DATA SHEET
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MOSFET - Power, Single N-Channel, STD Gate, μ8FL

40 V, 1.9 mΩ, 141 A

NVTFWS1D9N04XM

$V_{(BR)DSS}$	$R_{DS(ON)}$ MAX	I_D MAX
40 V	1.9 mΩ @ V_{GS} = 10 V	141 A

Features

- Low $R_{DS(on)}$ 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)

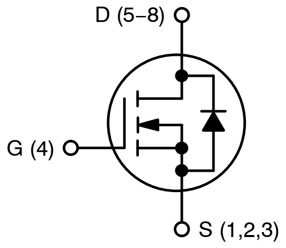
Parameter		Symbol	Value	Unit
Drain−to−Source Voltage		V_{DSS}	40	V
Gate−to−Source Voltage		V_{GS}	±20	V
Continuous Drain Current	T_C = 25°C	I_D	141	A
	T_C = 100°C		100	
Power Dissipation	T_C = 25°C	P_D	74	W
Pulsed Drain Current	T_A = 25°C, t_p = 10 μs	I_{DM}	852	A
Operating Junction and Storage Temperature Range		T_J, T_{stg}	−55 to +175	°C
Continuous Source−Drain Current (Body Diode)		I_S	104	A
Single Pulse Avalanche Energy ($I_{L(pk)}$ = 8.5 A)		E_{AS}	286	mJ
Lead Temperature for Soldering Purposes (1/8″ from case for 10 s)		T_L	260	°C

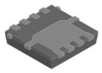
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

THERMAL RESISTANCE MAXIMUM RATINGS

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction−to−Case	$R_{\theta JC}$	2.0	°C/W
Thermal Resistance, Junction−to−Ambient	$R_{\theta JA}$	47	

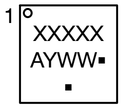
N-CHANNEL MOSFET





WDFNW8
(Full−Cut μ8FL WF)
CASE 515AN

MARKING DIAGRAM



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

ORDERING INFORMATION

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

December, 2024 − Rev. 0

Publication Order Number:
NVTFWS1D9N04XM/D

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 = 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			20	
Gate–to–Source Leakage Current	I_{GSS}	V_{DS} = 0 V, V_{GS} = 20 V			100	nA
ON CHARACTERISTICS						
Drain–to–Source On Resistance	$R_{DS(on)}$	V_{GS} = 10 V, I_D = 15 A, T_J = 25°C		1.6	1.9	mΩ
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = 70 μA, T_J = 25°C	2.5		3.5	V
Threshold Temperature Coefficient	$\Delta V_{GS(TH)}/\Delta T_J$	V_{GS} = V_{DS}, I_D = 70 μA		−7		mV/°C
Forward Transconductance	g_{FS}	V_{DS} = 5 V, I_D = 15 A		81		S
CHARGES AND CAPACITANCES						
Input Capacitance	C_{ISS}	V_{DS} = 25 V, V_{GS} = 0 V, f = 1 MHz,		1882		pF
Output Capacitance	C_{OSS}			1211		
Reverse Transfer Capacitance	C_{RSS}			20		
Total Gate Charge	$Q_{G(TOT)}$	V_{DD} = 32 V, I_D = 15 A, V_{GS} = 10 V		30		nC
Threshold Gate Charge	$Q_{G(TH)}$			6		nC
Gate–to–Source Charge	Q_{GS}			8		
Gate–to–Drain Charge	Q_{GD}			6		
Gate Resistance	R_G	f = 1 MHz		0.90		Ω
SWITCHING CHARACTERISTICS						
Turn–On Delay Time	$t_{d(ON)}$	Resistive Load, V_{GS} = 10 V, V_{DD} = 32 V, I_D = 15 A, R_G = 0 Ω		7		ns
Rise Time	t_r			14		
Turn–Off Delay Time	$t_{d(OFF)}$			10		
Fall Time	t_f			18		
DRAIN–SOURCE DIODE CHARACTERISTICS						
Forward Diode Voltage	V_{SD}	I_S = 15 A, V_{GS} = 0 V, T_J = 25°C		0.78	1.2	V
		I_S = 15 A, V_{GS} = 0 V, T_J = 125°C		0.63		
Reverse Recovery Time	t_{RR}	V_{GS} = 0 V, I_S = 15 A, dIs/dt = 100 A/μs, V_{DD} = 32 V, T_J = 25°C		42		ns
Charge Time	t_a			17		
Discharge Time	t_b			25		
Reverse Recovery Charge	Q_{RR}			38		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

