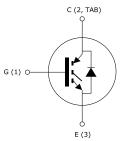
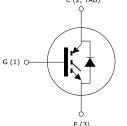
Datasheet

Trench gate field-stop IGBT, H series 1200 V, 25 A high speed









Product status links
STGW25H120DF2
STGWA25H120DF2

Product summary				
Order code STGW25H120DF2				
Marking	G25H120DF2			
Package	TO-247			
Packing Tube				
Order code	STGWA25H120DF2			
Marking	G25H120DF2			
Package	TO-247 long leads			
Packing	Tube			

Features

- Maximum junction temperature: T_J = 175 °C
- High speed switching series
- Minimized tail current
- $V_{CE(sat)} = 2.1 \text{ V (typ.)} @ I_C = 25 \text{ A}$
- 5 μ s minimum short circuit withstand time at T_J = 150 °C
- Safe paralleling
- Low thermal resistance
- Very fast recovery antiparallel diode

Applications

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

Description

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



1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V _{CES}	Collector-emitter voltage (V _{GE} = 0 V)	1200	V
1-	Continuous collector current at T _C = 25 °C	50	
I _C	Continuous collector current at T _C = 100 °C	25	_ A
I _{CP} ⁽¹⁾	Pulsed collector current	100	Α
V	Gate-emitter voltage	±20	V
V_{GE}	Transient gate-emitter voltage ($t_p \le 10 \mu s$, D ≤ 0.01)	±30	V
l _F	Continuous forward current at T _C = 25 °C	50	A
'F	Continuous forward current at T _C = 100 °C	25	_ A
I _{FP} ⁽¹⁾	Pulsed forward current	100	А
P _{TOT}	Total power dissipation at T _C = 25 °C	375	W
TJ	Operating junction temperature range	- 55 to 175	°C
T _{STG}	Storage temperature range	- 55 to 150	°C

^{1.} Pulse width limited by maximum junction temperature.

Table 2. Thermal data

Symbol	Parameter	Value	Unit
R _{thJC}	Thermal resistance, junction-to-case IGBT	0.4	°C/W
	Thermal resistance, junction-to-case diode	1.47	C/VV
R _{thJA}	Thermal resistance, junction-to-ambient	50	°C/W

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2 Electrical characteristics

 T_J = 25 °C unless otherwise specified.

Table 3. Static characteristics

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
V _{(BR)CES}	Collector-emitter breakdown voltage	V _{GE} = 0 V, I _C = 2 mA	1200			V
		V _{GE} = 15 V, I _C = 25 A		2.1	2.6	
V _{CE(sat)}	Collector-emitter saturation voltage	V _{GE} = 15 V, I _C = 25 A, T _J = 125 °C		2.4		V
		V _{GE} = 15 V, I _C = 25 A, T _J = 175 °C		2.5		
		I _F = 25 A		3.8	4.9	
V_{F}	Forward on-voltage	I _F = 25 A, T _J = 125 °C		3.05		V
		I _F = 25 A, T _J = 175 °C		2.8		
V _{GE(th)}	Gate threshold voltage	V _{CE} = V _{GE} , I _C = 1 mA	5	6	7	V
I _{CES}	Collector cut-off current	V _{GE} = 0 V, V _{CE} = 1200 V			25	μΑ
I _{GES}	Gate-emitter leakage current	V _{CE} = 0 V, V _{GE} = ±20 V			250	nA

Table 4. Dynamic characteristics

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
C _{ies}	Input capacitance	V _{CE} = 25 V, f = 1 MHz, V _{GE} = 0 V	-	2010	-	pF
C _{oes}	Output capacitance		-	146	-	pF
C _{res}	Reverse transfer capacitance		-	49	-	pF
Qg	Total gate charge	V_{CC} = 960 V, I_{C} = 25 A, V_{GE} = 0 to 15 V (see Figure 28. Gate charge test circuit)	-	100	-	nC
Q _{ge}	Gate-emitter charge		-	11	-	nC
Q _{gc}	Gate-collector charge		-	52	-	nC

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Table 5. IGBT switching characteristics (inductive load)

