

## N - CHANNEL ENHANCEMENT MODE FAST POWER MOS TRANSISTOR

TYPE	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STP10NA40	400 V	< 0.55 Ω	10 A
STP10NA40FI	400 V	< 0.55 Ω	6 A

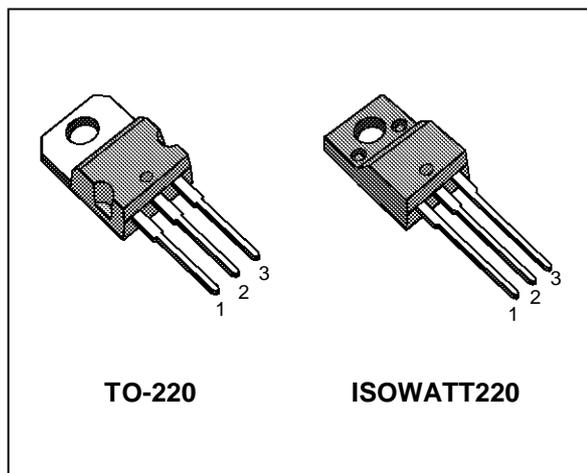
- TYPICAL R<sub>DS(on)</sub> = 0.46 Ω
- ± 30V GATE TO SOURCE VOLTAGE RATING
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW INTRINSIC CAPACITANCES
- GATE CHARGE MINIMIZED
- REDUCED THRESHOLD VOLTAGE SPREAD

### DESCRIPTION

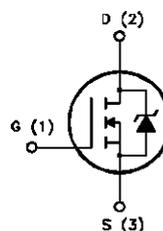
This series of POWER MOSFETS represents the most advanced high voltage technology. The optimized cell layout coupled with a new proprietary edge termination concur to give the device low R<sub>DS(on)</sub> and gate charge, unequalled ruggedness and superior switching performance.

### APPLICATIONS

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



### INTERNAL SCHEMATIC DIAGRAM



### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP10NA40	STP10NA40FI	
V <sub>DS</sub>	Drain-source Voltage (V <sub>GS</sub> = 0)	400		V
V <sub>DGR</sub>	Drain-gate Voltage (R <sub>GS</sub> = 20 kΩ)	400		V
V <sub>GS</sub>	Gate-source Voltage	± 30		V
I <sub>D</sub>	Drain Current (continuous) at T <sub>c</sub> = 25 °C	10	6	A
I <sub>D</sub>	Drain Current (continuous) at T <sub>c</sub> = 100 °C	6.3	3.8	A
I <sub>DM</sub> (●)	Drain Current (pulsed)	40	40	A
P <sub>tot</sub>	Total Dissipation at T <sub>c</sub> = 25 °C	125	45	W
	Derating Factor	1	0.36	W/°C
V <sub>ISO</sub>	Insulation Withstand Voltage (DC)	—	2000	V
T <sub>stg</sub>	Storage Temperature	-65 to 150		°C
T <sub>j</sub>	Max. Operating Junction Temperature	150		°C

(●) Pulse width limited by safe operating area

## STP10NA40/FI

### THERMAL DATA

			TO-220	ISOWATT220	
R <sub>thj-case</sub>	Thermal Resistance Junction-case	Max	1	2.78	°C/W
R <sub>thj-amb</sub>	Thermal Resistance Junction-ambient	Max	62.5		°C/W
R <sub>thc-sink</sub>	Thermal Resistance Case-sink	Typ	0.5		°C/W
T <sub>l</sub>	Maximum Lead Temperature For Soldering Purpose		300		°C

### AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I <sub>AR</sub>	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T <sub>j</sub> max, δ < 1%)	10	A
E <sub>AS</sub>	Single Pulse Avalanche Energy (starting T <sub>j</sub> = 25 °C, I <sub>D</sub> = I <sub>AR</sub> , V <sub>DD</sub> = 50 V)	500	mJ
E <sub>AR</sub>	Repetitive Avalanche Energy (pulse width limited by T <sub>j</sub> max, δ < 1%)	20	mJ
I <sub>AR</sub>	Avalanche Current, Repetitive or Not-Repetitive (T <sub>c</sub> = 100 °C, pulse width limited by T <sub>j</sub> max, δ < 1%)	6.3	A

