INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	11622496
	Filing Date	2007-01-12
	First Named Inventor	G.R. Mohan Rao
	Art Unit	2892
	Examiner Name	Ajay Arora
	Attorney Docket Number	0299-0001.01

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	/David M. Mundt/	Date (YYYY-MM-DD)	2011-10-12
Name/Print	David M. Mundt	Registration Number	41,207

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.**

PTO/SB/22 (09-11)
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PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a)	Docket Number (Optional) 0299-0001.01
Application Number 11/622496	Filed 01/12/2007
For SEMICONDUCTOR DEVICES WITH GRADED DOPANT REGIONS	
Art Unit 2892	Examiner Ajay Arora

This is a request under the provisions of 37 CFR 1.136(a) to extend the period for filing a reply in the above identified application.

The requested extension and fee are as follows (check time period desired and enter the appropriate fee below):

		Fee	Small Entity Fee	
☐	One month (37 CFR 1.17(a)(1))	$150	$75	$
☐	Two months (37 CFR 1.17(a)(2))	$560	$280	$
☑	Three months (37 CFR 1.17(a)(3))	$1270	$635	$ 635.00
☐	Four months (37 CFR 1.17(a)(4))	$1980	$990	$
☐	Five months (37 CFR 1.17(a)(5))	$2690	$1345	$

☑ Applicant claims small entity status. See 37 CFR 1.27.

☐ A check in the amount of the fee is enclosed.

☐ Payment by credit card. Form PTO-2038 is attached.

☐ The Director has already been authorized to charge fees in this application to a Deposit Account.

☑ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account Number 50-4199.

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

I am the

☐ applicant/inventor.

☐ assignee of record of the entire interest. See 37 CFR 3.71.
Statement under 37 CFR 3.73(b) is enclosed (Form PTO/SB/96).

☑ attorney or agent of record. Registration Number 41,207

☐ attorney or agent under 37 CFR 1.34.
Registration number if acting under 37 CFR 1.34 _____

/David M. Mundt/	October 12, 2011
Signature	Date
David M. Mundt	312-984-0144
Typed or printed name	Telephone Number

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below.

☑ Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.136(a). 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 1.11 and 1.14. This collection is estimated to take 6 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.**

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

Electronic Patent Application Fee Transmittal

Application Number:	11622496
Filing Date:	12-Jan-2007
Title of Invention:	SEMICONDUCTOR DEVICES WITH GRADED DOPANT REGIONS
First Named Inventor/Applicant Name:	G.R. Mohan Rao
Filer:	David Michael Mundt/Francisca Hubbard
Attorney Docket Number:	0299-0001.01

Filed as Small Entity

Utility under 35 USC 111(a) Filing Fees

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:				
Extension - 3 months with $0 paid	2253	1	635	

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
Request for continued examination	2801	1	465	465
Submission- Information Disclosure Stmt	1806	1	180	180
		Total in USD ($)		**1280**

Electronic Acknowledgement Receipt

EFS ID:	11169330
Application Number:	11622496
International Application Number:	
Confirmation Number:	3086
Title of Invention:	SEMICONDUCTOR DEVICES WITH GRADED DOPANT REGIONS
First Named Inventor/Applicant Name:	G.R. Mohan Rao
Customer Number:	70653
Filer:	David Michael Mundt/Francisca Hubbard
Filer Authorized By:	David Michael Mundt
Attorney Docket Number:	0299-0001.01
Receipt Date:	12-OCT-2011
Filing Date:	12-JAN-2007
Time Stamp:	13:34:33
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$1280
RAM confirmation Number	10379
Deposit Account	504199
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for Continued Examination (RCE)	RCE.pdf	161862 ef00f0e2a65ffc745ea1f300b71bef8424b8379c	no	1
Warnings:					
This is not a USPTO supplied RCE SB30 form.					
Information:					
2	Amendment After Final	Amendment.pdf	558486 9fd2d566e0f3b9a4ed0efc0565dbc3457936332b	no	9
Warnings:					
Information:					
3	Information Disclosure Statement (IDS) Form (SB08)	IDS.pdf	327332 6230733906e2d79abc352cdb16e8cab3b4202c81	no	3
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
4	Non Patent Literature	NPL1.pdf	636718 700dcded84d49b37e100633d61b66eda32597b75	no	3
Warnings:					
Information:					
5	Non Patent Literature	NPL2.pdf	1692888 3396ef026ab561a3d6cff3af6f53487009dfc51e	no	7
Warnings:					
Information:					
6	Non Patent Literature	NPL3.pdf	1539230 c4080c88ecf4434455da0fae2c8e61ec628285d5	no	4
Warnings:					
Information:					
7	Extension of Time	ExtOfTime.pdf	193401 0d00bf1451f4dbdf56c20b78d835e69d6965b8af	no	1
Warnings:					
Information:					
8	Fee Worksheet (SB06)	fee-info.pdf	34016 0810aec2afa88c6b23b93f1acdf5f74aa99808c5	no	2
Warnings:					

Information:	
Total Files Size (in bytes):	5143933

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 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.

PTO/SB/06 (07-06)
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PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number	Filing Date	
11/622,496	01/12/2007	☐ To be Mailed

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY ☒ RATE ($)	SMALL ENTITY FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =			X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 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			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT 10/12/2011

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 14	Minus	** 20	= 0	X $30 =	0	OR	X $ =	
Independent (37 CFR 1.16(h))	* 2	Minus	***8	= 0	X $125 =	0	OR	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))									
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE	0	OR	TOTAL ADD'L FEE	

AMENDMENT

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)	OR	RATE ($)	ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =		OR	X $ =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =		OR	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))									
☐ 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 number found in the appropriate box in column 1.

Legal Instrument Examiner:
/LINDA 18 WISE/

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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United States Patent and Trademark Office
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Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/622,496	01/12/2007	G.R. Mohan Rao	0299-0001.01	3086

70653 7590 12/20/2011
LAW OFFICES OF EUGENE M. CUMMINGS, P.C.
ONE NORTH WACKER DRIVE
SUITE 4130
CHICAGO, IL 60606

EXAMINER
ARORA, AJAY

ART UNIT	PAPER NUMBER
2892	

MAIL DATE	DELIVERY MODE
12/20/2011	PAPER

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.

PTOL-90A (Rev. 04/07)

Office Action Summary	Application No.	Applicant(s)	
	11/622,496	RAO, G.R. MOHAN	
	Examiner	Art Unit	
	AJAY K. ARORA	2892	

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

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 October 2011*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ 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.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

5)☒ Claim(s) *10-16 and 18-24* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *10-16 and 18-24* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

12)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

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

a)☐ All b)☐ Some * c)☐ None of:

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)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *10/12/2011*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 10/12/2011 has been entered.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claim 10-16 and 18-24 rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for “a unidirectional drift field” (see line 8 of base claims 10 and 18, each, which is shown in Figure 2 of the specification) , does not reasonably provide enablement for “drawing <u>all</u> minority carriers from said substrate to said surface layer” (emphasis added, see last two lines each of base claims 10 and 18). The specification does not enable any person skilled in the art to which it pertains, or

with which it is most nearly connected, to make and use the invention commensurate in scope with these claims. It is not clear if simply the application of "a unidirectional drift field" is sufficient to achieve the effect of "drawing all minority carriers from said substrate to said surface layer". In a complex electronic device, movement of minority carriers is affected by multiple forces and fields, and it does not appear that simply the presence of "a unidirectional drift field" in itself can achieve "drawing all minority carriers from said surface layer to said substrate". Whereas it is true that such a unidirectional drift field may attempt to apply a force on all minority carriers in a specific direction, it does not appear to ensure (without knowing other parameters of the device) that it will draw "all" minority carriers from said surface layer to said surface.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 10-11, and 18-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kamins (US 4,160,985) of prior record, hereinafter Kamins, in view Jastrzebski (US 4,481,522), hereinafter Jastrzebski, and further in view of Bamji (US 2002/0084430) of prior record, hereinafter Bamji.

Regarding claim 10, Kamins (refer to Figures 2-3) teaches a semiconductor device comprising:

a surface layer (23);

s substrate (19);

an active region (comprising photodiodes 11, 13, 15 and 17 are formed), disposed on one surface (i.e. upper surface in Figure 2) of said surface layer (23); and

a single drift layer (21) disposed between the other surface (i.e. lower surface in Figure 2) of said surface layer (23) and said substrate (19), said drift layer having a graded concentration of dopants (see Figure 3) extending between said surface layer and said substrate to create a drift field (Col. 2, line 64 - Col. 3, line 2) drawing minority carriers (Col. 2, lines 15-16) from said surface layer to said substrate (Col. 1, lines 38-46 and Col. 3, lines 8-11).

Kamins does not teach that the drift field is a “unidirectional drift field” so that it draws “all" minority carriers in a given direction. Jastrzebski (refer to Figures 1a-b) teaches a semiconductor device in which a drift field utilized is a “unidirectional drift field” so as to tend to draw “all” minority carriers in a specific direction' i.e. direction of the unidirectional drift field (Col. 5, lines 17-20 and 25-30). It would have been obvious to one of ordinary skills in the art at the time of the invention to modify Kamins so that the the drift field is a unidirectional drift field that it draws all minority carriers in a given direction. The ordinary artisan would have been motivated to modify Kamins for at least the purpose of optimizing the performance of any device that may be used in

conjunction with transistors (as part of an integrated circuit) that may require drawing of minority carriers in a specific direction to improve performance (see Jastrzebski, Col. 2, lines 22-42).

Further, whereas Kamins teaches photosensing elements like photodiodes and associated integrated circuit structures (Col. 2, lines 56-59), Kaminis does not teach that the semiconductor device is a “CMOS” semiconductor device and with the active region including “a source and a drain”. Bamji teaches that integrated circuit structures with photo detectors such as photodiodes may be arrays of CMOS devices (page 1, para 0004) wherein active regions may include a source and a drain (page 9, para 0098, 1st sentence). It would have been obvious to one of ordinary skills in the art at the time of the invention to modify Kamins so that the semiconductor device is a CMOS semiconductor device and with the active region includes a source and a drain. The ordinary artisan would have been motivated to modify Kamins for at least the purpose of using CMOS technology that is suitable for field effect devices with source and drain regions, as CMOS technology enables integration of images sensors on a single integrated circuit and reduction in power consumption (see Bamji, page 1, para 0002).

Claim 18 is similar to claim 10 (and hence the same rejection applies) except for the direction of drawing minority carriers. However, Kamins also teaches the direction of drawing minority carriers as in claim 18; i.e. drawing minority carriers (Col. 2, lines 15-16) may also be from said substrate to said surface layer (Col. 1, lines 38-46 and Col. 3, lines 6-18).

Regarding claims 11 and 19, Kamins teaches that said drift layer (21) is a deeply implanted layer (see Figures 2-3; also see Col. 2, lines 36-42).

6. Claims 12 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kamins, Jastrzebski and Bamji as applied to claims 10 and 18 above above, and further in view of Baliga (US 2002/0056883) of prior record, hereinafter Baliga.

Regarding claims 12 and 20, Kamins (refer to Figures 2-3) teaches substantially the claimed structure but does not teach that the drift layer is an “epitaxial" layer. Baliga (US 2002/0056883) teaches that it is known in the art that a drift layer with graded dopant concentration may be an epitaxial layer (page 2, para 0008, 2nd and 3rd sentences and page 9, para 0063, especially 7th – 9th sentences). It would have been obvious to one of ordinary skills in the art at the time of the invention to modify Kamins so that the drift layer is an epitaxial layer. The ordinary artisan would have been motivated to modify Kamins for at least the purpose of using a layer that has a uniform crystal structure which makes electrical properties more predictable and can also act as a base for further epitaxial layers in which devices may be formed.

