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# FDMC612PZ

## P-Channel PowerTrench® MOSFET -20 V, -14 A, 8.4 mΩ

### Features

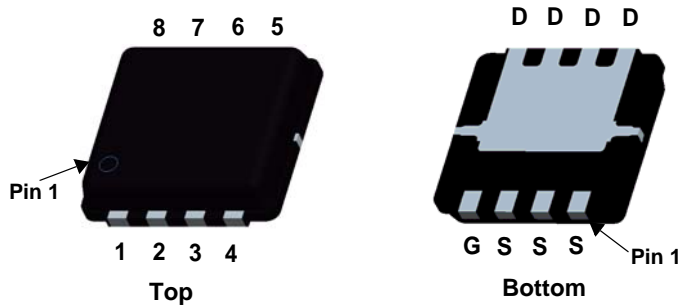
- Max  $r_{DS(on)}$  = 8.4 mΩ at  $V_{GS} = -4.5$  V,  $I_D = -14$  A
- Max  $r_{DS(on)}$  = 13 mΩ at  $V_{GS} = -2.5$  V,  $I_D = -11$  A
- High performance trench technology for extremely low  $r_{DS(on)}$
- High power and current handling capability in a widely used surface mount package
- Termination is Lead-free and RoHS Compliant
- HBM ESD capability level > 3.6 KV typical (Note 4)

### General Description

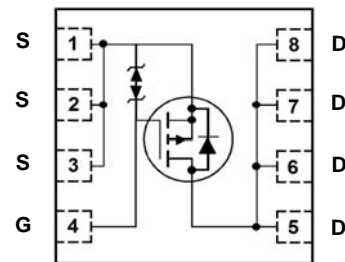
This P-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench® process that has been optimized for  $r_{DS(ON)}$ , switching performance and ruggedness.

### Applications

- Battery Management
- Load Switch



MLP 3.3x3.3



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

Symbol	Parameter	Ratings	Units	
$V_{DS}$	Drain to Source Voltage	-20	V	
$V_{GS}$	Gate to Source Voltage	±12	V	
$I_D$	Drain Current -Continuous	$T_C = 25$ °C	A	
	-Continuous	$T_A = 25$ °C (Note 1a)		
	-Pulsed			
$E_{AS}$	Single Pulse Avalanche Energy	(Note 3)	38	mJ
$P_D$	Power Dissipation	$T_C = 25$ °C	26	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	4.9	°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
FDMC612PZ	FDMC612PZ	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
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### Off Characteristics

$BV_{DSS}$	Drain to Source Breakdown Voltage	$I_D = -250\text{ }\mu\text{A}$ , $V_{GS} = 0\text{ V}$	-20			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = -250\text{ }\mu\text{A}$ , referenced to $25\text{ }^\circ\text{C}$		-19		mV/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = -16\text{ V}$ , $V_{GS} = 0\text{ V}$			-1	$\mu\text{A}$
$I_{GSS}$	Gate to Source Leakage Current	$V_{GS} = \pm 12\text{ V}$ , $V_{DS} = 0\text{ V}$			$\pm 10$	$\mu\text{A}$

### On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$ , $I_D = -250\text{ }\mu\text{A}$	-0.6	-0.9	-1.5	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 $25\text{ }^\circ\text{C}$		9		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = -4.5\text{ V}$ , $I_D = -14\text{ A}$		5.9	8.4	m $\Omega$
		$V_{GS} = -2.5\text{ V}$ , $I_D = -11\text{ A}$		8.2	13	
		$V_{GS} = -4.5\text{ V}$ , $I_D = -14\text{ A}$ , $T_J = 125\text{ }^\circ\text{C}$		8.3	13	
$g_{FS}$	Forward Transconductance	$V_{DS} = -5\text{ V}$ , $I_D = -14\text{ A}$		85		S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = -10\text{ V}$ , $V_{GS} = 0\text{ V}$ , $f = 1\text{ MHz}$		5710	7995	pF
$C_{oss}$	Output Capacitance			1215	1700	pF
$C_{rss}$	Reverse Transfer Capacitance			1170	1640	pF

