



STGD7NB60H-1

N-CHANNEL 7A - 600V IPAK PowerMESH™ IGBT

TYPE	V _{CES}	V _{CE(sat)}	I _C
STGD7NB60H-1	600 V	< 2.8 V	7 A

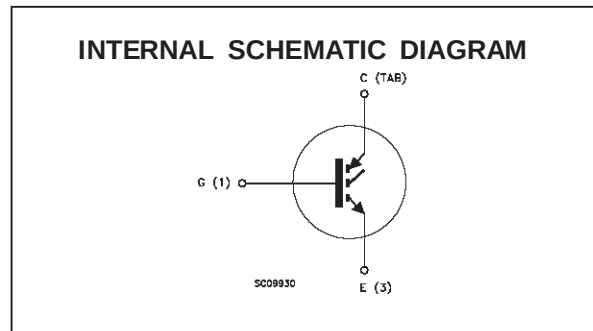
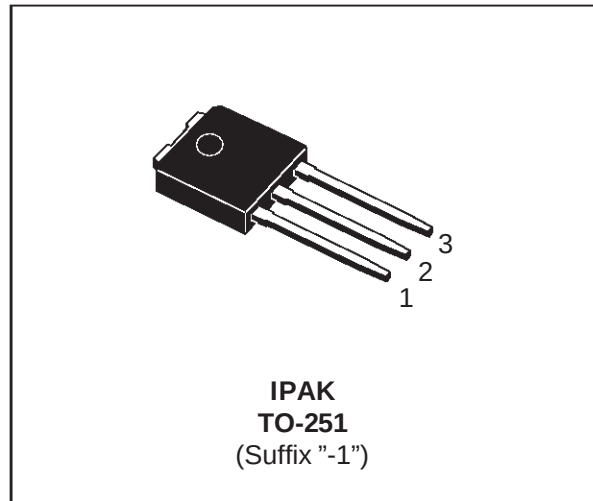
- HIGH INPUT IMPEDANCE (VOLTAGE DRIVEN)
- LOW ON-VOLTAGE DROP (V_{cesat})
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- VERY HIGH FREQUENCY OPERATION
- OFF LOSSES INCLUDE TAIL CURRENT
- THROUGH-HOLE IPAK (TO-251) POWER PACKAGE IN TUBE (SUFFIX "-1")

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 to achieve very low switching times for high frequency applications (<120kHz).

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 _{ECR}	Emitter-Collector Voltage	20	V
V _{GE}	Gate-Emitter Voltage	± 20	V
I _C	Collector Current (continuous) at T _c = 25 °C	14	A
I _C	Collector Current (continuous) at T _c = 100 °C	7	A
I _{CM} (•)	Collector Current (pulsed)	56	A
P _{tot}	Total Dissipation at T _c = 25 °C	55	W
	Derating Factor	0.44	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

$R_{thj-case}$	Thermal Resistance Junction-case	Max	2.27	$^{\circ}C/W$
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	100	$^{\circ}C/W$
$R_{thc-sink}$	Thermal Resistance Case-sink	Typ	1.5	$^{\circ}C/W$

ELECTRICAL CHARACTERISTICS ($T_j = 25^{\circ}C$ unless otherwise specified)

OFF

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

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_{GE(th)}$	Gate Threshold Voltage	$V_{CE} = V_{GE}$ $I_C = 250 \mu A$	3		5	V
$V_{CE(SAT)}$	Collector-Emitter Saturation Voltage	$V_{GE} = 15 V$ $I_C = 7 A$ $V_{GE} = 15 V$ $I_C = 7 A$ $T_j = 125^{\circ}C$		2.3 1.9	2.8	V V

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs}	Forward Transconductance	$V_{CE} = 25 V$ $I_C = 7 A$	3.5	5		S
C_{ies} C_{oes} C_{res}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{CE} = 25 V$ $f = 1 \text{ MHz}$ $V_{GE} = 0$	390 45 10	560 68 15	730 90 20	pF pF pF
Q_G Q_{GE} Q_{GC}	Total Gate Charge Gate-Emitter Charge Gate-Collector Charge	$V_{CE} = 480 V$ $I_C = 7 A$ $V_{GE} = 15 V$		42 7.9 17.6	55	nC nC nC
I_{CL}	Latching Current	$V_{clamp} = 480 V$ $R_G = 10 \Omega$ $T_j = 150^{\circ}C$	28			A

