



# FDMC4435BZ

## P-Channel Power Trench<sup>®</sup> MOSFET

-30 V, -18 A, 20 mΩ

### Features

- Max  $r_{DS(on)}$  = 20 mΩ at  $V_{GS} = -10$  V,  $I_D = -8.5$  A
- Max  $r_{DS(on)}$  = 37 mΩ at  $V_{GS} = -4.5$  V,  $I_D = -6.3$  A
- Extended  $V_{GSS}$  range (-25 V) for battery applications
- High performance trench technology for extremely low  $r_{DS(on)}$
- High power and current handling capability
- HBM ESD protection level >7 kV typical (Note 4)
- 100% UIL Tested
- Termination is Lead-free and RoHS Compliant

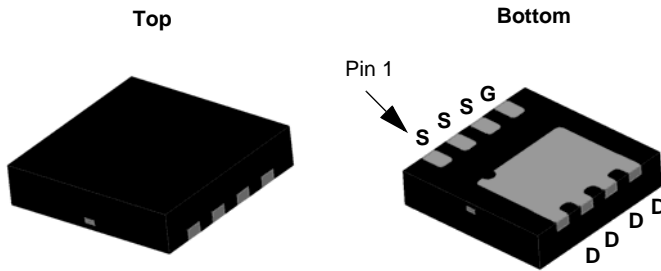


### General Description

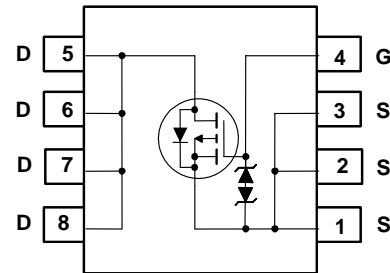
This P-Channel MOSFET is produced using Fairchild Semiconductor's advanced Power Trench<sup>®</sup> process that has been especially tailored to minimize the on-state resistance. This device is well suited for Power Management and load switching applications common in Notebook Computers and Portable Battery Packs.

### Applications

- High side in DC - DC Buck Converters
- Notebook battery power management
- Load switch in Notebook



MLP 3.3x3.3



### MOSFET Maximum Ratings $T_A = 25$ °C unless otherwise noted

Symbol	Parameter	Conditions	Rated Value	Units
$V_{DS}$	Drain to Source Voltage		-30	V
$V_{GS}$	Gate to Source Voltage		±25	V
$I_D$	Drain Current	-Continuous $T_C = 25$ °C	-18	A
		-Continuous $T_A = 25$ °C (Note 1a)	-8.5	
		-Pulsed	-50	
$E_{AS}$	Single Pulse Avalanche Energy	(Note 3)	32	mJ
$P_D$	Power Dissipation	$T_C = 25$ °C	31	W
	Power Dissipation	$T_A = 25$ °C (Note 1a)	2.3	
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range		-55 to +150	°C

### Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case		4	°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
FDMC4435BZ	FDMC4435BZ	MLP 3.3X3.3	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
$BV_{DSS}$	Drain to Source Breakdown Voltage	$I_D = -250\ \mu\text{A}, V_{GS} = 0\ \text{V}$	-30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = -250\ \mu\text{A}$ , referenced to $25\text{ }^\circ\text{C}$		21		mV/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = -24\ \text{V},$ $V_{GS} = 0\ \text{V},$ $T_J = 125\text{ }^\circ\text{C}$			-1 -100	$\mu\text{A}$
$I_{GSS}$	Gate to Source Leakage Current	$V_{GS} = \pm 25\ \text{V}, V_{DS} = 0\ \text{V}$			$\pm 10$	$\mu\text{A}$

## On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = -250\ \mu\text{A}$	-1.0	-1.8	-3.0	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = -250\ \mu\text{A}$ , referenced to $25\text{ }^\circ\text{C}$		-5		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = -10\ \text{V}, I_D = -8.5\ \text{A}$		14	20	m $\Omega$
		$V_{GS} = -4.5\ \text{V}, I_D = -6.3\ \text{A}$		21	37	
		$V_{GS} = -10\ \text{V}, I_D = -8.5\ \text{A},$ $T_J = 125\text{ }^\circ\text{C}$		20	29	
$g_{FS}$	Forward Transconductance	$V_{DD} = -5\ \text{V}, I_D = -8.5\ \text{A}$		25		S

## Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = -15\ \text{V}, V_{GS} = 0\ \text{V},$ $f = 1\ \text{MHz}$		1535	2040	pF
$C_{oss}$	Output Capacitance			310	410	pF
$C_{rss}$	Reverse Transfer Capacitance			280	420	pF
$R_g$	Gate Resistance	$f = 1\ \text{MHz}$		4		$\Omega$

## Switching Characteristics

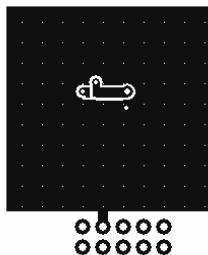
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = -15\ \text{V}, I_D = -8.5\ \text{A},$ $V_{GS} = -10\ \text{V}, R_{GEN} = 6\ \Omega$		10	20	ns	
$t_r$	Rise Time			9	18	ns	
$t_{d(off)}$	Turn-Off Delay Time			35	56	ns	
$t_f$	Fall Time			19	34	ns	
$Q_g$	Total Gate Charge		$V_{GS} = 0\ \text{V to } -10\ \text{V}$		38	53	nC
$Q_g$	Total Gate Charge	$V_{GS} = 0\ \text{V to } -4.5\ \text{V}$	$V_{DD} = -15\ \text{V},$ $I_D = -8.5\ \text{A}$		20	28	nC
$Q_{gs}$	Gate to Source Charge				4.3		nC
$Q_{gd}$	Gate to Drain "Miller" Charge				11		nC

## Drain-Source Diode Characteristics

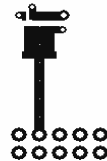
$V_{SD}$	Source to Drain Diode Forward Voltage	$V_{GS} = 0\ \text{V}, I_S = -8.5\ \text{A}$ (Note 2)		0.86	1.5	V
		$V_{GS} = 0\ \text{V}, I_S = -1.9\ \text{A}$ (Note 2)		0.74	1.2	
$t_{rr}$	Reverse Recovery Time	$I_F = -8.5\ \text{A}, di/dt = 100\ \text{A}/\mu\text{s}$		26	40	ns
$Q_{rr}$	Reverse Recovery Charge			12	20	nC

### NOTES:

1.  $R_{\theta JA}$  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.  $53\text{ }^\circ\text{C/W}$  when mounted on a  $1\ \text{in}^2$  pad of 2 oz copper



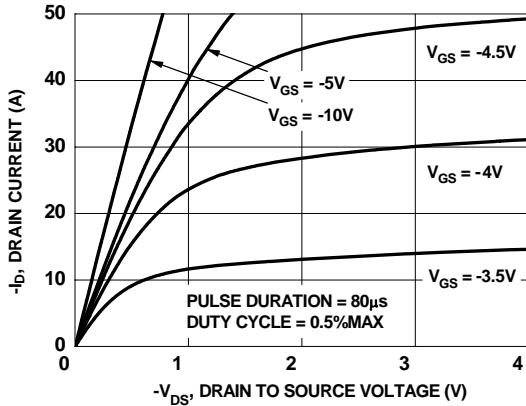
b.  $125\text{ }^\circ\text{C/W}$  when mounted on a minimum pad of 2 oz copper

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

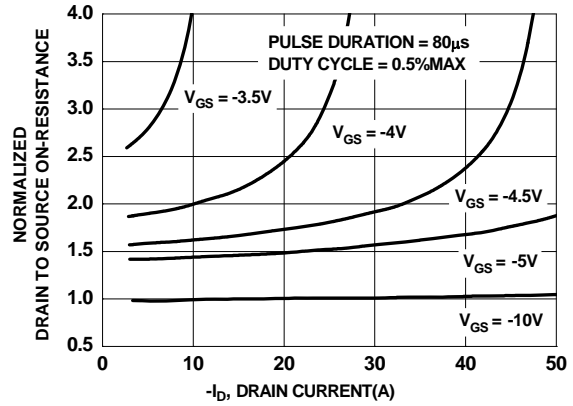
3. Starting  $T_J = 25\text{ }^\circ\text{C}$ ; P-ch:  $L = 1\ \text{mH}, I_{AS} = -8\ \text{A}, V_{DD} = -27\ \text{V}, V_{GS} = -10\ \text{V}$ .

