THE DATASHEET OF

FDN372S

September 2002

FAIRCHILD SEMICONDUCTOR®

FDN372S

30V N-Channel PowerTrench® SyncFET™

General Description

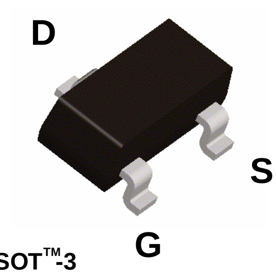
The FDN372S is designed to replace a single MOSFET and Schottky diode, used in synchronous DC-DC power supplies, with a single integrated component. This 30V MOSFET is designed to maximize power conversion efficiency with low Rds(on) and low gate charge. The FDN372S includes an integrated Schottky diode using Fairchild Semiconductor's monolithic SyncFET process, making it ideal as the low side switch in a synchronous converter.

Applications

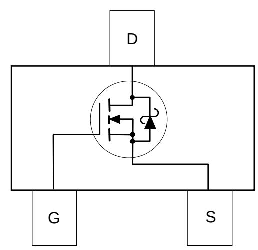
- DC-DC Converter
- Motor Drives

Features

- 2.6 A, 30 V. $R_{DS(ON)}$ = 40 mΩ @ V_{GS} = 10 V
  $R_{DS(ON)}$ = 50 mΩ @ V_{GS} = 4.5 V
- Low gate charge
- Fast switching speed
- High performance trench technology for extremely low $R_{DS(ON)}$



SuperSOT™-3



Absolute Maximum Ratings T_A=25°C unless otherwise noted

Symbol	Parameter		Ratings	Units
V_{DSS}	Drain-Source Voltage		30	V
V_{GSS}	Gate-Source Voltage		± 16	V
I_D	Drain Current – Continuous	(Note 1a)	2.6	A
	– Pulsed		10	
P_D	Power Dissipation for Single Operation	(Note 1a)	0.5	W
		(Note 1b)	0.46	
T_J, T_{STG}	Operating and Storage Junction Temperature Range		–55 to +150	°C

Thermal Characteristics

Symbol	Parameter		Ratings	Units
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	(Note 1a)	250	°C/W
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	(Note 1)	75	°C/W

Package Marking and Ordering Information

Device Marking	Device	Reel Size	Tape width	Quantity
372	FDN372S	7''	8mm	3000 units

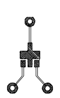
Electrical Characteristics

T_A = 25°C unless otherwise noted

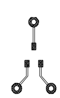
Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Off Characteristics						
BV_{DSS}	Drain–Source Breakdown Voltage	V_{GS} = 0 V, I_D = 1 mA	30			V
$\frac{\Delta BV_{DSS}}{\Delta T_J}$	Breakdown Voltage Temperature Coefficient	I_D = 10 mA, Referenced to 25°C		24		mV/°C
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 24 V, V_{GS} = 0 V			500	µA
I_{GSS}	Gate–Body Leakage	V_{GS} = ±16 V, V_{DS} = 0 V			±100	nA
On Characteristics (Note 2)						
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$, I_D = 1 mA	1	1.4	3	V
$\frac{\Delta V_{GS(th)}}{\Delta T_J}$	Gate Threshold Voltage Temperature Coefficient	I_D = 10 mA, Referenced to 25°C		–3.2		mV/°C
$R_{DS(on)}$	Static Drain–Source On–Resistance	V_{GS} = 10 V, I_D = 2.6 A V_{GS} = 4.5 V, I_D = 2.3 A V_{GS} = 10V, I_D = 2.6 A, T_J = 125°C		32 36 45	40 50 60	mΩ
$I_{D(on)}$	On–State Drain Current	V_{GS} = 10 V, V_{DS} = 5 V	10			A
g_{FS}	Forward Transconductance	V_{DS} = 10V, I_D = 2.6 A		15		S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 15 V, V_{GS} = 0 V, f = 1.0 MHz		630		pF
C_{oss}	Output Capacitance			115		pF
C_{rss}	Reverse Transfer Capacitance			45		pF
Rg	Gate Resistance	V_{GS} = 15 mV f = 1.0 MHz		2.4		Ω
Switching Characteristics (Note 2)						
$t_{d(on)}$	Turn–On Delay Time	V_{DD} = 15 V, I_D = 1 A, V_{GS} = 10 V, R_{GEN} = 6 Ω		7	14	ns
t_r	Turn–On Rise Time			5	10	ns
$t_{d(off)}$	Turn–Off Delay Time			21	34	ns
t_f	Turn–Off Fall Time			2.7	5.4	ns
Q_g	Total Gate Charge	V_{DS} = 15 V, I_D = 2.6 A, V_{GS} = 5 V		5.8	8.1	nC
Q_{gs}	Gate–Source Charge			1.3	1.9	nC
Q_{gd}	Gate–Drain Charge			1.2	1.7	nC
Drain–Source Diode Characteristics and Maximum Ratings						
I_S	Maximum Continuous Drain–Source Diode Forward Current				0.7	A
V_{SD}	Drain–Source Diode Forward Voltage	V_{GS} = 0 V, I_S = 0.7 A (Note 2)		440	700	mV
trr	Diode Reverse Recovery Time	I_F = 2.6 A, d_{iF}/d_t = 300 A/µs (Note 2)		10		ns
Qrr	Diode Reverse Recovery Charge			4		nC

