

# FDMC86116LZ

## N-Channel Power Trench® MOSFET 100 V, 7.5 A, 103 mΩ

### 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 4)
- 100% UIL Tested
- RoHS Compliant

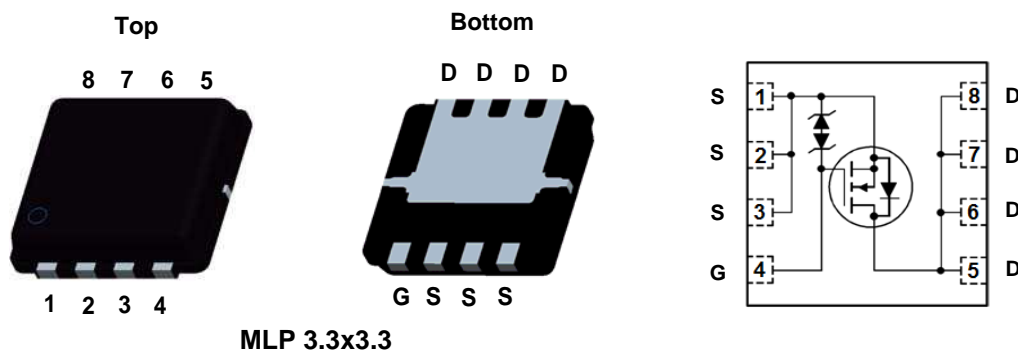


### General Description

This N-Channel logic Level MOSFETs are produced using Fairchild Semiconductor's advanced Power Trench® process that has been special tailored to minimize the on-state resistance and yet maintain superior switching performance. G-S zener has been added to enhance ESD voltage level.

### Application

- DC - DC Conversion



### MOSFET Maximum Ratings $T_A = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Ratings	Units
$V_{DS}$	Drain to Source Voltage	100	V
$V_{GS}$	Gate to Source Voltage	$\pm 20$	V
$I_D$	Drain Current -Continuous (Package limited) $T_C = 25^\circ\text{C}$	7.5	A
	-Continuous (Silicon limited) $T_C = 25^\circ\text{C}$	9.6	
	-Continuous $T_A = 25^\circ\text{C}$ (Note 1a)	3.3	
	-Pulsed	15	
$E_{AS}$	Single Pulse Avalanche Energy (Note 3)	12	mJ
$P_D$	Power Dissipation $T_C = 25^\circ\text{C}$	19	W
	Power Dissipation $T_A = 25^\circ\text{C}$ (Note 1a)	2.3	
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-55 to +150	$^\circ\text{C}$

### Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	6.5	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	53	

### Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMC86116Z	FDMC86116LZ	Power 33	13 "	12 mm	3000 units

**Electrical Characteristics**  $T_J = 25\text{ }^{\circ}\text{C}$  unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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**Off Characteristics**

$BV_{DSS}$	Drain to Source Breakdown Voltage	$I_D = 250\text{ }\mu\text{A}$ , $V_{GS} = 0\text{ V}$	100			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$ , referenced to $25\text{ }^{\circ}\text{C}$		73		mV/ $^{\circ}\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 80\text{ V}$ , $V_{GS} = 0\text{ V}$			1	$\mu\text{A}$
$I_{GSS}$	Gate to Source Leakage Current	$V_{GS} = \pm 20\text{ V}$ , $V_{DS} = 0\text{ V}$			$\pm 10$	$\mu\text{A}$

**On Characteristics**

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$ , $I_D = 250\text{ }\mu\text{A}$	1.0	1.8	2.2	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$ , referenced to $25\text{ }^{\circ}\text{C}$		-6		mV/ $^{\circ}\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{ V}$ , $I_D = 3.3\text{ A}$		79	103	m $\Omega$
		$V_{GS} = 4.5\text{ V}$ , $I_D = 2.7\text{ A}$		105	153	
		$V_{GS} = 10\text{ V}$ , $I_D = 3.3\text{ A}$ , $T_J = 125\text{ }^{\circ}\text{C}$		136	178	
$g_{FS}$	Forward Transconductance	$V_{DS} = 5\text{ V}$ , $I_D = 3.3\text{ A}$		11		S

