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MOSFET – N-Channel, Shielded Gate, POWERTRENCH®

100 V, 7.5 A, 103 mΩ

FDMC86116LZ, FDMC86116LZ-L701

General Description

This N−Channel logic Level MOSFETs are produced using ON Semiconductor's advanced POWERTRENCH process that incorporates Shielded Gate technology. This process has been optimized for the on−state resistance and yet maintain superior switching performance. G−S zener has been added to enhance ESD voltage level.

Features

- Max $r_{DS(on)}$ = 103 mΩ at V_{GS} = 10 V, I_D = 3.3 A
- Max $r_{DS(on)}$ = 153 mΩ at V_{GS} = 4.5 V, I_D = 2.7 A
- HBM ESD Protection Level > 3 kV Typical (Note 1)
- 100% UIL Tested
- These Devices are Pb−Free and are RoHS Compliant

Applications

- DC – DC Conversion

1. The diode connected between gate and source serves only as protection against ESD. No gate overvoltage rating is implied.

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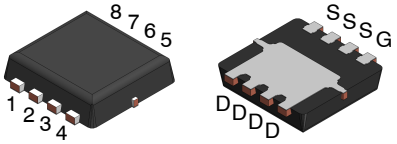
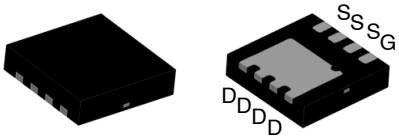


Top Bottom

WDFN8 3.3x3.3, 0.65P
CASE 511DR
FDMC3612

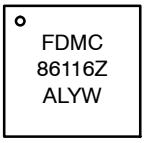


Top Bottom

WDFN8 3.3x3.3, 0.65P
CASE 511DQ
FDMC3612−L701

MARKING DIAGRAM

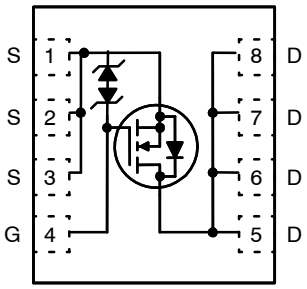
FDMC86116LZ



FDMC86116LZ−L701

FDMC86116Z	= Specific Device Code
A	= Assembly Site
XY	= 2−Digit Date Code
KK	= 2−Digit Lot Run Traceability Code
L	= Wafer Lot Number
YW	= Assembly Start Week

PIN ASSIGNMENT



ORDERING INFORMATION

See detailed ordering and shipping information on page 6 of this data sheet.

MOSFET MAXIMUM RATINGS (T_A = 25°C unless otherwise noted)

Symbol	Parameter			Ratings	Unit
V_{DS}	Drain to Source Voltage			100	V
V_{GS}	Gate to Source Voltage			±20	V
I_D	Drain Current	Continuous	T_C = 25°C	7.5	A
		Continuous (Note 3a)	T_A = 25°C	3.3	
		Pulsed		15	
E_{AS}	Single Pulse Avalanche Energy (Note 2)			12	mJ
P_D	Power Dissipation		T_C = 25°C	19	W
	Power Dissipation (Note 3a)		T_A = 25°C	2.3	
T_J, T_{STG}	Operating and Storage Junction Temperature Range			−55 to +150	°C

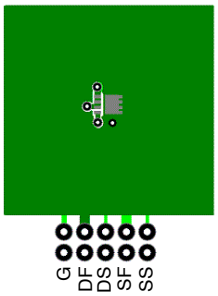
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

2. Starting T_J = 25°C; N−ch: L = 1 mH, I_{AS} = 5.0 A, V_{DD} = 90 V, V_{GS} = 10 V.

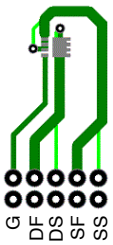
THERMAL CHARACTERISTICS

Symbol	Parameter	Ratings	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case	6.5	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 3a)	53	

3. $R_{\theta JA}$ is determined with the device mounted on a 1 in^2 pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR−4 material. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined bythe user's board design.



