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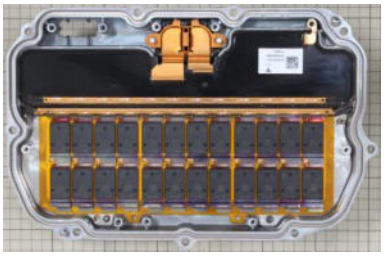
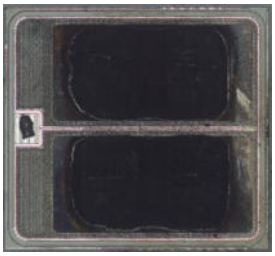
SiC power module(650V) : STMicroelectronics (equipped in the Tesla Model Y (2023)) Structure Analysis Report



Module appearance

SiC MOSFET package



SiC MOSFET die

Overview

The Tesla Model Y is an SUV-type BEV (battery electric vehicle), and the 2023 model comes in three types: RWD, Long Range (AWD), and Performance (AWD). It has a range of 605km and a top speed of 217km/h. This is structure and material analysis report on the STMicroelectronics SiC power module equipped in the Tesla Model Y Long Range (AWD), covering the following:

(1) Module structure analysis
(2) Plane and cross-section structure analysis of SiC MOSFET dies
(3) Comparison with the SiC module equipped in the Tesla Model 3 (2017 RWD) previously analyzed

Product features

- Motor output: 378kw. (Front : 158kw, Rear : 220kw)
  (*) Motor output (Rear) of Model 3: 211kw (estimated).
- 2 in 1 Half-Bridge module (SiC power module manufactured by STMicroelectronics)

【 Differences from the Tesla Model 3(2017) 】

(1) Change in the bonding material (solder) between the upper ribbon wire and the die
(2) Changes in the bonding material (die attach material) between the SiC die and die pad and between the insulating substrate and cooler.
(3) The SiC MOSFET die is the same generation as the one equipped in the Tesla Model 3.

Report price

Delivery within one week after order placement.

Please contact us for report pricing.

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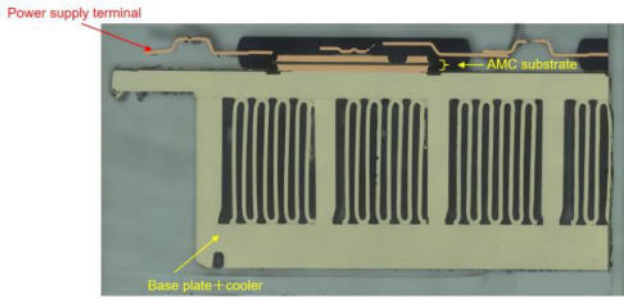
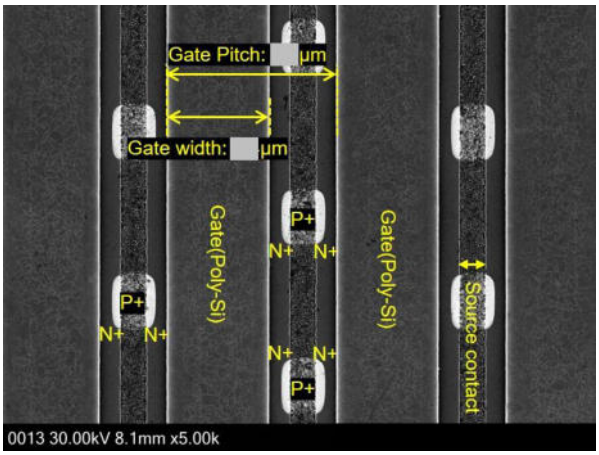
Excerpt from the structure analysis report



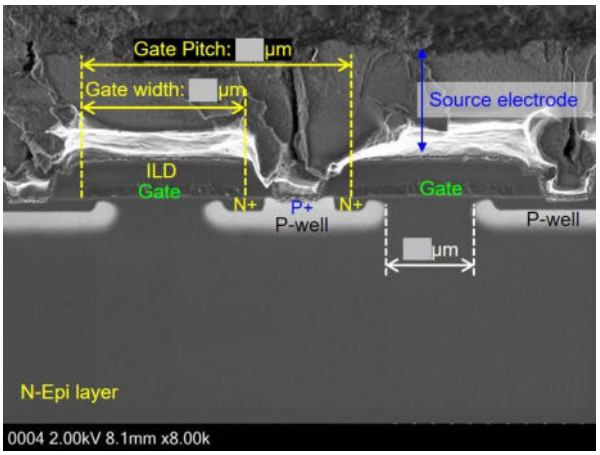
Module cross-section structure

Module structure summary

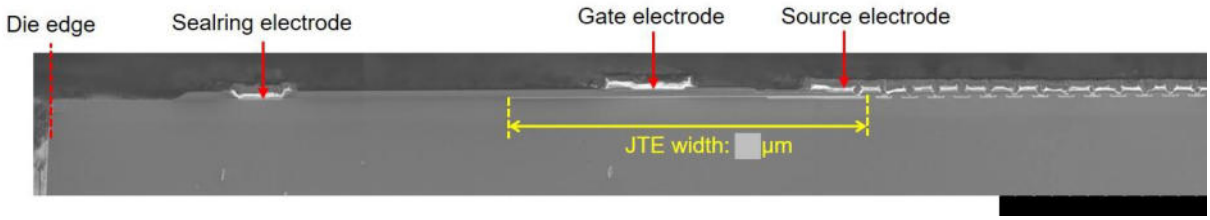
Number	Measurement points		Length measurement	Materials
1	Output terminal			
2	Cu clip			
2-1		Cu		
2-2		Solder		
2-3		Ni layer		
3	SiC-MOSFET			
3-1		Surface protection film		
3-2		Top Metal		
3-3		Substrate		
3-4		Backside metal-1		
3-5		Backside metal-2		
3-6		Backside metal-3		
4	Die attach			
5	AMC substrate			
5-1		AMC upper electrode		
5-2		Insulating substrate		
5-3		AMC bottom electrode		
6	Ag sinter			
7	Cooler			
7-1		Ni plating layer		
7-2		Base plate		
7-3		Cooling fins		
7-4		Cover		
8	Mold resin			



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



Cross-section SEM image of cell array



Cross-section SEM image of die outer periphery

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