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February 2016

FDMC8588DC

N-Channel Dual CoolTM 33 PowerTrench[®] MOSFET 25 V, 40 A, 5.7 m Ω

Features

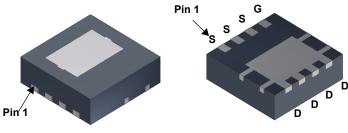
- Dual CoolTM Top Side Cooling PQFN package
- Max $r_{DS(on)}$ = 5.7 m Ω at V_{GS} = 4.5 V, I_D = 17 A
- State-of-the-art switching performance
- Lower output capacitance, gate resistance, and gate charge boost efficiency
- Shielded gate technology reduces switch node ringing and increases immunity to EMI and cross conduction
- RoHS Compliant

General Description

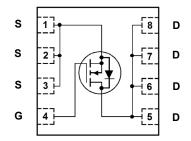
This N-Channel MOSFET has been designed specifically to improve the overall efficiency and to minimize switch node ringing of DC/DC converters using either synchronous or conventional switching PWM controllers. It has been optimized for low gate charge, low $r_{DS(on)}$, fast switching speed and body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

Applications

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







MOSFET Maximum Ratings $T_A = 25 \, ^{\circ}\text{C}$ 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
	Drain Current - Continuous (Package limited) T _C = 25 °C		40	
	- Continuous (Silicon Limited) T _C = 25 °C		73	_
ID	- Continuous	(Note 1a)	17	Α
	- Pulsed		60	
E _{AS}	Single Pulse Avalanche Energy	(Note 3)	29	mJ
В	Power Dissipation $T_C = 25 ^{\circ}C$		41	W
P_D	Power Dissipation T _A = 25 °C	(Note 1a)	3.0	VV
T _J , T _{STG}	Operating and Storage Junction Temperature Range		-55 to +150	°C

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	(Top Source)	7.0	
$R_{\theta JC}$	Thermal Resistance, Junction to Case	(Bottom Drain)	3.0	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1a)	42	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1b)	105	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1i)	17	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1j)	26	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1k)	12	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
08DC	FDMC8588DC	Dual Cool TM 33	13 "	12 mm	3000 units

Electrical Characteristics T_J = 25 °C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Тур	Max	Units
Off Chara	cteristics					
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		5		mV/°C
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 20 V, V _{GS} = 0 V			1	μА
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	$V_{GS} = V_{DS}, I_{D} = 250 \mu A$	0.8	1.2	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
		V _{GS} = 10 V, I _D = 18 A		3.6	5.0	
r _{DS(on)} Stati	Static Drain to Source On Resistance	$V_{GS} = 4.5 \text{ V}, I_D = 17 \text{ A}$		4.1	5.7	mΩ
		$V_{GS} = 10 \text{ V}, I_D = 18 \text{ A}, T_J = 125 ^{\circ}\text{C}$		5.5	7.6	
g _{FS}	Forward Transconductance	V _{DD} = 5 V, I _D = 17 A		103		S

Dynamic Characteristics

C _{iss}	Input Capacitance	V _{DS} = 13 V, V _{GS} = 0 V, f = 1 MHz	1695	pF
C _{oss}	Output Capacitance		493	pF
C _{rss}	Reverse Transfer Capacitance		63	pF
R_g	Gate Resistance		0.4	Ω

Switching Characteristics

t _{d(on)}	Turn-On Delay Time			8	ns
t _r	Rise Time	V_{DD} = 13 V, I_{D} = 17A, V_{GS} = 10 V, R_{GEN} = 6 Ω		3	ns
t _{d(off)}	Turn-Off Delay Time			25	ns
t _f	Fall Time			2	ns
$Q_{g(TOT)}$	Total Gate Charge at 4.5V			12	nC
Q_{gs}	Total Gate Charge	V _{DD} = 13 V, I _D = 17 A	;	3.0	nC
Q_{gd}	Gate to Drain "Miller" Charge		;	3.0	nC

Drain-Source Diode Characteristics

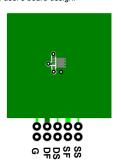
V	Source to Drain Diode Forward Voltage	$V_{GS} = 0 \text{ V}, I_{S} = 2 \text{ A}$	(Note 2)	0.7	1.2	V
V SD	Source to Drain Diode Forward voltage	$V_{GS} = 0 V, I_{S} = 17 A$	(Note 2)	0.8	1.2	٧
t _{rr}	Reverse Recovery Time			25		ns
Q _{rr}	Reverse Recovery Charge			10		nC

