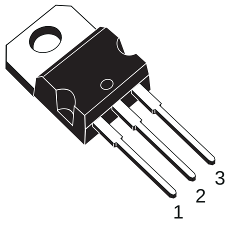
STP60NF06

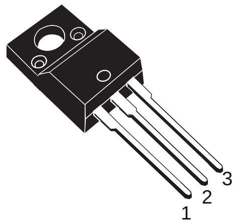
N-CHANNEL 60V - 0.014Ω - 60A TO-220/TO-220FP STripFET™ POWER MOSFET

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP60NF06 STP60NF06FP	60 V 60 V	< 0.016 Ω < 0.016 Ω	60A 60A

- TYPICAL R_{DS}(on) = 0.014Ω
- EXCEPTIONAL dv/dt CAPABILITY
- 100% AVALANCHE TESTED
- APPLICATION ORIENTED CHARACTERIZATION



TO-220



TO-220FP

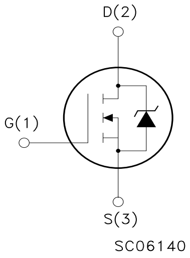
DESCRIPTION

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.

APPLICATIONS

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

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP60NF06	STP60NF06FP	
V_{DS}	Drain-source Voltage (V_{GS} = 0)	60		V
V_{DGR}	Drain-gate Voltage (R_{GS} = 20 kΩ)	60		V
V_{GS}	Gate- source Voltage	± 20		V
I_D	Drain Current (continuos) at T_C = 25°C	60	37	A
I_D	Drain Current (continuos) at T_C = 100°C	42	26	A
I_{DM} (●)	Drain Current (pulsed)	240	148	A
P_{TOT}	Total Dissipation at T_C = 25°C	110	42	W
	Derating Factor	0.73	0.28	W/°C
dv/dt (1)	Peak Diode Recovery voltage slope	4		V/ns
V_{ISO}	Insulation Winthstand Voltage (DC)	--	2500	V
T_{stg}	Storage Temperature	–65 to 175		°C
T_j	Max. Operating Junction Temperature			

(●) Pulse width limited by safe operating area

(1) $I_{SD} \leq 60A$, di/dt≤400 A/µs, $V_{DD} \leq 24V$, $Tj \leq T_{jMAX}$

THERMAL DATA

		TO-220	TO-220FP	
Rthj-case	Thermal Resistance Junction-case Max	1.36	3.57	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	62.5		°C/W
T_l	Maximum Lead Temperature For Soldering Purpose	300		°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I_{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T_j max)	30	A
E_{AS}	Single Pulse Avalanche Energy (starting T_j = 25 °C, $I_D = I_{AR}$, V_{DD} = 30 V)	360	mJ

ELECTRICAL CHARACTERISTICS (TCASE = 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	60			V
I_{DSS}	Zero Gate Voltage Drain Current (V_{GS} = 0)	V_{DS} = Max Rating V_{DS} = Max Rating, T_C = 125 °C			1 10	µA 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		4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10V, I_D = 30 A		0.014	0.016	Ω

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (1)	Forward Transconductance	V_{DS} =15V , I_D = 30 A		20		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25V, f = 1 MHz, V_{GS} = 0		1810 360 125		pF pF 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 V, I_D = 30 A R_G = 4.7Ω V_{GS} = 10V (see test circuit, Figure 3)		16 108		ns ns
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD} = 48V, I_D =60A,V_{GS} = 10V		49 18 14	66	nC nC nC

