



# STP22NF03L

N-CHANNEL 30V - 0.038Ω - 22A TO-220

STripFET™ POWER MOSFET

TYPE	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STP22NF03L	30V	<0.05Ω	22A

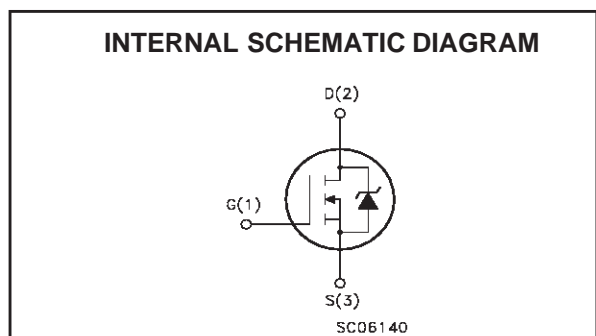
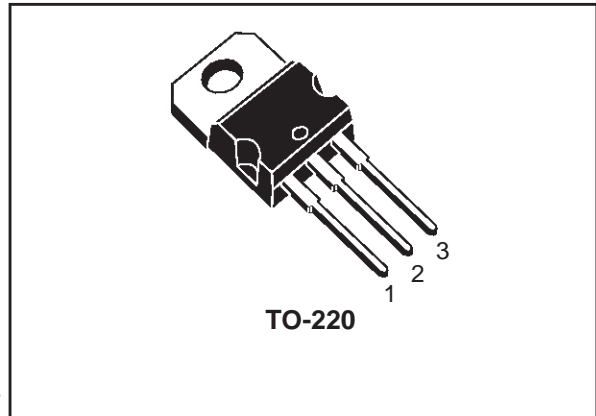
- TYPICAL R<sub>DS(on)</sub> = 0.038Ω
- EXCEPTIONAL dv/dt CAPABILITY
- LOW GATE CHARGE AT 100°C
- APPLICATION ORIENTED CHARACTERIZATION

## 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-DC & DC-AC CONVERTERS
- MOTOR CONTROL, AUDIO AMPLIFIERS
- HIGH CURRENT, HIGH SPEED SWITCHING
- SOLENOID AND RELAY DRIVERS
- AUTOMOTIVE ENVIRONMENT



## 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	22	A
I <sub>D</sub>	Drain Current (continuous) at T <sub>C</sub> = 100°C	16	A
I <sub>DM</sub> (●)	Drain Current (pulsed)	88	A
P <sub>TOT</sub>	Total Dissipation at T <sub>C</sub> = 25°C	45	W
	Derating Factor	0.3	W/°C
dv/dt (1)	Peak Diode Recovery voltage slope	6	V/ns
E <sub>AS</sub> (2)	Single Pulse Avalanche Energy	200	mJ
T <sub>stg</sub>	Storage Temperature	-65 to 175	°C
T <sub>j</sub>	Max. Operating Junction Temperature	175	°C

(●) Pulse width limited by safe operating area

(1) I<sub>SD</sub> ≤ 10A, di/dt ≤ 300A/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> = 11A, V<sub>DD</sub> = 15V

## STP22NF03L

### THERMAL DATA

Rthj-case	Thermal Resistance Junction-case Max	3.33	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	62.5	°C/W
T <sub>l</sub>	Maximum Lead Temperature For Soldering Purpose	300	°C

### 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	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> = ±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> = 10V, I <sub>D</sub> = 11 A V <sub>GS</sub> = 5 V, I <sub>D</sub> = 11 A		0.038 0.045	0.05 0.06	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> = 10V	22			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g <sub>fs</sub> (1)	Forward Transconductance	V <sub>DS</sub> > I <sub>D(on)</sub> × R <sub>DS(on)max</sub> , I <sub>D</sub> = 11A		7		S
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 25V, f = 1 MHz, V <sub>GS</sub> = 0		330		pF
C <sub>oss</sub>	Output Capacitance			90		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	$V_{DD} = 15V, I_D = 11A$		11		ns
$t_r$	Rise Time	$R_G = 4.7\Omega, V_{GS} = 4.5V$ (see test circuit, Figure 3)		100		ns
$Q_g$	Total Gate Charge	$V_{DD} = 24V, I_D = 22A,$ $V_{GS} = 10V$		6.5	9	nC
$Q_{gs}$	Gate-Source Charge			3.6		nC
$Q_{gd}$	Gate-Drain Charge			2		nC

