

MOSFET - Power, Single

N-Channel, μ 8FL

60 V, 20.3 m Ω , 27 A

NVTF5020N06C

Features

- Small Footprint (3.3 x 3.3 mm) for Compact Design
- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Q_G and Capacitance to Minimize Driver Losses
- NVTF5020N06C – 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 ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Parameter			Symbol	Value	Unit
Drain-to-Source Voltage			V _{DSS}	60	V
Gate-to-Source Voltage			V _{GS}	±20	V
Continuous Drain Current R _{θJC} (Notes 1, 3)	Steady State	T _C = 25°C	I _D	27	A
		T _C = 100°C		19	
Power Dissipation R _{θJC} (Note 1)		T _C = 25°C	P _D	31	W
		T _C = 100°C		15	
Continuous Drain Current R _{θJA} (Notes 1, 2, 3)	Steady State	T _A = 25°C	I _D	7	A
		T _A = 100°C		5	
Power Dissipation R _{θJA} (Notes 1, 2)		T _A = 25°C	P _D	2.5	W
		T _A = 100°C		1.2	
Pulsed Drain Current	T _A = 25°C, t _p = 10 μs		I _{DM}	128	A
Operating Junction and Storage Temperature Range			T _J , T _{stg}	-55 to +175	°C
Source Current (Body Diode)			I _S	25	A
Single Pulse Drain-to-Source Avalanche Energy (I _{L(pk)} = 5.7 A)			E _{AS}	17	mJ
Lead Temperature Soldering Reflow 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.

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. Surface-mounted on FR4 board using a 650 mm², 2 oz. Cu pad.
3. Maximum current for pulses as long as 1 second is higher but is dependent on pulse duration and duty cycle.

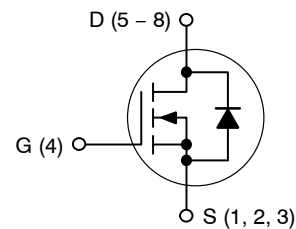


ON Semiconductor®

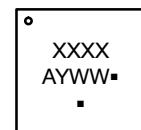
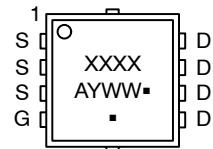
www.onsemi.com

$V_{(BR)DS}$	$R_{DS(on)}$ MAX	I_D MAX
60 V	20.3 m Ω @ 10 V	27 A

N-Channel



MARKING DIAGRAMS



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)	$R_{\theta JC}$	4.8	°C/W
Junction-to-Ambient – Steady State (Note 4)	$R_{\theta JA}$	59.7	

4. Surface-mounted on FR4 board using a 650 mm², 2 oz. Cu pad.

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

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
-----------	--------	----------------	-----	-----	-----	------

OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS} = 0\text{ V}, I_D = 250\text{ }\mu\text{A}$	60			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$	$I_D = 250\text{ }\mu\text{A}$, referenced to 25°C		29		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	$V_{GS} = 0\text{ V}, V_{DS} = 60\text{ V}$	$T_J = 25^\circ\text{C}$		10	μA
			$T_J = 125^\circ\text{C}$		250	
Gate-to-Source Leakage Current	I_{GSS}	$V_{DS} = 0\text{ V}, V_{GS} = 20\text{ V}$			100	nA

ON CHARACTERISTICS (Note 5)

Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 20\text{ }\mu\text{A}$	2.0		4.0	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$	$I_D = 20\text{ }\mu\text{A}$, referenced to 25°C		-7.8		mV/°C
Drain-to-Source On Resistance	$R_{DS(on)}$	$V_{GS} = 10\text{ V}, I_D = 4\text{ A}$		16.9	20.3	m Ω
Forward Transconductance	g_{FS}	$V_{DS} = 5\text{ V}, I_D = 4\text{ A}$		12		S
Gate-Resistance	R_G	$T_A = 25^\circ\text{C}$		1.0		Ω

CHARGES AND CAPACITANCES

Input Capacitance	C_{iss}	$V_{GS} = 0\text{ V}, f = 1\text{ MHz}, V_{DS} = 30\text{ V}$		355		pF
Output Capacitance	C_{oss}			260		
Reverse Transfer Capacitance	C_{rss}			4.9		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = 10\text{ V}, V_{DS} = 48\text{ V}, I_D = 4\text{ A}$		5.8		nC
Threshold Gate Charge	$Q_{G(TH)}$			1.4		
Gate-to-Source Charge	Q_{GS}			2.3		
Gate-to-Drain Charge	Q_{GD}			0.53		

