



# STP14NF12 STP14NF12FP

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

TYPE	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STP14NF12	120 V	< 0.18 Ω	14 A
STP14NF12FP	120 V	< 0.18 Ω	14 A

- TYPICAL R<sub>DS(on)</sub> = 0.16Ω
- EXCEPTIONAL dv/dt CAPABILITY
- APPLICATION ORIENTED CHARACTERIZATION

## 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

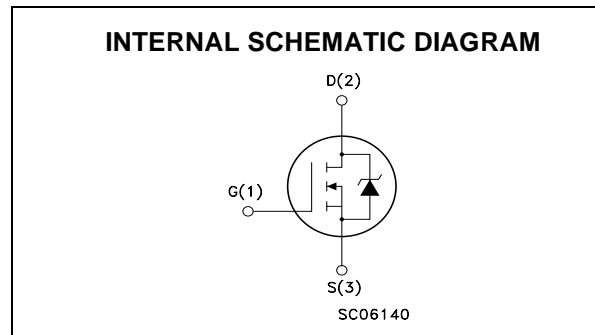
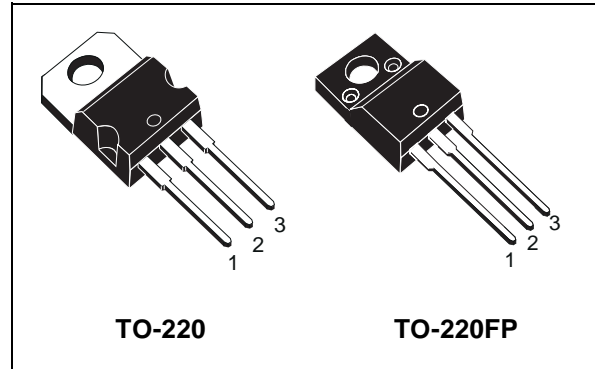
- HIGH-EFFICIENCY DC-DC CONVERTERS
- UPS AND MOTOR CONTROL

## ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP14NF12	STP14NF12FP	
V <sub>DS</sub>	Drain-source Voltage (V <sub>GS</sub> = 0)	120		V
V <sub>DGR</sub>	Drain-gate Voltage (R <sub>GS</sub> = 20 kΩ)	120		V
V <sub>GS</sub>	Gate- source Voltage	±20		V
I <sub>D</sub>	Drain Current (continuous) at T <sub>C</sub> = 25°C	14	8.5	A
I <sub>D</sub>	Drain Current (continuous) at T <sub>C</sub> = 100°C	9	6	A
I <sub>DM</sub> (●)	Drain Current (pulsed)	56	34	A
P <sub>TOT</sub>	Total Dissipation at T <sub>C</sub> = 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 <sub>AS</sub> (2)	Single Pulse Avalanche Energy	60		mJ
V <sub>ISO</sub>	Insulation Withstand Voltage (DC)	-	2500	V
T <sub>j</sub>	Operating Junction Temperature	-55 to 175		°C
T <sub>stg</sub>	Storage Temperature			

(●) Pulse width limited by safe operating area

(1) I<sub>SD</sub> ≤ 14A, 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> = 14A, V<sub>DD</sub> = 50V



## STP14NF12/STP14NF12FP

### 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 <sub>l</sub>	Maximum Lead Temperature For Soldering Purpose	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>	Drain-source Breakdown Voltage	I <sub>D</sub> = 250 μA, V <sub>GS</sub> = 0	120			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	2	3	4	V
R <sub>DS(on)</sub>	Static Drain-source On Resistance	V <sub>GS</sub> = 10V, I <sub>D</sub> = 7 A		0.16	0.18	Ω

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g <sub>fs</sub> (1)	Forward Transconductance	V <sub>DS</sub> = 15V, I <sub>D</sub> = 7 A		4		S
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = 25V, f = 1 MHz, V <sub>GS</sub> = 0		460		pF
C <sub>oss</sub>	Output Capacitance			70		pF
C <sub>rss</sub>	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	$V_{DD} = 50\text{ V}$ , $I_D = 7\text{ A}$		16		ns
$t_r$	Rise Time	$R_G = 4.7\Omega$ , $V_{GS} = 10\text{ V}$ (Resistive Load, see Figure 3)		25		ns
$Q_g$	Total Gate Charge	$V_{DD} = 80\text{ V}$ , $I_D = 14\text{ A}$ ,		15.5	21	nC
$Q_{gs}$	Gate-Source Charge	$V_{GS} = 10\text{ V}$		3.7		nC
$Q_{gd}$	Gate-Drain Charge			4.7		nC

