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NTMFS5113PL

Power MOSFET

–60 V, 14 mΩ, –64 A, Single P–Channel

Features

- Low $R_{DS(on)}$ to Minimize Conduction Losses
- High Current Capability
- Avalanche Energy Specified
- These Devices are Pb–Free, Halogen Free/BFR Free and are RoHS Compliant

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

Parameter	Symbol	Value	Unit
Drain–to–Source Voltage	V_{DS}	–60	V
Gate–to–Source Voltage	V_{GS}	± 20	V
Continuous Drain Current $R_{\theta JC}$ (Notes 1, 2, 3)	Steady State	$T_C = 25^\circ\text{C}$	I_D –64 A
		$T_C = 100^\circ\text{C}$	–45
Power Dissipation $R_{\theta JC}$ (Notes 1, 2)	Steady State	$T_C = 25^\circ\text{C}$	P_D 150 W
		$T_C = 100^\circ\text{C}$	75
Continuous Drain Current $R_{\theta JA}$ (Notes 1, 2, 3)	Steady State	$T_A = 25^\circ\text{C}$	I_D –10 A
		$T_A = 100^\circ\text{C}$	–7
Power Dissipation $R_{\theta JA}$ (Notes 1, 2)	Steady State	$T_A = 25^\circ\text{C}$	P_D 3.8 W
		$T_A = 100^\circ\text{C}$	1.9
Pulsed Drain Current	$T_A = 25^\circ\text{C}, t_p = 10 \mu\text{s}$	I_{DM} –415	A
Operating Junction and Storage Temperature	T_J, T_{stg}	–55 to 175	$^\circ\text{C}$
Source Current (Body Diode)	I_S	–150	A
Single Pulse Drain–to–Source Avalanche Energy ($T_J = 25^\circ\text{C}, V_{DD} = 50 \text{ V}, V_{GS} = 10 \text{ V}, I_{L(pk)} = 46 \text{ A}, L = 0.3 \text{ mH}, R_G = 25 \Omega$)	E_{AS}	315	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.

THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Junction–to–Case – Steady State (Drain) (Note 2)	$R_{\theta JC}$	1.0	$^\circ\text{C}/\text{W}$
Junction–to–Ambient – Steady State (Note 2)	$R_{\theta JA}$	39	$^\circ\text{C}/\text{W}$

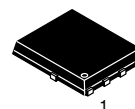
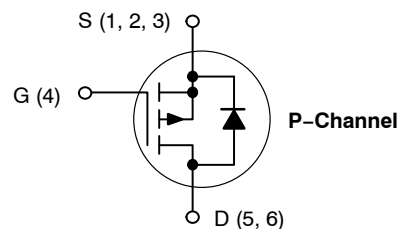
1. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
2. Surface–mounted on FR4 board using a 650 mm², 2 oz. Cu pad.
3. Continuous DC current rating. Maximum current for pulses as long as 1 second is higher but is dependent on pulse duration and duty cycle.



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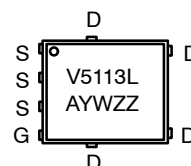
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$V_{(BR)DSS}$	$R_{DS(on)}$	I_D
–60 V	14 mΩ @ –10 V	–64 A
	22 mΩ @ –4.5 V	



DFN5
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 on page 5 of this data sheet.

NTMFS5113PL

ELECTRICAL CHARACTERISTICS (T_J = 25°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 V, I _D = -250 μA	-60			V
Zero Gate Voltage Drain Current	I _{DSS}	V _{GS} = 0 V, V _{DS} = -60 V	T _J = 25°C		-1.0	μA
			T _J = 125°C		-100	
Gate-to-Source Leakage Current	I _{GSS}	V _{DS} = 0 V, V _{GS} = ±20 V			±100	nA

ON CHARACTERISTICS (Note 4)

Gate Threshold Voltage	V _{GS(TH)}	V _{GS} = V _{DS} , I _D = -250 μA	-1.5		-2.5	V
Drain-to-Source On Resistance	R _{DS(on)}	V _{GS} = -10 V, I _D = -17 A		10.5	14	mΩ
		V _{GS} = -4.5 V, I _D = -5 A		16	22	
Foward Transconductance	g _{FS}	V _{DS} = -15 V, I _D = -15 A		43		S