SWITCHING CHARACTERISTICS (Note 6)

Turn-On Delay Time	$t_{d(on)}$	$V_{GS} = 10\text{ V}, V_{DS} = 48\text{ V}, I_D = 4\text{ A}, R_G = 6\text{ }\Omega$		6.5		ns
Rise Time	t_r			1.4		
Turn-Off Delay Time	$t_{d(off)}$			9.7		
Fall Time	t_f			4.0		

DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V _{SD}	V _{GS} = 0 V, I _S = 4 A	T _J = 25°C		0.81	1.2	V
			T _J = 125°C		0.67		
Reverse Recovery Time	t _{RR}	V _{GS} = 0 V, dI _S /dt = 100 A/μs, V _{DS} = 30 V, I _S = 4 A			24		ns
Charge Time	t _a				12		
Discharge Time	t _b				12		
Reverse Recovery Charge	Q _{RR}				12		nC

5. Pulse Test: Pulse Width $\leq 300\text{ }\mu\text{s}$, 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

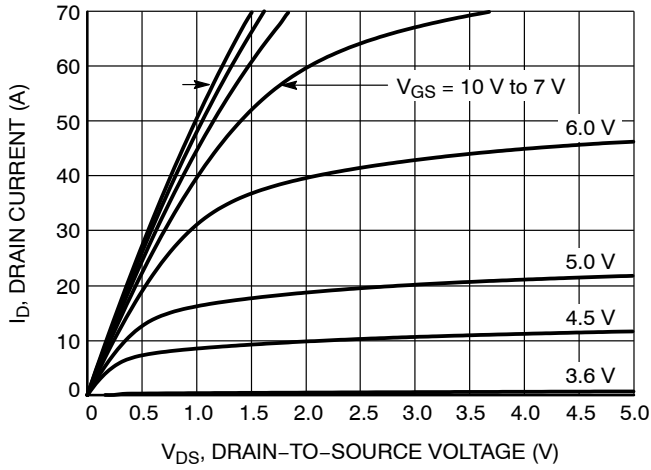


Figure 1. On-Region Characteristics

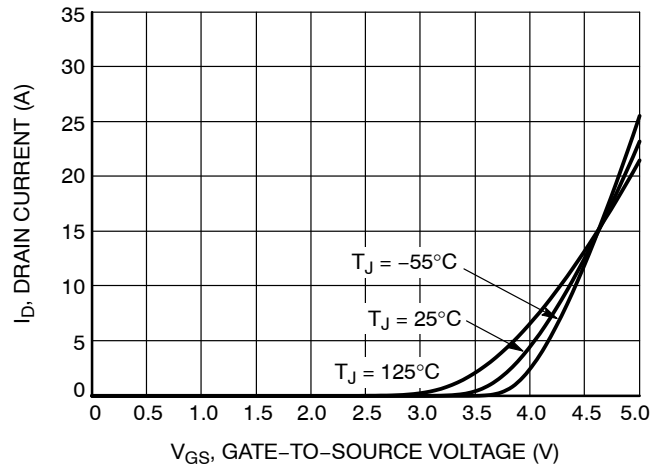


Figure 2. Transfer Characteristics

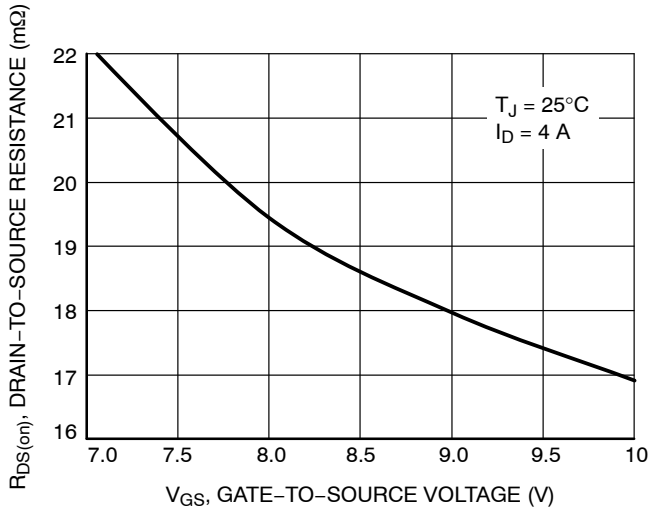


Figure 3. On-Resistance vs. Gate-to-Source Voltage

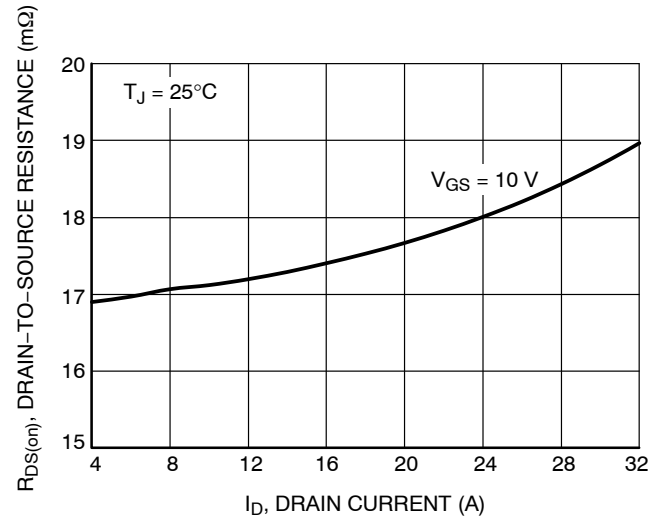


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

