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October 2014

FDMS7680

N-Channel PowerTrench[®] MOSFET 30 V, 6.9 m Ω

Features

- Max $r_{DS(on)} = 6.9 \text{ m}\Omega$ at $V_{GS} = 10 \text{ V}$, $I_D = 14 \text{ A}$
- Max $r_{DS(on)}$ = 11 m Ω at V_{GS} = 4.5 V, I_D = 11 A
- Advanced Package and Silicon combination for low r_{DS(on)} and high efficiency
- Next generation enhanced body diode technology, engineered for soft recovery.
- MSL1 robust package design
- 100% UIL tested
- RoHS Compliant

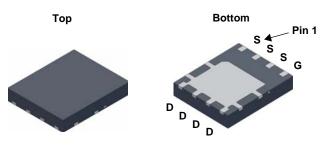


General Description

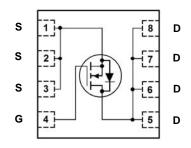
This N-Channel MOSFET has been designed specifically to improve the overall efficiency and to minimize switch node ringing of DC/DC converters using either synchronous or conventional switching PWM controllers. It has been optimized for low gate charge, low $r_{DS(on)}$, fast switching speed and body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

Applications

- IMVP Vcore Switching for Notebook
- VRM Vcore Switching for Desktop and Server
- OringFET / Load Switch
- DC-DC Conversion







MOSFET Maximum Ratings T_A = 25 °C unless otherwise noted

Symbol	Parameter			Ratings	Units
V _{DS}	Drain to Source Voltage			30	V
V_{GS}	Gate to Source Voltage			+/-20	V
	Drain Current -Continuous (Package limited)	T _C = 25 °C		28	
	-Continuous (Silicon limited)	T _C = 25 °C		53	Λ.
'D	-Continuous	T _A = 25 °C	(Note 1a)	14	Α
	-Pulsed		(Note 4)	80	
E _{AS}	Single Pulse Avalanche Energy		(Note 3)	29	mJ
D	Power Dissipation	T _C = 25 °C		33	W
P_{D}	Power Dissipation	T _A = 25 °C	(Note 1a)	2.5	VV
T_J , T_{STG}	Operating and Storage Junction Temperature R	ange		-55 to +150	°C

Thermal Characteristics

$R_{\theta J}$	JC	Thermal Resistance, Junction to Case		3.7	°C/W
$R_{\theta J}$	JA	Thermal Resistance, Junction to Ambient	(Note 1a)	50	*C/VV

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMS7680	FDMS7680	Power 56	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	$I_D = 250 \mu A, V_{GS} = 0 V$	30			V
$\frac{\Delta BV_{DS}}{\Delta T_{J}}$	Breakdown Voltage Temperature Coefficient	I_D = 250 μ A, referenced to 25 °C		13		mV/°C
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} = 24 V, V _{GS} = 0 V			1	μΑ
I _{GSS}	Gate to Source Leakage Current, Forward	V _{GS} = 20 V, V _{DS} = 0 V			100	nA

On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = 250 \mu A$	1.25	1.9	3.0	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	I_D = 250 μ A, referenced to 25 °C		-6		mV/°C
		$V_{GS} = 10 \text{ V}$, $I_{D} = 14 \text{ A}$		5.6	6.9	
r _{DS(on)}	Static Drain to Source On Resistance	V _{GS} = 4.5 V, I _D = 11 A		8.0	11	mΩ
		$V_{GS} = 10 \text{ V}, I_D = 14 \text{ A}, T_J = 125 ^{\circ}\text{C}$		7.3	10.1	
9 _{FS}	Forward Transconductance	V _{DS} = 5 V, I _D = 14 A		85		S

Dynamic Characteristics

C _{iss}	Input Capacitance	V 45 V V 0 V		1390	1850	pF
C _{oss}	Output Capacitance	$V_{DS} = 15 \text{ V}, V_{GS} = 0 \text{ V},$ $f = 1 \text{ MHz}$		430	575	pF
C _{rss}	Reverse Transfer Capacitance	1 - 1 1/11/12		60	85	pF
R_g	Gate Resistance		0.1	0.9	2.0	Ω

Switching Characteristics

t _{d(on)}	Turn-On Delay Time		10	20	ns
t _r	Rise Time	V _{DD} = 15 V, I _D = 14 A,	4	10	ns
t _{d(off)}	Turn-Off Delay Time	$V_{GS} = 10 \text{ V}, R_{GEN} = 6 \Omega$	21	34	ns
t _f	Fall Time		3	10	ns
Q_g	Total Gate Charge	V _{GS} = 0 V to 10 V	20	28	nC
Qg	Total Gate Charge	$V_{GS} = 0 \text{ V to } 4.5 \text{ V}$ $V_{DD} = 15 \text{ V}$	9	13	
Q _{gs}	Gate to Source Charge	I _D = 14 A	4.6		nC
Q _{gd}	Gate to Drain "Miller" Charge		2.3		nC

Drain-Source Diode Characteristics

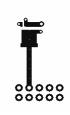
V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0 \text{ V}, I_{S} = 2.1 \text{ A}$ (Note 2)	0.74	1.2	V
	Source to Drain Diode Forward Voltage	$V_{GS} = 0 \text{ V}, I_{S} = 14 \text{ A}$ (Note 2)	0.83	1.3	v
t _{rr}	Reverse Recovery Time	1 44 4 4:/	24	39	ns
Q_{rr}	Reverse Recovery Charge	$I_F = 14 \text{ A}, \text{ di/dt} = 100 \text{ A/}\mu\text{s}$	8	15	nC
t _{rr}	Reverse Recovery Time	- I _E = 14 A, di/dt = 300 A/μs	20	36	ns
Q_{rr}	Reverse Recovery Charge	- I _F = 14 A, αι/αι = 300 A/μS	15	27	nC

Notes:

¹ R_{0JA} is determined with the device mounted on a 1 in² pad 2 oz copper pad on a 1.5 x 1.5 in. board of FR-4 material. R_{0JC} is guaranteed by design while R_{0CA} is determined by the user's board design.



a. 50 °C/W when mounted on a 1 $\rm in^2$ 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 $\mu\text{s},$ Duty cycle < 2.0%.

