FAIRCHILD SEMICONDUCTOR®

December 2011

FDMQ8203

GreenBridge™ Series of High-Efficiency Bridge Rectifiers
Dual N-Channel and Dual P-Channel PowerTrench® MOSFET
N-Channel: 100 V, 6 A, 110 mΩ P-Channel: -80 V, -6 A, 190 mΩ

Features

Q1/Q4: N-Channel

- Max $r_{DS(on)}$ = 110 mΩ at V_{GS} = 10 V, I_D = 3 A
- Max $r_{DS(on)}$ = 175 mΩ at V_{GS} = 6 V, I_D = 2.4 A

Q2/Q3: P-Channel

- Max $r_{DS(on)}$ = 190 mΩ at V_{GS} = -10 V, I_D = -2.3 A
- Max $r_{DS(on)}$ = 235 mΩ at V_{GS} = -4.5 V, I_D = -2.1 A
- Substantial efficiency benefit in PD solutions
- RoHS Compliant

General Description

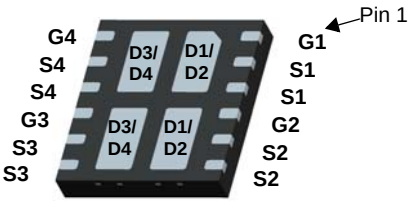
This quad mosfet solution provides ten-fold improvement in power dissipation over diode bridge.

Application

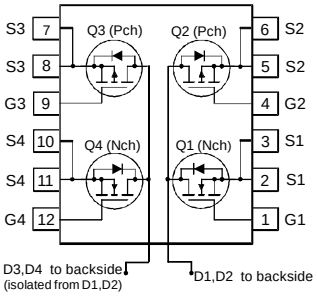
- High-Efficiency Bridge Rectifiers

Top

Bottom



MLP 4.5x5



MOSFET Maximum Ratings T_A = 25 °C unless otherwise noted

Symbol	Parameter			Q1/Q4	Q2/Q3	Units
V_{DS}	Drain to Source Voltage			100	-80	V
V_{GS}	Gate to Source Voltage			±20	±20	V
I_D	Drain Current -Continuous (Package limited)	T_C = 25 °C		6	-6	A
	-Continuous (Silicon limited)	T_C = 25 °C		10	-10	
	-Continuous	T_A = 25 °C	(Note 1a)	3.4	-2.6	
	-Pulsed			12	-10	
P_D	Power Dissipation for Single Operation	T_C = 25 °C		22	37	W
	Power Dissipation for Dual Operation	T_A = 25 °C	(Note 1a)	2.5		
T_J, T_{STG}	Operating and Storage Junction Temperature Range			-55 to +150		°C

Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1a)	50	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1b)	160	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMQ8203	FDMQ8203	MLP4.5x5	13 ”	12 mm	3000 units

