

MOSFET - Power, Single N-Channel, STD Gate, SO8-FL

40 V, 0.42 mΩ, 509 A

NVMFWS0D4N04XM

Features

- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Capacitance to Minimize Driver Losses
- Small Footprint (5x6 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 ($T_J = 25^\circ\text{C}$ unless otherwise stated)

Parameter	Symbol	Value	Unit
Drain-to-Source Voltage	V_{DSS}	40	V
Gate-to-Source Voltage	V_{GS}	± 20	V
Continuous Drain Current	I_D	$T_C = 25^\circ\text{C}$	509
		$T_C = 100^\circ\text{C}$	360
Power Dissipation	$T_C = 25^\circ\text{C}$	P_D	197
Pulsed Drain Current	$T_A = 25^\circ\text{C}$, $t_p = 10 \mu\text{s}$	I_{DM}	900
Pulsed Source Current (Body Diode)		I_{SM}	900
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 to +175	$^\circ\text{C}$
Source Current (Body Diode)	I_S	311	A
Single Pulse Avalanche Energy	$I_{PK} = 38.6 \text{ A}$	E_{AS}	2396
Lead Temperature for Soldering Purposes (1/8" from case for 10 s)	T_L	260	$^\circ\text{C}$

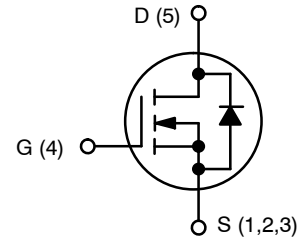
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

THERMAL CHARACTERISTICS

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case (Note 2)	$R_{\theta JC}$	0.76	$^\circ\text{C/W}$
Thermal Resistance, Junction-to-Ambient (Notes 1, 2)	$R_{\theta JA}$	38.2	

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.

$V_{(BR)DSS}$	$R_{DS(on)}$ MAX	I_D MAX
40 V	0.42 mΩ @ 10 V	509 A

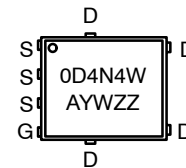


N-CHANNEL MOSFET



DFNW5 (SO-8FL WF)
CASE 507BD

MARKING DIAGRAM



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

ORDERING INFORMATION

See detailed ordering, marking and shipping information in the package dimensions section on page 2 of this data sheet.

NVMFWS0D4N04XM

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified)

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Drain-to-Source Breakdown Voltage	V _{(BR)DSS}	V _{GS} = 0 V, I _D = 250 μA, T _J = 25°C	40			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	ΔV _{(BR)DSS} /ΔT _J	I _D = 250 μA, Referenced to 25°C		14.9		mV/°C
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = 40 V, T _J = 25°C			1	μA
		V _{DS} = 40 V, T _J = 125°C			80	
Gate-to-Source Leakage Current	I _{GSS}	V _{GS} = 20 V, V _{DS} = 0 V			100	nA

ON CHARACTERISTICS

Drain-to-Source On Resistance	R _{DS(ON)}	V _{GS} = 10 V, I _D = 50 A, T _J = 25°C		0.33	0.42	mΩ
Gate Threshold Voltage	V _{GS(TH)}	V _{GS} = V _{DS} , I _D = 330 μA, T _J = 25°C	2.5	3	3.5	V
Gate Threshold Voltage Temperature Coefficient	ΔV _{GS(TH)} /ΔT _J	V _{GS} = V _{DS} , I _D = 330 μA		-7.21		mV/°C
Forward Trans-conductance	g _{FS}	V _{DS} = 5 V, I _D = 50 A		286		S

CHARGES, CAPACITANCES & GATE RESISTANCE

Input Capacitance	C _{ISS}	V _{DS} = 25 V, V _{GS} = 0 V, f = 1 MHz		8530		pF
Output Capacitance	C _{OSS}			5451		
Reverse Transfer Capacitance	C _{RSS}			72		
Total Gate Charge	Q _{G(TOT)}	V _{DD} = 32 V, I _D = 50 A, V _{GS} = 10 V		132		nC
Threshold Gate Charge	Q _{G(TH)}			24.9		
Gate-to-Source Charge	Q _{GS}			37.2		
Gate-to-Drain Charge	Q _{GD}			23.7		
Gate Resistance	R _G	f = 1 MHz		0.42		Ω

