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D E C I S I O N
of 25 February 2002

Case Number: T 0025/98 - 3.4.3

Application Number: 90306833.6

Publication Number: 0405849

IPC: H01L 23/525

Language of the proceedings: EN

Title of invention:
Severable conductive path in an integrated-circuit device

Applicant:
AT&T Corp.

Opponent:
-

Headword:
-

Relevant legal provisions:
EPC Art. 123(2), 84, 54, 56

Keyword:
"Clarity (yes - after amendments)"
"Inventive step (yes)"

Decisions cited:
-

Catchword:
-



Case Number: T 0025/98 - 3.4.3

D E C I S I O N
of the Technical Board of Appeal 3.4.3
of 25 February 2002

Appellant: AT&T Corp.
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Representative: Johnston, Kenneth Graham
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Decision under appeal: Decision of the Examining Division of the
European Patent Office posted 18 July 1997
refusing European patent application
No. 90 306 833.6 pursuant to Article 97(1) EPC.

Composition of the Board:

Chairman: R. K. Shukla
Members: M. Chomentowski
M. B. Günzel

Summary of Facts and Submissions

I. European patent application No. 90 306 833.6 (Publication No. 0 405 849) was refused by a decision of the examining division dated 18 July 1997 on the ground that dependent claim 5 lacked clarity (Art. 84 EPC).

II. Claims 1 and 5 of the set of 10 claims forming the basis of the decision read as follows:

"1. An integrated-circuit device comprising a dielectric-supported conductive path which comprises a programmable link,

characterized in that

away from said programmable link, said conductive path has a first thickness and, at said programmable link, said conductive path has a second thickness, said second thickness being less than said first thickness;

said conductive path having at least two transition regions, each of said transition regions having a tapered thickness and connecting said programmable link to the rest of said conductive path, the thickness of each of said transition regions changing from said first thickness to said second thickness."

"5. The device of claim 1 in which said programmable link is supported by a first portion of said dielectric, the interface between said first portion and said second portion being at a first level, and second and third respective portions of said dielectric adjacent to said first portion having a surface at a common second level, said first level being raised above said second level."

Moreover, the only other independent claim of the set of claims under consideration had the following text:

"6. In the manufacture of integrated-circuit devices, a method for making a dielectric-supported conductive path comprising a programmable link, said method comprising the steps of:

blanket depositing a first conductor layer on said dielectric,

etching to locally reduce the thickness of said first conductor layer, said etching producing an opening with tapered sides,

depositing a second conductor layer on said first conductor layer,

and etching to form said conductive path,

whereby said conductor path has locally reduced thickness as adapted for programming."

III. The decision was reasoned essentially as follows:

The feature "said second portion", in the expression "the interface between said first portion and said second portion being at a first level", is not clearly defined. The term "said" implies that a "second portion" is predefined in either claim 5 or claim 1 which clearly is not the case. It is also to be noted that it is not clear from the wording "said second portion being at a first level, and second and third respective portions of said dielectric", whether the second portion relates to the dielectric, or the programmable link. Furthermore, in accordance with this same wording claim 5 defines that the interface between "the first portion" and "the second portion" is at a

first level. Claim 5 further defines that the surface of the second and third respective portions of the dielectric are at a common second level below the first level. Thus, "the second portion" appears to be at two different levels. Accordingly, claim 5 does not meet the requirements of Article 84 EPC.

Moreover, it was stated in the decision that the subject-matter of claims 1 to 10 did not appear to meet the requirements of Article 52(1) EPC (lack of novelty or inventive step) with respect to documents

D1: Patent Abstracts of Japan, vol. 9, no. 302 (E-362) [2025], 29 November 1985; & JP-A-60 140 747;

D2: EP-A-0 146 688;

D3: GB-A-2 047 963;

D4: DE-A-3 817 137; and

D5: Patent Abstracts of Japan, vol. 7, no. 190 (E-194) [1335], 19 August 1983; & JP-A-58 092 252.

IV. The applicant lodged an appeal on 9 September 1997, paying the appeal fee on the next day. A statement setting out the grounds of the appeal was filed on 18 November 1997, containing a new set of 12 claims forming the basis of a main request, an auxiliary request being based on the same set of claims without claim 5.

