



# STV160NF02L

## N-CHANNEL 20V - 0.0016Ω - 160A PowerSO-10 STripFET™ II POWER MOSFET

TYPE	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STV160NF02L	20 V	< 0.0025 Ω	160 A

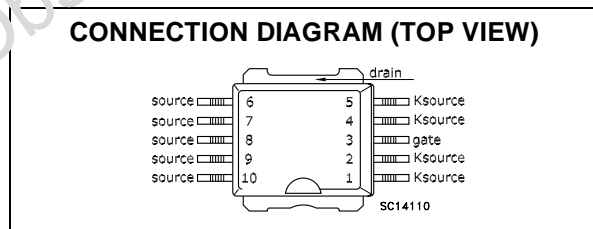
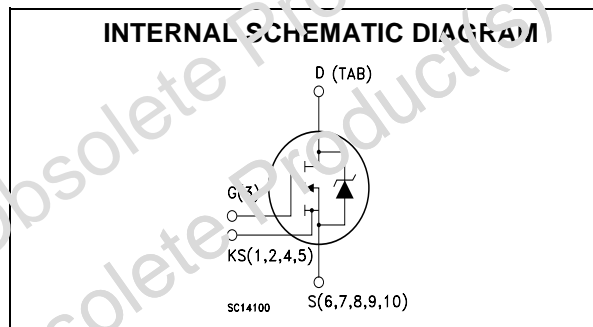
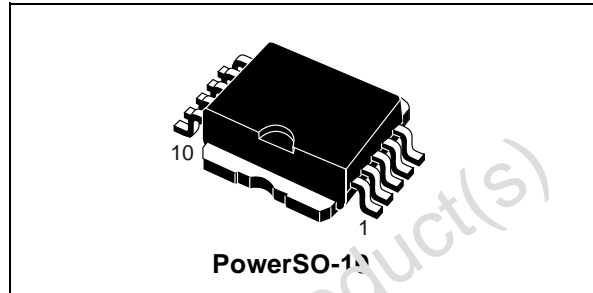
- TYPICAL R<sub>DS(on)</sub> = 0.0016 Ω
- LOW THRESHOLD DRIVE
- ULTRA LOW ON-RESISTANCE
- ULTRA FAST SWITCHING
- 100% AVALANCHE TESTED
- VERY LOW GATE CHARGE
- LOW PROFILE, VERY LOW PARASITIC INDUCTANCE PowerSO-10 PACKAGE

### DESCRIPTION

The **STV160NF02L** represents the second generation of Application Specific STMicroelectronics well established STripFET™ process based on a very unique strip layout design. The resulting MOSFET shows unrivalled high packing density with ultra low on-resistance and superior switching characteristics. Process simplification also translates into improved manufacturing reproducibility. This device is particularly suitable for high current, low voltage switching application where efficiency is crucial

### APPLICATIONS

- BUCK CONVERTERS IN HIGH PERFORMANCE TELECOM AND VRMs DC-DC CONVERTERS



### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V <sub>DS</sub>	Drain-source Voltage (V <sub>GS</sub> = 0)	20	V
V <sub>DGR</sub>	Drain-gate Voltage (R <sub>GS</sub> = 20 kΩ)	20	V
V <sub>GS</sub>	Gate- source Voltage	± 15	V
I <sub>D</sub> (**)	Drain Current (continuous) at T <sub>C</sub> = 25°C	160	A
I <sub>D</sub>	Drain Current (continuous) at T <sub>C</sub> = 100°C	113	A
I <sub>DM</sub> (●)	Drain Current (pulsed)	640	A
P <sub>TOT</sub>	Total Dissipation at T <sub>C</sub> = 25°C	210	W
	Derating Factor	1.4	W/°C
E <sub>AS</sub> (1)	Single Pulse Avalanche Energy	1.5	J
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) Starting T<sub>j</sub> = 25°C, I<sub>D</sub> = 80A, V<sub>DD</sub> = 20V

(\*\*) Limited only maximum junction temperature allowed by PowerSO-10

## STV160NF02L

### THERMAL DATA

Rthj-case	Thermal Resistance Junction-case Max	0.71	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	50	°C/W
T <sub>l</sub>	Maximum Lead Temperature For Soldering Purpose	300	°C

