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Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor's system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (_), the underscore (_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at www.onsemi.com. Please email any questions regarding the system integration to Fairchild_questions@onsemi.com.

February 2016

FDMS7650

N-Channel PowerTrench® MOSFET

30 V, 267 A, 0.99 mΩ

Features

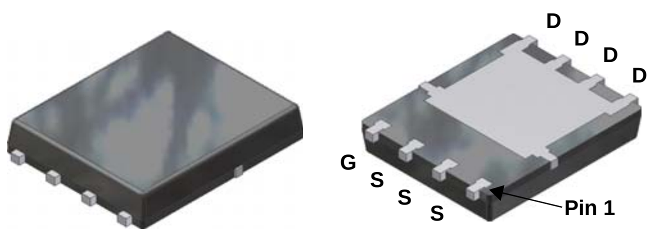
- Max $r_{DS(on)}$ = 0.99 mΩ at V_{GS} = 10 V, I_D = 36 A
- Max $r_{DS(on)}$ = 1.55 mΩ at V_{GS} = 4.5 V, I_D = 32 A
- Advanced Package and Silicon Combination for Low $r_{DS(on)}$ and High Efficiency
- MSL1 Robust Package Design
- 100% UIL Tested
- RoHS Compliant

General Description

This N-Channel MOSFET has been designed specifically to improve the overall efficiency and to minimize switch node ringing of DC/DC converters using either synchronous or conventional switching PWM controllers. It has been optimized for low gate charge and extremely low $r_{DS(on)}$.

Applications

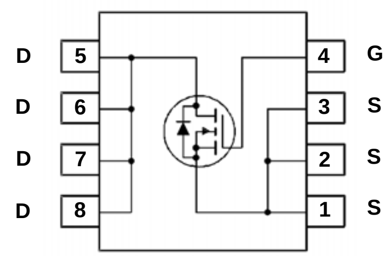
- OringFET
- Synchronous Rectifier



Top

Bottom

Power 56



MOSFET Maximum Ratings T_C = 25 °C unless otherwise noted.

Symbol	Parameter			Ratings	Units
V_{DS}	Drain to Source Voltage			30	V
V_{GS}	Gate to Source Voltage		(Note 4)	±20	V
I_D	Drain Current -Continuous	T_C = 25 °C	(Note 5)	267	A
	-Continuous	T_C = 100 °C	(Note 5)	169	
	-Continuous	T_A = 25 °C	(Note 1a)	36	
	-Pulsed		(Note 6)	1210	
E_{AS}	Single Pulse Avalanche Energy		(Note 3)	544	mJ
P_D	Power Dissipation	T_C = 25 °C		104	W
	Power Dissipation	T_A = 25 °C	(Note 1a)	2.5	
T_J, T_{STG}	Operating and Storage Junction Temperature Range			-55 to +150	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case		1.2	°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
FDMS7650	FDMS7650	Power 56	13 ”	12 mm	3000 units

Electrical Characteristics T_J = 25 °C unless otherwise noted.

Off Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250 μA, V_{GS} = 0 V	30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25 °C		15		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 24 V, V_{GS} = 0 V			1	μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = 20 V, V_{DS} = 0 V			100	nA

On Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250 μA	1	1.9	3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25 °C		-6		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 36 A		0.8	0.99	mΩ
		V_{GS} = 4.5 V, I_D = 32 A		1.1	1.55	
		V_{GS} = 10 V, I_D = 36 A, T_J = 125 °C		1.1	1.7	
g_{FS}	Forward Transconductance	V_{DS} = 5 V, I_D = 36 A		267		S

Dynamic Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
C_{iss}	Input Capacitance	V_{DS} = 15 V, V_{GS} = 0 V, f = 1 MHz		11250	14965	pF
C_{oss}	Output Capacitance			3050	4055	pF
C_{rss}	Reverse Transfer Capacitance			240	360	pF
R_g	Gate Resistance			1.4	3	Ω