**Dynamic Characteristics**

$C_{iss}$	Input Capacitance	$V_{DS} = 50\text{ V}$ , $V_{GS} = 0\text{ V}$ , $f = 1\text{ MHz}$		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		$\Omega$

**Switching Characteristics**

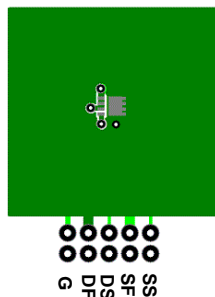
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 50\text{ V}$ , $I_D = 3.3\text{ A}$ , $V_{GS} = 10\text{ V}$ , $R_{GEN} = 6\text{ }\Omega$		4.5	10	ns
$t_r$	Rise Time			1.3	10	ns
$t_{d(off)}$	Turn-Off Delay Time			10	20	ns
$t_f$	Fall Time			1.4	10	ns
$Q_{g(TOT)}$	Total Gate Charge	$V_{GS} = 0\text{ V to }10\text{ V}$	$V_{DD} = 50\text{ V}$ , $I_D = 3.3\text{ A}$	4	6	nC
$Q_{g(TOT)}$	Total Gate Charge	$V_{GS} = 0\text{ V to }4.5\text{ V}$		2	3	nC
$Q_{gs}$	Total Gate Charge			0.8		nC
$Q_{gd}$	Gate to Drain "Miller" Charge			0.7		nC

**Drain-Source Diode Characteristics**

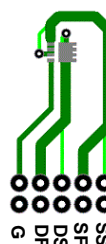
$V_{SD}$	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}$ , $I_S = 3.3\text{ A}$ (Note 2)		0.85	1.3	V
		$V_{GS} = 0\text{ V}$ , $I_S = 2\text{ A}$ (Note 2)		0.82	1.2	
$t_{rr}$	Reverse Recovery Time	$I_F = 3.3\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$		33	54	ns
$Q_{rr}$	Reverse Recovery Charge			23	38	nC

## NOTES:

1.  $R_{\theta JA}$  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

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

3. Starting  $T_J = 25\text{ }^{\circ}\text{C}$ ; N-ch:  $L = 1.0\text{ mH}$ ,  $I_{AS} = 5.0\text{ A}$ ,  $V_{DD} = 90\text{ V}$ ,  $V_{GS} = 10\text{ V}$ .

