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August 2016

FDMC013P030Z

P-Channel PowerTrench[®] MOSFET -30 V, -54 A, 7.0 mΩ

Features

- Max $r_{DS(on)}$ = 7.0 mΩ at $V_{GS} = -10$ V, $I_D = -14$ A
- Max $r_{DS(on)}$ = 12.0 mΩ at $V_{GS} = -4.5$ V, $I_D = -10$ 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 > 4 kV Typical (Note 4)

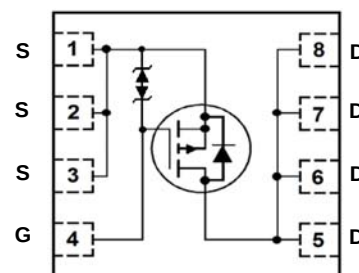
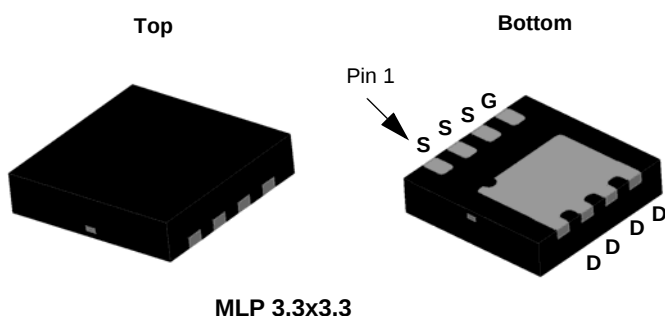


General Description

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



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 $T_C = 25^\circ\text{C}$ (Note 5)	-54	A
	Drain Current -Continuous $T_C = 100^\circ\text{C}$ (Note 5)	-35	
	-Continuous $T_A = 25^\circ\text{C}$ (Note 1a)	-14	
	-Pulsed (Note 4)	-309	
E_{AS}	Single Pulse Avalanche Energy (Note 3)	54	mJ
P_D	Power Dissipation $T_C = 25^\circ\text{C}$	30	W
	Power Dissipation $T_A = 25^\circ\text{C}$ (Note 1a)	2.4	
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	4.2	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	53	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMC013P030Z	FDMC013P030Z	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	$I_D = -250\text{ }\mu\text{A}$, $V_{GS} = 0\text{ V}$	-30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = -250\text{ }\mu\text{A}$, referenced to $25\text{ }^{\circ}\text{C}$		-13		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	-1.6	-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 $25\text{ }^{\circ}\text{C}$		5		mV/ $^{\circ}\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = -10\text{ V}$, $I_D = -14\text{ A}$		5.0	7.0	m Ω
		$V_{GS} = -4.5\text{ V}$, $I_D = -10\text{ A}$		8.0	12.0	
		$V_{GS} = -10\text{ V}$, $I_D = -14\text{ A}$, $T_J = 125\text{ }^{\circ}\text{C}$		6.2	10.4	
g_{FS}	Forward Transconductance	$V_{DS} = -5\text{ V}$, $I_D = -14\text{ A}$		60		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = -15\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$		4130	5785	pF
C_{oss}	Output Capacitance			1355	1895	pF
C_{rss}	Reverse Transfer Capacitance			1335	1870	pF

Switching Characteristics

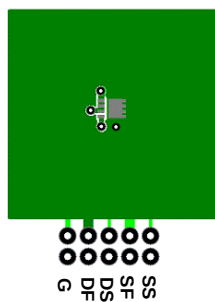
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = -15\text{ V}$, $I_D = -14\text{ A}$, $V_{GS} = -4.5\text{ V}$, $R_{GEN} = 6\text{ }\Omega$		34	55	ns
t_r	Rise Time			157	251	ns
$t_{d(off)}$	Turn-Off Delay Time			55	88	ns
t_f	Fall Time			94	150	ns
Q_g	Total Gate Charge			96	135	nC
Q_g	Total Gate Charge	$V_{GS} = 0\text{ V to } -4.5\text{ V}$	$V_{DD} = -15\text{ V}$, $I_D = -14\text{ A}$	58	81	nC
Q_{gs}	Gate to Source Charge			11		nC
Q_{gd}	Gate to Drain "Miller" Charge			36		nC

Drain-Source Diode Characteristics

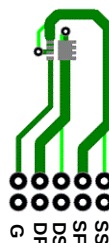
V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}$, $I_S = -14\text{ A}$ (Note 2)		-0.8	-1.3	V
		$V_{GS} = 0\text{ V}$, $I_S = -2\text{ A}$ (Note 2)		-0.7	-1.2	
t_{rr}	Reverse Recovery Time	$I_F = -14\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$		44	77	ns
Q_{rr}	Reverse Recovery Charge			23	37	nC

NOTES:

1. $R_{\theta JA}$ 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. $R_{\theta CA}$ is determined by the user's board design.



a) 53°C/W when mounted on a 1 in² pad of 2 oz copper



b) 125°C/W when mounted on a minimum pad

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

3. E_{AS} of 54 mJ is based on starting $T_J = 25\text{ }^{\circ}\text{C}$, $L = 3\text{ mH}$, $I_{AS} = 6\text{ A}$, $V_{DD} = 30\text{ V}$, $V_{GS} = 10\text{ V}$.

