

MOSFET - Power, Single N-Channel, STD Gate, SO8FL

40 V, 2.35 mΩ, 121 A

NVMFWS2D3N04XM

Features

- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Capacitance to Minimize Driver Losses
- Small Footprint (5 x 6 mm) with Compact Design
- AECQ101 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

Applications

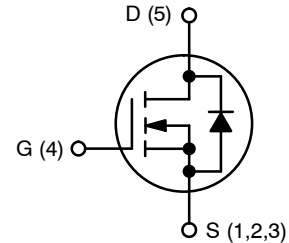
- Motor Drive
- Battery Protection
- Synchronous Rectification

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

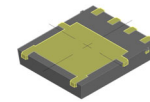
Parameter		Symbol	Value	Unit
Drain-to-Source Voltage		V_{DSS}	40	V
Gate-to-Source Voltage	DC	V_{GS}	± 20	V
Continuous Drain Current	$T_C = 25^{\circ}\text{C}$	I_D	121	A
	$T_C = 100^{\circ}\text{C}$		86	
Power Dissipation	$T_C = 25^{\circ}\text{C}$	P_D	63	W
Continuous Drain Current $R_{\theta JA}$	$T_A = 25^{\circ}\text{C}$	I_{DA}	29	A
	$T_A = 100^{\circ}\text{C}$		21	
Pulsed Drain Current	$T_C = 25^{\circ}\text{C}$, $t_p = 10\text{ }\mu\text{s}$	I_{DM}	688	A
Operating Junction and Storage Temperature Range		T_J, T_{STG}	-55 to +175	$^{\circ}\text{C}$
Source Current (Body Diode)		I_S	52.3	A
Single Pulse Avalanche Energy ($I_{PK} = 6.5\text{ A}$)		E_{AS}	155	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.

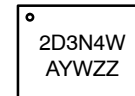
$V_{(BR)DSS}$	$R_{DS(on)} \text{ MAX}$	$I_D \text{ MAX}$
40 V	2.35 mΩ @ $V_{GS} = 10 \text{ V}$	121 A



N-CHANNEL MOSFET



DFNW5 (SO-8FL)
CASE 507BA



2D3N4W = Specific Device Code
A = Assembly Location
Y = Year
W = Work Week
ZZ = Assembly Lot Code

ORDERING INFORMATION

See detailed ordering, marking and shipping information in the package dimensions section on page 5 of this data sheet.

NVMFWS2D3N04XM

THERMAL CHARACTERISTICS

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case (Note 2)	$R_{\theta JC}$	2.4	°C/W
Thermal Resistance, Junction-to-Ambient (Notes 1, 2)	$R_{\theta JA}$	41.1	

- Surface mounted on FR4 board using 650 mm², 2 oz Cu pad.
- The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.

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	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}, T_J = 25^\circ\text{C}$	40			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$\Delta V_{(BR)DSS} / \Delta T_J$	$I_D = 1\text{ mA}$, Referenced to 25°C		15		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 40\text{ V}, T_J = 25^\circ\text{C}$			10	μA
		$V_{DS} = 40\text{ V}, T_J = 125^\circ\text{C}$			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	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 20\text{ A}, T_J = 25^\circ\text{C}$		2.03	2.35	m Ω
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 60\text{ }\mu\text{A}, T_J = 25^\circ\text{C}$	2.5		3.5	V
Gate Threshold Voltage Temperature Coefficient	$\Delta V_{GS(TH)} / \Delta T_J$	$V_{GS} = V_{DS}, I_D = 60\text{ }\mu\text{A}$		-7.21		mV/°C
Forward Trans-conductance	g_{FS}	$V_{DS} = 5\text{ V}, I_D = 20\text{ A}$		89.2		S

