

# MOSFET - Power, Single N-Channel, SO8-FL

30 V, 0.9 mΩ, 298 A

## NTMFS0D9N03CG

### Features

- Advanced Package (5x6 mm) with Excellent Thermal Conduction
- Ultra Low  $R_{DS(on)}$  to Improve System Efficiency
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

### Applications

- Hot Swap Application
- Power Load Switch
- Battery Management and Protection

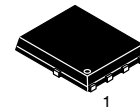
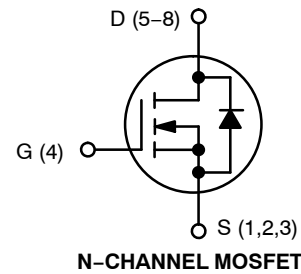
### MAXIMUM RATINGS ( $T_J = 25^\circ\text{C}$ unless otherwise stated)

Parameter		Symbol	Value	Unit	
Drain-to-Source Voltage		$V_{DSS}$	30	V	
Gate-to-Source Voltage		$V_{GS}$	$\pm 20$	V	
Continuous Drain Current $R_{\theta JC}$ (Note 2)	Steady State	$T_C = 25^\circ\text{C}$	$I_D$	298	A
		$T_C = 100^\circ\text{C}$		211	
Power Dissipation $R_{\theta JC}$ (Note 2)		$T_C = 25^\circ\text{C}$	$P_D$	144	W
Continuous Drain Current $R_{\theta JA}$ (Notes 1, 2)	Steady State	$T_A = 25^\circ\text{C}$	$I_D$	48	A
		$T_A = 100^\circ\text{C}$		34	
Power Dissipation $R_{\theta JA}$ (Notes 1, 2)		$T_A = 25^\circ\text{C}$	$P_D$	3.8	W
Pulsed Drain Current	$T_A = 25^\circ\text{C}, t_p = 10 \mu\text{s}$	$I_{DM}$	900	A	
Source Current (Body Diode)		$I_S$	120	A	
Single Pulse Drain-to-Source Avalanche Energy ( $I_L = 29.2 \text{ A}_{pk}$ )		$E_{AS}$	556	mJ	
Operating Junction and Storage Temperature		$T_J, T_{STG}$	-55 to +175	$^\circ\text{C}$	
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)		$T_L$	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.

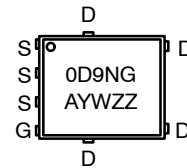
1. Surface-mounted on FR4 board using 1 in<sup>2</sup> pad, 2 oz Cu pad.
2. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.

$V_{(BR)DSS}$	$R_{DS(ON) MAX}$	$I_D MAX$
30 V	0.9 mΩ @ 10 V	298 A



SO-8 FLAT LEAD  
CASE 488AA  
STYLE 1

### MARKING DIAGRAM



- 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.

# NTMFS0D9N03CG

## THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction-to-Case – Steady State	$R_{\theta JC}$	1.0	°C/W
Junction-to-Ambient – Steady State (Note 3)	$R_{\theta JA}$	39	

3. Surface-mounted on FR4 board using 1 in<sup>2</sup> pad, 2 oz Cu pad.

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

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

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	30			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$	$I_D = 250\ \mu\text{A}$ , ref to $25^\circ\text{C}$		13		mV/°C
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{GS} = 0\text{ V}, V_{DS} = 30\text{ V}$	$T_J = 25^\circ\text{C}$		1.0	$\mu\text{A}$
			$T_J = 125^\circ\text{C}$		100	
Gate-to-Source Leakage Current	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = 20\text{ V}$			100	nA

### ON CHARACTERISTICS (Note 4)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 200\ \mu\text{A}$	1.3		2.2	V
Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$	$I_D = 200\ \mu\text{A}$ , ref to $25^\circ\text{C}$		-5		mV/°C
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 20\text{ A}$		0.71	0.9	m $\Omega$
Forward Transconductance	$g_{FS}$	$V_{DS} = 3\text{ V}, I_D = 20\text{ A}$		70		S
Gate Resistance	$R_G$	$T_A = 25^\circ\text{C}$		1.5		$\Omega$

