

## MOSFETs

Order code	Manufacturer code	Description
47-0207	n/a	STP36NF06 MOSFET N 60V 30A (RC)

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The enclosed information is believed to be correct, Information may change 'without notice' due to product improvement. Users should ensure that the product is suitable for their use. E. & O. E.	Revision A 04/07/2003



# STP36NF06 STP36NF06FP

N-CHANNEL 60V - 0.032  $\Omega$  - 30A TO-220/TO-220FP  
STripFET™ II POWER MOSFET

TYPE	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STP36NF06	60 V	<0.040 $\Omega$	30 A
STP36NF06FP	60 V	<0.040 $\Omega$	18 A(*)

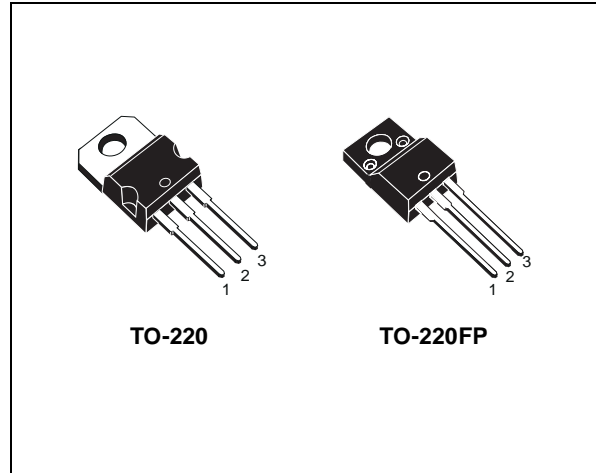
- TYPICAL R<sub>DS(on)</sub> = 0.032  $\Omega$
- EXCEPTIONAL dv/dt CAPABILITY
- 100% AVALANCHE TESTED
- APPLICATION ORIENTED CHARACTERIZATION

## DESCRIPTION

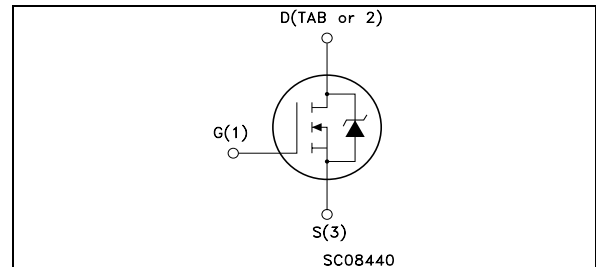
This Power MOSFET is the latest development of STMicroelectronics unique "Single Feature Size™" strip-based process. The resulting transistor shows extremely high packing density for low on-resistance, rugged avalanche characteristics and less critical alignment steps therefore a remarkable manufacturing reproducibility.

## APPLICATIONS

- HIGH CURRENT, HIGH SWITCHING SPEED



## INTERNAL SCHEMATIC DIAGRAM



## Ordering Information

SALES TYPE	MARKING	PACKAGE	PACKAGING
STP36NF06	STP36NF06	TO-220	TUBE
STP36NF06FP	STP36NF06FP	TO-220FP	TUBE

## ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP36NF06	STP36NF06FP	
V <sub>DS</sub>	Drain-source Voltage (V <sub>GS</sub> = 0)	60		V
V <sub>DGR</sub>	Drain-gate Voltage (R <sub>GS</sub> = 20 k $\Omega$ )	60		V
V <sub>GS</sub>	Gate- source Voltage	$\pm 20$		V
I <sub>D</sub>	Drain Current (continuous) at T <sub>C</sub> = 25°C	30	18(*)	A
I <sub>D</sub>	Drain Current (continuous) at T <sub>C</sub> = 100°C	21	12	A
I <sub>DM</sub> (•)	Drain Current (pulsed)	120	72	A
P <sub>tot</sub>	Total Dissipation at T <sub>C</sub> = 25°C	70	25	W
	Derating Factor	0.47	0.17	W/°C
dv/dt (1)	Peak Diode Recovery voltage slope	20		V/ns
E <sub>AS</sub> (2)	Single Pulse Avalanche Energy	200		mJ
T <sub>stg</sub>	Storage Temperature	-55 to 175		°C
T <sub>j</sub>	Max. Operating Junction Temperature			

(•) Pulse width limited by safe operating area.