**SWITCHING OFF**

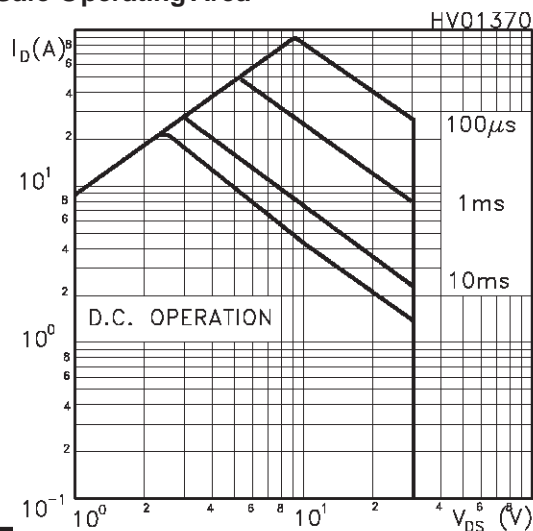
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(off)}$	Turn-off-Delay Time	$V_{DD} = 15V, I_D = 11A,$ $R_G = 4.7\Omega, V_{GS} = 4.5V$ (see test circuit, Figure 3)		25		ns
$t_f$	Fall Time			22		ns
$t_{r(off)}$	Off-voltage Rise Time	$V_{clamp} = 24V, I_D = 22A$ $R_G = 4.7\Omega, V_{GS} = 4.5V$		22		ns
$t_f$	Fall Time	(see test circuit, Figure 5)		55		ns
$t_c$	Cross-over Time			75		ns

**SOURCE DRAIN DIODE**

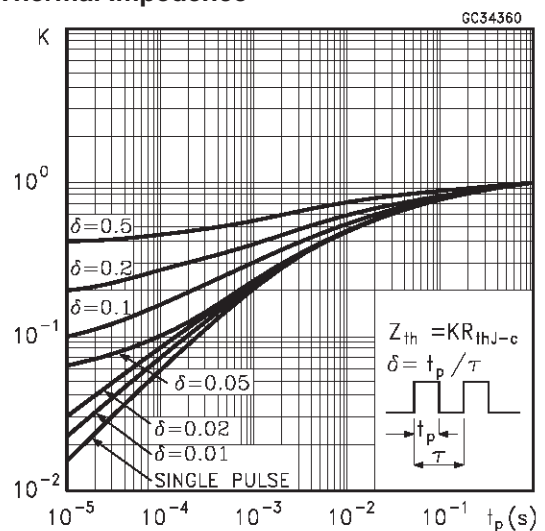
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain Current				22	A
$I_{SDM(1)}$	Source-drain Current (pulsed)				88	A
$V_{SD(2)}$	Forward On Voltage	$I_{SD} = 22A, V_{GS} = 0$			1.5	V
$t_{rr}$	Reverse Recovery Time	$I_{SD} = 22A, di/dt = 100A/\mu s,$ $V_{DD} = 15V, T_j = 150^\circ C$ (see test circuit, Figure 5)		30		ns
$Q_{rr}$	Reverse Recovery Charge			18		nC
$I_{RRM}$	Reverse Recovery Current			1.2		A