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
t _{d(on)}	Turn-on delay time			29	-	ns
t _r	Current rise time			12	-	ns
(di/dt) _{on}	Turn-on current slope	$V_{CE} = 600 \text{ V}, I_{C} = 25 \text{ A},$ $R_{G} = 10 \Omega, V_{GE} = 15 \text{ V}$		1774	_	A/µs
t _{d(off)}	Turn-off delay time			130	-	ns
t _f	Current fall time	(see Figure 27. Test circuit for inductive		106	-	ns
E _{on} ⁽¹⁾	Turn-on switching energy	load switching)		0.6	_	mJ
E _{off} ⁽²⁾	Turn-off switching energy			0.7	-	mJ
E _{ts}	Total switching energy			1.3	-	mJ
t _{d(on)}	Turn-on delay time			27.5	-	ns
t _r	Current rise time			13.5	-	ns
(di/dt) _{on}	Turn-on current slope	V _{CF} = 600 V, I _C = 25 A,		1522	-	A/µs
t _{d(off)}	Turn-off delay time	$R_G = 10 \Omega$, $V_{GE} = 15 V$, $T_J = 175 °C$		139	-	ns
t _f	Current fall time	(see Figure 27. Test circuit for inductive		200	-	ns
E _{on} ⁽¹⁾	Turn-on switching energy	load switching)		1.05	-	mJ
E _{off} ⁽²⁾	Turn-off switching energy			1.65	-	mJ
E _{ts}	Total switching energy			2.7	-	mJ
t _{sc}	Short-circuit withstand time	V _{CE} = 600 V, V _{GE} = 15 V, T _J = 150 °C,	5		-	μs

^{1.} Including the reverse recovery of the diode.

Table 6. Diode switching characteristics (inductive load)

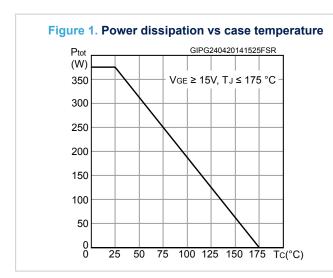
Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
t _{rr}	Reverse recovery time		-	303	-	ns
Qrr	Reverse recovery charge	I _F = 25 A, V _R = 600 V,	-	0.93	-	μC
I _{rrm}	Reverse recovery current	di/dt = 500 A/μs, V _{GE} = 15 V	-	15.3	-	А
dI _{rr} /dt	Peak rate of fall of reverse recovery current during t _b	(see Figure 27. Test circuit for inductive load switching)	-	400	_	A/µs
Err	Reverse recovery energy		-	0.52	-	mJ
t _{rr}	Reverse recovery time		-	508	-	ns
Q _{rr}	Reverse recovery charge	$I_F = 25 \text{ A}, V_R = 600 \text{ V},$ $di/dt = 500 \text{ A/}\mu\text{s}, V_{GE} = 15 \text{ V},$ $T_J = 175 \text{ °C}$ (see Figure 27. Test circuit for inductive load switching)	-	2.71	-	μC
I _{rrm}	Reverse recovery current		-	23		А
dI _{rr} /dt	Peak rate of fall of reverse recovery current during t _b		-	680		A/µs
E _{rr}	Reverse recovery energy	ioda omioimig,	-	1.56		mJ

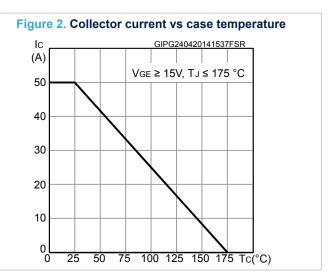
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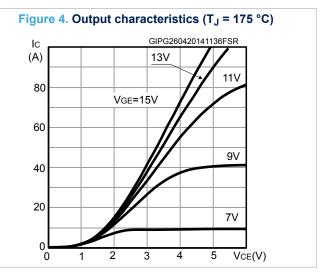
^{2.} Including the tail of the collector current.

