SGS-THOMSON MICROELECTRONICS

STK3NA60

## N - CHANNEL ENHANCEMENT MODE
FAST POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STK3NA60	600 V	< 4 Ω	2.7 A

- TYPICAL $R_{DS(on)}$ = 3.3 Ω
- ± 30V GATE TO SOURCE VOLTAGE RATING
- 100% AVALANCHE TESTED
- REPETITIVE AVALANCHE DATA AT 100°C
- LOW INTRINSIC CAPACITANCES
- GATE GHARGE MINIMIZED
- REDUCED THRESHOLD VOLTAGE SPREAD

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- DC-AC CONVERTERS FOR WELDING EQUIPMENT AND UNINTERRUPTIBLE POWER SUPPLIES AND MOTOR DRIVE

SOT82

INTERNAL SCHEMATIC DIAGRAM

D(2)

G(1)

S(3)

SC06140
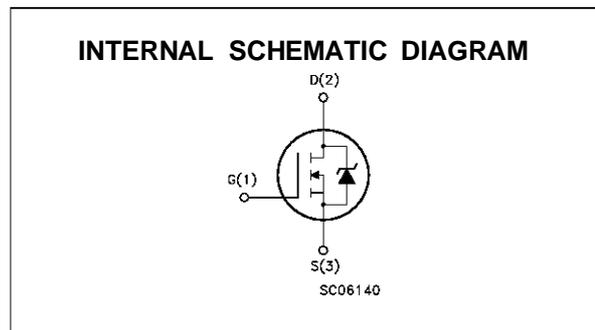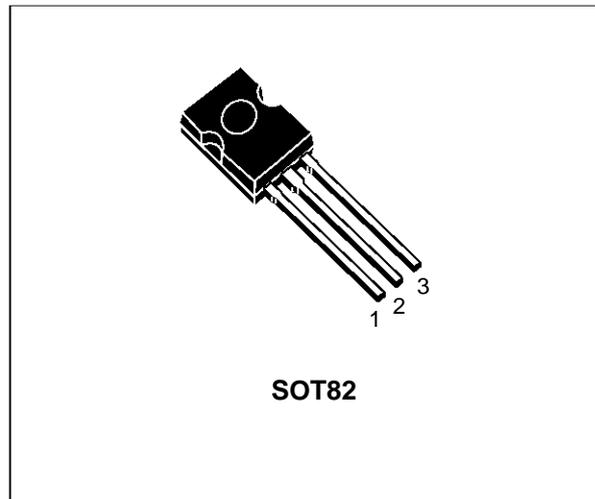
ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{GS} = 0)	600	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	600	V
V_{GS}	Gate-source Voltage	± 30	V
I_D	Drain Current (continuous) at T_c = 25 ^{o}C	2.7	A
I_D	Drain Current (continuous) at T_c = 100 ^{o}C	1.8	A
$I_{DM}(\bullet)$	Drain Current (pulsed)	10.8	A
P_{tot}	Total Dissipation at T_c = 25 ^{o}C	60	W
	Derating Factor	0.48	W/^{o}C
T_{stg}	Storage Temperature	-65 to 150	^{o}C
T_j	Max. Operating Junction Temperature	150	^{o}C

(•) Pulse width limited by safe operating area

THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case	Max	2.08	^{o}C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	62.5	^{o}C/W
$R_{thc-sink}$	Thermal Resistance Case-sink	Typ	0.5	^{o}C/W
T_l	Maximum Lead Temperature For Soldering Purpose		300	^{o}C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max, δ < 1%)	2.7	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 ^{o}C, I_D = I_{AR}, V_{DD} = 50 V)	40	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, δ < 1%)	1.6	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 ^{o}C, pulse width limited by T_j max, δ < 1%)	1.8	A

ELECTRICAL CHARACTERISTICS (T_{case} = 25 ^{o}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	600			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 ^{o}C			250 1000	μA μA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = $\pm$ 30 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 μA	2.25	3	3.75	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 1.5 A V_{GS} = 10V I_D = 1.5 A T_c = 100°C		3.3	4 8	Ω Ω
$I_{D(on)}$	On State Drain Current	V_{DS} > $I_{D(on)}$ x $R_{DS(on)max}$ V_{GS} = 10 V	2.9			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 = 1.5 A	1	2		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		380 57 17	500 75 23	pF pF pF