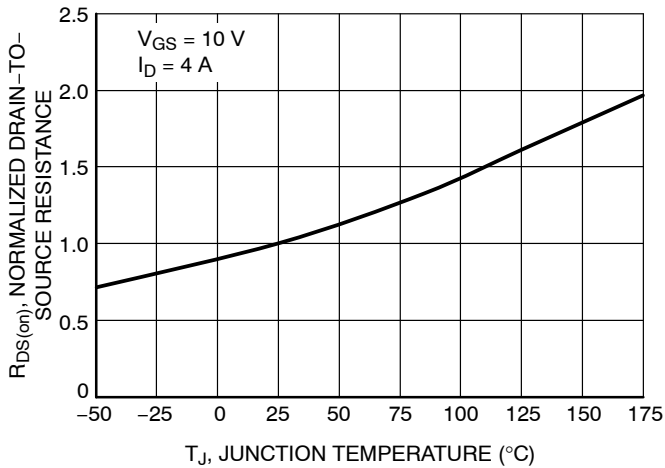


Figure 5. On-Resistance Variation with Temperature

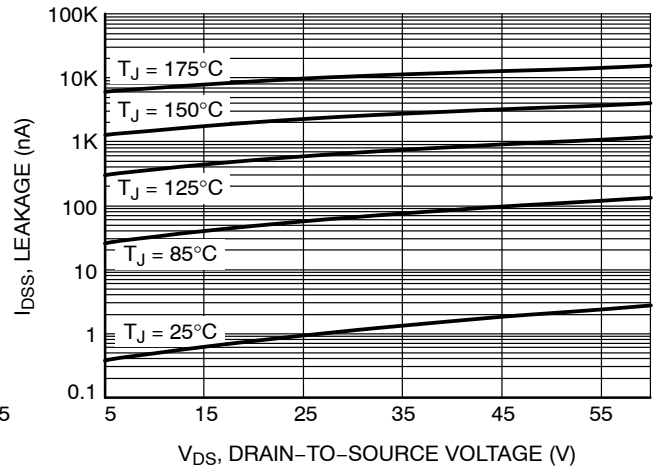


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

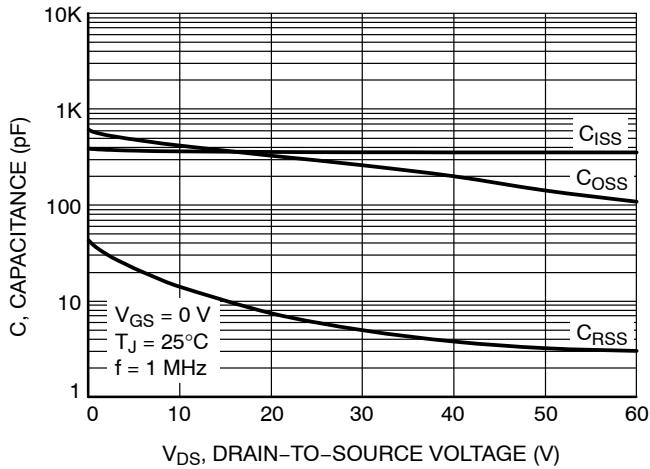


Figure 7. Capacitance Variation

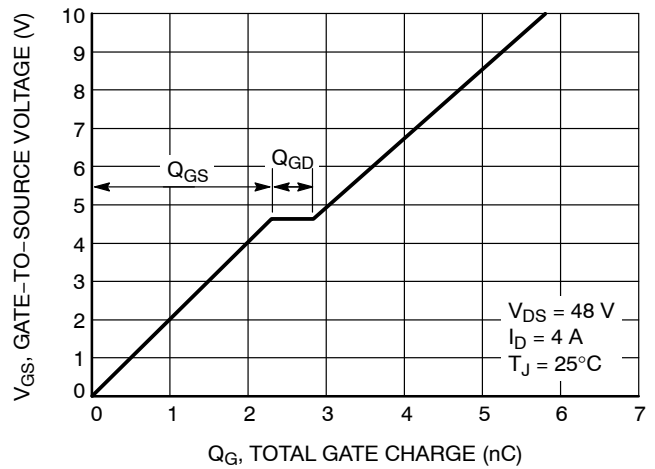


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

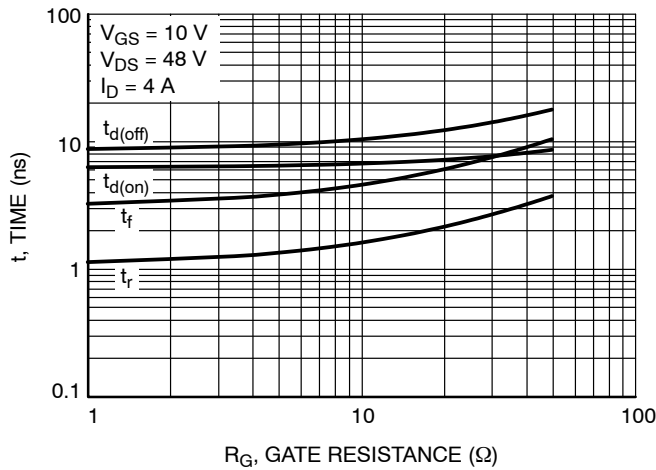


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

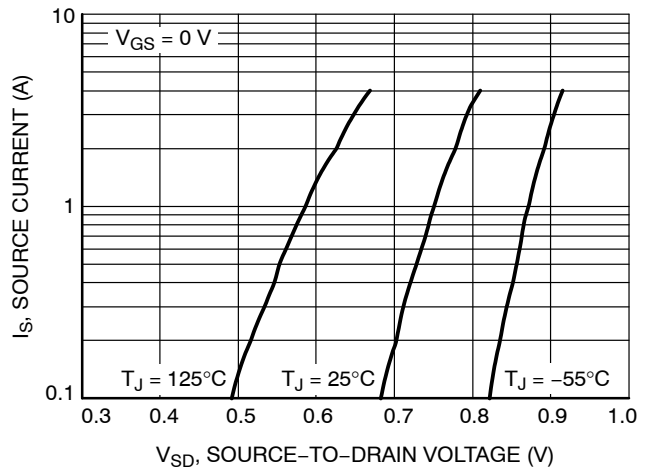


