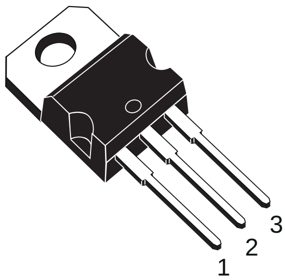
STGP10NB37LZ

N-CHANNEL CLAMPED 20A - TO-220
INTERNALLY CLAMPED PowerMesh™ IGBT

TYPE	V_{CES}	$V_{CE(sat)}$	I_C
STGP10NB37LZ	CLAMPED	< 1.8 V	20 A

- POLYSILICON GATE VOLTAGE DRIVEN
- LOW THRESHOLD VOLTAGE
- LOW ON-VOLTAGE DROP
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- HIGH VOLTAGE CLAMPING FEATURE

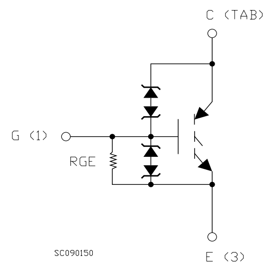


TO-220

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 built in collector-gate zener exhibits a very precise active clamping while the gate-emitter zener supplies an ESD protection.

INTERNAL SCHEMATIC DIAGRAM



APPLICATIONS

- AUTOMOTIVE IGNITION

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CES}	Collector-Emitter Voltage (V_{GS} = 0)	CLAMPED	V
V_{ECR}	Reverse Battery Protection	18	V
V_{GE}	Gate-Emitter Voltage	CLAMPED	V
I_C	Collector Current (continuos) at T_C = 100°C	20	A
I_{CM}	Collector Current (pulse width < 100µs)	60	A
P_{TOT}	Total Dissipation at T_C = 25°C	125	W
	Derating Factor	0.83	W/°C
E_{SD}	ESD (Human Body Model)	4	KV
T_{stg}	Storage Temperature	–65 to 175	°C
T_j	Max. Operating Junction Temperature	175	°C

THERMAL DATA

Rthj-case	Thermal Resistance Junction-case Max	1.2	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	62.5	°C/W
Rthc-sink	Thermal Resistance Case-sink Typ	0.2	°C/W

ELECTRICAL CHARACTERISTICS (TCASE = 25 °C UNLESS OTHERWISE SPECIFIED)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$BV_{(CES)}$	Clamped Voltage	I_C = 2 mA, V_{GE} = 0, Tj= - 40°C to 150°C	375	400	425	V
$BV_{(ECR)}$	Emitter Collector Break-down Voltage	I_{EC} = 75 mA, V_{GE} = 0, Tj= - 40°C to 150°C	18			V
BV_{GE}	Gate Emitter Break-down Voltage	I_G = ± 2 mA Tj= - 40°C to 150°C	12		16	V
I_{CES}	Collector cut-off Current (V_{GE} = 0)	V_{CE} = 15 V, V_{GE} =0 ,T_j =150 °C V_{CE} =200 V, V_{GE}=0 ,T_C =150°C			10 100	µA µA
I_{GES}	Gate-Emitter Leakage Current (V_{CE} = 0)	V_{GE} = ± 10V , V_{CE} = 0			± 700	µA
R_{GE}	Gate Emitter Resistance			20		KΩ

ON (1)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GE(th)}$	Gate Threshold Voltage	V_{CE} = V_{GE}, I_C = 250µA, Tj= - 40°C to 150°C	0.6		2.4	V
$V_{CE(SAT)}$	Collector-Emitter Saturation Voltage	V_{GE} =4.5V, I_C = 10 A, Tj= 25°C V_{GE} =4.5V, I_C = 10 A, Tc= -40°C		1.2 1.3	1.8	V V
I_C	Collector Current	V_{GE} = 4.5V, V_{CE} = 9 V	20			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs}	Forward Transconductance	V_{CE} = 15 V , I_C =20 A		18		S
C_{ies} C_{oes} C_{res}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{CE} = 25V, f = 1 MHz, V_{GE} = 0		1250 103 18		pF pF pF
Q_g	Gate Charge	V_{CE} = 320V, I_C = 10 A, V_{GE} = 5V		28		nC

FUNCTIONAL CHARACTERISTICS

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_L	Latching Current	V_{Clamp} = 320 V, T_C = 125 °C R_{GOFF} = 1KΩ , V_{GE} = 5 V L = 300µH	20			A
U.I.S.	Unclamped Inductive Switching Current	R_{GOFF} = 1KΩ , L = 1.6 mH , Tc= 125°C, Vcc = 30V	15			A

