MOSFET - Power, Single N-Channel

100 V, 38 mΩ, 21 A

NVTFS040N10MCL

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
- NVTFWS040N10MCL – Wettable Flanks Product
- AEC−Q101 Qualified and PPAP Capable
- These Devices are Pb−Free and are RoHS Compliant

$V_{(BR)DSS}$	$R_{DS(on)}$ MAX	I_D MAX
100 V	38 mΩ @ 10 V	21 A
	53 mΩ @ 4.5 V	

N−Channel

MARKING DIAGRAMS

WDFN8 (µ8FL) CASE 511AB

WDFNW8 (µ8FL WF) CASE 515AN

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

MAXIMUM RATINGS (T_J = 25°C unless otherwise noted)

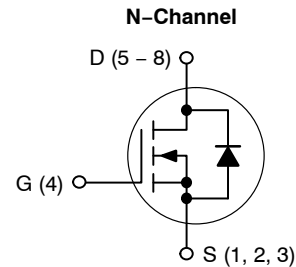| Parameter			Symbol	Value	Unit
Drain−to−Source Voltage			V_{DSS}	100	V
Gate−to−Source Voltage			V_{GS}	±20	V
Continuous Drain Current $R_{\theta JC}$ (Notes 1, 2, 3)	Steady State	T_C = 25°C	I_D	21	A
		T_C = 100°C		15	
Power Dissipation $R_{\theta JC}$ (Notes 1, 2)		T_C = 25°C	P_D	36	W
		T_C = 100°C		18	
Continuous Drain Current $R_{\theta JA}$ (Notes 1, 2, 3)	Steady State	T_A = 25°C	I_D	6.1	A
		T_A = 100°C		4.3	
Power Dissipation $R_{\theta JA}$ (Notes 1, 2)		T_A = 25°C	P_D	3.1	W
		T_A = 100°C		1.5	
Pulsed Drain Current	T_C = 25°C, t_p = 10 µs		I_{DM}	82	A
Source Current (Body Diode)			I_S	28	A
Operating Junction and Storage Temperature Range			T_J, T_{stg}	−55 to +175	°C
Single Pulse Drain−to−Source Avalanche Energy ($I_{L(pk)}$ = 0.9 A)			E_{AS}	109	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.
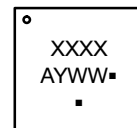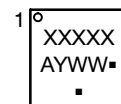
THERMAL RESISTANCE MAXIMUM RATINGS (Note 1)

Parameter	Symbol	Value	Unit
Junction−to−Case – Steady State (Note 2)	$R_{\theta JC}$	4.2	°C/W
Junction−to−Ambient – Steady State (Note 2)	$R_{\theta JA}$	49	

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.

ORDERING INFORMATION

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

NVTFS040N10MCL

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise specified)

