SGS-THOMSON MICROELECTRONICS

STW16N40

N - CHANNEL ENHANCEMENT MODE POWER MOS TRANSISTOR

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STW16N40	400 V	< 0.3 Ω	16 A

- TYPICAL $R_{DS(on)}$ = 0.21 Ω
- AVALANCHE RUGGED 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

TO-247

INTERNAL SCHEMATIC DIAGRAM
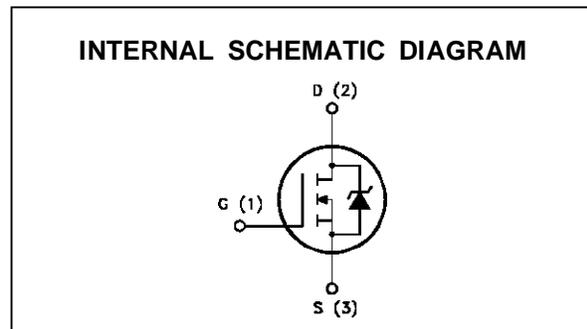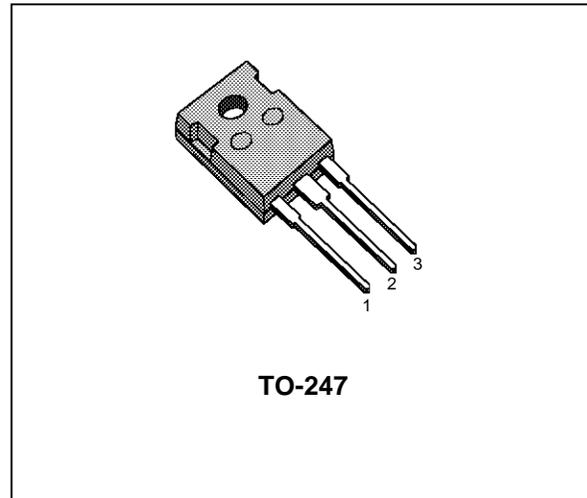
ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DS}	Drain-source Voltage (V_{GS} = 0)	400	V
V_{DGR}	Drain- gate Voltage (R_{GS} = 20 kΩ)	400	V
V_{GS}	Gate-source Voltage	$\pm$ 20	V
I_D	Drain Current (continuous) at T_c = 25 °C	16	A
I_D	Drain Current (continuous) at T_c = 100 °C	10	A
$I_{DM}(\bullet)$	Drain Current (pulsed)	64	A
P_{tot}	Total Dissipation at T_c = 25 °C	180	W
	Derating Factor	1.44	W/°C
T_{stg}	Storage Temperature	-65 to 150	°C
T_j	Max. Operating Junction Temperature	150	°C

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

THERMAL DATA

$R_{thj-case}$	Thermal Resistance Junction-case	Max	0.69	^{o}C/W
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	30	^{o}C/W
$R_{thj-amb}$	Thermal Resistance Case-sink	Typ	0.1	^{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%)	16	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 ^{o}C, I_D = I_{AR}, V_{DD} = 50 V)	435	mJ
E_{AR}	Repetitive Avalanche Energy (pulse width limited by T_j max, δ < 1%)	23	mJ
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (T_c = 100 ^{o}C, pulse width limited by T_j max, δ < 1%)	10	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	400			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} = ± 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	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V I_D = 8 A V_{GS} = 10V I_D = 8 A T_c = 100°C		0.21	0.3 0.6	Ω Ω
$I_{D(on)}$	On State Drain Current	V_{DS} > $I_{D(on)}$ x $R_{DS(on)max}$ V_{GS} = 10 V	16			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 = 8 A	6	12		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25 V f = 1 MHz V_{GS} = 0		2200 400 205	2900 550 270	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	$V_{DD} = 200$ V $I_D = 8$ A $R_G = 4.7$ Ω $V_{GS} = 10$ V (see test circuit, figure 3)		25 85	35 115	ns ns
$(di/dt)_{on}$	Turn-on Current Slope	$V_{DD} = 320$ V $I_D = 16$ A $R_G = 4.7$ Ω $V_{GS} = 10$ V (see test circuit, figure 5)		350		A/µs
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	$V_{DD} = 320$ V $I_D = 16$ A $V_{GS} = 10$ V		145 15 80	190	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	$V_{DD} = 320$ V $I_D = 16$ A $R_G = 4.7$ Ω $V_{GS} = 10$ V (see test circuit, figure 5)		105 35 150	140 50 200	ns ns ns

