

STP5NB60 STP5NB60FP

N - CHANNEL 600V - 1.8Ω - 5A - TO-220/TO-220FP PowerMESH™ MOSFET

TYPE	V _{DSS}	R _{DS(on)}	I _D
STP5NB60	600 V	< 2.0 Ω	5 A
STP5NB60FP	600 V	< 2.0 Ω	3 A

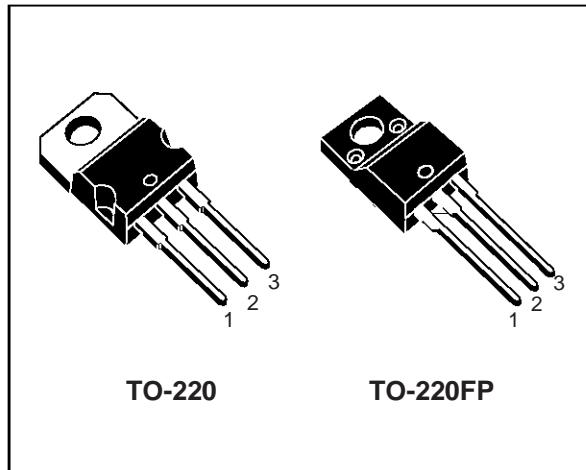
- TYPICAL R_{DS(on)} = 1.8 Ω
- EXTREMELY HIGH dv/dt CAPABILITY
- 100% AVALANCHE TESTED
- VERY LOW INTRINSIC CAPACITANCES
- GATE CHARGE MINIMIZED

DESCRIPTION

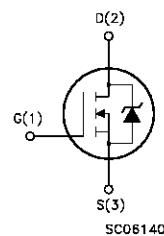
Using the latest high voltage MESH OVERLAY™ process, STMicroelectronics has designed an advanced family of power MOSFETs with outstanding performances. The new patent pending strip layout coupled with the Company's proprietary edge termination structure, gives the lowest RDS(on) per area, exceptional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

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH 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
		STP5NB60	STP5NB60FP	
V _{DS}	Drain-source Voltage (V _{GS} = 0)	600		V
V _{DGR}	Drain-gate Voltage (R _{GS} = 20 kΩ)	600		V
V _{GS}	Gate-source Voltage	± 30		V
I _D	Drain Current (continuous) at T _c = 25 °C	5	3	A
I _D	Drain Current (continuous) at T _c = 100 °C	3.1	1.9	A
I _{DM(•)}	Drain Current (pulsed)	20	20	A
P _{tot}	Total Dissipation at T _c = 25 °C	100	35	W
	Derating Factor	0.8	0.28	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} ≤ 5A, di/dt ≤ 200 A/μs, V_{DD} ≤ V_{(BR)DSS}, T_j ≤ T_{JMAX}

STP5NB60/FP

THERMAL DATA

			TO-220	TO220-FP	
R _{thj-case}	Thermal Resistance Junction-case	Max	1.25	3.57	°C/W
R _{thj-amb} R _{thc-sink} T _I	Thermal Resistance Junction-ambient Thermal Resistance Case-sink Maximum Lead Temperature For Soldering Purpose	Max Typ	62.5 0.5 300		°C/W °C/W °C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Min. Value	Max. Value	Unit
I _{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T _j max)		5	A
E _{AS}	Single Pulse Avalanche Energy (starting T _j = 25 °C, I _D = I _{AR} , V _{DD} = 50 V)		300	mJ

ELECTRICAL CHARACTERISTICS (T_{case} = 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	600			V
I _{DSS}	Zero Gate Voltage Drain Current (V _{GS} = 0)	V _{DS} = Max Rating V _{DS} = Max Rating T _c = 125 °C			1 50	μA μA
I _{GSS}	Gate-body Leakage Current (V _{DS} = 0)	V _{GS} = ± 30 V			± 100	nA

ON (*)

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 _{D(on)}	Static Drain-source On Resistance	V _{GS} = 10V I _D = 2.5 A		1.8	2.0	Ω
I _{D(on)}	On State Drain Current	V _{DS} > I _{D(on)} × R _{D(on)max} V _{GS} = 10 V	5.0			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g _{fs} (*)	Forward Transconductance	V _{DS} > I _{D(on)} × R _{D(on)max} I _D = 2.5 A	2.5	4.5		S
C _{iss} C _{oss} C _{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V _{DS} = 25 V f = 1 MHz V _{GS} = 0		680 103 10.5	884 139 14	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	$V_{DD} = 300 \text{ V}$ $I_D = 2.5 \text{ A}$ $R_G = 4.7 \Omega$ $V_{GS} = 10 \text{ V}$ (see test circuit, figure 3)		12 10	17 14	ns ns
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	$V_{DD} = 480 \text{ V}$ $I_D = 5 \text{ A}$ $V_{GS} = 10 \text{ V}$		21 7.6 7.5	30	nC nC nC

SWITCHING OFF

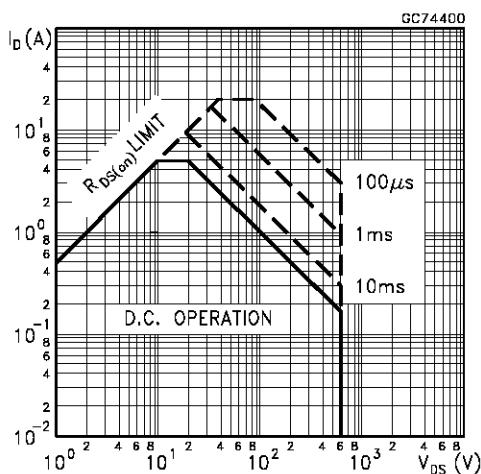
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(V_{off})}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	$V_{DD} = 480 \text{ V}$ $I_D = 5 \text{ A}$ $R_G = 4.7 \Omega$ $V_{GS} = 10 \text{ V}$ (see test circuit, figure 5)		8 7 15	13 12 23	ns ns ns

SOURCE DRAIN DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} $I_{SDM}(\bullet)$	Source-drain Current Source-drain Current (pulsed)				5 20	A A
$V_{SD} (\ast)$	Forward On Voltage	$I_{SD} = 5 \text{ A}$ $V_{GS} = 0$			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	$I_{SD} = 5 \text{ A}$ $di/dt = 100 \text{ A}/\mu\text{s}$ $V_{DD} = 100 \text{ V}$ $T_j = 150 \text{ }^\circ\text{C}$ (see test circuit, figure 5)		610 3.6 11.7		ns μC A

(*) Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %(\bullet) Pulse width limited by safe operating area

Safe Operating Area for TO-220



Safe Operating Area for TO-220FP

