



STGW12NB60H

N-CHANNEL 12A - 600V – TO-247

PowerMESH™ IGBT

TYPE	V _{CES}	V _{CE(sat)}	I _C
STGW12NB60H	600 V	< 2.8 V	12 A

- HIGH INPUT IMPEDANCE
- LOW ON-VOLTAGE DROP (V_{cesat})
- OFF LOSSES INCLUDE TAIL CURRENT
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- VERY HIGH FREQUENCY OPERATION
- CO-PACKAGED WITH TURBOSWITCH™
- TYPICAL SHORT CIRCUIT WITHSTAND TIME
5MICROS S-family, 4 micro H family
- ANTIPARALLEL DIODE

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.

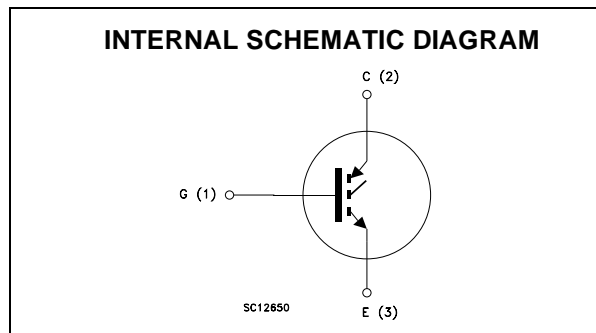
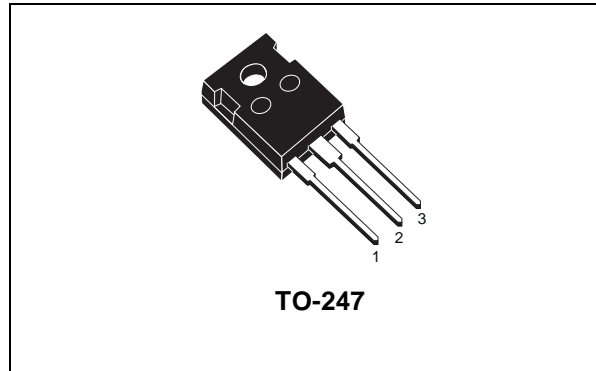
The suffix "H" identifies a family optimized for high frequency applications (up to 50kHz) in order to achieve very high switching performances (reduced t_{fall}) maintaining a low voltage drop.

APPLICATIONS

- HIGH FREQUENCY MOTOR CONTROLS
- SMPS and PFC IN BOTH HARD SWITCH AND RESONANT TOPOLOGIES
- UPS

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	24	A
I _C	Collector Current (continuous) at T _C = 100°C	12	A
I _{CM} (■)	Collector Current (pulsed)	96	A
P _{TOT}	Total Dissipation at T _C = 25°C	120	W
	Derating Factor	0.96	W/°C
T _{stg}	Storage Temperature	-65 to 150	°C
T _j	Max. Operating Junction Temperature	150	°C



STGW12NB60H

THERMAL DATA

Rthj-case	Thermal Resistance Junction-case Max	1.04	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	30	°C/W
Rthc-sink	Thermal Resistance Case-sink Typ	0.1	°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 ($V_{GE} = 0$)	$V_{CE} = \text{Max Rating}, T_C = 25 \text{ °C}$ $V_{CE} = \text{Max Rating}, T_C = 125 \text{ °C}$			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	$V_{CE} = V_{GE}, I_C = 250 \mu A$	3		5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$V_{GE} = 15V, I_C = 12 A$ $V_{GE} = 15V, I_C = 12 A, T_J = 125 \text{ °C}$		2.0 1.7	2.8	V V

