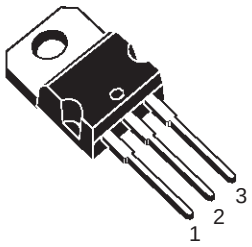
STGP20NB60H

N-CHANNEL 20A - 600V TO-220
PowerMESH™ IGBT

TYPE	V_{CES}	$V_{CE(sat)}$	I_C
STGP20NB60H	600 V	< 2.8 V	20 A

- HIGH INPUT IMPEDANCE (VOLTAGE DRIVEN)
- LOW ON-VOLTAGE DROP (V_{CESAT})
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- VERY HIGH FREQUENCY OPERATION
- OFF LOSSES INCLUDE TAIL CURRENT



TO-220

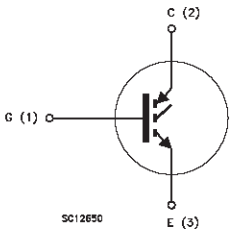
DESCRIPTION

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 perfomances. The suffix "H" identifies a family optimized to achieve very low switching times for high frequency applications (<120kHz).

APPLICATIONS

- HIGH FREQUENCY MOTOR CONTROLS
- WELDING EQUIPMENTS
- SMPS AND PFC IN BOTH HARD SWITCH AND RESONANT TOPOLOGIES

INTERNAL SCHEMATIC DIAGRAM



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)	160	A
P_{tot}	Total Dissipation at T_c = 25 °C	125	W
	Derating Factor	1.0	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

THERMAL DATA

$R_{thj\text{-}case}$	Thermal Resistance Junction-case	Max	1.0	°C/W
$R_{thj\text{-}amb}$	Thermal Resistance Junction-ambient	Max	62.5	oC/W
$R_{thc\text{-}h}$	Thermal Resistance Case-heatsink	Typ	0.5	°C/W

ELECTRICAL CHARACTERISTICS (T_j = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{BR(CES)}$	Collector-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_j = 25 °C V_{CE} = Max Rating T_j = 125 °C			10 100	µA µA
I_{GES}	Gate-Emitter Leakage Current (V_{CE} = 0)	V_{GE} = ± 20 V V_{CE} = 0			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GE(th)}$	Gate Threshold Voltage	V_{CE} = V_{GE} I_C = 250 µA	3		5	V
$V_{CE(SAT)}$	Collector-Emitter Saturation Voltage	V_{GE} = 15 V I_C = 20 A V_{GE} = 15 V I_C = 20 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 = 20 A	7.0	10		S
C_{ies} C_{oes} C_{res}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V_{CE} = 25 V f = 1 MHz V_{GE} = 0	1200 140 28	1700 200 40	2200 260 52	pF pF pF
Q_G Q_{GE} Q_{GC}	Total Gate Charge Gate-Emitter Charge Gate-Collector Charge	V_{CE} = 480 V I_C = 20 A V_{GE} = 15 V		110 13 51	145	nC nC nC
I_{CL}	Latching Current	V_{clamp} = 480 V R_G=10 Ω T_j = 150 °C	80			A

