



STGW20NB60K

N-CHANNEL 20A - 600V - TO-247 SHORT CIRCUIT PROOF PowerMESH™ IGBT

TYPE	V _{CES}	V _{CE(sat)}	I _C
STGW20NB60K	600 V	< 2.8 V	20 A

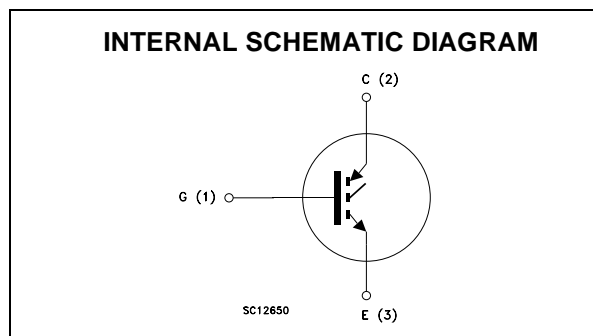
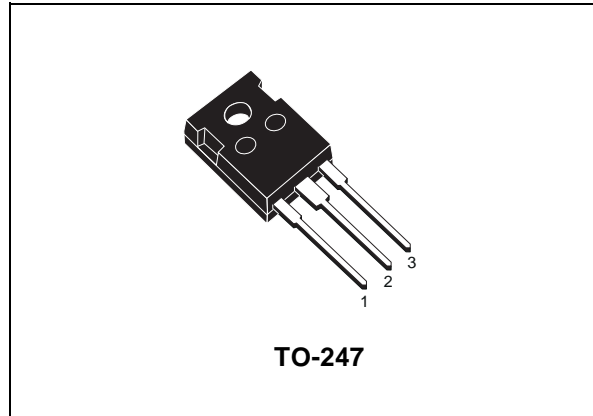
- HIGH INPUT IMPEDANCE (VOLTAGE DRIVEN)
- LOW ON-VOLTAGE DROP (V_{CE(sat)})
- LOW ON-LOSSES
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- OFF LOSSES INCLUDE TAIL CURRENT
- VERY HIGH FREQUENCY OPERATION
- SHORT CIRCUIT RATED
- LATCH CURRENT FREE OPERATION

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 "K" identifies a family optimized for high frequency motor control applications with short circuit withstand capability.

APPLICATIONS

- HIGH FREQUENCY MOTOR CONTROLS
- U.P.S.
- WELDING EQUIPMENTS



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V _{CES}	Collector-Emitter Voltage (V _{GS} = 0)	600	V
V _{ECR}	Emitter-Collector Voltage	20	V
V _{GE}	Gate-Emitter Voltage	±20	V
I _C	Collector Current (continuous) at T _C = 25°C	40	A
I _C	Collector Current (continuous) at T _C = 100°C	20	A
I _{CM} (▀)	Collector Current (pulsed)	80	A
T _{sc}	Short Circuit Withstand	10	μs
P _{TOT}	Total Dissipation at T _C = 25°C	150	W
	Derating Factor	1	W/°C
T _{stg}	Storage Temperature	-65 to 150	°C
T _j	Max. Operating Junction Temperature	150	°C

STGW20NB60K

THERMAL DATA

Rthj-case	Thermal Resistance Junction-case Max	0.83	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	62.5	°C/W
Rthc-h	Thermal Resistance Case-heatsink Typ	0.5	°C/W

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{BR(CES)}$	Collectro-Emitter Breakdown Voltage	$I_C = 250 \mu A, V_{GE} = 0$	600			V
I_{CES}	Collector cut-off ($V_{GE} = 0$)	$V_{CE} = \text{Max Rating}, T_C = 25 \text{ }^\circ\text{C}$ $V_{CE} = \text{Max Rating}, T_C = 125 \text{ }^\circ\text{C}$			10 100	μA μA
I_{GES}	Gate-Emitter Leakage Current ($V_{CE} = 0$)	$V_{GE} = \pm 20V, V_{CE} = 0$			± 100	nA

