

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

40 V, 3.1 mΩ, 94 A

NVMFWS2D9N04XM

Features

- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Capacitance to Minimize Driver Losses
- Small Footprint (5 x 6 mm) with Compact Design
- AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

Applications

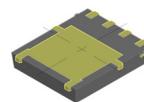
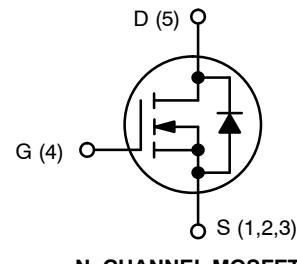
- Motor Drive
- Battery Protection
- Synchronous Rectification

MAXIMUM RATINGS (T_J = 25°C unless otherwise noted)

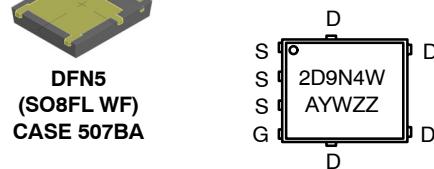
Parameter	Symbol	Value	Unit
Drain-to-Source Voltage	V _{DSS}	40	V
Gate-to-Source Voltage	V _{GS}	±20	V
Continuous Drain Current	T _C = 25°C	I _D	A
		66	
Power Dissipation	P _D	50	W
Continuous Drain Current R _{θJA}	T _A = 25°C	I _D	A
		18	
Pulsed Drain Current	I _{DM}	440	A
Operating Junction and Storage Temperature Range	T _J , T _{stg}	-55 to 175	°C
Source Current (Body Diode)	I _S	42	A
Single Pulse Drain-to-Source Avalanche Energy (I _{L(pk)} = 4.6 A)	E _{AS}	133	mJ
Lead Temperature Soldering Reflow for Soldering Purposes (1/8" from case for 10 s)	T _L	260	°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) MAX}	I _{D MAX}
40 V	3.1 mΩ @ 10 V	94 A



MARKING DIAGRAM



2D9N4W = 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.

THERMAL RESISTANCE RATINGS

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case (Note 2)	$R_{\theta JC}$	3	°C/W
Thermal Resistance, Junction-to-Ambient (Notes 1, 2)	$R_{\theta JA}$	41.6	

1. Surface-mounted on FR4 board using 650 mm², 2 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.

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	$\Delta V_{(BR)DSS}/\Delta T_J$	$I_D = 1 \text{ mA}, \text{Referenced to } 25^\circ\text{C}$		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}	$V_{DS} = 0 \text{ V}, V_{GS} = 20 \text{ V}$			100	nA

ON CHARACTERISTICS

Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 10 \text{ V}, I_D = 20 \text{ A}, T_J = 25^\circ\text{C}$		2.7	3.1	$\text{m}\Omega$
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 40 \mu\text{A}, T_J = 25^\circ\text{C}$	2.5		3.5	V
Gate Threshold Voltage Temperature Coefficient	$\Delta V_{GS(TH)}/\Delta T_J$	$V_{GS} = V_{DS}, I_D = 40 \mu\text{A}$		-7.2		mV/°C
Forward Transconductance	g_{FS}	$V_{DS} = 5 \text{ V}, I_D = 20 \text{ A}$		79.6		S

CHARGES & CAPACITANCES

Input Capacitance	C_{ISS}	$V_{DS} = 25 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHz}$		1000		pF
Output Capacitance	C_{OSS}			645		
Reverse Transfer Capacitance	C_{RSS}			12.3		
Total Gate Charge	$Q_{G(TOT)}$	$V_{DD} = 32 \text{ V}, I_D = 50 \text{ A}, V_{GS} = 10 \text{ V}$		15.7		nC
Threshold Gate Charge	$Q_{G(TH)}$			2.9		
Gate-to-Source Charge	Q_{GS}			4.8		
Gate-to-Drain Charge	Q_{GD}			3		
Gate Resistance	R_G	$f = 1 \text{ MHz}$		1		Ω

SWITCHING CHARACTERISTICS (Note 3)

