

STP36NF06 STP36NF06FP

N-channel 60V - 0.032Ω - 30A - TO-220/TO-220FP STripFET™ II Power MOSFET

General features

Туре	V _{DSS}	R _{DS(on)}	I _D
STP36NF06	60V	<0.040Ω	30A
STP36NF06FP	60V	<0.040Ω	18A ⁽¹⁾

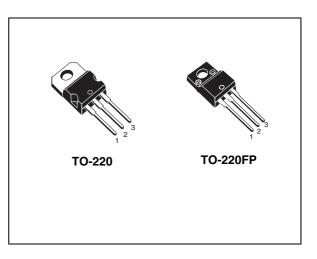
- 1. Current limited by package
- Exceptional dv/dt capability
- 100% avalanche tested
- Application oriented characterization

Description

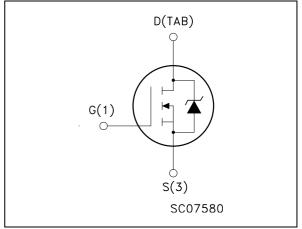
This Power MOSFET is the latest development of STMicroelectronics unique "Single Feature Size™" strip-based process. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalanche characteristics and less critical alignment steps therefore a remarkable manufacturing reproducibility.

Applications

Switching application



Internal schematic diagram



Order codes

Part number	Marking	Package	Packaging
STP36NF06	P36NF06	TO-220	Tube
STP36NF06FP	P36NF06	TO-220FP	Tube

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1 Electrical ratings

Table 1.	Absolute	maximum	ratings
	Abounde	IIIuAIIIIuIII	raungo

Symbol	Parameter	Va	Value	
		TO-220	TO-220FP	
V_{DS}	Drain-source voltage ($V_{GS} = 0$)	6	0	V
V _{GS}	Gate- source voltage	± 20		V
Ι _D	Drain current (continuous) at $T_C = 25^{\circ}C$	30	18 ⁽¹⁾	А
I _D	Drain current (continuous) at $T_{C} = 100^{\circ}C$	21	12 ⁽¹⁾	А
I _{DM} ⁽²⁾	Drain current (pulsed)	120	72	А
P _{tot}	Total dissipation at $T_{C} = 25^{\circ}C$	70	25	W
	Derating factor	0.47	0.17	W/°C
dv/dt ⁽³⁾	Peak diode recovery voltage slope	2	0	V/ns
E _{AS} ⁽⁴⁾	Single pulse avalanche energy	20	00	mJ
V _{ISO}	Insulation withstand voltage three leads to external heat $(t = 1s; Tc = 25^{\circ}C)$		2500	v
T _{stg}	Storage temperature	55 t	a 175	°C
Тj	Max. operating junction temperature	-55 (0	o 175	C

1. Current limited by package's thermal resistance

2. Pulse width limited by safe operating area.

3. $I_{SD} \leq 36A$, di/dt $\leq 400A/\mu s$, $V_{DD} \leq V_{(BR)DSS}$, $Tj \leq T_{JMAX}$

4. Starting $T_j = 25 \text{ °C}$, $I_D = 18A$, $V_{DD} = 45V$

Table 2.Thermal data

		TO-220	TO-220FP	
Rthj-case	Thermal resistance junction-case max	2.14	6	°C/W
Rthj-amb	Thermal resistance junction-ambient max	62	2.5	°C/W
Т _Ј	Maximum lead temperature for soldering purpose ⁽¹⁾	30	00	°C

1. 1.6 mm from case, for 10 sec.



2 Electrical characteristics

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

Table J.	On/on states					
Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
V _{(BR)DSS}	Drain-source breakdown voltage	I _D = 250μΑ, V _{GS} =0	60			V
I _{DSS}	Zero gate voltage drain current (V _{GS} = 0)	V_{DS} = max ratings V_{DS} = max ratings, T_{C} = 125°C			1 10	μΑ μΑ
I _{GSS}	Gate-body leakage current (V _{DS} = 0)	$V_{GS} = \pm 20V$			±100	nA
V _{GS(th)}	Gate threshold voltage	$V_{DS} = V_{GS}, \ I_D = 250 \mu A$	2		4	V
R _{DS(on)}	Static drain-source on resistance	V _{GS} = 10V, I _D = 15A		0.032	0.040	Ω

Table 3. On/off states

Table 4.Dynamic

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
9 _{fs} ⁽¹⁾	Forward transconductance	V _{DS} = 25V, I _D = 15A		12		S
C _{iss} C _{oss} C _{rss}	Input capacitance Output capacitance Reverse transfer capacitance	V _{DS} = 25V, f = 1MHz, V _{GS} = 0		690 170 68		pF pF pF
t _{d(on)} t _r t _{d(off)} t _f	Turn-on delay time Rise time Turn-off delay time Fall time	$V_{DD} = 30V, I_D = 18A$ $R_G = 4.7\Omega V_{GS} = 10V$ (see <i>Figure 15</i>)		10 40 27 9		ns ns ns ns
Q _g Q _{gs} Q _{gd}	Total gate charge Gate-source charge Gate-drain charge	$V_{DD} = 30V, I_D = 18A,$ $V_{GS} = 10V$ (see <i>Figure 16</i>)		23 6 9	31	nC nC nC

