SGS-THOMSON MICROELECTRONICS

STK3N50

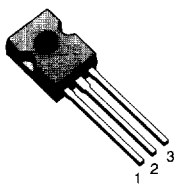
N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STK3N50	500 V	3.8 Ω	2.7 A

- AVALANCHE RUGGEDNESS TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- APPLICATION ORIENTED CHARACTERIZATION

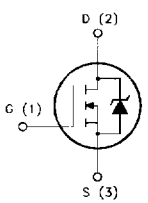
APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CHOPPER REGULATORS, CONVERTERS, MOTOR CONTROL, LIGHTING FOR INDUSTRIAL AND CONSUMER ENVIRONMENT



SOT-82 **SOT-194 (option)**

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{GS} = 0)	500	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	500	V
V_{GS}	Gate-source Voltage	± 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	2.7	A
I_D	Drain Current (continuous) at T_c = 100 °C	1.7	A
I_{DM}(•)	Drain Current (pulsed)	12	A
P_{tot}	Total Dissipation at T_c = 25 °C	60	W
	Derating Factor	0.48	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

THERMAL DATA

$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	2.08	°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, T_j = 25 °C)	2.8	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 25 V)	200	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_j = 100 °C)	1.6	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 µA V_{GS} = 0	500			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} = ± 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 µA	2		4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 1.4 A V_{GS} = 10V I_D = 1.4 A T_c = 100°C			3.8 7.6	Ω Ω
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ V_{GS} = 10 V	2.7			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 = 1.4 A	0.8			S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0			500 100 50	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} = 175 V I_D = 1.5 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 3)			75 62	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 400 V I_D = 2.8 A R_G = 50 Ω V_{GS} = 10 V (see test circuit, figure 5)		180		A/µs
Q_g	Total Gate Charge	V_{DD} = 400 V I_D = 2.8 A V_{GS} = 10 V		27	35	nC

SWITCHING OFF

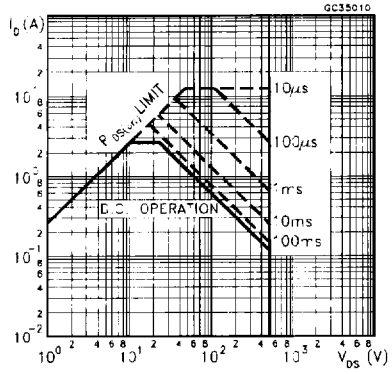
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$	Off-voltage Rise Time	V_{DD} = 400 V I_D = 2.8 A			60	ns
t_f	Fall Time	R_G = 50 Ω V_{GS} = 10 V			30	ns
t_c	Cross-over Time	(see test circuit, figure 5)			100	ns

SOURCE DRAIN DIODE

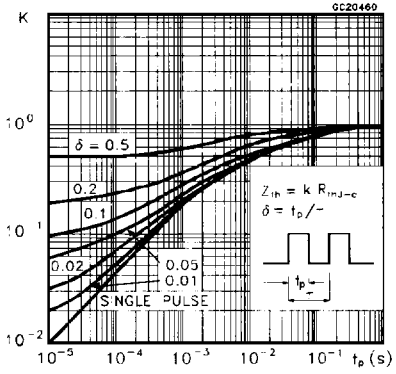
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain Current				2.8	A
I_{SDM}(•)	Source-drain Current (pulsed)				12	A
V_{SD}	Forward On Voltage	I_{SD} = 2.8 A V_{GS} = 0			1.6	V
t_{rr}	Reverse Recovery Time	I_{SD} = 2.8 A di/dt = 100 A/µs V_{DD} = 100 V T_j = 150 °C		450		ns
Q_{rr}	Reverse Recovery Charge	(see test circuit, figure 5)		3.6		µC
I_{RRM}	Reverse Recovery Current			16		A