SWITCHING ON

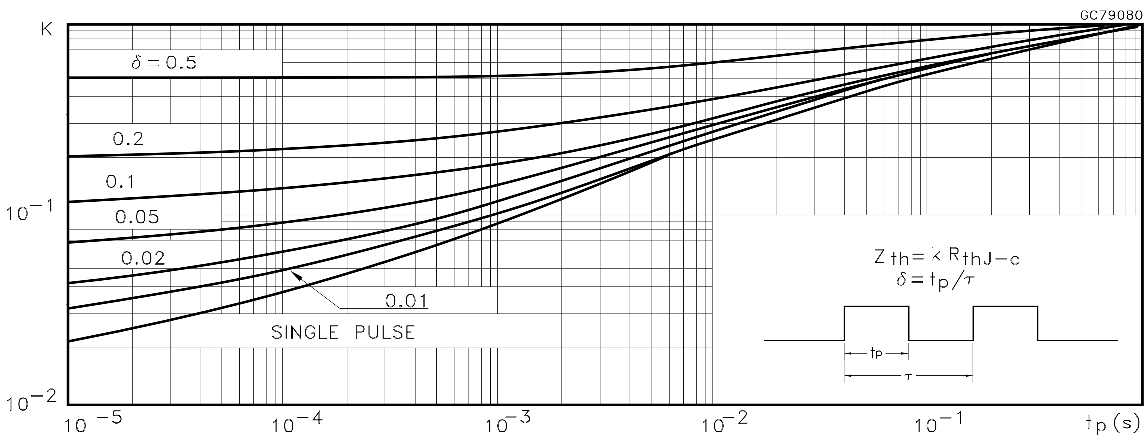
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Delay Time Rise Time	V_{CC} = 320 V, I_C = 10 A R_G = 1KΩ , V_{GE} = 5 V		520 340		ns ns
$(di/dt)_{on}$ Eon	Turn-on Current Slope Turn-on Switching Losses	V_{CC}= 320 V, I_C = 10 A R_G=1KΩ, V_{GE} = 5 V		17 180		A/µs µJ

SWITCHING OFF

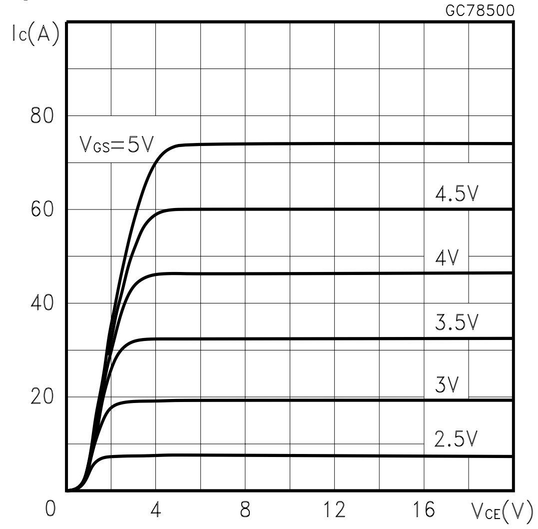
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t_c $t_r(V_{off})$ $t_d(_{off})$ t_f E_{off}(**)	Cross-over Time Off Voltage Rise Time Delay Time Fall Time Turn-off Switching Loss	V_{clamp} = 320 V, I_C = 10 A, R_{GE} = 1K Ω , V_{GE} = 5 V		4 2.2 14.8 1.5 4.0		µs µs µs µs mJ
t_c $t_r(V_{off})$ $t_d(_{off})$ t_f E_{off}(**)	Cross-over Time Off Voltage Rise Time Delay Time Fall Time Turn-off Switching Loss	V_{clamp} = 320 V, I_C = 10 A, R_{GE} = 1KΩ , V_{GE} = 5 V Tj = 125 °C		5.2 2.8 15.8 2 6.5		µs µs µs µs mJ

(●)Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %. (1)Pulse width limited by max. junction temperature. (**)Losses Include Also the Tail

