

MOSFET - Power, Single N-Channel, STD Gate, μ 8FL 40 V, 1.43 m Ω , 178 A

NVTFWS1D3N04XM

Features

- Low RDS(on) to Minimize Conduction Losses
- Low Capacitance to Minimize Driver Losses
- Small Footprint (3.3 x 3.3 mm) for 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	DC	V _{GS}	±20	V
Continuous Drain Current	T _C = 25°C	I _D	178	A
	T _C = 100°C		126	
Power Dissipation	T _A = 25°C	P _D	83	W
Pulsed Drain Current	T _C = 25°C, t _p = 10 μs	I _{DM}	895	A
Operating Junction and Storage Temperature Range		T _J , T _{stg}	-55 to +175	°C
Source Current (Body Diode)		I _S	71	A
Single Pulse Avalanche Energy (I _{LPK} = 17.2 A)		E _{AS}	281	mJ
Lead Temperature 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.

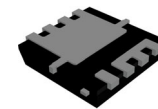
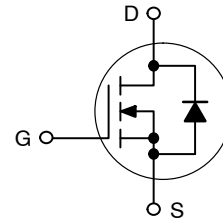
THERMAL CHARACTERISTICS

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case (Note 2)	R _{θJC}	1.8	°C/W
Thermal Resistance, Junction-to-Ambient (Notes 1, 2)	R _{θJA}	46.4	

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.

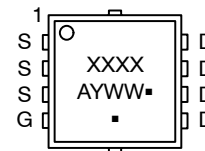
V _{(BR)DSS}	R _{DS(on)} TYP	I _D MAX
40 V	1.43 m Ω @ 10 V	178 A

N-CHANNEL MOSFET



WDFNW8
(μ 8FL)
CASE 515AP

MARKING DIAGRAM



XXXX = Specific Device Code
A = Assembly Location
Y = Year
WW = Work Week
▪ = Pb-Free Package

(Note: Microdot may be in either location)

ORDERING INFORMATION

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

NVTFWS1D3N04XM

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

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
-----------	--------	-----------------	-----	-----	-----	------

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/ $^\circ\text{C}$
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 40\text{ V}, T_J = 25^\circ\text{C}$	–	–	1	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	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 20\text{ A}, T_J = 25^\circ\text{C}$	–	1.24	1.43	m Ω
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS} = V_{DS}, I_D = 90\text{ }\mu\text{A}, T_J = 25^\circ\text{C}$	2.5	3	3.5	V
Gate Threshold Voltage Temperature Coefficient	$\Delta V_{GS(th)} / \Delta T_J$	$V_{GS} = V_{DS}, I_D = 90\text{ }\mu\text{A}$	–	–7.34	–	mV/ $^\circ\text{C}$
Forward Transconductance	g_{FS}	$V_{DS} = 5\text{ V}, I_D = 20\text{ A}$	–	103	–	S

CHARGES, CAPACITANCES & GATE RESISTANCE

Input Capacitance	C_{ISS}	$V_{GS} = 0\text{ V}, V_{DS} = 25\text{ V}, f = 1\text{ MHz}$	–	2288	–	pF
Output Capacitance	C_{OSS}		–	1449	–	
Reverse Transfer Capacitance	C_{RSS}		–	22	–	
Total Gate Charge	$Q_{G(tot)}$	$V_{DD} = 32\text{ V}, I_D = 50\text{ A}, V_{GS} = 10\text{ V}$	–	36	–	nC
Threshold Gate Charge	$Q_{G(th)}$		–	7	–	
Gate-to-Source Charge	Q_{GS}		–	11	–	
Gate-to-Drain Charge	Q_{GD}		–	7	–	
Gate Resistance	R_G	$f = 1\text{ MHz}$	–	0.7	–	Ω

SWITCHING CHARACTERISTICS

Turn-On Delay Time	$t_{d(on)}$	$V_{GS} = 0/10\text{ V}, I_D = 50\text{ A}, V_{DD} = 32\text{ V}, R_G = 0\text{ }\Omega$	–	21	–	ns
Rise Time	t_r		–	8	–	
Turn-Off Delay Time	$t_{d(off)}$		–	34	–	
Fall Time	t_f		–	8	–	

