

STS4DNFS30L

N-channel 30 V, 0.044 Ω, 4 A SO-8 STripFET™ MOSFET plus SCHOTTKY rectifier

Features

MOSFET	V _{DSS}	R _{DS(on)}	I _D
	30V	<0.056Ω	4A
SCHOTTKY	I _{F(AV)}	V _{RRM}	V _{F(MAX)}

- Standard outline for easy automated surface mount assembly
- Low threshold gate drive
- Integrated SCHOTTKY rectifier

Applications

■ Switching applications

Description

This device is an N-channel Power MOSFET. It 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, and cellular phones.

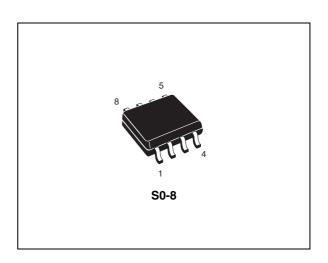


Figure 1. Internal schematic diagram

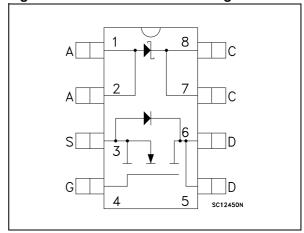


Table 1. Device summary

Order code	Marking	Package	Packaging
STS4DNFS30L	4DFS30L	SO-8	Tape and reel

Contents STS4DNFS30L

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STS4DNFS30L Electrical ratings

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V _{DS}	Drain-source voltage (v _{gs} = 0)	30	V
V _{DGR}	Drain-gate voltage ($R_{GS} = 20 \text{ k}\Omega$)	30	V
V_{GS}	Gate- source voltage	±16	V
I _D	Drain current (continuous) at T _C = 25°C	4	Α
I _D	Drain current (continuous) at T _C = 100°C	2.5	Α
I _{DM} ⁽¹⁾	Drain current (pulsed)	16	Α
P _{TOT}	Total dissipation at T _C = 25°C dual operation	2	W

^{1.} Pulse width limited by safe operating area.

Table 3. Schottky absolute maximum ratings

Symbol	Parameter		Value	Unit
V_{RRM}	Repetitive peak reverse voltage		30	V
I _{F(RMS)}	RMS forward current		20	Α
I _{F(AV)}	Average forward current	TL=125°C δ=0.5	3	Α
I _{FSM}	Surge non repetitive forward current	tp = 10 ms Sinusoidal	75	Α
I _{RRM}	Repetitive peak reverse current	tp = 2 μs F=1 kHz	1	Α
I _{RSM}	Non repetitive peak reverse current	tp = 100 μs	1	Α
dv/dt	Critical rate of rise of reverse voltage		10000	V/µs

Table 4. Thermal data

Symbol	Parameter Value		Unit
R _{thj-a}	Thermal resistance junction-ambient MOSFET ⁽¹⁾	62.5	°C/W
T _J	Junction temperature	-55 to 150	°C
T _{stg}	Storage temperature range	-55 to 150	°C

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

Electrical characteristics STS4DNFS30L

2 Electrical characteristics

(T_{CASE}=25°C unless otherwise specified).

Table 5. On/off states

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°C			1 10	μA μA
I _{GSS}	Gate-body leakage current (V _{DS} = 0)	V _{GS} = ±16V			±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 0.051	0.055 0.065	Ω Ω

Table 6. Dynamic

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
9 _{fs} ⁽¹⁾	Forward transconductance	V _{DS} = 15V, I _D =2A		5		S
C _{iss}	Input capacitance			330		pF
C _{oss}	Output capacitance	$V_{DS} = 25V, f = 1 \text{ MHz}, $ $V_{GS} = 0$		90		pF
C _{rss}	Reverse transfer capacitance	$V_{GS} = 0$		40		pF
Q_g	Total gate charge			6.5	9	nC
Q_{gs}	Gate-source charge	$V_{DD} = 24V, I_D = 4A,$ $V_{GS} = 5V$		3.6		nC
Q_{gd}	Gate-drain charge	165 01		2		nC

^{1.} Pulsed: Pulse duration = 300 μ s, duty cycle 1.5.

