



# STGW40NC60V

N-CHANNEL 50A - 600V TO-247

Hyper Fast PowerMESH™ IGBT

TYPE	V <sub>CES</sub>	V <sub>CE(sat)</sub> (Max) @25°C	I <sub>c</sub> @ 100°C
STGW40NC60V	600 V	< 2.5 V	50 A

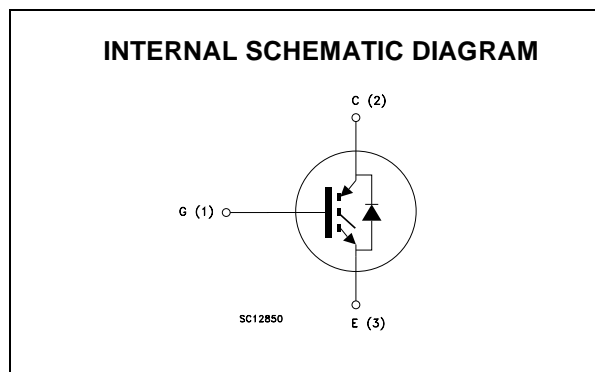
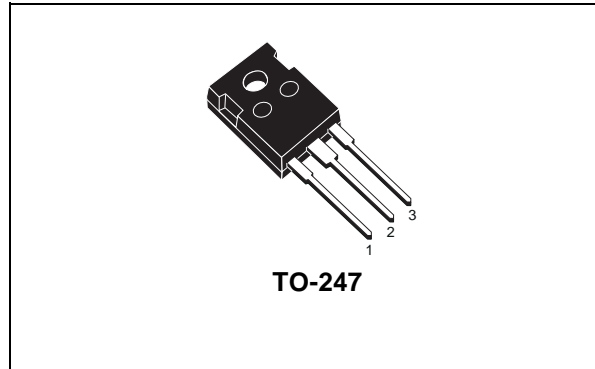
- HIGH INPUT IMPEDANCE
- OFF LOSSES INCLUDE TAIL CURRENT
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- VERY HIGH FREQUENCY OPERATION
- CO-PACKAGED WITH TURBOSWITCH ANTIPARALLEL DIODE

## 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 "V" identifies a family optimized for high frequency welding and SMPS applications.

## APPLICATIONS

- HIGH FREQUENCY INVERTERS
- SMPS and PFC IN BOTH HARD SWITCH AND RESONANT TOPOLOGIES
- UPS
- WELDING



## ORDERING INFORMATION

SALES TYPE	MARKING	PACKAGE	PACKAGING
STGW40NC60V	GW40NC60V	TO-247	TUBE

## STGW40NC60V

### 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	$\pm 20$	V
$I_C$	Collector Current (continuous) at $T_C = 25^\circ\text{C}$	80	A
$I_C$	Collector Current (continuous) at $T_C = 100^\circ\text{C}$	50	A
$I_{CM}(\bullet)$	Collector Current (pulsed)	220	A
$P_{TOT}$	Total Dissipation at $T_C = 25^\circ\text{C}$	260	W
	Derating Factor	2.6	W/ $^\circ\text{C}$
$T_{stg}$	Storage Temperature	- 55 to 125	$^\circ\text{C}$
$T_j$	Max. Operating Junction Temperature	125	$^\circ\text{C}$

( $\bullet$ )Pulse width limited by safe operating area

### THERMAL DATA

Rthj-case	Thermal Resistance Junction-case Max	0.385	$^\circ\text{C}/\text{W}$
Rthj-amb	Thermal Resistance Junction-ambient Max	30	$^\circ\text{C}/\text{W}$

### ELECTRICAL CHARACTERISTICS ( $T_{CASE} = 25^\circ\text{C}$ UNLESS OTHERWISE SPECIFIED)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{BR(CES)}$	Collector-Emitter Breakdown Voltage	$I_C = 1\text{ mA}, V_{GE} = 0$	600			V
$I_{CES}$	Collector cut-off ( $V_{GE} = 0$ )	$V_{CE} = \text{Max Rating}, T_C = 25^\circ\text{C}$ $V_{CE} = \text{Max Rating}, T_C = 125^\circ\text{C}$			250 1000	$\mu\text{A}$ $\mu\text{A}$
$I_{GES}$	Gate-Emitter Leakage Current ( $V_{CE} = 0$ )	$V_{GE} = \pm 20\text{ V}, V_{CE} = 0$			$\pm 250$	nA

