



# STP24NF10

## N - CHANNEL 100V - 0.07Ω - 24A TO-220 LOW GATE CHARGE STripFET™ POWER MOSFET

PRELIMINARY DATA

TYPE	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STP24NF10	100 V	< 0.077 Ω	24 A

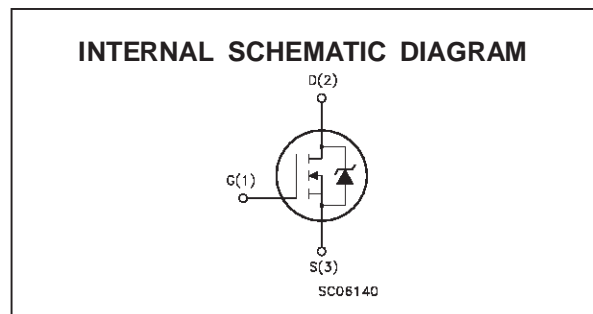
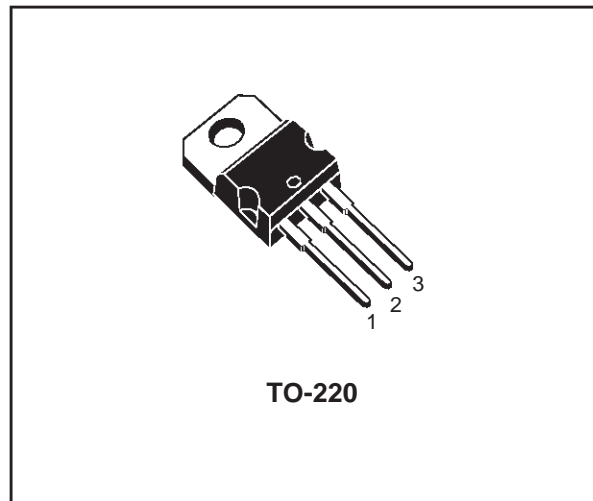
- TYPICAL R<sub>DS(on)</sub> = 0.07 Ω
- EXCEPTIONAL dv/dt CAPABILITY
- 100% AVALANCHE TESTED
- APPLICATION ORIENTED CHARACTERIZATION

### 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 high-efficiency, high-frequency isolated DC-DC converters for Telecom and Computer applications. It is also intended for any applications with low gate drive requirements.

### APPLICATIONS

- HIGH-EFFICIENCY DC-DC CONVERTERS
- UPS AND MOTOR CONTROL



### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V <sub>DS</sub>	Drain-source Voltage (V <sub>GS</sub> = 0)	100	V
V <sub>DGR</sub>	Drain- gate Voltage (R <sub>GS</sub> = 20 kΩ)	100	V
V <sub>GS</sub>	Gate-source Voltage	± 20	V
I <sub>D</sub>	Drain Current (continuous) at T <sub>c</sub> = 25 °C	24	A
I <sub>D</sub>	Drain Current (continuous) at T <sub>c</sub> = 100 °C	15	A
I <sub>DM</sub> (•)	Drain Current (pulsed)	96	A
P <sub>tot</sub>	Total Dissipation at T <sub>c</sub> = 25 °C	80	W
	Derating Factor	0.53	W/°C
dv/dt(1)	Peak Diode Recovery voltage slope	9	V/ns
E <sub>AS</sub> (2)	Single Pulse Avalanche Energy	75	mJ
T <sub>stg</sub>	Storage Temperature	-65 to 175	°C
T <sub>j</sub>	Max. Operating Junction Temperature	175	°C

(•) Pulse width limited by safe operating area

(2) starting T<sub>j</sub> = 25 °C, I<sub>b</sub> = 24A, V<sub>DD</sub> = 50V

(1) I<sub>SD</sub> ≤ 24 A, di/dt ≤ 300A/μs, V<sub>DD</sub> ≤ V<sub>(BR)DSS</sub>, T<sub>j</sub> ≤ T<sub>JMA</sub>

## STP24NF10

### THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case	Max	1.87	$^{\circ}C/W$
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	62.5	$^{\circ}C/W$
$T_I$	Maximum Lead Temperature For Soldering Purpose		300	$^{\circ}C$

