

PATENT ASSIGNMENT COVER SHEET

Electronic Version v1.1
 Stylesheet Version v1.2

EPAS ID: PAT4965417

| | | |
|---|---------------------------------|-----------------------|
| SUBMISSION TYPE: | NEW ASSIGNMENT | |
| NATURE OF CONVEYANCE: | ASSIGNMENT | |
| CONVEYING PARTY DATA | | |
| | Name | Execution Date |
| | SUNGGIL KIM | 03/25/2018 |
| | SANGSOO LEE | 04/02/2018 |
| | SEULYE KIM | 04/02/2018 |
| | HONGSUK KIM | 04/30/2018 |
| | JINTAE NOH | 04/10/2018 |
| | JI-HOON CHOI | 03/25/2018 |
| | JAEOYOUNG AHN | 03/26/2018 |
| | SANGHOON LEE | 03/26/2018 |
| RECEIVING PARTY DATA | | |
| Name: | SAMSUNG ELECTRONICS CO., LTD. | |
| Street Address: | 129, SAMSUNG-RO, YEONGTONG-GU | |
| City: | SUWON-SI, GYEONGGI-DO | |
| State/Country: | KOREA, REPUBLIC OF | |
| Postal Code: | 16677 | |
| PROPERTY NUMBERS Total: 1 | | |
| Property Type | Number | |
| Application Number: | 15981928 | |
| CORRESPONDENCE DATA | | |
| Fax Number: | (571)283-0740 | |
| <i>Correspondence will be sent to the e-mail address first; if that is unsuccessful, it will be sent using a fax number, if provided; if that is unsuccessful, it will be sent via US Mail.</i> | | |
| Phone: | 5712830720 | |
| Email: | aloomis@volentine.com | |
| Correspondent Name: | VOLENTINE, WHITT & FRANCO, PLLC | |
| Address Line 1: | 11951 FREEDOM DRIVE, SUITE 1300 | |
| Address Line 4: | RESTON, VIRGINIA 20190 | |
| ATTORNEY DOCKET NUMBER: | SEC.4282 | |
| NAME OF SUBMITTER: | ADAM C. VOLENTINE | |
| SIGNATURE: | //ADAM C. VOLENTINE/ | |

| | |
|---|--|
| DATE SIGNED: | 05/17/2018 |
| | This document serves as an Oath/Declaration (37 CFR 1.63). |
| Total Attachments: 12 source=Declaration_Assignment_Form#page1.tif source=Declaration_Assignment_Form#page2.tif source=Declaration_Assignment_Form#page3.tif source=Declaration_Assignment_Form#page4.tif source=Declaration_Assignment_Form#page5.tif source=Declaration_Assignment_Form#page6.tif source=Declaration_Assignment_Form#page7.tif source=Declaration_Assignment_Form#page8.tif source=Declaration_Assignment_Form#page9.tif source=Declaration_Assignment_Form#page10.tif source=Declaration_Assignment_Form#page11.tif source=Declaration_Assignment_Form#page12.tif | |

**COMBINED DECLARATION (37 CFR §1.63) FOR UTILITY PATENT APPLICATION AND
ASSIGNMENT FORM¹**

The undersigned acknowledges that this document is being used both as an assignment of the invention and as the declaration (37 CFR 1.63) for a Utility or Design Application.

WHEREAS, the undersigned, hereinafter referred to collectively as Assignor, has invented:

Title: **SEMICONDUCTOR MEMORY DEVICES AND METHODS OF FABRICATING THE SAME**

for which Assignor is about to make or has made United States or International application for patent.

WHEREAS, as a below named inventor(s), I/(we) hereby declare that:

Section I. Declaration

This declaration is directed to:

- ☒ The attached U.S. non-provisional patent application, or
- ☐ U.S. non-provisional patent application number 공정개발2팀(반도체연)/김성길/96015702, filed on _____, or
- ☐ PCT international patent application number _____, filed on _____.