Table 7. Switching times

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
t _{d(on)} t _r	Turn-on delay time Rise time	V_{DD} =15 V, I_{D} =2A, R_{G} =4.7 Ω , V_{GS} =5V (see Figure 13)		11 100		ns ns
t _{d(off)} t _f	Turn-off delay time Fall time	V_{DD} =15 V, I_{D} =2A, R_{G} =4.7 Ω , V_{GS} =5V (see Figure 13)		25 22		ns ns

Table 8. Source drain diode

Symbol	Parameter	Test conditions	Min	Тур.	Max	Unit
I _{SD}	Source-drain current				4	Α
I _{SDM} ⁽¹⁾	Source-drain current (pulsed)				16	Α
V _{SD} ⁽²⁾	Forward on voltage	$I_{SD} = 4A, V_{GS} = 0$			1.2	V
t _{rr} Q _{rr} I _{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	$I_{SD} = 4A, V_{DD} = 15V$ di/dt = 100A/ μ s, $T_j = 150$ °C (see Figure 15)		35 25 1.4		ns nC A

^{1.} Pulse width limited by safe operating area.

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

Electrical characteristics STS4DNFS30L

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

Figure 3. Thermal impedance

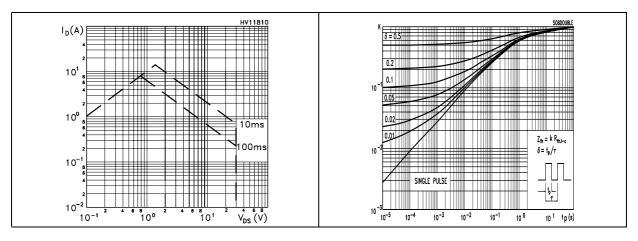


Figure 4. Output characteristics

Figure 5. Transfer characteristics

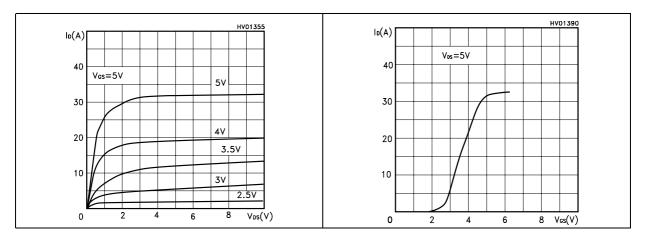


Figure 6. Transconductance

Figure 7. Static drain-source on resistance

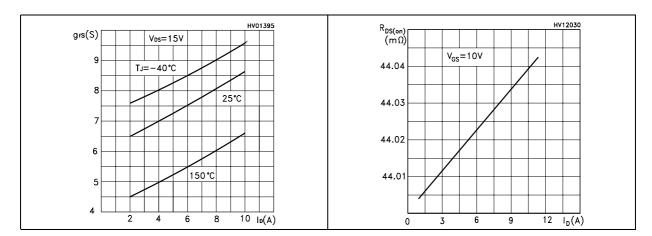


Figure 8. Gate charge vs. gate-source voltage Figure 9. Capacitance variations

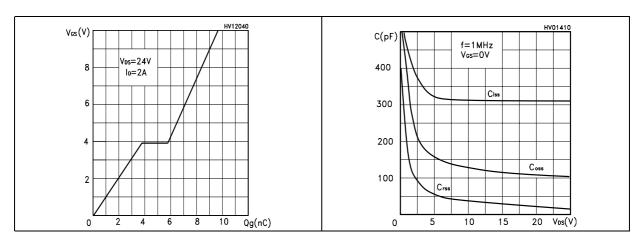


Figure 10. Normalized gate threshold voltage vs. temperature

Figure 11. Normalized on resistance vs. temperature

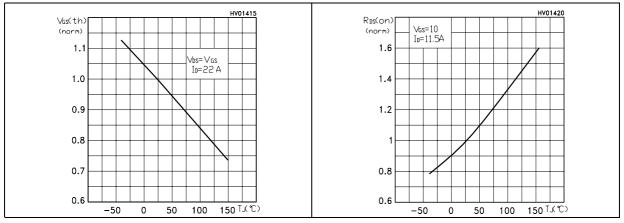
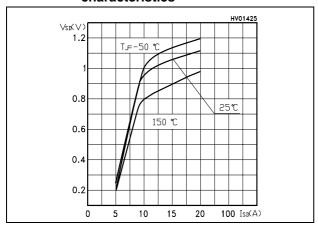