V. In the official communication dated 23 July 2001, the Board of appeal informed the appellant that the claims did not appear to be clear and to comply with Article 123(2) EPC.

VI. With his letter dated 22 November 2001, the appellant filed a new set of 12 claims and new description pages 1a, 2, 4 and 5.

The only independent claims 1 and 7 read as follows:

"1. An integrated-circuit device comprising a dielectric-supported conductive path which comprises a programmable link,

characterized in that

away from said programmable link, said conductive path has a first thickness and, at said programmable link, said conductive path has a second thickness, said second thickness being less than said first thickness;

said conductive path having a uniform width and at least two transition regions, each of said transition regions having a tapered thickness and connecting said programmable link to the rest of said conductive path, said rest of the conductive path having said first thickness and the thickness of each of said transition regions changing from said first thickness to said second thickness."

"7. In the manufacture of integrated-circuit devices, a method for making a dielectric-supported conductive path comprising a programmable link, said method comprising the steps of:

(a) blanket depositing a first conductor layer on said dielectric,

- (b) etching to locally reduce the thickness of said first conductor layer, said etching producing an opening in said first conductor layer with tapered sides,
- (c) depositing a second conductor layer on said first conductor layer and in said opening, and
- (d) etching the second conductor layer and the first conductor layer to form said conductive path, whereby said conductor path has locally reduced thickness as adapted for programming and a uniform width."

Dependent claim 5, which is an amended version of claim 5 of the set forming the basis of the decision under appeal, and claims 6 and 12, which are new dependent claims, read as follows:

"5. The device of claim 1 in which said programmable link is supported by a first portion of said dielectric, the interface between said first portion and said programmable link being at a first level, and second and third respective portions of said dielectric adjacent to said first portion having a surface at a common second level, said first level being raised above said common second level."

"6. The integrated circuit device of claim 4 wherein the second layer extends over the entire upper surface of the first layer."

"12. The method of claim 7 wherein step (d) further includes the step of etching the second conductor layer and the first conductor layer so that, in the conductor path, the second conductor layer extends over the entire upper surface of the first conductor layer."

(Emphasis added by the Board for showing the main amendments by addition or substitution with respect to the corresponding claims of the set of claims forming the basis of the decision under appeal).

The appellant requests that the decision under appeal be set aside and that a patent be granted on the basis of the following patent application documents:

Description:

Pages 1, 3 and 6 as filed;
Pages 1a, 2, 4 and 5 as filed with appellant's letter of 22 November 2001;

Claims:

Nos. 1 to 12 as filed with appellant's letter of 22 November 2001;

Drawings:

Sheets 1/2 and 2/2 as filed.

VII. The appellant argues essentially as follows in support of his request:

Clarity

In claim 5 as amended, the interface at a first level is between the "programmable link" and the first portion of the dielectric, so that there is no more ambiguity about the second and third portions of the dielectric and the common second level.

Novelty and inventive step

Claim 1 concerns an integrated-circuit device comprising a dielectric-supported conductive path which comprises a programmable link and tapered regions

between the programmable link and the rest of the conductive path. These device features, as well as the corresponding features of the method for making a dielectric-supported conductive path of this type, are not suggested by the cited prior art.

Therefore, the claims are new and involve an inventive step.

Reasons for the Decision

1. The appeal is admissible.

2. *Admissibility of the amendments*

2.1 Claim 1 as amended specifies that,

away from the programmable link, the conductive path has a first thickness and, at this programmable link, the conductive path has a second thickness, this second thickness being less than the first thickness;

the conductive path has a uniform width and at least two transition regions, each of said transition regions having a tapered thickness and connecting the programmable link to the rest of the conductive path; the rest of the conductive path has the first thickness and the thickness of each of the transition regions changes from the first thickness to the second thickness.

These amendments have a basis in the application as filed (see in particular claim 1; see also Figure 3 and the corresponding text).

Claim 7 as amended corresponds to claim 6 as originally filed and additionally includes the features of original claim 7 and 9. Moreover, it is specified in the claim that the second conductor layer and the first conductor layer are etched during the same etching step to form the conductive path, including the programmable link.

Figures 1 to 3 and the corresponding text of the application as filed provide a basis for the method as claimed in claim 7.

