

FDS8672S

N-Channel PowerTrench® SyncFET™ 30V, 18A, 4.8mΩ

Features

- Max $r_{DS(on)}$ = 4.8mΩ at $V_{GS} = 10V$, $I_D = 18A$
- Max $r_{DS(on)}$ = 7.0mΩ at $V_{GS} = 4.5V$, $I_D = 15A$
- Includes SyncFET Schottky body diode
- High performance trench technology for extremely low $r_{DS(on)}$ and fast switching
- High power and current handling capability
- 100% R_g (Gate Resistance) tested
- Termination is Lead-free and RoHS Compliant

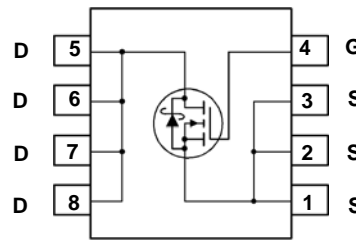
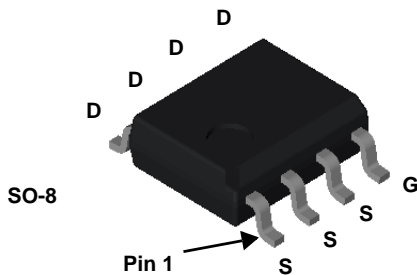


General Description

The FDS8672S is designed to replace a single MOSFET and Schottky diode in synchronous DC/DC power supplies. This 30V MOSFET is designed to maximize power conversion efficiency, providing a low $r_{DS(on)}$ and low gate charge. The FDS8672S includes a patented combination of a MOSFET monolithically integrated with a Schottky diode using Fairchild's monolithic SyncFET technology.

Application

- Synchronous Rectifier for DC/DC Converters
- Notebook Vcore low side switch
- Point of load low side switch



MOSFET Maximum Ratings $T_A = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Ratings	Units
V_{DS}	Drain to Source Voltage	30	V
V_{GS}	Gate to Source Voltage	± 20	V
I_D	Drain Current -Continuous	18	A
	-Pulsed	80	
E_{AS}	Single Pulse Avalanche Energy (Note 3)	216	mJ
P_D	Power Dissipation $T_A = 25^\circ\text{C}$ (Note 1a)	2.5	W
	Power Dissipation $T_A = 25^\circ\text{C}$ (Note 1b)	1.0	
T_J, T_{STG}	Operating and Storage Junction Temperature Range	-55 to +150	$^\circ\text{C}$

Thermal Characteristics

$R_{\theta JC}$	Thermal Resistance, Junction to Case (Note 1)	25	$^\circ\text{C}/\text{W}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient (Note 1a)	50	

Package Marking and Ordering Information

Device Marking	Device	Package	Reel Size	Tape Width	Quantity
FDS8672S	FDS8672S	SO8	13"	12mm	2500 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	$I_D = 1\text{mA}, V_{GS} = 0\text{V}$	30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	$I_D = 10\text{mA}$, referenced to 25°C		33		mV/ $^\circ\text{C}$
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 24\text{V}, V_{GS} = 0\text{V}$			500	μA
I_{GSS}	Gate to Source Leakage Current	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$			± 100	nA

On Characteristics

$V_{GS(th)}$	Gate to Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = 1\text{mA}$	1.0	2.1	3.0	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate to Source Threshold Voltage Temperature Coefficient	$I_D = 10\text{mA}$, referenced to 25°C		-5		mV/ $^\circ\text{C}$
$r_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 10\text{V}, I_D = 18\text{A}$		3.8	4.8	m Ω
		$V_{GS} = 4.5\text{V}, I_D = 15\text{A}$		5.3	7.0	
		$V_{GS} = 10\text{V}, I_D = 18\text{A}, T_J = 125^\circ\text{C}$		5.3	7.8	
g_{FS}	Forward Transconductance	$V_{DS} = 5\text{V}, I_D = 18\text{A}$		78		S