(\*) Current Limited by Package

(1) I<sub>SD</sub>  $\leq$  36A, di/dt  $\leq$  400A/ $\mu$ s, V<sub>DD</sub>  $\leq$  V<sub>(BR)DSS</sub>, T<sub>j</sub>  $\leq$  T<sub>JMAX</sub>

(2) Starting T<sub>j</sub> = 25 °C, I<sub>D</sub> = 18 A, V<sub>DD</sub> = 45V

**THERMAL DATA**

			TO-220	TO-220FP	
Rthj-case	Thermal Resistance Junction-case	Max	2.14	6	°C/W
Rthj-amb T <sub>l</sub>	Thermal Resistance Junction-ambient Maximum Lead Temperature For Soldering Purpose (1.6 mm from case, for 10 sec)	Max	62.5 300		°C/W °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	60			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> = ± 20 V			±100	nA

**ON (\*)**

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> = 250 μA	2			V
R <sub>DS(on)</sub>	Static Drain-source On Resistance	V <sub>GS</sub> = 10 V I <sub>D</sub> = 15 A		0.032	0.040	Ω

**DYNAMIC**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g <sub>fs</sub> (*)	Forward Transconductance	V <sub>DS</sub> = 25 V I <sub>D</sub> = 15 A		12		S
C <sub>iss</sub> C <sub>oss</sub> C <sub>rss</sub>	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V <sub>DS</sub> = 25V f = 1 MHz V <sub>GS</sub> = 0		690 170 68		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	$V_{DD} = 30\text{ V}$ $I_D = 18\text{ A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$ (Resistive Load, Figure 3)		10 40		ns ns
$Q_g$ $Q_{gs}$ $Q_{gd}$	Total Gate Charge Gate-Source Charge Gate-Drain Charge	$V_{DD} = 30\text{ V}$ $I_D = 36\text{ A}$ $V_{GS} = 10\text{ V}$		23 6 9	31	nC nC nC

**SWITCHING OFF**

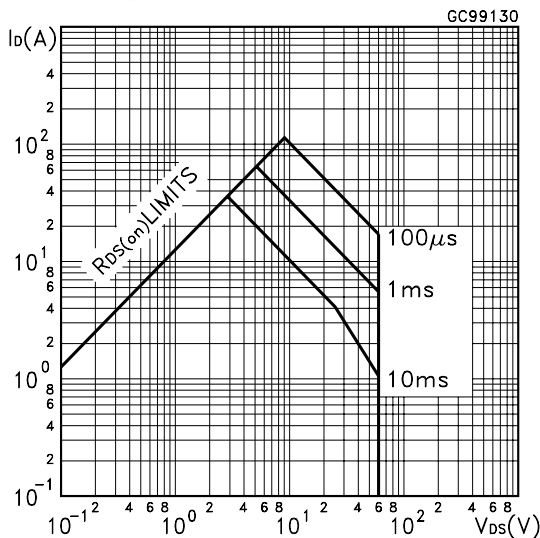
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(off)}$ $t_f$	Turn-off Delay Time Fall Time	$V_{DD} = 30\text{ V}$ $I_D = 18\text{ A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$ (Resistive Load, Figure 3)		27 9		ns ns

**SOURCE DRAIN DIODE**

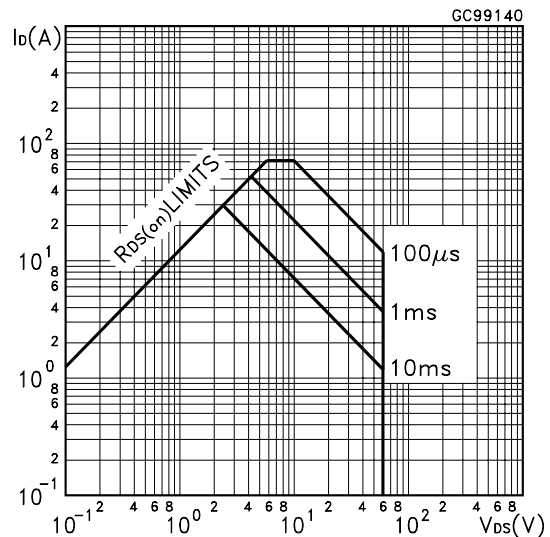
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{SD}$ $I_{SDM}$ (●)	Source-drain Current Source-drain Current (pulsed)				30 120	A A
$V_{SD}$ (*)	Forward On Voltage	$I_{SD} = 30\text{ A}$ $V_{GS} = 0$			1.5	V
$t_{rr}$ $Q_{rr}$ $I_{RRM}$	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery 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)		65 155 4.8		ns nC A

(\*)Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %.  
(●)Pulse width limited by safe operating area.

