

MOSFET – Power, Single, N-Channel, μ 8FL

30 V, 71 A, 4.2 m Ω

NVTFS4C06N

Features

- Low $R_{DS(on)}$ to Minimize Conduction Losses
- Low Capacitance to Minimize Driver Losses
- Optimized Gate Charge to Minimize Switching Losses
- NVTFS4C06NWF – Wettable Flanks Product
- NVT Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

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

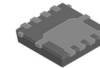
Symbol	Parameter	Value	Unit	
V_{DSS}	Drain-to-Source Voltage	30	V	
V_{GS}	Gate-to-Source Voltage	± 20	V	
I_D	Continuous Drain Current $R_{\theta JA}$ (Notes 1, 2, 4)	Steady State		
		$T_A = 25^\circ\text{C}$	21	A
P_D	Power Dissipation $R_{\theta JA}$ (Note 1, 2, 4)	$T_A = 100^\circ\text{C}$	15	
		$T_A = 25^\circ\text{C}$	3.1	W
I_D	Continuous Drain Current $R_{\theta JC}$ (Note 1, 3, 4)	$T_A = 100^\circ\text{C}$	1.6	
		$T_A = 25^\circ\text{C}$	71	A
P_D	Power Dissipation $R_{\theta JC}$ (Note 1, 3, 4)	$T_A = 100^\circ\text{C}$	50	A
		$T_A = 25^\circ\text{C}$	37	W
I_{DM}	Pulsed Drain Current	$T_A = 25^\circ\text{C}, t_p = 10 \mu\text{s}$	367	A
T_J, T_{stg}	Operating Junction and Storage Temperature	-55 to +175	$^\circ\text{C}$	
I_S	Source Current (Body Diode)	33	A	
E_{AS}	Single Pulse Drain-to-Source Avalanche Energy ($T_J = 25^\circ\text{C}, I_L = 26 A_{pk}, L = 0.1 \text{ mH}$)	34	mJ	
T_L	Lead Temperature for Soldering Purposes (1/8" from Case for 10 s)	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.

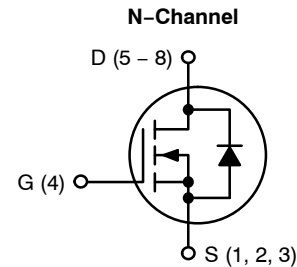
$V_{(BR)DSS}$	$R_{DS(on)}$ MAX	I_D MAX
30 V	4.2 m Ω @ 10 V	71 A
	6.1 m Ω @ 4.5 V	



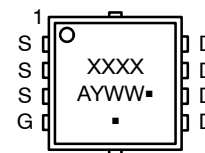
WDFN8 3.3x3.3, 0.65P
CASE 511AB



WDFNW8 3.3x3.3, 0.65P (Full-Cut μ 8FL WF)
CASE 515AN



MARKING DIAGRAM



- 4C06 = Specific Device Code for NVMTS4C06N
- 06WF = Specific Device Code of NVTFS4C06NWF
- 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 6 of this data sheet.

NOTE: Some of the devices on this data sheet have been **DISCONTINUED**. Please refer to the table on page 6.

NVTFS4C06N

THERMAL RESISTANCE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Junction-to-Case – Steady State (Drain) (Notes 1 and 4)	4.1	$^{\circ}C/W$
$R_{\theta JA}$	Junction-to-Ambient – Steady State (Notes 1 and 2)	48	

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. Assumes heat-sink sufficiently large to maintain constant case temperature independent of device power.
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.

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

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

$V_{(BR)DSS}$	Drain-to-Source Breakdown Voltage	$V_{GS} = 0 V, I_D = 250 \mu A$	30	–	–	V
$V_{(BR)DSS}/T_J$	Drain-to-Source Breakdown Voltage Temperature Coefficient		–	14.4	–	mV/ $^{\circ}C$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{GS} = 0 V, V_{DS} = 24 V$				
		$T_J = 25^{\circ}C$	–	–	1.0	μA
		$T_J = 125^{\circ}C$	–	–	10	
I_{GSS}	Gate-to-Source Leakage Current	$V_{DS} = 0 V, V_{GS} = \pm 20 V$	–	–	± 100	nA

ON CHARACTERISTICS (Note 5)

