



STGP20NB60K STGW20NB60K

N-CHANNEL 20A - 600V - TO-220/TO-247 SHORT CIRCUIT PROOF PowerMESH™ IGBT

TYPE	V _{CES}	V _{CE(sat)}	I _C
STGP20NB60K	600 V	< 2.8 V	20 A
STGW20NB60K	600 V	< 2.8 V	20 A

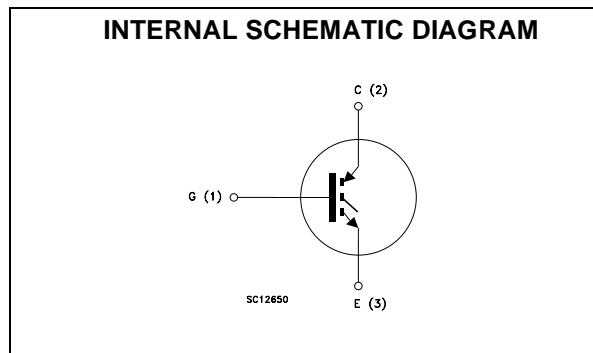
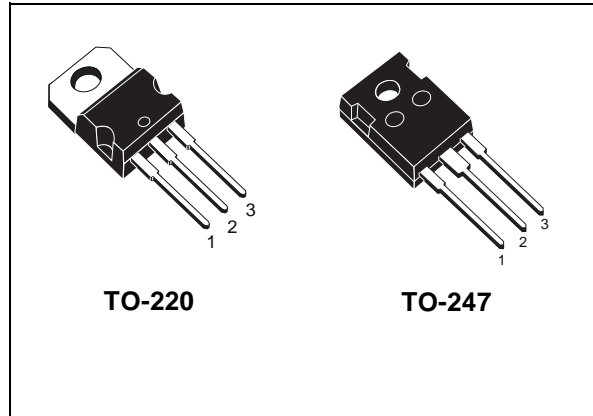
- HIGH INPUT IMPEDANCE (VOLTAGE DRIVEN)
- LOW ON-VOLTAGE DROP (V_{cesat})
- LOW ON-LOSSES
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- OFF LOSSES INCLUDE TAIL CURRENT
- VERY HIGH FREQUENCY OPERATION
- SHORT CIRCUIT RATED
- LATCH CURRENT FREE OPERATION

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



ORDERING INFORMATION

SALES TYPE	MARKING	PACKAGE	PACKAGING
STGP20NB60K	GP20NB60K	TO-220	TUBE
STGW20NB60K	GW20NB60K	TO-247	TUBE

STGP20NB60K - STGW20NB60K

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 $T_C = 25^\circ\text{C}$	40	A
I_C	Collector Current (continuous) at $T_C = 100^\circ\text{C}$	20	A
$I_{CM} (\square)$	Collector Current (pulsed)	80	A
T_{sc}	Short Circuit Withstand	10	μs
P_{TOT}	Total Dissipation at $T_C = 25^\circ\text{C}$	150	W
	Derating Factor	1.2	$\text{W}/^\circ\text{C}$
T_{stg}	Storage Temperature	- 55 to 150	$^\circ\text{C}$
T_j	Max. Operating Junction Temperature		

THERMAL DATA

		TO-220	TO-247	
Rthj-case	Thermal Resistance Junction-case Max	0.83		$^\circ\text{C}/\text{W}$
Rthj-amb	Thermal Resistance Junction-ambient Max	62.5	50	$^\circ\text{C}/\text{W}$

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

OFF

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

ON (1)

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

Electrical Characteristics (continued)

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs}	Forward Transconductance	$V_{CE} = 25\text{ V}, I_C = 20\text{ A}$		8		S
C_{ies}	Input Capacitance	$V_{CE} = 25\text{ V}, f = 1\text{ MHz}, V_{GE} = 0$		1560		pF
C_{oes}	Output Capacitance			190		pF
C_{res}	Reverse Transfer Capacitance			38		pF
Q_g Q_{ge} Q_{gc}	Total Gate Charge Gate-Emitter Charge Gate-Collector Charge	$V_{CE} = 480\text{ V}, I_C = 20\text{ A},$ $V_{GE} = 15\text{ V}$		85 14.4 51	115	nC nC nC
tscw	Short Circuit Withstand Time	$V_{ce} = 0.5\text{ BV}_{ces}, V_{GE} = 15\text{ V},$ $T_j = 125^\circ\text{C}, R_G = 10\ \Omega$	10			μs

