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November 2014

FDMC8588

N-Channel PowerTrench® MOSFET
25 V, 40 A, 5.7 mΩ

Features

- Max $r_{DS(on)}$ = 5.7 mΩ at V_{GS} = 4.5 V, I_D = 16.5 A
- State-of-the-art switching performance
- Lower output capacitance, gate resistance, and gate charge boost efficiency
- Shielded gate technology reduces switch node ringing and increases immunity to EMI and cross conduction
- RoHS Compliant

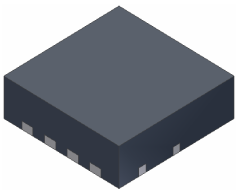
General Description

This N-Channel MOSFET has been designed specifically to improve the overall efficiency and to minimize switch node ringing of DC/DC converters using either synchronous or conventional switching PWM controllers. It has been optimized for low gate charge, low $r_{DS(on)}$, fast switching speed and body diode reverse recovery performance.

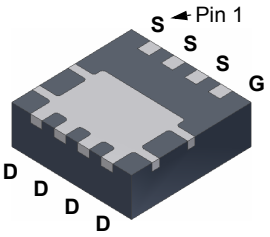
Applications

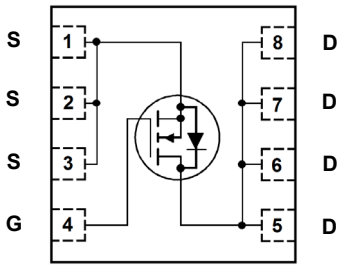
- High side switching for high end computing
- High power density DC-DC synchronous buck converter

Top



Bottom





Power 33

MOSFET Maximum Ratings T_A = 25 °C unless otherwise noted

Symbol	Parameter		Ratings	Units
V_{DS}	Drain to Source Voltage	(Note 5)	25	V
V_{GS}	Gate to Source Voltage	(Note 4)	±12	V
I_D	Drain Current - Continuous (Package limited) T_C = 25 °C		40	A
	- Continuous (Silicon Limited) T_C = 25 °C		59	
	- Continuous	(Note 1a)	16.5	
	- Pulsed		60	
E_{AS}	Single Pulse Avalanche Energy	(Note 3)	29	mJ
P_D	Power Dissipation T_C = 25 °C		26	W
	Power Dissipation T_A = 25 °C	(Note 1a)	2.4	
T_J, T_{STG}	Operating and Storage Junction Temperature Range		-55 to +150	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case T_C = 25 °C		4.7	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient T_A = 25 °C	(Note 1a)	53	

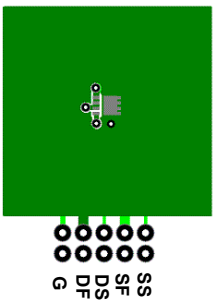
Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
08OD	FDMC8588	Power 33	13 ”	12 mm	3000 units

