

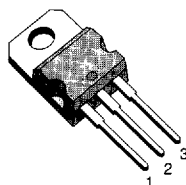
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V _{DSS}	R _{DS(on)}	I _D
STP60N05-16	50 V	< 0.016 Ω	60 A
STP60N06-16	60 V	< 0.016 Ω	60 A

- TYPICAL R_{DS(on)} = 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

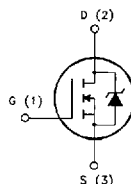
APPLICATIONS

- 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 _{DS}	Drain-source Voltage (V _{GS} = 0)	50	60	V
V _{DGR}	Drain- gate Voltage (R _{GS} = 20 kΩ)	50	60	V
V _{GS}	Gate-source Voltage	± 20		V
I _D	Drain Current (continuous) at T _c = 25 °C	60		A
I _D	Drain Current (continuous) at T _c = 100 °C	42		A
I _{DM} (*)	Drain Current (pulsed)	240		A
P _{tot}	Total Dissipation at T _c = 25 °C	150		W
	Derating Factor	1		W/°C
T _{stg}	Storage Temperature	-65 to 175		°C
T _j	Max. Operating Junction Temperature	175		°C

(*) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case	Max	1	°C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	62.5	°C/W
$R_{thj-amb}$	Thermal Resistance Case-sink	Typ	0.5	°C/W
T_I	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_I max, $\delta < 1\%$)	60	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_I = 25\text{ °C}$, $I_D = I_{AR}$, $V_{DD} = 25\text{ V}$)	600	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_I max, $\delta < 1\%$)	150	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100\text{ °C}$, pulse width limited by T_I max, $\delta < 1\%$)	42	A

ELECTRICAL CHARACTERISTICS ($T_{case} = 25\text{ °C}$ 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_{DSS}	Zero Gate Voltage Drain Current ($V_{GS} = 0$)	$V_{DS} = \text{Max Rating}$ $V_{DS} = \text{Max Rating} \times 0.8$ $T_c = 125\text{ °C}$			250 1000	μA μA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 20\text{ V}$			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250\text{ }\mu\text{A}$	2	2.9	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10\text{ V}$ $I_D = 30\text{ A}$ $V_{GS} = 10\text{ V}$ $I_D = 30\text{ A}$ $T_c = 100\text{ °C}$		0.013	0.016 0.032	Ω Ω
$I_{D(on)}$	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
$g_{fs} (*)$	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 30\text{ A}$	20	40		S
C_{iss}	Input Capacitance	$V_{DS} = 25\text{ V}$ $f = 1\text{ MHz}$ $V_{GS} = 0$		2900	3800	pF
C_{oss}	Output Capacitance			900	1200	pF
C_{rss}	Reverse Transfer Capacitance			230	300	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/ μ 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

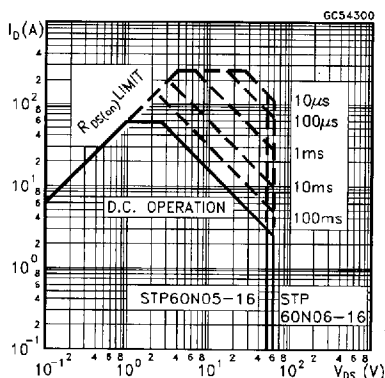
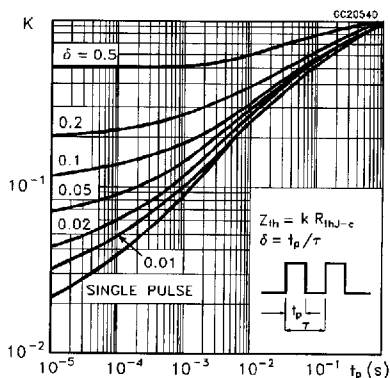
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_r(voff)$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	$V_{DD} = 40\text{ V}$ $I_D = 60\text{ A}$ $R_G = 50\ \Omega$ $V_{GS} = 10\text{ V}$ (see test circuit, figure 5)		185 250 480	260 350 680	ns ns ns