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs}	Forward Transconductance	$V_{CE} = 25 V, I_C = 12 A$		9.5		S
C_{ies}	Input Capacitance	$V_{CE} = 25V, f = 1 \text{ MHz}, V_{GE} = 0$		950		pF
C_{oes}	Output Capacitance			120		pF
C_{res}	Reverse Transfer Capacitance			27		pF
Q_g Q_{ge} Q_{gc}	Total Gate Charge Gate-Emitter Charge Gate-Collector Charge	$V_{CE} = 480V, I_C = 12 A,$ $V_{GE} = 15V$		68 10 30		nC nC nC
I_{CL}	Latching Current	$V_{clamp} = 480 V, T_J = 150 \text{ °C}$ $R_G = 10 \Omega$	48			A

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Delay Time Rise Time	$V_{CC} = 480 V, I_C = 12 A$ $R_G = 10 \Omega, V_{GE} = 15 V$		5 46		ns ns
$(di/dt)_{on}$ E_{on}	Turn-on Current Slope Turn-on Switching Losses	$V_{CC} = 480 V, I_C = 12 A$ $R_G = 10 \Omega, V_{GE} = 15 V,$ $T_J = 125 \text{ °C}$		1000 290		A/ μs μJ

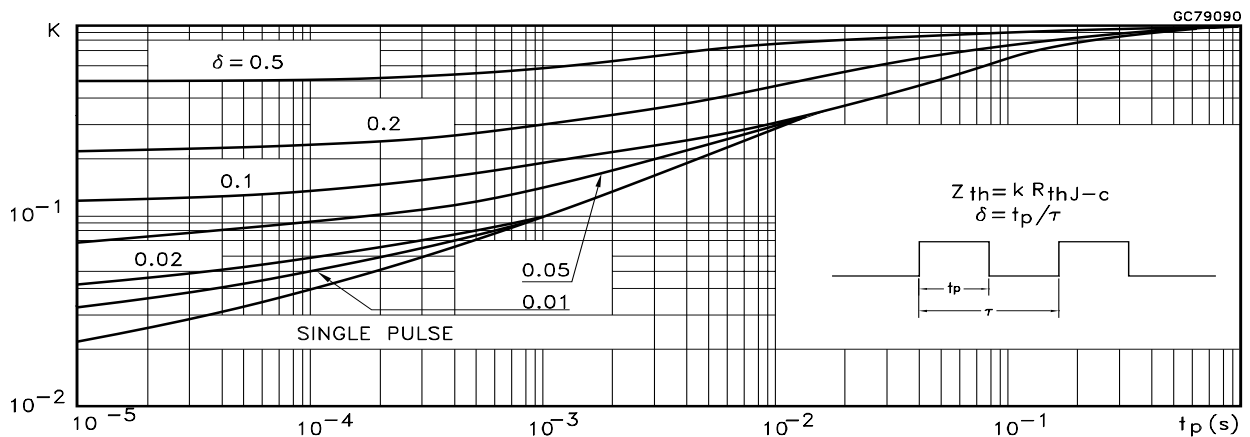
ELECTRICAL CHARACTERISTICS (CONTINUED)

SWITCHING OFF

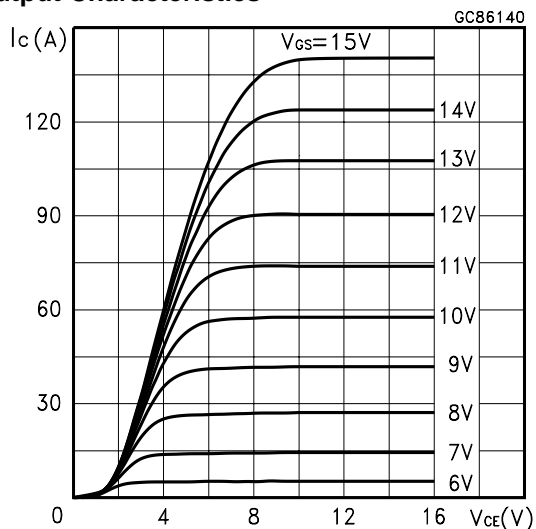
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t_c	Cross-over Time	$V_{CC} = 480\text{ V}, I_C = 12\text{ A},$ $R_{GE} = 10\ \Omega, V_{GE} = 15\text{ V}$		150		ns
$t_r(V_{off})$	Off Voltage Rise Time			27		ns
$t_{d(off)}$	Delay Time			76		ns
t_f	Fall Time			92		ns
$E_{off(**)}$	Turn-off Switching Loss			0.21		mJ
E_{ts}	Total Switching Loss			0.49		mJ
t_c	Cross-over Time	$V_{CC} = 480\text{ V}, I_C = 12\text{ A},$ $R_{GE} = 10\ \Omega, V_{GE} = 15\text{ V}$ $T_j = 125\text{ }^\circ\text{C}$		230		ns
$t_r(V_{off})$	Off Voltage Rise Time			76		ns
$t_{d(off)}$	Delay Time			95		ns
t_f	Fall Time			200		ns
$E_{off(**)}$	Turn-off Switching Loss			0.45		mJ
E_{ts}	Total Switching Loss			0.74		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)

