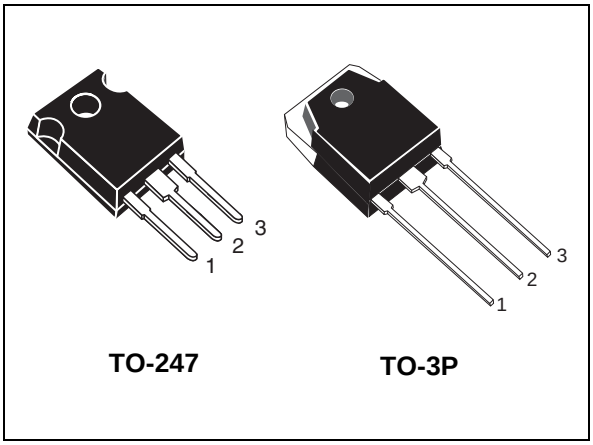
STGW28IH120DF
STGWT28IH120DF

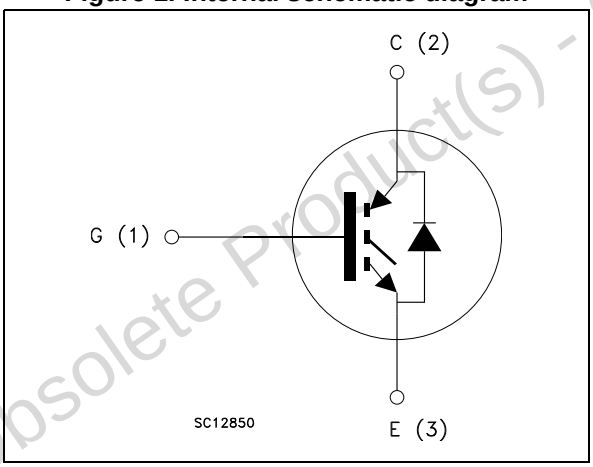
1200 V, 25 A IH series trench gate field-stop IGBT

Datasheet - preliminary data



TO-247 **TO-3P**

Figure 1. Internal schematic diagram



Features

- Designed for soft commutation only
- Maximum junction temperature: T_J = 175 °C
- Minimized tail current
- Low saturation voltage: $V_{CE(sat)}$ = 2.0 V (typ.) @ I_C = 25 A
- Tight parameters distribution
- Safe paralleling
- Low V_F soft recovery co-packaged diode
- Low thermal resistance
- Lead free package

Applications

- Induction heating
- Microwave oven
- Resonant converters

Description

These IGBTs are developed using an advanced proprietary trench gate field-stop structure and performance is optimized in both conduction and switching losses. A freewheeling diode with a low drop forward voltage is co-packaged. The result is a product specifically designed to maximize efficiency for any resonant and soft-switching application.

Table 1. Device summary

Order code	Marking	Package	Packaging
STGW28IH120DF	GW28IH120DF	TO-247	Tube
STGWT28IH120DF	GWT28IH120DF	TO-3P	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	50	A
I_C	Continuous collector current at T_C = 100 °C	25	A
I_{CP}(1)	Pulsed collector current	100	A
V_{GE}	Gate-emitter voltage	±20	V
I_F	Continuous forward current at T_C = 25 °C	50	A
I_F	Continuous forward current at T_C = 100 °C	25	A
$I_{FP(1)}$	Pulsed forward current	100	A
P_{TOT}	Total dissipation at T_C = 25 °C	375	W
T_{STG}	Storage temperature range	- 55 to 150	°C
T_J	Operating junction temperature	- 40 to 175	°C

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	0.4	°C/W
R_{thJC}	Thermal resistance junction-case diode	1.47	°C/W
R_{thJA}	Thermal resistance junction-ambient	50	°C/W

2 Electrical characteristics

T_J = 25 °C unless otherwise specified.

