

**UNITED STATES INTERNATIONAL TRADE COMMISSION
Washington, DC**

**Before the Honorable Monica Bhattacharyya
Administrative Law Judge**

In the Matter of

**CERTAIN POWER SEMICONDUCTORS,
AND MOBILE DEVICES AND
COMPUTERS CONTAINING SAME**

Inv. No. 337-TA-1308

**COMMISSION INVESTIGATIVE STAFF'S
INITIAL *MARKMAN* BRIEF**

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I. INTRODUCTION

In accordance with Ground Rule 6 and the Procedural Schedule (Order No. 8), the Commission Investigative Staff (“Staff”) respectfully submits this initial claim construction brief setting forth and explaining its proposed constructions for each of the disputed claim terms in asserted claims 1 and 2 of U.S. Patent No. 7,183,835 (“’835 Patent”). A technology tutorial and *Markman* hearing is scheduled for September 7, 2022. *See* Order No. 8 (May 24, 2022) at 2. A final (updated) joint proposed claim construction chart will be filed on September 14, 2022. *See id.* For the reasons discussed herein, the Staff submits that its proposed constructions are the most consistent with the intrinsic record, as well as the knowledge of those in the art, and should therefore be adopted.

II. PROCEDURAL BACKGROUND

This investigation was instituted by Commission vote on March 28, 2022, based on an Amended Complaint filed by Complainant Arigna Technology Limited (“Complainant” or “Arigna”) on March 17, 2022. *See* 87 Fed. Reg. 63 (April 1, 2022). The Amended Complaint alleges violations of 19 U.S.C. § 1337 (“Section 337”) by thirteen (13) named respondents in the importation into the United States, sale for importation, and/or sale within the United States after importation of certain power semiconductors with envelope tracking modules, and products containing same such as mobile devices, tablets, and laptop computers containing the same by reason of infringement of one or more of claims 1-2 of the ’835 Patent. *See id.*

Eight (8) of the named respondents have reached a settlement with Complainant and will soon be subject to a motion for termination of the investigation. *See* Order No. 12 (June 21,

2022); Order No. 14 (July 15, 2022).¹ The remaining respondents are Apple Inc. (“Apple”) and TCL Electronics Holdings Limited, TTE Technology, Inc., TCT Mobile (US) Inc., and TCL Communication Limited (collectively, “TCL”) (together, “Respondents”).

On June 17, 2022, Complainant, Respondents, and the Staff exchanged lists of proposed patent claim terms for construction. *See* Order No. 8 (May 24, 2022) at 2. The private parties and the Staff then exchanged initial proposed claim constructions for each disputed term with each other on July 8 and July 13, 2022, respectively. *See* Order No. 13 (June 29, 2022) at 2 (modifying procedural schedule). The parties subsequently met and conferred to endeavor to reduce the number of issues and terms in dispute and to select only eight (8) terms for the *Markman* briefing and hearing process. *See* Order No. 2 (March 29, 2022) at G.R. 6.2, 6.3; *see also id.* A joint claim construction chart was filed on July 15, 2022. *See* Order No. 8 at 2.

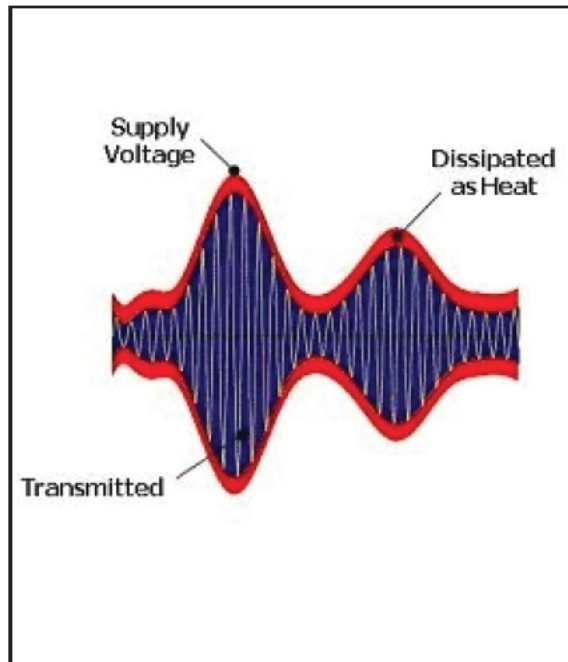
III. TECHNOLOGY BACKGROUND

A. ENVELOPE TRACKING

The accused products are all electronic devices with envelope tracking modules in them. *See* 87 Fed. Reg. 19124 (April 1, 2022) (Pursuant to “19 CFR 210.10(b)(1), the plain language description of the accused products or category of accused products, which defines the scope of the investigation, is ‘power semiconductors with envelope tracking modules, and products such as mobile devices, tablets, and computers containing the same’”). While envelope trackers have many electronic components in them, envelope tracking generally refers to a radio frequency (“RF”) power amplification technique where the power supply voltage of the RF power amplifier

¹ The settling respondents are Samsung Electronics Co., Ltd., Samsung Electronics America, Inc., Google LLC, Lenovo Group Ltd., Lenovo (United States) Inc., Motorola Mobility LLC, Microsoft Corporation, and OnePlus Technology (Shenzhen) Co., Ltd. Due to a procedural stay, these respondents did not participate in the claim construction process. *See* Order No. 12 (June 21, 2022); Order No. 14 (July 15, 2022).

is continuously adjusted by the envelope tracker to match the envelope of the RF signal. *See generally* Staff Ex. 1 (“ET101: An Introduction to Envelope Tracking for RF Amplifiers”). The following provides a visual depiction of an envelope-tracking RF power supply:



The result of using RF envelope tracking as opposed to a fixed power system is less power usage overall and less power that must be dissipated as heat. *See id.*

B. TRANSISTORS

Transistors are analog (not digital) devices. *See* Staff Ex. 2 (“Transistors”). Transistors can be used for two very different applications: as either switches or amplifiers. *See id.* When a transistor is used as a switch, the transistor is used in an on/off manner to control the flow of power to another (downstream) part of the circuit. *See id.* When used as a switch, the transistor must be driven between its cutoff (OFF) and saturation (ON) modes. *See id.* When a transistor is instead used as an amplifier, the transistor is used to turn a low power signal into one of higher power. *See id.* When used as an amplifier, a transistor will be operated in the region in between its cutoff and saturation modes. *See id.*

C. DIGITAL SIGNALS AND LOGIC GATES

Signals can be either analog or digital. *See* Staff Ex. 3 (“Digital vs. Analog”); Staff Ex. 4 (“What is Digital Logic?”). While analog signals are continuous and can take on a range of values, digital signals are generally binary and have only two states: high voltage (HIGH) and low voltage (LOW). *See id.* Logic gates are digital circuitry. *See id.*

A logical circuit can be designed to have either an “active-high” or an “active-low” signal (representing the state assigned as TRUE or logic 1). *See* Staff Ex. 5 (“Practical EE – Elements of Logic”). Using this convention, an active-high signal will have high voltage = TRUE (logic 1 state) and low voltage = FALSE (logic 0 state). *See id.* (“Active-High: HIGH = TRUE”). Conversely, an active-low signal will have low voltage = TRUE (logic 1 state) and high voltage = FALSE (logic 0 state). *See id.* (“Active-Low: LOW = TRUE”).

IV. LEGAL STANDARDS FOR CLAIM CONSTRUCTION

The purpose of claim construction is to explain disputed and material claim language in a way that will be useful to the decision maker. *See O2 Micro Int’l Ltd. v. Beyond Innovation Tech. Co. Ltd.*, 521 F.3d 1351, 1362 (Fed. Cir. 2008); *see also Abbott Labs. v. Sandoz, Inc.*, 544 F.3d 1341, 1360 (Fed. Cir. 2008) (“claims are construed as an aid to the decision-maker, by restating the claims in non-technical terms”). “Only those claim terms that are in controversy need to be construed, and only to the extent necessary to resolve the controversy.” *Certain Wireless Devices with 3G Capabilities and Components Thereof*, Inv. No. 337-TA-800, Initial Det. at 19 n.7 (June 2014).

Claim construction is generally treated as a matter of law. *See Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 979 (Fed. Cir. 1995) (en banc), *aff’d*, 517 U.S. 370 (1996).

However, claim construction may involve underlying factual determinations. *See Teva Pharms.*

USA, Inc. v. Sandoz, Inc., 135 S. Ct. 831, 837-38 (2015). Claims should be given their ordinary and customary meaning as understood by a person of ordinary skill in the art, viewing the claim terms in the context of the entire patent. *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312-13 (Fed. Cir. 2005); *see also On Demand Mach. Corp. v. Ingram Indus., Inc.*, 442 F.3d 1331, 1337 (Fed. Cir. 2006). In some cases, the ordinary meaning of claim language is readily apparent and claim construction will involve “little more than the application of the widely accepted meaning of commonly understood words.” *Id.* at 1314. In other cases, claim terms have a specialized meaning and it is necessary to determine what a person of ordinary skill in the art would have understood the disputed claim language to mean by analyzing “the words of the claims themselves, the remainder of the specification, the prosecution history, and extrinsic evidence concerning relevant scientific principles, the meaning of technical terms, and the state of the art.” *Id.* (quoting *Innova/Pure Water, Inc. v. Safari Water Filtration Sys., Inc.*, 381 F.3d 1111, 1116 (Fed. Cir. 2004)). Every claim term is presumed to have meaning, and any construction that renders a claim term superfluous is discouraged. *Innova*, 381 F.3d at 1119.