SWITCHING ON

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

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING OFF

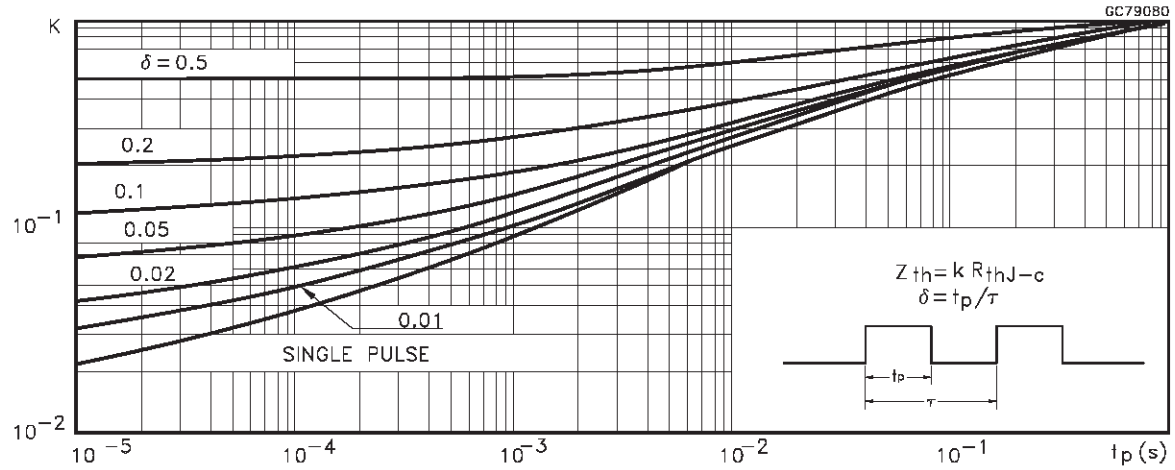
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t_c	Cross-Over Time	V_{CC} = 480 V, I_C = 20 A		115		ns
$t_r(v_{off})$	Off Voltage Rise Time	R_{GE} = 10 Ω, V_{GE} = 15 V		32		ns
$t_{d(off)}$	Delay Time			170		ns
t_f	Fall Time			75		ns
E_{off}(**)	Turn-off Switching Loss			0.4		mJ
E_{ts}	Total Switching Loss			0.65		mJ
t_c	Cross-Over Time	VCC = 480 V, I_C = 20 A		190		ns
$t_r(v_{off})$	Off Voltage Rise Time	R_{GE} = 10 Ω, V_{GE} = 15 V		55		ns
$t_{d(off)}$	Delay Time	T_j = 125 °C		210		ns
t_f	Fall Time			140		ns
E_{off}(**)	Turn-off Switching Loss			0.7		mJ
E_{ts}	Total Switching Loss			1.0		mJ

(•) Pulse width limited by max. junction temperature

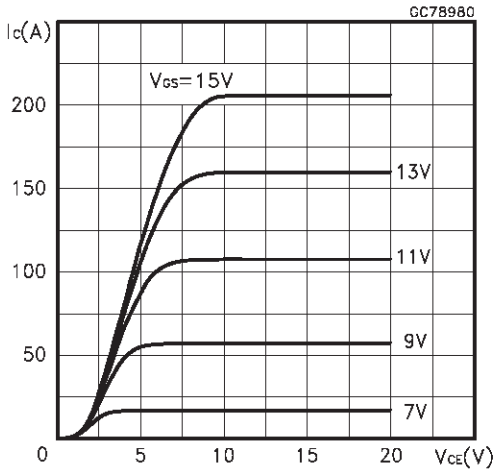
(*) Pulsed: Pulse duration = 300 µs, duty cycle 1.5 %

(**)Losses Include Also The Tail (Jedec Standardization)

