



STGB3NB60HD

N-CHANNEL 3A - 600V TO-263
PowerMESH™ IGBT

TYPE	V _{CES}	V _{CE(sat)}	I _C
STGB3NB60HD	600 V	< 2.8 V	3 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
- CO-PACKAGED WITH TURBOSWITCH™ ANTIPARALLEL DIODE
- SURFACE-MOUNTING D²PAK (TO-263)
POWER PACKAGE IN TAPE & REEL (SUFFIX "T4")

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).

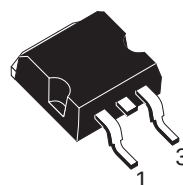
APPLICATIONS

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

ABSOLUTE MAXIMUM RATINGS

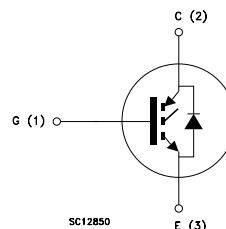
Symbol	Parameter	Value	Unit
V _{CES}	Collector-Emitter Voltage (V _{GS} = 0)	600	V
V _{GE}	Gate-Emitter Voltage	± 20	V
I _C	Collector Current (continuous) at T _c = 25 °C	6	A
I _C	Collector Current (continuous) at T _c = 100 °C	3	A
I _{CM} (•)	Collector Current (pulsed)	24	A
P _{tot}	Total Dissipation at T _c = 25 °C	70	W
	Derating Factor	0.56	W/°C
T _{stg}	Storage Temperature	-65 to 150	°C
T _j	Max. Operating Junction Temperature	150	°C

(•) Pulse width limited by max. junction temperature



**D²PAK
TO-263**
(Suffix "T4")

INTERNAL SCHEMATIC DIAGRAM



STGB3NB60HD

THERMAL DATA

R _{thj-case}	Thermal Resistance Junction-case	Max	1.78	°C/W
R _{thj-amb}	Thermal Resistance Junction-ambient	Max	62.5	°C/W
R _{thc-sink}	Thermal Resistance Case-sink	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			100 1000	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 = 3 A V _{GE} = 15 V I _C = 3 A T _j = 125 °C		2.4 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 = 3 A	1.3	2.4		S
C _{ies} C _{oes} C _{res}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V _{CE} = 25 V f = 1 MHz V _{GE} = 0	160 23 4.5	235 33 6.6	300 43 8.6	pF pF pF
Q _G Q _{GE} Q _{GC}	Total Gate Charge Gate-Emitter Charge Gate-Collector Charge	V _{CE} = 480 V I _C = 3 A V _{GE} = 15 V		21 6 7.6	27	nC nC nC
I _{CL}	Latching Current	V _{clamp} = 480 V R _G = 10Ω T _j = 150 °C	12			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 = 3 A V _{GE} = 15 V R _G = 10Ω		16 30		ns ns
(di/dt) _{on}	Turn-on Current Slope	V _{CC} = 480 V I _C = 3 A R _G = 10 Ω V _{GE} = 15 V		400		A/µs
E _{on(○)}	Turn-on Switching Losses	T _j = 125 °C		77		µJ

