

# NVMFS5A160PLZ

## Advance Information

### Power MOSFET

#### -60 V, 7.7 mΩ, -100 A, Single P-Channel



ON Semiconductor®

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#### Features

- Small Footprint (5 × 6 mm) for Compact Design
- Low  $R_{DS(on)}$  to Minimize Conduction Losses
- NVMFS5A160PLZWF :  
Wettable Flank Option for Enhanced Optical Inspection
- AEC-Q101 Qualified and PPAP Capable
- Pb-Free and RoHS compliance

#### SPECIFICATIONS

**ABSOLUTE MAXIMUM RATINGS** at  $T_j = 25^\circ\text{C}$  unless otherwise noted  
(Notes 1, 2, 3, 4)

| Parameter   |   | Symbol                   | Value       | Unit             |   |
|---|---|--------------------------|-------------|------------------|---|
| Drain to Source Voltage   |   | $V_{DSS}$                | -60         | V                |   |
| Gate to Source Voltage  |   | $V_{GS}$                 | $\pm 20$    | V                |   |
| Continuous Drain Current $R_{\theta JC}$ (Notes 2, 4)   | Steady State  | $T_C = 25^\circ\text{C}$ | $I_D$       | -100             | A |
|   |   | $T_C = 25^\circ\text{C}$ | $P_D$       | 200              | W |
| Power Dissipation $R_{\theta JA}$ (Note 2)  | Steady State  | $T_A = 25^\circ\text{C}$ | $I_D$       | -15              | A |
|   |   | $T_A = 25^\circ\text{C}$ | $P_D$       | 3.8              | W |
| Pulsed Drain Current  | $PW \leq 10 \mu\text{s}$ ,<br>duty cycle $\leq 1\%$ | $I_{DP}$                 | -400        | A                |   |
| Operating Junction and Storage Temperature  |   | $T_J$ ,<br>$T_{stg}$     | -55 to +175 | $^\circ\text{C}$ |   |
| Source Current (Body Diode)   |   | $I_S$                    | -100        | A                |   |
| Single Pulse Drain to Source Avalanche Energy ( $L = 1.0 \text{ mH}$ , $I_L(\text{pk}) = -26 \text{ A}$ ) |   | $E_{AS}$                 | 335         | mJ               |   |
| Lead Temperature for Soldering Purposes (1/8" from case for 10 s)   |   | $T_L$                    | 260         | $^\circ\text{C}$ |   |

#### THERMAL RESISTANCE MAXIMUM RATINGS

| Parameter                                 | Symbol          | Value | Unit               |
|---|-----------------|-------|--------------------|
| Junction to Case Steady State             | $R_{\theta JC}$ | 0.75  | $^\circ\text{C/W}$ |
| Junction to Ambient Steady State (Note 3) | $R_{\theta JA}$ | 39    |                    |

Note 1 : 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.

Note 2 : The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.

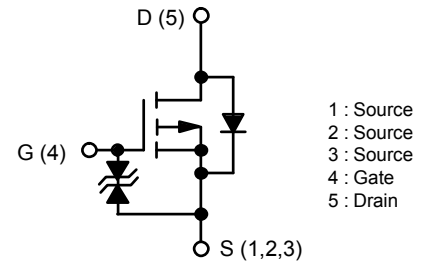
Note 3 : Surface mounted on FR4 board using a 650 mm<sup>2</sup>, 2 oz. Cu pad.

Note 4 : Maximum current for pulses as long as 1 second is higher but is dependent on pulse duration and duty cycle.