Notes:

1. $R_{\theta JA}$ is the sum of the junction-to-case and case-to-ambient thermal resistance where the case thermal reference is defined as the solder mounting surface of the drain pins. $R_{\theta JC}$ is guaranteed by design while $R_{\theta CA}$ is determined by the user's board design.



a) 250°C/W when mounted on a 0.02 in² pad of 2 oz. copper.



b) 270°C/W when mounted on a minimum pad.

Scale 1 : 1 on letter size paper

2. Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%

Typical Characteristics

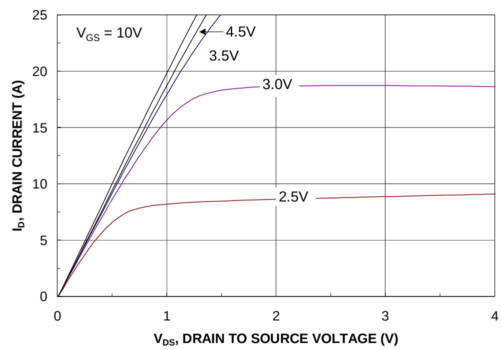


Figure 1. On-Region Characteristics.

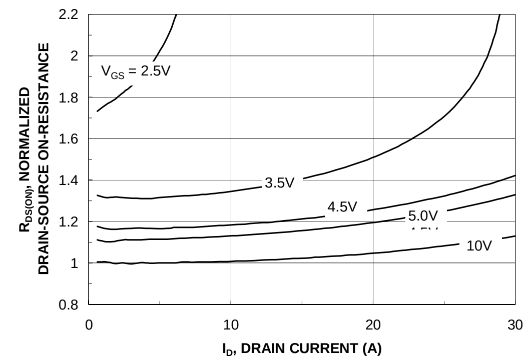


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

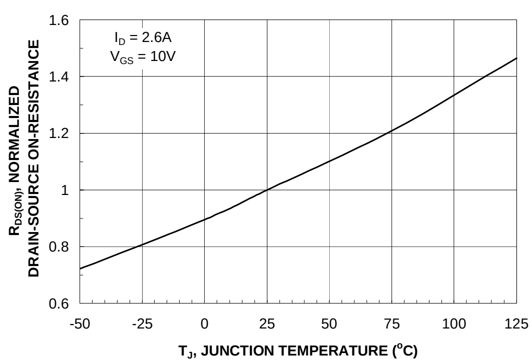


Figure 3. On-Resistance Variation with Temperature.

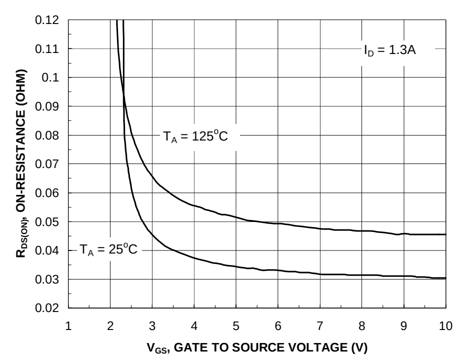


Figure 4. On-Resistance Variation with Gate-to-Source Voltage.

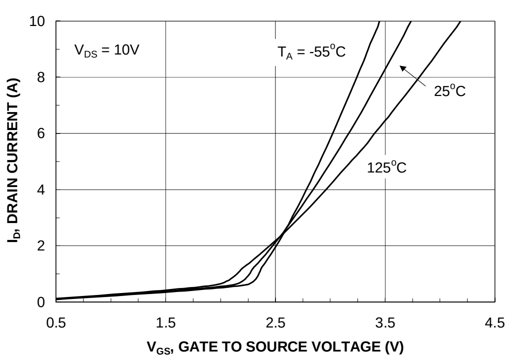


Figure 5. Transfer Characteristics.

