

# MOSFET - Power, Single N-Channel, SO8-FL 25 V, 0.68 mΩ, 365 A



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## NTMFS0D8N02P1E

### Features

- Small Footprint (5x6mm) for Compact Design
- Low  $R_{DS(on)}$  to Minimize Conduction Losses
- Low  $Q_G$  and Capacitance to Minimize Driver Losses
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

### Applications

- DC-DC Converters
- Power Load Switch
- Notebook Battery Management

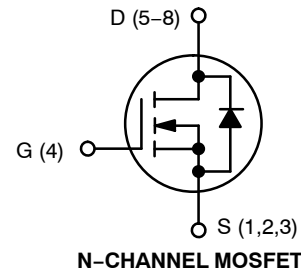
### MAXIMUM RATINGS ( $T_J = 25^\circ\text{C}$ unless otherwise stated)

Parameter		Symbol	Value	Unit	
Drain-to-Source Voltage		$V_{DS}$	25	V	
Gate-to-Source Voltage		$V_{GS}$	+16/ -12	V	
Continuous Drain Current $R_{\theta JC}$ (Note 1)	Steady State	$T_C = 25^\circ\text{C}$	$I_D$	365	A
		$T_C = 85^\circ\text{C}$		263	
Power Dissipation $R_{\theta JC}$ (Note 1)		$T_C = 25^\circ\text{C}$	$P_D$	139	W
Continuous Drain Current $R_{\theta JA}$ (Notes 1, 3)	Steady State	$T_A = 25^\circ\text{C}$	$I_D$	55	A
		$T_A = 85^\circ\text{C}$		40	
Power Dissipation $R_{\theta JA}$ (Notes 1, 3)		$T_A = 25^\circ\text{C}$	$P_D$	3.2	W
Continuous Drain Current $R_{\theta JA}$ (Notes 2, 3)	Steady State	$T_A = 25^\circ\text{C}$	$I_D$	30	A
		$T_A = 85^\circ\text{C}$		21	
Power Dissipation $R_{\theta JA}$ (Notes 2, 3)		$T_A = 25^\circ\text{C}$	$P_D$	0.93	W
Pulsed Drain Current	$T_A = 25^\circ\text{C}, t_p = 10 \mu\text{s}$	$I_{DM}$	762	A	
Single Pulse Drain-to-Source Avalanche Energy ( $I_L = 115.4 A_{pk}, L = 0.1 \text{ mH}$ ) (Note 4)		$E_{AS}$	666	mJ	
Operating Junction and Storage Temperature Range		$T_J, T_{STG}$	-55 to +150	$^\circ\text{C}$	
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)		$T_L$	260	$^\circ\text{C}$	

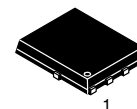
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Surface-mounted on FR4 board using 1 in<sup>2</sup> pad size, 2 oz Cu pad.
2. Surface-mounted on FR4 board using minimum pad size, 2 oz Cu pad.
3. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted. Actual continuous current will be limited by thermal & electro-mechanical application board design.  $R_{\theta JC}$  is determined by the user's board design.
4. 100% UIS tested at  $L = 1 \text{ mH}, I_{AS} = 30.7 \text{ A}$ .

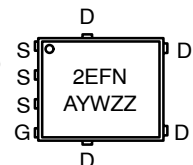
$V_{(BR)DSS}$	$R_{DS(ON)} \text{ MAX}$	$I_D \text{ MAX}$
25 V	0.68 mΩ @ 10 V	365 A
	0.80 mΩ @ 4.5 V	



### MARKING DIAGRAMS



SO-8 FLAT LEAD  
CASE 488AA  
STYLE 1



2EFN = Specific Device Code  
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 6 of this data sheet.