Analysis of the claim language, however, is not done in a vacuum. Instead, the claims “must be read in view of the specification, of which they are a part.” *Phillips*, 415 F.3d at 1315 (quoting *Markman*, 52 F.3d at 979). The Federal Circuit has repeatedly confirmed that the specification is “the single best guide to the meaning of a disputed term.” *Phillips*, 415 F.3d at 1315; *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1582 (Fed. Cir. 1996). The specification plays a primary role because it functions as a sort of dictionary, explaining the invention and defining the terms used in the claims. *Phillips*, 415 F.3d at 1315 (“[C]laims . . . do not stand alone. Rather, they are part of a ‘fully integrated written instrument,’ consisting principally of a specification that concludes with the claims.”) Nonetheless, while a patentee is

free to act as his or her own lexicographer, any special definition given to a word must be clear from the specification. *Vitronics*, 90 F.3d at 1582.

It is only the claims that delimit a patentee's right to exclude. *E.g.*, *Catalina Mktg. Int'l, Inc. v. Coolsavings.com, Inc.*, 289 F.3d 801, 807 (Fed. Cir. 2002) (scope of a patent claim is defined by the claim language); *Markman*, 52 F.3d at 978. Therefore, "[w]hile claim terms are understood in light of the specification, a claim construction must not import limitations from the specification into the claims." *Deere & Co. v. Bush Hog, LLC*, 703 F.3d 1349, 1354 (Fed. Cir. 2012) (citing *Phillips*, 415 F.3d at 1323); *Varco, L.P. v. Pason Sys. USA Corp.*, 436 F.3d 1368, 1372-73 (Fed. Cir. 2006). For example, claims are not usually limited in scope simply to the preferred embodiment(s) disclosed in the patent specification. *Linear Tech. Corp. v. International Trade Comm'n*, 566 F.3d 1049, 1058 (Fed. Cir. 2009); *RF Delaware, Inc. v. Pacific Keystone Techs., Inc.*, 326 F.3d 1255, 1263 (Fed. Cir. 2003). Likewise, statements pertaining to a specific embodiment of the invention, rather than to the invention as a whole, do not operate to limit the claims. *Praxair, Inc. v. ATMI, Inc.*, 543 F.3d 1306, 1323 (Fed. Cir. 2008). A party wishing to use a statement appearing in the specification to confine or otherwise affect a patent's scope must, at the very least, point to a term (or terms) in the patent claim with which to draw in those statements. *NTP, Inc. v. Research In Motion, Ltd.*, 418 F.3d 1282, 1310 (Fed. Cir. 2005). In other words, there must be a textual reference in the language of the patent claim with which to associate a proffered claim construction. *Id.* Absent that textual reference, the patent claim's scope should not be so limited. "The construction that stays true to the claim language and most naturally aligns with the patent's description of the invention will be, in the end, the correct construction." *Profectus Tech. LLC v. Huawei Techs. Co.*, 823 F.3d 1375, 1380-

81 (Fed. Cir. 2016) (quoting *Renishaw PLC v. Marposs Societa' per Azioni*, 158 F.3d 1243, 1250 (Fed. Cir. 1998)); *Phillips*, 415 F.3d at 1316.

Claims must also be read in view of the prosecution history to determine whether the inventor has used any terms in a manner inconsistent with their ordinary meaning or with positions taken during prosecution. *Biogen Idec, Inc. v. GlaxoSmithKline LLC*, 713 F.3d 1090, 1094-95 (Fed. Cir. 2013); *Southwall Techs., Inc. v. Cardinal IG Co.*, 54 F.3d 1570, 1576 (Fed. Cir. 1995). The prosecution history consists of the complete record of the patent examination proceedings before the U.S. Patent and Trademark Office, including cited prior art. *Phillips*, 415 F.3d at 1317. It may reveal “how the inventor understood the invention and whether the inventor limited the invention in the course of prosecution, making the claim scope narrower than it would otherwise be.” *Id.*; see also *Rhodia Chimie v. PPG Indus., Inc.*, 402 F.3d 1371, 1384 (Fed. Cir. 2005) (“The purpose of consulting the prosecution history in construing a claim is to ‘exclude any interpretation that was disclaimed during prosecution.’”).

In addition to the intrinsic evidence, extrinsic evidence may be considered if necessary to explain scientific principles, technical terms, and terms of art that appear in the patent and prosecution history and to determine how one skilled in the relevant art would understand terms in the claim. *Phillips*, 415 F.3d at 1317; *Markman*, 52 F.3d at 979. Extrinsic evidence consists of all evidence external to the patent and prosecution history, including “expert [and] inventor testimony, dictionaries, and technical treatises and articles.” *Vitronics*, 90 F.3d at 1584. Expert testimony may be useful to “provide background on the technology at issue, to explain how an invention works, to ensure that the court’s understanding of the technical aspects of the patent is consistent with that of a person of skill in the art, or to establish that a particular term in the patent or the prior art has a particular meaning in the pertinent field.” *Phillips*, 415 F.3d at 1318.

Nevertheless, extrinsic evidence is generally less reliable than the patent and its prosecution history, and “is unlikely to result in a reliable interpretation of patent claim scope unless considered in the context of the intrinsic evidence.” *Id.* at 1319. Expert testimony that is at odds with the intrinsic evidence must be disregarded. *Network Commerce, Inc. v. Microsoft Corp.*, 422 F.3d 1353, 1361 (Fed. Cir. 2005); *see Phillips*, 415 F.3d at 1318.

V. U.S. PATENT NO. 7,183,835

A. Patent Overview

U.S. Patent No. 7,183,835, entitled “Semiconductor Device which Realizes a Short-Circuit Protection Function Without Shunt Resistor, and Semiconductor Device Module,” issued on February 27, 2007, from U.S. Patent Application No. 11/023,590, which was filed on December 29, 2004. *See* Staff Ex. 6 (’835 Patent). The ’835 Patent was originally assigned to Mitsubishi Denki Kabushiki Kaisha of Tokyo, Japan. *See id.* The application claims priority to two Japanese patent applications, which were filed on January 6, 2004 and September 9, 2004, respectively. *See id.* The ’835 Patent has a total of 8 claims; claims 1, 3, 4, and 8 are independent. *See id.* The Commission instituted this investigation to determine whether there is a violation of Section 337 by reason of, *inter alia*, infringement of one or more of claims 1 and 2 of the ’835 Patent. 87 Fed. Reg. 63 (April 1, 2022).

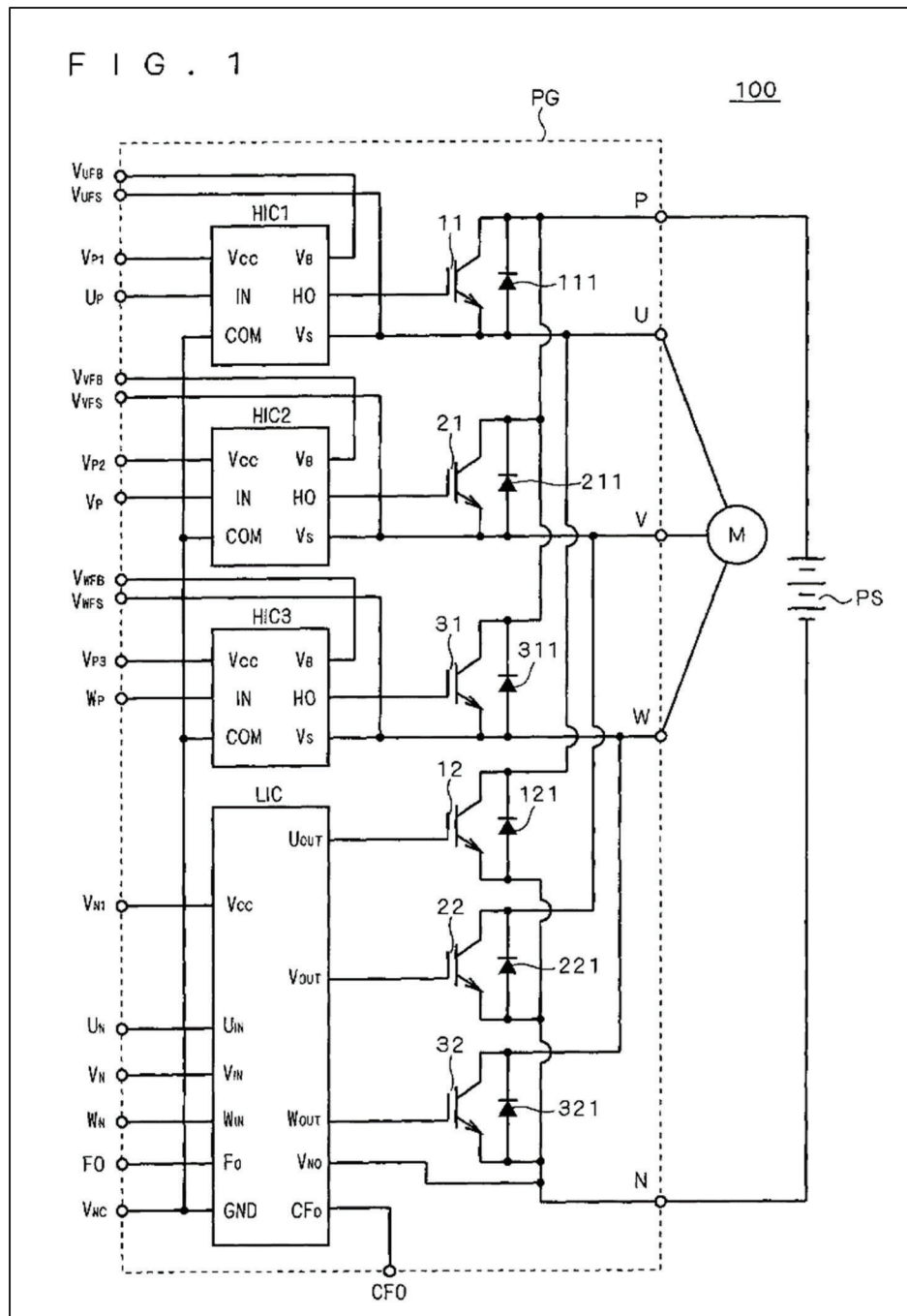
The ’835 Patent concerns one or more transistors used as a ***switching device*** that is turned on and off to control whether power reaches a downstream element such as “a motor system.” *See, e.g.*, ’835 Patent at 1:9-15 (“insulated gate type switching device such as an IGBT (Insulated Gate Bipolar Transistor) and so on”), 2:48-60 (“groups of transistors **11** and **12**, **21** and **22** and **31** and **32** (all N channel type) which are insulated gate type switching devices”), 11:8-11 (“thus a strain on a motor system can be reduced”). As explained in the patent, “[a] semiconductor

