

# MOSFET - Power, Single P-Channel, WDFN6 -30 V

## NVTFS012P03P8Z, NVTFWS012P03P8Z

### Features

- Small Footprint for Compact Design
- Low  $R_{DS(on)}$  to Minimize Conduction Losses
- AEC-Q101 Qualified
- These Devices are Pb-Free, Halogen-Free/BFR-Free and are RoHS Compliant

### Applications

- Battery Management
- Protection
- Power Load Switch

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

Parameter	Symbol	Value	Unit	
Drain-to-Source Voltage	$V_{DSS}$	-30	V	
Gate-to-Source Voltage	$V_{GS}$	$\pm 25$	V	
Continuous Drain Current $R_{\theta JA}$ (Notes 1, 3)	Steady State	$T_A = 25^\circ\text{C}$	$I_D$ -11.7	A
		$T_A = 85^\circ\text{C}$	-8.4	
Power Dissipation $R_{\theta JA}$ (Notes 1, 3)		$T_A = 25^\circ\text{C}$	$P_D$ 2.40	W
Continuous Drain Current $R_{\theta JA}$ (Notes 2, 3)	Steady State	$T_A = 25^\circ\text{C}$	$I_D$ -7.0	A
		$T_A = 85^\circ\text{C}$	-5.1	
Power Dissipation $R_{\theta JA}$ (Notes 2, 3)		$T_A = 25^\circ\text{C}$	$P_D$ 0.86	W
Pulsed Drain Current	$T_A = 25^\circ\text{C}, t_p = 10 \mu\text{s}$	$I_{DM}$ 47	A	
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	-55 to +175	$^\circ\text{C}$	
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.

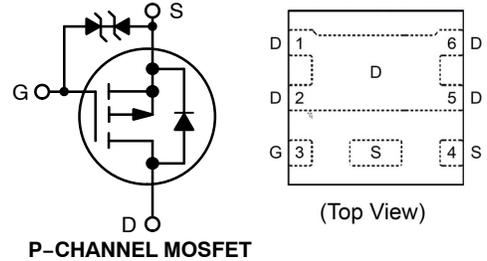
### THERMAL RESISTANCE MAXIMUM RATINGS (Note 1)

Parameter	Symbol	Value	Unit
Junction-to-Ambient - Steady State (Note 1)	$R_{\theta JA}$	52	$^\circ\text{C}/\text{W}$
Junction-to-Ambient - Steady State (Note 2)	$R_{\theta JA}$	145	

1. Surface-mounted on FR4 board using 1 in<sup>2</sup> pad size, 2 oz. Cu pad.
2. Surface-mounted on FR4 board using minimum pad size, 2 oz. Cu pad.
3. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted. Actual continuous current will be limited by thermal & electro-mechanical application board design.  $R_{\theta CA}$  is determined by the user's board design.

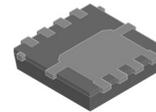
$V_{(BR)DSS}$	$R_{DS(on)}$ MAX	$I_D$ MAX
-30 V	11.3 m $\Omega$ @ -10 V	-11.7 A
	20 m $\Omega$ @ -4.5 V	

### ELECTRICAL CONNECTION

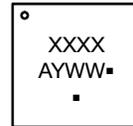


WDFN8  
( $\mu 8\text{FL}$ )  
CASE 511AB

### MARKING DIAGRAMS



WDFNW8  
( $\mu 8\text{FL WF}$ )  
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 on page 5 of this data sheet.

# NVTFS012P03P8Z, NVTFWS012P03P8Z

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	V <sub>(BR)DSS</sub>	V <sub>GS</sub> = 0 V, I <sub>D</sub> = -250 μA	-30			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	V <sub>(BR)DSS</sub> /T <sub>J</sub>	I <sub>D</sub> = -250 μA, ref to 25°C		-9.9		mV/°C
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = -30 V, T <sub>J</sub> = 25°C			-10	μA
Gate-to-Source Leakage Current	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±25 V			±10	μA

