

FDFME2P823ZT

Integrated P-Channel PowerTrench® MOSFET and Schottky Diode -20 V, -2.6 A, 142 mΩ

July 2010

Features

- Max $r_{DS(on)}$ = 142 mΩ at $V_{GS} = -4.5$ V, $I_D = -2.3$ A
- Max $r_{DS(on)}$ = 213 mΩ at $V_{GS} = -2.5$ V, $I_D = -1.8$ A
- Max $r_{DS(on)}$ = 331 mΩ at $V_{GS} = -1.8$ V, $I_D = -1.5$ A
- Max $r_{DS(on)}$ = 530 mΩ at $V_{GS} = -1.5$ V, $I_D = -1.2$ A
- Low profile: 0.55 mm maximum in the new package MicroFET 1.6x1.6 **Thin**
- **Schottky:** $V_F < 0.57$ V @ 1A
- Free from halogenated compounds and antimony oxides
- HBM ESD protection level > 1600 V (Note 3)
- RoHS Compliant



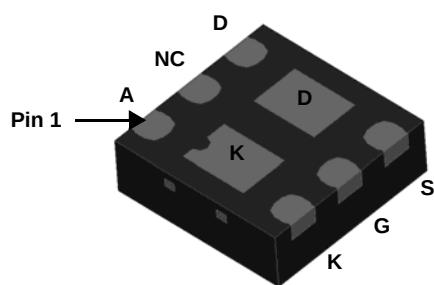
General Description

This device is designed specifically as a single package solution for the battery charge switch in cellular handset and other ultra-portable applications. It features as MOSFET with low on-state resistance and an independently connected low forward voltage schottky diode for minimum conduction losses.

The MicroFET 1.6x1.6 **Thin** package offers exceptional thermal performance for it's physical size and is well suited to switching and linear mode applications.

Applications

- Battery Charging
- DC-DC Conversion

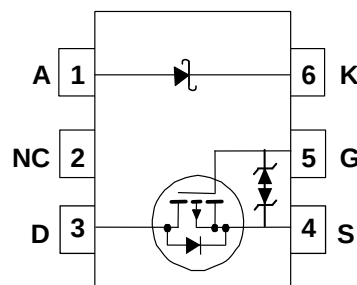


BOTTOM



TOP

MicroFET 1.6x1.6 Thin



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

Symbol	Parameter	Ratings	Units
V_{DS}	Drain to Source Voltage	-20	V
V_{GS}	Gate to Source Voltage	± 8	V
I_D	Drain Current -Continuous $T_A = 25^\circ\text{C}$ (Note 1a)	-2.6	A
	-Pulsed	-6	
P_D	Power Dissipation for Single Operation $T_A = 25^\circ\text{C}$ (Note 1a)	1.4	W
	Power Dissipation for Single Operation $T_A = 25^\circ\text{C}$ (Note 1b)	0.6	
V_{RRM}	Schottky Repetitive Peak Reverse Voltage	28	V
I_O	Schottky Average Forward Current	1	A
T_J, T_{STG}	Operating and Storage Junction Temperature Range (Note 4)	-55 to +150	$^\circ\text{C}$

Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Single Operation) (Note 1a)	90	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Single Operation) (Note 1b)	195	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Single Operation) (Note 1c)	110	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Single Operation) (Note 1d)	234	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
3T	FDFME2P823ZT	MicroFET 1.6x1.6 Thin	7 "	8 mm	5000 units

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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 $25\text{ }^{\circ}\text{C}$		-12		mV/ $^{\circ}\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = -16\text{ V}$, $V_{GS} = 0\text{ V}$			-1	μA
I_{GSS}	Gate to Source Leakage Current	$V_{GS} = \pm 8\text{ V}$, $V_{DS} = 0\text{ V}$			± 10	μA

