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

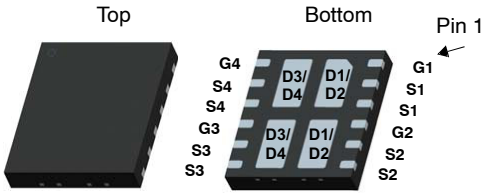
This quad mosfet solution provides ten−fold improvement in power dissipation over diode bridge.

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

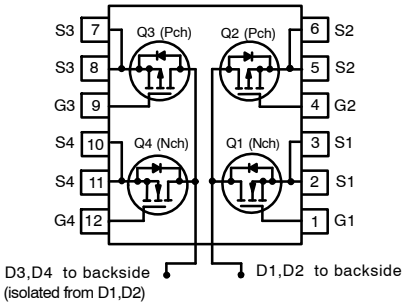


WDFN12 5x4.5, 0.8P
CASE 511CS

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†
FDMQ8203	MLP 4.5x5 (Pb−Free, Halide Free)	3000 / Tape & Reel

†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.

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C unless otherwise noted)

Symbol	Parameter		Q1/Q4	Q2/Q3	Unit
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

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

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

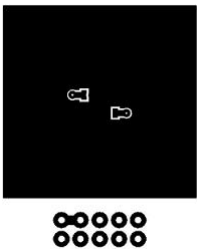
Symbol	Parameter	Test Condition	Type	Min	Typ	Max	Unit
OFF CHARACTERISTICS							
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250 μA, V_{GS} = 0 I_D = −250 μA, V_{GS} = 0	Q1/Q4 Q2/Q3	100 −80	− −	− −	V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, Referenced 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
I_{GSS}	Gate to Source Leakage Current	V_{GS} = ±20 V, V_{DS} = 0 V	Q1/Q4 Q2/Q3	− −	− −	±100 ±100	nA
ON CHARACTERISTICS (Note 2)							
$V_{GS(th)}$	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
$R_{DS(on)}$	Static Drain−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_{DD} = 50 V, V_{GS} = 0 V, f = 1.0 MHz	Q1/Q4 Q2/Q3	− −	158 639	210 850	pF
C_{oss}	Output Capacitance	Q2/Q3 V_{DS} = −40 V, V_{GS} = 0 V, f = 1.0 MHz	Q1/Q4 Q2/Q3	− −	41 46	55 65	pF
C_{rss}	Reverse Transfer Capacitance		Q1/Q4 Q2/Q3	− −	2.6 24	5 40	pF

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted) (continued)

Symbol	Parameter	Test Condition		Type	Min	Typ	Max	Unit
SWITCHING CHARACTERISTICS (Note 2)								
$t_{d(on)}$	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	V_{GS} = 0 V to 10 V V_{GS} = 0 V to −10 V	Q1/Q4: V_{DD} = 50 V, I_D = 3 A Q2/Q3 V_{DD} = −40 V, I_D = −2.3 A	Q1/Q4 Q2/Q3	– –	2.9 13	5 19	nC
Q_g	Total Gate Charge	V_{GS} = 0 V to 5 V V_{GS} = 0 V to −4.5 V		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 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 Q2/Q3: I_F = −2.3 A, di/dt = 100 A/μs		Q1/Q4 Q2/Q3	– –	32 26	52 42	ns
Q_{rr}	Reverse Recovery Charge			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 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)