ON (1)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GE(th)}$	Gate Threshold Voltage	$V_{CE} = V_{GE}, I_C = 250\ \mu\text{A}$	3	4	5	V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$V_{GE} = 15\text{ V}, I_C = 40\text{ A}, T_j = 25^\circ\text{C}$ $V_{GE} = 15\text{ V}, I_C = 40\text{ A}, T_j = 125^\circ\text{C}$		1.92 1.7	2.5	V V

## ELECTRICAL CHARACTERISTICS (CONTINUED)

## DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$g_{fs}$	Forward Transconductance	$V_{CE} = 25 \text{ V}$ , $I_C = 20 \text{ A}$		20		S
$C_{ies}$	Input Capacitance	$V_{CE} = 25 \text{ V}$ , $f = 1 \text{ MHz}$ , $V_{GE} = 0$		4550		pF
$C_{oes}$	Output Capacitance			350		pF
$C_{res}$	Reverse Transfer Capacitance			105		pF
$Q_g$ $Q_{ge}$ $Q_{gc}$	Total Gate Charge Gate-Emitter Charge Gate-Collector Charge	$V_{CE} = 480 \text{ V}$ , $I_C = 40 \text{ A}$ , $V_{GE} = 15 \text{ V}$		220 30 105		nC nC nC
$I_{CL}$	Latching Current	$V_{clamp} = 480 \text{ V}$ , $T_j = 125^\circ\text{C}$ $R_G = 10 \Omega$	220			A

## SWITCHING ON

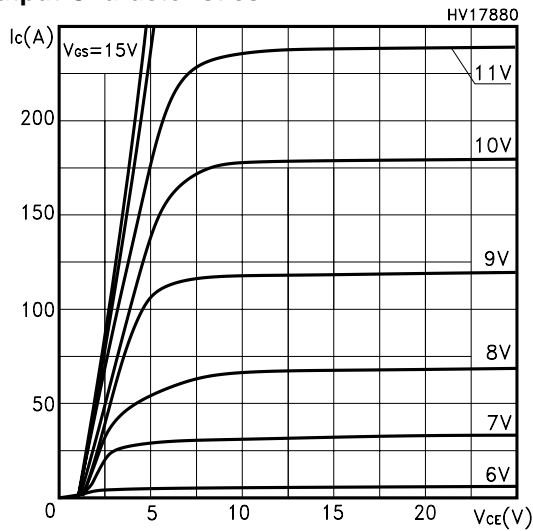
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ $t_r$	Turn-on Delay Time Rise Time	$V_{CC} = 480 \text{ V}$ , $I_C = 40 \text{ A}$ $R_G = 10 \Omega$ , $V_{GE} = 15 \text{ V}$		45 27		ns ns
$(di/dt)_{on}$ $E_{on}$	Turn-on Current Slope Turn-on Switching Losses	$V_{CC} = 480 \text{ V}$ , $I_C = 40 \text{ A}$ $R_G = 10 \Omega$ , $V_{GE} = 15 \text{ V}$ , $T_j = 125^\circ\text{C}$		1150 800		A/ $\mu\text{s}$ $\mu\text{J}$

