STGY50NC60WD

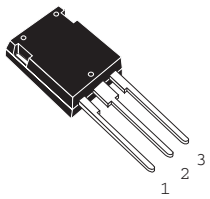
N-channel 600V - 50A - Max247
Very fast PowerMESH™ IGBT

PRELIMINARY DATA

General features

Type	V_{CES}	$V_{CE(sat)}$ (max)@25°C	I_C @100°C
STGY50NC60WD	600V	< 2.5V	50A

- High frequency operation
- Low C_{RES} / C_{IES} ratio (no cross-conduction susceptbility)
- Very soft ultra fast recovery antiparallel diode

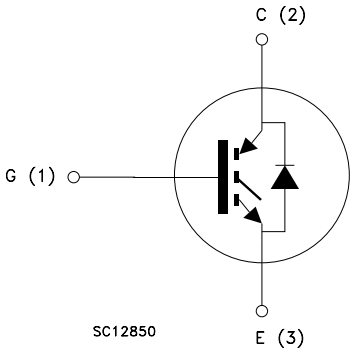


Max247

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 “W” identifies a family optimized for very high frequency application.

Internal schematic diagram



Applications

- High frequency inverters
- SMPS and PFC in both hard switch and resonant topologies
- Motor drivers, UPS

Order codes

Part number	Marking	Package	Packaging
STGY50NC60WD	GY50NC60WD	Max247	Tube

Contents

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{CES}	Collector-emitter voltage (V_{GS} = 0)	600	V
I_C (1)	Collector current (continuous) at T_C = 25°C	80	A
I_C (1)	Collector current (continuous) at T_C = 100°C	50	A
I_{CM} (2)	Collector current (pulsed)	190	A
I_F	Diode RMS forward current at T_C = 25°C	30	A
V_{GE}	Gate-emitter voltage	±20	V
P_{TOT}	Total dissipation at T_C = 25°C	260	W
T_{stg}	Storage temperature	– 55 to 150	°C
T_j	Operating junction temperature		

1. Calculated according to the iterative formula:

$$I_{C(T_C)} = \frac{T_{JMAX} - T_C}{R_{THJ-C} \times V_{CESAT(MAX)(T_C,\ I_C)}}$$

2. Pulse width limited by max junction temperature

Table 2. Thermal resistance

Symbol	Parameter	Value	Unit
Rthj-case	Thermal resistance junction-case max IGBT	0.48	°C/W
Rthj-case	Thermal resistance junction-case max diode	1.5	°C/W
Rthj-amb	Thermal resistance junction-ambient max	50	°C/W
T_L (1)	Maximum lead temperature for soldeing purpose	300	°C

1. 1.6mm from case, for 10sec

2 Electrical characteristics

(T_{CASE}=25°C unless otherwise specified)

Table 3. Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{BR(CES)}$	Collector-emitter breakdown voltage	I_C= 1mA, V_{GE}= 0	600			V
$V_{CE(sat)}$	Collector-emitter saturation voltage	V_{GE}= 15V, I_C= 40A V_{GE}= 15V, I_C=40A,Tc=125°C		1.9 1.7	2.5	V V
$V_{GE(th)}$	Gate threshold voltage	V_{CE}= V_{GE}, I_C= 250µA	3.75		5.75	V
I_{CES}	Collector cut-off current (V_{GE} = 0)	V_{GE}= Max rating,T_C= 25°C V_{GE}= Max rating,T_C= 125°C			250 1	µA mA
I_{GES}	Gate-emitter leakage current (V_{CE} = 0)	V_{GE}= ±20V , V_{CE}= 0			±100	nA
g_{fs}	Forward transconductance	V_{CE} = 15V, I_C= 20A		20		S

Table 4. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{ies} C_{oes} C_{res}	Input capacitance Output capacitance Reverse transfer capacitance	V_{CE} = 25V, f = 1MHz, V_{GE} = 0		4700 410 90		pF pF pF
Q_g Q_{ge} Q_{gc}	Total gate charge Gate-emitter charge Gate-collector charge	V_{CE} = 390V, I_C = 40A, V_{GE} = 15V, *Figure 2*		155 32.4 82.2		nC nC nC