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

# Typical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

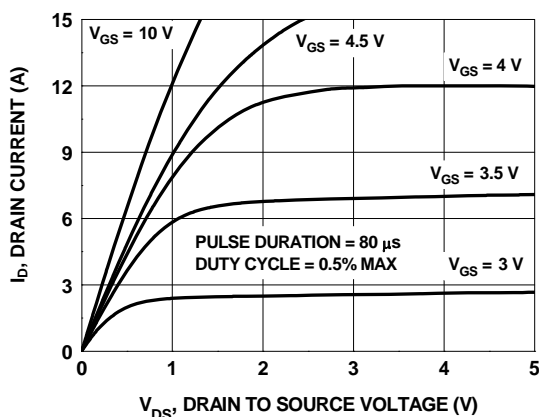


Figure 1. On Region Characteristics

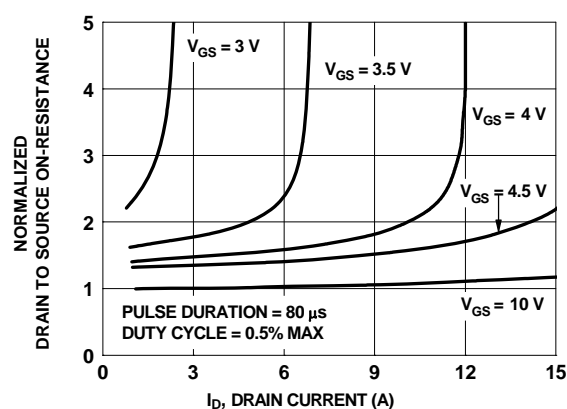


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

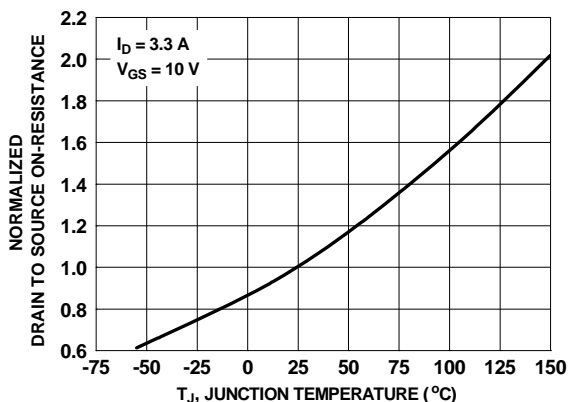


Figure 3. Normalized On Resistance vs Junction Temperature

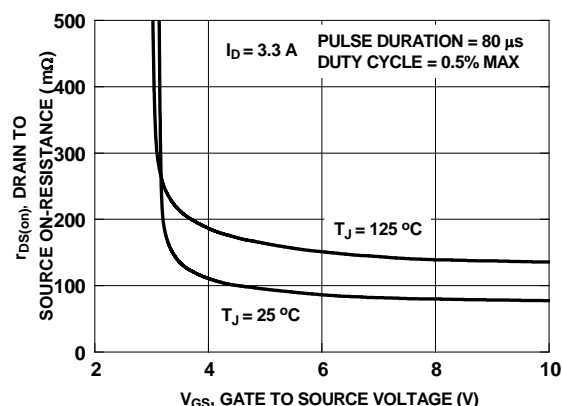


Figure 4. On-Resistance vs Gate to Source Voltage

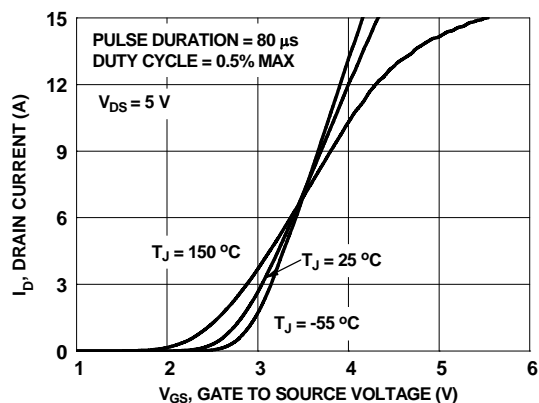


Figure 5. Transfer Characteristics

