

IGBT

Wafer Product Evaluation to the implementation by the long-term storage

Outline

This document shows the evaluation results about the pickup intensity of the die when storing it for a long term, and the soldering performance to evaluate the influence on implementation process by long-term storage of the wafer products including Sawn wafer of IGBTs.

Target Device

IGBT Wafer products

Contents

1. Introduction.....	2
2. Evaluation Content	2
2.1 Evaluation Samples and Conditions.....	2
2.1.1 Evaluation Samples.....	2
2.1.2 Evaluation Conditions.....	2
2.2 Evaluation for Pickup intensity	3
2.2.1 Measuring method for Pickup intensity	3
2.2.2 Evaluation result.....	3
2.2.2.1 Evaluation result 1 (8.8mm x 8.8mm size)	3
2.2.2.2 Evaluation result 2 (Die size: 14 x 14 mm).....	4
3. SUMMARY	5

1. Introduction

The shelf life of Sawn Wafer is limited by the adhesion between the dicing tape and the wafer. Due to long-term storage, the tape may be cured, the adhesion between the tape and the wafer may increase, and the chip pick-up performance may deteriorate.

There is also a concern that the glue of dicing tape remain on the wafer back side.

Renesas stored the IGBT wafer for a longer term to evaluate its margin against the storage period of 6 months, and performed die pickup and solderability evaluation.

2. Evaluation Content

2.1 Evaluation Samples and Conditions

2.1.1 Evaluation Samples

- (1) IGBT process: AE3 IGBT, 8inch
- (2) Die size: 8.8mm x 8.8mm, t 90um, 14mm x 14mm, t 90um
- (3) Back metal: Ni/Au
- (4) Dicing tape: UV Curable Dicing Tape
- (5) Packing: see figure below

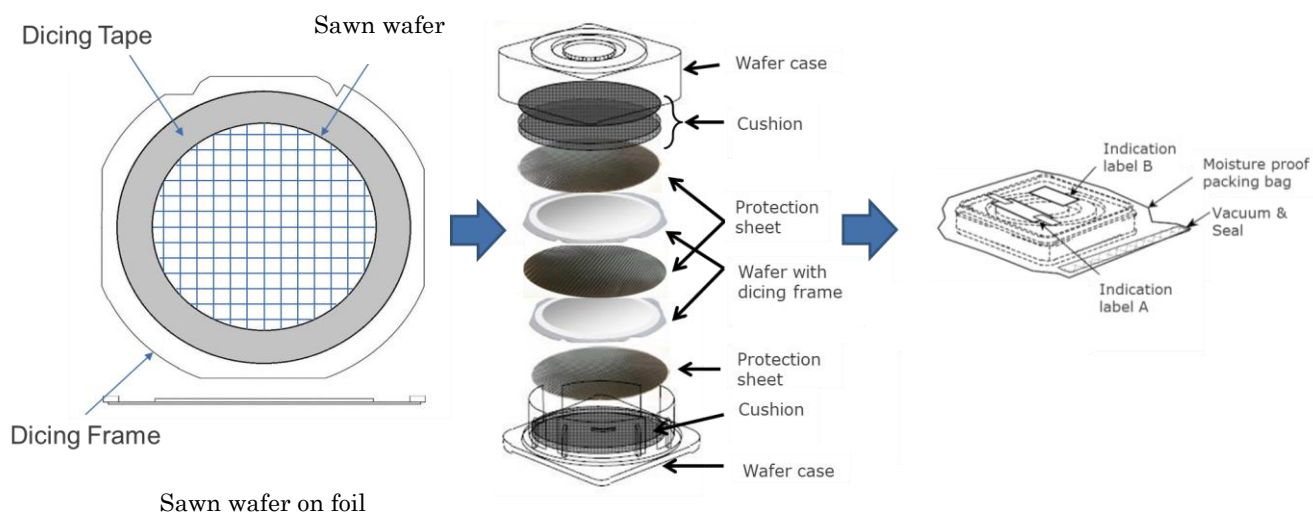


Figure 1 Packing example of wafer product

2.1.2 Evaluation Conditions

Table 1 Evaluation Conditions for Wafer product by Long-term storage

Test condition			Sample size	Evaluation item
Storage test	Room temperature	6 months	2wafer	① Pickup intensity
		9 months	1wafer	② Solderability
		18 months	1wafer	
	Low temperature	-40°C × 48hr	2wafer	
	High temperature	50°C × 240hr	2wafer	