SOURCE DRAIN DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} $I_{SDM}(•)$	Source-drain Current Source-drain Current (pulsed)				16 64	A A
V_{SD} (∗)	Forward On Voltage	$I_{SD} = 16$ A $V_{GS} = 0$			1.6	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	$I_{SD} = 16$ A di/dt = 100 A/µs $V_{DD} = 100$ V $T_j = 150$ °C (see test circuit, figure 5)		620 10.9 35		ns µC A

(∗) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %

(•) Pulse width limited by safe operating area
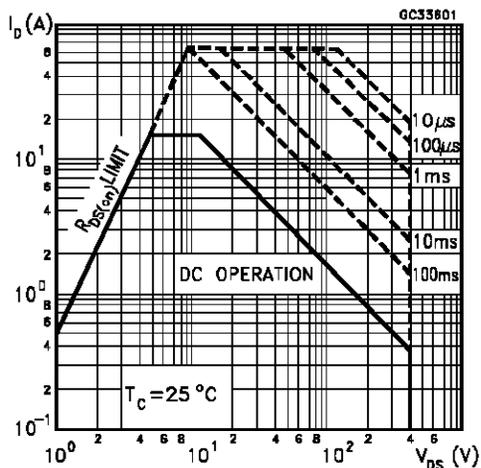
Safe Operating Areas   Thermal Impedance

SGS-THOMSON
MICROELECTRONICS
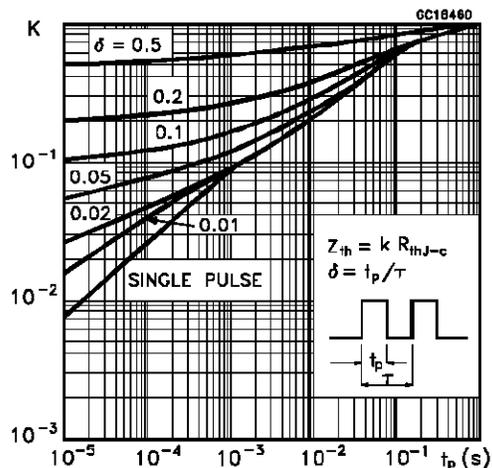
Derating Curve
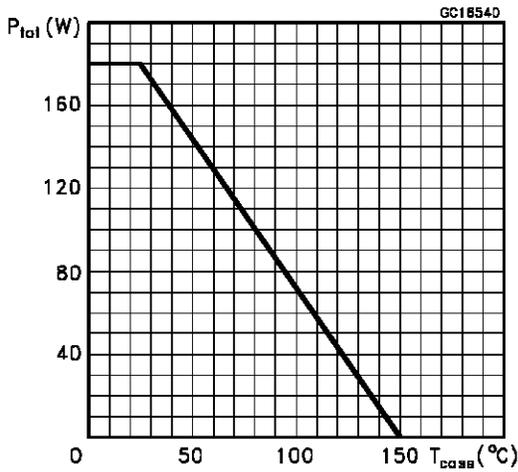

