Jazz Semiconductor Wafer Wire Bond Applications Note

Contents **Page**

Scope
The contents herein apply to Jazz Semiconductor products with thick top metal bonding pads.

Purpose
This application note is provided to Jazz customers to inform their packaging or assembly companies to exercise caution during the wire bonding of Jazz Semiconductor thick top metal wafers.

Why does the wire bonding process on thick metal require optimization?
Jazz's high performance, specially processed wafers use a thick top metal layer. Any misalignment during wire bonding, too high of bond force and power may cause excessive bond pad deformation and passivation sidewall cracking. Please pay special attention to the following guidelines.

Guidelines to probe and assembly companies.
Wirebond process design, development, characterization and optimization are essential for thick metal. Key bonding parameter settings, such as bonding force and pressure uniformity, bonding temperature, bonding duration time, ultrasonic frequency and power, are crucial to prevent excessive bond pad deformation and cracking, improve bonding yield and reliability. Too high of force or energy can cause excessive bond pad deformation and passivation cracking. Table 1 provides wire pull and ball shear results at various bonding test conditions. Figure 1 illustrates successful bonding on 6-microns thick top metal at one of the test conditions listed in table 1.

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. Alignment is critical. Bond ball must be centered and ensure 100% ball containment in bond pad opening. Bond size should not exceed 3/4 of the pad size.

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

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

Design considerations

1. If "older generation" wire bonders are utilized, square bond pad designs will assist with the ball centering on pad.
2. Recommend using Jazz bond pad design rules with proven wire bond reliability results.

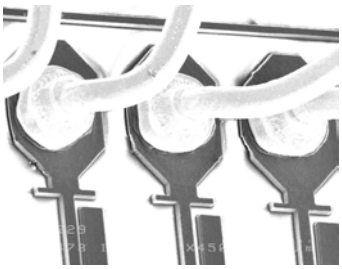
Supporting Data

Table 1: 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

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.

Figure 1 Wire bond with ball centered, and proper settings for 6-micron top metal. Post 100 hour HAST.



Assembly House A
Force: 25
Power: 65,
Duration: 20
Bond Pad opening: 74X94um