### ON CHARACTERISTICS (Note 4)

Gate Threshold Voltage	V <sub>GS(TH)</sub>	V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = -250 μA	-1.0		-3.0	V
Threshold Temperature Coefficient	V <sub>GS</sub> /T <sub>J</sub>	I <sub>D</sub> = -250 μA, ref to 25°C		-4.7		mV/°C
Drain-to-Source On Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> = -10 V, I <sub>D</sub> = -10 A		8.3	11.3	mΩ
		V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -10 A		13.3	20	
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> = -5 V, I <sub>D</sub> = -10 A		41		S

### CHARGES AND CAPACITANCES

Input Capacitance	C <sub>iss</sub>	V <sub>GS</sub> = 0 V, V <sub>DS</sub> = -15 V, f = 1.0 MHz		1535		pF
Output Capacitance	C <sub>oss</sub>			526		
Reverse Transfer Capacitance	C <sub>rss</sub>			506		
Total Gate Charge	Q <sub>G(TOT)</sub>	V <sub>GS</sub> = -4.5 V, V <sub>DS</sub> = -15 V, I <sub>D</sub> = -10 A		21		nC
Threshold Gate Charge	Q <sub>G(TH)</sub>			1.4		
Gate-to-Source Charge	Q <sub>GS</sub>			2.8		
Gate-to-Drain Charge	Q <sub>GD</sub>			14.8		
Total Gate Charge	Q <sub>G(TOT)</sub>	V <sub>GS</sub> = -10 V, V <sub>DS</sub> = -15 V, I <sub>D</sub> = -10 A		36		nC

### SWITCHING CHARACTERISTICS, V<sub>GS</sub> = 4.5 V (Note 5)

Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>GS</sub> = -4.5 V, V <sub>DD</sub> = -15 V, I <sub>D</sub> = -10 A, R <sub>G</sub> = 6 Ω		15		ns
Rise Time	t <sub>r</sub>			66		
Turn-Off Delay Time	t <sub>d(off)</sub>			48		
Fall Time	t <sub>f</sub>			77		

### SWITCHING CHARACTERISTICS, V<sub>GS</sub> = 10 V (Note 5)

Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>GS</sub> = -10 V, V <sub>DD</sub> = -15 V, I <sub>D</sub> = -10 A, R <sub>G</sub> = 6 Ω		7		ns
Rise Time	t <sub>r</sub>			17		
Turn-Off Delay Time	t <sub>d(off)</sub>			89		
Fall Time	t <sub>f</sub>			75		

### DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V <sub>SD</sub>	V <sub>GS</sub> = 0 V, I <sub>S</sub> = -10 A	T <sub>J</sub> = 25°C	0.82	1.3	V
			T <sub>J</sub> = 125°C	0.7		
Reverse Recovery Time	t <sub>RR</sub>	V <sub>GS</sub> = 0 V, dI <sub>S</sub> /dt = -100 A/μs, I <sub>S</sub> = -10 A		19		ns
Reverse Recovery Charge	Q <sub>RR</sub>			10		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.

4. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.

5. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

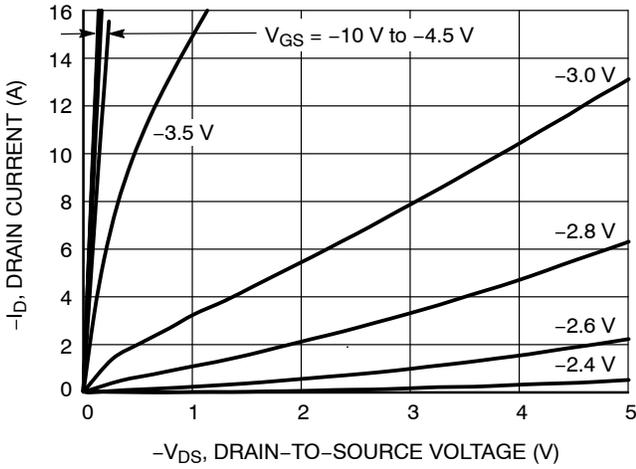


Figure 1. On-Region Characteristics

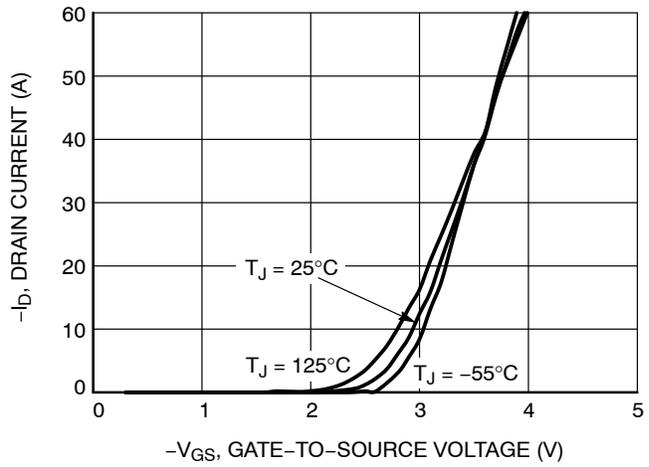


Figure 2. Transfer Characteristics

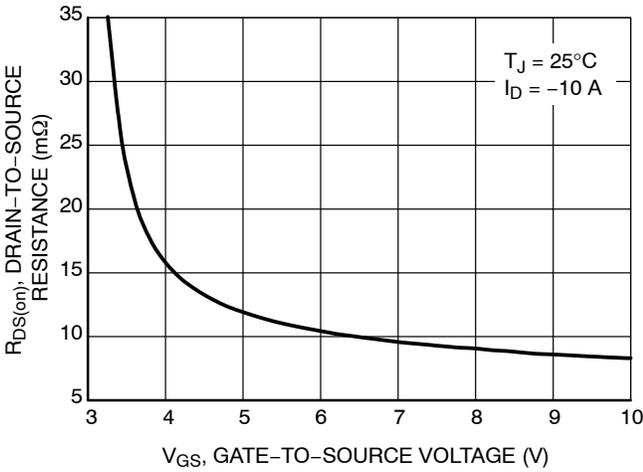


Figure 3. On-Resistance vs. Gate-to-Source Voltage (V)

