



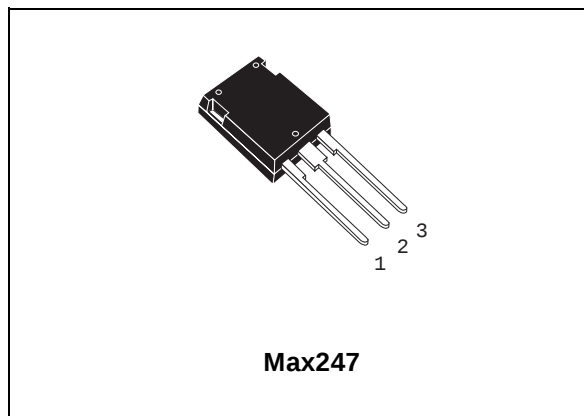
STGY50NB60HD

N-CHANNEL 50A - 600V - Max247

PowerMESH™ IGBT

TYPE	V _{CES}	V _{CE(sat)}	I _C
STGY50NB60HD	600 V	< 2.8 V	50 A

- HIGH INPUT IMPEDANCE (VOLTAGE DRIVEN)
- 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™ ANTIPARALLEL DIODE



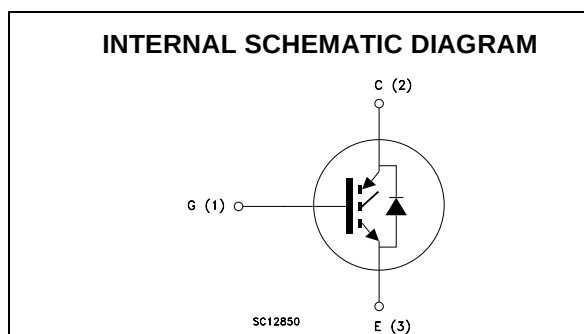
DESCRIPTION

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



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V _{CES}	Collector-Emitter Voltage (V _{GS} = 0)	600	V
V _{GE}	Gate-Emitter Voltage	± 20	V
I _C	Collector Current (continuous) at T _C = 25°C	100	A
I _C	Collector Current (continuous) at T _C = 100°C	50	A
I _{CM} (■)	Collector Current (pulsed)	400	A
P _{TOT}	Total Dissipation at T _C = 25°C	250	W
	Derating Factor	2	W/°C
T _{stg}	Storage Temperature	-65 to 150	°C
T _j	Max. Operating Junction Temperature	150	°C

(■) PULSE WIDTH LIMITED BY SAFE OPERATING AREA

STGY50NB60HD

THERMAL DATA

Rthj-case	Thermal Resistance Junction-case Max	0.5	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	30	°C/W
Rthc-h	Thermal Resistance Case-heatsink 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 µA, V _{GE} = 0	600			V
I _{CES}	Collector cut-off (V _{GE} = 0)	V _{CE} = Max Rating, T _C = 25 °C V _{CE} = Max Rating, T _C = 125 °C			100 1000	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	3		5	V
V _{CE} (sat)	Collector-Emitter Saturation Voltage	V _{GE} = 15V, I _C = 50 A V _{GE} = 15V, I _C = 50 A, T _J = 125°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 = 50 A		22		S
C _{ies}	Input Capacitance	V _{CE} = 25V, f = 1 MHz, V _{GE} = 0		4500		pF
C _{oes}	Output Capacitance			450		pF
C _{res}	Reverse Transfer Capacitance			90		pF
Q _g Q _{ge} Q _{gc}	Total Gate Charge Gate-Emitter Charge Gate-Collector Charge	V _{CE} = 480V, I _C = 50 A, V _{GE} = 15V		260 450 90		nC nC nC
I _{CL}	Latching Current	V _{clamp} = 480 V T _J = 150°C, R _G = 10 Ω	200			A

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t _d (on)	Turn-on Delay Time	V _{CC} = 480 V, I _C = 50 A R _G = 10Ω, V _{GE} = 15 V		20		ns
t _r	Rise Time			70		ns
(di/dt) _{on} E _{on}	Turn-on Current Slope Turn-on Switching Losses	V _{CC} = 480 V, I _C = 50 A, R _G = 10Ω V _{GE} = 15 V, T _J = 125°C		350 950		A/µs µJ

