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# MOSFET - Power, Single

## P-Channel, SO8-FL

### -30 V, 2.7 mΩ, -164 A

## NTMFS005P03P8Z

### Features

- Ultra Low  $R_{DS(on)}$  to Improve System Efficiency
- Advanced Package Technology in 5x6mm for Space Saving and Excellent Thermal Conduction
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

### Typical Applications

- Power Load Switch
- Protection: Reverse Current, Over Voltage, and Reverse Negative Voltage
- Battery Management

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

Parameter			Symbol	Value	Unit
Drain-to-Source Voltage			$V_{DSS}$	-30	V
Gate-to-Source Voltage			$V_{GS}$	$\pm 25$	V
Continuous Drain Current $R_{\theta JC}$ (Note 3)	Steady State	$T_C = 25^{\circ}\text{C}$	$I_D$	-164	A
		$T_C = 85^{\circ}\text{C}$		-118	
Power Dissipation $R_{\theta JC}$ (Note 3)		$T_C = 25^{\circ}\text{C}$	$P_D$	104	W
Continuous Drain Current $R_{\theta JA}$ (Notes 1, 3)	Steady State	$T_A = 25^{\circ}\text{C}$	$I_D$	-28.6	A
		$T_A = 85^{\circ}\text{C}$		-20.6	
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	$T_A = 25^{\circ}\text{C}$	$I_D$	-15.3	A
		$T_A = 85^{\circ}\text{C}$		-11	
Power Dissipation $R_{\theta JA}$ (Notes 2, 3)		$T_A = 25^{\circ}\text{C}$	$P_D$	0.9	W
Pulsed Drain Current	$T_A = 25^{\circ}\text{C}$ , $t_p = 10\text{ }\mu\text{s}$		$I_{DM}$	-597	A
Single Pulse Drain-to-Source Avalanche Energy ( $I_{Lpk} = 57.59\text{ A}$ )			$E_{AS}$	165.8	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.

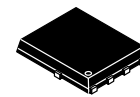
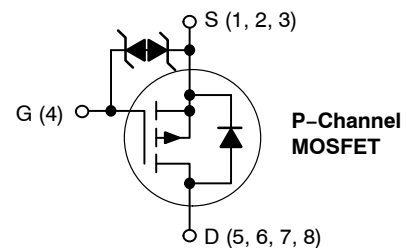
1. Surface-mounted on FR4 board using a 1 in<sup>2</sup> pad size, 2 oz. Cu pad.
2. Surface-mounted on FR4 board using a minimum pad size, 2 oz. Cu pad.
3. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions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



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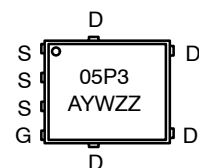
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$V_{(BR)DSS}$	$R_{DS(on)}$	$I_D$
-30 V	2.7 mΩ @ -10 V	-164 A
	4.4 mΩ @ -4.5 V	



SO-8 FLAT LEAD  
CASE 488AA  
STYLE 1

### MARKING DIAGRAM



A = Assembly Location  
Y = Year  
W = Work Week  
ZZ = Lot Traceability

### ORDERING INFORMATION

Device	Package	Shipping†
NTMFS005P03P8ZT1G	SO8-FL (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 Specification Brochure, BRD8011/D.

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## THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction-to-Case – Steady State (Drain) (Note 1)	$R_{\theta JC}$	1.2	$^{\circ}\text{C/W}$
Junction-to-Ambient – Steady State (Note 1)	$R_{\theta JA}$	40	$^{\circ}\text{C/W}$
Junction-to-Ambient – Steady State (Note 2)	$R_{\theta JA}$	137	$^{\circ}\text{C/W}$

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

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

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = -250\text{ }\mu\text{A}$	-30			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$	$I_D = -250\text{ }\mu\text{A}$ , ref to $25^{\circ}\text{C}$		-8.3		$\text{mV}/^{\circ}\text{C}$
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{GS} = 0\text{ V}, V_{DS} = -24\text{ V}$ $T_J = 25^{\circ}\text{C}$			-1.0	$\mu\text{A}$
Gate-to-Source Leakage Current	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = \pm 25\text{ V}$			$\pm 10$	$\mu\text{A}$

