# NVMFS5A140PLZ

# MOSFET – Power, Single P-Channel

## -40 V, -140 A, 4.2 mΩ

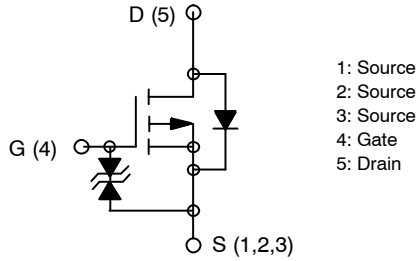
**ON Semiconductor®**

www.onsemi.com

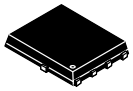
### Features

- Small Footprint (5 x 6 mm) for Compact Design
- Low $R_{DS(on)}$ to Minimize Conduction Losses
- NVMFS5A140PLZWF: Wettable Flank Option for Enhanced Optical Inspection
- AEC−Q101 Qualified and PPAP Capable
- These Devices are Pb−Free and are RoHS Compliant

| $V_{DSS}$ | $R_{DS(ON)}$ MAX | $I_D$ MAX |
|---|---|---|
| −40 V | 4.2 mΩ @ −10 V | −140 A |
| | 7.2 mΩ @ −4.5 V | |




**P-CHANNEL MOSFET**



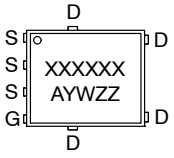
**DFN5**
**(SO−8FL)**

### SPECIFICATION MAXIMUM RATINGS ($T_J$ = 25°C unless otherwise noted) (Notes 1, 2, 3)

| Symbol | Parameter | | | Value | Unit |
|---|---|---|---|---|---|
| $V_{DSS}$ | Drain to Source Voltage | | | −40 | V |
| $V_{GS}$ | Gate to Source Voltage | | | ±20 | V |
| $I_D$ | Continuous Drain, Current $R_{\theta JC}$, (Notes 1, 3) | Steady State | $T_C$ = 25°C | −140 | A |
| $P_D$ | Power Dissipation $R_{\theta JC}$ (Note 1) | | $T_C$ = 25°C | 200 | W |
| $I_D$ | Continuous Drain: Current $R_{\theta JA}$ (Notes 1, 2, 3) | Steady State | $T_A$ = 25°C | −20 | A |
| $P_D$ | Power Dissipation $R_{\theta JA}$ (Note 1, 2) | | $T_A$ = 25°C | 3.8 | W |
| $I_{DP}$ | Pulsed Drain Current | PW ≤ 10 μs, duty cycle ≤ 1% | | −560 | A |
| $T_J$, $T_{STG}$ | Operating Junction and Storage Temperature | | | −55 to +175 | °C |
| $I_S$ | Source Current (Body Diode) | | | −140 | A |
| $E_{AS}$ | Single Pulse Drain to Source Avalanche Energy (L= 1.0 mH, $I_{L(pk)}$ = −29 A) | | | 420 | mJ |
| $T_L$ | Lead Temperature for Soldering Purposes (1/8" from case for 10 s) | | | 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.

### MARKING DIAGRAM




XXXXXX = Specific Device Code
5A140L(NVMFS5A140PLZ)
140LWF(NVMFS5A140PLZWF)
A = Assembly Location
Y = Year
W = Work Week
ZZ = Lot Traceability

### ORDERING INFORMATION

See detailed ordering and shipping information on page 7 of this data sheet.

### THERMAL CHARACTERISTICS

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $R_{\theta JC}$ | Junction to Case Steady State | 0.75 | °C/W |
| $R_{\theta JA}$ | Junction to Ambient Steady State (Note 2) | 39 | |

