Petitioner Semiconductor Components Industries, LLC (onsemi) Oral Argument for PTAB Hearing

Semiconductor Components Industries, LLC and Texas Instruments Incorporated v. Greenthread, LLC

IPR2023-01242 (U.S. Patent No. 11,121,222)

IPR2023-01243 (U.S. Patent No. 10,510,842)

IPR2023-01244 (U.S. Patent No. 11,121,222)

November 13, 2024

BAKER BOTTS

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DEMONSTRATIVE EXHIBIT – NOT EVIDENCE

Table of Contents

01 Overview of the ‘222 and ‘842 Patents and Instituted Grounds

02 The prior art discloses all claim limitations

03 The “aid carrier movement” limitations are obvious

04 The “opposite in conductivity” limitations are obvious

05 The “isolation region” dependent claims are obvious

06 Patent Owner’s settlement agreements do not show non-obviousness

07 The Petition is timely

OVERVIEW 01

OVERVIEW OF ’222 AND ’842 PATENTS AND INSTITUTED GROUNDS

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THE ’222 AND ’842 PATENTS

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’842 Patent

(12) **United States Patent**
Rao

(10) **Patent No.: US 10,510,842 B2**
(45) **Date of Patent: Dec. 17, 2019**

(54) **SEMICONDUCTOR DEVICES WITH GRADED DOPANT REGIONS**

(71) Applicant: **GREENTHREAD, LLC**, Dallas, TX (US)

(72) Inventor: **G.R. Mohan Rao**, Allen, TX (US)

(73) Assignee: **GREENTHREAD, LLC**, Dallas, TX (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **15/590,282**

(22) Filed: **May 9, 2017**

(65) **Prior Publication Data**

US 2017/0243876 A1 Aug. 24, 2017

Related U.S. Application Data

(60) Continuation of application No. 14/931,636, filed on Nov. 3, 2015, now Pat. No. 9,647,070, which is a continuation of application No. 14/515,584, filed on Oct. 16, 2014, now Pat. No. 9,190,502, which is a continuation of application No. 13/854,319, filed on

(Continued)

1. A semiconductor device, comprising:

a substrate of a first doping type at a first doping level having first and second surfaces;

a first active region disposed adjacent the first surface of the substrate with a second doping type opposite in conductivity to the first doping type and within which transistors can be formed;

a second active region separate from the first active region disposed adjacent to the first active region and within which transistors can be formed;

transistors formed in at least one of the first active region or second active region; and

at least a portion of at least one of the first and second active regions having at least one graded dopant concentration to aid carrier movement from the first surface to the second surface of the substrate.

’842 Patent, EX1001 (-01243), Claim 1

’222 Patent

(12) **United States Patent**
Rao

(10) **Patent No.: US 11,121,222 B2**
(45) **Date of Patent: Sep. 14, 2021**

(54) **SEMICONDUCTOR DEVICES WITH GRADED DOPANT REGIONS**

(71) Applicant: **GREENTHREAD, LLC**, Dallas, TX (US)

(72) Inventor: **G.R. Mohan Rao**, Allen, TX (US)

(73) Assignee: **GREENTHREAD, LLC**, Dallas, TX (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **16/947,294**

(22) Filed: **Jul. 27, 2020**

(65) **Prior Publication Data**

US 2021/0005716 A1 Jan. 7, 2021

Related U.S. Application Data

(60) Continuation of application No. 16/717,950, filed on Dec. 17, 2019, now Pat. No. 10,734,481, which is a (Continued)

1. A VLSI semiconductor device, comprising:

a substrate of a first doping type at a first doping level having a surface;

a first active region disposed adjacent the surface with a second doping type opposite in conductivity to the first doping type and within which transistors can be formed;

a second active region separate from the first active region disposed adjacent to the first active region and within which transistors can be formed;

transistors formed in at least one of the first active region or second active region;

at least a portion of at least one of the first and second active regions having at least one graded dopant concentration to aid carrier movement from the first and second active regions towards an area of the substrate where there are no active regions; and

at least one well region adjacent to the first or second active region containing at least one graded dopant region, the graded dopant region to aid carrier movement from the surface towards the area of the substrate where there are no active regions, wherein at least some of the transistors form digital logic of the VLSI semiconductor device.

’222 Patent, EX1001 (-01242, -01244), Claim 1

’222 Patent

(12) **United States Patent**
Rao

(10) **Patent No.: US 11,121,222 B2**
(45) **Date of Patent: Sep. 14, 2021**

(54) **SEMICONDUCTOR DEVICES WITH GRADED DOPANT REGIONS**

(71) Applicant: **GREENTHREAD, LLC**, Dallas, TX (US)

(72) Inventor: **G.R. Mohan Rao**, Allen, TX (US)

(73) Assignee: **GREENTHREAD, LLC**, Dallas, TX (US)

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US 2021/0005716 A1 Jan. 7, 2021

Related U.S. Application Data

(60) Continuation of application No. 16/717,950, filed on Dec. 17, 2019, now Pat. No. 10,734,481, which is a

(Continued)

44. A CMOS Semiconductor device, comprising:

a surface layer;

a substrate;

an active region including a source and a drain, disposed on one surface of the surface layer; a single drift layer disposed between the other surface of the surface layer and the substrate, the drift layer having a graded concentration of dopants extending between the surface layer and the substrate, **the drift layer further having a first static unidirectional electric drift field to aid the movement of carriers from the surface layer to an area of the substrate where there are no active regions**; and

at least one well region disposed in the single drift layer, the well region having a graded concentration of dopants and a second static unidirectional electric drift field to aid the movement of carriers from the surface layer to the area of the substrate where there are no active regions.

’222 Patent, EX1001 (-01242, -01244), Claim 44

INSTITUTED GROUNDS

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Instituted Grounds

IPR2023-01242 (U.S. Patent 11,121,222)			
Ground	**Claims**	**35 U.S.C. §**	**Prior art**
I	1–9, 13, 14, 16–21, 23–28, 32–42	103(a)	Kawagoe (EX1007)
II	1, 2, 4–9, 13–23, 25-28, 32–42	103(a)	Wieczorek (EX1006), Wolf (EX1008)
III	1–9, 13, 14, 16–21, 23–28, 32–42	103(a)	Kawagoe, Gupta (EX1014)
IV	1, 2, 4–9, 13–23, 25–28, 32–42	103(a)	Wieczorek, Wolf, Gupta
V	19, 37	103(a)	Kawagoe, Silverbrook (EX1042)
VI	19, 37	103(a)	Wieczorek, Wolf, Silverbrook

Institution Decision, Paper 32 (-01242)

Instituted Grounds

IPR2023-01243 (U.S. Patent 10,510,842)			
Ground	**Claims**	**35 U.S.C. §**	**Prior art**
I	1-18	103(a)	Kawagoe (EX1007)
II	1-3, 5-11, 13-18	103(a)	Wieczorek (EX1006), Wolf (EX1008)
III	1-18	103(a)	Kawagoe, Gupta (EX1014)
IV	1-3, 5-11, 13-18	103(a)	Wieczorek, Wolf, Gupta

Petition, Paper 2 (-01243), 13-62
Institution Decision, Paper 31 (-01243)

Instituted Grounds

IPR2023-01244 (U.S. Patent 11,121,222)			
Ground	**Claims**	**35 U.S.C. §**	**Prior art**
I	44	103(a)	Payne (EX1005)
II	44	103(a)	Sakai (EX1006), Kawagoe (EX1007)

Institution Decision, Paper 32 (-01244)

THE PRIOR ART DISCLOSES ALL CLAIM LIMITATIONS

02

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Kawagoe (U.S. Patent No. 6,043,114) [EX1007]

US006043114A

United States Patent [19]

Kawagoe et al.

[11] **Patent Number: 6,043,114**

[45] **Date of Patent: Mar. 28, 2000**

[54] **PROCESS FOR MANUFACTURING A SEMICONDUCTOR WAFER, A SEMICONDUCTOR WAFER, PROCESS FOR MANUFACTURING A SEMICONDUCTOR INTEGRATED CIRCUIT DEVICE, AND SEMICONDUCTOR INTEGRATED CIRCUIT DEVICE**

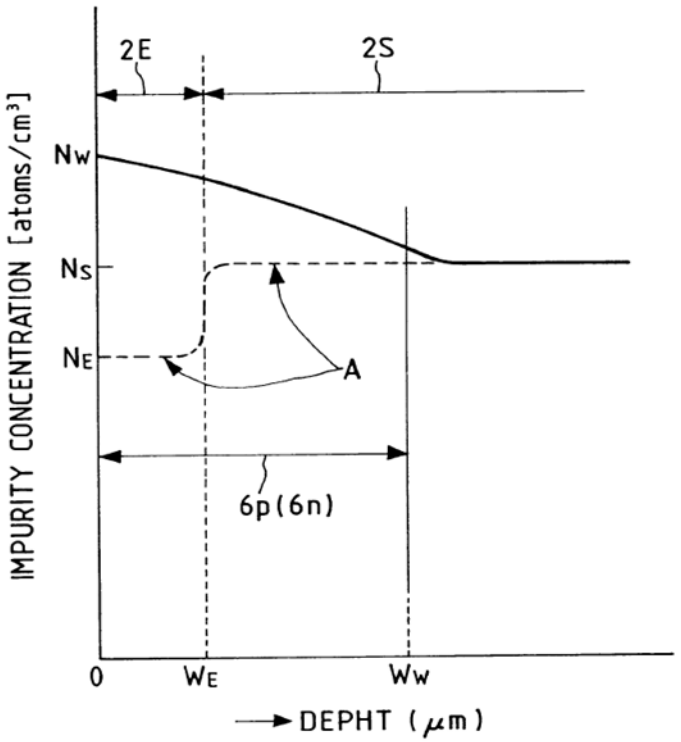
[75] Inventors: **Hiroto Kawagoe**, Hinode-machi; **Tatsumi Shirasu**, Kawasaki; **Shogo Kiyota**, Tateno-machi; **Norio Suzuki**, Higashimurayama; **Eiichi Yamada**, Kumage-gun; **Yuji Sugino**, Nakakoma-gun; **Manabu Kitano**, Yanai; **Yoshihiko Sakurai**; **Takashi Naganuma**, both of Nakakoma-gun; **Hisashi Arakawa**, Kohfu, all of Japan

[73] Assignee: **Hitachi, Ltd.**, Tokyo, Japan

[21] Appl. No.: **08/934,774**

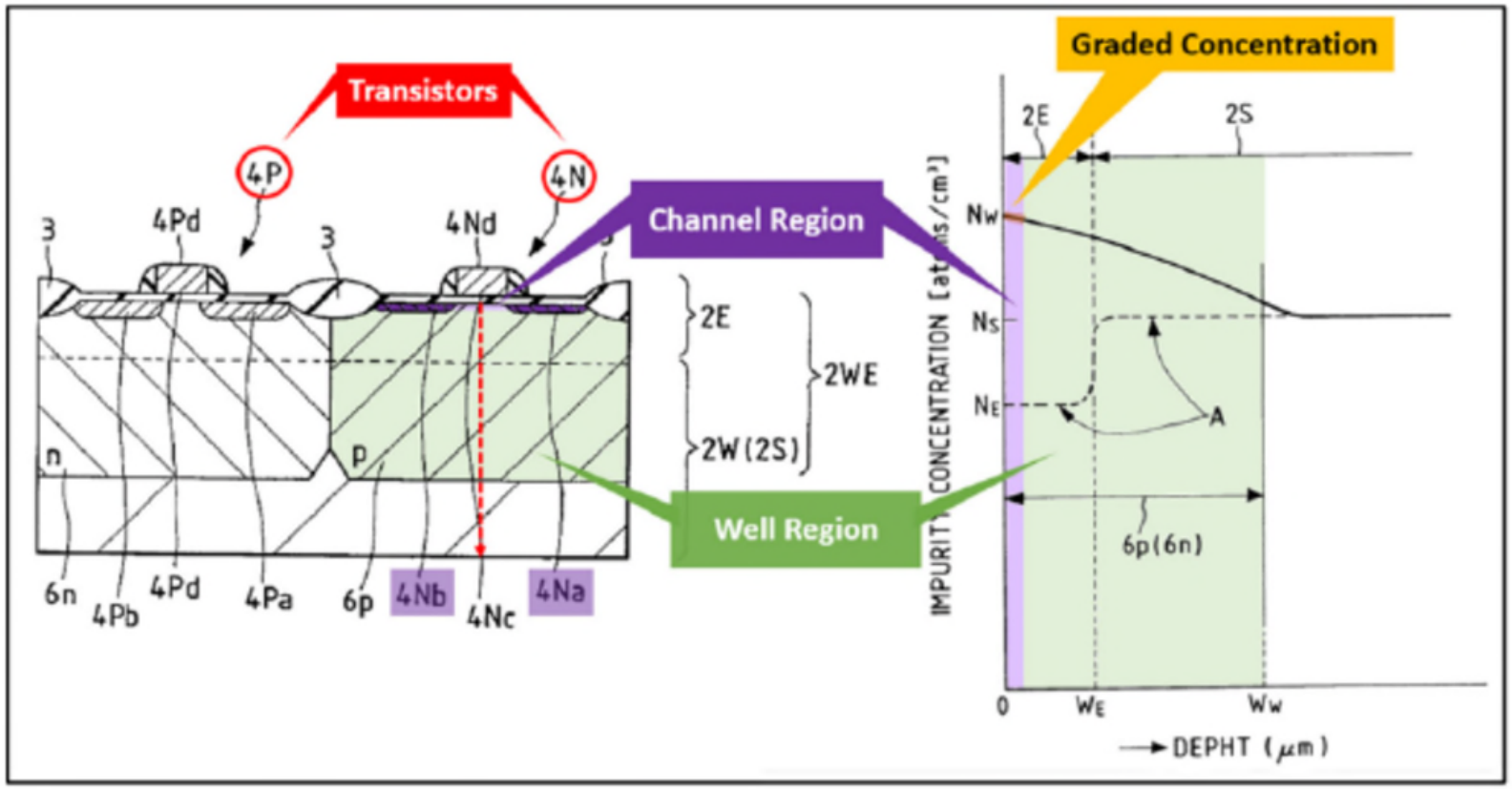
[22] Filed: **Sep. 22, 1997**

FIG. 17



Kawagoe, EX1007 (-01242, -01243, -01244)

Kawagoe has a graded dopant concentration to aid carrier movement



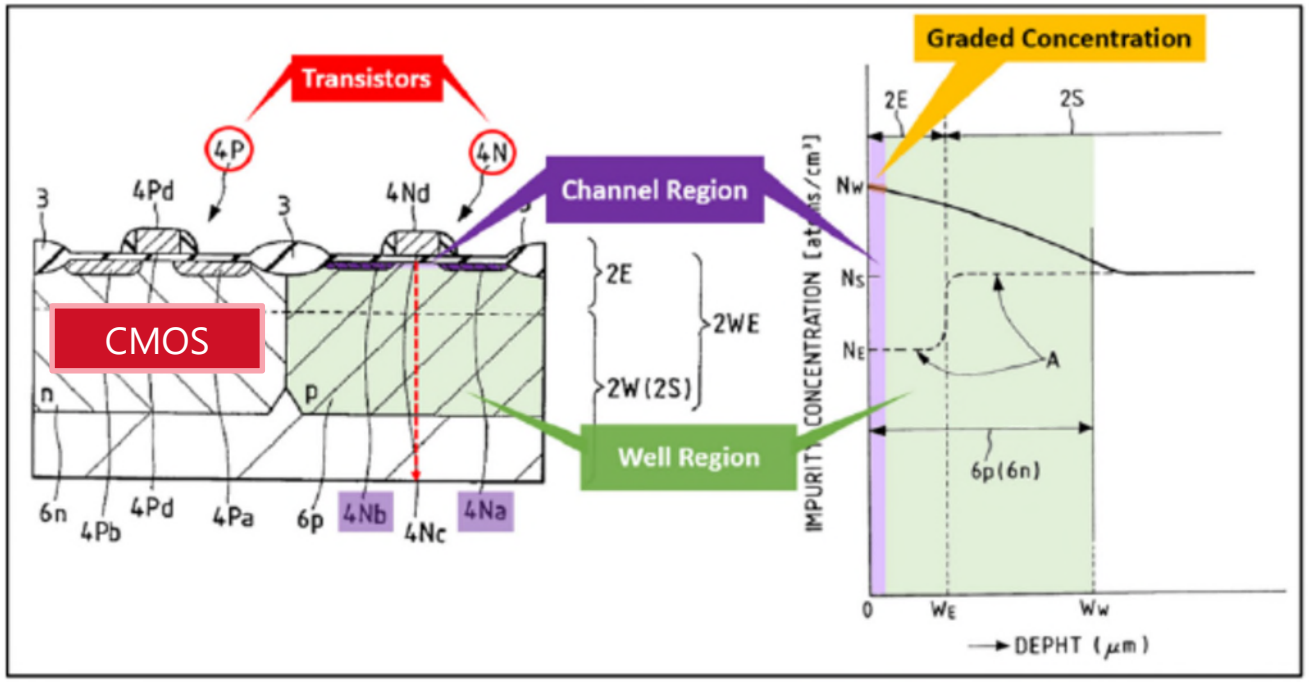
Kawagoe, EX1007, Figs. 17, 23 (annotated)

"Thus, the impurity concentration of the p-well 6p is given such a gradient that it is gradually lowered in the depthwise direction from the surface of the epitaxial layer 2E, so that the influence to be caused by the carriers (or electrons) due to the α-ray is lowered. Specifically, **the electrons produced by the α-ray are attracted to the substrate body 2S by that concentration gradient and prevented from entering the p-well 6p** so that the soft errors can be reduced in case the MIS memory of the DRAM or the like is formed in the p-well 6p."

Kawagoe, EX1007, 16:2-11

Petition, Paper 2 (-01242), 18-23;
Reply, Paper 62 (-01242), 1-15;
Petition, Paper 2 (-01243), 25-32;
Reply, Paper 61 (-01243), 1-15;
Petition, Paper 2 (-01244), 48-67;
Reply, Paper 61 (-01244), 1-13

Kawagoe discloses the elements of Claim 1 ('222 Patent)



1. A VLSI semiconductor device, comprising:

a substrate of a first doping type at a first doping level having a surface;

a first active region disposed adjacent the surface with a second doping type opposite in conductivity to the first doping type and within which transistors can be formed;

a second active region separate from the first active region disposed adjacent to the first active region and within which transistors can be formed;

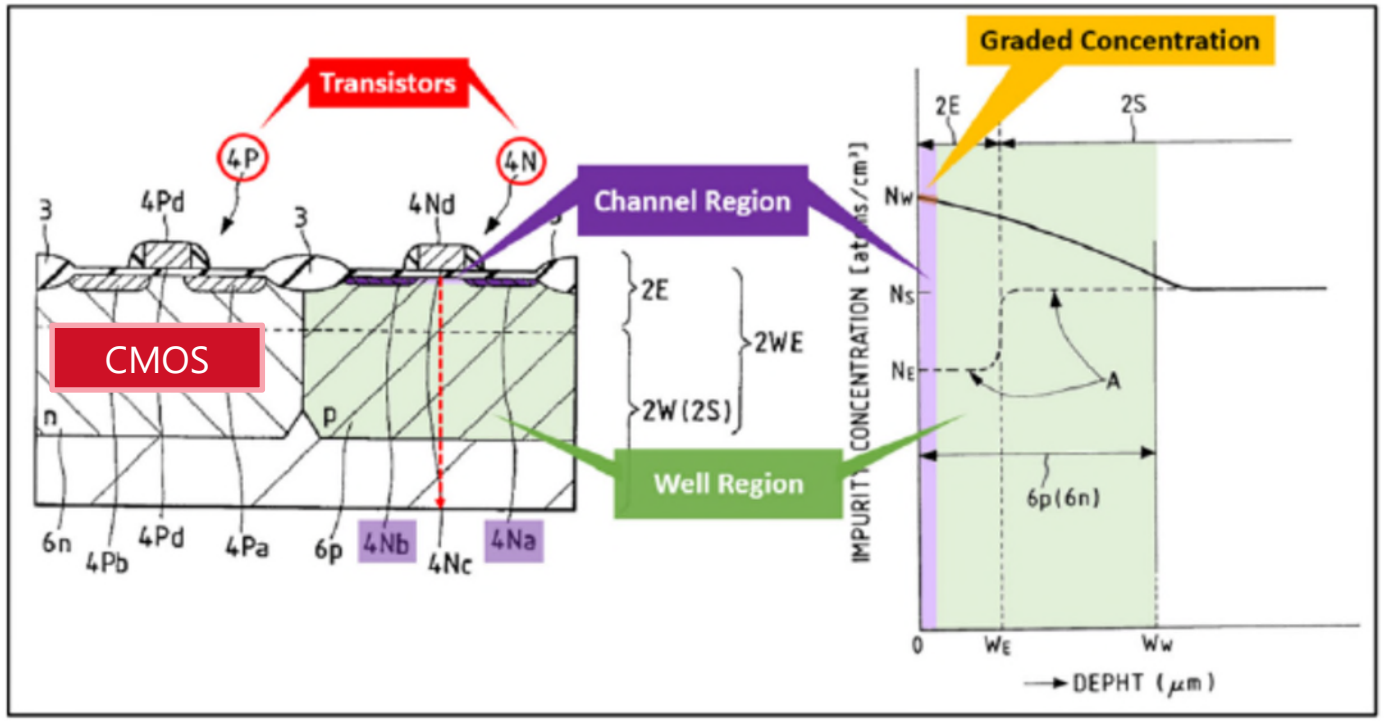
transistors formed in at least one of the first active region or second active region;

at least a portion of at least one of the first and second active regions having at least one graded dopant concentration to aid carrier movement from the first and second active regions towards an area of the substrate where there are no active regions; and

at least one well region adjacent to the first or second active region containing at least one graded dopant region, the graded dopant region to aid carrier movement from the surface towards the area of the substrate where there are no active regions, wherein at least some of the transistors form digital logic of the VLSI semiconductor device.

