



# STV40NE03L-20

## N - CHANNEL 30V - 0.014Ω - 40A - PowerSO-10 STripFET™ MOSFET

TYPE	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STV40NE03L-20	30 V	< 0.020 Ω	40 A

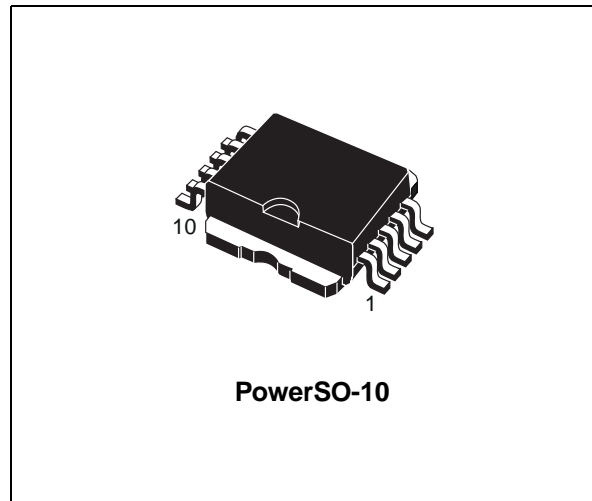
- TYPICAL R<sub>DS(on)</sub> = 0.014 Ω
- EXCEPTIONAL dv/dt CAPABILITY
- LOW GATE CHARGE A 100 °C
- APPLICATION ORIENTED CHARACTERIZATION

### DESCRIPTION

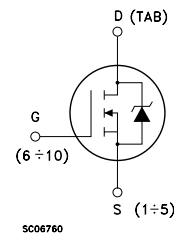
This Power MOSFET is the latest development of STMicroelectronics unique "Single Feature Size™" strip-based process. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalanche characteristics and less critical alignment steps therefore a remarkable manufacturing reproducibility.

### APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- DC-DC & DC-AC CONVERTERS IN HIGH PERFORMANCE VRMs
- AUTOMOTIVE ENVIRONMENT (INJECTION, ABS, AIR-BAG, LAMPDRIVERS, Etc.)



### INTERNAL SCHEMATIC DIAGRAM



### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V <sub>DS</sub>	Drain-source Voltage (V <sub>GS</sub> = 0)	30	V
V <sub>DGR</sub>	Drain- gate Voltage (R <sub>GS</sub> = 20 kΩ)	30	V
V <sub>GS</sub>	Gate-source Voltage	± 20	V
I <sub>D</sub>	Drain Current (continuous) at T <sub>c</sub> = 25 °C	40	A
I <sub>D</sub>	Drain Current (continuous) at T <sub>c</sub> = 100 °C	28	A
I <sub>DM</sub> (•)	Drain Current (pulsed)	160	A
P <sub>tot</sub>	Total Dissipation at T <sub>c</sub> = 25 °C	80	W
	Derating Factor	0.53	W/°C
dv/dt(1)	Peak Diode Recovery voltage slope	7	V/ns
T <sub>stg</sub>	Storage Temperature	-65 to 175	°C
T <sub>j</sub>	Max. Operating Junction Temperature	175	°C

(•) Pulse width limited by safe operating area

(1) I<sub>SD</sub> ≤ 40 A, di/dt ≤ 300 A/μs, V<sub>DD</sub> ≤ V<sub>(BR)DSS</sub>, T<sub>j</sub> ≤ T<sub>JMAX</sub>

## STV40NE03L-20

### THERMAL DATA

R <sub>thj-case</sub>	Thermal Resistance Junction-case	Max	1.88	°C/W
R <sub>thj-amb</sub>	Thermal Resistance Junction-ambient	Max	62.5	°C/W
R <sub>thc-sink</sub>	Thermal Resistance Case-sink	Typ	0.5	°C/W
T <sub>J</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, δ < 1%)	40	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> = 15V)	200	mJ

### ELECTRICAL CHARACTERISTICS (T<sub>J</sub> = -40 to 150 °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 T <sub>C</sub> = 25 °C I <sub>D</sub> = 250 μA V <sub>GS</sub> = 0	30 27			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current (V <sub>GS</sub> = 0)	V <sub>DS</sub> = Max Rating T <sub>C</sub> = 25 °C V <sub>DS</sub> = Max Rating			1 50	μA μA
I <sub>GSS</sub>	Gate-body Leakage Current (V <sub>DS</sub> = 0)	V <sub>GS</sub> = ± 20 V			± 100	nA