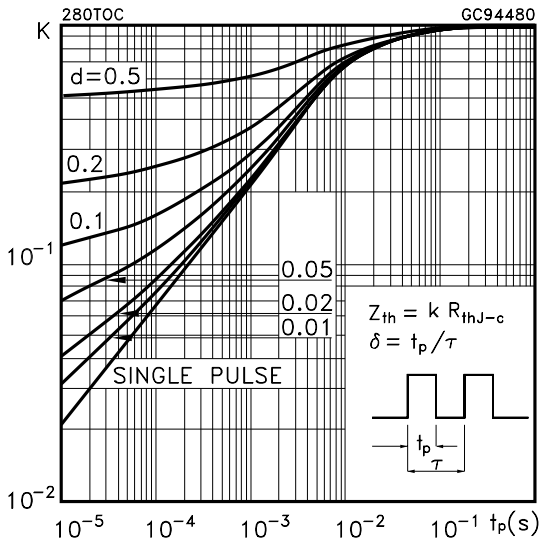
Safe Operating Area for TO-220



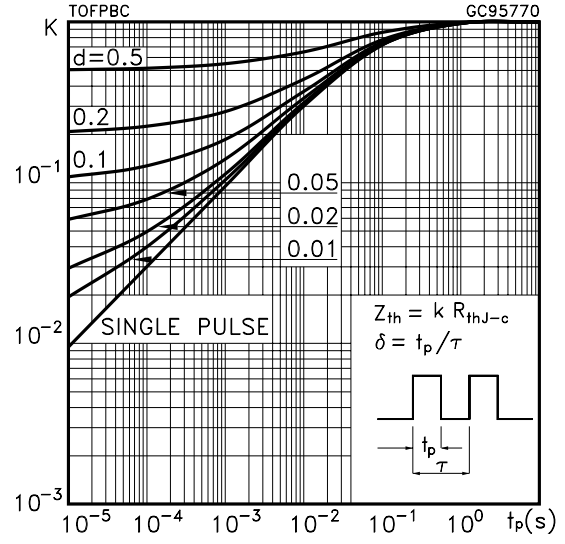
Safe Operating Area for TO-220FP



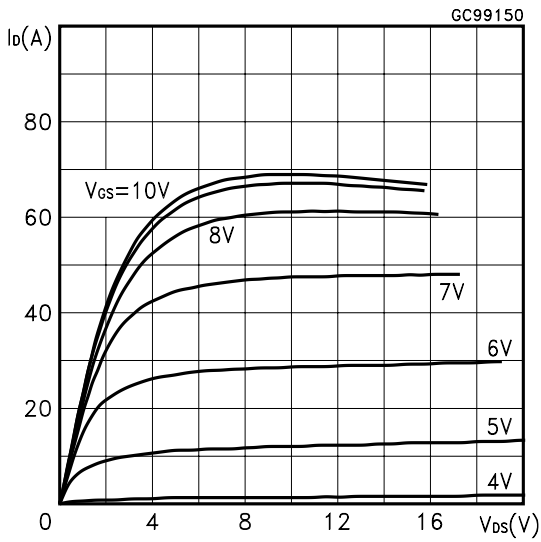
Thermal Impedance



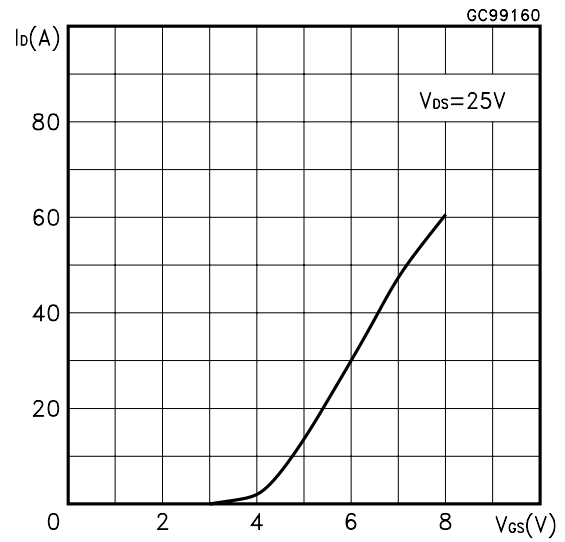