SWITCHING ON

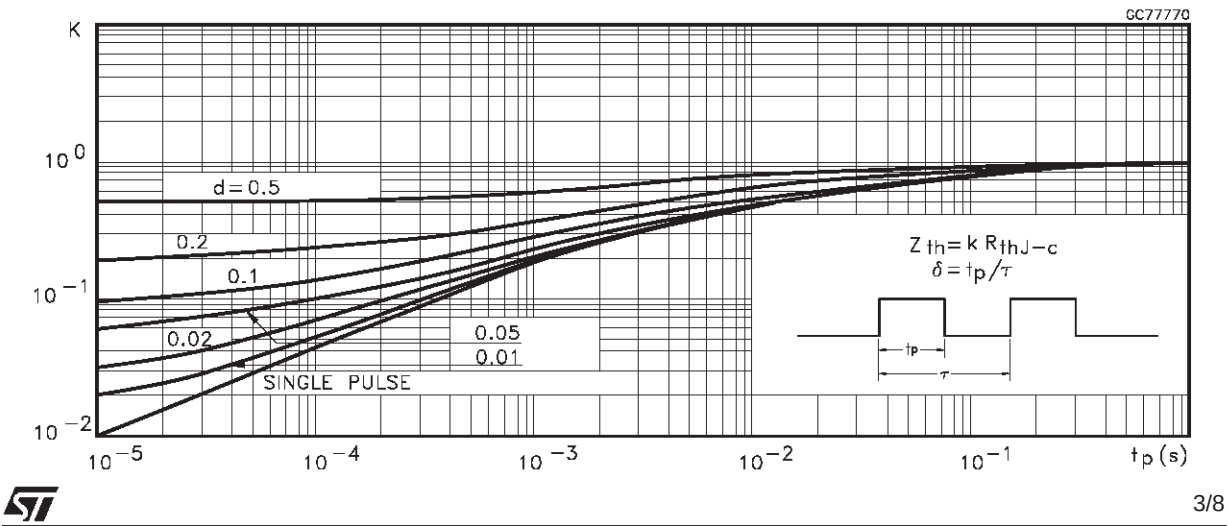
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Delay Time Rise Time	$V_{CC} = 480 V$ $I_C = 7 A$ $V_{GE} = 15 V$ $R_G = 10 \Omega$		15 48		ns ns
$(di/dt)_{on}$	Turn-on Current Slope	$V_{CC} = 480 V$ $I_C = 7 A$ $R_G = 10 \Omega$ $V_{GE} = 15 V$		160		A/ μs
E_{on}	Turn-on Switching Losses	$T_j = 125^{\circ}C$		70		μJ

ELECTRICAL CHARACTERISTICS (continued)
SWITCHING OFF

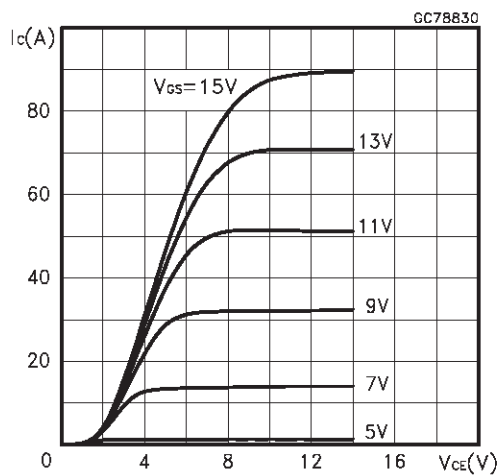
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t_c	Cross-Over Time	$V_{CC} = 480\text{ V}$ $I_C = 7\text{ A}$		85		ns
$t_r(V_{off})$	Off Voltage Rise Time	$R_{GE} = 10\ \Omega$ $V_{GE} = 15\text{ V}$		20		ns
$t_d(off)$	Delay Time			75		ns
t_f	Fall Time			70		ns
$E_{off(**)}$	Turn-off Switching Loss			85		μJ
E_{ts}	Total Switching Loss			130		μJ
t_c	Cross-Over Time	$V_{CC} = 480\text{ V}$ $I_C = 7\text{ A}$		150		ns
$t_r(V_{off})$	Off Voltage Rise Time	$R_{GE} = 10\ \Omega$ $V_{GE} = 15\text{ V}$		50		ns
$t_d(off)$	Delay Time	$T_j = 125\text{ }^\circ\text{C}$		110		ns
t_f	Fall Time			110		ns
$E_{off(**)}$	Turn-off Switching Loss			220		μJ
E_{ts}	Total Switching Loss			290		μJ