ON (1)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GE(th)}$	Gate Threshold Voltage	$V_{CE} = V_{GE}, I_C = 250\mu A$	5		7	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$V_{GE} = 15V, I_C = 20 A$ $V_{GE} = 15V, I_C = 20 A, T_J = 125^\circ C$		2.3 1.9	2.8	V V

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs}	Forward Transconductance	$V_{CE} = 25 V, I_C = 20 A$		8		S
C_{ies}	Input Capacitance	$V_{CE} = 25V, f = 1 \text{ MHz}, V_{GE} = 0$		1300		pF
C_{oes}	Output Capacitance			200		pF
C_{res}	Reverse Transfer Capacitance			30		pF
Q_g	Total Gate Charge	$V_{CE} = 480V, I_C = 20 A,$ $V_{GE} = 15V$		90		nC
Q_{ge}	Gate-Emitter Charge			T.B.D.		nC
Q_{gc}	Gate-Collector Charge			T.B.D.		nC
tscw	Short Circuit Withstand Time	$V_{ce} = 0.5 BV_{ces}, V_{GE} = 15 V,$ $T_J = 125^\circ C, R_G = 10 \Omega$	10			μs

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	$V_{CC} = 480 V, I_C = 20 A$ $R_G = 10\Omega, V_{GE} = 15 V$		20		ns
t_r	Rise Time			70		ns
$(di/dt)_{on}$	Turn-on Current Slope	$V_{CC} = 480 V, I_C = 20 A R_G = 10\Omega$ $V_{GE} = 15 V, T_J = 125^\circ C$		350		A/ μs
Eon	Turn-on Switching Losses			300		μJ

ELECTRICAL CHARACTERISTICS (CONTINUED)**SWITCHING OFF**

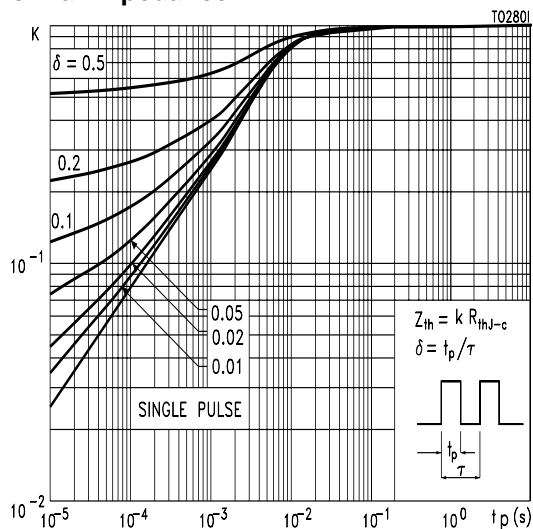
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t_c	Cross-over Time	$V_{CC} = 480\text{ V}$, $I_C = 20\text{ A}$, $R_{GE} = 10\ \Omega$, $V_{GE} = 15\text{ V}$		120		ns
$t_r(V_{off})$	Off Voltage Rise Time			35		ns
$t_{d(off)}$	Delay Time			130		ns
t_f	Fall Time			80		ns
$E_{off(**)}$	Turn-off Switching Loss			0.45		mJ
E_{ts}	Total Switching Loss			0.6		mJ
t_c	Cross-over Time	$V_{CC} = 480\text{ V}$, $I_C = 20\text{ A}$, $R_{GE} = 10\ \Omega$, $V_{GE} = 15\text{ V}$ $T_j = 125\text{ }^\circ\text{C}$		190		ns
$t_r(V_{off})$	Off Voltage Rise Time			55		ns
$t_{d(off)}$	Delay Time			160		ns
t_f	Fall Time			150		ns
$E_{off(**)}$	Turn-off Switching Loss			0.75		mJ
E_{ts}	Total Switching Loss			1.05		mJ