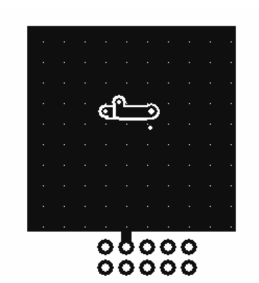
Switching Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 15 V, I_D = 36 A, V_{GS} = 10 V, R_{GEN} = 6 Ω		28	45	ns
t_r	Rise Time			24	38	ns
$t_{d(off)}$	Turn-Off Delay Time			83	133	ns
t_f	Fall Time			21	34	ns
Q_g	Total Gate Charge	V_{GS} = 0 V to 10 V; V_{DD} = 15 V, I_D = 36 A		149	209	nC
Q_g	Total Gate Charge	V_{GS} = 0 V to 4.5 V; V_{DD} = 15 V, I_D = 36 A		63	88	nC
Q_{gs}	Gate to Source Charge	V_{DD} = 15 V, I_D = 36 A		34		nC
Q_{gd}	Gate to Drain "Miller" Charge			13		nC

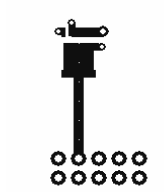
Drain-Source Diode Characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Units
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0 V, I_S = 2.1 A (Note 2)		0.7	1.2	V
		V_{GS} = 0 V, I_S = 36 A (Note 2)		0.8	1.3	
t_{rr}	Reverse Recovery Time	I_F = 36 A, di/dt = 100 A/μs		69	97	ns
Q_{rr}	Reverse Recovery Charge			56	90	nC

Notes:
1. $R_{\theta JA}$ is determined with the device mounted on a 1in^2 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 °C/W when mounted on a 1 in^2 pad of 2 oz copper.



b. 125 °C/W when mounted on a minimum pad of 2 oz copper.

2. Pulse Test: Pulse Width < 300 ms, Duty cycle < 2.0%.
3. Starting T_J = 25 °C, L = 1 mH, I_{AS} = 33 A, V_{DD} = 27 V, V_{GS} = 10 V.
4. As an N-ch device, the negative Vgs rating is for low duty cycle pulse ocurrence only. No continuous rating is implied.
5. Computed continuous current limited to Max Junction Temperature only, actual continuous current will be limited by thermal & electro-mechanical application board design.
6. Pulsed Id please refer to Fig 11 SOA graph for more details.

Typical Characteristics T_J = 25 °C unless otherwise noted.

