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Test chip and substrate design for flip chip microelectronic package thermal measurements

Abstract

Purpose: This paper's purpose is to review the design of a flip chip thermal test vehicle. Design/methodology/approach: Design requirements for different applications such as thermal characterization, assembly process optimization, and product burn-in simulation are outlined and the design processes of different thermal test chip structures including the temperature sensor and passive heaters are described in detail. The design of fireball heater, a novel test chip structure used for evaluating the effectiveness of heat spreading of advanced thermal solutions, is also explained. Findings: Describes the design considerations and processes of the package substrate and printed-circuit board with special emphasis on the physical routing of the thermal test chip structures. These design processes are supported with thermal data from various finite-element analyses carried out to evaluate the capability and limitations of thermal test vehicle design. Originality/value: The validation and calibration procedures of a thermal test vehicle are presented in this paper.

Keywords — Finite element analysis, printed circuits, tests and testing, thermal testing