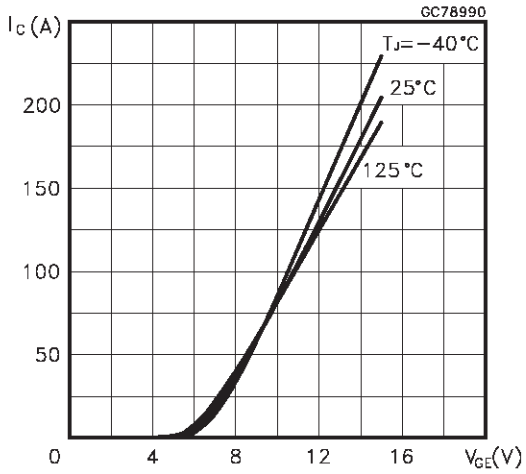
Thermal Impedance



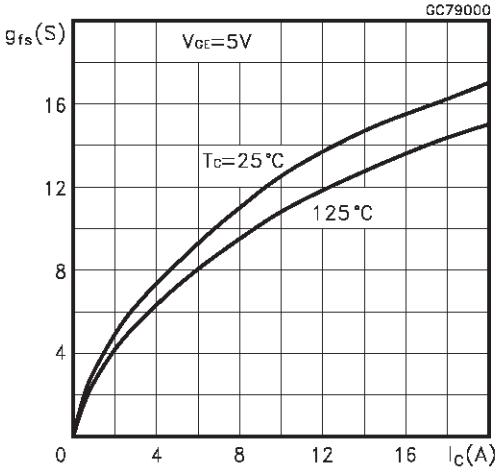
Output Characteristics



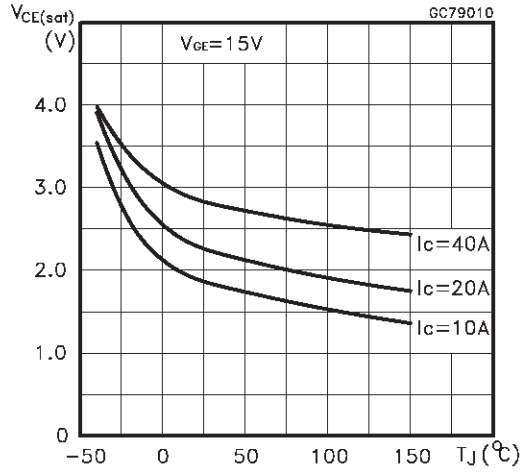
Transfer Characteristics



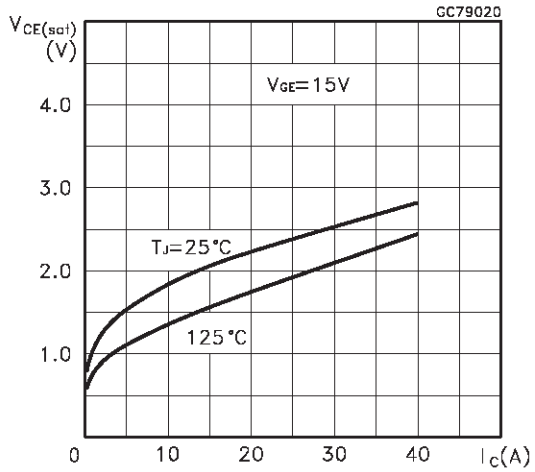
Transconductance



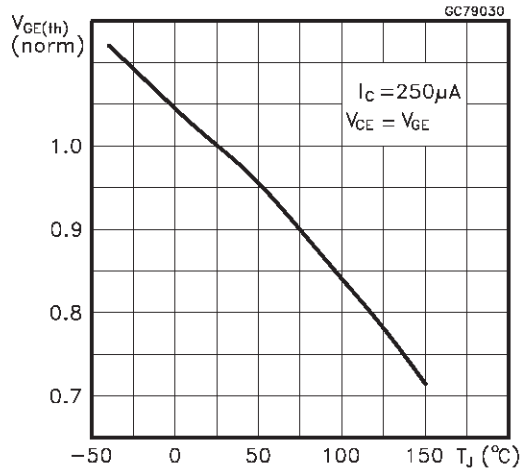
Collector-Emitter On Voltage vs Temperature



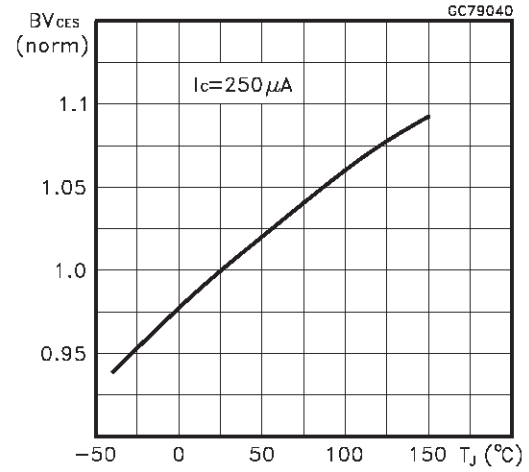
Collector-Emitter On Voltage vs Collector Current



