



STGP10NB60SDFP

N-CHANNEL 10A - 600V - TO-220FP

PowerMesh™ IGBT

TYPE	V _{CES}	V _{CE(sat)}	I _C
STGP10NB60SDFP	600	< 1.8 V	10 A

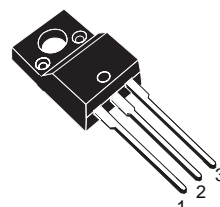
- HIGHT INPUT IMPEDANCE (VOLTAGE DRIVEN)
- LOW ON-VOLTAGE DROP
- HIGH CURRENT CAPABILITY
- OFF LOSSES INCLUDE TAIL CURRENT

DESCRIPTION

Using the latest high voltage technology based on a patented strip layout, STMicroelectronics has designed an advanced family of IGBTs, the PowerMESH™ IGBTs, with outstanding performances. The suffix "S" identifies a family optimized achieve minimum on-voltage drop for low frequency applications (<1kHz).

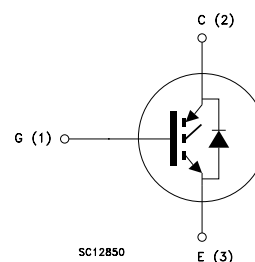
APPLICATIONS

- LIGHT DIMMER
- STATIC RELAYS
- MOTOR CONTROL



TO-220FP

INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V _{CES}	Collector-Emitter Voltage (V _{GS} = 0)	600	V
V _{ECR}	Reverse Battery Protection	20	V
V _{GE}	Gate-Emitter Voltage	± 20	V
I _C	Collector Current (continuous) at T _C = 25°C	20	A
I _C	Collector Current (continuous) at T _C = 100°C	10	A
I _{CM} (■)	Collector Current (pulsed)	80	A
P _{TOT}	Total Dissipation at T _C = 25°C	30	W
	Derating Factor	0.2	W/°C
V _{ISO}	Insulation Withstand Voltage A.C. (t = 1 sec; T _C = 25°C)	2500	V
T _{stg}	Storage Temperature	-65 to 150	°C
T _j	Max. Operating Junction Temperature	175	°C

(●) Pulse width limited by safe operating area

STGP10NB60SDFP

THERMAL DATA

Rthj-case	Thermal Resistance Junction-case Max	5	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	62.5	°C/W
Rthc-sink	Thermal Resistance Case-sink Typ	0.5	°C/W

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

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V _{BR(CES)}	Collector-Emitter Break-down Voltage	I _C = 250 µA, V _{GE} = 0,	600			V
V _{BR(CES)}	Emitter Collector Break-down Voltage	I _C = 1 mA, V _{GE} = 0,	20			V
I _{CES}	Collector cut-off Current (V _{GE} = 0)	V _{CE} = Max Rating, T _J = 25 °C V _{CE} = Max Rating, T _J = 125 °C			10 100	µA µA
I _{GES}	Gate-Emitter Leakage Current (V _{CE} = 0)	V _{GE} = ± 20V, V _{CE} = 0			± 100	nA

ON (1)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V _{GE(th)}	Gate Threshold Voltage	V _{CE} = V _{GE} , I _C = 250µA	2.5		5	V
V _{CE(SAT)}	Collector-Emitter Saturation Voltage	V _{GE} = 15V, I _C = 5 A, T _J = 25°C V _{GE} = 15V, I _C = 10 A, T _J = 25°C V _{GE} = 15V, I _C = 10 A, T _J = 125°C		1.15 1.35 1.25	1.8	V V V

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g _{fs}	Forward Transconductance	V _{CE} = 25 V, I _C = 10 A	5			S
C _{ies} C _{oes} C _{res}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V _{CE} = 25V, f = 1 MHz, V _{GE} = 0		610 65 12		pF pF pF
Q _g	Gate Charge	V _{CE} = 400V, I _C = 10 A, V _{GE} = 15V		33		nC
I _{CL}	Latching Current	V _{clamp} = 480V, R _G = 1kΩ, T _J = 125°C	20			A

