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Datasheet for the decision of 1 July 2014

Case Number: T 1637/10 - 3.4.03

Application Number: 96308093.2

Publication Number: 0773584

IPC: H01L23/31, H01L21/56

Language of the proceedings: EN

Title of invention:
Device having resin package and method of producing the same

Applicant:
Fujitsu Semiconductor Limited

Headword:

Relevant legal provisions:
EPC 1973 Art. 56

Keyword:
Inventive step (yes) - after amendment

Decisions cited:

Catchword:

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Case Number: T 1637/10 - 3.4.03

D E C I S I O N
of Technical Board of Appeal 3.4.03
of 1 July 2014

Appellant: (Applicant)	Fujitsu Semiconductor Limited 2-10-23 Shin-Yokohama Kohoku-ku, Yokohama-shi Kanagawa 222-0033 (JP)
Representative:	Gibbs, Christopher Stephen Haseltine Lake LLP Lincoln House, 5th Floor 300 High Holborn London WC1V 7JH (GB)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 22 February 2010 refusing European patent application No. 96308093.2 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman	G. Eliasson
Members:	R. Bekkering
	P. Mühlens

Summary of Facts and Submissions

I. The appeal is against the refusal of application No. 96 308 093 for lack of an inventive step, Article 56 EPC 1973, over documents:

D3: JP 07 226 475 A

D5: PATENT ABSTRACTS OF JAPAN, vol. 010, no. 329 (E-452), 8 November 1986 & JP 61 135131 A (NEC CORP), 23 June 1986

D7: PATENT ABSTRACTS OF JAPAN, vol. 017, no. 504 (E-1430), 10 September 1993 & JP 05 129473 A (SONY CORP), 25 May 1993.

II. The appellant requested in writing that the decision under appeal be set aside and a patent be granted on the basis of the following documents as sole request:

Description:

Pages 24, 34, 36, 37, 39, 40, 42, 44-46, 51, 53, 54, 57, 58, 60-62, 64-67, 70,72, 75-78, 82 and 83 as originally filed;
Pages 2 and 2+ filed with letter of 16 June 2009;
Pages 9-23, 25-33, 35, 38, 41, 43, 47-50, 52, 55, 56, 59, 63, 68, 69, 71, 73, 74 and 79-81 filed with letter of 29 May 2014;
Pages 1, 2a and 84 filed with letter of 25 June 2014;

Claims:

Nos. 1 to 6 of the second auxiliary request filed with letter of 5 July 2010;

Drawings:

Sheets 1/97 to 97/97 as originally filed.

III. Oral proceedings before the board, scheduled to take place on 1 July 2014 were cancelled, as deemed unnecessary in view of the amendments made in reply to the summons to these oral proceedings.

IV. Claim 1 reads as follows:

"*A device (110) comprising:*
a chip (111, 211) having a plurality of electrode pads provided on its upper surface;
a chip fixing resin (115) on which the chip is mounted at its lower surface;
a resin package (112, 212) sealing the chip, said resin package having resin projections (117) located on a mount-side, lower surface of the resin package, wherein said resin package is a molded package so that the resin projections are integrally formed with the resin package;
metallic films (113, 155, 290A, 290B) respectively provided to cover the resin projections;
bonding wires (118, 101, 163, 218, 245, 313) electrically connecting the electrode pads on said upper surface of said chip and the metallic films covering the resin projections; and
bonding balls or stud balls (101) respectively provided to the metallic films, wherein each bonding wire has an end connected to a said electrode pad and the other end bonded to a respective said bonding or stud ball so as to bond the bonding wire to a respective said metallic film;

wherein said resin projections extend downwards from the mount-side surface and laterally extend from at least one side surface of the resin package."

V. The appellant in substance provided the following arguments:

The device according to claim 1 had the advantage that a solder layer provided on the metallic film for connection to connection electrodes would extend along the metallic films to the side surface of the package. This in turn meant that it became possible to visually inspect the solder and to thereby determine whether the package was duly mounted on the circuit board. Hence, this construction of the resin projections and the metallic films made it possible to better check whether the package had been properly connected to a circuit board.