The above-identified application was made or authorized to be made by me (us).

I (we) believe that I am (we are) the original inventor (original joint inventors) of a claimed invention in the above-identified application.

I (we) hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

¹ This form requires the use of an Application Data Sheet.

SEC Ref No. **IE-201705-029-1-US0**

Attorney Ref No.

**IE-270748-US
SEC.4282**

COMBINED DECLARATION (37 CFR 1.63) FOR UTILITY PATENT APPLICATION AND ASSIGNMENT FORM

SAMSUNG ELECTRONICS CO., LTD.

I hereby state that I have reviewed and understand the contents of the above identified application, including the claims.

I acknowledge that I am aware of the duty to disclose information which is material to patentability as defined in 37 CFR § 1.56.

Section II. Assignment

In consideration of the sum of One Dollar (\$1.00) and other good and valuable consideration paid to each of the undersigned, the undersigned hereby sell(s) and assign(s) to

Samsung Electronics Co., Ltd.

having an address at 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do 16677, Republic of Korea (hereinafter designated as the Assignee), the entire (100%) right, title and interest for the United States as defined in 35 USC §100, in the invention described in the application identified in Section I of this document.

Assignor hereby confirms any prior assignment to Assignee, and to the extent that Assignor has not already done so, agrees to assign, and hereby does, sell, assign and transfer unto Assignee and its successors in interest, the full and exclusive right, title and interest in the United States of America and throughout the world, including the right to claim priority under the laws of the United States, the Paris Convention, and any foreign countries, to the inventions as described in the aforesaid application, to the aforesaid application itself, and all divisions, continuations, continuations-in-part, or other applications claiming priority directly or indirectly from the aforesaid application, and any United States or foreign Letters Patent, utility model, or other similar rights which may be granted thereon, including reissues, reexaminations and extensions thereof, and all copyright rights throughout the world in the aforesaid application and the subject matter disclosed therein, these rights, title and interest to be held and enjoyed by Assignee to the full end of the term for which the Letters Patent, utility model, or other similar rights, are granted and any extensions thereof as fully and entirely as the same would have been held by Assignor had this assignment and sale not been made, and the right to sue for, and recover for past infringements of, or liabilities for, any of the rights relating to any of the applications, patents, utility models, or other similar rights, resulting therefrom, and the copyright rights;

Assignor hereby covenants and agrees to execute all instruments or documents required or requested for the making and prosecution of any applications of any type for patent, utility model, or other similar rights, and for copyright, in the United States and in all foreign countries including, but not limited to, any provisional, continuation, continuation-in-part,

SEC Ref No. IE-201705-029-1-US0

Attorney Ref No.

IE-270748-US

SEC.4282

COMBINED DECLARATION (37 CFR 1.63) FOR UTILITY PATENT APPLICATION AND ASSIGNMENT FORM

Page 2 of 7

공정개발2팀(반도체연)/김성길/96015702/2018-03-25 10:00

PATENT

REEL: 045830 FRAME: 0004

divisional, renewal or substitute thereof, and as to letters patent any reissue, re-examination, or extension thereof, and for litigation regarding, or for the purpose of protecting title and to the said invention, the United States application for patent, or Letters Patent therefor, and to testify in support thereof, for the benefit of Assignee without further or other compensation than that above set forth;

Assignor hereby covenants that no assignment, sale, license, agreement or encumbrance has been or will be entered into which would conflict with this Assignment; and

Assignor hereby requests the United States Patent and Trademark Office to issue the Letters Patent of the United States of America to Assignee, and requests that any official of any country or countries foreign to the United States, whose duty it is to issue or grant patents and applications as aforesaid, to issue the Letters Patent, Utility Model Registration or other similar right to Assignee.

The undersigned hereby grant(s) the law firm of **VOLENTINE & WHITT, PLLC** the power to insert on this Declaration and Assignment any further identification which may be necessary or desirable in order to comply with the rules of the U.S. Patent and Trademark Office for recordation of this document.

