



# STW14NC50

## N-CHANNEL 500V - 0.31Ω - 14A TO-247

### PowerMesh™II MOSFET

TYPE	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STW14NC50	500V	< 0.38Ω	14 A

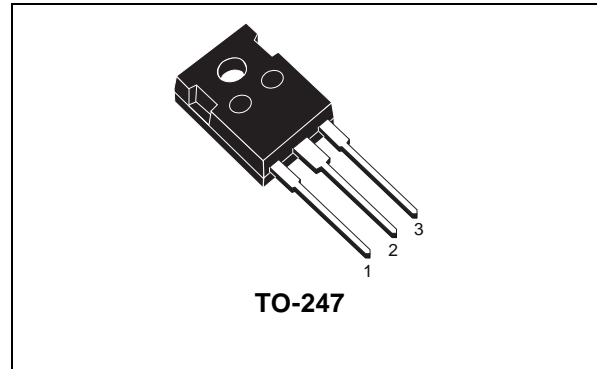
- TYPICAL R<sub>DS(on)</sub> = 0.31Ω
- EXTREMELY HIGH dv/dt CAPABILITY
- 100% AVALANCHE TESTED
- NEW HIGH VOLTAGE BENCHMARK
- GATE CHARGE MINIMIZED

#### DESCRIPTION

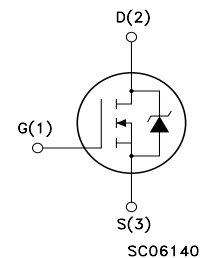
The PowerMESH™II is the evolution of the first generation of MESH OVERLAY™. The layout refinements introduced greatly improve the Ron\*area figure of merit while keeping the device at the leading edge for what concerns switching speed, gate charge and ruggedness.

#### APPLICATIONS

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



#### INTERNAL SCHEMATIC DIAGRAM



#### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V <sub>DS</sub>	Drain-source Voltage (V <sub>GS</sub> = 0)	500	V
V <sub>DGR</sub>	Drain-gate Voltage (R <sub>GS</sub> = 20 kΩ)	500	V
V <sub>GS</sub>	Gate- source Voltage	±30	V
I <sub>D</sub>	Drain Current (continuous) at T <sub>C</sub> = 25°C	14	A
I <sub>D</sub>	Drain Current (continuous) at T <sub>C</sub> = 100°C	8.7	A
I <sub>DM</sub> (●)	Drain Current (pulsed)	56	A
P <sub>TOT</sub>	Total Dissipation at T <sub>C</sub> = 25°C	190	W
	Derating Factor	1.5	W/°C
dv/dt(1)	Peak Diode Recovery voltage slope	3.5	V/ns
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

(1)I<sub>SD</sub> ≤ 14A, di/dt ≤ 100A/μs, V<sub>DD</sub> ≤ V<sub>(BR)DSS</sub>, T<sub>j</sub> ≤ T<sub>JMAX</sub>.

**STW14NC50****THERMAL DATA**

Rthj-case	Thermal Resistance Junction-case Max	0.66	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	30	°C/W
T <sub>I</sub>	Maximum Lead Temperature For Soldering Purpose	300	°C

**AVALANCHE CHARACTERISTICS**

Symbol	Parameter	Max Value	Unit
I <sub>AR</sub>	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T <sub>j</sub> max)	14	A
E <sub>AS</sub>	Single Pulse Avalanche Energy (starting T <sub>j</sub> = 25 °C, I <sub>D</sub> = I <sub>AR</sub> , V <sub>DD</sub> = 50 V)	800	mJ

