

# FDMS8820

## N-Channel PowerTrench® MOSFET 30 V, 116 A, 2.0 mΩ

### Features

- Max  $r_{DS(on)}$  = 2.0 mΩ at  $V_{GS} = 10\text{ V}$ ,  $I_D = 28\text{ A}$
- Max  $r_{DS(on)}$  = 2.4 mΩ at  $V_{GS} = 4.5\text{ V}$ ,  $I_D = 25\text{ A}$
- 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

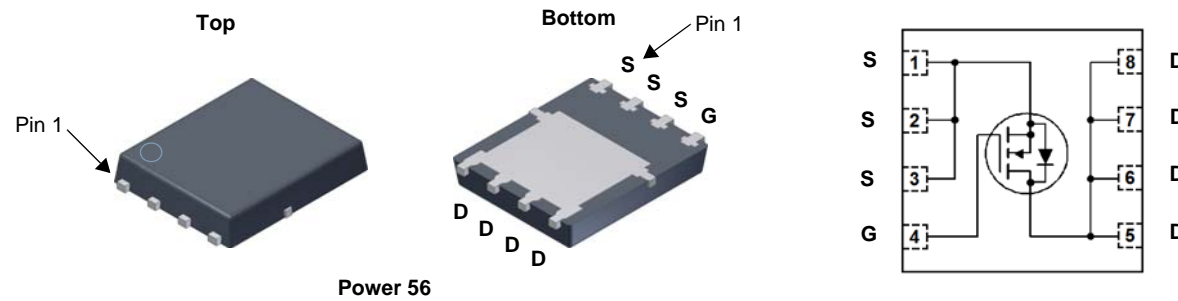


### General Description

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

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



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

Symbol	Parameter	Rated	Units
$V_{DS}$	Drain to Source Voltage	30	V
$V_{GS}$	Gate to Source Voltage (Note 4)	$\pm 20$	V
$I_D$	Drain Current -Continuous $T_C = 25\text{ °C}$	116	A
	-Continuous $T_A = 25\text{ °C}$ (Note 1a)	28	
	-Pulsed (Note 5)	180	
$E_{AS}$	Single Pulse Avalanche Energy (Note 3)	294	mJ
$P_D$	Power Dissipation $T_C = 25\text{ °C}$	78	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	1.6	°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
FDMS8820	FDMS8820	Power 56	13"	12 mm	3000 units

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

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

$BV_{DSS}$	Drain to Source Breakdown Voltage	$I_D = 250\ \mu\text{A}, V_{GS} = 0\ \text{V}$	30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , referenced to $25^\circ\text{C}$		19		mV/°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	$V_{GS} = V_{DS}, I_D = 250\ \mu\text{A}$	1.2	1.5	2.5	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 250\ \mu\text{A}$ , referenced to $25^\circ\text{C}$		-6		mV/°C
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\ \text{V}, I_D = 28\ \text{A}$		1.4	2.0	m $\Omega$
		$V_{GS} = 4.5\ \text{V}, I_D = 25\ \text{A}$		1.8	2.4	
		$V_{GS} = 10\ \text{V}, I_D = 28\ \text{A}, T_J = 125^\circ\text{C}$		2.0	2.8	
$g_{FS}$	Forward Transconductance	$V_{DS} = 5\ \text{V}, I_D = 28\ \text{A}$		76		S

### Dynamic Characteristics

$C_{iss}$	Input Capacitance	$V_{DS} = 15\ \text{V}, V_{GS} = 0\ \text{V},$ $f = 1\ \text{MHz}$		3995	5315	pF
$C_{oss}$	Output Capacitance			1295	1725	
$C_{rss}$	Reverse Transfer Capacitance			177	270	
$R_g$	Gate Resistance		0.1	1.1	2.5	

### Switching Characteristics

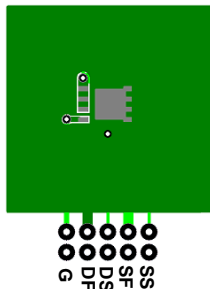
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 15\ \text{V}, I_D = 28\ \text{A},$ $V_{GS} = 10\ \text{V}, R_{GEN} = 6\ \Omega$		14	25	ns
$t_r$	Rise Time			7.7	16	
$t_{d(off)}$	Turn-Off Delay Time			41	66	
$t_f$	Fall Time			6.4	13	
$Q_g$	Total Gate Charge		$V_{GS} = 0\ \text{V to } 10\ \text{V}$		63	
$Q_g$	Total Gate Charge	$V_{GS} = 0\ \text{V to } 4.5\ \text{V}$		30	42	
$Q_{gs}$	Gate to Source Charge	$V_{DD} = 15\ \text{V},$ $I_D = 28\ \text{A}$		9.8		
$Q_{gd}$	Gate to Drain "Miller" Charge			8.2		