2.2 Evaluation for Pickup intensity

2.2.1 Measuring method for Pickup intensity

As shown in the figure below, measure the intensity when the chip peels off from dicing tape.

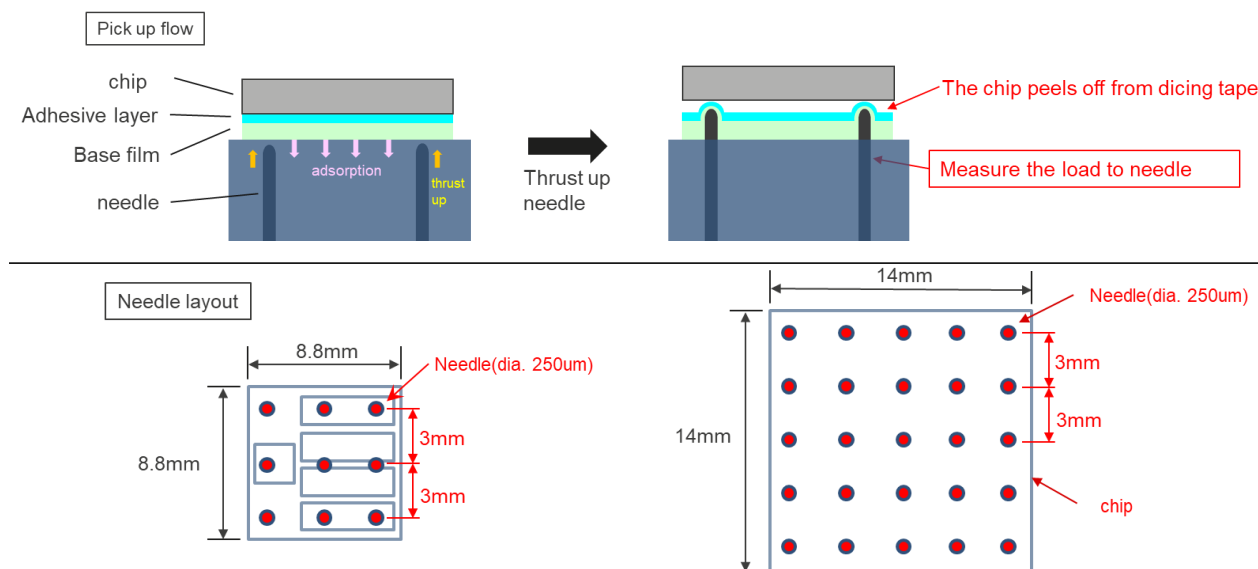


Figure 2 Measuring method for Pickup intensity

2.2.2 Evaluation result

2.2.2.1 Evaluation result 1 (8.8mm x 8.8mm size)

(1) Storage term and pickup intensity

There were no pickup errors under any of the storage conditions, and the pickup strength was not significantly different from the initial value.

