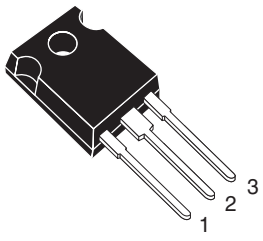
STGW15H120DF2

1200 V, 15 A high speed trench gate field-stop IGBT

Datasheet – preliminary data

Features

- Maximum junction temperature : T_J = 175 °C
- High speed switching
- Minimized tail current
- Low saturation voltage: $V_{CE(sat)}$ = 2.1 V (typ.) @ I_C = 15 A
- Safe paralleling
- 10 µs short-circuit withstand time at T_J = 150 °C
- Ultrafast free-wheeling diode co-packaged
- Low thermal resistance
- Lead free package

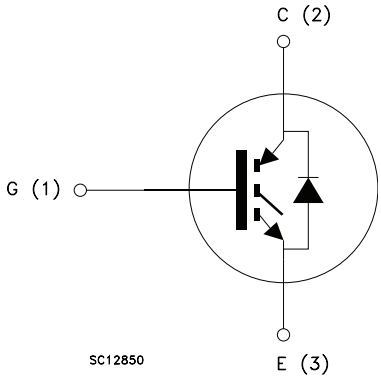


TO-247

Applications

- Uninterruptible power supply
- Welding machines
- Photovoltaic inverters
- Power factor correction
- High switching frequency converters

Figure 1. Internal schematic diagram



Description

This device is an IGBT developed using an advanced proprietary trench gate and field stop structure. The device is part of the "H" series of IGBTs, which represent an optimum compromise between conduction and switching losses to maximize the efficiency of high switching frequency converters. Moreover, a slightly positive $V_{CE(sat)}$ temperature coefficient and very tight parameter distribution result in safer paralleling operation.

Table 1. Device summary

Order code	Marking	Package	Packaging
STGW15H120DF2	GW15H120DF2	TO-247	Tube

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{CES}	Collector-emitter voltage (V_{GE} = 0)	1200	V
I_C	Continuous collector current at T_C = 25 °C	30	A
I_C	Continuous collector current at T_C = 100 °C	15	A
I_{CP} (1)	Pulsed collector current	60	A
V_{GE}	Gate-emitter voltage	±20	V
I_F	Continuous collector current at T_C = 25 °C	30	A
	Continuous collector current at T_C = 100 °C	15	A
I_{FP} (1)	Pulsed forward current	60	A
t_{SC}	Short-circuit withstand time at V_{CC} = 600 V, V_{GE} = 15 V, T_J = 150 °C	10	µs
P_{TOT}	Total dissipation at T_C = 25 °C	TBD	W
T_J	Operating junction temperature	– 55 to 175	°C
T_{STG}	Storage temperature range		

1. Pulse width limited by maximum junction temperature and turn-off within RBSOA

Table 3. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance junction-case IGBT	TBD	°C/W
R_{thJC}	Thermal resistance junction-case diode	TBD	°C/W
R_{thJA}	Thermal resistance junction-ambient	TBD	°C/W

2 Electrical characteristics

T_J = 25 °C unless otherwise specified.

Table 4. Static

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)CES}$	Collector-emitter breakdown voltage (V_{GE} = 0)	I_C = 1 mA	1200			V
$V_{CE(sat)}$	Collector-emitter saturation voltage	V_{GE} = 15 V, I_C = 15 A V_{GE} = 15 V, I_C = 15 A, T_J = 175 °C		2.1 2.4		V V
$V_{GE(th)}$	Gate threshold voltage	V_{CE} = V_{GE}, I_C = 1 mA		5		V
I_{CES}	Collector cut-off current (V_{GE} = 0)	V_{CE} = 1200 V V_{CE} = 1200 V, T_J = 125 °C			250 TBD	µA mA
I_{GES}	Gate-emitter leakage current (V_{CE} = 0)	V_{GE} = ± 20 V			250	nA

Table 5. Dynamic

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{ies} C_{oes} C_{res}	Input capacitance Output capacitance Reverse transfer capacitance	V_{CE} = 25 V, f = 1 MHz, V_{GE} = 0	-	TBD TBD TBD	-	pF pF pF
Q_g Q_{ge} Q_{gc}	Total gate charge Gate-emitter charge Gate-collector charge	V_{CE} = 600 V, I_C = 15 A, V_{GE} = 15 V	-	TBD TBD TBD	-	nC nC nC

Table 6. 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} = 600 V, I_C = 15 A R_G = 33 Ω, V_{GE} = 15 V *(see Figure 2)*	-	TBD TBD TBD	-	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} = 600 V, I_C = 15 A R_G = 33 Ω, V_{GE} = 15 V, T_J = 175 °C *(see Figure 2)*	-	TBD TBD TBD	-	ns ns A/µs
$t_r(V_{off})$ $t_{d(off)}$ t_f	Off voltage rise time Turn-off delay time Current fall time	V_{CC} = 600 V, I_C = 15 A R_G = 33 Ω, V_{GE} = 15 V *(see Figure 2)*	-	TBD TBD TBD	-	ns ns ns
$t_r(V_{off})$ $t_{d(off)}$ t_f	Off voltage rise time Turn-off delay time Current fall time	V_{CC} = 600 V, I_C = 15 A R_G = 33 Ω, V_{GE} = 15 V, T_J = 175 °C *(see Figure 2)*	-	TBD TBD TBD	-	ns ns ns