CHARGES AND CAPACITANCES

Input Capacitance	C _{iss}	V _{GS} = 0 V, f = 1.0 MHz, V _{DS} = -25 V		4400		pF
Output Capacitance	C _{oss}			505		
Reverse Transfer Capacitance	C _{rss}			319		
Total Gate Charge	Q _{G(TOT)}	V _{DS} = -48 V, I _D = -17 A	V _{GS} = -4.5 V	45		nC
			V _{GS} = -10 V	83		
Threshold Gate Charge	Q _{G(TH)}	V _{GS} = -10 V, V _{DS} = -48 V, I _D = -17 A		4		
Gate-to-Source Charge	Q _{GS}			13		
Gate-to-Drain Charge	Q _{GD}			27		
Plateau Voltage	V _{GP}			3.5		V

SWITCHING CHARACTERISTICS (Notes 4)

Turn-On Delay Time	t _{d(on)}	V _{GS} = -10 V, V _{DS} = -48 V, I _D = -17 A, R _G = 2.5 Ω		15		ns
Rise Time	t _r			37		
Turn-Off Delay Time	t _{d(off)}			54		
Fall Time	t _f			77		

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V _{SD}	V _{GS} = 0 V, I _S = -17 A	T _J = 25°C		-0.79	-1.0	V
			T _J = 125°C		-0.65		
Reverse Recovery Time	t _{RR}	V _{GS} = 0 V, di _S /dt = 100 A/μs, I _S = -17 A		41		ns	
Charge Time	t _a			22			
Discharge Time	t _b			19			
Reverse Recovery Charge	Q _{RR}			50		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

