

# **STP80NF12**

## N-channel 120 V, 0.013 Ω, 80 A, TO-220 STripFET™ II Power MOSFET

### **Features**

Туре	V <sub>DSS</sub> R <sub>DS(on)</sub> max		Ι <sub>D</sub>
STP80NF12	120 V	< 0.018 Ω	80 A

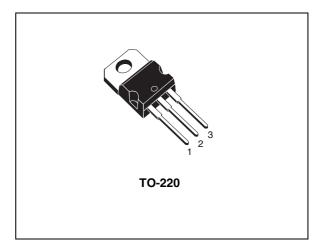
- Exceptional dv/dt capability
- 100% avalanche tested
- Application oriented characterization

### **Application**

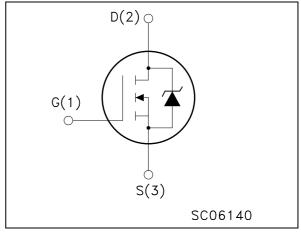
Switching applications

### Description

This MOSFET series realized with STMicroelectronics unique STripFET process has specifically been designed to minimize input capacitance and gate charge. It is therefore suitable as primary switch in advanced highefficiency, high-frequency isolated DC-DC converters for telecom and computer applications. It is also intended for any applications with low gate drive requirements.



#### Figure 1. Internal schematic diagram



#### Table 1. **Device summary**

Order code	Marking	Package	Packaging
STP80NF12	P80NF12	TO-220	Tube

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# 1 Electrical ratings

Table 2.	Absolute	maximum	ratings
	ADSUIULE	maximum	raunys

Symbol	Parameter	Value	Unit
V <sub>DS</sub>	Drain-source voltage ( $V_{GS} = 0$ )	120	V
V <sub>GS</sub>	Gate-source voltage	± 20	V
I <sub>D</sub> <sup>(1)</sup>	Drain current (continuous) at $T_C = 25 \ ^{\circ}C$	80	А
۱ <sub>D</sub>	Drain current (continuous) at $T_C=100$ °C	60	Α
I <sub>DM</sub> <sup>(2)</sup>	Drain current (pulsed)	320	А
P <sub>TOT</sub>	Total dissipation at $T_{C} = 25 \ ^{\circ}C$	300	W
	Derating factor	2.0	W/°C
dv/dt (3)	Peak diode recovery voltage slope	10	V/ns
E <sub>AS</sub> <sup>(4)</sup>	Single pulse avalanche energy	350	mJ
T <sub>J</sub> T <sub>stg</sub>	Operating junction temperature Storage temperature	-55 to 175	°C

1. Limited by Package

2. Pulse width limited by safe operating area

3.  $I_{SD}$  < 80 A, di/dt < 300 A/µs,  $V_{DD}$ = 80%  $V_{(BR)DSS}$ 

4. Starting  $T_J$  = 25 °C,  $I_D$  = 40 A,  $V_{DD}$  = 50 V

Symbol	Parameter	Value	Unit
R <sub>thJC</sub>	Thermal resistance junction-case max	0.5	°C/W
R <sub>thJA</sub>	Thermal resistance junction-ambient max	62.5	°C/W
Τ <sub>Ι</sub>	Maximum lead temperature for soldering purpose	300	°C

# 2 Electrical characteristics

(T<sub>CASE</sub> = 25 °C unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
V <sub>(BR)DSS</sub>	Drain-source breakdown voltage	$I_{D} = 250 \ \mu A, \ V_{GS} = 0$	120			V
I <sub>DSS</sub>	Zero gate voltage drain current ( $V_{GS} = 0$ )	V <sub>DS</sub> = Max rating, V <sub>DS</sub> = Max rating @125°C			1 10	μA μA
I <sub>GSS</sub>	Gate body leakage current (V <sub>DS</sub> = 0)	V <sub>GS</sub> = ±20 V			±100	nA
V <sub>GS(th)</sub>	Gate threshold voltage	$V_{DS} = V_{GS}$ , $I_D = 250 \ \mu A$	2			V
R <sub>DS(on)</sub>	Static drain-source on resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 40 A		0.013	0.018	Ω

