



IRF540

N-CHANNEL 100V - 0.065 Ω - 30A TO-220 LOW GATE CHARGE STripFET™ POWER MOSFET

TYPE	V _{DSS}	R _{DS(on)}	I _D
IRF540	100 V	<0.070 Ω	30 A

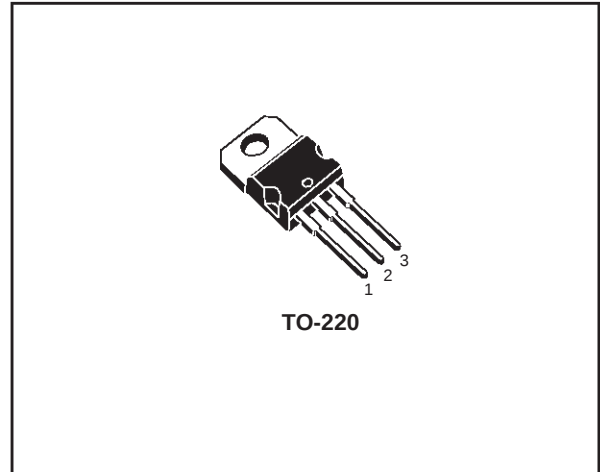
- TYPICAL R_{DS(on)} = 0.065 Ω
- EXCEPTIONAL dv/dt CAPABILITY
- 100% AVALANCHE TESTED
- LOW GATE CHARGE
- APPLICATION ORIENTED CHARACTERIZATION

DESCRIPTION

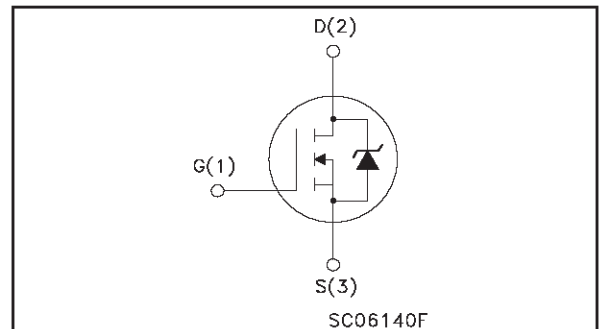
This MOSFET series realized with STMicroelectronics unique STripFET process has specifically been designed to minimize input capacitance and gate charge. It is therefore suitable as primary switch in advanced high-efficiency, high-frequency isolated DC-DC converters for Telecom and Computer applications.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

APPLICATIONS

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



INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V _{DS}	Drain-source Voltage (V _{GS} = 0)	100	V
V _{DGR}	Drain-gate Voltage (R _{GS} = 20 k Ω)	100	V
V _{GS}	Gate- source Voltage	± 20	V
I _D	Drain Current (continuous) at T _C = 25°C	30	A
I _D	Drain Current (continuous) at T _C = 100°C	21	A
I _{DM} (•)	Drain Current (pulsed)	120	A
P _{tot}	Total Dissipation at T _C = 25°C	100	W
	Derating Factor	1	W/°C
T _{stg}	Storage Temperature	-65 to 175	°C
T _j	Max. Operating Junction Temperature	-55 to 175	°C

(•) Pulse width limited by safe operating area.

THERMAL DATA

R _{thj-case}	Thermal Resistance Junction-case	Max	1.5	°C/W
R _{thj-amb}	Thermal Resistance Junction-ambient	Max	62.5	°C/W
T _l	Maximum Lead Temperature For Soldering Purpose	Typ	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	100			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 = 250 μA	2	3	4	V
R _{DS(on)}	Static Drain-source On Resistance	V _{GS} = 10 V I _D = 15 A		0.065	0.070	Ω

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g _{fs} (*)	Forward Transconductance	V _{DS} > I _{D(on)} × R _{DS(on)max} , I _D = 15 A		10		S
C _{iss} C _{oss} C _{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V _{DS} = 25V, f = 1 MHz, V _{GS} = 0		870 125 52		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	$V_{DD} = 50\text{ V}$ $I_D = 15\text{ A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$ (Resistive Load, Figure 3)		58 45		ns ns
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	$V_{DD} = 80\text{ V}$ $I_D = 30\text{ A}$ $V_{GS} = 10\text{ V}$		30 6 10	41	nC nC nC