### Switching Characteristics

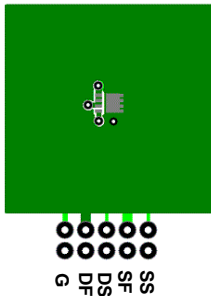
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = -10\text{ V}$ , $I_D = -14\text{ A}$ , $V_{GS} = -4.5\text{ V}$ , $R_{GEN} = 6\text{ }\Omega$		26	42	ns
$t_r$	Rise Time			52	83	ns
$t_{d(off)}$	Turn-Off Delay Time			96	154	ns
$t_f$	Fall Time			81	130	ns
$Q_g$	Total Gate Charge			53	74	nC
$Q_{gs}$	Gate to Source Charge	$V_{DD} = -10\text{ V}$ , $I_D = -14\text{ A}$ , $V_{GS} = -4.5\text{ V}$		9.4		nC
$Q_{gd}$	Gate to Drain "Miller" Charge			18		nC

### Drain-Source Diode Characteristics

$V_{SD}$	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}$ , $I_S = -14\text{ A}$ (Note 2)		-0.8	-1.3	V
		$V_{GS} = 0\text{ V}$ , $I_S = -2\text{ A}$ (Note 2)		-0.7	-1.2	
$t_{rr}$	Reverse Recovery Time	$I_F = -14\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$		39	62	ns
$Q_{rr}$	Reverse Recovery Charge			17	31	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  $R_{\theta JA}$  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:  $E_{AS}$  of 38 mJ is based on starting  $T_J = 25\text{ }^\circ\text{C}$ ,  $L = 0.3\text{ mH}$ ,  $I_{AS} = -16\text{ A}$ ,  $V_{DD} = -18\text{ V}$ ,  $V_{GS} = -10\text{ V}$ .