ON (\*)

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 T <sub>C</sub> = 25 °C V <sub>DS</sub> = V <sub>GS</sub> I <sub>D</sub> = 250 μA	1 0.6	1.8	2.5 3.0	V V
R <sub>DS(on)</sub>	Static Drain-source On Resistance	V <sub>GS</sub> = 10V I <sub>D</sub> = 20 A T <sub>C</sub> = 25 °C V <sub>GS</sub> = 5V I <sub>D</sub> = 20 A T <sub>C</sub> = 25 °C V <sub>GS</sub> = 10V I <sub>D</sub> = 20 A V <sub>GS</sub> = 5V I <sub>D</sub> = 20 A		0.014	0.02 0.023 0.04 0.046	Ω Ω Ω Ω
I <sub>D(on)</sub>	On State Drain Current	V <sub>DS</sub> > I <sub>D(on)</sub> × R <sub>DS(on)max</sub> V <sub>GS</sub> = 10 V	20			A

### 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> = 20 A	10			S
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 25 V f = 1 MHz V <sub>GS</sub> = 0		1850	2400	pF
C <sub>oss</sub>	Output Capacitance			450	590	pF
C <sub>rss</sub>	Reverse Transfer Capacitance			160	210	pF

**ELECTRICAL CHARACTERISTICS** (continued)

**SWITCHING ON**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Time	$V_{DD} = 15\text{ V}$ $I_D = 20\text{ A}$		25	33	ns
$t_r$	Rise Time	$R_G = 4.7\ \Omega$ $V_{GS} = 5\text{ V}$		160	210	ns
$Q_g$	Total Gate Charge	$V_{DD} = 24\text{ V}$ $I_D = 40\text{ A}$ $V_{GS} = 5\text{ V}$		29	38	nC
$Q_{gs}$	Gate-Source Charge			12		nC
$Q_{gd}$	Gate-Drain Charge			14		nC

**SWITCHING OFF**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(off)}$	Off-voltage Rise Time	$V_{DD} = 24\text{ V}$ $I_D = 40\text{ A}$		25	33	ns
$t_f$	Fall Time	$R_G = 4.7\ \Omega$ $V_{GS} = 5\text{ V}$		120	160	ns
$t_c$	Cross-over Time			155	210	ns

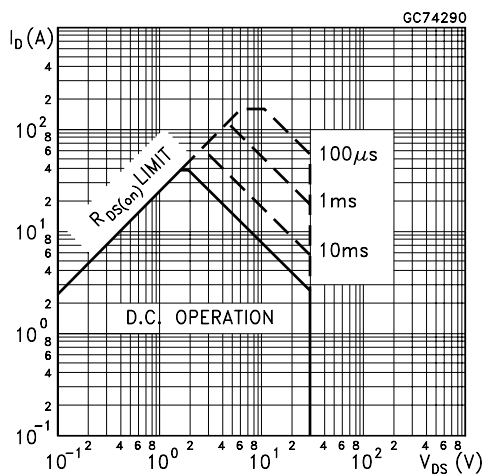
**SOURCE DRAIN DIODE**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain Current				40	A
$I_{SDM}(\bullet)$	Source-drain Current (pulsed)				160	A
$V_{SD} (*)$	Forward On Voltage	$I_{SD} = 40\text{ A}$ $V_{GS} = 0$			1.5	V
$t_{rr}$	Reverse Recovery Time	$I_{SD} = 40\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 20\text{ V}$ $T_j = 150\text{ }^\circ\text{C}$		50		ns
$Q_{rr}$	Reverse Recovery Charge			0.9		$\mu\text{C}$
$I_{RRM}$	Reverse Recovery Current			3.5		A

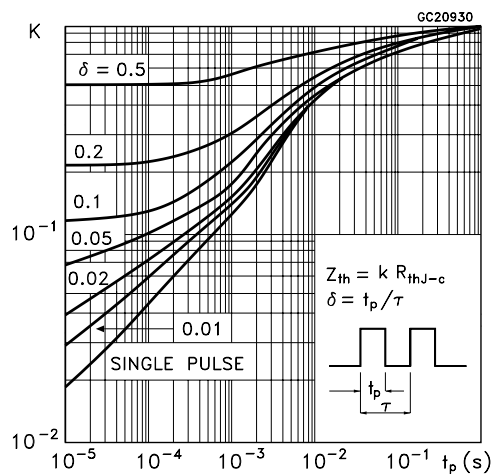
(\*) Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %

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

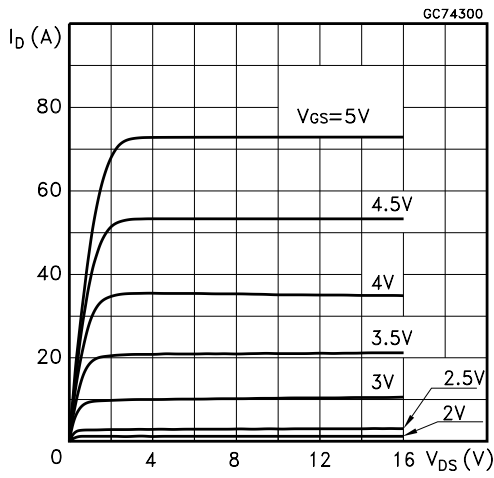
**Safe Operating Area**



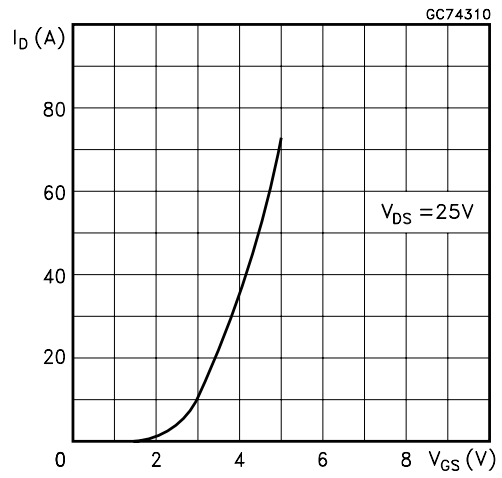
**Thermal Impedance**



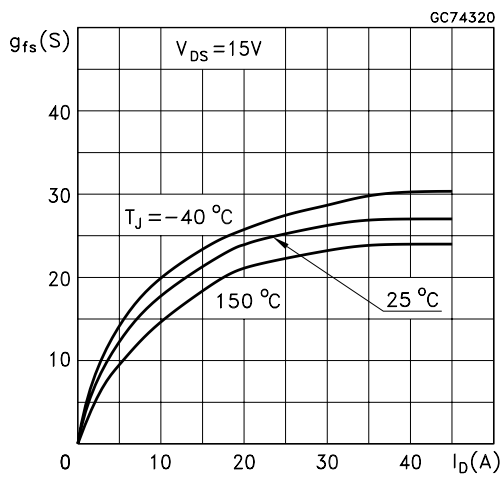
Output Characteristics



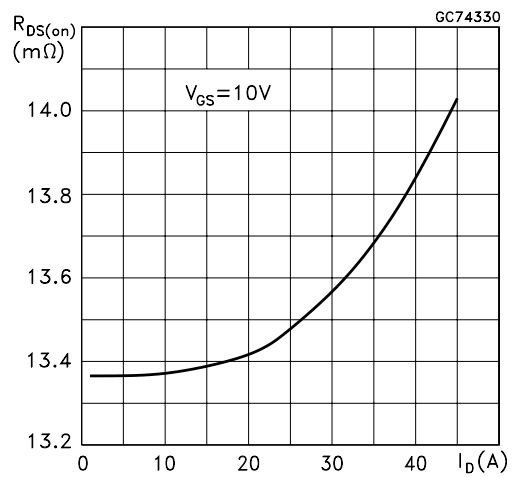
Transfer Characteristics



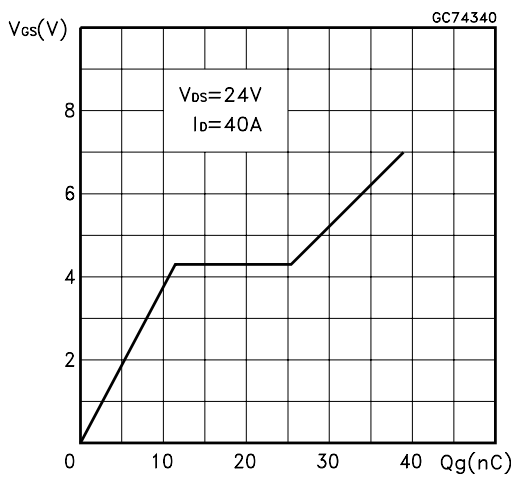
Transconductance



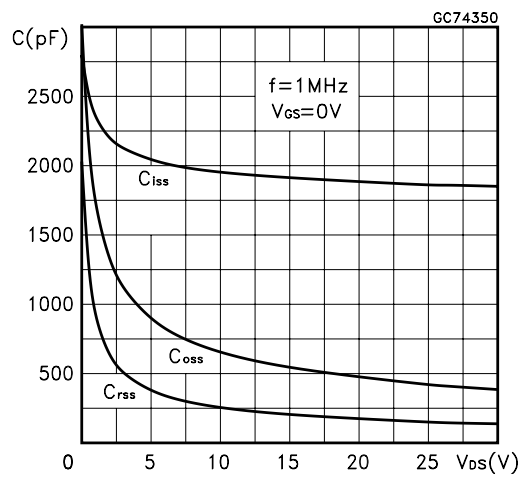
Static Drain-source On Resistance