Parameter	Symbol	Test Condition		Min	Typ	Max	Unit
OFF CHARACTERISTICS							
Drain−to−Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = 250 μA		100			V
Drain−to−Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$				50.3		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS} = 0 V, V_{DS} = 100 V	T_J = 25°C			1.0	μA
			T_J = 125°C			100	
Gate−to−Source Leakage Current	I_{GSS}	V_{DS} = 0 V, V_{GS} = 20 V				100	nA
ON CHARACTERISTICS (Note 4)							
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = 26 μA		1.0		3.0	V
Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$				−5.7		mV/°C
Drain−to−Source On Resistance	$R_{DS(on)}$	V_{GS} = 10 V	I_D = 5 A		31	38	mΩ
		V_{GS} = 4.5 V	I_D = 4 A		42	53	
Forward Transconductance	g_{FS}	V_{DS} = 10 V, I_D = 5 A			18		S
CHARGES, CAPACITANCES & GATE RESISTANCE							
Input Capacitance	C_{ISS}	V_{GS} = 0 V, f = 1 MHz, V_{DS} = 50 V			520		pF
Output Capacitance	C_{OSS}				200		
Reverse Transfer Capacitance	C_{RSS}				3.2		
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = 4.5 V, V_{DS} = 50 V; I_D = 4 A			4.1		nC
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = 10 V, V_{DS} = 50 V; I_D = 5 A			8.6		
Threshold Gate Charge	$Q_{G(TH)}$	V_{GS} = 10 V, V_{DS} = 50 V; I_D = 5 A			0.7		nC
Gate−to−Source Charge	Q_{GS}				1.7		
Gate−to−Drain Charge	Q_{GD}				1.3		
Plateau Voltage	V_{GP}				2.9		V
SWITCHING CHARACTERISTICS (Note 5)							
Turn−On Delay Time	$t_{d(ON)}$	V_{GS} = 10 V, V_{DS} = 50 V, I_D = 5 A			7.0		ns
Rise Time	t_r				7.4		
Turn−Off Delay Time	$t_{d(OFF)}$				16.3		
Fall Time	t_f				3.8		
DRAIN−SOURCE DIODE CHARACTERISTICS							
Forward Diode Voltage	V_{SD}	V_{GS} = 0 V, I_S = 5 A, T_J = 25°C			0.85	1.3	V
		V_{GS} = 0 V, I_S = 5 A, T_J = 125°C			0.73		
Reverse Recovery Time	t_{RR}	V_{GS} = 0 V, dI_S/dt = 100 A/μs, I_S = 2 A			13		ns
Reverse Recovery Charge	Q_{RR}				12		nC
Charge Time	t_a				25		ns
Discharge Time	t_b				15		ns

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.

NVTFS040N10MCL
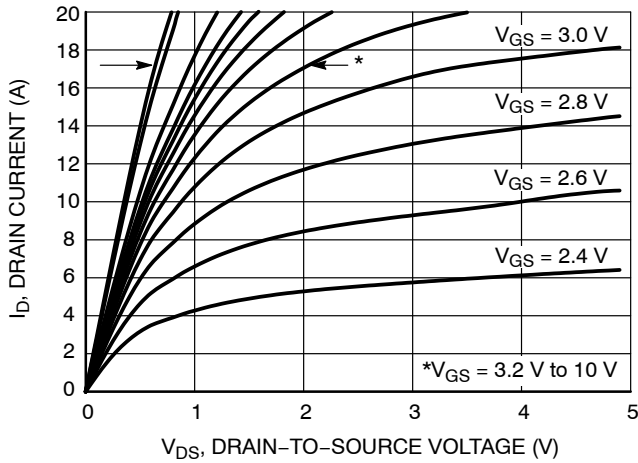
TYPICAL CHARACTERISTICS
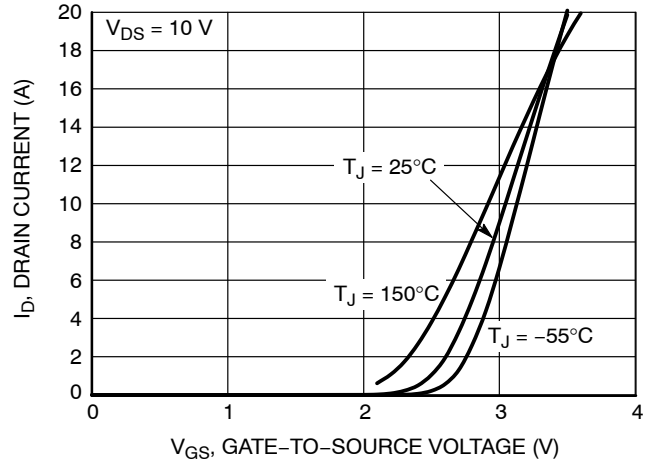