Table 5. Switching on/off (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r $(di/dt)_{on}$	Turn-on delay time Current rise time Turn-on current slope	V_{CC} = 390V, I_C = 40A R_G= 10Ω, V_{GE}= 15V, *Figure 3*		52 17 2400		ns ns A/µs
$t_{d(on)}$ t_r $(di/dt)_{on}$	Turn-on delay time Current rise time Turn-on current slope	V_{CC} = 390V, I_C = 40A R_G= 10Ω, V_{GE}= 15V, Tj = 125°C *Figure 3*		50 19 2000		ns ns A/µs
$t_{r(Voff)}$ $t_{d(Voff)}$ t_f	Off voltage rise time Turn-off delay time Current fall time	V_{CC} = 390V, I_C = 40A R_G= 10Ω, V_{GE}= 15V, *Figure 3*		31 240 35		ns ns ns
$t_{r(Voff)}$ $t_{d(Voff)}$ t_f	Off voltage rise time Turn-off delay time Current fall time	V_{CC} = 390V, I_C = 40A R_G= 10Ω, V_{GE}= 15V, Tj = 125°C *Figure 3*		60 280 63		ns ns ns

Table 6. Switching energy (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
E_{on} (1) E_{off} (2) E_{ts}	Turn-on switching losses Turn-off switching losses Total switching losses	V_{CC} = 390V, I_C = 40A R_G= 10Ω, V_{GE}= 15V, *Figure 1*		365 560 925	470 790 1260	µJ µJ µJ
E_{on} (1) E_{off} (2) E_{ts}	Turn-on switching losses Turn-off switching losses Total switching losses	V_{CC} = 390V, I_C = 40A R_G= 10Ω, V_{GE}= 15V, Tj = 125°C *Figure 1*		635 910 1545		µJ µJ µJ

1. Eon is the tun-on losses when a typical diode is used in the test circuit in *Figure 4* If the IGBT is offered in a package with a co-pak diode, the co-pack diode is used as external diode. IGBTs & Diode are at the same temperature (25°C and 125°C)
2. Turn-off losses include also the tail of the collector current

Table 7. Collector-emitter diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_f	Forward on-voltage	I_f = 20A I_f = 20A, Tj = 125°C		1.5 1	2.2	V V
t_{rr} Q_{rr} I_{rrm}	Reverse recovery time Reverse recovery charge Reverse recovery current	I_f = 20A ,V_R = 40V, Tj = 25°C, di/dt = 100 A/µs *Figure 4*		44 66 3		ns nC A
t_{rr} Q_{rr} I_{rrm}	Reverse recovery time Reverse recovery charge Reverse recovery current	I_f = 12A ,V_R = 40V, Tj =125°C, di/dt = 100A/µs *Figure 4*		88 237 5.4		ns nC A