4. Pulsed Id please refer to Fig 11 SOA graph for more details.

5. 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.

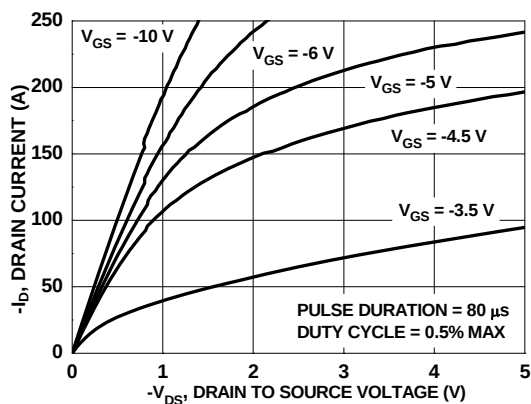


Figure 1. On Region Characteristics

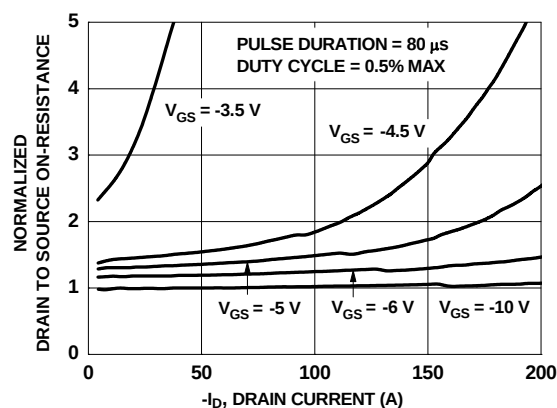


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

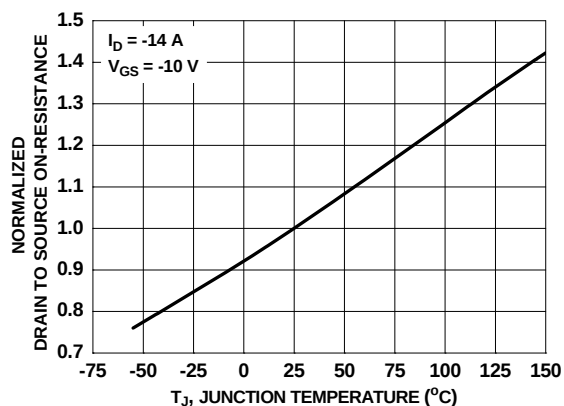


Figure 3. Normalized On Resistance vs. Junction Temperature

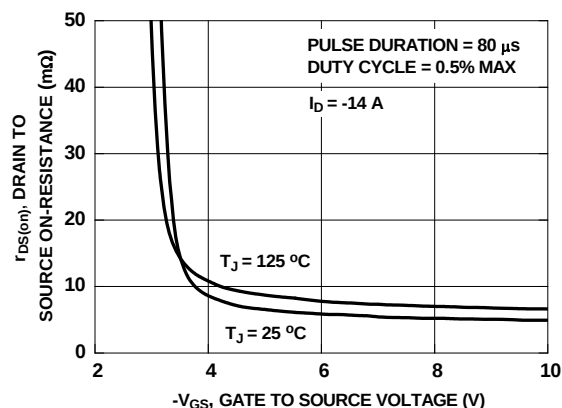


