MOSFET - Power, Single N-Channel, STD Gate, µ8FL
40 V, 1.43 mΩ, 178 A

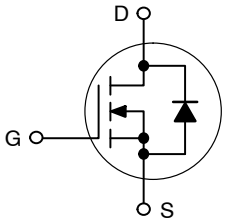
NVTFWS1D3N04XM

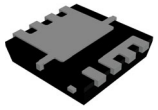
$V_{(BR)DSS}$	$R_{DS(on)}$ TYP	I_D MAX
40 V	1.43 mΩ @ 10 V	178 A

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

N−CHANNEL MOSFET





WDFNW8
(µ8FL)
CASE 515AP

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

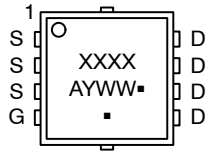
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

THERMAL CHARACTERISTICS

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction−to−Case (Note 2)	$R_{\theta JC}$	1.8	°C/W
Thermal Resistance, Junction−to−Ambient (Notes 1, 2)	$R_{\theta JA}$	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.

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.

ELECTRICAL CHARACTERISTICS (T_J = 25°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 V, I_D = 1 mA, T_J = 25°C	40	–	–	V
Drain−to−Source Breakdown Voltage Temperature Coefficient	$\Delta V_{(BR)DSS}/\Delta T_J$	I_D = 1 mA, Referenced to 25°C	–	15	–	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	–	–	100	
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 = 20 A, T_J = 25°C	–	1.24	1.43	mΩ
Gate Threshold Voltage	$V_{GS(th)}$	V_{GS} = V_{DS}, I_D = 90 μA, T_J = 25°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 μA	–	−7.34	–	mV/°C
Forward Transconductance	g_{FS}	V_{DS} = 5 V, I_D = 20 A	–	103	–	S
CHARGES, CAPACITANCES & GATE RESISTANCE						
Input Capacitance	C_{ISS}	V_{GS} = 0 V, V_{DS} = 25 V, f = 1 MHz	–	2288	–	pF
Output Capacitance	C_{OSS}		–	1449	–	
Reverse Transfer Capacitance	C_{RSS}		–	22	–	
Total Gate Charge	$Q_{G(tot)}$	V_{DD} = 32 V, I_D = 50 A, V_{GS} = 10 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 MHz	–	0.7	–	Ω
SWITCHING CHARACTERISTICS						
Turn-On Delay Time	$t_{d(on)}$	V_{GS} = 0/10 V, I_D = 50 A, V_{DD} = 32 V, R_G = 0 Ω	–	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 A, V_{GS} = 0 V, T_J = 25°C	–	0.79	1.2	V
		I_S = 20 A, V_{GS} = 0 V, T_J = 125°C	–	0.64	–	
Reverse Recovery Time	t_{rr}	V_{GS} = 0 V, I_S = 50 A, dI/dt = 100 A/μs, V_{DD} = 32 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