### 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	20			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 10	μA μA
I <sub>GSS</sub>	Gate-body Leakage Current (V <sub>DS</sub> = 0)	V <sub>GS</sub> = ± 15 V			±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> = 250μA	1			V
R <sub>DS(on)</sub>	Static Drain-source On Resistance	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 80 A V <sub>GS</sub> = 10 V, I <sub>D</sub> = 45 A V <sub>GS</sub> = 10 V, I <sub>D</sub> = 20 A V <sub>GS</sub> = 8 V, I <sub>D</sub> = 80 A V <sub>GS</sub> = 5 V, I <sub>D</sub> = 40 A V <sub>GS</sub> = 10 V, I <sub>D</sub> =80 A; T <sub>j</sub> = 175 °C V <sub>GS</sub> = 8 V, I <sub>D</sub> =80 A; T <sub>j</sub> = 175 °C V <sub>GS</sub> = 5 V, I <sub>D</sub> =40 A; T <sub>j</sub> = 175 °C	1.35	1.6 1.56 1.7 3.5	2.5 2.5 2.5 3.5 6 5.7 7 11.4	mΩ mΩ mΩ mΩ mΩ mΩ mΩ mΩ
I <sub>D(on)</sub>	On State Drain Current	V <sub>DS</sub> > I <sub>D(on)</sub> × R <sub>DS(on)</sub> max, V <sub>GS</sub> = 10V	160			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
α <sub>fs</sub> (1)	Forward Transconductance	V <sub>DS</sub> > I <sub>D(on)</sub> × R <sub>DS(on)</sub> max, I <sub>D</sub> = 80A		210		S
R <sub>g</sub>	Gate resistance	V <sub>DS</sub> = 0 V, f = 1 MHz, V <sub>GS</sub> = 0		0.5		Ω
C <sub>iss</sub> C <sub>oss</sub> C <sub>rss</sub>	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V <sub>DS</sub> = 15 V, f = 1 MHz, V <sub>GS</sub> = 0		4800 3000 680		pF pF pF
C <sub>iss</sub> C <sub>oss</sub> C <sub>rss</sub>	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V <sub>DS</sub> = 0 V, f = 1 MHz, V <sub>GS</sub> = 0		7000 12300 4200		pF pF pF
L <sub>S</sub>	Internal Source Inductance	From the Lead End (6mm from Package Body) to the Die Center		4		nH
L <sub>D</sub>	Internal Drain Inductance		Not Available on Surface Mounting Package			

**ELECTRICAL CHARACTERISTICS (CONTINUED)**

**SWITCHING ON**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	$V_{DD} = 10\text{ V}$ , $I_D = 80\text{ A}$		28		ns
$t_r$	Rise Time	$R_G = 4.7\Omega$ , $V_{GS} = 10\text{ V}$ (see test circuit, Figure 3)		800		ns
$Q_g$	Total Gate Charge	$V_{DD} = 16\text{ V}$ , $I_D = 160\text{ A}$ ,		115	160	nC
$Q_{gs}$	Gate-Source Charge	$V_{GS} = 10\text{ V}$		15		nC
$Q_{gd}$	Gate-Drain Charge			45		nC

**SWITCHING OFF**

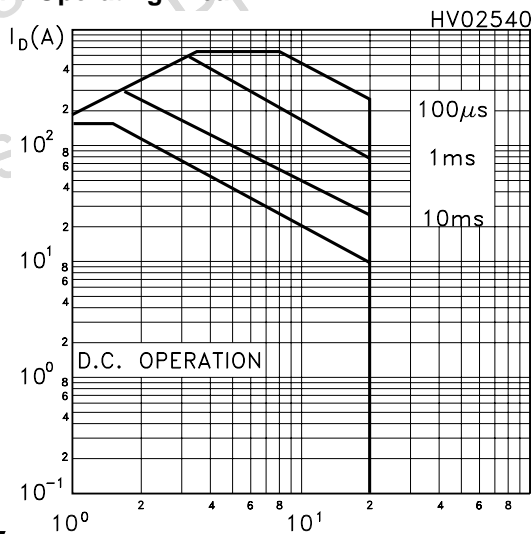
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(off)}$	Turn-off-Delay Time	$V_{DD} = 10\text{ V}$ , $I_D = 80\text{ A}$ ,		80		ns
$t_f$	Fall Time	$R_G = 4.7\Omega$ , $V_{GS} = 10\text{ V}$ (see test circuit, Figure 5)		240		ns
$t_{d(off)}$	Turn-off Delay Time	$V_{clamp} = 16\text{ V}$ , $I_D = 40\text{ A}$		80		ns
$t_{r(Voff)}$	Off-voltage Rise Time	$R_G = 4.7\Omega$ , $V_{GS} = 10\text{ V}$		40		ns
$t_f$	Fall Time			140		ns
$t_c$	Cross-over Time			200		ns