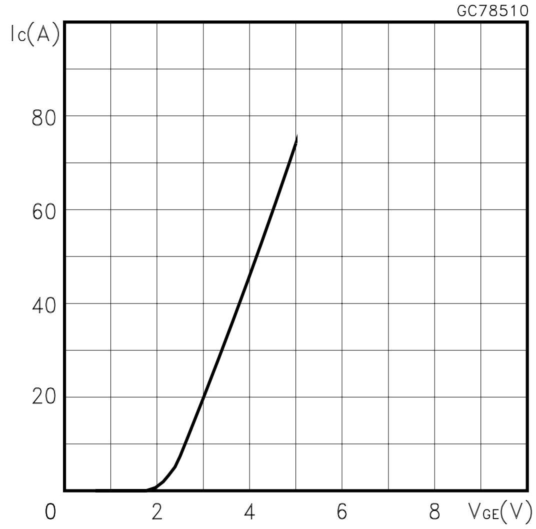
Normalized Transient Thermal Impedance



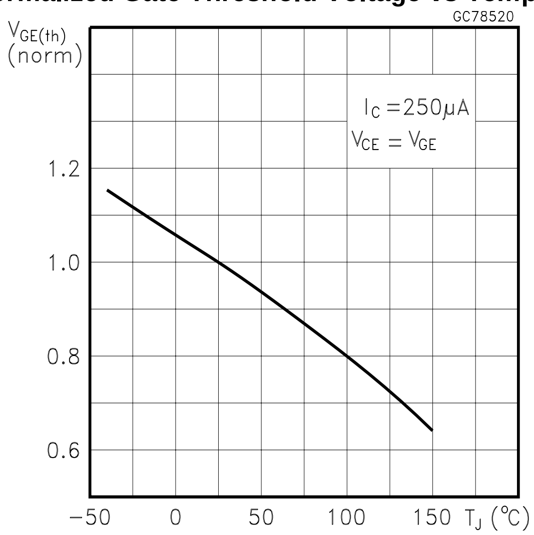
Output Characteristics



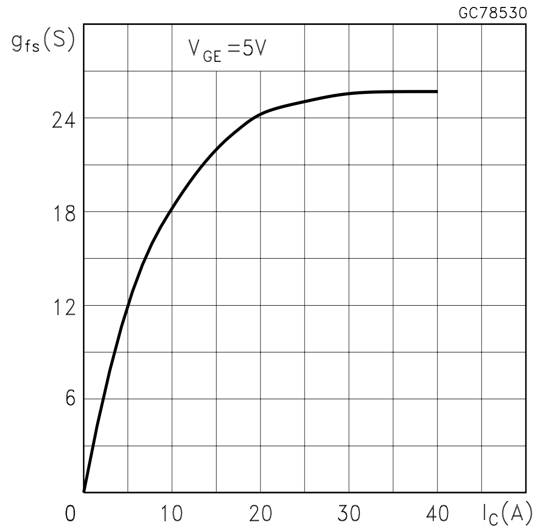
Transfer Characteristics



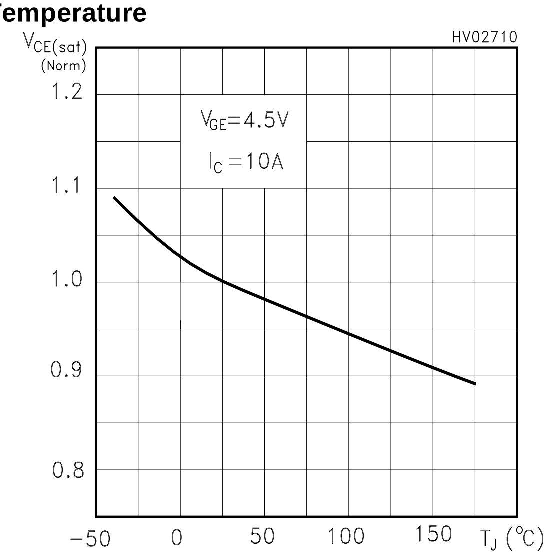
Normalized Gate Threshold Voltage vs Temp.



