



# STN3NF06L

## N-CHANNEL 60V - 0.07Ω - 4A SOT-223 STripFET™ II POWER MOSFET

TYPE	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STN3NF06L	60 V	< 0.1 Ω	4 A

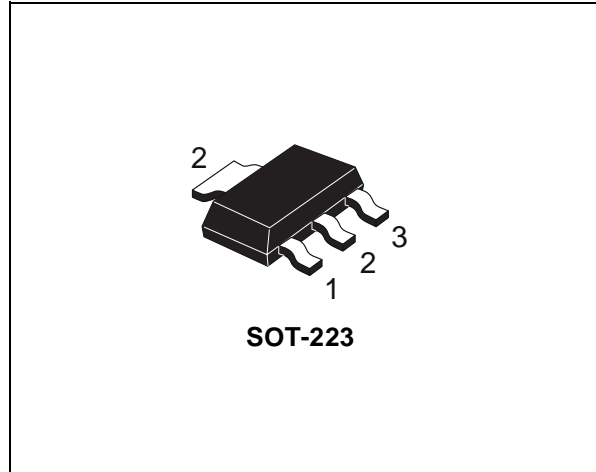
- TYPICAL R<sub>DS(on)</sub> = 0.07 Ω
- EXCEPTIONAL dv/dt CAPABILITY
- AVALANCHE RUGGED TECHNOLOGY
- 100% AVALANCHE TESTED
- LOW THRESHOLD DRIVE

### DESCRIPTION

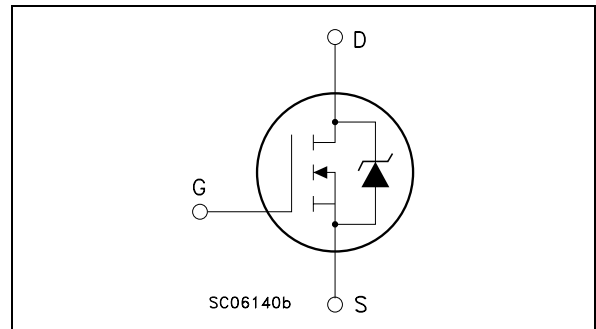
This Power MOSFET is the latest development of STMicroelectronics unique "Single Feature Size™" strip-based process. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalanche characteristics and less critical alignment steps therefore a remarkable manufacturing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

### APPLICATIONS

- DC-DC & DC-AC CONVERTERS
- DC MOTOR CONTROL (DISK DRIVERS, etc.)
- SYNCHRONOUS RECTIFICATION



### INTERNAL SCHEMATIC DIAGRAM



### 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	4	A
I <sub>D</sub>	Drain Current (continuous) at T <sub>C</sub> = 100°C	2.9	A
I <sub>DM(●●)</sub>	Drain Current (pulsed)	16	A
P <sub>tot</sub>	Total Dissipation at T <sub>C</sub> = 25°C	3.3	W
	Derating Factor	0.026	W/°C
dv/dt (1)	Peak Diode Recovery voltage slope	10	V/ns
E <sub>AS</sub> (2)	Single Pulse Avalanche Energy	200	mJ
T <sub>stg</sub>	Storage Temperature	-55 to 150	°C
T <sub>j</sub>	Operating Junction Temperature		

(●●) Pulse width limited by safe operating area.

(●) Current limited by the package

(1) I<sub>SD</sub> ≤ 3A, di/dt ≤ 150A/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> = 4A, V<sub>DD</sub> = 30V

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### THERMAL DATA

Rthj-pcb	Thermal Resistance Junction-PCB (*)	Max	38	°C/W
Rthj-pcb	Thermal Resistance Junction-PCB (**)	Max	100	°C/W
T <sub>l</sub>	Maximum Lead Temperature For Soldering Purpose (for 10 sec. 1.6 mm from case)	Typ	260	°C

(\*) When Mounted on FR-4 board with 1 inch<sup>2</sup> pad, 2 oz of Cu and t ≤ 10 sec

