



# STD40NF06LZ

## N-CHANNEL 60V - 0.020 Ω - 40A DPAK Zener-Protected STripFET™ II POWER MOSFET

TYPE	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STD40NF06LZ	60 V	< 25 mΩ	40 A

- TYPICAL R<sub>DS(on)</sub> = 0.020Ω
- 100% AVALANCHE TESTED
- LOW GATE CHARGE
- LOGIC LEVEL GATE DRIVE
- SURFACE-MOUNTING DPAK (TO-252)  
POWER PACKAGE IN TAPE & REEL  
(SUFFIX "T4")
- BUILT-IN ZENER DIODES TO IMPROVE ESD  
PROTECTION UP TO 2kV

### 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

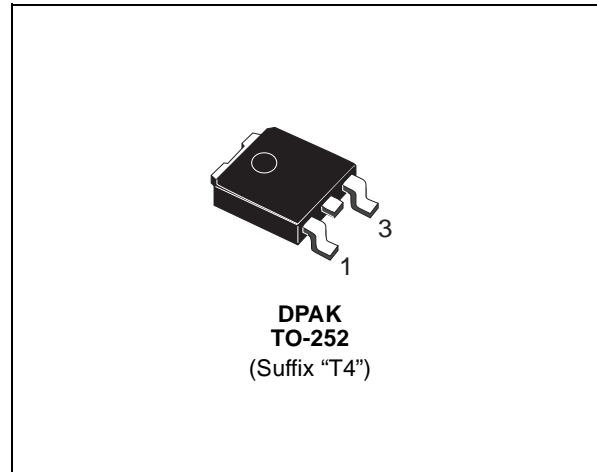
- SINGLE-ENDED SMPS IN MONITOTS,  
COMPUTER AND INDUSTRIAL  
APPLICATION
- WELDING EQUIPMENT
- AUTOMOTIVE

### ABSOLUTE MAXIMUM RATINGS

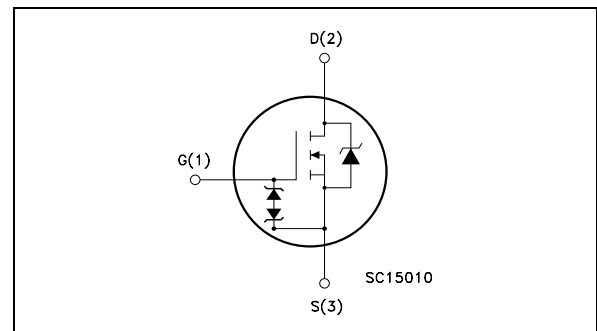
Symbol	Parameter	Value	Unit
V <sub>DS</sub>	Drain-source Voltage (V <sub>GS</sub> = 0)	60	V
V <sub>DGR</sub>	Drain-gate Voltage (R <sub>GS</sub> = 20 kΩ)	60	V
V <sub>GS</sub>	Gate- source Voltage	± 16	V
I <sub>D</sub>	Drain Current (continuous) at T <sub>C</sub> = 25°C	40	A
I <sub>D</sub>	Drain Current (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	100	W
	Derating Factor	0.67	W/°C
V <sub>ESD(G-S)</sub>	Gate-source ESD(HBM-C=100pF, R=15kΩ)	± 2.5	kV
dv/dt <sup>(1)</sup>	Peak Diode Recovery voltage slope	9	V/ns
E <sub>AS</sub> <sup>(2)</sup>	Single Pulse Avalanche Energy	450	mJ
T <sub>stg</sub>	Storage Temperature	-55 to 175	°C
T <sub>j</sub>	Max. Operating Junction Temperature		

(●) Pulse width limited by safe operating area.