Thermal Impedance for TO-220FP



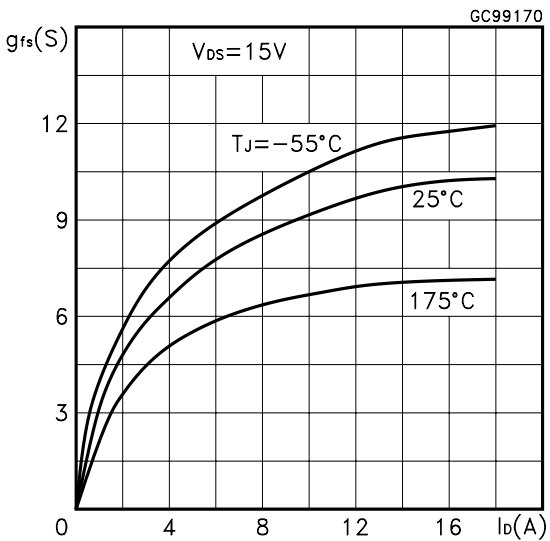
Output Characteristics



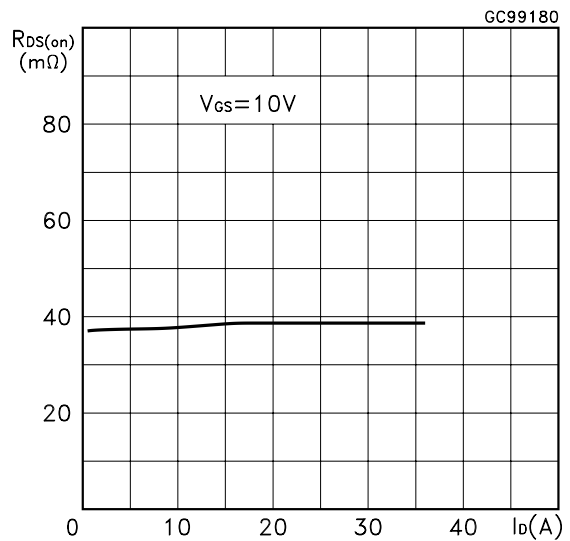
Transfer Characteristics



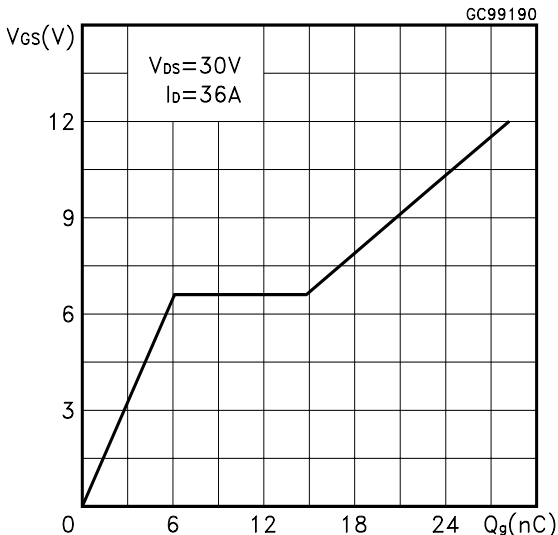
Transconductance



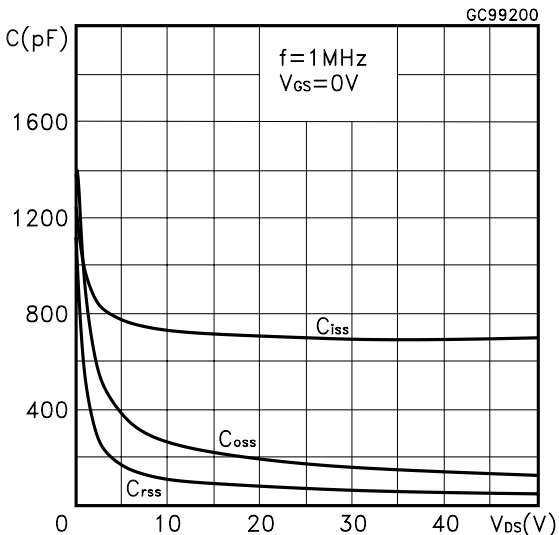