### CHARGES AND CAPACITANCES

Input Capacitance	$C_{ISS}$	$V_{GS} = 0\text{ V}, V_{DS} = 15\text{ V}, f = 1\text{ MHz}$	6615	9450	12285	pF
Output Capacitance	$C_{OSS}$		3014	4306	5598	
Reverse Transfer Capacitance	$C_{RSS}$		146	243	486	
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 10\text{ V}, V_{DS} = 15\text{ V}; I_D = 20\text{ A}$		131.4		nC
Threshold Gate Charge	$Q_{G(TH)}$			14.2		
Gate-to-Source Charge	$Q_{GS}$			24.2		
Gate-to-Drain Charge	$Q_{GD}$			13.5		

### SWITCHING CHARACTERISTICS (Note 5)

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 10\text{ V}, V_{DS} = 15\text{ V}, I_D = 20\text{ A}, R_G = 3.0\ \Omega$		20		ns
Rise Time	$t_r$			16		
Turn-Off Delay Time	$t_{d(OFF)}$			93		
Fall Time	$t_f$			24		

### DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	$V_{SD}$	$V_{GS} = 0\text{ V}, I_S = 10\text{ A}$	$T_J = 25^\circ\text{C}$		0.75	1.2	V
			$T_J = 125^\circ\text{C}$		0.60		
Reverse Recovery Time	$t_{RR}$	$V_{GS} = 0\text{ V}, dI_S/dt = 100\text{ A}/\mu\text{s}, V_{DS} = 15\text{ V}, I_S = 20\text{ A}$			83		ns
Reverse Recovery Charge	$Q_{RR}$				114		nC

