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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/510,262	07/12/2019	Dae Geun LEE	P6037USC1C1C1

CONFIRMATION NO. 1231

58027
H.C. PARK & ASSOCIATES, PLC
1894 PRESTON WHITE DRIVE
RESTON, VA 20191

POWER OF ATTORNEY NOTICE



OC000000071543681

Date Mailed: 04/25/2024

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 04/17/2024.

- The Power of Attorney to you in this application has been revoked by the applicant. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at (571) 272-4000 or (571) 272-4200 or 1-888-786-0101.

/byemane/



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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/510,262	07/12/2019	Dae Geun LEE	KSA0857USC3

CONFIRMATION NO. 1231

POA ACCEPTANCE LETTER



OC000000071543717

23413
CANTOR COLBURN LLP
20 Church Street
22nd Floor
Hartford, CT 06103

Date Mailed: 04/25/2024

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 04/17/2024.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at (571) 272-4000 or (571) 272-4200 or 1-888-786-0101.

/byemane/

TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5, unless the application number and filing date are identified in the Power of Attorney by Applicant form. If neither form PTO/AIA/82A nor form PTO/AIA/82B identifies the application to which the Power of Attorney is directed, the Power of Attorney will not be recognized in the application.

Application Number	16/510,262
Filing Date	07/12/2019
First Named Inventor	Dae Geun LEE
Title	ARRAY SUBSTRATE AND METHOD OF MOUNTING INTEGRATED CIRCUIT USING THE SAME
Art Unit	NYA
Examiner Name	NYA
Attorney Docket Number	KSA0857USC3

SIGNATURE of Applicant or Patent Practitioner

Signature	/James J. Merrick/	Date (Optional)	04/17/24
Name	James J. Merrick	Registration Number	43,801
Title (if Applicant is a juristic entity)	Patent Practitioner for Applicant		
Applicant Name (if Applicant is a juristic entity)		Samsung Display Co., Ltd.	

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.



*Total of 1 (one) forms are submitted.

A Federal agency may not conduct or sponsor, and a person is not required to respond to, nor shall a person be subject to a penalty for failure to comply with an information collection subject to the requirements of the Paperwork Reduction Act of 1995, unless the information collection has a currently valid OMB Control Number. The OMB Control Number for this information collection is 0651-0035. Public burden for this form is estimated to average 3 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the information collection. Send comments regarding this burden estimate or any other aspect of this information collection, including suggestions for reducing this burden to the Chief Administrative Officer, United States Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450 or email InformationCollection@uspto.gov. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS.** If filing this completed form by mail, send to: **Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)

- ☒ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above: 23413
- OR
- ☐ I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

Please recognize or change the correspondence address for the application identified in the attached transmittal letter or the boxes above to:

- ☒ The address associated with the above-mentioned Customer Number
- OR
- ☐ The address associated with Customer Number:
- OR

☐ Firm or Individual Name				
Address				
City	State	Zip		
Country				
Telephone	Email			

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

Samsung Display Co., Ltd.

- ☐ Inventor or Joint Inventor (title not required below)
- ☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)
- ☒ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)
- ☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature		Date (Optional)	4/12/2024
Name	Chang Sik Kim		
Title	Corporate EVP, Head of IP Legal & Strategy Team		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

☐ Total of forms are submitted.

A Federal agency may not conduct or sponsor, and a person is not required to respond to, nor shall a person be subject to a penalty for failure to comply with an information collection subject to the requirements of the Paperwork Reduction Act of 1995, unless the information collection has a currently valid OMB Control Number. The OMB Control Number for this information collection is 0651-0035. Public burden for this form is estimated to average 3 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the information collection. Send comments regarding this burden estimate or any other aspect of this information collection, including suggestions for reducing this burden to the Chief Administrative Officer, United States Patent and Trademark Office, P.O. Box 1450, Alexandria, VA 22313-1450 or email InformationCollection@uspto.gov. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS.** If filing this completed form by mail, send to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.



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ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #
16/510,262

RECEIPT DATE / TIME
04/17/2024 08:52:56 AM Z ET

ATTORNEY DOCKET #
P6037USC1C1C1

Title of Invention

ARRAY SUBSTRATE AND METHOD OF MOUNTING INTEGRATED CIRCUIT USING THE SAME

Application Information

APPLICATION TYPE Utility - Nonprovisional Application
under 35 USC 111(a)

PATENT # 11081503

CONFIRMATION # 1231

FILED BY Barbara Ward

PATENT CENTER # 65123956

FILING DATE 07/12/2019

CUSTOMER # 58027

FIRST NAMED
INVENTOR Dae Geun LEE

CORRESPONDENCE
ADDRESS -

AUTHORIZED BY James Merrick

Documents

TOTAL DOCUMENTS: 1

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
KSA0857USC3 POA__SDC.pdf	2	Power of Attorney	1348 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
KSA0857USC3 POA__SDC.pdf	97EC039282135956B6951714FBE0CA56E473DF54C94F3D533D 5A58186022D2B582C4EE86D44D0298FC2F7C67149C0F604504 56D2FA560768799603B546AB82F7

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized

by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.



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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/510,262	08/03/2021	11081503	P6037USCIC1C1	1231

58027 7590 07/14/2021
H.C. PARK & ASSOCIATES, PLC
1894 PRESTON WHITE DRIVE
RESTON, VA 20191

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (application filed on or after May 29, 2000)

The Patent Term Adjustment is 59 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (<http://pair.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site <http://pair.uspto.gov> for additional applicants):

Dae Geun LEE, Hwaseong-si, KOREA, REPUBLIC OF;
Samsung Display Co., Ltd., Yongin-si, KOREA, REPUBLIC OF;

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

PART B – FEE(S) TRANSMITTAL

Complete and send this form, together with the applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

By fax, send to: (571) 273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

H.C. Park & Associates, PLC
1894 Preston White Drive
Reston, VA 20191

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO	CONFIRMATION NO
16/510,262	July 12, 2019	Dae Geun LEE	P6037USC1C1C1	1231

TITLE OF INVENTION: ARRAY SUBSTRATE AND METHOD OF MOUNTING INTEGRATED CIRCUIT USING THE SAME

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
NONPROVISIONAL	UNDISCOUNTED	\$1200	\$0	\$0	\$1200	July 1, 2021

EXAMINER	ART UNIT	CLASS-SUBCLASS
TRINH, HOA B	2813	257-773000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363)

- ☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- ☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

- (1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
- (2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.
1. H.C. Park & Associates, PLC
- 2.
- 3.

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE or COUNTRY)

Samsung Display Co., Ltd.

Yongin-si, Republic of Korea

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☒ Corporation or other private group entity ☐ Government4a. Fees Submitted: ☒ Issue Fee ☐ Publication Fee (if required) ☐ Advance Order - # of Copies _____

4b. Method of Payment (Please first reapply any previously paid fee shown above):

- ☒ Electronic Payment via EFS-Web ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)
- ☒ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. 50-3698

5. Change of Entity Status (from status indicated above)

- ☐ Applicant certifying micro entity status. See 37 CFR 1.29.
- ☐ Applicant asserting small entity status. See 37 CFR 1.27.
- ☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid Certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken as a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken as a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /William L. Brooks/

Date 2021-06-30

Typed or printed name William L. Brooks

Registration No. 34,129

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal				
Application Number:		16510262		
Filing Date:		12-Jul-2019		
Title of Invention:		ARRAY SUBSTRATE AND METHOD OF MOUNTING INTEGRATED CIRCUIT USING THE SAME		
First Named Inventor/Applicant Name:		Dae Geun LEE		
Filer:		Hae-Chan Park/Yoon-Jae Lee		
Attorney Docket Number:		P6037USC1C1C1		
Filed as Large Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
UTILITY APPL ISSUE FEE	1501	1	1200	1200

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				1200

Electronic Acknowledgement Receipt	
EFS ID:	43142635
Application Number:	16510262
International Application Number:	
Confirmation Number:	1231
Title of Invention:	ARRAY SUBSTRATE AND METHOD OF MOUNTING INTEGRATED CIRCUIT USING THE SAME
First Named Inventor/Applicant Name:	Dae Geun LEE
Customer Number:	58027
Filer:	Hae-Chan Park/Yoon-Jae Lee
Filer Authorized By:	Hae-Chan Park
Attorney Docket Number:	P6037USC1C1C1
Receipt Date:	30-JUN-2021
Filing Date:	12-JUL-2019
Time Stamp:	20:07:49
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$1200
RAM confirmation Number	E20216TK11534727
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	P6037USC1C1C1_IssueFee.pdf	191740	no	2
			db8d9afb50535c6ffe26316d4831c60cda8614a		
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30172	no	2
			7348de539846d38f39f8b6524eecaad2419f8		
Warnings:					
Information:					
Total Files Size (in bytes):			221912		
This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503. <u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application. <u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course. <u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.					



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/510,262	07/12/2019	Dae Geun LEE	P6037USC1C1C1	1231
58027 7590 06/10/2021 H.C. PARK & ASSOCIATES, PLC 1894 PRESTON WHITE DRIVE RESTON, VA 20191			EXAMINER TRINH, HOA B	
			ART UNIT 2813	PAPER NUMBER
			NOTIFICATION DATE 06/10/2021	DELIVERY MODE ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

PATENT@PARK-LAW.COM



UNITED STATES DEPARTMENT OF COMMERCE
U.S. Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450

APPLICATION NO./ CONTROL NO.	FILING DATE	FIRST NAMED INVENTOR/ PATENT IN REEXAMINATION	ATTORNEY DOCKET NO.
16/510,262	07/12/2019	LEE, Dae Geun	P6037USC1C1C1

H.C. PARK & ASSOCIATES, PLC 1894 PRESTON WHITE DRIVE RESTON, VA 20191		EXAMINER	
		HOA (VIKKI) B TRINH	
		ART UNIT	PAPER
		2813	20210605

DATE MAILED: _____

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner for Patents

IDS filed on 04/29/2021 has been initialed by the examiner and placed in the file.

/HOA B TRINH/
Primary Examiner, Art Unit 2813

Receipt date: 04/29/2021

Doc code: IDS ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH /H.B.T/ PTO/SB/08a (02-18)
Doc description: Information Disclosure Statement (IDS) Filed Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	16510262
	Filing Date	2019-07-12
	First Named Inventor	Dae Geun LEE
	Art Unit	2813
	Examiner Name	TRINH, HOA B
	Attorney Docket Number	P6037USC1C1C1

U.S.PATENTS						
Examiner Initial*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	5951304		1999-09-14	WILDES et al.	Corresponding to JP H11112119

If you wish to add additional U.S. Patent citation information please click the Add button.

U.S.PATENT APPLICATION PUBLICATIONS						
Examiner Initial*	Cite No	Publication Number	Kind Code ¹	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1					

If you wish to add additional U.S. Published Application citation information please click the Add button.

FOREIGN PATENT DOCUMENTS								
Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ²	Kind Code ⁴	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T ⁵
	1	H11112119	JP		1999-04-23	GEN ELECTRIC	Corresponding to US 5951304	☐
	2	2009288540	JP		2009-12-10	TDK CORP		☐

If you wish to add additional Foreign Patent Document citation information please click the Add button

NON-PATENT LITERATURE DOCUMENTS								
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Receipt date: 04/29/2021

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		16510262
	Filing Date		2019-07-12
	First Named Inventor	Dae Geun LEE	
	Art Unit	2813	
	Examiner Name	TRINH, HOA B	
	Attorney Docket Number	P6037USC1C1C1	

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T ⁵
	1	Office Action dated April 21, 2021, from the Korean Patent Office for Korean Patent Application No. 10-2014-0073756	☐

If you wish to add additional non-patent literature document citation information please click the Add button

EXAMINER SIGNATURE

Examiner Signature	/HOA B TRINH/	Date Considered	05/10/2021
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*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /H.B.T/

Doc code: IDS

Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (02-18)

Approved for use through 11/30/2020. OMB 0651-0031

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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	Filing Date		2019-07-12	
	First Named Inventor	Dae Geun LEE		
	Art Unit	2813		
	Examiner Name	TRINH, HOA B		
	Attorney Docket Number	P6037USC1C1C1		

U.S.PATENTS						
Examiner Initial*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear
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If you wish to add additional U.S. Patent citation information please click the Add button.

U.S.PATENT APPLICATION PUBLICATIONS						
Examiner Initial*	Cite No	Publication Number	Kind Code ¹	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear
	1					

If you wish to add additional U.S. Published Application citation information please click the Add button.

FOREIGN PATENT DOCUMENTS								
Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ²	Kind Code ⁴	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear	T ⁵
	1	H11112119	JP		1999-04-23	GEN ELECTRIC	Corresponding to US 5951304	☐
	2	2009288540	JP		2009-12-10	TDK CORP		☐

If you wish to add additional Foreign Patent Document citation information please click the Add button

NON-PATENT LITERATURE DOCUMENTS								
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		16510262
	Filing Date		2019-07-12
	First Named Inventor	Dae Geun LEE	
	Art Unit	2813	
	Examiner Name	TRINH, HOA B	
	Attorney Docket Number	P6037USC1C1C1	

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T ⁵
	1	Office Action dated April 21, 2021, from the Korean Patent Office for Korean Patent Application No. 10-2014-0073756	☐

If you wish to add additional non-patent literature document citation information please click the Add button

EXAMINER SIGNATURE

Examiner Signature		Date Considered	
--------------------	--	-----------------	--

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

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	Filing Date	2019-07-12
	First Named Inventor	Dae Geun LEE
	Art Unit	2813
	Examiner Name	TRINH, HOA B
	Attorney Docket Number	P6037USC1C1C1

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☒ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☒ See attached certification statement.

☒ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☐ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/William L. Brooks/	Date (YYYY-MM-DD)	2021-04-29
Name/Print	William L. Brooks	Registration Number	34,129

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:

Dae Geun LEE, *et al.*

Serial No.: 16/510,262

Confirmation No.: 1231

Filed: July 12, 2019

Docket No.: P6037USC1C1C1

Group Art Unit: 2813

Examiner: TRINH, HOA B

For: **ARRAY SUBSTRATE AND METHOD OF MOUNTING INTEGRATED CIRCUIT
USING THE SAME**

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

CERTIFICATION STATEMENT PER 37 C.F.R. § 1.704(d)

Dear Commissioner:

Each item of information contained in the accompanying information disclosure statement was first cited in a communication from a foreign patent office in a counterpart application, and this communication was not received by any individual designated in 37 C.F.R. § 1.56(c) more than thirty days prior to the filing of the information disclosure statement.

Respectfully submitted,

/William L. Brooks/

William L. Brooks
Reg. No. 34,129

Date: April 29, 2021

CUSTOMER NUMBER: 58027
H.C. Park & Associates, PLC
1894 Preston White Drive
Reston, VA 20191
Tel: 703-288-5105
Fax: 703-288-5139
HCP/WLB/yjl

Electronic Patent Application Fee Transmittal				
Application Number:		16510262		
Filing Date:		12-Jul-2019		
Title of Invention:		ARRAY SUBSTRATE AND METHOD OF MOUNTING INTEGRATED CIRCUIT USING THE SAME		
First Named Inventor/Applicant Name:		Dae Geun LEE		
Filer:		Hae-Chan Park/Yoon-Jae Lee		
Attorney Docket Number:		P6037USC1C1C1		
Filed as Large Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous:				
SUBMISSION- INFORMATION DISCLOSURE STMT	1806	1	260	260
Total in USD (\$)				260

Electronic Acknowledgement Receipt	
EFS ID:	42597751
Application Number:	16510262
International Application Number:	
Confirmation Number:	1231
Title of Invention:	ARRAY SUBSTRATE AND METHOD OF MOUNTING INTEGRATED CIRCUIT USING THE SAME
First Named Inventor/Applicant Name:	Dae Geun LEE
Customer Number:	58027
Filer:	Hae-Chan Park/Yoon-Jae Lee
Filer Authorized By:	Hae-Chan Park
Attorney Docket Number:	P6037USC1C1C1
Receipt Date:	29-APR-2021
Filing Date:	12-JUL-2019
Time Stamp:	21:48:13
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$260
RAM confirmation Number	E20214SL49212203
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	P6037USC1C1C1_IDS.pdf	1440564	no	4
			187fdc73d104a8c6deea7ada76c478139d348a7a		
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
2	Foreign Reference	P6037USC1C1C1_FR1.pdf	1745082	no	11
			7800737114a42539e8d0aa4f7587f5182db2bd8d		
Warnings:					
Information:					
3	Foreign Reference	P6037USC1C1C1_FR2.pdf	2085811	no	11
			be4f653bd2aef10d36c447ca1a85f167cce4d0c		
Warnings:					
Information:					
4	Non Patent Literature	P6037USC1C1C1_NPL1.pdf	2868180	no	6
			a9bd525a899163e3aaa291e98d70d4a7916a7687		
Warnings:					
Information:					
5	Transmittal Letter	P6037USC1C1C1_1704_Statement.pdf	80388	no	1
			4bb19a4d88bb63321a653279f75a457fbcddeb18		
Warnings:					
Information:					
6	Fee Worksheet (SB06)	fee-info.pdf	30434	no	2
			656e4327ba5a1513c27b2c47666e2a806ca31443		
Warnings:					

Information:	
Total Files Size (in bytes):	8250459
This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503. <u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application. <u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course. <u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.	



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

58027 7590 04/01/2021
H.C. PARK & ASSOCIATES, PLC
1894 PRESTON WHITE DRIVE
RESTON, VA 20191

EXAMINER

TRINH, HOA B

ART UNIT

PAPER NUMBER

2813

DATE MAILED: 04/01/2021

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/510,262	07/12/2019	Dae Geun LEE	P6037USC1C1C1	1231

TITLE OF INVENTION: ARRAY SUBSTRATE AND METHOD OF MOUNTING INTEGRATED CIRCUIT USING THE SAME

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1200	\$0.00	\$0.00	\$1200	07/01/2021

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

58027 7590 04/01/2021
H.C. PARK & ASSOCIATES, PLC
1894 PRESTON WHITE DRIVE
RESTON, VA 20191

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/510,262	07/12/2019	Dae Geun LEE	P6037USC1C1C1	1231

TITLE OF INVENTION: ARRAY SUBSTRATE AND METHOD OF MOUNTING INTEGRATED CIRCUIT USING THE SAME

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$1200	\$0.00	\$0.00	\$1200	07/01/2021

EXAMINER	ART UNIT	CLASS-SUBCLASS
TRINH, HOA B	2813	257-773000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,

(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____

2 _____

3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE

(B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. Fees submitted: ☐ Issue Fee ☐ Publication Fee (if required) ☐ Advance Order - # of Copies _____

4b. Method of Payment: (Please first reapply any previously paid fee shown above)

☐ Electronic Payment via EFS-Web ☐ Enclosed check ☐ Non-electronic payment by credit card (Attach form PTO-2038)

☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. Change in Entity Status (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____

Date _____

Typed or printed name _____

Registration No. _____



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/510,262	07/12/2019	Dae Geun LEE	P6037USC1C1C1	1231
58027 7590 04/01/2021 H.C. PARK & ASSOCIATES, PLC 1894 PRESTON WHITE DRIVE RESTON, VA 20191			EXAMINER TRINH, HOA B	
			ART UNIT 2813	PAPER NUMBER
DATE MAILED: 04/01/2021				

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.** Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 16/510,262	Applicant(s) LEE, Dae Geun	
	Examiner HOA (VIKKI) B TRINH	Art Unit 2813	AIA (FITF) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 3/11/2021.
☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☒ The allowed claim(s) is/are 1-10 . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a) ☐ All b) ☐ Some *c) ☐ None of the:

1. ☐ Certified copies of the priority documents have been received.

2. ☐ Certified copies of the priority documents have been received in Application No. _____.

3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)	5. ☐ Examiner's Amendment/Comment
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____.	6. ☒ Examiner's Statement of Reasons for Allowance
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.	7. ☐ Other _____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.	

/HOA B TRINH/ Primary Examiner, Art Unit 2813	
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DETAILED ACTION

Notice of Pre-AIA or AIA Status

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Allowable Subject Matter

Claims 1-10 are allowed.

The following is an examiner's statement of reasons for allowance: The prior art of record does not disclose or fairly suggest either in singly or in combination a device as follows:

1. (Original) An electronic device, comprising: an array substrate; a pad portion disposed on the array substrate; and an integrated circuit disposed on the pad portion and comprising a bump portion; wherein: the pad portion comprises a first sub-pad unit comprising an inclined first pad and a second sub-pad unit comprising an inclined second pad; the first pad and the second pad are inclined in different directions symmetrically about an imaginary line that divides the pad portion; and the pad portion is electrically connected with the bump portion; the bump portion comprises a first sub-bump unit comprising an inclined first bump and a second sub-bump unit comprising an inclined second bump; the first bump

Art Unit: 2813

and the second bump are inclined in different directions symmetrically about the imaginary line that divides the pad portion.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the Examiner should be directed to (Vikki) Hoa B. Trinh whose telephone number is (571) 272-1719 and email is vikki.trinh@uspto.gov. The Examiner can normally be reached from Monday-Friday, 7:00 AM - 3:30 PM Eastern Time. If attempts to reach the examiner by telephone are unsuccessful, the Examiner's supervisor, Ms. Sue Purvis, can be reached at (571) 272-1236. The office fax number is 571-273-8300.

To schedule an Examiner's Interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice>.

Any request for information regarding to the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Also, status information for published applications may be obtained from either Private PAIR or Public Pair. In addition, status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. If you have questions pertaining to the Private PAIR system, please contact the Electronic Business Center (EBC) at 866-217-9197 (toll free).

Vikki Hoa Trinh /HOA B TRINH/
Primary Examiner, Art Unit 2813

Issue Classification 	Application/Control No. 16/510,262	Applicant(s)/Patent Under Reexamination LEE, Dae Geun
	Examiner HOA (VIKKI) B TRINH	Art Unit 2813

CPC						
Symbol					Type	Version
H01L	/	27	/	124	F	2013-01-01
H05K	/	1	/	111	I	2013-01-01
G02F	/	1	/	13458	I	2013-01-01
H01L	/	24	/	05	I	2013-01-01
H01L	/	24	/	06	I	2013-01-01
H01L	/	24	/	81	I	2013-01-01
H05K	/	2201	/	10128	A	2013-01-01
Y10T	/	29	/	49005	A	2015-01-15
H05K	/	1	/	189	A	2013-01-01
H05K	/	2201	/	09381	A	2013-01-01
H05K	/	2201	/	09418	A	2013-01-01
H05K	/	2201	/	09427	A	2013-01-01
H05K	/	2201	/	09709	A	2013-01-01
H05K	/	2201	/	09954	A	2013-01-01
H05K	/	2203	/	166	A	2013-01-01
Y02P	/	70	/	50	A	2015-11-01
H01L	/	27	/	3276	A	2013-01-01
H01L	/	2224	/	05552	A	2013-01-01
H01L	/	2224	/	06152	A	2013-01-01
H01L	/	2224	/	81132	A	2013-01-01
H01L	/	2924	/	3511	A	2013-01-01

CPC Combination Sets					
Symbol			Type	Set	Ranking
	/				

NONE (Assistant Examiner)		Total Claims Allowed: 10	
/HOA B TRINH/ Primary Examiner, Art Unit 2813 (Primary Examiner)		13 March 2021 (Date)	O.G. Print Claim(s) 1
			O.G. Print Figure 2

Issue Classification 	Application/Control No. 16/510,262	Applicant(s)/Patent Under Reexamination LEE, Dae Geun
	Examiner HOA (VIKKI) B TRINH	Art Unit 2813

INTERNATIONAL CLASSIFICATION			
CLAIMED			
H05K		1	11
NON-CLAIMED			

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS

CROSS REFERENCES(S)						
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	10	
/HOA B TRINH/ Primary Examiner, Art Unit 2813	13 March 2021	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	2

U.S. Patent and Trademark Office

Part of Paper No.: 20210313

Issue Classification 	Application/Control No. 16/510,262	Applicant(s)/Patent Under Reexamination LEE, Dae Geun
	Examiner HOA (VIKKI) B TRINH	Art Unit 2813

☒ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47															
CLAIMS															
Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
	1		10												
	2														
	3														
	4														
	5														
	6														
	7														
	8														
	9														

NONE (Assistant Examiner) _____ (Date) _____		Total Claims Allowed: 10	
/HOA B TRINH/ Primary Examiner, Art Unit 2813 (Primary Examiner) _____ (Date) 13 March 2021		O.G. Print Claim(s) 1	O.G. Print Figure 2

<i>Search Notes</i> 	Application/Control No. 16/510,262	Applicant(s)/Patent Under Reexamination LEE, Dae Geun
	Examiner HOA (VIKKI) B TRINH	Art Unit 2813

CPC - Searched*		
Symbol	Date	Examiner
h01l24/81,24, 25, g02f1/13458, h05k1/111,189,h05k2201/09427,09418, h01l2224/3225,73267	12/18/2020	hbt
update all above	03/13/2021	hbt

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
PE2E search, inventors, assignee searches, ip.com/npl	12/18/2020	hbt
update all above	03/13/2021	hbt

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
limited text search PGPUB	Interference Search Report	03/13/2021	hbt

/HOA B TRINH/ Primary Examiner, Art Unit 2813	
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Bibliographic Data

Application No: 16/510,262

Foreign Priority claimed: ☒ Yes ☐ No

35 USC 119 (a-d) conditions met: ☒ Yes ☐ No ☐ Met After Allowance

Verified and Acknowledged:

/HOA B TRINH/

Examiner's Signature

Initials

Title:

ARRAY SUBSTRATE AND METHOD OF MOUNTING
INTEGRATED CIRCUIT USING THE SAME

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
07/12/2019	257	2813	P6037USC1C1C1
RULE			

APPLICANTS

Samsung Display Co., Ltd., Yongin-si, KOREA, REPUBLIC OF

INVENTORS

Dae Geun LEE, Hwaseong-si, KOREA, REPUBLIC OF

CONTINUING DATA

This application is a CON of 15901846 02/21/2018 PAT 10373987

15901846 is a CON of 15429411 02/10/2017 PAT 9917113

15429411 is a CON of 14526182 10/28/2014 PAT 9591754

FOREIGN APPLICATIONS

KOREA, REPUBLIC OF KR10-2014-0073756 06/17/2014

IF REQUIRED, FOREIGN LICENSE GRANTED**

07/25/2019

STATE OR COUNTRY

KOREA, REPUBLIC OF

ADDRESS

H.C. PARK & ASSOCIATES, PLC

1894 PRESTON WHITE DRIVE

RESTON, VA 20191

UNITED STATES

FILING FEE RECEIVED

\$1,720

EAST Search History**EAST Search History (Prior Art)**

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	4	("20030160929" "20140321088").PN.	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2020/03/02 13:45
L2	10	("20060255474" "20080138935" "20090039496" "20090152715" "6867471").PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2020/03/02 13:45
L3	11	("5250843" "5353498" "5841193" "7619901").PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2020/03/02 13:45
L4	2	("7767496").PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2020/03/02 13:45
L5	2	("20080138935").PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2020/03/02 13:45
L6	4	((("20070273018") or ("20130234308")).PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2020/03/02 13:45
L7	6	((("5866952") or ("6919508")).PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2020/03/02 13:45
L8	10346	(h01I24/25,82,24).cpc.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2020/03/02 13:45
L9	18253	(h01I2224/3225,73267,8203,04105,24226,92244).cpc.	US-PGPUB; USPAT;	OR	OFF	2020/03/02 13:45

			USOCR; EPO; JPO; DERWENT			
L10	2	("2003160929").PN.	US- PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2020/03/02 13:45
L11	16073	(h05k1/111,189).cpc.	US- PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2020/03/02 13:45
L12	5623	(h05k2201/09427,09418,09381,09954,10128).cpc.	US- PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2020/03/02 13:45
L13	3620	(g02f1/13458).cpc.	US- PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2020/03/02 13:45
L14	617588	(samsung).as.	US- PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/03/02 13:45
L15	5183	(lee near2 dae).inv.	US- PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/03/02 13:45
L16	813	subpad	US- PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2020/03/02 13:45
L17	4	pad same (carrier wafer substrate board) same display same subpad	US- PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/03/02 13:45
L18	2884	pad same (carrier wafer substrate board) same display same non adj display	US- PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/03/02 13:45
L19	2	("9591754").PN.	US- PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2020/03/02 13:45
L20	4	("20030160929" "20140321088").PN.	US-	OR	ON	2020/03/02

			PGPUB; USPAT; EPO; JPO; DERWENT			13:45
L21	10	("20060255474" "20080138935" "20090039496" "20090152715" "6867471").PN.	US- PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2020/03/02 13:45
L22	11	("5250843" "5353498" "5841193" "7619901").PN.	US- PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2020/03/02 13:45
L23	2	("7767496").PN.	US- PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2020/03/02 13:45
L24	2	("20080138935").PN.	US- PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2020/03/02 13:45
L25	13061	(bump ball solder) same (carrier wafer substrate board) with adhesive and (encapsulant encapsulat\$3)	US- PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/03/02 13:45
L26	18245	(bump ball solder) same (carrier wafer substrate board) same adhesive and (encapsulant encapsulat\$3)	US- PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/03/02 13:45
L27	6665	(bump ball solder) same (carrier wafer substrate board) same adhesive same (encapsulant encapsulat\$3)	US- PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/03/02 13:45
L28	10496	(mold\$3 encapsulant encapsulat\$3) same (bump ball solder) same (carrier wafer substrate board) same adhesive	US- PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/03/02 13:45
L29	11691	(bump ball solder) same (carrier wafer substrate board) same wir\$3 same (encapsulant encapsulat\$3)	US- PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/03/02 13:45
L30	2529	(bump ball solder) same (carrier wafer substrate board) same wir\$3 same (encapsulant encapsulat\$3)	US- PGPUB;	OR	ON	2020/03/02 13:45

		and electrode	USPAT; USOCR; EPO; JPO; DERWENT			
L31	4	((("20070273018") or ("20130234308"))).PN.	US- PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2020/03/02 13:45
L32	6	((("5866952") or ("6919508"))).PN.	US- PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2020/03/02 13:45
L33	10723	(carrier wafer substrate board) same wir\$3 same (encapsulant encapsulat\$3) and electrode	US- PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/03/02 13:45
L34	85704	((carrier wafer substrate board) same wir\$3 same (resin encapsulant encapsulat\$3) and (bump ball electrode))	US- PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/03/02 13:45
L35	10346	(h01124/25,82,24).cpc.	US- PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2020/03/02 13:45
L36	18253	(h0112224/3225,73267,8203,04105,24226,92244).cpc.	US- PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2020/03/02 13:45
L37	2	("2003160929").PN.	US- PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2020/03/02 13:45
L38	16073	(h05k1/111,189).cpc.	US- PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2020/03/02 13:45
L39	5623	(h05k2201/09427,09418,09381,09954,10128).cpc.	US- PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2020/03/02 13:45
L40	3620	(g02f1/13458).cpc.	US- PGPUB; USPAT; EPO; JPO;	OR	ON	2020/03/02 13:45