7. Claims 13-16 and 21-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kamins, Jastrzebski and Bamji as applied to claims 10 and 18 above

above, and further in view of Fujimoto (2002/0102783) of prior record, hereinafter Fujimoto; and Ishaque (US 5,517,052) of prior record, hereinafter Ishaque.

Regarding claims 13-16 and 21-24, Kamins (refer to Figure 3) teaches substantially the claimed structure but does not specifically state if the gradient is “linear”, “quasi-linear”, “exponential”; or "complimentary error function". Fujimoto teaches that an impurity region having a concentration gradient may have a profile that is linear, exponential,“or a combination thereof (page 3, para 0038). Further, Ishaque teaches that doping gradient is typically complementary error function or Gaussian if a deep diffusion process is used (Col. 3, line 49 to Col. 4, line 14). Given that Kamins teaches that a desired electric field is formed as a result of the gradient in doping (thus suggesting the gradient affects profile of the field) and various profiles of concentration gradient are known (as explained above in view of Fujimoto and Ishaque), it would have been obvious to one of ordinary skills in the art at the time of the invention to modify Kamins so that the gradient is linear, exponential; or alternatively other profiles such as “quasi-linear” or "complimentary error function", which are essentially combinations of linear and exponential profiles. The ordinary artisan would have been motivated to modify Kamins for at least the purpose of creating a specific profile of the electric field that is suitable for directing the minority carriers in a specific direction.

Response to Arguments

8. Applicant's arguments with respect to claims 10 and 18 (see pages 6-8 of applicant's response of 10/12/2011) have been considered but are moot in view of the new ground(s) of rejection. However, applicant's response related to advisory action (on page 7 of applicant's response) is still relevant. This has been addressed in the 35 USC 112, 1st paragraph rejection above.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to AJAY K. ARORA whose telephone number is (571)272-8347. The examiner can normally be reached on Mon through Fri, 8:30am to 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Thao X. Le can be reached on (571) 272-1708. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/AJAY K. ARORA/
Primary Examiner, Art Unit 2892

Notice of References Cited	Application/Control No. 11/622,496	Applicant(s)/Patent Under Reexamination RAO, G.R. MOHAN	
	Examiner AJAY K. ARORA	Art Unit 2892	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-4,481,522	11-1984	Jastrzebski et al.	257/229
	B	US-			
	C	US-			
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*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.

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	11622496	RAO, G.R. MOHAN
	Examiner	**Art Unit**
	AJAY K ARORA	2892

SEARCHED

Class	Subclass	Date	Examiner
257	655	12/16/2011	AKA

SEARCH NOTES

Search Notes	Date	Examiner
Revised EAST search history report	12/16/2011	AKA

INTERFERENCE SEARCH

Class	Subclass	Date	Examiner

	/A. K. A./ Primary Examiner.Art Unit 2892

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-10)
Approved for use through 07/31/2012. 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	11622496
	Filing Date	2007-01-12
	First Named Inventor	G.R. Mohan Rao
	Art Unit	2892
	Examiner Name	Ajay Arora
	Attorney Docket Number	0299-0001.01

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					
	2					
	3					
	4					
	5					

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

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	11622496
	Filing Date	2007-01-12
	First Named Inventor	G.R. Mohan Rao
	Art Unit	2892
	Examiner Name	Ajay Arora
	Attorney Docket Number	0299-0001.01

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							☐

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]
/A.A./	1	A. S. GROVE, Physics and Technology of Semiconductor Devices, John Wiley Sons, Inc., New York, November 1967	☐
/A.A./	2	W. MURRAY BULLIS and W. R. RUNYAN, Influence of Mobility and Lifetime Variations on Drift-Field Effects in Silicon-Junction Devices, IEEE Transactions on Electron Devices, Vol. Ed-14, No. 2, February 1967	☐
/A.A./	3	BERINDER BRAR et al., Herb's Bipolar Transistors, IEEE Transactions on Electron Devices, Vol. 48, No. 11, November 2001	☐

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

EXAMINER SIGNATURE

Examiner Signature	/Ajay Arora/	Date Considered	12/16/2011

*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	11622496
	Filing Date	2007-01-12
	First Named Inventor	G.R. Mohan Rao
	Art Unit	2892
	Examiner Name	Ajay Arora
	Attorney Docket Number	0299-0001.01

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	/David M. Mundt/	Date (YYYY-MM-DD)	2011-10-12
Name/Print	David M. Mundt	Registration Number	41,207

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.**

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	456	(257/655).CCLS.	USPAT; USOCR	OR	OFF	2011/12/16 09:45
S92	1	("4481522").PN.	USPAT; USOCR	OR	OFF	2011/12/16 08:02

12/16/2011 10:39:51 AM
C:\Users\aarora\Documents\EAST\Workspaces\11622496.wsp

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	11622496	RAO, G.R. MOHAN
	Examiner	**Art Unit**
	AJAY K ARORA	2892

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	08/02/2010	04/10/2011	12/16/2011						
	1	-	-	-						
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	6	-	-	-						
	7	-	-	-						
	8	-	-	-						
	9	-	-	-						
	10	✓	✓	✓						
	11	✓	✓	✓						
	12	✓	✓	✓						
	13	✓	✓	✓						
	14	✓	✓	✓						
	15	✓	✓	✓						
	16	✓	✓	✓						
	17	✓	-	-						
	18	✓	✓	✓						
	19	✓	✓	✓						
	20	✓	✓	✓						
	21	✓	✓	✓						
	22	✓	✓	✓						
	23	✓	✓	✓						
	24	✓	✓	✓						
	25	✓	-	-						

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.	:	11/622,496
Confirmation No.	:	3086
Inventor	:	G. R. Mohan Rao
Filed	:	January 12, 2007
TC/A.U.	:	2892
Examiner	:	Ajay Arora
Title	:	SEMICONDUCTOR DEVICES WITH GRADED DOPANT REGIONS
Docket No.	:	0299-0001.01

RESPONSE PURSUANT TO 37 CFR 1.114

AMENDMENT E

Sir:

In response to the non-final Office Action of December 20, 2011, Applicant submits the following amendment:

Claims. Amendments to the claims begin on page 2 of this amendment.

Remarks. Remarks begin on page 6 of this amendment.

LISTING OF CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Claims:

1. (Canceled)

2. (Canceled)

3. (Canceled)

4. (Canceled)

5. (Canceled)

6. (Canceled)

7. (Canceled)

8. (Canceled)

9. (Canceled)

10. (Currently Amended) A CMOS Semiconductor device comprising:

a surface layer;

a substrate;

an active region including a source and a drain, disposed on one surface of said surface layer; and

a single drift layer disposed between the other surface of said surface layer and said substrate, said drift layer having a graded concentration of dopants extending between said surface layer and said substrate to create and maintain a single static unidirectional electric drift field to aid the movement of ~~drawing~~ ~~all~~ minority carriers from said surface layer to said substrate.

11. (Original) The CMOS Semiconductor device of claim 10 wherein said drift layer is a deeply-implanted layer.

12. (Original) The CMOS Semiconductor device of claim 10 wherein said drift layer is an epitaxial layer.

13. (Original) The CMOS Semiconductor device of claim 10 wherein said graded concentration follows a linear gradient.

14. (Original) The CMOS Semiconductor device of claim 10 wherein said graded concentration follows a quasi-linear gradient.

15. (Original) The CMOS Semiconductor device of claim 10 wherein said graded concentration follows an exponential gradient.

16. (Original) The CMOS Semiconductor device of claim 10 wherein said graded concentration follows a complimentary error function gradient.

17. (Canceled)

18. (Currently amended) A CMOS Semiconductor device comprising:

a surface layer;

a substrate;

an active region including a source and a drain, disposed on one surface of said surface layer; and

a single drift layer disposed between the other surface of said surface layer and said substrate, said drift layer having a graded concentration of dopants extending between said surface layer and said substrate to create and maintain a single static unidirectional electric drift field to aid the movement of ~~drawing~~ ~~all~~ minority carriers from said substrate to said surface layer.

19. (Original) The CMOS Semiconductor device of claim 18 wherein said drift layer is a deeply-implanted layer.

20. (Original) The CMOS Semiconductor device of claim 18 wherein said drift layer is an epitaxial layer.

21. (Original) The CMOS Semiconductor device of claim 18 wherein said graded concentration follows a linear gradient.

22. (Original) The CMOS Semiconductor device of claim 18 wherein said graded concentration follows a quasi-linear gradient.

23. (Original) The CMOS Semiconductor device of claim 18 wherein said graded concentration follows an exponential gradient.

24. (Original) The CMOS Semiconductor device of claim 18 wherein said graded concentration follows a complimentary error function gradient.

25. (Canceled)

REMARKS

Applicant has carefully reviewed the non-final Office Action of December 20, 2012 ("Office Action") and in response thereto states as follows:

The Office Action maintains a rejection pursuant to 35 U.S.C. §112, first paragraph, and in particular states that, because "movement of minority carriers is affected by multiple forces and fields … it does not appear that simply the presence of 'a unidirectional drift field' in itself can achieve 'drawing all minority carriers from said surface layer to said substrate.'" Office Action at ¶3.

Applicant respectfully disagrees with this position because (as previously argued by Applicant) a unidirectional drift (electric) field necessarily affects all the present minority carriers in the same way – moving all minority carriers in the same direction because of the unidirectional drift due to the existence of the electric field. *See* "Physics and Technology of Semiconductor Devices," A.S. Grove, pp. 224-225, John Wiley and Sons, Inc., New York, 1st Edition 1967 ("This same electric field will then be of such direction as to aid the motion of injected holes. Thus the injected minority carriers will now move not only by diffusion but also by drift due to the existence of this electric field."). Depending on the particular slope of the graded concentration of dopant, all minority carriers are either swept "down" (from the surface layer to the substrate) or "up" (from the substrate to the surface layer). *See* Applicant's Figs. 5(b) and 5(c).

The Office Action also states that "such a unidirectional drift field may attempt to apply a force on all minority carriers in a specific direction, it does not appear to ensure (without knowing other parameters of the device) that it will draw 'all' minority carriers…" Yet, this argument appears to not consider that the graded dopant concentration itself creates a "built-in"

electrical field that forces the movement of carriers into a particular direction, whereby the "direction" of the electrical field and the resulting direction of the carrier movement depends solely on the slope of the graded concentration of dopant. With regard to the existence of a "built-in" electric field created by a graded dopant density, *see*, e.g., Jastrzebski (US 4,481,522) col. 5, lines 11-13 (cited in Office Action). Applicant respectfully submits that this inherent "built-in" unidirectional electric field is the additional parameter for ensuring that all minority carriers are being moved in one direction and which parameter the Office Action deemed to be missing from the disclosure.

However, without conceding Applicant's position on this issue, Applicant has further amended claims 10 and 18 to overcome the rejection pursuant to 35 U.S.C. 112, first paragraph. In particular, Applicant has removed the word "all" from the rejected claim language which now reads: "unidirectional electric drift field to aid the movement of minority carriers ..." This claim language is supported at least by Applicant's disclosure in paragraph 11 and original claim 6.