**SWITCHING OFF**

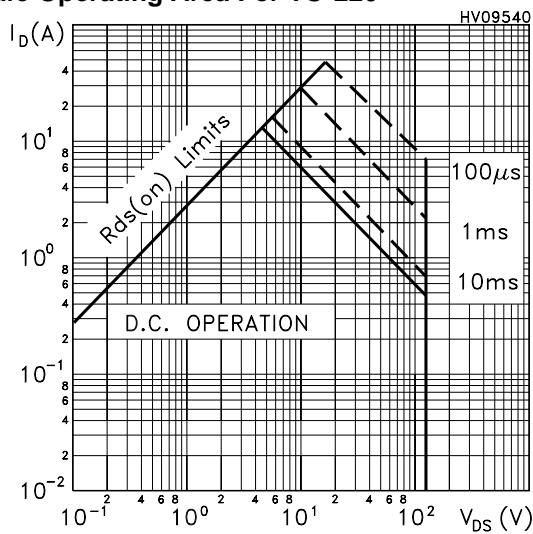
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(off)}$	Turn-off-Delay Time	$V_{DD} = 50\text{ V}$ , $I_D = 7\text{ A}$ ,		32		ns
$t_f$	Fall Time	$R_G = 4.7\Omega$ , $V_{GS} = 10\text{ V}$ (Resistive Load, see Figure 3)		8		ns

**SOURCE DRAIN DIODE**

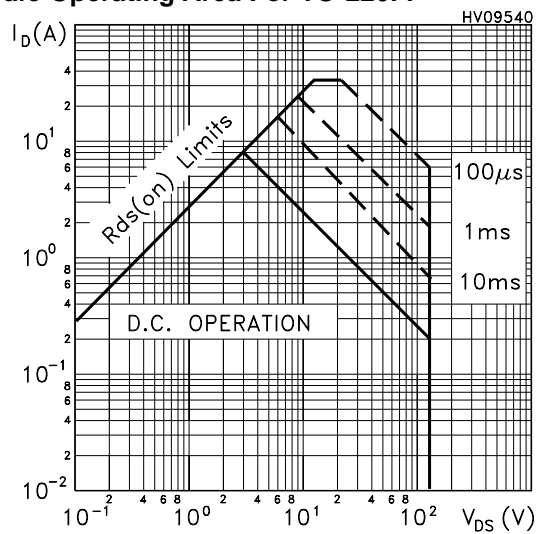
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{SD}$	Source-drain Current				14	A
$I_{SDM(2)}$	Source-drain Current (pulsed)				56	A
$V_{SD(1)}$	Forward On Voltage	$I_{SD} = 14\text{ A}$ , $V_{GS} = 0$			1.5	V
$t_{rr}$	Reverse Recovery Time	$I_{SD} = 14\text{ A}$ , $di/dt = 100\text{ A}/\mu\text{s}$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

