

# 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

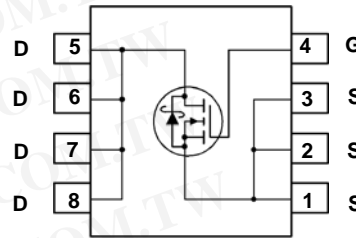
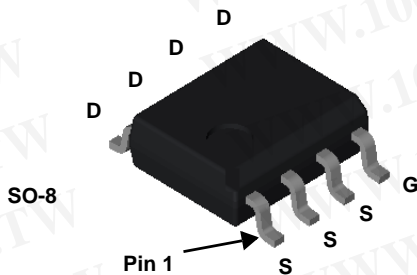


### General Description

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	$\pm 20$	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	$^\circ\text{C/W}$
$R_{\theta JA}$	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 $25^\circ\text{C}$		33		mV/°C
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 24\text{V}, V_{GS} = 0\text{V}$			500	$\mu\text{A}$
$I_{GSS}$	Gate to Source Leakage Current	$V_{GS} = \pm 20\text{V}, V_{DS} = 0\text{V}$			$\pm 100$	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 $25^\circ\text{C}$		-5		mV/°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 $\Omega$
		$V_{GS} = 4.5\text{V}, I_D = 15\text{A}$		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
$C_{rss}$	Reverse Transfer Capacitance			135	205	pF
$R_g$	Gate Resistance		$f = 1\text{MHz}$	0.6	2.0	$\Omega$

### 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  $1\text{in}^2$  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.



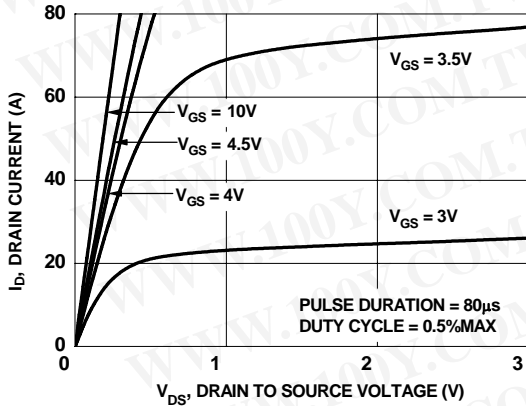
a)  $50^\circ\text{C/W}$  when mounted on a  $1\text{in}^2$  pad of 2 oz copper.



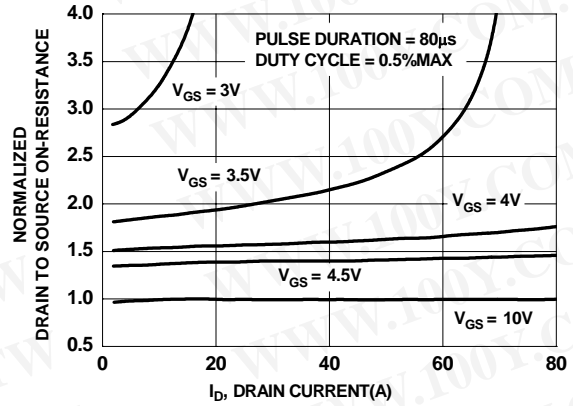
b)  $125^\circ\text{C/W}$  when mounted on a minimum pad.

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

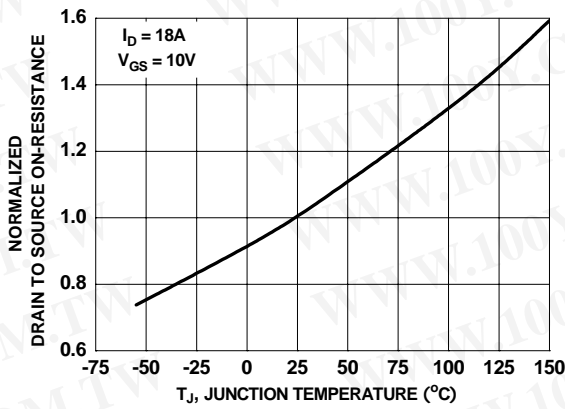
**Typical Characteristics**  $T_J = 25^\circ\text{C}$  unless otherwise noted



