

# MOSFET – Power, Single N-Channel, Logic Level, SO8FL

40 V, 0.7 mΩ, 349 A

## NTMFS0D7N04XL

### Features

- Low  $R_{DS(on)}$  to Minimize Conduction Loss
- Low  $Q_{RR}$  with Soft Recovery to Minimize  $E_{RR}$  Loss and Voltage Spike
- Low  $Q_G$  and Capacitance to Minimize Driving and Switching Loss
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

### Typical Applications

- High Switching Frequency DC-DC Conversion
- Synchronous Rectification

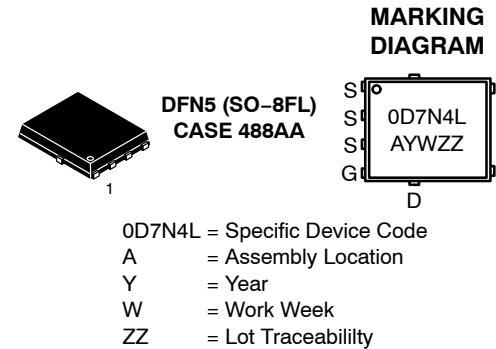
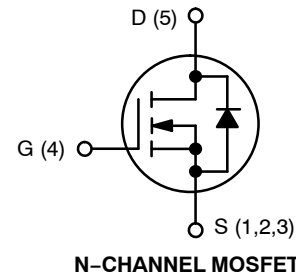
### MAXIMUM RATINGS ( $T_J = 25^\circ\text{C}$ unless otherwise stated)

Parameter		Symbol	Value	Unit
Drain-to-Source Voltage		$V_{DSS}$	40	V
Gate-to-Source Voltage	DC	$V_{GS}$	$\pm 20$	V
Continuous Drain Current (Note 2)	$T_C = 25^{\circ}\text{C}$	$I_D$	349	A
	$T_C = 100^{\circ}\text{C}$		247	
Power Dissipation (Note 2)	$T_C = 25^{\circ}\text{C}$	$P_D$	167	W
	$T_C = 100^{\circ}\text{C}$		83	
Pulsed Drain Current	$T_C = 25^{\circ}\text{C}$ , $t_p = 100\text{ }\mu\text{s}$	$I_{DM}$	1667	A
Pulsed Source Current (Body Diode)		$I_{SM}$	1667	
Operating Junction and Storage Temperature Range		$T_J, T_{STG}$	-55 to +175	$^{\circ}\text{C}$
Source Current (Body Diode)		$I_S$	256	A
Single Pulse Avalanche Energy ( $I_{PK} = 97\text{ A}$ ) (Note 3)		$E_{AS}$	470	mJ
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, 1 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.
3.  $E_{AS}$  of 470 mJ is based on started  $T_J = 25^\circ\text{C}$ ,  $I_{AS} = 97 \text{ A}$ ,  $V_{DD} = 32 \text{ V}$ ,  $V_{GS} = 10 \text{ V}$ , 100% avalanche tested.
4.  $R_{\theta JCT}$  Thermal Resistance – Junction to Case Top =  $20^\circ\text{C/W}$ .

$V_{(BR)DS}$	$R_{DS(ON)}$ MAX	$I_D$ MAX
40 V	0.7 mΩ @ 10 V	349 A
	1.1 mΩ @ 4.5 V	



### ORDERING INFORMATION

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

# NTMFS0D7N04XL

## THERMAL CHARACTERISTICS

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.9	°C/W
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	38	

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

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

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}$	40			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$\Delta V_{(BR)DSS} / \Delta T_J$	$I_D = 1\text{ mA}$ , Referenced to $25^\circ\text{C}$		16.6		mV/°C
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{DS} = 40\text{ V}, T_J = 25^\circ\text{C}$			10	$\mu\text{A}$
		$V_{DS} = 40\text{ V}, T_J = 125^\circ\text{C}$			100	
Gate-to-Source Leakage Current	$I_{GSS}$	$V_{GS} = 20\text{ V}, V_{DS} = 0\text{ V}$			100	nA