## SWITCHING OFF

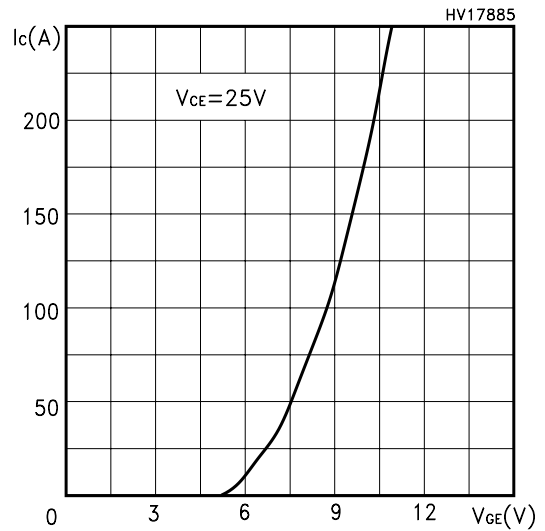
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_r(V_{off})$ $t_{d(off)}$ $t_f$	Off Voltage Rise Time Delay Time Fall Time	$V_{CC} = 480 \text{ V}$ , $I_C = 40 \text{ A}$ , $R_{GE} = 10 \Omega$ , $V_{GE} = 15 \text{ V}$ $T_j = 25^\circ\text{C}$		37 270 70		ns ns ns
$E_{off(**)}$ $E_{ts}$	Turn-off Switching Loss Total Switching Loss			1120 1880		$\mu\text{J}$ $\mu\text{J}$
$t_r(V_{off})$ $t_{d(off)}$ $t_f$ $E_{off(**)}$ $E_{ts}$	Off Voltage Rise Time Delay Time Fall Time Turn-off Switching Loss Total Switching Loss		$V_{CC} = 480 \text{ V}$ , $I_C = 40 \text{ A}$ , $R_{GE} = 10 \Omega$ , $V_{GE} = 15 \text{ V}$ $T_j = 125^\circ\text{C}$		67 325 120 1600 2400	

Note: 1. Pulsed: Pulse duration = 300  $\mu\text{s}$ , duty cycle 1.5 %.  
2. Pulse width limited by max. junction temperature.  
(\*\*)Losses include Also the Tail (Jedec Standardization)