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

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

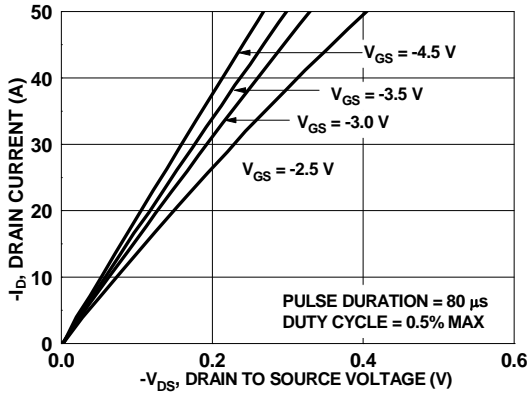


Figure 1. On-Region Characteristics

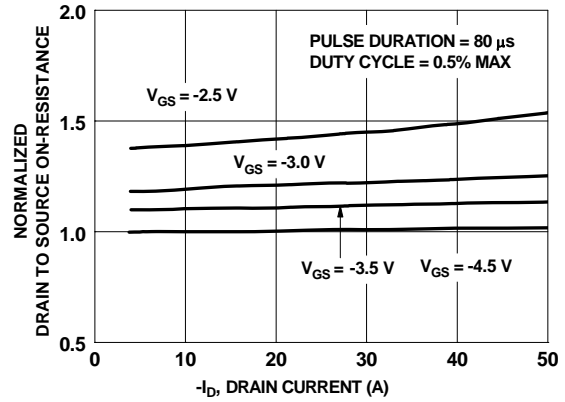


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

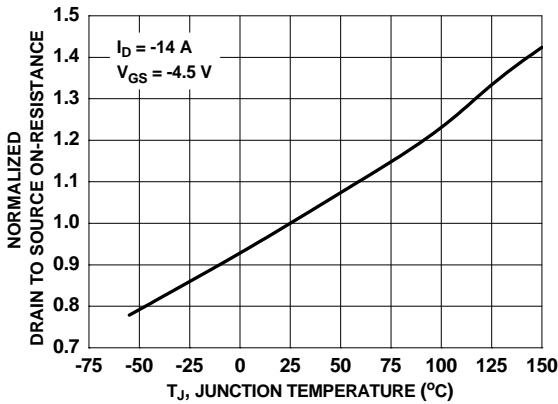


Figure 3. Normalized On-Resistance vs Junction Temperature

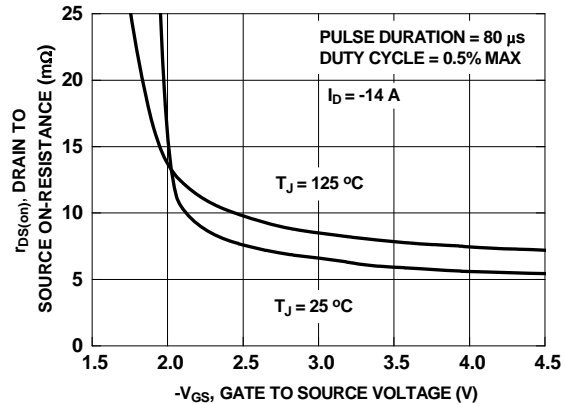


Figure 4. On-Resistance vs Gate to Source Voltage

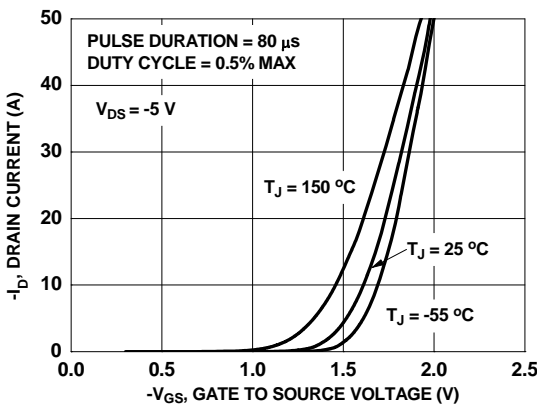


Figure 5. Transfer Characteristics

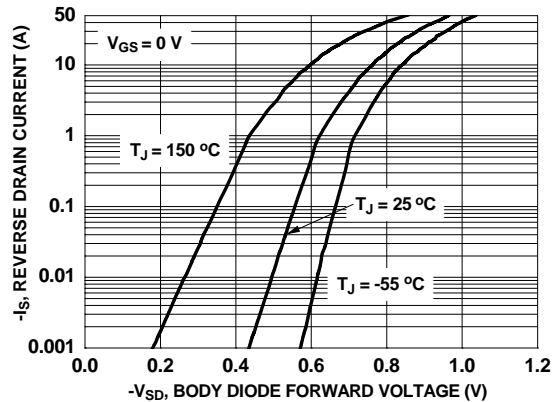
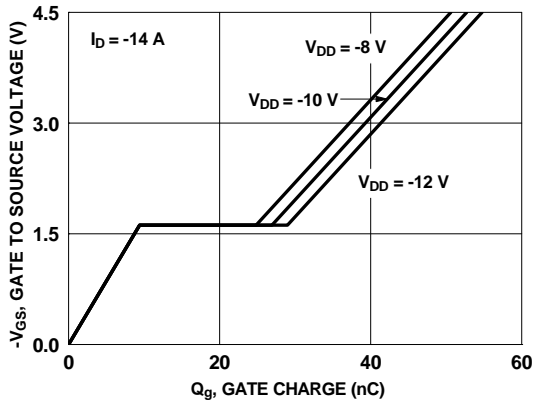
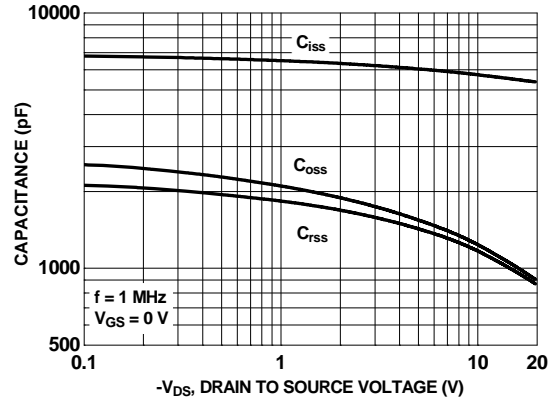


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

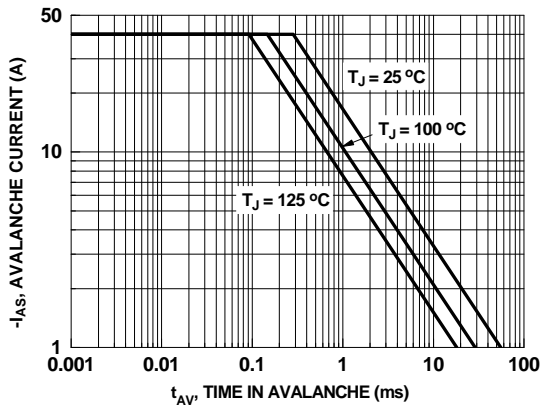
**Typical Characteristics**  $T_J = 25\text{ }^\circ\text{C}$  unless otherwise noted