a. 53°C/W when mounted on a 1 in^2 pad of 2 oz copper



b. 125°C/W when mounted on a minimum pad of 2 oz copper

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250 μA, V_{GS} = 0 V	100	–	–	V
ΔBV_{DSS} / ΔT_J	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25°C	–	73	–	mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 80 V, V_{GS} = 0 V	–	–	1	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±20 V, V_{DS} = 0 V	–	–	±10	μA
ON CHARACTERISTICS						
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250 μA	1.0	1.8	2.2	V
$\Delta V_{GS(th)}$ / ΔT_J	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25°C	–	−6	–	mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 3.3 A	–	79	103	mΩ
		V_{GS} = 4.5 V, I_D = 2.7 A	–	105	153	
		V_{GS} = 10 V, I_D = 3.3 A, T_J = 125°C	–	136	178	
g_{FS}	Forward Transconductance	V_{DS} = 5 V, I_D = 3.3 A	–	11	–	S
DYNAMIC CHARACTERISTICS						
C_{iss}	Input Capacitance	V_{DS} = 50 V, V_{GS} = 0 V, f = 1 MHz	–	232	310	pF
C_{oss}	Output Capacitance		–	45	60	pF
C_{rss}	Reverse Transfer Capacitance		–	2.4	5	pF
R_g	Gate Resistance		–	0.7	–	Ω
SWITCHING CHARACTERISTICS						
$t_{d(on)}$	Turn−On Delay Time	V_{DD} = 50 V, I_D = 3.3 A, V_{GS} = 10 V, R_{GEN} = 6 Ω	–	4.5	10	ns
t_r	Rise Time		–	1.3	10	ns
$t_{d(off)}$	Turn−Off Delay Time		–	10	20	ns
t_f	Fall Time		–	1.4	10	ns
$Q_{g(TOT)}$	Total Gate Charge	V_{GS} = 0 V to 10 V, V_{DD} = 50 V, I_D = 3.3 A	–	4	6	nC
$Q_{g(TOT)}$	Total Gate Charge	V_{GS} = 0 V to 4.5 V, V_{DD} = 50 V, I_D = 3.3 A	–	2	3	nC
Q_{gs}	Total Gate Charge	V_{DD} = 50 V, I_D = 3.3 A	–	0.8	–	nC
Q_{gd}	Gate to Drain “Miller” Charge		–	0.7	–	nC
DRAIN−SOURCE DIODE CHARACTERISTICS						
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0 V, I_S = 3.3 A (Note 4)	–	0.85	1.3	V
		V_{GS} = 0 V, I_S = 2 A (Note 4)	–	0.82	1.2	
t_{rr}	Reverse Recovery Time	I_F = 3.3 A, di/dt = 100 A/μs	–	33	54	ns
Q_{rr}	Reverse Recovery Charge		–	23	38	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 < 2.0%.

TYPICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

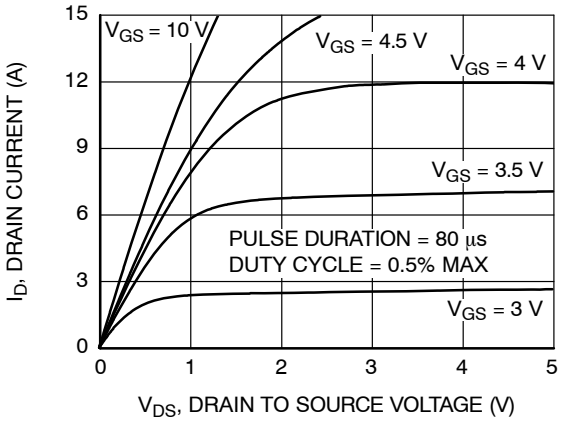


Figure 1. On Region Characteristics

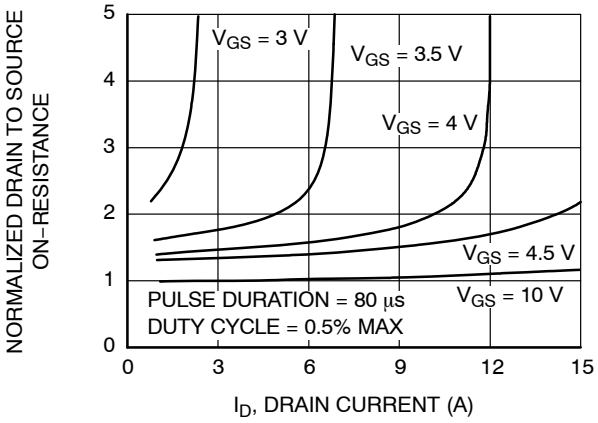


Figure 2. Normalized On−Resistance vs. Drain Current and Gate Voltage

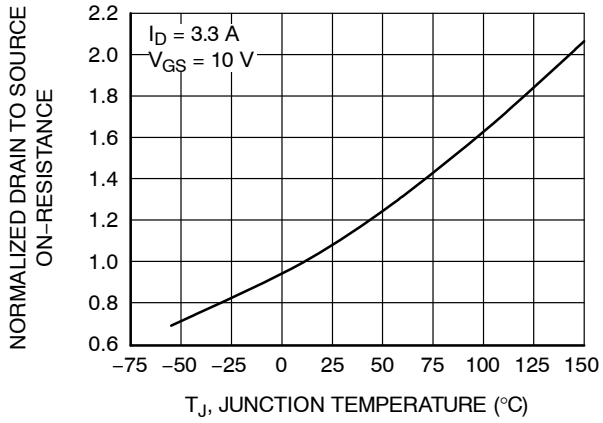


Figure 3. Normalized On Resistance vs. Junction Temperature

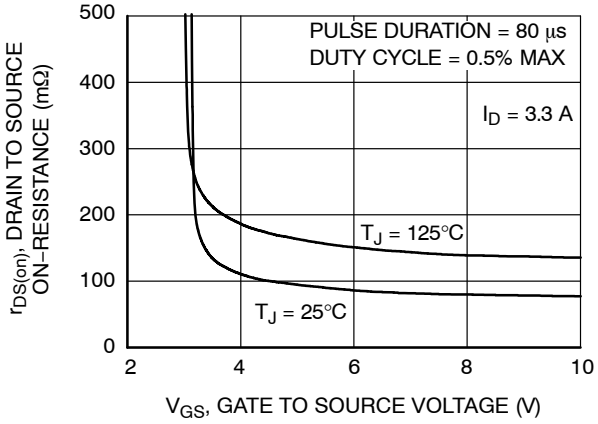


Figure 4. On−Resistance vs. Gate to Source Voltage

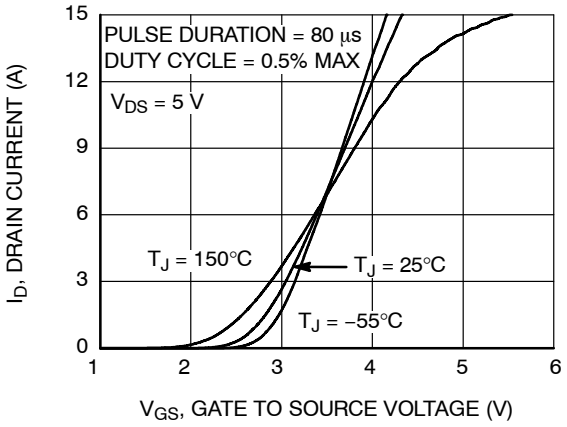


Figure 5. Transfer Characteristics

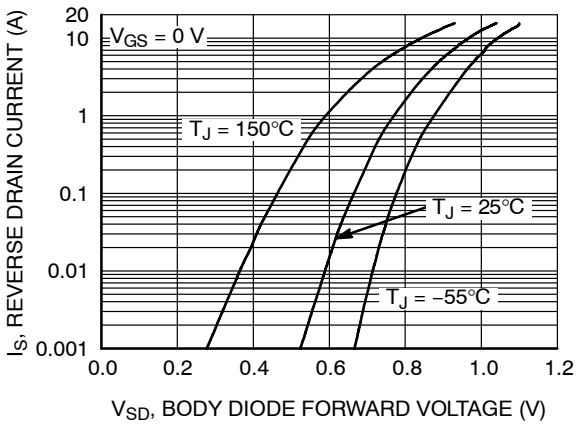


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

TYPICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted) (continued)