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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} = 300 V I_D = 1.5 A R_G = 18 Ω V_{GS} = 10 V (see test circuit, figure 3)		14 25	20 35	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	V_{DD} = 400 V I_D = 3 A R_G = 18 Ω V_{GS} = 10 V (see test circuit, figure 5)		300		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 480 V I_D = 3 A V_{GS} = 10 V		22 6 9	30	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} = 480 V I_D = 3 A R_G = 18 Ω V_{GS} = 10 V (see test circuit, figure 5)		13 24 12	18 34 17	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)				2.7 10.8	A A
V_{SD} (∗)	Forward On Voltage	I_{SD} = 2.7 A V_{GS} = 0			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 3 A di/dt = 100 A/µs V_{DD} = 100 V T_j = 150 °C (see test circuit, figure 5)		460 5.6 24		ns µC A

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

Safe Operating Area

Thermal Impedance

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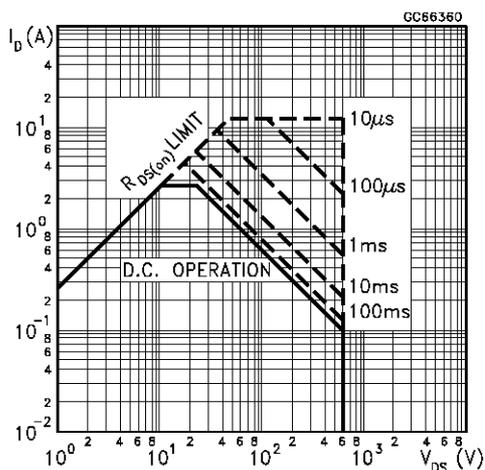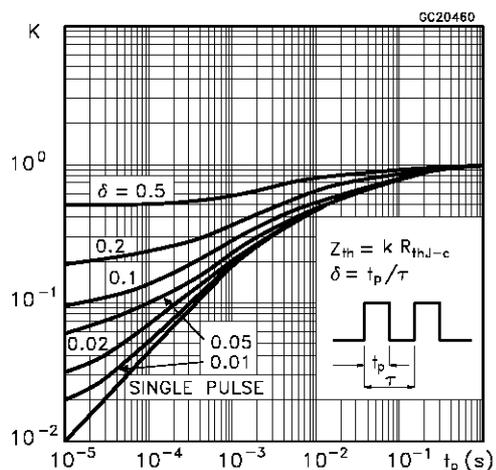
Derating Curve
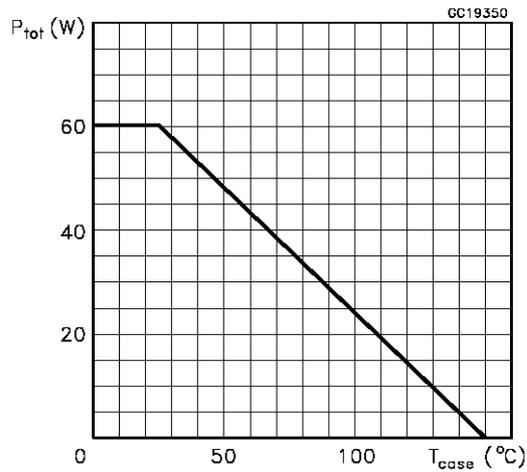