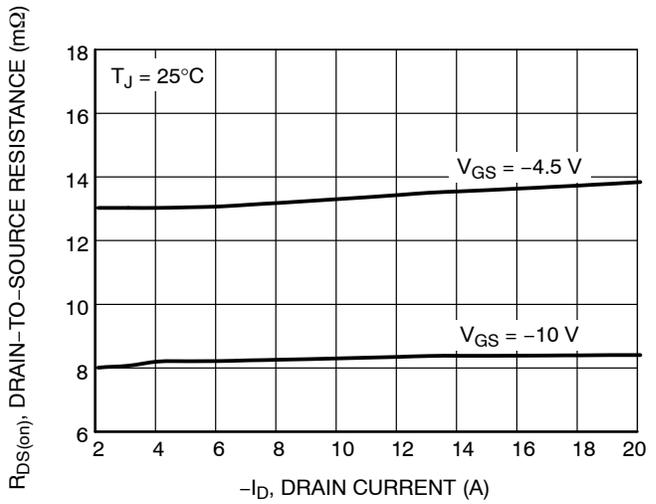


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

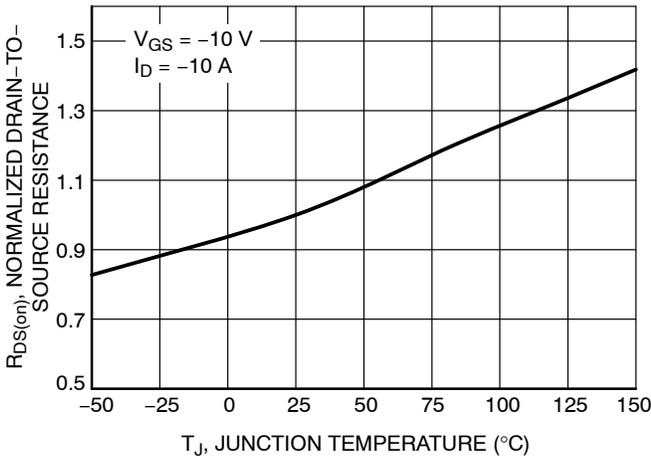


Figure 5. On-Resistance Variation with Temperature

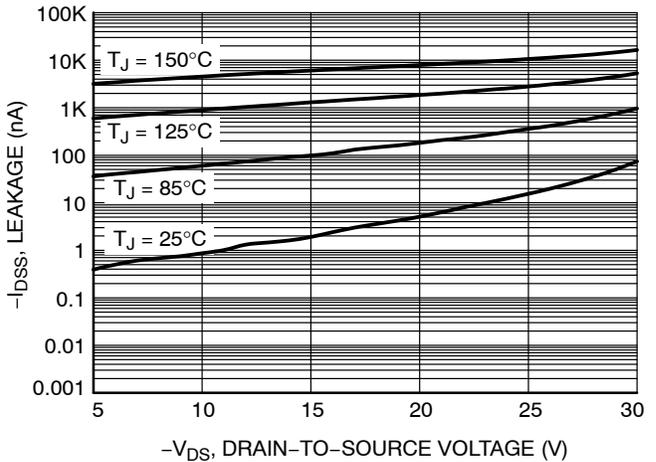


Figure 6. Drain-to-Source Leakage Current vs. Voltage

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## TYPICAL CHARACTERISTICS

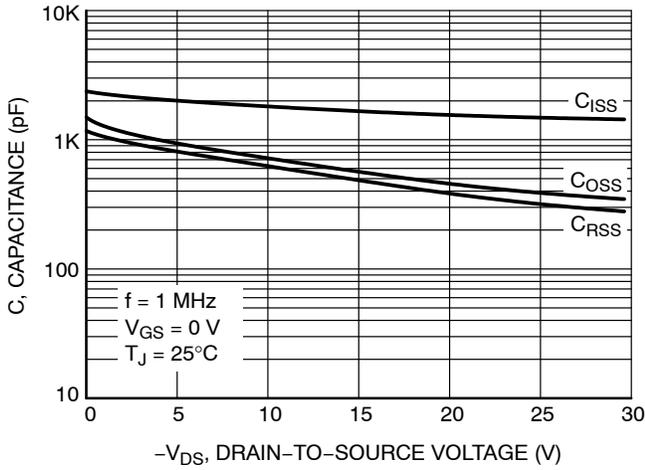


Figure 7. Capacitance Variation