Note: 1. Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %.
 2. Pulse width limited by max. junction temperature.
 (**) Losses include Also the Tail (Jedec Standardization)

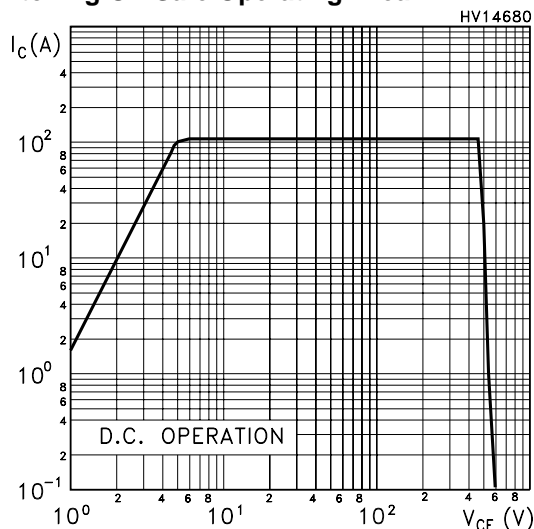
COLLECTOR-EMITTER DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_f	Forward Current				10	A
I_{fm}	Forward Current pulsed				80	A
V_f	Forward On-Voltage	$I_f = 10\text{ A}$ $I_f = 10\text{ A}$, $T_j = 125\text{ }^\circ\text{C}$		1.27 1	2.0	V V
t_{rr}	Reverse Recovery Time	$I_f = 10\text{ A}$, $V_R = 27\text{ V}$, $T_j = 125\text{ }^\circ\text{C}$, $di/dt = 100\text{ A}/\mu\text{s}$		80.5		ns
Q_{rr}	Reverse Recovery Charge			181		nC
I_{rrm}	Reverse Recovery Current			4.5		A