Petition, Paper 2 (-01242), 6-28

Kawagoe discloses the elements of Claim 1 ('842 Patent)



1. A semiconductor device, comprising:

a substrate of a first doping type at a first doping level having first and second surfaces;

a first active region disposed adjacent the first surface of the substrate with a second doping type opposite in conductivity to the first doping type and within which transistors can be formed;

a second active region separate from the first active region disposed adjacent to the first active region and within which transistors can be formed;

transistors formed in at least one of the first active region or second active region; and

at least a portion of at least one of the first and second active regions having at least one graded dopant concentration to aid carrier movement from the first surface to the second surface of the substrate.

Petition, Paper 2 (-01243), 13-32

Wieczorek (U.S. Patent App. Pub. 2003/0183856) [EX1006/1038]

US 20030183856A1

(19) **United States**

(12) **Patent Application Publication**

Wieczorek et al.

(10) **Pub. No.: US 2003/0183856 A1**

(43) **Pub. Date: Oct. 2, 2003**

(54) **SEMICONDUCTOR DEVICE HAVING A RETROGRADE DOPANT PROFILE IN A CHANNEL REGION AND METHOD FOR FABRICATING THE SAME**

(76) Inventors: **Karsten Wieczorek**, Dresden (DE); **Manfred Horstmann**, Dresden (DE); **Rolf Stephan**, Dresden (DE)

Correspondence Address:
J. Mike Amerson
Williams, Morgan & Amerson, P.C.
Suite 250
7676 Hillmont
Houston, TX 77040 (US)

(21) Appl. No.: **10/282,980**

(22) Filed: **Oct. 29, 2002**

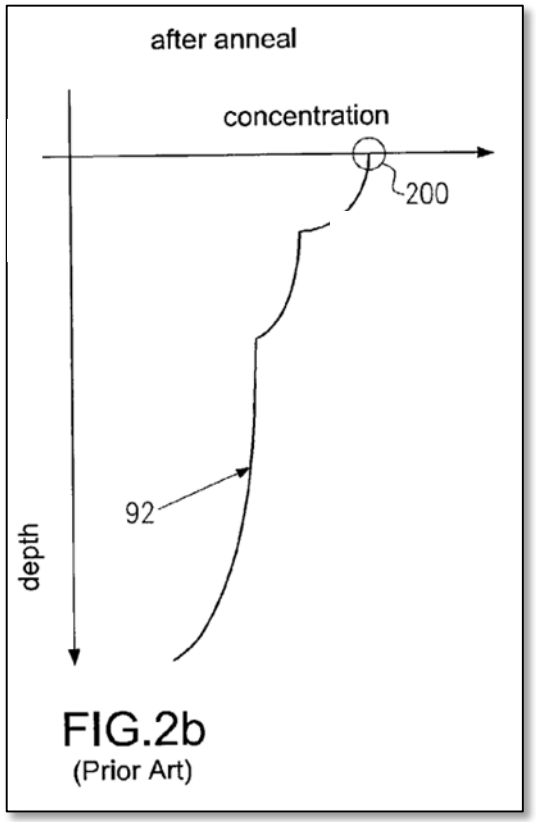
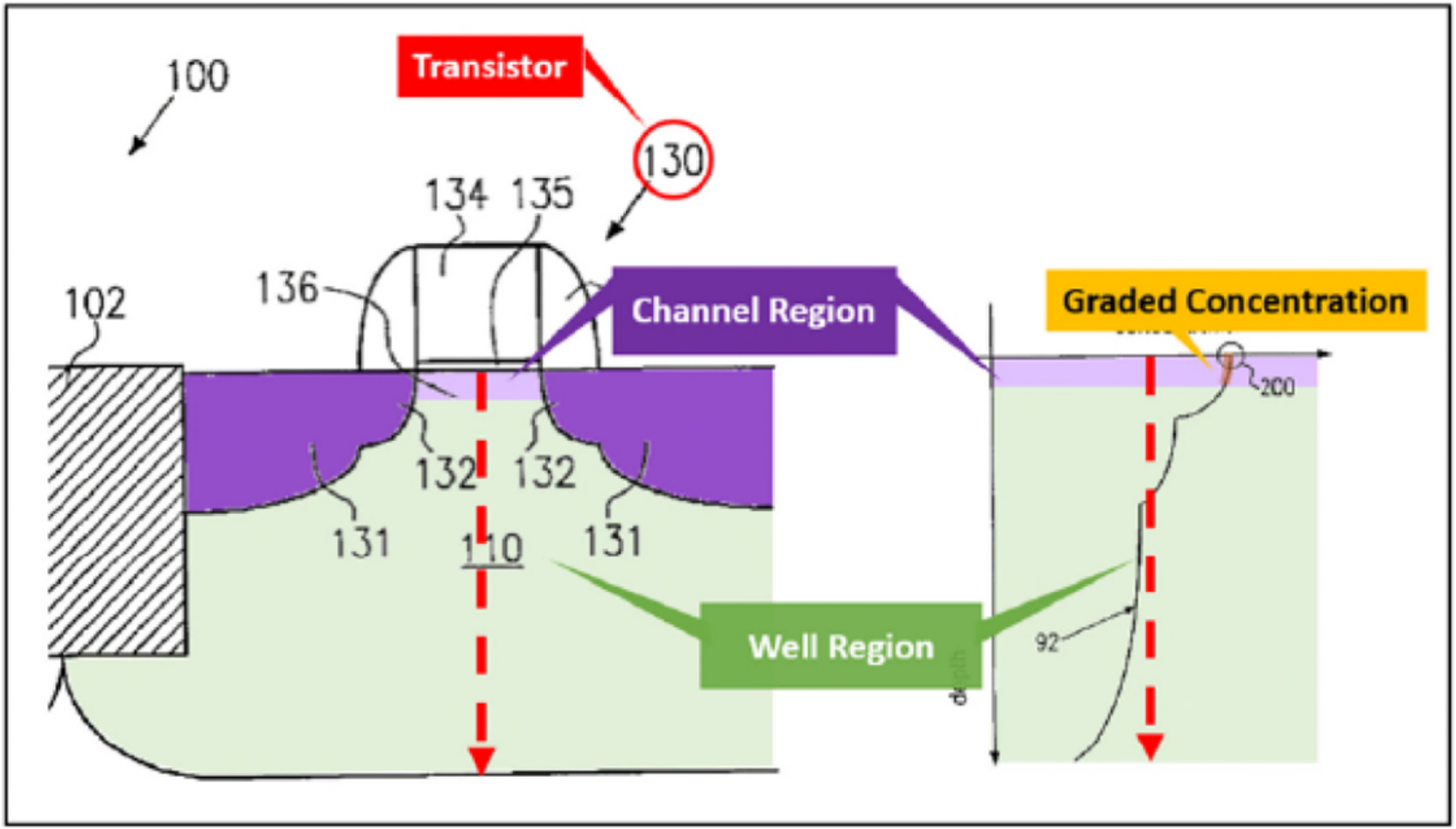


FIG.2b
(Prior Art)

Wieczorek, EX1006 (-01242, -01243), EX1038 (-01244)

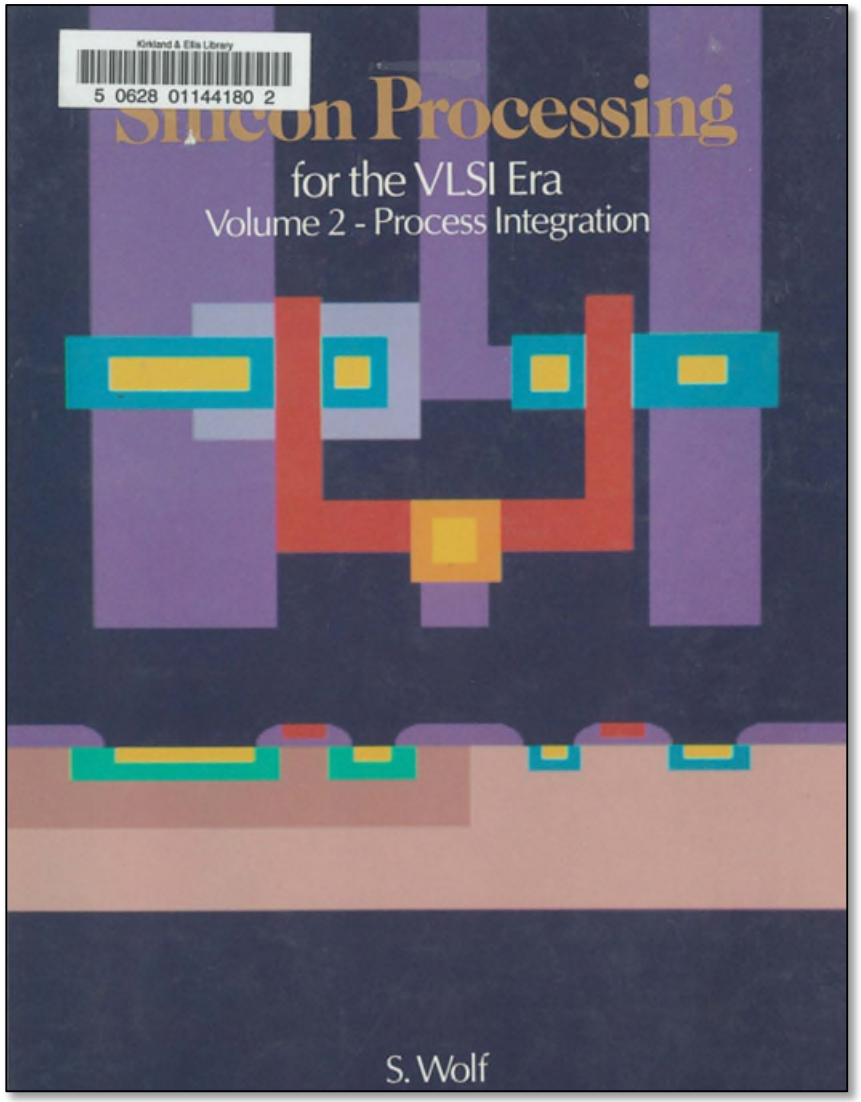
Wieczorek has a graded dopant concentration to aid carrier movement



Wieczorek, EX1006 (-01242, -01243), EX1038 (-01244), Fig. 1b/2b (annotated)

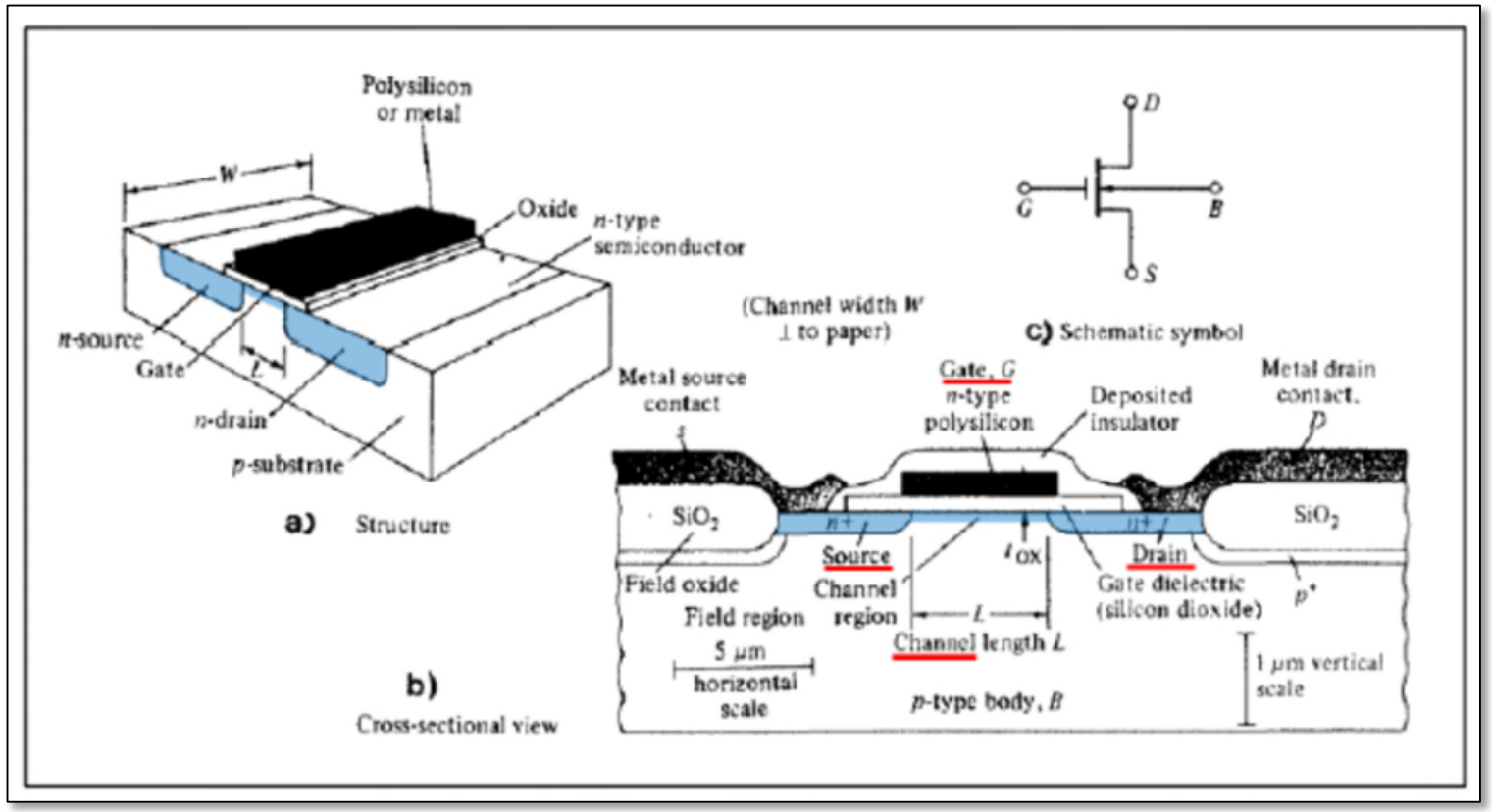
Petition, Paper 2 (-01242), 55-62;
Reply, Paper 62 (-01242), 15-16;
Petition, Paper 2 (-01243), 50-54;
Reply, Paper 61 (-01243), 15-16;
Petition, Paper 2 (-01244), 51-52, 56

Wolf (*Silicon Processing for the VLSI Era*) (2000) [EX1008]



Wolf, EX1008 (-01242, -01243, -01244)

Wolf: active regions include source, drain, and channel of transistor



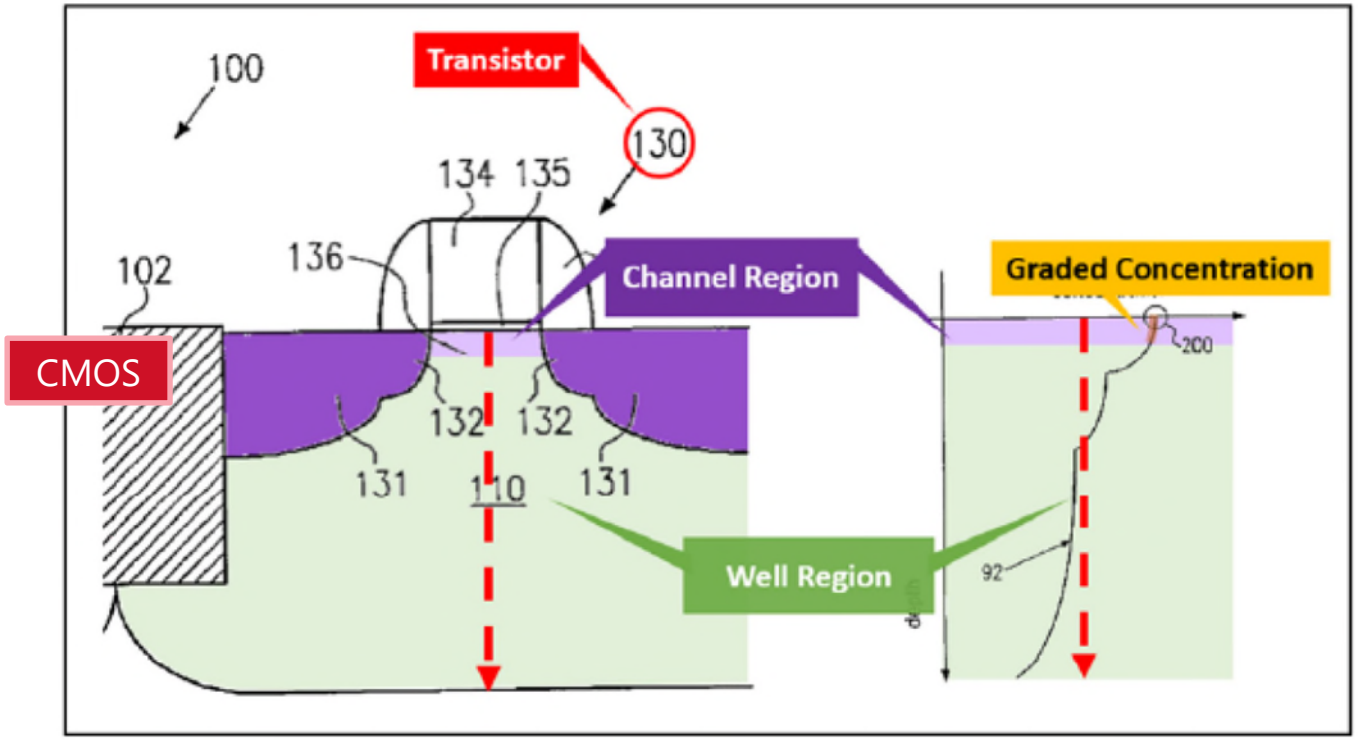
Wolf, EX1008 (-01242, -01243, -01244), pp. 299-300 (annotated)

"The top surface of the body consists of active or transistor regions as well as passive or (field) regions. The active regions are those in which transistor action occurs; i.e., the channel and the heavily doped source and drain regions."

Wolf, EX1008B (01242), pp. 300

Petition, Paper 2 (-01242), 13-16, 45, 52-58;
Reply, Paper 62 (-01242), 15-19;
Petition, Paper 2 (-01243), 19-23, 40, 46-52;
Reply, Paper 61 (-01243), 15-19;
Petition, Paper 2 (-01244), 15-18, 45-48

Wieczorek/Wolf discloses the elements of Claim 1 ('222 Patent)



1. A VLSI semiconductor device, comprising:

a substrate of a first doping type at a first doping level having a surface;

a first active region disposed adjacent the surface with a second doping type opposite in conductivity to the first doping type and within which transistors can be formed;

a second active region separate from the first active region disposed adjacent to the first active region and within which transistors can be formed;

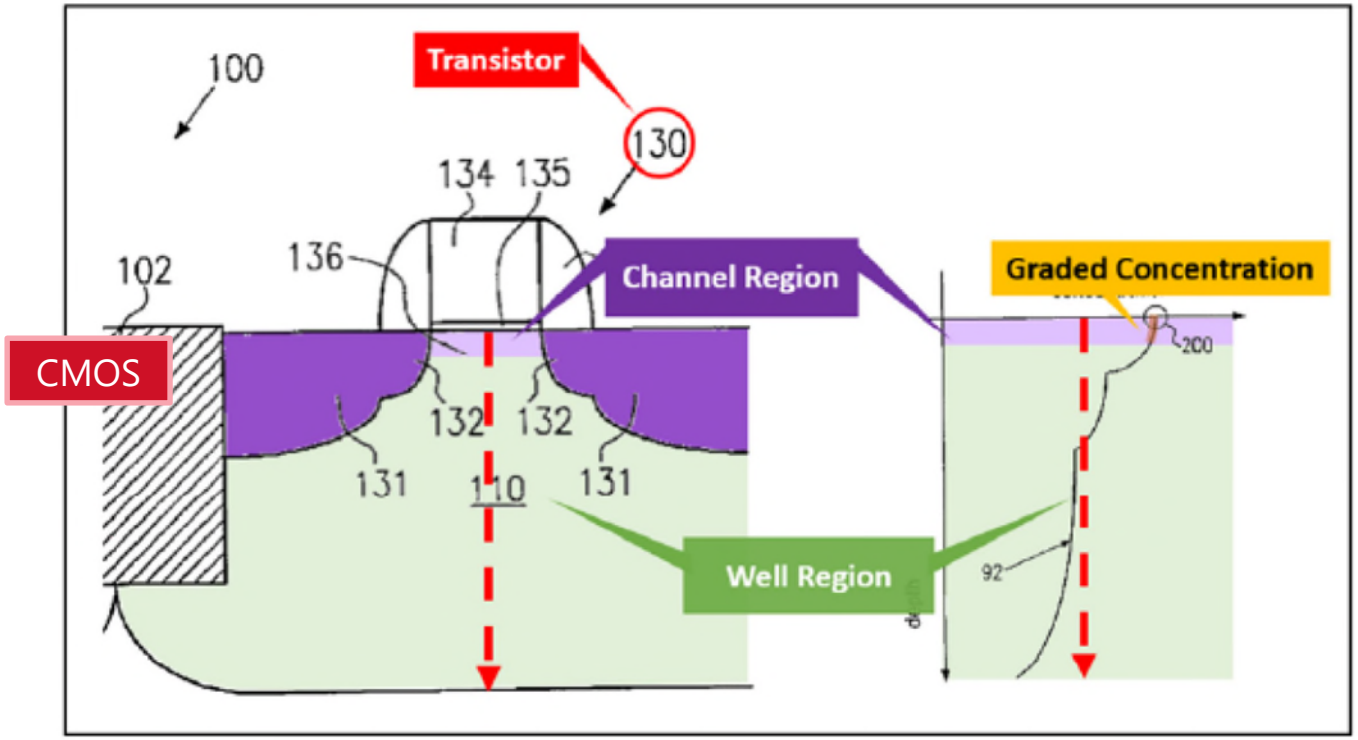
transistors formed in at least one of the first active region or second active region;

at least a portion of at least one of the first and second active regions having at least one graded dopant concentration to aid carrier movement from the first and second active regions towards an area of the substrate where there are no active regions; and

at least one well region adjacent to the first or second active region containing at least one graded dopant region, the graded dopant region to aid carrier movement from the surface towards the area of the substrate where there are no active regions, wherein at least some of the transistors form digital logic of the VLSI semiconductor device.