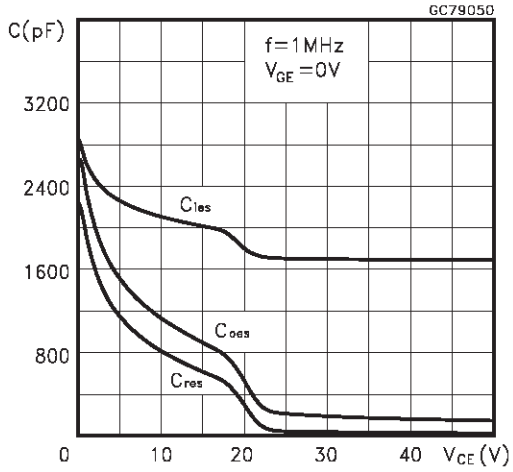
Gate Threshold vs Temperature



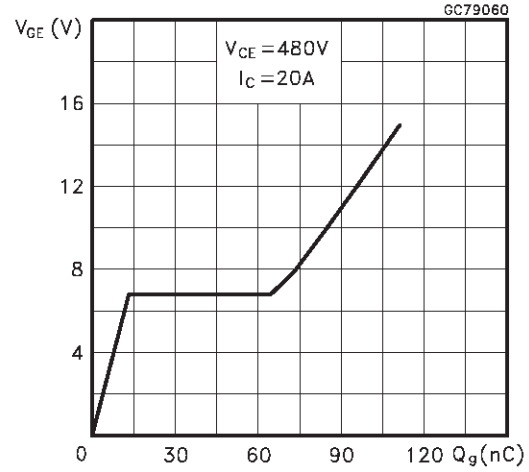
Normalized Breakdown Voltage vs Temperature



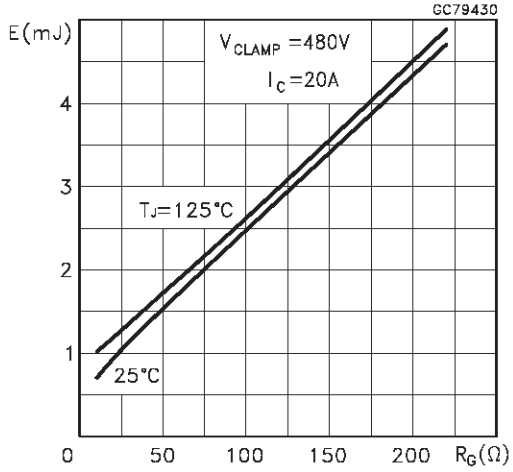
Capacitance Variations



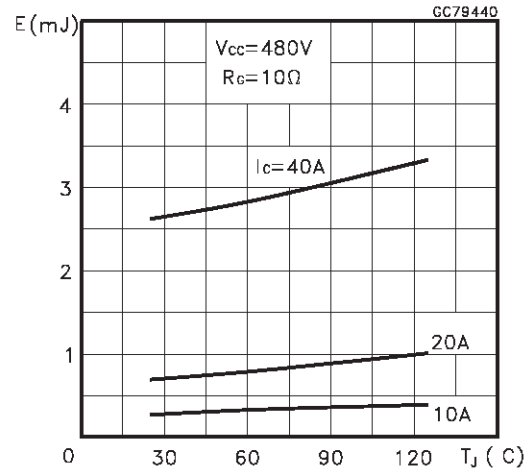
Gate Charge vs Gate-Emitter Voltage



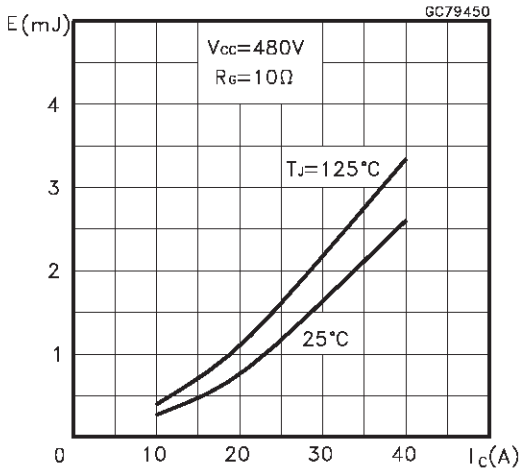
Total Switching Losses vs Gate Resistance



