# **MOSFET** - Power, Single N-Channel, μ8FL 60 V, 20.3 mΩ, 27 A

## **NVTFS020N06C**

#### **Features**

- Small Footprint (3.3 x 3.3 mm) for Compact Design
- Low R<sub>DS(on)</sub> to Minimize Conduction Losses
- Low Q<sub>G</sub> and Capacitance to Minimize Driver Losses
- NVTFWS020N06C Wettable Flank Option for Enhanced Optical Inspection
- AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb–Free, Halogen Free/BFR Free and are RoHS Compliant

#### **Typical Applications**

- Power Tools, Battery Operated Vacuums
- UAV/Drones, Material Handling
- BMS/Storage, Home Automation

### **MAXIMUM RATINGS** ( $T_J = 25^{\circ}C$ unless otherwise noted)

Parar	Symbol	Value	Unit		
Drain-to-Source Voltage			$V_{DSS}$	60	V
Gate-to-Source Voltage	9		V <sub>GS</sub>	±20	V
Continuous Drain Current R <sub>B.IC</sub>		T <sub>C</sub> = 25°C	I <sub>D</sub>	27	Α
(Notes 1, 3)	Steady	T <sub>C</sub> = 100°C		19	
Power Dissipation	State T <sub>C</sub> = 25°C		P <sub>D</sub>	31	W
R <sub>θJC</sub> (Note 1)		T <sub>C</sub> = 100°C		15	
Continuous Drain Current R <sub>0.IA</sub>	Steady State	T <sub>A</sub> = 25°C	I <sub>D</sub>	7	Α
(Notes 1, 2, 3)		T <sub>A</sub> = 100°C		5	
Power Dissipation		T <sub>A</sub> = 25°C	P <sub>D</sub>	2.5	W
R <sub>θJA</sub> (Notes 1, 2)		T <sub>A</sub> = 100°C		1.2	
Pulsed Drain Current	T <sub>A</sub> = 25	°C, t <sub>p</sub> = 10 μs	I <sub>DM</sub>	128	Α
Operating Junction and Storage Temperature Range			T <sub>J</sub> , T <sub>stg</sub>	–55 to +175	ç
Source Current (Body D	I <sub>S</sub>	25	Α		
Single Pulse Drain-to-S Energy (I <sub>L(pk)</sub> = 5.7 A)	E <sub>AS</sub>	17	mJ		
Lead Temperature Soldering Reflow for Soldering Purposes (1/8" from case for 10 s)			TL	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.

- The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
- 2. Surface-mounted on FR4 board using a 650 mm<sup>2</sup>, 2 oz. Cu pad.
- Maximum current for pulses as long as 1 second is higher but is dependent on pulse duration and duty cycle.

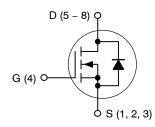


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V <sub>(BR)DSS</sub>	R <sub>DS(on)</sub> MAX	I <sub>D</sub> MAX
60 V	20.3 mΩ @ 10 V	27 A

#### N-Channel



## MARKING DIAGRAMS



CASE 511AB

S XXXX D D XXXXX S AYWW• D D



WDFNW8 (Full-Cut μ8FL) CASE 515AN



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, marking and shipping information in the package dimensions section on page 5 of this data sheet.

#### THERMAL RESISTANCE RATINGS

Parameter	Symbol	Value	Unit
Junction-to-Case - Steady State (Note 4)	$R_{ heta JC}$	4.8	°C/W
Junction-to-Ambient - Steady State (Note 4)	$R_{ heta JA}$	59.7	

<sup>4.</sup> Surface-mounted on FR4 board using a 650 mm<sup>2</sup>, 2 oz. Cu pad.

