

# MOSFET – Dual, N-Channel, POWERTRENCH<sup>®</sup>

**30 V, 9.5 mΩ and 20 mΩ**

## FDMC8200

### General Description

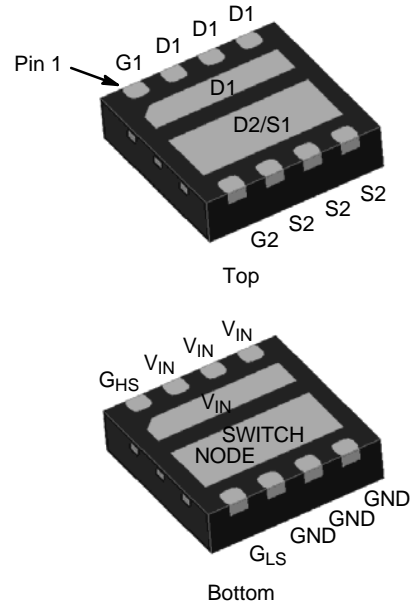
This device includes two specialized N-Channel MOSFETs in a dual Power33 (3 mm x 3 mm MLP) package. The switch node has been internally connected to enable easy placement and routing of synchronous buck converters. The control MOSFET (Q1) and synchronous MOSFET (Q2) have been designed to provide optimal power efficiency.

### Features

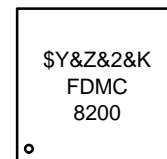
- Q1: N-Channel
  - ♦ Max  $r_{DS(on)}$  = 20 mΩ at  $V_{GS} = 10$  V,  $I_D = 6$  A
  - ♦ Max  $r_{DS(on)}$  = 32 mΩ at  $V_{GS} = 4.5$  V,  $I_D = 5$  A
- Q2: N-Channel
  - ♦ Max  $r_{DS(on)}$  = 9.5 mΩ at  $V_{GS} = 10$  V,  $I_D = 9$  A
  - ♦ Max  $r_{DS(on)}$  = 13.5 mΩ at  $V_{GS} = 4.5$  V,  $I_D = 7$  A
- This Device is Pb-Free, Halide Free and is RoHS Compliant

### Applications

- Mobile Computing
- Mobile Internet Devices
- General Purpose Point of Load

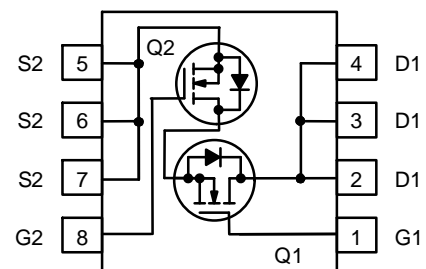


### MARKING DIAGRAM



\$Y = Logo  
&Z = Assembly Plant Code  
&2 = 2-Digit Date Code  
&K = 2-Digits Lot Run Traceability Code  
FDMC8200 = Device Code

### PIN ASSIGNMENT



### ORDERING INFORMATION

See detailed ordering and shipping information on page 9 of this data sheet.

# FDMC8200

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

Symbol	Parameter	Q1	Q2	Unit
V <sub>DS</sub>	Drain to Source Voltage	30	30	V
V <sub>GS</sub>	Gate to Source Voltage (Note 3)	±20	±20	V
I <sub>D</sub>	Drain Current – Continuous (Package Limited) T <sub>C</sub> = 25°C	18	18	A
	– Continuous (Silicon Limited) T <sub>C</sub> = 25°C	23	45	
	– Continuous T <sub>A</sub> = 25°C	8 (Note 1a)	12 (Note 1b)	
	– Pulsed	40	40	
P <sub>D</sub>	Power Dissipation T <sub>A</sub> = 25°C	1.9 (Note 1a)	2.2 (Note 1b)	W
	Power Dissipation T <sub>A</sub> = 25°C	0.7 (Note 1c)	0.9 (Note 1d)	
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 (T<sub>C</sub> = 25°C, unless otherwise noted)

Symbol	Parameter	Q1	Q2	Unit
R <sub>θJA</sub>	Thermal Resistance, Junction to Ambient	65 (Note 1a)	55 (Note 1b)	°C/W
R <sub>θJA</sub>	Thermal Resistance, Junction to Ambient	180 (Note 1c)	145 (Note 1d)	
R <sub>θJC</sub>	Thermal Resistance, Junction to Case	7.5	4	

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

Symbol	Parameter	Test Conditions	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 V I <sub>D</sub> = 250 μA, V <sub>GS</sub> = 0 V	Q1 Q2	30 30	– –	– –	V
$\frac{\Delta V_{DSS}}{\Delta T_J}$	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 Q2	– –	14 14	– –	mV/°C
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = 24 V, V <sub>GS</sub> = 0 V V <sub>DS</sub> = 24 V, V <sub>GS</sub> = 0 V	Q1 Q2	– –	– –	1 1	μA
I <sub>GSS</sub>	Gate to Source Leakage Current	V <sub>GS</sub> = ±20 V, V <sub>GS</sub> = 0 V	Q1 Q2	– –	– –	100 100	nA

