



# STS12NF30L

## N-channel 30 V, 0.008 $\Omega$ , 12 A STripFET™ II Power MOSFET in SO-8 package

Datasheet — production data

### Features

Order code	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STS12NF30L	30 V	< 0.009 $\Omega$	12 A

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

### Applications

- Switching application

### Description

This Power MOSFET has been developed using STMicroelectronics' unique STripFET process, which is specifically designed to minimize input capacitance and gate charge. This renders the device suitable for use as primary switch in advanced high-efficiency isolated DC-DC converters for telecom and computer applications, and applications with low gate charge driving requirements.

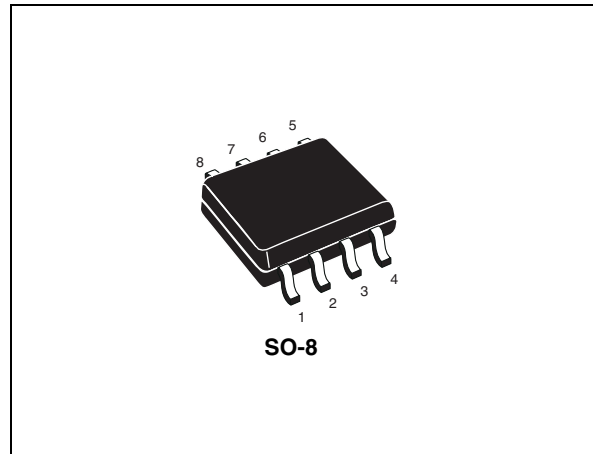


Figure 1. Internal schematic diagram

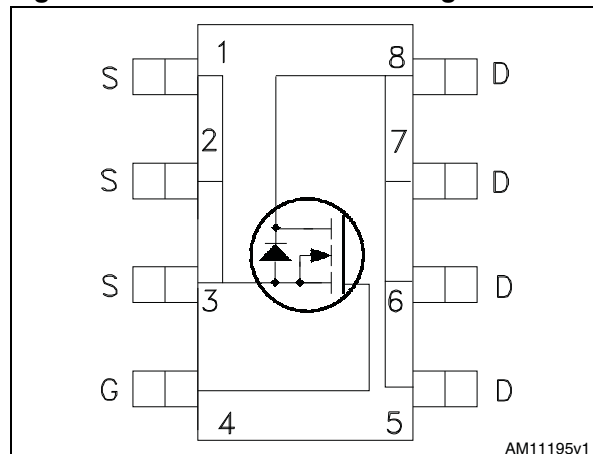


Table 1. Device summary

Order code	Marking	Package	Packaging
STS12NF30L	12F30L	SO-8	Tape and reel

# Contents

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# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{DS}$	Drain-source voltage	30	V
$V_{GS}$	Gate- source voltage	$\pm 16$	V
$I_D$	Drain current (continuous) at $T_C = 25\text{ }^\circ\text{C}$	12	A
$I_D$	Drain current (continuous) at $T_C = 100\text{ }^\circ\text{C}$	7.5	A
$I_{DM}^{(1)}$	Drain current (pulsed)	48	A
$P_{TOT}$	Total dissipation at $T_a = 25\text{ }^\circ\text{C}$	2.5	W
$T_J$	Maximum operating junction temperature	150	$^\circ\text{C}$
$T_{stg}$	Storage temperature	-55 to 150	$^\circ\text{C}$

1. Pulse width limited by safe operating area

**Table 3. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thj-a}^{(1)}$	Thermal resistance junction-ambient max	50	$^\circ\text{C}/\text{W}$

1. When mounted on FR-4 board of 1inch<sup>2</sup>, 2oz Cu, t < 10 sec

## 2 Electrical characteristics

( $T_{CASE} = 25\text{ °C}$  unless otherwise specified)

**Table 4. On/off states**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown voltage	$I_D = 250\ \mu\text{A}$ , $V_{GS} = 0$	30			V
$I_{DSS}$	Zero gate voltage Drain current ( $V_{GS} = 0$ )	$V_{DS} = 30\text{ V}$ $V_{DS} = 30\text{ V}$ , $T_C = 125\text{ °C}$			1 10	$\mu\text{A}$ $\mu\text{A}$
$I_{GSS}$	Gate-body leakage current ( $V_{DS} = 0$ )	$V_{GS} = \pm 16\text{ V}$			$\pm 100$	nA
$V_{GS(th)}$	Gate threshold voltage	$V_{DS} = V_{GS}$ , $I_D = 250\ \mu\text{A}$	1			V
$R_{DS(on)}$	Static drain-source on-resistance	$V_{GS} = 10\text{ V}$ , $I_D = 6\text{ A}$ $V_{GS} = 4.5\text{ V}$ , $I_D = 6\text{ A}$		0.008 0.01	0.009 0.011	$\Omega$ $\Omega$

