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# FDMS7670

## N-Channel PowerTrench<sup>®</sup> MOSFET

30 V, 3.8 mΩ

### Features

- Max  $r_{DS(on)}$  = 3.8 mΩ at  $V_{GS} = 10\text{ V}$ ,  $I_D = 21\text{ A}$
- Max  $r_{DS(on)}$  = 5.0 mΩ at  $V_{GS} = 4.5\text{ V}$ ,  $I_D = 17\text{ A}$
- Advanced Package and Silicon design for low  $r_{DS(on)}$  and high efficiency
- Next generation enhanced body diode technology, engineered for soft recovery. Provides Schottky-like performance with minimum EMI in sync buck converter applications
- MSL1 robust package design
- 100% UIL tested
- RoHS Compliant

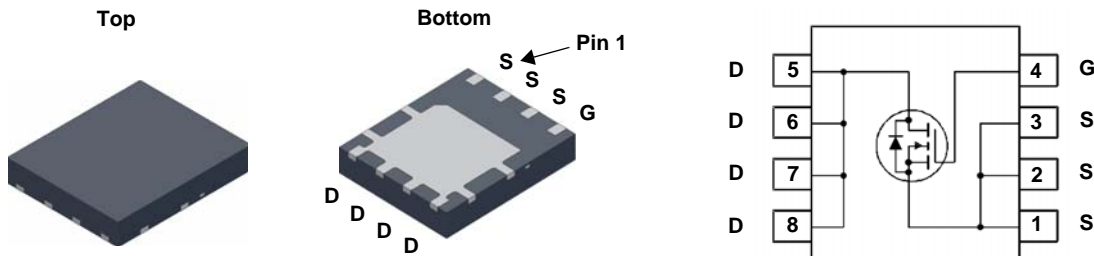


### General Description

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



Power 56

### MOSFET Maximum Ratings $T_A = 25\text{ °C}$ unless otherwise noted

Symbol	Parameter	Ratings	Units
$V_{DS}$	Drain to Source Voltage	30	V
$V_{GS}$	Gate to Source Voltage (Note 4)	±20	V
$I_D$	Drain Current -Continuous (Package limited) $T_C = 25\text{ °C}$	42	A
	-Continuous (Silicon limited) $T_C = 25\text{ °C}$	105	
	-Continuous $T_A = 25\text{ °C}$ (Note 1a)	21	
	-Pulsed	150	
$E_{AS}$	Single Pulse Avalanche Energy (Note 3)	144	mJ
$P_D$	Power Dissipation $T_C = 25\text{ °C}$	62	W
	Power Dissipation $T_A = 25\text{ °C}$ (Note 1a)	2.5	
$T_J, T_{STG}$	Operating and Storage Junction Temperature Range	-55 to +150	°C

### Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case	2.0	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	50	

### Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDMS7670	FDMS7670	Power 56	13 "	12 mm	3000 units

## Electrical Characteristics $T_J = 25\text{ }^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
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### Off Characteristics

$BV_{DSS}$	Drain to Source Breakdown Voltage	$I_D = 250\text{ }\mu\text{A}$ , $V_{GS} = 0\text{ V}$	30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$ , referenced to $25\text{ }^\circ\text{C}$		15		mV/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 24\text{ V}$ , $V_{GS} = 0\text{ V}$			1	$\mu\text{A}$
$I_{GSS}$	Gate to Source Leakage Current, Forward	$V_{GS} = 20\text{ V}$ , $V_{DS} = 0\text{ V}$			100	nA

### On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}$ , $I_D = 250\text{ }\mu\text{A}$	1.25	1.9	3.0	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250\text{ }\mu\text{A}$ , referenced to $25\text{ }^\circ\text{C}$		-7		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{ V}$ , $I_D = 21\text{ A}$		2.9	3.8	m $\Omega$
		$V_{GS} = 4.5\text{ V}$ , $I_D = 17\text{ A}$		4.1	5.0	
		$V_{GS} = 10\text{ V}$ , $I_D = 21\text{ A}$ , $T_J = 125\text{ }^\circ\text{C}$		4.0	5.3	
$g_{FS}$	Forward Transconductance	$V_{DS} = 5\text{ V}$ , $I_D = 21\text{ A}$		136		S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 15\text{ V}$ , $V_{GS} = 0\text{ V}$ , $f = 1\text{ MHz}$		3085	4105	pF
$C_{oss}$	Output Capacitance			990	1315	pF
$C_{rss}$	Reverse Transfer Capacitance			75	115	pF
$R_g$	Gate Resistance			1.2	2.5	$\Omega$

