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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

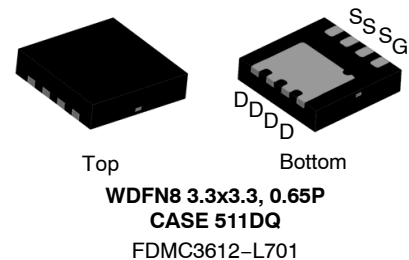
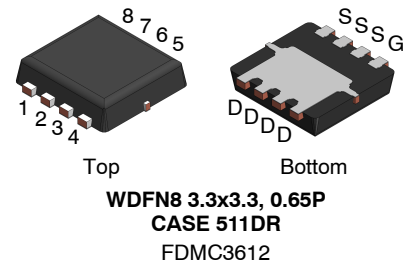
### Applications

- DC – DC Conversion

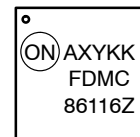


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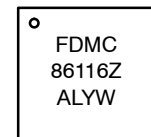
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### MARKING DIAGRAM



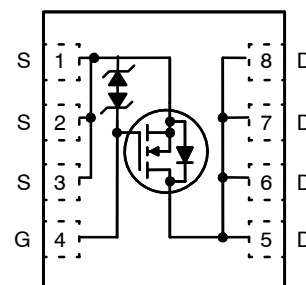
FDMC86116LZ



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.

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

# FDMC86116LZ, FDMC86116LZ-L701

## MOSFET MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

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

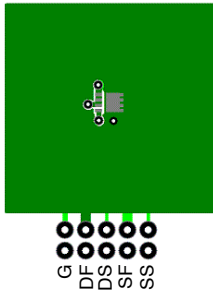
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

2. Starting  $T_J = 25^\circ\text{C}$ ; N-ch:  $L = 1\text{ mH}$ ,  $I_{AS} = 5.0\text{ A}$ ,  $V_{DD} = 90\text{ V}$ ,  $V_{GS} = 10\text{ V}$ .

## THERMAL CHARACTERISTICS

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

3.  $R_{\theta JA}$  is determined with the device mounted on a 1 in<sup>2</sup> 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 by the user's board design.



a.  $53^\circ\text{C}/\text{W}$  when mounted on a 1 in<sup>2</sup> pad of 2 oz copper



b.  $125^\circ\text{C}/\text{W}$  when mounted on a minimum pad of 2 oz copper

# FDMC86116LZ, FDMC86116LZ-L701

## ELECTRICAL CHARACTERISTICS (T<sub>J</sub> = 25°C unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

BV <sub>DSS</sub>	Drain to Source Breakdown Voltage	I <sub>D</sub> = 250 μA, V <sub>GS</sub> = 0 V	100	–	–	V
ΔBV <sub>DSS</sub> / ΔT <sub>J</sub>	Breakdown Voltage Temperature Coefficient	I <sub>D</sub> = 250 μA, referenced to 25°C	–	73	–	mV/°C
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 80 V, V <sub>GS</sub> = 0 V	–	–	1	μA
I <sub>GSS</sub>	Gate to Source Leakage Current	V <sub>GS</sub> = ±20 V, V <sub>DS</sub> = 0 V	–	–	±10	μA

### ON CHARACTERISTICS

V <sub>GS(th)</sub>	Gate to Source Threshold Voltage	V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 250 μA	1.0	1.8	2.2	V
ΔV <sub>GS(th)</sub> / ΔT <sub>J</sub>	Gate to Source Threshold Voltage Temperature Coefficient	I <sub>D</sub> = 250 μA, referenced to 25°C	–	–6	–	mV/°C
r <sub>DS(on)</sub>	Static Drain to Source On Resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 3.3 A	–	79	103	mΩ
		V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 2.7 A	–	105	153	
		V <sub>GS</sub> = 10 V, I <sub>D</sub> = 3.3 A, T <sub>J</sub> = 125°C	–	136	178	
g <sub>FS</sub>	Forward Transconductance	V <sub>DS</sub> = 5 V, I <sub>D</sub> = 3.3 A	–	11	–	S