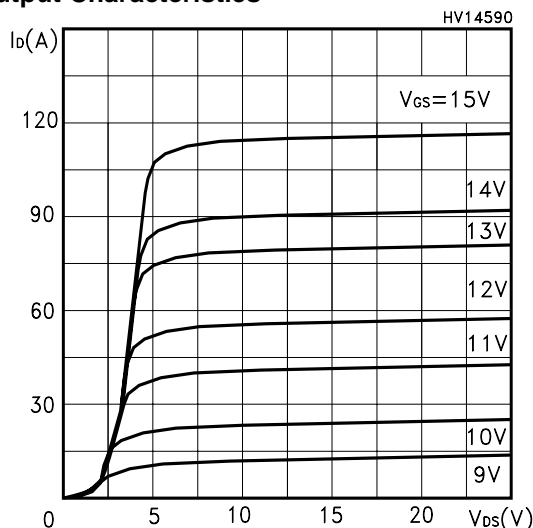
Thermal Impedance



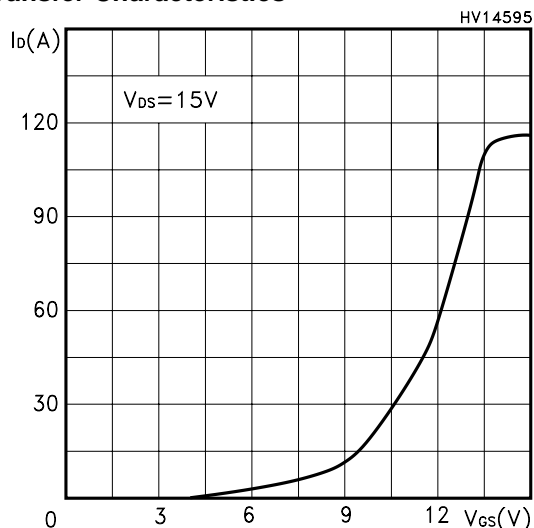
Switching Off Safe Operating Area



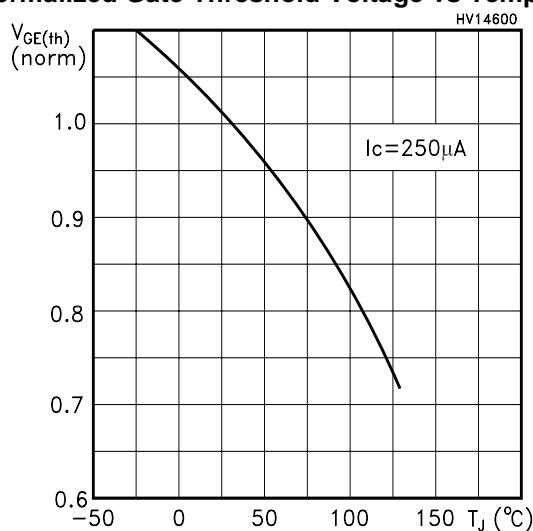
Output Characteristics



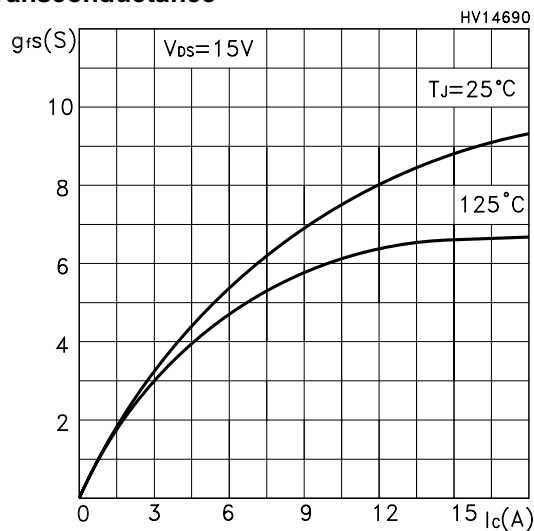
Transfer Characteristics



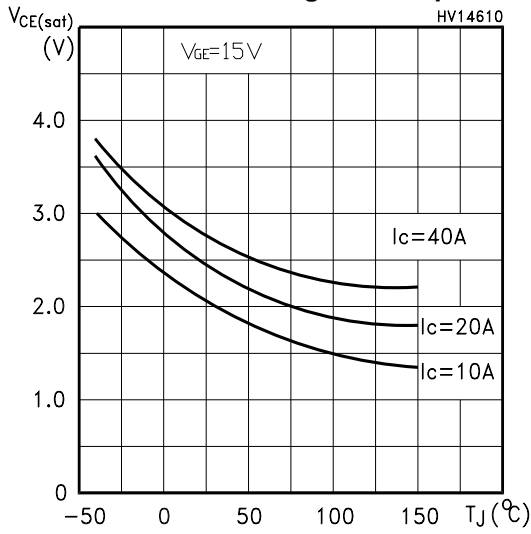
Normalized Gate Threshold Voltage vs Temp.



