

STS4DNFS30

N-channel - 30V - 0.044Ω - 4.5A SO-8 STripFET™ Power MOSFET plus schottky rectifier

General features

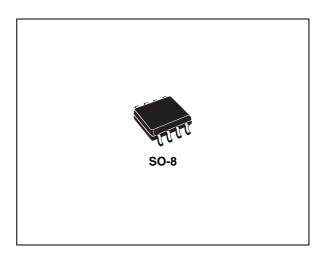
Туре	V _{DSS}	R _{DS(on)}	۱ _D
STS4DNFS30	30V	<0.055Ω	4.5A
Schottky	I _{F(AV)}	V _{RRM}	V _{F(MAX)}

Description

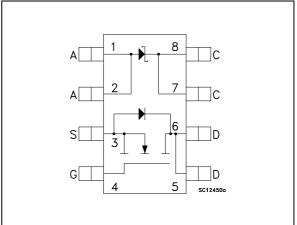
This product associates the latest low voltage STripFET[™] in n-channel version to a low drop Schottky diode. Such configuration is extremely versatile in implementing a large variety of DC-DC converters for printers, portable equipment.

Applications

Switching application



Internal schematic diagram



Order codes

Part number	Marking	Package	Packaging
STS4DNFS30	S4DNFS30	SO-8	Tape & reel

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1 Electrical ratings

Table 1.	Mosfet	absolute	maximum	ratings

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source voltage ($V_{GS} = 0$)	30	V
V _{GS}	Gate- source voltage	± 20	V
I _D	Drain current (continuous) at $T_C = 25^{\circ}C$	4.5	Α
I _D	Drain current (continuous) at $T_C = 100^{\circ}C$	3.2	А
$I_{DM}^{(1)}$	Drain current (pulsed)	13	Α
P _{TOT}	Total dissipation at $T_{C} = 25^{\circ}C$	2	W

1. Pulse width limited by safe operating area

Table 2. Schottky absolute maximum ratings

Symbol	Parameter		Value	Unit
V _{RRM}	Repetitive peak reverse voltage		30	V
I _{F(RMS)}	RMS forward current		10	А
I _{F(AV)}	Average forward current	T _L =125°C δ=0.5	4	A
I _{FSM}	Surge non repetitive forward current	tp=10ms Sinusoidal	75	A
I _{RRM}	Repetitive peak reverse current	tp=2µs F=1kHz	1	A
I _{RSM}	Non repetitive peak reverse current	tp=100µs	1	А
dv/dt	Critical rate of rise of reverse voltage		10000	v/µs

Table 3. Thermal data

Symbol	Parameter	Value	Unit
Rthj-amb	Thermal resistance junction-amb Mosfet ⁽¹⁾	62.5	°C/W
T _{stg}	Storage temperature range Max	-55 to 150	°C
Тј	Junction temperature	-55 to 150	°C

1. Mounted on FR-4 board (steady state)



2 Electrical characteristics

(Tcase =25°C unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
V _{(BR)DSS}	Drain-source breakdown voltage	$I_{D} = 250 \mu A, V_{GS} = 0$	30			V
I _{DSS}	Zero gate voltage drain current (V _{GS} = 0)	$V_{DS} = Max rating$ $V_{DS} = Max rating, T_{C}=125^{\circ}C$			1 10	μA μA
I _{GSS}	Gate-body leakage current (V _{DS} = 0)	$V_{GS} = \pm 20V$			± 100	nA
V _{GS(th)}	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 250 \mu A$	1			V
R _{DS(on)}	Static drain-source on resistance	$V_{GS} = 10V, I_D = 2A$ $V_{GS} = 5V, I_D = 2A$		0.044	0.055 0.085	Ω Ω

Table 4. On /off states

Table 5. Static

Symbol	Parameter	Test conditions		Min.	Тур.	Max.	Unit
I _R ⁽¹⁾	Reverse leakage current	$T_j = 25^{\circ}C$ $T_j = 100^{\circ}C$	V _R = V _{RRM}		6	200 15	μA mA
V _F ⁽¹⁾	Zero gate voltage	$T_j = 25^{\circ}C$ $T_j = 125^{\circ}C$	I _F = 2A		0.325	0.45 0.375	V V
VF Y	drain current ($V_{GS} = 0$)	$T_j = 25^{\circ}C$ $T_j = 125^{\circ}C$	I _F = 4A		0.43	0.53 0.51	V V