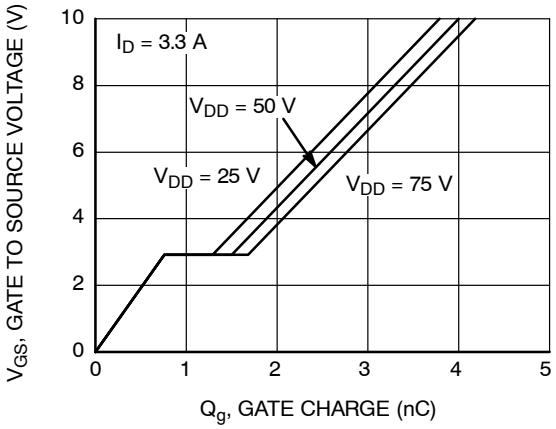


Figure 7. Gate Charge Characteristics

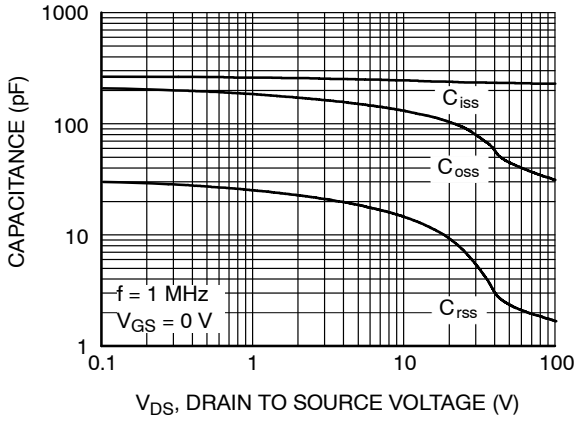


Figure 8. Capacitance vs. Drain to Source Voltage

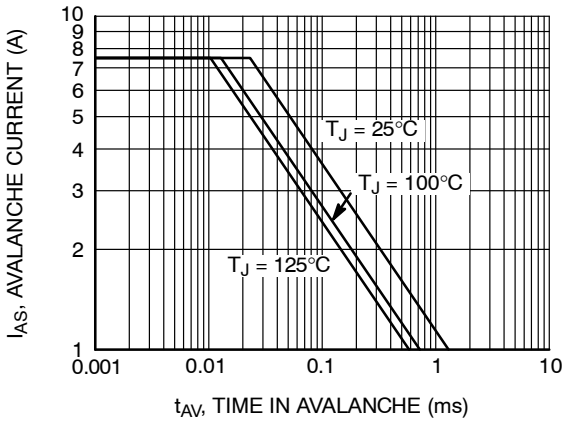


Figure 9. Unclamped Inductive Switching Capability

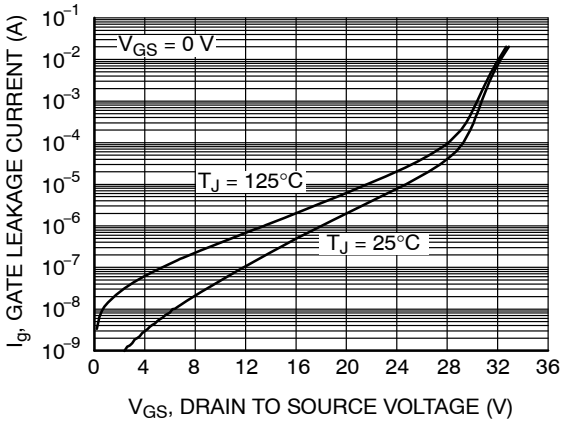


Figure 10. Gate Leakage Current vs. Gate to Source Voltage

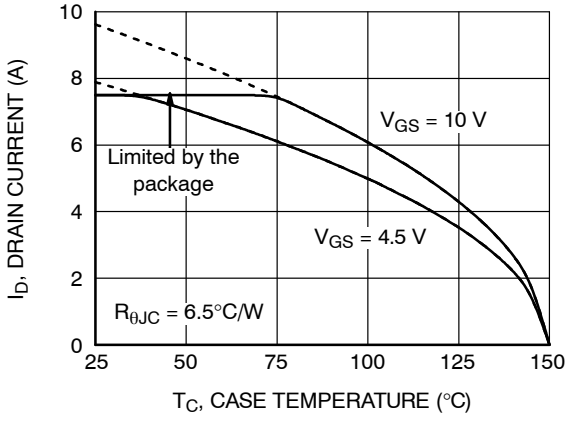


Figure 11. Maximum Continuous Drain Current vs. Case Temperature

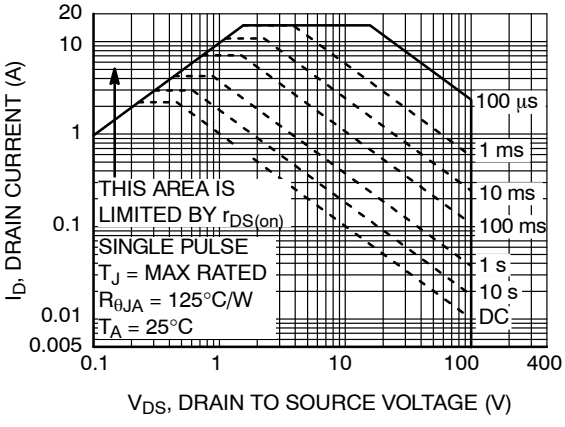


Figure 12. Forward Bias Safe Operating Area

TYPICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted) (continued)