Table 7. Switching energy (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
Eon (1) E_{off} (2) E_{ts}	Turn-on switching losses Turn-off switching losses Total switching losses	V_{CC} = 600 V, I_C = 15 A R_G = 33 Ω, V_{GE} = 15 V *(see Figure 2)*	-	TBD 0.6 TBD	-	mJ mJ mJ
Eon (1) E_{off} (2) E_{ts}	Turn-on switching losses Turn-off switching losses Total switching losses	V_{CC} = 600 V, I_C = 15 A R_G = 33 Ω, V_{GE} = 15 V T_J = 175 °C *(see Figure 2)*	-	TBD 0.85 TBD	-	mJ mJ mJ

1. Energy losses include reverse recovery of the diode
2. Turn-off losses include also the tail of the collector current

Table 8. Collector-emitter diode

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_F	Forward on-voltage	I_F = 15 A I_F = 15 A, T_J = 175 °C	-	 TBD	TBD	V V
t_{rr} Q_{rr} I_{rrm}	Reverse recovery time Reverse recovery charge Reverse recovery current	I_F = 15 A, V_R = 45 V, R_G = 33 Ω *(see Figure 5)*	-	TBD TBD TBD	-	ns µC A
t_{rr} Q_{rr} I_{rrm}	Reverse recovery time Reverse recovery charge Reverse recovery current	I_F = 15 A, V_R = 45 V, T_J = 175 °C, R_G = 33 Ω *(see Figure 5)*	-	TBD TBD TBD	-	ns µC A

3 Test circuits

Figure 2. Test circuit for inductive load switching

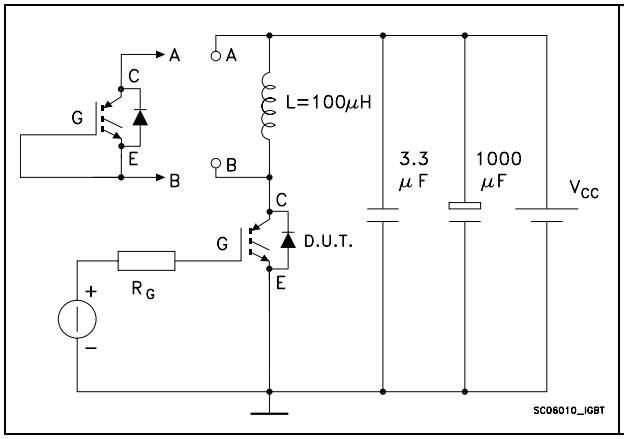


Figure 3. Gate charge test circuit

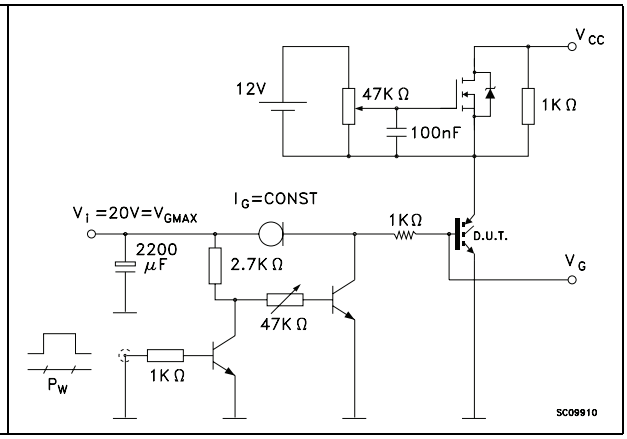


Figure 4. Switching waveform

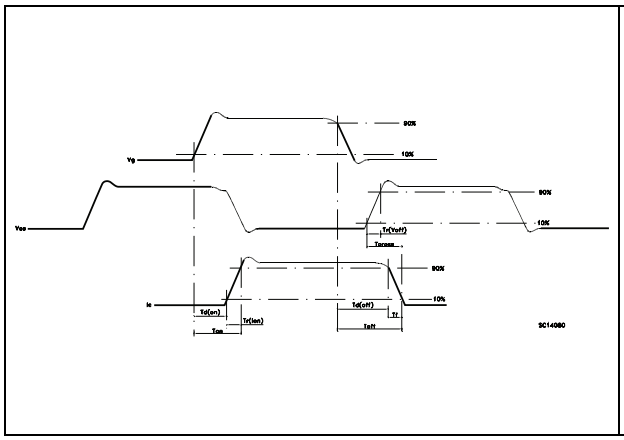
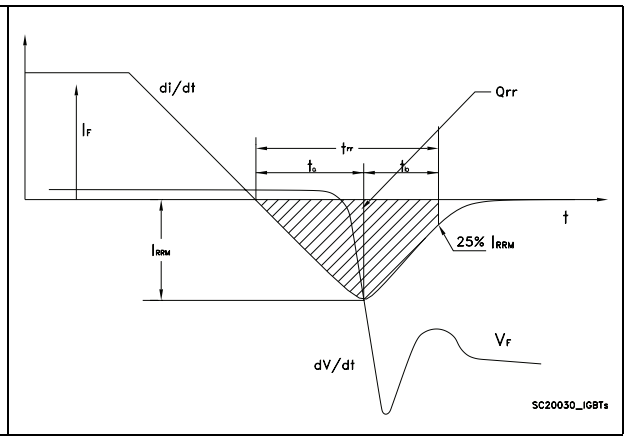