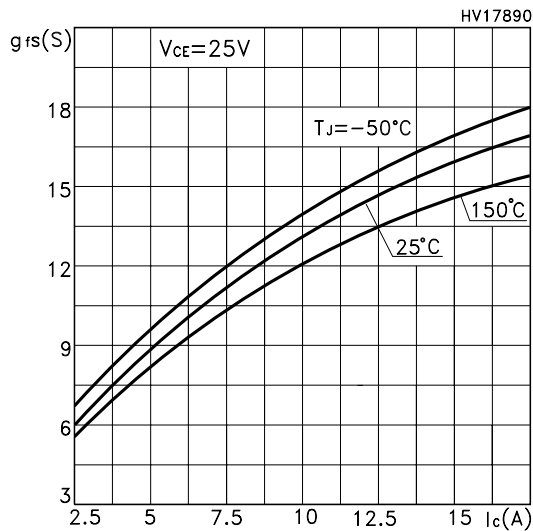
Output Characteristics



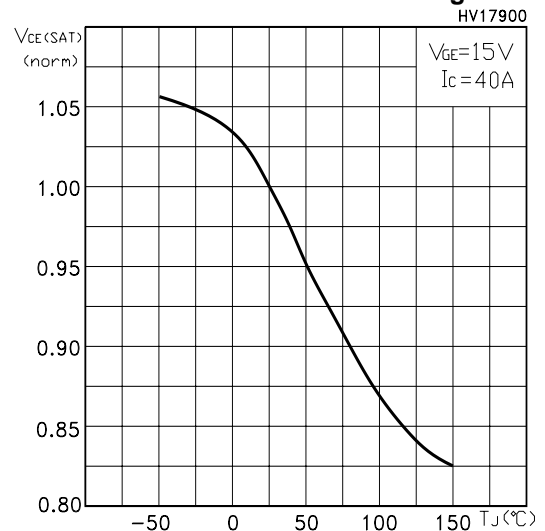
Transfer Characteristics



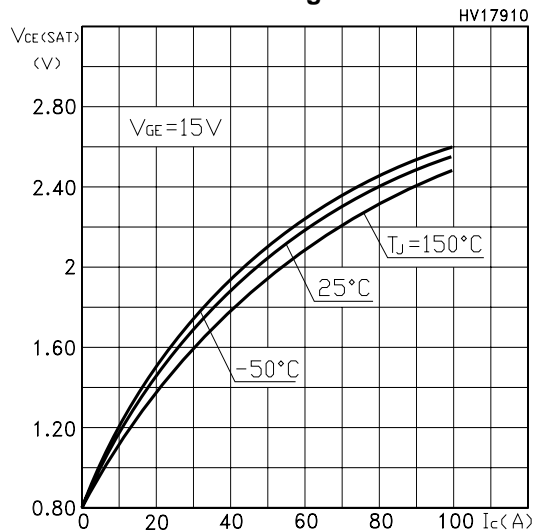
Transconductance



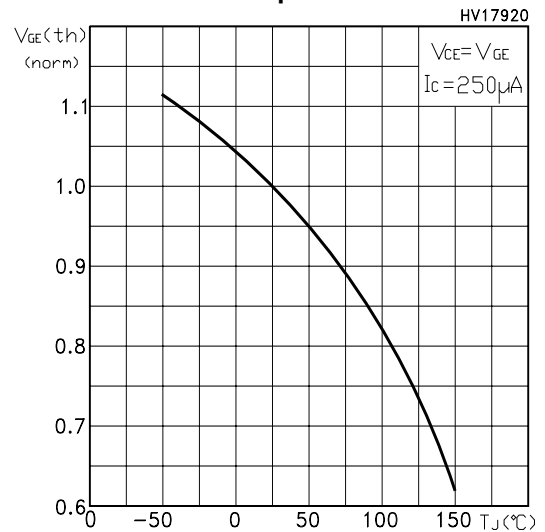
Normalized Collector-Emitter On Voltage vs Temp.



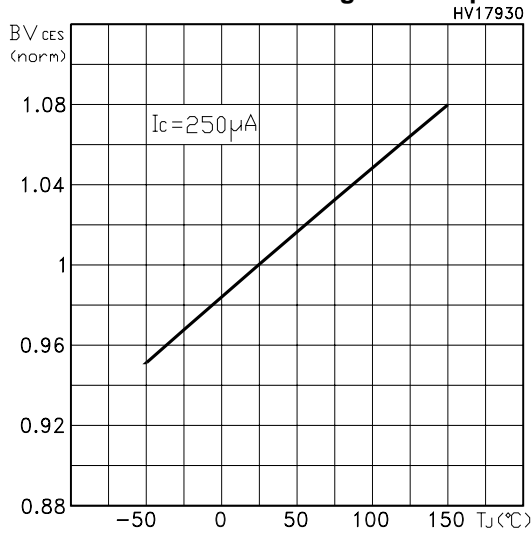
Collector-Emitter On Voltage vs Collector Current



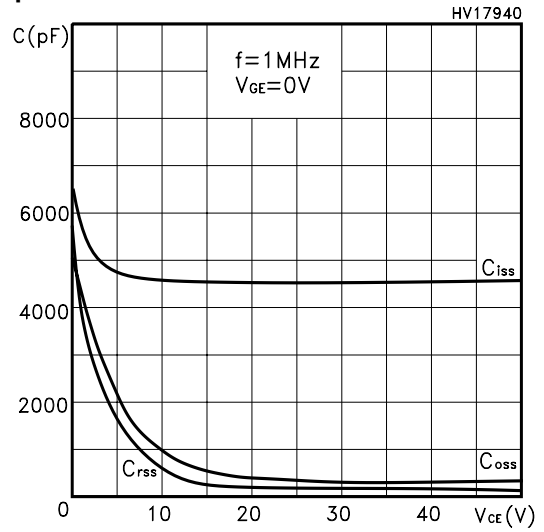
Gate Threshold vs Temperature



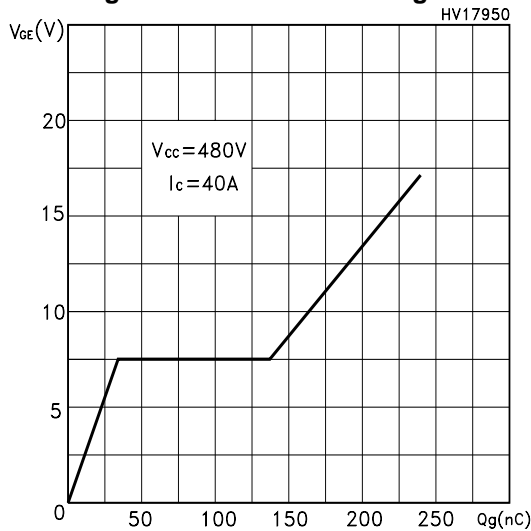
Normalized Breakdown Voltage vs Temperature



