

MOSFET – Power, Single N-Channel 40 V, 4.8 mΩ, 74 A



NVTFS5C460NL

Features

- Small Footprint (3.3 x 3.3 mm) for Compact Design
- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Capacitance to Minimize Driver Losses
- NVTFS5C460NLWF – Wettable Flanks Product
- AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free and are RoHS Compliant

MAXIMUM RATINGS ($T_J = 25^\circ\text{C}$ 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 $R_{\theta JC}$ (Notes 1, 2, 3, 4)	Steady State	$T_C = 25^\circ\text{C}$	I_D	74
		$T_C = 100^\circ\text{C}$		42
Power Dissipation $R_{\theta JC}$ (Notes 1, 2, 3)		$T_C = 25^\circ\text{C}$	P_D	50
		$T_C = 100^\circ\text{C}$		25
Continuous Drain Current $R_{\theta JA}$ (Notes 1, 3, 4)	Steady State	$T_A = 25^\circ\text{C}$	I_D	19
		$T_A = 100^\circ\text{C}$		13
Power Dissipation $R_{\theta JA}$ (Notes 1, 3)		$T_A = 25^\circ\text{C}$	P_D	3.1
		$T_A = 100^\circ\text{C}$		1.6
Pulsed Drain Current	$T_A = 25^\circ\text{C}$, $t_p = 10\ \mu\text{s}$	I_{DM}	321	A
Operating Junction and Storage Temperature Range		T_J , T_{stg}	-55 to +175	°C
Source Current (Body Diode)		I_S	42	A
Single Pulse Drain-to-Source Avalanche Energy ($I_{L(pk)} = 4.6\text{ A}$)		E_{AS}	104	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 (Note 1)

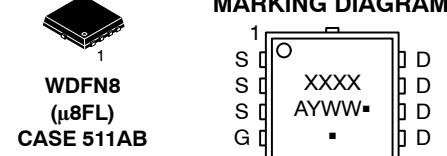
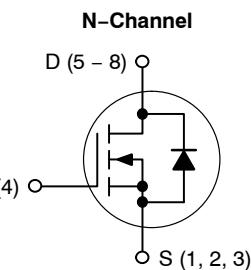
Parameter	Symbol	Value	Unit
Junction-to-Case – Steady State (Note 3)	$R_{\theta JC}$	3.0	°C/W
Junction-to-Ambient – Steady State (Note 3)	$R_{\theta JA}$	47.7	

1. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.
2. Ψ is used as required per JESD51-12 for packages in which substantially less than 100% of the heat flows to single case surface.
3. Surface-mounted on FR4 board using a 650 mm^2 , 2 oz. Cu pad.
4. Continuous DC current rating. Maximum current for pulses as long as 1 second is higher but is dependent on pulse duration and duty cycle.

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$V_{(BR)DSS}$	$R_{DS(on)}$ MAX	I_D MAX
40 V	4.8 mΩ @ 10 V	74 A
	7.6 mΩ @ 4.5 V	



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.

NVTFS5C460NL

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(\text{BR})\text{DSS}}$	$V_{\text{GS}} = 0 \text{ V}, I_D = 250 \mu\text{A}$	40			V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{\text{GS}} = 0 \text{ V}, V_{\text{DS}} = 40 \text{ V}$	$T_J = 25^\circ\text{C}$		10	μA
			$T_J = 125^\circ\text{C}$		250	
Gate-to-Source Leakage Current	I_{GSS}	$V_{\text{DS}} = 0 \text{ V}, V_{\text{GS}} = 20 \text{ V}$			100	nA

ON CHARACTERISTICS (Note 5)

Gate Threshold Voltage	$V_{\text{GS}(\text{TH})}$	$V_{\text{GS}} = V_{\text{DS}}, I_D = 40 \mu\text{A}$	1.2		2.0	V
Drain-to-Source On Resistance	$R_{\text{DS}(\text{on})}$	$V_{\text{GS}} = 10 \text{ V}, I_D = 35 \text{ A}$		4	4.8	$\text{m}\Omega$
		$V_{\text{GS}} = 4.5 \text{ V}, I_D = 35 \text{ A}$		6.1	7.6	
Forward Transconductance	g_{FS}	$V_{\text{DS}} = 15 \text{ V}, I_D = 35 \text{ A}$		72		S

