

<b>PATENT ASSIGNMENT COVER SHEET</b>
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Electronic Version v1.1  
 Stylesheet Version v1.2

EPAS ID: PAT5257100

<b>SUBMISSION TYPE:</b>	NEW ASSIGNMENT
<b>NATURE OF CONVEYANCE:</b>	ASSIGNMENT
<b>CONVEYING PARTY DATA</b>	
<b>Name</b>	<b>Execution Date</b>
SEUNG-GYU JEONG	11/21/2018
DO-SUN HONG	11/21/2018
JUNG-HYUN KWON	11/21/2018
WON-GYU SHIN	11/21/2018
<b>RECEIVING PARTY DATA</b>	
<b>Name:</b>	SK HYNIX INC.
<b>Street Address:</b>	2091, GYEONGCHUNG-DAERO
<b>Internal Address:</b>	BUBAL-EUB, ICHEON-SI
<b>City:</b>	GYEONGGI-DO
<b>State/Country:</b>	KOREA, REPUBLIC OF
<b>PROPERTY NUMBERS Total: 1</b>	
<b>Property Type</b>	<b>Number</b>
<b>Application Number:</b>	16203591
<b>CORRESPONDENCE DATA</b>	
<b>Fax Number:</b>	(206)359-7198
<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>	
<b>Phone:</b>	206 359 8000
<b>Email:</b>	patentprocurement@perkinscoie.com
<b>Correspondent Name:</b>	BING AI
<b>Address Line 1:</b>	P.O. BOX 1247
<b>Address Line 4:</b>	SEATTLE, WASHINGTON 98111-1247
<b>ATTORNEY DOCKET NUMBER:</b>	088453-8156.US00
<b>NAME OF SUBMITTER:</b>	JAYME HOFF
<b>SIGNATURE:</b>	/Jayme Hoff/
<b>DATE SIGNED:</b>	11/29/2018
This document serves as an Oath/Declaration (37 CFR 1.63).	
<b>Total Attachments: 16</b>	
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**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

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In re Patent Application of:  
Jung-Hyun KWON et al.

Application No.: Not yet assigned

Filed: Herewith

For:  
**MEMORY MODULE AND OPERATION METHOD  
OF THE SAME**

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Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA22313-1450

**DECLARATION AND ASSIGNMENT BY THE INVENTOR  
UNDER RULE 37 C.F.R. § 1.63 EFFECTIVE ON SEPTEMBER 16, 2012**

I, Seung-Gyu JEONG, hereby declare that:

I believe I am the sole original inventor or an original joint inventor of a claimed invention in a patent application entitled:

**MEMORY MODULE AND OPERATION METHOD OF THE SAME**

the specification of which is attached hereto and identified as Attorney Docket No. 088453-8156.US00.

I believe the following persons are additional original joint inventors of the above-identified patent application:

Jung-Hyun KWON of Seocho-gu, Seoul, Korea; and  
Won-Gyu SHIN of Songpa-gu, Seoul, Korea; and  
Do-Sun HONG of Icheon-si, Gyeonggi-do, Korea.

Inventor : Jung-Hyun KWON et al.  
Appl. No. : Not yet assigned  
Filed : Herewith  
Page : 2 of 4

Docket No.: 088453-8156.US00

I made, authorized to make, or will make or authorize to make the above-identified patent application at the U.S. Patent and Trademark Office.

I have reviewed and understand the contents of the above-identified patent application including the claims.

I am aware of the duty to disclose to the U.S. Patent and Trademark Office all information known to me to be material to patentability as defined in 37 CFR §1.56.

I hereby acknowledge that any willful false statement made in the above declaration is punishable under 18 USC §1001 by fine or imprisonment of not more than five (5) years, or both.

#### ASSIGNMENT

I hereby assign to SK hynix Inc., a corporation of Korea, having a place of business at 2091, Gyeongchung-daero, Bubal-eub, Icheon-si, Gyeonggi-do, Korea, and its successors and assigns (collectively hereinafter called “the Assignee”), the entire right, title and interest throughout the world in any and all inventions and improvements which are described in an application for United States Patent filed by me, entitled *MEMORY MODULE AND OPERATION METHOD OF THE SAME*, filed on November 28, 2018, and assigned U.S. Application Number 16/203,591.

