New Release

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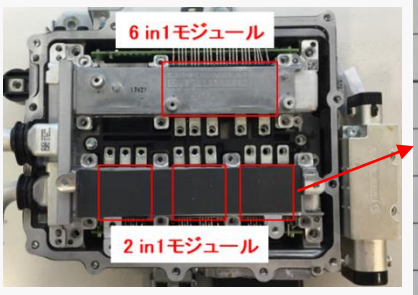
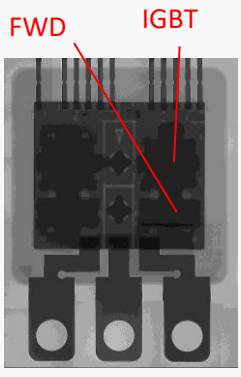
INFINEON 2 in 1* POWER MODULE STRUCTURE ANLYSIS REPORT – Product used in the Hyundai IONIQ PHEV



Inverter unit

Power module



X-ray

IGBT

* One IGBT and one free-wheeling diode form one pair. There are tow pairs in one package. This is referred to as 2in 1. There are two types of power modules in this inverter unit: one is 2 in 1, the other is 6 in 1. We analyzed the 2 in 1 inverter.

Product outline

The Electric Power Control Unit (EPCU) found within the 2018 Hyundai IONIQ PHEV uses Infineon's third generation half-bridge IGBT power module. This product is estimated to be equivalent to Infineon's "FF400R07A01E3_S6" 700V/400A component, a part of the HybridPACK™ family.

Basic features

- Double-sided cooling structure with DBC boards are attached to both sides of the package.
- A spacer is used to connect the IGBT die to the DBC board within the package.
- There are current sense, emitter sense, and temperature sense pads on the IGBT chip.
- The IGBT process is estimated to be equivalent to TRENCHSTOP™ IGBT3.

Report contents

- Estimation of the internal layout from the results of module plane analysis.
- Cross section and material analysis with focus on components of the double-sided cooling structure.
- IGBT die analysis: plane and cross-section analysis of the cell area and the die edge.
- The area and area ratio of the current sensing emitter are calculated from plane observations.
- Structure analysis of the temperature sense diode.
- Thermal resistance estimation based on structural analysis results.

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

19G-0040-1

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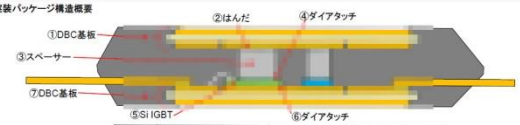
Excerpts from the analysis report

表 4: 実装パッケージ構造概要



番号	測定箇所		測長	材料
1	基板(DBC)			
1-1		上部金属層		
1-2		絶縁層		
1-3		添加物		
1-4		下部金属層		
2	はんだ			
3	スペーサー			
4	ダイアタッチ			
5	IGBT			
5-1		表面保護膜		
5-2		パッシベーション		
5-3		基板		
5-4		裏面電極-1		
5-5		裏面電極-2		
5-6		裏面電極-3		
5-7		裏面電極-4		
6	ダイアタッチ			
7	基板(DBC)			
7-1		上部金属層		
7-2		絶縁層		
7-3		添加物		
7-4		下部金属層		

2-2. パッケージ平面構造解析

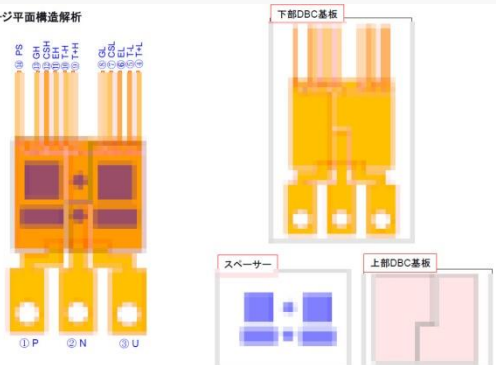
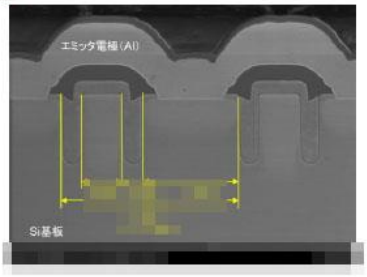


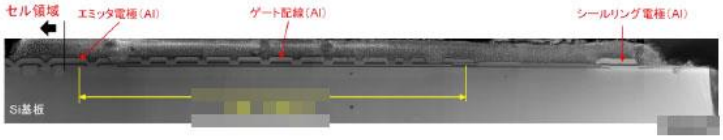
Fig. 2-2-5 パッケージレイアウト模式図

断面構造解析

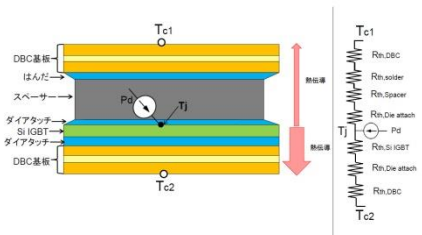
セル部



外周部



4-1. IGBT熱解析:熱抗モデル



4-2. IGBT熱解析:1-D Rth、jc推定

・IGBT (スイッチあたり1つのトランジスタ)
Rth,jc = [redacted] °C/W per switch

・熱抵抗の成分は左表(①～⑬)。
・IGBTチップの上側(①～⑦)で支配的となっているのは[redacted]

・IGBTチップの下側のみの熱抵抗が[redacted]

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