Table 2 Pickup intensity evaluation result

Storage condition	Pickup intensity [g]					
	initial	Low temp. -40degC	High temp. 50degC	room temp. around 25degC		
	1week	48hours	240hours	6months	9months	18months
MAX	106	102	111	108	105	108
MIN	97	92	102	97	97	100
AVE	101	97	107	102	101	105

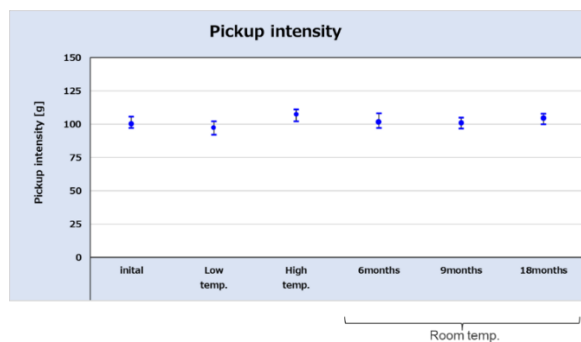


Figure 3 Pickup intensity evaluation result

(2) Solderability

No remaining adhesive on back side electrode and solder spread all over top side and back side electrode. The evaluation result found no issues.

Solder specification : Sn5Sb0.6Ni0.05P
Sample size : 5pcs on each condition

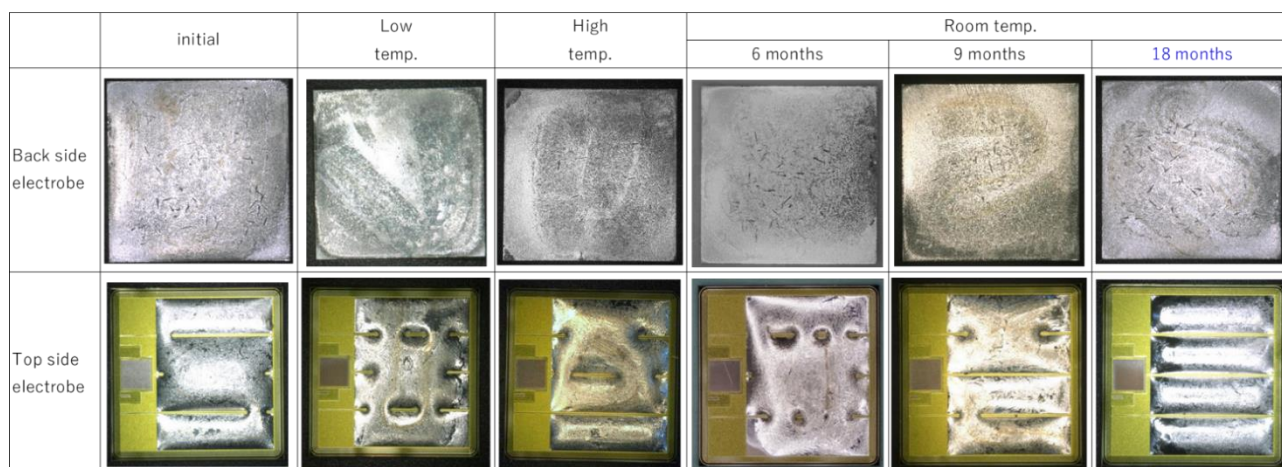


Figure 4 Representative electrode photo after soldering

2.2.2.2 Evaluation result 2 (Die size: 14 x 14 mm)

(1) Storage term and pickup intensity

There were no pickup errors under any of the storage conditions, and the pickup strength was not significantly different from the initial value.

Table 3 Pickup intensity evaluation result

Pick up intensity[g]	Month, Room Temp		
	0	6	18
MAX	71.6	72.2	73.7
MIN	67.1	70.2	65.6
AVE	69.2	71.3	69.8

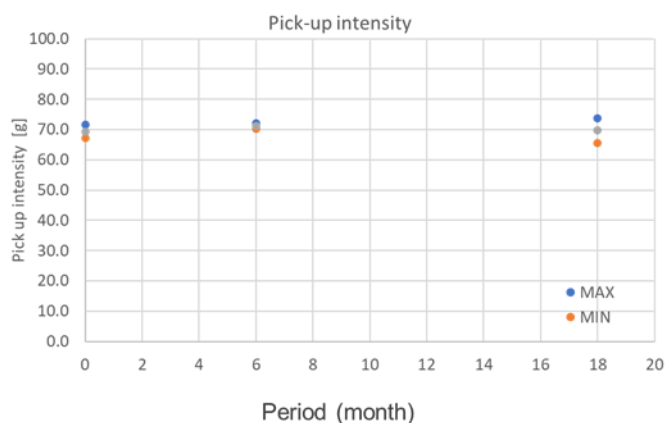


Figure 5 Pickup intensity evaluation result

(2) Solderability

Solder spread all over top side as below. The evaluation result found no issues.

