



ON Semiconductor®

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

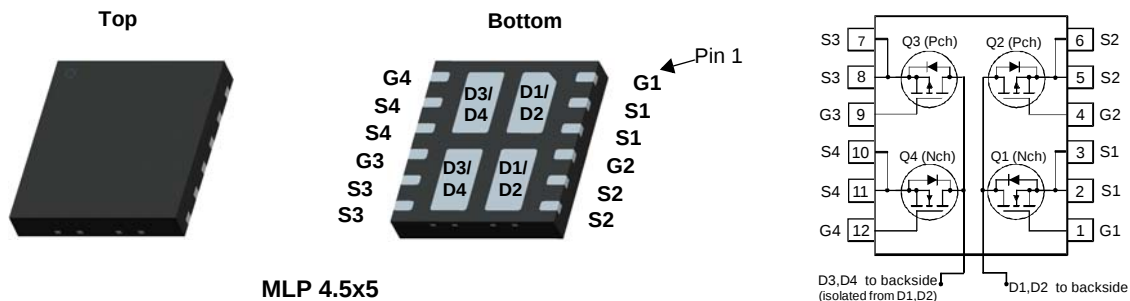


General Description

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

Application

■ High-Efficiency Bridge Rectifiers



MOSFET Maximum Ratings $T_A = 25^\circ\text{C}$ 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	$^\circ\text{C/W}$
$R_{\theta JA}$	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 $T_J = 25\text{ }^{\circ}\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Type	Min	Typ	Max	Units
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Off Characteristics

BV_{DSS}	Drain to Source Breakdown Voltage	$I_D = 250\text{ }\mu\text{A}$, $V_{GS} = 0\text{ V}$ $I_D = -250\text{ }\mu\text{A}$, $V_{GS} = 0\text{ V}$	Q1/Q4 Q2/Q3	100 -80			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$, referenced to $25\text{ }^{\circ}\text{C}$ $I_D = -250\text{ }\mu\text{A}$, referenced to $25\text{ }^{\circ}\text{C}$	Q1/Q4 Q2/Q3		72 -79		mV/ $^{\circ}\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 80\text{ V}$, $V_{GS} = 0\text{ V}$ $V_{DS} = -64\text{ V}$, $V_{GS} = 0\text{ V}$	Q1/Q4 Q2/Q3			1 -1	μA μA
I_{GSS}	Gate to Source Leakage Current	$V_{GS} = \pm 20\text{ V}$, $V_{DS} = 0\text{ V}$	Q1/Q4 Q2/Q3			± 100 ± 100	nA nA

On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$, $I_D = 250\text{ }\mu\text{A}$ $V_{GS} = V_{DS}$, $I_D = -250\text{ }\mu\text{A}$	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	$I_D = 250\text{ }\mu\text{A}$, referenced to $25\text{ }^{\circ}\text{C}$ $I_D = -250\text{ }\mu\text{A}$, referenced to $25\text{ }^{\circ}\text{C}$	Q1/Q4 Q2/Q3		-8 5		mV/ $^{\circ}\text{C}$
$r_{DS(on)}$	Drain to Source On Resistance	$V_{GS} = 10\text{ V}$, $I_D = 3\text{ A}$ $V_{GS} = 6\text{ V}$, $I_D = 2.4\text{ A}$ $V_{GS} = 10\text{ V}$, $I_D = 3\text{ A}$, $T_J = 125\text{ }^{\circ}\text{C}$	Q1/Q4		85 118 147	110 175 191	m Ω
		$V_{GS} = -10\text{ V}$, $I_D = -2.3\text{ A}$ $V_{GS} = -4.5\text{ V}$, $I_D = -2.1\text{ A}$ $V_{GS} = -10\text{ V}$, $I_D = -2.3\text{ A}$, $T_J = 125\text{ }^{\circ}\text{C}$	Q2/Q3		161 188 273	190 235 323	
g_{FS}	Forward Transconductance	$V_{DS} = 10\text{ V}$, $I_D = 3\text{ A}$ $V_{DS} = -10\text{ V}$, $I_D = -2.3\text{ A}$	Q1/Q4 Q2/Q3		6 6		S

