



FDMS6681Z

P-Channel PowerTrench® MOSFET

-30 V, -122 A, 3.2 mΩ

Features

- Max $r_{DS(on)}$ = 3.2 mΩ at $V_{GS} = -10$ V, $I_D = -21.1$ A
- Max $r_{DS(on)}$ = 5.0 mΩ at $V_{GS} = -4.5$ V, $I_D = -15.7$ A
- Advanced Package and Silicon combination for low $r_{DS(on)}$
- HBM ESD Protection Level of 8kV Typical(Note 3)
- MSL1 Robust Package Design
- RoHS Compliant

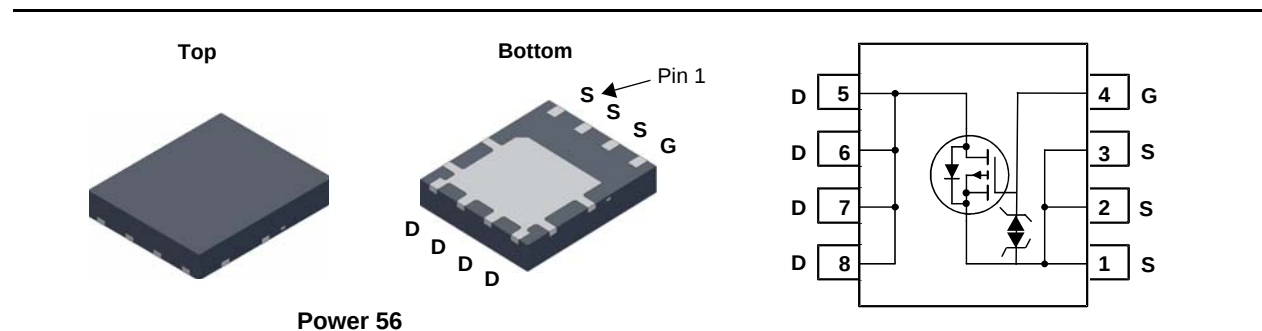


General Description

The FDMS6681Z has been designed to minimize losses in load switch applications. Advancements in both silicon and package technologies have been combined to offer the lowest $r_{DS(on)}$ and ESD protection.

Applications

- Load Switch in Notebook and Server
- Notebook Battery Pack Power Management



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 $T_C = 25^\circ\text{C}$ (Note5)	-122	A
	-Continuous $T_C = 100^\circ\text{C}$ (Note5)	-77	
	-Continuous $T_A = 25^\circ\text{C}$ (Note 1a)	-21.1	
	-Pulsed (Note4)	-600	
P_D	Power Dissipation $T_C = 25^\circ\text{C}$	73	W
	Power Dissipation $T_A = 25^\circ\text{C}$ (Note 1a)	2.5	
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	1.7	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	50	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMS6681Z	FDMS6681Z	Power 56	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	$I_D = -250\text{ }\mu\text{A}$, $V_{GS} = 0\text{ V}$	-30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = -250\text{ }\mu\text{A}$, referenced to $25\text{ }^{\circ}\text{C}$		20		mV/ $^{\circ}\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = -24\text{ V}$, $V_{GS} = 0\text{ V}$			-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	$V_{GS} = V_{DS}$, $I_D = -250\text{ }\mu\text{A}$	-1	-1.7	-3	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 $25\text{ }^{\circ}\text{C}$		-7		mV/ $^{\circ}\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = -10\text{ V}$, $I_D = -22.1\text{ A}$		2.7	3.2	m Ω
		$V_{GS} = -4.5\text{ V}$, $I_D = -15.7\text{ A}$		4.0	5.0	
		$V_{GS} = -10\text{ V}$, $I_D = -22.1\text{ A}$, $T_J = 125\text{ }^{\circ}\text{C}$		3.9	5.0	
g_{FS}	Forward Transconductance	$V_{DD} = -10\text{ V}$, $I_D = -22.1\text{ A}$		143		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = -15\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$		7803	10380	pF
C_{oss}	Output Capacitance			1540	2050	pF
C_{rss}	Reverse Transfer Capacitance			1345	2020	pF