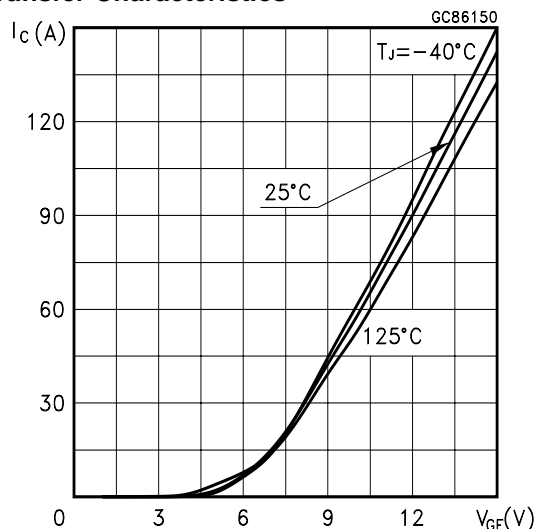
Thermal Impedance



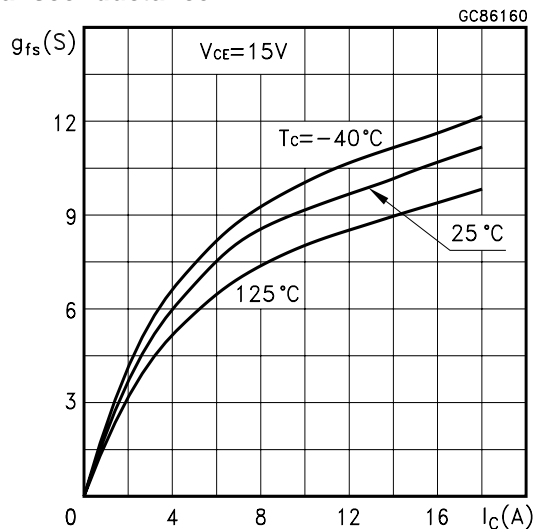
Output Characteristics



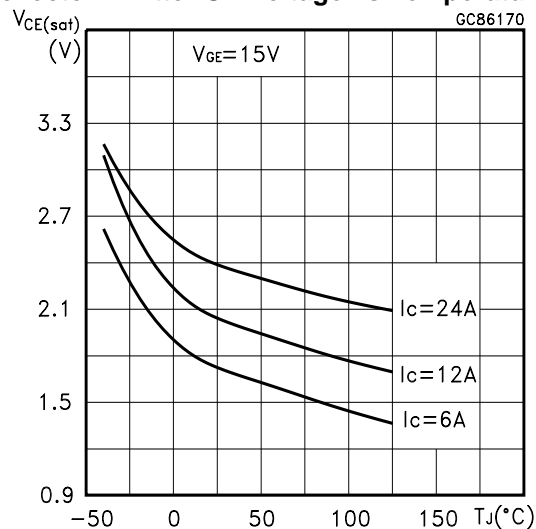
Transfer Characteristics



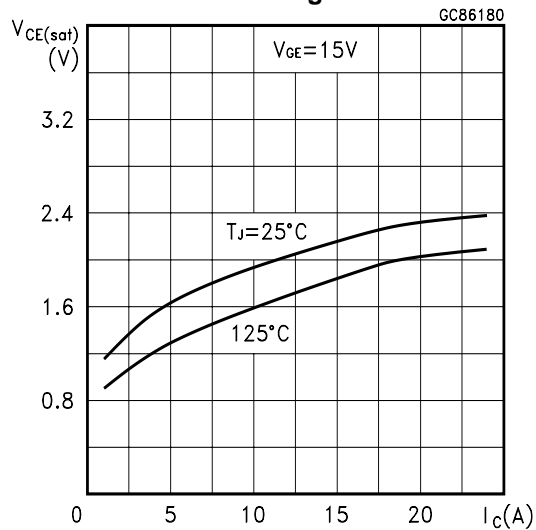