Figure 4. On-Resistance vs. Gate to Source Voltage

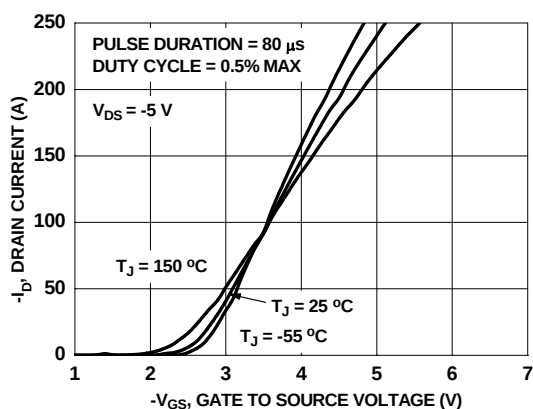


Figure 5. Transfer Characteristics

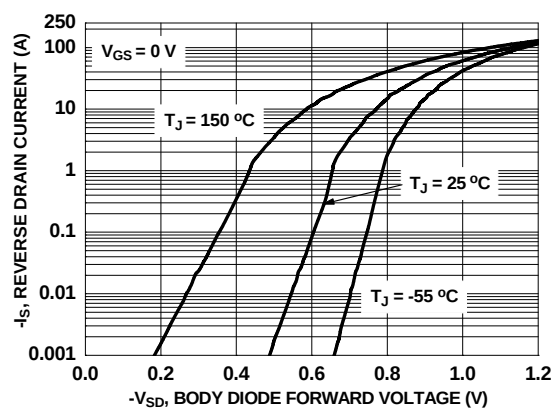


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

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

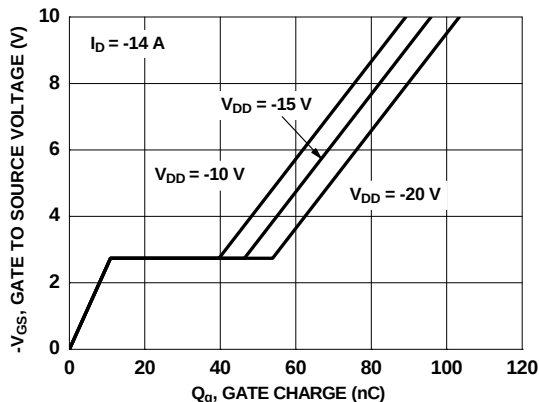


Figure 7. Gate Charge Characteristics

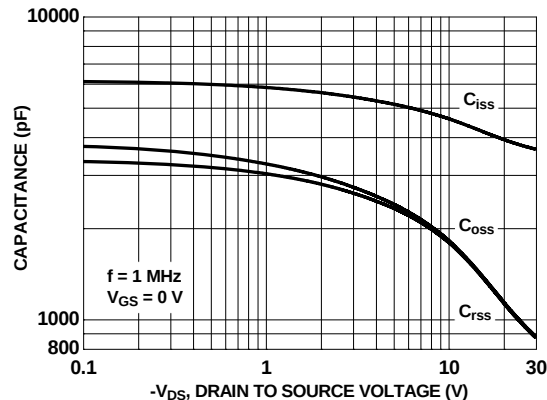


Figure 8. Capacitance vs. Drain to Source Voltage

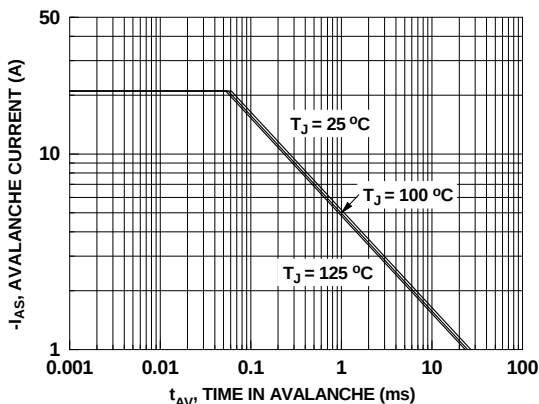