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	$V_{CC} = 480\text{ V}$, $I_C = 10\text{ A}$ $R_G = 1\text{ K}\Omega$, $V_{GE} = 15\text{ V}$		0.7		μs
t_r	Rise Time			0.46		μs
$(di/dt)_{on}$	Turn-on Current Slope	$V_{CC} = 480\text{ V}$, $I_C = 10\text{ A}$ $R_G = 1\text{ K}\Omega$, $V_{GE} = 15\text{ V}$		8		$\text{A}/\mu\text{s}$
E_{on}	Turn-on Switching Losses			0.6		mJ

SWITCHING OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t_c	Cross-over Time	$V_{clamp} = 480\text{ V}$, $I_C = 10\text{ A}$, $R_{GE} = 1\text{ K}\Omega$, $V_{GE} = 15\text{ V}$		2.2		μs
$t_r(V_{off})$	Off Voltage Rise Time			1.2		μs
t_f	Fall Time			1.2		μs
$E_{off}(^{**})$	Turn-off Switching Loss			5.0		mJ
t_c	Cross-over Time	$V_{clamp} = 480\text{ V}$, $I_C = 10\text{ A}$, $R_{GE} = 1\text{ K}\Omega$, $V_{GE} = 15\text{ V}$ $T_j = 125\text{ }^\circ\text{C}$		3.8		μs
$t_r(V_{off})$	Off Voltage Rise Time			1.2		μs
t_f	Fall Time			1.9		μs
$E_{off}(^{**})$	Turn-off Switching Loss			8.0		mJ

COLLECTOR-EMITTER DIODE

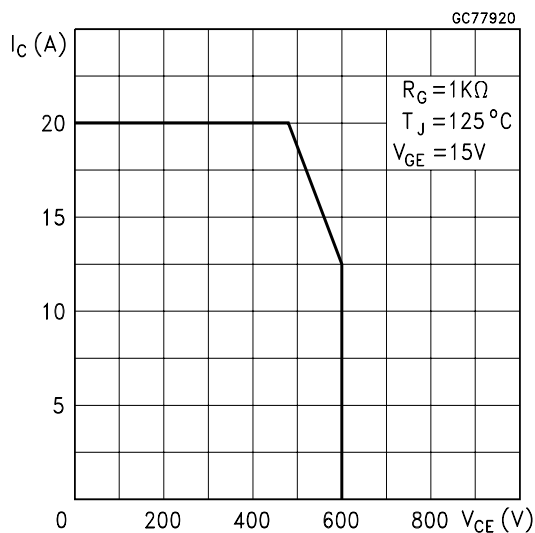
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_f	Forward Current				7	A
I_{fm}	Forward Current pulsed				56	A
V_f	Forward On-Voltage	$I_f = 3.5\text{ A}$ $I_f = 3.5\text{ A}$, $T_j = 125\text{ }^\circ\text{C}$		1.4 1.15	1.9	V V
t_{rr}	Reverse Recovery Time	$I_f = 7\text{ A}$, $V_R = 35\text{ V}$, $T_j = 125\text{ }^\circ\text{C}$, $di/dt = 100\text{ A}/\mu\text{s}$		50		ns
Q_{rr}	Reverse Recovery Charge			70		nC
I_{rrm}	Reverse Recovery Current			2.7		A

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

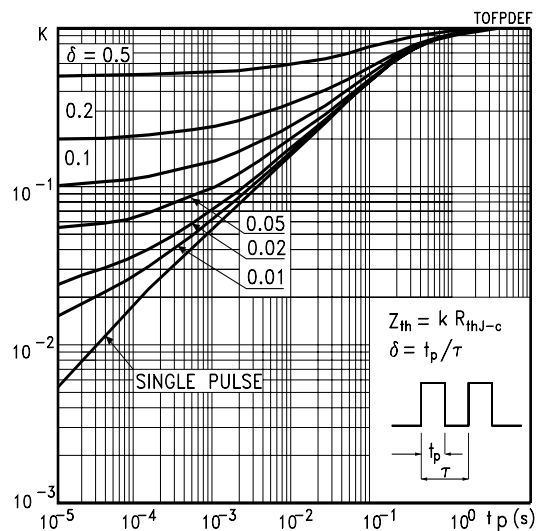
(1) Pulse width limited by max. junction temperature.

