



STGY50NB60HD

N-CHANNEL 50A - 600V MAX247 PowerMESH™ IGBT

PRELIMINARY DATA

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

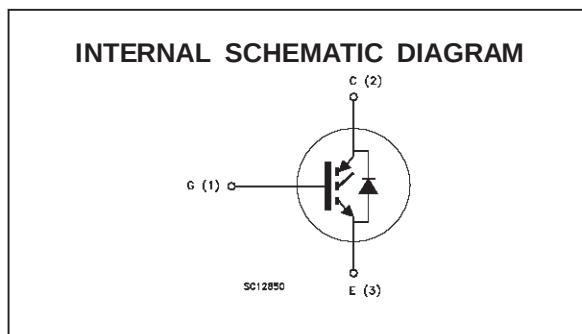
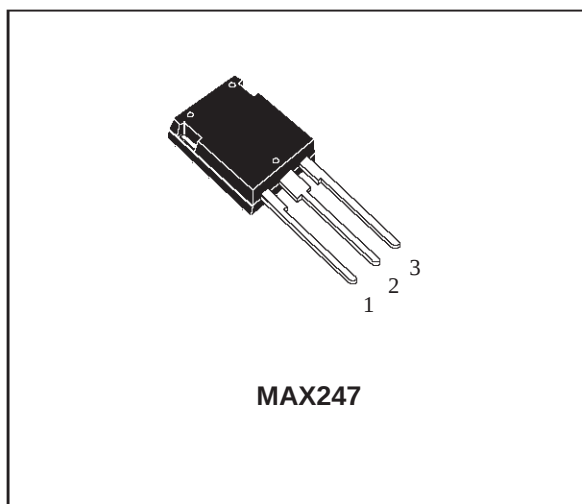
- HIGH INPUT IMPEDANCE (VOLTAGE DRIVEN)
- LOW ON-VOLTAGE DROP (V_{CESAT})
- LOW GATE CHARGE
- HIGH CURRENT CAPABILITY
- VERY HIGH FREQUENCY OPERATION
- OFF LOSSES INCLUDE TAIL CURRENT
- CO-PACKAGED WITH TURBOSWITCH™ ANTIPARALLEL DIODE

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 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



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

$R_{thj-case}$	Thermal Resistance Junction-case	Max	0.5	$^{\circ}C/W$
$R_{thj-amb}$	Thermal Resistance Junction-ambient	Max	30	$^{\circ}C/W$
R_{thc-h}	Thermal Resistance Case-heatsink	Typ	0.1	$^{\circ}C/W$

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 ($V_{GE} = 0$)	$V_{CE} = \text{Max Rating}$ $T_j = 25^{\circ}C$ $V_{CE} = \text{Max Rating}$ $T_j = 125^{\circ}C$			100 1000	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	$V_{GE} = 15 V$ $I_C = 50 A$ $V_{GE} = 15 V$ $I_C = 50 A$ $T_j = 125^{\circ}C$		2.3 1.9	2.8	V V

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g_{fs}	Forward Transconductance	$V_{CE} = 25 V$ $I_C = 50 A$		22		S
C_{ies} C_{oes} C_{res}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	$V_{CE} = 25 V$ $f = 1 \text{ MHz}$ $V_{GE} = 0$		4500 450 90		pF pF pF
Q_G Q_{GE} Q_{GC}	Total Gate Charge Gate-Emitter Charge Gate-Collector Charge	$V_{CE} = 480 V$ $I_C = 50 A$ $V_{GE} = 15 V$		260 28 15		nC nC nC
I_{CL}	Latching Current	$V_{clamp} = 480 V$ $R_G = 10 \Omega$ $T_j = 150^{\circ}C$	200			A

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Delay Time Rise Time	$V_{CC} = 480 V$ $I_C = 50 A$ $V_{GE} = 15 V$ $R_G = 10 \Omega$		20 70		ns ns
$(di/dt)_{on}$	Turn-on Current Slope	$V_{CC} = 480 V$ $I_C = 50 A$ $R_G = 10 \Omega$ $V_{GE} = 15 V$		350		A/ μs
$E_{on(\gamma)}$	Turn-on Switching Losses	$T_j = 125^{\circ}C$		950		μJ

