New Release

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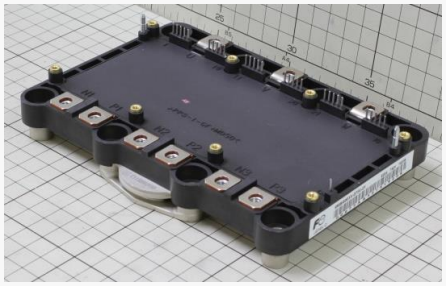
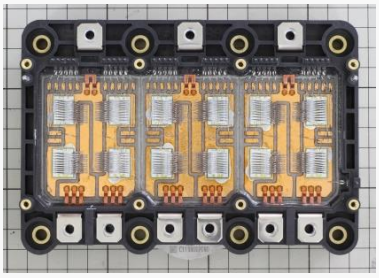
FUJI ELECTRIC 6MBI800XV-075V-01 IGBT MODULE FOR EV & HEV DETAILED ANALYSIS REPORTS

February 2020. LTEC Corporation released three analysis reports (structure, IGBT die, and process flow and electrical characteristics) of the Fuji Electric IGBT module. This module is for automotive application, Vces=750V, Ic=800A. The IGBT die is a 7th generation X series Reverse Conducting device (RC-IGBT).



Module



Module inside

IGBT die image

Report contents

- Layout, the device structure, the internal configuration of the cooler, and an analysis of the heat removal mechanism.
- Planar layout, cross section, EDX analysis of the RC-IGBT, and die structure analysis including analysis of the FWD regions.
- Process analysis report, including process technology of the RC-IGBT
- Estimate of the number of masks and the manufacturing process flow. The integration of the IGBT, the Free Wheeling Diode and temperature sensors.
- Ic-Vce characteristics, off-state collector leakage current and breakdown voltage, extraction of the activation energy from the temperature dependency of off-state leakage current.
- Comparison with Infineon IGBT7.

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

19G-0004-1

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Table of Contents
Module structure analysis report

Table of Contents
IGBT chip structure analysis report

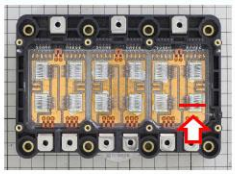
Table of contents
Process and electric characteristic analysis report

Excerpts from the module structural analysis report

(Report in English)

モジュール断面構造分析

富士電機
6MBI800XV-075V-01



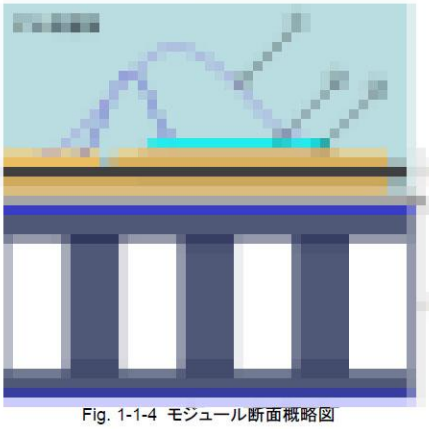
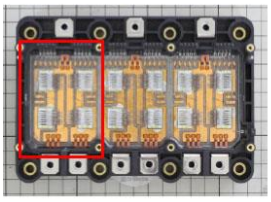


Fig. 1-1-4 モジュール断面概略図

表2：モジュール断面構造概要

	測定箇所		測長結果	材料
1	ワイヤ			
2	IGBT			
2-1		表面保護膜		
2-2		配線層		
2-3		基板		
2-4		裏面電極-1		
2-5		裏面電極-2		
3	ダイアタッチ			
4	基板（AMC）			
4-1		上部金属層		
4-2		ろう材		
4-3		絶縁層		
4-4		添加物		
4-5		ろう材		
4-6		下部金属層		
5	半田			
6	冷却器			
6-1		メッキ		
6-2		ベース板		
6-3		ろう材		
6-4		フィン		
6-5		ろう材		
6-6		ジャケット		
6-7		メッキ		