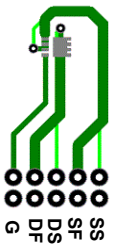
Electrical Characteristics T_J = 25 °C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	I_D = 250 µA , V_{GS} = 0 V	25			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 250 µA , referenced to 25 °C		17		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 20 V, V_{GS} = 0 V			1	µA
I_{GSS}	Gate to Source Leakage Current, Forward	V_{GS} = 12 V, V_{DS} = 0 V			100	nA
On Characteristics						
$V_{GS(th)}$	Gate to Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 250 µA	0.8	1.4	1.8	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 250 µA , referenced to 25 °C		-4		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 10 V, I_D = 17 A		3.5	5.0	mΩ
		V_{GS} = 4.5 V, I_D = 16.5 A		4.3	5.7	
		V_{GS} = 10 V, I_D = 17 A,T_J = 125 °C		4.8	6.9	
g_{FS}	Forward Transconductance	V_{DD} = 5 V, I_D = 16.5 A		85		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 13 V, V_{GS} = 0 V, f = 1 MHz		1228	1720	pF
C_{oss}	Output Capacitance			441	620	pF
C_{rss}	Reverse Transfer Capacitance			69	100	pF
R_g	Gate Resistance		0.1	0.5	1.5	Ω
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 13 V, I_D = 16.5A, V_{GS} = 10 V, R_{GEN} = 6 Ω		8	16	ns
t_r	Rise Time			3	10	ns
$t_{d(off)}$	Turn-Off Delay Time			25	40	ns
t_f	Fall Time			2	10	ns
$Q_{g(TOT)}$	Total Gate Charge at 4.5V	V_{DD} = 13 V, I_D = 16.5 A		12	17	nC
Q_{gs}	Total Gate Charge			3.0		nC
Q_{gd}	Gate to Drain “Miller” Charge			3.3		nC
Drain-Source Diode Characteristics						
V_{SD}	Source to Drain Diode Forward Voltage	V_{GS} = 0 V, I_S = 2 A (Note 2)		0.7	1.2	V
		V_{GS} = 0 V, I_S = 16.5 A (Note 2)		0.8	1.2	V
t_{rr}	Reverse Recovery Time	I_F = 16.5 A, di/dt = 100 A/µs		25		ns
Q_{rr}	Reverse Recovery Charge			10		nC

Notes:
1. $R_{\theta JA}$ is determined with the device mounted on a 1in^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. 53 °C/W when mounted on a 1 in^2 pad of 2 oz copper



b. 125 °C/W when mounted on a minimum pad of 2 oz copper

2. Pulse Test: Pulse Width < 300 µs, Duty cycle < 2.0%.

3. E_{AS} of 29 mJ is based on starting T_J = 25 °C, L = 1.2 mH, I_{AS} = 7 A, V_{DD} = 23 V, V_{GS} = 10V. 100% tested at L = 0.1 mH, I_{AS} = 16 A.

4. As an N-ch device, the negative Vgs rating is for low duty cycle pulse occurrence only. No continuous rating is implied.

5. The continuous Vds rating is 25V; however, a pulse of 28 V peak voltage for no longer than 3ns duration at 500KHz frequency can be applied.