Independent claims 10 and 18 stand rejected as obvious in view of the combined teachings of Kamins (US 4,160,985) of prior record in view of Jastrzebski (US 4,481,522) and Bamji (US 2002/0084430) of prior record. Kamins discloses a photosensing device in which selective doping of a semiconductor substrate of the device produces electric fields in the substrate which accelerate photogenerated charge carriers toward or away from the surface of the device. Abstract, Fig. 3. As the Office Action acknowledges, Kamins does not teach that the electric drift field is a "unidirectional electric drift field."

Jastrzebski discloses three-phase charge-coupled device (CCD) imagers having unidirectional electric drift fields in their semiconductive substrates to improve the operation of the CCD (*see* e.g., col. 1, lines 5-8, col 2, lines 62-64, col. 3, lines 20-52 and Fig. 1a). Jastrzebski

describes the three-phase clocking signals as follows:

> **Electrodes 13 and 16 are shown connected to receive a first phase ϕ_1 of the three-phase clocking signals; electrodes 14 and 17, to receive a second phase ϕ_2 of those signals; and electrodes 15 and 18, to receive a third phase ϕ_3 of those signals. The successive application of the clocking signals ϕ_1, ϕ_2, and ϕ_3 in order of their ordinal number subscripts will, as known, cause shift of charge packets in potential wells induced under the electrodes in a rightward direction on each clocking signal transition. These potential wells are associated with the charge depletion regions induced below the electrodes receiving relatively positive clocking signal phases. In FIG. 1 the depletion regions are shown in dashed outline being induced under electrode pairs 13, 14 and 16, 17 presumed to be receiving ϕ_1, ϕ_2 clock voltages relatively positive to the ϕ_3 clock voltage applied to electrodes 15 and 18.**

(Jastrzebski, Col. 3, lines 20-36, underlines added).

As the underlined text above indicates, the application of clocking signals causes a shift of charge packets in the regions directly underneath the electrodes which causes a change of value of the unidirectional electric drift field located directly underneath the electrodes. Unlike the capacitor electrodes/gates in a CMOS image sensor, which have a fixed potential, the electrodes/gates in a CCD shift register do not have a fixed potential. As made clear in Jastrzebski, successive application of clocked signals effectively creates multiple electrical fields underneath the gates with varying electric values (potentials), or at least, arguably, one dynamic (varying with time) unidirectional electric field with varying electric (values) potentials. That is so because the electric field described in Jastrzebski is influenced by at least two factors. First, φ1, φ2 and φ3 "swing" back and forth (shift) their charge and therefore modulate the electric field created by the graded dopant concentration in the substrate. Second, this modulation disturbs the electric field and affects the effectiveness of the electric field to aid the movement of carriers in a single desired direction. Because a CMOS image sensor only has electrodes/gates with a fixed potential, there is no modulation of the electric unidirectional drift field.

Consequently, Applicant's claimed CMOS semiconductor device includes a single static (time-invariant) unidirectional electric drift field.

Applicant has amended claims 10 and 18 to better distinguish over the cited prior art by claiming "a graded concentration of dopants extending between said surface layer and said substrate to create and maintain a single static unidirectional electric drift field to aid the movement of minority carriers."

Bamji discloses a method to measure distance or brightness using a CMOS sensor. The most recent office action cites Bamji against claim 10 for the proposition that integrated circuit structures with photo detectors may be arrays of CMOS devices. However, Applicant respectfully submits that this disclosure is moot in view of the above recited shortcomings in the disclosure of Kamins and Jastrzebski and in view of Applicant's additional amendments to claims 10 and 18.

Claims 11-16 depend on claim 10 and for at least the same reason that claim 10 is patentable over the cited prior art, claims 11-16 are patentable as well. Claims 19-24 depend on claim 18 and for at least the reasons that claim 18 is patentable over the cited prior art, claims 19-24 are patentable as well.

CONCLUSION

Applicant respectfully submits that in view of the amendments made to the claims and the discussion set forth herein, this application is now in condition for allowance. However, should Examiner be of the opinion that further amendment or response is required; Applicant encourages Examiner to contact the undersigned attorney at the telephone number set forth below. The Commissioner is authorized to charge any additional fees or deficiencies or credit any overpayments to Eugene M. Cummings, P.C., Deposit Account No. **50-4199**, with reference to attorney docket number (0299-0001.01).

Respectfully submitted,

By: _____

David M. Mundt, Reg. No. 41,207

Law Offices of Eugene M. Cummings, P.C.
1 N. Wacker
Suite 4130
Chicago, Illinois 60606

Telephone: (312) 984-0144
Facsimile: (312) 984-0146

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Page 293

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U.S. Patent and Trademark Office; U.S. DEPARMENT OF COMMERCE
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PETITION FOR EXTENSION OF TIME UNDER 37 CFR 1.136(a)	Docket Number (Optional) 0299-0001.01
Application Number 11/622496	Filed 01/12/2007
For SEMICONDUCTOR DEVICES WITH GRADED DOPANT REGIONS	
Art Unit 2892	Examiner Ajay Arora

This is a request under the provisions of 37 CFR 1.136(a) to extend the period for filing a reply in the above identified application.

The requested extension and fee are as follows (check time period desired and enter the appropriate fee below):

		Fee	Small Entity Fee	
☑	One month (37 CFR 1.17(a)(1))	$150	$75	$ 75.00
☐	Two months (37 CFR 1.17(a)(2))	$560	$280	$
☐	Three months (37 CFR 1.17(a)(3))	$1270	$635	$
☐	Four months (37 CFR 1.17(a)(4))	$1980	$990	$
☐	Five months (37 CFR 1.17(a)(5))	$2690	$1345	$

☑ Applicant claims small entity status. See 37 CFR 1.27.

☐ A check in the amount of the fee is enclosed.

☐ Payment by credit card. Form PTO-2038 is attached.

☐ The Director has already been authorized to charge fees in this application to a Deposit Account.

☑ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment, to Deposit Account Number 50-4199.

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

I am the

☐ applicant/inventor.

☐ assignee of record of the entire interest. See 37 CFR 3.71. Statement under 37 CFR 3.73(b) is enclosed (Form PTO/SB/96).

☑ attorney or agent of record. Registration Number 41,207

☐ attorney or agent under 37 CFR 1.34. Registration number if acting under 37 CFR 1.34 _____

/David M. Mundt/	April 17, 2012
Signature	Date
David M. Mundt	312-984-0144
Typed or printed name	Telephone Number

NOTE: Signatures of all the inventors or assignees of record of the entire interest or their representative(s) are required. Submit multiple forms if more than one signature is required, see below.

☑ Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.136(a). 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 1.11 and 1.14. This collection is estimated to take 6 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.**

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

Electronic Patent Application Fee Transmittal

Application Number:	11622496
Filing Date:	12-Jan-2007
Title of Invention:	SEMICONDUCTOR DEVICES WITH GRADED DOPANT REGIONS
First Named Inventor/Applicant Name:	G.R. Mohan Rao
Filer:	David Michael Mundt/Francisca Hubbard
Attorney Docket Number:	0299-0001.01

Filed as Small Entity

Utility under 35 USC 111(a) Filing Fees

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:				
Extension - 1 month with $0 paid	2251	1	75	

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
			Total in USD ($)	**75**

Electronic Acknowledgement Receipt

EFS ID:	12560817
Application Number:	11622496
International Application Number:	
Confirmation Number:	3086
Title of Invention:	SEMICONDUCTOR DEVICES WITH GRADED DOPANT REGIONS
First Named Inventor/Applicant Name:	G.R. Mohan Rao
Customer Number:	70653
Filer:	David Michael Mundt/Francisca Hubbard
Filer Authorized By:	David Michael Mundt
Attorney Docket Number:	0299-0001.01
Receipt Date:	17-APR-2012
Filing Date:	12-JAN-2007
Time Stamp:	15:20:02
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$75
RAM confirmation Number	1922
Deposit Account	504199
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Amendment/Req. Reconsideration-After Non-Final Reject	AmendmentE.pdf	694682 df7ff0ed5b70459b2c714986b91a259d9e26330c	no	10
Warnings:					
Information:					
2	Extension of Time	ExtOfTime.pdf	132721 dee7fa1a4348d38dd841d010681af572790a8c55	no	1
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	30313 837f11c98ef38348acddbabb3fbf17ca31904272	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	857716		

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

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/622,496	01/12/2007	G.R. Mohan Rao	0299-0001.01	3086

70653 7590 08/13/2012
LAW OFFICES OF EUGENE M. CUMMINGS, P.C.
ONE NORTH WACKER DRIVE
SUITE 4130
CHICAGO, IL 60606

EXAMINER
ARORA, AJAY

ART UNIT	PAPER NUMBER
2892	

MAIL DATE	DELIVERY MODE
08/13/2012	PAPER

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.

PTOL-90A (Rev. 04/07)

Office Action Summary	Application No.	Applicant(s)	
	11/622,496	RAO, G.R. MOHAN	
	Examiner	Art Unit	
	AJAY K. ARORA	2892	

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

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 April 2012*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ 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.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

5)☒ Claim(s) *10-16 and 18-24* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *10-16 & 18-24* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

12)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

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

a)☐ All b)☐ Some * c)☐ None of:

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)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claim 10-16 and 18-24 rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for "to create a unidirectional electric drift field" (see lines 8-9 of base claims 10 and 18) , does not reasonably provide enablement for "to create and <u>maintain</u> a <u>single static</u> unidirectional electric drift field" (emphasis added, as recited in lines 8-9 of the currently amended claims 10 and 18). The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the invention commensurate in scope with these claims. Applicant has not pointed out to the part of the specification that supports the above amendment. Also, in view of arguments that applicant has presented on pages 8-9 of applicant's response of 04/17/2012 to argue that Jastrzebski reference does not read on "to create and <u>maintain</u> a <u>single static</u> unidirectional electric drift field", it is not clear how any of applicant's Figures conveys the above limitation any more than Figure 1 of Jastrzebski.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 10-11, and 18-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kamins (US 4,160,985) of prior record, hereinafter Kamins, in view Jastrzebski (US 4,481,522) of prior record, hereinafter Jastrzebski, and further in view of Bamji (US 2002/0084430) of prior record, hereinafter Bamji.

Regarding claim 10, Kamins (refer to Figures 2-3) teaches a semiconductor device comprising:

a surface layer (23);

s substrate (19);

an active region (comprising photodiodes 11, 13, 15 and 17 are formed), disposed on one surface (i.e. upper surface in Figure 2) of said surface layer (23); and

a single drift layer (21) disposed between the other surface (i.e. lower surface in Figure 2) of said surface layer (23) and said substrate (19), said drift layer having a graded concentration of dopants (see Figure 3) extending between said surface layer and said substrate, which is capable of creating and maintaining a single static electric

drift field (because the drift field is created by graded concentration of dopants which does not change over time; i.e. it is "single static"). Also see Col. 2, lines 15-16; Col. 2, line 64 - Col. 3, line 2; Col. 1, lines 38-46; and Col. 3, lines 8-11).

Kamins does not teach that the drift field is a "unidirectional drift field" that is capable of aiding the movement of minority carriers in a given direction. Jastrzebski (refer to Figures 1a-b) teaches a semiconductor device in which a drift field utilized is a "unidirectional drift field" so as aid movement of minority carriers in a specific direction; i.e. direction of the unidirectional drift field (Col. 5, lines 17-20 and 25-30). It would have been obvious to one of ordinary skills in the art at the time of the invention to modify Kamins so that the drift field is a unidirectional drift field that is capable of aiding the movement of minority carriers in a given direction. The ordinary artisan would have been motivated to modify Kamins for at least the purpose of optimizing the performance of any device that may be used in conjunction with transistors (as part of an integrated circuit) that may require drawing of minority carriers in a specific direction to improve performance (see Jastrzebski, Col. 2, lines 22-42).

