Connector for Making Electrical Contact at Semiconductor Scales and Method for Forming Same

A connector, and method for forming same, for electrically connecting to pads formed on a semiconductor device includes a substrate and an array of contact elements of conductive material formed on the substrate. Each contact element includes a base portion attached to the top surface of the substrate and a curved spring portion extending from the base portion and having a distal end projecting above the substrate. The curved spring portion is formed to curve away from a plane of contact and has a curvature disposed to provide a controlled wiping action when engaging a respective pad of the semiconductor device.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER:

IPC 7 H01L23/48 H01R13/24 H01R12/22 H01R43/00

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 H01L H01R GOIR

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

<table>
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<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
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<tbody>
<tr>
<td>A</td>
<td>US 5 152 695 A (GRABBE ET AL) 6 October 1992 (1992-10-06) abstract; figures column 1, line 55 - column 4, line 11</td>
<td>38,52,66</td>
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</table>

X Further documents are listed in the continuation of box C. X Patent family members are listed in annexe.

* 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 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 data 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 principles 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 of other such documents, such combination being obvious to a person skilled in the art

**A** document member of the same patent family

Date of the actual completion of the International search 11 October 2005

Date of mailing of the International search report 16.10.05

Name and mailing address of the ISA European Patent Office, P.B. 5618 Patentlaan 2 NL-2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax. (+31-70) 340-2016

Authorized officer Serrano Funcla, J

Form PCT/ISA/210 (second sheet) (January 2004)
<table>
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<td>X</td>
<td>US 5 802 699 A (FJELSTAD ET AL) 8 September 1998 (1998-09-08) abstract; figures 1,2,8,10 column 7, line 24 - line 44 column 14, line 33 - column 15, line 58 column 19, line 26 - column 21, line 15</td>
<td>1,38-40</td>
</tr>
<tr>
<td>X</td>
<td>EP 1 280 241 A (HEWLETT-PACKARD COMPANY) 29 January 2003 (2003-01-29) abstract; figures 1-6 paragraph ‘0001! - paragraph ‘0016!</td>
<td>1, 52,66</td>
</tr>
</tbody>
</table>
### Box II Observations where certain claims were found unsearchable (Continuation of Item 2 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(3)(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 III Observations where unity of invention is lacking (Continuation of Item 3 of first sheet)

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

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see additional sheet
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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.:

   1–20, 45–71, 38–40

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

1. claims: 1-20, 45-71
   Connectors to contact corresponding connectors in a semiconductor. The shape of a distal end of the connectors is such that it achieves more reliable and flexible contact achieving wiping action

2. claims: 21-33
   Contact elements having different properties in order to achieve better contact

3. claims: 34-37
   Ground planes in a semiconductor including contacts in order to match the impedance

4. claims: 38-40
   Circuits in a semiconductor including contacts

5. claims: 41-43
   Thermal conducting planes in a semiconductor having contacts in order to reduce temperature

6. claim: 44
   Coaxial contact in a semiconductor in order to improve signal transmission
<table>
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<tr>
<th>Patent document cited in search report</th>
<th>Publication date</th>
<th>Patent family member(s)</th>
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<tr>
<td>US 2003129866 A1</td>
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