Chapter 8. Assembly and Mounting of Microwave Micromodules and Microblocks

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Abstract: The examination of structural and technological features of microwave (MW) modules, along with trends in their development, is a focal point of this chapter. Detailed descriptions are given concerning the technological operations entailed in assembling MW microblocks, capable of operating at frequencies up to 20 GHz, inclusive of vibrational and ultrasonic soldering. Investigative efforts delve into dependences concerning the degree of wetting of microstrips in response to exposure time to ultrasonic (US) vibrations. These investigations reveal that optimal wetting within a 15-s timeframe is achieved for Sn–Pb solder and galvanic coating with a tin–bismuth alloy. This favorable outcome is attributed to the superior fluidity exhibited by this solder in comparison to Sn–In solder, as well as the absence of intermetallic formation during the soldering process of tin–bismuth coatings, which deteriorates the wetting process, as in the case of gold coatings. The implementation of US vibrations in pulse mode, characterized by pulse frequencies ranging from 0.5 to 10 Hz and depths of 2 to 6, aims to mitigate the formation of wave superpositions leading to the development of nodes and lobes of displacement amplitude in the solder. By localizing a homogeneous cavitation process within the molten solder, this methodology facilitates the simultaneous destruction of oxide films across the entire soldered surface of the microstrip board,

thereby creating conducive conditions for complete wetting of the board surface by the solder, without the use of fluxes. The use of high-frequency heating in combination with a ferrite magnetic circuit during the sealing of microblock packages composed of diamagnetic alloys is explored. This approach serves to enhance process efficiency, augment the reliability of microelectronic devices, and facilitate the substitution of lead-free solders for conventional tin-cadmium and tin–bismuth solders, thus addressing environmental concerns and regulatory requirements.

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