Output Characteristics
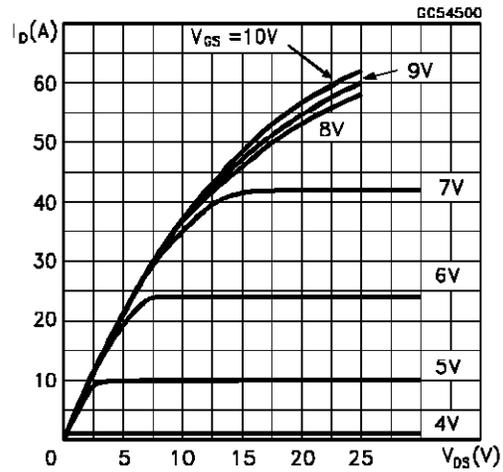

Transfer Characteristics
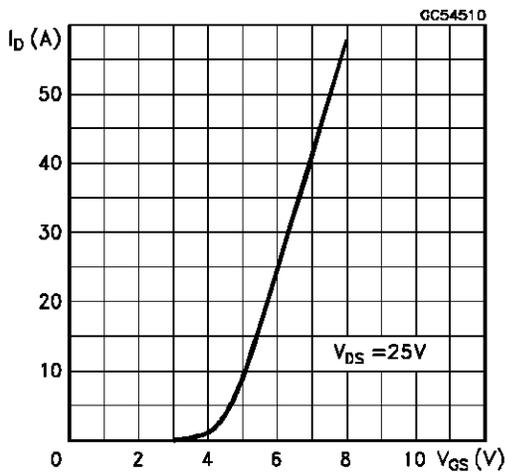
Transconductance
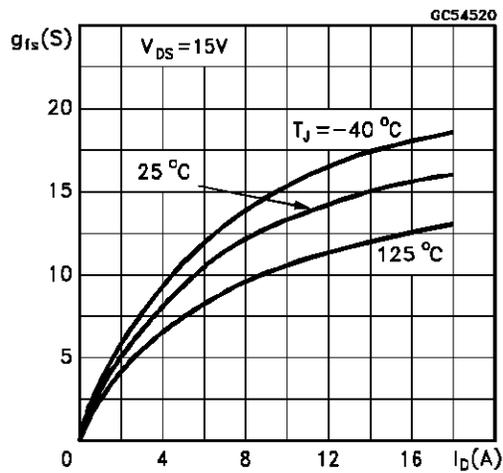

Static Drain-source On Resistance
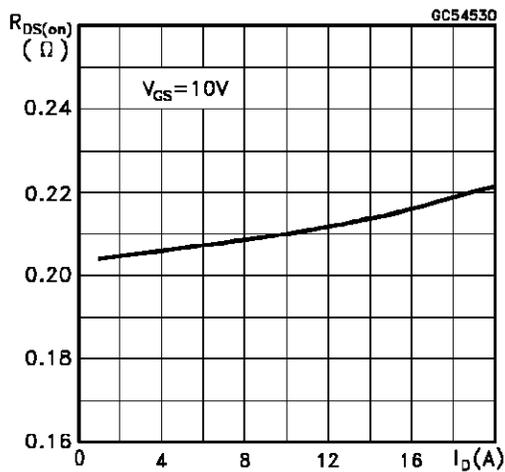
Gate Charge vs Gate-source Voltage