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

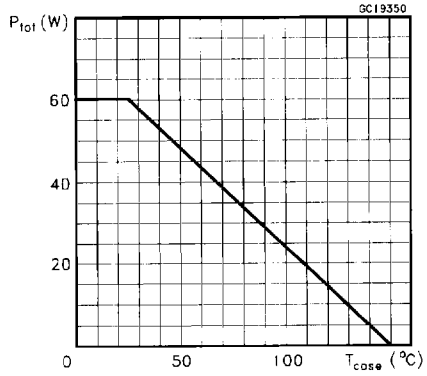
Safe Operating Area



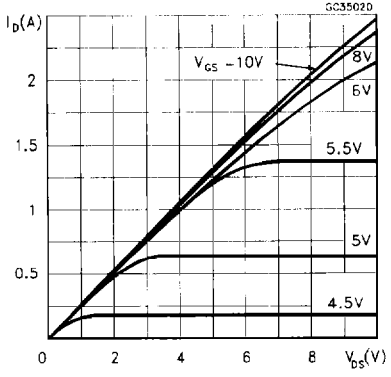
Thermal Impedance



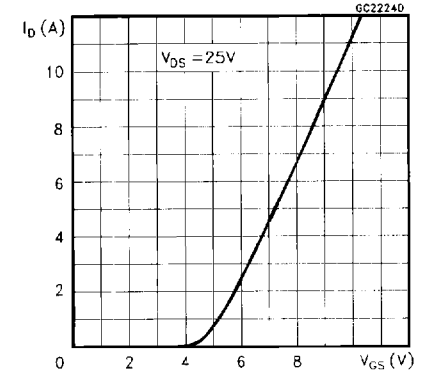
Derating Curve



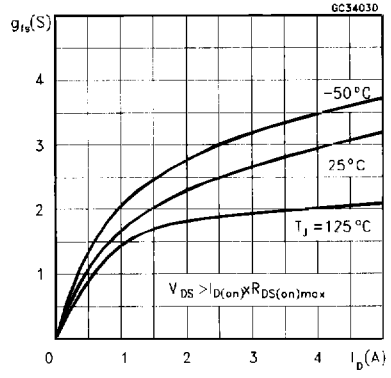
Output Characteristics



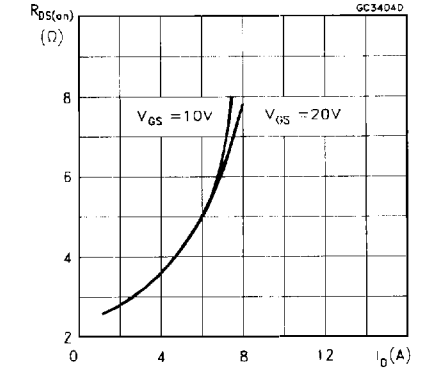
Transfer Characteristics



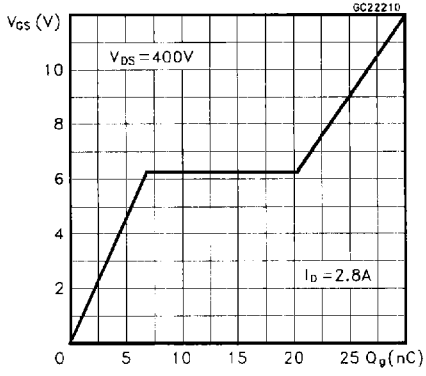
Transconductance



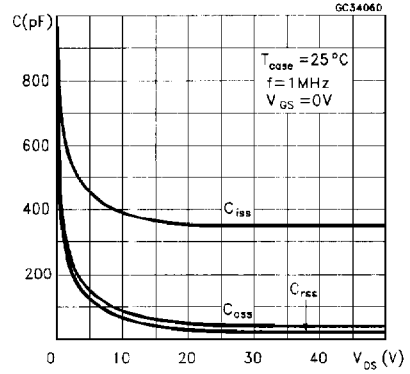
Static Drain-source On Resistance



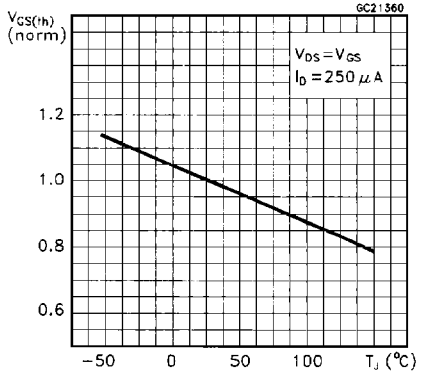
Gate Charge vs Gate-source Voltage



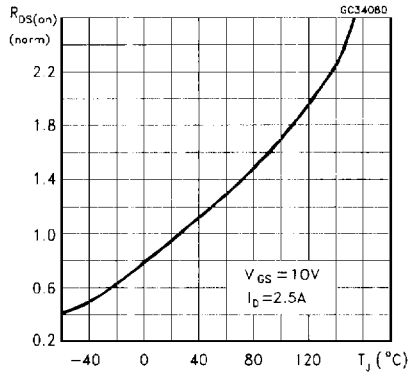
Capacitance Variations



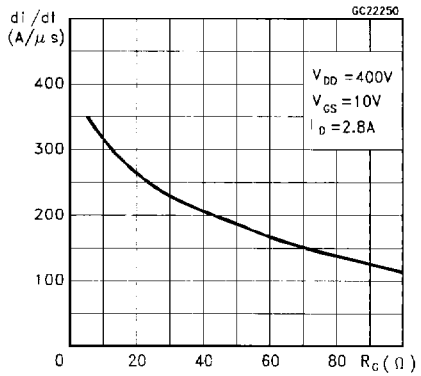
Normalized Gate Threshold Voltage vs Temperature



