward Trans-conductance                      | g <sub>FS</sub>                       | V <sub>DS</sub> = 5 V, I <sub>D</sub> = 30 A                                       |     | 174   |     | 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              |  | 5862 |  | pF |
| Output Capacitance           | C <sub>OSS</sub>    |                                                                       |  | 3760 |  |    |
| Reverse Transfer Capacitance | C <sub>RSS</sub>    |                                                                       |  | 50   |  |    |
| Total Gate Charge            | Q <sub>G(TOT)</sub> | V <sub>DD</sub> = 32 V, I <sub>D</sub> = 50 A, V <sub>GS</sub> = 10 V |  | 92.2 |  | nC |
| Threshold Gate Charge        | Q <sub>G(TH)</sub>  |                                                                       |  | 17.2 |  |    |
| Gate-to-Source Charge        | Q <sub>GS</sub>     |                                                                       |  | 25.8 |  |    |
| Gate-to-Drain Charge         | Q <sub>GD</sub>     |                                                                       |  | 17.4 |  |    |
| Gate Resistance              | R <sub>G</sub>      | f = 1 MHz                                                             |  | 0.60 |  | 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 |  | 28  |  | ns |
| Rise Time           | t <sub>r</sub>      |                                                                                                                     |  | 9   |  |    |
| Turn-Off Delay Time | t <sub>d(OFF)</sub> |                                                                                                                     |  | 47  |  |    |
| Fall Time           | t <sub>f</sub>      |                                                                                                                     |  | 7.3 |  |    |

### SOURCE TO DRAIN DIODE CHARACTERISTICS

|                         |                 |                                                                                           |  |      |  |    |
|-------------------------|-----------------|-------------------------------------------------------------------------------------------|--|------|--|----|
| Forward Diode Voltage   | V <sub>SD</sub> | I <sub>S</sub> = 30 A, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 25°C                       |  | 0.78 |  | V  |
|                         |                 | I <sub>S</sub> = 30 A, V <sub>GS</sub> = 0 V, T <sub>J</sub> = 125°C                      |  | 0.63 |  |    |
| 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 |  | 83   |  | ns |
| Charge Time             | t <sub>a</sub>  |                                                                                           |  | 47   |  |    |
| Discharge Time          | t <sub>b</sub>  |                                                                                           |  | 36   |  |    |
| Reverse Recovery Charge | Q <sub>RR</sub> |                                                                                           |  | 246  |  | 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

