

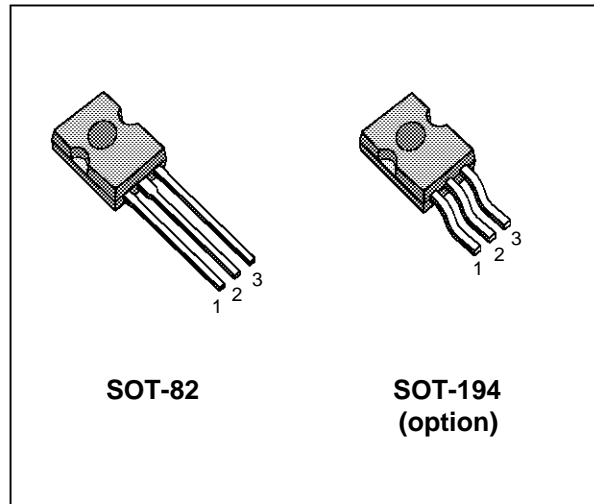
## N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STK2N80	800 V	< 7 Ω	2.1 A

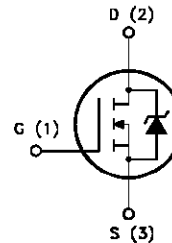
- TYPICAL R<sub>DS(on)</sub> = 5 Ω
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW INPUT CAPACITANCE
- LOW GATE CHARGE
- APPLICATION ORIENTED CHARACTERIZATION

### APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- CONSUMER AND INDUSTRIAL LIGHTING



### INTERNAL SCHEMATIC DIAGRAM



### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V <sub>DS</sub>	Drain-source Voltage (V <sub>GS</sub> = 0)	800	V
V <sub>DGR</sub>	Drain- gate Voltage (R <sub>GS</sub> = 20 kΩ)	800	V
V <sub>GS</sub>	Gate-source Voltage	± 20	V
I <sub>D</sub>	Drain Current (continuous) at T <sub>c</sub> = 25 °C	2.1	A
I <sub>D</sub>	Drain Current (continuous) at T <sub>c</sub> = 100 °C	1.3	A
I <sub>DM</sub> (•)	Drain Current (pulsed)	9.6	A
P <sub>tot</sub>	Total Dissipation at T <sub>c</sub> = 25 °C	70	W
	Derating Factor	0.56	W/°C
T <sub>stg</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	1.78	$^{\circ}C/W$
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	80	$^{\circ}C/W$
$R_{thj-amb}$	Thermal Resistance Case-sink	Typ	0.7	$^{\circ}C/W$
$T_l$	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 $T_j$ max, $\delta < 1\%$ )	2.1	A
$E_{AS}$	Single Pulse Avalanche Energy (starting $T_j = 25^{\circ}C$ , $I_D = I_{AR}$ , $V_{DD} = 25 V$ )	80	mJ
$E_{AR}$	Repetitive Avalanche Energy (pulse width limited by $T_j$ max, $\delta < 1\%$ )	2.8	mJ
$I_{AR}$	Avalanche Current, Repetitive or Not-Repetitive ( $T_c = 100^{\circ}C$ , pulse width limited by $T_j$ max, $\delta < 1\%$ )	1.3	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	$I_D = 250 \mu A$ $V_{GS} = 0$	800			V
$I_{DSS}$	Zero Gate Voltage Drain Current ( $V_{GS} = 0$ )	$V_{DS} = \text{Max Rating}$ $V_{DS} = \text{Max Rating} \times 0.8$ $T_c = 125^{\circ}C$			25 250	$\mu A$ $\mu A$
$I_{GSS}$	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	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	$V_{GS} = 10V$ $I_D = 1 A$		5	7	$\Omega$
$I_{D(on)}$	On State Drain Current	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $V_{GS} = 10 V$	2.1			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$g_{fs} (*)$	Forward Transconductance	$V_{DS} > I_{D(on)} \times R_{DS(on)max}$ $I_D = 1 A$	1.2	1.9		S
$C_{iss}$	Input Capacitance	$V_{DS} = 25 V$ $f = 1 MHz$ $V_{GS} = 0$		460	600	pF
$C_{oss}$	Output Capacitance			55	70	pF
$C_{rss}$	Reverse Transfer Capacitance			22	30	pF