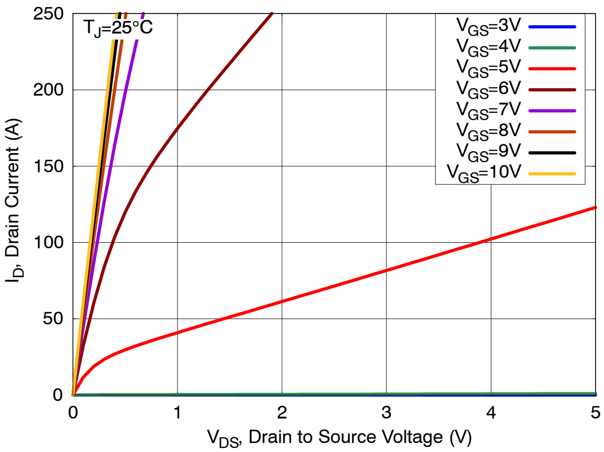


Figure 1. On−Region Characteristics

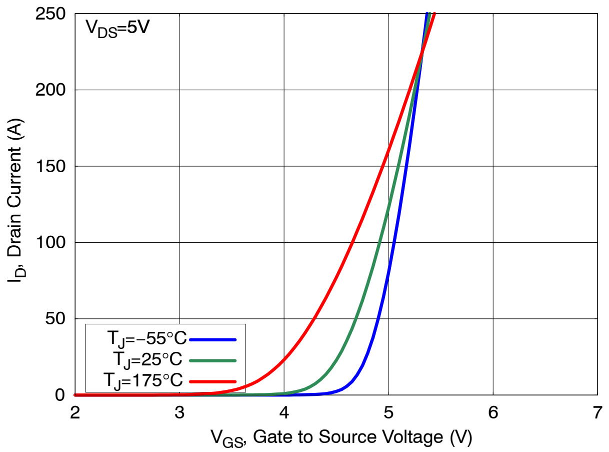


Figure 2. Transfer Characteristics

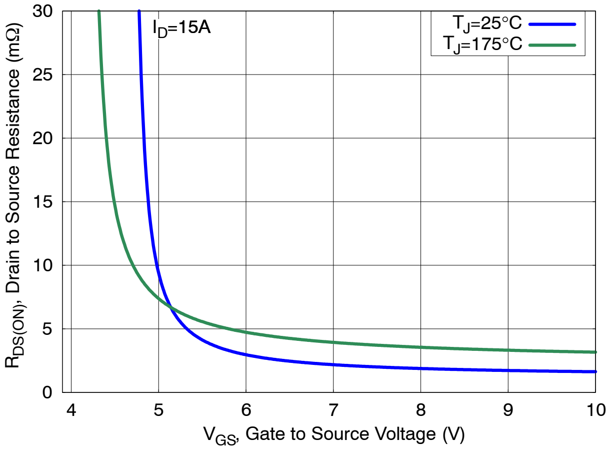


Figure 3. On−Resistance vs. Gate Voltage

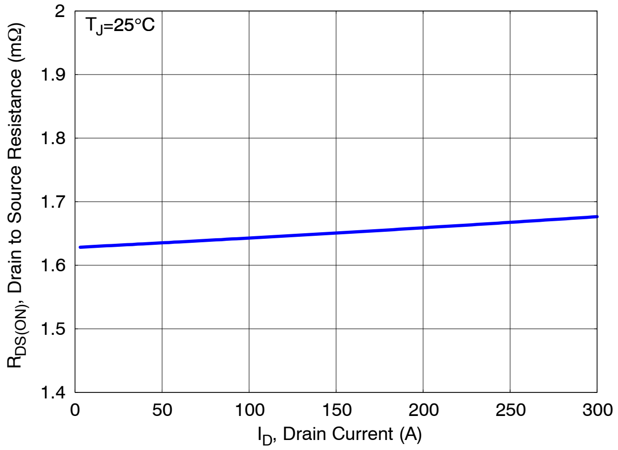


Figure 4. On−Resistance vs. Drain Current

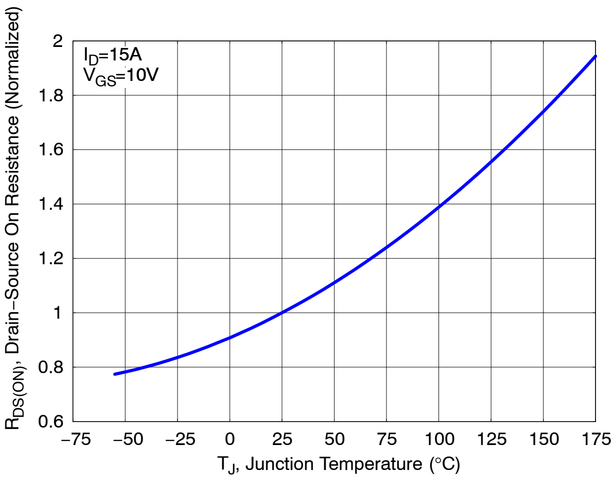