^{3.} Starting T $_J$ = 25 °C, L = 0.3 mH, I $_{AS}$ = 14 A, V $_{DD}$ = 27 V, V $_{GS}$ = 10 V.

^{4.} Pulse Id refers to Figure.11 Forward Bias Safe Operation Area.

Typical Characteristics $T_J = 25$ °C unless otherwise noted

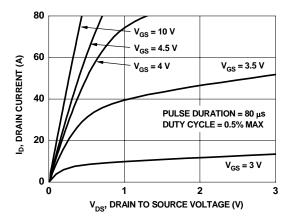


Figure 1. On Region Characteristics

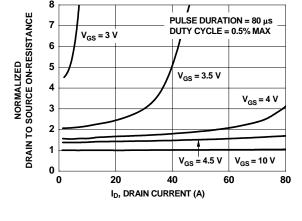


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

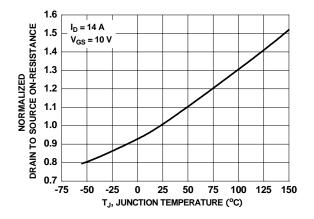


Figure 3. Normalized On Resistance vs Junction Temperature

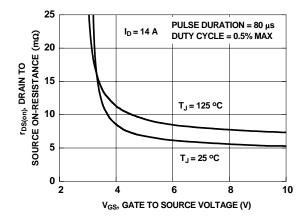


Figure 4. On-Resistance vs Gate to Source Voltage

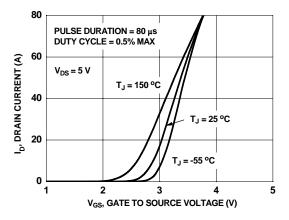


Figure 5. Transfer Characteristics

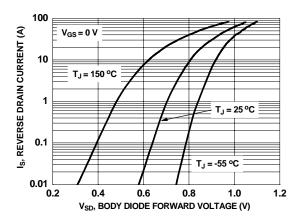


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

Typical Characteristics $T_J = 25$ °C unless otherwise noted

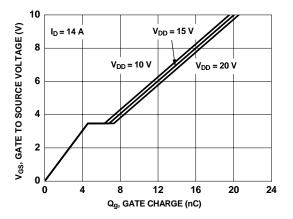
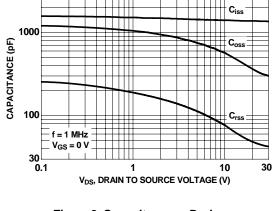


Figure 7. Gate Charge Characteristics



3000

Figure 8. Capacitance vs Drain to Source Voltage

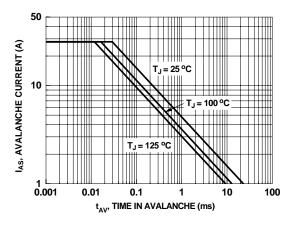


Figure 9. Unclamped Inductive Switching Capability

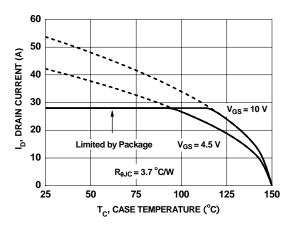


Figure 10. Maximum Continuous Drain Current vs Case Temperature

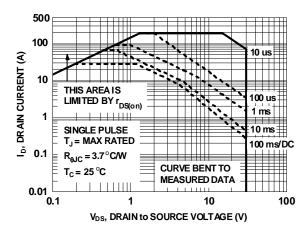


Figure 11. Forward Bias Safe Operating Area

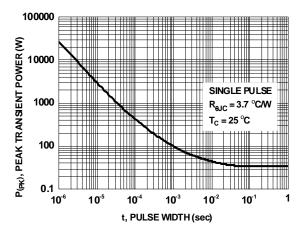


Figure 12. Single Pulse Maximum Power Dissipation

Typical Characteristics T_J = 25 °C unless otherwise noted

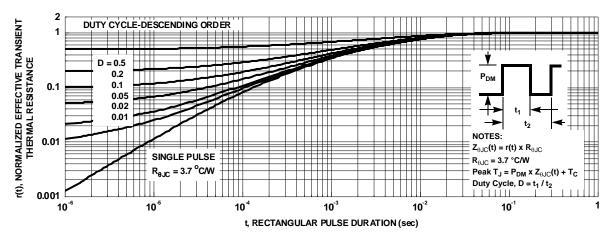


Figure 13. Junction-to-Ambient Transient Thermal Response Curve

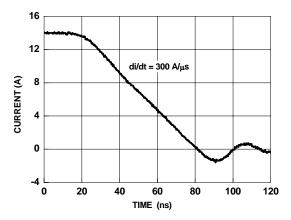


Figure 14. Body Diode Reverse Recovery Characteristics



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Офис по работе с юридическими лицами:

105318, г. Москва, ул. Щербаковская д. 3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: info@moschip.ru

Skype отдела продаж:

moschip.ru moschip.ru_6 moschip.ru_4 moschip.ru_9