(●) Pulse width limited by max. junction temperature
(*) Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %
(**) Losses Include Also The Tail (Jedec Standardization)

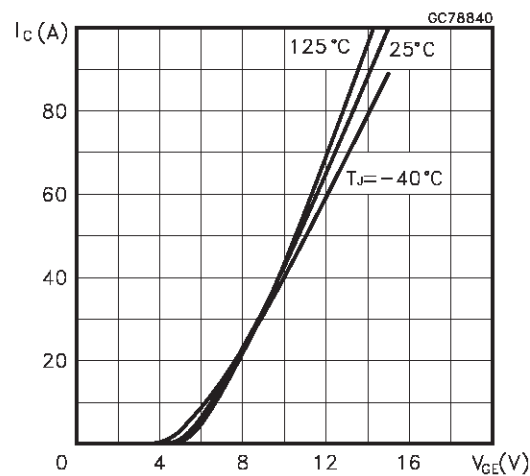
Thermal Impedance



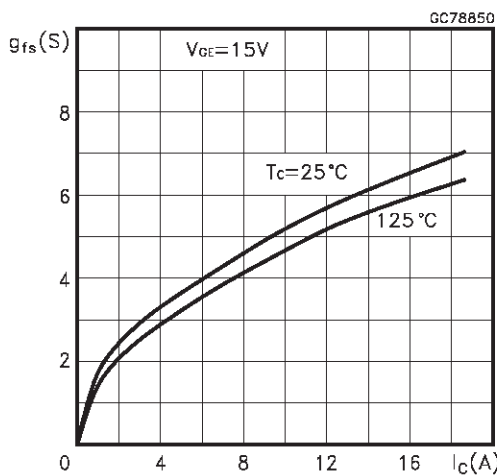
Output Characteristics



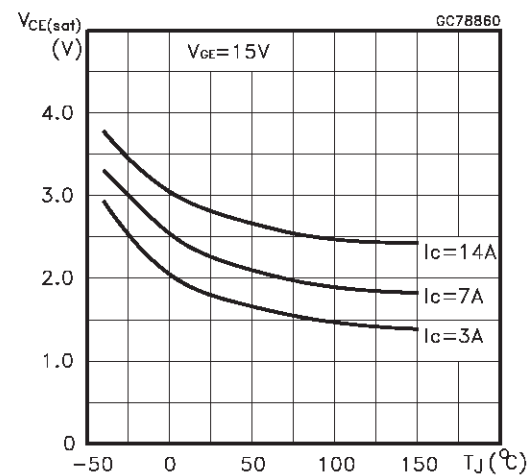
Transfer Characteristics



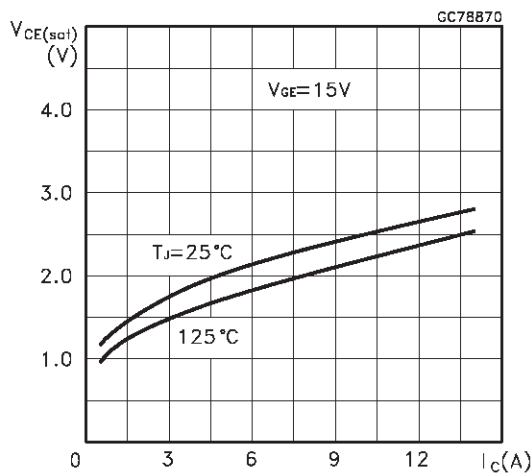
Transconductance



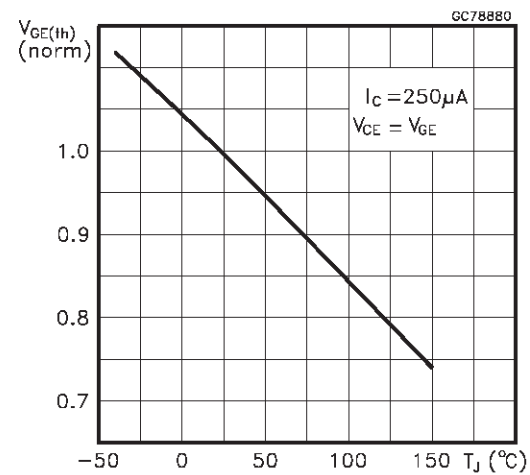
Collector-Emitter On Voltage vs Temperature