			DERWENT			
L41	37187	(257/773,774,737,738).ccls.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/03/02 13:45
L42	617588	(samsung).as.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/03/02 13:45
L43	5183	(lee near2 dae).inv.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/03/02 13:45
L44	813	subpad	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	2020/03/02 13:45
L45	4	pad same (carrier wafer substrate board) same display same subpad	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/03/02 13:45
L46	2884	pad same (carrier wafer substrate board) same display same non adj display	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/03/02 13:45
L47	2	("9591754").PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2020/03/02 13:45
L48	101430	(inclined or slope or angle) near5 (pad electrode interconnect)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/03/02 13:45
L49	106762	(bump ball) near5 pad	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/03/02 13:45
L50	2399	L48 and L49	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/03/02 13:45

L51	8606	parallelogram adj shape	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/03/02 13:45
L52	25	L50 and L51	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/03/02 13:45
L53	76	L49 and L51	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/03/02 13:45
L54	361	L48 and L51	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/03/02 13:45
L55	549	L48 and L41	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/03/02 13:45
L56	611	L48 and (L36 L37 L38 L39)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/03/02 13:45
L57	3	("6114754").PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2020/03/02 13:45
L58	6	((("9917113") or ("9591754"))).PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2020/03/02 13:45
L59	2	("20140321088").PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2020/03/02 13:45
L60	9	("2014/0321088").URPN.	USPAT	OR	ON	2020/03/02 13:45
L61	7	("20180182781" "20060007086" "20150021765" "20130099375" "9660171" "20090321953" "20140048930" "20150200210" "9698128" "20110024919" "20100171121" "20110233755"	USPAT	OR	ON	2020/03/02 13:45

		"9691678" "20090196003" "20090321954" "20150109544" "20130020722" "5998875" "20150270442" "7816690" "20020179904" "20170323999" "20160131350" "20170148954" "20100155862" "20030027423" "20150168754" "20150062966" "20070122013" "20120049223" "5410182" "20030003740" "6849873" "20150270461" "20150346869" "20070096155").pn.				
L62	101430	(inclined or slope or angle) near5 (pad electrode interconnect)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/03/02 13:45
L63	106762	(bump ball) near5 pad	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/03/02 13:45
L64	2399	L62 and L63	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/03/02 13:45
L65	294	L64 and (LCD (liquid near2 display) OLED)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2020/03/02 13:45
L66	4	("20060181299" "20060082001").pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2020/03/02 13:45
L67	0	L66 and pad and bump and inclin\$5	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2020/03/02 13:45
L68	1	L66 and pad and bump	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2020/03/02 13:45
L69	2	("7888678").pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/03/02 13:45
L70	30	L8 and L50	US-PGPUB; USPAT; USOCR; EPO; JPO;	OR	OFF	2020/03/02 13:45

			DERWENT			
L71	41	L9 and L50	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2020/03/02 13:45
L72	124	L11 and L50	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2020/03/02 13:45
L73	71	L12 and L50	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2020/03/02 13:45
L74	29	L13 and L50	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2020/03/02 13:45
L75	74	L14 and L50	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2020/03/02 13:45
L76	10	L15 and L50	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2020/03/02 13:45
L77	4	L16 and L50	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	2020/03/02 13:45
L78	310	((inclined or slope or angle) near5 (pad electrode interconnect) and array adj substrate).clm.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/03/02 13:45
L81	24	("8436467" "9660171" "9312232" "9018759" "5998875" "7888678" "8736079" "7786600" "8436462").pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/03/02 13:45
L82	101430	(inclined or slope or angle) near5 (pad electrode interconnect)	US-PGPUB; USPAT; USOCR; EPO; JPO;	OR	ON	2020/03/02 13:45

			DERWENT			
L83	106762	(bump ball) near5 pad	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/03/02 13:45
L84	2399	L82 and L83	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/03/02 13:45
L85	167	L84 and (257/737-738.ccls.)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/03/02 13:45
L92	3709	(inclined or slope or angle) near5 (bump solder) and (substrate wafer board) and (pad electrode interconnect)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/03/02 14:08
L93	20	92 and 8	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/03/02 14:08
L94	36	92 and 9	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/03/02 14:08
L95	241	92 and 11	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/03/02 14:08
L96	101	92 and 12	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/03/02 14:08
L97	12	92 and 13	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	2020/03/02 14:08

3/2/2020 2:08:54 PM

C:\Users\vttrinh\Documents\EAST\Workspaces\16510262.wsp

Doc Code: DIST.E.FILE Document Description: Electronic Terminal Disclaimer - Filed		PTO/SB/26 U.S. Patent and Trademark Office Department of Commerce	
Electronic Petition Request	TERMINAL DISCLAIMER TO OBVIATE A DOUBLE PATENTING REJECTION OVER A "PRIOR" PATENT		
Application Number	16510262		
Filing Date	12-Jul-2019		
First Named Inventor	Dae Geun LEE		
Attorney Docket Number	P6037USC1C1C1		
Title of Invention	ARRAY SUBSTRATE AND METHOD OF MOUNTING INTEGRATED CIRCUIT USING THE SAME		
☒ Filing of terminal disclaimer does not obviate requirement for response under 37 CFR 1.111 to outstanding Office Action ☒ This electronic Terminal Disclaimer is not being used for a Joint Research Agreement.			
Owner		Percent Interest	
Samsung Display Co., Ltd.		100%	
The owner(s) with percent interest listed above in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term of prior patent number(s) 10373987 as the term of said prior patent is presently shortened by any terminal disclaimer. The owner hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and the prior patent are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns. In making the above disclaimer, the owner does not disclaim the terminal part of the term of any patent granted on the instant application that would extend to the expiration date of the full statutory term of the prior patent, "as the term of said prior patent is presently shortened by any terminal disclaimer," in the event that said prior patent later: - expires for failure to pay a maintenance fee; - is held unenforceable; - is found invalid by a court of competent jurisdiction; - is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321; - has all claims canceled by a reexamination certificate; - is reissued; or - is in any manner terminated prior to the expiration of its full statutory term as presently shortened by any terminal disclaimer. ☒ Terminal disclaimer fee under 37 CFR 1.20(d) is included with Electronic Terminal Disclaimer request.			

☐ I certify, in accordance with 37 CFR 1.4(d)(4), that the terminal disclaimer fee under 37 CFR 1.20(d) required for this terminal disclaimer has already been paid in the above-identified application.	
Applicant claims the following fee status: ☐ Small Entity ☐ Micro Entity ☒ Regular Undiscounted	
I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.	
THIS PORTION MUST BE COMPLETED BY THE SIGNATORY OR SIGNATORIES I certify, in accordance with 37 CFR 1.4(d)(4) that I am: ☒ An attorney or agent registered to practice before the Patent and Trademark Office who is of record in this application Registration Number <u>34129</u> ☐ A sole inventor ☐ A joint inventor; I certify that I am authorized to sign this submission on behalf of all of the inventors as evidenced by the power of attorney in the application ☐ A joint inventor; all of whom are signing this request	
Signature	/William L. Brooks/
Name	William L. Brooks

*Statement under 37 CFR 3.73(b) is required if terminal disclaimer is signed by the assignee (owner).
 Form PTO/SB/96 may be used for making this certification. See MPEP § 324.

Electronic Patent Application Fee Transmittal				
Application Number:		16510262		
Filing Date:		12-Jul-2019		
Title of Invention:		ARRAY SUBSTRATE AND METHOD OF MOUNTING INTEGRATED CIRCUIT USING THE SAME		
First Named Inventor/Applicant Name:		Dae Geun LEE		
Filer:		Hae-Chan Park/Minyoung Jo		
Attorney Docket Number:		P6037USC1C1C1		
Filed as Large Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
STATUTORY OR TERMINAL DISCLAIMER	1814	1	170	170
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				170

Doc Code: DISQ.E.FILE

Document Description: Electronic Terminal Disclaimer – Approved

Application No.: 16510262

Filing Date: 12-Jul-2019

Applicant/Patent under Reexamination: LEE

Electronic Terminal Disclaimer filed on March 11, 2021

☒ APPROVED

This patent is subject to a terminal disclaimer

☐ DISAPPROVED

Approved/Disapproved by: Electronic Terminal Disclaimer automatically approved by EFS-Web

U.S. Patent and Trademark Office

Electronic Acknowledgement Receipt	
EFS ID:	42160751
Application Number:	16510262
International Application Number:	
Confirmation Number:	1231
Title of Invention:	ARRAY SUBSTRATE AND METHOD OF MOUNTING INTEGRATED CIRCUIT USING THE SAME
First Named Inventor/Applicant Name:	Dae Geun LEE
Customer Number:	58027
Filer:	Hae-Chan Park/Minyoung Jo
Filer Authorized By:	Hae-Chan Park
Attorney Docket Number:	P6037USC1C1C1
Receipt Date:	11-MAR-2021
Filing Date:	12-JUL-2019
Time Stamp:	20:52:56
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$170
RAM confirmation Number	E20213AK52502620
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Terminal Disclaimer-Filed (Electronic)	eTerminal-Disclaimer.pdf	33489	no	2
			f81f235a82db1d7dbc903199ee85093fb8d3fb12		
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30351	no	2
			d5aac70d70794bf477975e000462fea0f6be2524		
Warnings:					
Information:					
Total Files Size (in bytes):			63840		
This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503. <u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application. <u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course. <u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.					

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:

Dae Geun LEE

Serial No.: 16/510,262

Confirmation No.: 1231

Filed: July 12, 2019

Docket No.: P6037USC1C1C1

Group Art Unit: 2813

Examiner: TRINH, HOA B

For: **ARRAY SUBSTRATE AND METHOD OF MOUNTING INTEGRATED
CIRCUIT USING THE SAME**

Mail Stop: Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

REPLY UNDER 37 C.F.R. § 1.111

Dear Commissioner:

In response to the Non-Final Office Action mailed December 23, 2020 ("Office Action"), Applicant respectfully requests reconsideration of the Application in view of the following Remarks.

A **Claim List** begins on page 2.

Remarks begin on page 4.

No extensions of time are required at this time. If extensions of time are necessary to prevent abandonment of this Application, then they are petitioned for under 37 C.F.R. § 1.136(a). No fees for net addition of claims are required at this time. Any fees required for extensions of time or for the net addition of claims may be charged to Deposit Account No. 50-3698.

CLAIM LIST

This claim list replaces all prior claim lists in the Application.

1. (Original) An electronic device, comprising:
an array substrate;
a pad portion disposed on the array substrate; and
an integrated circuit disposed on the pad portion and comprising a bump portion;
wherein:
the pad portion comprises a first sub-pad unit comprising an inclined first pad and a
second sub-pad unit comprising an inclined second pad;
the first pad and the second pad are inclined in different directions symmetrically about
an imaginary line that divides the pad portion; and
the pad portion is electrically connected with the bump portion;
the bump portion comprises a first sub-bump unit comprising an inclined first bump and
a second sub-bump unit comprising an inclined second bump;
the first bump and the second bump are inclined in different directions symmetrically about
the imaginary line that divides the pad portion.
2. (Original) The electronic device of claim 1, wherein at least one of the first pad and the
second pad has a parallelogram shape.
3. (Original) The electronic device of claim 1, wherein:
the first bump has a same inclination angle as the first pad; and
the second bump has a same inclination angle as the second pad.

4. (Original) The electronic device of claim 1, wherein a shape of the first bump corresponds to a shape of the first pad, and a shape of the second bump corresponds to a shape of the second pad.

5. (Original) The electronic device of claim 1, wherein the first pad is electrically connected with the first bump and the second pad is electrically connected with the second bump.

6. (Original) The electronic device of claim 1, wherein an area of the first pad is greater than an area of the first bump.

7. (Original) The electronic device of claim 1, wherein:
the first bump comprises a first region and a second region; and
the first region overlaps the first pad and the second region does not overlap the first pad.

8. (Original) The electronic device of claim 1, wherein at least one of the first pad and the second pad has a quadrangle shape.

9. (Original) The electronic device of claim 2, wherein the pad portion further comprises a third sub-pad unit comprising a third pad having a rectangular shape and disposed between the first sub-pad unit and the second sub-pad unit.

10. (Original) The electronic device of claim 9, wherein the bump portion further comprises a third sub-bump unit comprising a third bump having a rectangular shape and disposed between the first sub-bump unit and the second sub-bump unit.

REMARKS

The claims have not been amended. Accordingly, claims 1-10 are currently pending in the Application, of which claim 1 is independent.

Applicant respectfully requests reconsideration and timely withdrawal of the pending rejection for the reasons discussed below.

Rejection of Claims under Double Patenting

Claims 1-10 are rejected on the ground of nonstatutory double patenting as being unpatentable over claims 1-10 of U.S. Patent No. 10,373,987 issued to Lee. ("Lee").

Applicant has submitted a terminal disclaimer to overcome this rejection. Accordingly, Applicant respectfully requests withdrawal of this double patenting rejection of claims 1-10.

Applicant notes that "[t]he filing of a terminal disclaimer to obviate a rejection based on nonstatutory double patenting is not an admission of the propriety of the rejection [because] the filing of a terminal disclaimer simply serves the statutory function of removing the rejection of double patenting, and raises neither a presumption nor estoppel on the merits of the rejection" (MPEP § 804.02.II, citations omitted). Hence, the terminal disclaimer included with this reply simply serves the statutory function of removing the double patenting rejection without raising a presumption or estoppel on the merits of the rejection.

CONCLUSION

A full and complete response has been made to the pending Office Action, and the stated ground for rejection has been overcome or rendered moot. Accordingly, all pending claims are allowable, and the Application is in condition for allowance.

The Examiner is invited to contact Applicant's undersigned representative at the number below if it would expedite prosecution. Prompt and favorable consideration of this Reply is respectfully requested.

Respectfully submitted,

/William L. Brooks/

William L. Brooks
Reg. No. 34,129

Date: March 11, 2021

CUSTOMER NUMBER: 58027
H.C. Park & Associates, PLC
1894 Preston White Drive
Reston, VA 20191
Tel: 703-288-5105
Fax: 703-288-5139
HCP/WLB/yjl

Electronic Acknowledgement Receipt	
EFS ID:	42160792
Application Number:	16510262
International Application Number:	
Confirmation Number:	1231
Title of Invention:	ARRAY SUBSTRATE AND METHOD OF MOUNTING INTEGRATED CIRCUIT USING THE SAME
First Named Inventor/Applicant Name:	Dae Geun LEE
Customer Number:	58027
Filer:	Hae-Chan Park/Minyoung Jo
Filer Authorized By:	Hae-Chan Park
Attorney Docket Number:	P6037USC1C1C1
Receipt Date:	11-MAR-2021
Filing Date:	12-JUL-2019
Time Stamp:	20:59:29
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		P6037USC1C1C1_Reply_Non_F inal_Office_Action.pdf	111795	yes	5
			ca2d49c1d1395d02d73a248a0bf046ea107 a0fd9		

Multipart Description/PDF files in .zip description			
Document Description	Start	End	
Amendment/Req. Reconsideration-After Non-Final Reject	1	1	
Claims	2	3	
Applicant Arguments/Remarks Made in an Amendment	4	5	

Warnings:

Information:

Total Files Size (in bytes):	111795
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New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875				Application or Docket Number 16/510,262		Filing Date 07/12/2019		☐ To be Mailed					
ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO													
APPLICATION AS FILED - PART I													
		(Column 1)	(Column 2)										
FOR		NUMBER FILED	NUMBER EXTRA		RATE (\$)		FEE (\$)						
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))		N/A	N/A		N/A								
☐ SEARCH FEE (37 CFR 1.16(k), (l), or (m))		N/A	N/A		N/A								
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))		N/A	N/A		N/A								
TOTAL CLAIMS (37 CFR 1.16(j))		minus 20 =	*		x \$100 =								
INDEPENDENT CLAIMS (37 CFR 1.16(h))		minus 3 =	*		x \$460 =								
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))		If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).											
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))													
* If the difference in column 1 is less than zero, enter "0" in column 2.						TOTAL							
APPLICATION AS AMENDED - PART II													
		(Column 1)	(Column 2)		(Column 3)								
AMENDMENT	03/11/2021	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE (\$)		ADDITIONAL FEE (\$)				
	Total (37 CFR 1.16(j))	* 10	Minus	** 20	= 0		x \$100 =		0				
	Independent (37 CFR 1.16(h))	* 1	Minus	*** 3	= 0		x \$480 =		0				
	☐ Application Size Fee (37 CFR 1.16(s))												
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))												
								TOTAL ADD'L FEE		0			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE (\$)		ADDITIONAL FEE (\$)				
	Total (37 CFR 1.16(j))	*	Minus	**	=		x \$0 =						
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x \$0 =						
	☐ Application Size Fee (37 CFR 1.16(s))												
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))												
								TOTAL ADD'L FEE					
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.								LIE					
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".								/SHARON D HARRIS/					
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".													
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.													

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/510,262	07/12/2019	Dae Geun LEE	P6037USC1C1C1	1231
58027 7590 12/23/2020 H.C. PARK & ASSOCIATES, PLC 1894 PRESTON WHITE DRIVE RESTON, VA 20191			EXAMINER TRINH, HOA B	
			ART UNIT 2813	PAPER NUMBER
			NOTIFICATION DATE 12/23/2020	DELIVERY MODE ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

PATENT@PARK-LAW.COM

DETAILED ACTION

Notice of Pre-AIA or AIA Status

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the “right to exclude” granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on nonstatutory double patenting provided the reference application or patent either is shown to be commonly owned with the examined application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement. See MPEP § 717.02 for applications subject to examination under the first inventor to file provisions of the AIA as explained in MPEP § 2159. See MPEP § 2146 *et seq.* for applications not subject to examination under the first inventor to file provisions of the AIA. A terminal disclaimer must be signed in compliance with 37 CFR 1.321(b).

The USPTO Internet website contains terminal disclaimer forms which may be used. Please visit www.uspto.gov/patent/patents-forms. The filing date of the application in which the form is filed determines what form (e.g., PTO/SB/25, PTO/SB/26, PTO/AIA/25, or PTO/AIA/26) should be used. A web-based eTerminal Disclaimer may be filled out completely online using web-screens. An eTerminal Disclaimer that meets all requirements is auto-processed and approved immediately upon submission. For more information about eTerminal Disclaimers, refer to www.uspto.gov/patents/process/file/efs/guidance/eTD-info-l.jsp.

Claims 1-10 are rejected on the ground of nonstatutory double patenting as being unpatentable over claims 1-10 of U.S. Patent No. 10,373,987 . Although the claims at issue are not identical, they are not patentably distinct from each other because the inclined first pad and the inclined second pad of the present application would have formed the inclined shape as recited in the US Patent '987.

As to claim 1, claim 1 of US Patent '987 disclose:

1. An electronic device, comprising: an array substrate; a pad portion disposed on the array substrate; and an integrated circuit disposed on the pad portion and comprising a bump portion; wherein: the pad portion comprises a first sub-pad unit comprising an inclined first pad and a second sub-pad unit comprising an inclined second pad; the first pad and the second pad are inclined in different directions symmetrically about an imaginary line that divides the pad portion; and the pad portion is electrically connected with the bump portion; the bump portion comprises a first sub-bump unit comprising an inclined first bump and a second sub-bump unit comprising an inclined second bump; the first bump and the second bump are inclined in different directions symmetrically about the imaginary line that divides the pad portion.

As to claim 2, claim 1 of US Patent '987 disclose:

2. The electronic device of claim 1, wherein at least one of the first pad and the second pad has a parallelogram shape.

It is noted that the inclined pads of present application and the US Patent '987 have parallelogram shape.

As to claim 3, claim 1 of US Patent '987 disclose:

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3. The electronic device of claim 1, wherein: the first bump has a same inclination angle as the first pad; and the second bump has a same inclination angle as the second pad.

As to claim 4, claims 1,3 of US Patent '987 disclose:

4. The electronic device of claim 1, wherein a shape of the first bump corresponds to a shape of the first pad, and a shape of the second bump corresponds to a shape of the second pad.

As to claim 5, claims 1, 4 of US Patent '987 disclose:

5. The electronic device of claim 1, wherein the first pad is electrically connected with the first bump and the second pad is electrically connected with the second bump.

As to claim 6, claims 1,5 of US Patent '987 disclose:

6. The electronic device of claim 1, wherein an area of the first pad is greater than an area of the first bump.

As to claim 7, claims 1,6 of US Patent '987 disclose:

7. The electronic device of claim 1, wherein: the first bump comprises a first region and a second region; and the first region overlaps the first pad and the second region does not overlap the first pad.

As to claim 8, claims 1,8 of US Patent '987 disclose:

8. The electronic device of claim 1, wherein at least one of the first pad and the second pad has a quadrangle shape.

As to claim 9, claims 1,9 of US Patent '987 disclose:

9. The electronic device of claim 2, wherein the pad portion further comprises a third sub-pad unit comprising a third pad having a rectangular shape and disposed between the first sub-pad unit and the second sub-pad unit.

As to claim 10, claims 1, 10 of US Patent '987 disclose:

10. The electronic device of claim 9, wherein the bump portion further comprises a third sub-bump unit comprising a third bump having a rectangular shape and disposed between the first sub-bump unit and the second sub-bump unit.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Chen (2017/0038630) discloses a device having a plurality of rectangular pads.

Seong (2008/0128699) discloses a device having a plurality of pads and wires.

Any inquiry concerning this communication or earlier communications from the Examiner should be directed to (Vikki) Hoa B. Trinh whose telephone number is (571) 272-1719 and email is vikki.trinh@uspto.gov. The Examiner can normally be reached from Monday-Friday, 7:00 AM - 3:30 PM Eastern Time. If attempts to reach the examiner by telephone are unsuccessful, the Examiner's supervisor, Ms. Sue Purvis, can be reached at (571) 272-1236. The office fax number is 571-273-8300.

To schedule an Examiner's Interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at <http://www.uspto.gov/interviewpractice> .

Any request for information regarding to the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Also, status information for published applications may be obtained from either Private PAIR or Public Pair. In addition, status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. If you have questions pertaining to the Private PAIR system, please contact the Electronic Business Center (EBC) at 866-217-9197 (toll free).

Vikki Hoa Trinh /HOA B TRINH/
Primary Examiner, Art Unit 2813

Application/Control Number:16/510,262
Art Unit:2813

Page8

<i>Notice of References Cited</i>	Application/Control No. 16/510,262		Applicant(s)/Patent Under Reexamination LEE, Dae Geun	
	Examiner HOA (VIKKI) B TRINH		Art Unit 2813	Page 1 of 1

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*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20170038630-A1	02-2017	CHEN; Hung-Kun	G02F1/1368	1/1
*	B	US-20080128699-A1	06-2008	Seong; Seok-Je	G02F1/1345	257/59
*	C	US-10373987-B2	08-2019	Lee; Dae Geun	H01L24/05	1/1
	D					
	E					
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*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
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	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
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*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

<i>Search Notes</i> 	Application/Control No. 16/510,262	Applicant(s)/Patent Under Reexamination LEE, Dae Geun
	Examiner HOA (VIKKI) B TRINH	Art Unit 2813

CPC - Searched*		
Symbol	Date	Examiner
h01l24/81,24, 25, g02f1/13458, h05k1/111,189,h05k2201/09427,09418, h01l2224/3225,73267	12/18/2020	hbt

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
PE2E search, inventors, assignee searches, ip.com/npl	12/18/2020	hbt

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

/HOA B TRINH/ Primary Examiner, Art Unit 2813	
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Receipt date: 07/12/2019

Doc code: IDS ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /H.B.T/ PTO/SB/08a (02-18)
Doc description: Information Disclosure Statement (IDS) Filed Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		16510262	
	Filing Date		2019-07-12	
	First Named Inventor	Dae Geun LEE		
	Art Unit			
	Examiner Name			
	Attorney Docket Number		P6037USC1C1C1	

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Examiner Initial*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear		
	1	6114754		2000-09-05	KATA			
If you wish to add additional U.S. Patent citation information please click the Add button.								
U.S.PATENT APPLICATION PUBLICATIONS								
Examiner Initial*	Cite No	Publication Number	Kind Code ¹	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear		
	1	20030160929		2003-08-28	KURASAWA			
	2	20140321088		2014-10-30	BAE et al.	Corresponding to EP 2811337		
	3	20130188109		2013-07-05	CHEN			
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Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ²	Kind Code ⁴	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T ⁵
	1	10-2011-0119004	KR		2011-11-02	LG Electronics Inc.		☐

Receipt date: 07/12/2019

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		16510262	
	Filing Date		2019-07-12	
	First Named Inventor	Dae Geun LEE		
	Art Unit			
	Examiner Name			
	Attorney Docket Number		P6037USC1C1C1	

	2	10-2013-0053280	KR		2013-05-23	LG Display Co., Ltd.		☐
	3	10-2008-0086214	KR		2008-09-25	Samsung SDI Co., Ltd.		☐
	4	10-2007-0007633	KR		2007-01-16	Samsung Electronics Co., Ltd.		☐
	5	2012-058533	JP		2012-03-22	Hitachi Displays Ltd., et al.		☐
	6	2007-242942	JP		2007-09-20	SEIKO EPSON CORP.		☐
	7	H04-352132	JP		1992-12-07	HITACHI LTD.		☐
	8	2000-187452	JP		2000-07-04	CANON INC.		☐
	9	2811337	EP		2014-12-10	SAMSUNG DISPLAY CO., LTD.	Corresponding to US 2014/0321088	☐

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NON-PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T5
	1	Extended European Search Report, issued October 7, 2015, in European Patent Application No. 15152709.0.	☐

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /H.B.T/

Receipt date: 07/12/2019

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	16510262
	Filing Date	2019-07-12
	First Named Inventor	Dae Geun LEE
	Art Unit	
	Examiner Name	
	Attorney Docket Number	P6037USC1C1C1

2	Non-Final Office Action issued July 1, 2016, in U.S. Patent Application No. 14/526,182.	☐
3	Notice of Allowance issued October 21, 2016, in U.S. Patent Application No. 14/526,182.	☐
4	Non-Final Office Action dated July 3, 2017, issued in U.S. Patent Application No. 15/429,411.	☐
5	Non-Final Office Action issued April 6, 2018, in U.S. Patent Application No. 15/901,846.	☐
6	Final Office Action issued January 2, 2019, in U.S. Patent Application No. 15/901,846.	☐
7	Notice of Allowance issued March 26, 2019, in U.S. Patent Application No. 15/901,846.	☐

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EXAMINER SIGNATURE

Examiner Signature	/HOA B TRINH/	Date Considered	03/02/2020
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*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /H.B.T/

PE2E SEARCH - Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	British Equivalents	Time Stamp
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L119	6	((("5866952") or ("6919508")).PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2019/03/11 05:14 PM
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L127	3155	(g02f1/13458).cpc.	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	ON	2019/03/11 05:14 PM

L128	593294	(samsung).as.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2019/03/11 05:14 PM
L129	4902	(lee near2 dae).inv.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2019/03/11 05:14 PM
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L171	2253	L169 and L170	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2019/03/11 05:14 PM
L172	7932	parallelogram adj shape	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2019/03/11 05:14 PM
L173	19	L171 and L172	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2019/03/11 05:14 PM

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L181	4	("2014/0321088").URPN.	USPAT	OR	ON	ON	2019/03/11 05:14 PM
L182	7	("20180182781" "20060007086" "20150021765" "20130099375" "9660171" "20090321953" "20140048930" "20150200210" "9698128" "20110024919" "20100171121" "20110233755" "9691678" "20090196003" "20090321954" "20150109544" "20130020722" "5998875" "20150270442" "7816690" "20020179904" "20170323999" "20160131350" "20170148954" "20100155862"	USPAT	OR	ON	ON	2019/03/11 05:14 PM

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L183	95923	(inclined or slope or angle) near5 (pad electrode interconnect)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2019/03/11 05:14 PM
L184	100437	(bump ball) near5 pad	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2019/03/11 05:14 PM
L185	2253	L183 and L184	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2019/03/11 05:14 PM
L186	267	L185 and (LCD (liquid near2 display) OLED)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	OFF	2019/03/11 05:14 PM
L188	4	("20060181299" "20060082001").pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	OFF	2019/03/11 05:14 PM
L189	0	L188 and pad and bump and inclin\$5	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	OFF	2019/03/11 05:14 PM
L190	1	L188 and pad and bump	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	OFF	2019/03/11 05:14 PM
L191	2	("7888678").pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2019/03/11 05:54 PM
L193	30	L122 and L171	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	OFF	2019/03/11 05:57 PM
L194	35	L123 and L171	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	OFF	2019/03/11 05:57 PM
L195	113	L125 and L171	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	OFF	2019/03/11 05:57 PM

L196	61	L126 and L171	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	OFF	2019/03/11 05:58 PM
L197	20	L127 and L171	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	OFF	2019/03/11 05:58 PM
L198	63	L128 and L171	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	OFF	2019/03/11 05:58 PM
L199	6	L129 and L171	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	OFF	2019/03/11 05:58 PM
L200	4	L130 and L171	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	OFF	2019/03/11 05:58 PM
L201	288	((inclined or slope or angle) near5 (pad electrode interconnect) and array adj substrate).clm.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2019/03/11 06:00 PM
L213	24	("8436467" "9660171" "9312232" "9018759" "5998875" "7888678" "8736079" "7786600" "8436462").pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2019/03/11 09:16 PM
L214	95923	(inclined or slope or angle) near5 (pad electrode interconnect)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2019/03/11 09:44 PM
L215	100437	(bump ball) near5 pad	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2019/03/11 09:44 PM
L216	2253	L214 and L215	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2019/03/11 09:44 PM
L217	167	L216 and (257/737- 738.ccls.)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2019/03/11 09:44 PM
L218	10	L217 and @ad>="20140617"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2019/03/11 09:44 PM
L219	157	L217 and @ad<="20140617"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2019/03/11 09:45 PM

L220	4	("20030160929" "20140321088").PN.	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L221	10	("20060255474" "20080138935" "20090039496" "20090152715" "6867471").PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	OFF	2020/12/18 06:11 AM
L222	11	("5250843" "5353498" "5841193" "7619901").PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	OFF	2020/12/18 06:11 AM
L223	2	("7767496").PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L224	2	("20080138935").PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L225	4	((("20070273018") or ("20130234308")).PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L226	6	((("5866952") or ("6919508")).PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L227	12678	(h01I24/25,82,24).cpc.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	OFF	2020/12/18 06:11 AM
L228	21638	(h01I2224/3225,73267,8203,04105,24226,92244).cpc.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	OFF	2020/12/18 06:11 AM
L229	2	("2003160929").PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L230	19474	(h05k1/111,189).cpc.	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L231	6914	(h05k2201/09427,09418,09381,09954,10128).cpc.	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L232	4191	(g02f1/13458).cpc.	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L233	637216	(samsung).as.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L234	5406	(lee near2 dae).inv.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM

L235	887	subpad	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L236	6	pad same (carrier wafer substrate board) same display same subpad	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L237	3533	pad same (carrier wafer substrate board) same display same non adj display	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L238	2	("9591754").PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L239	4	("20030160929" "20140321088").PN.	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
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L241	11	("5250843" "5353498" "5841193" "7619901").PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	OFF	2020/12/18 06:11 AM
L242	2	("7767496").PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L243	2	("20080138935").PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L244	13720	(bump ball solder) same (carrier wafer substrate board) with adhesive and (encapsulant encapsulat\$3)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L245	19177	(bump ball solder) same (carrier wafer substrate board) same adhesive and (encapsulant encapsulat\$3)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L246	6897	(bump ball solder) same (carrier wafer substrate board) same adhesive same (encapsulant encapsulat\$3)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L247	10806	(mold\$3 encapsulant encapsulat\$3) same	US-PGPUB; USPAT; USOCR; EPO; JPO;	OR	ON	ON	2020/12/18 06:11 AM

		(bump ball solder) same (carrier wafer substrate board) same adhesive	DERWENT				
L248	12079	(bump ball solder) same (carrier wafer substrate board) same wir\$3 same (encapsulant encapsulat\$3)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L249	2594	(bump ball solder) same (carrier wafer substrate board) same wir\$3 same (encapsulant encapsulat\$3) and electrode	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L250	4	((("20070273018") or ("20130234308"))).PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L251	6	((("5866952") or ("6919508"))).PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L252	11415	(carrier wafer substrate board) same wir\$3 same (encapsulant encapsulat\$3) and electrode	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L253	89394	((carrier wafer substrate board) same wir\$3 same (resin encapsulant encapsulat\$3) and (bump ball electrode))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L254	12678	(h01I24/25,82,24).cpc.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	OFF	2020/12/18 06:11 AM
L255	21638	(h01I2224/3225,73267,82 03,04105,24226,92244).c pc.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	OFF	2020/12/18 06:11 AM
L256	2	("2003160929").PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L257	19474	(h05k1/111,189).cpc.	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L258	6914	(h05k2201/09427,09418, 09381,09954,10128).cpc.	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L259	4191	(g02f1/13458).cpc.	US-PGPUB; USPAT; EPO;	OR	ON	ON	2020/12/18

L260	40466	(257/773,774,737,738).ccl s.	JPO; DERWENT US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	06:11 AM 2020/12/18 06:11 AM
L261	637216	(samsung).as.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L262	5406	(lee near2 dae).inv.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L263	887	subpad	US-PGPUB; USPAT; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L264	6	pad same (carrier wafer substrate board) same display same subpad	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L265	3533	pad same (carrier wafer substrate board) same display same non adj display	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L266	2	("9591754").PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L267	104809	(inclined or slope or angle) near5 (pad electrode interconnect)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L268	111404	(bump ball) near5 pad	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L269	2330	L169 and L170	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L270	9137	parallelogram adj shape	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L271	20	L171 and L172	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L272	79	L170 and L172	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L273	358	L169 and L172	US-PGPUB; USPAT; USOCR; EPO; JPO;	OR	ON	ON	2020/12/18 06:11 AM

L274	506	L169 and L162	DERWENT				
			US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L275	652	L169 and (L157 L158 L159 L160)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L276	3	("6114754").PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	OFF	2020/12/18 06:11 AM
L277	7	((("9917113") or ("9591754"))).PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	OFF	2020/12/18 06:11 AM
L278	2	("20140321088").PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	OFF	2020/12/18 06:11 AM
L279	12	("2014/0321088").URPN.	USPAT	OR	ON	ON	2020/12/18 06:11 AM
L280	7	("20180182781" "20060007086" "20150021765" "20130099375" "9660171" "20090321953" "20140048930" "20150200210" "9698128" "20110024919" "20100171121" "20110233755" "9691678" "20090196003" "20090321954" "20150109544" "20130020722" "5998875" "20150270442" "7816690" "20020179904" "20170323999" "20160131350" "20170148954" "20100155862" "20030027423" "20150168754" "20150062966" "20070122013" "20120049223" "5410182" "20030003740"	USPAT	OR	ON	ON	2020/12/18 06:11 AM

		"6849873" "20150270461" "20150346869" "20070096155").pn.					
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L282	111404	(bump ball) near5 pad	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L283	2330	L183 and L184	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L284	264	L185 and (LCD (liquid near2 display) OLED)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	OFF	2020/12/18 06:11 AM
L285	4	("20060181299" "20060082001").pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	OFF	2020/12/18 06:11 AM
L286	0	L188 and pad and bump and inclin\$5	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	OFF	2020/12/18 06:11 AM
L287	1	L188 and pad and bump	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	OFF	2020/12/18 06:11 AM
L288	2	("7888678").pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L289	17	L122 and L171	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	OFF	2020/12/18 06:11 AM
L290	41	L123 and L171	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	OFF	2020/12/18 06:11 AM
L291	122	L125 and L171	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	OFF	2020/12/18 06:11 AM
L292	64	L126 and L171	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	OFF	2020/12/18 06:11 AM
L293	26	L127 and L171	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	OFF	2020/12/18 06:11 AM

L294	78	L128 and L171	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	OFF	2020/12/18 06:11 AM
L295	7	L129 and L171	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	OFF	2020/12/18 06:11 AM
L296	4	L130 and L171	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	OFF	OFF	2020/12/18 06:11 AM
L297	368	((inclined or slope or angle) near5 (pad electrode interconnect) and array adj substrate).clm.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L298	25	("8436467" "9660171" "9312232" "9018759" "5998875" "7888678" "8736079" "7786600" "8436462").pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L299	104809	(inclined or slope or angle) near5 (pad electrode interconnect)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L300	111404	(bump ball) near5 pad	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L301	2330	L214 and L215	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L302	141	L216 and (257/737- 738.ccls.)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L303	9	L217 and @ad>="20140617"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L304	132	L217 and @ad<="20140617"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:11 AM
L305	10	("10373987" "20110085119" "20090273753" "20080185705" "20100193947").pn.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:26 AM
L306	29222	(h01l27/124).cpc.	US-PGPUB; USPAT; USOCR; EPO; JPO;	OR	ON	ON	2020/12/18 06:27 AM

L307	79144	(h01I2224/16225).cpc.	DERWENT US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:27 AM
L308	26823	(h01I25/50).cpc.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:30 AM
L309	31620	(h01I24/81).cpc.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:30 AM
L310	197	216 AND 309	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:31 AM
L311	91	216 AND 308	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:31 AM
L312	209	216 AND 307	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:32 AM
L313	55	216 AND 306	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT	OR	ON	ON	2020/12/18 06:32 AM

PE2E SEARCH - Search History (Interference)

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Receipt date: 01/15/2020

Doc code: IDS ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /H.B.T/

PTO/SB/08a (02-18)

Doc description: Information Disclosure Statement (IDS) Filed

Approved for use through 11/30/2020. OMB 0651-0031

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	16510262
	Filing Date	2019-07-12
	First Named Inventor	Dae Geun LEE
	Art Unit	2813
	Examiner Name	TRINH, HOA B
	Attorney Docket Number	P6037USC1C1C1

U.S.PATENTS						
Examiner Initial*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	5951304		1999-09-14	WILDES et al.	
	2	9894792		2018-02-13	BAE et al.	Corresponding to CN 104123902
	3	6909488		2005-06-21	KURASAWA	Corresponding to CN 1441288

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Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ²	Kind Code ⁴	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T ⁵
	1	104123902	CN		2014-10-29	SAMSUNG DISPLAY CO LTD	Corresponding to US9,894,792	☐

Receipt date: 01/15/2020

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		16510262	
	Filing Date		2019-07-12	
	First Named Inventor	Dae Geun LEE		
	Art Unit	2813		
	Examiner Name	TRINH, HOA B		
	Attorney Docket Number	P6037USC1C1C1		

	2	1441288	CN		2003-09-10	SEIKO EPSON CORP	Corresponding to US 6,909,488	☐
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NON-PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T ⁵
	1		☐

If you wish to add additional non-patent literature document citation information please click the Add button

EXAMINER SIGNATURE

Examiner Signature	/HOA B TRINH/	Date Considered	03/02/2020
--------------------	---------------	-----------------	------------

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /H.B.T/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	16510262
	Filing Date	2019-07-12
	First Named Inventor	Dae Geun LEE
	Art Unit	2813
	Examiner Name	TRINH, HOA B
	Attorney Docket Number	P6037USC1C1C1

U.S. PATENTS						
Examiner Initial*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear
	1	5951304		1999-09-14	WILDES et al.	
	2	9894792		2018-02-13	BAE et al.	Corresponding to CN 104123902
	3	6909488		2005-06-21	KURASAWA	Corresponding to CN 1441288

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U.S. PATENT APPLICATION PUBLICATIONS						
Examiner Initial*	Cite No	Publication Number	Kind Code ¹	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear
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FOREIGN PATENT DOCUMENTS								
Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ²	Kind Code ⁴	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear	T ⁵
	1	104123902	CN		2014-10-29	SAMSUNG DISPLAY CO LTD	Corresponding to US9,894,792	☐

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		16510262	
	Filing Date		2019-07-12	
	First Named Inventor		Dae Geun LEE	
	Art Unit		2813	
	Examiner Name		TRINH, HOA B	
	Attorney Docket Number		P6037USC1C1C1	

	2	1441288	CN		2003-09-10	SEIKO EPSON CORP	Corresponding to US 6,909,488	☐
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If you wish to add additional Foreign Patent Document citation information please click the Add button

NON-PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T ⁵
	1		☐

If you wish to add additional non-patent literature document citation information please click the Add button

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Examiner Signature		Date Considered	
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*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

**INFORMATION DISCLOSURE
STATEMENT BY APPLICANT**
(Not for submission under 37 CFR 1.99)

Application Number	16510262
Filing Date	2019-07-12
First Named Inventor	Dae Geun LEE
Art Unit	2813
Examiner Name	TRINH, HOA B
Attorney Docket Number	P6037USC1C1C1

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

- ☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

- ☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

- ☐ See attached certification statement.
- ☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.
- ☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/William L. Brooks/	Date (YYYY-MM-DD)	2020-01-15
Name/Print	William L. Brooks	Registration Number	34,129

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
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9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt	
EFS ID:	38308067
Application Number:	16510262
International Application Number:	
Confirmation Number:	1231
Title of Invention:	ARRAY SUBSTRATE AND METHOD OF MOUNTING INTEGRATED CIRCUIT USING THE SAME
First Named Inventor/Applicant Name:	Dae Geun LEE
Customer Number:	58027
Filer:	Hae-Chan Park/Jihee Choi
Filer Authorized By:	Hae-Chan Park
Attorney Docket Number:	P6037USC1C1C1
Receipt Date:	15-JAN-2020
Filing Date:	12-JUL-2019
Time Stamp:	18:33:39
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	P6037USC1C1C1IDSFORM.pdf	72259	no	4
			24427989936af5192fae3d2ae3540ff211b5771a		

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Information:					
This is not an USPTO supplied IDS fillable form					
2	Foreign Reference	P6037USC1C1C1FR1.pdf	24453733	no	28
			e58d0542c42ae737694d0a8c8a1cb7ca5b46cb1c		
Warnings:					
Information:					
3	Foreign Reference	P6037USC1C1C1FR2.pdf	19000698	no	21
			81ff4675c48a9d27f68c1174cf010356627716b8		
Warnings:					
Information:					
Total Files Size (in bytes):				43526690	
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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/510,262	07/12/2019	Dae Geun LEE	P6037USC1C1C1

CONFIRMATION NO. 1231

58027
H.C. PARK & ASSOCIATES, PLC
1894 PRESTON WHITE DRIVE
RESTON, VA 20191

PUBLICATION NOTICE



OC000000112309471

Title:ARRAY SUBSTRATE AND METHOD OF MOUNTING INTEGRATED CIRCUIT USING THE SAME

Publication No.US-2019-0333939-A1

Publication Date:10/31/2019

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The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently <http://www.uspto.gov/patft/>.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Public Records Division. The Public Records Division can be reached by telephone at (571) 272-3150 or (800) 972-6382, by facsimile at (571) 273-3250, by mail addressed to the United States Patent and Trademark Office, Public Records Division, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently <https://portal.uspto.gov/pair/PublicPair>. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

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Application number: 10-2014-0073756

Date of availability of document: 10 Jul 2019 (10.07.2019)

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출 원 번 호 : 10-2014-0073756
Application Number

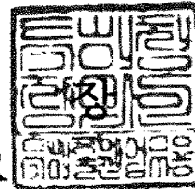
출 원 년 월 일 : 2014년 06월 17일
Filing Date Jun. 17, 2014

출 원 인 : 삼성디스플레이 주식회사
Applicant(s) Samsung Display Co., Ltd.

2019년 09월 19일

특 허 청

COMMISSIONER



제출 일자 : 2014-06-17

【서지사항】

【서류명】	특허출원서
【출원구분】	특허출원
【출원인】	
【명칭】	삼성디스플레이 주식회사
【특허고객번호】	1-2012-016455-2
【대리인】	
【명칭】	특허법인 가산
【대리인번호】	9-2007-100101-9
【지정된변리사】	김국현, 김동진
【포괄위임등록번호】	2012-056833-0
【발명의 국문명칭】	어레이 기판 및 이를 이용한 집적 회로 실장 방법
【발명의 영문명칭】	ARRAY SUBSTRATE AND METHOD FOR MOUNTING INTEGRATED CIRCUIT USING THE SAME
【발명자】	
【성명】	이대근
【성명의 영문표기】	LEE, Dae Geun
【주민등록번호】	770405-1XXXXXX
【우편번호】	445-790
【주소】	경기도 화성시 동탄중앙로 213 (반송동, 시범한빛마을금호 어울림아파트) 245동
【국적】	KR

제출 일자 : 2014-06-17

【취지】 위와 같이 특허청장에게 제출합니다.

대리인 특허법인 가산

(서명 또는 인)

【수수료】

【출원료】	0	면	46,000	원
【가산출원료】	40	면	0	원
【우선권주장료】	0	건	0	원
【심사청구료】	0	항	0	원
【합계】	46,000			원

【판명의 설명】

【판명의 명칭】

아레이 기판 빛 이용한 집적 회로 실장 방법 (ARRAY SUBSTRATE AND

METHOD FOR MOUNTING INTEGRATED CIRCUIT USING THE SAME)

【기술분야】

【0001】 본 발명은 아레이 기판 빛 이용한 집적 회로 실장 방법에 관한

것이다.

【발명의 배경이 되는 기술】

【0002】 액정 표시 장치(LCD) 또는 유기 발광 표시 장치(OLED) 등과 같은 표

시 장치는 표시 영역과 표시 영역에 외측에 배치되는 비표시 영역을 포함하는 아레이

이 기판을 포함할 수 있다. 아레이 기판은 액정 표시 장치나 유기 발광 표시 장치

등에서 각 화소를 독립적으로 구동하기 위한 회로 기판으로 사용된다. 아레이 기판

상에는 주사 신호를 전달하는 게이트 배선과 화상 신호를 전달하는 데이터 배선,

박막 트랜지스터, 각종 유기 또는 무기 절연막 등이 배치되어 있고, 이 중 박막 트

랜지스터는 게이트 배선의 일부인 게이트 전극과 채널을 형성하는 반도체층, 데이터

터 배선의 일부인 소스 전극과 드레인 전극 등으로 이루어져, 소위 칩 조자로서의

역할을 한다.

【0003】 표시 영역의 외측에 배치되는 비표시 영역에는 표시 영역의 게이트

라인 또는 데이터 라인과 연결되는 복수의 배선이 배치된다. 복수의 배선은 다양한

형태로 연장되며 그 일단이 어레이 기판 하부 패드부에 배치된 패드들과 연결될 수 있다. 패드부에는 게이트 라인과 데이터 라인에 각각 구동 신호를 인가하는 구동 집적 회로에 배치될 수 있다. 즉, 구동 집적 회로의 범프는 패드부의 각 패드와 1:1 매칭되어 정렬되며, 각 구동 신호를 패드부에 제공한다.

【발명의 내용】

【해결하고자 하는 과제】

【0004】 이러한 어레이 기판은 표시 장치가 플렉서블화 됨에 따라, 폴리 이미드(polyimide)와 같은 가요성 물질로 형성될 수 있다. 다만, 가요성 어레이 기판은 패드부가 형성된 이후, 수행되는 제조 공정에서 기판의 크기의 변화될 수 있다. 즉, 이에 따라 구동 집적 회로의 범프와 패드부가 오정렬(Miss-Alignment)되는 문제가 발생한다.

【0005】 이에 본 발명이 해결하고자 하는 과제는, 가요성 어레이 기판의 크기가 변화하더라도 구동 집적 회로의 범프와 패드부의 오정렬(Miss-Alignment)을 방지할 수 있는 어레이 기판을 제공하고자 하는 것이다.

【0006】 나아가, 본 발명이 해결하고자 하는 다른 과제는, 가요성 어레이 기판의 크기가 변화하더라도 구동 집적 회로의 범프와 패드부의 오정렬(Miss-Alignment)을 방지할 수 있는 집적 회로 실장 방법을 제공하고자 하는 것이다.

【0007】 본 발명의 과제들은 이상에서 언급한 기술적 과제로 제한되지 않으며, 언급되지 않은 또 다른 기술적 과제들은 아래의 기재로부터 당업자에게 명확하

게 이해될 수 있을 것이다.

【과제의 해결 수단】

【0008】 상기 파제를 해결하기 위한 본 발명의 일 실시예에 따른 어레이 기판은 표시 영역 및 상기 표시 영역을 둘러싸는 비표시 영역을 포함하는 어레이 기판에 있어서, 상기 비표시 영역은 페드부를 포함하고, 상기 페드부는 적어도 하나의 평행사변형 형태의 제1 페드를 포함한다.

【0009】 상기 제1 페드는 제1 방향으로 연장된 제1 단면, 상기 제1 단면과 평행한 제2 단면, 상기 제1 단면의 일단으로부터 제1 경사각을 형성하며 연장되는 제1 장면 및 상기 제1 장면과 평행하는 제2 장면을 포함할 수 있다.

【0010】 또한, 상기 페드부는 적어도 하나의 직사각형 형태의 제2 페드를 중첩부에 더 포함할 수 있다.

【0011】 상기 제1 페드는 복수이고, 상기 복수의 제1 페드는 제2 페드를 기준으로 대칭되어 배치될 수 있다.

【0012】 나아가, 상기 제1 페드는 복수이고, 상기 복수의 제1 페드는 상기 페드부를 양분하는 가상의 선을 기준으로 대칭되어 배치될 수 있다.

【0013】 상기 가상의 선과 가까이 위치할수록 상기 제1 페드의 단면과 장면이 형성하는 경사각은 커질 수 있다.

【0014】 상기 페드부는 데이터 구동 집적회로가 실장되는 제1 페드부와 연결 인쇄 회로 기판이 실장되는 제2 페드부를 포함하고, 상기 제1 페드부 및 상기 제2

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패드부 각각 상기 제1 패드를 적어도 하나 포함할 수 있다.

【0015】 상기 데이터 구동 집적회로와 상기 연성 인쇄 회로 기판은 상기 제1

패드의 형상에 대응되는 적어도 하나의 범포를 포함하고, 상기 제1 패드의 장변은

상기 범포의 장변보다 길게 형성될 수 있다.

【0016】 상기 파제를 해결하기 위한 본 발명의 다른 실시예에 따른 어레이

기판은 표시 영역 및 상기 표시 영역을 둘러싸는 비표시 영역을 포함하는 어레이

기판에 있어서, 상기 비표시 영역은 패드부를 포함하되, 상기 패드부는 상기 패드

부를 양분하는 가상의 선과의 이격 거리가 서로 상이한 제1 서브 패드부 및 제2 서

브 패드부를 포함한다.

【0017】 상기 제1 서브 패드부와 상기 제2 서브 패드부는 각각 제1 방향을

따라 배열되는 복수의 패드를 포함할 수 있다.

【0018】 상기 복수의 패드는 상기 가상의 선을 기준으로 대칭될 수 있다.

【0019】 상기 복수의 패드는 직사각형 형태일 수 있다.

【0020】 상기 복수의 패드는 평행사변형 형태일 수 있다.

【0021】 상기 복수의 패드는 단변과 장변이 형성하는 경사각이 서로 상이하

고, 상기 경사각은 상기 가상의 선과 가까운수록 커질 수 있다.

【0022】 상기 제1 서브 패드부와 상기 제2 서브 패드부는 상기 제1 방향과

수직인 제2 방향을 따라 배치될 수 있다.

【0023】 상기 다른 과제를 해결하기 위한 본 발명의 일 실시예에 따른 직접 회로 실장 방법은 어레이 기판의 패드부와 집적 회로의 범프를 정렬하는 단계, 상기 패드부와 상기 범프의 제1 방향에 따른 오정렬 값(b)를 산출하는 단계 및 상기 오정렬 값(b)에 대응하여 상기 집적 회로를 상기 제1 방향과 수직인 제2 방향으로 이동하는 단계를 포함한다.

【0024】 상기 패드부는 적어도 하나의 평행사변형 형태의 제1 패드를 포함하고, 상기 평행사변형의 단변과 장변은 제1 경사각($\theta 1$)의 기울기를 형성할 수 있다.

【0025】 상기 집적 회로의 이동 거리(a)는 상기 제1 방향에 따른 오정렬 값(b)에 상기 제1 경사각($\theta 1$)의 탄젠트 값을 곱한 값일 수 있다.

【0026】 상기 집적 회로의 범프는 상기 제1 패드와 대응되는 기울기를 가지는 평행사변형 형태이고, 상기 제1 패드의 장변은 상기 범프의 장변보다 길게 형성될 수 있다.

【0027】 상기 패드부는 상기 패드부를 양분하는 가상의 선과의 이격 거리가 서로 상이한 제1 서브 패드부 및 제2 서브 패드부를 포함하고, 상기 제1 서브 패드부 및 상기 제2 서브 패드부는 제2 방향을 따라 배치되되, 상기 집적 회로의 이동 단계는, 상기 제1 서브 패드부에서 제2 서브 패드부로 집적 회로를 이동하는 단계일 수 있다.

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【0028】 기타 원시예의 구체적인 사항들은 상세한 설명 및 도면들에 포함되어 있다.

【발명의 효과】

【0029】 본 발명의 원시예들에 의하면 적어도 다음과 같은 효과가 있다.

【0030】 구동 칩 회로의 범포와 패드부의 오정렬(Miss-Aligment)을 방지할 수 있다.

【0031】 또한, 구동 칩 회로의 설장 효율성을 높일 수 있다.

【0032】 본 발명에 따른 효과는 이상에서 예시된 내용에 의해 제한되지 않으며, 더욱 다양한 효과들이 본 명세서 내에 포함되어 있다.

【도면의 간단한 설명】

【0033】 도 1은 본 발명의 원시예에 따른 어레이 기판의 평면도이다.

도 2는 본 발명의 원시예에 따른 어레이 기판의 패드부와 테이터 구동 칩 회로와의 범포를 개략적으로 나타낸 평면도이다.

도 3은 패드부에 정장 설장 된 범포를 개략적으로 나타낸 평면도이다.

도 4 내지 도 7은 어레이 기판의 패장 또는 수축에 따른 패드부의 변형과 이에 대응한 범포의 이동을 나타낸 평면도이다.

도 8은 본 발명의 다른 원시예에 따른 제1 패드부의 개략적인 형태를 나타낸 평면도이다.

도 9는 본 발명의 또 다른 원시예에 따른 제1 패드부의 개략적인 형태를 나타

타낸 평면도이다.

도 10 내지 도 12는 본 발명의 또 다른 실시예에 따른 패드부의 개략적인 형태를 나타낸 평면도이다.

도 13은 본 발명의 또 다른 실시예에 따른 패드부의 개략적인 형태를 나타낸 평면도이다.

도 13은 본 발명의 다른 실시예에 따른 전압 생성부의 블록도이다.

도 14는 본 발명의 또 다른 실시예에 따른 집적 회로 실장 방법의 순서도이다.

【발명을 실시하기 위한 구체적인 내용】

【0034】 본 발명의 이점 및 특징, 그리고 그것들을 달성하는 방법은 첨부되는 도면과 함께 상세하게 후술되어 있는 실시예들을 참조하면 명확해질 것이다. 그러나 본 발명은 이하에서 개시되는 실시예들에 한정되는 것이 아니라 서로 다른 다양한 형태로 구현될 것이며, 단지 본 실시예들은 본 발명의 개시가 완전하도록 하며, 본 발명이 속하는 기술분야에서 통상의 지식을 가진 자에게 발명의 범주를 완전하게 알려주기 위해 제공되는 것이며, 본 발명은 청구항의 범주에 의해 정의될 뿐이다.

【0035】 본 명세서에서, 동일한 식별 부호는 동일한 구성을 지칭한다.

【0036】 비록 제1, 제2 등이 다양한 구성요소들을 서술하기 위해서 사용되나, 이들 구성요소들은 이들 용어에 의해 제한되지 않음은 물론이다. 이들

용어들은 단지 하나의 구성요소를 다른 구성요소와 구별하기 위하여 사용하는 것이다. 따라서, 이하에서 언급되는 제1 구성요소는 본 발명의 기술적 사상 내에서 제2 구성요소일 수도 있음은 물론이다.

【0037】 이하, 첨부된 도면을 참고로 하여 본 발명의 실시예들에 대해 설명한다.

【0038】 도 1은 본 발명의 일 실시예에 따른 어레이 기판의 평면도이다.

【0039】 도 1을 참조하면, 어레이 기판(100)은 표시 영역(DA)과 비표시 영역(NA)을 포함한다.

【0040】 표시 영역(DA)은 화상이 표시되는 영역일 수 있다. 표시 영역(DA)은 매트릭스 배열된 복수의 화소(PX)를 포함할 수 있다. 각 화소(PX)에는 화상을 표시하는 표시 소자 및 표시 소자와 전기적으로 연결되는 박막 트랜지스터 등이 형성될 수 있다. 여기서, 표시 소자는 유기 발광 소자일 수 있지만, 이에 한정되는 것은 아니다. 각 화소(PX)는 게이트 라인(GL)과 이와 교차하는 데이터 라인(DL)에 의해 정의될 수 있다. 게이트 라인(GL)은 제1 방향(X)을 따라 연장될 수 있으며, 데이터 라인(DL)은 제1 방향(X)과 교차하는 제2 방향(Y)을 따라 연장될 수 있다. 여기서 제1 방향(X)은 매트릭스 배열된 복수의 화소(PX)의 행방향에 대응하고, 제2 방향(Y)은 열방향에 대응할 수 있다.

【0041】 비표시 영역(NA)은 화상이 표시되지 않은 영역일 수 있으며, 표시 영역(DA)을 둘러쌀 수 있다. 비표시 영역(NA)은 어레이 기판(100)의 에지와 인접한

영역일 수 있으며, 어레이 기판(100)의 가장자리부에 위치한 영역일 수 있다. 비표시 영역(NA)은 제1 패드부(110), 게이트 구동부(120) 및 전원 공급부(130) 등이 형성될 수 있다.

【0042】 제1 패드부(110)는 데이터 라인(DL)에 데이터 신호 전압을 인가하는 데이터 구동 집적회로(IC)가 실장되는 영역일 수 있다. 즉, 데이터 구동 집적회로(IC)는 COG(Chip On Glass) 방식으로 어레이 기판(100)에서 제1 패드부(110) 상에 배치되는 실장될 수 있다. 즉, 제1 패드부(110)는 COG 패드부일 수 있다. 여기서 어레이 기판(100)이 가요성 물질로 형성되었다면 COP(Chip On Plastic)이라 정의할 수 있다. 게이트 구동부(120)는 데이터 구동 집적회로(IC)가 형성된 가장자리에 수직인 일측 가장자리에 형성될 수 있다. 게이트 구동부(120)는 게이트 라인(GL)으로 게이트 신호 전압을 제공할 수 있으며, 복수의 화소(PX)를 순차적으로 스캔할 수 있다. 전원 공급부(130)은 데이터 구동 집적회로(IC)가 형성된 가장자리에 수직인 타측 가장자리에 형성될 수 있다. 전원 공급부(130)은 각 화소(PX)의 구동에 필요한 전원 전압을 제공할 수 있다.

【0043】 여기서, 제1 패드부(110)는 일방향으로 배열된 복수의 패드를 포함할 수 있으며, 데이터 구동 집적회로(IC)는 상기 복수의 패드와 대응하는 범프를 포함할 수 있다. 즉, 데이터 구동 집적회로(IC)의 각 범프와 제1 패드부(110)의 각 패드는 일대일 대응되어 연결될 수 있다. 이하, 도 2 내지 도 7을 참조하여, 복수의 패드와 복수의 범프의 관계에 대해 보다 상세히 설명하도록 한다.

【0044】 도 2는 본 발명의 일 실시예에 따른 어레이 기판의 패드부와 데이터 구동 집적회로의 범프를 개략적으로 나타낸 평면도이며, 도 3은 패드부에 정상 실장된 범프를 개략적으로 나타낸 평면도이며, 도 4 내지 도 7은 어레이 기판의 팽창 또는 수축에 따른 패드부의 변형과 이에 대응한 범프의 이동을 나타낸 평면도이다.

【0045】 도 2 내지 도 7을 참조하면, 제1 패드부(110)는 복수의 패드(P1, P2, P3)를 포함할 수 있다. 복수의 패드(P1, P2, P3)는 제1 방향(X)을 따라 배열될 수 있다. 제1 패드부(110)은 제1 서브 패드부(110a), 제2 서브 패드부(110b) 및 제3 서브 패드부(110c)로 정의될 수 있다.

【0046】 제1 서브 패드부(110a)는 제1 패드부(110)의 일단에 위치할 수 있으며, 제2 서브 패드부(110b)는 제1 패드부(110)에서 중심부에 위치할 수 있으며, 제3 서브 패드부(110c)는 제1 패드부(110)의 타단에 위치할 수 있다. 즉, 제1 서브 패드부(110a)와 제3 서브 패드부(110c)는 제2 서브 패드부(110b)를 기준으로 대칭될 수 있다. 제1 서브 패드부(110a)와 제3 서브 패드부(110c)는 거울 쌍 관계로 동일한 구성일 수 있다.

【0047】 제1 서브 패드부(110a)는 적어도 하나의 제1 경사각($\theta 1$)으로 기울어진 평행사변형 형태의 제1 패드(P1)를 포함할 수 있다. 제1 패드(P1)는 제1 방향(X)으로 연장된 제1 단변(S1), 제1 단변(S1)과 평행한 제2 단변(S2), 제1 단변(S1)과 제1 경사각($\theta 1$)을 형성하는 제1 장변(L1) 및 제1 장변(L1)과 평행한 제2 장변(L2)을 포함할 수 있다. 즉, 제1 장변(S1)은 제1 단변(S1)의 일단에서 제1 경사각($\theta 1$)을 가지도록 연장되어 제2 단변(S2)의 일단과 접할 수 있다. 그리고 제2 장

변(S2)은 제1 단변(S1)의 타단에서 제1 경사각($\theta 1$)을 가지도록 연장되어 제2 단변(S2)의 일단과 접할 수 있다. 여기서 제1 패드(P1)는 제1 단변(S1)을 기준으로 양의 제1 방향(+X)과 양의 제2 방향(+Y)의 합의 방향으로 기울어질 수 있으나, 이에 한정되는 것은 아니다. 몇몇 실시예에서 제1 서브 패드부(110a)에 포함된 패드(P)는 제1 단변(S1)을 기준으로 음의 제1 방향(-X)과 양의 제2 방향(+Y)의 합의 방향으로 기울어질 수 도 있다. 여기서, 제1 경사각($\theta 1$)은 어레이 기판(100)에서 제1 패드부(110)와 표시 영역(DA)간의 거리 등을 고려하여 공정 상 조절될 수 있는 것으로 특정 각도에 한정되는 것은 아니다.