Switching Characteristics

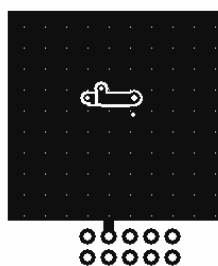
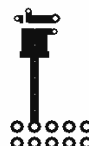
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = -15\text{ V}$, $I_D = -22.1\text{ A}$, $V_{GS} = -10\text{ V}$, $R_{GEN} = 6\text{ }\Omega$		15	24	ns
t_r	Rise Time			38	61	ns
$t_{d(off)}$	Turn-Off Delay Time			260	416	ns
t_f	Fall Time			197	316	ns
Q_g	Total Gate Charge	$V_{GS} = 0\text{ V}$ to -10 V	$V_{DD} = -15\text{ V}$, $I_D = -22.1\text{ A}$	172	241	nC
Q_g	Total Gate Charge	$V_{GS} = 0\text{ V}$ to -5 V		97	136	nC
Q_{gs}	Gate to Source Charge			22		nC
Q_{gd}	Gate to Drain "Miller" Charge			46		nC

Drain-Source Diode Characteristics

V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}$, $I_S = -2.1\text{ A}$ (Note 2)		0.68	1.2	V
		$V_{GS} = 0\text{ V}$, $I_S = -22.1\text{ A}$ (Note 2)		0.79	1.25	V
t_{rr}	Reverse Recovery Time	$I_F = -22.1\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$		44	71	ns
Q_{rr}	Reverse Recovery Charge			39	63	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. 50 $^{\circ}\text{C}/\text{W}$ 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%.
- The diode connected between the gate and source serves only as protection against ESD. No gate overvoltage rating is implied.
- Pulsed I_d please refer to Fig 12 SOA graph for more details.
- Computed continuous current limited to Max Junction Temperature only, actual continuous current will be limited by thermal electro-mechanical application board design.