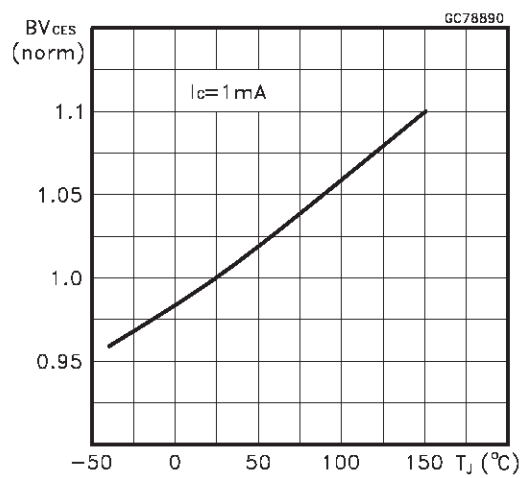
Collector-Emitter On Voltage vs Collector Current



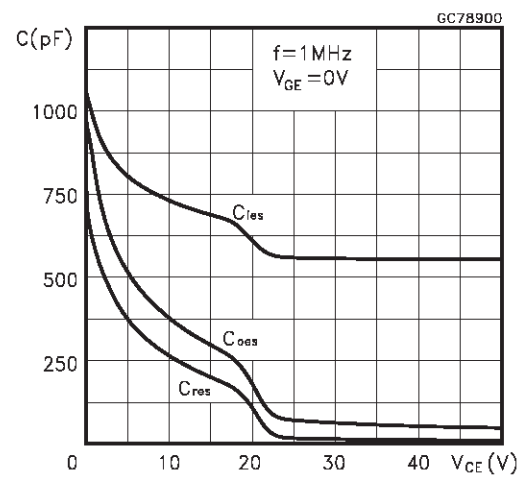
Gate Threshold vs Temperature



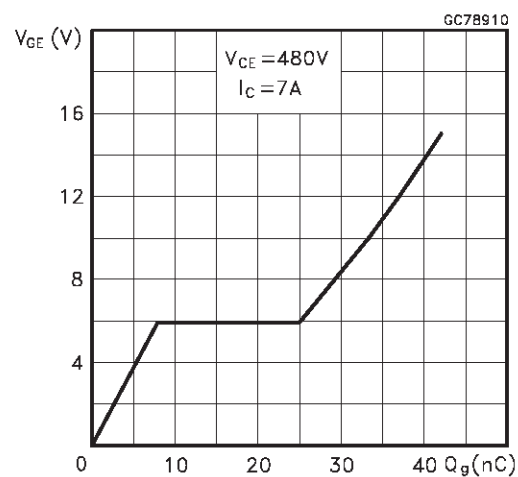
Normalized Breakdown Voltage vs Temperature