Typical Characteristics T_J = 25°C unless otherwise noted

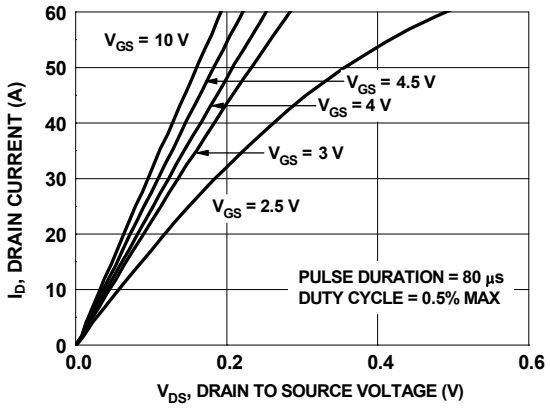


Figure 1. On Region Characteristics

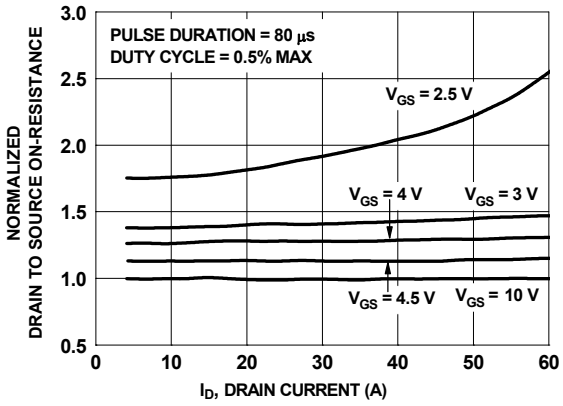


Figure 2. Normalized On-Resistance vs. Drain Current and Gate Voltage

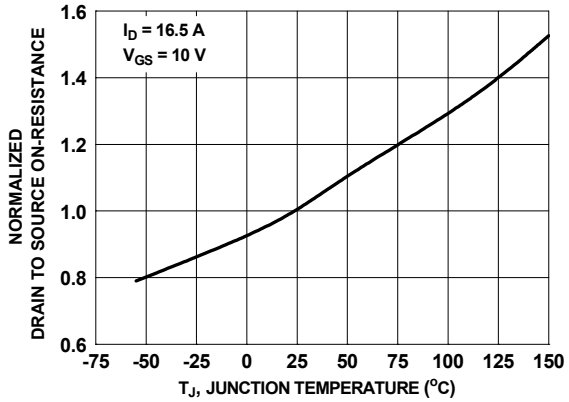


Figure 3. Normalized On Resistance vs. Junction Temperature

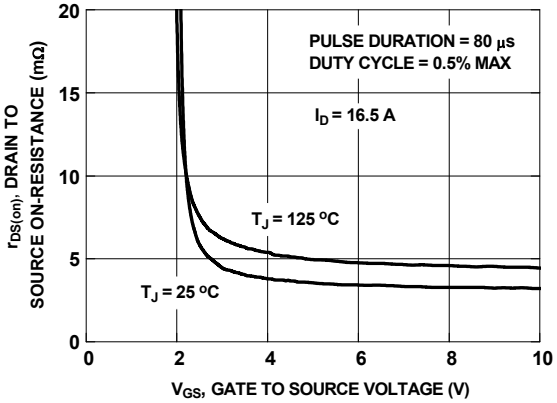


Figure 4. On-Resistance vs. Gate to Source Voltage

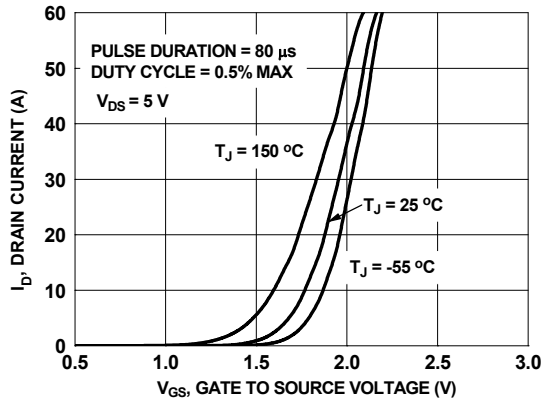


