



# STN4NE03L

## N - CHANNEL 30V - 0.037Ω - 4A - SOT-223 STripFET™ POWER MOSFET

TYPE	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STN4NE03L	30 V	< 0.05 Ω	4 A

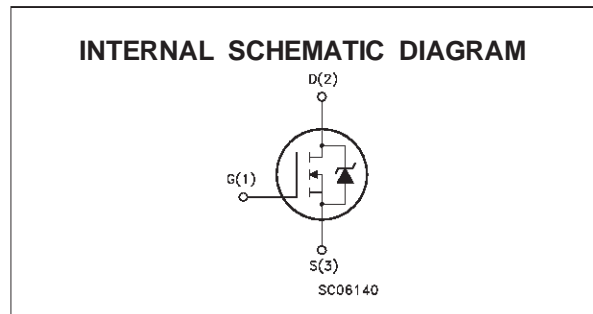
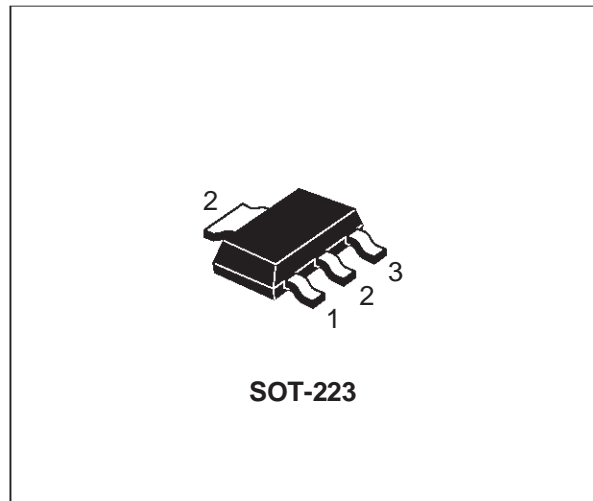
- TYPICAL R<sub>DS(on)</sub> = 0.037 Ω
- EXCEPTIONAL dv/dt CAPABILITY
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- APPLICATION ORIENTED CHARACTERIZATION

### 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

- DC MOTOR CONTROL (DISK DRIVES, etc.)
- DC-DC & DC-AC CONVERTERS
- SYNCHRONOUS RECTIFICATION
- POWER MANAGEMENT IN BATTERY-OPERATED AND PORTABLE EQUIPMENT



### 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	± 15	V
I <sub>D</sub> (*)	Drain Current (continuous) at T <sub>c</sub> = 25 °C	4	A
I <sub>D</sub> (*)	Drain Current (continuous) at T <sub>c</sub> = 100 °C	2.5	A
I <sub>DM</sub> (•)	Drain Current (pulsed)	16	A
P <sub>tot</sub>	Total Dissipation at T <sub>c</sub> = 25 °C	2.5	W
	Derating Factor	0.02	W/°C
dv/dt (1)	Peak Diode Recovery voltage slope	6	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

(\*) Limited by package

(1) I<sub>SD</sub> ≤ 10A, di/dt ≤ 200A/μS, V<sub>DD</sub> ≤ V<sub>(BR)DSS</sub>, T<sub>j</sub> ≤ T<sub>jMAX</sub>

## STN4NE03L

### THERMAL DATA

R <sub>thj-pcb</sub>	Thermal Resistance Junction-PC Board	Max	50	°C/W
R <sub>thj-amb</sub>	Thermal Resistance Junction-ambient (Surface Mounted)	Max	60	°C/W
T <sub>l</sub>	Maximum Lead Temperature For Soldering Purpose		260	°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)	4	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> = 15 V)	20	mJ

### 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	30			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 (\*)

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	1.6	2.5	V
R <sub>DS(on)</sub>	Static Drain-source On Resistance	V <sub>GS</sub> = 10 V I <sub>D</sub> = 2 A V <sub>GS</sub> = 5 V I <sub>D</sub> = 2 A		0.033 0.046	0.05 0.06	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	4			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> = 2 A	1	3		S
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 25 V f = 1 MHz V <sub>GS</sub> = 0 V		680	950	pF
C <sub>oss</sub>	Output Capacitance			160	220	pF
C <sub>rss</sub>	Reverse Transfer Capacitance			60	85	pF

