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(54) Title: FABRICATION OF MEMS AND MOEMS COMPONENTS

(57) Abrégé/Abstract:
The invention relates to a method for producing a component (2), especially a micromechanical, micro-electro-mechanical, or micro-opto-electro-mechanical component (2), as well as such a component (2) which has an active structure (27) that is embedded in a layer structure. In order to be able to better contact electrodes (5) of the active structure (27), strip conductor bridges (34) are formed by etching first and second depressions (14, 15) having a first and second, different etching depth (D1, D2) into a covering layer (13) of a first layer combination (10) that additionally encompasses a substrate (11) and an insulation layer (12). The deeper depression (14) is used for insulating the strip conductor bridge (34) while the shallower depression (15) provides a moving space for the active structure (27), said moving space being bridged by the strip conductor bridge (34).
METHOD FOR THE PRODUCTION OF A COMPONENT, AND COMPONENT

VERFAHREN ZUR HERSTELLUNG VON LEITERBAHNBRÜCKEN UND BAUTEIL MIT LEITFÄHIGER SCHICHT

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(57) Zusammenfassung: Erfindungsgemäß wird ein Verfahren zur Herstellung eines Bauteils (2), insbesondere eines mikromechanischen, mikro-elektromechanischen oder mikro-opto-elektromechanischen Bauteils (2) sowie ein solches Bauteil (2) beschrieben, welches eine aktive Struktur (27) aufweist, die in eine Schichtstruktur eingebettet ist. Zur besseren Kontakthaltung von Elektroden (5) der aktiven Struktur (27) werden Leiterbahnbücken (34) ausgebildet, in dem ein Schichtverband (10), der zudem ein Substrat (11) und eine Isolationsschicht (12) aufweist, erste und zweite Vertiefungen (14, 15) mit einer ersten und zweiten voneinander verschiedenen Ätztiefe (D1, D2) geläutert werden. Die tiefere Vertiefung (14) dient der Isolierung der Leiterbahnbücken (34) und die flächere Vertiefung (15) stellt einen Bewegungsraum für die aktive Struktur (27) dar, welcher durch die Leiterbahnbücken (34) überbrückt wird.
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mit internationalen Recherchenberichten
Fabrication of MEMS and MOEMS components

The invention relates to a method for the production of micromechanical, micro-electromechanical (MEMS) or micro-opto-electromechanical (MOEMS) components, and to such a component.

In order to minimize environmental influences such as moisture and contaminants, (e.g. dust) on micro-electromechanical components (MEMS) or micro-opto-electromechanical components (MOEMS), active structures of such components are often hermetically encapsulated. In this case, "active structure" should be understood to mean, in particular, movable structures, optical structures or structures having both movable and optical components (e.g. movable mirrors). The term "active region" denotes the region or volume of the component in which the active structure lies or moves. The hermetically tight encapsulation can furthermore be utilized for setting a specific internal pressure in the region of the active structures, which is advantageous particularly in components whose functioning is dependent on a defined internal pressure, such as e.g. acceleration sensors and gyroscopes (rate-of-rotation sensors).

In order that production can be implemented as cost-effectively as possible, the fabrication of MEMS or MOEMS components generally takes place at the wafer level. The joining processes that are often to be carried out in this case can be effected for example on the basis of direct bonding processes and anodic bonding processes.

Leading electrical contacts out from the hermetically tight region of the component in order to make contact with specific parts of the component (e.g. in order to make contact with the active structure) is difficult to
realize from the standpoint of fabrication technology. Various possibilities are considered: Electrical contacts can be realized for example by laterally extending semiconductor layers which are produced by means of implantation or diffusion methods and have a low sheet resistance. Furthermore, a realization by means of patterned conductive layers covered with a planarized passivation layer is possible.

As an alternative, the electrical contacts can be led out from the component in the form of a plurality of vertically extending plated-through holes.

DE102005015584 describes a method for the production of a component in which the active region and hence the active structure of the component is isolated from the environment of the component (as far as contaminants and moisture are concerned) before the contact holes are produced. Electric currents required by the active structure for the operation of the component and signals generated by the active structure are respectively fed to the active structure and tapped off from the latter via the contact holes and via the conductive structure layer adjacent thereto. However, the technology described does not enable any crossover of interconnects. In particular, it is not possible to make contact with regions (e.g. electrodes) lying within a movable structure that is closed (in a component layer plane) with a tenably small area requirement. Therefore, the movable structures realized by means of this technology in MEMS often have openings for the interconnects to electrodes.