Output Characteristics
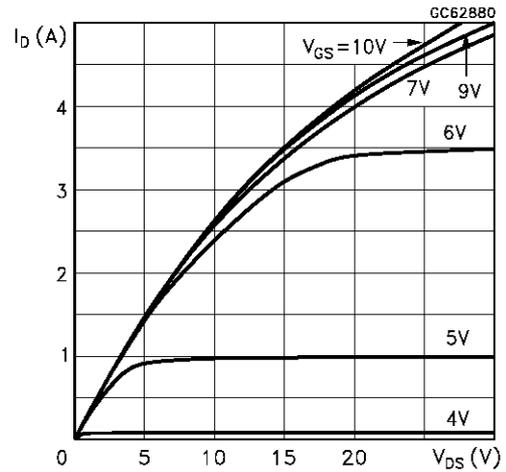

Transfer Characteristics
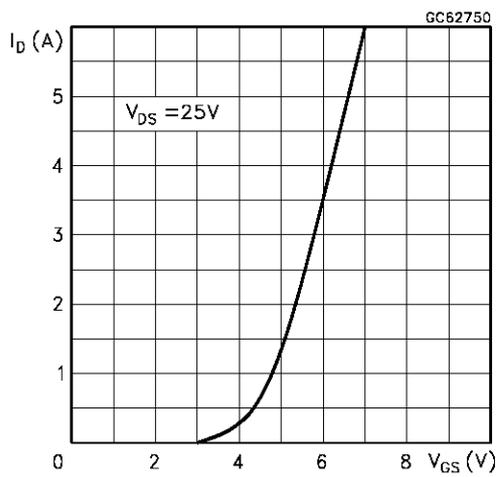
Transconductance
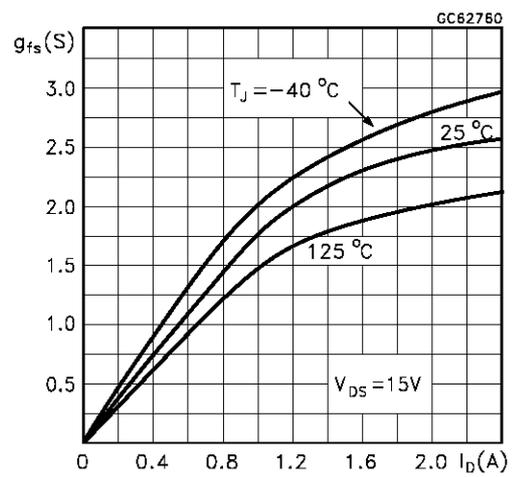

Static Drain-source On Resistance
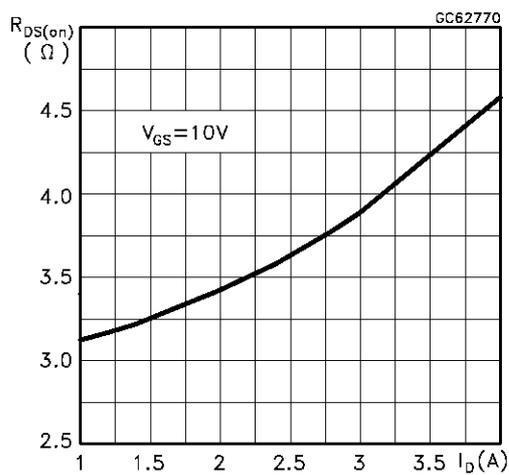
Gate Charge vs Gate-source Voltage

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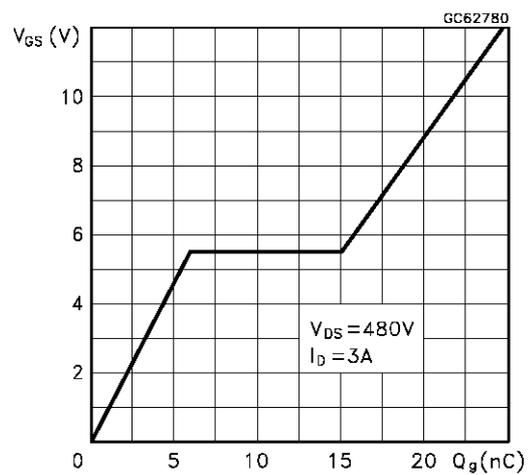
Capacitance Variations

$C(pF)$

GC62790

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

C_{iss}

C_{rss}

C_{oss}

$V_{DS}(V)$
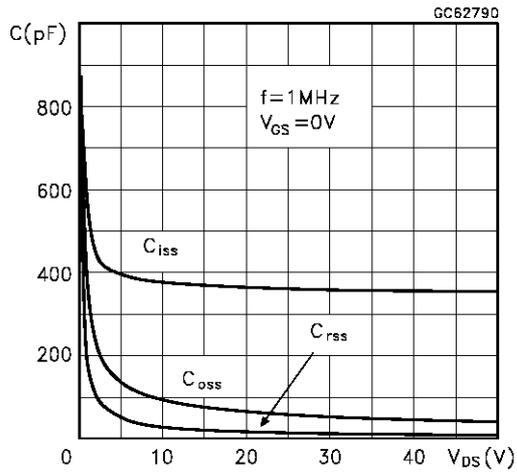
Normalized Gate Threshold Voltage vs Temperature