**ELECTRICAL CHARACTERISTICS** (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Time	$V_{DD} = 15\text{ V}$ $I_D = 10\text{ A}$		15	20	ns
$t_r$	Rise Time	$R_G = 4.7\ \Omega$ $V_{GS} = 5\text{ V}$ (see test circuit, figure 3)		70	100	ns
$Q_g$	Total Gate Charge	$V_{DD} = 24\text{ V}$ $I_D = 20\text{ A}$ $V_{GS} = 5\text{ V}$		22	30	nC
$Q_{gs}$	Gate-Source Charge			7		nC
$Q_{gd}$	Gate-Drain Charge			7		nC

SWITCHING OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$	Off-voltage Rise Time	$V_{DD} = 24\text{ V}$ $I_D = 20\text{ A}$		12	17	ns
$t_f$	Fall Time	$R_G = 4.7\ \Omega$ $V_{GS} = 5\text{ V}$ (see test circuit, figure 5)		33	46	ns
$t_c$	Cross-over Time			55	77	ns

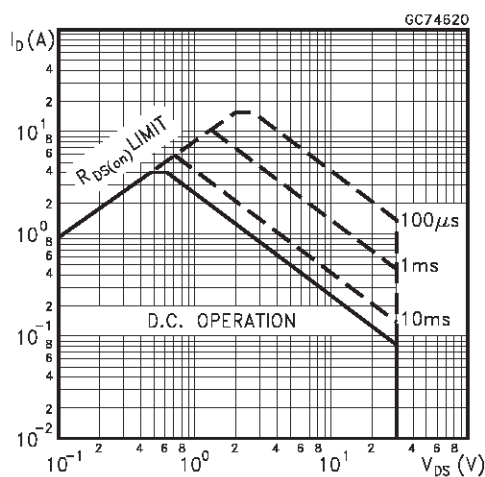
SOURCE DRAIN DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain Current				4	A
$I_{SDM}(\bullet)$	Source-drain Current (pulsed)				16	A
$V_{SD}(\ast)$	Forward On Voltage	$I_{SD} = 4\text{ A}$ $V_{GS} = 0$			1.5	V
$t_{rr}$	Reverse Recovery Time	$I_{SD} = 20\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 15\text{ V}$ $T_j = 150\text{ }^\circ\text{C}$ (see test circuit, figure 5)		40		ns
$Q_{rr}$	Reverse Recovery Charge			45		$\mu\text{C}$
$I_{RRM}$	Reverse Recovery Current			2.2		A

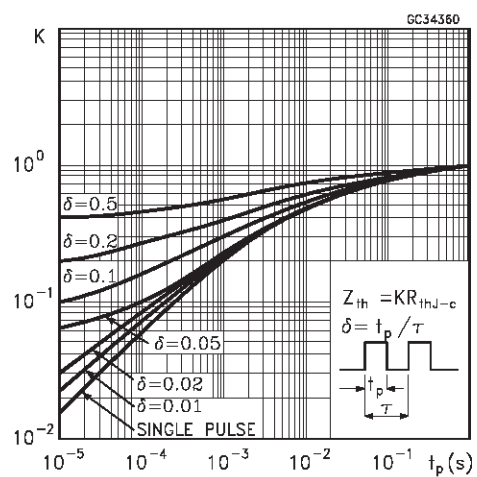
(\*) Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %

(•) Pulse width limited by safe operating area

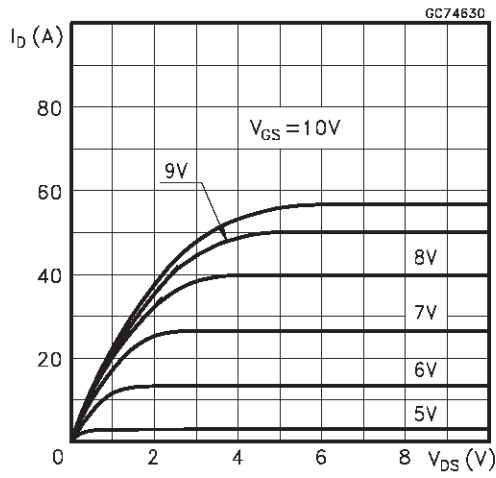
Safe Operating Area



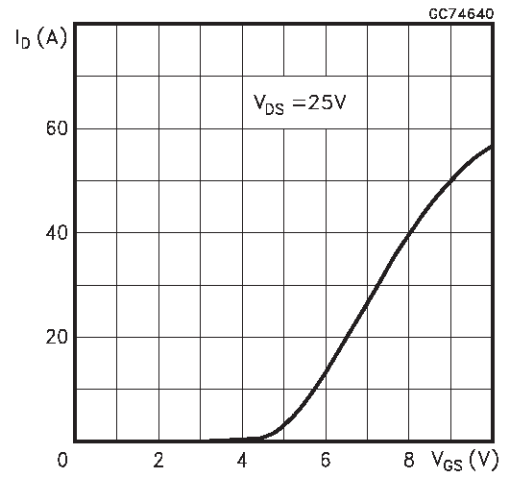
Thermal Impedance



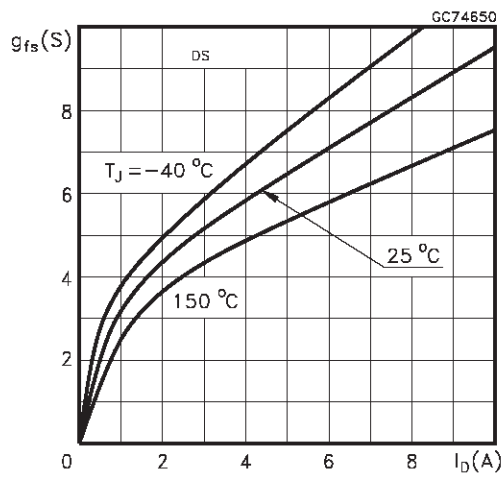
Output Characteristics



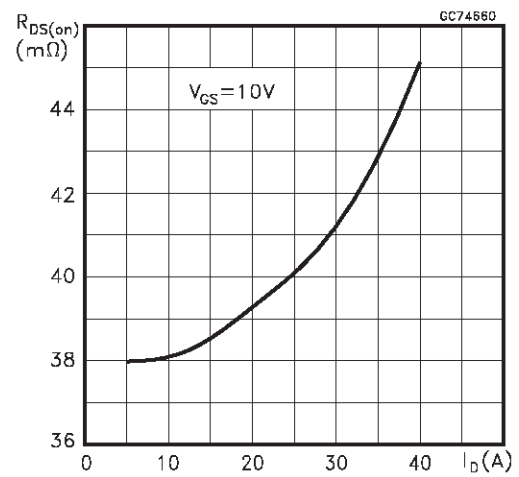
Transfer Characteristics



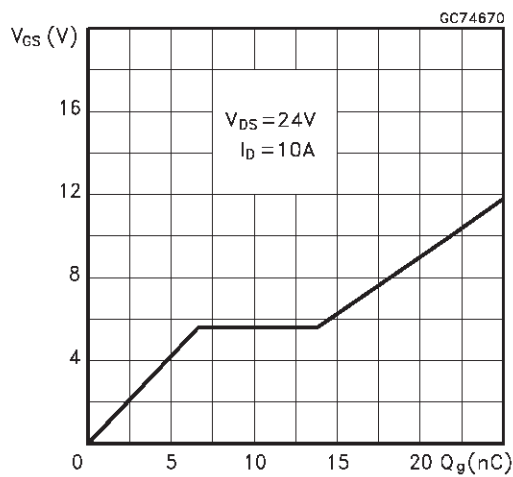
Transconductance



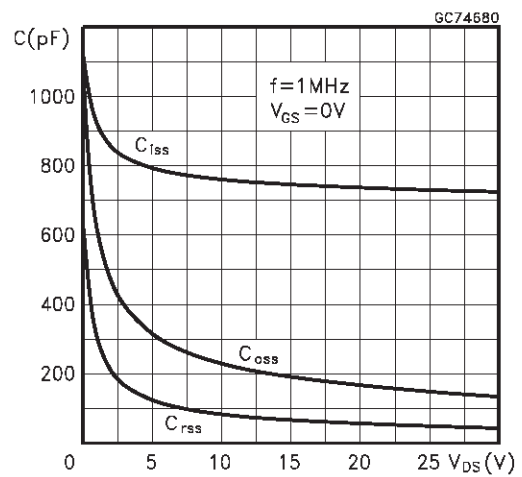