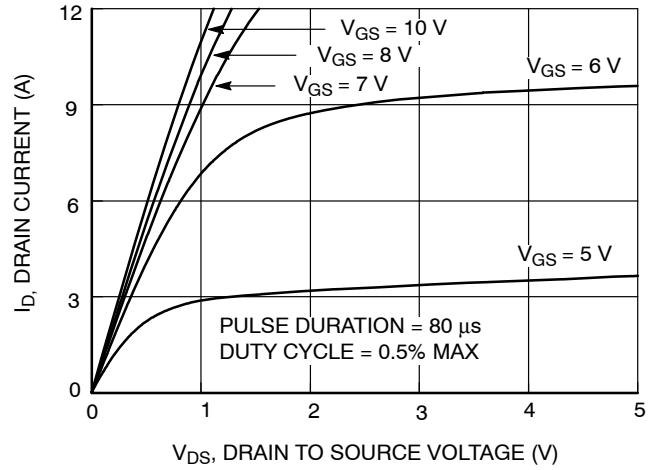


Figure 1. On Region Characteristics

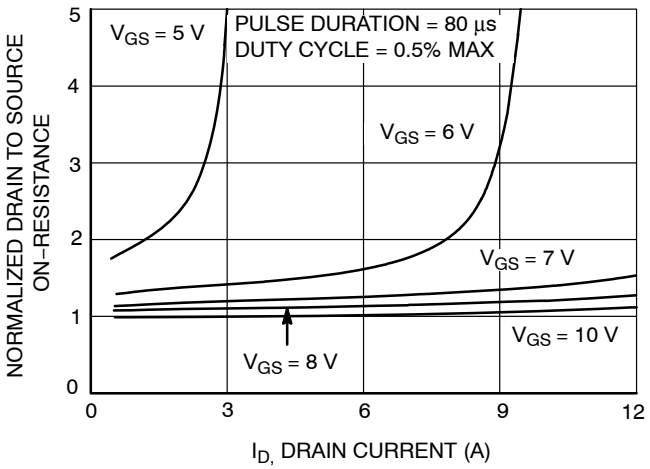


Figure 2. Normalized On−Resistance vs Drain Current and Gate Voltage

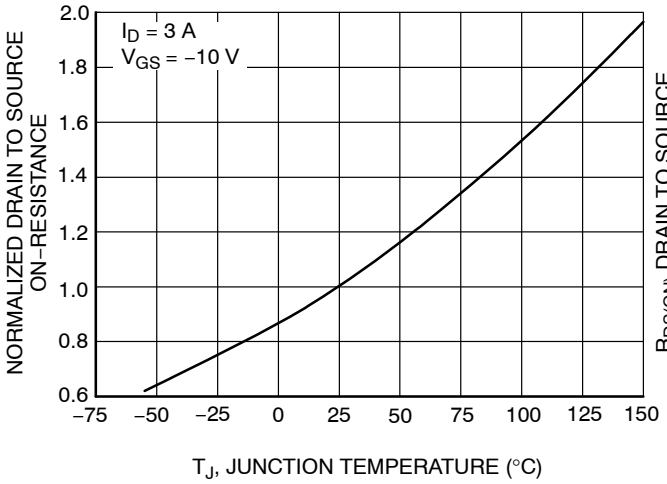


Figure 3. Normalized On Resistance vs Junction Temperature

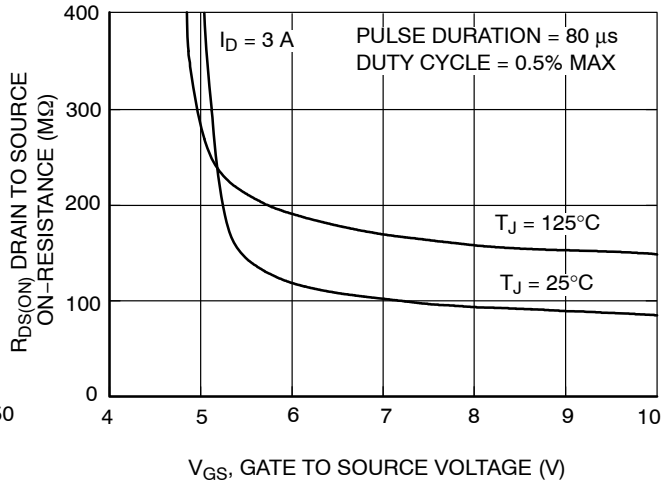