3-1. モジュール内部観察



X方向寸法

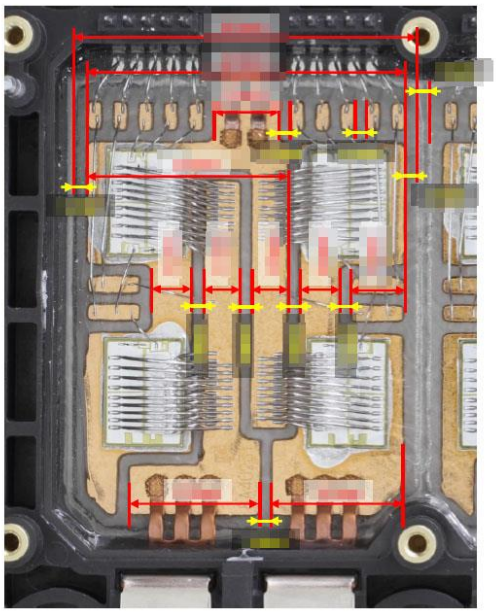


Fig. 3-1-6 モジュール内部拡大

Excerpts from the module structural analysis report

(Report in English)

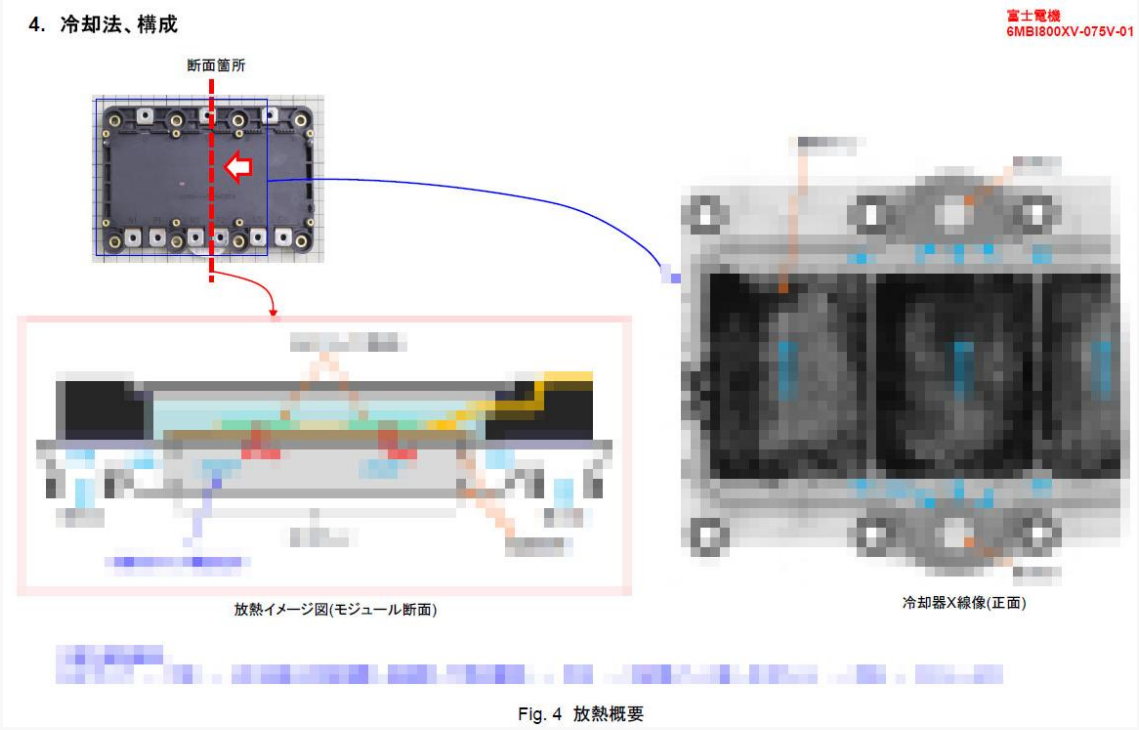
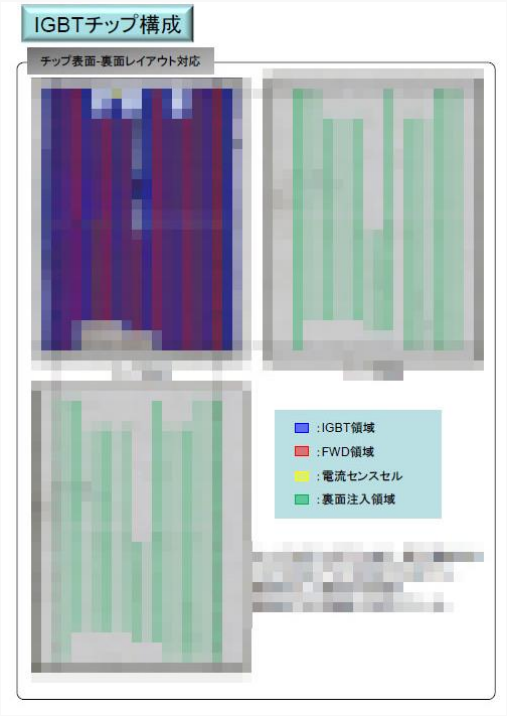


