



# STP62NS04Z

## N-CHANNEL CLAMPED 12.5mΩ - 62A TO-220 FULLY PROTECTED MESH OVERLAY™ MOSFET

TYPE	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STP62NS04Z	CLAMPED	<0.015 Ω	62 A

- TYPICAL R<sub>DS(on)</sub> = 0.0125 Ω
- 100% AVALANCHE TESTED
- LOW CAPACITANCE AND GATE CHARGE
- 175 °C MAXIMUM JUNCTION TEMPERATURE

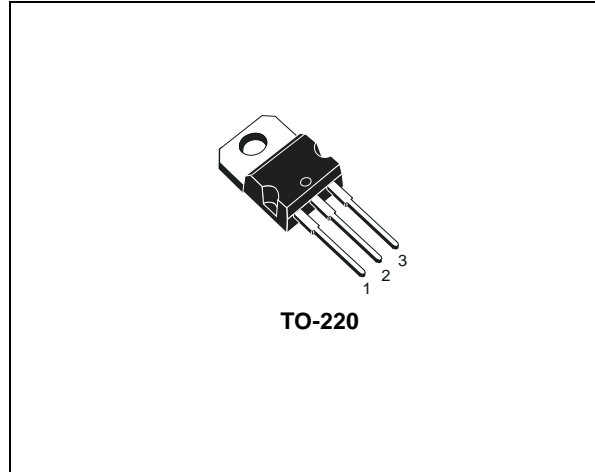
### DESCRIPTION

This fully clamped Mosfet is produced by using the latest advanced Company's Mesh Overlay process which is based on a novel strip layout.

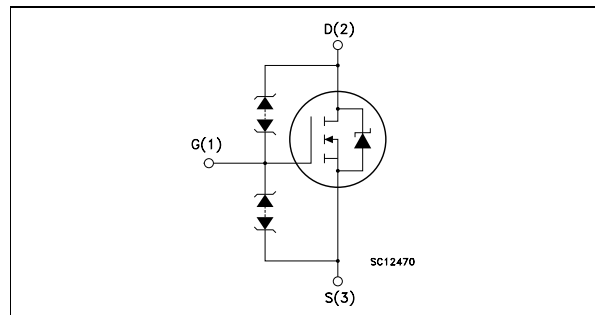
The inherent benefits of the new technology coupled with the extra clamping capabilities make this product particularly suitable for the harshest operation conditions such as those encountered in the automotive environment. Any other application requiring extra ruggedness is also recommended.

### APPLICATIONS

- ABS, SOLENOID DRIVERS
- POWER TOOLS



### INTERNAL SCHEMATIC DIAGRAM



### Ordering Information

SALES TYPE	MARKING	PACKAGE	PACKAGING
STP62NS04Z	P62NS04Z	TO-220	TUBE

### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V <sub>DS</sub>	Drain-source Voltage (V <sub>GS</sub> = 0)	CLAMPED	V
V <sub>DG</sub>	Drain-gate Voltage	CLAMPED	V
V <sub>GS</sub>	Gate- source Voltage	CLAMPED	V
I <sub>D</sub>	Drain Current (continuous) at T <sub>C</sub> = 25°C	62	A
I <sub>D</sub>	Drain Current (continuous) at T <sub>C</sub> = 100°C	37.5	A
I <sub>DG</sub>	Drain Gate Current (continuous)	± 50	mA
I <sub>GS</sub>	Gate Source Current (continuous)	± 50	mA
I <sub>DM</sub> (●)	Drain Current (pulsed)	248	A
P <sub>tot</sub>	Total Dissipation at T <sub>C</sub> = 25°C	110	W
	Derating Factor	0.74	W/°C
dv/dt <sup>(1)</sup>	Peak Diode Recovery voltage slope	8	V/ns
E <sub>AS</sub> <sup>(2)</sup>	Single Pulse Avalanche Energy	500	mJ
V <sub>ESD</sub>	ESD (HBM - C = 100pF, R=1.5 kΩ)	8	kV
T <sub>stg</sub>	Storage Temperature	-55 to 175	°C
T <sub>j</sub>	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> = 20V

