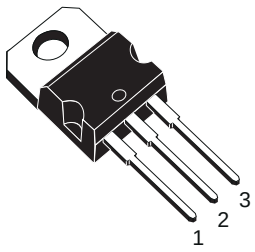
STP14NF12
STP14NF12FP

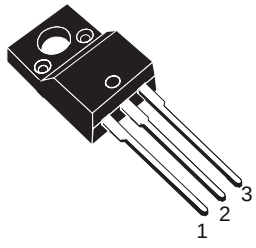
N-CHANNEL 120V - 0.16Ω - 14A TO-220/TO-220FP
LOW GATE CHARGE STripFET™ POWER MOSFET

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP14NF12	120 V	< 0.18 Ω	14 A
STP14NF12FP	120 V	< 0.18 Ω	14 A

- TYPICAL $R_{DS}(on)$ = 0.16Ω
- EXCEPTIONAL dv/dt CAPABILITY
- APPLICATION ORIENTED CHARACTERIZATION



TO-220

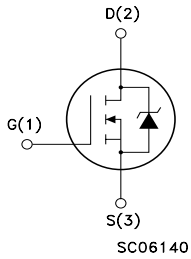


TO-220FP

DESCRIPTION

This Power MOSFET series realized with STMicroelectronics unique STripFET process has specifically been designed to minimize input capacitance and gate charge. It is therefore suitable as primary switch in advanced high-efficiency isolated DC-DC converters for Telecom and Computer application. It is also intended for any application with low gate charge drive requirements

INTERNAL SCHEMATIC DIAGRAM



APPLICATIONS

- HIGH-EFFICIENCY DC-DC CONVERTERS
- UPS AND MOTOR CONTROL

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP14NF12	STP14NF12FP	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	120		V
V_{DGR}	Drain-gate Voltage (R_{GS} = 20 kΩ)	120		V
V_{GS}	Gate- source Voltage	±20		V
I_D	Drain Current (continuous) at T_C = 25°C	14	8.5	A
I_D	Drain Current (continuous) at T_C = 100°C	9	6	A
I_{DM} (●)	Drain Current (pulsed)	56	34	A
P_{TOT}	Total Dissipation at T_C = 25°C	60	25	W
	Derating Factor	0.4	0.17	W/°C
dv/dt (1)	Peak Diode Recovery voltage slope	9		V/ns
E_{AS} (2)	Single Pulse Avalanche Energy	60		mJ
V_{ISO}	Insulation Withstand Voltage (DC)	-	2500	V
T_j	Operating Junction Temperature	-55 to 175		°C
T_{stg}	Storage Temperature			

(●) Pulse width limited by safe operating area

(1) I_{SD} ≤14A, di/dt ≤300A/µs, V_{DD} ≤ $V_{(BR)DSS}$, T_j ≤ $T_{JMAX.}$
(2) Starting T_j = 25°C, I_D = 14A, V_{DD} = 50V

THERMAL DATA

		TO-220	TO-220FP	
Rthj-case	Thermal Resistance Junction-case Max	2.5	6	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	62.5		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose	300		°C

ELECTRICAL CHARACTERISTICS (T_{CASE} = 25 °C UNLESS OTHERWISE SPECIFIED)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{(BR)DSS}$	Drain-source Breakdown Voltage	I_D = 250 µA, V_{GS} = 0	120			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating			1	µA
		V_{DS} = Max Rating, T_C = 125 °C			10	µA
I_{GSS}	Gate-body Leakage Current (V_{DS} = 0)	V_{GS} = ±20V			±100	nA

ON (1)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS} = V_{GS}, I_D = 250µA	2	3	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V, I_D = 7 A		0.16	0.18	Ω

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (1)	Forward Transconductance	V_{DS} = 15V , I_D = 7 A		4		S
C_{iss}	Input Capacitance	V_{DS} = 25V, f = 1 MHz, V_{GS} = 0		460		pF
C_{oss}	Output Capacitance			70		pF
C_{rss}	Reverse Transfer Capacitance			30		pF