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

**Safe Operating Area For TO-220**

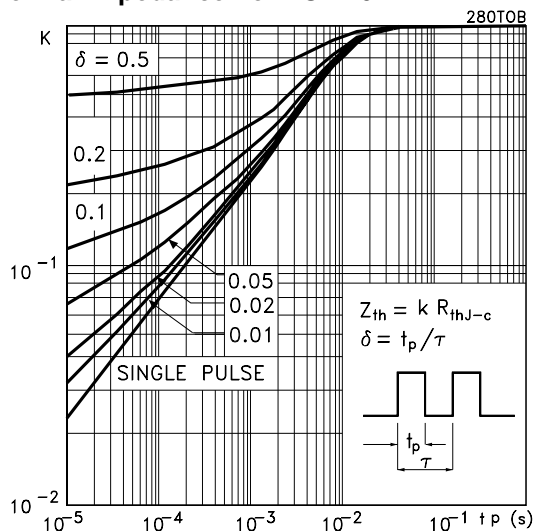


**Safe Operating Area For TO-220FP**

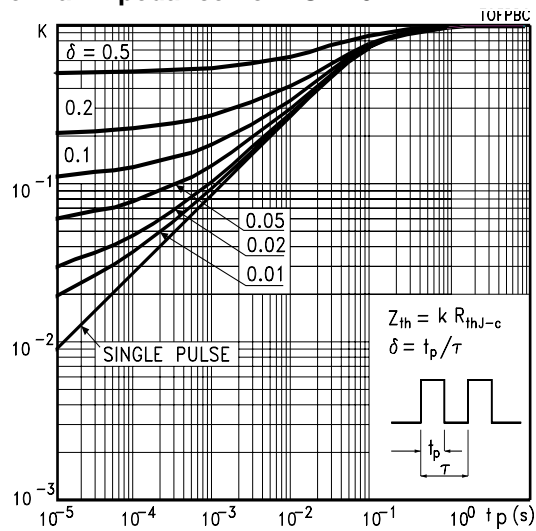


# STP14NF12/STP14NF12FP

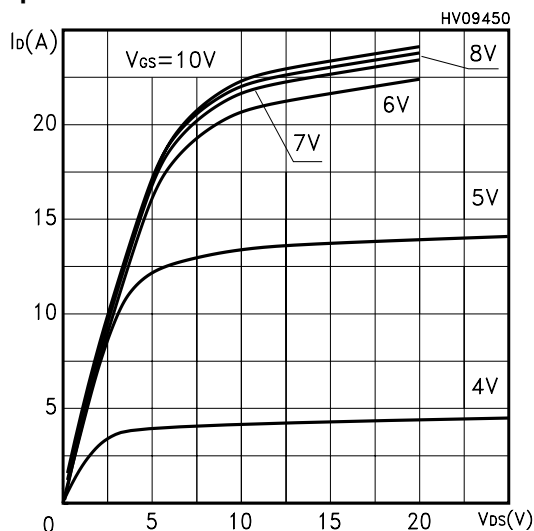
### Thermal Impedance For TO-220



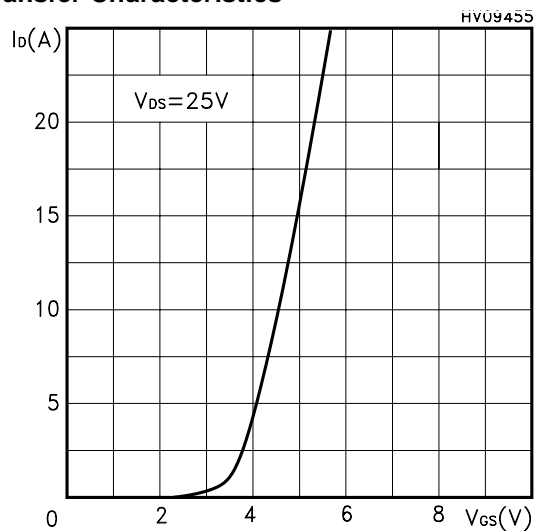
### Thermal Impedance For TO-220FP



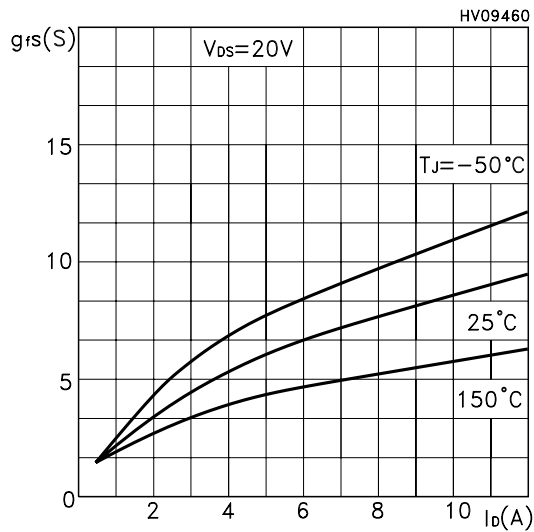