Petition, Paper 2 (-01242), 45-63

Wieczorek/Wolf discloses the elements of Claim 1 ('842 Patent)



1. A semiconductor device, comprising:

a substrate of a first doping type at a first doping level having first and second surfaces;

a first active region disposed adjacent the first surface of the substrate with a second doping type opposite in conductivity to the first doping type and within which transistors can be formed;

a second active region separate from the first active region disposed adjacent to the first active region and within which transistors can be formed;

transistors formed in at least one of the first active region or second active region; and

at least a portion of at least one of the first and second active regions having at least one graded dopant concentration to aid carrier movement from the first surface to the second surface of the substrate.

Petition, Paper 2 (-01243), 40-54

Payne (U.S. Patent 4,684,971) [EX1005] (-01244)

United States Patent [19]

Payne

[11] **Patent Number: 4,684,971**

[45] **Date of Patent: Aug. 4, 1987**

[54] **ION IMPLANTED CMOS DEVICES**

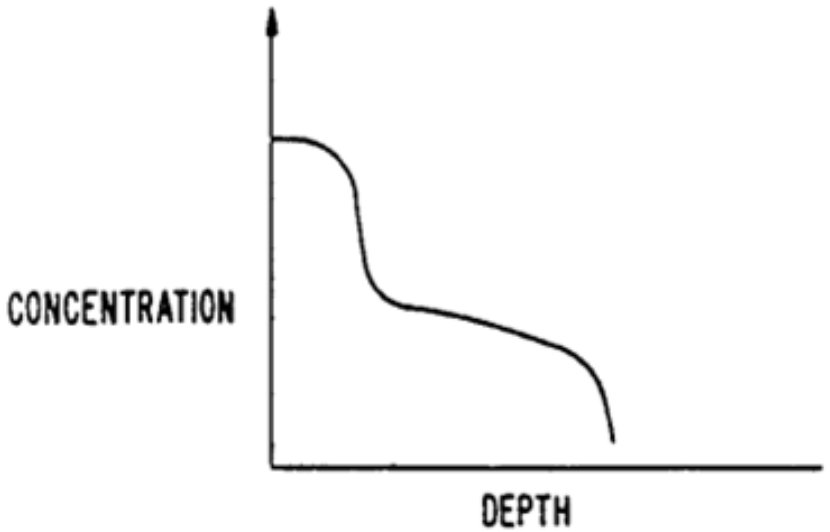
[75] Inventor: **Richard S. Payne**, Andover, Mass.

[73] Assignee: **American Telephone and Telegraph Company, AT&T Bell Laboratories,** Murray Hill, N.J.

[21] Appl. No.: **243,621**

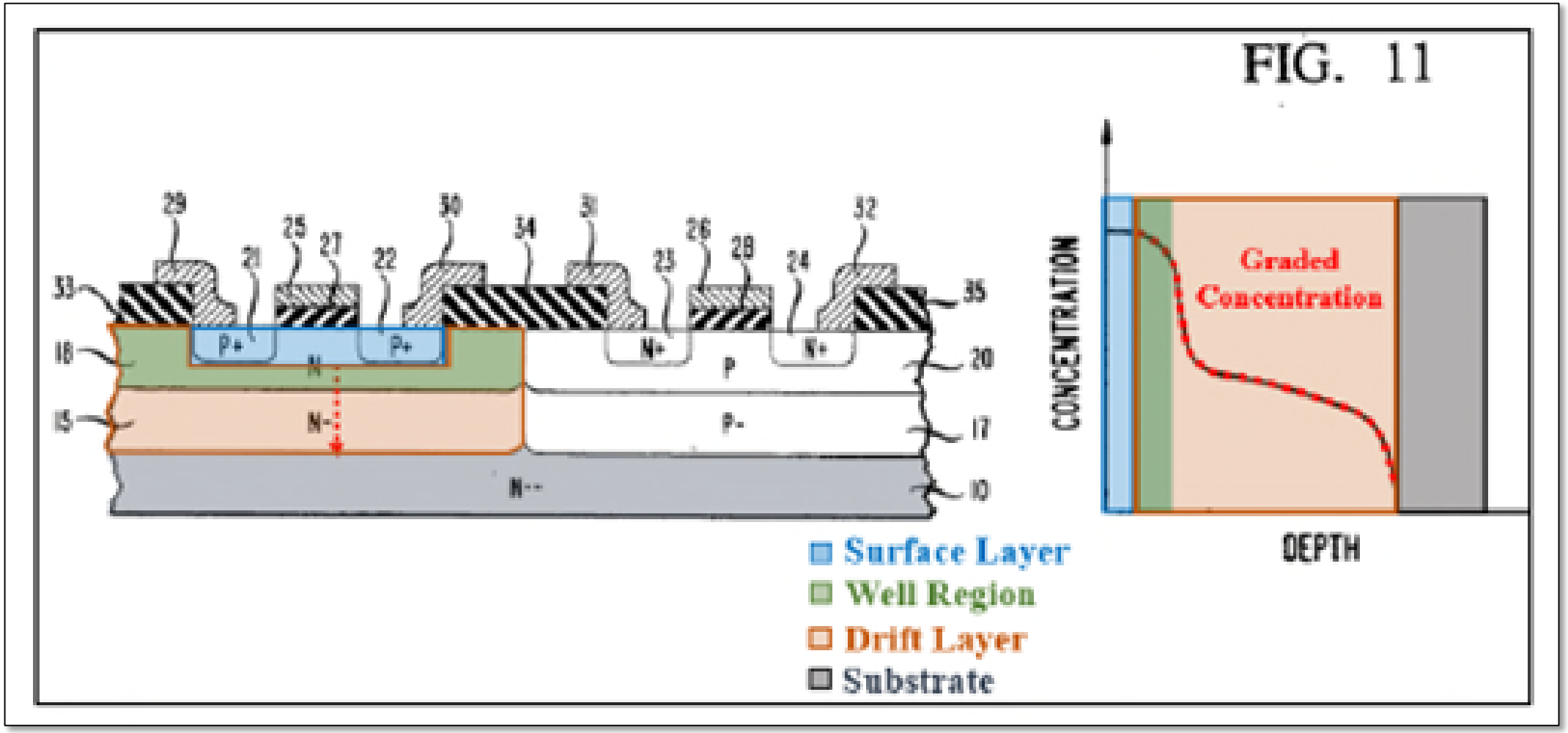
[22] Filed: **Mar. 13, 1981**

FIG. 11



Payne, EX1005 (-01244)

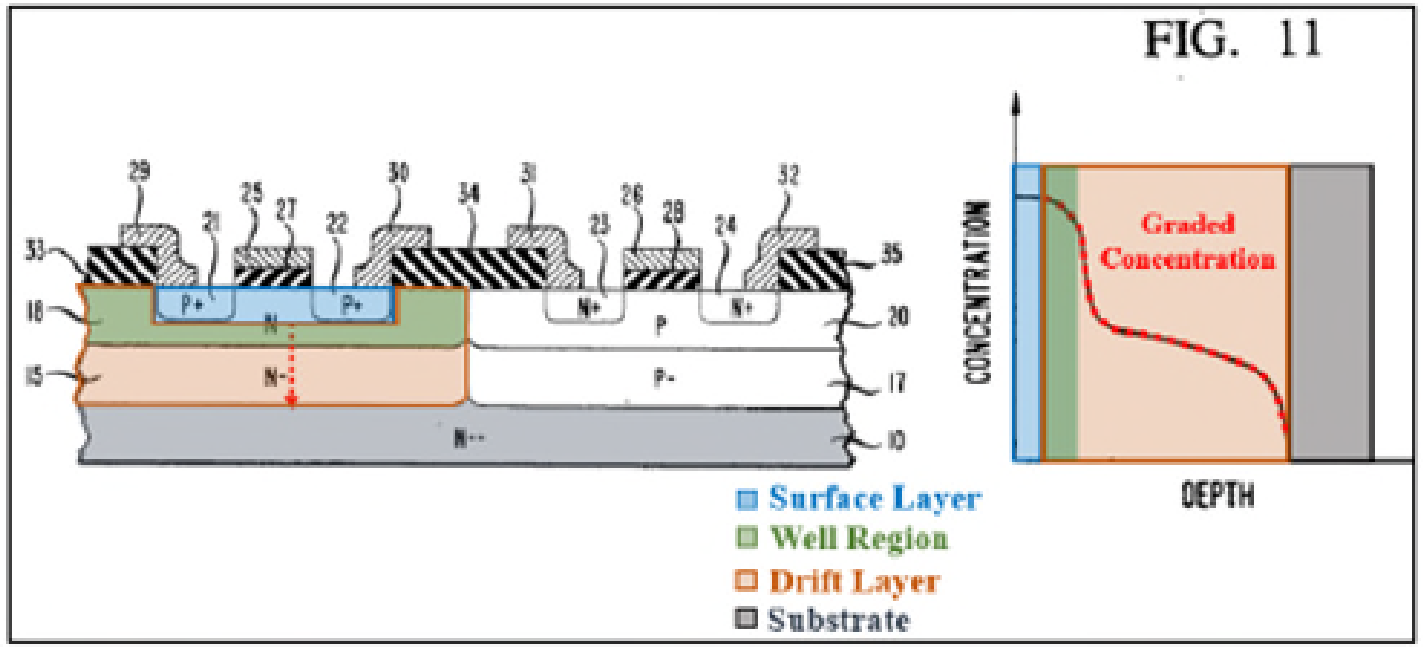
Payne has a graded dopant concentration to aid carrier movement



Payne, EX1005 (-01244), Figs. 10, 11 (annotated)

Petition, Paper 2 (-01244), 18-40
Reply, Paper 61 (-01244), 13-16

Payne discloses the elements of Claim 44 ('222 Patent)



44. A CMOS Semiconductor device, comprising:

a surface layer;

a substrate;

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

a single drift layer disposed between the other surface of the surface layer and the substrate, the drift layer having a graded concentration of dopants extending between the surface layer and the substrate, **the drift layer further having a first static unidirectional electric drift field to aid the movement of carriers from the surface layer to an area of the substrate where there are no active regions**; and

at least one well region disposed in the single drift layer, the well region having a graded concentration of dopants and a second static unidirectional electric drift field to aid the movement of carriers from the surface layer to the area of the substrate where there are no active regions.

Petition, Paper 2 (-01244), 11-40

Sakai (U.S. Patent 4,907,058) [EX1006] (-01244)

United States Patent [19]
Sakai

[11] **Patent Number: 4,907,058**
[45] **Date of Patent: Mar. 6, 1990**

[54] **COMPLEMENTARY SEMICONDUCTOR DEVICE HAVING A DOUBLE WELL**

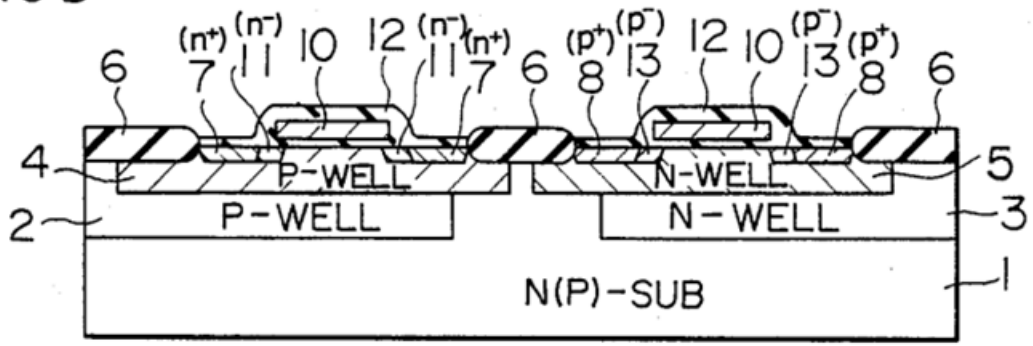
[75] Inventor: **Yoshio Sakai**, Tsukui, Japan

[73] Assignee: **Hitachi, Ltd.**, Tokyo, Japan

[21] Appl. No.: **214,674**

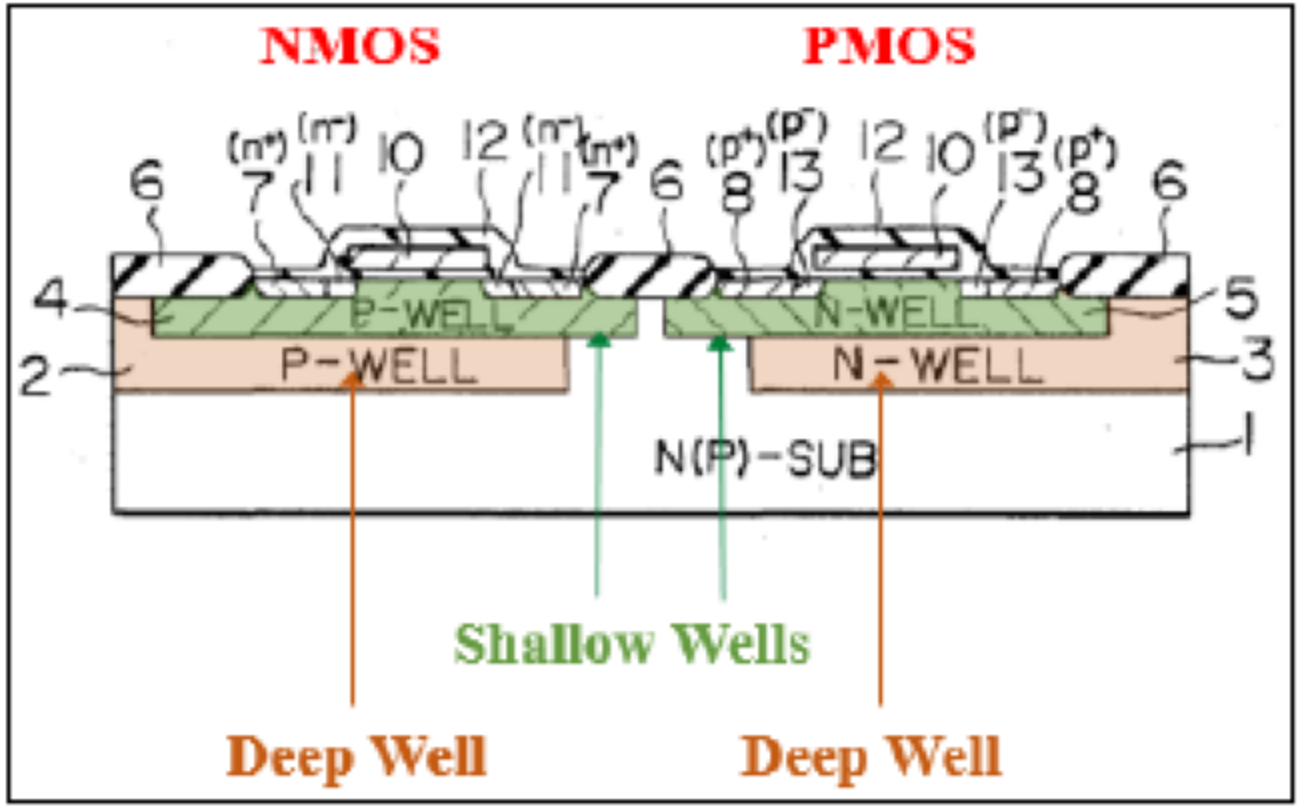
[22] Filed: **Jul. 1, 1988**

FIG. 10D



Sakai, EX1006 (-01244)

Sakai has twin double wells and high-to-low dopant concentrations



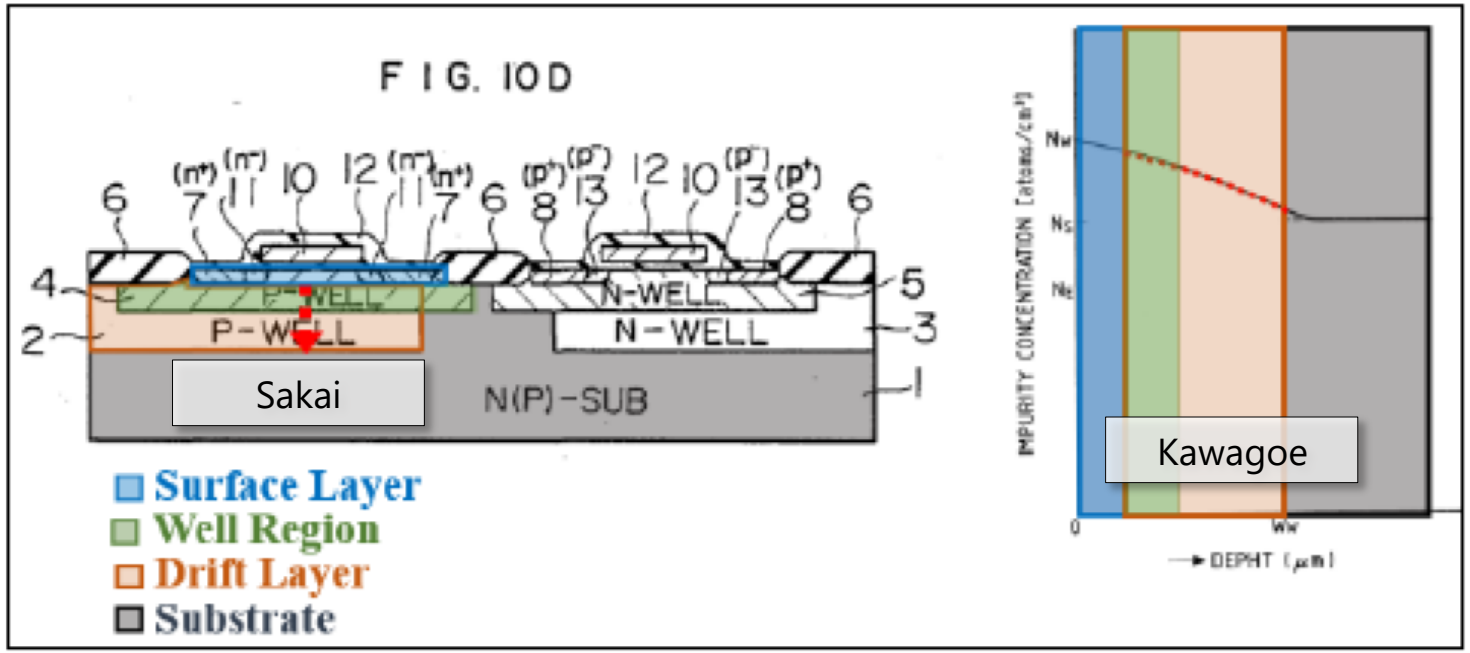
Sakai, EX1006 (-01244), Fig. 10D (annotated)

"At first, a P-well region 2 and an N-well region 3 each **having an impurity concentration of 10^{15} to 10^{16} atoms per cm^3** and a depth of 3 to 5μm are formed in a surface portion of an N- or P-silicon substrate 1 [...]. Next, a P-type impurity and an N-type impurity are implanted [...], and the impurity-doped regions thus obtained are extended [...] to form a shallow P-well region 4 and a shallow N-well region 5 each having a depth of 0.5 to 1.5μm and **an impurity concentration of $5x10^{16}$ to 10^{18}** atoms per cm^3[.]"

Sakai, EX1006 (-01244), 5:56-6:4

Petition, Paper 2 (-01244), 10, 48-57

Sakai/Kawagoe discloses the elements of Claim 44 ('222 Patent)



44. A CMOS Semiconductor device, comprising:

a surface layer;

a substrate;

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

a single drift layer disposed between the other surface of the surface layer and the substrate, the drift layer having a graded concentration of dopants extending between the surface layer and the substrate, **the drift layer further having a first static unidirectional electric drift field to aid the movement of carriers from the surface layer to an area of the substrate where there are no active regions**; and

at least one well region disposed in the single drift layer, the well region having a graded concentration of dopants and a second static unidirectional electric drift field to aid the movement of carriers from the surface layer to the area of the substrate where there are no active regions.

Petition, Paper 2 (-01244), 40-67

Gupta (U.S. Patent 6,163,877) [EX1014] (-01242, -01243)

US006163877A

United States Patent [19]

Gupta

[11] **Patent Number: 6,163,877**

[45] **Date of Patent: *Dec. 19, 2000**

[54] **METHOD AND APPARATUS FOR OPTIMIZING TRANSISTOR CELL LAYOUT WITH INTEGRATED TRANSISTOR FOLDING**

[75] Inventor: **Avaneendra Gupta**, Ann Arbor, Mich.

[73] Assignee: **Intel Corporation**, Santa Clara, Calif.

[*] Notice: This patent issued on a continued prosecution application filed under 37 CFR 1.53(d), and is subject to the twenty year patent term provisions of 35 U.S.C. 154(a)(2).