ELECTRICAL CHARACTERISTICS (continued)**SWITCHING OFF**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
t_c	Cross-Over Time	$V_{CC} = 480 \text{ V}$ $I_C = 50 \text{ A}$		166		ns
$t_r(V_{off})$	Off Voltage Rise Time	$R_{GE} = 10 \text{ } \Omega$ $V_{GE} = 15 \text{ V}$		48		ns
$t_d(off)$	Delay Time			326		ns
t_f	Fall Time			90		ns
$E_{off}(^{**})$	Turn-off Switching Loss			2.1		mJ
$E_{ts}(^{\circ})$	Total Switching Loss			3		mJ
t_c	Cross-Over Time	$V_{CC} = 480 \text{ V}$ $I_C = 50 \text{ A}$		270		ns
$t_r(V_{off})$	Off Voltage Rise Time	$R_{GE} = 10 \text{ } \Omega$ $V_{GE} = 15 \text{ V}$		75		ns
$t_d(off)$	Delay Time	$T_j = 125 \text{ } ^\circ\text{C}$		340		ns
t_f	Fall Time			200		ns
$E_{off}(^{**})$	Turn-off Switching Loss			2.9		mJ
$E_{ts}(^{\circ})$	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	$I_f = 50 \text{ A}$				V
		$I_f = 50 \text{ A}$ $T_j = 125 \text{ } ^\circ\text{C}$		2		V
t_{rr}	Reverse Recovery Time	$I_f = 50 \text{ A}$ $V_R = 200 \text{ V}$		200		nS
Q_{rr}	Reverse Recovery Charge	$dI/dt = 100 \text{ A}/\mu\text{S}$ $T_j = 125 \text{ } ^\circ\text{C}$				nC
I_{rrm}	Reverse Recovery Current					A