**ELECTRICAL CHARACTERISTICS** (continued)

**SWITCHING ON**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ $t_r$	Turn-on Time Rise Time	$V_{DD} = 400\text{ V}$ $I_D = 1.5\text{ A}$ $R_G = 50\ \Omega$ $V_{GS} = 10\text{ V}$ (see test circuit, figure 3)		38 42	50 57	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	$V_{DD} = 640\text{ V}$ $I_D = 2\text{ A}$ $R_G = 50\ \Omega$ $V_{GS} = 10\text{ V}$ (see test circuit, figure 5)		160		A/ $\mu$ s
$Q_g$ $Q_{gs}$ $Q_{gd}$	Total Gate Charge Gate-Source Charge Gate-Drain Charge	$V_{DD} = 640\text{ V}$ $I_D = 2\text{ A}$ $V_{GS} = 10\text{ V}$		31 6 14	40	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	$V_{DD} = 640\text{ V}$ $I_D = 2\text{ A}$ $R_G = 50\ \Omega$ $V_{GS} = 10\text{ V}$ (see test circuit, figure 5)		70 25 108	90 32 140	ns ns ns

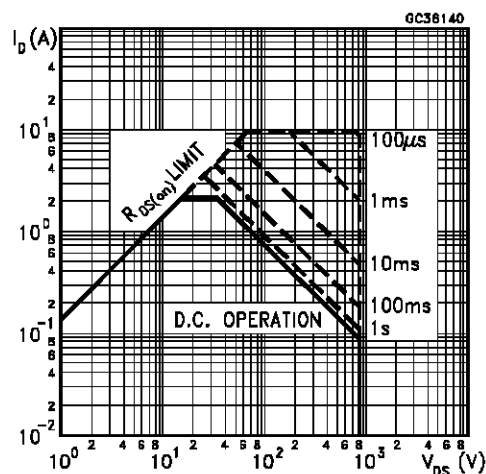
**SOURCE DRAIN DIODE**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{SD}$ $I_{SDM}(\bullet)$	Source-drain Current Source-drain Current (pulsed)				2.1 9.6	A A
$V_{SD} (*)$	Forward On Voltage	$I_{SD} = 2.1\text{ A}$ $V_{GS} = 0$			2	V
$t_{rr}$ $Q_{rr}$ $I_{RRM}$	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	$I_{SD} = 2\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 100\text{ V}$ $T_j = 150\text{ }^\circ\text{C}$ (see test circuit, figure 5)		920 18.4 40		ns $\mu$ C A

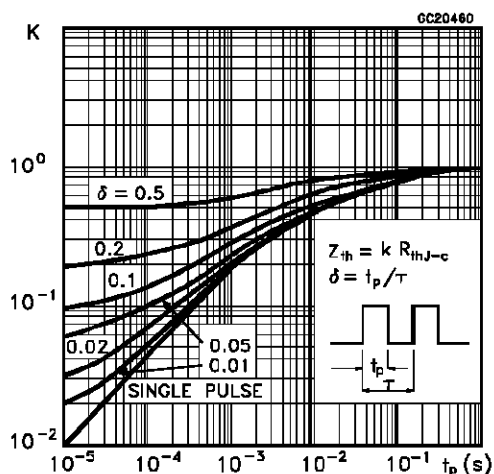
(\*) Pulsed: Pulse duration = 300  $\mu$ s, duty cycle 1.5 %

