

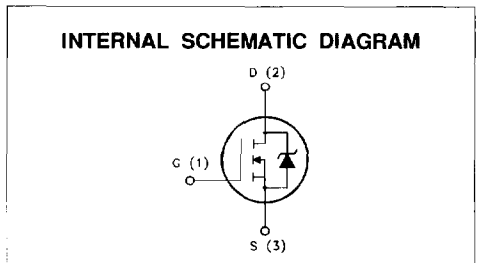
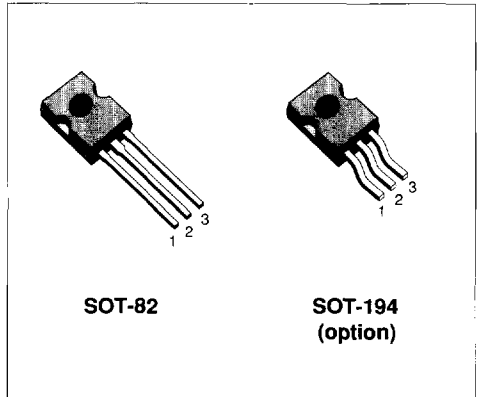
## N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STK3055E	60 V	0.15 Ω	13 A

- AVALANCHE RUGGEDNESS TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW GATE CHARGE
- 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.)



### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V <sub>DS</sub>	Drain-source Voltage (V <sub>GS</sub> = 0)	60	V
V <sub>DGR</sub>	Drain- gate Voltage (R <sub>GS</sub> = 20 kΩ)	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	13	A
I <sub>D</sub>	Drain Current (continuous) at T <sub>c</sub> = 100 °C	8	A
I <sub>DM</sub> (*)	Drain Current (pulsed)	52	A
P <sub>tot</sub>	Total Dissipation at T <sub>c</sub> = 25 °C	50	W
	Derating Factor	0.4	W/°C
T <sub>slg</sub>	Storage Temperature	-65 to 150	°C
T <sub>j</sub>	Max. Operating Junction Temperature	150	°C

(\*) Pulse width limited by safe operating area

**THERMAL DATA**

$R_{thj-case}$	Thermal Resistance Junction-case	Max	2.5	$^{\circ}C/W$
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	80	$^{\circ}C/W$
$R_{thc-s}$	Thermal Resistance Case-sink	Typ	0.7	$^{\circ}C/W$
$T_I$	Maximum Lead Temperature For Soldering Purpose		275	$^{\circ}C$

**AVALANCHE CHARACTERISTICS**

Symbol	Parameter	Max Value	Unit
$I_{AR}$	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by $T_I$ max, $\delta < 1\%$ )	13	A
$E_{AS}$	Single Pulse Avalanche Energy (starting $T_I = 25^{\circ}C$ , $I_D = I_{AR}$ , $V_{DD} = 25 V$ )	30	mJ
$E_{AR}$	Repetitive Avalanche Energy (pulse width limited by $T_I$ max, $\delta < 1\%$ )	7	mJ
$I_{AR}$	Avalanche Current, Repetitive or Not-Repetitive ( $T_c = 100^{\circ}C$ , pulse width limited by $T_I$ max, $\delta < 1\%$ )	8	A

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

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	$I_D = 250 \mu A$ $V_{GS} = 0$	60			V
$I_{DSS}$	Zero Gate Voltage Drain Current ( $V_{GS} = 0$ )	$V_{DS} = \text{Max Rating}$ $V_{DS} = \text{Max Rating} \times 0.8$ $T_c = 125^{\circ}C$			250 1000	$\mu A$ $\mu A$
$I_{GSS}$	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	$V_{DS} = V_{GS}$ $I_D = 250 \mu A$	2		4	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10V$ $I_D = 6 A$ $V_{GS} = 10V$ $I_D = 6 A$ $T_c = 100^{\circ}C$			0.15 0.3	$\Omega$ $\Omega$
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10 V$	13			A

**DYNAMIC**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$g_{fs} (*)$	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 6 A$	3			S
$C_{iss}$	Input Capacitance	$V_{DS} = 25 V$ $f = 1 MHz$ $V_{GS} = 0$			600	pF
$C_{oss}$	Output Capacitance				300	pF
$C_{rss}$	Reverse Transfer Capacitance				150	pF

**ELECTRICAL CHARACTERISTICS** (continued)

**SWITCHING ON**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ $t_r$	Turn-on Time Rise Time	$V_{DD} = 25\text{ V}$ $I_D = 9\text{ A}$ $R_G = 50\ \Omega$ $V_{GS} = 10\text{ V}$ (see test circuit, figure 3)		45 75	65 100	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	$V_{DD} = 40\text{ V}$ $I_D = 13\text{ A}$ $R_G = 50\ \Omega$ $V_{GS} = 10\text{ V}$ (see test circuit, figure 5)		700		A/ $\mu\text{s}$
$Q_g$	Total Gate Charge	$V_{DD} = 40\text{ V}$ $I_D = 13\text{ A}$ $V_{GS} = 10\text{ V}$		18	25	nC