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## THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction-to-Case – Steady State (Note 1)	$R_{\theta JC}$	0.9	°C/W
Junction-to-Ambient – Steady State (Note 1)	$R_{\theta JA}$	39	
Junction-to-Ambient – Steady State (Note 2)	$R_{\theta JA}$	135	°C/W

## 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	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}$	25			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$	$I_D = 1\text{ mA}$ , ref to $25^\circ\text{C}$		16		mV/°C
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{GS} = 0\text{ V}, V_{DS} = 20\text{ V}$	$T_J = 25^\circ\text{C}$		1	$\mu\text{A}$
			$T_J = 125^\circ\text{C}$		250	
Gate-to-Source Leakage Current	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = +16\text{ V}/-12\text{ V}$			$\pm 100$	nA

### ON CHARACTERISTICS (Note 5)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 2\text{ mA}$	1.2		2.0	V
Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$	$I_D = 2\text{ mA}$ , ref to $25^\circ\text{C}$		-4.4		mV/°C
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 46\text{ A}$		0.44	0.68	m $\Omega$
		$V_{GS} = 4.5\text{ V}, I_D = 43\text{ A}$		0.54	0.80	
Forward Transconductance	$g_{FS}$	$V_{DS} = 5\text{ V}, I_D = 46\text{ A}$		307		S
Gate Resistance	$R_G$	$T_A = 25^\circ\text{C}$		0.48		$\Omega$

### CHARGES AND CAPACITANCES

Input Capacitance	$C_{ISS}$	$V_{GS} = 0\text{ V}, V_{DS} = 13\text{ V}, f = 1\text{ MHz}$		8600		pF
Output Capacitance	$C_{OSS}$			2285		
Reverse Transfer Capacitance	$C_{RSS}$			129		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 13\text{ V}; I_D = 46\text{ A}$		52		nC
Threshold Gate Charge	$Q_{G(TH)}$			10		
Gate-to-Source Charge	$Q_{GS}$			21		
Gate-to-Drain Charge	$Q_{GD}$			9		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 10\text{ V}, V_{DS} = 13\text{ V}; I_D = 46\text{ A}$		116		nC

### SWITCHING CHARACTERISTICS, $V_{GS} = 4.5\text{ V}$ (Note 6)

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 13\text{ V}, I_D = 46\text{ A}, R_G = 6.0\ \Omega$		45		ns
Rise Time	$t_r$			24		
Turn-Off Delay Time	$t_{d(OFF)}$			68		
Fall Time	$t_f$			20		

### SWITCHING CHARACTERISTICS, $V_{GS} = 10\text{ V}$ (Note 6)

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 10\text{ V}, V_{DS} = 13\text{ V}, I_D = 46\text{ A}, R_G = 6.0\ \Omega$		23		ns
Rise Time	$t_r$			6.8		
Turn-Off Delay Time	$t_{d(OFF)}$			123		
Fall Time	$t_f$			19		

### DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	$V_{SD}$	$V_{GS} = 0\text{ V}, I_S = 46\text{ A}$	$T_J = 25^\circ\text{C}$		0.77	1.2	V
			$T_J = 125^\circ\text{C}$		0.62		

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
<b>DRAIN-SOURCE DIODE CHARACTERISTICS</b>						
Reverse Recovery Time	$t_{RR}$	$V_{GS} = 0\text{ V}$ , $dI_S/dt = 100\text{ A}/\mu\text{s}$ , $I_S = 46\text{ A}$		64		ns
Reverse Recovery Charge	$Q_{RR}$			87		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.