### ON CHARACTERISTICS

Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 49\text{ A}$		0.58	0.7	m $\Omega$
		$V_{GS} = 6\text{ V}, I_D = 49\text{ A}$		0.66	0.9	
		$V_{GS} = 4.5\text{ V}, I_D = 39\text{ A}$		0.77	1.1	
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 250\text{ }\mu\text{A}$	1.3		2.2	V
Gate Threshold Voltage Temperature Coefficient	$\Delta V_{GS(TH)} / \Delta T_J$	$V_{GS} = V_{DS}, I_D = 250\text{ }\mu\text{A}$		-5.35		mV/°C
Forward Transconductance	$g_{FS}$	$V_{DS} = 5\text{ V}, I_D = 49\text{ A}$		245		S

### CHARGES, CAPACITANCES & GATE RESISTANCE

Input Capacitance	$C_{ISS}$	$V_{GS} = 0\text{ V}, V_{DS} = 20\text{ V}, f = 1\text{ MHz}$		7090		pF
Output Capacitance	$C_{OSS}$			1860		
Reverse Transfer Capacitance	$C_{RSS}$			40		
Output Charge	$Q_{OSS}$	$V_{GS} = 0\text{ V}, V_{DS} = 20\text{ V}$		72		nC
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 4.5\text{ V}, V_{DD} = 20\text{ V}; I_D = 49\text{ A}$		42		
		$V_{GS} = 6\text{ V}, V_{DD} = 20\text{ V}; I_D = 49\text{ A}$		57		
		$V_{GS} = 10\text{ V}, V_{DD} = 20\text{ V}; I_D = 49\text{ A}$		96		
Threshold Gate Charge	$Q_{G(TH)}$	$V_{GS} = 10\text{ V}, V_{DD} = 20\text{ V}; I_D = 49\text{ A}$		11		
Gate-to-Source Charge	$Q_{GS}$			20		
Gate-to-Drain Charge	$Q_{GD}$			6		
Gate Plateau Voltage	$V_{GP}$			2.89		V
Gate Resistance	$R_G$	$f = 1\text{ MHz}$		0.5		$\Omega$

### SWITCHING CHARACTERISTICS

Turn-On Delay Time	$t_{d(ON)}$	Resistive Load, $V_{GS} = 0/10\text{ V}, V_{DD} = 20\text{ V},$ $I_D = 49\text{ A}, R_G = 2.5\text{ }\Omega$		25		ns
Rise Time	$t_r$			7		
Turn-Off Delay Time	$t_{d(OFF)}$			64		
Fall Time	$t_f$			5		

# NTMFS0D7N04XL

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
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### SOURCE-TO-DRAIN DIODE CHARACTERISTICS

Forward Diode Voltage	$V_{SD}$	$V_{GS} = 0\text{ V}, I_S = 49\text{ A}, T_J = 25^\circ\text{C}$		0.8	1.2	V
		$V_{GS} = 0\text{ V}, I_S = 49\text{ A}, T_J = 125^\circ\text{C}$		0.65		
Reverse Recovery Time	$t_{RR}$	$V_{GS} = 0\text{ V}, dl/dt = 300\text{ A}/\mu\text{s},$ $I_S = 49\text{ A}, V_{DD} = 20\text{ V}$		39		ns
Charge Time	$t_a$			21		
Discharge Time	$t_b$			18		
Reverse Recovery Charge	$Q_{RR}$			87		

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.

