

## PATENT ASSIGNMENT COVER SHEET

Electronic Version v1.1  
 Stylesheet Version v1.2

EPAS ID: PAT2722605

| SUBMISSION TYPE:                                                                                                                                                                                                                                                                                                                                                                             | NEW ASSIGNMENT                   |               |                               |                     |                              |                |                       |                |                    |                |            |              |            |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|---------------|-------------------------------|---------------------|------------------------------|----------------|-----------------------|----------------|--------------------|----------------|------------|--------------|------------|
| NATURE OF CONVEYANCE:                                                                                                                                                                                                                                                                                                                                                                        | ASSIGNMENT                       |               |                               |                     |                              |                |                       |                |                    |                |            |              |            |
| CONVEYING PARTY DATA                                                                                                                                                                                                                                                                                                                                                                         |                                  |               |                               |                     |                              |                |                       |                |                    |                |            |              |            |
| <table border="1"> <thead> <tr> <th>Name</th> <th>Execution Date</th> </tr> </thead> <tbody> <tr> <td>JIN GOOK KIM</td> <td>02/05/2014</td> </tr> <tr> <td>DAE HYUN CHUNG</td> <td>01/10/2014</td> </tr> <tr> <td>SEUNG JUN BAE</td> <td>01/08/2014</td> </tr> <tr> <td>SEUNG HOON LEE</td> <td>02/07/2014</td> </tr> <tr> <td>WON HWA SHIN</td> <td>12/12/2013</td> </tr> </tbody> </table> |                                  | Name          | Execution Date                | JIN GOOK KIM        | 02/05/2014                   | DAE HYUN CHUNG | 01/10/2014            | SEUNG JUN BAE  | 01/08/2014         | SEUNG HOON LEE | 02/07/2014 | WON HWA SHIN | 12/12/2013 |
| Name                                                                                                                                                                                                                                                                                                                                                                                         | Execution Date                   |               |                               |                     |                              |                |                       |                |                    |                |            |              |            |
| JIN GOOK KIM                                                                                                                                                                                                                                                                                                                                                                                 | 02/05/2014                       |               |                               |                     |                              |                |                       |                |                    |                |            |              |            |
| DAE HYUN CHUNG                                                                                                                                                                                                                                                                                                                                                                               | 01/10/2014                       |               |                               |                     |                              |                |                       |                |                    |                |            |              |            |
| SEUNG JUN BAE                                                                                                                                                                                                                                                                                                                                                                                | 01/08/2014                       |               |                               |                     |                              |                |                       |                |                    |                |            |              |            |
| SEUNG HOON LEE                                                                                                                                                                                                                                                                                                                                                                               | 02/07/2014                       |               |                               |                     |                              |                |                       |                |                    |                |            |              |            |
| WON HWA SHIN                                                                                                                                                                                                                                                                                                                                                                                 | 12/12/2013                       |               |                               |                     |                              |                |                       |                |                    |                |            |              |            |
| RECEIVING PARTY DATA                                                                                                                                                                                                                                                                                                                                                                         |                                  |               |                               |                     |                              |                |                       |                |                    |                |            |              |            |
| <table border="1"> <tr> <td>Name:</td> <td>SAMSUNG ELECTRONICS CO., LTD.</td> </tr> <tr> <td>Street Address:</td> <td>129 SAMSUNG-RO, YEONGTONG-GU</td> </tr> <tr> <td>City:</td> <td>SUWON-SI, GYEONGGI-DO</td> </tr> <tr> <td>State/Country:</td> <td>KOREA, REPUBLIC OF</td> </tr> <tr> <td>Postal Code:</td> <td>443-742</td> </tr> </table>                                             |                                  | Name:         | SAMSUNG ELECTRONICS CO., LTD. | Street Address:     | 129 SAMSUNG-RO, YEONGTONG-GU | City:          | SUWON-SI, GYEONGGI-DO | State/Country: | KOREA, REPUBLIC OF | Postal Code:   | 443-742    |              |            |
| Name:                                                                                                                                                                                                                                                                                                                                                                                        | SAMSUNG ELECTRONICS CO., LTD.    |               |                               |                     |                              |                |                       |                |                    |                |            |              |            |
| Street Address:                                                                                                                                                                                                                                                                                                                                                                              | 129 SAMSUNG-RO, YEONGTONG-GU     |               |                               |                     |                              |                |                       |                |                    |                |            |              |            |
| City:                                                                                                                                                                                                                                                                                                                                                                                        | SUWON-SI, GYEONGGI-DO            |               |                               |                     |                              |                |                       |                |                    |                |            |              |            |