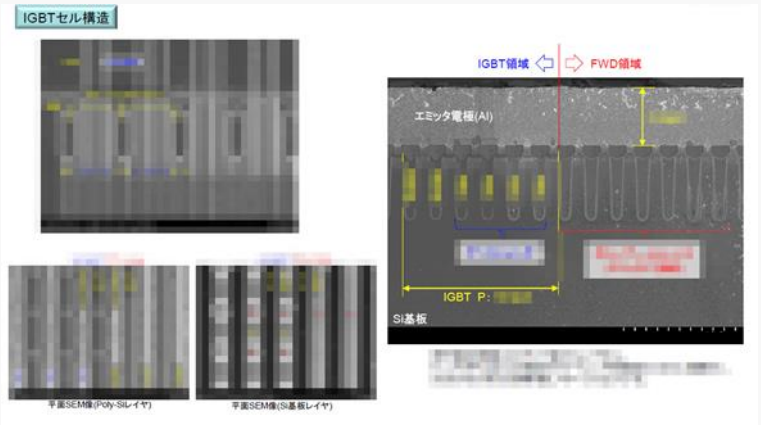
Fig. 4 放熱概要

Fig. 4-1-4 冷却器断面OM像

Excerpts from the die structure analysis report

(Report in English)





3-3. 断面構造解析(SEM)

セル部断面まとめ

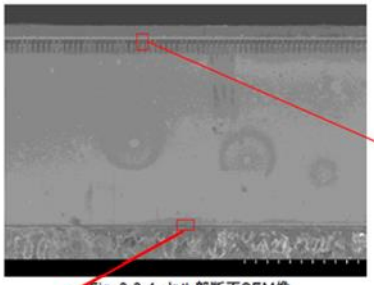


Fig. 3-3-4 セル部断面SEM像

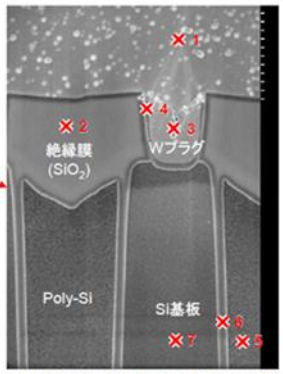


Fig. 3-3-6 セル部断面SEM像(IGBT領域)

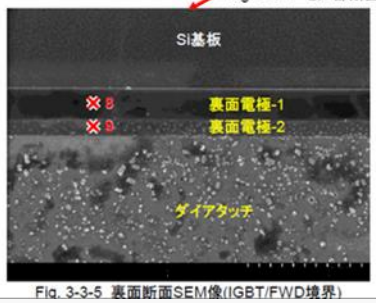
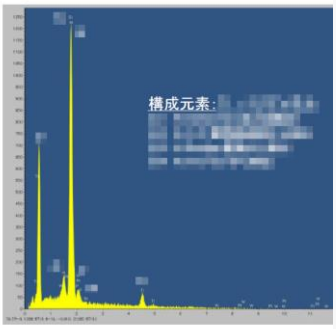


Fig. 3-3-5 裏面断面SEM像(IGBT/FWD境界)

Table. 3-3-1 セル部 各層膜厚/EDX分析結果 ※モジュール構造解析レポート参照

	測定箇所	測長結果	材料
	IGBT		
	保護膜※		
1	表面電極		
2	層間絶縁膜		
3	コンタクトプラグ		
4	バリアメタル		
5	Gate電極		
6	Gate絶縁膜		
7	基板		
8	裏面電極-1		
9	裏面電極-2		