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

GC62800

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

$T_J (^{\circ}C)$
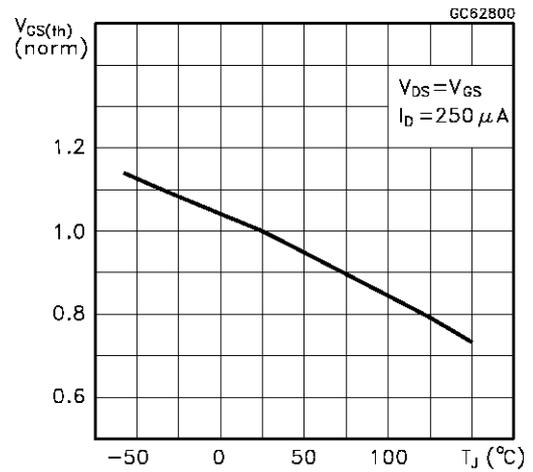
Normalized On Resistance vs Temperature

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

GC62810

$V_{GS} = 10V$
$I_D = 1.5A$

$T_J (^{\circ}C)$

Turn-on Current Slope

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

GC62820

$V_{DD} = 480V$
$V_{GS} = 10V$
$I_D = 3A$

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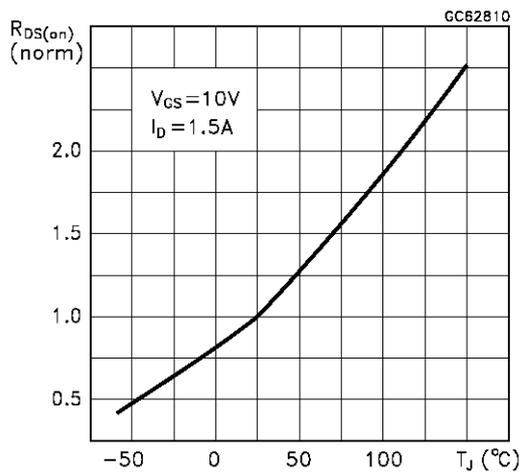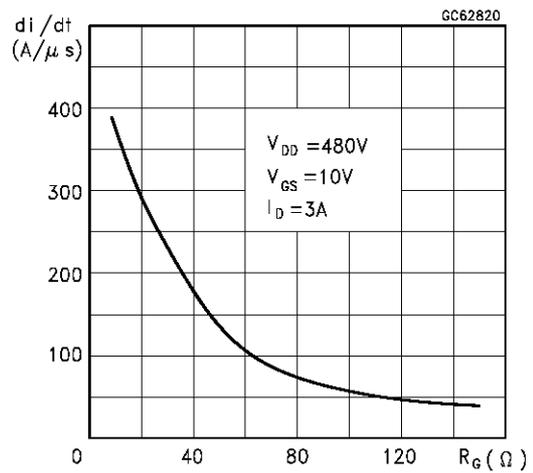
Turn-off Drain-source Voltage Slope

dv/dt (V/ns)

