![ST] SGS-THOMSON
MICROELECTRONICS

STK6N20

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STK6N20	200 V	< 0.7 Ω	6 A

- TYPICAL $R_{DS(on)}$ = 0.55 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- APPLICATION ORIENTED CHARACTERIZATION

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- UNINTERRUPTIBLE POWER SUPPLY (UPS)
- MOTOR CONTROL, AUDIO AMPLIFIERS
- INDUSTRIAL ACTUATORS
- DC-DC & DC-AC CONVERTERS FOR TELECOM, INDUSTRIAL AND CONSUMER ENVIRONMENT

SOT-82 **SOT-194 (option)**
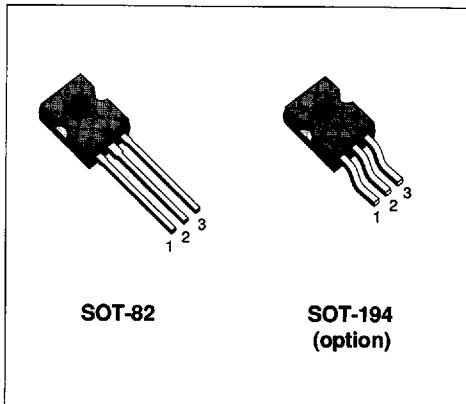
INTERNAL SCHEMATIC DIAGRAM
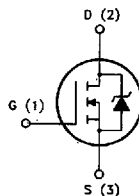
ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{GS} = 0)	200	V
V_{DGR}	Drain-gate Voltage (R_{GS} = 20 kΩ)	200	V
V_{GS}	Gate-source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	6	A
I_D	Drain Current (continuous) at T_c = 100 °C	4	A
$I_{DM}(\bullet)$	Drain Current (pulsed)	24	A
P_{tot}	Total Dissipation at T_c = 25 °C	55	W
	Derating Factor	0.44	W/°C
T_{stg}	Storage Temperature	-65 to 150	°C
T_j	Max. Operating Junction Temperature	150	°C

(•) Pulse width limited by safe operating area

May 1993

THERMAL DATA

$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	2.27	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient	Max	80	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Case-sink	Typ	0.7	°C/W
T_l	Maximum Lead Temperature For Soldering Purpose		275	°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, $\delta < 1\%$)	6	A
E_{AS}	Single Pulse Avalanche Energy (starting $T_j = 25\ °C$, $I_D = I_{AR}$, $V_{DD} = 50\ V$)	20	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, $\delta < 1\%$)	5	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive ($T_c = 100\ °C$, pulse width limited by T_j max, $\delta < 1\%$)	4	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	$I_D = 250\ \mu A$ $V_{GS} = 0$	200			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	μA μA
I_{GSS}	Gate-body Leakage Current ($V_{DS} = 0$)	$V_{GS} = \pm 20\ V$			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ $I_D = 250\ \mu A$	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10V$ $I_D = 3\ A$ $V_{GS} = 10V$ $I_D = 3\ A$ $T_c = 100°C$		0.55	0.7 1.4	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)}$ x $R_{DS(on)max}$ $V_{GS} = 10\ V$	6			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (*)	Forward Transconductance	$V_{DS} > I_{D(on)}$ x $R_{DS(on)max}$ $I_D = 3\ A$	1.5	3.5		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{DS} = 25\ V$ $f = 1\ MHz$ $V_{GS} = 0$		460 90 20	600 120 30	pF pF pF

SGS-THOMSON
MICROELECTRONICS

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Time	$V_{DD} = 100$ V $\quad I_D = 3$ A		30	45	ns
t_r	Rise Time	$R_G = 50\ \Omega \quad V_{GS} = 10$ V		70	100	ns
		(see test circuit, figure 3)				
$(di/dt)_{on}$	Turn-on Current Slope	$V_{DD} = 160$ V $\quad I_D = 6$ A		155		A/μs
		$R_G = 50\ \Omega \quad V_{GS} = 10$ V				
		(see test circuit, figure 5)				
Q_g	Total Gate Charge	$V_{DD} = 160$ V $\quad I_D = 6$ A $\quad V_{GS} = 10$ V		20	30	nC
Q_{gs}	Gate-Source Charge			6		nC
Q_{gd}	Gate-Drain Charge			8		nC

SWITCHING OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$	Off-voltage Rise Time	$V_{DD} = 160$ V $\quad I_D = 6$ A		40	60	ns
t_f	Fall Time	$R_G = 50\ \Omega \quad V_{GS} = 10$ V		25	35	ns
t_c	Cross-over Time	(see test circuit, figure 5)		65	95	ns