On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$, $I_D = -250\text{ }\mu\text{A}$	-0.4	-0.6	-1.0	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 $25\text{ }^{\circ}\text{C}$		2		mV/ $^{\circ}\text{C}$
$r_{DS(on)}$	Drain to Source On Resistance	$V_{GS} = -4.5\text{ V}$, $I_D = -2.3\text{ A}$		95	142	m Ω
		$V_{GS} = -2.5\text{ V}$, $I_D = -1.8\text{ A}$		120	213	
		$V_{GS} = -1.8\text{ V}$, $I_D = -1.5\text{ A}$		150	331	
		$V_{GS} = -1.5\text{ V}$, $I_D = -1.2\text{ A}$		190	530	
		$V_{GS} = -4.5\text{ V}$, $I_D = -2.3\text{ A}$, $T_J = 125\text{ }^{\circ}\text{C}$		128	190	
g_{FS}	Forward Transconductance	$V_{DS} = -4.5\text{ V}$, $I_D = -2.3\text{ A}$		7		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = -10\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$		305	405	pF
C_{oss}	Output Capacitance			55	75	pF
C_{rss}	Reverse Transfer Capacitance			50	75	pF

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = -10\text{ V}$, $I_D = -1\text{ A}$, $V_{GS} = -4.5\text{ V}$, $R_{GEN} = 6\text{ }\Omega$		4.7	10	ns
t_r	Rise Time			4.8	10	ns
$t_{d(off)}$	Turn-Off Delay Time			33	53	ns
t_f	Fall Time			16	29	ns
Q_g	Total Gate Charge	$V_{DD} = -10\text{ V}$, $I_D = -2.3\text{ A}$, $V_{GS} = -4.5\text{ V}$		5.5	7.7	nC
Q_{gs}	Gate to Source Gate Charge			0.6		nC
Q_{gd}	Gate to Drain "Miller" Charge			1.4		nC

Drain-Source Diode Characteristics

V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}$, $I_S = -0.9\text{ A}$ (Note 2)		-0.8	-1.2	V
t_{rr}	Reverse Recovery Time	$I_F = -2.3\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$		16	29	ns
Q_{rr}	Reverse Recovery Charge			4.4	10	nC

Schottky Diode Characteristics

I_R	Reverse Leakage	$V_R = 28\text{ V}$	$T_J = 25\text{ }^{\circ}\text{C}$		15	100	μA
			$T_J = 85\text{ }^{\circ}\text{C}$		0.46	4.7	mA
V_F	Forward Voltage	$I_F = 1\text{ A}$	$T_J = 25\text{ }^{\circ}\text{C}$		0.47	0.57	V
			$T_J = 85\text{ }^{\circ}\text{C}$		0.45		
V_F	Forward Voltage	$I_F = 500\text{ mA}$	$T_J = 25\text{ }^{\circ}\text{C}$		0.38	0.48	V
			$T_J = 85\text{ }^{\circ}\text{C}$		0.33		

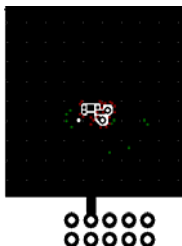
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Electrical Characteristics

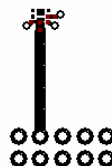
Notes:

1. $R_{\theta JA}$ is determined with the device mounted on a 1 in² 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) MOSFET $R_{\theta JA} = 90$ °C/W when mounted on a 1 in² pad of 2 oz copper, 1.5 " x 1.5 " x 0.062 " thick PCB.
- (b) MOSFET $R_{\theta JA} = 195$ °C/W when mounted on a minimum pad of 2 oz copper.
- (c) Schottky $R_{\theta JA} = 110$ °C/W when mounted on a 1 in² pad of 2 oz copper, 1.5 " x 1.5 " x 0.062" thick PCB.
- (d) Schottky $R_{\theta JA} = 234$ °C/W when mounted on a minimum pad of 2 oz copper.



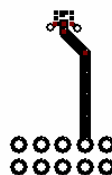
a. 90 °C/W when mounted on a 1 in² pad of 2 oz copper.



b. 195 °C/W when mounted on a minimum pad of 2 oz copper.



c. 110 °C/W when mounted on a 1 in² pad of 2 oz copper.



d. 234 °C/W when mounted on a minimum pad of 2 oz copper.