SWITCHING ON

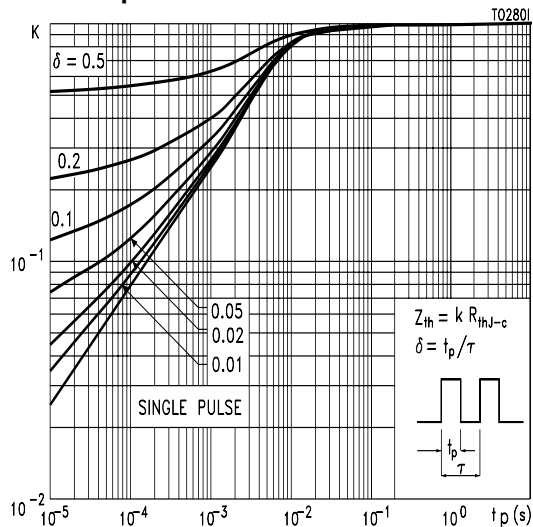
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	$V_{CC} = 480\text{ V}, I_C = 20\text{ A}$ $R_G = 10\ \Omega, V_{GE} = 15\text{ V}$		40		ns
t_r	Rise Time			36		ns
$(di/dt)_{on}$	Turn-on Current Slope	$V_{CC} = 480\text{ V}, I_C = 20\text{ A}, R_G = 10\ \Omega,$ $V_{GE} = 15\text{ V}, T_j = 125^\circ\text{C}$		350		A/ μs
Eon	Turn-on Switching Losses			650		μJ

SWITCHING OFF

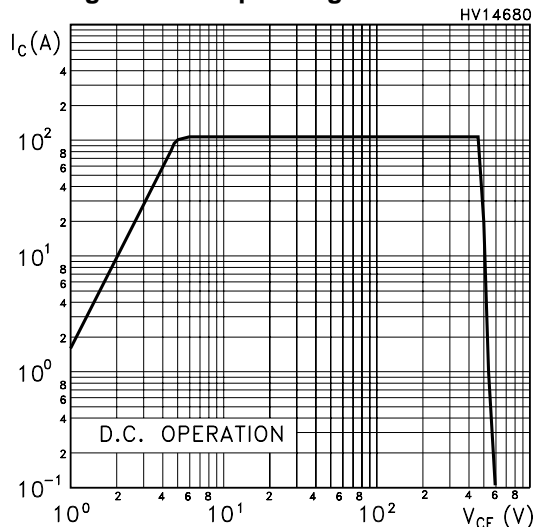
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t_c	Cross-over Time	$V_{CC} = 480\text{ V}, I_C = 20\text{ A},$ $R_{GE} = 10\ \Omega, V_{GE} = 15\text{ V}$		130		ns
$t_r(V_{off})$	Off Voltage Rise Time			25		ns
$t_{d(off)}$	Delay Time			105		ns
t_f	Fall Time			95		ns
$E_{off(**)}$	Turn-off Switching Loss				0.5	
E_{ts}	Total Switching Loss			0.6		mJ
t_c	Cross-over Time	$V_{CC} = 480\text{ V}, I_C = 20\text{ A},$ $R_{GE} = 10\ \Omega, V_{GE} = 15\text{ V}$ $T_j = 125^\circ\text{C}$		175		ns
$t_r(V_{off})$	Off Voltage Rise Time			46		ns
$t_{d(off)}$	Delay Time			130		ns
t_f	Fall Time			150		ns
$E_{off(**)}$	Turn-off Switching Loss				0.70	
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)