Therefore, the object of the invention is to specify a method for producing a component, in particular a micromechanical, micro-electromechanical or micro-opto-electromechanical component, and such a component by
means of which interconnect crossovers and in particular bridges over movable structures can be realized.

The object is achieved according to the invention by means of a method for fabricating a MEMS or MOEMS component and by means of a MEMS or MOEMS component.

In this case, a first layer assembly is produced, which has a first substrate, on said first substrate a first insulation layer and on said first insulation layer an at least partly conductive covering layer, first depressions and second depressions are produced in the covering layer, wherein the first depressions have a first etching depth and the second depressions have a second etching depth, which is smaller than the first etching depth, and the first etching depth is at least equal to the thickness of the covering layer, and an at least partly conductive structure layer is applied to the covering layer in such a way that the structure layer adjoins the covering layer at least in regions.

So-called interconnect bridges are realized by the different etching depths, the structures being bridged by said interconnect bridges.

The method according to the invention increases the design freedom or the design diversity since new structures become possible. As a result of absent openings, a stiffer structure is brought about, which leads to the reduction of parasitic movements and effects. Moreover, the number of bonding pads can be reduced, thus giving rise to lower costs as a result of a smaller area requirement and an increase in the yield.
or reliability.

In one preferred configuration of the method and of the component produced according to the invention is produced by patterning the structure layer, wherein the patterning can be effected before or after the application of the structure layer to the first layer assembly. The patterning can be effected, for example, by applying a mask on the surface of the structure layer and subsequently etching the structure layer. If the structure layer is not patterned until after application, then it is not necessary to take account of any joining tolerances during the application of the structure layer.

In accordance with further advantageous configurations of the method and of the component, the application of an encapsulation layer or of a second layer assembly enables a hermetically tight encapsulation at the wafer level with an adjustable internal pressure and simultaneously affords the possibility of producing a shield electrically insulated from the other electrical contacts for protection against external electromagnetic interference fields. In this case, the structure layer can also be part of the second layer assembly, which furthermore has a second substrate and a second insulation layer.

A simple access to the metal contact-making areas through the encapsulation layer can be achieved by means of contact holes produced in the encapsulation layer before the application of the encapsulation layer to the structure layer.

When using the second layer assembly, preferably, in the side of the second substrate facing the structure layer, before the application of the structure layer to
the second layer assembly, third depressions are produced, the lateral positions of which correspond at least in part to the lateral positions of the contact holes that are formed later in the second substrate. The third depressions can be used as contact holes (or at least as parts of the contact holes), in a later process stage of the production method according to the invention.

In an advantageous manner, in the side of the second substrate facing the structure layer, before the application of the structure layer to the second layer assembly, fourth depressions are produced, the lateral positions of which correspond at least in part to the lateral positions of the active structure or the active structure of the structure layer; the second depressions can correspondingly likewise be produced at these lateral positions. The second and respectively fourth depressions enable a mechanical movement (e.g. a vibration) of that region of the structure layer which lies within the active region. Furthermore, the second and respectively fourth depressions can be used for setting specific parameters of the component: Since the mechanical vibration quality under specific conditions is dependent primarily on the pressure enclosed into the component, on the geometry of the active (movable) structure and on the direct surroundings thereof, it is possible, for example, to influence the vibration quality of a vibratory active structure in a targeted manner through the choice of the extents of the second and respectively fourth depressions. Thus, the vibration quality is all the greater, the deeper the second and respectively fourth depressions (for the same pressure within the component).

In the case of a symmetrical arrangement as a result of identical etching depths of the second and fourth depressions, symmetrical gas surroundings of the
movable active structure arise. This substantially depresses resulting damping forces perpendicular to the plane of the layers and parasitic movements resulting therefrom.

If third depressions have been formed within the second substrate, then it is possible, in order to form the contact holes, proceeding from that surface of the second substrate which is remote from the structure layer, to remove at least part of the second substrate as far as a vertical position corresponding to the vertical position of the bottoms of the third depressions. The third depressions are thus "opened" and available as contact holes.

It is likewise possible for a portion of the first depressions and a portion of the third depressions to be situated above and respectively below the active structure.