**ELECTRICAL CHARACTERISTICS (TCASE = 25 °C UNLESS OTHERWISE SPECIFIED)**

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V <sub>(BR)DSS</sub>	Drain-source Breakdown Voltage	I <sub>D</sub> = 250 µA, V <sub>GS</sub> = 0	500			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current (V <sub>GS</sub> = 0)	V <sub>DS</sub> = Max Rating V <sub>DS</sub> = Max Rating, T <sub>C</sub> = 125 °C			1 50	µA µA
I <sub>GSS</sub>	Gate-body Leakage Current (V <sub>DS</sub> = 0)	V <sub>GS</sub> = ±30V			±100	nA

ON (1)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 µA	2	3	4	V
R <sub>DS(on)</sub>	Static Drain-source On Resistance	V <sub>GS</sub> = 10V, I <sub>D</sub> = 7A		0.31	0.38	Ω

**DYNAMIC**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g <sub>fs</sub>	Forward Transconductance	V <sub>DS</sub> > I <sub>D(on)</sub> × R <sub>DS(on)max</sub> , I <sub>D</sub> = 7A		13		S
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 25V, f = 1 MHz, V <sub>GS</sub> = 0		2000		pF
C <sub>oss</sub>	Output Capacitance			300		pF
C <sub>rss</sub>	Reverse Transfer Capacitance			43		pF

**STW14NC50****ELECTRICAL CHARACTERISTICS (CONTINUED)****SWITCHING ON**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	$V_{DD} = 250V, I_D = 7A$ $R_G = 4.7\Omega, V_{GS} = 10V$		20		ns
$t_r$	Rise Time	(see test circuit, Figure 3)		23		ns
$Q_g$	Total Gate Charge	$V_{DD} = 400V, I_D = 14A,$ $V_{GS} = 10V, R_G = 4.7\Omega$		75	90	nC
$Q_{gs}$	Gate-Source Charge			10		nC
$Q_{gd}$	Gate-Drain Charge			38		nC

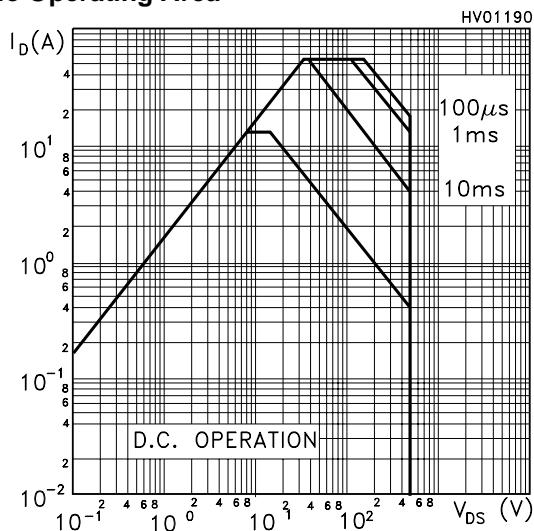
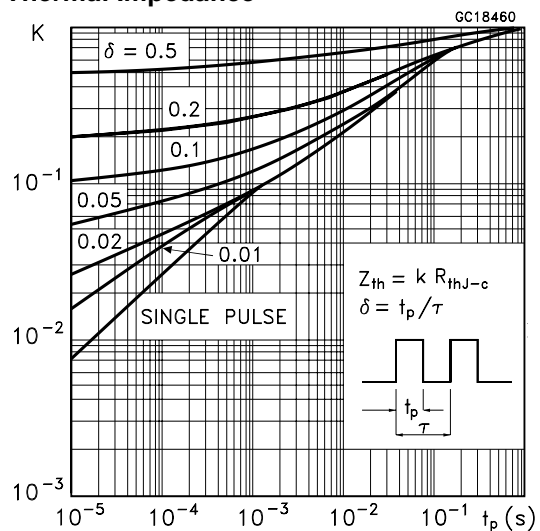
**SWITCHING OFF**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$	Off-voltage Rise Time	$V_{DD} = 400V, I_D = 14A,$ $R_G = 4.7\Omega, V_{GS} = 10V$		25		ns
$t_f$	Fall Time	(see test circuit, Figure 5)		30		ns
$t_c$	Cross-over Time			62		ns