ELECTRICAL CHARACTERISTICS (CONTINUED)**SWITCHING OFF**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t_c	Cross-over Time	$V_{CC} = 480 \text{ V}$, $I_C = 50 \text{ A}$, $R_{GE} = 10 \Omega$, $V_{GE} = 15 \text{ V}$		166		ns
$t_r(V_{off})$	Off Voltage Rise Time			48		ns
$t_{d(off)}$	Delay Time			326		ns
t_f	Fall Time			90		ns
$E_{off(**)}$	Turn-off Switching Loss			2.1		mJ
E_{ts}	Total Switching Loss			3		mJ
t_c	Cross-over Time	$V_{CC} = 480 \text{ V}$, $I_C = 50 \text{ A}$, $R_{GE} = 10 \Omega$, $V_{GE} = 15 \text{ V}$ $T_j = 125^\circ \text{C}$		270		ns
$t_r(V_{off})$	Off Voltage Rise Time			75		ns
$t_{d(off)}$	Delay Time			340		ns
t_f	Fall Time			200		ns
$E_{off(**)}$	Turn-off Switching Loss			2.9		mJ
E_{ts}	Total Switching Loss			3.85		mJ

COLLECTOR-EMITTER DIODE

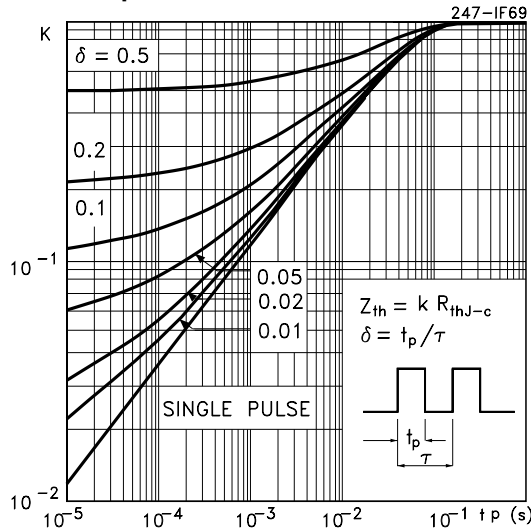
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_f	Forward Current				50	A
I_{fm}	Forward Current pulsed				400	A
V_f	Forward On-Voltage	$I_f = 50 \text{ A}$ $I_f = 50 \text{ A}$, $T_j = 125^\circ \text{C}$		1.65 1.60	2	V V
t_{rr}	Reverse Recovery Time	$I_f = 50 \text{ A}$, $V_R = 100 \text{ V}$, $T_j = 125^\circ \text{C}$, $di/dt = 100 \text{ A}/\mu\text{s}$		150		ns
Q_{rr}	Reverse Recovery Charge			510		nC
I_{rrm}	Reverse Recovery Current			7.5		A

Note: 1. Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %.

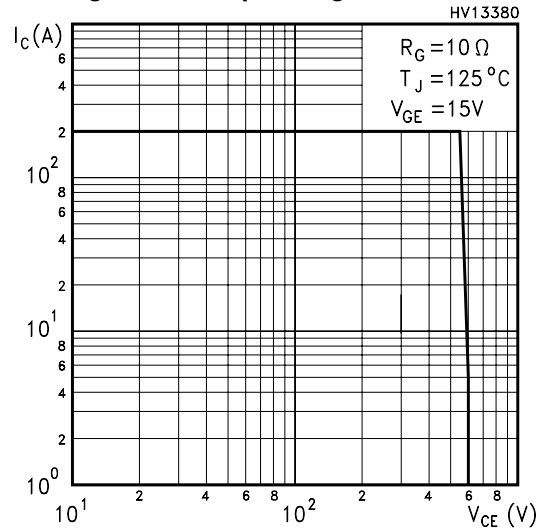
2. Pulse width limited by max. junction temperature.

(**) Losses include Also the Tail (Jedec Standardization)