#### Table 4. On/off states

#### Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
9 <sub>fs</sub> <sup>(1)</sup>	Forward transconductance	V <sub>DS</sub> =15 V, I <sub>D</sub> = 40 A		80		S
C <sub>iss</sub> C <sub>oss</sub> C <sub>rss</sub>	Input capacitance Output capacitance Reverse transfer capacitance	V <sub>DS</sub> =25 V, f=1 MHz, V <sub>GS</sub> =0		4300 600 230		pF pF pF
Q <sub>g</sub> Q <sub>gs</sub> Q <sub>gd</sub>	Total gate charge Gate-source charge Gate-drain charge	V <sub>DD</sub> = 80 V, I <sub>D</sub> = 80 A V <sub>GS</sub> =10 V		140 23 51	189	nC nC nC

1. Pulsed: pulse duration=300 $\mu$ s, duty cycle 1.5%

#### Table 6. Switching times

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
t <sub>d(on)</sub> t <sub>r</sub> t <sub>d(off)</sub> t <sub>f</sub>	Turn-on delay time Rise time Turn-off delay time Fall time	$V_{DD}$ = 50 V, $I_{D}$ = 40 A, R <sub>G</sub> =4.7 $\Omega$ , V <sub>GS</sub> =10 V <i>Figure 13 on page 8</i>		40 145 134 115		ns ns ns ns

Symbol	Parameter	Test conditions	Min.	Тур.	Max	Unit
I <sub>SD</sub>	Source-drain current				80	А
I <sub>SDM</sub> <sup>(1)</sup>	Source-drain current (pulsed)				320	А
$V_{SD}^{(2)}$	Forward on voltage	I <sub>SD</sub> =80 A, V <sub>GS</sub> =0			1.3	V
t <sub>rr</sub> Q <sub>rr</sub> I <sub>RRM</sub>	Reverse recovery time Reverse recovery charge Reverse recovery current	I <sub>SD</sub> =80 A, di/dt = 100 A/μs, V <sub>DD</sub> =35 V, T <sub>J</sub> = 150 °C		155 0.85 11		ns μC Α

 Table 7.
 Source drain diode

1. Pulse width limited by safe operating area

2. Pulsed: pulse duration = 300  $\mu$ s, duty cycle 1.5%



GC94470

GC97370

Vos=25V

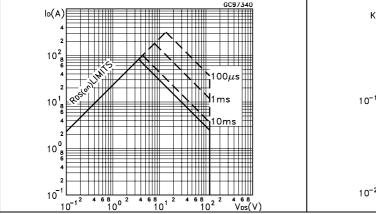
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Vgs(V)

### 2.1 Electrical characteristics (curves)

### Figure 2. Safe operating area

Figure 3. Thermal impedance





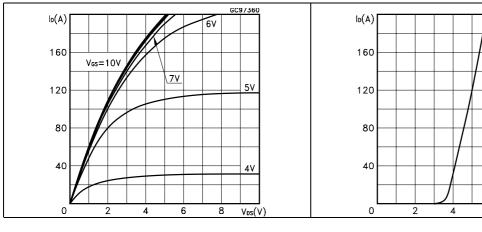
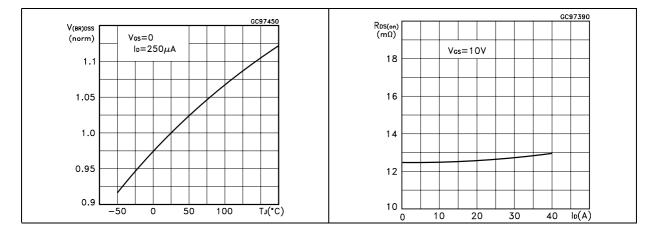
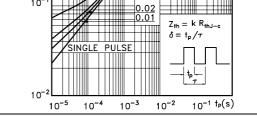


Figure 6. Normalized B<sub>VDSS</sub> vs. temperature



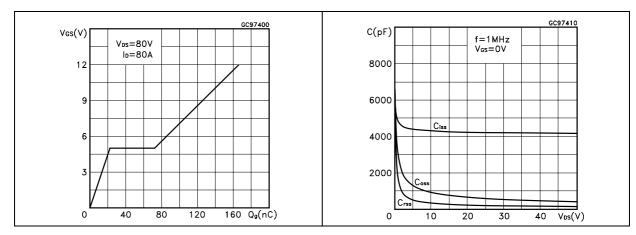
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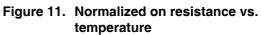
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Figure 5. Transfer characteristics