(1) I<sub>SD</sub> ≤ 40A, di/dt ≤ 100A/μs, V<sub>DD</sub> ≤ V<sub>(BR)DSS</sub>, T<sub>j</sub> ≤ T<sub>JMAX</sub>.  
 (2) Starting T<sub>j</sub> = 25 °C I<sub>D</sub> = 20A V<sub>DD</sub> = 45V



### INTERNAL SCHEMATIC DIAGRAM



# STD40NF06LZ

## THERMAL DATA

Rthj-case	Thermal Resistance Junction-case	Max	1.5	°C/W
Rthj-PCB	Thermal Resistance Junction-PCB (#)	Max	50	°C/W
T <sub>l</sub>	Maximum Lead Temperature For Soldering Purpose		300	°C

(#) When Mounted on 1 inch<sup>2</sup> FR-4 board, 2 oz Cu.

## ELECTRICAL CHARACTERISTICS (T<sub>case</sub> = 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	60			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> = ± 16 V			±10	μA

### 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	1			V
R <sub>DS(on)</sub>	Static Drain-source On Resistance	V <sub>GS</sub> = 5 V I <sub>D</sub> = 20 A V <sub>GS</sub> = 10 V I <sub>D</sub> = 20 A			0.030 0.025	Ω Ω

### DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g <sub>fs</sub> (*)	Forward Transconductance	V <sub>DS</sub> = 15 V I <sub>D</sub> = 20 A		25		S
C <sub>iSS</sub>	Input Capacitance	V <sub>DS</sub> = 25V, f = 1 MHz, V <sub>GS</sub> = 0		1360		pF
C <sub>oSS</sub>	Output Capacitance			302		pF
C <sub>rSS</sub>	Reverse Transfer Capacitance			115		pF

**ELECTRICAL CHARACTERISTICS** (continued)

**SWITCHING ON**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ $t_r$	Turn-on Delay Time Rise Time	$V_{DD} = 30\text{ V}$ $I_D = 20\text{ A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 4.5\text{ V}$ (Resistive Load, Figure 3)		17 75		ns ns
$Q_g$ $Q_{gs}$ $Q_{gd}$	Total Gate Charge Gate-Source Charge Gate-Drain Charge	$V_{DD} = 48\text{ V}$ $I_D = 40\text{ A}$ $V_{GS} = 10\text{ V}$		54 11 12		nC nC nC

www.DataSheet4U.com

**SWITCHING OFF**

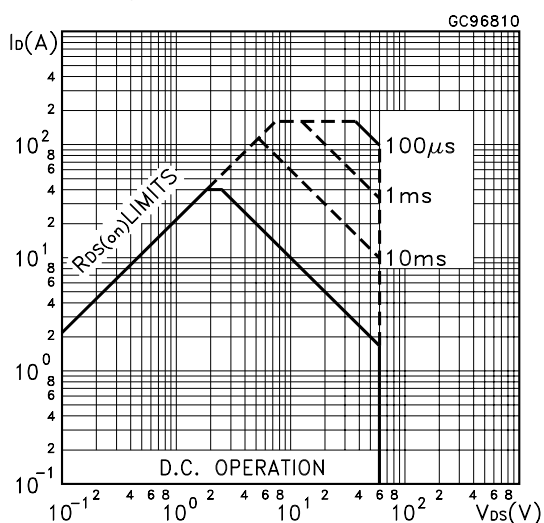
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(off)}$ $t_f$	Turn-off Delay Time Fall Time	$V_{DD} = 30\text{ V}$ $I_D = 20\text{ A}$ $R_G = 4.7\ \Omega$ , $V_{GS} = 4.5\text{ V}$ (Resistive Load, Figure 3)		38 23		ns ns

