



SGS-THOMSON
MICROELECTRONICS

STP53N05

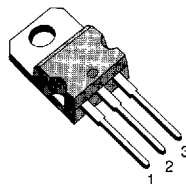
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V _{DSS}	R _{DS(on)}	I _D
STP53N05	50 V	< 0.025 Ω	53 A

- TYPICAL R_{DS(on)} = 0.022 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- 175°C OPERATING TEMPERATURE
- APPLICATION ORIENTED CHARACTERIZATION

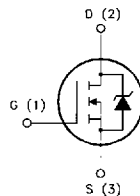
APPLICATIONS

- 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
V _{DS}	Drain-source Voltage (V _{GS} = 0)	50	V
V _{DGR}	Drain- gate Voltage (R _{GS} = 20 k Ω)	50	V
V _{GS}	Gate-source Voltage	± 20	V
I _D	Drain Current (continuous) at T _c = 25 °C	53	A
I _D	Drain Current (continuous) at T _c = 100 °C	37	A
I _{DM} (*)	Drain Current (pulsed)	212	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 _l	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, $\delta < 1\%$)	53	A
E _{AS}	Single Pulse Avalanche Energy (starting T _j = 25 °C, I _D = I _{AR} , V _{DD} = 25 V)	450	mJ
E _{AR}	Repetitive Avalanche Energy (pulse width limited by T _j max, $\delta < 1\%$)	110	mJ
I _{AR}	Avalanche Current, Repetitive or Not-Repetitive (T _c = 100 °C, pulse width limited by T _j max, $\delta < 1\%$)	37	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 μ A V _{GS} = 0	50			V
I _{DSS}	Zero Gate Voltage Drain Current (V _{GS} = 0)	V _{DS} = Max Rating V _{DS} = Max Rating x 0.8 T _c = 125 °C			250 1000	μ A μ A
I _{GSS}	Gate-body Leakage Current (V _{DS} = 0)	V _{GS} = $\pm$ 20 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 μ A	2	2.9	4	V
R _{DS(on)}	Static Drain-source On Resistance	V _{GS} = 10V I _D = 26.5 A V _{GS} = 10V I _D = 26.5 A T _c = 100°C		0.022	0.025 0.05	Ω Ω
I _{D(on)}	On State Drain Current	V _{DS} > I _{D(on)} x R _{DS(on)max} V _{GS} = 10 V	53			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g _{fs} (*)	Forward Transconductance	V _{DS} > I _{D(on)} x R _{DS(on)max} I _D = 26.5 A	17	22		S
C _{iss}	Input Capacitance	V _{DS} = 25 V f = 1 MHz V _{GS} = 0		1700	2200	pF
C _{oss}	Output Capacitance			630	850	pF
C _{rss}	Reverse Transfer Capacitance			200	260	pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	$V_{DD} = 25\text{ V}$ $I_D = 26.5\text{ A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$ (see test circuit, figure 3)		50 110	70 160	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	$V_{DD} = 40\text{ V}$ $I_D = 53\text{ A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$ (see test circuit, figure 5)		460		A/ μ s
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	$V_{DD} = 40\text{ V}$ $I_D = 53\text{ A}$ $V_{GS} = 10\text{ V}$		50 14 25	70	nC nC nC

SWITCHING OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$	Off-voltage Rise Time	$V_{DD} = 40\text{ V}$ $I_D = 53\text{ A}$		55	80	ns
t_f	Fall Time	$R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$		50	70	ns
t_c	Cross-over Time	(see test circuit, figure 5)		110	160	ns