2. Pulse Test: Pulse Width < 300 μs, Duty cycle < 2.0%.

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

4. Rating is applicable to MOSFET only.

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

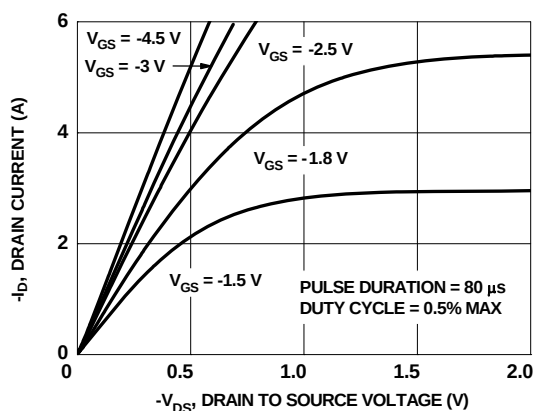


Figure 1. On Region Characteristics

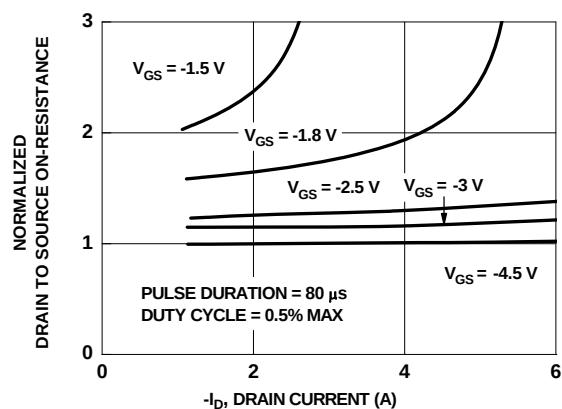


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

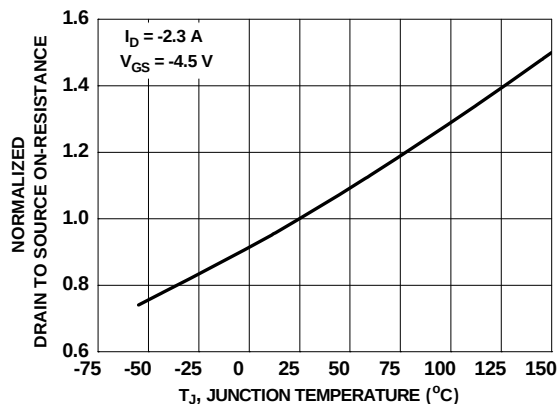


Figure 3. Normalized On Resistance vs Junction Temperature