(\*\*) When Mounted on minimum footprint

### 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 10	μA μA
I <sub>GSS</sub>	Gate-body Leakage Current (V <sub>DS</sub> = 0)	V <sub>GS</sub> = ± 16 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		2.8	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> = 5 V I <sub>D</sub> = 1.5 A		0.07 0.085	0.10 0.12	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> = 1.5 A		3		S
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 25V, f = 1 MHz, V <sub>GS</sub> = 0		340		pF
C <sub>oss</sub>	Output Capacitance			63		pF
C <sub>rss</sub>	Reverse Transfer Capacitance			30		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	$V_{DD} = 30\text{ V}$ $I_D = 1.5\text{ A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 5\text{ V}$ (Resistive Load, Figure 3)		9 25		ns ns
$Q_g$ $Q_{gs}$ $Q_{gd}$	Total Gate Charge Gate-Source Charge Gate-Drain Charge	$V_{DD} = 48\text{ V}$ $I_D = 3\text{ A}$ $V_{GS} = 5\text{ V}$		7 1.5 2.8	9	nC nC nC

**SWITCHING OFF**

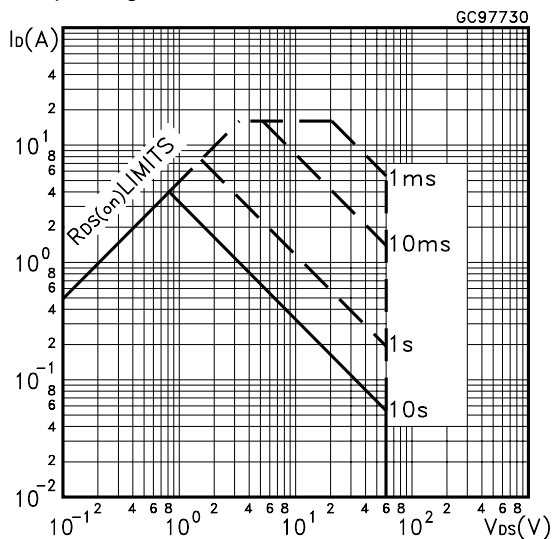
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(off)}$ $t_f$	Turn-off Delay Time Fall Time	$V_{DD} = 30\text{ V}$ $I_D = 1.5\text{ A}$ $R_G = 4.7\ \Omega$ , $V_{GS} = 5\text{ V}$ (Resistive Load, Figure 3)		20 10		ns ns

**SOURCE DRAIN DIODE**

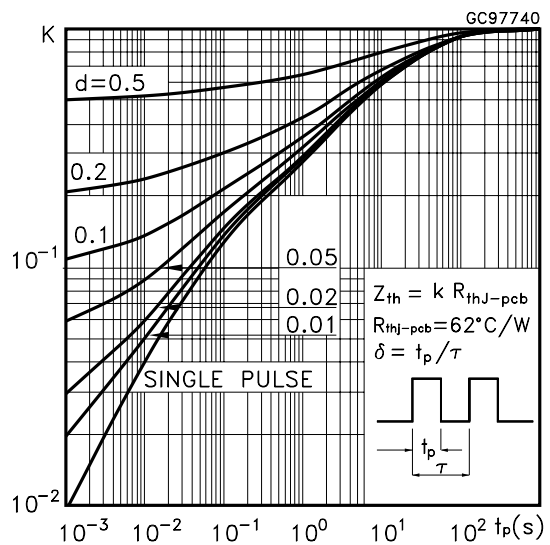
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{SD}$ $I_{SDM} (\bullet)$	Source-drain Current Source-drain Current (pulsed)				4 16	A A
$V_{SD} (*)$	Forward On Voltage	$I_{SD} = 4\text{ A}$ $V_{GS} = 0$			1.5	V
$t_{rr}$ $Q_{rr}$ $I_{RRM}$	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	$I_{SD} = 4\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 25\text{ V}$ $T_j = 150^\circ\text{C}$ (see test circuit, Figure 5)		50 88 3.5		ns nC A