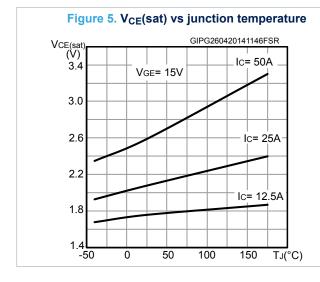


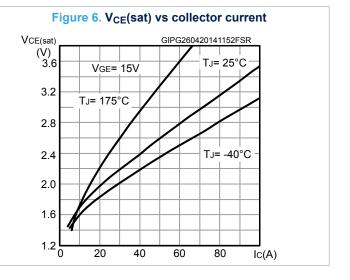
2.1 Electrical characteristics (curves)











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20

10

rectangular current shape, (duty cycle=0.5, V_{CC} = 600V, R_{G} =10 Ω

V_{GE} = 0/15 V, T_J =175°C)

Figure 7. Collector current vs switching frequency

Ic (A)

GIPG260420141200FSR

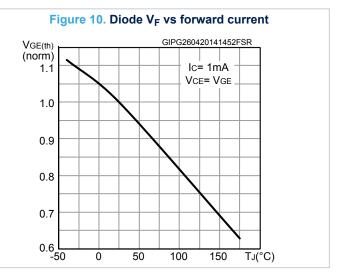
TC=80°C

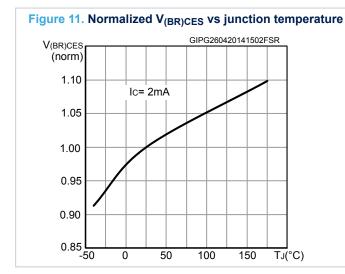
TC=100°C

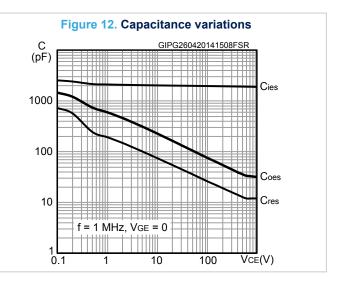
10

 \overline{f} (kHz)

Figure 8. Safe operating area GIPG260420141214FSR (A) 100 1 µs 10 µs 10 100 µs 1 ms Single pulse Tc= 25°C, TJ ≤ 175°C **VGE= 15V** 0.1 100 1000 VCE(V)







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Figure 13. Gate charge vs gate-emitter voltage

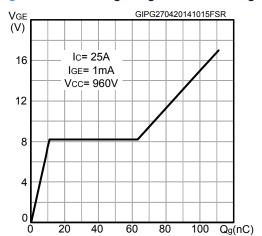


Figure 14. Switching energy vs collector current

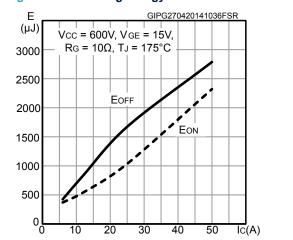


Figure 15. Switching energy vs gate resistance

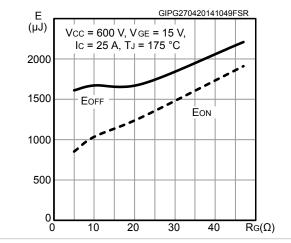


Figure 16. Switching energy vs junction temperature

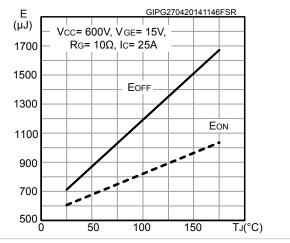


Figure 17. Switching energy vs collector-emitter voltage

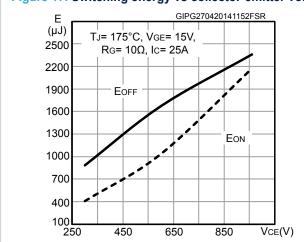
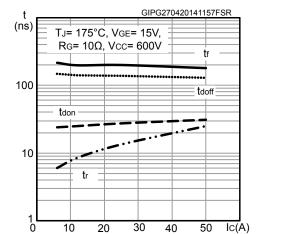


Figure 18. Switching times vs collector current



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Figure 19. Switching times vs gate resistance