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



Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
I _{SD} I _{SDM} ⁽¹⁾	Source-drain current Source-drain current (pulsed)				30 120	A A
V _{SD} ⁽²⁾	Forward on voltage	I _{SD} = 30A, V _{GS} = 0			1.5	V
t _{rr} Q _{rr} I _{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	I _{SD} = 30A, di/dt = 100A/μs, V _{DD} = 30V, Τ _j = 150°C (see <i>Figure 17</i>)		65 155 4.8		ns nC A

Table 5.Source drain diode

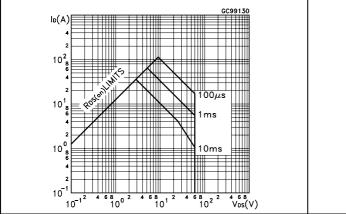
1. Pulse width limited by safe operating area.

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



2.1 Electrical characteristics (curves)

Figure 1. Safe operating area for TO-220





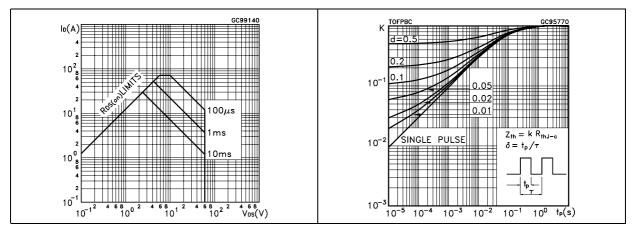
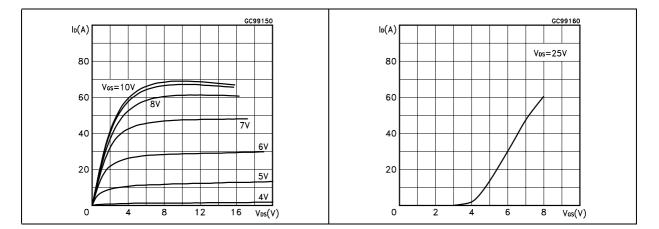


Figure 2.





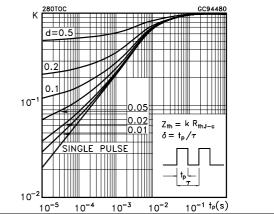
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Figure 4. Thermal impedance for TO-220FP



Thermal impedance for TO-220

GC99200

Figure 7. Transconductance

Figure 8. Static drain-source on resistance

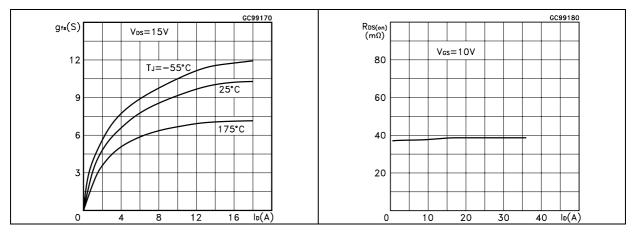


Figure 9. Gate charge vs. gate-source voltage Figure 10. Capacitance variations

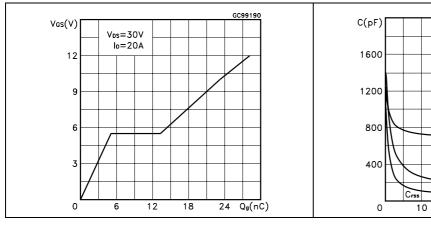


Figure 11. Normalized gate threshold voltage Figure 12 vs. temperature

Figure 12. Normalized on resistance vs. temperature

20

C.

f=1MHz Vgs=0V

Ciss

30

40

Vos(V)

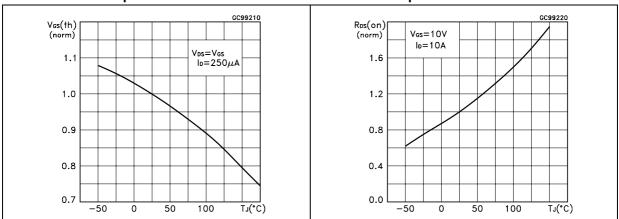
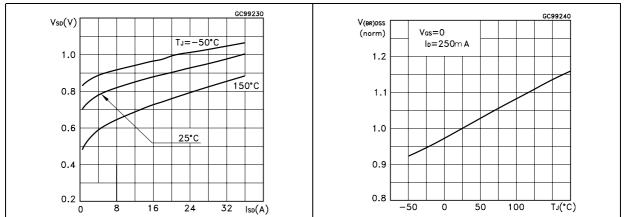


Figure 13. Source-drain diode forward characteristics

Figure 14. Normalized B_{VDSS} vs. temperature





1ΚΩ

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D.U.T.