### ON CHARACTERISTICS

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 Q2	1.0 1.0	2.3 2.3	3.0 3.0	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	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 Q2	– –	–5 –6	– –	mV/°C
r <sub>DS(on)</sub>	Static Drain to Source On Resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 6 A V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 5 A V <sub>GS</sub> = 10 V, I <sub>D</sub> = 6 A, T <sub>J</sub> = 125°C	Q1	– – –	16 24 22	20 32 28	mΩ
		V <sub>GS</sub> = 10 V, I <sub>D</sub> = 9 A V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 7 A V <sub>GS</sub> = 10 V, I <sub>D</sub> = 9 A, T <sub>J</sub> = 125°C	Q2	– – –	7.3 9.5 10	9.5 13.5 13	
g <sub>FS</sub>	Forward Transconductance	V <sub>DD</sub> = 5 V, I <sub>D</sub> = 6 A V <sub>DD</sub> = 5 V, I <sub>D</sub> = 9 A	Q1 Q2	– –	29 56	– –	S

### DYNAMIC CHARACTERISTICS

C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 15 V, V <sub>GS</sub> = 0 V, f = 1 MHz	Q1 Q2	– –	495 1180	660 1570	pF
C <sub>oss</sub>	Output Capacitance		Q1 Q2	– –	145 330	195 440	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		Q1 Q2	– –	20 30	30 45	pF

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

Symbol	Parameter	Test Conditions	Type	Min	Typ	Max	Unit
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### DYNAMIC CHARACTERISTICS

$R_g$	Gate Resistance	$f = 1\text{ MHz}$	Q1 Q2	– –	1.4 1.4	– –	$\Omega$
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### SWITCHING CHARACTERISTICS

$t_{d(on)}$	Turn-On Delay Time	Q1 $V_{DD} = 15\text{ V}$ , $I_D = 1\text{ A}$ , $V_{GS} = 10\text{ V}$ , $R_{GEN} = 6\ \Omega$ Q2 $V_{DD} = 15\text{ V}$ , $I_D = 1\text{ A}$ , $V_{GS} = 10\text{ V}$ , $R_{GEN} = 6\ \Omega$	Q1 Q2	– –	11 13	20 23	ns
$t_r$	Rise Time		Q1 Q2	– –	3.1 4	10 10	ns
$t_{d(off)}$	Turn-Off Delay Time		Q1 Q2	– –	35 38	56 60	ns
$t_f$	Fall Time		Q1 Q2	– –	1.3 6	10 12	ns
$Q_{g(TOT)}$	Total Gate Charge	$V_{GS} = 0\text{ V to }10\text{ V}$ Q1: $V_{DD} = 15\text{ V}$ , $I_D = 6\text{ A}$ Q2: $V_{DD} = 15\text{ V}$ , $I_D = 9\text{ A}$	Q1 Q2	– –	7.3 16	10 22	nC
$Q_{g(TOT)}$	Total Gate Charge	$V_{GS} = 0\text{ V to }4.5\text{ V}$ Q1: $V_{DD} = 15\text{ V}$ , $I_D = 6\text{ A}$ Q2: $V_{DD} = 15\text{ V}$ , $I_D = 9\text{ A}$	Q1 Q2	– –	3.1 7	4.3 10	nC
$Q_{gs}$	Gate to Source Charge	Q1: $V_{DD} = 15\text{ V}$ , $I_D = 6\text{ A}$	Q1 Q2	– –	1.8 4.1	– –	nC
$Q_{gd}$	Gate to Drain "Miller" Charge	Q2: $V_{DD} = 15\text{ V}$ , $I_D = 9\text{ A}$	Q1 Q2	– –	1 1.5	– –	nC

### DRAIN-SOURCE CHARACTERISTICS

$V_{SD}$	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}$ , $I_S = 6\text{ A}$ (Note 2) $V_{GS} = 0\text{ V}$ , $I_S = 9\text{ A}$ (Note 2)	Q1 Q2	– –	0.8 0.8	1.2 1.2	V
$t_{rr}$	Reverse Recovery Time	Q1 $I_F = 6\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{S}$	Q1 Q2	– –	13 21	24 34	ns
$Q_{rr}$	Reverse Recovery Charge	Q2 $I_F = 9\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{S}$	Q1 Q2	– –	2.3 5.6	10 12	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.

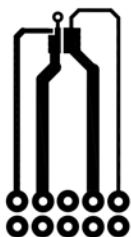
- $R_{\theta JA}$  is determined with the device mounted on a 1 in<sup>2</sup> pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material.  $R_{\theta JC}$  is guaranteed by design while  $R_{\theta CA}$  is determined by the user's board design.



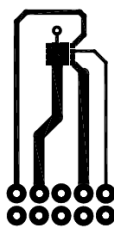
- 65°C/W when mounted on a 1 in<sup>2</sup> pad of 2 oz copper



- 55°C/W when mounted on a 1 in<sup>2</sup> pad of 2 oz copper



- 180°C/W when mounted on a minimum pad of 2 oz copper



- 145°C/W when mounted on a minimum pad of 2 oz copper

- Pulse Test: Pulse Width < 300  $\mu\text{s}$ , Duty cycle < 2.0%.
- As an N-ch device, the negative  $V_{gs}$  rating is for low duty cycle pulse occurrence only. No continuous rating is implied.

