



March 2015

FDMS86550

N-Channel PowerTrench[®] MOSFET

60 V, 234 A, 1.65 mΩ

Features

- Max $r_{DS(on)}$ = 1.65 mΩ at $V_{GS} = 10$ V, $I_D = 32$ A
- Max $r_{DS(on)}$ = 2.2 mΩ at $V_{GS} = 8$ V, $I_D = 27$ A
- Advanced Package and Silicon combination for low $r_{DS(on)}$ and high efficiency
- MSL1 robust package design
- 100% UIL tested
- RoHS Compliant

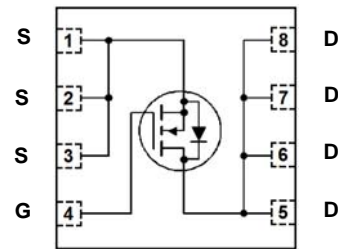
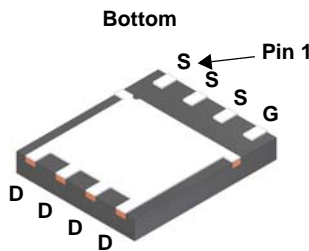
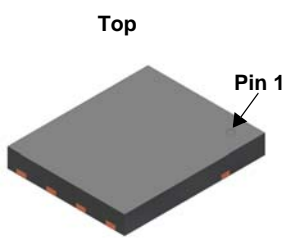


General Description

This N-Channel MOSFET is produced using Fairchild Semiconductor's advanced PowerTrench[®] process that has been especially tailored to minimize the on-state resistance and yet maintain superior switching performance.

Applications

- Primary DC-DC MOSFET
- Secondary Synchronous Rectifier
- Load Switch



Power 56

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

Symbol	Parameter	Ratings	Units
V_{DS}	Drain to Source Voltage	60	V
V_{GS}	Gate to Source Voltage	±20	V
I_D	Drain Current -Continuous	$T_C = 25$ °C (Note 5)	234
	-Continuous	$T_C = 100$ °C (Note 5)	148
	-Continuous	$T_A = 25$ °C (Note 1a)	32
	-Pulsed	(Note 4)	1021
E_{AS}	Single Pulse Avalanche Energy	(Note 3)	937
P_D	Power Dissipation	$T_C = 25$ °C	156
	Power Dissipation	$T_A = 25$ °C (Note 1a)	2.7
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	0.8	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	45	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMS86550	FDMS86550	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	$I_D = 250\text{ }\mu\text{A}$, $V_{GS} = 0\text{ V}$	60			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$, referenced to $25\text{ }^\circ\text{C}$		31		mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 48\text{ V}$, $V_{GS} = 0\text{ V}$			1	μA
I_{GSS}	Gate to Source Leakage Current	$V_{GS} = \pm 20\text{ V}$, $V_{DS} = 0\text{ V}$			± 100	nA

On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$, $I_D = 250\text{ }\mu\text{A}$	2.5	3.3	4.5	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 $25\text{ }^\circ\text{C}$		-12		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{ V}$, $I_D = 32\text{ A}$		1.4	1.65	m Ω
		$V_{GS} = 8\text{ V}$, $I_D = 27\text{ A}$		1.7	2.2	
		$V_{GS} = 10\text{ V}$, $I_D = 32\text{ A}$, $T_J = 125\text{ }^\circ\text{C}$		2.2	2.6	
g_{FS}	Forward Transconductance	$V_{DS} = 5\text{ V}$, $I_D = 32\text{ A}$		96		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 30\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$		8235	11530	pF
C_{oss}	Output Capacitance			2140	3000	pF
C_{rss}	Reverse Transfer Capacitance			70	120	pF
R_g	Gate Resistance		0.1	0.9	2.7	Ω