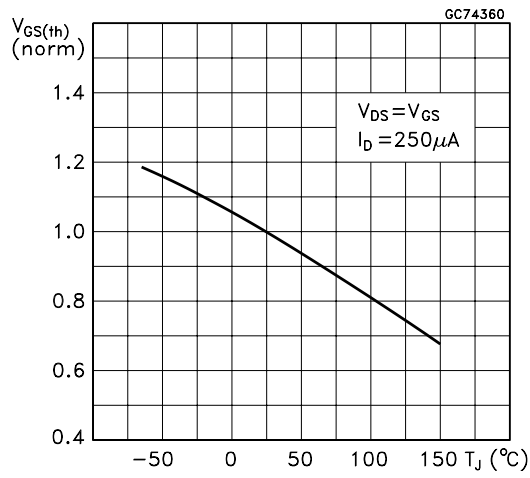
Gate Charge vs Gate-source Voltage



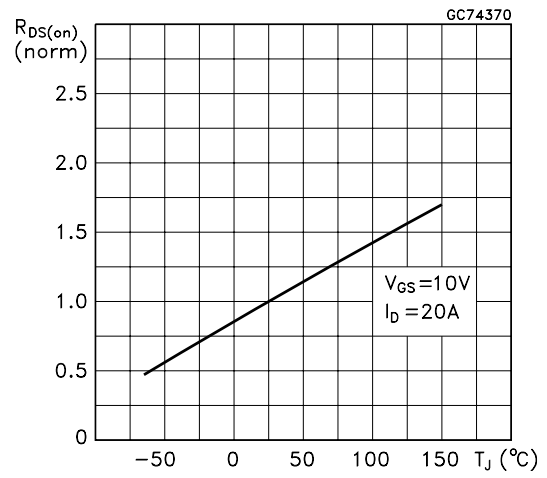
Capacitance Variations



Normalized Gate Threshold Voltage vs Temperature



Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics

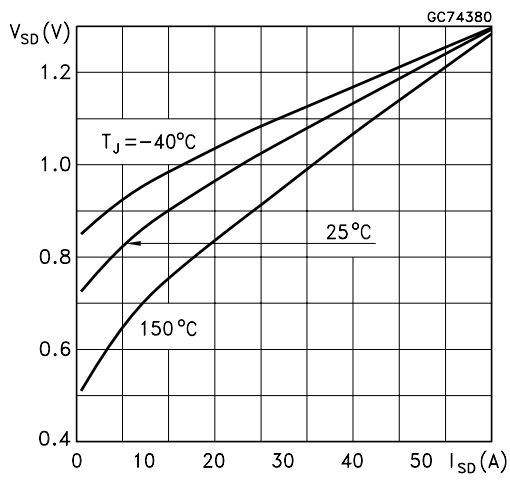


Fig. 1: Unclamped Inductive Load Test Circuit

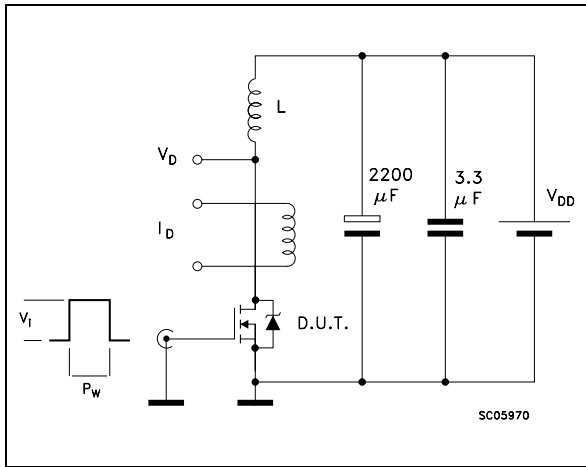


Fig. 2: Unclamped Inductive Waveform

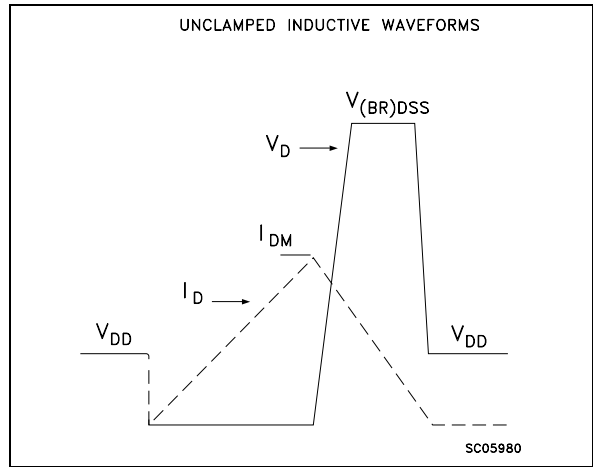