**SOURCE DRAIN DIODE**

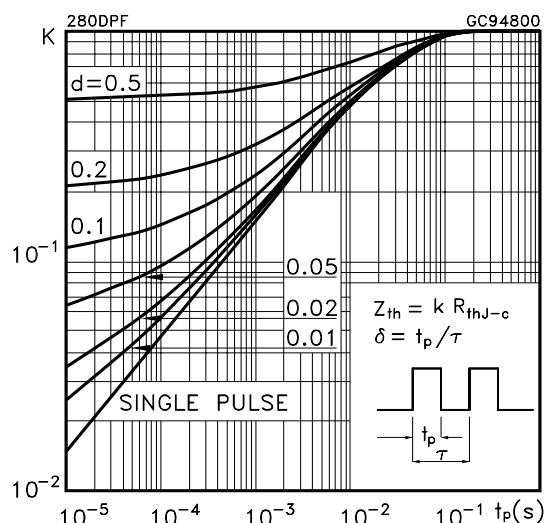
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{SD}$ $I_{SDM} (\bullet)$	Source-drain Current Source-drain Current (pulsed)				40 160	A A
$V_{SD} (*)$	Forward On Voltage	$I_{SD} = 40\text{ A}$ $V_{GS} = 0$			1.6	V
$t_{rr}$ $Q_{rr}$ $I_{RRM}$	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	$I_{SD} = 40\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 30\text{ V}$ $T_j = 150^\circ\text{C}$ (see test circuit, Figure 5)		66 142 4.3		ns nC A

(\*) Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %  
 (•) Pulse width limited by safe operating area.

