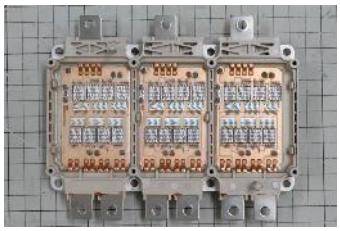
New Release

LTEC Corporation

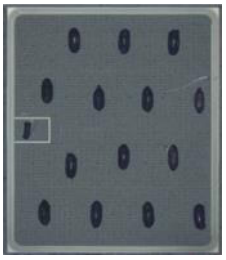
Your most experienced partner in IP protection

IGBT power module(750V): BYD (equipped in ATTO 3) BG820F08B14L5 Module & IGBT Structure Analysis Report

https://www.byd.com/jp/car/atto3



Module appearance



IGBT die

Overview

BYD, China's largest EV (electric vehicle) manufacturer began selling the ATTO 3 in China in February 2022.

The ATTO 3 is equipped in a 58.56 kWh battery and can travel 485km.

It has also been on sale in Japan since January 2023 as an EV passenger car for the Japanese market.

This report is a structure analysis report that clarifies the details of the IGBT power module equipped in the "ATTO 3" inverter and the IGBT mounted in the module.

Product features

- Product number: BG820F08B14L5 750V Si-IGBT IC = 820A
- Product release data: 2022 URL : https://www.bjxchip.com/web/soft/bg820f08b14l5.pdf
- Module equipped in ATTO 3 motor 150kW (system voltage 390V)
- IGBT uses 750V trench and field stop technology
- Module current capacity(Ic＝500A :TF=65℃, Tvj=150℃, Ic＝820A : TF=25℃, Tvj=175℃)
- The current density is 3.4 A/mm².

Report Contents

1. Module structure analysis report (35 pages)

- An external thermistor is used as the temperature detection element, and no temperature sensor diode is formed into the chips.
- Aluminum oxide DBC substrate is used for the insulating layer.

2. IGBT structure analysis report (76 pages)

- Trench type IGBT, 1-phase Si-IGBT(4 dies) and Si-FWD (3 dies).
- Cell pitch, trench width and depth are the same as those of Infineon EDT2 using a micro-trench process.
  * The trench bottom shape is distinctive. (This is confirmed in products of Chinese manufacturers)
- Due to issues with the size of the contact diameter and trench width, electrode extraction pads are used.

Report price

Delivered one week after order placement. **Please contact us for report pricing.**

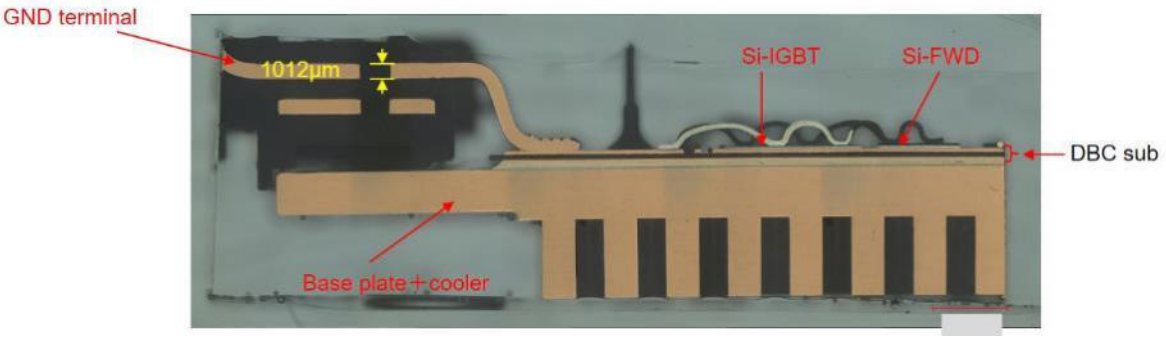
LTEC Corporation US Representative Office www.ltec-biz.com/en/
2310 Homestead Rd, C1 #231 Los Altos, CA 94024
Phone: +1-(650) 382-1181
Contact2@ltec.biz