SOURCE DRAIN DIODE

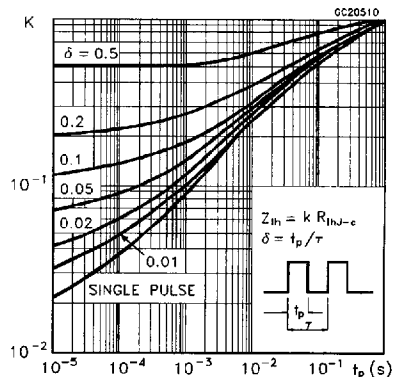
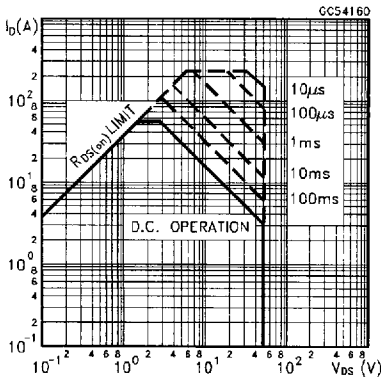
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain Current				53	A
$I_{SDM}(\bullet)$	Source-drain Current (pulsed)				212	A
$V_{SD} (*)$	Forward On Voltage	$I_{SD} = 53\text{ A}$ $V_{GS} = 0$			2	V
t_{rr}	Reverse Recovery Time	$I_{SD} = 53\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 30\text{ V}$ $T_j = 150\text{ }^\circ\text{C}$ (see test circuit, figure 5)		150		ns
Q_{rr}	Reverse Recovery Charge			0.45		μC
I_{RRM}	Reverse Recovery Current			6		A

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

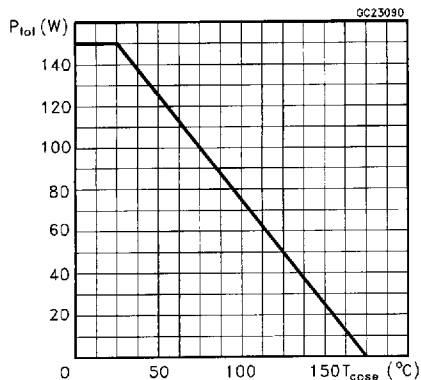
($\bullet$) Pulse width limited by safe operating area