$V_{GS(TH)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250 \mu A$	1.3	–	2.2	V
$V_{GS(TH)}/T_J$	Negative Threshold Temperature Coefficient		–	3.8	–	mV/ $^{\circ}C$
$R_{DS(on)}$	Drain-to-Source On Resistance	$V_{GS} = 10 V, I_D = 30 A$	–	3.4	4.2	m Ω
		$V_{GS} = 4.5 V, I_D = 30 A$	–	4.9	6.1	
g_{FS}	Forward Transconductance	$V_{DS} = 1.5 V, I_D = 15 A$	–	58	–	S
R_G	Gate Resistance	$T_A = 25^{\circ}C$	–	1.0	–	Ω

CHARGES AND CAPACITANCES

C_{ISS}	Input Capacitance	$V_{GS} = 0 V, f = 1 MHz, V_{DS} = 15 V$	–	1683	–	pF
C_{OSS}	Output Capacitance		–	841	–	
C_{RSS}	Reverse Transfer Capacitance		–	40	–	
C_{RSS}/C_{ISS}	Capacitance Ratio	$V_{GS} = 0 V, V_{DS} = 15 V, f = 1 MHz$	–	0.023	–	
$Q_{G(TOT)}$	Total Gate Charge	$V_{GS} = 4.5 V, V_{DS} = 15 V; I_D = 30 A$	–	11.6	–	nC
$Q_{G(TH)}$	Threshold Gate Charge		–	2.6	–	
Q_{GS}	Gate-to-Source Charge		–	4.7	–	
Q_{GD}	Gate-to-Drain Charge		–	4.0	–	
V_{GP}	Gate Plateau Voltage		–	3.1	–	V
$Q_{G(TOT)}$	Total Gate Charge	$V_{GS} = 10 V, V_{DS} = 15 V; I_D = 30 A$	–	26	–	nC

SWITCHING CHARACTERISTICS (Note 6)

$t_{d(ON)}$	Turn-On Delay Time	$V_{GS} = 4.5 V, V_{DS} = 15 V, I_D = 15 A, R_G = 3.0 \Omega$	–	10	–	ns
t_r	Rise Time		–	32	–	
$t_{d(OFF)}$	Turn-Off Delay Time		–	18	–	
t_f	Fall Time		–	5.0	–	
$t_{d(ON)}$	Turn-On Delay Time	$V_{GS} = 10 V, V_{DS} = 15 V, I_D = 15 A, R_G = 3.0 \Omega$	–	8.0	–	ns
t_r	Rise Time		–	28	–	
$t_{d(OFF)}$	Turn-Off Delay Time		–	24	–	
t_f	Fall Time		–	3.0	–	

NVTFS4C06N

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

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit	
DRAIN-SOURCE DIODE CHARACTERISTICS							
V_{SD}	Forward Diode Voltage	$V_{GS} = 0\text{ V},$ $I_S = 10\text{ A}$	$T_J = 25^\circ\text{C}$	-	0.8	1.1	V
			$T_J = 125^\circ\text{C}$	-	0.63	-	
t_{RR}	Reverse Recovery Time	$V_{GS} = 0\text{ V},$ dIS/dt = 100 A/ $\mu\text{s},$ $I_S = 30\text{ A}$	-	34	-	ns	
t_a	Charge Time		-	17	-		
t_b	Discharge Time		-	17	-		
Q_{RR}	Reverse Recovery Charge		-	22	-	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.

