



US007372284B2

(12) **United States Patent**
Holcombe et al.

(10) **Patent No.:** **US 7,372,284 B2**

(45) **Date of Patent:** **May 13, 2008**

(54) **METHOD AND APPARATUS FOR PROBING AT ARBITRARY LOCATIONS WITHIN AN INACCESSIBLE ARRAY OF LEADS THE SOLDER BALLS OR PINS ACTUALLY CONNECTING A VLSI IC PACKAGE TO A SUBSTRATE OR SOCKET**

6,614,245 B1 * 9/2003 Endo 324/754

* cited by examiner

Primary Examiner—Ernest Karlsen

(75) Inventors: **Brent A. Holcombe**, Colorado Springs, CO (US); **Brock J. LaMeres**, Colorado Springs, CO (US); **Kenneth W Johnson**, Colorado Springs, CO (US)

(57) **ABSTRACT**

(73) Assignee: **Agilent Technologies, Inc.**, Santa Clara, CA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 171 days.

A probe for an array of interconnecting leads between a PCA and an IC has one or more contacts extending laterally from or plated upon one or more arms formed of a flexible printed circuit, and connected by traces along the arm(s) to a header that itself affords connection to measurement equipment. The flexible printed circuit is thin enough to loosely slide between the top of the PCA or PCB and the bottom of the IC. The arm or arms is/are narrow enough to slide between the adjacent leads forming the array, while the normally flat contacts will successively interfere with, to engage and electrically contact, consecutive layers of leads as the probe is progressively inserted. An arm is not so stiff that it cannot yield by a slight compressive warping as the contacts encounter leads. Indexing may be "by feel" or by visible indicia along a top surface of the probe or by a reticle device that moves over the top of the IC, which then has a pattern of indicia corresponding to lead location. Forming the shape of a Kapton substrate may also include use of a CVL operating in the range of 250 nm to 290 nm for the creation of extended copper contacts by the removal of underlying Kapton. Plating processes may also be used in the fabrication of (non-extended) wrap-around contacts at the edges of the Kapton.

(21) Appl. No.: **11/345,007**

(22) Filed: **Jan. 31, 2006**

(65) **Prior Publication Data**

US 2007/0176611 A1 Aug. 2, 2007

(51) **Int. Cl.**
G01R 1/067 (2006.01)

(52) **U.S. Cl.** **324/754; 324/72.5**

(58) **Field of Classification Search** None
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,222,378 B1 * 4/2001 Campbell et al. 324/754

16 Claims, 10 Drawing Sheets