GC62830

$V_{DD} = 480V$
$V_{GS} = 10V$
$I_D = 3A$

$R_G (\Omega)$

Cross-over Time

$t_C (ns)$

GC62840

$V_{DD} = 480V$
$V_{GS} = 10V$
$I_D = 3A$

$R_G (\Omega)$

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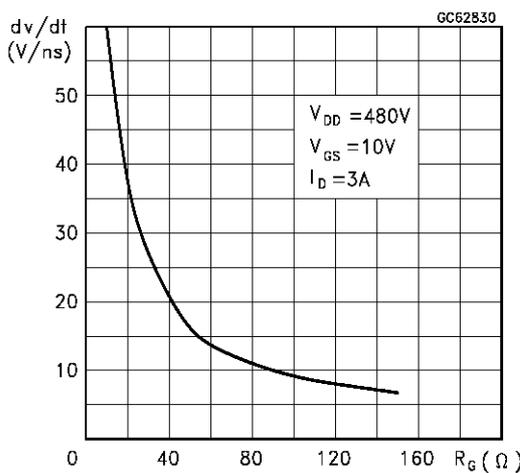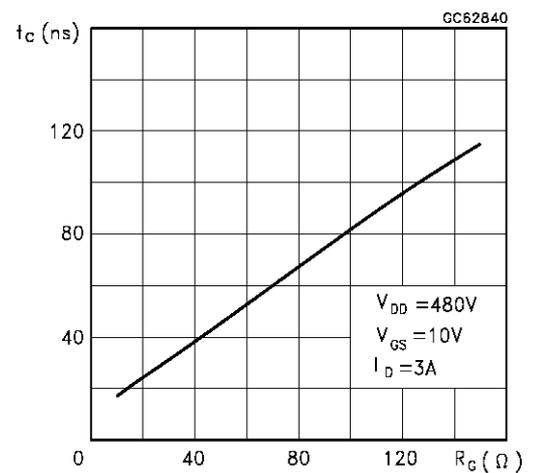
Switching Safe Operating Area
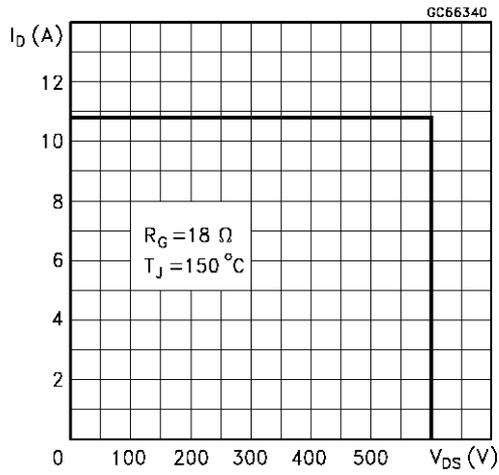
Accidental Overload Area
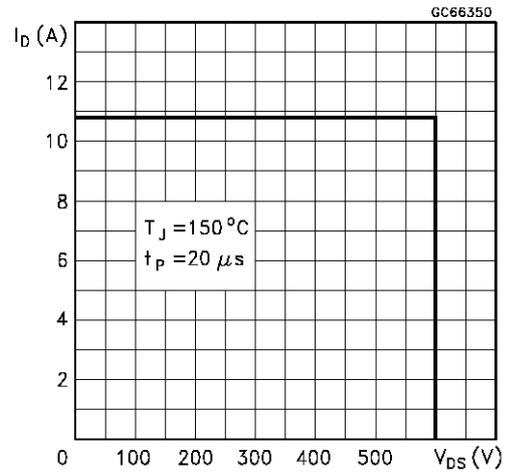
Source-drain Diode Forward Characteristics
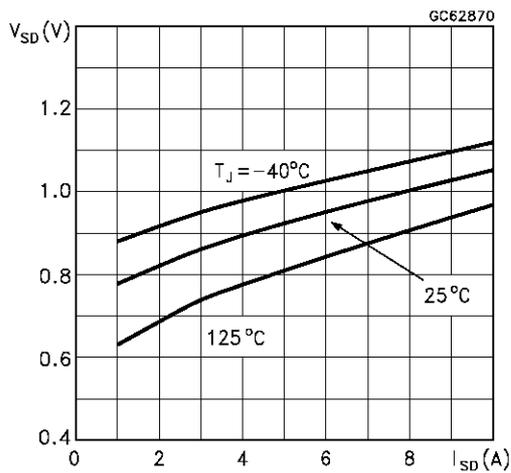
Fig. 1: Unclamped Inductive Load Test Circuit