Switching Characteristics

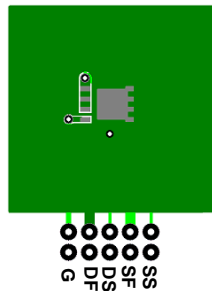
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 30\text{ V}$, $I_D = 32\text{ A}$, $V_{GS} = 10\text{ V}$, $R_{GEN} = 6\text{ }\Omega$		43	69	ns	
t_r	Rise Time			27	43	ns	
$t_{d(off)}$	Turn-Off Delay Time			42	67	ns	
t_f	Fall Time			11	20	ns	
Q_g	Total Gate Charge		$V_{GS} = 0\text{ V to } 10\text{ V}$		110	154	nC
Q_g	Total Gate Charge	$V_{GS} = 0\text{ V to } 8\text{ V}$	$V_{DD} = 30\text{ V}$, $I_D = 32\text{ A}$		90	126	nC
Q_{gs}	Gate to Source Charge				40		nC
Q_{gd}	Gate to Drain "Miller" Charge				20		nC

Drain-Source Diode Characteristics

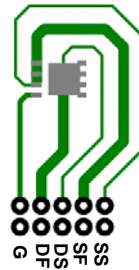
V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}$, $I_S = 2.1\text{ A}$ (Note 2)		0.7	1.2	V
		$V_{GS} = 0\text{ V}$, $I_S = 32\text{ A}$ (Note 2)		0.8	1.3	
t_{rr}	Reverse Recovery Time	$I_F = 32\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$		68	109	ns
Q_{rr}	Reverse Recovery Charge			62	99	nC

Notes:

1. $R_{\theta JA}$ is determined with the device mounted on a 1 in^2 pad 2 oz copper pad on a $1.5 \times 1.5\text{ in.}$ board of FR-4 material. $R_{\theta CA}$ is determined by the user's board design.



a. $45\text{ }^\circ\text{C/W}$ when mounted on a 1 in^2 pad of 2 oz copper.



b. $115\text{ }^\circ\text{C/W}$ when mounted on a minimum pad of 2 oz copper.

2. Pulse Test: Pulse Width < $300\text{ }\mu\text{s}$, Duty cycle < 2.0%.

3. E_{AS} of 937 mJ is based on starting $T_J = 25\text{ }^\circ\text{C}$, $L = 3\text{ mH}$, $I_{AS} = 25\text{ A}$, $V_{DD} = 60\text{ V}$, $V_{GS} = 10\text{ V}$. 100% test at $L = 0.1\text{ mH}$, $I_{AS} = 79\text{ A}$.