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

6. Switching characteristics are independent of operating junction temperatures.

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## TYPICAL CHARACTERISTICS

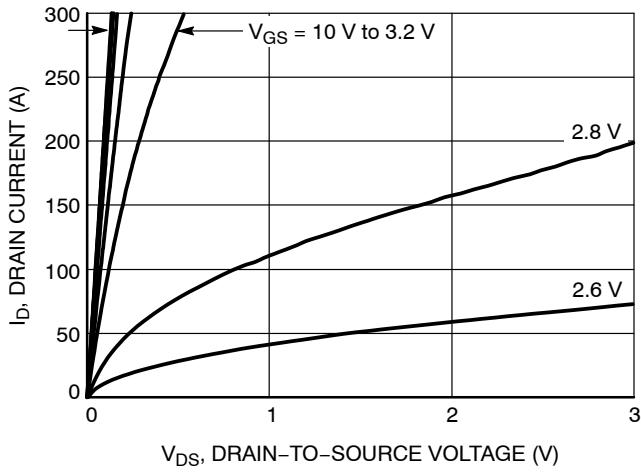


Figure 1. On-Region Characteristics

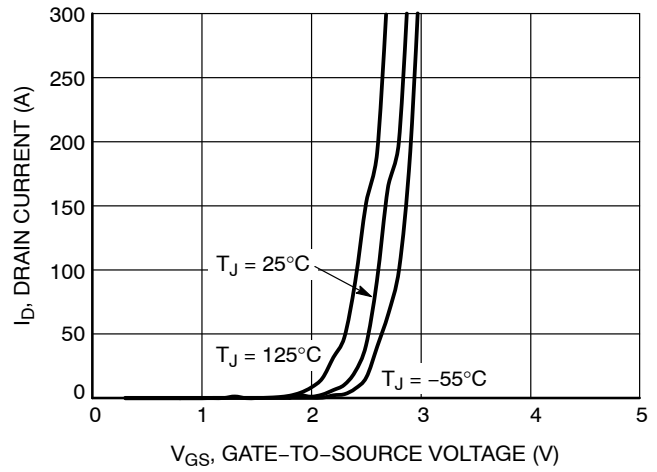


Figure 2. Transfer Characteristics

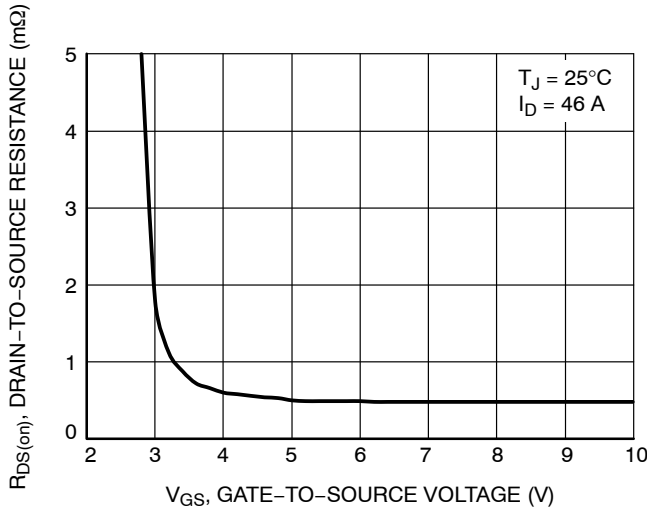


