

# **MOSFET – Dual N-Channel and Dual P-Channel, POWERTRENCH®, GreenBridge™ Series of High-Efficiency Bridge Rectifiers**

**N-Channel: 100 V, 6 A, 110 mΩ**

**P-Channel: -80 V, -6 A, 190 mΩ**

## **FDMQ8203**

### **General Description**

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

### **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

### **Applications**

- High-Efficiency Bridge Rectifiers
- Substantial Efficiency Benefit in PD Solutions
- These Device is Pb-Free, Halide Free and is RoHS Compliant

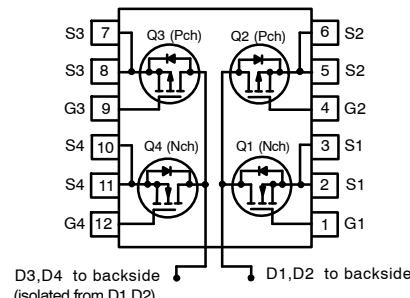


### **MARKING DIAGRAM**



FDMQ8203 = Specific Device Code  
 Z = Assembly Plant Code  
 XY = Date Code  
 KK = Lot Run Traceability Code

### **N-Channel / P-Channel**



### **ORDERING INFORMATION**

Device	Package	Shipping <sup>†</sup>
FDMQ8203	MLP 4.5x5 (Pb-Free, Halide Free)	3000 / Tape & Reel

<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, [BRD8011/D](#).

# FDMQ8203

## ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = 25°C unless otherwise noted)

Symbol	Parameter		Q1/Q4	Q2/Q3	Unit
V <sub>DS</sub>	Drain to Source Voltage		100	-80	V
V <sub>GS</sub>	Gate to Source Voltage		±20	±20	V
I <sub>D</sub>	Drain Current	- Continuous (Package Limited) T <sub>C</sub> = 25°C	6	-6	A
		- Continuous (Silicon Limited) T <sub>C</sub> = 25°C	10	-10	
		- Continuous T <sub>A</sub> = 25°C (Note 1a)	3.4	-2.6	
		- Pulsed	12	-10	
P <sub>D</sub>	Power Dissipation for Single Operation	T <sub>C</sub> = 25°C	22	37	W
	Power Dissipation for Dual Operation	T <sub>A</sub> = 25°C (Note 1a)	2.5		
T <sub>J</sub> , T <sub>STG</sub>	Operating and Storage Junction Temperature Range		-55 to +150		°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

## THERMAL CHARACTERISTICS

Symbol	Parameter	Value	Unit
R <sub>θJA</sub>	Thermal Resistance, Junction to Ambient (Note 1a)	50	°C/W
R <sub>θJA</sub>	Thermal Resistance, Junction to Ambient (Note 1b)	160	

## ELECTRICAL CHARACTERISTICS (T<sub>J</sub> = 25°C unless otherwise noted)

Symbol	Parameter	Test Condition	Type	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

BV <sub>DSS</sub>	Drain to Source Breakdown Voltage	I <sub>D</sub> = 250 μA, V <sub>GS</sub> = 0 I <sub>D</sub> = -250 μA, V <sub>GS</sub> = 0	Q1/Q4 Q2/Q3	100 -80	- -	- -	V
ΔBV <sub>DSS</sub> ΔT <sub>J</sub>	Breakdown Voltage Temperature Coefficient	I <sub>D</sub> = 250 μA, Referenced to 25°C I <sub>D</sub> = -250 μA, Referenced to 25°C	Q1/Q4 Q2/Q3	- -	72 -79	- -	mV/°C
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 80 V, V <sub>GS</sub> = 0 V V <sub>DS</sub> = -64 V, V <sub>GS</sub> = 0 V	Q1/Q4 Q2/Q3	- -	- -	1 -1	μA
I <sub>GSS</sub>	Gate to Source Leakage Current	V <sub>GS</sub> = ±20 V, V <sub>DS</sub> = 0 V	Q1/Q4 Q2/Q3	- -	- -	±100 ±100	nA