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

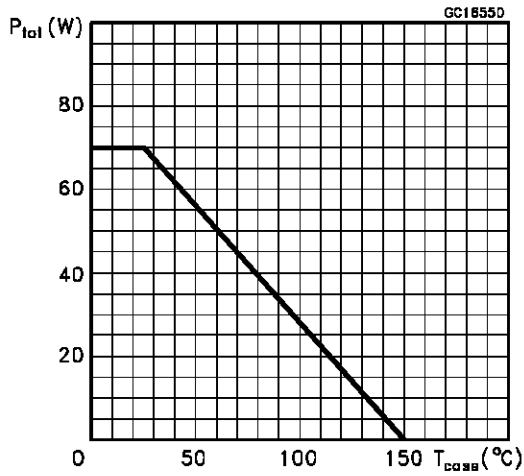
**Safe Operating Area**



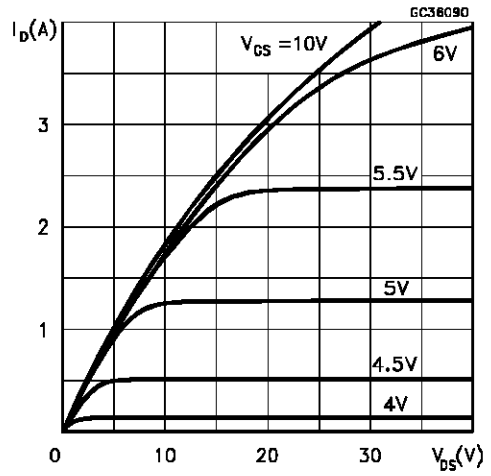
**Thermal Impedance**



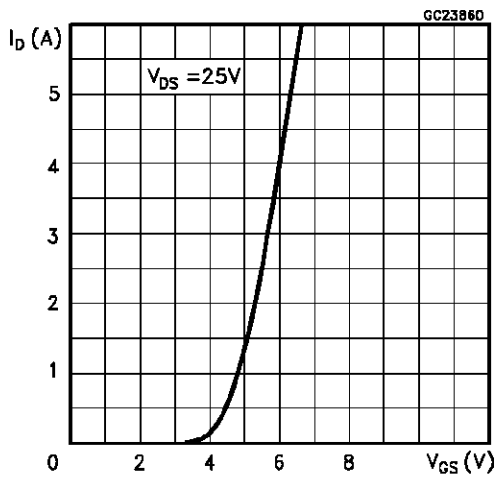
Derating Curve



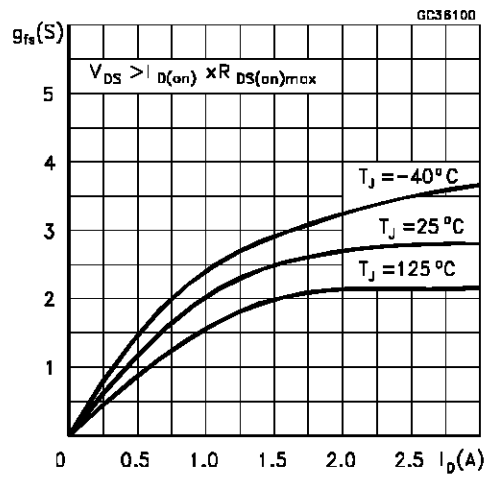
Output Characteristics



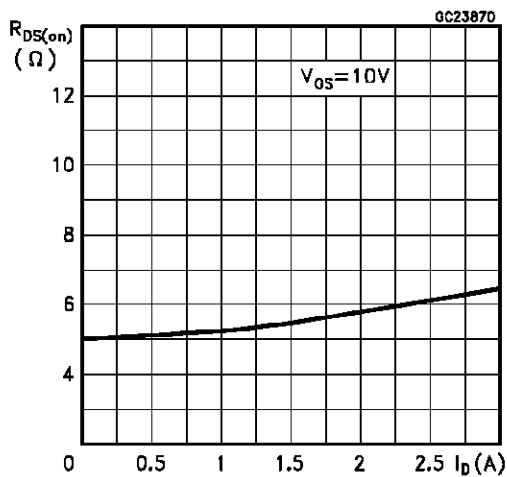
Transfer Characteristics