## STP62NS04Z

### THERMAL DATA

Rthj-case	Thermal Resistance Junction-case	Max	1.36	°C/W
Rthj-amb	Thermal Resistance Junction-ambient	Max	62.5	°C/W
T <sub>l</sub>	Maximum Lead Temperature For Soldering Purpose (for 10 sec., 1.6mm from case)		300	°C

### 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>	Clamped Voltage	I <sub>D</sub> = 1 mA, V <sub>GS</sub> = 0	33			V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current (V <sub>GS</sub> = 0)	V <sub>DS</sub> = 16 V			10	μA
I <sub>GSS</sub>	Gate-body Leakage Current (V <sub>DS</sub> = 0)	V <sub>GS</sub> = ± 10 V			10	μA
V <sub>GSS</sub>	Gate-Source Breakdown Voltage	I <sub>GS</sub> = 100 μA	18			V

#### 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	2		4	V
R <sub>DS(on)</sub>	Static Drain-source On Resistance	V <sub>GS</sub> = 10 V I <sub>D</sub> = 30 A		12.5	15	mΩ

#### 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> = 30A		20		S
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 25V, f = 1 MHz, V <sub>GS</sub> = 0		1330		pF
C <sub>oss</sub>	Output Capacitance			420		pF
C <sub>rss</sub>	Reverse Transfer Capacitance			135		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	$V_{DD} = 20\text{ V}$ $I_D = 20\text{ A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$ (Resistive Load, Figure 3)		13 104		ns ns
$Q_g$ $Q_{gs}$ $Q_{gd}$	Total Gate Charge Gate-Source Charge Gate-Drain Charge	$V_{DD} = 20\text{ V}$ $I_D = 40\text{ A}$ $V_{GS} = 10\text{ V}$		34 10 11.5	47	nC nC nC

**SWITCHING OFF**

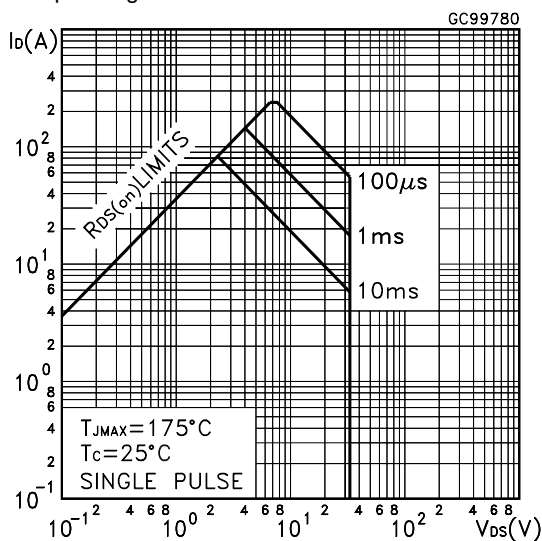
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(off)}$ $t_f$	Turn-off Delay Time Fall Time	$V_{DD} = 20\text{ V}$ $I_D = 20\text{ A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$ (Resistive Load, Figure 3)		41 42		ns ns
$t_r(V_{off})$ $t_f$ $t_c$	Off-voltage Rise Time Fall Time Cross-over Time	$V_{clamp} = 30\text{ V}$ $I_D = 40\text{ A}$ $R_G = 4.7\ \Omega$ , $V_{GS} = 10\text{ V}$ (Inductive Load, Figure 5)		30 54 90		ns ns ns

