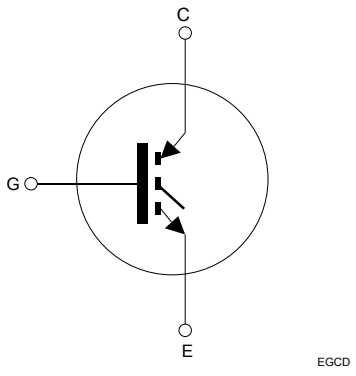
STG15M120F3D8

Datasheet

1200 V, 15 A trench gate field-stop M series low-loss IGBT die in D8 packing



Features

- 10 µs of short-circuit withstand time
- Low $V_{CE(sat)}$ = 1.85 V (typ.) at I_C = 15 A
- Positive $V_{CE(sat)}$ temperature coefficient
- Tight parameter distribution
- Minimized junction temperature: T_J = 175 °C

Applications

- Motor control
- Industrial drives
- PFC
- UPS
- Solar
- General purpose inverter

Description

This device is an IGBT developed using an advanced proprietary trench gate field-stop structure. The device is part of the M series IGBTs, which represent an optimal balance between inverter system performance and efficiency where the low-loss and the short-circuit functionality is essential. Furthermore, the positive $V_{CE(sat)}$ temperature coefficient and the tight parameter distribution result in safer paralleling operation.

Product status link
STG15M120F3D8

Product summary	
Order code	STG15M120F3D8
V_{CE}	1200 V
I_{CN}	15 A
Die size	4.40 x 4.40 mm
Packing	D8

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{CES}	Collector-emitter voltage (V_{GE} = 0 V)	1200	V
V_{GE}	Gate-emitter voltage	±20	V
I_{CN}(1)	Continuous collector current at T = 100 °C	15	A
I_{CP}(1)(2)	Pulsed collector current	45	A
t_{SC}(3)	Short-circuit withstand time V_{CC} = 600 V, V_{GE} = 15 V, $V_{CE(peak)}$ ≤ 1200 V, T_{Jstart} ≤ 150 °C	10	µs
T_J	Operating junction temperature range	-55 to 175	°C

1. *Nominal collector current for die packaged in ST discrete solution. Current level depends on the assembly thermal properties and is limited by maximum junction temperature.*
2. *Pulse width is limited by maximum junction temperature.*
3. *Evaluated by characterization, not tested in production.*

2 Electrical characteristics

T_J = 25 °C unless otherwise specified.

Table 2. Static characteristics (tested on wafer unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)CES}$	Collector-emitter breakdown voltage	I_C = 2 mA, V_{GE} = 0 V	1200			V
$V_{CE(sat)}$	Collector-emitter saturation voltage	V_{GE} = 15 V, I_C = 15 A			2.4	V
$V_{GE(th)}$	Gate threshold voltage	V_{CE} = V_{GE}, I_C = 500 µA	5	6	7	V
I_{CES}	Collector cut-off current	V_{GE} = 0 V, V_{CE} = 1200 V			25	µA
I_{GES}	Gate-emitter leakage current	V_{CE} = 0 V, V_{GE} = ±20 V			±250	nA

Table 3. Electrical characteristics (evaluated by characterization, not tested in production)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{CE(sat)}$	Collector-emitter saturation voltage	V_{GE} = 15 V, I_C = 15 A	-	1.85	2.3	V
		V_{GE} = 15 V, I_C = 15 A, T_J = 175 °C	-	2.2		V
C_{ies}	Input capacitance	V_{CE} = 25 V, f = 1 MHz, V_{GE} = 0 V	-	985		pF
C_{oes}	Output capacitance		-	118		pF
C_{res}	Reverse transfer capacitance		-	38		pF
Q_g	Total gate charge	V_{CC} = 960 V, I_C = 15 A, V_{GE} = 0 to 15 V	-	53		nC