SOURCE DRAIN DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain Current				6	A
$I_{SDM}(•)$	Source-drain Current (pulsed)				24	A
V_{SD} (∗)	Forward On Voltage	$I_{SD} = 6$ A $\quad V_{GS} = 0$			1.5	V
t_{rr}	Reverse Recovery Time	$I_{SD} = 6$ A $\qquad di/dt = 100$ A/μs		170		ns
		$V_{DD} = 100$ V $\quad T_j = 150$ °C				
Q_{rr}	Reverse Recovery Charge	(see test circuit, figure 5)		1		μC
I_{RRM}	Reverse Recovery Current			12		A

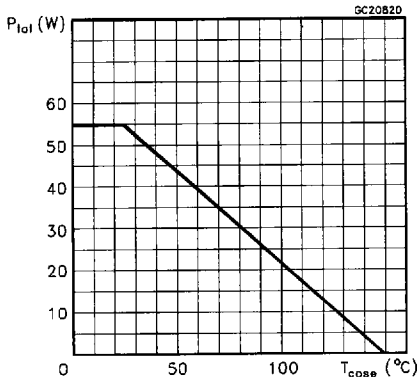(∗) Pulsed: Pulse duration = 300 μs, duty cycle 1.5 %
(•) Pulse width limited by safe operating area

Safe Operating Area
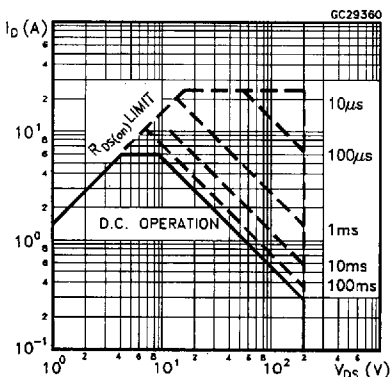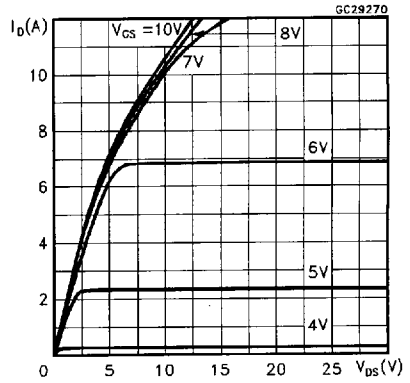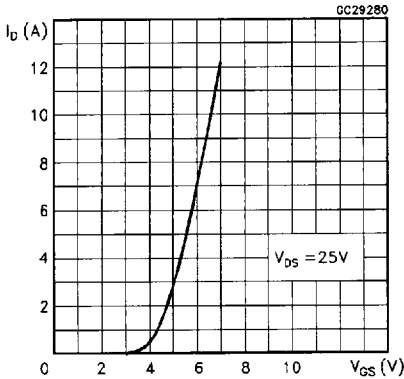
Thermal Impedance
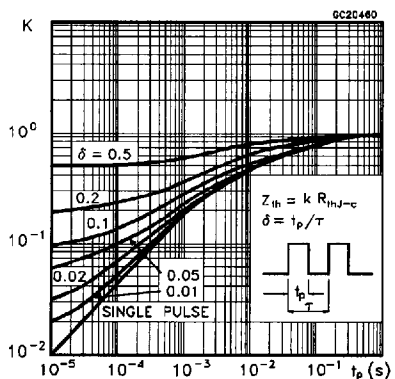
Derating Curve