NVTFS4C06N

TYPICAL CHARACTERISTICS

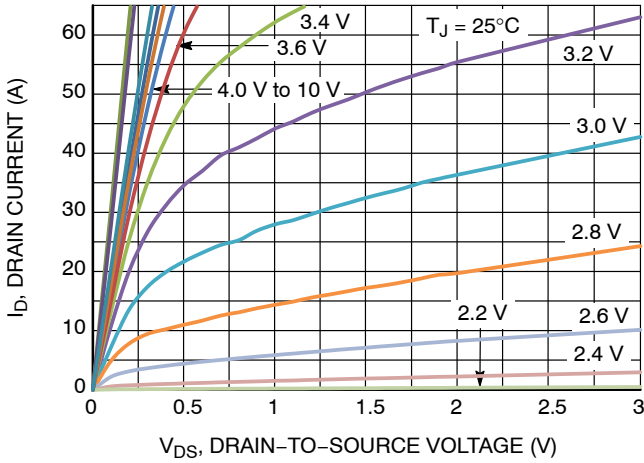


Figure 1. On-Region Characteristics

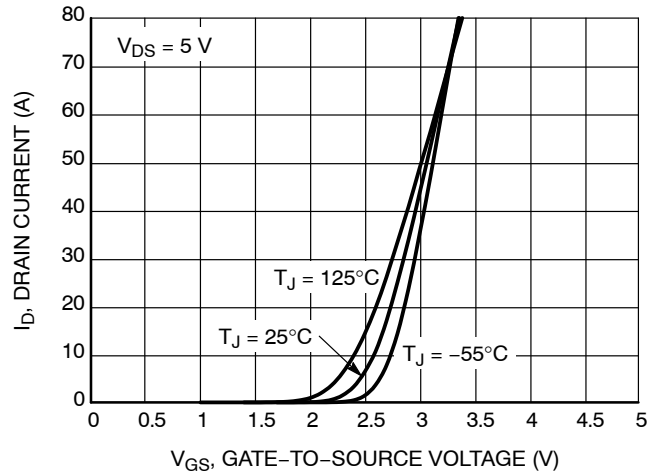


Figure 2. Transfer Characteristics

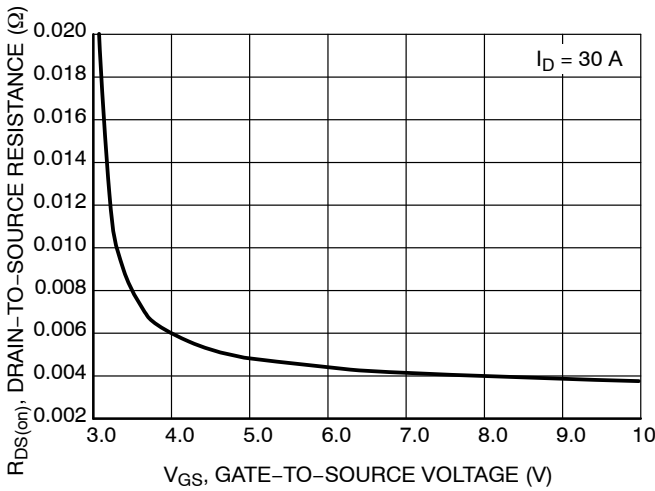


Figure 3. On-Resistance vs. V_{GS}

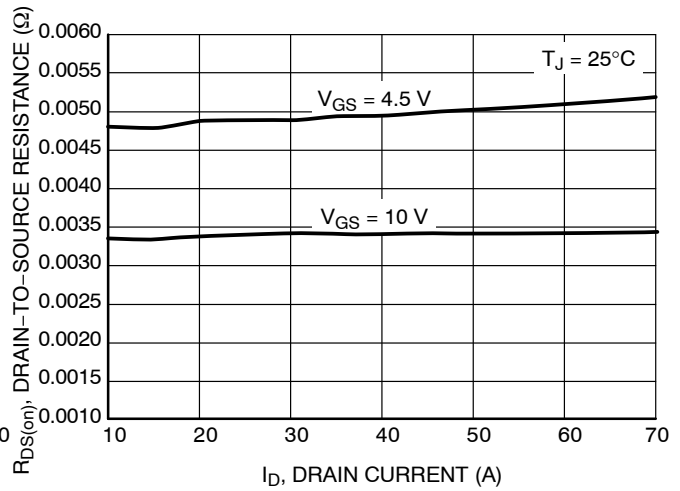