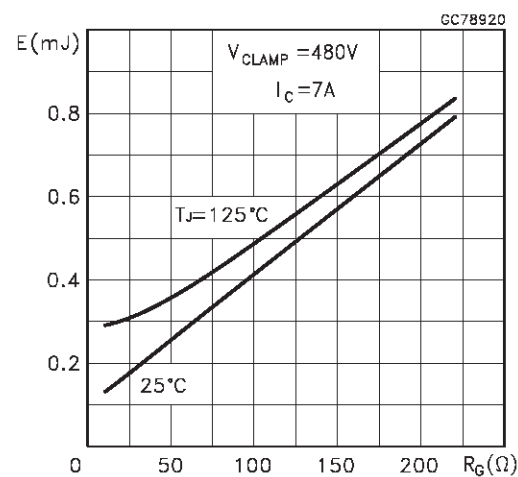
Capacitance Variations



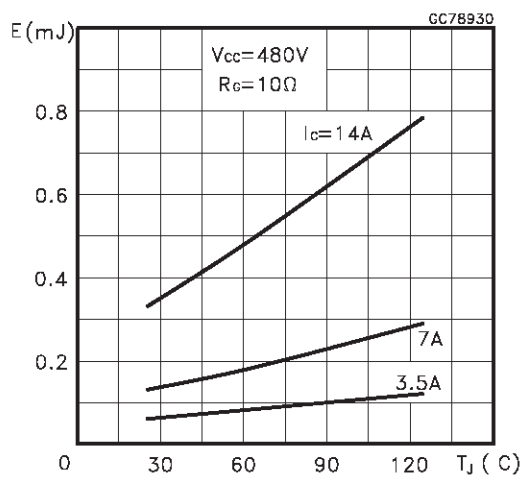
Gate Charge vs Gate-Emitter Voltage



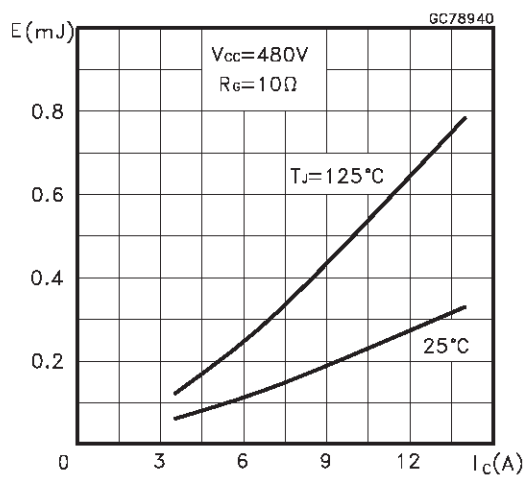
Total Switching Losses vs Gate Resistance