Figure 9. Unclamped Inductive Switching Capability

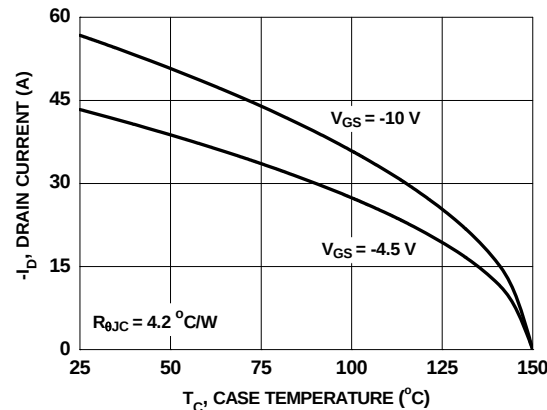


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

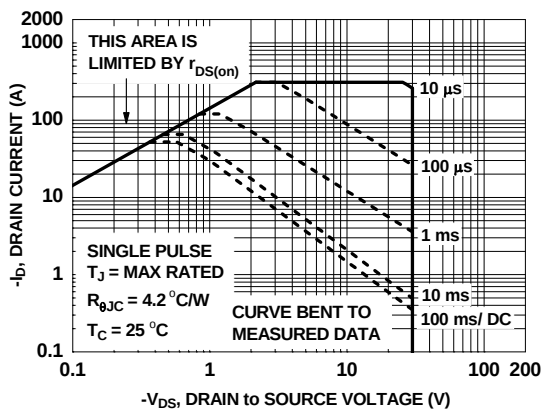


Figure 11. Forward Bias Safe Operating Area

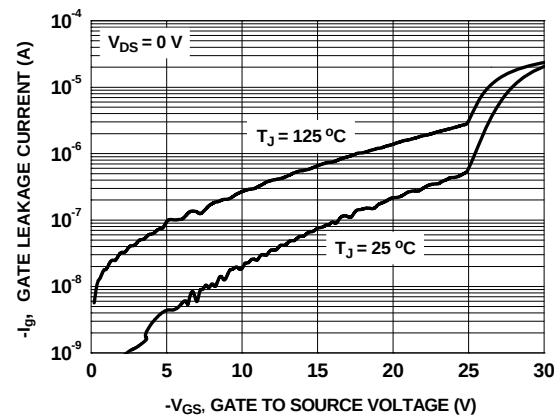


Figure 12. I_{gss} vs. V_{gss}

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

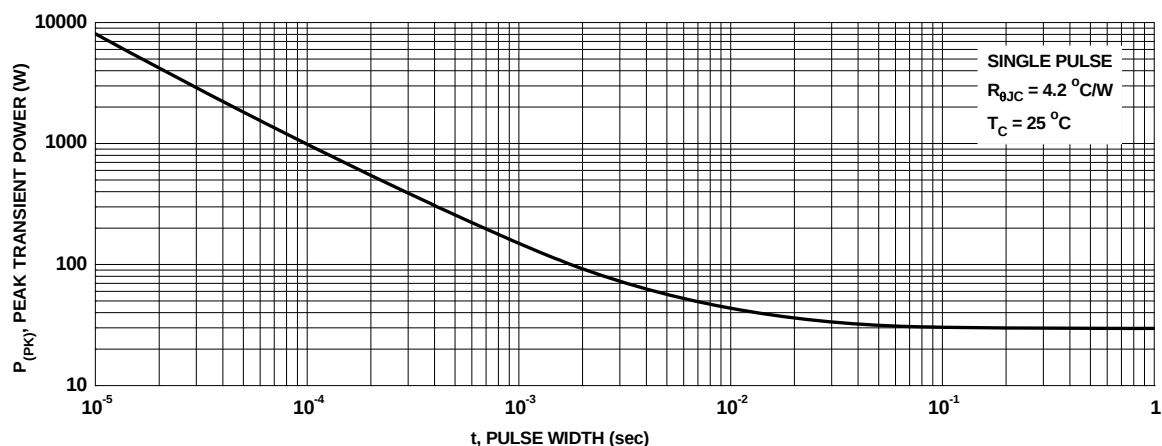


Figure 13. Single Pulse Maximum Power Dissipation