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

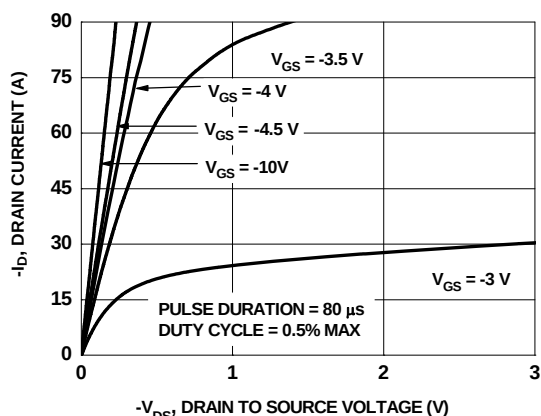


Figure 1. On Region Characteristics

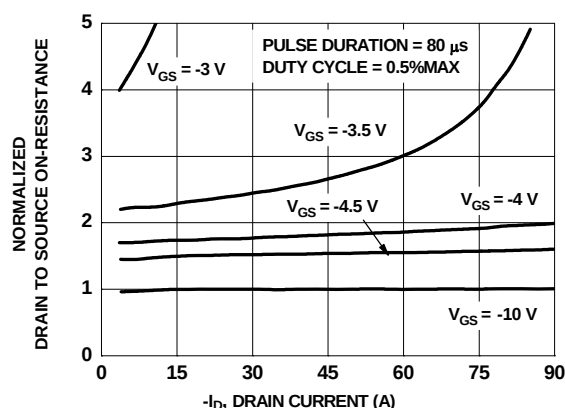


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

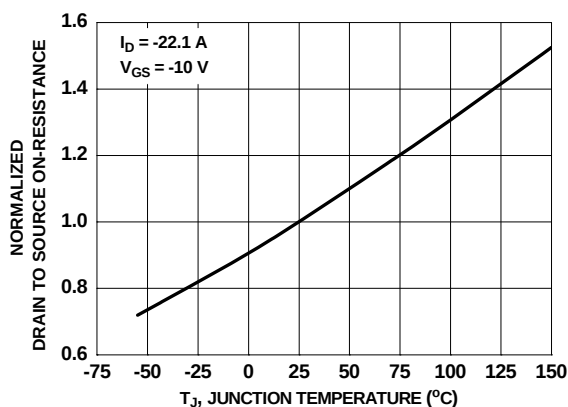


Figure 3. Normalized On Resistance vs Junction Temperature

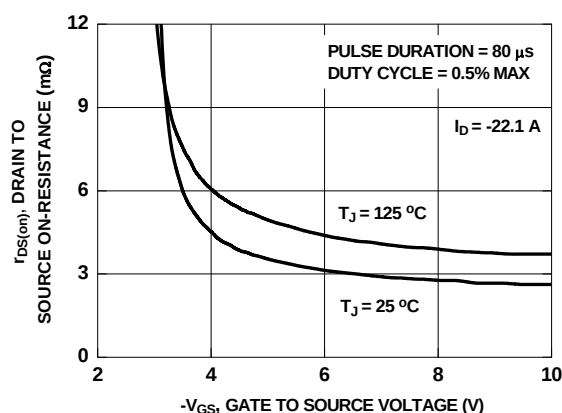


Figure 4. On-Resistance vs Gate to Source Voltage

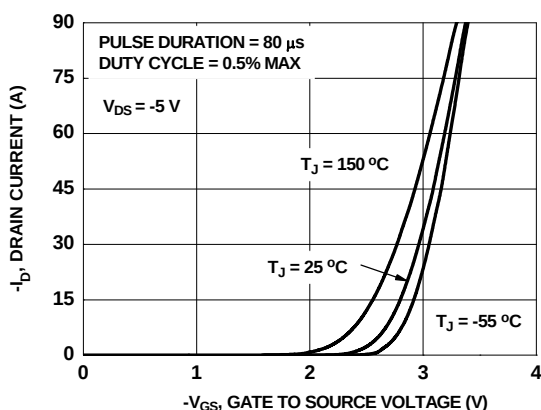


Figure 5. Transfer Characteristics

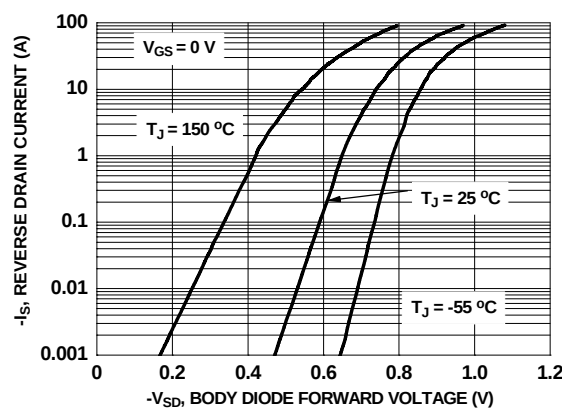


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

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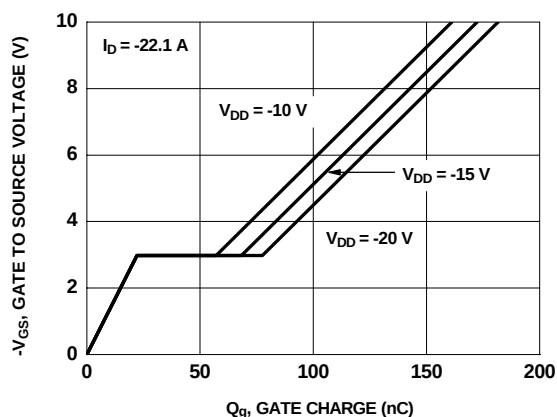