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

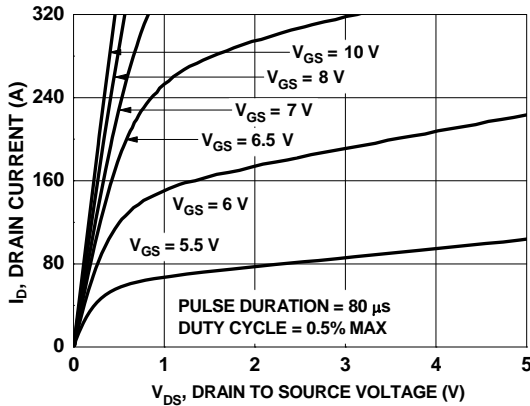


Figure 1. On-Region Characteristics

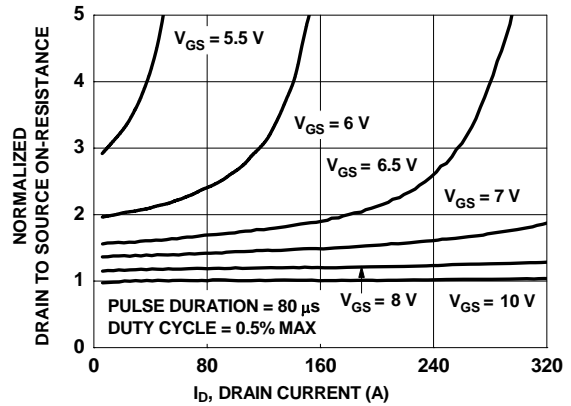


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

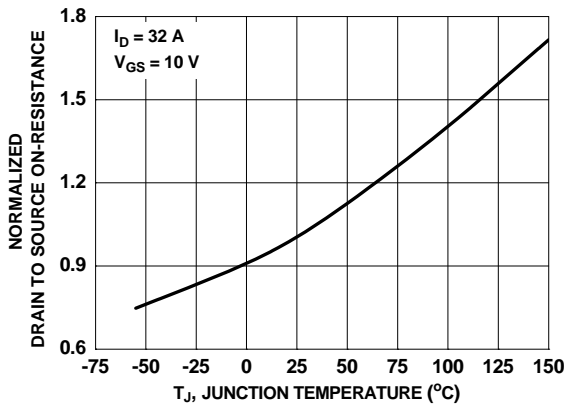


Figure 3. Normalized On-Resistance vs Junction Temperature

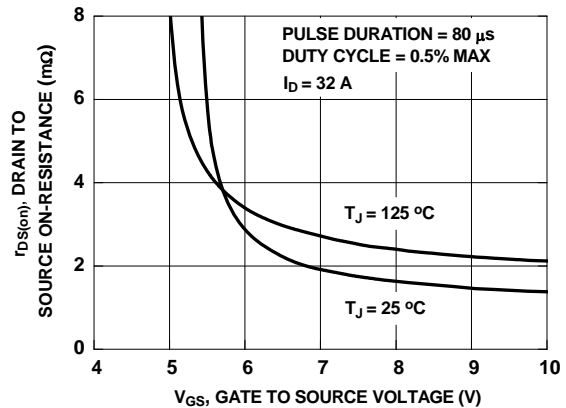


Figure 4. On-Resistance vs Gate to Source Voltage

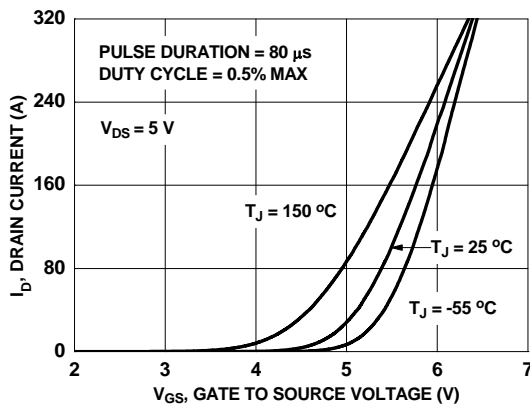


Figure 5. Transfer Characteristics