SEM-EDX結果

Excerpts from the process and device characterization report

(Report in English)

3-5. プロセス技術に関する観察と考察

Fuji Electric 6MBI800XV-0

IGBT領域

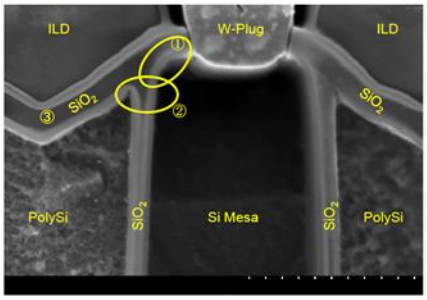


Fig. 3-5-2　IGBT領域のRC-IGBTセルアレイの断面SEM像 トレンチとSiメサの詳細

①トレンチトップの丸みが観察される⇒
②Trench PolySi-sidewallでの「バーズビーク」あり⇒
③トレンチPolySiおよびSi Mesa上のSiO2（～250nm）→

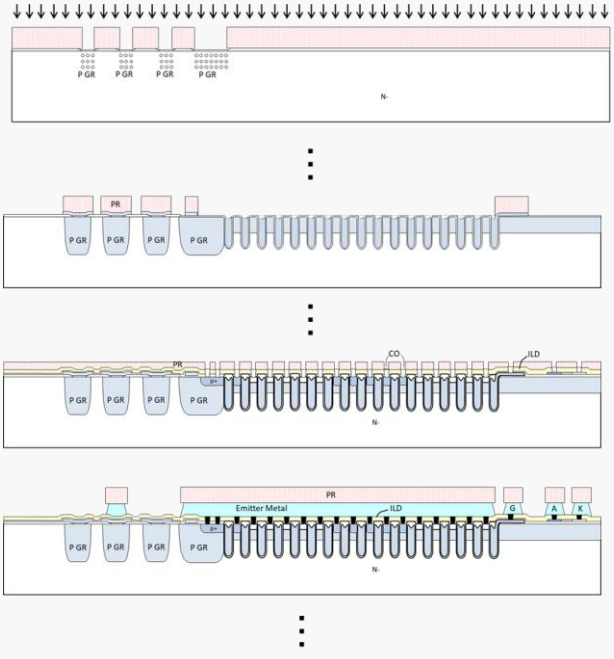
4. 製造プロセスフロー解析

4-1. Si-RC-IGBTのフロントエンドウェーハプロセスフロー(推定)

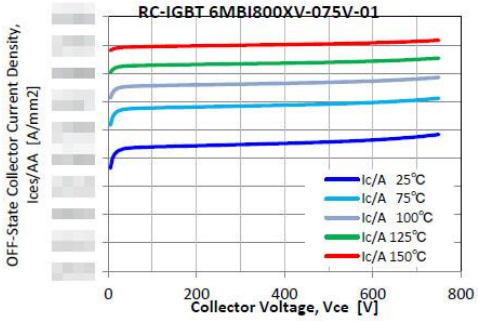
マスク	プロセス工程	コメント
	ウェーハ	Si FZ N-type 基板 N-(～50-60Ωcm)
	第1酸化	熱酸化≈50nm
[1]	AMフォト	Alignment Mark

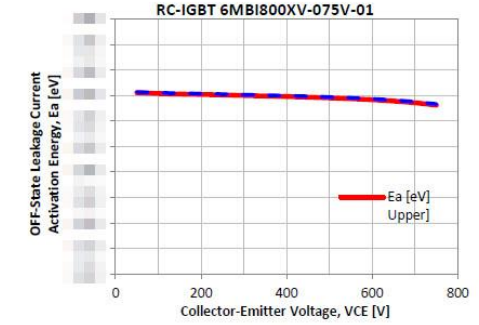
Wafer processing up to back-metallization:　photo/masking steps

•チッププロセスレベル:　枚マスク(層)



Process flow sequence diagram





Off-state collector leakage current per unit area and extraction of the activation energy

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