**SOURCE DRAIN DIODE**

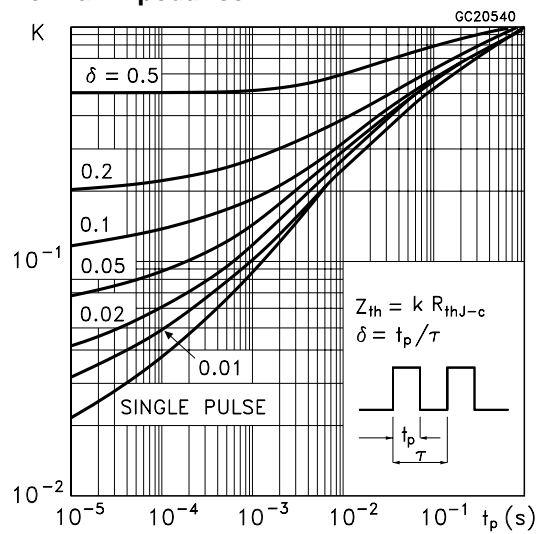
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain Current				160	A
$I_{SDM(1)}$	Source-drain Current (pulsed)				640	A
$V_{SD(2)}$	Forward On Voltage	$I_{SD} = 160\text{ A}$ , $V_{GS} = 0$			1.5	V
$t_{rr}$	Reverse Recovery Time	$I_{SD} = 80\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ ,		90		ns
$Q_{rr}$	Reverse Recovery Charge	$V_{DD} = 15\text{ V}$ , $T_j = 25^\circ\text{C}$		225		nC
$I_{RRM}$	Reverse Recovery Current	(see test circuit, Figure 5)		5		A