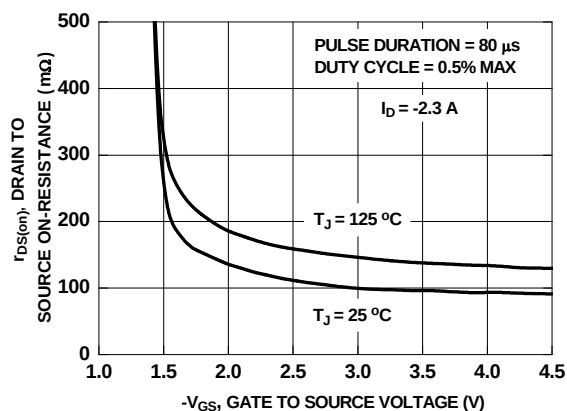


Figure 4. On-Resistance vs Gate to Source Voltage

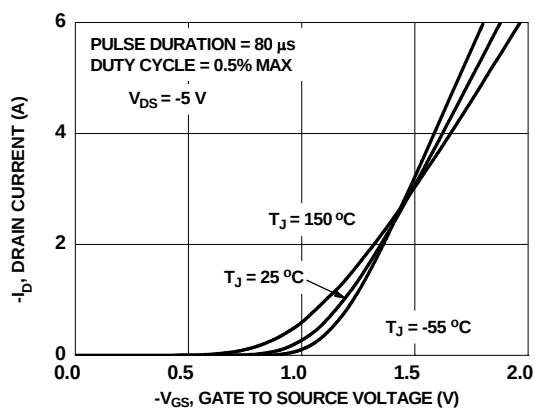


Figure 5. Transfer Characteristics

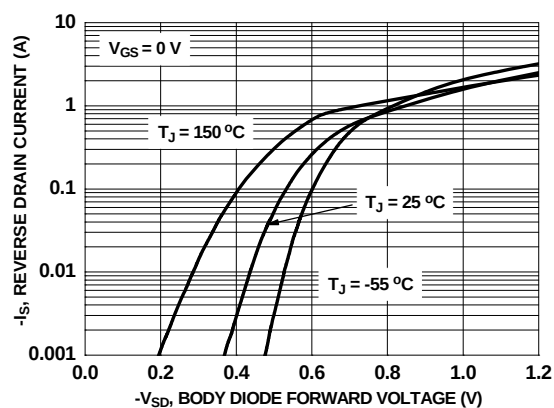


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

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

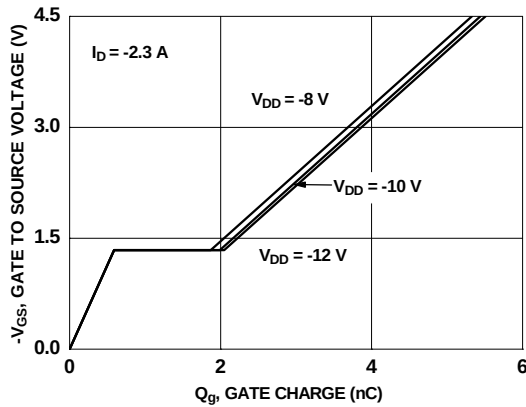


Figure 7. Gate Charge Characteristics

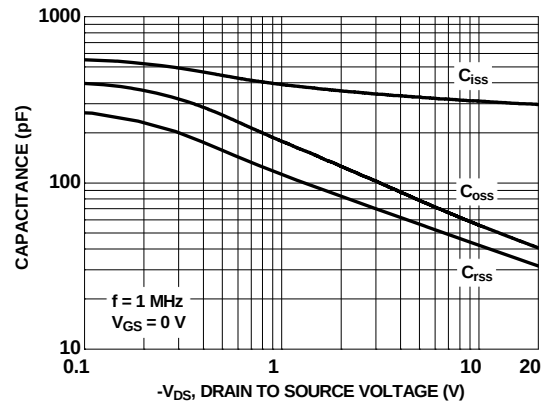


