



**STP60N05-16  
STP60N06-16**

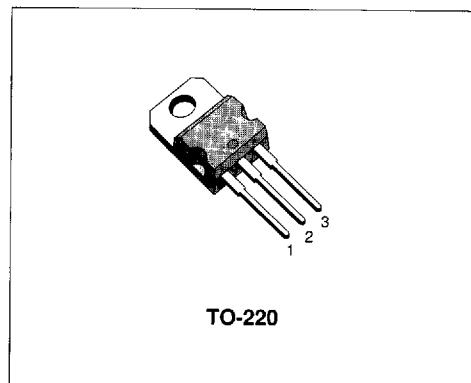
**N - CHANNEL ENHANCEMENT MODE  
POWER MOS TRANSISTOR**

TYPE	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STP60N05-16	50 V	< 0.016 Ω	60 A
STP60N06-16	60 V	< 0.016 Ω	60 A

- TYPICAL R<sub>DS(on)</sub> = 0.013 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- VERY HIGH CURRENT CAPABILITY
- APPLICATION ORIENTED CHARACTERIZATION

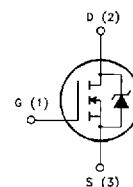
**APPLICATIONS**

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- REGULATORS
- DC-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)



TO-220

**INTERNAL SCHEMATIC DIAGRAM**



**ABSOLUTE MAXIMUM RATINGS**

Symbol	Parameter	Value		Unit
		STP60N05-16	STP60N06-16	
V <sub>D</sub>	Drain-source Voltage (V <sub>GS</sub> = 0)	50	60	V
V <sub>DGR</sub>	Drain- gate Voltage (R <sub>GS</sub> = 20 kΩ)	50	60	V
V <sub>GS</sub>	Gate-source Voltage	± 20		V
I <sub>D</sub>	Drain Current (continuous) at T <sub>c</sub> = 25 °C	60		A
I <sub>D</sub>	Drain Current (continuous) at T <sub>c</sub> = 100 °C	42		A
I <sub>DM(•)</sub>	Drain Current (pulsed)	240		A
P <sub>tot</sub>	Total Dissipation at T <sub>c</sub> = 25 °C	150		W
	Derating Factor	1		W/°C
T <sub>stg</sub>	Storage Temperature	-65 to 175		°C
T <sub>j</sub>	Max. Operating Junction Temperature	175		°C

(\*) Pulse width limited by safe operating area

## THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case	Max	1	$^{\circ}\text{C}/\text{W}$
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	62.5	$^{\circ}\text{C}/\text{W}$
$R_{thj-amb}$	Thermal Resistance Case-sink	Typ	0.5	$^{\circ}\text{C}/\text{W}$
$T_J$	Maximum Lead Temperature For Soldering Purpose		300	$^{\circ}\text{C}$

## AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
$I_{AR}$	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by $T_J$ max, $\delta < 1\%$ )	60	A
$E_{AS}$	Single Pulse Avalanche Energy (starting $T_J = 25^{\circ}\text{C}$ , $I_D = I_{AR}$ , $V_{DD} = 25\text{ V}$ )	600	mJ
$E_{AR}$	Repetitive Avalanche Energy (pulse width limited by $T_J$ max, $\delta < 1\%$ )	150	mJ
$I_{AR}$	Avalanche Current, Repetitive or Not-Repetitive ( $T_c = 100^{\circ}\text{C}$ , pulse width limited by $T_J$ max, $\delta < 1\%$ )	42	A

ELECTRICAL CHARACTERISTICS ( $T_{case} = 25^{\circ}\text{C}$  unless otherwise specified)

## OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250\text{ }\mu\text{A}$ $V_{GS} = 0$ for STP60N05-16 for STP60N06-16	50 60			V V
$I_{oss}$	Zero Gate Voltage Drain Current ( $V_{GS} = 0$ )	$V_{DS} = \text{Max Rating}$ $V_{DS} = \text{Max Rating} \times 0.8$ $T_c = 125^{\circ}\text{C}$			250 1000	$\mu\text{A}$ $\mu\text{A}$
$I_{gss}$	Gate-body Leakage Current ( $V_{DS} = 0$ )	$V_{GS} = \pm 20\text{ V}$			$\pm 100$	nA

## ON (\*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250\text{ }\mu\text{A}$	2	2.9	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10\text{ V}$ $I_D = 30\text{ A}$ $V_{GS} = 10\text{ V}$ $I_D = 30\text{ A}$ $T_c = 100^{\circ}\text{C}$		0.013	0.016 0.032	$\Omega$ $\Omega$
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10\text{ V}$	60			A

## DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$g_{ds} (*)$	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 30\text{ A}$	20	40		S
$C_{iss}$ $C_{oss}$ $C_{rss}$	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25\text{ V}$ $f = 1\text{ MHz}$ $V_{GS} = 0$		2900 900 230	3800 1200 300	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	$V_{DD} = 30 \text{ V}$ $I_D = 30 \text{ A}$ $R_G = 50 \Omega$ $V_{GS} = 10 \text{ V}$ (see test circuit, figure 3)		75 370	105 520	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	$V_{DD} = 40 \text{ V}$ $I_D = 60 \text{ A}$ $R_G = 50 \Omega$ $V_{GS} = 10 \text{ V}$ (see test circuit, figure 5)		190		A/ $\mu\text{s}$
$Q_g$ $Q_{gs}$ $Q_{gd}$	Total Gate Charge Gate-Source Charge Gate-Drain Charge	$V_{DD} = 40 \text{ V}$ $I_D = 60 \text{ A}$ $V_{GS} = 10 \text{ V}$		105 18 44	150	nC nC nC

**SWITCHING OFF**

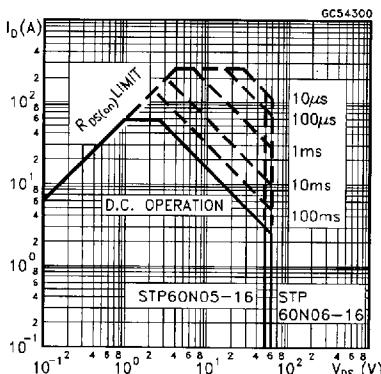
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Volt)}$ $t_f$ $t_c$	Off-voltage Rise Time Fall Time Cross-over Time	$V_{DD} = 40 \text{ V}$ $I_D = 60 \text{ A}$ $R_G = 50 \Omega$ $V_{GS} = 10 \text{ V}$ (see test circuit, figure 5)		185 250 480	260 350 680	ns ns ns

**SOURCE DRAIN DIODE**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{SD}$ $I_{SDM(\bullet)}$	Source-drain Current Source-drain Current (pulsed)				60 240	A A
$V_{SD} (\bullet)$	Forward On Voltage	$I_{SD} = 60 \text{ A}$ $V_{GS} = 0$			1.6	V
$t_{rr}$	Reverse Recovery Time	$I_{SD} = 60 \text{ A}$ $di/dt = 100 \text{ A}/\mu\text{s}$		120		ns
$Q_{rr}$	Reverse Recovery Charge	$V_{DD} = 30 \text{ V}$ $T_j = 150^\circ\text{C}$ (see test circuit, figure 5)		0.36		$\mu\text{C}$
$I_{RRM}$	Reverse Recovery Current			6		A

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

(•) Pulse width limited by safe operating area

**Safe Operating Areas****Thermal Impedance**