Total Switching Losses vs Temperature



Total Switching Losses vs Collector Current



Switching Off Safe Operating Area

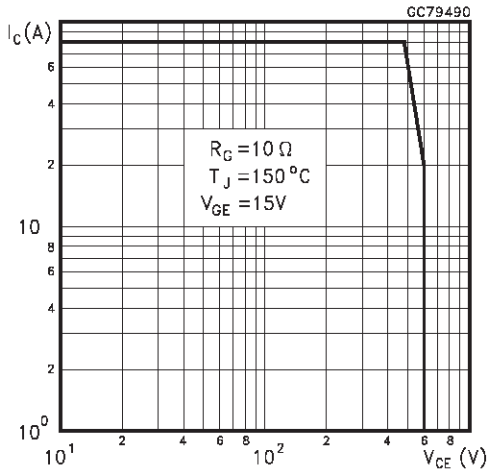
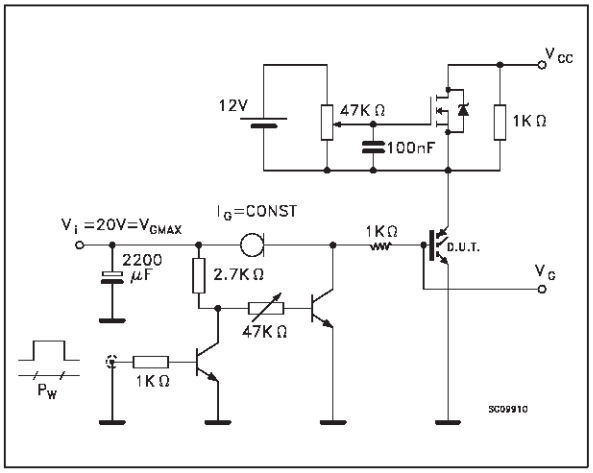


