United States District Court,
E.D. Texas, Marshall Division.

POWER MOSFET TECHNOLOGIES, L.L.C,
Plaintiff.
v.
(1) SIEMENS AG, a German Corporation, (2) Infineon Technologies Corporation, a Delaware Corporation, (3) SGS-Thompson Microelectronics N.V., a Netherlands Corporation, (4) STMicroelectronics, Inc., (5) STMicroelectronics (RB), Inc., a Delaware Corporation, (6) SGS-Thomson Microelectronics, Inc., a Delaware Corporation (7) International Rectifier Corporation, a Delaware Corporation, (8) International Rectifier Corporation, North Carolina, a North Carolina Corporation,
Defendants.

No. 2:99-CV-168

April 23, 2001.

Jay P. Kesan, Asst. Professor of Law Univ of Illinois College of Law, Champaign, IL, Pro Se.

Carl R. Roth, Law Office of Carl R. Roth, Marshall, TX, Alfonso Garcia Chan, Michael Wayne Shore, Akin Gump Strauss Hauer & Feld, Dallas, TX, Allen M. Sokal, IV and Donald R. Dunner, Smith R. Brittingham, IV, Finnegan Henderson Farabow Garrett & Dunner, Washington, DC, Edward Lewis Hohn, Nix Patterson & Roach, Daingerfield, TX, for Plaintiffs.

Gilbert Irvine Low, Orgain Bell & Tucker, Beaumont, TX, Robert Martin Chiaviello, Jr., Fulbright & Jaworski, Jeffery Derek Baxter, Baker Botts, Jane Politz Brandt and Bruce S. Sostek, Thompson & Knight, James Patrick Bradley, Li Chen, Sidley Austin Brown & Wood, Dallas, TX, Neil P. Sirota, Robert Neuner, Baker Botts LLP, New York, NY, Nicholas H. Patton, Patton & Tidwell, Damon Michael Young, John Michael Pickett and Lance Lee, Young Pickett & Lee, Texarkana, TX, Hubert Oxford, III, Benckenstein & Oxford, Michael Keith Eaves, Spain Calvert & Eaves, Robert William Craft, Jr., Beaumont Foundation of America, Beaumont, TX, David E. Killough, Vinson & Elkins, L.L.P., Austin, TX, for Defendants.

ORDER

FOLSOM**, J.**

By order dated June 27, 2000. issues regarding patent construction were referred to Professor Jay P. Kesan for report and recommendation, pursuant to Rule 53 of the Federal Rules of Civil Procedure. Professor Kesan's completed report was forwarded to the parties January 31, 2001 and then filed March 12, *see* Doc. No. 308. Objections to the report were heard by the Court March 22. Having reviewed the report and pertinent law. the Court ADOPTS Professor Kesan's report with the following supplementation and modification.

The term "contacting" in independent claim 11 as in "contact layer contacting all said first semiconductor regions and said second semiconductor regions ..." is defined as "permitting or enabling contact." Claim 11 of the Chen patent is drawn generally to a semiconductor power device and covers several embodiments. One set of embodiments (e.g., Fig.4) shows the contact layer touching the first and second semiconductor regions. But another embodiment (see Fig. 8) shows the contact layer being separated from the first sand second semiconductor regions by other layer(s). Construing "contacting" as being restricted to physically touching would improperly read some embodiments into claim 11, and thereby, improperly limit its scope. *See,* Ekchian v. Home Depot, Inc., 104 F.3d 1299, 1302-03 (Fed.Cir.1997).

It is so ordered.

REPORT AND RECOMMENDATIONS OF THE SPECIAL MASTER REGARDING CLAIM CONSTRUCTION

KESAN, J.

I. INTRODUCTION

This patent infringement case involves a patent relating to power semiconductor technology, U.S. Patent No. 5,216,275 (the "Chen Patent"). Plaintiff Power MOSFET Technologies, L.L.C. ("PMT") asserts that defendant Infineon Technologies Corp. ("Infineon") infringes claims 11 through 16 of the Chen Patent, and defendant STMicroelectronics, Inc. ("ST") infringes claims 11 through 13 of the Chen Patent. Each defendant denies infringement. Defendant Infineon further alleges that claims 1-10, 12, 15, and 17-19 are not infringed and/or invalid and that claims 1-19 are unenforceable.

On August 28-29, 2000, a *Markman* hearing was held before Special Master Jay Kesan to consider the five limitations in the claims of the Chen Patent which remain in dispute between the parties. This report addresses the interpretation of those five terms, namely "contact layer," "voltage sustaining layer," "contacting," "interface" and "nonuniform."

II. CLAIMS AT ISSUE

A. Independent Claim 11

A semiconductor power device comprising:

a first *contact layer* of a first conductivity type;

a second *contact layer* of a second conductivity type; and

a *voltage sustaining layer* between said first and second *contact layers,* said voltage sustaining layer comprising first semiconductor regions of the first conductivity type and second semiconductor regions of a second conductivity type, said first and second semiconductor regions being alternately arranged,

the first *contact layer contacting* all said first semiconductor regions and said second semiconductor regions to form a first *interface,*

the second *contact layer contacting* with all the first and second semiconductor regions to form a second *interface*

wherein the first and second semiconductor regions are doped with dopants

and the effective dopant distribution in every region in the *voltage sustaining region* is *non-uniform,* the dopant concentration in the first semiconductor regions is greater near the first *contact layer* than near the second *contact layer* and the dopant concentration in the second semiconductor regions is greater near the *second contact* layer than near the first *contact layer*.

Chen Patent, col. 7, ln. 58 to col. 8, ln. 14 (emphases added).

B. Dependent Claim 12

The semiconductor device of claim 11,
wherein the first *contact layer* is an n+ layer,

the second *contact layer* is a p+ layer,

the first semiconductor regions are n regions doped with donors and

the second semiconductor regions are p regions doped with acceptors.

Chen Patent, col. 8, ln. 15-19.

C. Dependent Claim 13

The semiconductor device of claim 11,
wherein the doped first *contact layer* is a p+ layer,

the second *contact layer* is an n+ layer,

the first semiconductor regions are p regions doped with acceptors and

the second semiconductor regions are n regions doped with donors.

Chen Patent, col. 8, lines 20-25.

D. Independent Claim 14

A semiconductor power device comprising:

a first *contact layer* of a first conductivity type;

a second *contact layer* of a second conductivity type; and

a *voltage sustaining layer* between said first and second *contact layers,* said *voltage sustaining layer*

comprising first semiconductor regions of the first conductivity type and second semiconductor regions of a second conductivity type which are alternately arranged,

the first *contact layer contacting* all said first semiconductor regions and said second semiconductor regions to form a first *interface,*

the second *contact layer contacting* with all the first and second semiconductor regions directly to form a second *interface*

wherein said first and second *interface* are parallel to each other

and wherein the first and second semiconductor regions are shaped in a manner that in a cross-section of the *voltage sustaining layer* parallel to the first and second *interface,* one of the first semiconductor regions and one of the second semiconductor regions form a close packed hexagonal unit,

the first semiconductor region is within a circle about the center of the close-packed hexagonal unit and

one of said second semiconductor regions is outside the circle.

Chen Patent, col. 8, lines 26-51.

E. Dependent Claim 15

The semiconductor device of claim 14,
wherein the first *contact layer* is an n+ layer,

the second *contact layer* is a p+ layer,

the first semiconductor regions are n regions

and the second semiconductor regions are p regions.

Chen Patent, col. 8, ln. 52-56.

F. Dependent Claim 16

The semiconductor device of claim 14,
wherein the first *contact layer* is a p+ layer,

the second *contact layer* is an n+ layer,

the first semiconductor regions are p regions

and the second semiconductor regions are n regions.

Chen Patent, col. 8, lines 57-61.

III. LAW OF CLAIM INTERPRETATION

The following canons of claim interpretation set forth the legal framework for the analysis presented in Section IV of this report.

A. Evidence

In construing claim language, there are two types of evidence a court may consider, intrinsic evidence and extrinsic evidence. Vitronics Corp. v. Conceptronic, Inc., 90 F.3d 1576, 1582 (Fed.Cir.1996). Intrinsic evidence consists of the patent claims, specification, and prosecution history, including arguments and amendments. *Id*. "Extrinsic evidence is that evidence which is external to the patent and file history, such as expert testimony, inventor testimony, dictionaries, and technical treatises and articles." *Id*. at 1584.