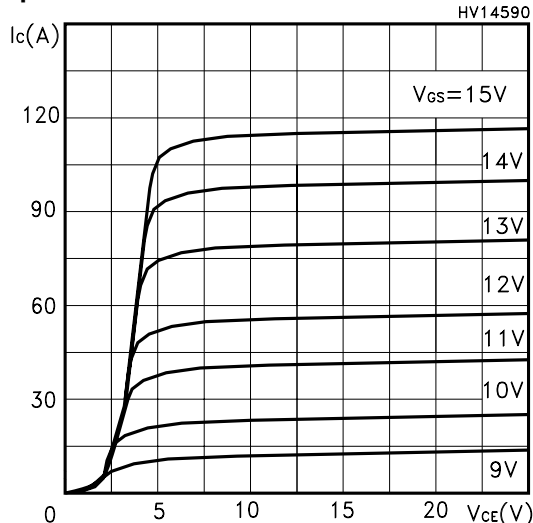
Thermal Impedance



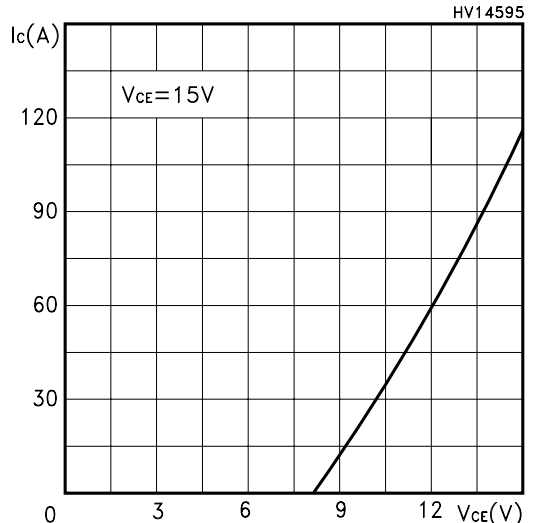
Switching Off Safe Operating Area



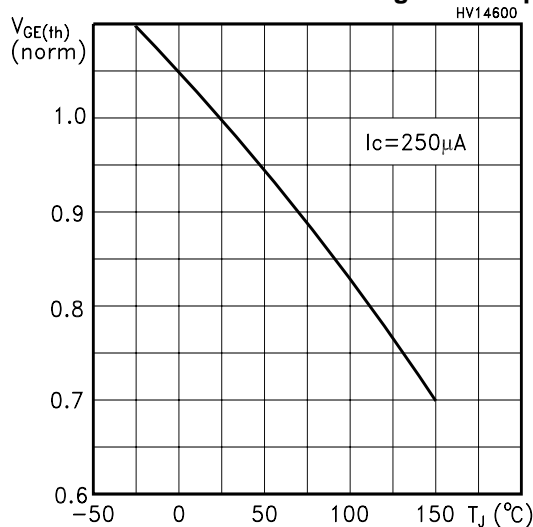
Output Characteristics



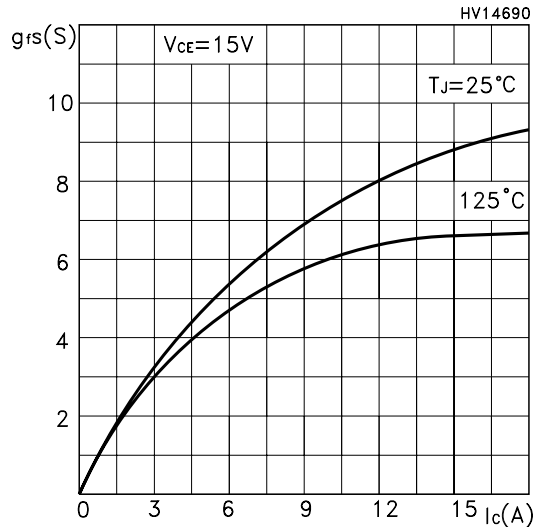
Transfer Characteristics



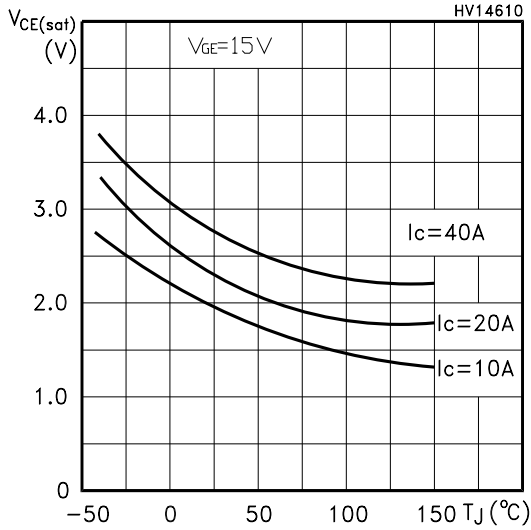
Normalized Gate Threshold Voltage vs Temp.