Table 4. Static characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)CES}$	Collector-emitter breakdown voltage (V_{GE} = 0)	I_C = 2 mA	1200			V
$V_{CE(sat)}$	Collector-emitter saturation voltage	V_{GE} = 15 V, I_C = 25 A		2		V
		V_{GE} = 15 V, I_C = 25 A T_J = 125 °C		2.25		
		V_{GE} = 15 V, I_C = 25 A T_J = 175 °C		2.35		
		V_{GE} = 15 V, I_C = 50 A		2.55		
V_F	Forward on-voltage	I_F = 25 A		1.3		V
		I_F = 25 A T_J = 125 °C		TBD		V
		I_F = 25 A T_J = 175 °C		TBD		V
$V_{GE(th)}$	Gate threshold voltage	V_{CE} = V_{GE}, I_C = 1 mA		6.0		V
I_{CES}	Collector cut-off current (V_{GE} = 0)	V_{CE} = 1200 V			250	µA
I_{GES}	Gate-emitter leakage current (V_{CE} = 0)	V_{GE} = ± 20 V			250	nA

Table 5. Dynamic characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
C_{ies}	Input capacitance	V_{CE} = 25 V, f = 1 MHz, V_{GE} = 0	-	3500	-	pF
C^{oes}	Output capacitance		-	120	-	pF
C_{res}	Reverse transfer capacitance		-	22	-	pF
Q_g	Total gate charge	V_{CC} = 600 V, I_C = 25 A, V_{GE} = 15 V, see *Figure 4*	-	88	-	nC
Q_{ge}	Gate-emitter charge		-	20	-	nC
Q_{gc}	Gate-collector charge		-	24	-	nC

Table 6. IGBT switching characteristics (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(off)}$	Turn-off delay time	V_{CE} = 600 V, I_C = 25 A, R_G = 22 Ω, V_{GE} = 15 V, see *Figure 2*		TBD		ns
t_f	Current fall time		-	TBD	-	ns
E_{off}(1)	Turn-off switching losses		-	0.93	-	mJ
$t_{d(off)}$	Turn-off delay time	V_{CE} = 600 V, I_C = 25 A, R_G = 22 Ω, V_{GE} = 15 V, T_J = 175 °C, see *Figure 2*		TBD		ns
t_f	Current fall time		-	TBD	-	ns
E_{off}(1)	Turn-off switching losses		-	1.85	-	mJ

1. Turn-off losses include also the tail of the collector current.

Table 7. IGBT switching characteristics (capacitive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
E_{off}(1)	Turn-off switching losses	V_{CC} = 900V, R_G = 10 Ω, I_C = 50 A, L = 500 µH, C_{snub} = 300 nF, see *Figure 3*	-	235	-	µJ
		V_{CC} = 900V, R_G = 10 Ω, I_C = 50 A, L = 500 µH, C_{snub} = 300 nF, T_J = 175 °C, see *Figure 3*	-	410	-	