device in which the insulated gate type *switching device* such as the IGBT and so on and a control circuit controlling a drive of that switching device are packaged is called as an IPM (Intelligent Power Module)[.]” *Id.* at 1:17-20 (emphasis added). Conventionally, in the prior art, short-circuit protection for an Intelligent Power Module (“IPM”), composed of a switching device and its associated control circuitry, would be provided “by connecting a shunt resistor detecting a main current flowing between main power terminals of the switching device outside the package and monitoring the main current.” *Id.* at 1:21-45. The patented invention purportedly differs from the prior art in that it specifically provides for a short circuit protection mechanism that is integrated into the IPM and that thereby *avoids the need for and use of a shunt resistor*. *See id.* at 1:63-2:5, 3:65-4:2 (“The inverter module **100** described above has a composition that a shunt resistor and a current detecting terminal connecting the shunt resistor which are conventionally necessary *are not included* but the LVIC or the HVIC in the module includes the short-circuit protection function.”). This allows for the module to be made smaller, as well as for less wiring so that “the voltage surge according to the switching of the switching device can be reduced.” *Id.* at 7:23-44 (“Effect”), 10:55-11:7 (“Effect”).

The short circuit protection mechanism of the ’835 Patent is based on recognition by the patent inventors that, in the event of a short circuit condition, “the control output signal” that is supplied to the gate of the switching transistor in their semiconductor device module will also be transformed. *See* ’835 Patent at 4:14-20 (“the control output signal is also influenced when that transistor is short-circuited, and a signal waveform different from that in a normal operating state occurs.”), Fig. 5 (control signal S3). “The present invention [of the ’835 Patent] is focused on this phenomenon, and it detects the short-circuit by monitoring the control output signal of the insulated gate transistor[.]” *Id.* at 4:20-23. Accordingly, the ’835 Patent is directed to circuitry

for use with a switching device that accomplishes a short circuit protection mechanism, without a shunt resistor, by “detecting the control output signal and controlling and forcing the driver to stop the control output signal when a detecting voltage of the control output signal exceeds a predetermined reference voltage before a predetermined period passes after the control output signal indicates a conduction of the insulated gate transistor.” *Id.* at 1:52-62, 4:23-26 (“in the case of the short-circuit, the short-circuit protection of the insulated gate transistor is performed by forcing the control device LIC to stop the control output”).

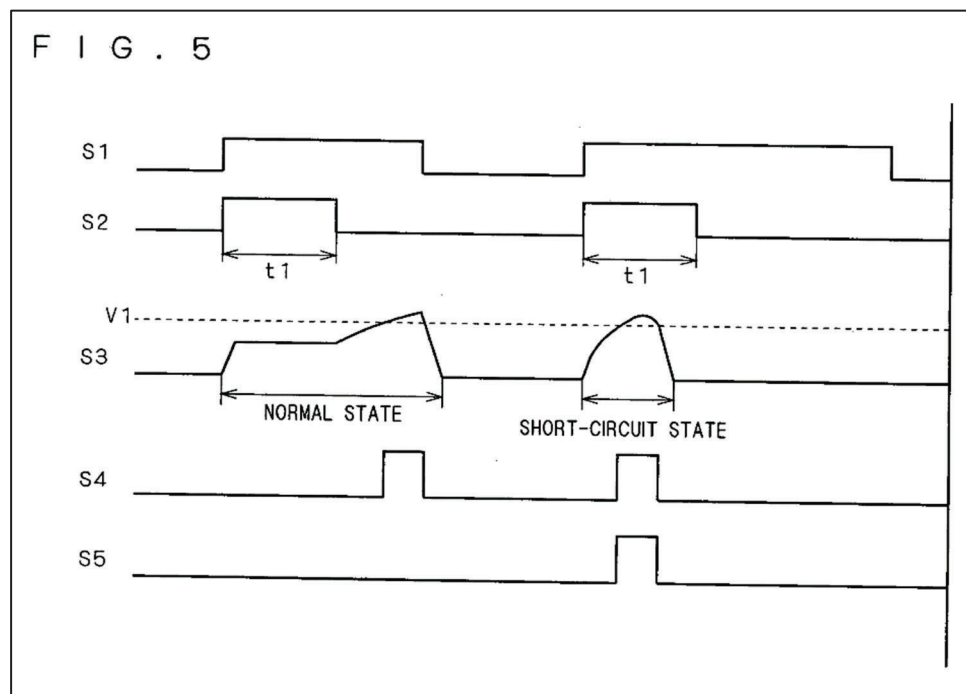
In a preferred embodiment, the '835 Patent describes an inverter module **100** as an example of an IPM. *See* '835 Patent at 2:37-7:43. Inverters offer speed or torque control for electric motors. *See* Staff Ex. 7 (“What Is an Inverter?”). Inverter module **100** is illustrated in Figure 1 below. “As shown in FIG. 1, groups of transistors **11** and **12**, **21** and **22** and **31** and **32** (all N channel type) *which are insulated gate switching devices* such as an IGBT (Insulated Gate Bipolar Transistor) and so on are connected in a totem pole like between P-N terminals....” *See* '835 Patent at 2:48-60. There is also a power source PS, and “the respective phases of a three-phase motor M are connected with the output terminals U, V, and W, for example.” *See id.*



'835 Patent at Fig. 1 (showing control signals HO, U_{out}, V_{out}, and W_{out} supplied to gates of switching transistors).

"The inverter module **100** has a composition that a control output signal is supplied to respective gate electrodes of the transistors **11**, **21**, and **31** from respective control signal output terminals HO of the control devices HIC1, HIC2, and HIC3." '835 Patent at 3:3-7. "The inverter

module [also] has a composition that a control output signal is supplied to the respective gate electrodes of the transistors **12**, **22**, and **32** from the control signal output terminals U_{out} , V_{out} , and W_{out} of the control device LIC, respectively.” *Id.* at 3:36-40. “The inverter module **100** described above has a composition that a shunt resistor and a current detecting terminal connecting the shunt resistor which are conventionally necessary are not included but the ... module includes the short-circuit protection function.” *Id.* at 3:65-4:2.



'835 Patent at Fig. 5.

Figure 5 (above) shows how distortions in the control signal **S3** can be detected when the control signal exceeds a reference voltage **V1** during time interval t_1 . See '835 Patent at 5:60-7:21 (explaining same). In Figure 5, **S1** is the control input signal, **S2** is a pulse signal “which comes to be in the significant condition according to a building up of the control input signal **S1**, and a period t_1 ,” **S3** is the control output signal (applied to the gate of the switching transistor), **S4** is a comparison result signal output by a comparator (when the control output signal **S3** exceeds reference voltage **V1**), and **S5** is a stop signal to stop the gate driver from outputting the

control output signal S3 (and thus shut off the transistor). *See id.* at 5:52-7:21.

The patent teaches that the time period t1 can be set so that it matches a time period where “the control output signal S3 is clamped to a certain voltage for the determined period after its rising, in case that it normally operates.” *See id.* at 6:6-53. According to the patent, “[b]y setting the period in this manner t1, it is possible to prevent the transistor 12 from being forced to be turned OFF, even if the control output signal S3 exceeds the reference voltage V1 when the transistor normally operates.” *Id.* at 6:50-53. However,

in case that the transistor 12 comes to be ON in a state that a short-circuit occurs between the source and drain of the transistor 12, or, in case that the transistor 12 comes to be ON in a state that the transistor 11 connected in a totem pole like with the transistor 12 (FIG. 1) is ON (arm short-circuit), a clamp period of the voltage does not exist in the control output signal S3, and the voltage of the control output signal S3 rises rapidly to be almost equal to that of the drive voltage VCC. This state is illustrated in Fig. 5 as a waveform of the control output signal S3 in a short-circuit state.

