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

## 25 V, 4.2 mΩ, 75 A



ON Semiconductor®

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## NTMFS4D8N02H

### Features

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

### Typical Applications

- High Performance DC-DC Converters
- System Voltage Rails
- Netcom, Telecom
- Servers & Point of Load

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

Parameter		Symbol	Value	Unit	
Drain-to-Source Voltage		$V_{DS}$	25	V	
Gate-to-Source Voltage		$V_{GS}$	$\pm 20$	V	
Continuous Drain Current $R_{\theta JC}$ (Note 1)	Steady State	$T_C = 25^\circ\text{C}$	$I_D$	75	A
		$T_C = 25^\circ\text{C}$	$P_D$	41	W
Power Dissipation $R_{\theta JC}$ (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	$I_D$	21	A
		$T_A = 25^\circ\text{C}$	$P_D$	3.2	W
Continuous Drain Current $R_{\theta JA}$ (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	$I_D$	21	A
Power Dissipation $R_{\theta JA}$ (Note 1)	Steady State	$T_A = 25^\circ\text{C}$	$P_D$	3.2	W
Pulsed Drain Current	$T_A = 25^\circ\text{C}, t_p = 10 \mu\text{s}$	$I_{DM}$	216	A	
Single Pulse Drain-to-Source Avalanche Energy ( $I_{L(pk)} = 32 \text{ A}, L = 0.1 \text{ mH}$ ) (Note 2)		$E_{AS}$	51	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	$^\circ\text{C}$	

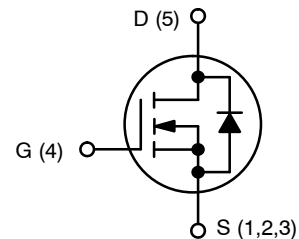
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

### THERMAL RESISTANCE MAXIMUM RATINGS

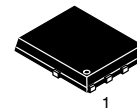
Parameter	Symbol	Value	Unit
Junction-to-Case - Steady State (Note 1)	$R_{\theta JC}$	3.7	$^\circ\text{C}/\text{W}$
Junction-to-Ambient - Steady State (Note 1)	$R_{\theta JA}$	47.3	

1. Surface-mounted on FR4 board using a 1 in<sup>2</sup>, 2 oz. Cu pad.
2. This is the absolute maximum rating. Parts are 100% UIS tested at  $T_J = 25^\circ\text{C}$ ,  $V_{GS} = 10 \text{ V}$ ,  $I_L = 21 \text{ A}$ ,  $E_{AS} = 22 \text{ mJ}$ .

$V_{(BR)DSS}$	$R_{DS(ON)} \text{ MAX}$	$I_D \text{ MAX}$
25 V	4.2 mΩ @ 10 V	75 A
	7.0 mΩ @ 4.5 V	

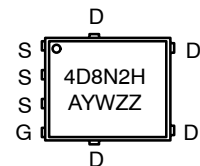


N-CHANNEL MOSFET



DFN5 (SO-8FL) CASE 488AA STYLE 1

### MARKING DIAGRAM



4D8N2H = Specific Device Code  
 A = Assembly Location  
 Y = Year  
 W = Work Week  
 ZZ = Lot Traceability

### ORDERING INFORMATION

See detailed ordering, marking and shipping information on page 5 of this data sheet.

# NTMFS4D8N02H

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>						
Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\ \mu\text{A}$	25			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$	$I_D = 250\ \mu\text{A}$ , ref to $25^\circ\text{C}$		10.6		mV/ $^\circ\text{C}$
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{GS} = 0\text{ V}, V_{DS} = 20\text{ V}$	$T_J = 25^\circ\text{C}$		1.0	$\mu\text{A}$
			$T_J = 125^\circ\text{C}$		10	
Gate-to-Source Leakage Current	$I_{GSS}$	$V_{DS} = 0\text{ V}, V_{GS} = 20\text{ V}$			100	nA