Further, whereas Kamins teaches photosensing elements like photodiodes and associated integrated circuit structures (Col. 2, lines 56-59), Kaminis does not teach that the semiconductor device is a "CMOS" semiconductor device and with the active region including "a source and a drain". Bamji teaches that integrated circuit structures with photo detectors such as photodiodes may be arrays of CMOS devices (page 1, para 0004) wherein active regions may include a source and a drain (page 9, para 0098, 1st sentence). It would have been obvious to one of ordinary skills in the art at the time of

the invention to modify Kamins so that the semiconductor device is a CMOS semiconductor device and with the active region includes a source and a drain. The ordinary artisan would have been motivated to modify Kamins for at least the purpose of using CMOS technology that is suitable for field effect devices with source and drain regions, as CMOS technology enables integration of images sensors on a single integrated circuit and reduction in power consumption (see Bamji, page 1, para 0002).

It is noted that claim 10 is a product claim but recites a method therein (i.e. "create and maintain a single static unidirectional electric drift field"; emphasis added). Therefore, claim 10 (same applies to claim 18) amounts to a product by process claim. *"Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." In re Thorpe, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985). See MPEP 2113.* To the extent the limitation of "create and maintain a single static unidirectional electric drift field" applies to the electric drift field inherently created by the claimed "graded concentration of dopants", it conveys a structural limitation. However, if the above implies absence of other electric fields (see applicant's arguments on page 8 of applicant's response of 4/17/2012), that does not constitute a structural limitation but rather method steps.

Claim 18 is similar to claim 10 (and hence the same rejection applies) except for the direction of drawing minority carriers. However, Kamins also teaches the direction of drawing minority carriers as in claim 18; i.e. drawing minority carriers (Col. 2, lines 15-16) may also be from said substrate to said surface layer (Col. 1, lines 38-46 and Col. 3, lines 6-18).

Regarding claims 11 and 19, Kamins teaches that said drift layer (21) is a deeply implanted layer (see Figures 2-3; also see Col. 2, lines 36-42).

5. Claims 12 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kamins, Jastrzebski and Bamji as applied to claims 10 and 18 above above, and further in view of Baliga (US 2002/0056883) of prior record, hereinafter Baliga.

Regarding claims 12 and 20, Kamins (refer to Figures 2-3) teaches substantially the claimed structure but does not teach that the drift layer is an “epitaxial" layer. Baliga (US 2002/0056883) teaches that it is known in the art that a drift layer with graded dopant concentration may be an epitaxial layer (page 2, para 0008, 2nd and 3rd sentences and page 9, para 0063, especially 7th – 9th sentences). It would have been obvious to one of ordinary skills in the art at the time of the invention to modify Kamins so that the drift layer is an epitaxial layer. The ordinary artisan would have been motivated to modify Kamins for at least the purpose of using a layer that has a uniform crystal structure

which makes electrical properties more predictable and can also act as a base for further epitaxial layers in which devices may be formed.

6. Claims 13-16 and 21-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kamins, Jastrzebski and Bamji as applied to claims 10 and 18 above above, and further in view of Fujimoto (2002/0102783) of prior record, hereinafter Fujimoto; and Ishaque (US 5,517,052) of prior record, hereinafter Ishaque.

Regarding claims 13-16 and 21-24, Kamins (refer to Figure 3) teaches substantially the claimed structure but does not specifically state if the gradient is “linear”, “quasi-linear”, “exponential”; or "complimentary error function". Fujimoto teaches that an impurity region having a concentration gradient may have a profile that is linear, exponential,“or a combination thereof (page 3, para 0038). Further, Ishaque teaches that doping gradient is typically complementary error function or Gaussian if a deep diffusion process is used (Col. 3, line 49 to Col. 4, line 14). Given that Kamins teaches that a desired electric field is formed as a result of the gradient in doping (thus suggesting the gradient affects profile of the field) and various profiles of concentration gradient are known (as explained above in view of Fujimoto and Ishaque), it would have been obvious to one of ordinary skills in the art at the time of the invention to modify Kamins so that the gradient is linear, exponential; or alternatively other profiles such as “quasi-linear” or "complimentary error function", which are essentially combinations of linear and exponential profiles. The ordinary artisan would have been motivated to modify

Kamins for at least the purpose of creating a specific profile of the electric field that is suitable for directing the minority carriers in a specific direction.

Response to Arguments

7. Applicant's arguments with respect to 35 USC 112, 1st paragraph rejection of claims 10 and 18 related to "drawing all minority carriers from said substrate to said surface layer" have been considered but are moot because the arguments do not apply in view of the amendment to the claims. However, the amendments result in new 35 USC 112, 1st paragraph rejections, which have been outlined above.

8. Applicant's arguments with respect to 35 USC 103(a) rejections of claims 10 and 18 (see 2nd last paragraph of page 7 to page 9) have been considered but they are not persuasive.

9. On page 7, last paragraph to page 9, 1st paragraph of applicant's response, applicant argues that because Jastrzebski reference teaches "clocking signals" in addition to the drift field created by graded dopant concentration, it does not read on "create and maintain a single static unidirectional electric drift field". This argument is not persuasive. This argument is addressed in the revised rejection of claims 10 and 18, which now points out product-by-process limitations.

Conclusion

10. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to AJAY K. ARORA whose telephone number is (571)272-8347. The examiner can normally be reached on Mon through Fri, 8:30am to 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Thao X. Le can be reached on (571) 272-1708. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/AJAY K. ARORA/
Primary Examiner, Art Unit 2892

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	11622496	RAO, G.R. MOHAN
	Examiner	**Art Unit**
	AJAY K ARORA	2892

SEARCHED

Class	Subclass	Date	Examiner
257	655	12/16/2011	AKA

SEARCH NOTES

Search Notes	Date	Examiner
Revised EAST search history report	12/16/2011	AKA
Revised EAST search history report	8/10/2012	AKA

INTERFERENCE SEARCH

Class	Subclass	Date	Examiner

	/A. K. A./ Primary Examiner.Art Unit 2892

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S94	0	(single WITh static WITH drift) AND ((gradient OR grading OR graded) WITH dop$3)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2012/08/10 00:21
S96	1	(unidirectional WITH field WITH drift) AND ((gradient OR grading OR graded) WITH dop$3)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2012/08/10 00:24

8/10/2012 1:40:03 AM
C:\Users\aarora\Documents\EAST\Workspaces\11622496.wsp

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	11622496	RAO, G.R. MOHAN
	Examiner	**Art Unit**
	AJAY K ARORA	2892

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	08/02/2010	04/10/2011	12/16/2011	08/10/2012					
	1	-	-	-	-					
	2	-	-	-	-					
	3	-	-	-	-					
	4	-	-	-	-					
	5	-	-	-	-					
	6	-	-	-	-					
	7	-	-	-	-					
	8	-	-	-	-					
	9	-	-	-	-					
	10	✓	✓	✓	✓					
	11	✓	✓	✓	✓					
	12	✓	✓	✓	✓					
	13	✓	✓	✓	✓					
	14	✓	✓	✓	✓					
	15	✓	✓	✓	✓					
	16	✓	✓	✓	✓					
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	18	✓	✓	✓	✓					
	19	✓	✓	✓	✓					
	20	✓	✓	✓	✓					
	21	✓	✓	✓	✓					
	22	✓	✓	✓	✓					
	23	✓	✓	✓	✓					
	24	✓	✓	✓	✓					
	25	✓	-	-	-					

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.	:	11/622,496
Confirmation No.	:	3086
Inventor	:	G. R. Mohan Rao
Filed	:	January 12, 2007
TC/A.U.	:	2892
Examiner	:	Ajay Arora
Title	:	SEMICONDUCTOR DEVICES WITH GRADED DOPANT REGIONS
Docket No.	:	0299-0001.01

RESPONSE PURSUANT TO 37 CFR 1.114

AMENDMENT F

Sir:

In response to the final Office Action of August 13, 2012, Applicant submits the following amendment:

Claims. Amendments to the claims begin on page 2 of this amendment.

Remarks. Remarks begin on page 6 of this amendment.

LISTING OF CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Claims:

1. (Canceled)

2. (Canceled)

3. (Canceled)

4. (Canceled)

5. (Canceled)

6. (Canceled)

7. (Canceled)

8. (Canceled)

9. (Canceled)

10. (Currently Amended) A CMOS Semiconductor device comprising:

a surface layer;

a substrate;

an active region including a source and a drain, disposed on one surface of said surface layer; ~~and~~

a single drift layer disposed between the other surface of said surface layer and said substrate, said drift layer having a graded concentration of dopants extending between said surface layer and said substrate, said drift layer further having a first ~~to create and maintain a single~~ static unidirectional electric drift field to aid the movement of minority carriers from said surface layer to said substrate; and

at least one well region disposed in said single drift layer, said well region having a graded concentration of dopants and a second static unidirectional electric drift field to aid the movement of minority carriers from said surface layer to said substrate.

11. (Original) The CMOS Semiconductor device of claim 10 wherein said drift layer is a deeply-implanted layer.

12. (Original) The CMOS Semiconductor device of claim 10 wherein said drift layer is an epitaxial layer.

13. (Original) The CMOS Semiconductor device of claim 10 wherein said graded concentration follows a linear gradient.

14. (Original) The CMOS Semiconductor device of claim 10 wherein said graded concentration follows a quasi-linear gradient.

15. (Original) The CMOS Semiconductor device of claim 10 wherein said graded concentration follows an exponential gradient.

16. (Original) The CMOS Semiconductor device of claim 10 wherein said graded concentration follows a complimentary error function gradient.

17. (Canceled)

18. (Currently amended) A CMOS Semiconductor device comprising:

a surface layer;

a substrate;

an active region including a source and a drain, disposed on one surface of said surface layer; ~~and~~

a single drift layer disposed between the other surface of said surface layer and said substrate, said drift layer having a graded concentration of dopants extending between said surface layer and said substrate, said drift layer further having a first ~~to create and maintain a single~~ static unidirectional electric drift field to aid the movement of minority carriers from said substrate to said surface layer; and

at least one well region disposed in said single drift layer, said well region having a graded concentration of dopants and a second static unidirectional electric drift field to aid the

movement of minority carriers from said substrate to said surface layer.

19. (Original) The CMOS Semiconductor device of claim 18 wherein said drift layer is a deeply-implanted layer.

20. (Original) The CMOS Semiconductor device of claim 18 wherein said drift layer is an epitaxial layer.

21. (Original) The CMOS Semiconductor device of claim 18 wherein said graded concentration follows a linear gradient.

22. (Original) The CMOS Semiconductor device of claim 18 wherein said graded concentration follows a quasi-linear gradient.

23. (Original) The CMOS Semiconductor device of claim 18 wherein said graded concentration follows an exponential gradient.

24. (Original) The CMOS Semiconductor device of claim 18 wherein said graded concentration follows a complimentary error function gradient.