Id. at 6:54-64. When the transistor is short-circuited, a logical circuit (such as an RS flip-flop) will receive two pulse signals both in a “significant” condition that together indicate that the control output signal S3 exceeds the reference voltage V1 during a time interval t1. *See id.* at 6:65-7:21. Based on the combination of the two “significant” pulse signals, the logical circuit will issue a stop signal S5 to stop the control output signal supplied to the gate of the transistor 12 so that “the transistor 12 is forced to be in OFF state.” *See id.*

Asserted claims 1 and 2 are reproduced below.

1. A semiconductor device controlling a drive of an insulated gate transistor by generating a control output signal on a basis of a control input signal, comprising:
a driver outputting said control output signal and a short-circuit protection circuit detecting said control output signal and controlling and forcing said driver to stop said control output signal when a detecting voltage of said control output signal exceeds a predetermined reference voltage before a predetermined period passes after said control output signal indicates a conduction of said insulated gate transistor, wherein said short-circuit protection circuit includes:

pulse generation circuit receiving said control input signal and outputting a first pulse signal being significant only in said predetermined period according to a timing when said control input signal *indicates the conduction of said insulated gate transistor*;

a comparator receiving the detecting voltage of said control output signal, performing a comparison with said reference voltage and outputting a second pulse signal being significant during a period when the detecting voltage of said control output signal exceeds said reference voltage; and

a logical circuit receiving said first and second pulse signals and outputting a stop signal forcing said driver to stop said control output signal when said second pulse signal becomes significant during a period when said first pulse signal is significant.

2. The semiconductor device according to claim 1, wherein

said predetermined period when said first pulse signal is significant is set on a basis of a period when a voltage of said control output signal is clamped constantly when said insulated gate transistor normally operates.

'835 Patent at claims 1-2 (emphasis added).

The disputed claim limitations that are being addressed as part of the *Markman* process have been emphasized using italics and underlining in the above claims. The '835 Patent never mentions or uses any transistors for power amplification purposes (such as, power amplification for radio frequency ("RF") signals).

B. Level of Ordinary Skill in the Art

The purpose of claim construction is to determine the ordinary and customary meaning of the claims as understood by a "person of ordinary skill" in the relevant art at the time of the invention. *See Phillips*, 415 F.3d at 1312-13. The first step in the analysis is to determine the level of skill possessed by such a person. "Factors that may be considered in determining level of skill include: type of problems encountered in art; prior art solutions to those problems; rapidity with which innovations are made; sophistication of the technology; and educational level of active workers in the field." *Certain Wearable Activity Tracking Devices, Systems, and Components Thereof*, Inv. No. 337-TA-973, Order No. 16 at 9 (May 16, 2016) (quoting *Mintz v. Dietz & Watson, Inc.*, 679 F.3d 1372, 1376 (Fed. Cir. 2012)).

The Staff proposes that a person of ordinary skill in the art at the time of the invention would have at least a bachelor's degree in electrical engineering or a similar discipline, and two or more years of industry or additional academic experience in the areas of power semiconductor devices and/or electrical circuit design. Additional relevant work experience could substitute for academic experience and vice versa. The Staff does not expect that any competing definitions proposed by the parties for "one of ordinary skill" are likely to materially affect the construction of the disputed claim terms.

C. Disputed Claim Terms

The parties dispute the proper meaning of eight (8) terms in the asserted claims of the '835 Patent. The Staff's position as to the proper construction for each of the disputed terms is set forth below.

1. claim preamble (as limitation) (claim 1)

The parties dispute whether the preamble in claim 1 of the '835 Patent should be construed as a limitation. The Staff and Respondents contend that the preamble is limiting. Complainant claims otherwise.

Complainant's Construction	Staff's and Respondents' Construction
Non-limiting preamble	The preamble is limiting

There are two reasons why the preamble to claim 1 is a limitation. In general, a preamble limits the claimed invention if it "recites essential structure or steps, or if it is necessary to give life, meaning, and vitality to the claim." *Catalina Mktg. Int'l, Inc. v. Coolsavings.com, Inc.*, 289 F.3d 801, 808 (Fed. Cir. 2002) (internal quotation marks omitted). "When limitations in the body of the claim rely upon and derive antecedent basis from the preamble, then the preamble may act as a necessary component of the claimed invention." *Eaton Corp. v. Rockwell*

Int'l Corp., 323 F.3d 1332, 1339 (Fed. Cir. 2003) (citations omitted). “A claim preamble has the import that the claim as a whole suggests for it. In other words, when the claim drafter chooses to use both the preamble and the body to define the subject matter of the claimed invention, the invention so defined, and not some other, is the one the patent protects.” *Bell Comm'ncs Research, Inc. v. Vitalink Comm'ncs Corp.*, 55 F.3d 615, 620 (Fed. Cir. 1995).

First, in claim 1, the language of the preamble provides an antecedent basis for subsequent limitations found in the body of the claim. For example, the body of the claim first refers to “said control output signal” and “said insulated gate transistor.” See '835 Patent at claim 1. These are direct references back to the preamble statement for “[a] semiconductor device controlling a drive of an insulated gate transistor by generating a control output signal on a basis of a control input signal.” See *id.* Courts have repeatedly found preambles to be limiting where “limitations in the body of the claim rely upon and derive antecedent basis from the preamble.” *Pacing Techs., LLC v. Garmin Int'l, Inc.*, 778 F.3d 1021, 1023-24 (Fed. Cir. 2015); *Highmark, Inc. v. Allcare Health Mgmt. Sys.*, 687 F.3d 1300 (Fed. Cir. 2012); *Eaton Corp. v. Rockwell Int'l Corp.*, 323 F.3d 1332, 1339 (Fed. Cir. 2003).

Second, the preamble is necessary to give structure and meaning to the claim. As explained in the '835 Patent, the short-circuit protection circuit of the patented invention is specifically intended for and only likely to work with an insulated gate type switching device and its associated control circuitry. See '835 Patent at 1:10-14 (“more particularly, [the present invention] relates to ***a semiconductor device and a semiconductor device module including a short-circuit protection function of an insulated gate type switching device***”), 1:52-2:3, 7:23-31, 10:55-11:2, Abstract. The short-circuit protection circuit set forth in the body of the claim language is thus integrated into the semiconductor device with the structure and operation recited

in the claim preamble. *See id.* Against this backdrop, it is apparent that the claim preamble is intended to be read not simply as an explanation of purpose but as a structural limitation. *See id.* at 1:52-2:9. Therefore, the Staff submits that the preamble of claim 1 should be construed as limiting.

2. “insulated gate transistor” (claims 1 and 2)

The parties dispute the meaning of the term “insulated gate transistor” appearing in asserted claims 1 and 2 of the ’835 Patent. The parties have proposed the following constructions for this limitation.

Staff’s and Complainant’s Construction	Respondents’ Construction
“a transistor whose gate is electrically insulated from the channel”	Plain meaning, <i>i.e.</i> IGBT (insulated gate bipolar transistor)

The Staff agrees with Complainant that the disputed term “insulated gate transistor” should be construed as “a transistor whose gate is electrically insulated from the channel.”

The Staff is of the view that the term “insulated gate transistor” would be clear to ordinary artisans based on the ’835 Patent and their knowledge in the art. For background in the art, there are three basic categories of transistors used in the field: 1) “bipolar transistors (bipolar junction transistors: BJTs), field-effect transistors (FETs), and insulated-gate bipolar transistors (IGBTs).” *See* Staff Ex. 8 (Toshiba: “What types of transistors are available?”). Insulated-gate field-effect transistors or metal-oxide-semiconductor field effect transistors (“MOSFETs”) are a well-known derivative of FETs. *See* Staff Ex. 9 (“Insulated-Gate Field Effect Transistors (MOSFET)”). *Insulated-gate bipolar transistors (“IGBTs”) and MOSFETs have similar gate structures with a gate that is electrically insulated from the channel.* *See* Staff Ex. 10 (“The MOSFET”); Staff Ex. 11 (“Insulated Gate Bipolar Transistor”). *See id.* While IGBTs and MOSFETs each have some distinct advantages and disadvantages to them, IGBTs and

MOSFETs are both capable of being used as switches. *See id.*

The '835 Patent specifically describes an IGBT as its preferred embodiment of “insulated gate transistor.” For example, the patent states: “As shown in FIG. 1, groups of transistors **11** and **12**, **21** and **22** and **31** and **32** (all N channel type) which are insulated gate type switching devices such as an IGBT (Insulated Gate Bipolar Transistor) and so on are connected in a totem pole like between P-N terminals....” *See* '835 Patent at 3:40-51 (“Composition Example of an IPM Applying the Present Invention”). However, the patent always uses the claim term “insulated gate transistor” as a broader term that is distinct and separate from the terms “Insulated Gate Bipolar Transistor” and “IGBT.” *See* '835 Patent at 1:14-15 (“an insulated gate type switching device ***such as*** an IGBT (Insulated Gate Bipolar Transistor) ***and so on***”), 1:17-19. The patent specification thus makes it clear that an IGBT is just an ***example*** of an “insulated gate transistor” that can be used for the patented invention. *See id.*; *see also Amgen Inc. v. Hoechst Marion Roussel, Inc.*, 314 F.3d 1313, 1328 (Fed. Cir. 2003) (“our precedent is clear that claims are not perforce limited to the embodiments disclosed in the specification”). The '835 Patent specifically states: “an insulated gate type switching device ***such as*** an IGBT (Insulated Gate Bipolar Transistor) ***and so on***.” '835 Patent at 1:14-15 (emphasis added).

