

# NVMFS5A140PLZ

## MOSFET – Power, Single P-Channel

**-40 V, -140 A, 4.2 mΩ**



**ON Semiconductor®**

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### 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

### SPECIFICATION MAXIMUM RATINGS ( $T_J = 25^\circ\text{C}$ 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	$\pm 20$	V
$I_D$	Continuous Drain Current $R_{\theta JC}$ (Notes 1, 3)	$T_C = 25^\circ\text{C}$ -140	A
$P_D$	Power Dissipation $R_{\theta JC}$ (Note 1)	$T_C = 25^\circ\text{C}$ 200	W
$I_D$	Continuous Drain Current $R_{\theta JA}$ (Notes 1, 2, 3)	$T_A = 25^\circ\text{C}$ -20	A
$P_D$	Power Dissipation $R_{\theta JA}$ (Note 1, 2)	$T_A = 25^\circ\text{C}$ 3.8	W
$I_{DP}$	Pulsed Drain Current	$PW \leq 10 \mu\text{s}$ , duty cycle $\leq 1\%$	-560 A
$T_J, T_{STG}$	Operating Junction and Storage Temperature	-55 to +175	$^\circ\text{C}$
$I_S$	Source Current (Body Diode)	-140	A
$E_{AS}$	Single Pulse Drain to Source Avalanche Energy ( $L = 1.0 \text{ mH}$ , $I_{L(pk)} = -29 \text{ A}$ )	420	mJ
$T_L$	Lead Temperature for Soldering Purposes (1/8" from case for 10 s)	260	$^\circ\text{C}$

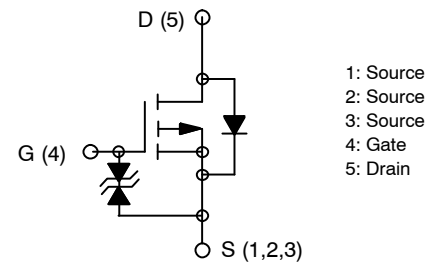
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

### THERMAL CHARACTERISTICS

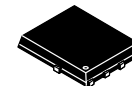
Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Junction to Case Steady State	0.75	$^\circ\text{C/W}$
$R_{\theta JA}$	Junction to Ambient Steady State (Note 2)	39	

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<sup>2</sup>, 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.

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

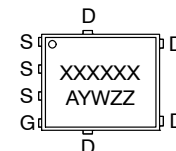


**P-CHANNEL MOSFET**



**DFN5 (SO-8FL)**

### 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.

# NVMFS5A140PLZ

## ELECTRICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

$V_{(BR)DSS}$	Drain to Source Breakdown Voltage	$I_D = -1\text{ mA}, V_{GS} = 0\text{ V}$	-40			V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = -40\text{ V}, V_{GS} = 0\text{ V}$	$T_J = 25^\circ\text{C}$		-1.0	$\mu\text{A}$
			$T_J = 100^\circ\text{C}$ (Note 4)		-100	$\mu\text{A}$
$I_{GSS}$	Gate to Source Leakage Current	$V_{GS} = \pm 16\text{ V}, V_{DS} = 0\text{ V}$			$\pm 10$	$\mu\text{A}$

### ON CHARACTERISTICS (Note 5)

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = -10\text{ V}, I_D = -1\text{ mA}$	-1.2		-2.6	V
$R_{DS(on)}$	Drain to Source On Resistance	$V_{GS} = -10\text{ V}$	$I_D = -50\text{ A}$	3.2	4.2	$\text{m}\Omega$
		$V_{GS} = -4.5\text{ V}$	$I_D = -50\text{ A}$	5.0	7.2	
$g_{FS}$	Forward Transconductance	$V_{DS} = -10\text{ V}, I_D = -50\text{ A}$		125		S

### CHARGES, CAPACITANCES & GATE RESISTANCE

$C_{iss}$	Input Capacitance	$V_{GS} = 0\text{ V}, f = 1\text{ MHz}$ $V_{DS} = -20\text{ V},$		7400		$\text{pF}$
$C_{oss}$	Output Capacitance			1030		
$C_{rss}$	Reverse Transfer Capacitance			720		
$Q_{g(tot)}$	Total Gate Charge	$V_{GS} = -10\text{ V}, I_D = -50\text{ A}$ $V_{DS} = -20\text{ V},$		136		$\text{nC}$
$Q_{gs}$	Gate to Source Charge			26		
$Q_{gd}$	Gate to Drain Charge			31		

