



ON Semiconductor®

FDMC4435BZ

P-Channel Power Trench® 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

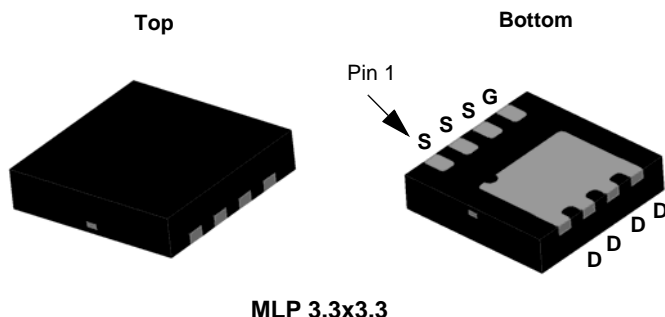


General Description

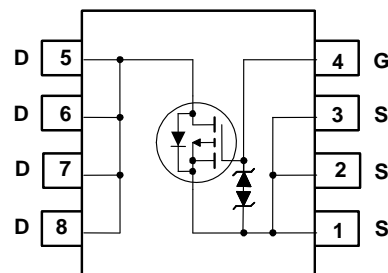
This P-Channel MOSFET is produced using ON Semiconductor's advanced Power Trench® process that has been especially tailored to minimize the on-state resistance. This device is well suited for Power Management and load switching applications common in Notebook Computers and Portable Battery Packs.

Applications

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



MLP 3.3x3.3



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

Symbol	Parameter	Ratings	Units
V_{DS}	Drain to Source Voltage	-30	V
V_{GS}	Gate to Source Voltage	± 25	V
I_D	Drain Current -Continuous $T_C = 25^\circ\text{C}$	-18	A
	-Continuous $T_A = 25^\circ\text{C}$ (Note 1a)	-8.5	
	-Pulsed	-50	
E_{AS}	Single Pulse Avalanche Energy (Note 3)	32	mJ
P_D	Power Dissipation $T_C = 25^\circ\text{C}$	31	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	4	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	53	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMC4435BZ	FDMC4435BZ	MLP 3.3X3.3	13 "	12 mm	3000 units

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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Off Characteristics

BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = -250\ \mu\text{A}$, $V_{GS} = 0\ \text{V}$	-30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = -250\ \mu\text{A}$, referenced to 25°C		21		mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = -24\ \text{V}$, $V_{GS} = 0\ \text{V}$, $T_J = 125^\circ\text{C}$			-1	μA
I_{GSS}	Gate to Source Leakage Current	$V_{GS} = \pm 25\ \text{V}$, $V_{DS} = 0\ \text{V}$			± 10	μA

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°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 Ω
		$V_{GS} = -4.5\ \text{V}$, $I_D = -6.3\ \text{A}$		21	37	
		$V_{GS} = -10\ \text{V}$, $I_D = -8.5\ \text{A}$, $T_J = 125^\circ\text{C}$		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		Ω

Switching Characteristics

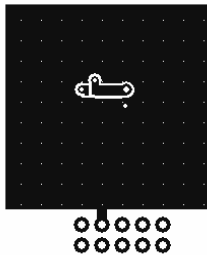
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = -15\ \text{V}$, $I_D = -8.5\ \text{A}$, $V_{GS} = -10\ \text{V}$, $R_{GEN} = 6\ \Omega$		10	20	ns
t_r	Rise Time			9	18	ns
$t_{d(off)}$	Turn-Off Delay Time			35	56	ns
t_f	Fall Time			19	34	ns
Q_g	Total Gate Charge			38	53	nC
Q_g	Total Gate Charge	$V_{GS} = 0\ \text{V}$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

Drain-Source Diode Characteristics

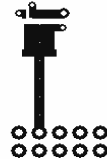
V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0\ \text{V}$, $I_S = -8.5\ \text{A}$ (Note 2)		0.86	1.5	V
		$V_{GS} = 0\ \text{V}$, $I_S = -1.9\ \text{A}$ (Note 2)		0.74	1.2	
t_{rr}	Reverse Recovery Time	$I_F = -8.5\ \text{A}$, $di/dt = 100\ \text{A}/\mu\text{s}$		26	40	ns
Q_{rr}	Reverse Recovery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