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

5. Switching characteristics are independent of operating junction temperatures.

# NTMFS0D9N03CG

## TYPICAL CHARACTERISTICS

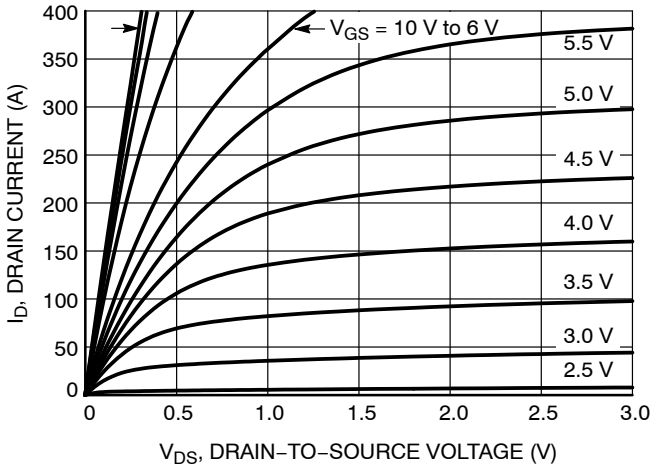


Figure 1. On-Region Characteristics

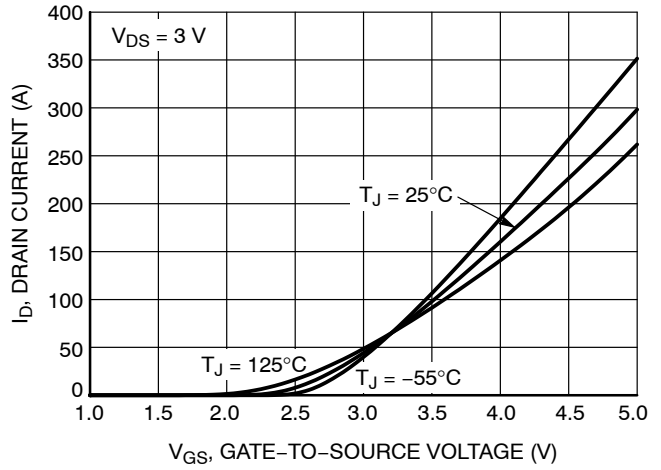


Figure 2. Transfer Characteristics

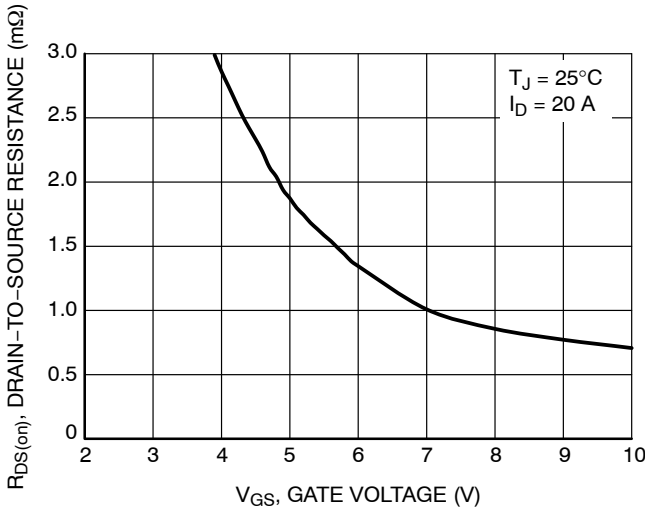


Figure 3. On-Resistance vs. Gate-to-Source Voltage

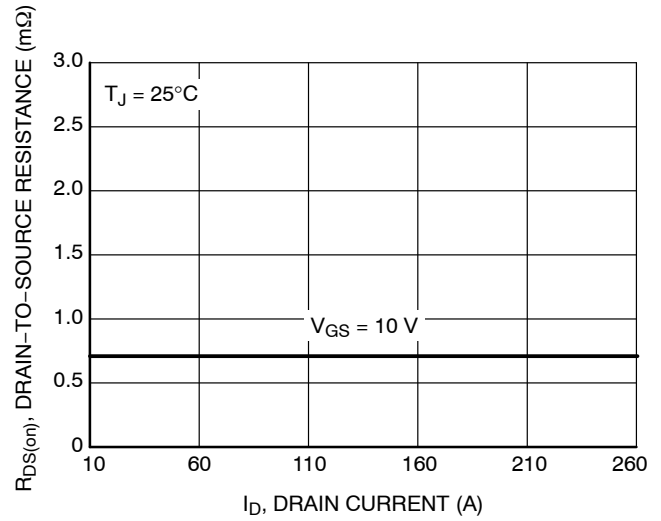


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

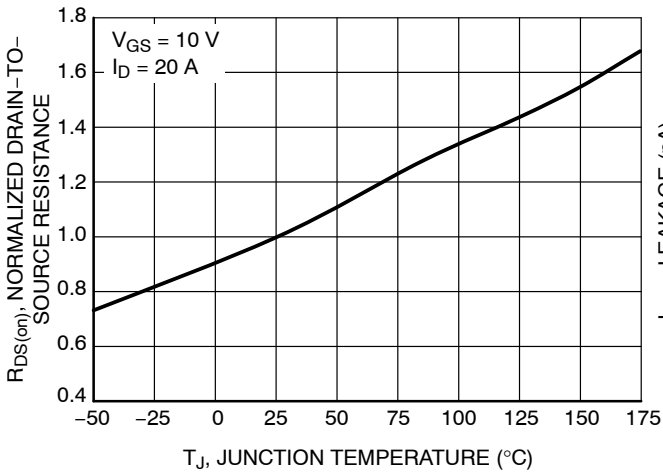


Figure 5. On-Resistance Variation with Temperature

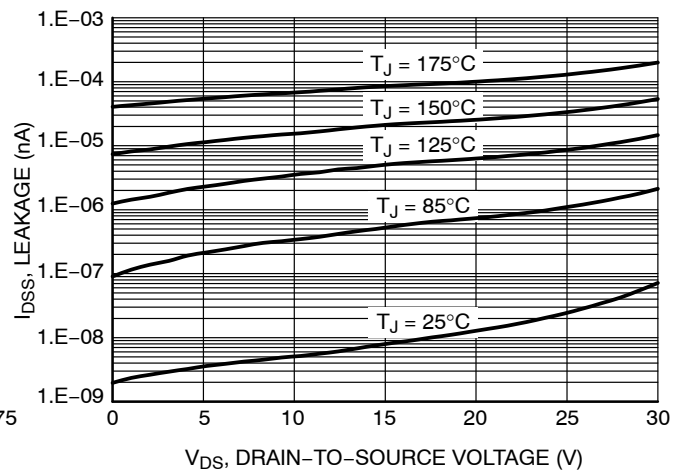
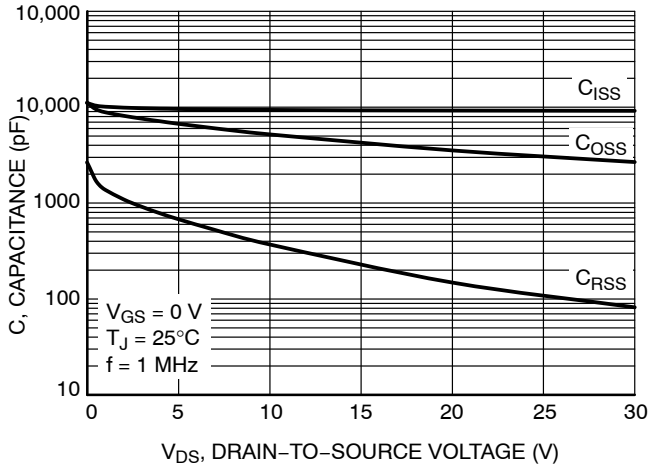