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING OFF

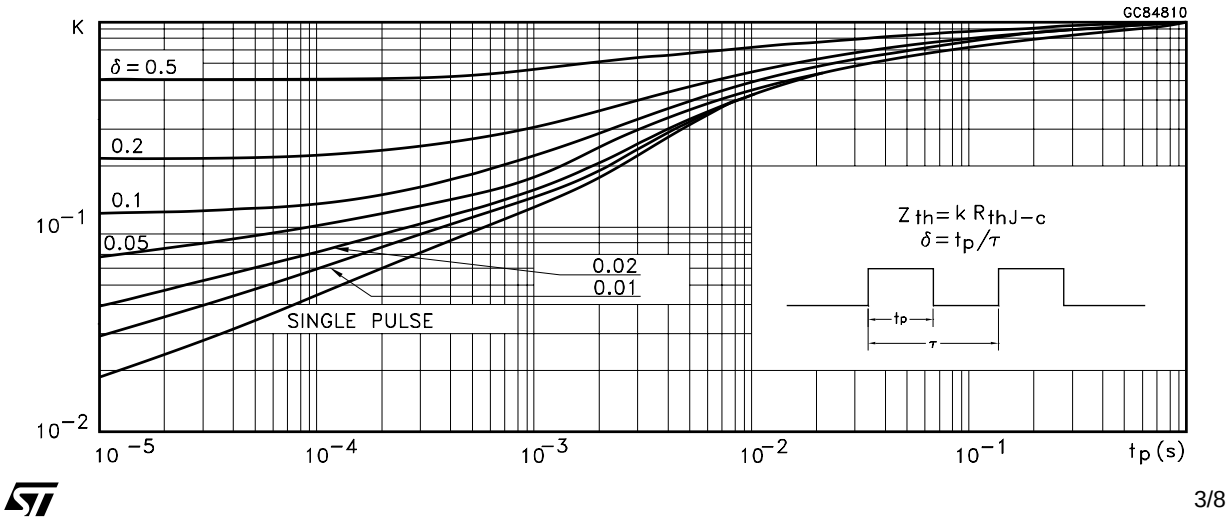
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t_c	Cross-Over Time	$V_{CC} = 480\text{ V}$ $I_C = 3\text{ A}$		90		ns
$t_r(V_{off})$	Off Voltage Rise Time	$R_{GE} = 10\ \Omega$ $V_{GE} = 15\text{ V}$		36		ns
$t_d(off)$	Delay Time			53		ns
t_f	Fall Time			70		ns
$E_{off}(^{**})$	Turn-off Switching Loss			33		μJ
$E_{ts}(^{\circ})$	Total Switching Loss			100		μJ
t_c	Cross-Over Time	$V_{CC} = 480\text{ V}$ $I_C = 3\text{ A}$		180		ns
$t_r(V_{off})$	Off Voltage Rise Time	$R_{GE} = 10\ \Omega$ $V_{GE} = 15\text{ V}$		82		ns
$t_d(off)$	Delay Time	$T_j = 125\text{ }^{\circ}\text{C}$		58		ns
t_f	Fall Time			110		ns
$E_{off}(^{**})$	Turn-off Switching Loss			88		μJ
$E_{ts}(^{\circ})$	Total Switching Loss			165		μJ

COLLECTOR-EMITTER DIODE

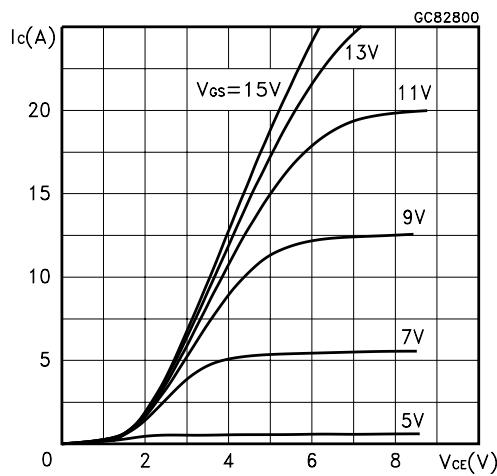
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_f	Forward Current				3	A
I_{fm}	Forward Current pulsed				24	A
V_f	Forward On-Voltage	$I_f = 3\text{ A}$ $I_f = 3\text{ A}$ $T_j = 125\text{ }^{\circ}\text{C}$		1.6 1.4	2.0	V V
t_{rr}	Reverse Recovery Time	$I_f = 3\text{ A}$ $dI/dt = 100\text{ A}/\mu\text{S}$ $V_R = 200\text{ V}$ $T_j = 125\text{ }^{\circ}\text{C}$		87		ns
Q_{rr}	Reverse Recovery Charge			160		nC
I_{rrm}	Reverse Recovery Current			3.7		A

(●) Pulse width limited by max. junction temperature
 (°) Include recovery losses on the STTA306 freewheeling diode
 (*) Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %
 (**) Losses Include Also The Tail (Jedec Standardization)