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

**ELECTRICAL CHARACTERISTICS** ($T_J$ = 25°C unless otherwise noted)

| Symbol | Parameter | Test Condition | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | | |
| $V_{(BR)DSS}$ | Drain to Source Breakdown Voltage | $I_D$ = −1 mA, $V_{GS}$ = 0 V | | −40 | | | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$ = −40 V, $V_{GS}$ = 0 V | $T_J$ = 25°C | | | −1.0 | μA |
| | | | $T_J$ = 100°C (Note 4) | | | −100 | μA |
| $I_{GSS}$ | Gate to Source Leakage Current | $V_{GS}$ = ±16 V, $V_{DS}$ = 0 V | | | | ±10 | μA |
| **ON CHARACTERISTICS** (Note 5) | | | | | | | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$ = −10 V, $I_D$ = −1 mA | | −1.2 | | −2.6 | V |
| $R_{DS(on)}$ | Drain to Source On Resistance | $V_{GS}$ = −10 V | $I_D$ = −50 A | | 3.2 | 4.2 | mΩ |
| | | $V_{GS}$ = −4.5 V | $I_D$ = −50 A | | 5.0 | 7.2 | |
| $g_{FS}$ | Forward Transconductance | $V_{DS}$ = −10 V, $I_D$ = −50 A | | | 125 | | S |
| **CHARGES, CAPACITANCES & GATE RESISTANCE** | | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{GS}$ = 0 V, f = 1 MHz $V_{DS}$ = −20 V, | | | 7400 | | pF |
| $C_{oss}$ | Output Capacitance | | | | 1030 | | |
| $C_{rss}$ | Reverse Transfer Capacitance | | | | 720 | | |
| $Q_{g(tot)}$ | Total Gate Charge | $V_{GS}$ = −10 V, $I_D$ = −50 A $V_{DS}$ = −20 V, | | | 136 | | nC |
| $Q_{gs}$ | Gate to Source Charge | | | | 26 | | |
| $Q_{gd}$ | Gate to Drain Charge | | | | 31 | | |
| **SWITCHING CHARACTERISTICS** (Note 6) | | | | | | | |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{DS}$ = −20 V, $I_D$ = −50 A, $V_{GS}$ = −10 V, $R_G$ = 50 Ω | | | 50 | | ns |
| $t_r$ | Rise Time | | | | 860 | | |
| $t_{d(off)}$ | Turn-Off Delay Time | | | | 540 | | |
| $t_f$ | Fall Time | | | | 740 | | |
| **DRAIN-SOURCE DIODE CHARACTERISTICS** | | | | | | | |
| $V_{SD}$ | Forward Diode Voltage | $V_{GS}$ = 0 V, $I_S$ = −50 A | | | −0.83 | −1.5 | V |
| $t_{rr}$ | Reverse Recovery Time | $V_{GS}$ = 0 V, $I_S$ = −50 A di/dt = 100 A/μs | | | 108 | | ns |
| $Q_{rr}$ | Reverse Recovery Charge | | | | 236 | | 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.

4. The maximum value is specified by design at $T_J$ = 100 °C. Product is not tested to this condition in production.
5. Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2 %.
6. Switching characteristics are independent of operating junction temperatures.