Safe Operating Areas

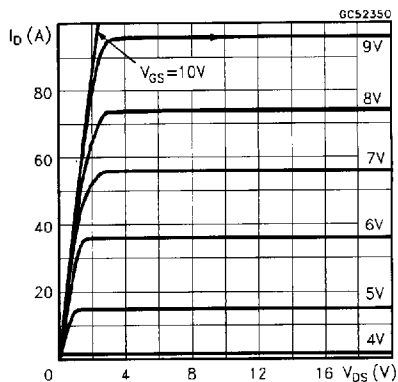
Thermal Impedance



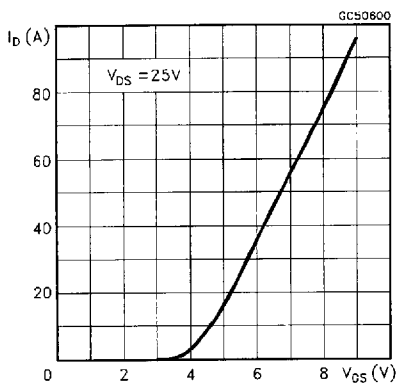
Derating Curve



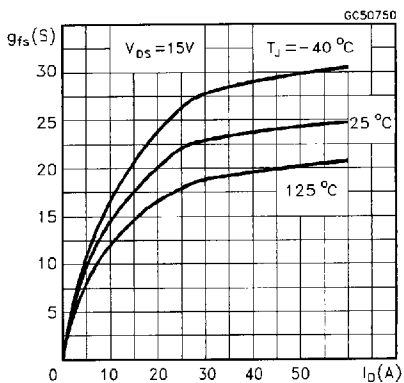
Output Characteristics



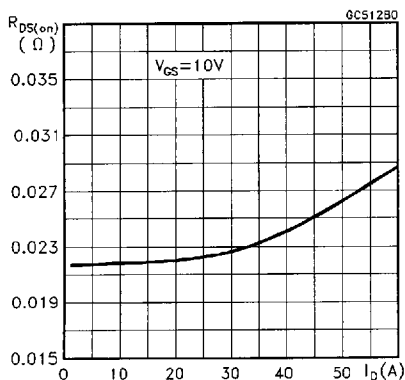
Transfer Characteristics



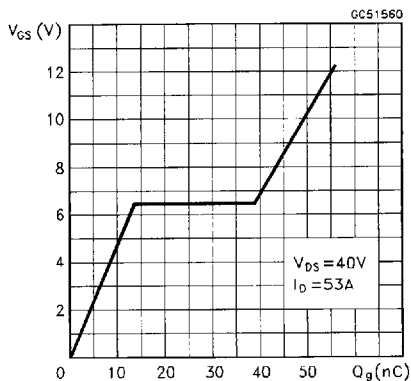
Transconductance



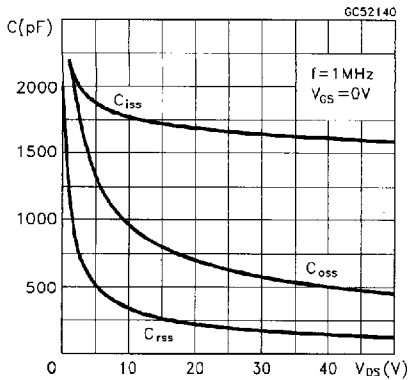
Static Drain-source On Resistance



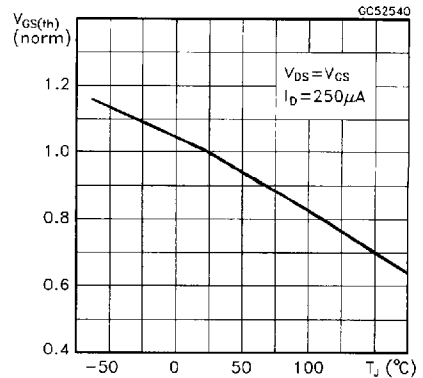
Gate Charge vs Gate-source Voltage



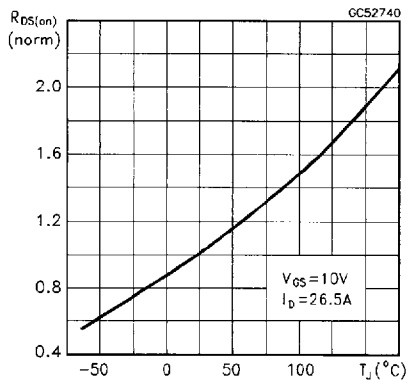
Capacitance Variations



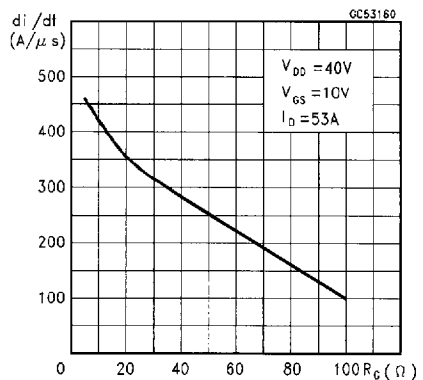
Normalized Gate Threshold Voltage vs Temperature