Transconductance



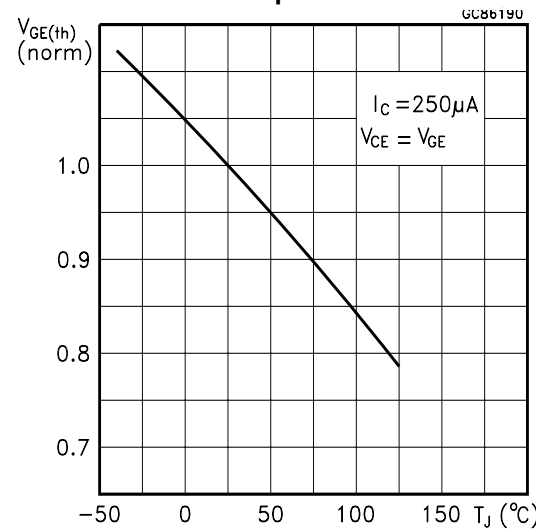
Collector-Emitter On Voltage vs Temperature



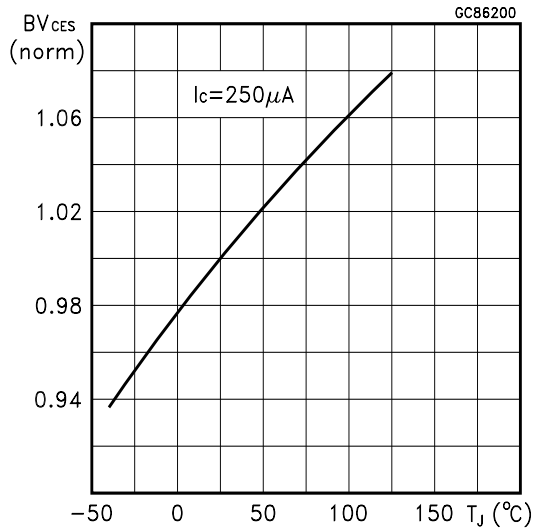
Collector-Emitter On Voltage vs Collector Current