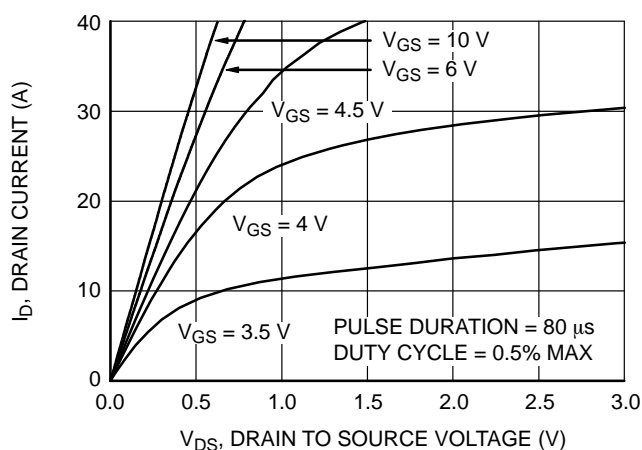
TYPICAL CHARACTERISTICS (Q1 N-CHANNEL) ( $T_J = 25^\circ\text{C}$ , unless otherwise noted)

Figure 1. On Region Characteristics

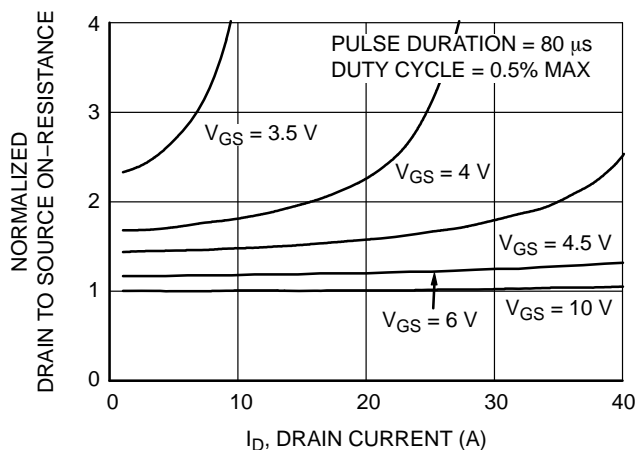


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

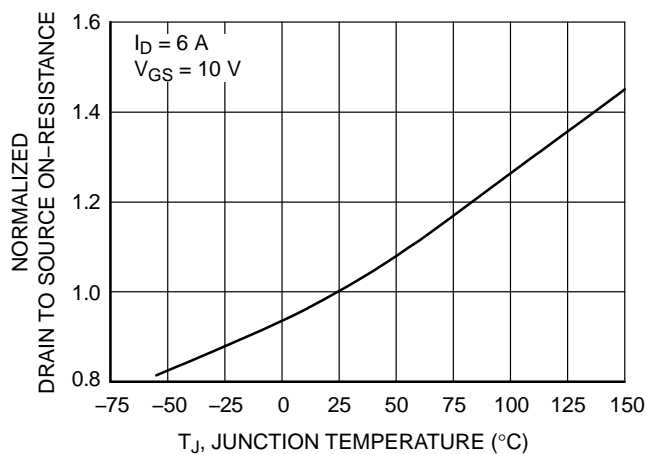


Figure 3. Normalized On Resistance vs. Junction Temperature

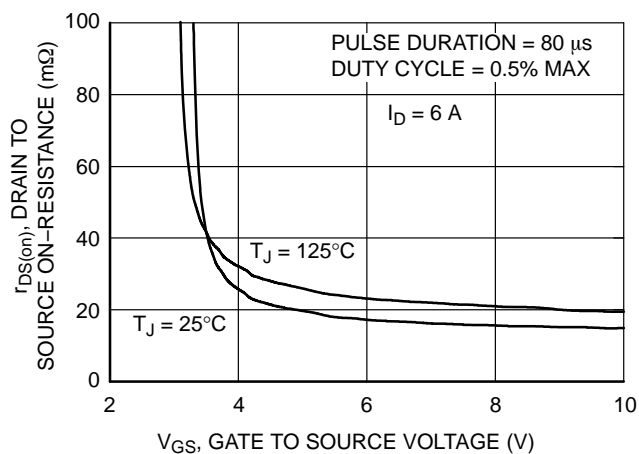


Figure 4. On-Resistance vs. Gate to Source Voltage

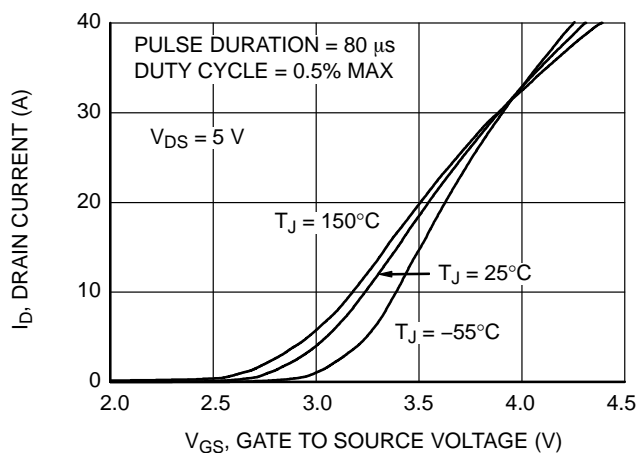


Figure 5. Transfer Characteristics