Dynamic Characteristics

C_{iss}	Input Capacitance	Q1/Q4: $V_{DS} = 50\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$	Q1/Q4 Q2/Q3		158 639	210 850	pF
C_{oss}	Output Capacitance	Q2/Q3:	Q1/Q4 Q2/Q3		41 46	55 65	pF
C_{rss}	Reverse Transfer Capacitance	$V_{DS} = -40\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1\text{ MHz}$	Q1/Q4 Q2/Q3		2.6 24	5 40	pF

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	Q1/Q4:	Q1/Q4 Q2/Q3		3.8 4.7	10 10	ns
t_r	Rise Time	$V_{DD} = 50\text{ V}$, $I_D = 3\text{ A}$, $V_{GS} = 10\text{ V}$, $R_{GEN} = 6\text{ }\Omega$	Q1/Q4 Q2/Q3		1.3 2.8	10 10	ns
$t_{d(off)}$	Turn-Off Delay Time	Q2/Q3:	Q1/Q4 Q2/Q3		7.5 22	15 35	ns
t_f	Fall Time	$V_{DD} = -40\text{ V}$, $I_D = -2.3\text{ A}$, $V_{GS} = -10\text{ V}$, $R_{GEN} = 6\text{ }\Omega$	Q1/Q4 Q2/Q3		1.9 2.7	10 10	ns
Q_g	Total Gate Charge	$V_{GS} = 0\text{ V}$ to 10 V $V_{GS} = 0\text{ V}$ to -10 V	Q1/Q4 Q2/Q3		2.9 13	5 19	nC
Q_g	Total Gate Charge	$V_{GS} = 0\text{ V}$ to 5 V $V_{GS} = 0\text{ V}$ to -4.5 V	Q1/Q4 Q2/Q3		1.6 6.4	3 10	nC
Q_{gs}	Gate to Source Gate Charge	Q2/Q3: $V_{DD} = -40\text{ V}$, $I_D = -2.3\text{ A}$	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 $T_J = 25\text{ }^{\circ}\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Type	Min	Typ	Max	Units
Drain-Source Diode Characteristics							
V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}$, $I_S = 3\text{ A}$ (Note 2) $V_{GS} = 0\text{ V}$, $I_S = -2.3\text{ A}$ (Note 2)	Q1/Q4 Q2/Q3		0.86 -0.82	1.3 -1.3	V
t_{rr}	Reverse Recovery Time	Q1/Q4: $I_F = 3\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$	Q1/Q4 Q2/Q3		32 26	52 42	ns
Q_{rr}	Reverse Recovery Charge	Q2/Q3: $I_F = -2.3\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$	Q1/Q4 Q2/Q3		21 26	34 42	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. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



a. 50 $^{\circ}\text{C}/\text{W}$ when mounted on a 1 in² pad of 2 oz copper, the board designed Q1+Q3 or Q2+Q4.



b. 160 $^{\circ}\text{C}/\text{W}$ 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) $T_J = 25^\circ\text{C}$ unless otherwise noted

