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

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) Diching tape: UV Curable Dicing Tape

(5) Packing: see figure below

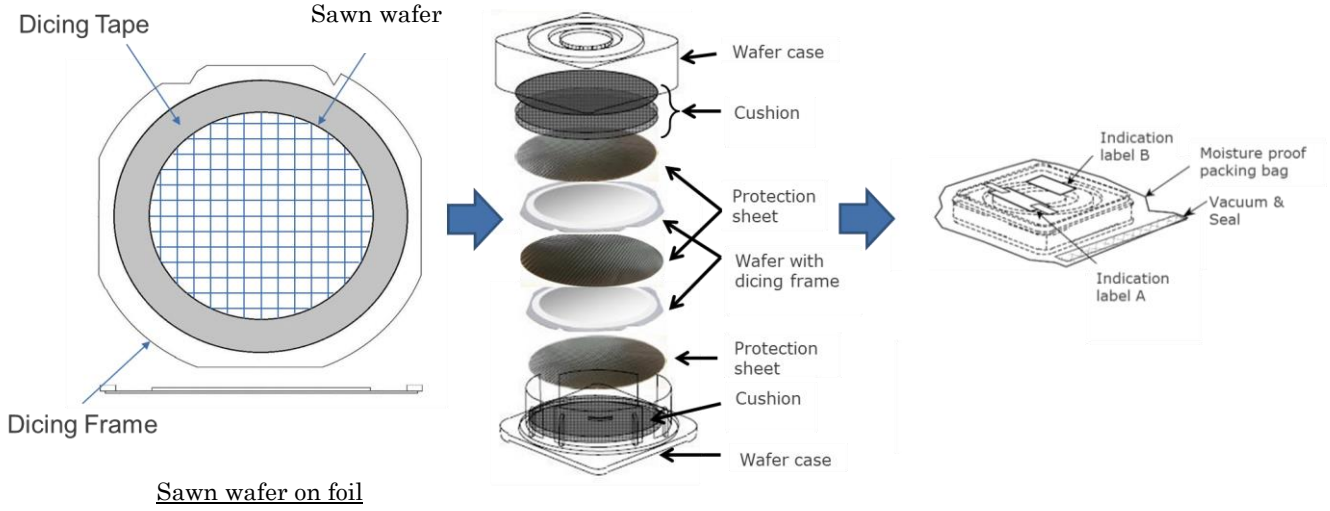


Figure 1 Packing example of wafer product

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 ② Solderability
		9 months	1wafer	
		18 months	1wafer	
	Low temperature	-40℃ × 48hr	2wafer	
	High temperature	50℃ × 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.

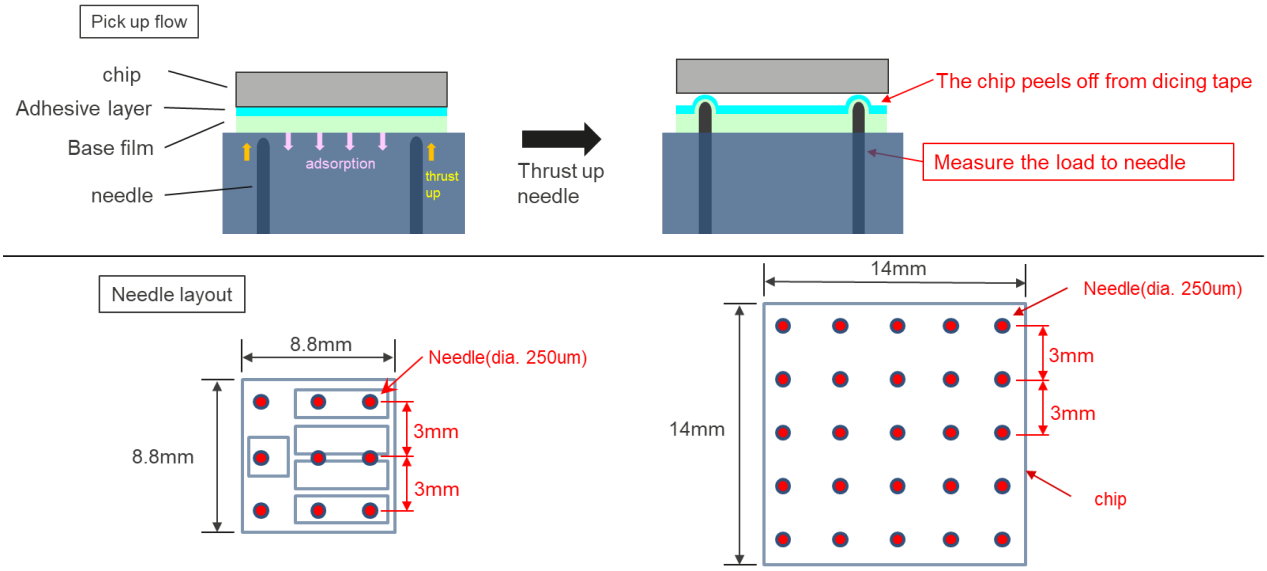


Figure 2 Measuring method for Pickup intensity

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]					
	inital	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