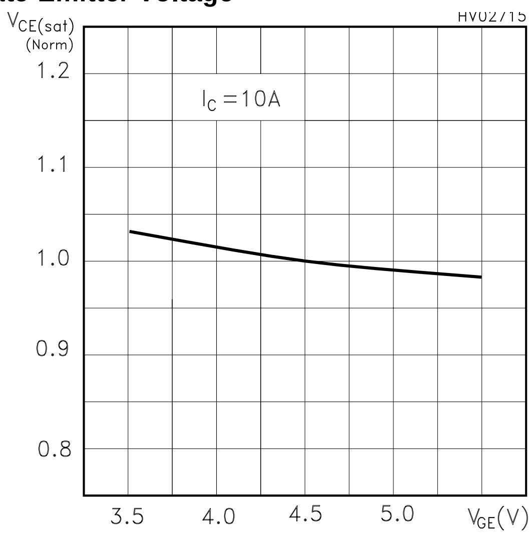
Transconductance



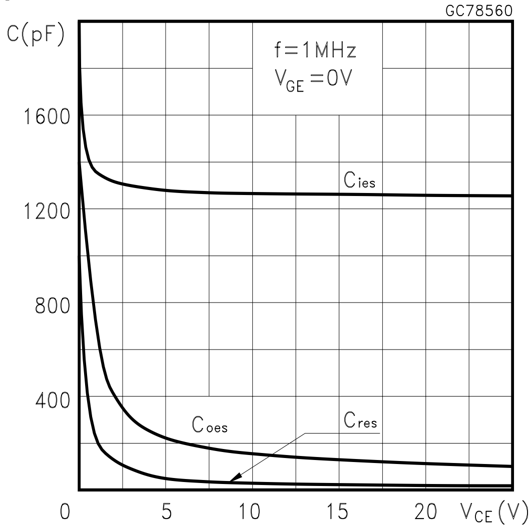
Normalized Collector-Emitter On Voltage vs Temperature



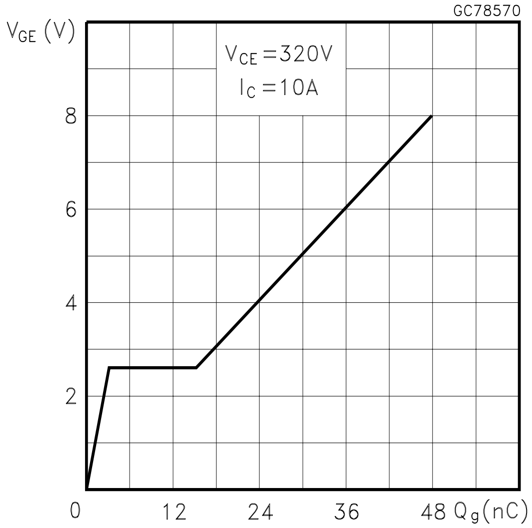
Normalized Collector-Emitter On Voltage vs Gate-Emitter Voltage