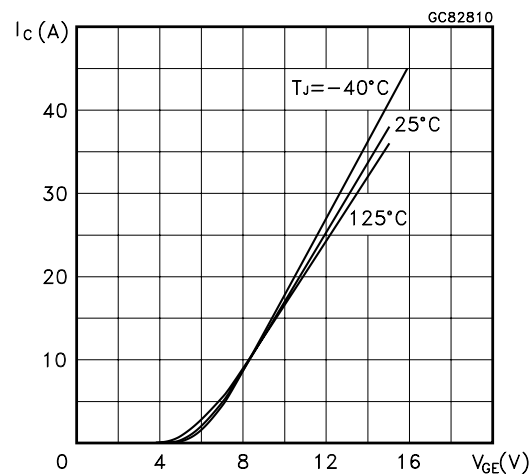
Thermal Impedance



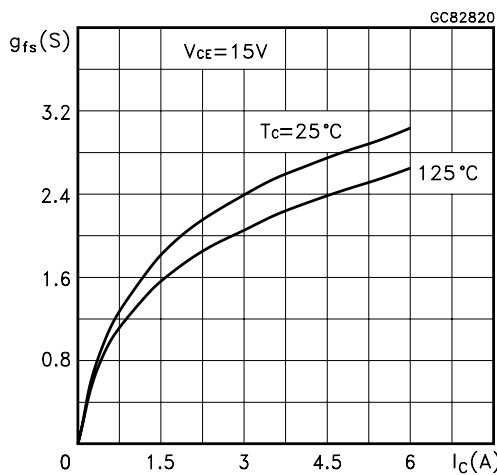
Output Characteristics



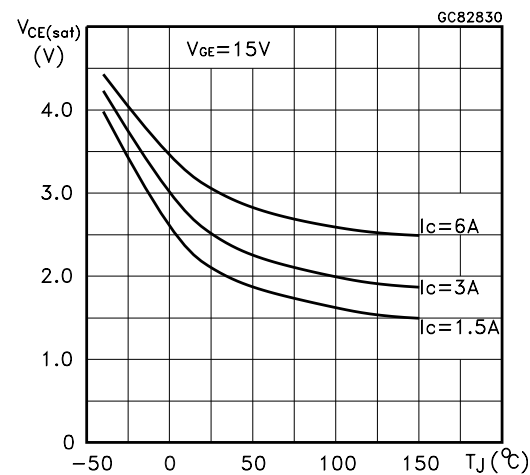
Transfer Characteristics



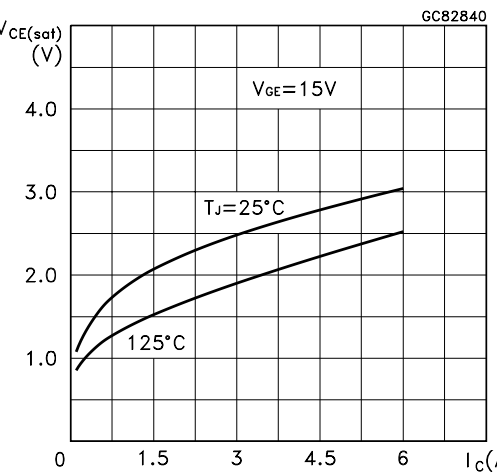
Transconductance



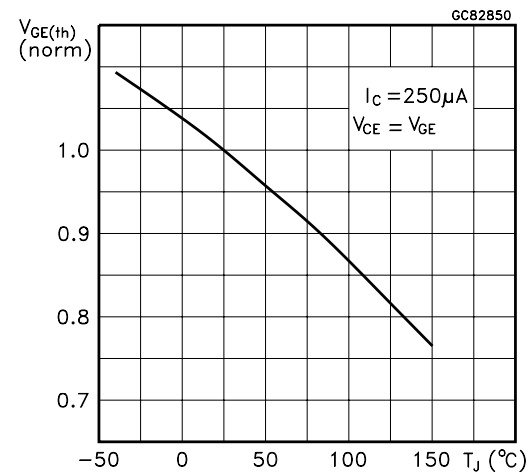
Collector-Emitter On Voltage vs Temperature



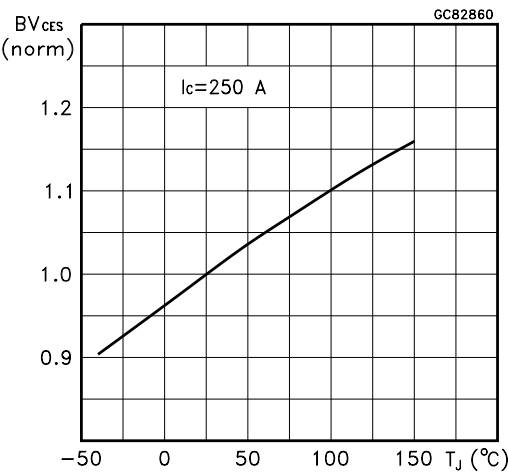
Collector-Emitter On Voltage vs Collector Current