SWITCHING OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(off)}$ t_f	Turn-off Delay Time Fall Time	$V_{DD} = 50\text{ V}$ $I_D = 30\text{ A}$ $R_G = 4.7\ \Omega$, $V_{GS} = 10\text{ V}$ (Resistive Load, Figure 3)		49 17		ns ns
$t_r(v_{off})$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	$V_{clamp} = 80\text{ V}$ $I_D = 30\text{ A}$ $R_G = 4.7\ \Omega$, $V_{GS} = 10\text{ V}$ (Inductive Load, Figure 5)		43 21 39		ns ns ns

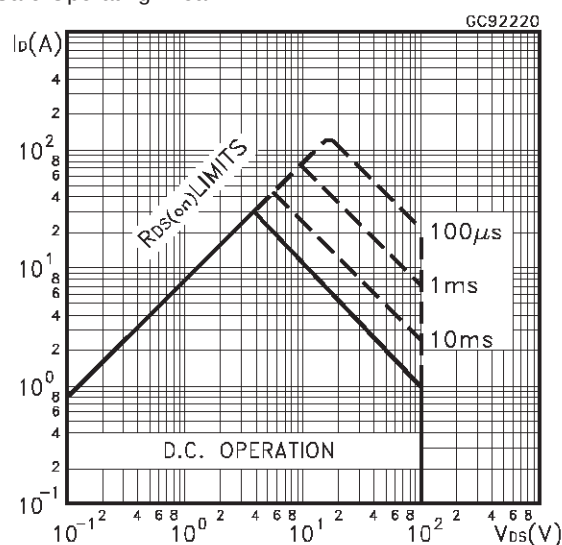
SOURCE DRAIN DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} $I_{SDM} (\bullet)$	Source-drain Current Source-drain Current (pulsed)				30 120	A A
$V_{SD} (*)$	Forward On Voltage	$I_{SD} = 30\text{ A}$ $V_{GS} = 0$			1.3	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	$I_{SD} = 30\text{ A}$ $di/dt = 100\text{ A}/\mu\text{s}$ $V_{DD} = 30\text{ V}$ $T_j = 150^\circ\text{C}$ (see test circuit, Figure 5)		100 375 7.5		ns nC A

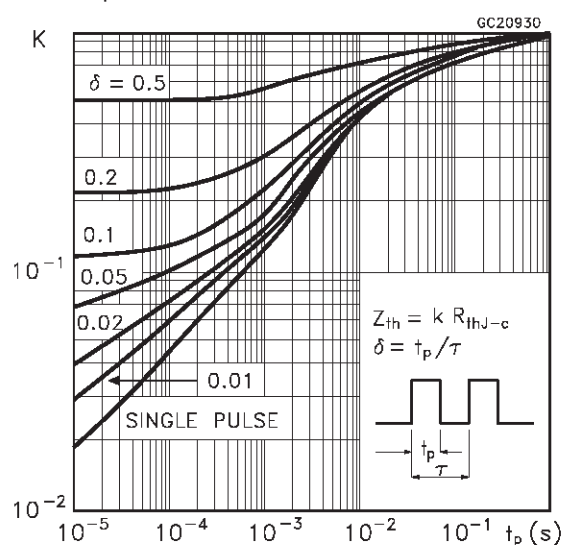
(*) Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %.

($\bullet$) Pulse width limited by safe operating area.