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

**Safe Operating Area**

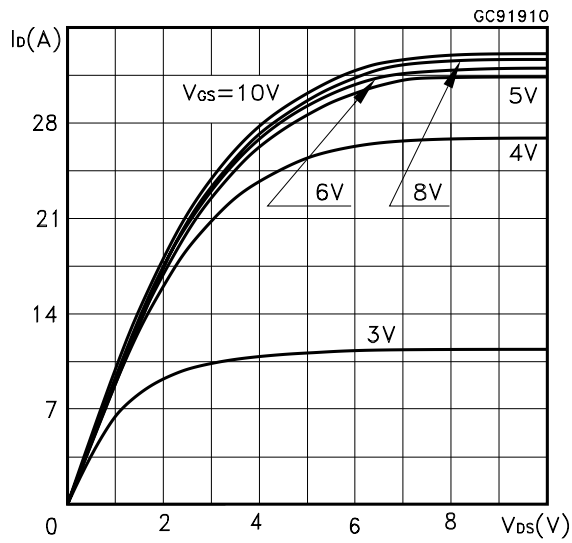


**Thermal Impedance**

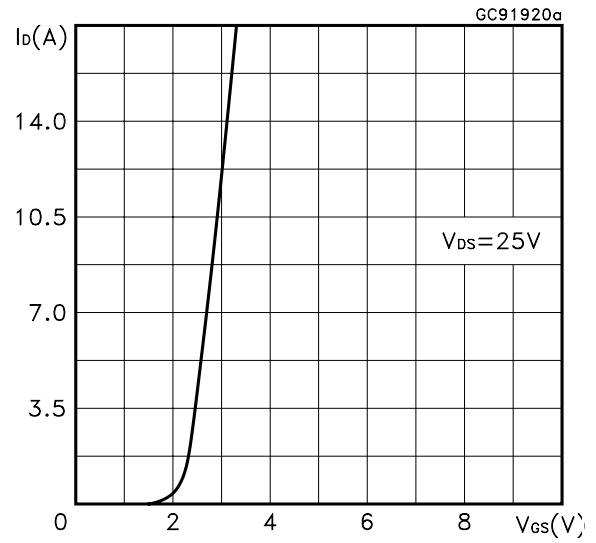


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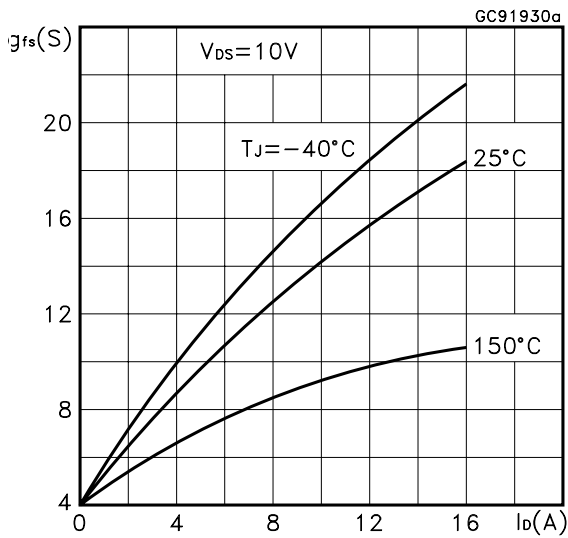
Output Characteristics