ELECTRICAL CHARACTERISTICS (CONTINUED)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	V_{DD} = 50 V, I_D = 7 A		16		ns
t_r	Rise Time	R_G = 4.7Ω V_{GS} = 10V (Resistive Load, see Figure 3)		25		ns
Q_g	Total Gate Charge	V_{DD} = 80 V, I_D = 14 A,		15.5	21	nC
Q_{gs}	Gate-Source Charge	V_{GS} = 10V		3.7		nC
Q_{gd}	Gate-Drain Charge			4.7		nC

SWITCHING OFF

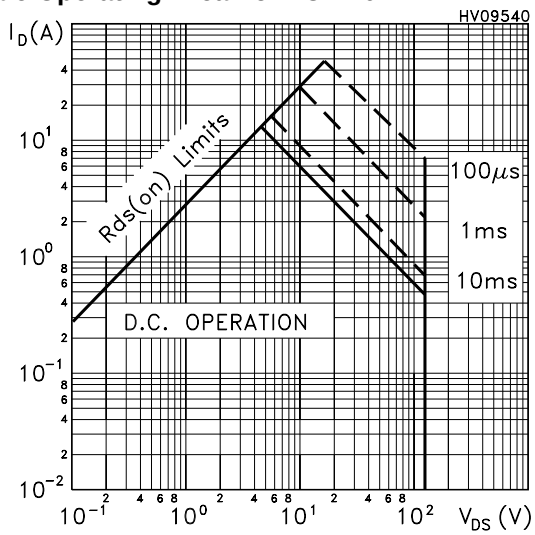
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(off)}$	Turn-off-Delay Time	V_{DD} = 50 V, I_D = 7 A,		32		ns
t_f	Fall Time	R_G = 4.7Ω, V_{GS} = 10V (Resistive Load, see Figure 3)		8		ns

SOURCE DRAIN DIODE

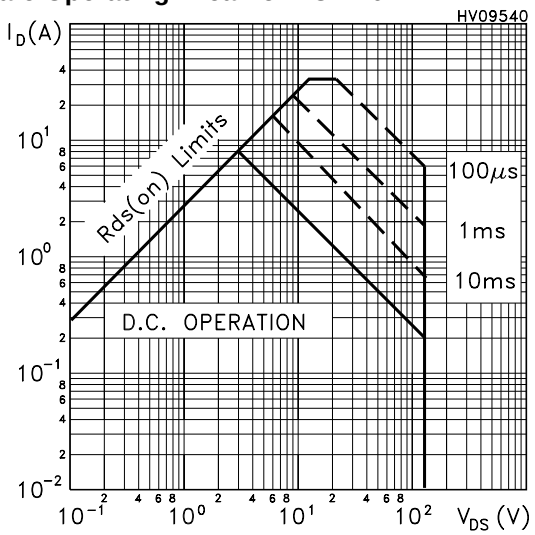
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain Current				14	A
I_{SDM} (2)	Source-drain Current (pulsed)				56	A
V_{SD} (1)	Forward On Voltage	I_{SD} = 14 A, V_{GS} = 0			1.5	V
t_{rr}	Reverse Recovery Time	I_{SD} = 14 A, di/dt = 100A/µs,		92		ns
Q_{rr}	Reverse Recovery Charge	V_{DD} = 50 V, T_j = 150°C		230		nC
I_{RRM}	Reverse Recovery Current	(see test circuit, Figure 5)		5		A

