

STF40NF06

N-channel 60V - 0.024Ω - 23A - TO-220FP STripFET™ II Power MOSFET

General features

Туре	V _{DSS}	R _{DS(on)}	I _D
STF40NF06	60V	<0.028Ω	23A

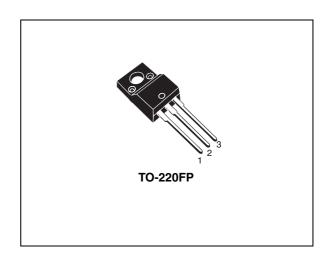
- Exceptional dv/dt capability
- Low gate charge at 100°C
- Application oriented characterization
- 100% avalanche tested

Description

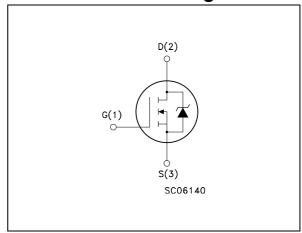
This MOSFET is the latest development of STMicroelectronics unique "Single Feature Size™" strip-based process. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalance characteristics and less critical alignment steps therefore a remarkable manufacturing reproducibility.

Applications

■ Switching application



Internal schematic diagram



Order codes

Part number	Marking	Package	Packaging
STF40NF06	F40NF06	TO-220FP	Tube

Contents STF40NF06

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STF40NF06 Electrical ratings

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V _{DS}	Drain-source voltage (V _{GS} = 0)	60	٧
V _{GS}	Gate-source voltage	± 20	V
I _D	Drain current (continuous) at T _C = 25°C	23	Α
I _D	Drain current (continuous) at T _C =100°C	16	Α
I _{DM} ⁽¹⁾	Drain current (pulsed)	92	Α
P _{TOT}	Total dissipation at T _C = 25°C	30	W
	Derating Factor	0.2	W/°C
dv/dt ⁽²⁾	Peak diode recovery voltage slope	10	V/ns
E _{AS} ⁽³⁾	Single pulse avalanche energy	250	mj
V _{ISO}	Insulation withstand voltage (RMS) from all three leads to external heat sink (t=1s; Tc= 25°C)	2500	V
T _J T _{stg}	Operating junction temperature Storage temperature	-55 to 175	°C

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

Table 2. Thermal data

R _{thj-case}	Thermal resistance junction-case Max	5.0	°C/W
T _I	Maximum lead temperature for soldering purpose	275	°C

^{2.} $I_{SD} \leq 40A$, di/dt $\leq 300A/\mu s$, $V_{DD} \leq V_{(BR)DSS}$, $Tj \leq T_{JMAX}$

^{3.} Starting $T_i = 25^{\circ}C$, $I_D = 20A$, $V_{DD} = 30V$

Electrical characteristics STF40NF06

2 Electrical characteristics

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

Table 3. 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}	Zero gate voltage drain current (V _{GS} = 0)	$V_{DS} = Max \text{ rating,}$ $V_{DS} = Max \text{ rating } @125^{\circ}C$			1 10	μ Α μ Α
I _{GSS}	Gate body leakage current (V _{DS} = 0)	V _{GS} = ±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 = 11.5A		0.024	0.028	Ω

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
g _{fs} ⁽¹⁾	Forward transconductance	$V_{DS} = 30V, I_D = 11.5A$		12		S
C_{iss} C_{oss} C_{rss}	Input capacitance Output capacitance Reverse transfer capacitance	V _{DS} =25V, f=1 MHz, V _{GS} =0		920 225 80		pF pF pF
Q _g Q _{gs} Q _{gd}	Total gate charge Gate-source charge Gate-drain charge	V _{DD} =48V, I _D = 10A V _{GS} =10V		32 6.5 15	43	nC nC nC

^{1.} Pulsed: pulse duration=300µs, duty cycle 1.5%

Table 5. Switching times

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
t _{d(on)}	Turn-on Delay Time Rise Time	V_{DD} = 30V, I_D = 20A, R_G = 4.7 Ω , V_{GS} = 10V (see Figure 13)		27 11		ns ns
t _{d(off)}	Turn-off-delay time Fall time	V_{DD} = 30V, I_D = 20A, R_G = 4.7 Ω , V_{GS} =10V (see Figure 13)		27 11		ns ns

Table 6. Source drain diode

Symbol	Parameter	Test conditions	Min	Тур.	Max	Unit
I _{SD}	Source-drain current				23	Α
I _{SDM} ⁽¹⁾	Source-drain current (pulsed)				92	Α
V _{SD} ⁽²⁾	Forward on voltage	I _{SD} =23A, V _{GS} =0			1.3	V
t _{rr} Q _{rr} I _{RRM}	Reverse recovery time Reverse recovery charge Reverse recovery current	I _{SD} =40A, di/dt = 100A/μs, V _{DD} =10V, Tj=150°C (see Figure 15)		63 150 4.8		ns nC A

