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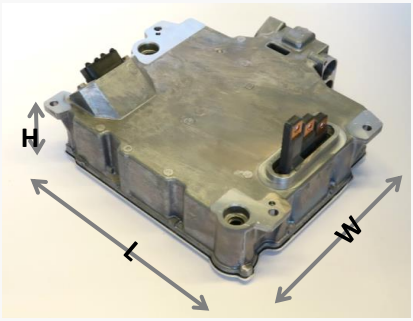
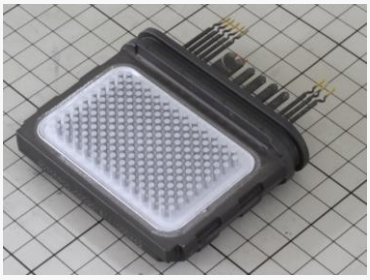
HITACHI AUTOMOTIVE POWER MODULE STRUCTURE ANLYSIS REPORT – Product used in the of the Audi eTRON 55 QUATTRO EV



Inverter unit



Power module

IGBT

Product outline

- Audi eTraon is the first EV from Audi.
- The inverter unit is manufactured by Hitachi Automotive, and it realizes high outpower density by installing double sided cooling power module (approximately 160% higher power density compared to the company's conventional product).

Basic features

- This power module is a compact high-efficiency double-sided cooling power module that incorporates a new generation IGBT (Insulated Gate Bipolar Transistor).
- It uses heat sinks with pin type cooling fins on both sides. An insulating sheet is used between the cooling fin and the lead frame. DBC board is not used.

Report contents

- The internal layout is estimated from the results of the module plane analysis. Cross-section analysis and material analysis are performed centering on the joints and components of the double-sided cooling structure.
- In the IGBT analysis, in addition to the plane and cross-section analysis of the cell area and the die edge, the structure is estimated from the plane observation of the temperature sensing diode and the gate protection diode.
- The module thermal resistance including the water-cooling part of the heat sink is estimated based on the results of the structural analysis.

Note: The report price may change over time. For current price contact **info@ltecusa.com**.

19G-0018-3

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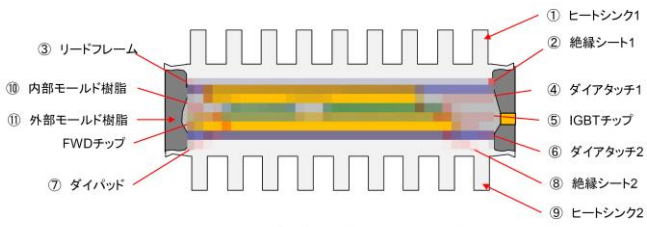
Excerpts from the analysis report



番号	測定箇所		測長	材料
1	ヒートシンク①			
1-1		酸化金属層		
1-2		金属層		
1-3		酸化金属層		
2	絶縁シート①			
2-1		主剤		
2-2		フィラー1		
2-3		フィラー2		
3	リードフレーム			
3-1		Cu層		
3-2		Niメッキ層		
4	ダイアタッチ①			
5	IGBT			
6	ダイアタッチ②			
7	ダイパッド			
7-1		Ni層		
7-2		金属層		

番号	測定箇所		測長	材料
8	絶縁シート②			
8-1		主剤		
8-2		フィラー1		
8-3		フィラー2		
9	ヒートシンク②			
9-1		酸化金属層		
9-2		金属層		
9-3		酸化金属層		
10	内部モールド樹脂			
10-1		フィラー1		
10-2		フィラー2		
10-3		樹脂		
11	外部モールド樹脂			
11-1		フィラー1		
11-2		フィラー2		
11-3		樹脂		

Fig. 2-1-8 チップレイアウト

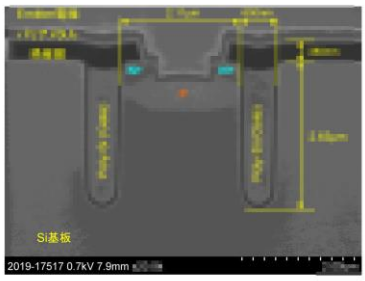


Fig. 3-3-16 トランジスタセル部 断面SEM像

※注入層は推定

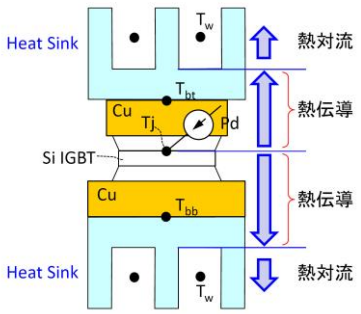


Fig.4-1-1: 熱抵抗モデル