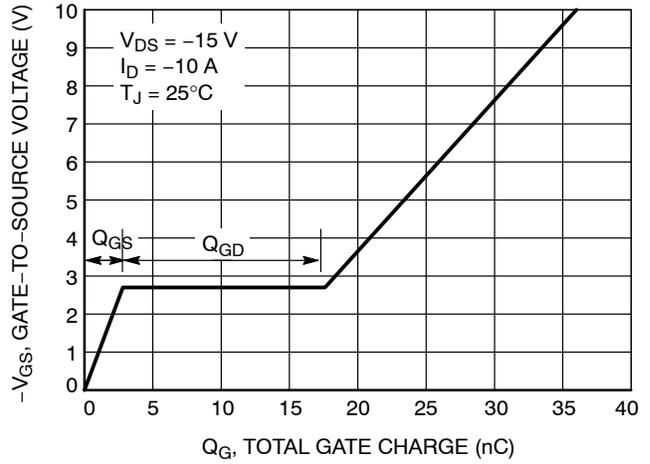


Figure 8. Gate-to-Source vs. Total Charge

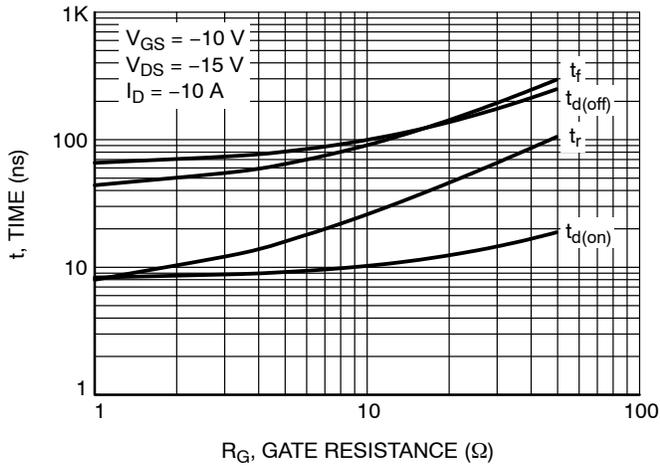


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

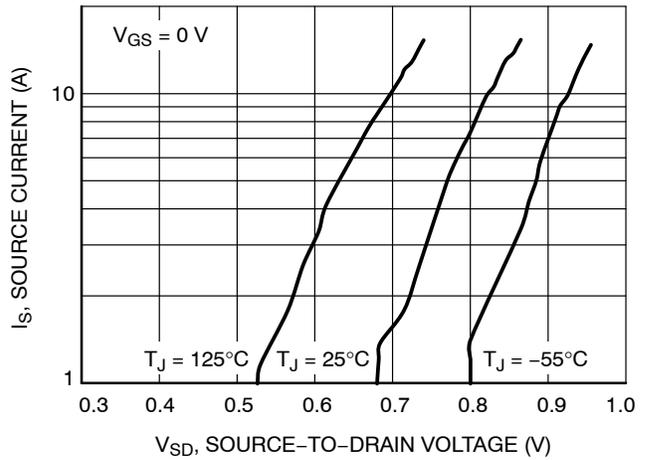


Figure 10. Diode Forward Voltage vs. Current

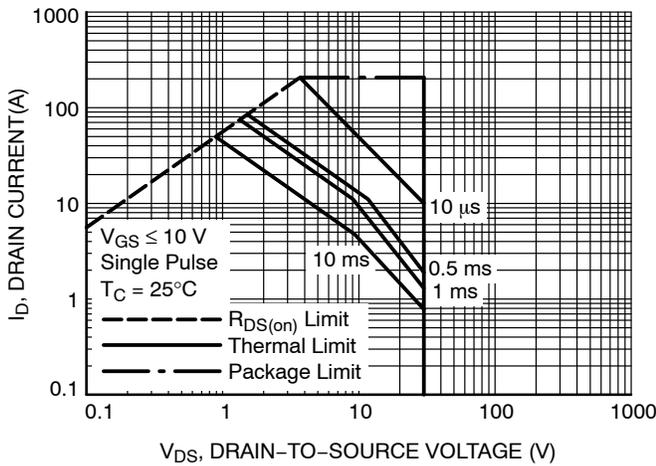


Figure 11. Maximum Rated Forward Biased Safe Operating Area

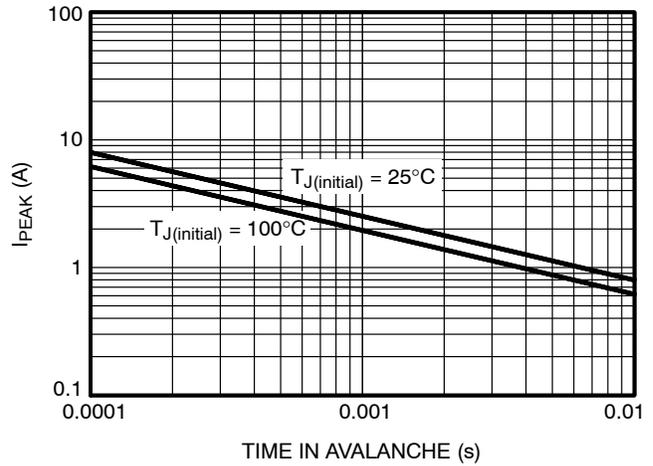
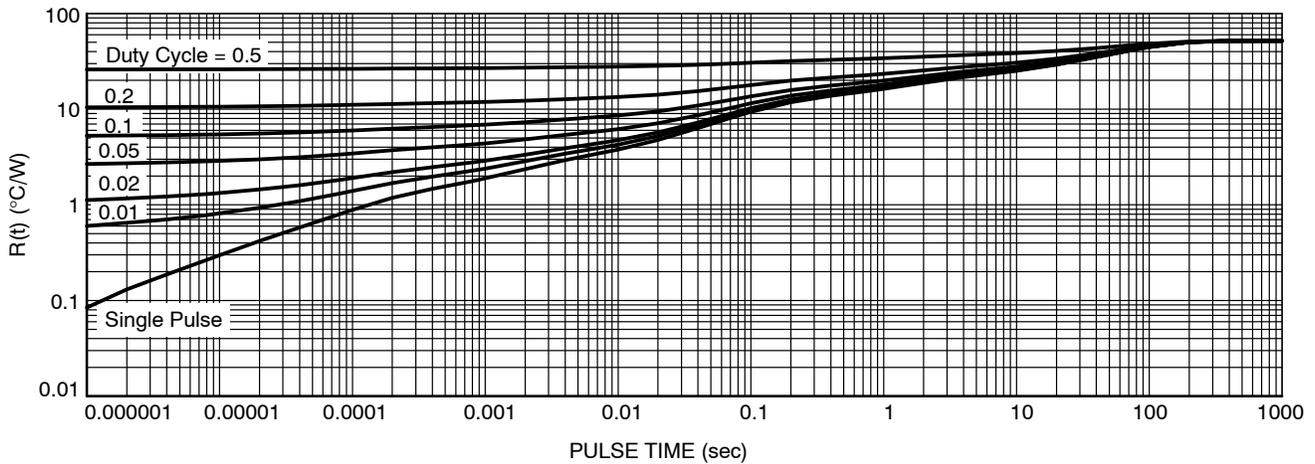