| State/Country:                                                                                                                                                                                                                                                                                                                                                                               | KOREA, REPUBLIC OF               |               |                               |                     |                              |                |                       |                |                    |                |            |              |            |
| Postal Code:                                                                                                                                                                                                                                                                                                                                                                                 | 443-742                          |               |                               |                     |                              |                |                       |                |                    |                |            |              |            |
| PROPERTY NUMBERS Total: 1                                                                                                                                                                                                                                                                                                                                                                    |                                  |               |                               |                     |                              |                |                       |                |                    |                |            |              |            |
| <table border="1"> <thead> <tr> <th>Property Type</th> <th>Number</th> </tr> </thead> <tbody> <tr> <td>Application Number:</td> <td>13668965</td> </tr> </tbody> </table>                                                                                                                                                                                                                    |                                  | Property Type | Number                        | Application Number: | 13668965                     |                |                       |                |                    |                |            |              |            |
| Property Type                                                                                                                                                                                                                                                                                                                                                                                | Number                           |               |                               |                     |                              |                |                       |                |                    |                |            |              |            |
| Application Number:                                                                                                                                                                                                                                                                                                                                                                          | 13668965                         |               |                               |                     |                              |                |                       |                |                    |                |            |              |            |
| CORRESPONDENCE DATA                                                                                                                                                                                                                                                                                                                                                                          |                                  |               |                               |                     |                              |                |                       |                |                    |                |            |              |            |
| Fax Number:                                                                                                                                                                                                                                                                                                                                                                                  | (703)668-8200                    |               |                               |                     |                              |                |                       |                |                    |                |            |              |            |
| Phone:                                                                                                                                                                                                                                                                                                                                                                                       | 703-668-8000                     |               |                               |                     |                              |                |                       |                |                    |                |            |              |            |
| Email:                                                                                                                                                                                                                                                                                                                                                                                       | dcmailroom@hdp.com               |               |                               |                     |                              |                |                       |                |                    |                |            |              |            |
| <i>Correspondence will be sent via US Mail when the email attempt is unsuccessful.</i>                                                                                                                                                                                                                                                                                                       |                                  |               |                               |                     |                              |                |                       |                |                    |                |            |              |            |
| Correspondent Name:                                                                                                                                                                                                                                                                                                                                                                          | HARNESS, DICKEY & PIERCE, P.L.C. |               |                               |                     |                              |                |                       |                |                    |                |            |              |            |
| Address Line 1:                                                                                                                                                                                                                                                                                                                                                                              | P.O. BOX 8910                    |               |                               |                     |                              |                |                       |                |                    |                |            |              |            |
| Address Line 4:                                                                                                                                                                                                                                                                                                                                                                              | RESTON, VIRGINIA 20195           |               |                               |                     |                              |                |                       |                |                    |                |            |              |            |
| ATTORNEY DOCKET NUMBER:                                                                                                                                                                                                                                                                                                                                                                      | 6668-000035-US-COA               |               |                               |                     |                              |                |                       |                |                    |                |            |              |            |
| NAME OF SUBMITTER:                                                                                                                                                                                                                                                                                                                                                                           | JOHN A. CASTELLANO               |               |                               |                     |                              |                |                       |                |                    |                |            |              |            |