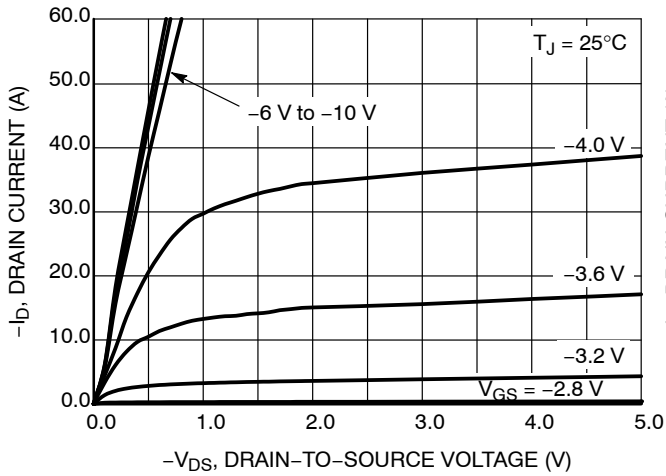


Figure 1. On-Region Characteristics

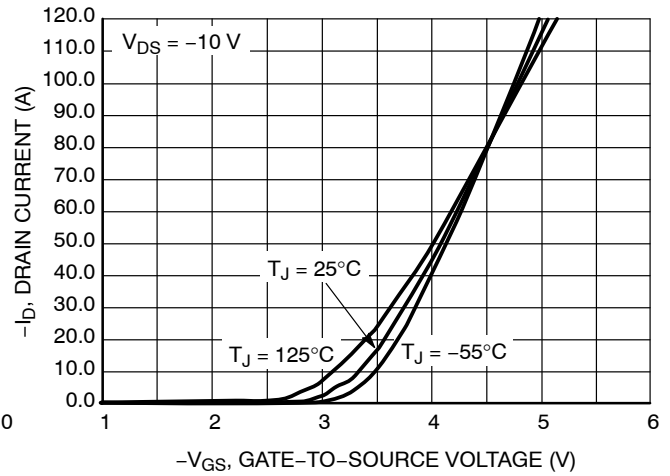


Figure 2. Transfer Characteristics

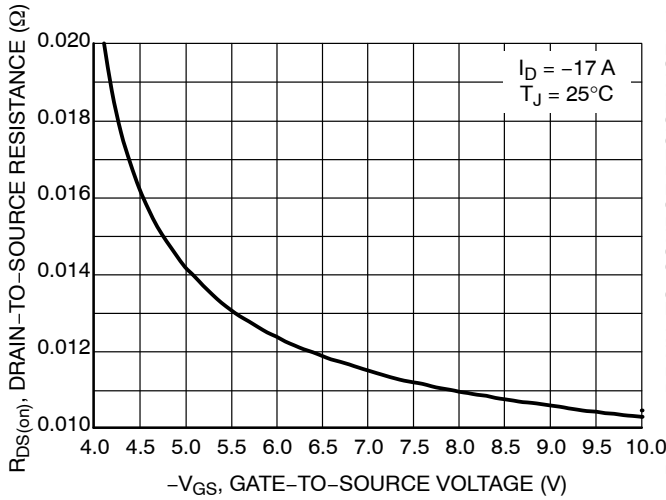


Figure 3. On-Resistance vs. Gate-to-Source Voltage

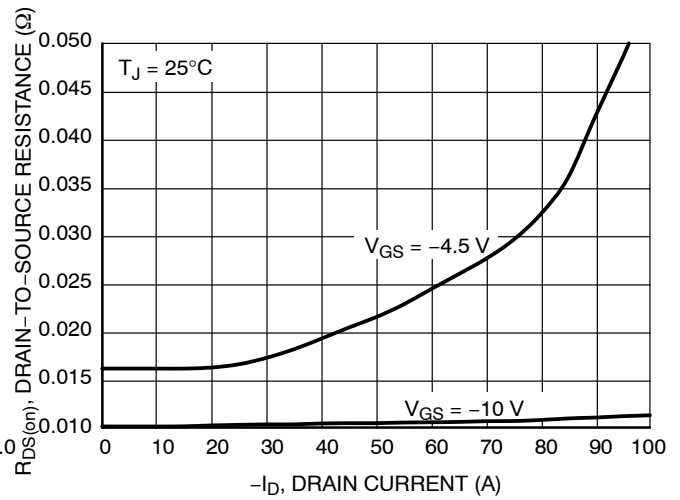


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

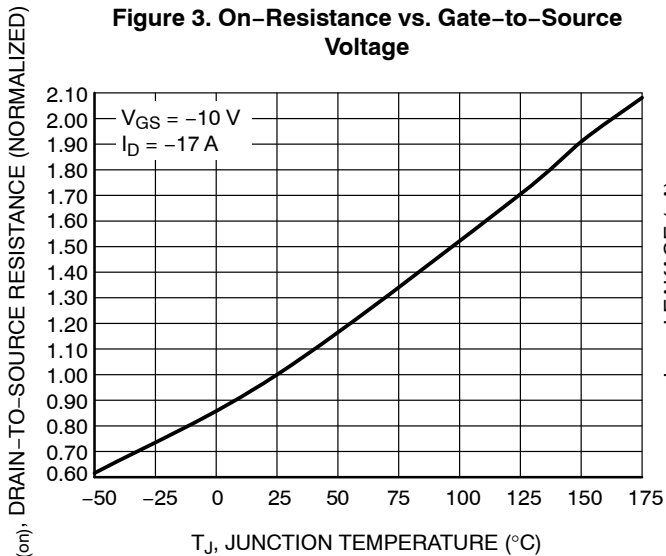