**SOURCE DRAIN DIODE**

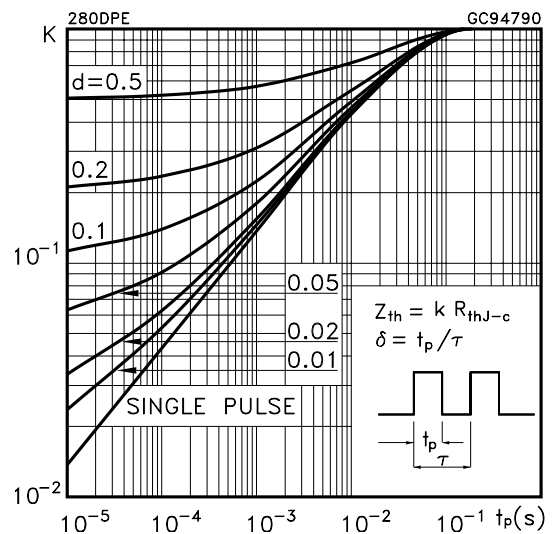
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{SD}$ $I_{SDM}(\bullet)$	Source-drain Current Source-drain Current (pulsed)				62 248	A A
$V_{SD}(\ast)$	Forward On Voltage	$I_{SD} = 62\text{ A}$ $V_{GS} = 0$			1.5	V
$t_{rr}$ $Q_{rr}$ $I_{RRM}$	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	$I_{SD} = 40\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 20\text{ V}$ $T_j = 150^\circ\text{C}$ (see test circuit, Figure 5)		45 65 2.9		ns nC A

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

**Safe Operating Area**

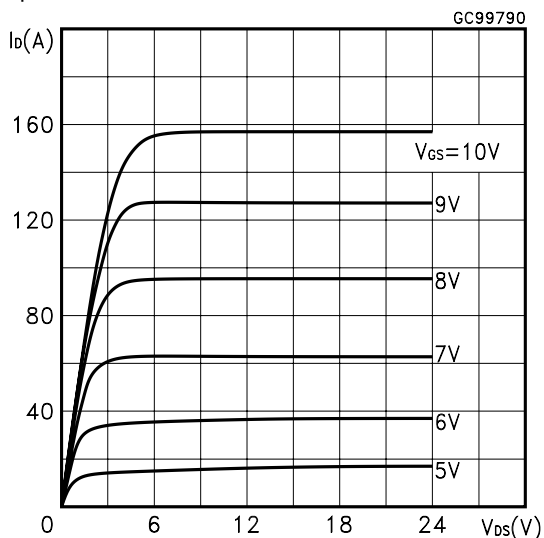


**Thermal Impedance**

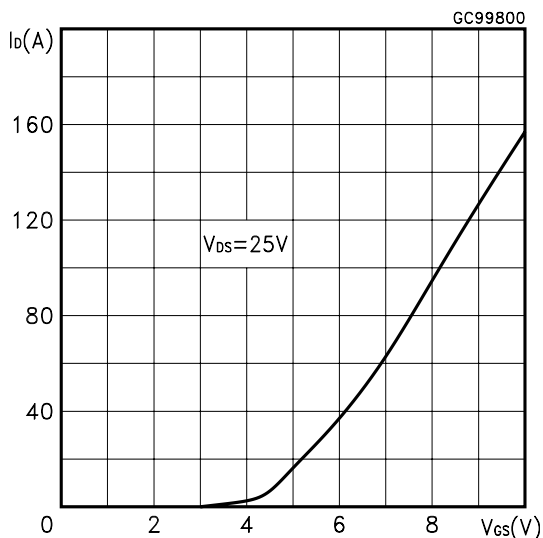


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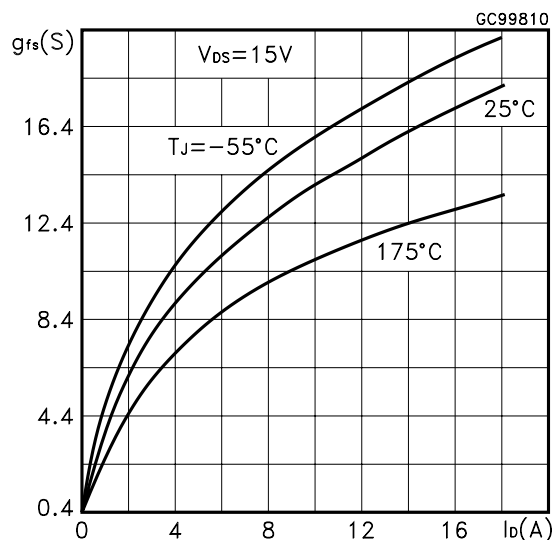
Output Characteristics