### Drain-Source Diode Characteristics

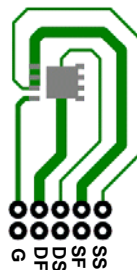
$V_{SD}$	Source to Drain Diode Forward Voltage	$V_{GS} = 0\ \text{V}, I_S = 2.0\ \text{A}$ (Note 2)		0.7	1.1	V
		$V_{GS} = 0\ \text{V}, I_S = 28\ \text{A}$ (Note 2)		0.8	1.2	
$t_{rr}$	Reverse Recovery Time	$I_F = 28\ \text{A}, di/dt = 100\ \text{A}/\mu\text{s}$		43	69	ns
$Q_{rr}$	Reverse Recovery Charge			27	43	

#### Notes:

1.  $R_{\theta JA}$  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.  $50^\circ\text{C}/\text{W}$  when mounted on a  $1\ \text{in}^2$  pad of 2 oz copper



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

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

3.  $E_{AS}$  of 294 mJ is based on starting  $T_J = 25^\circ\text{C}$ ; N-ch:  $L = 3\ \text{mH}, I_{AS} = 14\ \text{A}, V_{DD} = 30\ \text{V}, V_{GS} = 10\ \text{V}$ . 100% test at  $L = 0.1\ \text{mH}, I_{AS} = 45\ \text{A}$ .

4. As an N-ch device, the negative  $V_{GS}$  rating is for low duty cycle pulse occurrence only. No continuous rating is implied.

5. Pulsed  $I_d$  limited by junction temperature,  $t_d \leq 100\ \mu\text{s}$ , please refer to SOA curve for more details.