Electrical Characteristics T_J = 25 °C unless otherwise noted

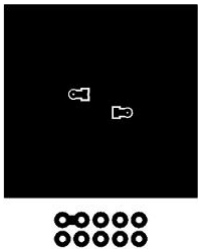
Symbol	Parameter	Test Conditions	Type	Min	Typ	Max	Units
Off Characteristics							
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250 μA, V_{GS} = 0 V I_D = -250 μA, V_{GS} = 0 V	Q1/Q4 Q2/Q3	100 -80			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25 °C I_D = -250 μA, referenced to 25 °C	Q1/Q4 Q2/Q3		72 -79		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 80 V, V_{GS} = 0 V V_{DS} = -64 V, V_{GS} = 0 V	Q1/Q4 Q2/Q3			1 -1	μA μA
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±20 V, V_{DS}= 0 V	Q1/Q4 Q2/Q3			±100 ±100	nA nA
On Characteristics							
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250 μA V_{GS} = V_{DS}, I_D = -250 μA	Q1/Q4 Q2/Q3	2 -1	3 -1.6	4 -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 I_D = -250 μA, referenced to 25 °C	Q1/Q4 Q2/Q3		-8 5		mV/°C
$r_{DS(on)}$	Drain to Source On Resistance	V_{GS} = 10 V, I_D = 3 A V_{GS} = 6 V, I_D = 2.4 A V_{GS} = 10 V, I_D = 3 A , T_J = 125 °C	Q1/Q4		85 118 147	110 175 191	mΩ
		V_{GS} = -10 V, I_D = -2.3 A V_{GS} = -4.5 V, I_D = -2.1 A V_{GS} = -10 V, I_D = -2.3 A, T_J = 125 °C	Q2/Q3		161 188 273	190 235 323	
g_{FS}	Forward Transconductance	V_{DS} = 10 V, I_D = 3 A V_{DS} = -10 V, I_D = -2.3 A	Q1/Q4 Q2/Q3		6 6		S
Dynamic Characteristics							
C_{iss}	Input Capacitance	Q1/Q4: V_{DS} = 50 V, V_{GS} = 0 V, f = 1 MHZ Q2/Q3: V_{DS} = -40 V, V_{GS} = 0 V, f = 1 MHZ	Q1/Q4 Q2/Q3		158 639	210 850	pF
C_{oss}	Output Capacitance		Q1/Q4 Q2/Q3		41 46	55 65	pF
C_{rss}	Reverse Transfer Capacitance		Q1/Q4 Q2/Q3		2.6 24	5 40	pF
Switching Characteristics							
$t_{d(on)}$	Turn-On Delay Time	Q1/Q4: V_{DD} = 50 V, I_D = 3 A, V_{GS} = 10 V, R_{GEN} = 6 Ω Q2/Q3: V_{DD} = -40 V, I_D = -2.3 A, V_{GS} = -10 V, R_{GEN} = 6 Ω	Q1/Q4 Q2/Q3		3.8 4.7	10 10	ns
t_r	Rise Time		Q1/Q4 Q2/Q3		1.3 2.8	10 10	ns
$t_{d(off)}$	Turn-Off Delay Time		Q1/Q4 Q2/Q3		7.5 22	15 35	ns
t_f	Fall Time		Q1/Q4 Q2/Q3		1.9 2.7	10 10	ns
Q_g	Total Gate Charge	VGS = 0 V to 10 V VGS = 0 V to -10 V Q1/Q4: V_{DD} = 50 V, I_D = 3 A	Q1/Q4 Q2/Q3		2.9 13	5 19	nC
Q_g	Total Gate Charge	VGS = 0 V to 5 V VGS = 0 V to -4.5 V	Q1/Q4 Q2/Q3		1.6 6.4	3 10	nC
Q_{gs}	Gate to Source Gate Charge	Q2/Q3: V_{DD} = -40 V, I_D = -2.3A	Q1/Q4 Q2/Q3		0.8 1.6		nC
Q_{gd}	Gate to Drain “Miller” Charge		Q1/Q4 Q2/Q3		0.8 2.6		nC

Electrical Characteristics T_J = 25 °C unless otherwise noted

Symbol	Parameter	Test Conditions	Type	Min	Typ	Max	Units
Drain-Source Diode Characteristics							
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0 V, I_S = 3 A (Note 2) V_{GS} = 0 V, I_S = -2.3 A (Note 2)	Q1/Q4 Q2/Q3		0.86 -0.82	1.3 -1.3	V
t_{rr}	Reverse Recovery Time	Q1/Q4: I_F = 3 A, di/dt = 100 A/μs	Q1/Q4 Q2/Q3		32 26	52 42	ns
Q_{rr}	Reverse Recovery Charge	Q2/Q3: I_F = -2.3 A, di/dt = 100 A/μs	Q1/Q4 Q2/Q3		21 26	34 42	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 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, the board designed Q1+Q3 or Q2+Q4.

b. 160 °C/W when mounted on a minimum pad of 2 oz copper, the board designed Q1+Q3 or Q2+Q4.