CHARGES AND CAPACITANCES

Input Capacitance	C_{iss}	$V_{\text{GS}} = 0 \text{ V}, f = 1.0 \text{ MHz}, V_{\text{DS}} = 25 \text{ V}$		1300		pF
Output Capacitance	C_{oss}			530		
Reverse Transfer Capacitance	C_{rss}			22		
Threshold Gate Charge	$Q_{\text{G}(\text{TH})}$	$V_{\text{GS}} = 10 \text{ V}, V_{\text{DS}} = 20 \text{ V}, I_D = 35 \text{ A}$		2.5		nC
Gate-to-Source Charge	Q_{GS}			4.7		
Gate-to-Drain Charge	Q_{GD}			3		
Total Gate Charge	$Q_{\text{G}(\text{TOT})}$		$V_{\text{GS}} = 10 \text{ V}, V_{\text{DS}} = 20 \text{ V}, I_D = 35 \text{ A}$	11		nC

SWITCHING CHARACTERISTICS (Note 6)

Turn-On Delay Time	$t_{\text{d}(\text{on})}$	$V_{\text{GS}} = 10 \text{ V}, V_{\text{DS}} = 20 \text{ V}, I_D = 35 \text{ A}$		9.2		ns
Rise Time	t_r			97		
Turn-Off Delay Time	$t_{\text{d}(\text{off})}$			17		
Fall Time	t_f			4.4		

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V_{SD}	$V_{\text{GS}} = 0 \text{ V}, I_S = 35 \text{ A}$	$T_J = 25^\circ\text{C}$		0.86	1.2	V
			$T_J = 125^\circ\text{C}$		0.75		
Reverse Recovery Time	t_{RR}	$V_{\text{GS}} = 0 \text{ V}, dI_S/dt = 100 \text{ A}/\mu\text{s}, I_S = 35 \text{ A}$			29		ns
Charge Time	t_a				14		
Discharge Time	t_b				14		
Reverse Recovery Charge	Q_{RR}				12		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.

5. Pulse Test: Pulse Width $\leq 300 \mu\text{s}$, Duty Cycle $\leq 2\%$.
6. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

