IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

AMPT, LLC, *Plaintiff,* v. SOLAREDGE TECHNOLOGIES, INC. AND SOLAREDGE TECHNOLOGIES LTD., *Defendants.*	Civil Action No. _____ **JURY TRIAL DEMANDED**

COMPLAINT FOR PATENT INFRINGEMENT

Plaintiff Ampt, LLC ("Ampt" or "Plaintiff") brings this Complaint for patent infringement against Defendants SolarEdge Technologies, Inc. ("SolarEdge Inc.") and SolarEdge Technologies Ltd. ("SolarEdge Ltd.") (collectively, "SolarEdge" or "Defendants") and alleges as follows:

THE PARTIES

1. Ampt is a Colorado limited liability company, having its principal place of business at 4850 Innovation Drive, Fort Collins, CO 80525.

2. On information and belief, SolarEdge Inc. is a Delaware corporation having its principal place of business in the United States at 700 Tasman Drive, Milpitas, California 95035.

3. On information and belief, SolarEdge Ltd. is a limited liability company organized under the laws of Israel with its principal place of business located at 1 HaMada Street, Herzliya, Israel, and is wholly owned by SolarEdge Inc.

JURISDICTION AND VENUE

4. This action arises under the patent laws of the United States, Title 35 of the United States Code. Accordingly, this Court has exclusive subject matter jurisdiction over this action under

28 U.S.C. §§ 1331 and 1338(a).

5. This Court has personal jurisdiction over Defendants. On information and belief, Defendants are subject to this Court's specific and general personal jurisdiction pursuant to due process and/or the Delaware Long Arm Statute, due at least to their substantial business in this State and judicial district, including: (a) conducting at least part of their infringing activities alleged herein; and (b) regularly doing or soliciting business, engaging in other persistent conduct, and/or deriving substantial revenue from infringing goods offered for sale, sold, and imported and services provided to Delaware residents vicariously through and/or in concert with their intermediaries, distributors, importers, customers, and/or subsidiaries or affiliates. SolarEdge Ltd. has purposefully availed itself of the privileges of conducting business in the United States and, more specifically, in Delaware and this district. For example, SolarEdge Ltd. has sought protection and benefit from the laws of the State of Delaware by placing the Accused Products (defined below) into the stream of commerce through an established distribution channel with awareness and/or intent that they will be purchased and/or installed by consumers in this district. Personal jurisdiction exists over SolarEdge Inc. also because it is a corporation organized and existing under the laws of Delaware.

6. On information and belief, SolarEdge Inc. and SolarEdge Ltd. hold themselves out as a unitary entity and operate as a single integrated business with respect to the sale and distribution of solar energy power system products throughout the United States, including in this judicial district.

7. For these reasons and for other reasons that will be presented to the Court if jurisdiction is challenged, the Court has personal jurisdiction over Defendants.

8. Venue is proper in this district under 28 U.S.C. §§ 1391 and 1400(b) because, among other reasons, Defendants have committed acts of infringement in this district, directly or indirectly, by conducting their business extensively throughout this district such as by shipping, manufacturing,

distributing, offering for sale, selling, and advertising the Accused Products, and by purposefully and voluntarily placing the Accused Products into this district and into the stream of commerce with the intention and expectation that they will be purchased and/or installed by consumers in this district. On information and belief, Defendants also use the Accused Products in this district. Venue is proper in this district as to SolarEdge Inc. under 28 U.S.C. §§ 1391 and 1400(b) also because it is a corporation organized and existing under the laws of Delaware and resides in Delaware for purposes of venue under 28 U.S.C. § 1400(b).

THE ASSERTED PATENTS

9. Ampt is a recognized leader in photovoltaic (PV) power technology and has been awarded many patents, including U.S. Patent Nos. 7,605,498 ("the '498 patent"), 7,719,140 ("the '140 patent"), 9,673,630 ("the '630 patent"), 10,608,437 ("the '437 patent"), 10,886,746 ("the '746 patent"), 11,070,062 ("the '062 patent"), 11,070,063 ("the '063 patent"), and 11,289,917 ("the '917 patent") (collectively, the "Asserted Patents").

10. The '498 patent, entitled "Systems For Highly Efficient Solar Power Conversion," was duly and legally issued by the United States Patent and Trademark Office on October 20, 2009, to inventors Anatoli Ledenev and Robert M. Porter. The '498 patent issued from U.S. Patent Application No. 12/363,709. The patent application was filed on January 30, 2009. A copy of the '498 patent is attached hereto as Exhibit 1. Ampt is the owner and assignee of all substantial rights in the '498 patent.

11. The '140 patent, entitled "Systems For Boundary Controlled Solar Power Conversion," was duly and legally issued by the United States Patent and Trademark Office on May 18, 2010, to inventors Anatoli Ledenev and Robert M. Porter. The '140 patent issued from U.S. Patent Application No. 12/581,726. The patent application was filed on October 19, 2009. A copy of the '140 patent is attached hereto as Exhibit 2. Ampt is the owner and assignee of all substantial rights in the '140 patent.

12. The '630 patent, entitled "Protected Conversion Solar Power System," was duly and

legally issued by the United States Patent and Trademark Office on June 6, 2017, to inventors Anatoli Ledenev and Robert M. Porter. The '630 patent issued from U.S. Patent Application No. 15/219,149. The patent application was filed on July 25, 2016. A copy of the '630 patent is attached hereto as Exhibit 3. Ampt is the owner and assignee of all substantial rights in the '630 patent.

13. The '437 patent, entitled "Feedback Based Photovoltaic Conversion Systems," was duly and legally issued by the United States Patent and Trademark Office on March 31, 2020, to inventors Anatoli Ledenev and Robert M. Porter. The '437 patent issued from U.S. Patent Application No. 15/679,745. The patent application was filed on August 17, 2017. A copy of the '437 patent is attached hereto as Exhibit 4. Ampt is the owner and assignee of all substantial rights in the '437 patent.

14. The '746 patent, entitled "Alternating Conversion Solar Power System," was duly and legally issued by the United States Patent and Trademark Office on January 5, 2021, to inventors Anatoli Ledenev and Robert M. Porter. The '746 patent issued from U.S. Patent Application No. 17/036,630. The patent application was filed on September 29, 2020. A copy of the '746 patent is attached hereto as Exhibit 5. Ampt is the owner and assignee of all substantial rights in the '746 patent.

15. The '062 patent, entitled "Photovoltaic Conversion Systems," was duly and legally issued by the United States Patent and Trademark Office on July 20, 2021, to inventors Anatoli Ledenev and Robert M. Porter. The '062 patent issued from U.S. Patent Application No. 16/834,639. The patent application was filed on March 30, 2020. A copy of the '062 patent is attached hereto as Exhibit 6. Ampt is the owner and assignee of all substantial rights in the '062 patent.

16. The '063 patent, entitled "Method For Alternating Conversion Solar Power," was duly and legally issued by the United States Patent and Trademark Office on July 20, 2021, to inventors Anatoli Ledenev and Robert M. Porter. The '063 patent issued from U.S. Patent Application No. 17/063,669. The patent application was filed on October 5, 2020. A copy of the '063 patent is attached

hereto as Exhibit 7. Ampt is the owner and assignee of all substantial rights in the '063 patent.