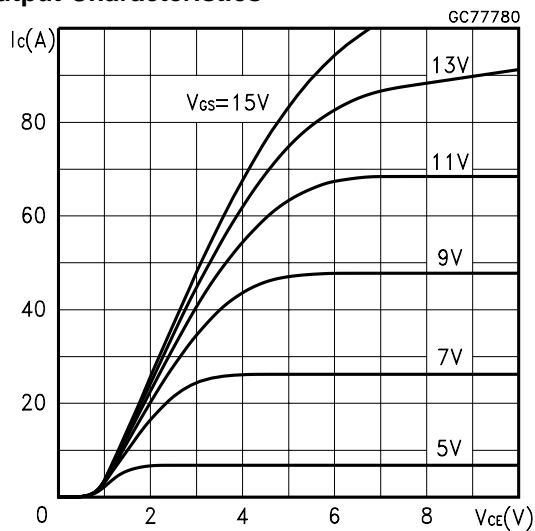
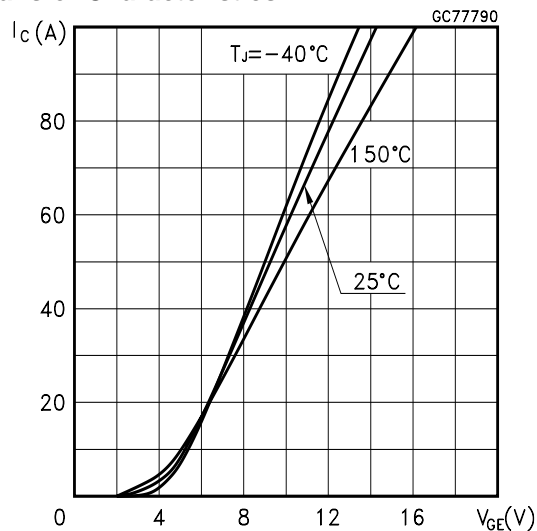
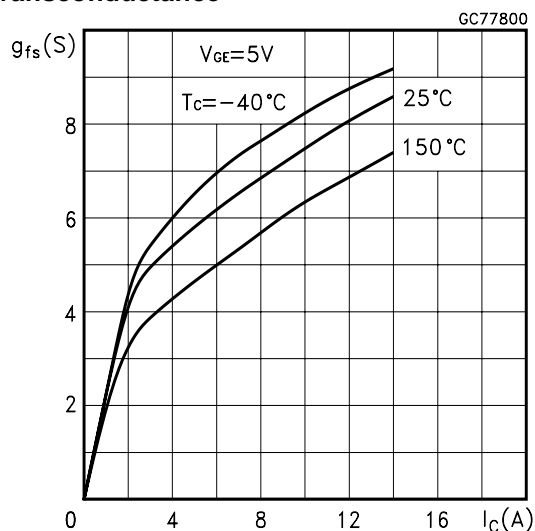
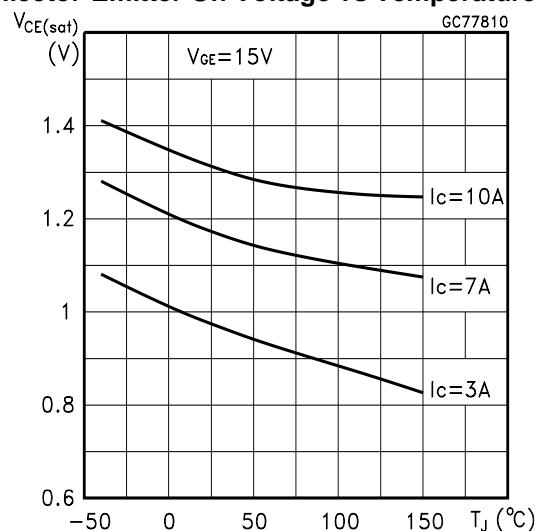
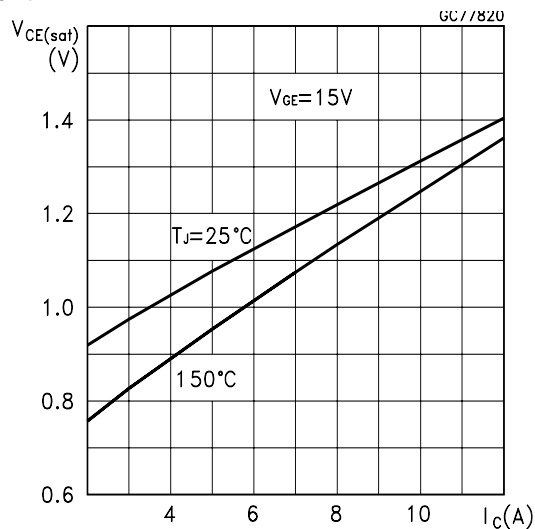
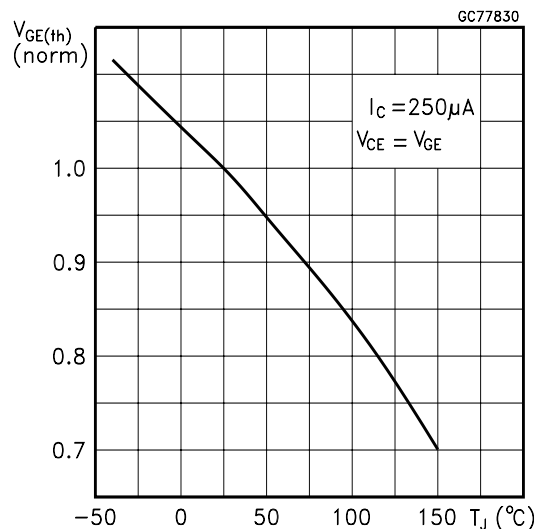
(**) Losses Include Also the Tail