Therefore, the Staff is of the view that the claim language is intentionally drawn to an “insulated gate transistor,” which is a transistor whose gate is electrically insulated from the channel, and not more specifically to an IGBT. *See generally Phillips*, 415 F.3d at 1314 (noting “claim terms are normally used consistently throughout the patent”); *see also Amgen v. Hoechst*, 314 F.3d at 1328 (rejecting “attempt to limit the scope of the asserted claims under any unduly constricted reading of the specification”). If the patentee had wanted to limit the claims to an IGBT, they could have done so using the same specific terminology for an IGBT that they use in

the patent specification. *See* '835 Patent at 1:14-15 (specifically using the term IGBT), 1:17-18 (same), 2:49-51 (same). But they did not do so. In view of both the patent specification and the knowledge in the art generally, the Staff believes that a person of ordinary skill would understand the term “insulated gate transistor” to allow for the use of any transistor, such as an IGBT or a MOSFET, “whose gate is electrically insulated from the channel.” Accordingly, the Staff submits that the disputed term should be construed as “a transistor whose gate is electrically insulated from the channel.”

3. “controlling a drive of an insulated gate transistor” (claim 1)

The parties dispute the meaning of the claim limitation “controlling a drive of an insulated gate transistor” in claim 1 of the '835 Patent. The “controlling a drive of an insulated gate transistor” limitation is part of the preamble found in claim 1. The Staff, as set forth above, believes that the preamble is limiting. The parties’ proposed constructions are as follows.

Complainant’s Construction	Staff’s and Respondents’ Construction
Non-limiting preamble Alternatively, plain and ordinary meaning, e.g., controlling the signal applied to the gate of an insulated gate transistor	controlling the voltage supplied to the gate of an insulated gate transistor to switch the transistor between ON and OFF states

The Staff agrees with Respondents that the disputed limitation should be construed as “controlling the voltage supplied to the gate of an insulated gate transistor to switch the transistor between ON and OFF states.”

The '835 Patent always describes an insulated gate transistor that is used as a switching device. *See* '835 Patent at 1:9-15 (“Field of the Invention”: “insulated gate type switching device”). A disputed claim term must necessarily be construed within the context of the surrounding patent. *See, e.g., Atlas IP, LLC v. Medtronic, Inc.*, 809 F.3d 599, 605 (Fed. Cir. 2015) (explaining “although ‘establish’ might mean ‘initiate’ in some contexts, *it must mean*

more in this context”); *Phillips*, 415 F.3d at 1315 (explaining the patent specification is “the single best guide to the meaning of a disputed term”). For technical background, “[o]ne of the most fundamental applications of a transistor is using it to control the flow of power to another part of the circuit -- using it as an electric switch. Driving it in either cutoff or saturation mode, the transistor can create the binary on/off effect of a switch.” Staff Ex. 2 (Transistors – learn.sparkfun.com) (emphasis added). In the context of the ’835 Patent, the limitation “controlling a drive of an insulated gate transistor” is most definitely a reference to switching the transistor between its ON and OFF states. See ’835 Patent at 1:17-20 (“a control circuit controlling a drive of that *switching* device”).

Further, in the ’835 Patent, the control circuitry of the semiconductor device *always* specifically operates to drive the transistor by “controlling *the voltage* supplied to the gate of an insulated gate transistor to switch the transistor between ON and OFF states.” See ’835 Patent at 5:52-6:5 (emphasis added). For example, the ’835 Patent specifically describes the “performance of the control device LIC” to make the transistor be ON and OFF as follows:

The control input signal **S1** supplied from the outside through the control signal input terminal U_{IN} *makes the transistor 12 be ON* according to its rising and the transistor **12** maintains the ON state during a period when that control input signal **S1** is in a high potential state.

Accordingly, as shown in FIG. 5, the control output signal **S3** outputted from the gate drive **GD** rises according to the building up of the control input signal **S1**. *Moreover, when a voltage of the control output signal S3 exceeds a threshold value of the transistor 12, the transistor 12 comes to be in the ON state*, and a collector-emitter voltage of the transistor **12** drops, thus a voltage of the control output signal **S3** is clamped to a certain voltage for a determined period by a mirror effect, however, the voltage of the control output signal **S3** rises to be a value almost equal to the drive voltage of the gate driver **GD** after that. *Moreover, it falls according to a trailing edge of the control input signal S1, and makes the transistor 12 be OFF.*

’835 Patent at 5:52-6:5 (emphasis added). Therefore, the Staff agrees with Respondents

that the disputed claim term should be construed as “controlling the voltage supplied to the gate of an insulated gate transistor to switch the transistor between ON and OFF states.”

Complainant maintains that the preamble is not limiting. This argument fails for the reasons set forth above. However, to the extent the preamble is limiting, Complainant argues that the disputed term should be construed as “plain and ordinary meaning, e.g., controlling the signal applied to the gate of an insulated gate transistor.”

Complainant’s issues with the Staff’s and Respondents’ construction appear to be the following: First, Complainant takes issue with specifying that the control circuitry supplies a voltage to the gate of the insulated gate transistor. However, there is no discernable way to practice the invention described in the ’835 Patent and provide for its accompanying short-circuit protection function using something that is not a voltage. *See* ’835 Patent at 6:11-26 (comparator of short-circuit protection circuit compares control output signal to a reference voltage V1). The patent repeatedly references and *always* describes the control signal as a voltage. *See id.* at 5:62-6:3 (“when a voltage of the control output signal S3 exceeds a threshold value on the transistor 12, the transistor 12 comes to be in ON state”). To the best of the Staff’s knowledge and research, insulated gate transistors used as switches are always voltage-controlled. *See* Staff Exs. 10-11. Second, Complainant seeks to not limit the claim language to a transistor that is being operated as a switch. But this is entirely at odds with the device described and claimed by the ’835 Patent.

The ’835 Patent never describes an insulated gate transistor being used in any manner other than as an ON/OFF switch. The very field of the invention is a “switching device.” *See* ’835 Patent at 1:9-20. The ’835 Patent never contemplates a transistor used for a substantially

different operation such as power amplification. In fact, even the Complainant’s own Amended Complaint states that “[t]he ’835 Patent generally *claims* a semiconductor device and semiconductor device module that provide short-circuit protection for insulated gate type *switching devices*.” Amended Complaint, EDIS Doc. ID No. 76522 (March 17, 2022), at ¶ 39. As further explained in Complainant’s Nontechnical Description of the ’835 Patent: “The patent describes a novel IPM (Intelligent Power Module) package which consists of a semiconductor device having an insulated gate type switching device, such as an IGBT (Insulated Gate Bipolar Transistor), and *a control circuit for controlling the switching device*.” *Id.* at ¶ 40 (emphasis added). In sum, to hold that the disputed limitation does not call for controlling a transistor as a switch would be a tremendous distortion of the invention described and claimed in the ’835 Patent.

Finally, Complainant’s construction is flawed because simply controlling a signal applied to the gate of a transistor does not necessarily serve to “*drive*” the transistor. When a transistor is operated as a switch, if a voltage below the saturation threshold is applied, the transistor will not do anything. *See* ’835 Patent at 5:3-65 (“when a voltage of the control output signal S3 *exceeds a threshold value* of the transistor **12**, the transistor **12** comes to be in the ON state”). For these reasons, Complainant’s proposed construction should be rejected. The Staff’s and Respondents’ construction of “controlling the voltage supplied to the gate of an insulated gate transistor to switch the transistor between ON and OFF states” should be adopted for the disputed claim limitation.

4. “indicates a/the conduction of said insulated gate transistor” (claim 1)

The parties dispute the meaning of the claim language “indicates a/the conduction of said insulated gate transistor” in claim 1 of the ’835 Patent. The parties’ proposed constructions are

as follows.

Complainant's Construction	Staff's and Respondents' Construction
Plain and ordinary meaning, e.g., indicates that said insulated gate transistor is turned on	indicates that said insulated gate transistor is in the ON state

The Staff is of the view that the Staff's and Respondents' proposed construction of "indicates that said insulated gate transistor is in the ON state" is the better construction for this disputed claim limitation.

The surrounding claim language is "when said control *output* signal indicates a conduction of said insulated gate transistor" and "when said control *input* signal indicates the conduction of said insulated gate transistor." *See* '835 Patent at claim 1. The preamble to the '835 Patent specifies that the control output signal is generated based on the control input signal. *See id.* The specification specifically describes an insulated gate transistor used as a switch where the rising and falling value of the control input and output signals will indicate whether the transistor is in its ON or OFF state. *See* '835 Patent at 5:60-6:5. The ON state corresponds with conduction by the insulated gate transistor. *See id.* at 1:63-2:5 ("controlling and forcing the driver to stop the control output signal when a detecting voltage of the control output signal exceeds a predetermined reference voltage before a predetermined period passes after the control output signal indicates a conduction of the insulated gate transistor"). The '835 Patent describes halting the control output signal in the event of a short-circuit to stop the transistor from conducting. *See id.* Therefore, the Staff submits that "indicates that said insulated gate transistor is in the ON state" is an accurate and well-supported construction for this claim limitation.