NOTES:

- $R_{\theta JA}$ is determined with the device mounted on a 1 in² 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 in² pad of 2 oz copper



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

- Pulse Test: Pulse Width < 300 μs , Duty cycle < 2.0 %.
- Starting $T_J = 25^\circ\text{C}$; P-ch: $L = 1\ \text{mH}$, $I_{AS} = -8\ \text{A}$, $V_{DD} = -27\ \text{V}$, $V_{GS} = -10\ \text{V}$.
- 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

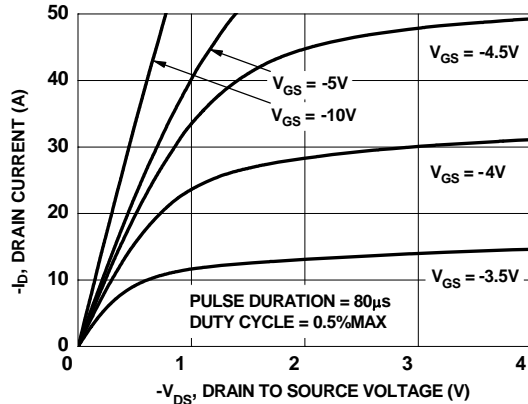


Figure 1. On-Region Characteristics

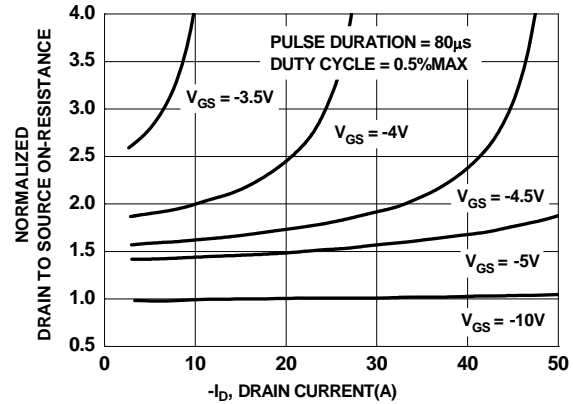


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

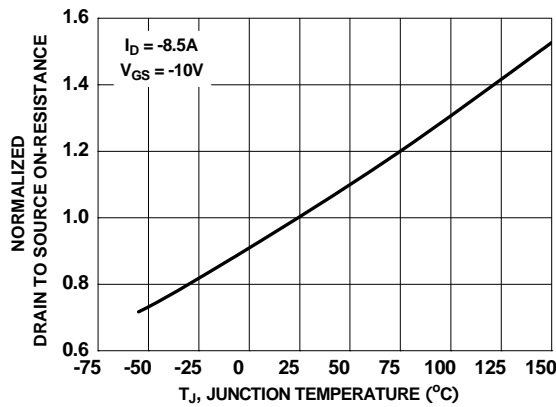


Figure 3. Normalized On-Resistance vs Junction Temperature

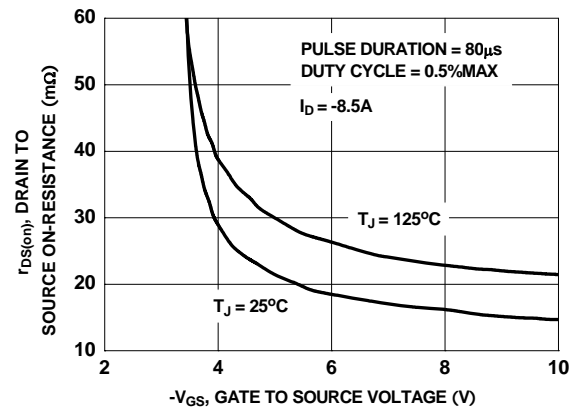


Figure 4. On-Resistance vs Gate to Source Voltage