Figure 5. On-Resistance Variation with Temperature

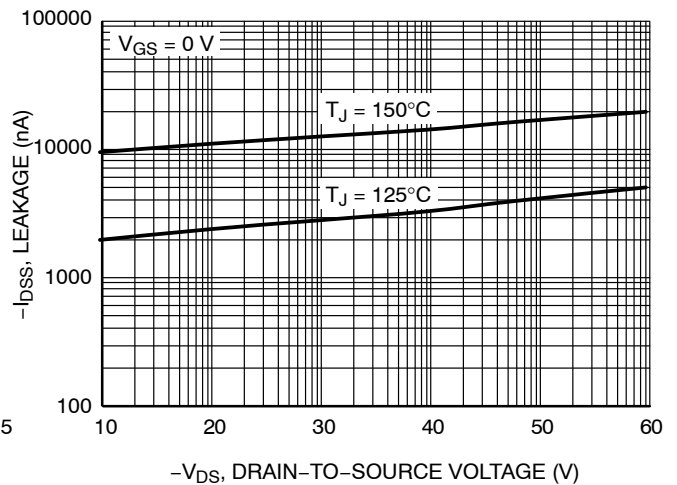


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

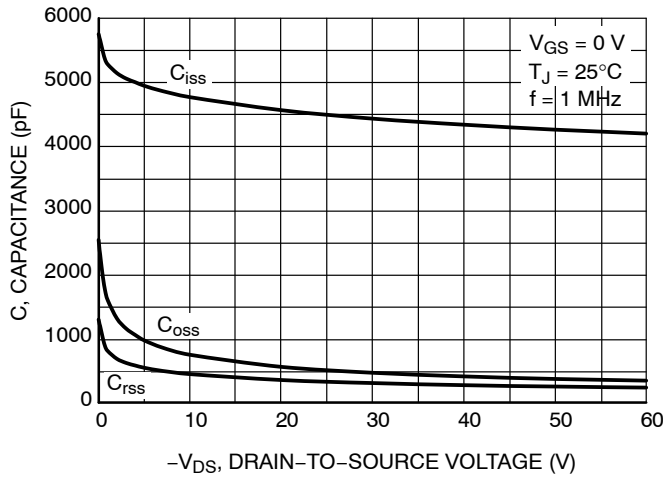


Figure 7. Capacitance Variation

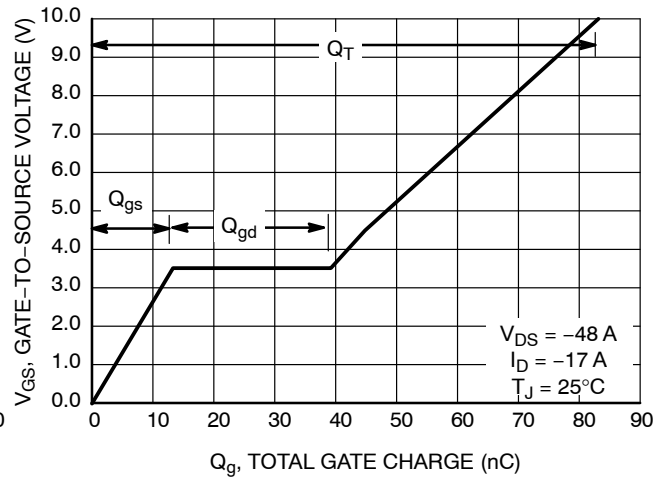


Figure 8. Gate-to-Source Voltage vs. Total Charge

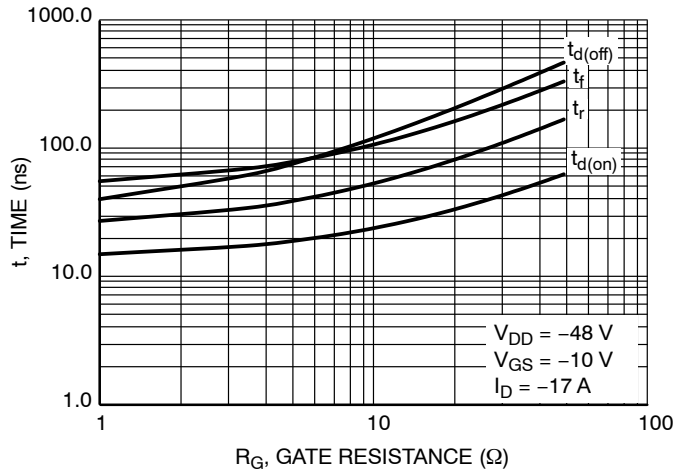


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