【0048】 제2 서브 패드부(110b)는 적어도 하나의 직사각형 형태의 제2 패드(P2)를 포함할 수 있다. 즉, 제2 서브 패드부(110b)는 단변에 대해 수직한 장변을 가지고 경사지지 않은 제2 패드(P)를 포함할 수 있다.

【0049】 제3 서브 패드부(110c)는 제2 서브 패드부(110b)를 기준으로 제1 서브 패드부(110a)와 대칭될 수 있다. 즉, 제3 서브 패드부(110c)는 제1 단변(S1)을 기준으로 음의 제1 방향(-X)과 양의 제2 방향(+Y)의 합의 방향으로 기울어진 적어도 하나의 제3 패드(P3)를 포함할 수 있다. 제1 패드(P1)와 제3 패드(P3)는 제2 방향(Y)으로 갈수록 제2 서브 패드부(110b) 쪽으로 기울어진 형태일 수 있다. 즉, 제1 패드부(110)는 중심부에 위치하여 기울어지지 않는 사각형 형상의 제2 패드(P2)를 포함할 수 있다. 그리고, 제1 패드부(110)는 일단과 타단에 각각 위치하고 제2 패드(P2)쪽으로 기울어진 평행사변형 형태의 제1 패드(P1) 및 제3 패드(P3)를 포함할 수 있다.

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【0050】 데이터 구동 집적회로(IC)는 복수의 범포(B)를 포함할 수 있다. 복

수의 범포(B)는 제1 페드부(110)와 대응되는 형성될 수 있다. 즉, 복수의 범포(B)

의 중심부에는 경사를 가지지 않는 사각형 형상의 범포가 위치할 수 있으며, 이를

기준으로 중심부쪽으로 경사진 평행사변형의 범포가 일단과 타단에 각각 위치할 수

있다.

【0051】 데이터 구동 집적회로(IC)의 각 범포(B)는 제1 페드부(110)의 페드

와 대응되어 연결될 수 있다. 즉, 데이터 구동 집적회로(IC)의 각 범포(B)와 제1

페드부(110)의 각 페드는 이방성 전도 필름(ACF)를 통해 연결될 수 있으며, 이를

통해 전기적인 신호를 주고 받을 수 있다. 도 3에 도시된 바와 같이, 기 설계한 대

로 정상적으로 어레이 기판(100)이 형성되었을 경우 각 범포(B)는 제1 페드부(11

0)의 페드와 일대일로 매칭될 수 있으며, 데이터 구동 집적회로(IC)는 정상적으로

어레이 기판(100)에 실장될 수 있다. 제1 페드부(110)는 범포(B)와의 용이한 결합

을 위해, 단면과 장변의 권이(가 범포(B)의 단면과 장변의 권이보다 크게 형성될 수

있다. 즉, 제1 페드부(110)의 각 페드의 전체적인 크기는 각 범포보다 크게 형성될

수 있다. 여기서, 각 페드의 장변은 후술할 구동 집적회로(IC)의 제2 방향(Y)의 이

동을 보장하기 위해 범포(B)의 장변보다 보다 크게 형성될 수 있다. 각 페드의 장

변은 범포(B)의 장변보다 1.5배 내지 2배의 권이일 수 있으나, 이에 한정되는 것은

아니다.

【0052】 가요성 물질을 형성된 어레이 기판(100)은 공정 과정 중에서 수축

또는 팽창이 발생될 수 있다. 어레이 기판(100)의 팽창과 수축은 제1 페드부(110)

가 형성된 이후 수행되는 공정 과정에서 주로 발생될 수 있다. 어레이 기판(100)은 제1 방향(X) 및/또는 제2 방향(Y)을 따라 수축 또는 팽창될 수 있다.

【0053】 즉, 도 4에 도시된 바와 같이, 어레이 기판(100)은 제1 방향(X)을 따라 팽창될 수 있으며, 도 6에 도시된 바와 같이, 어레이 기판(100)은 제1 방향(X)을 따라 수축될 수 있다. 이러한 제1 방향(X)에 따른 어레이 기판의 팽창 또는 수축은 어레이 기판(100)의 말단부에 주로 발생하기 때문에, 제1 서브 패드부(110a)와 제3 서브 패드부(110c)는 큰 영향을 받을 수 있다. 즉, 제1 서브 패드부(110a)와 제3 서브 패드부(110c)는 어레이 기판(100)의 팽창에 따라 기 설계된 위치보다 바깥쪽으로 위치하게 될 수 있으며, 어레이 기판(100)의 수축에 따라 기 설계된 위치보다 보다 안쪽으로 위치하게 될 수 있다. 제1 서브 패드부(110a)와 제3 서브 패드부(110c)의 위치 변화에 의해 데이터 구동 집적회로(IC)의 복수의 범프(B)와의 오정렬이 유발될 수 있다.

【0054】 다만, 본 실시예에 따른 제1 패드부(110)와 복수의 범프(B)는 상기 설명한 바와 같이, 일정한 기울기로 경사진 평행사변형 형태이기 때문에 어레이 기판의 변형에 유연하게 대응할 수 있다. 도 4와 같이 어레이 기판(100)이 팽창된 경우, 데이터 구동 집적회로(IC)를 양의 제2 방향(+Y)으로 이동하여 변형된 제1 패드부(110)와 복수의 범프(B)를 정렬시킬 수 있다. 즉, 도 5에 도시된 바와 같이, 양의 제2 방향(+Y)으로 이동된 데이터 구동 집적회로(IC)는 제1 패드부(110)와 정렬될 수 있으며, 정상적으로 실장될 수 있다. 또한, 도 6과 같이 어레이 기판(100)이 수축된 경우, 데이터 구동 집적회로(IC)를 음의 제2 방향(-Y)으로 이동하여 변형된

제1 패드부(110)와 복수의 범프(B)를 정렬시킬 수 있다. 즉, 도 7에 도시된 바와 같이, 음의 제2 방향(-Y)으로 이동된 데이터 구동 집적회로(IC)는 제1 패드부(110)와 정렬될 수 있으며, 정상적으로 실장될 수 있다.

【0055】 여기서, 오정렬을 수정하기 위해 필요한 데이터 구동 집적회로(IC)의 제2 방향(Y)의 이동 거리(a)는 제1 방향(X)만큼 오 정렬된 길이(b)를 고려하여 다음과 같은 수학적식1로 계산될 수 있다.

【0056】 [수학적식 1]

【0057】 $a = b \tan \theta$

【0058】 즉, 본 실시예에 따른 어레이 기판(100)은 수축 또는 팽창에 의한 제1 패드부(110)의 변형이 발생하더라도, 데이터 구동 집적회로(IC)를 양 또는 음의 제2 방향(+Y, -Y)으로 위치 변경하여 제1 패드부(110)와 범프(B)의 오정렬을 수정할 수 있다. 이에 따라 구동 집적 회로의 실장 효율성을 높일 수 있다.

【0059】 다시, 도 1을 참조하면 어레이 기판(100)은 연성 인쇄 회로 기판(FPC)와의 결합을 위한 제2 패드부(140)를 더 포함할 수 있다. 즉, 제2 패드부(140)는 FOG 패드부일 수 있다. 연성 인쇄 회로 기판(FPC)은 표시 장치의 구동을 제어하는 호스트(미도시)로부터 제공되는 어레이 기판(100)의 구동에 필요한 신호들을 전달하는 가교 역할을 할 수 있다. 연성 인쇄 회로 기판(FPC)은 제2 패드부(140)와의 연결을 위한 복수의 범프를 포함할 수 있으며, 각 범프는 이방성 도전 필름(ACF)를 통해 대응되는 제2 패드부(140)의 각 패드와 전기적으로 결합할 수 있

다. 결합된 범프와 패드를 통해 연성 인쇄 회로 기판(FPC)는 제2 패드부(140)와 전기적으로 신호를 주고 받을 수 있다.

【0060】 제2 패드부(140)는 어레이 기판(100)의 에지 영역을 따라 배치될 수 있으며, 제1 패드부(110)보다 더 외곽 영역에 배치될 수 있다. 제2 패드부(140)는 제1 패드부(110), 게이트 구동부(120) 및 전원 공급부(130)와 배선을 통해 전기적으로 연결될 수 있으며, 신호를 전달할 수 있다.

【0061】 제2 패드부(140) 또한 상술한 어레이 기판(100)의 변형에 영향을 받을 수 있으며, 이에 따라 말단부의 배열이 변경될 수도 있다. 다만, 본 실시예에 따른 제2 패드부(140)의 형태 또한 제1 패드부(110)와 실질적으로 동일할 수 있기에, 이러한 어레이 기판(100)의 변형에 유연하게 대응할 수 있다. 즉, 제2 패드부(140)의 양 말단부는 일정한 기울기로 경사진 평행사변형 형태의 패드로 구성될 수 있으며, 이에 따라 연성 인쇄 회로 기판(FPC)을 제2 방향(Y)을 따라 이동하여 오정렬을 수정할 수 있다.

【0062】 이하, 본 발명의 다른 실시예에 대해 설명하도록 한다. 이하의 실시예에서, 이미 언급된 구성과 동일한 구성에 대해서는 그 설명을 생략하거나 간략화하고 차이점을 위주로 설명한다.

【0063】 도 8은 본 발명의 다른 실시예에 따른 제1 패드부의 개략적인 형태를 나타낸 평면도이다.

【0064】 도 8을 참조하면, 제1 패드부(210)는 적어도 하나의 평행사변형 형

서 가장의 선(CL)은 제2 방향(Y)과 나란하게 연장될 수 있다.

【0068】여기서, 복수의 제1 패드(P)는 단면과 장면이 형성하는 경사각이 서로 다를 수 있다. 그리고, 제1 패드의 단면과 장면이 형성하는 경사각은 가장의 선(CL)과 가까이 위치할수록 커질 수 있다. 제1 패드부(310)에서 가장 란단에 위치하

생략하거나 간략화하고 차이점을 위주로 설명한다.

【0067】도 9를 참조하면, 제1 패드부(310)는 적어도 하나의 평형 사면형 형태의 제1 패드(P)를 포함할 수 있다. 제1 패드(P)는 복수일 수 있으며, 복수의 제1 패드(P)는 제1 방향(X)을 따라 배열될 수 있다. 그리고 복수의 제1 패드(P)는 제1 패드부(310)를 양분하는 가장의 선(CL)을 기준으로 대칭되어 배치될 수 있다. 여기

【0066】도 9는 본 발명의 또 다른 실시예에 따른 제1 패드부의 개략적인 형태를 나타낸 평면도이다. 이미 언급된 구성과 동일한 구성에 대해서는 그 설명을 생략하거나 간략화하고 차이점을 위주로 설명한다.

【0065】도 1 내지 도 7의 제1 패드부(110)와 비교하여, 본 실시예에 따른 제1 패드부(210)는 중심부에도 평형사면형 형태의 제1 패드(P)가 배열될 수 있다. 공정 환경에 따라 어레이 기판의 수축 또는 팽창은 제1 패드부(210)의 중심부의 패드 배열까지 변화를 줄 수 있다. 본 실시예에 따른 제1 패드부(210)는 이러한 어레이 기판의 변화에 적절히 대응할 수 있는 효과를 제공할 수 있다.

제1 패드(P)는 제1 방향(X)을 따라 배열될 수 있다. 그리고 복수의 제1 패드(P)는 제1 패드부(210)를 양분하는 가장의 선(CL)을 기준으로 대칭되어 배치될 수 있다. 여기

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는 패드의 단면과 장변이 형성하는 경사각(θ_1)은 이와 이웃하는 패드의 단면과 장변이 형성하는 경사각(θ_2)보다 작을 수 있다. 그리고, 가상의 선(CL)과 가장 가까운 면이 형성하는 패드의 단면과 장변이 형성하는 경사각은 실질적으로 90도일 수 있다.

【0069】공정 환경에 따라 여러이 기판의 변형 정도는 중심부에서 말단부까지 달리 나타날 수 있으며, 말단부로 관수축 변형 정도가 커질 수 있다. 본 실시예에 따른 제1 패드부(310)는 이러한 여러이 기판의 변형에 적절히 대응할 수 있는 효과를 제공할 수 있다.

【0070】도 10 내지 도 12는 본 발명의 또 다른 실시예에 따른 패드부의 개략적인 형태를 나타낸 평면도이다.

【0071】도 10 내지 도 12를 참조하면, 제1 패드부(410)는 여러이 기판의 비표시 영역(NA)에 형성될 수 있으며, 테이터 구동 집적회로(IC)가 실장되는 영역일 수 있다. 테이터 구동 집적회로(IC)는 복수의 범프(B)를 포함하고 있으며, 각 범프(B)는 제1 패드부(410)의 각 패드와 정렬되어 결합될 수 있다.

【0072】제1 패드부(410)는 제1 서브 패드부(410a) 내지 제3 서브 패드부(410c)를 포함한다. 여기서, 제1 서브 패드부(410a) 내지 제3 서브 패드부(410c)는 제2 방향(Y)을 따라 배치될 수 있다. 제1 내지 제3 서브 패드부(410a, 410b, 410c)는 테이터 구동 집적회로(IC)의 복수의 범프(B)와 대응되는 복수의 패드(P)를 각각 포함할 수 있다. 여기서, 복수의 패드(P)는 직사각형 형상일 수 있다. 각 서브 패드부에 포함된 복수의 패드(P)는 제1 방향(X)을 따라 배열될 수 있다. 또한, 복수의 패드(P)는 제1 패드부(410)를 양끝하는 가상의 선(CL)을 기준으로 대칭하여

배치될 수 있다. 데이터 구동 집적회로(IC)는 제1 내지 제3 서브 패드부(410a, 410b, 410c) 중 어느 하나와 연결될 수 있다. 예시적으로 복수의 범프(B)는 제2 및 제3 서브 패드부(410b, 410c)과는 연결되지 않고 제1 서브 패드부(410a)와 정렬되어 연결될 수 있다. 이 경우 데이터 구동 집적회로(IC)는 제1 서브 패드부(410a)를 통해 데이터 전압 신호를 표시 영역(DA)에 제공할 수 있다.

【0073】 제1 서브 패드부(410a) 내지 제3 서브 패드부(410c)는 제1 패드부(410)를 양분하는 가상의 선(CL)과의 이격 거리가 서로 상이할 수 있다. 여기서, 가상의 선(CL)은 제1 패드부(410)의 중심을 제2 방향(Y)으로 가로지르는 선일 수 있다. 즉, 제1 서브 패드부(410a)는 가상의 선(CL)과 가장 가까이 배치될 수 있으며, 제3 서브 패드부(410c)는 가상의 선(CL)과 가장 멀리 배치될 수 있다. 그리고 제2 서브 패드부(410b)는 제1 서브 패드부(410a)보다 멀고 제3 서브 패드부(410c)보다 가까이 가상의 선(CL)과 이격될 수 있다.

【0074】 여기서, 도 10에 도시된 바와 같이, 제2 서브 패드부(410b)에 포함된 복수의 패드(P)의 배열 위치는 데이터 구동 집적회로(IC)의 기 설계된 범프(B)의 배열 위치와 일치할 수 있다. 즉, 제1 패드부(410)가 형성된 어레이 기판의 변형이 발생되지 않는다면 데이터 구동 집적 회로(IC)의 범프(B)는 제2 서브 패드부(410b)의 패드(P)에 정렬될 수 있으며, 데이터 구동 집적 회로(IC)는 제2 서브 패드부(410b)에 실장될 수 있다.

【0075】 다만, 도 11에 도시된 바와 같이, 어레이 기판이 팽창되는 경우 제1 내지 제3 서브 패드부(410a, 410b, 410c)의 배열은 어레이 기판의 바깥 방향으로

팽창될 수 있다. 이 경우, 제2 서브 패드부(410b)에 포함된 복수의 패드(P)의 배열 위치는 데이터 구동 집적회로(IC)의 기 설계된 범프(B)의 배열 위치와 일치하지 않게 될 수 있다. 대신, 제1 서브 패드부(410a)에 포함된 복수의 패드(P)의 배열 위치가 구동 집적 회로(IC)의 기 설계된 범프(B)의 배열 위치와 일치할 수 있다. 즉, 데이터 구동 집적 회로(IC)는 제1 서브 패드부(410a)에 정상적으로 실장될 수 있다.

【0076】 또한, 도 12에 도시된 바와 같이, 어레이 기판이 수축되는 경우 제1 내지 제3 서브 패드부(410a, 410b, 410c)의 배열은 어레이 기판의 안쪽 방향으로 수축될 수 있다. 이 경우, 제2 서브 패드부(410b)에 포함된 복수의 패드(P)의 배열 위치는 데이터 구동 집적회로(IC)의 기 설계된 범프(B)의 배열 위치와 일치하지 않으나, 제3 서브 패드부(410c)에 포함된 복수의 패드(P)의 배열 위치는 데이터 구동 집적회로(IC)의 기 설계된 범프(B)의 배열 위치와 일치될 수 있다. 즉, 데이터 구동 집적 회로(IC)는 제3 서브 패드부(410c)에 정상적으로 실장될 수 있다.

【0077】 즉, 본 실시예에 따른 제1 패드부(410)는 어레이 기판이 수축 또는 팽창되더라도 기 설계된 구동 집적 회로(IC)를 적용할 수 있는 서브 패드부를 더 포함하기에 구동 집적 회로(IC)의 실장 효율성을 높일 수 있다.

【0078】 도 13은 본 발명의 또 다른 실시예에 따른 패드부의 개략적인 형태를 나타낸 평면도이다. 이미 언급된 구성과 동일한 구성에 대해서는 그 설명을 생략하거나 간략화하고 차이점을 위주로 설명한다.

【0079】 도 13을 참조하면, 제1 패드부(510)는 제1 서브 패드부(510a) 내지

제3 서브 패드부(510c)를 포함한다. 여기서, 제1 서브 패드부(510a) 내지 제3 서브 패드부(510c)는 제2 방향(Y)을 따라 배치될 수 있다. 제1 내지 제3 서브 패드부(510a, 510b, 510c)는 복수의 패드(P)를 각각 포함할 수 있다. 즉, 본 실시예에의 제1 패드부(510)는 어레이 기판이 수축 또는 팽창되더라도 기 설계된 구동 집적 회로(IC)를 적용할 수 있는 서브 패드부를 더 포함하기에 구동 집적 회로(IC)의 실장 효율성을 높일 수 있다.

【0080】 또한, 본 실시예의 복수의 패드(P)는 도 10 내지 도 12의 복수의 패드(P)와 달리 평행사변형 형태일 수 있다. 그리고 복수의 패드(P)와 각각 대응되는 데이터 구동 집적회로(IC)의 복수의 범프(B)의 형상도 평행사변형일 수 있으며, 복수의 범프(B)의 장변은 대응되는 패드(P)의 장변보다 작게 형성될 수 있다. 즉, 복수의 범프(B)는 각 서브 패드부(510a, 510b, 510c)내에서의 제2 방향(Y)으로의 이동이 가능할 수 있다. 즉, 본 실시예에 따른 제1 패드부(510)는 구동 집적 회로(IC)의 실장 효율성을 보다 높일 수 있는 효과를 제공할 수 있다.

【0081】 이하, 본 발명의 또 다른 실시예에 대해 설명하도록 한다.

【0082】 도 14는 본 발명의 또 다른 실시예에 따른 집적 회로 실장 방법의 순서도이다. 이하의 실시예의 설명을 위해 도 1 내지 도 13이 참조될 수 있다.

【0083】 도 14를 참조하면, 집적 회로 실장 방법은 패드와 범프를 정렬하는 단계(S110), 패드와 범프의 오정렬 값을 산출하는 단계(S120) 및 집적 회로의 위치를 이동하는 단계(S130)을 포함한다.

【0084】 먼저, 패드와 범프를 정렬한다(S110).

【0085】 이전 단계에서, 어레이 기판(100)과 집적 회로(IC)는 이미 준비된 상태일 수 있다. 이와 관련된 자세한 설명은 생략하도록 한다.

【0086】 어레이 기판(100)은 화상을 표시하는 표시 영역(DA)과 표시 영역(DA)을 둘러싸는 비표시 영역(NA)을 포함할 수 있다. 제1 패드부(110)는 비표시 영역(NA)에 형성될 수 있으며, 집적 회로(IC)로부터 신호를 전달받아 표시 영역(DA)에 제공할 수 있다. 즉, 제1 패드부(110)는 집적회로(IC)가 실장되는 영역일 수 있다. 즉, 구동 집적회로(IC)는 COG(Chip On Glass) 방식으로 어레이 기판(100)에 실장될 수 있다. 즉, 제1 패드부(110)는 COG 패드부일 수 있다. 여기서 어레이 기판(100)이 가요성 물질로 형성되었다면 COP(Chip On Plastic)이라 정의할 수 있다.

【0087】 제1 패드부(110)는 복수의 패드를 포함할 수 있으며, 구동 집적회로(IC)는 복수의 패드에 대응되는 복수의 범프를 포함할 수 있다. 복수의 패드와 복수의 범프는 각각 일대일 대응되어 연결될 수 있다. 제1 패드부(110) 및 범프(B)가 형성된 위치의 일단 또는 양단에는 적어도 하나의 정렬 마크(Alignment Mark)가 형성될 수 있다. 제1 패드부(110)의 정렬 마크(Alignment Mark)와 범프(B)의 정렬 마크(Alignment Mark)를 대응시킴에 따라 제1 패드부(110)와 범프(B)는 정렬될 수 있다.

【0088】 이어서, 패드와 범프의 오정렬 값을 산출한다(S120).

【0089】 여기서, 제1 패드부(110)가 형성된 어레이 기판은 기판을 준비하는 공정 중 팽창 또는 수축될 수 있다. 이러한, 어레이 기판의 팽창 또는 수축에 의해 제1 패드부(110)의 배열에 변화가 발생할 수 있다. 즉, 제1 패드부(110)와 범프(b)의 각 정렬 마크를 일치하더라도 각 패드와 각 범프 간에 오정렬이 발생할 수 있다. 이러한, 패드와 범프 간의 오정렬 값을 스캔 작업을 통해 산출할 수 있다. 즉, 고체 촬상 장치 등을 통해 패드와 범프의 정렬 된 상태를 촬상할 수 있으며, 패드와 범프의 오정렬 된 거리를 산출할 수 있다. 여기서, 제1 방향(X)에 따른 어레이 기판의 팽창 또는 수축에 패드의 정렬이 변화될 수 있으므로, (Miss-Alignment Value, b)은 패드와 오버랩되지 않고 돌출된 범프(B)의 제1 방향(X) 길이에 해당할 수 있다.

【0090】 여기서, 오정렬 값 산출 단계(S120)는 오정렬 값(b)을 분석하는 단계를 더 포함할 수 있다. 즉, 오정렬 값(b)이 임계 값보다 이하 경우에는 다음 단계(S130)로 진행하지 않고 곧바로 패드와 범프를 결합시킬 수 있다. 다만, 오정렬 값(b)이 임계 값을 초과하는 경우 오정렬을 수정하는 과정이 필요하며, 다음 단계(S130)로 진행하게 된다.

【0091】 이어서, 집적 회로의 위치를 이동한다(S130).

【0092】 제1 패드부(110)는 적어도 하나의 평행사변형 형태의 제1 패드를 포함할 수 있다. 즉, 제1 패드는 단변과 장변이 제1 경사각($\theta 1$)을 형성하는 평행사변형일 수 있다. 즉, 여기서 제1 패드(110)는 도 1 내지 도 7의 제1 패드(110)일 수 있으나, 이에 한정되는 것은 아니며, 도 8의 제1 패드(210) 및 도 9의 제1 패드

(310) 또한 물론 적용될 수 있다. 제1 패드(110)에 대한 구체적인 설명은 상술한 바와 실질적으로 동일하기에 생략하도록 한다.

【0093】 또한, 집적 회로의 범프 또한 제1 패드와 대응되는 기울기를 가지는 평행사변형 형태일 수 있다. 그리고, 제1 패드의 장변은 범프의 장변보다 길게 형성될 수 있다. 이는 하기와 같은 집적 회로의 위치 이동을 보장하기 위함이다.

【0094】 여기서, 집적 회로는 패드와 범프의 오정렬을 수정하기 위해 위치가 이동될 수 있다. 즉, 집적 회로는 얼라인 마크와 다른 위치로 이동될 수 있다. 집적 회로는 제1 방향(X)과 교차하는 제2 방향(Y)으로 이동될 수 있다. 여기서, 집적 회로의 이동거리(a)는 제1 방향에 따른 오정렬 값(b)에 제1 패드의 제1 경사각(θ)의 탄젠트 값을 곱한 값일 수 있다. 즉, 상술한 수학식 1과 같이 계산될 수 있다.

【0095】 즉, 본 실시예에 따른 집적 회로의 실장 방법은 어레이 기판의 변화에 의해 패드와 범프의 오정렬이 발생하더라도, 제1 패드는 평행사변형 형태를 가지기에, 제2 방향(Y)으로의 위치 이동만으로도 패드와 범프의 오정렬은 수정될 수 있다. 따라서, 용이하게 패드와 범프의 오정렬은 수정될 수 있으며, 이에 따라 집적 회로는 효율적으로 실장될 수 있다.

【0096】 또한, 몇몇 실시예에서 집적 회로의 이동 단계(S130)는 다른 서브 패드부 집적 회로를 이동하는 단계일 수 있다. 즉, 몇몇 실시예에서의 패드부는 도 10 내지 도 12의 제1 패드부(410) 또는 도 13의 제1 패드부(510)가 적용될 수 있다. 즉, 제1 패드부(410)는 제1 내지 제3 서브 패드부(410a, 410b, 410c)를 포함

할 수 있다. 제1 내지 제3 서브 패드부(410a, 410b, 410c)는 제1 패드부(410)를 양분하는 가상의 선과의 이격 거리가 서로 상이할 수 있다. 즉, 제2 서브 패드부(410b)는 기 설계된 집적 회로의 범프와 대응되는 배열을 가질 수 있으며, 제1 및 제3 서브 패드부(410a, 410c)는 이와 배열이 다를 수 있다. 즉, 제1 및 제3 서브 패드부(410a, 410c)는 수축 또는 팽창된 어레이 기판에 적용하기 위한 예비적인 패드부일 수 있다. 즉, 몇몇 실시예에서의 집적 회로 이동 단계(S130)는 오정렬 값을 고려하여 제2 서브 패드부(410b)에서 제1 서브 패드부(410a) 또는 제3 서브 패드부(410c)로 집적 회로를 이동시키는 단계일 수 있다. 오정렬이 수정된 집적 회로(IC)는 이방성 도전 필름(ACF)을 매개로 패드부와 결합될 수 있다.

【0097】 이상 첨부된 도면을 참조하여 본 발명의 실시예들을 설명하였지만, 본 발명이 속하는 기술분야에서 통상의 지식을 가진 자는 본 발명의 그 기술적 사상이나 필수적인 특징을 변경하지 않고서 다른 구체적인 형태로 실시될 수 있다는 것을 이해할 수 있을 것이다. 그러므로 이상에서 기술한 실시예들은 모든 면에서 예시적인 것이며 한정적이 아닌 것으로 이해해야만 한다.

【부호의 설명】

【0098】 100: 어레이 기판

110, 210, 310, 410, 510: 제1 패드부

120: 게이트 구동부

130: 전원 공급부

제출 일자 : 2014-06-17

140: 제2 패드부

45-27

【특허청구범위】

【청구항 1】

표시 영역 및 상기 표시 영역을 둘러싸는 비표시 영역을 포함하는 어레이 기판에 있어서,

상기 비표시 영역은 패드부를 포함하고,

상기 패드부는 적어도 하나의 평행사변형 형태의 제1 패드를 포함하는 어레이 기판.

【청구항 2】

제1 항에 있어서,

상기 제1 패드는 제1 방향으로 연장된 제1 단변, 상기 제1 단변과 평행한 제2 단변, 상기 제1 단변의 일단으로부터 제1 경사각을 형성하며 연장되는 제1 장변 및 상기 제1 장변과 평행하는 제2 장변을 포함하는 어레이 기판.

【청구항 3】

제1 항에 있어서,

상기 패드부는 적어도 하나의 직사각형 형태의 제2 패드를 중심부에 더 포함하는 어레이 기판.

【청구항 4】

제3 항에 있어서,

상기 제1 패드는 복수이고,

제출 일자 : 2014-06-17

상기 복수의 제1 페드는 제2 페드를 기준으로 대칭되어 배치되는 어레이 기
판.

【청구항 5】

제1 항에 있어서,

상기 제1 페드는 복수이고,

상기 복수의 제1 페드는 상기 페드부를 양분하는 가상의 선을 기준으로 대칭

되어 배치되는 어레이 기판.

【청구항 6】

제5 항에 있어서,

상기 가상의 선과 가까이 위치할 수록 상기 제1 페드의 단면과 장면이 형성

하는 경사각은 커지는 어레이 기판.

【청구항 7】

제1 항에 있어서,

상기 페드부는 데이터 구동 집적회로가 실장되는 제1 페드부와 연결 인쇄 회

로 기판이 실장되는 제2 페드부를 포함하고,

상기 제1 페드부 및 상기 제2 페드부 각각 상기 제1 페드를 적어도 하나 포

함하는 어레이 기판.

【청구항 8】

제7 항에 있어서,

상기 데이터 구동 집적회로와 상기 연성 인쇄 회로 기판은 상기 제1 패드의 형상에 대응되는 적어도 하나의 범프를 포함하고,

상기 제1 패드의 장변은 상기 범프의 장변보다 길게 형성되는 어레이 기판.

【청구항 9】

표시 영역 및 상기 표시 영역을 둘러싸는 비표시 영역을 포함하는 어레이 기판에 있어서,

상기 비표시 영역은 패드부를 포함하되,

상기 패드부는 상기 패드부를 양분하는 가상의 선과의 이격 거리가 서로 상이한 제1 서브 패드부 및 제2 서브 패드부를 포함하는 어레이 기판.

【청구항 10】

제9 항에 있어서,

상기 제1 서브 패드부와 상기 제2 서브 패드부는 각각 제1 방향을 따라 배열되는 복수의 패드를 포함하는 어레이 기판.

【청구항 11】

제10 항에 있어서,

상기 복수의 패드는 상기 가상의 선을 기준으로 대칭되는 어레이 기판.

【청구항 12】

제10 항에 있어서,

상기 복수의 패드는 직사각형 형태인 어레이 기판.

【청구항 13】

제10 항에 있어서,

상기 복수의 패드는 평행사변형 형태인 어레이 기관.

【청구항 14】

제13 항에 있어서,

상기 복수의 패드는 단변과 장변이 형성하는 경사각이 서로 상이하고,

상기 경사각은 상기 가상의 선과 가까울 수록 커지는 어레이 기관.