SOURCE-TO-DRAIN DIODE CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$I_S = 20\text{ A}, V_{GS} = 0\text{ V}, T_J = 25^\circ\text{C}$	–	0.79	1.2	V
		$I_S = 20\text{ A}, V_{GS} = 0\text{ V}, T_J = 125^\circ\text{C}$	–	0.64	–	
Reverse Recovery Time	t_{rr}	$V_{GS} = 0\text{ V}, I_S = 50\text{ A}, di/dt = 100\text{ A}/\mu\text{s}, V_{DD} = 32\text{ V}$	–	48	–	ns
Charge Time	t_a		–	20	–	
Discharge Time	t_b		–	28	–	
Reverse Recovery Charge	Q_{RR}		–	48	–	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 PERFORMANCE CHARACTERISTICS

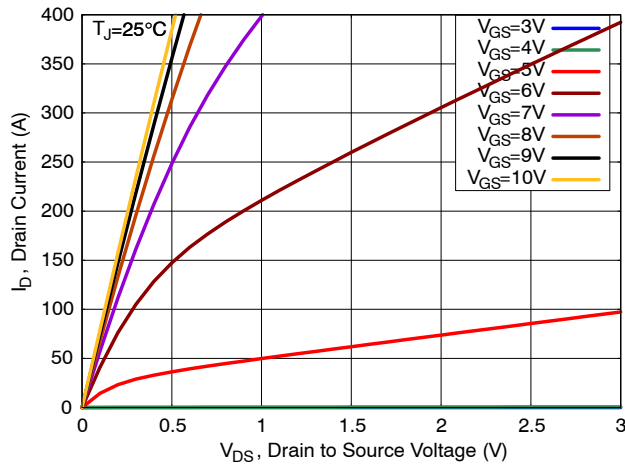


Figure 1. On-Region Characteristics

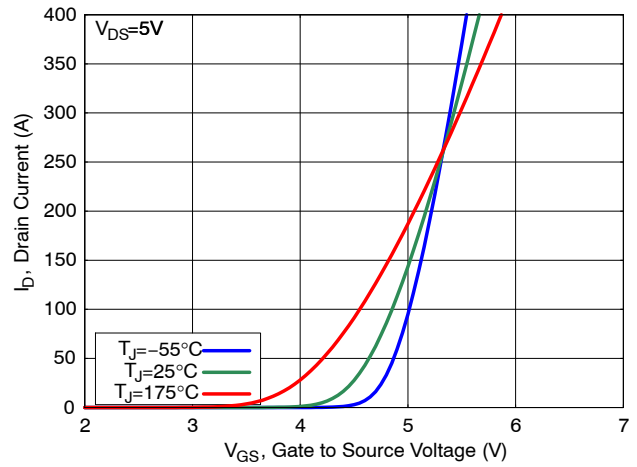


Figure 2. Transfer Characteristics

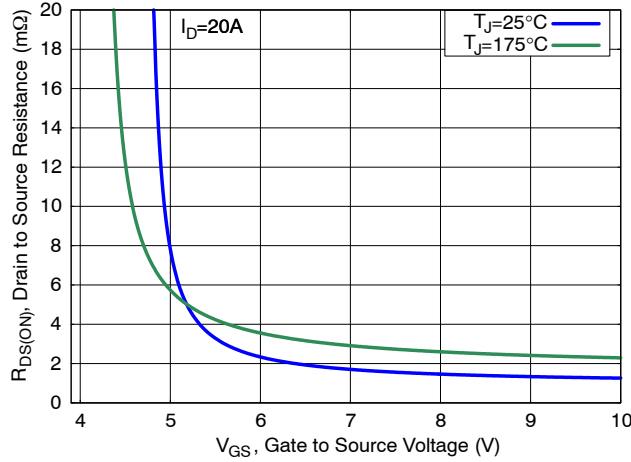


Figure 3. On-Resistance vs. Gate Voltage

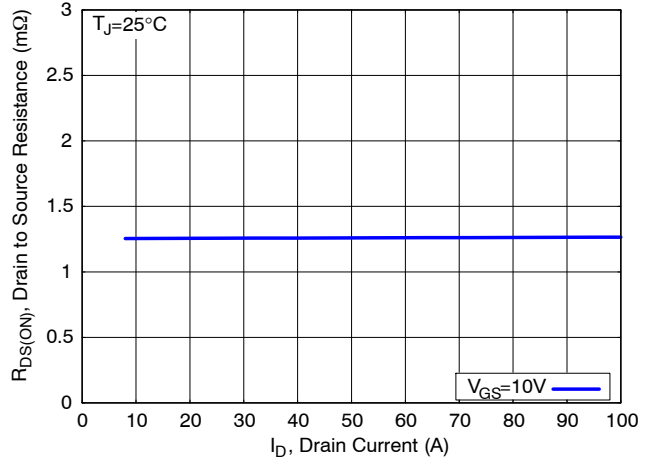


Figure 4. On-Resistance vs. Drain Current

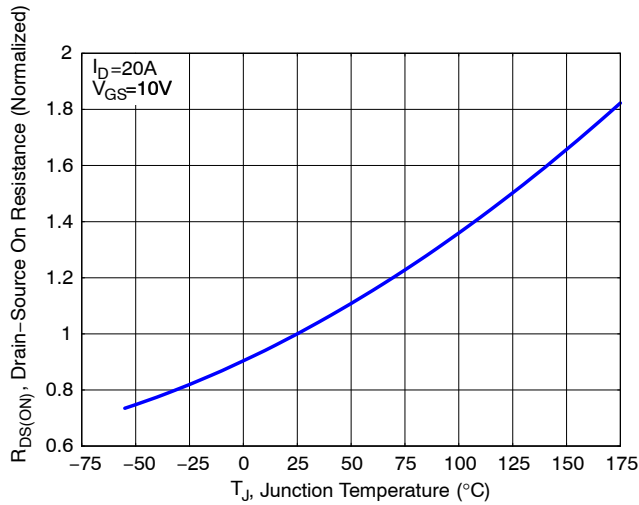


Figure 5. Normalized ON Resistance vs. Junction Temperature

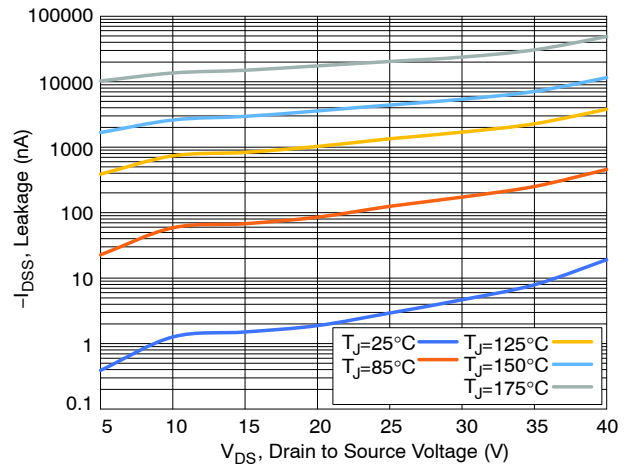


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL PERFORMANCE CHARACTERISTICS