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

Typical Characteristics (N-Channel) T_J = 25 °C unless otherwise noted

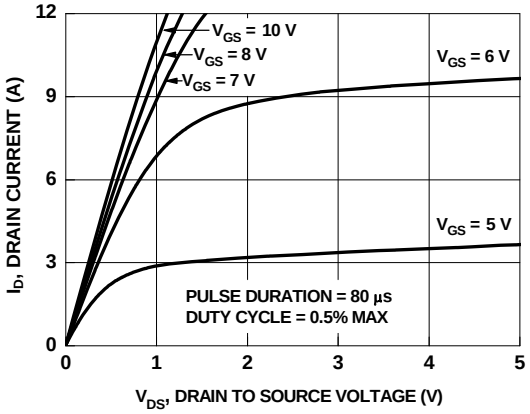


Figure 1. On Region Characteristics

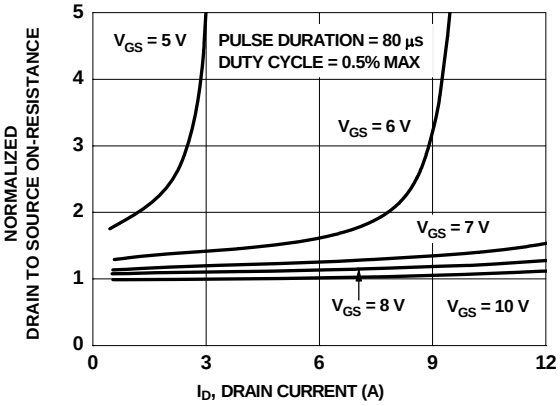


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

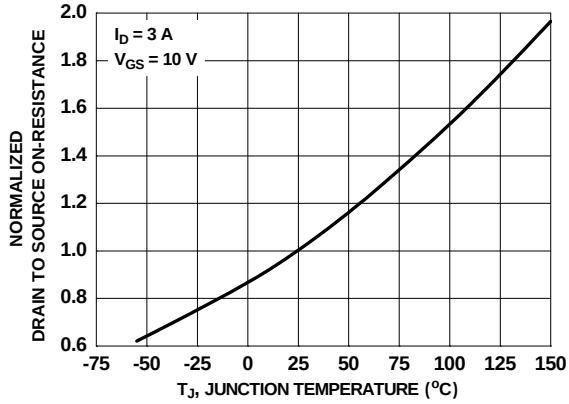


Figure 3. Normalized On Resistance vs Junction Temperature

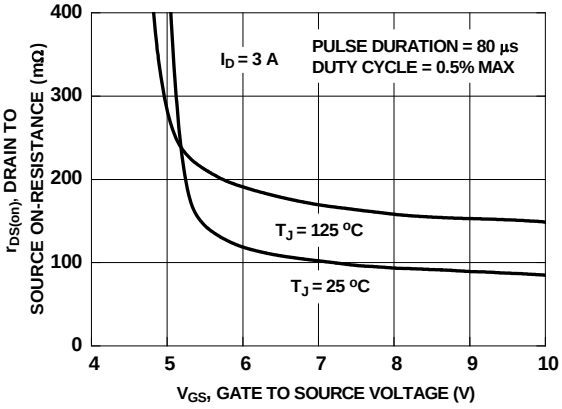


Figure 4. On-Resistance vs Gate to Source Voltage

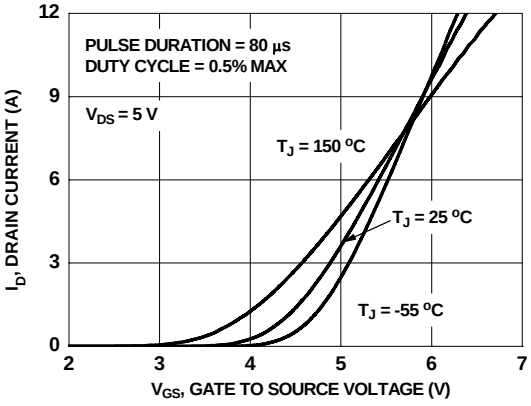


Figure 5. Transfer Characteristics

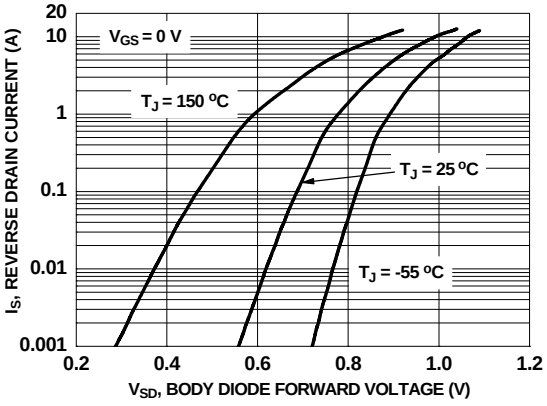


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics (N-Channel) T_J = 25 °C unless otherwise noted