Figure 1. On−Region Characteristics
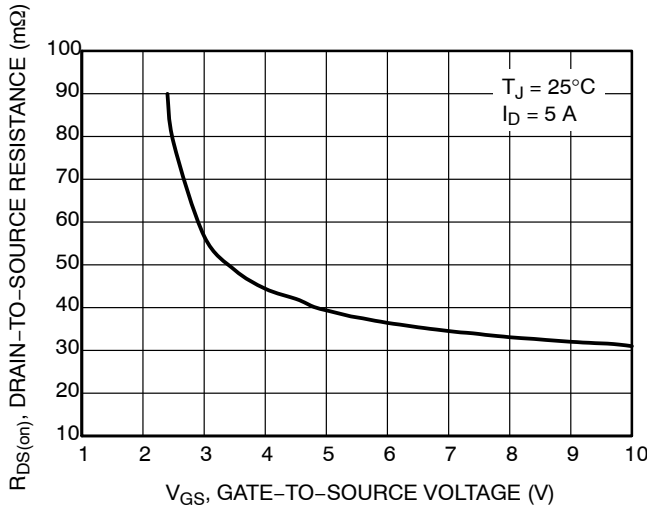

Figure 2. Transfer Characteristics

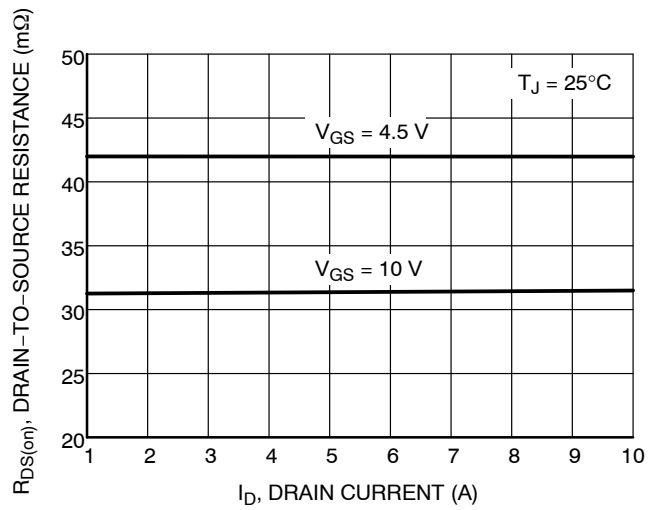Figure 3. On−Resistance vs. Gate−to−Source Voltage

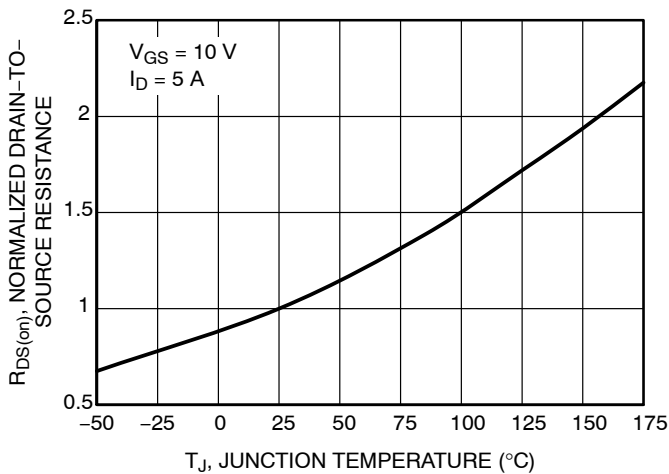
Figure 4. On−Resistance vs. Drain Current and Gate Voltage

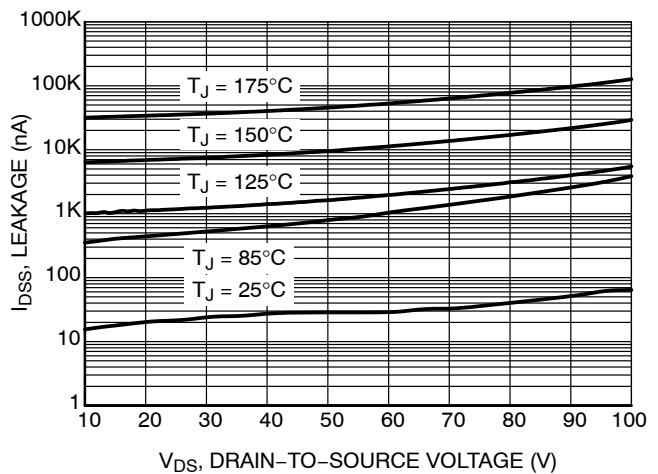Figure 5. On−Resistance Variation with Temperature