"It is well-settled that, in interpreting an asserted claim, the court should look first to the intrinsic evidence of record...." *Id*. at 1582. Extrinsic evidence is admissible at the trial court's discretion, Key Pharms., Inc. v. Hercon Labs. Corp., 161 F.3d 709, 716 (Fed.Cir.1998), but should be considered only if analysis of the intrinsic evidence fails to resolve the disputed term, Vitronics, 90 F.3d at 1582. "This evidence may be helpful to explain scientific principles, the meaning of technical terms, and terms of art that appear in the patent and prosecution history." Markman v. Westview Instruments, Inc., 52 F.3d 967, 980 (Fed.Cir.1995) (en banc), *aff'd,* 517 U.S. 370, 116 S.Ct. 1384, 134 L.Ed.2d 577 (1996). It may also help to demonstrate the state of the prior art at the time of the invention. *Id*. However, it cannot be used to vary or contradict the claim language or specification. Vitronics, 90 F.3d at 1584. To the extent that extrinsic evidence teaches a claim construction inconsistent with the intrinsic evidence, a court is free to ignore such extrinsic evidence. Markman, 52 F.3d at 983.

Although extrinsic, "[a] dictionary is not prohibited extrinsic evidence, and is an available resource of claim construction," Vanguard Prods. Corp. v. Parker Hannifin Corp., 2000 WL 1827708 3 FN1 (Fed.Cir.2000), which, along with technical treatises, a judge may consult at any time, Vitronics, 90 F.3d at 1584 n6. "Although a dictionary definition may not enlarge the scope of a term when the specification and the prosecution history show that the inventor, or recognized usage in the field of the invention, have given the term a limited or specialized meaning, a dictionary is often useful to aid the court in determining the correct meaning to be ascribed to a term as it was used. *Vanguard* at 3. The Federal Circuit has cautioned, though, against transforming dictionary definitions into technical terms of art with legal significance by explaining that:

FN1. *Vanguard* has not yet been printed in the U.S.P.Q. The page number cited represents the page number from the Westlaw printout.

The best source for understanding a technical term is the specification from which it arose, informed, as needed, by the prosecution history. The evolution of restrictions in the claims, in the course of examination in the PTO, reveals how those closest to the patenting process-the inventor and the patent examiner-viewed the subject matter.
Multiform Dessicants, Inc. v. Medzam Ltd., 133 F.3d 1473, 1478 (Fed.Cir.1998).

B. Analysis

An overriding rule of claim construction is that, when possible, claim terms should be construed so as to preserve the validity of the patent. Modine Mfg. Cov. v. U.S. Int'l Trade Comm'n, 75 F.3d 1545, 1557 (Fed.Cir.1996).

Claim Terms: Since "[i]t is the claims that define the claimed invention," Constant v. Advanced Micro-Devices, Inc., 848 F.2d 1560, 1571 (Fed.Cir.1988), "[u]nder proper claim construction methodology, we look first to the language of the claims." Mantech Envtl. Corp. v. Hudson Envtl. Servs., Inc., 152 F.3d 1368, 1373 (Fed.Cir.1998). Both asserted and nonasserted claims terms are considered, and they are generally given their ordinary meaning. Vitronics, 90 F.3d at 1583. However, "a patentee may choose to be his own lexicographer and use terms in a manner other than their ordinary meaning, as long as the special definition of the term is clearly stated in the patent specification or file history." Id. at 1582. If the word is a technical term, it "is interpreted as having the meaning that it would be given by persons experienced in the field of the invention, unless it is apparent from the patent and the prosecution history that the inventor used the term with a different meaning." Hoechst Celanese Corp. v. BP Chems. Ltd., 78 F.3d 1575, 1578 (Fed.Cir.1996).

Regarding how claims relate to one another for purposes of claim construction, each claim defines a separate invention. Jones v. Hardy, 727 F.2d 1524, 1528 (Fed.Cir.1984). Where some claims are narrow and others are broader, the limitations from the narrow claims cannot be read into the broader claims. Marsh-McBirney, Inc. v. Montedoro-Whitney Corp., 882 F.2d 498, 504 (Fed.Cir.1989) Thus, "[i]t is improper for courts to read into an independent claim a limitation explicitly set forth in [a dependent claim]." Envtl. Designs Ltd. v. Union Oil Co. of California, 713 F.2d 693, 699 (Fed.Cir.1984).

Specification: Next, the specification must be considered to determine whether it supports the ordinary meaning of the claims. Johnson Worldwide Assoc., Inc. v. Zebco Corp., 175 F.3d 985, 989 (Fed.Cir.1999); Vitronics, 90 F.3d at 1582. Although "claims must be read in view of the specification," Markman, 52 F.3d at 979, "a construing court does not accord the specification, prosecution history, and other relevant evidence the same weight as the claims themselves, but consults these sources to give the necessary context to the claim language." Eastman Kodak Co. v. Goodyear Tire & Rubber Co., 114 F.3d 1547, 1552 (Fed.Cir.1997). The specification can alter the plain meaning of the claim terms only if (1) the inventor clearly uses a term in the specification in a manner inconsistent with its ordinary meaning, or (2) the terms in the claims remain unclear. *Johnson* at 990. However, when the specification does define a term, expressly or by implication, it serves as a dictionary for that term. Vitronics, 90 F.3d at 1582.

Between the written description and the claims, though, it is always the claims that delimit the right to exclude. Markman, 52 F.3d at 980. "[A]s a general matter, the claims of a patent are not limited by preferred embodiments." CVI/Beta Ventures, Inc. v. Tura LP, 112 F.3d 1146, 1158 (Fed.Cir.1997). "Although the specification may aid the court in interpreting the meaning of disputed language in the claim, particular embodiments and examples appearing in the specification will not generally be read into the claims." Constant, 848 F.2d at 1571.

Prosecution History: The last item of intrinsic evidence a court may consider is the prosecution history, which is the complete record of all proceedings relating to the patent at issue before the Patent and Trademark Office, including any cited prior art. Vitronics, 90 F.3d at 1582-83. "Although the prosecution history can and should be used to understand the language used in the claims, it too cannot 'enlarge, diminish, or vary' the limitations in the claim." Markman, 52 F.3d at 980. However, "the prosecution history limits the interpretation of claim terms so as to exclude any interpretation that was disclaimed during prosecution." Southwall Tech., Inc. v. Cardinal IG Co., 54 F.3d 1570, 1576 (Fed.Cir.1995).

Arguments distinguishing amended claims over prior art provide public notice of the scope of those claims

because when "an applicant is indicating what the claims do not cover, he is by implication surrendering such protection." Ekchian v. Home Depot, Inc., 104 F.3d 1299, 1304 (Fed.Cir.1997). Therefore, prosecution history estoppel bars expanding the claims beyond limitations added to distinguish over prior art. *Id*. In addition, there is also the idea that an element need not be explicitly described in a certain prior art device for the same element in a claimed invention to read upon that prior art, if it would be understood by one of ordinary skill in the art that the prior art device would inherently contain the element. *See* Hazani v. U.S. Int'l Trade Comm'n, 126 F.3d 1473, 1477 (Fed.Cir.1977).

Under the Federal Circuit's recent ruling in Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co., 234 F.3d 558 (Fed.Cir.2000), any amendment, including a voluntary or "unexplained" amendment, that narrows the scope of a claim for any reason related to patentability (including the requirements of s. 112) will give rise to prosecution history estoppel with regard to the amended element. *Id*. at preamble; s. III.A. "[W]hen a claim amendment creates prosecution history estoppel, no range of equivalents is available for the amended claim element." *Id*.

Extrinsic Evidence: If the meanings of the disputed claim terms remain unresolved after examination of the intrinsic evidence and dictionaries, a court can turn to extrinsic evidence for further clarification. Vitronics, 90 F.3d at 1582. In this case, however, the Special Master was able to ascertain the meanings of the disputed terms with only the aid of the intrinsic evidence and technical dictionaries. Therefore, the details of the rules governing use of extrinsic evidence are not further discussed.

C. The Fundamental Dispute Between the Parties

The parties claim to base their arguments upon only intrinsic evidence, except for dictionaries. [R. 12 at 7-9; R. 98 at 17-20].FN2 During the *Markman* hearing, though, the parties accused each other of trying to backdoor extrinsic evidence, particularly the alleged infringing devices. (R. 140 at 9 to 142 at 10). In addition, PMT submitted deposition testimony, and two articles and a power point presentation authored by Professor Chen. However, the Special Master did not find it necessary to rely upon any evidence other than the intrinsic evidence and technical dictionaries to construe the disputed claim terms.

FN2. The "R" in the citation refers to the transcript of the *Markman* hearing. The first number references the page number, and the numbers following the "at" reference the line numbers.

