

March 2011

FDMC8200S

Dual N-Channel PowerTrench[®] MOSFET 30 V, 10 m Ω , 20 m Ω

Features

Q1: N-Channel

■ Max $r_{DS(on)} = 20 \text{ m}\Omega$ at $V_{GS} = 10 \text{ V}$, $I_D = 6 \text{ A}$

■ Max $r_{DS(on)} = 32 \text{ m}\Omega$ at $V_{GS} = 4.5 \text{ V}$, $I_D = 5 \text{ A}$

Q2: N-Channel

■ Max $r_{DS(on)} = 10 \text{ m}\Omega$ at $V_{GS} = 10 \text{ V}$, $I_D = 8.5 \text{ A}$

■ Max $r_{DS(on)} = 13.5 \text{ m}\Omega$ at $V_{GS} = 4.5 \text{ V}$, $I_D = 7.2 \text{ A}$

■ RoHS Compliant

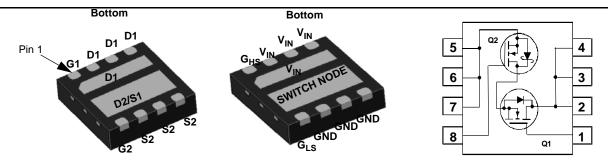


General Description

This device includes two specialized N-Channel MOSFETs in a due power33(3mm X 3mm 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.

Applications

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



Power33

MOSFET Maximum Ratings $T_C = 25^{\circ}C$ unless otherwise noted

Symbol	Parameter			Q1	Q2	Units
V _{DS}	Drain to Source Voltage			30	30	V
V _{GS}	Gate to Source Voltage		(Note 4)	±20	±20	V
I _D	Drain Current -Continuous (Package limited)	T _C = 25 ℃		18	13	
	-Continuous (Silicon limited)	T _C = 25 ℃		23	46	_
	-Continuous	T _A = 25 ℃		6 ^{1a}	8.5 ^{1b}	A
	-Pulsed			40	27	
E _{AS}	Single Pulse Avalanche Energy		(Note 3)	12	32	
P_{D}	Power Dissipation for Single Operation	T _A = 25℃		1.9 ^{1a}	2.5 ^{1b}	10/
	Power Dissipation for Single Operation	T _A = 25℃		0.7 ^{1c}	1.0 ^{1d}	W
T _J , T _{STG}	Operating and Storage Junction Temperature I	Range		-55 to	+150	C

Thermal Characteristics

$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	65 ^{1a}	50 ^{1b}	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	180 ^{1c}	125 ^{1d}	℃/W
$R_{\theta JC}$	Thermal Resistance, Junction to Case	7.5	4.2	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMC8200S	FDMC8200S	Power 33	13"	12 mm	3000 units

Electrical Characteristics $T_J = 25\%$ unless otherwise noted

Symbol	Parameter	Test Conditions	Type	Min	Тур	Max	Units
Off Chara	cteristics						
BV _{DSS}	Drain to Source Breakdown Voltage	$I_D = 250 \mu A, V_{GS} = 0 V$ $I_D = 1 m A, V_{GS} = 0 V$	Q1 Q2	30 30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25°C I_D = 1mA, referenced to 25°C	Q1 Q2		14 13		mV/℃
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 24 V, V _{GS} = 0 V	Q1 Q2			1 500	μА
I _{GSS}	Gate to Source Leakage Current	V _{GS} = ±20 V, V _{DS} = 0 V	Q1 Q2			100 100	nA nA