Fig. 1: Gate Charge test Circuit

Fig. 2: Test Circuit For Inductive Load Switching



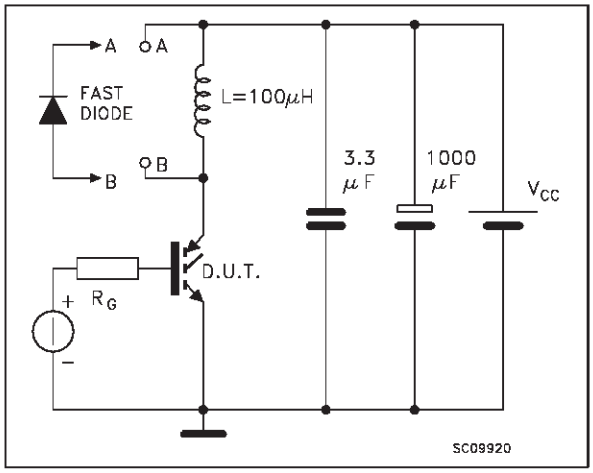
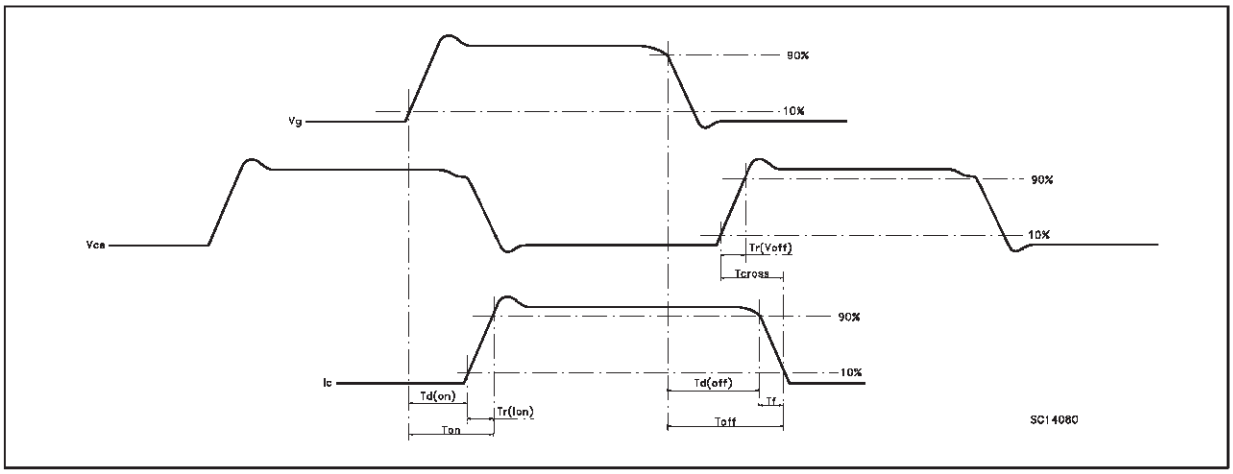
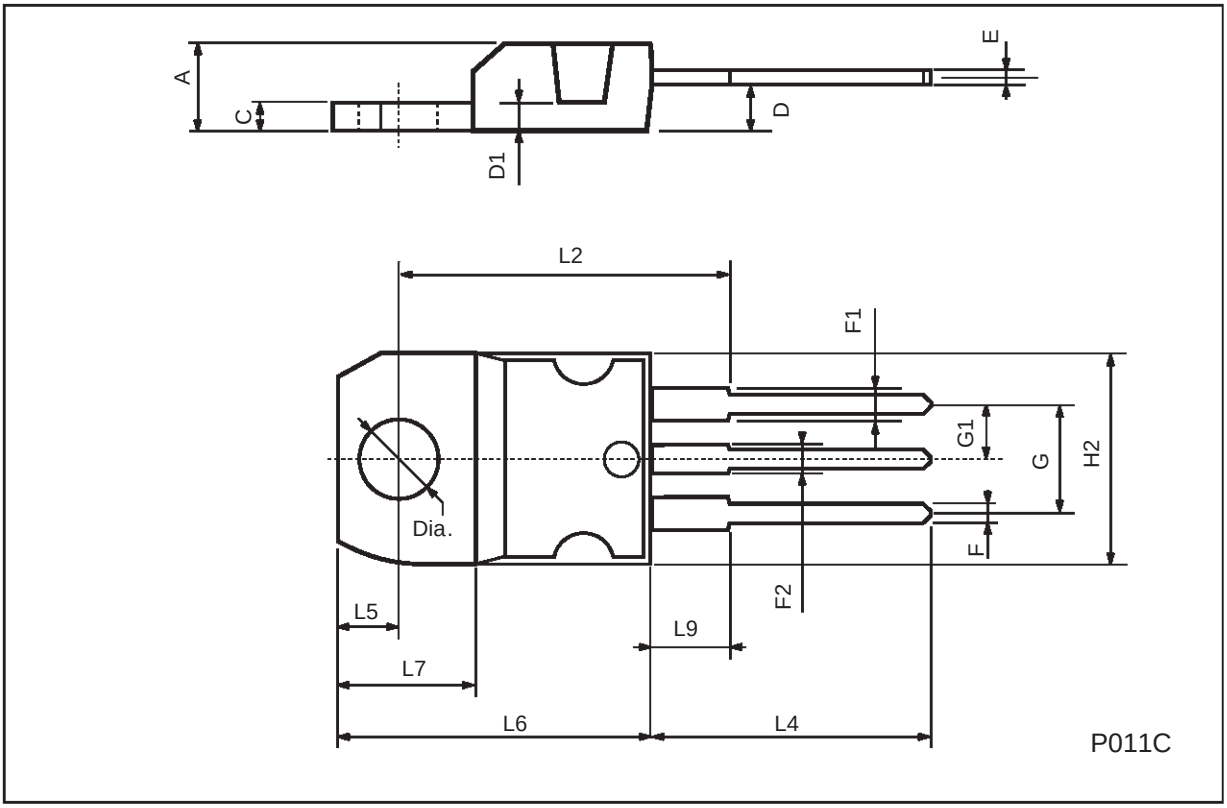


Fig. 3: Switching Waveforms



TO-220 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
C	1.23		1.32	0.048		0.051
D	2.40		2.72	0.094		0.107
D1		1.27			0.050	
E	0.49		0.70	0.019		0.027
F	0.61		0.88	0.024		0.034
F1	1.14		1.70	0.044		0.067
F2	1.14		1.70	0.044		0.067
G	4.95		5.15	0.194		0.203
G1	2.4		2.7	0.094		0.106
H2	10.0		10.40	0.393		0.409
L2		16.4			0.645	
L4	13.0		14.0	0.511		0.551
L5	2.65		2.95	0.104		0.116
L6	15.25		15.75	0.600		0.620
L7	6.2		6.6	0.244		0.260
L9	3.5		3.93	0.137		0.154
DIA.	3.75		3.85	0.147		0.151



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