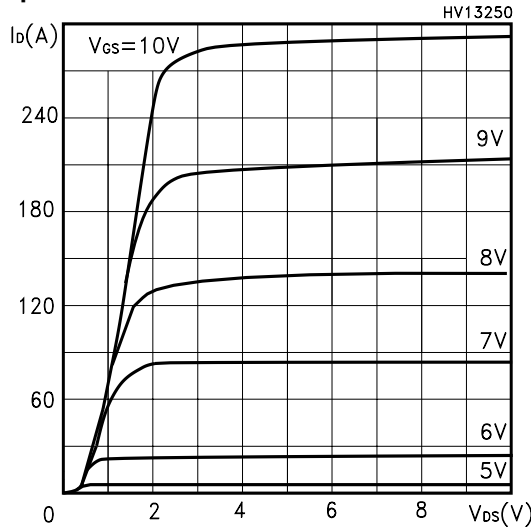
Thermal Impedance



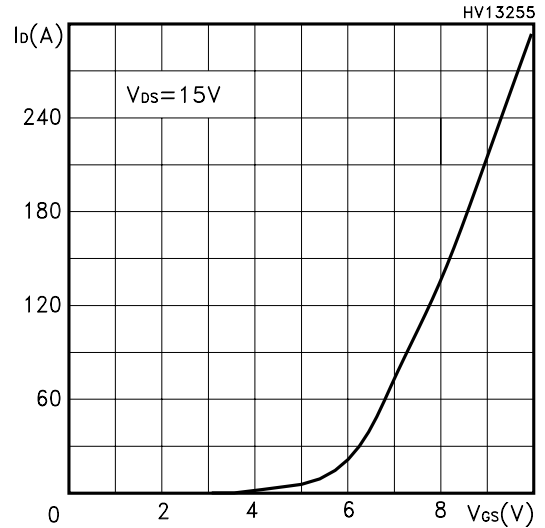
Switching Off Safe Operating Area



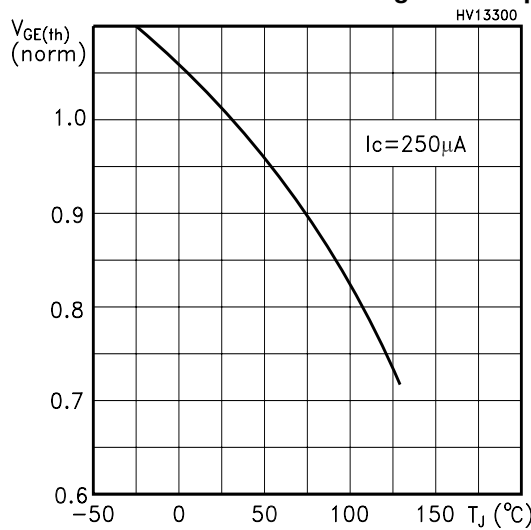
Output Characteristics



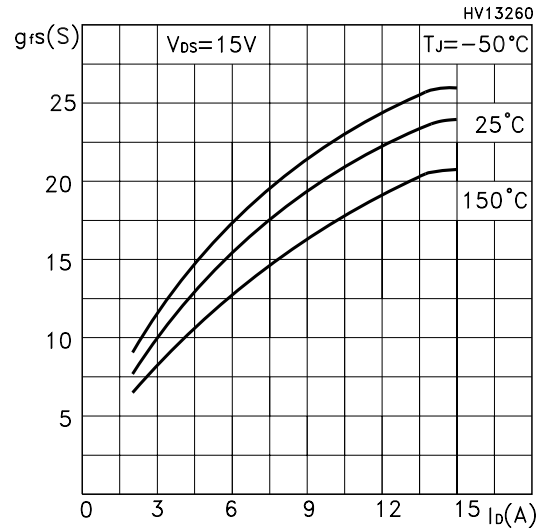
Transfer Characteristics

