**~~Patent~~ Claims:**

~~1. A method for manufacturing a plurality of optical modules each comprising a first and a second optical component, the method comprising the steps of~~

~~a) providing a first substrate wafer on which a plurality of the first optical components is present on a top side of the first substrate wafer;~~

~~b) providing a second substrate wafer having a material region which is a continuous laterally defined region in which material of the second substrate is present, wherein a plurality of the second optical components is present in said material region;~~

~~c) achieving a lateral alignment of the first and second substrate wafers such that each of the first optical components is present in a laterally defined region not overlapping said material region;~~

~~d) interconnecting the first and second substrate wafers in said lateral alignment such that the top side of the first substrate wafer faces a bottom side of the second substrate wafer with no further wafer in between.~~

~~2. The method according to claim 1, wherein the second substrate wafer comprises a plurality of open regions which are laterally defined regions in which no material of the second substrate is present, and wherein each of the first optical components is present in one of these open regions.~~

~~3. The method according to claim 1 or claim 2, wherein the first optical components are laterally positioned in one of a plurality of first regions each, and the second optical components are laterally positioned in one of a plurality of second~~

~~regions each, wherein none of the first regions overlaps with any one of the second regions.~~

~~4. The method according to one of claims 1 to 3, wherein the second substrate wafer constitutes an integrally formed part.~~

~~5. The method according to one of claims 1 to 4, wherein the second substrate wafer is continuous with a plurality of protrusions protruding in a direction opposite to a direction pointing from the bottom side of the second substrate wafer to the top side of the first substrate wafer.~~

~~6. The method according to one of claims 1 to 4, comprising the steps of~~

~~e) providing a wafer referred to as second spacer wafer; and~~

~~f) interconnecting the second substrate wafer and the second spacer wafer;~~

~~wherein step f) is carried out before step d) or during step d) or after step d), and wherein after step d), the second substrate wafer is arranged between the first substrate wafer and the second spacer wafer.~~

~~7. The method according to one of claims 1 to 6, comprising the steps of~~

~~g) providing a third substrate wafer, wherein on or at the third substrate wafer a plurality of third optical components is present and/or the third substrate wafer comprises a plurality of laterally defined transparent regions; and~~

~~h) connecting the third substrate wafer to the first substrate wafer and/or the second substrate wafer via a wafer referred to as first spacer wafer, such that the second substrate wafer is arranged between the first substrate wafer and the third~~

substrate wafer, wherein the first spacer wafer is optionally is continuous with the third spacer wafer;

wherein step h) is carried out after step d) or simultaneously with step d).

8. The method according to claim 7, wherein, after step h), the second substrate wafer is present between the first substrate wafer and the first spacer wafer, and wherein the first spacer wafer vertically extends from the second substrate wafer to the third substrate wafer such that a vertical distance between the second substrate wafer and the third substrate wafer is defined by the vertical extension of the first spacer wafer.

9. The method according to one of claims 1 to 8, wherein the first optical components are active optical components and the second optical components are passive optical components.

10. The method according to one of claims 1 to 9, comprising the step of

r) replicating the second optical components on the second substrate wafer.

11. The method according to one of claims 1 to 9, comprising the step of attaching the second optical components to the second substrate wafer, in particular using pick-and-place.

12. The method according to one of claims 1 to 11, wherein one of said first optical components is produced together with or produced on or attached to the first substrate wafer in a first specific location and orientation using a first process, and one of said second optical components is produced together with or produced on or attached to the

second substrate wafer in a second specific location and orientation using a second process, and wherein said first and second specific locations are mutually laterally distant so closely that space requirements of said first and second processes preclude at least one of

- to simultaneously produce together with or produce on or attach to the first substrate wafer one of said first optical components in said first specific location and orientation using said first process and produce together with or produce on or attach to the second substrate wafer one of said second optical components in said second specific location and orientation using said second process;
- to firstly produce together with or produce on or attach to the first substrate wafer one of said first optical components in said first specific location and orientation using said first process and then produce together with or produce on or attach to the second substrate wafer one of said second optical components in said second specific location and orientation using said second process;
- to firstly produce together with or produce on or attach to the second substrate wafer one of second first optical components in said second specific location and orientation using said second process and then produce together with or produce on or attach to the first substrate wafer one of said first optical components in said first specific location and orientation using said first process;

after establishing an interconnection between the first substrate wafer and the second substrate wafer.