(●) Pulse width limited by max. junction temperature

($\circ$) Include recovery losses on the STTA2006 freewheeling diode

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

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

Fig. 1: Gate Charge test Circuit

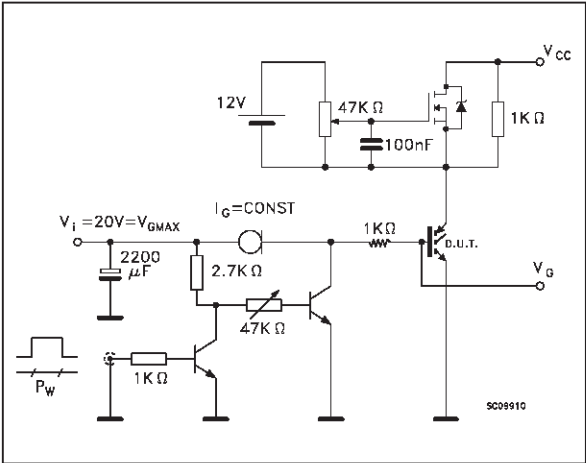


Fig. 2: Test Circuit For Inductive Load Switching

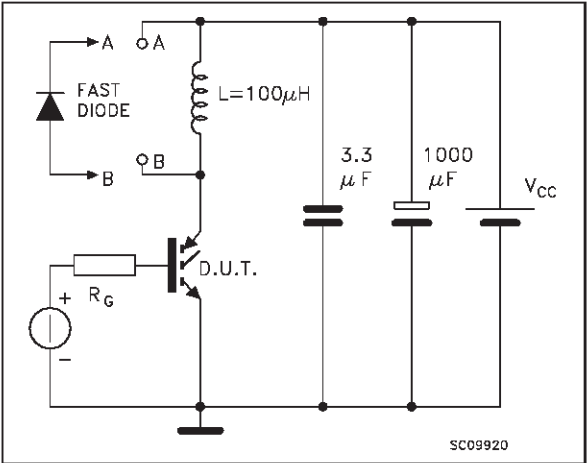
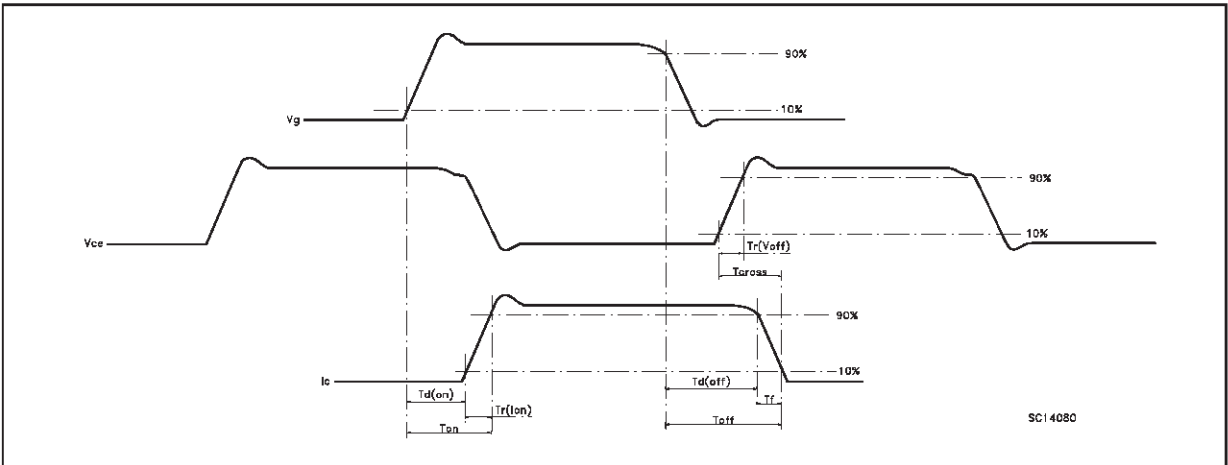
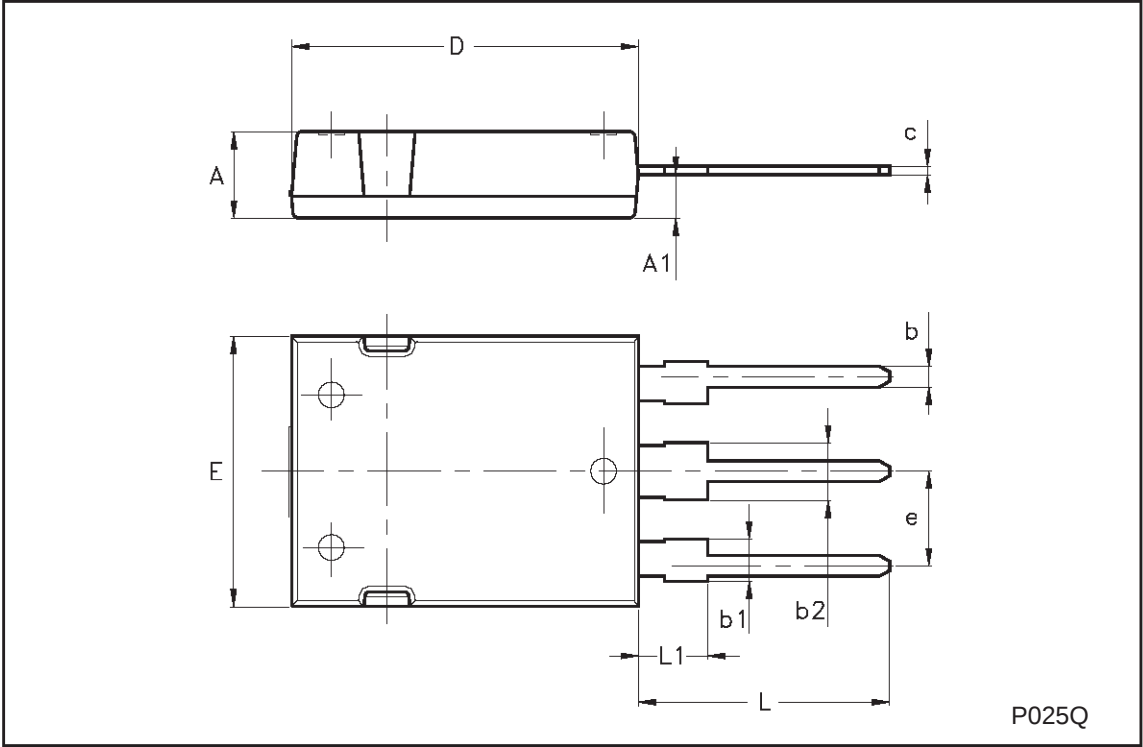


Fig. 3: Switching Waveforms



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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