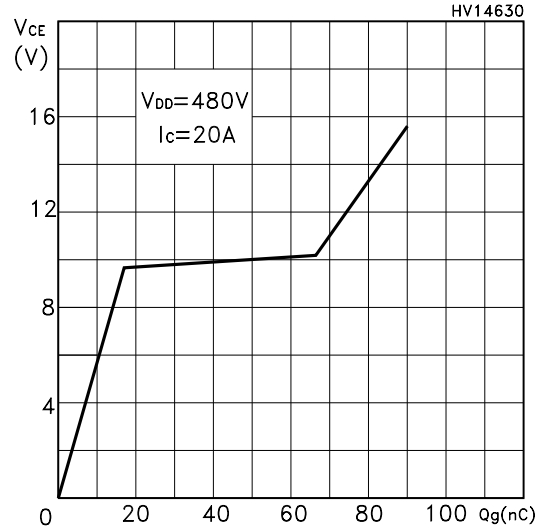
Transconductance



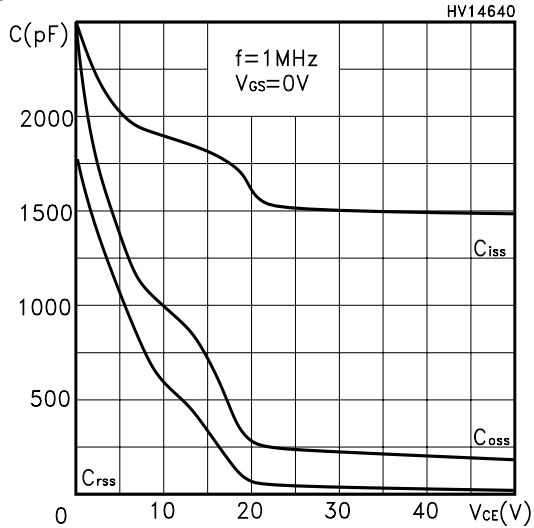
Collector-Emitter On Voltage vs Temperature