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

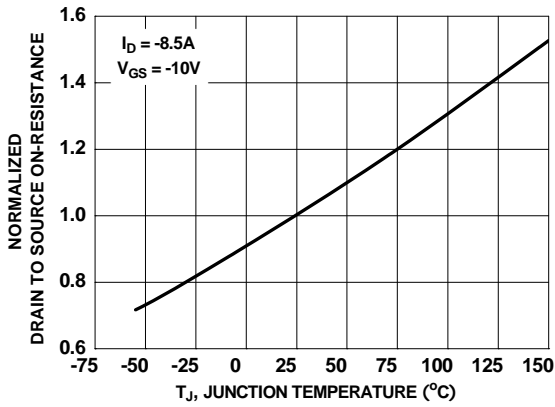
**Typical Characteristics**  $T_J = 25^\circ\text{C}$  unless otherwise noted



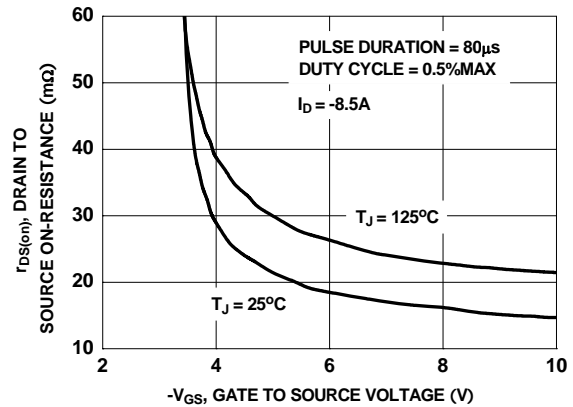
**Figure 1. On-Region Characteristics**



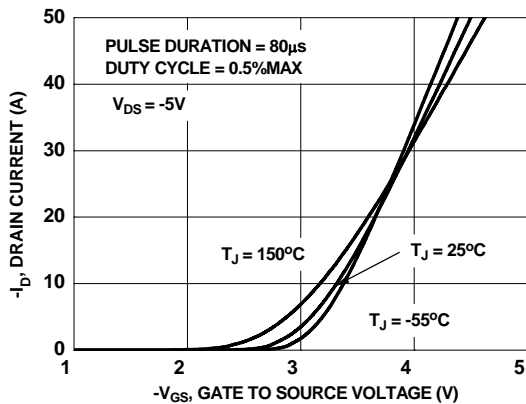
**Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage**



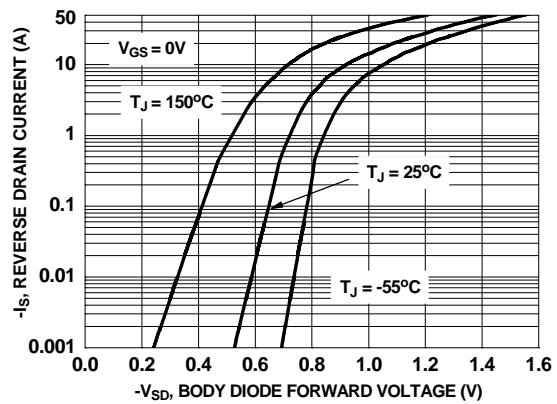
**Figure 3. Normalized On-Resistance vs Junction Temperature**