**SOURCE DRAIN DIODE**

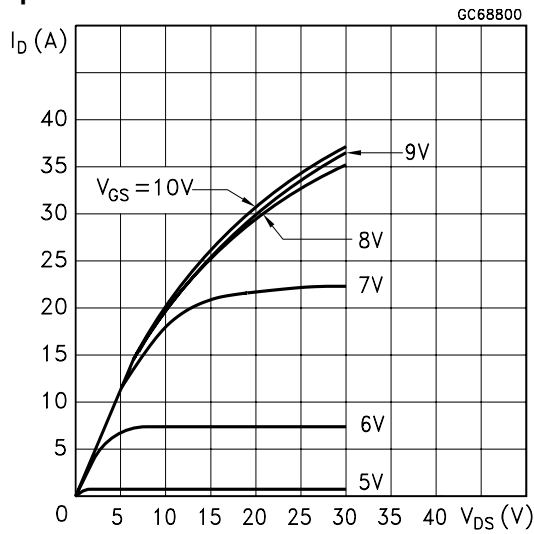
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain Current				14	A
$I_{SDM(2)}$	Source-drain Current (pulsed)				56	A
$V_{SD(1)}$	Forward On Voltage	$I_{SD} = 14A, V_{GS} = 0$			1.6	V
$t_{rr}$	Reverse Recovery Time	$I_{SD} = 14A, di/dt = 100A/\mu s,$ $V_{DD} = 100V, T_j = 150^\circ C$		670		ns
$Q_{rr}$	Reverse Recovery Charge	(see test circuit, Figure 5)		6.7		$\mu C$
$I_{RRM}$	Reverse Recovery Current			20		A

Note: 1. Pulsed: Pulse duration = 300  $\mu s$ , duty cycle 1.5 %.  
2. Pulse width limited by safe operating area.

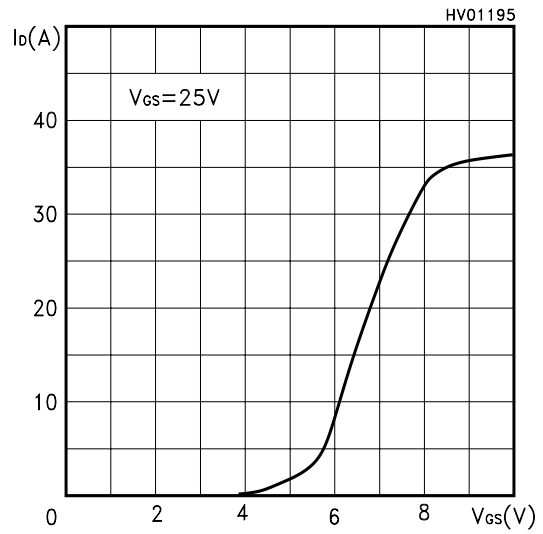
**Safe Operating Area****Thermal Impedance**

