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# MOSFET – N-Channel, Shielded Gate, POWERTRENCH®

150 V, 9.4 A, 134 mΩ

## FDMC86244, FDMC86244-L701

### General Description

This N-Channel MOSFET is 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.

### Features

- Max  $r_{DS(on)}$  = 134 mΩ at  $V_{GS} = 10\text{ V}$ ,  $I_D = 2.8\text{ A}$
- Max  $r_{DS(on)}$  = 186 mΩ at  $V_{GS} = 6\text{ V}$ ,  $I_D = 2.4\text{ A}$
- Low Profile – 1 mm Max in Power 33
- 100% UIL Tested
- These Devices are Pb-Free and are RoHS Compliant

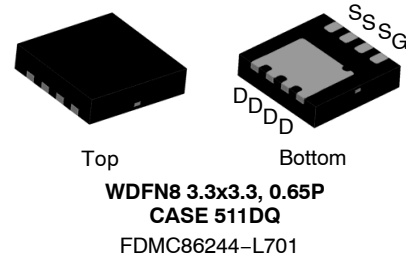
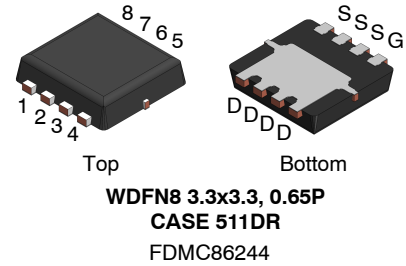
### Applications

- DC – DC Conversion

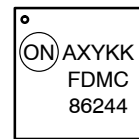


ON Semiconductor®

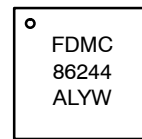
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### MARKING DIAGRAM



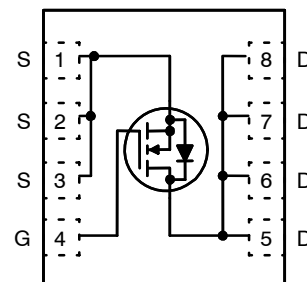
FDMC86244



FDMC86244-L701

FDMC86244 = 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.

# FDMC86244, FDMC86244-L701

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

Symbol	Parameter	Ratings	Unit	
$V_{DS}$	Drain to Source Voltage	150	V	
$V_{GS}$	Gate to Source Voltage	$\pm 20$	V	
$I_D$	Drain Current	Continuous	$T_C = 25^\circ\text{C}$	A
		Continuous (Note 2a)	$T_A = 25^\circ\text{C}$	
		Pulsed		
$E_{AS}$	Single Pulse Avalanche Energy (Note 1)	12	mJ	
$P_D$	Power Dissipation	$T_C = 25^\circ\text{C}$	26	W
	Power Dissipation (Note 2a)	$T_A = 25^\circ\text{C}$	2.3	
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-55 to +150	$^\circ\text{C}$	

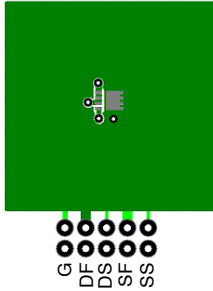
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

- Starting  $T_J = 25^\circ\text{C}$ ; N-ch:  $L = 1.0\text{ mH}$ ,  $I_{AS} = 5.0\text{ A}$ ,  $V_{DD} = 135\text{ V}$ ,  $V_{GS} = 10\text{ V}$ .

## THERMAL CHARACTERISTICS

Symbol	Parameter	Ratings	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case	4.7	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 2a)	125	

- $R_{\theta JA}$  is determined with the device mounted on a  $1\text{ in}^2$  pad 2 oz copper pad on a  $1.5 \times 1.5\text{ in.}$  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  $1\text{ in}^2$  pad of 2 oz copper