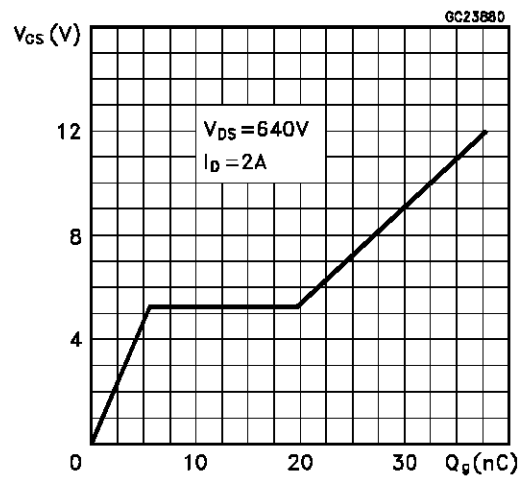
Transconductance



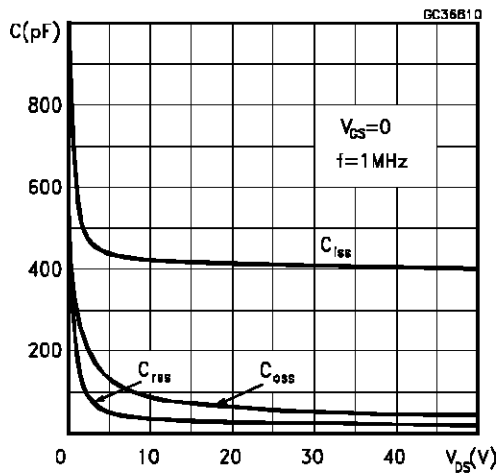
Static Drain-source On Resistance



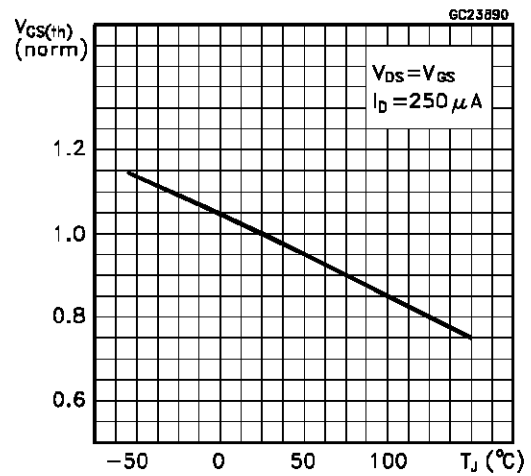
Gate Charge vs Gate-source Voltage



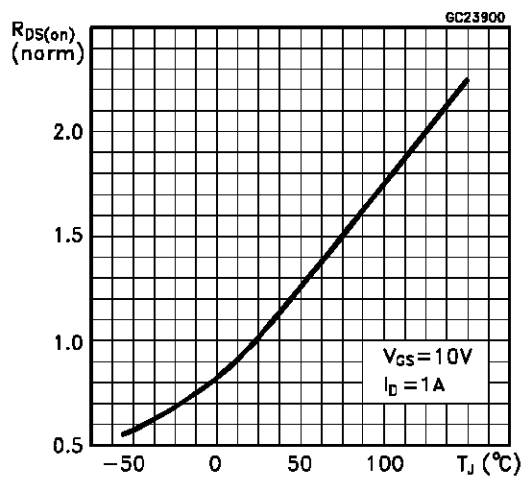
Capacitance Variations



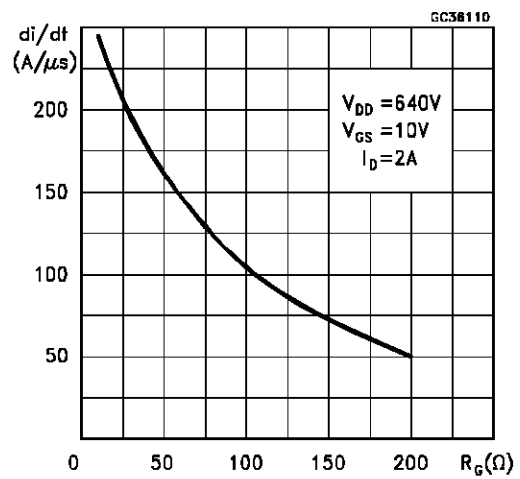
Normalized Gate Threshold Voltage vs Temperature