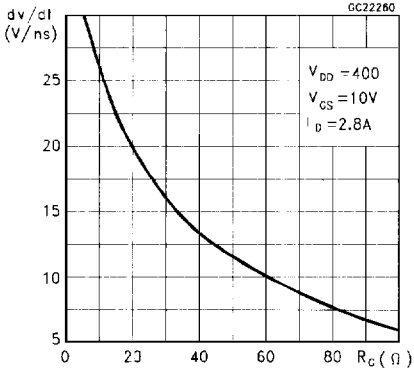
Normalized On Resistance vs Temperature



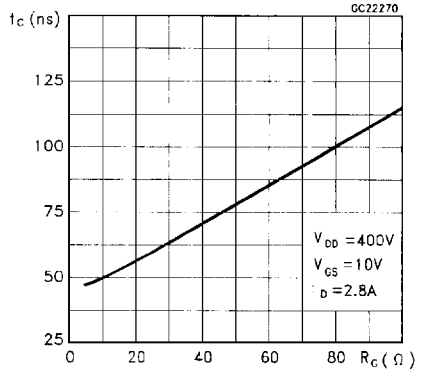
Turn-on Current Slope



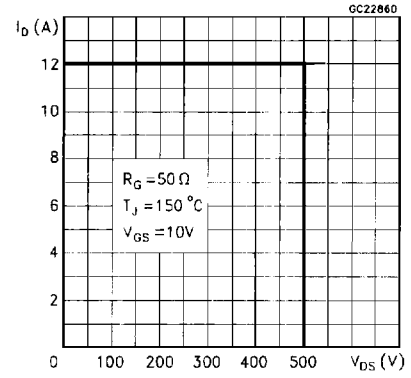
Turn-off Drain-source Voltage Slope



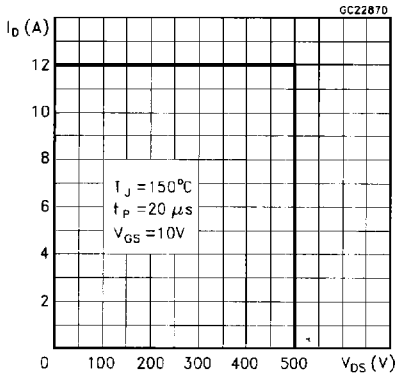
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

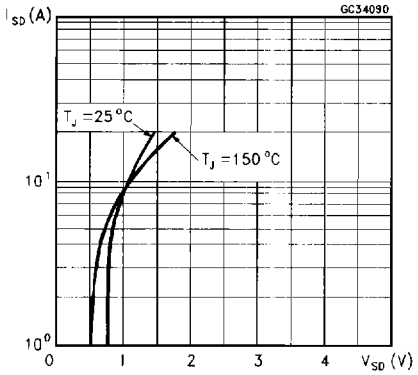


Fig. 1: Unclamped Inductive Load Test Circuits

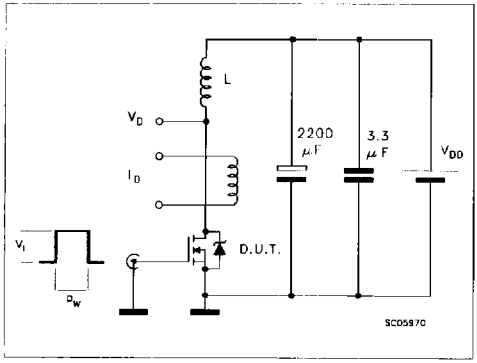


Fig. 2: Unclamped Inductive Waveforms

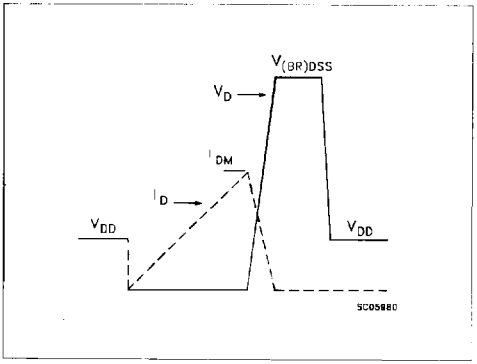


Fig. 3: Switching Times Test Circuits For Resistive Load

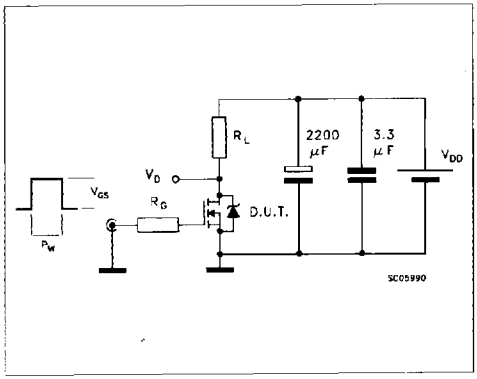


Fig. 4: Gate Charge Test Circuit

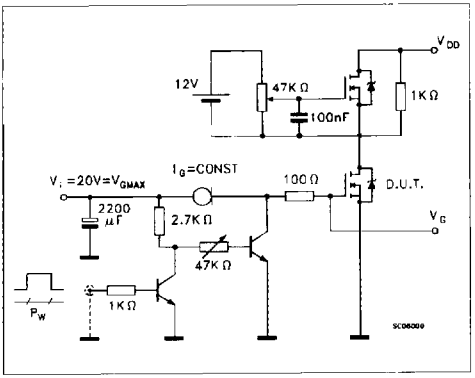


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times