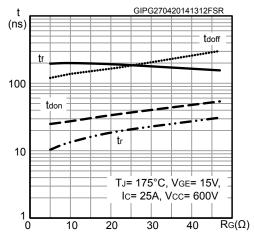


Figure 20. Reverse recovery current vs diode current slope

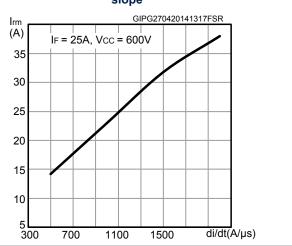


Figure 21. Reverse recovery time vs diode current slope

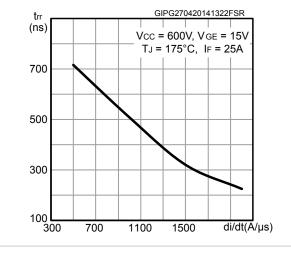


Figure 22. Reverse recovery charge vs diode current slope

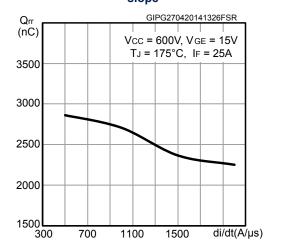


Figure 23. Reverse recovery energy vs diode current slope

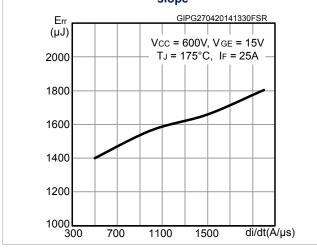
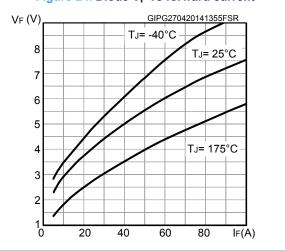
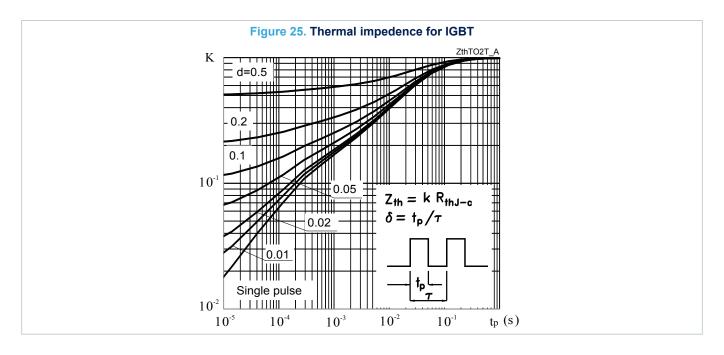


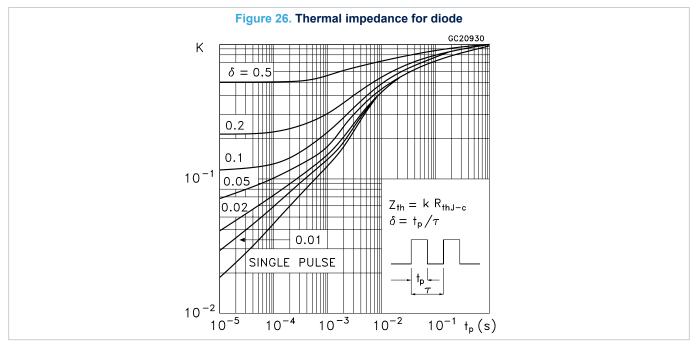
Figure 24. Diode V_F vs forward current



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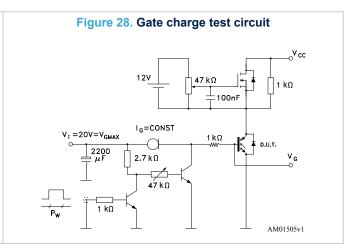


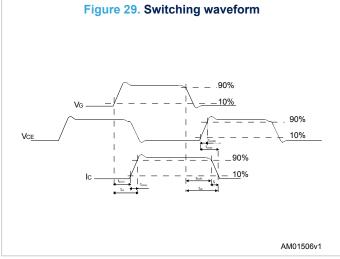
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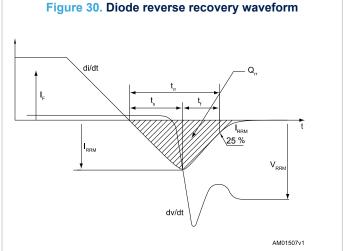


