



# STW200NF03

## N-CHANNEL 30V - 0.002 Ω - 120A TO-247 ULTRA LOW ON-RESISTANCE STripFET™ II MOSFET

TYPE	V <sub>DSS</sub>	R <sub>DS(on)</sub>	I <sub>D</sub>
STW200NF03	30V	<0.0028Ω	120A

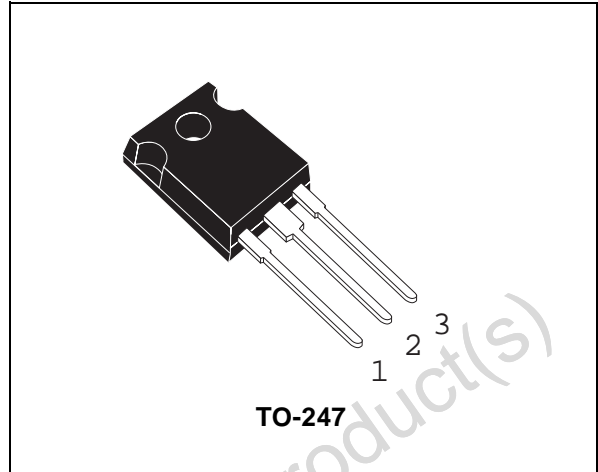
- TYPICAL R<sub>DS(on)</sub> = 0.002 Ω
- 100% AVALANCHE TESTED

### DESCRIPTION

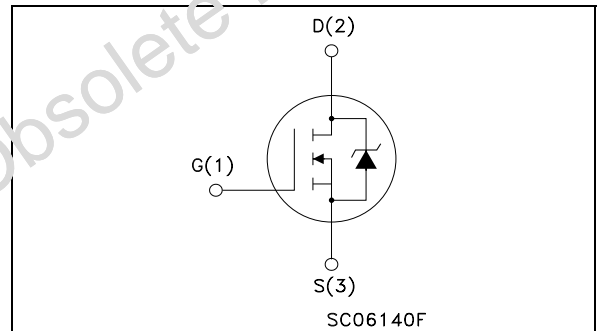
This Power MOSFET series realized with STMicroelectronics unique STripFET process has specifically been designed to minimize input capacitance and gate charge. It is particularly suitable in OR-ing function circuits and synchronous rectification.

### APPLICATIONS

- HIGH-EFFICIENCY DC-DC CONVERTERS
- HIGH CURRENT, HIGH SWITCHING SPEED
- OR-ING FUNCTION



### INTERNAL SCHEMATIC DIAGRAM



### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V <sub>DS</sub>	Drain-source Voltage (V <sub>GS</sub> = 0)	30	V
V <sub>DGF</sub>	Drain-gate Voltage (R <sub>GS</sub> = 20 kΩ)	30	V
V <sub>GS</sub>	Gate- source Voltage	± 20	V
I <sub>D(●)</sub>	Drain Current (continuous) at T <sub>C</sub> = 25°C	120	A
I <sub>D</sub>	Drain Current (continuous) at T <sub>C</sub> = 100°C	120	A
I <sub>DM(●●)</sub>	Drain Current (pulsed)	480	A
P <sub>tot</sub>	Total Dissipation at T <sub>C</sub> = 25°C	350	W
	Derating Factor	2.33	W/°C
dv/dt (1)	Peak Diode Recovery voltage slope	1.5	V/ns
E <sub>AS</sub> (2)	Single Pulse Avalanche Energy	4	J
T <sub>stg</sub>	Storage Temperature	-55 to 175	°C
T <sub>j</sub>	Operating Junction Temperature		

(●●) Pulse width limited by safe operating area.  
(●) Current limited by package

(1) I<sub>SD</sub> ≤ 120A, di/dt ≤ 200A/μs, V<sub>DD</sub> ≤ V(BR)DSS, T<sub>j</sub> ≤ T<sub>JMAX</sub>.  
(2) Starting T<sub>j</sub> = 25 °C, I<sub>D</sub> = 60 A, V<sub>DD</sub> = 15V

**STW200NF03****THERMAL DATA**

Rthj-case	Thermal Resistance Junction-case	Max	0.43	°C/W
Rthj-amb	Thermal Resistance Junction-ambient	Max	50	°C/W
T <sub>l</sub>	Maximum Lead Temperature For Soldering Purpose	Typ	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	30			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> = 250 μA	2	3	4	V
R <sub>DS(on)</sub>	Static Drain-source On Resistance	V <sub>GS</sub> = 10 V I <sub>D</sub> = 60 A		0.002	0.0028	Ω

