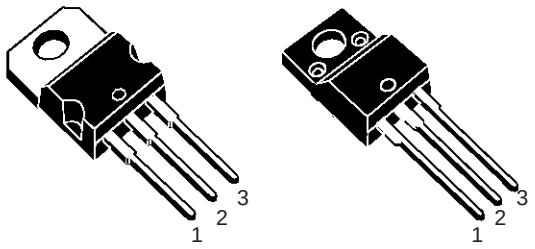
STP9NB50
STP9NB50FP

N-CHANNEL 500V - 0.75 Ω - 8.6 A TO-220/TO-220FP
PowerMesh™ MOSFET

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP9NB50	500 V	< 0.85 Ω	8.6 A
STP9NB50FP	500 V	< 0.85 Ω	4.9 A

- TYPICAL R_{DS}(on) = 0.75 Ω
- EXTREMELY HIGH dv/dt CAPABILITY
- 100% AVALANCHE TESTED
- VERY LOW INTRINSIC CAPACITANCES
- GATE CHARGE MINIMIZED



TO-220 **TO-220FP**

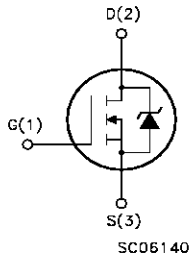
DESCRIPTION

Using the latest high voltage MESH OVERLAY™ process, STMicroelectronics has designed an advanced family of power MOSFETs with outstanding performances. The new patent pending strip layout coupled with the Company's proprieraty edge termination structure, gives the lowest $R_{DS(on)}$ per area, exceptional avalanche and dv/dt capabilities and unrivalled gate charge and switching characteristics.

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITH MODE POWER SUPPLIES (SMPS)
- DC-AC CONVERTERS FOR WELDING EQUIPMENT AND UNINTERRUPTIBLE POWER SUPPLIES AND MOTOR DRIVE

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP9NB50	STP9NB50FP	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	500		V
V_{DGR}	Drain-gate Voltage (R_{GS} = 20 kΩ)	500		V
V_{GS}	Gate- source Voltage	±30		V
I_D	Drain Current (continuos) at T_C = 25°C	8.6	4.9	A
I_D	Drain Current (continuos) at T_C = 100°C	5.4	3.1	A
I_{DM} (●)	Drain Current (pulsed)	34.4	34.4	A
P_{TOT}	Total Dissipation at T_C = 25°C	125	40	W
	Derating Factor	1	0.32	W/°C
dv/dt (1)	Peak Diode Recovery voltage slope	4.5	4.5	V/ns
V_{ISO}	Insulation Withstand Voltage (DC)	-	2000	V
T_{stg}	Storage Temperature	–65 to 150		°C
T_j	Max. Operating Junction Temperature	150		°C

(●)Pulse width limited by safe operating area

(1)I_{SD}<9A, di/dt<200A/µ, V_{DD}<$V_{(BR)DSS}$,TJ<T_{JMAX}

THERMAL DATA

		TO-220	TO-220FP	
Rthj-case	Thermal Resistance Junction-case Max	1	3.13	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	62.5		°C/W
Rthc-sink	Thermal Resistance Case-sink Typ	0.5		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose	300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max)	8.6	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 50 V)	520	mJ

ELECTRICAL CHARACTERISTICS (TCASE = 25 °C UNLESS OTHERWISE SPECIFIED)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA, V_{GS} = 0	500			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating			1	µA
		V_{DS} = Max Rating, T_C = 125 °C			50	µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ±30V			±100	nA

ON (1)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$, I_D = 250 µA	3	4	5	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V, I_D = 4.3 A		0.75	0.85	Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$, V_{GS} = 10V	8.6			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (1)	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$, I_D = 4.3 A		5.7		S
C_{iss}	Input Capacitance	V_{DS} = 25V, f = 1 MHz, V_{GS} = 0		1250		pF
C_{oss}	Output Capacitance			175		pF
C_{rss}	Reverse Transfer Capacitance			20		pF

ELECTRICAL CHARACTERISTICS (CONTINUED)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	V_{DD} = 250 V, I_D = 4.3 A R_G = 4.7Ω V_{GS} = 10 V (see test circuit, Figure 3)		19		ns
t_r	Rise Time			11		ns
Q_g	Total Gate Charge	V_{DD} = 400V, I_D = 8.6 A, V_{GS} = 10V		32	45	nC
Q_{gs}	Gate-Source Charge			10.6		nC
Q_{gd}	Gate-Drain Charge			13.7		nC

SWITCHING OFF

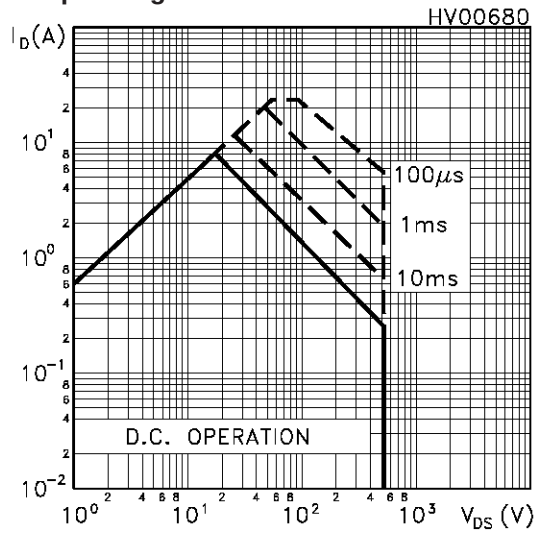
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$	Off-voltage Rise Time	V_{DD} = 400V, I_D = 8.6 A, R_G = 4.7Ω, V_{GS} = 10V (see test circuit, Figure 5)		11.5		ns
t_f	Fall Time			11		ns
t_c	Cross-over Time			20		ns

SOURCE DRAIN DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain Current				8.6	A
I_{SDM} (2)	Source-drain Current (pulsed)				34.4	A
V_{SD} (1)	Forward On Voltage	I_{SD} = 8.6 A, V_{GS} = 0			1.6	V
t_{rr}	Reverse Recovery Time	I_{SD} = 8.6 A, di/dt = 100A/µs, V_{DD} = 100V, T_j = 150°C (see test circuit, Figure 5)		420		ns
Q_{rr}	Reverse Recovery Charge			3.5		µC
I_{RRM}	Reverse Recovery Current			16.5		A

Note: 1. Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %.
2. Pulse width limited by safe operating area.

Safe Operating Area



Safe Operating Area for TO-220FP