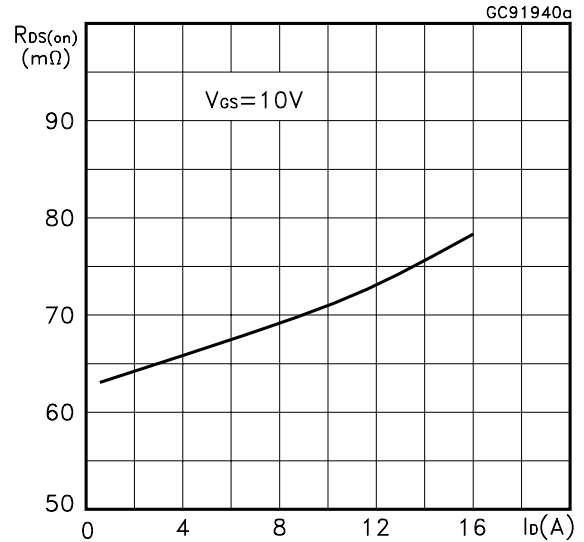
Transfer Characteristics



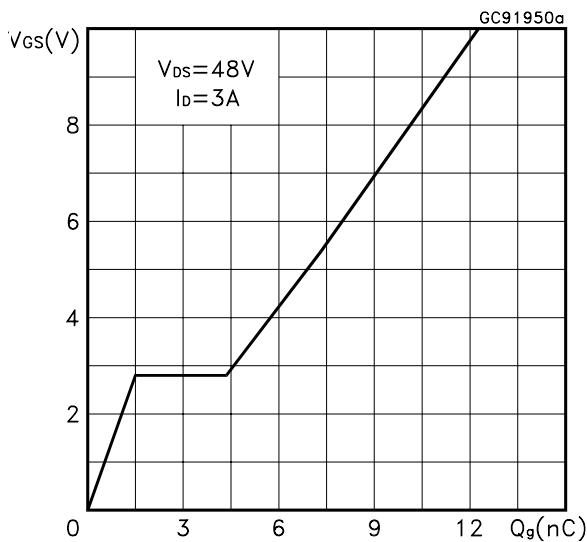
Transconductance



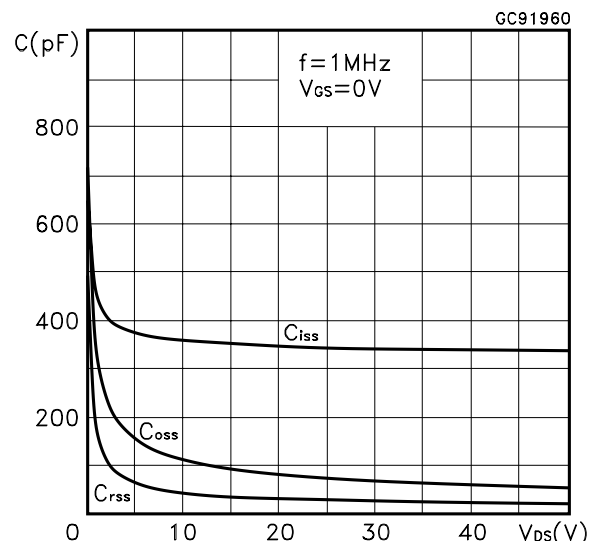
Static Drain-source On Resistance



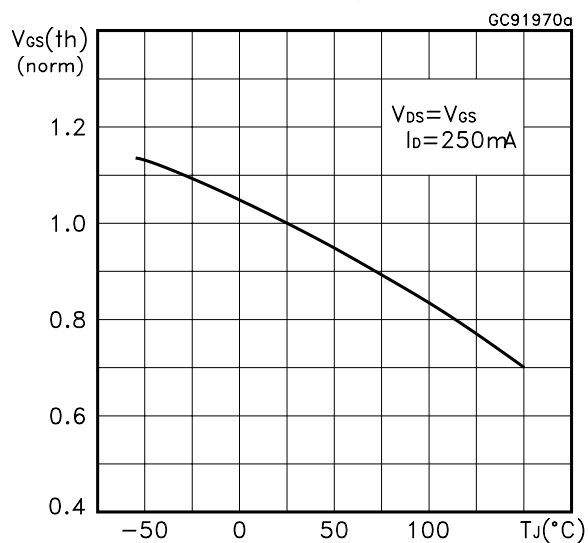
Gate Charge vs Gate-source Voltage