Although the parties also disagree over various other technical points of claim construction, the fundamental dispute between the plaintiff and the defendants is over the weight the Court should properly accord to terms in the claims versus definitions, explanations and examples found in the specification. In a nutshell, PMT asserts that the Court should not look beyond the claims unless the claim terms are ambiguous or to check for special definitions, (R. 13 at 21; R. 14 at 13-15), while defendants assert that the Court cannot "treat the claims in a vacuum" and must read them in context with the specification, drawings and cited prior art, (R. 99 at 1-8).

In support of its position that the claims should be accorded primacy and, if unambiguous, the Court should examine the specification only to determine if the inventor used a special definition different from an ordinary one, PMT relies on the principle that, "[i]t is the claim that sets the metes and bounds of the invention entitled to the protection of the patent system." Zenith Labs., Inc. v. Bristol-Myers Squibb Co., 19 F.3d 1418, 1424 (Fed.Cir.1994). PMT contends that, although claims are read in view of the specification,

"particular embodiments appearing in a specification will not be read into the claims." Electro Med. Sys., S.A. v. Cooper Life Sciences, Inc., 34 F.3d 1048, 1054 (Fed.Cir.1994). Further, "[t]he written description part of the specification itself does not delimit the right to exclude. That's the function and purpose of claims. Although the prosecution history can and should be used to understand the language used in the claims it, too, cannot enlarge, diminish or vary the limitation in the claim." Markman, 52 F.3d at 979. PMT also directs the Court to *Harmon:*

Thus claims are always construed in light of the specification, but that does not mean that the claims incorporate all the disclosures of the specification. While examples disclosed in the preferred embodiments may aid in the proper interpretation of a claim term, the scope of the claim is not necessarily limited by such examples.

ROBERT L. HARMON, HARMON'S PATENTS AND THE FEDERAL CIRCUIT s. 5 .6(c) (4th ed.1998). In sum, it is PMT's position that in construing a claim, one "can only put the specifications or figures into the claims if the claim specifically incorporates them by reference." [R. 16 at 10-12].

Infineon, on the other hand, argues that PMT is misinterpreting the case law to suggest that claim construction analysis begins and ends with the language of the claims, and intrinsic evidence should be ignored (R. 99 at 1-8; Infineon Resp. Br. at 4). Infineon quotes *Vitronics:* "the specification is always highly relevant to the claim construction analysis," and "it is the best guide to the meaning of a disputed term." Vitronics, 90 F.3d at 1582. Infineon also reminds the Court that a patentee can be his own lexicographer, and if he has defined a term in the specification in a way that differs from its ordinary meaning, then the patentee's meaning supercedes. (R. 96 at 13-16; R. 99 at 14-18; Infineon Resp. Br. at 4). Infineon asserts that, in this case, "contact layer" and "voltage sustaining layer" "have no ordinary meaning and must be construed based on a meaning derived from the specification." (Infineon Resp. Br. at 4). Infineon denies PMT's assertion that limitations from the specification or figures can be incorporated into the claims only by express reference. (R. 100 at 3-5). However, Infineon contends that it is not reading limitations from the specifications into the claims, but is instead only relying on the specification to "construe limitations that are already recited in the claims." (Infineon Resp. Br. at 6). Finally, Infineon contends that, as a matter of policy, "when a claim term can reasonably be given two meanings, and neither the specification nor the file history provides a clear basis for selecting one or the other, a court should adopt the *narrower* meaning on the ground that the patentee is ultimately responsible for the ambiguous claim language." (Infineon Resp. Br. at 6) (emphasis in original). Infineon asserts that permitting the patentee to adopt the broader meaning would undermine the public notice function of a patent.FN3 *Id.*

FN3. At the *Markman* hearing, ST did not give a separate presentation on the law of claim construction, and adopted Infineon's statement of the applicable law. (R. 133 at 10-12).

IV. DISPUTED CLAIM LIMITATIONS

A. Contact Layer

1. Plaintiff's Interpretation

Plaintiff PMT asserts that "contact layer" should be defined as "a component, element, region, layer, or zone

capable of 'electrical contact', *i.e.,* co-acting with other electrical components, elements, regions, layers or zones to enable the flow of current to complete or interrupt a circuit." (R. 20 at 17-21). More specifically, PMT asserts that a layer may have many differently doped sublayers, as long as all perform the same function and are of the same conductivity type (*i.e.,* n or p). (R. 28 at 8 to 29 at 4).

PMT first argues that this definition is required by the unambiguous language of claim 11. (R. 18 at 16; 23 at 1-2) (referencing Chen Patent, col. 7, ln. 59-61). Nevertheless, PMT also offers support from the prosecution history, arguing that 'layers' and 'regions' are interchangeable and that horizontal regions from the original application were recast as layers simply to make the invention easier for the examiner to understand. (R. 23 at 11 to 24 at 5) (comparing original claim 1 to issued claim 1 and the patentee's Remarks that the changes were made to "better claim the present invention," Amendment at 9). Thus, "lateral structures above and below the voltage sustaining layer are layers and [vertical] structures in the voltage sustaining layer are regions." (R. 24 at 1-4). PMT asserts that embodiments in the specification disclose that a "layer" need not be of a single thickness, nor contiguous, nor continuous. (R. 24 at 18 to 25 at 4; PMT Resp. Br. at 7-8) (referencing Chen Patent Figures 1, 4-6, and 8-9). Thus, PMT asserts that a layer can be composed of many sublayers. (R. 28 at 9-10).

Regarding conductivity, PMT denies that the contact layers described in the Chen Patent are limited to p+ and n+ contact layers because the claim language speaks only of a "conductivity type," meaning genus p-type or n-type, and does not specify a particular species of conductivity. (R. 26 at 20 to 27 at 22; R. 234 at 12-24). Further, PMT points out that as originally filed, the first and second contact layers were called regions, and all regions were disclosed as either p-type or n-type or simply as the species p or n. (R. 23 at 2-9) (referencing, *e.g.,* original claim 1, Application at 15). PMT concedes that no contact layer described in the specification is other than p+ or n+, but argues that an absence of an embodiment in the specification does not build a limitation into the claims. (R. 233 at 4-12).

Thus, PMT argues that "contact" layer should be defined in terms of its function (contact) and so may include several components in one functional area, as long as everything has the same conductivity type and same function. (R. 28 at 8 to 29 at 4; R. 72 at 1-7; R. 234 at 25 to R. 235 at 11). PMT offers, by way of example of a "contact layer," items 3 and 4 from Figure 4 of the Chen Patent. (R. 73 at 19-24). PMT concedes, however, that item 2 would not be included in the "contact layer" because it is of a different conductivity type. (R. 71 at 25 to R. 72 at 1-4).

PMT urges the Court to reject defendants' proposed definitions first on the ground that a heavy doping requirement violates the doctrine of claim differentiation. (R. 231 at 22-23). Specifically, PMT contends that if the Court were to adopt a heavy doping limitation on "contact layer", claim 11 would be indistinguishable from claims 12 and 13, and claim 14 would be indistinguishable from claims 15 and 16. (R. 231 at 24 to R. 232 at 15). PMT asserts that defendants' rebuttal that claim 13 can be distinguished from claim 11 because claim 13 includes a specific polarity fails because it does not take into account claim 12, which specifies the opposite polarity. (R. 300 at 11-23). PMT thus contends that dependent claims 12 and 13, considered as a pair, cannot be differentiated from independent claim 11. *Id.*

PMT asserts that Chen's attack on breakdown voltage in the patent can only be reconciled with a general p-type or n-type contact layer. (R. 233 at 18-22). PMT rebuts defendants' argument that its proposed definition is indefinite by pointing out that "contact layer" in the claims is always accompanied by language specifically locating it within the device relative to the voltage sustaining layer. (R. 235 at 12 to R. 236 at 5) (referencing, *e.g.,* Chen Patent, col. 7, ln. 62-63). PMT distinguishes "contact layer" from "voltage

sustaining layer" on the basis that prior art devices contain components that are not heavily doped, but which nevertheless are part of the contact layer because they take on charge from an outside source when the device is turned on. (R. 236 at 14 to 237 at 8) (referencing Coe Patent, Figure 13). PMT explains that it is a predominant function test: if the structure functions predominantly to avoid breakdown, then it is a contact layer; if it function predominantly to sustain voltage, then it is a voltage sustaining layer. (R. 237 at 3-8). In the alternative, PMT distinguishes "contact layer" from voltage sustaining layer on the basis that the voltage sustaining layer must contain alternating regions; therefore, everything above and below the area of alternating regions is contact layer. (R. 230 at 20 to R. 231 at 2) (referencing, *e.g.,* Chen Patent, col. 7, ln. 66-68).