### ELECTRICAL CHARACTERISTICS (T<sub>case</sub> = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V <sub>(BR)DSS</sub>	Drain-source Breakdown Voltage	I <sub>D</sub> = 250 μA V <sub>GS</sub> = 0	400			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current (V <sub>GS</sub> = 0)	V <sub>DS</sub> = Max Rating V <sub>DS</sub> = Max Rating x 0.8 T <sub>c</sub> = 125 °C			25 250	μA μA
I <sub>GSS</sub>	Gate-body Leakage Current (V <sub>DS</sub> = 0)	V <sub>GS</sub> = ± 30 V			± 100	nA

ON (\*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> I <sub>D</sub> = 250 μA	2.25	3	3.75	V
R <sub>DS(on)</sub>	Static Drain-source On Resistance	V <sub>GS</sub> = 10V I <sub>D</sub> = 5 A		0.46	0.55	Ω
I <sub>D(on)</sub>	On State Drain Current	V <sub>DS</sub> > I <sub>D(on)</sub> x R <sub>DS(on)max</sub> V <sub>GS</sub> = 10 V	10			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g <sub>fs</sub> (*)	Forward Transconductance	V <sub>DS</sub> > I <sub>D(on)</sub> x R <sub>DS(on)max</sub> I <sub>D</sub> = 5 A	5	7.2		S
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 25 V f = 1 MHz V <sub>GS</sub> = 0		1180	1600	pF
C <sub>oss</sub>	Output Capacitance			200	260	pF
C <sub>rss</sub>	Reverse Transfer Capacitance			55	75	pF

**ELECTRICAL CHARACTERISTICS** (continued)

**SWITCHING ON**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ $t_r$	Turn-on Time Rise Time	$V_{DD} = 200\text{ V}$ $I_D = 5\text{ A}$ $R_G = 47\ \Omega$ $V_{GS} = 10\text{ V}$ (see test circuit, figure 3)		35 115	50 155	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	$V_{DD} = 320\text{ V}$ $I_D = 10\text{ A}$ $R_G = 47\ \Omega$ $V_{GS} = 10\text{ V}$ (see test circuit, figure 5)		250		A/ $\mu$ s
$Q_g$ $Q_{gs}$ $Q_{gd}$	Total Gate Charge Gate-Source Charge Gate-Drain Charge	$V_{DD} = 320\text{ V}$ $I_D = 10\text{ A}$ $V_{GS} = 10\text{ V}$		54 8 27	75	nC nC nC

**SWITCHING OFF**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ $t_f$ $t_c$	Off-voltage Rise Time Fall Time Cross-over Time	$V_{DD} = 320\text{ V}$ $I_D = 10\text{ A}$ $R_G = 47\ \Omega$ $V_{GS} = 10\text{ V}$ (see test circuit, figure 5)		75 30 120	105 45 160	ns ns ns

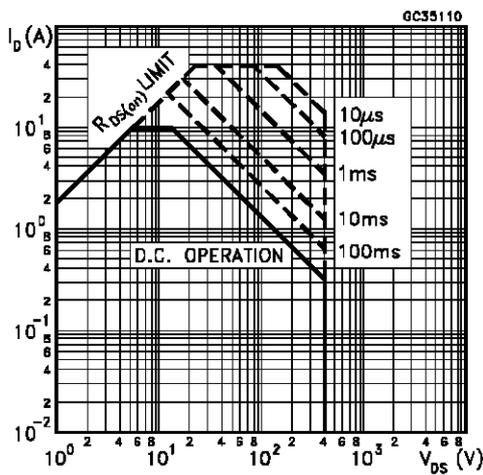
**SOURCE DRAIN DIODE**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{SD}$ $I_{SDM}(\bullet)$	Source-drain Current Source-drain Current (pulsed)				10 40	A A
$V_{SD} (*)$	Forward On Voltage	$I_{SD} = 10\text{ A}$ $V_{GS} = 0$			1.6	V
$t_{rr}$ $Q_{rr}$ $I_{RRM}$	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	$I_{SD} = 10\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 100\text{ V}$ $T_j = 150\text{ }^\circ\text{C}$ (see test circuit, figure 5)		470 6.5 27.5		ns $\mu$ C A

(\*) Pulsed: Pulse duration = 300  $\mu$ s, duty cycle 1.5%

( $\bullet$ ) Pulse width limited by safe operating area

**Safe Operating Areas for TO-220**



**Safe Operating Areas for ISOWATT220**