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

Figure 10. Normalized gate threshold voltage vs. temperature



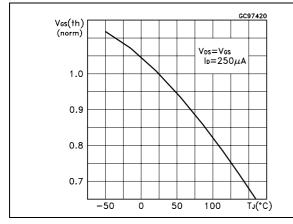
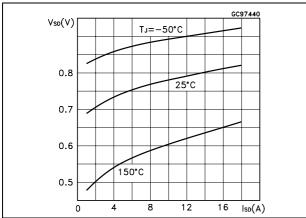
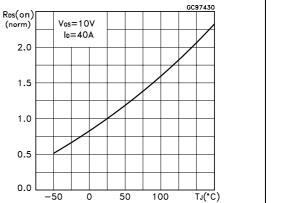


Figure 12. Source-drain diode forward characteristics







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## 3 Test circuit

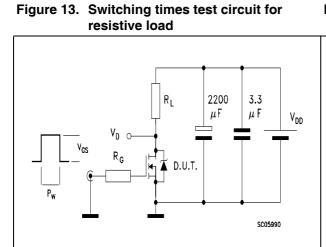
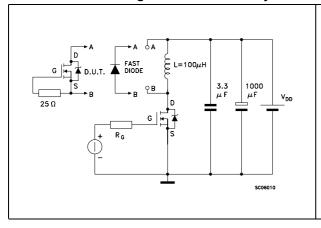
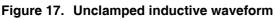
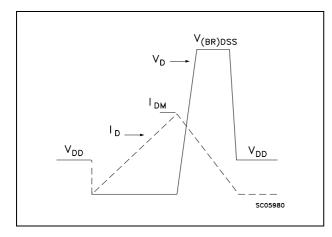


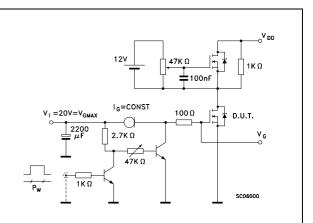
Figure 15. Test circuit for inductive load switching and diode recovery times



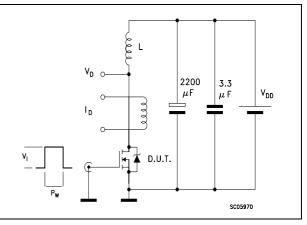




### Figure 14. Gate charge test circuit







### 4 Package mechanical data

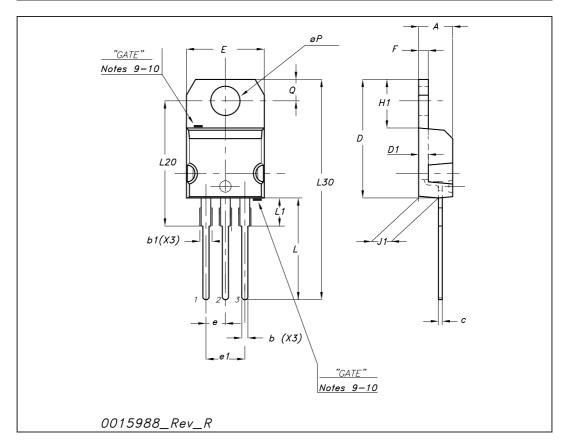
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<b>TO-220</b>	mechanical	data

Dim	mm			inch		
	Min	Тур	Max	Min	Тур	Max
А	4.40		4.60	0.173		0.181
b	0.61		0.88	0.024		0.034
b1	1.14		1.70	0.044		0.066
С	0.48		0.70	0.019		0.027
D	15.25		15.75	0.6		0.62
D1		1.27			0.050	
E	10		10.40	0.393		0.409
е	2.40		2.70	0.094		0.106
e1	4.95		5.15	0.194		0.202
F	1.23		1.32	0.048		0.051
H1	6.20		6.60	0.244		0.256
J1	2.40		2.72	0.094		0.107
L	13		14	0.511		0.551
L1	3.50		3.93	0.137		0.154
L20		16.40			0.645	
L30		28.90			1.137	
ØP	3.75		3.85	0.147		0.151
Q	2.65		2.95	0.104		0.116



# 5 Revision history

Date	Revision	Changes	
21-Jun-2004	2	Preliminary version	
24-Jul-2006	3	The document has been reformatted, SOA updated	
31-Jan-2007	4	Typo mistake on <i>Table 2</i> .	
10-Apr-2007	5	Typo mistake on Table 2 and Table 3	
19-Apr-2007	6	Corrected value on Table 4	
17-Nov-2008	7	Inserted E <sub>AS</sub> value on <i>Table 2</i> .	



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