Figure 10. Diode Forward Voltage vs. Current

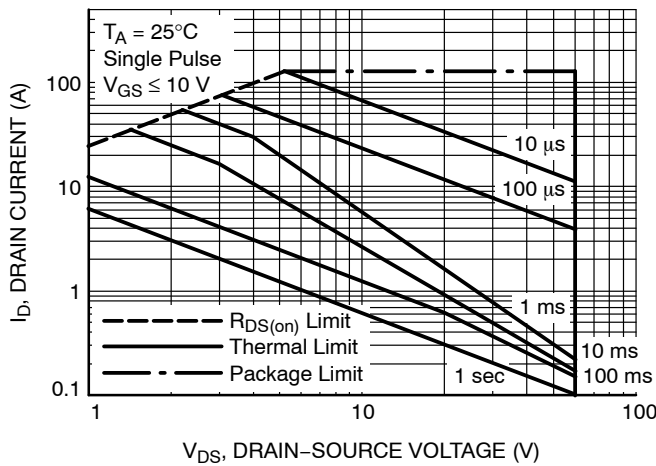


Figure 11. Safe Operating Area

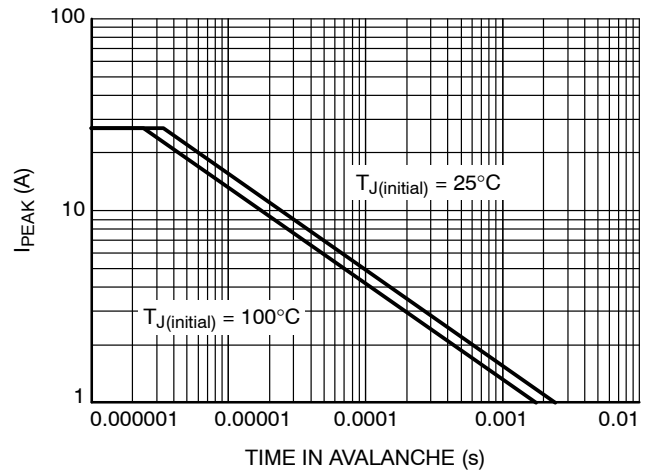


Figure 12. Maximum Drain Current vs. Time in Avalanche

NVTFS020N06C

TYPICAL CHARACTERISTICS

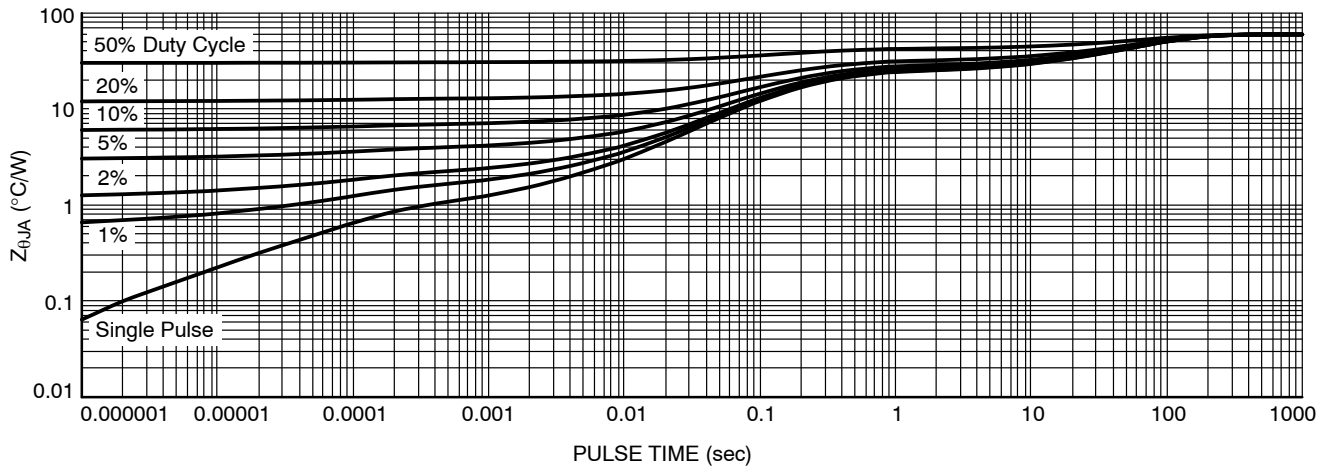


Figure 13. Thermal Characteristics

DEVICE ORDERING INFORMATION

Device	Marking	Package	Shipping†
NVTFS020N06CTAG	20NC	μ 8FL (Pb-Free)	1500 / Tape & Reel
NVTFWS020N06CTAG	20NW	μ 8FL (Pb-Free, Wettable Flanks)	1500 / Tape & Reel

