STGW50H65F

50 A, 650 V field stop trench gate IGBT

Preliminary data

Features

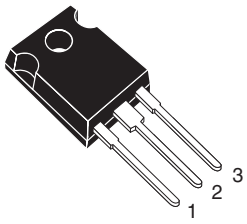
- Very high speed switching
- Tight parameters distribution
- Easy paralleling
- Low thermal resistance

Applications

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

Description

Using advanced proprietary trench gate and field stop structure, this IGBT leads to an optimized compromise between conduction and switching losses maximizing the efficiency for high switching frequency converters. Furthermore, a slightly positive $V_{CE(sat)}$ temperature coefficient and a very tight parameter distribution result in an easier paralleling operation.



TO-247

Figure 1. Internal schematic diagram

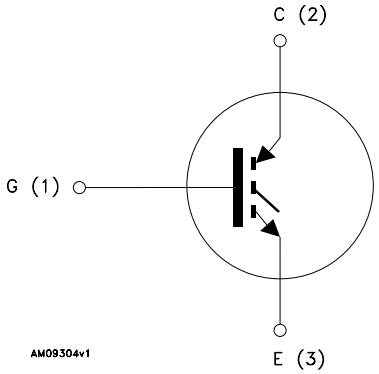


Table 1. Device summary

Order code	Marking	Package	Packaging
STGW50H65F	GW50H65F	TO-247	Tube

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{CES}	Collector-emitter voltage (V_{GE} = 0)	650	V
I_C	Continuous collector current at T_C = 25 °C	100	A
I_C	Continuous collector current at T_C = 100 °C	50	A
I_{CP} (1)	Pulsed collector current	200	A
V_{GE}	Gate-emitter voltage	±20	V
P_{TOT}	Total dissipation at T_C = 25 °C	360	W
T_J	Operating junction temperature	- 55 to 150	°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	0.35	°C/W
R_{thJA}	Thermal resistance junction-ambient	50	°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 = 2 mA	650			V
$V_{CE(sat)}$	Collector-emitter saturation voltage	V_{GE} = 15 V, I_C = 50 A		1.9		V
		V_{GE} = 15 V, I_C = 50 A T_J = 125 °C		2.1		
$V_{GE(th)}$	Gate threshold voltage	V_{CE} = V_{GE}, I_C = 1 mA		6.5		V
I_{CES}	Collector cut-off current (V_{GE} = 0)	V_{CE} = 650 V			25	µA
I_{GES}	Gate-emitter leakage current (V_{CE} = 0)	V_{GE} = ± 20 V			100	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	-	7500 210 120	-	pF pF pF
Q_g	Total gate charge			TBD		nC
Q_{ge}	Gate-emitter charge			TBD		nC
Q_{gc}	Gate-collector charge			TBD		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_{CE} = 400 V, I_C = 50 A, R_G = 4.7 Ω, V_{GE} = 15 V	-	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_{CE} = 400 V, I_C = 50 A, R_G = 4.7 Ω, V_{GE} = 15 V T_J = 125 °C	-	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_{CE} = 400 V, I_C = 50 A, R_G = 4.7 Ω, V_{GE} = 15 V	-	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_{CE} = 400 V, I_C = 50 A, R_G = 4.7 Ω, V_{GE} = 15 V T_J = 125 °C	-	TBD TBD TBD	-	ns ns ns

Table 7. Switching energy (inductive load)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
Eon (1)	Turn-on switching losses	V_{CE} = 400 V, I_C = 50 A, R_G = 4.7 Ω, V_{GE} = 15 V	-	TBD	-	mJ
E_{off} (2)	Turn-off switching losses			0.8		mJ
E_{ts}	Total switching losses			TBD		mJ
Eon (1)	Turn-on switching losses	V_{CE} = 400 V, I_C = 50 A, R_G = 4.7 Ω, V_{GE} = 15 V T_J = 125 °C	-	TBD	-	mJ
E_{off} (2)	Turn-off switching losses			1.1		mJ
E_{ts}	Total switching losses			TBD		mJ