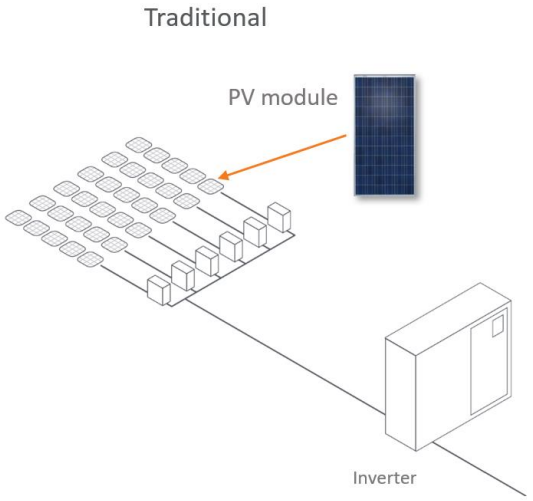
17. The '917 Patent, entitled "Optimized Photovoltaic Conversion System," was duly and legally issued by the United States Patent and Trademark Office on March 29, 2022, to inventors Anatoli Ledenev and Robert M. Porter. The '917 Patent issued from U.S. Patent Application No. 17/379,516. The patent application was filed on July 19, 2021. A copy of the '917 patent is attached hereto as Exhibit 8. Ampt is the owner and assignee of all substantial rights in the '917 patent.

18. Each of the Asserted Patents claims priority to provisional application No. 60/980,157, filed on October 15, 2007, provisional application No. 60/982,053, filed on October 23, 2007, and provisional application No. 60/986,979, filed on November 9, 2007. *See* Exs. 1-8.

FACTUAL BACKGROUND

A. Background On The Technology

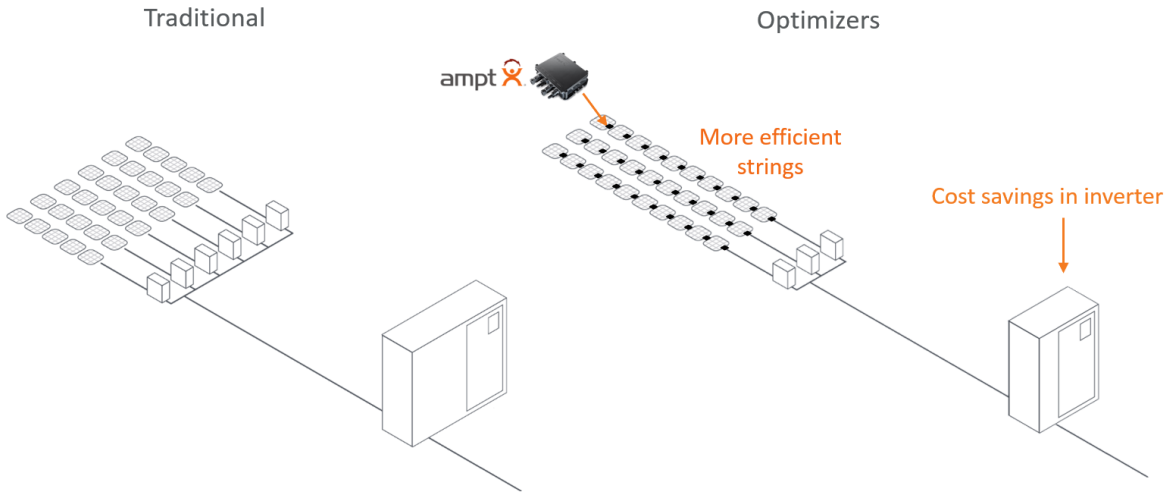
19. Solar power systems generate electrical power from sunlight. Photovoltaic (PV) cells, arranged in solar panels, convert light into electric current. The solar panels are connected to inverters, which convert the direct-current (DC) output from solar panels to alternating current (AC).



20. Solar panels are typically connected together in series in what are called "strings" in order to provide the voltage needed by the inverter. However, this arrangement has inefficiencies. The

panels need to be arranged so that the system can produce power both during times with full sun (*e.g.*, noon in the summer) and times with less sun (*e.g.*, 2 p.m. in the winter). At the same time the inverters need to be able to handle a wide range of operating conditions, again so that the system can produce power both during times with full sun and times with less sun. Additional problems arise because different panels in the same string can produce different amounts of power at the same time, for example when some panels are shaded by a cloud, a tree, or a building. In such situations the low-power panel(s) can inhibit the production of the entire string of panels.

21. Adding power optimizers helps address these problems by allowing the voltage output by individual solar panels in a string to be either raised or lowered to maximize the power output of each panel in the context of the string. This allows the maximum available power of each panel to be delivered, and longer and more flexible strings of panels. It also allows inverters that handle a smaller range of operating conditions. Together, this allows solar systems that are more cost-effective (*i.e.*, have a lower cost per kilowatt hour produced) and thus more efficient from an economic point of view.



22. However, the electronics in the power optimizers need to be protected from conditions that could damage them. In situations where different panels in the same string are producing different amounts of power (typically because of shading), the electrical conditions experienced by a particular

optimizer can be damaging. While it is possible to protect the panels/power optimizers that are experiencing potentially-damaging conditions by bypassing them, this loses the power output of those panels/power optimizers, which may negate the benefits of using power optimizers in the first place.

23. Ampt invented solar power systems that solve these problems using power optimizers that contain high-efficiency power converters that both allow maximum power-point output, and use operational boundary conditions that continue producing power during conditions that might otherwise require the optimizer to be bypassed. The combination of these elements both enhances efficiency and reduces the overall cost per kilowatt-hour of the solar power system. The inventive solar power systems and power optimizers are described in the Asserted Patents as well as Ampt's website.[1]

24. For example, Figure 5 in each of the '630, '746, '437, '062, '063, and '917 patents shows the power optimizer circuits of Ampt's inventions, which describe a dual-mode configuration that provides high efficiency for their specific use-case. For example, Figure 5A (reproduced below) shows a power optimizer circuit that includes both a buck conversion circuit (described, for example, in the '630 patent at 11:58-12:8) and a boost conversion circuit (described, for example, in the '630 patent at 12:9-25).

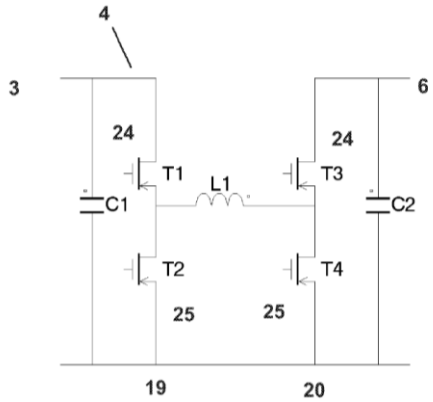


Fig. 5A

[1] *See, e.g.*, https://ampt.com/products/string-optimizers/.