**Safe Operating Area**

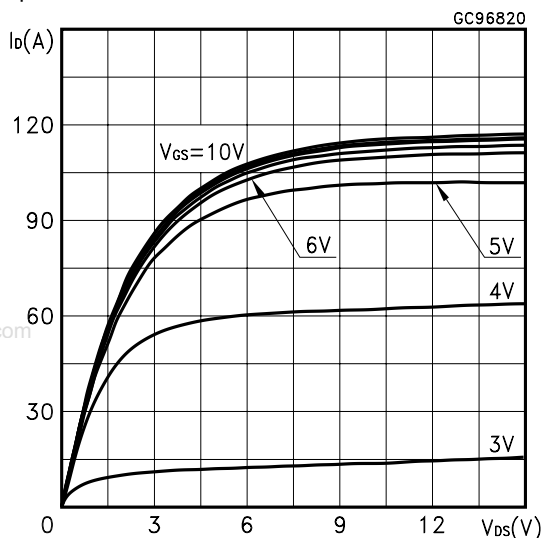


**Thermal Impedance**

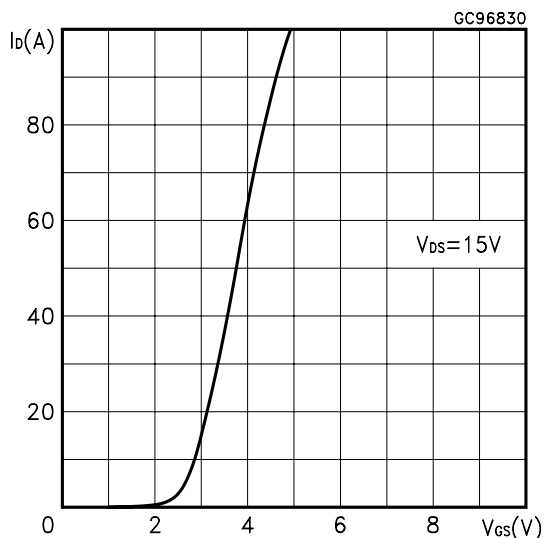


# STD40NF06LZ

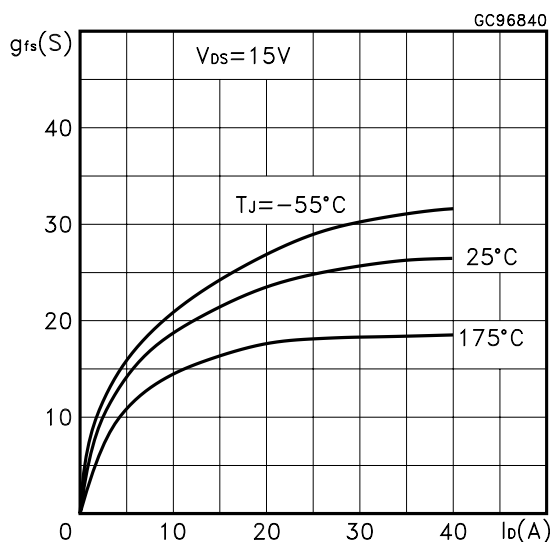
Output Characteristics



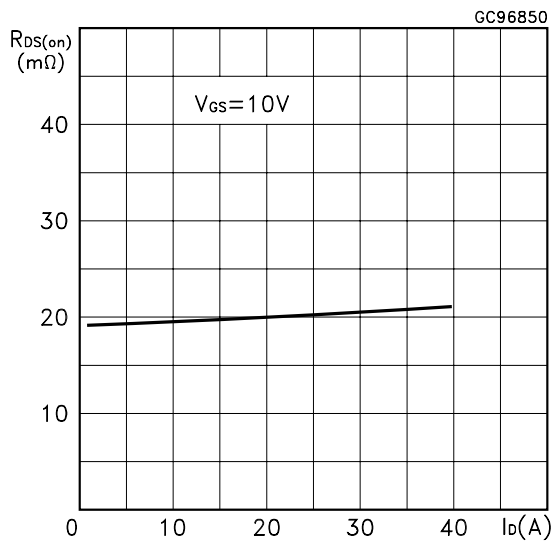
Transfer Characteristics



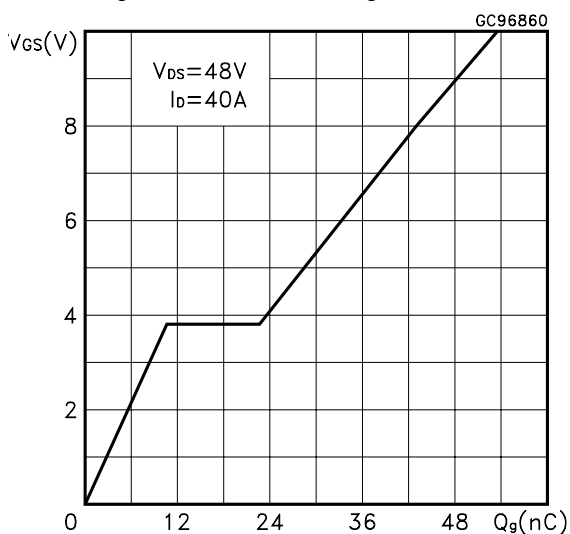
Transconductance



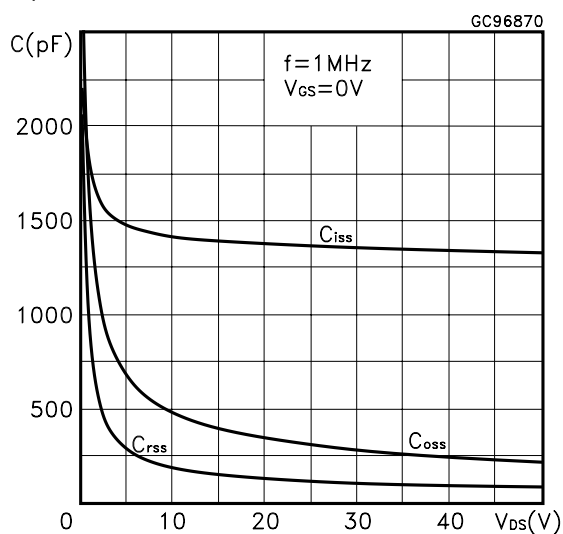