1. Pulse test: tp=380 μ s, δ < 2%. To evaluate the conduction losses use the following equation:

$$P = 0.24 \times I_{F(AV)} + 0.068I_{F^2}(RMS)$$

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
9 _{fs}	Forward transconductance	V _{DS} =10V, I _D =2A		5		S
C _{iss} C _{oss} C _{rss}	Input capacitance Output capacitance Reverse transfer capacitance	V _{DS} = 25 V, f = 1 MHz, V _{GS} = 0		330 115 28		pF pF pF
Q _g Q _{gs} Q _{gd}	Total gate charge Gate-source charge Gate-drain charge	$V_{DD} = 15V, I_D = 4.5A,$ $V_{GS} = 5V$ (see <i>Figure 13</i>)		4.7 1.2 2.1		nC nC nC



	•					
Symbol	Parameter	Test Conditions	Min.	Тур.	Max	Unit
t _{d(on)} t _r	Turn-on delay time Rise time	$V_{DD} = 15V, I_D = 2A,$ $R_G = 4.7\Omega, V_{GS} = 5V$ (see <i>Figure 12</i>)		9 17		ns ns
t _{d(off)} t _f	Turn-off delay time Fall time	$V_{DD} = 15V, I_D = 2A,$ $R_G = 4.7\Omega, V_{GS} = 5V$ (see <i>Figure 12</i>)		15 6		ns ns

Table 7.Switching times

Table 8.Source drain diode

Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
I _{SD} I _{SDM} ⁽¹⁾	Source-drain current Source-drain current (pulsed)				4.5 13	A A
V _{SD} ⁽²⁾	Forward on voltage	I _{SD} = 4.5A, V _{GS} = 0			1.2	V
t _{rr} Q _{rr} I _{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	I_{SD} = 4.5A, di/dt = 100A/µs V_{DD} = 15V, T _j = 150°C (see <i>Figure 17</i>)		22 14.3 1.3		ns nC A

1. Pulse width limited by safe operating area

2. Pulsed: Pulse duration = 300 μ s, duty cycle 1.5 %



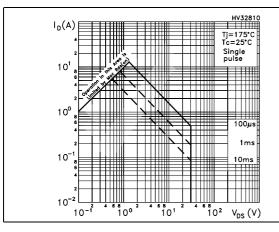
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 $Z_{th} = k R_{thJ-a}$ $\delta = t_p / \tau$

10^{0†}(s)

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area





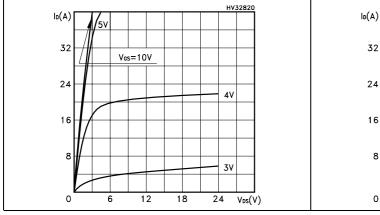


Figure 5. Source-drain diode forward characteristics

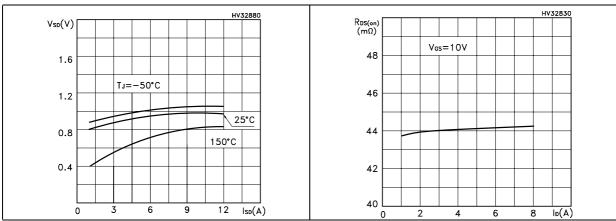


Figure 4. Transfer characteristics

10⁻³

<u>10⁻⁵</u>

Thermal impedance

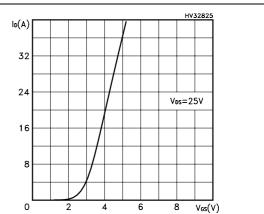
Figure 2.

Κ

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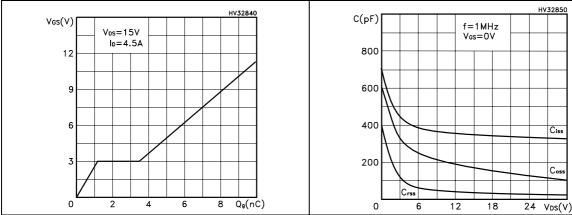
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Figure 6. Static drain-source on resistance



Gate charge vs gate-source voltage Figure 8. Capacitance variations Figure 7.