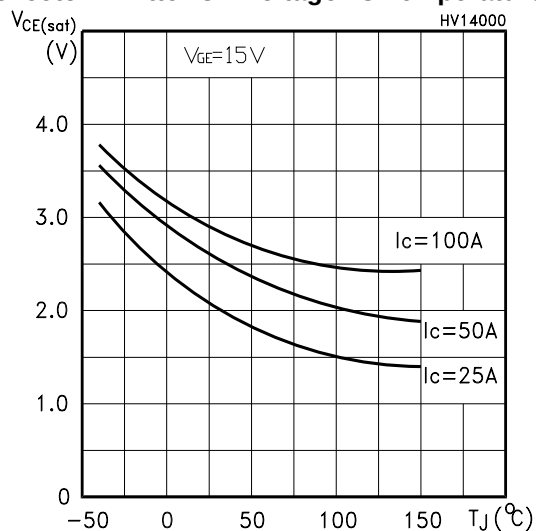
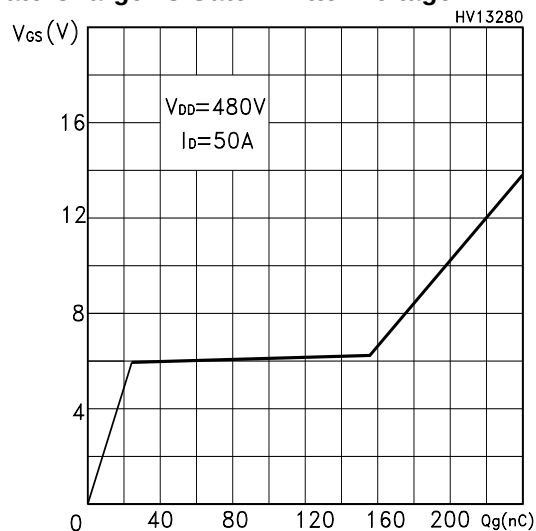
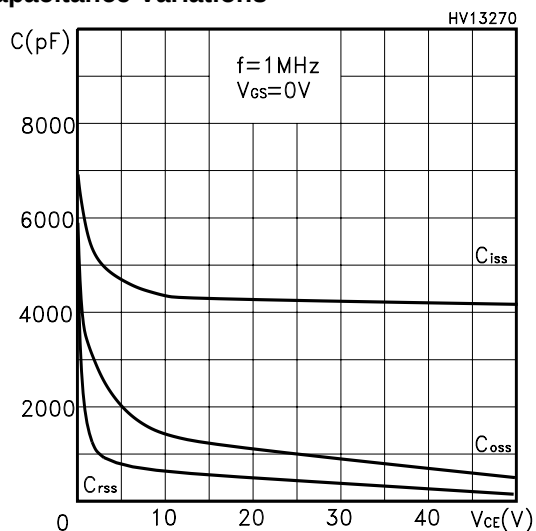
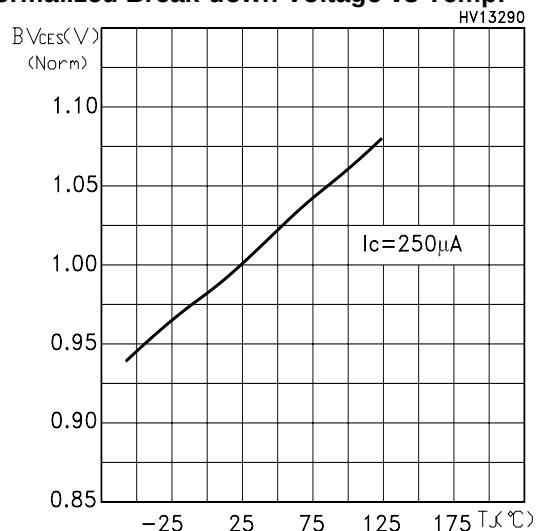
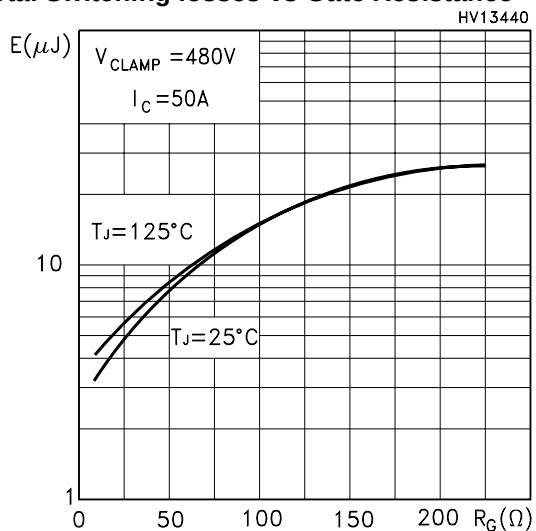
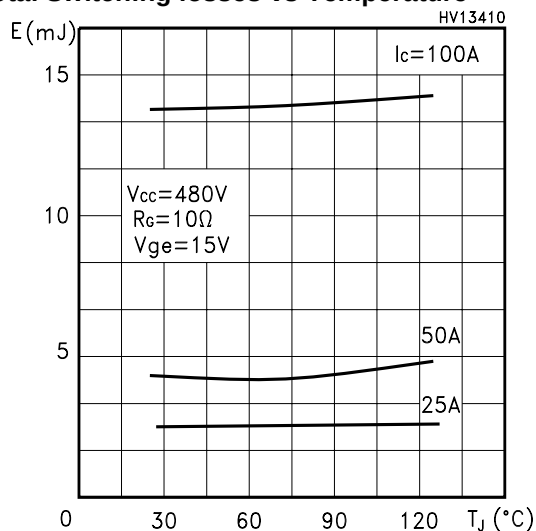


Normalized Gate Threshold Voltage vs Temp.