Table 4. Switching characteristics on inductive load (evaluated by characterization, not tested in production)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on delay time	V_{CC} = 600 V, I_C = 15 A, V_{GE} = 15 V, R_G = 22 Ω	-	26	-	ns
t_r	Current rise time		-	12	-	ns
$t_{d(off)}$	Turn-off-delay time		-	122	-	ns
t_f	Current fall time		-	163	-	ns
E_{off} (1)	Turn-off switching energy		-	850	-	µJ
$t_{d(on)}$	Turn-on delay time	V_{CC} = 600 V, I_C = 15 A, V_{GE} = 15 V, R_G = 22 Ω, T_J = 175 °C	-	25	-	ns
t_r	Current rise time		-	14	-	ns
$t_{d(off)}$	Turn-off-delay time		-	136	-	ns
t_f	Current fall time		-	270	-	ns
E_{off} (1)	Turn-off switching energy		-	1130	-	µJ

1. *Including the tail of the collector current.*

Note: The aforementioned values are not tested at chip level and are strongly dependent on the package/module design and the mounting technology. Refer to STGWA15M120DF3 datasheet for further information.

3 Die layout

Figure 1. **Die drawing (dimensions are in mm)**

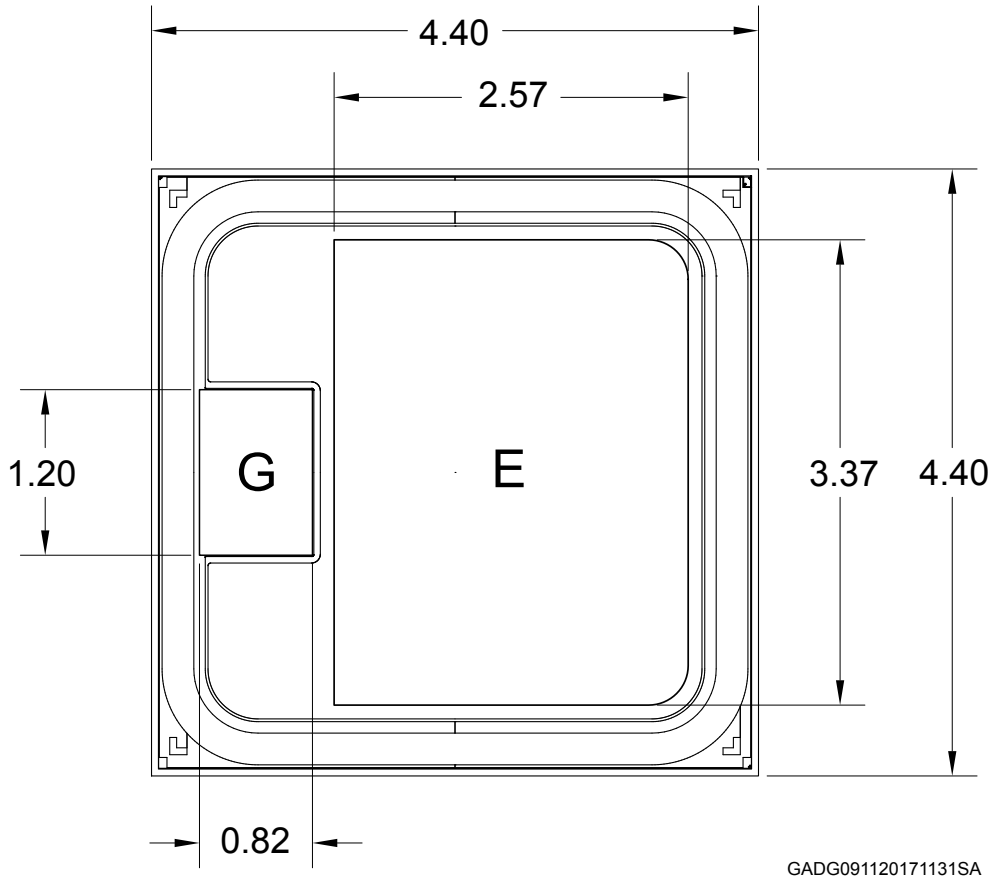


Table 5. **Mechanical parameters**

Symbol		Value	Unit
Die size including scribe line		4.40 x 4.40	mm
Wafer size		200	mm
Maximum possible dice per wafer		1353	dice
Die thickness		110	µm
Front side passivation		Silicone nitride	
Emitter pad size including gate pad		2.57 x 3.37	mm
Gate pad size		0.82 x 1.20	mm
Front side metallization	composition	AlCu	
	thickness	4.5	µm
Back side metallization	composition	Al/Ti/NiV/Ag	
	thickness	0.65	µm
Die bond		Electrically conductive glue or soft solder	
Recommended wire bonding		≤500	µm

