STP12PF06
STF12PF06

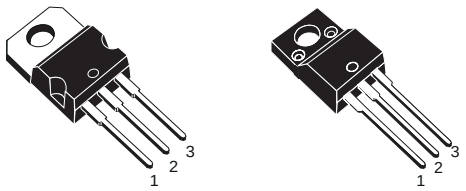
P-CHANNEL 60V - 0.18 Ω - 12A TO-220/TO-220FP
STripFET™ II POWER MOSFET

Table 1: General Features

TYPE	V_{DSS}	$R_{DS(on)}$	I_D
STP12PF06	60 V	< 0.20 Ω	12 A
STF12PF06	60 V	< 0.20 Ω	12 A

- TYPICAL R_{DS}(on) = 0.18 Ω
- EXCEPTIONAL dv/dt CAPABILITY
- 100% AVALANCHE TESTED
- LOW GATE CHARGE
- APPLICATION ORIENTED CHARACTERIZATION

Figure 1:Package



TO-220 **TO-220FP**

DESCRIPTION

This Power MOSFET is the latest development of STMicroelectronis 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

- MOTOR CONTROL
- DC-DC & DC-AC CONVERTERS

Figure 2: Internal Schematic Diagram

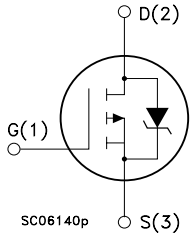


Table 2: Order Codes

PART NUMBER	MARKING	PACKAGE	PACKAGING
STP12PF06	P12PF06	TO-220	TUBE
STF12PF06	F12PF06	TO-220FP	TUBE

Table 3: ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP20PF06	STF20PF06	
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 (continuous) at T_C = 25°C	12	8	A
I_D	Drain Current (continuous) at T_C = 100°C	8.4	5.6	A
I_{DM}(•)	Drain Current (pulsed)	48	32	A
P_{tot}	Total Dissipation at T_C = 25°C	60	225	W
	Derating Factor	0.4	0.17	W/°C
dv/dt (1)	Peak Diode Recovery voltage slope	6		V/ns
E_{AS} (2)	Single Pulse Avalanche Energy	200		mJ
T_{stg}	Storage Temperature	-55 to 175		°C
T_j	Operating Junction Temperature			

(•) Pulse width limited by safe operating area.
NOTE:For the P-CHANNEL MOSFET actual polarity of voltages and current has to be reversed.

(1) I_{SD} ≤12A, di/dt ≤200A/µs, V_{DD} ≤ $V_{(BR)DSS}$, T_j ≤ T_{JMAX}
(2) Starting T_j = 25 ºC, I_D = 12A, V_{DD}= 25V

Table 4: THERMAL DATA

			TO-220	TO-220FP	
Rthj-case	Thermal Resistance Junction-case	Max	2.5	5.35	°C/W
Rthj-amb T_l	Thermal Resistance Junction-ambient Maximum Lead Temperature For Soldering Purpose	Max	62.5 300		°C/W °C

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

Table 5: 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) 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

Table 6: ON (*)

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	4	V
$R_{DS(on)}$	Static Drain-source On Resistance	V_{GS} = 10 V I_D = 10 A		0.18	0.20	Ω

Table 7: DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs} (2)	Forward Transconductance	V_{DS} = 15 V I_D = 6 A	2.5	6		S
C_{iss} C_{oss} C_{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{DS} = 25V f = 1 MHz V_{GS} = 0		850 230 75		pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

Table 8: 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 = 6 A R_G = 4.7 Ω V_{GS} = 10 V (Resistive Load, Figure 19)		20 40		ns ns
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	V_{DD}= 48 V I_D= 12 A V_{GS}= 10 V		16 4 6	21	nC nC nC

Table 9: 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 = 6 A R_G = 4.7Ω, V_{GS} = 10 V (Resistive Load, Figure 19)		40 10		ns ns