Figure 5. Normalized ON Resistance vs. Junction Temperature

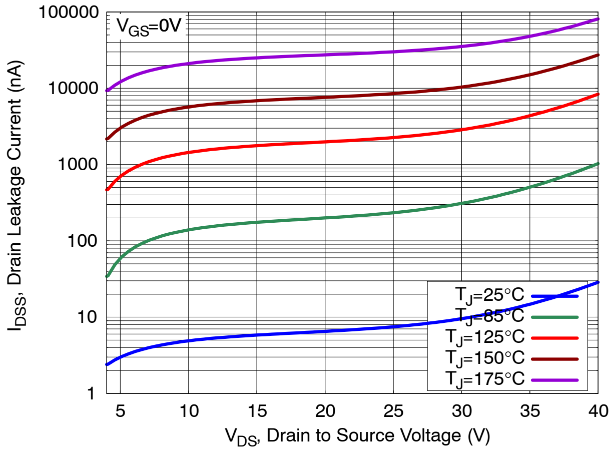


Figure 6. Drain Leakage Current vs. Drain Voltage

TYPICAL CHARACTERISTICS

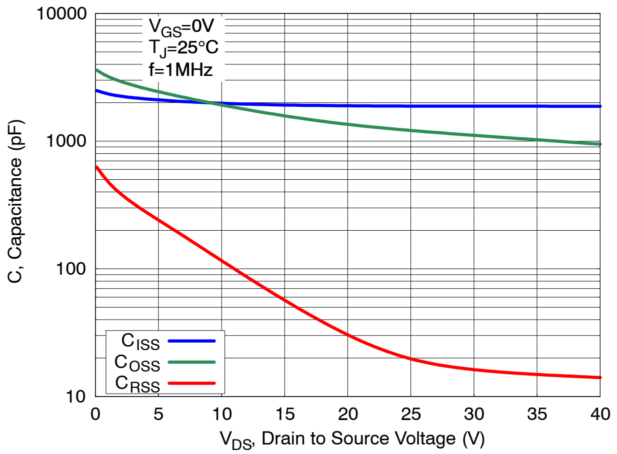


Figure 7. Capacitance Characteristics

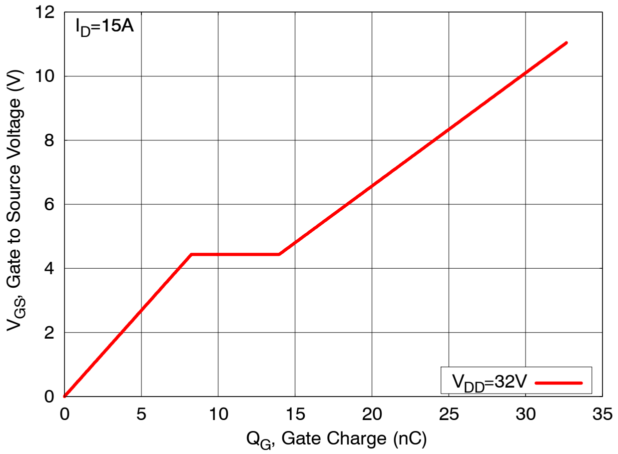


Figure 8. Gate Charge Characteristics