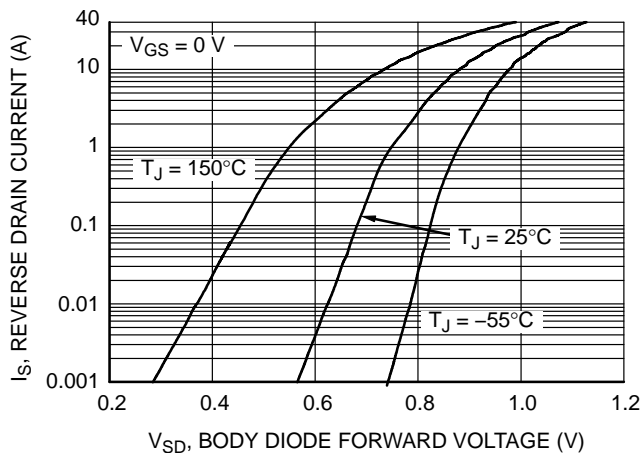
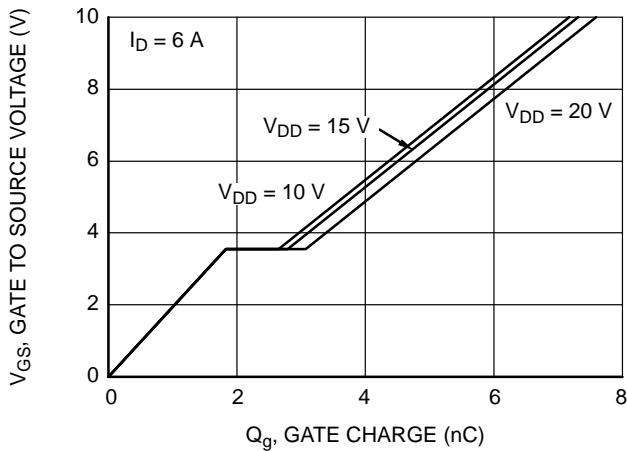
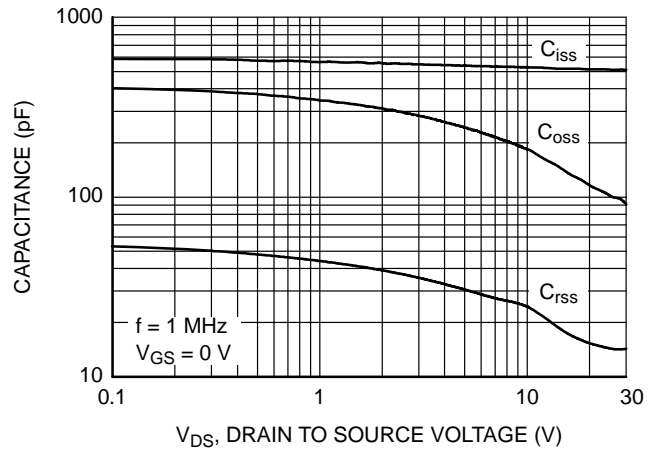


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

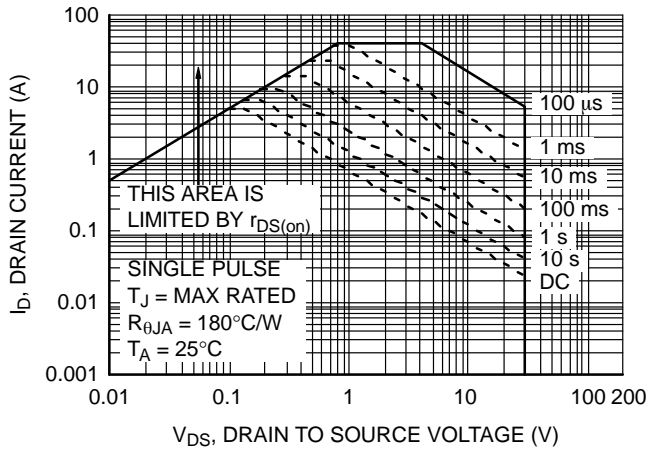
**TYPICAL CHARACTERISTICS (Q1 N-CHANNEL)** ( $T_J = 25^\circ\text{C}$ , unless otherwise noted) (continued)



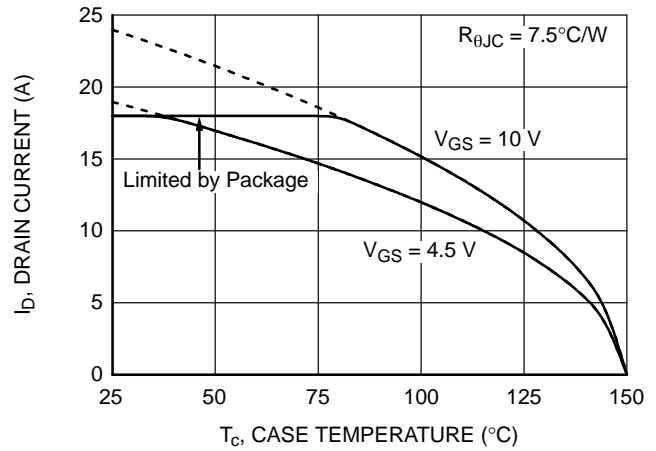
**Figure 7. Gate Charge Characteristics**



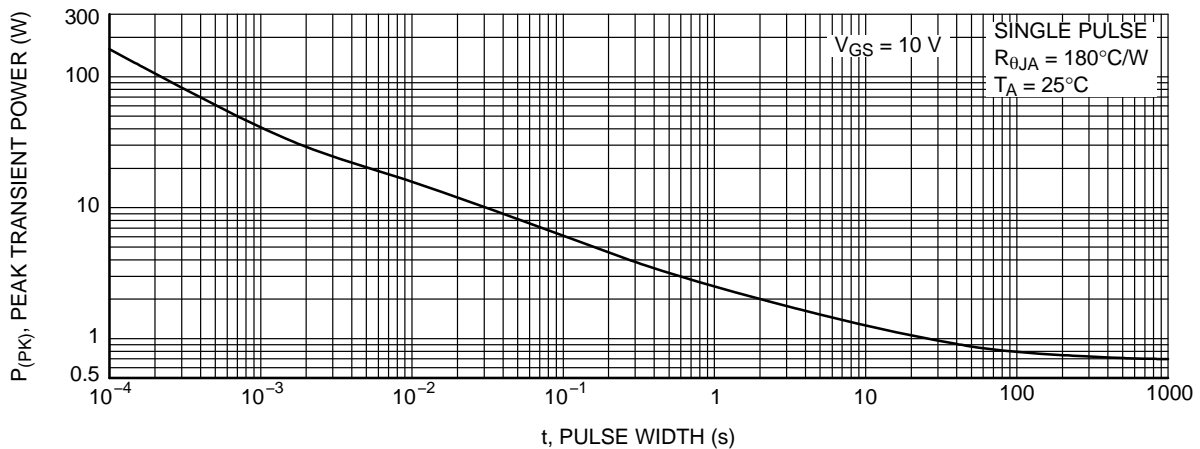
**Figure 8. Capacitance vs. Drain to Source Voltage**