Figure 7. Gate Charge Characteristics

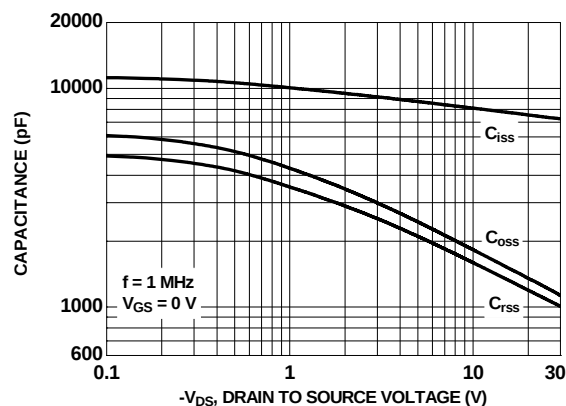


Figure 8. Capacitance vs Drain to Source Voltage

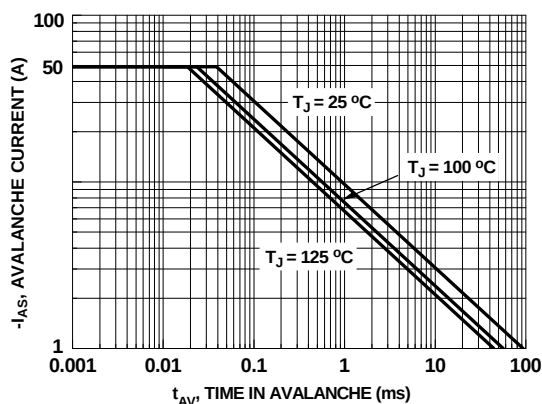


Figure 9. Unclamped Inductive Switching Capability

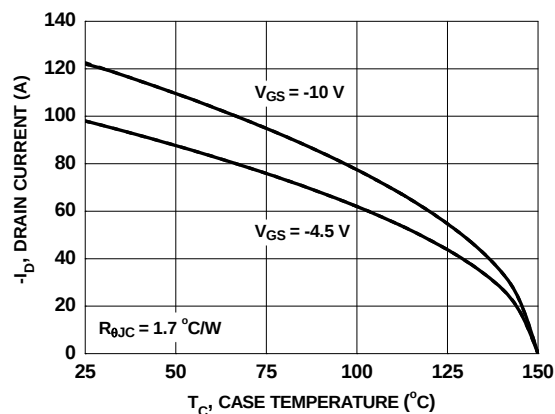


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

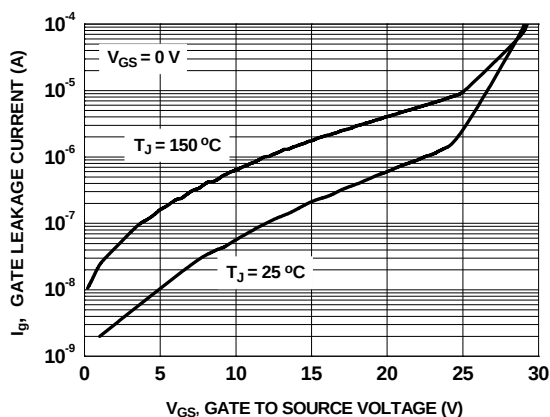


Figure 11. I_{gss} vs V_{gss}

