TECHNOLOGY 2004
Paper Abstract

Name: M. 1 Ierman (main contact), 1.. Lowry, K. Lee, E. Kolawa, A. Tulintseff, S. Senturia, J. Whitaker, M. Piket-May, and K. Shalkhauser

Position/Title: Member Technical Staff

Affiliation: JPL

Address: 48(K) Oak Grove Dr.
Pasadena CA 91109
M/S 161-213

Phone: 818-3 s4-8s41 **FAX: 818-393-687s**

Gov't Agency/Lab the Subject Technology Was Developed By/For: JPL, Director's Discretionary Fund

Contract No.(if applicable):

Paper Title: A High Frequency Electronic Packaging Technology

Category: Electronics (or Adv. manufacturing)

Description:

Commercial and {{eve.rnme.nt communications, radar, and information systems face the challenge of cost and mass reduction via the application of advanced packaging technology. A majority of both government and industry support has been focused on low frequency digital elect ronics. However higher operating frequencies for both digital and analog circuits will be require.d for future s ystem is. 'l'his paper discusses the kick-off of a JPL sponsored Director's Discretionary Fund project to specifically address the needs of high frequency packaging. We are working with industry, universities (Massachusetts Institute of Technology, The University of Michigan, University of Colorado, and California Institute of Technology), NASA I ewis Research Center, and Do1) to characterize and analyze high frequency multichip module. packages. Wc will present our initial progress for this effort which complements our ongoing. work cm manufacturable n~illimcter-wave packages.

Our project is divided into two broad categories: package material systems and RF performance. The former category evaluates advanced materials for multichip modules. Low cost alumina substrates with excellent surface finish arc readily available but the thermal conductivity of alumina is not adequate for some applications. Aluminum nitride provides high thermal conductivity but commercially available substrates c1o not have adequate surface. finish for high frequency applications (30-40GI 17,) and are relatively expensive. in order to take advantage of both the. surface finish of alumina and the high thermal conductivity of AIN , we deposited AIN films on alumina substrates using rf reactive sputtering of Al in argon/nitrogen plasma. These st rucut ures were then characterized for thermal thermal stabilit y, met al lizat ion adhesion and chemical stability and compared. in addition, as part of this task wc will work with industry to characterize multi-met al systems and high densit y interconnection techniques.

in the second category of this effort, we arc investigating a novel application of non-invasive electro-optic probing to characterize both digital and RF circuits. The initial step is to demonstrate that this technique can be applied to a closed structure. Using this technique, an active RF/mixed-signal multichip phased arra y module will be characterized. We arc also developing full-wave electromagnetic CAD techniques which industry can adopt to accurately analyze active circuits in a package environment.