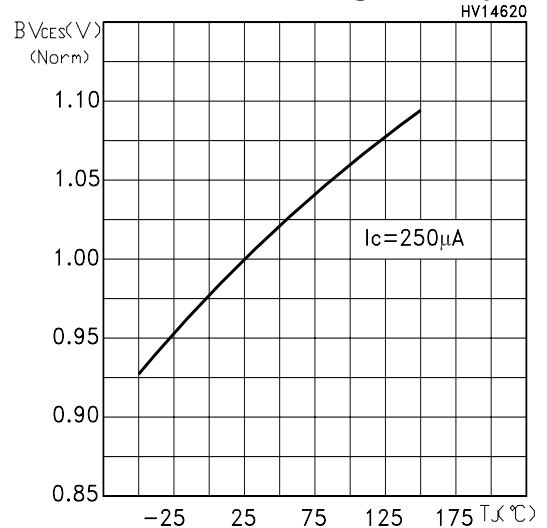
Gate-Charge vs Gate-Emitter Voltage



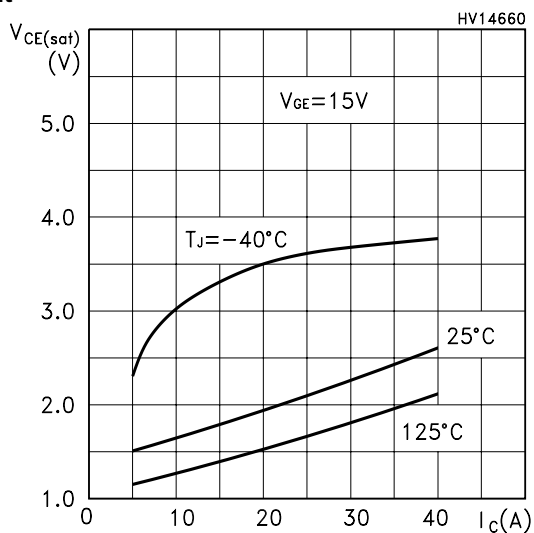
Capacitance Variations



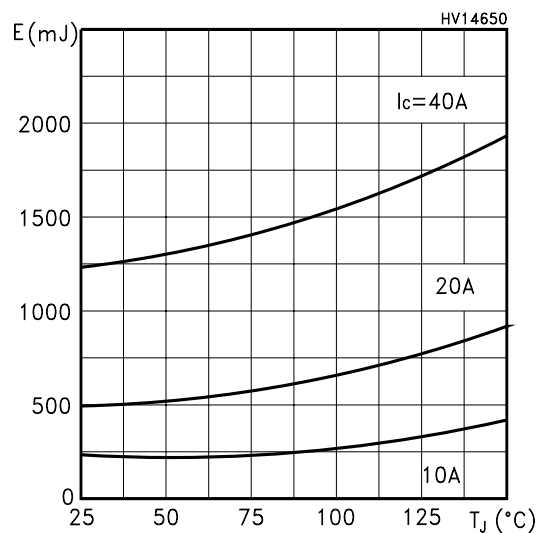
Normalized Break-down Voltage vs Temp.