#### **ELECTRICAL CHARACTERISTICS** (T<sub>J</sub> = 25°C unless otherwise noted)

Parameter	Symbol	Test Condition		Min	Тур	Max	Unit
OFF CHARACTERISTICS					•	•	
Drain-to-Source Breakdown Voltage	V <sub>(BR)DSS</sub>	$V_{GS} = 0 \text{ V}, I_D = 250 \mu\text{A}$		60			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	V <sub>(BR)DSS</sub> /T <sub>J</sub>	I <sub>D</sub> = 250 μA, referenced to 25°C			29		mV/°C
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>GS</sub> = 0 V,	T <sub>J</sub> = 25°C			10	μΑ
		$V_{DS} = 60 \text{ V}$	T <sub>J</sub> = 125°C			250	1
Gate-to-Source Leakage Current	I <sub>GSS</sub>	$V_{DS} = 0 V, V_{G}$	<sub>S</sub> = 20 V			100	nA
ON CHARACTERISTICS (Note 5)							
Gate Threshold Voltage	V <sub>GS(TH)</sub>	$V_{GS} = V_{DS}, I_{D}$	= 20 µA	2.0		4.0	V
Negative Treshold Temperature Coefficient	V <sub>GS(TH)</sub> /T <sub>J</sub>	I <sub>D</sub> = 20 μA, referenced to 25°C			-7.8		mV/°C
Drain-to-Source On Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V,	<sub>D</sub> = 4 A		16.9	20.3	mΩ
Forward Transconductance	9 <sub>FS</sub>	V <sub>DS</sub> = 5 V, I <sub>D</sub> = 4 A			12		S
Gate-Resistance	$R_{G}$	T <sub>A</sub> = 25°C			1.0		Ω
CHARGES AND CAPACITANCES							
Input Capacitance	C <sub>iss</sub>	$V_{GS} = 0 \text{ V, f} = 1 \text{ MHz,} $ $V_{DS} = 30 \text{ V}$			355		pF
Output Capacitance	C <sub>oss</sub>				260		1
Reverse Transfer Capacitance	C <sub>rss</sub>				4.9		1
Total Gate Charge	Q <sub>G(TOT)</sub>	$V_{GS}$ = 10 V, $V_{DS}$ = 48 V, $I_{D}$ = 4 A			5.8		nC
Threshold Gate Charge	Q <sub>G(TH)</sub>				1.4		1
Gate-to-Source Charge	$Q_{GS}$				2.3		1
Gate-to-Drain Charge	$Q_{GD}$				0.53		1
SWITCHING CHARACTERISTICS (No	ote 6)						
Turn-On Delay Time	t <sub>d(on)</sub>				6.5		ns
Rise Time	t <sub>r</sub>	V <sub>GS</sub> = 10 V, V <sub>C</sub>	<sub>S</sub> = 48 V,		1.4		1
Turn-Off Delay Time	t <sub>d(off)</sub>	$V_{GS} = 10 \text{ V}, V_{D}$ $I_{D} = 4 \text{ A}, R_{G}$	= 6 Ω		9.7		1
Fall Time	t <sub>f</sub>				4.0		1
DRAIN-SOURCE DIODE CHARACTE	RISTICS						
Forward Diode Voltage	$V_{SD}$	V <sub>GS</sub> = 0 V,	T <sub>J</sub> = 25°C		0.81	1.2	V
		$V_{GS} = 0 \text{ V},$ $I_{S} = 4 \text{ A}$ $I_{J} = 25^{\circ}\text{C}$ $I_{J} = 125^{\circ}\text{C}$			0.67		]
Reverse Recovery Time	t <sub>RR</sub>		-		24		ns
Charge Time	t <sub>a</sub>	$V_{GS} = 0 \text{ V, } dl_S/dt = 100 \text{ A/}\mu\text{s,}$ $V_{DS} = 30 \text{ V, } l_S = 4 \text{ A}$			12		1
Discharge Time	t <sub>b</sub>				12		1
Reverse Recovery Charge	Q <sub>RR</sub>				12		nC

<sup>5.</sup> Pulse Test: Pulse Width  $\leq$  300  $\mu s,$  Duty Cycle  $\leq$  2%.