1. Turn-off losses include also the tail of the collector current.

3 Test circuits

Figure 2. Test circuit for inductive load switching

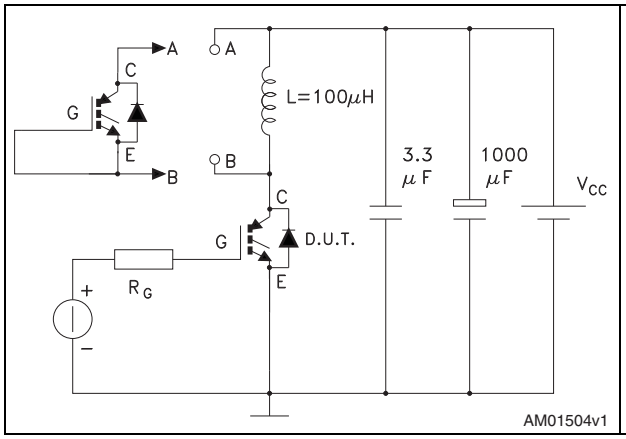


Figure 3. Test circuit for capacitive load switching

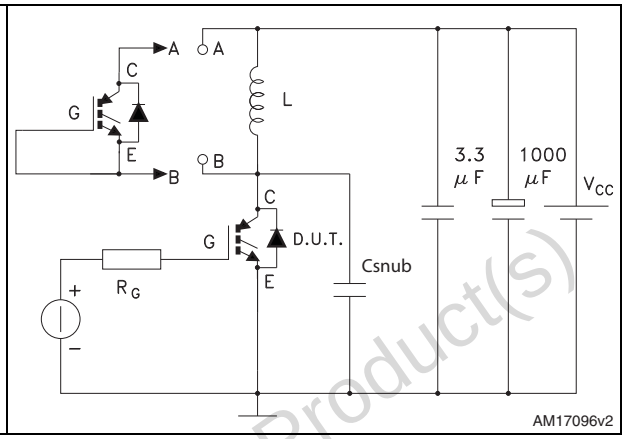


Figure 4. Gate charge test circuit

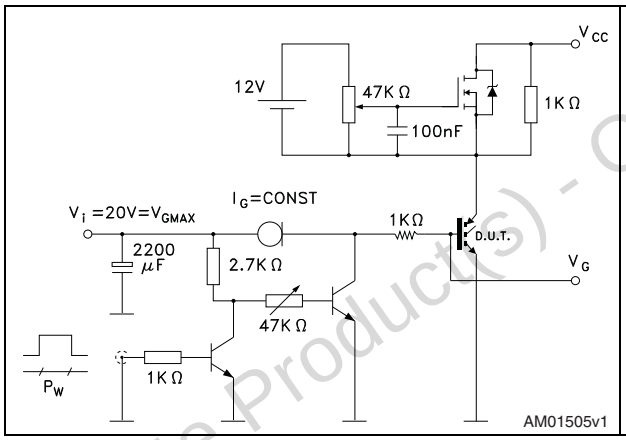
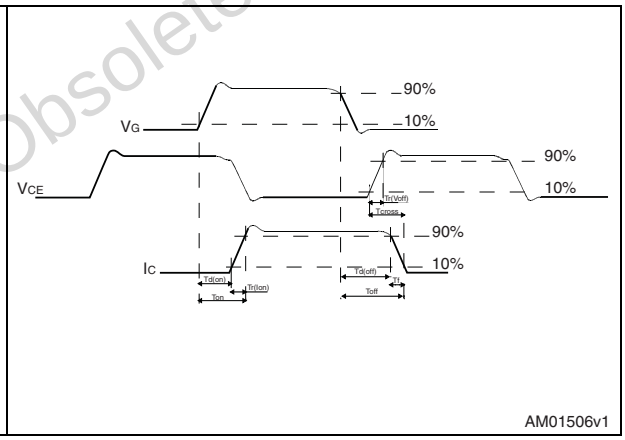


Figure 5. Switching waveform



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 8. 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	5.30	5.45	5.60
L	14.20		14.80
L1	3.70		4.30
L2		18.50	
∅P	3.55		3.65
∅R	4.50		5.50
S	5.30	5.50	5.70