SGS-THOMSON
**MICROELECTRONICS**
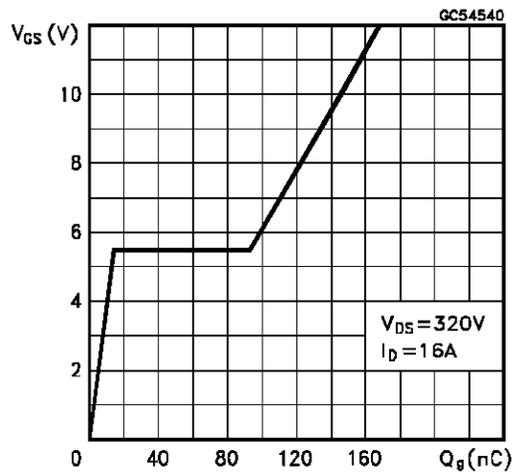
Capacitance Variations
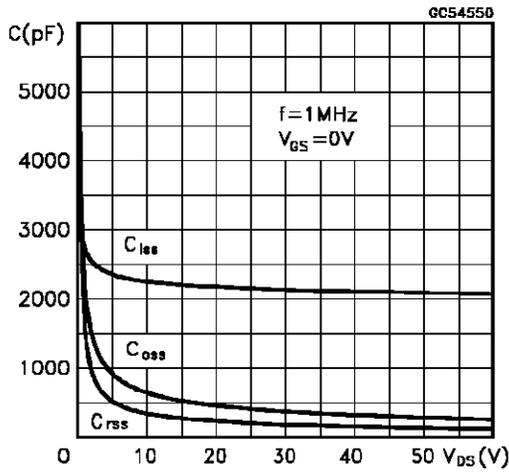
Normalized Gate Threshold Voltage vs Temperature
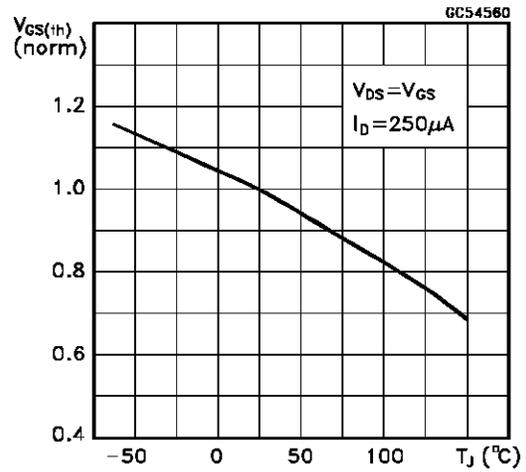
Normalized On Resistance vs Temperature
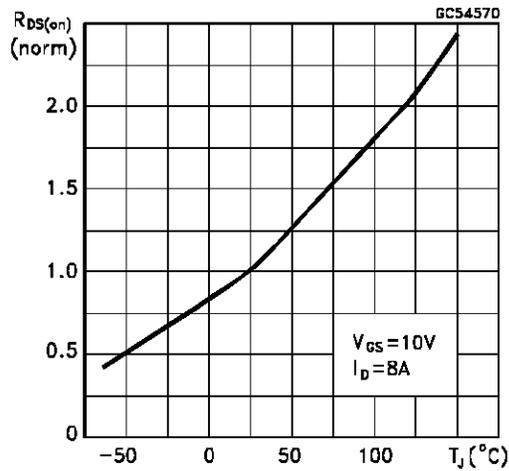
Turn-on Current Slope
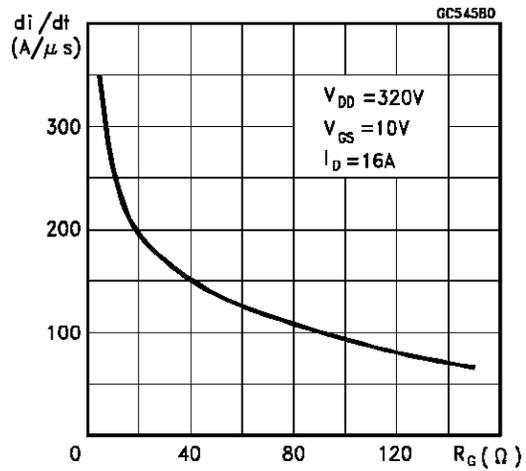
Turn-off Drain-source Voltage Slope


