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January 2015

FDMS86350ET80

N-Channel PowerTrench[®] MOSFET

80 V, 198 A, 2.4 mΩ

Features

- Extended T_J rating to 175°C
- Max r_{DS(on)} = 2.4 mΩ at V_{GS} = 10 V, I_D = 25 A
- Max r_{DS(on)} = 3.2 mΩ at V_{GS} = 8 V, I_D = 22 A
- Advanced Package and Silicon combination for low r_{DS(on)} and high efficiency
- MSL1 robust package design
- 100% UIL tested
- RoHS Compliant

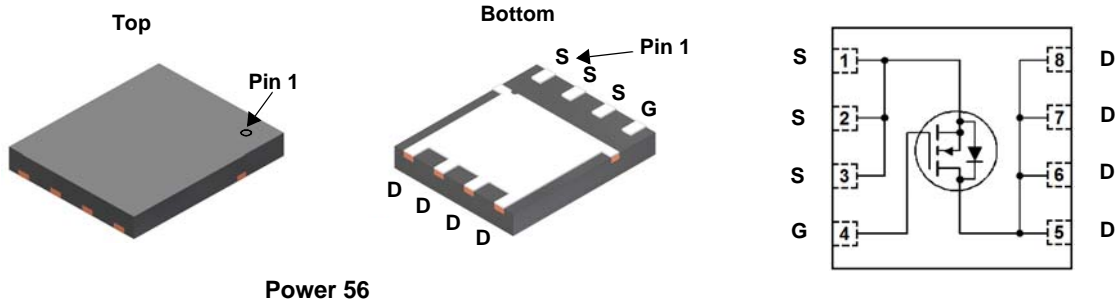


General Description

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

Applications

- Primary MOSFET
- Synchronous Rectifier
- Load Switch
- Motor Control Switch



Power 56

MOSFET Maximum Ratings T_A = 25 °C unless otherwise noted

Symbol	Parameter	Conditions	Rated Value	Units
V _{DS}	Drain to Source Voltage		80	V
V _{GS}	Gate to Source Voltage		±20	V
I _D	Drain Current -Continuous	T _C = 25 °C (Note 5)	198	A
		T _C = 100 °C (Note 5)	140	
		T _A = 25 °C (Note 1a)	25	
		(Note 4)	693	
E _{AS}	Single Pulse Avalanche Energy	(Note 3)	864	mJ
P _D	Power Dissipation	T _C = 25 °C	187	W
		T _A = 25 °C (Note 1a)	3.3	
T _J , T _{STG}	Operating and Storage Junction Temperature Range		-55 to +175	°C

Thermal Characteristics

R _{θJC}	Thermal Resistance, Junction to Case		0.8	°C/W
R _{θJA}	Thermal Resistance, Junction to Ambient	(Note 1a)	45	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMS86350ET	FDMS86350ET80	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	$I_D = 250\text{ }\mu\text{A}$, $V_{GS} = 0\text{ V}$	80			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$, referenced to $25\text{ }^\circ\text{C}$		45		mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 64\text{ V}$, $V_{GS} = 0\text{ V}$			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	3.8	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	$V_{GS} = 10\text{ V}$, $I_D = 25\text{ A}$		2.0	2.4	m Ω
		$V_{GS} = 8\text{ V}$, $I_D = 22\text{ A}$		2.5	3.2	
		$V_{GS} = 10\text{ V}$, $I_D = 25\text{ A}$, $T_J = 125\text{ }^\circ\text{C}$		3.1	3.8	
g_{FS}	Forward Transconductance	$V_{DS} = 5\text{ V}$, $I_D = 25\text{ A}$		70		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 40\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$		8030		pF
C_{oss}	Output Capacitance			1370		pF
C_{rss}	Reverse Transfer Capacitance			31		pF
R_g	Gate Resistance		0.1	1.1	3	Ω