Table 10: SOURCE DRAIN DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} I_{SDM} (1)	Source-drain Current Source-drain Current (pulsed)				10 40	A A
V_{SD} (2)	Forward On Voltage	I_{SD} = 12 A V_{GS} = 0			2.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	I_{SD} = 12 A di/dt = 100A/µs V_{DD} = 30 V T_j = 150°C (see test circuit, Figure 21)		100 260 5.2		ns nC A

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

Figure 3: Safe Operating Area for TO-220

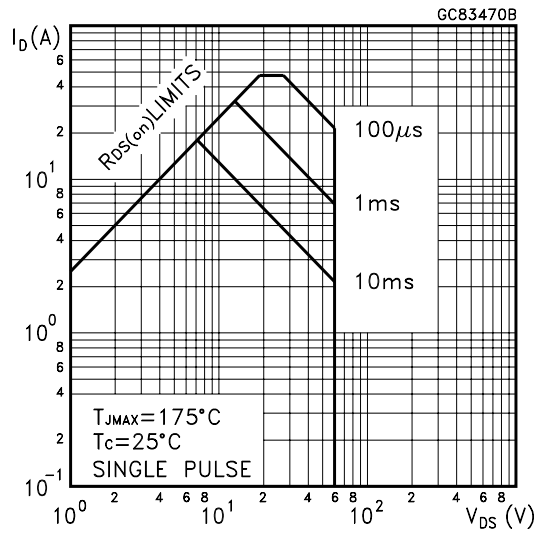


Figure 4: Safe Operating Area for TO-220FP

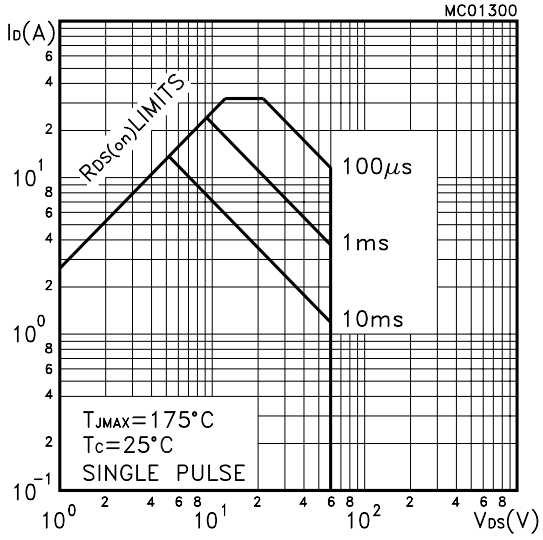


Figure 5: Thermal Impedance

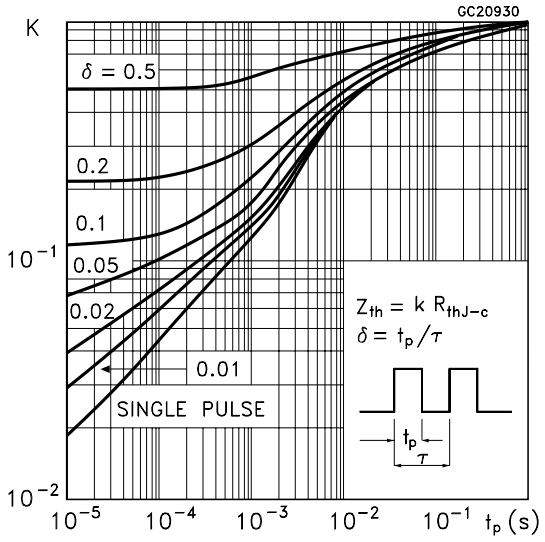


