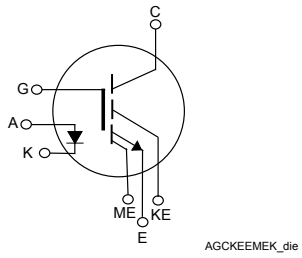
STG320MH75FD11AG

Datasheet

Automotive-grade trench gate field-stop 750 V, 320 A narrow mesa 2nd series IGBT bare die in D11 packing



Features

- AEC-Q101 qualified
- 3 µs of minimum short-circuit withstand time at V_{CC} = 450 V, V_{GE} = 15 V, starting T_J = 175 °C
- Low $V_{CE(sat)}$ = 1.5 V (typ.) at I_C = 500 A
- Temperature and current sensors integrated circuitry
- Enhanced switching performances
- Increased BV robustness
- Top and back metallization suitable for high performances modules

Applications

- Main inverter (electric traction)

Product status link
STG320MH75FD11AG

Product summary	
Order code	STG320MH75FD11AG
V_{CE}	750 A
I_{CN}	320 A
Die size	14.0 x 9.4 mm
Packing	D11

Description

This IGBT is developed using a new advanced proprietary trench gate field-stop fine pitch cell allowing lower $V_{CE(sat)}$ at very high current density. A perfectly engineered trench allows very good t_{sc} with low $V_{CE(sat)}$ and optimized switching performances. Mesa technology multiple field-stop profile reduces V_{CE} overshoot through turn-off di/dt optimization and allows breakdown voltage robustness increase. This die is equipped with sensors circuitry for temperature and current. From a mechanical point of view it offers polyimide top die passivation suitable for power modules and both sides metallization suitable for sintering processes.

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{CES}	Collector-emitter voltage (V_{GE} = 0 V)	750	V
V_{GE}	Gate-emitter voltage	±20	V
I_{CN}(1)	Continuous collector current at T = 25 °C	360	A
	Continuous collector current at T = 100 °C	215	
I_{CP}(2)	Pulsed collector current (t_P < 1 ms)	1300	A
t_{sc}(3)	Short-circuit withstand time V_{CC} = 450 V, V_{GE} = ±15 V, V_{CE} (peak) ≤ 650 V, starting T_J = 175 °C	3	µs
T_J	Operating junction temperature range	-40 to 175	°C

1. *Nominal collector current for die packaged in ST dedicated solution with R_{thJC} = 0.2 °C/W. 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)

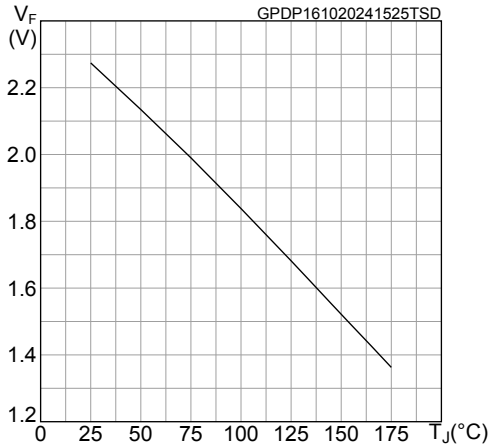
Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$V_{(BR)CES}$	Collector-emitter breakdown voltage	I_C = 100 µA, V_{GE} = 0 V	750	-	-	V
$V_{CE(sat)}$	Collector-emitter saturation voltage	V_{GE} = 15 V, I_C = 90 A	-	1.0	1.2	V
		V_{GE} = 15 V, I_C = 500 A	-	1.5	1.75	
		V_{GE} = 15 V, I_C = 350 A, T_J = 175 °C(1)	-	1.45	1.7	
		V_{GE} = 15 V, I_C = 500 A, T_J = 175 °C(1)	-	1.6	1.9	
$V_{GE(thp)}$	Pinched gate threshold voltage	V_{CE} = 5.5 V, I_C = 4 mA	5.5	6.5	7.5	V
I_{CES}	Collector cut-off current	V_{CE} = 700 V, V_{GE} = 0 V	-	-	6	µA
I_{GES}	Gate-emitter leakage current	V_{GE} = ±20 V, V_{CE} = 0 V	-	-	±150	nA
MCSR	Mirror current sensing ratio (I_C / I_{Mirror})	I_C = 500 A	-	1100	-	-

1. *Specified by design, not tested in production.*

Table 3. Diode temperature sensor

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
V_{F_ts}	Temperature sensor forward voltage	I_F = 200 µA	2.22	-	2.32	V
	Temperature sensor coefficient		-	5.7	-	mV/°C

Figure 1. Typical diode temperature sensor characteristics



3 Die layout

Figure 2. Die drawing (dimensions are in mm)