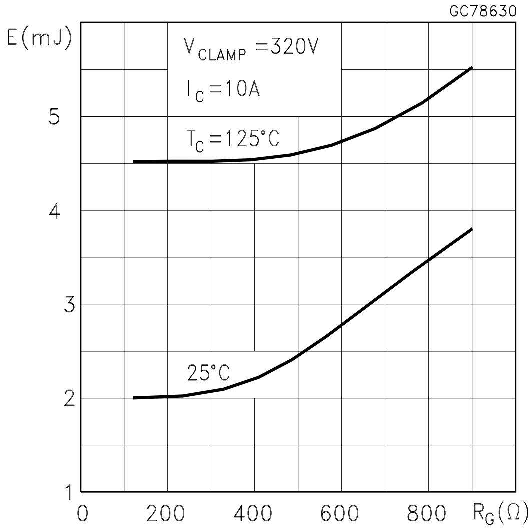
Capacitance Variations



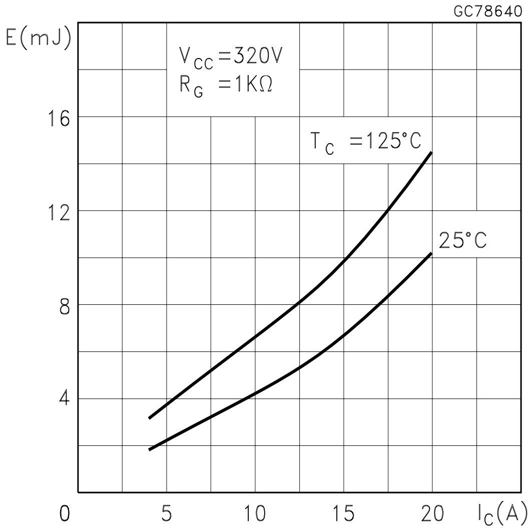
Gate Charge vs Gate-Emitter Voltage



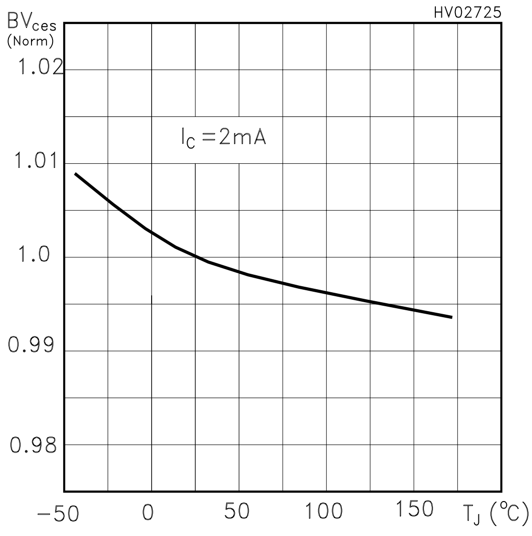
Off Losses vs Gate Resistance



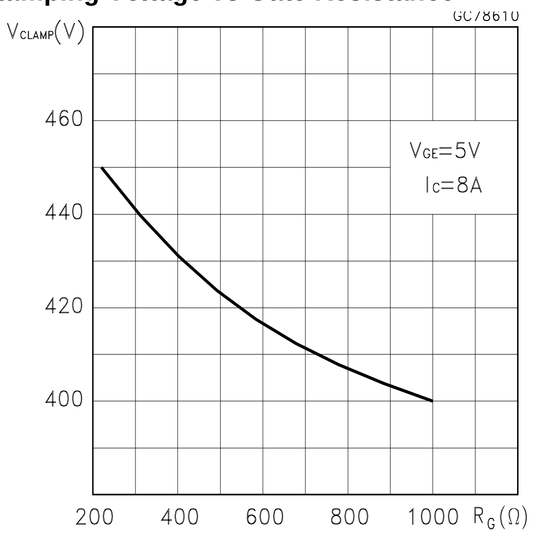
Off Losses vs Collector Current



Normalized Break-down Voltage vs Temp.