On Characteristics

V _{GS(th)}	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250 \mu A$ $V_{GS} = V_{DS}, I_D = 1 m A$	Q1 Q2	1.0 1.0	2.3 2.0	3.0 3.0	٧
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 250 μA, referenced to 25°C I_D = 1mA, referenced to 25°C	Q1 Q2		-5 -6		mV/℃
「DS(on)	Static Drain to Source On Resistance	$V_{GS} = 10 \text{ V}, I_D = 6 \text{ A}$ $V_{GS} = 4.5 \text{ V}, I_D = 5 \text{ A}$ $V_{GS} = 10 \text{ V}, I_D = 6 \text{ A}, T_J = 125^{\circ}C$	Q1		16 24 22	20 32 28	mΩ
		$V_{GS} = 10 \text{ V}, \ I_D = 8.5 \text{ A}$ $V_{GS} = 4.5 \text{ V}, \ I_D = 7.2 \text{ A}$ $V_{GS} = 10 \text{ V}, \ I_D = 8.5 \text{ A}, \ T_J = 125 ^{\circ}\text{C}$	Q2		7.8 10.3 11.4	10.0 13.5 13.1	11122
g _{FS}	Forward Transconductance	$V_{DD} = 5 \text{ V}, I_{D} = 6 \text{ A}$ $V_{DD} = 5 \text{ V}, I_{D} = 8.5 \text{ A}$	Q1 Q2		29 43		S

Dynamic Characteristics

C _{iss}	Input Capacitance		Q1 Q2		495 1080	660 1436	pF
C _{oss}	Output Capacitance	$V_{DS} = 15 \text{ V}, V_{GS} = 0 \text{ V}, f = 1 \text{ MHZ}$	Q1 Q2		145 373	195 495	pF
C _{rss}	Reverse Transfer Capacitance		Q1 Q2		20 35	30 52	pF
R _g	Gate Resistance		Q1 Q2	0.2 0.2	1.4 1.2	4.2 3.6	Ω

Switching Characteristics

t _{d(on)}	Turn-On Delay Time	Q1	$V_{DD} = 15 \text{ V, } I_{D} = 1 \text{ A,}$ $V_{GS} = 10 \text{ V, } R_{GEN} = 6 \Omega$		11 7.6	20 15	ns
t _r	Rise Time				3.1 1.8	10 10	ns
t _{d(off)}	Turn-Off Delay Time	Q2 V _{DD} = 15 V, I _D = 1			35 21	56 34	ns
t _f	Fall Time	$V_{GS} = 10 \text{ V}, R_{GEN}$		Q1 Q2	1.3 8.5	10 17	ns
Q _{g(TOT)}	Total Gate Charge	V _{GS} = 0 V to 10 V		Q1 Q2	7.3 15.7	10 22	nC
$Q_{g(TOT)}$	Total Gate Charge	V _{GS} = 0 V to 4.5 V	$V_{DD} = 15 \text{ V},$ $I_{D} = 6 \text{ A}$	Q1 Q2	3.1 7.2	4.3 10	nC
Q _{gs}	Gate to Source Charge		Q2	Q1 Q2	1.8 3		nC
Q _{gd}	Gate to Drain "Miller" Charge		$V_{DD} = 15 \text{ V}$ $I_{D} = 8.5 \text{ A}$	Q1 Q2	1 1.9		nC

Units

Electrical Characteristics $T_J = 25\%$ unless otherwise noted

Parameter

Drain-S	Drain-Source Diode Characteristics							
V _{SD}	Source-Drain Diode Forward Voltage	$V_{GS} = 0 \text{ V, } I_{S} = 6 \text{ A}$ $V_{GS} = 0 \text{ V, } I_{S} = 8.5 \text{ A}$ $V_{GS} = 0 \text{ V, } I_{S} = 1.3 \text{ A}$	(Note 2) (Note 2) (Note 2)	Q1 Q2 Q2		0.8 0.8 0.6	1.2 1.2 0.8	V
t _{rr}	Reverse Recovery Time	Q1 I _F = 6 A, di/dt = 100 A/s		Q1 Q2		13 20	24 32	ns
Q _{rr}	Reverse Recovery Charge	Q2 $I_F = 8.5 \text{ A, di/dt} = 300 \text{ A/s}$		Q1 Q2		2.3 15	10 24	nC

Test Conditions

Notes:

Symbol

1. $R_{\theta JA}$ is determined with the device mounted on a 1in² 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.65 °C/W when mounted on a 1 in² pad of 2 oz copper



