

N - CHANNEL ENHANCEMENT MODE FAST POWER MOS TRANSISTOR

PRELIMINARY DATA

TYPE	V _{bss}	R _{DS(on)}	I _D
STP4NA60FP	600 V	< 2.2 Ω	2.7 A

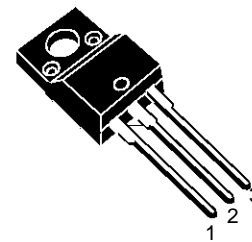
- TYPICAL R_{DS(on)} = 1.85 Ω
- ± 30 V GATE TO SOURCE VOLTAGE RATING
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW INTRINSIC CAPACITANCES
- GATE CHARGE MINIMIZED
- REDUCED THRESHOLD VOLTAGE SPREAD

DESCRIPTION

This series of POWER MOSFETS represents the most advanced high voltage technology. The optimized cell layout coupled with a new proprietary edge termination concur to give the device low R_{DS(on)} and gate charge, unequalled ruggedness and superior switching performance.

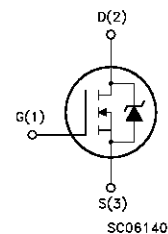
APPLICATIONS

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



TO-220FP

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V _{DS}	Drain-source Voltage (V _{GS} = 0)	600	V
V _{DGR}	Drain- gate Voltage (R _{GS} = 20 k Ω)	600	V
V _{GS}	Gate-source Voltage	± 30	V
I _D	Drain Current (continuous) at T _c = 25 °C	2.7	A
I _D	Drain Current (continuous) at T _c = 100 °C	1.8	A
I _{DM} (•)	Drain Current (pulsed)	17.2	A
P _{tot}	Total Dissipation at T _c = 25 °C	35	W
	Derating Factor	0.28	W/°C
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

STP4NA60FP

THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case	Max	3.57	$^{\circ}C/W$
$R_{thj-amb}$	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, $\delta < 1\%$)	4.3	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25^{\circ}C$, $I_D = I_{AR}$, $V_{DD} = 50 V$)	95	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 ($V_{GS} = 0$)	$V_{DS} = \text{Max Rating}$ $V_{DS} = \text{Max Rating}$ $T_c = 100^{\circ}C$			25 250	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	$V_{DS} = V_{GS}$ $I_D = 250 \mu A$	2.25	3	3.75	V
$R_{DS(on)}$	Static Drain-source On Resistance			1.85	2.2	Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10 V$	4.3			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$g_{fs} (*)$	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 2 A$	2.5	3.7		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25 V$ $f = 1 MHz$ $V_{GS} = 0$		700 100 24	910 130 35	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)**SWITCHING ON**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Time	$V_{DD} = 300\text{ V}$ $I_D = 2\text{ A}$		23	35	ns
t_r	Rise Time	$R_G = 47\ \Omega$ $V_{GS} = 10\text{ V}$		60	85	ns
Q_g	Total Gate Charge	$V_{DD} = 480\text{ V}$ $I_D = 2\text{ A}$ $V_{GS} = 10\text{ V}$		32	45	nC
Q_{gs}	Gate-Source Charge			7		nC
Q_{gd}	Gate-Drain Charge			14		nC

SWITCHING OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$	Off-voltage Rise Time	$V_{DD} = 480\text{ V}$ $I_D = 4\text{ A}$		45	60	ns
t_f	Fall Time	$R_G = 47\ \Omega$ $V_{GS} = 10\text{ V}$		17	25	ns
t_c	Cross-over Time	(see test circuit, figure 5)		70	95	ns