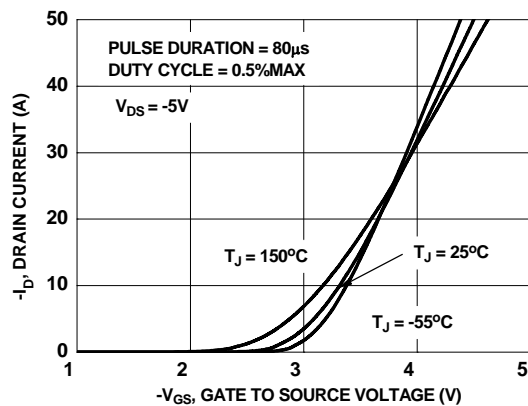


Figure 5. Transfer Characteristics

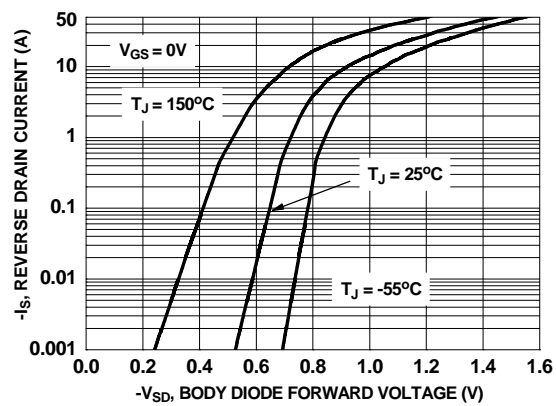


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

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

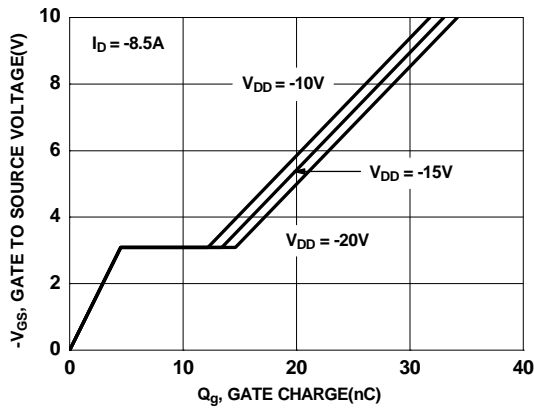


Figure 7. Gate Charge Characteristics

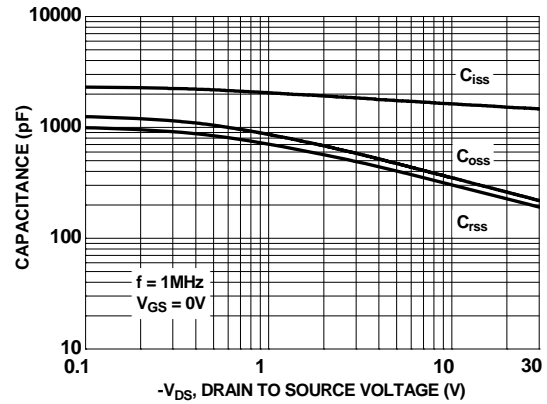


Figure 8. Capacitance vs Drain to Source Voltage

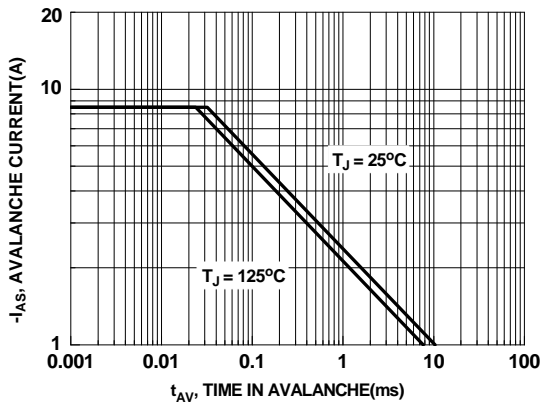