# STW14NC50

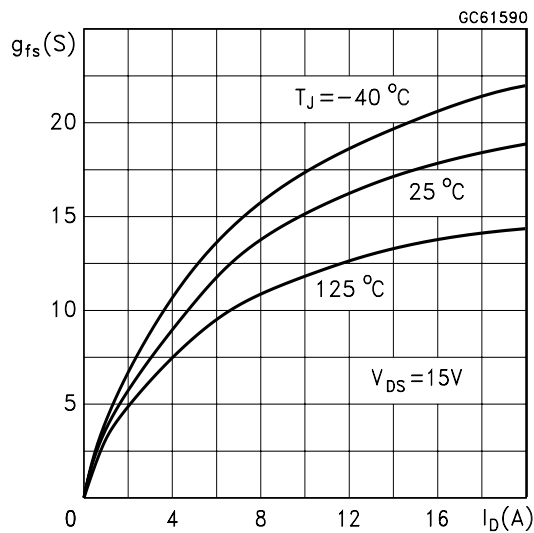
## Output Characteristics



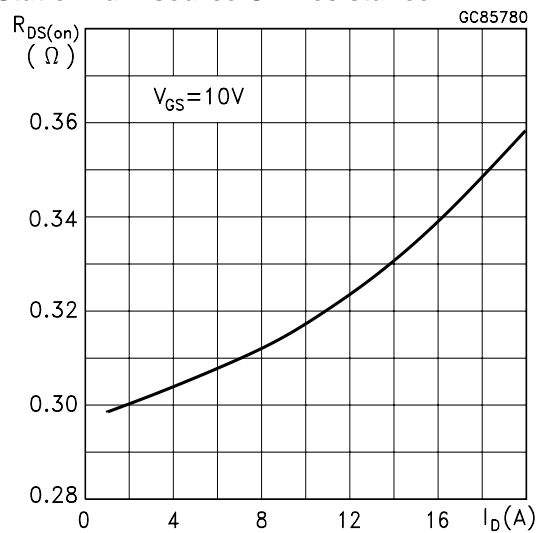
## Transfer Characteristics



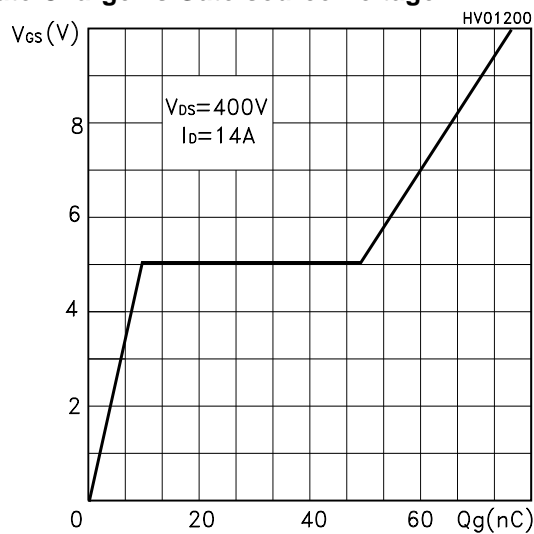
## Transconductance



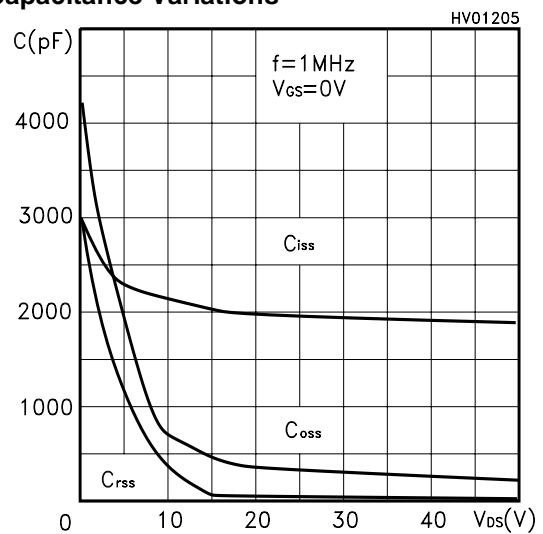