Thermal Characteristics

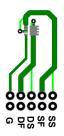
$R_{\theta JC}$	Thermal Resistance, Junction to Case	(Top Source)	7.0	
$R_{\theta JC}$	Thermal Resistance, Junction to Case	(Bottom Drain)	3.0	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1a)	42	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1b)	105	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1c)	29	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1d)	40	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1e)	19	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1f)	23	C/VV
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1g)	30	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1h)	79	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1i)	17	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1j)	26	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1k)	12	
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	(Note 1I)	16	

Notes

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. 42 °C/W when mounted on a 1 in² pad of 2 oz copper



b. 105 °C/W when mounted on a minimum pad of 2 oz copper

- c. Still air, 20.9x10.4x12.7mm Aluminum Heat Sink, 1 in² pad of 2 oz copper
- d. Still air, 20.9x10.4x12.7mm Aluminum Heat Sink, minimum pad of 2 oz copper
- e. Still air, 45.2x41.4x11.7mm Aavid Thermalloy Part # 10-L41B-11 Heat Sink, 1 in² pad of 2 oz copper
- f. Still air, 45.2x41.4x11.7mm Aavid Thermalloy Part # 10-L41B-11 Heat Sink, minimum pad of 2 oz copper
- g. 200FPM Airflow, No Heat Sink,1 in² pad of 2 oz copper
- h. 200FPM Airflow, No Heat Sink, minimum pad of 2 oz copper
- i. 200FPM Airflow, 20.9x10.4x12.7mm Aluminum Heat Sink, 1 in² pad of 2 oz copper
- j. 200FPM Airflow, 20.9x10.4x12.7mm Aluminum Heat Sink, minimum pad of 2 oz copper
- k. 200FPM Airflow, 45.2x41.4x11.7mm Aavid Thermalloy Part # 10-L41B-11 Heat Sink, 1 in² pad of 2 oz copper
- I. 200FPM Airflow, 45.2x41.4x11.7mm Aavid Thermalloy Part # 10-L41B-11 Heat Sink, minimum pad of 2 oz copper
- 2. Pulse Test: Pulse Width < 300 μ s, 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

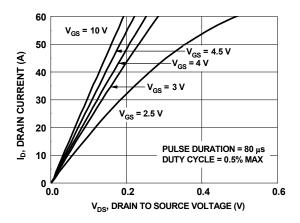


Figure 1. On Region Characteristics

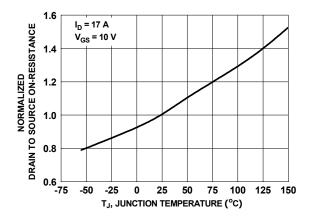


Figure 3. Normalized On Resistance vs Junction Temperature

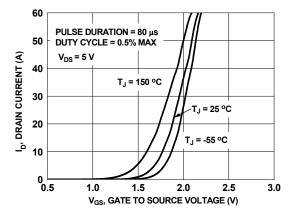


Figure 5. Transfer Characteristics

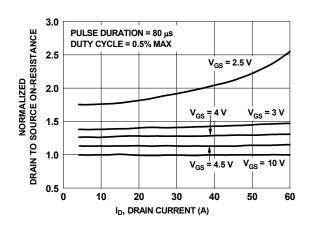


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

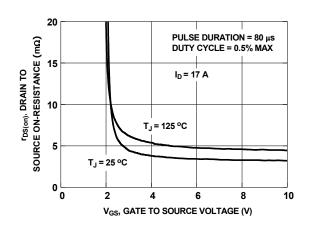


Figure 4. On-Resistance vs Gate to Source Voltage

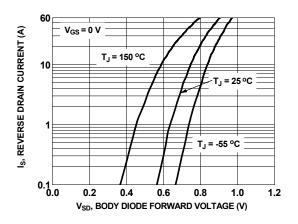


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics $T_J = 25^{\circ}C$ unless otherwise noted