Static Drain-source On Resistance



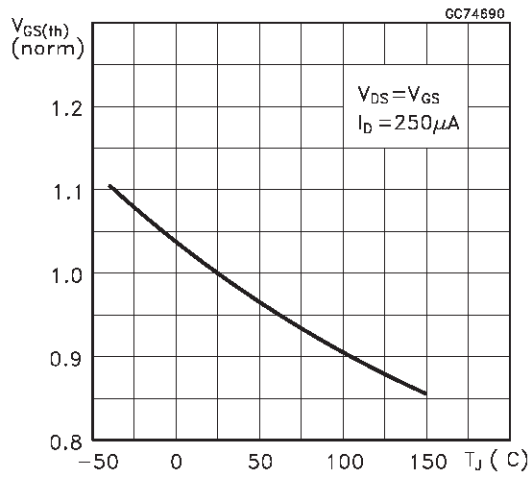
Gate Charge vs Gate-source Voltage



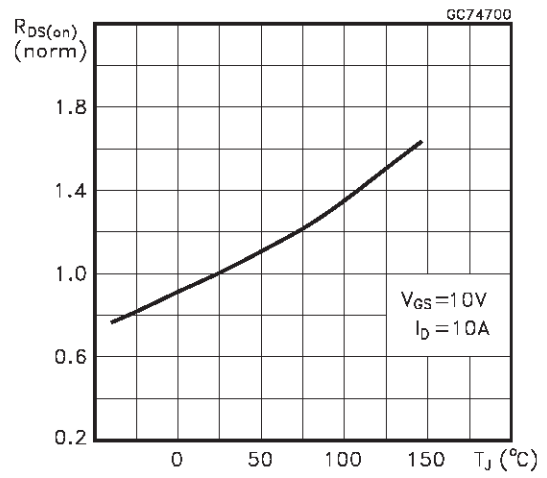
Capacitance Variations



Normalized Gate Threshold Voltage vs Temperature



Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics

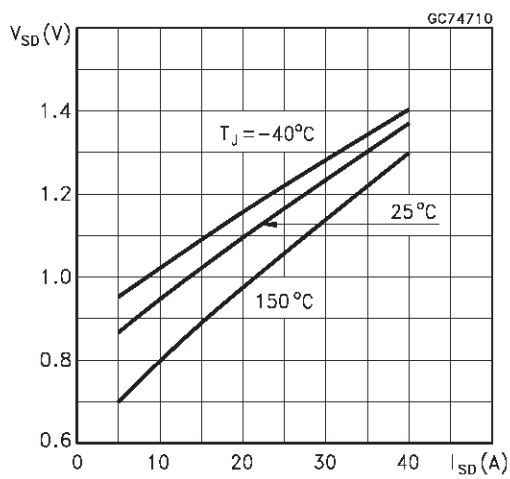


Fig. 1: Unclamped Inductive Load Test Circuit

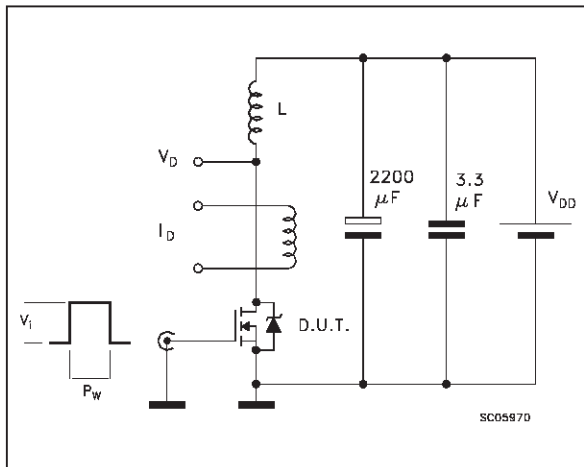


Fig. 2: Unclamped Inductive Waveform