Turn-On Delay Time	$t_{d(ON)}$	Resistive Load, $V_{GS} = 0/10 \text{ V}, V_{DD} = 32 \text{ V}, I_D = 50 \text{ A}, R_G = 0 \Omega$		13.1		ns
Rise Time	t_r			4.5		
Turn-Off Delay Time	$t_{d(OFF)}$			19.8		
Fall Time	t_f			3.8		

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$V_{GS} = 0 \text{ V}, I_S = 20 \text{ A}, T_J = 25^\circ\text{C}$		0.84	1.2	V
		$V_{GS} = 0 \text{ V}, I_S = 20 \text{ A}, T_J = 125^\circ\text{C}$		0.7		
Reverse Recovery Time	t_{RR}	$V_{GS} = 0 \text{ V}, I_S = 50 \text{ A}, di/dt = 100 \text{ A}/\mu\text{s}, V_{DD} = 32 \text{ V}$		107		ns
Charge Time	t_a			38		
Discharge Time	t_b			69		
Reverse Recovery Time	Q_{RR}			391		

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. Switching characteristics are independent of operating junction temperatures

TYPICAL CHARACTERISTICS

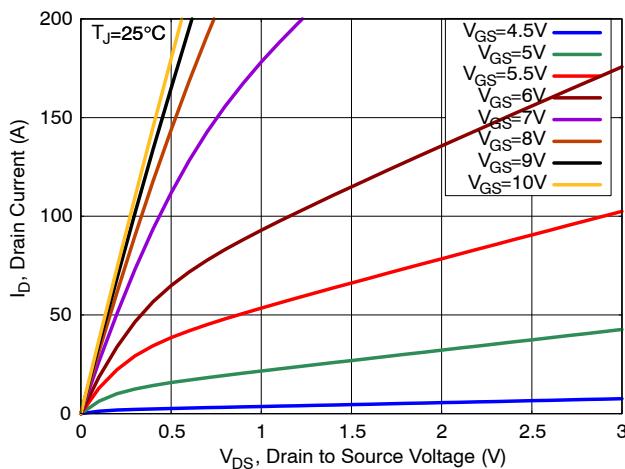


Figure 1. On-Region Characteristics

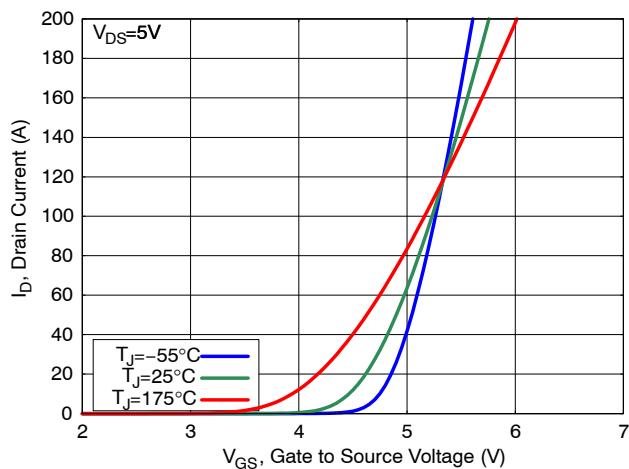


Figure 2. Transfer Characteristics

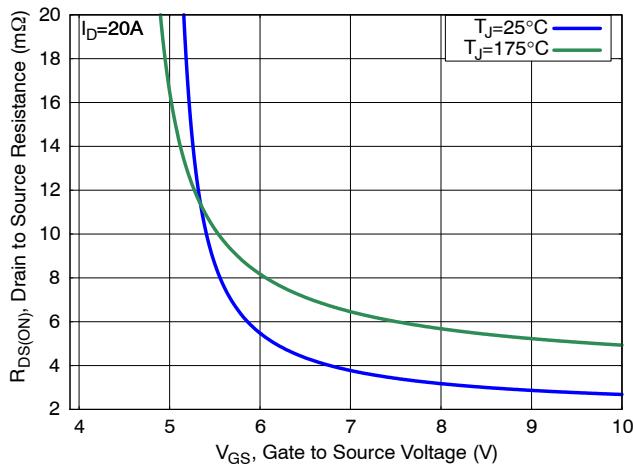


