Chapter 12: Microassembly of Integrated Circuits and Micromodules

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Abstract: Wire bonding remains a primary method for assembling integrated circuits and micromodules due to its high process automation and versatility across manufacturing technological options, as well as the geometric dimensions of the products. Significant progress has been made in the development of interconnection methods in integrated electronic devices, mitigating the complexity of these operations and notable successes towards their full automation. Various processes such as thermocompression bonding, ultrasonic (US) bonding, and thermo-ultrasonic bonding during the assembly of integrated circuits and micromodules are extensively examined. The characteristics of automatic equipment for bonding, along with the peculiarities of the tools employed, are provided for comprehensive understanding. In ultrasonic bonding, mechanical vibrations of ultrasonic frequency are introduced into the contact zone, resulting in the plastic deformation of the wire lead and the removal of oxide films, thereby creating atomically clean juvenile surfaces. This process intensifies the formation of active centers during the bond formation without significant wire deformation or substantial heating. Thermo-ultrasonic bonding involves the combined action of ultrasonic energy, tool loading force, and heating temperature up to 200–220°C. This combination enhances the reproducibility of bond quality and eliminates sensitivity to variations in the properties of the materials being bonded, leading to more consistent and reliable results.

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