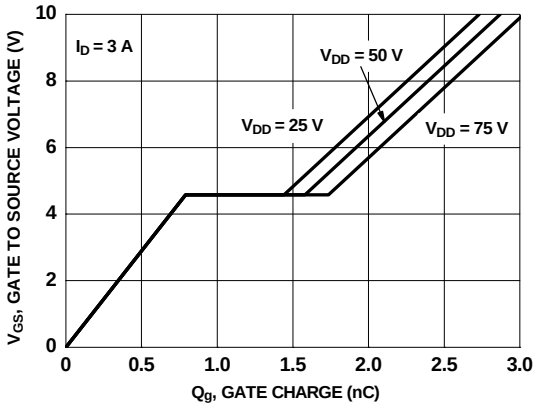


Figure 7. Gate Charge Characteristics

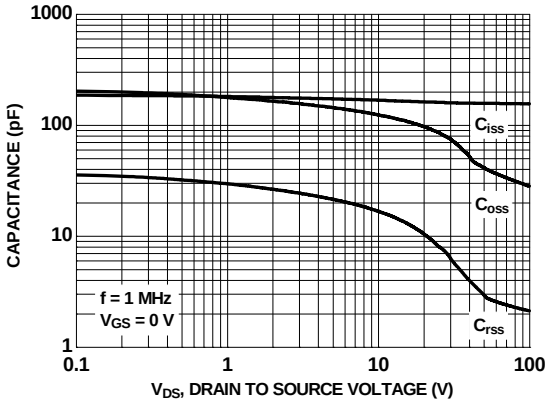


Figure 8. Capacitance vs Drain to Source Voltage

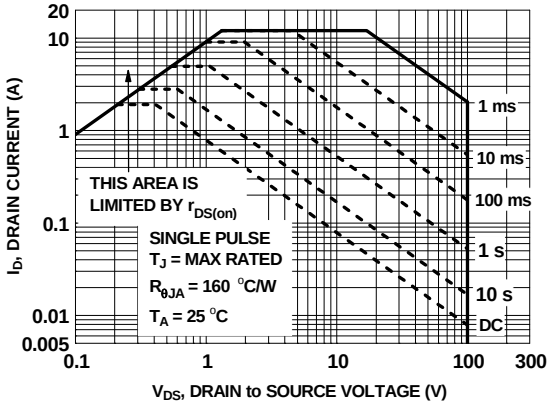


Figure 9. Forward Bias Safe Operating Area

Typical Characteristics (P-Channel) T_J = 25 °C unlenss otherwise noted

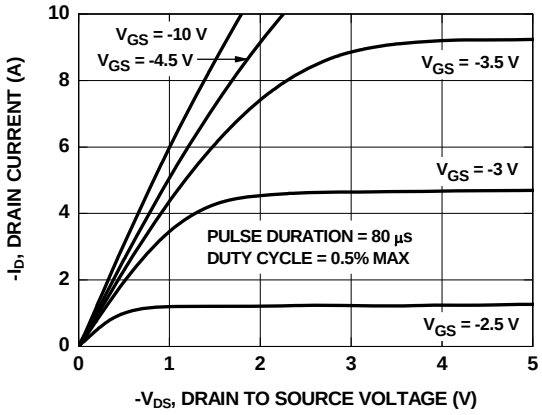


Figure 10. On-Region Characteristics

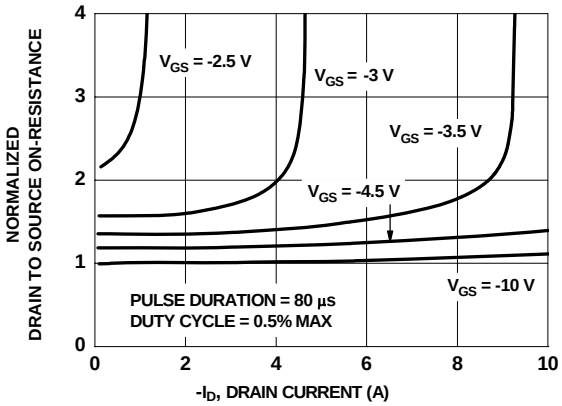