# NTMFS0D7N04XL

## TYPICAL CHARACTERISTICS

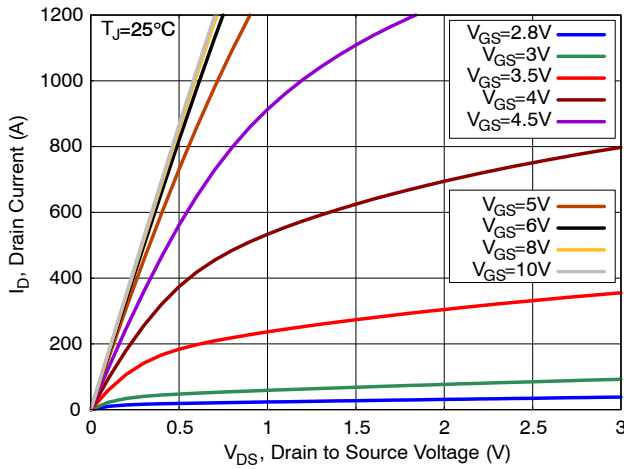


Figure 1. On-Region Characteristics

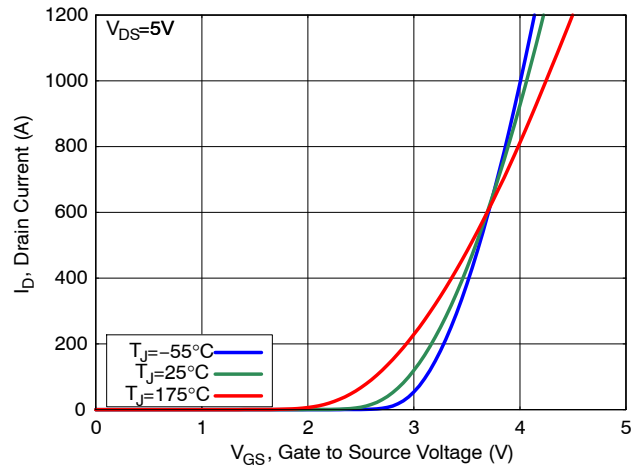


Figure 2. Transfer Characteristics

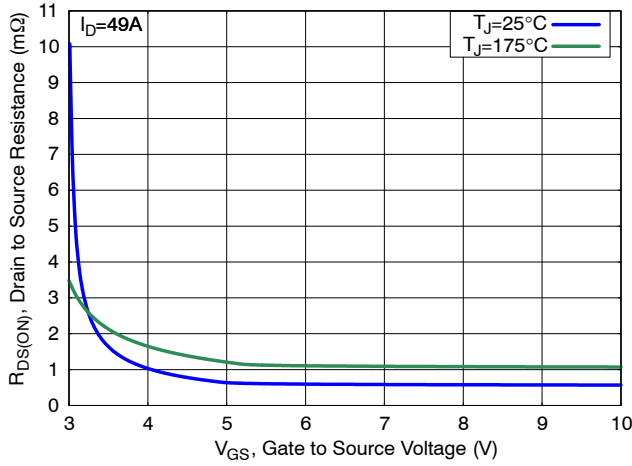


Figure 3. On-Resistance vs. Gate Voltage

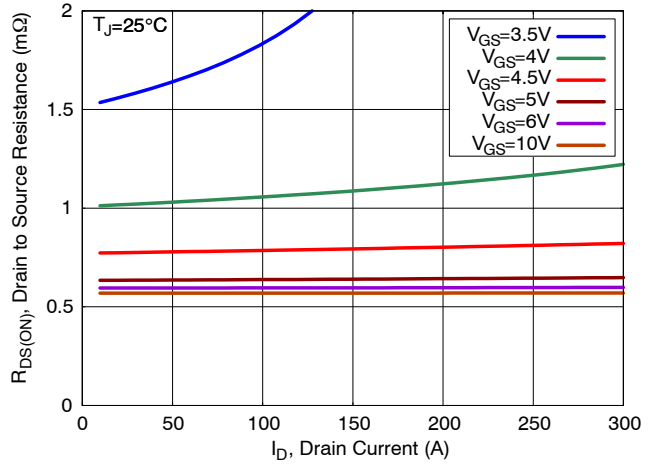