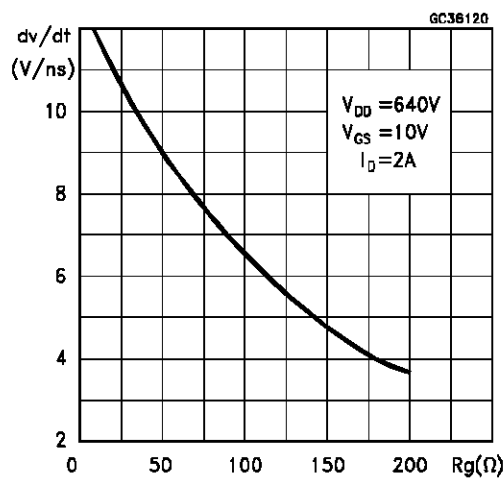
Normalized On Resistance vs Temperature



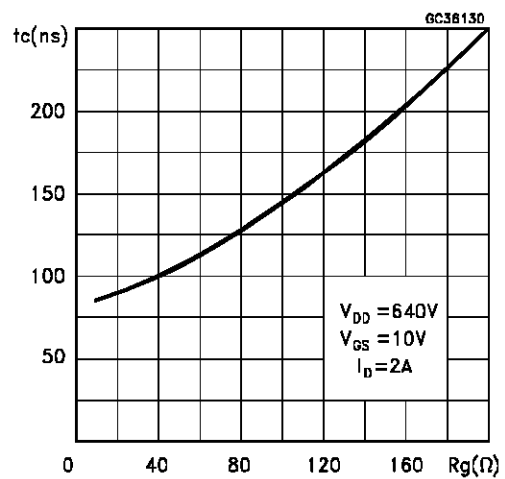
Turn-on Current Slope



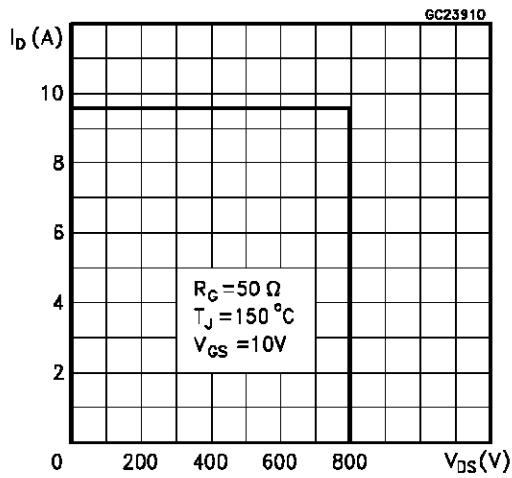
Turn-off Drain-source Voltage Slope



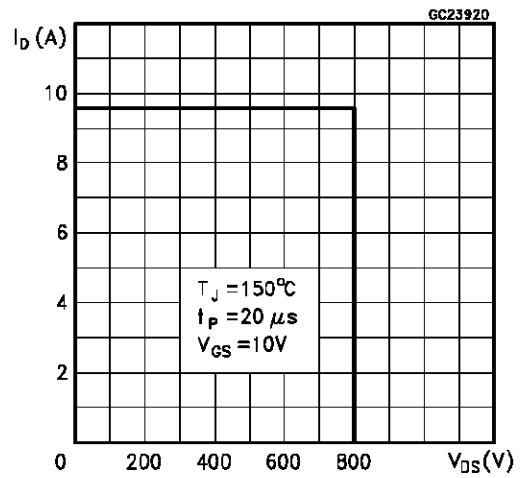
Cross-over Time



Switching Safe Operating Area



Accidental Overload Area



Source-drain Diode Forward Characteristics