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

^{2.} Pulsed: pulse duration=300µs, duty cycle 1.5%

Electrical characteristics STF40NF06

2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

10² 10³ 100μs 1 10μs 1

Figure 2. Thermal impedance

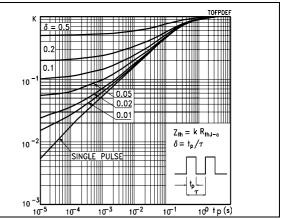


Figure 3. Output characterisics

Figure 4. Transfer characteristics

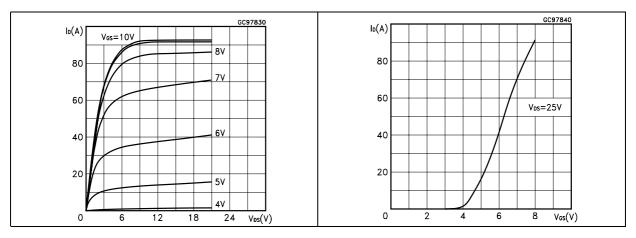


Figure 5. Transconductance

Figure 6. Static drain-source on resistance

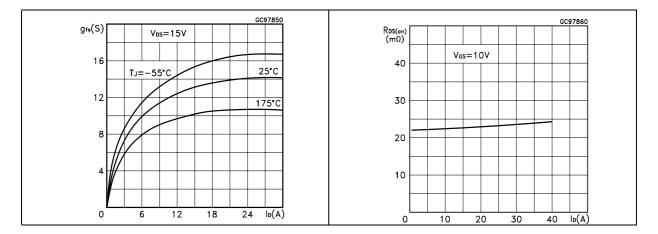


Figure 7. Gate charge vs gate-source voltage Figure 8. Capacitance variations

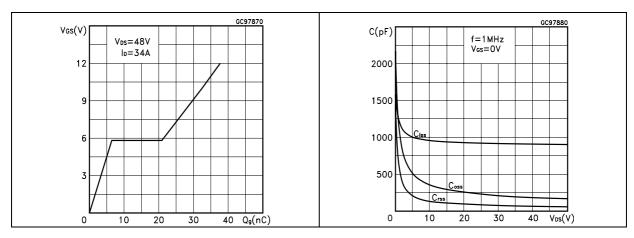


Figure 9. Normalized gate threshold voltage vs temperature

Figure 10. Normalized on resistance vs temperature

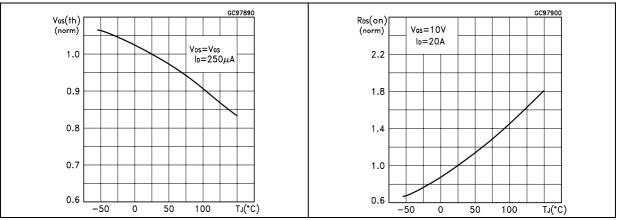
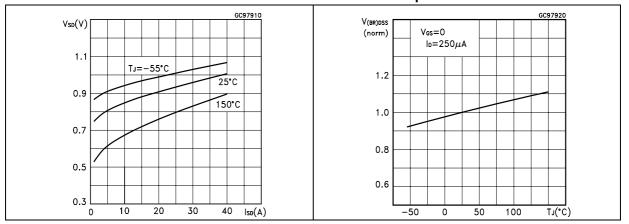


Figure 11. Source-drain diode forward characteristics

Figure 12. Normalized breakdown voltage vs temperature



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Test circuit STF40NF06

3 Test circuit

Figure 13. Switching times test circuit for resistive load

Figure 14. Gate charge test circuit

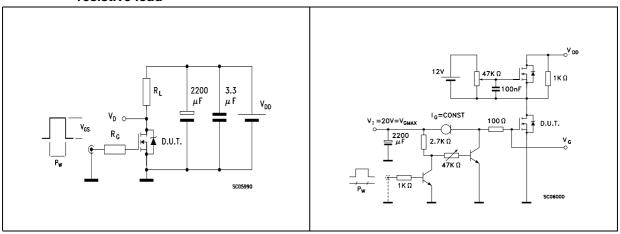


Figure 15. Test circuit for inductive load switching and diode recovery times

Figure 16. Unclamped Inductive load test circuit

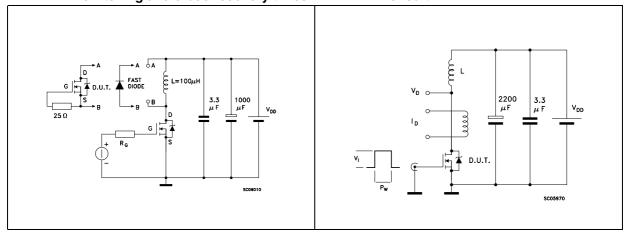
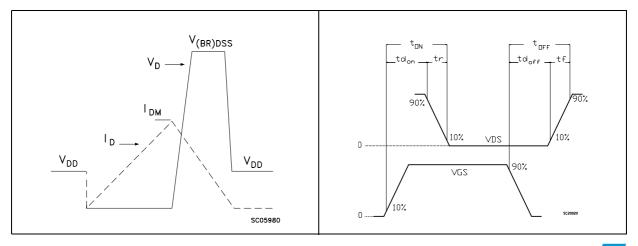


Figure 17. Unclamped inductive waveform

Figure 18. Switching time waveform

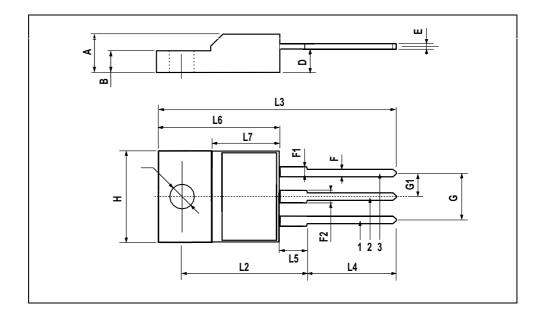


4 Package mechanical data

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

TO-220FP MECHANICAL DATA

DIM		mm.			inch		
DIM.	MIN.	TYP	MAX.	MIN.	TYP.	MAX.	
Α	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	4 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	



STF40NF06 Revision history

5 Revision history

Table 7. Revision history

Date	Revision	Changes
12-Nov-2004	1	First release
27-May-2005	2	Final datasheet
04-Sep-2006	3	New template, no content change

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