Figure 3. On-Resistance vs. Gate Voltage

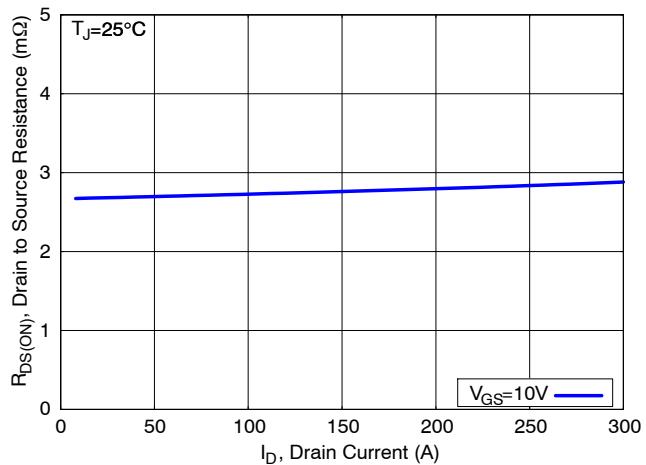


Figure 4. On-Resistance vs. Drain Current

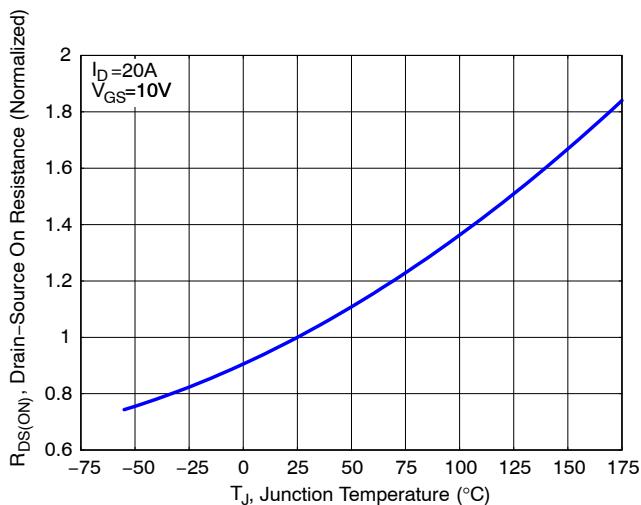


Figure 5. Normalized ON Resistance vs. Junction Temperature

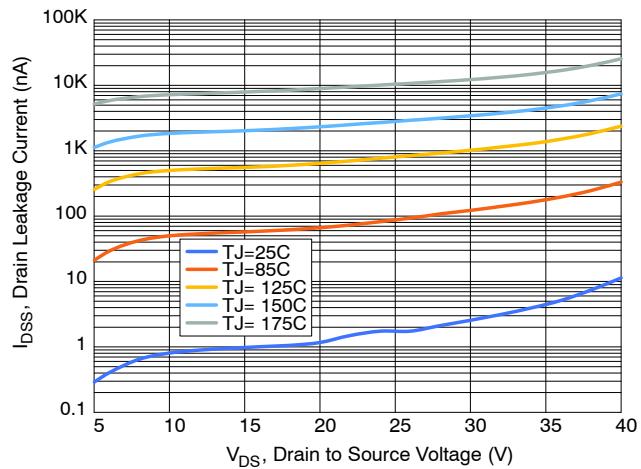
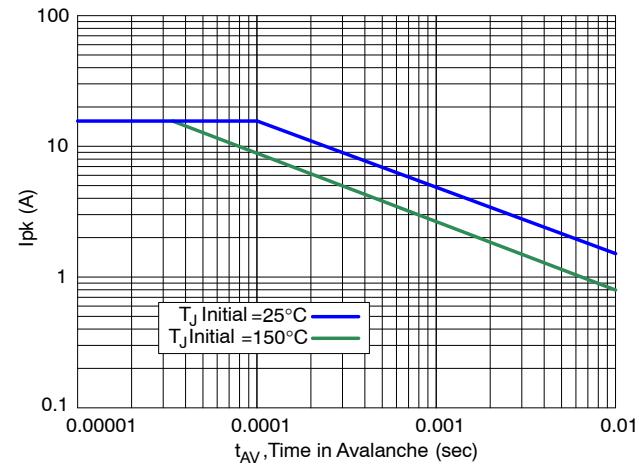
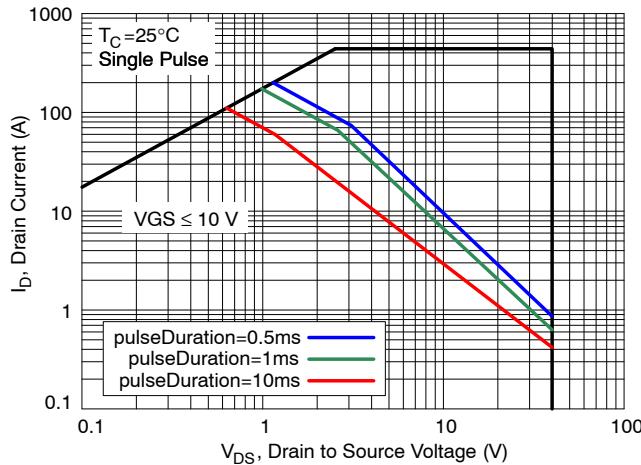
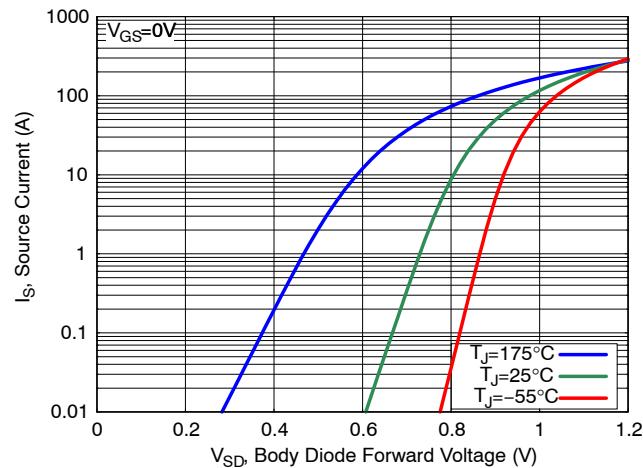
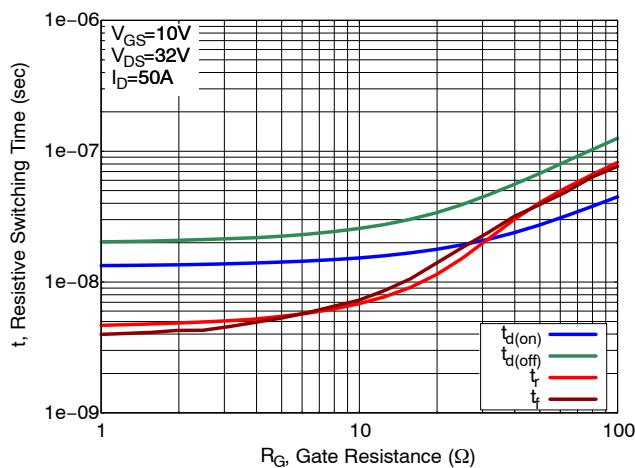
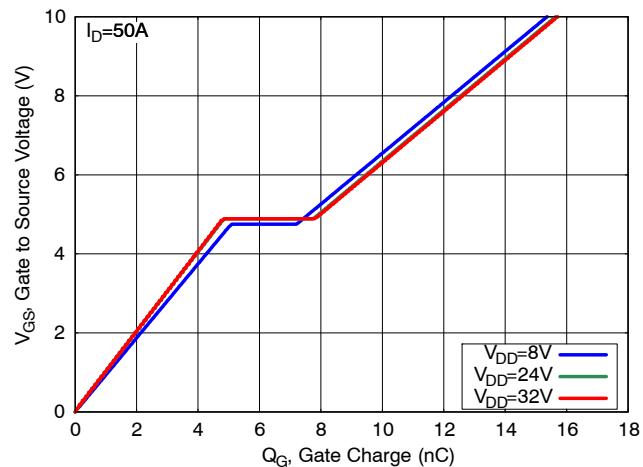
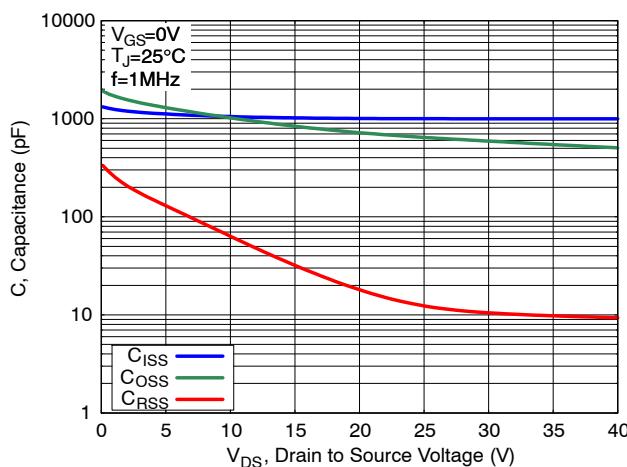