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

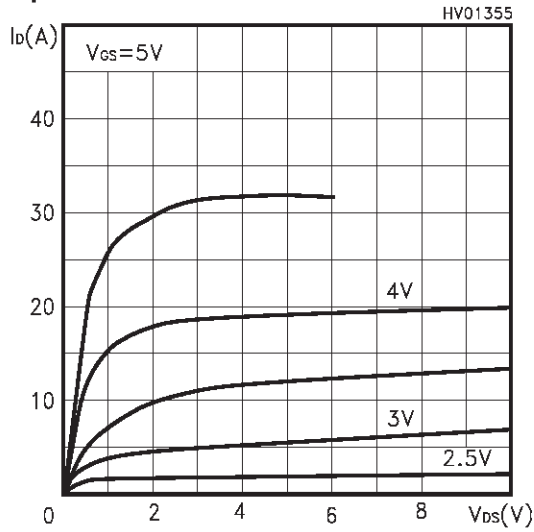
**Safe Operating Area**



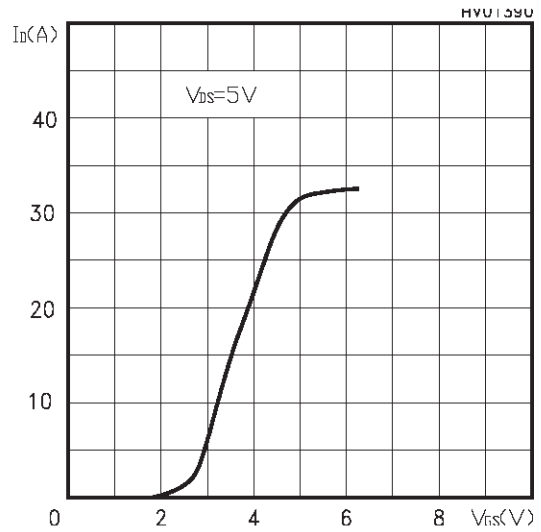
**Thermal Impedence**



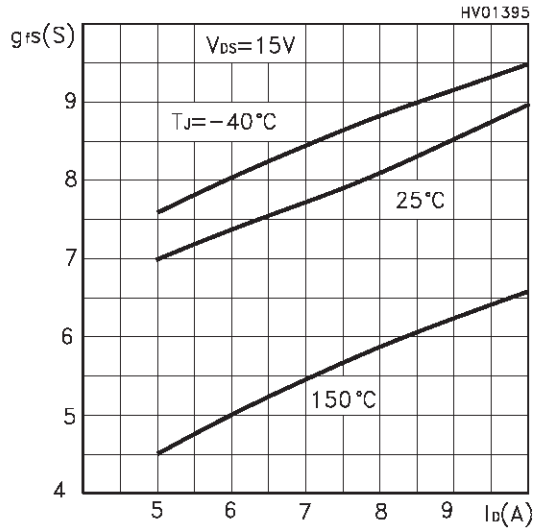
Output Characteristics



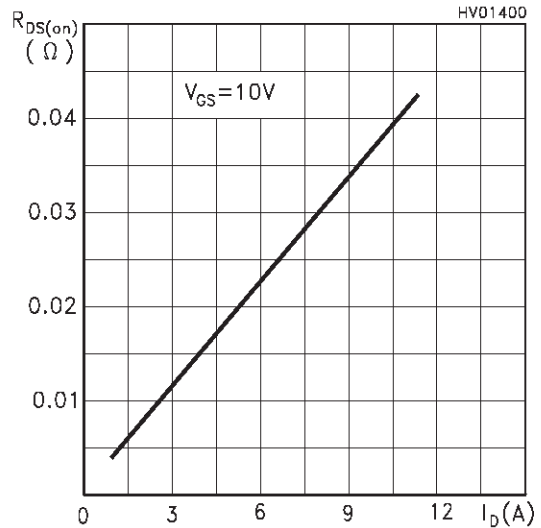
Transfer Characteristics