SWITCHING CHARACTERISTICS

Turn-On Delay Time	t _{d(ON)}	Resistive Load, V _{GS} = 0/10 V, V _{DD} = 32 V, I _D = 50 A, R _G = 0 Ω		9.98		ns
Rise Time	t _r			5.49		
Turn-Off Delay Time	t _{d(OFF)}			15.5		
Fall Time	t _f			8.41		

SOURCE-TO-DRAIN DIODE CHARACTERISTICS

Forward Diode Voltage	V _{SD}	I _S = 50 A, V _{GS} = 0 V, T _J = 25°C		0.79	1.2	V
		I _S = 50 A, V _{GS} = 0 V, T _J = 125°C		0.63		
Reverse Recovery Time	t _{RR}	V _{GS} = 0 V, I _S = 50 A, di/dt = 100 A/μs, V _{DD} = 32 V		148		ns
Charge Time	t _a			47.3		
Discharge Time	t _b			101		
Reverse Recovery Charge	Q _{RR}			337		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.

DEVICE ORDERING INFORMATION

Device	Marking	Package	Shipping [†]
NVMFWS0D4N04XMT1G	0D4N4W	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.

TYPICAL CHARACTERISTICS

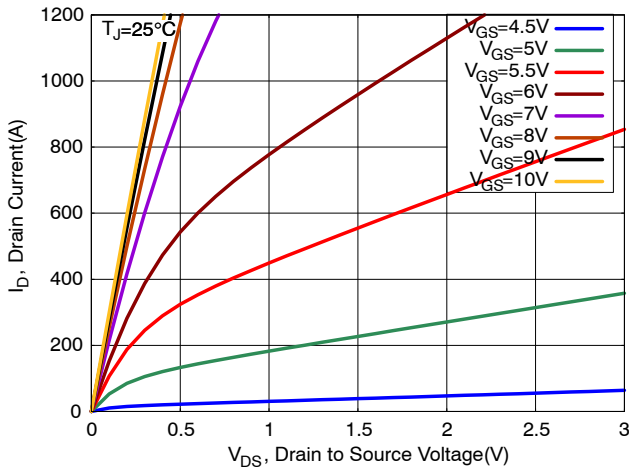


Figure 1. On-Region Characteristics

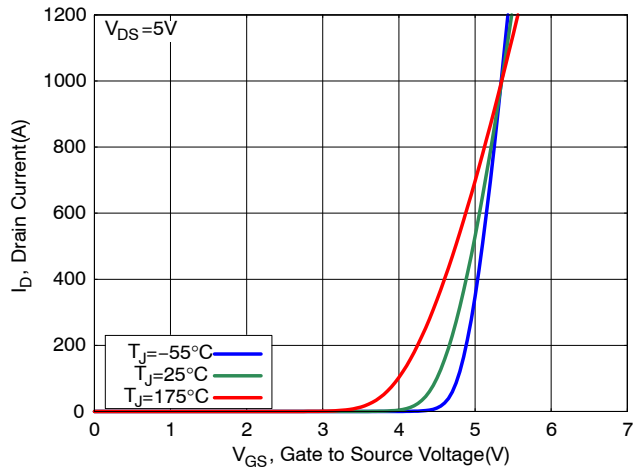


Figure 2. Transfer Characteristics

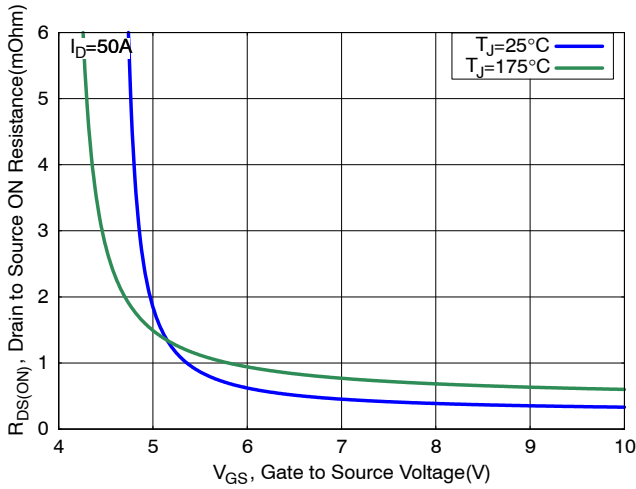


Figure 3. On-Resistance vs. Gate Voltage

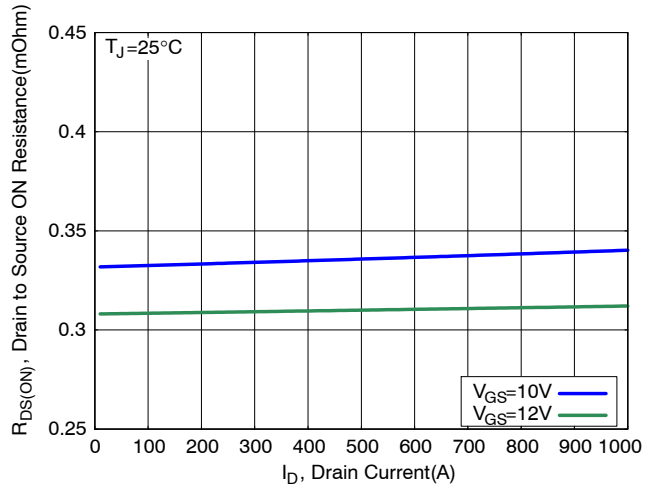


Figure 4. On-Resistance vs. Drain Current

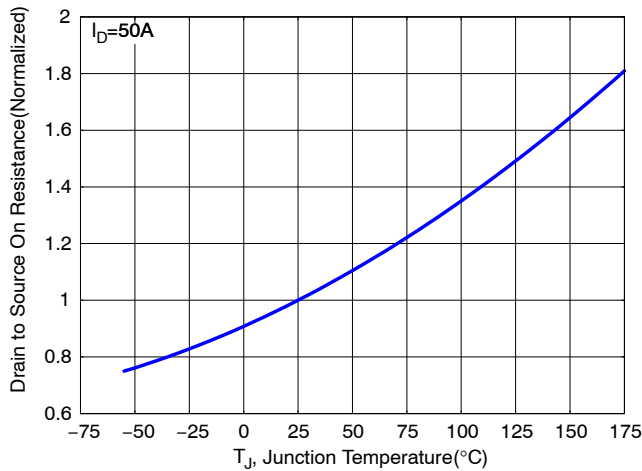


Figure 5. Normalized ON Resistance vs. Junction Temperature

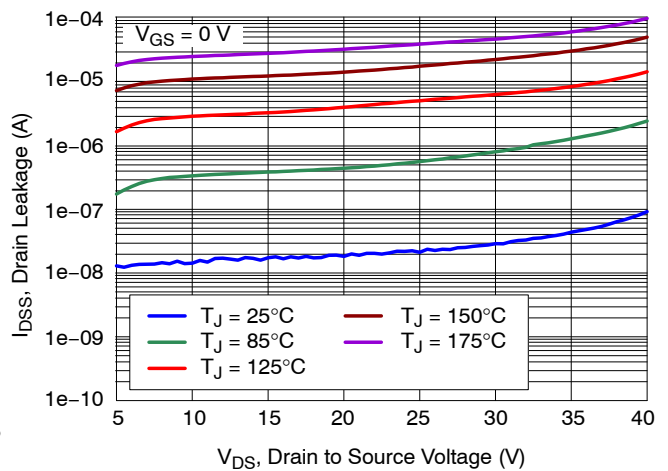


Figure 6. Drain to Source Voltage vs. Drain Leakage

NVMFWS0D4N04XM

TYPICAL CHARACTERISTICS (Continued)