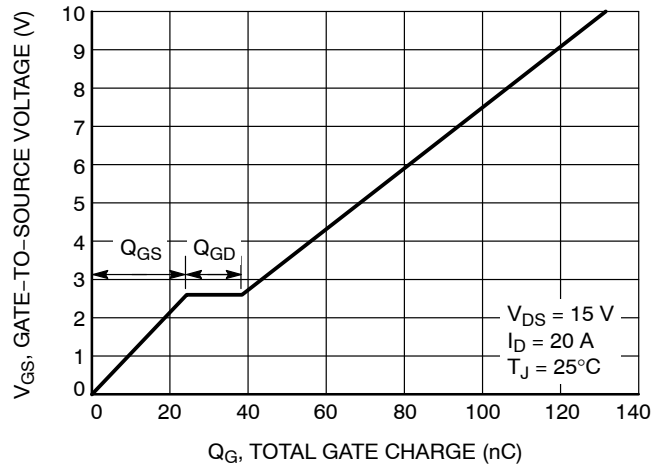
Figure 6. Drain-to-Source Leakage Current vs. Voltage

# NTMFS0D9N03CG

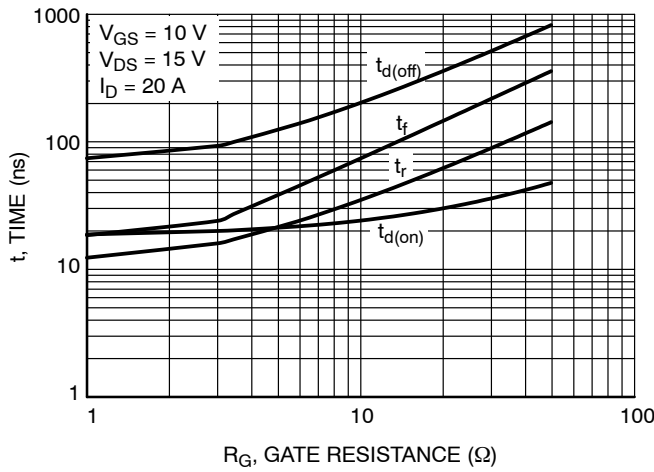
## TYPICAL CHARACTERISTICS



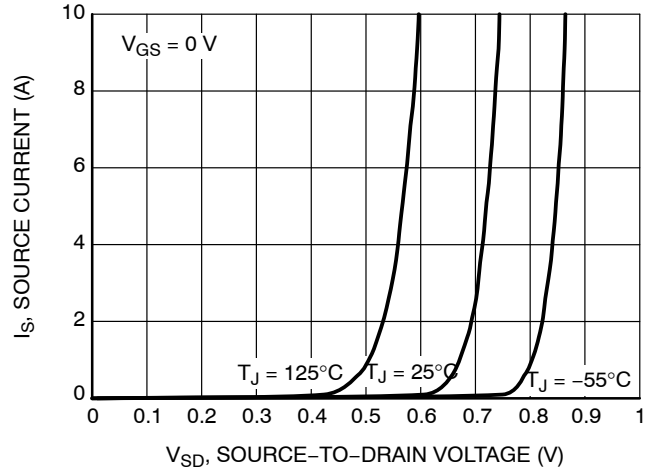
**Figure 7. Capacitance Variation**



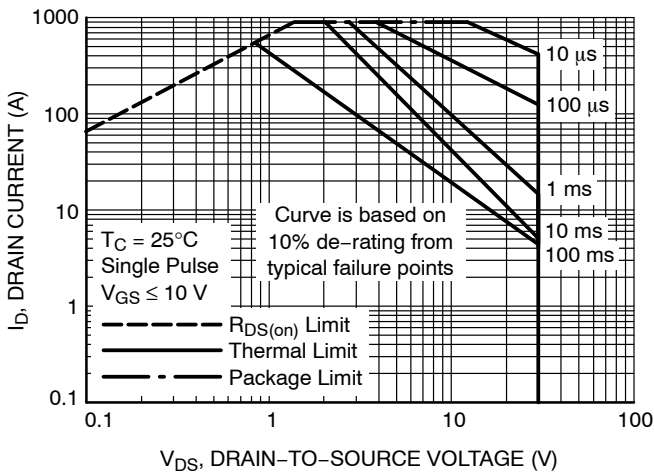
**Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge**



