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**Datasheet for the decision  
of 6 September 2006**

**Case Number:** T 1232/05 - 3.5.02

**Application Number:** 95939966.8

**Publication Number:** 0795200

**IPC:** H01R 9/00

**Language of the proceedings:** EN

**Title of invention:**

Mounting electronic components to a circuit board

**Applicant:**

FormFactor, Inc.

**Opponent:**

-

**Headword:**

-

**Relevant legal provisions:**

EPC Art. 56

**Keyword:**

"Inventive step - after amendment (yes) "

**Decisions cited:**

-

**Catchword:**

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Case Number: T 1232/05 - 3.5.02

**D E C I S I O N**  
of the Technical Board of Appeal 3.5.02  
of 6 September 2006

**Appellant:** FormFactor, Inc.  
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**Representative:** Gerd Mollekopf  
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**Decision under appeal:** Decision of the Examining Division of the  
European Patent Office posted 25 February 2005  
refusing European application No. 95939966.8  
pursuant to Article 97(1) EPC.

**Composition of the Board:**

**Chairman:** W. J. L. Wheeler  
**Members:** J.-M. Cannard  
E. Lachacinski

## Summary of Facts and Submissions

I. The appellant contests the decision of the examining division to refuse European patent application No. 95 939 966.8. The reasons given for the refusal were that the subject-matter of claim 1 filed on 3 February 2005 did not meet the requirements of Articles 84, 52(1) and 56 EPC.

II. The documents (according to the numbering given on pages 1 and 2 of the appealed decision):

D4: IBM Technical Disclosure Bulletin, vol. 29, no. 11, April 1987, New York US, pages 5021 and 5022, "Bimetal VLSI Chip Interconnections",

D9: IBM Technical Disclosure Bulletin, vol. 36, no. 7, July 1993, New York US, pages 137 and 138, "Interposer for Direct Chip Attach or Surface Mount Array Devices", and

D12: US-A-5 137 461,

considered in the first instance proceedings, remain relevant to the present case.

III. Independent claims 1 and 14 of the set of claims according to the current request, which was filed during the oral proceedings held on 6 September 2006 before the Board of appeal, read as follows:

Claim 1:

"Socket adapted to removably connect a first electronic component (304) to a second electronic component (302) comprising:

a plurality of elongate, resilient contact structures (320) extending away from a first surface (310a) of a support substrate (310), said elongate, resilient contact structures (320) being adapted to deflect so that contact regions (320b) of said elongate, resilient contact structures form pressure connections with first terminals (308) of the first electronic component (304);

a plurality of contact structures (314) disposed on the opposing surface (310b) of the support substrate (310), wherein the opposing surface (310b) is facing a surface of the second electronic component (302) on which second terminals (306) are formed and wherein the plurality of contact structures is permanently connected to the second terminals (306) of the second electronic component (302), the contact structures (314) are connected through the support substrate (310) to the elongate, resilient contact structures (320);

a frame element (330) disposed around a peripheral edge of the support substrate (310); and

means (340) adapted to urge the first electronic component (304) against the contact regions (320b) of the resilient contact structures (320);

characterized in that

said frame element (330) has a distance element (336), wherein the urging means (340) holds the first electronic component (304) against an upper surface of the distance element (336) to position the first terminals (308) of the first electronic component (304) at a predefined distance above the first surface (310a),

wherein all said elongate, resilient contact structures (320) have an un-deflected vertical height normal to the first surface (310a) and the predefined distance is less than the un-deflected vertical height of the elongate, resilient contact structures (320); and

wherein all said elongate, resilient contact structures (320) are adapted to elastically deflect such that the contact regions (320b) are deflected in a downward direction and in a lateral direction when forming said pressure connection."

