

**MTP3N60**  
**MTP3N60FI**

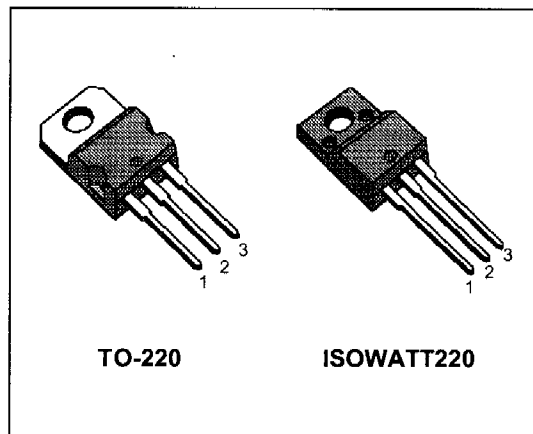
**N - CHANNEL ENHANCEMENT MODE  
POWER MOS TRANSISTOR**

TYPE	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
MTP3N60	600 V	< 2.5 Ω	3.9 A
MTP3N60FI	600 V	< 2.5 Ω	2.5 A

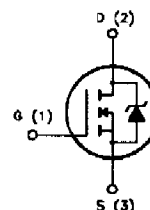
- TYPICAL R<sub>DS(on)</sub> = 2 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- APPLICATION ORIENTED CHARACTERIZATION

**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**

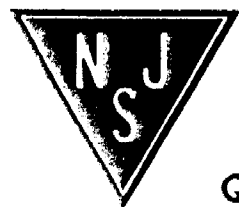


**ABSOLUTE MAXIMUM RATINGS**

Symbol	Parameter	Value		Unit
		MTP3N60	MTP3N60FI	
V <sub>DS</sub>	Drain-source Voltage (V <sub>GS</sub> = 0)	600		V
V <sub>DGR</sub>	Drain- gate Voltage (R <sub>GS</sub> = 20 kΩ)	600		V
V <sub>GS</sub>	Gate-source Voltage	± 20		V
I <sub>D</sub>	Drain Current (continuous) at T <sub>c</sub> = 25 °C	3.9	2.5	A
I <sub>D</sub>	Drain Current (continuous) at T <sub>c</sub> = 100 °C	2.4	1.5	A
I <sub>DM</sub> (*)	Drain Current (pulsed)	14	14	A
P <sub>tot</sub>	Total Dissipation at T <sub>c</sub> = 25 °C	100	35	W
	Derating Factor	0.8	0.28	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

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## MTP3N60/FI

### THERMAL DATA

		TO-220	ISOWATT220		
R <sub>thj-case</sub>	Thermal Resistance Junction-case	Max	1.25	3.57	°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%)	3.9	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> = 25 V)	300	mJ
E <sub>AR</sub>	Repetitive Avalanche Energy (pulse width limited by T <sub>J</sub> max, δ < 1%)	7.7	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%)	2.4	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	600			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> = ± 20 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> = 1 mA	2	3	4.5	V
R <sub>DS(on)</sub>	Static Drain-source On Resistance	V <sub>GS</sub> = 10V I <sub>D</sub> = 1.5 A		2	2.5	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	3.9			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> = 1.5 A	1.5	2.6		S
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 25 V f = 1 MHz V <sub>GS</sub> = 0		560	800	pF
C <sub>oss</sub>	Output Capacitance			90	130	pF
C <sub>rss</sub>	Reverse Transfer Capacitance			40	55	pF

**ELECTRICAL CHARACTERISTICS** (continued)  
SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Time	$V_{DD} = 225\text{ V}$ $I_D = 2.5\text{ A}$		45	60	ns
$t_r$	Rise Time	$R_G = 15\ \Omega$ $V_{GS} = 10\text{ V}$ (see test circuit, figure 3)		33	42	ns
$(di/dt)_{on}$	Turn-on Current Slope	$V_{DD} = 480\text{ V}$ $I_D = 4\text{ A}$ $R_G = 15\ \Omega$ $V_{GS} = 10\text{ V}$ (see test circuit, figure 5)		200		A/ $\mu$ s
$Q_g$	Total Gate Charge	$V_{DD} = 480\text{ V}$ $I_D = 4\text{ A}$ $V_{GS} = 10\text{ V}$		43	55	nC
$Q_{gs}$	Gate-Source Charge			6		nC
$Q_{gd}$	Gate-Drain Charge			21		nC

SWITCHING OFF

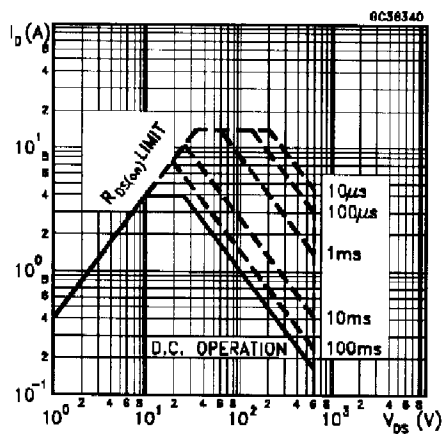
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(voff)}$	Off-voltage Rise Time	$V_{DD} = 480\text{ V}$ $I_D = 4\text{ A}$		35	45	ns
$t_f$	Fall Time	$R_G = 15\ \Omega$ $V_{GS} = 10\text{ V}$		40	55	ns
$t_c$	Cross-over Time	(see test circuit, figure 5)		60	75	ns

SOURCE DRAIN DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain Current				3.9	A
$I_{SDM}(\bullet)$	Source-drain Current (pulsed)				14	A
$V_{SD}(\ast)$	Forward On Voltage	$I_{SD} = 3.9\text{ A}$ $V_{GS} = 0$			2	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 test circuit, figure 5)		420		ns
$Q_{rr}$	Reverse Recovery Charge			3.7		$\mu\text{C}$
$I_{RRM}$	Reverse Recovery Current			18		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