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3 Test circuit

Figure 15. Switching times test circuit for resistive load

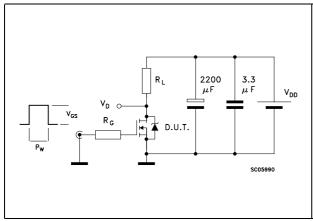
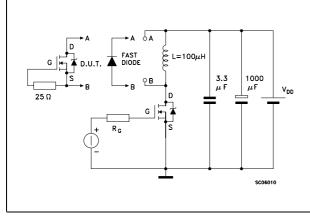


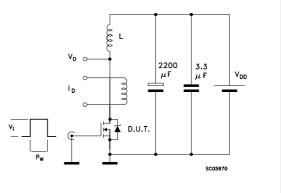
Figure 17. Test circuit for inductive load switching and diode recovery times





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Figure 18. Unclamped Inductive load test circuit





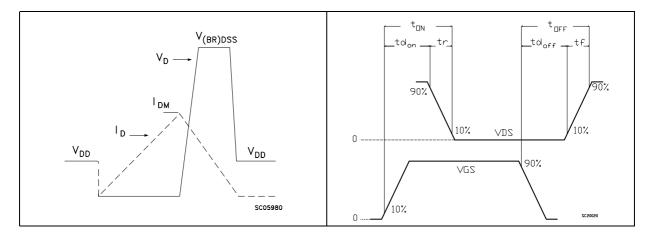


Figure 16. Gate charge test circuit

 $V_i = 20V = V_{GMAX}$

2200 µF

1ΚΩ

127

I_G=CONST

()

47KΩ

2.7KΩ

47K Ω

∔100n₽

100 Ω

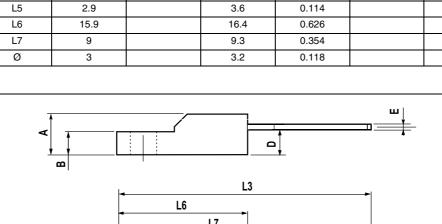
4 Package mechanical data

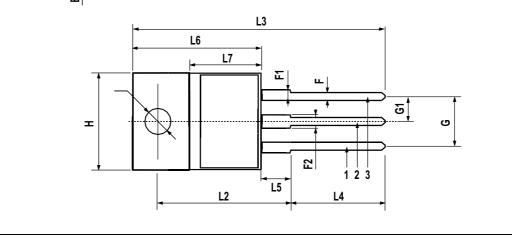
In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings 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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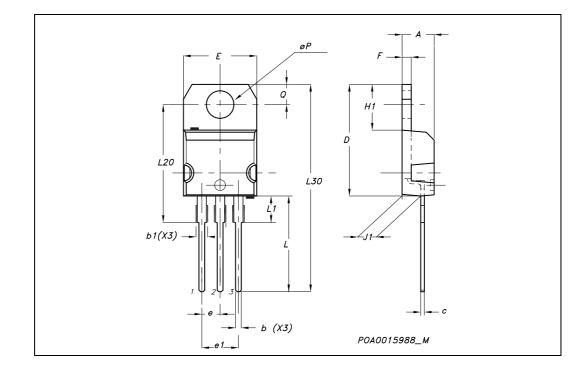
TO-220FP MECHANICAL DATA							
DIM.		mm.			inch		
DIIVI.	MIN.	ТҮР	MAX.	MIN.	TYP.	MAX.	
А	4.4		4.6	0.173		0.181	
В	2.5		2.7	0.098		0.106	
D	2.5		2.75	0.098		0.108	
Е	0.45		0.7	0.017		0.027	
F	0.75		1	0.030		0.039	
F1	1.15		1.7	0.045		0.067	
F2	1.15		1.7	0.045		0.067	
G	4.95		5.2	0.195		0.204	
G1	2.4		2.7	0.094		0.106	
Н	10		10.4	0.393		0.409	
L2		16			0.630		
L3	28.6		30.6	1.126		1.204	
L4	9.8		10.6	.0385		0.417	
L5	2.9		3.6	0.114		0.141	
L6	15.9		16.4	0.626		0.645	
L7	9		9.3	0.354		0.366	
Ø	3		3.2	0.118		0.126	





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TO-220 MECHANICAL DATA							
		mm.		inch			
DIM.	MIN.	ТҮР	MAX.	MIN.	TYP.	MAX	
А	4.40		4.60	0.173		0.181	
b	0.61		0.88	0.024		0.034	
b1	1.15		1.70	0.045		0.066	
С	0.49		0.70	0.019		0.027	
D	15.25		15.75	0.60		0.620	
Е	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		0.052	
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		
øР	3.75		3.85	0.147		0.151	
Q	2.65		2.95	0.104		0.116	



TO 220 MECHANICAL DATA

5 Revision history

Date	Revision	Changes
09-Sep-2004	3	Complete version
16-Aug-2006	4	The document has been reformatted
19-Dec-2006	5	Missing value on <i>Table 3.</i> (V _{GS(th)})
21-Feb-2007	6	Typo mistake on page 1



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