Report No : 23R-1029-1,2
Release day: 2024.05.17

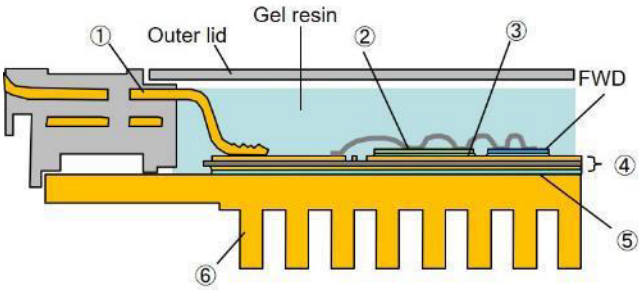
1. Module structure analysis report

Table of Contents

Excerpt from Module structure analysis report



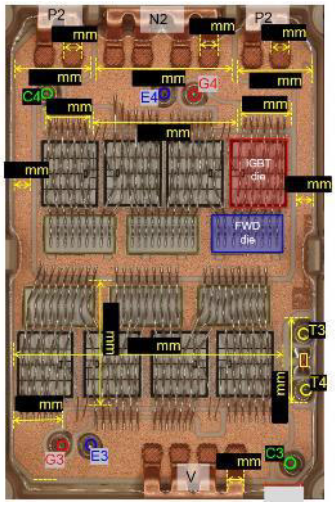
Module cross-sectional OM image



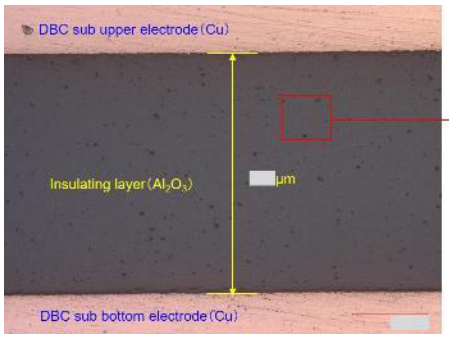
Module cross-sectional structure image

Number	Measurement points		Length measurement	Materials
1	Output terminal		[illegible]	[illegible]
2	Si-IGBT		[illegible]	[illegible]
2-1		Bonding wire	[illegible]	[illegible]
2-2		Protective film	[illegible]	[illegible]
2-3		Substrate	[illegible]	[illegible]
2-4		Backside metal-1	[illegible]	[illegible]
2-5		Backside metal-2	[illegible]	[illegible]
2-6		Backside metal-3	[illegible]	[illegible]
3	Die attach(IGBT)		[illegible]	[illegible]
4	DBC sub		[illegible]	[illegible]
4-1		DBC upper electrode	[illegible]	[illegible]
4-2		Insulating substrate	[illegible]	[illegible]
4-3		DBC bottom electrode	[illegible]	[illegible]
5	Solder		[illegible]	[illegible]
6	Cooler		[illegible]	[illegible]
6-1		Ni plating layer	[illegible]	[illegible]
6-2		Ni-P plating layer	[illegible]	[illegible]
6-3		Base plate	[illegible]	[illegible]
6-4		Cooling pin	[illegible]	[illegible]
7	Case		[illegible]	[illegible]

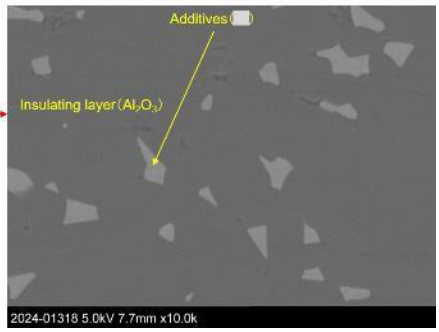
Table: Module structure summary



Module internal layout



OM image



SEM image

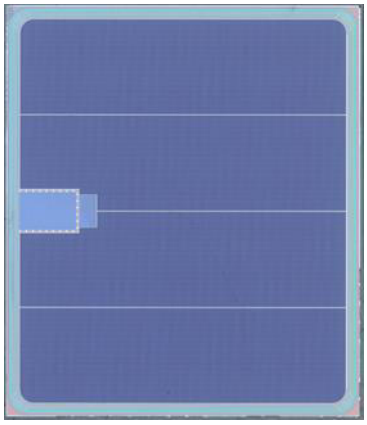
DBC substrate insulating layer

LTEC Corporation US Representative Office www.ltec-biz.com/en/
2310 Homestead Rd, C1 #231 Los Altos, CA 94024
Phone: +1-(650) 382-1181
Contact2@ltec.biz