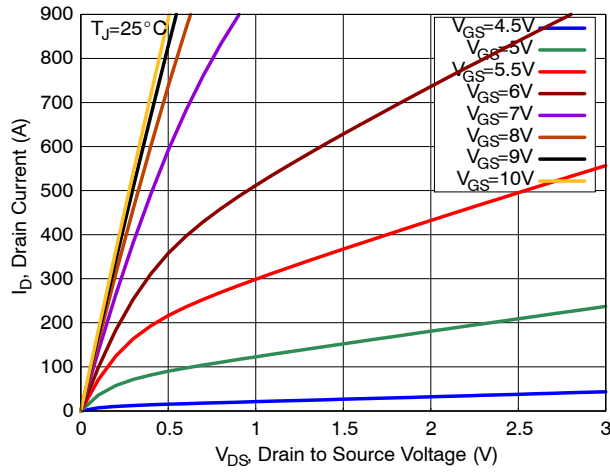


Figure 1. On-Region Characteristics

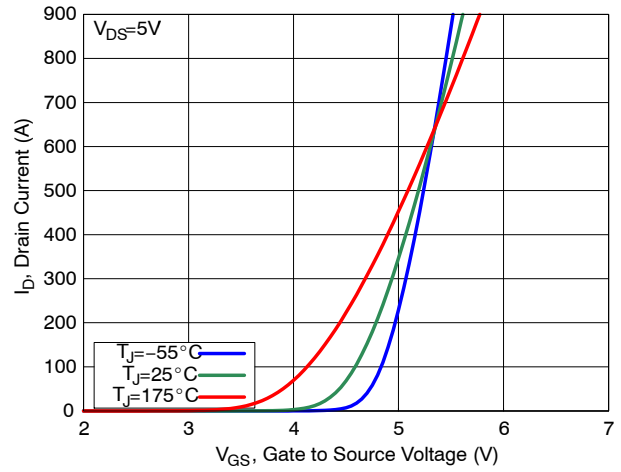


Figure 2. Transfer Characteristics

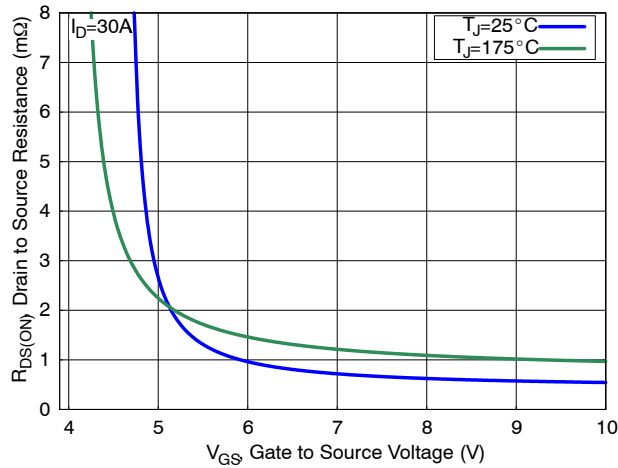


Figure 3. On-Resistance vs. Gate Voltage

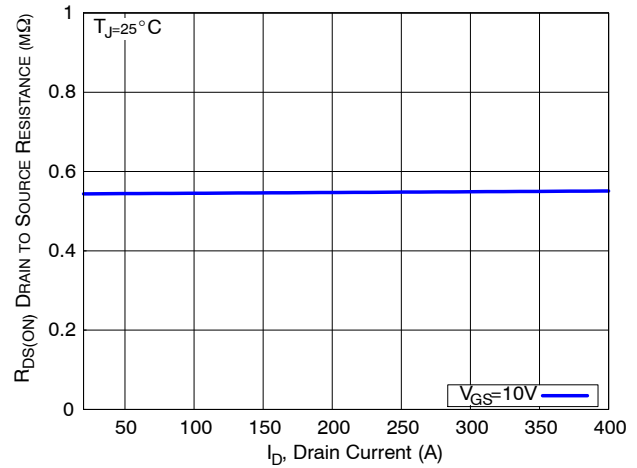