Figure 8. Capacitance vs Drain to Source Voltage

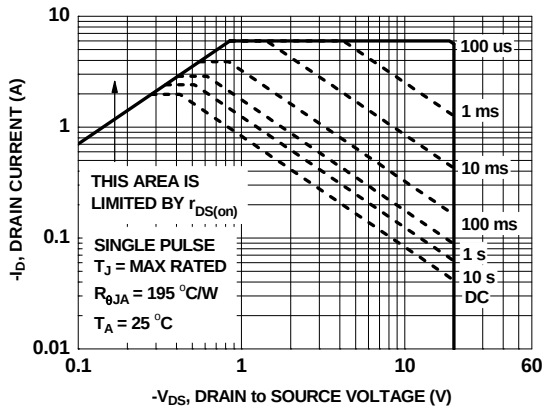


Figure 9. Forward Bias Safe Operating Area

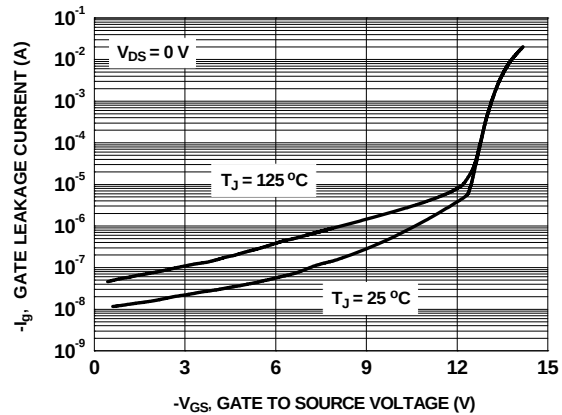


Figure 10. Gate Leakage Current vs Gate to Source Voltage

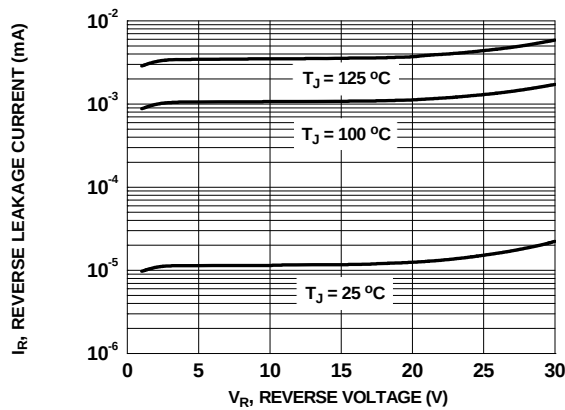


Figure 11. Schottky Diode Reverse Current

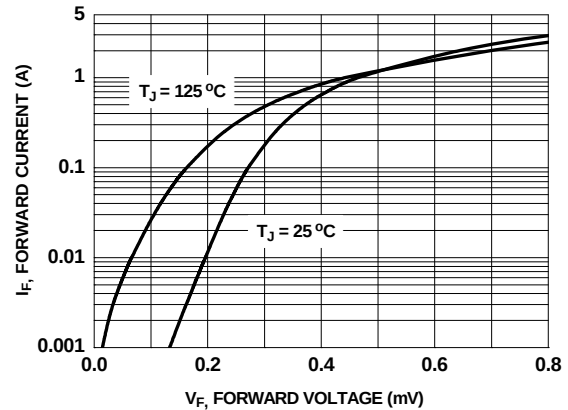


Figure 12. Schottky Diode Forward Voltage

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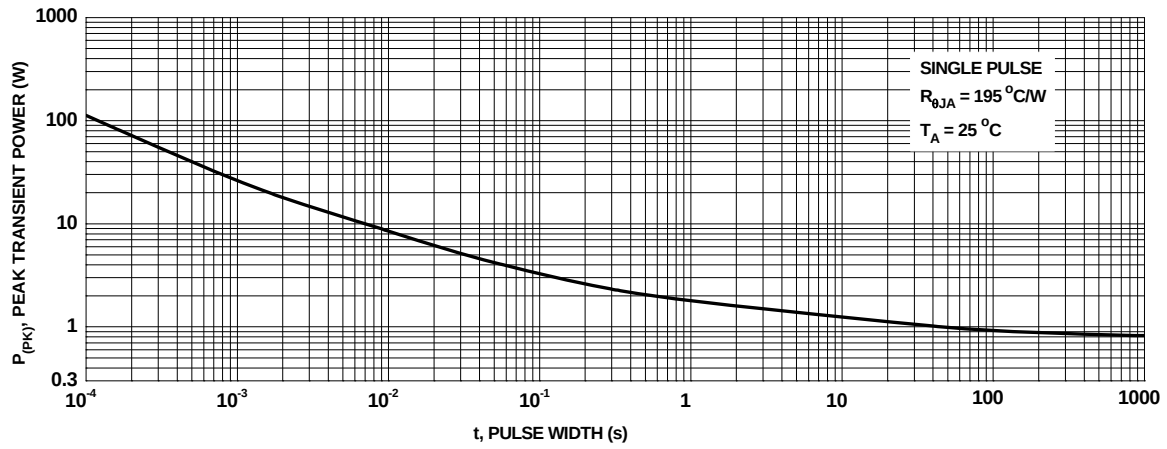