25. Additionally, Figure 7 in each of the Asserted Patents shows a power optimizer's operation with both maximum power point (MPP) tracking and the operational boundary conditions of Ampt's inventions: the "overcurrent limit" and the "overvoltage limit."

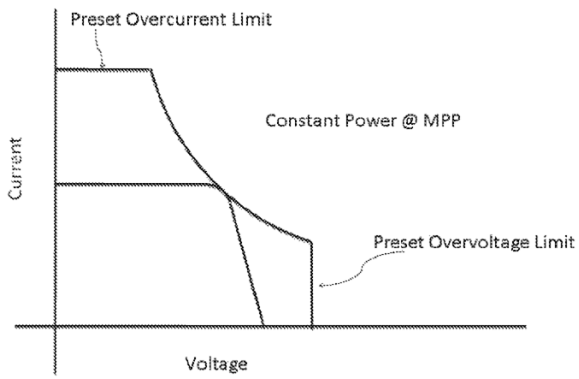


Fig. 7A

B. Background On SolarEdge's Infringement

26. SolarEdge infringes Ampt's inventions in order to compete in the business of offering for sale and selling certain solar power systems and components thereof.

27. More specifically, SolarEdge manufactures, uses, sells, offers for sale, and/or imports optimizers and other solar products, including inverters, that are designed to be installed and operated together within the United States without authority, in a manner that constitutes infringement of one or more claims of the Asserted Patents, including when such optimizers are used, sold, offered for sale, and/or imported for use in a solar power system (collectively, the "Accused Products").

28. The Accused Products include all of the SolarEdge's optimizers that are manufactured, used, sold, offered for sale, and/or imported within the United States including, without limitation, each and every model of SolarEdge optimizer products such as the SolarEdge P401 and P960 optimizers.

29. On information and belief, the SolarEdge P401 optimizer is representative of all other similar SolarEdge optimizer products described herein. Additional models of the accused SolarEdge optimizers represented by the P401 optimizer include, without limitation, the following models: P320-

P505, P730, P750, P801-P1100, P860-P-1101, S440-S550, and OPJ300.[2]

30. SolarEdge's optimizers are designed to be installed and operated with SolarEdge's inverters, such as the SolarEdge SE3000H-US, SE3800-US, SE5000H-US, SE6000H-US, SE7600H-US, SE10000H-US, SE11400H-US, SE9KUS, SE17.3KUS, SE30KUS and SE40KUS inverters.

31. On information and belief, a SolarEdge solar power system that includes a package of P401 power optimizers and the SE3800H-US inverter is representative of all other similar SolarEdge solar power systems described herein.

32. On information and belief, the use of a SolarEdge solar power system that includes a package of P401 power optimizers and the SE3800H-US inverter is representative of all other similar uses of a SolarEdge solar power system.

33. On information and belief, SolarEdge has made, used, sold, offered to sell, imported, installed, and/or have had installed Accused Products in Delaware.

COUNT I
(INFRINGEMENT OF U.S. PATENT NO. 7,605,498)

34. Plaintiff repeats and realleges paragraphs 1-33 as if fully set forth at length herein.

35. SolarEdge has and continues to infringe one or more claims of the '498 patent in this judicial district and elsewhere in the United States.

36. 78. Upon information and belief, SolarEdge makes, uses, sells, offers for sale, and/or imports into the United States the Accused Products.

37. SolarEdge directly infringes the '498 patent under 35 U.S.C. § 271(a), literally and/or under the doctrine of equivalents, by using the Accused Products in an infringing manner within the United States, including in installation, testing and demonstrating the Accused Products.

38. For example, SolarEdge directly infringes at least claim 1 of the '498 patent, either

[2] *See also* https://www.solaredge.com/us/products/power-optimizers#/.

literally or under the doctrine of equivalents. The asserted claim(s) of the '498 patent are valid, enforceable, and currently in full force and effect.

39. Claim 1 of the '498 patent recites:

> A highly efficient method of series string solar energy power conversion comprising the steps of:
>
> establishing a plurality of solar energy sources, each providing a DC photovoltaic output;
>
> creating a plurality of high voltage highly varying DC photovoltaic outputs from said plurality of solar energy sources;
>
> individually establishing each of said high voltage, highly varying DC photovoltaic outputs as an individual DC photovoltaic input to a plurality of individual high efficiency switchmode photovoltaic DC-DC converters;
>
> individually high efficiency conversion duty cycle controlling operation of a plurality of switch elements within each of said individual high efficiency switchmode photovoltaic DC-DC converters;
>
> photovoltaic boundary condition controlling said plurality of switch elements within each of said individual high efficiency switchmode photovoltaic DC-DC converters;
>
> maximum photovoltaic power point controlling said plurality of switch elements within each of said individual high efficiency switchmode photovoltaic DC-DC converters slaved to said step of photovoltaic boundary condition controlling said plurality of switch elements;
>
> feeding each of said high voltage, highly varying DC photovoltaic outputs through a photovoltaic voltage increase modality of photovoltaic DC-DC power conversion;
>
> feeding each of said high voltage, highly varying DC photovoltaic outputs through a photovoltaic voltage decrease modality of photovoltaic DC-DC power conversion responsive to said photovoltaic voltage increase modality of photovoltaic DC-DC power conversion;
>
> slavedly individual panel dedicated maximum photovoltaic power point DC-DC converting each of said high voltage, highly varying DC photovoltaic outputs;
>
> boundary condition DC-DC converting said high voltage, highly varying DC photovoltaic outputs;
>
> individually substantially power isomorphically converting each said high voltage, highly varying DC photovoltaic outputs into a plurality of converted DC photovoltaic outputs while accomplishing said step of individual dedicated maximum photovoltaic power point converting said DC photovoltaic input from each of said plurality of solar panels;

serially connecting said plurality of converted DC photovoltaic outputs to create a combined higher voltage converted DC photovoltaic output from said plurality of solar panels;

establishing said combined higher voltage converted DC photovoltaic output as a converted DC photovoltaic input to a high voltage, high power photovoltaic DC-AC inverter; and

inverting said converted DC photovoltaic input into a high power inverted AC photovoltaic output.

40. As one non-limiting example of said infringement, on information and belief, SolarEdge practices each and every step recited in claim 1 of the '498 patent by using a solar power system that includes a package of P401 power optimizers and the SE3800H-US inverter, as described below.