### Output Characteristics



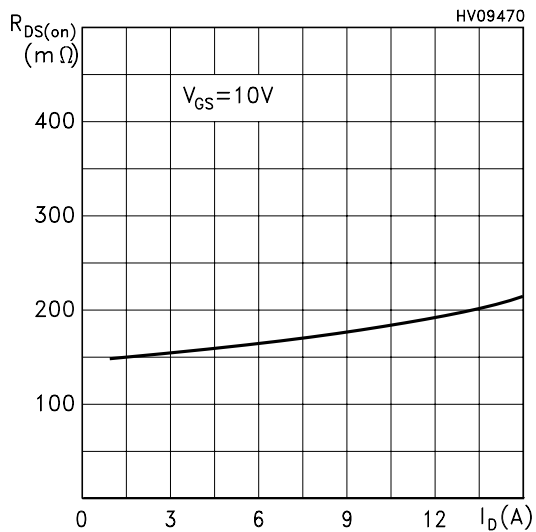
### Transfer Characteristics



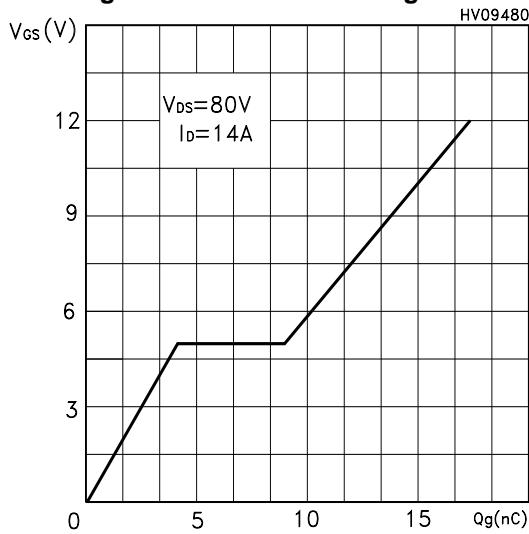
### Transconductance



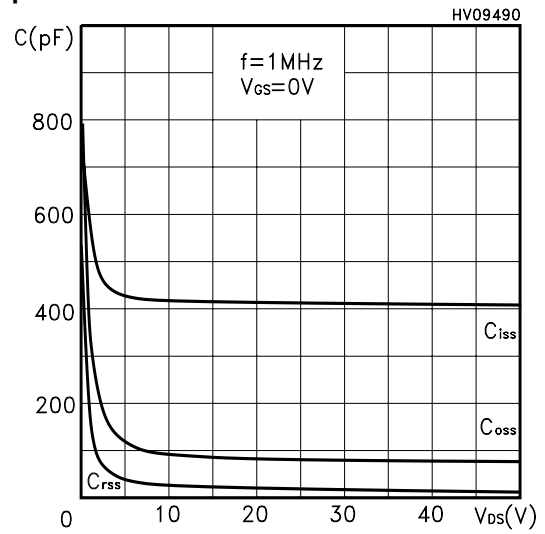
### Static Drain-source On Resistance



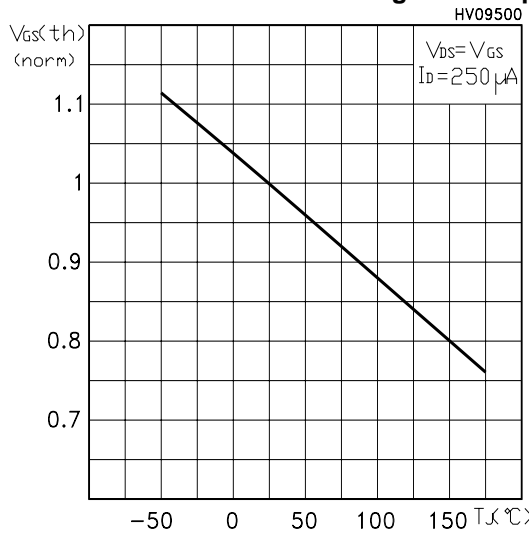
Gate Charge vs Gate-source Voltage



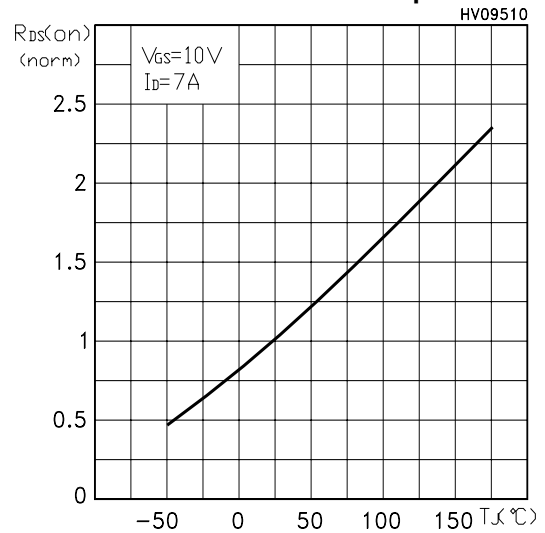
Capacitance Variations



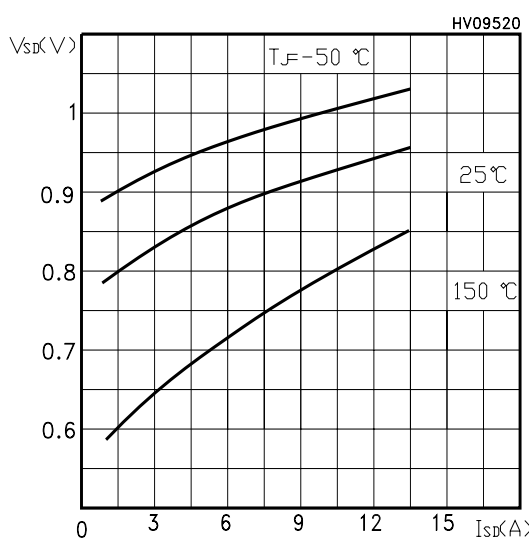
Normalized Gate Threshold Voltage vs Temp.



Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics



Normalized BVDSS vs Temperature

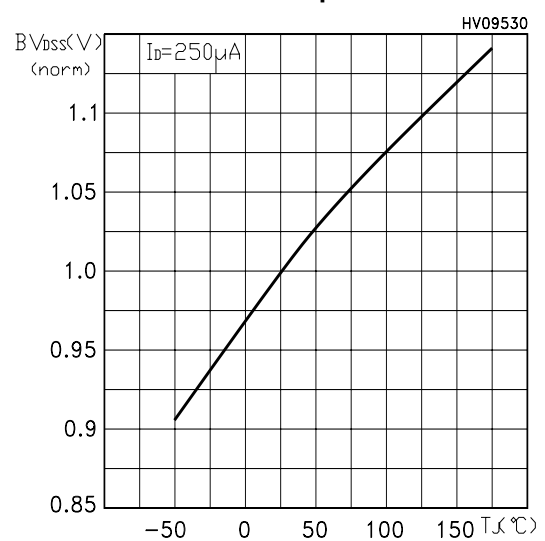


Fig. 1: Unclamped Inductive Load Test Circuit

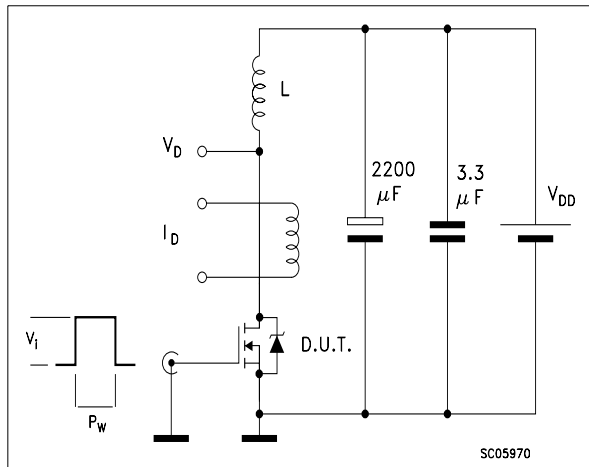


Fig. 2: Unclamped Inductive Waveform