## ON CHARACTERISTICS (Note 3)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 250\ \mu\text{A}$	1.2		2.1	V
Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$	$I_D = 250\ \mu\text{A}$ , ref to $25^\circ\text{C}$		-4.2		mV/ $^\circ\text{C}$
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}$	$I_D = 20\text{ A}$	3.4	4.2	m $\Omega$
		$V_{GS} = 4.5\text{ V}$	$I_D = 15\text{ A}$	5.4	7.0	
Forward Transconductance	$g_{FS}$	$V_{DS} = 5\text{ V}, I_D = 15\text{ A}$		54		S
Gate Resistance	$R_G$	$T_A = 25^\circ\text{C}$		0.9		$\Omega$

## CHARGES & CAPACITANCES

Input Capacitance	$C_{ISS}$	$V_{GS} = 0\text{ V}, V_{DS} = 12\text{ V}, f = 1\text{ MHz}$		780		pF
Output Capacitance	$C_{OSS}$			530		
Reverse Transfer Capacitance	$C_{RSS}$			39		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 12\text{ V}; I_D = 30\text{ A}$		6.2		nC
Threshold Gate Charge	$Q_{G(TH)}$			1.4		
Gate-to-Source Charge	$Q_{GS}$			2.5		
Gate-to-Drain Charge	$Q_{GD}$			1.5		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 10\text{ V}, V_{DS} = 12\text{ V}; I_D = 30\text{ A}$		13.4		nC

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

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 4.5\text{ V}, V_{DS} = 12\text{ V}, I_D = 30\text{ A}, R_G = 3\ \Omega$		9.7		ns
Rise Time	$t_r$			7.4		
Turn-Off Delay Time	$t_{d(OFF)}$			13		
Fall Time	$t_f$			5.2		

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

Turn-On Delay Time	$t_{d(ON)}$	$V_{GS} = 10\text{ V}, V_{DS} = 12\text{ V}, I_D = 30\text{ A}, R_G = 3\ \Omega$		6.9		ns
Rise Time	$t_r$			2.6		
Turn-Off Delay Time	$t_{d(OFF)}$			18		
Fall Time	$t_f$			2.7		

## DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	$V_{SD}$	$V_{GS} = 0\text{ V}, I_S = 10\text{ A}$	$T_J = 25^\circ\text{C}$		0.8	1.0	V
			$T_J = 125^\circ\text{C}$		0.65		
Reverse Recovery Time	$t_{RR}$	$V_{GS} = 0\text{ V}, di_S/dt = 100\text{ A}/\mu\text{s}, I_S = 10\text{ A}$		28		ns	
Charge Time	$t_a$			14			
Discharge Time	$t_b$			14			
Reverse Recovery Charge	$Q_{RR}$			11			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.