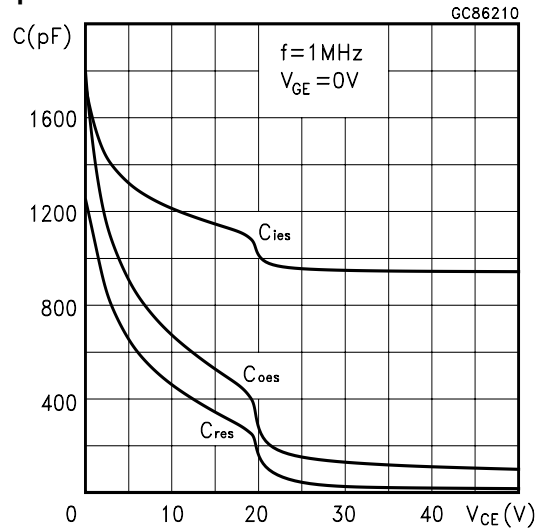
Gate Threshold vs Temperature



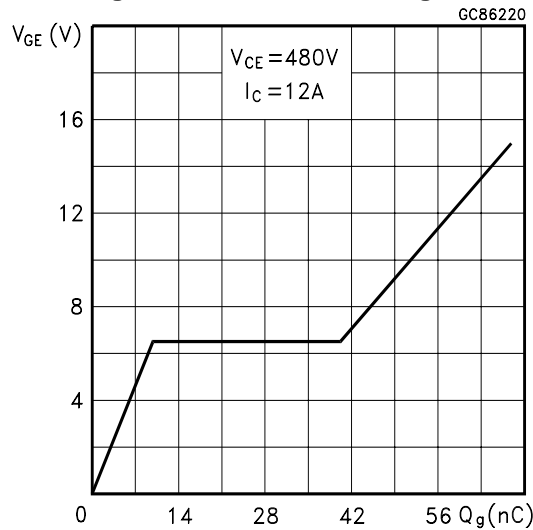
Normalized Breakdown Voltage vs Temperature



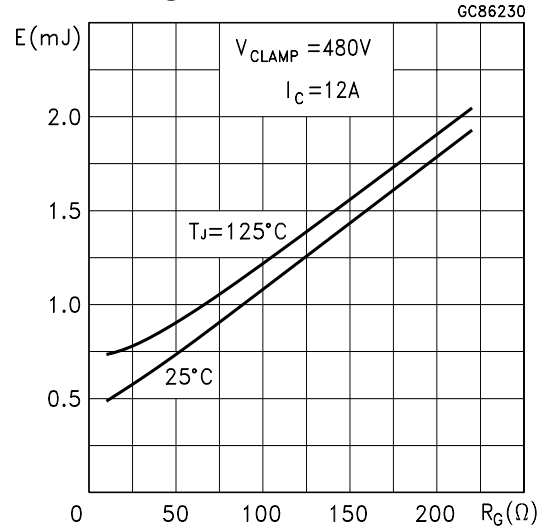
Capacitance Variations



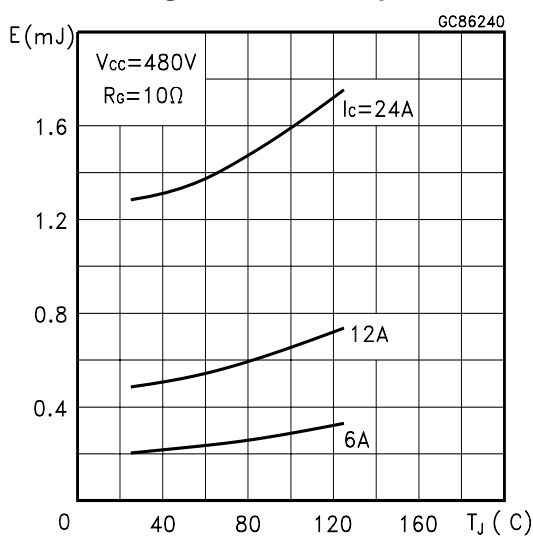
Gate Charge vs Gate-Emitter Voltage



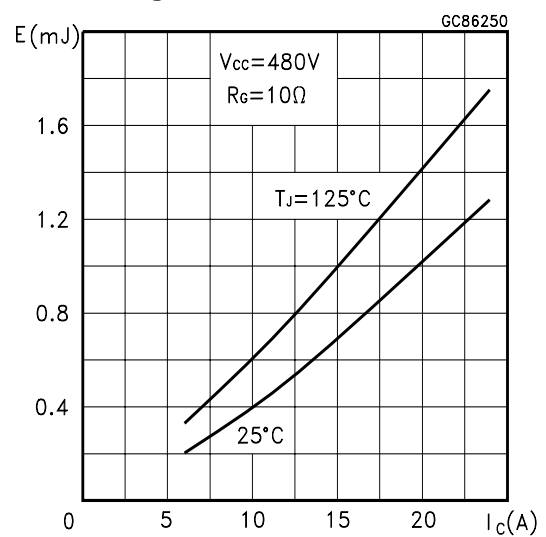
Total Switching Losses vs Gate Resistance