Switching Off Safe Operating Area

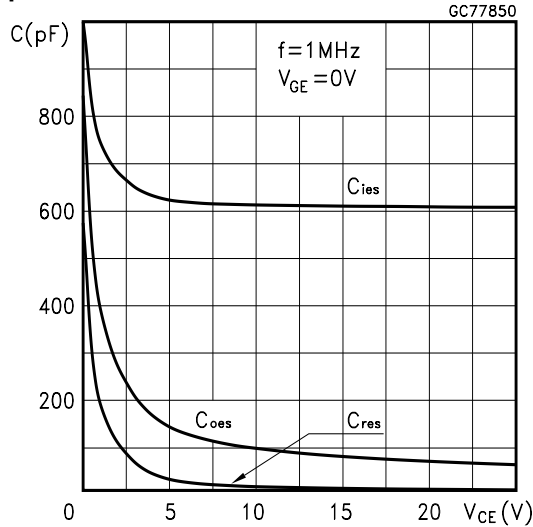


Thermal Impedance

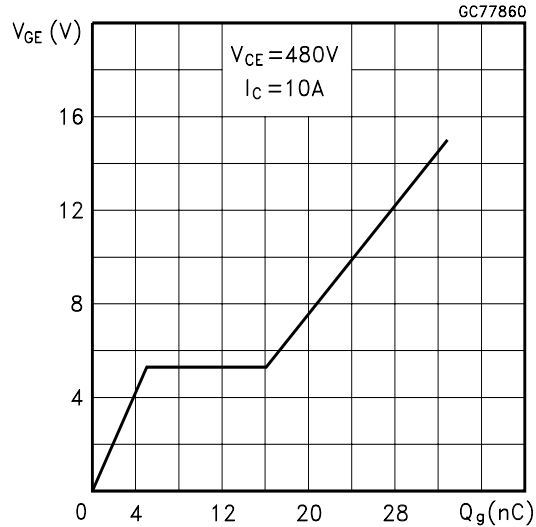


Output Characteristics

Transfer Characteristics

Transconductance

Collector-Emitter On Voltage vs Temperature

Collector-Emitter On Voltage vs Collector Current

Gate Threshold Voltage vs Temperature