25. (Canceled)

REMARKS

Applicant has carefully reviewed the final Office Action of August 13, 2012 ("Office Action") and in response thereto states as follows:

Claims 10-16 and 18-24 stand rejected pursuant to 35 U.S.C. 112, first paragraph because Applicant's specification does not enable "to create and maintain a single static unidirectional electric drift field." Office Action at ¶2. Without conceding the merits of this rejection, Applicant has further amended base claims 10 and 18 to overcome the rejection pursuant to 35 U.S.C. 112, first paragraph. In particular, Applicant has removed any reference to the terms "create," "maintain" and "single." With regard to the remaining term "static," Applicant respectfully notes that prior art reference Kamins (US 4,160,985), just like Applicant, discloses the presence of a "static" drift field, "because the drift field is created by graded concentration of dopants which does not change over time." See Office Action ¶4 p.4 lines 1-3, further citing to Kamins, Col. 2, lines 15-16; Col. 2, line 64 – Col. 3, line 2; Col. 1, lines 38-46; and Col. 3, lines 8-11.

Claims 10-11 and 18-19 stand rejected as obvious in view of the combined teachings of Kamins (of prior record) in view of Jastrzebski (US 4,481,522) (of prior record) and Bamji (US 2002/0084430) (of prior record). Applicant has previously summarized the disclosure of these references. Without conceding any of Applicant's positions, Applicant has further amended independent claims 10 and 18 to better distinguish over the cited prior art by claiming "at least one well region disposed in said single drift layer, said well region having a graded concentration of dopants and a second static unidirectional electric drift field to aid the movement of minority carriers." Applicant respectfully submits that neither Kamins nor Jastrzebski, disclose the above limitation.

Finally, Applicant has further amended claims 10 and 18 to address the Examiner's

position that claims 10 and 18 as previously submitted are product by process claims. See Office Action at p.5. In particular, Applicant has amended claim 10 as follows:

> "a single drift layer disposed between the other surface of said surface layer and said substrate, said drift layer having a graded concentration of dopants extending between said surface layer and said substrate, said drift layer further having a first ~~to create and maintain a single~~ static unidirectional electric drift field to aid the movement of minority carriers from said substrate to said surface layer ..."

Claims 11-16 depend on claim 10 and for at least the same reason that claim 10 is patentable over the cited prior art, claims 11-16 are patentable as well. Claims 19-24 depend on claim 18 and for at least the reasons that claim 18 is patentable over the cited prior art, claims 19-24 are patentable as well.

CONCLUSION

Applicant respectfully submits that in view of the amendments made to the claims and the discussion set forth herein, this application is now in condition for allowance. However, should Examiner be of the opinion that further amendment or response is required; Applicant encourages Examiner to contact the undersigned attorney at the telephone number set forth below. The Commissioner is authorized to charge any additional fees or deficiencies or credit any overpayments to Eugene M. Cummings, P.C., Deposit Account No. **50-4199**, with reference to attorney docket number (0299-0001.01).

Respectfully submitted,

By: _____
David M. Mundt, Reg. No. 41,207

Law Offices of Eugene M. Cummings, P.C.
1 N. Wacker
Suite 4130
Chicago, Illinois 60606

Telephone: (312) 984-0144
Facsimile: (312) 984-0146

Electronic Acknowledgement Receipt

EFS ID:	13981170
Application Number:	11622496
International Application Number:	
Confirmation Number:	3086
Title of Invention:	SEMICONDUCTOR DEVICES WITH GRADED DOPANT REGIONS
First Named Inventor/Applicant Name:	G.R. Mohan Rao
Customer Number:	70653
Filer:	David Michael Mundt/Francisca Hubbard
Filer Authorized By:	David Michael Mundt
Attorney Docket Number:	0299-0001.01
Receipt Date:	15-OCT-2012
Filing Date:	12-JAN-2007
Time Stamp:	11:20:04
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Amendment After Final	AmendmentF.pdf	473206 200b0f61139362e54ef9b9229051b8cc71a7b5e7	no	8

Warnings:

Information:

Total Files Size (in bytes):	473206

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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.

PTO/SB/06 (07-06)
Approved for use through 1/31/2007. OMB 0651-0032
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 displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number	Filing Date	
11/622,496	01/12/2007	☐ To be Mailed

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY ☒ RATE ($)	SMALL ENTITY ☒ FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =			X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 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			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT 10/15/2012

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 14	Minus	** 20	= 0	X $31 =	0	OR	X $ =	
Independent (37 CFR 1.16(h))	* 2	Minus	***8	= 0	X $125 =	0	OR	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))									
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE	0	OR	TOTAL ADD'L FEE	

AMENDMENT

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =		OR	X $ =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =		OR	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))									
☐ 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 number found in the appropriate box in column 1.

Legal Instrument Examiner:
/RAMONA WILSON/

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

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.
11/622,496	01/12/2007	G.R. Mohan Rao	0299-0001.01	3086

70653 7590 10/24/2012
LAW OFFICES OF EUGENE M. CUMMINGS, P.C.
ONE NORTH WACKER DRIVE
SUITE 4130
CHICAGO, IL 60606

EXAMINER
ARORA, AJAY

ART UNIT	PAPER NUMBER
2892	

MAIL DATE	DELIVERY MODE
10/24/2012	PAPER

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.

PTOL-90A (Rev. 04/07)

Advisory Action Before the Filing of an Appeal Brief	**Application No.** *11/622,496*	**Applicant(s)** RAO, G.R. MOHAN
	Examiner AJAY K. ARORA	**Art Unit** 2892

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

THE REPLY FILED 15 October 2012 FAILS TO PLACE THIS APPLICATION IN CONDITION FOR ALLOWANCE.

NO NOTICE OF APPEAL FILED

1. ☒ The reply was filed after a final rejection. No Notice of Appeal has been filed. To avoid abandonment of this application, applicant must timely file one of the following replies: (1) an amendment, affidavit, or other evidence, which places the application in condition for allowance;

(2) a Notice of Appeal (with appeal fee) in compliance with 37 CFR 41.31; or (3) a Request for Continued Examination (RCE) in compliance with 37 CFR 1.114 if this is a utility or plant application. Note that RCEs are not permitted in design applications. The reply must be filed within one of the following time periods:

a) ☐ The period for reply expires _____months from the mailing date of the final rejection.

b) ☒ The period for reply expires on: (1) the mailing date of this Advisory Action; or (2) the date set forth in the final rejection, whichever is later. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of the final rejection.

c) ☐ A prior Advisory Action was mailed more than 3 months after the mailing date of the final rejection in response to a first after-final reply filed within 2 months of the mailing date of the final rejection. The current period for reply expires months from the mailing date of *the prior Advisory Action* or SIX MONTHS from the mailing date of the final rejection, whichever is earlier.

Examiner Note: If box 1 is checked, check either box (a), (b) or (c). ONLY CHECK BOX (b) WHEN THIS ADVISORY ACTION IS THE FIRST RESPONSE TO APPLICANT'S FIRST AFTER-FINAL REPLY WHICH WAS FILED WITHIN TWO MONTHS OF THE FINAL REJECTION. ONLY CHECK BOX (c) IN THE LIMITED SITUATION SET FORTH UNDER BOX (c). See MPEP 706.07(f).

Extensions of time may be obtained under 37 CFR 1.136(a). The date on which the petition under 37 CFR 1.136(a) and the appropriate extension fee have been filed is the date for purposes of determining the period of extension and the corresponding amount of the fee. The appropriate extension fee under 37 CFR 1.17(a) is calculated from: (1) the expiration date of the shortened statutory period for reply originally set in the final Office action; or (2) as set forth in (b) or (c) above, if checked. Any reply received by the Office later than three months after the mailing date of the final rejection, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

NOTICE OF APPEAL

2. ☐ The Notice of Appeal was filed on _____. A brief in compliance with 37 CFR 41.37 must be filed within two months of the date of filing the Notice of Appeal (37 CFR 41.37(a)), or any extension thereof (37 CFR 41.37(e)), to avoid dismissal of the appeal. Since a Notice of Appeal has been filed, any reply must be filed within the time period set forth in 37 CFR 41.37(a).

AMENDMENTS

3. ☒ The proposed amendments filed after a final rejection, but prior to the date of filing a brief, will not be entered because

a) ☒ They raise new issues that would require further consideration and/or search (see NOTE below);

b) ☐ They raise the issue of new matter (see NOTE below);

c) ☐ They are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal; and/or

d) ☐ They present additional claims without canceling a corresponding number of finally rejected claims.

NOTE: *The new limitations of base claims 10 requiring "at least one well region disposed in said single drift layer, said well region having a graded concentration of dopants and a second static unidirectional electric drift field to aid the movement of minority carriers from said surface layer to said substrate" (see last 3 lines of claim 10). Amended base claim 18 also recites similar new limitations (see last 3 lines of claim 18)*. (See 37 CFR 1.116 and 41.33(a)).

4. ☐ The amendments are not in compliance with 37 CFR 1.121. See attached Notice of Non-Compliant Amendment (PTOL-324).

5. ☐ Applicant's reply has overcome the following rejection(s): _____.

6. ☐ Newly proposed or amended claim(s) _____ would be allowable if submitted in a separate, timely filed amendment canceling the non-allowable claim(s).

7. ☐ For purposes of appeal, the proposed amendment(s): (a) ☐ will not be entered, or (b) ☐ will be entered, and an explanation of how the new or amended claims would be rejected is provided below or appended.

AFFIDAVIT OR OTHER EVIDENCE

8. ☐ The affidavit or other evidence filed after final action, but before or on the date of filing a Notice of Appeal will not be entered because applicant failed to provide a showing of good and sufficient reasons why the affidavit or other evidence is necessary and was not earlier presented. See 37 CFR 1.116(e).

9. ☐ The affidavit or other evidence filed after the date of filing the Notice of Appeal, but prior to the date of filing a brief, will not be entered because the affidavit or other evidence failed to overcome all rejections under appeal and/or appellant fails to provide a showing of good and sufficient reasons why it is necessary and was not earlier presented. See 37 CFR 41.33(d)(1).

10. ☐ The affidavit or other evidence is entered. An explanation of the status of the claims after entry is below or attached.

REQUEST FOR RECONSIDERATION/OTHER

11. ☐ The request for reconsideration has been considered but does NOT place the application in condition for allowance because: _____.

12. ☐ Note the attached Information *Disclosure Statement*(s). (PTO/SB/08) Paper No(s). _____

13. ☐ Other: _____.

STATUS OF CLAIMS

14. The status of the claim(s) is (or will be) as follows:

Claim(s) allowed: .

Claim(s) objected to: .

/AJAY K. ARORA/
Primary Examiner, Art Unit 2892

DO NOT ENTER: /A.A./

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.	:	11/622,496
Confirmation No.	:	3086
Inventor	:	G. R. Mohan Rao
Filed	:	January 12, 2007
TC/A.U.	:	2892
Examiner	:	Ajay Arora
Title	:	SEMICONDUCTOR DEVICES WITH GRADED DOPANT REGIONS
Docket No.	:	0299-0001.01

RESPONSE PURSUANT TO 37 CFR 1.114

AMENDMENT F

Sir:

In response to the final Office Action of August 13, 2012, Applicant submits the following amendment:

Claims. Amendments to the claims begin on page 2 of this amendment.

Remarks. Remarks begin on page 6 of this amendment.

PTO/SB/30 (07-09)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Request for Continued Examination (RCE) Transmittal

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

Application Number	11/622496
Filing Date	01/12/2007
First Named Inventor	G.R. Mohan Rao
Art Unit	2892
Examiner Name	Ajay Arora
Attorney Docket Number	0299-0001.01

This is a Request for Continued Examination (RCE) under 37 CFR 1 .114 of the above-identified application.
Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. See Instruction Sheet for RCEs (not to be submitted to the USPTO) on page 2.