### Switching Characteristics

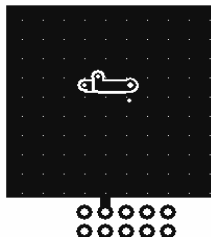
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 15\text{ V}$ , $I_D = 21\text{ A}$ , $V_{GS} = 10\text{ V}$ , $R_{GEN} = 6\text{ }\Omega$		15	26	ns	
$t_r$	Rise Time			6	12	ns	
$t_{d(off)}$	Turn-Off Delay Time			31	50	ns	
$t_f$	Fall Time			5	10	ns	
$Q_g$	Total Gate Charge		$V_{GS} = 0\text{ V to }10\text{ V}$		40	56	nC
$Q_g$	Total Gate Charge	$V_{GS} = 0\text{ V to }4.5\text{ V}$	$V_{DD} = 15\text{ V}$ , $I_D = 21\text{ A}$		17	24	nC
$Q_{gs}$	Gate to Source Charge				9.8		nC
$Q_{gd}$	Gate to Drain "Miller" Charge				4.4		nC

### Drain-Source Diode Characteristics

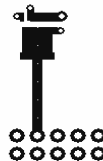
$V_{SD}$	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{ V}$ , $I_S = 2.1\text{ A}$ (Note 2)		0.7	0.95	V
		$V_{GS} = 0\text{ V}$ , $I_S = 21\text{ A}$ (Note 2)		0.8	1.1	
$t_{rr}$	Reverse Recovery Time	$I_F = 21\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$		38	61	ns
$Q_{rr}$	Reverse Recovery Charge			19	34	nC
$t_a$	Reverse Recovery Fall Time			14		ns
$t_b$	Reverse Recovery Rise Time			24		ns
S	Softness ( $t_b/t_a$ )			1.7		
$t_{rr}$	Reverse Recovery Time	$I_F = 21\text{ A}$ , $di/dt = 300\text{ A}/\mu\text{s}$		32	51	ns
$Q_{rr}$	Reverse Recovery Charge			34	54	nC

Notes:

- $R_{\theta JA}$  is determined with the device mounted on a  $1\text{ in}^2$  pad 2 oz copper pad on a  $1.5 \times 1.5\text{ in.}$  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.  $50\text{ }^\circ\text{C/W}$  when mounted on a  $1\text{ in}^2$  pad of 2 oz copper.



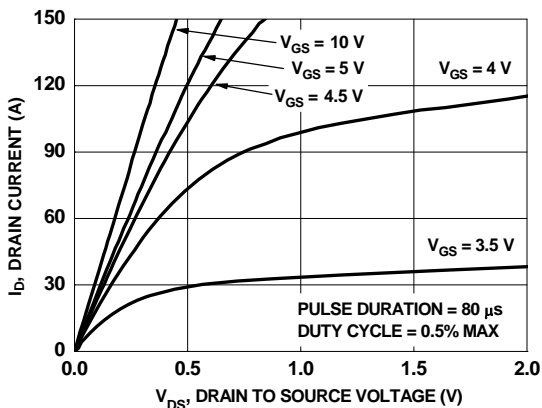
b.  $125\text{ }^\circ\text{C/W}$  when mounted on a minimum pad of 2 oz copper.

- Pulse Test: Pulse Width <  $300\text{ }\mu\text{s}$ , Duty cycle < 2.0%.