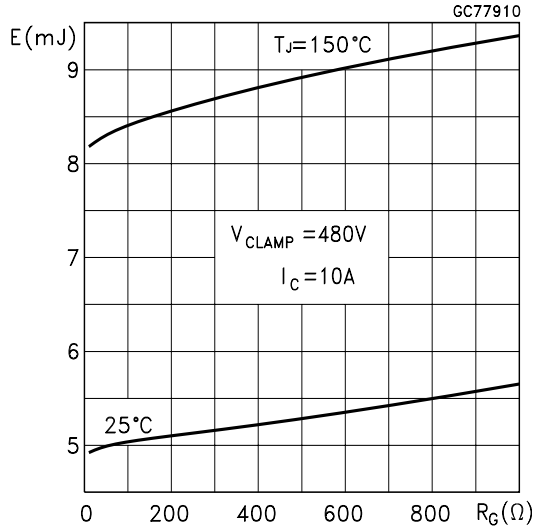
Capacitance Variations



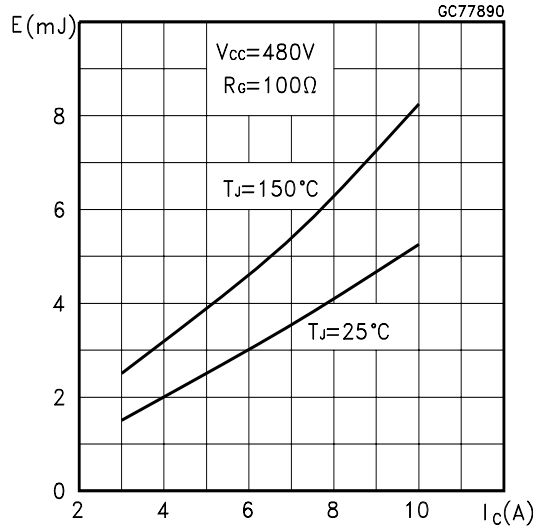
Gate Charge vs Gate-Emitter Voltage



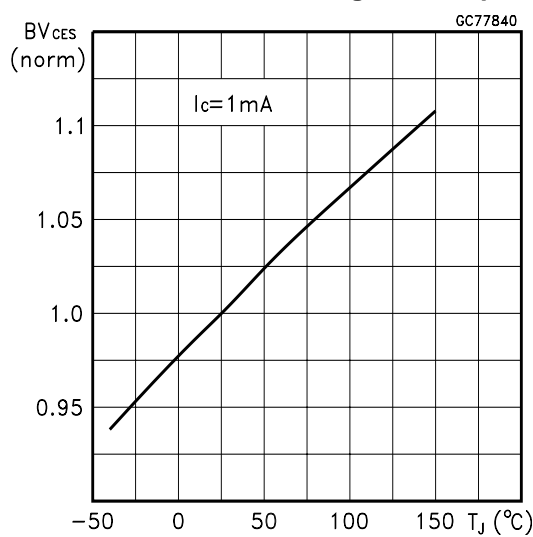
Off Losses vs Gate Resistance



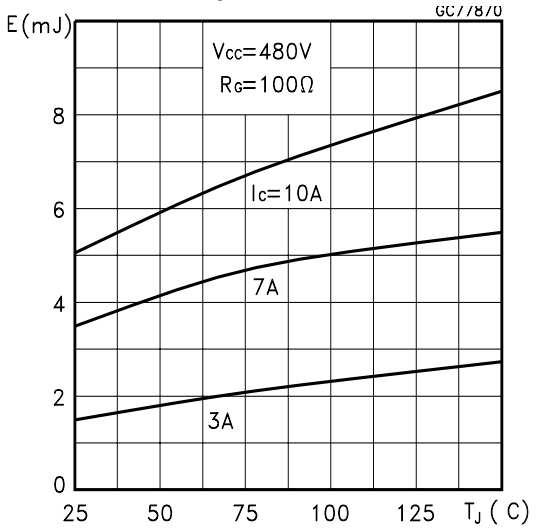
Off Losses vs Collector Current



Normalized Break-down Voltage vs Temp.