3 Test circuit

Figure 1. Test circuit for inductive load switching

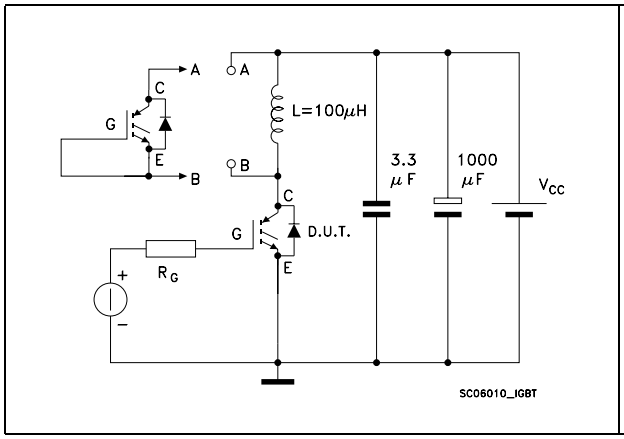


Figure 2. Gate charge test circuit

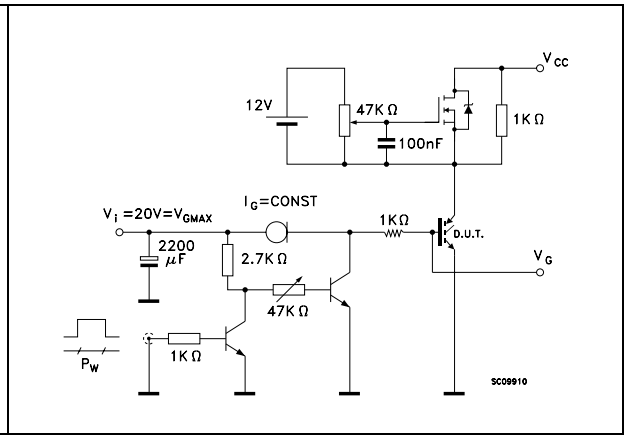


Figure 3. Switching waveform

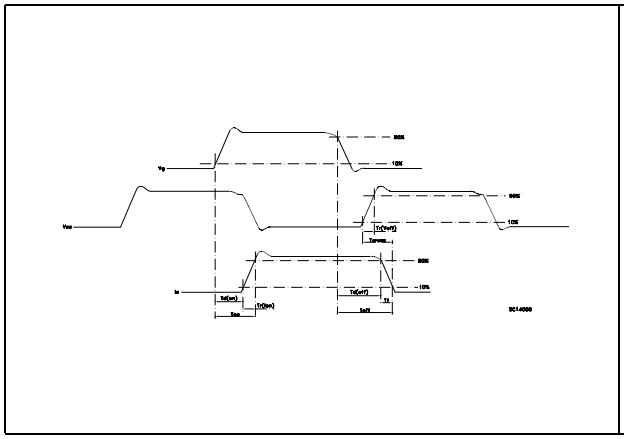
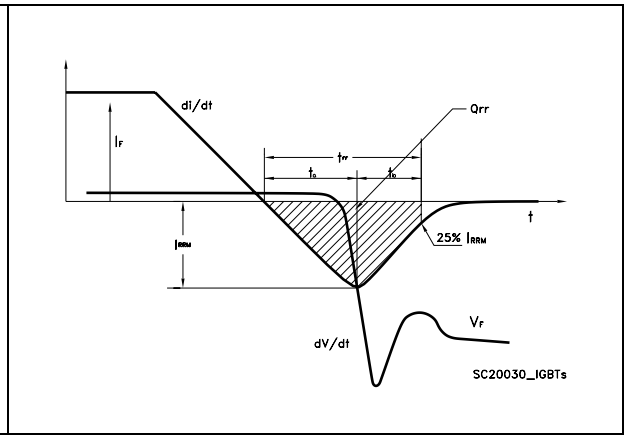


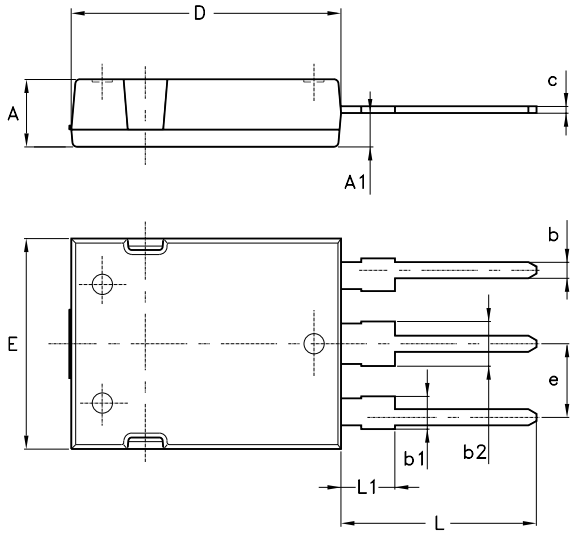
Figure 4. Diode recovery time waveform



4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect . The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: *www.st.com*

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			



5 Revision history

Table 8. Revision history

Date	Revision	Changes
09-Oct-2006	1	Initial release.

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