This document contains information on a new product. Specifications and information herein are subject to change without notice.

| $V_{DSS}$ | $R_{DS(on)}$ Max | $I_D$ Max |
|-----------|------------------|-----------|
| -60 V     | 7.7 mΩ @ -10 V   | -100 A    |
|           | 10.5 mΩ @ -4.5 V |           |

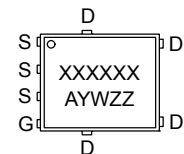
#### ELECTRICAL CONNECTION



#### P-Channel MOSFET



#### MARKING DIAGRAM



XXXXXX= Specific Device Code  
5A160L(NVMFS5A160PLZ)  
160LWF(NVMFS5A160PLZWF)

A = Assembly Location  
Y = Year  
W = Work Week  
ZZ = Lot Traceability

#### ORDERING INFORMATION

See detailed ordering and shipping information on page 6 of this data sheet.

# NVMFS5A160PLZ

**ELECTRICAL CHARACTERISTICS** at  $T_J = 25^\circ\text{C}$  unless otherwise specified (Note 5)

| Parameter | Symbol | Conditions | Value |     |     | Unit |
|-----------|--------|------------|-------|-----|-----|------|
|           |        |            | min   | typ | max |      |

**OFF CHARACTERISTICS**

|                                   |               |   |                           |  |          |               |
|-----------------------------------|---------------|---|---------------------------|--|----------|---------------|
| Drain to Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS} = 0\text{ V}, I_D = -1\text{ mA}$       | -60                       |  |          | V             |
| Zero-Gate Voltage Drain Current   | $I_{DSS}$     | $V_{GS} = 0\text{ V}$                           | $T_J = 25^\circ\text{C}$  |  | -1.0     | $\mu\text{A}$ |
|                                   |               | $V_{DS} = -60\text{ V}$                         | $T_J = 100^\circ\text{C}$ |  | -100     | $\mu\text{A}$ |
| Gate to Source Leakage Current    | $I_{GSS}$     | $V_{GS} = \pm 16\text{ V}, V_{DS} = 0\text{ V}$ |                           |  | $\pm 10$ | $\mu\text{A}$ |

**ON CHARACTERISTICS** (Note 6)

|                               |              |   |                      |     |      |                  |
|-------------------------------|--------------|---|----------------------|-----|------|------------------|
| Gate Threshold Voltage        | $V_{GS(th)}$ | $V_{DS} = -10\text{ V}, I_D = -1\text{ mA}$ | -1.2                 |     | -2.6 | V                |
| Drain to Source On Resistance | $R_{DS(on)}$ | $V_{GS} = -10\text{ V}$                     | $I_D = -50\text{ A}$ | 5.8 | 7.7  | $\text{m}\Omega$ |
|                               |              | $V_{GS} = -4.5\text{ V}$                    | $I_D = -50\text{ A}$ | 7.3 | 10.5 | $\text{m}\Omega$ |
| Forward Transconductance      | $g_{FS}$     | $V_{DS} = -10\text{ V}, I_D = -50\text{ A}$ |                      | 119 |      | S                |

**CHARGES, CAPACITANCES & GATE RESISTANCE**

|                              |              |   |  |       |  |    |
|------------------------------|--------------|---|--|-------|--|----|
| Input Capacitance            | $C_{iss}$    | $V_{GS} = 0\text{ V}, f = 1\text{ MHz},$<br>$V_{DS} = -20\text{ V}$     |  | 7,700 |  | pF |
| Output Capacitance           | $C_{oss}$    |   |  | 720   |  |    |
| Reverse Transfer Capacitance | $C_{rss}$    |   |  | 540   |  |    |
| Total Gate Charge            | $Q_{g(tot)}$ | $V_{GS} = -10\text{ V}, V_{DS} = -36\text{ V},$<br>$I_D = -50\text{ A}$ |  | 160   |  | nC |
| Gate to Source Charge        | $Q_{gs}$     |   |  | 24    |  |    |
| Gate to Drain Charge         | $Q_{gd}$     |   |  | 45    |  |    |