### SWITCHING CHARACTERISTICS (Note 6)

$t_{d(on)}$	Turn-On Delay Time	$V_{DS} = -20\text{ V}, I_D = -50\text{ A},$ $V_{GS} = -10\text{ V}, R_G = 50\ \Omega$		50		$\text{ns}$
$t_r$	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	$V_{GS} = 0\text{ V}, I_S = -50\text{ A}$		-0.83	-1.5	V
$t_{rr}$	Reverse Recovery Time	$V_{GS} = 0\text{ V}, I_S = -50\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$		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  $T_J = 100^\circ\text{C}$ . Product is not tested to this condition in production.
5. Pulse Test: pulse width  $\leq 300\ \mu\text{s}$ , duty cycle  $\leq 2\%$ .
6. Switching characteristics are independent of operating junction temperatures.

# NVMFS5A140PLZ

## TYPICAL CHARACTERISTICS

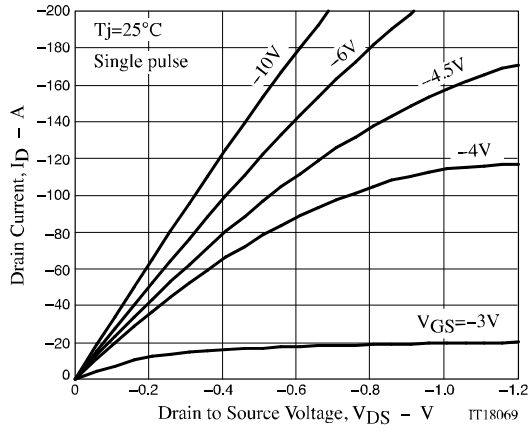


Figure 1.  $I_D - V_{DS}$

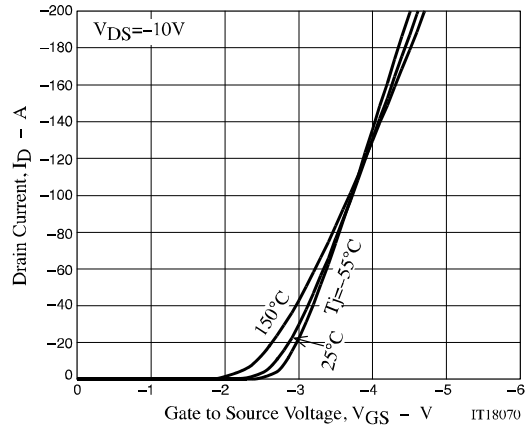


Figure 2.  $I_D - V_{GS}$

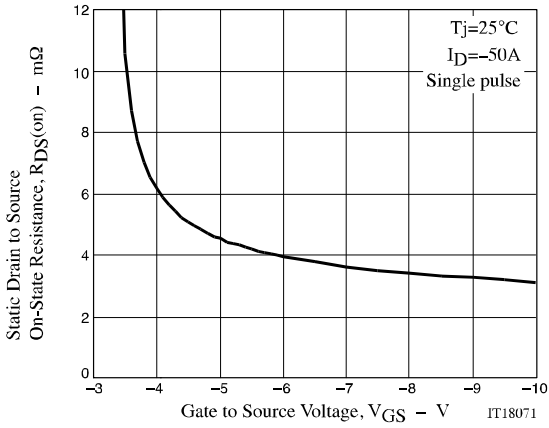


Figure 3.  $R_{DS(on)} - V_{GS}$

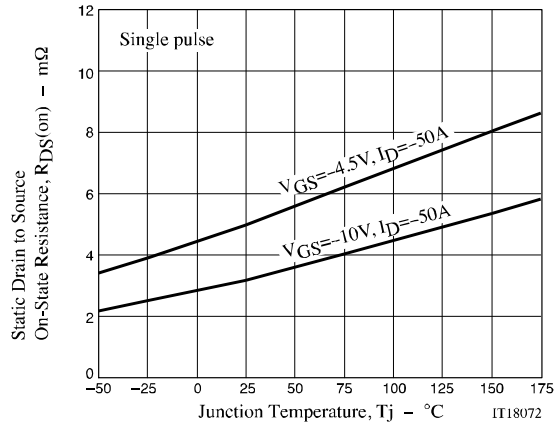


Figure 4.  $R_{DS(on)} - T_J$

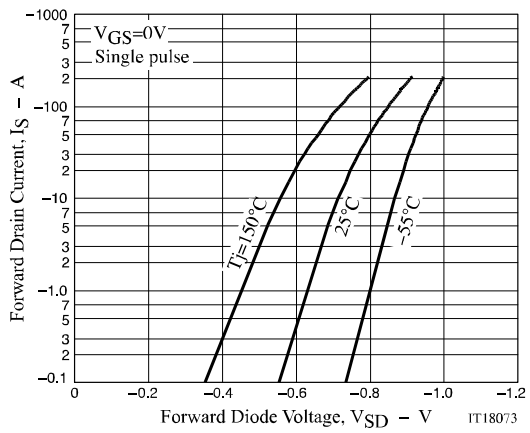


Figure 5.  $I_S - V_{SD}$

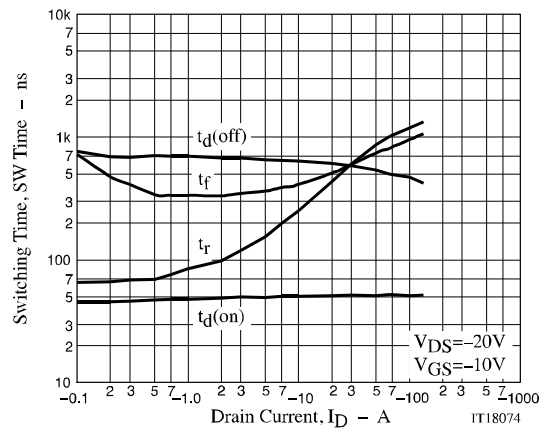


Figure 6. SW Time -  $I_D$

# NVMFS5A140PLZ

## TYPICAL CHARACTERISTICS

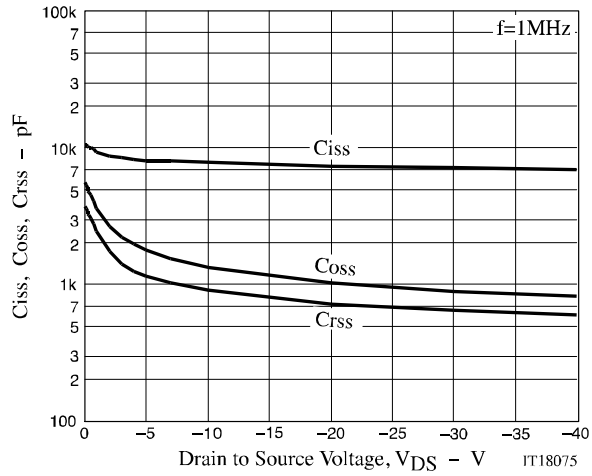