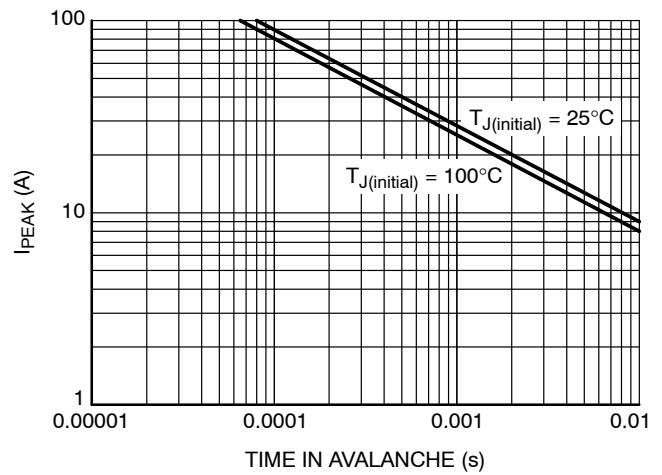
**Figure 9. Resistive Switching Time Variation vs. Gate Resistance**



**Figure 10. Diode Forward Voltage vs. Current**



**Figure 11. Safe Operating Area**



**Figure 12. IPEAK vs. Time in Avalanche**

# NTMFS0D9N03CG

## TYPICAL CHARACTERISTICS

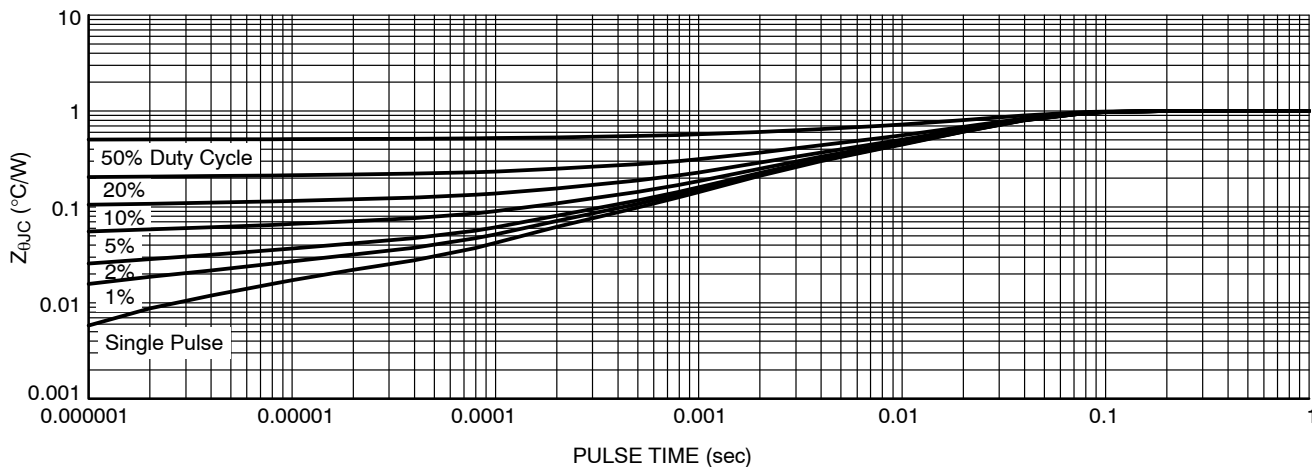


Figure 13. Thermal Impedance

### DEVICE ORDERING INFORMATION

Device	Marking	Package	Shipping†
NTMFS0D9N03CGT1G	0D9NG	DFN5 (Pb-Free)	1500 / 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.

# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

ON Semiconductor®



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.

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°

### 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

\*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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