



# THE DATASHEET OF STS3DNE60L





# STS3DNE60L

## DUAL N-CHANNEL 60V - 0.065Ω - 3A SO-8 STripFET™ POWER MOSFET

TYPE	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STS3DNE60L	60 V	< 0.08 Ω	3 A

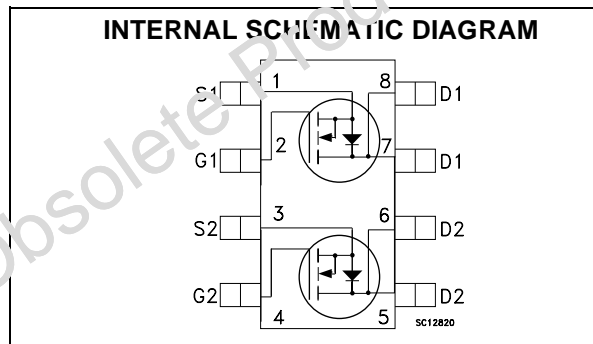
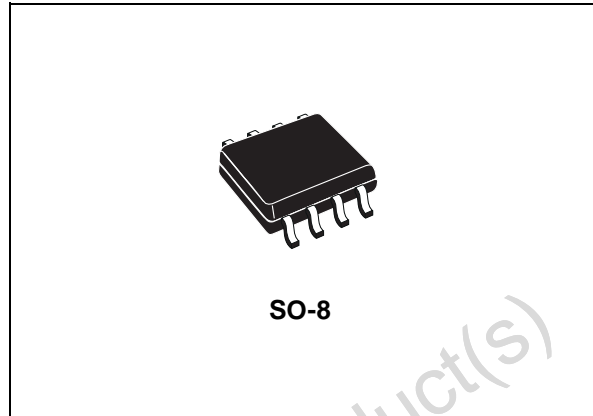
- TYPICAL R<sub>DS(on)</sub> = 0.065Ω
- LOW THRESHOLD GATE DRIVE
- STANDARD OUTLINE FOR EASY AUTOMATED SURFACE MOUNT ASSEMBLY

### 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

- DC MOTOR DRIVE
- DC-DC CONVERTERS
- BATTERY MANAGEMENT IN NOMADIC EQUIPMENT
- POWER MANAGEMENT IN PORTABLE/ DESKTOP PCs



### 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	± 20	V
I <sub>D</sub>	Drain Current (continuous) at T <sub>C</sub> = 25°C Single Operation	3	A
	Drain Current (continuous) at T <sub>C</sub> = 100°C Single Operation	1.9	A
I <sub>DM</sub> (•)	Drain Current (pulsed)	12	A
P <sub>TOT</sub>	Total Dissipation at T <sub>C</sub> = 25°C Dual Operation	1.6	W
	Total Dissipation at T <sub>C</sub> = 25°C Single Operation	2.0	W

(•)Pulse width limited by safe operating area

## STS3DNE60L

### THERMAL DATA

Rthj-amb	(*)Thermal Resistance Junction-amb Max Single Operation (*)Thermal Resistance Junction-amb Max Dual Operation	62.5 78	°C/W °C/W
T <sub>j</sub>	Max. Operating Junction Temperature	150	°C
T <sub>stg</sub>	Storage Temperature	- 55 to 150	°C

(\*) Mounted on FR-4 Board (t ≤ 10 sec)

### 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	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 10	μA μA
I <sub>GSS</sub>	Gate-body Leakage Current (V <sub>DS</sub> = 0)	V <sub>GS</sub> = ± 20V			±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> = 1.5 A V <sub>GS</sub> = 4.5 V, I <sub>D</sub> = 1.5 A		0.065 0.08	0.08 0.1	Ω Ω

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g <sub>fs</sub> (1)	Forward Transconductance	V <sub>DS</sub> = 15V, I <sub>D</sub> = 1.5 A		5		S
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 25 V, f = 1 MHz, V <sub>GS</sub> = 0		815		pF
C <sub>oss</sub>	Output Capacitance			125		pF
C <sub>rss</sub>	Reverse Transfer Capacitance			40		pF