**SWITCHING CHARACTERISTICS** (Note 7)

|                     |              |   |  |     |  |    |
|---------------------|--------------|---|--|-----|--|----|
| Turn-ON Delay Time  | $t_{d(on)}$  | $V_{GS} = -10\text{ V}, V_{DS} = -36\text{ V},$<br>$I_D = -50\text{ A}, R_G = 50\ \Omega$ |  | 50  |  | ns |
| Rise Time           | $t_r$        |   |  | 690 |  |    |
| Turn-Off Delay Time | $t_{d(off)}$ |   |  | 645 |  |    |
| Fall Time           | $t_f$        |   |  | 643 |  |    |

**DRAIN SOURCE DIODE CHARACTERISTICS**

|                         |          |  |  |       |      |    |
|-------------------------|----------|--|--|-------|------|----|
| Forward Diode Voltage   | $V_{SD}$ | $V_{GS} = 0\text{ V}, I_S = -50\text{ A}$  |  | -0.83 | -1.5 | V  |
| Reverse Recovery Time   | $t_{rr}$ | $V_{GS} = 0\text{ V}, di/dt = 100\text{ A}/\mu\text{s},$<br>$I_S = -50\text{ A}$ |  | 93    |      | ns |
| Reverse Recovery Charge | $Q_{rr}$ |  |  | 218   |      | nC |