Solder specification : Sn/5Sb/0.6Ni/0.05P
Sample size : 5pcs on each condition
Room temp

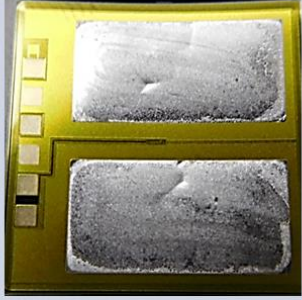
Storage Period	Initial	6 months	18 months
Top side solderability			
Result	No issue	No issue	No issue

Figure 6 Representative electrode photo after soldering

3. SUMMARY

Pickup and solderability characteristics do not show any abnormality at room temperature storage test for 18 months and high/low temperature storage test, and all evaluation results are passed.

Revision History

Rev.	Date	Description	
		Page	Summary
1.00	July 5, 2024	-	First edition

Notice

1. Descriptions of circuits, software and other related information in this document are provided only to illustrate the operation of semiconductor products and application examples. You are fully responsible for the incorporation or any other use of the circuits, software, and information in the design of your product or system. Renesas Electronics disclaims any and all liability for any losses and damages incurred by you or third parties arising from the use of these circuits, software, or information.
2. Renesas Electronics hereby expressly disclaims any warranties against and liability for infringement or any other claims involving patents, copyrights, or other intellectual property rights of third parties, by or arising from the use of Renesas Electronics products or technical information described in this document, including but not limited to, the product data, drawings, charts, programs, algorithms, and application examples.
3. No license, express, implied or otherwise, is granted hereby under any patents, copyrights or other intellectual property rights of Renesas Electronics or others.
4. You shall be responsible for determining what licenses are required from any third parties, and obtaining such licenses for the lawful import, export, manufacture, sales, utilization, distribution or other disposal of any products incorporating Renesas Electronics products, if required.
5. You shall not alter, modify, copy, or reverse engineer any Renesas Electronics product, whether in whole or in part. Renesas Electronics disclaims any and all liability for any losses or damages incurred by you or third parties arising from such alteration, modification, copying or reverse engineering.
6. Renesas Electronics products are classified according to the following two quality grades: "Standard" and "High Quality". The intended applications for each Renesas Electronics product depends on the product's quality grade, as indicated below.

"Standard": Computers; office equipment; communications equipment; test and measurement equipment; audio and visual equipment; home electronic appliances; machine tools; personal electronic equipment; industrial robots; etc.

"High Quality": Transportation equipment (automobiles, trains, ships, etc.); traffic control (traffic lights); large-scale communication equipment; key financial terminal systems; safety control equipment; etc.

Unless expressly designated as a high reliability product or a product for harsh environments in a Renesas Electronics data sheet or other Renesas Electronics document, Renesas Electronics products are not intended or authorized for use in products or systems that may pose a direct threat to human life or bodily injury (artificial life support devices or systems; surgical implantations; etc.), or may cause serious property damage (space system; undersea repeaters; nuclear power control systems; aircraft control systems; key plant systems; military equipment; etc.). Renesas Electronics disclaims any and all liability for any damages or losses incurred by you or any third parties arising from the use of any Renesas Electronics product that is inconsistent with any Renesas Electronics data sheet, user's manual or other Renesas Electronics document.