Total Switching Losses vs Temperature



Total Switching Losses vs Collector Current



Switching Off Safe Operating Area

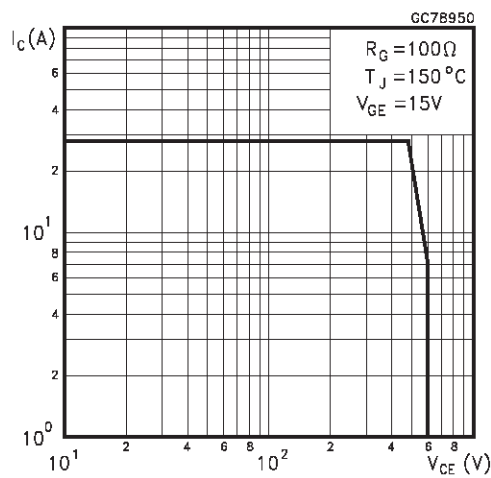


Fig. 1: Gate Charge test Circuit

Fig. 2: Test Circuit For Inductive Load Switching

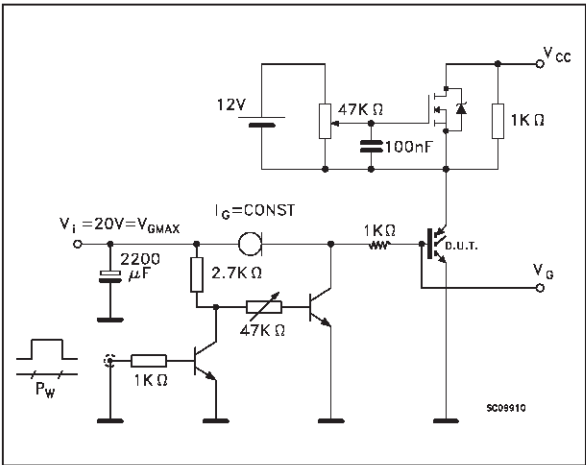
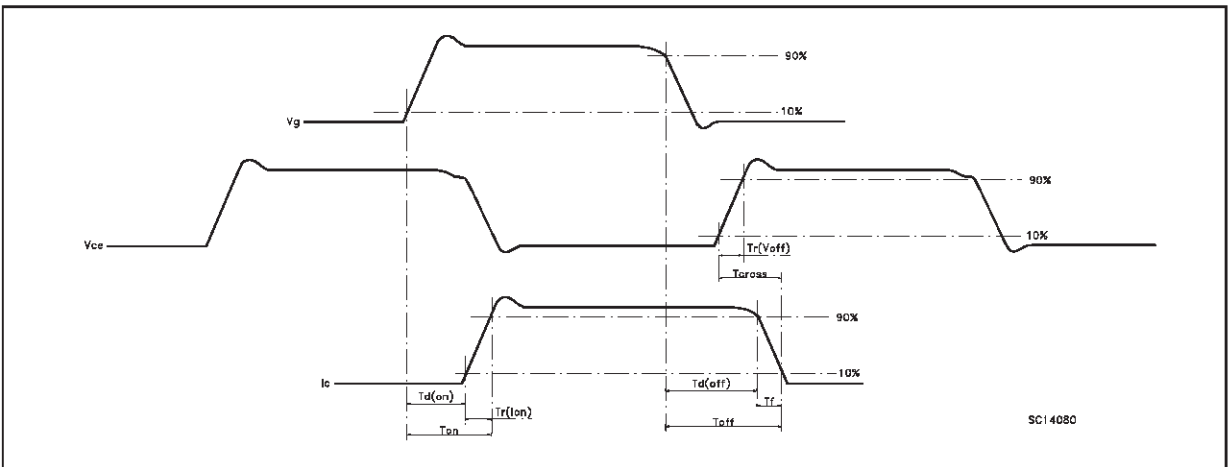
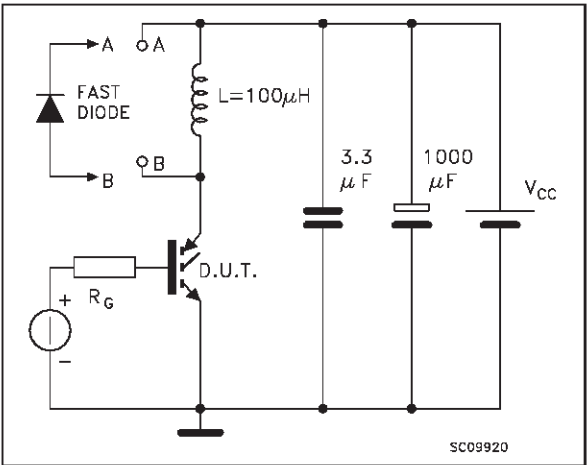
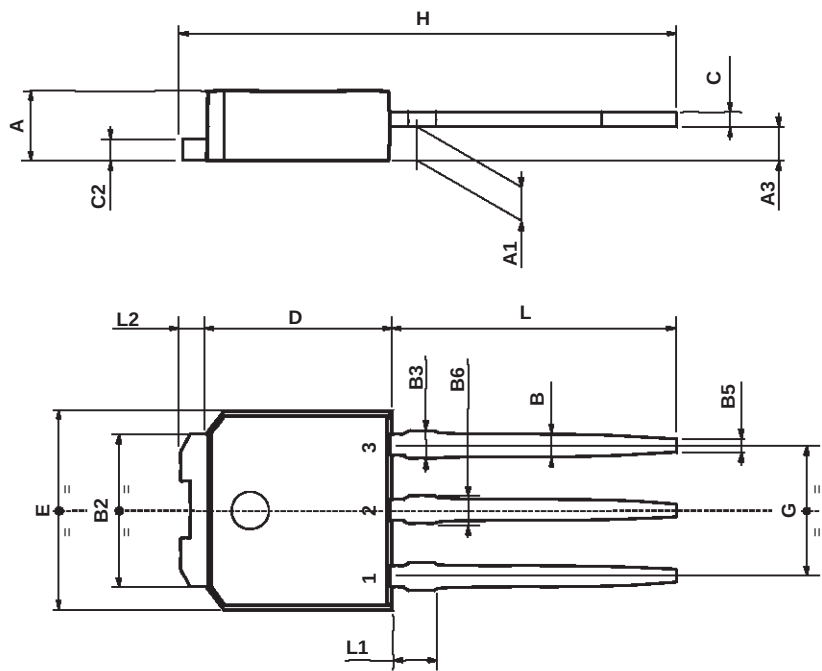


Fig. 3: Switching Waveforms



TO-251 (IPAK) MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	2.2		2.4	0.086		0.094
A1	0.9		1.1	0.035		0.043
A3	0.7		1.3	0.027		0.051
B	0.64		0.9	0.025		0.031
B2	5.2		5.4	0.204		0.212
B3			0.85			0.033
B5		0.3			0.012	
B6			0.95			0.037
C	0.45		0.6	0.017		0.023
C2	0.48		0.6	0.019		0.023
D	6		6.2	0.236		0.244
E	6.4		6.6	0.252		0.260
G	4.4		4.6	0.173		0.181
H	15.9		16.3	0.626		0.641
L	9		9.4	0.354		0.370
L1	0.8		1.2	0.031		0.047
L2		0.8	1		0.031	0.039



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