SOURCE DRAIN DIODE

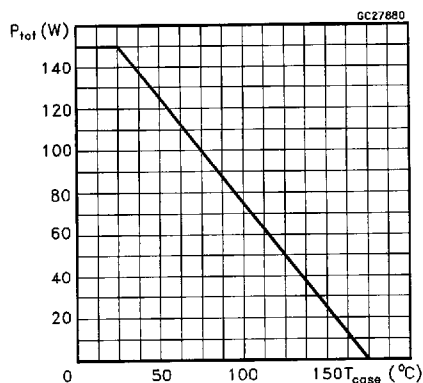
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} $I_{SDM}(\bullet)$	Source-drain Current Source-drain Current (pulsed)				60 240	A A
$V_{SD}(\ast)$	Forward On Voltage	$I_{SD} = 60\text{ A}$ $V_{GS} = 0$			1.6	V
t_{rr}	Reverse Recovery Time	$I_{SD} = 60\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$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

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

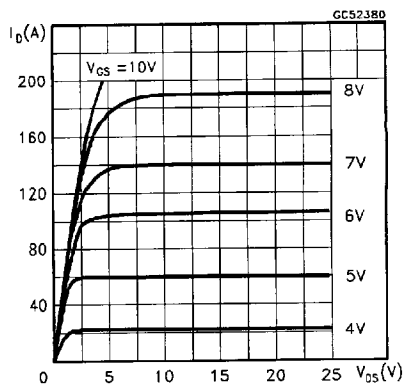
(*) Pulse width limited by safe operating area