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

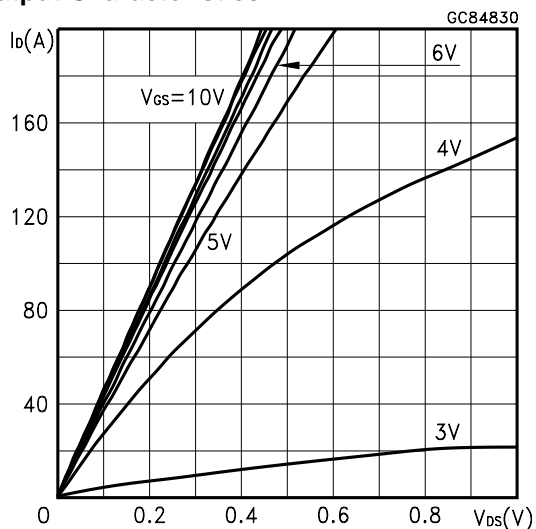
**Safe Operating Area**



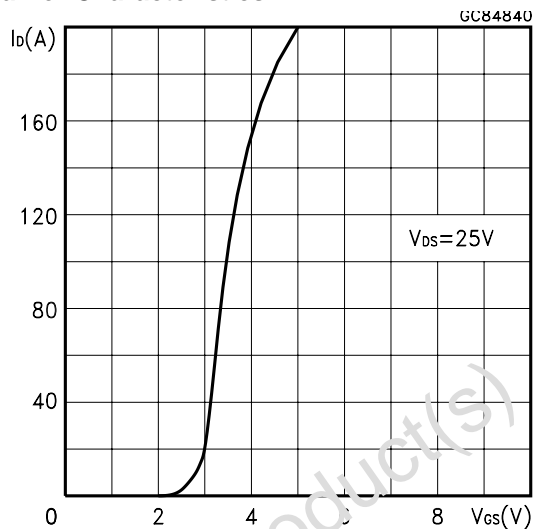
**Thermal Impedance**



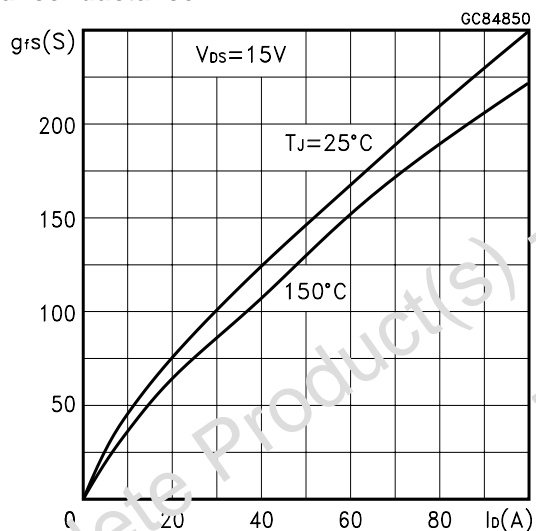
Output Characteristics



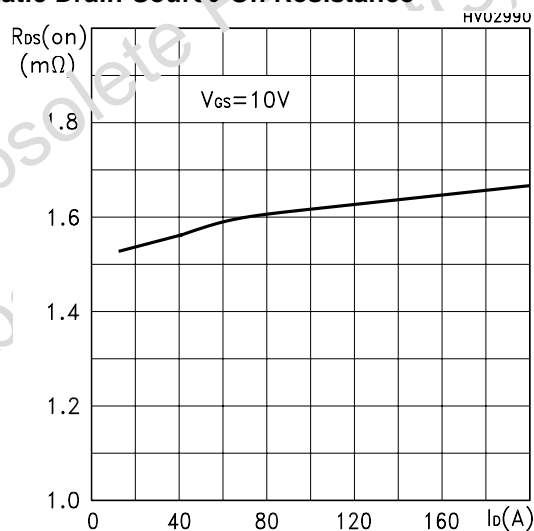
Transfer Characteristics



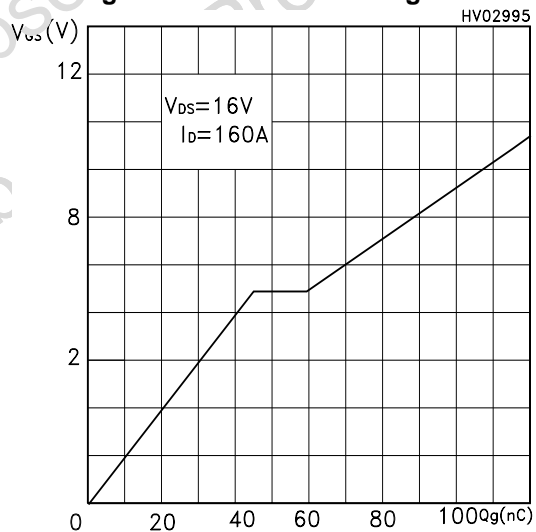
Transconductance