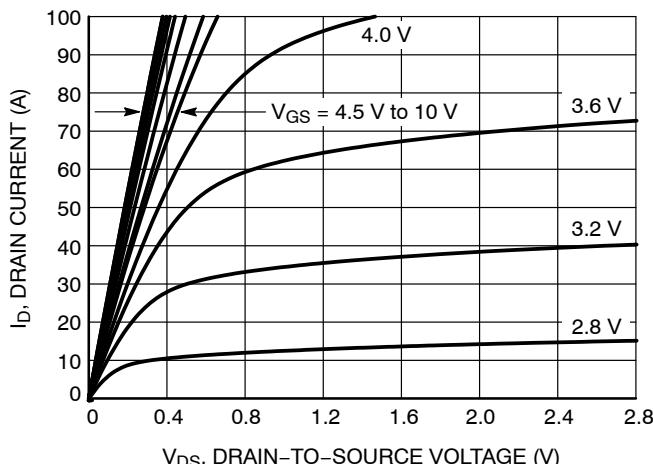


Figure 1. On-Region Characteristics

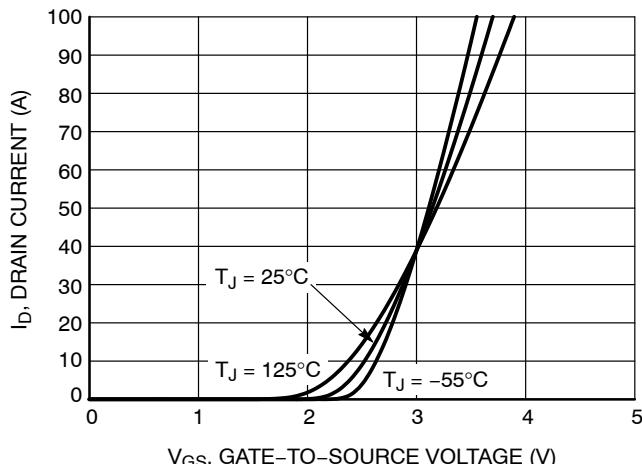


Figure 2. Transfer Characteristics

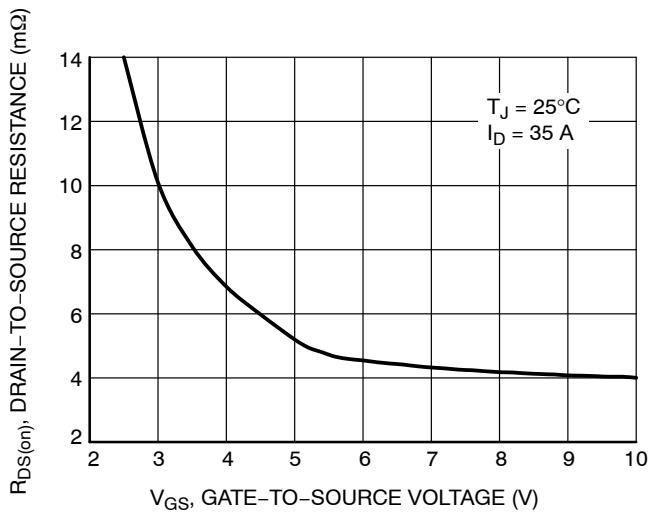


Figure 3. On-Resistance vs. Gate-to-Source Voltage

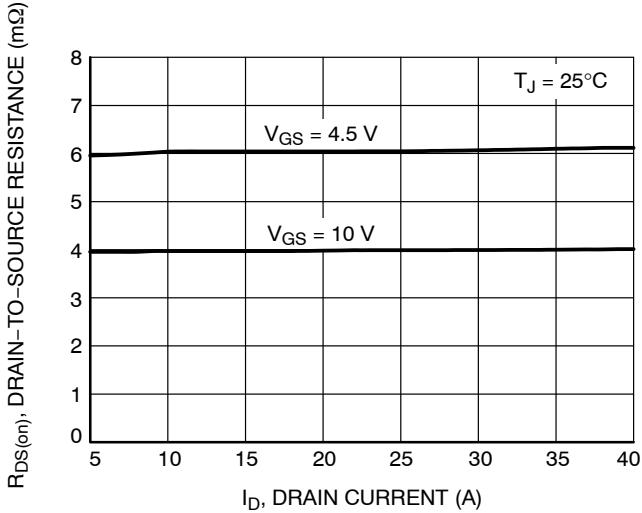


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

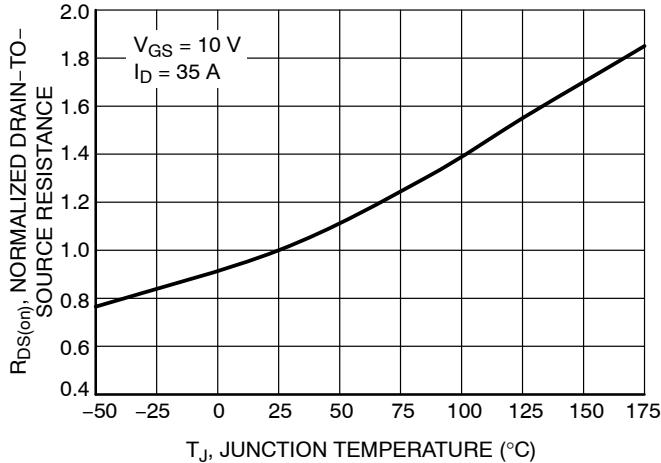


Figure 5. On-Resistance Variation with Temperature

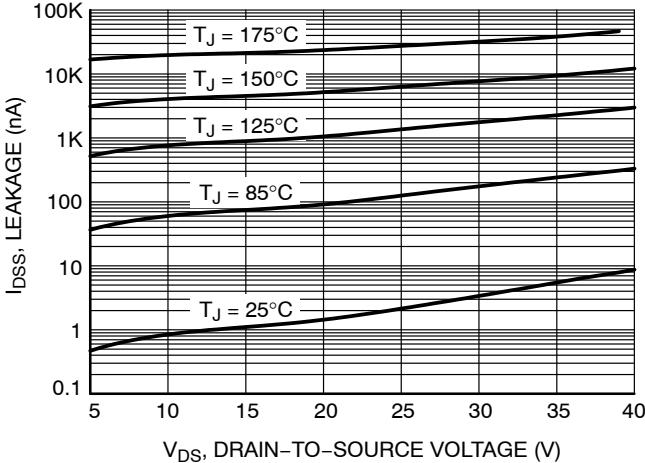


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