## TYPICAL CHARACTERISTICS

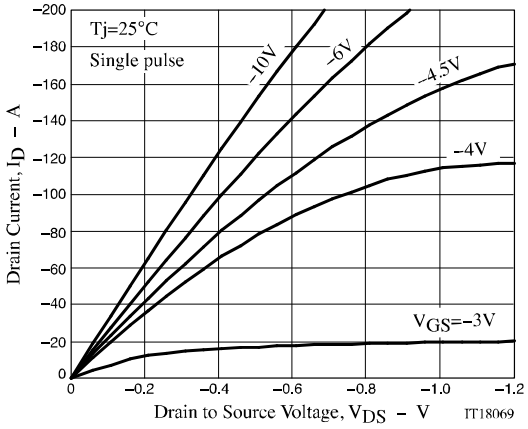



**Figure 1. $I_D$ – $V_{DS}$**

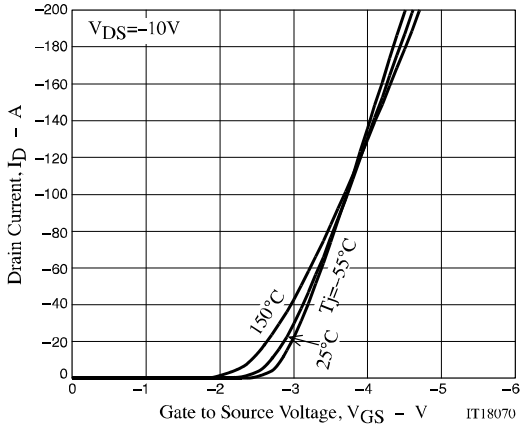



**Figure 2. $I_D$ – $V_{GS}$**

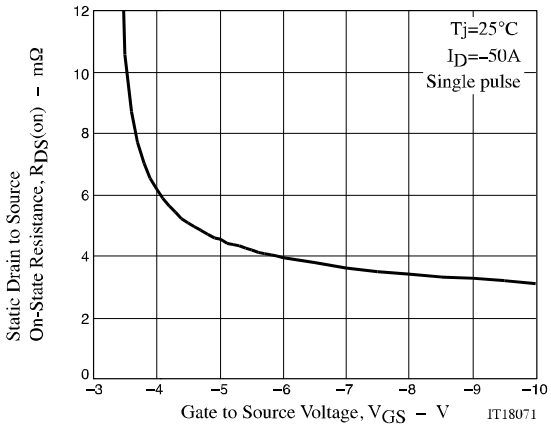



**Figure 3. $R_{DS(on)}$ – $V_{GS}$**

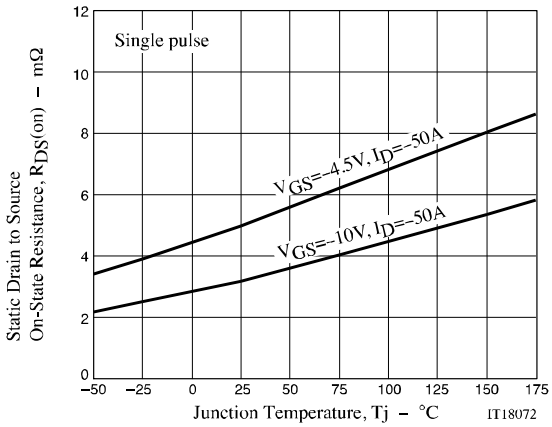