[21] Appl. No.: **08/744,199**

[22] Filed: **Nov. 5, 1996**

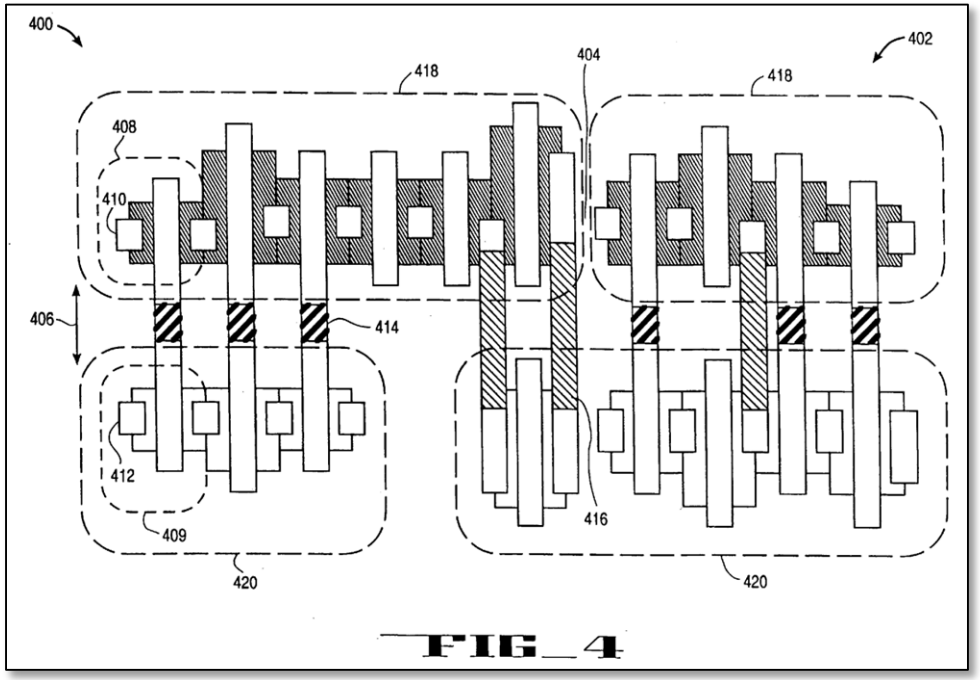
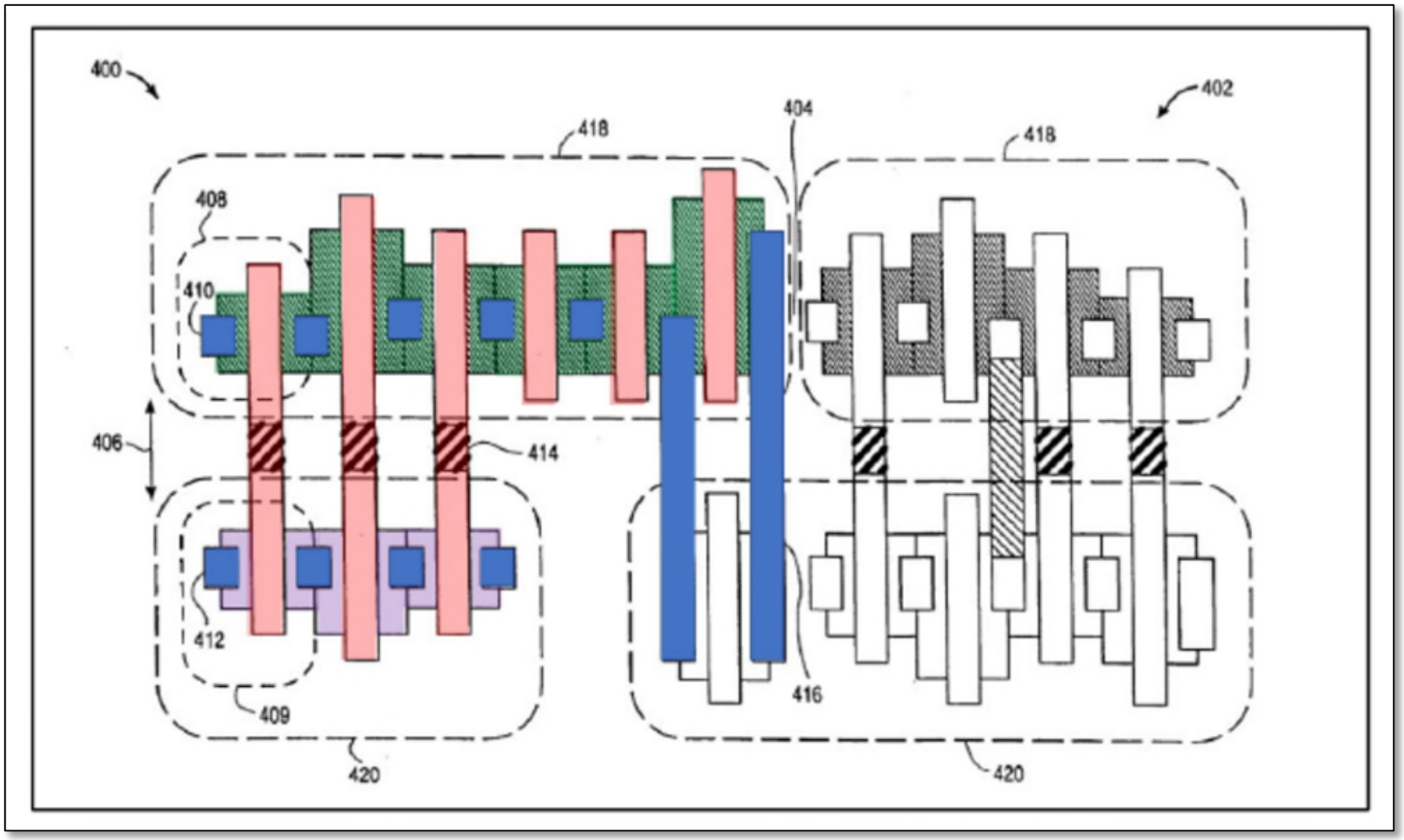


FIG_4

Gupta, EX1014
(-01242, -01243)

Gupta: a plurality of "transistors" or "devices" was well known



Gupta, EX1014 (-01242, -01243), Fig. 4 (annotated)

"FIG. 4 is an illustration of a layout style known as one dimensional layout style. [...] Referring to FIG. 4, one dimensional layout 402 includes two horizontal diffusion rows for the placement of P and N transistors. PMOS transistors are placed in top row 418 and NMOS transistor are placed in bottom row 420. If two adjacent transistors have electrically equivalent terminals, they are abutted so as to share a diffusion area, forming a chain."

Gupta, EX1014 (-01242, -01243), 4:12-43

Petition, Paper 2 (-01242), 78-83;
Petition, Paper 2 (-01243), 62-67

Silverbrook (U.S. Patent 6,614,560) [EX1042] (-01242)

US006614560B1

(12) **United States Patent**
Silverbrook

(10) **Patent No.: US 6,614,560 B1**
(45) **Date of Patent: Sep. 2, 2003**

(54) **INTEGRATED CAMERA CIRCUIT INCLUDING IMAGE SENSOR, IMAGE PROCESSING, AND PRINTER DRIVE CIRCUITS**

(75) Inventor: **Kia Silverbrook**, Sydney (AU)

(73) Assignee: **Silverbrook Research Pty Ltd**, Balmain (AU)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/113,104**

(22) Filed: **Jul. 10, 1998**

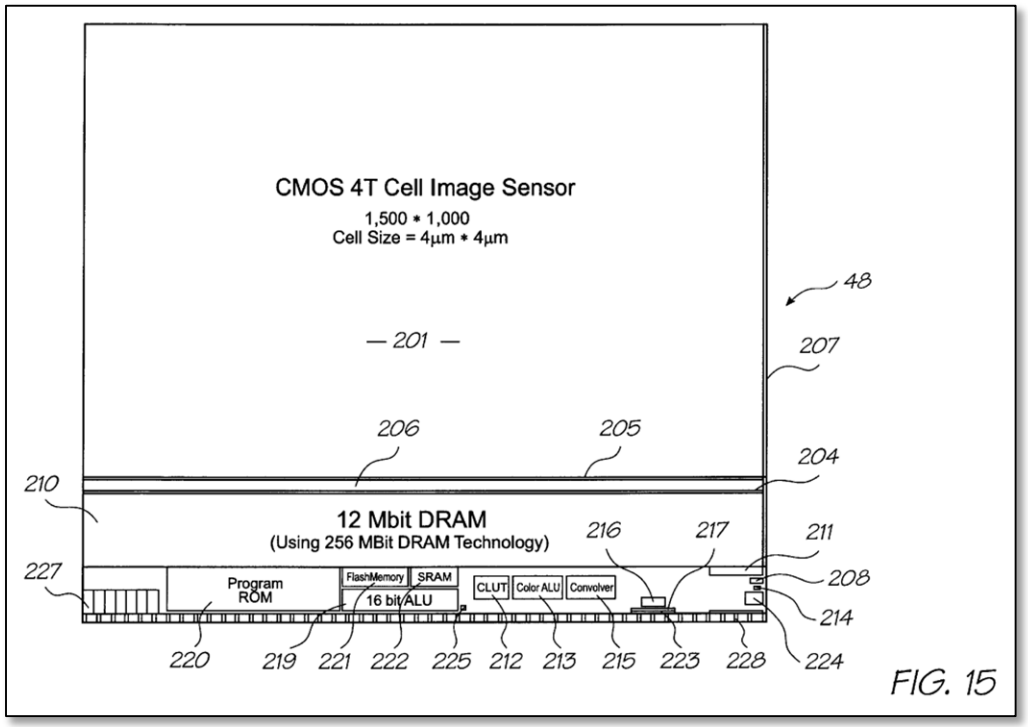
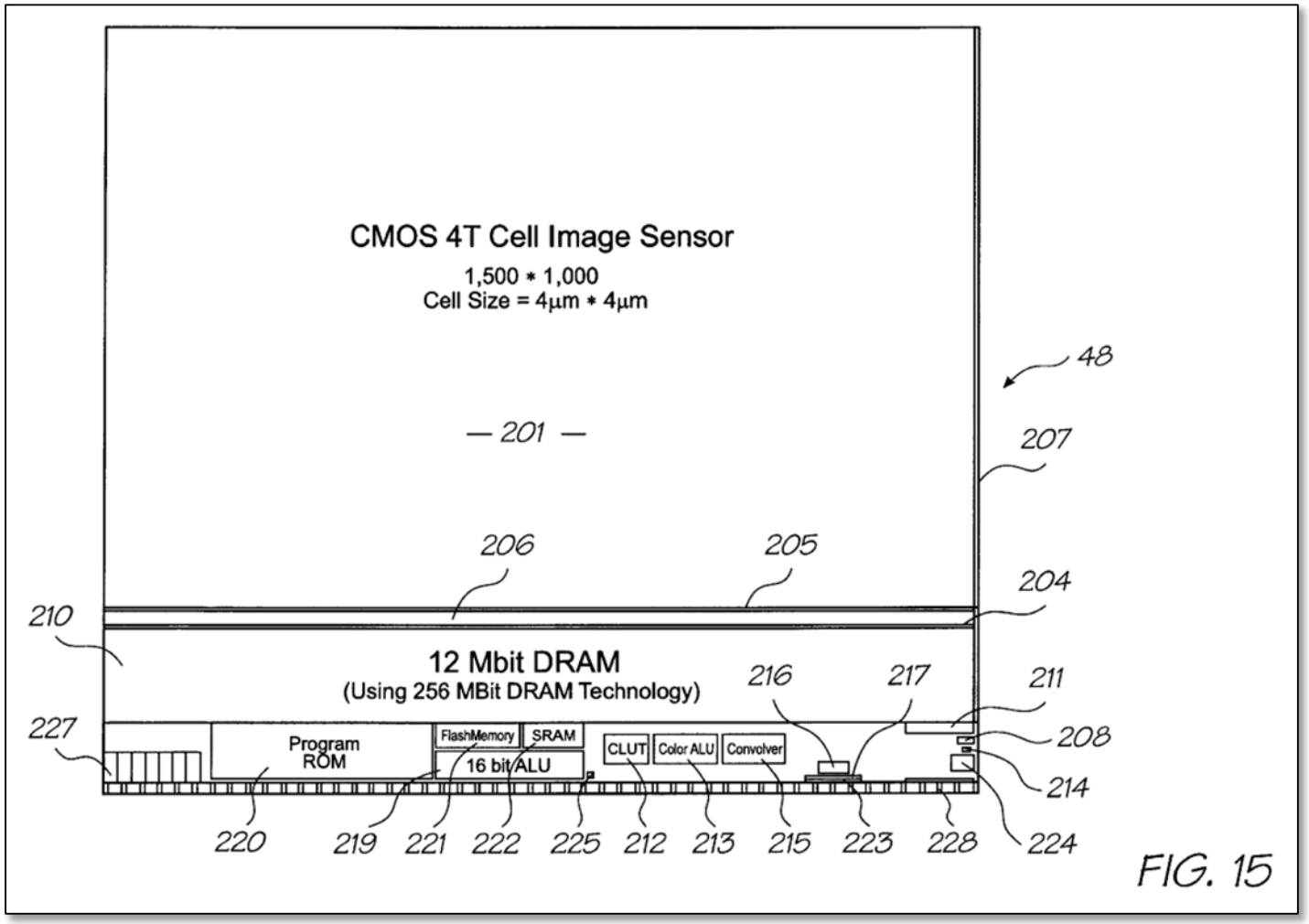


FIG. 15

Silverbrook, EX1042 (-01242)

Silverbrook: "CMOS image sensors" were well known



Silverbrook, EX1042 (-01242), Fig. 15

"Turning now to FIG. 15, there is shown an example layout of the Image Capture and Processing Chip (ICP) 48. The Image Capture and Processing Chip 48 provides most of the electronic functionality of the camera with the exception of the print head chip. The chip 48 is a highly integrated System. It combines CMOS image Sensing, analog to digital conversion, digital image processing, DRAM Storage, ROM, and miscellaneous control functions in a Single chip."

Silverbrook, EX1042 (-01242), 6:41-49

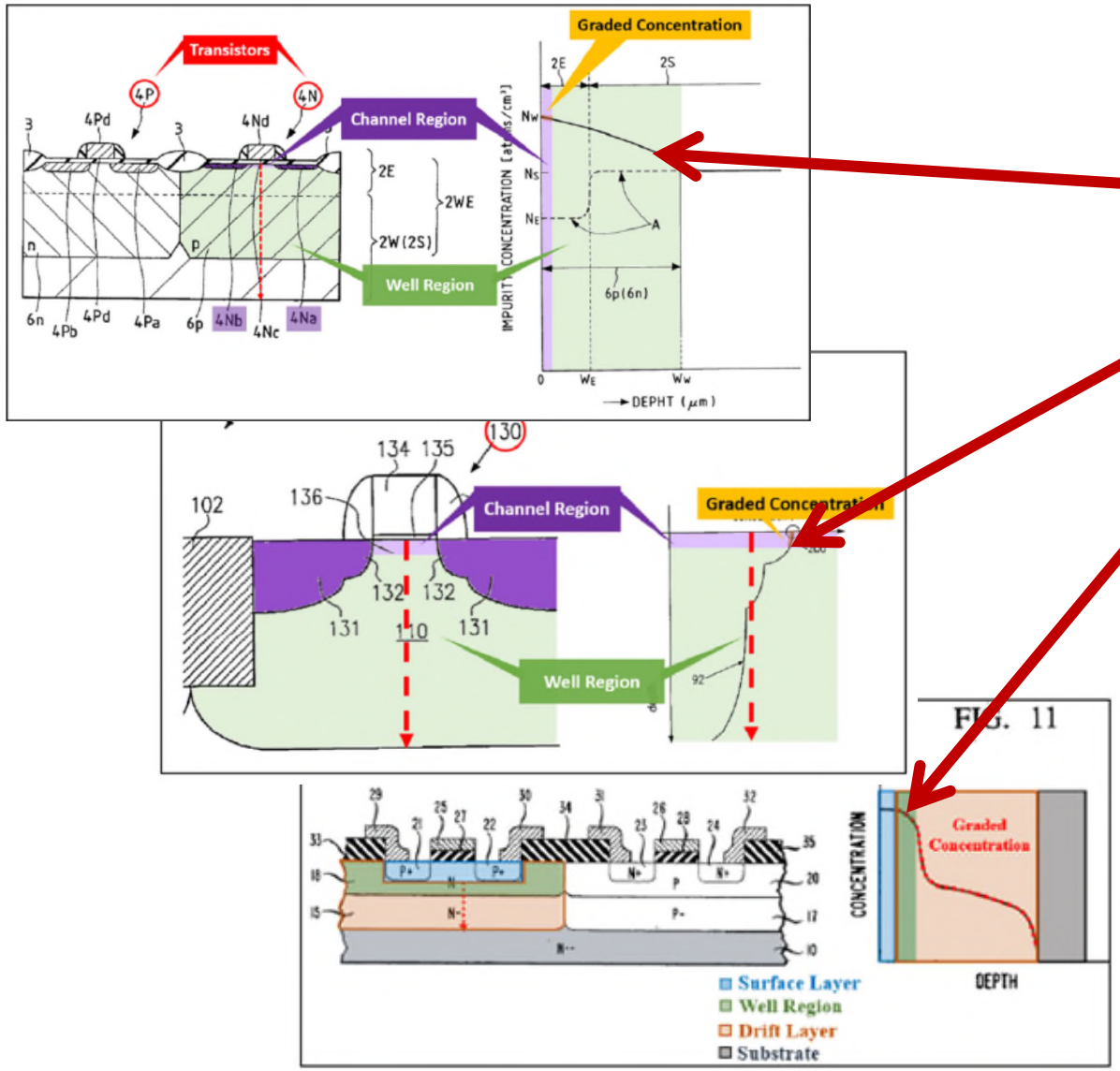
Petition, Paper 2 (-01242), 83-85

THE "AID CARRIER MOVEMENT" LIMITATIONS ARE OBVIOUS

03

BAKER BOTTS

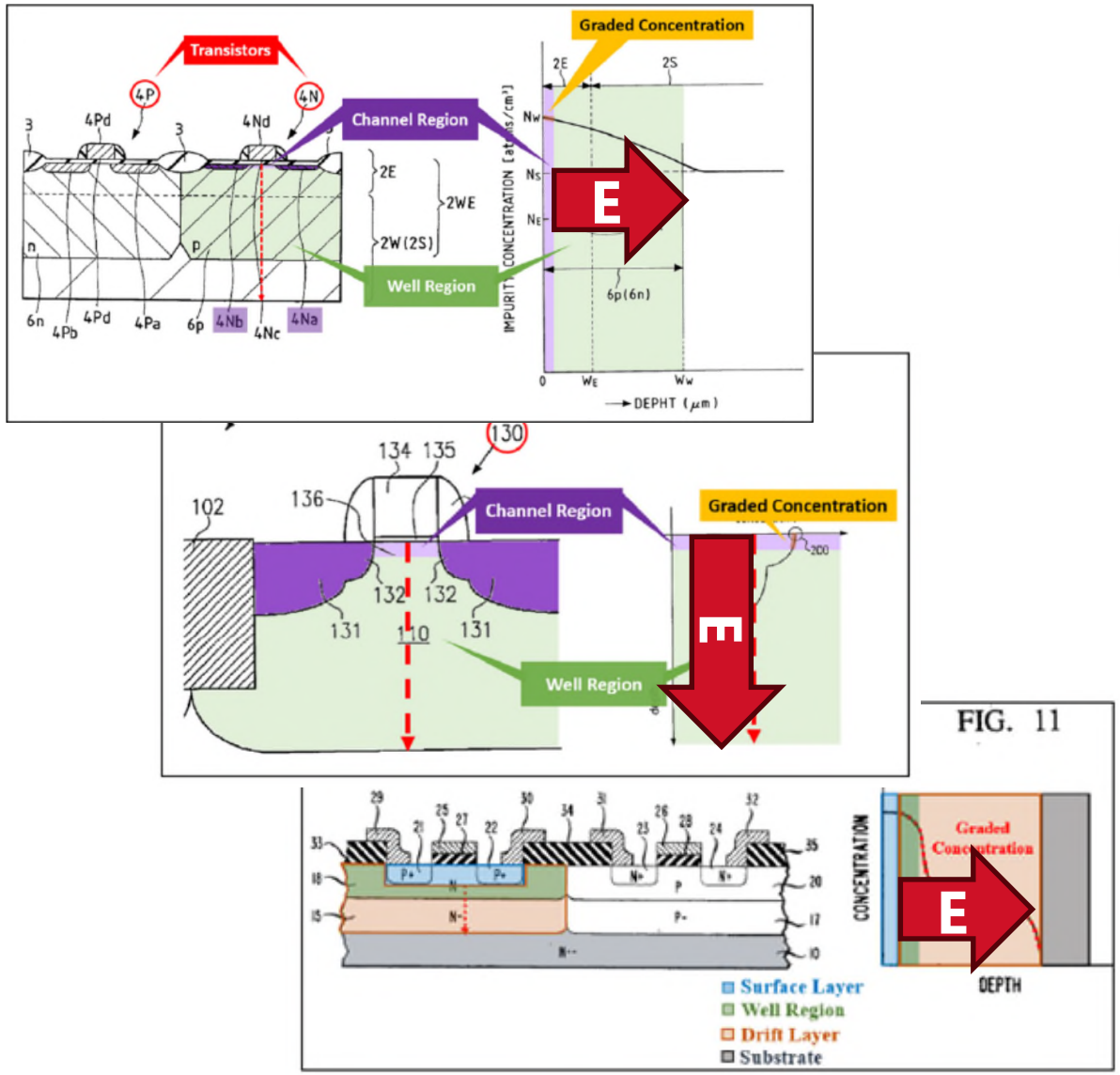
The prior art gradients aid carrier movement



- No dispute that there are graded dopant concentrations in Kawagoe, Wieczorek, and Payne
- No dispute that graded dopant concentrations generate electric fields
- No dispute that electric fields provide a force in the same direction of field

Reply, Paper 62 (-01242), 1-2;
Reply, Paper 61 (-01243), 1-2;
Reply, Paper 61 (-01244), 1-2

No dispute that graded concentrations generate electric fields



EX1052 (-01242, -01243, -01244), 83:24-84:23

Q. And how does the -- how does a graded dopant concentration relate to the idea of carrier drift?

A. There's really two things that go on, but one is **the gradient of a charge causes electrical -- electrical field**...The gradient is just the first derivative. It's a differential operator. So it's the slope, literally. **So the slope of the charge densities are proportional to the field that's given off. So this charge gradient produces a field which will act upon other charge particles**.