**ELECTRICAL CHARACTERISTICS (CONTINUED)**

**SWITCHING ON**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	$V_{DD} = 30\text{ V}$ , $I_D = 3\text{ A}$ $R_G = 4.7\Omega$ , $V_{GS} = 5\text{ V}$ (see test circuit, Figure 3)		20		ns
$t_r$	Rise Time			30		ns
$Q_g$	Total Gate Charge	$V_{DD} = 24\text{ V}$ , $I_D = 3\text{ A}$ , $V_{GS} = 4.5\text{ V}$		13.5		nC
$Q_{gs}$	Gate-Source Charge			6		nC
$Q_{gd}$	Gate-Drain Charge			3.5		nC

**SWITCHING OFF**

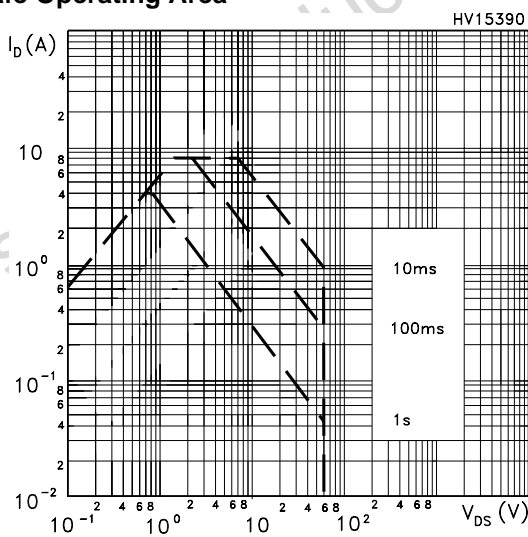
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(off)}$	Off-voltage Rise Time	$V_{DD} = 48\text{ V}$ , $I_D = 3\text{ A}$ $R_G = 4.7\Omega$ , $V_{GS} = 5\text{ V}$ (see test circuit, Figure 5)		12		ns
$t_f$	Fall Time			16		ns
$t_c$	Cross-over Time			32		ns

**SOURCE DRAIN DIODE**

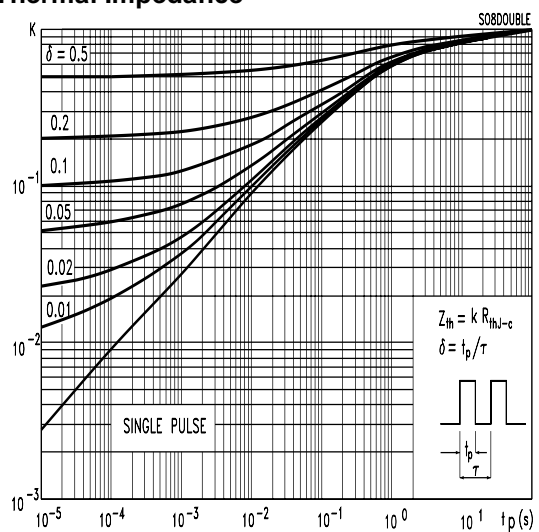
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain Current				3	A
$I_{SDM(1)}$	Source-drain Current (pulsed)				12	A
$V_{SD(2)}$	Forward On Voltage	$I_{SD} = 3\text{ A}$ , $V_{GS} = 0$			1.2	V
$t_{rr}$	Reverse Recovery Time	$I_{SD} = 3\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$ , $V_{DD} = 30\text{ V}$ , $T_j = 150^\circ\text{C}$ (see test circuit, Figure 5)		60		ns
$Q_{rr}$	Reverse Recovery Charge			130		nC
$I_{RRM}$	Reverse Recovery Current			4		A