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

# FDMC86244, FDMC86244-L701

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

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

$BV_{DSS}$	Drain to Source Breakdown Voltage	$I_D = 250 \mu\text{A}$ , $V_{GS} = 0 \text{ V}$	150	-	-	V
$\Delta BV_{DSS} / \Delta T_J$	Breakdown Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$ , referenced to $25^\circ\text{C}$	-	106	-	mV/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 120 \text{ V}$ , $V_{GS} = 0 \text{ V}$	-	-	1	$\mu\text{A}$
$I_{GSS}$	Gate to Source Leakage Current	$V_{GS} = \pm 20 \text{ V}$ , $V_{DS} = 0 \text{ V}$	-	-	$\pm 100$	nA

### ON CHARACTERISTICS

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$ , $I_D = 250 \mu\text{A}$	2	2.6	4	V
$\Delta V_{GS(th)} / \Delta T_J$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250 \mu\text{A}$ , referenced to $25^\circ\text{C}$	-	-9	-	mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10 \text{ V}$ , $I_D = 2.8 \text{ A}$	-	105	134	m $\Omega$
		$V_{GS} = 6 \text{ V}$ , $I_D = 2.4 \text{ A}$	-	120	186	
		$V_{GS} = 10 \text{ V}$ , $I_D = 2.8 \text{ A}$ , $T_J = 125^\circ\text{C}$	-	199	254	
$g_{FS}$	Forward Transconductance	$V_{DS} = 10 \text{ V}$ , $I_D = 2.8 \text{ A}$	-	8	-	S

### DYNAMIC CHARACTERISTICS

$C_{iss}$	Input Capacitance	$V_{DS} = 75 \text{ V}$ , $V_{GS} = 0 \text{ V}$ , $f = 1 \text{ MHz}$	-	257	345	pF
$C_{oss}$	Output Capacitance		-	32	45	pF
$C_{rss}$	Reverse Transfer Capacitance		-	1.8	5	pF

### SWITCHING CHARACTERISTICS

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 75 \text{ V}$ , $I_D = 2.8 \text{ A}$ , $V_{GS} = 10 \text{ V}$ , $R_{GEN} = 6 \Omega$	-	5.3	11	ns
$t_r$	Rise Time		-	1.5	10	ns
$t_{d(off)}$	Turn-Off Delay Time		-	9.9	20	ns
$t_f$	Fall Time		-	2.3	10	ns
$Q_{g(TOT)}$	Total Gate Charge	$V_{GS} = 0 \text{ V}$ to $10 \text{ V}$ , $V_{DD} = 75 \text{ V}$ , $I_D = 2.8 \text{ A}$	-	4.2	5.9	nC
$Q_{g(TOT)}$	Total Gate Charge	$V_{GS} = 0 \text{ V}$ to $5 \text{ V}$ , $V_{DD} = 75 \text{ V}$ , $I_D = 2.8 \text{ A}$	-	2.4	3.4	nC
$Q_{gs}$	Total Gate Charge	$V_{DD} = 75 \text{ V}$ , $I_D = 2.8 \text{ A}$	-	1.1	-	nC
$Q_{gd}$	Gate to Drain "Miller" Charge		-	1.0	-	nC

### DRAIN-SOURCE DIODE CHARACTERISTICS

$V_{SD}$	Source to Drain Diode Forward Voltage	$V_{GS} = 0 \text{ V}$ , $I_S = 2.8 \text{ A}$ (Note 3)	-	0.81	1.3	V
		$V_{GS} = 0 \text{ V}$ , $I_S = 2 \text{ A}$ (Note 3)	-	0.79	1.2	
$t_{rr}$	Reverse Recovery Time	$I_F = 2.8 \text{ A}$ , $di/dt = 100 \text{ A}/\mu\text{s}$	-	48	76	ns
$Q_{rr}$	Reverse Recovery Charge		-	38	61	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.

