

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: HARRIS, Philip Holland & Hart LLP P.O. Box 11583 Salt Lake City, Utah 84147 USA |
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| Date of mailing (day/month/year) 19 March 2020 (19.03.2020) |
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| Applicant's or agent's file reference P292WO1541 | FOR FURTHER ACTION See paragraph 2 below |
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| International application No. PCT/US2019/063389 | International filing date (day/month/year) 26 November 2019 (26.11.2019) | Priority date(day/month/year) 06 December 2018 (06.12.2018) |
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| International Patent Classification (IPC) or both national classification and IPC G06F 11/10(2006.01)i, G11C 29/52(2006.01)i |
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| Applicant MICRON TECHNOLOGY, INC. |
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1. This opinion contains indications relating to the following items:

- Box No. I Basis of the opinion
- Box No. II Priority
- Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- Box No. IV Lack of unity of invention
- Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- Box No. VI Certain documents cited
- Box No. VII Certain defects in the international application
- Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

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.

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.
For further options, see Form PCT/ISA/220.

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|  <p>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</p> | <p>Date of completion of this opinion 19 March 2020 (19.03.2020)</p> | <p>Authorized officer KWON, Sungho Telephone No. +82-42-481-3547</p>  |
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WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US2019/063389

Box No. I 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 43*bis*.1(b))
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 13*ter*.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 13*ter*.1(a)).
 - on paper or in the form of an image file (Rule 13*ter*.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:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US2019/063389

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

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|-------------------------------|--------|-------------|-----|
| Novelty (N) | Claims | <u>1-24</u> | YES |
| | Claims | <u>NONE</u> | NO |
| Inventive step (IS) | Claims | <u>1-24</u> | YES |
| | Claims | <u>NONE</u> | NO |
| Industrial applicability (IA) | Claims | <u>1-24</u> | YES |
| | Claims | <u>NONE</u> | NO |

2. Citations and explanations :

Reference is made to the following documents:

D1: US 2015-0286529 A1 (MICRON TECHNOLOGY, INC.) 08 October 2015

D2: US 2010-0223532 A1 (SANG BEOM KANG et al.) 02 September 2010

D3: US 2018-0151197 A1 (SK HYNIX INC.) 31 May 2018

D4: KR 10-2018-0059149 A (SK HYNIX INC.) 04 June 2018

D5: US 2014-0359398 A1 (SANDISK TECHNOLOGIES INC.) 04 December 2014

D6: US 2011-0271164 A1 (BYOUNG-YOUNG AHN et al.) 03 November 2011

I. Novelty and Inventive Step (PCT Article 33(2) and (3))

1. Claims 1-6

None of the cited documents discloses the features of claim 1: a redundant ECC circuit coupled with a redundant data plane and configured to receive redundant data from a redundant data plane. And it is not obvious to a person skilled in the art from the cited documents, when taken individually or in any combination. Claims 2-6 are dependent on claim 1.

Therefore, claims 1-6 are novel and involve an inventive step.

2. Claims 7-11

None of the cited documents discloses the features of claim 7: a redundant error correction code (ECC) circuit coupled with a redundant data plane; and an AND logic gate coupled with an output for a redundant ECC circuit and configured to output a signal representative of a result of an exclusive-OR (XOR) operation on a redundant data based at least in part on a control signal. And it is not obvious to a person skilled in the art from the cited documents,

Continued on Supplemental Box

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of : Box No. V

when taken individually or in any combination. Claims 8-11 are dependent on claim 7.

Therefore, claims 7-11 are novel and involve an inventive step.

3. Claims 12-19

None of the cited documents discloses the features of claim 12: transferring redundant data for a first data plane from a redundant data plane to a redundant ECC circuit coupled with a redundant data plane; and generating syndrome bits for a codeword comprising a data and a redundant data based at least in part on outputs of respective ECC circuits of multiple data planes and an output of a redundant ECC circuit. And it is not obvious to a person skilled in the art from the cited documents, when taken individually or in any combination. Claims 13-19 are dependent on claim 12.

Therefore, claims 12-19 are novel and involve an inventive step.

4. Claims 20-24

None of the cited documents discloses the features of claim 20: transferring a result of a bitwise operation to a set of logic gates based at least in part on a redundant data corresponding to data stored by a data plane. And it is not obvious to a person skilled in the art from the cited documents, when taken individually or in any combination. Claims 21-24 are dependent on claim 20.

Therefore, claims 20-24 are novel and involve an inventive step.

II. Industrial Applicability (PCT Article 33(4))

Claims 1-24 are industrially applicable.