CHARGES, CAPACITANCES & GATE RESISTANCE

Input Capacitance	C_{ISS}	$V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$		1417		pF
Output Capacitance	C_{OSS}			911		
Reverse Transfer Capacitance	C_{RSS}			15.5		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 10\text{ V}, V_{DD} = 32\text{ V}, I_D = 50\text{ A}$		22.2		nC
Threshold Gate Charge	$Q_{G(TH)}$			4.2		
Gate-to-Source Charge	Q_{GS}			6.7		
Gate-to-Drain Charge	Q_{GD}			4.3		
Gate Resistance	R_G	$f = 1\text{ MHz}$		0.93		Ω

SWITCHING CHARACTERISTICS

Turn-On Delay Time	$t_{d(ON)}$	Resistive Load, $V_{GS} = 0/10\text{ V}, V_{DD} = 32\text{ V},$ $I_D = 50\text{ A}, R_G = 0\text{ }\Omega$		15.2		ns
Rise Time	t_r			5.1		
Turn-Off Delay Time	$t_{d(OFF)}$			23.4		
Fall Time	t_f			4.2		

SOURCE-TO-DRAIN DIODE CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$V_{GS} = 0\text{ V}, I_S = 20\text{ A}, T_J = 25^\circ\text{C}$		0.82		V
		$V_{GS} = 0\text{ V}, I_S = 20\text{ A}, T_J = 125^\circ\text{C}$		0.69		
Reverse Recovery Time	t_{RR}	$V_{GS} = 0\text{ V}, I_S = 50\text{ A},$ $di/dt = 100\text{ A}/\mu\text{s}, V_{DD} = 32\text{ V}$		98		ns
Charge Time	t_a			45		
Discharge Time	t_b			53		
Reverse Recovery Charge	Q_{RR}			245		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.