In rebuttal of Infineon's contention that a layer must be continuous and extend over the entire device, PMT directs the Court to the figures in Chen depicting processed devices, like Figure 4, and notes that Chen describes these figures as representing his invention, and points out that they contain discontinuous contact layers. (R. 295 at 1-22) (referencing Chen Patent, col. 5, ln. 19-20; col. 5, ln. 50-51). Noting that the terms "continuous" or "uninterrupted" do not appear in the patent, PMT further points out that the contact layers are uninterrupted when deposited and argues that they do not have to remain uninterrupted in the finished device. (R. 296 at 17-21; R. 295 at 8-10) (referencing, *e.g.,* Chen Patent, col. 5, ln. 56-67). PMT rebuts Infineon's argument regarding the use of "layer" in association with unprocessed devices (*i.e.,* Chen, Figures 2 & 7) versus the use of "regions" with processed devices (*i.e.,* Chen, Figures 4, 5, & 6) on the ground that the difference goes back to the original filing and illustrates that the drafter meant the terms to be interchangeable but, just to make the orientation easier to understand, recast vertical areas as "regions" and horizontal areas as "layers." (R. 295 at 23 to 296 at 14; R. 298 at 14-23). Finally, PMT contends that Infineon's position regarding "contact layer" is inconsistent with its position on "voltage sustaining layer", which Infineon accepts as being made up of multiple regions. (R. 297 at 1-4).

In rebuttal of defendant ST's arguments under *Festo,* PMT argues that *Festo* is inapplicable to the construction of the disputed claim terms because *Festo* does not alter literal infringement analysis, and PMT seeks only a literal interpretation, not any equivalency. (PMT Resp. to ST *Festo* Br. at 2, 4) (citing *Festo,* 56 U.S.P.Q.2d at 1-6). PMT argues that claim terms are to be construed from the viewpoint of one of ordinary skill in the art, not from narrow definitions culled from lay dictionaries, and that *Festo* does not teach otherwise. (*Id*. at 2-3). Specifically, PMT argues that "contact layer" is literally understood in the art of semiconductor technology as not necessarily continuous, and "contacted all" is literally understood to denote electrical and/or physical relationships. (*Id*. at 5). Finally, PMT argues that *Festo* is also inapplicable in this case because it requires that the prosecution history "reflect a clear and unmistakable surrender of subject matter," and PMT asserts that the prosecution history is completely devoid of any such assertion. (*Id*. at 6) (quoting *Festo,* 56 U.S.P.Q.2d at 14, s. III.B) (internal punctuation omitted).

2. Defendants' Interpretation FN4

FN4. To the extent that the parties may have changed their positions about the meanings of some of the disputed claim terms, the Special Master has ignored earlier positions and focused instead on the parties' latest positions, represented by the arguments pressed during the August 28-29, 2000 *Markman* hearing. Although the Special Master restates some of the parties' latest and most relevant arguments regarding the disputed claim terms, this is not intended to be exhaustive. However, all of the arguments from the three rounds of pre-hearing briefing, the arguments presented at the *Markman* hearing, and the *Festo* supplemental briefing have been considered in this recommendation.

Because independent claim 14 has been asserted against Infineon, but not against ST, Infineon's proposed definition contains elements additional to ST's proposed definition, and Infineon presents arguments in addition to the defendants' common arguments. A hybrid definition incorporating the elements common to both defendants would be, "a heavily doped layer forming an interface with the voltage sustaining layer." FN5 Defendants' common arguments are addressed first, followed by Infineon's definition and additional arguments.

FN5. Infineon's specific proposed definition is, "a single thickness of n+ or p+ semiconductor material lying over or under the voltage sustaining layer." (R. 105 at 7-10). ST's specific proposed definition is, "a heavily doped layer forming an interface with the voltage sustaining layer and extending to an external surface of the semiconductor material." (ST slide # 41).

Regarding conductivity, defendants argue that a "contact layer" must be heavily, as opposed to lightly, doped because a lightly doped layer would sustain voltage, *i.e.*, have the same function as the voltage sustaining layer. (R. 107 at 10-25; R. 183 at 10-24). Thus, if a lightly doped condition were included in the definition of "contact layer," there would be no functional difference between the terms "contact layer" and "voltage sustaining layer." (R. 107 at 10-15; R. 183 at 10-24). Defendants also point out that all the embodiments in the Chen Patent, such as Figure 7, items 4 and 8, illustrate a heavily doped layer. (R. 107 at 15-19; R. 184 at 9-11). Further, Infineon claims that the only conductivity species discussed throughout the specification are the n+ and p+ species; there is no mention of n or p, or-or players. (R. 109 at 12-16). Finally, defendants urge that the Court reject PMT's proposed definition as vague or overbroad in that "capable of electrical contact" would describe every structure in the device. (R. 117 at 5-12; R. 184 at 15 to 185 at 6). Therefore, that definition would not enable one to differentiate a "contact layer" from any other structure in the device and thus read "contact layer" out of the claims, violating the principle that every word in a claim has meaning. *Id*. Defendants rebut PMT's contention that their proposition that a contact layer must be heavily doped violates the principle of claim differentiation on the ground that claim 13 imposes a further limitation over claim 11 in that it identifies the specific polarity of the conductivity types. (R. 285 at 18-25).

In addition to those elements of a proposed definition it asserts in common with ST, Infineon further asserts that a contact layer should be defined as "a single thickness of n+ or p+ semiconductor material." (R. 105 at 7-10). Infineon distinguishes "layer" from "region," FN6 by taking "region" to mean "a generic term for any structure on a semiconductor." (R. 111 at 14-15). In Infineon's understanding, "all layers are regions," but "only regions that extend across the entire device can be layers." (R. 112 at 5-6). By way of illustration, Infineon offers Figure 4, item 4 of the Chen Patent as an example of a layer and Figure 4, item 3, as an example of a region. (R. 112 at 10-14). Regarding the composite buffer layer (referred to in the Chen patent as the CB-layer), which it describes as comprising alternating regions of opposite conductivity, Infineon contends that "layer" does not imply a single conductivity type and can be constructed of regions. (R. 271 at 13-22). Therefore, its definition of "contact layer" does not conflict with its definition of "voltage sustaining layer." (R. 270 at 21 to 271 at 12).

FN6. ST denies PMT's assertion that it proposes that a "contact layer" must physically touch the voltage sustaining layer. (R. 185 at 17-24; R. 199 at 4-19).

In support of its proposition that a "layer" should be restricted to a single thickness, Infineon points first to the amendment made during prosecution of the Chen Patent wherein the inventor added the term "layer," and, defendant contends, adopted Figure 7 as the embodiment properly illustrating "layer." (R. 105 at 23 to 106 at 2). Prior to amendment, the patent contained no reference to "layer," only to "regions," (R. 105 at 1-4), and Infineon argues that the inventor knew that the terms were not interchangeable and intentionally chose to use the ordinary, and narrower, meaning of "layer." (R. 110 at 8-12). Since the change was made in an amendment responding to a rejection of all the original patent claims in light of prior art, Infineon argues that it is implicit that the change was made specifically to overcome prior art. (R. 106 at 11-21; R. 107 at 1-9; R. 116 at 17-24). Thus, by choosing to designate the areas above and below the voltage sustaining layer as a "layer," Chen gave up the broader meaning of "region." (R. 105 at 2 to 107 at 8; R. 273 at 13-18). Infineon urges the Court to adopt the ordinary and plain meaning of "layer": "one thickness, course, or fold laid or lying over or under another." (Infineon Br. at 10) (citing WEBSTER'S NEW COLLEGIATE DICTIONARY (9th ed.1975)). Infineon points out that all of the claims refer to a contact layer in the singular, rather than the plural, form, whereas original claims had referred to "regions" in the plural. (R. 265 at 17-24). Finally, Infineon points out that the embodiments show only a single thickness "layer," such as items 4 and 8 of Figure 7, (R. 110 at 19-22), and that the examiner chose Figure 7-showing a single thickness "layer"-to put on the patent cover as representative of the invention, (R. 115 at 23-25).

In support of its proposition that a layer must extend horizontally over the entire device, Infineon points to the descriptions in claims 11 and 14 of the "contact layers" contacting all the first and second regions of the voltage sustaining layer. (R. 266 at 19-20; R. 270 at 1-5) (referencing Chen Patent, col. 7, ln. 68 to col. 8, ln. 5). Infineon contends that only two figures in the Chen Patent illustrate an arrangement where the second contact layer (*i.e.,* item 8) contacts all the regions, and those are Figures 2 and 7. (R. 267 at 10-19).