### DYNAMIC CHARACTERISTICS

C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 50 V, V <sub>GS</sub> = 0 V, f = 1 MHz	–	232	310	pF
C <sub>oss</sub>	Output Capacitance		–	45	60	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		–	2.4	5	pF
R <sub>g</sub>	Gate Resistance		–	0.7	–	Ω

### SWITCHING CHARACTERISTICS

t <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> = 50 V, I <sub>D</sub> = 3.3 A, V <sub>GS</sub> = 10 V, R <sub>GEN</sub> = 6 Ω	–	4.5	10	ns
t <sub>r</sub>	Rise Time		–	1.3	10	ns
t <sub>d(off)</sub>	Turn-Off Delay Time		–	10	20	ns
t <sub>f</sub>	Fall Time		–	1.4	10	ns
Q <sub>g(TOT)</sub>	Total Gate Charge	V <sub>GS</sub> = 0 V to 10 V, V <sub>DD</sub> = 50 V, I <sub>D</sub> = 3.3 A	–	4	6	nC
Q <sub>g(TOT)</sub>	Total Gate Charge	V <sub>GS</sub> = 0 V to 4.5 V, V <sub>DD</sub> = 50 V, I <sub>D</sub> = 3.3 A	–	2	3	nC
Q <sub>gs</sub>	Total Gate Charge	V <sub>DD</sub> = 50 V, I <sub>D</sub> = 3.3 A	–	0.8	–	nC
Q <sub>gd</sub>	Gate to Drain "Miller" Charge		–	0.7	–	nC

### DRAIN-SOURCE DIODE CHARACTERISTICS

V <sub>SD</sub>	Source to Drain Diode Forward Voltage	V <sub>GS</sub> = 0 V, I <sub>S</sub> = 3.3 A (Note 4)	–	0.85	1.3	V
		V <sub>GS</sub> = 0 V, I <sub>S</sub> = 2 A (Note 4)	–	0.82	1.2	
t <sub>rr</sub>	Reverse Recovery Time	I <sub>F</sub> = 3.3 A, di/dt = 100 A/μs	–	33	54	ns
Q <sub>rr</sub>	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 ( $T_J = 25^\circ\text{C}$  unless otherwise noted)