3. Pulse Test: Pulse Width < 300  $\mu\text{s}$ , Duty cycle < 2.0%.

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

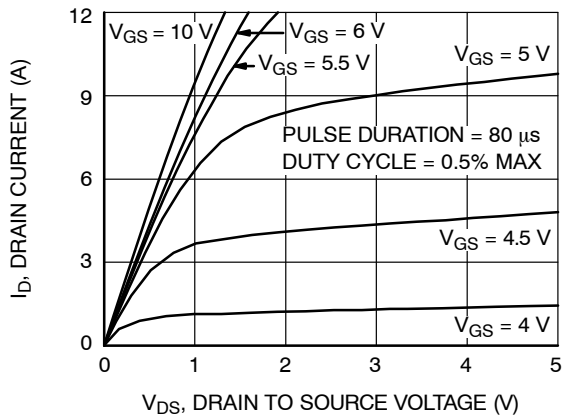


Figure 1. On Region Characteristics

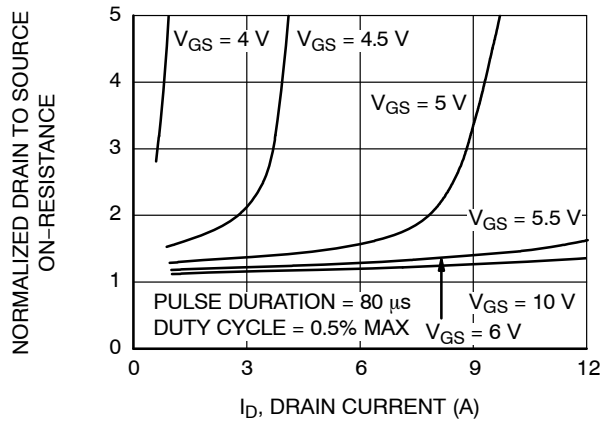


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

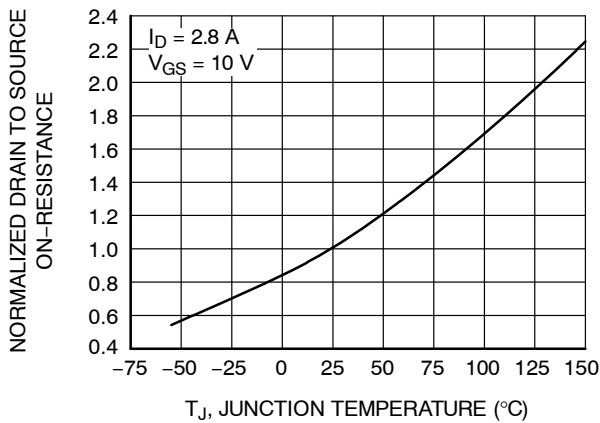


Figure 3. Normalized On Resistance vs. Junction Temperature

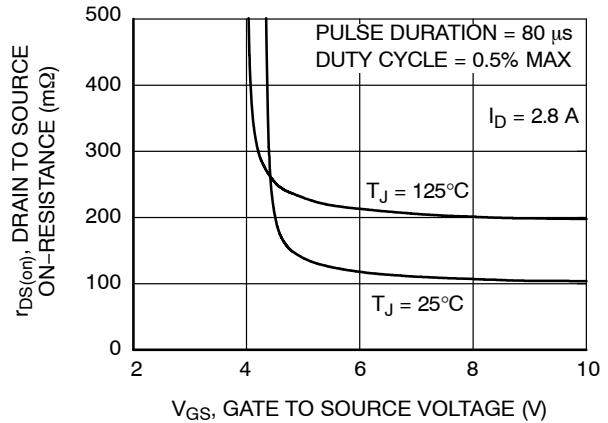


Figure 4. On-Resistance vs. Gate to Source Voltage