【청구항 15】

제13 항에 있어서,

상기 제1 서브 패드부와 상기 제2 서브 패드부는 상기 제1 방향과 수직인 제2 방향을 따라 배치되는 어레이 기관.

【청구항 16】

어레이 기관의 패드부와 집적 회로의 범프를 정렬하는 단계;

상기 패드부와 상기 범프의 제1 방향에 따른 오정렬 값(b)을 산출하는 단계;

및

상기 오정렬 값(b)에 대응하여 상기 집적 회로를 상기 제1 방향과 수직인 제2 방향으로 이동하는 단계를 포함하는 집적 회로 실장 방법.

【청구항 17】

제16 항에 있어서,
상기 패드부는 적어도 하나의 평행사변형 형태의 제1 패드를 포함하고,
상기 평행사변형의 단변과 장변은 제1 경사각($\theta 1$)의 기울기를 형성하는 집적 회로 실장 방법.

【청구항 18】

제17 항에 있어서,
상기 집적 회로의 이동 거리(a)는 상기 제1 방향에 따른 오정렬 값(b)에 상기 제1 경사각($\theta 1$)의 탄젠트 값을 곱한 값인 집적 회로 실장 방법.

【청구항 19】

제17 항에 있어서,
상기 집적 회로의 범프는 상기 제1 패드와 대응되는 기울기를 가지는 평행사변형 형태이고,
상기 제1 패드의 장변은 상기 범프의 장변보다 길게 형성되는 집적 회로 실장 방법.

【청구항 20】

제16 항에 있어서,
상기 패드부는 상기 패드부를 양분하는 가상의 선과의 이격 거리가 서로 상이한 제1 서브 패드부 및 제2 서브 패드부를 포함하고,

제출 일자 : 2014-06-17

상기 제1 서브 패드부 및 상기 제2 서브 패드부는 제2 방향을 따라 배치되되,

상기 집적 회로의 이동 단계는,

상기 제1 서브 패드부에서 제2 서브 패드부로 집적 회로를 이동하는 단계인
집적 회로 실장 방법.

【요약서】

【요약】

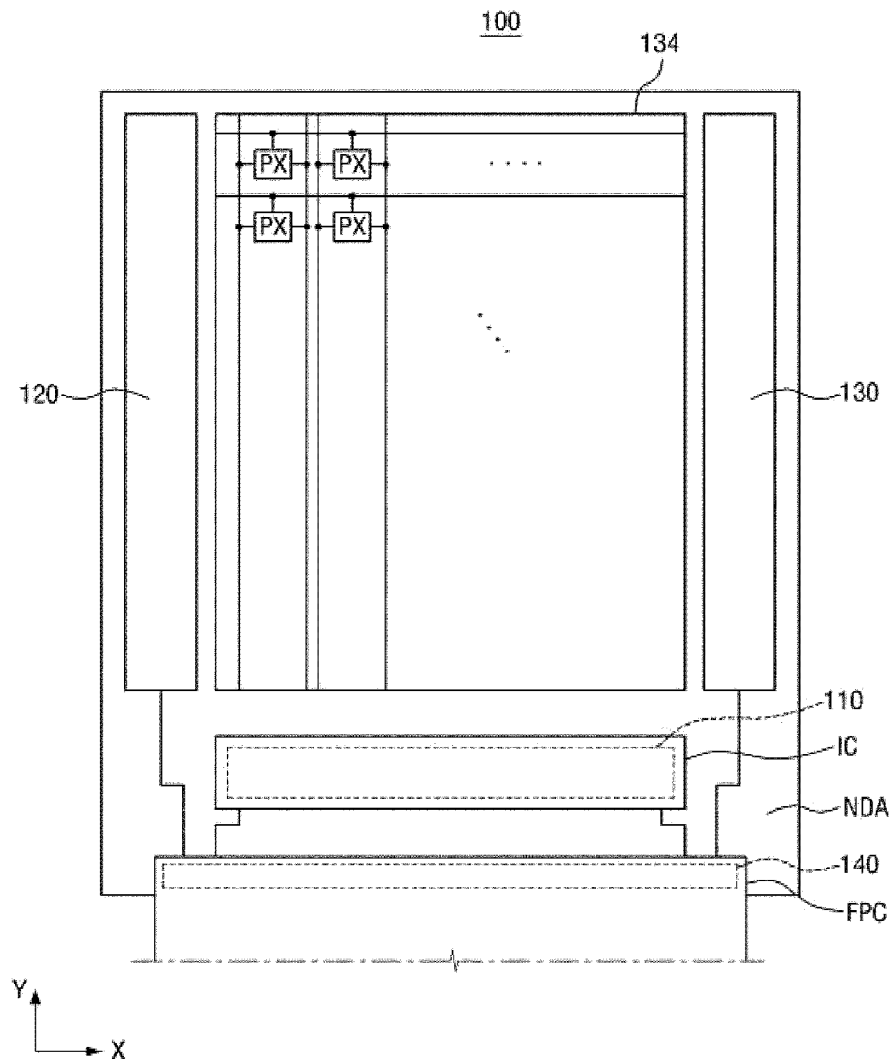
어레이 기판이 제공된다. 표시 영역 및 상기 표시 영역을 둘러싸는 비표시 영역을 포함하는 어레이 기판에 있어서, 상기 비표시 영역은 패드부를 포함하고, 상기 패드부는 적어도 하나의 평행사변형 형태의 제1 패드를 포함한다.

【대표도】

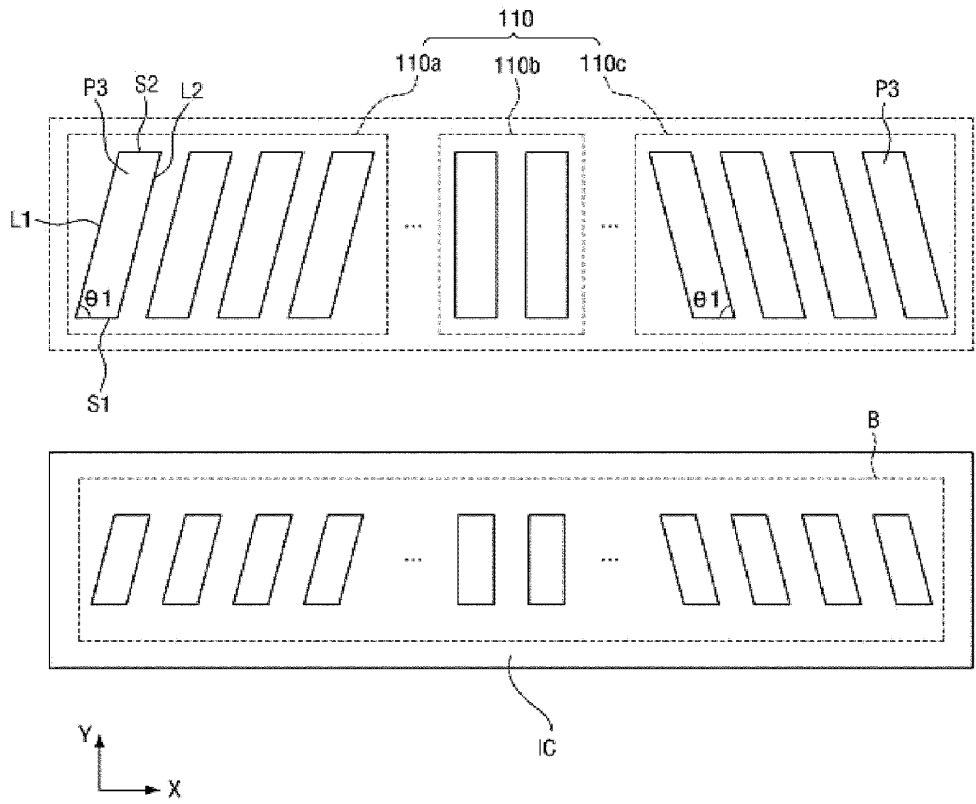
도 1

【도면】

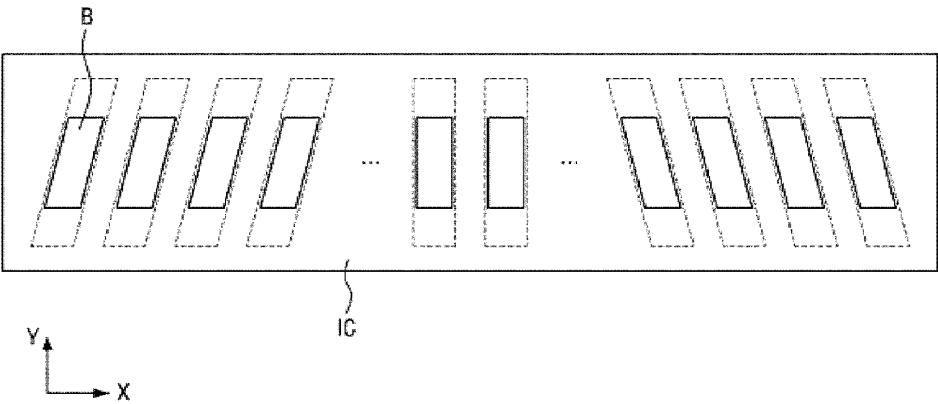
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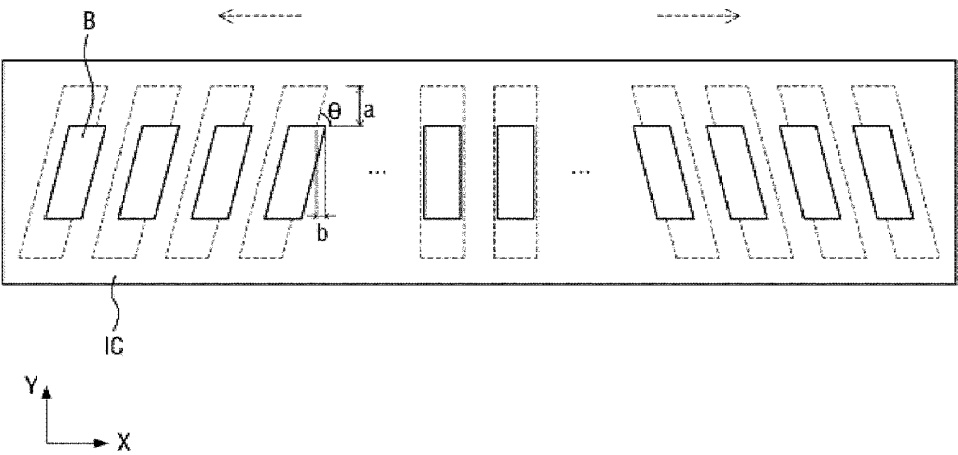
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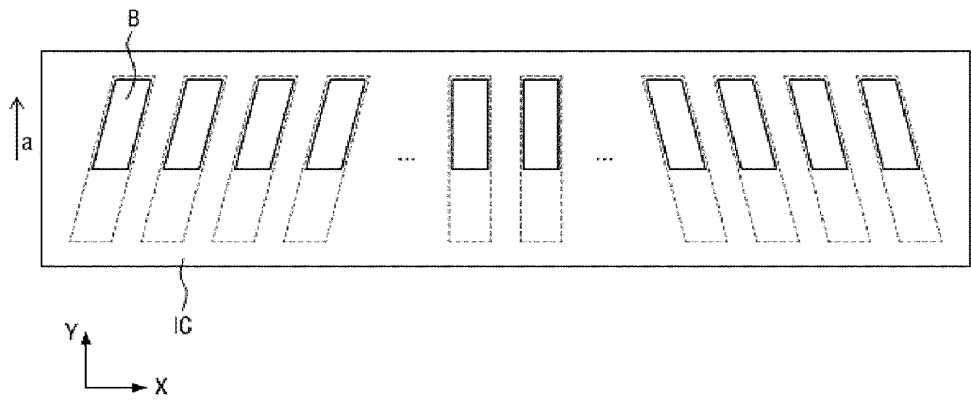
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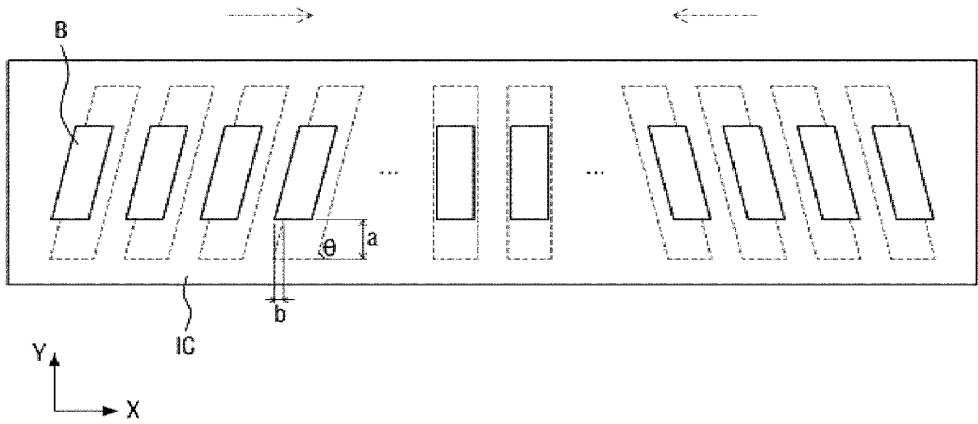
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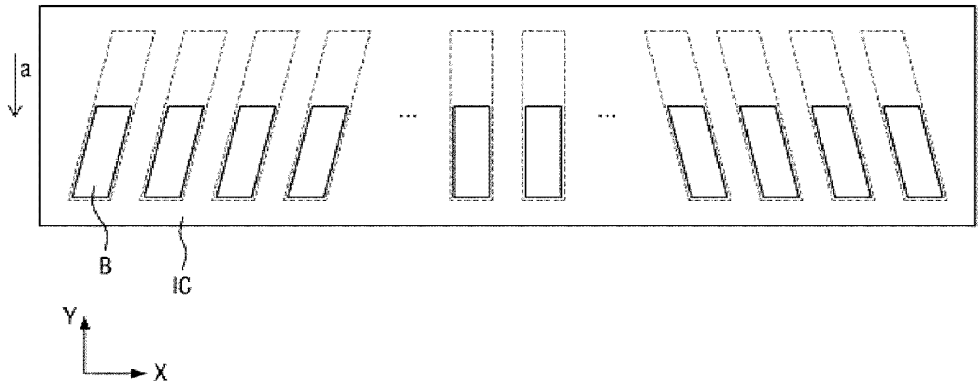
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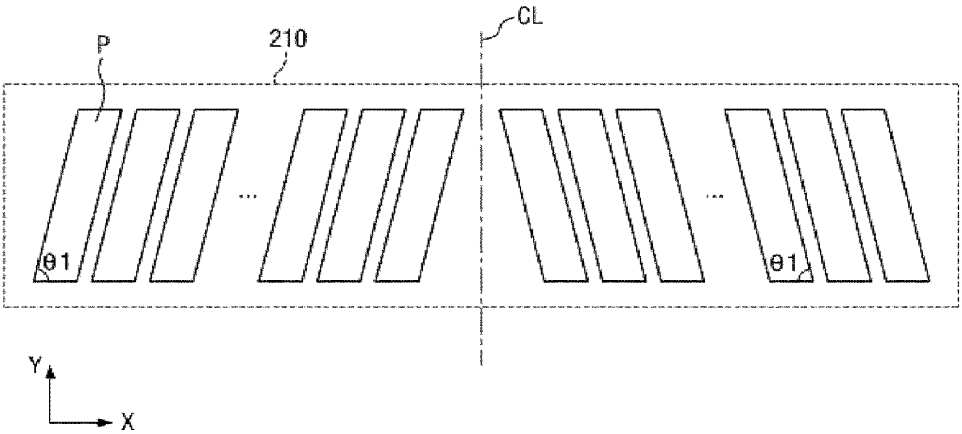
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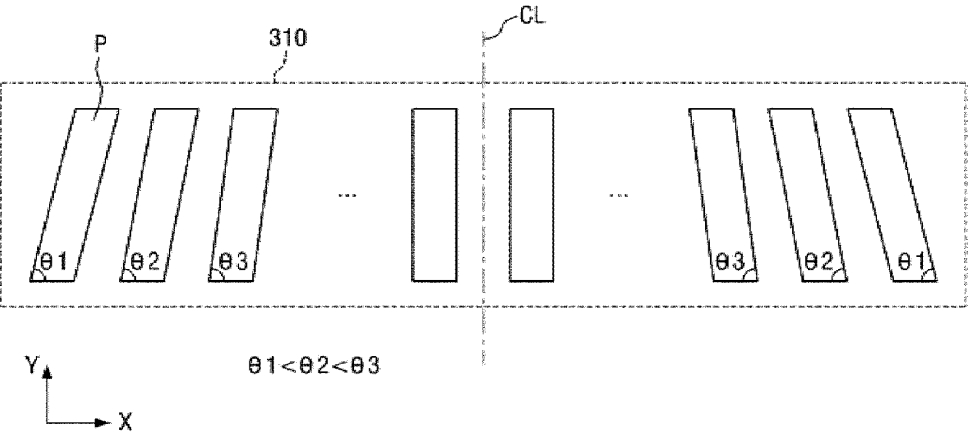
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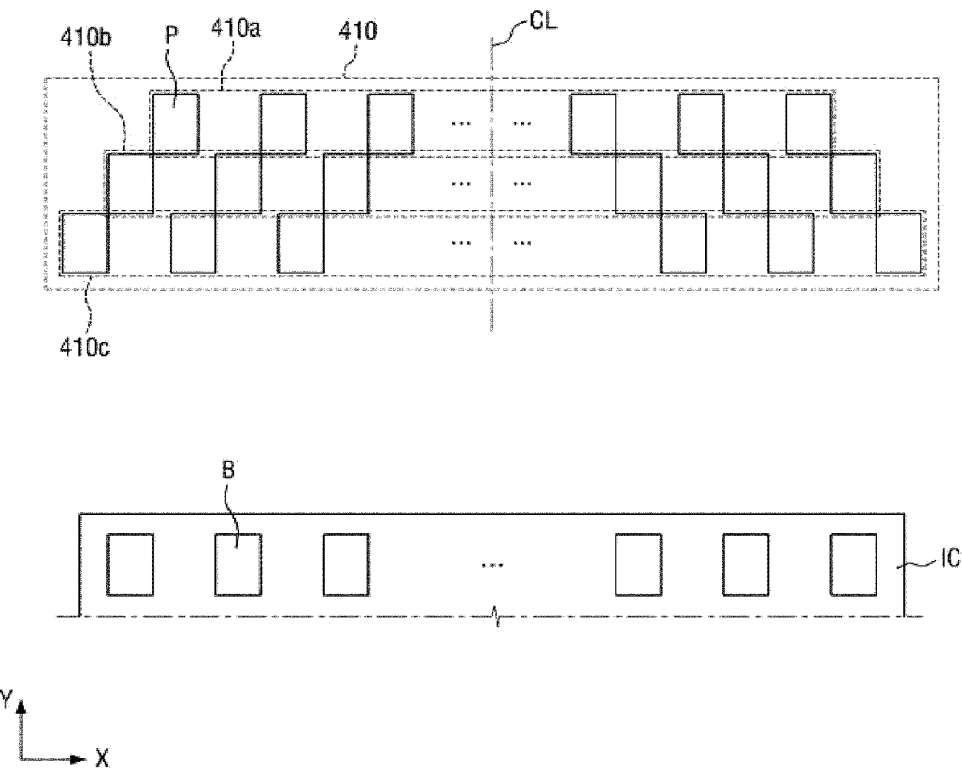
【도 8】



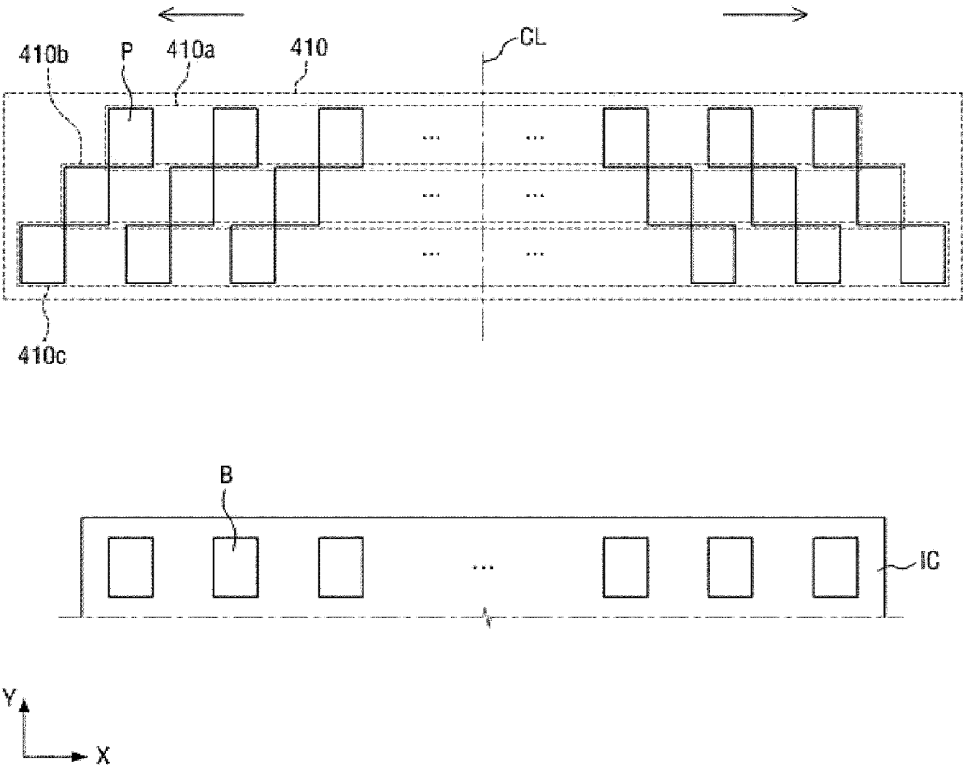
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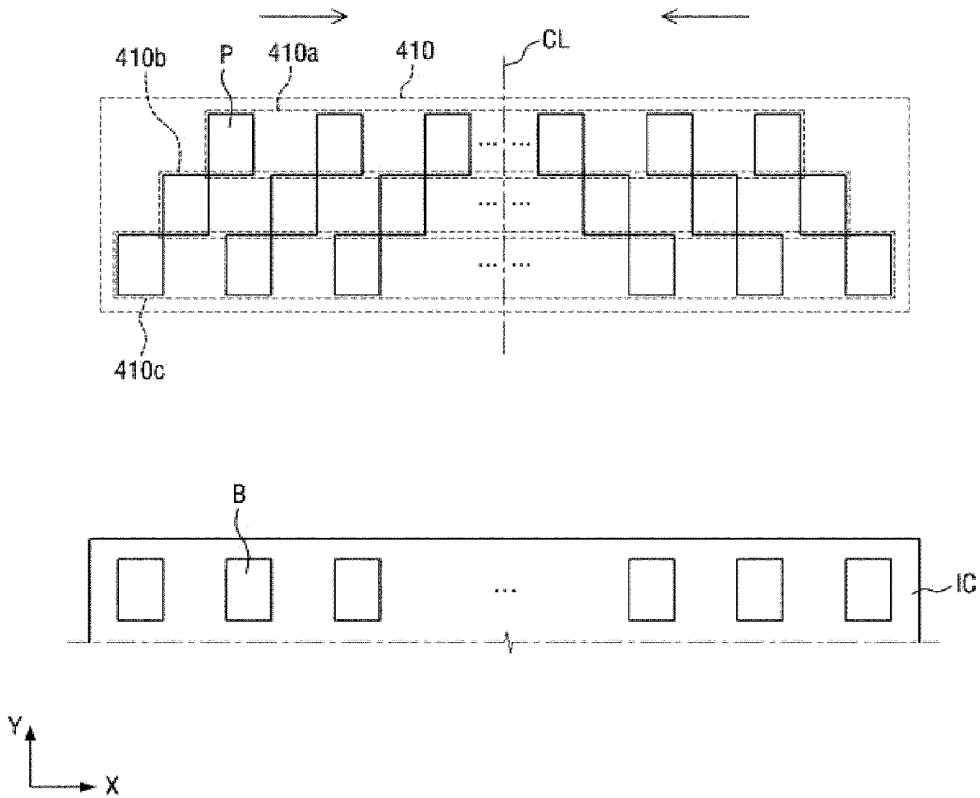
【도 10】



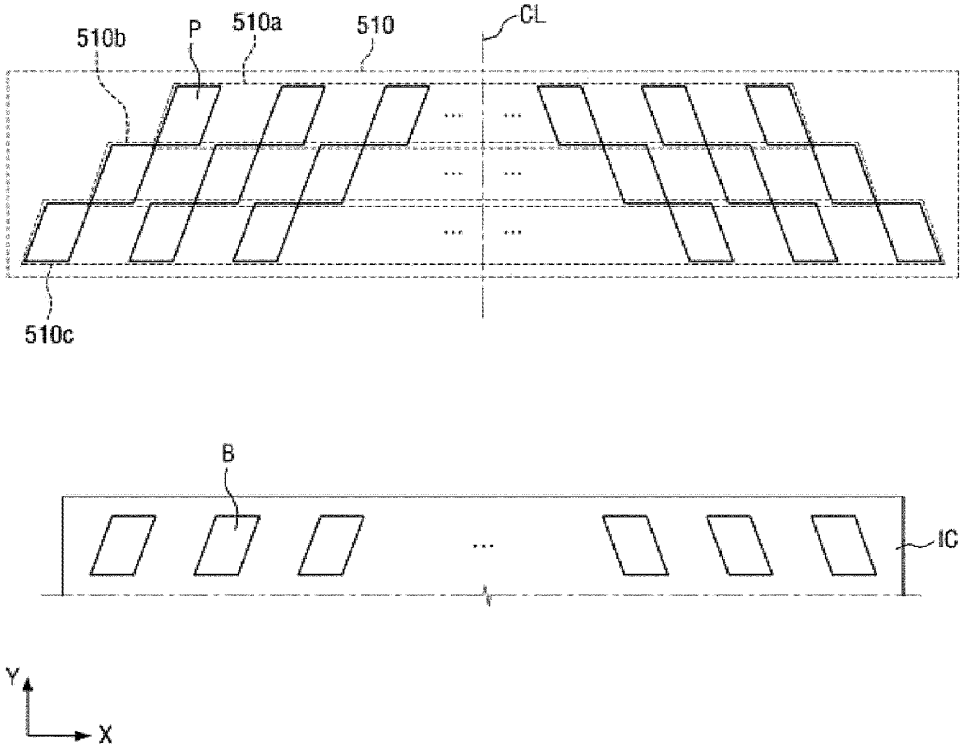
【도 11】



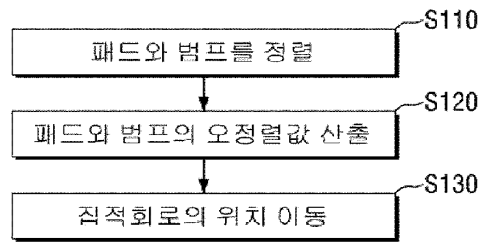
【도 12】



【도 13】



【도 14】





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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO.	TOT CLAIMS	IND CLAIMS
16/510,262	07/12/2019	2813	1720	P6037USC1C1C1	10	1

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Receipt is acknowledged of this non-provisional utility patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

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Power of Attorney: The patent practitioners associated with Customer Number 58027

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which is a CON of 15/429,411 02/10/2017 PAT 9917113
which is a CON of 14/526,182 10/28/2014 PAT 9591754

Foreign Applications (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see <http://www.uspto.gov> for more information.)

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The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 16/510,262**

Projected Publication Date: 10/31/2019

Non-Publication Request: No

Early Publication Request: No

Title

ARRAY SUBSTRATE AND METHOD OF MOUNTING INTEGRATED CIRCUIT USING THE SAME

Preliminary Class

257

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

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For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, <http://www.stopfakes.gov>. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific

page 2 of 4

countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER
Title 35, United States Code, Section 184
Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

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This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign Assets Control, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875					Application or Docket Number 16/510,262	
APPLICATION AS FILED - PART I						
(Column 1)		(Column 2)		SMALL ENTITY		OR
FOR	NUMBER FILED	NUMBER EXTRA	RATE(\$)	FEE(\$)	OTHER THAN SMALL ENTITY	
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A		N/A	300
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A		N/A	660
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A		N/A	760
TOTAL CLAIMS (37 CFR 1.16(j))	10	minus 20 = *			OR	x 100 = 0.00
INDEPENDENT CLAIMS (37 CFR 1.16(h))	1	minus 3 = *			OR	x 460 = 0.00
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).					0.00
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))						0.00
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL		TOTAL	1720
APPLICATION AS AMENDED - PART II						
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)	OTHER THAN SMALL ENTITY
	Total (37 CFR 1.16(i))	*	Minus **	=	x =	OR
	Independent (37 CFR 1.16(h))	*	Minus ***	=	x =	OR
	Application Size Fee (37 CFR 1.16(s))					OR
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					OR
TOTAL ADD'L FEE					OR	TOTAL ADD'L FEE
(Column 1)		(Column 2)		(Column 3)		SMALL ENTITY
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)	OTHER THAN SMALL ENTITY
	Total (37 CFR 1.16(i))	*	Minus **	=	x =	OR
	Independent (37 CFR 1.16(h))	*	Minus ***	=	x =	OR
	Application Size Fee (37 CFR 1.16(s))					OR
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					OR
TOTAL ADD'L FEE					OR	TOTAL ADD'L FEE
* If the entry in column 1 is less than the entry in column 2, write "0" in column 3. ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20". *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3". The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.						



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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY. DOCKET NO.	TOT CLAIMS	IND CLAIMS
16/510,262	07/12/2019	2811	1720	P6037USC1C1C1	10	1

CONFIRMATION NO. 1231

FILING RECEIPT



0000000109922990

58027
H.C. PARK & ASSOCIATES, PLC
1894 PRESTON WHITE DRIVE
RESTON, VA 20191

Date Mailed: 07/26/2019

Receipt is acknowledged of this non-provisional utility patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

Please verify the accuracy of the data presented on this receipt. If an error is noted on this Filing Receipt, please submit a written request for a corrected Filing Receipt, including a properly marked-up ADS showing the changes with strike-through for deletions and underlining for additions. If you received a "Notice to File Missing Parts" or other Notice requiring a response for this application, please submit any request for correction to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections provided that the request is grantable.

Inventor(s)

Dae Geun LEE, Hwaseong-si, KOREA, REPUBLIC OF;

Applicant(s)

Samsung Display Co., Ltd., Yongin-si, KOREA, REPUBLIC OF;

Power of Attorney: The patent practitioners associated with Customer Number 58027

Domestic Priority data as claimed by applicant

This application is a CON of 15/901,846 02/21/2018 PAT 10373987
which is a CON of 15/429,411 02/10/2017 PAT 9917113
which is a CON of 14/526,182 10/28/2014 PAT 9591754

Foreign Applications (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see <http://www.uspto.gov> for more information.)