I authorize and request an attorney appointed in said application to hereafter insert above the filing date and application number of said application when known.

This assignment includes the entire right, title and interest in said application, all legal equivalents thereof in any country, any and all United States and foreign patents, utility models, and design registrations granted for any of said inventions and improvements, including, but not limited to, all divisions, continuations, reissues, reexamination certificates, any and all certificates issued in any post-grant proceeding, and extensions of said applications and patents of the United States, foreign patents, utility models, and design registrations, and the right to claim priority based on the filing date of said application under the International Convention for

Inventor : Jung-Hyun KWON et al.  
Appl. No. : Not yet assigned  
Filed : Herewith  
Page : 3 of 4

Docket No.: 088453-8156.US00

the Protection of Industrial Property, the Patent Cooperation Treaty, the European Patent Convention, and all other treaties of like purposes, and the right to seek relief and recover all damages, including, but not limited to, a reasonable royalty, by reason of infringement or any other violation of patent or patent application rights. I authorize the Assignee to apply in all countries in my name or in the name of the Assignee for patents, utility models, design registrations and like rights of exclusion and for inventors' certificates for said inventions and improvements.

In addition, I hereby confirm the sale, assignment, and transfer to the Assignee of the entire right, title and interest throughout the world in said inventions and improvements that occurred by operation of an employment agreement between me and the Assignee existing at the time said inventions and improvements were made. Should I have any remaining interest, I hereby sell, assign, and transfer any right, title and interest I may have in said inventions and improvements anywhere in the world to the Assignee.

The foregoing assignments, sale and transfer have been made for good and valuable consideration, the receipt of which is hereby acknowledged.

I hereby represent and covenant that no assignment, sale, agreement or encumbrance has been or will be made or entered into that would conflict with the assignment of said inventions and improvements to the Assignee.

I further covenant for myself and my respective heirs, legal representatives and assigns, to assist the Assignee in handling various procedures, tasks and documentation in connection with this assignment, including, but not limited to, providing to the Assignee promptly upon the request of the Assignee all pertinent facts and documents relating to said invention and improvements, and said patents, said legal equivalents or other legal instrument as may be known and accessible to me and testifying as to the same in any interference, litigation, or proceeding relating thereto, and promptly executing and delivering to the Assignee or its legal representative any and all papers, documents, instruments or affidavits in connection with obtaining, maintaining, issuing or enforcing said application, said inventions and improvements, and said patents, said equivalents and other legal instrument which may be necessary or desirable to carry out the purposes thereof.

Inventor : Jung-Hyun KWON et al.  
Appl. No. : Not yet assigned  
Filed : Herewith  
Page : 4 of 4

Docket No.: 028453-8156-US00

I hereby authorize and request the Commissioner of Patents and Trademarks to issue one or more patents in the United States for said inventions and improvements to SK hynix Inc. as assignee of the entire interest, for the sole use and benefit of Assignee, its successors and assigns.

I am competent to execute the above declaration and assignment. I hereby have duly executed the declaration and assignment below with my name.

Full name of inventor: Seung-Gyu JEONG

Inventor's signature: Seung-Gyu JEONG

Date: 2013-11-21

Perkins Coie LLP  
P.O. Box 1247  
Seattle, Washington 98111-1247  
Telephone: (858) 720-5700  
Facsimile: (206) 359-7198

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

---

In re Patent Application of:  
Jung-Hyun KWON et al.

Application No.: Not yet assigned

Filed: Herewith

For:  
MEMORY MODULE AND OPERATION METHOD  
OF THE SAME

---

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA22313-1450

**DECLARATION AND ASSIGNMENT BY THE INVENTOR**  
**UNDER RULE 37 C.F.R. § 1.63 EFFECTIVE ON SEPTEMBER 16, 2012**

I, Do-Sun HONG, hereby declare that:

I believe I am the sole original inventor or an original joint inventor of a claimed invention in a patent application entitled:

**MEMORY MODULE AND OPERATION METHOD OF THE SAME**

the specification of which is attached hereto and identified as Attorney Docket No. 088453-8156.US00.