Figure 4. On−Resistance vs Gate to Source Voltage

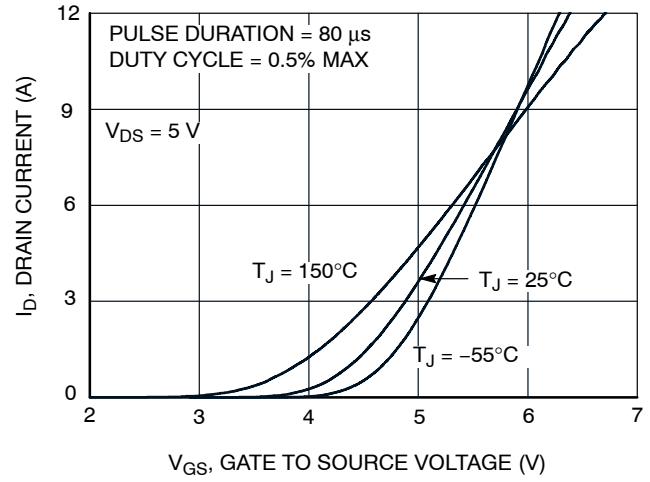


Figure 5. Transfer Characteristics

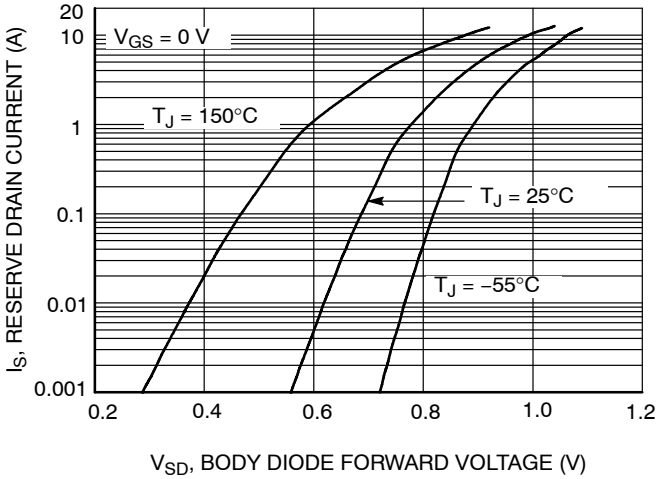


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

TYPICAL CHARACTERISTICS (N−CHANNEL) (T_J = 25°C unless otherwise noted) (continued)