Reply, Paper 62 (-01242), 1-3;
Reply, Paper 61 (-01243), 1-3;
Reply, Paper 61 (-01244), 1-2

No dispute that electric fields "provide a force … aiding movement in the direction of the force"

EX2058 (-01242, -01243, -01244), 165:17-166:6

Q. And you relied on that logic, […] if slope is downward, then carriers will move; is that basically the logic that you applied? […]

A. No. As I've said, if […] you have a downward-sloping graded dopant concentration, we know from **the basic physics** that that will lead to an electric field and that will create a force, which tends to move the carriers.

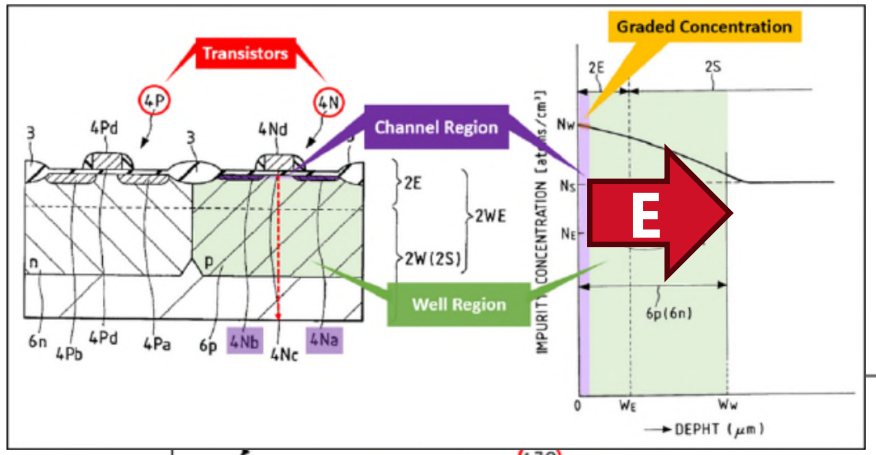
EX1052 (-01242, -01243, -01244), 108:15-23

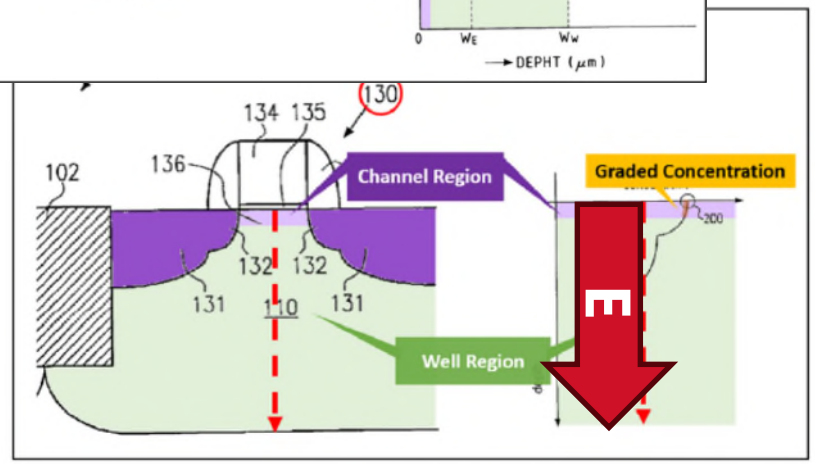
Q. So when you talk about in paragraph 49 a concentration gradient aiding carrier movement or impeding carrier movement, that cannot be agnostic to the direction of the carrier movement, right?

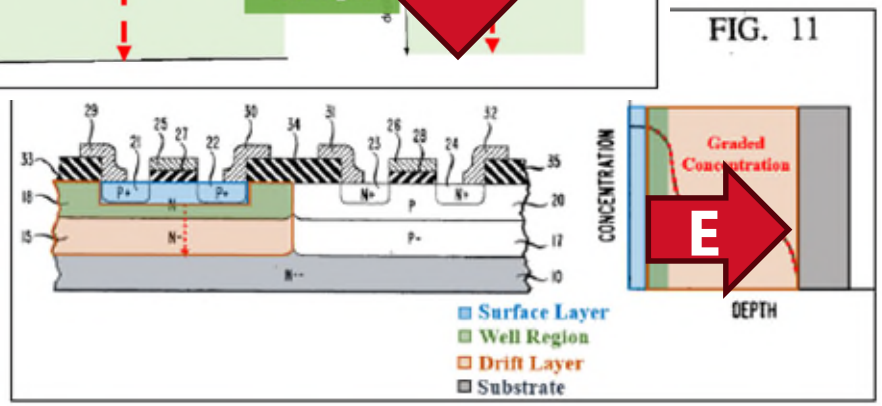
A. Well, a field will provide a force in a direction aiding -- direction -- aiding movement in the direction of the force. **That's just basic physics**.

Reply, Paper 62 (-01242), 1-2, 8-9; Reply, Paper 61 (-01243), 1-2, 9; Reply, Paper 61 (-01244), 1-2, 8

It should be undisputed that these forces "aid carrier movement"







Petitioner's Expert

"[W]e know from **the basic physics** that that will lead to an electric field and that will create a force, which tends to move the carriers."

EX2058 (-01242, -01243, -01244), 165:17-166:6

PO's Expert

"[A] field will provide a force in a direction aiding -- direction -- aiding movement in the direction of the force. **That's just basic physics**."

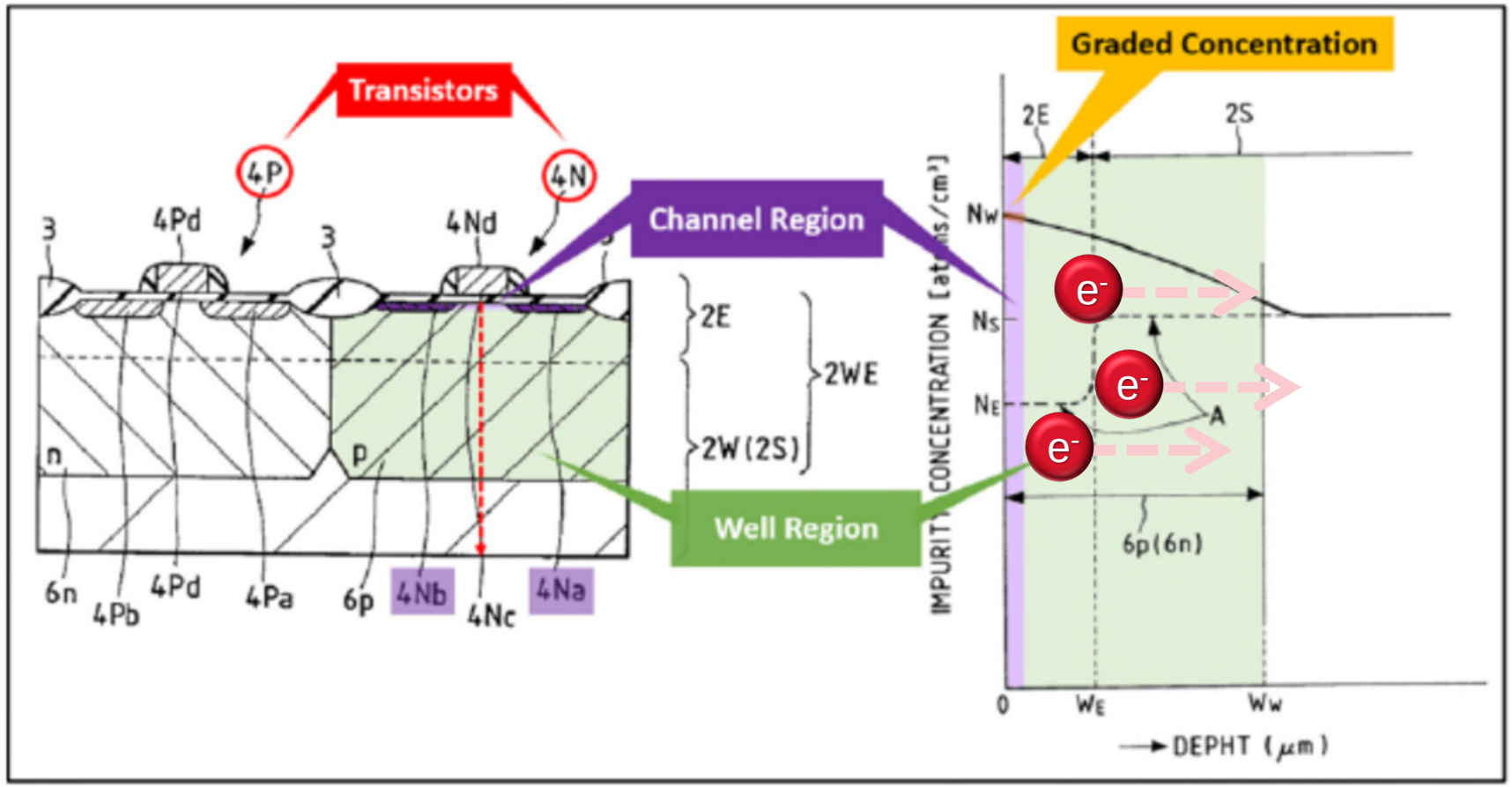
EX1052 (-01242, -01243, -01244), 108:15-23

Reply, Paper 62 (-01242), 1-2, 8-9; Reply, Paper 61 (-01243), 1-2, 9; Reply, Paper 61 (-01244), 1-2, 8

It should be undisputed that these forces "aid carrier movement"

Kawagoe: "electrons produced by the α-ray are **attracted to the substrate body 2S by that concentration gradient** and prevented from entering the p-well"

Kawagoe, EX1007 (-01242, -01243, -01244), 16:2-11, Figs. 17, 23



Petition, Paper 2 (-01242), 24-28;
POR, Paper 47 (-01242), 16;
Reply, Paper 62 (-01242), 7-10;
Petition, Paper 2 (-01243), 27-32;
POR, Paper 46 (-01243), 16-17;
Reply, Paper 61 (-01243), 7-10;
Petition, Paper 2 (-01244), 57-67;
POR, Paper 46 (-01244), 16-17;
Reply, Paper 61 (-01244), 6-9

Kawagoe, EX1007 (-01242, -01243, -01244), Figs. 17, 23

Greenthread's flawed arguments about "aid carrier movement"

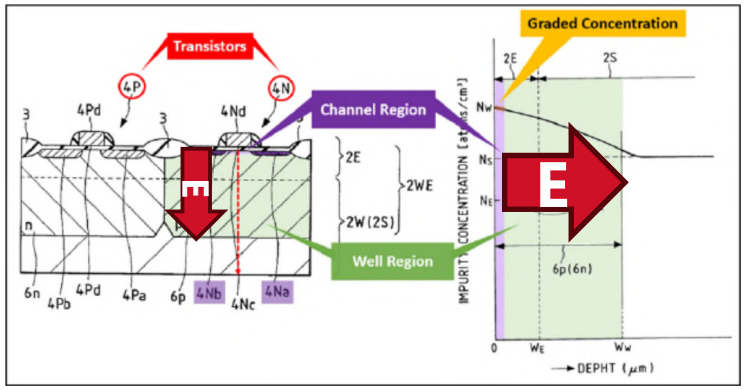
What Greenthread says:	Why this argument fails:
• "Graded" does not mean "aided"	• *Petitioner has shown that specific gradients in prior art would aid carrier movement*
• Direction of slope insufficient to show "aided"	• *The patents do not disclose any required slope magnitude*
• External hypothetical forces may overcome internal electric field from gradient	• *The prior art does not have such external forces*
• Kawagoe does not address carriers in the active region	• *The same electric field in Kawagoe extends through active region and well*

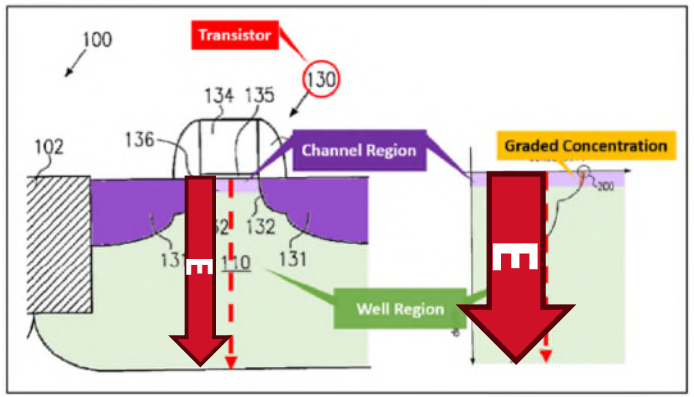
Reply, Paper 62 (-01242), 1-15;
Reply, Paper 61 (-01243), 1-15;
Reply, Paper 61 (-01244), 1-13

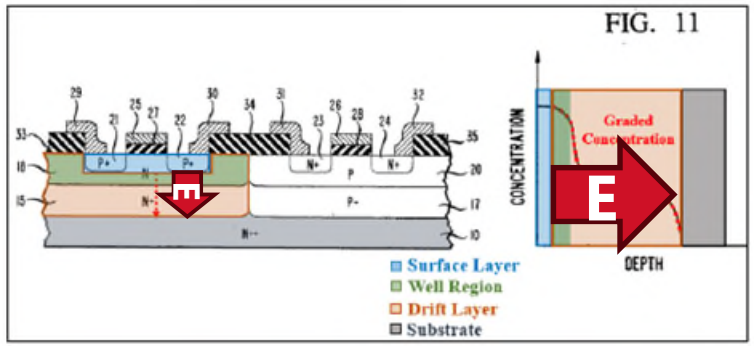
PETITIONER HAS NEVER ARGUED "GRADED" MEANS "AIDED"

BAKER BOTTS

The prior art gradients aid movement in the claimed direction







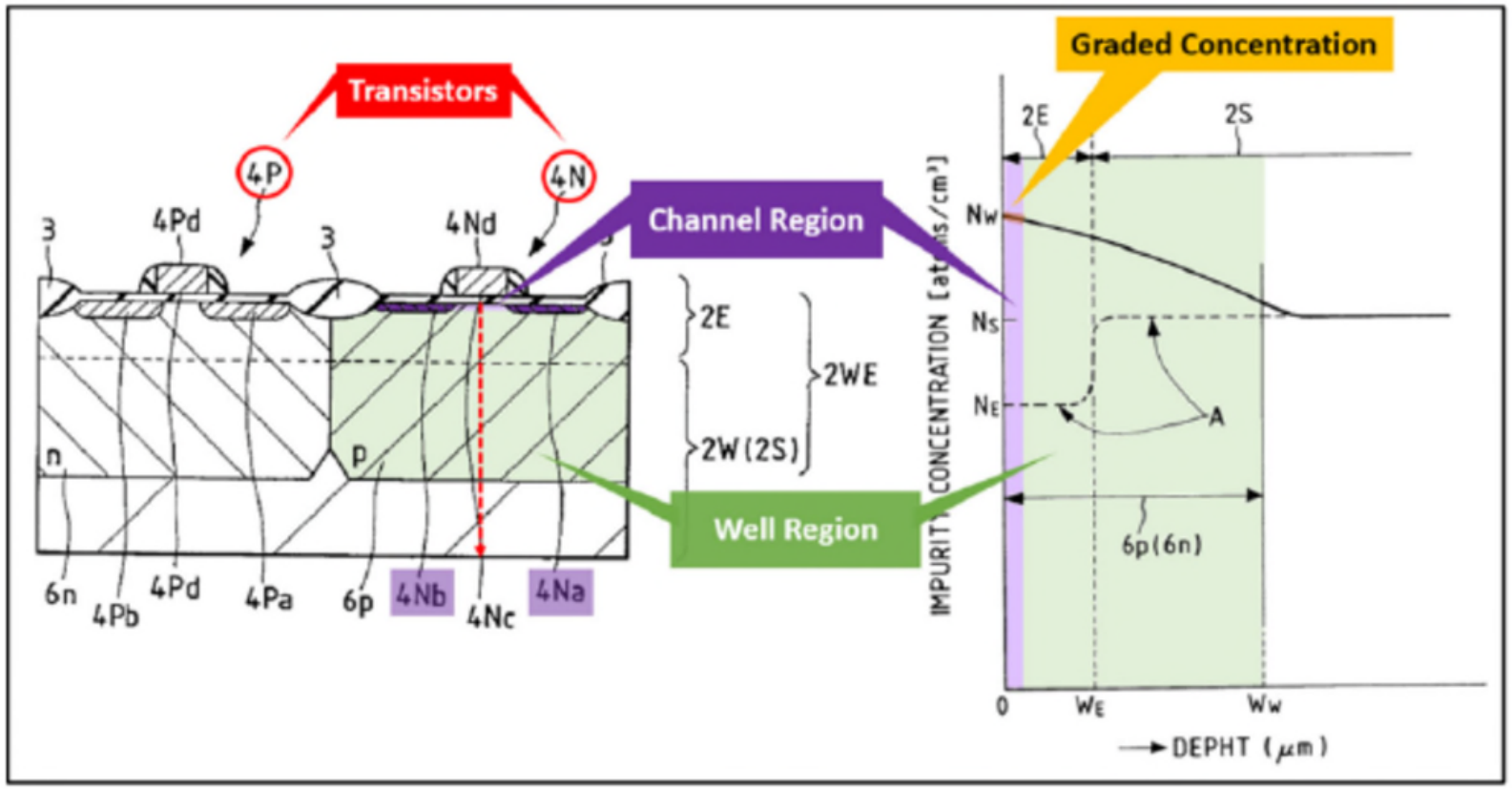
Claim 1 (842): at least one graded dopant concentration to aid carrier movement **from the first surface to the second surface of the substrate**

Claim 1 (222): at least one graded dopant concentration to aid carrier movement **from the first and second active regions towards an area of the substrate where there are no active regions**

Claim 44 (222): a first static unidirectional electric drift field to aid the movement of carriers **from the surface layer to an area of the substrate where there are no active regions**

Reply, Paper 62 (-01242), 1-4; Petition, Paper 2 (-01242), 18-28, 55-60;
Reply, Paper 61 (-01243), 1-4; Petition, Paper 2 (-01243), 25-32, 50-54;
Reply, Paper 61 (-01244), 1-4; Petition, Paper 2 (-01244), 24-40, 57-67

Petitioner applied plain and ordinary meaning



"[T]he impurity concentration of the p-well 6p is given such a gradient that it is ***gradually lowered in the depthwise direction from the surface*** of the epitaxial layer 2E, so that the influence to be caused by the carriers (or electrons) due to the α-ray is lowered. Specifically, the ***electrons produced by the α-ray are attracted to the substrate body 2S by that concentration gradient*** … so that the soft errors can be reduced in case the MIS memory of the DRAM or the like is formed in the p-well 6p."

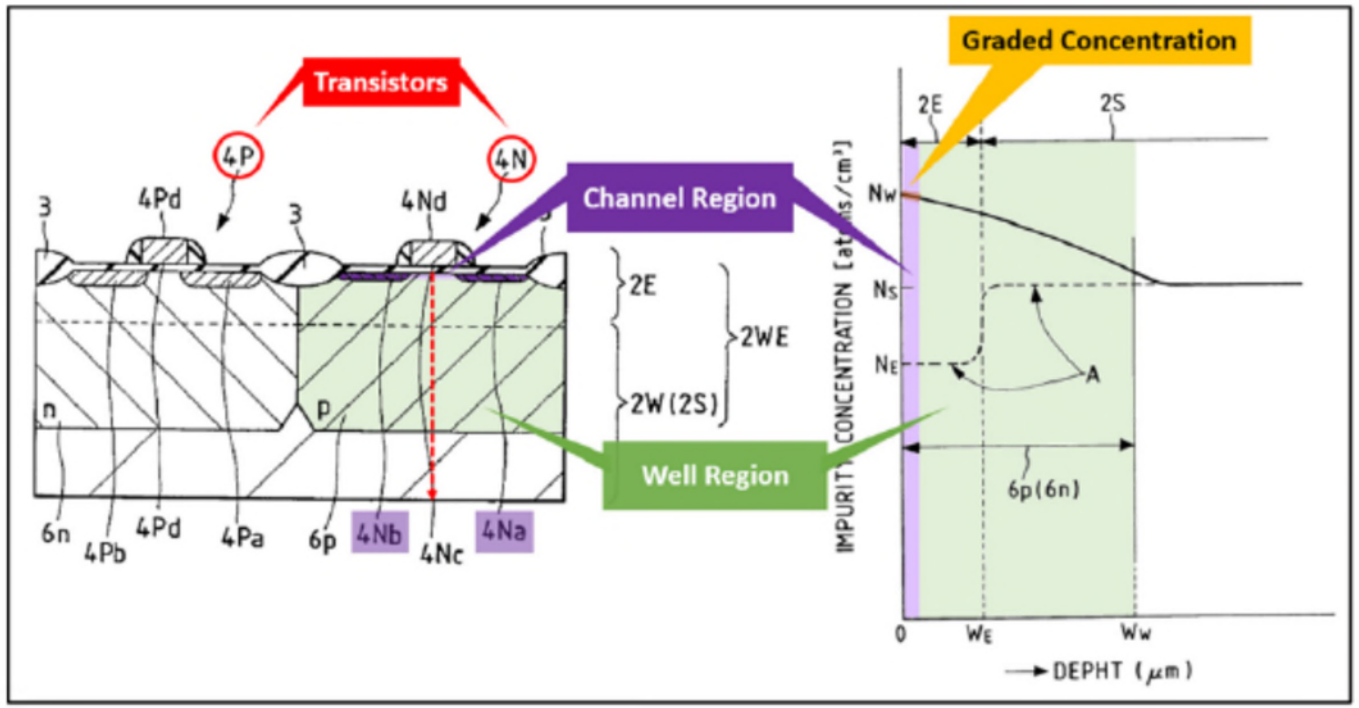
Kawagoe, EX1007 (-01242, -01243, -01244), 16:2-11, Figs. 17, 23

Petition at 22: "In light of the above, Kawagoe satisfies elements [1.5]/[21.5]/[39.5]/[41.5]/[42.5] under Patent Owner's plain meaning construction of the 'to aid carrier movement' term."