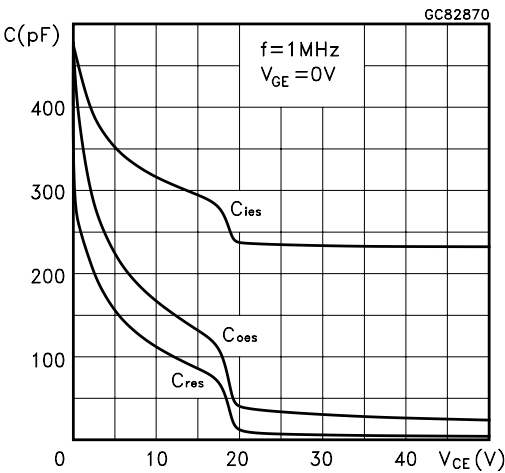
Gate Threshold vs Temperature



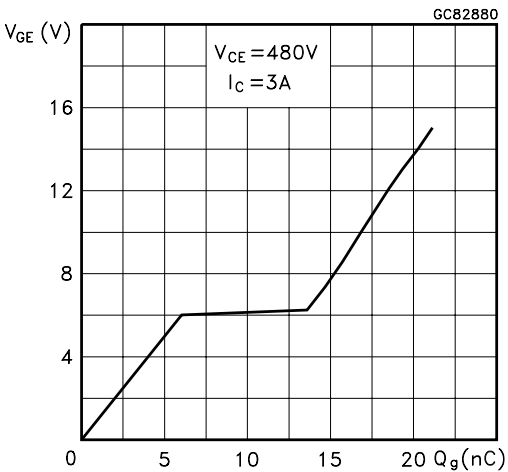
Normalized Breakdown Voltage vs Temperature



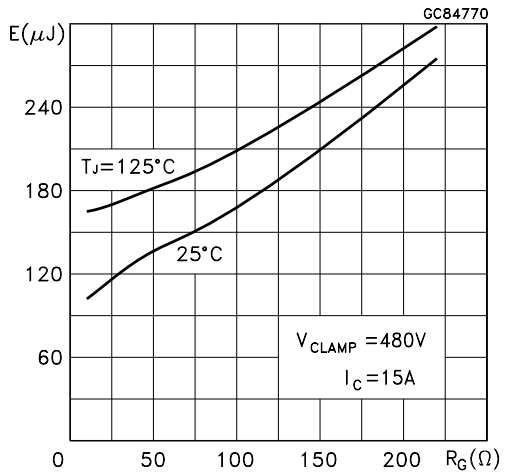
Capacitance Variations



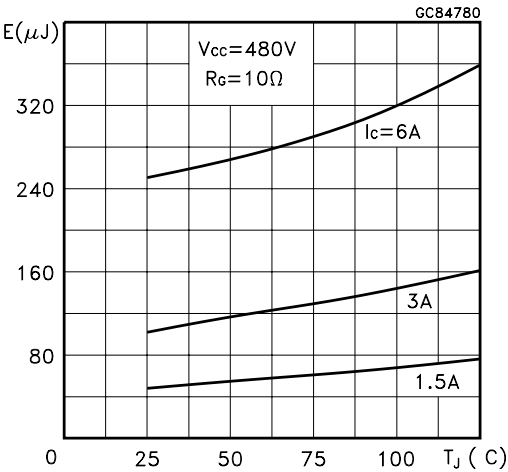
Gate Charge vs Gate-Emitter Voltage



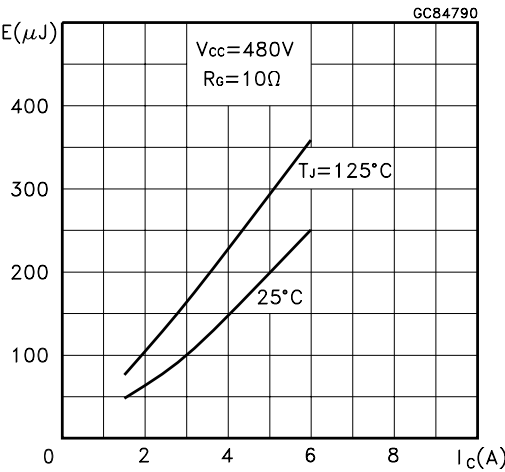
Total Switching Losses vs Gate Resistance