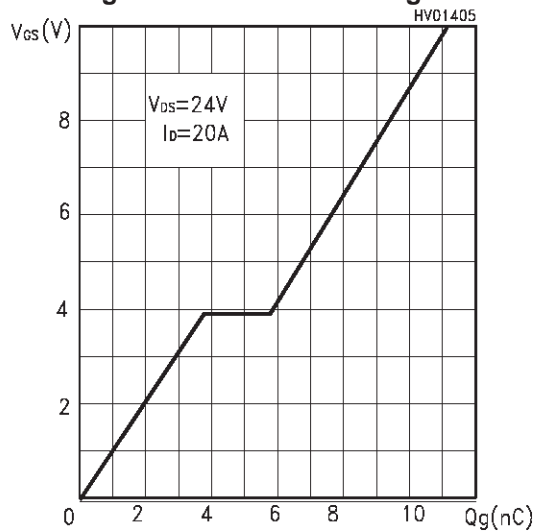
Transconductance



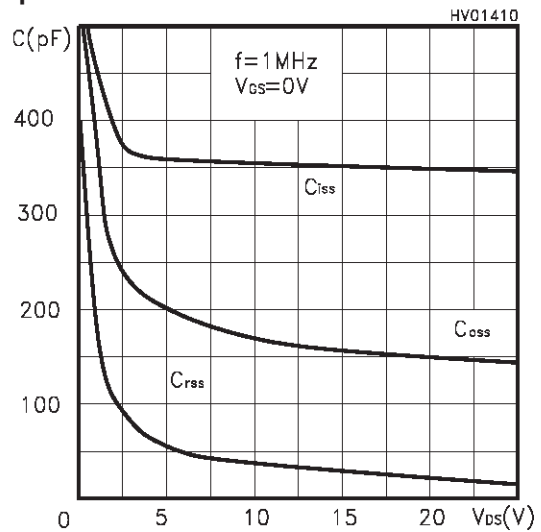
Static Drain-source On Resistance



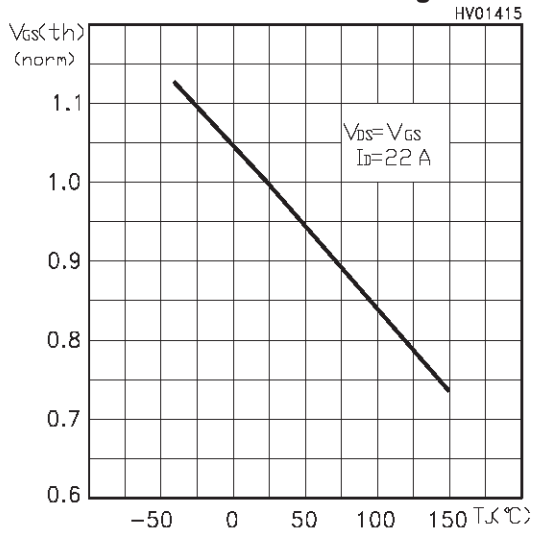
Gate Charge vs Gate-source Voltage



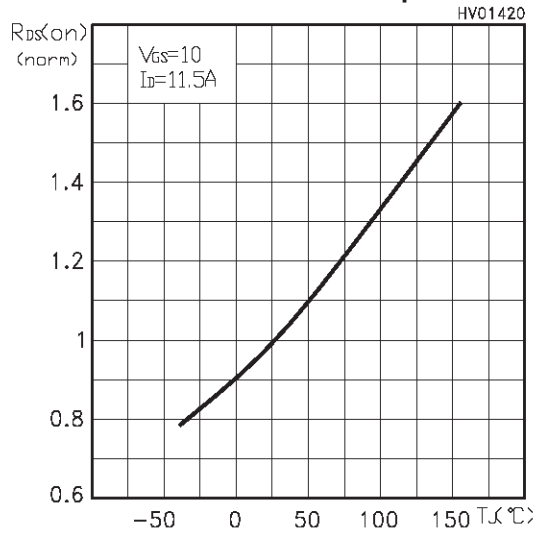
Capacitance Variations



Normalized Gate Threshold Voltage vs Temp.



Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics

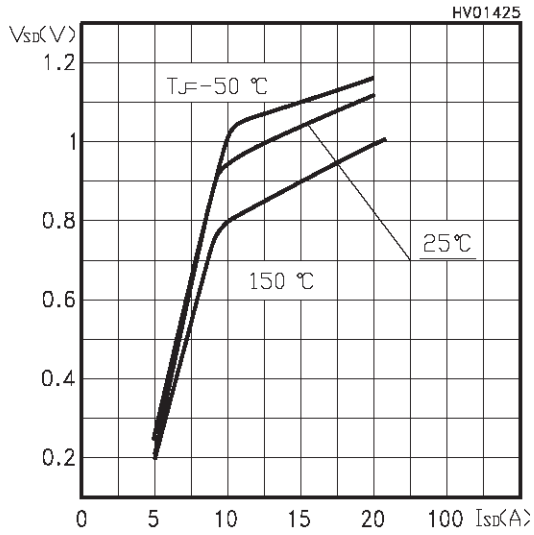


Fig. 1: Unclamped Inductive Load Test Circuit

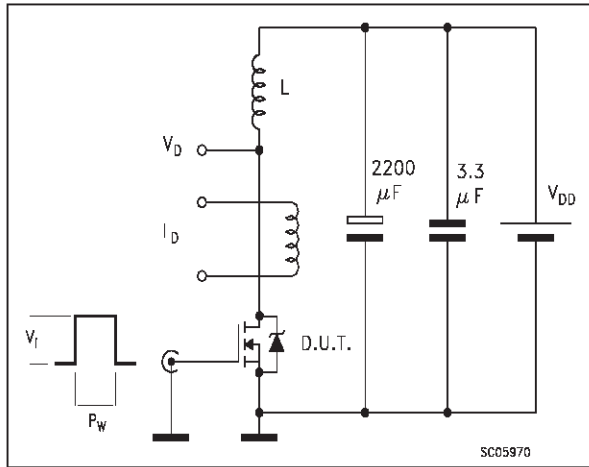


Fig. 2: Unclamped Inductive Waveform

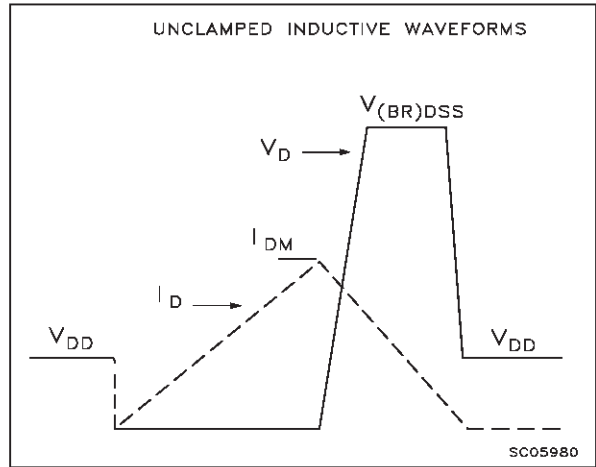


Fig. 3: Switching Times Test Circuit For Resistive Load

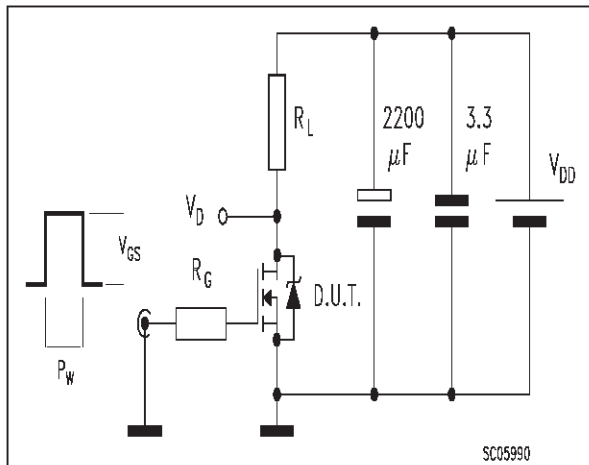


Fig. 4: Gate Charge test Circuit

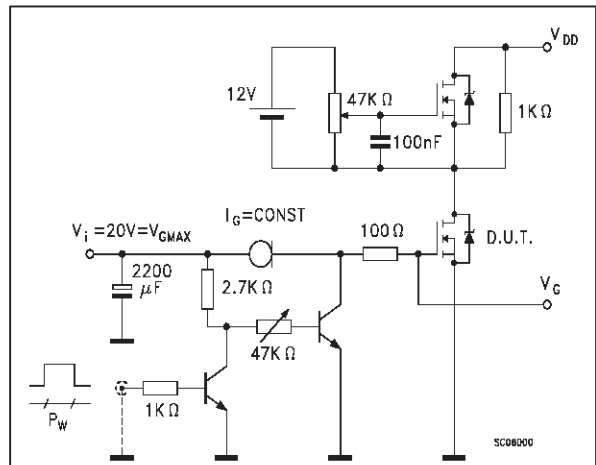
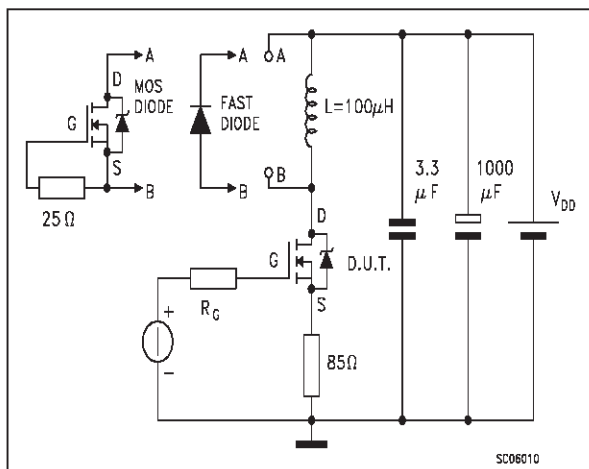