Figure 6: Thermal Impedance for TO-220FP

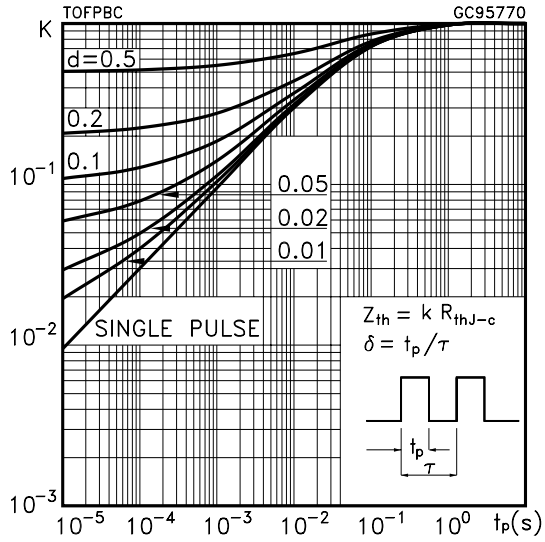


Figure 7: Output Characteristics

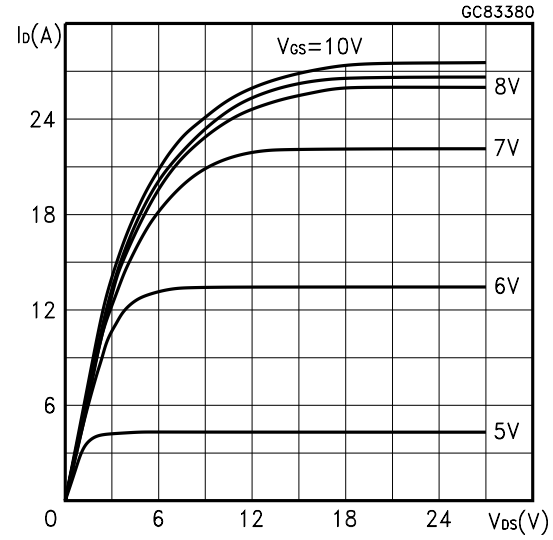


Figure 8: Transfer Characteristics

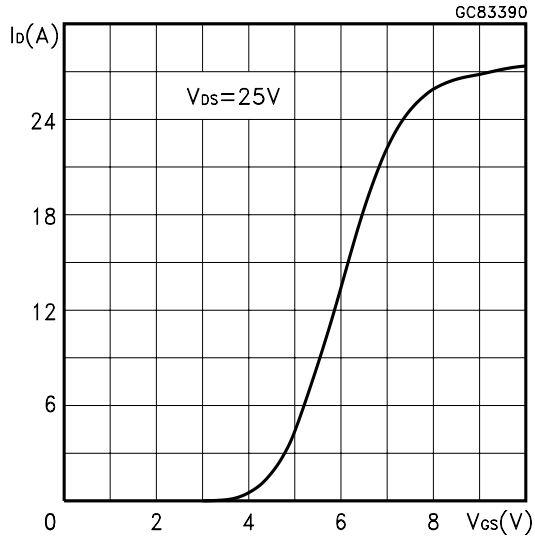


Figure 9: Transconductance

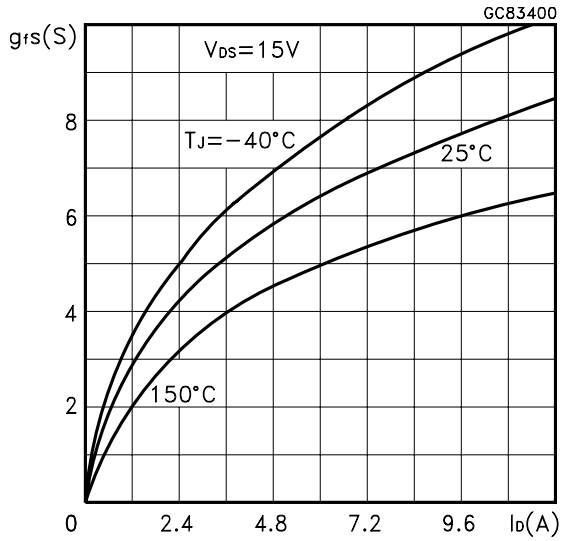


Figure 10: Static Drain-source On Resistance

