Flip Chip Assembly on Board using Anisotropic Conductive Film and Electroless Ni/Au Bumps

이방성 도전 필름과 무전해 니켈/금 범프를 이용한 플립칩 공정에 관한 연구

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Flip chip assembly directly on organic boards offers miniaturization of package size as well as reduction in interconnection distances resulting in a high performance and cost-competitive packaging method particulary in high frequency applications. This paper describes the investigations of alternative low cost flip-chip mounting processes using electroless Ni/Au bump, Au stud bump and anisotropic conductive adhesive/film as an interconnection material on organic board such as FR-4.

As bumps for flip chip, electroless Ni/Au plating was performed and characterized in mechanical and electrical point of view. Electroless Ni plating is a potential candidate for cost reduction in bump formation because of selective autocatalytic metal deposition directly on the aluminum pads. Effect of annealing on Ni bump characteristics informed that the formation of crystalline nickel with Ni_3P precipitation above 300 °C causes an increase of hardness and an increase of the intrinsic stress resulting in a reliability limitation.

As an interconnection material, anisotropic conductive film was prepared and interconnected using Fine Placer. Conventional ACF is usually composed of insulating polymer matrix and conductive filler. However, modified ACF composed of nickel conductive fillers for electrical conductor and silica fillers for modification of film properties such as CTE, tensile strength and toughness was applied for improved electrical and mechanical properties of ACF interconnection.

As mechanical properties of ACF interconnection, the thermal stress distribution of ACF cross-section which is limited by the thermal expansion mismatch between chip and substrate was measured by moire fringe method. The stress level was decreased with modified ACF interconnection.