Safe Operating Areas**Thermal Impedance**

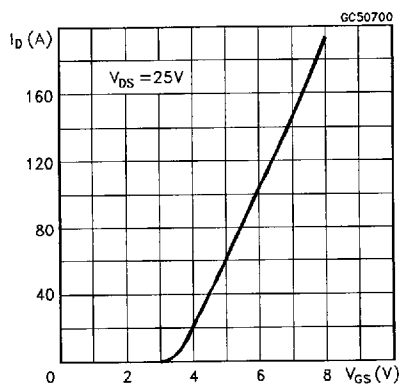
Derating Curve



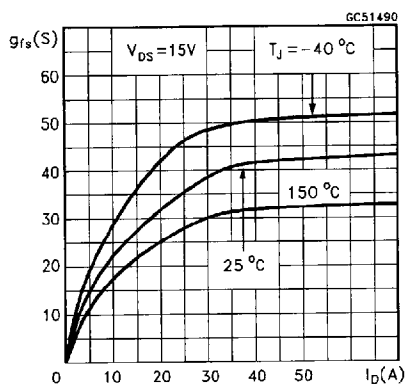
Output Characteristics



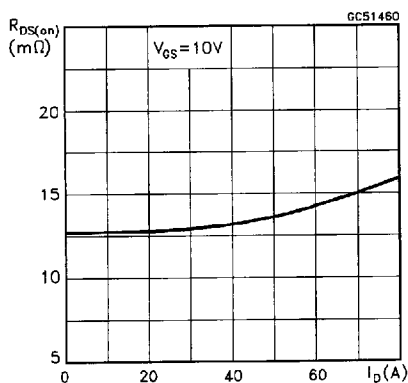
Transfer Characteristics



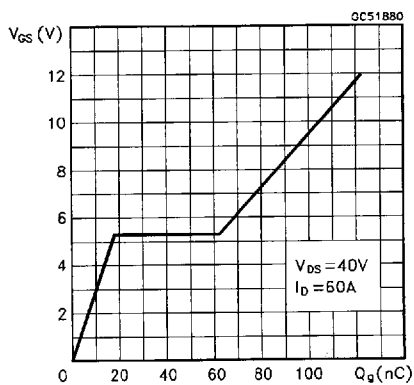
Transconductance



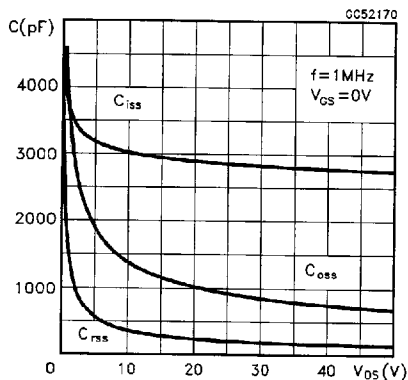
Static Drain-source On Resistance



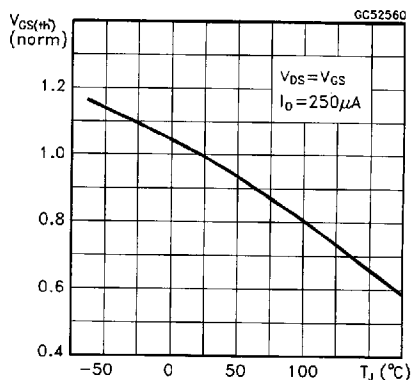
Gate Charge vs Gate-source Voltage



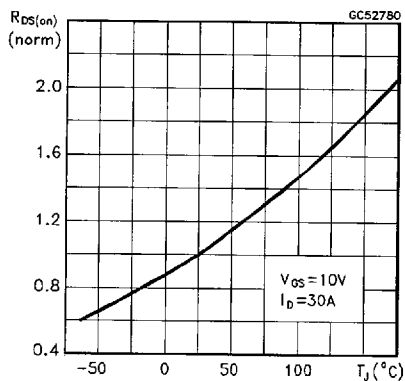
Capacitance Variations



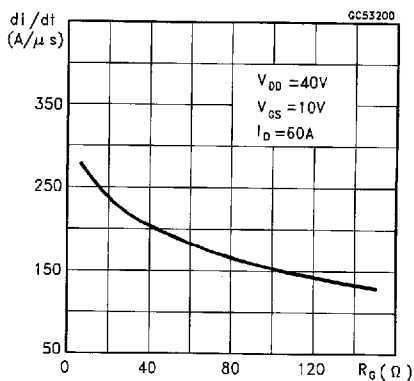
Normalized Gate Threshold Voltage vs Temperature



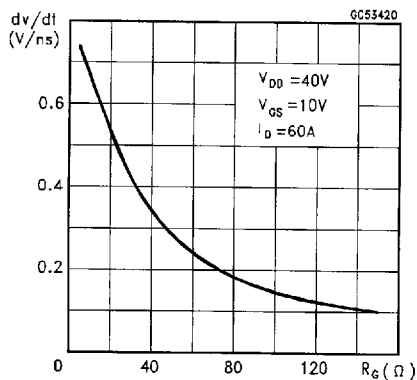
Normalized On Resistance vs Temperature



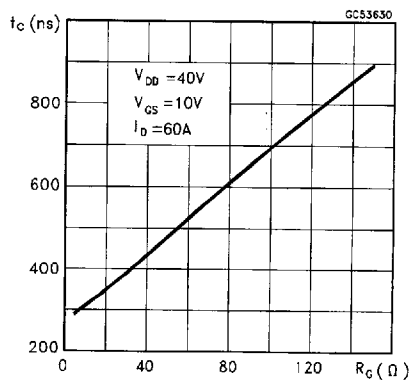
Turn-on Current Slope



Turn-off Drain-source Voltage Slope

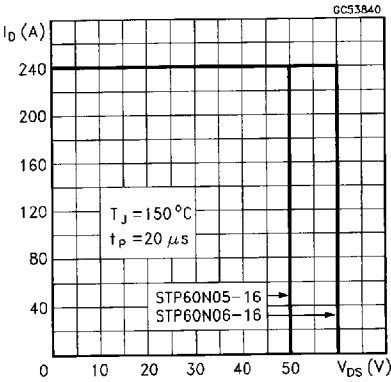
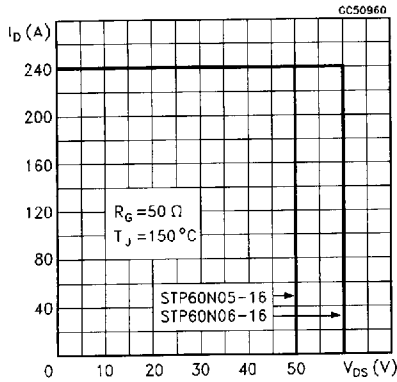