## Static Drain-source On Resistance



## Gate Charge vs Gate-source Voltage

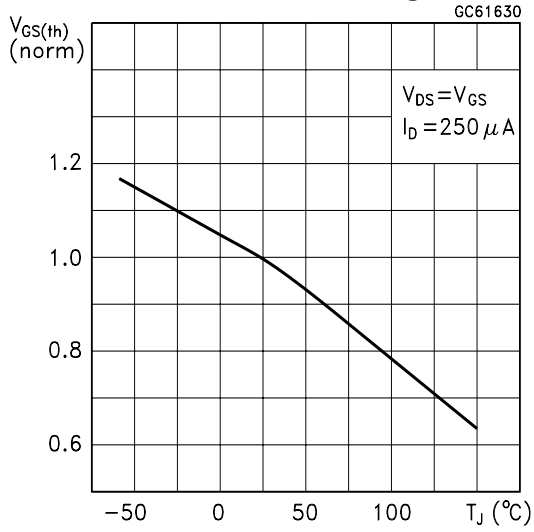


## Capacitance Variations

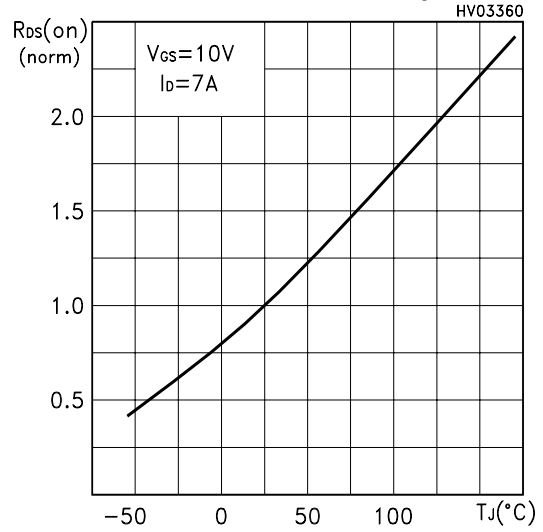


## STW14NC50

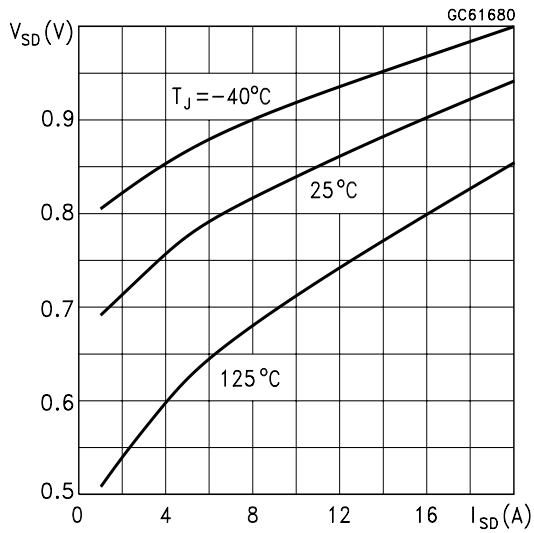
**Normalized Gate Threshold Voltage vs Temp.**