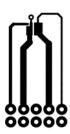
b.50 °C/W when mounted on a 1 in² pad of 2 oz copper

Type

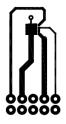
Min

Typ

Max



c. 180 ℃/W when mounted on a minimum pad of 2 oz copper



d. 125 ℃/W when mounted on a minimum pad of 2 oz copper

- 2. Pulse Test: Pulse Width < 300 $\,\mu s,\, Duty\,\, cycle < 2.0\%.$
- 3. Starting Q1: T = 25 °C, L = 1 mH, I = 5 A, Vgs = 10V, Vdd = 27V, 100% test at L = 3 mH, I = 4 A; Q2: T = 25 °C, L = 1 mH, I = 8 A, Vgs = 10V, Vdd = 27V, 100% test at L = 3 mH, I = 3.2 A.
- 4. As an N-ch device, the negative Vgs rating is for low duty cycle pulse ocurrence only. No continuous rating is implied.

Typical Characteristics (Q1 N-Channel) T_J = 25℃ unless otherwise noted

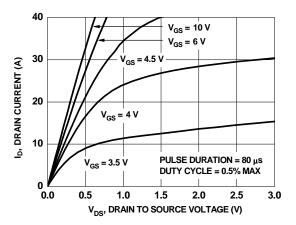


Figure 1. On Region Characteristics

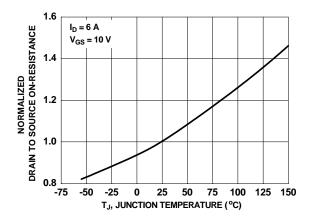


Figure 3. Normalized On Resistance vs Junction Temperature

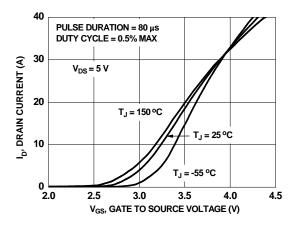


Figure 5. Transfer Characteristics

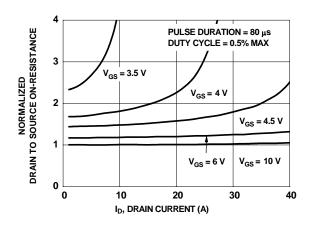


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

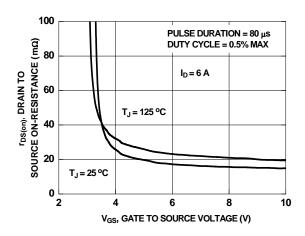


Figure 4. On-Resistance vs Gate to Source Voltage

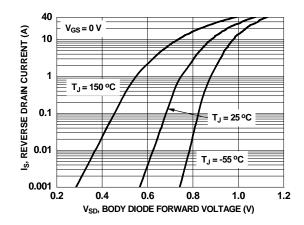


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics (Q1 N-Channel) T_J = 25℃ unless otherwise noted