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

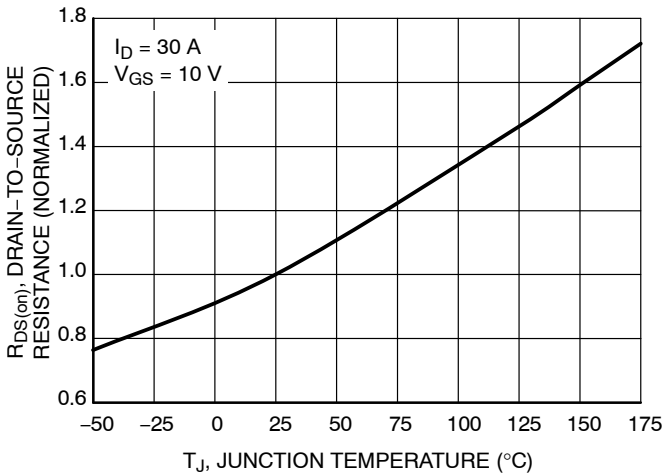


Figure 5. On-Resistance Variation with Temperature

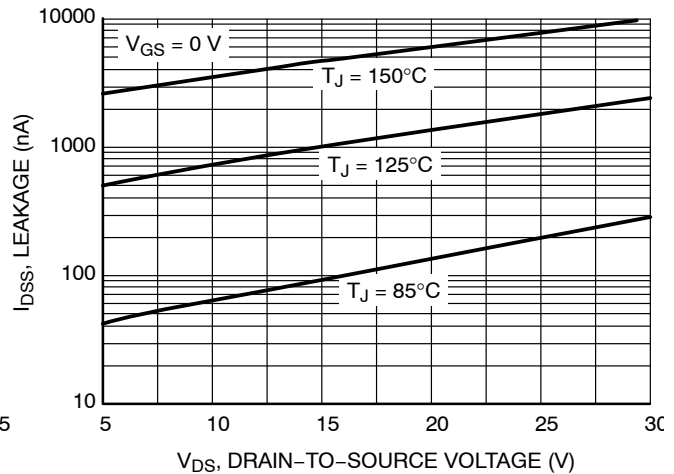


Figure 6. Drain-to-Source Leakage Current vs. Voltage

NVTFS4C06N

TYPICAL CHARACTERISTICS (continued)