**Normalized On Resistance vs Temperature**

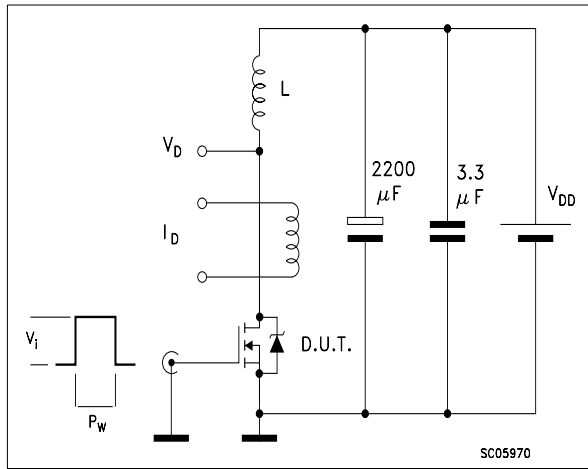


**Source-drain Diode Forward Characteristics**

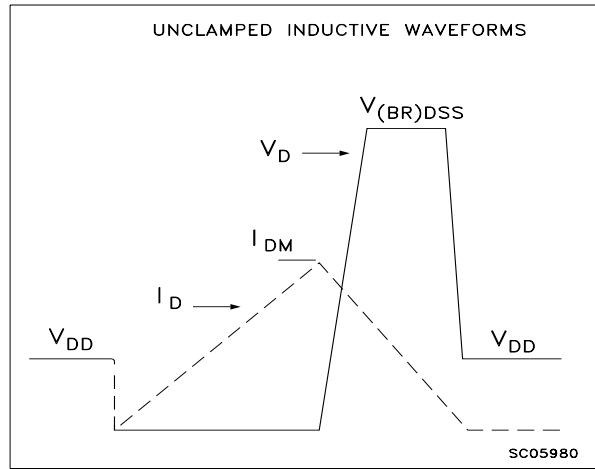


**STW14NC50**

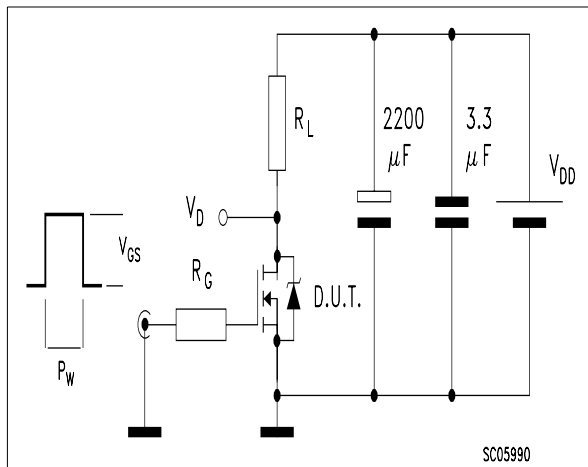
**Fig. 1: Unclamped Inductive Load Test Circuit**



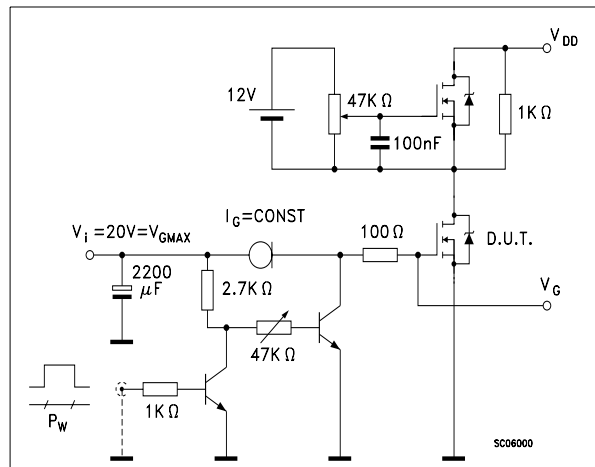
**Fig. 2: Unclamped Inductive Waveform**



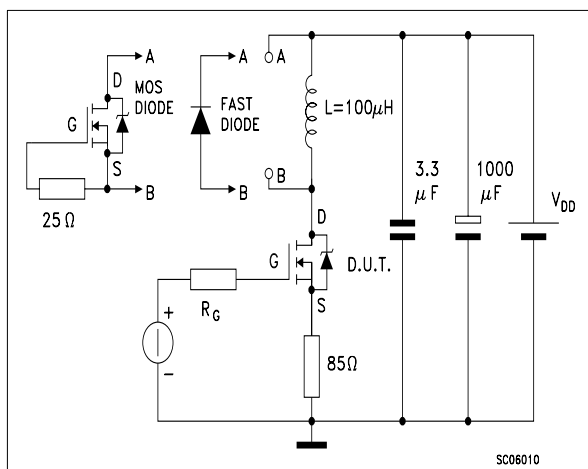
**Fig. 3: Switching Times Test Circuit For Resistive Load**