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

4. Switching characteristics are independent of operating junction temperatures.

# NTMFS4D8N02H

## TYPICAL CHARACTERISTICS

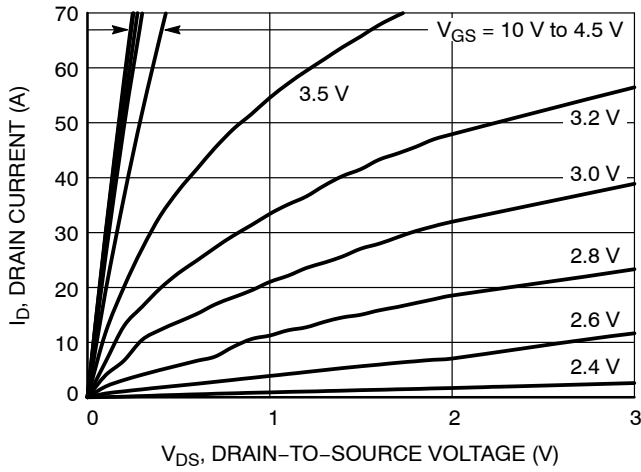


Figure 1. On-Region Characteristics

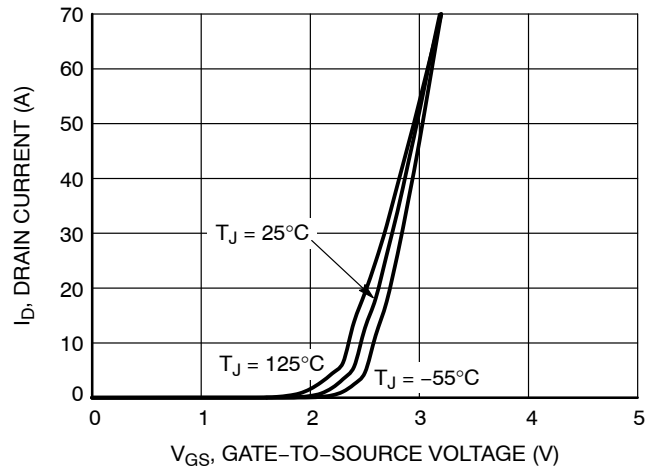


Figure 2. Transfer Characteristics

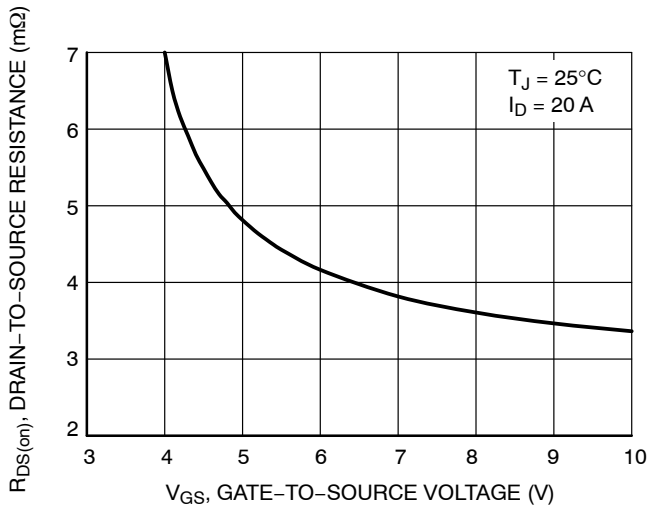


Figure 3. On-Resistance vs. Gate-to-Source Voltage

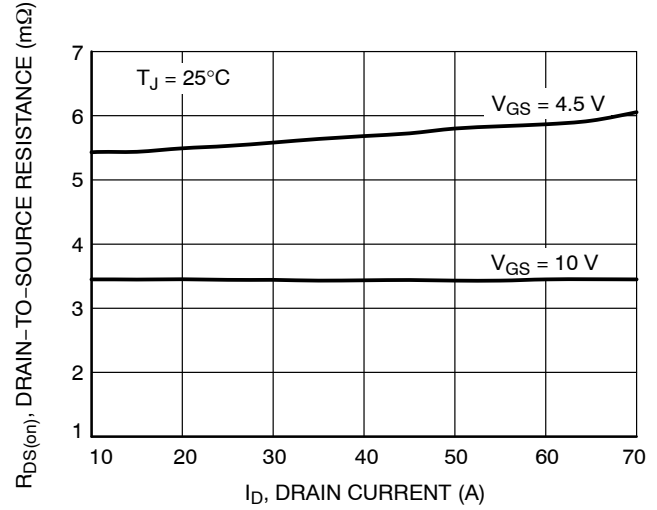


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

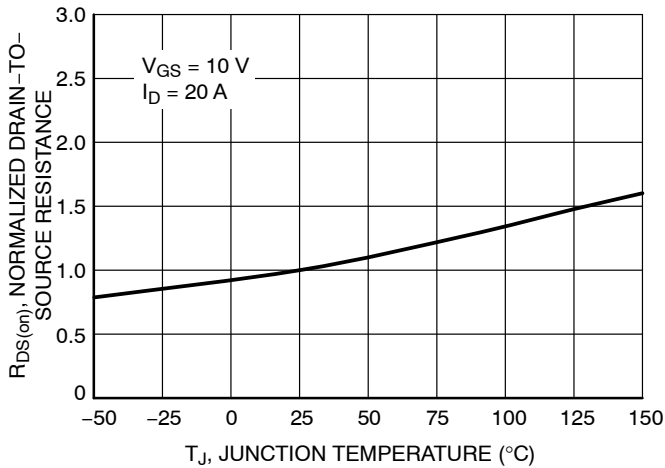