Figure 3. On-Resistance vs. Gate-to-Source Voltage

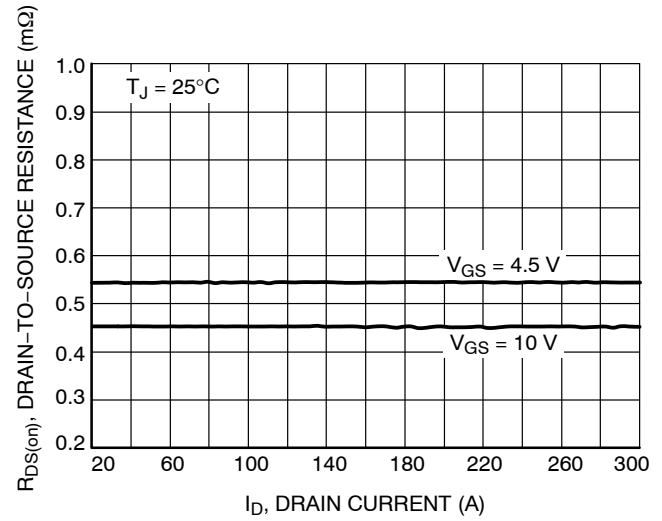


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

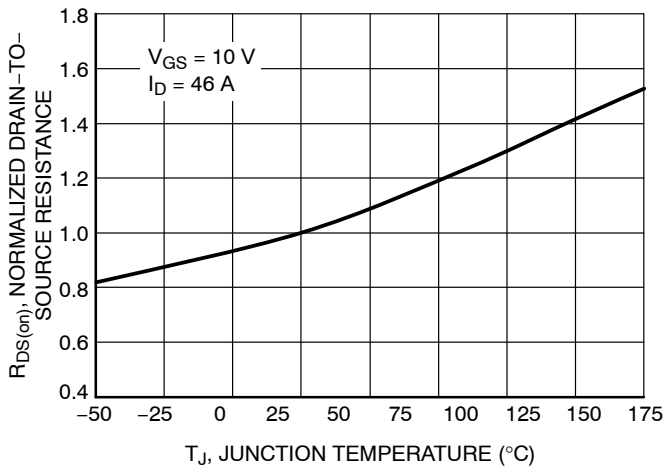


Figure 5. On-Resistance Variation with Temperature

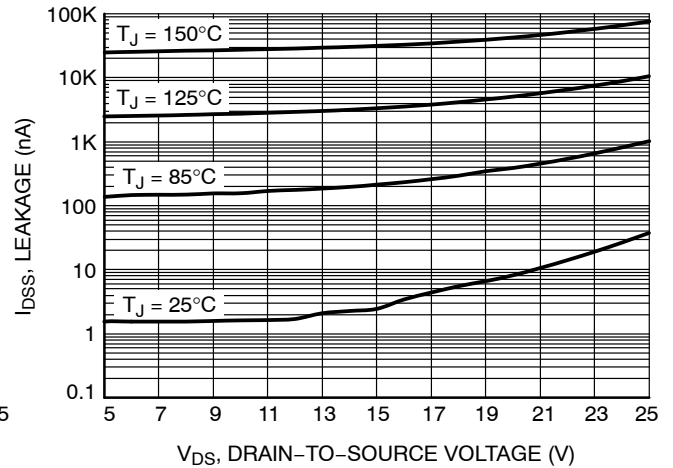


Figure 6. Drain-to-Source Leakage Current vs. Voltage

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## TYPICAL CHARACTERISTICS