**Table 5. Dynamic**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$C_{iss}$	Input capacitance			2400		pF
$C_{oss}$	Output capacitance	$V_{DS} = 25\text{ V}$ , $f = 1\text{ MHz}$ , $V_{GS} = 0$	-	590		pF
$C_{rss}$	Reverse transfer capacitance			200		pF
$Q_g$	Total gate charge	$V_{DD} = 24\text{ V}$ , $I_D = 12\text{ A}$ ,		35	50	nC
$Q_{gs}$	Gate-source charge	$V_{GS} = 4.5\text{ V}$	-	9		nC
$Q_{gd}$	Gate-drain charge	(see Figure 13)		18		nC

**Table 6. Switching times**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	$V_{DD} = 15\text{ V}$ , $I_D = 6\text{ A}$ ,	-	35	-	ns
$t_r$	Rise time	$R_G = 4.7\ \Omega$ ,		90		ns
$t_{d(off)}$	Turn-off-delay time	$V_{GS} = 4.5\text{ V}$	-	80	-	ns
$t_f$	Fall time	(see Figure 12)		35		ns
$t_{r(Voff)}$	Off-voltage rise time	$V_{DD} = 24\text{ V}$ , $I_D = 12\text{ A}$ ,	-	35	-	ns
$t_f$	fall time	$R_G = 4.7\ \Omega$ , $V_{GS} = 4.5\text{ V}$		35		ns
$t_c$	cross-over time	(see Figure 14)		80		ns

Table 7. Source drain diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max	Unit	
$I_{SD}$	Source-drain current		-		12	A	
$I_{SDM}^{(1)}$	Source-drain current (pulsed)		-		48	A	
$V_{SD}^{(2)}$	Forward on voltage	$I_{SD} = 12\text{ A}$ , $V_{GS} = 0$	-		1.3	V	
$t_{rr}$	Reverse recovery time	$I_{SD} = 12\text{ A}$ , $V_{DD} = 15\text{ V}$ $di/dt = 100\text{ A}/\mu\text{s}$ , $T_j = 150\text{ }^\circ\text{C}$ <i>(see Figure 14)</i>	-	114		ns	
$Q_{rr}$	Reverse recovery charge					456	nC
$I_{RRM}$	Reverse recovery current					8	A

