X-Wire™ - Wire Bonding Interconnection Technology

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Advanced wire bonding technology is constantly being driven to higher geometric capability (finer pitches, longer loops) resulting in increasing packaging and assembly costs. X-Wire Technology addresses these critical issues by providing a continuous insulative coating with precisely controlled dielectric properties on today's bonding wires. X-Wire Technology uses existing wire bond assembly infrastructure and processes.

Table 1, presents a typical X-Wire bonding performance obtained on several package types representative of the present mix in semiconductor assembly operations

Table 1: Bonding Parameters and Performance Data for Several Package Types

Bonding Results ASM Eagle 60		
Primary Materials BGA = ASM (1200), 35 mm X 35 mm, 1.0 mm Ball Pitch Base Wire, Tanaka (GMH-2), 1 mil (25 um) Diameter		
1st Bond Performance	**Average Ball Size**	**Standard Deviation**
Free Air Ball	43 um	1.0 um
	Force	**Standard Deviation**
Ball Shear, Grams	23.5	1.7
Ball Shear, Grams/mil2	6.7	0.5
2nd Bond Performance		
Package Type	**Average Stitch Pull (Grams)**	**Standard Deviation**
BGA ASM Pacific Std. Substrate	9.05	0.48
BGA (X-Wire Customer Substrate)	8.49	0.61
Leadframe (X-Wire)	6.01	0.74

The performance of X-Wire Technology in trial production operations demonstrates the robustness required for present and future manufacturing requirements. First and second bond X-Wire bond morphologies are shown in Figure 1, and are very typical of acceptable industry standards.

Figure 1: Typical First & Second Bond Morphology of X -Wire

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Adhesion of the coating has been found to be exceptional before, during and after bonding operations. No de-lamination of the coating from the base wire is noted in the micrographs in Figure 2 notwithstanding the typical plastic deformation necessary to produce the second bond (stitch). Inspection of the loops above first bond where scratching due to capillary friction can often be found, did not exhibit any de-lamination/de-adhesion. An internal check of adhesion in the formation of an overhand knot from coated wire even with a small bend radius (shown below) fails to cause de-lamination. The coating only de-laminates in accordance with design underneath the second bond.

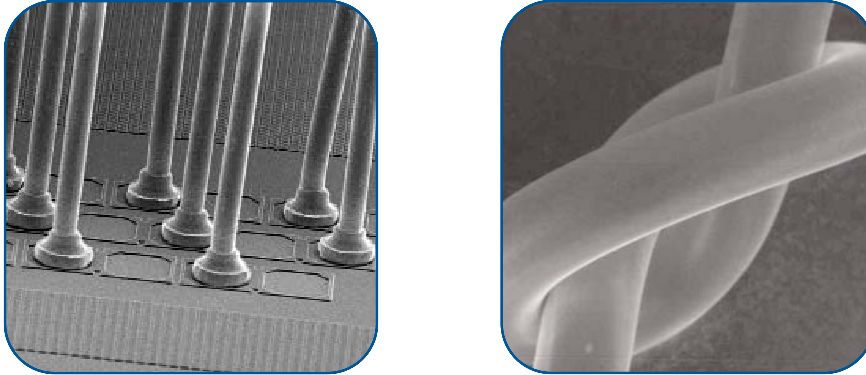

Figure 2: On Device Looping Performance & Coating Adhesion Test Knot

With the industry trend to multi-tier, staggered bond pads, long loops, low loops and issues related to wire lean, sagging, S-ing with stacked die, X-Wire™ capabilities represent a proven advance to global wire bonding performance. Figure 3 represents some of the advanced wire bonding capabilities of packages using X-Wire. It is fully compatible with present semiconductor assembly practices and equipment while offering superior packing architecture and assembly performance. The full capability of X-Wire is presently being developed to intercept the ITRS and commercial product roadmaps driving the semiconductor packaging industry.

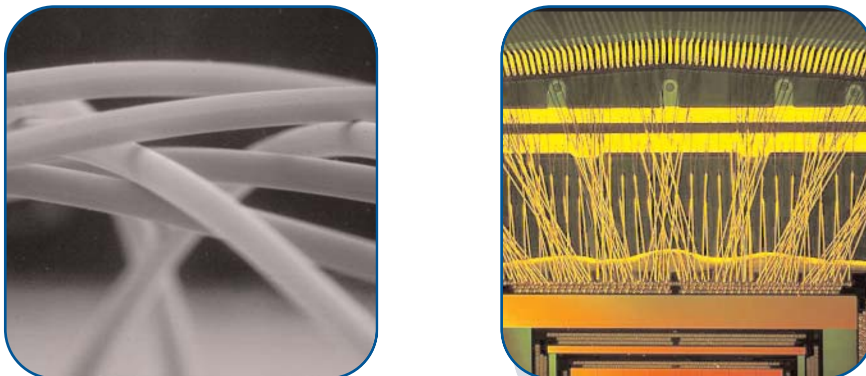

Figure 3: Looping Performance enabled by X-Wire

For further information visit: www.microbonds.com

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