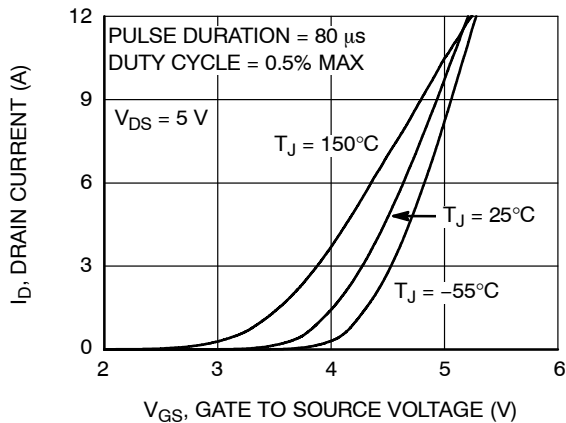


Figure 5. Transfer Characteristics

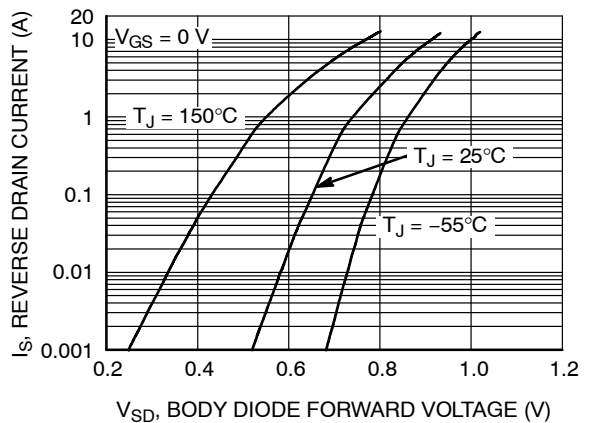


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

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

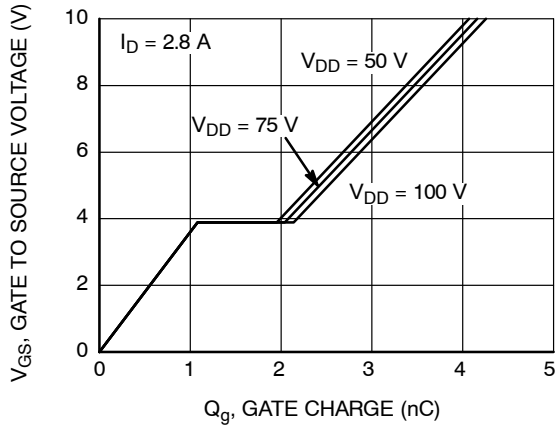


Figure 7. Gate Charge Characteristics

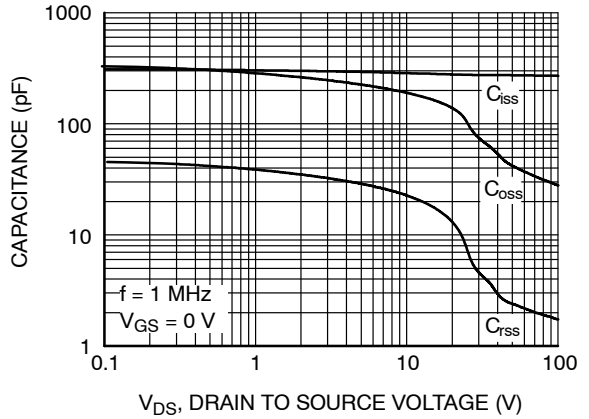


Figure 8. Capacitance vs. Drain to Source Voltage

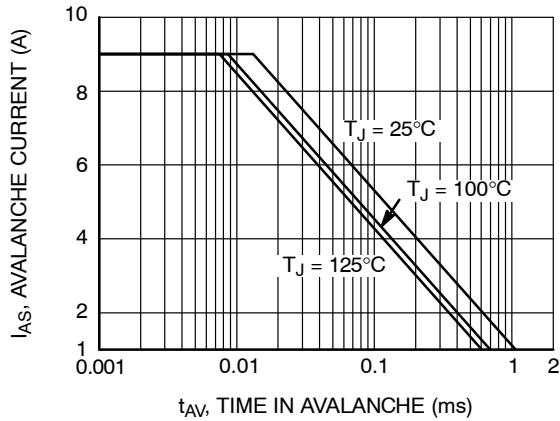


Figure 9. Unclamped Inductive Switching Capability

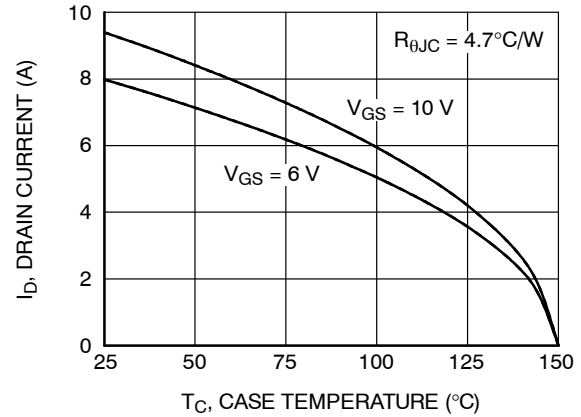