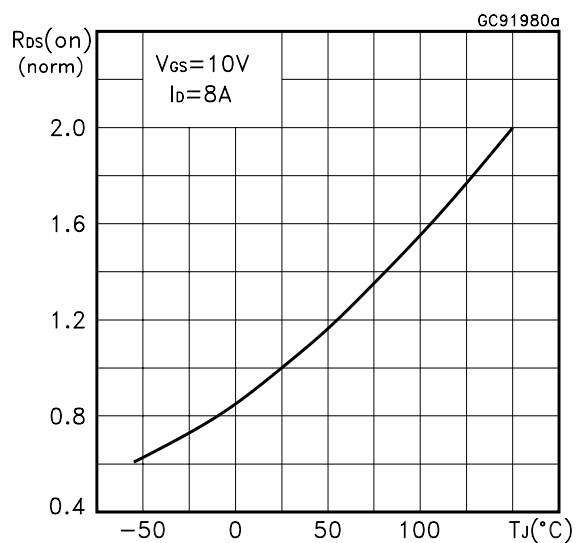
Capacitance Variations



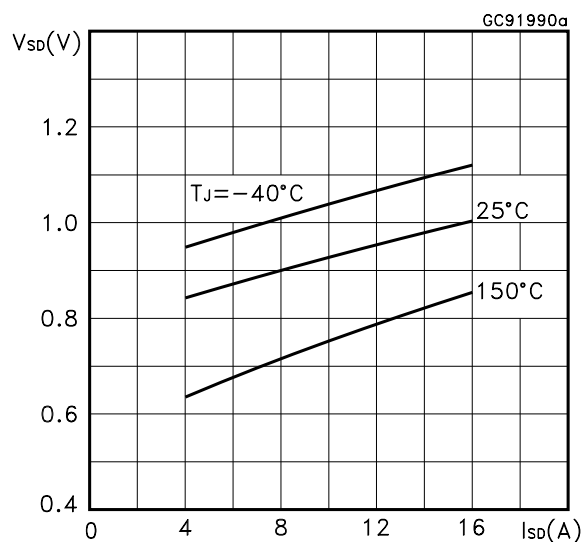
Normalized Gate Threshold Voltage vs Temperature



Normalized on Resistance vs Temperature



Source-drain Diode Forward Characteristics



Normalized Breakdown Voltage vs Temperature.