Figure 4. On-Resistance vs. Drain Current

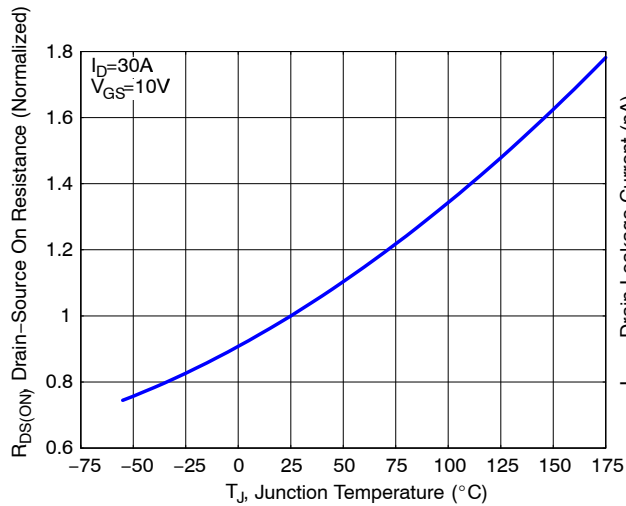


Figure 5. Normalized On-Resistance vs. Junction Temperature

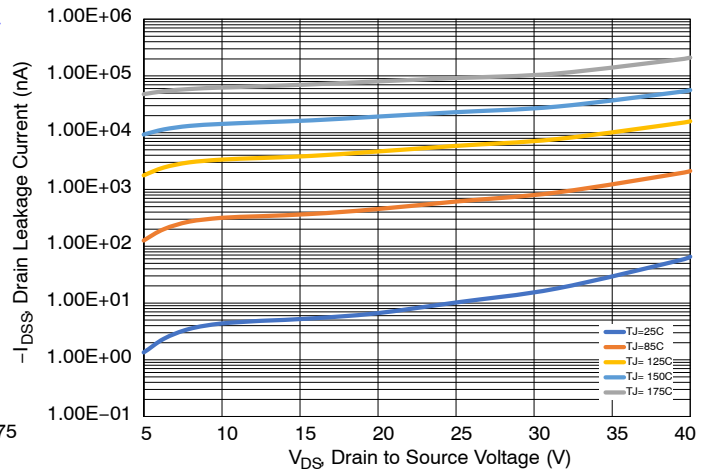


Figure 6. Drain-to-Source Leakage Current vs. Drain Voltage

TYPICAL CHARACTERISTICS (continued)