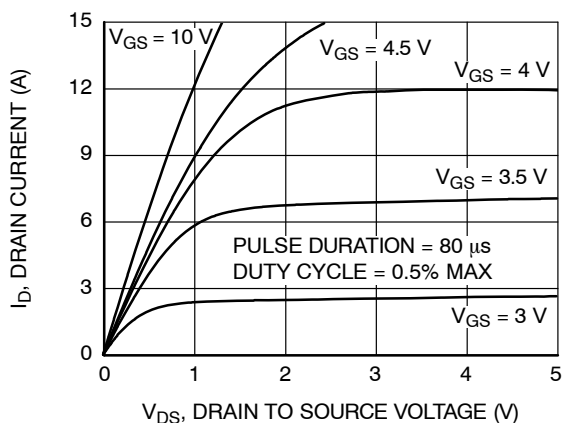


Figure 1. On Region Characteristics

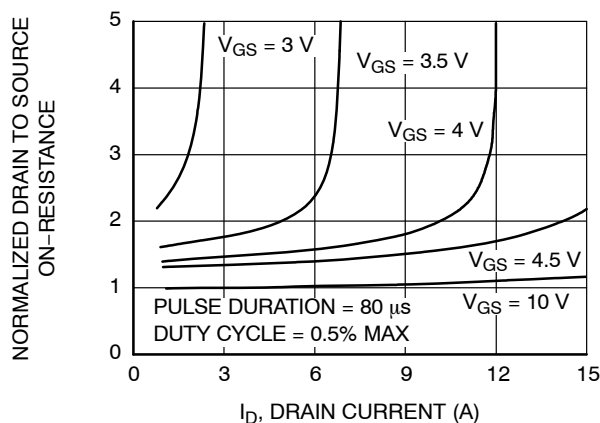


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

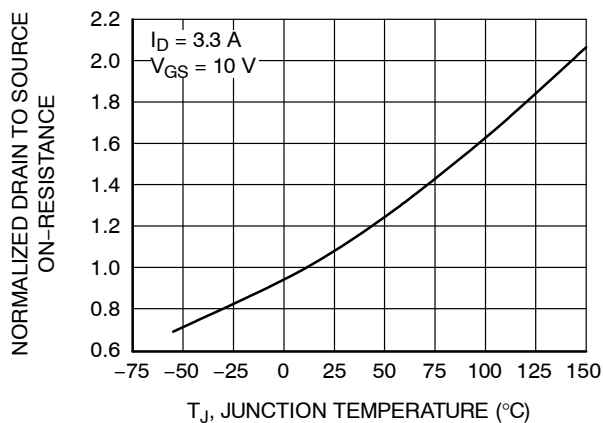


Figure 3. Normalized On Resistance vs. Junction Temperature

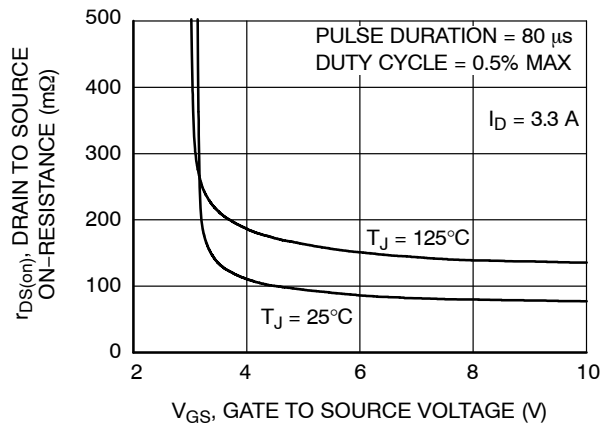


Figure 4. On-Resistance vs. Gate to Source Voltage

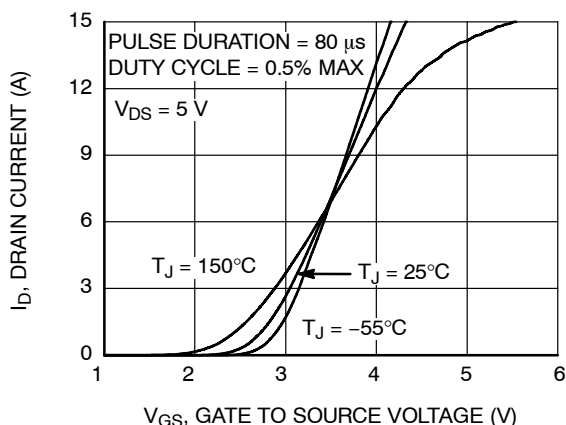


Figure 5. Transfer Characteristics