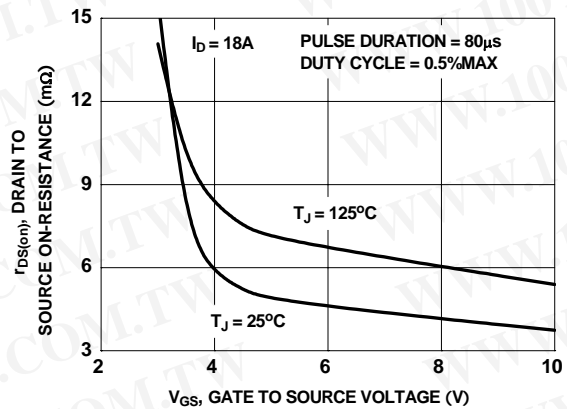
**Figure 1. On-Region Characteristics**



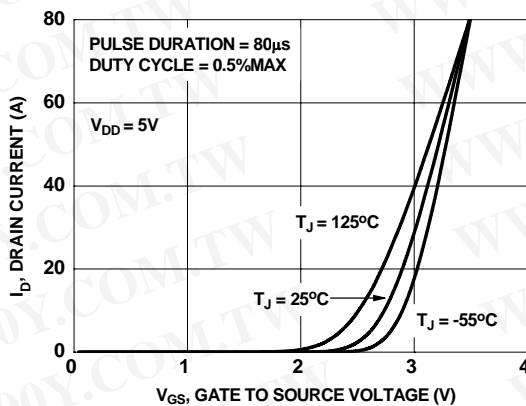
**Figure 2. Normalized On-Resistance vs Drain Current and Gate Voltage**



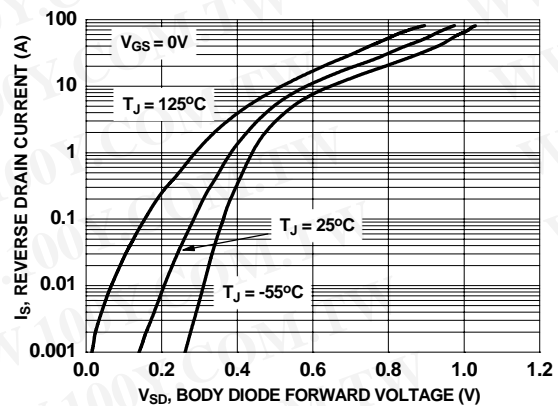
**Figure 3. Normalized On-Resistance vs Junction Temperature**



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

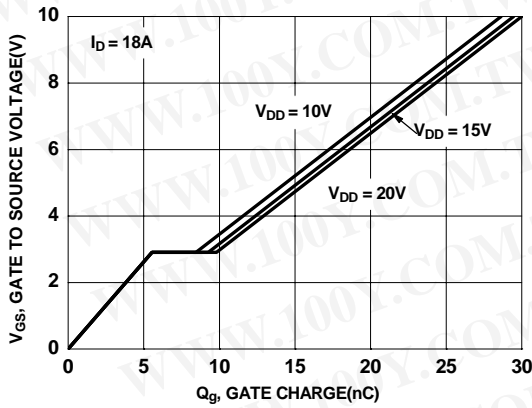


**Figure 5. Transfer Characteristics**

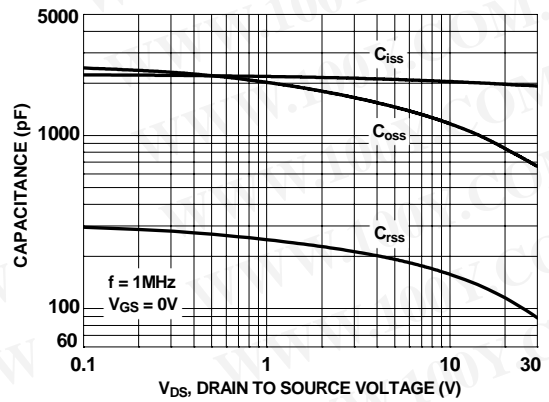


**Figure 6. Source to Drain Diode Forward Voltage vs Source Current**

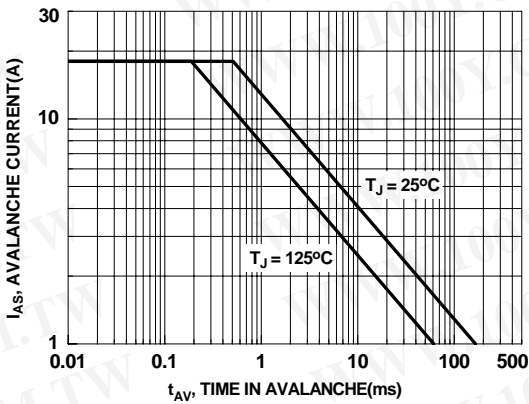
**Typical Characteristics**  $T_J = 25^\circ\text{C}$  unless otherwise noted



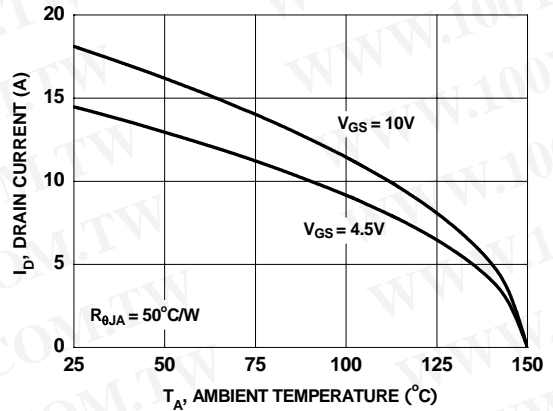
**Figure 7. Gate Charge Characteristics**