Off Losses vs Temperature



Emitter-Collector Diode Characteristics

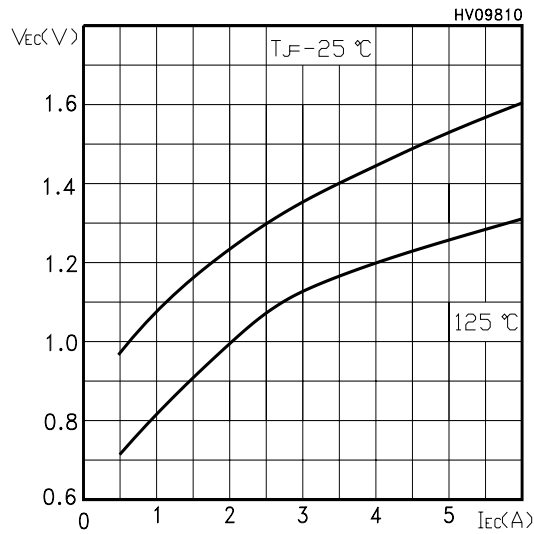


Fig. 1: Gate Charge test Circuit

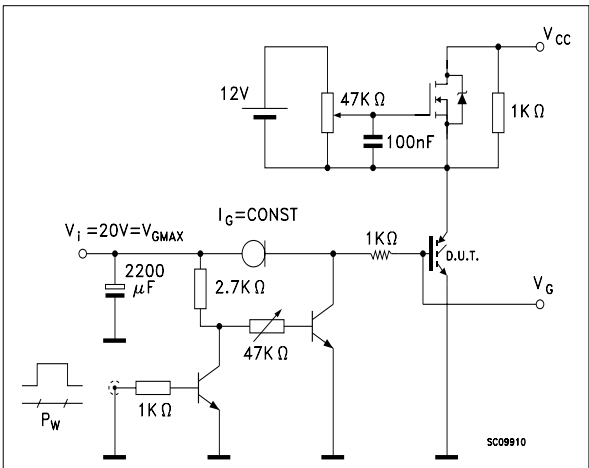
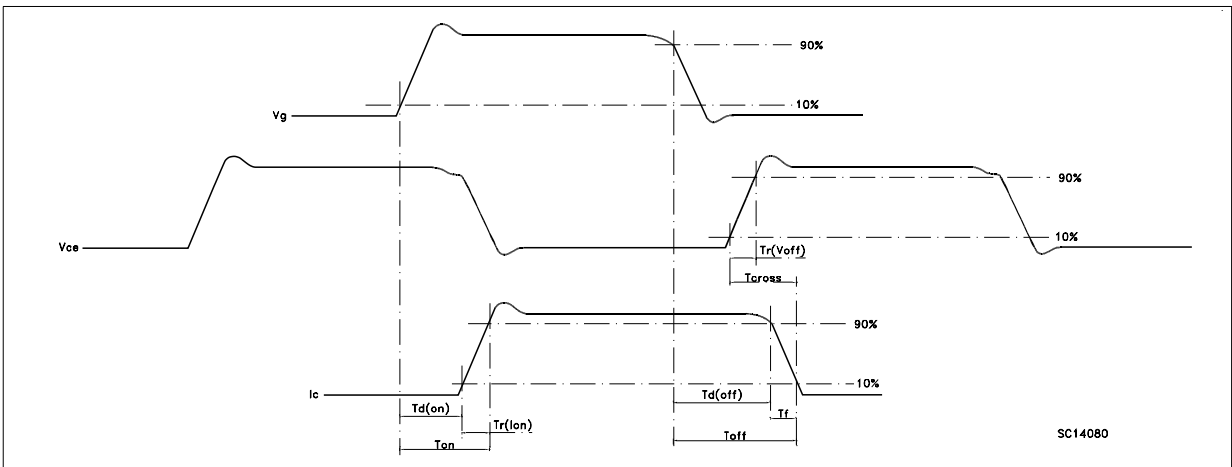
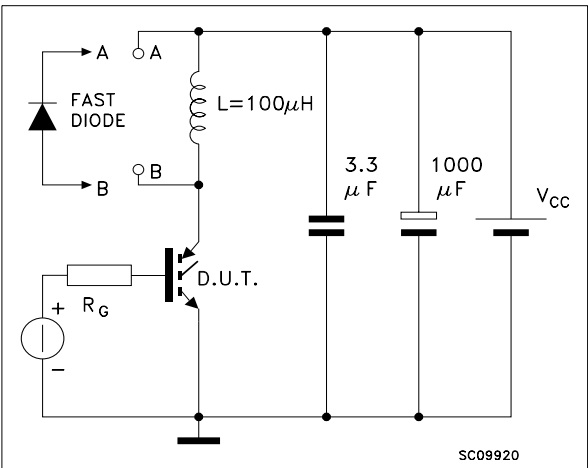