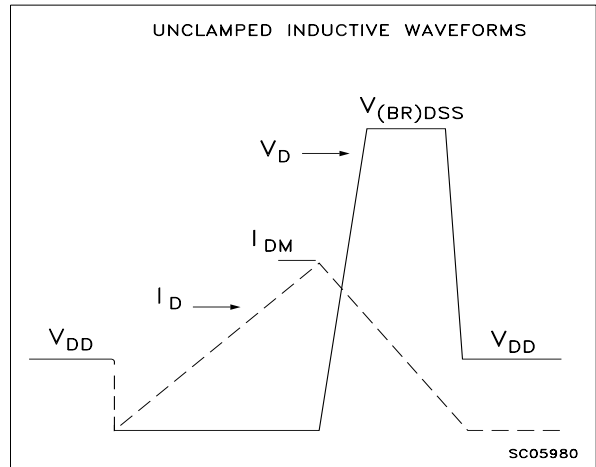


Fig. 3: Switching Times Test Circuit For Resistive Load

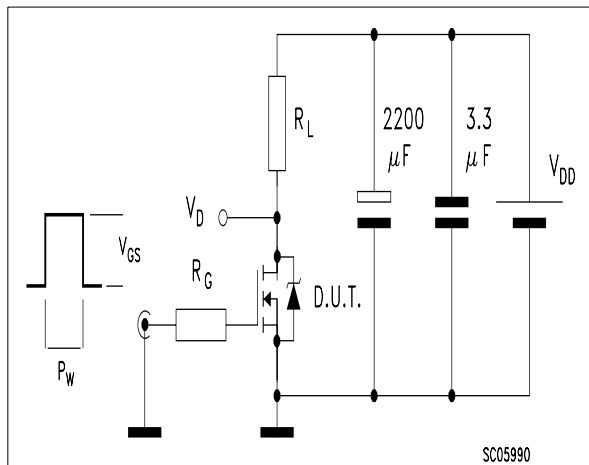


Fig. 4: Gate Charge test Circuit

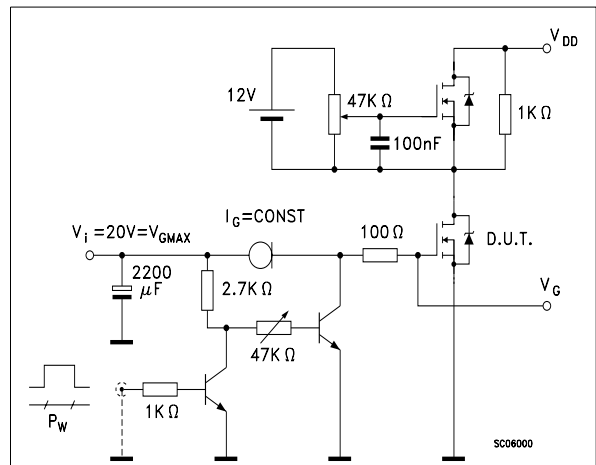
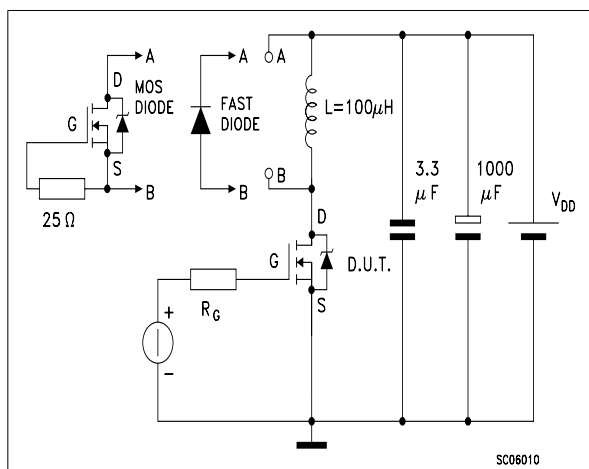
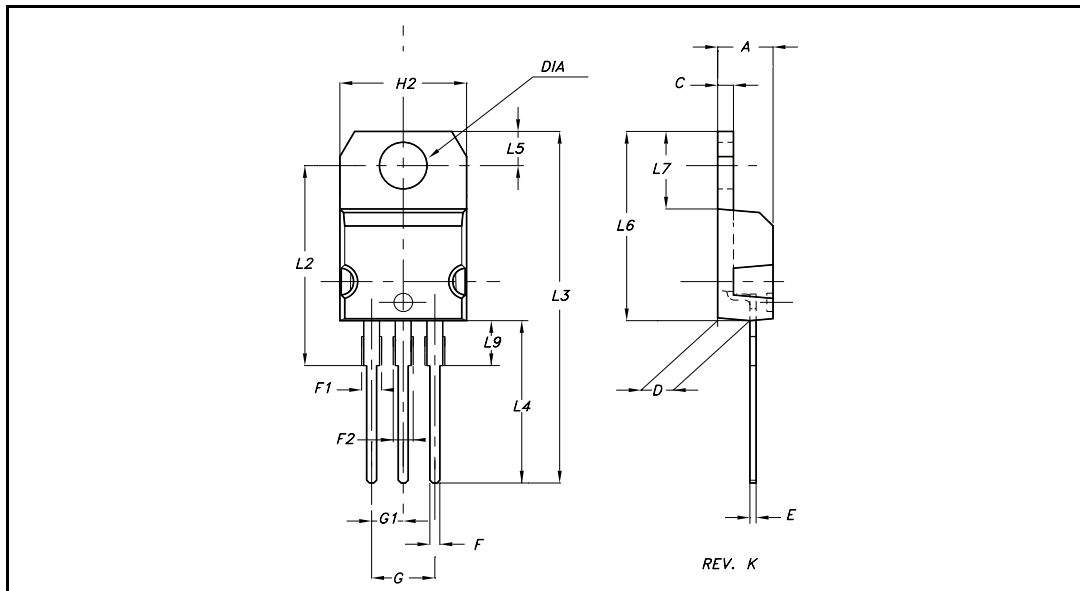