TYPICAL CHARACTERISTICS

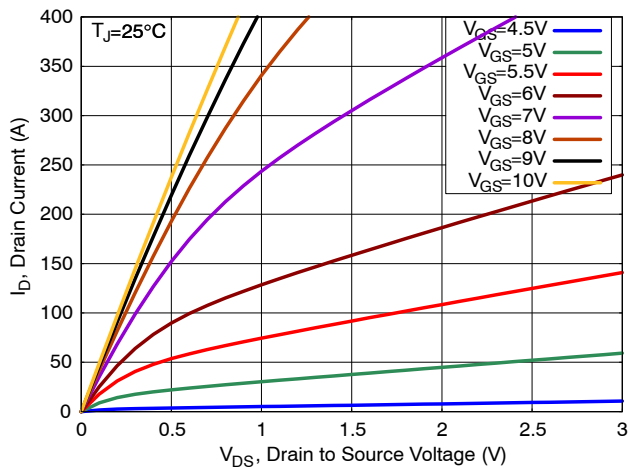


Figure 1. On-Region Characteristics

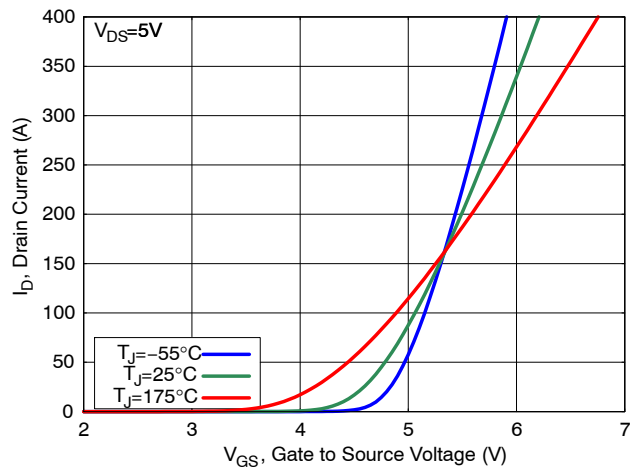


Figure 2. Transfer Characteristics

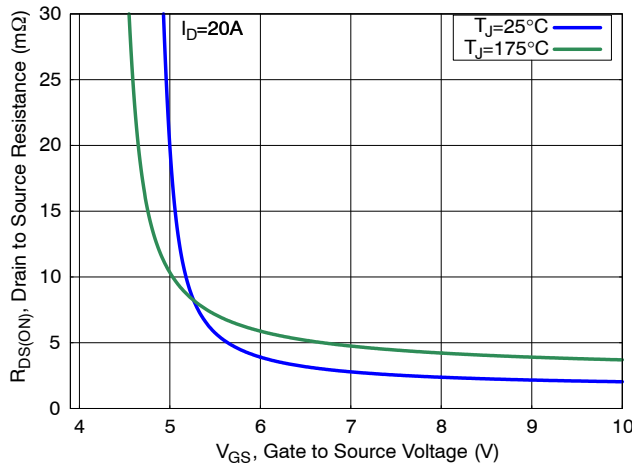


Figure 3. On-Resistance vs. V_{GS}

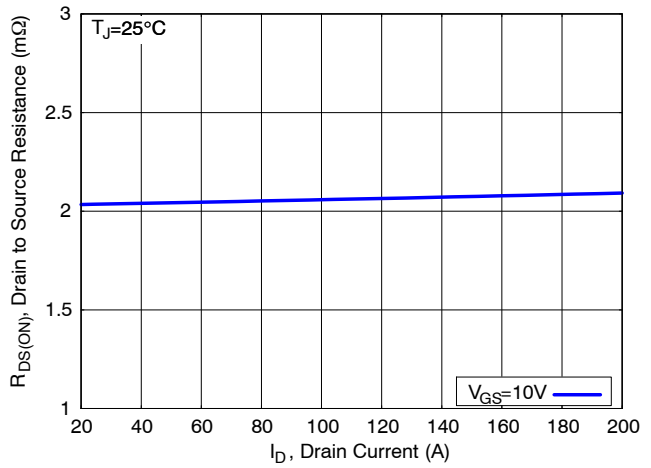


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

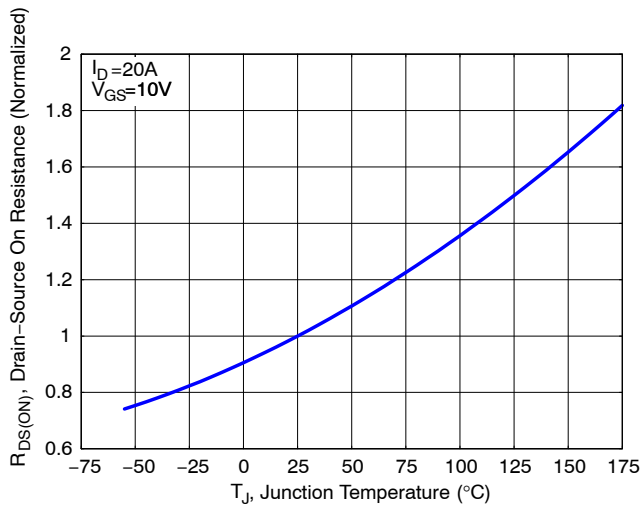


Figure 5. On-Resistance Variation with Temperature

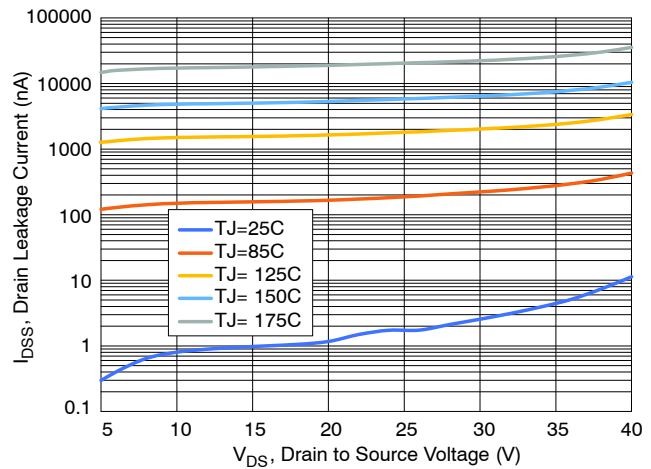