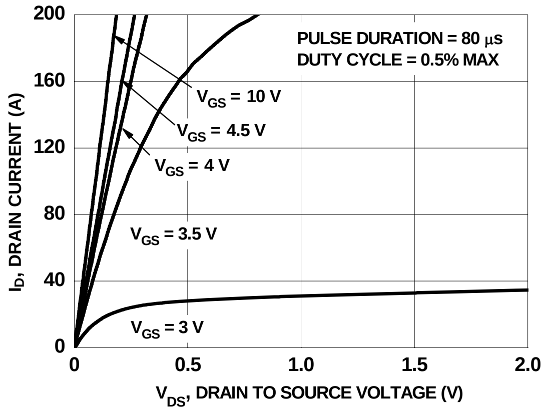


Figure 1. On Region Characteristics

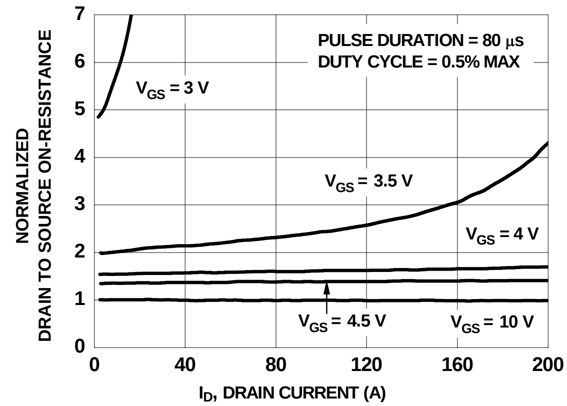


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

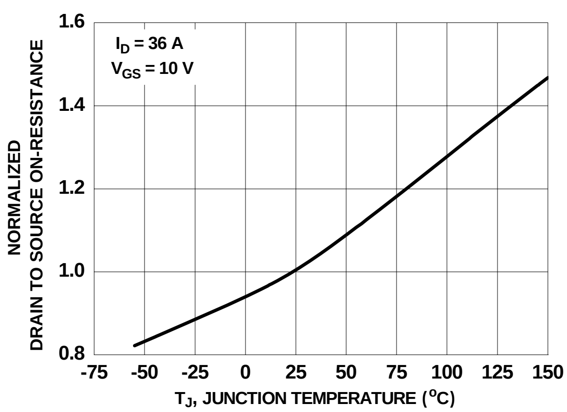


Figure 3. Normalized On Resistance vs. Junction Temperature

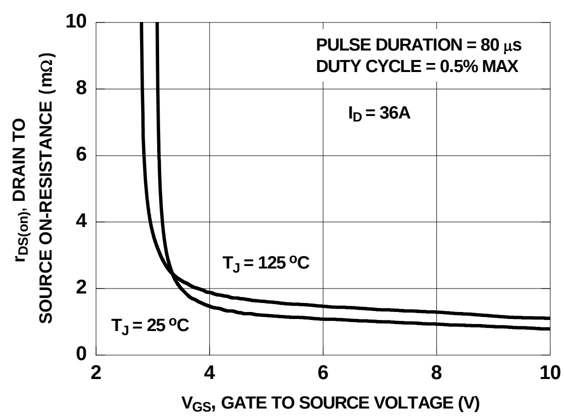


Figure 4. On-Resistance vs. Gate to Source Voltage

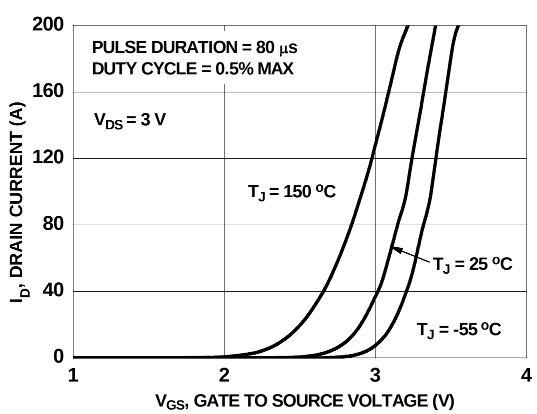


Figure 5. Transfer Characteristics

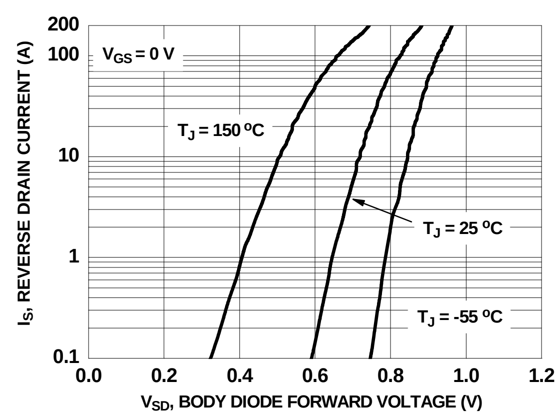


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

Typical Characteristics T_J = 25 °C unless otherwise noted.