### ON CHARACTERISTICS (Note 2)

V <sub>GS(th)</sub>	Gate to Source Threshold Voltage	V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 250 μA V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = -250 μA	Q1/Q4 Q2/Q3	2 -1	3 -1.6	4 -3	V
ΔV <sub>GS(th)</sub> ΔT <sub>J</sub>	Gate to Source Threshold Voltage Temperature Coefficient	I <sub>D</sub> = 250 μA, Referenced to 25°C I <sub>D</sub> = -250 μA, Referenced to 25°C	Q1/Q4 Q2/Q3	- -	-8 5	- -	mV/°C
R <sub>DS(on)</sub>	Static Drain-Source On-Resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 3 A V <sub>GS</sub> = 6 V, I <sub>D</sub> = 2.4 A V <sub>GS</sub> = 10 V, I <sub>D</sub> = 3 A, T <sub>J</sub> = 125°C	Q1/Q4	- - -	85 118 147	110 175 191	mΩ
		V <sub>GS</sub> = -10 V, I <sub>D</sub> = -2.3 A V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -2.1 A V <sub>GS</sub> = -10 V, I <sub>D</sub> = -2.3 A, T <sub>J</sub> = 125°C	Q2/Q3	- - -	161 188 273	190 235 323	
g <sub>F</sub>	Forward Transconductance	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 3 A V <sub>DS</sub> = -10 V, I <sub>D</sub> = -2.3 A	Q1/Q4 Q2/Q3	- -	6 6	- -	S

## DYNAMIC CHARACTERISTICS

C <sub>iss</sub>	Input Capacitance	Q1/Q4 V <sub>DD</sub> = 50 V, V <sub>GS</sub> = 0 V, f = 1.0 MHz Q2/Q3 V <sub>DS</sub> = -40 V, V <sub>GS</sub> = 0 V, f = 1.0 MHz	Q1/Q4 Q2/Q3	- -	158 639	210 850	pF
C <sub>oss</sub>	Output Capacitance		Q1/Q4 Q2/Q3	- -	41 46	55 65	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		Q1/Q4 Q2/Q3	- -	2.6 24	5 40	pF

ELECTRICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$  unless otherwise noted) (continued)

Symbol	Parameter	Test Condition	Type	Min	Typ	Max	Unit	
<b>SWITCHING CHARACTERISTICS (Note 2)</b>								
$t_{d(on)}$	Turn-On Delay Time	Q1/Q4 $V_{DD} = 50\text{ V}$ , $I_D = 3\text{ A}$ , $V_{GS} = 10\text{ V}$ , $R_{GEN} = 6\Omega$	Q1/Q4 Q2/Q3	— —	3.8 4.7	10 10	ns	
$t_r$	Rise Time	Q2/Q3	Q1/Q4 Q2/Q3	— —	1.3 2.8	10 10	ns	
$t_{d(off)}$	Turn-Off Delay Time	Q2/Q3 $V_{DD} = -40\text{ V}$ , $I_D = -2.3\text{ A}$ , $V_{GS} = -10\text{ V}$ , $R_{GEN} = 6\Omega$	Q1/Q4 Q2/Q3	— —	7.5 22	15 35	ns	
$t_f$	Fall Time	Q2/Q3	Q1/Q4 Q2/Q3	— —	1.9 2.7	10 10	ns	
$Q_g$	Total Gate Charge	$V_{GS} = 0\text{ V}$ to $10\text{ V}$ $V_{GS} = 0\text{ V}$ to $-10\text{ V}$	Q1/Q4: $V_{DD} = 50\text{ V}$ , $I_D = 3\text{ A}$	Q1/Q4 Q2/Q3	— —	2.9 13	5 19	nC
$Q_g$	Total Gate Charge	$V_{GS} = 0\text{ V}$ to $5\text{ V}$ $V_{GS} = 0\text{ V}$ to $-4.5\text{ V}$	Q2/Q3 $V_{DD} = -40\text{ V}$ , $I_D = -2.3\text{ A}$	Q1/Q4 Q2/Q3	— —	1.6 6.4	3 10	nC
$Q_{gs}$	Gate-Source Gate Charge		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	

## DRAIN-SOURCE DIODE CHARACTERISTICS

$V_{SD}$	Source to Drine Diode Forward Voltage	$V_{GS} = 0\text{ V}$ , $I_S = 3\text{ A}$ $V_{GS} = 0\text{ V}$ , $I_S = -2.3\text{ A}$	(Note 2) (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	

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

1.  $R_{\theta JA}$  is determined with the device mounted on a  $1\text{ in}^2$  pad 2 oz copper pad on a  $1.5 \times 1.5$  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  $1\text{ in}^2$  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  $< 300\text{ }\mu\text{s}$ , Duty Cycle  $< 2.0\%$