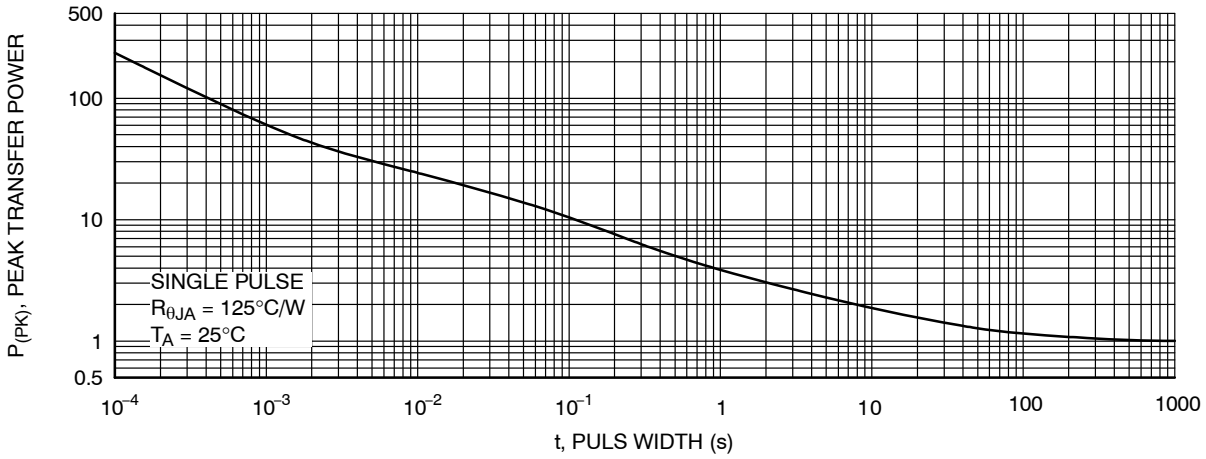


Figure 13. Single pulse Maximum Power Dissipation

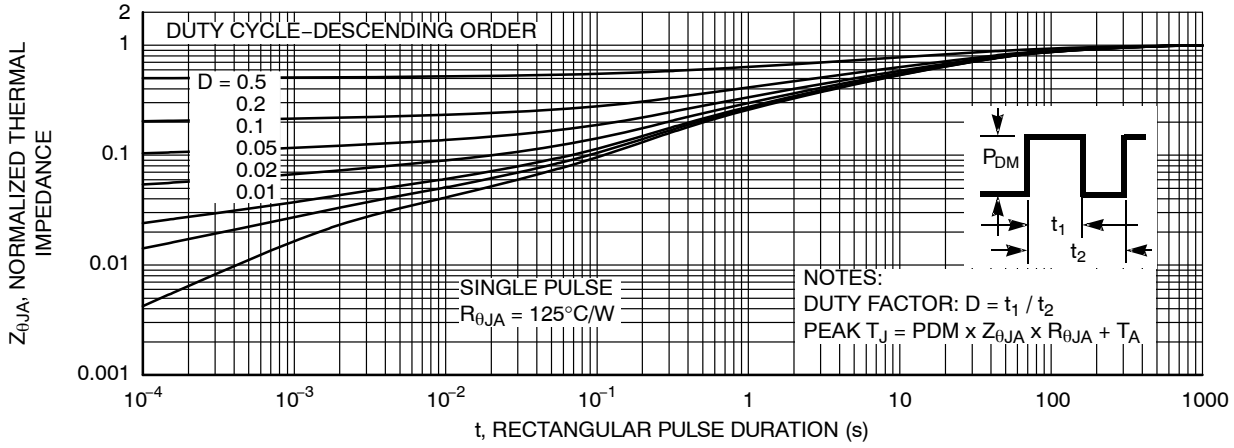


Figure 14. Junction−to−Ambient Transient Thermal Response Curve

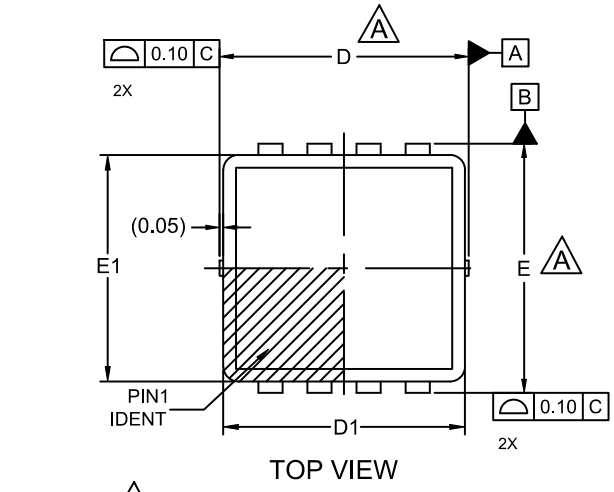
ORDERING INFORMATION

Device	Device Marking	Package Type	Reel Size	Tape Width	Shipping†
FDMC86116LZ	FDMC86116Z	WDFN8 3.3x3.3, 0.65P Power 33 (Pb−Free)	13”	12 mm	3000 / Tape & Reel
FDMC86116LZ−L701	FDMC86116Z	WDFN8 3.3x3.3, 0.65P Power 33 (Pb−Free)	13”	12 mm	3000 / Tape & Reel

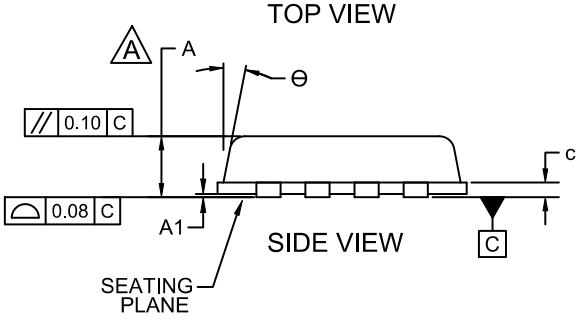