Figure 6. Drain-to-Source Leakage Current vs. Voltage

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TYPICAL CHARACTERISTICS

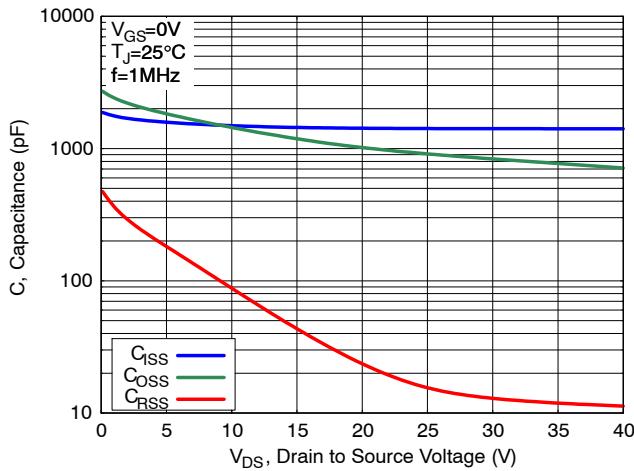


Figure 7. Capacitance Characteristics

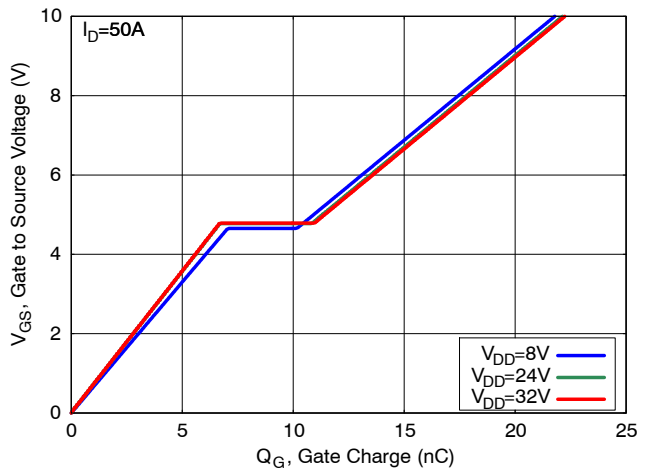


Figure 8. Gate-to-Source Voltage vs. Total Charge

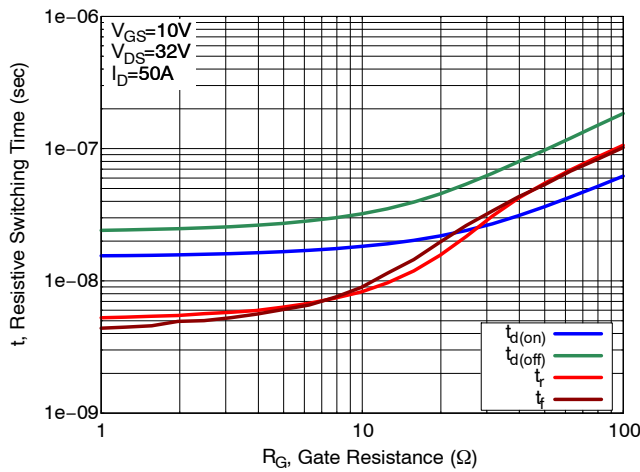


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

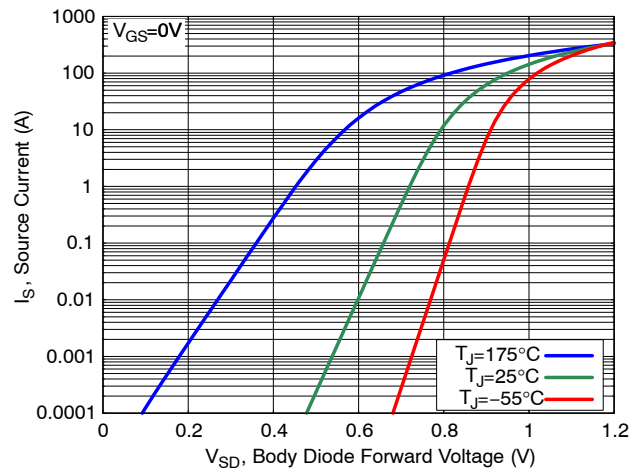


Figure 10. Diode Forward Voltage vs. Current