1. Pulse width limited by safe operating area.

2. Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5%

## 2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

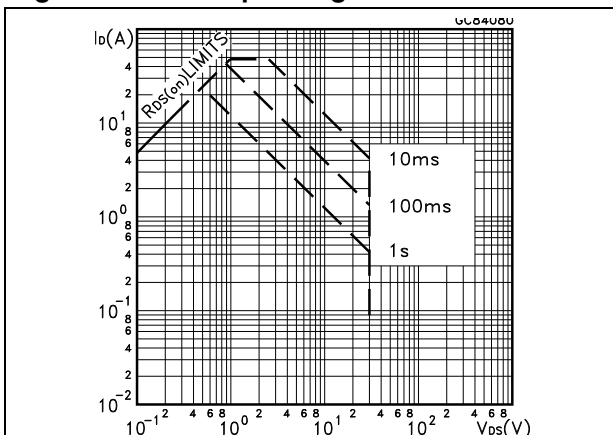


Figure 3. Thermal impedance

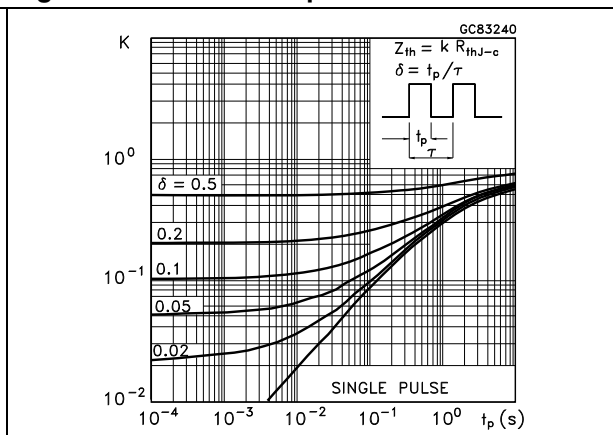


Figure 4. Output characteristics

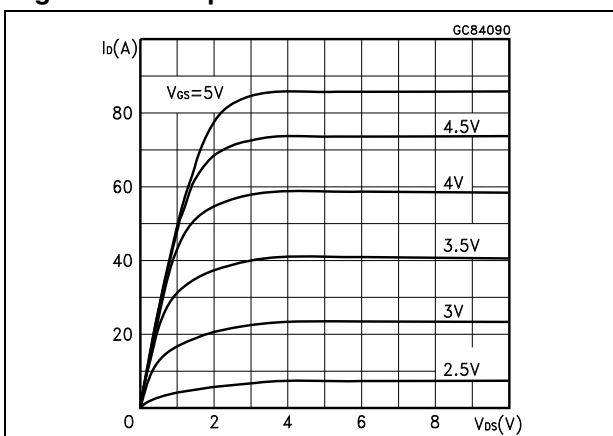


Figure 5. Transfer characteristics

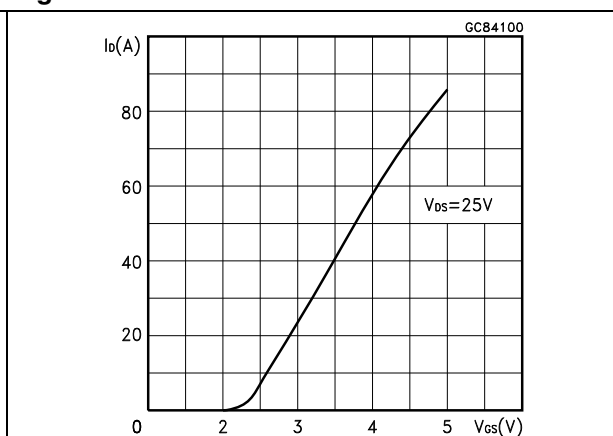


Figure 6. Source-drain diode forward characteristics

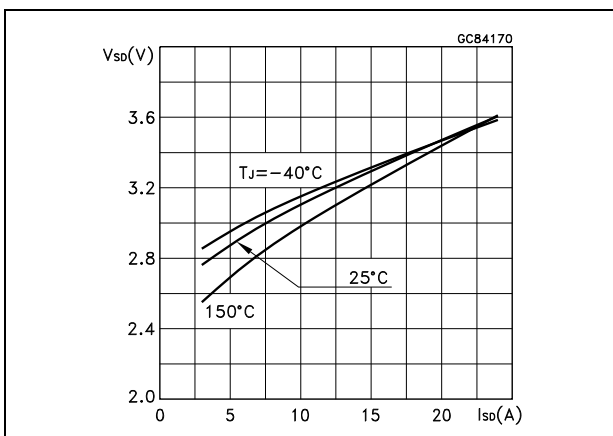
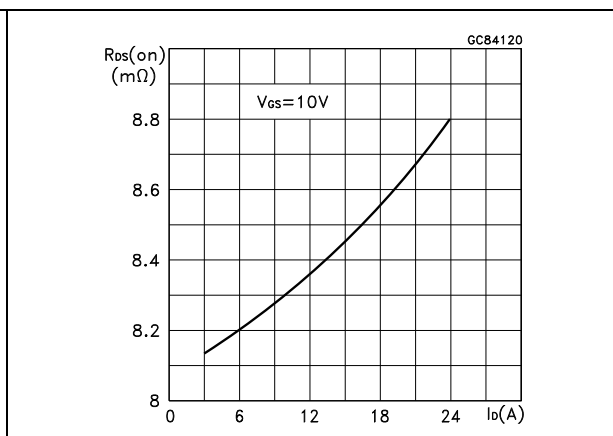
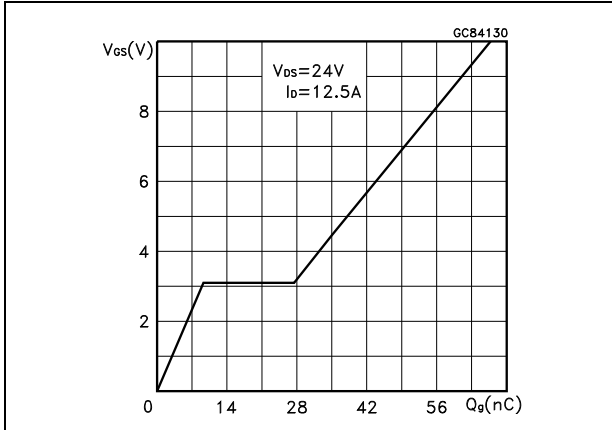