Figure 4. On-Resistance vs. Drain Current

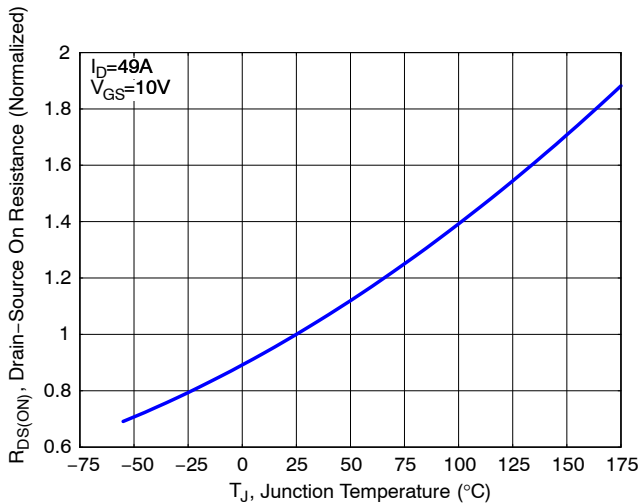


Figure 5. Normalized ON Resistance vs. Junction Temperature

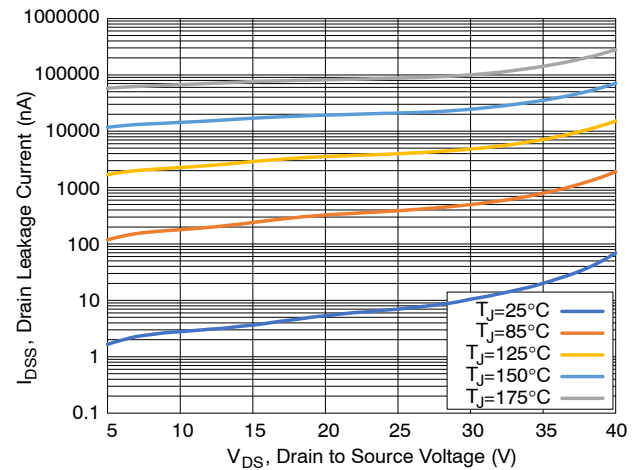


Figure 6. Drain Leakage Current vs. Drain Voltage

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## TYPICAL CHARACTERISTICS (CONTINUED)