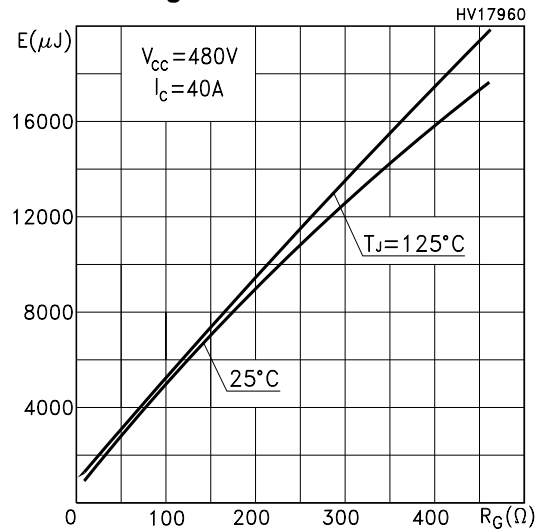
Capacitance Variations



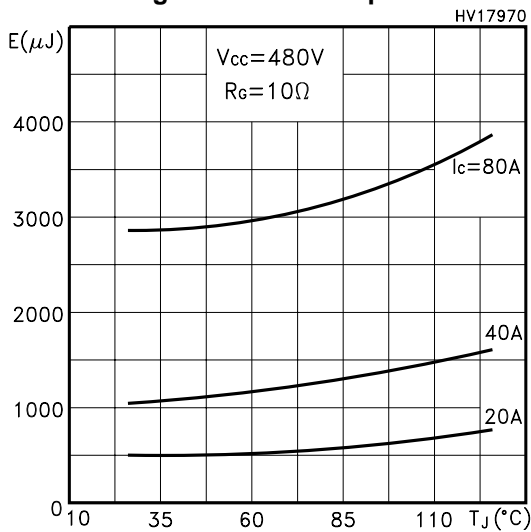
Gate Charge vs Gate-Emitter Voltage



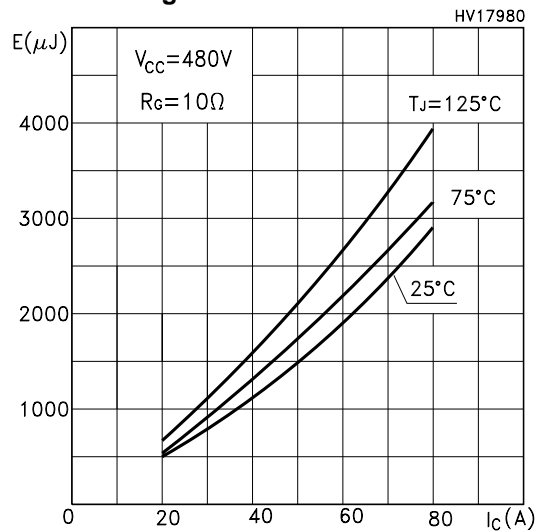
Total Switching Losses vs Gate Resistance