Reply, Paper 62 (-01242), 1-4; Petition, Paper 2 (-01242), 22, 27, 59;
Reply, Paper 61 (-01243), 1-4; Petition, Paper 2 (-01243), 29, 53;
Reply, Paper 61 (-01244), 1-4; Petition, Paper 2 (-01244), 32, 39, 60, 66

Petitioner addressed an alternative construction

Petition at 22: "Kawagoe also satisfies these claim elements under Intel's alternative proposed construction that the term means 'to **sweep the carriers** from the first and second active regions towards an area of the substrate where there is no active region.'" (Cleaned up)



"Kawagoe's Figure 17 illustrates a downward-sloping graded dopant concentration and Applicant represented to Patent Office during prosecution of the parent '195 Patent that a downward-sloping graded dopant concentration was known in the prior art to create an **'inherent 'built-in' unidirectional electric field' that sweeps carriers** down into the substrate (where there are no active regions)[.]"

Reply, Paper 62 (-01242), 1-4; Petition, Paper 2 (-01242), 22-23, 27-28, 59-60;
Reply, Paper 61 (-01243), 1-4; Petition, Paper 2 (-01243), 29-30, 53-54;
Reply, Paper 61 (-01244), 1-4; Petition, Paper 2 (-01244), 32-33, 39-40, 60-61, 66-67
EX1016 (-01242, -01243), EX1020 (-01244), 289-290

NO SPECIFIC SLOPE IS REQUIRED

BAKER BOTTS

The claims do not require any specific dopant gradient

Claim 1 (222): at least a portion of at least one of the first and second active regions having at least one graded dopant concentration to **aid carrier movement** from the first and second active regions towards an area of the substrate where there are no active regions

Claim 1 (842): at least a portion of at least one of the first and second active regions having at least one graded dopant concentration to **aid carrier movement** from the first surface to the second surface of the substrate

Claim 44 (222): the drift layer further having a first static unidirectional electric drift field to **aid the movement of carriers** from the surface layer to an area of the substrate where there are no active regions

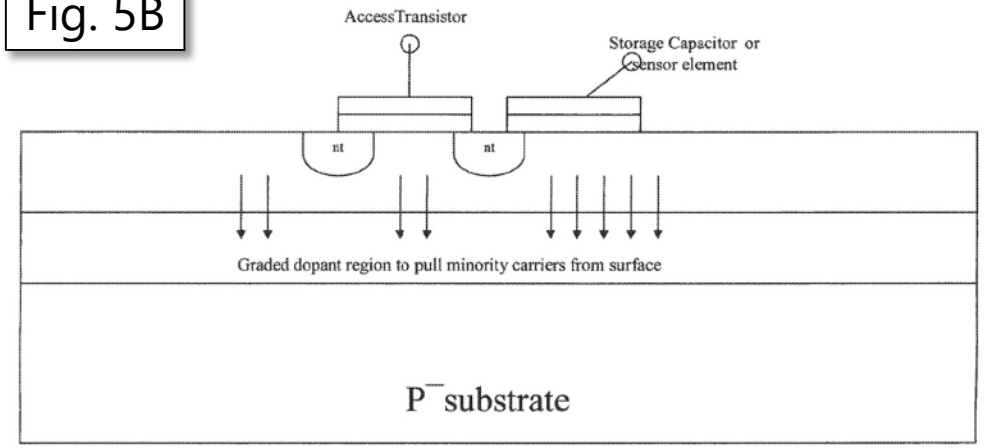
Reply, Paper 62 (-01242), 5-9; Petition, Paper 2 (-01242), 18-28, 55-60;
Reply, Paper 61 (-01243), 5-9; Petition, Paper 2 (-01243), 25-32, 50-54;
Reply, Paper 61 (-01244), 4-8; Petition, Paper 2 (-01244), 24-40, 57-67

The specification only refers to a "relative slope"

"The relative slope of the donor concentration throughout the base creates a suitable aiding drift electric field."

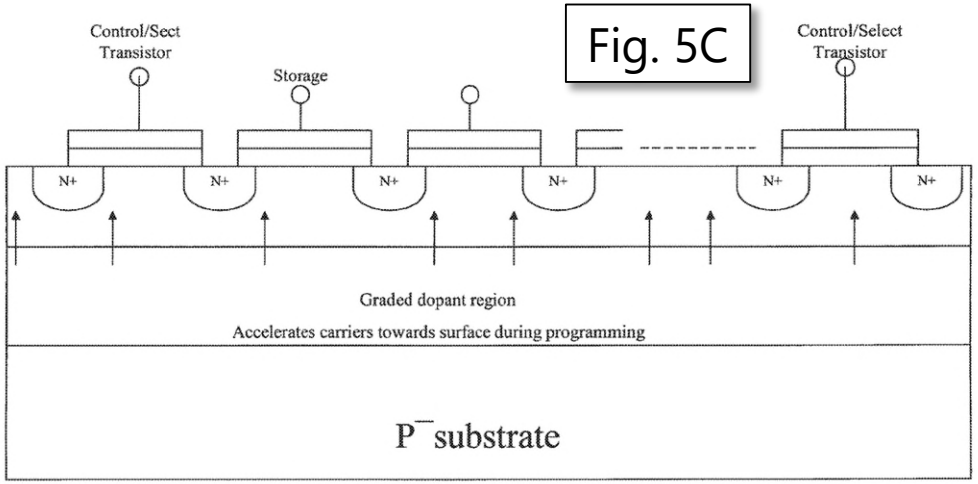
'222 Patent, EX1001 (-01242, -01244), 2:60-64
'842 Patent, EX1002 (-01243), 3:1-4

Fig. 5B



'222 Patent, EX1001 (-01242, -01244), Fig. 5B
'842 Patent, EX1002 (-01243), Fig. 5B

Fig. 5C



'222 Patent, EX1001 (-01242, -01244), Fig. 5C
'842 Patent, EX1002 (-01243), Fig. 5C

Reply, Paper 62 (-01242), 6;
Reply, Paper 61 (-01243), 6;
Reply, Paper 61 (-01244), 5

Applicant later explained "relative slope" means one side being "relatively lower than the other side"

Related U.S. Patent Application 17/728,588 – Response filed **August 1, 2024**

In ¶[0011], a description of a p-n-p transistor is set forth specifically with respect to Figure 1:

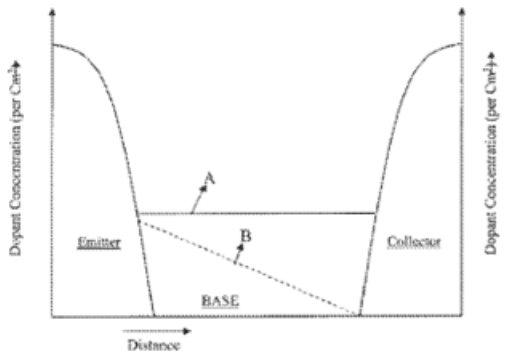


Figure 1 Prior Art

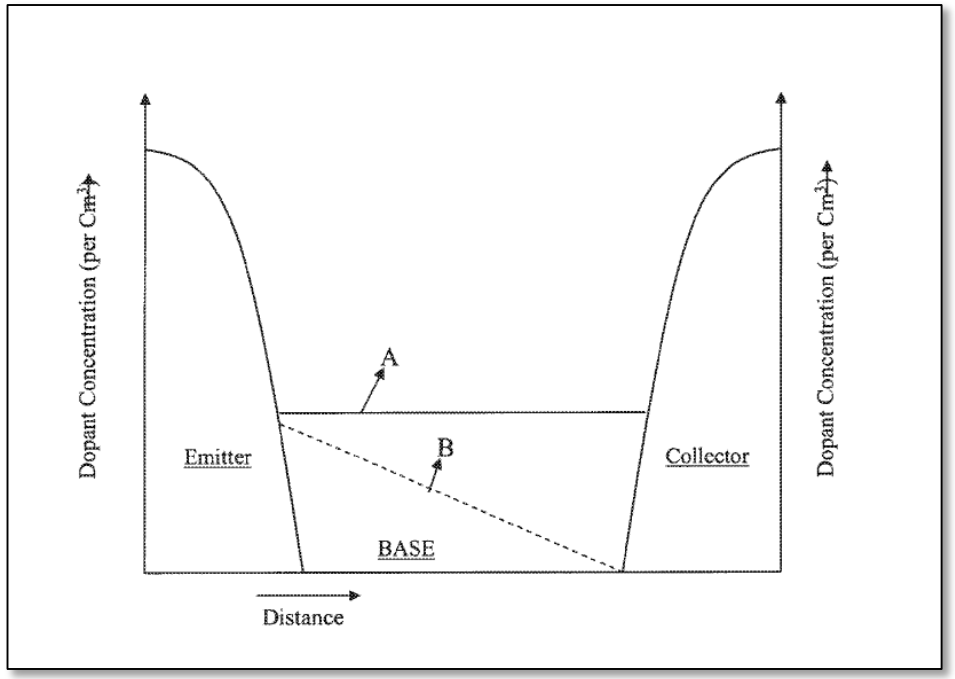
EX1054 (-01242, -01243, -01244), 12;
EX1055 (-01242, -01243, -01244), 5

"The structure of this transistor is described as having a base region that has a donor dopant concentration gradient that is high at the emitter-base junction and low at the base-collector injunction. This corresponds to the label 'B' in Figure 1. **This is defined as a 'relative slope' which means nothing more than the fact that one-side is relatively lower than the other side.** This slope is defined "throughout" the base to create 'a suitable aiding drift electric field, to help the holes (p-n-p transistor) traverse from the emitter to collector."

EX1054 (-01242, -01243, -01244), 12;
EX1055 (-01242, -01243, -01244), 5

Reply, Paper 62 (-01242), 6;
Reply, Paper 61 (-01243), 6;
Reply, Paper 61 (-01244), 5

Example dopant concentrations for emitter-collector gradient are irrelevant



'222 Patent, EX1001 (-01242, -01244), Fig. 1
'842 Patent, EX1002 (-01243), Fig. 1

"The relative doping concentrations **of emitter and collector regions** varies from 10^{18} to $10^{20}/cm^3$, whereas the base region is 10^{14} to $10^{16}/cm^3$ depending on the desired characteristics of the BJT. In graded base p-n-p transistors, the donor dopant concentration may be 10 to 100x at the emitter-base junction, relative to the base-collector junction 60 (1x). The gradient can be linear, quasi linear, exponential or complimentary error function. The relative slope of the donor concentration throughout the base creates a suitable aiding drift electric field, **to help the holes (p-n-p transistor) transverse from emitter to collector**."

'222 Patent, EX1001 (-01242, -01244), 2:54-64
'842 Patent, EX1002 (-01243), 2:62-3:11

PO Sur-Reply, Paper 65 (-01242), Paper 64 (-01243), 20-21;
PO Sur-Reply, Paper 64 (-01244), 16

PO represented that "particular direction" of gradient determines carrier movement

Greenthread, LLC *Plaintiff,* *v.* Intel Corporation; Dell Inc.; and Dell Technologies Inc. *Defendants.*	Civil Action No. 6:22-cv-105-ADA JURY TRIAL DEMANDED

GREENTHREAD'S RESPONSIVE CLAIM CONSTRUCTION BRIEF

"These dopants can also change the net electrical charge distribution in the surrounding silicon, which can influence the motion of other charge carriers passing by. When the dopant concentration is graded **in a particular direction,** other charge carriers will move in the gradient direction (or opposite direction) depending on the charge carrier's polarity. This phenomenon is called 'carrier drift.'"

EX1020 (-01242, -01243), native p. 2, exhibit p. 11

Reply, Paper 62 (-01242), 3-4;
Reply, Paper 61 (-01243), 3-4

PO represented that magnitude is irrelevant

Greenthread, LLC *Plaintiff,* *v.* Intel Corporation; Dell Inc.; and Dell Technologies Inc. *Defendants.*	Civil Action No. 6:22-cv-105-ADA JURY TRIAL DEMANDED

GREENTHREAD'S RESPONSIVE CLAIM CONSTRUCTION BRIEF

"The claim specifies the graded dopants create an electric field that aids movement of the carriers away from the surface layer. Defendants assert that the specification does not provide guidance on how to assess or measure carrier movement. This is not true. The claims and the specification make clear that **the electric field must move the carriers in a particular direction** (from the surface layer to the substrate). **Whether the carrier movement has a particular speed or acceleration is beyond the scope of the claim, as long as it meets the other limitations of the claim**."

EX1020 (-01242, -01243), native p. 29, exhibit p. 38

Reply, Paper 62 (-01242), 3;
Reply, Paper 61 (-01243), 3

THE PRIOR ART DOES NOT HAVE EXTERNAL FORCES

BAKER BOTTS

Dr. Blalock explained that the prior art does not disclose hypothetical opposing forces

Q. So you mentioned that if there aren't other fields present and the carrier was introduced into that field, you'll move the carrier. Where could other fields come from?

A. Externally applied voltages from the circuit, if the structure's in a circuit, things like that. Or I suppose some environmental effect. I don't know.

Q. Is anything like that described in the prior art reference that you are relying on, Kawagoe?

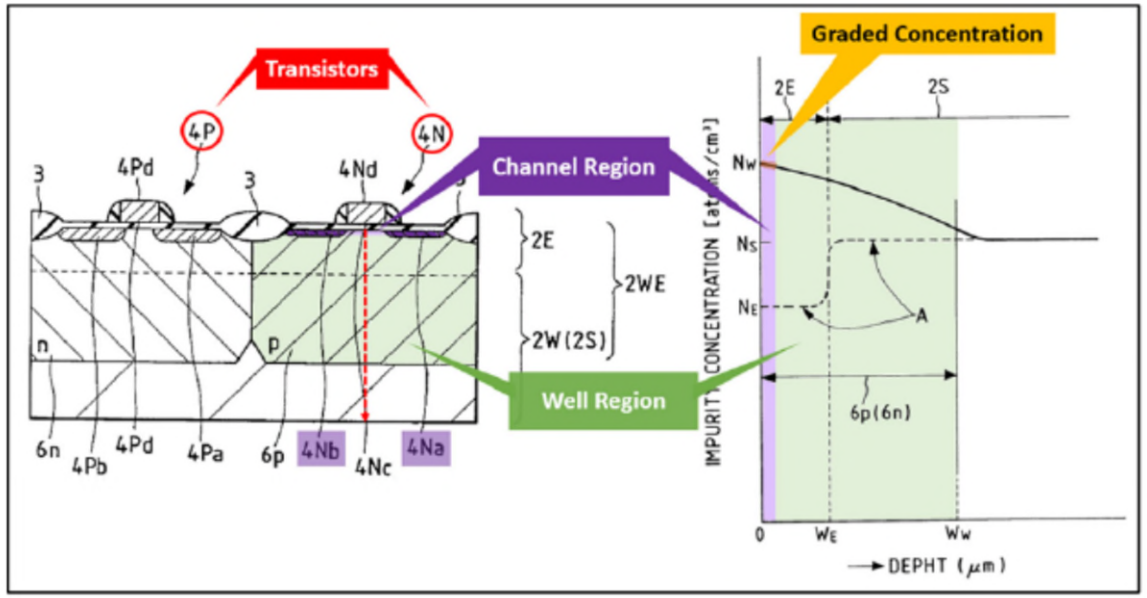
A. As I said, **none of that is** -- all these discussions are about we built this device and we put in a gradient to create this electric field, which tends to move carriers down into the substrate. And we don't need to get into the rest of it. [...]

Reply, Paper 62 (-01242), 8, 10-12;
Reply, Paper 61 (-01243), 8, 10-12;
Reply, Paper 61 (-01244), 7, 9-11

EX2058, 132:6–22

Electrons prevented from entering p-well because there are no external forces stronger than the concentration gradient

Kawagoe: "electrons produced by the α-ray are attracted to the substrate body 2S by that concentration gradient **and prevented from entering the p-well**"



Kawagoe, EX1007 (-01242, -01243, -01244), 16:2-11, Figs. 17, 23

Institution Decision, Paper 21 (IPR2024-00263), 19:

"Indeed, the fact that carriers are prevented from entering the active regions in Kawagoe, such as p-well 6p, appears to be **strong evidence that the downward facing electric field is not negated** or reversed by other fields or forces."

Reply, Paper 62 (-01242), 10-12; Petition, Paper 2 (-01242), 18-28; Reply, Paper 61 (-01243), 10-12; Petition, Paper 2 (-01243), 25-32; Reply, Paper 61 (-01244), 9-11; Petition, Paper 2 (-01244), 48-67

The Examiner did not suggest other parameters required for "aid carrier movement" term

Greenthread: "[D]uring prosecution, the examiner said … that 'without knowing other parameters of the device' one cannot say whether the field would aid carrier movement."

POR, Paper 47 (-01242), 16 (citing EX1016, 270));
POR, Paper 46 (-01243), 16 (citing EX1016, 270);
POR, Paper 46 (-01244), 14 (citing EX1020, 270)

What the Examiner ***actually*** said:

"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."

Reply, Paper 62 (-01242), Paper 61 (-01243), 6 (citing EX1016, 270); Reply, Paper 61 (-01244), 5 (citing EX1020, 270)

Applicant represented that a unidirectional electric field "ensur[es] that all minority carriers are being moved"

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.

EX1016 (-01242), 286
EX1016 (-01243), 286
EX1020 (-01244), 286

"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[.] […] 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."

EX1016 (-01242), 290
EX1016 (-01243), 290
EX1020 (-01244), 290

Reply, Paper 62 (-01242), 4-5;
Reply, Paper 61 (-01243), 4-5;
Reply, Paper 61 (-01244), 3-4

KAWAGOE'S GRADIENT AIDS CARRIER MOVEMENT FROM WELL TO SUBSTRATE

BAKER BOTTS

Carriers are present throughout Kawagoe's device

Q. Okay. Electrons from a variety of sources would be found throughout the Kawagoe device, right?

A. There are other electrons generated from other things, yes.

EX1052 (-01242, -01243, -01244), 118:9-13

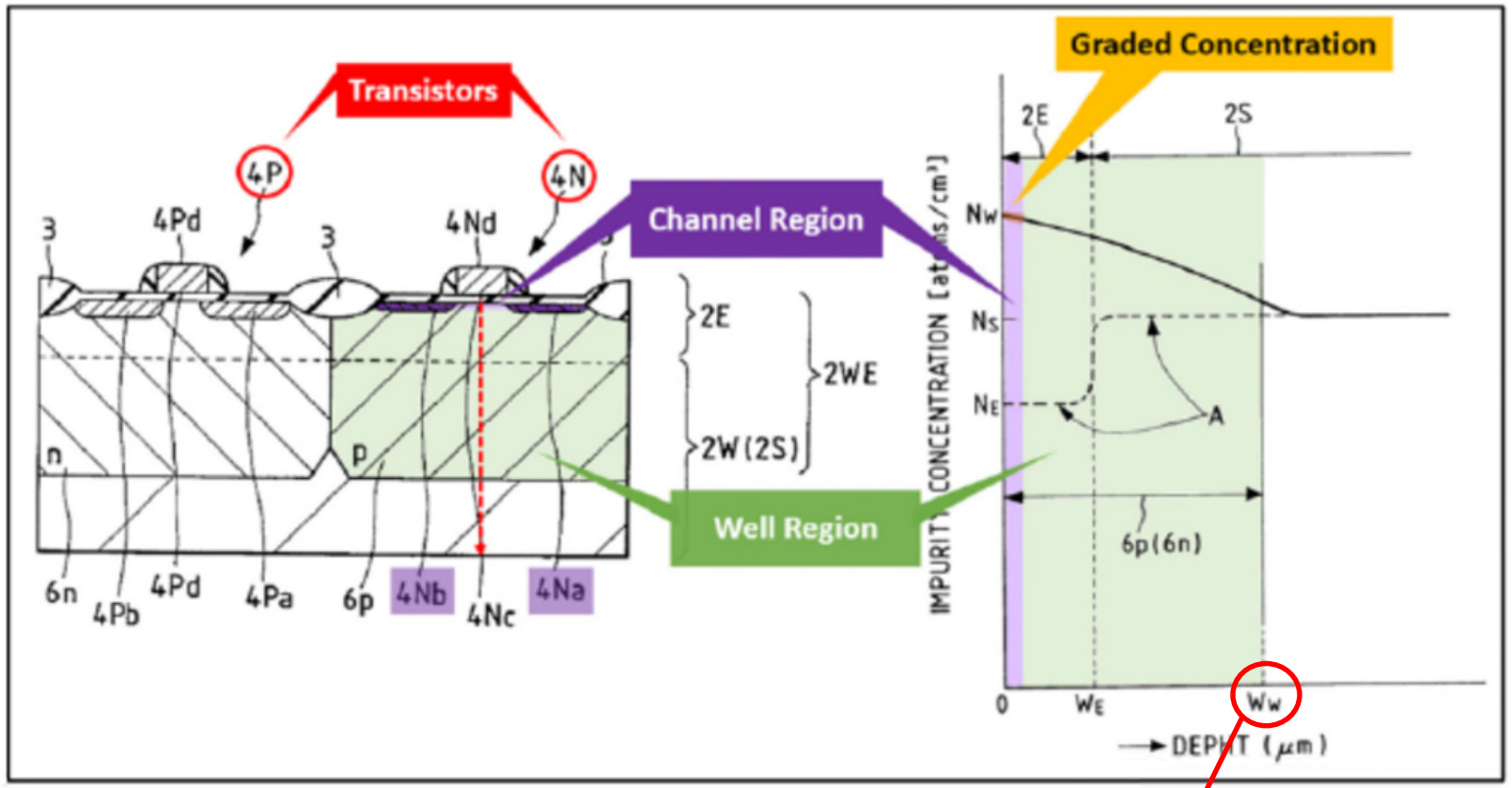
Q. For the device shown in Figure 17 of Kawagoe, along the depth 0 to WW, is there any region where there would not be electrons?