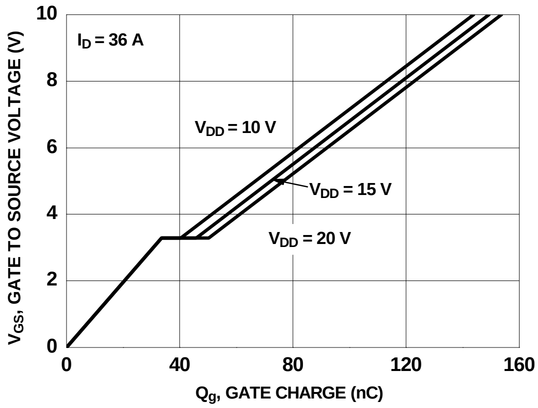


Figure 7. Gate Charge Characteristics

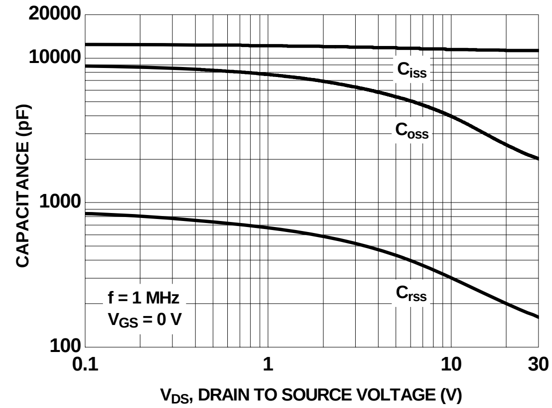


Figure 8. Capacitance vs. Drain to Source Voltage

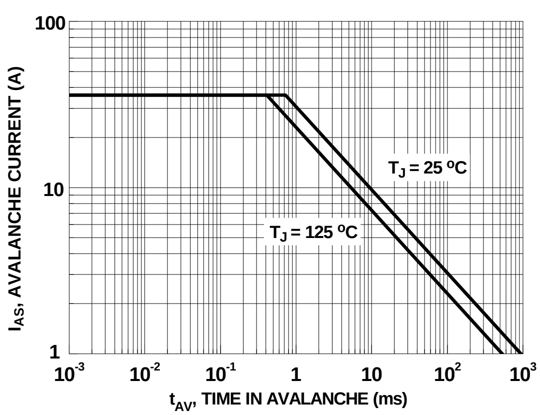


Figure 9. Unclamped Inductive Switching Capability

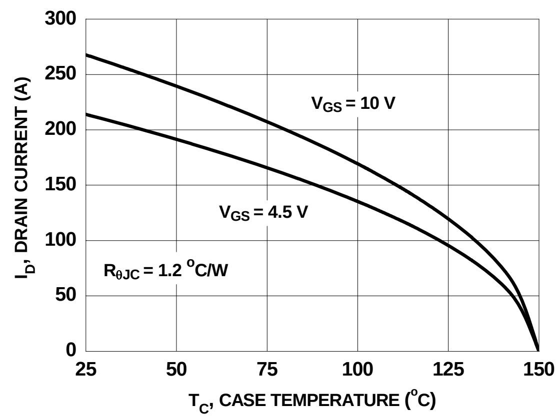


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

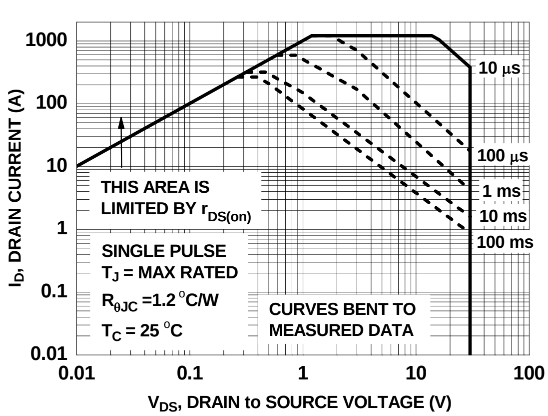


Figure 11. Forward Bias Safe Operating Area

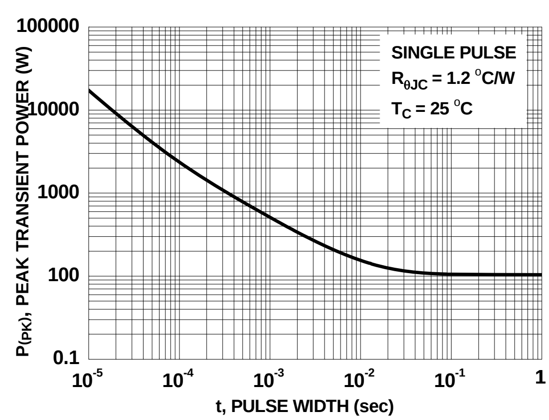


Figure 12. Single Pulse Maximum Power Dissipation

Typical Characteristics T_J = 25 °C unless otherwise noted.