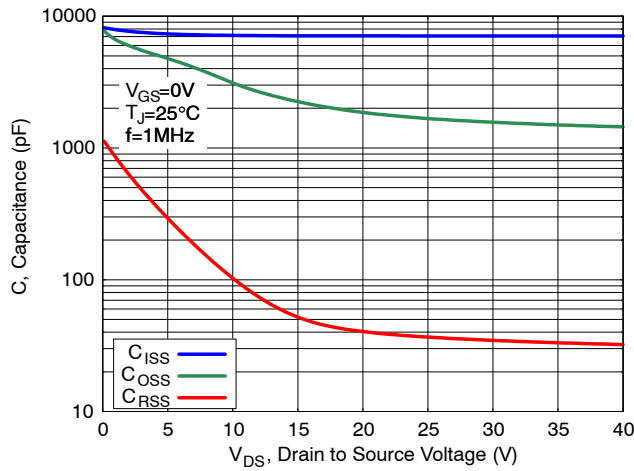


Figure 7. Capacitance Characteristics

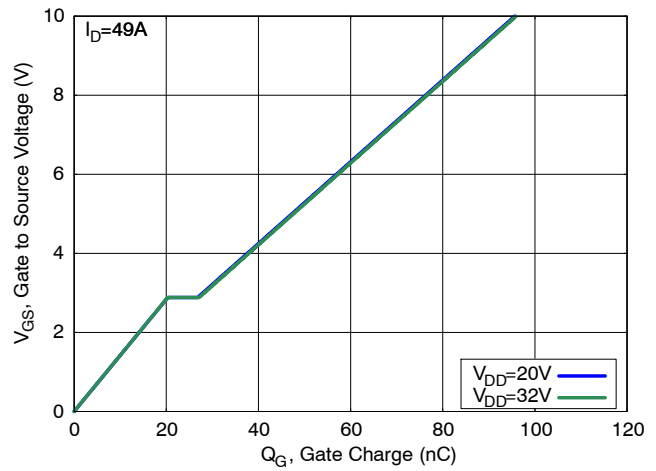


Figure 8. Gate Charge Characteristics

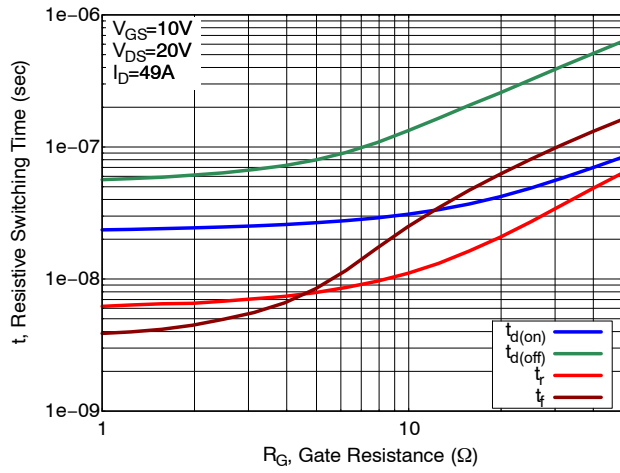


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

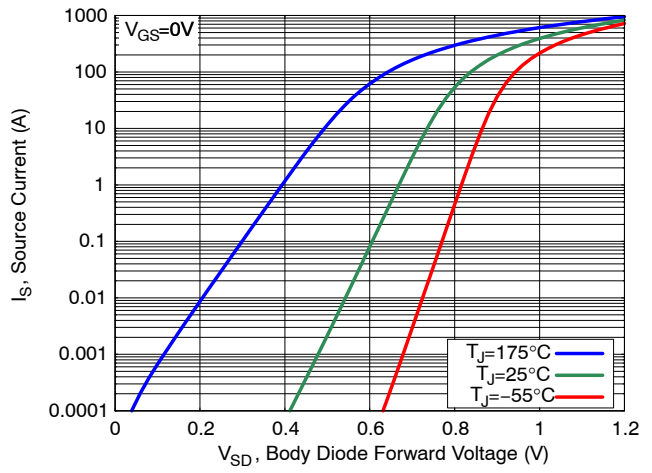


Figure 10. Diode Forward Characteristics

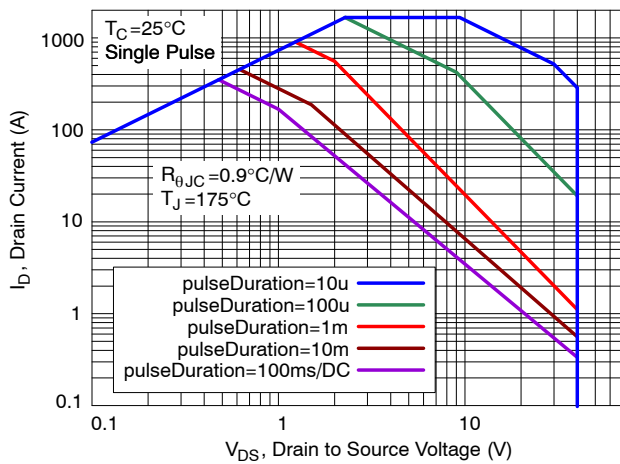


Figure 11. Safe Operating Area (SOA)

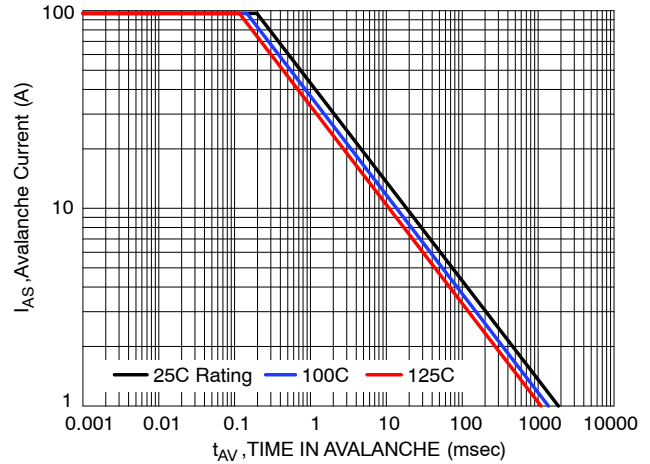


Figure 12. Avalanche Current vs. Pulse Time (UIS)