SOURCE DRAIN DIODE

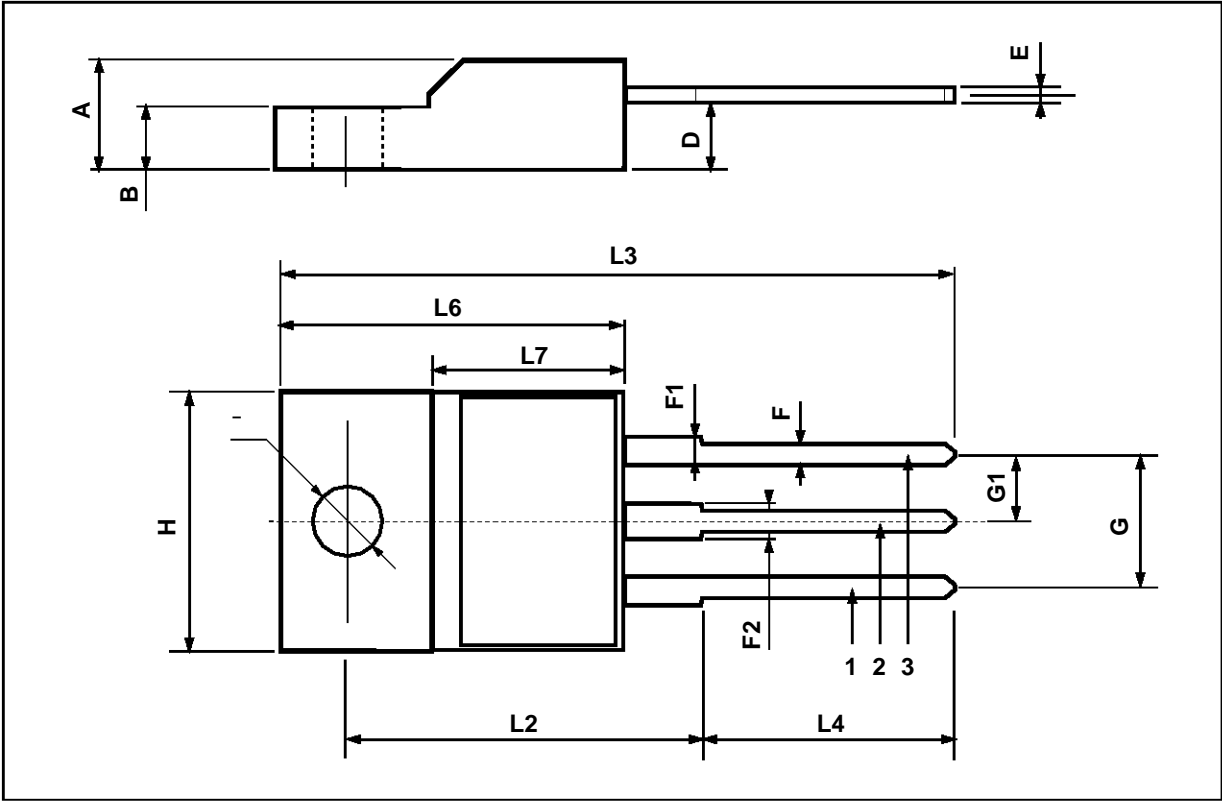
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain Current				4.3	A
$I_{SDM}(\bullet)$	Source-drain Current (pulsed)				17.2	A
$V_{SD} (*)$	Forward On Voltage	$I_{SD} = 4.3\text{ A}$ $V_{GS} = 0$			1.6	V
t_{rr}	Reverse Recovery Time	$I_{SD} = 4\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 100\text{ V}$ $T_j = 150\text{ }^\circ\text{C}$ (see circuit, figure 5)		480		ns
Q_{rr}	Reverse Recovery Charge			6		μC
I_{RRM}	Reverse Recovery Current			25		A

(*) Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %

(\bullet) Pulse width limited by safe operating area

TO-220FP MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
B	2.5		2.7	0.098		0.106
D	2.5		2.75	0.098		0.108
E	0.45		0.7	0.017		0.027
F	0.75		1	0.030		0.039
F1	1.15		1.7	0.045		0.067
F2	1.15		1.7	0.045		0.067
G	4.95		5.2	0.195		0.204
G1	2.4		2.7	0.094		0.106
H	10		10.4	0.393		0.409
L2		16			0.630	
L3	28.6		30.6	1.126		1.204
L4	9.8		10.6	0.385		0.417
L6	15.9		16.4	0.626		0.645
L7	9		9.3	0.354		0.366
Ø	3		3.2	0.118		0.126



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