Cross-over Time

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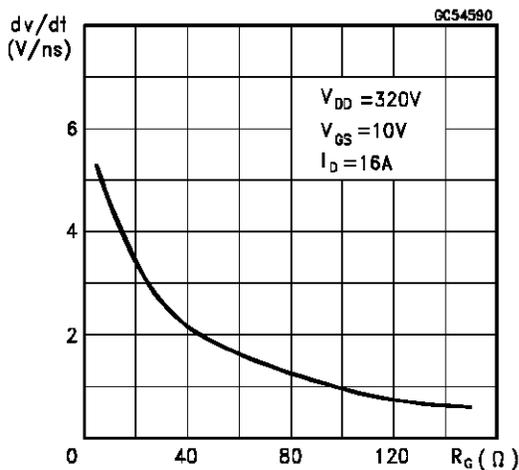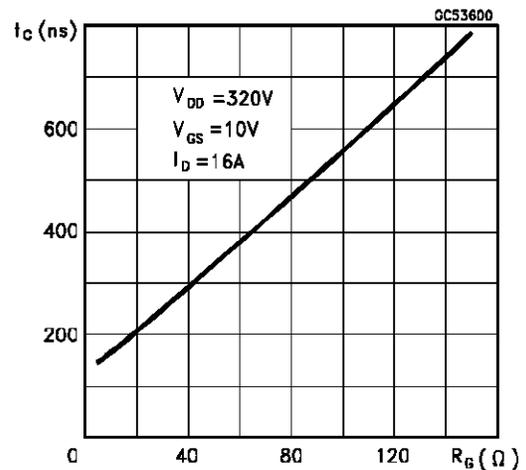
Switching Safe Operating Area
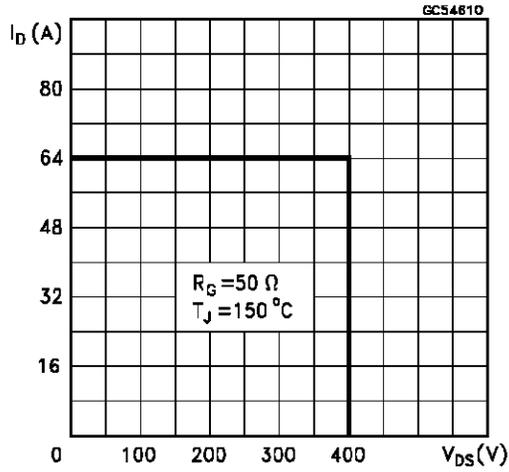
Accidental Overload Area
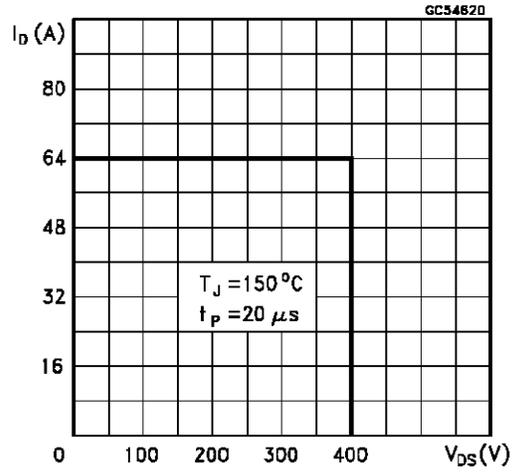
Source-drain Diode Forward Characteristics
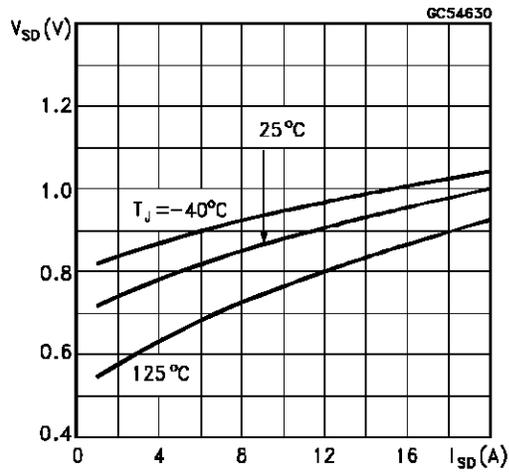
Fig. 1: Unclamped Inductive Load Test Circuits