Figure 11. Normalized on-Resistance vs Drain Current and Gate Voltage

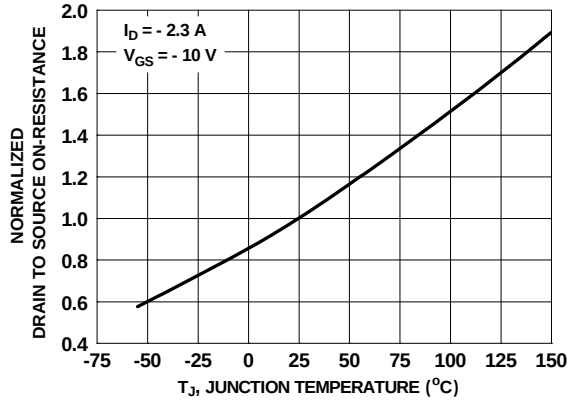


Figure 12. Normalized On-Resistance vs Junction Temperature

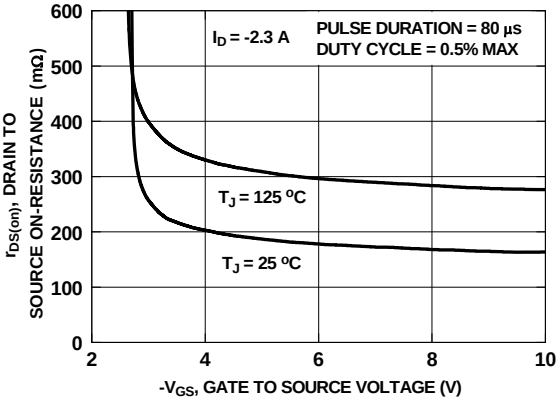


Figure 13. On-Resistance vs Gate to Source Voltage

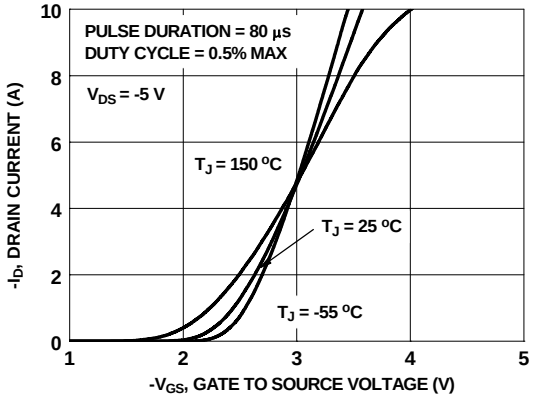


Figure 14. Transfer Characteristics

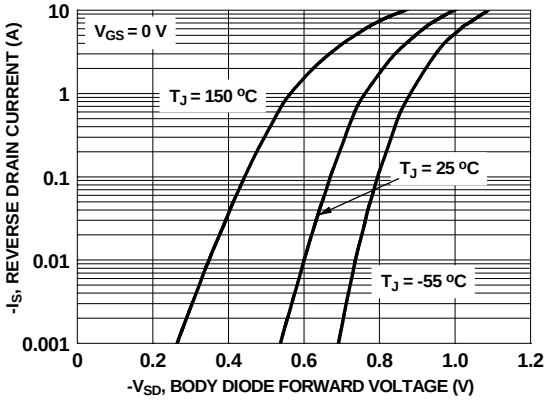


Figure 15. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics (P-Channel) T_J = 25 °C unlenss otherwise noted