## TYPICAL CHARACTERISTICS (N-CHANNEL) ( $T_J = 25^\circ\text{C}$ unless otherwise noted)

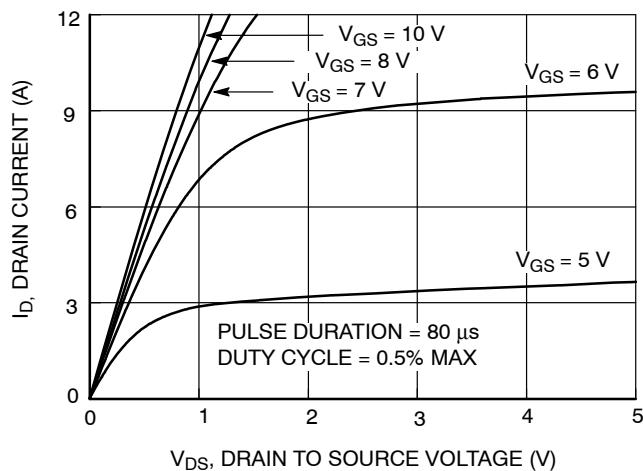


Figure 1. On Region Characteristics

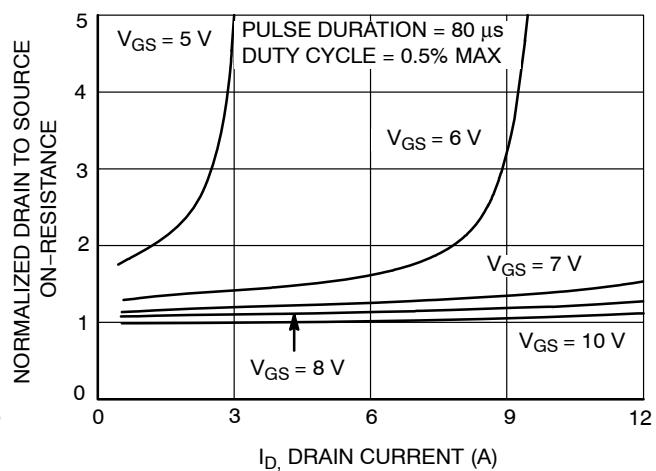


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

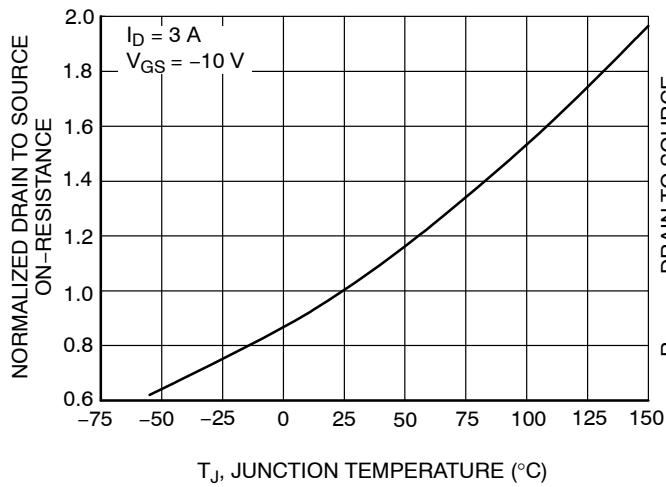


Figure 3. Normalized On Resistance vs Junction Temperature

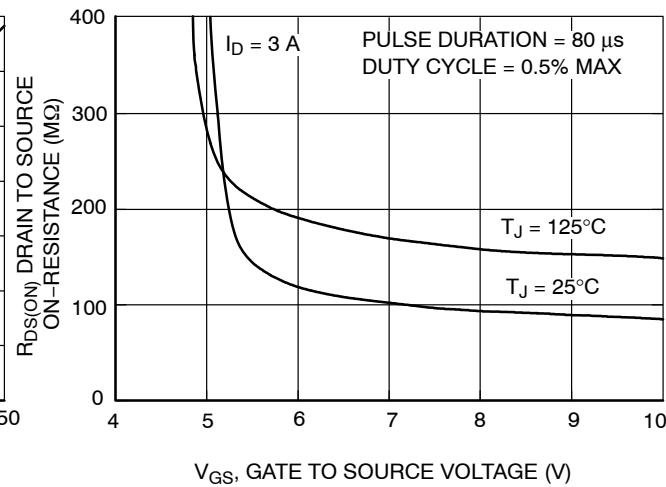


Figure 4. On-Resistance vs Gate to Source Voltage

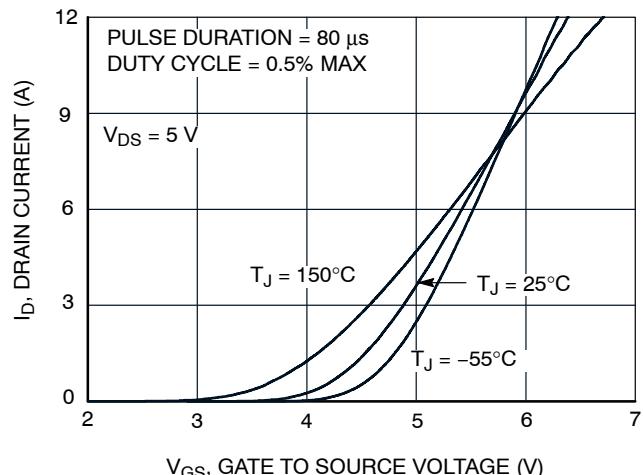


Figure 5. Transfer Characteristics