SWITCHING OFF

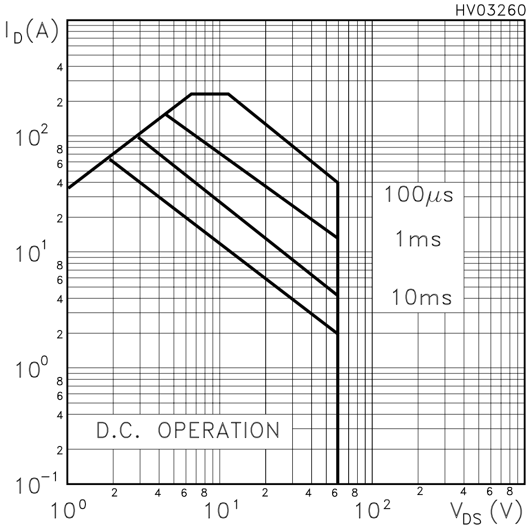
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(off)}$ t_f	Turn-off-Delay Time Fall Time	V_{DD} = 30 V, I_D = 30 A, R_G = 4.7Ω, V_{GS} = 10V (see test circuit, Figure 3)		43 20		ns ns
$t_{d(off)}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	Vclamp =48V, I_D = 60 A R_G = 4.7Ω, V_{GS} = 10V (see test circuit, Figure 3)		40 12 21		ns ns ns

SOURCE DRAIN DIODE

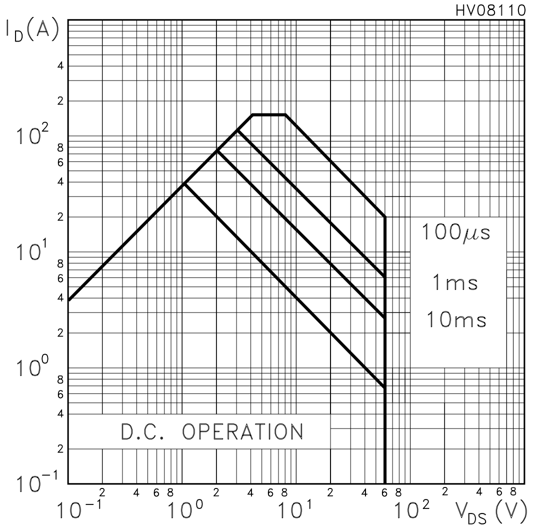
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM} (2)	Source-drain Current Source-drain Current (pulsed)				60 240	A A
V_{SD} (1)	Forward On Voltage	I_{SD} = 60 A, V_{GS} = 0			1.3	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 60 A, di/dt = 100A/µs, V_{DD} = 25V, T_j = 150°C (see test circuit, Figure 5)		73 182 5		ns nC A