In one particularly preferred embodiment, the first and second substrates and also the structure layer and the covering layer are composed of silicon. However, the invention is not restricted to this; other materials/material combinations are also conceivable. Silicon generally has the advantages of good mechanical properties, high availability and well-developed processing methods. If the components mentioned above are composed of silicon, then this has the following advantages: low thermal stress (this advantage is always present if the two substrates and also the covering and structure layers are composed of the same material) and also little outgassing during the thermal joining process (compared with Pyrex or SD2 (both materials are glasses sold by the companies "Corning Glas" and "Hoya" respectively), whereby pressures of less than 0.01 mbar can be realized within the component.
In an advantageous manner, the different etching depths can be produced by means of a two-stage dry etching step by means of a double mask.

5 By producing electrodes for the active structure at the positions of the second depressions in/on the covering layer, it is possible to realize buried electrodes that can be used to detect and impress movements and forces perpendicular to the wafer plane.

10 By means of a three-stage etching process, both buried electrodes and interconnect bridges can be realized jointly in one component.

15 The invention is explained in more detail by means of exemplary embodiments with reference to the figures in the drawing, in which figure 1 shows a process sequence with steps 1-1, 1-2, 1-3, 1-4 and 1-5 for the patterning of depressions having different etching depths with the aid of a double mask,

20 figure 2 shows a process sequence of the method according to the invention on the basis of sectional illustrations 2-1, 2-2, 2-3 and 2-4,

25 figure 3 shows a schematic plan view of a micromechanical sensor structure with openings for the interconnects as in the prior art,

30 figure 4 shows a schematic plan view of a comparable sensor structure according to the invention, which was produced by the method according to the invention,

figure 5 shows a sectional illustration of a component with a buried electrode,

figure 6 shows a sectional illustration of a component with a buried electrode and with an interconnect bridge,

35 figure 7a shows a further sectional illustration of a component with an interconnect bridge along the sectional area I-I' in figure 7b, and
figure 7b shows a schematic cross section of a component along the sectional area II-II' in figure 7a, superimposed by a section along the area III-III' in figure 7a (light gray shade) and a section along the area IV-IV' in figure 7a (dark gray shade).

In the figures, identical or mutually corresponding regions, components and component groups are identified by the same reference numerals.

In the present invention, a so-called cover wafer 10, in particular an SOI wafer (SOI: Silicon on Insulator), can be used for example for a first layer assembly, said wafer being patterned by means of a two-stage patterning step, for example a two-stage dry etching step (DRIE: Deep Reactive Ion Etching) using a double mask. In this case, the SOI wafer 10 comprises a first silicon substrate 11, a first insulation layer 12, generally silicon dioxide, and a covering layer 13, which is isolated from the first substrate 11 by the buried first insulation layer 12.

Figure 1 illustrates how a first depression 14 having a first etching depth D1 and a second depression 15 having a second etching depth D2 are realized (the result is illustrated in step 1-5). Firstly, an oxide layer 16 is realized on the SOI wafer 10 and patterned (step 1-1). Afterward, a layer of photoresist 17 is applied, exposed and developed (step 1-2). In the following patterning step, the regions in the silicon of the covering layer 13 are etched which have openings at the same location in the oxide layer 16 and in the photoresist mask 17, in the example at the lateral position of the later first depression 14 (step 1-3). After the first patterning step, the photoresist 17 is removed (step 1-4). Openings in the oxide layer 16 which were previously covered with photoresist 17 are uncovered in the process. In the second patterning
step, these regions and the regions already patterned in the first patterning step are etched into the silicon of the covering layer 13. After the two etching steps, the regions of the first depressions 14 which had already been patterned in the first patterning step have been opened down to the buried oxide 12 of the SOI wafer, in order to enable an electrical insulation of different electrodes. The depth of the second etching step determines the later distance between a bridge and the movable structure (or the interconnect in the structure layer 26) (step 1-5), as can be seen below with reference to figure 2. The buried oxide 12 acts as an etching stop.

In the next step, the oxide 16 is removed (since the silicon surface lying underneath is bonded later, the removal is preferably effected wet-chemically). In this case, the buried oxide 12 at the bottoms of the first depressions 14 is also removed wholly (see figure 2-1) or partly. However, this does not have a disadvantageous effect on the function. The cover wafer 10 then has the structure illustrated in figure 2-1 with first depressions 14 having a first etching depth D1, which corresponds to the thickness of the covering layer 13 and thus extend at least down to the buried oxide 12, and with second depressions 15 having a second etching depth D2, which is smaller than the first etching depth D1.