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

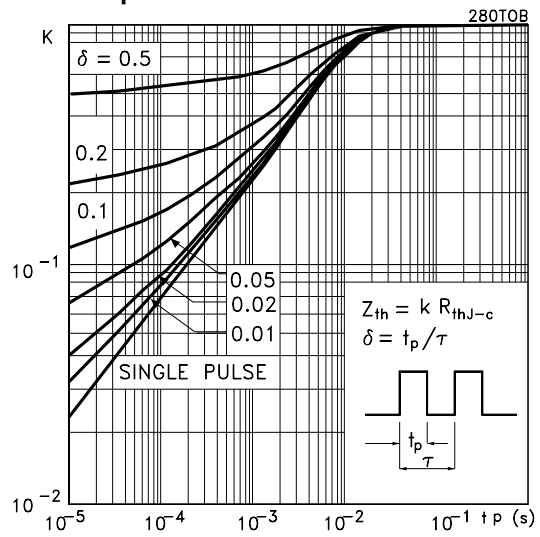
Safe Operating Area For TO-220



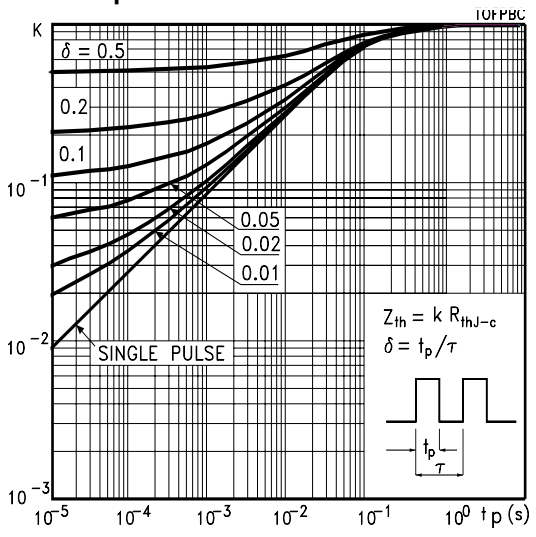
Safe Operating Area For TO-220FP



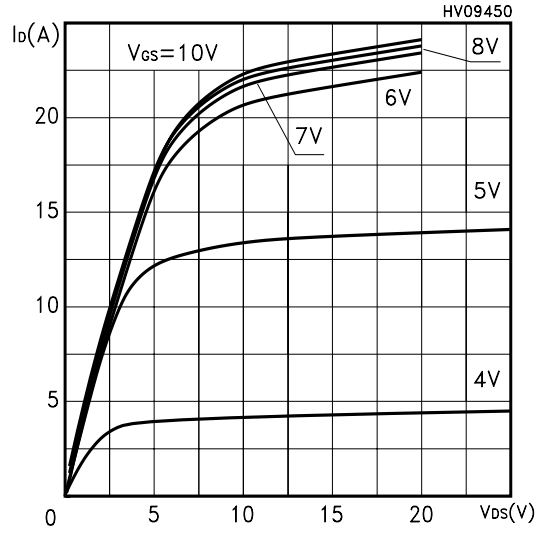
Thermal Impedance For TO-220