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

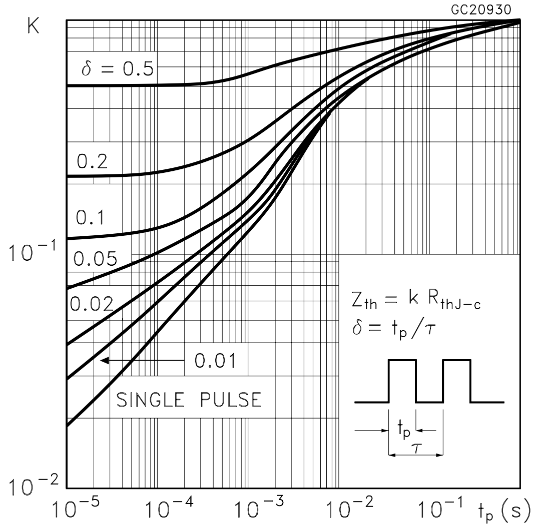
Safe Operating Area for TO-220



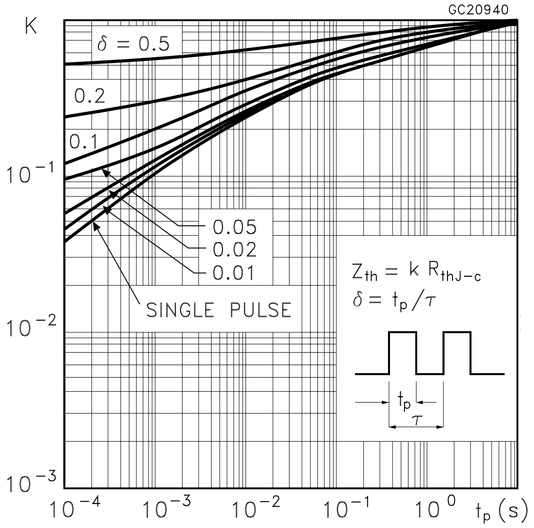
Safe Operating Area for TO-220FP



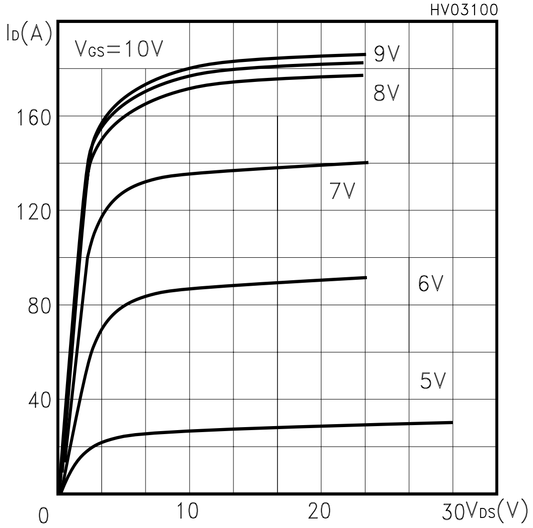
Thermal Impedence for TO-220



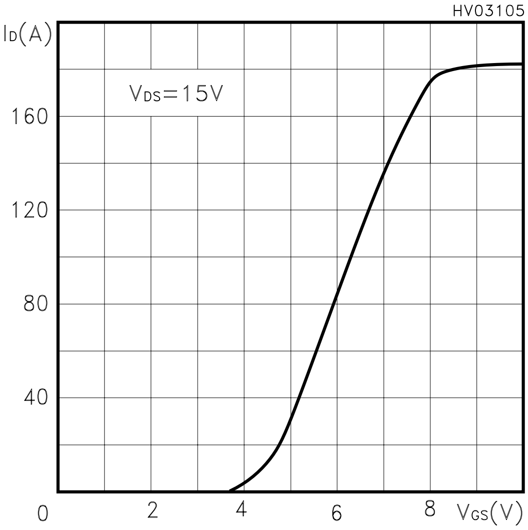
Thermal Impedence for TO-220FP



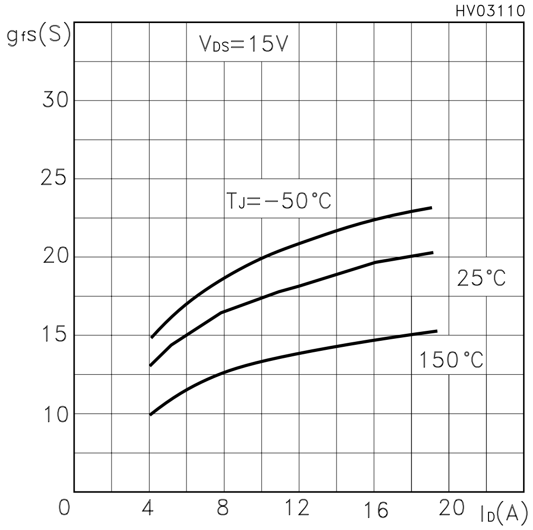