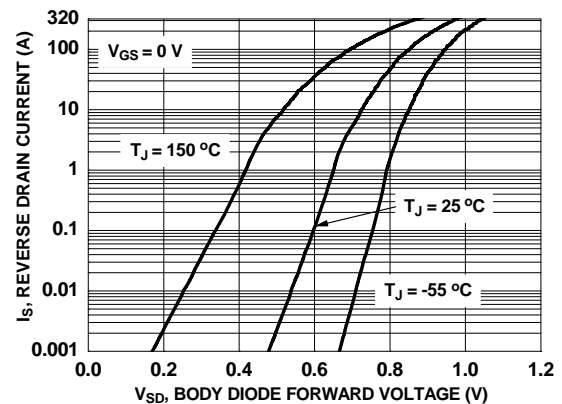


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

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

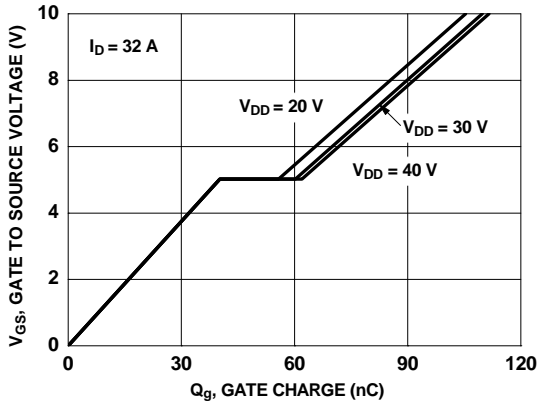


Figure 7. Gate Charge Characteristics

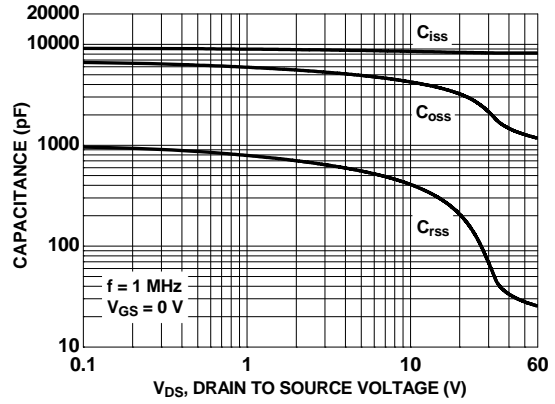


Figure 8. Capacitance vs Drain to Source Voltage

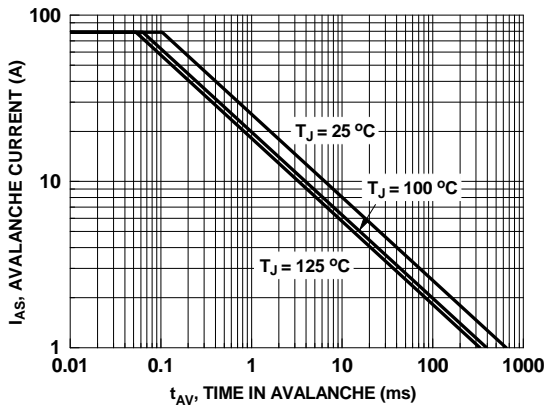


Figure 9. Unclamped Inductive Switching Capability

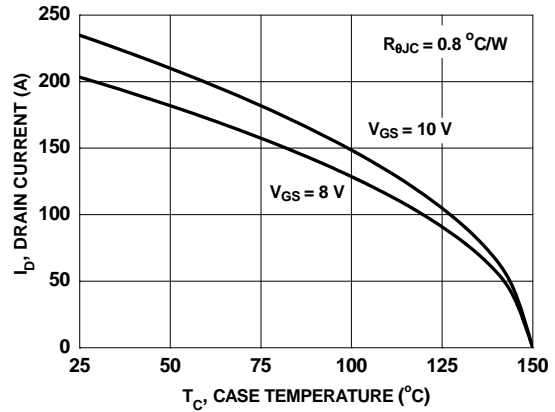


Figure 10. Maximum Continuous Drain Current vs Case Temperature