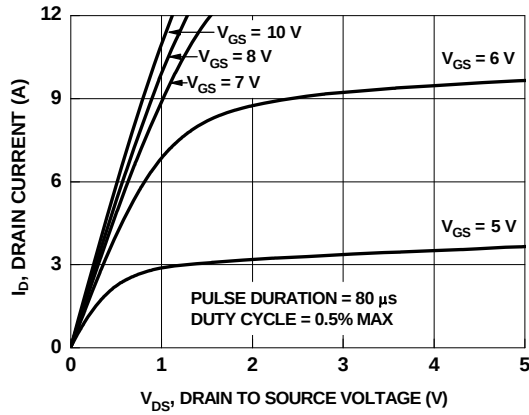


Figure 1. On Region Characteristics

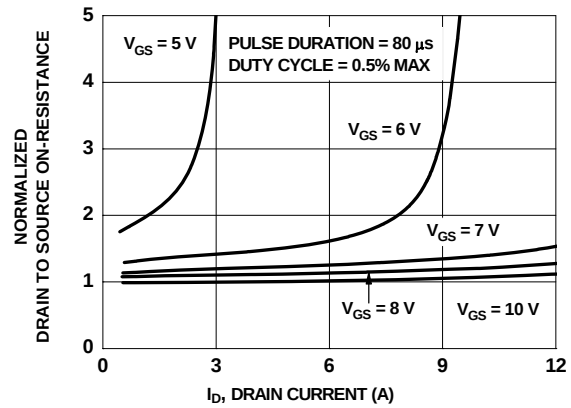


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

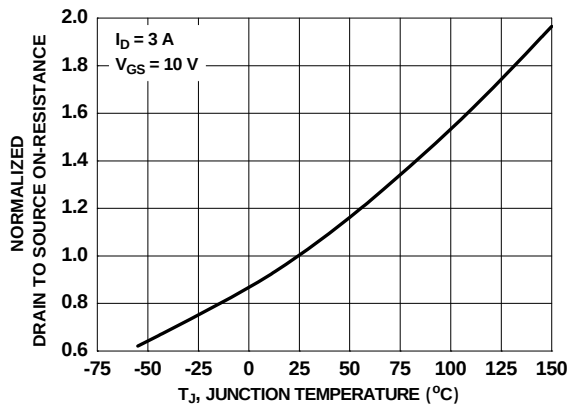


Figure 3. Normalized On Resistance vs Junction Temperature

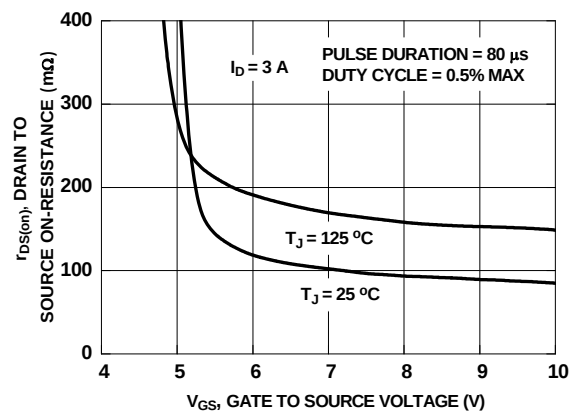


Figure 4. On-Resistance vs Gate to Source Voltage

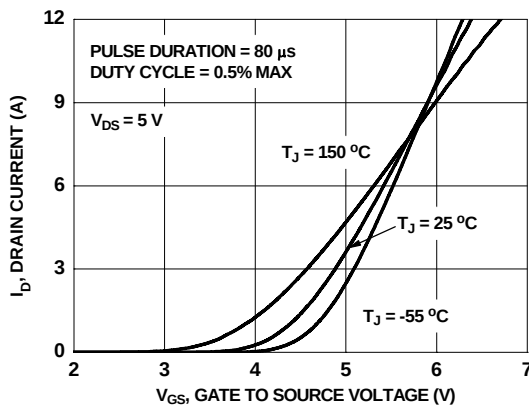


Figure 5. Transfer Characteristics

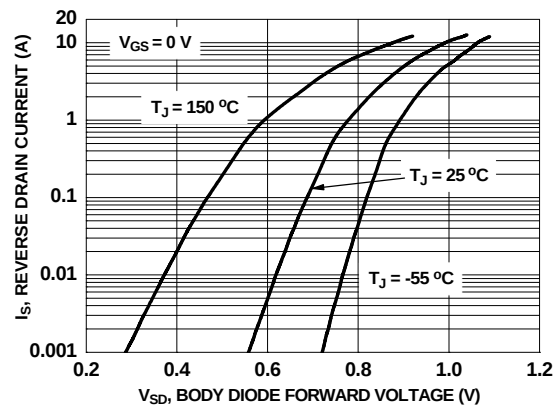


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics (N-Channel) $T_J = 25\text{ }^{\circ}\text{C}$ unless otherwise noted