1. Submission required under 37 CFR 1.114 Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

   a. ☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

      i. ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____

      ii. ☐ Other _____

   b. ☒ Enclosed

      i. ☒ Amendment/Reply

      ii. ☐ Affidavit(s)/ Declaration(s)

      iii. ☐ Information Disclosure Statement (IDS)

      iv. ☐ Other _____

2. Miscellaneous

   Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a

   a. ☐ period of _____ months. (Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

   b. ☐ Other _____

3. Fees The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.
   The Director is hereby authorized to charge the following fees any underpayment of fees or credit any overpayments to

   a. ☒ Deposit Account No. 50-4199 .

      i. ☒ RCE fee required under 37 CFR 1.17(e)

      ii ☐ Extension of time fee (37 CFR 1.136 and 1.17)

      iii ☐ Other _____

   b. ☐ Check in the amount of $ _____ enclosed

   c. ☐ Payment by credit card (Form PTO-2038 enclosed)

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

Signature	/David M. Mundt/	Date	November 13, 2012
Name (Print/Type)	David M. Mundt	Registration No.	41,207

CERTIFICATE OF MAILING OR TRANSMISSION

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Mail Stop RCE, Commissioner for Patents, P. O. Box 1450, Alexandria, VA 22313-1450 or facsimile transmitted to the U.S. Patent and Trademark Office on the date shown below.

Signature	Francisca M A Hubbard Electronic Filing		
Name (Print/Type)	Francisca M. A. Hubbard	Date	November 13, 2012

This collection of information is required by 37 CFR 1.114. 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 1.11 and 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: Mail Stop RCE, 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.

American LegalNet, Inc.
www.FormsWorkFlow

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.	:	11/622,496
Confirmation No.	:	3086
Inventor	:	G. R. Mohan Rao
Filed	:	January 12, 2007
TC/A.U.	:	2892
Examiner	:	Ajay Arora
Title	:	SEMICONDUCTOR DEVICES WITH GRADED DOPANT REGIONS
Docket No.	:	0299-0001.01

REQUEST FOR CONTINUED EXAMINATION

AMENDMENT F

Sir:

In response to the Advisory Action of October 24, 2012, Applicant submits the following amendment:

Claims. Amendments to the claims begin on page 2 of this amendment.

Remarks. Remarks begin on page 6 of this amendment.

LISTING OF CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Claims:

1. (Canceled)

2. (Canceled)

3. (Canceled)

4. (Canceled)

5. (Canceled)

6. (Canceled)

7. (Canceled)

8. (Canceled)

9. (Canceled)

10. (Currently Amended) A CMOS Semiconductor device comprising:

a surface layer;

a substrate;

an active region including a source and a drain, disposed on one surface of said surface layer; ~~and~~

a single drift layer disposed between the other surface of said surface layer and said substrate, said drift layer having a graded concentration of dopants extending between said surface layer and said substrate, said drift layer further having a first ~~to create and maintain a single~~ static unidirectional electric drift field to aid the movement of minority carriers from said surface layer to said substrate; and

at least one well region disposed in said single drift layer, said well region having a graded concentration of dopants and a second static unidirectional electric drift field to aid the movement of minority carriers from said surface layer to said substrate.

11. (Original) The CMOS Semiconductor device of claim 10 wherein said drift layer is a deeply-implanted layer.

12. (Original) The CMOS Semiconductor device of claim 10 wherein said drift layer is an epitaxial layer.

13. (Original) The CMOS Semiconductor device of claim 10 wherein said graded concentration follows a linear gradient.

14. (Original) The CMOS Semiconductor device of claim 10 wherein said graded concentration follows a quasi-linear gradient.

15. (Original) The CMOS Semiconductor device of claim 10 wherein said graded concentration follows an exponential gradient.

16. (Original) The CMOS Semiconductor device of claim 10 wherein said graded concentration follows a complimentary error function gradient.

17. (Canceled)

18. (Currently amended) A CMOS Semiconductor device comprising:

a surface layer;

a substrate;

an active region including a source and a drain, disposed on one surface of said surface layer; ~~and~~

a single drift layer disposed between the other surface of said surface layer and said substrate, said drift layer having a graded concentration of dopants extending between said surface layer and said substrate, said drift layer further having a first ~~to create and maintain a single~~ static unidirectional electric drift field to aid the movement of minority carriers from said substrate to said surface layer; and

at least one well region disposed in said single drift layer, said well region having a graded concentration of dopants and a second static unidirectional electric drift field to aid the

movement of minority carriers from said substrate to said surface layer.

19. (Original) The CMOS Semiconductor device of claim 18 wherein said drift layer is a deeply-implanted layer.

20. (Original) The CMOS Semiconductor device of claim 18 wherein said drift layer is an epitaxial layer.

21. (Original) The CMOS Semiconductor device of claim 18 wherein said graded concentration follows a linear gradient.

22. (Original) The CMOS Semiconductor device of claim 18 wherein said graded concentration follows a quasi-linear gradient.

23. (Original) The CMOS Semiconductor device of claim 18 wherein said graded concentration follows an exponential gradient.

24. (Original) The CMOS Semiconductor device of claim 18 wherein said graded concentration follows a complimentary error function gradient.

25. (Canceled)

REMARKS

Applicant has carefully reviewed the Advisory Action of October 24, 2012. In addition, Applicant incorporates herein by reference the October 15, 2012 Response to the Final Office Action and states as follows:

Claims 10-16 and 18-24 stand rejected pursuant to 35 U.S.C. 112, first paragraph because Applicant's specification does not enable "to create and maintain a single static unidirectional electric drift field." Office Action at ¶2. Without conceding the merits of this rejection, Applicant has further amended base claims 10 and 18 to overcome the rejection pursuant to 35 U.S.C. 112, first paragraph. In particular, Applicant has removed any reference to the terms "create," "maintain" and "single." With regard to the remaining term "static," Applicant respectfully notes that prior art reference Kamins (US 4,160,985), just like Applicant, discloses the presence of a "static" drift field, "because the drift field is created by graded concentration of dopants which does not change over time." See Office Action ¶4 p.4 lines 1-3, further citing to Kamins, Col. 2, lines 15-16; Col. 2, line 64 – Col. 3, line 2; Col. 1, lines 38-46; and Col. 3, lines 8-11.

Claims 10-11 and 18-19 stand rejected as obvious in view of the combined teachings of Kamins (of prior record) in view of Jastrzebski (US 4,481,522) (of prior record) and Bamji (US 2002/0084430) (of prior record). Applicant has previously summarized the disclosure of these references. Without conceding any of Applicant's positions, Applicant has further amended independent claims 10 and 18 to better distinguish over the cited prior art by claiming "at least one well region disposed in said single drift layer, said well region having a graded concentration of dopants and a second static unidirectional electric drift field to aid the movement of minority carriers." Applicant respectfully submits that neither Kamins nor Jastrzebski, disclose the above limitation.

Finally, Applicant has further amended claims 10 and 18 to address the Examiner's position that claims 10 and 18 as previously submitted are product by process claims. See Office Action at p.5. In particular, Applicant has amended claim 10 as follows:

> "a single drift layer disposed between the other surface of said surface layer and said substrate, said drift layer having a graded concentration of dopants extending between said surface layer and said substrate, said drift layer further having a first ~~to create and maintain a single~~ static unidirectional electric drift field to aid the movement of minority carriers from said substrate to said surface layer ..."

Claims 11-16 depend on claim 10 and for at least the same reason that claim 10 is patentable over the cited prior art, claims 11-16 are patentable as well. Claims 19-24 depend on claim 18 and for at least the reasons that claim 18 is patentable over the cited prior art, claims 19-24 are patentable as well.

CONCLUSION

Applicant respectfully submits that in view of the amendments made to the claims and the discussion set forth herein, this application is now in condition for allowance. However, should Examiner be of the opinion that further amendment or response is required; Applicant encourages Examiner to contact the undersigned attorney at the telephone number set forth below. The Commissioner is authorized to charge any additional fees or deficiencies or credit any overpayments to Eugene M. Cummings, P.C., Deposit Account No. **50-4199**, with reference to attorney docket number (0299-0001.01).

Respectfully submitted,

Date: November 13, 2012

By: /David M. Mundt/
David M. Mundt, Reg. No. 41,207

Law Offices of Eugene M. Cummings, P.C.
1 North Wacker Drive
Suite 4130
Chicago, Illinois 60606

Telephone: (312) 984-0144
Facsimile: (312) 984-0146

Electronic Patent Application Fee Transmittal

Application Number:	11622496
Filing Date:	12-Jan-2007
Title of Invention:	SEMICONDUCTOR DEVICES WITH GRADED DOPANT REGIONS
First Named Inventor/Applicant Name:	G.R. Mohan Rao
Filer:	David Michael Mundt/Francisca Hubbard
Attorney Docket Number:	0299-0001.01

Filed as Small Entity

Utility under 35 USC 111(a) Filing Fees

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($)
Miscellaneous:				
Request for continued examination	2801	1	465	465
		Total in USD ($)		**465**

Electronic Acknowledgement Receipt

EFS ID:	14209126
Application Number:	11622496
International Application Number:	
Confirmation Number:	3086
Title of Invention:	SEMICONDUCTOR DEVICES WITH GRADED DOPANT REGIONS
First Named Inventor/Applicant Name:	G.R. Mohan Rao
Customer Number:	70653
Filer:	David Michael Mundt/Francisca Hubbard
Filer Authorized By:	David Michael Mundt
Attorney Docket Number:	0299-0001.01
Receipt Date:	13-NOV-2012
Filing Date:	12-JAN-2007
Time Stamp:	09:12:35
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$465
RAM confirmation Number	17230
Deposit Account	504199
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for Continued Examination (RCE)	RCE.pdf	151110 669bd13352097826785b6b507e921bb2d21f3ba0	no	1
Warnings:					
This is not a USPTO supplied RCE SB30 form.					
Information:					
2	Amendment After Final	AmendmentF.pdf	726410 c3fe02a1a6fa54c984a7668cd2344d6e4c426b1f	no	8
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	30433 1669af2e315b53327c32b94c85ccbe287af2f2ce	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	907953	

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.

PTO/SB/06 (07-06)
Approved for use through 1/31/2007. OMB 0651-0032
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 displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number	Filing Date	
11/622,496	01/12/2007	☐ To be Mailed

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY ☒ RATE ($)	SMALL ENTITY FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =		OR	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =			X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 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))							
			TOTAL			TOTAL	

* If the difference in column 1 is less than zero, enter "0" in column 2.

APPLICATION AS AMENDED – PART II

AMENDMENT 11/13/2012

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	* 14	Minus	** 20	= 0	X $31 =	0	OR	X $ =	
Independent (37 CFR 1.16(h))	* 2	Minus	***8	= 0	X $125 =	0	OR	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))									
☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE	0	OR	TOTAL ADD'L FEE	

AMENDMENT

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE ($)	SMALL ENTITY ADDITIONAL FEE ($)	OR	OTHER THAN SMALL ENTITY RATE ($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE ($)
Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =		OR	X $ =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =		OR	X $ =	
☐ Application Size Fee (37 CFR 1.16(s))									
☐ 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 number found in the appropriate box in column 1.

Legal Instrument Examiner:
/LAJUAN HICKSON/

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

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

70653 7590 12/12/2012
LAW OFFICES OF EUGENE M. CUMMINGS, P.C.
ONE NORTH WACKER DRIVE
SUITE 4130
CHICAGO, IL 60606

EXAMINER
ARORA, AJAY

ART UNIT	PAPER NUMBER
2892	

DATE MAILED: 12/12/2012

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/622,496	01/12/2007	G.R. Mohan Rao	0299-0001.01	3086

TITLE OF INVENTION: SEMICONDUCTOR DEVICES WITH GRADED DOPANT REGIONS

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	YES	$885	$300	$0	$1185	03/12/2013

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 SMALL ENTITY status shown above.