Still further, the device having this construction also had the advantage that it could be mounted vertically on a circuit board. This in turn increased the mounting density. The device could be mounted vertically because the resin projections could be inserted into through holes on a circuit board.

Starting from D3, and seeking to make the structure easier to test during manufacture, there was nothing to lead the skilled person to the claimed invention. There was no teaching at all as to how such an outcome would be achieved, and there was no suggestion at all of providing resin projections which extend from the side surface of the package. Similarly, starting from D3 and seeking to increase mounting density, there was no teaching that would lead the skilled person to provide resin projections which extended from the side surface

of the package. Starting from D5, there was also no suggestion of such resin projections, and nothing to incite the skilled person when considering testing the structure or mounting density to arrive at a device having such resin projections. The same applied to D7. In D5 and D7 there were not even any resin parts that projected outward from the mount-side surface of the package, let alone from a side surface.

As each of D3, D5 and D7 was devoid of any relevant teaching that could possibly lead the skilled person to a structure as claimed, none of them could make up the deficiencies of the others. Claim 1 was therefore inventive over these documents, alone or in combination.

Reasons for the Decision

1. The appeal is admissible.

2. *Amendments*

Claim 1 as amended is based on claims 14, 18 and 19 as originally filed and on the description as originally filed (cf 14th to 16th embodiment, page 56, line 12 to page 69, line 22; figures 83 to 108).

Claims 2 to 6 are based on originally filed claims 15, 16, 20, 21 and 22, respectively.

Accordingly, the amendments comply with Article 123(2) EPC.

3. Novelty

3.1 Document D3

Document D3 discloses a device comprising resin projections covered with a metallic layer forming part of a lead frame (cf figure 1) or of a tape (cf figures 13, 14).

In particular, concerning the latter embodiment (cf figures 13, 14), document D3 discloses, using the terminology of claim 1, a device comprising:
a chip (11) having a plurality of electrode pads provided on its upper surface;
a chip fixing means on which the chip is mounted at its lower surface;
a resin package (13) sealing the chip, said resin package having resin projections (21) located on a mount-side, lower surface of the resin package, wherein said resin package is a molded package so that the resin projections are integrally formed with the resin package;
metallic films (32) respectively provided to cover the resin projections;
bonding wires (19) electrically connecting the electrode pads on said upper surface of said chip and the metallic films covering the resin projections; wherein said resin projections extend downwards from the mount-side surface.

The appellant argued that D3 showed leads (12, 17, 18) which were not metallic films covering resin projections.

It is, however, noted that the expression "*film*" includes a thin layer. The leads (12, 17, 18) of D3,

and even more so the lead pattern (44) of the tape (42) which is so thin as to deform during resin molding (cf D3, figure 14), are thin metallic layers and thus metallic films. Moreover, in both cases these films cover the resin projections (21).

Not mentioned in D3 is that

- a resin is used for attaching the chip,

- bonding balls or stud balls respectively are provided to the metallic films, wherein each bonding wire has an end connected to a said electrode pad and the other end bonded to a respective said bonding or stud ball so as to bond the bonding wire to a respective said metallic film, and

- said resin projections laterally extend from at least one side surface of the resin package.

Accordingly, the subject-matter of claim 1 is new over document D3 (Article 54(1) EPC 1973).

3.2 Document D7

Document D7 discloses (see eg figure 9), using the terminology of claim 1, a device comprising:
a chip (1) having a plurality of electrode pads provided on its upper surface;
a chip fixing means resin on which the chip is mounted at its lower surface;
a resin package (5) sealing the chip, said resin package having resin projections (cf figure 9) located on a mount-side, lower surface of the resin package, wherein said resin package is a molded package so that the

resin projections are integrally formed with the resin package;
metallic films (6, 8, 9) respectively provided to cover the resin projections;
bonding wires (3) electrically connecting the electrode pads on said upper surface of said chip and the metallic films covering the resin projections;
wherein said resin projections extend downwards from the mount-side surface (see figure 9).