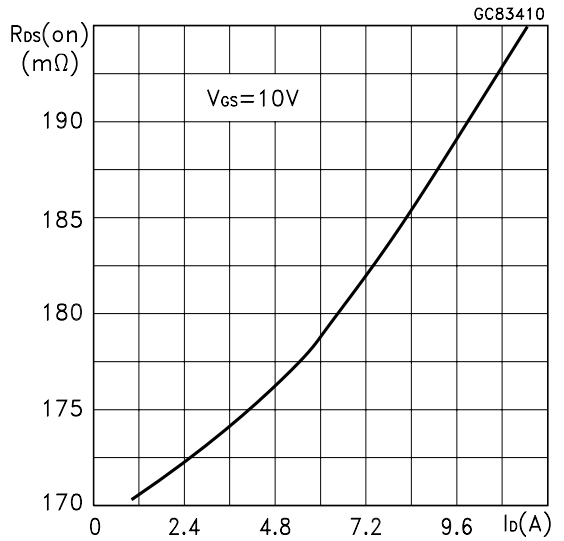


Figure 11: Gate Charge vs Gate-source Voltage

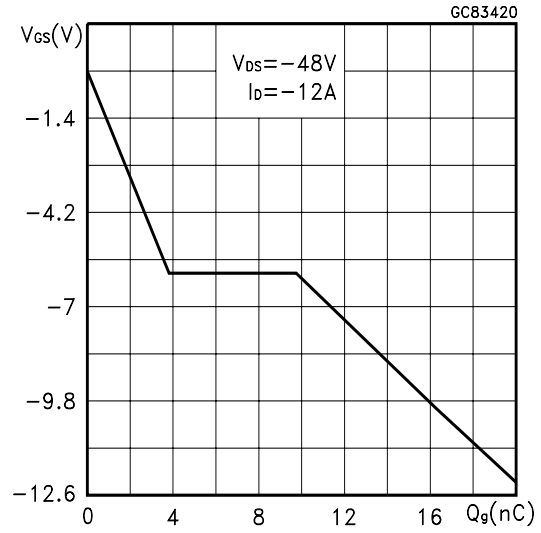


Figure 12: Capacitance Variations

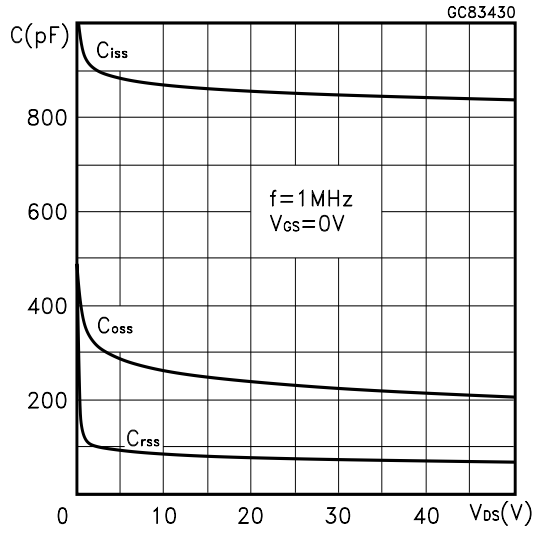


Figure 13: Normalized Gate Threshold Voltage vs Temperature

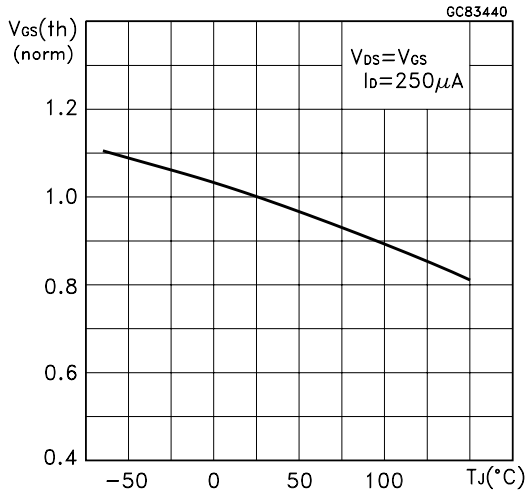


Figure 14: Normalized on Resistance vs Temperature