7. No semiconductor product is absolutely secure. Notwithstanding any security measures or features that may be implemented in Renesas Electronics hardware or software products, Renesas Electronics shall have absolutely no liability arising out of any vulnerability or security breach, including but not limited to any unauthorized access to or use of a Renesas Electronics product or a system that uses a Renesas Electronics product. RENESAS ELECTRONICS DOES NOT WARRANT OR GUARANTEE THAT RENESAS ELECTRONICS PRODUCTS, OR ANY SYSTEMS CREATED USING RENESAS ELECTRONICS PRODUCTS WILL BE INVULNERABLE OR FREE FROM CORRUPTION, ATTACK, VIRUSES, INTERFERENCE, HACKING, DATA LOSS OR THEFT, OR OTHER SECURITY INTRUSION ("Vulnerability Issues"). RENESAS ELECTRONICS DISCLAIMS ANY AND ALL RESPONSIBILITY OR LIABILITY ARISING FROM OR RELATED TO ANY VULNERABILITY ISSUES. FURTHERMORE, TO THE EXTENT PERMITTED BY APPLICABLE LAW, RENESAS ELECTRONICS DISCLAIMS ANY AND ALL WARRANTIES, EXPRESS OR IMPLIED, WITH RESPECT TO THIS DOCUMENT AND ANY RELATED OR ACCOMPANYING SOFTWARE OR HARDWARE, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY, OR FITNESS FOR A PARTICULAR PURPOSE.
8. When using Renesas Electronics products, refer to the latest product information (data sheets, user's manuals, application notes, "General Notes for Handling and Using Semiconductor Devices" in the reliability handbook, etc.), and ensure that usage conditions are within the ranges specified by Renesas Electronics with respect to maximum ratings, operating power supply voltage range, heat dissipation characteristics, installation, etc. Renesas Electronics disclaims any and all liability for any malfunctions, failure or accident arising out of the use of Renesas Electronics products outside of such specified ranges.
9. Although Renesas Electronics endeavors to improve the quality and reliability of Renesas Electronics products, semiconductor products have specific characteristics, such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Unless designated as a high reliability product or a product for harsh environments in a Renesas Electronics data sheet or other Renesas Electronics document, Renesas Electronics products are not subject to radiation resistance design. You are responsible for implementing safety measures to guard against the possibility of bodily injury, injury or damage caused by fire, and/or danger to the public in the event of a failure or malfunction of Renesas Electronics products, such as safety design for hardware and software, including but not limited to redundancy, fire control and malfunction prevention, appropriate treatment for aging degradation or any other appropriate measures. Because the evaluation of microcomputer software alone is very difficult and impractical, you are responsible for evaluating the safety of the final products or systems manufactured by you.
10. Please contact a Renesas Electronics sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. You are responsible for carefully and sufficiently investigating applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive, and using Renesas Electronics products in compliance with all these applicable laws and regulations. Renesas Electronics disclaims any and all liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.
11. Renesas Electronics products and technologies shall not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable domestic or foreign laws or regulations. You shall comply with any applicable export control laws and regulations promulgated and administered by the governments of any countries asserting jurisdiction over the parties or transactions.
12. It is the responsibility of the buyer or distributor of Renesas Electronics products, or any other party who distributes, disposes of, or otherwise sells or transfers the product to a third party, to notify such third party in advance of the contents and conditions set forth in this document.
13. This document shall not be reprinted, reproduced or duplicated in any form, in whole or in part, without prior written consent of Renesas Electronics.
14. Please contact a Renesas Electronics sales office if you have any questions regarding the information contained in this document or Renesas Electronics products.

(Note1) "Renesas Electronics" as used in this document means Renesas Electronics Corporation and also includes its directly or indirectly controlled subsidiaries.

(Note2) "Renesas Electronics product(s)" means any product developed or manufactured by or for Renesas Electronics.

(Rev.5.0-1 October 2020)

Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu,
Koto-ku, Tokyo 135-0061, Japan
www.renesas.com

Trademarks

Renesas and the Renesas logo are trademarks of Renesas Electronics Corporation. All trademarks and registered trademarks are the property of their respective owners.

Contact information

For further information on a product, technology, the most up-to-date version of a document, or your nearest sales office, please visit:
www.renesas.com/contact/.