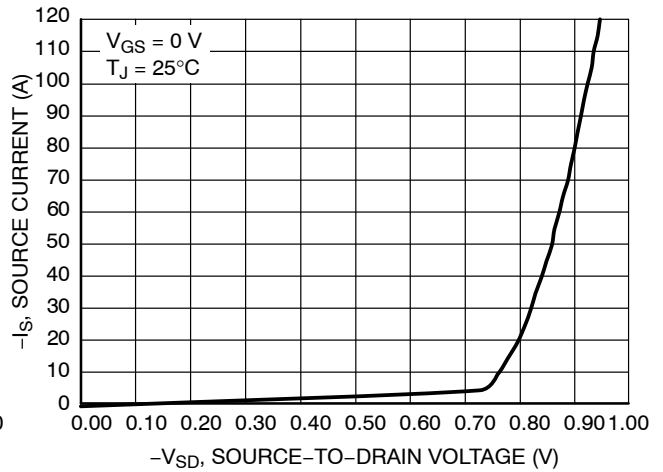


Figure 10. Diode Forward Voltage vs. Current

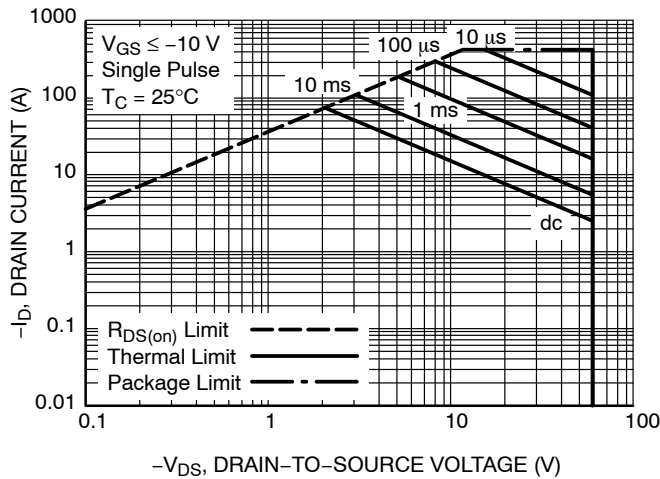


Figure 11. Maximum Rated Forward Biased Safe Operating Area

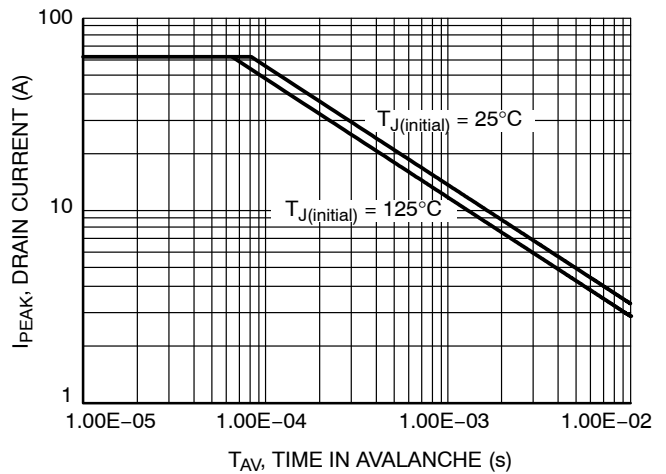


Figure 12. Avalanche Characteristics

NTMFS5113PL

TYPICAL CHARACTERISTICS

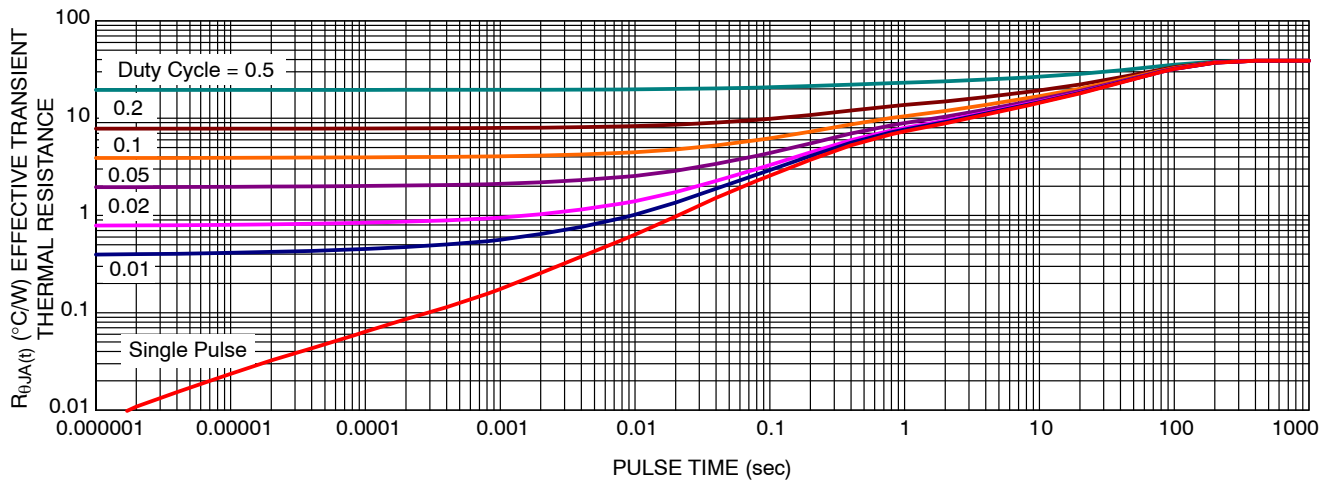


Figure 13. Thermal Response