Static Drain-source On Resistance



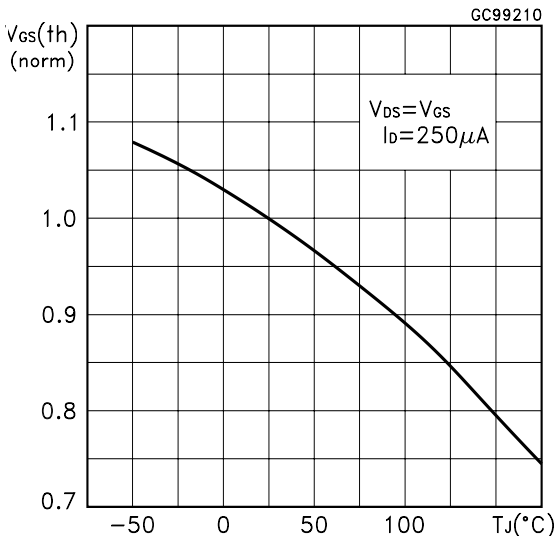
Gate Charge vs Gate-source Voltage



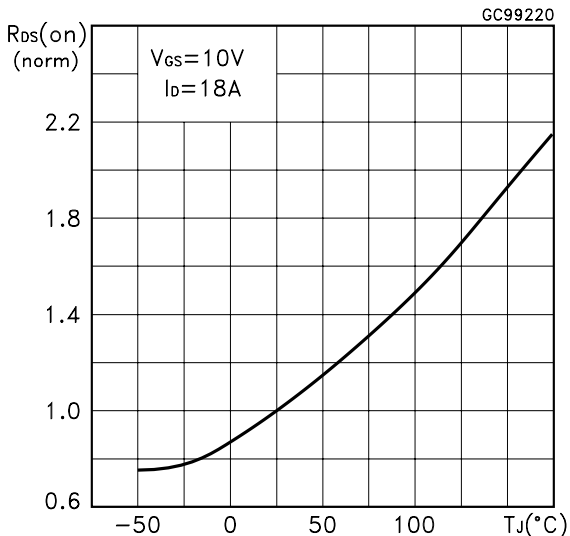
Capacitance Variations



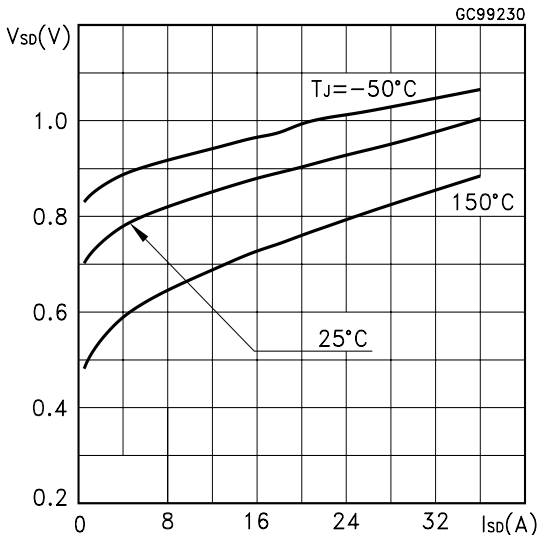
Normalized Gate Threshold Voltage vs Temperature