Figure 5. Transfer Characteristics

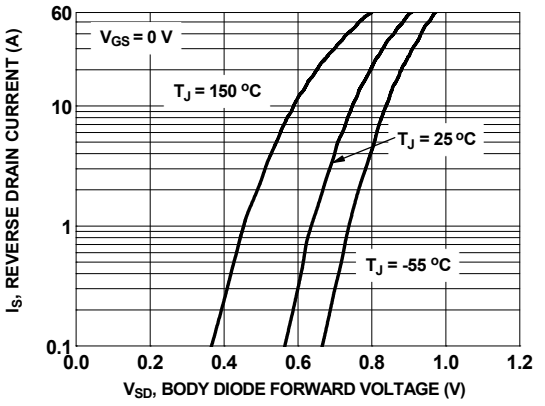


Figure 6. Source to Drain Diode Forward Voltage vs. Source Current

Typical Characteristics T_J = 25°C unless otherwise noted

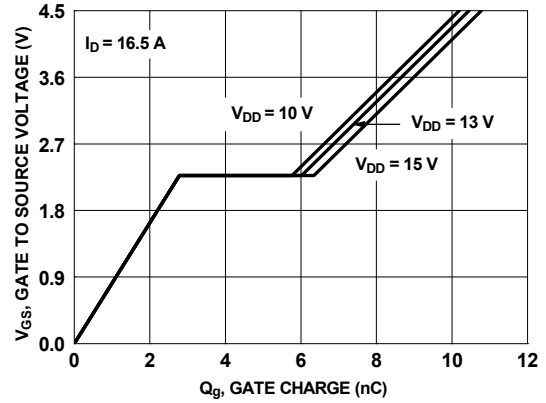


Figure 7. Gate Charge Characteristics

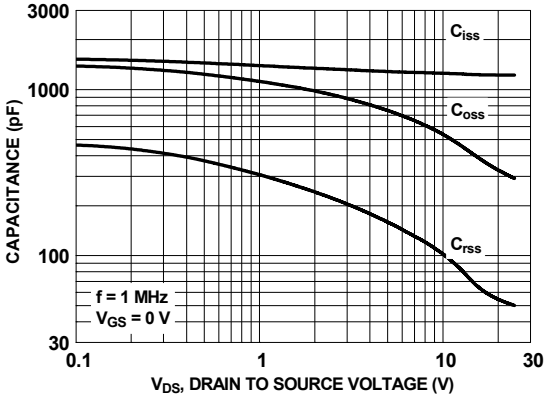


Figure 8. Capacitance vs. Drain to Source Voltage

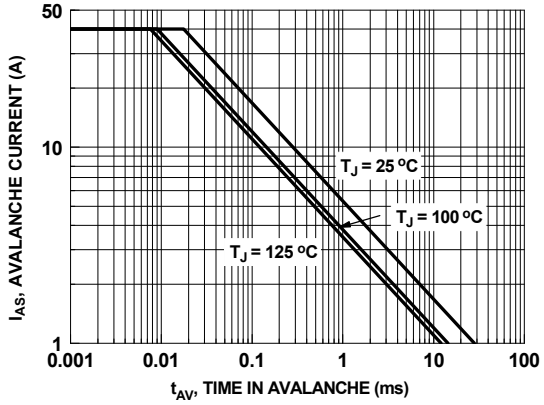


Figure 9. Unclamped Inductive Switching Capability