A. This is a p-well, so it is substantially holes. There are electrons as minority species.

EX1052 (-01242, -01243, -01244), 120:11-17

Reply, Paper 62 (-01242), 12-13;
Reply, Paper 61 (-01243), 12-13;
Reply, Paper 61 (-01244), 11-12

Kawagoe's electric field "from 0 past Ww" pushes electrons down



Kawagoe, EX1007 (-01242, -01243, -01244), Figs. 17, 23; 15:26-36; EX1052 (-01242, -01243, -01244), 110:18-116:3

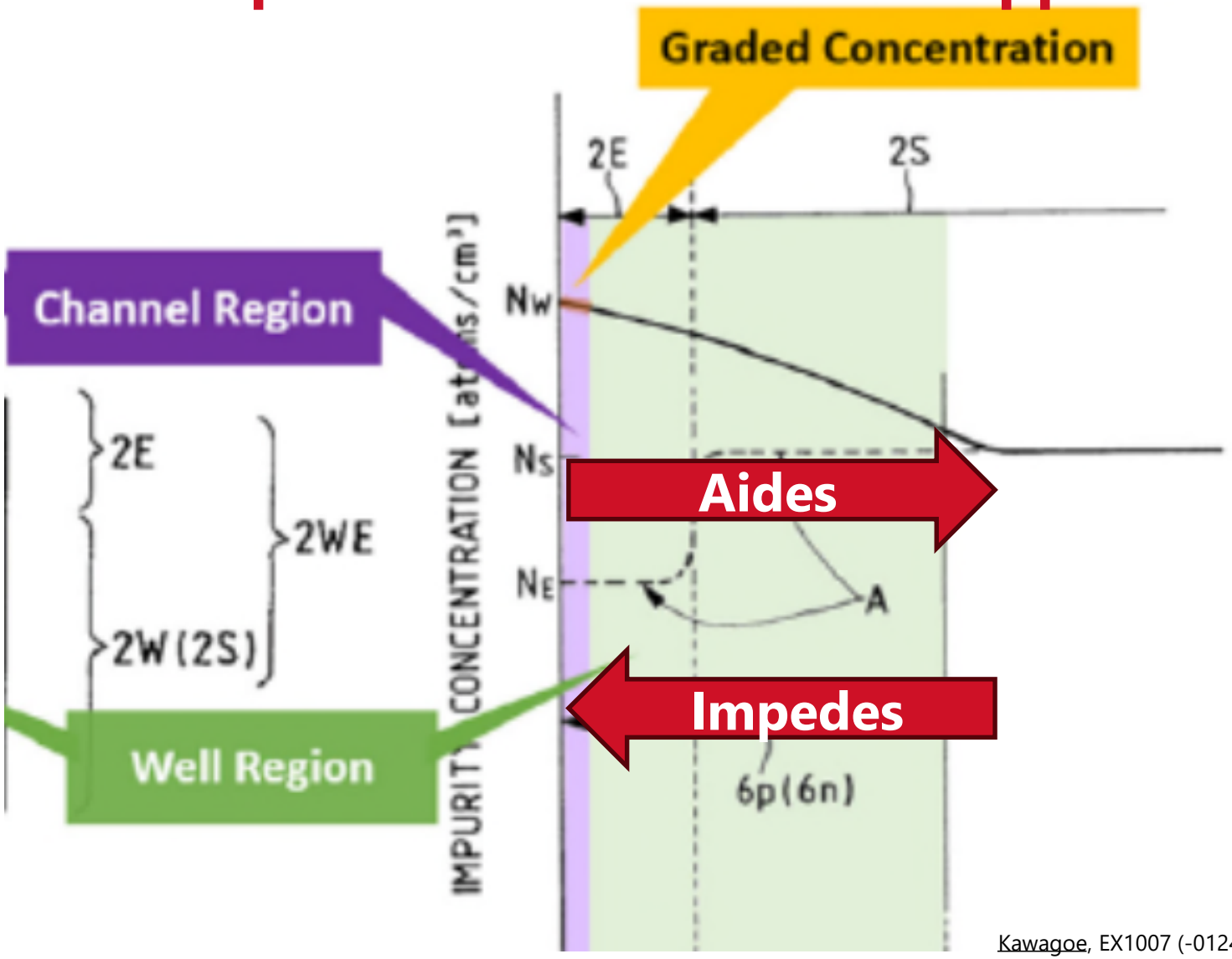
Reply, Paper 62 (-01242), 11-12;
Reply, Paper 61 (-01243), 11-12;
Reply, Paper 61 (-01244), 10-12

Q. So throughout the depth in Kawagoe from 0 past WW, there is an electric field pushing electrons downward?

A. **Yes**, there's that field shown in Figure 17.

EX1052 (-01242, -01243, -01244), 113:12-16

The electric field both aides electron movement one direction and impedes movement in the opposite direction



Kawagoe, EX1007 (-01242, -01243, -01244), Figs. 17, 23

A. I'm not sure, beyond that, what there is to say, you know. **The field -- the force of the electric field and its direction provide -- aids movement in the direction of the field**.

Q. And it impedes movement in the opposite direction?

A. Yeah, **in -- the 180 degree opposite direction, yes, it will repel, and it pushes it away**.

EX1052 (-01242, -01243, -01244), 109:6-14

Reply, Paper 62 (-01242), 10-12;
Reply, Paper 61 (-01243), 10-12;
Reply, Paper 61 (-01244), 9-12

Nishizawa disproves PO's argument about whether alpha ray strikes create electrons in the active region

EX1052 (-01242, -01243, -01244), 125:5-19

Q. Okay. So would you agree with me that the n+ regions 12 and 13 in Figure 35 correspond to an active region?

[…] A. I would say, generally, these look to be part of an active region, yes.

Q. And if you look at column 19, line 41, 42, this is just after the discussion you cited in your report, right?

A. Same column, same paragraph, I think, yes.

Q. And there's a sentence at line 41 that says, "In other words, **several ten thousand electrons will flow into the n+ type region 13**"[?]

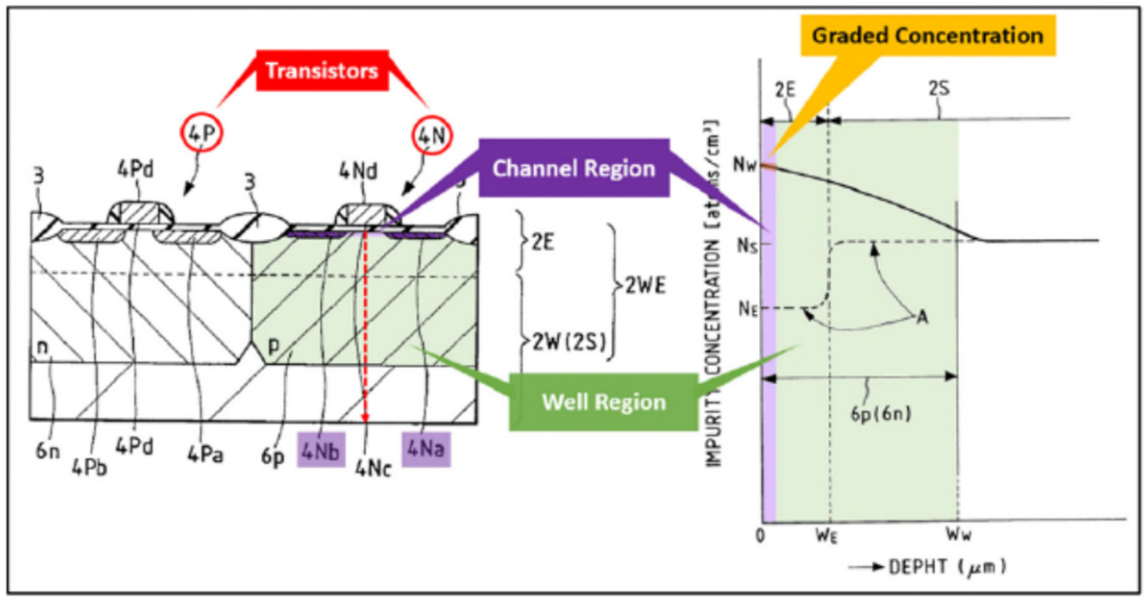
A. Yes.

Nishizawa, EX2060 (-01242, -01243, -01244), 19:41-42, Figs. 34-36; EX1052 (-01242, -01243, -01244), 123:17-128:11

Reply, Paper 62 (-01242), 13-14;
Reply, Paper 61 (-01243), 13-14;
Reply, Paper 61 (-01244), 12-13

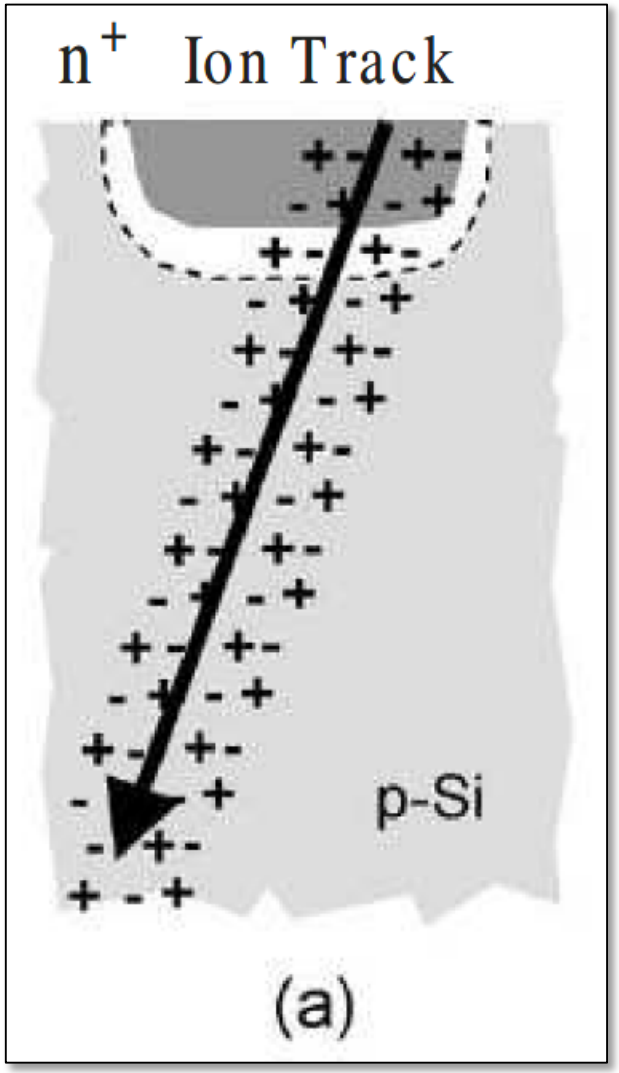
Petitioner is not proposing to modify Kawagoe in view of Wang

Petition (-01242) at 28: "Indeed, as discussed in Wang and as was well understood in the art, an a-ray generates a stream of millions of carriers (*e.g.*, electrons) that can cause single-event upset (SEU) soft errors."



Petition, Paper 2 (-01242), 28;
Reply, Paper 62 (-01242), 14-15
Petition, Paper 2 (-01243), 28-29;
Reply, Paper 61 (-01243), 14-15;
Petition, Paper 2 (-01244), 29-30;
Reply, Paper 61 (-01244), 13-14

Kawagoe, EX1007 (-01242, -01243, -01244), 16:2-11, Figs. 17, 23



Wang, EX1009 (-01242, -01243), EX1013 (-01244), Fig. 2(a)

THE "OPPOSITE IN CONDUCTIVITY" LIMITATIONS ARE OBVIOUS

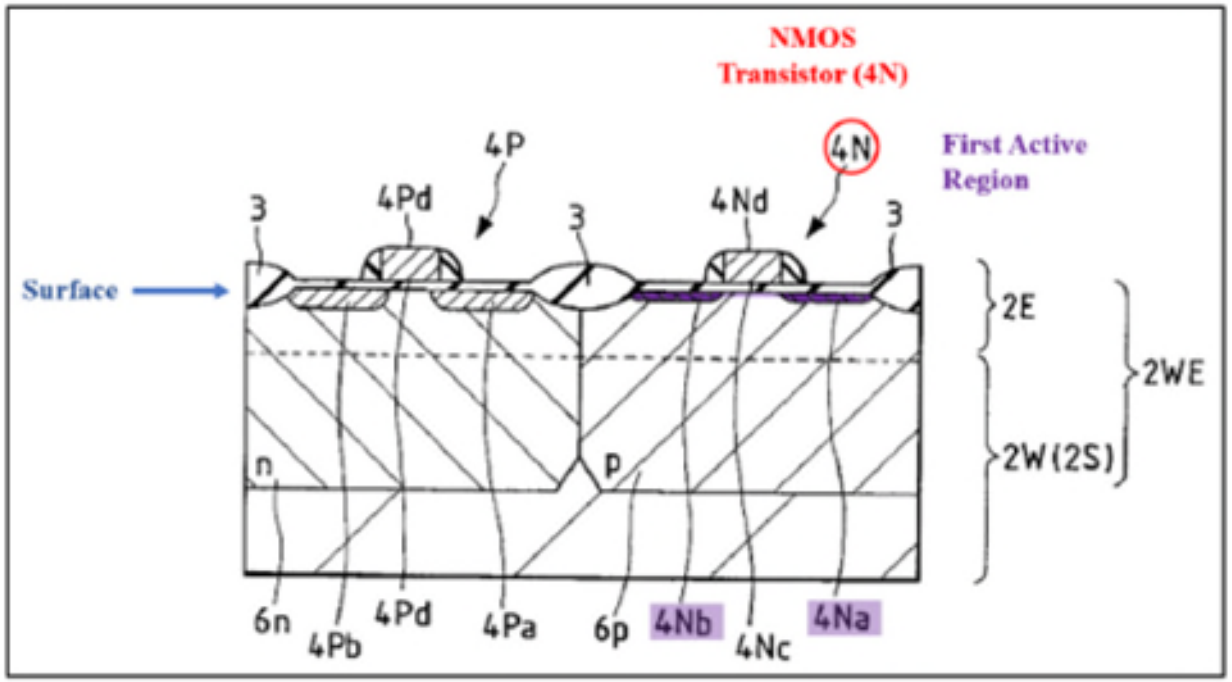
04

BAKER BOTTS

NMOS active region is opposite in conductivity to P-type substrate

[1.2]	a first active region disposed adjacent the surface with a second doping type opposite in conductivity to the first doping type and within which transistors can be formed;

See also limitations [21.2], [39.2], [41.2], [42.2] ('222 patent); limitations [1.2], [9.2] ('842 patent).



Petition, Paper 2 (-01242), 13-16;
Reply, Paper 62 (-01242), 16-19;
Petition, Paper 2 (-01243), 19-22, 36;
Reply, Paper 61 (-01243), 16-19

"The element forming region, as enclosed by the field insulating film 3, is formed, for example, **with an n-channel MOS.FET (as will be shortly referred to as 'nMOS') 4N** and a p-channel MOS.FET (as will be shortly referred to as 50 'pMOS') 4P, and these nMOS 4N and pMOS 4P constitute a CMOS (i.e., Complementary Metal Oxide Semiconductor) circuit."

* * *

"The semiconductor regions 4Na and 4Nb are regions for forming the source-drain regions of the nMOS 4N. **The semiconductor regions 4Na and 4Nb are doped with an n-type impurity** such as phosphor (P) or arsenic (As) in a concentration (dose) of about $1x10^{15}$ atoms/cm^2."

Kawagoe, EX1007 (-01242, -01243), 8:46-9:3;
see also 14:46-55, 15:26-40;
EX1003 (-01242), ¶81; EX1003 (-01243), ¶79.

Figures in ’222/’842 patents show NMOS and P substrate

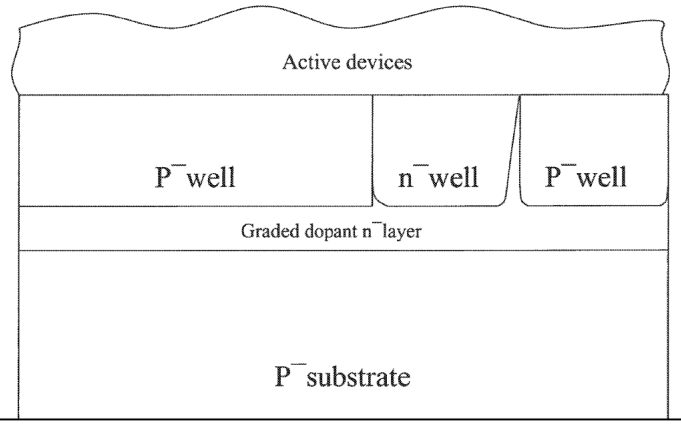


Fig 5A – CMOS (both) & P substrate

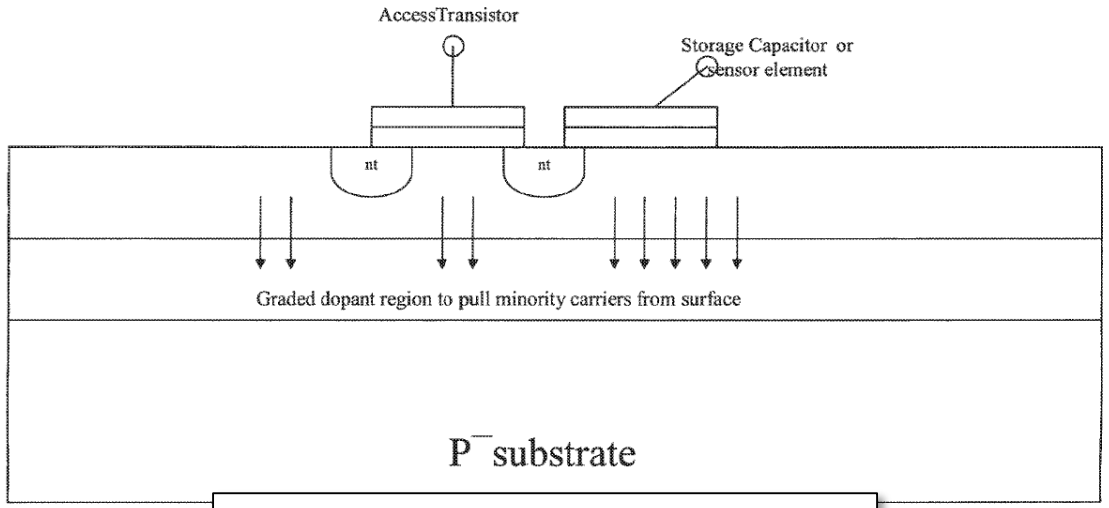


Fig 5B – NMOS & P substrate

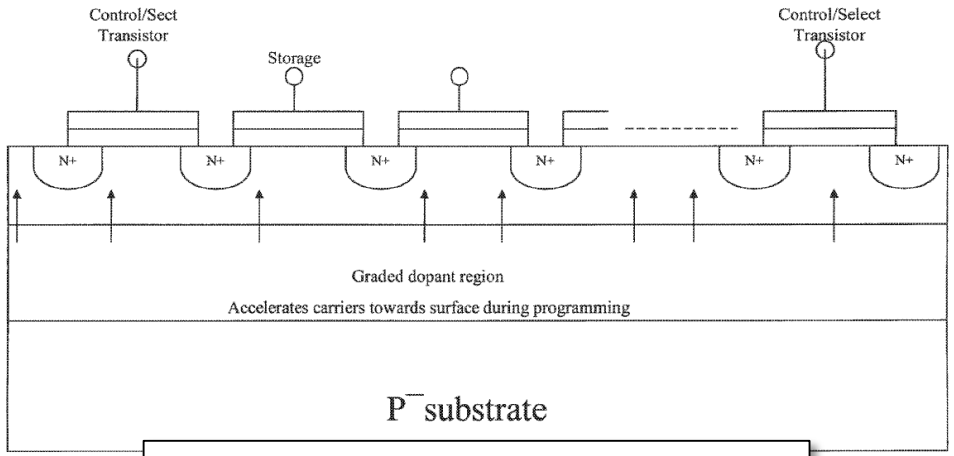
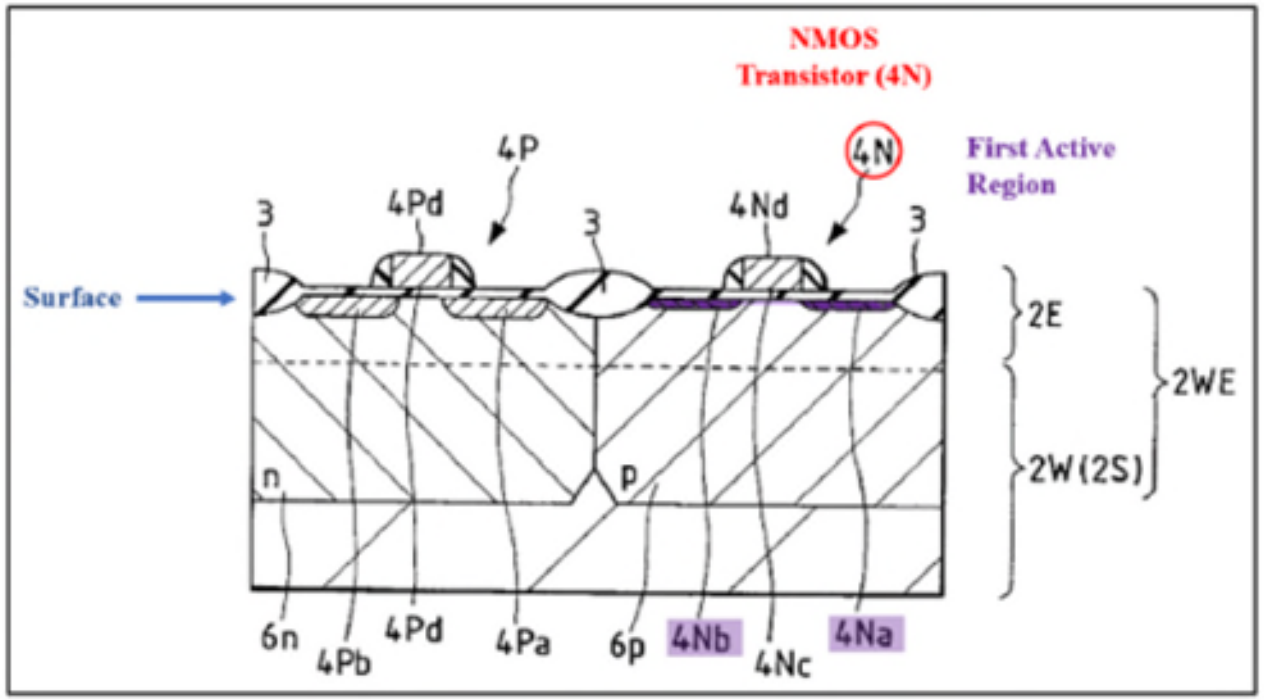


Fig 5C – NMOS & P substrate

’222 Patent (EX1001), Figs. 5A, 5B, 5C
Reply, Paper 62 (-01242), 16-18;
Reply, Paper 61 (-01243), 16-18

The "doping type" of active region is not limited to well/channel

EX1052, 137:1-14



Kawagoe, EX1007 (-01242, -01243), 8:46-9:3; *see also* 14:46-55, 15:26-40; EX1003 (-01242), ¶81; EX1003 (-01243), ¶79.