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g <sub>fs</sub> (*)	Forward Transconductance	V <sub>DS</sub> = 15 V I <sub>D</sub> = 60 A		200		S
C <sub>iSS</sub>	Input Capacitance	V <sub>DS</sub> = 25V, f = 1 MHz, V <sub>GS</sub> = 0		10		nF
C <sub>oSS</sub>	Output Capacitance			3.35		nF
C <sub>rSS</sub>	Reverse Transfer Capacitance			385		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	$V_{DD} = 15\text{ V}$ $I_D = 60\text{ A}$ $R_G = 4.7\ \Omega$ $V_{GS} = 10\text{ V}$ (Resistive Load, Figure 3)		50 300		ns ns
$Q_g$ $Q_{gs}$ $Q_{gd}$	Total Gate Charge Gate-Source Charge Gate-Drain Charge	$V_{DD}=15\text{V}$ $I_D=120\text{A}$ $V_{GS}= 10\text{ V}$ (see test circuit, Figure 4)		210 63.5 63.5	280	nC nC nC

**SWITCHING OFF**

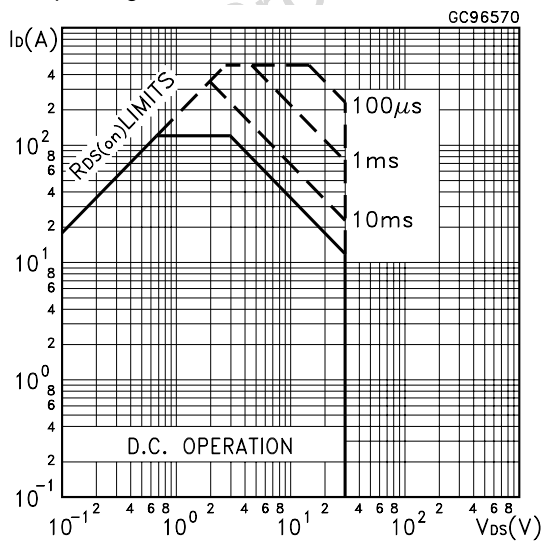
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(off)}$ $t_f$	Turn-off Delay Time Fall Time	$V_{DD} = 15\text{ V}$ $I_D = 60\text{ A}$ $R_G = 4.7\ \Omega$ , $V_{GS} = 10\text{ V}$ (Resistive Load, Figure 3)		100 80		ns ns

**SOURCE DRAIN DIODE**

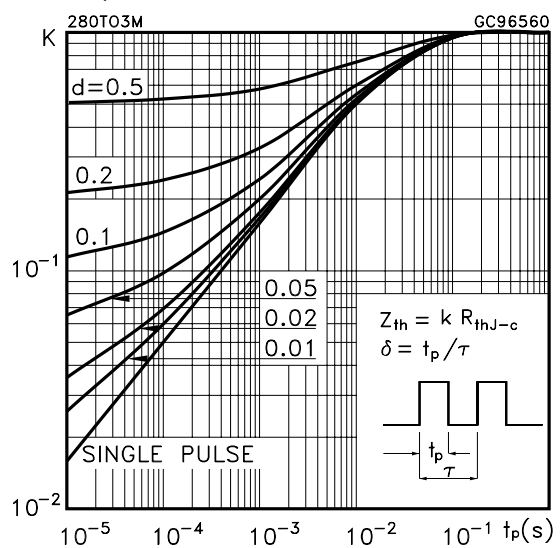
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{SD}$ $I_{SDM} (\bullet)$	Source-drain Current Source-drain Current (pulsed)				120 480	A A
$V_{SD} (*)$	Forward On Voltage	$I_{SD} = 120\text{ A}$ $V_{GS} = 0$			1.3	V
$t_{rr}$ $Q_{rr}$ $I_{RRM}$	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	$I_{SD} = 120\text{ A}$ $di/dt = 100\text{A}/\mu\text{s}$ $V_{DD} = 20\text{ V}$ $T_j = 150^\circ\text{C}$ (see test circuit, Figure 5)		90 250 5.5		ns nC A