Fig. 3: Switching Times Test Circuits For Resistive Load

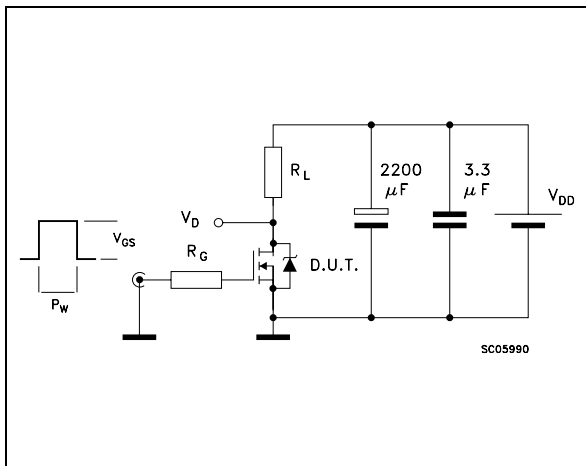


Fig. 4: Gate Charge test Circuit

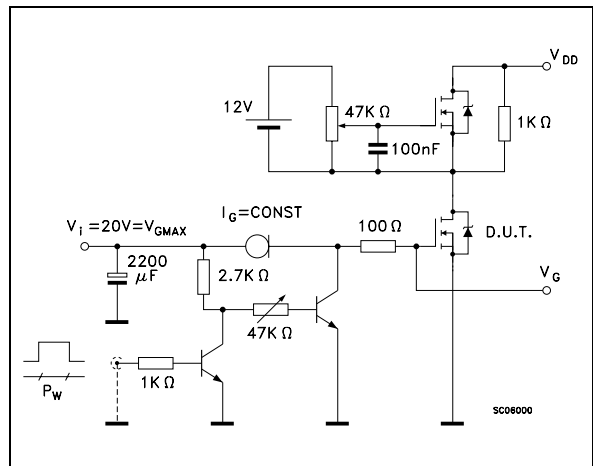
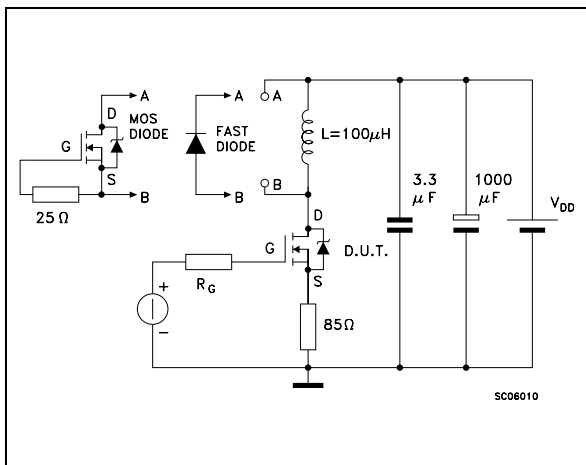
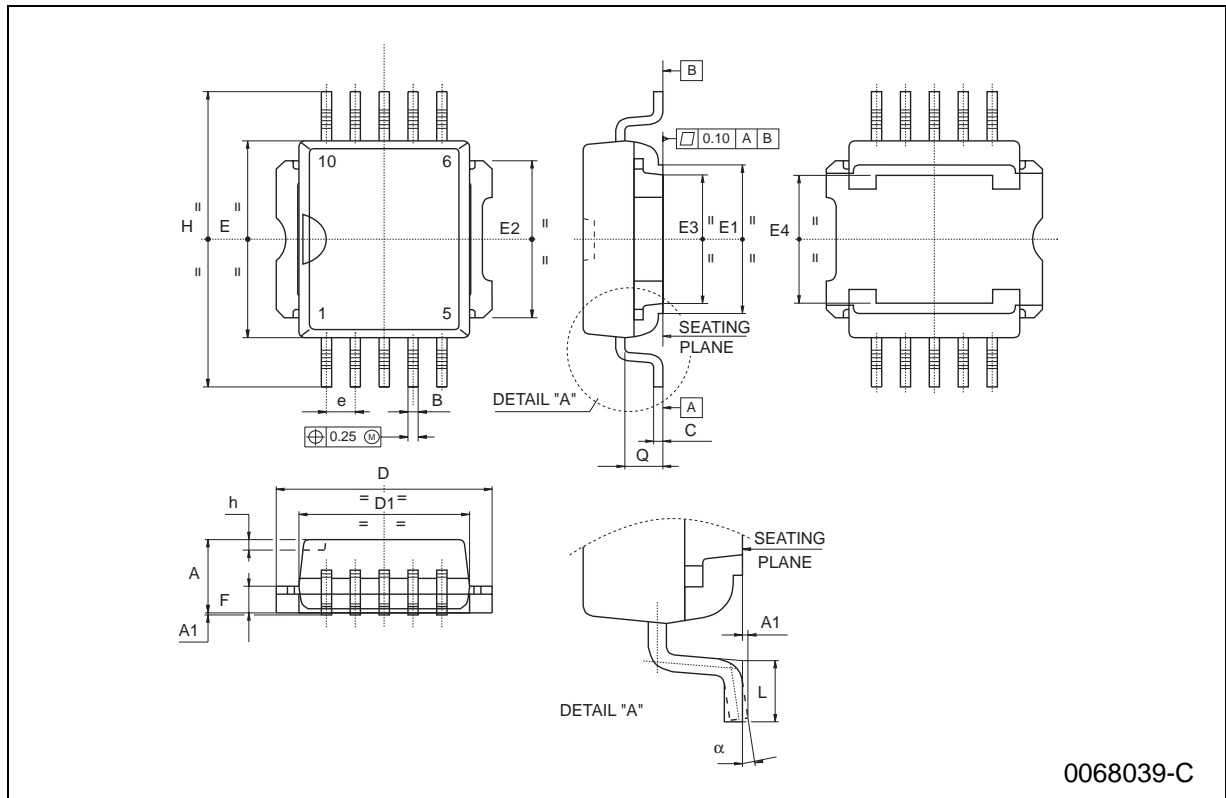


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



**PowerSO-10 MECHANICAL DATA**

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	3.35		3.65	0.132		0.144
A1	0.00		0.10	0.000		0.004
B	0.40		0.60	0.016		0.024
c	0.35		0.55	0.013		0.022
D	9.40		9.60	0.370		0.378
D1	7.40		7.60	0.291		0.300
E	9.30		9.50	0.366		0.374
E1	7.20		7.40	0.283		0.291
E2	7.20		7.60	0.283		0.300
E3	6.10		6.35	0.240		0.250
E4	5.90		6.10	0.232		0.240
e		1.27			0.050	
F	1.25		1.35	0.049		0.053
H	13.80		14.40	0.543		0.567
h		0.50			0.002	
L	1.20		1.80	0.047		0.071
q		1.70			0.067	
$\alpha$	0°		8°			



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>