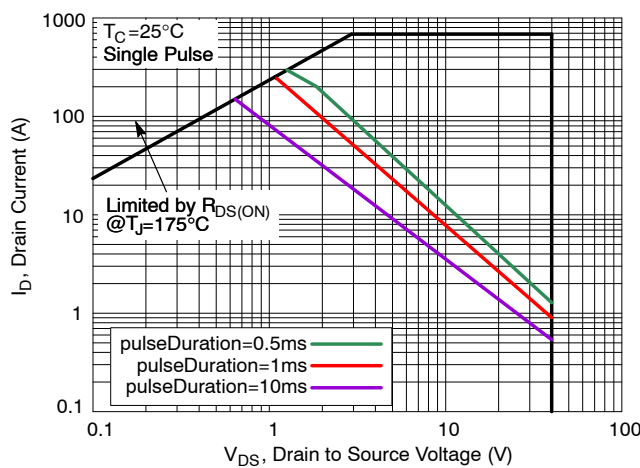


Figure 11. Safe Operating Area (SOA)

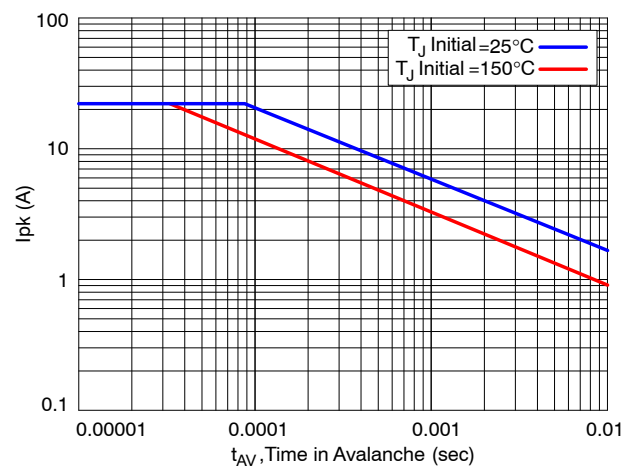


Figure 12. Avalanche Current vs Pulse Time (UIS)

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TYPICAL CHARACTERISTICS

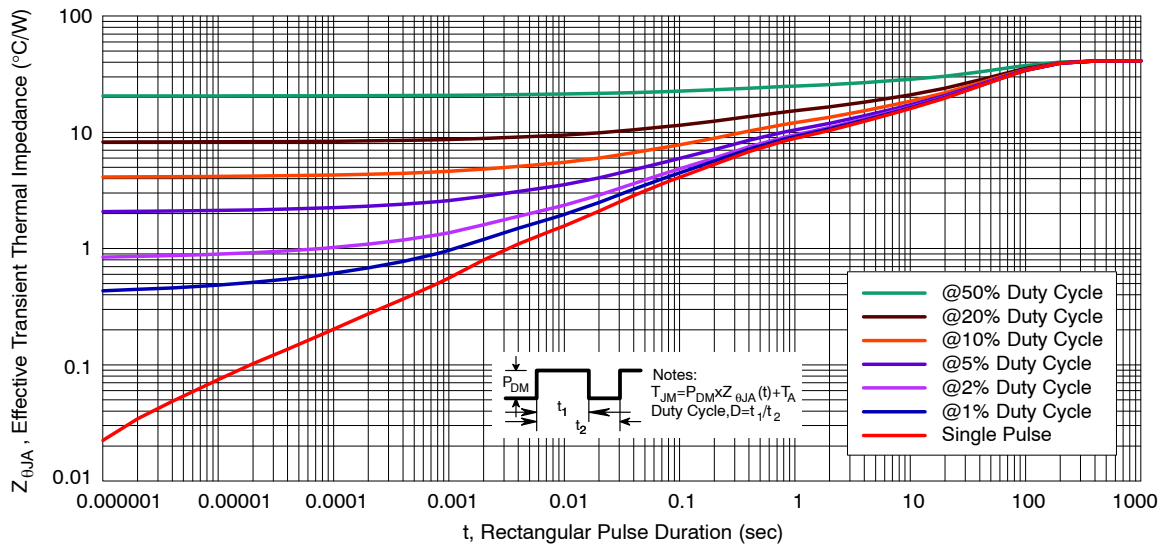


Figure 13. Transient Thermal Response

ORDERING INFORMATION

Device	Marking	Package	Shipping†
NVMFWS2D3N04XMT1G	2D3N4W	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.