DEVICE ORDERING INFORMATION

Device	Marking	Package	Shipping†
NTMFS5113PLT1G	V5113L	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.

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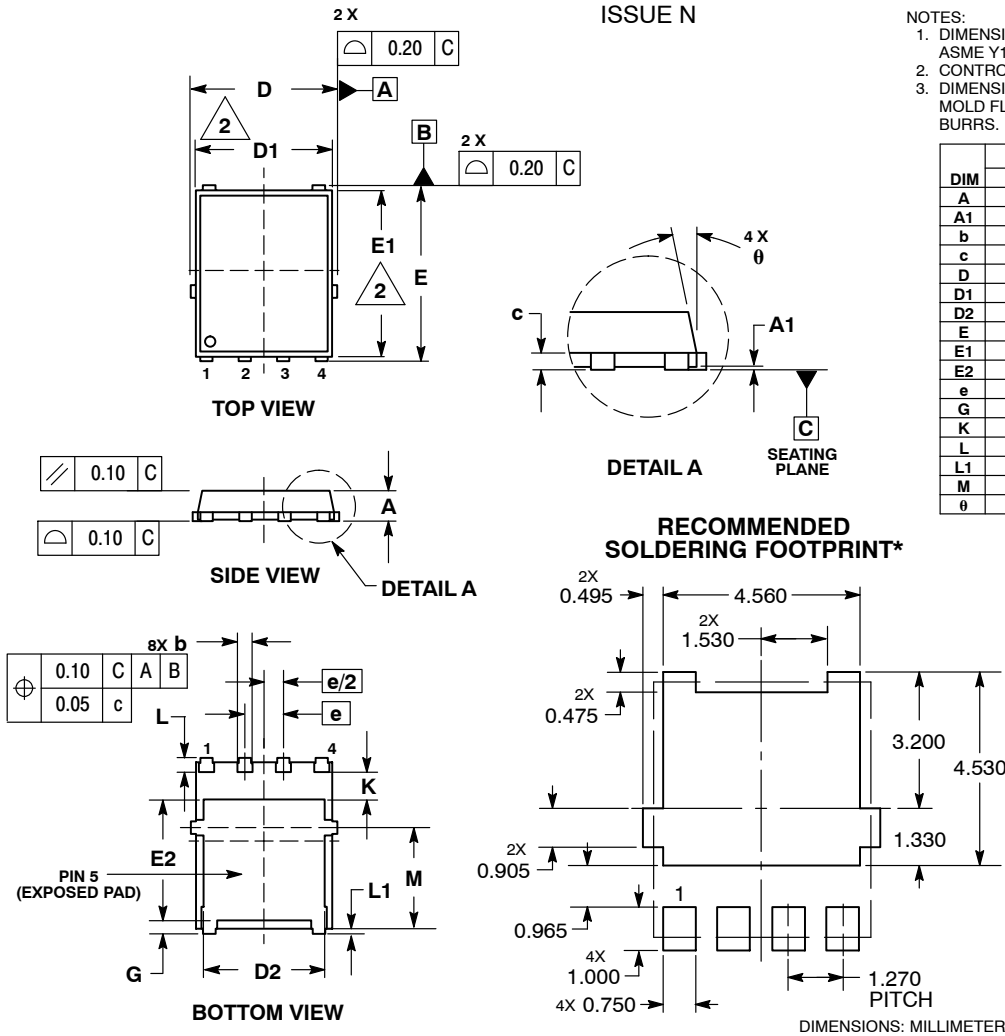
PACKAGE DIMENSIONS

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:
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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