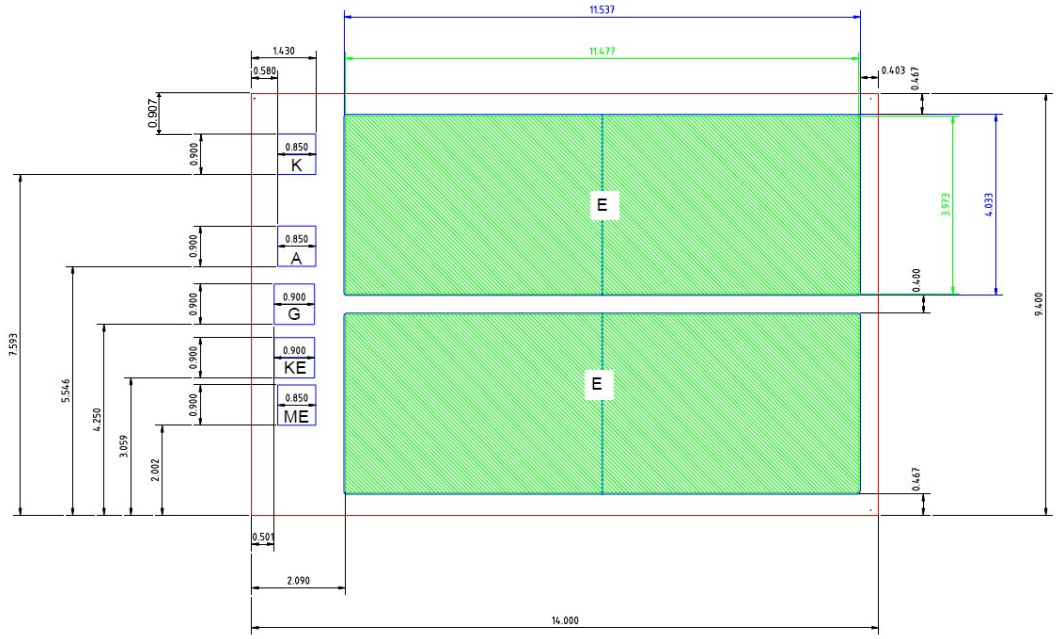


Table 4. Mechanical parameters

Symbol		Value	Unit
Die size including scribe line		14.0 x 9.40	mm
Wafer size		200	mm
Maximum possible dice per wafer		188	dice
Die thickness		80	µm
Front side passivation		Polyimide	
Emitter pad size		11.54 x 4.03 (x2)	mm
Gate pad size		0.9 x 0.9	mm
Front side metallization	composition	TiAl/Ti/Ni/Ag	
	thickness	4500/150/580/630	nm(1)
Back side metallization	composition	Al/Ti/NiV/Ag	
	thickness	100/100/1100/150	nm(1)
Die bond		Soft solder	
Recommended wire bonding		Dedicated clip	

1. *Tolerances: for Ni frontside ±50 nm, for NiV backside ±100 nm, for all other layers ±10%*

3.1 Packing information

Table 5. Die delivery

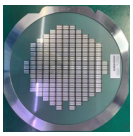
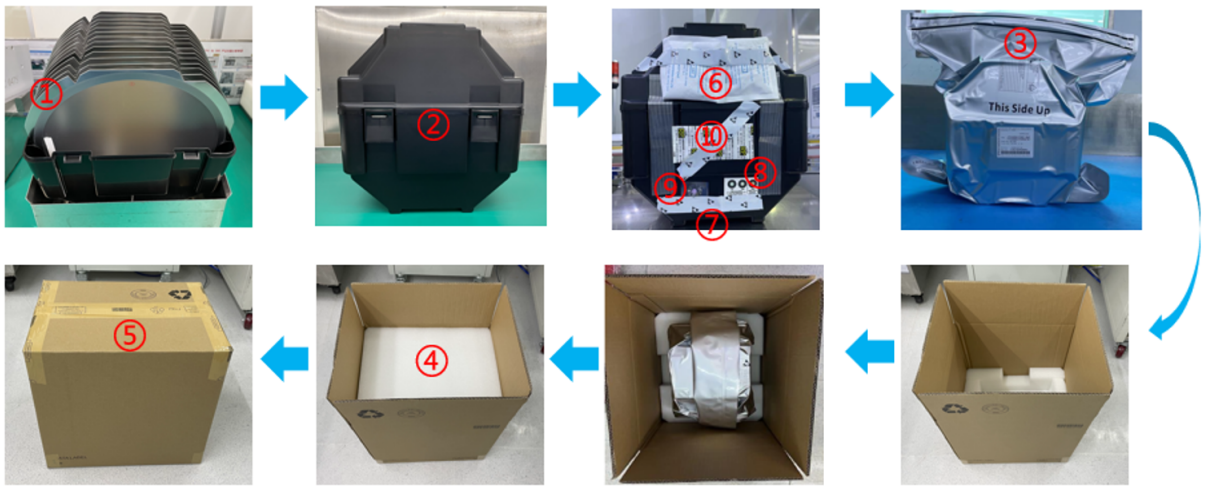
Package option	Description	Picture
D11	Known good dice (KGD) 100% tested in UV cured reconstructed wafer, supported by metallic ring frame. Reconstructed wafers are packed into a black box sealed under vacuum in a moisture barrier bag, with oxygen absorber, oxygen indicator, desiccant dry and HIC card. Some inked dice can be present after final QA visual inspection.	