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS



TYPICAL CHARACTERISTICS

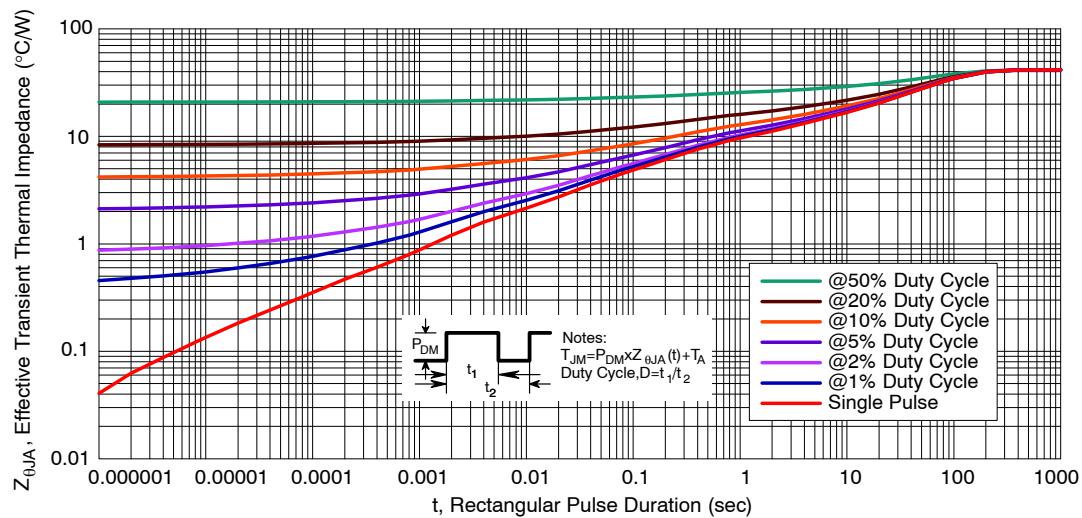
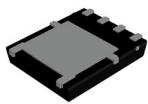