13. The method according to one of claims 1 to 12, wherein one of said first optical components is produced together with or produced on or attached to the first substrate wafer in a first specific location and orientation using a first process, and one of said second optical components is produced together with or produced on or attached to the second substrate wafer in a second specific location and orientation using a second

~~process, and wherein said first and second specific locations are mutually laterally distant so closely that space requirements of said first and second processes preclude at least one of~~

- ~~to simultaneously produce together with or produce on or attach to one single substrate wafer one of said first optical components in a location and orientation corresponding to said first specific location and orientation using said first process and produce together with or produce on or attach to said one single substrate wafer one of said second optical components in a location and orientation corresponding to said second specific location and orientation using said second process;~~
- ~~to firstly produce together with or produce on or attach to one single substrate wafer one of said first optical components in a location and orientation corresponding to said first specific location using said first process and then produce together with or produce on or attach to said one single substrate wafer one of said second optical components in a location and orientation corresponding to said second specific location and orientation using said second process;~~
- ~~to firstly produce together with or produce on or attach to one single substrate wafer one of second first optical components in a location and orientation corresponding to said second specific location using said second process and then produce together with or produce on or attach to said one single substrate wafer one of said first optical components in a location and orientation corresponding to said first specific location and orientation using said first process.~~

~~14. The method according to one of claims 1 to 13, wherein a lateral distance between a specific one of the plurality of first optical components and a specific one of~~

the plurality of second optical components is smaller than 800 µm, more particularly wherein one of the following applies

- said specific first optical component and said specific second optical component are both active optical components and wherein said lateral distance is smaller than 800 µm, more particularly smaller than 400 µm;
- said specific first optical component and said specific second optical component are both replicated passive optical components and wherein said lateral distance is smaller than 800 µm, more particularly smaller than 500 µm;
- said specific first optical component is an active optical component and said specific second optical component is a replicated passive optical component and wherein said lateral distance is smaller than 800 µm, more particularly smaller than 600 µm, even more particularly smaller than 350 µm.

15. The method according to one of claims 1 to 14, wherein the second optical components are replicated optical components, in particular lens elements, each of which is integrally formed with a surrounding portion at least partially surrounding the respective optical component, each of the surrounding portions being produced in the same replication process as applied during producing the respective second optical component, the method comprising the step of

m) creating a plurality of openings in the second substrate wafer;

wherein by carrying out step m), at least a portion of each of the surrounding portions is removed.

16. The method according to one of claims 1 to 15, wherein conductor paths are present on the top side of the first substrate wafer in the material region, in particular in laterally defined regions occupied by second optical components.

~~17. The method according to one of claims 1 to 16, wherein in said lateral alignment a space between a first and a second optical component of one and the same optical module is absent any further part or portion of the optical module, at least apart from an optionally present portion of the second substrate wafer and/or from a bonding agent optionally present on the top side of the first substrate wafer.~~

~~18. The method according to one of claims 1 to 17, wherein the second substrate wafer has a profile with cutting lines inclined with respect to the vertical direction, in particular such that an undercut between the second substrate wafer and the top side of the first substrate wafer is established.~~

~~19. Use of a method according to one of claim 1 to 18 for reducing a lateral distance between first and second optical components of one and the same optical module or for achieving a lateral distance between first and second optical components of one and the same optical module which is smaller than achievable using a single substrate wafer only on which the first and second optical components are present due to corresponding processing and in corresponding locations and orientations.~~

~~20~~1. An optical module comprising:

— a first substrate having a top side on which a first active optical component is present;

— a second substrate having a bottom side;

wherein the first substrate and the second substrate are interconnected such that the top side of the first substrate faces the bottom side of the second substrate with no

further substrate in between the first and second substrates, and the second substrate is stacked onto the first substrate ~~in a direction referred to as vertical direction~~;

wherein the second substrate has

— a material region which is a laterally defined region in which material of the second substrate is present and ~~in~~ having a top side on which a second passive optical component is present, the top side of the material region being on a side of the second substrate opposite that of the bottom side of the second substrate; and

— at least one open region which is a laterally defined region in which no material of the second substrate is present;

wherein at least a portion of the first active optical component is laterally located within the at least one open region.

2~~1~~. The optical module according to claim ~~20~~1, wherein the first active optical component is laterally positioned in a first region and the second passive optical component is laterally positioned in a second region, wherein the first region and the second region do not overlap.

~~22~~3. The optical module according to claim ~~20 or claim 2~~1, wherein the first active optical component is arranged such that it vertically extends beyond the bottom side of the second substrate.

~~23~~4. The optical module according to ~~one of~~ claim~~s 20 to 22~~1, wherein the first active optical component is surrounded by a boundary between the material region and the at least one open region.

~~24~~5. The optical module according to ~~one of~~ claim~~s~~ ~~20 to 23~~1, further comprising a third substrate and a first spacer, wherein the first spacer is present between the first substrate and the third substrate~~, more particularly between the second substrate and the third substrate, and wherein the first spacer is optionally continuous with the third substrate~~.

6. The optical module according to claim 1, comprising a second spacer, the second spacer extending from a top side of the second substrate opposite to the bottom side of the second substrate into a direction opposite to a direction pointing from the bottom side of the second substrate to the top side of the first substrate.