**SWITCHING OFF**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$ $t_f$	Off-voltage Rise Time Fall Time	$V_{DD} = 40\text{ V}$ $I_D = 13\text{ A}$ $R_G = 50\ \Omega$ $V_{GS} = 10\text{ V}$ (see test circuit, figure 5)		50 40	65 55	ns ns
$t_c$	Cross-over Time			90	120	ns

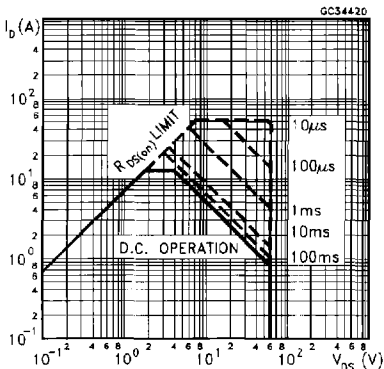
**SOURCE DRAIN DIODE**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{SD}$ $I_{SDM}(\bullet)$	Source-drain Current Source-drain Current (pulsed)				13 52	A A
$V_{SD}(\ast)$	Forward On Voltage	$I_{SD} = 13\text{ A}$ $V_{GS} = 0$			1.5	V
$t_{rr}$	Reverse Recovery Time	$I_{SD} = 13\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 30\text{ V}$ $T_J = 150\text{ }^\circ\text{C}$ (see test circuit, figure 5)		80		ns
$Q_{rr}$	Reverse Recovery Charge			0.15		$\mu\text{C}$
$I_{RRM}$	Reverse Recovery Current			4.5		A

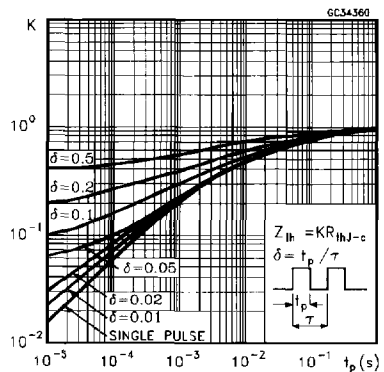
( $\ast$ ) Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %

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

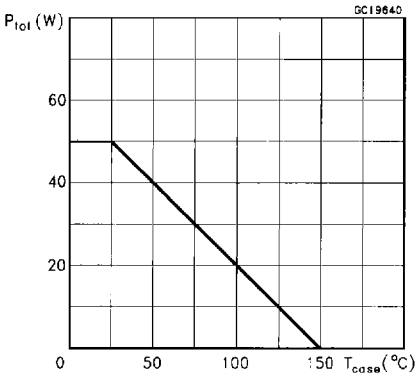
**Safe Operating Area**



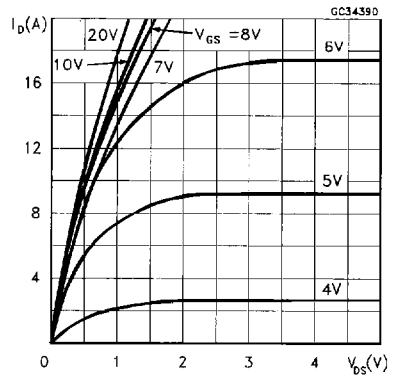
**Thermal Impedance**



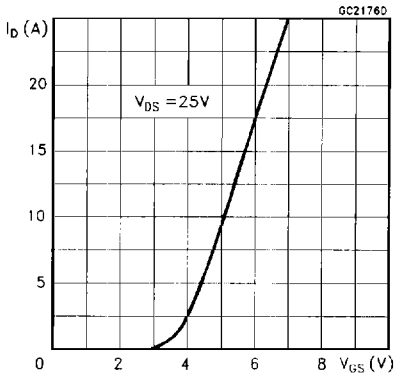
Derating Curve



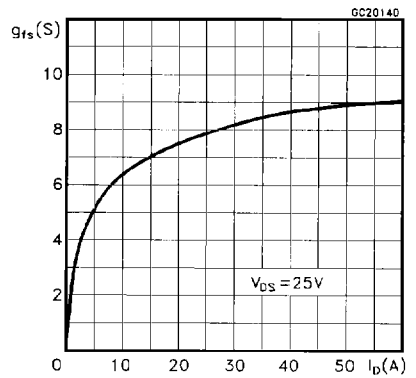
Output Characteristics



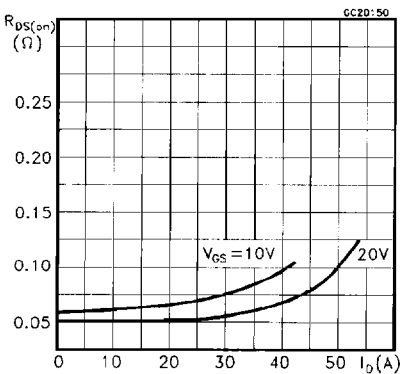
Transfer Characteristics



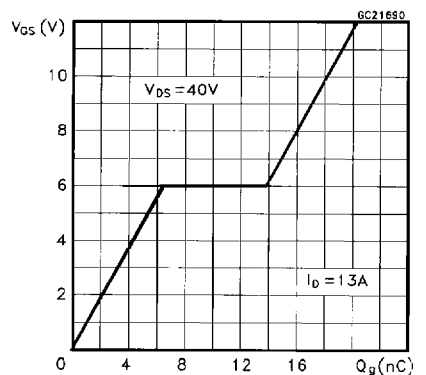
Transconductance



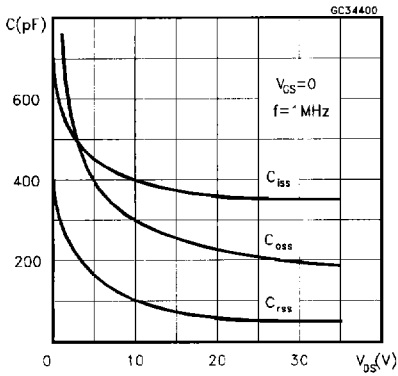
Static Drain-source On Resistance



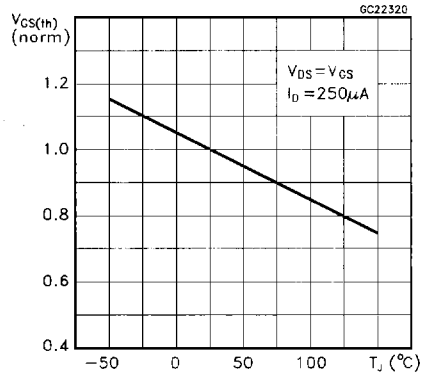
Gate Charge vs Gate-source Voltage



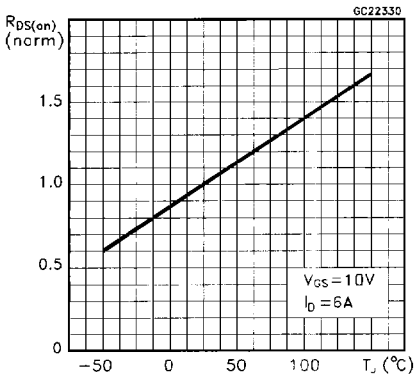
Capacitance Variations



Normalized Gate Threshold Voltage vs Temperature



Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics

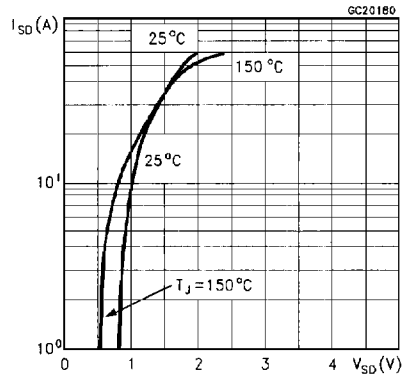
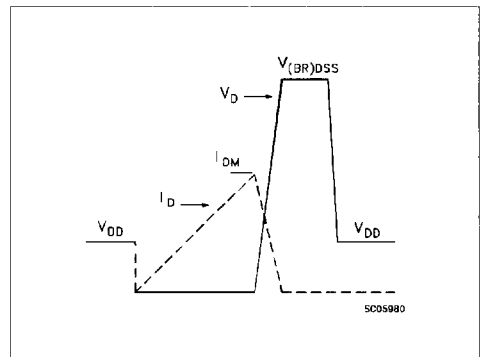
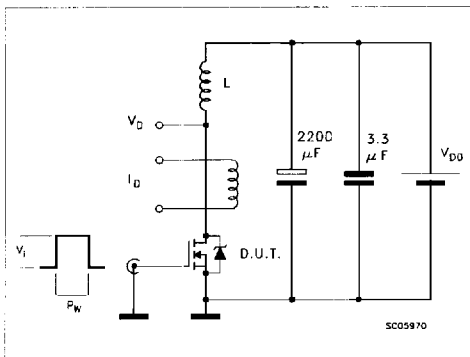
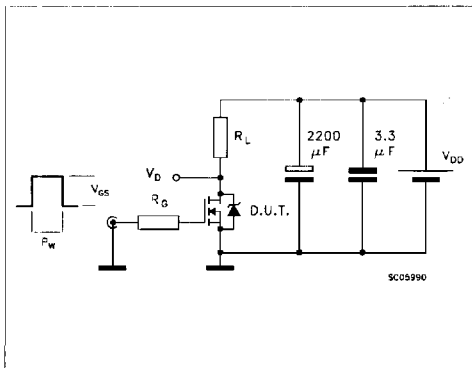


Fig. 1: Unclamped Inductive Load Test Circuits

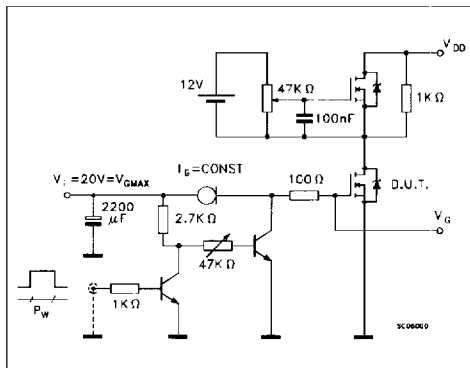
Fig. 2: Unclamped Inductive Waveforms



**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**