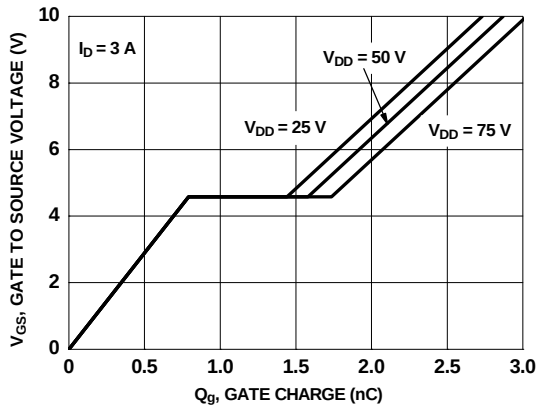


Figure 7. Gate Charge Characteristics

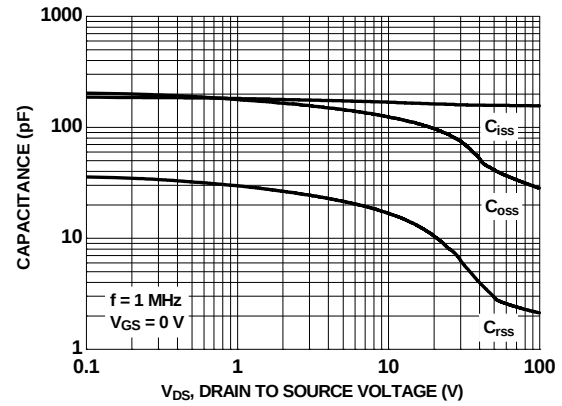


Figure 8. Capacitance vs Drain to Source Voltage

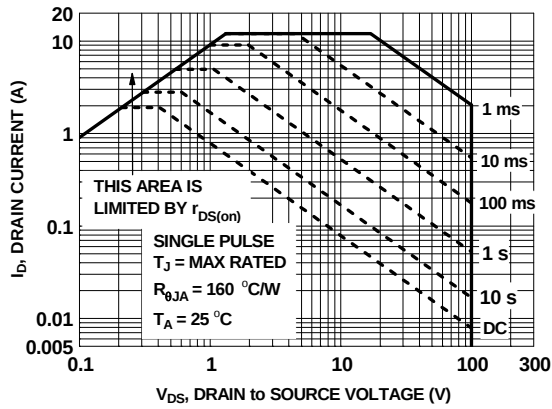


Figure 9. Forward Bias Safe Operating Area

Typical Characteristics (P-Channel) $T_J = 25^\circ\text{C}$ unless otherwise noted