REPUBLIC OF KOREA 10-2014-0073756 06/17/2014 No Access Code Provided

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

Request to Retrieve - This application either claims priority to one or more applications filed in an intellectual property Office that participates in the Priority Document Exchange (PDX) program or contains a proper **Request to Retrieve Electronic Priority Application(s)** (PTO/SB/38 or its equivalent). Consequently, the USPTO will attempt to electronically retrieve these priority documents.

If Required, Foreign Filing License Granted: 07/25/2019

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 16/510,262**

Projected Publication Date: 10/31/2019

Non-Publication Request: No

Early Publication Request: No

Title

ARRAY SUBSTRATE AND METHOD OF MOUNTING INTEGRATED CIRCUIT USING THE SAME

Preliminary Class

257

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

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countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

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Title 35, United States Code, Section 184
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This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign Assets Control, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

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Doc code: IDS

Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (02-18)

Approved for use through 11/30/2020. OMB 0651-0031

U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		
	Filing Date		2019-07-12
	First Named Inventor	Dae Geun LEE	
	Art Unit		
	Examiner Name		
	Attorney Docket Number		P6037USC1C1C1

U.S. PATENTS								
Examiner Initial*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear		
	1	6114754		2000-09-05	KATA			
If you wish to add additional U.S. Patent citation information please click the Add button.								
U.S. PATENT APPLICATION PUBLICATIONS								
Examiner Initial*	Cite No	Publication Number	Kind Code ¹	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear		
	1	20030160929		2003-08-28	KURASAWA			
	2	20140321088		2014-10-30	BAE et al.	Corresponding to EP 2811337		
	3	20130188109		2013-07-05	CHEN			
If you wish to add additional U.S. Published Application citation information please click the Add button.								
FOREIGN PATENT DOCUMENTS								
Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ²	Kind Code ⁴	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear	T ⁵
	1	10-2011-0119004	KR		2011-11-02	LG Electronics Inc.		☐

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number			
	Filing Date		2019-07-12	
	First Named Inventor	Dae Geun LEE		
	Art Unit			
	Examiner Name			
	Attorney Docket Number		P6037USC1C1C1	

	2	10-2013-0053280	KR		2013-05-23	LG Display Co., Ltd.		☐
	3	10-2008-0086214	KR		2008-09-25	Samsung SDI Co., Ltd.		☐
	4	10-2007-0007633	KR		2007-01-16	Samsung Electronics Co., Ltd.		☐
	5	2012-058533	JP		2012-03-22	Hitachi Displays Ltd., et al.		☐
	6	2007-242942	JP		2007-09-20	SEIKO EPSON CORP.		☐
	7	H04-352132	JP		1992-12-07	HITACHI LTD.		☐
	8	2000-187452	JP		2000-07-04	CANON INC.		☐
	9	2811337	EP		2014-12-10	SAMSUNG DISPLAY CO., LTD.	Corresponding to US 2014/0321088	☐

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NON-PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T5
	1	Extended European Search Report, issued October 7, 2015, in European Patent Application No. 15152709.0.	☐

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		
	Filing Date		2019-07-12
	First Named Inventor	Dae Geun LEE	
	Art Unit		
	Examiner Name		
	Attorney Docket Number		P6037USC1C1C1

	2	Non-Final Office Action issued July 1, 2016, in U.S. Patent Application No. 14/526,182.	☐
	3	Notice of Allowance issued October 21, 2016, in U.S. Patent Application No. 14/526,182.	☐
	4	Non-Final Office Action dated July 3, 2017, issued in U.S. Patent Application No. 15/429,411.	☐
	5	Non-Final Office Action issued April 6, 2018, in U.S. Patent Application No. 15/901,846.	☐
	6	Final Office Action issued January 2, 2019, in U.S. Patent Application No. 15/901,846.	☐
	7	Notice of Allowance issued March 26, 2019, in U.S. Patent Application No. 15/901,846.	☐

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EXAMINER SIGNATURE

Examiner Signature		Date Considered	
--------------------	--	-----------------	--

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

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	Filing Date		2019-07-12
	First Named Inventor	Dae Geun LEE	
	Art Unit		
	Examiner Name		
	Attorney Docket Number		P6037USC1C1C1

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ See attached certification statement.

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/William L. Brooks/	Date (YYYY-MM-DD)	2019-07-12
Name/Print	William L. Brooks	Registration Number	34,129

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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The information provided by you in this form will be subject to the following routine uses:

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2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Fig. 1