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

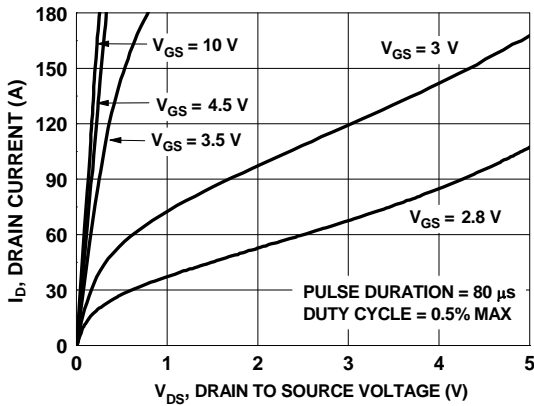


Figure 1. On Region Characteristics

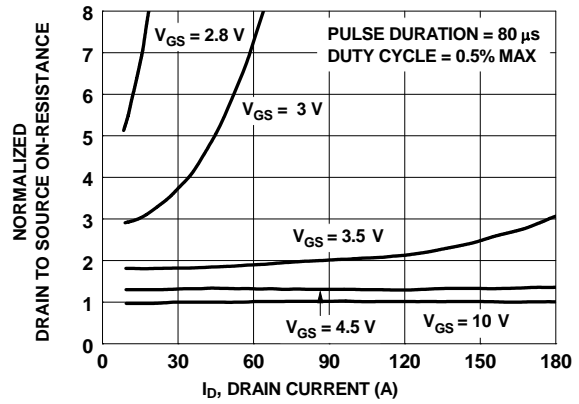


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

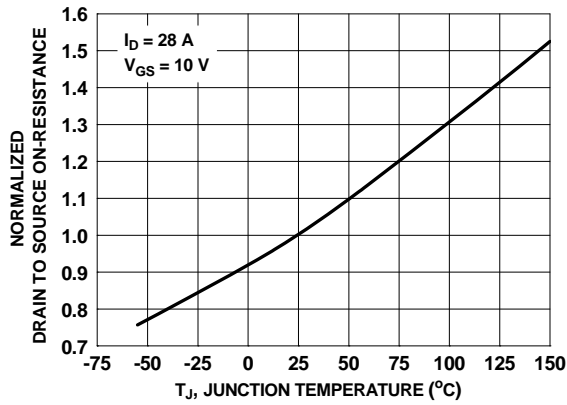


Figure 3. Normalized On Resistance vs Junction Temperature

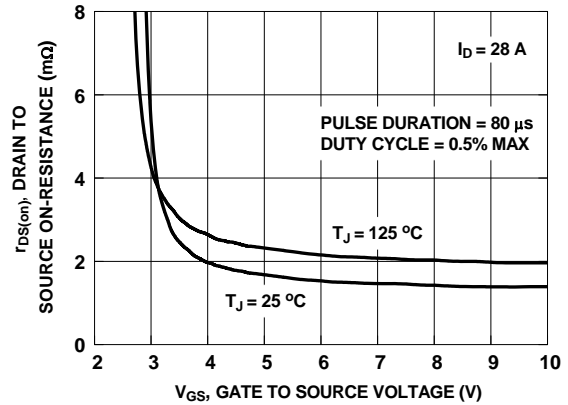


Figure 4. On-Resistance vs Gate to Source Voltage

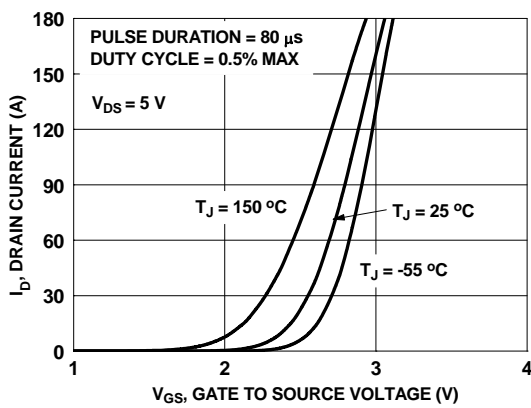


Figure 5. Transfer Characteristics

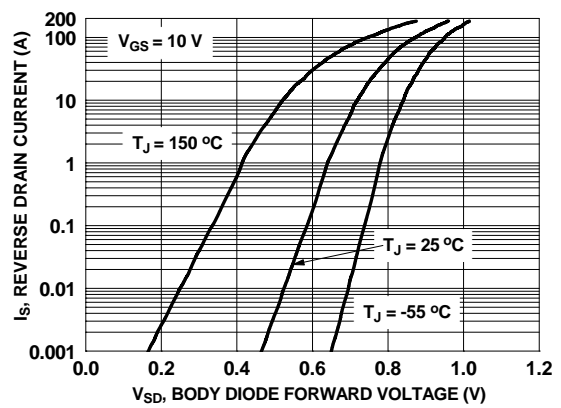
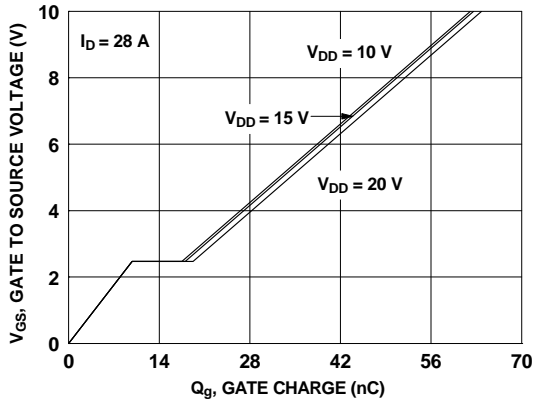
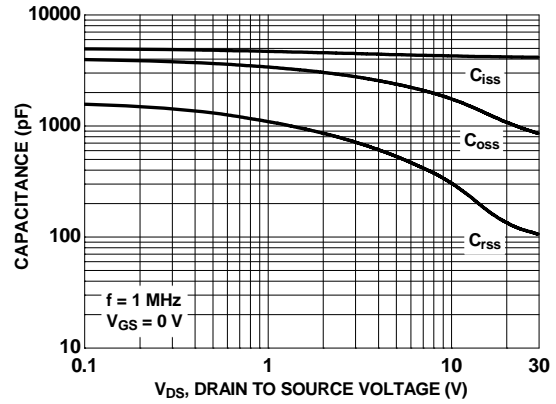


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

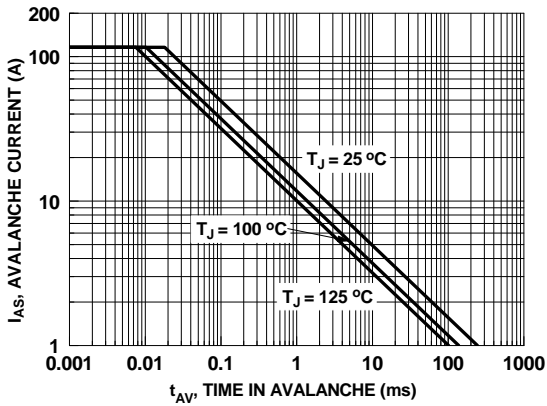
**Typical Characteristics**  $T_J = 25\text{ }^\circ\text{C}$  unless otherwise noted