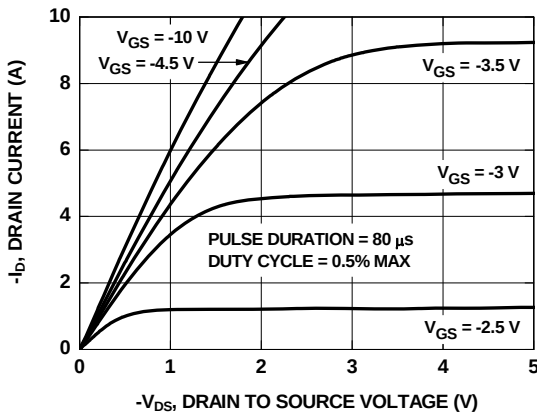


Figure 10. On-Region Characteristics

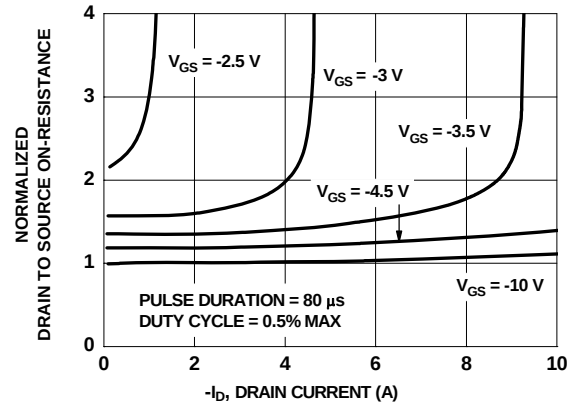


Figure 11. Normalized on-Resistance vs Drain Current and Gate Voltage

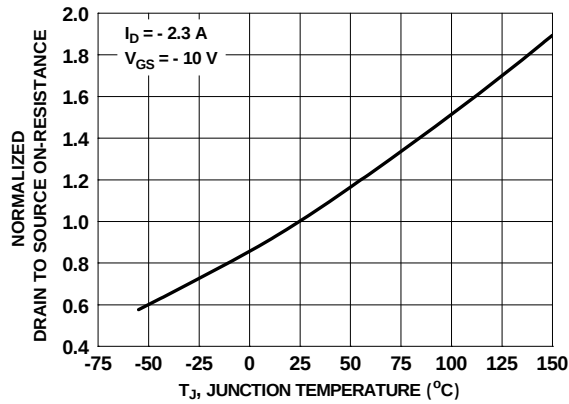


Figure 12. Normalized On-Resistance vs Junction Temperature

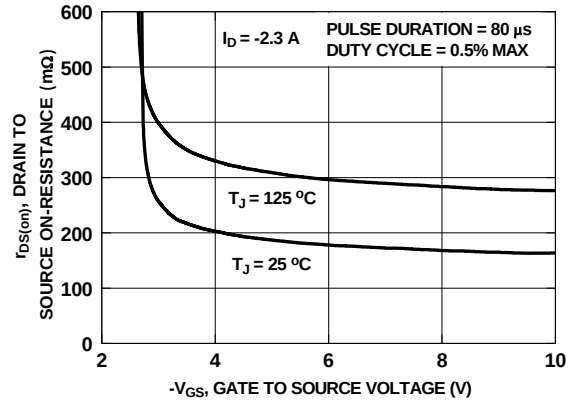


Figure 13. On-Resistance vs Gate to Source Voltage

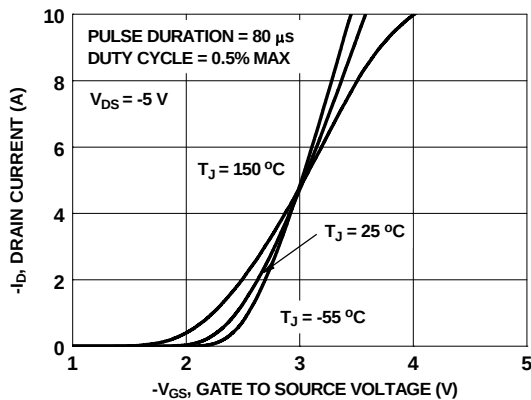


Figure 14. Transfer Characteristics

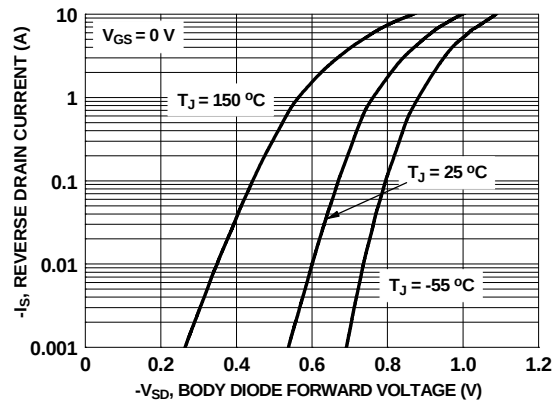


Figure 15. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics (P-Channel) $T_J = 25^\circ\text{C}$ unless otherwise noted