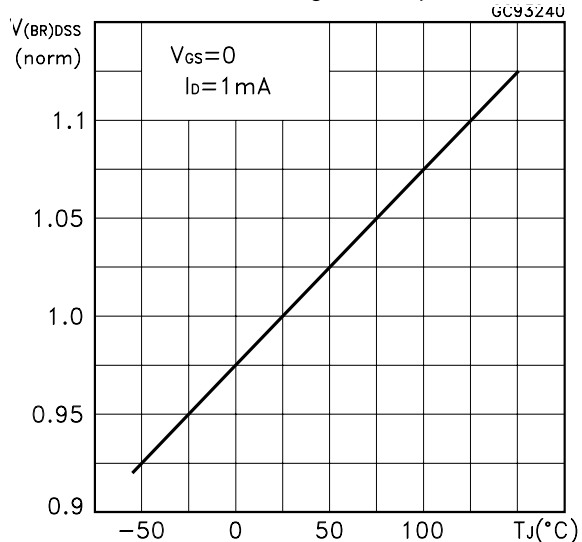


Fig. 1: Unclamped Inductive Load Test Circuit

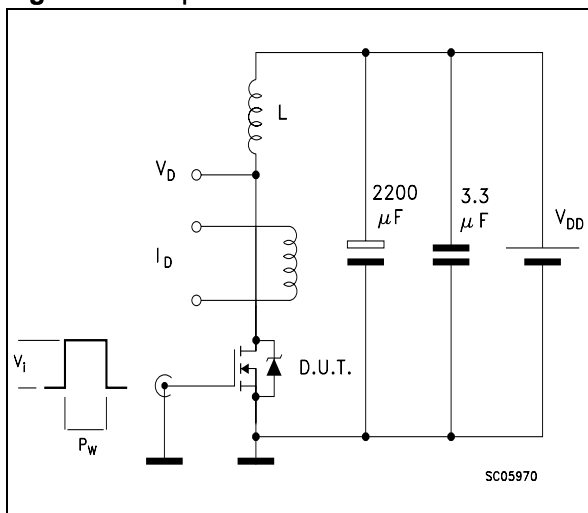


Fig. 2: Unclamped Inductive Waveform

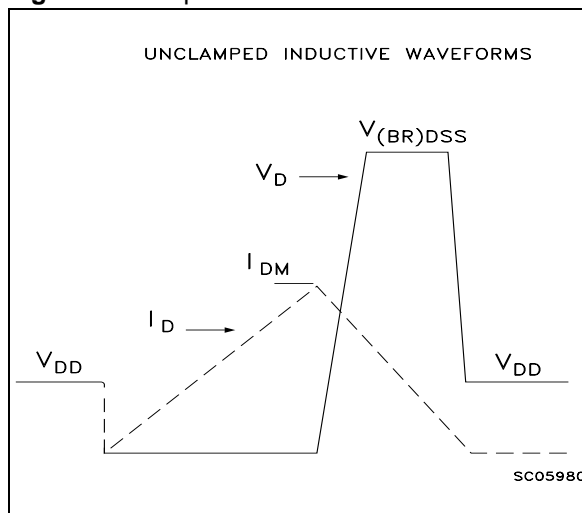


Fig. 3: Switching Times Test Circuits For Resistive Load

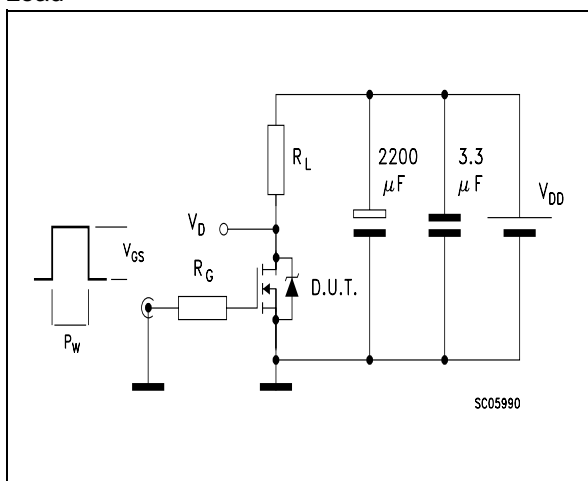