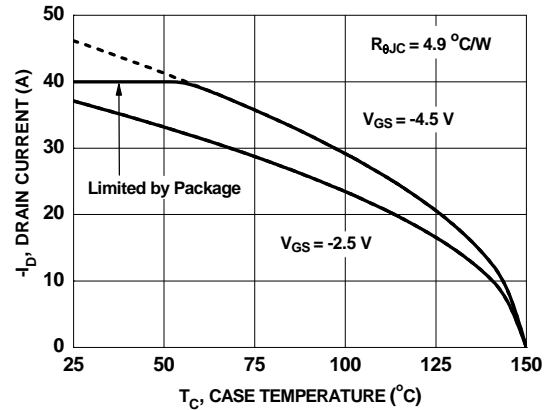
**Figure 7. Gate Charge Characteristics**



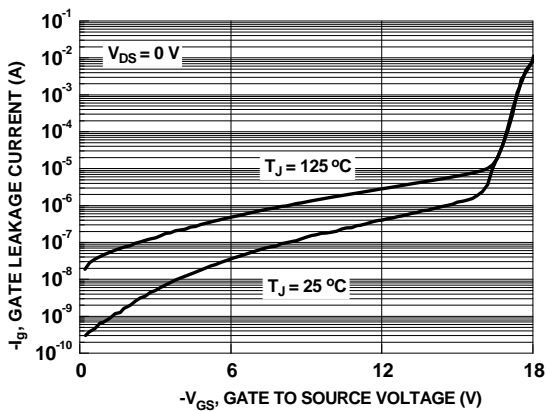
**Figure 8. Capacitance vs Drain to Source Voltage**



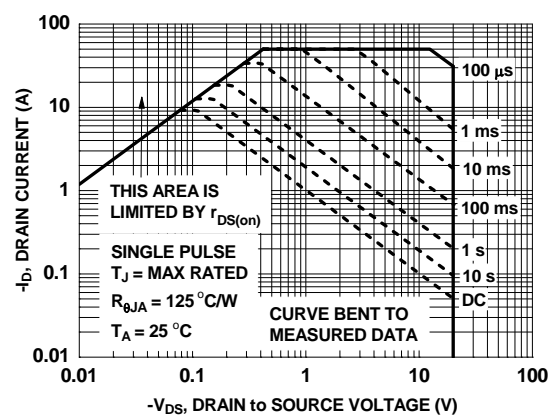
**Figure 9. Unclamped Inductive Switching Capability**