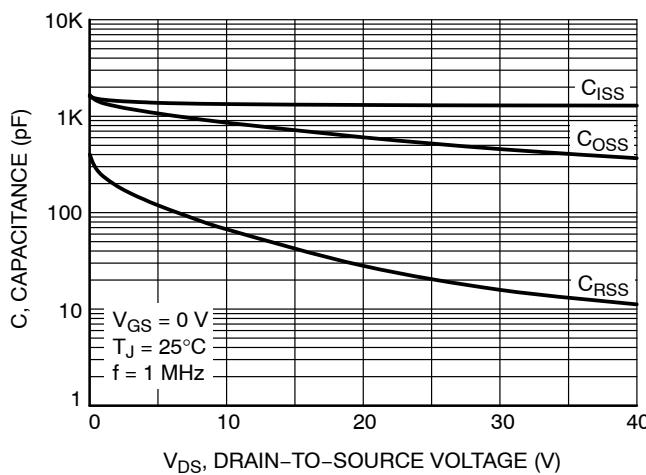


Figure 7. Capacitance Variation

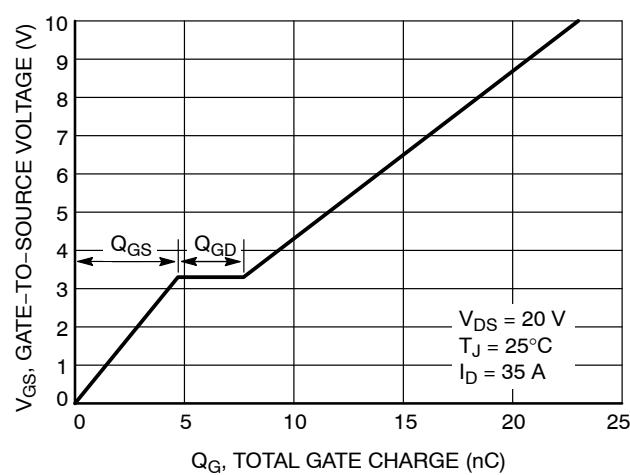


Figure 8. Gate-to-Source vs. Total Charge

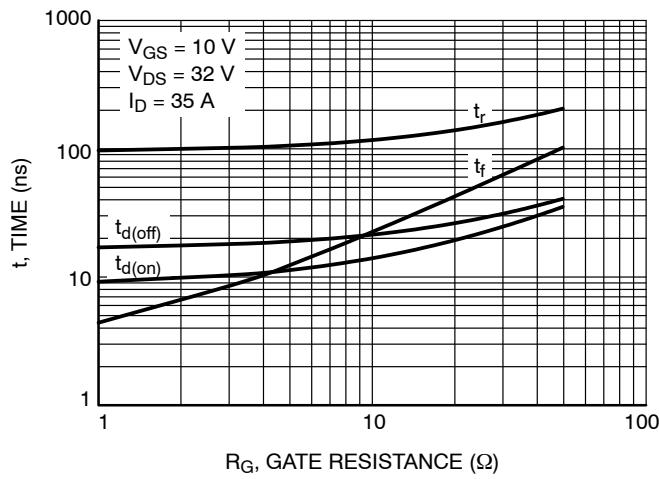


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

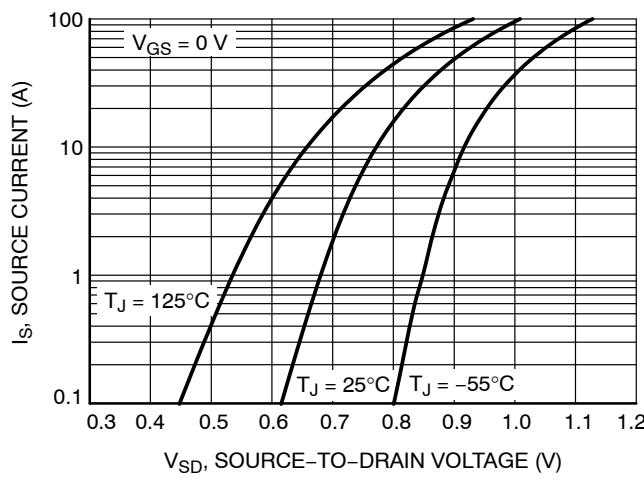


Figure 10. Diode Forward Voltage vs. Current

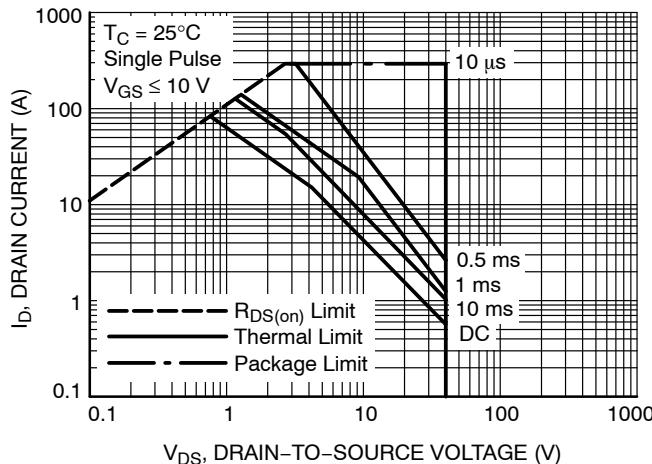


Figure 11. Maximum Rated Forward Biased Safe Operating Area

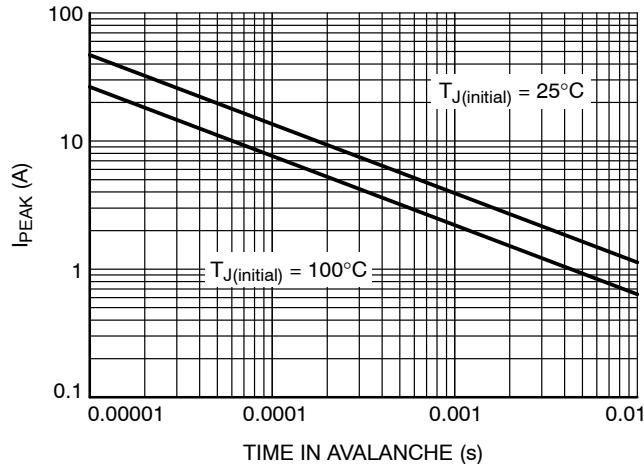


Figure 12. Maximum Drain Current vs. Time in Avalanche