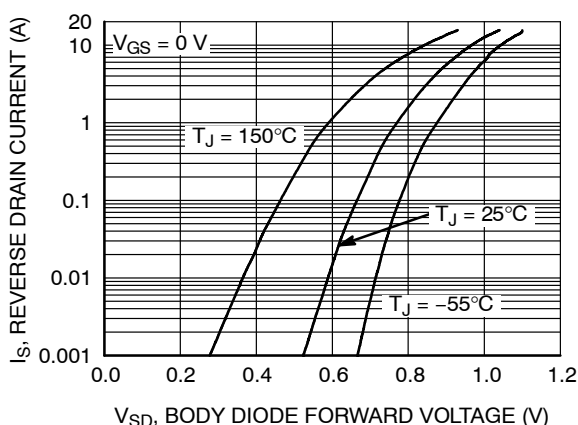


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

# FDMC86116LZ, FDMC86116LZ-L701

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

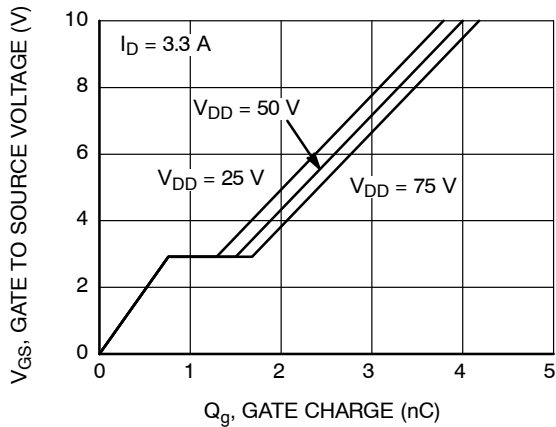


Figure 7. Gate Charge Characteristics

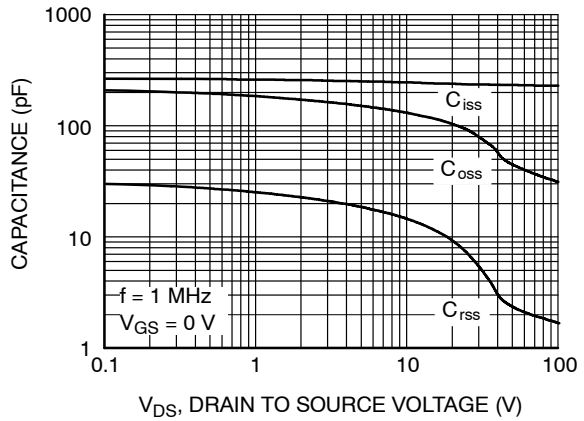


Figure 8. Capacitance vs. Drain to Source Voltage

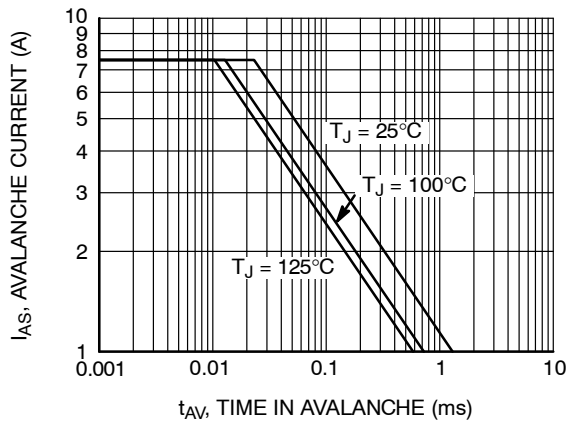


Figure 9. Unclamped Inductive Switching Capability

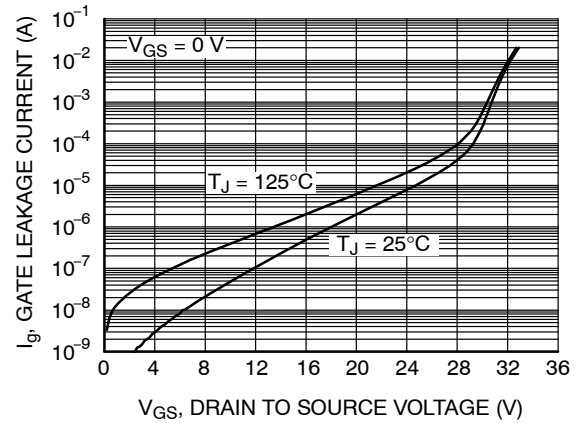