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

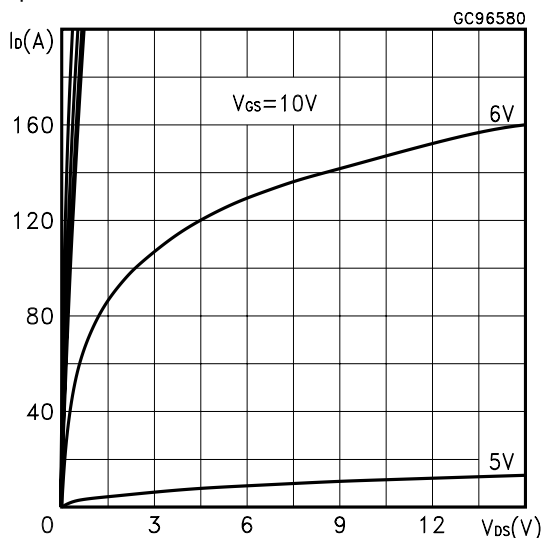
**Safe Operating Area**



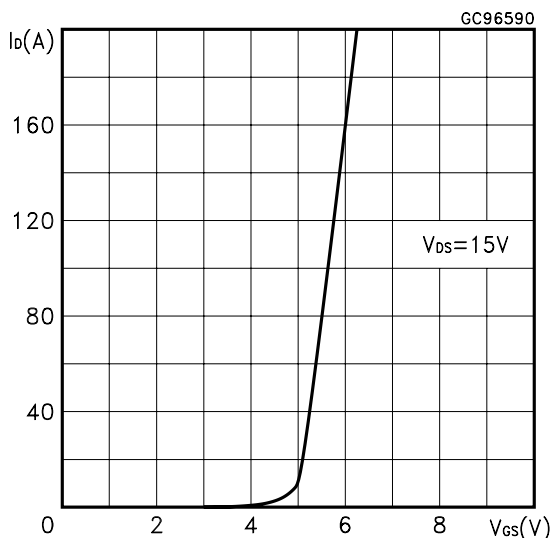
**Thermal Impedance**



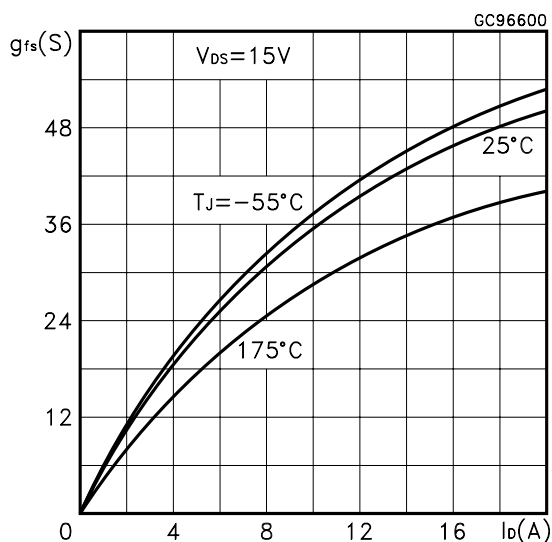
Output Characteristics



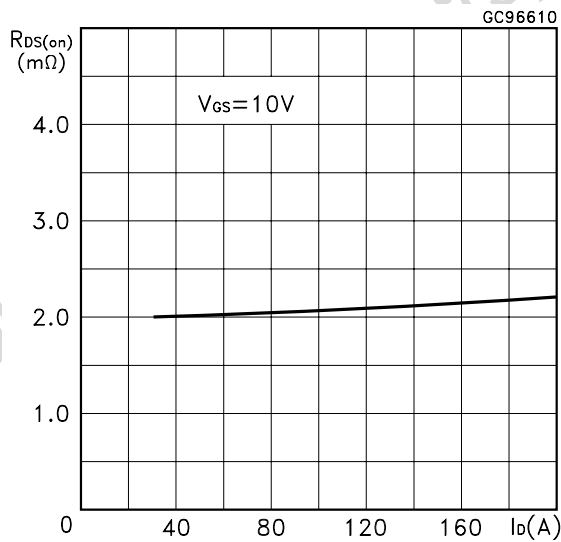
Transfer Characteristics



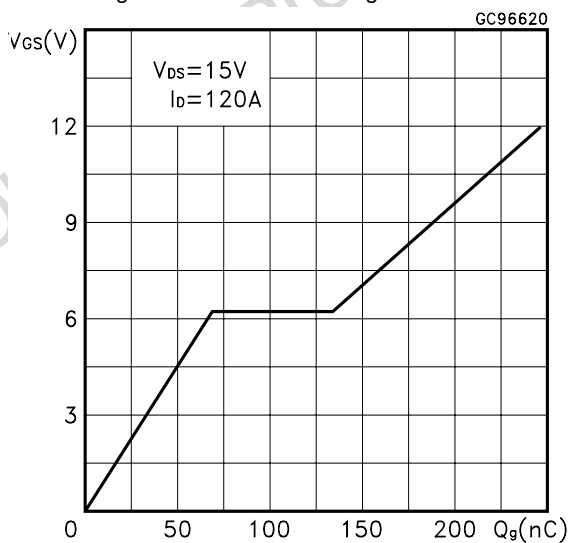
Transconductance



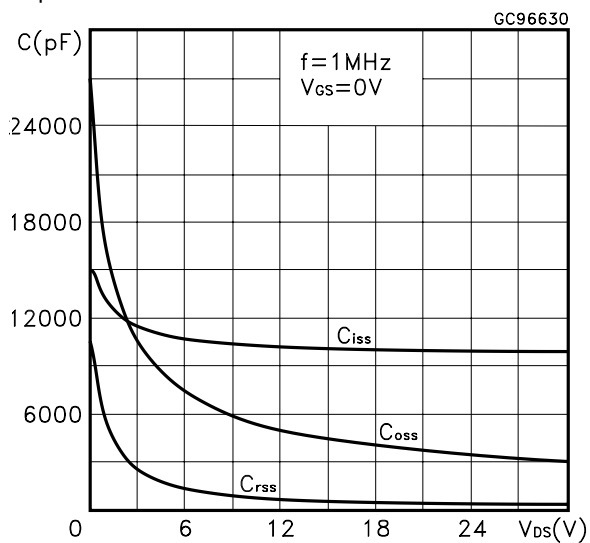