Total Switching Losses vs Temperature



Total Switching Losses vs Collector Current



Switching Off Safe Operating Area

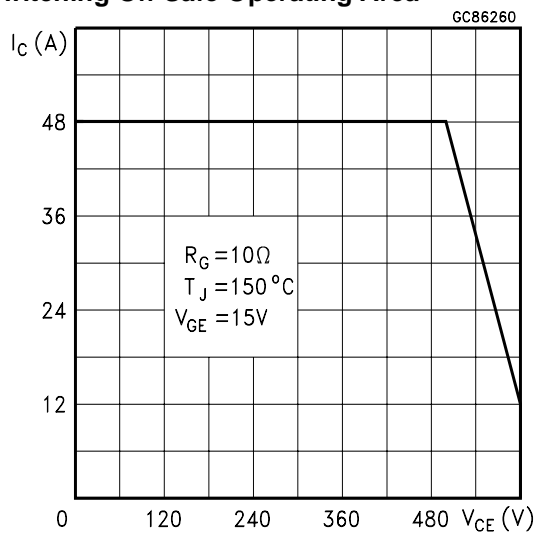


Fig. 1: Gate Charge test Circuit

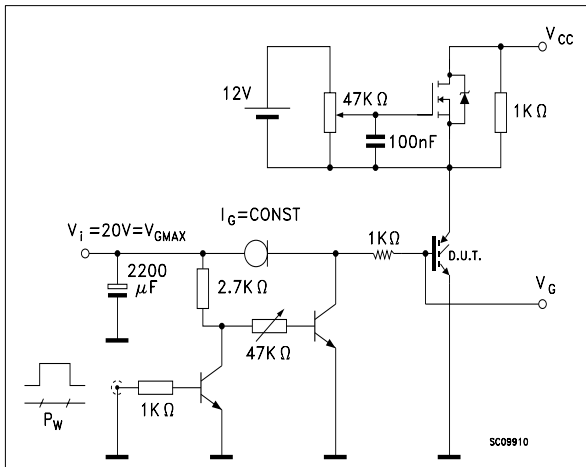
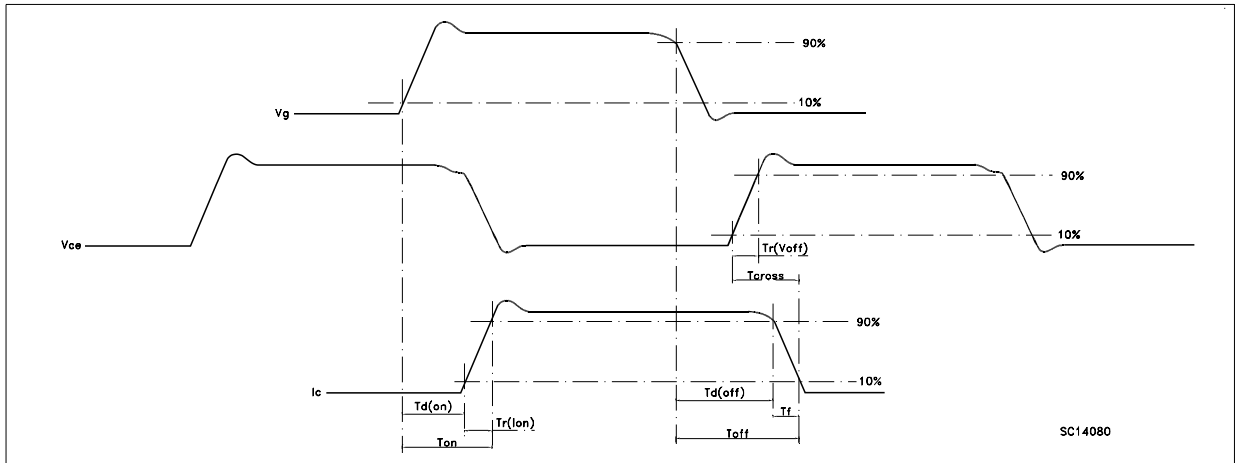