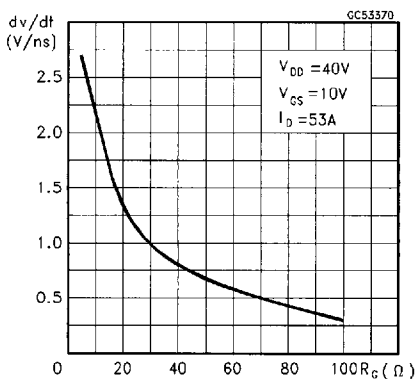
Normalized On Resistance vs Temperature



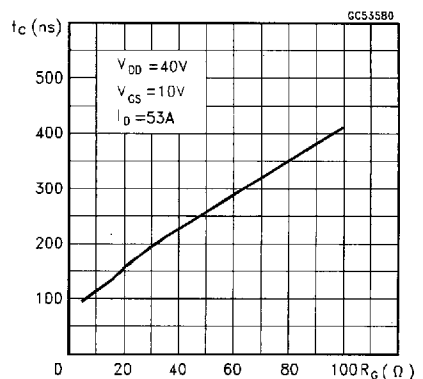
Turn-on Current Slope



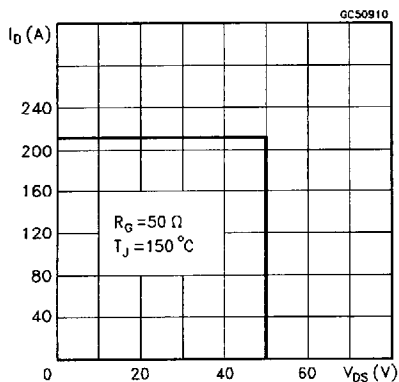
Turn-off Drain-source Voltage Slope



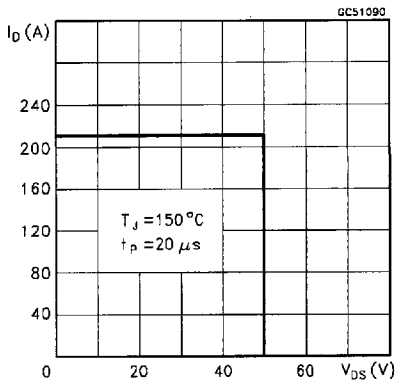
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

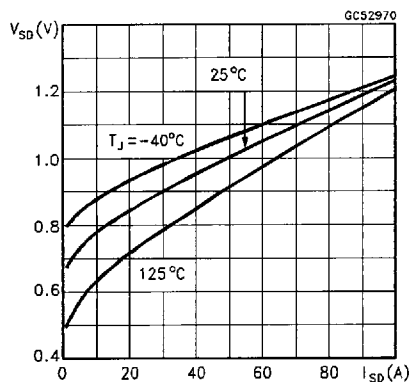


Fig. 1: Unclamped Inductive Load Test Circuits

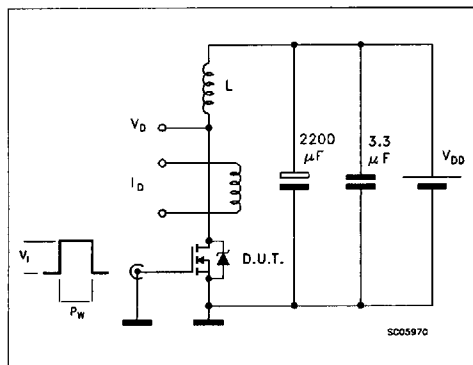


Fig. 2: Unclamped Inductive Waveforms

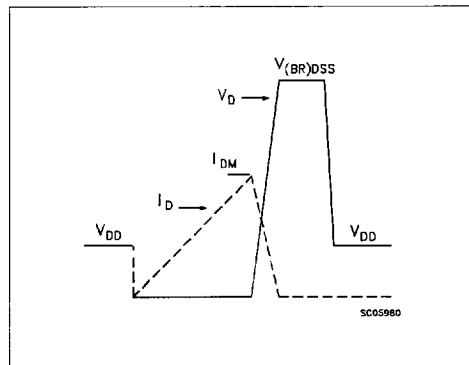


Fig. 3: Switching Times Test Circuits For Resistive Load

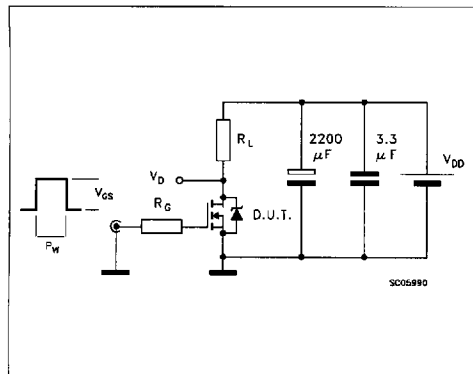


Fig. 4: Gate Charge Test Circuit

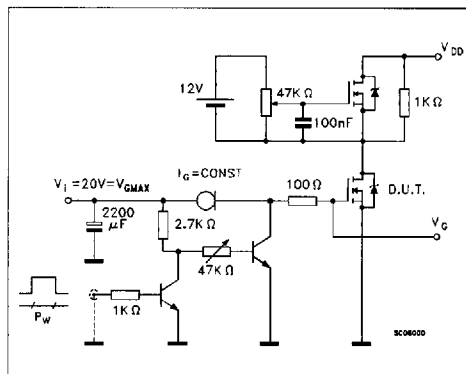


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times