At first glance, Complainant's construction does not appear all that different from the construction proposed by the Staff and Respondents. Except, it is not clear precisely what Complainant means by "transistor is turned on." It is also potentially telling that Complainant

has been unwilling to agree to Staff’s and Respondents’ construction which more clearly uses the term “ON state.” The Staff is concerned that Complainant’s construction might mean the transistor is “turned on” whenever it is receiving a signal input even if the signal input is below the saturation threshold needed to switch the transistor to its “ON state” and cause it to be conducting. The Staff is also concerned that Complainant’s construction might be part of an attempt to read the claim language onto a transistor being used as an amplifier and not a switch. The patent is exclusively concerned with a transistor used as a switch. For these reasons, the substantially better construction for “indicates a/the conduction of said insulated gate transistor” is the Staff’s and Respondents’ construction of “indicates that said insulated gate transistor is in the ON state.”

5. “significant” (claim 1)

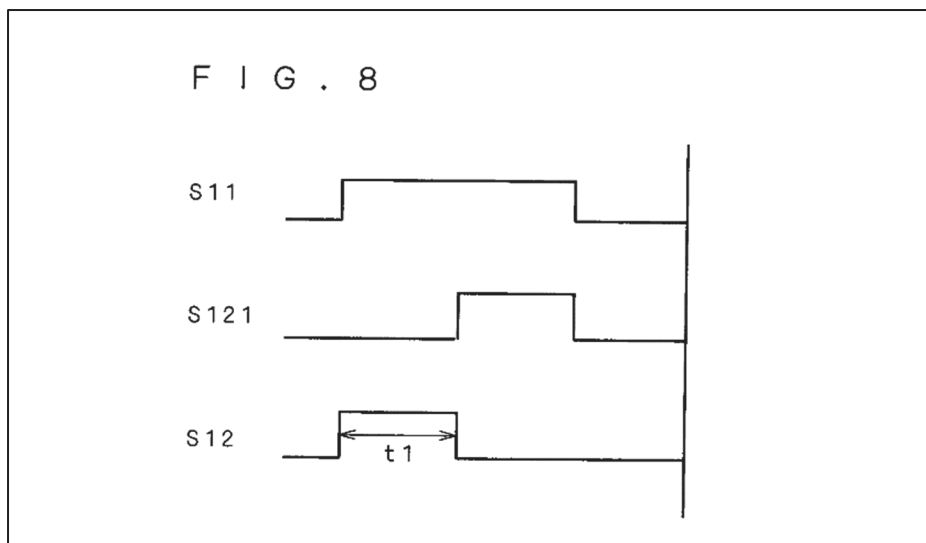
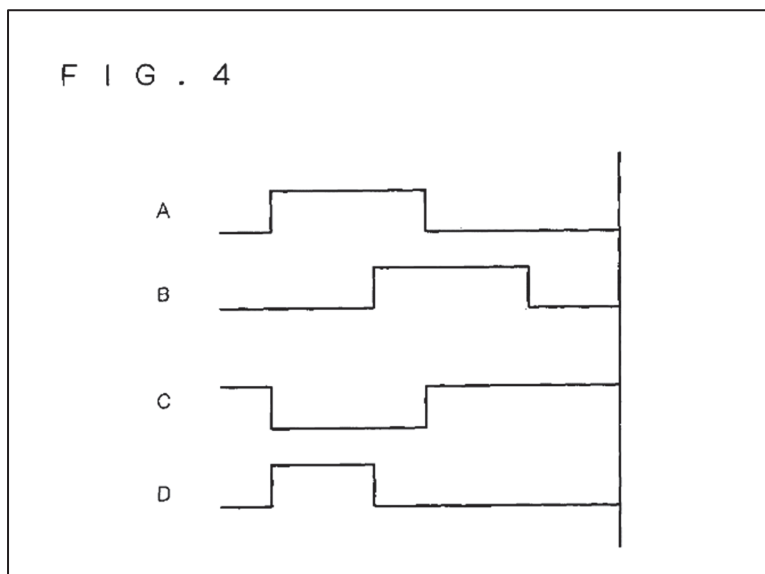
The parties dispute the meaning of the term “significant” in claim 1 of the ’835 Patent. The parties propose the following constructions for this limitation.

Complainant’s Construction	Respondents’ Construction	Staff’s Construction
Plain and ordinary meaning, e.g., active	Plain meaning, <i>i.e.</i> large or important enough to have a meaningful effect, <i>e.g.</i> , a HIGH potential state	active-high or active-low state indicating a condition is met

The Staff proposes to construe the disputed term as “active-high or active-low state indicating a condition is met.” The “significant” signal limitations were a central part of the patent examiner’s stated reasons for allowance of the asserted patent claims. *See* Staff Ex. 12 (10/19/2006 Notice of Allowance). It is thus important to get this construction as precise as

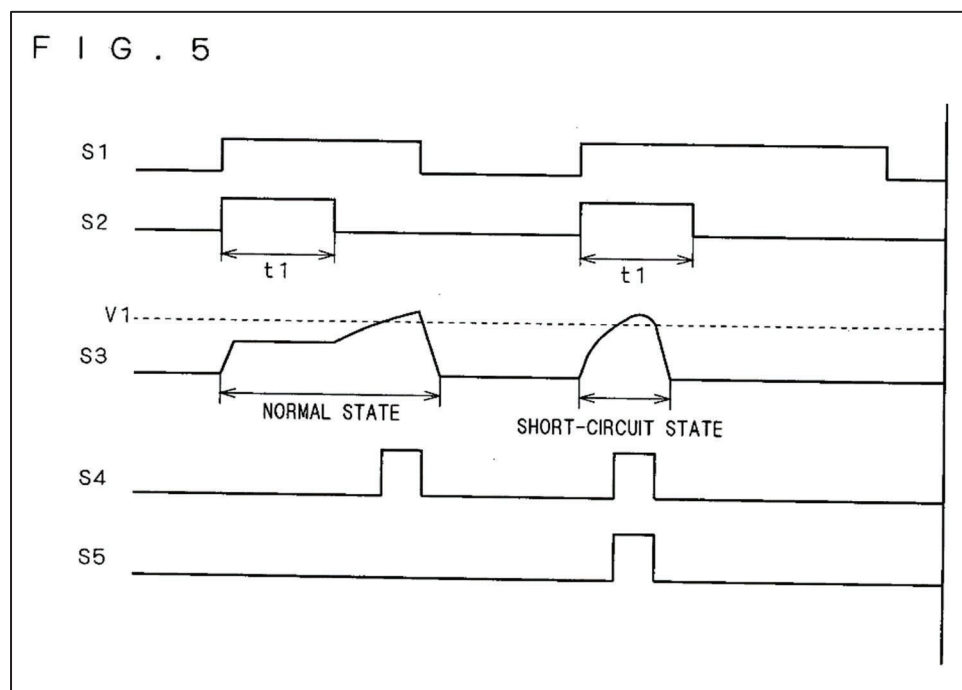
possible. The Staff is of the view that its proposed construction is clearer than the constructions proposed by either of the private parties.

The Staff's construction for "significant" is intended to refer to *one* of two possible logic states for a digital (logic) signal. *See generally* Staff Ex. 5. In the context of the claims, "significant" is always used to refer to a pulse signal that will be provided to a logical circuit (asserted claim 1) or a signal selective part (unasserted claim 4). *See* '835 Patent at claims 1, 4. The following figures from the '835 Patent illustrate a pulse signal:



'835 Patent at Figs. 4 and 8. A pulse signal is a digital signal with only two states: HIGH and LOW. *See id.* The pulse signals recited in the claims are also depicted as signals S2 and S4 in Figure 5 shown in the background section above. *See id.* at Fig. 5. In the example shown in Figure 5, the “significant” condition for both signals happens to have been defined as the “HIGH” state. *See id.*

As can be seen in Figure 5, for example, the “significant” condition for the pulse signals S2 and S4 always represents a *change* from the baseline (HIGH or LOW) condition that directly correlates to a particular condition or event having occurred. *See* '835 Patent at 10:17-26.



Id. at Fig. 5. Here, the events are the control output signal S3 exceeding the reference voltage V1 for S4, and the set time period t1 which is triggered by the rising of the control input signal S1 for S2. *See id.* at 6:52-6:53. For example, in one instance, the patent explains that

the comparison result signal S14 outputted by the comparator 13 comes to be in the “H” or “L” state on a basis of a comparison result between that divided voltage and the reference voltage V1. That is to say, *when the divided voltage of the control output signal S13 exceeds the reference voltage V1*, the comparator

13 makes the comparison result signal **S14** which is the output of the comparator **13** be in *the significant condition, the “H” state in this case*.