6. Switching characteristics are independent of operating junction temperatures.

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**

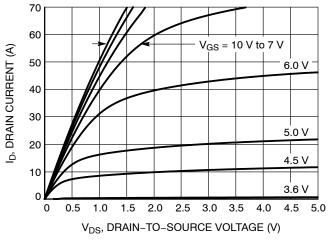


Figure 1. On-Region Characteristics

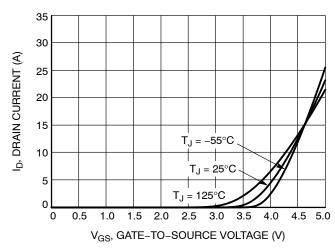


Figure 2. Transfer Characteristics

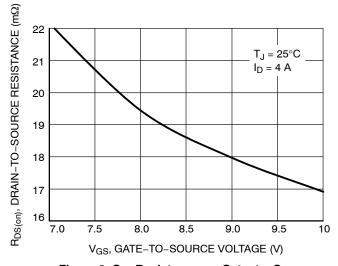


Figure 3. On-Resistance vs. Gate-to-Source Voltage

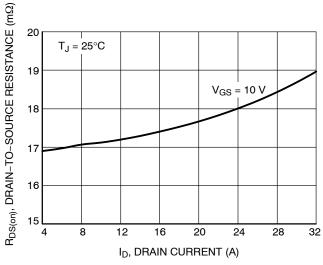


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

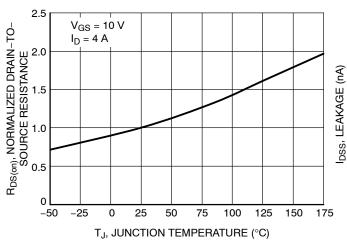


Figure 5. On–Resistance Variation with Temperature

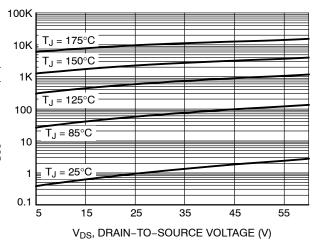


Figure 6. Drain-to-Source Leakage Current vs. Voltage

#### **TYPICAL CHARACTERISTICS**

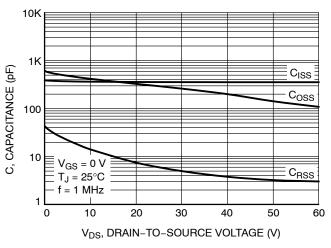


Figure 7. Capacitance Variation

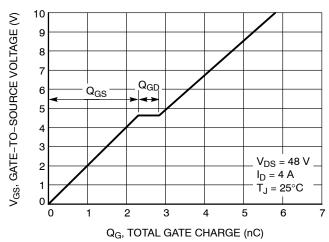


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

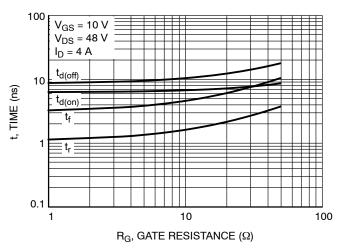


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

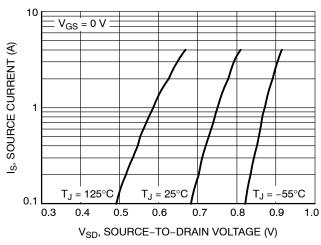


Figure 10. Diode Forward Voltage vs. Current

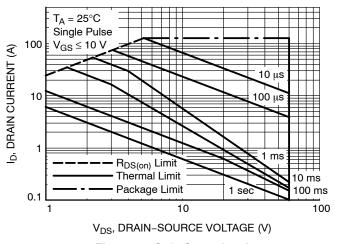


Figure 11. Safe Operating Area

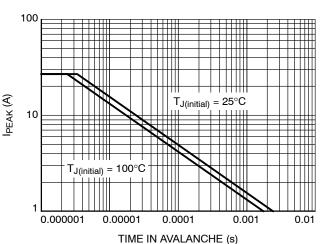


Figure 12. Maximum Drain Current vs. Time in Avalanche

#### **TYPICAL CHARACTERISTICS**

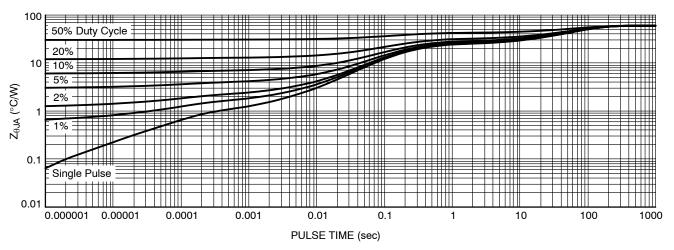


Figure 13. Thermal Characteristics

#### **DEVICE ORDERING INFORMATION**

Device	Marking	Package	Shipping <sup>†</sup>
NVTFS020N06CTAG	20NC	μ8FL (Pb–Free)	1500 / Tape & Reel
NVTFWS020N06CTAG	20NW	μ8FL (Pb–Free, Wettable Flanks)	1500 / Tape & Reel

<sup>†</sup>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.