Switching Characteristics

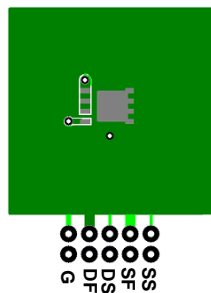
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 40\text{ V}$, $I_D = 25\text{ A}$, $V_{GS} = 10\text{ V}$, $R_{GEN} = 6\text{ }\Omega$		50	80	ns
t_r	Rise Time			34	55	ns
$t_{d(off)}$	Turn-Off Delay Time			40	65	ns
t_f	Fall Time			11	20	ns
Q_g	Total Gate Charge		$V_{GS} = 0\text{ V to } 10\text{ V}$	110	155	nC
Q_g	Total Gate Charge	$V_{GS} = 0\text{ V to } 8\text{ V}$	90	127	nC	
Q_{gs}	Gate to Source Charge	$V_{DD} = 40\text{ V}$, $I_D = 25\text{ A}$		46		nC
Q_{gd}	Gate to Drain "Miller" Charge			23		nC

Drain-Source Diode Characteristics

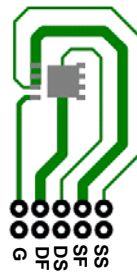
V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}$, $I_S = 2.1\text{ A}$ (Note 2)		0.71	1.2	V
		$V_{GS} = 0\text{ V}$, $I_S = 25\text{ A}$ (Note 2)		0.79	1.3	
t_{rr}	Reverse Recovery Time	$I_F = 25\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$		63	101	ns
Q_{rr}	Reverse Recovery Charge			62	100	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 864 mJ is based on starting $T_J = 25\text{ }^\circ\text{C}$, $L = 3\text{ mH}$, $I_{AS} = 24\text{ A}$, $V_{DD} = 80\text{ V}$, $V_{GS} = 10\text{ V}$, 100% test at $L = 0.1\text{ mH}$, $I_{AS} = 74\text{ A}$.