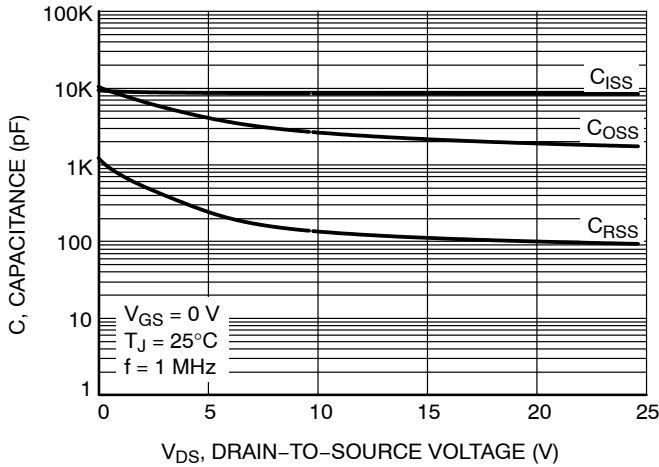


Figure 7. Capacitance Variation

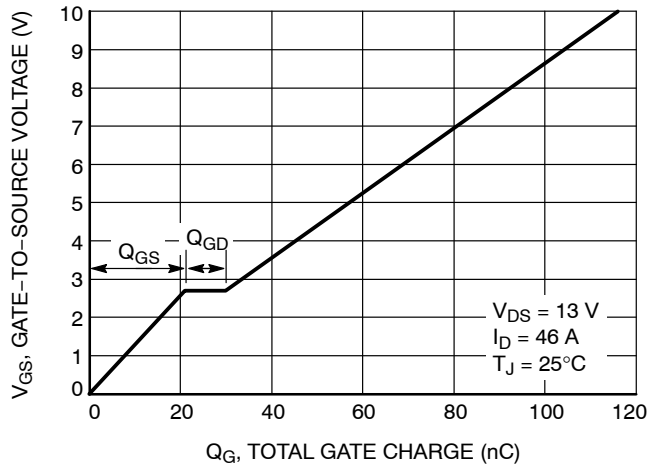


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

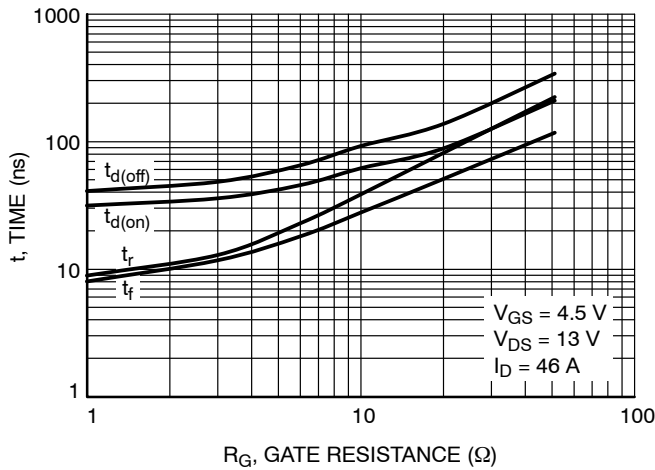


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

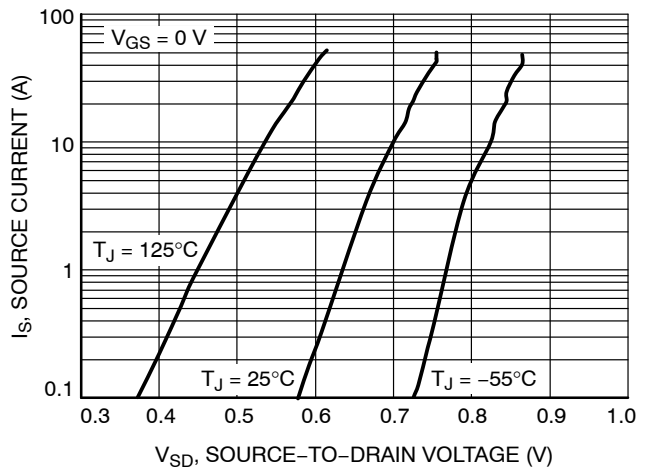


Figure 10. Diode Forward Voltage vs. Current

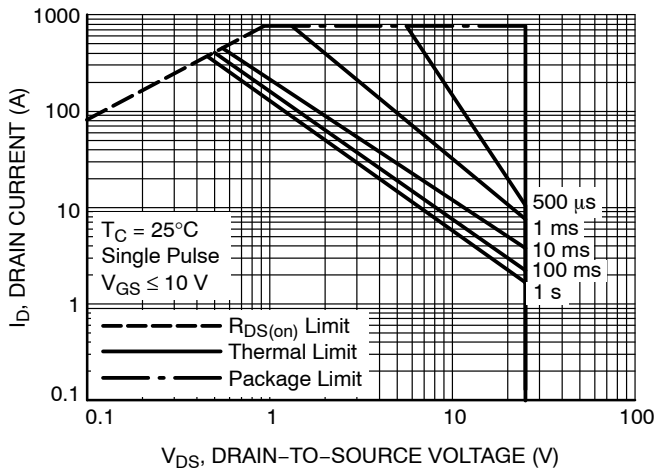


Figure 11. Safe Operating Area