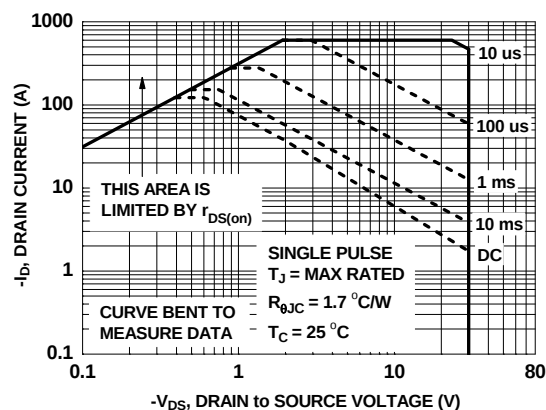


Figure 12. Forward Bias Safe Operating Area

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

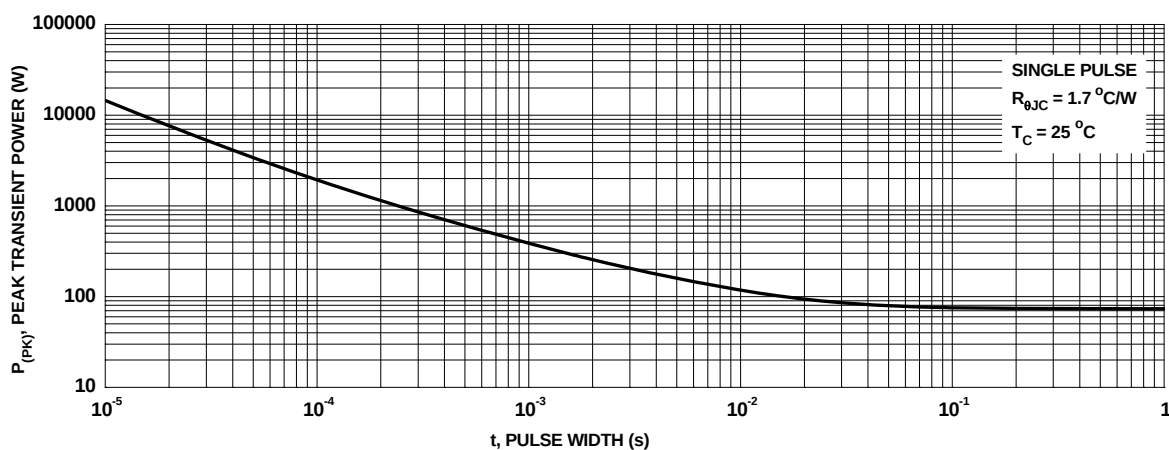


Figure 13. Single Pulse Maximum Power Dissipation

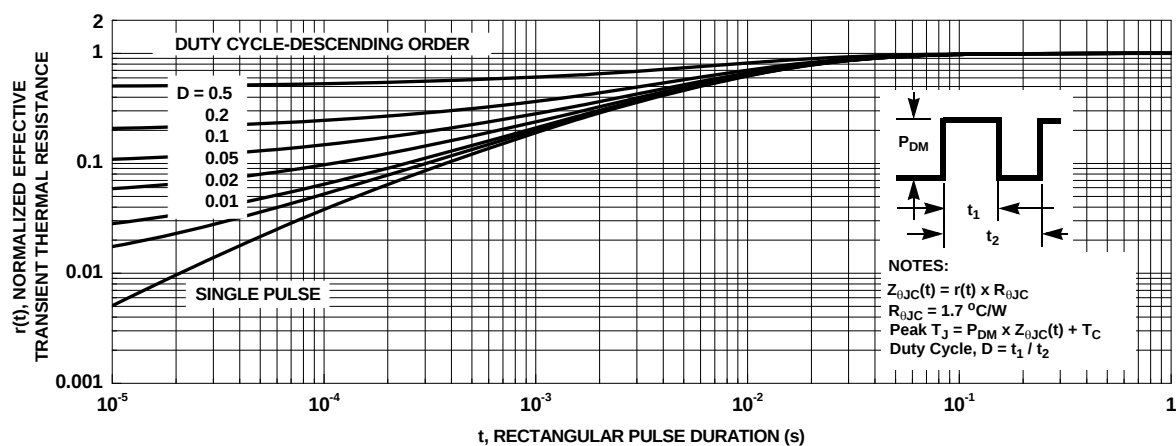
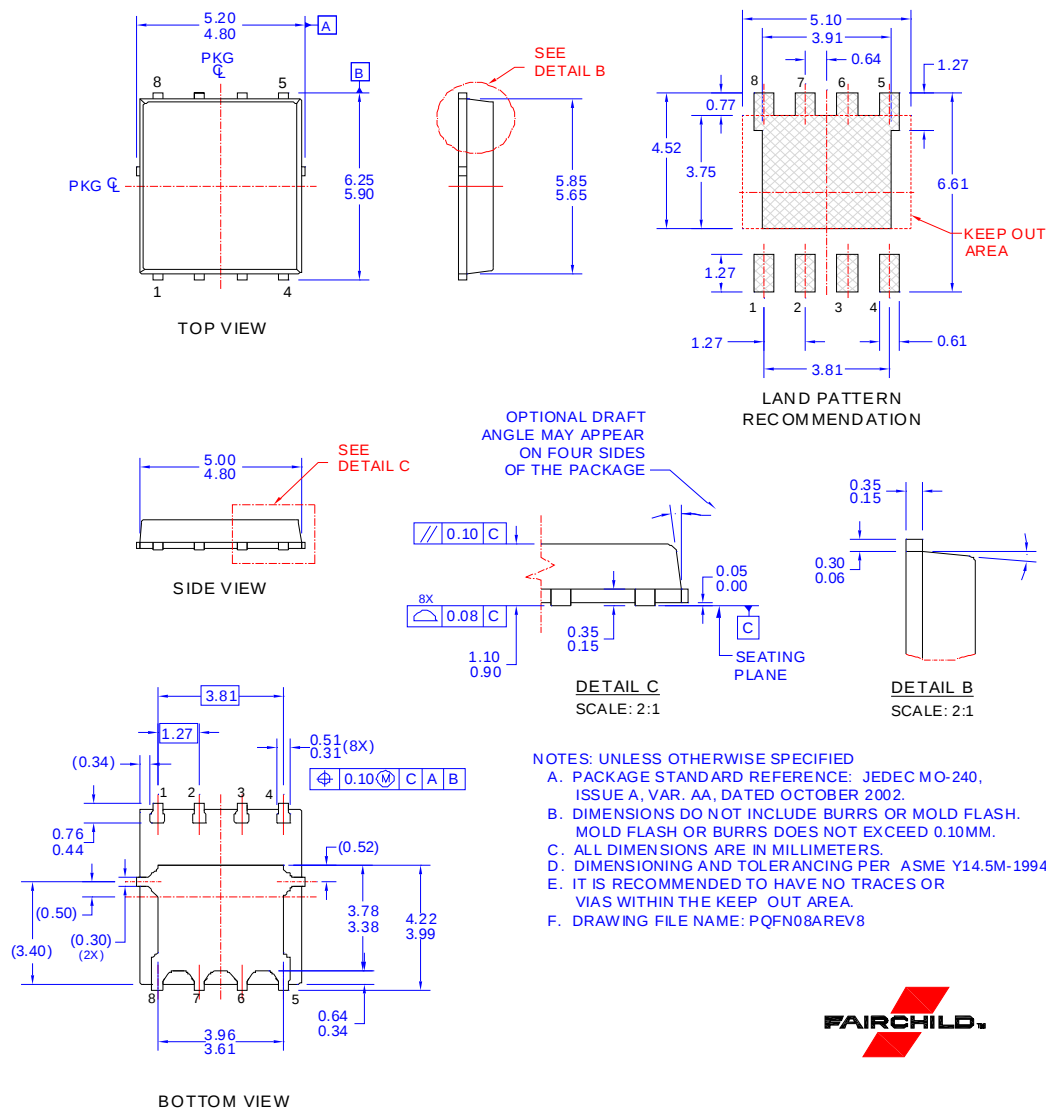


Figure 14. Transient Thermal Response Curve

Dimensional Outline and Pad Layout