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

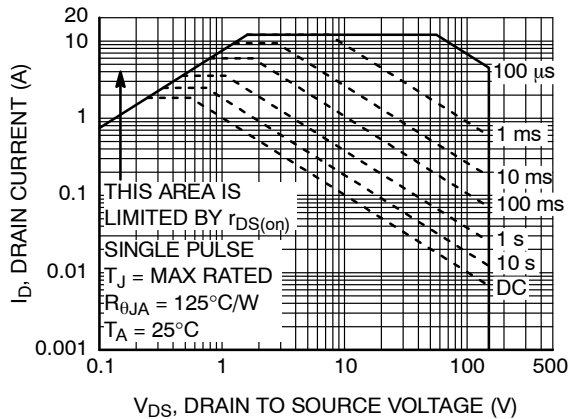


Figure 11. Forward Bias Safe Operating Area

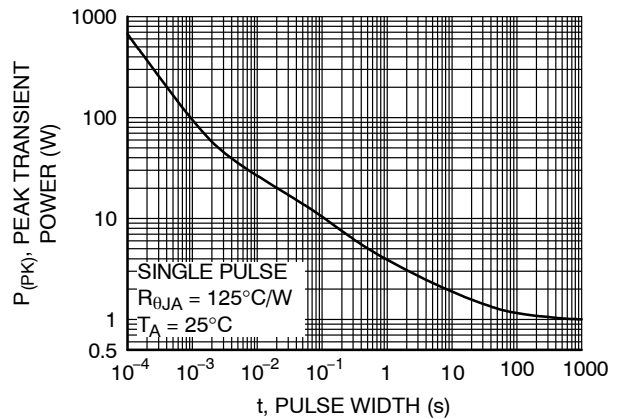


Figure 12. Single Pulse Maximum Power Dissipation

# FDMC86244, FDMC86244-L701

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

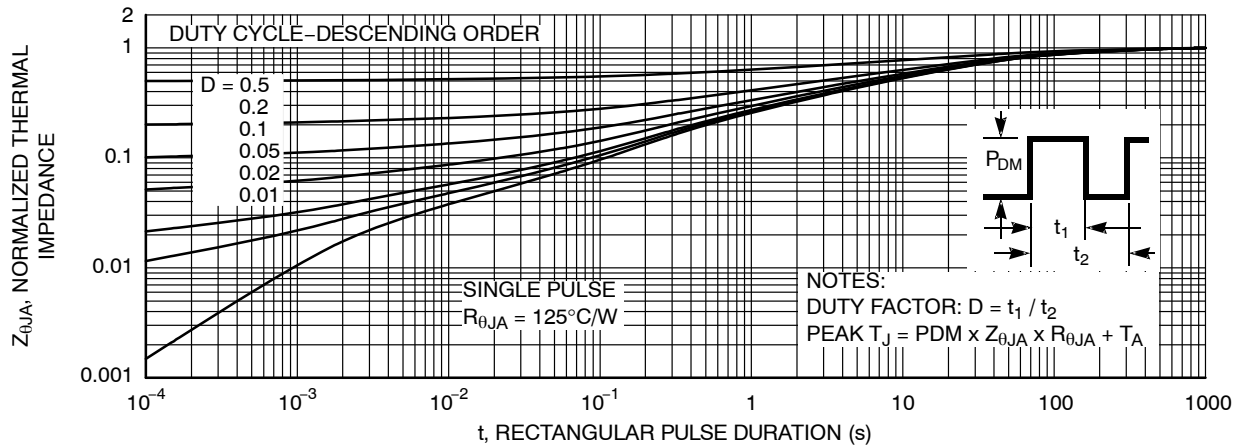


Figure 13. Junction-to-Ambient Transient Thermal Response Curve

### ORDERING INFORMATION

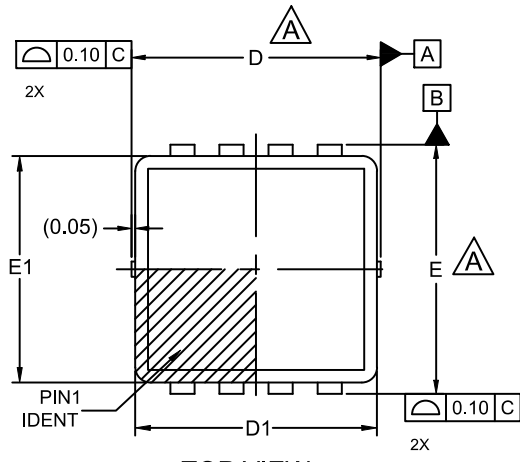