Section III. Inventor(s)/Assignor(s) Signature(s)

| LEGAL NAME OF FIRST INVENTOR/ASSIGNOR | Family Name | First Given Name | Second Given Name |
|---|----------------------------|--------------------------------|-------------------|
| | 공정개발2팀(반도체연) KIM | 김성길/96015702 SUNGGIL | |
| <p>SIGNATURE <u>Kim sung gil</u> DATE <u>2018.03.25</u></p> | | | |

SEC Ref No. **IE-201705-029-1-US0**

Attorney Ref No.

**IE-270748-US
SEC.4282**

COMBINED DECLARATION (37 CFR 1.63) FOR UTILITY PATENT APPLICATION AND ASSIGNMENT FORM

Page 3 of 7

공정개발2팀(반도체연)/김성길/96015702/2018-03-25 10:00

**PATENT
REEL: 045830 FRAME: 0005**

| LEGAL NAME OF SECOND INVENTOR/ASSIGNOR | Family Name | First Given Name | Second Given Name |
|--|-------------|------------------|-------------------|
| | LEE | SANGSOO | |
| <p>SIGNATURE <u>Sang soo Lee</u> DATE <u>2018. 04. 02.</u></p> | | | |

| LEGAL NAME OF THIRD INVENTOR/ASSIGNOR | Family Name | First Given Name | Second Given Name |
|--|-------------|------------------|-------------------|
| | KIM | SEULYE | |
| <p>SIGNATURE <u>Seulye Kim</u> DATE <u>2018. 04. 02.</u></p> | | | |

| LEGAL NAME OF FOURTH INVENTOR/ASSIGNOR | Family Name | First Given Name | Second Given Name |
|--|-------------|------------------|-------------------|
| | KIM | HONGSUK | |
| <p>SIGNATURE _____ DATE _____</p> | | | |

SEC Ref No. IE-201705-029-1-US0

Attorney Ref No.

IE-270748-US
SEC.4282

COMBINED DECLARATION (37 CFR 1.63) FOR UTILITY PATENT APPLICATION AND ASSIGNMENT FORM

Page 4 of 7

| LEGAL NAME OF FIFTH INVENTOR/ASSIGNOR | Family Name | First Given Name | Second Given Name |
|--|-------------|------------------|-------------------|
| | NOH | JINTAE | |
| <p>SIGNATURE <u>Jintae Noh</u> DATE <u>2018. 4. 10</u></p> | | | |

| LEGAL NAME OF SIXTH INVENTOR/ASSIGNOR | Family Name | First Given Name | Second Given Name |
|--|-------------|------------------|-------------------|
| | CHOI | JI-HOON | |
| <p>SIGNATURE <u>Choi Ji Hoon</u> DATE <u>2018. 3. 25</u></p> | | | |

| LEGAL NAME OF SEVENTH INVENTOR/ASSIGNOR | Family Name | First Given Name | Second Given Name |
|--|-------------|------------------|-------------------|
| | AHN | JAEOYOUNG | |
| <p>SIGNATURE <u>Jaeyoung Ahn</u> DATE <u>2018. 3. 26</u></p> | | | |

SEC Ref No. IE-201705-029-1-US0

Attorney Ref No.

IE-270748-US
SEC.4282

COMBINED DECLARATION (37 CFR 1.63) FOR UTILITY PATENT APPLICATION AND ASSIGNMENT FORM

Page 5 of 7

공정개발2팀(반도체연)/김성길/96015702/2018-03-25 10:00

PATENT

REEL: 045830 FRAME: 0007

| LEGAL NAME OF EIGHTH INVENTOR/ASSIGNOR | Family Name | First Given Name | Second Given Name |
|--|-------------|------------------|-------------------|
| | LEE | SANGHOON | |