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

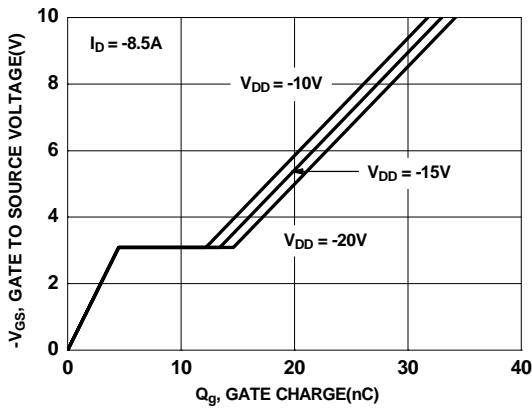


**Figure 5. Transfer Characteristics**

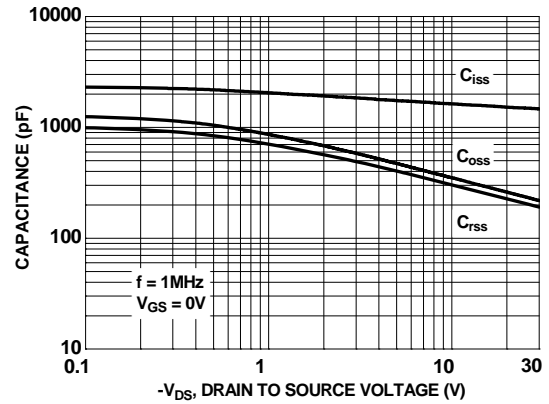


**Figure 6. Source to Drain Diode Forward Voltage vs Source Current**

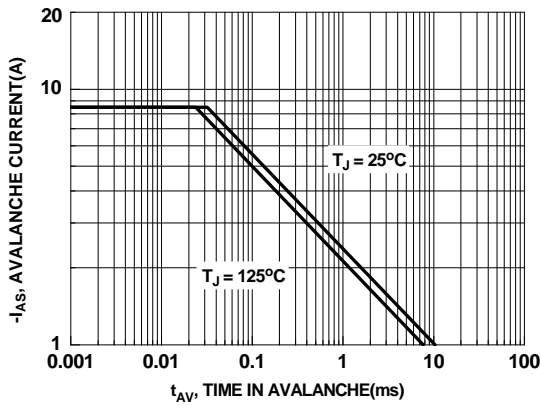
**Typical Characteristics**  $T_J = 25^\circ\text{C}$  unless otherwise noted



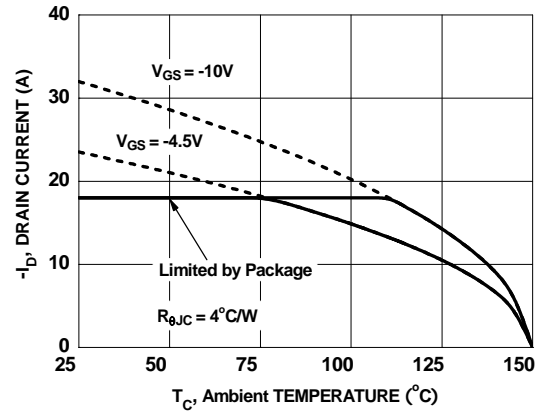
**Figure 7. Gate Charge Characteristics**



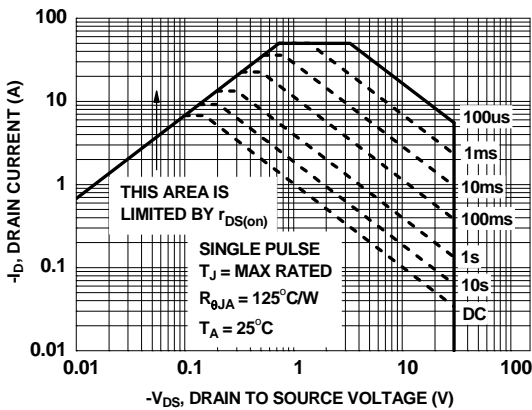
**Figure 8. Capacitance vs Drain to Source Voltage**



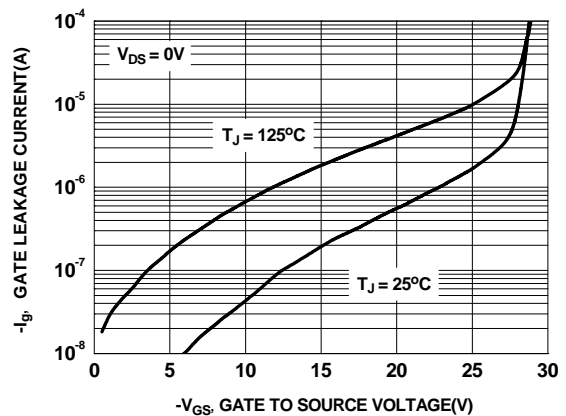
**Figure 9. Unclamped Inductive Switching Capability**