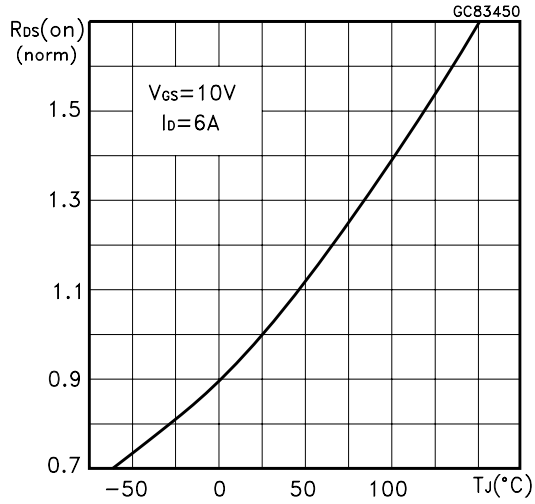


Figure 15: Source-drain Diode Forward Characteristics

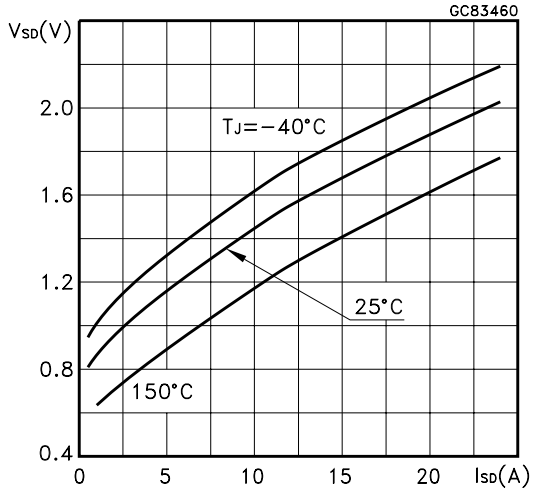


Figure 16: Normalized Breakdown Voltage Temperature

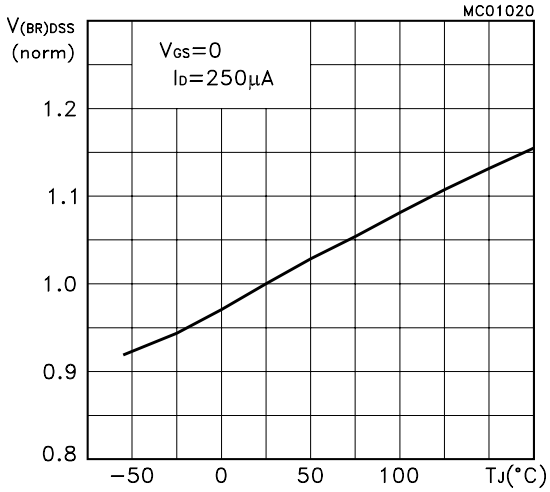


Figure 17: Unclamped Inductive Load Test Circuit

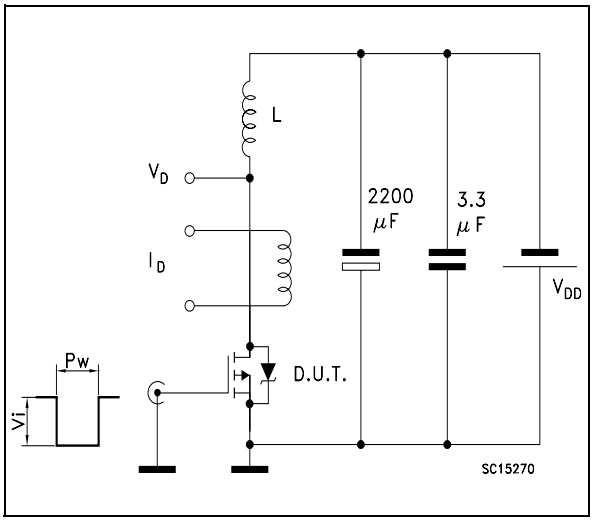