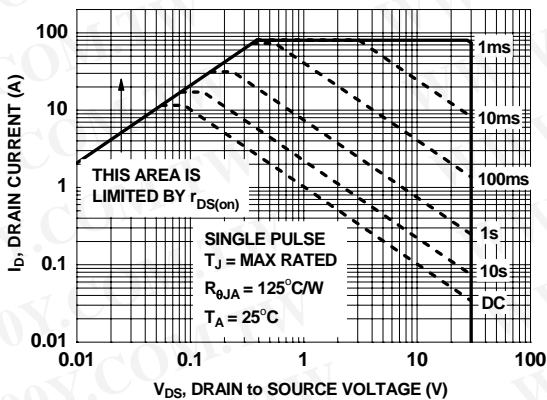
**Figure 8. Capacitance vs Drain to Source Voltage**



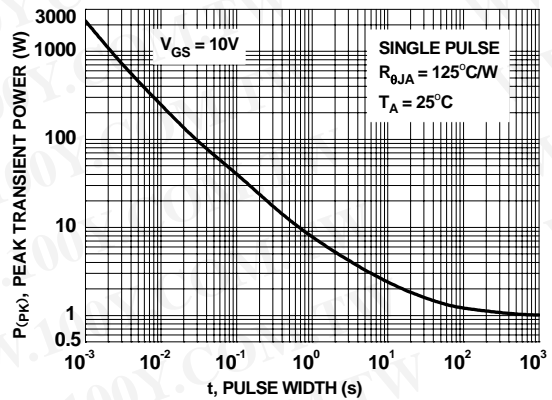
**Figure 9. Unclamped Inductive Switching Capability**



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



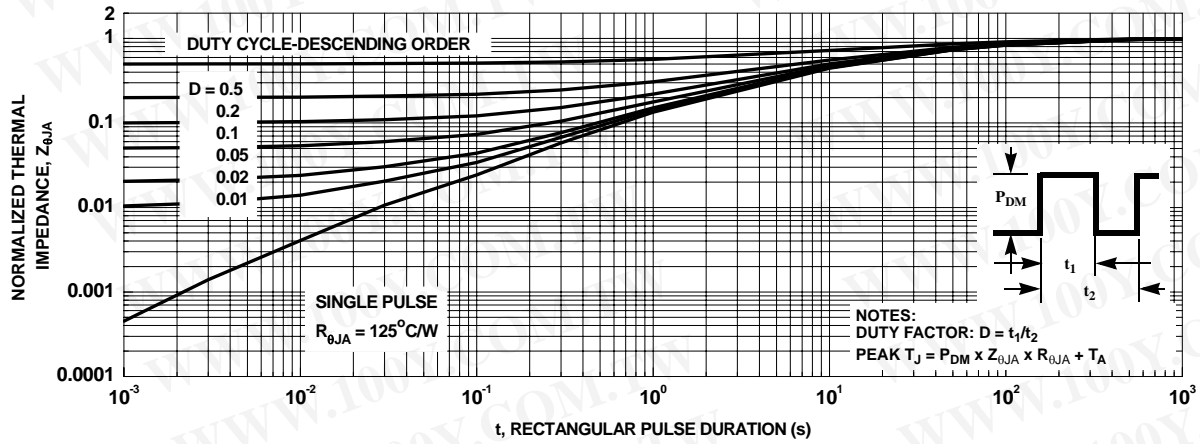
**Figure 11. Forward Bias Safe Operating Area**



**Figure 12. Single Pulse Maximum Power Dissipation**

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



**Figure 13. Transient Thermal Response Curve**

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**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.

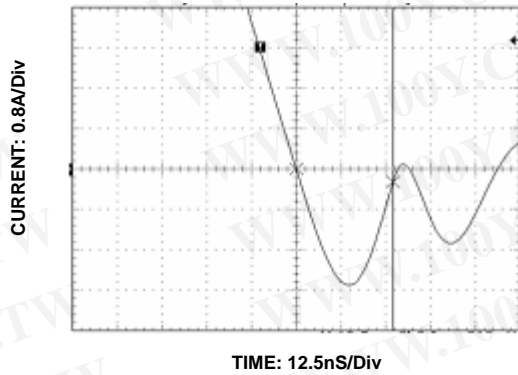


Figure 14. FDS8672S SyncFET Body Diode Reverse Recovery Characteristics

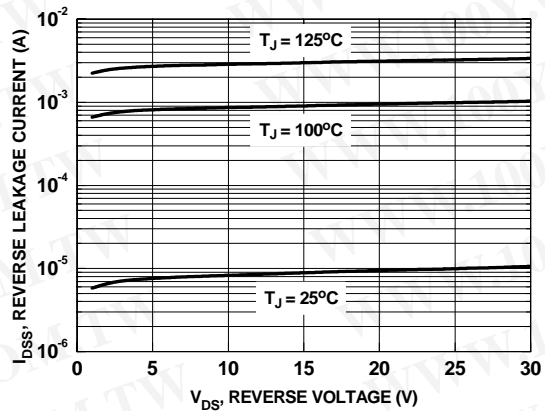


Figure 15. SyncFET Body Diode Reverse Leakage vs Drain to Source Voltage

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