**Figure 10. Maximum Continuous Drain Current vs Case Temperature**



**Figure 11. Forward Bias Safe Operating Area**



**Figure 12. I<sub>gss</sub> vs V<sub>gss</sub>**

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

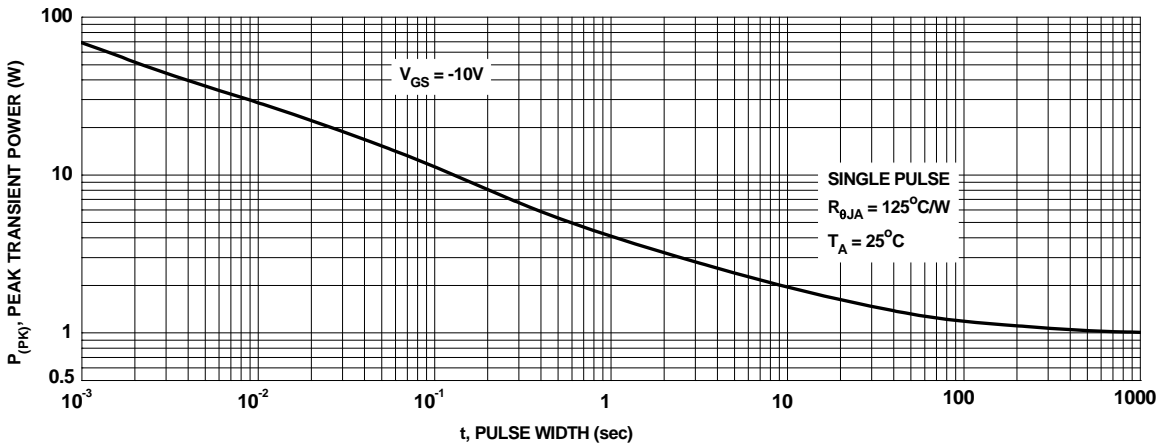


Figure 13. Single Pulse Maximum Power Dissipation

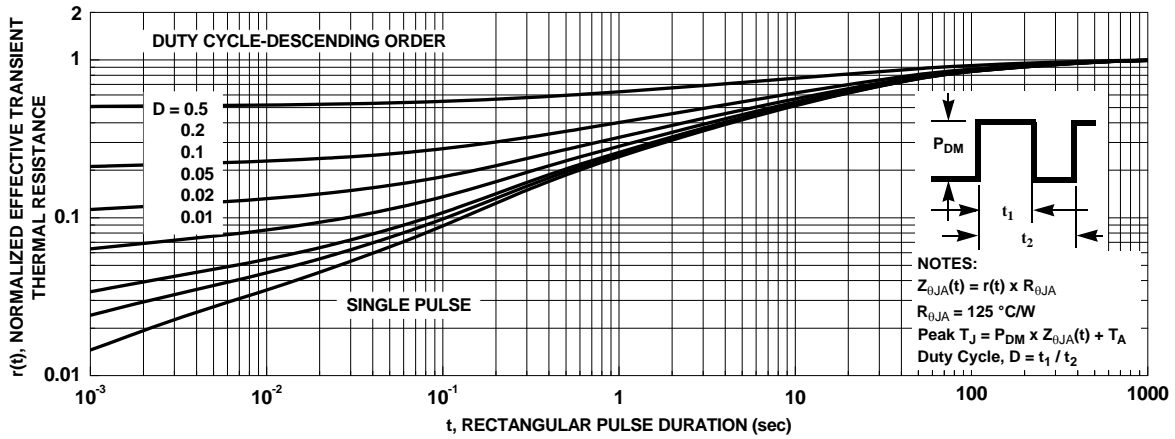
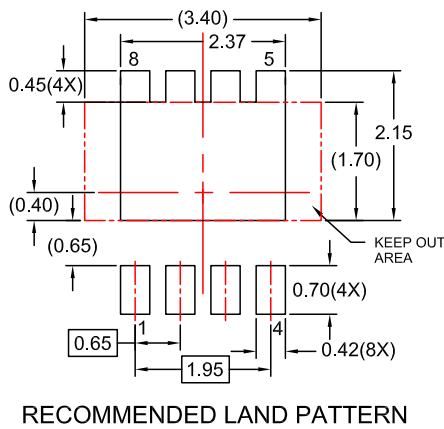
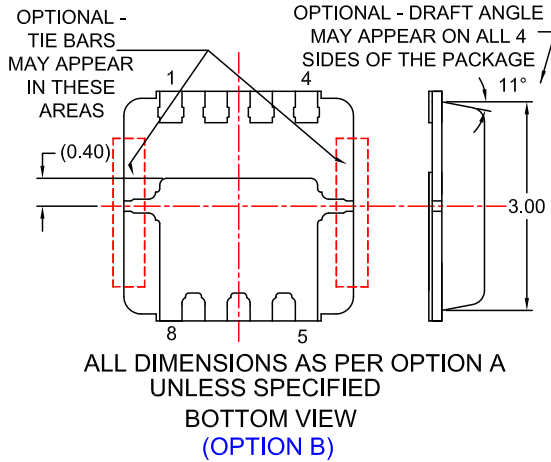
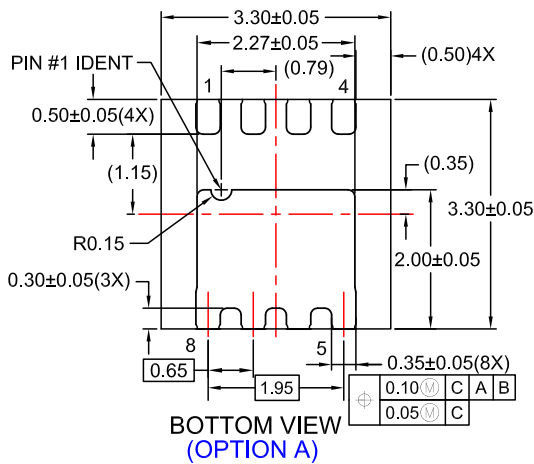
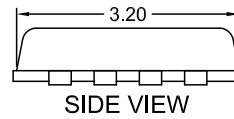
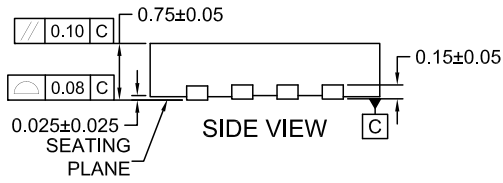
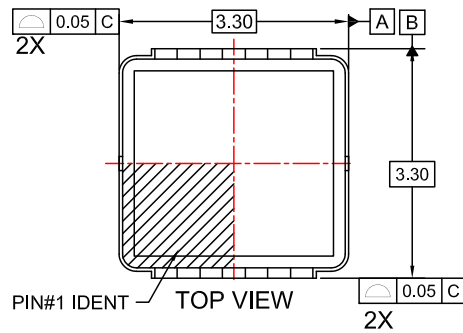
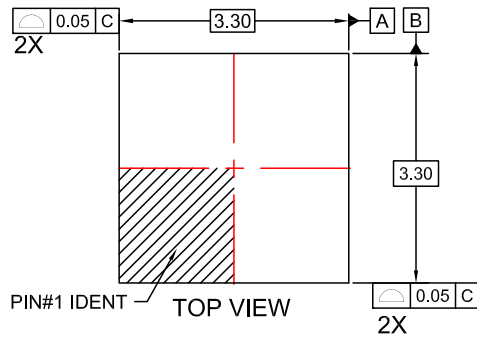