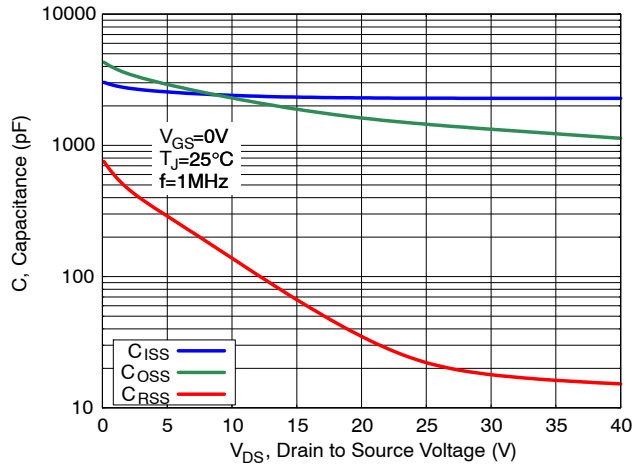


Figure 7. Capacitance Characteristics

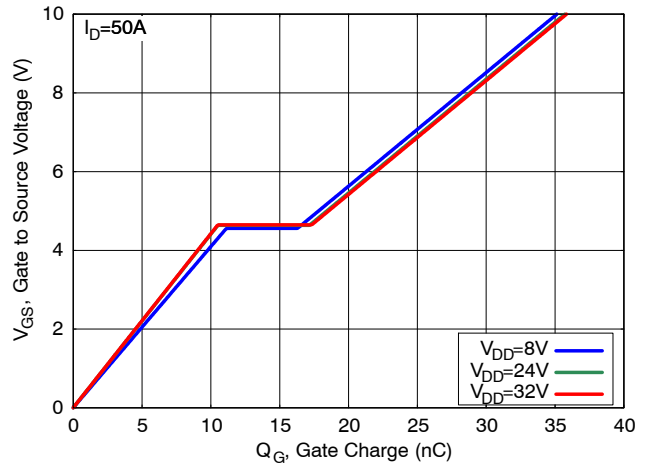


Figure 8. Gate Charge Characteristics

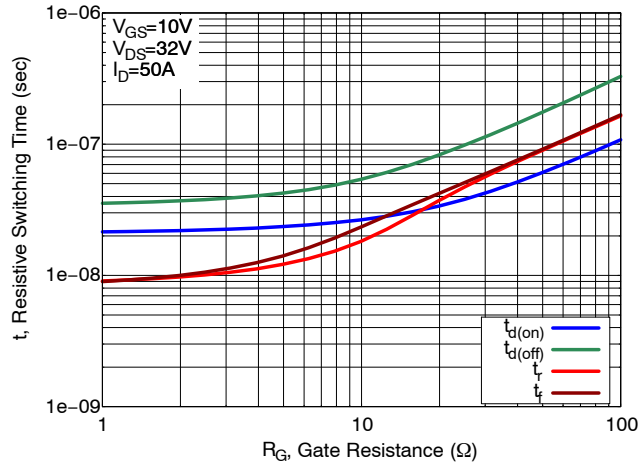


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

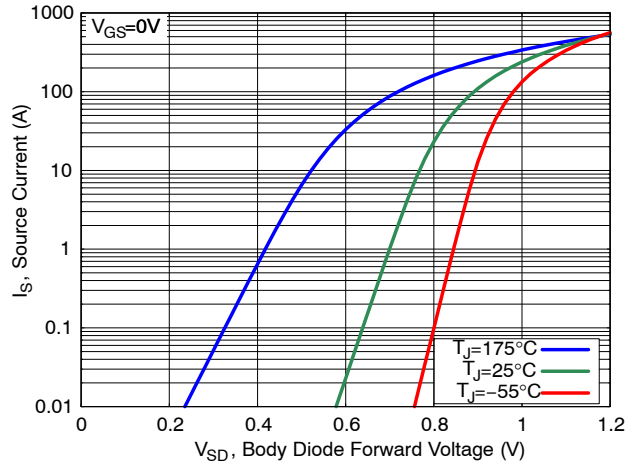


Figure 10. Diode Forward Characteristics

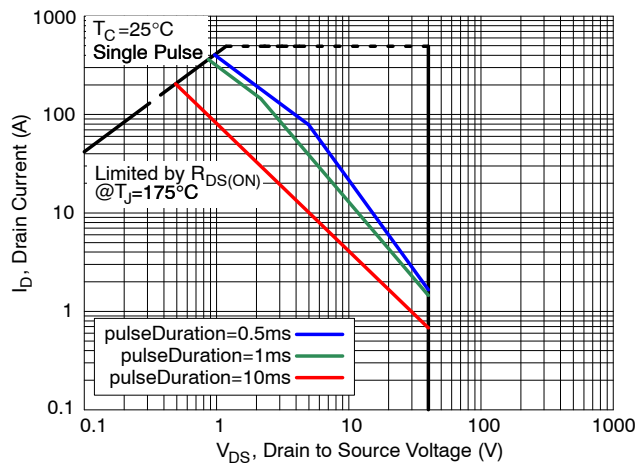


Figure 11. Safe Operating Area (SOA)