Figure 7.  $C_{iss}$ ,  $C_{oss}$ ,  $C_{rss}$  -  $V_{DS}$

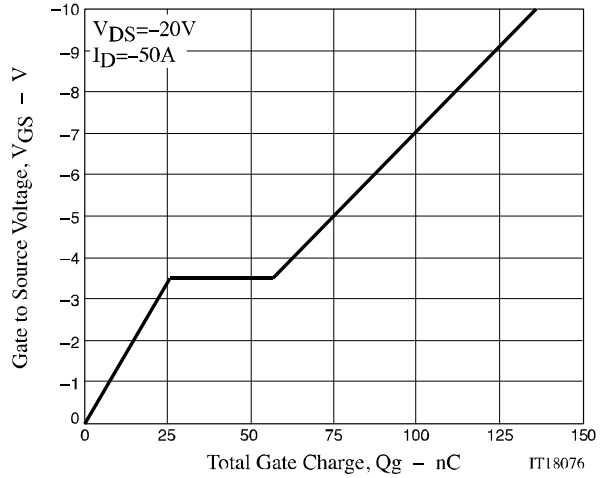


Figure 8.  $V_{GS}$  -  $Q_g$

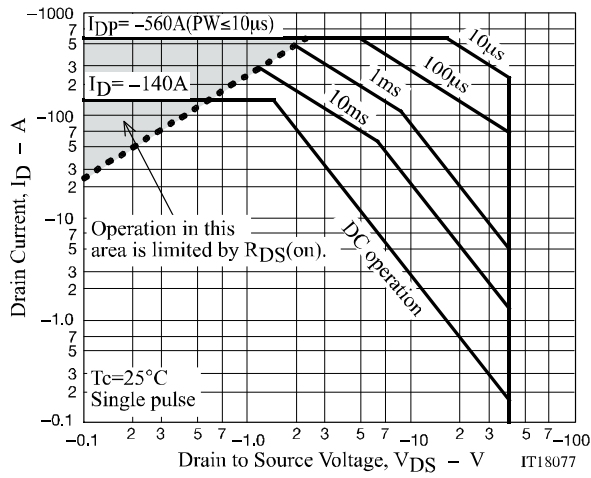


Figure 9. SOA

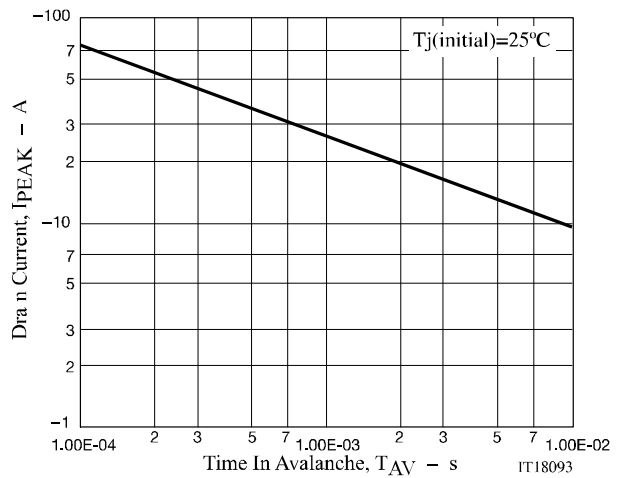


Figure 10.  $I_{PEAK}$  -  $T_{AV}$

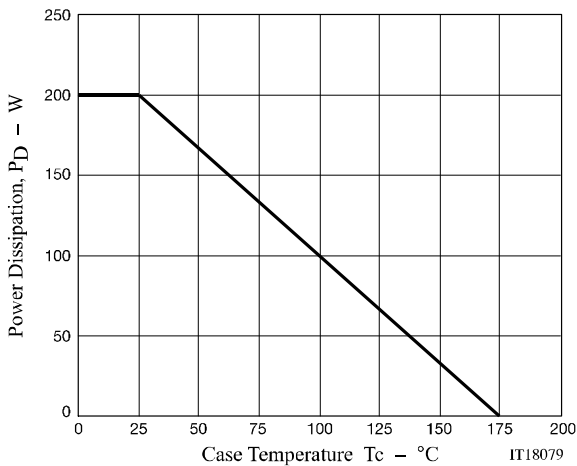


Figure 11.  $P_D$  -  $T_c$

# NVMFS5A140PLZ

## TYPICAL CHARACTERISTICS

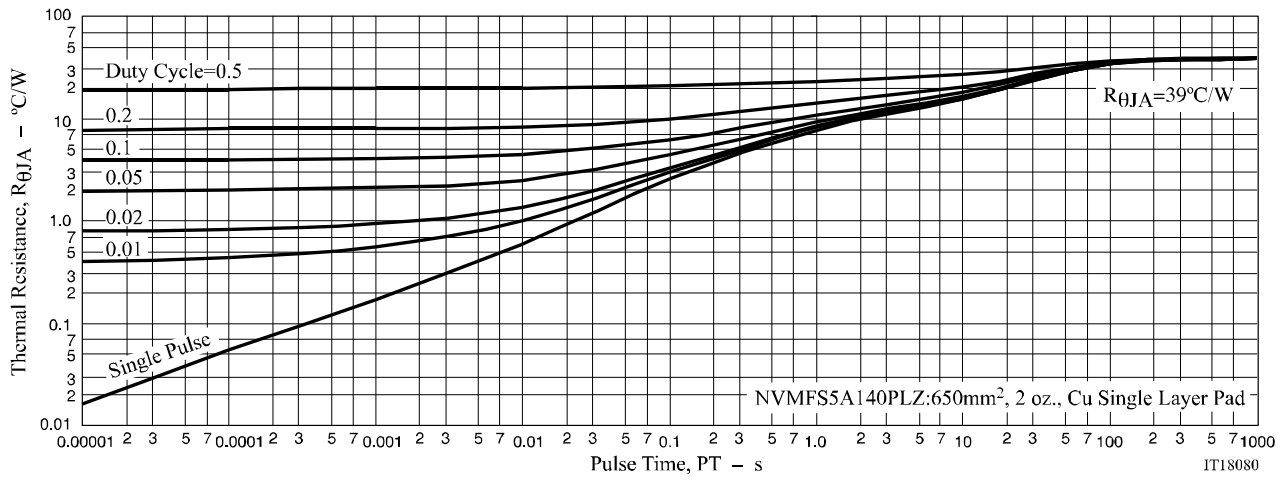


Figure 12.  $R_{\theta JA}$  - Pulse Time

# NVMFS5A140PLZ

## ORDERING INFORMATION

Device	Marking	Package	Shipping (Qty / Packing) <sup>†</sup>
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