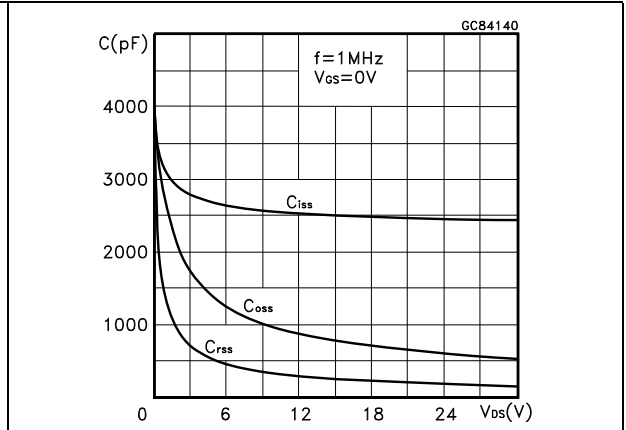
Figure 7. Static drain-source on resistance



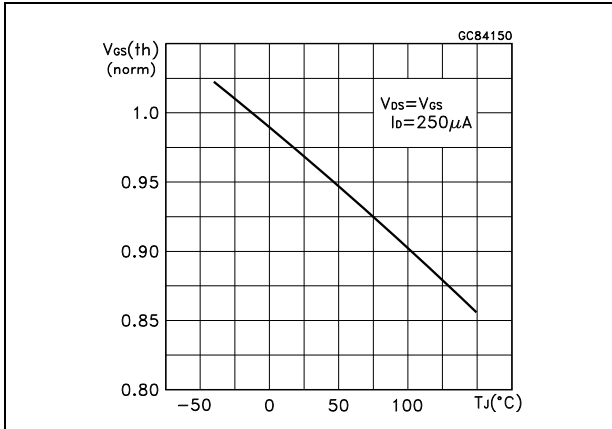
**Figure 8. Gate charge vs. gate-source voltage**



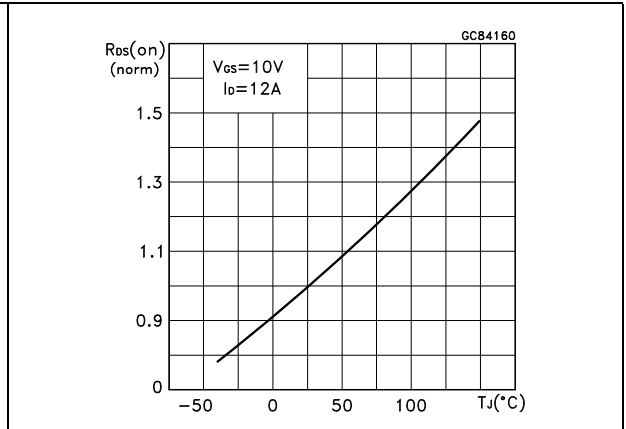
**Figure 9. Capacitance variations**



**Figure 10. Normalized gate threshold voltage vs. temperature**



**Figure 11. Normalized on-resistance vs. temperature**



### 3 Test circuit

**Figure 12. Switching times test circuit for resistive load**



AM01468v1

**Figure 13. Gate charge test circuit**



AM01469v1

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



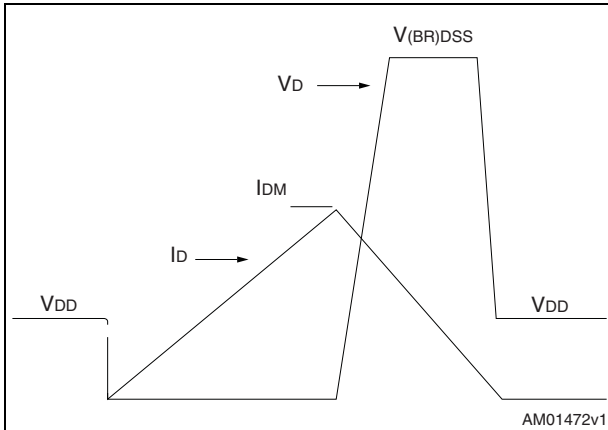
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**Figure 15. Unclamped Inductive load test circuit**