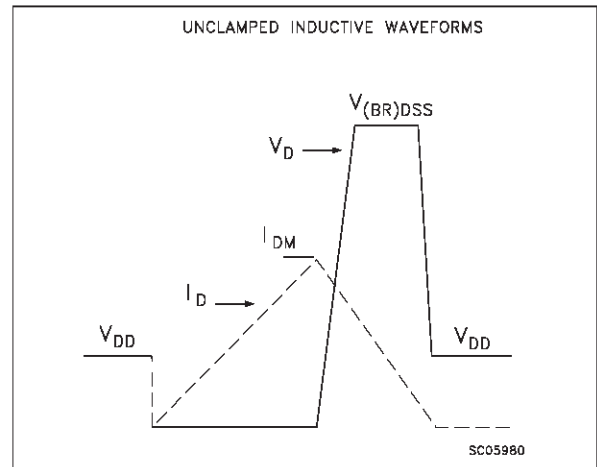


Fig. 3: Switching Times Test Circuits For Resistive Load

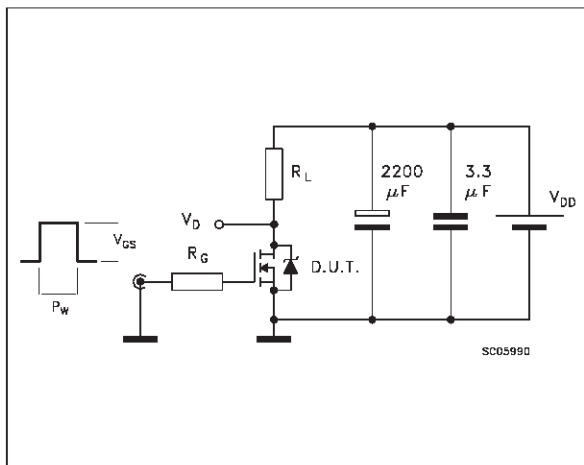


Fig. 4: Gate Charge test Circuit

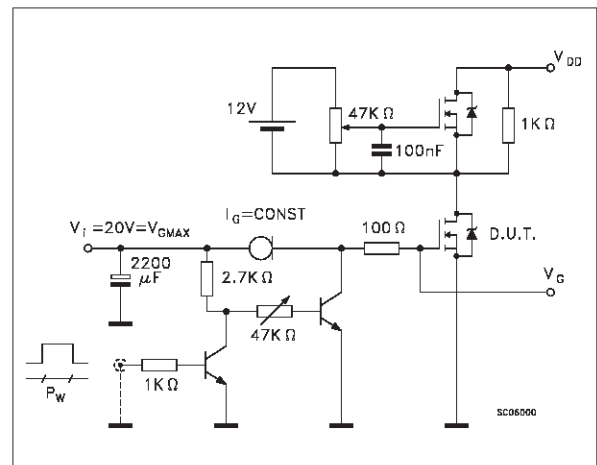
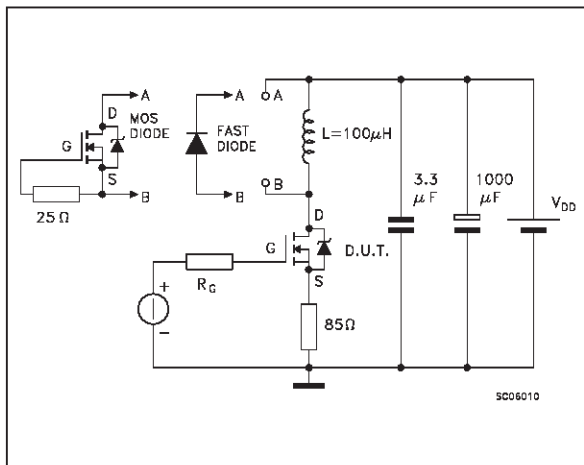
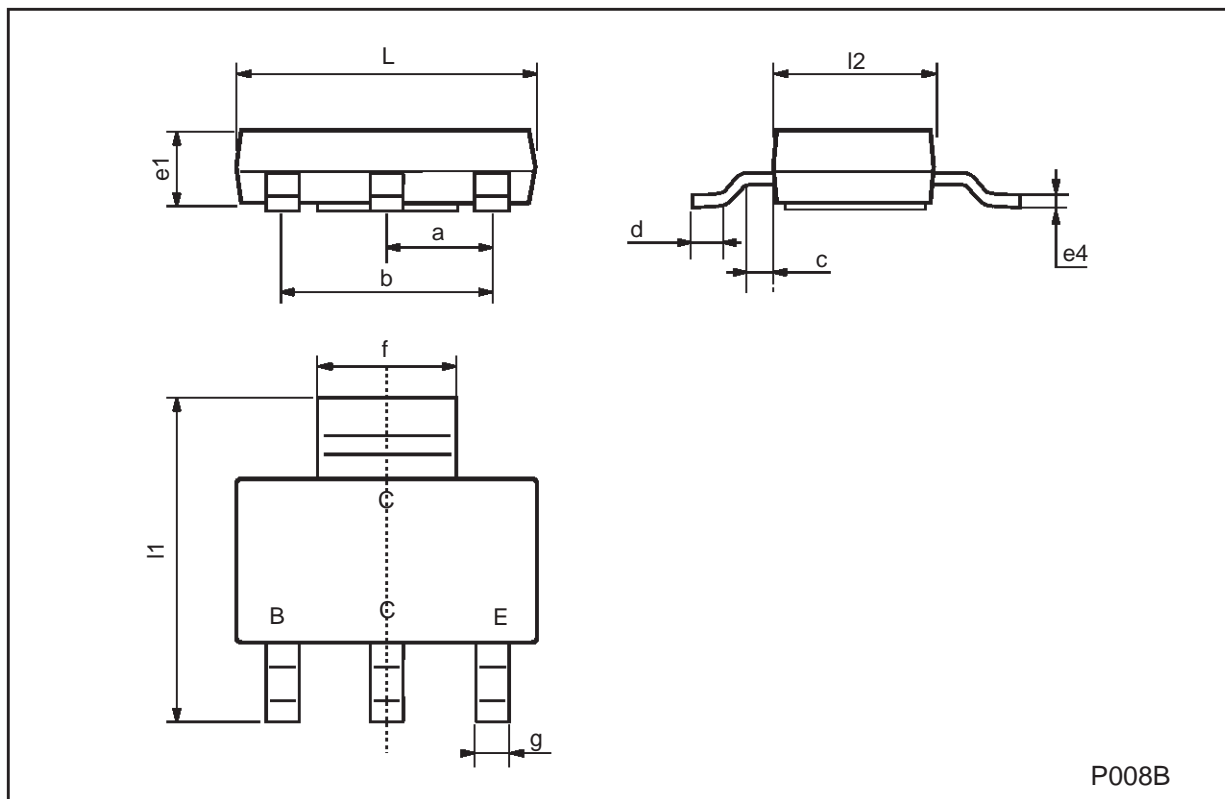


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



## SOT-223 MECHANICAL DATA

DIM.	mm			mils		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
a	2.27	2.3	2.33	89.4	90.6	91.7
b	4.57	4.6	4.63	179.9	181.1	182.3
c	0.2	0.4	0.6	7.9	15.7	23.6
d	0.63	0.65	0.67	24.8	25.6	26.4
e1	1.5	1.6	1.7	59.1	63	66.9
e4			0.32			12.6
f	2.9	3	3.1	114.2	118.1	122.1
g	0.67	0.7	0.73	26.4	27.6	28.7
l1	6.7	7	7.3	263.8	275.6	287.4
l2	3.5	3.5	3.7	137.8	137.8	145.7
L	6.3	6.5	6.7	248	255.9	263.8



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