Output Characteristics



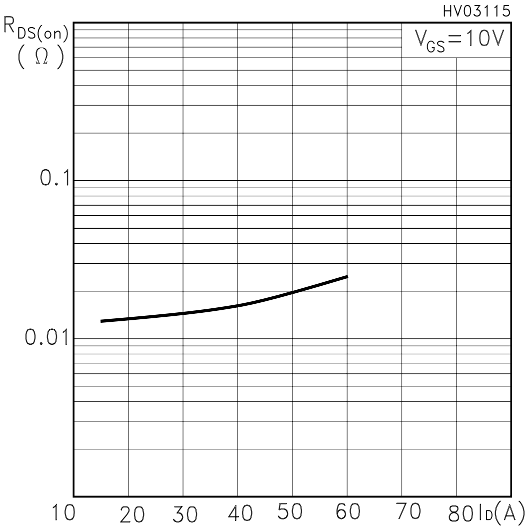
Transfer Characteristics



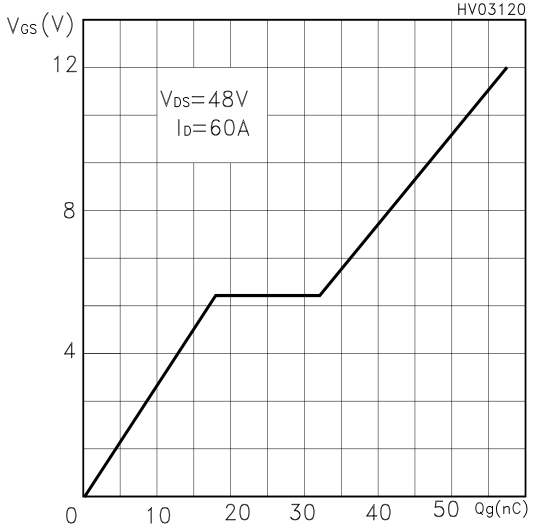
Transconductance



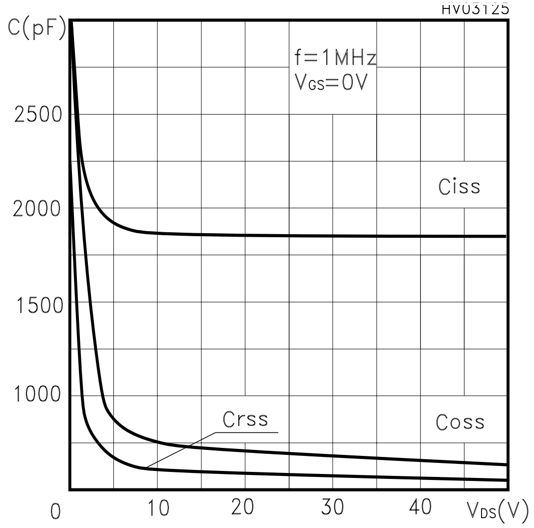
Static Drain-source On Resistance



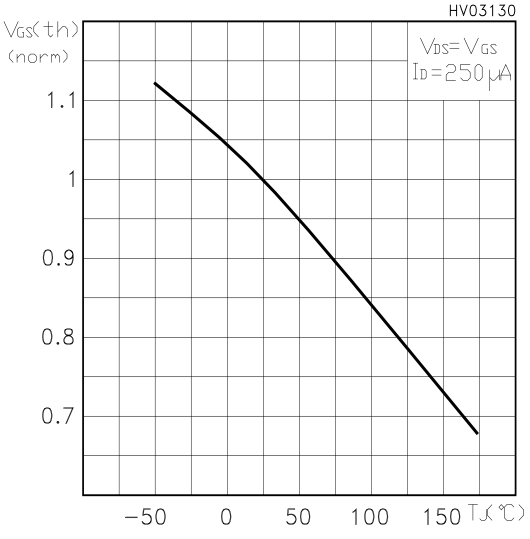
Gate Charge vs Gate-source Voltage



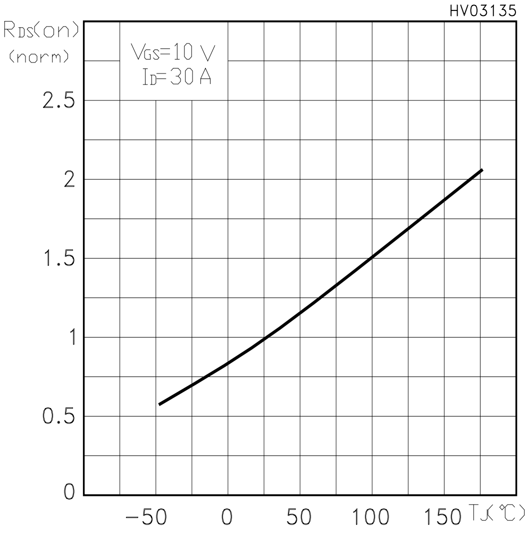
