Jazz Semiconductor Wafer Packaging Assembly

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Scope

The contents herein apply to Jazz semiconductor products with and without Polyimide and with 3 micron thick or greater top metal metalization.

Purpose

This application note is to inform packaging assembly companies to exercise caution during back grinding, dicing, picking and placing, and wire bonding of Jazz Semiconductor wafers with thick top metalization.

Why does the assembly process on thick metal require optimization?

Jazz's high performance, specially processed wafers use a thick top metal layer. Any abrupt contact to the top surface of the wafer could result in permanent damage to the top metallization.

Guidelines to assembly companies

Assembly process design, development, characterization and optimization are essential for thick metal. Key material, process, and parameter selections and settings are crucial to prevent damages of the top metallization. There are many ways to prevent damaging the top metal. Here are a few proven tips that have been found helpful.

1. Use small probe tip and over travel to reduce probe scrub marks or use long bond pads to help reduce probe mark and wire bond area overlap. This is to avoid non-stick on pads with reduce down force and ultrasonic power. To ensure adequate bondability, probe mark damage should be < 25% of the open pad size and not in the center of the pad

2. Select a thick, low adhesive strength tape for back grinding and wafer dicing (see table 1 examples). Reduce the tapping pressure during wafer taping process.

3. Lower grinding rate; decrease water flow rate during wafer grinding; slow down grinding tape-peeling process.

4. Select a pyramid non-contact collect such as IPIR and IPNC series from SPT, or a soft tip for die pick up and attach, and reduce pick up and bonding forces.

5. Bond ball must be centered and ensure 100% ball containment in bond pad opening. Bond size should not exceed ¾ of the pad size.

6. Adjust the first bond force, set the first bond force between 20 to 25 grams

7. Fine tune ultrasonic power and duration; recommend setting bond temperature at 200C, and ultrasonic power to 70mW for 20ms.

8. Reduce molding compounds transfer pressure and speed.

Tables 2 and 3 provides wire pull and ball shear results at various bonding test conditions with and without polyimide. Figure 1 illustrates successful bonding on 6-microns thick top metal without polyimide at one of the test conditions listed in table 2. Figure 2 illustrates successful bonding on 6-microns thick top metal with polyimide at one of the test conditions listed in table 3.

Table 1: Recommended grinding and dicing tapes

	Backgrind Tape				
				Adhesion (N/20mm)	
Supplier	Model	Type	Thk	Before	After
Furukawa	SP-537T-S230	UV	230	1.44	0.01
Nitto	BT-230E-CM	Non-UV	230	0.18	N/A

	Dicing Saw Tape				
				Adhesion (N/20mm)	
Supplier	Model	Type	Thk	Before	After
Furukawa	UC-353EP-110	UV	110	1.4	0.1

Supporting Data

Table 2: Wire Pull and Bond Shear evaluation results for 3 and 6-micron thick top metal

Test	Metal Layers	Top Metal Thickness	Bond Force	Power	Duration	Wire Pull	Ball Shear	PO (1)	Ass'y (2)	Package Yield (3)
1	4	6um	20	85	15	10.5	33.5	74x94	B	97.04
2	4	6um	25	70	15	8.4	36.6	74x94	A	99.2
3	4	6um	25	70	20	9.1	40.6	74x94	A	100
4	4	6um	25	70	20	8.5	40.9	74x94	A	100
5	4	6um	25	65	20	8.0	32.8	74x94	A	97.51
6	4	6um	25	65	20	8.9	31.5	74x94	A	99.39
7	4	6um	20	70	15	9.2	33.4	74x94	A	100
8	4	3um	25	65	20	8.9	34.8	74x94	A	95.4
9	4	3um	25	65	20	8.6	39.0	74x94	A	100
10	4	3um	25	65	20	7.9	35.8	74x94	A	100
11	4	3um	20	70	22	8.1	31.2	74x94	A	100
12	4	3um	20	70	22	7.8	29.0	74x94	A	99.62
13	5	6um	20	85	15	10.8	47.4	64x64	B	N/A
14	5	6um	20	85	15	11.9	31.4	64x64	B	N/A
15	5	6um	20	85	15	12.9	29.5	64x64	B	N/A
16	5	6um	20	85	15	11.4	29.5	64x64	B	N/A
17	6	3um	20	85	15	11.1	35.0	74x94	B	99.5

Table 3: Wire Pull and Bond Shear evaluation results for 3 and 6-micron thick top metal with Polyimide.

