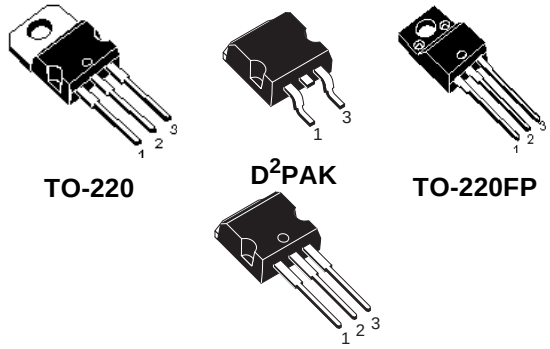
STP5NC50 - STP5NC50FP
STB5NC50 - STB5NC50-1

N-CHANNEL 500V - 1.3Ω - 5.5A TO-220/FP/D²PAK/I²PAK
PowerMesh™II MOSFET

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP5NC50	500 V	< 1.5Ω	5.5A
STP5NC50FP	500 V	< 1.5Ω	5.5A
STB5NC50	500 V	< 1.5Ω	5.5A
STB5NC50-1	500 V	< 1.5Ω	5.5A

- TYPICAL $R_{DS}(on)$ = 1.3Ω
- EXTREMELY HIGH dv/dt CAPABILITY
- 100% AVALANCHE TESTED
- NEW HIGH VOLTAGE BENCHMARK
- GATE CHARGE MINIMIZED



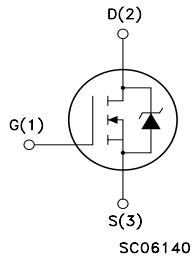
DESCRIPTION

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 swithing speed, gate charge and ruggedness.

APPLICATIONS

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

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP5NC50 STB5NC50/-1	STP5NC50FP	
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	5.5	5.5(*)	A
I_D	Drain Current (continuos) at T_C = 100°C	3.5	3.5(*)	A
I_{DM} (•)	Drain Current (pulsed)	22	22	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	3.5		V/ns
V_{ISO}	Insulation Withstand Voltage (DC)	-	2500	V
T_j T_{stg}	Operating Junction Temperature Storage Temperature	-55 to 175 -65 to 175		°C °C

(*)Limited only by maximum temperature allowed

(•)Pulse width limited by safe operating area

(1)I_{SD} ≤5.5A, di/dt ≤100A/µs, $V_{DD} \leq V_{(BR)DSS}$, $T_j \leq T_{JMAX.}$

THERMAL DATA

		TO-220 D^2PAK I^2PAK	TO-220FP	
Rthj-case	Thermal Resistance Junction-case Max	1.25	3.57	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	62.5		°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)	5.5	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 50 V)	280	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 = 250µA, 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 = 250µA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V, I_D = 2 A		1.3	1.5	Ω

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 = 2.5A		4		S
C_{iss}	Input Capacitance	V_{DS} = 25V, f = 1 MHz, V_{GS} = 0		480		pF
C_{oss}	Output Capacitance			80		pF
C_{rss}	Reverse Transfer Capacitance			11.5		pF

ELECTRICAL CHARACTERISTICS
(CONTINUED)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	V_{DD} = 250V, I_D = 2.5A		14		ns
t_r	Rise Time	R_G = 4.7Ω V_{GS} = 10V (see test circuit, Figure 3)		15		ns
Q_g	Total Gate Charge	V_{DD} = 400V, I_D = 5.5A,		17.5	24.5	nC
Q_{gs}	Gate-Source Charge	V_{GS} = 10V		3		nC
Q_{gd}	Gate-Drain Charge			9		nC

SWITCHING OFF

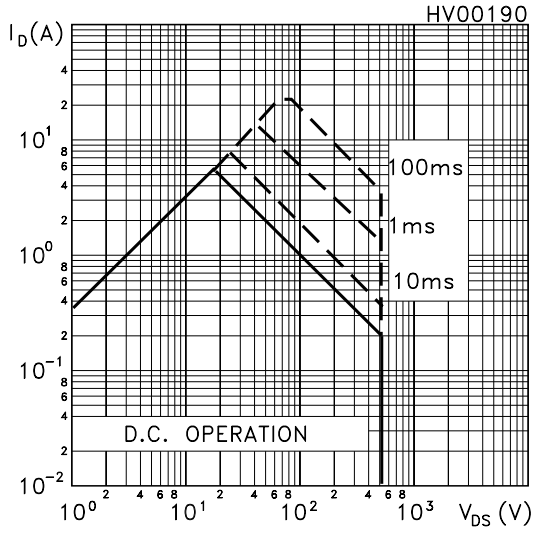
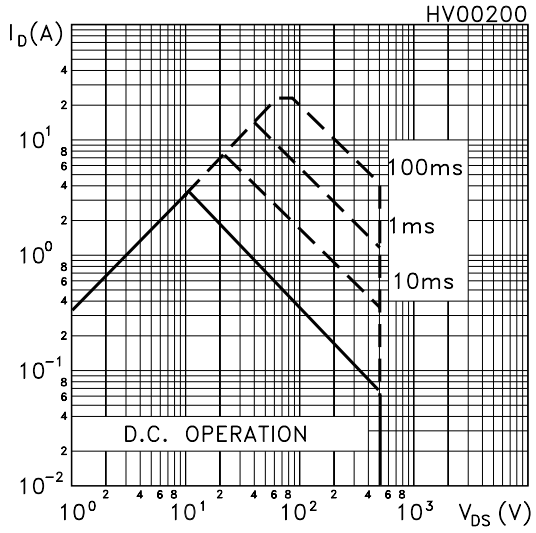
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$	Off-voltage Rise Time	V_{DD} = 400V, I_D = 5.5A,		12		ns
t_f	Fall Time	R_G = 4.7Ω, V_{GS} = 10V (see test circuit, Figure 5)		14		ns
t_c	Cross-over Time			20		ns

SOURCE DRAIN DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain Current				5.5	A
I_{SDM} (2)	Source-drain Current (pulsed)				22	A
V_{SD} (1)	Forward On Voltage	I_{SD} = 5.5A, V_{GS} = 0			1.6	V
t_{rr}	Reverse Recovery Time	I_{SD} = 5.5A, di/dt = 100A/µs,		360		ns
Q_{rr}	Reverse Recovery Charge	V_{DD} = 100V, T_j = 150°C (see test circuit, Figure 5)		1.6		µC
I_{RRM}	Reverse Recovery Current			9		A

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

Safe Operating Area for TO-220/D2PAK/I2PAK



Safe Operating Area for TO-220FP