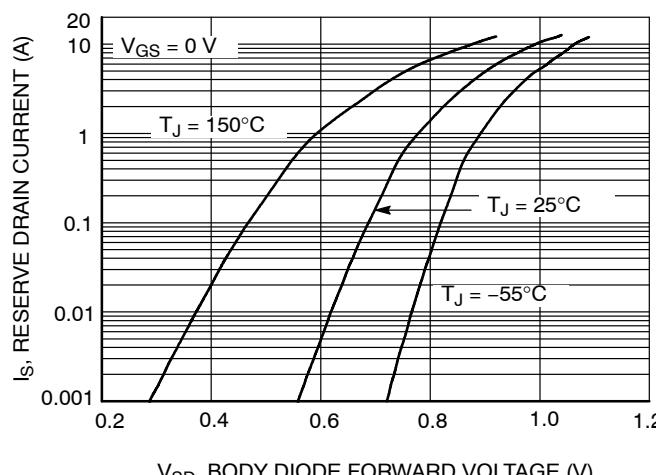


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

## TYPICAL CHARACTERISTICS (N-CHANNEL) ( $T_J = 25^\circ\text{C}$ unless otherwise noted) (continued)

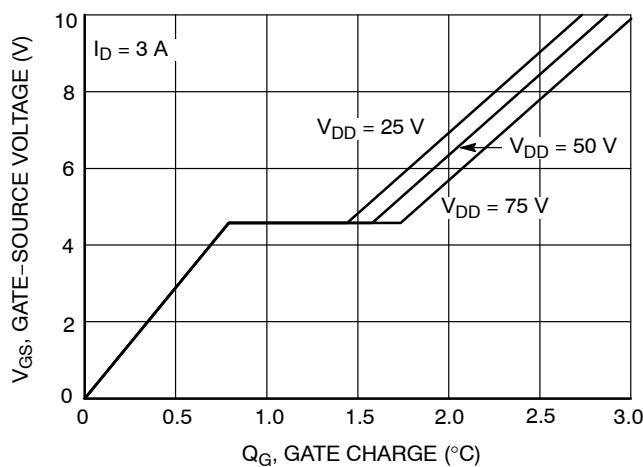


Figure 7. Gate Charge Characteristics

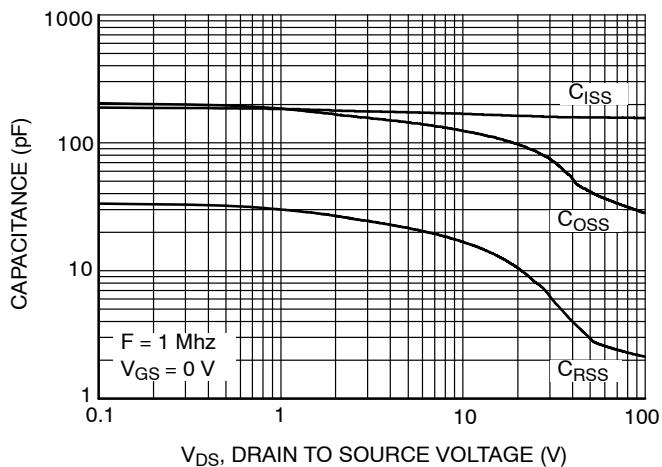


Figure 8. Capacitance vs Drain to Source Voltage

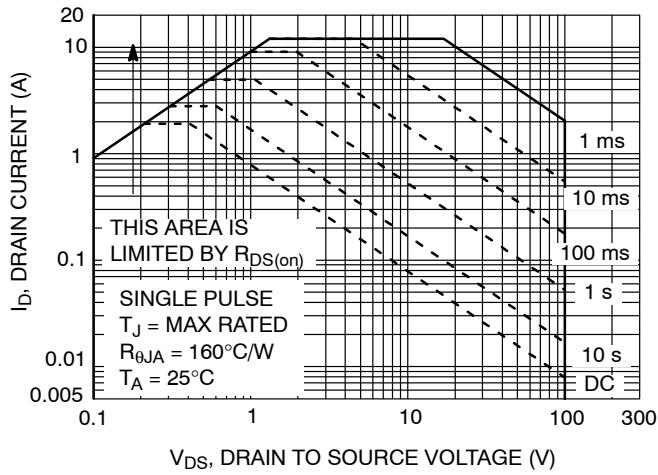


Figure 9. Forward Bias Safe Operating Area

## TYPICAL CHARACTERISTICS (P-CHANNEL) ( $T_J = 25^\circ\text{C}$ unless otherwise noted)

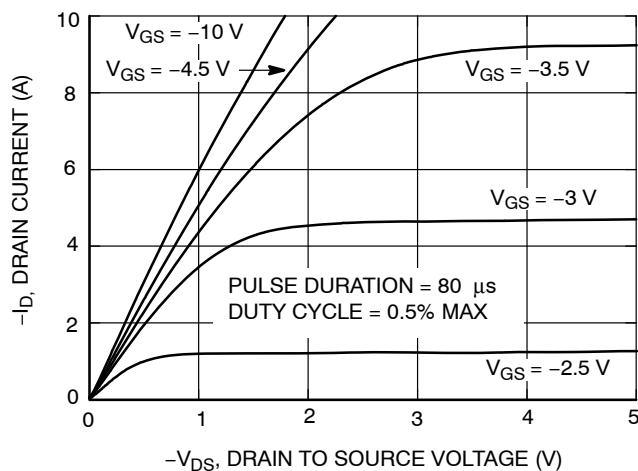