Fig. 4: Gate Charge test Circuit

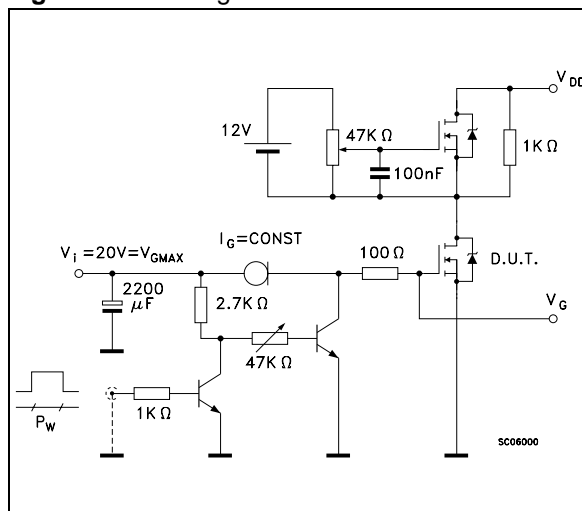
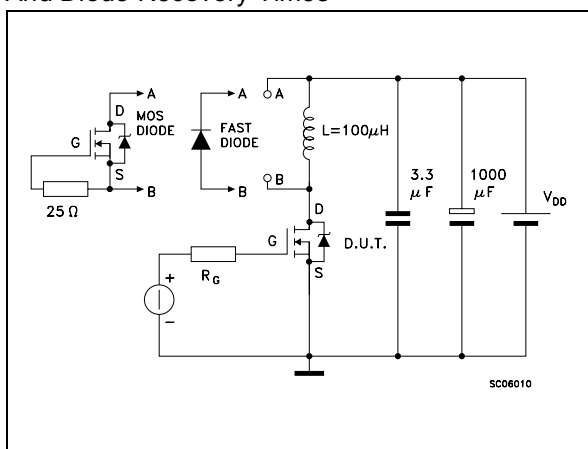
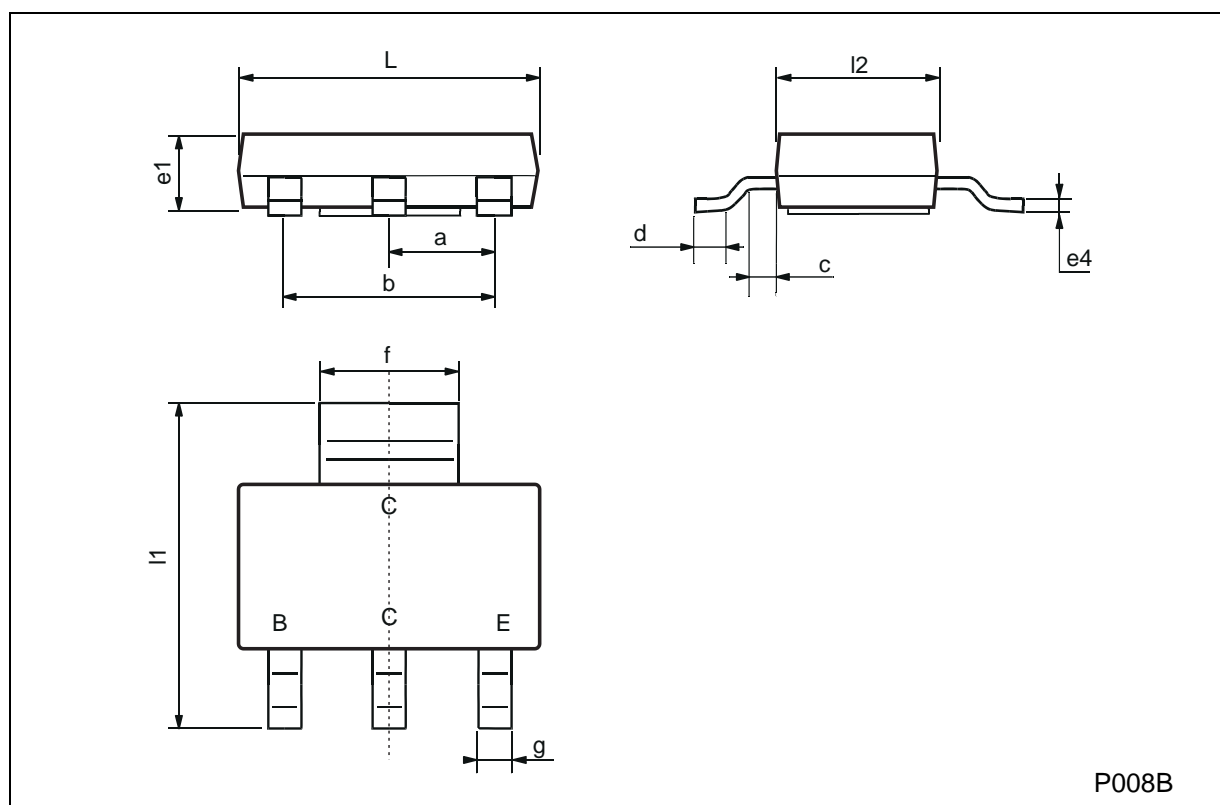


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



## 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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