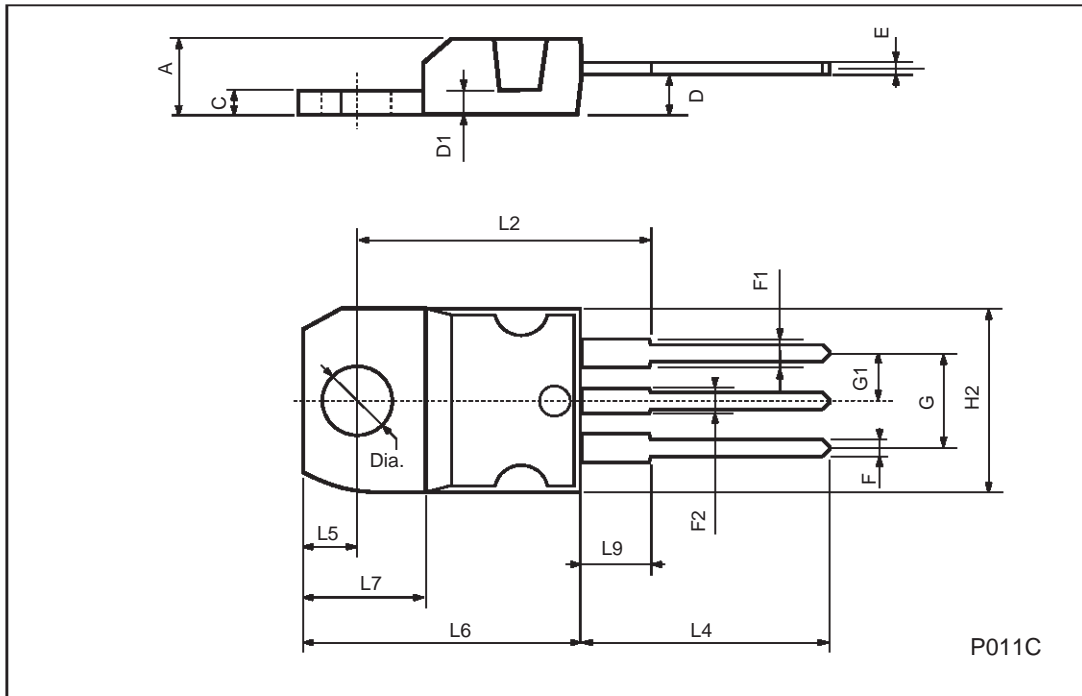


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



TO-220 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	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	2.4		2.7	0.094		0.106
H2	10.0		10.40	0.393		0.409
L2		16.4			0.645	
L4	13.0		14.0	0.511		0.551
L5	2.65		2.95	0.104		0.116
L6	15.25		15.75	0.600		0.620
L7	6.2		6.6	0.244		0.260
L9	3.5		3.93	0.137		0.154
DIA.	3.75		3.85	0.147		0.151



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