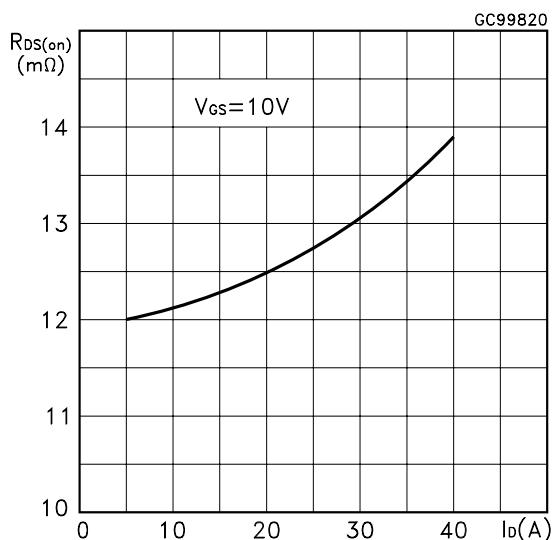
Transfer Characteristics



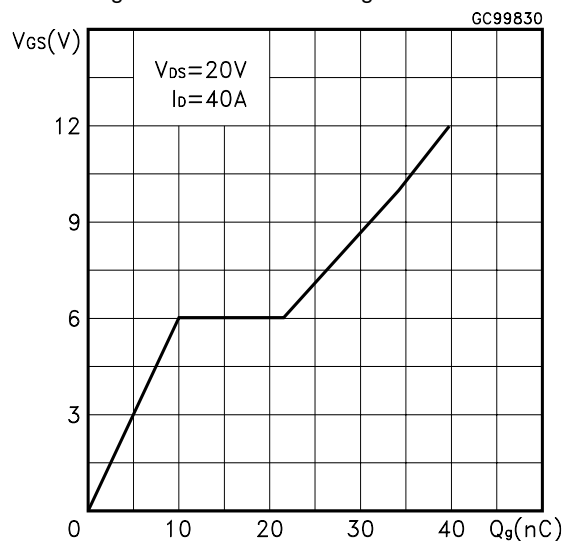
Transconductance



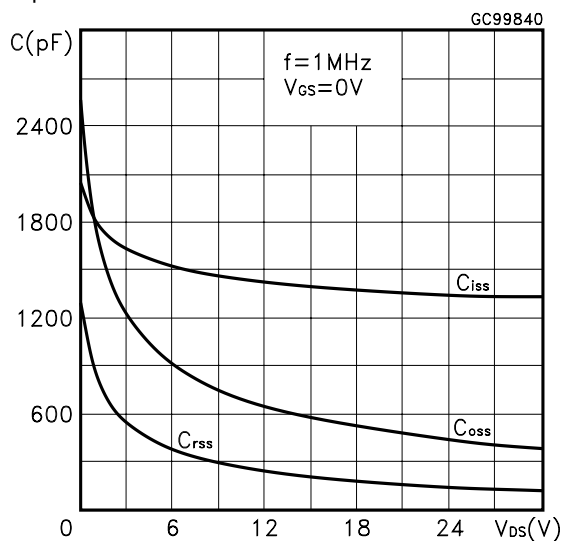
Static Drain-source On Resistance



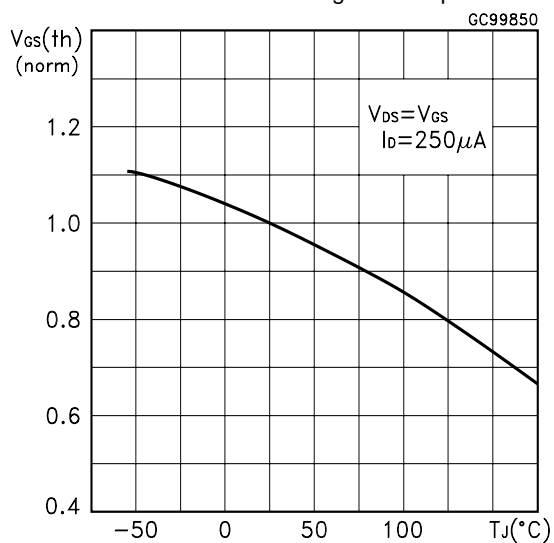
Gate Charge vs Gate-source Voltage