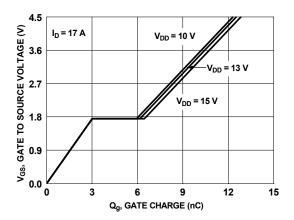


Figure 7. Gate Charge Characteristics

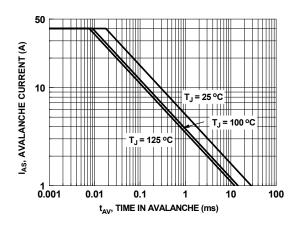


Figure 9. Unclamped Inductive Switching Capability

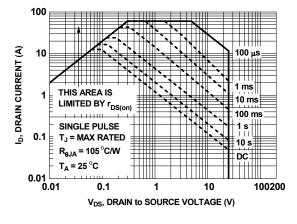


Figure 11. Forward Bias Safe Operating Area

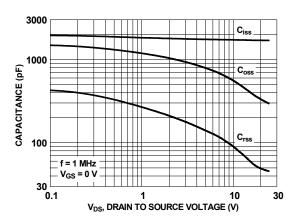


Figure 8. Capacitance vs Drain to Source Voltage

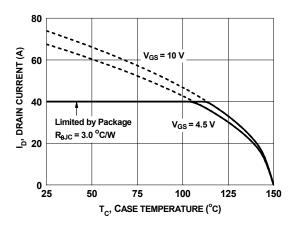


Figure 10. Maximum Continuous Drain Current vs Case Temperature

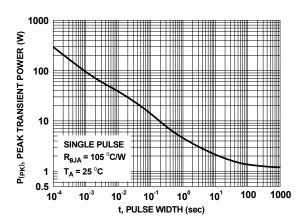


Figure 12. Single Pulse Maximum Power Dissipation

Typical Characteristics T_J = 25°C unless otherwise noted

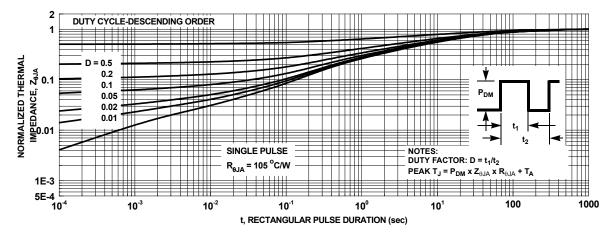
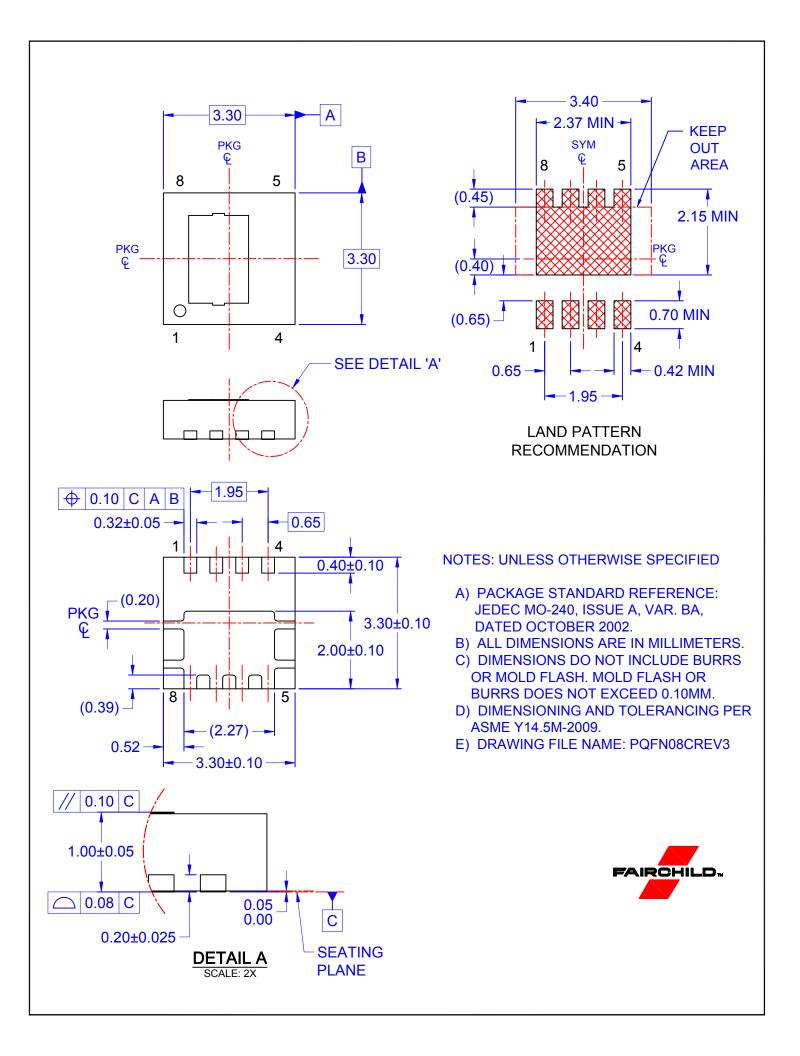


Figure 13. Junction-to-Ambient Transient Thermal Response Curve



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