Figure 18: Unclamped Inductive Waveform

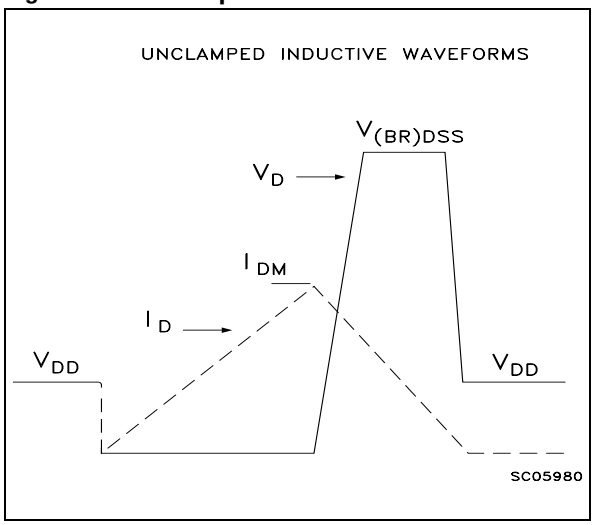


Figure 19: Switching Times Test Circuits For Resistive Load

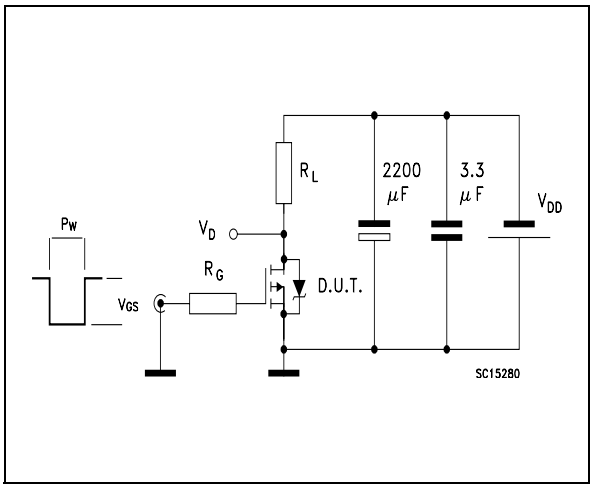


Figure 20: Gate Charge test Circuit

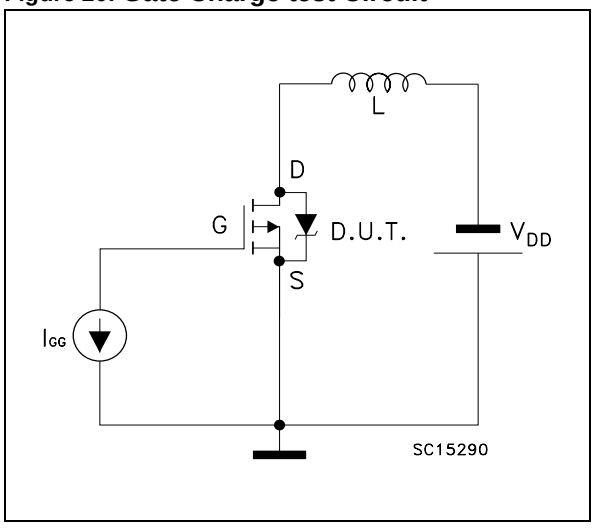
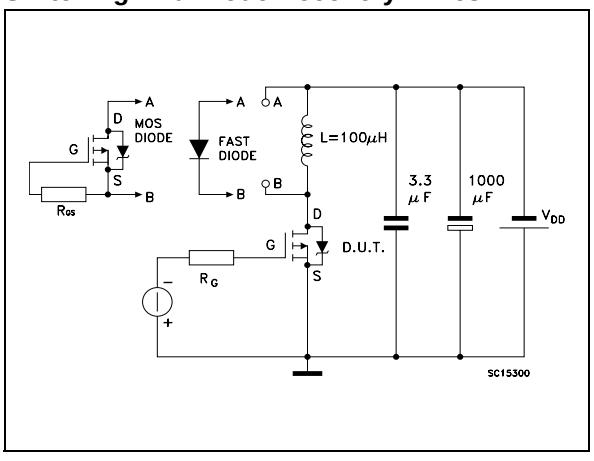
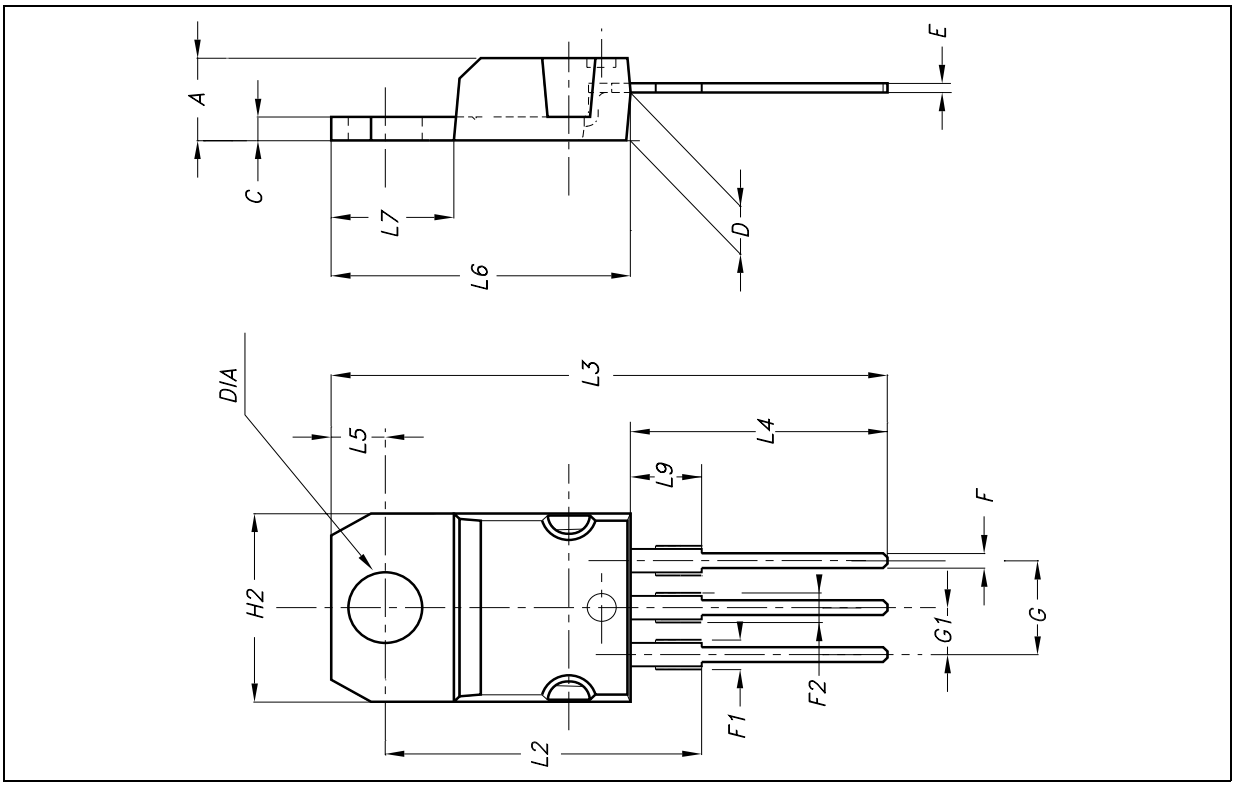