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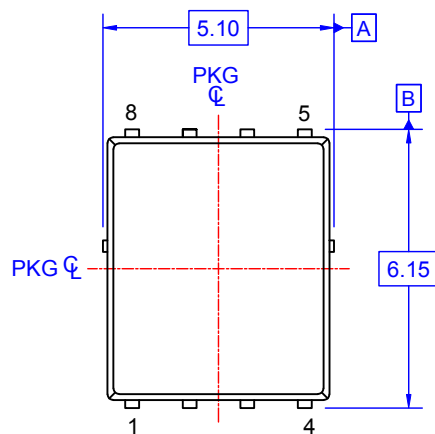
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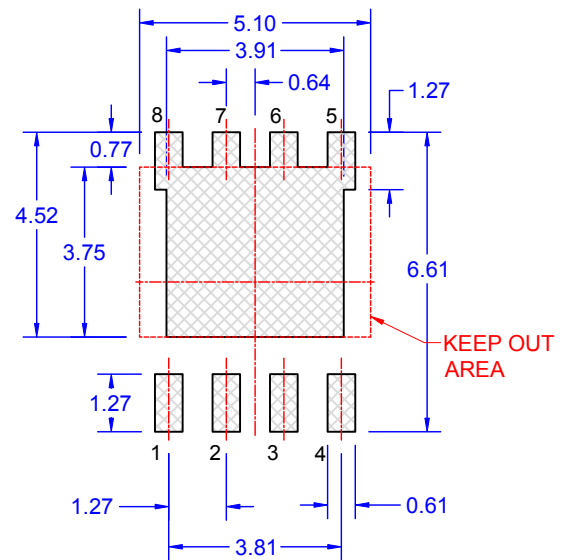
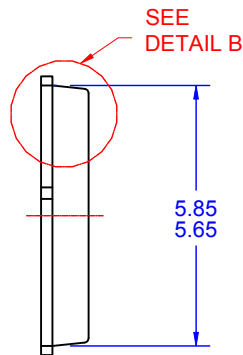
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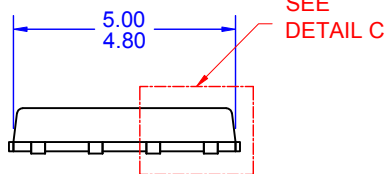
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TOP VIEW