Figure 13. Transient Thermal Response

DEVICE ORDERING INFORMATION

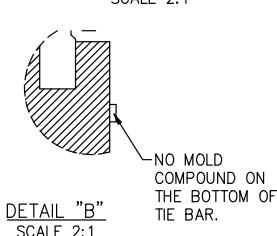
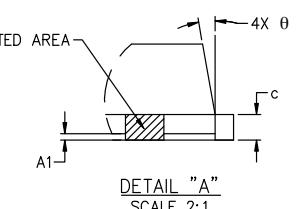
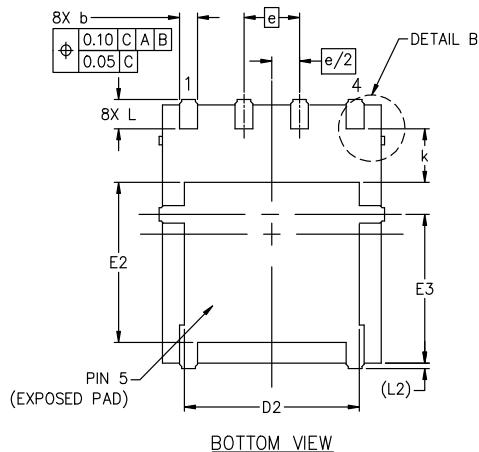
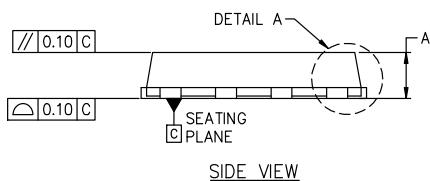
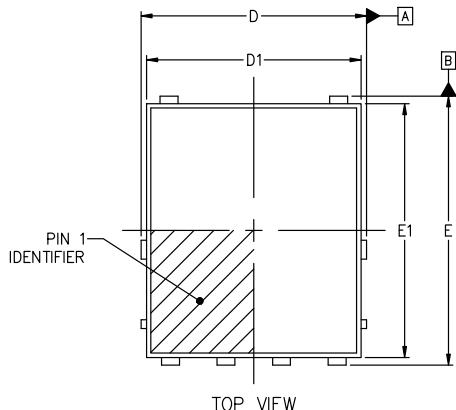
Device	Marking	Package	Shipping [†]
NVMFWS2D9N04XMT1G	2D9N4W	DFNW5 (Pb-Free)	1500 / Tape & Reel

[†]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.



DFNW5 4.90x5.90x1.00, 1.27P
CASE 507BA
ISSUE C

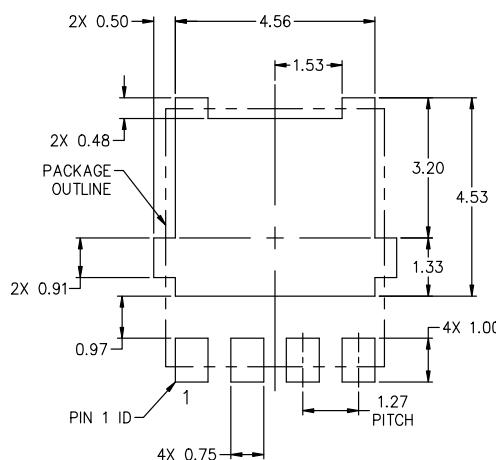
DATE 19 SEP 2024



NOTES:

1. DIMENSIONING AND TOLERANCING CONFORM TO ASME Y14.5M-2018.
2. ALL DIMENSIONS ARE IN 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.

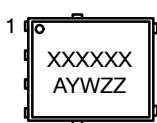
DIM	MILLIMETERS		
	MIN	NOM	MAX
A	0.90	1.00	1.10
A1	0.00	---	0.05
b	0.33	0.41	0.51
c	0.23	0.28	0.33
D	5.00	5.15	5.30
D1	4.70	4.90	5.10
D2	3.80	4.00	4.20
E	6.00	6.15	6.30
E1	5.70	5.90	6.10
E2	3.45	3.65	3.85
E3	3.00	3.40	3.80
e		1.27 BSC	
k	1.20	1.35	1.50
L	0.51	0.57	0.71
L2		0.15 REF.	
θ	0°	6°	12°



RECOMMENDED MOUNTING FOOTPRINT*

*FOR ADDITIONAL INFORMATION ON OUR Pb-FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ONSEMI SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.

**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.

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DESCRIPTION:	DFNW5 4.90x5.90x1.00, 1.27P	PAGE 1 OF 1

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