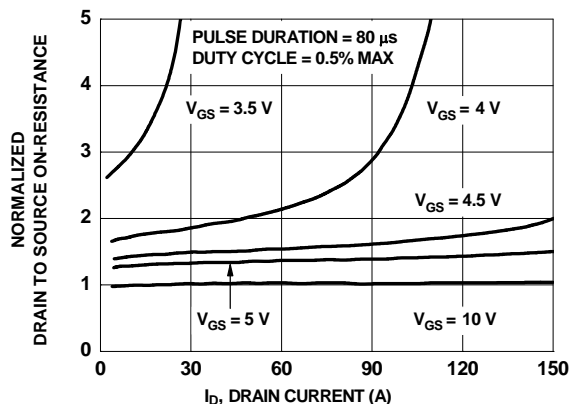
- $E_{AS}$  of 144 mJ is based on starting  $T_J = 25\text{ }^\circ\text{C}$ ,  $L = 1\text{ mH}$ ,  $I_{AS} = 17\text{ A}$ ,  $V_{DD} = 27\text{ V}$ ,  $V_{GS} = 10\text{ V}$ . 100% test at  $L = 0.3\text{ mH}$ ,  $I_{AS} = 22\text{ A}$ .

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

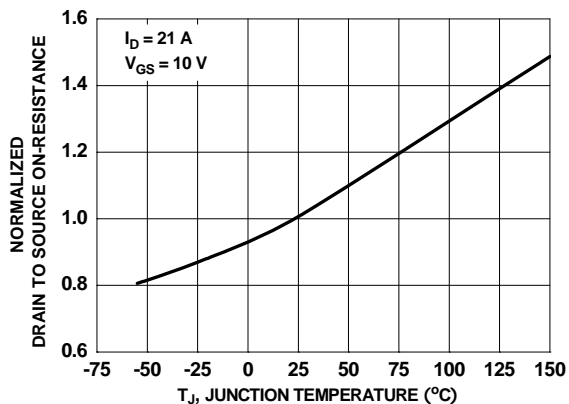
**Typical Characteristics**  $T_J = 25\text{ }^\circ\text{C}$  unless otherwise noted



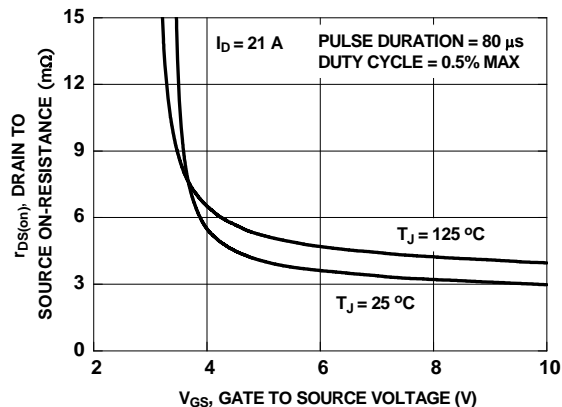
**Figure 1. On Region Characteristics**



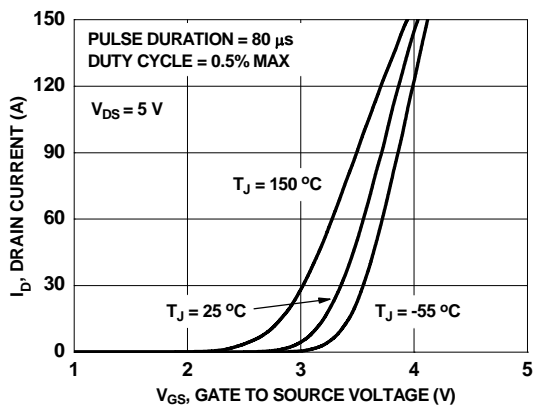
**Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage**



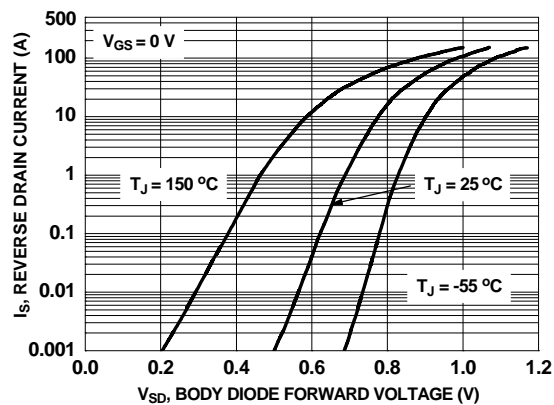
**Figure 3. Normalized On Resistance vs Junction Temperature**