Figure 10. Gate Leakage Current vs. Gate to Source Voltage

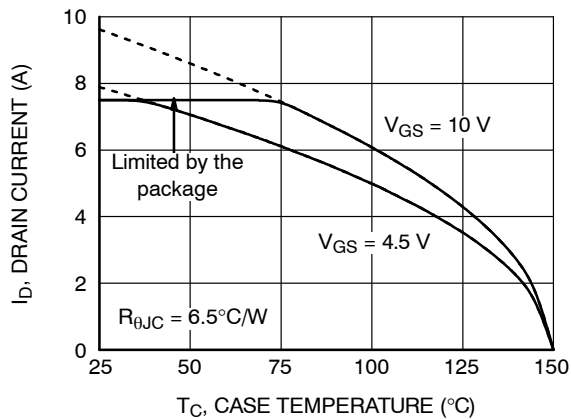


Figure 11. Maximum Continuous Drain Current vs. Case Temperature

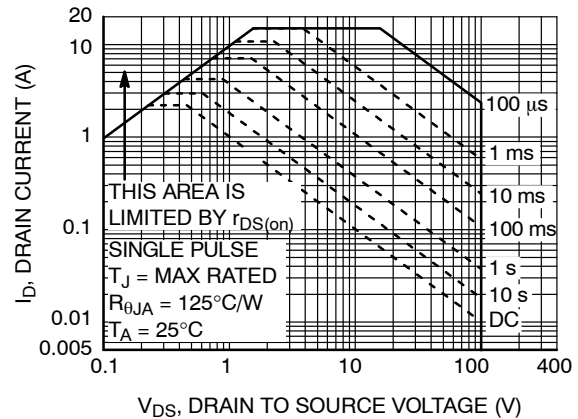


Figure 12. Forward Bias Safe Operating Area

# FDMC86116LZ, FDMC86116LZ-L701

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

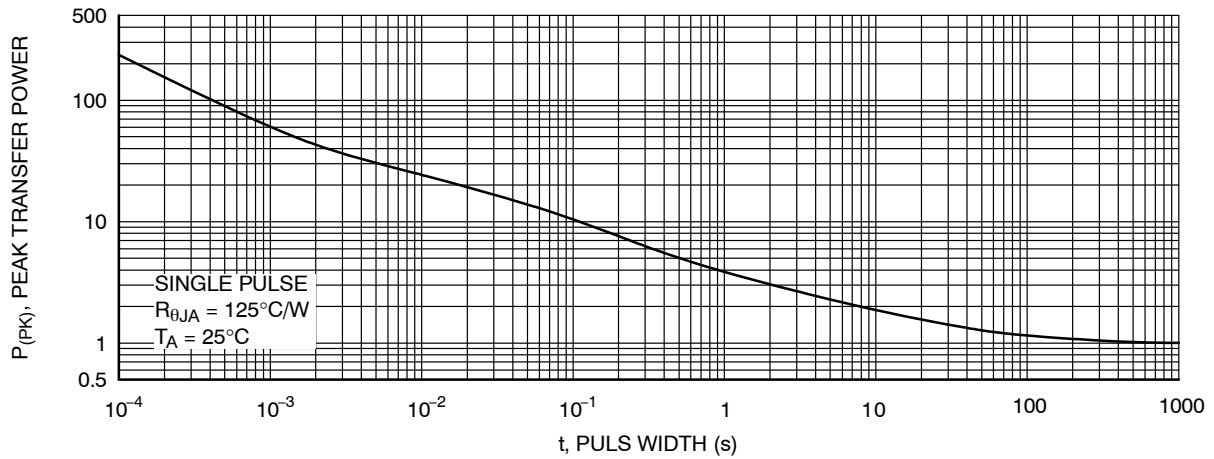


Figure 13. Single pulse Maximum Power Dissipation

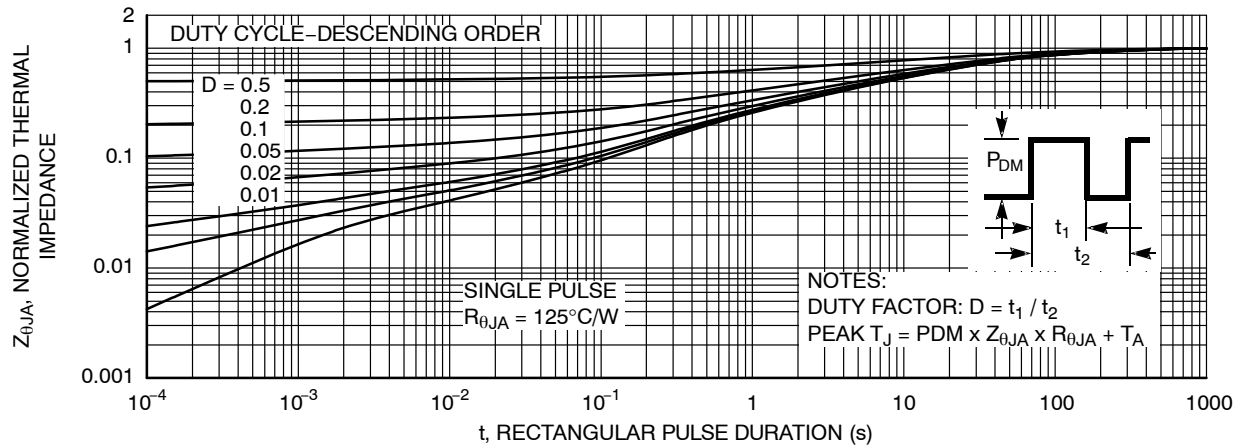