Figure 12.  $I_{PEAK}$  vs. Time in Avalanche

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## TYPICAL CHARACTERISTICS



**Figure 13. Thermal Characteristics**

### DEVICE ORDERING INFORMATION

Device	Device Marking	Package	Shipping <sup>†</sup>
NVTFS012P03P8ZTAG	12P3	WDFN8 (Pb-Free)	1500 / Tape & Reel
NVTFWS012P03P8ZTAG	12PW	WDFN8 (Pb-Free, Wettable Flank)	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.

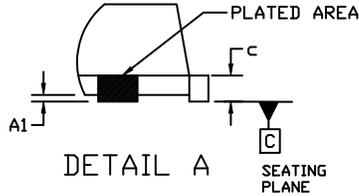
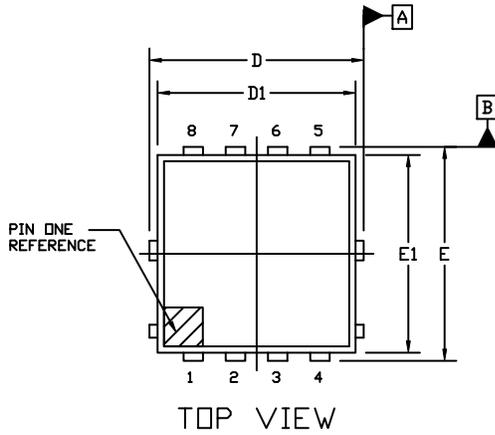
# NVTF5012P03P8Z, NVTFWS012P03P8Z

## PACKAGE DIMENSIONS

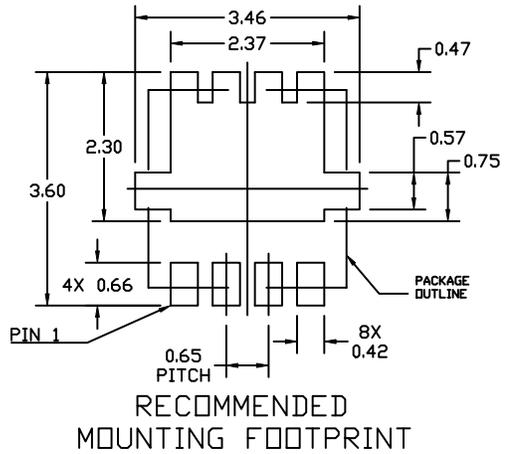
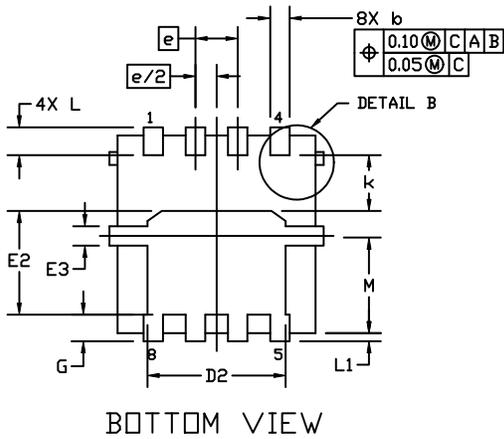
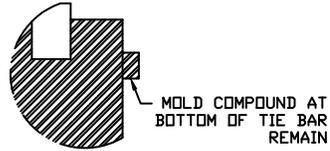
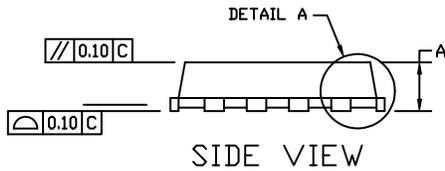
WDFNW8 3.3x3.3, 0.65P (Full-Cut  $\mu$ 8FL WF)  
CASE 515AN  
ISSUE O