41. SolarEdge does and will make, use, offer to sell, sell, and/or import a system for series string solar energy power conversion. For example, SolarEdge and its distributers install, monitor and operate solar power conversion system that includes an inverter such as the SE3800H-US and a plurality of P401 power optimizers and that designed and intended to be installed on solar panels mounted in a series string. *See, e.g.*, https://www.solaredge.com/us/products/power-optimizer#/.[3]

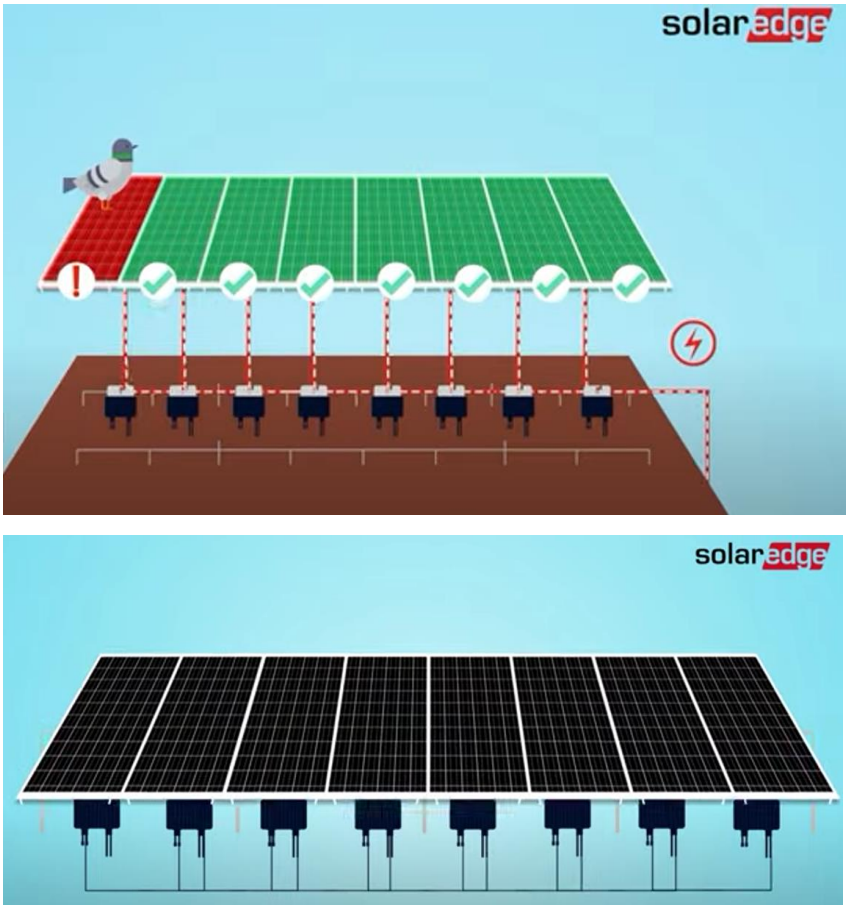
42. As depicted on SolarEdge's website, it offers for sale solar power systems, including those that include power optimizers such as the P401 and an inverter such as the SE3800H-US. This includes providing directions on finding SolarEdge authorized installers.[4]

43. Further, SolarEdge does and will make, use, offer to sell, sell, and/or import a system

[3] *See also* https://www.solaredge.com/sites/default/files/se-P5-series-add-on-power-optimizer-datasheet-na.pdf; https://www.solaredge.com/sites/default/files/se-installer-starter-guide-eng.pdf; https://www.solaredge.com/sites/default/files/se-three-phase-inverter-setapp-480-datasheet-na.pdf.

[4] *See, e.g.*, https://www.solaredge.com/sites/default/files/se-hd-wave-single-phase-inverter-with-setapp-datasheet-na.pdf; https://www.solaredge.com/sites/default/files/se-installer-starter-guide-eng.pdf; https://www.solaredge.com/us/commercial-solutions-pv-professionals; https://www.solaredge.com/sites/default/files/se-three-phase-inverter-setapp-480-datasheet-na.pdf; https://www.solaredge.com/us/find-installer; https://www.solaredge.com/sites/default/files/residential_catalogue_eng.pdf.

that establishes a plurality of solar energy sources, each providing a DC photovoltaic output. A SolarEdge solar power system that includes a plurality of P401 power optimizers and an inverter such as the SE3800H-US are connected to a plurality of solar energy sources (i.e., solar panels), each providing a DC photovoltaic output.



https://youtu.be/oFDHqmDymrY.

44. SolarEdge's "Concept of Orientation" provides an example of a plurality of solar energy sources:

Scenario 1 – Ideal Conditions: Initially, we assume all the modules are exposed to full irradiance, each providing 200W of power. The power output of each solar module is maintained at the module's maximum power point by an input control loop within the corresponding power optimizer. This MPP loop dictates to the power optimizer an input current I_{in} and input voltage V_{in} that ensure the transfer of the entire 200W from the module to the DC bus. We assume an MPP voltage for each module (given perfectly matched modules for demonstration purposes) of V_{MPP} = 32V. This means the input voltage to the power optimizer is 32V, and the input current is 200W/32V = 6.25A. The input voltage to the inverter is controlled by a separate feedback loop. For simplicity, in this example the inverter requires a constant 400V. Since there are ten serially-connected modules, each providing 200W, the input current to the inverter is 2000W/400V = 5A. Thus, the DC bus current flowing through each of the power optimizers must be 5A. This means that each power optimizer in this example provides an output voltage of 200W/5A = 40V. In this case, the power optimizers are acting as up converters, converting the 32V input voltage to the target 40V output voltage. The various system currents and voltages in this case are illustrated in Figure 1.

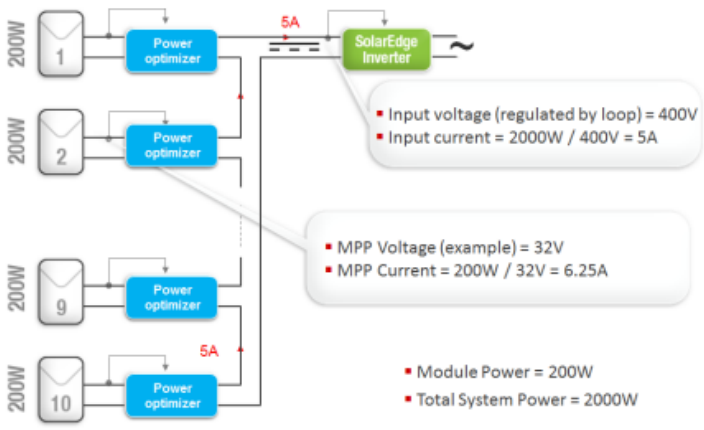
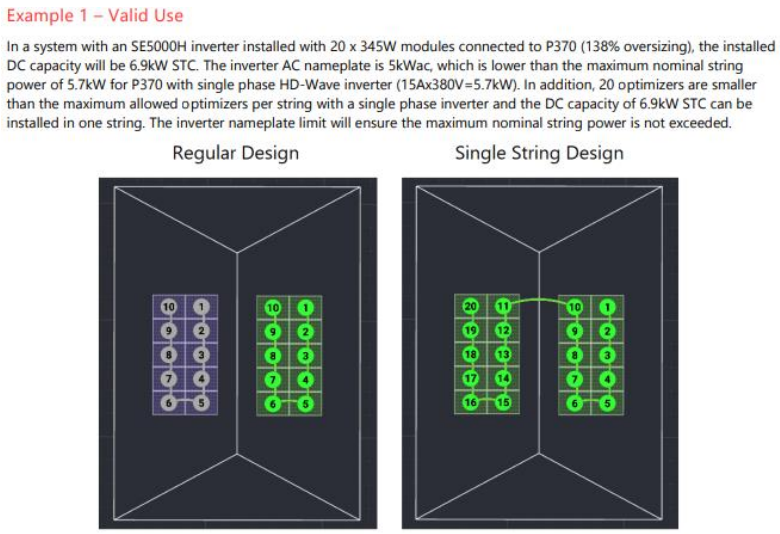


Figure 1: Operation under Ideal Conditions

https://www.solaredge.com/sites/default/files/se_application_fixed_string_voltage.pdf at 1-2.