According to the appellant, in document D7 there were no resin parts that projected outward from the mount-side surface of the package.

It is, however, noted that in D7, in the embodiment shown in figure 9, the package has projections integrally formed with the package, located on the mount-side and which extend downwards from the mount-side surface.

The subject-matter of claim 1 differs from D7 in that

- a resin is used for attaching the chip,

- bonding balls or stud balls respectively are provided to the metallic films, wherein each bonding wire has an end connected to a said electrode pad and the other end bonded to a respective said bonding or stud ball so as to bond the bonding wire to a respective said metallic film, and

- said resin projections laterally extend from at least one side surface of the resin package.

Accordingly, the subject-matter of claim 1 is also new over document D7 (Article 54(1) EPC 1973).

3.3 The subject-matter of claim 1 is also new over the remaining available, more remote prior art.

In particular, in document D5 the package does not have resin projections, which extend downwards from the mount-side surface and/or extend laterally from the side surface of the package.

4. Inventive step

As indicated in the description, and essentially argued by the appellant, the device according to claim 1 has the advantage that a solder layer provided on the metallic films of the device for connection to connection electrodes of a circuit board on which the device is mounted, will extend along the metallic films to the side surface of the package (cf original description, page 57, lines 24 to 36 and figure 85).

This in turn means that it becomes possible to visually inspect the solder and to thereby determine whether the package is duly mounted on and soldered to the circuit board (cf original description, page 57, line 36, to page 58, line 1). This construction of the resin projections and the metallic films, thus, makes it possible to better check whether the package has been properly connected to the circuit board.

Moreover, the device having this construction also has the advantage that it can be mounted vertically on a circuit board. The resin projections which extend laterally can be inserted into through holes in the circuit board, so that the device stands upright (cf

original description, page 68, lines 2 to 26 and figure 104). This in turn allows for increasing the mounting density and makes it easy to check the solder connection between the device and the circuit board (cf original description, page 68, lines 26 to 32).

Accordingly, in particular having regard to the last of the above distinguishing features over document D3, the objective problem to be solved relative to D3 may be formulated as to improve mounting inspection and density.

None of the cited documents addresses this problem. Moreover, the solution as claimed is not suggested in any of the available prior art. In particular, none of the documents D3, D5 or D7, nor any of the other cited documents suggests providing resin projections, which extend from the side surface of the package with covering metallic films as claimed.

The same applies when starting from document D7.

Accordingly, having regard to the available state of the art, the subject-matter of claim 1 is not obvious to a person skilled in the art and, thus, involves an inventive step (Article 56 EPC 1973).

Claims 2 to 6 are dependent on claim 1, providing further limitations. The subject-matter of these claims, therefore, also involves an inventive step.

5. The patent application documents also meet the remaining requirements of the EPC, so that a patent can be granted on the basis of these documents.

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 with the following documents:

   Description:

   Pages 24, 34, 36, 37, 39, 40, 42, 44-46, 51, 53, 54, 57, 58, 60-62, 64-67, 70,72, 75-78, 82 and 83 as originally filed;
   Pages 2 and 2+ filed with letter of 16 June 2009;
   Pages 9-23, 25-33, 35, 38, 41, 43, 47-50, 52, 55, 56, 59, 63, 68, 69, 71, 73, 74 and 79-81 filed with letter of 29 May 2014;
   Pages 1, 2a and 84 filed with letter of 25 June 2014;

   Claims:

   Nos. 1 to 6 of the second auxiliary request filed with letter of 5 July 2010;

   Drawings:

   Sheets 1/97 to 97/97 as originally filed.

The Registrar: The Chairman:

S. Sánchez Chiquero G. Eliasson

Decision electronically authenticated