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

PACKAGE DIMENSIONS

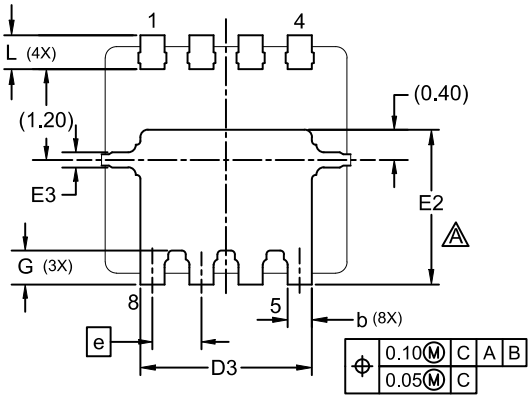
WDFN8 3.3x3.3, 0.65P
CASE 511DR
ISSUE A



TOP VIEW



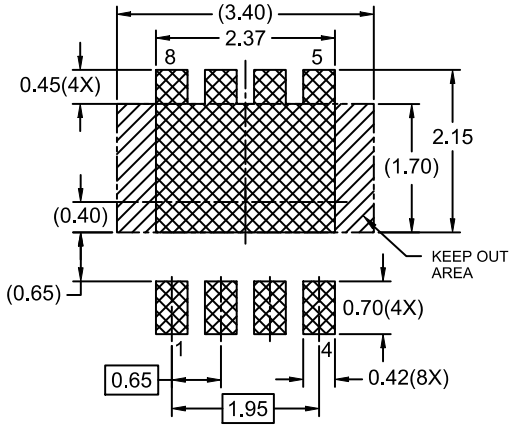
SIDE VIEW



BOTTOM VIEW

NOTES:
A. DIMENSIONS ARE IN MILLIMETERS.
B. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 2009.
C. SEATING PLANE IS DEFINED BY TERMINAL TIPS ONLY
D. BODY DIMENSIONS DO NOT INCLUDE MOLD FLASH PROTRUSIONS NOR GATE BURRS. MOLD FLASH PROTRUSION OR GATE BURR DOES NOT EXCEED 0.150MM.

