

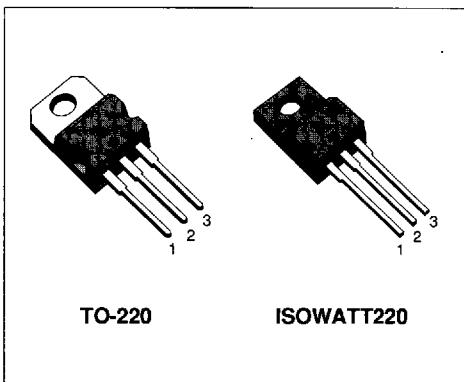
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V _{DSS}	R _{D(on)}	I _D
STP4N40	400 V	< 2.1 Ω	4 A
STP4N40FI	400 V	< 2.1 Ω	3 A

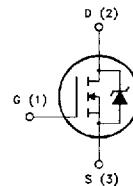
- TYPICAL R_{D(on)} = 1.65 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- APPLICATION ORIENTED CHARACTERIZATION

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CHOPPER REGULATORS, CONVERTERS, MOTOR CONTROL, LIGHTING FOR INDUSTRIAL AND CONSUMER ENVIRONMENT



INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP4N40	STP4N40FI	
V _{DS}	Drain-source Voltage (V _{GS} = 0)	400		V
V _{DGR}	Drain-gate Voltage (R _{GS} = 20 kΩ)	400		V
V _{GS}	Gate-source Voltage		± 20	V
I _D	Drain Current (continuous) at T _c = 25 °C	4	3	A
I _D	Drain Current (continuous) at T _c = 100 °C	2.5	1.9	A
I _{DM(•)}	Drain Current (pulsed)	16	16	A
P _{tot}	Total Dissipation at T _c = 25 °C	75	35	W
	Derating Factor	0.6	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

THERMAL DATA

			TO-220	ISOWATT220	
R _{thj-case}	Thermal Resistance Junction-case	Max	1.67	3.57	°C/W
R _{thj-amb}	Thermal Resistance Junction-ambient	Max		62.5	°C/W
R _{thc-sink}	Thermal Resistance Case-sink	Typ		0.5	°C/W
T _j	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, δ < 1%)	4	A
E _{AS}	Single Pulse Avalanche Energy (starting T _j = 25 °C, I _D = I _{AR} , V _{DD} = 50 V)	110	mJ
E _{AR}	Repetitive Avalanche Energy (pulse width limited by T _j max, δ < 1%)	7	mJ
I _{AR}	Avalanche Current, Repetitive or Not-Repetitive (T _c = 100 °C, pulse width limited by T _j max, δ < 1%)	2.5	A

ELECTRICAL CHARACTERISTICS (T_{case} = 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	400			V
I _{DSS}	Zero Gate Voltage Drain Current (V _{GS} = 0)	V _{DS} = Max Rating V _{DS} = Max Rating × 0.8 T _c = 125 °C			250 1000	μA μA
I _{GSS}	Gate-body Leakage Current (V _{DS} = 0)	V _{GS} = ± 20 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 μA	2	3	4	V
R _{D(on)}	Static Drain-source On Resistance	V _{GS} = 10V I _D = 2 A V _{GS} = 10V I _D = 2 A T _c = 100 °C		1.65	2.1 4.2	Ω Ω
I _{D(on)}	On State Drain Current	V _{DS} > I _{D(on)} × R _{D(on)max} V _{GS} = 10 V	4			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g _{fs} (*)	Forward Transconductance	V _{DS} > I _{D(on)} × R _{D(on)max} I _D = 2 A	1	2.1		S
C _{iss} C _{oss} C _{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V _{DS} = 25 V f = 1 MHz V _{GS} = 0		350 68 32	450 90 45	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)**SWITCHING ON**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	$V_{DD} = 175 \text{ V}$ $I_D = 2 \text{ A}$ $R_G = 50 \Omega$ $V_{GS} = 10 \text{ V}$ (see test circuit, figure 3)		25 70	33 90	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	$V_{DD} = 320 \text{ V}$ $I_D = 4 \text{ A}$ $R_G = 50 \Omega$ $V_{GS} = 10 \text{ V}$ (see test circuit, figure 5)		110		A/ μs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	$V_{DD} = 320 \text{ V}$ $I_D = 4 \text{ A}$ $V_{GS} = 10 \text{ V}$		25 7 11	35	nC nC nC

SWITCHING OFF

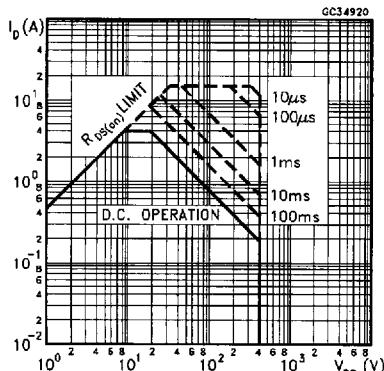
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(voff)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	$V_{DD} = 320 \text{ V}$ $I_D = 4 \text{ A}$ $R_G = 50 \Omega$ $V_{GS} = 10 \text{ V}$ (see test circuit, figure 5)		50 28 75	65 35 95	ns ns ns

SOURCE DRAIN DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} $I_{SDM(\bullet)}$	Source-drain Current Source-drain Current (pulsed)				4 16	A A
V_{SD} (*)	Forward On Voltage	$I_{SD} = 4 \text{ A}$ $V_{GS} = 0$			2	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	$I_{SD} = 4 \text{ A}$ $di/dt = 100 \text{ A}/\mu\text{s}$ $V_{DD} = 100 \text{ V}$ $T_j = 150^\circ\text{C}$ (see test circuit, figure 5)		400 5.9 29.5		ns μC A

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

(•) Pulse width limited by safe operating area

Safe Operating Areas For TO-220**Safe Operating Areas For ISOWATT220**