**Figure 4. $R_{DS(on)}$ – $T_J$**

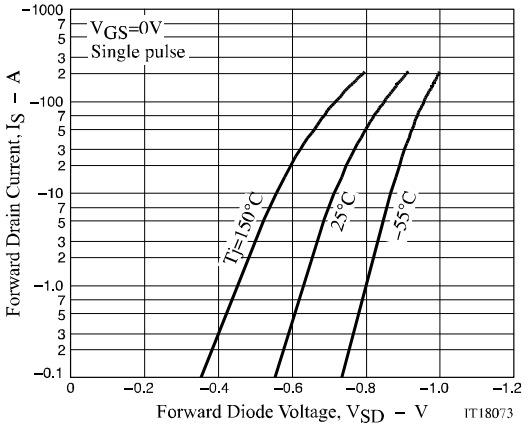



**Figure 5. $I_S$ – $V_{SD}$**

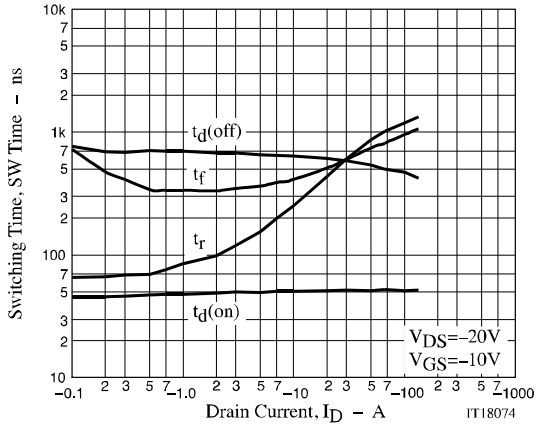



**Figure 6. SW Time – $I_D$**

## TYPICAL CHARACTERISTICS

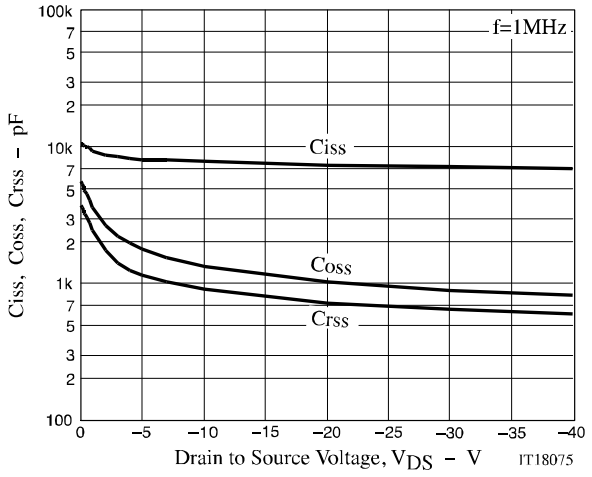



**Figure 7. $C_{iss}$, $C_{oss}$, $C_{rss}$ – $V_{DS}$**

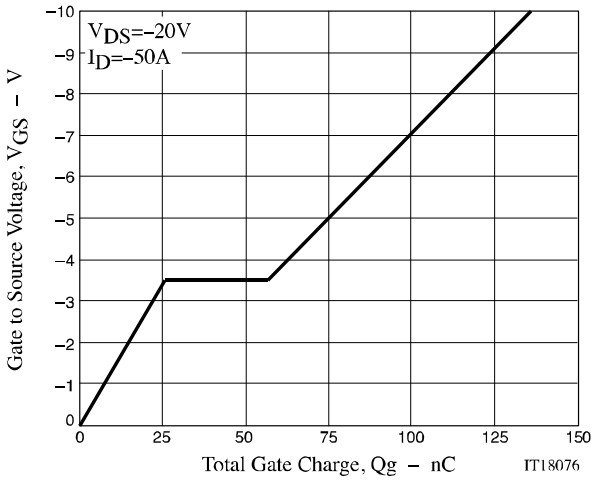