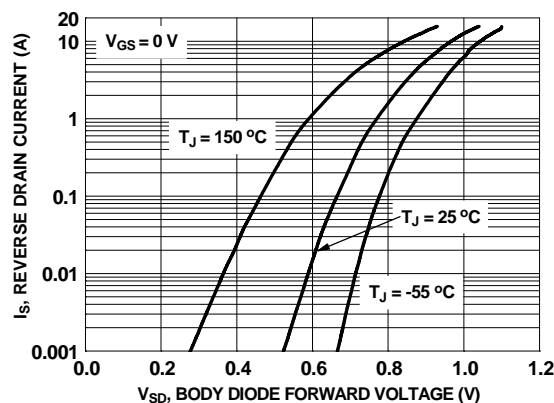


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

## Typical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted

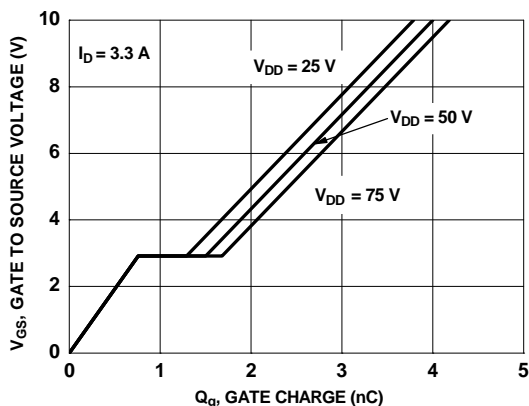


Figure 7. Gate Charge Characteristics

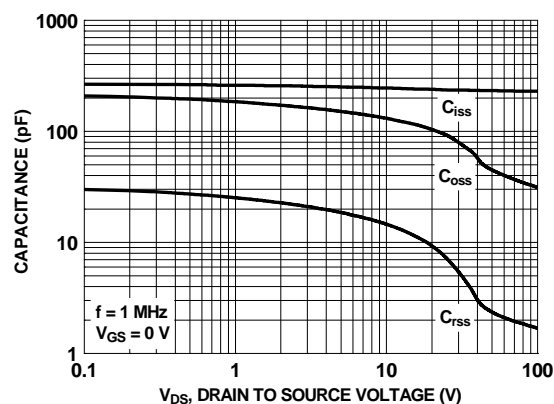


Figure 8. Capacitance vs Drain to Source Voltage

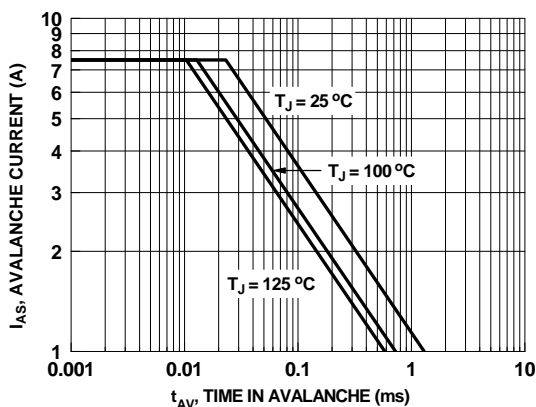


Figure 9. Unclamped Inductive Switching Capability

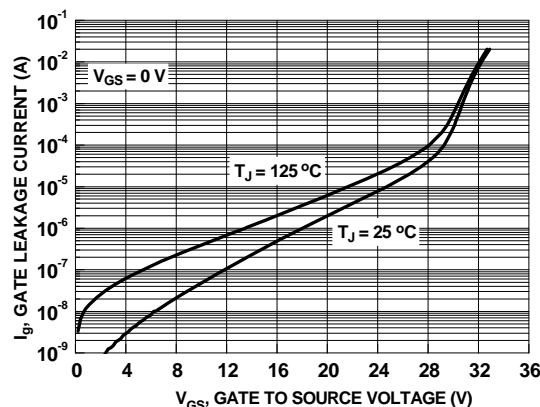


Figure 10. Gate Leakage Current vs Gate to Source Voltage