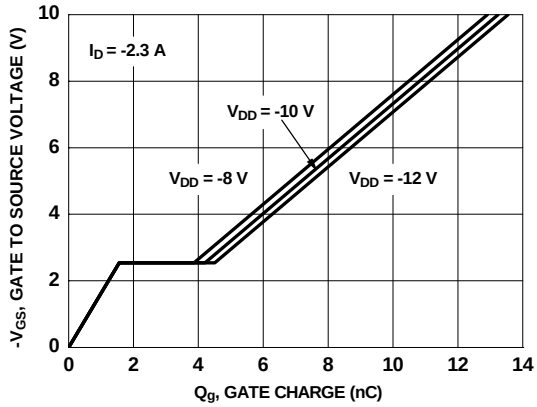


Figure 16. Gate Charge Characteristics

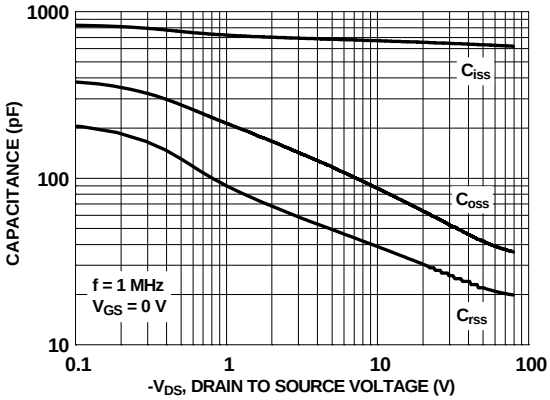


Figure 17. Capacitance vs Drain to Source Voltage

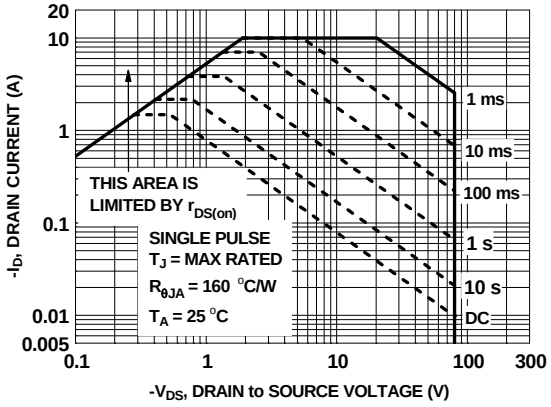


Figure 18. Forward Bias Safe Operating Area