# NTMFS0D7N04XL

## TYPICAL CHARACTERISTICS (CONTINUED)

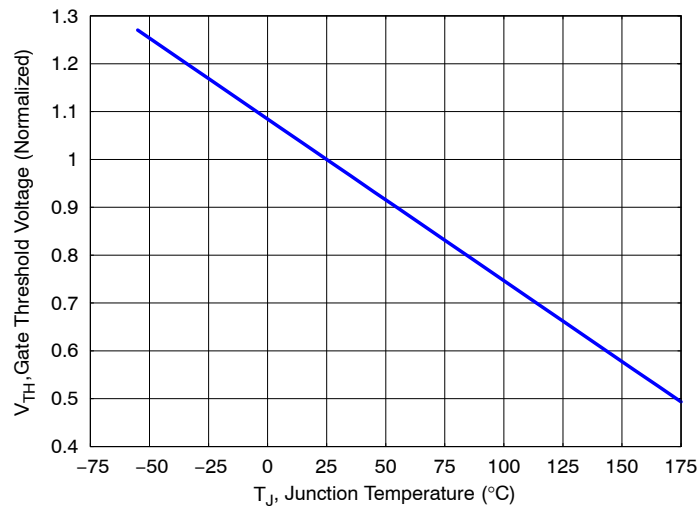


Figure 13. Gate Threshold Voltage vs. Junction Temperature

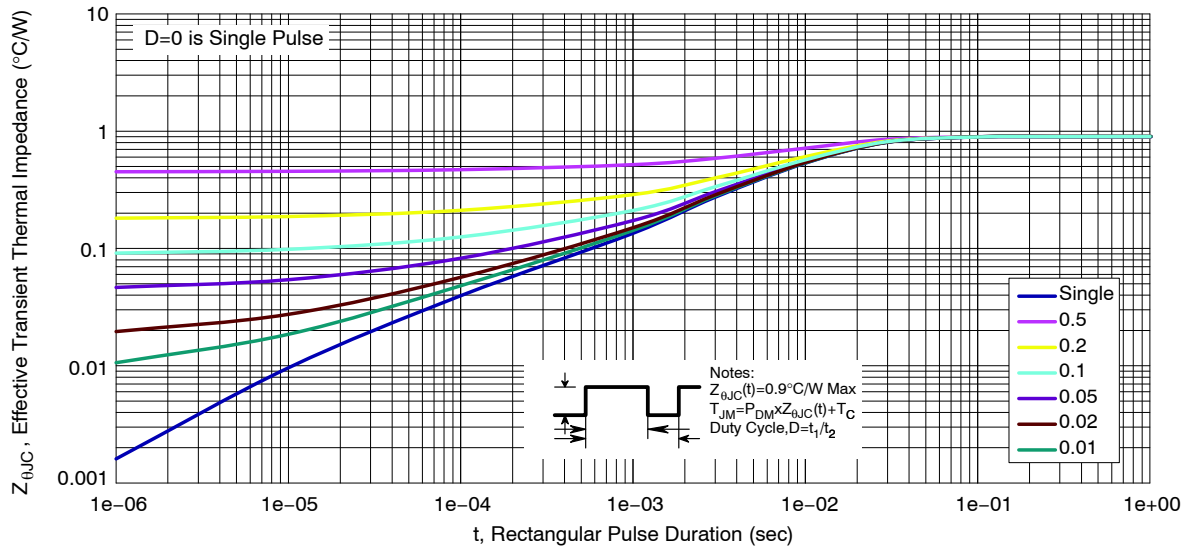


Figure 14. Thermal Characteristics

### DEVICE ORDERING INFORMATION

Device	Marking	Package	Shipping <sup>†</sup>
NTMFS0D7N04XLT1G	0D7N4L	DFN5 (Pb-Free)	1500 / Tape & Reel