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 15\text{V}, V_{GS} = 0\text{V},$ $f = 1\text{MHz}$		2005	2670	pF
C_{oss}	Output Capacitance			985	1310	pF
C_{riss}	Reverse Transfer Capacitance			135	205	pF
R_g	Gate Resistance	$f = 1\text{MHz}$		0.6	2.0	Ω

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 15\text{V}, I_D = 18\text{A},$ $V_{GS} = 10\text{V}, R_{GEN} = 6\Omega$		12	22	ns
t_r	Rise Time			4	10	ns
$t_{d(off)}$	Turn-Off Delay Time			26	42	ns
t_f	Fall Time			3	10	ns
Q_g	Total Gate Charge		$V_{GS} = 0\text{V to } 10\text{V}$	$V_{DD} = 15\text{V},$ $I_D = 18\text{A}$	29	41
Q_g	Total Gate Charge	$V_{GS} = 0\text{V to } 5\text{V}$	15		21	nC
Q_{gs}	Gate to Source Charge		5.5			nC
Q_{gd}	Gate to Drain "Miller" Charge		3.7			nC

Drain-Source Diode Characteristics

V_{SD}	Source to Drain Diode Forward Voltage	$V_{GS} = 0\text{V}, I_S = 18\text{A}$		0.8	1.2	V
		$V_{GS} = 0\text{V}, I_S = 1.8\text{A}$		0.4	0.7	
t_{rr}	Reverse Recovery Time	$I_F = 18\text{A}, di/dt = 300\text{A}/\mu\text{s}$		27	43	ns
Q_{rr}	Reverse Recovery Charge			31	50	nC

NOTES:

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



b) 125°C/W when mounted on a minimum pad.

2. Pulse Test: Pulse Width $< 300\mu\text{s}$, Duty cycle $< 2.0\%$.
3. Starting $T_J = 25^\circ\text{C}$, $L = 3\text{mH}$, $I_{AS} = 12\text{A}$, $V_{DD} = 30\text{V}$, $V_{GS} = 10\text{V}$.