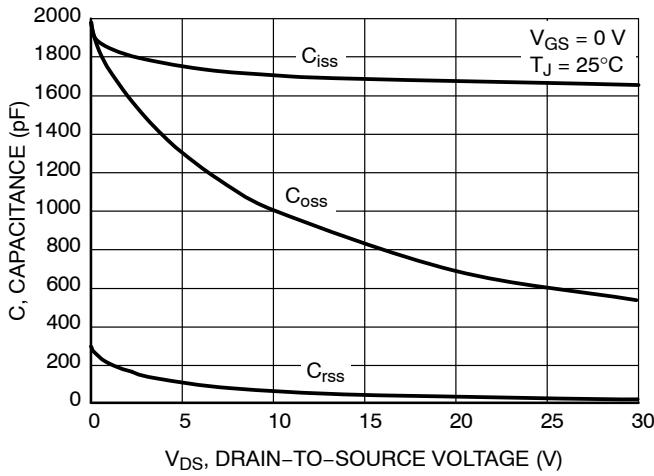


Figure 7. Capacitance Variation

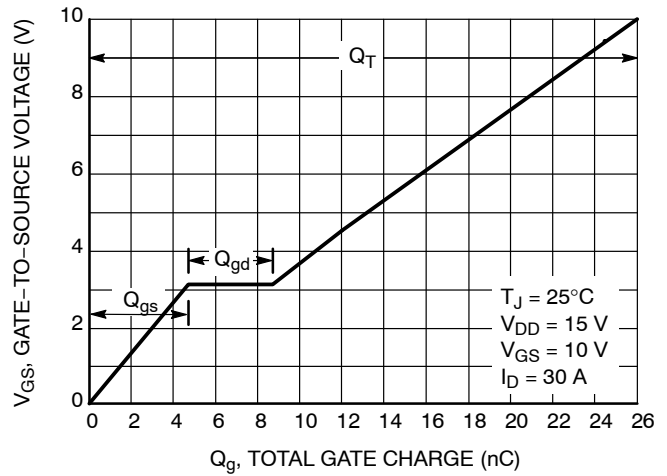


Figure 8. Gate-to-Source and Drain-to-Source Voltage vs. Total Charge

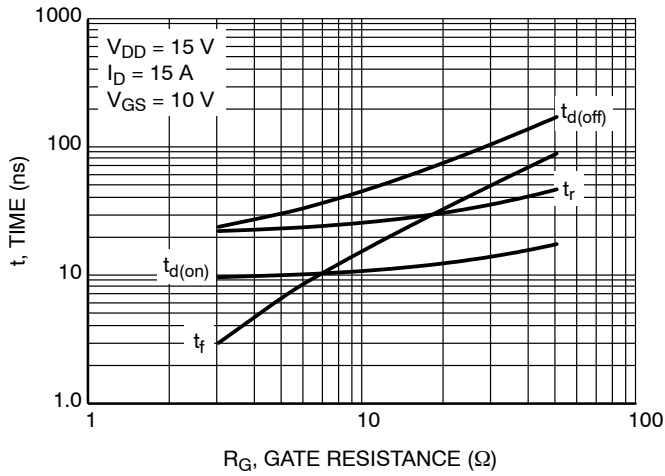


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

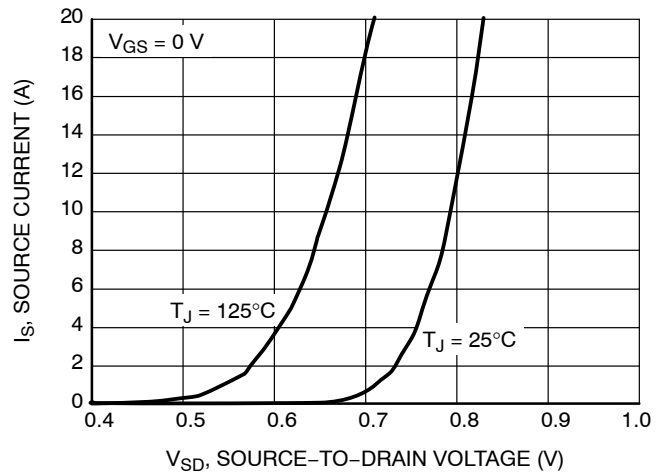


Figure 10. Diode Forward Voltage vs. Current

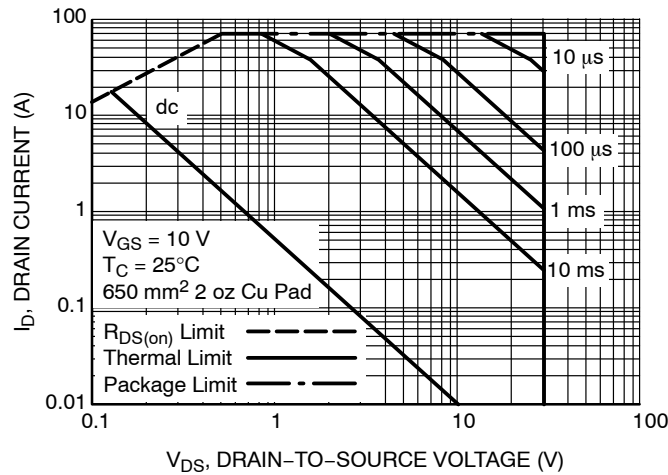


Figure 11. Maximum Rated Forward Biased Safe Operating Area

NVTFS4C06N

TYPICAL CHARACTERISTICS (continued)