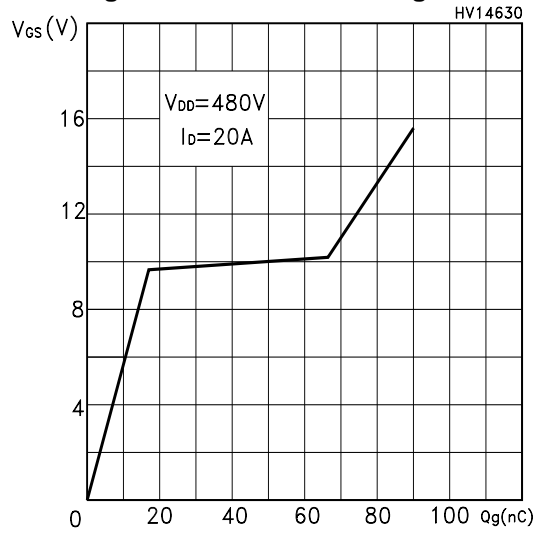
Transconductance



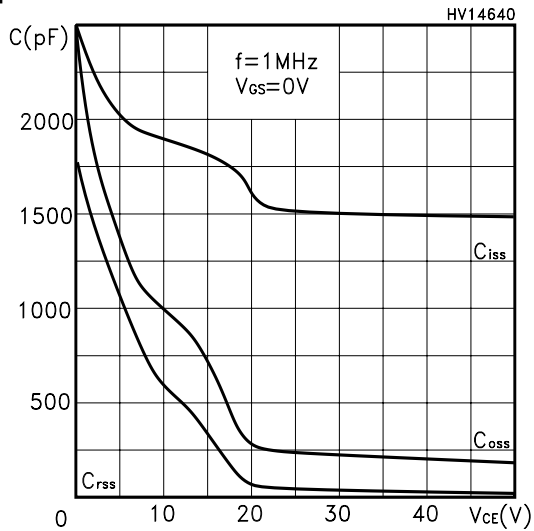
Collector-Emitter On Voltage vs Temperature



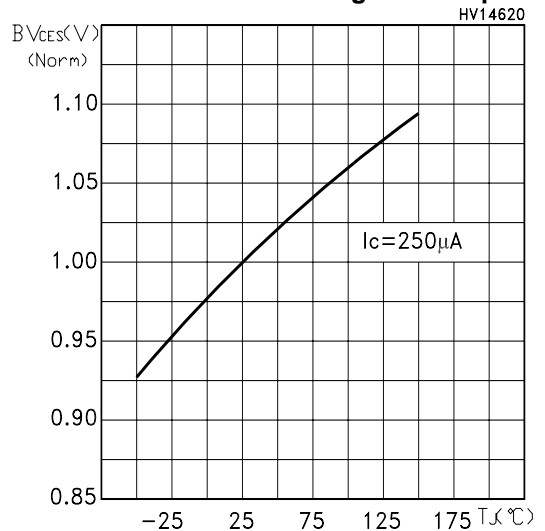
Gate-Charge vs Gate-Emitter Voltage



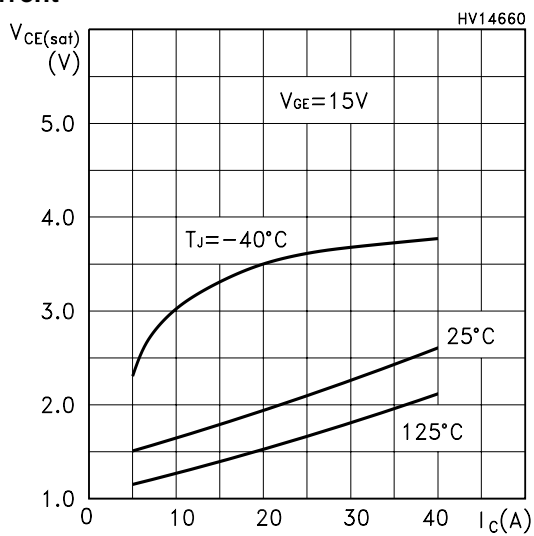
Capacitance Variations



Normalized Break-down Voltage vs Temp.