In addition to the arguments it pressed at the *Markman* hearing, Infineon submitted supplemental briefing arguing that the Federal Circuit's recent ruling in Festo FN7 mandates adoption of its proposed definition of "contact layer." In sum, Infineon argues that the addition by amendment of the elements "layer" and "all" narrowed the scope of "contact layer" from a meaning that, as originally filed, arguably could have been construed to include discontinuous regions 2 and 3 in Figure 5 to one that, in the claims as issued, can only include a continuous layer like that represented by items 4 and 8 in Figure 7. (Infineon Supp. Br. at 1, 5-6). Specifically, Infineon argues that substitution of the singular "layer" for the plural "regions" eliminates the possibility that the first and second contact layers can be made up of more than one element (*i.e.,* discontinuous), or of more than one conductivity type. *Id.* at 7. In addition, Infineon asserts that the substitution of "contacting all" or "contacting with all" for "contacted with" to describe the interfaces between the first and second contact layers and the voltage sustaining layer restricts the formation of those interfaces to "continuous and uninterrupted contact of the respective first and second layers with the alternating p and n regions of the CB-layer" because the adjective "all" requires continuous contact and, under *Festo,* precludes any equivalency (*i.e.,* discontinuity). *Id.*

FN7. Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co., Ltd., 234 F.3d 558, 56 U .S.P.Q.2d 1865 (Fed.Cir. Nov.29, 2000).

3. Recommended Interpretation

The Special Master recommends that "contact layer" FN8 be defined as "the semiconductor material between the metal contacts and the voltage sustaining layer that is designed to perform two contacting

functions: (a) permit ohmic contacts to be formed at the terminals (e.g., the source or emitter contacts) and (b) provide a connection between the metal contacts FN9 and the voltage sustaining layer such that the reverse voltage across the device terminals is sustained primarily FN10 across the voltage sustaining layer." (*See, e.g.,* Chen Patent, col. 5, ln. 56-61; col. 6, ln. 22-26 and ln. 33-36; col. 1, ln. 13-16).

FN8. The discussion of "contact layer" and "contacting" is very limited in the patent specification because the focus of the patent is on the point of novelty of the invention, the design of the CB-layer.

FN9. For example, the source contacts in the MOSFET devices and the emitter contacts in the bipolar devices.

FN10. It is well known to one of ordinary skill in the art that there will be some voltage drop across the ohmic contacts and the contact layers.

Contact layer is defined in terms of the function that it performs in the device. The "contact layer" may include multiple regions that need not be continuous or contiguous, or even of the same conductivity type, unless so limited by the claims.FN11 This is illustrated by the different embodiments in the specification, where the "contact layer" is designed differently in the various embodiments but performs the specific functions outlined above, regardless of whether the embodiment is a vertical MOSFET, a bipolar transistor, or a static induction transistor. For example, see regions 3 of the contact layers in Figs. 4, 5 and 6, and region 11 in Fig. 8, all of which are discontinuous, and the contact layers in Figs. 2 and 7 which are continuous.

FN11. Note that the claims of the Chen Patent do specifically limit a contact layer to a single conductivity type. (*See, e.g.,* Chen Patent, col. 7, ln. 59-60; col. 8, ln. 27-28).

In the field of semiconductor technology, a layer is commonly understood to mean semiconductor material that is disposed onto a semiconductor substrate or created by standard semiconductor processing techniques, such as epitaxy, diffusion, or implantation. When a layer is processed, for example, by etching followed by oxide deposition, it becomes further defined into regions. FN12 Because a layer is so processed into these regions, however, does not mean that layer ceases to have any meaning. These processed regions are part of the same layer. Such an understanding of layer is consistent with how that term is used in the patent in connection with the terms "contact layer" and "voltage sustaining layer," as both are layers that are further processed so that, internally, they are made up of regions. (Chen Patent, col. 5, ln. 26-26; col. 5, ln. 32-36).

FN12. For example, in Figure 1, the patentee describes the formation of *layer* 3, then further processing it to form *regions* 2 (and so also regions 3). (Chen Patent, col. 5, ln. 24-26). Similarly, in Figure 4, the patentee describes forming *layer* 5, then further processing it into *regions* 6 and 7 of the voltage sustaining layer. (Chen Patent, col. 5, ln. 52-55).

Festo does not require a different interpretation in this situation. It is true, as Infineon states, that "an amendment that narrows the scope of a claim for any reason related to the statutory requirements for a

patent will give rise to prosecution history estoppel with respect to the amended claim element." *Festo,* 56 U.S.P.Q.2d at preamble. "[R]elated to the statutory requirements for a patent" include amendments in response to a s. 112 rejection, any voluntary amendment that narrows the scope of a claim for a reason related to patentability, and "unexplained" amendments. *Id*. The *Festo* court held that when prosecution history estoppel applies, the patentee can get no equivalents for the amended elements and is restricted to literal infringement. *Id*. Any voluntary amendment, however, must evidence an intent to surrender subject matter. *Id*. at s. III.B.

However, substituting "layer" for "regions" as the patentee did during prosecution, did not narrow the claims under the proposed understanding of those terms. The patentee's remarks accompanying the amendment make it clear that the patentee made this change to "better claim the present invention" in order to overcome the s. 112 objection. (Chen Patent, Amendment at 9). Later remarks about the additions of the non-uniform dopant distribution and dielectric layers to distinguish over Coe and Ploog in order to overcome the s. 102(b) and s. 103 rejections reinforce the conclusion that the change involving the use of "layer" was not directed to those rejections, and so the patentee was not relying on the change from "regions" to "layer" to overcome prior art. (Chen Patent, Amendment at 10).

Further, the amendments during the prosecution of the Chen patent may be deemed to have expanded the scope of the claims instead of narrowing them. In the claims which issued, the first and second contact layers are not explicitly restricted to n+ or p+ regions, as they are in the original claims. (referencing Chen Patent, original claim 1, Application at 15; issued claim 11, col. 7, ln. 59 to col. 8, ln. 6). In addition, the original claims as filed use a narrower term, "CB-layer", which is then amended to recite a broader term, "voltage sustaining layer." (compare, *e.g .,* original claim 1, Application at 15, and issued claim 11, Chen Patent, col. 7, ln. 62-63).

B. Contacting

1. Plaintiff's Interpretation

Plaintiff PMT asserts that "contacting" should be defined as "capable of electrical contact." (R. 41 at 20-21). PMT contends that "contacting" can include physically touching, but denies that it requires physically touching, (R. 45 at 8-25; R. 59 at 19-25), on the basis that then nothing could act as a buffer or intermediate between a contact layer and any of the regions in the voltage sustaining layer, (R. 38 at 5-9). PMT argues further that any requirement for physical touching is indicated in the claims by use of the phrase "*directly* contacting." (R. 41 at 22-25) (referencing Chen Patent, col. 6, ln. 59-60; Chen Patent, col. 8, ln. 38-39); *see also* R. 59 at 19-24; R. 241 at 19-22). According to PMT, if "contacting" meant only "physically touching," then "directly" would be superfluous, wherein every term in a patent has meaning. (R. 42 at 1-5). Instead, PMT asserts that almost every use of "contacting" or "contact" in the Chen Patent makes sense only in the context of electrical contact and that such meaning is necessary to be consistent with the meaning of "contact layer." (R. 42 at 25 to 43 at 18; R. 240 at 21-23). Further, PMT points out that the IEEE Dictionary defines "contact" as "conducting parts that co-act with another conducting part to make or break a circuit." (R. 43 at 19-23 (citing IEEE STANDARD DICTIONARY OF ELECTRICAL AND ELECTRONICS TERMS 185 (Frank Jay, ed. 1984) (ANSI/IEEE Std 100-1984)). Specifically, PMT contends that the phrase "contact layer contacting" does not preclude a condition where the contact layer is electrically contacting the voltage sustaining layer through a less doped intermediate layer. (R. 243 at 15 to 244 at 19).

PMT characterizes defendants' proposed construction of this term as an impermissible attempt to back-load a limitation from the specification into the claims. (R. 43 at 23-25). Plaintiff rebuts the defendants' argument

that its definition of "contacting" is indefinite on the basis that each time it is used in the claims, it is accompanied by language that structurally orients it by making clear that it means linking the voltage sustaining layer to a contact layer. (R. 241 at 9-15) (referencing Chen Patent, col. 6, ln. 56-60; col. 7, ln. 68 to col. 8, ln. 4; col. 8, ln. 35-40). Finally, PMT rebuts defendants' argument that "contacting" is limited to meaning "touching" by the prosecution history by explaining that the examiner's referenced comment can be interpreted to mean electric contact because a dielectric layer would block both physical and electric contact. (R. 44 at 15-25).