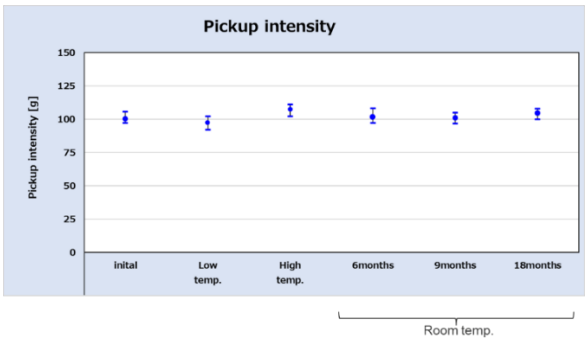


Figure 3 Pickup intensity evaluation result

(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 : Sn/5Sb/0.6Ni/0.05P
Sample size : 5pcs on each condition

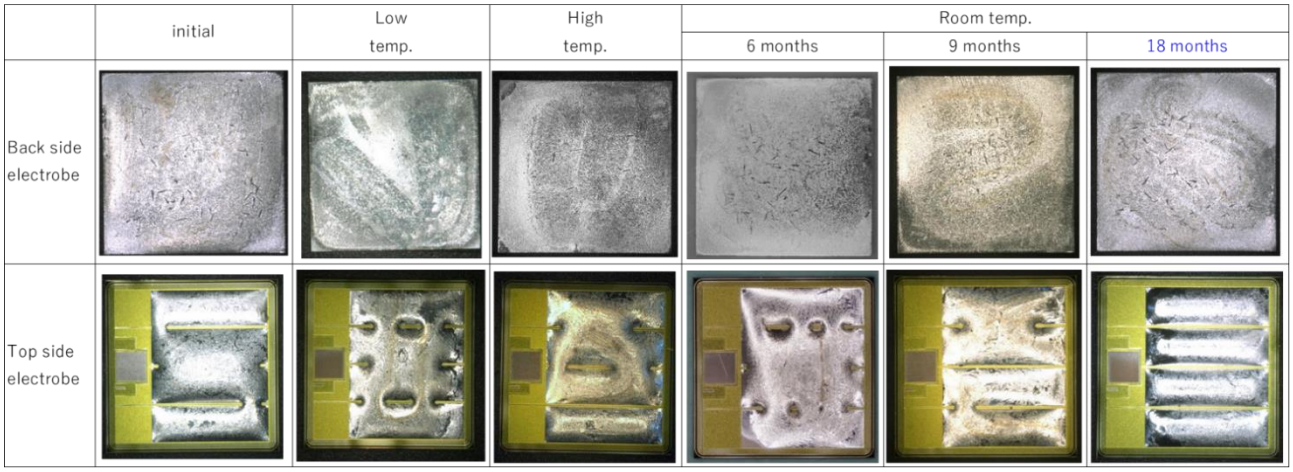


Figure 4 Representative electrode photo after soldering

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

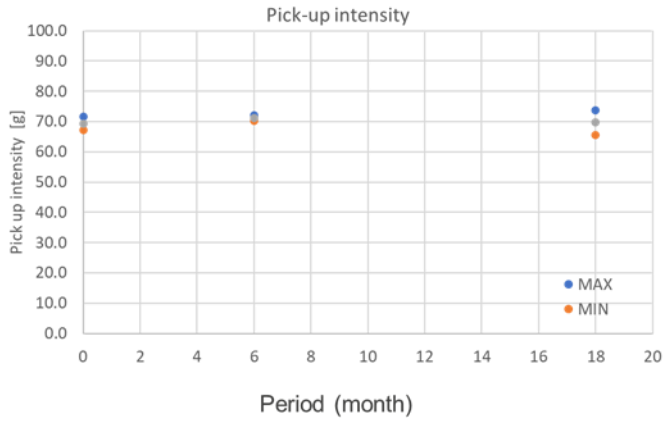


Figure 5 Pickup intensity evaluation result

(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

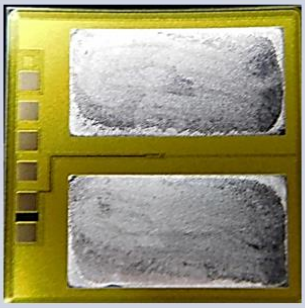
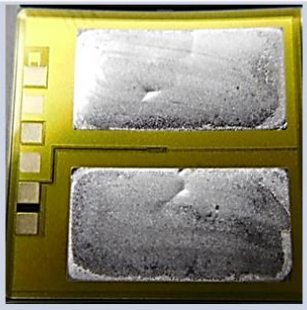
Storage Period	Initial	6 months	18 months
Top side solderability			
Result	No issue	No issue	No issue

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

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