Figure 10. On-Region Characteristics

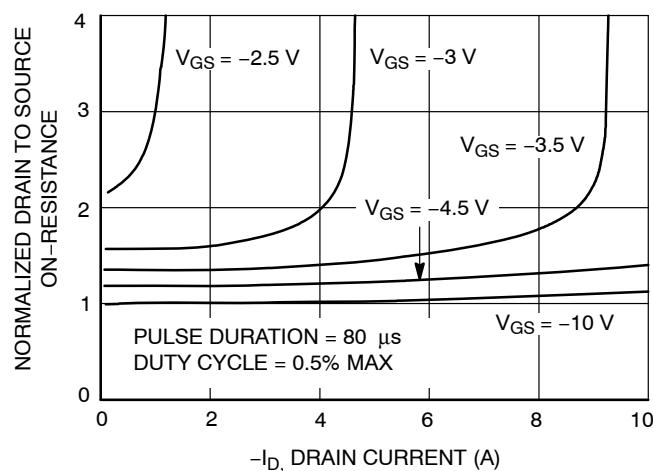


Figure 11. Normalized On-Resistance vs Drain Current and Gate Voltage

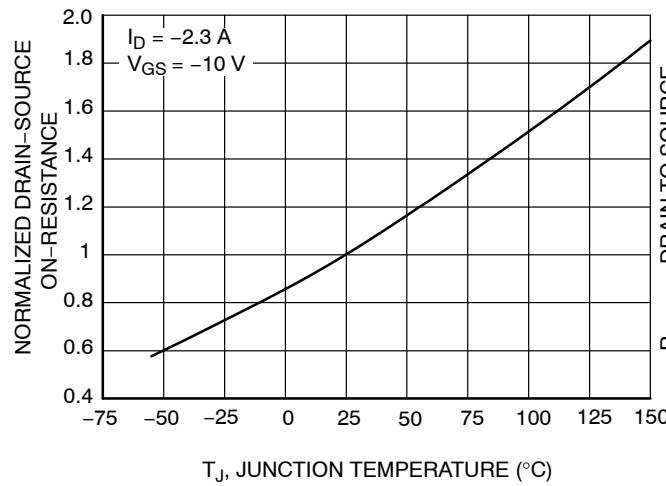


Figure 12. Normalized On-Resistance vs Junction Temperature

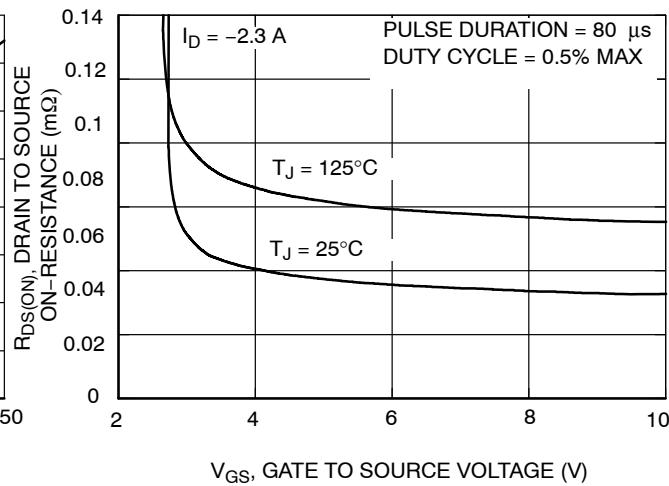


Figure 13. On-Resistance vs Gate to Source Voltage

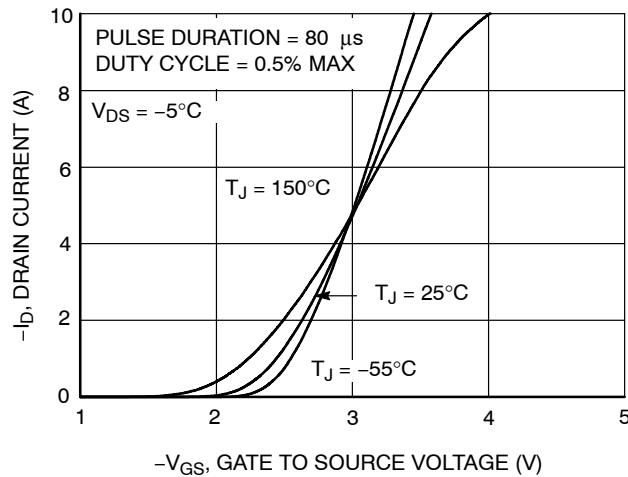


Figure 14. Transfer Characteristics

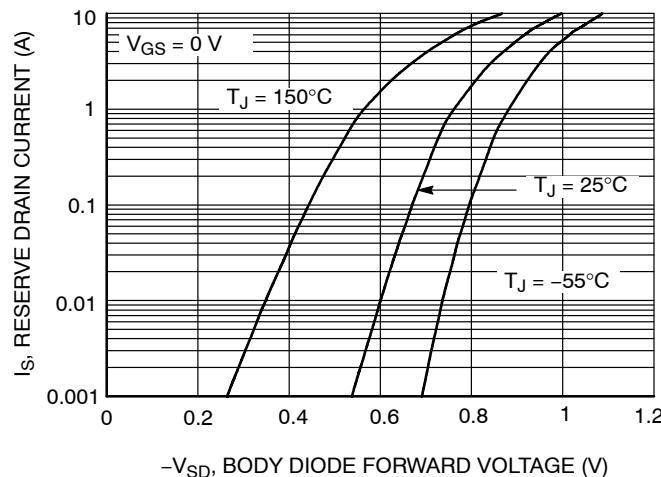