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

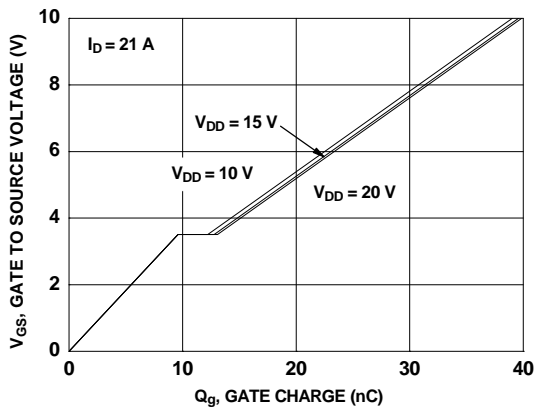


**Figure 5. Transfer Characteristics**

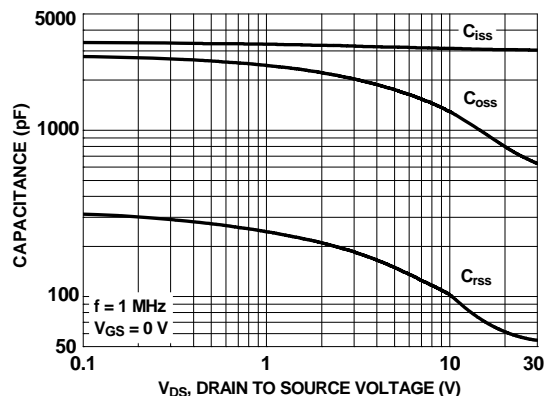


**Figure 6. Source to Drain Diode Forward Voltage vs Source Current**

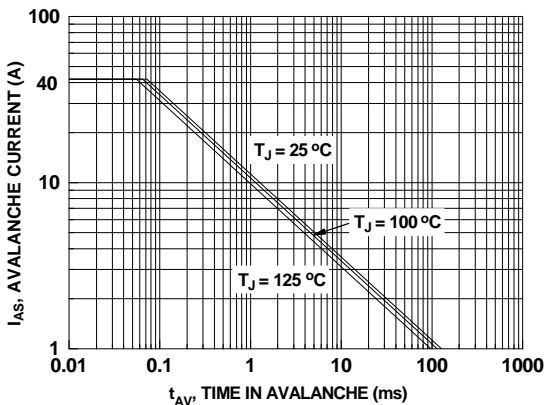
**Typical Characteristics**  $T_J = 25\text{ }^\circ\text{C}$  unless otherwise noted



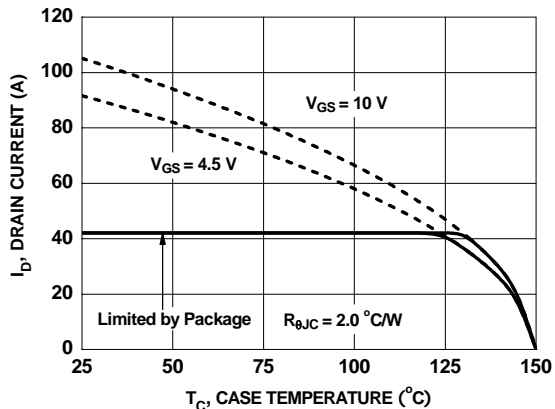
**Figure 7. Gate Charge Characteristics**



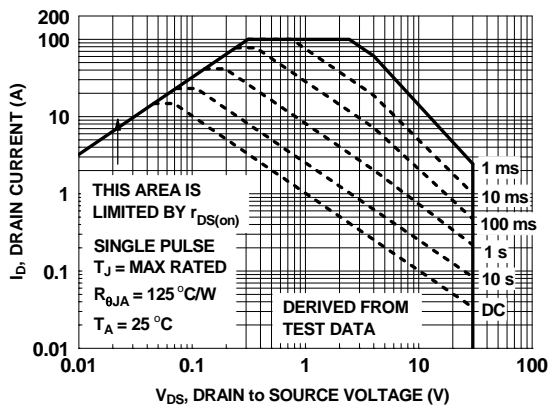
**Figure 8. Capacitance vs Drain to Source Voltage**