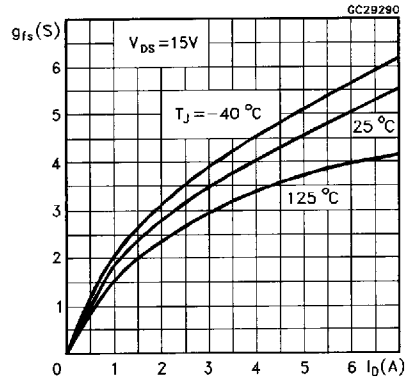Output Characteristics

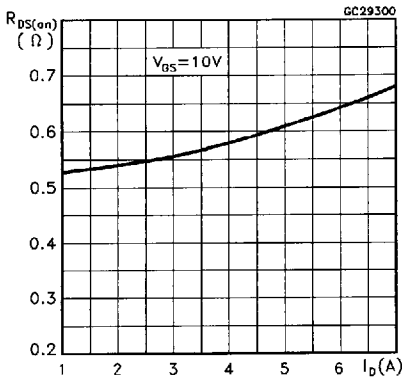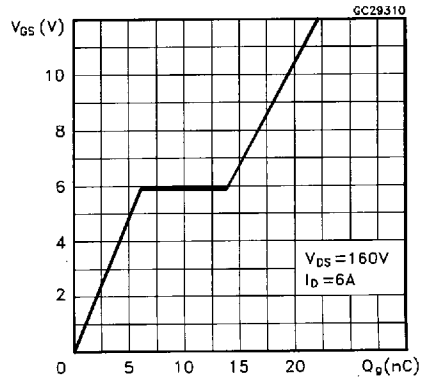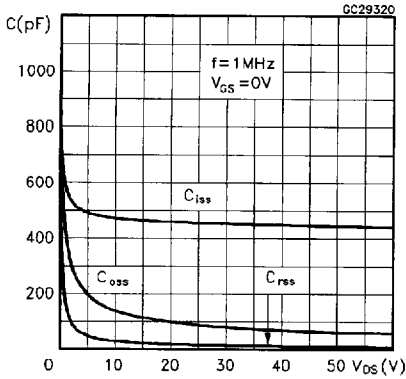

Transfer Characteristics

Transconductance
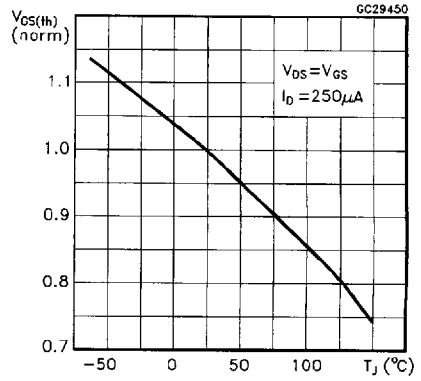

Static Drain-source On Resistance

Gate Charge vs Gate-source Voltage

SGS-THOMSON
MICROELECTRONICS

Capacitance Variations

$C(pF)$

$f = 1MHz$
$V_{GS} = 0V$

C_{iss}

C_{oss} C_{rss}

$V_{DS}(V)$

Normalized Gate Threshold Voltage vs Temperature

$V_{GS(th)}$ (norm)

$V_{DS} = V_{GS}$
$I_D = 250\mu A$

$T_J (°C)$

Normalized On Resistance vs Temperature

$R_{DS(on)}$ (norm)

$V_{GS} = 10V$
$I_D = 3A$

$T_J (°C)$

Turn-on Current Slope

di/dt $(A/\mu s)$

$V_{DD} = 160V$
$V_{GS} = 10V$
$I_D = 6A$

$R_G (\Omega)$
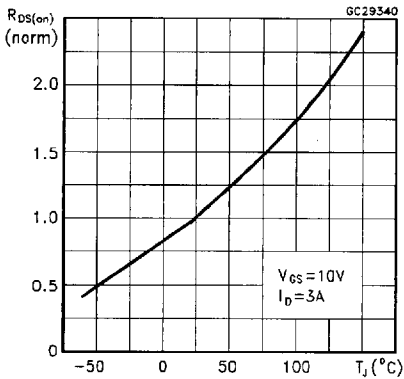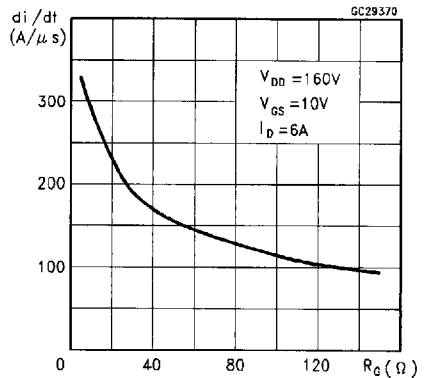
Turn-off Drain-source Voltage Slope

dv/dt (V/ns)