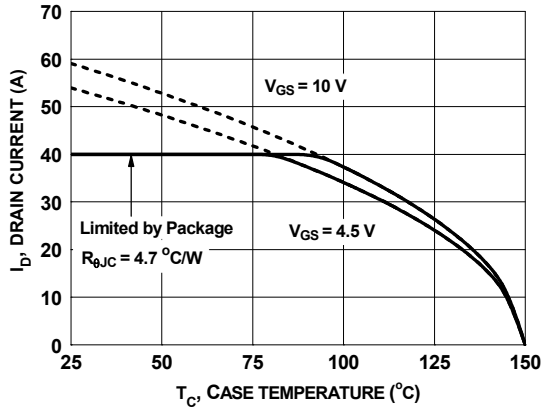


Figure 10. Maximum Continuous Drain Current vs. Case Temperature

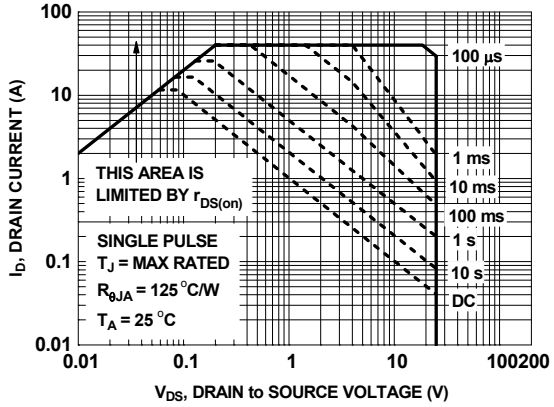


Figure 11. Forward Bias Safe Operating Area

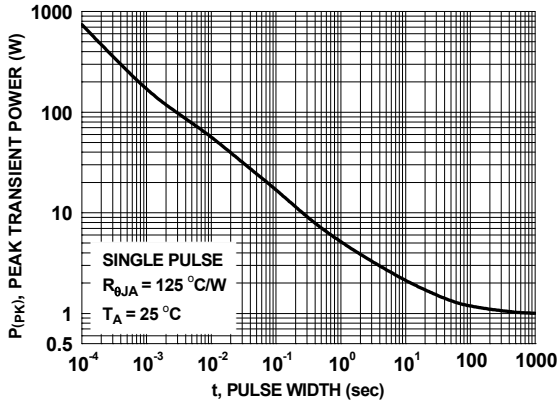


Figure 12. Single Pulse Maximum Power Dissipation

Typical Characteristics T_J = 25°C unless otherwise noted

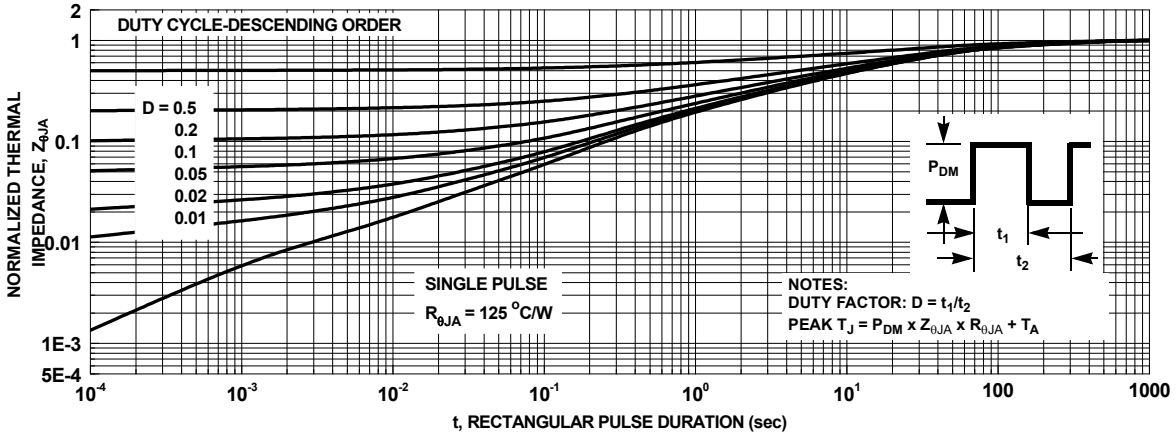
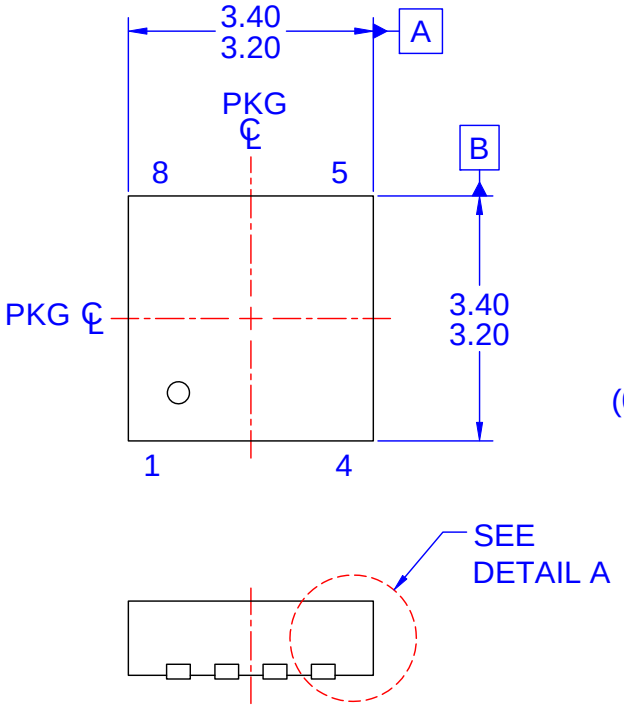
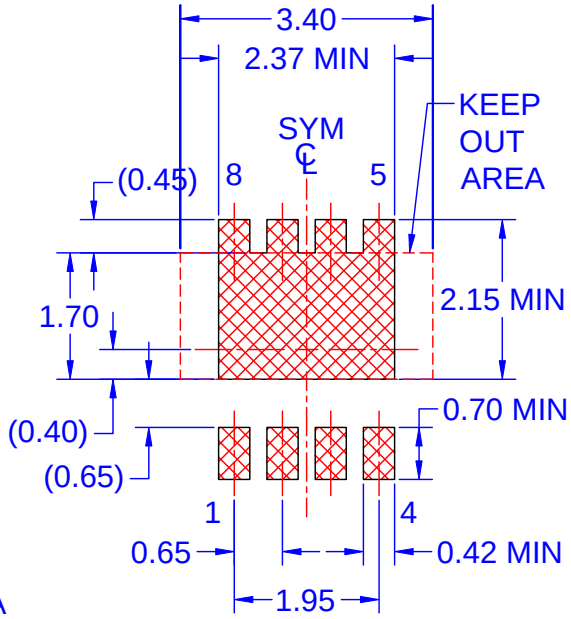
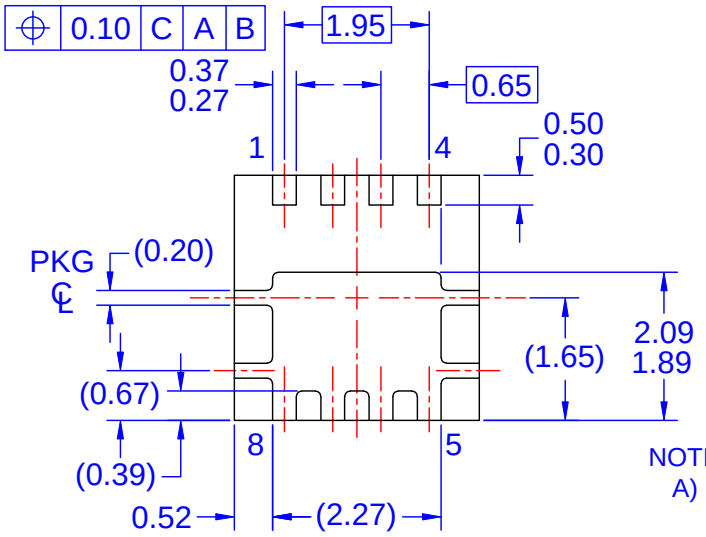