### ELECTRICAL CHARACTERISTICS ( $T_{case} = 25^{\circ}C$ unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250 \mu A$ $V_{GS} = 0$	100			V
$I_{DSS}$	Zero Gate Voltage Drain Current ( $V_{GS} = 0$ )	$V_{DS} = \text{Max Rating}$ $V_{DS} = \text{Max Rating}$ $T_c = 125^{\circ}C$			1 10	$\mu A$ $\mu A$
$I_{GSS}$	Gate-body Leakage Current ( $V_{DS} = 0$ )	$V_{GS} = \pm 20 V$			$\pm 100$	nA

ON (\*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250 \mu A$	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10 V$ $I_D = 12 A$		0.07	0.077	$\Omega$
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10 V$	24			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$g_{fs} (*)$	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 12 A$		20		S
$C_{iss}$	Input Capacitance	$V_{DS} = 25 V$ $f = 1 MHz$ $V_{GS} = 0$		870		pF
$C_{oss}$	Output Capacitance			125		pF
$C_{rss}$	Reverse Transfer Capacitance			52		pF

**ELECTRICAL CHARACTERISTICS** (continued)

## SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	$V_{DD} = 50\text{ V}$ $I_D = 12\text{ A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$ (Resistive Load, see fig. 3)		58		ns
$t_r$	Rise Time			45		ns
$Q_g$	Total Gate Charge	$V_{DD} = 80\text{ V}$ $I_D = 24\text{ A}$ $V_{GS} = 10\text{ V}$		30		nC
$Q_{gs}$	Gate-Source Charge			6		nC
$Q_{gd}$	Gate-Drain Charge			10		nC

## SWITCHING OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(off)}$	Turn-off Delay Time	$V_{DD} = 27\text{ V}$ $I_D = 12\text{ A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$ (Resistive Load, see fig. 3)		49		ns
$t_f$	Fall Time			17		ns
$t_{d(off)}$	Off-voltage Rise Time	$V_{clamp} = 80\text{ V}$ $I_D = 24\text{ A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$ (Inductive Load, see fig. 5)		43		ns
$t_f$	Fall Time			36		ns
$t_c$	Cross-over Time			39		ns

## SOURCE DRAIN DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain Current				24	A
$I_{SDM}(\bullet)$	Source-drain Current (pulsed)				96	A
$V_{SD}(\ast)$	Forward On Voltage	$I_{SD} = 24\text{ A}$ $V_{GS} = 0$			1.5	V
$t_{rr}$	Reverse Recovery Time	$I_{SD} = 24\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 50\text{ V}$ $T_j = 150\text{ }^\circ\text{C}$ (see test circuit, fig. 5)		100		ns
$Q_{rr}$	Reverse Recovery Charge			375		nC
$I_{RRM}$	Reverse Recovery Current			7.5		A