Collector-Emitter on Voltage vs Collector Current



Turn-Off Energy Losses vs Temperature



Total Switch Losses vs Collector Current

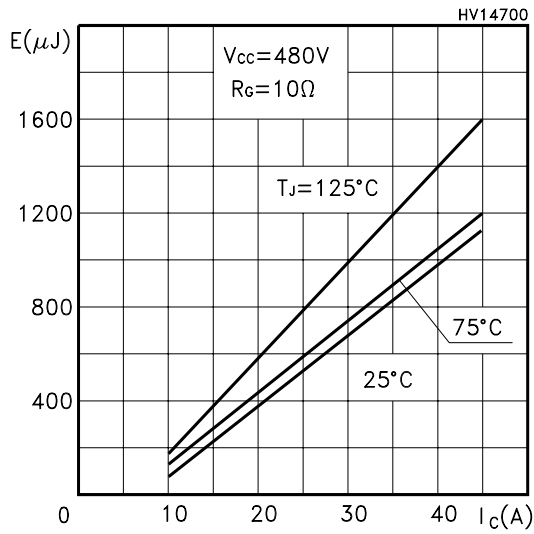


Fig. 1: Gate Charge test Circuit

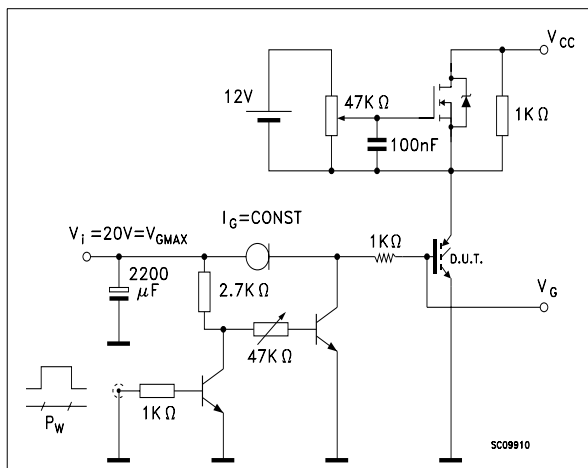
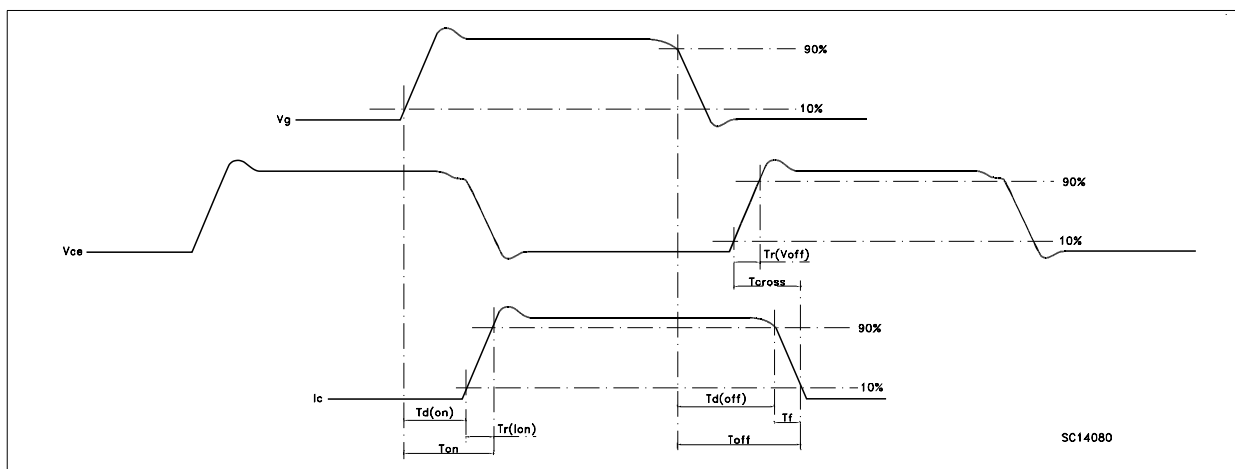
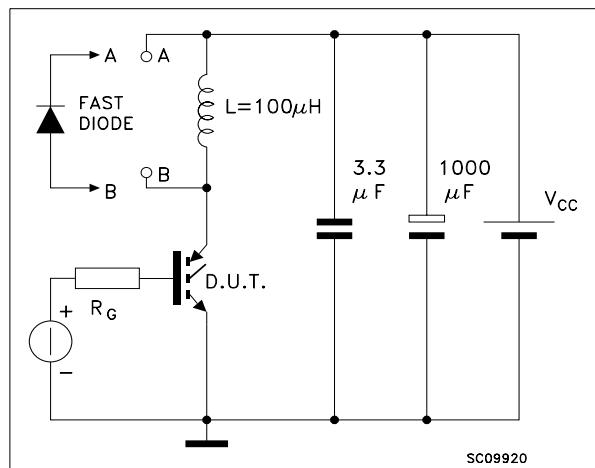
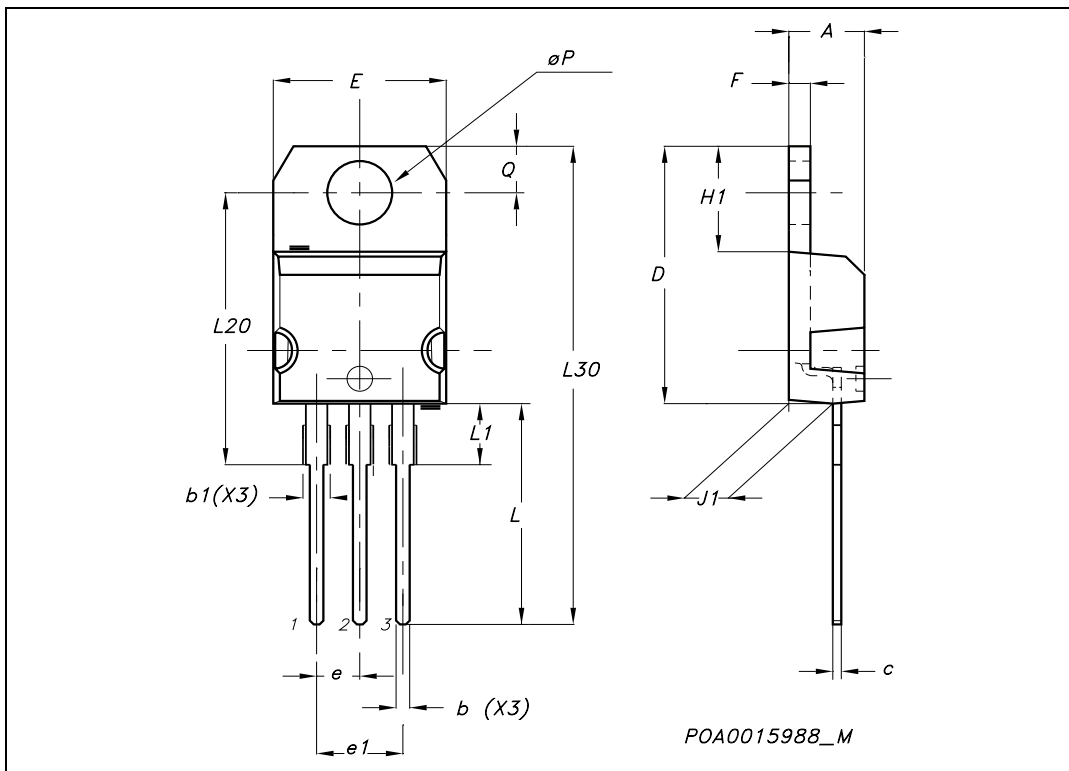