Clamping Voltage vs Gate Resistance



Self Clamped Inductive Switching IMAX vs Open Secondary Coil

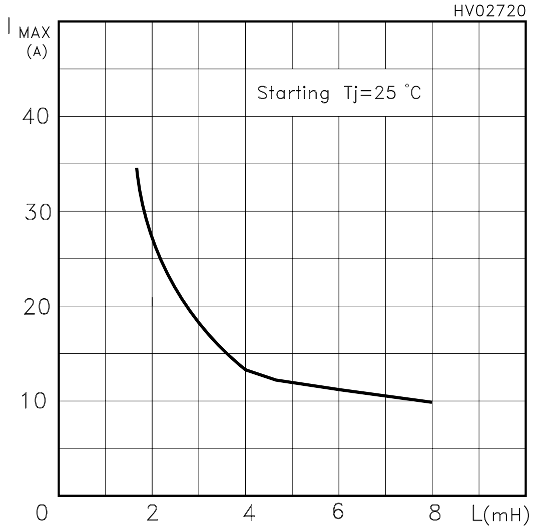


Fig. 1: Unclamped Inductive Load Test Circuit

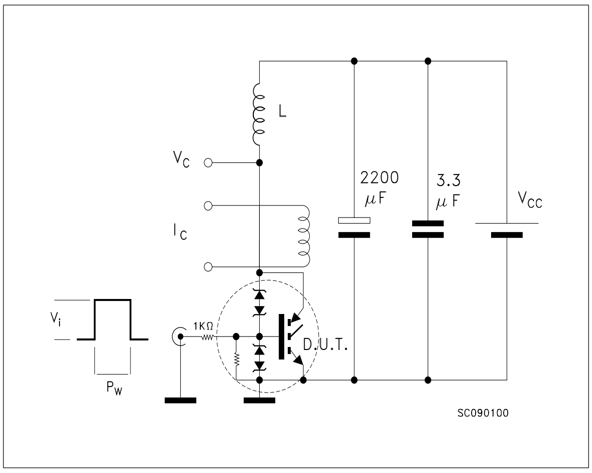


Fig. 2: Unclamped Inductive Waveform

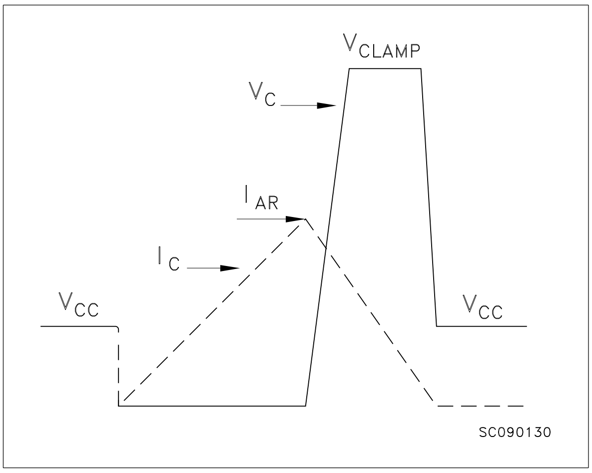


Fig. 3: Test Circuit For Inductive Load Switching And Diode Recovery Times

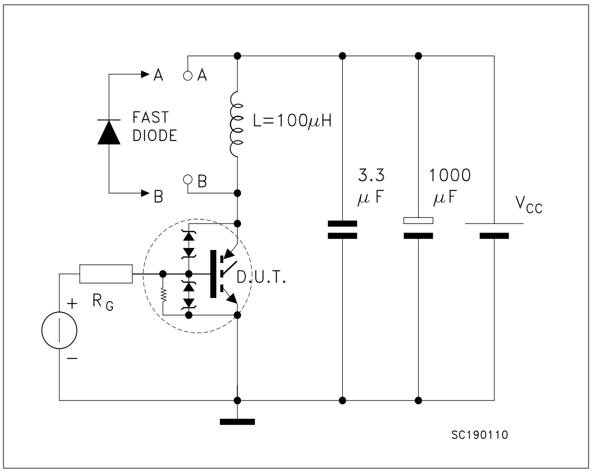
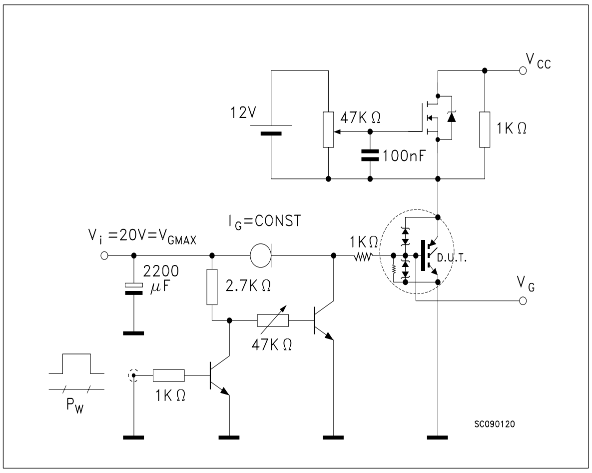
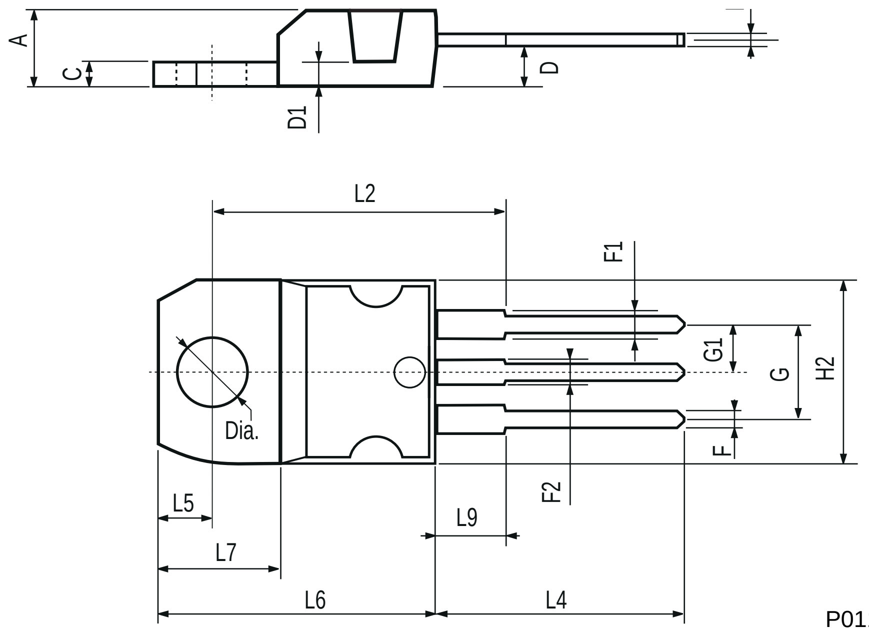


Fig. 4: Gate Charge test Circuit



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
D1		1.27			0.050	
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	2.4		2.7	0.094		0.106
H2	10.0		10.40	0.393		0.409
L2		16.4			0.645	
L4	13.0		14.0	0.511		0.551
L5	2.65		2.95	0.104		0.116
L6	15.25		15.75	0.600		0.620
L7	6.2		6.6	0.244		0.260
L9	3.5		3.93	0.137		0.154
DIA.	3.75		3.85	0.147		0.151



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