(\*) Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %

(•) Pulse width limited by safe operating area

Fig. 1: Unclamped Inductive Load Test Circuit



Fig. 2: Unclamped Inductive Waveform

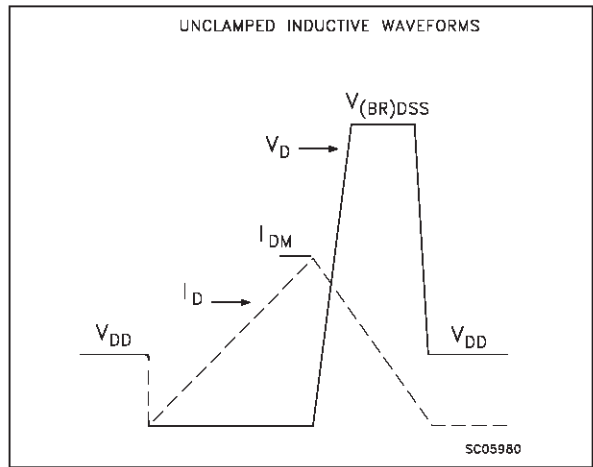


Fig. 3: Switching Times Test Circuits For Resistive Load



Fig. 4: Gate Charge test Circuit

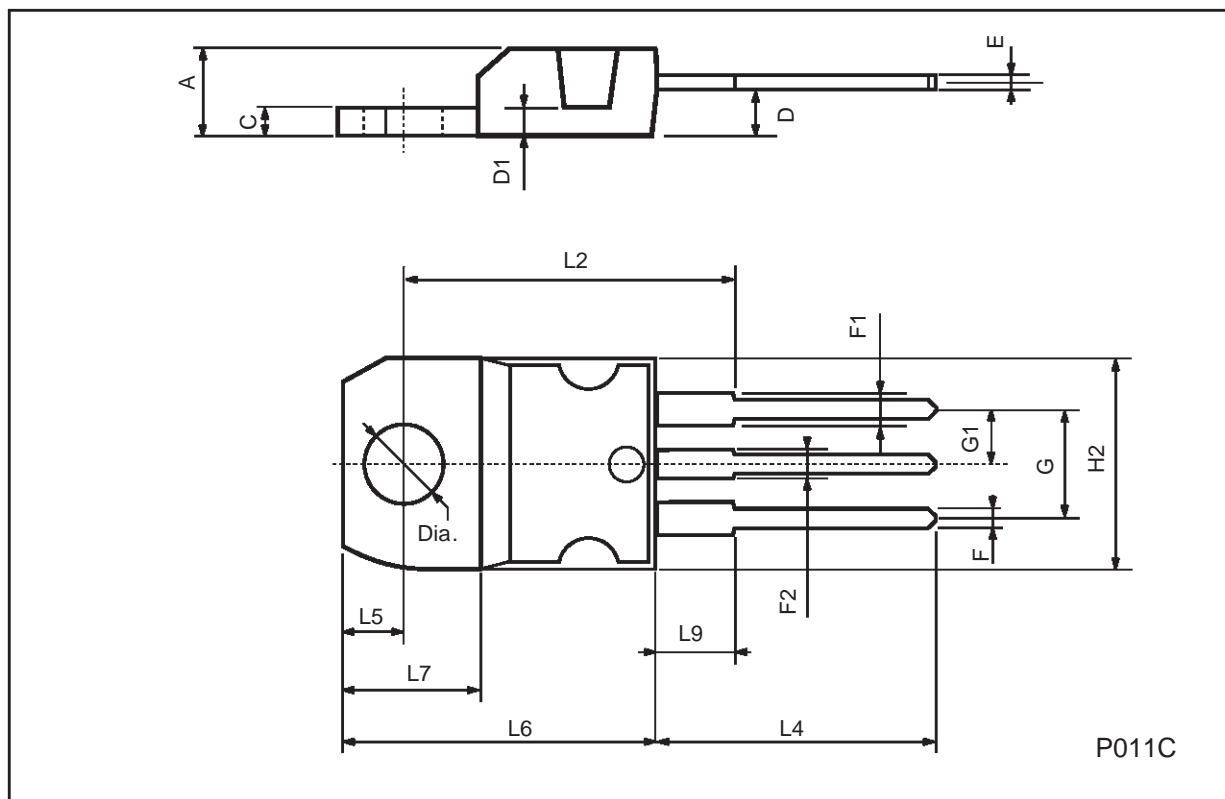


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



## TO-220 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
C	1.23		1.32	0.048		0.051
D	2.40		2.72	0.094		0.107
D1		1.27			0.050	
E	0.49		0.70	0.019		0.027
F	0.61		0.88	0.024		0.034
F1	1.14		1.70	0.044		0.067
F2	1.14		1.70	0.044		0.067
G	4.95		5.15	0.194		0.203
G1	2.4		2.7	0.094		0.106
H2	10.0		10.40	0.393		0.409
L2		16.4			0.645	
L4	13.0		14.0	0.511		0.551
L5	2.65		2.95	0.104		0.116
L6	15.25		15.75	0.600		0.620
L7	6.2		6.6	0.244		0.260
L9	3.5		3.93	0.137		0.154
DIA.	3.75		3.85	0.147		0.151



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