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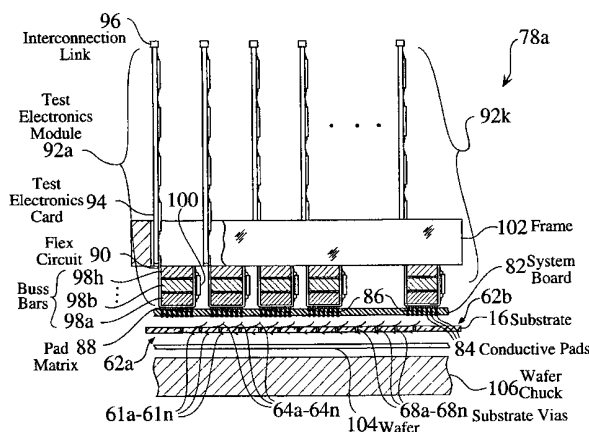
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(54) Title: TEST INTERFACE FOR ELECTRONIC CIRCUITS



(57) Abstract: Several embodiments of massively parallel interface structures are disclosed, which may be used in a wide variety of permanent or temporary applications, such as for interconnecting integrated circuits (ICs) to test and burn-in equipment, for interconnecting modules within electronic devices, for interconnecting computers and other peripheral devices within a network, or for interconnecting other electronic circuitry. Preferred embodiments of the massively parallel interface structures provide massively parallel integrated circuit test assemblies. The massively parallel interface structures preferably use one or more substrates to establish connections between one or more integrated circuits on a semiconductor wafer, and one or more test modules. One or more layers on the intermediate substrates preferably include MEMS and/or thin-film fabricated spring probes. The parallel interface assemblies provide tight signal pad pitch and compliance, and preferably enable the parallel testing or burn-in of multiple ICs, using commercial wafer probing equipment. In some preferred embodiments, the parallel interface assembly structures include separable standard electrical connector components, which reduces assembly manufacturing cost and manufacturing time. These structures and assemblies enable high speed testing in wafer form.



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INTERNATIONAL SEARCH REPORT

International Application No

PC 1/US 00/14768

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G01R1/073

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G01R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 96 15458 A (KHANDROS ET AL.) 23 May 1996 (1996-05-23)	1, 5, 7, 10, 20, 33, 35, 37, 40, 49, 69, 71, 74, 77, 78
Y	page 8, line 17 -page 9, line 31 page 49, line 1 -page 51, line 12 page 52, line 24 -page 58, line 10 page 64, line 2 -page 65, line 26; figures 5, 7 ----- -/--	2, 6, 11, 24-28, 31, 32, 34, 53-57, 60, 61, 73, 75

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

° Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

Date of the actual completion of the international search

12 March 2001

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INTERNATIONAL SEARCH REPORT

International Application No
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5 848 685 A (SMITH ET AL.) 15 December 1998 (1998-12-15) cited in the application abstract; figure 6 ---	2, 6, 34, 73, 75
Y	US 5 144 228 A (SORNA ET AL.) 1 September 1992 (1992-09-01) column 10, line 1 - line 36; figure 8 ---	24-26, 53-55
Y	US 4 924 589 A (LEEDY) 15 May 1990 (1990-05-15) column 7, line 26 - line 35; figures 6, 10 ---	28, 31, 32, 57, 60, 61
Y	EP 0 369 112 A (MANIA) 23 May 1990 (1990-05-23) abstract; figures 1-3 ---	11
Y	US 5 600 257 A (LEAS ET AL.) 4 February 1997 (1997-02-04) column 5, line 46 - column 7, line 24 column 9, line 64 - column 10, line 65 column 13, line 12 - line 40; figures 1, 3A, 6A, 6B, 7A, 7B	27, 56
A	---	13, 42, 62-66
X	US 5 828 226 A (HIGGINS ET AL.) 27 October 1998 (1998-10-27) column 2, line 15 - line 22 column 4, line 8 - line 47 column 5, line 32 - line 50 column 5, line 57 - column 6, line 5 column 6, line 29 - line 45; figures 1, 2, 5-15 ---	1, 2, 7, 10, 11, 19, 20, 33, 34, 40, 48, 49, 69, 70, 72, 73, 77, 78
A	EP 0 623 826 A (HUGHES AIRCRAFT) 9 November 1994 (1994-11-09) abstract; figure 7 ---	62, 63
A	DE 36 30 548 A (MANIA) 10 March 1988 (1988-03-10) abstract; figures 2-4 -----	62

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 00/14768

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- The additional search fees were accompanied by the applicant's protest.
- No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-61, 69-78

System or process for connecting to at least one IC on a wafer comprising a probe substrate, at least one interface module and means for bringing the probe substrate and the interface module into contact.

2. Claims: 62-68

An interface module having an insulative module base comprising a power control module in thermal contact with a conductor extending from the insulative module base.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 00/14768

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