I believe the following persons are additional original joint inventors of the above-identified patent application:

Jung-Hyun KWON of Seocho-gu, Seoul, Korea; and  
Won-Gyu SHIN of Songpa-gu, Seoul, Korea; and  
Seung-Gyu JEONG of Gwangmyeong-si, Gyeonggi-do, Korea.

Inventor : Jung-Hyun KWON et al.  
Appl. No. : Not yet assigned  
Filed : Herewith  
Page : 2 of 4

Docket No.: 088453-8156.US00

I made, authorized to make, or will make or authorize to make the above-identified patent application at the U.S. Patent and Trademark Office.

I have reviewed and understand the contents of the above-identified patent application including the claims.

I am aware of the duty to disclose to the U.S. Patent and Trademark Office all information known to me to be material to patentability as defined in 37 CFR §1.56.

I hereby acknowledge that any willful false statement made in the above declaration is punishable under 18 USC §1001 by fine or imprisonment of not more than five (5) years, or both.

#### ASSIGNMENT

I hereby assign to SK hynix Inc., a corporation of Korea, having a place of business at 2091, Gyeongchung-daero, Bubal-eub, Icheon-si, Gyeonggi-do, Korea, and its successors and assigns (collectively hereinafter called “the Assignee”), the entire right, title and interest throughout the world in any and all inventions and improvements which are described in an application for United States Patent filed by me, entitled *MEMORY MODULE AND OPERATION METHOD OF THE SAME*, filed on November 28, 2018, and assigned U.S. Application Number 16/203,591.

I authorize and request an attorney appointed in said application to hereafter insert above the filing date and application number of said application when known.

This assignment includes the entire right, title and interest in said application, all legal equivalents thereof in any country, any and all United States and foreign patents, utility models, and design registrations granted for any of said inventions and improvements, including, but not limited to, all divisions, continuations, reissues, reexamination certificates, any and all certificates issued in any post-grant proceeding, and extensions of said applications and patents of the United States, foreign patents, utility models, and design registrations, and the right to claim priority based on the filing date of said application under the International Convention for



Inventor : Jung-Hyun KWON et al.  
Appl. No. : Not yet assigned  
Filed : Herewith  
Page : 3 of 4

Docket No.: 088453-8156.US00

the Protection of Industrial Property, the Patent Cooperation Treaty, the European Patent Convention, and all other treaties of like purposes, and the right to seek relief and recover all damages, including, but not limited to, a reasonable royalty, by reason of infringement or any other violation of patent or patent application rights. I authorize the Assignee to apply in all countries in my name or in the name of the Assignee for patents, utility models, design registrations and like rights of exclusion and for inventors' certificates for said inventions and improvements.

In addition, I hereby confirm the sale, assignment, and transfer to the Assignee of the entire right, title and interest throughout the world in said inventions and improvements that occurred by operation of an employment agreement between me and the Assignee existing at the time said inventions and improvements were made. Should I have any remaining interest, I hereby sell, assign, and transfer any right, title and interest I may have in said inventions and improvements anywhere in the world to the Assignee.

The foregoing assignments, sale and transfer have been made for good and valuable consideration, the receipt of which is hereby acknowledged.

I hereby represent and covenant that no assignment, sale, agreement or encumbrance has been or will be made or entered into that would conflict with the assignment of said inventions and improvements to the Assignee.

I further covenant for myself and my respective heirs, legal representatives and assigns, to assist the Assignee in handling various procedures, tasks and documentation in connection with this assignment, including, but not limited to, providing to the Assignee promptly upon the request of the Assignee all pertinent facts and documents relating to said invention and improvements, and said patents, said legal equivalents or other legal instrument as may be known and accessible to me and testifying as to the same in any interference, litigation, or proceeding relating thereto, and promptly executing and delivering to the Assignee or its legal representative any and all papers, documents, instruments or affidavits in connection with obtaining, maintaining, issuing or enforcing said application, said inventions and improvements, and said patents, said equivalents and other legal instrument which may be necessary or desirable to carry out the purposes thereof.