### ON CHARACTERISTICS (Note 4)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = -250\text{ }\mu\text{A}$	-1.0		-3.0	V
Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$	$I_D = -250\text{ }\mu\text{A}$ , ref to $25^{\circ}\text{C}$		5.3		$\text{mV}/^{\circ}\text{C}$
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = -10\text{ V}, I_D = -22\text{ A}$		1.8	2.7	$\text{m}\Omega$
		$V_{GS} = -4.5\text{ V}, I_D = -16\text{ A}$		2.9	4.4	
Foward Transconductance	$g_{FS}$	$V_{DS} = -5\text{ V}, I_D = -16\text{ A}$		87		S

### CHARGES AND CAPACITANCES

Input Capacitance	$C_{iss}$	$V_{GS} = 0\text{ V}, V_{DS} = -15\text{ V}, f = 1.0\text{ MHz}$		7880		pF
Output Capacitance	$C_{oss}$			2630		
Reverse Transfer Capacitance	$C_{rss}$			2550		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = -4.5\text{ V}, V_{DS} = -15\text{ V}, I_D = -22\text{ A}$		112		nC
Threshold Gate Charge	$Q_{G(TH)}$			8		
Gate-to-Source Charge	$Q_{GS}$			16		
Gate-to-Drain Charge	$Q_{GD}$			76		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = -10\text{ V}, V_{DS} = -15\text{ V}, I_D = -22\text{ A}$		183		

### SWITCHING CHARACTERISTICS, $V_{GS} = 4.5\text{ V}$ (Note 4)

Turn-On Delay Time	$t_{d(on)}$	$V_{GS} = -4.5\text{ V}, V_{DS} = -15\text{ V}, I_D = -22\text{ A}, R_G = 6\text{ }\Omega$		56		ns
Rise Time	$t_r$			308		
Turn-Off Delay Time	$t_{d(off)}$			124		
Fall Time	$t_f$			269		

### SWITCHING CHARACTERISTICS, $V_{GS} = 10\text{ V}$ (Note 4)

Turn-On Delay Time	$t_{d(on)}$	$V_{GS} = -10\text{ V}, V_{DS} = -15\text{ V}, I_D = -22\text{ A}, R_G = 6\text{ }\Omega$		22		ns
Rise Time	$t_r$			79		
Turn-Off Delay Time	$t_{d(off)}$			220		
Fall Time	$t_f$			258		

### DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	$V_{SD}$	$V_{GS} = 0\text{ V}, I_S = -22\text{ A}$	$T_J = 25^{\circ}\text{C}$		-0.77	-1.3	V
			$T_J = 125^{\circ}\text{C}$		-0.63		

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## ELECTRICAL CHARACTERISTICS (T<sub>J</sub> = 25°C unless otherwise noted)

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

Reverse Recovery Time	t <sub>RR</sub>	V <sub>GS</sub> = 0 V, dI <sub>S</sub> /dt = 100 A/μs, I <sub>S</sub> = -22 A		57		ns
Charge Time	t <sub>a</sub>			34		
Discharge Time	t <sub>b</sub>			23		
Reverse Recovery Charge	Q <sub>RR</sub>			77		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. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.