In a next process step, a patterned second insulation layer 21 is produced on the surface of a second substrate 20. Afterward, third depressions 22 having a third etching depth D3 and fourth depressions 23 having a fourth etching depth D4 are produced in the surface of the second substrate 20. In this case, the widths B1 of the third depressions 22 turn out to be smaller than the widths B2 of the cutouts of the second insulation layer 21 above the third depressions 22. In this way,
break-off edges 24 arise in the regions adjoining the third depressions 22, the function of which edges will be described later.

In order to produce a second layer assembly 25, in a next process step a structure layer 26 is applied to the further insulation layer 21, wherein the structure layer 26 bears on the individual regions of the second insulation layer 21.

In a following process step, the structure layer 26 is patterned in such a way that an active structure 27 arises, wherein outer regions 30 (the chip edge, that is to say the edge region of the component to be produced) of the structure layer 26 are electrically insulated from the conductive regions "within" the component by trenches 31. The construction illustrated in figure 2-2 has then arisen.

In a next process step, the result of which is illustrated in figure 2-3, the first layer assembly 10 and the second layer assembly 25 are joined together, in such a way that the covering layer 13 adjoins the structure layer 26 and the second depressions 15 and the fourth depressions 23 are located above and respectively below the active structure 27. What is not illustrated but is likewise desired in part is the fact that at least a portion of the first depressions 14 and a portion of the third depressions 22 are also situated above and respectively below the active structure 27.

During the bonding of the first layer assembly 10 onto the second layer assembly 25 "SOI with buried cavities", silicon is bonded onto a silicon rather than a silicon being bonded onto oxide. Besides the hermetically tight mechanical bond, a connection having the lowest possible electrical resistance has to be produced in this case.
In a next process step, a bonding pad region 35 of the second substrate 20 is etched back as far as a vertical position corresponding to the vertical position of the bottoms of the third depressions 22, with the result that the third depressions 22 are uncovered and contact holes 36 arise.

In the next process step, a metallization layer is then deposited on the surface of the second substrate 20, wherein, on account of the presence of the break-off edges 24, that part of the metallization layer which is deposited within the third depressions 22 is electrically isolated from the rest of the metallization layer, with the result that metal contact-making areas 32 arise within the third depressions 22. Afterward, contact is made with the metal contact-making areas 32 by means of bonding wires 33, thus resulting in the structure in figure 2-4.

If desired, in a further process step, a further metallization layer, a further metallization layer can be deposited (not illustrated) on that surface of the first substrate 11 which is remote from the structure layer 26. The further metallization layer and also the metallization layer serve as shielding electrodes for shielding undesirable electromagnetic fields. The two metallization layers can be connected to a defined, common potential or to different potentials.

Accordingly, the invention has described a method for producing micro-electromechanical or micro-opto-electromechanical components, in particular components having hermetically tightly encapsulated active structures and areas for making electrical contact therewith. The production method according to the invention enables a hermetically tight encapsulation of specific regions of the structure layer at the wafer
level with an adjustable internal pressure and affords the possibility of connecting the electrodes 5 in the structure layer by means of interconnect bridges 34 over active structures 27, such as are shown by way of example in figure 2-4, without having to provide openings 3 as illustrated in figure 3. As a result, it is possible to realize structures 1 as illustrated in figure 4 in which the electrodes 5 can be contact-connected via the interconnect bridges 34 (not illustrated here) and, as a result, the structures 1 are not interrupted in comparison with the open structures 6 in figure 3.

In order to insulate the conductive material of the second substrate, use is advantageously made of break-off edges 24 that bring about an electrical isolation of the electrically conductive sidewalls of the contact hole 36 from the bottom of the contact hole, said bottom being connected (often directly) to an electrode of the component.

The metallization of the contact regions is carried out only after the conclusion of all the joining processes. It is thus possible to use methods such as, for example, silicon direct bonding (SDB) with temperature loads of greater than 400°C provided that no doped active regions exist within the structure layer 26, the doping profiles of which could be impaired at relatively high temperatures.