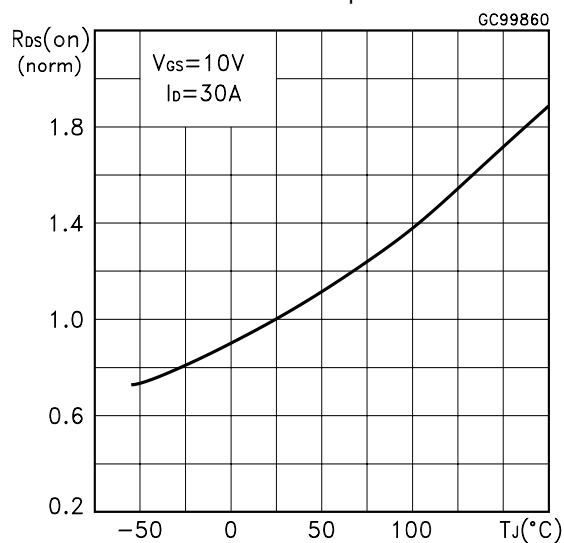
Capacitance Variations



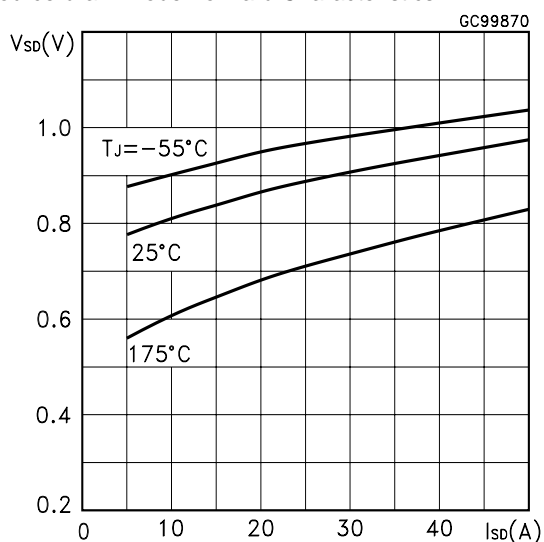
Normalized Gate Threshold Voltage vs Temperature



Normalized on Resistance vs Temperature



Source-drain Diode Forward Characteristics



Normalized Breakdown Voltage Temperature.