TYPICAL CHARACTERISTICS

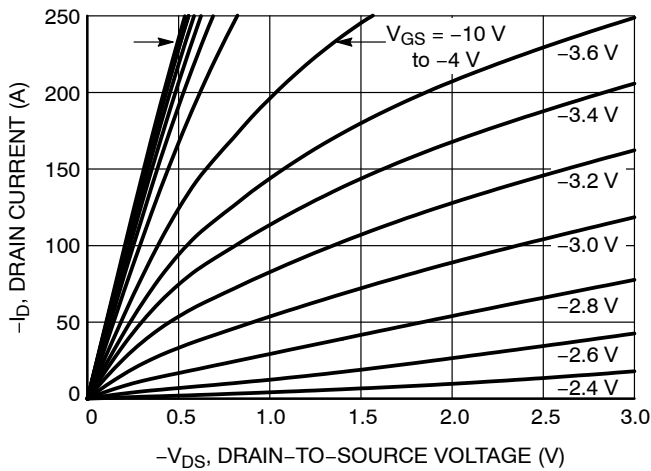


Figure 1. On-Region Characteristics

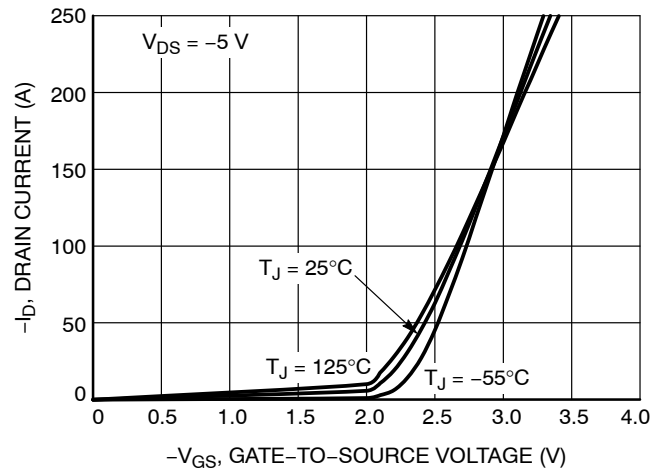


Figure 2. Transfer Characteristics

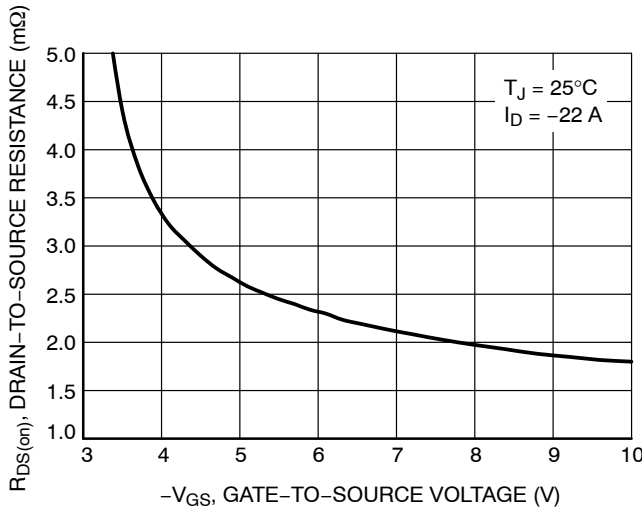


Figure 3. On-Resistance vs. Gate-to-Source Voltage

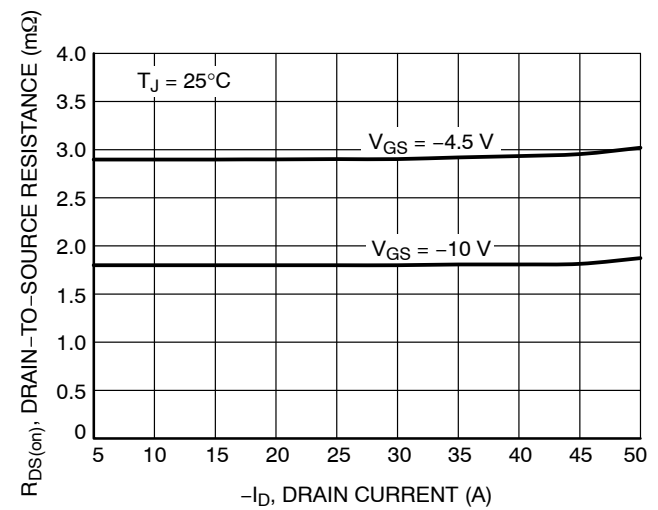


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