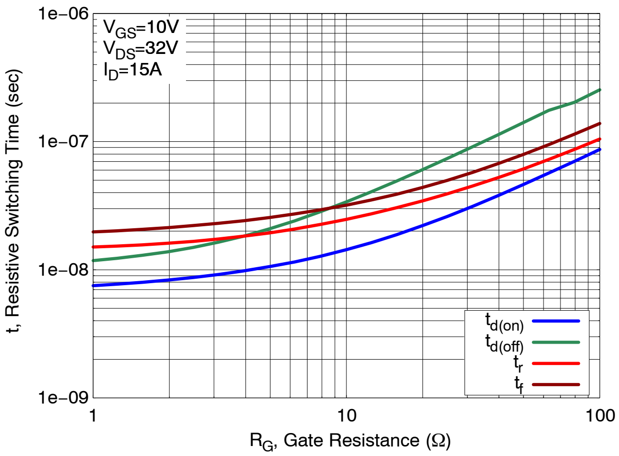


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

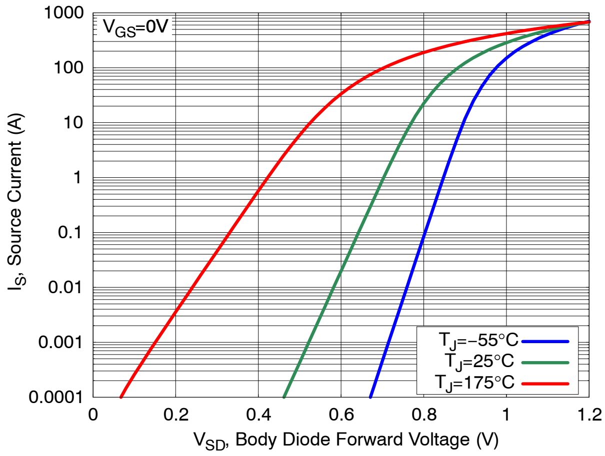


Figure 10. Diode Forward Characteristics

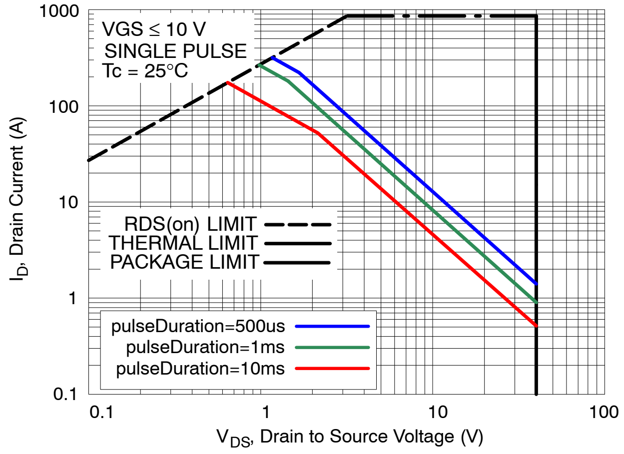


Figure 11. Safe Operating Area (SOA)

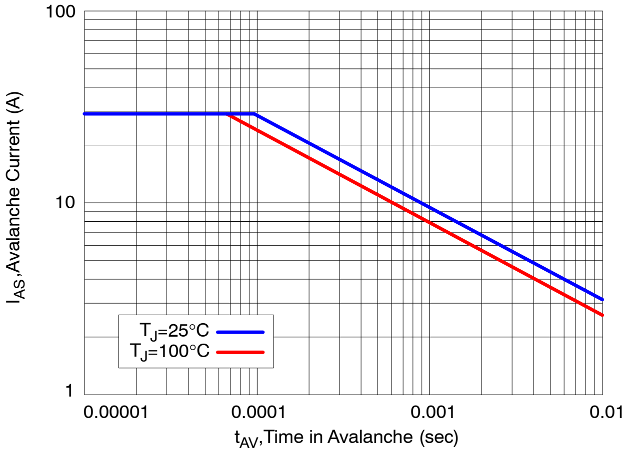


Figure 12. Avalanche Current vs. Pulse Time (UIS)