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

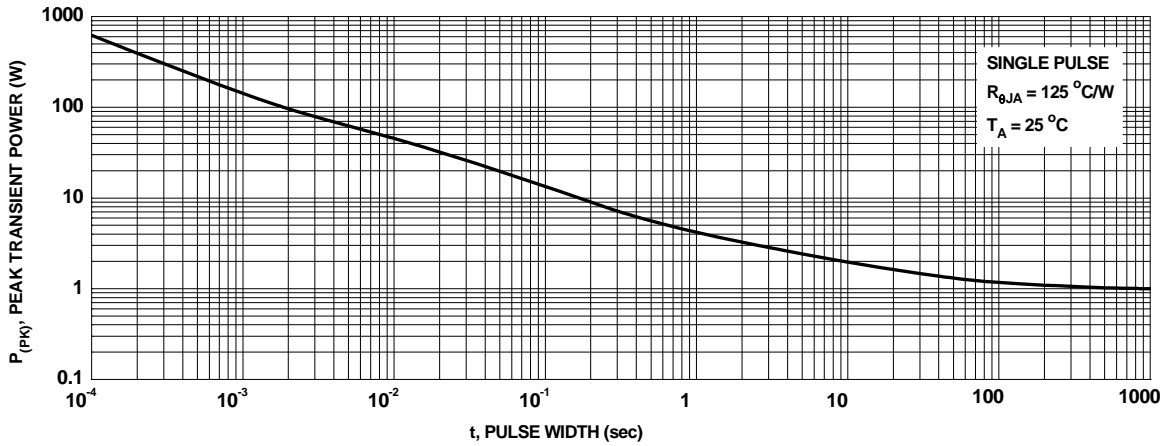


**Figure 11. Gate Leakage Current vs Gate to Source Voltage**

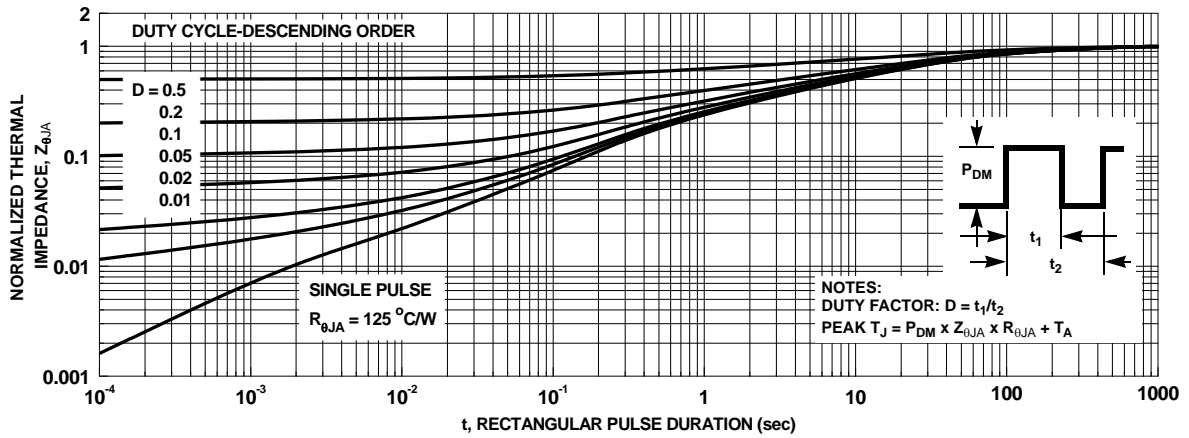


**Figure 12. Forward Bias Safe Operating Area**

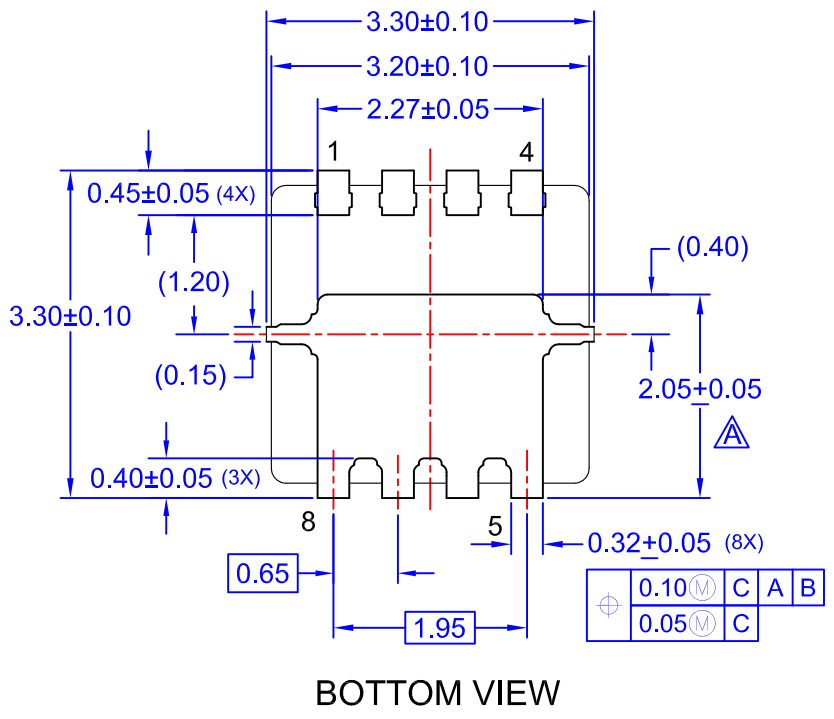
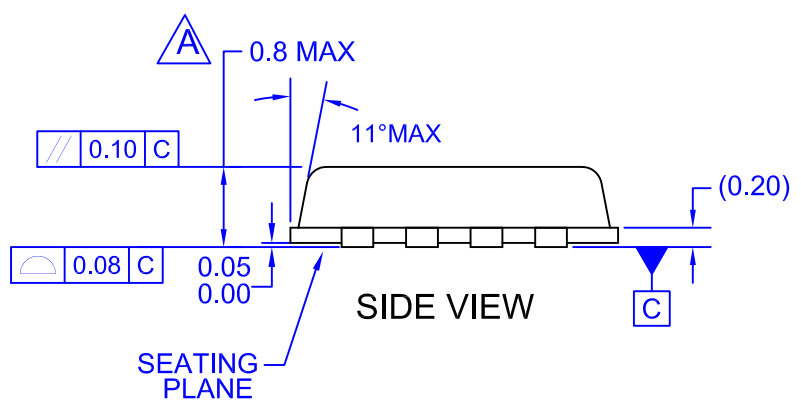
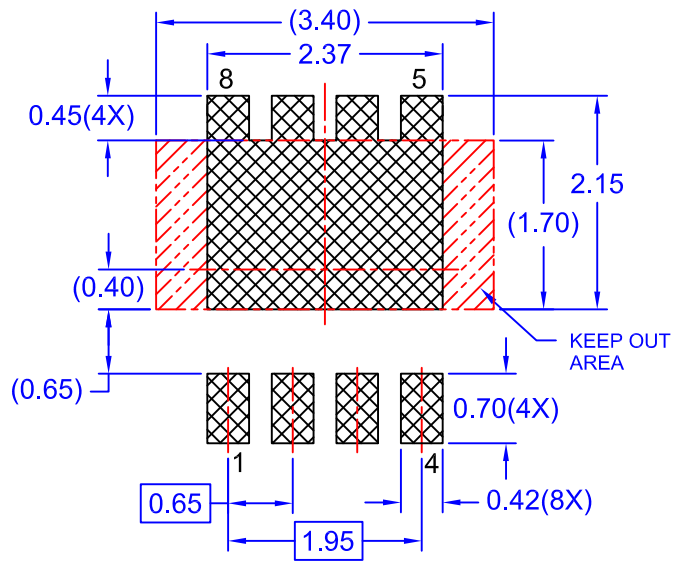
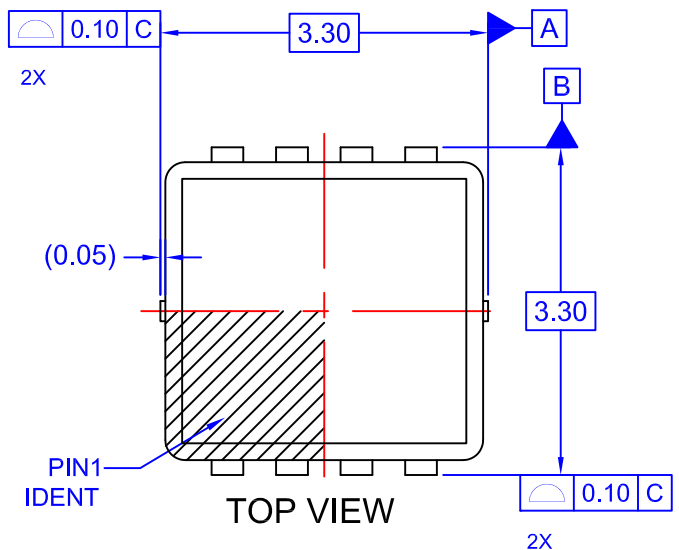
**Typical Characteristics**  $T_J = 25\text{ }^\circ\text{C}$  unless otherwise noted



**Figure 13. Single Pulse Maximum Power Dissipation**



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



- NOTES:**
- A. EXCEPT AS NOTED, PACKAGE CONFORMS TO JEDEC REGISTRATION MO-240 VARIATION BA.
  - B. DIMENSIONS ARE IN MILLIMETERS.
  - C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 2009.
  - D. SEATING PLANE IS DEFINED BY TERMINAL TIPS ONLY
  - E. BODY DIMENSIONS DO NOT INCLUDE MOLD FLASH PROTRUSIONS NOR GATE BURRS.
  - F. FLANGE DIMENSIONS INCLUDE INTERTERMINAL FLASH OR PROTRUSION. INTERTERMINAL FLASH OR PROTRUSION SHALL NOT EXCEED 0.25MM PER SIDE.
  - G. IT IS RECOMMENDED TO HAVE NO TRACES OR VIA WITHIN THE KEEP OUT AREA.
  - H. DRAWING FILENAME: MKT-MLP08Trev4.
  - I. GENERAL RADII FOR ALL CORNERS SHALL BE 0.20MM MAX.



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