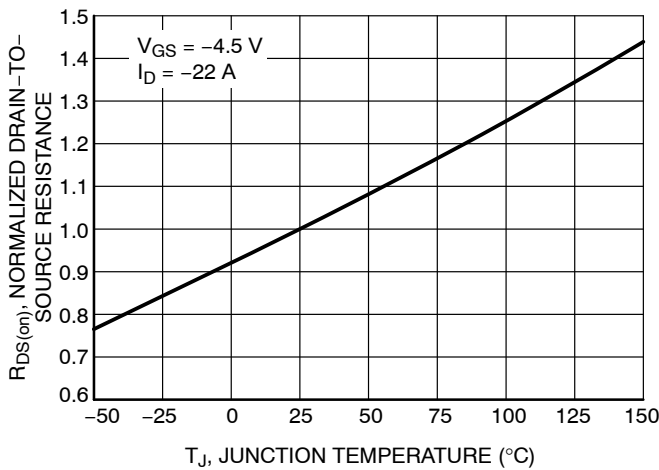


Figure 5. On-Resistance Variation with Temperature

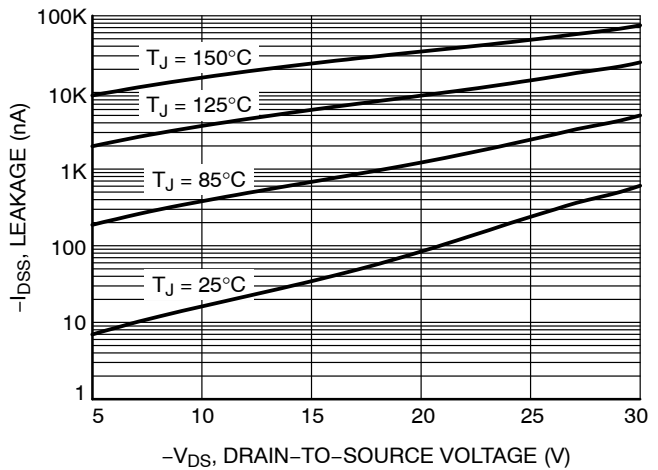


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

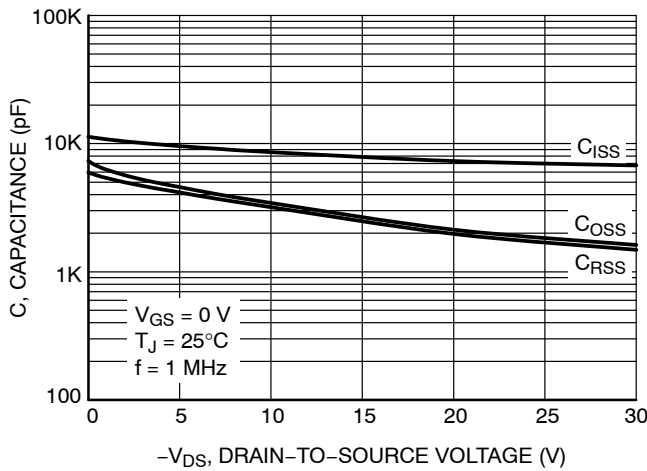


Figure 7. Capacitance Variation

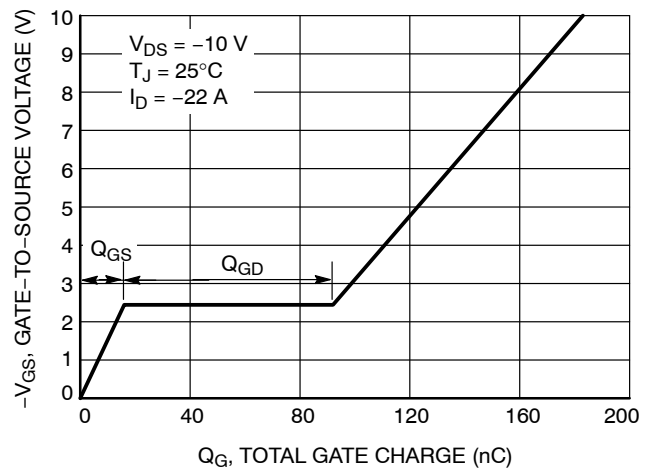


Figure 8. Gate-to-Source Voltage vs. Total Charge

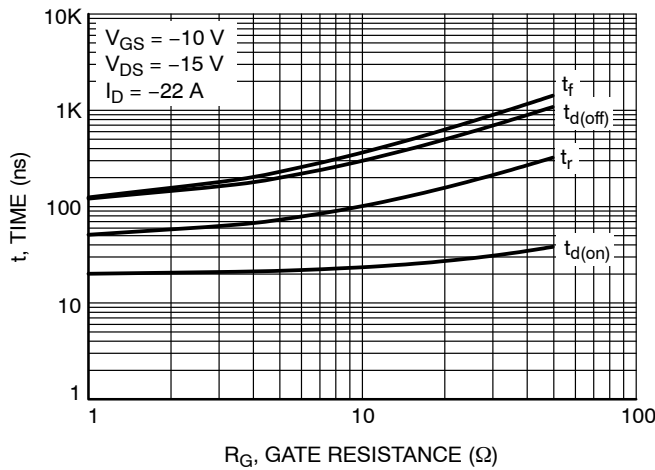