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



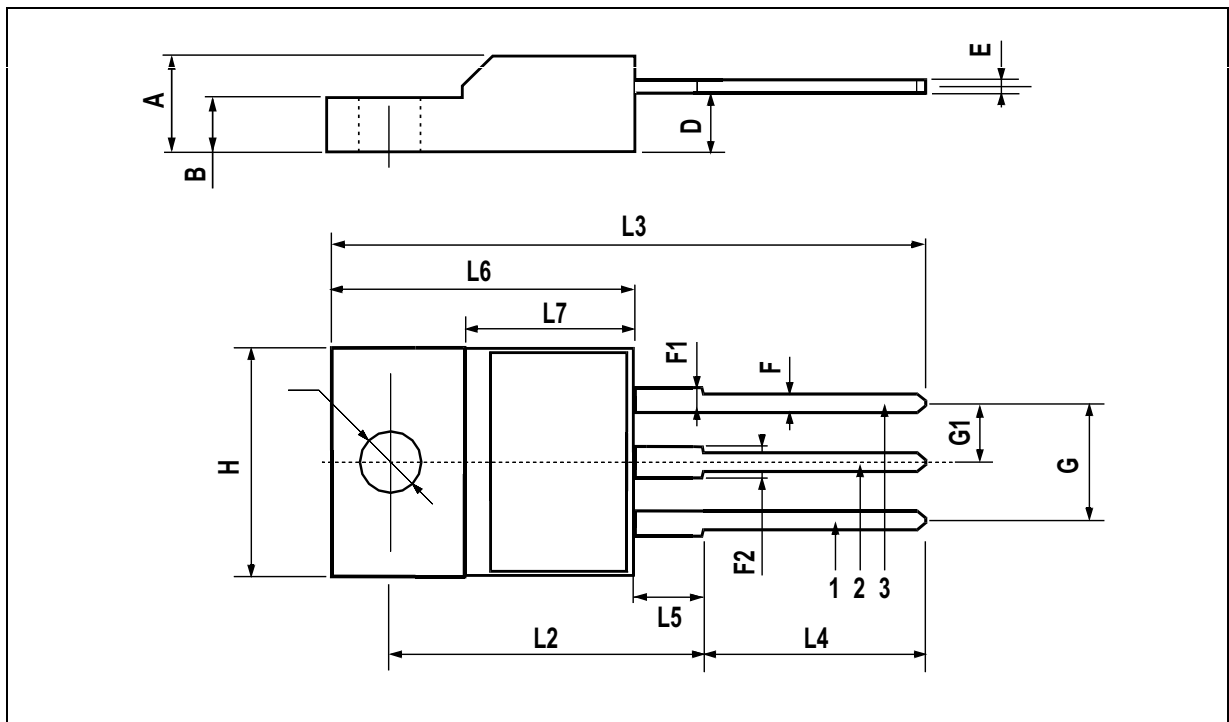
**TO-220 MECHANICAL DATA**

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
∅	3		3.2	0.118		0.126





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