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.	NDM.	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

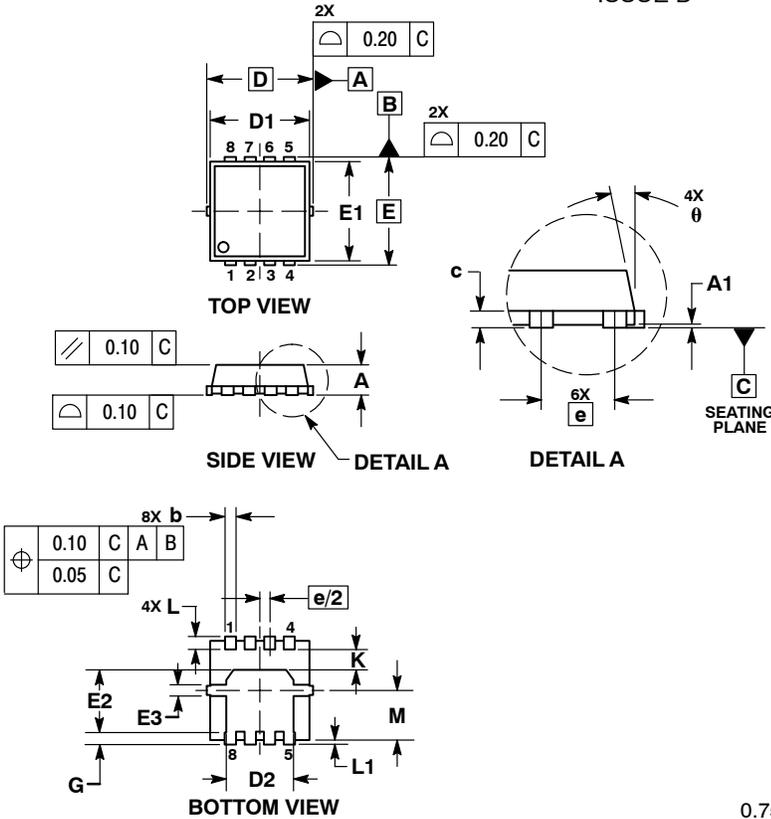


\* For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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## PACKAGE DIMENSIONS

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

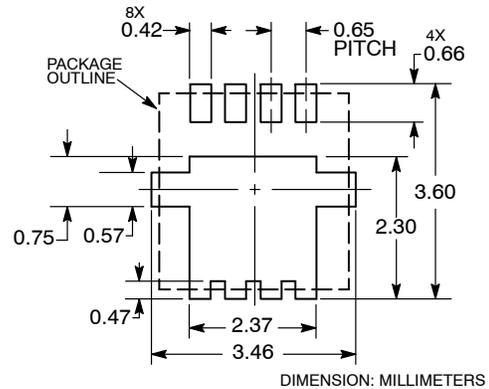


NOTES:

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

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	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
c	0.15	0.20	0.25	0.006	0.008	0.010
D	3.30 BSC			0.130 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
e	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
M	1.40	1.50	1.60	0.055	0.059	0.063
θ	0 °	---	12 °	0 °	---	12 °

### SOLDERING FOOTPRINT\*



\*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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