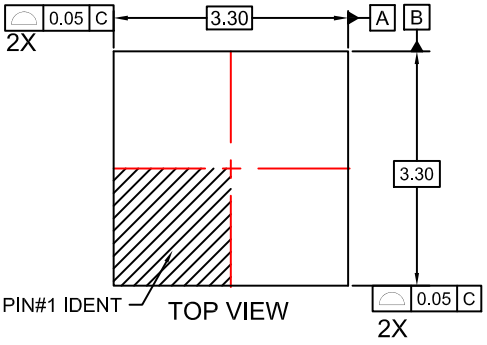
DIM	MILLIMETERS		
	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	0.00	-	0.05
b	0.27	0.32	0.37
c	0.15	0.20	0.25
D	3.20	3.30	3.40
D1	3.10	3.20	3.30
D3	2.17	2.27	2.37
E	3.20	3.30	3.40
E1	2.90	3.00	3.10
E2	1.95	2.05	2.15
E3	0.15	0.20	0.25
e	0.65 BSC		
G	0.40	0.45	0.50
L	0.40	0.45	0.50
Θ	0	-	12

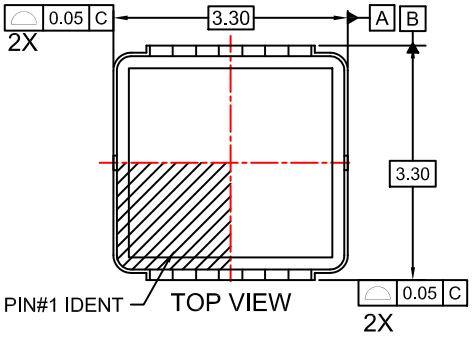


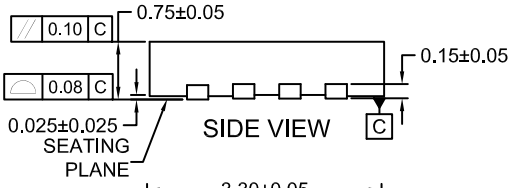
RECOMMENDED LAND PATTERN

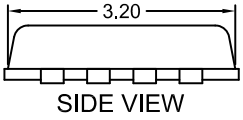
PACKAGE DIMENSIONS

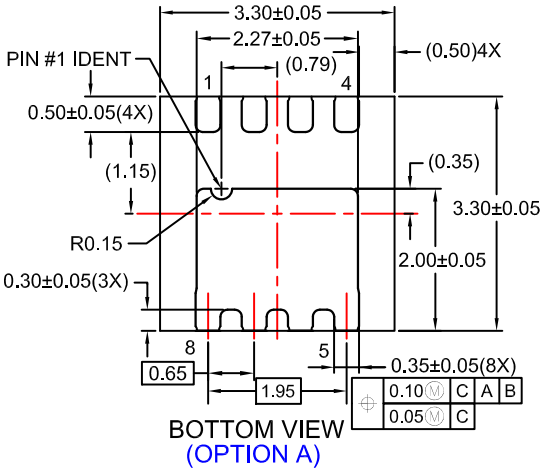
WDFN8 3.3x3.3, 0.65P
CASE 511DQ
ISSUE O

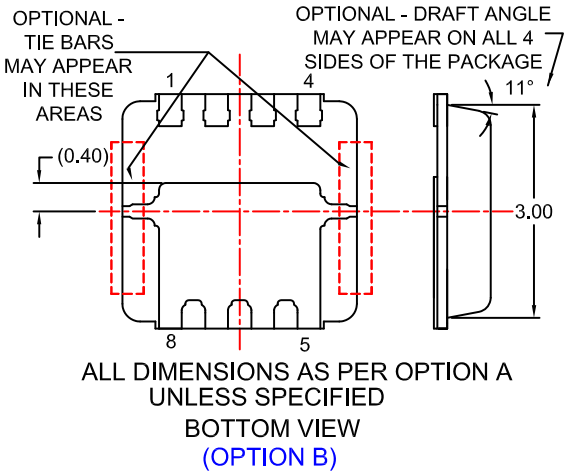


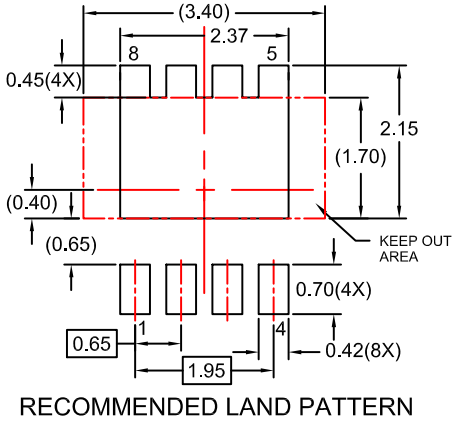












PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Email Requests to: orderlit@onsemi.com

ON Semiconductor Website: www.onsemi.com

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