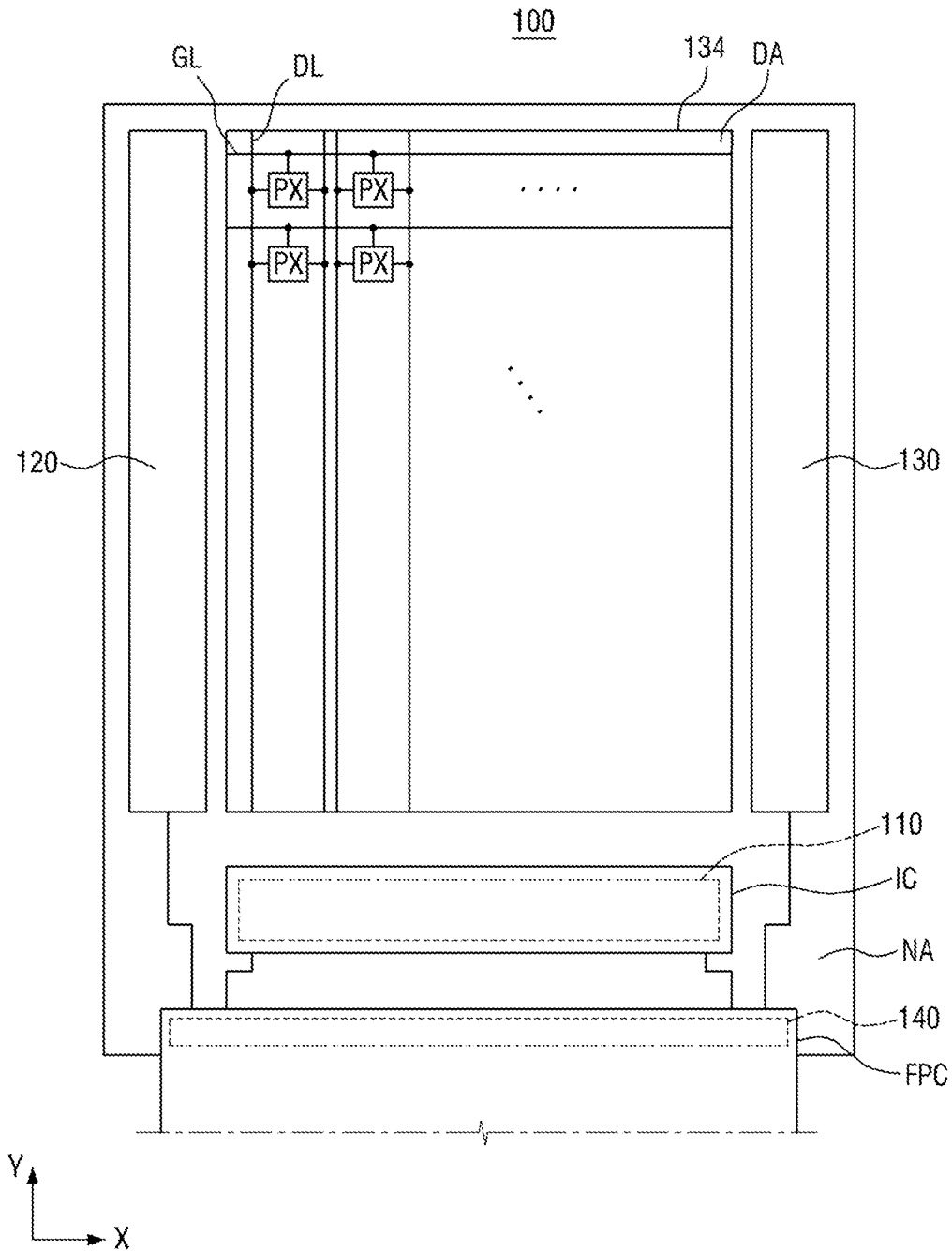


Fig.2

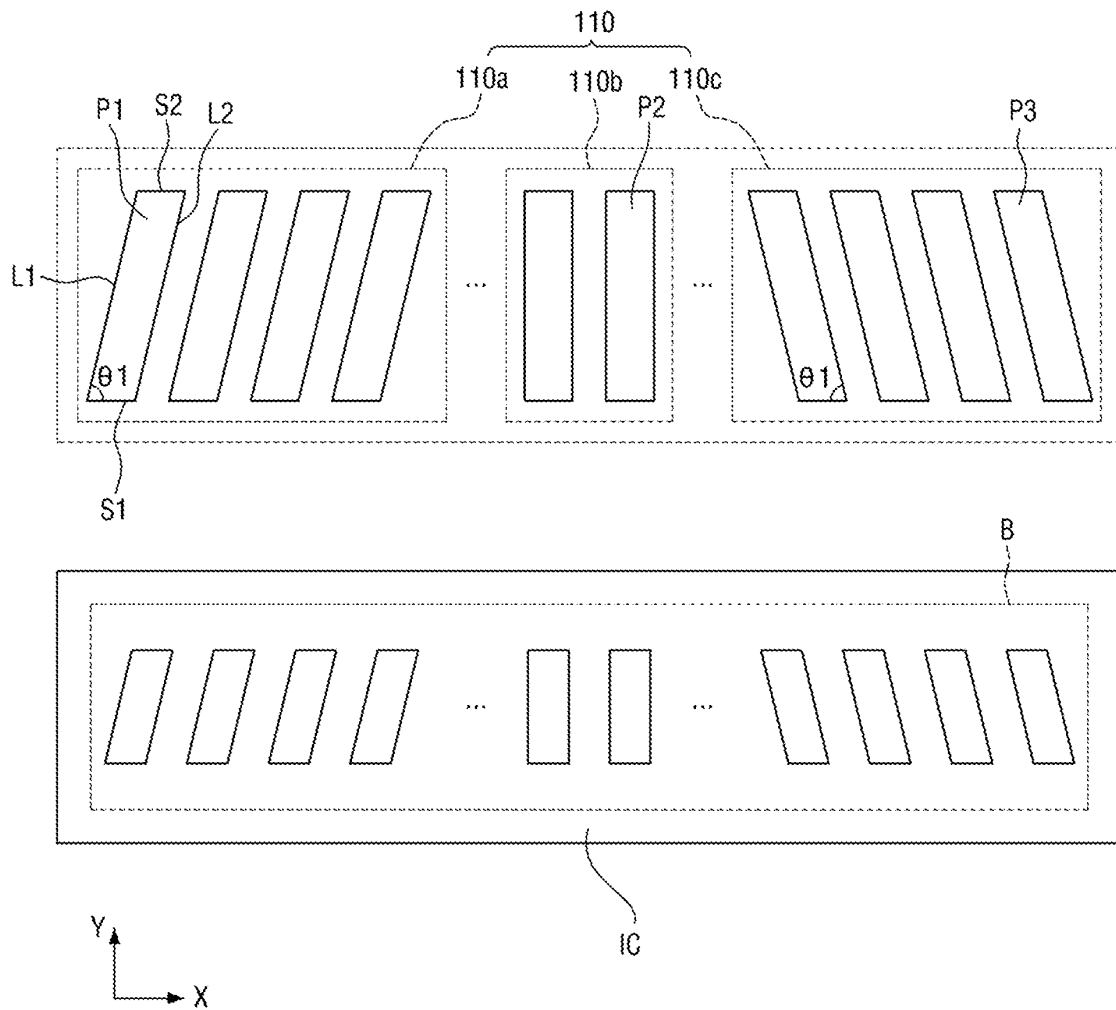


Fig.3

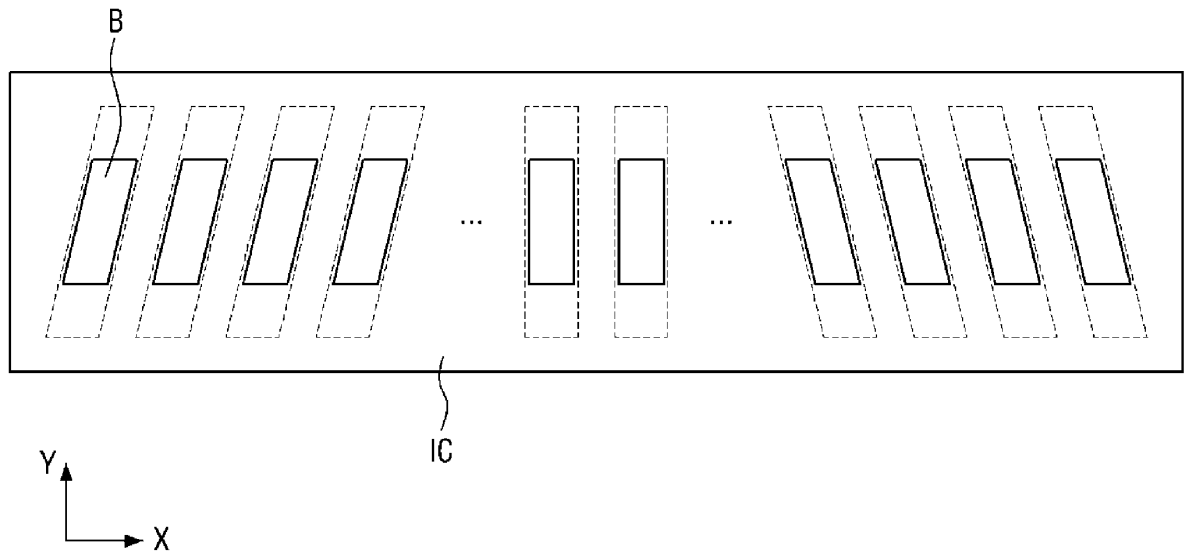


Fig.4

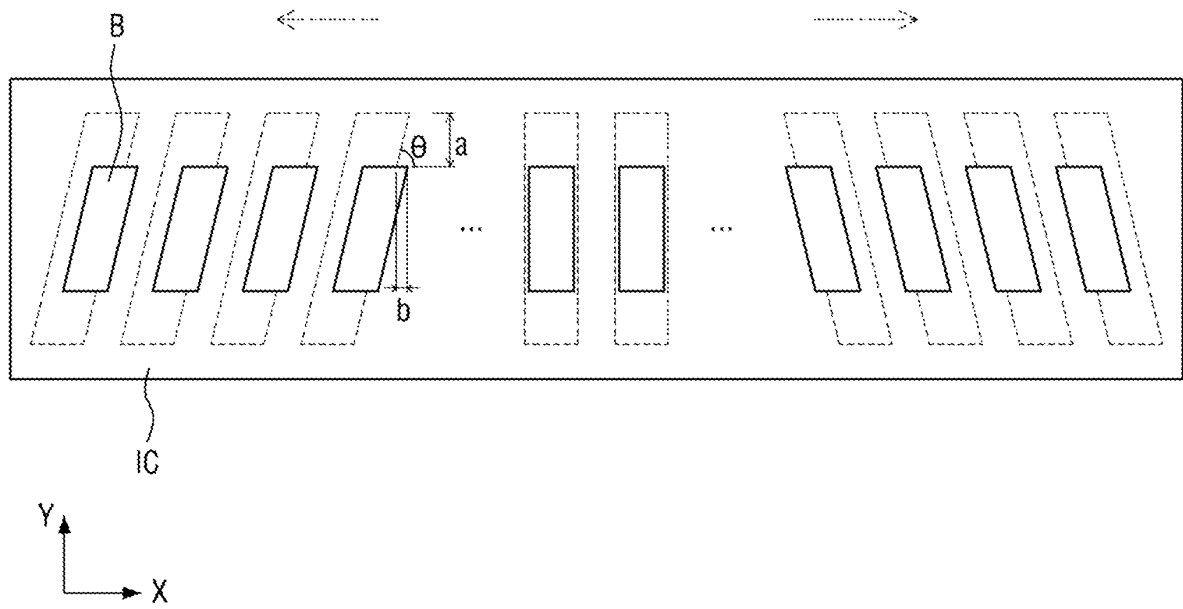


Fig.5

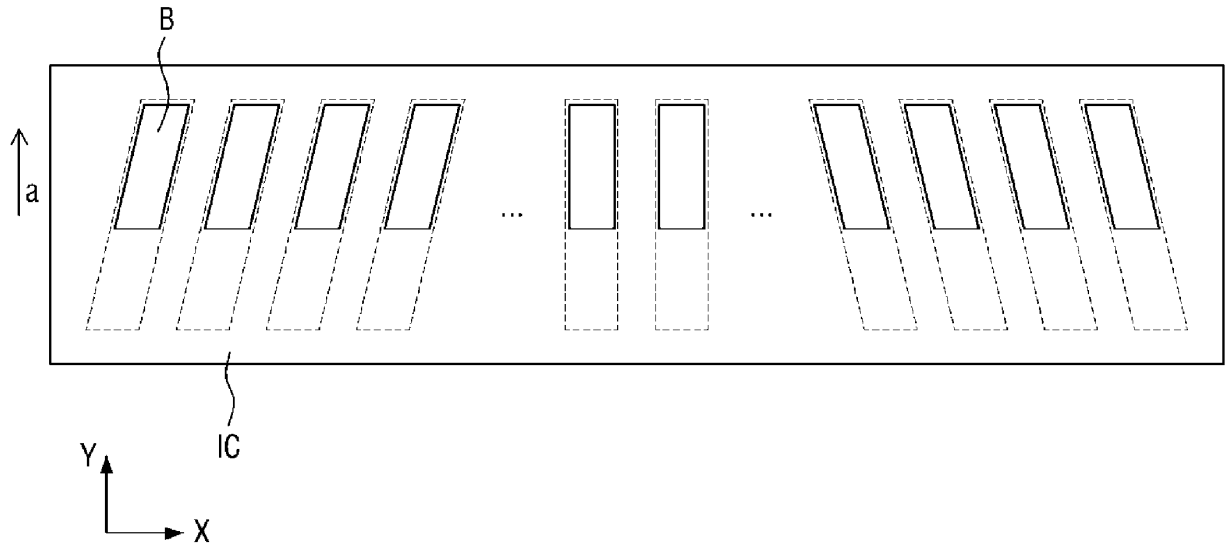


Fig.6

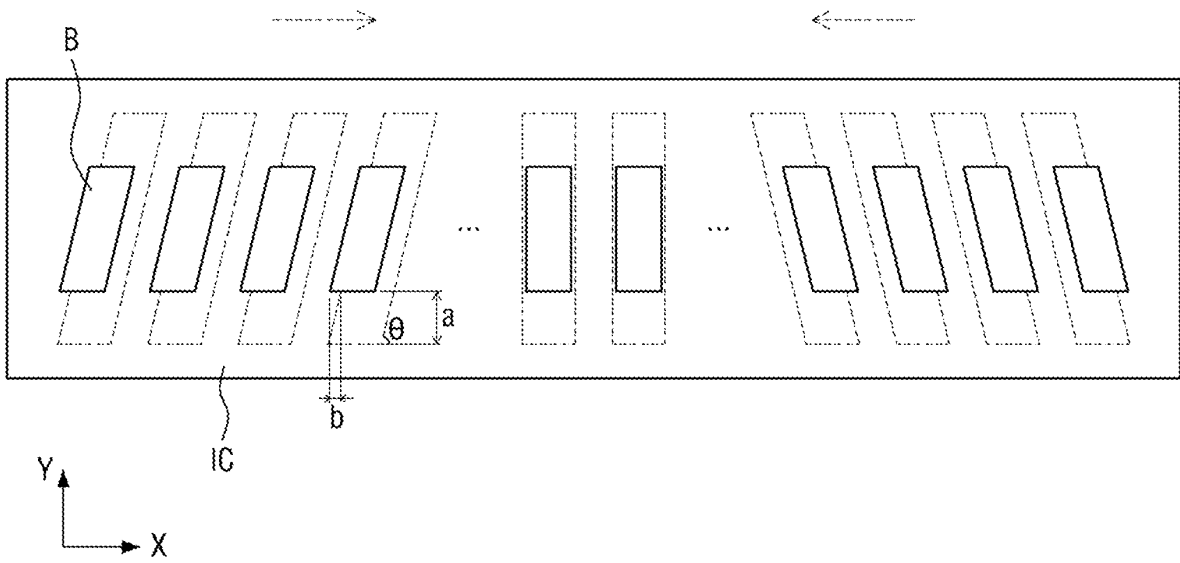


Fig.7

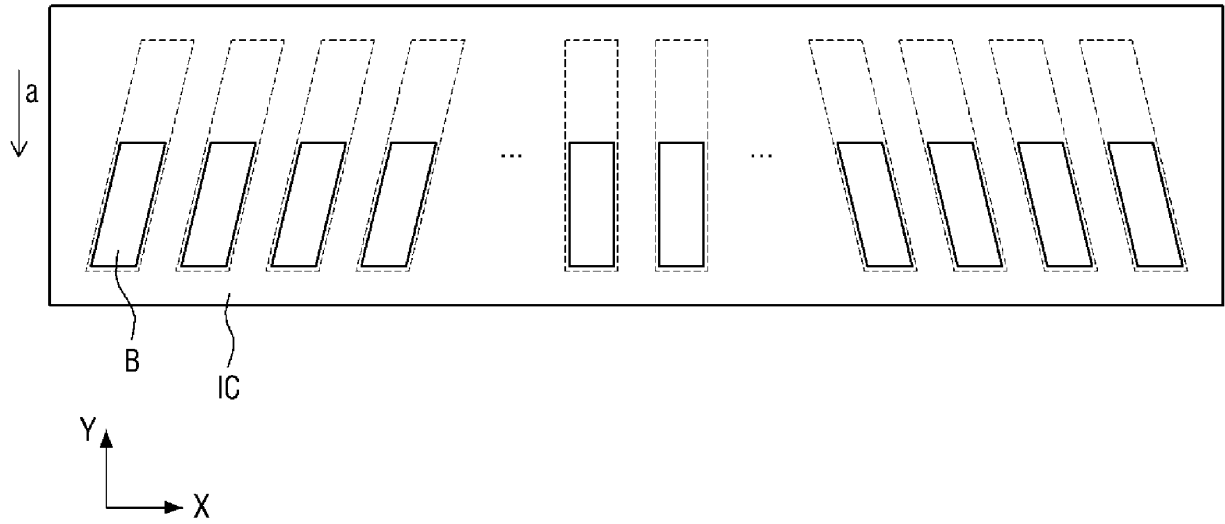


Fig.8

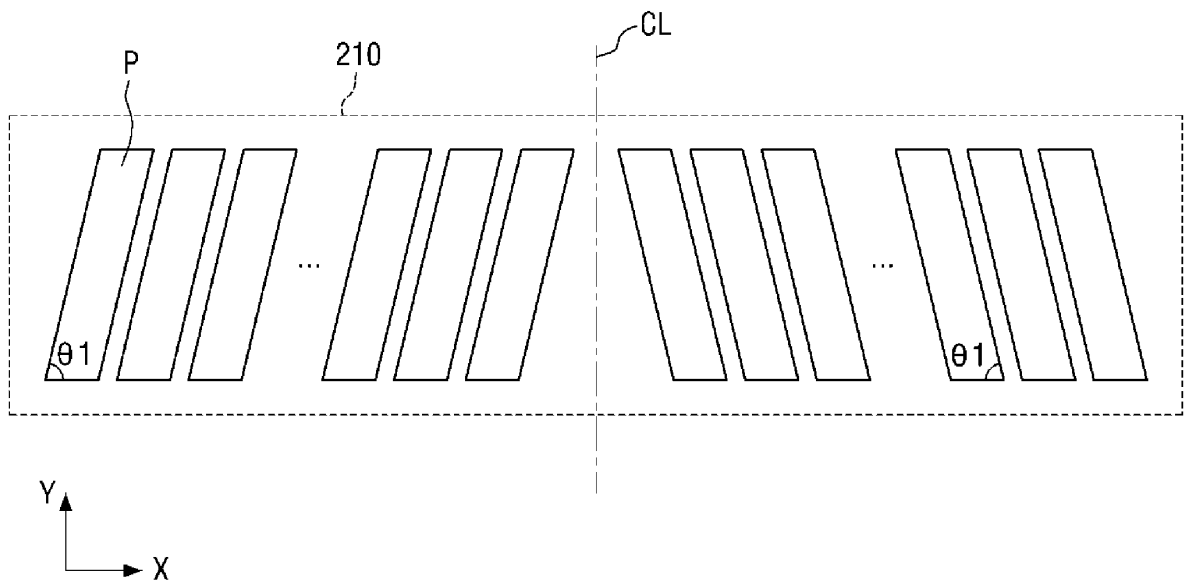


Fig.9

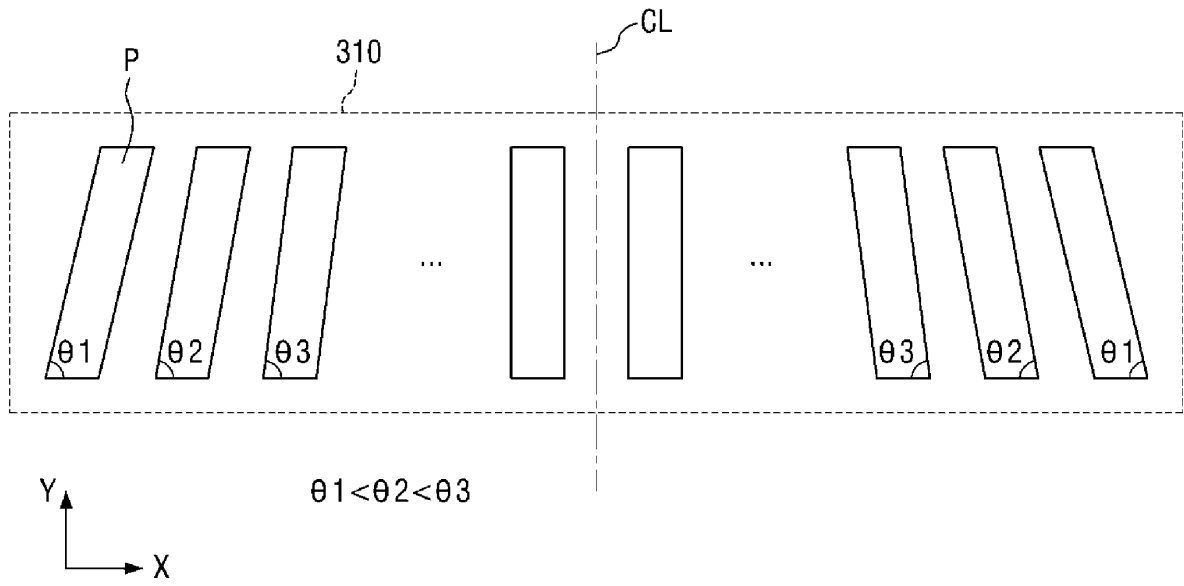


Fig.10

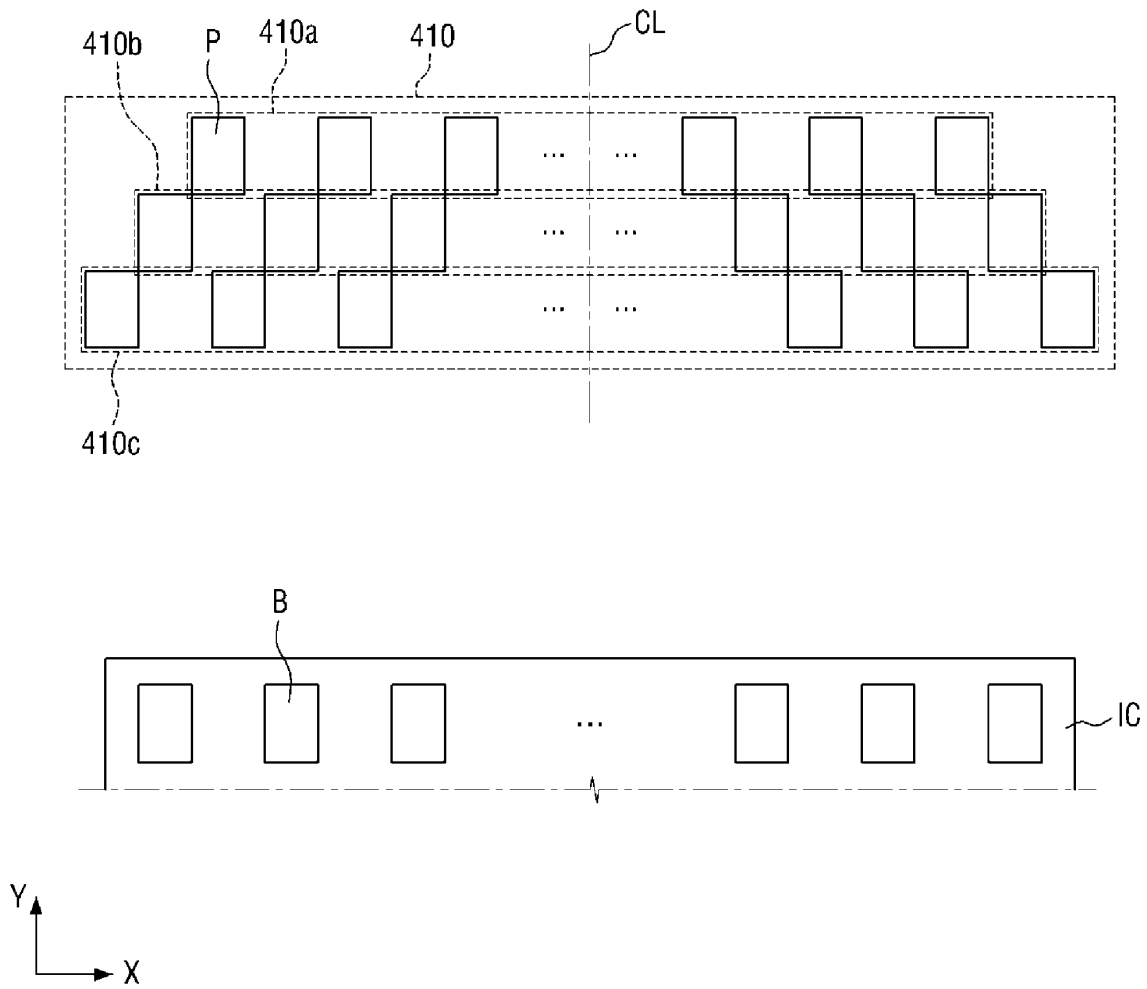


Fig.11

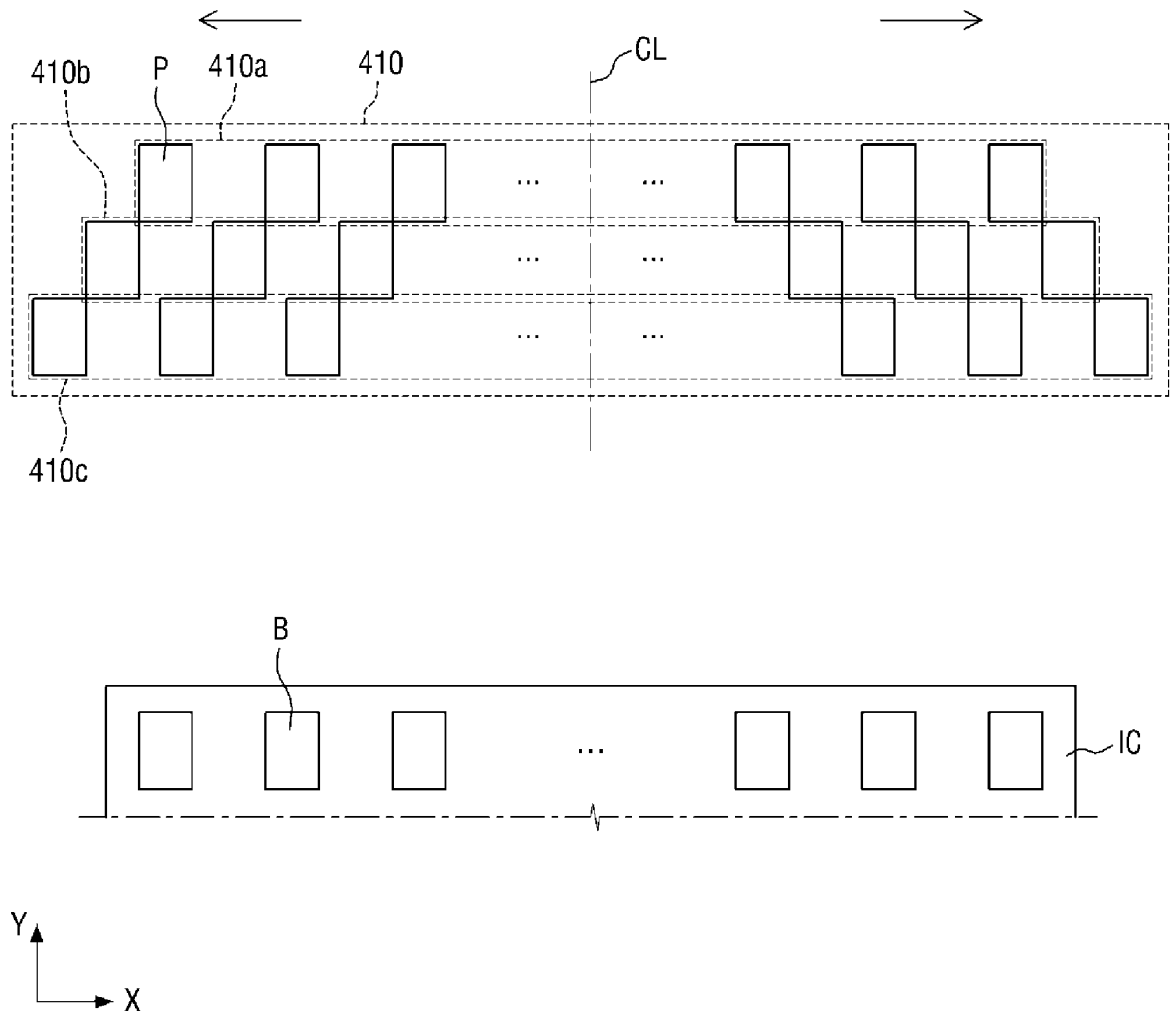


Fig.12

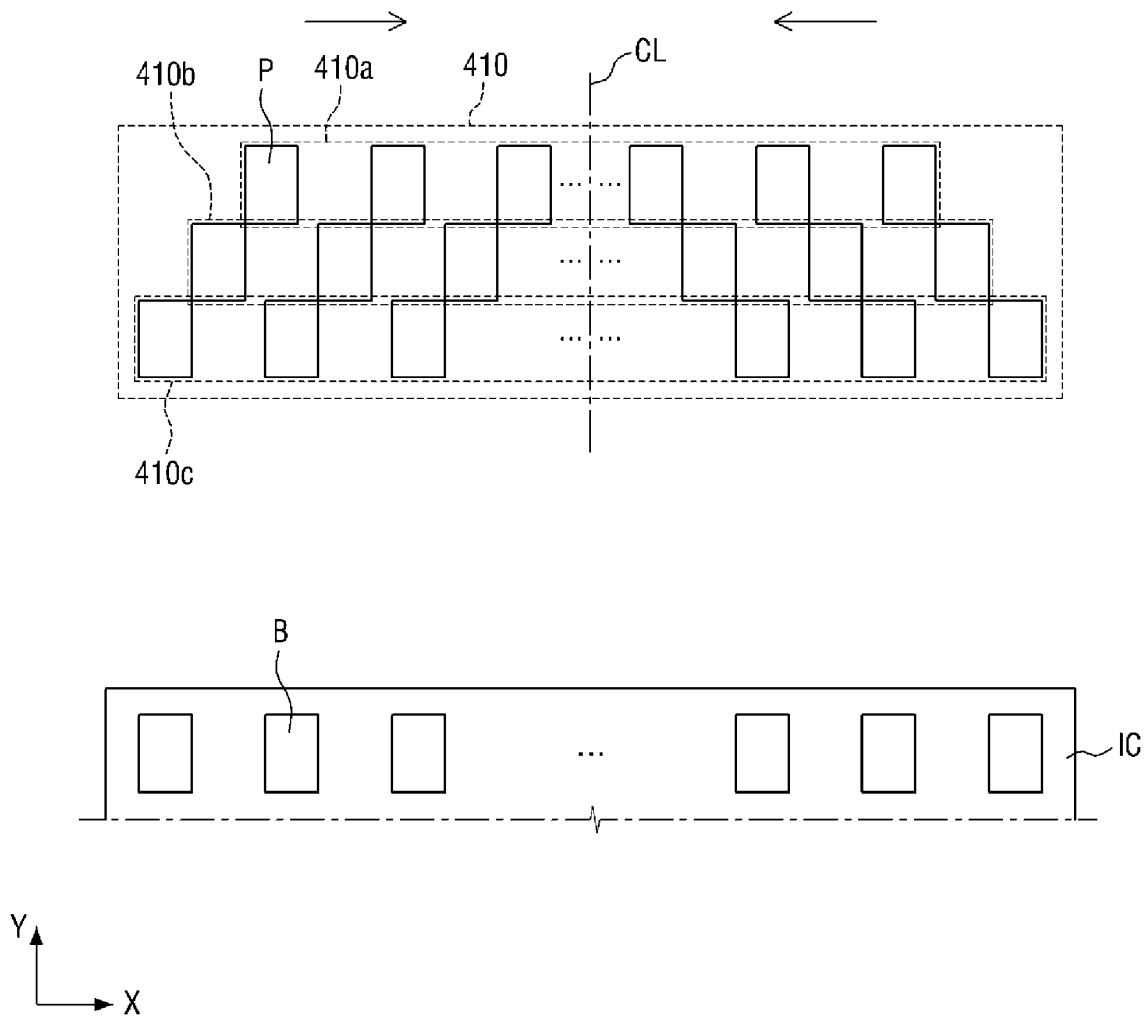


Fig.13

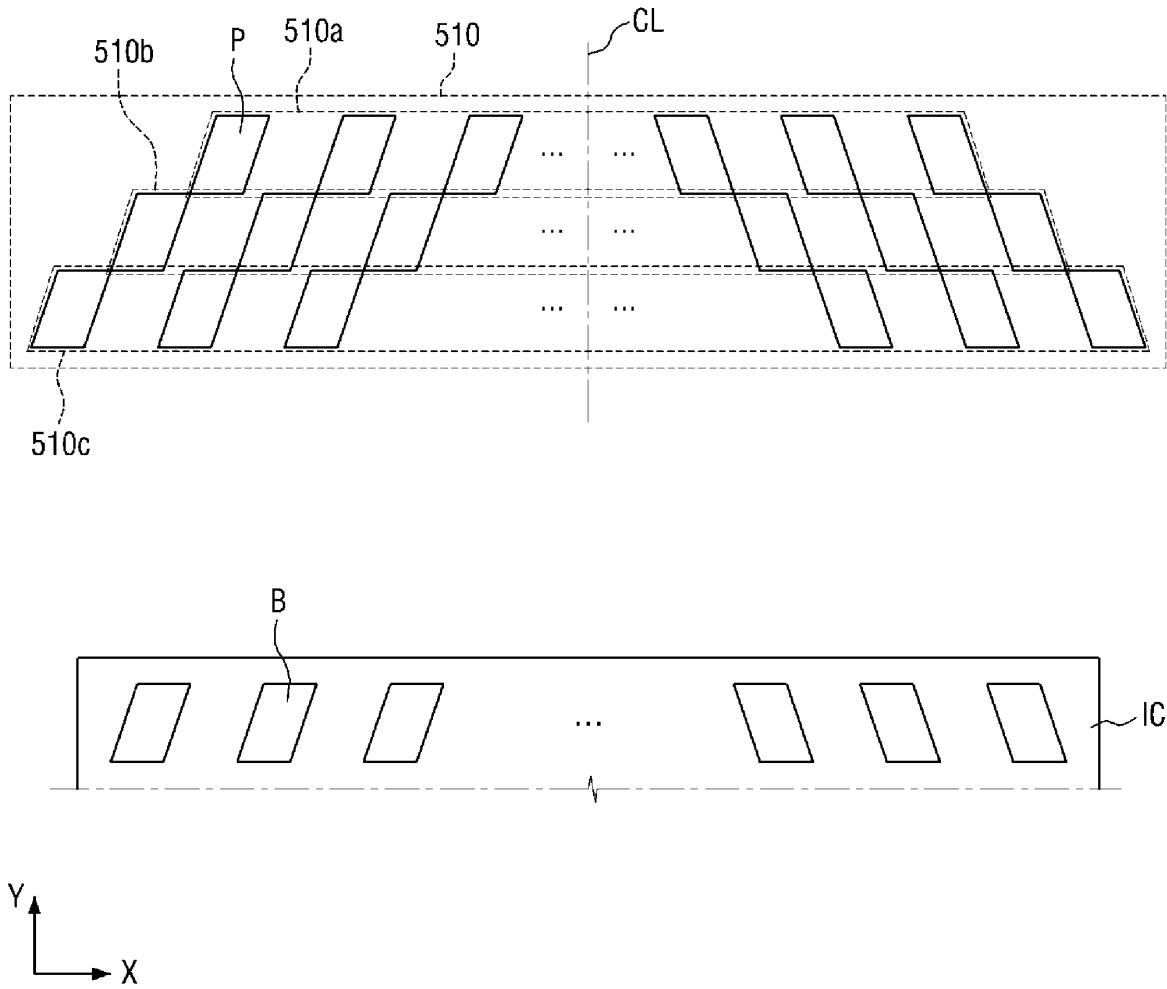
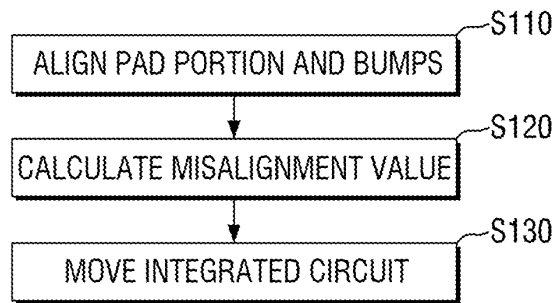


Fig.14





HC Park & Associates, PLC

COUNSELORS AT LAW

ASSIGNMENT SERVING AS DECLARATION PER 37 C.F.R. § 1.63(e)

As a below named inventor and Assignor, I declare that:

This assignment and declaration are directed to:

☒ The attached application entitled **ARRAY SUBSTRATE AND METHOD OF MOUNTING INTEGRATED CIRCUIT USING THE SAME** having attorney docket number docketno ("Application"), which claims priority from: Korean Patent Application No. 10-2014-0073756, filed June 17, 2014.

☐ As amended on _____ (if applicable);

The above-identified Application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the Application.

I 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.

Whereas, Assignor has invented a new, original and ornamental design for an article of manufacture ("Invention") disclosed in the Application,

Whereas, Assignor desires to convey all rights, titles, and interests in and to the same to:

Samsung Display Co., Ltd.
95, Samsung 2 Ro, Giheung-gu
Gyeonggi-do
Yongin-city
Republic of Korea

Samsung Display Co., Ltd. herein further referred to as ("Assignee").

Now, for valuable consideration by Assignee to Assignor, the receipt of which is hereby acknowledged, and for other good and valuable consideration, Assignee and Assignor hereby agree as follows:

Assignor hereby conveys, assigns, sells and transfers to Assignee all rights, title and interests in and to the Invention disclosed in said application and in and to any Letters Patent of the United States (US), any continuation, division, renewal, or substitute thereof, and hereby grant to Assignee the right to apply in its own name for patents or inventor's certificates and related rights heretofore or hereafter filed for the Invention in any and all countries, including (without limitation) all rights to claim priority based thereon, all patents granted thereon and all reissues, extensions and renewals thereof.



HC Park & Associates, PLC

COUNSELORS AT LAW

Docket No. P6037US00

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

Assignor further covenants that Assignee will, upon Assignee's request, be provided promptly with all pertinent facts and documents relating to the Invention, Patent, Application and any patents granted thereon, as may be known and accessible to Assignor, and Assignor will testify as to the same in any interference, litigation or proceeding related thereto and will promptly execute and deliver to Assignee or Assignee's legal representative any and all papers, instruments or affidavits required to apply for, protect, obtain, maintain, issue, defend and enforce the Application, Patent, Invention, whether in the US or any and all foreign countries and any patents granted thereon and/or for obtaining any reissue or reissues of any patent which may be granted for the invention and perform such further acts which may be necessary or desirable to carry out the intent of this agreement as the Assignee thereof shall hereafter require and prepare at assignee's expense.

IN WITNESS WHEREOF, Inventor and Assignor has hereunto set hand and seal.

First Inventor's and Assignor's Name: Dae Gaun LEE

Address: #245, 213, Dongtanjungang-ro
Gyeonggi-do
Hwaseong-si
Republic of Korea

First Inventor's and Assignor's Signature: *Dae Gaun LEE*

Date: October 20, 2014

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	P6037USC1C1C1
		Application Number	
Title of Invention	ARRAY SUBSTRATE AND METHOD OF MOUNTING INTEGRATED CIRCUIT USING THE SAME		
The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76. This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.			

Secrecy Order 37 CFR 5.2:

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1 Remove				
Legal Name				
Prefix	Given Name	Middle Name	Family Name	Suffix
	Dae Geun		LEE	
Residence Information (Select One) ☐ US Residency ☒ Non US Residency ☐ Active US Military Service				
City	Hwaseong-si	Country of Residence ⁱ	KR	
Mailing Address of Inventor:				
Address 1		#245, 213, Dongtanjungang-ro		
Address 2		Gyeonggi-do		
City	Hwaseong-si	State/Province		
Postal Code		Country ⁱ	KR	
All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the Add button. Add				

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below. For further information see 37 CFR 1.33(a).			
☐ An Address is being provided for the correspondence information of this application.			
Customer Number	58027		
Email Address		Add Email	Remove Email

Application Information:

Title of the Invention	ARRAY SUBSTRATE AND METHOD OF MOUNTING INTEGRATED CIRCUIT USING THE SAME		
Attorney Docket Number	P6037USC1C1C1	Small Entity Status Claimed	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	12	Suggested Figure for Publication (if any)	

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	P6037USC1C1C1
		Application Number	
Title of Invention	ARRAY SUBSTRATE AND METHOD OF MOUNTING INTEGRATED CIRCUIT USING THE SAME		

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32). Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	☒ Customer Number	☐ US Patent Practitioner	☐ Limited Recognition (37 CFR 11.9)
Customer Number	58027		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.

When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	Pending	Remove	
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Continuation of	15/901846	2018-02-21

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number		P6037USC1C1C1	
		Application Number			
Title of Invention		ARRAY SUBSTRATE AND METHOD OF MOUNTING INTEGRATED CIRCUIT USING THE SAME			
Prior Application Status		Patented		Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
15/901846	Continuation of	15/429411	2017-02-17	9917113	2018-03-13
Prior Application Status		Patented		Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
15/429411	Continuation of	14/526182	2014-10-28	9591754	2017-03-07
Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the Add button.					

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)ⁱ the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Application Number		Country ⁱ	Filing Date (YYYY-MM-DD)	Remove	Access Code ⁱ (if applicable)
10-2014-0073756		KR	2014-06-17		A77F
Additional Foreign Priority Data may be generated within this form by selecting the Add button.					

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.

☐ NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	P6037USC1C1C1
		Application Number	
Title of Invention	ARRAY SUBSTRATE AND METHOD OF MOUNTING INTEGRATED CIRCUIT USING THE SAME		

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	P6037USC1C1C1
		Application Number	
Title of Invention	ARRAY SUBSTRATE AND METHOD OF MOUNTING INTEGRATED CIRCUIT USING THE SAME		

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.			
Applicant 1			
If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.			
Clear			
☒ Assignee	☐ Legal Representative under 35 U.S.C. 117	☐ Joint Inventor	
☐ Person to whom the inventor is obligated to assign.		☐ Person who shows sufficient proprietary interest	
If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:			
Name of the Deceased or Legally Incapacitated Inventor:			
If the Applicant is an Organization check here. ☒			
Organization Name	Samsung Display Co., Ltd.		
Mailing Address Information For Applicant:			
Address 1	1, Samsung-ro, Giheung-gu		
Address 2	Gyeonggi-do		
City	Yongin-si	State/Province	
Country	KR	Postal Code	
Phone Number		Fax Number	
Email Address			
Additional Applicant Data may be generated within this form by selecting the Add button.			

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	P6037USC1C1C1	
		Application Number		
Title of Invention	ARRAY SUBSTRATE AND METHOD OF MOUNTING INTEGRATED CIRCUIT USING THE SAME			

Assignee 1

Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

If the Assignee or Non-Applicant Assignee is an Organization check here. ☐

Prefix	Given Name	Middle Name	Family Name	Suffix

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1				
Address 2				
City		State/Province		
Country ⁱ		Postal Code		
Phone Number		Fax Number		
Email Address				

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button.

Signature:

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). **However, if this Application Data Sheet is submitted with the INITIAL filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).**

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e.g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/William L. Brooks/		Date (YYYY-MM-DD)	2019-07-12
First Name	William	Last Name	Brooks	Registration Number
		34,129		

Additional Signature may be generated within this form by selecting the Add button.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76		Attorney Docket Number	P6037USC1C1C1
		Application Number	
Title of Invention	ARRAY SUBSTRATE AND METHOD OF MOUNTING INTEGRATED CIRCUIT USING THE SAME		

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal				
Application Number:				
Filing Date:				
Title of Invention:		ARRAY SUBSTRATE AND METHOD OF MOUNTING INTEGRATED CIRCUIT USING THE SAME		
First Named Inventor/Applicant Name:		Dae Geun LEE		
Filer:		Hae-Chan Park/Sheila Jallow		
Attorney Docket Number:		P6037USC1C1C1		
Filed as Large Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
UTILITY APPLICATION FILING	1011	1	300	300
UTILITY SEARCH FEE	1111	1	660	660
UTILITY EXAMINATION FEE	1311	1	760	760
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				1720

Electronic Acknowledgement Receipt	
EFS ID:	36571620
Application Number:	16510262
International Application Number:	
Confirmation Number:	1231
Title of Invention:	ARRAY SUBSTRATE AND METHOD OF MOUNTING INTEGRATED CIRCUIT USING THE SAME
First Named Inventor/Applicant Name:	Dae Geun LEE
Customer Number:	58027
Filer:	Hae-Chan Park/Sheila Jallow
Filer Authorized By:	Hae-Chan Park
Attorney Docket Number:	P6037USC1C1C1
Receipt Date:	12-JUL-2019
Filing Date:	
Time Stamp:	15:44:29
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	\$1720
RAM confirmation Number	071519INTEFSW15455000
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		P6037USC1C1C1_SPECIFICATION.pdf	80667	yes	26
			83384dcd4bd6b76855917bea08effbebd7f3a5bc		
	Multipart Description/PDF files in .zip description				
	Document Description		Start	End	
	Abstract		26	26	
	Drawings-only black and white line drawings		23	25	
	Specification		1	22	
Warnings:					
Information:					
2	Power of Attorney	P6037USC1C1C1_POA_STATEMENT.pdf	1425759	no	8
			196b3803d4d2e2748f16d12e567056131c7f8f55		
Warnings:					
Information:					
3	Non Patent Literature	P6037USC1C1C1_NOA_NPL_3.pdf	1108816	no	9
			97570ee6777b5f2386e5cddc5e46f5f7d67be918		
Warnings:					
Information:					
4	Non Patent Literature	P6037USC1C1C1_NFOA_NPL_1.pdf	1199156	no	11
			81672ac80c2577581d3094a6201b5d4337795d0e		
Warnings:					
Information:					
5	Information Disclosure Statement (IDS) Form (SB08)	P6037USC1C1C1_IDS.pdf	67999	no	5
			7c474835638100c2793e73fd5b34c3b5ab1f1350		

Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
6	Non Patent Literature	P6037USC1C1C1_FOA_NPL_2.pdf	1329794	no	13
			77e0b11b496f350907e5cf6920630022b1584801		
Warnings:					
Information:					
7	Drawings-only black and white line drawings	P6037USC1C1C1_DWGS.pdf	1627640	no	12
			ce9f89cb432195c27e366d2a3baaf08e1196f181		
Warnings:					
Information:					
8	Oath or Declaration filed	P6037USC1C1C1_DECLARATION_OATH.pdf	273125	no	2
			0ef58adace7a435b7a1a2a6ba57ef741d919359a		
Warnings:					
Information:					
9	Application Data Sheet	P6037USC1C1C1_ADS.pdf	122195	no	8
			790ebac893df1f6c5f2828b403e7dcb5d9a47bab		
Warnings:					
Information:					
This is not an USPTO supplied ADS fillable form					
10	Fee Worksheet (SB06)	fee-info.pdf	34661	no	2
			25631c13efd9e78fdbc8cbdfdfcdcd18d35261d3		
Warnings:					
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ABSTRACT

An electronic device, including an array substrate, a pad portion disposed on the array substrate, and an integrated circuit disposed on the pad portion and comprising a bump portion. The pad portion includes a first sub-pad unit including a first pad having an inclined shape and a
5 second sub-pad unit including a second pad having an inclined shape. The first pad and the second pad are symmetrically arranged with respect to an imaginary line that divides the pad portion. The pad portion is electrically connected with the bump portion.

WHAT IS CLAIMED IS:

1 1. An electronic device, comprising:
2 an array substrate;
3 a pad portion disposed on the array substrate; and
4 an integrated circuit disposed on the pad portion and comprising a bump portion;
5 wherein:
6 the pad portion comprises a first sub-pad unit comprising an inclined first pad and a
7 second sub-pad unit comprising an inclined second pad;
8 the first pad and the second pad are inclined in different directions symmetrically about
9 an imaginary line that divides the pad portion; and
10 the pad portion is electrically connected with the bump portion;
11 the bump portion comprises a first sub-bump unit comprising an inclined first bump and a
12 second sub-bump unit comprising an inclined second bump;
13 the first bump and the second bump are inclined in different directions symmetrically
14 about the imaginary line that divides the pad portion.

1 2. The electronic device of claim 1, wherein at least one of the first pad and the
2 second pad has a parallelogram shape.

1 3. The electronic device of claim 1, wherein:
2 the first bump has a same inclination angle as the first pad; and
3 the second bump has a same inclination angle as the second pad.

1 4. The electronic device of claim 1, wherein a shape of the first bump corresponds
2 to a shape of the first pad, and a shape of the second bump corresponds to a shape of the second
3 pad.

1 5. The electronic device of claim 1, wherein the first pad is electrically connected
2 with the first bump and the second pad is electrically connected with the second bump.

1 6. The electronic device of claim 1, wherein an area of the first pad is greater than
2 an area of the first bump.

1 7. The electronic device of claim 1, wherein:
2 the first bump comprises a first region and a second region; and
3 the first region overlaps the first pad and the second region does not overlap the first pad.

1 8. The electronic device of claim 1, wherein at least one of the first pad and the
2 second pad has a quadrangle shape.

1 9. The electronic device of claim 2, wherein the pad portion further comprises a
2 third sub-pad unit comprising a third pad having a rectangular shape and disposed
3 between the first sub-pad unit and the second sub-pad unit.

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1 10. The electronic device of claim 9, wherein the bump portion further comprises a
2 third sub-bump unit comprising a third bump having a rectangular shape and disposed between
3 the first sub-bump unit and the second sub-bump unit.

ARRAY SUBSTRATE AND METHOD OF MOUNTING INTEGRATED CIRCUIT USING THE SAME

CROSS-REFERENCE TO RELATED APPLICATIONS

5 **[0001]** This application is a Continuation of U.S. Patent Application No. 15/901,846,
filed February 21, 2018, which is a Continuation of U.S. Patent Application No. 15/429,411,
filed on February 10, 2017, now issued as U.S. Patent No. 9,917,113, which is a Continuation of
U.S. Patent Application No. 14/526,182, filed on October 28, 2014, now issued as U.S. Patent
No. 9,591,754, and claims priority from Korean Patent Application No. 10-2014-0073756, filed
10 on June 17, 2014, all of which are hereby incorporated by reference for all purposes as if fully set
forth herein.

BACKGROUND

[0002] FIELD

15 **[0003]** Exemplary embodiments relate to a method of mounting an integrated circuit
using an array substrate.

[0004] DISCUSSION OF THE BACKGROUND

20 **[0005]** A display device, such as a liquid crystal display (LCD) device or an organic
light-emitting diode (OLED) device, may include an array substrate, which has a display area
and a non-display area surrounding the display area. The array substrate may be used as a circuit
board for separately driving pixels of the display device. Gate wiring for transmitting a scan
signal, data wiring for transmitting an image signal, thin-film transistors (TFTs), and various
organic or inorganic insulating layers may be provided on the array substrate. Each of the TFTs

include a gate electrode that forms part of the gate wiring, a semiconductor layer that forms a channel with the gate electrode, and a source electrode and a drain electrode that form parts of the data wiring. The TFT may function as a switching device.

[0006] In the non-display area, which surrounds the display area, wires may be provided. The wires may be connected to gate lines or data lines in the display area. The wires may extend in various shapes, and may also be connected to pads in a pad unit below the array substrate. In the pad unit, a driving integrated circuit may be provided. The driving integrated circuit may apply driving signals to the gate lines and the data lines. The driving integrated circuit may include a plurality of bumps, which are aligned with, and provide driving signals to, the pads, respectively, of the pad unit.

[0007] The array substrate may be formed of a flexible material, such as polyimide, in accordance with recent trends in manufacturing flexible displays. However, the size of a flexible array substrate may change during processes, which are then followed by the formation of a pad unit, thereby causing misalignment between the bumps of a driving integrated circuit and the pads of the pad unit.

[0008] The above information disclosed in this Background section is only for enhancement of understanding of the background of the inventive concept and, therefore, it may contain information that does not form the prior art that is already known in this country to a person of ordinary skill in the art.

SUMMARY

[0009] Exemplary embodiments provide an array substrate capable of preventing misalignment between the bumps of a driving integrated circuit and the pads of a pad unit

regardless of a change in the size of a flexible array substrate.

[0010] Exemplary embodiments also provide a method of mounting an integrated circuit, which is capable of preventing misalignment between the bumps of a driving integrated circuit and the pads of a pad unit regardless of a change in the size of a flexible array substrate.

5 [0011] Additional aspects will be set forth in the detailed description which follows, and, in part, will be apparent from the disclosure, or may be learned by practice of the inventive concept.

[0012] An exemplary embodiment discloses an array substrate, including a display area and a non-display area configured to surround the display area, wherein the non-display area
10 includes a pad portion, and the pad portion includes one or more first pads, which are formed as parallelograms.

[0013] An exemplary embodiment also discloses an array substrate, including a display area; and a non-display area configured to surround the display area, wherein the non-display area includes a pad portion, and the pad portion includes a first sub-pad unit and a second sub-
15 pad unit that differ from each other in terms of the distance between either end thereof and an imaginary line that divides the pad portion in half.

[0014] An exemplary embodiment also discloses a method of mounting an integrated circuit, the method including aligning a pad portion of an array substrate with a plurality of bumps of an integrated circuit; calculating a misalignment value that indicates a degree of
20 misalignment between the pad portion and the bumps in a first direction; and moving the integrated circuit in a second direction that is perpendicular to the first direction, according to the misalignment value.

[0015] The foregoing general description and the following detailed description are

exemplary and explanatory and are intended to provide further explanation of the claimed subject matter.

BRIEF DESCRIPTION OF THE DRAWINGS

5 **[0016]** The accompanying drawings, which are included to provide a further understanding of the inventive concept, and are incorporated in and constitute a part of this specification, illustrate exemplary embodiments of the inventive concept, and, together with the description, serve to explain principles of the inventive concept.

10 **[0017]** FIG. 1 is a plan view of an array substrate according to an exemplary embodiment.

[0018] FIG. 2 is a plan view illustrating a pad portion and a data driving integrated circuit, according to an exemplary embodiment.

[0019] FIG. 3 is a plan view illustrating a data driving integrated circuit properly mounted on a pad portion.

15 **[0020]** FIGS. 4, 5, 6, and 7 are plan views illustrating the deformation of a pad portion in accordance with expansion or contraction of an array substrate and the resulting movement of bumps of a data driving integrated circuit.

[0021] FIG. 8 is a plan view of a pad portion according to another exemplary embodiment.

20 **[0022]** FIG. 9 is a plan view of a pad portion according to another exemplary embodiment.

[0023] FIGS. 10, 11, and 12 are plan views of a pad portion according to another exemplary embodiment.

[0024] FIG. 13 is a plan view of a pad portion according to another exemplary embodiment.

[0025] FIG. 14 is a flowchart illustrating a method of mounting an integrated circuit, according to an exemplary embodiment.

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DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENTS

[0026] In the following description, for the purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding of various exemplary embodiments. It is apparent, however, that various exemplary embodiments may be practiced without these specific details or with one or more equivalent arrangements. In other instances, well-known structures and devices are shown in block diagram form in order to avoid unnecessarily obscuring various exemplary embodiments.

[0027] In the accompanying figures, the size and relative sizes of layers, films, panels, regions, etc., may be exaggerated for clarity and descriptive purposes. Also, like reference numerals denote like elements.

[0028] When an element or layer is referred to as being "on," "connected to," or "coupled to" another element or layer, it may be directly on, connected to, or coupled to the other element or layer or intervening elements or layers may be present. When, however, an element or layer is referred to as being "directly on," "directly connected to," or "directly coupled to" another element or layer, there are no intervening elements or layers present. For the purposes of this disclosure, "at least one of X, Y, and Z" and "at least one selected from the group consisting of X, Y, and Z" may be construed as X only, Y only, Z only, or any combination of two or more of X, Y, and Z, such as, for instance, XYZ, XYY, YZ, and ZZ. Like numbers refer to like elements

throughout. As used herein, the term "and/or" includes any and all combinations of one or more of the associated listed items.