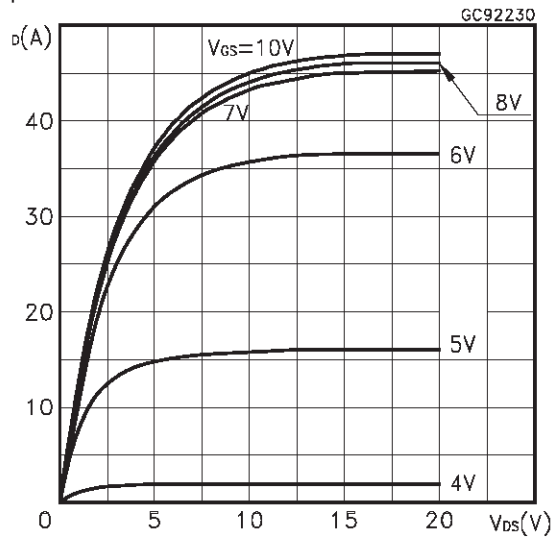
Safe Operating Area



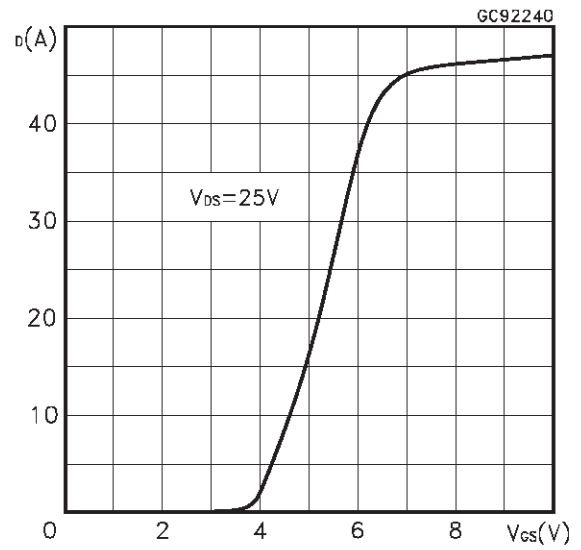
Thermal Impedance



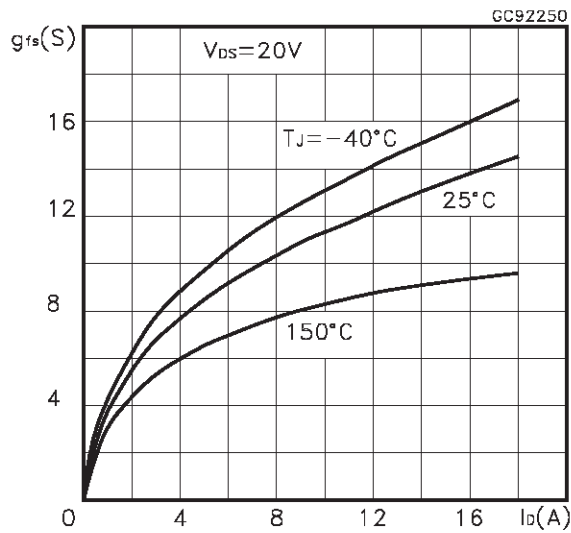
Output Characteristics



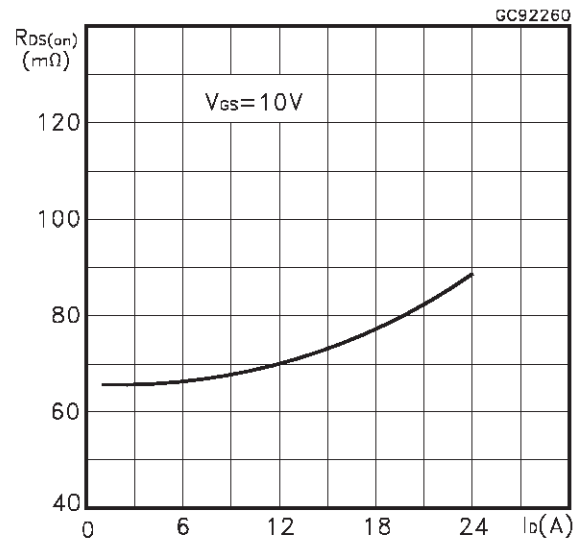
Transfer Characteristics



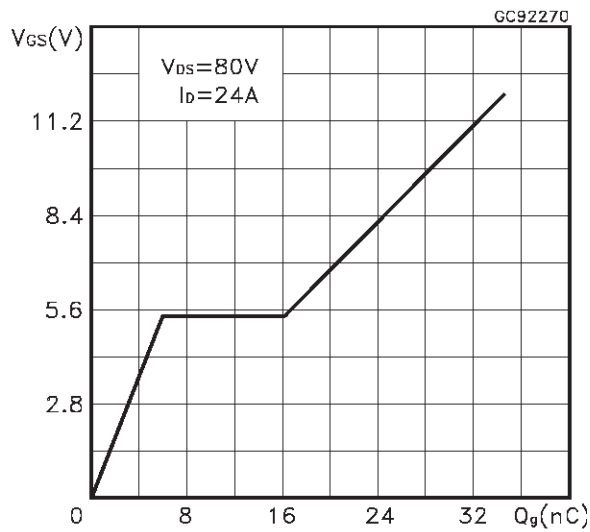
Transconductance



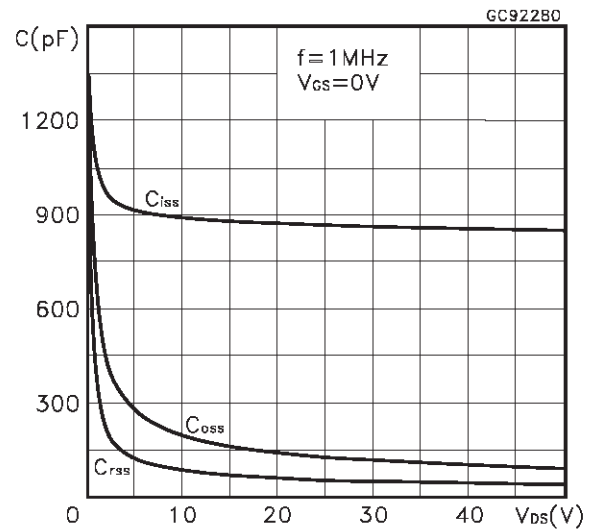