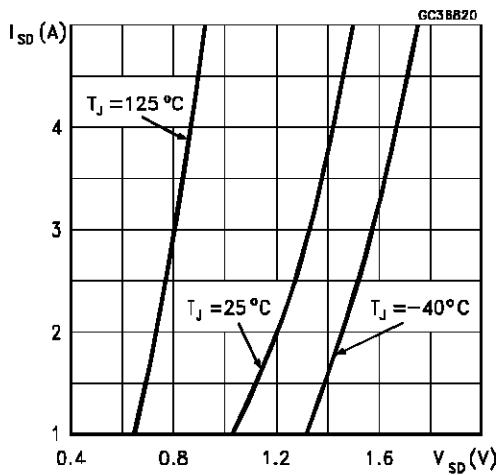
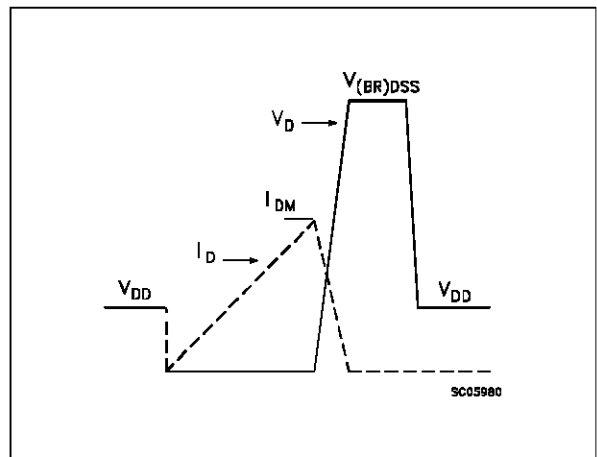
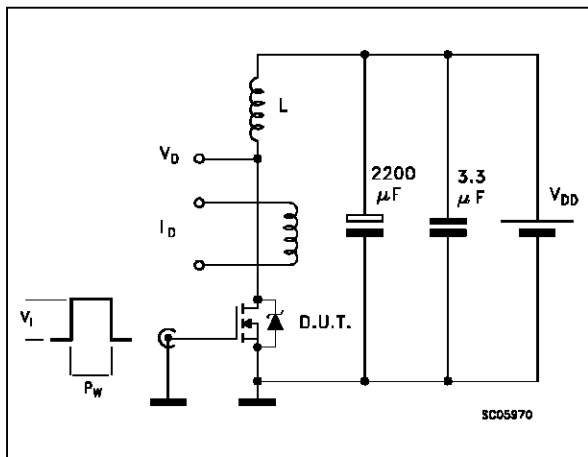
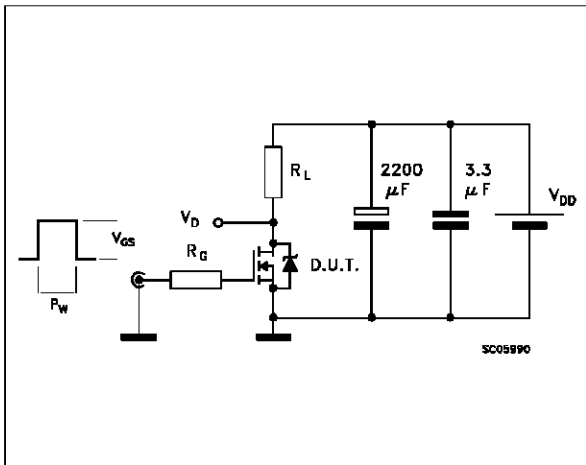


Fig. 1: Unclamped Inductive Load Test Circuits

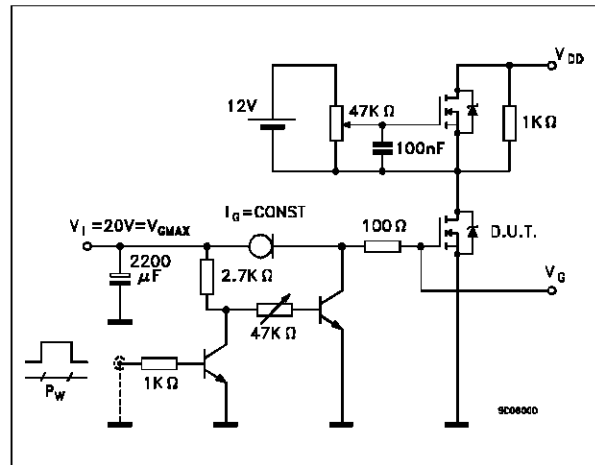
Fig. 2: Unclamped Inductive Waveforms



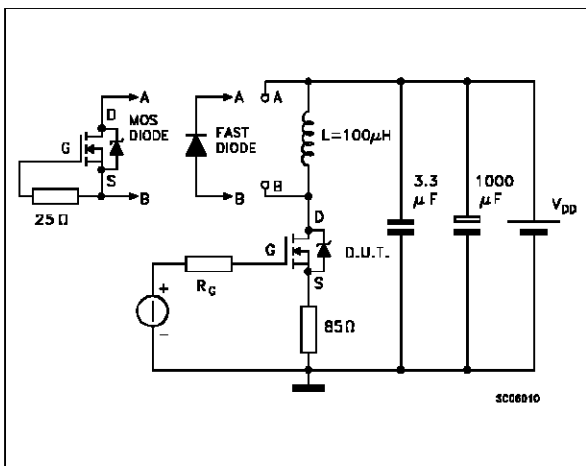
**Fig. 3:** Switching Times Test Circuits For Resistive Load