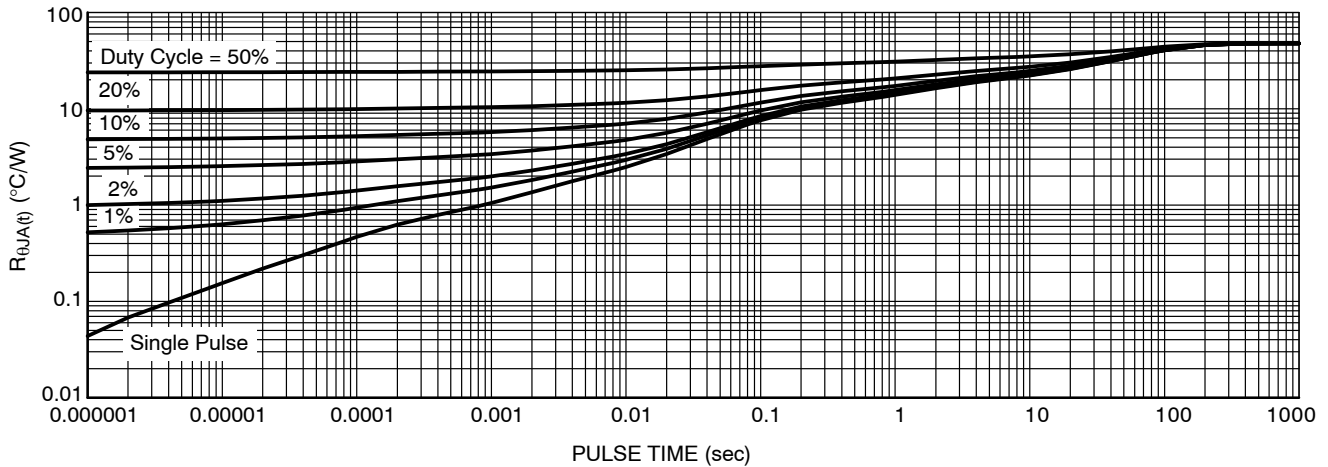


Figure 12. Thermal Response

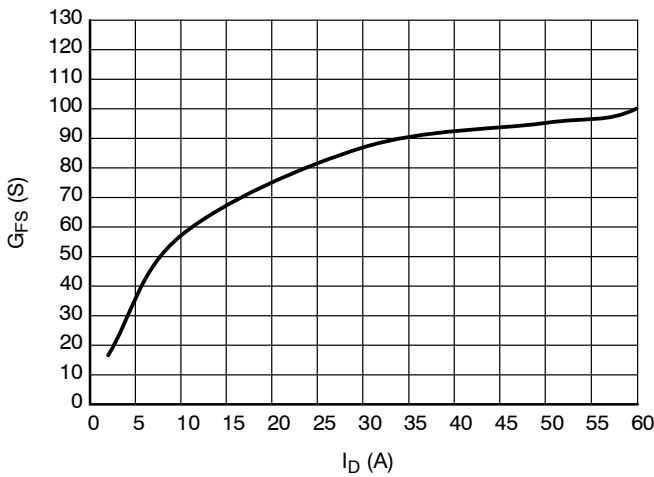


Figure 13. G_{FS} vs. I_D

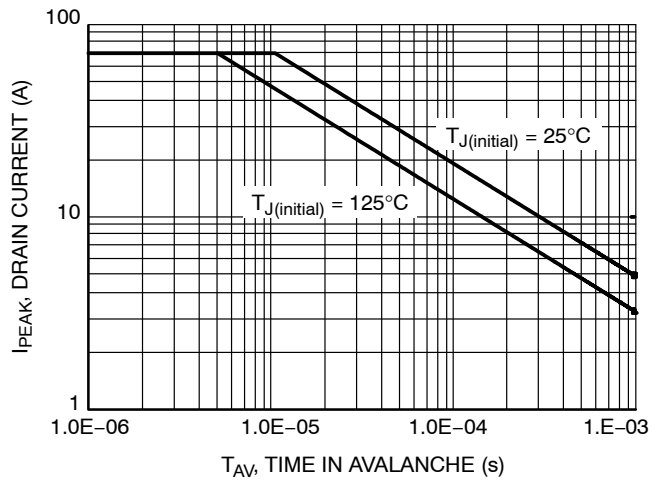


Figure 14. Avalanche Characteristics

ORDERING INFORMATION

Device	Package	Shipping†
NVTFS4C06NTAG	WDFN8 3.3x3.3, 0.65P (Pb-Free)	1500 / Tape & Reel
NVTFS4C06NTWG	WDFN8 3.3x3.3, 0.65P (Pb-Free)	5000 / Tape & Reel

DISCONTINUED (Note 7)

NVTFS4C06NWFTAG	WDFNW8 3.3x3.3, 0.65P (Full-Cut μ 8FL WF) (Pb-Free)	1500 / Tape & Reel
NVTFS4C06NWFTWG	WDFNW8 3.3x3.3, 0.65P (Full-Cut μ 8FL WF) (Pb-Free)	5000 / 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](#).

7. **DISCONTINUED:** These devices are not recommended for new design. Please contact your **onsemi** representative for information. The most current information on these devices may be available on www.onsemi.com.

MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



SCALE 2:1

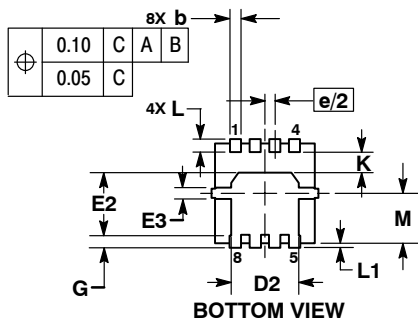
WDFN8 3.3x3.3, 0.65P
CASE 511AB
ISSUE D

DATE 23 APR 2012

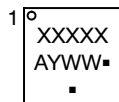


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
 2. CONTROLLING DIMENSION: MILLIMETERS.
 3. DIMENSION D1 AND E1 DO NOT INCLUDE MOLD FLASH PROTRUSIONS OR GATE BURRS.