<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.

# 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.

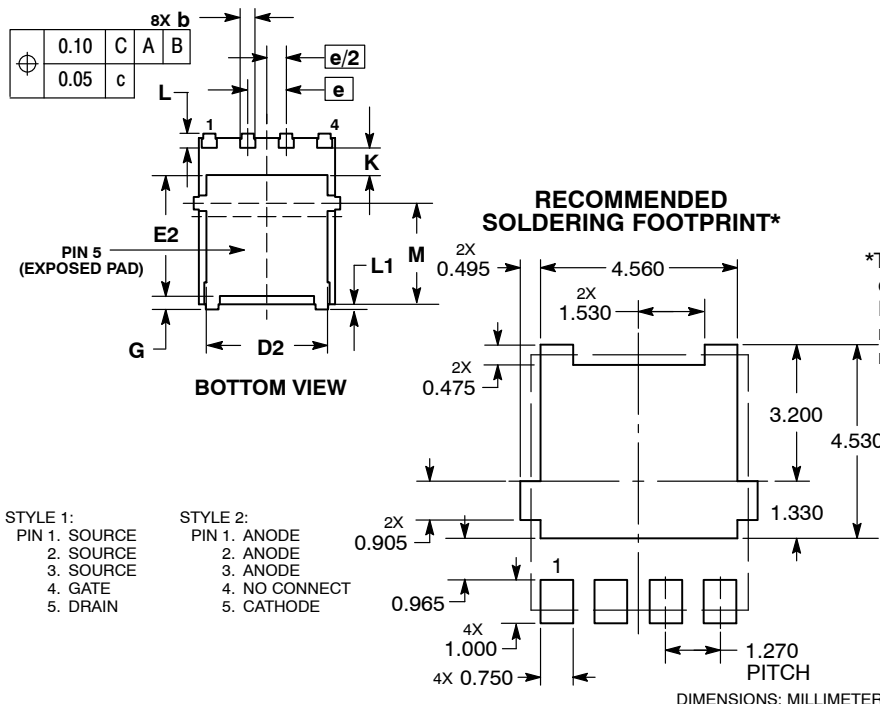
DIM	MILLIMETERS		
	MIN	NOM	MAX
A	0.90	1.00	1.10
A1	0.00	---	0.05
b	0.33	0.41	0.51
c	0.23	0.28	0.33
D	5.00	5.15	5.30
D1	4.70	4.90	5.10
D2	3.80	4.00	4.20
E	6.00	6.15	6.30
E1	5.70	5.90	6.10
E2	3.45	3.65	3.85
e	1.27 BSC		
G	0.51	0.575	0.71
K	1.20	1.35	1.50
L	0.51	0.575	0.71
L1	0.125 REF		
M	3.00	3.40	3.80
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.

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DESCRIPTION:	DFN5 5x6, 1.27P (SO-8FL)	PAGE 1 OF 1

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