**Figure 9. Forward Bias Safe Operating Area**



**Figure 10. Maximum Continuous Drain Current vs. Case Temperature**



**Figure 11. Single Pulse Maximum Power Dissipation**

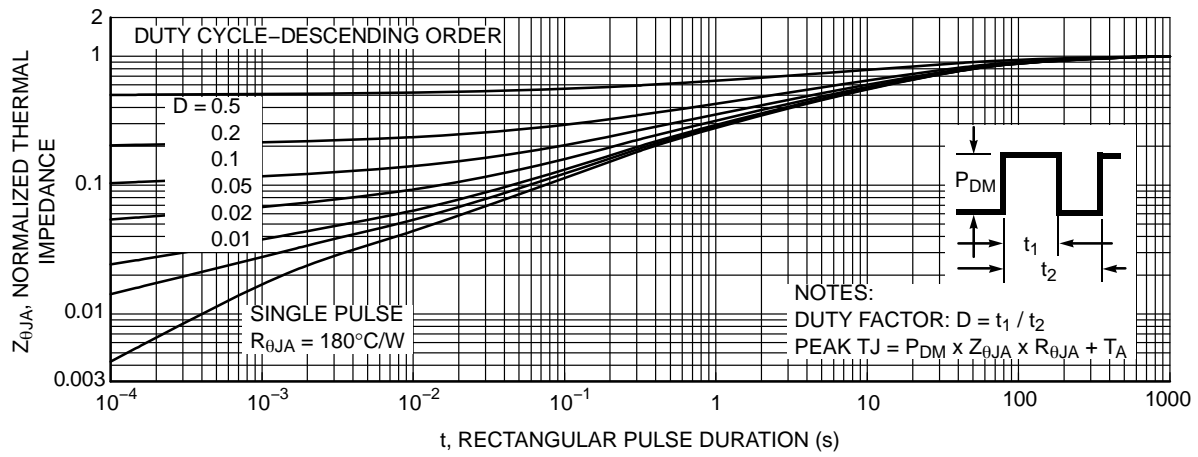
TYPICAL CHARACTERISTICS (Q1 N-CHANNEL) ( $T_J = 25^\circ\text{C}$ , unless otherwise noted) (continued)

Figure 12. Junction-to-Ambient Transient Thermal Response Curve

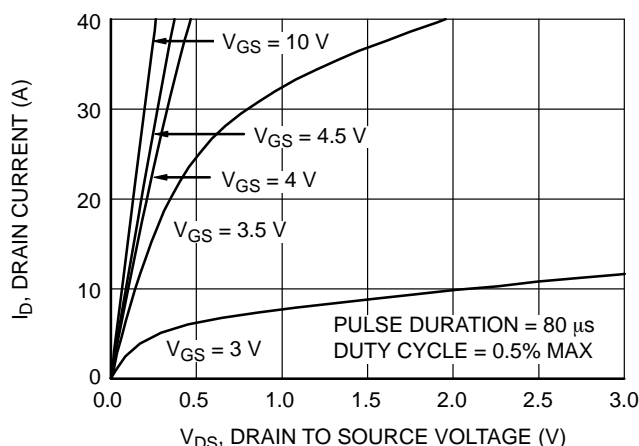
TYPICAL CHARACTERISTICS (Q2 N-CHANNEL) ( $T_J = 25^\circ\text{C}$ , unless otherwise noted)