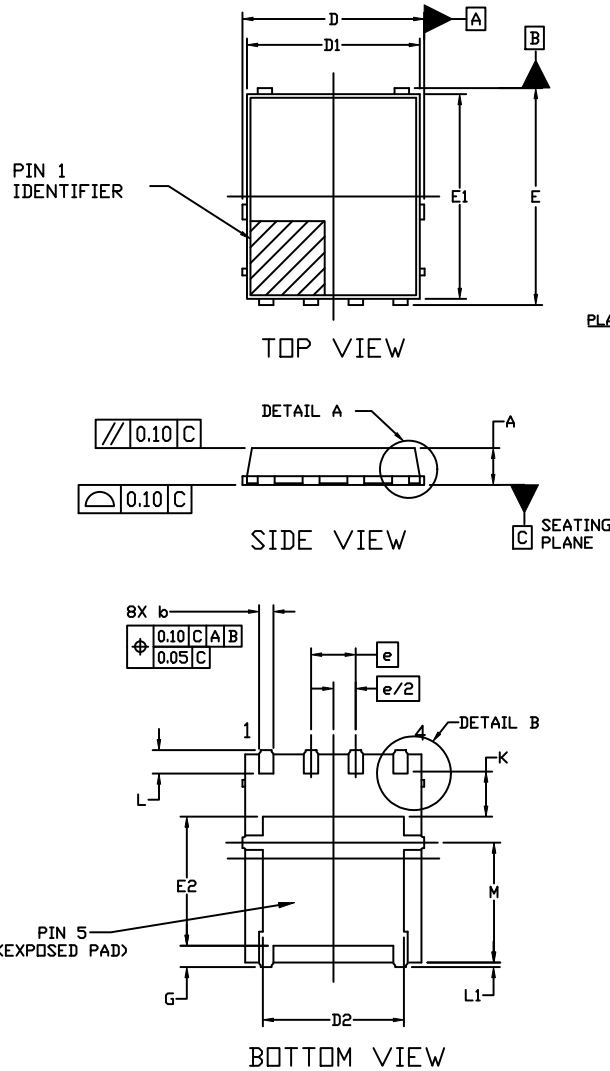
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PACKAGE DIMENSIONS

DFNW5 5x6 (FULL-CUT SO8FL WF)

CASE 507BA

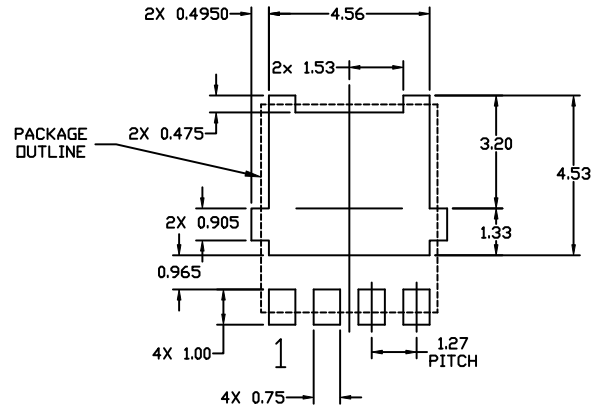
ISSUE A



NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS
3. DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.
4. THIS PACKAGE CONTAINS WETTABLE FLANK DESIGN FEATURES TO AID IN FILLET FORMATION ON THE LEADS DURING MOUNTING.

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	0.150 REF		
M	3.00	3.40	3.80
θ	0°	---	12°



- * 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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