Fig. 2: Test Circuit For Inductive Load Switching



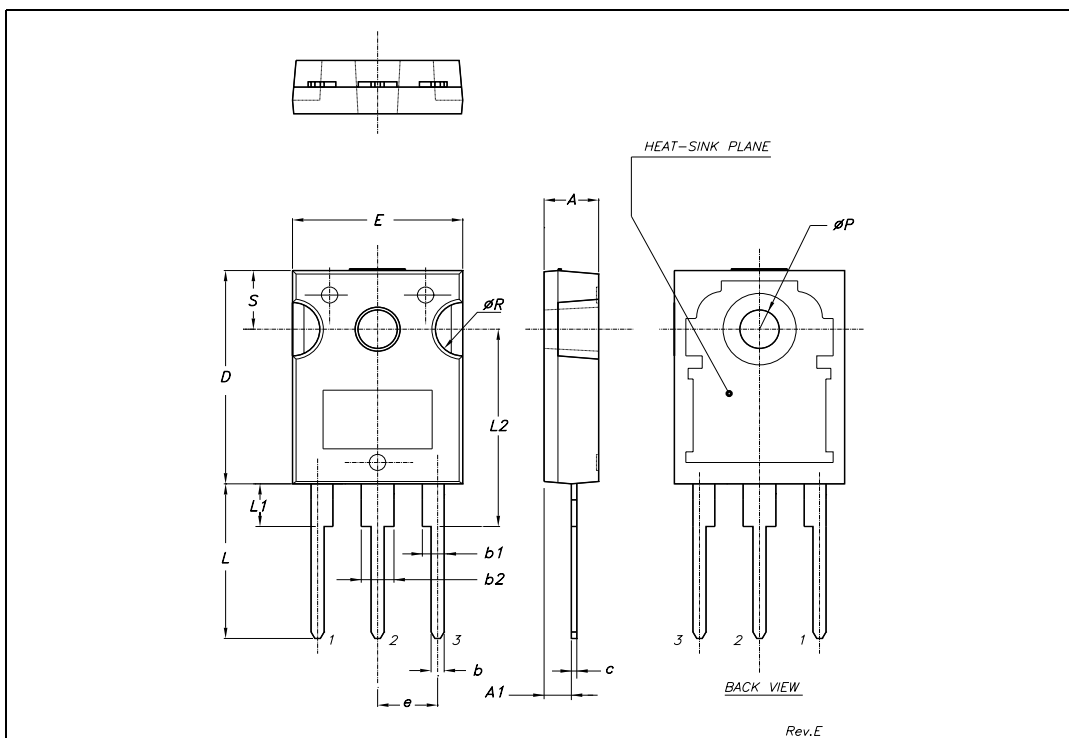
TO-220 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
b	0.61		0.88	0.024		0.034
b1	1.15		1.70	0.045		0.066
c	0.49		0.70	0.019		0.027
D	15.25		15.75	0.60		0.620
E	10		10.40	0.393		0.409
e	2.40		2.70	0.094		0.106
e1	4.95		5.15	0.194		0.202
F	1.23		1.32	0.048		0.052
H1	6.20		6.60	0.244		0.256
J1	2.40		2.72	0.094		0.107
L	13		14	0.511		0.551
L1	3.50		3.93	0.137		0.154
L20		16.40			0.645	
L30		28.90			1.137	
øP	3.75		3.85	0.147		0.151
Q	2.65		2.95	0.104		0.116



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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