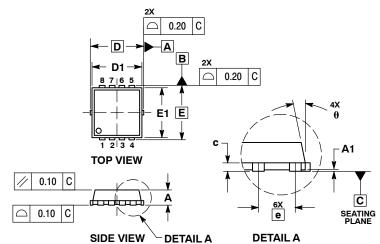




SCALE 2:1

#### WDFN8 3.3x3.3, 0.65P CASE 511AB ISSUE D

**DATE 23 APR 2012** 



#### NOTES:

- DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
  CONTROLLING DIMENSION: MILLIMETERS.
  DIMENSION D1 AND E1 DO NOT INCLUDE MOLD FLASH
  PROTRUSIONS OR GATE BURRS.

	MILLIMETERS		INCHES			
DIM	MIN	NOM	MAX	MIN	NOM	MAX
Α	0.70	0.75	0.80	0.028	0.030	0.031
A1	0.00		0.05	0.000		0.002
b	0.23	0.30	0.40	0.009	0.012	0.016
С	0.15	0.20	0.25	0.006	0.008	0.010
D		3.30 BSC			.130 BSC	
D1	2.95	3.05	3.15	0.116	0.120	0.124
D2	1.98	2.11	2.24	0.078	0.083	0.088
E		3.30 BSC		0.130 BSC		
E1	2.95	3.05	3.15	0.116	0.120	0.124
E2	1.47	1.60	1.73	0.058	0.063	0.068
E3	0.23	0.30	0.40	0.009	0.012	0.016
е		0.65 BSC		0.026 BSC		
G	0.30	0.41	0.51	0.012	0.016	0.020
K	0.65	0.80	0.95	0.026	0.032	0.037
L	0.30	0.43	0.56	0.012	0.017	0.022
L1	0.06	0.13	0.20	0.002	0.005	0.008
М	1.40	1.50	1.60	0.055	0.059	0.063
θ	0 °		12 °	0 °		12 °

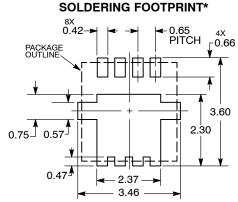


#### **GENERIC MARKING DIAGRAM\***



XXXXX = Specific Device Code Α = Assembly Location

= Year = Work Week WW = Pb-Free Package



DIMENSION: MILLIMETERS

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

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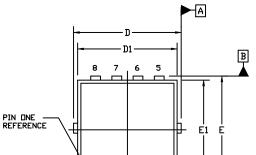
<sup>\*</sup>This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "■", may or may not be present. Some products may not follow the Generic Marking.



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

CASE 515AN **ISSUE O** 

**DATE 25 AUG 2020** 

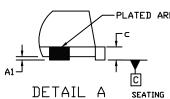


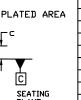
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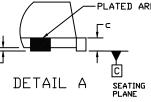
TOP VIEW

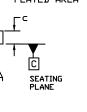


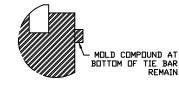
- 1. DIMENSIONING AND TOLERANCING PERASME Y14.5M. 2009.
- 2. CONTROLLING DIMENSION: MILLIMETERS
- DIMENSION DI AND EI DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.





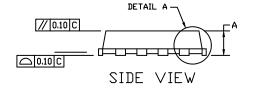




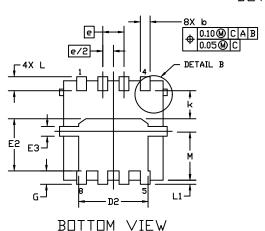


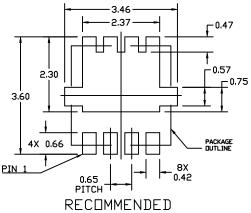
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MILLIMETERS



DETAIL B





MOUNTING FOOTPRINT

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

#### **GENERIC** MARKING DIAGRAM\*

XXXX AYWW= XXXX = Specific Device Code

= Assembly Location

= Year WW = Work Week = Pb-Free Package \*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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