2. Defendants' Interpretation

Defendants assert that "contacting" should be defined to mean "touching." (R. 120 at 18; R. 185 at 25 to 186 at 1). They argue that the Court should reject PMT's definition on the basis that it is vague because, in an electrical device, all elements co-act with one another. (R. 120 at 20-25; R. 198 at 3-7 and ST slide # 51). Infineon explains that there is a fundamental distinction between plaintiff's and defendants' proposed definitions, that distinction being that plaintiff would have the Court adopt electrical definitions, while the defendants urge structural or physical definitions. (R. 121 at 1-4). Infineon argues for structural definitions because it regards the patent as disclosing a new *structure* of an electrical device. (R. 121 at 4-13).

Defendants also urge the Court to reject PMT's definition on the ground that it is erroneously based on how the noun "contact" is used in the patent in the context of a metal contact, and not on how the verb "contacting" is actually used in the patent. (R. 123 at 15-24; R. 185 at 21 to 186 at 1). Further, defendants argue that PMT is limited to "touching" as the definition of "contacting" because the examiner based a s. 112 rejection upon that meaning of "contacting", and Chen acquiesced because he made no attempt to correct the examiner. (R. 124 at 1-13). Finally, ST argues that the dielectric of claim 2 prevents physical contact between the first contact layer and the second semiconductor regions and this is why claim 1 omits "contacting." (Infineon Resp. Br. at 10) (referencing Chen Patent, col. 6, ln. 56-64). Therefore, "contacting" must mean physical contact. *Id*. ST argues that the use of "directly" in conjunction with "contacting" in certain of the claims does not alter this interpretation because there is no structural distinction for using it to describe the top interface. (R. 193 at 2-17).

3. Recommended Interpretation

The Special Master recommends that "contacting" be defined in terms of its relationship with the term "contact layer" as "permitting or enabling contact." Thus, "contacting" is not limited to physical contact and can also include electrical contact.

Throughout the claims, "contacting" is always used in conjunction with "contact layer" in the specific phrase "contact layer contacting," indicating that it is meant to describe the function of the "contact layer." (*See, e.g.,* Chen Patent, col. 6, ln. 56-67; col. 7, ln. 68). The term "contacting" is never used in the claims independently, without the words "contact layer" preceding it. Read in light of the disclosure, we see that this "contacting" function of the contact layer is to permit ohmic contacts at the terminals (*See, e.g.,* source "S" in Figure 4 or emitter "E" in Fig. 8) and to contact the voltage sustaining layer from either side (*i.e.,* the top and bottom side). (*See, e.g.,* Chen Patent, col. 5, ln. 56-61). This is most apparent in the inventor's description of the CB-layer and its relationship to the contact layer: "Each n-region and each p-region of the CB-layer has two surfaces *contacted* respectively with the n+-region and the p+-region." (Chen Patent, col. 2, ln. 8-10) (emphasis added). This language clearly demonstrates that "contacting" refers to the function and relationship of the contact layers to the voltage sustaining layer.

This interpretation is supported by how the term "contact" is used in the field of semiconductor technology. Specifically, "contact" is defined as, "[a] conducting part that *acts* with another conducting part to make or break a circuit." THE NEW IEEE STANDARD DICTIONARY OF ELECTRICAL AND ELECTRONICS TERMS 249 (Christopher J. Booth ed., 5th ed. 1993) (IEEE Std 100-1992) (emphasis added).FN13 As can be seen, this definition does not restrict "contact" to physical contact.

FN13. *See also* RUDOLF F. GRAF, MODERN DICTIONARY OF ELECTRONICS 148 (5th ed. 1977) ("To join two conductors or conducting objects in order to provide a complete path for current flow.").

Defendants' "slippery slope" concern that electrically contacting is too vague a meaning because, in an electrical device all elements co-act with one another, becomes irrelevant because the definition outlined above limits itself to the specific kind of "contacting" that results from the introduction of the contact layers on either side of the voltage sustaining layer. Considered in this context, "contacting" describes the function of the "contact layer", which contacts the voltage sustaining layer on one side of the contact layer and permits ohmic contacts at the other side of the contact layer. (*See, e.g.,* Chen Patent, col. 2, ln. 8-10). As noted above, the contact layer provides a connection between the terminals of the device and the voltage sustaining layer and sustains the reverse voltage applied between the device terminals, primarily across the voltage sustaining layer. In other words, "contacting" has meaning only when read together with the term "contact layer" as in "contact layer contacting."

Similarly, Infineon's contention that "contacting" must mean "physically touching" to distinguish Chen's claim 14 over the Lidow patent, U.S. Patent No. 4,593,302, is unpersuasive because there are other elements to claim 14 which distinguish over the prior art.

C. Voltage Sustaining Layer

1. Plaintiff's Interpretation

Plaintiff PMT asserts that "voltage sustaining layer" should be defined as "a structure comprising 'alternating' regions of p-type conductivity and n-type conductivity." (PMT Br. at 13). As with "contact layer," PMT argues that "layer" is used in the Chen Patent to mean a horizontal orientation, and "region" is used to mean a vertical orientation. (R. 37 at 11-13). Thus, the voltage sustaining layer is "a horizontal area containing vertical regions." (Id. at 11). In support of its proposed definition, PMT asserts that the inventor chose to be his own lexicographer and unambiguously defined "voltage sustaining layer" in the patent claims. (Id. at 1-5; 15 to 38 at 3; R. 224 at 8-18; R. 231 at 14-15) (referencing Chen Patent, col. 1, ln. 55-col. 2, ln. 3; col. 7, ln. 62 to col. 8, ln. 6). In the specification, the inventor calls the type of voltage sustaining layer disclosed by the patent a composite buffer layer, or CB-layer, and PMT regards "voltage sustaining layer" and "CB-layer" as interchangeable. (R. 89 at 22-25; R. 225 at 6 to R. 227 at 16) (referencing, *inter alia,* Chen Patent col. 1, ln. 55-58; col. 1, ln. 67 to col. 2, ln. 8; col. 2, ln. 22-23). PMT admits that the voltage sustaining layer can contain components other than regions of p or n-type conductivity, but urges that the inventor's definition of CB-layer (*i.e.,* voltage sustaining layer) requires that all components occur in an alternating arrangement. (R. 90 at 4 to 91 at 16; R. 228 at 23 to R. 229 at 24; R. 230 at 20-25). PMT thus contends that everything below that layer of alternating regions is contact layer. (R. 230 at 24 to 231 at 2).

PMT rejects defendants' proposed interpretation first on the ground that it requires back-loading limitations from the generic "voltage sustaining layer" described in the specification into the "voltage sustaining layer"

defined in the claims. (R. 216 at 14 to 217 at 24). PMT contends that the definition that defendants take from the background is actually only Chen's description of the prior art, *i.e.*, of what his invention is *not*. (R. 219 at 10-17) (referencing Chen Patent, col. 1, ln. 11-15). Finally, PMT argues that all semiconductor devices, including Chen's, will sustain some voltage in areas other than their "voltage sustaining layers"; therefore, it is vague to define that structure in terms of its function alone. (R. 221 at 9-19).

2. Defendants' Interpretation

There is some variation in defendants' proposed definitions of "voltage sustaining layer", but "the lightly doped layer of the device that sustains voltage in the off state" FN14 sufficiently incorporates their most recent and relevant arguments. Defendants base their proposed definition directly on the language the inventor used to define the term in the specification. (R. 119 at 20-25; Infineon Br. at 20; R. 176 at 1-16) (referencing Chen Patent, col. 1, ln. 11-15). Defendants reject PMT's claim that "voltage sustaining layer" and "CB-layer" are interchangeable, arguing that the inventor explicitly defined "CB-layer" in the claims in a way that makes clear he meant it as one species of the genus "voltage sustaining layer." (R. 119 at 12-23; R. 176 at 1 to 177 at 5) (referencing Chen Patent, col 1, ln. 55 to col. 2, ln. 2). Defendants contend that the definition of "voltage sustaining layer" that PMT offers the Court is the definition that should instead be applied to "CB-layer." (R. 120 at 7-8; R. 177 at 4-14). Defendant ST explains further that the phrase "called hereafter" that immediately precedes the first use of the term "voltage sustaining layer" in the specification is used to mean "defined as"; therefore, that preceding language is the inventor's intended definition, not the later language used in association with the "CB-layer." (R. 176 at 1-24) (referencing Chen Patent, col. 1 ln. 55 to col. 2, ln. 2). According to ST, PMT's definition would impermissibly incorporate limitations from a preferred embodiment, the CB-layer, into the definition of "voltage sustaining layer." (R. 177 at 17-19) (referring PMT to it's own Br. at 5 and citing SRI Int'l v. Matsushita Elec. Corp., 775 F.2d 1107, 1118-25 (Fed.Cir.1985) (en banc)). Finally, defendants rebut PMT's characterization of their proposed definition as merely Chen's description of the prior art by pointing out that Chen's CB-layer was also prior art under Coe, U.S. Patent No. 4,754,310. (R. 279 at 11-13).