Figure 14. Junction-to-Ambient Transient Thermal Response Curve

### 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

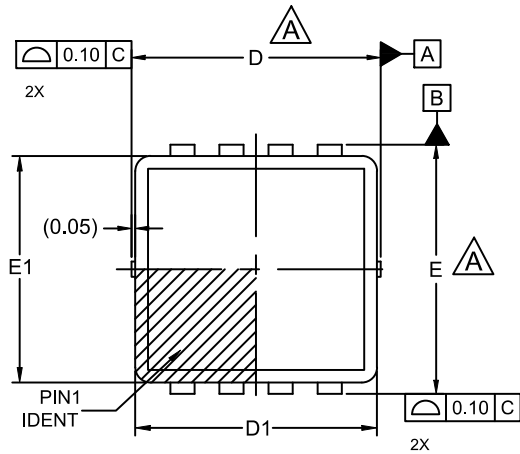
†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

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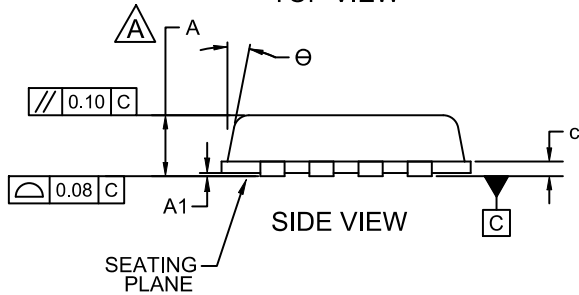
# FDMC86116LZ, FDMC86116LZ-L701

## PACKAGE DIMENSIONS

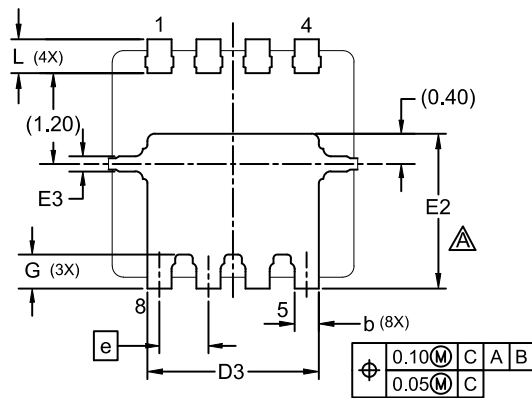
WDFN8 3.3x3.3, 0.65P  
CASE 511DR  
ISSUE A