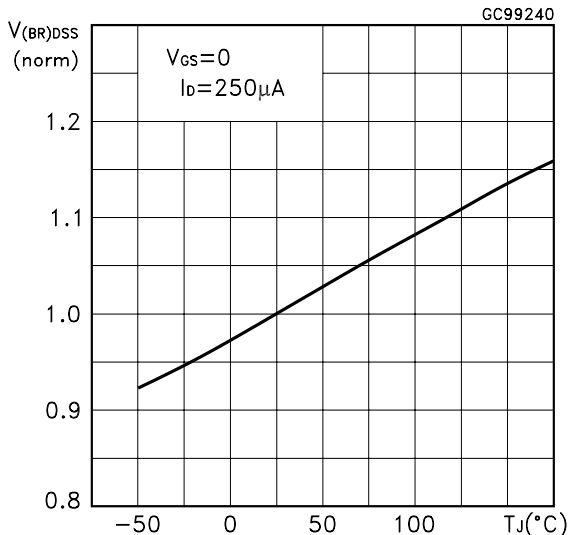
Normalized on Resistance vs Temperature



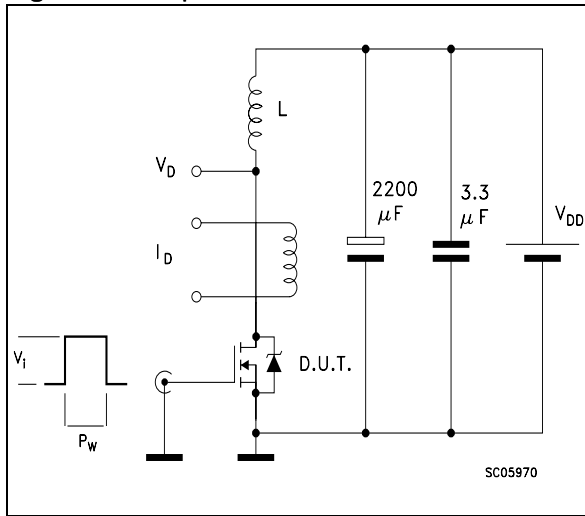
Source-drain Diode Forward Characteristics



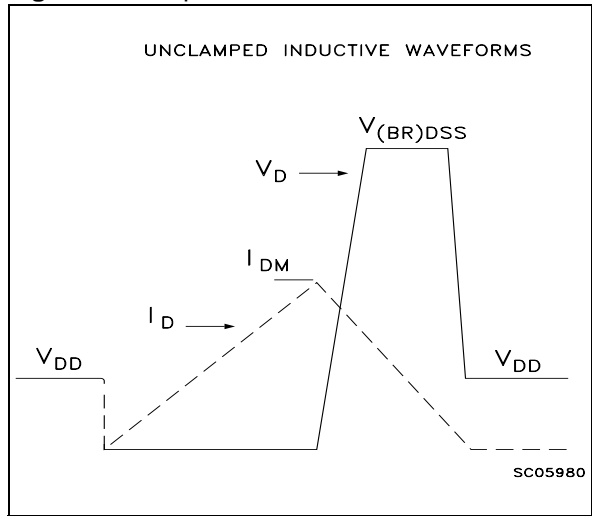
Normalized Breakdown Voltage Temperature



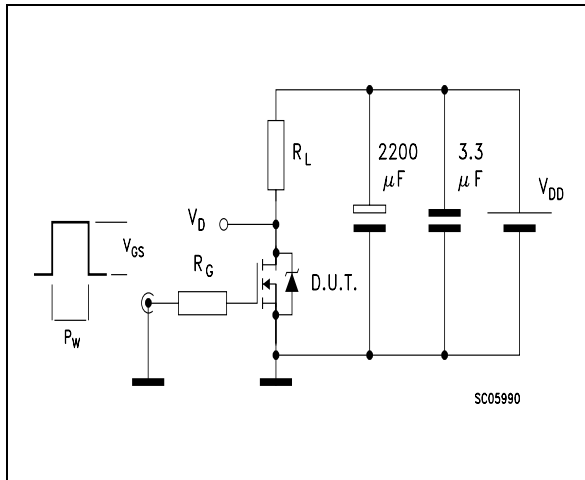
**Fig. 1: Unclamped Inductive Load Test Circuit**