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 °

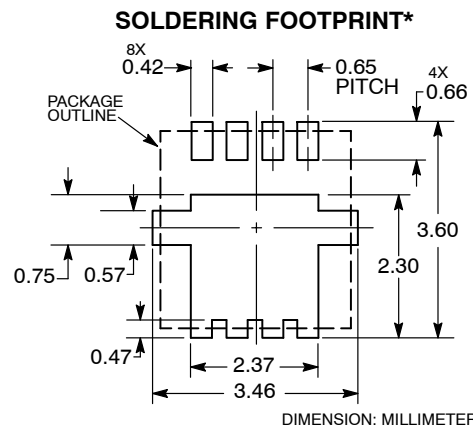


GENERIC MARKING DIAGRAM*



- 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.



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

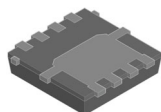
DOCUMENT NUMBER:	98AON30561E	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	WDFN8 3.3X3.3, 0.65P	PAGE 1 OF 1

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MECHANICAL CASE OUTLINE

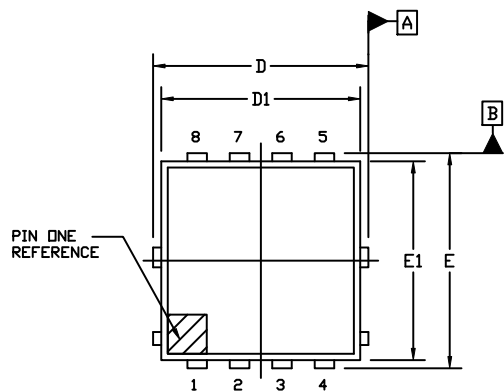
PACKAGE DIMENSIONS

ON Semiconductor®

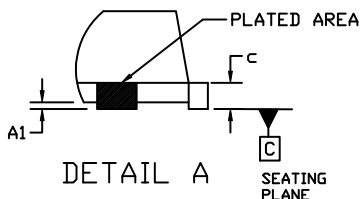


WDFNW8 3.3x3.3, 0.65P (Full-Cut μ 8FL WF) CASE 515AN ISSUE O

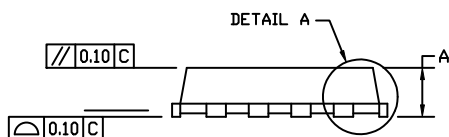
DATE 25 AUG 2020



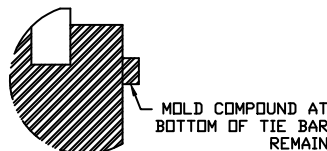
TOP VIEW



DETAIL A



SIDE VIEW

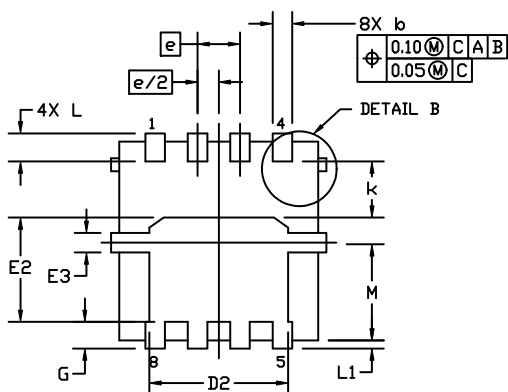


DETAIL B

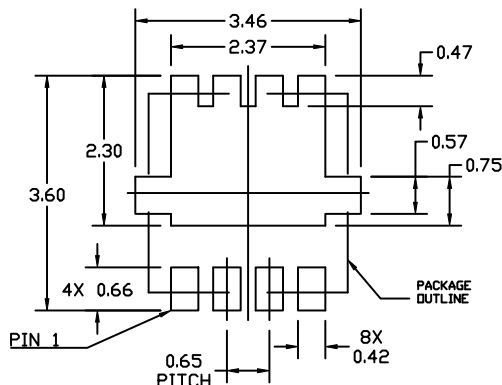
NOTES:

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



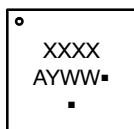
BOTTOM VIEW



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.

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.

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DESCRIPTION:	WDFNW8 3.3x3.3, 0.65P (Full-Cut μ8FL WF)	PAGE 1 OF 1

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