

STS4DNF60L

N-channel 60V - 0.045Ω - 4A - SO-8 STripFET™ Power MOSFET

Features

Туре	V _{DSS}	R _{DS(on)}	I _D
STS4DNF60L	60V	<0.055Ω	4A

- Standard outline for easy automated surface mount assembly
- Low threshold drive

Application

■ Switching applications

Description

This Power MOSFET is the latest development of STMicroelectronics unique "single feature size" strip-based pocess. The resulting transistor shows extremely high packing density fow low onresistance, rugged avalanche characteristics and less critical alignment steps therefore a remarkable manufacturing reproducibility.

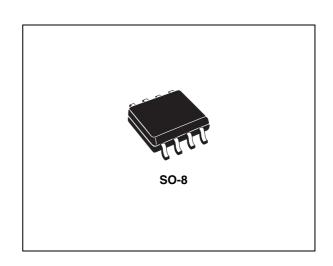


Figure 1. Internal schematic diagram

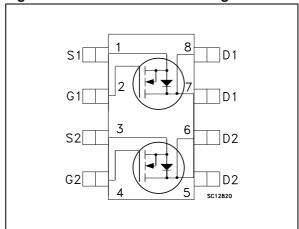


Table 1. Device summary

Order code	Marking	Package	Packaging	
STS4DNF60L	4DF60L	SO-8	Tape & reel	

Contents STS4DNF60L

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STS4DNF60L Electrical ratings

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V _{DS}	Drain-source voltage (V _{GS} = 0)	60	V
V _{GS}	Gate- source voltage	± 15	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} ⁽²⁾	Total dissipation at T _C = 25°C	2	W
T _j T _{stg}	Operating junction temperature Storage temperature	-55 to 150	°C

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

Table 3. Thermal data

Symbol	Parameter	Value	Unit
Rthj-pcb	Thermal resistance junction-pcb D.O. ⁽¹⁾	62.5	°C/W

^{1.} When mounted on inch² FR-4 board, 2 Oz Cu, $t \le 10 sec$, dual operation

^{2.} Ptot=1.6W for Single Operation

Electrical characteristics STS4DNF60L

2 Electrical characteristics

(Tcase = 25°C unless otherwise specified)

Table 4. On /off states

Symbol	Parameter Test conditions		Min.	Тур.	Max.	Unit
V _{(BR)DSS}	Drain-source breakdown voltage	$I_D = 250\mu A, V_{GS} = 0$	60			V
I _{DSS}		V_{DS} = Max rating V_{DS} = Max rating, T_{C} =125°C			1 10	μ Α μ Α
I _{GSS}	Gate-body leakage current (V _{DS} = 0)	V _{GS} = ± 15V			± 100	nA
V _{GS(th)}	Gate threshold voltage	$V_{DS} = V_{GS}$, $I_D = 250\mu A$	1	1.7	2.5	V
R _{DS(on)}	Static drain-source on resistance	$V_{GS} = 10V, I_D = 2A$ $V_{GS} = 4.5V, I_D = 2A$		0.045 0.050	0.055 0.065	Ω Ω

Table 5. Dynamic

Symbol	ymbol Parameter Test conditions		Min.	Тур.	Max.	Unit
9 _{fs}	Forward transconductance	V _{DS} =25V, I _D =2A		25		S
C _{iss} C _{oss} C _{rss}	Input capacitance Output capacitance Reverse transfer capacitance VDS = 25 V, f = 1 MHz, VGS = 0			1030 140 40		pF pF pF
Q _g Q _{gs} Q _{gd}	Total gate charge Gate-source charge Gate-drain charge	$V_{DD} = 48V$, $I_D = 4A$, $V_{GS} = 4.5V$ (see Figure 13)		15 4 4		nC nC nC

Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Тур.	Max	Unit
t _{d(on)} t _r	Turn-on delay time Rise time	$V_{DD} = 30V, I_D = 2.2A,$ $R_G = 4.7\Omega, V_{GS} = 10V$ (see <i>Figure 12</i>)		15 28		ns ns
t _{d(off)}	Turn-off delay time Fall time	$V_{DD} = 30V, I_D = 2.2A,$ $R_G = 4.7\Omega, V_{GS} = 10V$ (see <i>Figure 12</i>)		45 10		ns ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
I _{SD}	Source-drain current Source-drain current (pulsed)				4 16	A A
V _{SD} ⁽²⁾	Forward on voltage	$I_{SD} = 4A$, $V_{GS} = 0$			1.2	٧
t _{rr} Q _{rr} I _{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	$I_{SD} = 4A$, di/dt = 100A/ μ s $V_{DD} = 20V$, $T_j = 25$ °C (see <i>Figure 17</i>)		85 85 2		ns nC A