4. Pulse Id please refer to Fig.11 SOA curve 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

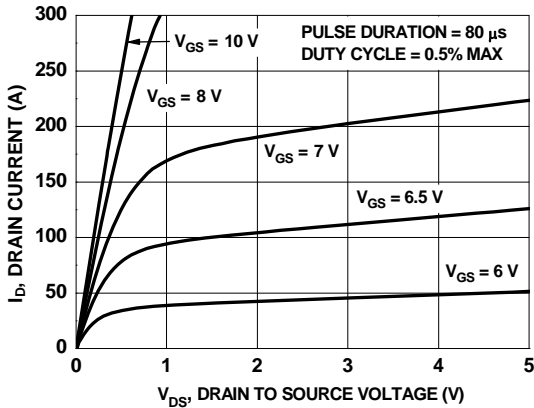


Figure 1. On-Region Characteristics

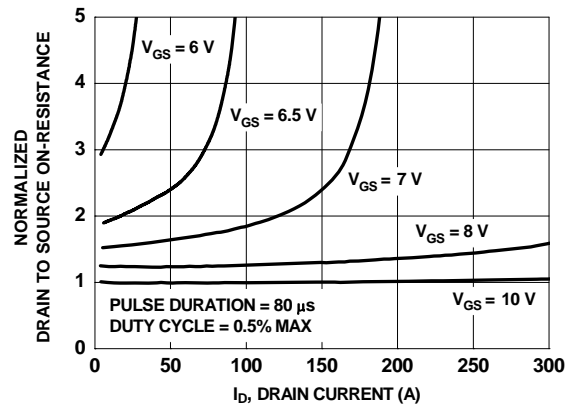


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

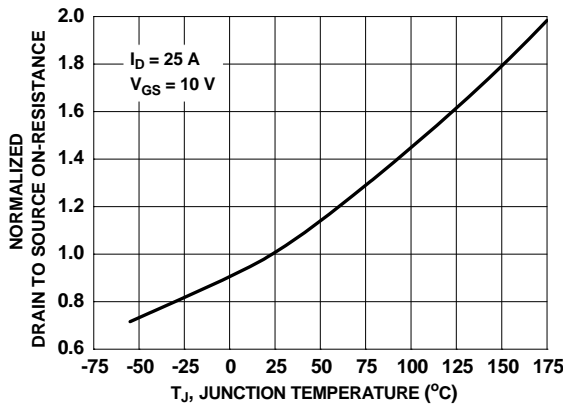


Figure 3. Normalized On-Resistance vs Junction Temperature

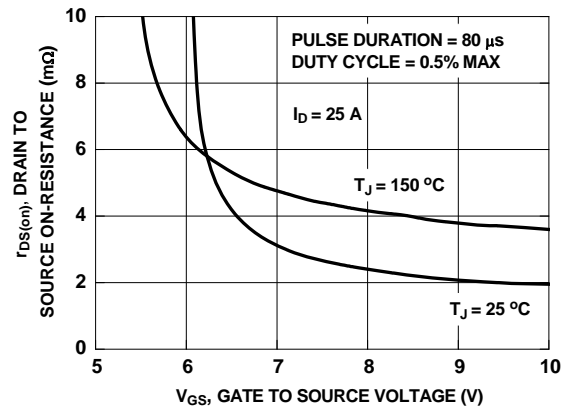


Figure 4. On-Resistance vs Gate to Source Voltage