Figure 5. On-Resistance Variation with Temperature

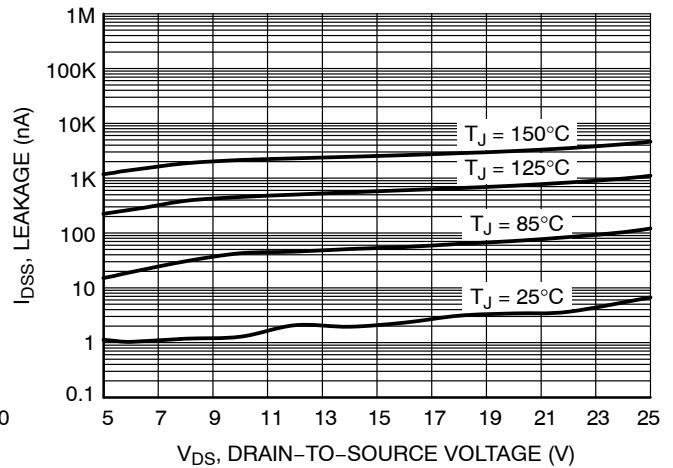


Figure 6. Drain-to-Source Leakage Current vs. Voltage

# NTMFS4D8N02H

## TYPICAL CHARACTERISTICS

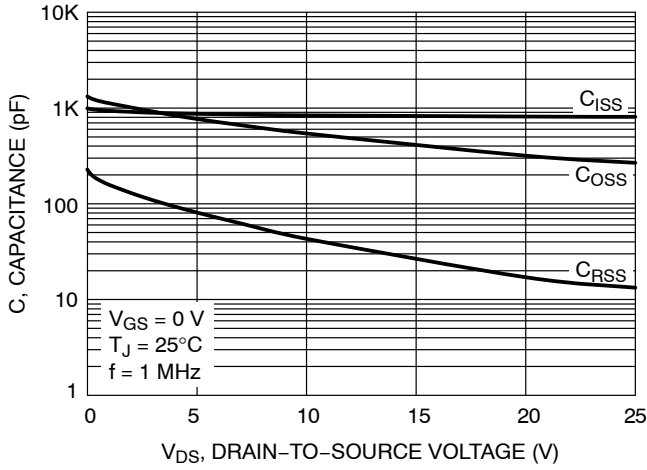


Figure 7. Capacitance Variation

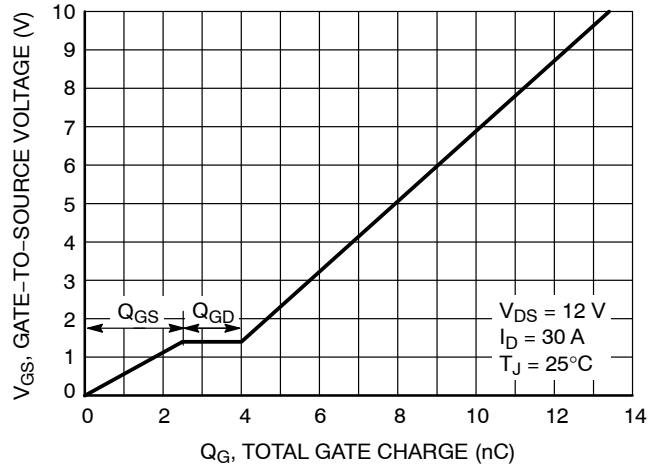


Figure 8. Gate-to-Source vs. Total Charge

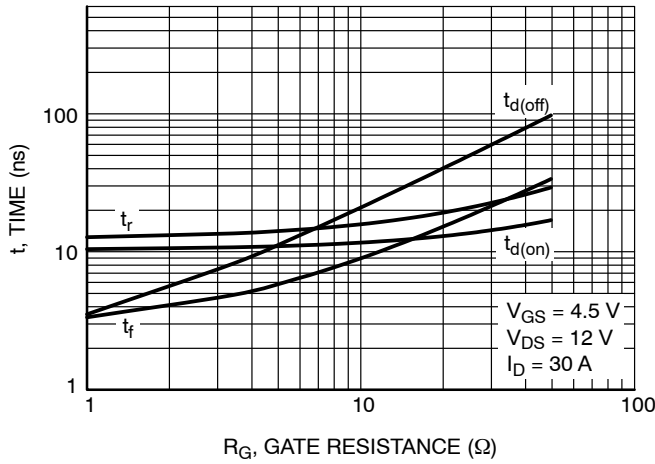


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

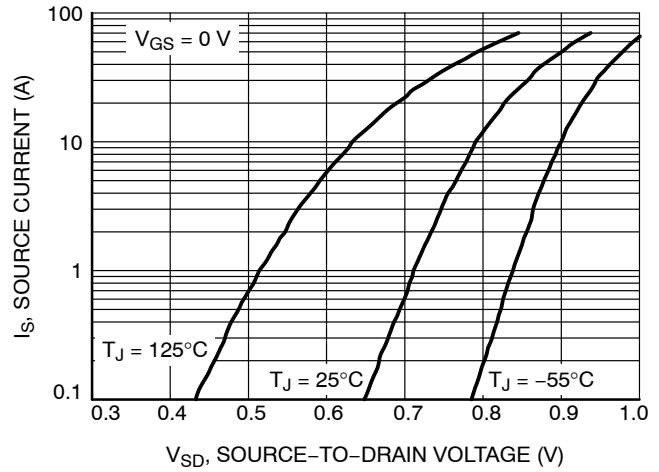


Figure 10. Diode Forward Voltage vs. Current