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

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

Electrical characteristics STS4DNF60L

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

Figure 3. Thermal impedance

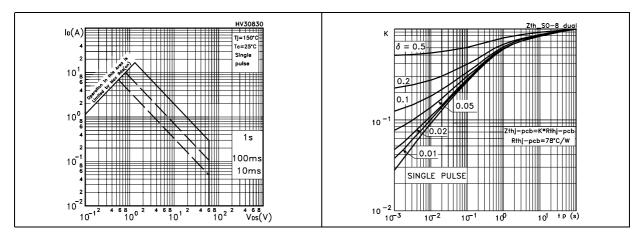


Figure 4. Output characterisics

Figure 5. Transfer characteristics

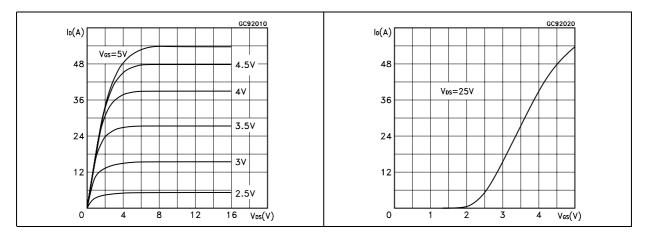
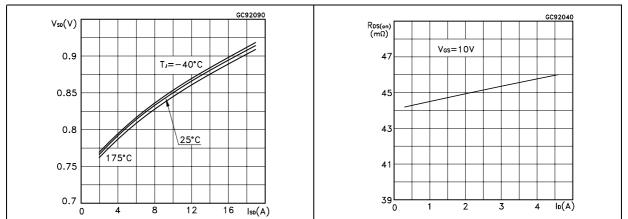


Figure 6. Source-drain diode forward characteristics

Figure 7. Static drain-source on resistance



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

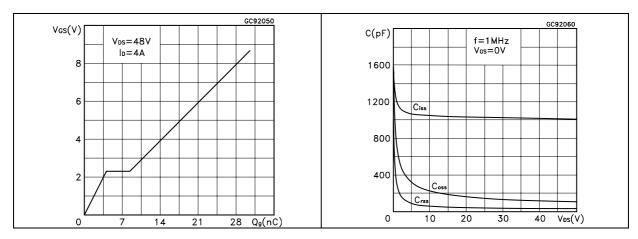
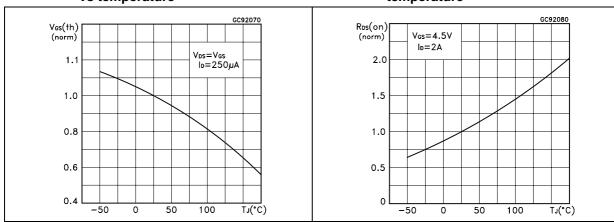


Figure 10. Normalized gate threshold voltage Figure 11. Normalized on resistance vs vs temperature temperature



Test circuits STS4DNF60L

3 Test circuits

Figure 12. Switching times test circuit for resistive load

Figure 13. Gate charge test circuit

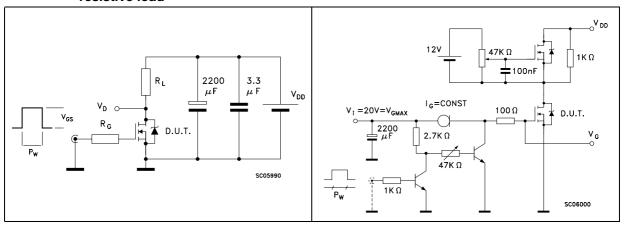


Figure 14. Test circuit for inductive load switching and diode recovery times

Figure 15. Unclamped Inductive load test circuit

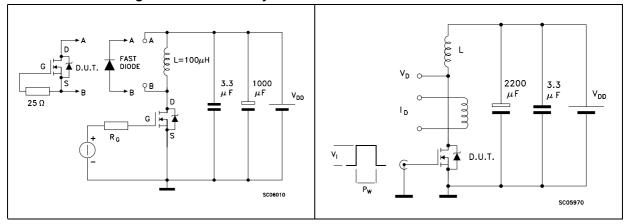
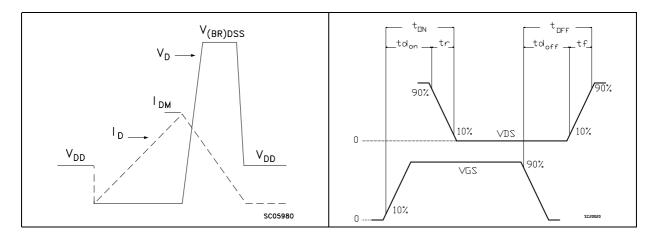


Figure 16. Unclamped inductive waveform

Figure 17. Switching time waveform



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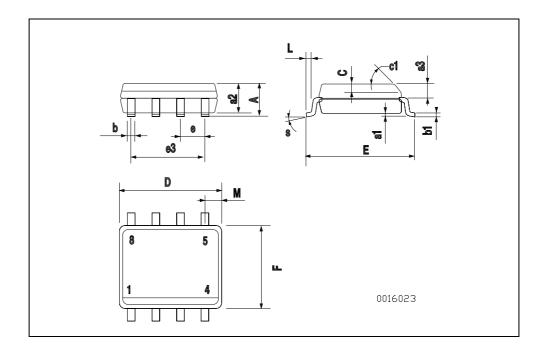
4 Package mechanical data

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

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SO-8 MECHANICAL DATA

DIM		mm.			inch	
DIM.	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
Α			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
E	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
S			8 (1	max.)		•



STS4DNF60L Revision history

5 Revision history

Table 8. Document revision history

Date	Revision	Changes
30-May-2005	5	Initial electronic version
29-Mar-2006	6	Modified Figure 2 and Figure 3
16-May-2006	7	Modified internal schematic diagram
29-Aug-2007	8	Marking has been updated

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