Static Drain-source On Resistance



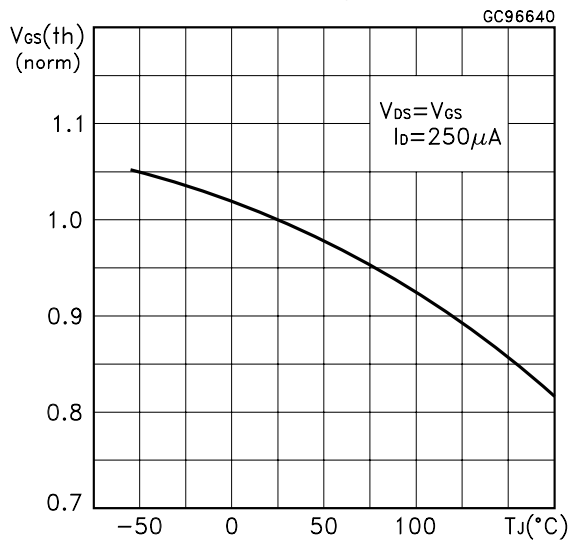
Gate Charge vs Gate-source Voltage



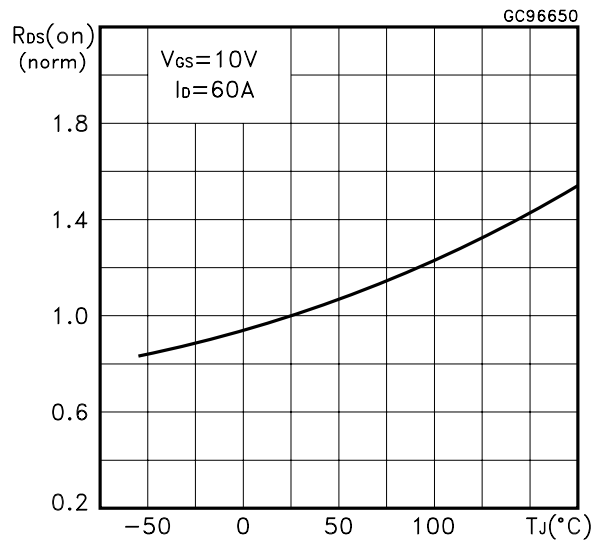
Capacitance Variations



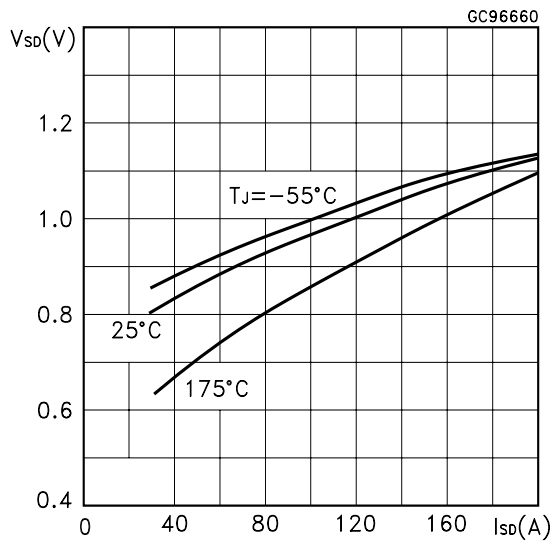
Normalized Gate Threshold Voltage vs Temperature



Normalized on Resistance vs Temperature



Source-drain Diode Forward Characteristics



Normalized Breakdown Voltage vs Temperature.

