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Title

Terahertz Characterization of Dielectric Substrates for Component Design and Nondestructive Evaluation of Packages

Source

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Abstract

In this paper, terahertz (THz) characterization of dielectric substrates, THz planar and quasi-optical components, THz probing of planar devices, and THz nondestructive evaluation (NDE) are demonstrated. In particular, the goals of this paper are: 1) characterization of dielectric substrates for THz packaging applications; 2) design, fabrication, and evaluation of THz components built using some of these dielectric substrates; and 3) the use of the dielectric characterization approach and dielectric properties in NDE of electronic packages. The background theory for characterizing dielectric substrates using THz time-domain signals is provided. The Nelder and Mead modified simplex optimization algorithm is utilized in order to extract the dielectric properties of different packaging materials encompassing organic, inorganic, and composite materials. A planar THz power splitter, a dielectric probe, and a low-cost polymer-based quasi-optical band-stop interference filter are demonstrated. THz NDE of electronics packages is demonstrated for packaging delamination and moisture ingress in dielectric films.