Claim 14:

"Method of removably connecting a first electronic component (304) to a second electronic component (302),

wherein said second electronic component (302) has a plurality of second terminals (306) on a surface thereof,

wherein said first electronic component (304) has a plurality of first terminals (308),

wherein a support substrate has a first surface (310a), a second surface (310b) opposite the first surface and a frame element (330) disposed around a peripheral edge of the support substrate (310),

wherein the frame element has a distance element (336);

wherein a plurality of elongate, resilient contact structures (320) are mounted to the first surface (310a) of the support substrate (310);

wherein a plurality of contact structures (314) are mounted to the second surface (310b) of the support substrate; and

wherein the contact structures (314) are connected through the support substrate (310) to the elongate, resilient contact structures (320);

the method comprising the steps of:

disposing the support substrate (310) over the second electronic component (302),

mounting the support substrate (310) to the second electronic component (302) so as to make permanent electrical connections between the contact structures (314) and the second terminals (306); and

urging the first electronic component (304) against the elongate, resilient contact structures (320) until the first electronic component (304) is

disposed against an upper surface of the distance element (336), thereby elastically deflecting all said elongate, resilient contact structures so that contact regions (320b) of said elongate, resilient contact structures are deflected in a downward direction and in a lateral direction to form pressure connections between the terminals (308) and the elongate, resilient contact structures (320), the distance element (336) positioning the first electronic component (304) at a predefined distance above the first surface (310a)."

Claims 2 to 13 are dependent on claim 1 and claims 15 to 21 are dependent on claim 14.

IV. The appellant's arguments may be summarized as follows:

The claimed subject-matter differed from the socket disclosed in figure 2 of document D4 by more than the feature: "the plurality of contact structures is permanently connected to the second terminals of a second electronic component". D4 did not show a combination of a first electronic element, a support substrate and a second electronic element as specified in the claims. Contact structures disposed on the opposing surface of the support substrate and permanently connected to second terminals of a second electronic component, resilient contact structures having an un-deflected vertical height normal to the first surface of the substrate, and means adapted to urge the first electronic component against an upper surface of a distance element to position the terminals of this first component above the first surface of the substrate at a predefined distance, less than the un-deflected vertical height of the resilient contact

structures, were all features recited in the present claim 1, which were not disclosed in D4.

Document D9 formed the closest prior art. However, neither a distance element of a frame element for positioning a first electronic component above the first surface of a support substrate at a predefined distance, less than the un-deflected vertical height of resilient contact structures, nor resilient contact structures adapted to elastically deflect as recited in the present claim 1 were disclosed in D9.

If the dendrites described in D9 and D12 were replaced by the bimetal pads described in D4, it would make no sense to provide the socket according to D9 with urging means. In D4, the resilient contact structures were formed by bimetal pads which were deflected by a temperature variation. It was not obvious whether the bimetal pads could be forcibly bent from an un-deflected to a deflected state without permanent damage to the bimetal structure. Even if the skilled person had replaced the prior art dendrites by the bimetal pads disclosed in D4, he would not come to the solution recited in claims 1 and 14.

V. The appellant requested that the decision under appeal be set aside and that a patent be granted in the following version:

claims 1 to 21 as filed in the oral proceedings, description, pages 1 to 9, 9a, 9b, 10 to 61 and 72 to 88 as filed in the oral proceedings (it being noted that pages 62 to 71 have been cancelled without



replacement) and drawings, sheets 1/7 to 7/7 filed during the oral proceedings.

### **Reasons for the Decision**

1. The appeal is admissible.
2. Considering that the present application was filed in 1995, i.e. more than 10 years ago, the Board, being satisfied, for the reasons given below, that the set of claims filed in the oral proceedings held on 6 September 2006 meets the requirements of the Convention, has chosen, pursuant to Article 111(1) EPC, not to remit the case to the department of first instance, but to exercise the power within the competence of the first instance for further examination of the amended description and drawings filed in the course of the oral proceedings.

#### *Admissibility of the amendments*

3. The Board is satisfied that the claims, the description and the drawings according to the current request meet the requirements of Article 84 EPC and do not contravene Article 123(2) EPC.
  - 3.1 This applies in particular to claim 1, which relates to a socket adapted to removably connect a first electronic component to a second electronic component according to the first embodiment described in the originally filed description with reference to figure 3 and is partly based on claims 17, 19, 25 and 27 as originally filed. According to the description

(published PCT application, page 1, lines 4 to 5; page 10, lines 2 to 18; page 47, lines 13 to 17), the socket of the invention is adapted for removably connecting a first electronic component to a second electronic component. According to the embodiment of figure 3, the resilient contact structures are "adapted to deflect" and the contact structures are "permanently connected" to the second component (description, pages 49 to 50, bridging paragraph; pages 47 to 48, bridging paragraph). The features according to the characterising part of claim 1 are disclosed in figure 3 and in the related passages of the description (pages 49 to 50, bridging paragraph; page 50, lines 9 to 19; page 51, lines 8 to 27; page 52, line 22 to page 53, line 14).