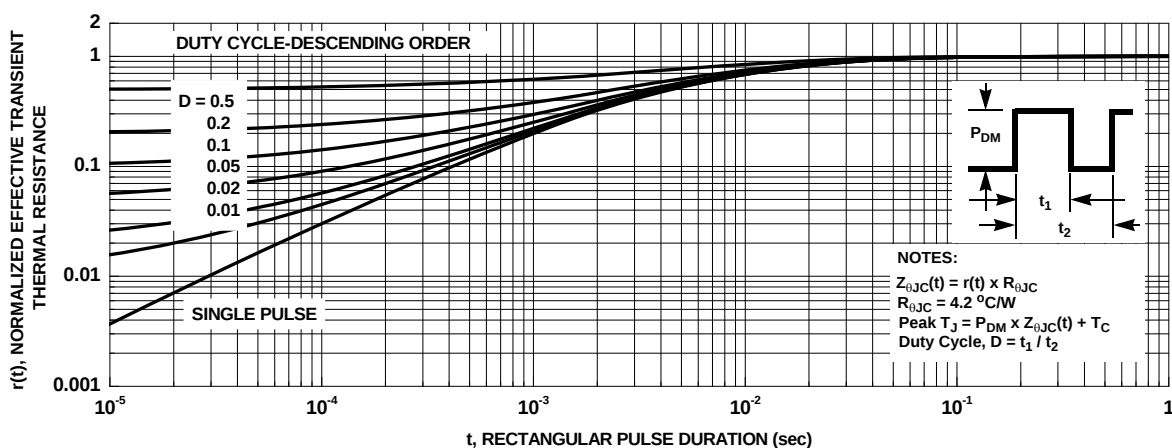
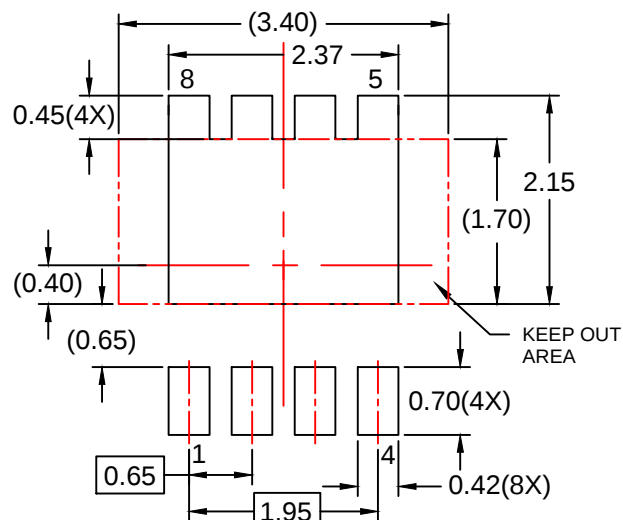
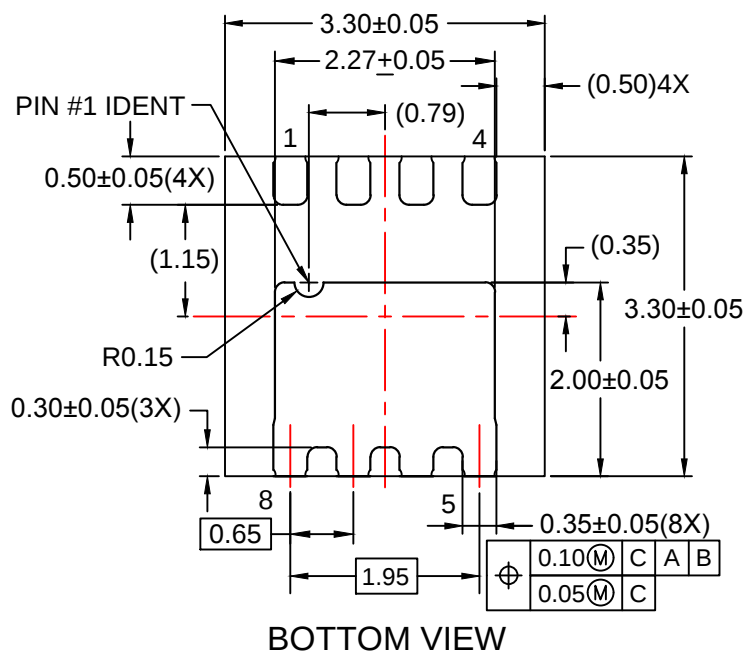
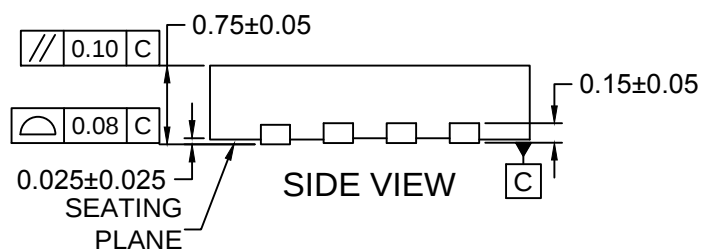
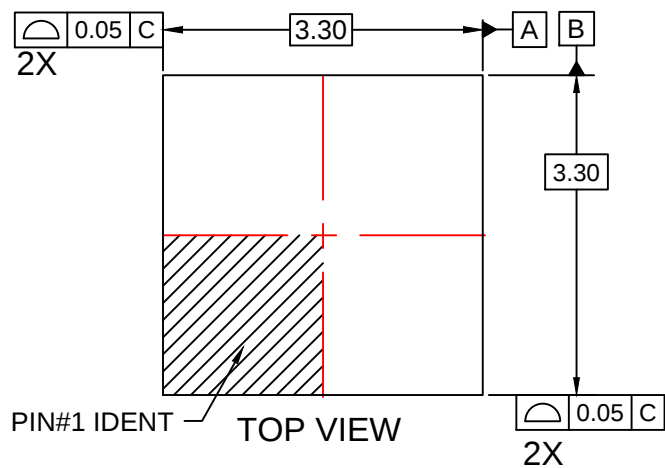


Figure 14. Junction to Case Transient Thermal Response Curve



RECOMMENDED LAND PATTERN

NOTES:

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- DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 2009.
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