Id. at 10:17-26 (emphasis added). However, a person of skill would readily understand that one can design a circuit with *either* the HIGH potential or the LOW potential as the baseline (or not significant) logic state. *See* '835 Patent at 10:21-26 (“the output of the comparator **13** be in the significant condition, the ‘H’ state *in this case*”); *see also* Staff Ex. 5 (Elements of Logic) (“You might jump to the conclusion that convention assigns high voltage = TRUE and low voltage = FALSE, but this is incorrect. Each state of the signal can mean either logic state, but which state that is must be defined for each signal.”).

Thus, depending on circuit design, the pulse signal can be defined to have either an “active-high” or an “active-low” state, which refers to its non-baseline state. *See* Staff Ex. 5. The circuit is designed such that the “active-high” or “active-low” state corresponds to a condition or event occurring (*e.g.*, a time interval, another signal turning on or off, a comparator output indicating a signal is above or below a given threshold, etc.). This is what it means for a pulse signal to be “significant.” Therefore, the Staff submits that the term “significant” should be construed as “active-high or active-low state indicating a condition is met.”

While the Staff would welcome appropriate refinements to its construction from the private parties, neither of the constructions for the term “significant” that have been proposed by Complainant and Respondents so far is a good one. Respondents’ proposed construction is too narrow. It problematically appears to limit the term to being “large” in size or always the “HIGH potential state.” While the '835 Patent uses the HIGH state as an example, the patent specification includes language indicating that the HIGH state will not be the significant condition in all cases. '835 Patent at 6:38-39 (“...the significant condition, in the “H” state *in this case*”), 10:22-26 (“...the significant condition, in the “H” state *in this case*”). For example,

the '835 Patent explains that “the comparator 2 makes the comparison result signal S4 which is the output of the comparator 2 be in a significant condition and *a high potential “H” state in this case*, when the voltage of the control output signal S3 exceeds the reference voltage V1.” '835 Patent at 6:13-17. This ignores that logic circuitry can alternatively be set-up where the low potential “L” state, and not the “H” potential state, is the significant condition. *See id.* To the extent that Respondents’ construction would in all cases exclude the LOW state from being the significant logic condition, it is wrong and should be rejected.

Additionally, while the “significant” condition is *meaningful* in that it differs from the baseline and is indicative of *some* condition having been met, it is not altogether clear what the Respondents mean by “important enough to have a meaningful effect.” “Significance” is assigned by the circuit designer (and here specified by the ensuing claim language). There is no requirement that a logic signal or its associated event must be sizeable or important for it to be made indicative of a logic state.

Meanwhile, Complainant’s proposed construction of “plain and ordinary meaning, e.g., active” suffers from a lack of clarity. It is not clear what Complainant means by the word “active,” used in isolation. Complainant’s construction does not specify that the term “significant” is being used in the claims to refer to one of two possible logic states for a digital signal. It could be problematic if Complainant were during the infringement stage permitted to label nearly any signal output as “significant” or “active.” The term “active” can even have a different meaning in the art when not used in the context of a HIGH or LOW logic signal. *See* Staff Ex. 2 (using term differently in reference to power amplification). For these reasons, the Staff proposes that the disputed claim limitation be construed as “active-high or active-low state indicating a condition is met.”

6. “clamped constantly” (claim 2)

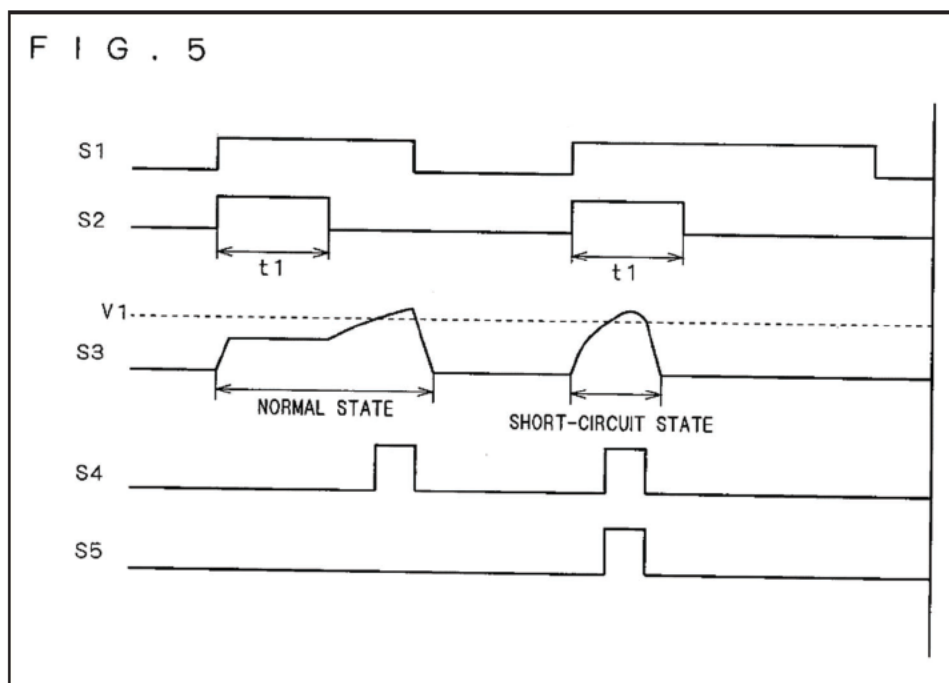
The parties dispute the meaning of the term “clamped constantly” in dependent claim 2 of the ’835 Patent. The parties’ proposed constructions for this limitation are as follows.

Staff’s and Complainant’s Construction	Respondents’ Construction
held at a constant voltage	clamped to a certain voltage for a determined period by a Miller effect

The Staff agrees with Complainant that the term “clamped constantly” means “held at a constant voltage.”

With respect to the preferred embodiment, the ’835 Patent explains that “a voltage of the control output signal S3 is *clamped to a certain voltage* for a determined period by a mirror effect,² however the voltage of the control output signal S3 rises to be a value almost equal to the drive voltage VCC of the gate driver GD after that.” ’835 Patent at 5:66-6:3 (emphasis added). The patent also explains that “a period t1 ... is set to be almost equal to the period when the control output signal S3 is clamped to a certain voltage.” *Id.* at 6:38-40. In Figure 5 shown on the next page, one can see how the control output signal S3 is held at a constant voltage during the time period t1.

² Respondents believe this was a typographical error in the patent and should be “Miller effect.”



'835 Patent at Fig. 5. Likewise, for a second embodiment, the patent also refers to “a period when the control output signal is clamped to a constant voltage.” *See id.* at 9:35-37, Fig. 7 (showing control output signal S13 clamped constantly during time period t_1).

Therefore, in view of the patent specification, the Staff submits that the claim term “clamped constantly” should be construed as “held at a constant voltage.”

The Respondents’ proposed construction of the term “clamped constantly” as “clamped to a certain voltage for a determined period by a Miller effect” should be rejected, because the language of dependent claim 2 does not specify or require that a particular clamp circuit method must be used to make the control output signal be “clamped constantly.” *See* '835 Patent at claim 2. There is no reason for transforming clear claim language that plainly means “held at a constant voltage” into the lengthy limitation sought by Respondents. *See generally Phillips*, 415 F.3d at 1316 (“The construction that stays *true to the claim language* and most naturally aligns with the patent’s description of the invention will be, in the end, the correct construction.”).

While the Miller effect is one possible way that the clamping limitation of the claimed invention could be accomplished, it is not necessarily the only type of clamping circuit available or known in the art. The second preferred embodiment in the patent instructs that “the control output signal S13 is clamped to a constant voltage” for a period almost equal to period t1, without specifying how the clamping is done. *See id.* at 9:31-37, Fig. 7 (showing control output signal S13 clamped constantly during time period t1). The patent specifically discusses obtaining a reference voltage V1 by clamping done using a Zener diode method, which is different from a Miller clamp: “by clamping the drive voltage VCC to a desired voltage with employing a zener voltage characteristic of the zener diode ZD.” ’835 Patent at 4:43-49. Therefore, the Staff is of the view that Respondents’ proposed construction impermissibly reads the words “for a determined period by a Miller effect” into the claim. The Staff submits that “clamped constantly” should be construed as “held at a constant voltage,” without the extra verbiage proposed by Respondents.

7. “control output signal” (claim 1)

The parties dispute the meaning of the term “control output signal” in claim 1 of the ’835 Patent. The parties’ proposed constructions for this limitation are as follows.

Complainant’s Construction	Staff’s and Respondents’ Construction
Plain and ordinary meaning, e.g., output signal that is controlling an insulated gate transistor	signal supplied to the gate of an insulated gate transistor to switch the transistor between ON and OFF states

The Staff agrees with Respondents that the term “control output signal” should be construed as “signal supplied to the gate of an insulated gate transistor to switch the transistor between the ON and OFF states.”