Total Switching Losses vs Temperature



Total Switching Losses vs Collector Current



Switching Off Safe Operating Area

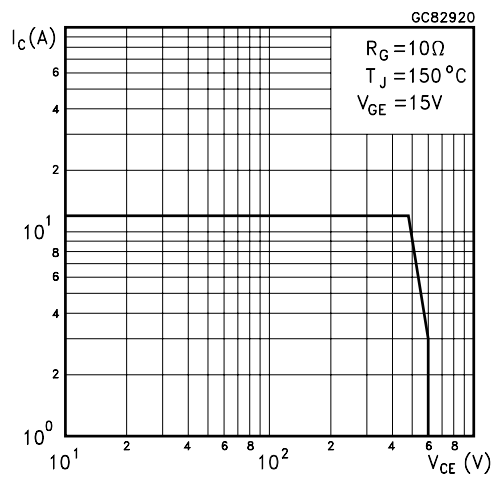


Fig. 1: Gate Charge test Circuit

Diode Forward Voltage

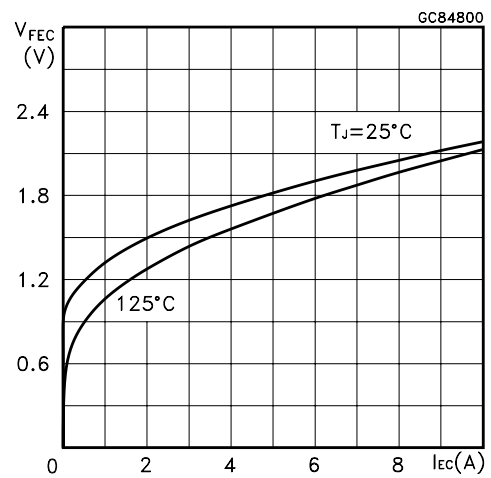


Fig. 2: Test Circuit For Inductive Load Switching

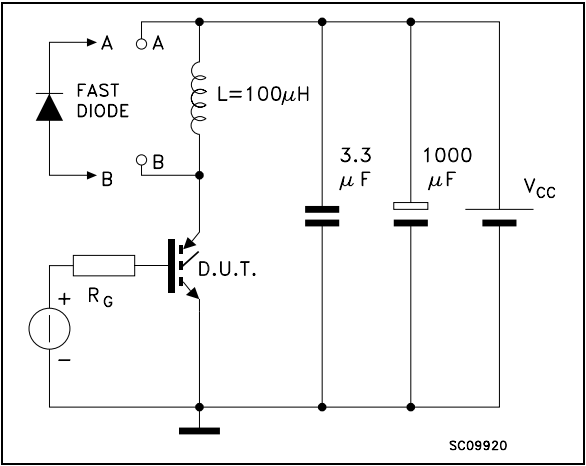
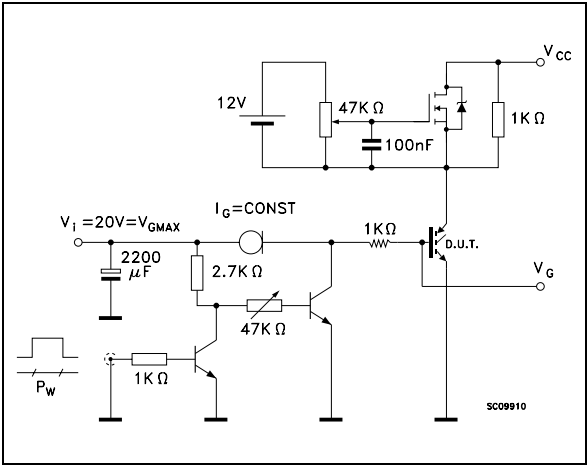
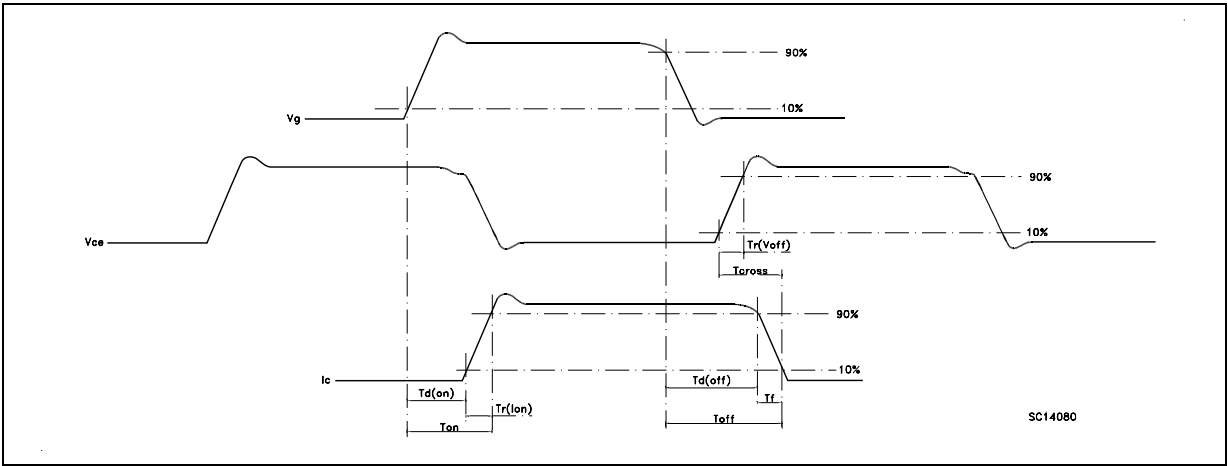