~~25~~7. The optical module according to ~~one of~~ claim~~s~~ ~~20 to 24~~5, comprising a second spacer, the second spacer extending from a top side of the second substrate opposite to the bottom side of the second substrate into a direction opposite to a direction pointing from the bottom side of the second substrate to the top side of the first substrate, ~~wherein~~ the second spacer ~~is optionally continuous with~~ being at a distance from the ~~second~~ third substrate.

~~26. The optical module according to claim 24~~ and ~~claim 25, the second spacer being at a distance from the third substrate.~~

~~27~~8. The optical module according to ~~one of~~ claim~~s~~ ~~20 to 26~~1, wherein at least one conductor path is present on the top side of the first substrate in the material region~~, in particular in a laterally defined region occupied by the second optical component~~.

~~28~~9. The optical module according to ~~one of~~ claim~~s~~ ~~20 to 27~~1, wherein no part or component of the optical module is present between the first active optical component and the second passive optical component~~, at least apart from an optionally present portion of the second substrate and/or from a bonding agent optionally present on the top side of the first substrate~~.

~~29~~10. The optical module according to ~~one of~~ claim~~s~~ ~~20 to 28~~1, wherein the second substrate is structured in such a way that an undercut between the second substrate and the top side of the first substrate is established.

~~30~~11. The optical module according to ~~one of~~ claim~~s~~ ~~20 to 29~~1, wherein a lateral distance between the first active optical component~~s~~ and the second passive optical component~~s~~ is smaller than 800 µm~~, more particularly smaller than 500 µm, even more particularly smaller than 350 µm~~.

~~31~~12. A wafer stack comprising a plurality of optical modules according to ~~one of~~ claim~~s~~ ~~20 to 30~~1.

~~32~~13. A wafer stack comprising:

— a first substrate wafer on which a plurality of first active optical components is present on a top side of the first substrate wafer;

— a second substrate wafer having one or more openings and a material region which is a continuous laterally defined region in which material of the second substrate is present, wherein a plurality of second passive optical components is present on a top side of~~in~~ said material region;

wherein the top side of the first substrate wafer faces a bottom side of the second substrate wafer with no further wafer in between, and wherein at least a portion of each first active optical component of the plurality of first active optical components is present in a ~~laterally defined region not overlapping~~ respective one of the one or more openings~~material region~~.

~~33~~14. A device comprising ~~an~~the optical module according to ~~one of~~ claim~~s 20 to 30~~1 ~~or an optical module manufactured according to one of claims 1 to 18.~~

~~34. The device according to claim 33~~, further comprising a printed circuit board on which the optical module is mounted.

~~35~~15. ~~The~~ A device comprising the optical module according to claim ~~33 or claim 34~~1, wherein the device is at least one of

- a portable or mobile computing device;
- a smart phone;
- a tablet computer;
- a digital reader;
- a photographic device;
- a digital camera;
- a game controller;
- a sensing device;
- a sensor.

16. The optical module according to claim 5, wherein the first spacer is present between the second substrate and the third substrate.

17. The optical module according to claim 1, wherein the first active optical component is projecting into or through the at least one open region.

18. The optical module according to claim 1, wherein the first active optical component protrudes into the at least one open region of the second substrate and extends beyond a top side of the second substrate.

19. The optical module according to claim 5, wherein the first spacer is continuous with the third substrate.

20. The optical module according to claim 6, wherein the second spacer is continuous with the second substrate.

21. The optical module according to claim 8, wherein the at least one conductor path is present in a laterally defined region occupied by the second passive optical component.

22. The wafer stack according to claim 13, wherein each first active optical component of the plurality of first active optical components protrudes from the top side of the first substrate wafer beyond a top side of the second substrate wafer.

23. The wafer stack according to claim 13, wherein the second substrate wafer has a multitude of openings, and each first active optical component of the plurality of first active optical components projects into or through a respective one of the one or more openings.

24. The wafer stack according to claim 13, wherein each first active optical component of the plurality of first active optical components protudes into a respective one of the one or more openings of the second substrate and extends beyond a top side of the second substrate.

25. The optical module according to claim 1, wherein no part or component of the optical module is present between the first active optical component and the second passive optical component other than one or more of the following:

a portion of the second substrate;

a bonding agent on the top side of the first substrate.

26. The optical module according to claim 1 wherein the first and second substrates are bonded directly to one another.

27. The optical module according to claim 1 wherein the first and second substrates are bonded directly to one another only by adhesive.

28. The optical module of claim 1 wherein the second passive optical component is a reflective optical component.

29. The optical module of claim 1 wherein the second passive optical component is a curved mirror.

30. The wafer stack of claim 13 wherein each of the second passive optical components is a reflective optical component.

31. The wafer stack of claim 13 wherein each of the second passive optical components is a curved mirror.