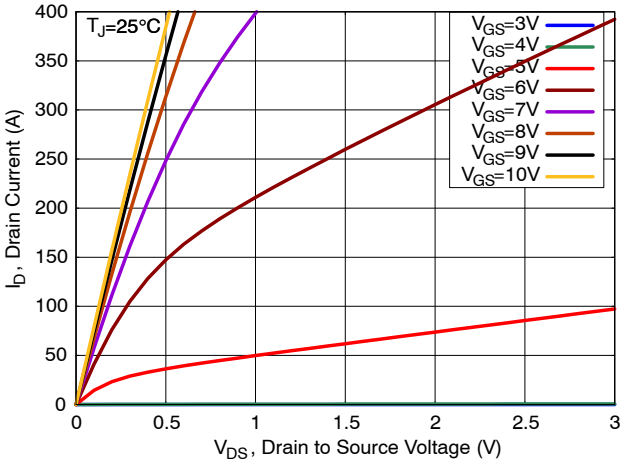


Figure 1. On−Region Characteristics

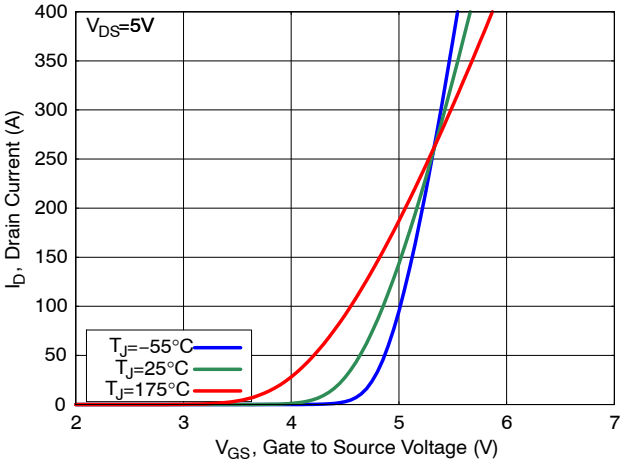


Figure 2. Transfer Characteristics

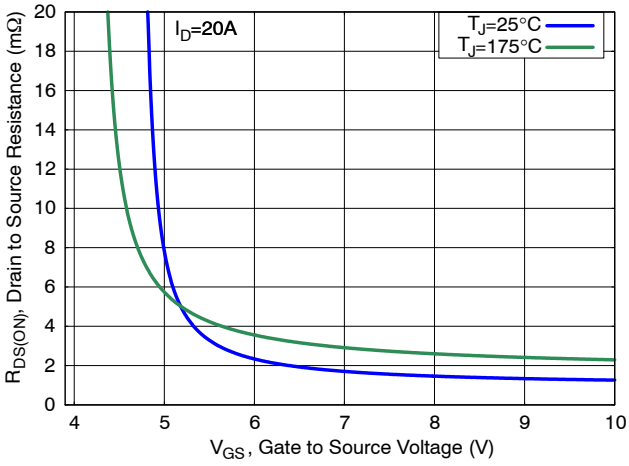


Figure 3. On−Resistance vs. Gate Voltage

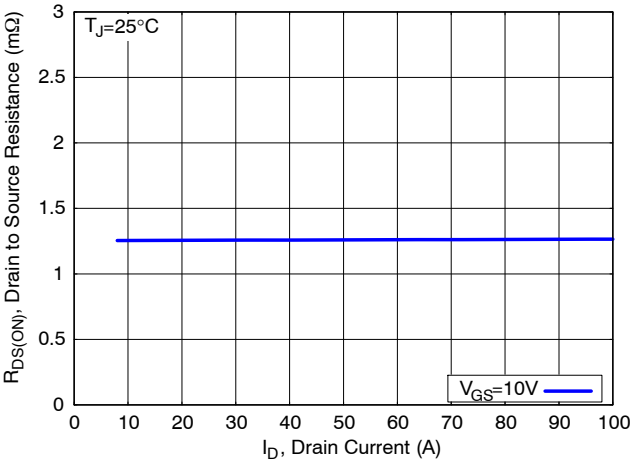


Figure 4. On−Resistance vs. Drain Current

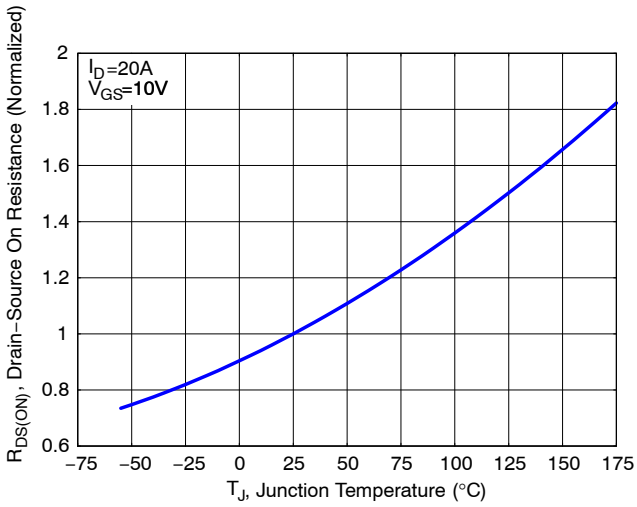


Figure 5. Normalized ON Resistance vs. Junction Temperature