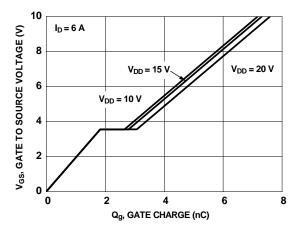


Figure 7. Gate Charge Characteristics

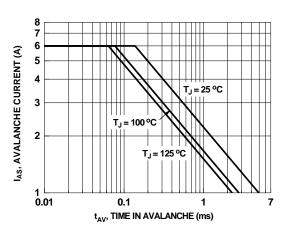


Figure 9. Unclamped Inductive Switching Capability

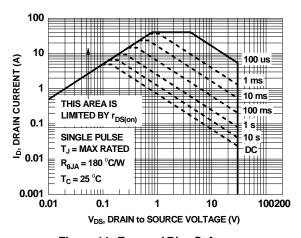


Figure 11. Forward Bias Safe Operating Area

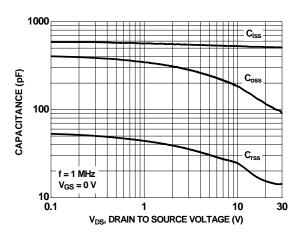


Figure 8. Capacitance vs Drain to Source Voltage

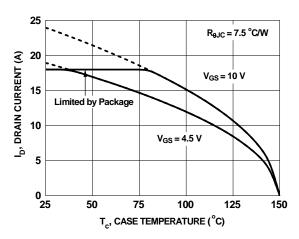


Figure 10. Maximum Continuous Drain Current vs Case Temperature

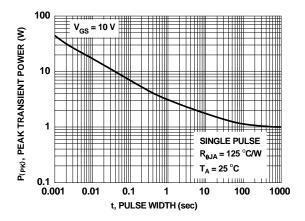


Figure 12. Single Pulse Maximum Power Dissipation

Typical Characteristics (Q1 N-Channel) T_J = 25℃ unless otherwise noted

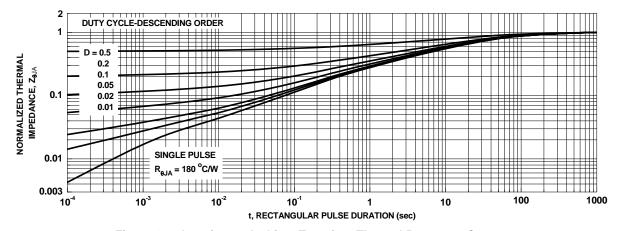


Figure 13. Junction-to-Ambient Transient Thermal Response Curve

Typical Characteristics (Q2 N-Channel) T_J = 25 ℃ unless otherwise noted

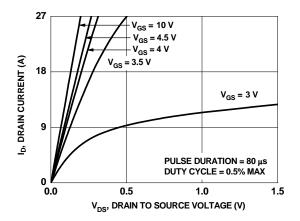


Figure 14. On-Region Characteristics

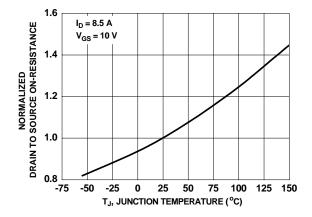


Figure 16. Normalized On-Resistance vs Junction Temperature

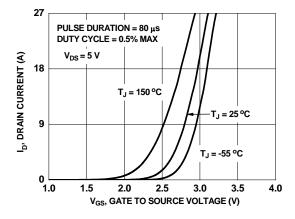


Figure 18. Transfer Characteristics

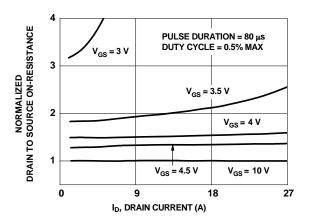


Figure 15. Normalized on-Resistance vs Drain Current and Gate Voltage

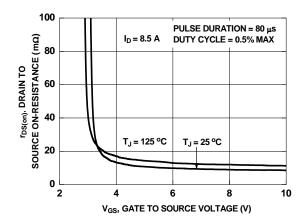


Figure 17. On-Resistance vs Gate to Source Voltage

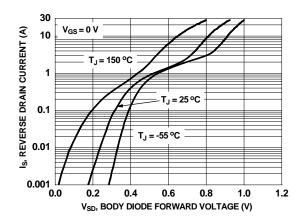


Figure 19. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics (Q2 N-Channel) T_J = 25℃ unless otherwise noted