Figure 13. On-Region Characteristics

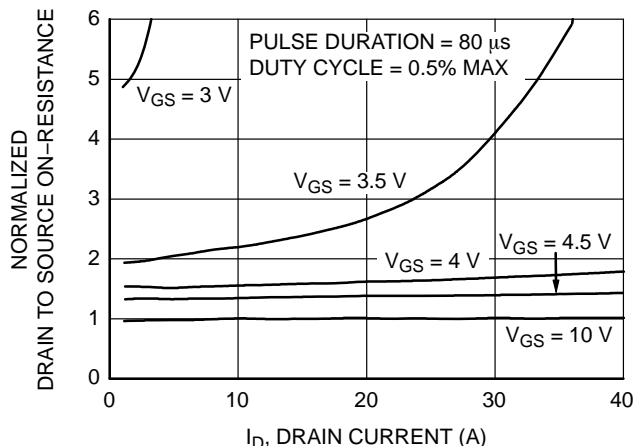


Figure 14. Normalized On-Resistance vs. Drain Current and Gate Voltage

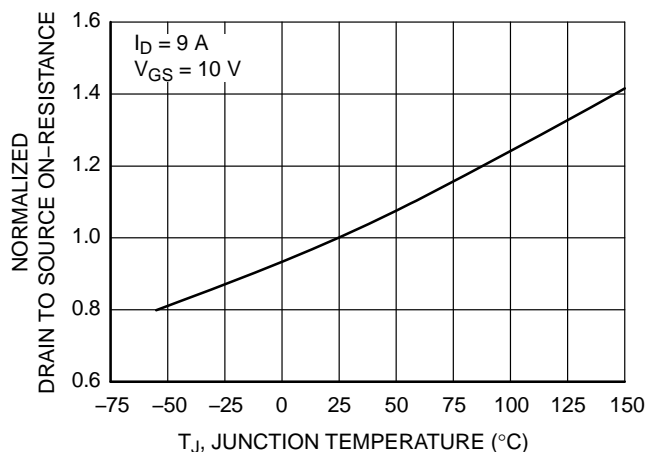


Figure 15. Normalized On Resistance vs. Junction Temperature

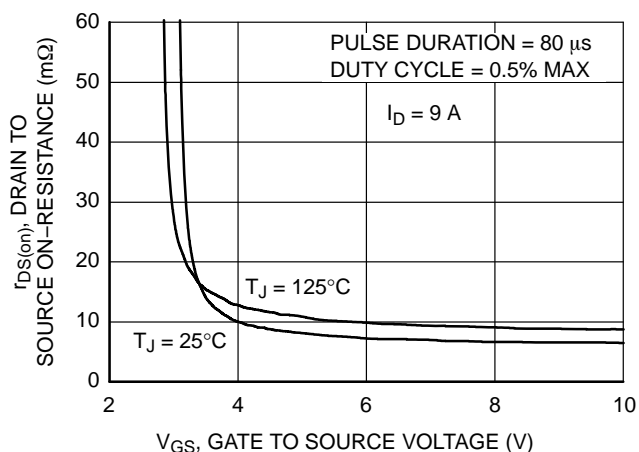


Figure 16. On-Resistance vs. Gate to Source Voltage

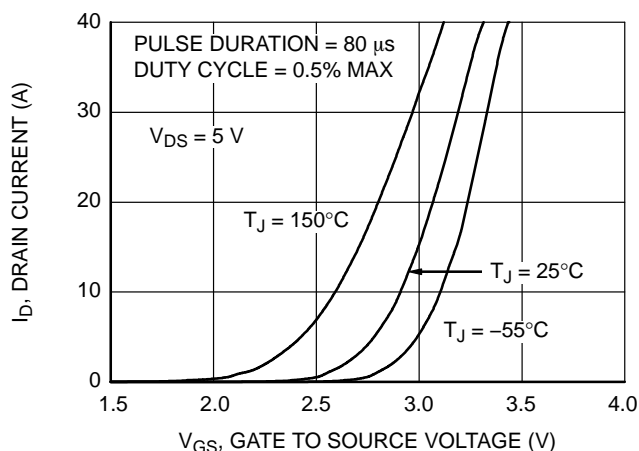


Figure 17. Transfer Characteristics

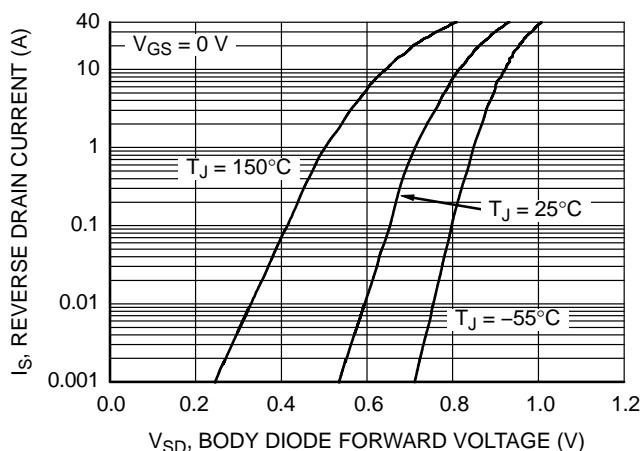


Figure 18. Source to Drain Diode Forward Voltage vs. Source Current

TYPICAL CHARACTERISTICS (Q2 N-CHANNEL) ( $T_J = 25^\circ\text{C}$ , unless otherwise noted) (continued)