Table 6. Die delivery

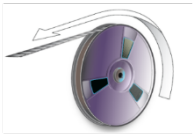
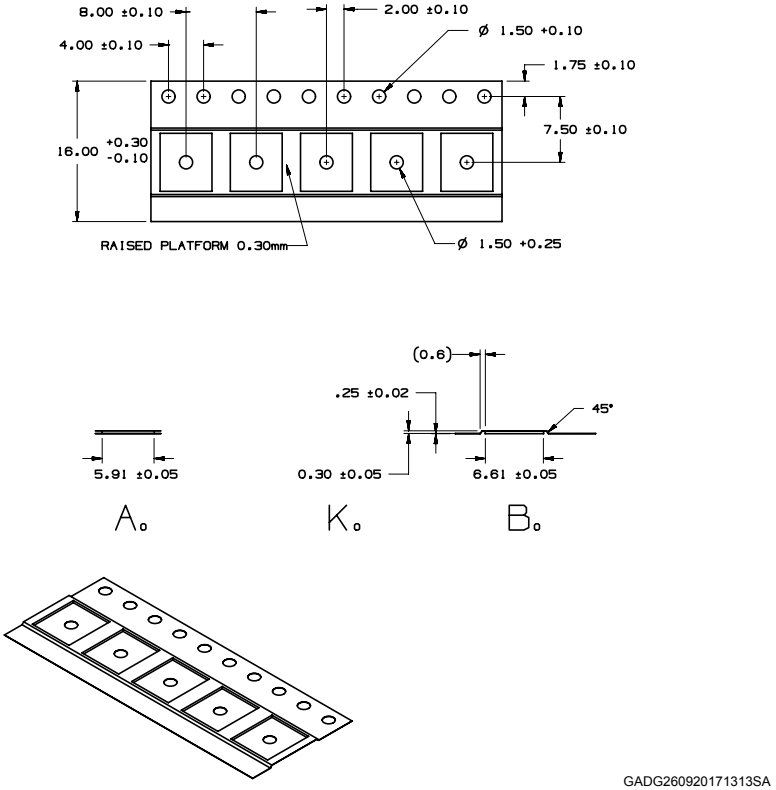
Package option	Test conditions	Details
D8	Wafer (8 inches) tested, inked, cut and each die is picked up and submitted to an automatic visual inspection on back side. Each die is tested and again submitted to visual inspection on both top and back side. Finally each die is placed inside reel pocket, again submitted to a top side visual inspection and sealed with a cover tape	

Figure 2. Tape drawing (dimensions in mm)



4 Additional information

4.1 Additional testing and screening

For customers requiring product supplied as known good die (KGD) or requiring specific die level testing (i.e. for dynamic and switching characterization), please contact the local ST sales office.

If KGD is requested, the shipping delivery is D8.

4.2 Shipping

Several shipping options are offered, consult the local ST sales office for availability:

- Die on film sticky foil - suffix on sales type D7
- Carrier tape - suffix on sales type D8

4.3 Handling

- Products must be handled only at ESD safe workstations. Standard ESD precautions and safe work environments are as defined in MIL-HDBK-263.
- Products must be handled only in a class 1000 or better-designated clean room environment.
- Singular die are not to be handled with tweezers. A vacuum wand with a non-metallic ESD protected tip should be used.

4.4 Wafer/die storage

Once the packaging is opened, the wafer must be stored in a dry, inert atmosphere, such as nitrogen.

Optimum temperature for storage is 18 °C ±2 °C with as few variations as possible to avoid parasitic polymerization of the adhesive. Sawn wafers must be processed within 12 weeks after receipt by customer.

After the customer opens the package, the customer is responsible for the products.

Revision history

Table 7. **Document revision history**

Date	Revision	Changes
18-Jan-2022	1	First release.