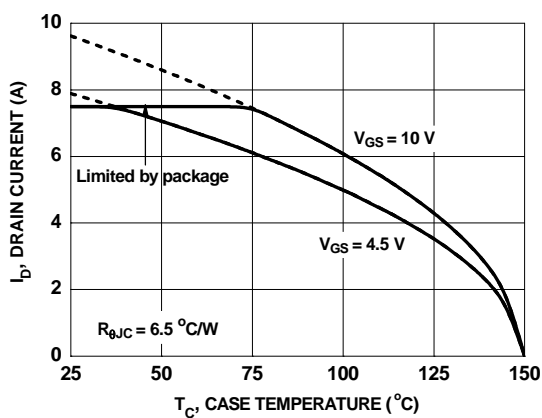


Figure 11. Maximum Continuous Drain Current vs Case Temperature

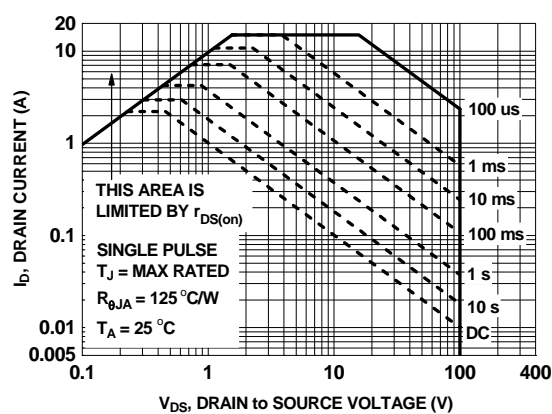


Figure 12. Forward Bias Safe Operating Area

# Typical Characteristics $T_J = 25\text{ }^{\circ}\text{C}$ unless otherwise noted

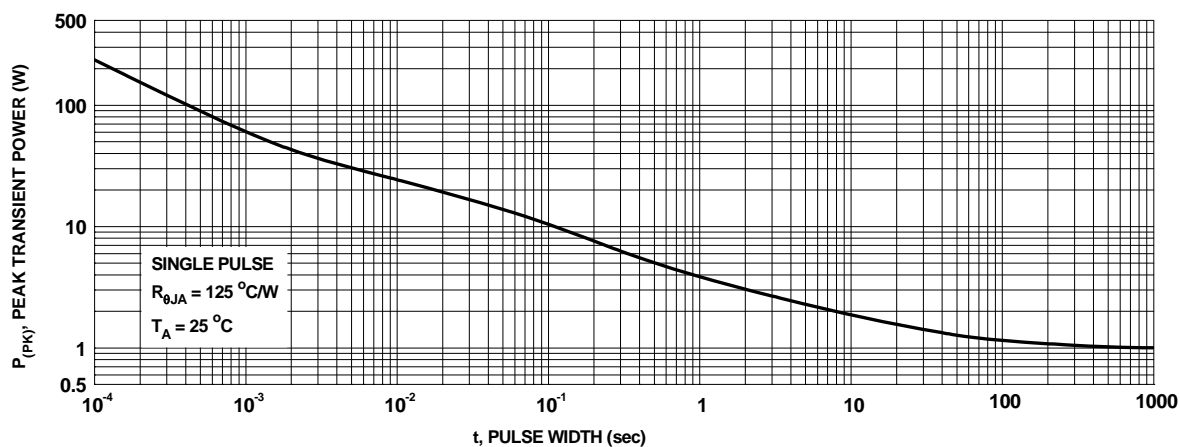


Figure 13. Single Pulse Maximum Power Dissipation

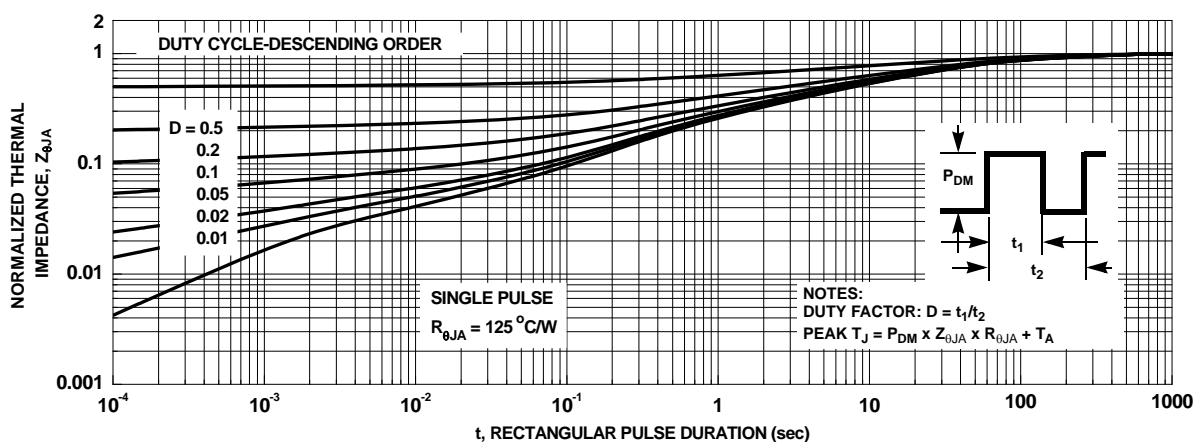
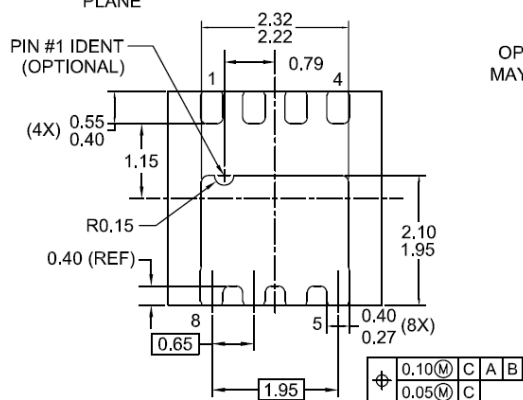
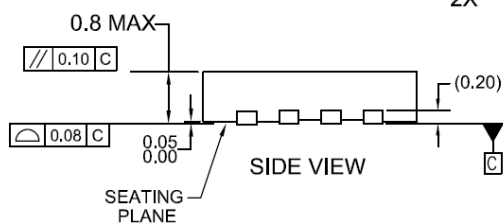
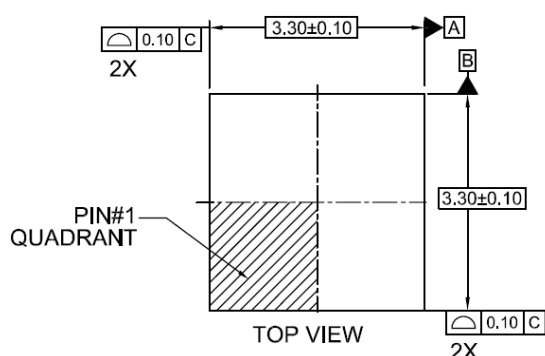
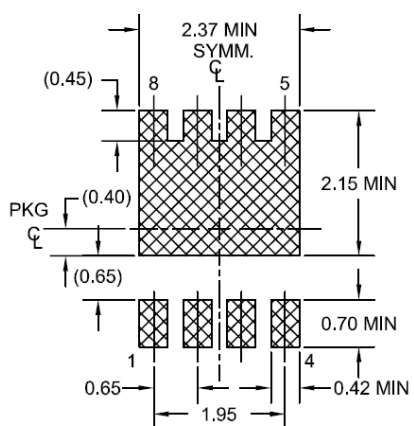