SIGNATURE Lee Sanghoon DATE 2018. 3. 26

SAMSUNG

공정개발2팀(반도체연)/김성길/96015702

SEC Ref No. IE-201705-029-1-US0 Attorney Ref No. IE-270748-US
SEC.4282

COMBINED DECLARATION (37 CFR 1.63) FOR UTILITY PATENT APPLICATION AND ASSIGNMENT FORM

**COMBINED DECLARATION (37 CFR §1.63) FOR UTILITY PATENT APPLICATION AND
ASSIGNMENT FORM¹**

The undersigned acknowledges that this document is being used both as an assignment of the invention and as the declaration (37 CFR 1.63) for a Utility or Design Application.

WHEREAS, the undersigned, hereinafter referred to collectively as Assignor, has invented:

Title: **SEMICONDUCTOR MEMORY DEVICES AND METHODS OF FABRICATING THE SAME**

for which Assignor is about to make or has made United States or International application for patent.

WHEREAS, as a below named inventor(s), I/(we) hereby declare that:

Section I. Declaration

This declaration is directed to:

- ☒ The attached U.S. non-provisional patent application, or
- ☐ U.S. non-provisional patent application number _____, filed on _____, or
- ☐ PCT international patent application number _____, filed on _____.

The above-identified application was made or authorized to be made by me (us).

I (we) believe that I am (we are) the original inventor (original joint inventors) of a claimed invention in the above-identified application.

I (we) hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

¹ This form requires the use of an Application Data Sheet.

SEC Ref No.

IE-201705-029-1-US0

Attorney Ref No.

IE-270748-US

SEC.4282

I hereby state that I have reviewed and understand the contents of the above identified application, including the claims.

I acknowledge that I am aware of the duty to disclose information which is material to patentability as defined in 37 CFR § 1.56.

Section II. Assignment

In consideration of the sum of One Dollar (\$1.00) and other good and valuable consideration paid to each of the undersigned, the undersigned hereby sell(s) and assign(s) to

Samsung Electronics Co., Ltd.

having an address at 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do 16677, Republic of Korea (hereinafter designated as the Assignee), the entire (100%) right, title and interest for the United States as defined in 35 USC §100, in the invention described in the application identified in Section I of this document.

Assignor hereby confirms any prior assignment to Assignee, and to the extent that Assignor has not already done so, agrees to assign, and hereby does, sell, assign and transfer unto Assignee and its successors in interest, the full and exclusive right, title and interest in the United States of America and throughout the world, including the right to claim priority under the laws of the United States, the Paris Convention, and any foreign countries, to the inventions as described in the aforesaid application, to the aforesaid application itself, and all divisions, continuations, continuations-in-part, or other applications claiming priority directly or indirectly from the aforesaid application, and any United States or foreign Letters Patent, utility model, or other similar rights which may be granted thereon, including reissues, reexaminations and extensions thereof, and all copyright rights throughout the world in the aforesaid application and the subject matter disclosed therein, these rights, title and interest to be held and enjoyed by Assignee to the full end of the term for which the Letters Patent, utility model, or other similar rights, are granted and any extensions thereof as fully and entirely as the same would have been held by Assignor had this assignment and sale not been made, and the right to sue for, and recover for past infringements of, or liabilities for, any of the rights relating to any of the applications, patents, utility models, or other similar rights, resulting therefrom, and the copyright rights;

Assignor hereby covenants and agrees to execute all instruments or documents required or requested for the making and prosecution of any applications of any type for patent, utility model, or other similar rights, and for copyright, in the United States and in all foreign countries including, but not limited to, any provisional, continuation, continuation-in-part,

SEC Ref No.

IE-201705-029-1-US0

Attorney Ref No.