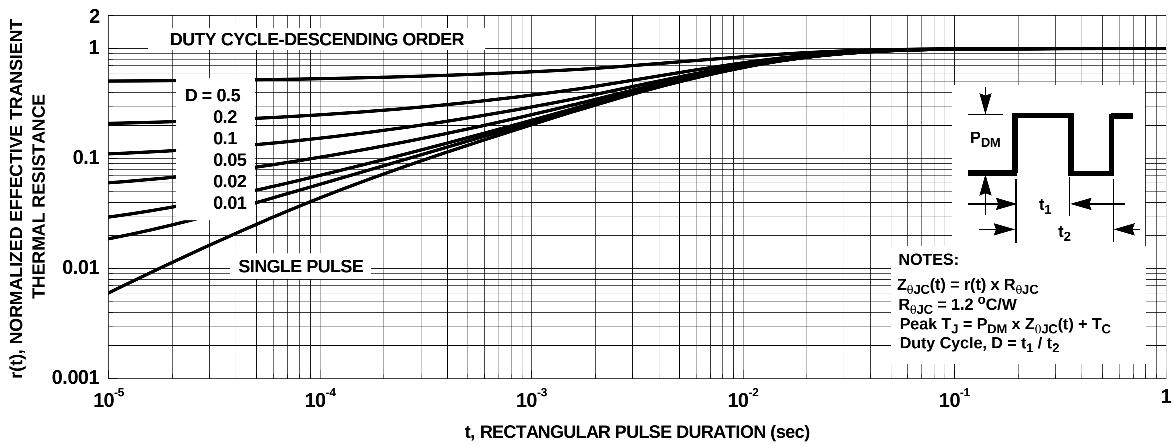
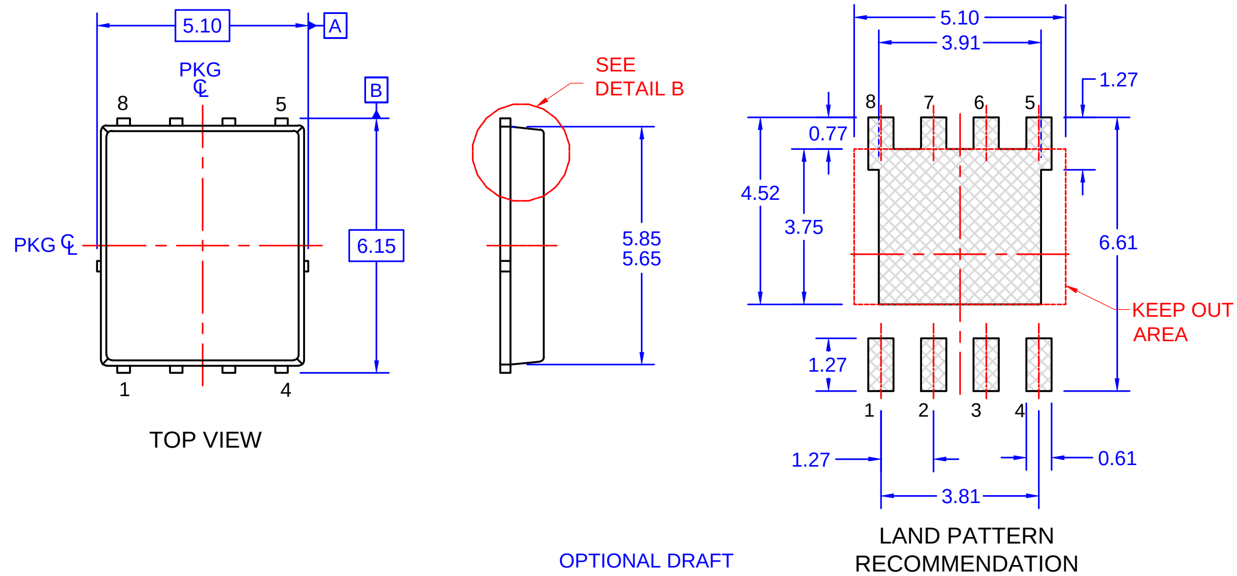
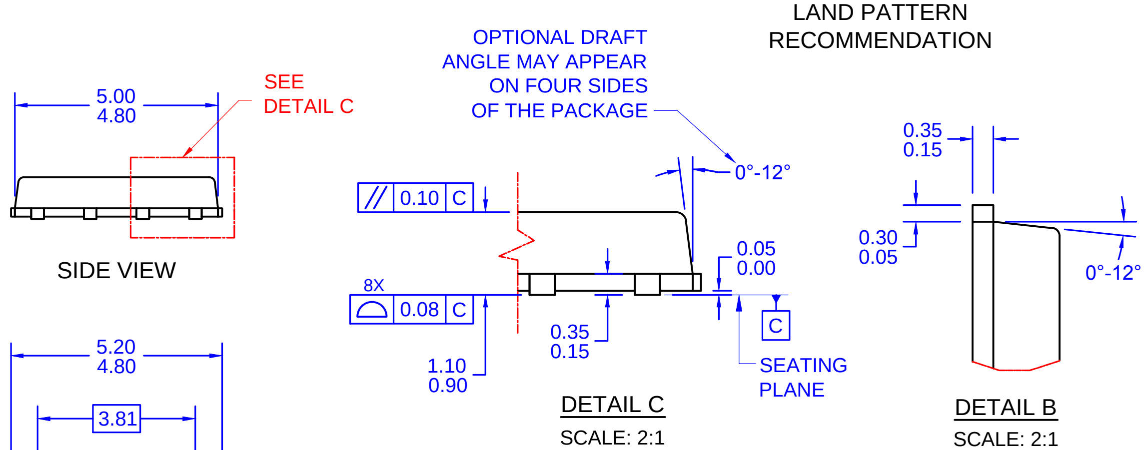
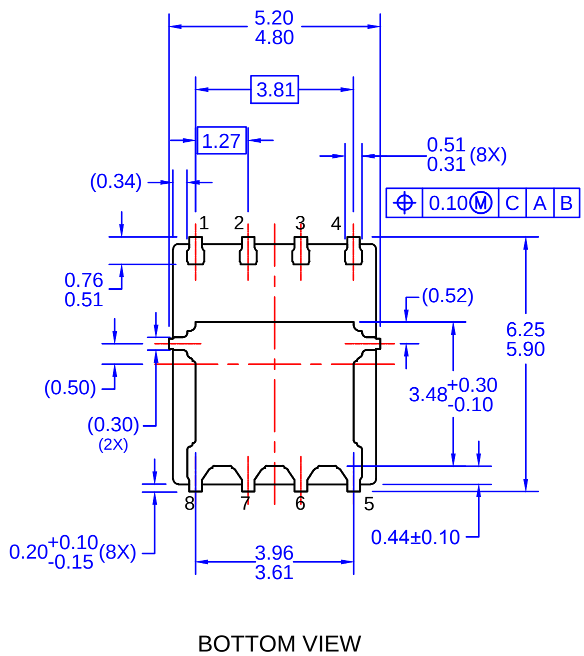


Figure 13. Junction-to-Case Transient Thermal Response Curve

PQFN8 5X6, 1.27P
CASE 483AE
ISSUE A







NOTES: UNLESS OTHERWISE SPECIFIED

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

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