45. SolarEdge's design guideline also provides an example of a "valid use" that connects 20 optimizers to 20 solar energy sources:



https://www.solaredge.com/sites/default/files/se-power-optimizer-single-string-design-application-note.pdf at 1.

46. Further, SolarEdge does and will make, use, offer to sell, sell, and/or import a system that creates a plurality of high voltage highly varying DC photovoltaic outputs from said plurality of solar energy sources.

47. SolarEdge's "Concept of Orientation" provides an example of a plurality of solar energy sources, where each source has varying DC outputs:

Scenario 2 - Partial Shading: Next, we assume module #9 is shaded and consequently produces only 40W of power. The other 9 modules are not shaded and each still produces 200W of power. The power optimizer of the shaded module maintains that module at its maximum power point, which is now lowered due to the shading. Assuming V_{MPP} = 28V, the current is 40W/28V = 1.43A. The total power produced by the string is now 9x200W+40W = 1840W. Since the inverter still needs to maintain an input voltage of 400V, the input current to the inverter will now be 1840W/400V = 4.6A. This means that the DC bus current must be 4.6A. Therefore, the power optimizers of the 9 un-shaded modules will have an output of 200W/4.6A = 43.5V.

In contrast, the power optimizer attached to the shaded module will output 40W/4.6A = 8.7V. The input to the inverter can be obtained by summing 9 modules providing 43.5V and 1 module providing 8.7V, i.e. 9x43.5V+8.7V = 400V, as required by the inverter. In this case, the 9 power optimizers producing 200W each are essentially acting as up converters, converting the 32V input voltage to a 43.5V output voltage, whereas the power optimizer of module #9 is acting as a down converter, converting the 28V input voltage to an 8.7V output voltage.

The various system currents and voltages in this case are illustrated in Figure 2.

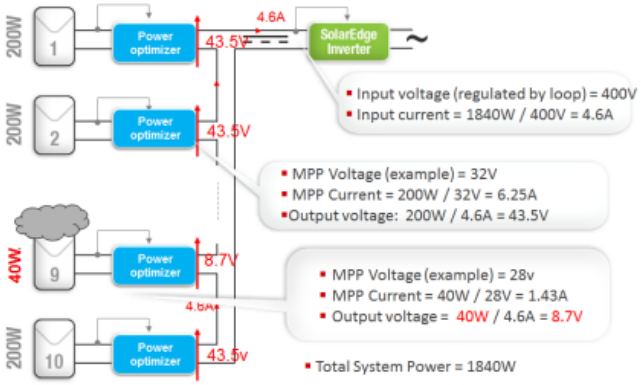
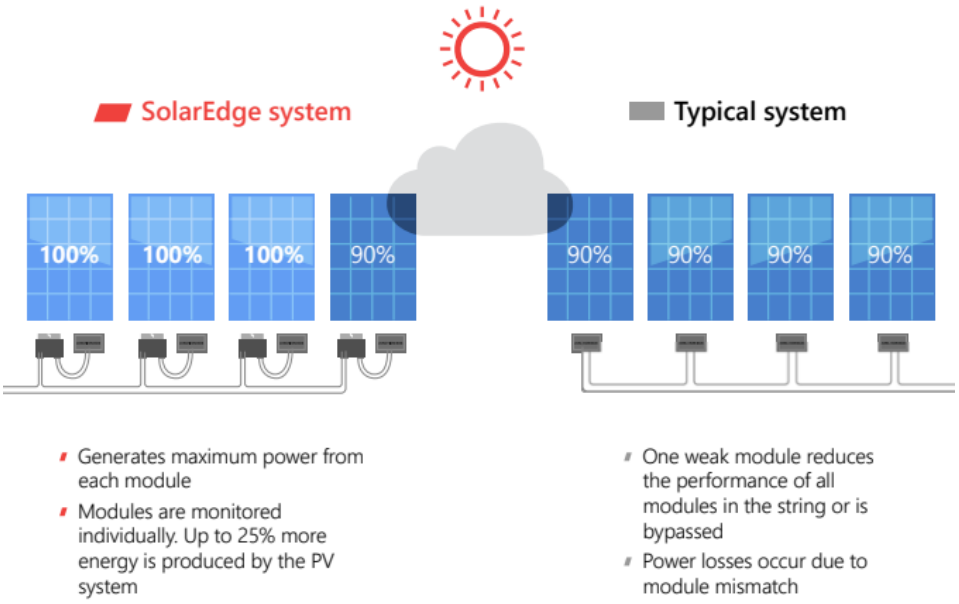


Figure 2: Operation with Partial Shading

https://www.solaredge.com/sites/default/files/se_application_fixed_string_voltage.pdf at 2.

48. SolarEdge advertises that each of its solar panels operates at "its maximum ability" and is thus operating with varying DC photovoltaic outputs:



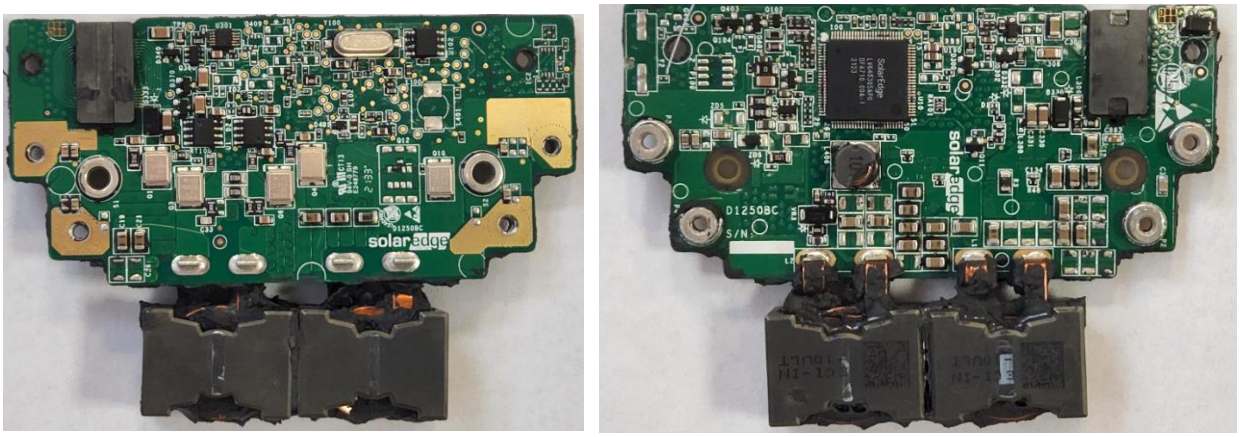
https://www.solaredge.com/sites/default/files/residential_catalogue_eng.pdf at 8.