Collector-Emitter on Voltage vs Collector Current



Turn-Off Energy Losses vs Temperature

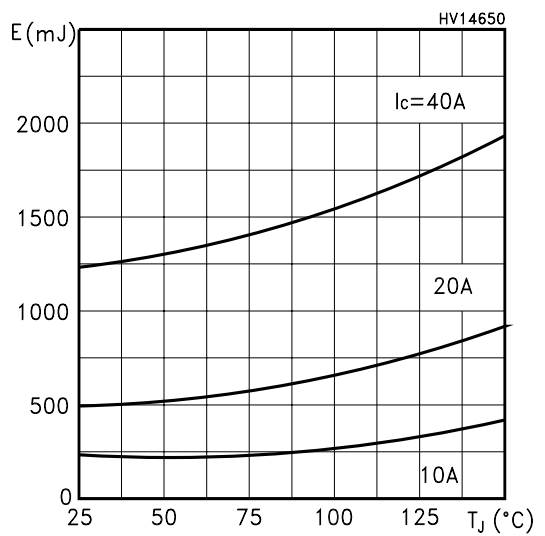


Fig. 1: Gate Charge test Circuit

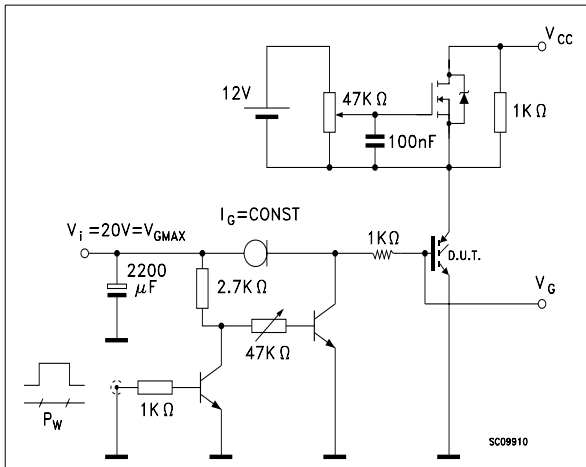
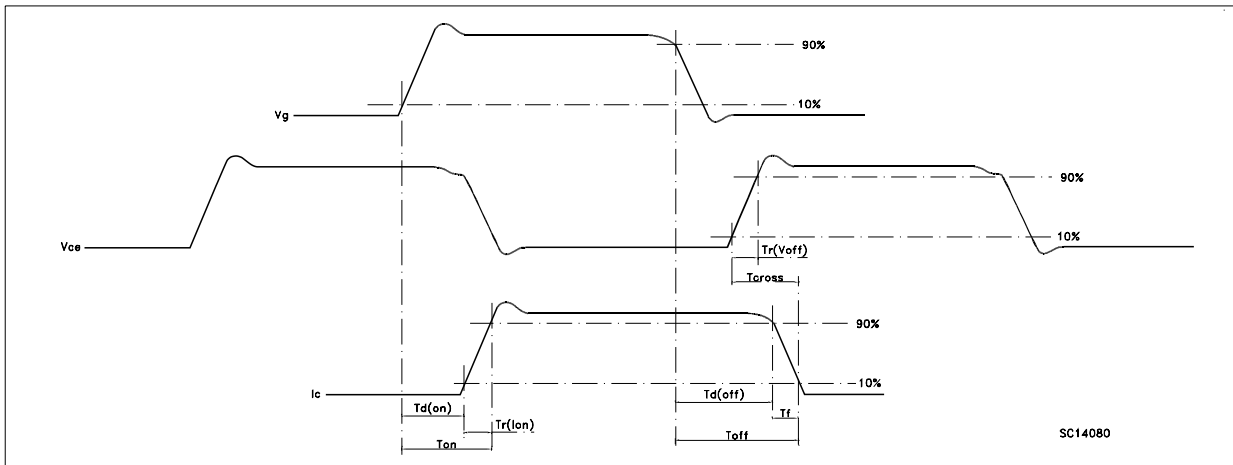
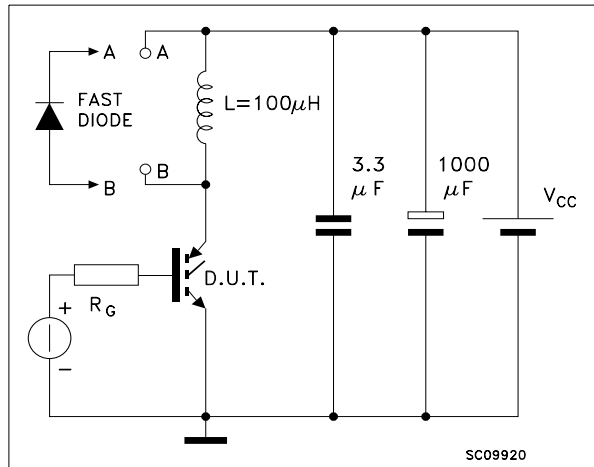
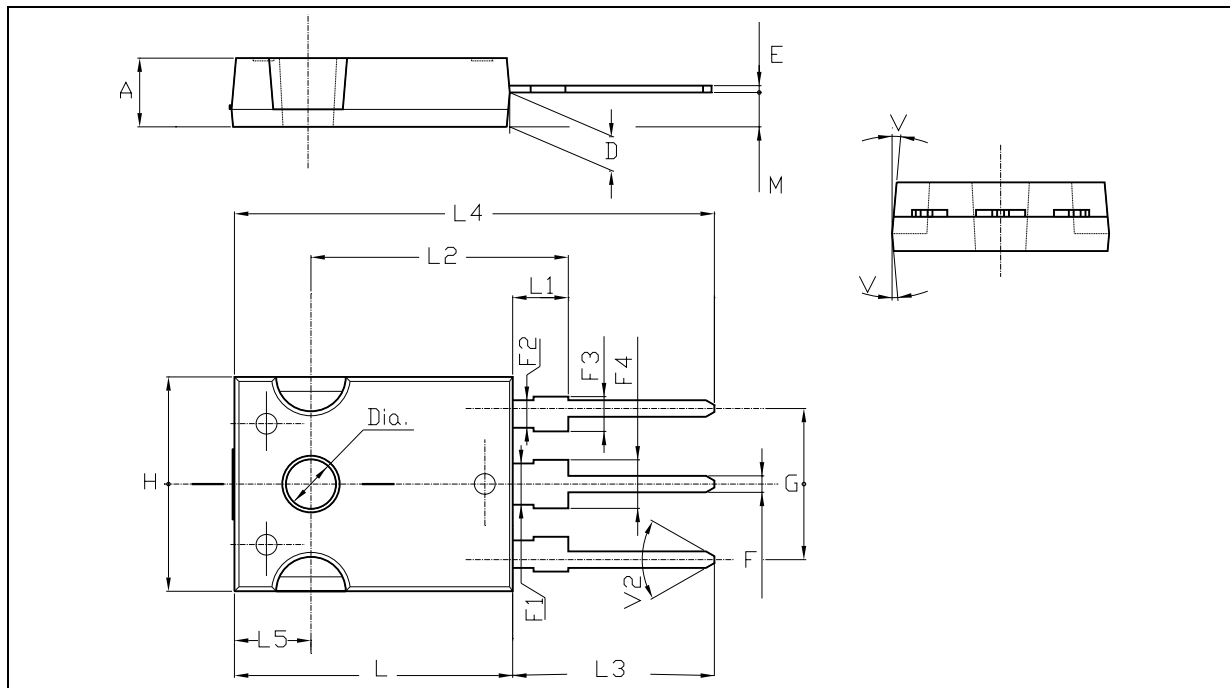


Fig. 2: Test Circuit For Inductive Load Switching (SC09920)



TO-247 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.85		5.15	0.19		0.20
D	2.20		2.60	0.08		0.10
E	0.40		0.80	0.015		0.03
F	1		1.40	0.04		0.05
F1		3			0.11	
F2		2			0.07	
F3	2		2.40	0.07		0.09
F4	3		3.40	0.11		0.13
G		10.90			0.43	
H	15.45		15.75	0.60		0.62
L	19.85		20.15	0.78		0.79
L1	3.70		4.30	0.14		0.17
L2		18.50			0.72	
L3	14.20		14.80	0.56		0.58
L4		34.60			1.36	
L5		5.50			0.21	
M	2		3	0.07		0.11
V		5°			5°	
V2		60°			60°	
Dia	3.55		3.65	0.14		0.143



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