Figure 5. Diode recovery time waveform



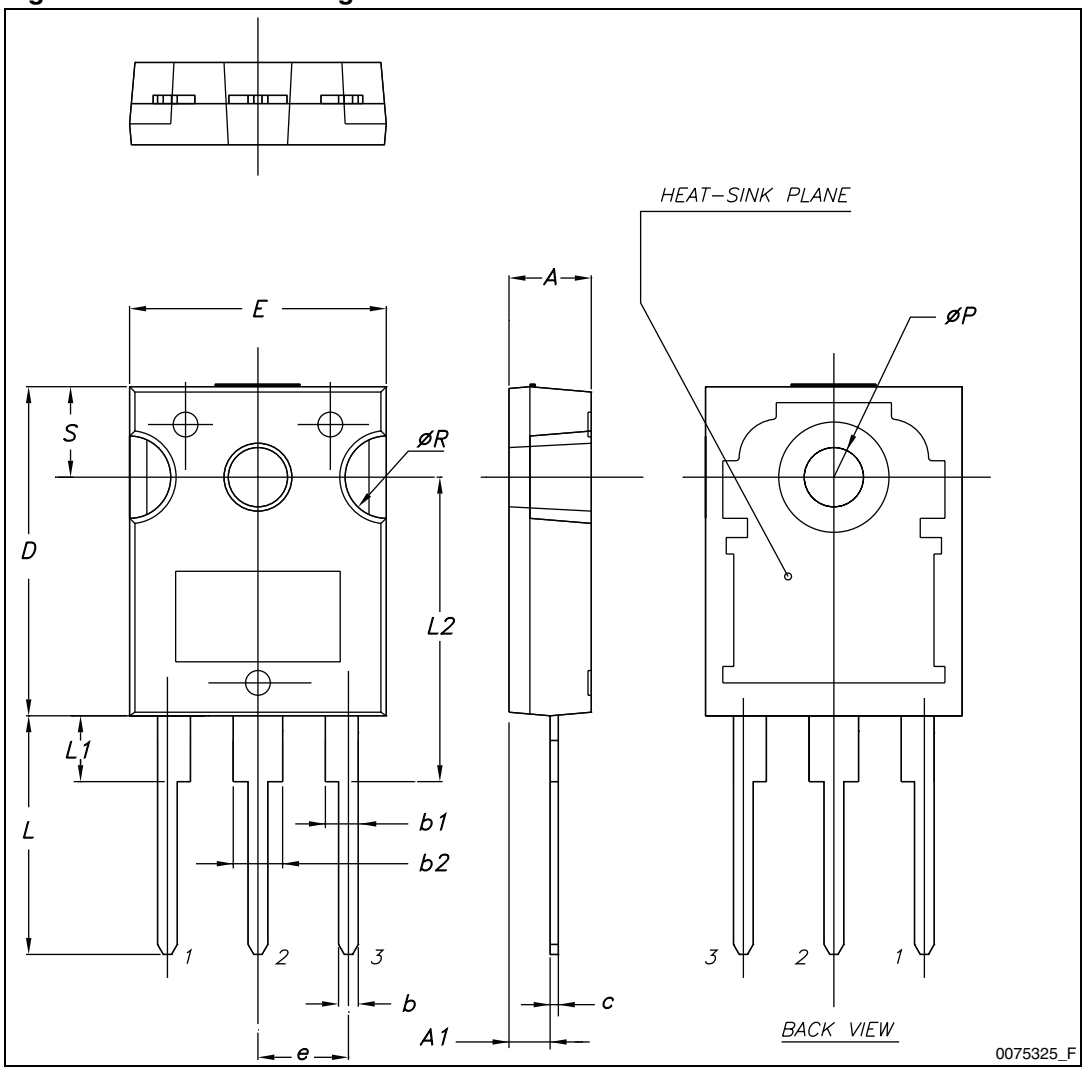
4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: www.st.com. ECOPACK® is an ST trademark.

Table 9. TO-247 mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.85		5.15
A1	2.20		2.60
b	1.0		1.40
b1	2.0		2.40
b2	3.0		3.40
c	0.40		0.80
D	19.85		20.15
E	15.45		15.75
e		5.45	
L	14.20		14.80
L1	3.70		4.30
L2		18.50	
∅P	3.55		3.65
∅R	4.50		5.50
S		5.50	

Figure 6. TO-247 drawing



5 Revision history

Table 10. Document revision history

Date	Revision	Changes
03-Oct-2012	1	Initial release.

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