Figure 21: Test Circuit For Inductive Load Switching And Diode Recovery Times



TO-220 MECHANICAL DATA

DIM.	mm.			inch.		
	MIN.	TYP.	MAX.	MIN.	TYP.	TYP.
A	4.4		4.6	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		0.067
F2	1.14		1.70	0.044		0.067
G	4.95		5.15	0.194		0.203
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		0.260
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	0.385		0.417
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

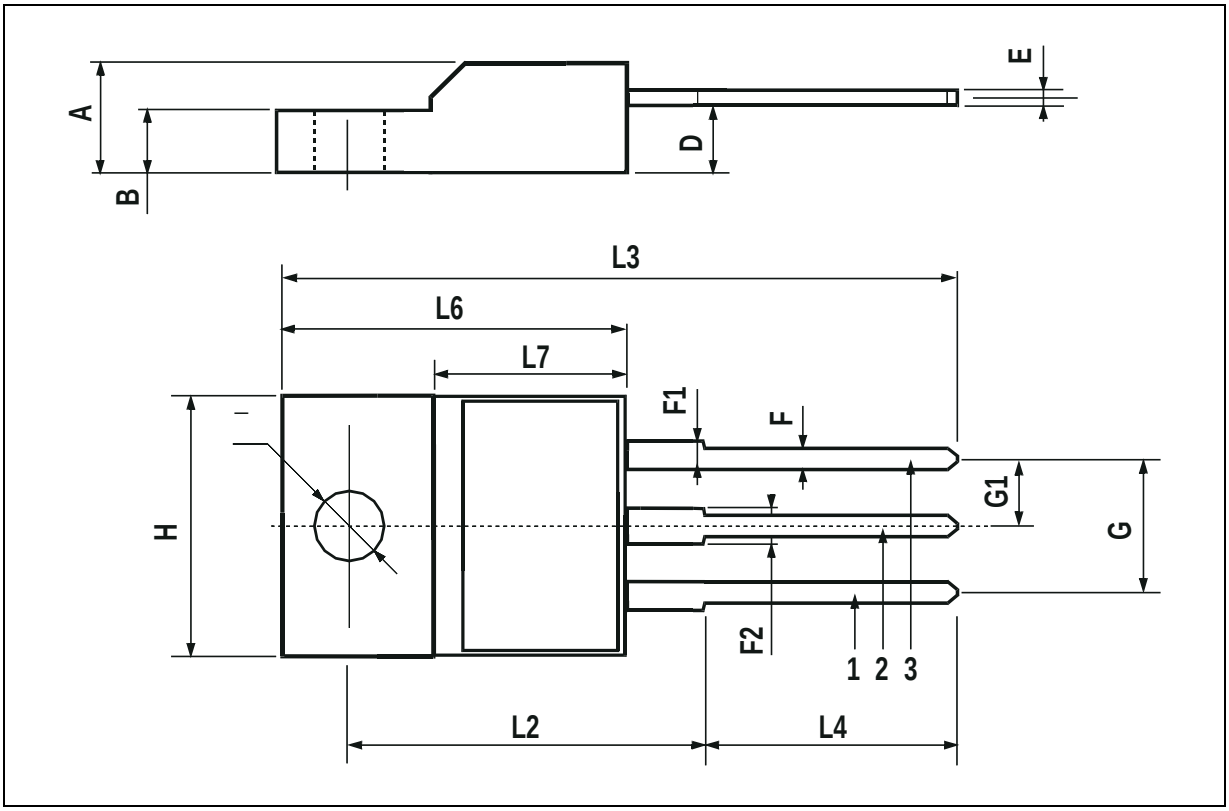


Table 11:Revision History

Date	Revision	Description of Changes
March 2005	1.0	FIRST ISSUE
March 2005	2.0	MINOR REVISION