TYPICAL CHARACTERISTICS

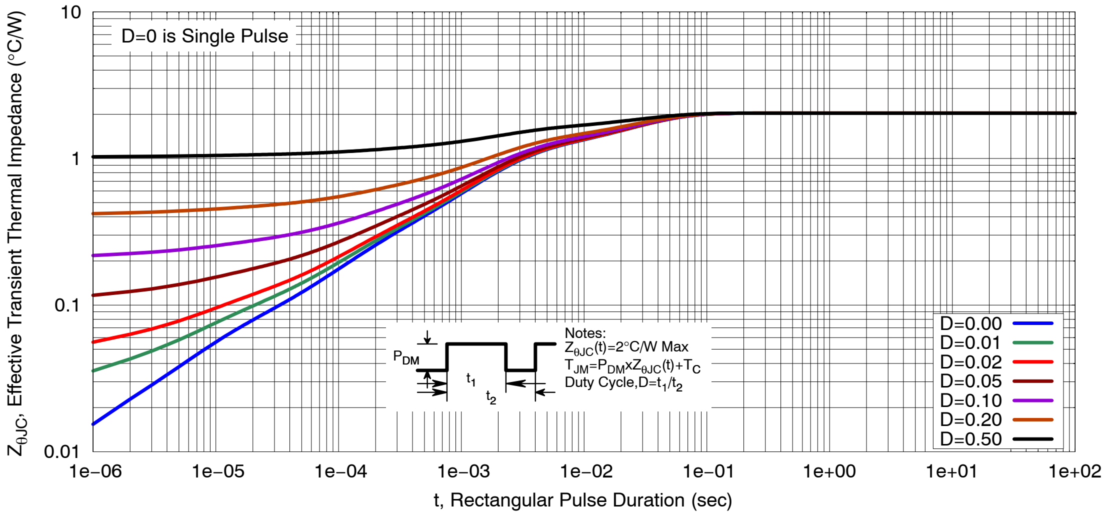


Figure 13. Transient Thermal Response

ORDERING INFORMATION

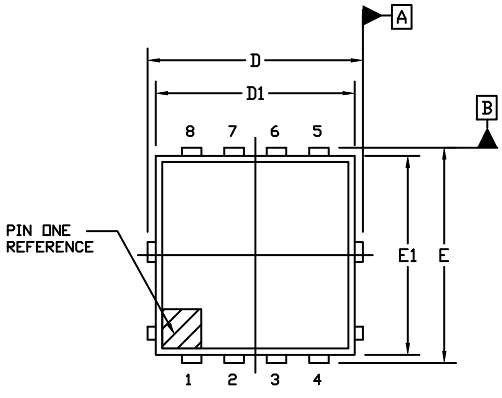
Device	Marking	Package Type	Shipping†
NVTFWS1D9N04XMTAG	1D9W	WDFN8 (Pb-Free)	1500 / Tape & Reel

†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.

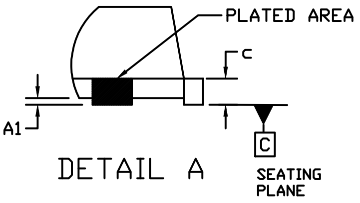
PACKAGE DIMENSIONS

WDFNW8 3.3x3.3, 0.65P (Full−Cut μ8FL WF)

CASE 515AN
ISSUE O



TOP VIEW

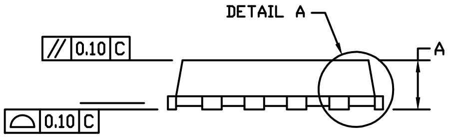


DETAIL A

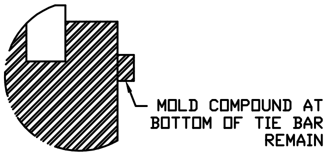
NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009.
2. CONTROLLING DIMENSION: MILLIMETERS
3. DIMENSION D1 AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

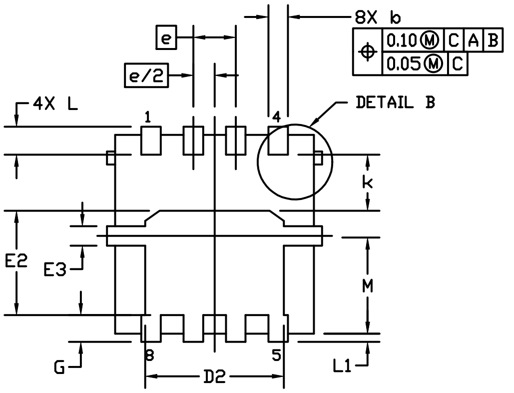
DIM	MILLIMETERS MIN.	MILLIMETERS NOM.	MILLIMETERS MAX.
A	0.70	0.75	0.80
A1	0.00	----	0.05
b	0.23	0.30	0.40
c	0.15	0.20	0.25
D	3.05	3.30	3.55
D1	2.95	3.05	3.15
D2	1.98	2.11	2.24
E	3.05	3.30	3.55
E1	2.95	3.05	3.15
E2	1.47	1.60	1.73
E3	0.23	0.30	0.40
e	0.65 BSC		
G	0.30	0.41	0.51
K	0.65	0.80	0.95
L	0.30	0.43	0.59
L1	0.06	0.13	0.20
M	1.40	1.50	1.60



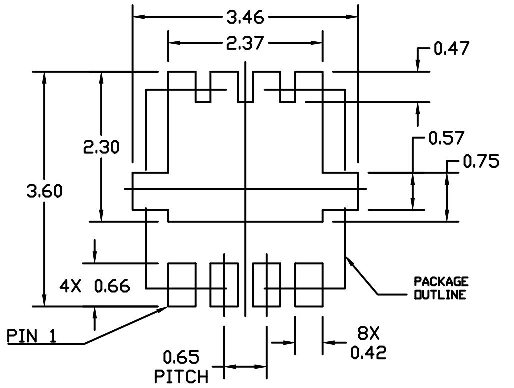
SIDE VIEW



DETAIL B



BOTTOM VIEW



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.

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