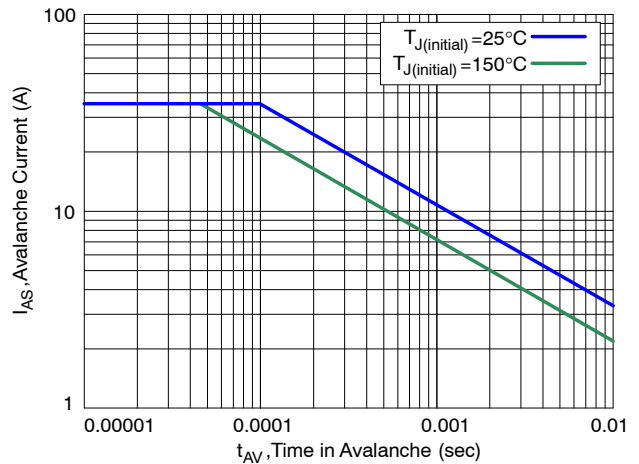


Figure 12. Avalanche Current vs. Pulse Time (UIS)

NVTFWS1D3N04XM

TYPICAL PERFORMANCE CHARACTERISTICS

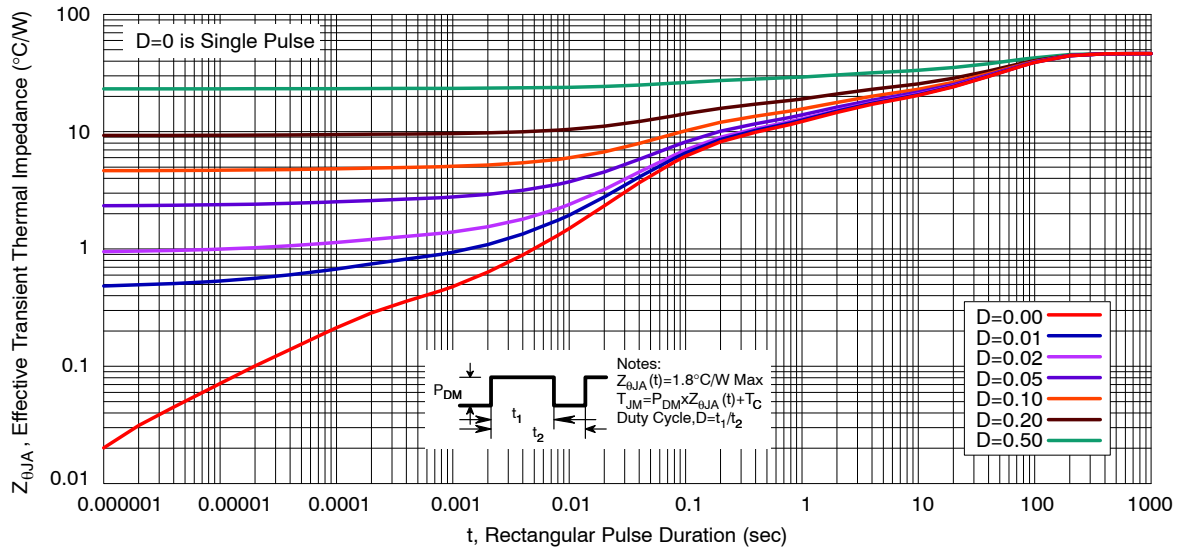
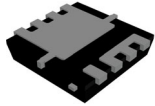


