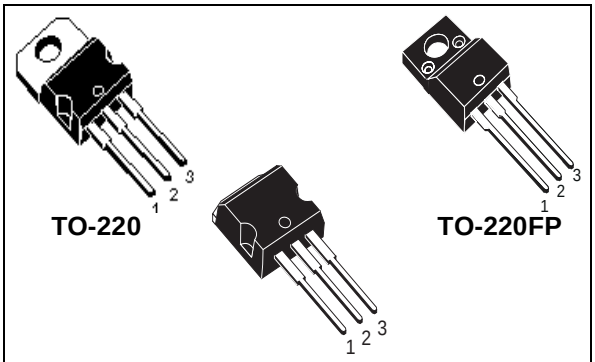
STP4NC60A - STP4NC60AFP
STB4NC60A-1

N-CHANNEL 600V - 1.8Ω - 4.2A TO-220/TO-220FP/I^2PAK
PowerMesh™II MOSFET

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP4NC60A	600V	< 2Ω	4.2A
STP4NC60AFP	600V	< 2Ω	4.2A
STB4NC60A-1	600V	< 2Ω	4.2A

- TYPICAL R_{DS}(on) = 1.8Ω
- EXTREMELY HIGH dv/dt CAPABILITY
- 100% AVALANCHE TESTED
- NEW HIGH VOLTAGE BENCHMARK
- GATE CHARGE MINIMIZED



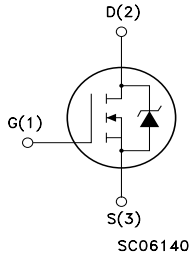
DESCRIPTION

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 DRIVERS

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP(B)4NC60A(-1)	STP4NC60AFP	
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 (continuos) at T_C = 25°C	4.2	4.2(*)	A
I_D	Drain Current (continuos) at T_C = 100°C	2.6	2.6(*)	A
I_{DM} (•)	Drain Current (pulsed)	16.8	16.8(*)	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	3.5	V/ns
V_{ISO}	Insulation Withstand Voltage (DC)	-	2500	V
T_{stg}	Storage Temperature	–60 to 150		°C
T_j	Max. Operating Junction Temperature			

(•)Pulse width limited by safe operating area
(*)Limited only by maximum Temperature allowed
(1)I_{SD} ≤4.2A, di/dt ≤300A/µs, V_{DD} ≤ $V_{(BR)DSS}$, T_j ≤ $T_{JMAX.}$

THERMAL DATA

		TO-220/I^{2}PAK	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)	4.2	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, I_D = I_{AR}, V_{DD} = 50 V)	250	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	600			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 =1.5 A		1.8	2	Ω

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (1)	Forward Transconductance	V_{DS} > $I_{D(on)}$ x $R_{DS(on)max}$, I_D = 2A		3.7		S
C_{iss}	Input Capacitance	V_{DS} = 25V, f = 1 MHz, V_{GS} = 0		475		pF
C_{oss}	Output Capacitance			72		pF
C_{rss}	Reverse Transfer Capacitance			10		pF

ELECTRICAL CHARACTERISTICS (CONTINUED)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	V_{DD} = 300V, I_D = 2A R_G = 4.7Ω ,V_{GS} = 10V (see test circuit, Figure 3)		14		ns
t_r	Rise Time			14		ns
Q_g	Total Gate Charge	V_{DD} = 480V, I_D = 4A, V_{GS} = 10V		16.5	21.1	nC
Q_{gs}	Gate-Source Charge			2.5		nC
Q_{gd}	Gate-Drain Charge			9		nC

SWITCHING OFF

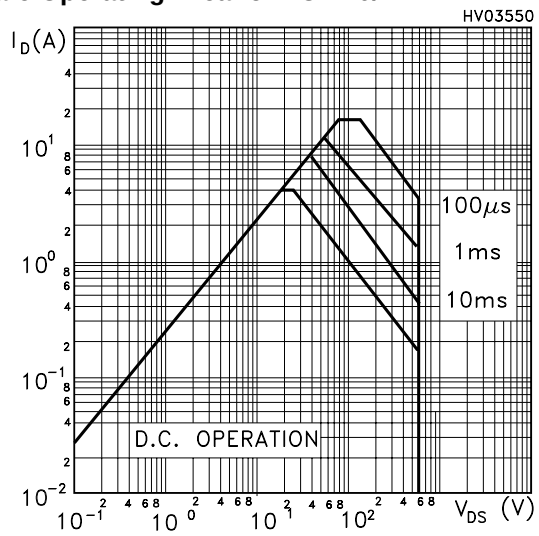
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$	Off-voltage Rise Time	V_{DD} = 480V, I_D = 4A, R_G = 4.7Ω, V_{GS} = 10V (see test circuit, Figure 5)		15		ns
t_f	Fall Time			19		ns
t_c	Cross-over Time			24		ns

SOURCE DRAIN DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain Current				4.2	A
I_{SDM} (2)	Source-drain Current (pulsed)				16.8	A
V_{SD} (1)	Forward On Voltage	I_{SD} = 4.2A, V_{GS} = 0			1.6	V
t_{rr}	Reverse Recovery Time	I_{SD} = 4A, di/dt = 100A/µs, V_{DD} = 100V, T_j = 150°C (see test circuit, Figure 5)		600		ns
Q_{rr}	Reverse Recovery Charge			2.7		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/I²PAK



Safe Operating Area for TO-220FP