Q. The n-type source and drain for the NMOS on the right-hand side of Kawagoe, an n-type source and drain is opposite in conductivity type to a p-type substrate, right?

[...]A. **An n-type source and drain is n-type. A p-type substrate is a p-type, so they would be opposite, yes**.

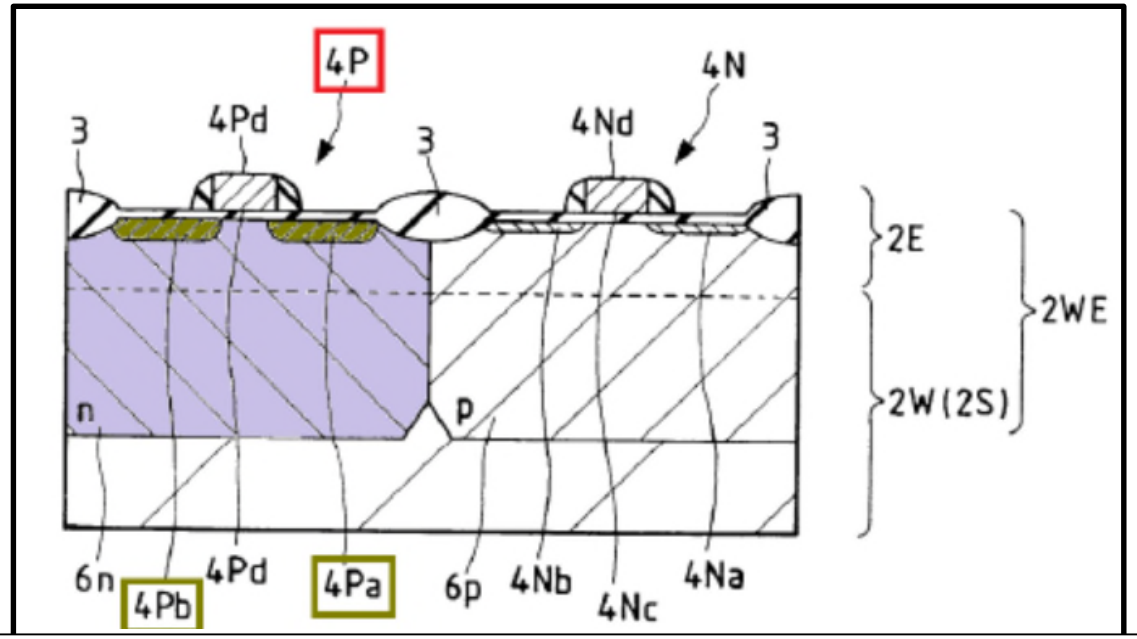
Q. Would you say that the source and drain are part of the active region?

[...]A. **Sources and drains are part of the active region, yes**.

EX1052 (-01242, -01243, -01244), 137:1-14

POR, Paper 47 (-01242), 31-33;
POR, Paper 46 (-01243), 31-33;
Reply, Paper 62 (-01242), 16-18;
Reply, Paper 61 (-01243), 16-18

Kawagoe satisfies Greenthread's narrow construction for "doping type" of active region



Kawagoe shows a CMOS, it has both types

EX1052, 135:3-9

Q. And you told me that you believed that Figure 5B did have an active region conductivity type that was opposite to the p-type substrate?

Q. Yes, you view Figure 5B along with, of course, 5A, and the description that says **it's a CMOS substrate, it has both types**.

EX1052 (-01242, -01243, -01244), 135:3-9; *see also* 22:7-28:24, 71:12-75:23, 132:24-137:14

Kawagoe, EX1007 (-01242, -01243), 9:40-54, 17:50-54, 18:15-23, 21:55-61, Fig. 23

Reply, Paper 62 (-01242), 18-19;
Reply, Paper 61 (-01243), 18-19

THE ISOLATION REGION CLAIMS ARE OBVIOUS

05

Claims 6 and 27 ('222 patent); Claims 7 and 15 ('842 patent)

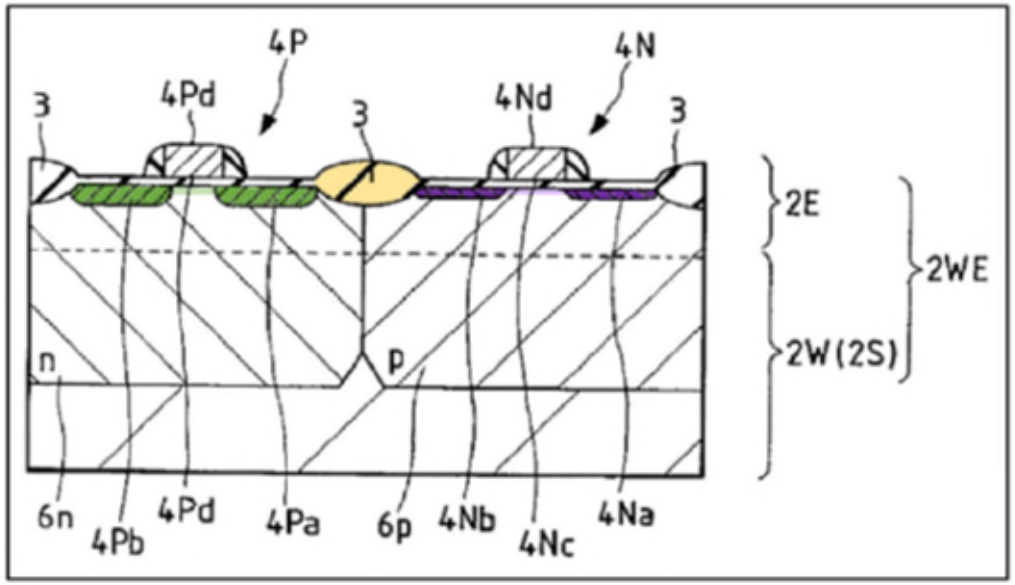
6	The VLSI semiconductor device of claim 1, wherein the first active region and second active region are each **separated by at least one isolation region**.
27	The VLSI semiconductor device of claim 21, wherein the first active region and second active region are each **separated by at least one isolation region**.
7	The semiconductor device of claim 1, wherein the first active region and second active region are each **separated by at least one isolation region**.
15	The semiconductor device of claim 9, wherein the first active region and second active region are each **separated by at least one isolation region**.

Claims do not say **how much** separation is required

Petition, Paper 2 (-01242), 31-32;
Reply, Paper 62 (-01242), 19-22

Kawagoe alone or in view of Gupta satisfies claims 6 and 27 of the ’222 patent and claims 7 and 15 of the ’842 patent

<u>Kawagoe</u>: insulating film 3 separates at least the surface portions of the first and second active regions

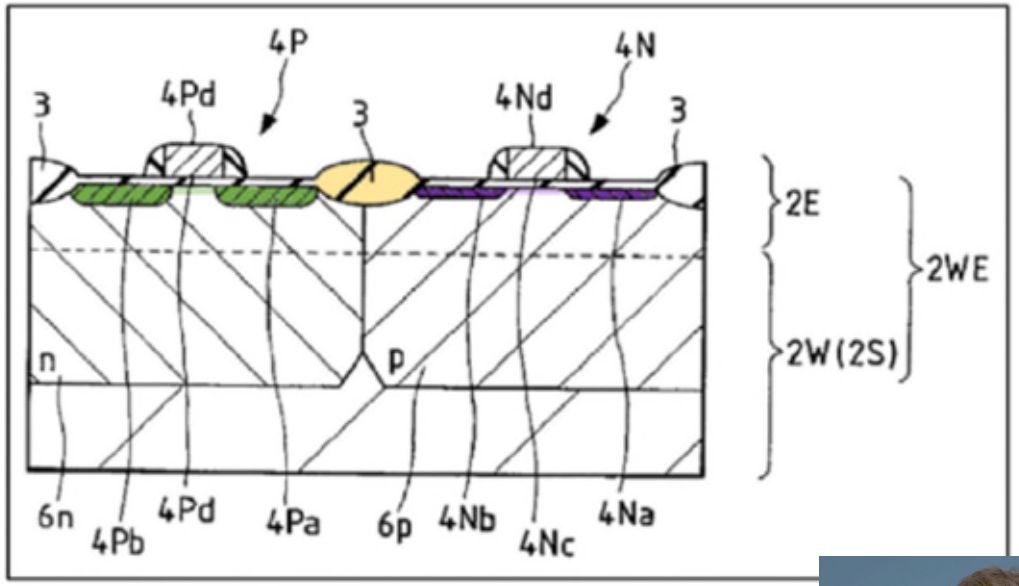


Petition, Paper 2 (-01242), 31-32;
Reply, Paper 62 (-01242), 19-21;
Petition, Paper 2 (-01243), 34-35, 38;
Reply, Paper 61 (-01243), 19-21

Kawagoe contemplates active regions “formed in the range of the thickness of epitaxial layer 2E” (as alleged by Greenthread), but ***also*** teaches active regions having a depth (e.g., 0.5 μm) that is significantly less than epitaxial layer 2E (e.g., 5 μm)

<u>Kawagoe</u>, EX1007 (-01242, -01243), 8:40-52, 15:37-40, 17:62-18:8, 8:36-40, 9:3-6, 9:47-53, 17:22-25;
<u>Wolf</u>, EX1008A (-01242, -01243), 818-20, FIG. 16-11(f);
EX1003 (-01242), ¶116;
EX1003 (-01243), ¶103

Kawagoe alone or in view of Gupta satisfies claims 6 and 27 of the ’222 patent and claims 7 and 15 of the ’842 patent



Kawagoe: “Next, as shown in FIG. 6, the field insulating film 3 made of SiO_2 or the like is formed over the principal surface of the epitaxial layer 2E **by the LOCOS method or the like**.”

Kawagoe, EX1007 (-01242, -01243), 8:40-52, 15:37-40, 17:62-18:8; Wolf, EX1008A (-01242, -01243), 818-20, FIG. 16-11(f); EX1003 (-01242), ¶116; EX1003 (-01243), ¶103.

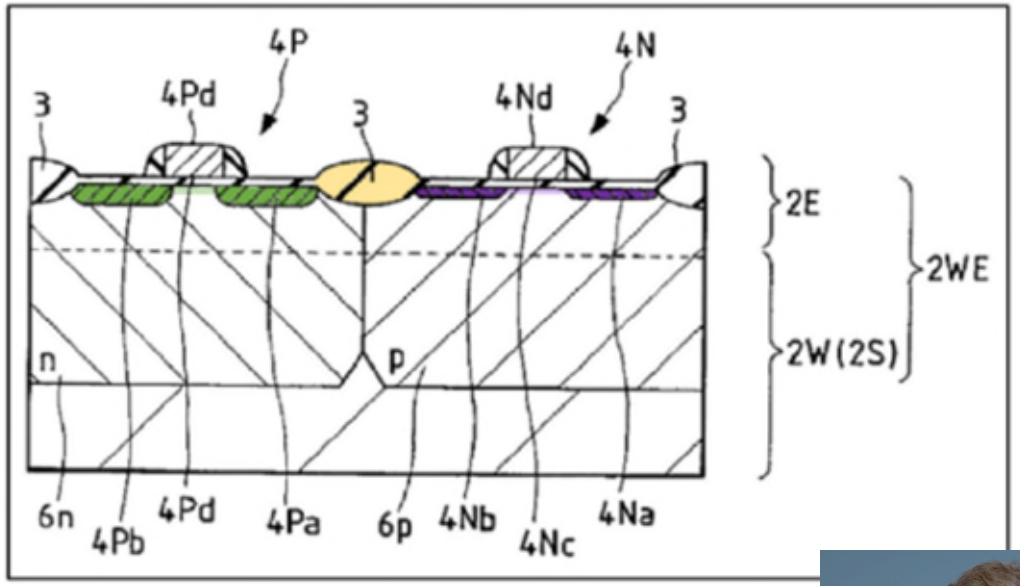
Q. Do you know how LOCOS works?

A. It's a usually either steam or ozone -- high-temperature oxygen oxidation of a silicon -- areas of a silicon substrate… **it consumes a portion of the silicon and works its way downward**.

EX1052 (-01242, -01243, -01244), 139:2-142:2

Petition, Paper 2 (-01242), 31-32;
Reply, Paper 62 (-01242), 21;
Petition, Paper 2 (-01243), 34-35, 38;
Reply, Paper 61 (-01243), 21

Kawagoe still teaches an "isolation region" under Greenthread's interpretation



"Over the principal surface of the epitaxial layer 2E, there is formed a field insulating film 3 which is made of silicon dioxide (SiO_2), for example. Incidentally, **a channel stopper region is formed below the field insulating film 3**, although not shown."

Kawagoe, EX1007 (-01242, -01243, -01244), 8:40-45

A. Essentially, [a channel stopper region's] purpose is to stop errant carriers from migrating from one transistor to another. It needs to be deep enough to do that, but not deeper.

EX1052 (-01242, -01243, -01244), 142:24-143:6

Reply, Paper 62 (-01242), 21-22;
Reply, Paper 61 (-01243), 21-22

GREENTHREAD'S LICENSE AGREEMENTS DO NOT SHOW NON-OBVIOUSNESS

06

Evidence of nexus is required for license agreements

"[T]he fact that a patent has been licensed, taken alone, generally is insufficient for purposes of showing commercial success."

Itron Networked Sols., Inc. v. Acoustic Tech., Inc., No. IPR2017-01031, 2018 WL 10440326, at *10 (P.T.A.B. Aug. 21, 2018)

"[A]ffirmative evidence of nexus [is required][…] because it is often cheaper to take licenses than to defend infringement suits."

Iron Grip Barbell, 392 F.3d at 1324 (internal quotation marks omitted)

A licensee being "a market leader . . . [with] a good reputation in the industry" is not sufficient to establish a nexus between the claimed invention and the license

GCE Gas Control Equip. Inc. v. VBOX, Inc., IPR2023-00326, Paper 27, 56-58 (P.T.A.B. June 24, 2024) (Final Written Decision)

Reply, Paper 62 (-01242), 23-26;
Reply, Paper 61 (-01243), 23-26;
Reply, Paper 61 (-01244), 17-20

PO's litigation settlements are not evidence of non-obviousness

Greenthread POR (at 39): "Finally, licenses that are part of litigation settlements can also be probative of non-obviousness. ***Fox Factory Inc. v. SRAM LLC,* IPR2017-00472, Paper 64 at 44 (PTAB April 18, 2018)**."

POR, Paper 47 (-01242), 39; POR, Paper 46 (-01243), 38; POR, Paper 46 (-01244), 37

The Federal Circuit **vacated** because "the Board **erroneously presumed nexus** between the evidence of secondary considerations and the independent claims"

Fox Factory, Inc. v. SRAM, LLC, 944 F.3d 1366, 1378 (Fed. Cir. 2019)

On remand, the Board found **all challenged claims unpatentable** because: "Patent Owner shows a weak nexus" for licenses mentioning the patents at issues and "no nexus with respect to the remaining licenses" that did not.

Fox Factory, Inc. v. SRAM, LLC, IPR2017-00472, Paper 74, 4, 14, 24-25 (P.T.A.B. Feb. 25, 2021)

Reply, Paper 62 (-01242), 24;
Reply, Paper 61 (-01243), 24;
Reply, Paper 61 (-01244), 18

No evidence that licensees valued of the claimed inventions

Mr. John, President of Greenthread

Q. Have you looked at the claims of the ‘842 Patent?
A. No.

Q. Have you looked at the claims of the ‘222 Patent?
A. Not that I can remember.

Q. Are you aware of any connection between the claims of the ‘222 Patent and the license agreements in your declaration?
A. Not being an engineer, no.

Q. Are you aware of any connection between the claims of the ‘842 Patent and the licenses in your declaration?
A. Don’t remember.

Q. At any time during any of the negotiations for any of the license agreements that are mentioned in your· declaration, did any of the licensees mention a specific claim from the ‘842 or ‘222 Patent?
A. I don’t know.

Reply, Paper 62 (-01242), 22-23;
Reply, Paper 61 (-01243), 22-23;
Reply, Paper 61 (-01244), 16-17

EX1053 (-01242, -01243, -01244), 25:25-26:25

No evidence that licensees valued of the claimed inventions

Mr. John, President of Greenthread

Q. Are the ’842 Patent and ’222 Patent that are at issue in these proceedings particularly valuable to Greenthread?

A. Not that I remember.

EX1053 (-01242, -01243, -01244), 25:9-14

Q. Do you know if [licensees] ever mentioned the ’222 Patent or ’842 Patent that are at issue in this litigation?

A. I don’t remember.

EX1053 (-01242, -01243, -01244), 24:21-25:1

Reply, Paper 62 (-01242), 22-23;
Reply, Paper 61 (-01243), 22-23;
Reply, Paper 61 (-01244), 16-17

RPX's involvement shows licenses motivated by litigation cost

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We provide compelling cost savings

RPX's interests are 100% aligned with those of our clients. We work to ensure that each RPX client avoids more in legal costs and settlements each year than they pay RPX in subscription fees. We quantify the cost savings we have delivered collaboratively with the client. Together, we review the RPX acquisitions relevant to the client and determine a specific "avoided cost". The cumulative avoided cost is applied against the client's annual fee to calculate the dollar savings we have delivered for the year. We have been very successful delivering cost savings to all of the members in our network, a key factor in our consistently strong annual renewal rate.

EX1051 (-01242, -01243, -01244), 2

We are a unique solution to all forms of patent risk

Only RPX has the scale and independence to efficiently acquire patent portfolios pre-litigation and out of active litigation. Only RPX can spread the cost of reducing patent litigation across a large network of participating companies. Only RPX has accurate litigation cost data and a proven actuarial model to provide affordable, comprehensive patent litigation insurance. And only RPX can deliver – to companies of any size and with a patent litigation problem of any severity – significant, quantifiable, and cost-effective reduction of risk.

EX1051 (-01242, -01243, -01244), , 1

Reply, Paper 62 (-01242), 24-26;
Reply, Paper 61 (-01243), 24-26;
Reply, Paper 61 (-01244), 18-20

THE PETITION IS TIMELY 07

BAKER BOTTS

Greenthread's arguments have already been rejected by the Board and during Director Review

- Petitioner onsemi filed this IPR in response to Patent Owner's lawsuit

- Arms-length customer/supplier agreements do not create privity

  See, e.g., *WesternGeco*, 889 F.3d at 1319-1322; *Wi-Fi One, LLC v. Broadcom Corp.*, 887 F.3d 1329, 1340–41 (Fed. Cir. 2018); *Samsung Electronics Co. Ltd. v. Netlist Inc.*, IPR2022-00615, Paper 64 at 22-26 (PTAB, June 30, 2023).

- No evidence showing that any prior litigant is in privity with Petitioner

  Worlds Inc. v. Bungie, Inc., 903 F.3d 1237, 1242–44 (Fed. Cir. 2018)

Reply, Paper 62 (-01242), 26-28;
Reply, Paper 61 (-01243), 26-28;
Reply, Paper 61 (-01244), 20-22;
Order Denying Director Review, Paper 44 (-01242), Paper 43 (-01243, -01244)

Greenthread's arguments have already been rejected by the Board and during Director Review

It would be fundamentally unfair to allow Patent Owner to manufacture privity between Petitioner and a prior litigant

- Patent Owner's privity arguments rest on idea that ***PO's*** agreement with RPX created a time bar for Petitioner
- Petitioner was a stranger to the RPX agreement and a stranger to the prior litigations

➢ **Petitioner should not be denied its day in court because of PO's conduct**

Reply, Paper 62 (-01242), 26-28;
Reply, Paper 61 (-01243), 26-28;
Reply, Paper 61 (-01244), 20-22

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