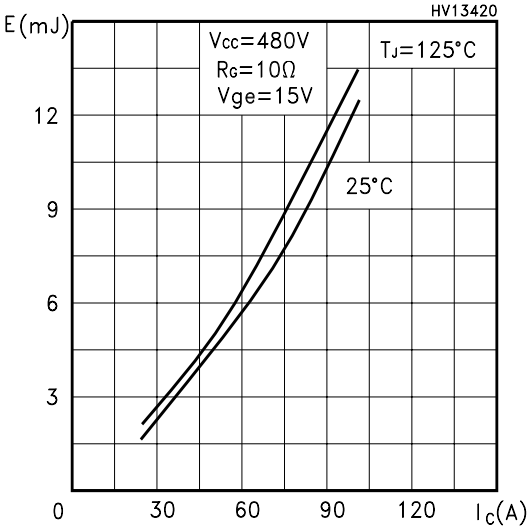


Transconductance



Collector-Emitter On Voltage vs Temperature**Gate-Charge vs Gate-Emitter Voltage****Capacitance Variations****Normalized Break-down Voltage vs Temp.****Total Switching losses vs Gate Resistance****Total Switching losses vs Temperature**

Total Switching losses vs I_C



Diode Forward Voltage

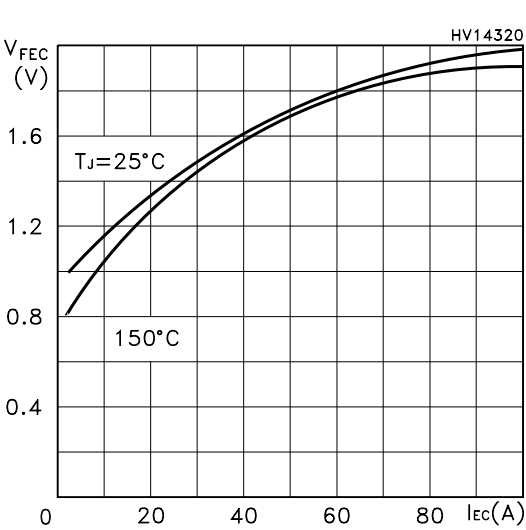


Fig. 1: Gate Charge test Circuit

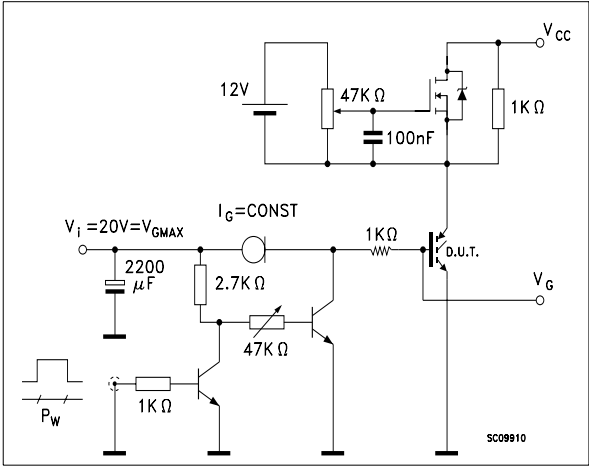