NVTFS5C460NL

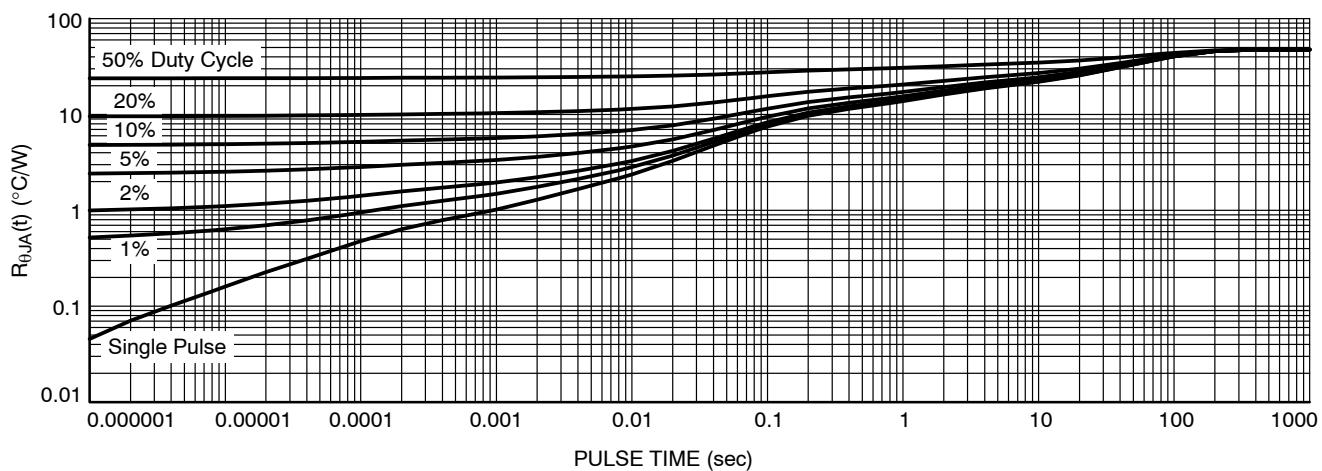


Figure 13. Thermal Response

DEVICE ORDERING INFORMATION

Device	Marking	Package	Shipping [†]
NVTFS5C460NLTAG	60NL	WDFN8 (Pb-Free)	1500 / Tape & Reel
NVTFS5C460NLWFTAG	60LW	WDFN8 (Pb-Free, Wettable Flanks)	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.

MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

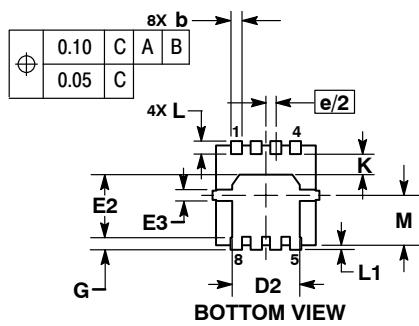
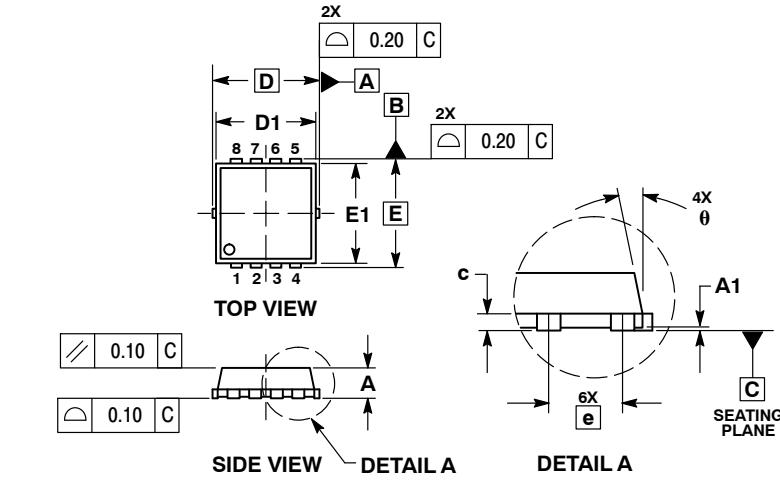
onsemiTM



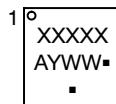
SCALE 2:1

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

DATE 23 APR 2012



**GENERIC
MARKING DIAGRAM***



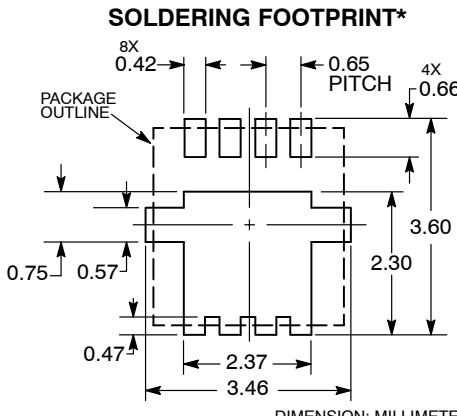
XXXXX = Specific Device Code
A = Assembly Location
Y = Year
WW = Work Week
□ = Pb-Free Package

*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.

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



*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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DESCRIPTION:	WDFN8 3.3x3.3, 0.65P	PAGE 1 OF 1

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