Figure 14. Junction-to-Ambient Transient Thermal Response Curve

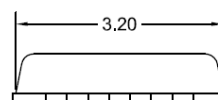
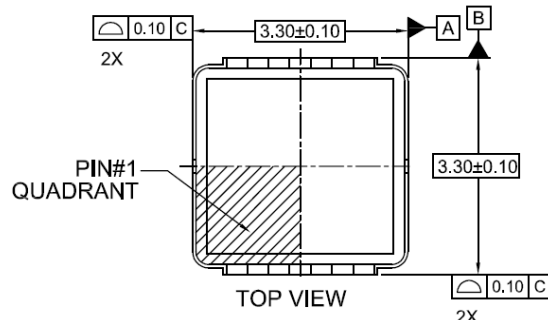
## Dimensional Outline and Pad Layout



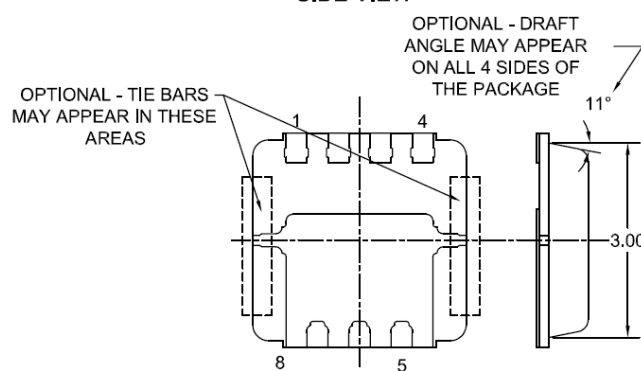
BOTTOM VIEW  
(OPTION A)



## RECOMMENDED LAND PATTERN



**SIDE VIEW**



ALL DIMENSIONS AS PER OPTION A  
UNLESS SPECIFIED

BOTTOM VIEW  
(OPTION B)

NOTES:

- A. PACKAGE DOES NOT FULLY CONFORM TO JEDEC REGISTRATION MO-240.  
B. DIMENSIONS ARE IN MILLIMETERS.  
C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.  
D. DIMENSIONS DOES NOT INCLUDE BURRS OR MOLD FLASH. BURRS OR  
MOLD FLASH SHALL NOT EXCEED 0.10MM.  
E. LAND PATTERN RECOMMENDATION IS BASED ON FSC DESIGN ONLY.  
F. DRAWING FILENAME: MLP33-08rev1.



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2. A critical component in any component of a life support, device, or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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Datasheet Identification	Product Status	Definition
Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
Obsolete	Not In Production	Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.