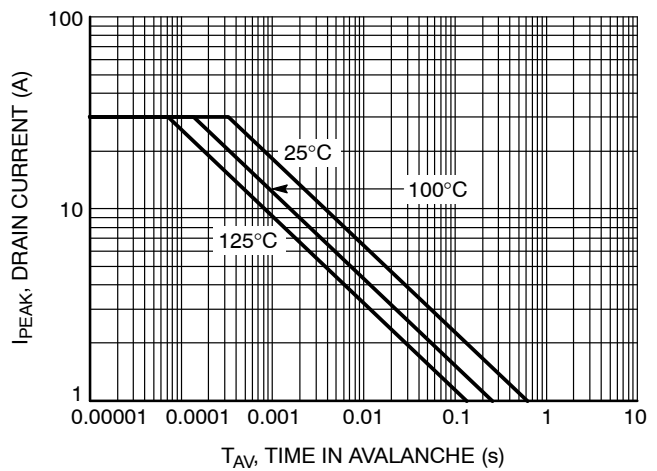


Figure 12. Maximum Drain Current vs. Time in Avalanche

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## TYPICAL CHARACTERISTICS

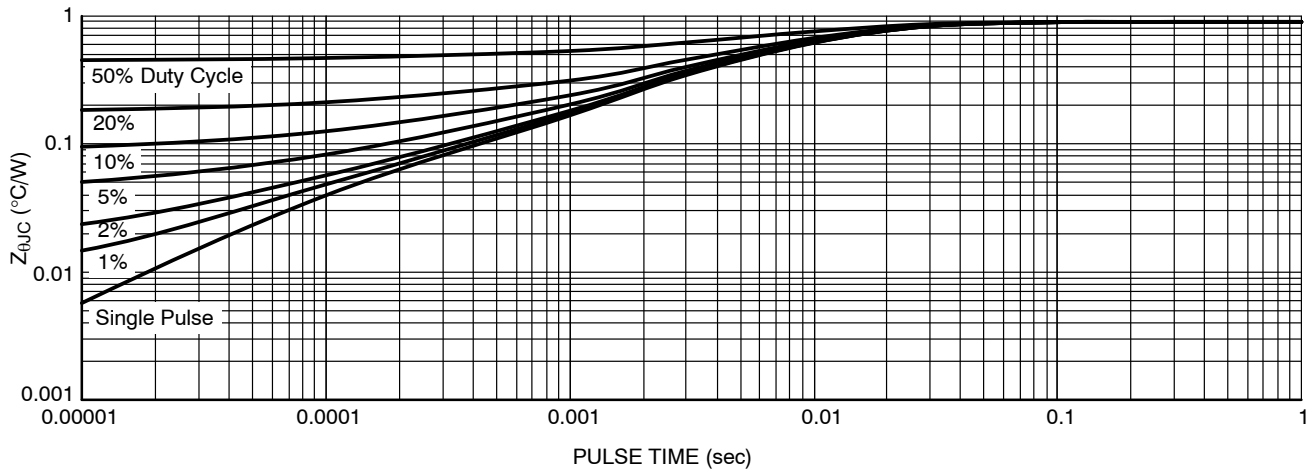


Figure 13. Thermal Impedance

### DEVICE ORDERING INFORMATION

Device	Marking	Package	Shipping <sup>†</sup>
NTMFS0D8N02P1ET1G	2EFN	DFN5 (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.