Fig. 2: Unclamped Inductive Waveform

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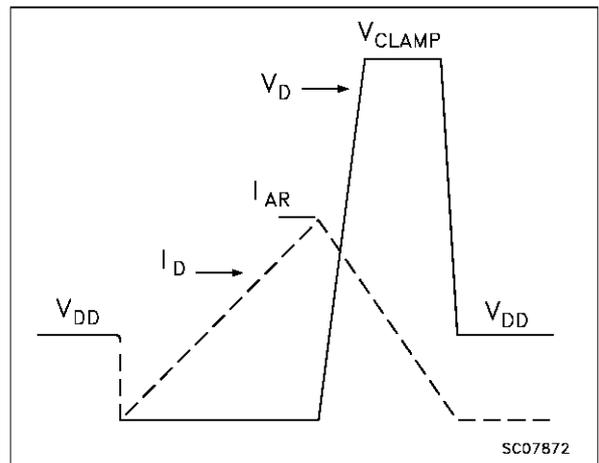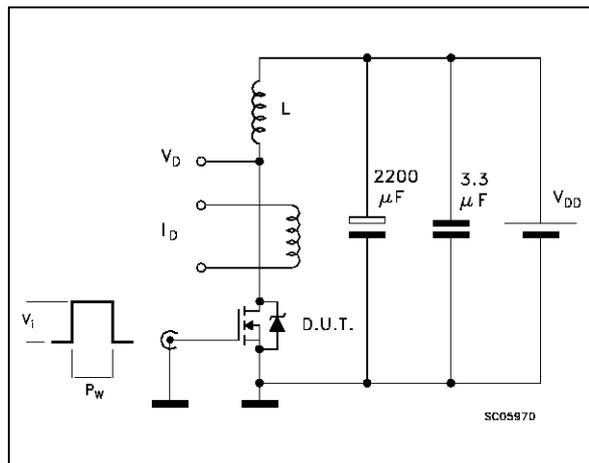
**Fig. 3:** Switching Times Test Circuits For Resistive Load
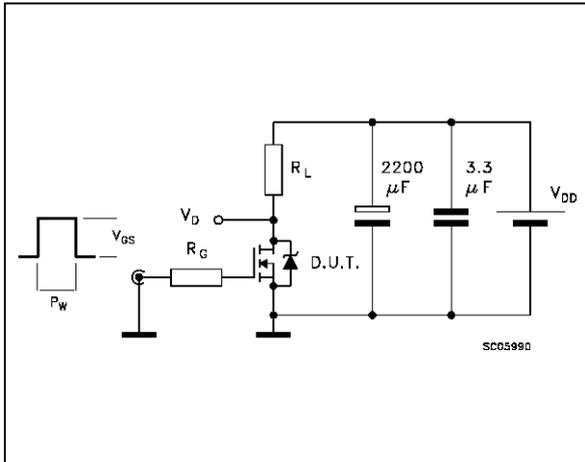
Fig. 4: Gate Charge test Circuit
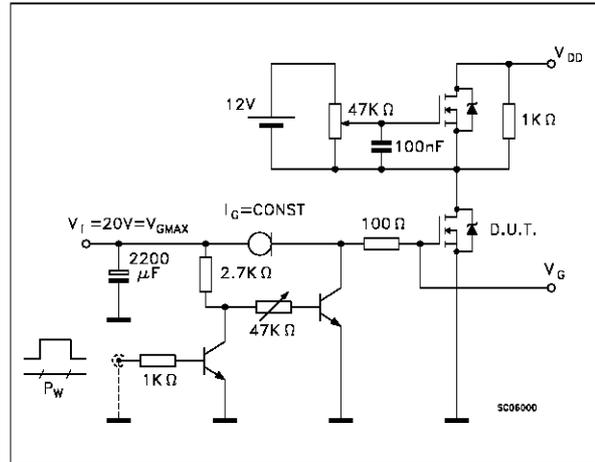
Fig. 5: Test Circuit For Inductive Load Switching And DIode Recovery Times

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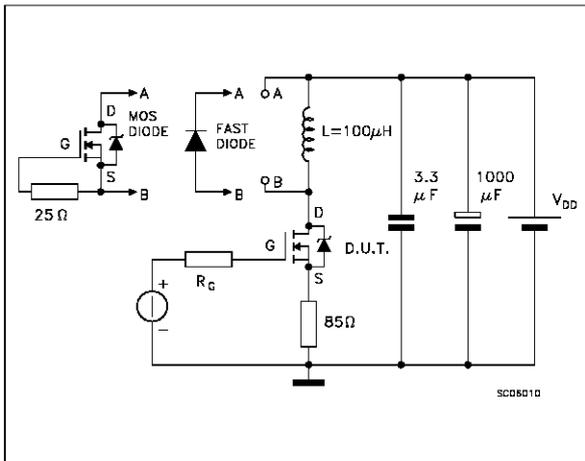
SOT-82 MECHANICAL DATA

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	

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