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

3 Test circuits

Figure 2. Test circuit for inductive load switching

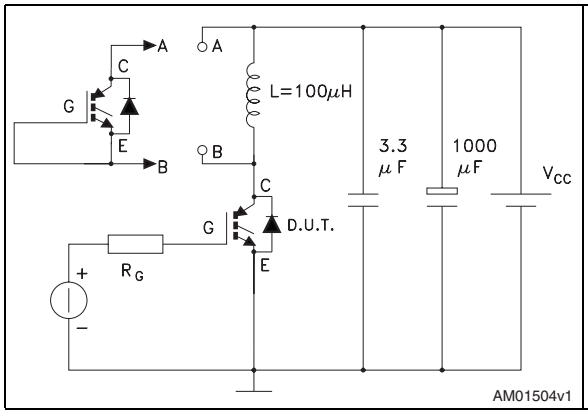


Figure 3. Gate charge test circuit

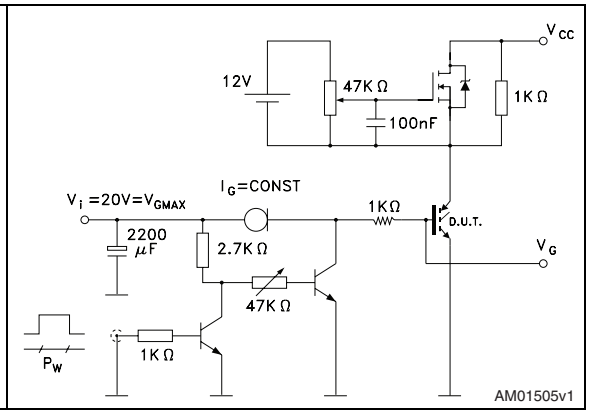
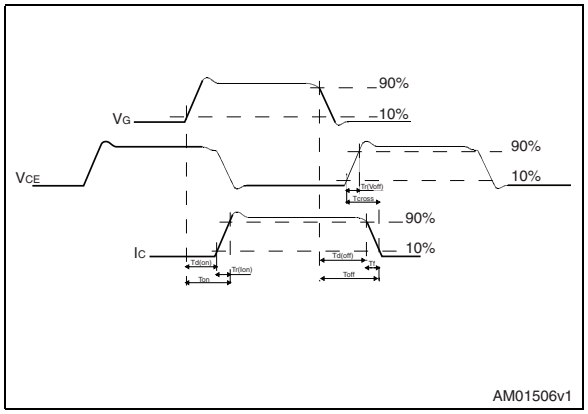


Figure 4. Switching waveform



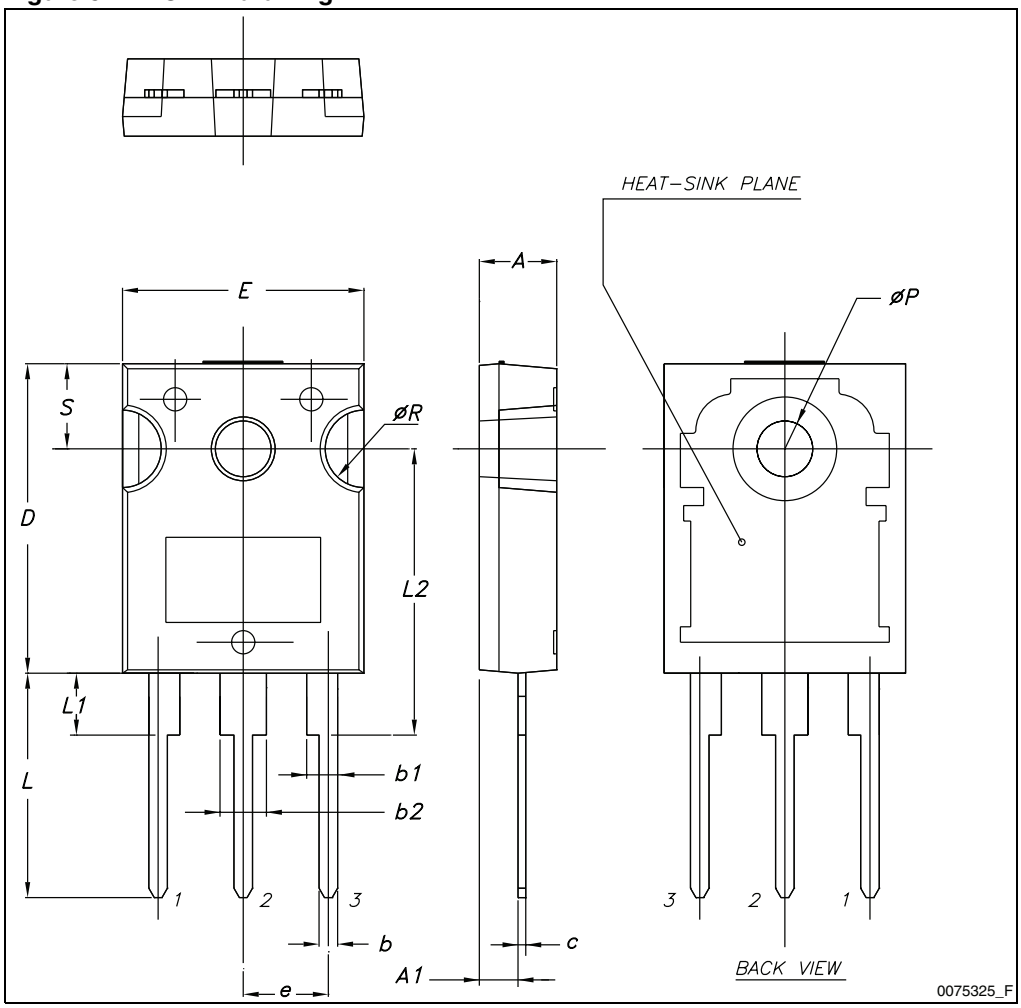
4 Package mechanical data

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		5.45	
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 5. TO-247 drawing



5 Revision history

Table 9. Document revision history

Date	Revision	Changes
28-Apr-2011	1	Initial release.

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