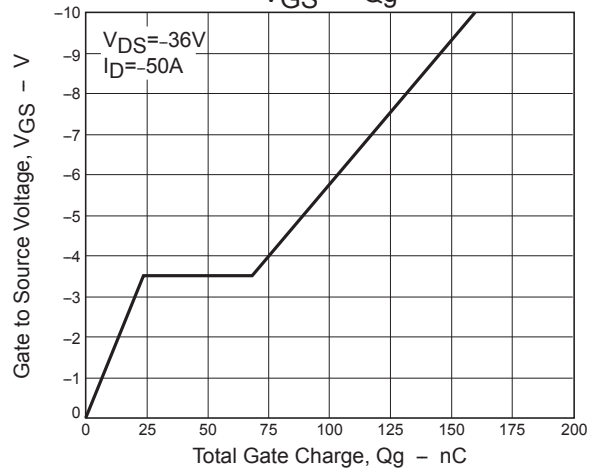
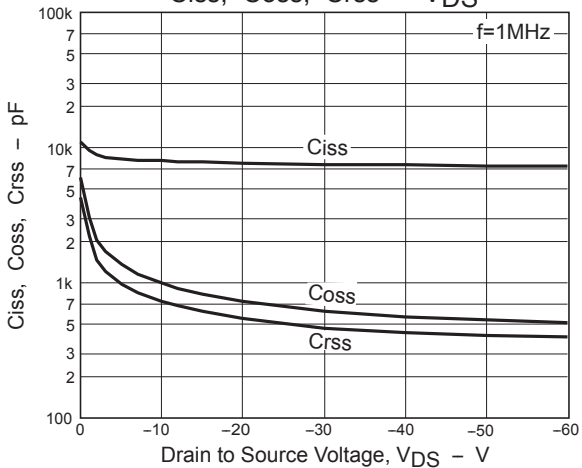
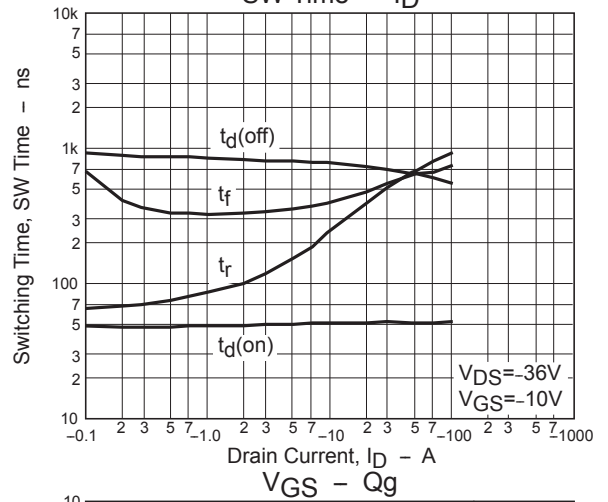
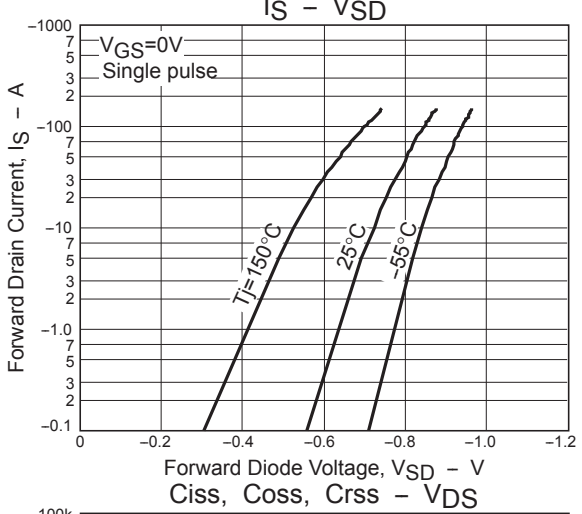
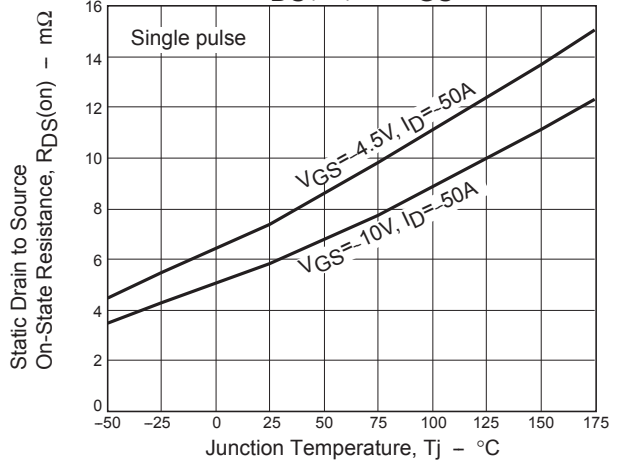
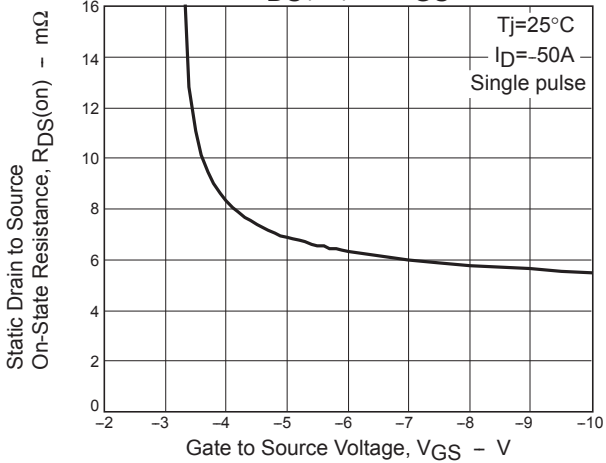
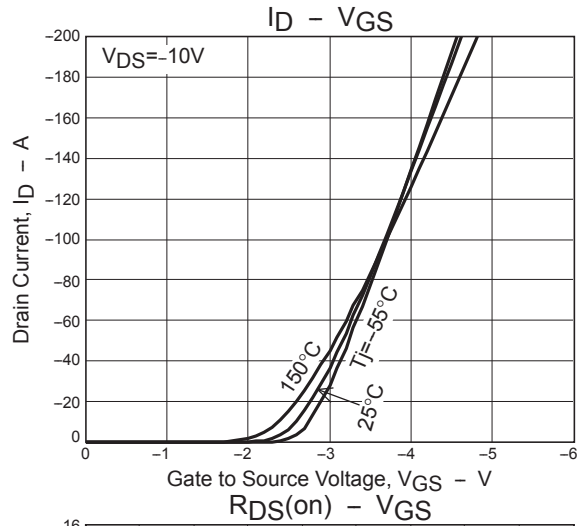
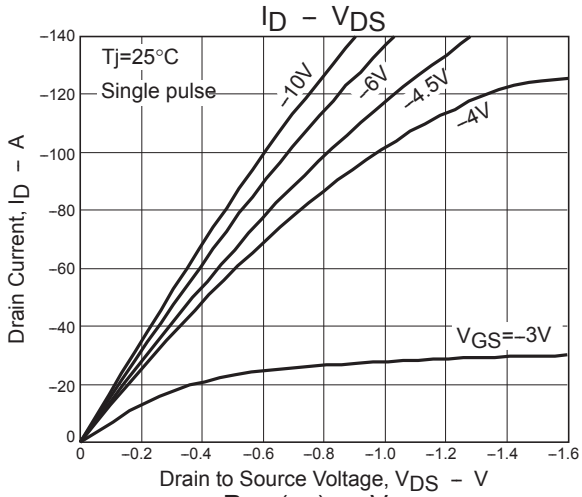
Note 5 : Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted.

Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

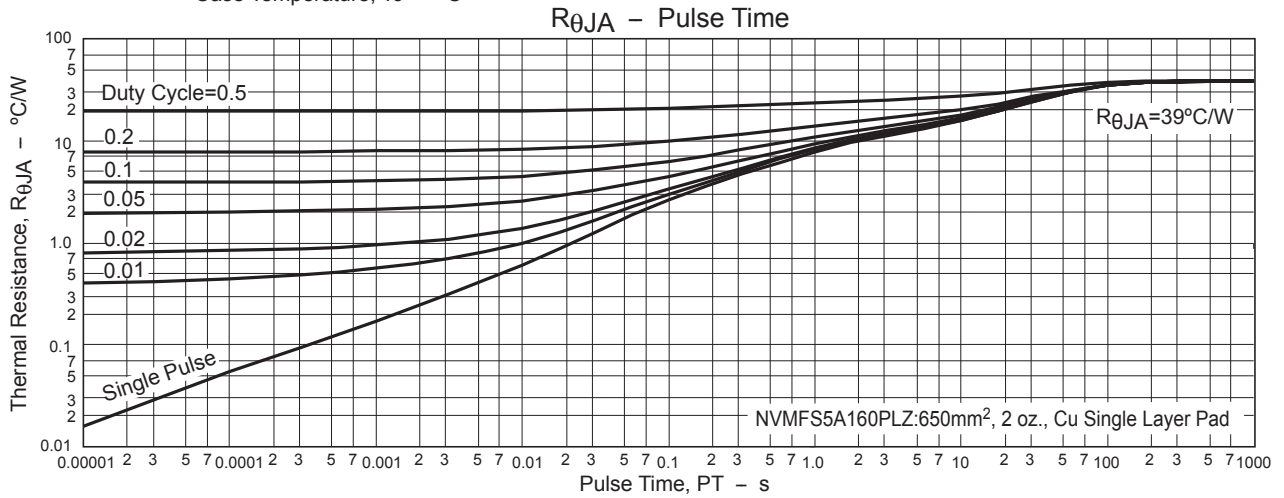
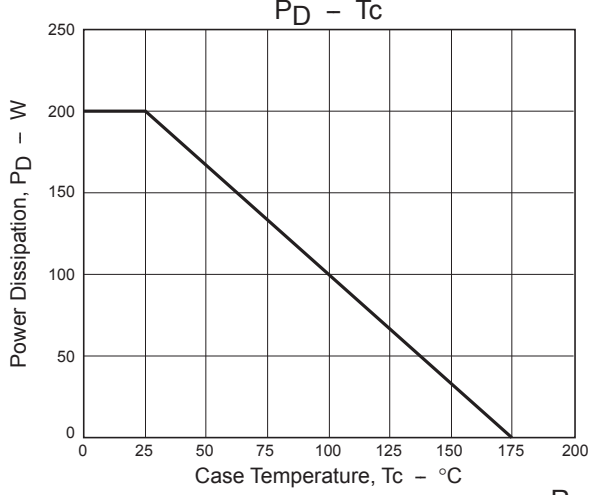
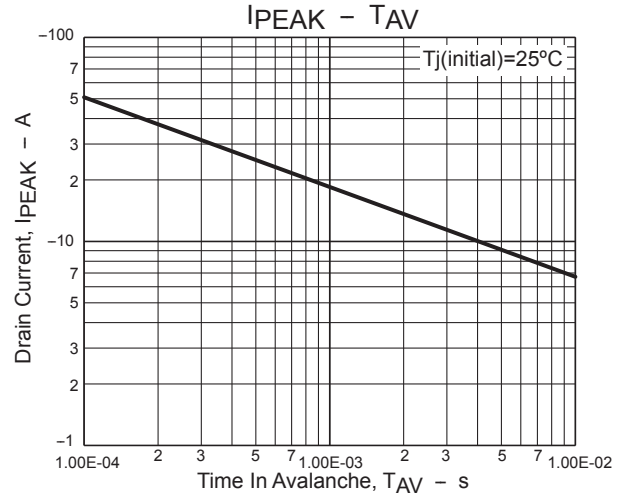
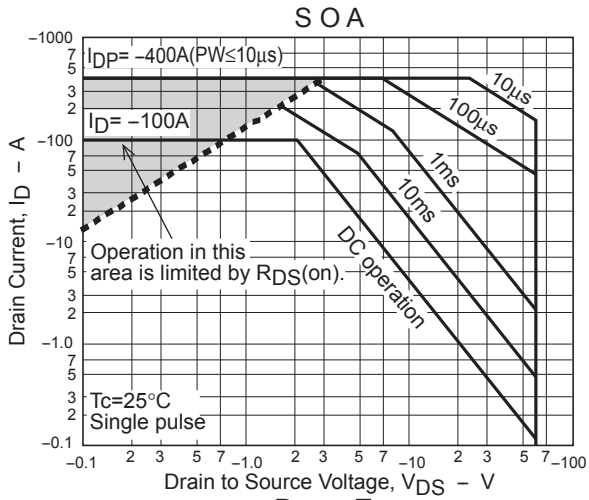
Note 6 : Pulse Test: pulse width  $\leq 300\ \mu\text{s}$ , duty cycle  $\leq 2\%$ .