**Figure 8. $V_{GS}$ – $Q_g$**

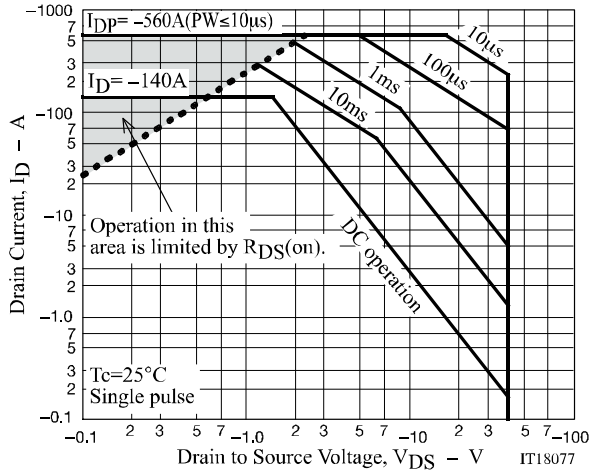



**Figure 9. SOA**

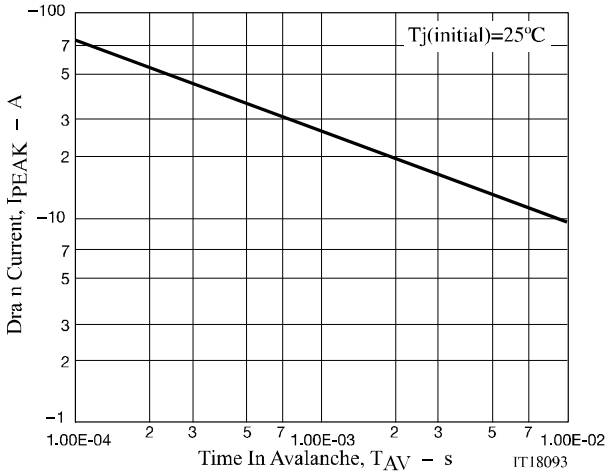



**Figure 10. $I_{PEAK}$ – $T_{AV}$**

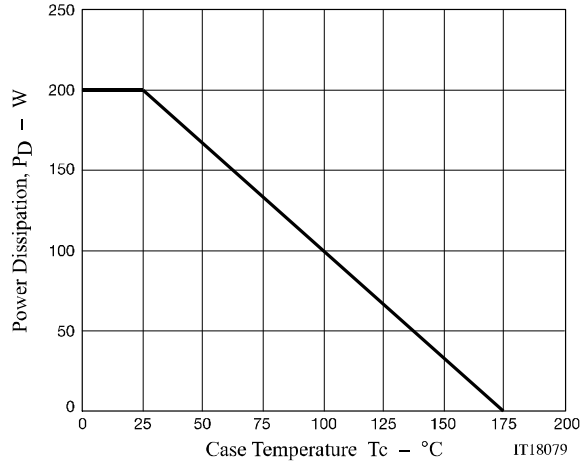



**Figure 11. $P_D$ – $T_C$**

## TYPICAL CHARACTERISTICS

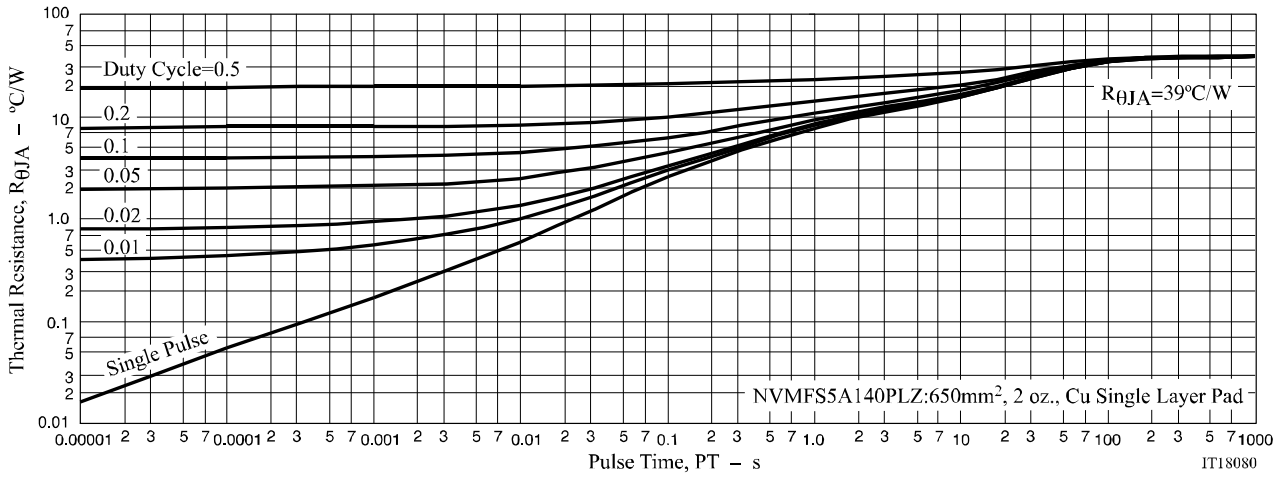
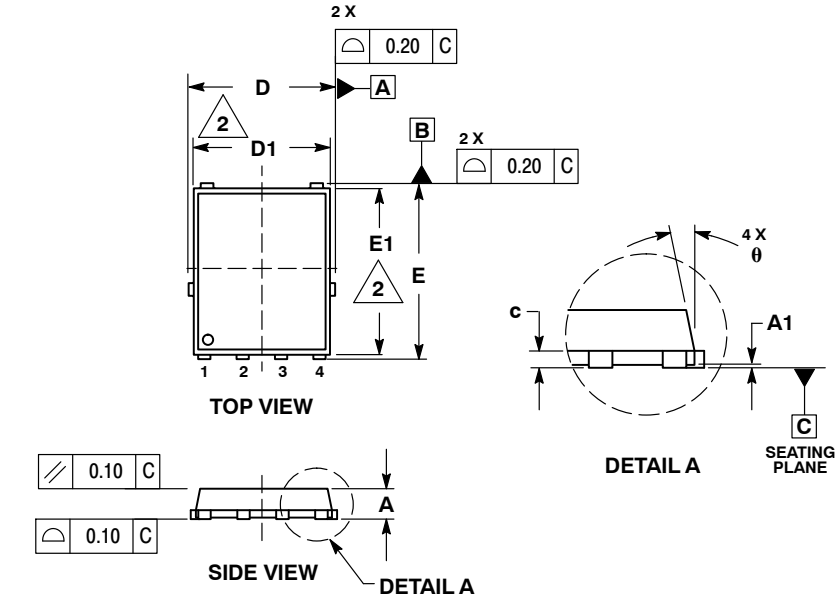