Figure 13. Single Pulse Maximum Power Dissipation

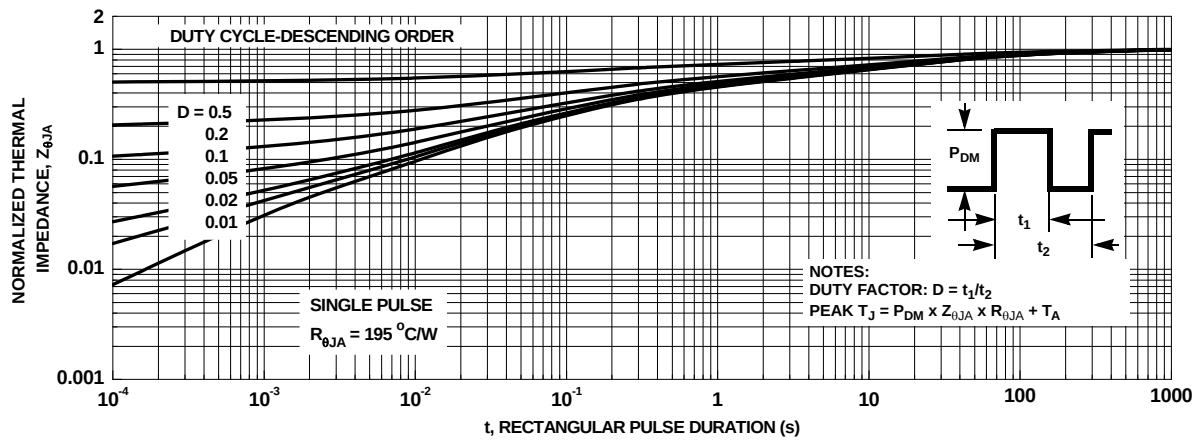
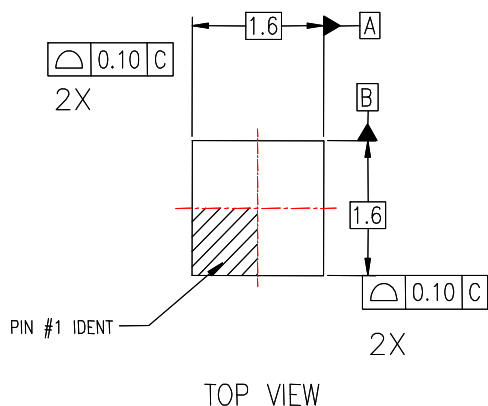
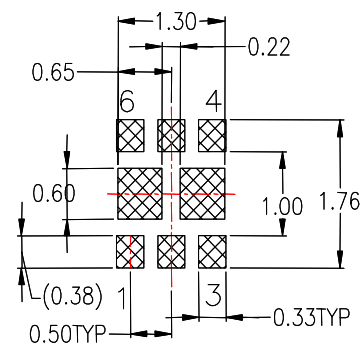


Figure 14. Junction-to-Ambient Transient Thermal Response Curve

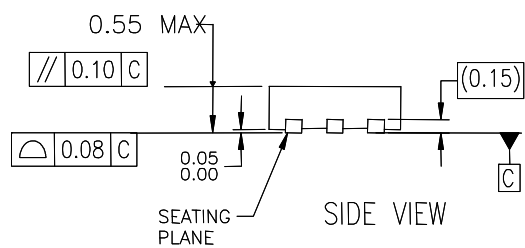
Dimensional Outline and Pad Layout



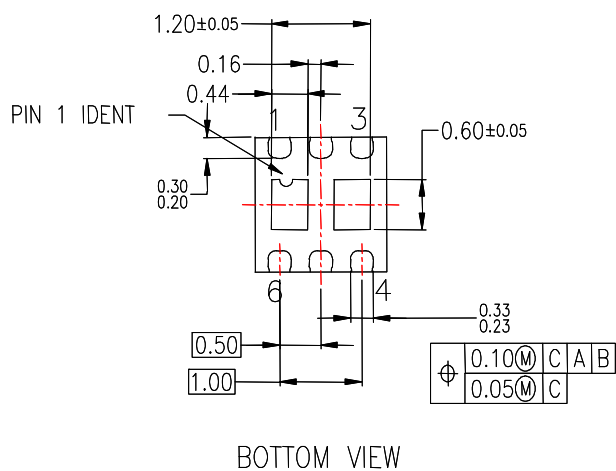
TOP VIEW



RECOMMENDED LAND PATTERN



SIDE VIEW



BOTTOM VIEW



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