Figure 9. Normalized gate threshold voltage vs temperature

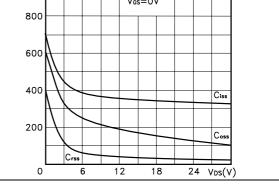


Figure 10. Normalized on resistance vs temperature

Vcs=10V

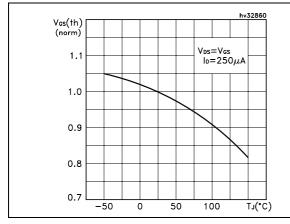
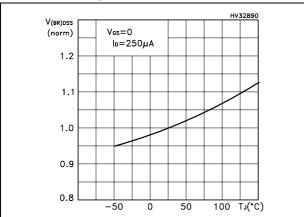
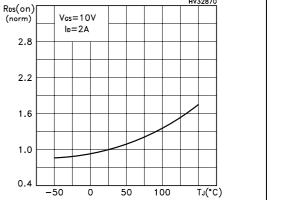


Figure 11. Normalized BV_{DSS} voltage vs temperature





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3 Test circuits

Figure 12. Switching times test circuit for resistive load

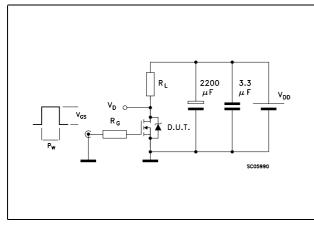
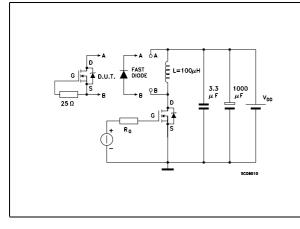


Figure 14. Test circuit for inductive load switching and diode recovery times





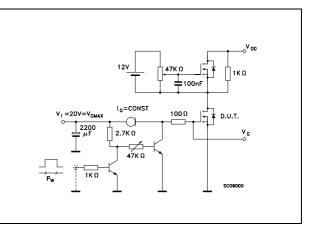


Figure 15. Unclamped inductive load test circuit

Figure 13. Gate charge test circuit

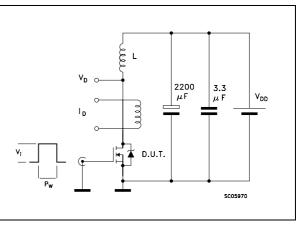
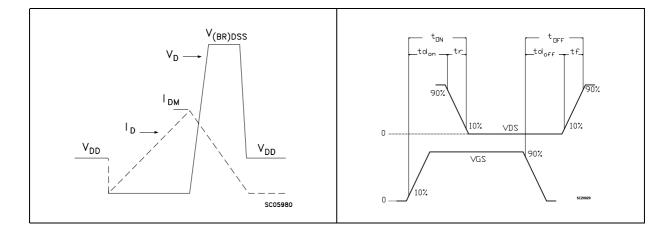


Figure 17. Switching time waveform



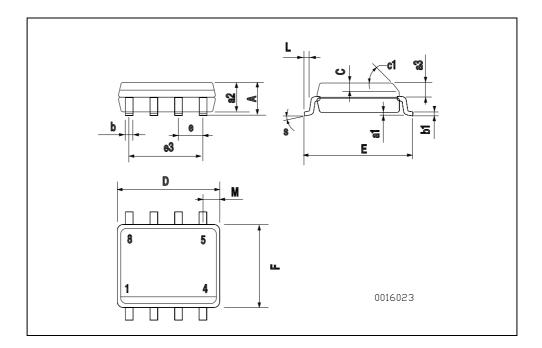
4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect . The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com



DIM.	mm.			inch		
	MIN.	ТҮР	MAX.	MIN.	TYP.	MAX.
А			1.75			0.068
a1	0.1		0.25	0.003		0.009
a2			1.65			0.064
a3	0.65		0.85	0.025		0.033
b	0.35		0.48	0.013		0.018
b1	0.19		0.25	0.007		0.010
С	0.25		0.5	0.010		0.019
c1	45 (typ.)					
D	4.8		5.0	0.188		0.196
Е	5.8		6.2	0.228		0.244
е		1.27			0.050	
e3		3.81			0.150	
F	3.8		4.0	0.14		0.157
L	0.4		1.27	0.015		0.050
М			0.6			0.023

SO-8 MECHANICAL DATA



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5 Revision history

Table 9.Revision history

Date	Revision	Changes
19-Jul-2005	1	First release



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