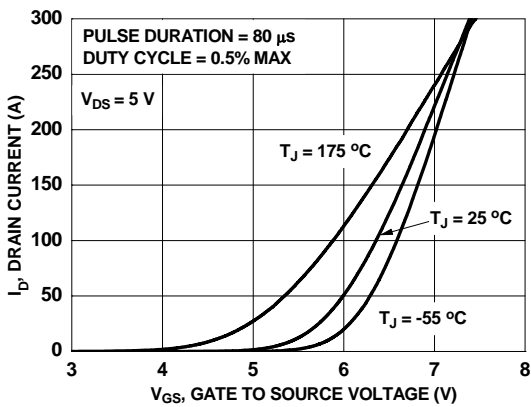


Figure 5. Transfer Characteristics

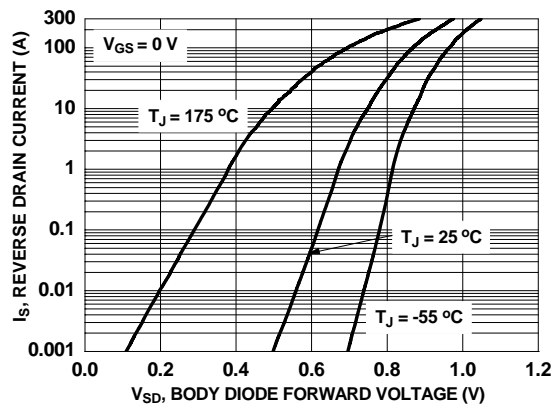


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

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

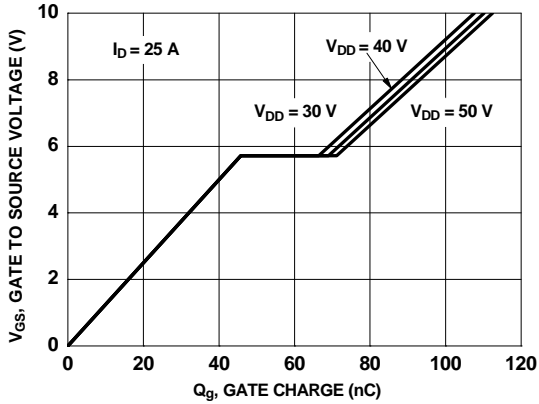


Figure 7. Gate Charge Characteristics

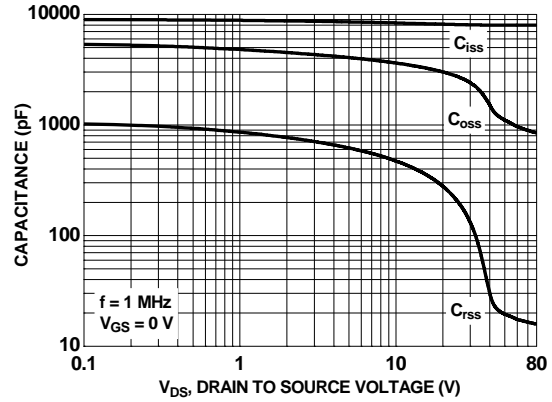


Figure 8. Capacitance vs Drain to Source Voltage

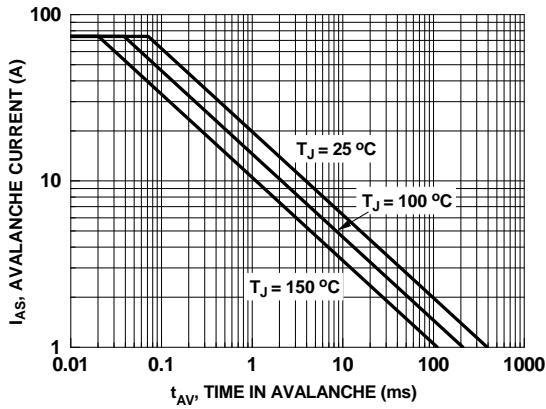