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

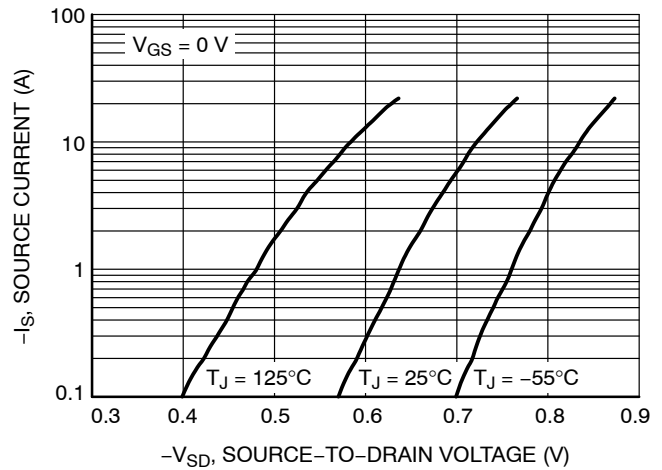


Figure 10. Diode Forward Voltage vs. Current

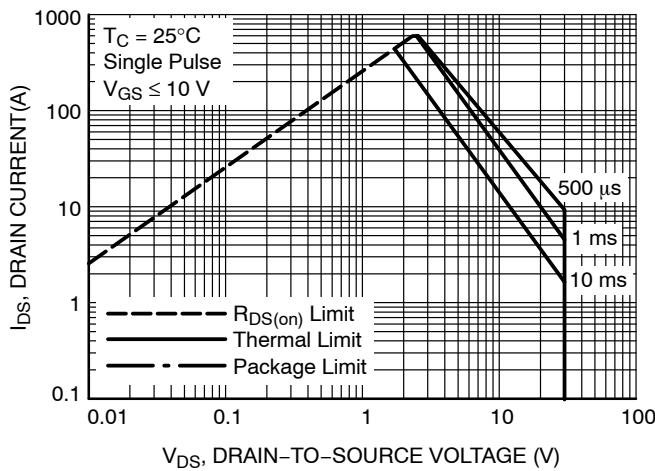


Figure 11. Maximum Rated Forward Biased Safe Operating Area

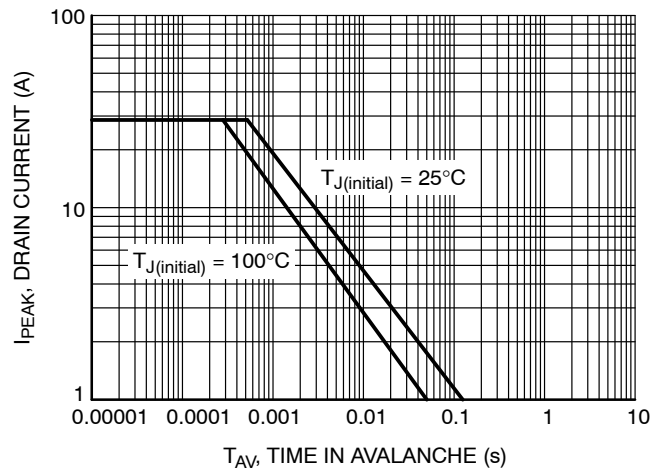


Figure 12.  $I_{PEAK}$  vs. Time in Avalanche

# NTMFS005P03P8Z

## TYPICAL CHARACTERISTICS

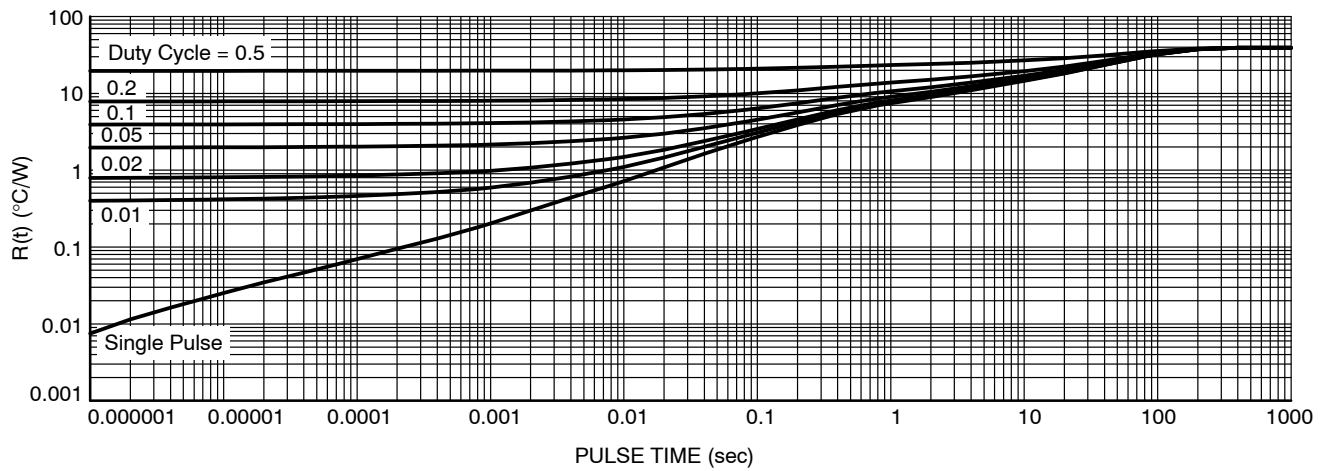