Figure 13. Transient Thermal Response

PACKAGE MARKING AND ORDERING INFORMATION

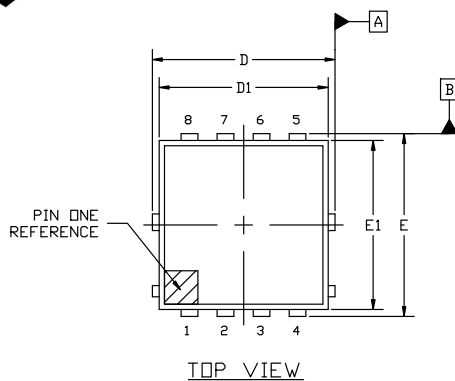
Part Number	Top Marking	Package	Packing Method	Reel Size	Tape Width	Quantity
NVTFWS1D3N04XMTAG	1D3W	WDFNW8	Tape & Reel	N/A	N/A	1500 Units


WDFNW8 3.30x3.30x0.75, 0.65P
CASE 515AP
ISSUE A

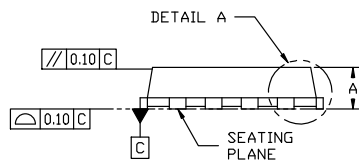
DATE 07 NOV 2023

NOTES:

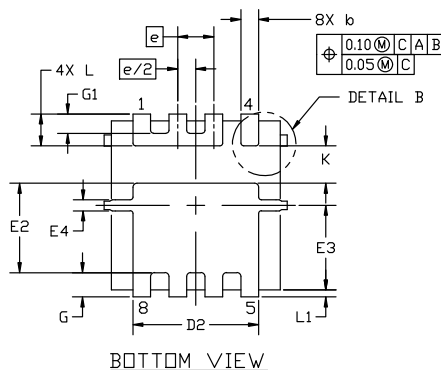
1. DIMENSIONING AND TOLERANCING CONFORM TO ASME Y14.5-2018.
2. ALL DIMENSION ARE IN MILLIMETERS.
3. DIMENSION D1 AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.
4. FULL-CUT u8FL FUSED WF.



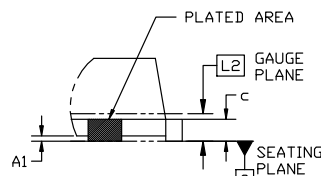
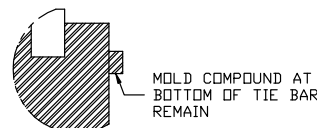
TOP VIEW



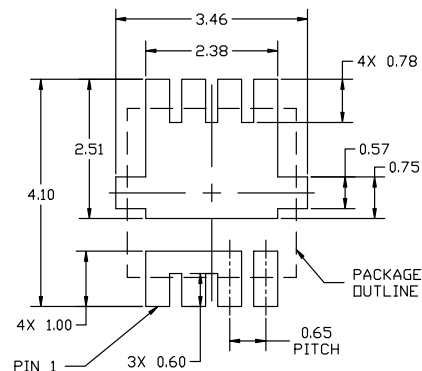
SIDE VIEW



BOTTOM VIEW

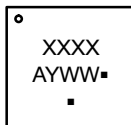

DETAIL "A"
SCALE 2:1

DETAIL "B"
SCALE 2:1

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.70	0.75	0.80
A1	0.00	----	0.05
b	0.23	0.33	0.43
c	0.15	0.20	0.25
D	3.20	3.30	3.40
D1	2.95	3.13	3.30
D2	1.98	2.20	2.40
E	3.20	3.30	3.40
E1	2.80	3.00	3.15
E2	1.40	1.60	1.80
E3	1.35	1.50	1.60
E4	0.15	0.25	0.40
e	0.65 BSC		
G	0.30	0.43	0.55
G1	0.25	0.35	0.45
K	0.55	0.75	0.95
L	0.35	0.52	0.65
L1	0.06	0.15	0.30
L2	0.25 BSC		



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
WW = Work Week
▪ = Pb-Free Package

(Note: Microdot may be in either location)

*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:	98AON24557H	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	WDFNW8 3.30x3.30x0.75, 0.65P	PAGE 1 OF 1

onsemi and onsemi are trademarks of Semiconductor Components Industries, LLC dba onsemi or its subsidiaries in the United States and/or other countries. onsemi reserves the right to make changes without further notice to any products herein. onsemi makes no warranty, representation or guarantee regarding the 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. onsemi 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