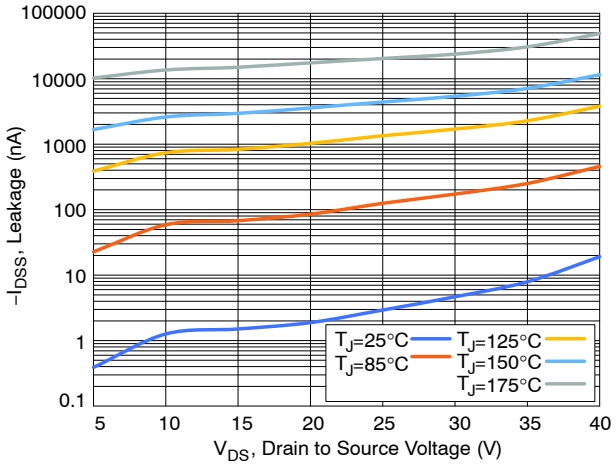


Figure 6. Drain−to−Source Leakage Current vs. Voltage

TYPICAL PERFORMANCE CHARACTERISTICS

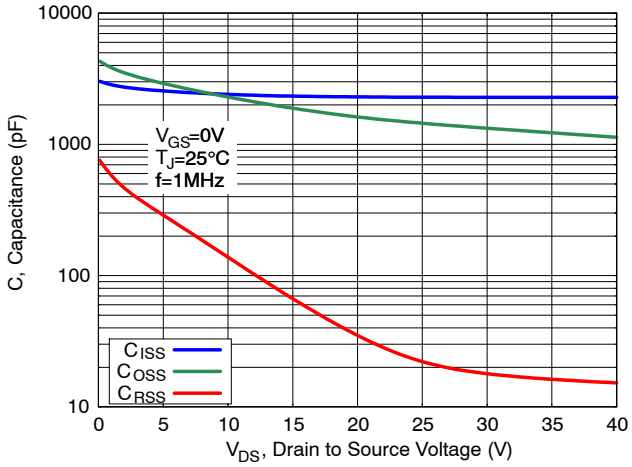


Figure 7. Capacitance Characteristics

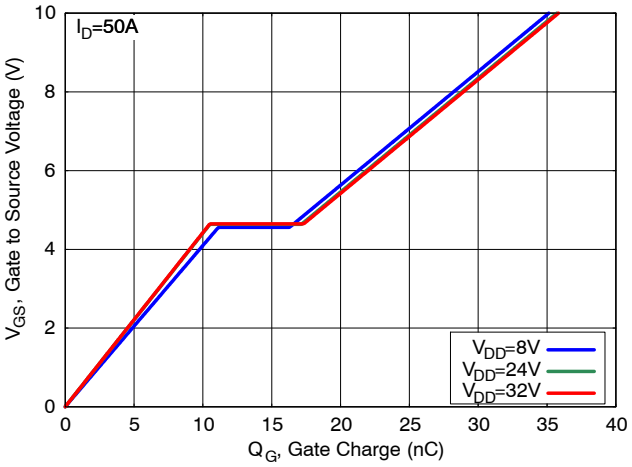


Figure 8. Gate Charge Characteristics

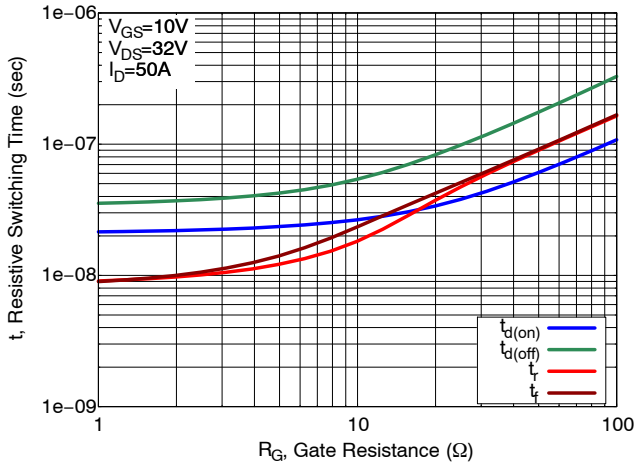


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