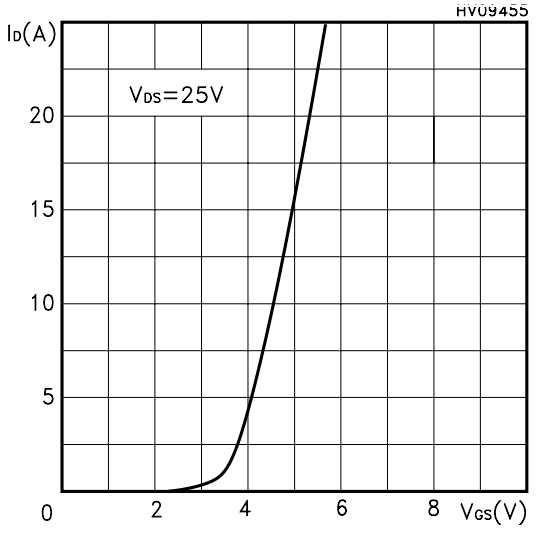
Thermal Impedance For TO-220FP



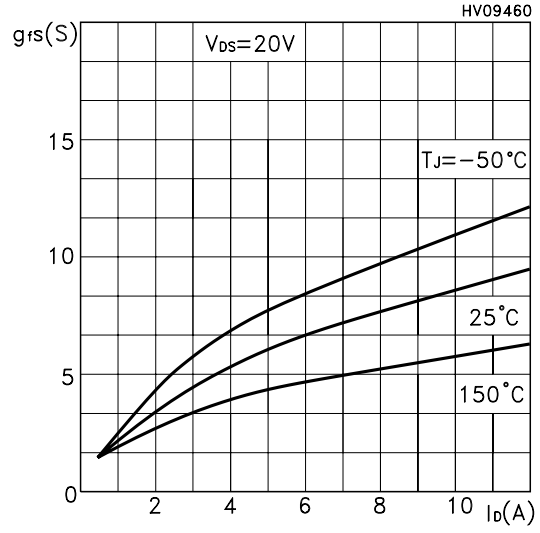
Output Characteristics



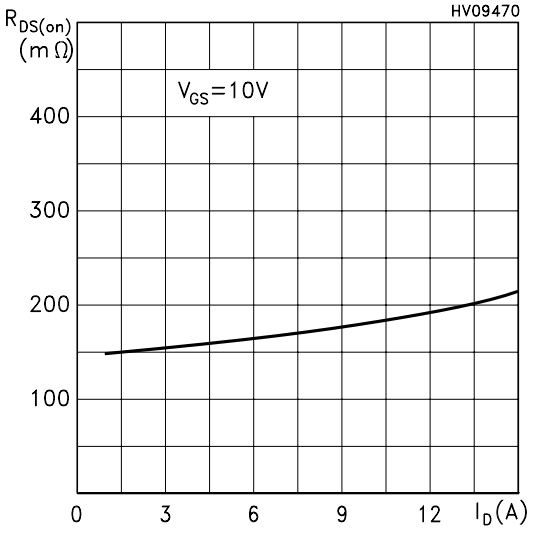
Transfer Characteristics



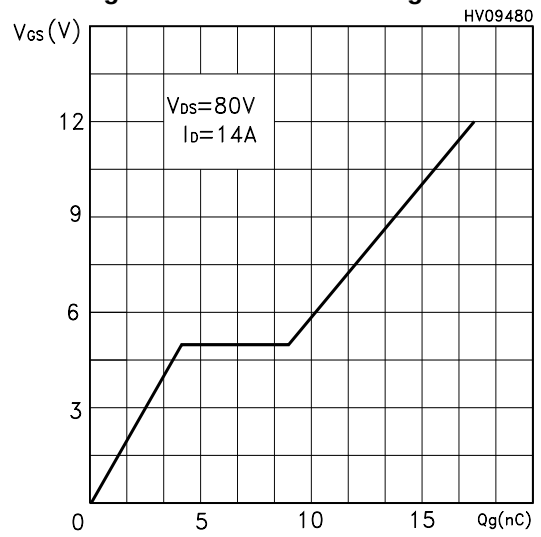
Transconductance



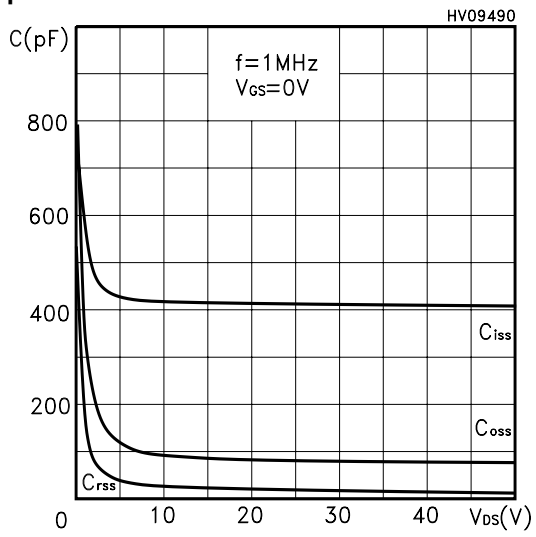