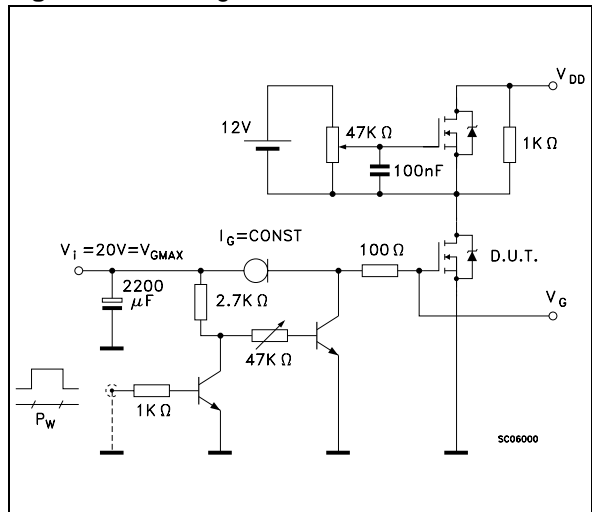
**Fig. 2: Unclamped Inductive Waveform**



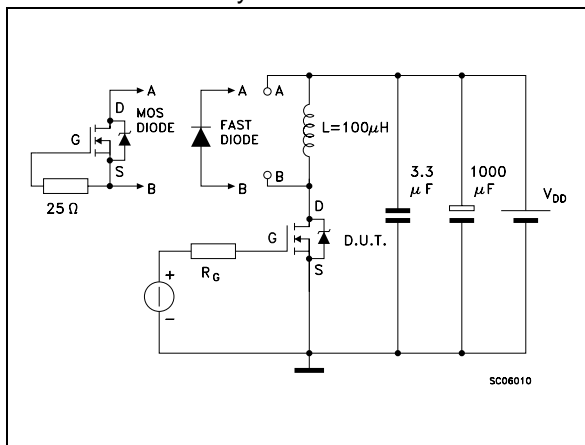
**Fig. 3: Switching Times Test Circuits For Resistive Load**