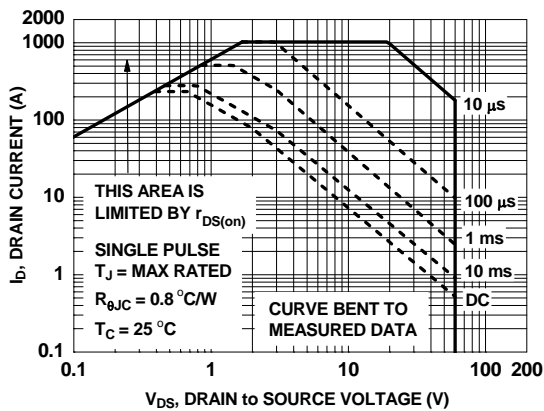


Figure 11. Forward Bias Safe Operating Area

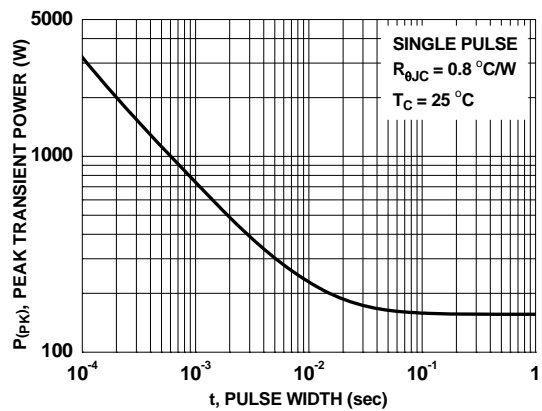


Figure 12. Single Pulse Maximum Power Dissipation

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

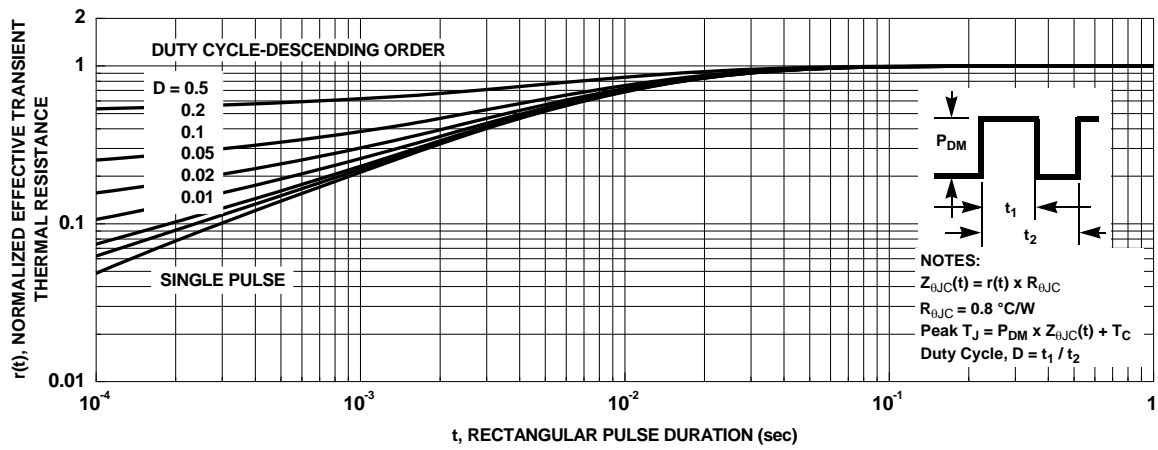
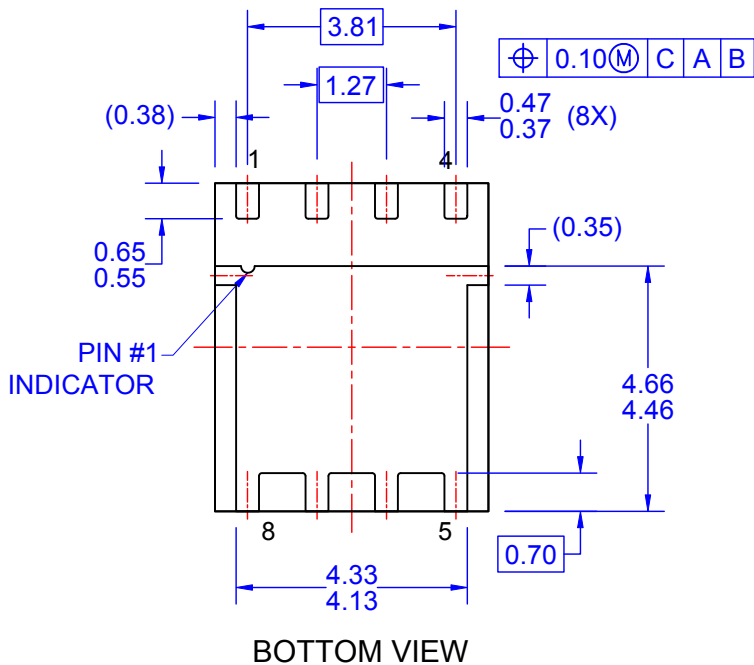
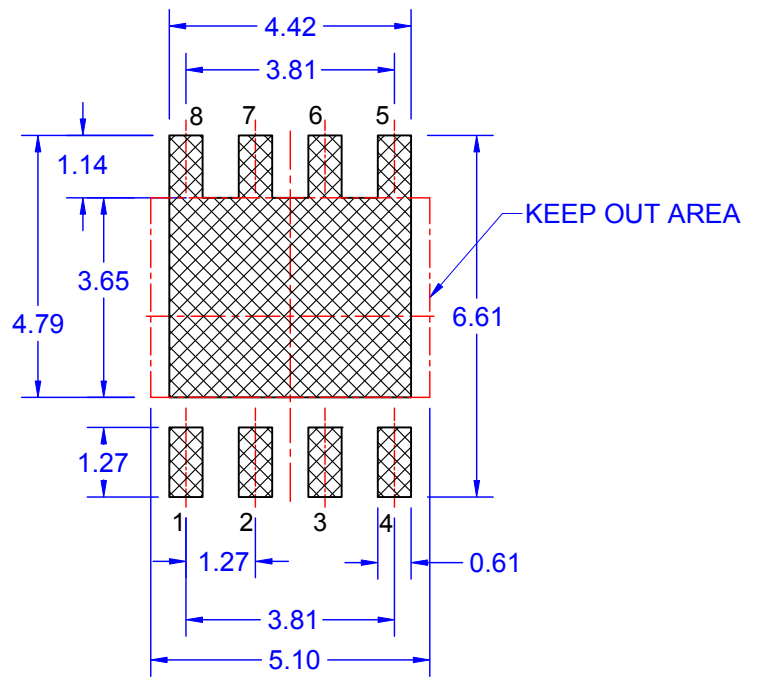
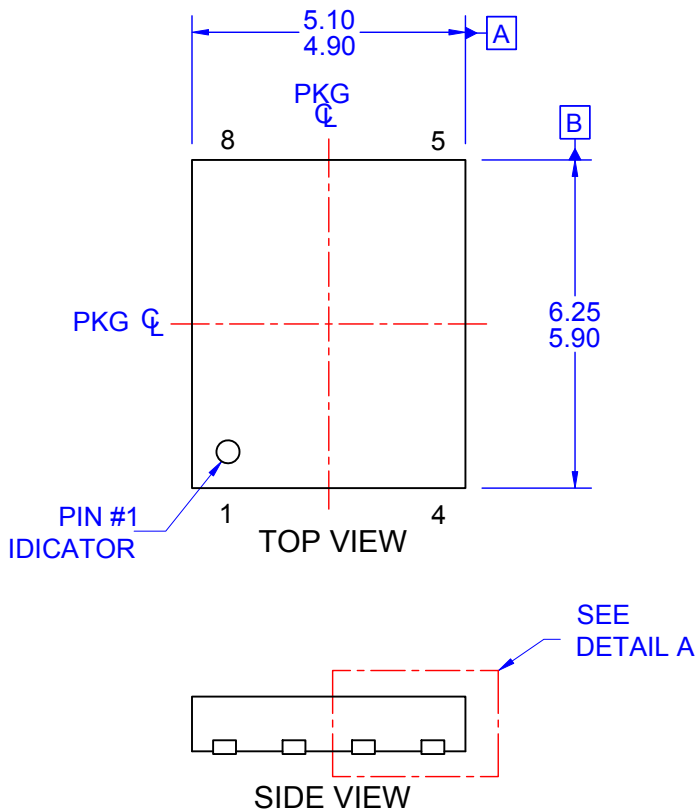
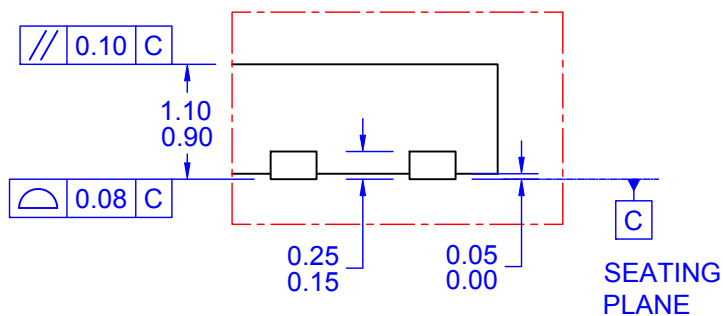


Figure 13. Transient Thermal Response Curve



- NOTES: UNLESS OTHERWISE SPECIFIED
- A) PACKAGE STANDARD REFERENCE: JEDEC MO-240, ISSUE A, VAR. AA,
 - B) ALL DIMENSIONS ARE IN MILLIMETERS.
 - C) DIMENSIONS DO NOT INCLUDE BURRS OR MOLD FLASH. MOLD FLASH OR BURRS DOES NOT EXCEED 0.10MM.
 - D) DIMENSIONING AND TOLERANCING PER ASME Y14.5M-2009.
 - E) IT IS RECOMMENDED TO HAVE NO TRACES OR VIAS WITHIN THE KEEP OUT AREA.
 - F) DRAWING FILE NAME: PQFN08JREV3.



DETAIL A
SCALE: 2:1



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