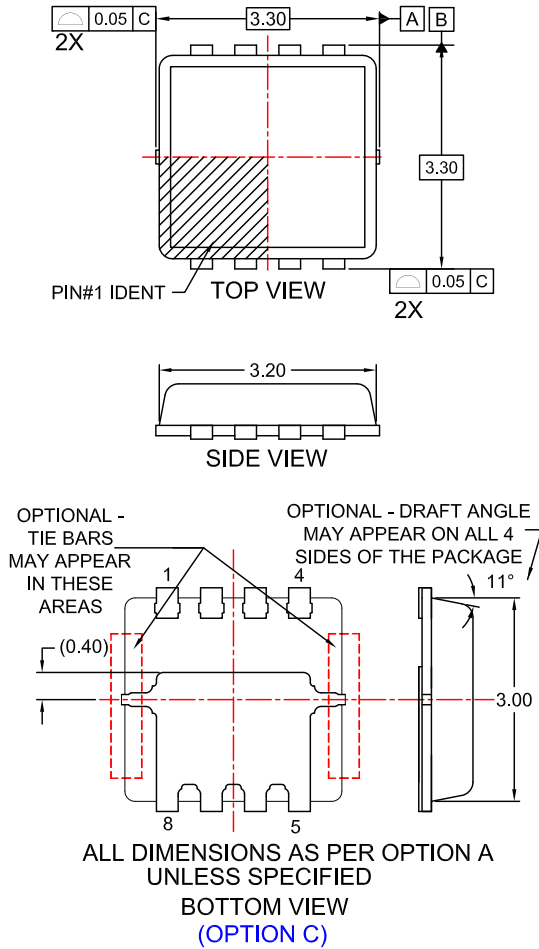


Figure 14. Transient Thermal Response Curve

### Dimensional Outline and Pad Layout



## Dimensional Outline and Pad Layout



### 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, 2009.
- D. LAND PATTERN RECOMMENDATION IS EXISTING INDUSTRY LAND PATTERN
- E. DIMENSIONS DO NOT INCLUDE BURRS OR MOLD FLASH. BURRS OR MOLD FLASH SHALL NOT EXCEED 0.10MM.
- F. DRAWING FILENAME: MKT-MLP08Wrev3.
- G. OPTION A - SAWN MLP, OPTIONS B & C - PUNCH MLP.








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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.
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