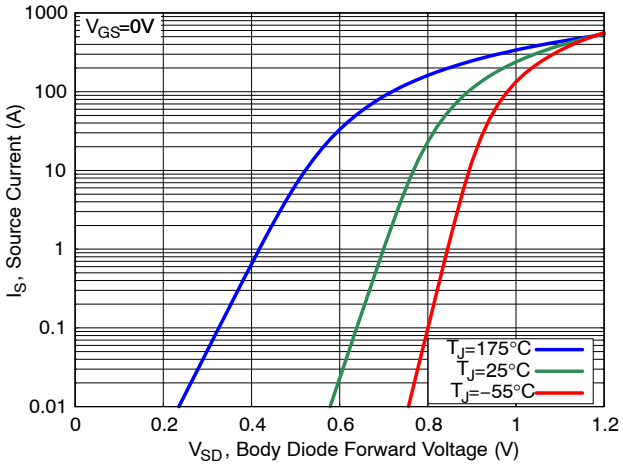


Figure 10. Diode Forward Characteristics

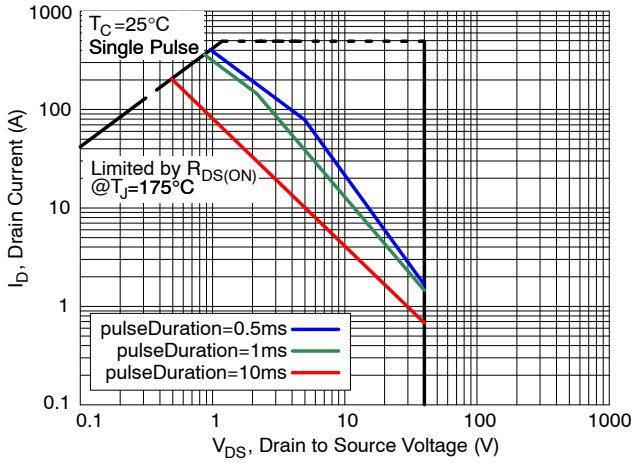


Figure 11. Safe Operating Area (SOA)

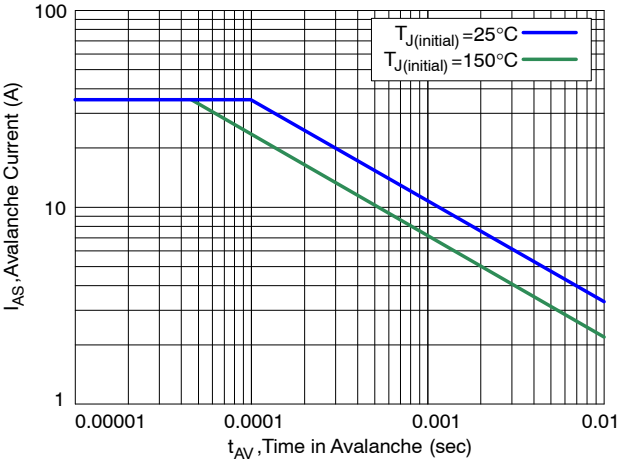


Figure 12. Avalanche Current vs. Pulse Time (UIS)

TYPICAL PERFORMANCE CHARACTERISTICS

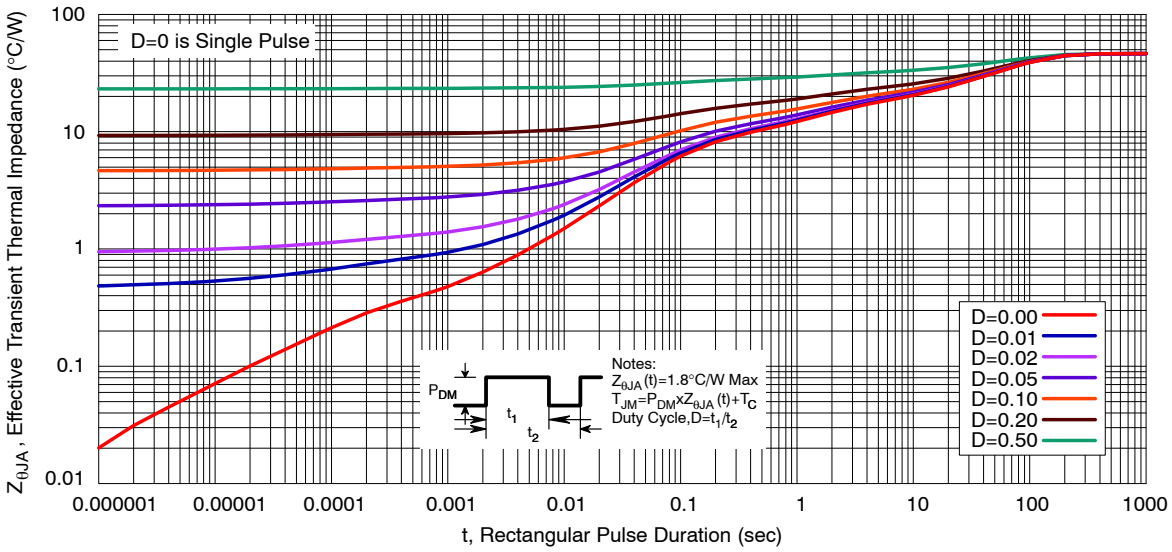
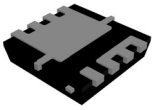