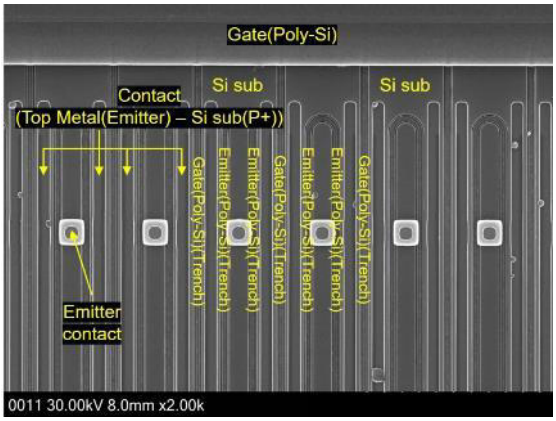
2. IGBT structure analysis report

Table of Contents

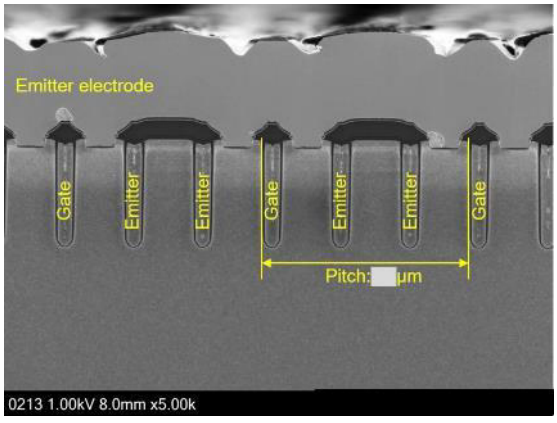
Excerpt from IGBT structure analysis report



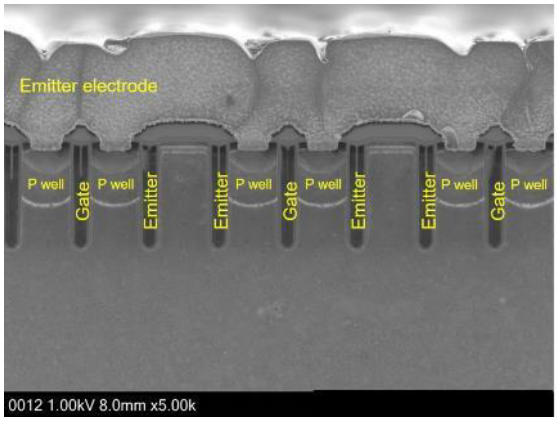
Si IGBT die (Poly-Si layer)



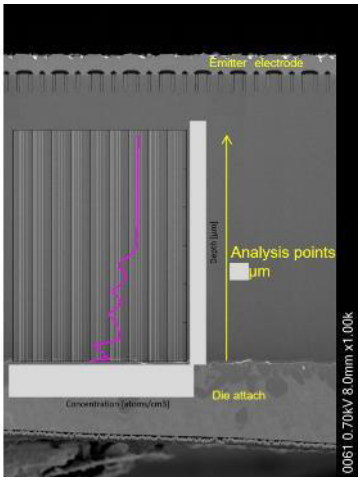
Plane SEM image of cell array (Poly-Si layer)

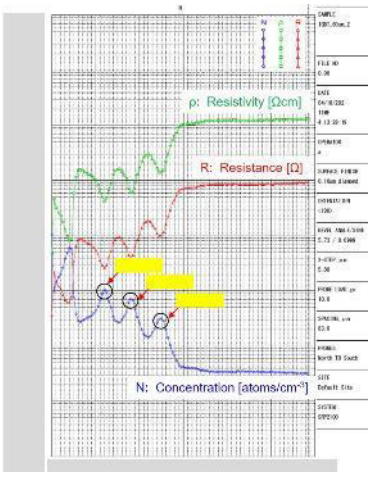


Cross-sectional SEM image of cell array



Cross-sectional SEM image of cell array (Stain etching)





※ The SR analysis results in this analysis report do not include data on the thickness and carrier concentration of the P+ Collector layer.

SR analysis of IGBT backside

LTEC Corporation US Representative Office www.ltec-biz.com/en/
2310 Homestead Rd, C1 #231 Los Altos, CA 94024
Phone: +1-(650) 382-1181
Contact2@ltec.biz