FN14. Defendant Infineon specifically asserts that "voltage sustaining layer" should be defined as "the lightly doped layer between n+ and p+ regions that sustains voltage." (R. 120 at 3-5). Defendant ST specifically asserts that "voltage sustaining layer" should be defined as "the layer of the device that sustains the reverse voltage of the device in the off state." (ST Br. at 11; ST slide # 26).

ST separately denies that the voltage sustaining layer must be limited to alternating n and p regions because the drafter specifically used the term "comprising," meaning "including the following elements, but not excluding others," FN15 to describe the structure rather than the term "consisting of," meaning "the following elements and nothing more." (R. 178 at 2 to 179 at 6) (referencing Chen col. 7, ln. 64). ST argues that it makes no difference that none of the embodiments show any other structures, because "comprising" specifically allows for other structures, even if not disclosed. (R. 179 at 15-17). Therefore, under ST's construction, a "voltage sustaining layer" could include anything that sustains a voltage and forms an interface with the contact layers. (R. 180 at 14-18).

FN15. The parties have agreed to this definition of "comprising." (R. 178 at 2-5).

3. Recommended Interpretation

The Special Master recommends that "voltage sustaining layer" also be defined in terms of its function as the "layer that primarily sustains the voltage applied between the terminals of the device." As with "contact layer", "voltage sustaining" is used as an adjective describing the function of this layer within the device. Whether or not this layer can include structures beyond those described as the "CB-layer" can be conclusively determined because the structure of the voltage sustaining layer is explicitly defined in the claims.FN16 (*See, e.g.,* Chen Patent, col. 7, ln. 63 to col. 8, ln. 6). Chen described the voltage sustaining as "*comprising* first semiconductor regions of the first conductivity type and...." (Chen Patent, col. 7, ln. 64-65) (emphasis added). "Comprising" is a term of art well-known to any patent attorney that is used to mean "including, but not limited to ." FN17 By using it, the patentee signaled his clear intent that the voltage sustaining layer includes the CB-layer structure, but that it not be restricted from including other layers or structures. Such an interpretation is consistent with the patentee's description of the CB-layer as the point of novelty of the voltage sustaining layer. (Chen Patent, col. 1, ln. 55 to col. 2, ln. 21). Chen describes the CB-layer as "a new structure of the voltage sustaining layer," but nothing in the disclosure is inconsistent with the idea that the voltage sustaining layer may include structures other than the CB-layer. (Chen Patent, col. 1, ln. 55 to col. 2, ln. 21). If the patentee had intended to so limit the voltage sustaining layer, he could have easily done so by using "consisting of", meaning "including these elements but no others," FN18 rather than "comprising", or he could have used the term "CB-layer" in the claims rather than "voltage sustaining layer," as he did in the original claims, as filed. Instead, his use of "comprising" makes clear that the voltage sustaining layer must contain the alternating regions of the CB-layer, (Chen Patent, col. 1, ln. 54 to col. 2, ln. 21), but is not limited to those alternating regions. The specific embodiments in the Chen Patent do show the voltage sustaining layer to be just the CB-layer, but to read such a limitation into the term "voltage sustaining layer" would be an impermissible reading of limitations from the preferred embodiments into the claims. Constant, 848 F.2d at 1571. Further, restricting the "voltage sustaining layer" to a particular dopant concentration would be similarly impermissible because of the use of "comprising." (Chen Patent, col. 7, ln. 64). The rule against reading limitations from preferred embodiments into the claims remains true even though every embodiment discloses a voltage sustaining layer that is just the CB-layer. Constant, 848 F.2d at 1571. Thus, under the recommended definition, a voltage sustaining layer may also contain additional structures or layers (in addition to the CB-layer), as long as those structures perform the function of sustaining the voltage across the terminals of the device.

FN16. Vitronics, 90 F.3d at 1582 (patentee may choose to be his own lexicographer, as long as the special definition is clearly stated); Constant, 848 F.2d at 1571 ("[i]t is the claims that define the claimed invention"). Thus, ST's assertion that the phrase "called hereafter" in the specification signals the inventor's intended definition is incorrect because a clear definition in the claims supercedes any description in the specification.

FN17. *See* Stiftung v. Renishaw PLC, 945 F.2d 1173, 1178 (Fed.Cir.1991).

FN18. Georgia-Pacific Corp. v. U.S. Gypsum Co., 195 F.3d 1322, 1327 (Fed.Cir.1999).

The single use of the term "voltage sustaining *region*" in, for example, claim 11, confuses the analysis, but does not change the result. (Chen Patent, col. 8, ln. 8) (emphasis added). This alternate phrase, voltage sustaining region, is not found in the patent disclosure. There are two possible reasons for the use of this alternate phrase: either it is merely a scrivener's error, FN19 or the patentee uses "voltage sustaining region"

to mean a voltage sustaining layer plus or minus something else that also sustains voltage. However, such a meaning is nonsensical because, as explained, the definition of "voltage sustaining layer" is already left open by the use of "comprising." Trying to define "voltage sustaining region" as a "voltage sustaining layer" (which may already include other structures) that may then include other layers or structures leads to an absurd result. Thus, the most reasonable explanation is that the alternate phrase "voltage sustaining region" is simply a benign claim drafting error and should be read as "voltage sustaining layer" for claim construction purposes.FN20

FN19. Otherwise, there would be a problem that the term "voltage sustaining region" has no antecedent basis in claim 1.

FN20. If any meaning is to be attributed to the alternate phrase, it would serve to support PMT's argument that "region" and "layer" are interchangeable.

D. Interface

1. Plaintiff's Interpretation

Plaintiff PMT asserts that "interface" should be defined as "an electrical engagement between two components, elements, regions, layers or zones." (R. 42 at 12-14). PMT denies that "interface" must include a physical boundary to avoid vagueness because the term is always defined structurally by surrounding language (*Id*. at 17-23; R. 246 at 8-10). Plaintiff also argues that its definition of "interface" is internally consistent with [its] definitions of "contacting" and "contact layer." (R. 247 at 1-3). PMT rebuts defendants' contention that all the figures in the specification disclose common boundaries by pointing out three figures where it asserts the interfaces are not necessarily planar: Figures 5 and 9 have interfaces with non-continuous, non-contiguous segments with curved edges, and Figure 6 has interfaces with non-continuous, non-contiguous edges. (PMT Resp. Br. at 14 & n45).

2. Defendants' Interpretation

Defendants effectively assert that "interface" should be defined as "a common boundary where two surfaces touch." FN21 (R. 120 at 19-20; R. 199 at 25 to R. 200 at 6). Defendants base their definition, in part, on their interpretation of language in claims 14 and 17 which describes a cross-section of the voltage sustaining layer parallel to the first and second interface. (R. 121 at 14-21; R. 201 at 3-12) (referencing Chen Patent, col. 8, ln. 43-51; col. 9, ln. 10 to col. 10, ln. 2). Defendants argue that the terms "cross-section" and "parallel" taken together in their ordinary,FN22 geometric meaning require a physical boundary between the contact layer and voltage sustaining layer. (R. 121 at 18 to 122 at 12; R. 201 at 3 to 202 at 22) (referencing Chen, col. 2, ln. 1-4, 8). Further, defendants assert that the language in claim 3 describing interfaces as perpendicular to the plain of the dielectric layer are an even clearer indication that "interface" must be a structural term. (R. 291 at 20-25) (referencing Chen Patent, col. 6, ln. 65-66). Finally, defendants contend that the Court should reject PMT's proposed definition of "contacting" because it is based on language in the patent where the term "contact" is used as a noun, as in metal contact, and has no reference to use in the patent of the verb "contacting." (R. 123 at 16-24; R. 205 at 1-20) (referencing, *e.g.,* Chen Patent, col. 6, ln. 25).

FN21. The definition given is Infineon's exact proposed definition. ST's exact proposed definition is, "an

internal surface forming a common boundary between adjacent semiconductor portions. (R. 199 at 25 to R. 200 at 1 and ST slide # 54).