Claim 5 concerns a device as defined in claim 1 in which the programmable link is supported by a first portion of the dielectric; the interface between the first portion and the programmable link is at a first level, and second and third respective portions of the dielectric adjacent to the first portion have a surface at a common second level; the first level is raised above the common second level. Thus, the device of claim 5 has a "pedestal structure" in accordance with Figure 4 and page 4, line 31 to page 5, line 13 of the application as filed.

The new claim 6 concerns an integrated circuit of claim 4 wherein the second layer of the conductive path extends over the entire upper surface of the first layer of the conductive path, as derivable for instance from Figure 3 of the application as filed.

Claim 12 concerns a method of claim 7 wherein the etching step (d) of claim 1 further includes the step of etching the second conductor layer and the first conductor layer so that, in the conductor path, the second conductor layer extends over the entire upper surface of the first conductor layer, and this is shown for instance in Figure 3 of the application as filed.

Therefore, the application satisfies the requirement of Article 123(2) EPC that a European patent application may not be amended in such a way that it contains subject-matter which extends beyond the content of the application as filed.

3. *Clarity*

Claim 5 concerns a device according to claim 1 in which the programmable link is supported by a first portion of the dielectric; the interface between the first portion and the programmable link is at a first level; second and third respective portions of the dielectric adjacent to the first portion have a surface at a common second level; the first level is raised above the common second level.

The interface in claim 5 is between the first portion of the dielectric and the programmable link is thus at a first level, which is raised above the common level of the second and third portions of the dielectric, which are both adjacent to the first portion, these second and third portion having a common second level.

Therefore, the features and in particular those relating to the second portion are clearly defined in claim 5, and it is unambiguous that this second portion relates to the dielectric, and not to the programmable link, and that it is at a second level, which is also the level of the third portion, as disclosed in the description in relation to Figure 4.

The claims therefore clearly define the invention and are consistent with the description and the drawings, and they thus satisfy the requirements of Article 84 EPC.

4. *Novelty and inventive step*

The prior art documents D1 to D5 all concern integrated-circuit devices comprising a dielectric-supported conductive path which comprises a programmable link, which link can be severed for instance using a laser, thereby cutting circuit paths and so forming a desired circuit, and methods for making integrated circuits of this type.

In the device of claim 1, locally reduced cross-sectional area of the conductive track at the location of the programmable link results from locally reduced thickness, while width remains essentially constant, thereby facilitating severing of the link (see page 1, line 11 to page 1a, line 3).

As convincingly argued by the appellant, none of these documents disclose conductive paths with tapered transition regions between the programmable link and the rest of the conductive path as in claim 1 or claim 7.

Claims 1 and 7 are therefore new (Art. 54 EPC).

Also, as argued by the appellant, the transition regions contribute to the continuity ("step coverage") of the second conductor layer deposited after window etching of the first conductive layer for forming the upper part of the rest of the conductive track. There is no motivation to modify the method of document D4 to provide the transition regions since in the document D4 a window to expose the programmable link is formed in the second conductive layer (28) and not the first conductive layer (27).

Also, in document D1 (cf. Figure d), the width of the programmable link is reduced in comparison to the first conductive layer (3) for ease of programming. It would therefore be contrary to the teaching of document D1 to provide a conductive path having a uniform width as in the invention as claimed in claims 1 and 7.

Therefore, the invention as claimed in claims 1 and 7 is not obvious to a person skilled in the art, so that the claims involve an inventive step in the sense of Article 56 EPC.

5. Consequently, the claims are patentable in the sense of Article 52(1) EPC so that a patent can be granted on this basis (Art. 97(2) EPC).
6. Therefore, oral proceedings requested auxiliarily by the appellant are not necessary.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the first instance with the order to grant a patent on the basis of the following patent application documents:

Description:

Pages 1, 3 and 6 as filed;

Pages 1a, 2, 4 and 5 as filed with appellant's letter of 22 November 2001;

Claims:

Nos. 1 to 12 as filed with appellant's letter of
22 November 2001;

Drawings:

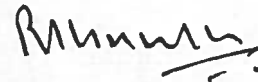
Sheets 1/2 and 2/2 as filed.

The Registrar:

The Chairman:



D. Spigarello



R. K. Shukla