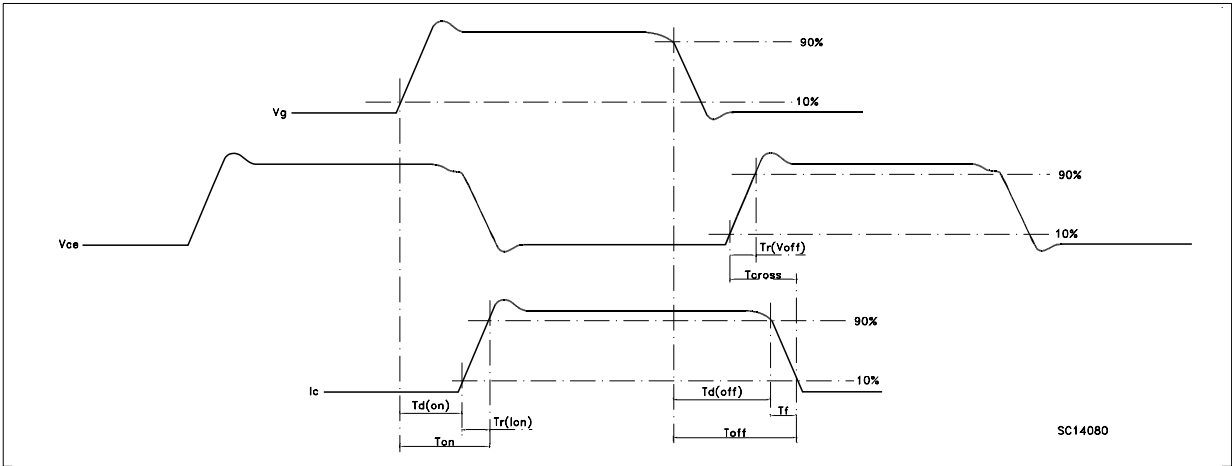
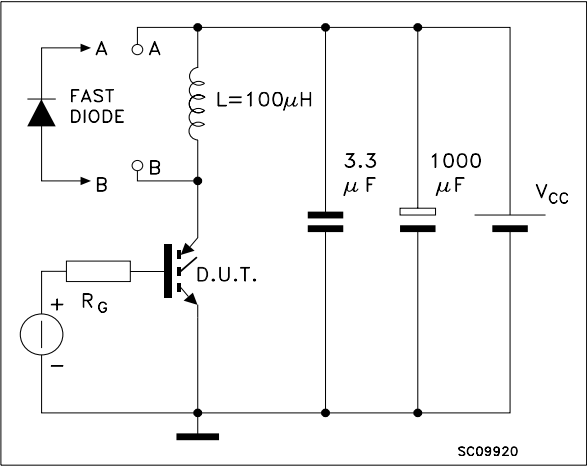
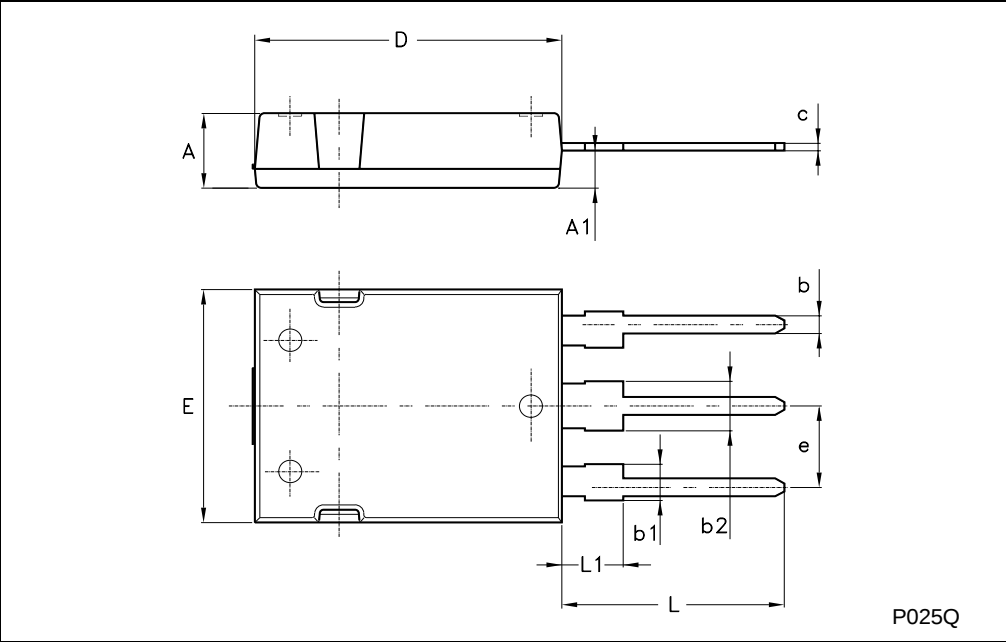


Fig. 2: Test Circuit For Inductive Load Switching



Max247 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.70		5.30			
A1	2.20		2.60			
b	1.00		1.40			
b1	2.00		2.40			
b2	3.00		3.40			
c	0.40		0.80			
D	19.70		20.30			
e	5.35		5.55			
E	15.30		15.90			
L	14.20		15.20			
L1	3.70		4.30			



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