Static Drain-source On Resistance



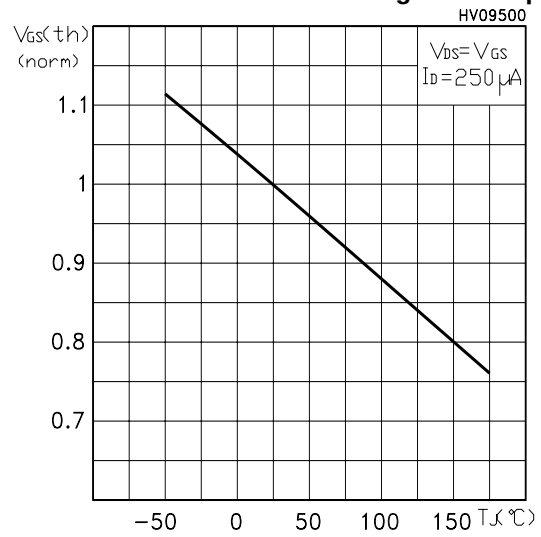
Gate Charge vs Gate-source Voltage



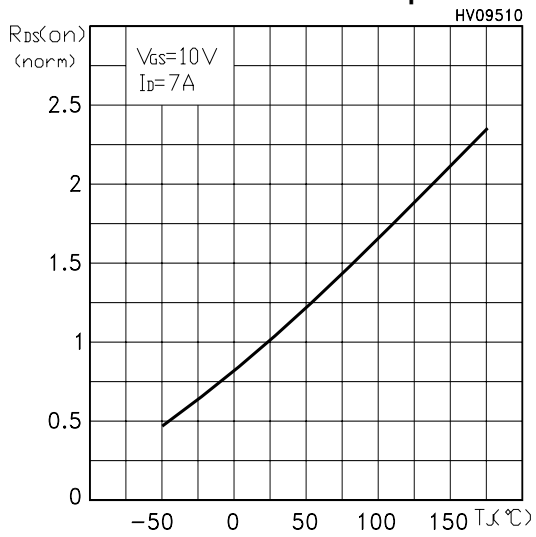
Capacitance Variations



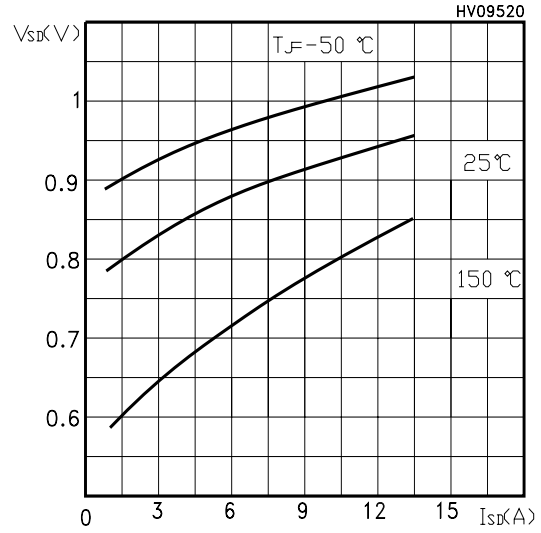
Normalized Gate Threshold Voltage vs Temp.



Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics



Normalized BVDSS vs Temperature

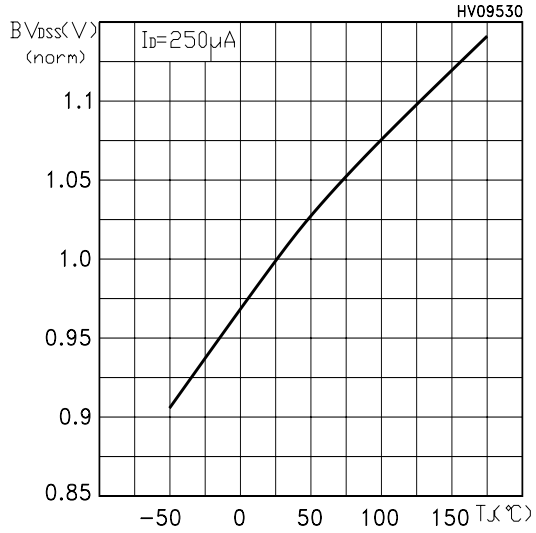


Fig. 1: Unclamped Inductive Load Test Circuit

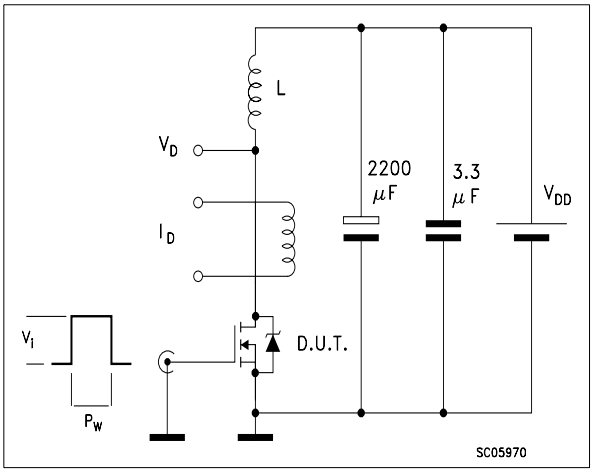


Fig. 2: Unclamped Inductive Waveform

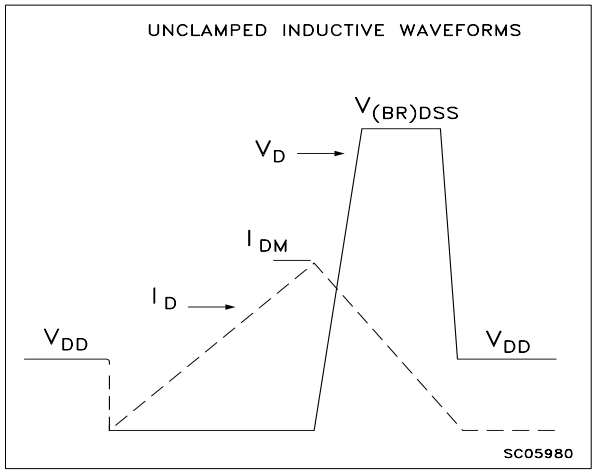


Fig. 3: Switching Times Test Circuit For Resistive Load

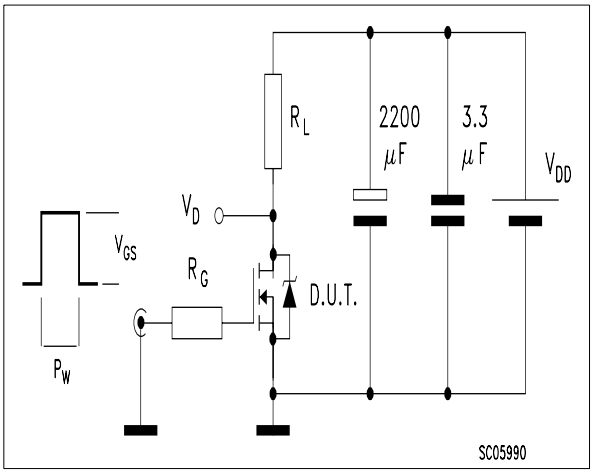


Fig. 4: Gate Charge test Circuit

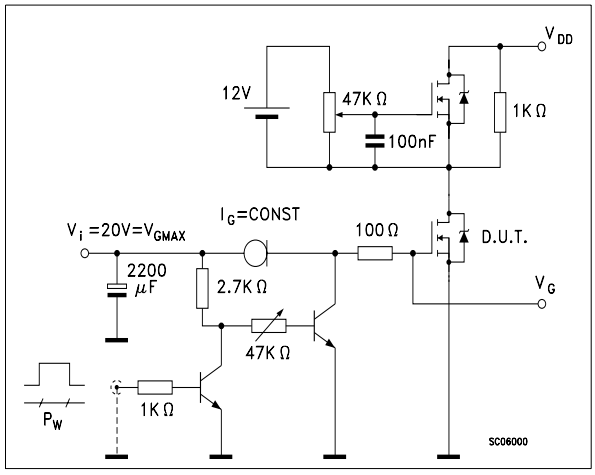
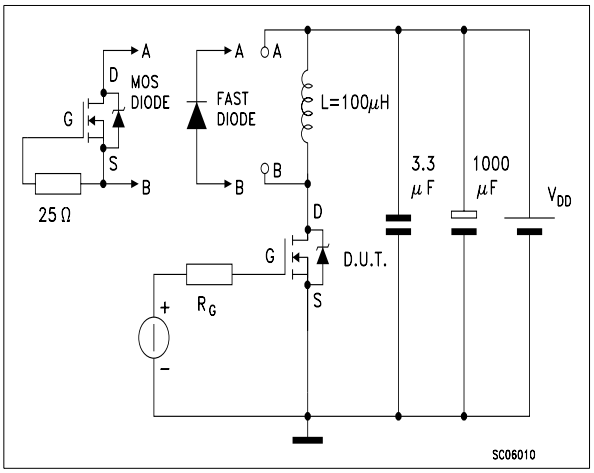
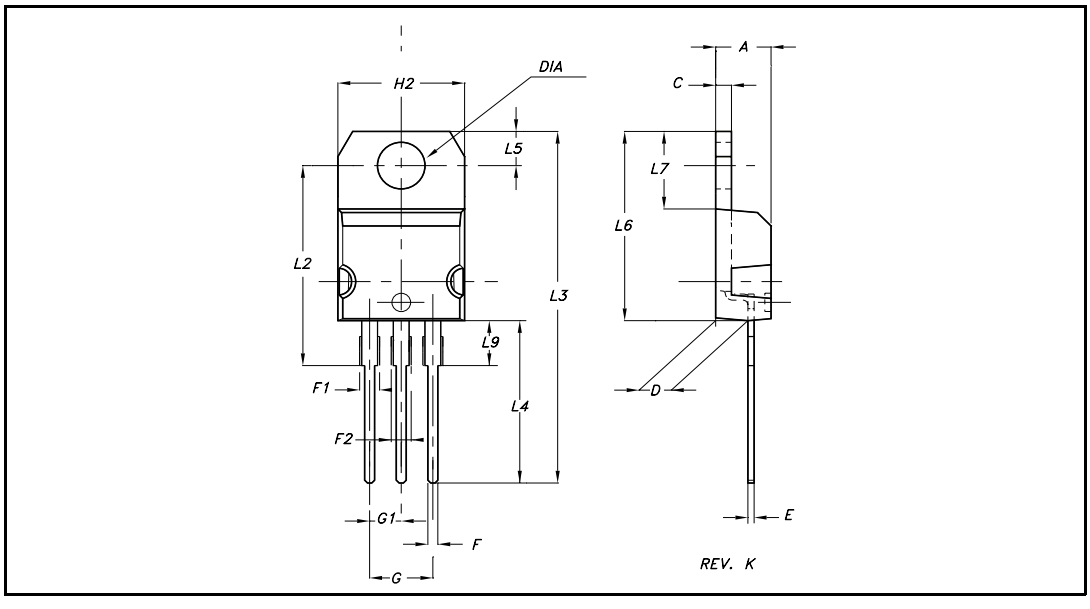


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



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
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		0.066
F2	1.14		1.70	0.044		0.066
G	4.95		5.15	0.194		0.202
G1	2.40		2.70	0.094		0.106
H2	10		10.40	0.393		0.409
L2		16.40			0.645	
L3		28.90			1.137	
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		0.259
L9	3.50		3.93	0.137		0.154
DIA	3.75		3.85	0.147		0.151



TO-220FP MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
B	2.5		2.7	0.098		0.106
D	2.5		2.75	0.098		0.108
E	0.45		0.7	0.017		0.027
F	0.75		1	0.030		0.039
F1	1.15		1.7	0.045		0.067
F2	1.15		1.7	0.045		0.067
G	4.95		5.2	0.195		0.204
G1	2.4		2.7	0.094		0.106
H	10		10.4	0.393		0.409
L2		16			0.630	
L3	28.6		30.6	1.126		1.204
L4	9.8		10.6	.0385		0.417
L5	2.9		3.6	0.114		0.141
L6	15.9		16.4	0.626		0.645
L7	9		9.3	0.354		0.366
Ø	3		3.2	0.118		0.126