Inventor : Jung-Hyun K. WOH et al.  
Appl. No. : Not yet assigned  
Filed : Herewith  
Page : 4 of 4

Docket No.: 088453-8156.US00

I hereby authorize and request the Commissioner of Patents and Trademarks to issue one or more patents in the United States for said inventions and improvements to SK hynix Inc. as assignee of the entire interest, for the sole use and benefit of Assignee, its successors and assigns.

I am competent to execute the above declaration and assignment. I hereby have duly executed the declaration and assignment below with my name.

Full name of inventor: Do-Sun HONG

Inventor's signature: Do-Sun HONG

Date: 2018. 11. 21

Perkins Coie LLP  
P.O. Box 1247  
Seattle, Washington 98111-1247  
Telephone: (858) 720-5700  
Facsimile: (206) 359-7198

SK hynix 

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**PATENT**  
**REEL: 047617 FRAME: 0916**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

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In re Patent Application of:  
Jung-Hyun KWON et al.

Application No.: Not yet assigned

Filed: Herewith

For:  
MEMORY MODULE AND OPERATION METHOD  
OF THE SAME

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Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA22313-1450

**DECLARATION AND ASSIGNMENT BY THE INVENTOR**  
**UNDER RULE 37 C.F.R. § 1.63 EFFECTIVE ON SEPTEMBER 16, 2012**

I, Jung-Hyun KWON, hereby declare that:

I believe I am the sole original inventor or an original joint inventor of a claimed invention in a patent application entitled:

**MEMORY MODULE AND OPERATION METHOD OF THE SAME**

the specification of which is attached hereto and identified as Attorney Docket No. 088453-8156.US00.

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Seung-Gyu JEONG of Gwangmyeong-si, Gyeonggi-do, Korea; and  
Do-Sun HONG of Icheon-si, Gyeonggi-do, Korea.

Inventor : Jung-Hyun KWON et al.  
Appl. No. : Not yet assigned  
Filed : Herewith  
Page : 2 of 4

Docket No.: 088453-8156.US00

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#### ASSIGNMENT

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I authorize and request an attorney appointed in said application to hereafter insert above the filing date and application number of said application when known.

This assignment includes the entire right, title and interest in said application, all legal equivalents thereof in any country, any and all United States and foreign patents, utility models, and design registrations granted for any of said inventions and improvements, including, but not limited to, all divisions, continuations, reissues, reexamination certificates, any and all certificates issued in any post-grant proceeding, and extensions of said applications and patents of the United States, foreign patents, utility models, and design registrations, and the right to claim priority based on the filing date of said application under the International Convention for

Inventor : Jung-Hyun KWON et al.  
Appl. No. : Not yet assigned  
Filed : Herewith  
Page : 3 of 4

Docket No.: 088453-8156.US00

the Protection of Industrial Property, the Patent Cooperation Treaty, the European Patent Convention, and all other treaties of like purposes, and the right to seek relief and recover all damages, including, but not limited to, a reasonable royalty, by reason of infringement or any other violation of patent or patent application rights. I authorize the Assignee to apply in all countries in my name or in the name of the Assignee for patents, utility models, design registrations and like rights of exclusion and for inventors' certificates for said inventions and improvements.

In addition, I hereby confirm the sale, assignment, and transfer to the Assignee of the entire right, title and interest throughout the world in said inventions and improvements that occurred by operation of an employment agreement between me and the Assignee existing at the time said inventions and improvements were made. Should I have any remaining interest, I hereby sell, assign, and transfer any right, title and interest I may have in said inventions and improvements anywhere in the world to the Assignee.

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I hereby represent and covenant that no assignment, sale, agreement or encumbrance has been or will be made or entered into that would conflict with the assignment of said inventions and improvements to the Assignee.