Figure 12. Source-drain diode forward characteristics



Test circuit STS4DNFS30L

3 Test circuit

Figure 13. Switching times test circuit for resistive load

Figure 14. Gate charge test circuit

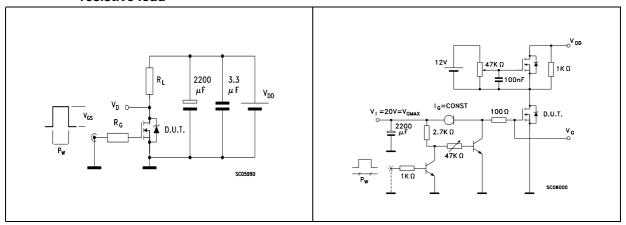


Figure 15. Test circuit for inductive load switching and diode recovery times

Figure 16. Unclamped Inductive load test circuit

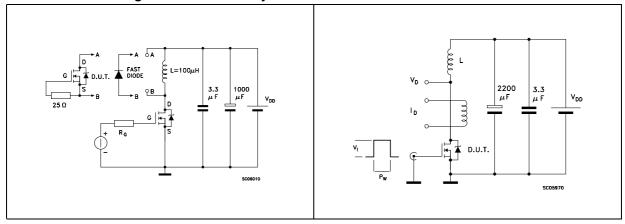
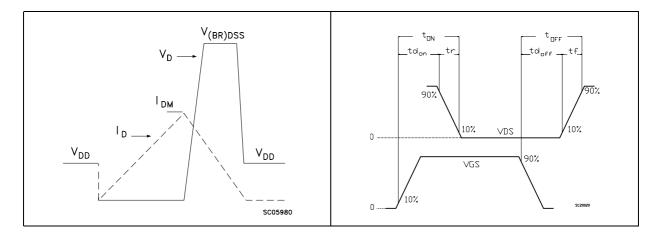


Figure 17. Unclamped inductive waveform

Figure 18. Switching time waveform



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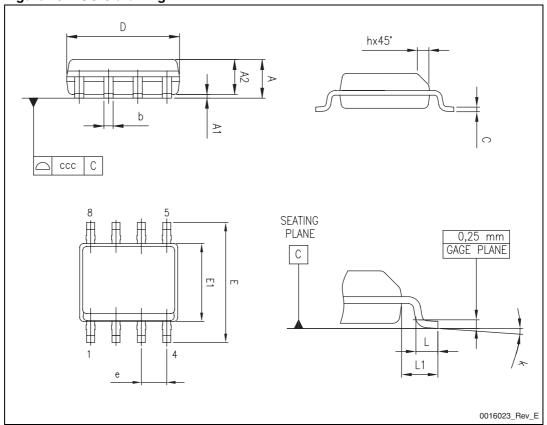
4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: www.st.com. ECOPACK is an ST trademark.

Table 9. SO-8 mechanical data

Dim		mm	
Dim.	Min.	Тур.	Max.
А			1.75
A1	0.10		0.25
A2	1.25		
b	0.28		0.48
С	0.17		0.23
D	4.80	4.90	5.00
E	5.80	6.00	6.20
E1	3.80	3.90	4.00
е		1.27	
h	0.25		0.50
L	0.40		1.27
L1		1.04	
k	0°		8°
ccc			0.10

Figure 19. SO-8 drawing



Revision history STS4DNFS30L

5 Revision history

Table 10. Document revision history

Date	Revision	Changes
21-Jun-2004	2	Complete version
10-Nov-2006	3	The document has been reformatted
26-Jan-2007	4	Typo mistakes on <i>Table 2</i> .
29-Jun-2011	5	Modified marking in <i>Table 1</i> . Updated mechanical data.

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