Figure 6. Drain−to−Source Leakage Current vs. Voltage
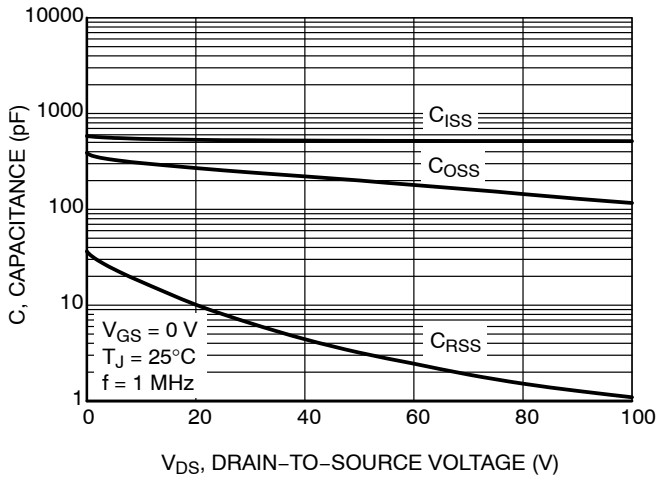
NVTFS040N10MCL

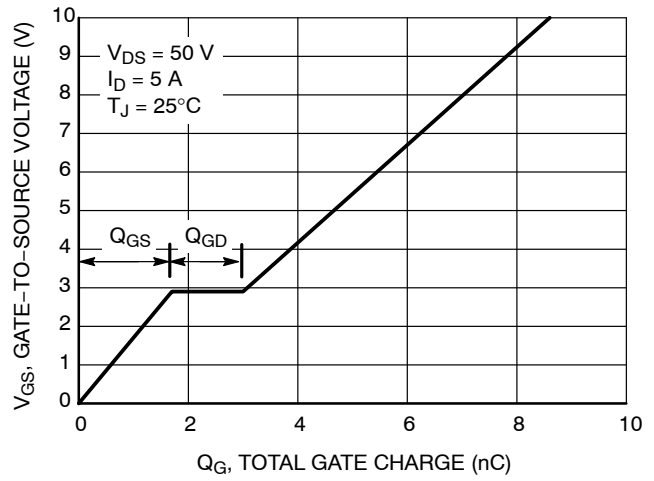## TYPICAL CHARACTERISTICS

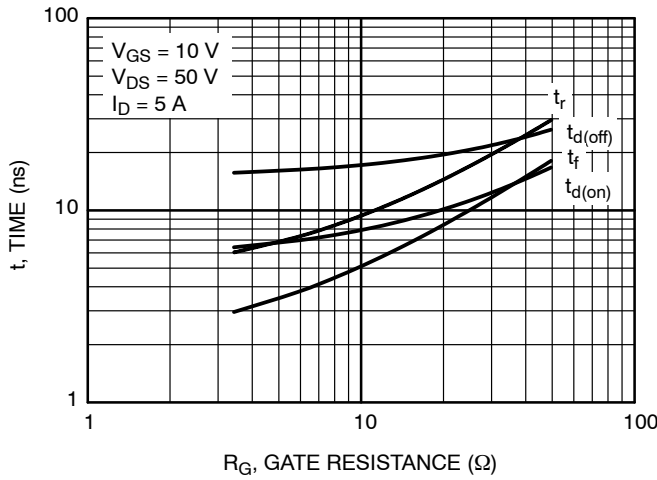**Figure 7. Capacitance Variation**

Figure 8. Gate−to−Source Voltage vs. Total Charge