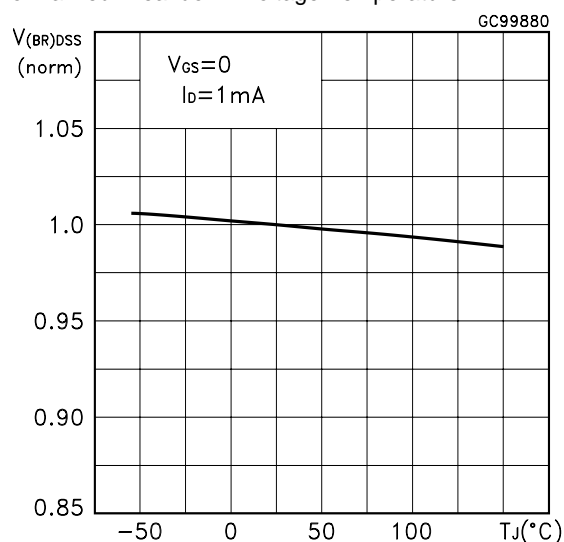


Fig. 1: Unclamped Inductive Load Test Circuit

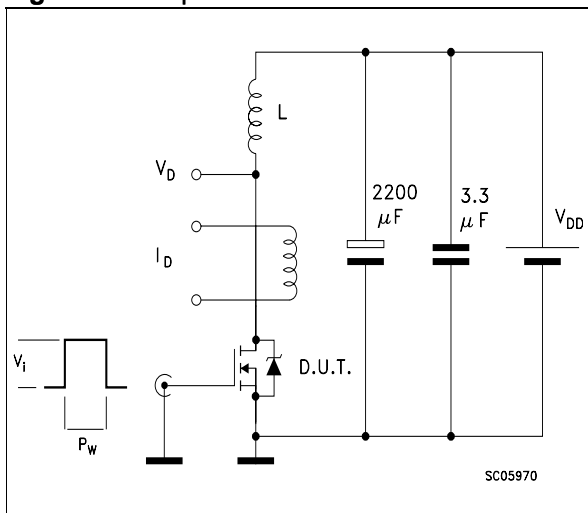


Fig. 2: Unclamped Inductive Waveform

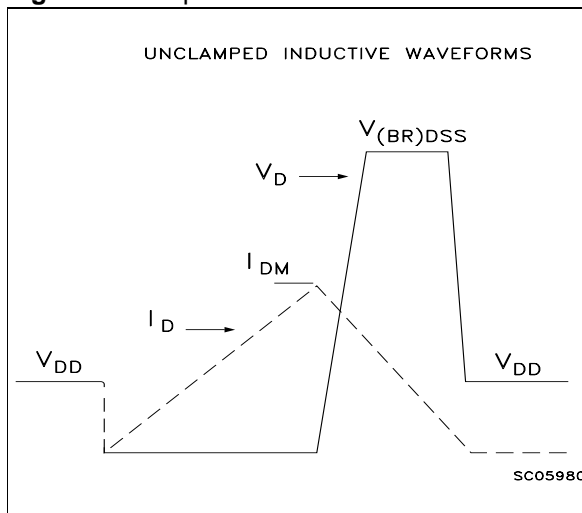


Fig. 3: Switching Times Test Circuits For Resistive Load

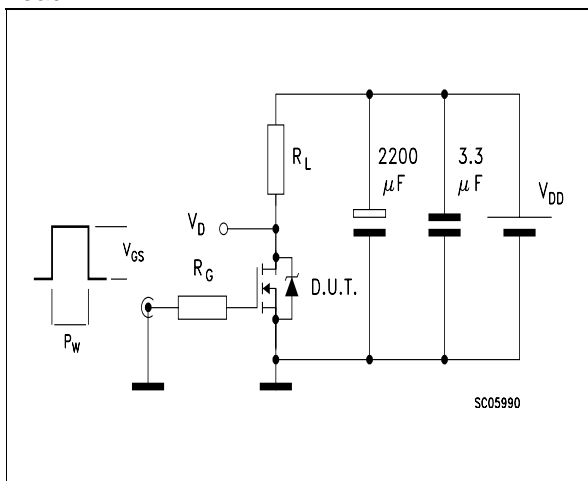


Fig. 4: Gate Charge test Circuit

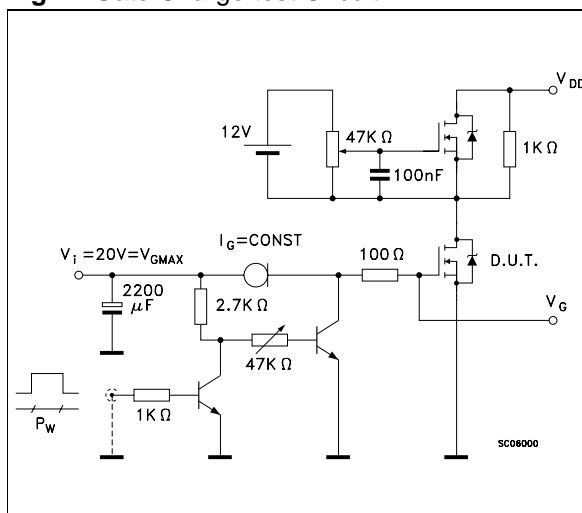
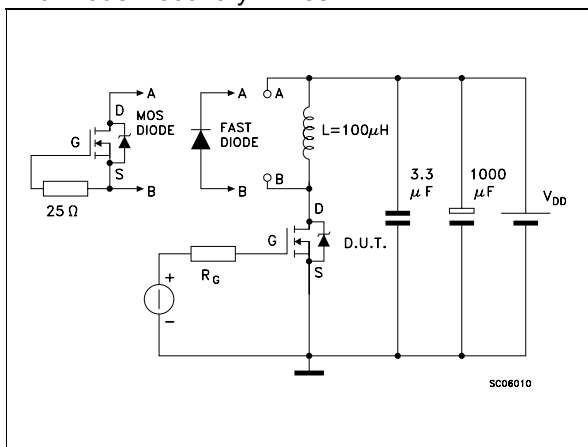
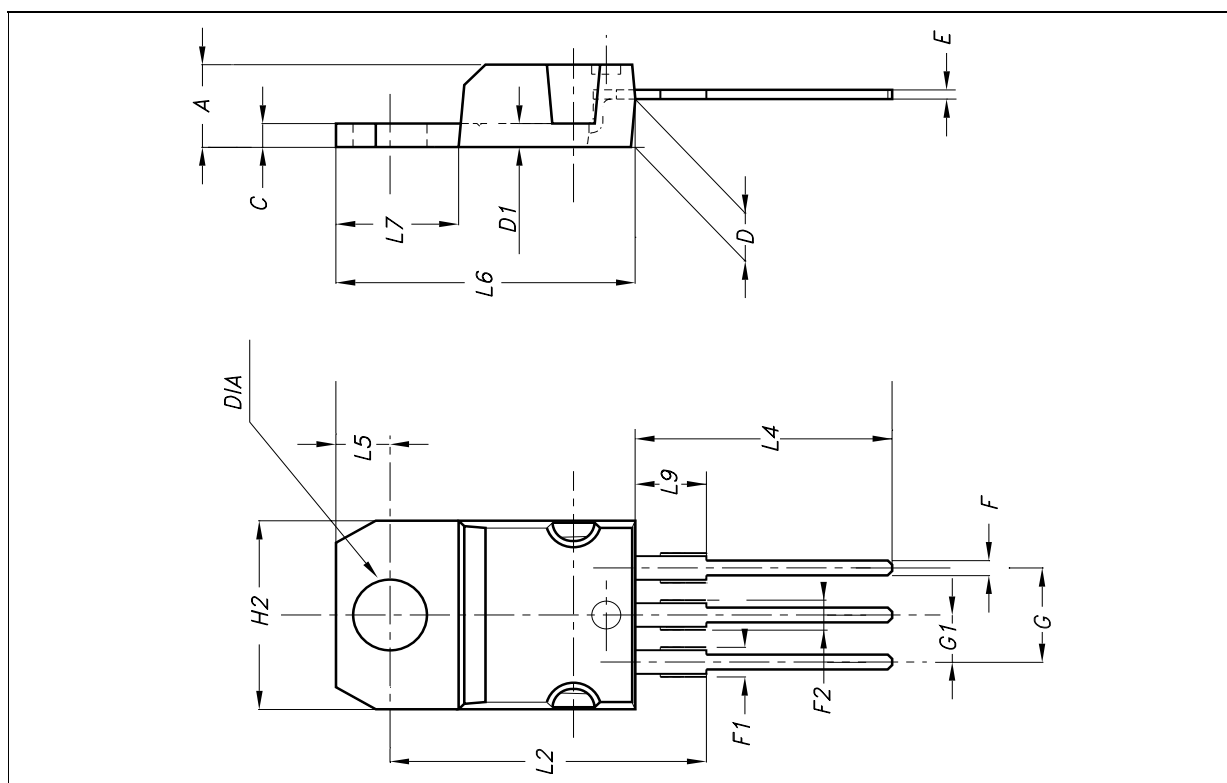


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



## TO-220 MECHANICAL DATA

DIM.	mm.			inch.		
	MIN.	TYP.	MAX.	MIN.	TYP.	TYP.
A	4.4		4.6	0.173		0.181
C	1.23		1.32	0.048		0.051
D	2.40		2.72	0.094		0.107
D1		1.27			0.050	
E	0.49		0.70	0.019		0.027
F	0.61		0.88	0.024		0.034
F1	1.14		1.70	0.044		0.067
F2	1.14		1.70	0.044		0.067
G	4.95		5.15	0.194		0.203
G1	2.40		2.70	0.094		0.106
H2	10		10.40	0.393		0.409
L2	16.10	16.40	16.73	0.633	0.645	0.658
L4	13		14	0.511		0.551
L5	2.65		2.95	0.104		0.116
L6	15.25		15.75	0.600		0.620
L7	6.20		6.60	0.244		0.260
L9	3.50		3.93	0.137		0.154
DIA	3.75		3.85	0.147		0.151



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