Static Drain-source On Resistance



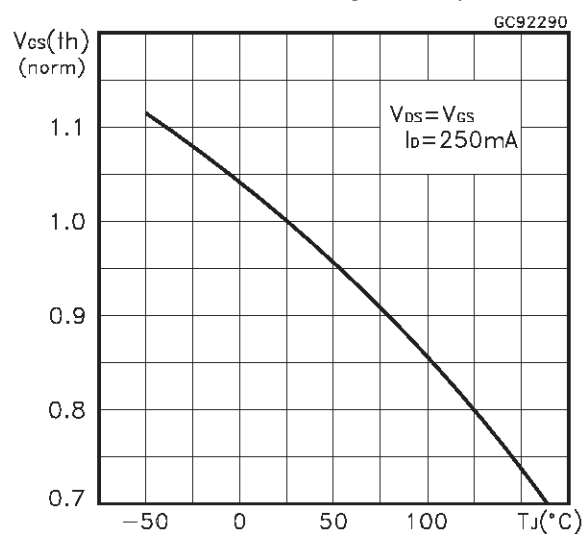
Gate Charge vs Gate-source Voltage



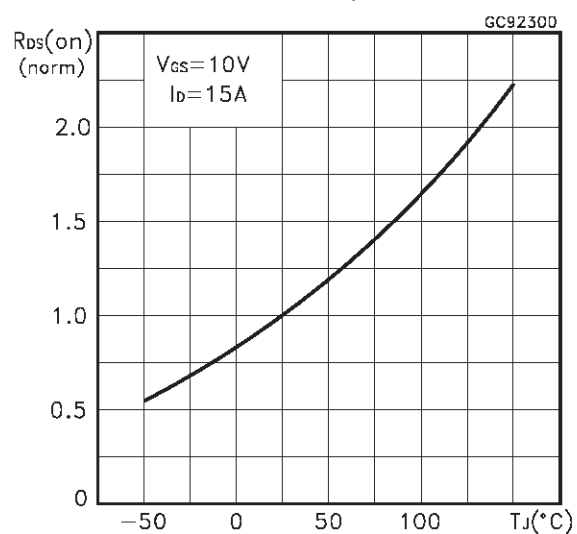
Capacitance Variations



Normalized Gate Threshold Voltage vs Temperature



Normalized on Resistance vs Temperature



Source-drain Diode Forward Characteristics