Note 7 : Switching characteristics are independent of operating junction temperatures.

# NVMFS5A160PLZ



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## PACKAGE DIMENSIONS

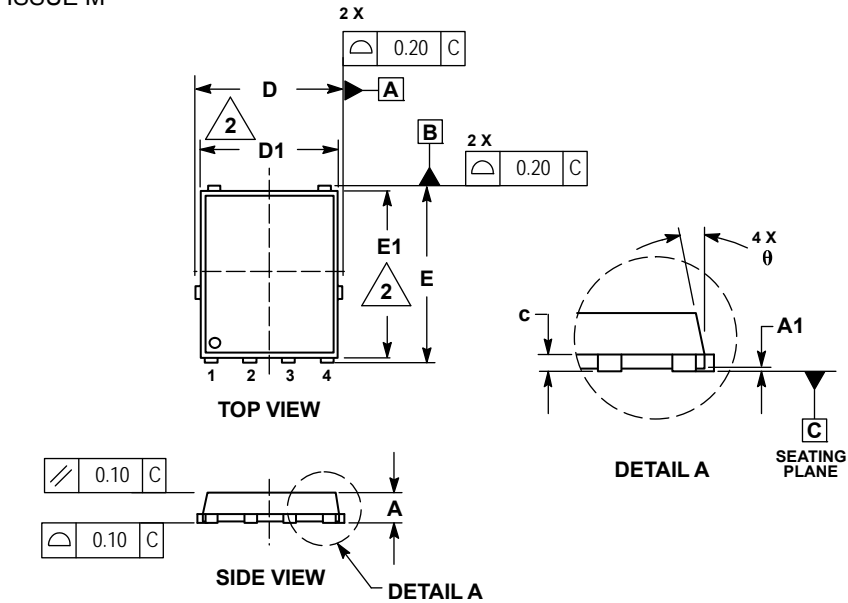
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DFN5 5x6, 1.27P