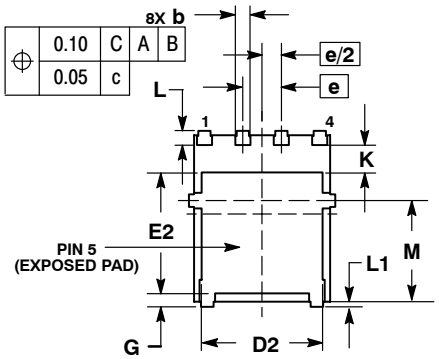

**Figure 12. $R_{\theta JA}$ – Pulse Time**

**DFN5 5x6, 1.27P**
**(SO−8FL)**
CASE 488AA
ISSUE M



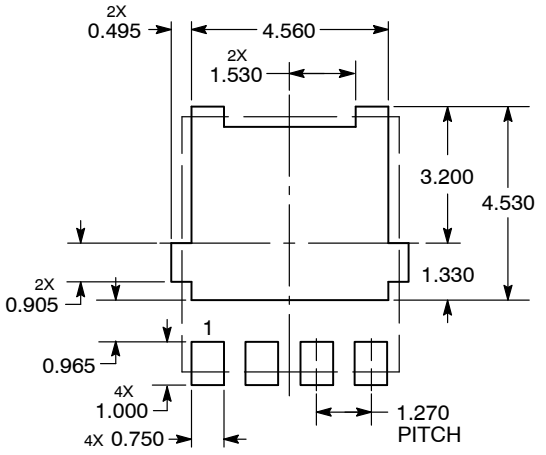

NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION D1 AND E1 DO NOT INCLUDE MOLD FLASH PROTRUSIONS OR GATE BURRS.

| | 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 | 0.125 REF | | |
| M | 3.00 | 3.40 | 3.80 |
| θ | 0 ° | --- | 12 ° |




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

**RECOMMENDED**
**SOLDERING FOOTPRINT***




DIMENSIONS: MILLIMETERS

## ORDERING INFORMATION

| Device | Marking | Package | Shipping (Qty / Packing)† |
|---|---|---|---|
| NVMFS5A140PLZT1G | 5A140L | DFN5 5x6, 1.27P (SO−8FL) (Pb-Free) | 1.500 / Tape & Reel |
| NVMFS5A140PLZWFT1G | 140LWF | DFN5 5x6, 1.27P (SO−8FL) (Pb-Free / Wettable Flanks) | 1.500 / Tape & Reel |
| NVMFS5A140PLZT3G | 5A140L | DFN5 5x6, 1.27P (SO−8FL) (Pb-Free) | 5.000 / Tape & Reel |
| NVMFS5A140PLZWFT3G | 140LWF | DFN5 5x6, 1.27P (SO−8FL) (Pb-Free / Wettable Flanks) | 5.000 / 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.



## PUBLICATION ORDERING INFORMATION

**LITERATURE FULFILLMENT**:
Literature Distribution Center for ON Semiconductor
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**Fax**: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
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**Europe, Middle East and Africa Technical Support:**
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