Figure 15. Source to Drain Diode Forward Voltage vs Source Current

## TYPICAL CHARACTERISTICS (Q1 P-CHANNEL) ( $T_J = 25^\circ\text{C}$ unless otherwise noted) (continued)

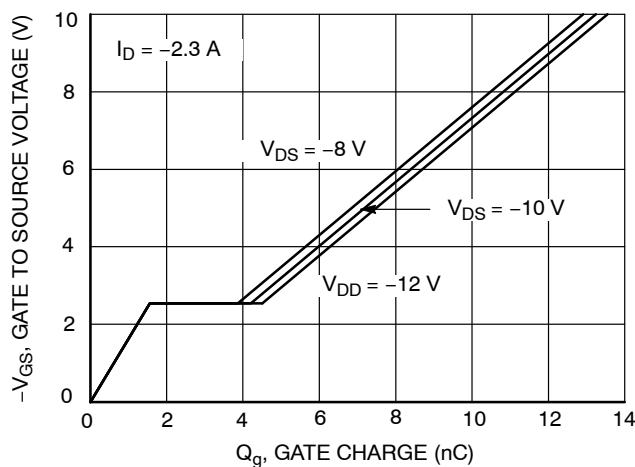


Figure 16. Gate Charge Characteristics

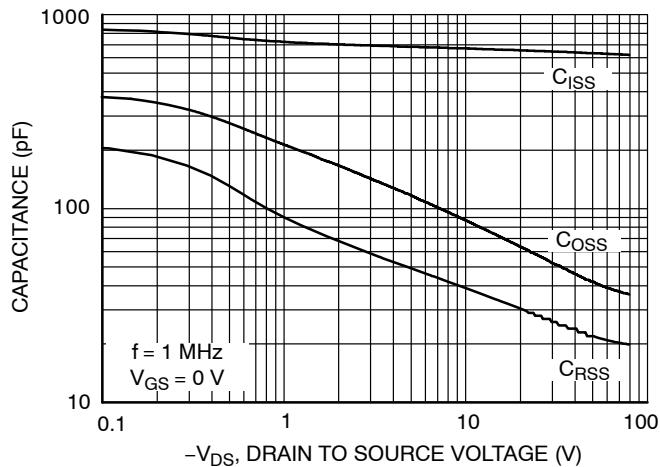


Figure 17. Capacitance vs Drain to Source Voltage

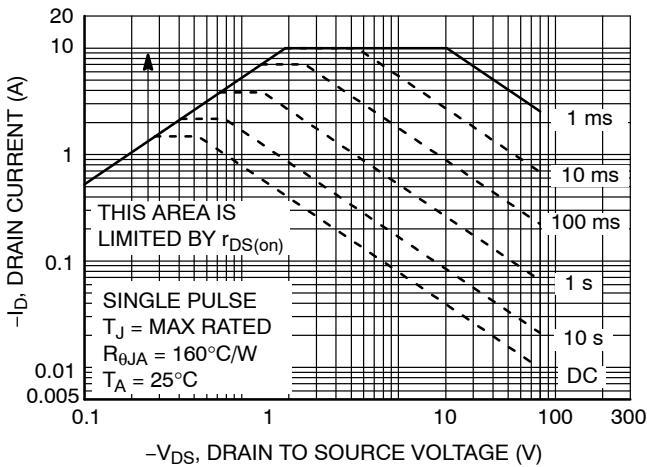


Figure 18. Forward Bias Safe Operating Area

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## TYPICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$ unless otherwise noted)