Test	Metal Layers	Top Metal Thickness	Bond Force 1/2	Power 1/2	Duration 1/2	Wire Pull	Ball Shear	PO (1)	Ass'y (2)	Package Yield (3)
1	4	6um	25/90	70/100	20/20	8.43	37.2	74x94	A	99.04
2	4	6um	25/90	70/100	20/20	8.3	41.26	74x94	A	99.38
3	4	6um	25/90	70/100	20/20	8.62	35.56	74x94	A	94.44
4	4	6um	25/90	70/100	20/20	8.75	34.99	74x94	A	96.42
5	4	3um	25/90	70/100	20/20	9.13	32.8	74x94	A	97.51
6	4	3um	25/90	70/100	20/20	9.7	31.5	74x94	A	99.39
7	4	3um	25/90	70/100	20/20	9.31	33.4	74x94	A	100
8	4	3um	28/90	65/100	20/20	8.1	38.36	74x94	B	95.4
9	4	3um	25/90	70/100	20/20	8.87	39	74x94	A	100
10	4	3um	25/90	70/100	20/20	8.59	35.8	74x94	A	100
11	4	3um	25/90	70/100	20/20	8.55	31.2	74x94	A	100

Wire Bond: Automatic Gold Ball Bonder
Machine: K&S 1488L at S vs. K&S 1488 turbo at A.
Wire: AFW - AW99, Size: 1.2 -1.0 mil, Elongation: 2-7%, Tensile Strength: 17-25gm
(1) Bond pad shape is octagon.
(2) Assembly house test were performed.
(3) Package yield defined as pass all bondability specifications.
(4) Die size: 2.56mm x 2.6mm

Figure 1: Wire bond with ball centered and proper setting for 6-um top metal without polyimide. Post 100 hour HAST.

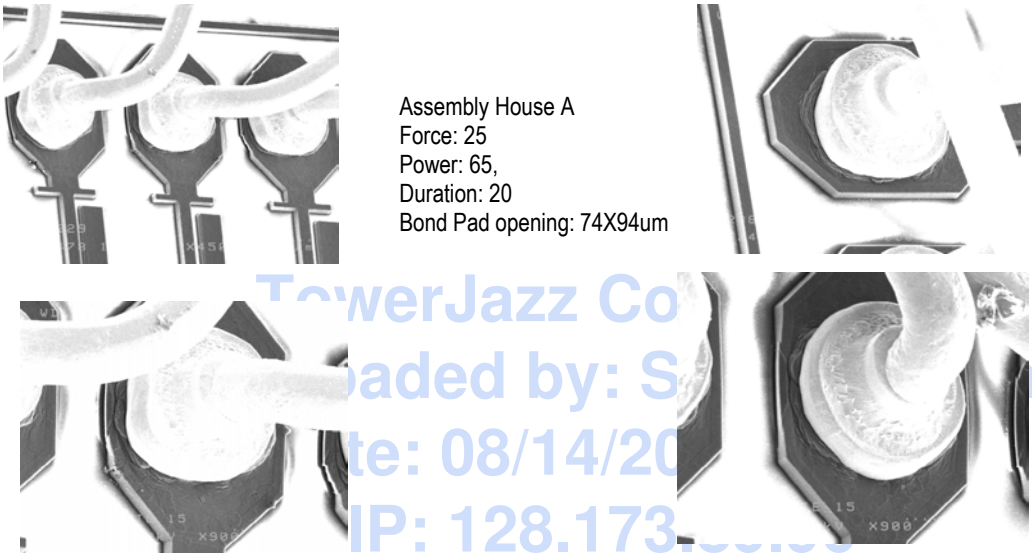

Figure 2: Bonding on 6-microns thick top metal with Polyimide.