Figure 13. Thermal Characteristics

# NTMFS005P03P8Z

## PACKAGE DIMENSIONS

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

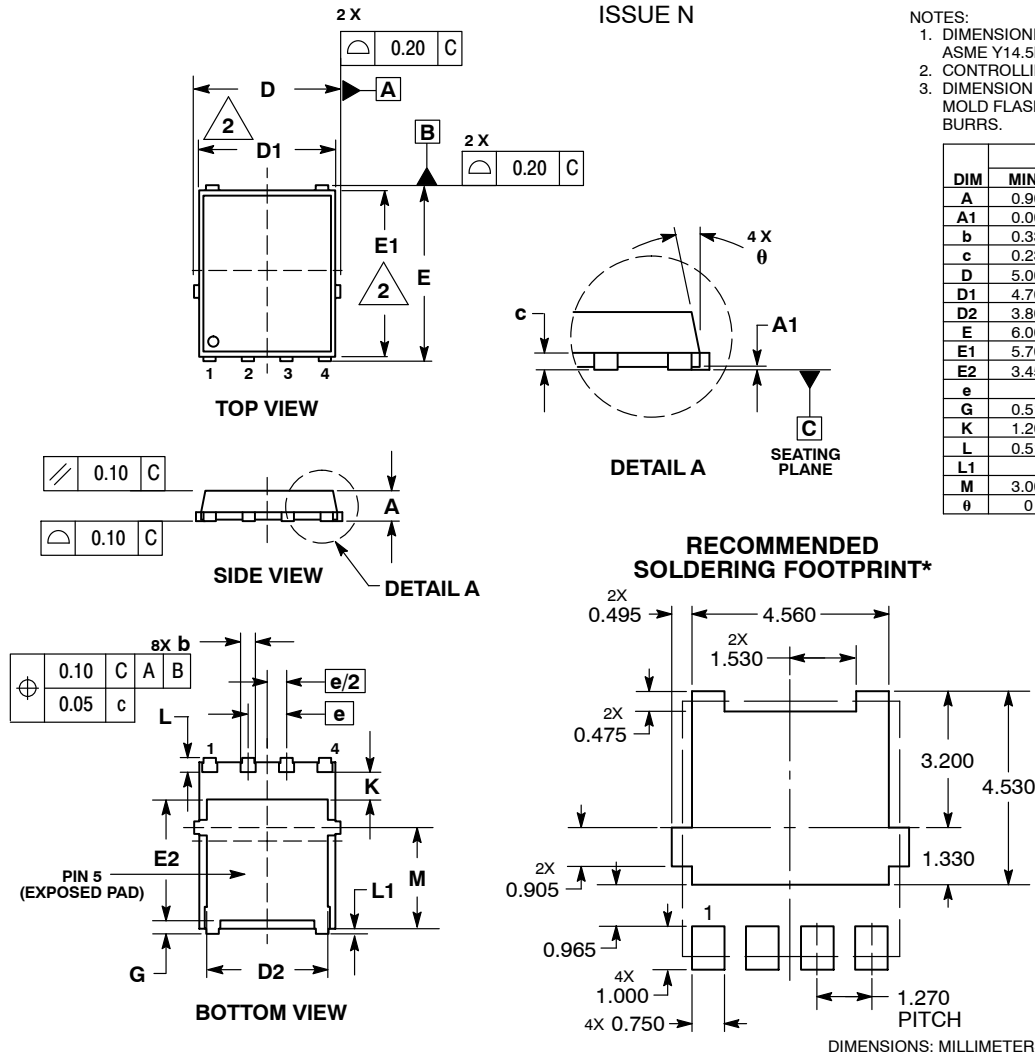
### NOTES:

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
- SOURCE
- SOURCE
- GATE
- DRAIN



\*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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