The invention can be applied to the production process for any (miniaturized) components, in particular to the production process for a micromechanical, micro-electromechanical or micro-opto-electromechanical component, such as acceleration sensors, rate-of-rotation sensors, pressure sensors, optical couplers, etc.
Figures 2-2 to 2-4 illustrate the optional case in which the second substrate 20 is also patterned by means of a two-stage DRIE step (before the realization of the structure layer 26). In this case, the first etching depth D1 and the third etching depth D3 are chosen to be identical and the second etching depth D2 is also chosen to be identical to the fourth etching depth D4. This has the advantage of symmetrical gas surroundings of the active structure 27. This substantially suppresses resulting damping forces perpendicular to the wafer plane and parasitic movements resulting therefrom.

If there is no need for a hermetically tight encapsulation of the structures in the structure layer 26, the structure layer 26 can be realized on the described first layer assembly 10 by means of SDB (Silicon Direct Bonding) and can be patterned (after the realization of bonding pads e.g. by means of aluminum sputtering and etching).

It is also possible to realize a structure layer 26 on the above-described first layer assembly 10 and subsequently to pattern it. By means of SDB, anodic bonding, anodic bonding with e.g. a sputtered Pyrex interlayer or other joining methods, it is subsequently possible to realize an encapsulation by means of an encapsulation layer (e.g. a second substrate 20). In this case, the encapsulation layer (e.g. 20) can be prepatterned in order to ensure access to the metal contact-making areas 32. This variant leads to cross sections similar or identical to those shown in figure 2-4. In this way, the metal contact-making areas 32 can be applied to the structure layer 26 actually prior to the encapsulation, and the active structure 27 can be tested. However, low-temperature joining methods should then be used for the last joining process, in order to prevent the metal contact-making areas 32 from being
destroyed in this case.

Figure 5 illustrates that the two-stage patterning can also realize buried electrodes 40, which can be used primarily to detect and impress movements and forces in the z direction (perpendicular to the wafer plane).

By means of a three-stage patterning with fifth depressions 41 having a fifth etching depth D5, the result of which is illustrated in figure 6, it is possible to realize both buried electrodes 40 and interconnect bridges 34.

In this case, the buried electrodes 40 are realized for example by the material of the corresponding layer (the covering layer 13) itself, or else by deposition of an additional metallization layer on the corresponding layer (the covering layer 13).

Figures 7a and 7b show a further illustration of a component for the purpose of better elucidation. In this case, figure 7a illustrates a schematic section along the sectional area I-I’ in figure 7b, while figure 7b shows a schematic cross section along the sectional area II-II’ in figure 7a, superimposed by a section along the area III-III’ in figure 7a (light gray shade) and a section along the area IV-IV’ in figure 7a (dark gray shade). In this case, the cross section in figure 7b shows particularly well the active structure 27 and the interconnect bridge 34, which connects an electrode 5 situated within the active structure to a connection 51 outside the active structure. In this case, the component illustrated also shows an example of the fact that a portion of the first depressions 14 and of the third depressions 22 are situated symmetrically above and respectively below the active structure, as are the second depressions 15 and the fourth depressions 23. In the case of a
symmetrical arrangement as a result of identical etching depths of the second and fourth depressions 15, 23 and of the first and third depressions 14, 22, symmetrical gas surroundings of the movable active structure 27 arise. This substantially suppresses resulting damping forces perpendicular to the plane of the layers and parasitic movements resulting therefrom.
Claims

1. A method for producing a component (2), the method comprising the following steps:
   - production of a first layer assembly (10), which has a first substrate (11), a first insulation layer (12) on the first substrate (11) and an at least partly conductive covering layer (13) on the first insulation layer (12),
   - production of first depressions (14) and second depressions (15) in the covering layer (13), wherein the first depressions (14) have a first etching depth and the second depressions (15) have a second etching depth, which is smaller than the first etching depth, and the first etching depth is at least equal to the thickness of the covering layer (13),
   - application of an at least partly conductive structure layer (26) to the covering layer (13), the structure layer (26) adjoining the covering layer (13) at least in regions.

2. The method for producing a component (2) as claimed in claim 1 wherein the component is a micromechanical, a micro-electromechanical or a micro-opto-electromechanical.

3. The method for producing a component (2) as claimed in any of claims 1 and 2, characterized in that an active structure (27) of the component (2) is produced by patterning the structure layer (26), wherein the patterning is effected before or after the application of the structure layer (26) to the covering layer (13).