Typical Characteristics T_J = 25 °C unlenss otherwise noted

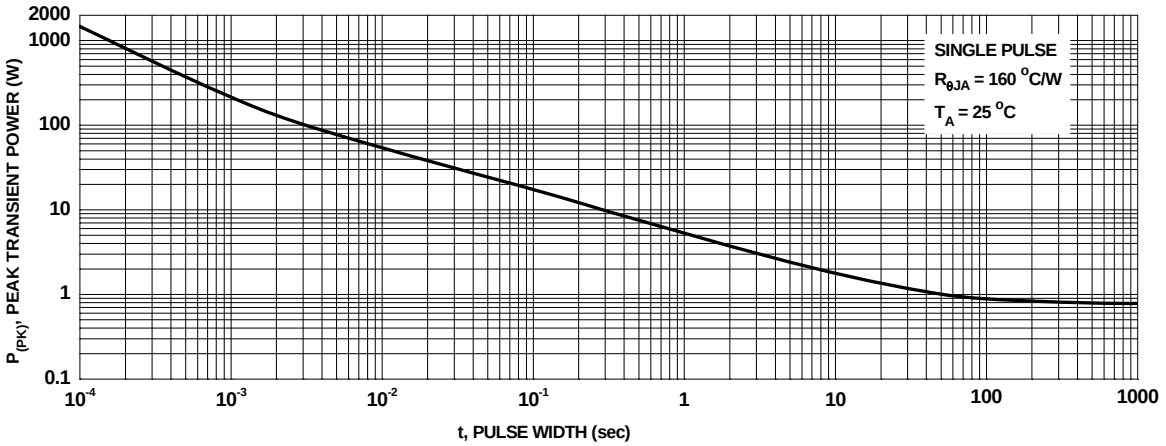


Figure 19. Single Pulse Maximum Power Dissipation

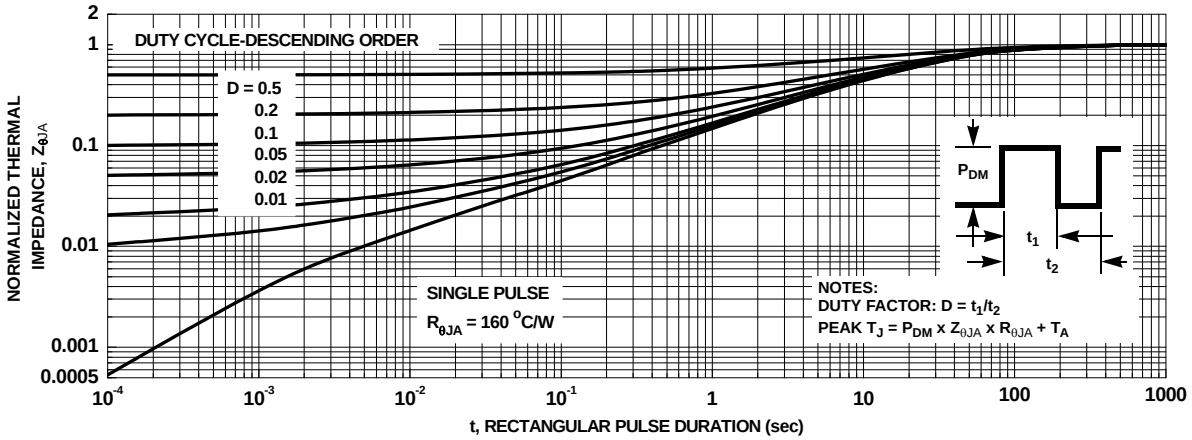
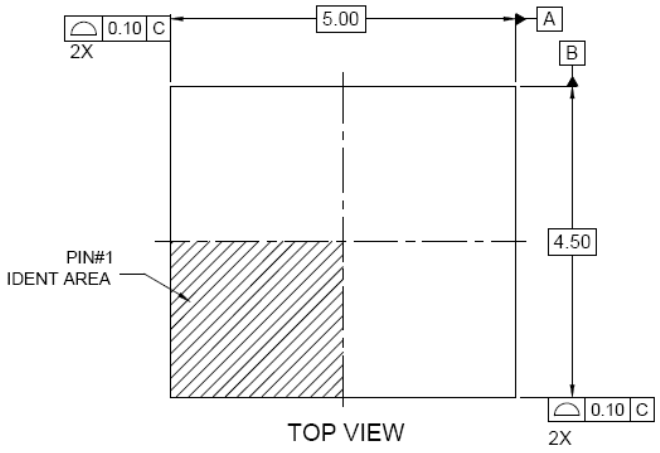
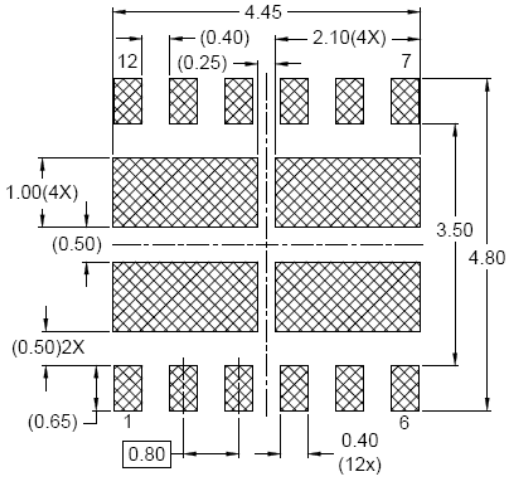
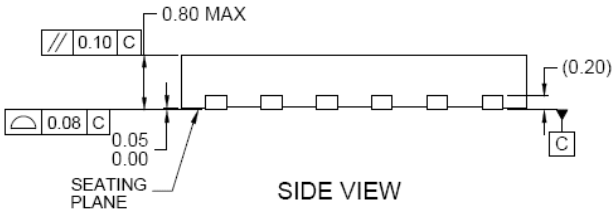