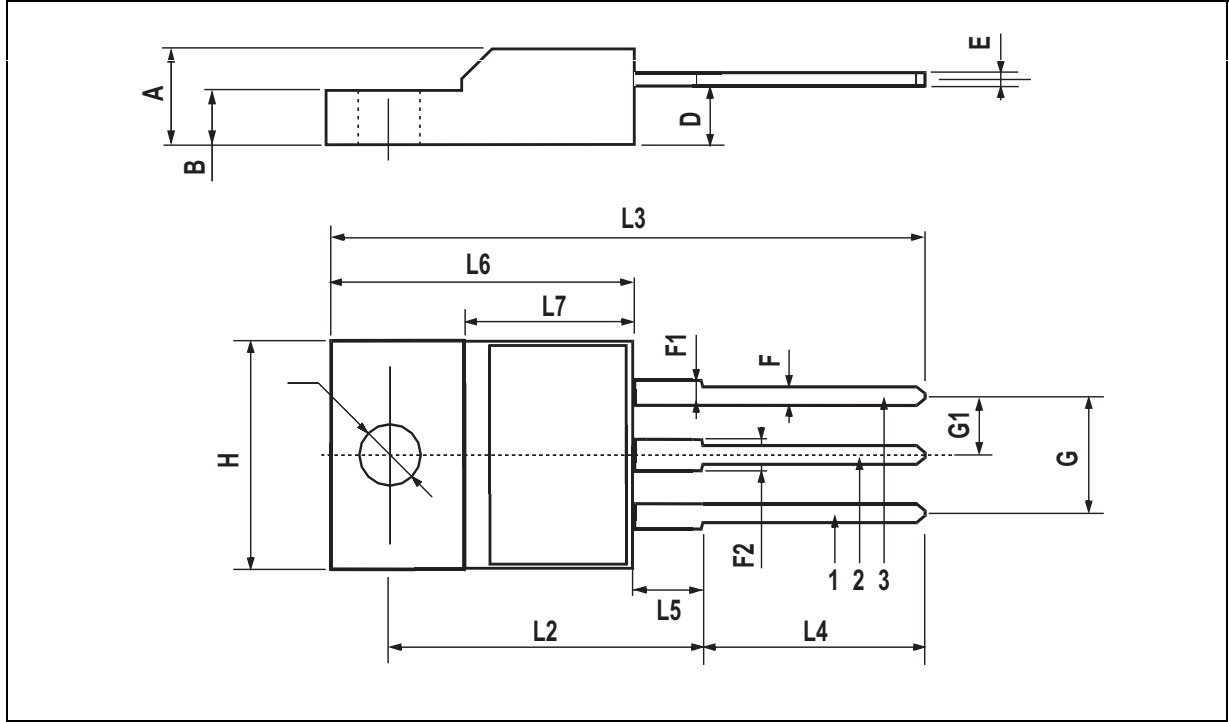


Fig. 2: Test Circuit For Inductive Load Switching



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		1.5	0.045		0.067
F2	1.15		1.5	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
Ø	3		3.2	0.118		0.126



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