49. Further, SolarEdge does and will make, use, offer to sell, sell, and/or import a system that individually establishes each of said high voltage, highly varying DC photovoltaic outputs as an individual DC photovoltaic input to a plurality of individual high efficiency switchmode photovoltaic DC-DC converters. For example, a SolarEdge solar power system that includes a plurality of P401 power optimizers and an inverter such as the SE3800H-US contains plurality of individual high efficiency switchmode photovoltaic DC-DC converters (one in each P401 optimizer). *See* https://youtu.be/oFDHqmDymrY.

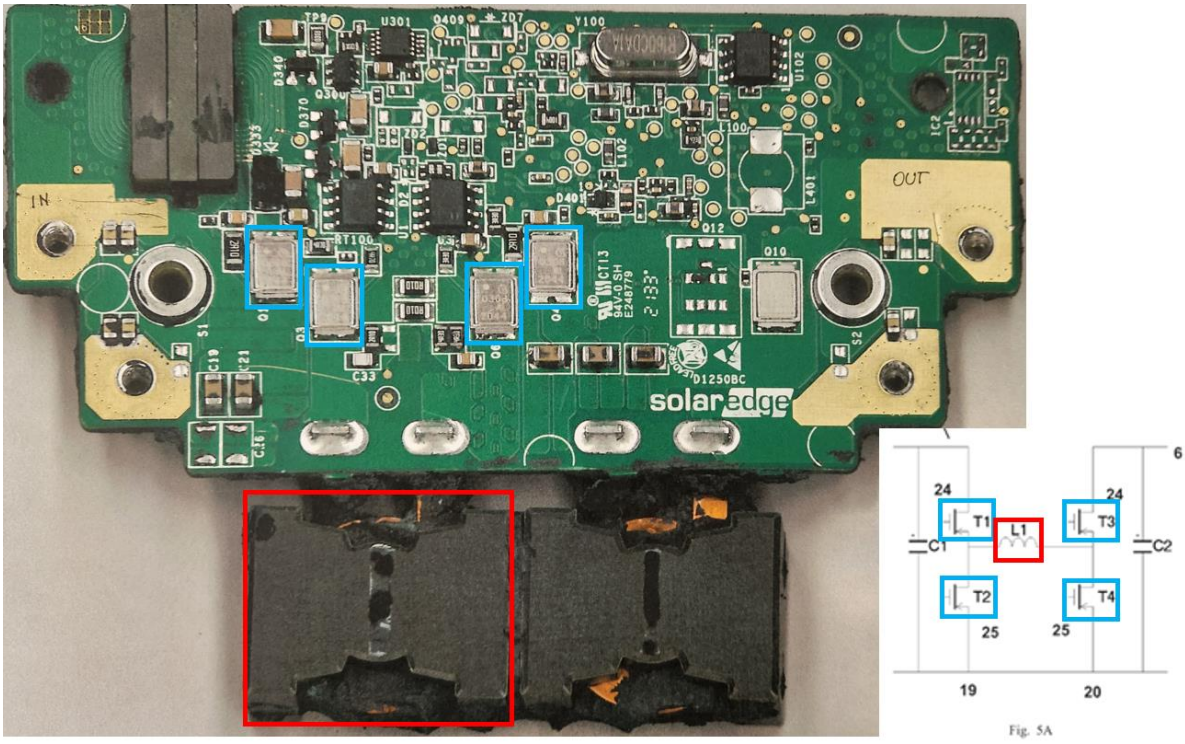
50. SolarEdge's "Concept of Orientation" provides an example of each of said high voltage, highly varying DC photovoltaic outputs as an individual DC photovoltaic input to a plurality of individual high efficiency switchmode photovoltaic DC-DC converters.[5]

51. In addition, SolarEdge does and will make, use, offer to sell, sell, and/or import a system wherein each photovoltaic DC-DC power converter comprises a boost and buck power conversion circuit in any order (i.e., switchmode photovoltaic DC-DC converters). A SolarEdge solar power system that includes a plurality of P401 power optimizers and an inverter such as the SE3800H-US contains a plurality of power converters (one in each P401 optimizer). On information and belief, each P401 optimizer uses a switchmode photovoltaic DC-DC converter that includes boost conversion circuitry and buck conversion circuitry. Front and back photographs of the circuit board in a P401 optimizer are shown below.

[5] *See* https://www.solaredge.com/sites/default/files/se_application_fixed_string_voltage.pdf at 2.

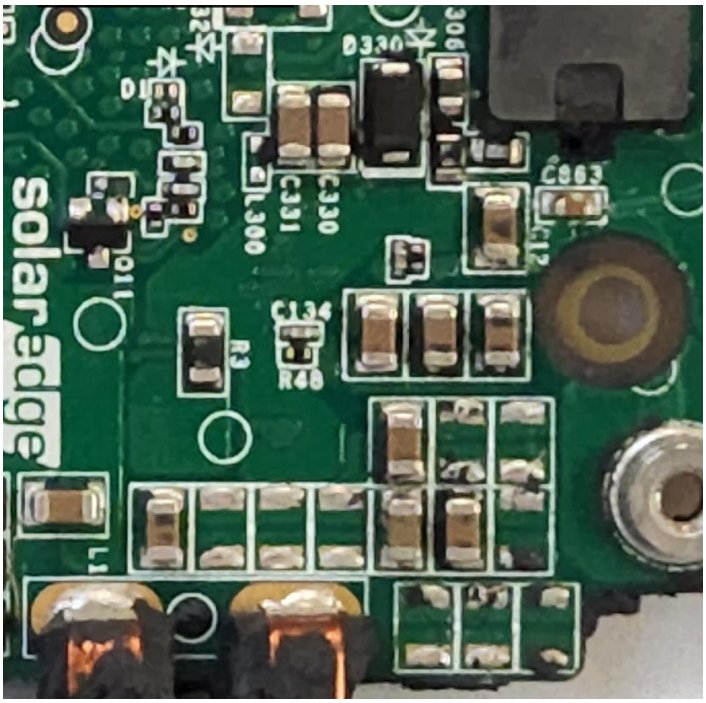


52. On information and belief, the item labeled on the P401 board as L1 (marked in red in the annotated photograph below) is an inductor as depicted in Figures 5A and 5B of the patent, and the transistors on the P401 board labeled as Q1, Q3, Q4, and Q6 (marked in blue in the annotated photograph below) correspond to the transistors marked as T1 – T4 in Figure 5A of the patent. As in the patent, these components are configured so that the P401's circuitry can use both a buck conversion circuit and a boost conversion circuit and alternate between them as needed.



53. Figure 5A in the patent also identifies capacitors C1 and C2 as part of the buck and

boost conversion circuitry. The P401 board contains many capacitors (typically marked with the prefix C), as shown for example in the close-up photo of a portion of the P401 board shown below. Discovery is needed to identify the specific capacitors used for this functionality; on information and belief at least two capacitors are acting as part of the boost and buck conversion circuitry in the P401 that corresponds to the circuit shown in Figure 5A of the patent.