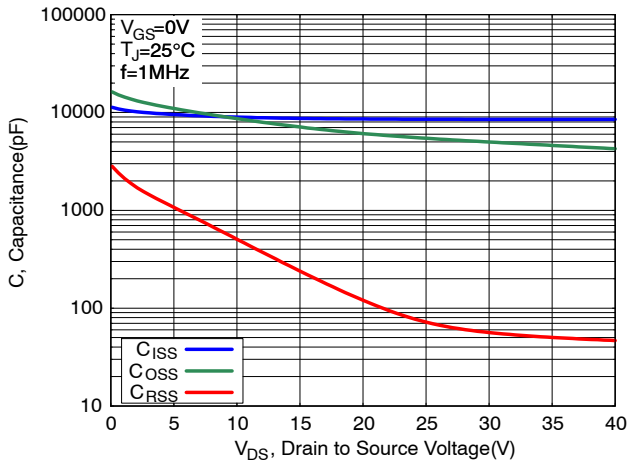


Figure 7. Capacitance Characteristics

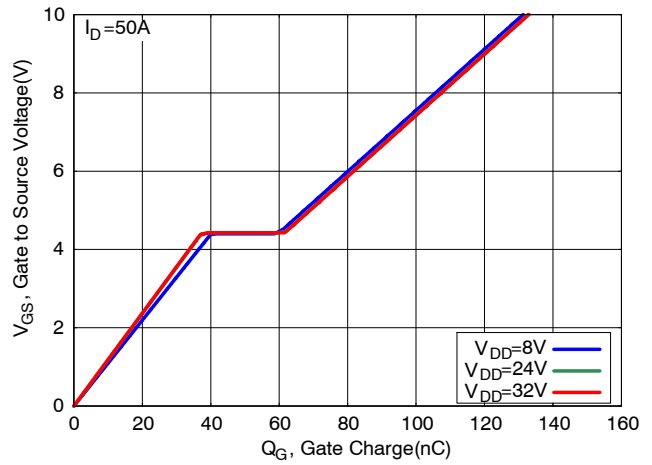


Figure 8. Gate Charge Characteristics

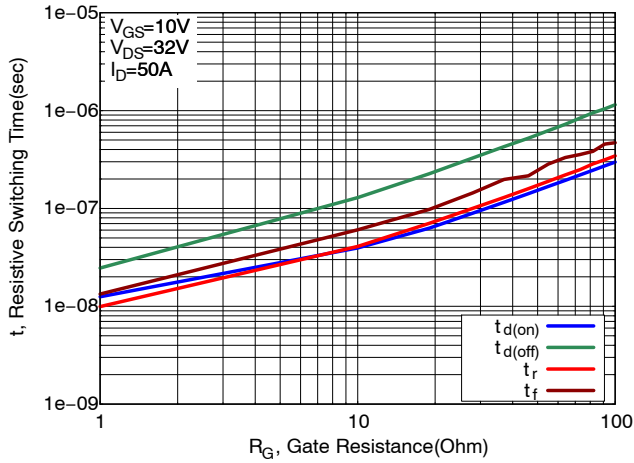


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

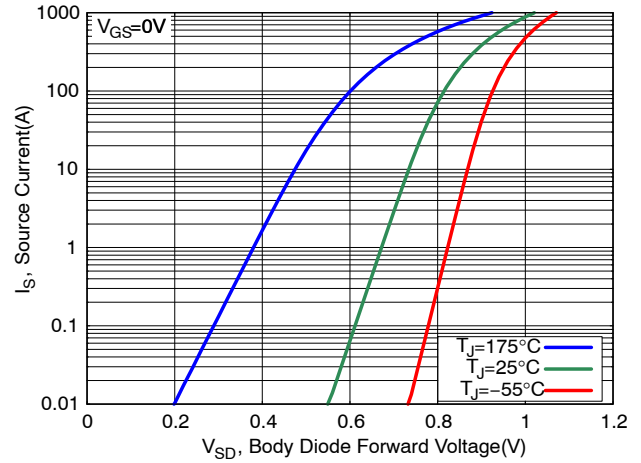


Figure 10. Diode Forward Characteristics

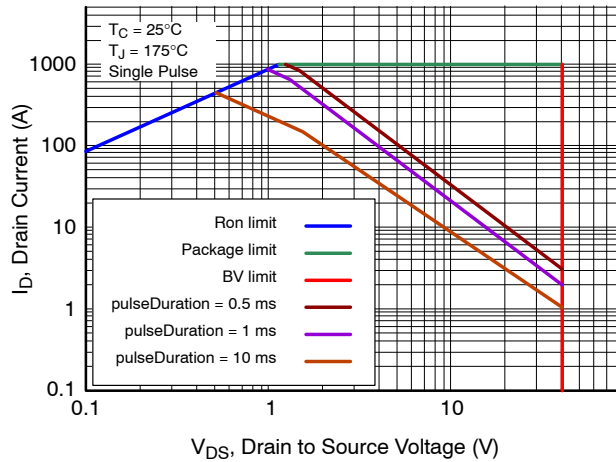


Figure 11. Safe Operating Area (SOA)