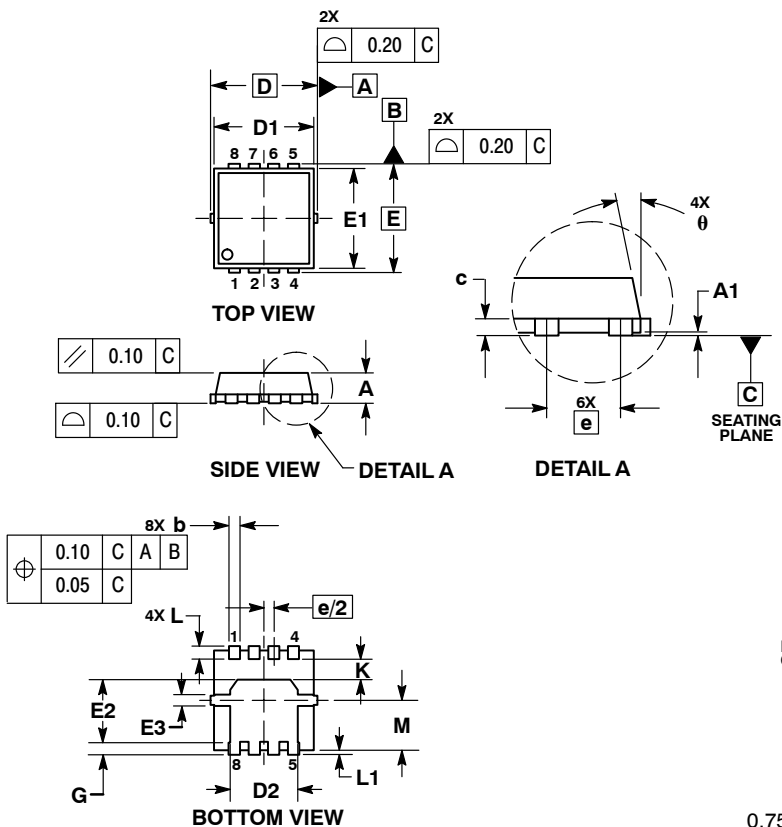
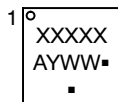
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.



SCALE 2:1

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

DATE 23 APR 2012


GENERIC
MARKING DIAGRAM*


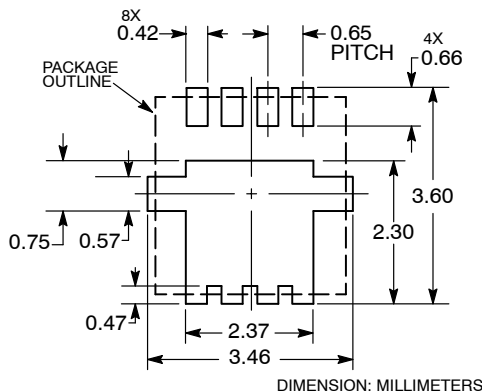
XXXXX = Specific Device Code
A = Assembly Location
Y = Year
WW = Work Week
▪ = Pb-Free Package

*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 °	---	12 °

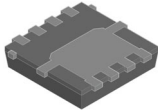
SOLDERING FOOTPRINT*


DIMENSION: MILLIMETERS

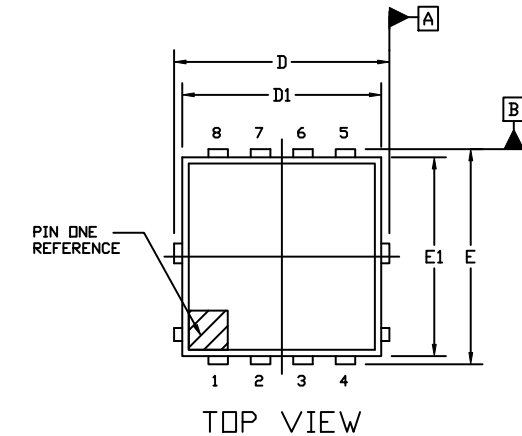
*For additional information on our Pb-Free strategy and soldering details, please download the onsemi Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

DOCUMENT NUMBER:	98AON30561E	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	WDFN8 3.3X3.3, 0.65P	PAGE 1 OF 1

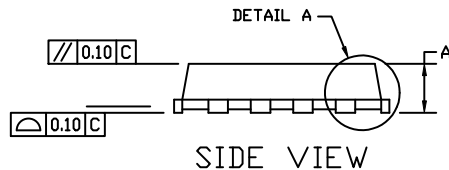
onsemi and onsemi are trademarks of Semiconductor Components Industries, LLC dba onsemi or its subsidiaries in the United States and/or other countries. onsemi reserves the right to make changes without further notice to any products herein. onsemi makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does onsemi assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. onsemi does not convey any license under its patent rights nor the rights of others.