Figure 9. Resistive Switching Time Variation vs. Gate Resistance
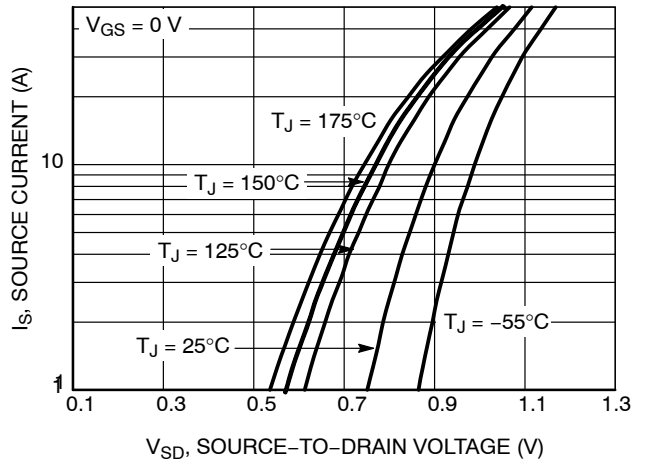
Figure 10. Diode Forward Voltage vs. Current
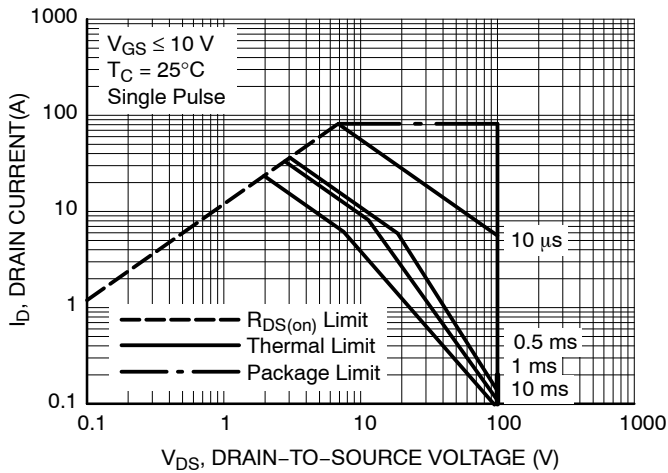
Figure 11. Maximum Rated Forward Biased Safe Operating Area
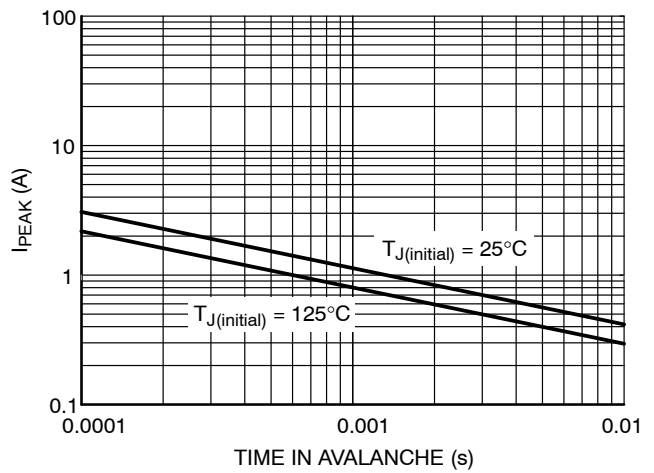
Figure 12. I_{PEAK} vs. Time in Avalanche