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

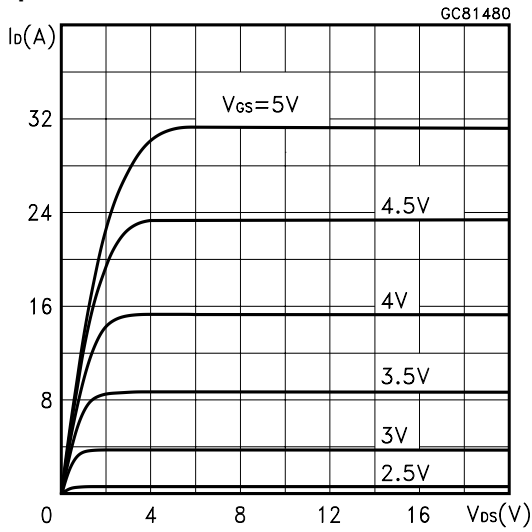
**Safe Operating Area**



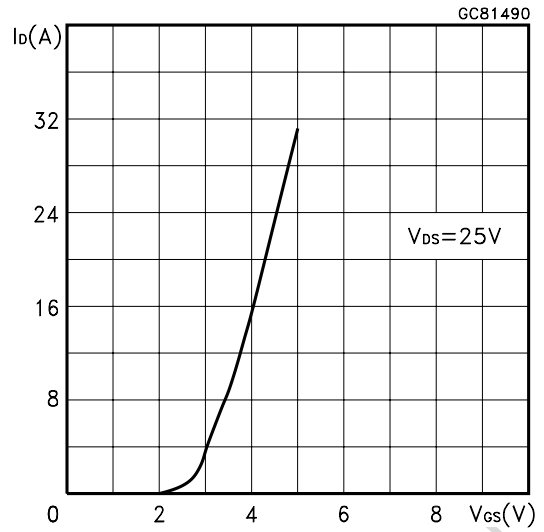
**Thermal Impedance**



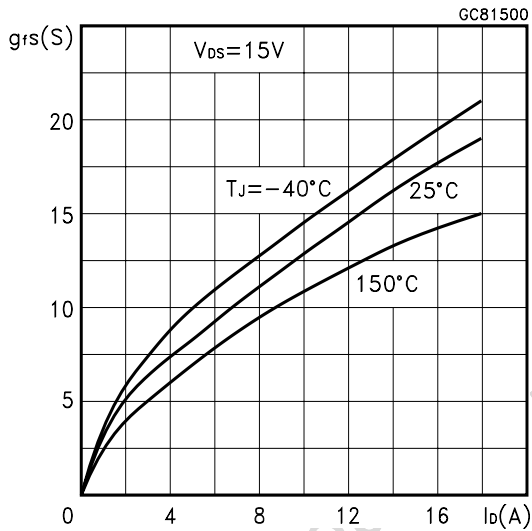
Output Characteristics



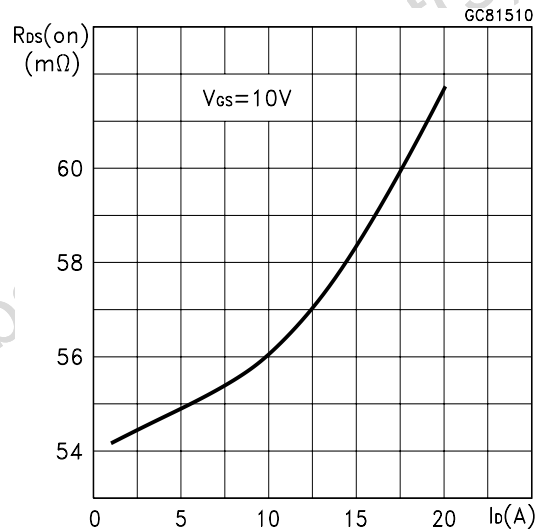
Transfer Characteristics



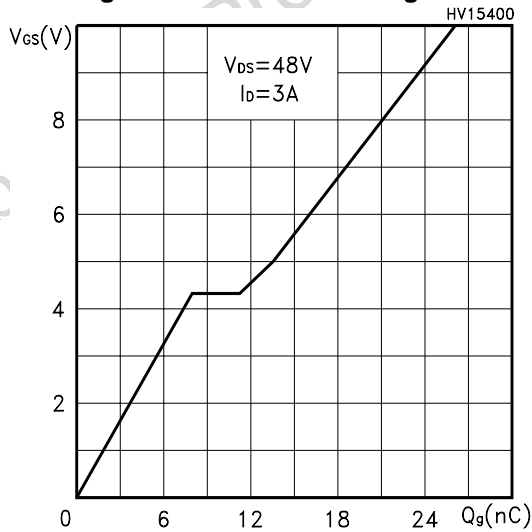