Figure 9. Unclamped Inductive Switching Capability

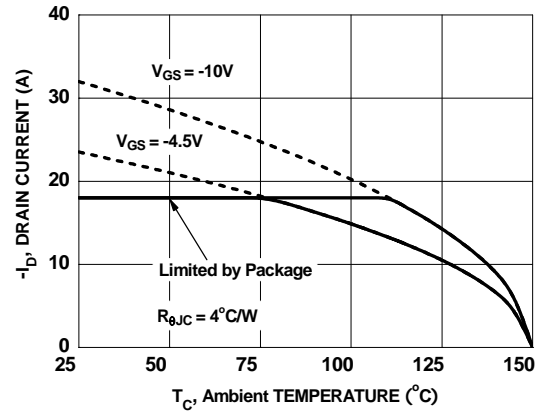


Figure 10. Maximum Continuous Drain Current vs Case Temperature

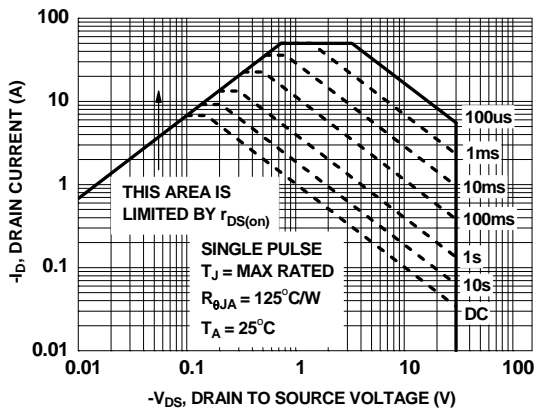


Figure 11. Forward Bias Safe Operating Area

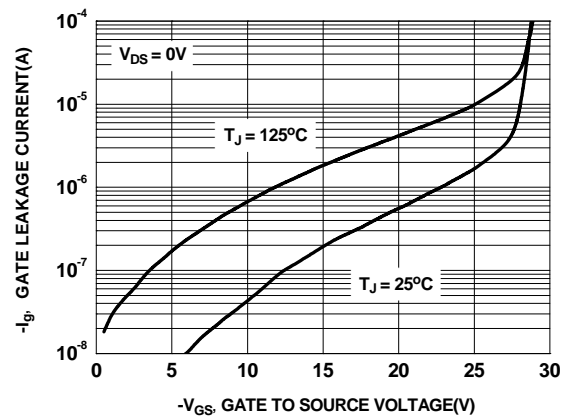


Figure 12. I_{gss} vs V_{gss}

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

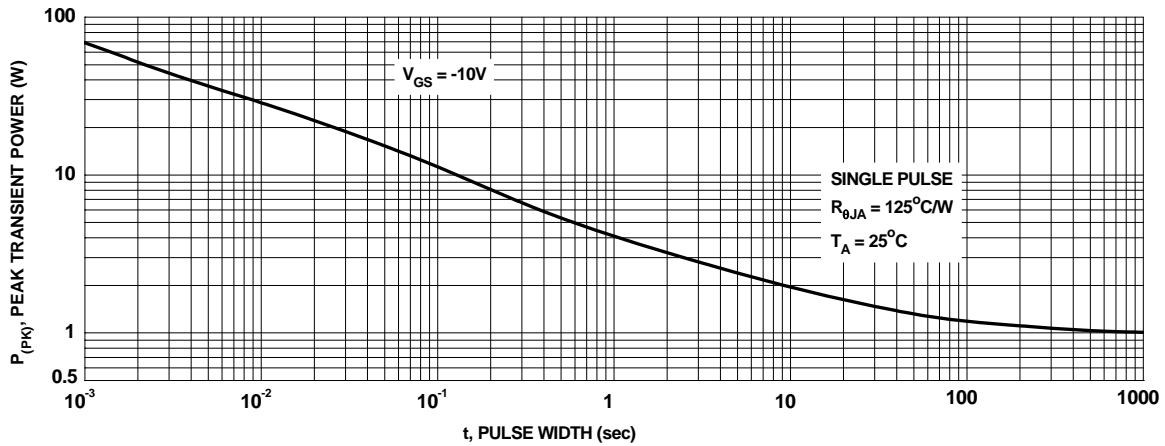