IE-270748-US

SEC.4282

divisional, renewal or substitute thereof, and as to letters patent any reissue, re-examination, or extension thereof, and for litigation regarding, or for the purpose of protecting title and to the said invention, the United States application for patent, or Letters Patent therefor, and to testify in support thereof, for the benefit of Assignee without further or other compensation than that above set forth;

Assignor hereby covenants that no assignment, sale, license, agreement or encumbrance has been or will be entered into which would conflict with this Assignment; and

Assignor hereby requests the United States Patent and Trademark Office to issue the Letters Patent of the United States of America to Assignee, and requests that any official of any country or countries foreign to the United States, whose duty it is to issue or grant patents and applications as aforesaid, to issue the Letters Patent, Utility Model Registration or other similar right to Assignee.

The undersigned hereby grant(s) the law firm of **VOLENTINE & WHITT, PLLC** the power to insert on this Declaration and Assignment any further identification which may be necessary or desirable in order to comply with the rules of the U.S. Patent and Trademark Office for recordation of this document.

Section III. Inventor(s)/Assignor(s) Signature(s)

| LEGAL NAME OF FIRST INVENTOR/ASSIGNOR | Family Name | First Given Name | Second Given Name |
|---|-------------|------------------|-------------------|
| | KIM | SUNGGIL | |
| <div>SIGNATURE _____ DATE _____</div> | | | |

SEC Ref No.

IE-201705-029-1-US0

Attorney Ref No.

IE-270748-US

SEC.4282

| LEGAL NAME OF SECOND INVENTOR/ASSIGNOR | Family Name | First Given Name | Second Given Name |
|--|-------------|------------------|-------------------|
| | LEE | SANGSOO | |
| <p>SIGNATURE _____ DATE _____</p> | | | |

| LEGAL NAME OF THIRD INVENTOR/ASSIGNOR | Family Name | First Given Name | Second Given Name |
|---|-------------|------------------|-------------------|
| | KIM | SEULYE | |
| <p>SIGNATURE _____ DATE _____</p> | | | |

| LEGAL NAME OF FOURTH INVENTOR/ASSIGNOR | Family Name | First Given Name | Second Given Name |
|--|-------------|------------------|-------------------|
| | KIM | HONGSUK | |
| <p>SIGNATURE <u>Kim Hongsuk</u> DATE <u>2018.04.30</u></p> | | | |

SEC Ref No. IE-201705-029-1-US0

Attorney Ref No.

IE-270748-US
SEC.4282

| | | | |
|---|-------------|------------------|-------------------|
| LEGAL NAME OF FIFTH INVENTOR/ASSIGNOR | Family Name | First Given Name | Second Given Name |
| | NOH | JINTAE | |
| <p>SIGNATURE _____ DATE _____</p> | | | |

| | | | |
|---|-------------|------------------|-------------------|
| LEGAL NAME OF SIXTH INVENTOR/ASSIGNOR | Family Name | First Given Name | Second Given Name |
| | CHOI | JI-HOON | |
| <p>SIGNATURE _____ DATE _____</p> | | | |

| | | | |
|---|-------------|------------------|-------------------|
| LEGAL NAME OF SEVENTH INVENTOR/ASSIGNOR | Family Name | First Given Name | Second Given Name |
| | AHN | JAEOYOUNG | |
| <p>SIGNATURE _____ DATE _____</p> | | | |

SEC Ref No.

IE-201705-029-1-US0

Attorney Ref No.

IE-270748-US**SEC.4282**

| | | | |
|--|-------------|------------------|-------------------|
| LEGAL NAME OF EIGHTH INVENTOR/ASSIGNOR | Family Name | First Given Name | Second Given Name |
| | LEE | SANGHOON | |
| <div style="text-align: center; margin-top: 100px;">SIGNATURE _____ DATE _____</div> | | | |

SEC Ref No. **IE-201705-029-1-US0**

Attorney Ref No. **IE-270748-US**
SEC.4282

COMBINED DECLARATION (37 CFR 1.63) FOR UTILITY PATENT APPLICATION AND ASSIGNMENT FORM

Page 6 of 6

RECORDED: 05/17/2018

PATENT
REEL: 045830 FRAME: 0014