Figure 9. Unclamped Inductive Switching Capability

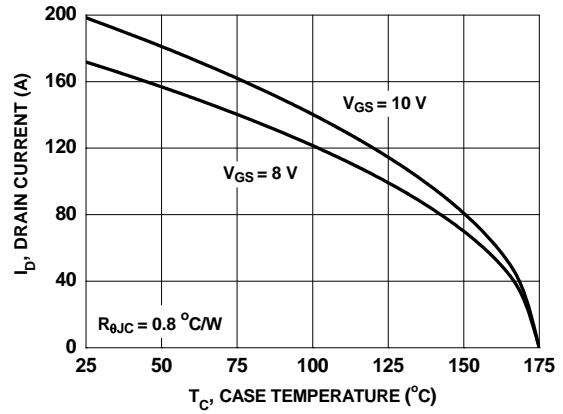


Figure 10. Maximum Continuous Drain Current vs Case Temperature

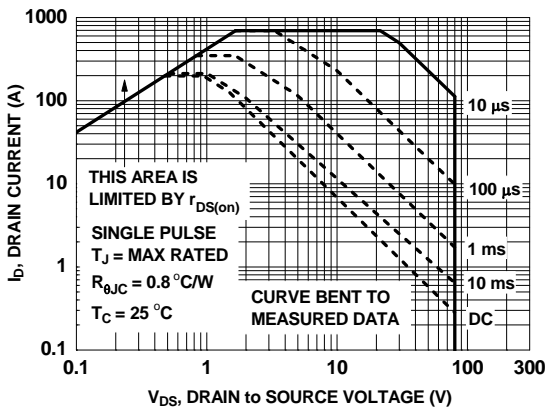


Figure 11. Forward Bias Safe Operating Area

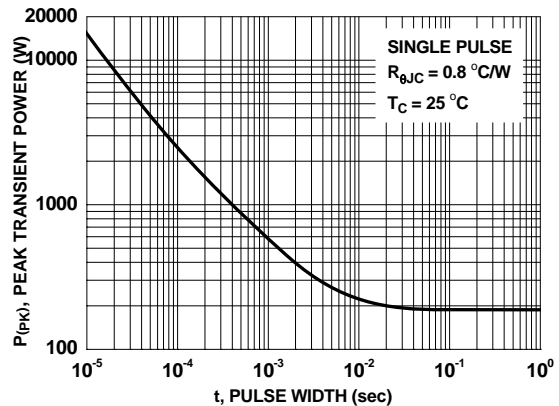


Figure 12. Single Pulse Maximum Power Dissipation

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

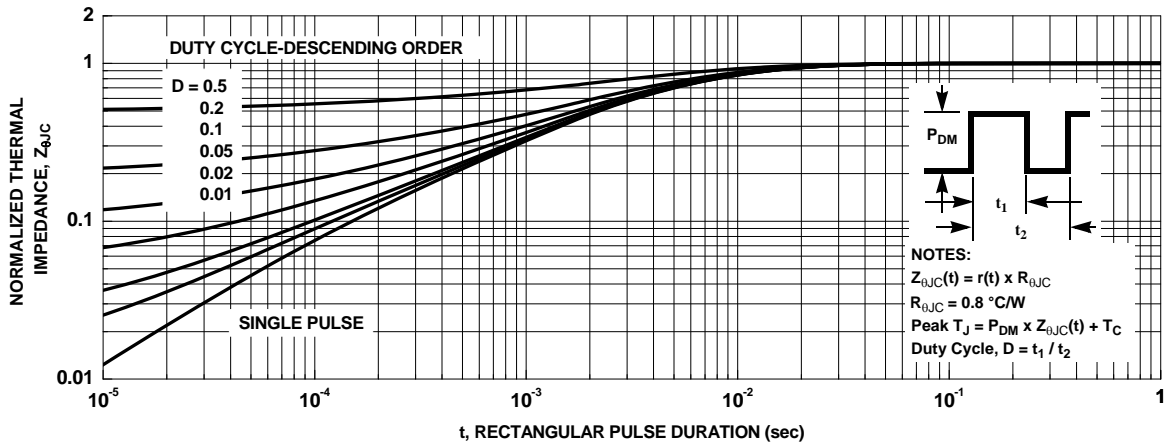
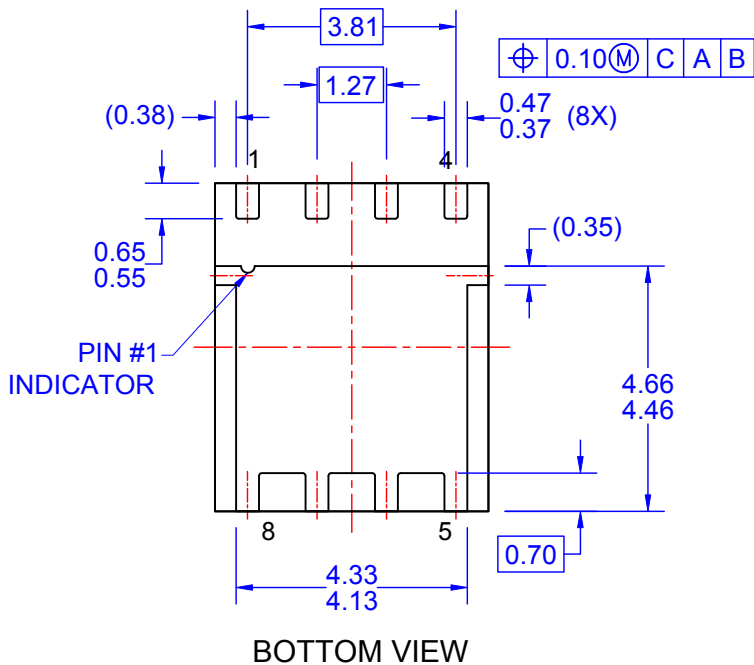