Figure 13. Single Pulse Maximum Power Dissipation

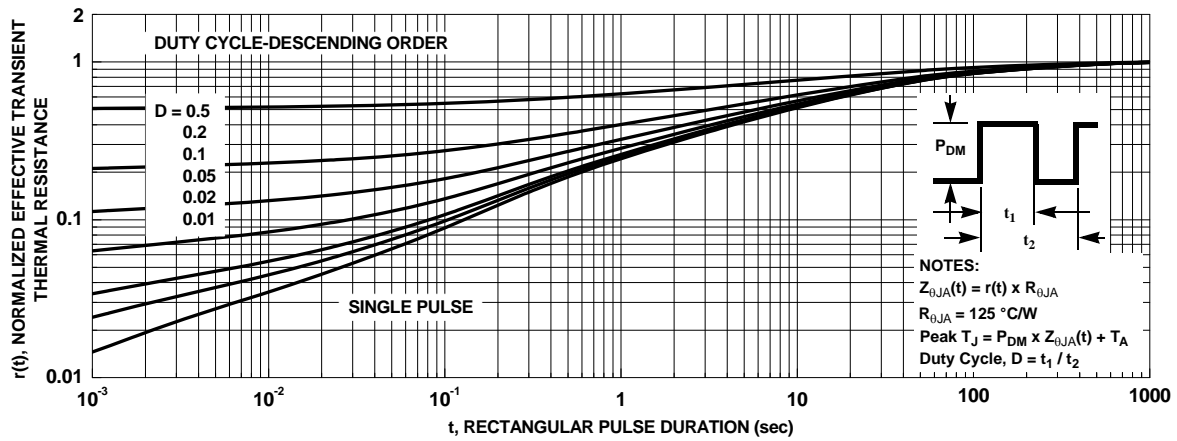
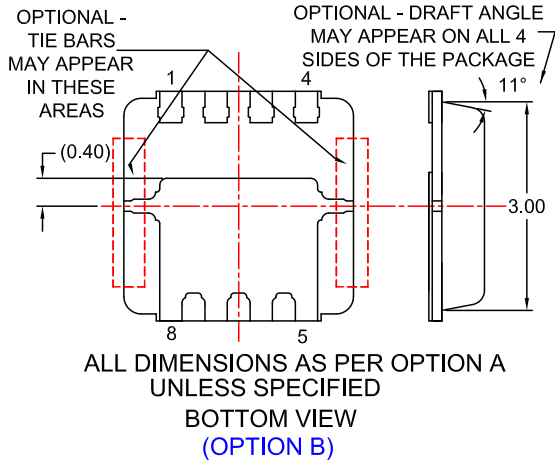
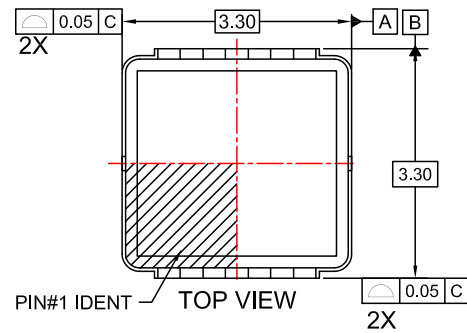
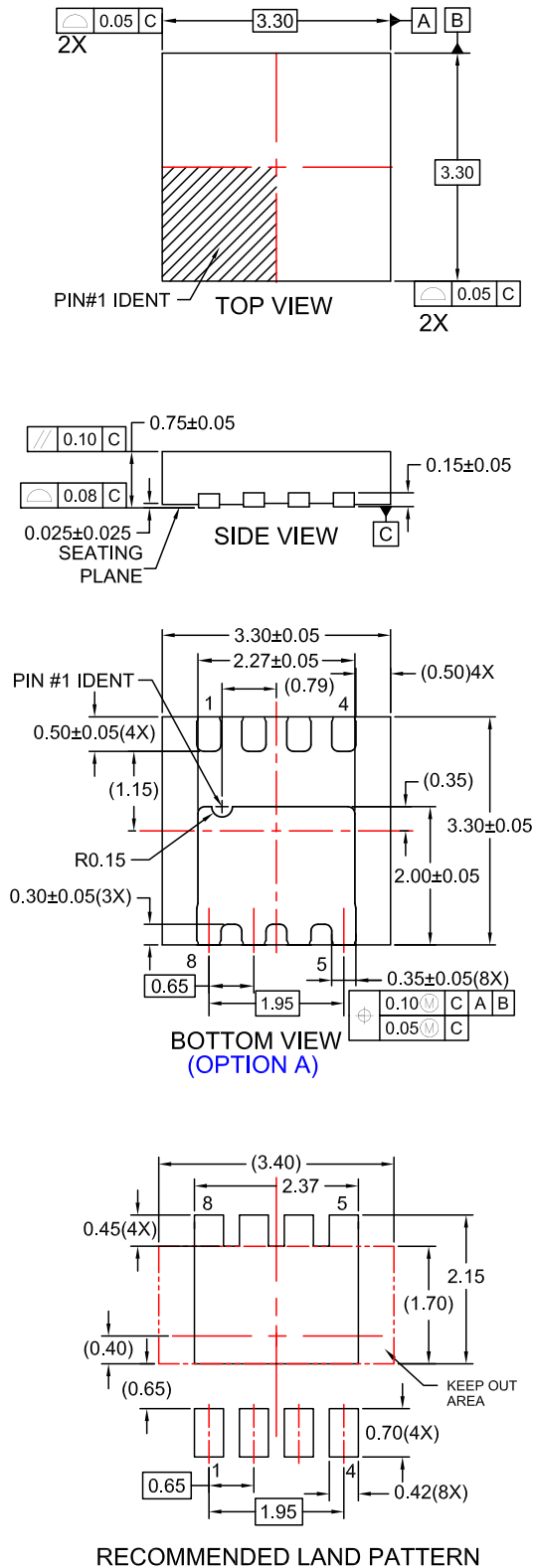
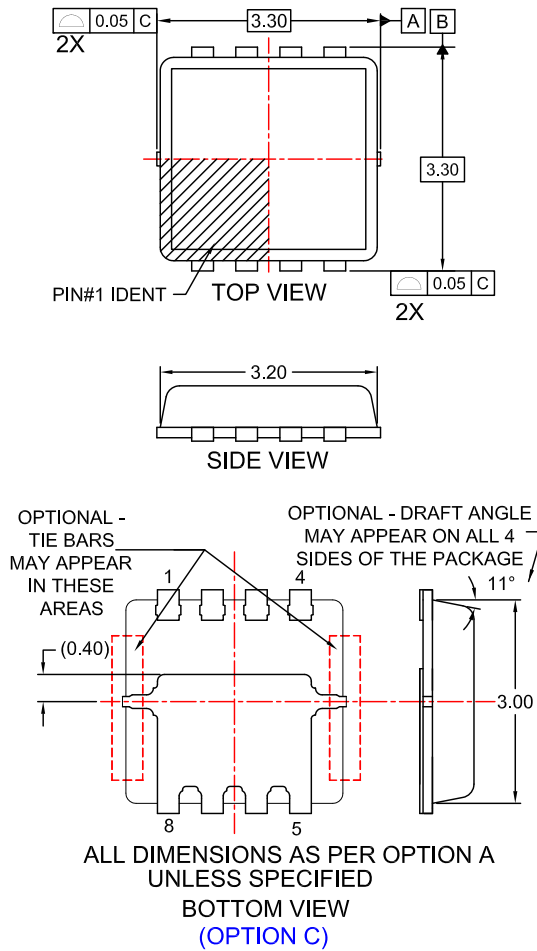


Figure 14. Transient Thermal Response Curve

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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