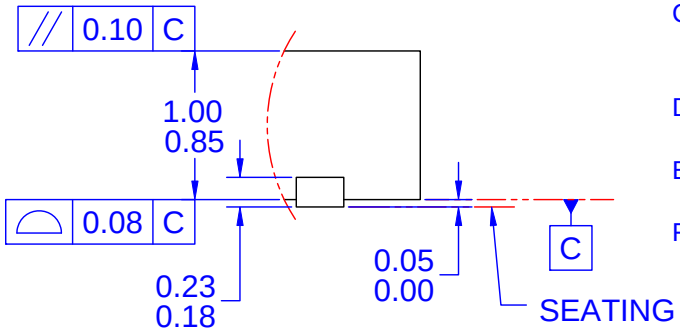
Figure 13. Junction-to-Ambient Transient Thermal Response Curve





LAND PATTERN
RECOMMENDATION





DETAIL A
SCALE: 2X

NOTES: UNLESS OTHERWISE SPECIFIED

A) PACKAGE STANDARD REFERENCE: JEDEC MO-240, ISSUE A, VAR. BA, DATED OCTOBER 2002.

B) ALL DIMENSIONS ARE IN MILLIMETERS.

C) DIMENSIONS DO NOT INCLUDE BURRS OR MOLD FLASH. MOLD FLASH OR BURRS DOES NOT EXCEED 0.10MM.

D) DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.

E) IT IS RECOMMENDED TO HAVE NO TRACES OR VIAS WITHIN THE KEEP OUT AREA.

F) DRAWING FILE NAME: PQFN08BREV2

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