Capacitance Variations



Normalized Gate Threshold Voltage vs Temperature



Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics

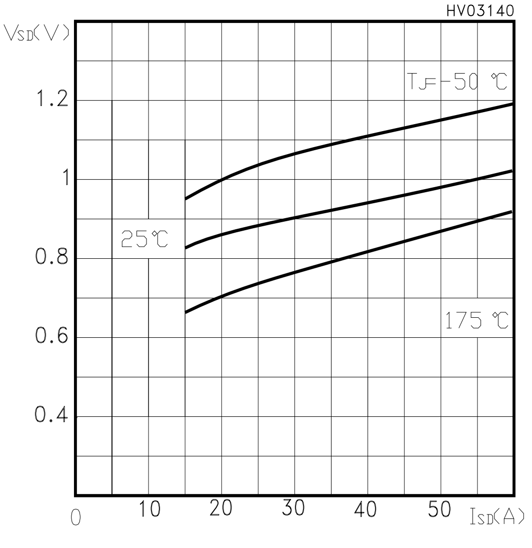


Fig. 1: Unclamped Inductive Load Test Circuit

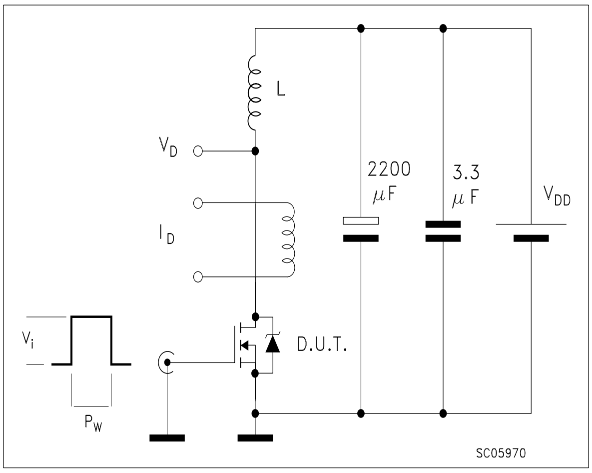


Fig. 2: Unclamped Inductive Waveform

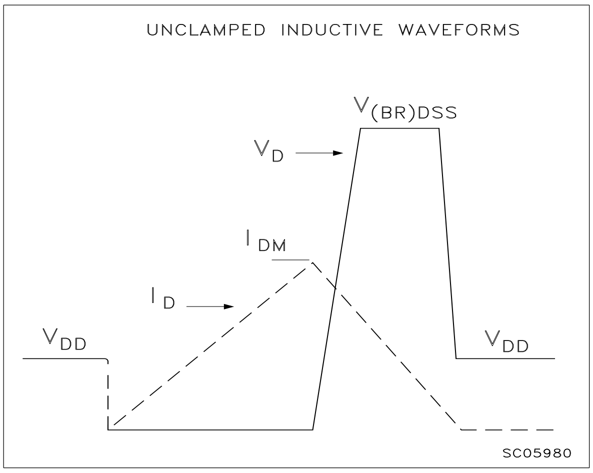


Fig. 3: Switching Times Test Circuit For Resistive Load