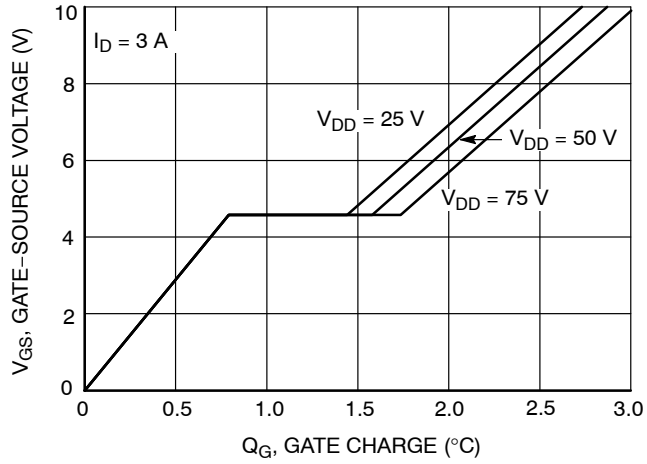


Figure 7. Gate Charge Characteristics

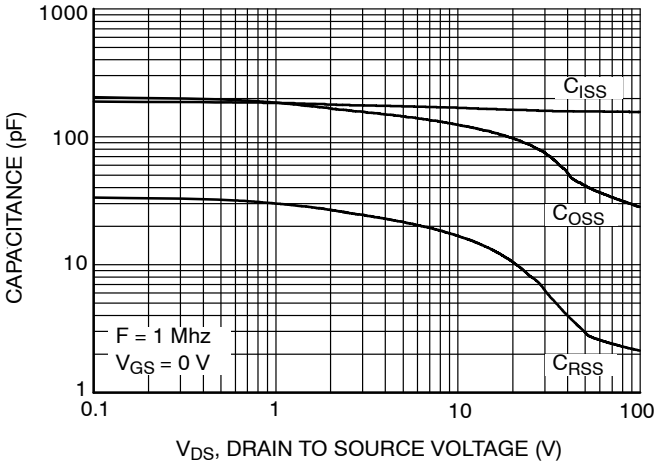


Figure 8. Capacitance vs Drain to Source Voltage

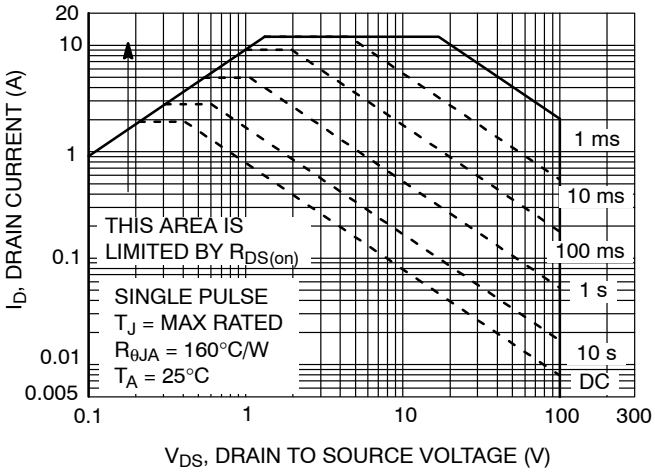


Figure 9. Forward Bias Safe Operating Area

TYPICAL CHARACTERISTICS (P−CHANNEL) (T_J = 25°C unless otherwise noted)