Device	Device Marking	Package Type	Reel Size	Tape Width	Shipping <sup>†</sup>
FDMC86244	FDMC86244	WDFN8 3.3x3.3, 0.65P Power 33 (Pb-Free)	13"	12 mm	3000 / Tape & Reel
FDMC86244-L701	FDMC86244	WDFN8 3.3x3.3, 0.65P Power 33 (Pb-Free)	13"	12 mm	3000 / Tape & Reel

<sup>†</sup>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.

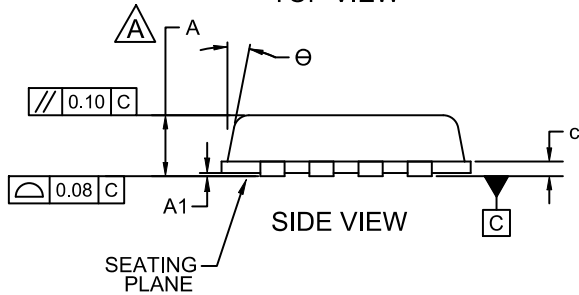
# FDMC86244, FDMC86244-L701

## PACKAGE DIMENSIONS

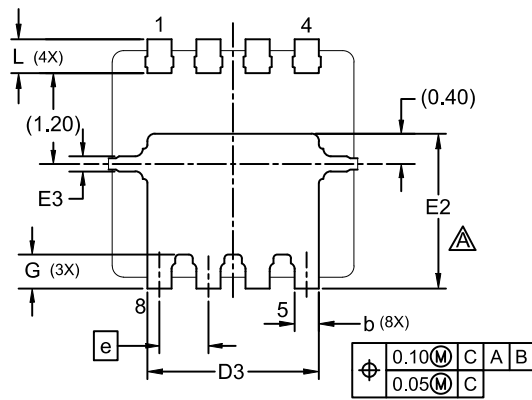
**WDFN8 3.3x3.3, 0.65P**  
**CASE 511DR**  
**ISSUE A**