Ultimately, “[t]he only meaning that matters in claim construction is the meaning in the context of the patent.” *Trustees of Columbia Univ. in City of N.Y. v. Symantec Corp.*, 811 F.3d

1359, 1363 (Fed. Cir. 2016) (citing to *Phillips*, 415 F.3d at 1316). The '835 Patent is entirely clear that the “control output signal” is a “signal supplied to the gate of an insulated gate transistor.” *See, e.g.*, '835 Patent at 3:3-7 (“***a control output signal is supplied to respective gate electrodes of the transistors 11, 21 and 31*** from respective control signal output terminals HO of the control devices HIC1, HIC2 and HIC3”), 3:36-40 (“The inverter module **100** has a composition that ***a control output signal is supplied to respective gate electrodes of the transistors 12, 22 and 32*** from control signal output terminals U_{out}, V_{out}, and W_{out} of the control device LIC, respectively.”), 4:14-16 (“As shown in FIG. 2, ***the control output signal is supplied to the gate electrode of the transistor 12*** from the control signal output terminal U_{out} of the control device LIC”), 4:27-33 (“the control output signal of the insulated gate transistor ... is supplied as a control output signal **S3** to the gate electrode of the transistor **12**”), Abstract (“***A control output signal is supplied to a gate electrode of an insulated gate transistor*** from a control signal output terminal of a control device...”).

The Patent is also clear that the transistor is a switch where the purpose or function of the “control output signal” is “to switch the transistor between ON and OFF states.” 4:11-16 (“the composition is described by applying a circuit performing ***a switching control*** of the transistor **12** as an example in the control device LIC. As shown in FIG. 2, the control output signal is supplied to the gate electrode of the transistor **12** from the control signal output terminal U_{out} of the control device LIC”), 5:60-6:5 (“the control output signal **S3** outputted from the gate driver GD rises according to the building up of the control input signal **SI**. Moreover, when a voltage of the control output signal **S3** exceeds a threshold value of the transistor **12**, the transistor **12** comes to be in ON state....”). Therefore, in view of the overwhelming intrinsic evidence, the Staff submits that the disputed term should be construed as “signal supplied to the gate of an

insulated gate transistor to switch the transistor between ON and OFF states.” *See AIA Engineering Ltd. v. Magotteaux Intern. S/A*, 657 F.3d 1264, 1278 (Fed. Cir. 2011) (“Where, as here, the specification reveals a special meaning for a term that differs from the meaning it might otherwise possess, that special meaning governs[.]”).

It is also worth noting that, during an office action discussing a prior art rejection (to application claim 1) during patent prosecution, the patent examiner referred to “a control output signal” as “a control output signal (*i.e.* the unlabeled ***signal applied to the gate of transistor*** 11) on the basis of a control input signal (*i.e.* the TURN-ON and TURN-OFF INSTRUCTIONS).” Staff Ex. 13 (7/7/2006 Non-Final Office Action) at 8. The applicants did not dispute the examiner’s understanding of “a control output signal”; they instead proceeded to cancel the challenged independent claim (application claim 1) so that their dependent application claims allowed on other grounds could issue. *See* Staff Ex. 14 (10/10/2006 Amendment and Response). This evidence only further supports the Staff’s and Respondent’s construction.

Complainant’s proposed construction of “plain and ordinary meaning, e.g., output signal that is controlling an insulated gate transistor” is problematic, because it simply moves the claim language around and avoids specifying ***how*** the signal is “controlling” the transistor. Complainant’s proposed construction overlooks that the disputed claim term was coined by the patentee to specifically refer to a ***gate*** signal applied to control a switching transistor. *See Iridescent Networks, Inc. v. AT&T Mobility, LLC*, 933 F.3d 1345, 1353 (Fed. Cir. 2019) (“Rather, because ***the disputed term is a coined term, meaning it has no ordinary and customary meaning***, the question is whether the intrinsic evidence provides objective boundaries to the scope of the term.”); *3M Innovative Properties Co. v. Tredegar Corp.*, 725 F.3d 1315, 1321 (Fed. Cir. 2013) (“Idiosyncratic language, highly technical terms, and terms coined by the

inventor are best understood by reference to the specification.”). By not requiring that the disputed signal must be supplied to the gate of a transistor, Complainant’s construction is overly broad such that it could potentially be read onto a power source provided to a transistor and a short-circuit protection function that disconnects the power source rather than the gate signal. *See* ’835 Patent at 2:48-59 (stating that the transistors are also “connected with a power source PS”), Fig. 1 (showing control signal output terminals HO, U_{out}, V_{out}, and W_{out} and also power source “PS”). This is not the invention described in the patent. *See id.* at 4:14-26 (monitoring the waveform of the signal supplied to the gate and disconnecting that signal in the event of a short-circuit). Likewise, by not specifying how the disputed signal is “controlling” the transistor, Complainant’s construction might potentially be read onto a transistor being used as a power amplifier when the patent is only ever concerned with a transistor used as a switch. This is also not the invention described in the patent. *See id.* at 1:10-20 (field of the invention is a transistor used as a switch). For these reasons, the Staff submits that the term “control output signal” should be construed as “signal supplied to the gate of an insulated gate transistor to switch the transistor between ON and OFF states.”

8. “short circuit protection circuit” (claim 1)

The parties dispute the meaning of the term “short circuit protection circuit” in claim 1 of the ’835 Patent. The parties’ proposed constructions for this limitation are as follows.

Complainant’s Construction	Staff’s and Respondents’ Construction
Plain and ordinary meaning, e.g., circuit that performs function of short-circuit protection	circuit that performs short-circuit protection without a shunt resistor

The Staff agrees with Respondents that the disputed term should be construed as “circuit that performs short-circuit protection without a shunt resistor.”

As with the term “control output signal,” the term “short circuit protection circuit” was

coined by the patentee to specifically refer to the circuitry for providing a short-circuit protection function that they allege to have invented. The very title of the '835 Patent is: "Semiconductor Device Which Realizes *a Short-Circuit Protection Function Without Shunt Resistor*, and Semiconductor Device Module." '835 Patent at Title (emphasis added). In fact, during patent prosecution, the patent examiner objected to the patent applicants' original title of "Semiconductor Device and Semiconductor Device Module" as generic in nature and not descriptive enough. The examiner instructed the applicants to submit a new title "*that is indicative of the invention to which the claims are directed*." It is suggested the title indicate a short-circuit protection, or control, circuit for an insulated gate transistor." Staff Ex. 13 (7/7/2006 Non-Final Office Action) at 8. In response to this express instruction for a title "that is indicative of the invention to which the claims are directed," the applicants submitted the current patent title for a "semiconductor device which realizes *a short-circuit protection function without shunt resistor*, and semiconductor device module." See Staff Ex. 14 (10/10/2006 Amendment and Response).

The crux of the invention and sole purported advance over the prior art is a switching device that includes short-circuit protection *without a shunt resistor*. See '835 Patent at 1:47-51 (Summary of Invention: "A semiconductor device which realizes a short-circuit protection function *without a shunt resistor* and an IPM in which the semiconductor device is built are provided."). Every time that the patent specification uses the term "short-circuit protection circuit," it is in reference to circuitry that removes the need for a shunt resistor. See *id.* at 1:63-2:5 ("thus a composition for the short-circuit protection can be simplified"). For example, the '835 Patent states: "The inverter module **100** described above has a composition that a shunt resistor and a current detecting terminal connecting the shunt resistor which are conventionally

necessary are not included but the LVIC or the HVIC in the module includes the short-circuit protection function.” ’835 Patent at 3L65-4:2. It would not make sense for the claimed “short-circuit protection circuit” to include a shunt resistor, because that would defeat the advantage touted in the patent of being able to make the device smaller. *See id.* at 7:22-43 (without a shunt resistor, “it is possible to make the module small” and “the voltage surge according to the switching of the switching device can be reduced”), 10:55-11:11 (further noting that “a strain on a motor system can be reduced”).

In other cases, courts have found that the title along with how the patentees repeatedly describe their patented invention in the patent specification may serve to limit the claim scope. For example, in *UltimatePointer, L.L.C. v. Nintendo Co., Ltd.*, 816 F.3d 816, 823-24 (Fed. Cir. 2016), the Federal Circuit affirmed a construction of “handheld device” as “handheld *direct pointing* device,” based on the patent title “Easily-Deployable Interactive Direct Pointing System” and how the patent specification repeatedly emphasized a system for interacting with a presentation in a “direct-pointing” manner. Similarly, in *RuckusWireless, Inc. v. Innovation Wireless Sol’ns, LLC*, 824 F.3d 999, 1002-04 (Fed. Cir. 2016), the Federal Circuit affirmed a construction of the term “communications path” as limited to wired and not wireless communication where the title of the patent family was “Communicating Information Packets via Telephone Lines,” the patent specification only described wired communications, and every disclosed embodiment in the patent specification included a telephone wire.

Ultimately, “[w]here the specification makes clear that the invention does not include a particular feature, that feature is deemed to be outside the reach of the claims of the patent, even though the language of the claims, read without reference to the specification, might be considered broad enough to encompass the feature in question.” *SciMed Life Sys., Inc. v. Adv.*

Cardiovascular Sys., Inc., 242 F.3d 1337, 1341 (Fed. Cir. 2001) (holding “[b]ecause the three SciMed patents make clear that the lumens referred to in the claims are all coaxial in structure, the district court was correct to construe the patents as disclaiming the dual lumen configuration”). Here, the patent specification is manifestly clear that the “short-circuit protection circuit” of the patented invention does not include a shunt resistor. Accordingly, the claim requirement for a “short-circuit protection circuit” should be construed to require a “circuit that performs short-circuit protection without a shunt resistor.”

VI. CONCLUSION

For the reasons set forth above, the Staff respectfully submits that its constructions should be adopted for each of the disputed claim terms.

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Respectfully submitted,

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