FN22. ST urges the Court to examine the extrinsic evidence of a common dictionary to ascertain the meaning of "interface." ST proposes that the court examine WEBSTER'S COLLEGIATE DICTIONARY 610 (10th ed.1996), wherein "interface" is defined as "a surface forming a common boundary of two bodies, spaces or phases." (R. 200 at 6-11). ST contends this is how a person of ordinary skill in the art would understand "interface." (R. 200 at 4-6).

Infineon argues separately that, during prosecution, the examiner issued a s. 112 rejection based on "contact" meaning "touching," and Chen acquiesced in this definition by responding to the objection without contesting the use of the term in that way. (R. 124 at 1-13).

ST separately contends that the Court should reject PMT's proposed definition as indefinite because it imposes no structural limitation on the term "interface, "which it asserts must be construed in conjunction with "contacting." (R. 200 at 12-18; R. 202 at 14-17; R. 186 at 8-11). Finally, ST points out that every figure in the Chen Patent shows "interface" as a common boundary. (R. 201 at 25 to 202 at 5 and ST slide # 58).

3. Recommended Interpretation

The Special Master recommends that "interface" be defined as it would be by one of ordinary skill in the art of semiconductor technology as, "the common boundary between two regions or layers in the device." Such boundary can ordinarily be mechanical, electrical, or functional.FN23 However, the term is used throughout the claims to mean the common boundary between the "contact layer" and the "voltage sustaining layer." (*See, e.g.,* Chen Patent, col. 7, ln. 68 to col. 8, ln. 5). Given the overall structure of the Chen MOS devices, these two layers will touch each other, *see, e.g.,* Chen Patent, col. 5, ln. 52-58 (describing the formation and relationship of the various elements), even if that boundary is perhaps elusive because it can only be ascertained by referencing the definitions of two other elements (*i.e.,* the contact layer and the voltage sustaining layer) that are defined in terms of their function, rather than their structure. Nevertheless, in the Chen patent, this interface is necessarily physical because it is a junction between two semiconductor layers, the contact layer and the voltage sustaining layer.

FN23. RUDOLF F. GRAF, MODERN DICTIONARY OF ELECTRONICS 369 (5th ed. 1977) ("A common boundary between two or more items. May be mechanical, electrical, functional, or contractual.").

E. Non-uniform

1. Plaintiff's Interpretation

Plaintiff PMT asserts that "non-uniform" should be defined simply as it is stated in the claims: "the dopant concentration in the first semiconductor regions is greater near the first contact layer than near the second contact layer and the dopant concentration in the second semiconductor regions is greater near the second contact layer than near the first contact layer." (R. 49 at 11-17) (referencing Chen Patent, col. 8, ln. 8-14). PMT argues that basic English grammar rules tell us that the language following the comma after

"nonuniform" is an explanation of that term. (R. 247 at 18-22). PMT denies that a specific dopant gradient is required, arguing that the specification explains that all that is needed is a sort of inverse doping so that dopant is more diffuse at the bottom of p columns than at the top, and more diffuse at the top of n columns than at the bottom, or vice versa (R. 50 at 17-22 (referencing Chen Patent, col. 3, ln. 41-47); R. 51 at 7-13)). Further, PMT asserts that claim 11 covers any varying dopant concentration, no matter the method that produces it, including conventional manufacturing techniques. (R. 54 at 9-14, R. 255 at 5-12). Finally, PMT argues that defendants' proposed definition requires the impermissible reading of limitations from a preferred embodiment into claim 11. (R. 50 at 23 to 51 at 3; R. 218 at 15-24) (referencing Chen Patent, col. 3, ln. 37-47).

2. Defendants' Interpretation

Defendants assert that "non-uniform" should be defined as "doped to add an additional impurity gradient to the original 'uniform' impurity concentration." FN24 (Infineon Br. at 40). Defendants argue that there are two components to this limitation: (1) additional dopant must be added to the normal dopant distribution that results from a conventional manufacturing process, and (2) the resulting distribution must be graded in some direction. (R. 126 at 12-16; R. 135 at 17 to 136 at 10). In support of the first component, defendants remind the Court that the parties had previously agreed that "uniform" meant those "items whose measure is within normal manufacturing variations." FN25 (R. 124 at 21-23; R. 160 at 7-9 and ST slide # 18 (paraphrasing)). Defendants argue that, since "non-uniform" is understood in terms of something not "uniform," by definition it must mean "variations beyond those that would result from a conventional manufacturing process." (R. 124 at 24 to 125 at 13; R. 139 at 22-23). Defendants also contend that, since these variations occur during normal manufacturing, they would necessarily be present throughout the prior art of semiconductor devices; thus, this first component of the limitation is necessary to distinguish over such prior art, including the Coe Patent cited during prosecution. (R. 126 at 16-19; R. 143 at 4 to 146 at 7; R. 147 at 1-21) (referencing Coe Patent, U.S. Patent No. 4,754,310).

FN24. Defendant ST's proposed definition varies only slightly: "doping apart from any normal manufacturing variations (such as random changes in doping concentration and cross-boundary diffusion), as well as an additional impurity gradient added to the original uniform impurity concentration." (R. 162 at 4-6 and ST slide # 21).

FN25. However, during its rebuttal at the *Markman* hearing, PMT retracted its agreement to the meaning of "uniform" because it contends that manufacturing techniques change over time, so the definition provides no certainty. (R. 218 at 2-8; R. 253 at 20-25). PMT proposes instead a definition from the AMERICAN HERITAGE DICTIONARY, "always the same, unchanging, unvarying, without fluctuation." (R. 258 at 21-22).

In support of the second component of their proposed definition, defendants argue that the specification implicitly describes "non-uniform" as a graded doping condition, that claim 11 incorporates the grading limitation by reference to "non-uniform", and that Chen included such condition specifically to distinguish over the Coe Patent. (R. 126 at 12-19; R. 139 at 7-19 and ST slides # 6-10) (referencing Chen Patent, col. 3, ln. 38-47, col. 8 ln. 6-14 and Amendment at 12, ln. 27 to 13, ln. 23). Specifically, defendant ST explains that, in claim 11, "non-uniform" is a separate limitation from the clause immediately following and that PMT's proposed definition ignores the prosecution history and the definition provided in the specification

and would effectively read the "non-uniform" limitation out of the claims. (R. 152 at 15 to 154 at 18 and ST slides # 18-19). Both defendants point out that the specification describes only two doping conditions, the uniform one that results from normal manufacturing processes and a *graded* doping condition. (R. 125 at 2-18; R. 158 at 17-18) (referencing Chen Patent, ln. 37-47). ST further argues that claim 11 would fail for indefiniteness if the limitation of a gradient were not included. (R. 158 at 19-25). ST continues that, since it is a law of claim construction that patent claims should be construed to uphold validity, this Court should adopt its narrower construction that would render the claim definite. (R. 159 at 1-13 and ST slide # 20) (citing Modine Mfg. Co. v. United States Int'l Trade Comm'n, 75 F.3d 1535, 1557 (Fed.Cir.1996)).

3. Recommended Interpretation

The Special Master recommends that "non-uniform" be given its plain meaning of "not uniform." Out of the multitude of different doping possibilities in the voltage sustaining layer, the particular type of non-uniform doping that is chosen, is recited by the clause immediately following the use of "non-uniform" in claim 11. (Chen Patent, col. 8, ln. 8-14). That language explains that the non-uniformity indicated is a condition wherein the p and n regions in the voltage sustaining layer are inversely doped such that the dopant concentration in each region increases as it approaches the contact layer of the corresponding conductivity type. (Chen Patent, col. 8, ln. 8-14). The benefit to be achieved from such a doping condition, as explained in the disclosure, Chen Patent, col. 3, ln. 37-47, is that the on-resistance of the device is lowered using this specific non-uniform doping profile. (Chen Patent, col. 8, ln. 40-41).

How the non-uniformity is achieved is not relevant to the interpretation of this term. The claims at issue in the patent are structural claims, and the specific steps or methods used to achieve that structure is not part of a structural claim. Nor does the specification in any way limit the range of possible methods that could be used to achieve the non-uniformity. Specifically, nothing in the patent precludes a non-uniformity of the specific type described that is realized through conventional semiconductor processing techniques. Therefore, it is simply left to one of ordinary skill in the art to determine how best to achieve the specific non-uniform doping profile in the voltage sustaining layer.

V. CONCLUSION

For the foregoing reasons, the Special Master recommends to the Court that the five patent claim limitations remaining in dispute in this litigation be defined as outlined above in this report.

E.D.Tex.,2001.
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