# MECHANICAL CASE OUTLINE

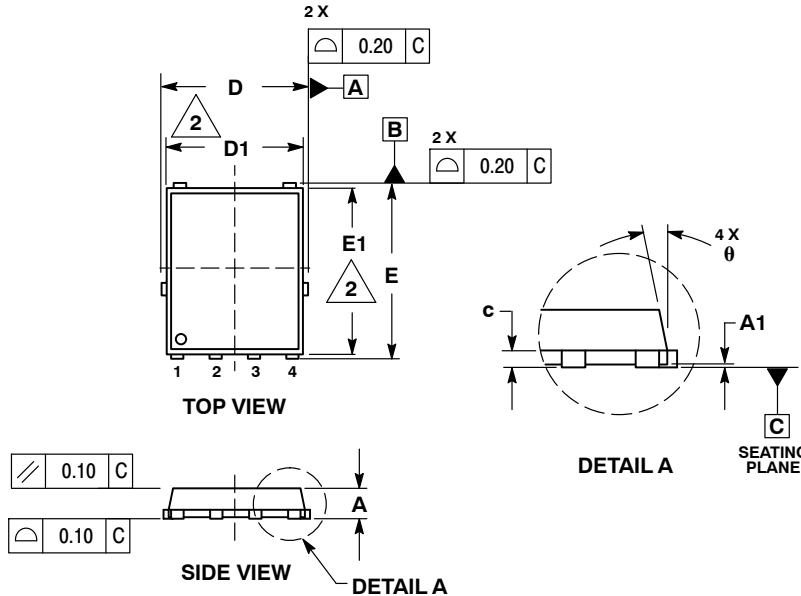
## PACKAGE DIMENSIONS



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.

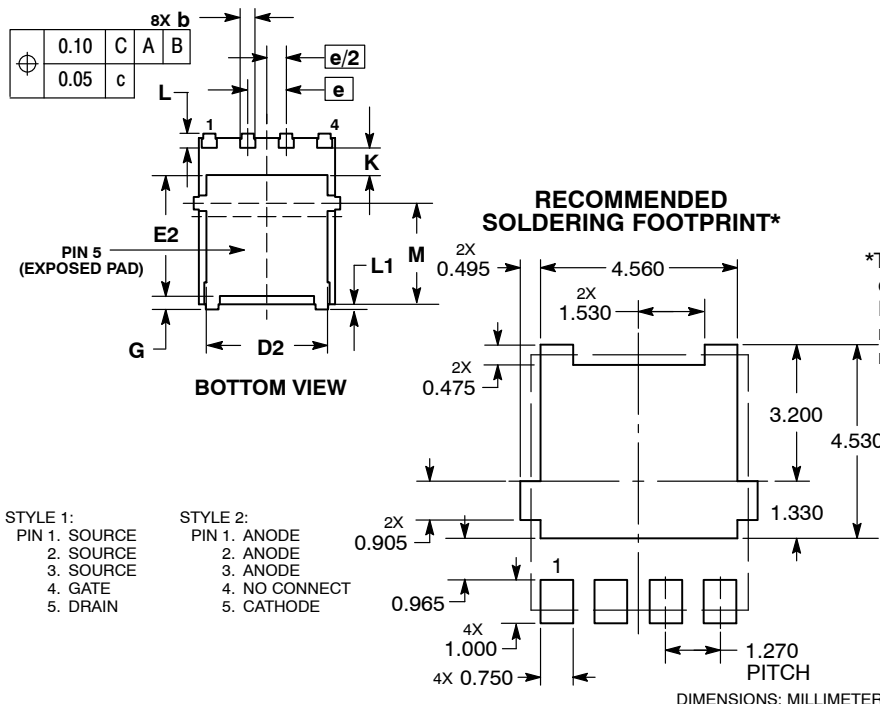
DIM	MILLIMETERS		
	MIN	NOM	MAX
A	0.90	1.00	1.10
A1	0.00	---	0.05
b	0.33	0.41	0.51
c	0.23	0.28	0.33
D	5.00	5.15	5.30
D1	4.70	4.90	5.10
D2	3.80	4.00	4.20
E	6.00	6.15	6.30
E1	5.70	5.90	6.10
E2	3.45	3.65	3.85
e	1.27 BSC		
G	0.51	0.575	0.71
K	1.20	1.35	1.50
L	0.51	0.575	0.71
L1	0.125 REF		
M	3.00	3.40	3.80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