Figure 6. TO-247 drawing

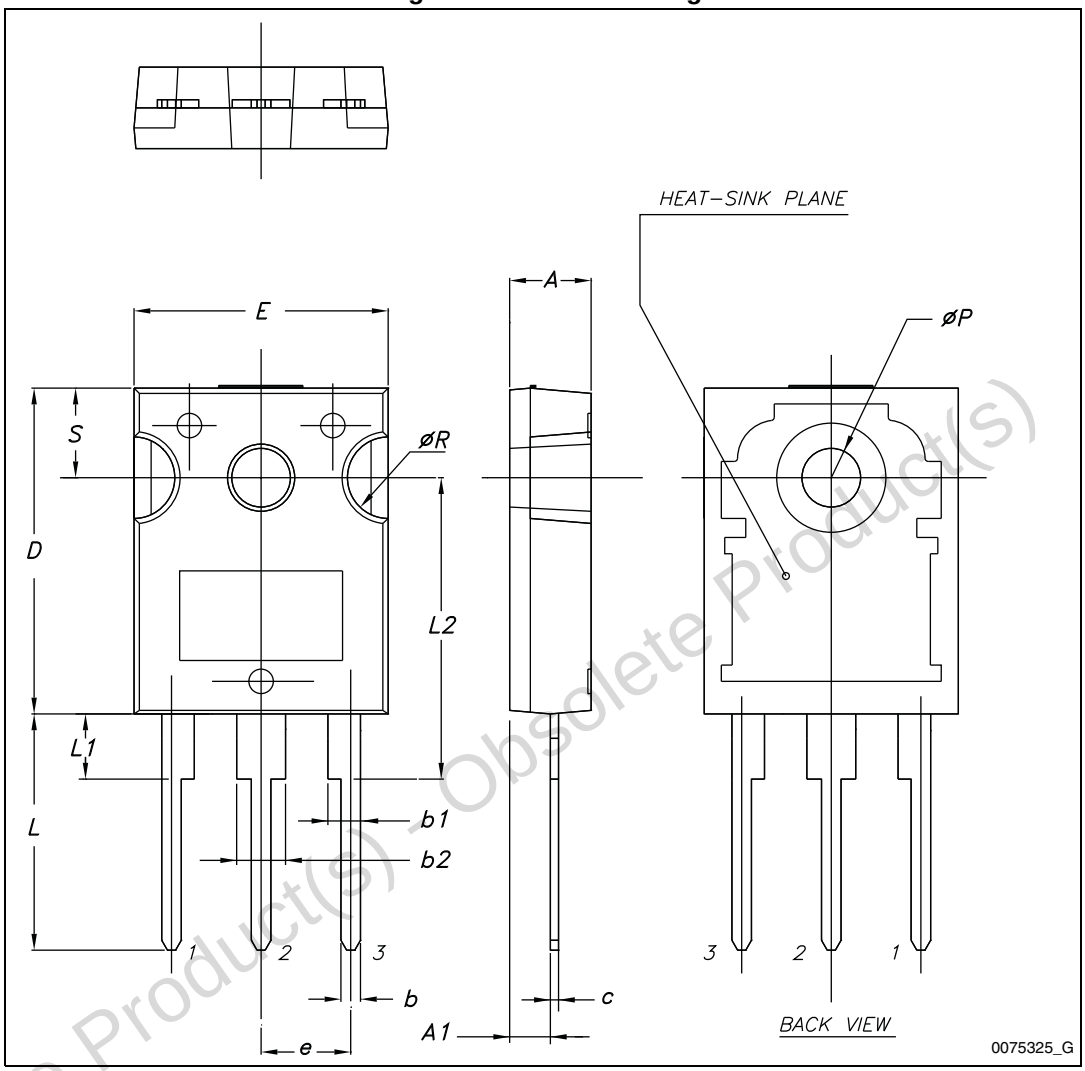
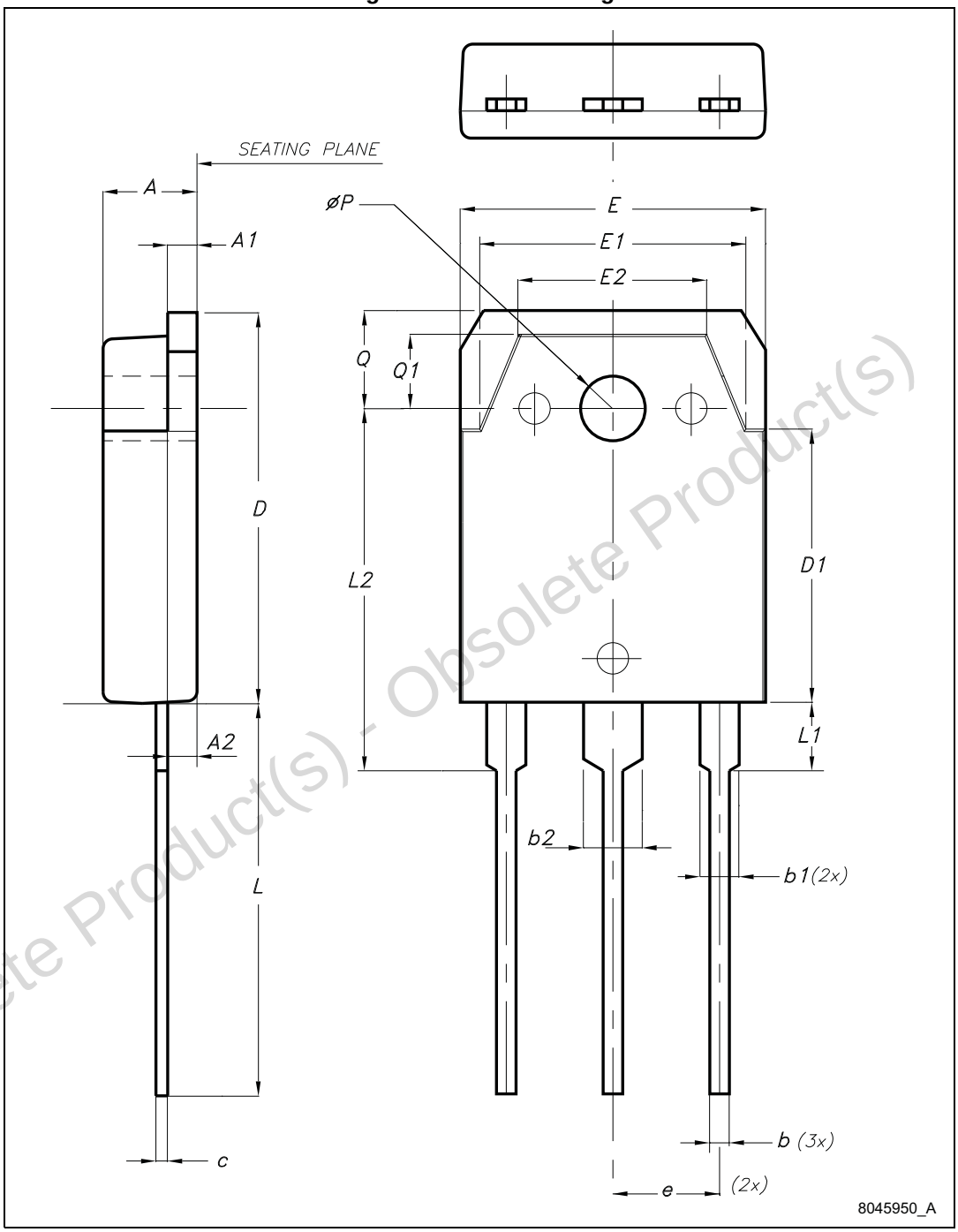


Table 9. TO-3P mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	4.60		5
A1	1.45	1.50	1.65
A2	1.20	1.40	1.60
b	0.80	1	1.20
b1	1.80		2.20
b2	2.80		3.20
c	0.55	0.60	0.75
D	19.70	19.90	20.10
D1		13.90	
E	15.40		15.80
E1		13.60	
E2		9.60	
e	5.15	5.45	5.75
L	19.50	20	20.50
L1		3.50	
L2	18.20	18.40	18.60
øP	3.10		3.30
Q		5	
Q1		3.80	

Figure 7. TO-3P drawing



5 Revision history

Table 10. Document revision history

Date	Revision	Changes
07-Feb-2012	1	Initial release.
28-Nov-2012	2	Added Section 2.1 Electrical characteristics (curves).
08-Feb-2013	3	Modified title in cover page. Removed Section 2.1. Added new order code STGW28IH120DF and mechanical data *Table 8 on page 6*, *Figure 6 on page 7*.
14-Mar-2013	4	Modified title, features and description in cover page.

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