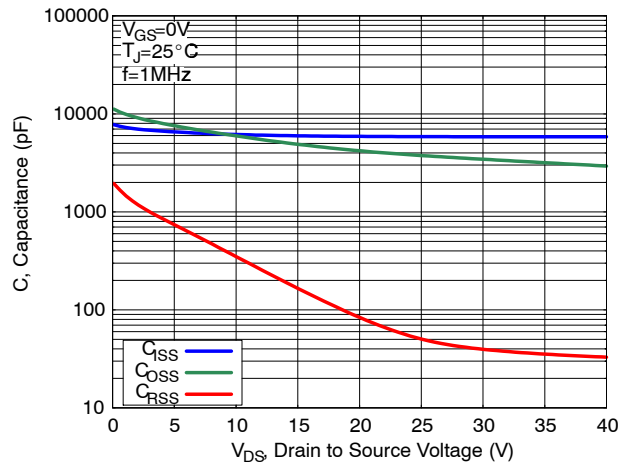


Figure 7. Capacitance Characteristics

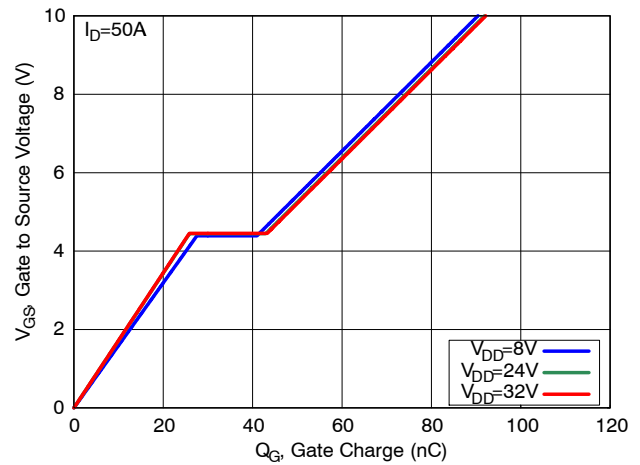


Figure 8. Gate Charge Characteristics

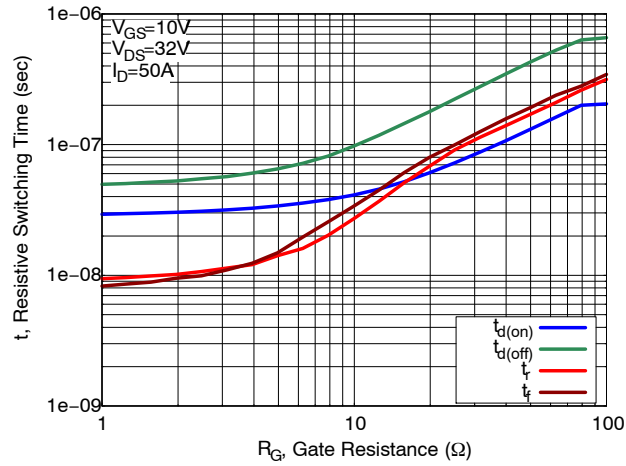


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

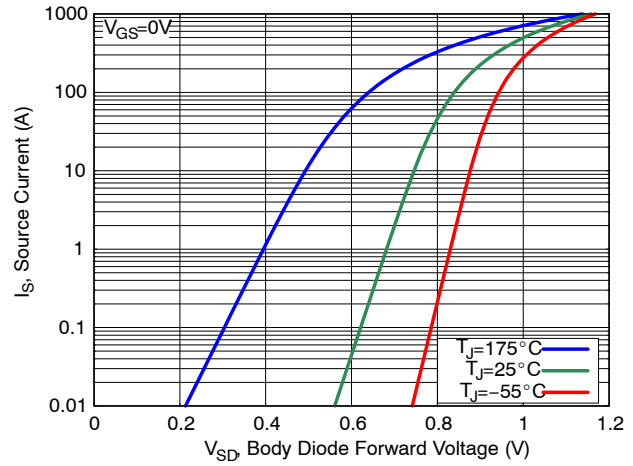


Figure 10. Diode Forward Voltage vs. Current

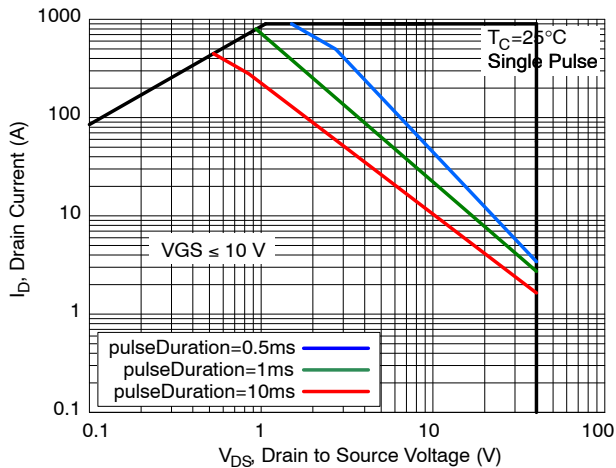


Figure 11. Safe Operating Area (SOA)

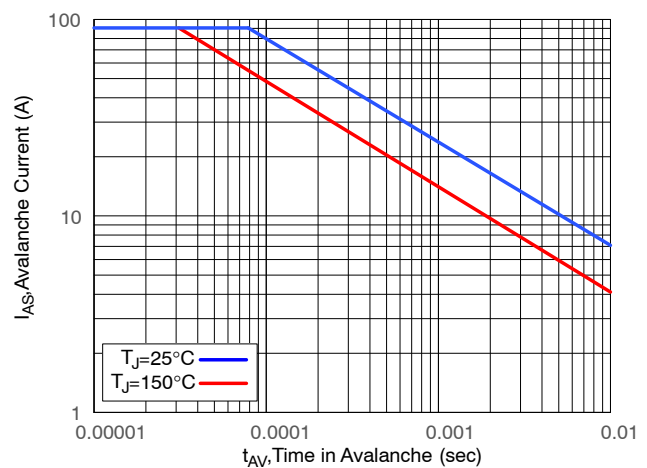


Figure 12. Avalanche Current vs. Pulse Time (UIS)