I further covenant for myself and my respective heirs, legal representatives and assigns, to assist the Assignee in handling various procedures, tasks and documentation in connection with this assignment, including, but not limited to, providing to the Assignee promptly upon the request of the Assignee all pertinent facts and documents relating to said invention and improvements, and said patents, said legal equivalents or other legal instrument as may be known and accessible to me and testifying as to the same in any interference, litigation, or proceeding relating thereto, and promptly executing and delivering to the Assignee or its legal representative any and all papers, documents, instruments or affidavits in connection with obtaining, maintaining, issuing or enforcing said application, said inventions and improvements, and said patents, said equivalents and other legal instrument which may be necessary or desirable to carry out the purposes thereof.

Inventor : Jung-Hyun KWON et al.  
Appl. No. : Not yet assigned  
Filed : Herewith  
Page : 4 of 4

Docket No.: 088453-8156.US00

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I am competent to execute the above declaration and assignment. I hereby have duly executed the declaration and assignment below with my name.

Full name of inventor: Jung-Hyun KWON

Inventor's signature: Kwon, Jung-Hyun

Date: 2015. 11. 21

Perkins Coie LLP  
P.O. Box 1247  
Seattle, Washington 98111-1247  
Telephone: (858) 730-5700  
Facsimile: (206) 359-7198

SK hynix 

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**PATENT**  
**REEL: 047617 FRAME: 0920**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

---

In re Patent Application of:  
Jung-Hyun KWON et al.

Application No.: Not yet assigned

Filed: Herewith

For:  
MEMORY MODULE AND OPERATION METHOD  
OF THE SAME

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Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA22313-1450

**DECLARATION AND ASSIGNMENT BY THE INVENTOR**  
**UNDER RULE 37 C.F.R. § 1.63 EFFECTIVE ON SEPTEMBER 16, 2012**

I, Won-Gyu SHIN, hereby declare that:

I believe I am the sole original inventor or an original joint inventor of a claimed invention in a patent application entitled:

**MEMORY MODULE AND OPERATION METHOD OF THE SAME**

the specification of which is attached hereto and identified as Attorney Docket No. 088453-8156.US00.

I believe the following persons are additional original joint inventors of the above-identified patent application:

Jung-Hyun KWON of Seocho-gu, Seoul, Korea; and  
Seung-Gyu JEONG of Gwangmyeong-si, Gyeonggi-do, Korea; and  
Do-Sun HONG of Icheon-si, Gyeonggi-do, Korea.

Inventor : Jung-Hyun KWON et al.  
Appl. No. : Not yet assigned  
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Page : 2 of 4

Docket No.: 088453-8156.US00

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Inventor : Jung-Hyun KWON et al.  
Appl. No. : Not yet assigned  
Filed : Herewith  
Page : 3 of 4

Docket No.: 088453-8156.US00

the Protection of Industrial Property, the Patent Cooperation Treaty, the European Patent Convention, and all other treaties of like purposes, and the right to seek relief and recover all damages, including, but not limited to, a reasonable royalty, by reason of infringement or any other violation of patent or patent application rights. I authorize the Assignee to apply in all countries in my name or in the name of the Assignee for patents, utility models, design registrations and like rights of exclusion and for inventors' certificates for said inventions and improvements.

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Inventor : Jung-Hyun K WON et al.  
Appl. No. : Not yet assigned  
Filed : Herewith  
Page : 4 of 4

Docket No.: 088453-0156.US00

I hereby authorize and request the Commissioner of Patents and Trademarks to issue one or more patents in the United States for said inventions and improvements to SK hynix Inc. as assignee of the entire interest, for the sole use and benefit of Assignee, its successors and assigns.

I am competent to execute the above declaration and assignment. I hereby have duly executed the declaration and assignment below with my name.

Full name of inventor: Won-Gyu SHIN

Inventor's signature: Won-Gyu SHIN

Date: 2018 11 21

Perkins Coie LLP  
P.O. Box 1247  
Seattle, Washington 98111-1247  
Telephone: (858) 720-5700  
Facsimile: (206) 359-7198

SK hynix 

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