- 3.2 The method steps in the present claim 14 are partly based on method claim 1 as originally filed. The structural features and the method step recited in the last paragraph of claim 14 correspond to the features recited in the present claim 1.
- 3.3 The features of claims 2, 4, 5, 10, 18 and 21 are disclosed in the embodiment shown in figure 3 and in the related parts of the description. Claims 3, 6, 7, 8, 9, 11, 12 and 13 respectively correspond in substance to the original claims 18, 22, 20, 21, 24, 28, 38 and 23 which are appended to claim 17. Dependent claims 15, 16, 17, 19 and 20 respectively correspond in substance to original dependent claims 2, 4, 5, 7 and 3.
- 3.4 The description and the drawings have been adapted to the amended claims, in particular the unclear passages and figures which were inconsistent with the subject-

matter of the present claims have been deleted. A mention of cited prior art documents, in particular the relevant documents D4, D9, and D12, has been included.

*Novelty - Inventive step*

4. The novelty of the subject-matter of the original independent claims has not been disputed.
  
5. Document D9, which could be seen as the closest prior art, discloses the features of the preamble of claim 1. D9 shows a socket (interposer) for removably connecting a first electronic component (active device, DCA chip or SMA module) to a second electronic component (circuit card). A plurality of resilient contact structures (dendrite interconnects, which are described in document D12, cited in D9) extends away from a first surface of a support substrate (ceramic package) and their contact regions form pressure connections with terminals of the first component. Contact structures (DCA or SMA interconnects) disposed on the opposite surface of the support substrate are permanently connected to terminals of the second component and to the resilient contact structures through the support substrate. A frame is disposed around a peripheral edge of the support substrate and means (spring clip) are adapted to urge the first component terminals against the contact regions of the resilient contact structures.
  - 5.1 The features according to the characterising part of claim 1 are not disclosed in D9. In particular, D9 does not disclose a distance element of the frame to position the first component at a predefined distance above the first surface of the substrate. Nor does D9

disclose elongate, resilient contact structures, which have an un-deflected vertical height normal to the first surface, the predefined distance being less than the un-deflected vertical height of the resilient contact structures, which are adapted to elastically deflect such that the contact regions thereof are deflected in a downward direction and in a lateral direction when forming the pressure connection.

6. Starting from D9 and having regard to the effects provided by the claimed invention, the objective technical problem addressed by the invention can be seen as providing a predictable and reliable pressure connection between the contact regions of the resilient contact structures and the terminals of the first electronic component.
  
7. None of the prior art cited documents would have led the person skilled in the art to consider the combination of features recited in the characterising part of claim 1.
  - 7.1 The foregoing consideration applies more specifically to document D4. D4 (see figure 2) relates to a device for connecting chip pads of an electronic component to wires on a connector. Bimetal pads, which at low temperature extend in the plane of the connector, become curved at operating temperature, exerting an elastic pressure on the chip pads. However, the features recited in the characterising part of claim 1 are not disclosed in D4. Moreover, D4 would not suggest replacing the bimetal pads by elongate, resilient structures which would be adapted to deflect when their contact regions are urged against the electronic

component because the use of bimetal material is an essential feature of D4 and the purpose of the device according to D4 (page 2022, lines 10 to 12) is to "eliminate enforced plugging that would damage the thin contact needles when the VLSI chip, ..., is plugged", thus to avoid the use of urging means. Hence, in the judgement of the Board, the subject-matter of claim 1 involves an inventive step.

8. Corresponding considerations apply to independent method claim 14.
  
9. For the foregoing reasons, in the Board's judgement, the subject-matter of the present claims is considered to be new and involve an inventive step within the meaning of Articles 54 and 56 EPC. The application as amended meets the requirements of the EPC.

**Order**

**For these reasons it is decided that :**

1. The decision under appeal is set aside.
  
2. The case is remitted to the department of first instance with the order to grant a patent in the version requested in the oral proceedings:

claims: 1 to 21 as filed in the oral proceedings,

description: pages 1 to 9, 9a, 9b, 10 to 61 and 72 to 88 as filed in the oral proceedings (it being noted that pages 62 to 71 have been cancelled without replacement), and

drawings: sheets 1/7 to 7/7 filed during the oral proceedings.

The Registrar:

The Chairman:

U. Bultmann

W. J. L. Wheeler