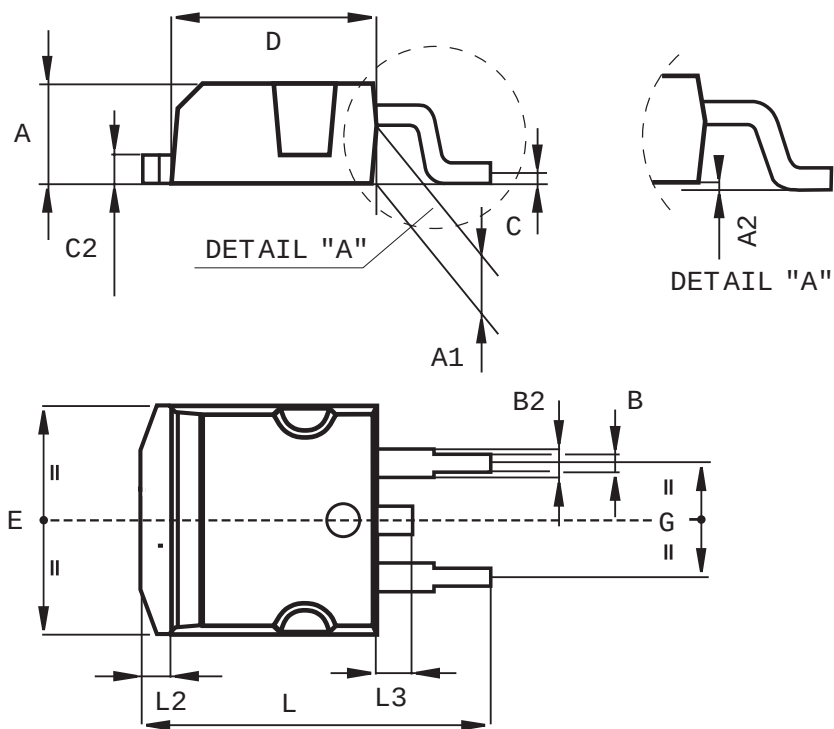


Fig. 3 Switching Waveforms



TO-263 (D²PAK) MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
A1	2.49		2.69	0.098		0.106
B	0.7		0.93	0.027		0.036
B2	1.14		1.7	0.044		0.067
C	0.45		0.6	0.017		0.023
C2	1.21		1.36	0.047		0.053
D	8.95		9.35	0.352		0.368
E	10		10.4	0.393		0.409
G	4.88		5.28	0.192		0.208
L	15		15.85	0.590		0.624
L2	1.27		1.4	0.050		0.055
L3	1.4		1.75	0.055		0.068



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