NVTFS040N10MCL

TYPICAL CHARACTERISTICS
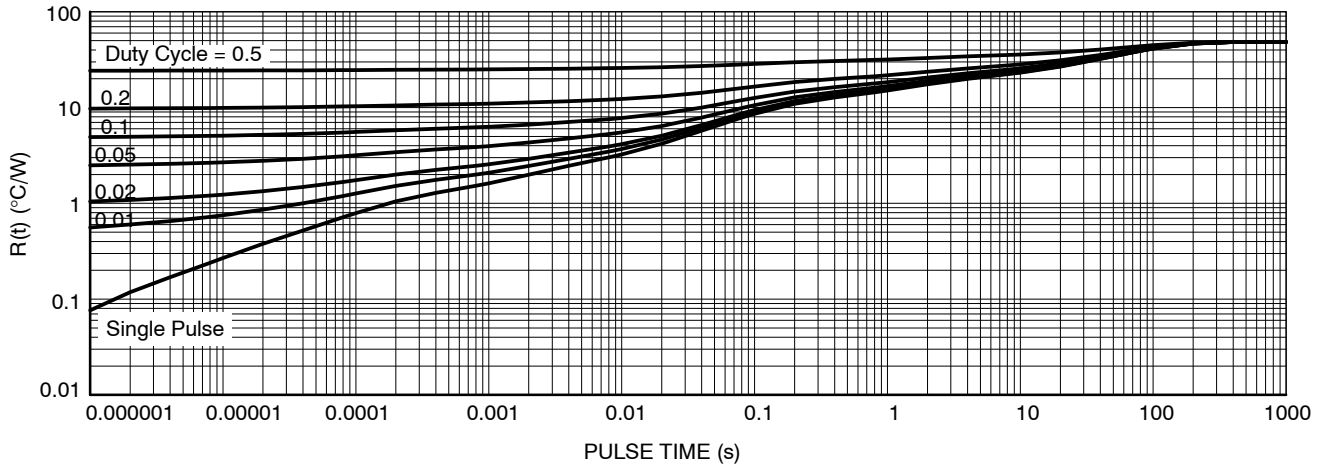
Figure 13. Thermal Characteristics

DEVICE ORDERING INFORMATION

Device	Marking	Package	Shipping[†]
NVTFS040N10MCLTAG	40L1	WDFN8 (Pb−Free)	1500 / Tape & Reel
NVTFWS040N10MCLTAG	40W1	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.

onsemi™

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

SCALE 2:1

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.

2X | 0.20 | C

D | A
B
2X | 0.20 | C

8 7 6 5

E1 | E

1 2 3 4

TOP VIEW

4X θ

c

A1

// | 0.10 | C

⌒ | 0.10 | C

A

SIDE VIEW — **DETAIL A**

6X e

DETAIL A

SEATING PLANE | C

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 °

8X b

⊕ | 0.10 | C | A | B
| 0.05 | C

4X L | e/2

1 | 4

K

E2

E3

M

G

8 | 5

D2

L1

BOTTOM VIEW

GENERIC MARKING DIAGRAM*

1
XXXXX
AYWW▪
▪

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.

SOLDERING FOOTPRINT*

8X 0.42

0.65 PITCH

4X 0.66

PACKAGE OUTLINE

3.60

2.30

0.75 | 0.57

0.47

2.37

3.46

DIMENSION: MILLIMETERS

*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

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

DATE 25 AUG 2020
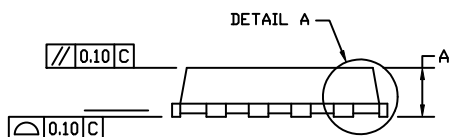
NOTES:

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.

PIN ONE REFERENCE

TOP VIEW

PLATED AREA

DETAIL A

SEATING PLANE

SIDE VIEW

DETAIL A

MOLD COMPOUND AT BOTTOM OF TIE BAR REMAIN

DETAIL B

DIM	MILLIMETERS		
	MIN.	NOM.	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

8X b

⊕ 0.10 Ⓜ C A B

DETAIL B

BOTTOM VIEW
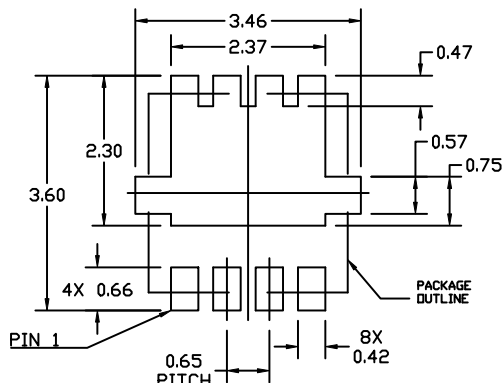
RECOMMENDED MOUNTING FOOTPRINT

3.46
2.37
0.47
0.57
0.75
2.30
3.60
4X 0.66
PIN 1
0.65 PITCH
8X 0.42
PACKAGE OUTLINE

* 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
AYWW▪
▪

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

ADDITIONAL INFORMATION

◊