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

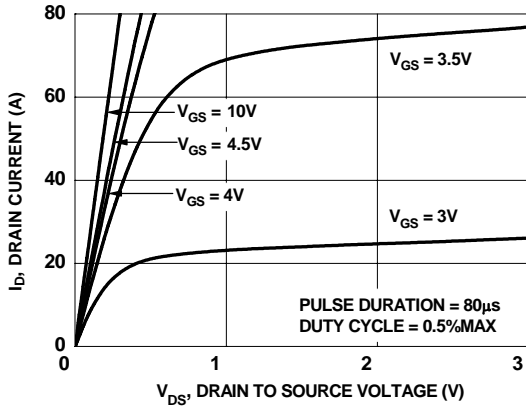


Figure 1. On-Region Characteristics

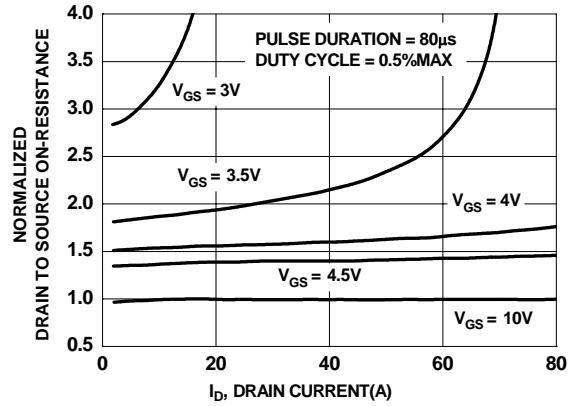


Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage

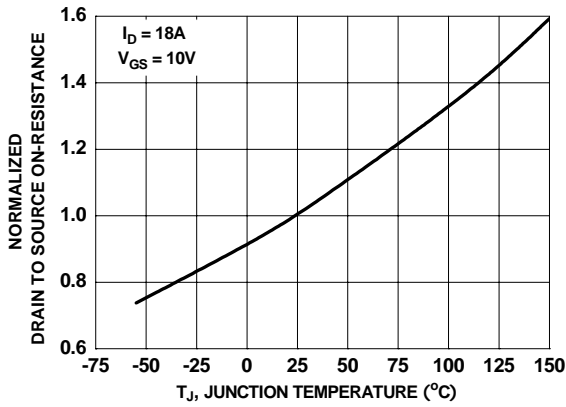


Figure 3. Normalized On-Resistance vs Junction Temperature

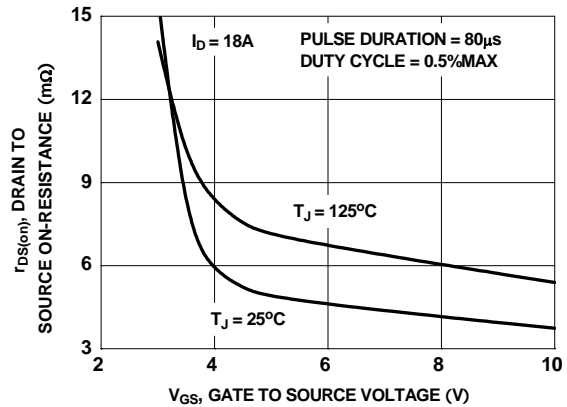


Figure 4. On-Resistance vs Gate to Source Voltage

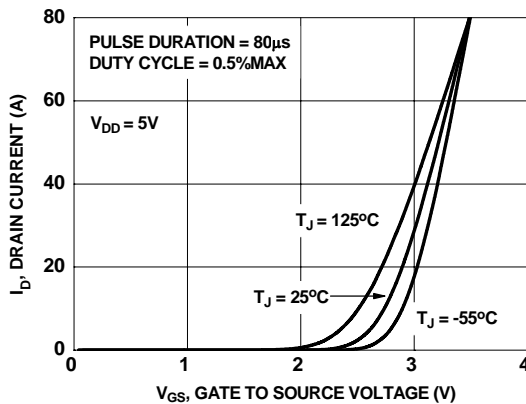


Figure 5. Transfer Characteristics

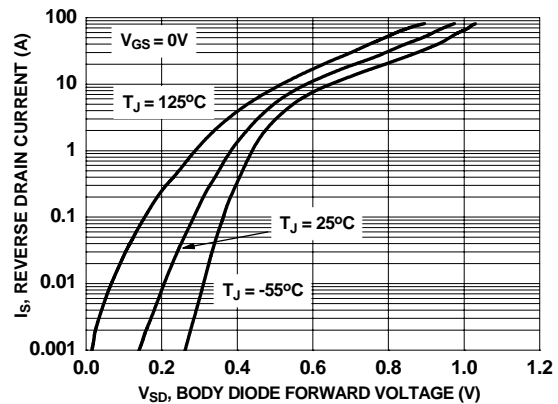


Figure 6. Source to Drain Diode Forward Voltage vs Source Current

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

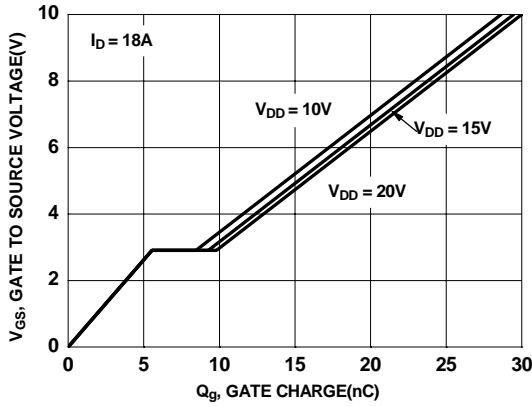


Figure 7. Gate Charge Characteristics