**Fig. 4: Gate Charge test Circuit**

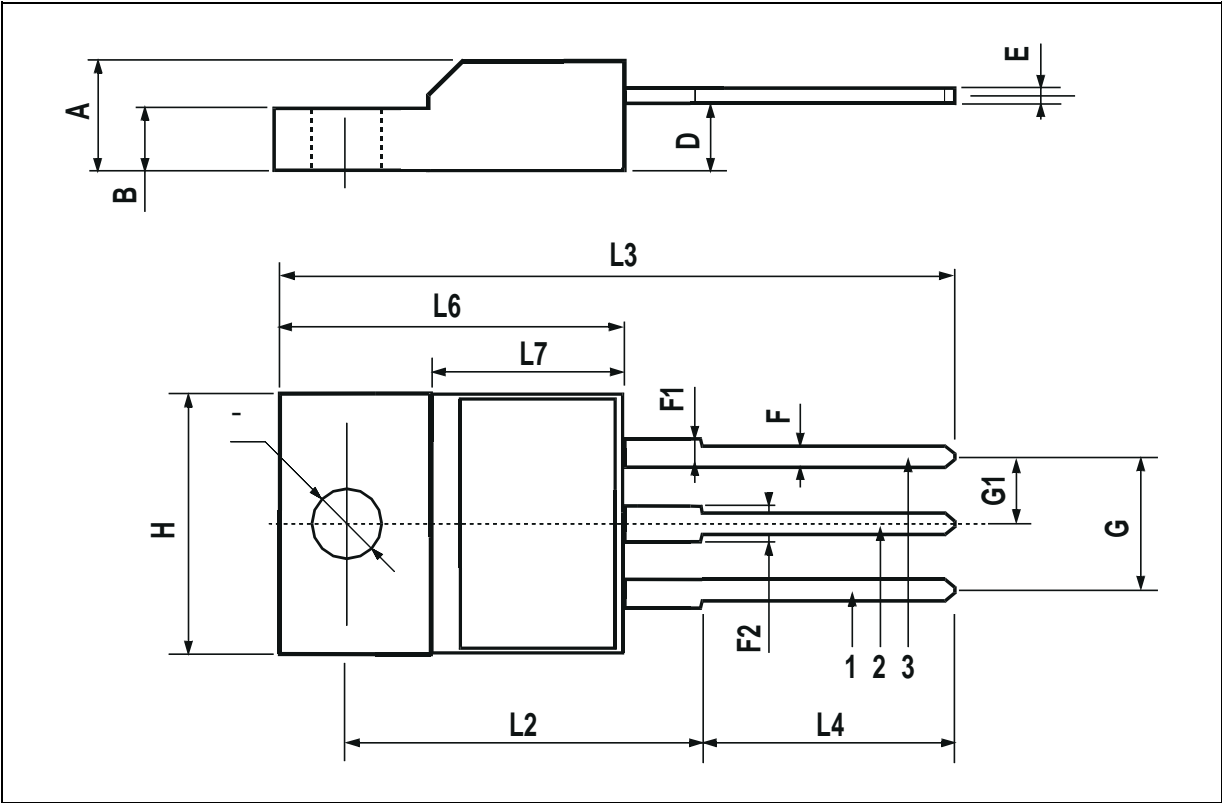


**Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times**



**TO-220FP MECHANICAL DATA**

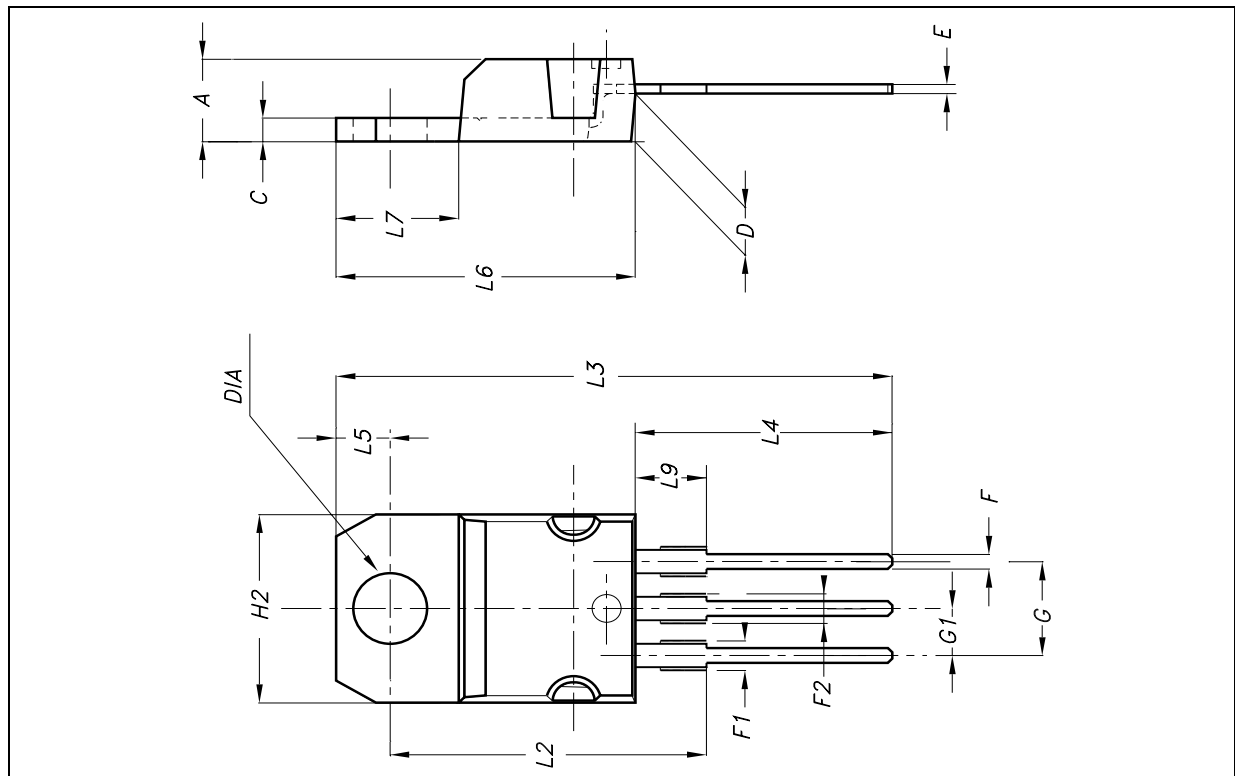
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
B	2.5		2.7	0.098		0.106
D	2.5		2.75	0.098		0.108
E	0.45		0.7	0.017		0.027
F	0.75		1	0.030		0.039
F1	1.15		1.7	0.045		0.067
F2	1.15		1.7	0.045		0.067
G	4.95		5.2	0.195		0.204
G1	2.4		2.7	0.094		0.106
H	10		10.4	0.393		0.409
L2		16			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
∅	3		3.2	0.118		0.126





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



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