# NVMFWS0D63N04XM

## TYPICAL CHARACTERISTICS (continued)

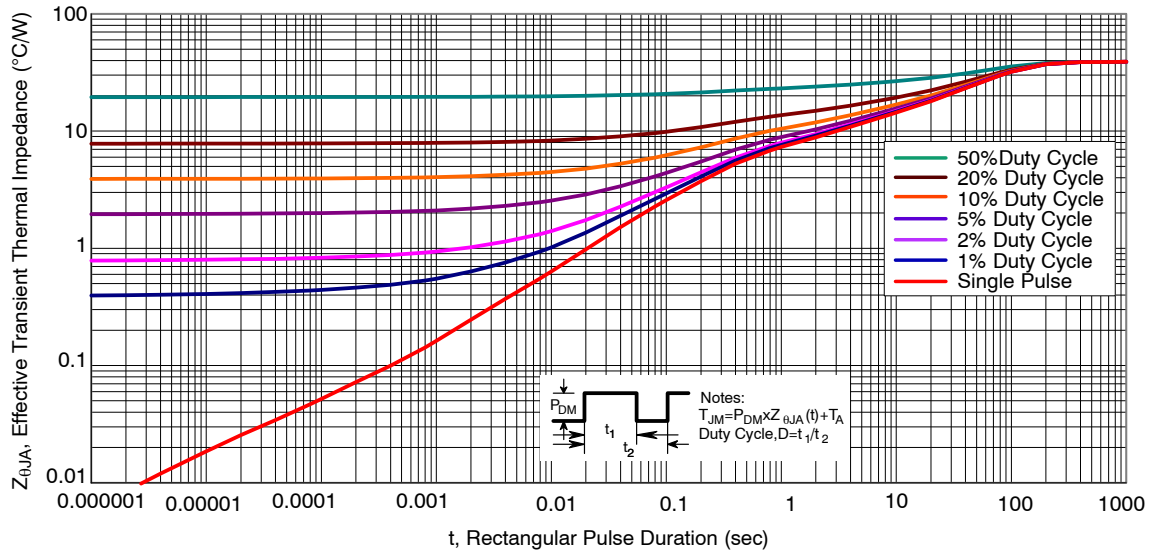


Figure 13. Thermal Characteristics

### ORDERING INFORMATION

| Device             | Marking | Package            | Shipping <sup>†</sup> |
|--------------------|---------|--------------------|-----------------------|
| NVMFWS0D63N04XMT1G | 063N4W  | DFNW5<br>(Pb-Free) | 1500 / Tape & Reel    |

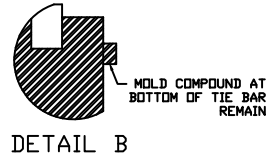
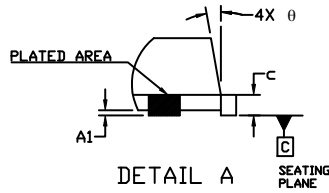
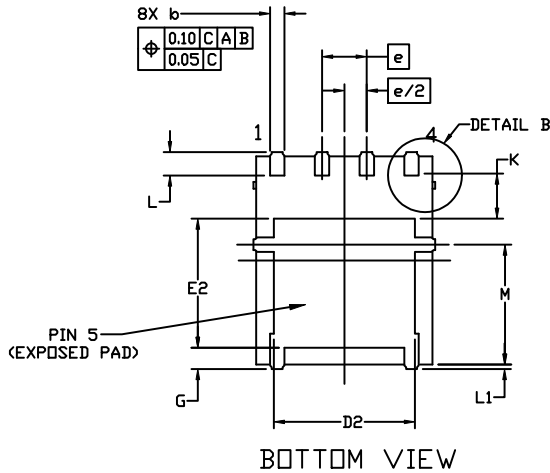
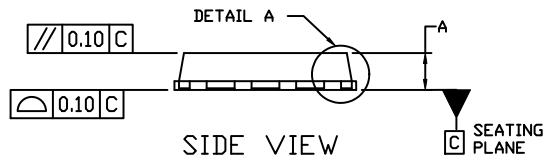
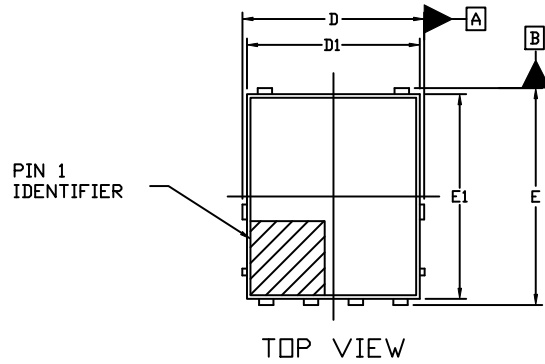
<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

PACKAGE DIMENSIONS

DFNW5 5x6 (FULL-CUT SO8FL WF)

CASE 507BA

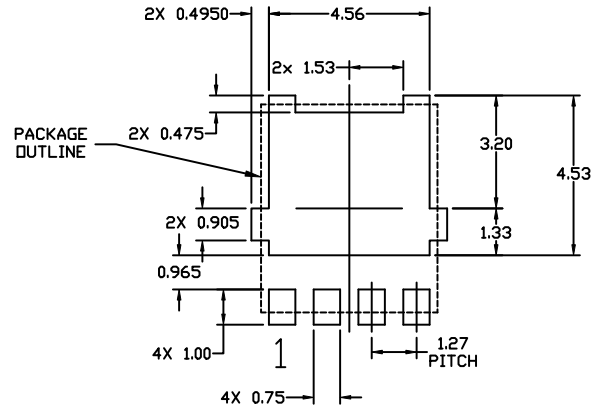
ISSUE A



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          | 4.70      | 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          | 0.150 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 ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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