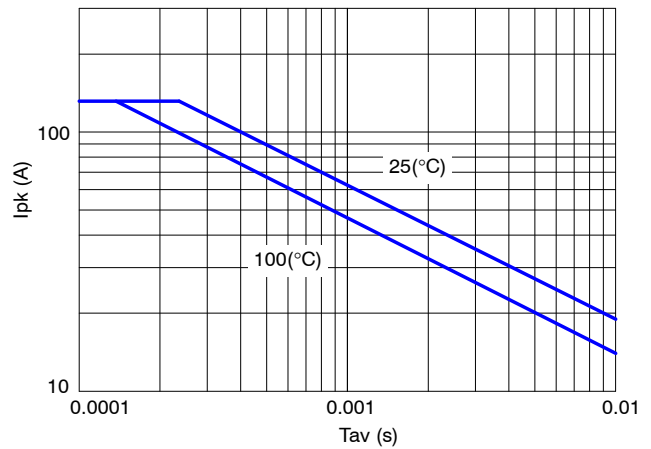


Figure 12. Avalanche Current vs. Pulse Time (UIS)

NVMFWS0D4N04XM

TYPICAL CHARACTERISTICS (Continued)

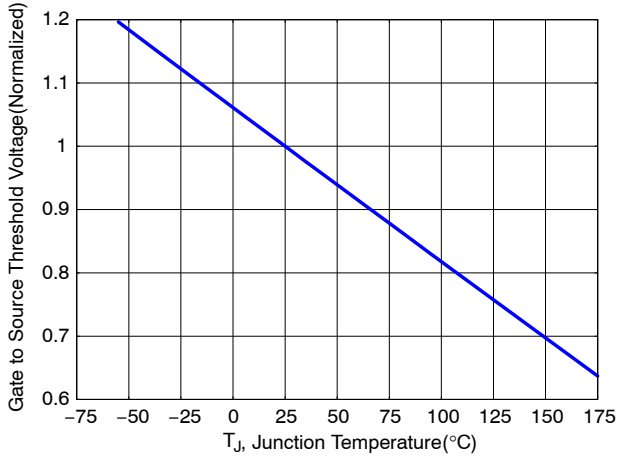


Figure 13. Gate Threshold Voltage vs. Junction Temperature

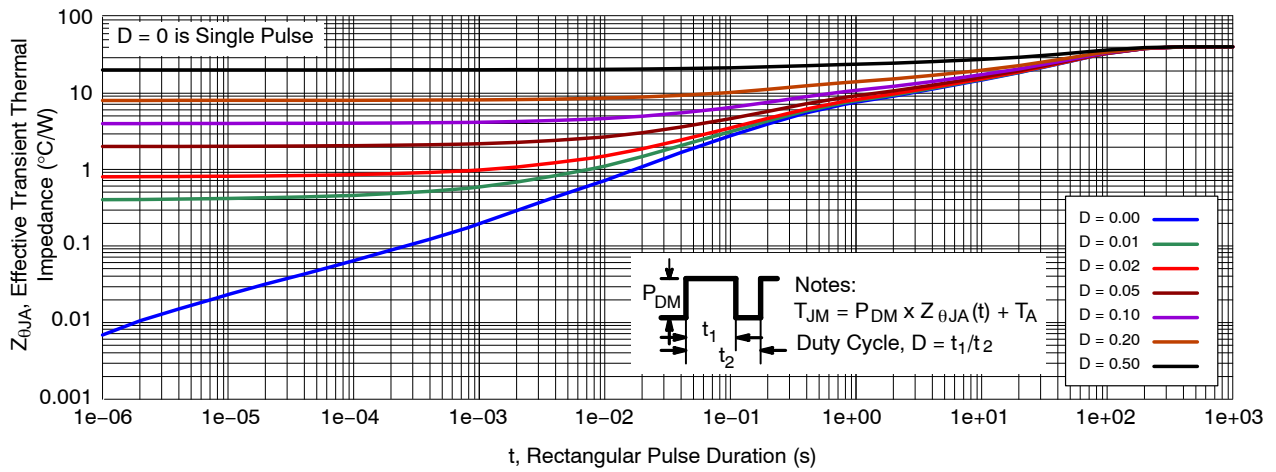


Figure 14. Thermal Response

MECHANICAL CASE OUTLINE

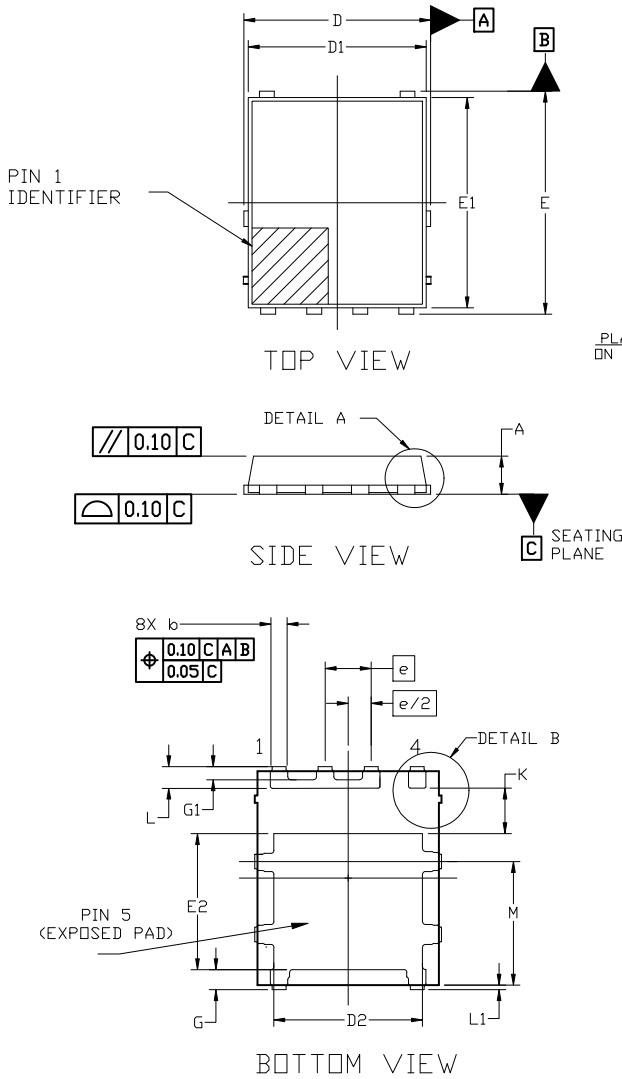
PACKAGE DIMENSIONS

ON Semiconductor®



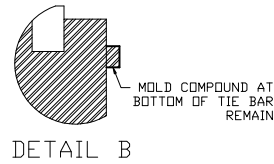
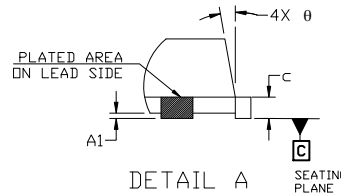
DFNW5 5x6, FULL-CUT SO8FL WF CASE 507BD ISSUE O

DATE 13 APR 2021

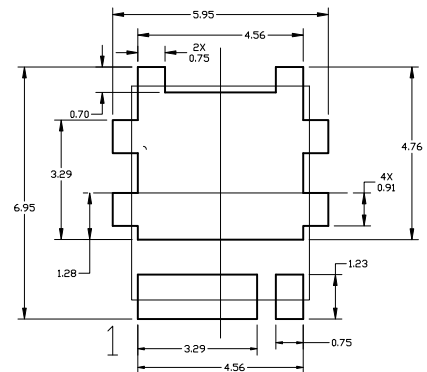


NOTES:

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.



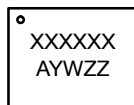
DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.90	1.00	1.10
A1	0.00	---	0.05
b	0.33	0.41	0.51
c	0.23	0.28	0.33
D	5.00	5.15	5.30
D1	4.80	5.00	5.20
D2	3.90	4.10	4.30
E	6.00	6.15	6.30
E1	5.70	5.90	6.10
E2	3.55	3.75	3.95
e	1.27 BSC		
G	0.50	0.55	0.70
G1	0.26	0.36	0.46
k	1.10	1.25	1.40
L	0.50	0.60	0.70
L1	0.150 REF		
M	3.00	3.40	3.80
θ	0°	---	12°



RECOMMENDED MOUNTING FOOTPRINT

* For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERM/D.

GENERIC MARKING DIAGRAM*



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

*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.

DOCUMENT NUMBER:	98AON31027H	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	DFNW5 5x6, FULL-CUT SO8FL WF	PAGE 1 OF 1

ON Semiconductor and ON are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. ON Semiconductor does not convey any license under its patent rights nor the rights of others.

onsemi, **Onsemi**, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi**'s product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

ADDITIONAL INFORMATION

TECHNICAL PUBLICATIONS:

Technical Library: www.onsemi.com/design/resources/technical-documentation
onsemi Website: www.onsemi.com

ONLINE SUPPORT: www.onsemi.com/support

For additional information, please contact your local Sales Representative at www.onsemi.com/support/sales