TOP VIEW



SIDE VIEW

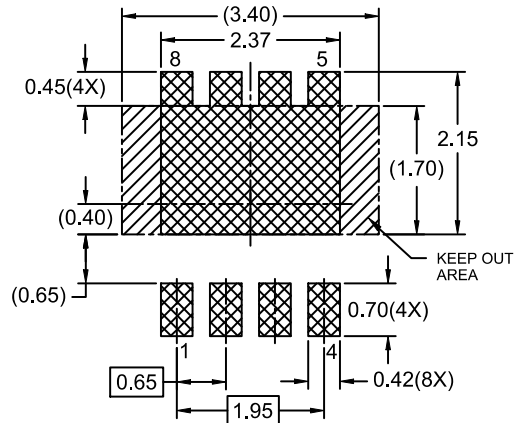


BOTTOM VIEW

**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
Θ	0	-	12

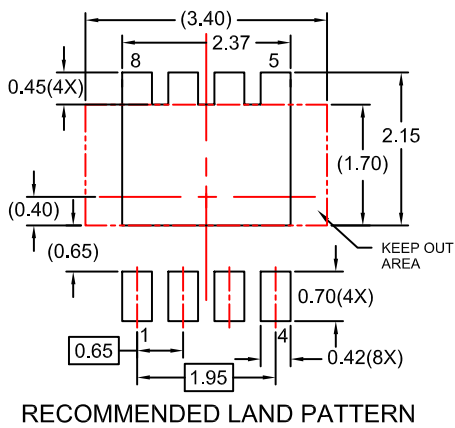
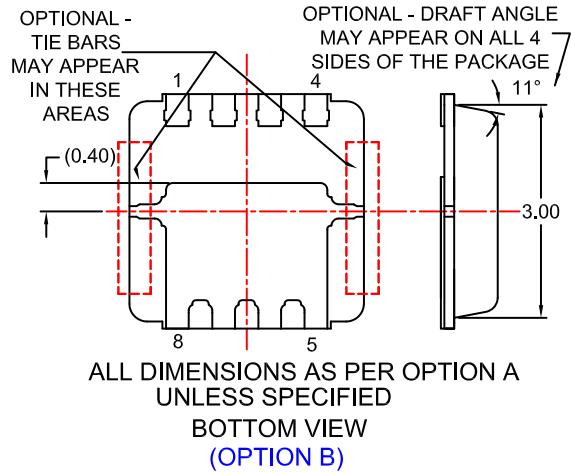
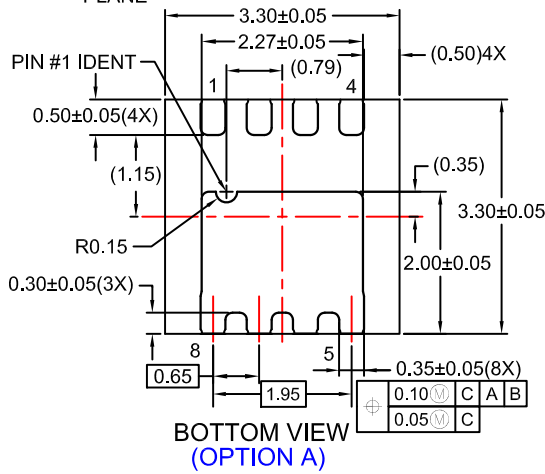
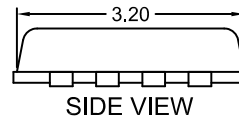
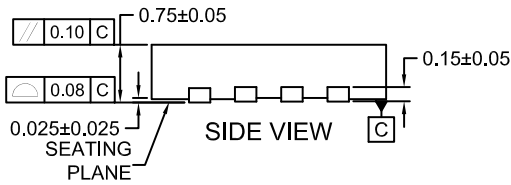
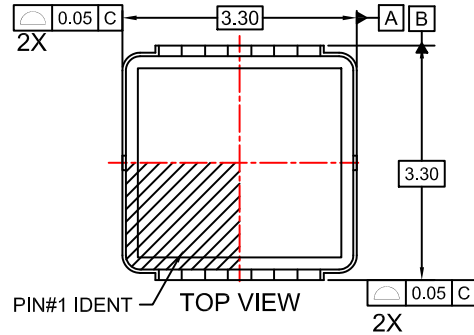
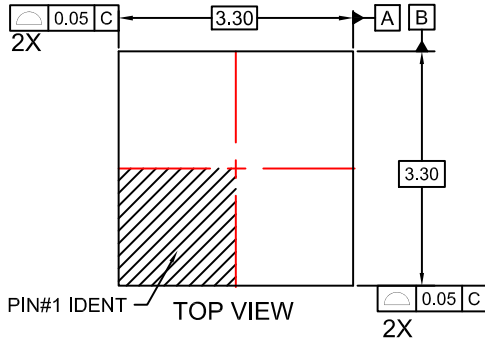



RECOMMENDED LAND PATTERN



PACKAGE DIMENSIONS

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



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