WDFNW8 3.3x3.3, 0.65P (Full-Cut μ8FL WF)
CASE 515AN
ISSUE O

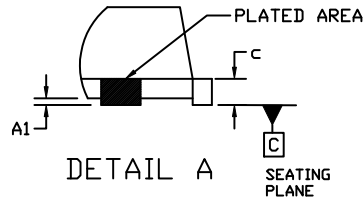
DATE 25 AUG 2020



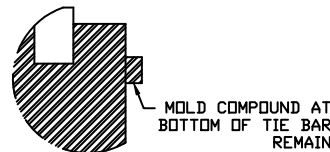
TOP VIEW



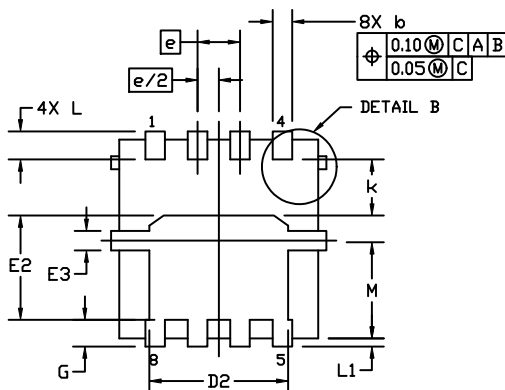
SIDE VIEW



DETAIL A



DETAIL B

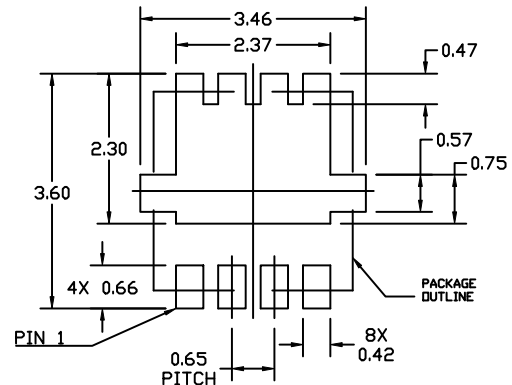


BOTTOM VIEW

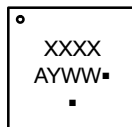
DIM	MILLIMETERS		
	MIN.	NDM.	MAX.
A	0.70	0.75	0.80
A1	0.00	----	0.05
b	0.23	0.30	0.40
c	0.15	0.20	0.25
D	3.05	3.30	3.55
D1	2.95	3.05	3.15
D2	1.98	2.11	2.24
E	3.05	3.30	3.55
E1	2.95	3.05	3.15
E2	1.47	1.60	1.73
E3	0.23	0.30	0.40
e	0.65 BSC		
G	0.30	0.41	0.51
K	0.65	0.80	0.95
L	0.30	0.43	0.59
L1	0.06	0.13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

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.


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, SOLDERM/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:	98AON24556H	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 3.3x3.3, 0.65P (Full-Cut μ8FL WF)	PAGE 1 OF 1

onsemi and onsemi are trademarks of Semiconductor Components Industries, LLC dba onsemi or its subsidiaries in the United States and/or other countries. onsemi reserves the right to make changes without further notice to any products herein. onsemi makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does onsemi assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. onsemi does not convey any license under its patent rights nor the rights of others.

onsemi, **Onsemi**, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi**'s product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

ADDITIONAL INFORMATION

TECHNICAL PUBLICATIONS:

Technical Library: www.onsemi.com/design/resources/technical-documentation
onsemi Website: www.onsemi.com

ONLINE SUPPORT: www.onsemi.com/support

For additional information, please contact your local Sales Representative at
www.onsemi.com/support/sales