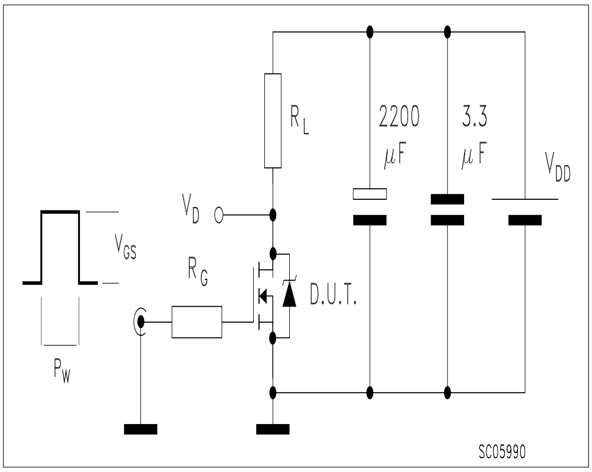


Fig. 4: Gate Charge test Circuit

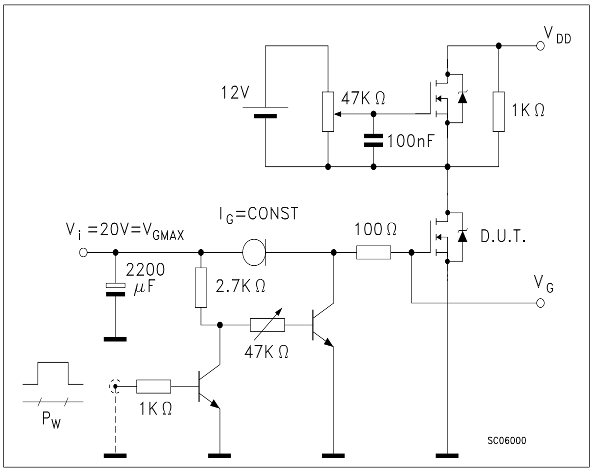
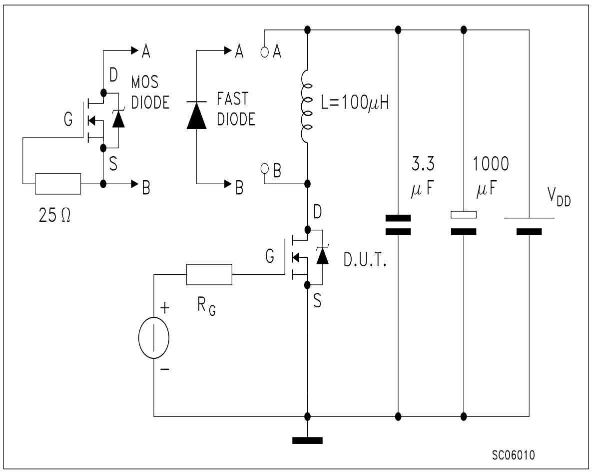
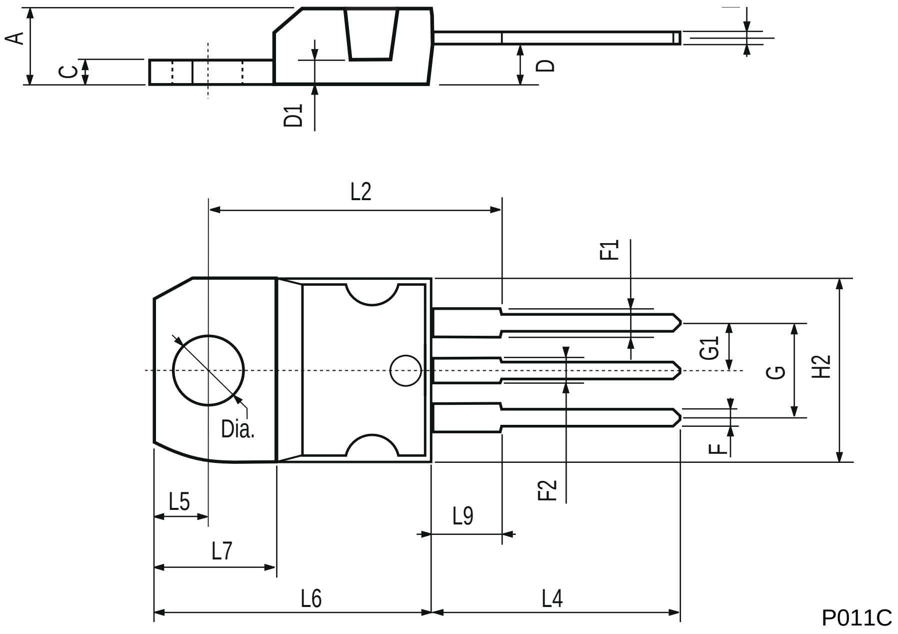


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



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



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