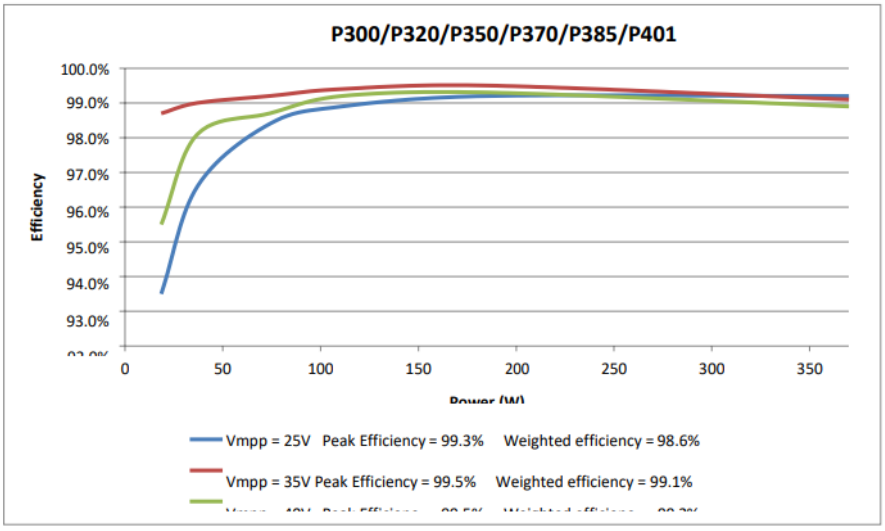
54. Further, SolarEdge does and will make, use, offer to sell, sell, and/or import a system with individually high efficiency conversion duty cycle controlling operation of a plurality of switch elements within each of said individual high efficiency switchmode photovoltaic DC-DC converters. A SolarEdge solar power system that includes a plurality of P401 power optimizers and an inverter such as the SE3800H-US contains in each P401 optimizer converter functionality control circuitry that controls said at least one dual mode photovoltaic DC-DC converter to achieve, high efficiency conversion duty cycle controlling operation.

55. On information and belief, the SolarEdge power optimizers provide maximum power point tracking by duty cycle controlling switch elements (outlined in blue in the photographs above)

within the switchmode photovoltaic DC-DC converters.

56. SolarEdge advertises that the control circuitry that controls the switchmode photovoltaic DC-DC converter achieves "Superior efficiency (99.5%)," and makes clear that that no substantial portion of the energy is lost as heat energy.[6]

57. SolarEdge's website represents that the S-Series and P-Series optimizers have a maximum efficiency of 99.5% and a weighted efficiency of 98.8%.



https://www.solaredge.com/sites/default/files/application_note_solaredge_optimizers_efficiency.pdf at 2.

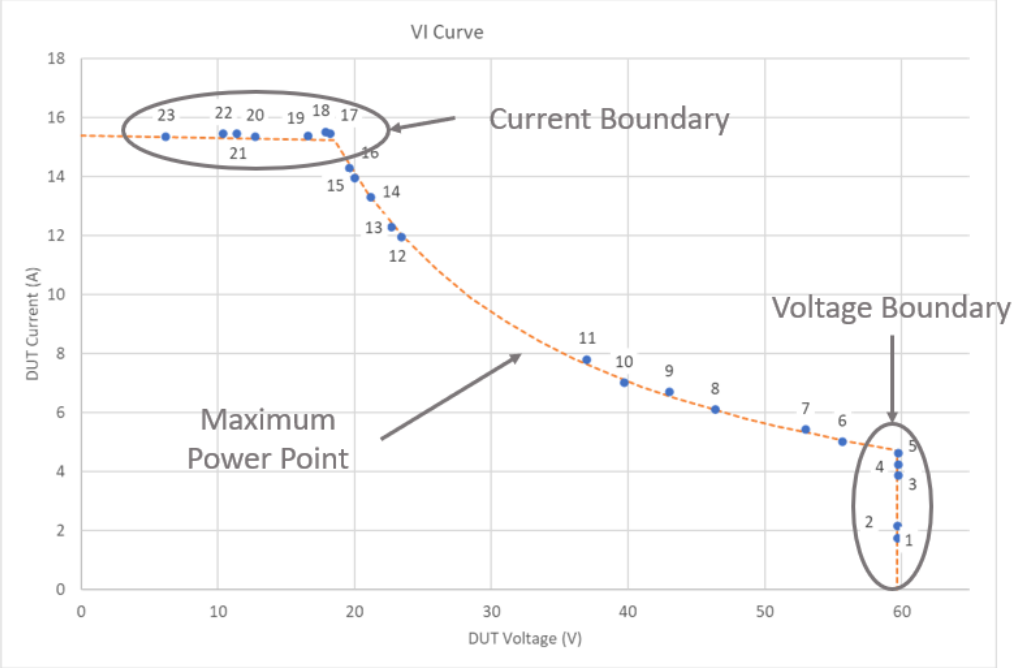
58. Moreover, the SolarEdge website states its power optimizers are "highly efficient, maintaining over 98% conversion efficiency over a wide range of conditions." *See* https://www.solaredge.com/sites/default/files/se_application_fixed_string_voltage.pdf at 1.

59. Further, SolarEdge does and will make, use, offer to sell, sell, and/or import a system where photovoltaic boundary condition control said plurality of switch elements within each of said individual high efficiency switchmode photovoltaic DC-DC converters. A SolarEdge solar power system that includes a plurality of P401 power optimizers and an inverter such as the SE3800H-US

[6] *See* https://www.solaredge.com/sites/default/files/se-P5-series-add-on-power-optimizer-datasheet-na.pdf.

contains in each P401 optimizer a switch circuit configured and arranged to be sufficient to power said solar power system during operation of said solar power system to produce operational power, and while producing operational power to be capable of alternating between: maximum power point tracking, overcurrent boundary condition control of said converted photovoltaic DC output at other than maximum power point, and overvoltage boundary condition control of said converted photovoltaic DC output at other than said maximum power point.

60. Testing of the P401 optimizer in conjunction with a SolarEdge SE3800H-US Inverter and a Keysight Solar Array Simulator with five E4376A modules shows that it provides operational power at a maximum power point level, an overcurrent boundary level, and an overvoltage boundary level. The testing also shows that the overcurrent boundary and overvoltage boundary levels are different from the maximum power point level.



61. Further, SolarEdge does and will make, use, offer to sell, sell, and/or import a system where photovoltaic boundary condition control said plurality of switch elements within each of said individual high efficiency switchmode photovoltaic DC-DC converters. A SolarEdge solar power

system that includes a plurality of P401 power optimizers and an inverter such as the SE3800H-US contains in each P401 optimizer a switch circuit configured and arranged to be sufficient to power said solar power system during operation of said solar power system to produce operational power, and while producing operational power to be capable of alternating between: maximum power point tracking, overcurrent boundary condition control of said converted photovoltaic DC output at other than maximum power point, and overvoltage boundary condition control of said converted photovoltaic DC output at other than said maximum power point.