4. The method for producing a component (2) as claimed in claim 3, characterized in that metal contact-making areas (32) are produced in regions on the surface of the structure layer (26) opposite to the covering layer (13).

5. The method for producing a component as claimed in any of claims 3 and 4, characterized in that an encapsulation layer for encapsulating the active structure (27) is applied to the surface of the structure layer (26) opposite to the covering layer (13).

6. The method for producing a component (2) as claimed in claim 5, characterized in that
the encapsulation layer, before being applied to the covering layer (13), is provided with contact holes (36) that enable access to the metal contact-making areas (32) after the encapsulation layer has been applied to the covering layer (13).

7. The method for producing a component (2) as claimed in any of claims 1, 2 and 4, characterized in that
the step of application of the structure layer (26) to the covering layer (13) comprises the following steps:
- production of a second layer assembly (25), which comprises a second substrate (20) and a second insulation layer (21), which covers at least part of the surface of the second substrate (20),
- application of the structure layer (26) to the second insulation layer (21), and
- application of the second layer assembly (25) to the covering layer (13), the structure layer (26) adjoining the covering layer (13) at least in regions.

8. The method for producing a component (2) as claimed in claim 7, characterized in that
an active structure (27) of the component (2) is produced by patterning the structure layer (26), wherein the patterning is effected before or after the application of the structure layer (26) to the second layer assembly (25).

9. The method for producing a component (2) as claimed in claim 8, characterized in that
the first and the second layer assemblies (10, 25) and also the structure layer (26) are configured such that after the application of the second layer assembly (25), at least a part of the structure layer (26) which comprises the active structure (27) is hermetically tightly sealed by the first and second layer assemblies (10, 25).

10. The method for producing a component (2) as claimed in any of claims 7 to 9, characterized in that
contact holes (36) are formed in the second substrate (20).

11. The method for producing a component (2) as claimed in claim 10, characterized in that
- in the side of the second substrate (20) facing the structure layer (26), before the application of the structure layer (26) to the second layer assembly (25), third depressions (22) are produced, and
- the lateral positions of the contact holes (36) correspond at least in part to the lateral positions of the third depressions (22).

12. The method as claimed in any of claims 10 and 11, characterized in that in the side of the second substrate (20) facing the structure layer (26), before the application of the structure layer (26) to the second layer assembly (25), fourth depressions (23) are produced, the lateral positions of which correspond at least in part to the lateral positions of the active structure (27) of the structure layer (26).

13. The method as claimed in any of claims 3 to 6, or respectively 8 to 12, characterized in that at least one of the second depressions (15) produced in the covering layer (13) and the first depressions (14) are produced at lateral positions which correspond at least in part to the lateral positions of the active structure (27) of the structure layer (26).

14. The method as claimed in any of claims 12 or 13, characterized in that the etching depth of the fourth depressions (23) is chosen to be equal to the second etching depth (D2) of the second depressions (15) of the covering layer (13).

15. The method as claimed in any of claims 1, 2 and 7, characterized in that the first substrate (11), the second substrate (20), the structure layer (26) and the covering layer (13) are composed of the same material.

16. The method as claimed in claim 15, characterized in that the material of the first substrate (11), the second substrate (20), the structure layer (26) and the covering layer (13) is silicon.

17. The method as claimed in any of claims 1 to 16, characterized in that at least one of the different first (D1) and second etching depths (D2) of the first depressions (14) and second depressions (15) and the different third (D3) and fourth etching depths (D4) of the third depressions (22) and fourth depressions (23) are produced by means of a two-stage dry etching step by means of a double mask (16, 17).
18. The method as claimed in any of claims 1 to 17, **characterized in that**
electrodes (40) for the active structure (27) are produced at the positions of the
second depressions (15) in/on the covering layer (13).

19. The method as claimed in any of claims 1 to 18, **characterized in that**
- fifth depressions (41) having a fifth etching depth (D5), which differs from the
  first etching depth (D1) and the second etching depth (D2), are formed in the
  covering layer (13), and in that
- electrodes (40) for the active structure (27) are produced at the positions of the
  fifth depressions (41) in/on the covering layer (13).

20. The method as claimed in any of claims 1 to 19, **characterized in that**
an interconnect bridge (34) is produced in the covering layer (13), said interconnect
bridge connecting an electrode (5) within the active structure (27) to the structure
layer (26) outside the active structure (27).