[0029] Although the terms first, second, etc. may be used herein to describe various elements, components, regions, layers, and/or sections, these elements, components, regions, layers, and/or sections should not be limited by these terms. These terms are used to distinguish one element, component, region, layer, and/or section from another element, component, region, layer, and/or section. Thus, a first element, component, region, layer, and/or section discussed below could be termed a second element, component, region, layer, and/or section without departing from the teachings of the present disclosure.

[0030] Spatially relative terms, such as "beneath," "below," "lower," "above," "upper," and the like, may be used herein for descriptive purposes, and, thereby, to describe one element or feature's relationship to another element(s) or feature(s) as illustrated in the drawings.

Spatially relative terms are intended to encompass different orientations of an apparatus in use, operation, and/or manufacture in addition to the orientation depicted in the drawings. For example, if the apparatus in the drawings is turned over, elements described as "below" or "beneath" other elements or features would then be oriented "above" the other elements or features. Thus, the exemplary term "below" can encompass both an orientation of above and below. Furthermore, the apparatus may be otherwise oriented (e.g., rotated 90 degrees or at other orientations), and, as such, the spatially relative descriptors used herein interpreted accordingly.

[0031] The terminology used herein is for the purpose of describing particular embodiments and is not intended to be limiting. As used herein, the singular forms, "a," "an," and "the" are intended to include the plural forms as well, unless the context clearly indicates

otherwise. Moreover, the terms “comprises,” “comprising,” “includes,” and/or “including,” when used in this specification, specify the presence of stated features, integers, steps, operations, elements, components, and/or groups thereof, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof.

5 **[0032]** Unless otherwise defined, all terms (including technical and scientific terms) used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this disclosure is a part. Terms, such as those defined in commonly used dictionaries, should be interpreted as having a meaning that is consistent with their meaning in the context of the relevant art and will not be interpreted in an idealized or overly formal sense, unless
10 expressly so defined herein.

[0033] Referring to FIG. 1, an array substrate 100 includes a display area DA and a non-display area NA.

[0034] The display area DA may be a region where an image is displayed. The display area DA may include pixels PX arranged in a matrix. Each of the pixels PX may be provided
15 with a display element displaying an image, and a thin-film transistor (TFT) electrically connected to the display element. The display element may be an organic light-emitting diode (OLED), for example. The pixels PX may be defined by gate lines GL and data lines DL intersecting the gate lines GL. The gate lines GL may extend in a first direction X, and the data lines DL may extend in a second direction Y intersecting the first direction X. The first direction
20 X may correspond to a direction of rows of the pixels PX, and the second direction Y may correspond to a direction of columns of the pixels PX.

[0035] The non-display area NA may be a region where no image is displayed, and may surround the display area DA. The non-display area NA may also be a region adjoining, or

provided along, the edges of the array substrate 100. In the non-display area NA, a pad portion 110, a gate driving unit 120, and a power supply unit 130 may be provided.

[0036] The pad portion 110 may be a region where a data driving integrated circuit IC, which applies a data signal voltage to the data lines DL, is mounted. The data driving integrated circuit IC may be Chip-on-Glass (COG)-mounted on the pad portion 110 on the array substrate 100. That is, the pad portion 110 may be a COG pad unit. Alternatively, in response to the array substrate 100 being formed of a flexible material, the pad portion 110 may be a Chip-on-Plastic (COP) pad unit.

[0037] The gate driving unit 120 may be provided on a side of the array substrate 100 perpendicular to the side where the data driving integrated circuit IC is provided. The gate driving unit 120 may provide a gate signal voltage to the gate lines GL, and may sequentially scan the pixels PX. The power supply unit 130 may be provided on side of the array substrate 100 opposite to the side where the gate driving unit 120 is provided. The power supply unit 130 may provide a power voltage necessary for driving the pixels PX.

[0038] The pad portion 110 may include a plurality of pads arranged in one direction. The data driving integrated circuit IC may include a plurality of bumps B corresponding to the pads, respectively, of the pad portion 110. That is, the bumps B of the data driving integrated circuit IC may be connected one-on-one to the pads of the pad portion 110. The relationship between the pads of the pad portion 110 and the bumps B of the data driving integrated circuit IC will hereinafter be described with reference to FIGS. 2 to 7.

[0039] Referring to FIGS. 2 to 7, the pad portion 110 may include a plurality of pads. The pads may be arranged in the first direction X. The pad portion 110 may be divided into a first sub-pad unit 110a, a second sub-pad unit 110b, and a third sub-pad unit 110c.

[0040] The first sub-pad unit 110a may be provided on one side of the pad portion 110, the second sub-pad unit 110b may be provided in the middle of the pad portion 110, and the third sub-pad unit 110c may be provided on the other side of the pad portion 110. That is, the first sub-pad unit 110a and the third sub-pad unit 110c may be arranged symmetrically with respect to the second sub-pad unit 110b. The first sub-pad unit 110a and the third sub-pad unit 110c may have a “mirror pair” relationship, and may have the same structure.

[0041] The first sub-pad unit 110a may include one or more first pads P1, which are formed as parallelograms having a first inclination angle θ_1 . Each of the first pads P1 may have a first short side S1 extending in the first direction X, a second short side S2 parallel to the first short side S1, a first long side L1 forming the first inclination angle θ_1 with the first short side S1, and a second long side L2 parallel to the first long side L1. That is, the first long side L1 may extend diagonally from one end of the first short side S1 at the first inclination angle θ_1 and meet one end of the second short side S2, the second long side L2 may extend diagonally from the other end of the first short side S1 at the first inclination angle θ_1 and meet the other end of the second short side S2. For example, each of the first pads P1 may be inclined from the first short side S1 thereof in a direction of the sum of a positive first direction +X and a positive second direction +Y. In an alternative exemplary embodiment, each of the first pads P1 may be inclined from the first short side S1 thereof in a direction of the sum of a negative first direction -X and the positive second direction +Y. The first inclination angle θ_1 may be appropriately determined in consideration of the distance between the pad portion 110 and the display area DA, and is not necessarily limited to a certain angle or a certain range of angles. The first inclination angle θ_1 may represent an angle between a lengthwise direction of the first pads P1 (a direction parallel to the long sides L1, L2) and a lengthwise direction of pad portion 110. In

other words, first inclination angle θ_1 may be equal to the acute internal angles of the respective first pads P1.

[0042] The second sub-pad unit 110b may include one or more second pads P2, which are formed as rectangles. That is, the second sub-pad unit 110b may include one or more second
5 pads P2, which are not inclined and have a pair of parallel short sides and a pair of parallel long sides perpendicular to the pair of parallel short sides.

[0043] The third sub-pad unit 110c may be arranged symmetrically with the first sub-pad unit 110a with respect to the second sub-pad unit 110b. That is, the third sub-pad unit 110c may include one or more third pads P3 which are inclined from a first short side S1 thereof in a
10 direction of the sum of the negative first direction $-X$ and the positive second direction $+Y$. The first pads P1 and the third pads P3 may be inclined from the bottom to the top thereof, toward the second sub-pad unit 110b, along the second direction Y. That is, the pad portion 110 may include the second pads P2, which are provided in the middle of the pad portion 110 and are formed as rectangles that are not inclined, the first pads P1, which are provided on one side of
15 the pad portion 110 and are formed as parallelograms that are inclined from the bottom to the top thereof toward the second pads P2, and the third pads P3, which are provided on the other side of the pad portion 110 and are formed as parallelograms that are also inclined from the bottom to the top thereof toward the second pads P2.

[0044] The data driving integrated circuit IC may include a plurality of bumps B. The
20 bumps B may be formed to conform to the shape of the pad portion 110. More specifically, the bumps B may include one or more rectangular bumps B that are not inclined in the middle of the data driving integrated circuit IC, and one or more rectangular bumps B that are provided on one side of the data driving integrated circuit IC and are inclined from the bottom to the top thereof

toward the rectangular bumps B, and one or more rectangular bumps B that are provided on the other side of the data driving integrated circuit IC and are also inclined from the bottom to the top thereof toward the rectangular bumps B.

[0045] The bumps B of the data driving integrated circuit IC may be connected to the pads, respectively, of the pad portion 110. More specifically, the bumps B of the data driving integrated circuit IC may be coupled to the pads of the pad portion 110 via an anisotropic conductive film (ACF), and thus, may be able to exchange electrical signals with each other. As illustrated in FIG. 3, in a case in which the array substrate 100 being properly fabricated as designed, the bumps B of the data driving integrated circuit IC may one-on-one correspond to the pads of the pad portion 110, and the data driving integrated circuit IC may be properly mounted on the array substrate 100. To facilitate connecting the pads of the pad portion 110 and the bumps B of the data driving integrated circuit IC, the pads of the pad portion 110 may be formed to have longer short sides and longer long sides than the bumps B of the data driving integrated circuit IC. That is, the size of the pads of the pad portion 110 may be larger than the size of the bumps B of the data driving integrated circuit IC. The pads of the pad portion 110 may be formed to have longer sides than the bumps B of the data driving integrated circuit IC to ensure the movement of the data driving integrated circuit IC in the second direction Y. The pads of the pad portion 110 may be formed to have sides that are 1.5 to 2 times longer than the bumps B of the data driving integrated circuit IC, for example.

[0046] In a case in which the array substrate 100 is formed of a flexible material, the array substrate 100 may expand or contract, especially during processes followed by the formation of the pad portion 110. The array substrate 100 may contract or expand in the first direction X and/or the second direction Y.

[0047] More specifically, the array substrate 100 may expand in the first direction X, as illustrated in FIG. 4, and may contract in the first direction X, as illustrated in FIG. 6. The expansion or contraction of the array substrate 100 in the first direction X may occur mostly at the sides of the array substrate 100, and may considerably affect the first sub-pad unit 110a and the third sub-pad unit 110c. That is, in response to the array substrate 100 expanding or contracting, the first sub-pad unit 110a and the third sub-pad unit 110c may be positioned more outwardly or inwardly than they are designed to be. As a result of the displacement of the first sub-pad unit 110a and the third sub-pad unit 110c, the pads of the pad portion 110 may be misaligned with the bumps B of the data driving integrated circuit IC.

[0048] However, because the pad portion 110 and the data driving integrated circuit IC include pads or bumps B that are formed as parallelograms with a predetermined inclination angle, the pad portion 110 and the data driving integrated circuit IC may flexibly respond to the deformation of the array substrate 100. In response to the array substrate 100 expanding, as illustrated in FIG. 4, the bumps B of the data driving integrated circuit IC may be aligned with the pads of the pad portion 110, which is deformed as a result of the expansion of the array substrate 100, by moving the data driving integrated circuit IC toward the positive second direction +Y by a distance a, as illustrated in FIG. 5. As a result, the data driving integrated circuit IC may be aligned with the pad portion 110, and may be properly mounted on the array substrate 100. On the other hand, in response to the array substrate 100 contracting, the bumps B of the data driving integrated circuit IC may be aligned with the pads of the pad portion 110, which are deformed as a result of the contraction of the array substrate 100, by moving the data driving integrated circuit IC toward a negative second direction -Y by the distance a, as illustrated in FIG. 6. As a result, the data driving integrated circuit IC may be aligned with the

pad portion 110, and may be properly mounted on the array substrate 100.

[0049] The distance a by which the data driving integrated circuit IC is moved in the second direction Y to be aligned with the pad portion 110 may be calculated by using Equation

(1): $a = b \tan \theta$... (1).

5

[0050] Even if the pad portion 110 is deformed as a result of the contraction or expansion of the array substrate 100, the data driving integrated circuit IC may be aligned again with the pad portion 110 by moving the data driving integrated circuit IC toward the positive or negative
10 second direction $+Y$ or $-Y$. Accordingly, the efficiency of mounting the data driving integrated circuit IC may be improved.

[0051] Referring back to FIG. 1, the array substrate 100 may also include a second pad unit 140, which is provided for coupling the array substrate 100 to a flexible printed circuit board (FPCB). The second pad unit 140 may be a Flex-on-Glass (FOG) pad unit. The FPCB may
15 serve as a bridge between a host (not illustrated) and the array substrate 100 for transmitting various signals for driving the array substrate 100 to the array substrate 100. The FPCB may include a plurality of bumps B for being connected to the second pad unit 140, and the bumps B of the FPCB may be electrically connected to a plurality of pads, respectively, of the second pad unit 140 via an ACF. Accordingly, the FPCB may electrically exchange signals with the second
20 pad unit 140 via the bumps B thereof and the pads of the second pad unit 140.

[0052] The second pad unit 140 may be provided along an edge of the array substrate 100, and may be closer than the pad portion 140 to the edge of the array substrate 100. The second pad unit 140 may be electrically connected to, and transmit signals to, the pad portion

110, the gate driving unit 120, and the power supply unit 130 via wiring.

[0053] The second pad unit 140, like the pad portion 110, may be affected by the deformation of the array substrate 120 and, as a result, the arrangement of the pads in the second pad unit 140, especially those on either side of the second pad unit 140, may be changed.

5 However, the second pad unit 140 has substantially the same structure as the pad portion 110, and may, thus, flexibly respond to the deformation of the array substrate 100, similar to the pad portion 110. More specifically, the pads on either side of the second pad unit 140 may be formed as parallelograms with a predetermined inclination angle, and any misalignment between the FPCB and the second pad unit 140 may be corrected by moving the FPCB in the second
10 direction Y, i.e., may divide the pad portion 210 widthwise.

[0054] Pad portions according to another exemplary embodiment will hereinafter be described in detail with reference to FIG. 8, focusing mainly on differences with the previous exemplary embodiment. In FIGS. 1 to 13, like reference numerals indicate like elements, and thus, detailed descriptions thereof will be omitted.

15 [0055] Referring to FIG. 8, a pad portion 210 may include one or more first pads P, which are formed as parallelograms. Two or more first pads P may be provided, and may be arranged in a first direction X. The first pads P may be arranged symmetrically with respect to an imaginary line CL that divides the pad portion 210 in half. The imaginary line CL may extend parallel to a second direction Y.

20 [0056] In this exemplary embodiment, unlike in the exemplary embodiment of FIGS. 1 to 7, the first pads P, which are formed as parallelograms, are provided not only on either side of the pad portion 210, but also in the middle of the pad portion 210. The expansion or contraction of an array substrate may affect the arrangement of the pads in the pad portion 210 (especially

those in the middle of the pad portion 210), but the pad portion 210 may effectively deal with the deformation of the array substrate.

[0057] FIG. 9 is a plan view of a pad portion according to another exemplary embodiment and will hereinafter be described, focusing mainly on differences with the previous
5 exemplary embodiments of the invention.

[0058] Referring to FIG. 9, a pad portion 310 may include one or more first pads P, which are formed as parallelograms. Two or more first pads P may be provided, and may be arranged in a first direction X. The first pads P may be arranged symmetrically with respect to an imaginary line CL that divides the pad portion 210 in half. The imaginary line CL may
10 extend parallel to a second direction Y, i.e., may divide the pad portion 210 widthwise.

[0059] The first pads P may have different inclination angles from one another. More specifically, the inclination angle of the first pads P may become greater the closer the first pads P are to the imaginary line CL. An inclination angle θ_1 of first pads P at either end of the pad portion 310 may be less than an inclination angle θ_2 of first pads P respectively next to the first
15 pads P at either end of the pad portion 310. First pads P closest to the imaginary line CL may have an inclination angle of about 90 degrees.

[0060] The degree of the deformation of an array substrate may vary (or increase) from the center to the sides of the array substrate. The pad portion 310 may effectively deal with the deformation of the array substrate.

[0061] Referring to FIGS. 10 to 12 illustrating another exemplary embodiment, a pad
20 portion 410 may be provided in a non-display area NA of an array substrate, and may be a region where a data driving integrated circuit IC is mounted. The data driving integrated circuit IC may include a plurality of bumps B, and the bumps B may be aligned with, and coupled to, a plurality

of pads P, respectively, of the pad portion 410.

[0062] The pad portion 410 may include a first sub-pad unit 410a, a second sub-pad unit 410b, and a third sub-pad unit 410c. The first sub-pad unit 410a, the second sub-pad unit 410b, and the third sub-pad unit 410c may be arranged in a second direction Y. Each of the first sub-
5 pad unit 410a, the second sub-pad unit 410b, and the third sub-pad unit 410c may include a plurality of pads P that are arranged in the first direction X. The pads P of each of the first sub-pad unit 410a, the second sub-pad unit 410b, and the third sub-pad unit 410c may be arranged symmetrically with respect to an imaginary line CL that divides the pad portion 410 in half. The data driving integrated circuit IC may be connected to one of the first sub-pad unit 410a, the
10 second sub-pad unit 410b, and the third sub-pad unit 410c. In an example, the bumps B may be aligned with, and connected to, the first sub-pad unit 410a, but not to the second sub-pad unit 410b and the third sub-pad unit 410c. In this exemplary embodiment, the data driving integrated circuit IC may provide a data voltage signal to a display area DA via the first sub-pad unit 410a.

[0063] The first sub-pad unit 410a, the second sub-pad unit 410b, and the third sub-pad
15 unit 410c may differ from one another in terms of the distance between an end thereof and the imaginary line CL. The imaginary line CL may be a line extending in the second direction Y through the center of the pad portion 410. Either end of the first sub-pad unit 410a may be closest to the imaginary line CL, either end of the third sub-pad unit 410c may be furthest apart from the imaginary line CL, and either end of the second sub-pad unit 410 may be more apart
20 than the first sub-pad unit 410a, and less apart than the third sub-pad unit 410c, from the imaginary line CL.

[0064] As illustrated in FIG. 10, the arrangement of pads P in the second sub-pad unit 410b may coincide with the arrangement of the bumps B of the data driving integrated circuit IC.

That is, in response to the array substrate where the pad portion 410 is not being deformed, the bumps B of the data driving integrated circuit IC may be mounted on the second sub-pad unit 410b by being aligned with the pads P, respectively, of the second sub-pad unit 410b.

[0065] However, as illustrated in FIG. 11, in response to expansion of the array substrate, the first sub-pad unit 410a, the second sub-pad unit 410b, and the third sub-pad unit 410c may expand in a direction toward the outside of the array substrate. As a result, the arrangement of the pads P in the second sub-pad unit 410b may no longer coincide with the arrangement of the bumps B of the data driving integrated circuit IC. However, the arrangement of pads P in the first sub-pad unit 410a may now coincide with the arrangement of the bumps B of the data driving integrated circuit IC. Thus, the data driving integrated circuit IC may be properly mounted on the first sub-pad unit 410a, instead of on the second sub-pad unit 410b.

[0066] On the other hand, as illustrated in FIG. 12, in response to contraction of the array substrate, the first sub-pad unit 410a, the second sub-pad unit 410b, and the third sub-pad unit 410c may contract in a direction toward the inside of the array substrate. As a result, the arrangement of the pads P in the second sub-pad unit 410b may no longer coincide with the arrangement of the bumps B of the data driving integrated circuit IC. However, the arrangement of pads P in the third sub-pad unit 410c may now coincide with the arrangement of the bumps B of the data driving integrated circuit IC. Thus, the data driving integrated circuit IC may be properly mounted on the third sub-pad unit 410c, instead of on the second sub-pad unit 410b.

[0067] According to this exemplary embodiment, the pad portion 410 includes a plurality of sub-pad units available for application to a driving integrated circuit and thus, may improve the efficiency of mounting a driving integrated circuit regardless of the expansion or contraction of an array substrate.

[0068] FIG. 13 is a plan view of a pad portion according to another exemplary embodiment, focusing mainly on differences with the previous exemplary embodiments.

[0069] Referring to FIG. 13, a pad portion 510 may include a first sub-pad unit 510a, a second sub-pad unit 510b, and a third sub-pad unit 510c. The first sub-pad unit 510a, the second sub-pad unit 510b, and the third sub-pad unit 510c may be arranged in a second direction Y. Each of the first sub-pad unit 510a, the second sub-pad unit 510b, and the third sub-pad unit 510c may include a plurality of pads P. The pad portion 510 includes a plurality of sub-pad units available for application to a driving integrated circuit and, therefore, may improve the efficiency of mounting a driving integrated circuit, regardless of the expansion or contraction of an array substrate.

[0070] The pads P, unlike the pads of FIGS. 10 to 12, may be formed as parallelograms. A data integrated circuit IC may include a plurality of bumps B corresponding to the pads P, respectively. The bumps B, like the pads P, may be formed as parallelograms. The bumps B may be formed to have shorter long sides than the pads P. That is, the bumps B may be moved in the second direction Y without being deviated from their respective pads P in the first, second, or third sub-pad unit 510a, 510b or 510c. That is, the pad portion 510 may further improve the efficiency of mounting a driving integrated circuit.

[0071] FIG. 14 is a flowchart illustrating a method of mounting an integrated circuit, according to an exemplary embodiment of the invention. The method will hereinafter be described with reference to FIGS. 1 to 14.

[0072] Referring to FIG. 14, the method includes aligning pads and bumps (step S110), calculating a misalignment value, which indicates the degree of misalignment between the pads and the bumps (step S120), and moving an integrated circuit (step S130).

[0073] More specifically, as illustrated in FIGS. 1 to 14, pads of a pad portion 110 and bumps B of a data driving integrated circuit IC are aligned (step S110).

[0074] An array substrate 100 and the data driving integrated circuit IC may be prepared in advance, and a description of the preparation of the array substrate 100 and the integrated circuit will, therefore, be omitted.

[0075] The array substrate 100 may include a display area DA displaying an image and a non-display area NA surrounding the display area DA. The pad portion 110 may be provided in the non-display area NA, may receive signals from the data driving integrated circuit IC, and may provide the signals to the display area DA. That is, the pad portion 110 may be a region where the data driving integrated circuit IC is mounted. The data driving integrated circuit IC may be COG-mounted on the pad portion 110. That is, the pad portion 110 may be a COG pad unit. Alternatively, in response to the array substrate 100 being formed of a flexible material, the pad portion 110 may be a COP pad unit.

[0076] The pad portion 110 may include a plurality of pads, and the driving integrated circuit IC may include a plurality of bumps B corresponding to the pads, respectively. The pads may be connected to the bumps B in a one-on-one arrangement. At least one alignment mark may be provided on one or both sides of each of the pad portion 110, and the data driving integrated circuit IC, and the data driving integrated circuit IC may be aligned with the pad portion 110 by aligning the alignment marks of the pad portion 110 and the data driving integrated circuit IC with each other.

[0077] The misalignment value is then calculated (S120).

[0078] The array substrate 100 where the pad portion 110 is provided may expand or contract during the preparation of the array substrate 100. The expansion or contraction of the

array substrate 100 may affect the arrangement of the pads in the pad portion 110. That is, as a result of the expansion or contraction of the array substrate 100, the pads of the pad portion 110 may be misaligned with the bumps B, respectively, of the data driving integrated circuit IC, even if the alignment marks of the pad portion 110 and the data driving integrated circuit IC are still aligned with each other. The misalignment value, which indicates the degree of misalignment between the pads of the pad portion 110 and the bumps B of the data driving integrated circuit IC, may be calculated by scanning. In one example, a solid-state imaging device may be used to capture an image of the state of alignment between the pads of the pad portion 110 and the bumps B of the data driving integrated circuit IC, and a distance b by which the pads of the pad portion 110 and the bumps B of the data driving integrated circuit IC are misaligned with each other, i.e., the misalignment value, may be calculated based on the captured image. The misalignment value b may a length in a first direction X by which the bumps B of the data driving integrated circuit IC are deviated from their respective pads of the pad portion 110 due to the expansion or contraction of the array substrate 100 in the first direction.

15 **[0079]** The calculation of the misalignment value b may include analyzing the misalignment value b. That is, in response to the misalignment value b being less than a predetermined threshold, the pads of the pad portion 110 and the bumps B of the data driving integrated circuit IC may be coupled together without proceeding to step S130. In response to the misalignment value b being greater than the predetermined threshold, a predetermined
20 correction process for the misalignment between the pad portion 110 and the data driving integrated circuit IC is needed, and the method proceeds to step S130.

[0080] The data driving integrated circuit IC is moved (step S130).

[0081] The pad portion 110 may include one or more first pads P1, which are formed as

parallelograms. For example, the first pads P1 may be formed as parallelograms having a first inclination angle θ_1 . The method has been described, taking the pad portion 110 of FIGS. 1 to 7 as an example, but is also applicable to the pad portion 210 of FIG. 8 and the pad portion 310 of FIG. 9. The pad portion 110 has already been described above with reference to FIGS. 1 to 7,
5 and thus, a detailed description thereof will be omitted.

[0082] The bumps B of the data driving integrated circuit IC may also be formed as parallelograms having the same inclination angle as the first pads of the pad portion 110. The first pads of the pad portion 110 may be formed to have longer sides than the bumps B of the data driving integrated circuit IC to ensure the movement of the data driving integrated circuit IC
10 in a second direction Y.

[0083] The data driving integrated circuit IC may be moved to correct its misalignment with the pad portion 110. That is, the data driving integrated circuit IC may be moved to a position that does not necessarily coincide with a position indicated by the alignment mark(s) thereof. The data driving integrated circuit IC may be moved in the second direction Y, which
15 intersects the first direction X. A distance a by which the data driving integrated circuit IC is to be moved to correct the misalignment between the data driving integrated circuit IC and the pad portion 110 may be calculated by using Equation (1) above, i.e., by multiplying the misalignment value b by the tangent of the first inclination angle θ_1 of the first pads of the pad portion 110.

[0084] According to this exemplary embodiment, because the first pads of the pad
20 portion 110 are formed as parallelograms, the misalignment between the pads of the pad portion 110 and the bumps B of the data driving integrated circuit IC may be easily corrected simply by moving the data driving integrated circuit IC in the second direction Y. Accordingly, it is possible to facilitate aligning or realigning the pad portion 110 and the data driving integrated

circuit with each other and, thus, to improve the efficiency of mounting an integrated circuit.

[0085] In an example, the movement of the data driving integrated circuit IC (S130) may include moving the data driving integrated circuit IC from one sub-pad unit to another sub-pad unit of a pad portion. In this example, the pad portion 410 of FIGS. 10 to 12 or the pad portion 510 of FIG. 13 may be used. More specifically, as illustrated in FIGS. 10 to 12, the pad portion 410 may include a first sub-pad unit 410a, a second sub-pad unit 410b, and a third sub-pad unit 410c. The first sub-pad unit 410a, the second sub-pad unit 410b, and the third sub-pad unit 410c may differ from one another in terms of the distance between an end thereof and an imaginary line CL that divides the pad portion 410 in half. The arrangement of pads in the second sub-pad unit 410b may correspond to the arrangement of the bumps B of the data driving integrated circuit IC, but the arrangement of pads in the first or third sub-pad unit 410a or 410c may differ from the arrangement of the bumps B of the data driving integrated circuit IC. That is, the first sub-pad unit 410a and the third sub-pad unit 410c may be reserved for application to a contracted or expanded array substrate. That is, the movement of the data driving integrated circuit IC (S130) may include moving the data driving integrated circuit IC from the second sub-pad unit 410b to the first or third sub-pad unit 410a or 410c according to the misalignment value b. In response to the data driving integrated circuit IC being corrected for its misalignment with the pad portion 110, 210, 310, 410, or 510, the data driving integrated circuit IC may be coupled to the pad portion 110, 210, 310, 410, or 510 via an ACF.

[0086] Although certain exemplary embodiments and implementations have been described herein, other embodiments and modifications will be apparent from this description. Accordingly, the inventive concept is not limited to such embodiments, but rather to the broader scope of the presented claims and various obvious modifications and equivalent arrangements.

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☐ Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):

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Name	Registration Number

As attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignment documents attached to this form in accordance with 37 CFR 3.73(c).

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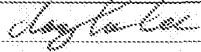
Assignee name and address:

Samsung Display Co., Ltd.
1, Samsung-ro, Giheung-gu, Gyeonggi-do, Yongin-si, Republic of Korea

A copy of this form, together with a statement under 37 CFR 3.73(c) (Form PTO/AIA/60 or equivalent) is required to be filed in each application in which this form is used. The statement under 37 CFR 3.73(c) may be completed by one of the practitioners appointed in this form, and must identify the application in which this Power of Attorney is to be filed.

SIGNATURE of Assignee of Record

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee.

Signature		Date	September 26, 2017
Name	Dong-Ho Lee	Telephone	+82-31-209-3626
Title	Director of IP Prosecution Group, Samsung Display Co., Ltd.		

This collection of information is required by 37 CFR 1.91, 1.92, and 1.93. The information is required to obtain or retain a benefit by the public, which is to update (and by the USPTO to process) the file of a patent or reexamination proceeding. Confidentiality is governed by 35 U.S.C. 321 and 37 CFR 1.11 and 1.14. This collection is estimated to take 18 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: Samsung Display Co., Ltd.

Application No./Patent No.: _____ Filed/Issue Date: 2019-07-12

Titled: ARRAY SUBSTRATE AND METHOD OF MOUNTING INTEGRATED CIRCUIT USING THE SAME

Samsung Display Co., Ltd., a Corporation

(Name of Assignee)

(Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose **one** of options 1, 2, 3 or 4 below):

1. ☒ The assignee of the entire right, title, and interest.
2. ☐ An assignee of less than the entire right, title, and interest (check applicable box):
- ☐ The extent (by percentage) of its ownership interest is ____%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.
- ☐ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (e.g., bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

- A. ☒ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel 034054, Frame 0756, or for which a copy thereof is attached.
- B. ☐ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

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[Page 1 of 2]

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[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/William L. Brooks/

2019-07-12

Signature

Date

William L. Brooks

34,129

Printed or Typed Name

Title or Registration Number

[Page 2 of 2]

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7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
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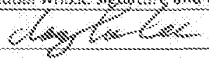
Assignee name and address:

Samsung Display Co., Ltd.
1, Samsung-ro, Giheung-gu, Gyeonggi-do, Yongin-si, Republic of Korea

A copy of this form, together with a statement under 37 CFR 3.73(c) (Form PTO/AIA/56 or equivalent) is required to be filed in each application in which this form is used. The statement under 37 CFR 3.73(c) may be completed by one of the practitioners appointed in this form, and must identify the application in which this Power of Attorney is to be filed.

SIGNATURE of Assignee of Record

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee.

Signature		Date	September 28, 2017
Name	Dong-Ho Lee	Telephone	+82-31-209-3626
Title	Director of IP Prosecution Group, Samsung Display Co., Ltd.		

This collection of information is required by 37 CFR 1.31, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public, which is to update (and by the USPTO to process) the file of a patent or reexamination proceeding. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 18 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: Samsung Display Co., Ltd.

Application No./Patent No.: _____ Filed/Issue Date: 2019-07-12

Titled: ARRAY SUBSTRATE AND METHOD OF MOUNTING INTEGRATED CIRCUIT USING THE SAME

Samsung Display Co., Ltd., a Corporation

(Name of Assignee)

(Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose **one** of options 1, 2, 3 or 4 below):

1. ☒ The assignee of the entire right, title, and interest.

2. ☐ An assignee of less than the entire right, title, and interest (check applicable box):

☐ The extent (by percentage) of its ownership interest is ____%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.

☐ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

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4. ☐ The recipient, via a court proceeding or the like (e.g., bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

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The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/William L. Brooks/

2019-07-12

Signature

Date

William L. Brooks

34,129

Printed or Typed Name

Title or Registration Number

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1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
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6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.