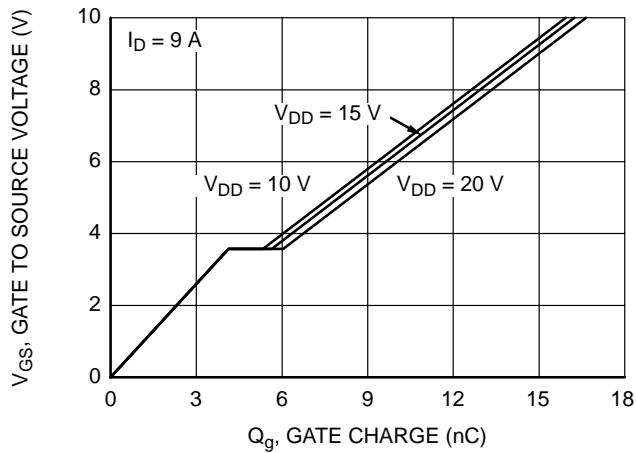


Figure 19. Gate Charge Characteristics

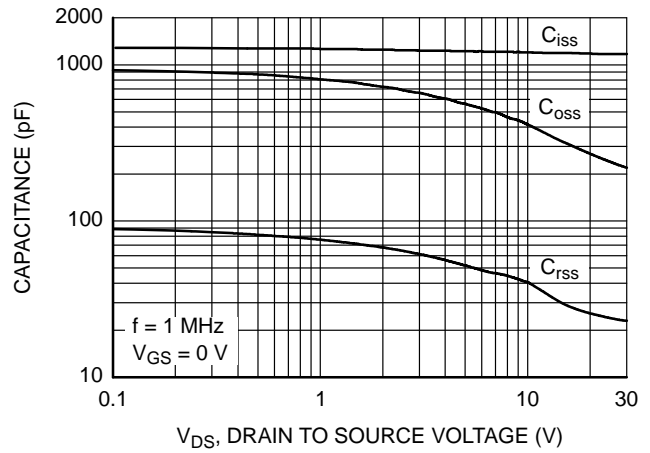


Figure 20. Capacitance vs. Drain to Source Voltage

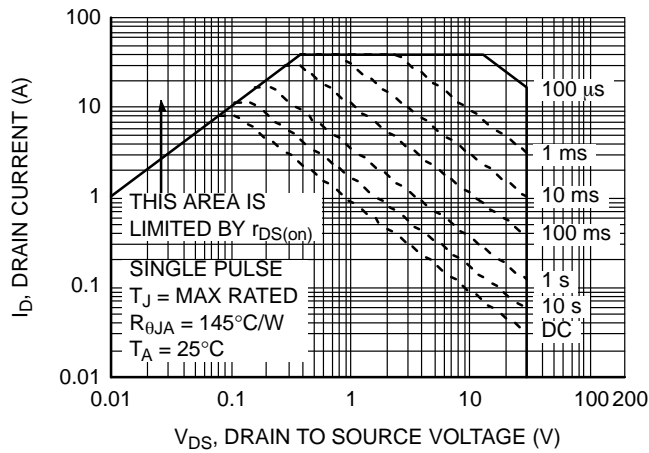


Figure 21. Forward Bias Safe Operating Area

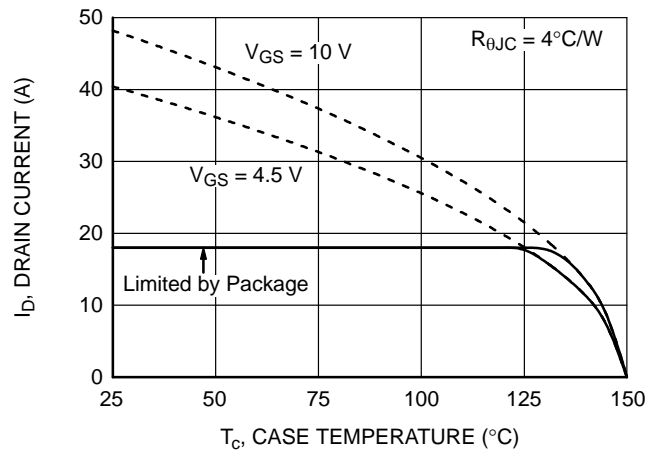


Figure 22. Maximum Continuous Drain Current vs. Case Temperature

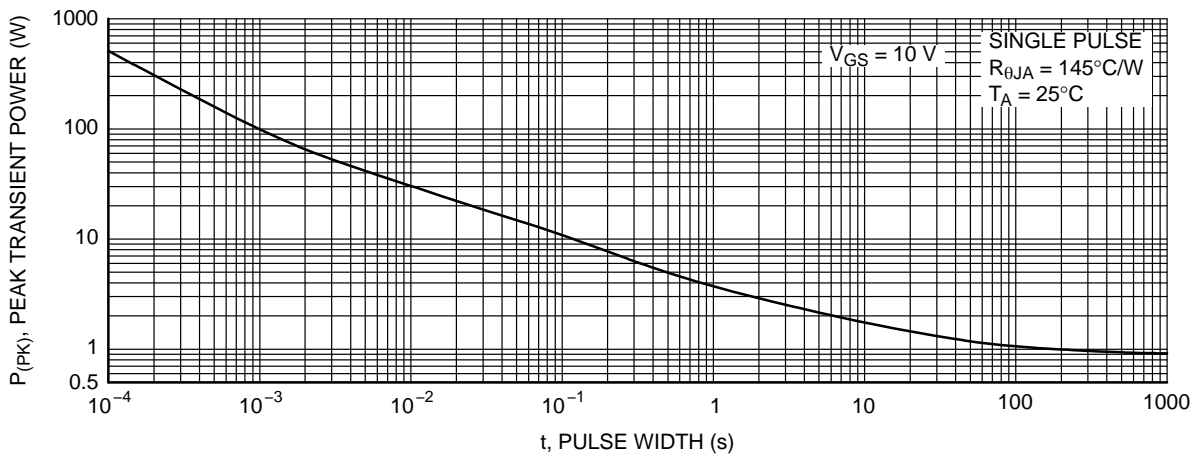


Figure 23. Single Pulse Maximum Power Dissipation



# FDMC8200

## TYPICAL CHARACTERISTICS (Q2 N-CHANNEL) ( $T_J = 25^\circ\text{C}$ , unless otherwise noted) (continued)

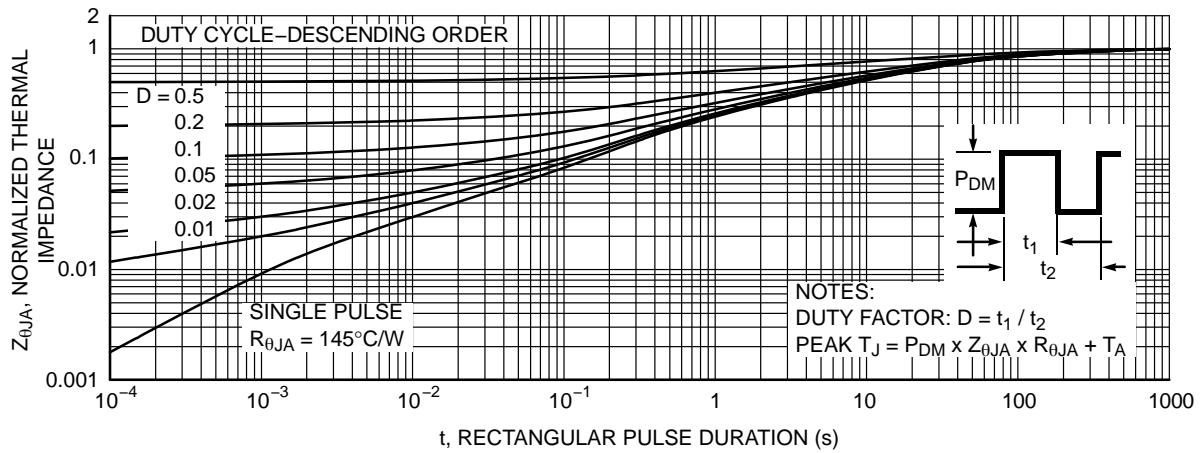


Figure 24. Junction-to-Ambient Transient Thermal Response Curve

### PACKAGE MARKING AND ORDERING INFORMATION

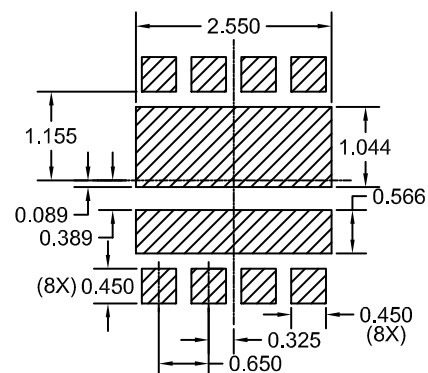