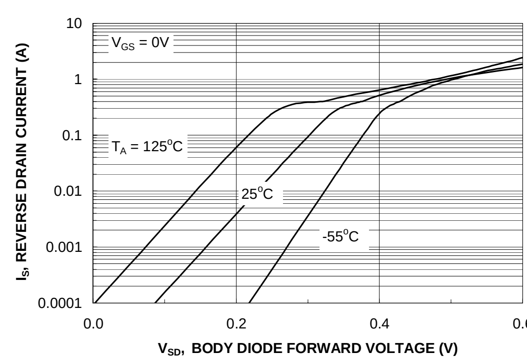


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Characteristics

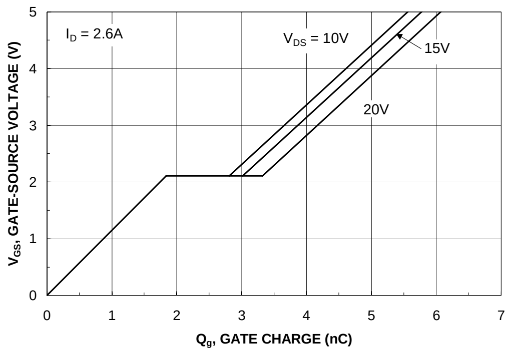


Figure 7. Gate Charge Characteristics.

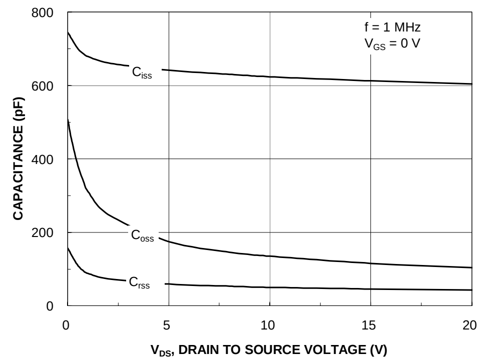


Figure 8. Capacitance Characteristics.

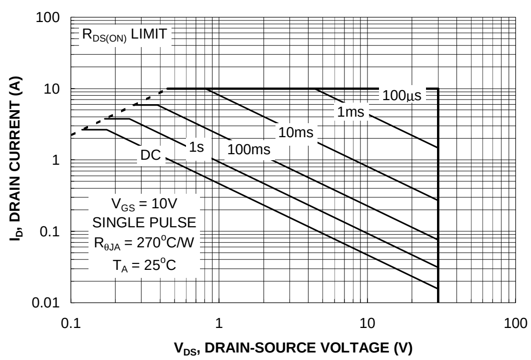


Figure 9. Maximum Safe Operating Area.

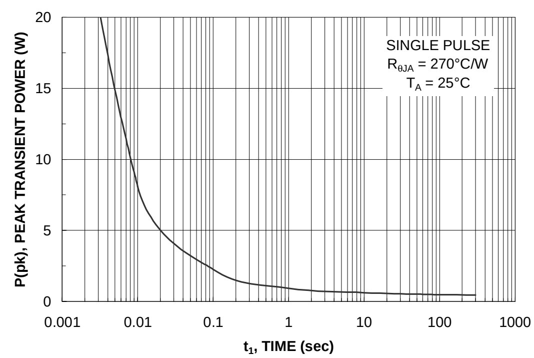


Figure 10. Single Pulse Maximum Power Dissipation.

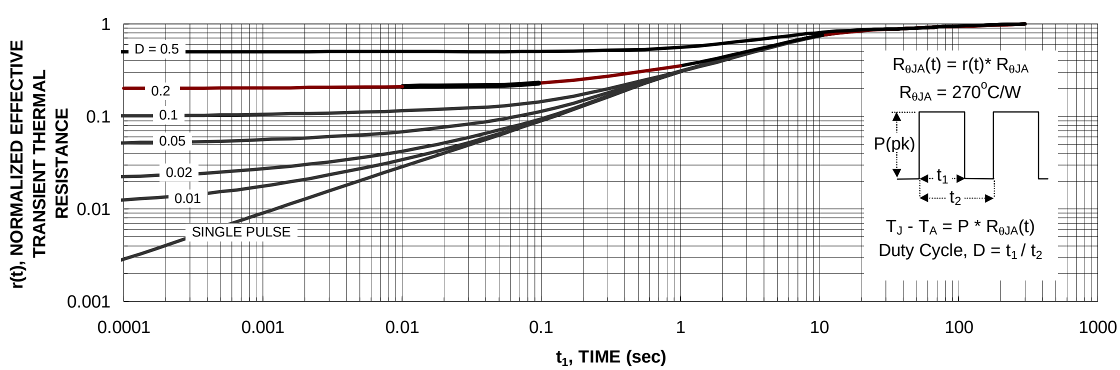


Figure 11. Transient Thermal Response Curve.

Thermal characterization performed using the conditions described in Note 1b.
Transient thermal response will change depending on the circuit board design.

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CoolFET™	FASTr™	MicroFET™	PowerTrench®	SuperSOT™-6
CROSSVOLT™	FRFET™	MicroPak™	QFET™	SuperSOT™-8
DOME™	GlobalOptoisolator™	MICROWIRE™	QS™	SyncFET™
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