TOP VIEW



SIDE VIEW

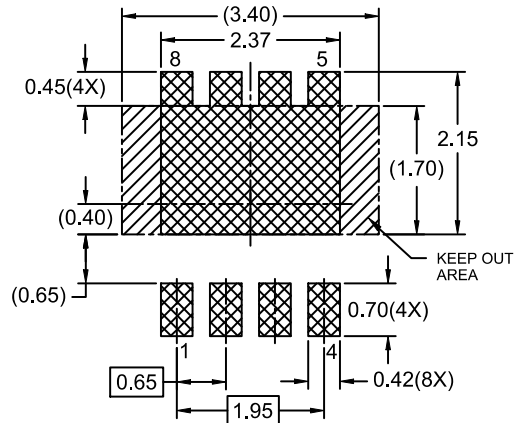


BOTTOM VIEW

### 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
Ø	0	-	12



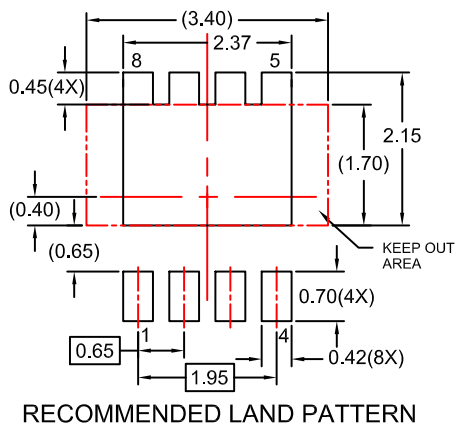
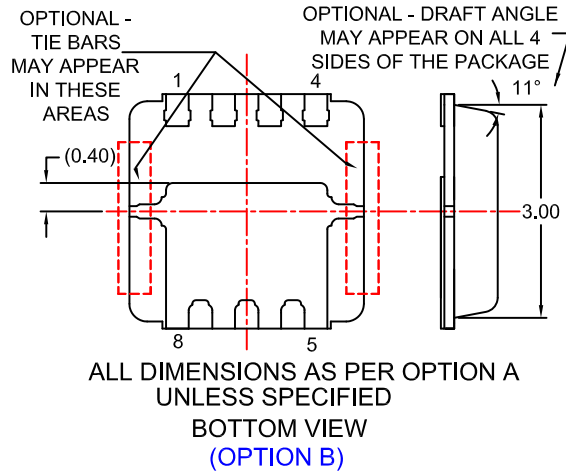
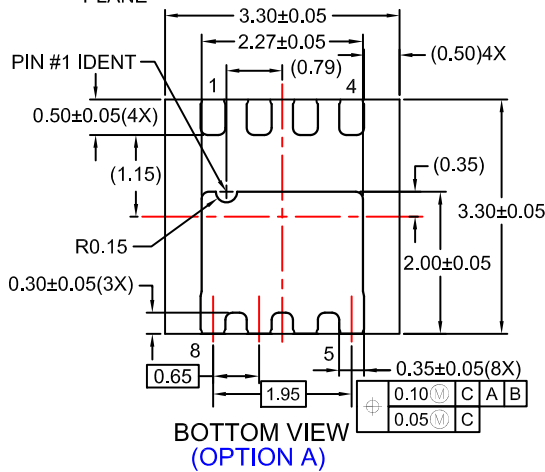
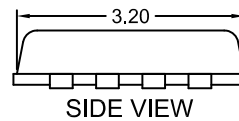
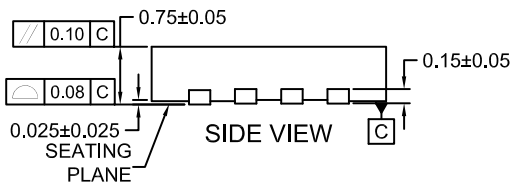
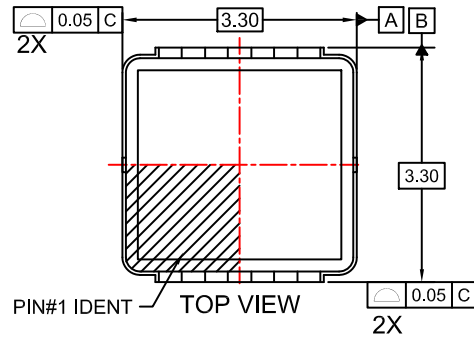
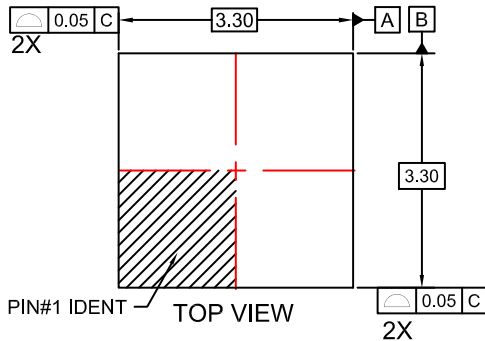
RECOMMENDED LAND PATTERN




# FDMC86116LZ, FDMC86116LZ-L701

## PACKAGE DIMENSIONS

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



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