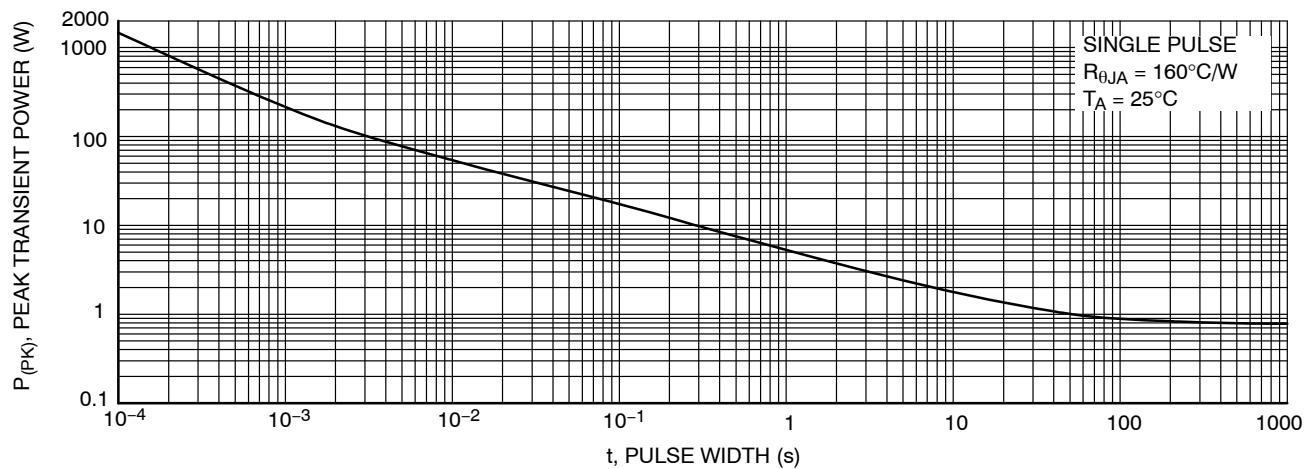


Figure 19. Single Pulse Maximum Power Dissipation

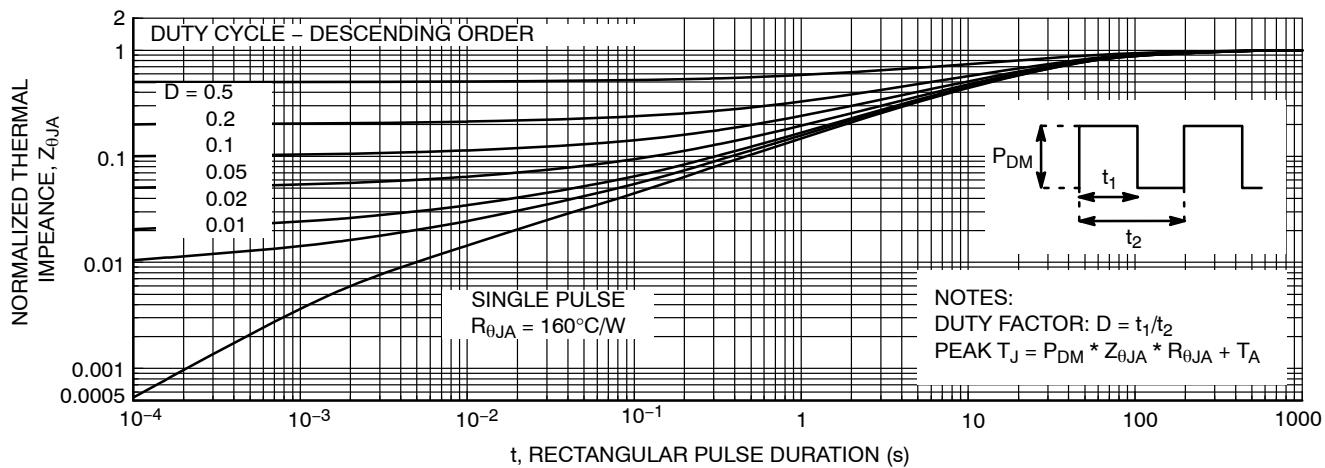