$V_{DD} = 160V$
$V_{GS} = 10V$
$I_D = 6A$

$R_G (\Omega)$

Cross-over Time

$t_c (ns)$

$V_{DD} = 160V$
$V_{GS} = 10V$
$I_D = 6A$

$R_G (\Omega)$
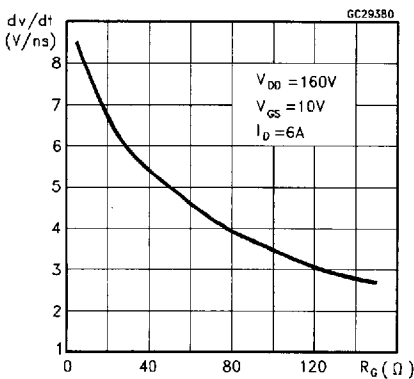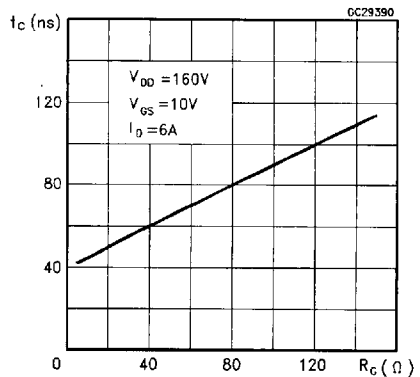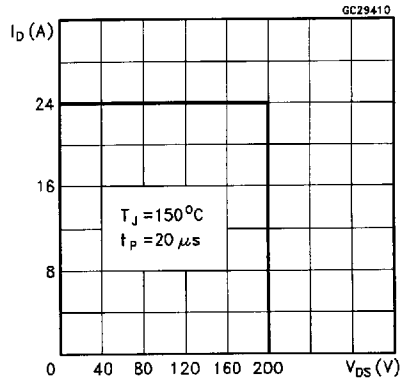
Switching Safe Operating Area
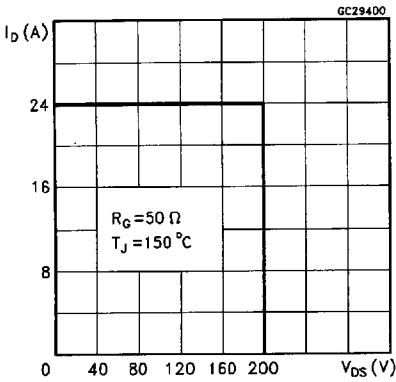
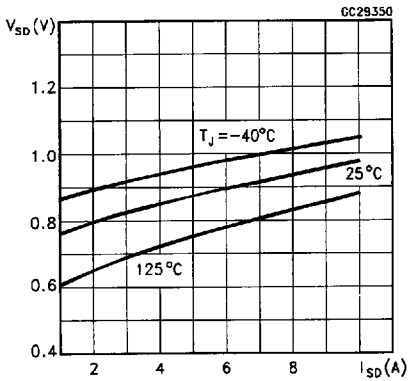
Accidental Overload Area

Source-drain Diode Forward Characteristics

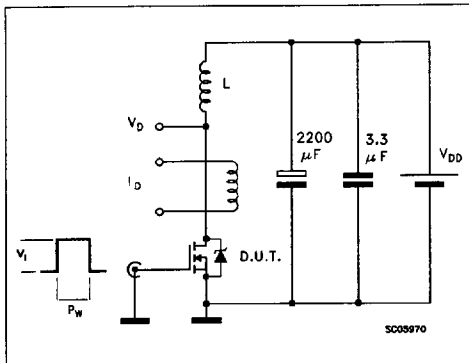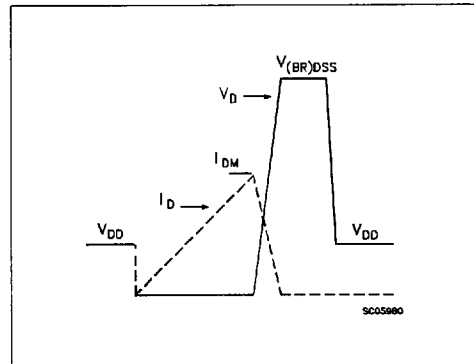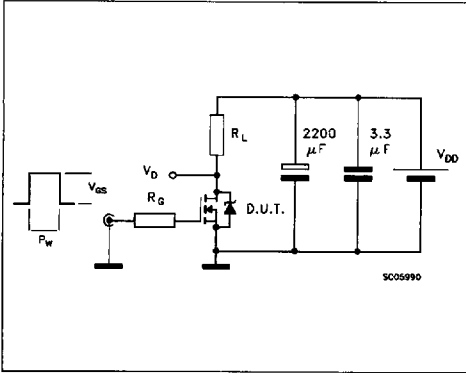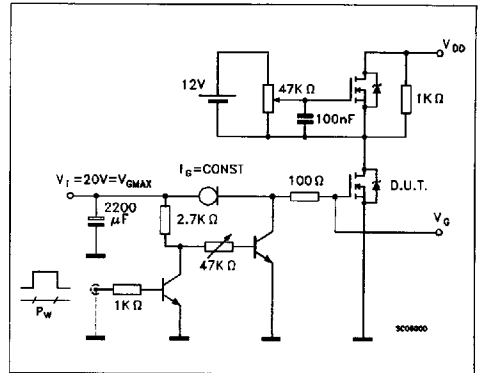**Fig. 1:** Unclamped Inductive Load Test Circuits

Fig. 2: Unclamped Inductive Waveforms

SGS-THOMSON
MICROELECTRONICS

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