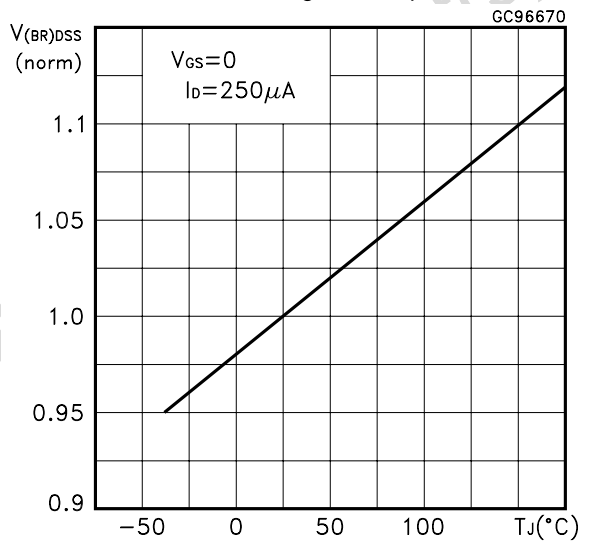


Fig. 1: Unclamped Inductive Load Test Circuit



Fig. 2: Unclamped Inductive Waveform



Fig. 3: Switching Times Test Circuits For Resistive Load

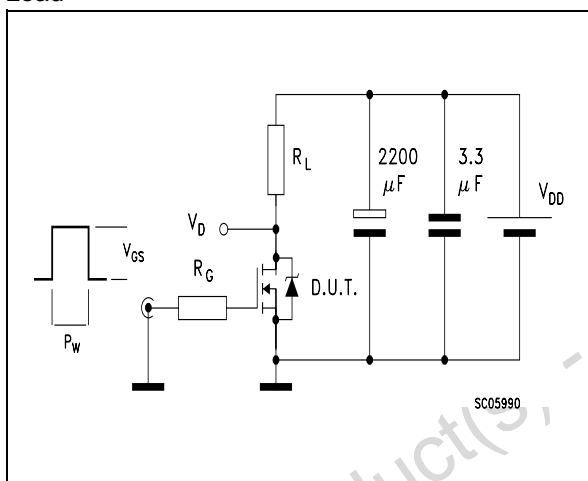


Fig. 4: Gate Charge test Circuit

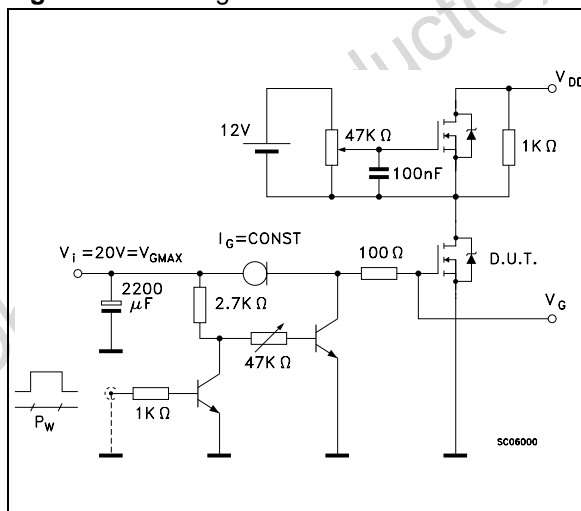
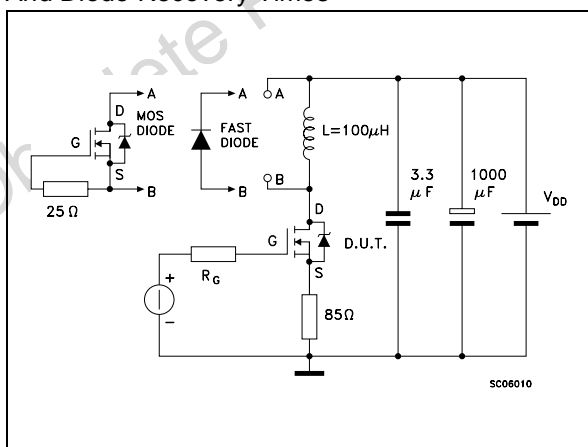
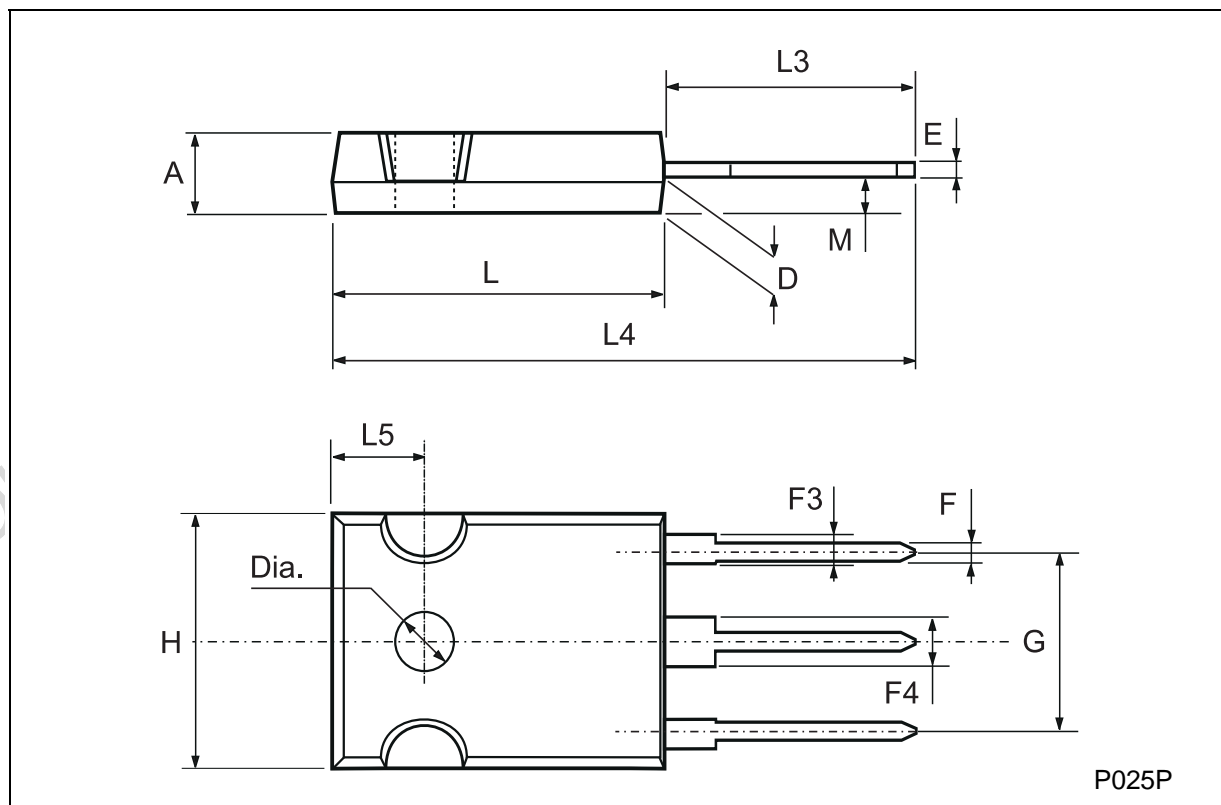


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



## TO-247 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.7		5.3	0.185		0.209
D	2.2		2.6	0.087		0.102
E	0.4		0.8	0.016		0.031
F	1		1.4	0.039		0.055
F3	2		2.4	0.079		0.094
F4	3		3.4	0.118		0.134
G		10.9			0.429	
H	15.3		15.9	0.602		0.626
L	19.7		20.3	0.776		0.779
L3	14.2		14.8	0.559		0.582
L4		34.6			1.362	
L5		5.5			0.217	
M	2		3	0.079		0.118



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