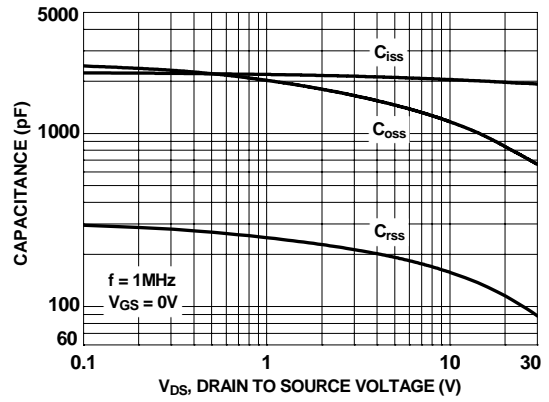


Figure 8. Capacitance vs Drain to Source Voltage

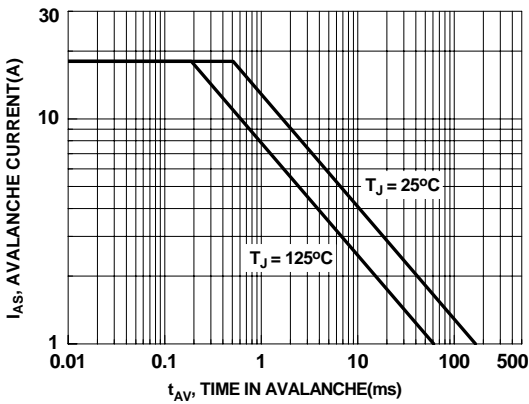


Figure 9. Unclamped Inductive Switching Capability

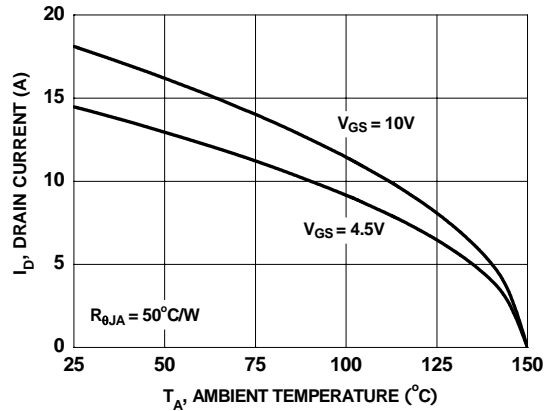


Figure 10. Maximum Continuous Drain Current vs Ambient Temperature

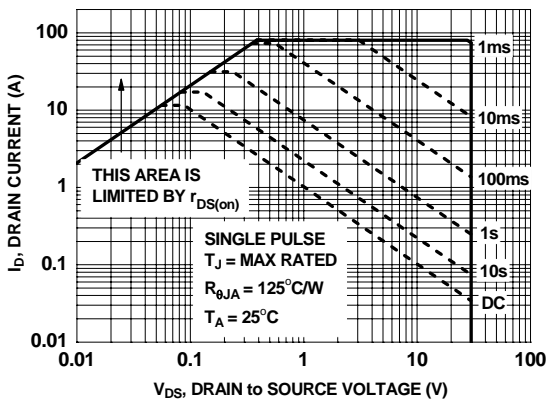


Figure 11. Forward Bias Safe Operating Area

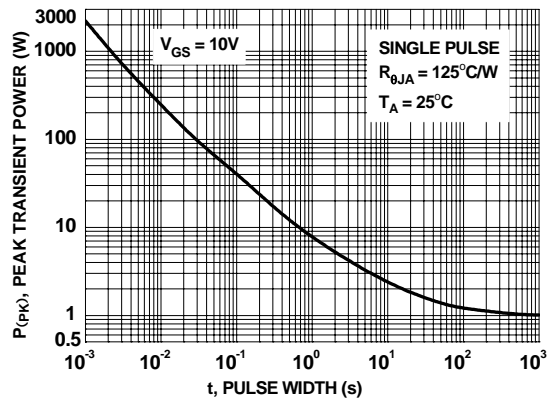


Figure 12. Single Pulse Maximum Power Dissipation

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

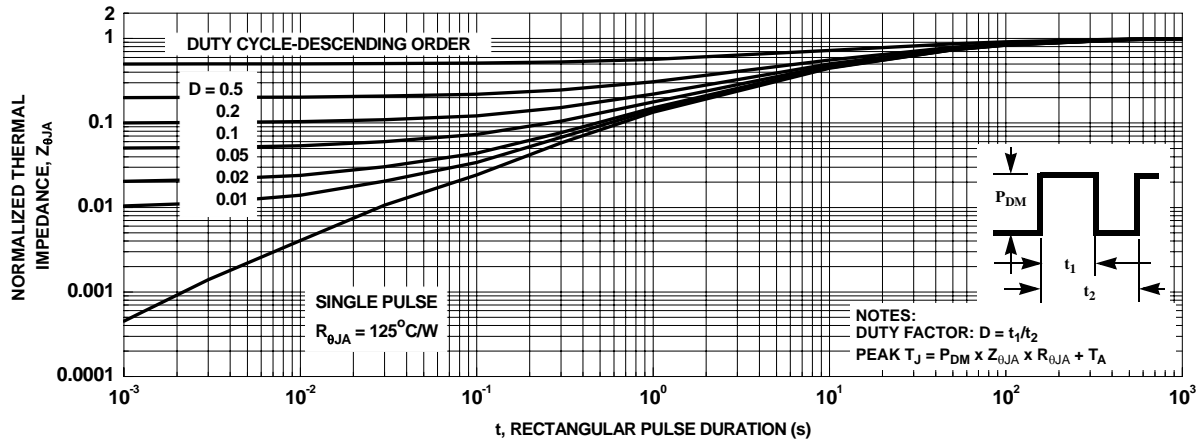


Figure 13. Transient Thermal Response Curve

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

SyncFET Schottky Body Diode Characteristics