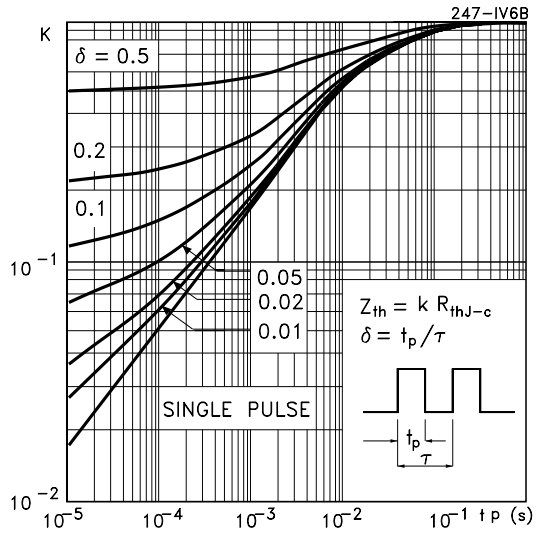
Total Switching Losses vs Temperature



Total Switching Losses vs Collector Current



Thermal Impedance for Max247



Turn-Off SOA

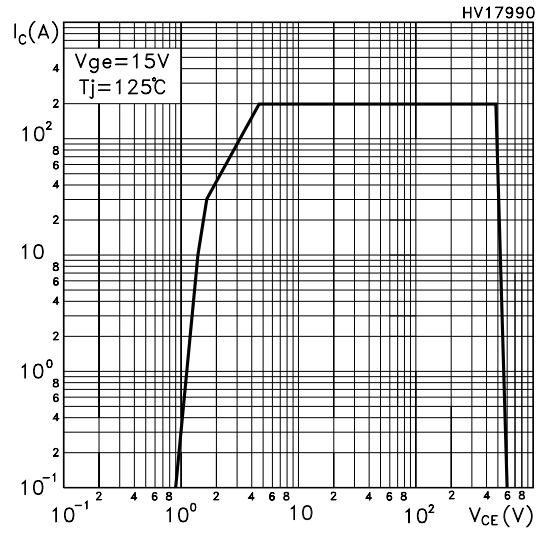


Fig. 1: Gate Charge test Circuit

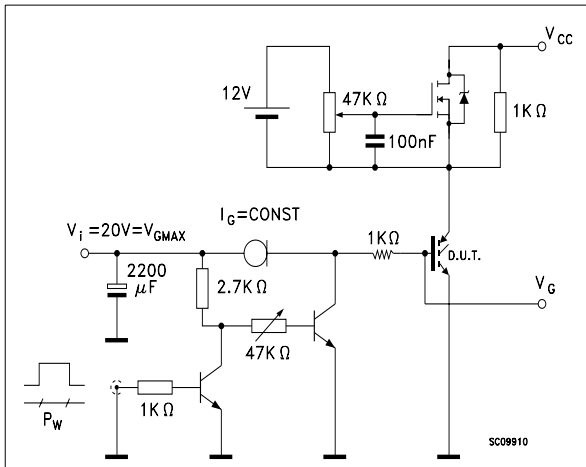
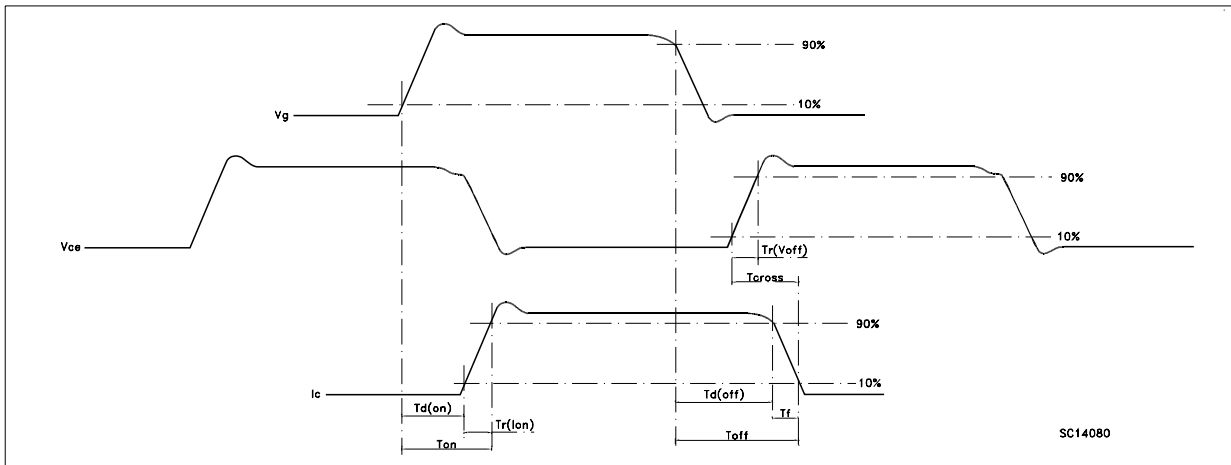
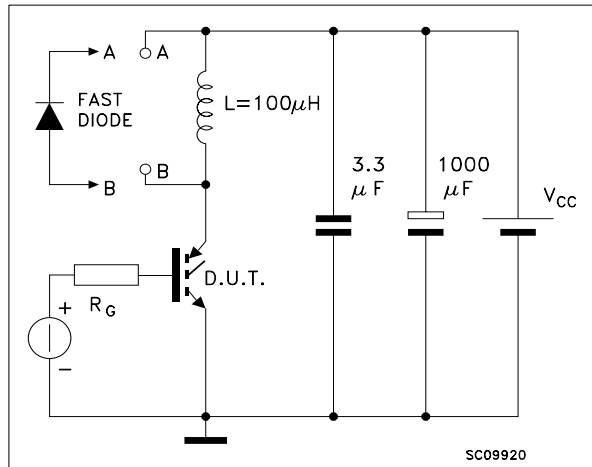
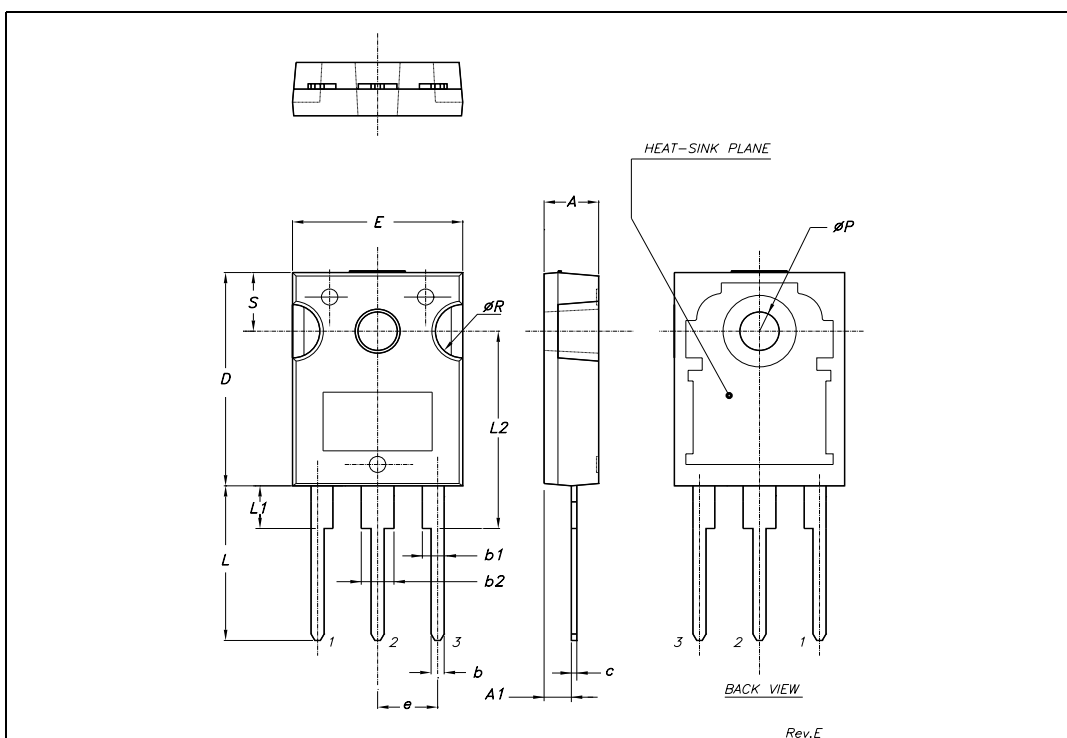


Fig. 2: Test Circuit For Inductive Load Switching (SC09920)



**TO-247 MECHANICAL DATA**

DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.85		5.15	0.19		0.20
A1	2.20		2.60	0.086		0.102
b	1.0		1.40	0.039		0.055
b1	2.0		2.40	0.079		0.094
b2	3.0		3.40	0.118		0.134
c	0.40		0.80	0.015		0.03
D	19.85		20.15	0.781		0.793
E	15.45		15.75	0.608		0.620
e		5.45			0.214	
L	14.20		14.80	0.560		0.582
L1	3.70		4.30	0.14		0.17
L2		18.50			0.728	
øP	3.55		3.65	0.140		0.143
øR	4.50		5.50	0.177		0.216
S		5.50			0.216	





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