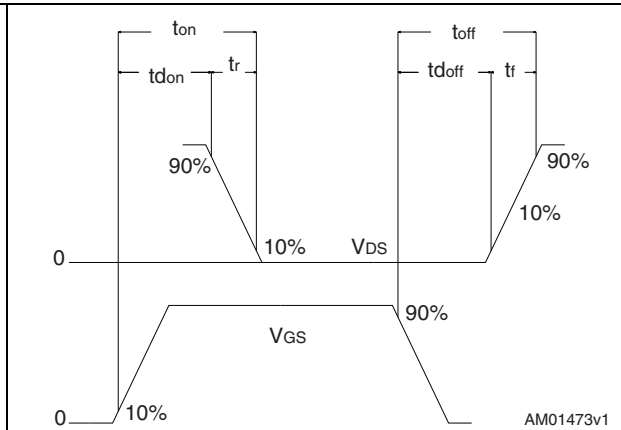
AM01471v1

**Figure 16. Unclamped inductive waveform**



AM01472v1

**Figure 17. Switching time waveform**



AM01473v1



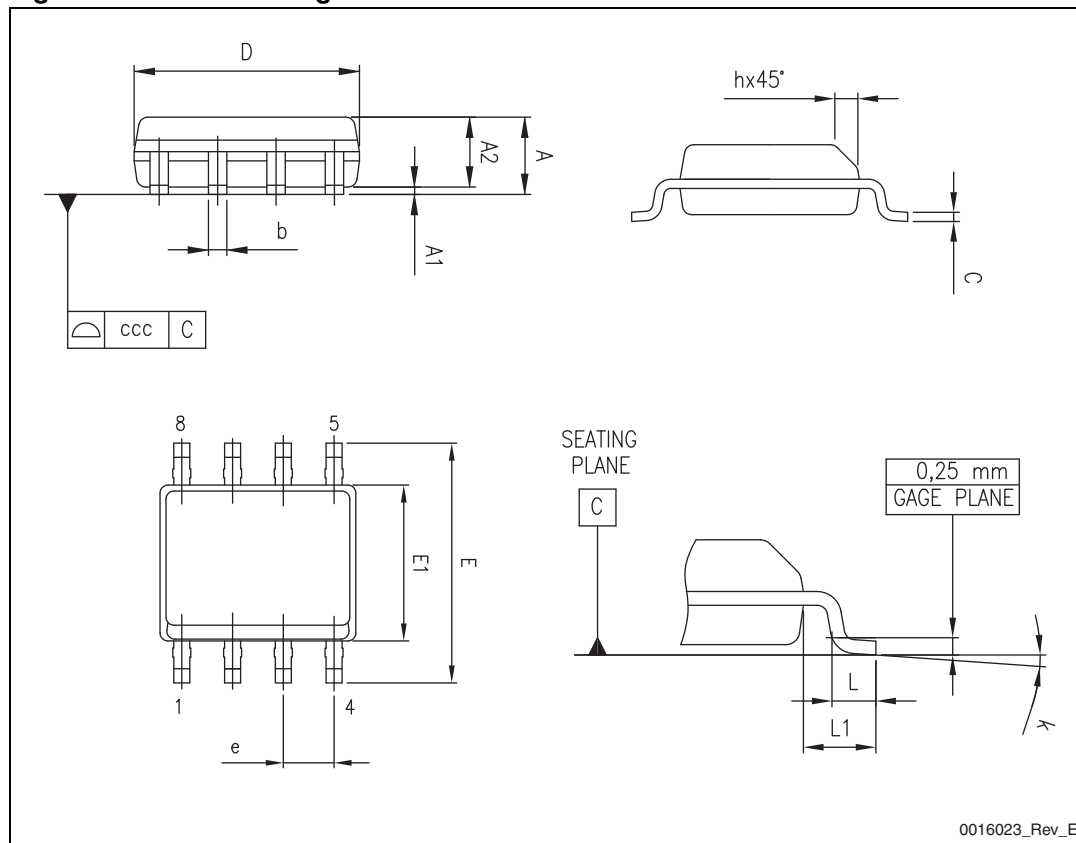
## 4 Package mechanical data

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

Table 8. SO-8 mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A			1.75
A1	0.10		0.25
A2	1.25		
b	0.28		0.48
c	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
e		1.27	
h	0.25		0.50
L	0.40		1.27
L1		1.04	
k	0°		8°
ccc			0.10

Figure 18. SO-8 drawing



## 5 Revision history

**Table 9. Document revision history**

Date	Revision	Changes
09-Sep-2004	6	Complete version
17-Aug-2006	7	New template, no content change
31-Jan-2007	8	Typo mistake on <a href="#">Table 2</a> .
08-May-2007	9	Mistake on <a href="#">Table 7</a>
14-Mar-2012	10	<a href="#">Table 1: Device summary</a> has been corrected. Minor text changes.

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