Figure 20. Junction-to-Ambient Transient Thermal Response Curve

Dimensional Outline and Pad Layout







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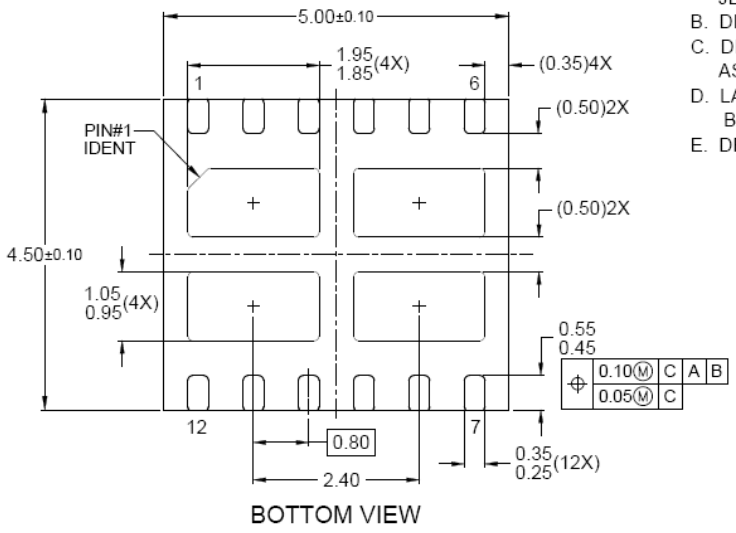
D. LAND PATTERN RECOMMENDATION IS BASED ON FSC DESIGN ONLY.
E. DRAWING FILENAME: MKT-MLP12Erev2.



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2. A critical component in any component of a life support, device, or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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PRODUCT STATUS DEFINITIONS

Definition of Terms

Datasheet Identification	Product Status	Definition
Advance Information	Formative / In Design	Datasheet contains the design specifications for product development. Specifications may change in any manner without notice.
Preliminary	First Production	Datasheet contains preliminary data; supplementary data will be published at a later date. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve design.
No Identification Needed	Full Production	Datasheet contains final specifications. Fairchild Semiconductor reserves the right to make changes at any time without notice to improve the design.
Obsolete	Not In Production	Datasheet contains specifications on a product that is discontinued by Fairchild Semiconductor. The datasheet is for reference information only.

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