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



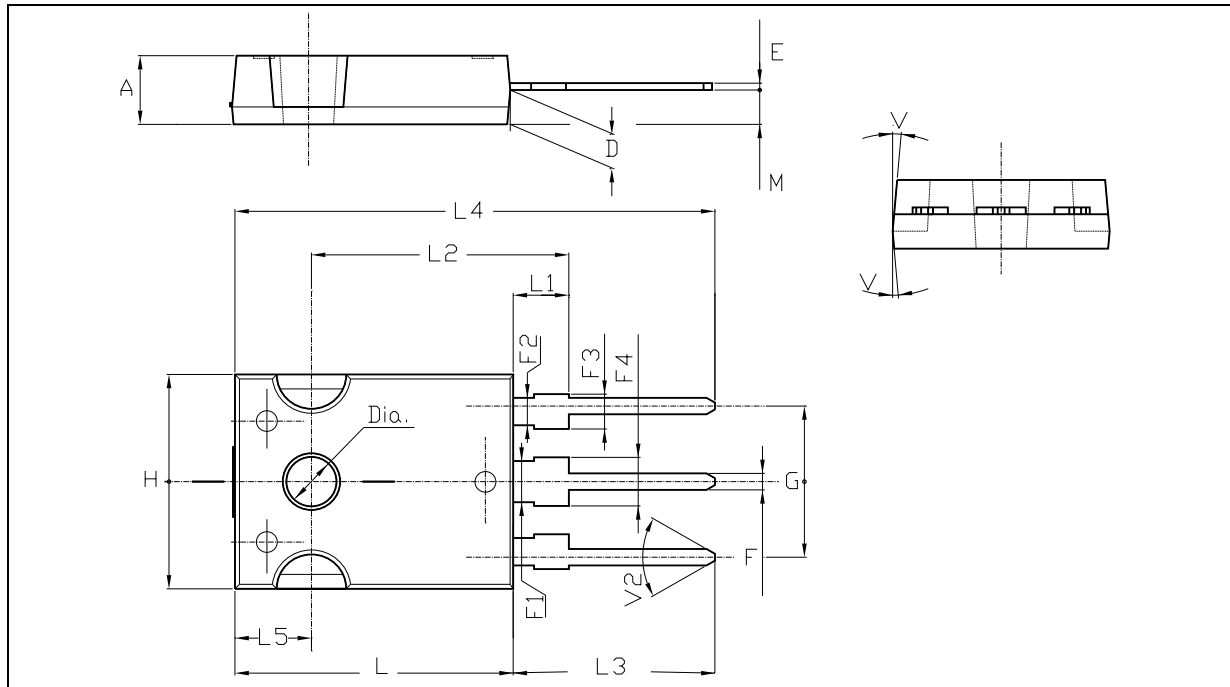
**Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times**



## STW14NC50

## TO-247 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.85		5.15	0.19		0.20
D	2.20		2.60	0.08		0.10
E	0.40		0.80	0.015		0.03
F	1		1.40	0.04		0.05
F1		3			0.11	
F2		2			0.07	
F3	2		2.40	0.07		0.09
F4	3		3.40	0.11		0.13
G		10.90			0.43	
H	15.45		15.75	0.60		0.62
L	19.85		20.15	0.78		0.79
L1	3.70		4.30	0.14		0.17
L2		18.50			0.72	
L3	14.20		14.80	0.56		0.58
L4		34.60			1.36	
L5		5.50			0.21	
M	2		3	0.07		0.11
V		5°			5°	
V2		60°			60°	
Dia	3.55		3.65	0.14		0.143



## STW14NC50

---

Information furnished is believed to be accurate and reliable. However, STMicroelectronics assumes no responsibility for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of STMicroelectronics. Specification mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied. STMicroelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of STMicroelectronics.

The ST logo is a trademark of STMicroelectronics

© 2000 STMicroelectronics – Printed in Italy – All Rights Reserved

STMicroelectronics GROUP OF COMPANIES

Australia - Brazil - China - Finland - France - Germany - Hong Kong - India - Italy - Japan - Malaysia - Malta - Morocco -  
Singapore - Spain - Sweden - Switzerland - United Kingdom - U.S.A.

<http://www.st.com>