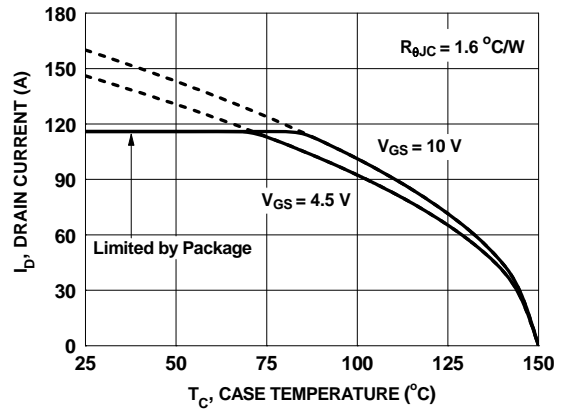
**Figure 7. Gate Charge Characteristics**



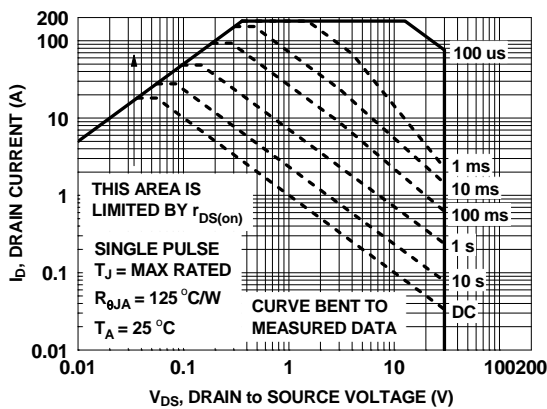
**Figure 8. Capacitance vs Drain to Source Voltage**



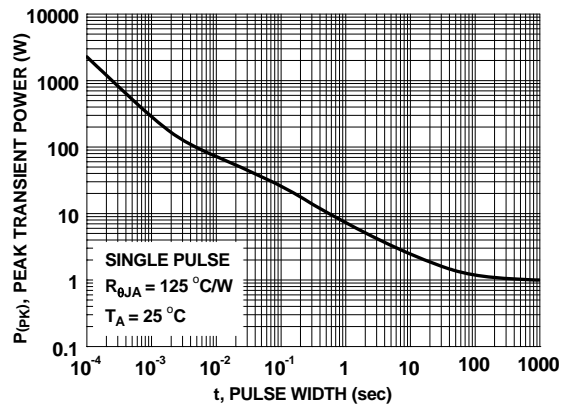
**Figure 9. Unclamped Inductive Switching Capability**



**Figure 10. Maximum Continuous Drain Current vs Case Temperature**

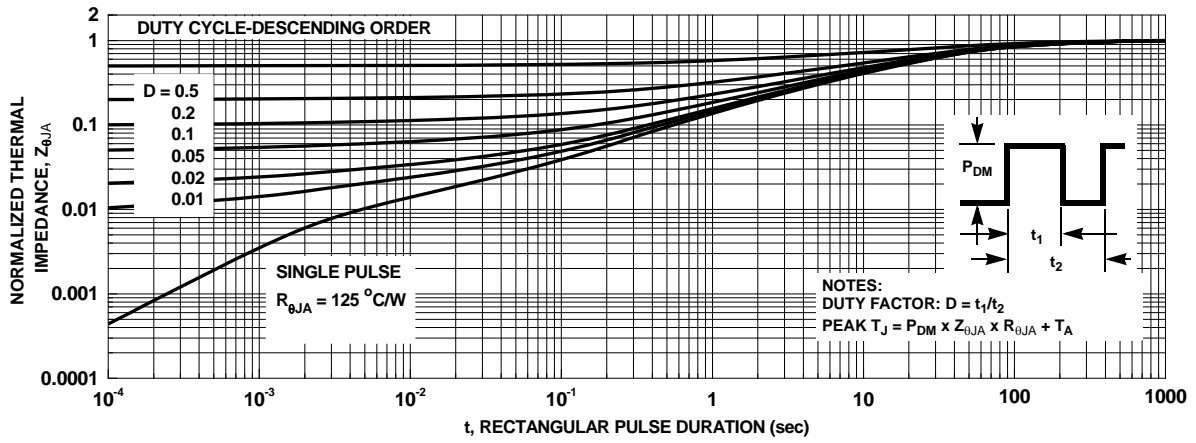


**Figure 11. Forward Bias Safe Operating Area**



**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**





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