21. A micromechanical, micro-electromechanical or micro-opto-electromechanical
component (2), comprising:
- a first layer assembly (10), which has a first substrate (11), a first insulation
  layer (12) on the first substrate (11) and a covering layer (13) on the first insulation
  layer (12),
- an at least partly conductive structure layer (26) arranged on the covering layer
  (13), and
- first depressions (14) and second depressions (15) in the covering layer (13), said
depressions proceeding from an interface with the structure layer (26), wherein the
first depressions (14) have a first etching depth (D1) and the second depressions
(15) have a second etching depth (D2), which is smaller than the first etching depth
(D1), and the first etching depth (D1) is at least equal to the thickness of the
covering layer (13).

22. The micromechanical, micro-electromechanical or micro-opto-electromechanical
component (2) as claimed in claim 21, **characterized by**
an active structure (27) of the component (2) formed in the structure layer (26).
23. The component (2) as claimed in claim 22, characterized by
metal contact-making areas (32) on the surface of the structure layer (26) opposite to the covering layer (13).

24. The component (2) as claimed in any of claims 22 and 23, characterized by
an encapsulation layer for encapsulating the active structure (27) on the surface of the structure layer (26) opposite to the covering layer (13).

25. The component (2) as claimed in claim 23, characterized by
an encapsulation layer for encapsulating the active structure (27) on the surface of the structure layer (26) opposite to the covering layer (13), and
contact holes (36) in the encapsulation layer for enabling access to the metal contact-making areas (32).

26. The component (2) as claimed in any of claims 21 and 23, characterized by
a second layer assembly (25), which has a second substrate (20) and a second insulation layer (21), which covers at least part of the surface of the second substrate (20), wherein the second layer assembly (25) is arranged on the side of the structure layer (26) opposite to the covering layer (13).

27. The component (2) as claimed in claim 26, characterized by
an active structure (27) of the component (2) formed in the structure layer (26).

28. The component (2) as claimed in claim 27, characterized in that
a part of the structure layer (26) which comprises the active structure (27) is hermetically tightly sealed by the first and second layer assemblies (10, 25).

29. The component (2) as claimed in any of claims 26 to 28, characterized by
contact holes (36) formed in the second substrate (20).

30. The component (2) as claimed in claim 29,
**characterized in that**
in the side of the second substrate (20) facing the structure layer (26), third depressions (22) are present, the lateral positions of which correspond at least in part to the lateral positions of the contact holes (36).

31. The component (2) as claimed in any of claims 29 and 30,

**characterized in that**
in the side of the second substrate (20) facing the structure layer (26), fourth depressions (23) are present, the lateral positions of which correspond at least in part to the lateral positions of the active structure (27) of the structure layer (26).

32. The component (2) as claimed in any of claims 27 to 31,

**characterized in that**

at least one of the second depressions (15) present in the covering layer (13) and the first depressions (14) are at lateral positions which correspond at least in part to the lateral positions of the active structure (27) of the structure layer (26).

33. The component (2) as claimed in any of claims 31 and 32,

**characterized in that**

a fourth etching depth (D4) of the fourth depressions (23) is equal to the second etching depth (D2) of the second depressions (15) of the covering layer (13).

34. The component (2) as claimed in any of claim 21 and 26,

**characterized in that**

the first substrate (11), the second substrate (20), the structure layer (26) and the covering layer (13) are composed of the same semiconductor material.

35. The method as claimed in claim 34,

**characterized in that**

the material of the first substrate (11), the second substrate (20), the structure layer (26) and the covering layer (13) is silicon.

36. The component (2) as claimed in any of claims 21 to 35,

**characterized by**

electrodes (40) in/on the covering layer (13) at the positions of the second depressions (15).

37. The component (2) as claimed in any of claims 21 to 35,
characterized by
fifth depressions (41) having a fifth etching depth (D5) in the covering layer (13) and
by electrodes (40) in/on the covering layer (13) at the positions of the fifth depressions (41).

38. The component (2) as claimed in any of claims 21 to 37,
characterized by
at least one interconnect bridge (34) formed in the covering layer (13), said at least
one interconnect bridge connecting an electrode (5) within the active structure (27)
to the structure layer (26) outside the active structure (27).