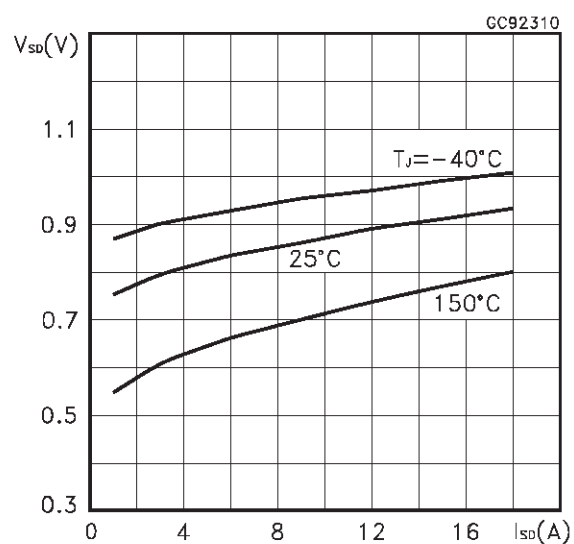


Fig. 1: Unclamped Inductive Load Test Circuit

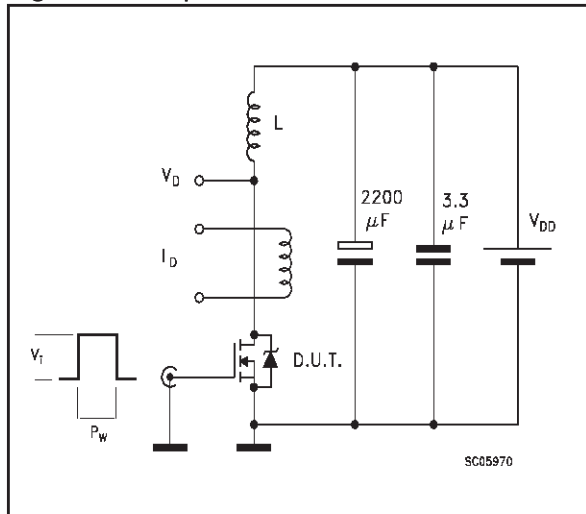


Fig. 2: Unclamped Inductive Waveform

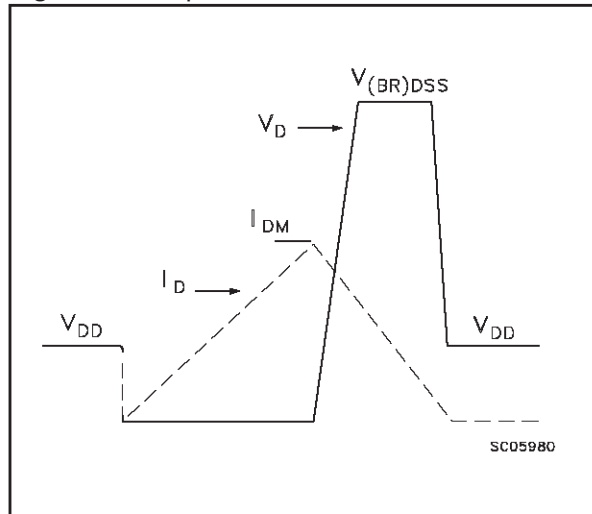


Fig. 3: Switching Times Test Circuits For Resistive Load

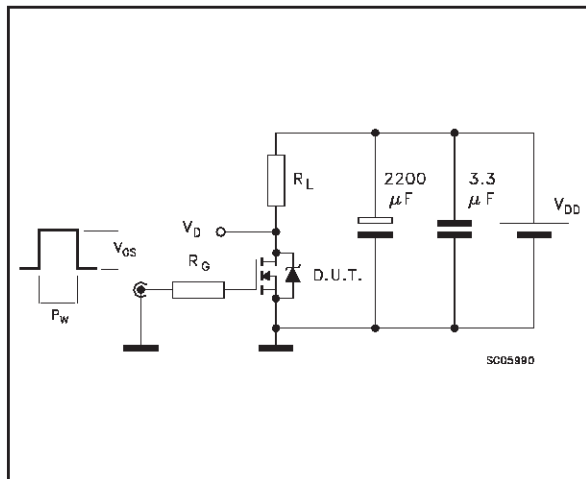


Fig. 4: Gate Charge test Circuit