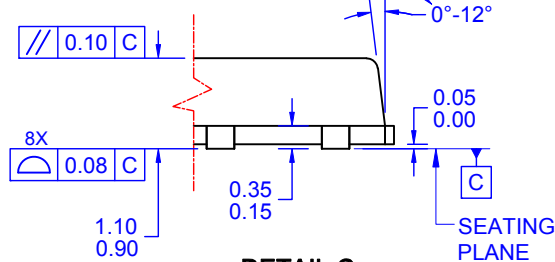


LAND PATTERN
RECOMMENDATION



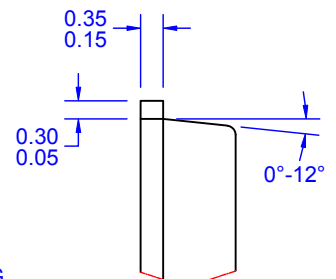
SIDE VIEW

OPTIONAL DRAFT
ANGLE MAY APPEAR
ON FOUR SIDES
OF THE PACKAGE



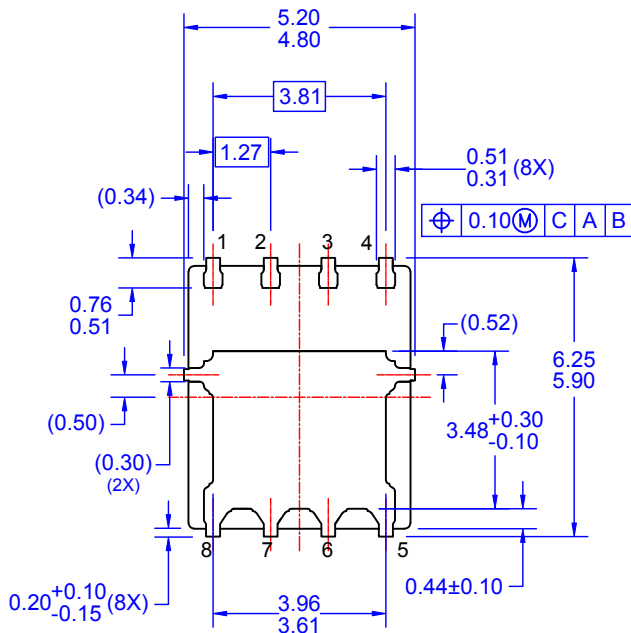
DETAIL C

SCALE: 2:1



DETAIL B

SCALE: 2:1



BOTTOM VIEW

NOTES: UNLESS OTHERWISE SPECIFIED

- PACKAGE STANDARD REFERENCE: JEDEC MO-240, ISSUE A, VAR. AA, DATED OCTOBER 2002.
- DIMENSIONS DO NOT INCLUDE BURRS OR MOLD FLASH. MOLD FLASH OR BURRS DOES NOT EXCEED 0.10MM.
- ALL DIMENSIONS ARE IN MILLIMETERS.
- DIMENSIONING AND TOLERANCING PER ASME Y14.5M-2009.
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