Static Drain-source On Resistance



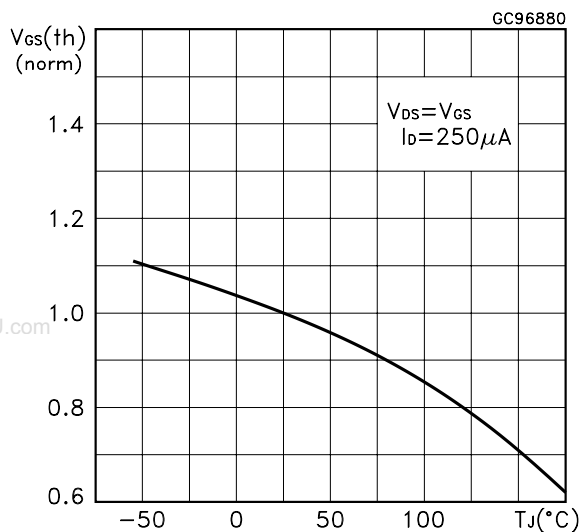
Gate Charge vs Gate-source Voltage



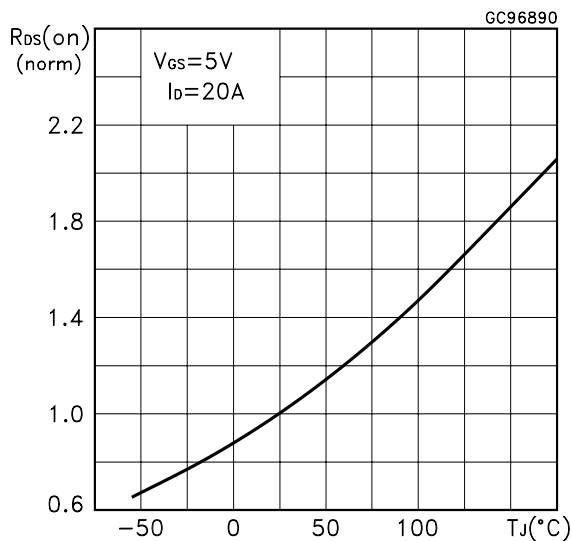
Capacitance Variations



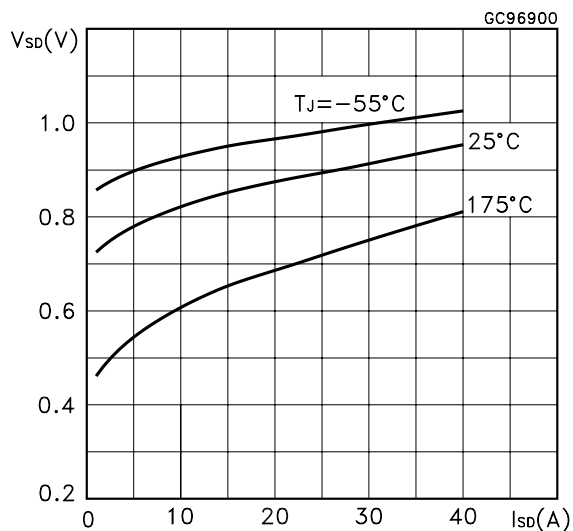
Normalized Gate Threshold Voltage vs Temperature



Normalized on Resistance vs Temperature



Source-drain Diode Forward Characteristics



Normalized Breakdown Voltage vs Temperature.