Figure 13. Transient Thermal Response

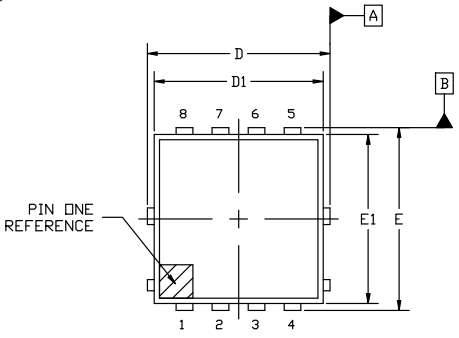
PACKAGE MARKING AND ORDERING INFORMATION

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

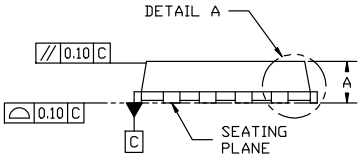


WDFNW8 3.30x3.30x0.75, 0.65P
CASE 515AP
ISSUE A

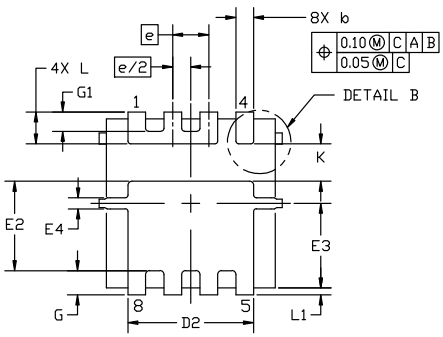
DATE 07 NOV 2023



TOP VIEW



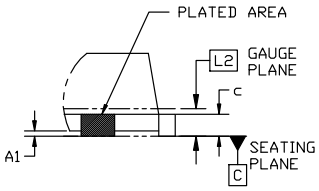
SIDE VIEW



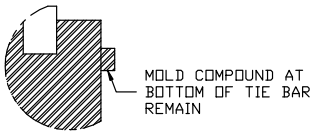
BOTTOM VIEW

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.

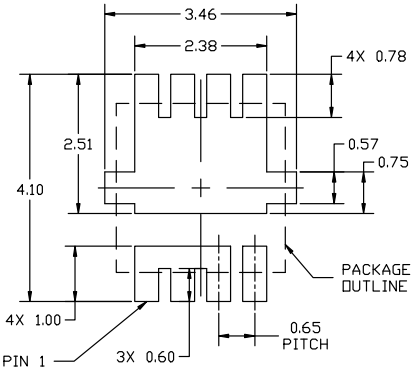


DETAIL "A"
SCALE 2:1



DETAIL "B"
SCALE 2:1

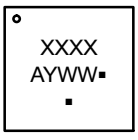
DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.70	0.75	0.80
A1	0.00	----	0.05
b	0.23	0.33	0.43
c	0.15	0.20	0.25
D	3.20	3.30	3.40
D1	2.95	3.13	3.30
D2	1.98	2.20	2.40
E	3.20	3.30	3.40
E1	2.80	3.00	3.15
E2	1.40	1.60	1.80
E3	1.35	1.50	1.60
E4	0.15	0.25	0.40
e	0.65 BSC		
G	0.30	0.43	0.55
G1	0.25	0.35	0.45
K	0.55	0.75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

ADDITIONAL INFORMATION

TECHNICAL PUBLICATIONS:
Technical Library: www.onsemi.com/design/resources/technical−documentation
onsemi Website: www.onsemi.com

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