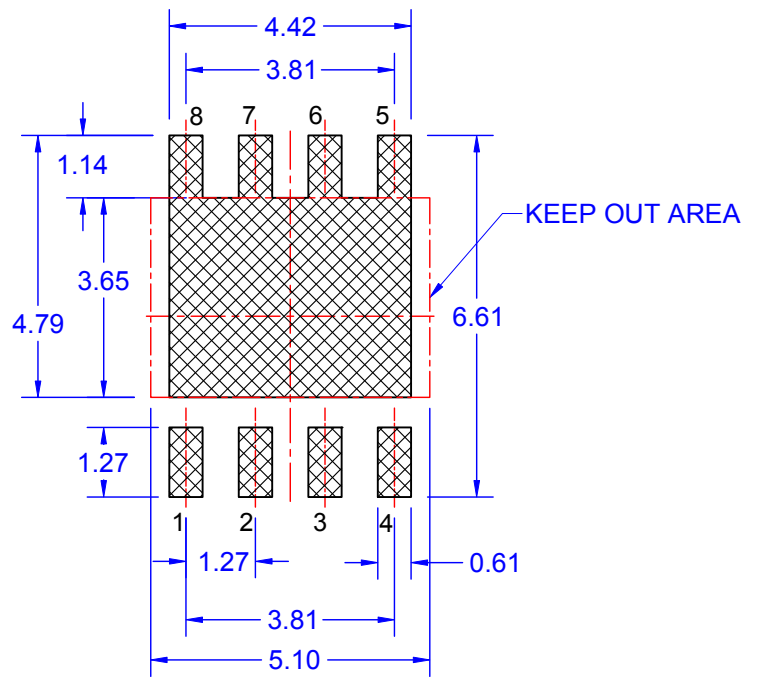
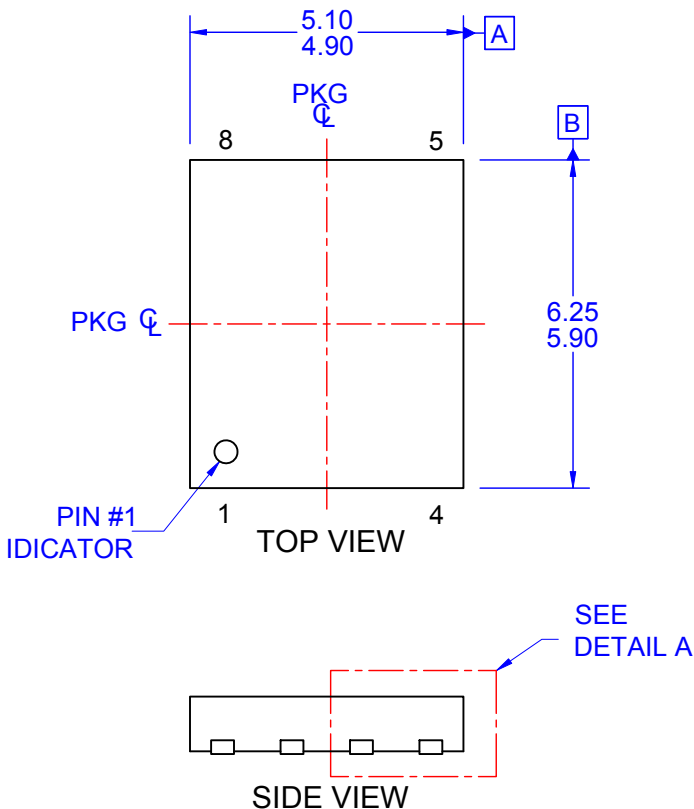
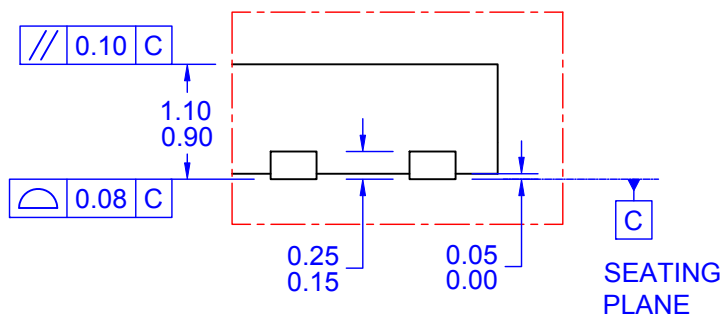


Figure 13. Junction-to-Case Transient Thermal Response Curve



- NOTES: UNLESS OTHERWISE SPECIFIED
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 - B) ALL DIMENSIONS ARE IN MILLIMETERS.
 - C) DIMENSIONS DO NOT INCLUDE BURRS OR MOLD FLASH. MOLD FLASH OR BURRS DOES NOT EXCEED 0.10MM.
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