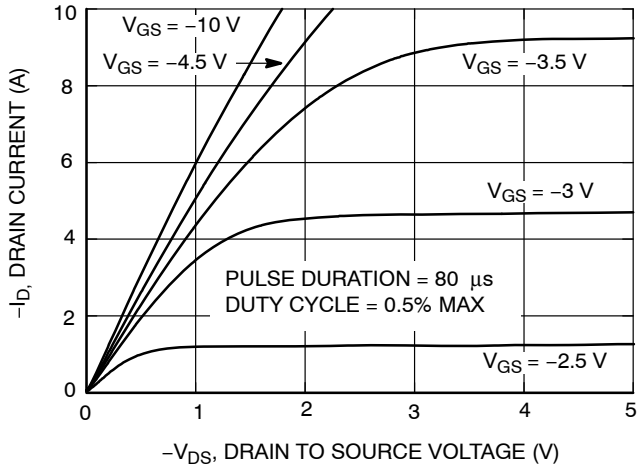


Figure 10. On−Region Characteristics

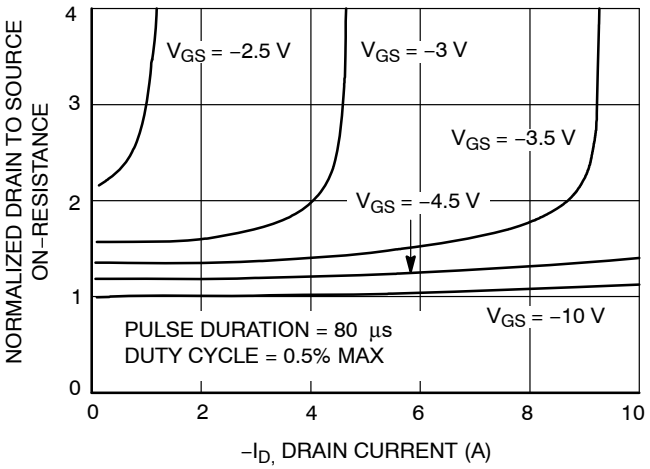


Figure 11. Normalized On−Resistance vs Drain Current and Gate Voltage

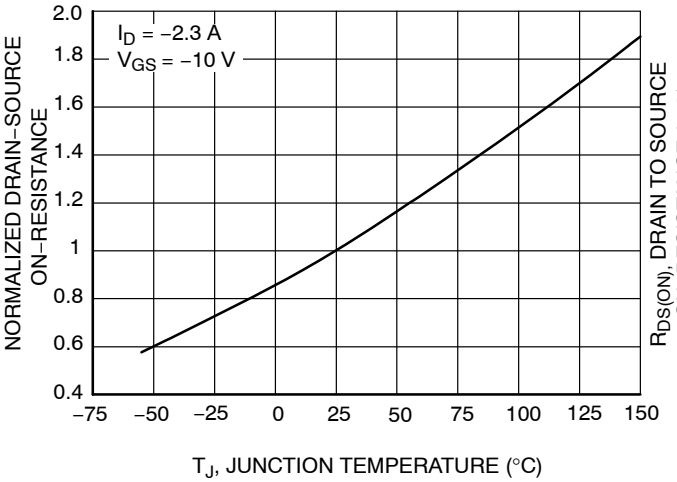


Figure 12. Normalized On−Resistance vs Junction Temperature

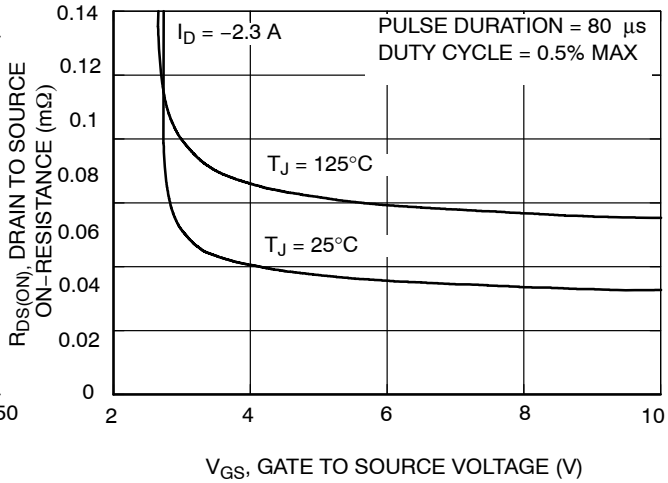


Figure 13. On−Resistance vs Gate to Source Voltage

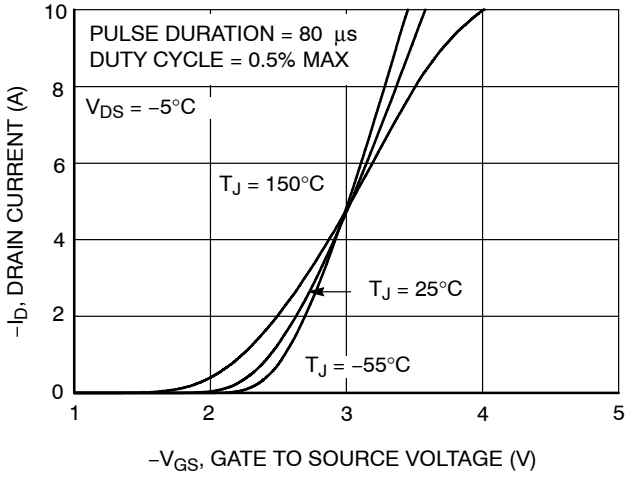


Figure 14. Transfer Characteristics

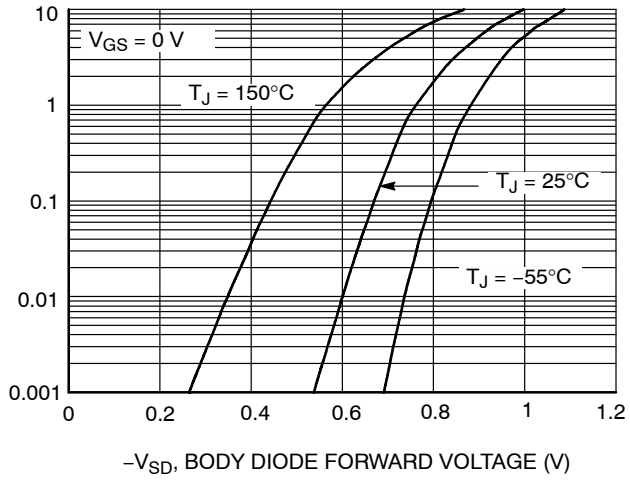


Figure 15. Source to Drain Diode Forward Voltage vs Source Current

TYPICAL CHARACTERISTICS (Q1 P−CHANNEL) (T_J = 25°C unless otherwise noted) (continued)