Table 6. Packing materials

Item[1]	Description
1	8" wafer frame DY-WVR-001-S304-ST
2	Box multiwafer on frame 150/200 mm
3	Antistatic shielding bag 545x610 mm
4	Protect foam for wafer packing
5	390x325x410 mm carton box
6	Desiccant dry clay tyvek paper
7	ESD tape (25x33 mm)
8	HIC co free 3 spots 5-10-60%
9	Oxygen indicator card
10	Oxygen adsorber of RP-5An DOUYEE

1. *Refer to Figure 3 item number.*

Figure 3. Packing with reconstructed wafer

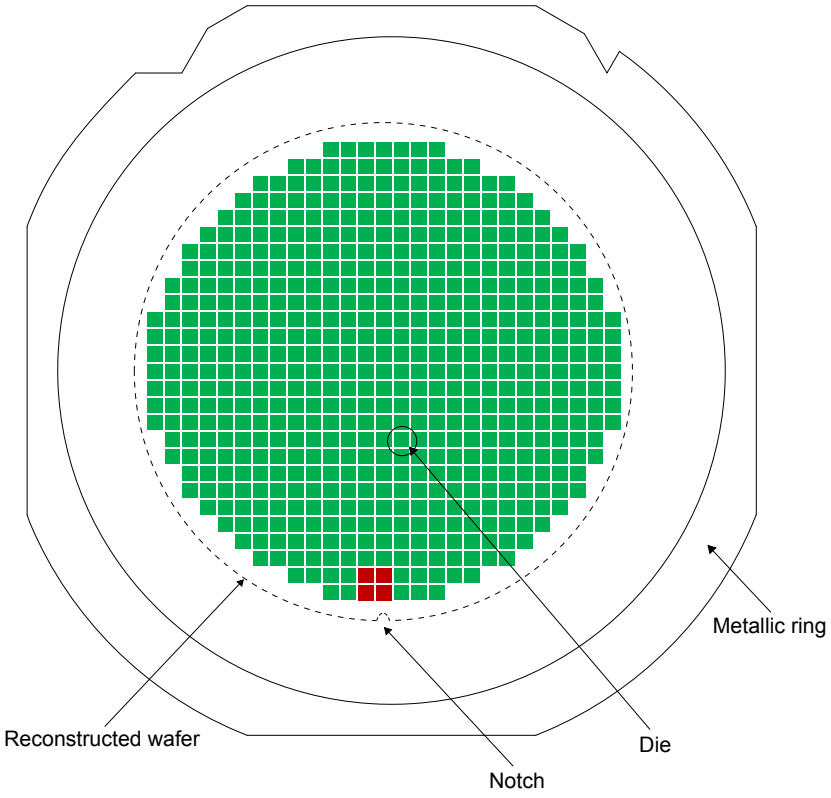


The wafers on frames are shipped inside a black box containing 25 wafers maximum.

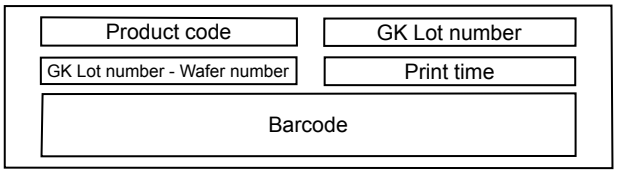
Figure 4. **Black box wafers**



Figure 5. **Notch orientation and label**



Label



Picture not in scale,
used for demonstration purposes only.

GADG051220231242GT

4 Additional information

4.1 Handling

- Products should only be handled in ESD-safe workstations. Standard ESD precautions and safe work environments are defined in MIL-HDBK-263.
- Products must be handled in a class 1000 clean room or higher.
- The single die should not be handled with tweezers. A vacuum wand with a non-metallic tip protected against electrostatic discharge must be used.

4.2 Wafer storage

To avoid contamination and/or degradation of the product after shipment, proper storage conditions are required.

- For unopened moisture barrier bag and canister box, the maximum storage time (starting ST shipment date) is up to 6 months with storage at room temperature between 5 °C and 28 °C max.
- For opened moisture barrier bag and canister box, the maximum storage time is 13 weeks after bag opening with storage under N2 dry flow and temperature 18 to 28 °C (usual manufacturing clean room temperature), without exceeding a total of maximum 6 months of unopened + opened storage period. Please check first the O2 (Oxygen) indicator located on the canister box: pink color means “good”, and blue means pieces should “not be used”.
- Humidity range: < 30 %.
- Particle count: Class 6 per ISO 14644:1999 vacuum sealed or backfilled with inert gas.

Revision history

Table 7. **Document revision history**

Date	Revision	Changes
07-Mar-2025	1	First release.
28-May-2025	2	Updated Table 4. Mechanical parameters.
21-Jul-2025	3	Updated Section 4.2: Wafer storage.

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