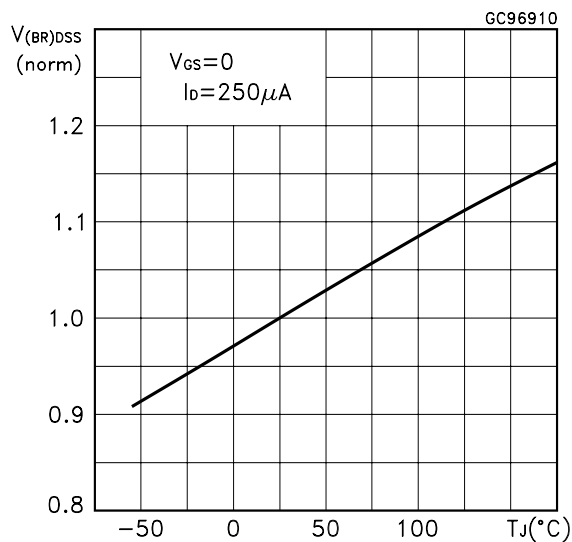


Fig. 1: Unclamped Inductive Load Test Circuit

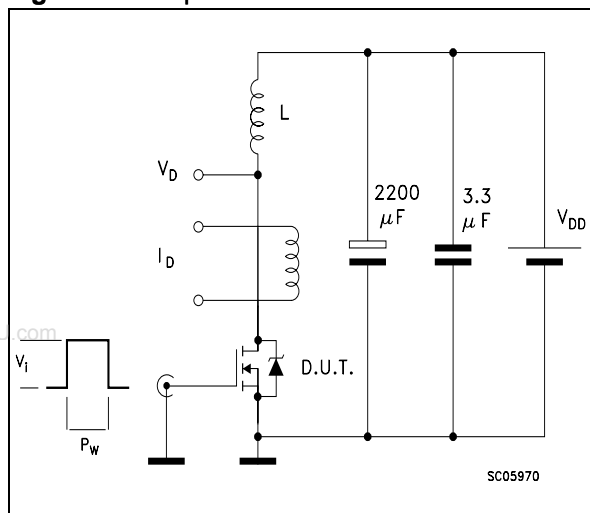


Fig. 2: Unclamped Inductive Waveform



Fig. 3: Switching Times Test Circuits For Resistive Load

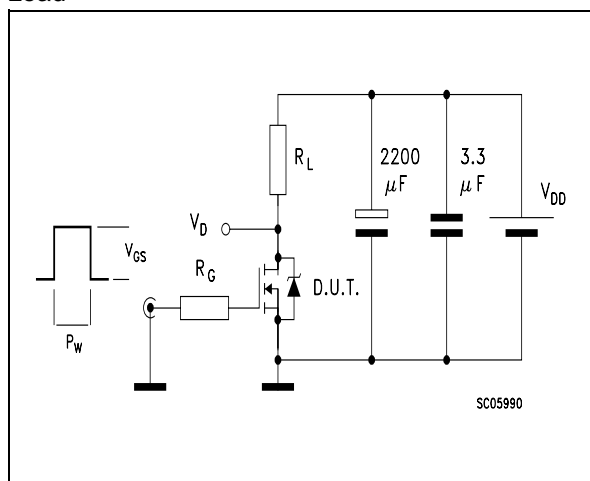


Fig. 4: Gate Charge test Circuit

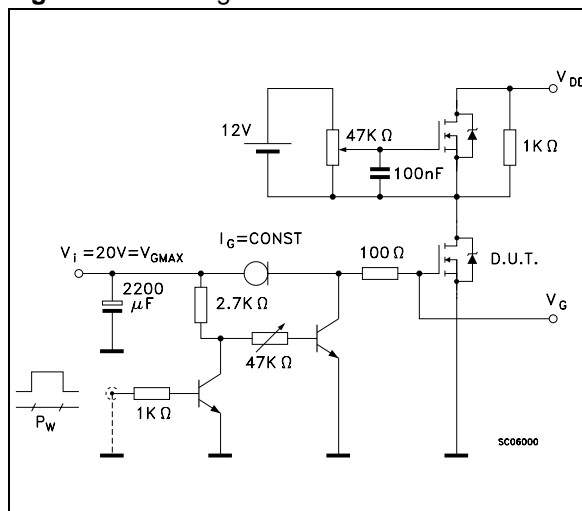
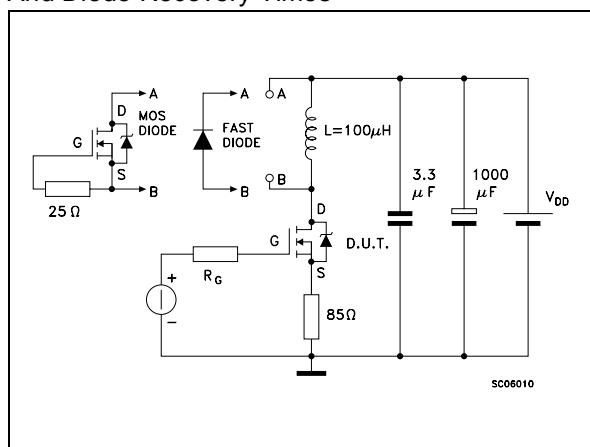
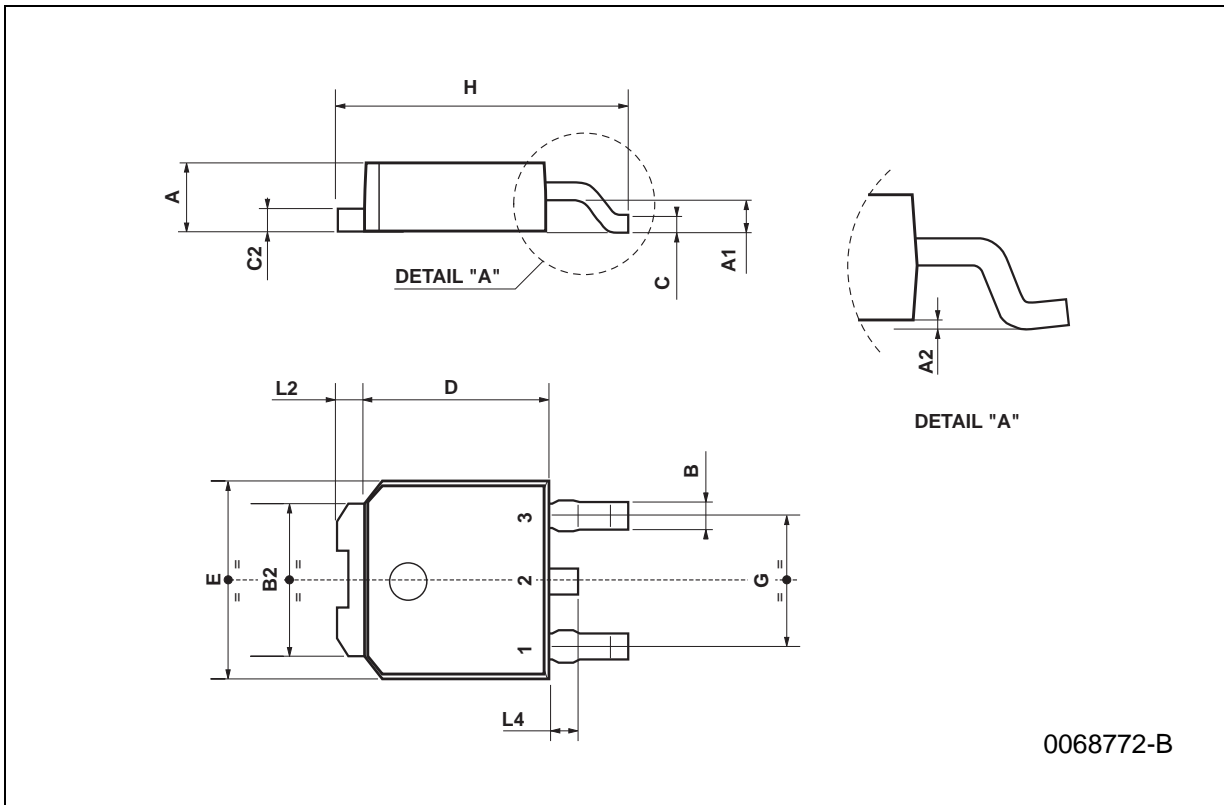


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



**TO-252 (DPAK) MECHANICAL DATA**

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	2.2		2.4	0.086		0.094
A1	0.9		1.1	0.035		0.043
A2	0.03		0.23	0.001		0.009
B	0.64		0.9	0.025		0.035
B2	5.2		5.4	0.204		0.212
C	0.45		0.6	0.017		0.023
C2	0.48		0.6	0.019		0.023
D	6		6.2	0.236		0.244
E	6.4		6.6	0.252		0.260
G	4.4		4.6	0.173		0.181
H	9.35		10.1	0.368		0.397
L2		0.8			0.031	
L4	0.6		1	0.023		0.039



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 registered trademark of STMicroelectronics  
© 2001 STMicroelectronics - All Rights Reserved

All other names are the property of their respective owners.

STMicroelectronics GROUP OF COMPANIES  
Australia - Brazil - Canada - China - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco -  
Singapore - Spain - Sweden - Switzerland - United Kingdom - United States.

<http://www.st.com>