If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

A. If the status is the same, pay the TOTAL FEE(S) DUE shown above.

B. If the status above is to be removed, check box 5b on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and twice the amount of the ISSUE FEE shown above, or

If the SMALL ENTITY is shown as NO:

A. Pay TOTAL FEE(S) DUE shown above, or

B. If applicant claimed SMALL ENTITY status before, or is now claiming SMALL ENTITY status, check box 5a on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and 1/2 the ISSUE FEE shown above.

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: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PTOL-85 (Rev. 02/11)

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (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)

70653 7590 12/12/2012
LAW OFFICES OF EUGENE M. CUMMINGS, P.C.
ONE NORTH WACKER DRIVE
SUITE 4130
CHICAGO, IL 60606

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 facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/622,496	01/12/2007	G.R. Mohan Rao	0299-0001.01	3086

TITLE OF INVENTION: SEMICONDUCTOR DEVICES WITH GRADED DOPANT REGIONS

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	YES	$885	$300	$0	$1185	03/12/2013

EXAMINER	ART UNIT	CLASS-SUBCLASS
ARORA, AJAY	2892	257-371000

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 03-02 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 has been filed for recordation as set forth in 37 CFR 3.11. 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. The following fee(s) are submitted:
- ❑ Issue Fee
- ❑ Publication Fee (No small entity discount permitted)
- ❑ Advance Order - # of Copies _____

4b. Payment of Fee(s): (**Please first reapply any previously paid issue fee shown above**)
- ❑ A check is enclosed.
- ❑ Payment by credit card. Form PTO-2038 is attached.
- ❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
- ❑ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27.
- ❑ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

This collection of information 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 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, 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.

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.
11/622,496	01/12/2007	G.R. Mohan Rao	0299-0001.01	3086

70653 7590 12/12/2012
LAW OFFICES OF EUGENE M. CUMMINGS, P.C.
ONE NORTH WACKER DRIVE
SUITE 4130
CHICAGO, IL 60606

EXAMINER
ARORA, AJAY

ART UNIT	PAPER NUMBER
2892	

DATE MAILED: 12/12/2012

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

The Patent Term Adjustment to date is 0 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 0 day(s).

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 Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

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.	Applicant(s)	
	11/622,496	RAO, G.R. MOHAN	
	Examiner	Art Unit	
	AJAY K. ARORA	2892	

-- 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 *11/13/12*.

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 *10-16 & 18-24*. 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).
   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)
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
5. ☐ Examiner's Amendment/Comment
6. ☒ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/AJAY K. ARORA/
Primary Examiner, Art Unit 2892

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 11/13/2012 has been entered.

Reasons for Allowance

1. Claims 10-16 and 18-24 are allowed. The following is an examiner's statement of reasons for allowance:

2. Claims 10-16 and 18-24 are allowed because the prior art of record does not teach or suggest, singularly or in combination, at least the limitations of base claim 10 which requires "at least one well region disposed in said single drift layer, said well region having a graded concentration of dopants and a second static unidirectional electric drift field to aid the movement of minority carriers from said surface layer to said

substrate" (see last 3 lines of claim 10). Base claim 18 recites similar limitations (see last 3 lines of claim 18).

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

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

Any inquiry concerning this communication or earlier communications from the examiner should be directed to AJAY K. ARORA whose telephone number is (571)272-8347. The examiner can normally be reached on Mon through Fri, 8:30am to 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Thao X. Le can be reached on (571) 272-1708. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/AJAY K. ARORA/
Primary Examiner, Art Unit 2892

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	11622496	RAO, G.R. MOHAN
	Examiner	**Art Unit**
	AJAY K ARORA	2892

SEARCHED

Class	Subclass	Date	Examiner
257	655	12/16/2011	AKA

SEARCH NOTES

Search Notes	Date	Examiner
Revised EAST search history report	12/16/2011	AKA
Revised EAST search history report	8/10/2012	AKA
Revised EAST search history	11/19/2012	AKA
Inventor search	11/19/2012	AKA
.clm. interference search	11/19/2012	AKA

INTERFERENCE SEARCH

Class	Subclass	Date	Examiner
257	655	12/16/2011	AKA

	/A. K. A./ Primary Examiner.Art Unit 2892

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	11622496	RAO, G.R. MOHAN
	Examiner	**Art Unit**
	AJAY K ARORA	2892

ORIGINAL		INTERNATIONAL CLASSIFICATION									
CLASS	SUBCLASS	CLAIMED					NON-CLAIMED				
257	655	H	0	1	L	21 / 02 (2006.01.01)					

CROSS REFERENCE(S)

CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)				
257	611	E33.048			
438	510				

☒ **Claims renumbered in the same order as presented by applicant** ☐ **CPA** ☐ **T.D.** ☐ **R.1.47**

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
-	1	-	17												
-	2	8	18												
-	3	9	19												
-	4	10	20												
-	5	11	21												
-	6	12	22												
-	7	13	23												
-	8	14	24												
-	9	-	25												
1	10														
2	11														
3	12														
4	13														
5	14														
6	15														
7	16														

NONE (Assistant Examiner)	(Date)	**Total Claims Allowed:** 14	
/AJAY K ARORA/ Primary Examiner.Art Unit 2892 (Primary Examiner)	12/04/2012 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 5b

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	0	(unidirectional WITH field WITH drift) AND ((gradient OR grading OR graded) WITH dop$3).clm.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2012/11/19 14:46
L2	0	(unidirectional WITH field WITH drift) AND ((gradient OR grading OR graded) WITH dop$3).clm.	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2012/11/19 14:46
L3	0	((GR) near2 (RAO)).INV.	US-PGPUB; USPAT	OR	ON	2012/11/19 14:48
L4	0	((GR) near2 (RAO)).INV.	EPO; JPO; DERWENT	OR	ON	2012/11/19 14:48
L5	0	(("G.R.") near2 (RAO)).INV.	EPO; JPO; DERWENT	OR	ON	2012/11/19 14:49
L6	89	(mohan near2 RAO).INV.	EPO; JPO; DERWENT	OR	ON	2012/11/19 14:49
L7	245	(mohan near2 RAO).INV.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2012/11/19 14:49
L8	2	l7 and (grad$3 WITH dop$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2012/11/19 14:50
S1	2	("20070158790").PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/04/08 11:10
S2	58	("20020074585" | "20040063288" | "4001864" | "4347654" | "4866000" | "5130262" | "5213988" | "5329144" | "5480816" | "5496746" | "5569612" | "5575862" | "5797999" | "6211028" | "6452086" | "6472715" | "6670544" | "6683343" | "6696314" | "6706550" | "6713813" | "6737722" | "6744117" | "6747883" | "6753202" | "6754093" | "6756616" | "RE37441").PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/04/08 11:19
S3	1096	(graded OR gradation) WITH (dopant OR	US-PGPUB;	OR	ON	2008/04/08

		doping) WITH concentration	USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB			11:47
S4	805	S3 AND ("257" OR "438").clas.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/04/08 11:47
S5	253	(graded OR gradation) WITH (dopant OR doping) WITH concentration WITH (semiconductor OR silicon)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/04/08 11:49
S6	7	S5 SAME (carrier WITH (movement OR mobility))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/04/08 11:51
S7	48	S5 AND (((carrier OR electron OR hole) WITH (movement OR mobility)) SAME ((emitter WITH collector) OR (source WITH drain)))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/04/08 11:55
S8	58	("20020074585" | "20040063288" | "4001864" | "4347654" | "4866000" | "5130262" | "5213988" | "5329144" | "5480816" | "5496746" | "5569612" | "5575862" | "5797999" | "6211028" | "6452086" | "6472715" | "6670544" | "6683343" | "6696314" | "6706550" | "6713813" | "6737722" | "6744117" | "6747883" | "6753202" | "6754093" | "6756616" | "RE37441").PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/07/18 12:16
S10	13	S8 AND ("dopant concentration" OR "concentration of dopant")	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/07/18 12:17
S11	0	S8 AND (dop$3 WITH (concentrat$3 OR amount OR quantity) WITH (variable OR varying OR grad$3)) AND ((doping OR dopant) WITH well) AND ((carrier OR charge) WITH (moving OR movement OR mobile OR mobility))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/07/18 12:22
S12	1136	(graded OR gradation) WITH (dopant OR doping) WITH concentration	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/07/18 12:22
S13	86	S12 AND (dop$3 WITH (concentrat$3 OR amount OR quantity) WITH (variable OR varying OR grad$3)) AND ((doping OR dopant) WITH well) AND ((carrier OR	US-PGPUB; USPAT; USOCR; EPO; JPO;	OR	ON	2008/07/18 12:22

		charge) WITH (moving OR movement OR mobile OR mobility))	DERWENT; IBM_TDB			
S14	29	("20020068409" | "6303450" | "6437406" | "6458665" | "6483158" | "6489223" | "6509241").PN. OR ("6743684").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2008/07/18 13:13
S15	34	uniform$2 WITH dop$3 WITH drift WITH epitaxial	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/07/23 15:19
S16	2	("5637898").PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/07/23 15:26
S17	0	(non-uniform$2 OR nonuniform$2 OR grad43 OR grading OR gradient) WITH (dopant OR doping) WITH well WITH carrier WITH (movement OR mobility) WITH ((away WITH active WITH surface) OR (towards WITH substrate))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/07/23 15:40
S18	4	(non-uniform$2 OR nonuniform$2 OR grad$3 OR grading OR gradient) WITH (dopant OR doping) WITH well WITH carrier WITH (movement OR mobility) WITH ((away WITH active WITH surface) OR (towards WITH substrate))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/07/23 15:40
S19	4	("4001864").PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/07/23 15:43
S20	58	("20020074585" | "20040063288" | "4001864" | "4347654" | "4866000" | "5130262" | "5213988" | "5329144" | "5480816" | "5496746" | "5569612" | "5575862" | "5797999" | "6211028" | "6452086" | "6472715" | "6670544" | "6683343" | "6696314" | "6706550" | "6713813" | "6737722" | "6744117" | "6747883" | "6753202" | "6754093" | "6756616" | "RE37441").PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/07/23 15:57
S21	92	S15 S19 S20	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/07/23 15:58
S22	39	S21 AND ((non-uniform$2 OR nonuniform$2 OR grad$3 OR grading OR gradient) WITH (dopant OR doping))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/07/23 15:58
S23	60	S21 AND well	US-PGPUB; USPAT; USOCR;	OR	ON	2008/07/23 15:59

			EPO; JPO; DERWENT; IBM_TDB			
S24	39	S22 AND well	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/07/23 15:59
S25	2	S22 AND (well WITH carrier WITH (movement OR mobility) WITH ((away WITH active WITH surface) OR (towards WITH substrate)))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/07/23 16:00
S26	3	S22 AND (well WITH (carrier OR movement OR mobility) WITH ((away WITH active WITH surface) OR (towards WITH substrate)))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/07/23 16:00
S27	2	("20030042511").PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/07/23 16:05
S28	2	S21 AND (substrate WITH carrier WITH away WITH ((active WITH surface) OR (towards NEAR2 substrate) OR (direction NEAR4 substrate)))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/07/23 17:17
S29	3	S21 AND (substrate WITH (carrier OR holes OR electron OR majority OR charge) WITH away WITH ((active WITH surface) OR (towards NEAR2 substrate) OR (direction NEAR4 substrate)))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/07/23 17:18
S30	30	S21 AND ((non-uniform$2 OR nonuniform$2 OR grad$3 OR grading OR gradient) WITH (dopant OR doping) WITH substrate)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/07/23 17:26
S31	253	(grad$3 OR grading OR gradient) NEAR2 (dopant OR doping) NEAR4 substrate	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/07/23 17:33
S32	5	dopant WITH concentration WITH donor WITH acceptor WITH optimiz$3	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/07/23 18:02
S33	2	10/182,784	US-PGPUB; USPAT; USOCR;	OR	ON	2008/07/23 18:06