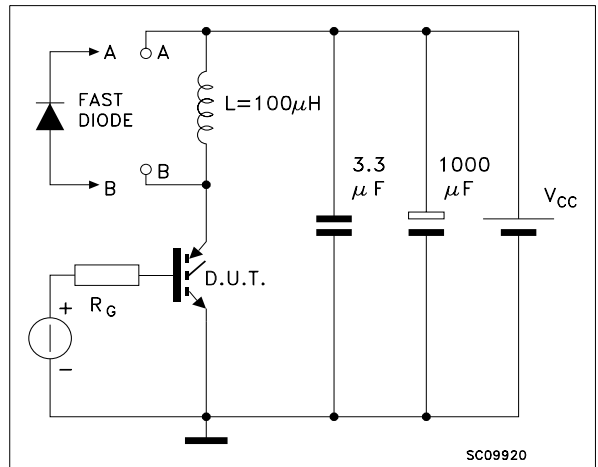
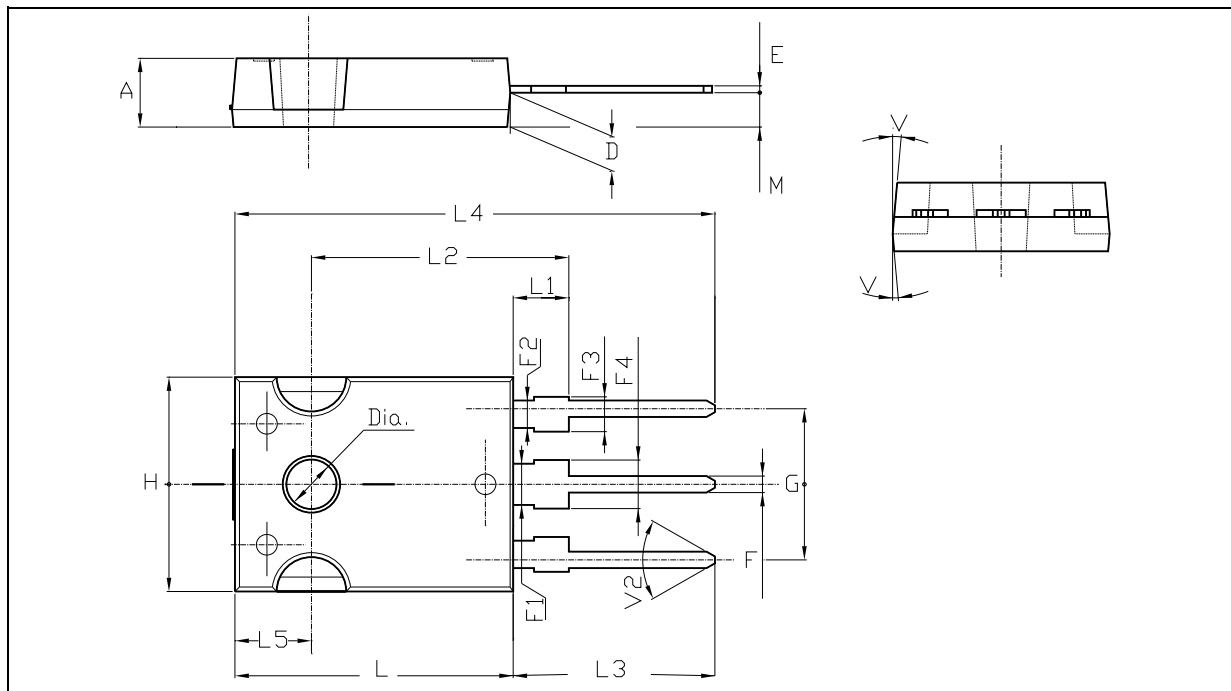


Fig. 2: Test Circuit For Inductive Load Switching



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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