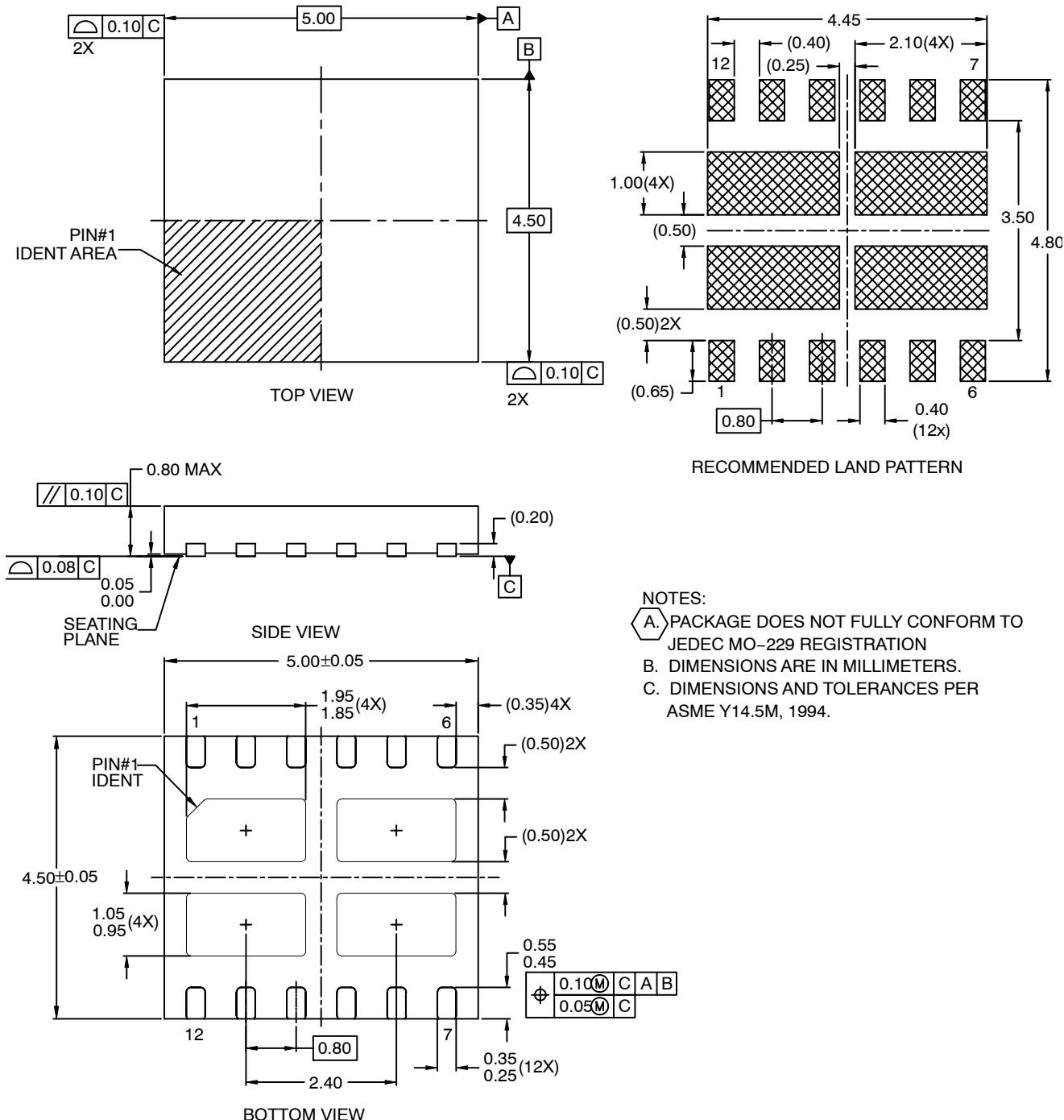
Figure 20. Junction-to-Ambient Transient Thermal Response Curve

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