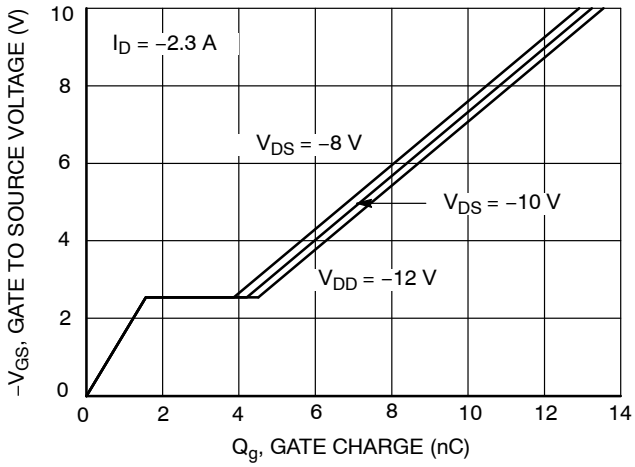


Figure 16. Gate Charge Characteristics

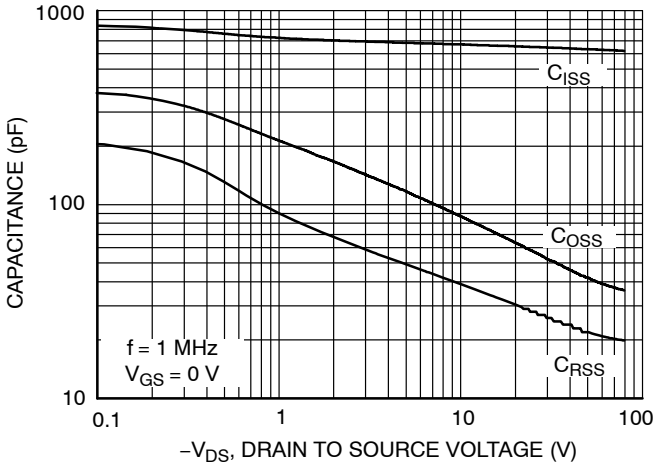


Figure 17. Capacitance vs Drain to Source Voltage

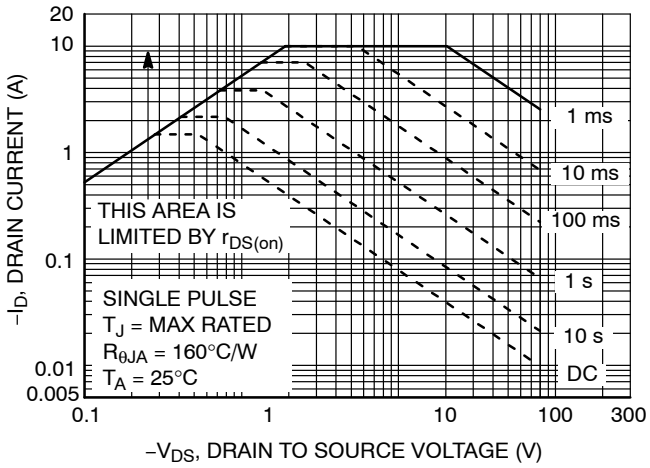


Figure 18. Forward Bias Safe Operating Area

TYPICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

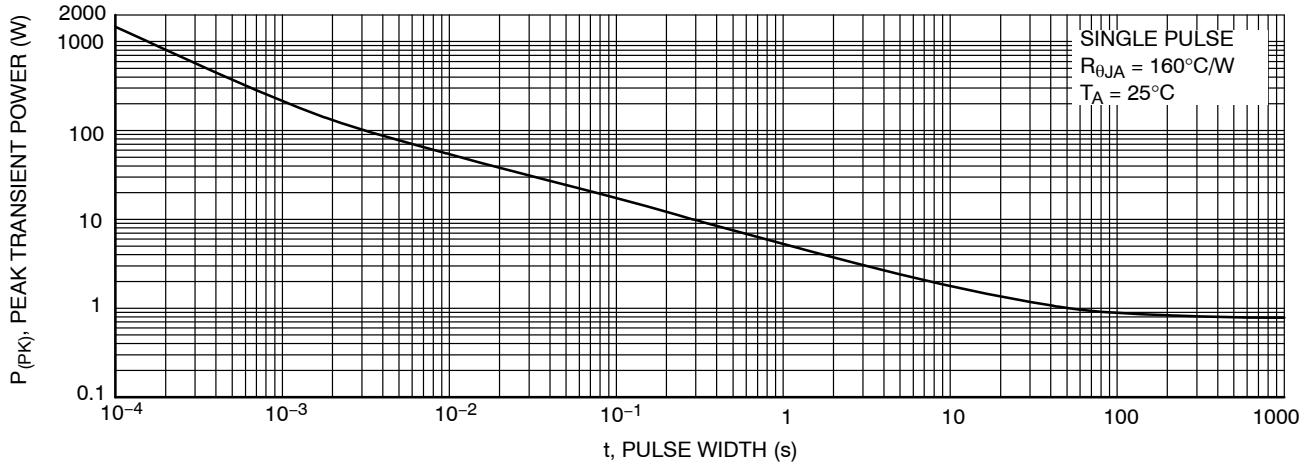


Figure 19. Single Pulse Maximum Power Dissipation

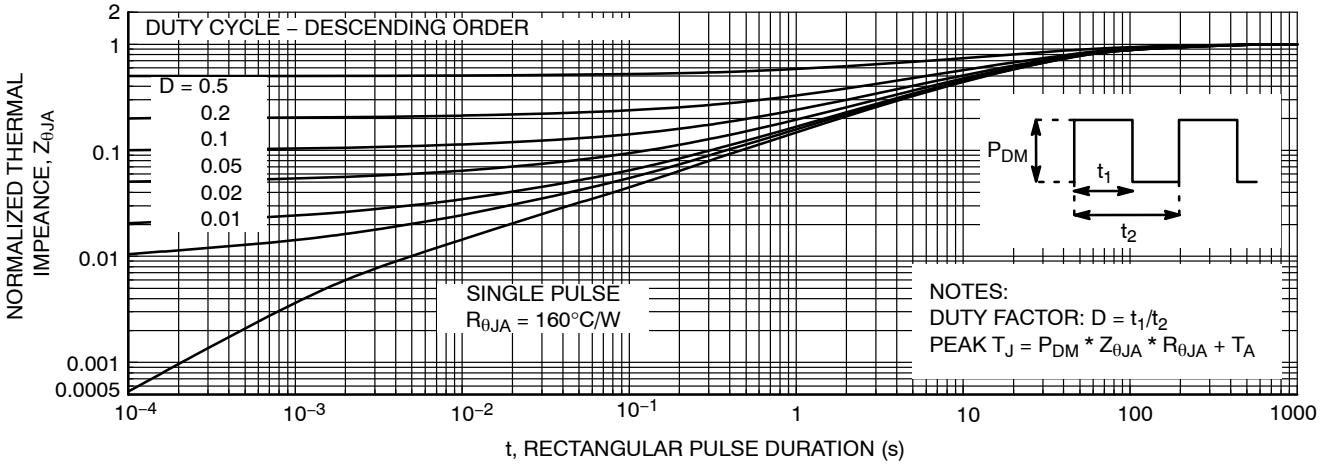


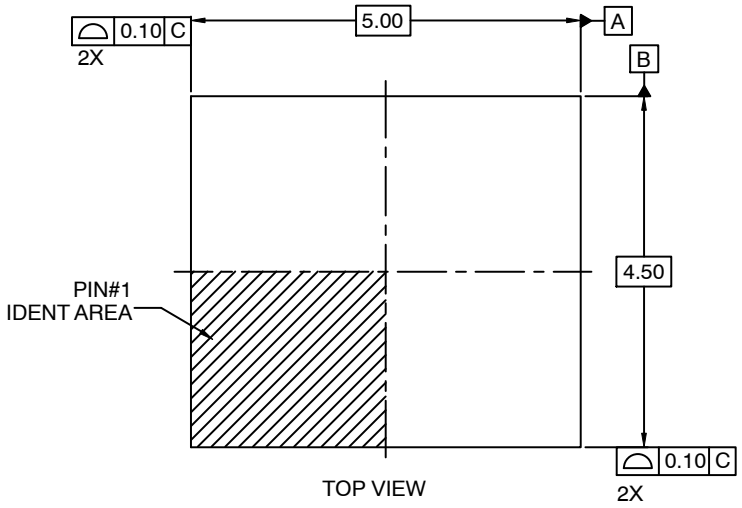
Figure 20. Junction−to−Ambient Transient Thermal Response Curve

MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

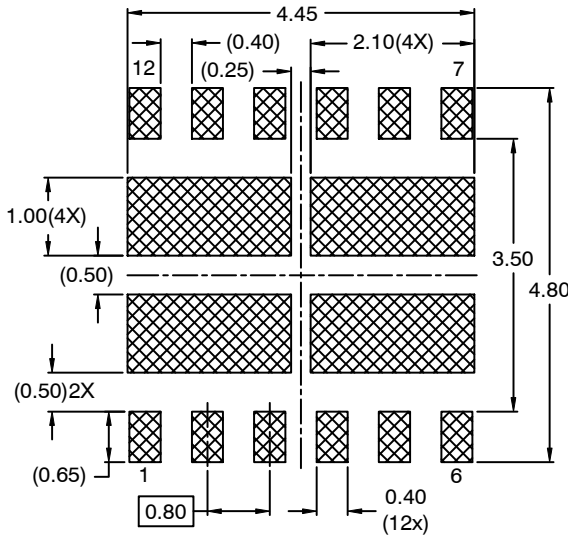
ON Semiconductor®

WDFN12 5x4.5, 0.8P
CASE 511CS
ISSUE O

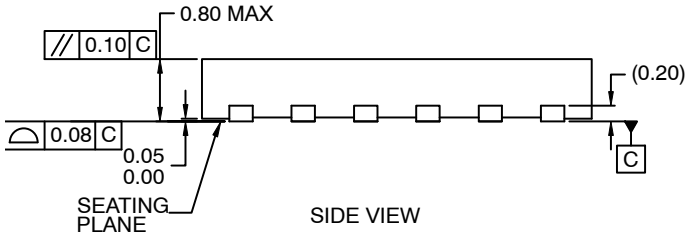
DATE 31 AUG 2016



TOP VIEW

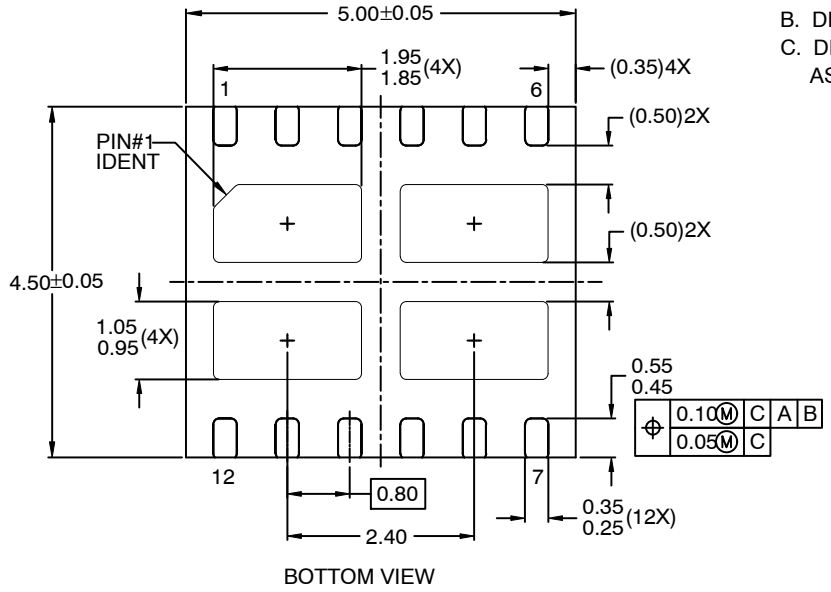


RECOMMENDED LAND PATTERN



SIDE VIEW

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.



BOTTOM VIEW

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DESCRIPTION:	**WDFN12 5X4.5, 0.8P**		**PAGE 1 OF 1**

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