

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

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| To: PERDOK, MONIQUE M SCHWEGMAN LUNDBERG & WOESSNER, P.A. P.O. BOX 2938 MINNEAPOLIS MN 55402 USA | | Date of mailing (day/month/year) 31 January 2018 (31.01.2018) | |
| Applicant's or agent's file reference P107946PCTY7 | | FOR FURTHER ACTION See paragraph 2 below | |
| International application No. PCT/US2017/056998 | International filing date (day/month/year) 17 October 2017 (17.10.2017) | Priority date(day/month/year) 17 November 2016 (17.11.2016) | |
| International Patent Classification (IPC) or both national classification and IPC H01L 25/065(2006.01)i, H01L 25/07(2006.01)i, H01L 23/48(2006.01)i | | | |
| Applicant INTEL CORPORATION | | | |
| <p>1. This opinion contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the opinion</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Rule 43bis. I(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input checked="" type="checkbox"/> Box No. VIII Certain observations on the international application</p> <p>2. FURTHER ACTION</p> <p>If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.</p> <p>If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.</p> <p>For further options, see Form PCT/ISA/220.</p> | | | |

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| Name and mailing address of the ISA/KR International Application Division Korean Intellectual Property Office 189 Cheongsa-ro, Seo-gu, Daejeon, 35208, Republic of Korea Facsimile No. +82-42-481-8578 | Date of completion of this opinion 31 January 2018 (31.01.2018) | Authorized officer JANG, Gijeong Telephone No. +82-42-481-8364 |
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Box No. 1 Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of :
 - the international application in the language in which it was filed
 - a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))
2. This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))
3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing:
 - a. forming part of the international application as filed:
 - in the form of an Annex C/ST.25 text file.
 - on paper or in the form of an image file.
 - b. furnished together with the international application under PCT Rule 13ter.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.
 - c. furnished subsequent to the international filing date for the purposes of international search only:
 - in the form of an Annex C/ST.25 text file (Rule 13ter.1(a)).
 - on paper or in the form of an image file (Rule 13ter.1(b) and Administrative Instructions, Section 713).
4. In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

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Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

| | | | |
|-------------------------------|--------|-------------|-----|
| Novelty (N) | Claims | <u>1-25</u> | YES |
| | Claims | <u>NONE</u> | NO |
| Inventive step (IS) | Claims | <u>1-25</u> | YES |
| | Claims | <u>NONE</u> | NO |
| Industrial applicability (IA) | Claims | <u>1-25</u> | YES |
| | Claims | <u>NONE</u> | NO |

2. Citations and explanations :

Reference is made to the following documents:

- D1: US 2016-0172331 A1 (SK HYNIX INC.) 16 June 2016
- D2: US 2016-0315071 A1 (APPLE INC.) 27 October 2016
- D3: US 2015-0243631 A1 (TESSERA, INC.) 27 August 2015
- D4: US 2010-0109139 A1 (DONG-HO LEE) 06 May 2010
- D5: US 2012-0168967 A1 (YU-WEI HUANG et al.) 05 July 2012

1. Novelty and Inventive Step

1.1. Claims 1-13

The subject matter of claim 1 differs from these prior art documents in that a microelectronic device comprises: first and second semiconductor dies supported by a substrate in laterally spaced relation to one another defining a first gap extending in a first direction; and third and fourth semiconductor dies extending over the first and second semiconductor dies and in laterally spaced relation to one another defining a second gap extending in a second direction angularly offset from the first direction of the first gap. And it is not obvious to a person skilled in the art by the documents, taken alone or in combination. Therefore, claim 1 meets the requirements of PCT Article 33(2) and (3) with respect to novelty and inventive step.

Claims 2-13 are directly or indirectly dependent on claim 1 and therefore meet the requirements of PCT Article 33(2) and (3).

1.2. Claims 14-21

The subject matter of claim 14 differs from these prior art documents in that a

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Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

It is not clear whether the phrase "the multiple die" mentioned in claim 14 refers to "the multiple die of the base layer" or "the multiple layer of the second layer". Therefore, claim 14 does not meet the requirements of PCT Article 6. (Note: Referring to the description, it seems to be a typo of "the multiple layer of the second layer".)

The phrase "the first and second layers" used in claim 15 lacks proper antecedent basis. Therefore, claim 15 does not meet the requirements of PCT Article 6. (Note: Referring to the description, it seems to be a typo of "the base and second layers".)

The phrase "the first layer" used in claim 21 lacks proper antecedent basis. Therefore, claim 21 does not meet the requirements of PCT Article 6. (Note: Referring to the description, it seems to be a typo of "the base layer".)

Supplemental Box

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Continuation of : Box No. V

method of manufacturing a microelectronic device comprises: attaching multiple semiconductor dies to a substrate to form a base layer of die, the multiple dies of the base layer arranged in a first orientation, wherein the multiple dies are in laterally spaced relation to one another to define at least one gap extending in a first direction; and attaching multiple semiconductor dies to the multiple dies of the base layer to form a second layer of die, the multiple dies of the second layer arranged in a second orientation, wherein the multiple dies are in laterally spaced relation to one another to define at least one gap extending in a second direction angularly offset from the first direction. And it is not obvious to a person skilled in the art by the documents, taken alone or in combination. Therefore, claim 14 meets the requirements of PCT Article 33(2) and (3) with respect to novelty and inventive step.

Claims 15-21 are directly or indirectly dependent on claim 14 and therefore meet the requirements of PCT Article 33(2) and (3).

1.3. Claims 22-25

The subject matter of claim 22 differs from these prior art documents in that a method of manufacturing a microelectronic device comprises: attaching multiple semiconductor dies to a substrate to form a base layer of die, the multiple dies of the base layer arranged in a first orientation, wherein the multiple dies are in laterally spaced relation to one another to define at least one gap extending in a first direction; and attaching multiple semiconductor dies to the multiple dies of the base layer to form a second layer of die, the multiple die of the second layer arranged in a second orientation, wherein the multiple dies are in laterally spaced relation to one another to define at least one gap extending in a second direction angularly offset from the first direction. And it is not obvious to a person skilled in the art by the documents, taken alone or in combination. Therefore, claim 22 meets the requirements of PCT Article 33(2) and (3) with respect to novelty and inventive step.

Claims 23-25 are dependent on claim 22 and therefore meet the requirements of PCT Article 33(2) and (3).

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2. Industrial Applicability

Claims 1-25 are industrially applicable under PCT Article 33(4).