**Fig. 4:** Gate Charge Test Circuit

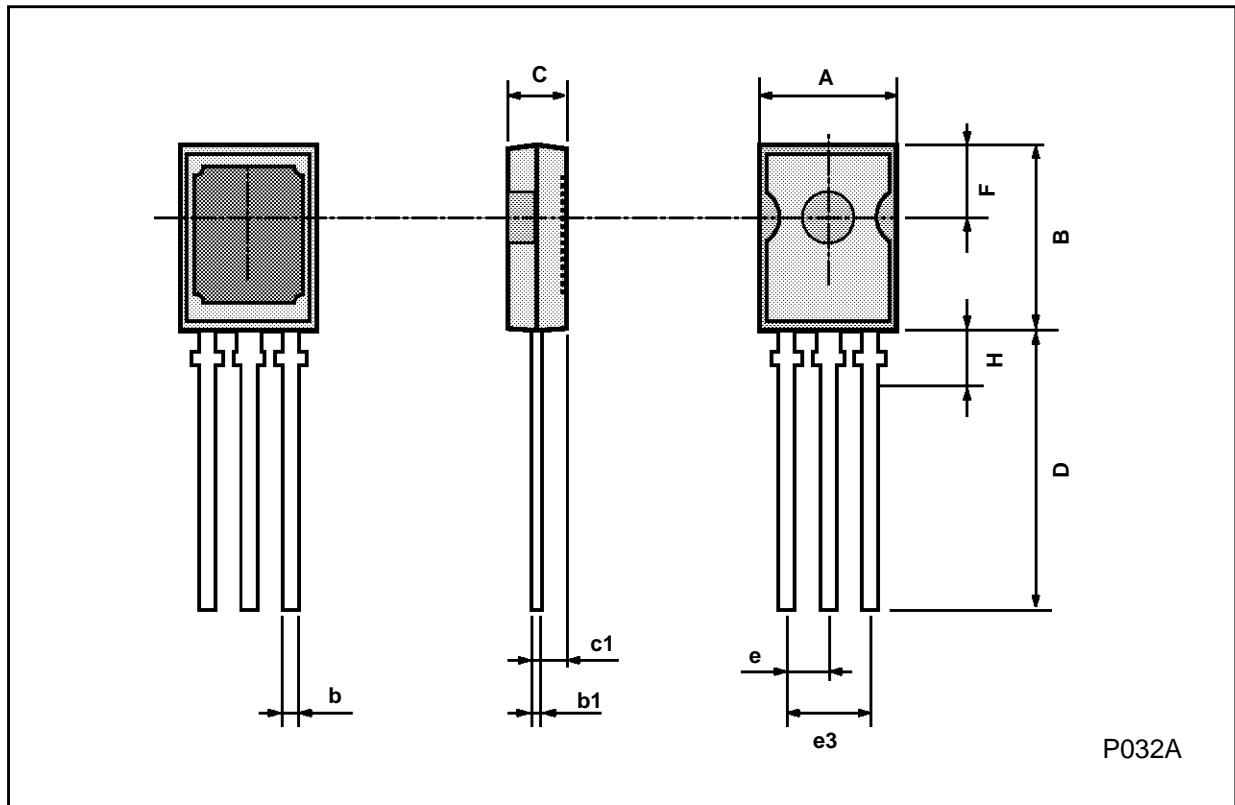


**Fig. 5:** Test Circuit For Inductive Load Switching And Diode Recovery Times



**SOT-82 MECHANICAL DATA**

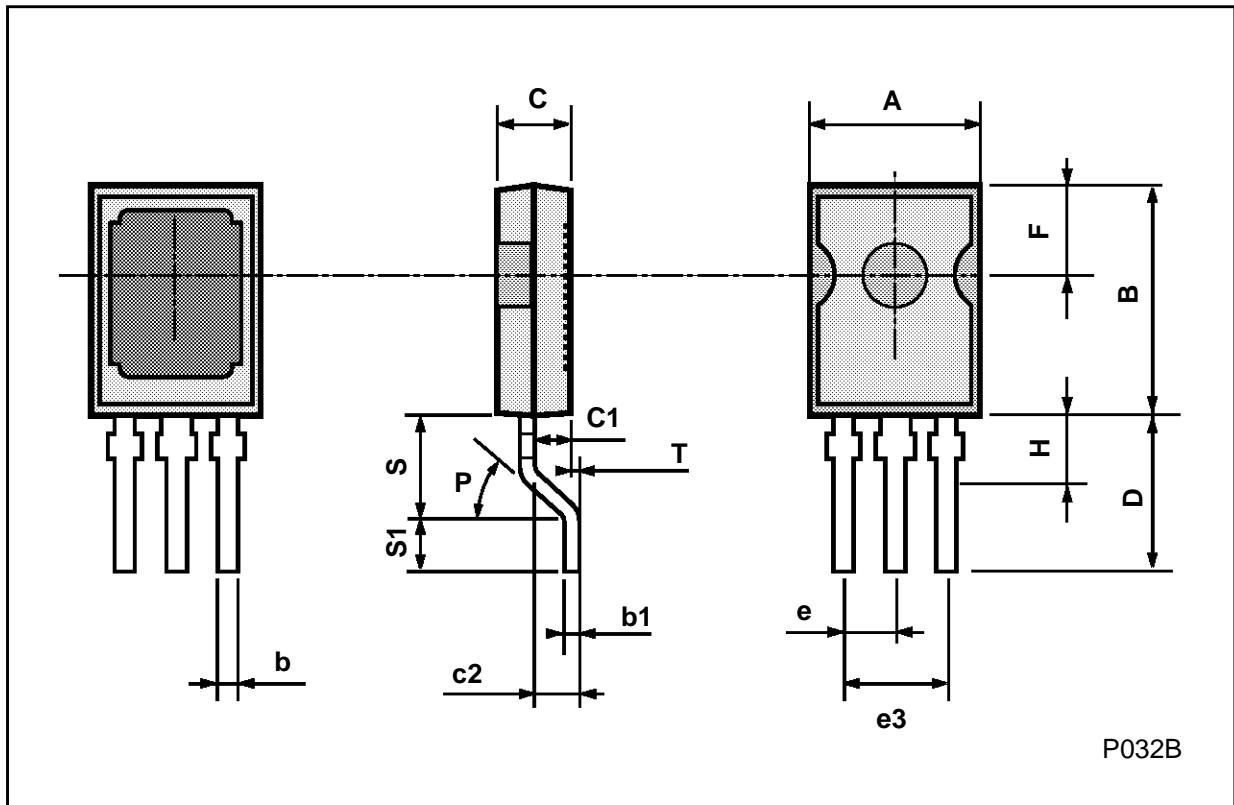
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	7.4		7.8	0.291		0.307
B	10.5		11.3	0.413		0.445
b	0.7		0.9	0.028		0.035
b1	0.49		0.75	0.019		0.030
C	2.4		2.7	0.04		0.106
c1		1.2			0.047	
D		15.7			0.618	
e		2.2			0.087	
e3		4.4			0.173	
F		3.8			0.150	
H			2.54		0.100	





**SOT-194 MECHANICAL DATA**

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	7.4		7.8	0.291		0.307
B	10.5		11.3	0.413		0.445
b	0.7		0.9	0.028		0.035
b1	0.49		0.75	0.019		0.030
C	2.4		2.7	0.094		0.106
c1		1.2			0.047	
c2		1.3			0.051	
D		6			0.236	
e		2.2			0.087	
e3		4.4			0.173	
F		3.8			0.150	
H			2.54			0.100
P	45° (typ.)					
S		4			0.157	
S1		2			0.079	
T		0.1			0.004	



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