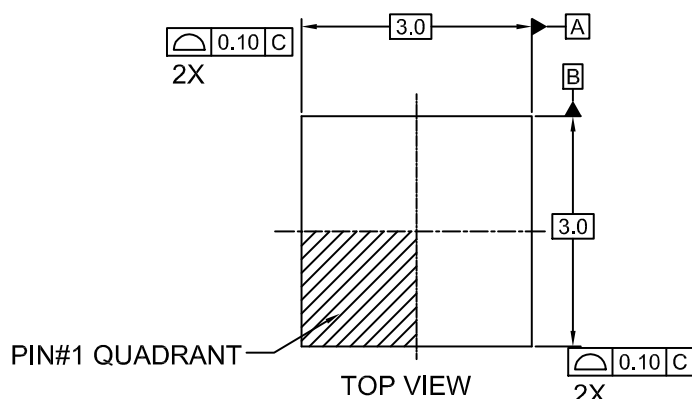
Device	Device Marking	Package	Reel Size	Tape Width	Shipping <sup>†</sup>
FDMC8200	FDMC8200	WDFN8 3x3, 0.65P (Power 33) (Pb-Free, Halide Free)	13"	12 mm	3000 / Tape & Reel

<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.

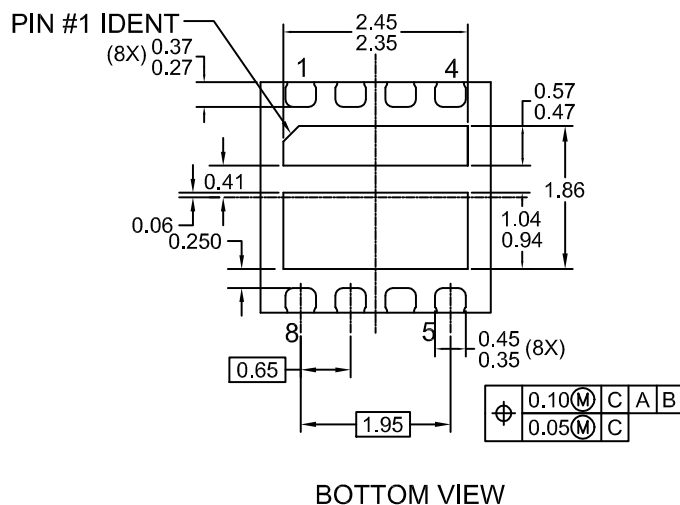
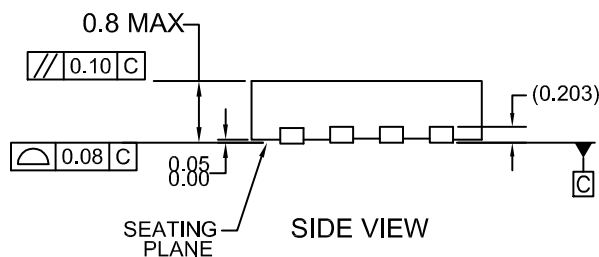
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**WDFN8 3x3, 0.65P**  
CASE 511DE  
ISSUE O

DATE 31 AUG 2016



## RECOMMENDED LAND PATTERN



NOTES:

- A. DOES NOT CONFORM TO JEDEC  
REGISTRATION MO-229
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS AND TOLERANCES PER  
ASME Y14.5M, 1994

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