			EPO; JPO; DERWENT; IBM_TDB			
S34	0	S20 AND (dopant WITH concentration WITH donor WITH acceptor)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/07/23 18:22
S35	0	S20 AND (dopant WITH donor WITH acceptor)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/07/23 18:22
S36	5	(dopant WITH donor WITH acceptor WITH optimiz$3)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/07/23 18:26
S37	5	(dopant WITH donor WITH acceptor WITH (optimiz$ OR optimization OR optimal))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/07/23 18:27
S38	487	(donor WITH acceptor WITH (optimiz$ OR optimization OR optimal))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/07/23 18:27
S39	14	S38 AND semiconductor.ab.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/07/23 18:28
S40	0	(layer WITH dopant WITH wafer WITH transfer$4 WITH ((another OR second OR alternate) NEAR1 wafer)) AND (wafer NEAR1 bond$3)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/07/23 18:49
S41	0	(dopant WITH wafer WITH transfer$4 WITH ((another OR second OR alternate) NEAR1 wafer)) AND (wafer NEAR1 bond$3)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/07/23 18:49
S42	0	(dopant WITH transfer$4 WITH ((another OR second OR alternate) NEAR1 wafer)) AND (wafer NEAR1 bond$3)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/07/23 18:50
S43	0	(dopant WITH transfer$4 WITH ((another OR second OR alternate) NEAR1 wafer))	US-PGPUB; USPAT; USOCR;	OR	ON	2008/07/23 18:50

			EPO; JPO; DERWENT; IBM_TDB			
S44	14807	wafer NEAR1 bond$3	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/07/23 18:51
S45	33	S44 AND (dopant WITH transfer$4)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2008/07/23 18:51
S46	579	(257/655,269).CCLS.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2008/07/24 09:14
S47	539	(257/655).CCLS.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/01/02 21:01
S48	695	VLSI AND ((graded OR gradation OR gradient) WITH (dopant OR doping OR impurit$3))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/05/24 11:04
S49	62	S48 AND (((carrier OR electron OR hole) WITH (movement OR mobility)) SAME ((emitter WITH collector) OR (source WITH drain)))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/05/24 11:05
S50	4	S48 AND (well WITH carrier WITH (movement OR mobility) WITH ((away WITH active WITH surface) OR (towards WITH substrate)))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/05/24 11:06
S51	4	("4001864").PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/05/24 11:10
S52	2	("6831292").PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/05/24 11:36
S53	2	("5029277").PN.	US-PGPUB; USPAT; USOCR;	OR	OFF	2009/05/24 12:17

			EPO; JPO; DERWENT; IBM_TDB			
S54	551	(257/655).CCLS.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/05/24 12:52
S55	564	(257/655).CCLS.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/12/22 10:12
S56	2	("6831292").PN.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2009/12/22 10:14
S57	10	(US-20040072395-$ or US-20010046753-$ or US-20010050382-$ or US-20020093281-$ or US-20030042511-$).did. or (US-6743684-$ or US-5359221-$ or US-5637898-$ or US-5627092-$ or US-5029277-$).did. or (US-20020093281-A-$).did.	US-PGPUB; USPAT; DERWENT	OR	ON	2009/12/22 10:26
S58	0	S57 AND drift WITH aid$3	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/12/22 10:27
S59	7	(drift WITH aid$3) WITH dopant WITH concentration	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2009/12/22 10:27
S60	173	((graded OR gradient OR gradation) NEAR2 (dop$3 OR impurity)) WITH between WITH substrate AND (active OR source OR drain OR source/drain)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/08/01 12:45
S61	74	S60 AND CMOS	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/08/01 13:43
S62	5	(complementary WITH error WITH function WITH gradient)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/08/01 19:12
S64	55	CMOS AND (exponential WITH gradient)	US-PGPUB; USPAT;	OR	ON	2010/08/01 19:13

			USOCR; EPO; JPO; DERWENT; IBM_TDB			
S65	712	CMOS AND (linear WITH gradient)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/08/01 19:14
S66	12	S64 AND S65	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/08/01 19:14
S67	0	S66 AND S62	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/08/01 19:15
S68	7	(grad$3 WITH (dop$3 OR donor)) SAME ((dopant OR donor) WITH (sweep$3 OR mov$3 OR attract$3) WITH substrate)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/08/01 19:58
S69	4	(grad$3 WITH (dop$3 OR donor)) SAME ((dopant OR donor) WITH driv$3 WITH (toward OR into OR deep$2) WITH substrate)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/08/01 20:00
S70	16	(layer WITH (dopant OR donor) WITH concentration WITH minority WITH substrate)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/08/01 20:02
S71	3377	((graded OR gradation OR gradient) NEAR3 (dopant OR doping OR impurity OR donor OR acceptor)) AND (semiconductor OR CMOS OR FET OR "field effect" OR NMOS OR PMOS).ab.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/08/02 04:28
S72	371	S71 AND (drift WITH field)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/08/02 04:29
S73	0	S71 AND (minority WITH carrier WITH into WITH substrate)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/08/02 04:29
S74	114	S71 AND (minority WITH carrier WITH substrate)	US-PGPUB; USPAT;	OR	ON	2010/08/02 04:30

			USOCR; EPO; JPO; DERWENT; IBM_TDB			
S75	33	S72 AND S74	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/08/02 04:30
S76	88	S71 AND (drift WITH layer WITH (graded OR gradation OR gradient) WITH (dopant OR doping OR impurity OR donor OR acceptor))	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/08/02 04:47
S77	7	S76 AND (drift WITH layer WITH between WITH substrate)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/08/02 04:48
S78	8028	photodiode WITH CMOS	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/08/02 05:13
S79	0	S78 AND S76	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/08/02 05:14
S80	0	S78 AND S77	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/08/02 05:14
S81	7	S71 AND S77	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/08/02 05:14
S82	98	S71 AND S78	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/08/02 05:20
S83	9	S72 AND S78	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/08/02 05:20
S84	2	("20020084430").PN.	US-PGPUB; USPAT;	OR	OFF	2010/08/02 05:26

			USOCR; EPO; JPO; DERWENT; IBM_TDB			
S85	172	(drift WITH layer WITH epitaxial) AND S71	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/08/02 07:16
S86	47	S71 AND (linear AND exponential)	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/08/02 08:04
S87	3	S86 AND "complimentary error function"	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/08/02 08:04
S88	8	S86 AND donor	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2010/08/02 08:38
S89	583	(257/655).CCLS.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2010/08/02 10:21
S90	593	(257/655).CCLS.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2011/01/11 11:40
S91	598	(257/655).CCLS.	US-PGPUB; USPAT; USOCR; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2011/04/10 20:57
S92	1	("4481522").PN.	USPAT; USOCR	OR	OFF	2011/12/16 08:02
S93	456	(257/655).CCLS.	USPAT; USOCR	OR	OFF	2011/12/16 09:45
S94	0	(single WITh static WITH drift) AND ((gradient OR grading OR graded) WITH dop$3)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2012/08/10 00:21
S95	22	(static WITH drift) AND ((gradient OR grading OR graded) WITH dop$3)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2012/08/10 00:21

S96	1	(unidirectional WITH field WITH drift) AND ((gradient OR grading OR graded) WITH dop$3)	US-PGPUB; USPAT; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2012/08/10 00:24

11/19/2012 2:57:22 PM
C:\Users\aarora\Documents\EAST\Workspaces\11622496.wsp

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	11622496	RAO, G.R. MOHAN
	Examiner	**Art Unit**
	AJAY K ARORA	2892

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☒ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	08/02/2010	04/10/2011	12/16/2011	08/10/2012	11/19/2012				
	1	-	-	-	-	-				
	2	-	-	-	-	-				
	3	-	-	-	-	-				
	4	-	-	-	-	-				
	5	-	-	-	-	-				
	6	-	-	-	-	-				
	7	-	-	-	-	-				
	8	-	-	-	-	-				
	9	-	-	-	-	-				
	10	✓	✓	✓	✓	=				
	11	✓	✓	✓	✓	=				
	12	✓	✓	✓	✓	=				
	13	✓	✓	✓	✓	=				
	14	✓	✓	✓	✓	=				
	15	✓	✓	✓	✓	=				
	16	✓	✓	✓	✓	=				
	17	✓	-	-	-	-				
	18	✓	✓	✓	✓	=				
	19	✓	✓	✓	✓	=				
	20	✓	✓	✓	✓	=				
	21	✓	✓	✓	✓	=				
	22	✓	✓	✓	✓	=				
	23	✓	✓	✓	✓	=				
	24	✓	✓	✓	✓	=				
	25	✓	-	-	-	-				

PART B - FEE(S) TRANSMITTAL

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Francisca M.A. Hubbard	(Depositor's name)
[signature]	(Signature)
March 12, 2013	(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/622,496	01/12/2007	G.R. Mohan Rao	0299-0001.01	3086

TITLE OF INVENTION: SEMICONDUCTOR DEVICES WITH GRADED DOPANT REGIONS

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	YES	$885	$300	$0	$1185	03/12/2013

EXAMINER	ART UNIT	CLASS-SUBCLASS
ARORA, AJAY	2892	257-371000

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.
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2. For printing on the patent front page, list
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1 Eugene M. Cummings, P.C.
2
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3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

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(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

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5. **Change in Entity Status** (from status indicated above)
- ☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27.
- ☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

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Authorized Signature [signature] Date March 12, 2013

Typed or printed name David M. Mundt Registration No. 41,207

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Electronic Patent Application Fee Transmittal

Application Number:	11622496
Filing Date:	12-Jan-2007
Title of Invention:	SEMICONDUCTOR DEVICES WITH GRADED DOPANT REGIONS
First Named Inventor/Applicant Name:	G.R. Mohan Rao
Filer:	David Michael Mundt/Francisca Hubbard
Attorney Docket Number:	0299-0001.01

Filed as Small Entity

Utility under 35 USC 111(a) Filing Fees

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	2501	1	885	885
Publ. Fee- Early, Voluntary, or Normal	1504	1	300	300

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**1185**

Electronic Acknowledgement Receipt

EFS ID:	15191627
Application Number:	11622496
International Application Number:	
Confirmation Number:	3086
Title of Invention:	SEMICONDUCTOR DEVICES WITH GRADED DOPANT REGIONS
First Named Inventor/Applicant Name:	G.R. Mohan Rao
Customer Number:	70653
Filer:	David Michael Mundt/Francisca Hubbard
Filer Authorized By:	David Michael Mundt
Attorney Docket Number:	0299-0001.01
Receipt Date:	12-MAR-2013
Filing Date:	12-JAN-2007
Time Stamp:	15:32:54
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$1185
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Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	IssueFee.pdf	169875 03bcbf9d7d2927752ec0c60b4ff01d078e7fafc1	no	1
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	31843 3959a4d0703527cbda6bd4c321ef249fa665b73d	no	2
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