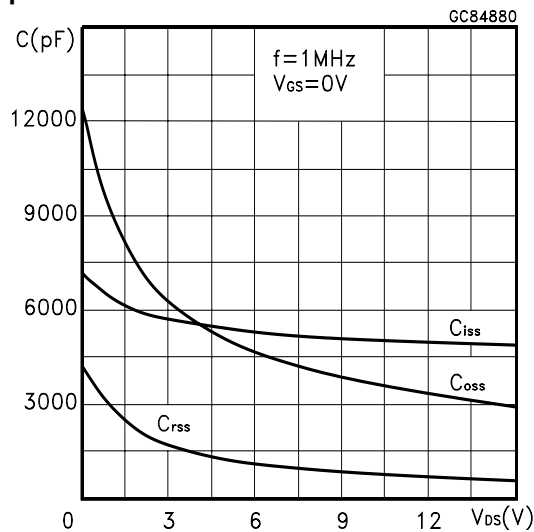
Static Drain-Source On Resistance



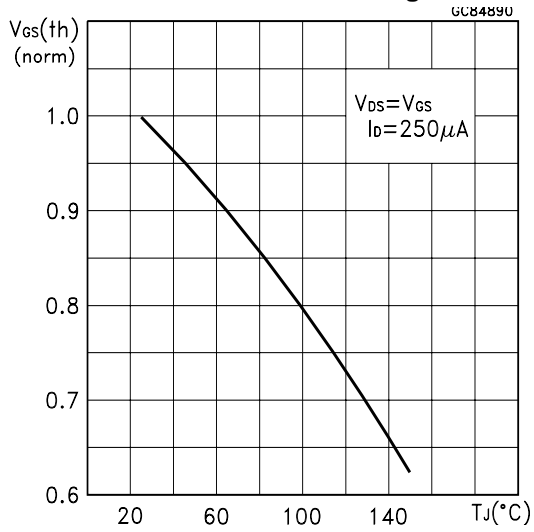
Gate Charge vs Gate-source Voltage



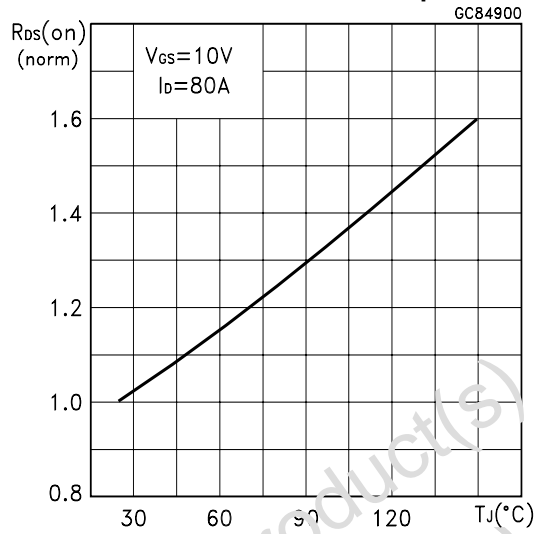
Capacitance Variations



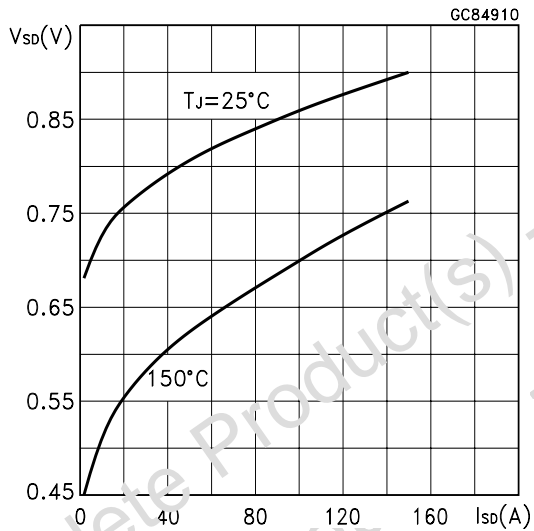
Normalized Gate Threshold Voltage vs Temp.



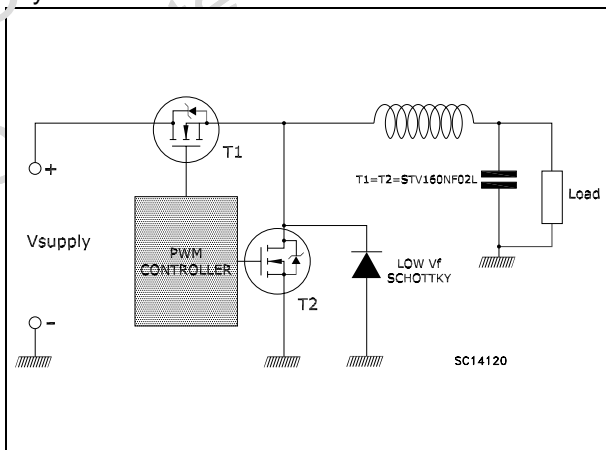
Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics



Basic Schematic For Motherboard VRM With Synchronous Rectification



Basic Schematic Mosfets Switch Used In Secondary Side Of a Froward Convert

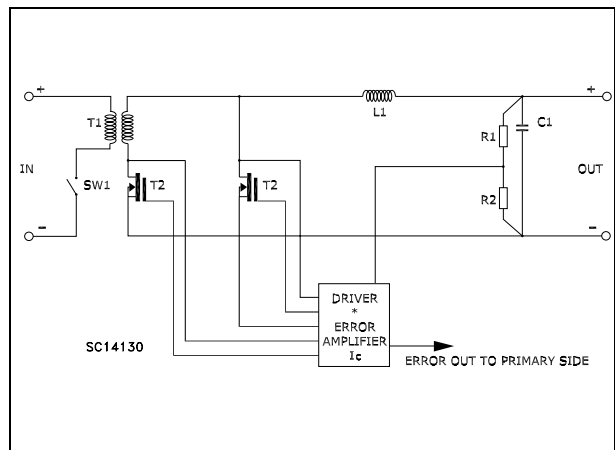


Fig. 1: Unclamped Inductive Load Test Circuit

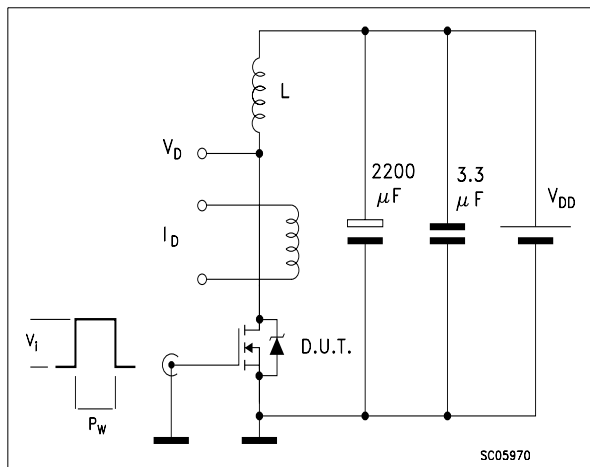


Fig. 2: Unclamped Inductive Waveform

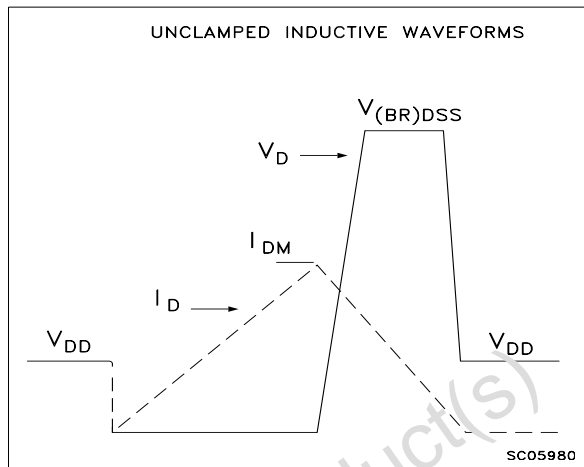


Fig. 3: Switching Times Test Circuit For Resistive Load

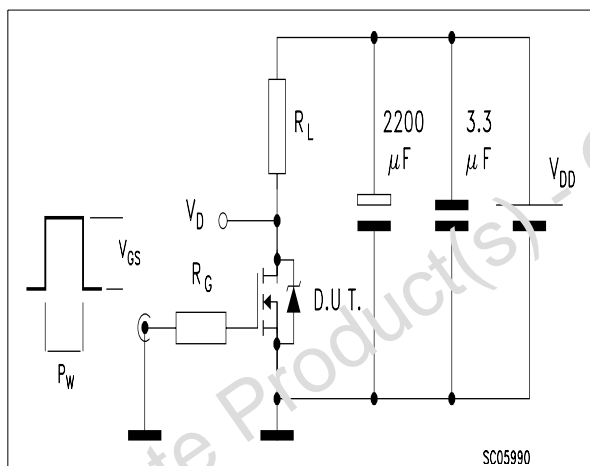


Fig. 4: Gate Charge Test Circuit

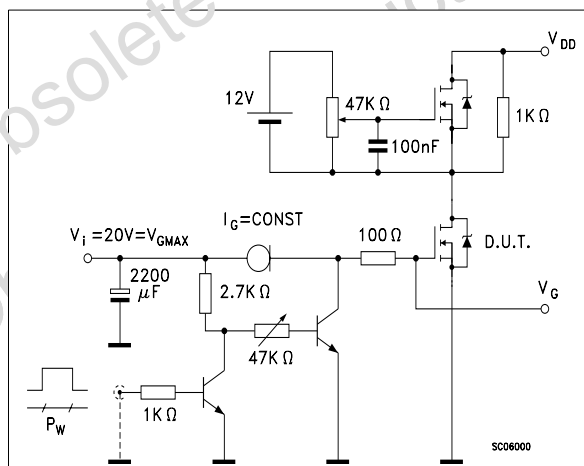
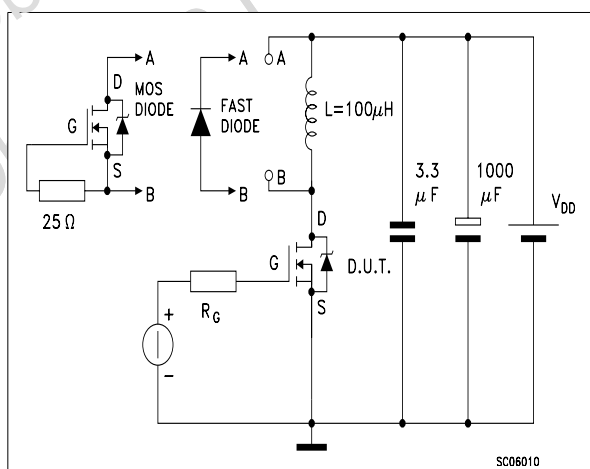
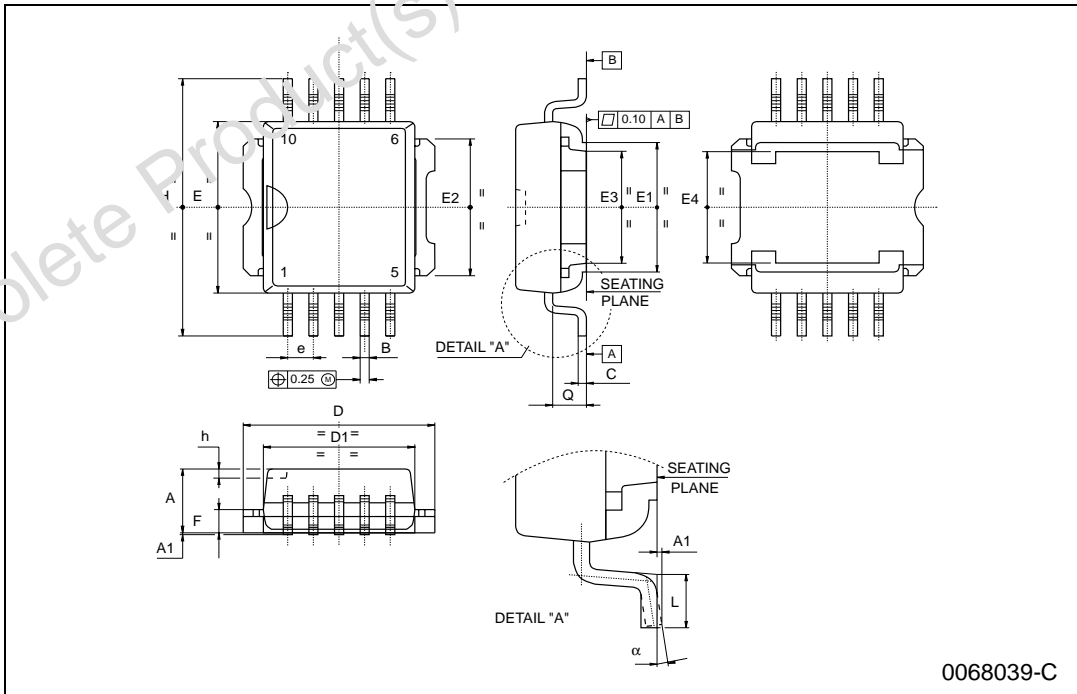


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



**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		1.27			0.050	
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
F	1.25		1.35	0.049		0.053
h		0.50			0.002	
H	13.80		14.40	0.543		0.567
L	1.20		1.80	0.047		0.071
q		1.70			0.067	
$\alpha$	0°		8°			



Obsolete Product(s) - Obsolete Product(s)

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. Specifications 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 registered trademark of STMicroelectronics  
All other names are the property of their respective owners

© 2004 STMicroelectronics - All Rights Reserved  
STMicroelectronics GROUP OF COMPANIES

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States.

<http://www.st.com>