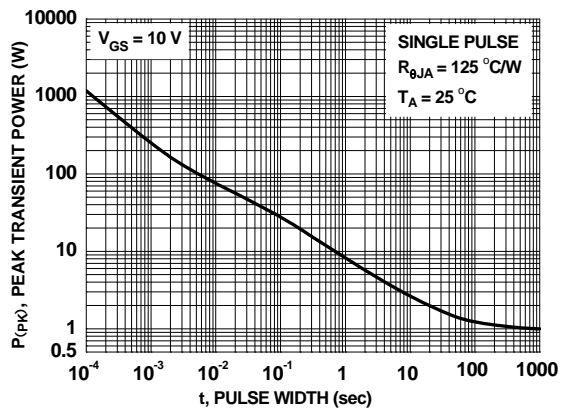
**Figure 9. Unclamped Inductive Switching Capability**



**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  $T_J = 25\text{ }^\circ\text{C}$  unless otherwise noted

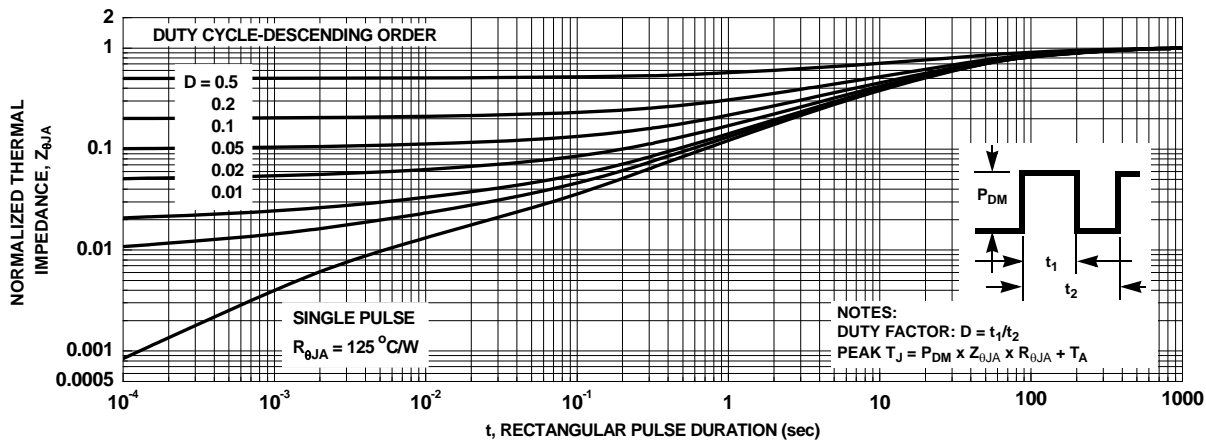


Figure 13. Junction-to-Ambient Transient Thermal Response Curve

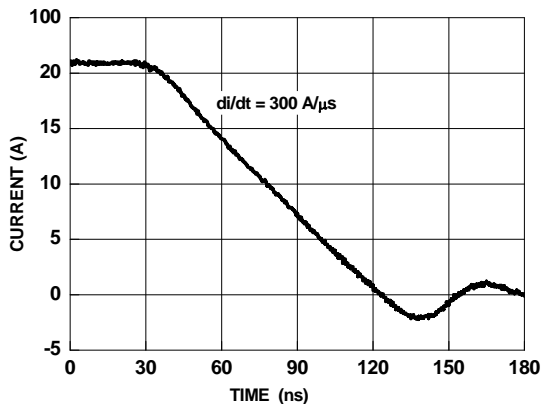


Figure 14. Body Diode Reverse Recovery Characteristics



TOP VIEW



LAND PATTERN RECOMMENDATION



SIDE VIEW

OPTIONAL DRAFT ANGLE MAY APPEAR ON FOUR SIDES OF THE PACKAGE



DETAIL C  
SCALE: 2:1



DETAIL B  
SCALE: 2:1



BOTTOM VIEW

NOTES: UNLESS OTHERWISE SPECIFIED

- A. PACKAGE STANDARD REFERENCE: JEDEC MO-240, ISSUE A, VAR. AA, DATED OCTOBER 2002.
- B. DIMENSIONS DO NOT INCLUDE BURRS OR MOLD FLASH. MOLD FLASH OR BURRS DOES NOT EXCEED 0.10MM.
- C. ALL DIMENSIONS ARE IN MILLIMETERS.
- D. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-2009.
- E. IT IS RECOMMENDED TO HAVE NO TRACES OR VIAS WITHIN THE KEEP OUT AREA.
- F. DRAWING FILE NAME: PQFN08AREV10



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