|                                                                                                                                                                                                                                |                                                            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|
| Signature:                                                                                                                                                                                                                     | /John A. Castellano/                                       |
| Date:                                                                                                                                                                                                                          | 02/11/2014                                                 |
|                                                                                                                                                                                                                                | This document serves as an Oath/Declaration (37 CFR 1.63). |
| <b>Total Attachments: 5</b><br>source=Declaration_Assign#page1.tif<br>source=Declaration_Assign#page2.tif<br>source=Declaration_Assign#page3.tif<br>source=Declaration_Assign#page4.tif<br>source=Declaration_Assign#page5.tif |                                                            |

**COMBINED DECLARATION (37 CFR §1.63) FOR UTILITY PATENT APPLICATION AND  
ASSIGNMENT FORM<sup>1</sup>**

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 DEVICES, METHODS OF OPERATING THE SEMICONDUCTOR  
DEVICES, AND SYSTEMS HAVING THE SAME**

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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 13/668,965, filed on November 5, 2012, 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.

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<sup>1</sup> This form requires the use of an Application Data Sheet.

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SEC Ref No. ID-200707-023-1-US1

Attorney Ref No. 6668-000035/US/COA

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 443-742, 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, divisional, renewal or substitute thereof, and as to letters patent any reissue, re-

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SEC Ref No. ID-200707-023-1-US1

Attorney Ref No. 6668-000035/US/COA

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 **Harness, Dickey & Pierce, PLC** 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<br>FIRST<br>INVENTOR/ASSIGNOR | Family Name | First Given Name | Second Given Name |
|---------------------------------------------|-------------|------------------|-------------------|
|                                             | Kim         | Jin              | Gook              |

|                                                                                                                  |                         |
|------------------------------------------------------------------------------------------------------------------|-------------------------|
| SIGNATURE <u>Jingook Kim </u> | DATE <u>Feb 5, 2014</u> |
|------------------------------------------------------------------------------------------------------------------|-------------------------|

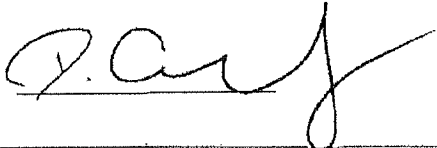
SEC Ref No. ID-200707-023-1-US1

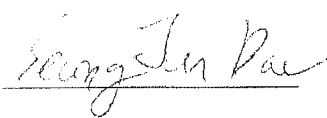
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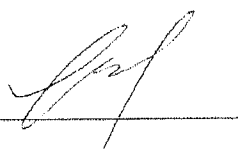
COMBINED DECLARATION (37 CFR 1.63) FOR UTILITY PATENT APPLICATION AND ASSIGNMENT FORM

Page 3 of 5

**PATENT**  
**REEL: 032195 FRAME: 0919**

|                                                                                                                              |             |                  |                   |
|------------------------------------------------------------------------------------------------------------------------------|-------------|------------------|-------------------|
| LEGAL NAME OF<br>SECOND<br>INVENTOR/ASSIGNOR                                                                                 | Family Name | First Given Name | Second Given Name |
|                                                                                                                              | Chung       | Dae              | Hyun              |
| <p>SIGNATURE  DATE <u>Jan. 10, 2014</u></p> |             |                  |                   |

|                                                                                                                           |             |                  |                   |
|---------------------------------------------------------------------------------------------------------------------------|-------------|------------------|-------------------|
| LEGAL NAME OF<br>THIRD<br>INVENTOR/ASSIGNOR                                                                               | Family Name | First Given Name | Second Given Name |
|                                                                                                                           | Bae         | Seung            | Jun               |
| <p>SIGNATURE  DATE <u>1/8/2014</u></p> |             |                  |                   |

|                                                                                                                               |             |                  |                   |
|-------------------------------------------------------------------------------------------------------------------------------|-------------|------------------|-------------------|
| LEGAL NAME OF<br>FOURTH<br>INVENTOR/ASSIGNOR                                                                                  | Family Name | First Given Name | Second Given Name |
|                                                                                                                               | Lee         | Seung            | Hoon              |
| <p>SIGNATURE  DATE <u>Feb. 7, 2014</u></p> |             |                  |                   |

SEC Ref No. ID-200707-023-1-US1Attorney Ref No. 6668-000035/US/COA

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

Page 4 of 5

**PATENT**  
**REEL: 032195 FRAME: 0920**

|                                                                 |             |                  |                   |
|-----------------------------------------------------------------|-------------|------------------|-------------------|
| LEGAL NAME OF<br>FIFTH<br>INVENTOR/ASSIGNOR                     | Family Name | First Given Name | Second Given Name |
|                                                                 | Shin        | Won              | Hwa               |
| <div>SIGNATURE <u>Shin Won Hwa</u> DATE <u>2013.12.12</u></div> |             |                  |                   |

SEC Ref No. ID-200707-023-1-US1 Attorney Ref No. 6668-000035/US/COA