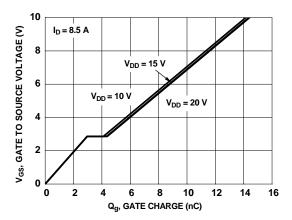


Figure 20. Gate Charge Characteristics

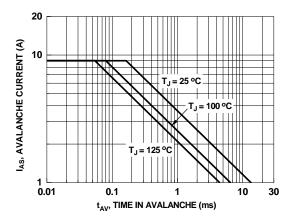


Figure 22. Unclamped Inductive Switching Capability

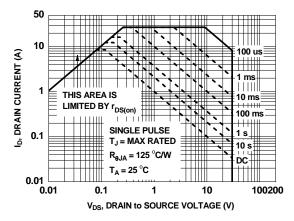


Figure 24. Forward Bias Safe Operating Area

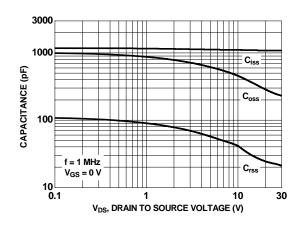


Figure 21. Capacitance vs Drain to Source Voltage

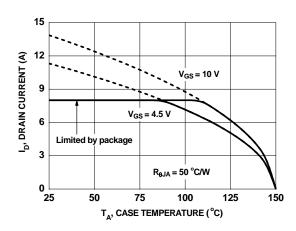


Figure 23. Maximum Continuous Drain Current vs Case Temperature

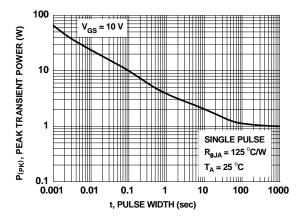


Figure 25. Single Pulse Maximum Power Dissipation

Typical Characteristics (Q2 N-Channel) $T_J = 25 \text{ } \text{C}$ unless otherwise noted

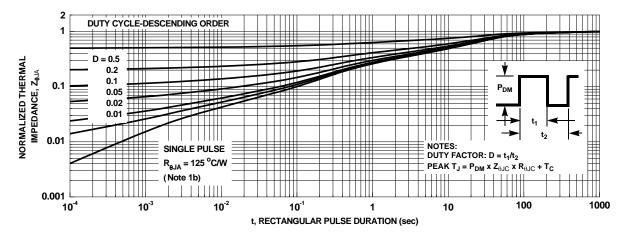


Figure 26. Junction-to-Ambient Transient Thermal Response Curve

Typical Characteristics (continued)

SyncFET Schottky body diode Characteristics

Fairchild's SyncFET process embeds a Schottky diode in parallel with PowerTrench MOSFET. This diode exhibits similar characteristics to a discrete external Schottky diode in parallel with a MOSFET. Figure 14 shows the reverses recovery characteristic of the FDMC8200S.

Schottky barrier diodes exhibit significant leakage at high temperature and high reverse voltage. This will increase the power in the device.

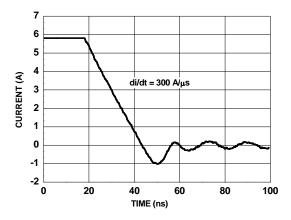


Figure 27. FDMC8200S SyncFET body diode reverse recovery characteristic

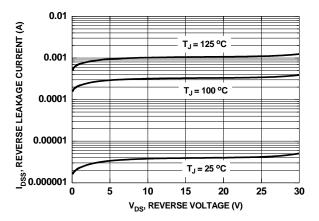
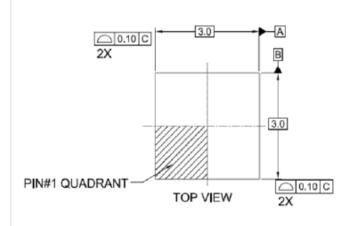
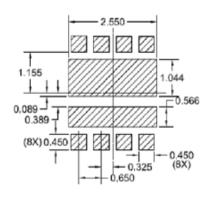
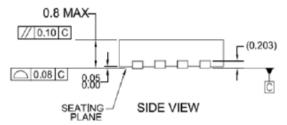


Figure 28. SyncFET body diode reverses leakage versus drain-source voltage

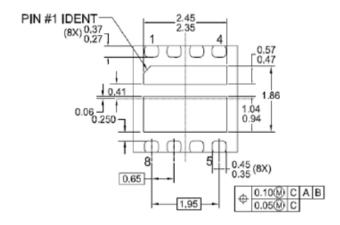
Dimensional Outline and Pad Layout















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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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