Tranconductance



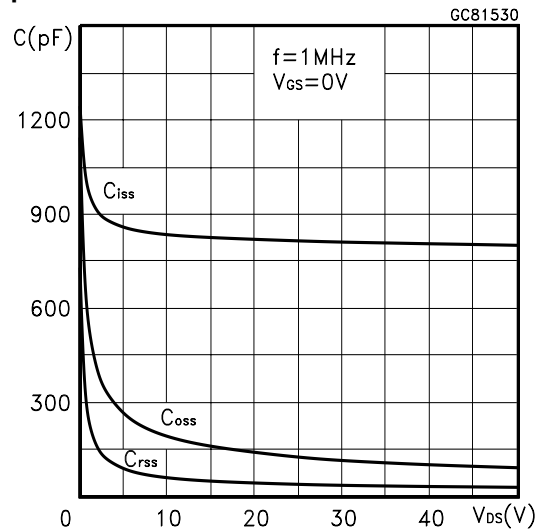
Static Drain-Source On Resistance



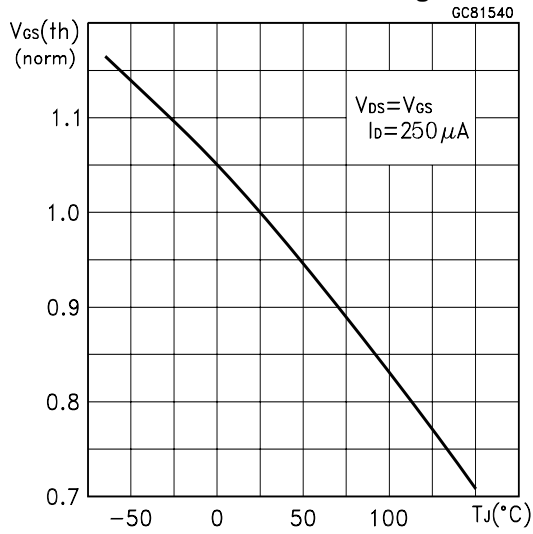
Gate Charge vs Gate-source Voltage



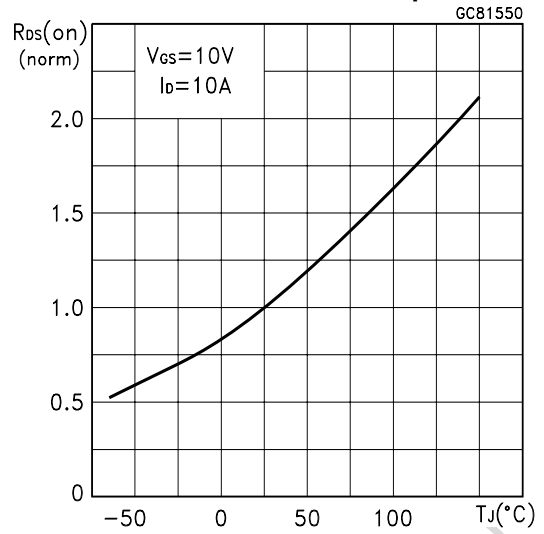
Capacitance Variations



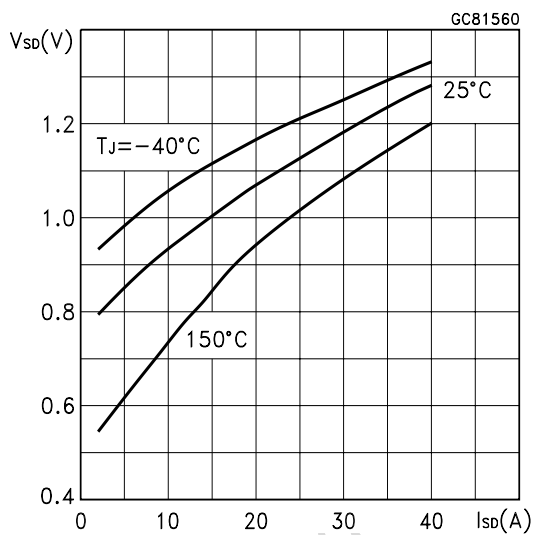
Normalized Gate Threshold Voltage vs Temp.



Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics



Obsolete Product(s)

Fig. 1: Unclamped Inductive Load Test Circuit

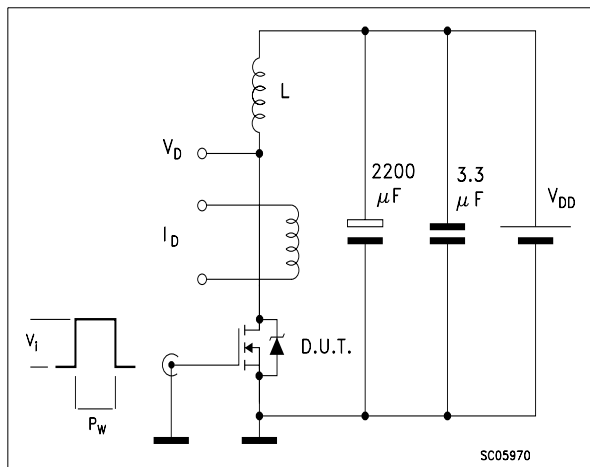


Fig. 2: Unclamped Inductive Waveform

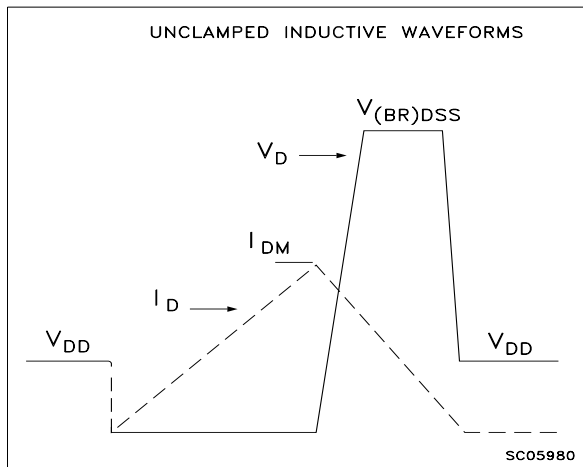


Fig. 3: Switching Times Test Circuit For Resistive Load

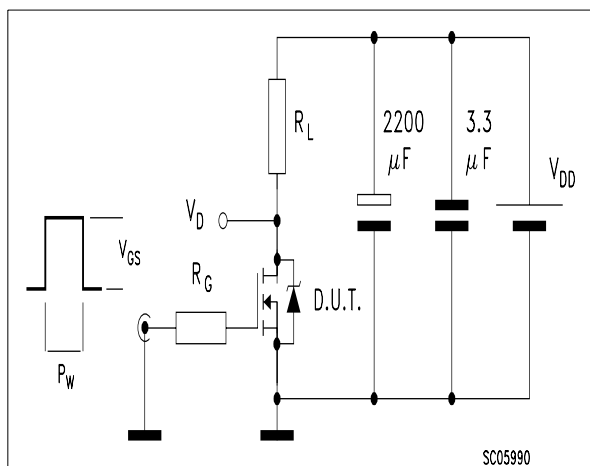


Fig. 4: Gate Charge test Circuit

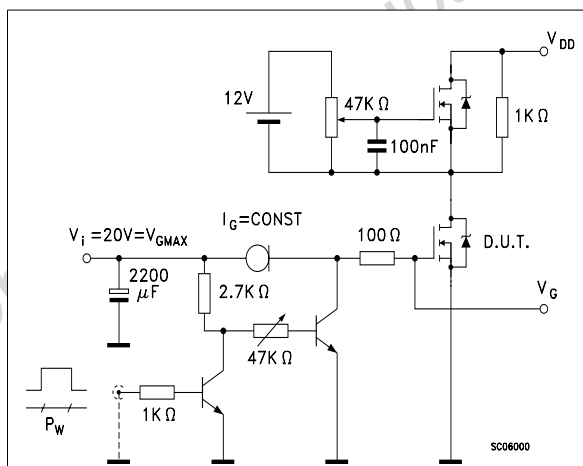
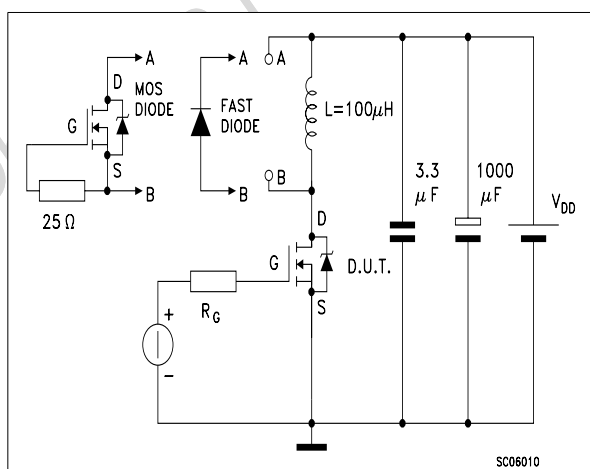
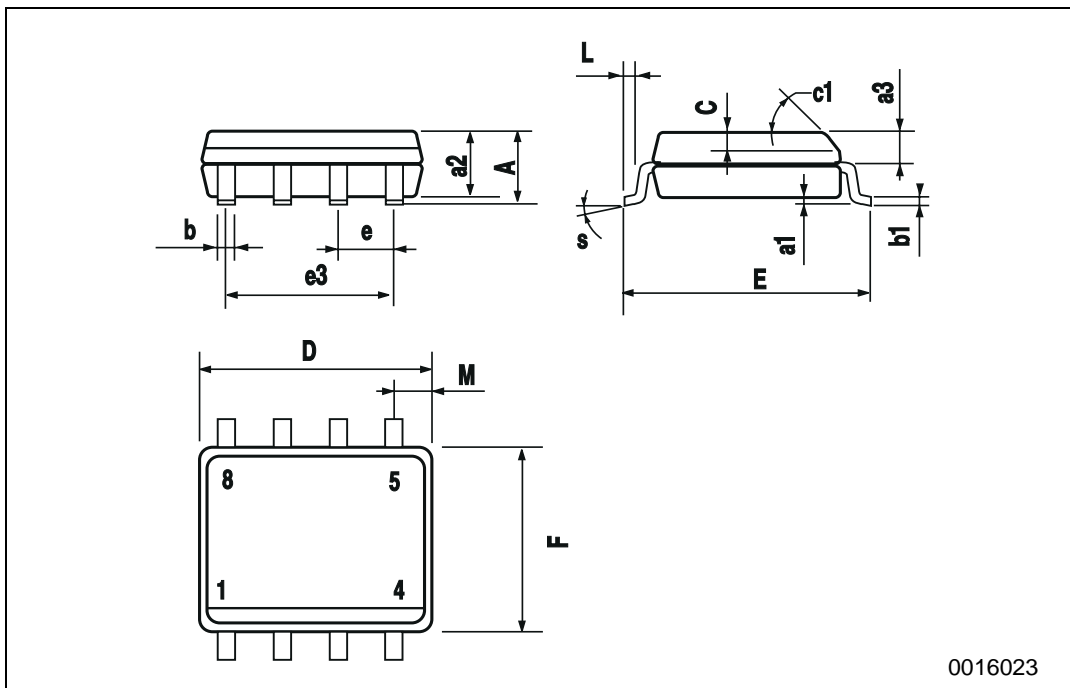


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



**SO-8 MECHANICAL DATA**

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.25	0.003		0.009
a2			1.65			0.064
a3	0.65		0.85	0.025		0.033
b	0.35		0.48	0.013		0.018
b1	0.19		0.25	0.007		0.010
C	0.25		0.5	0.010		0.019
c1	45 (typ.)					
D	4.8		5.0	0.188		0.196
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		3.81			0.150	
F	3.8		4.0	0.14		0.157
L	0.4		1.27	0.015		0.050
M			0.6			0.023
S	8 (max.)					



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