Fairchild's SyncFET process embeds a Schottky diode in parallel with PowerTrench MoSFET. This diode exhibits similar characteristics to a discrete external Schottky diode in parallel with a MOSFET. Figure 14 shows the reverse recovery characteristic of the FDS8672S.

Schottky barrier diodes exhibit significant leakage at high temperature and high reverse voltage. This will increase the power in the device.

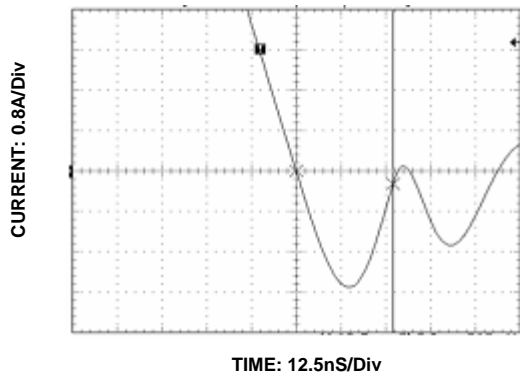


Figure 14. FDS8672S SyncFET Body Diode Reverse Recovery Characteristics

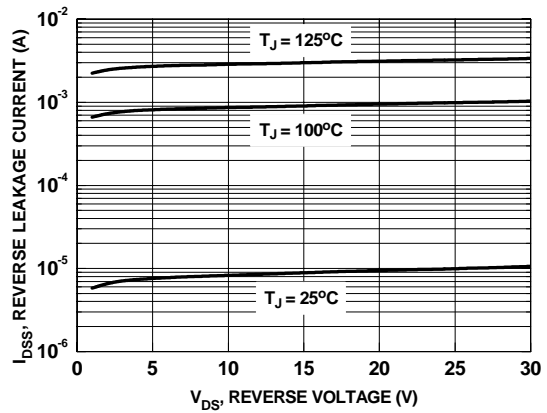
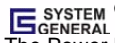




Figure 15. SyncFET Body Diode Reverse Leakage vs Drain to Source Voltage



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