3 Test circuits

Figure 27. Test circuit for inductive load switching







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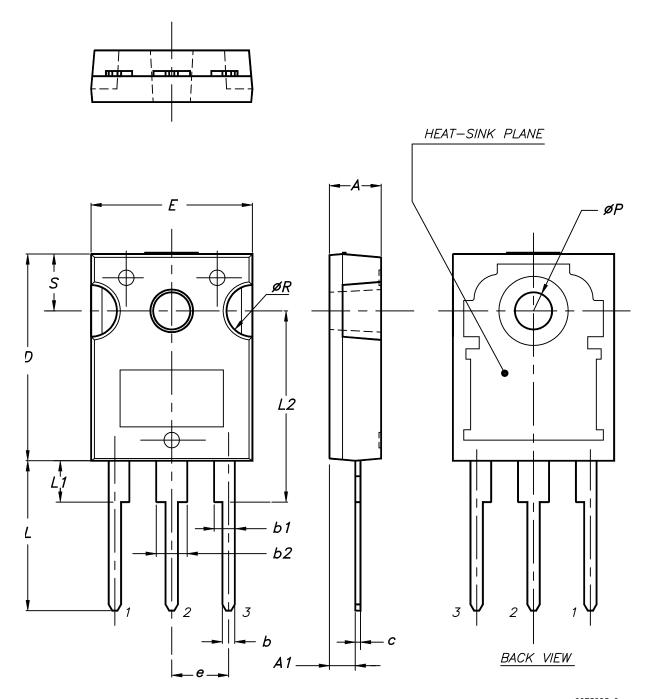


4 Package information

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.

4.1 TO-247 package information

Figure 31. TO-247 package outline



0075325_9

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Table 7. TO-247 package mechanical data

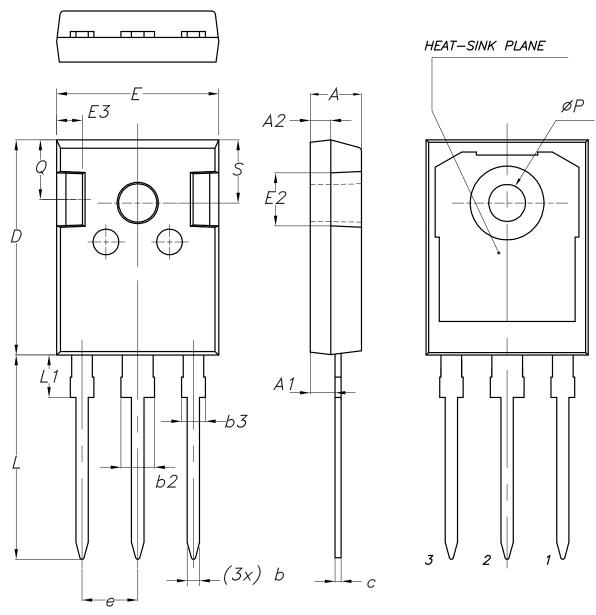
Dim.	mm				
Dilli.	Min.	Тур.	Max.		
А	4.85		5.15		
A1	2.20		2.60		
b	1.0		1.40		
b1	2.0		2.40		
b2	3.0		3.40		
С	0.40		0.80		
D	19.85		20.15		
E	15.45		15.75		
е	5.30	5.45	5.60		
L	14.20		14.80		
L1	3.70		4.30		
L2		18.50			
ØP	3.55		3.65		
ØR	4.50		5.50		
S	5.30	5.50	5.70		

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4.2 TO-247 long leads package information

Figure 32. TO-247 long leads package outline



8463846_2_F

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Table 8. TO-247 long leads package mechanical data

Dim.		mm	
Dilli.	Min.	Тур.	Max.
А	4.90	5.00	5.10
A1	2.31	2.41	2.51
A2	1.90	2.00	2.10
b	1.16		1.26
b2			3.25
b3			2.25
С	0.59		0.66
D	20.90	21.00	21.10
E	15.70	15.80	15.90
E2	4.90	5.00	5.10
E3	2.40	2.50	2.60
е	5.34	5.44	5.54
L	19.80	19.92	20.10
L1			4.30
Р	3.50	3.60	3.70
Q	5.60		6.00
S	6.05	6.15	6.25

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Revision history

Table 9. Document revision history

Date	Revision	Changes
03-Oct-2012	1	Initial release.
28-Feb-2014	2	Updated title and features in cover page. Minor text changes.
31-Mar-2014	3	Document status promoted from preliminary to production data. Updated <i>Table 4: Static characteristics</i> and <i>Table 6: IGBT switching characteristics</i> (inductive load). Added Section 2.1: Electrical characteristics (curves).
06-Mar-2015	4	Added 4.2: TO-247 long leads, package information. Minor text changes.
10-Mar-2021	5	Updated Table 1. Absolute maximum ratings. Minor text changes.

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	4.2	TO-247 long leads package information	13
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