(SO-8FL)

CASE 488AA

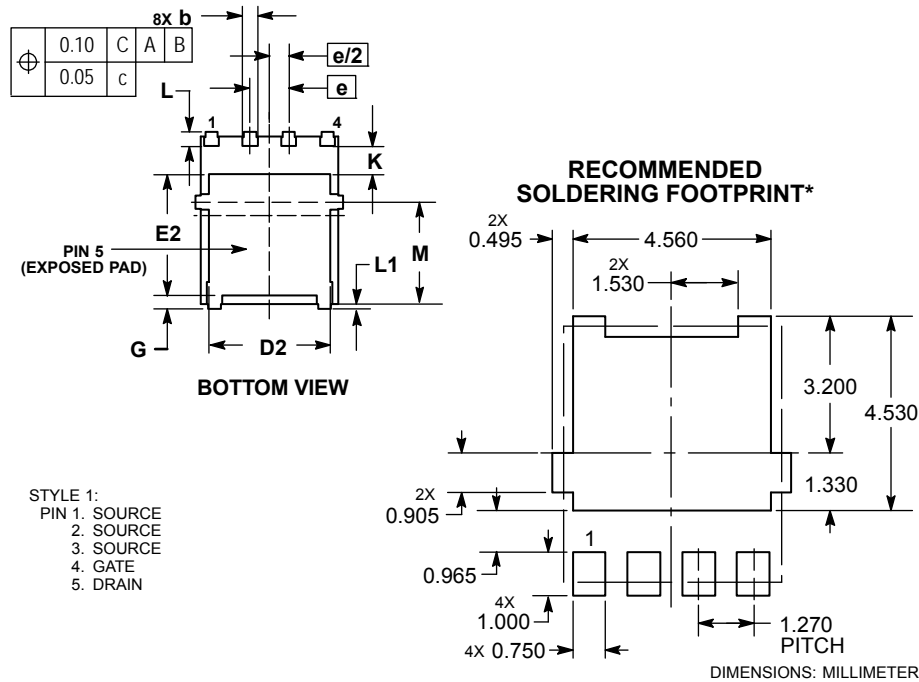
ISSUE M



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 ° |



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

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

# NVMFS5A160PLZ

## ORDERING INFORMATION

| Device             | Marking | Package  | Shipping (Qty / Packing) |
|--------------------|---------|--|--------------------------|
| NVMFS5A160PLZT1G   | 5A160L  | DFN5 5x6, 1.27P (SO-8FL)<br>(Pb-Free)                  | 1,500 / Tape & Reel      |
| NVMFS5A160PLZWFT1G | 160LWF  | DFN5 5x6, 1.27P (SO-8FL)<br>(Pb-Free, Wettable Flanks) |                          |
| NVMFS5A160PLZT3G   | 5A160L  | DFN5 5x6, 1.27P (SO-8FL)<br>(Pb-Free)                  | 5,000 / Tape & Reel      |
| NVMFS5A160PLZWFT3G | 160LWF  | DFN5 5x6, 1.27P (SO-8FL)<br>(Pb-Free, Wettable Flanks) |                          |

† 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. [http://www.onsemi.com/pub\\_link/Collateral/BRD8011-D.PDF](http://www.onsemi.com/pub_link/Collateral/BRD8011-D.PDF)

Note on usage : Since the NVMFS5A160PLZ is a MOSFET product, please avoid using this device in the vicinity of highly charged objects. Please contact sales for use except the designated application.

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