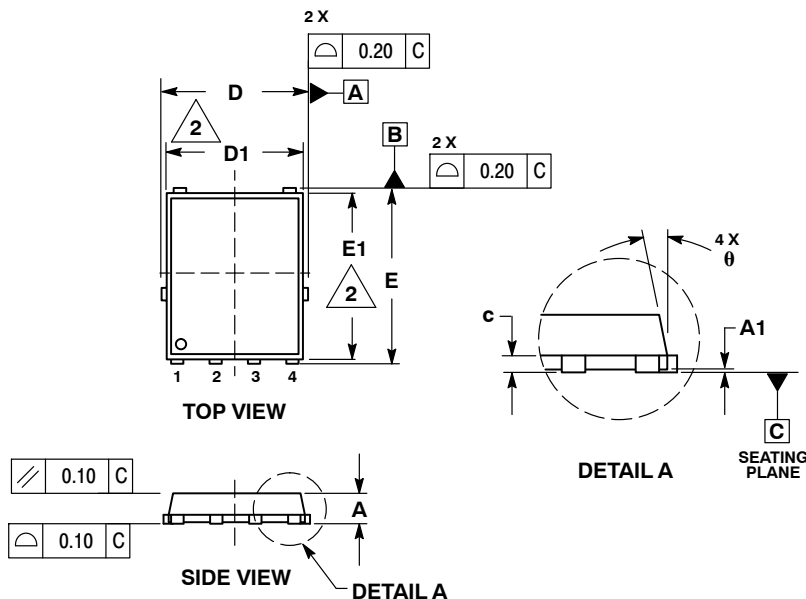
<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.



SCALE 2:1

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

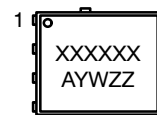
DATE 25 JUN 2018



## NOTES:

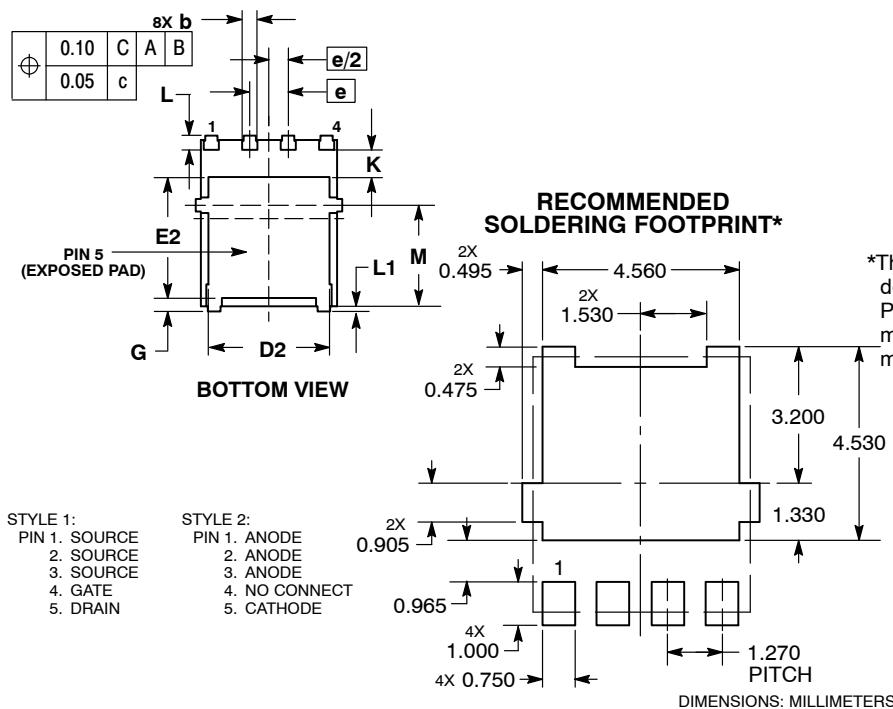
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION D1 AND E1 DO NOT INCLUDE MOLD FLASH PROTRUSIONS OR GATE BURRS.

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 onsemi Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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

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