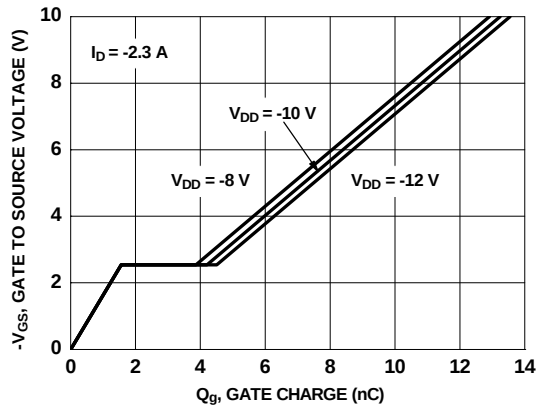


Figure 16. Gate Charge Characteristics

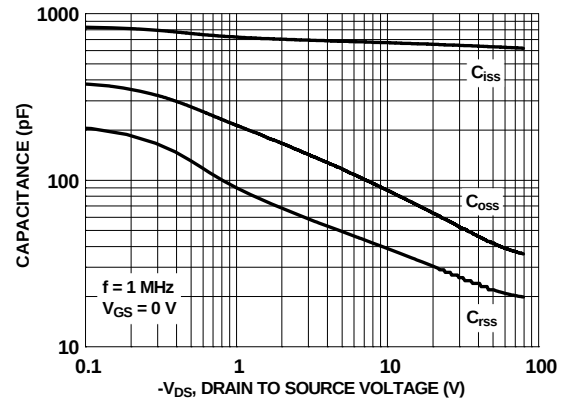


Figure 17. Capacitance vs Drain to Source Voltage

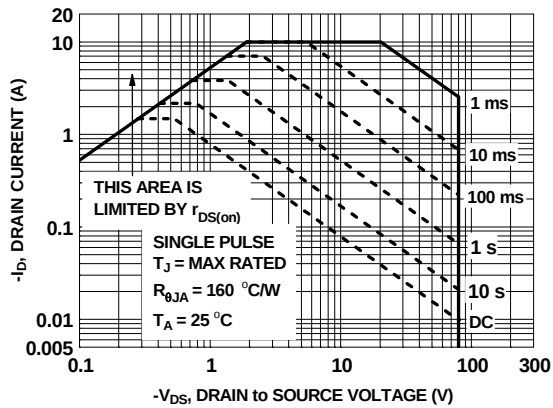


Figure 18. Forward Bias Safe Operating Area

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

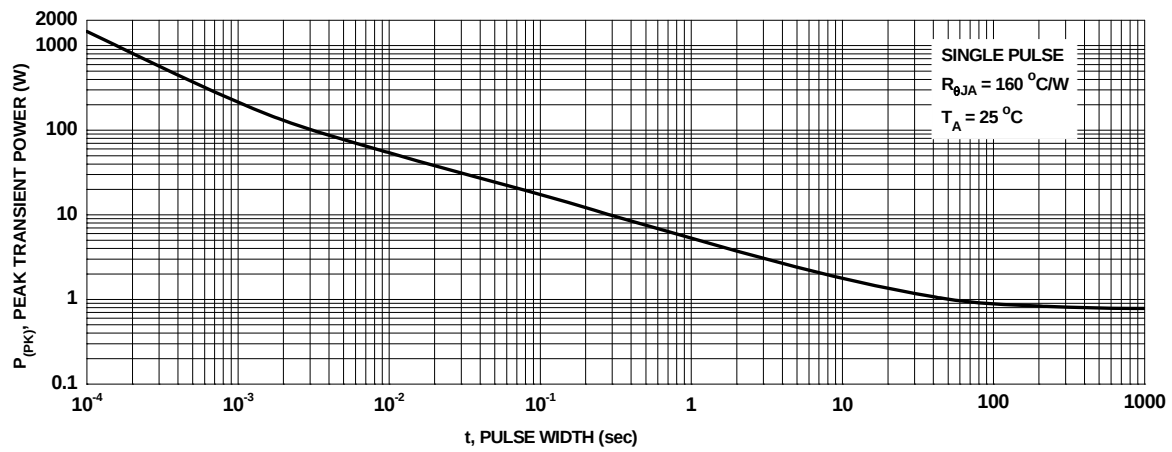


Figure 19. Single Pulse Maximum Power Dissipation

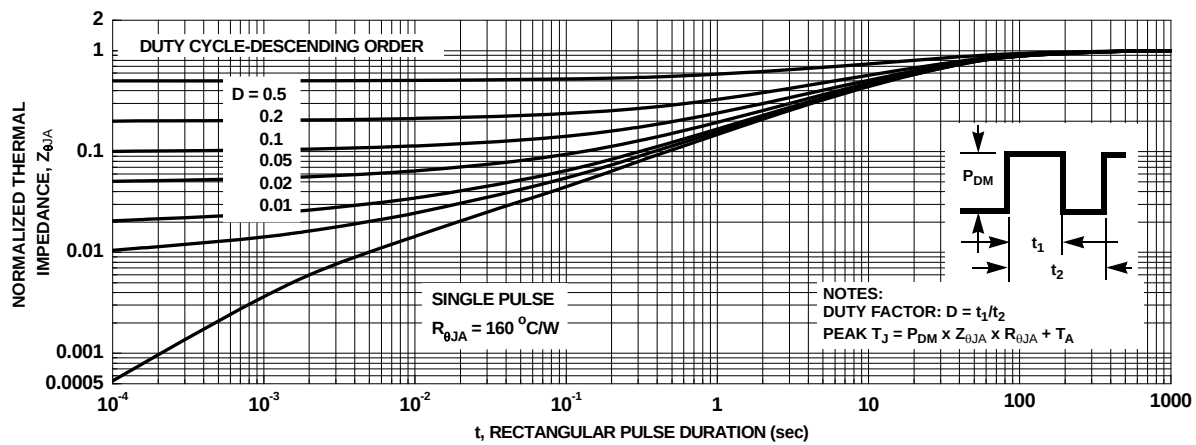
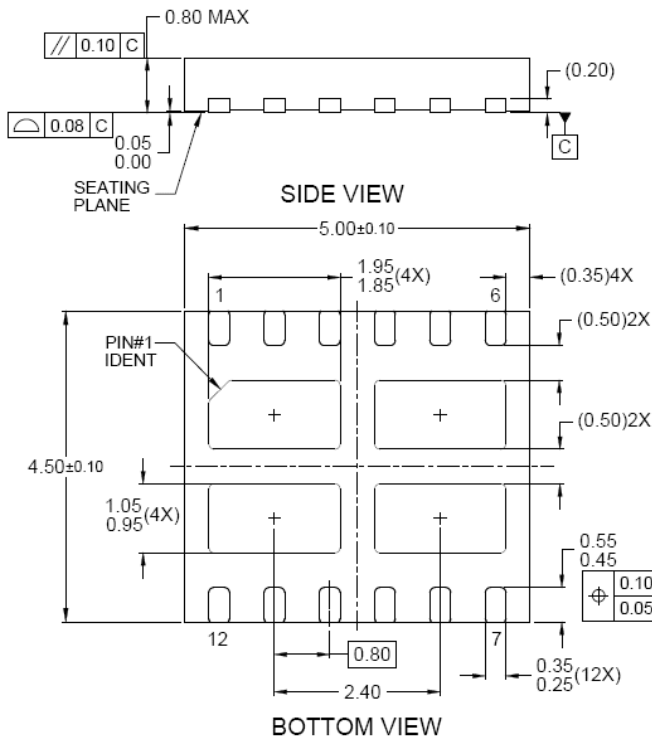