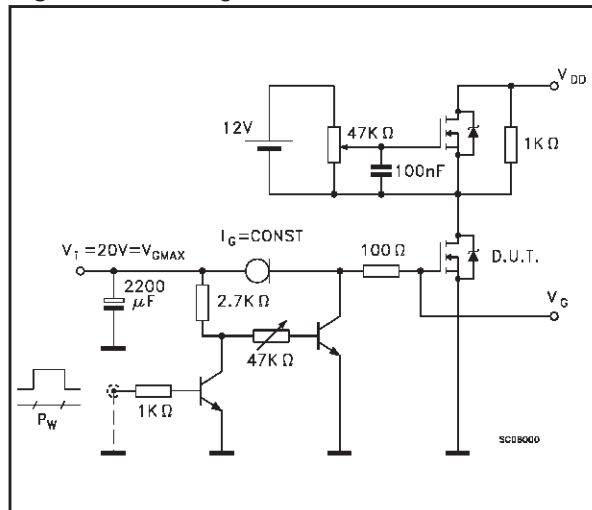
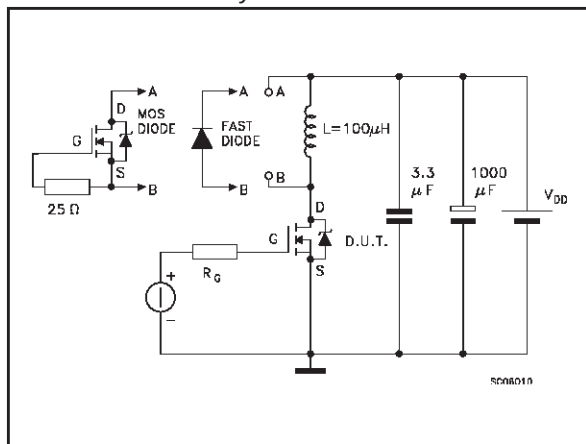
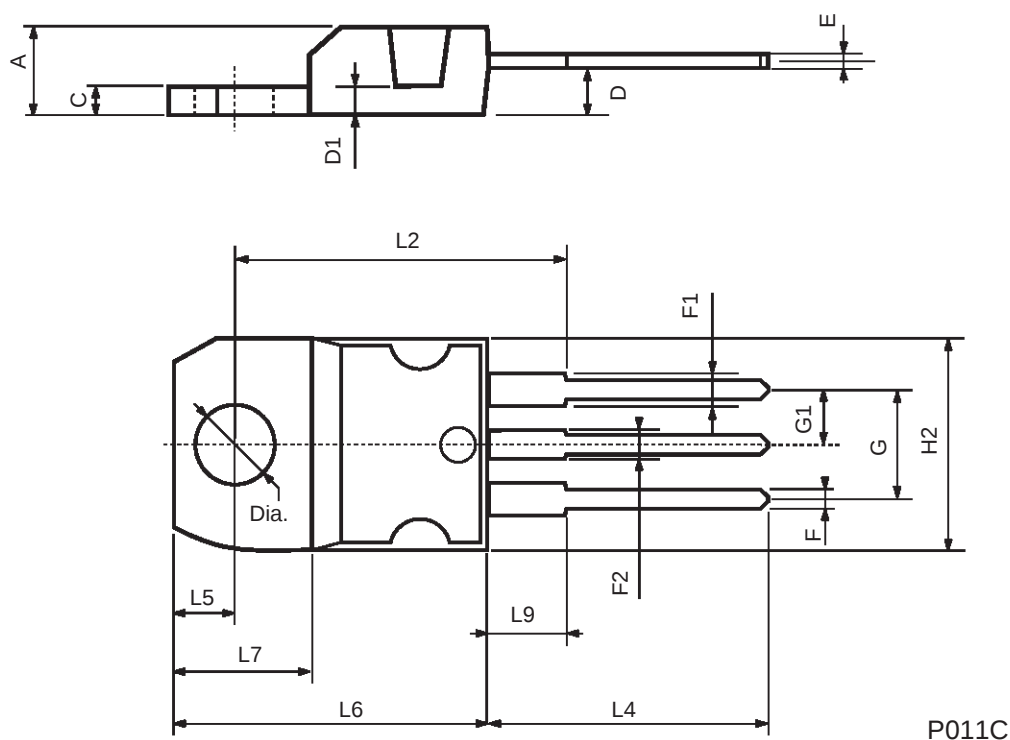


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



TO-220 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	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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