Fig. 2: Unclamped Inductive Waveforms

SGS-THOMSON
MICROELECTRONICS
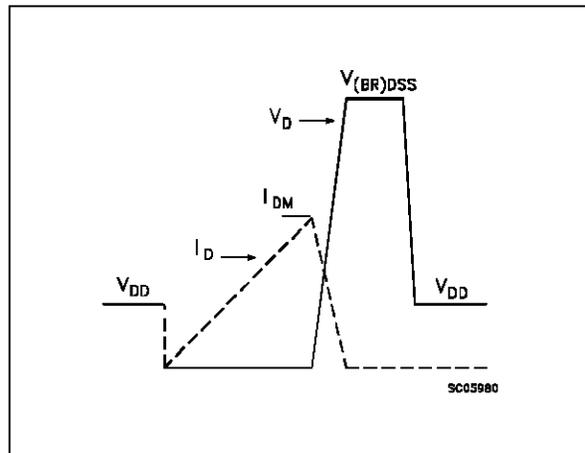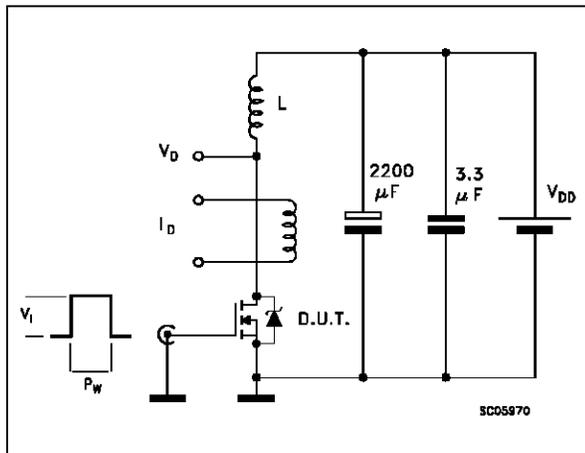
Fig. 3: Switching Times Test Circuits For Resistive Load
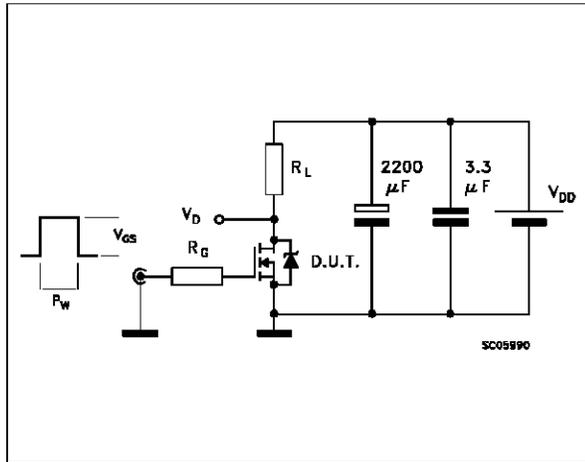
Fig. 4: Gate Charge Test Circuit
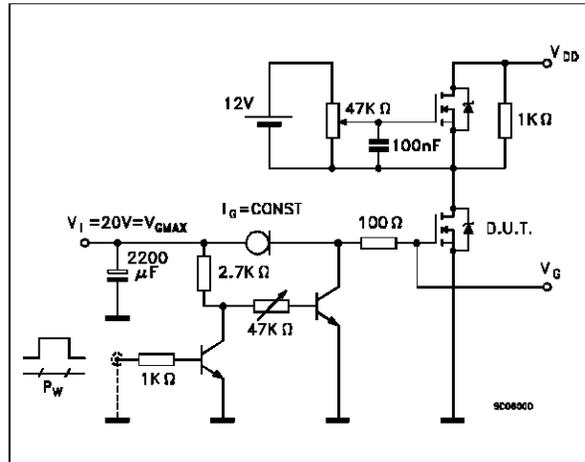
Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times

SGS-THOMSON
MICROELECTRONICS
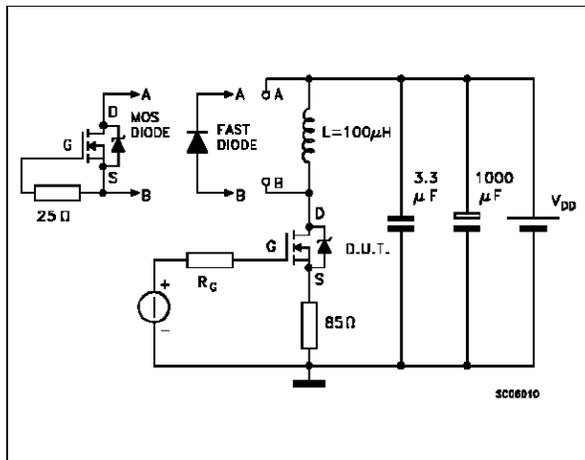
TO-247 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.7		5.3	0.185		0.208
A1			2.87			0.113
A2	1.5		2.5	0.059		0.098
b	1		1.4	0.039		0.055
b1			2.25			0.088
b2	3.05		3.43	0.120		0.135
C	0.4		0.8	0.015		0.031
D	20.4		21.18	0.803		0.833
e	5.43		5.47	0.213		0.215
E	15.3		15.95	0.602		0.628
L	15.57			0.613		
L1	3.7		4.3	0.145		0.169
Q	5.3		5.84	0.208		0.230
ØP	3.5		3.71	0.137		0.146

SGS-THOMSON
MICROELECTRONICS

SGS-THOMSON
MICROELECTRONICS