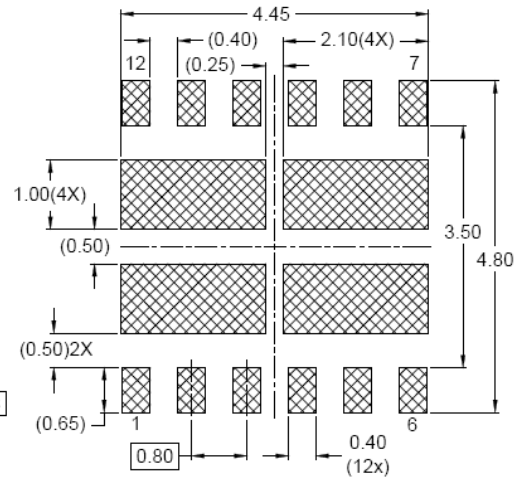
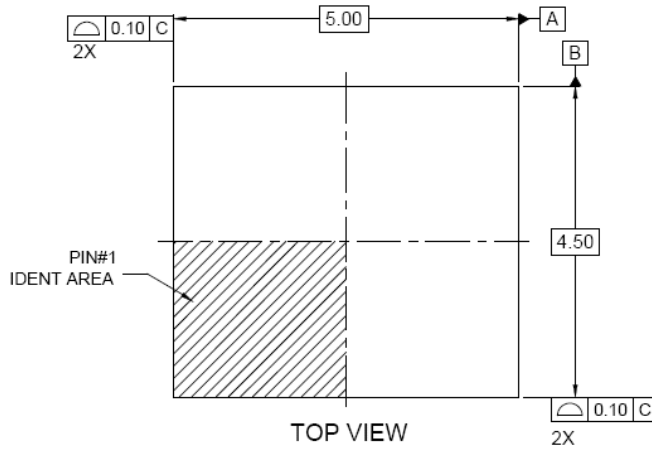


Figure 20. Junction-to-Ambient Transient Thermal Response Curve

Dimensional Outline and Pad Layout



NOTES:

- A. PACKAGE DOES NOT FULLY CONFORM TO JEDEC MO-229 REGISTRATION
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
- D. LAND PATTERN RECOMMENDATION IS BASED ON FSC DESIGN ONLY.
- E. DRAWING FILENAME: MKT-MLP12Erev2.

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