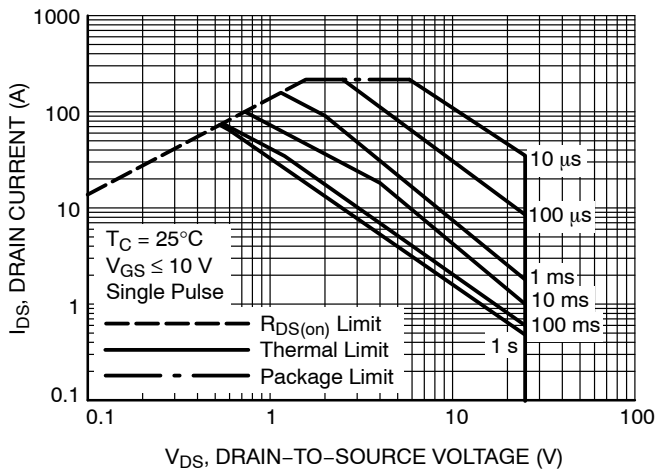


Figure 11. Maximum Rated Forward Biased Safe Operating Area

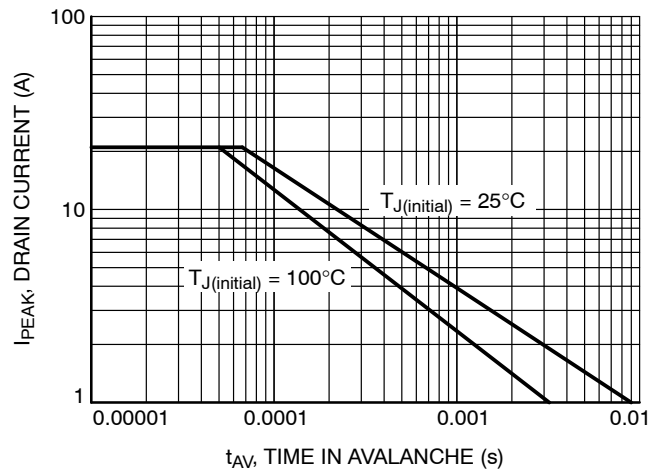


Figure 12. Maximum Drain Current vs. Time in Avalanche

# NTMFS4D8N02H

## TYPICAL CHARACTERISTICS

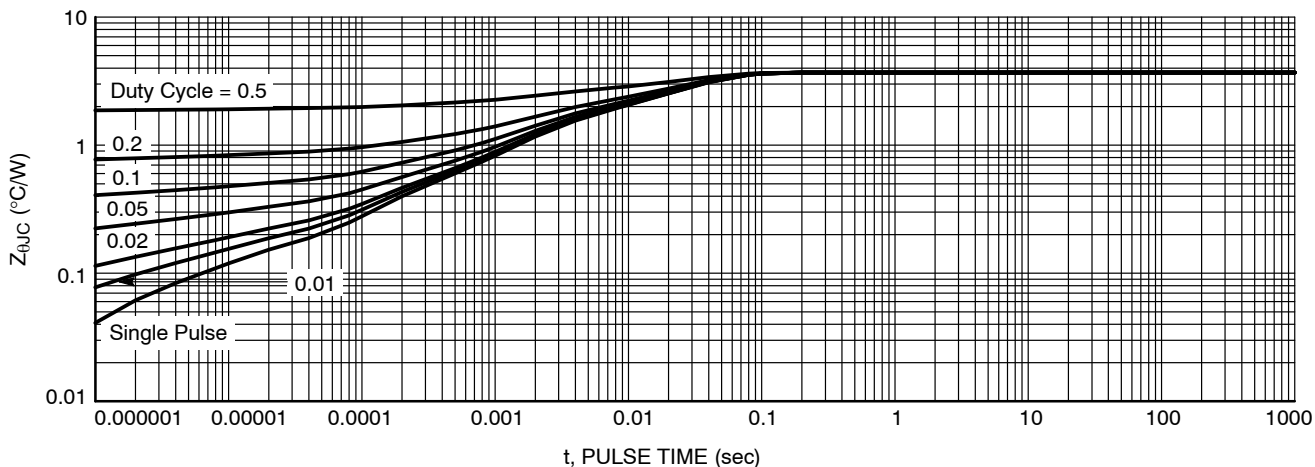


Figure 13. Transient Thermal Impedance

### DEVICE ORDERING INFORMATION

Device	Marking	Package	Shipping <sup>†</sup>
NTMFS4D8N02HT1G	4D8N2H	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.

# NTMFS4D8N02H

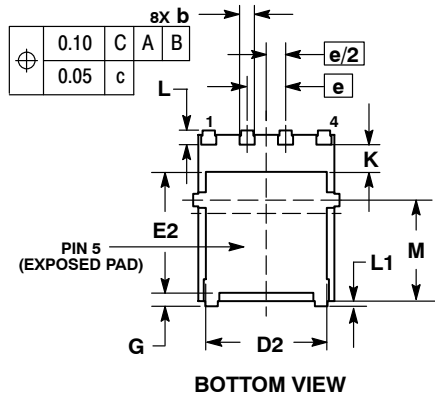