Cross-over Time



Switching Safe Operating Area

Accidental Overload Area



Source-drain Diode Forward Characteristics

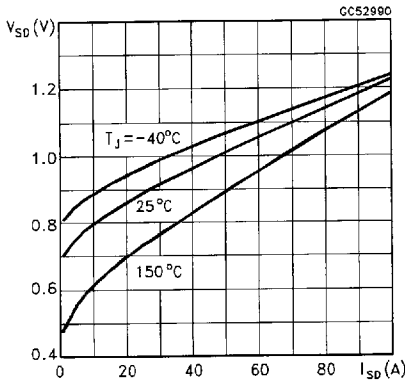


Fig. 2: Unclamped Inductive Waveforms

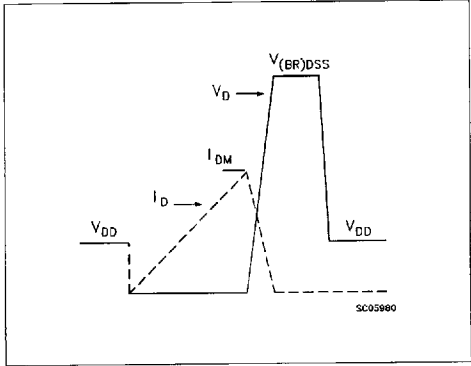


Fig. 1: Unclamped Inductive Load Test Circuits

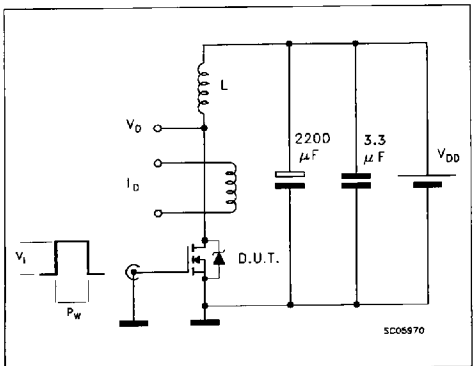


Fig. 3: Switching Times Test Circuits For Resistive Load

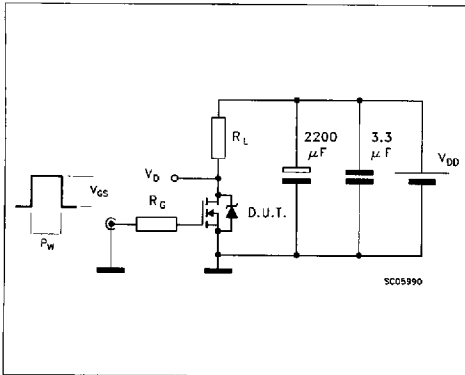


Fig. 4: Gate Charge Test Circuit

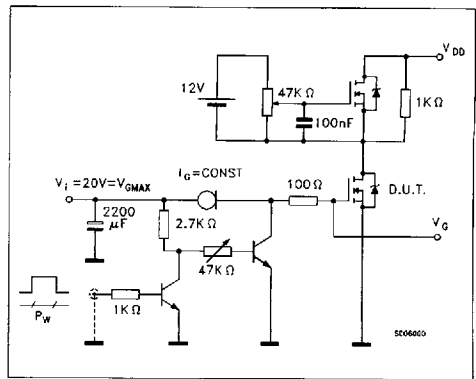


Fig. 5: Test Circuit For Inductive Load Switching And Diode Reverse Recovery Time

