



STP9NC60 STP9NC60FP

N - CHANNEL 600V - 0.6Ω - 9A TO-220/TO-220FP PowerMESH™ II MOSFET

TYPE	V _{DSS}	R _{DS(on)}	I _D
STP9NC60	600 V	< 0.75 Ω	9.0 A
STP9NC60FP	600 V	< 0.75 Ω	5.2 A

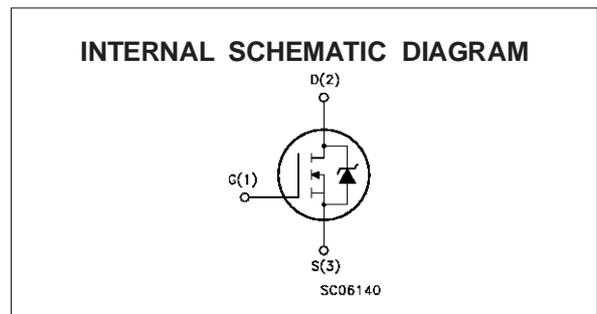
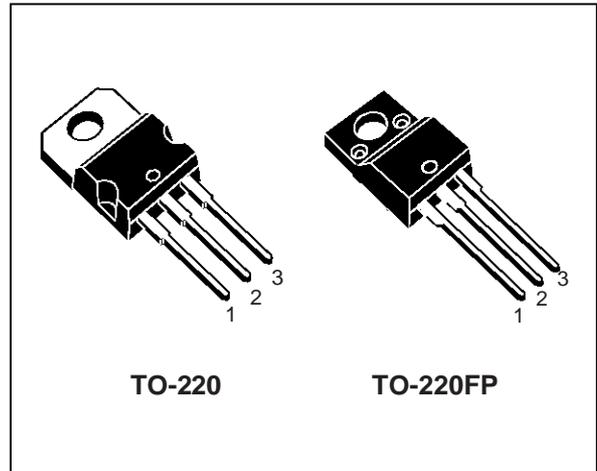
- ✓ TYPICAL R_{DS(on)} = 0.6 Ω
- ✓ EXTREMELY HIGH dv/dt CAPABILITY
- ✓ 100% AVALANCHE TESTED
- ✓ NEW HIGH VOLTAGE BENCHMARK
- ✓ GATE CHARGE MINIMIZED

DESCRIPTION

The PowerMESH™ II is the evolution of the first generation of MESH OVERLAY™. The layout refinements introduced greatly improve the Ron*area figure of merit while keeping the device at the leading edge for what concerns switching speed, gate charge and ruggedness.

APPLICATIONS

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



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP9NC60	STP9NC60FP	
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	9.0	5.2	A
I _D	Drain Current (continuous) at T _c = 100 °C	5.7	3.3	A
I _{DM} (•)	Drain Current (pulsed)	36	36	A
P _{tot}	Total Dissipation at T _c = 25 °C	125	40	W
	Derating Factor	1.0	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 ≤ 200 A/μs, V_{DD} ≤ V_{(BR)DSS}, T_j ≤ T_{JMAX}

STP9NC60/FP

THERMAL DATA

		TO-220	TO-220FP		
$R_{thj-case}$	Thermal Resistance Junction-case	Max	1.0	3.12	$^{\circ}C/W$
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	62.5		$^{\circ}C/W$
$R_{thc-sink}$	Thermal Resistance Case-sink	Typ	0.5		$^{\circ}C/W$
T_l	Maximum Lead Temperature For Soldering Purpose		300		$^{\circ}C$

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	9	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25^{\circ}C$, $I_D = I_{AR}$, $V_{DD} = 50 V$)	850	mJ

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	$I_D = 250 \mu A$ $V_{GS} = 0$	600			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 50	μA μA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 30 V$			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250 \mu A$	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10V$ $I_D = 4 A$		0.6	0.75	Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10 V$	9.0			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$g_{fs} (*)$	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 4 A$		10		S
C_{iss}	Input Capacitance	$V_{DS} = 25 V$ $f = 1 MHz$ $V_{GS} = 0$		1400		pF
C_{oss}	Output Capacitance			196		pF
C_{rss}	Reverse Transfer Capacitance			31		pF

ELECTRICAL CHARACTERISTICS (continued)
SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	$V_{DD} = 300\text{ V}$ $I_D = 4.5\text{ A}$		28		ns
t_r	Rise Time	$R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$ (Resistive Load, see fig. 3)		15		ns
Q_g	Total Gate Charge	$V_{DD} = 480\text{ V}$ $I_D = 9.0\text{ A}$ $V_{GS} = 10\text{ V}$		44	62	nC
Q_{gs}	Gate-Source Charge			10.5		nC
Q_{gd}	Gate-Drain Charge			19.5		nC

SWITCHING OFF

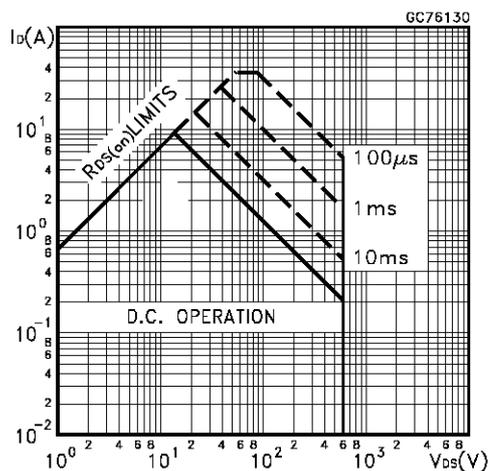
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(off)}$	Turn-off Delay Time	$V_{DD} = 300\text{ V}$ $I_D = 4.5\text{ A}$		53		ns
t_f	Fall Time	$R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$ (Resistive Load, see fig. 3)		30		ns
$t_{r(Voff)}$	Off-voltage Rise Time	$V_{DD} = 480\text{ V}$ $I_D = 9.0\text{ A}$		15		ns
t_f	Fall Time	$R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$		12		ns
t_c	Cross-over Time	(Inductive Load, see fig. 5)		24		ns

SOURCE DRAIN DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain Current				9.0	A
$I_{SDM}(\bullet)$	Source-drain Current (pulsed)				36	A
$V_{SD} (*)$	Forward On Voltage	$I_{SD} = 9\text{ A}$ $V_{GS} = 0$			1.6	V
t_{rr}	Reverse Recovery Time	$I_{SD} = 9\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 100\text{ V}$ $T_j = 150\text{ }^\circ\text{C}$ (see test circuit, fig. 5)		610		ns
Q_{rr}	Reverse Recovery Charge			5.4		μC
I_{RRM}	Reverse Recovery Current			17		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