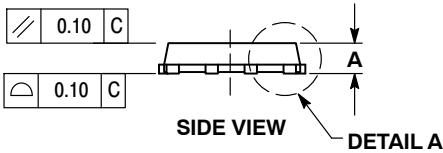
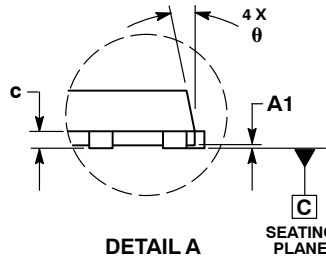
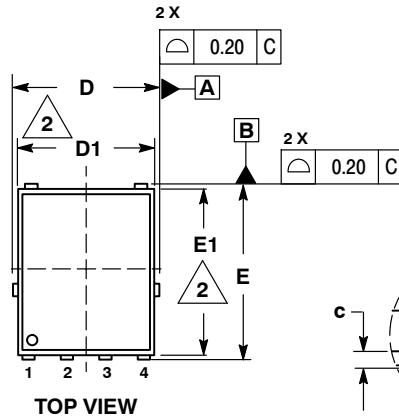
## PACKAGE DIMENSIONS

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

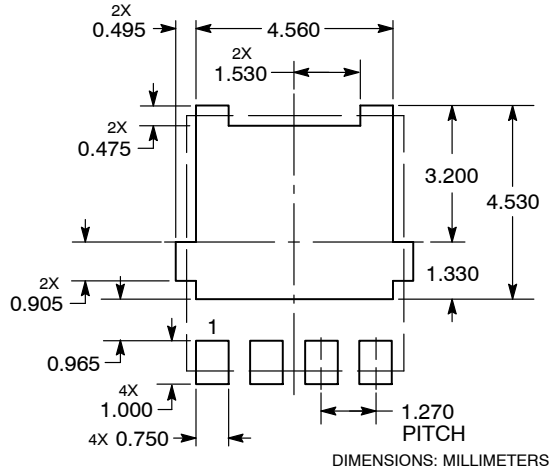
NOTES:

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.

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°



### RECOMMENDED SOLDERING FOOTPRINT\*



- STYLE 1:
1. SOURCE
  2. SOURCE
  3. SOURCE
  4. GATE
  5. 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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