62. SolarEdge's website states that "The SolarEdge Power Optimizers increase energy output from PV systems by constantly tracking the maximum power point (MPPT) of each module individually." https://www.solaredge.com/us/products/power-optimizers#/.[7]

63. SolarEdge's "Concept of Orientation" provides a description of using circuitry to control said photovoltaic DC-DC power converter to produce operational power at a maximum power point level.[8]

64. As discussed above, testing of the P401 optimizer in conjunction with a SolarEdge SE3800H-US Inverter and a Keysight Solar Array Simulator with five E4376A modules shows that it provides operational power at a maximum power point level.

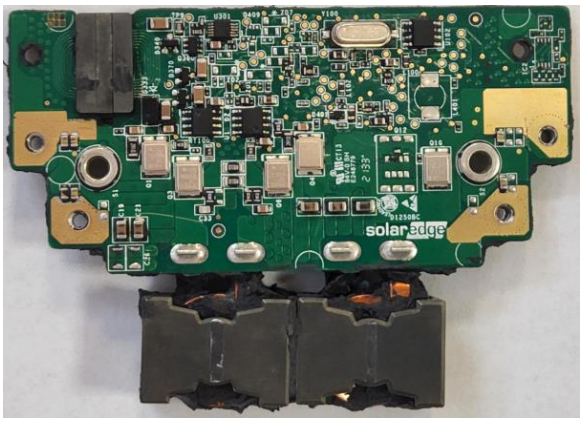
65. Furthermore, the SolarEdge datasheets specifies a MPPT Operating Range, which is the Maximum Power Point Tracking Operating Range.

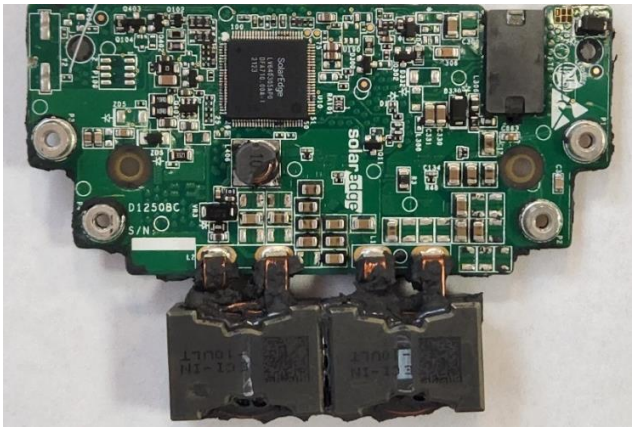
[7] *See also* https://youtu.be/oFDHqmDymrY.
[8] *See* https://www.solaredge.com/sites/default/files/se_application_fixed_string_voltage.pdf at 1.

Optimizer Model (Typical Module Compatibility)	P320 (for high-power 60-cell modules)	P401 (for high-power 60/72-cell modules)	
INPUT			
Rated Input DC Power[1]	320	400	W
Absolute Maximum Input Voltage (Voc at lowest temperature)	48	60	Vdc
MPPT Operating Range	8 - 48	8 - 60	Vdc
Maximum Short Circuit Current (Isc)	11	11.75	Adc
Maximum Efficiency	99.5		%
Weighted Efficiency	98.8		%
Overvoltage Category	II		

https://www.solaredge.com/sites/default/files/se-P5-series-frame-mounted-power-optimizer-datasheet-na.pdf at 2.

66. Further, SolarEdge does and will makes, uses, offers to sell, sells, and/or imports a system wherein feeding each of said high voltage, highly varying DC photovoltaic outputs through a photovoltaic voltage increase modality of photovoltaic DC-DC power conversion (i.e., boost conversion). A SolarEdge solar power system that includes a plurality of P401 power optimizers and an inverter such as the SE3800H-US contains a plurality of power converters (one in each P401 optimizer). On information and belief, each P401 optimizer uses a switchmode photovoltaic DC-DC converter that includes boost conversion circuitry and buck conversion circuitry. Front and back photographs of the circuit board in a P401 optimizer are shown below.





67. On information and belief, the item labeled on the P401 board as L1 (marked in red in the annotated photograph below) is an inductor as depicted in Figures 5A and 5B of the patent, and the transistors on the P401 board labeled as Q1, Q3, Q4, and Q6 (marked in blue in the annotated photograph below) correspond to the transistors marked as T1 – T4 in Figure 5A of the patent. As in

the patent, these components are configured so that the P401's circuitry can use both a buck conversion circuit and a boost conversion circuit and alternate between them as needed.

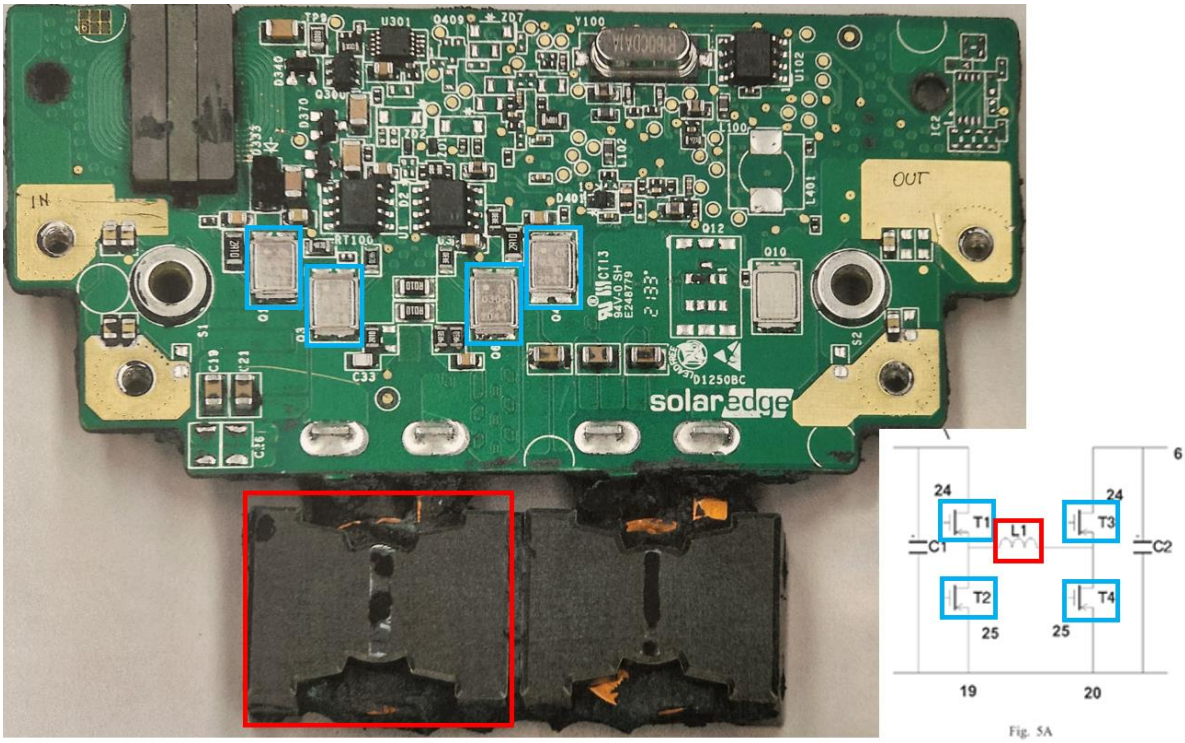
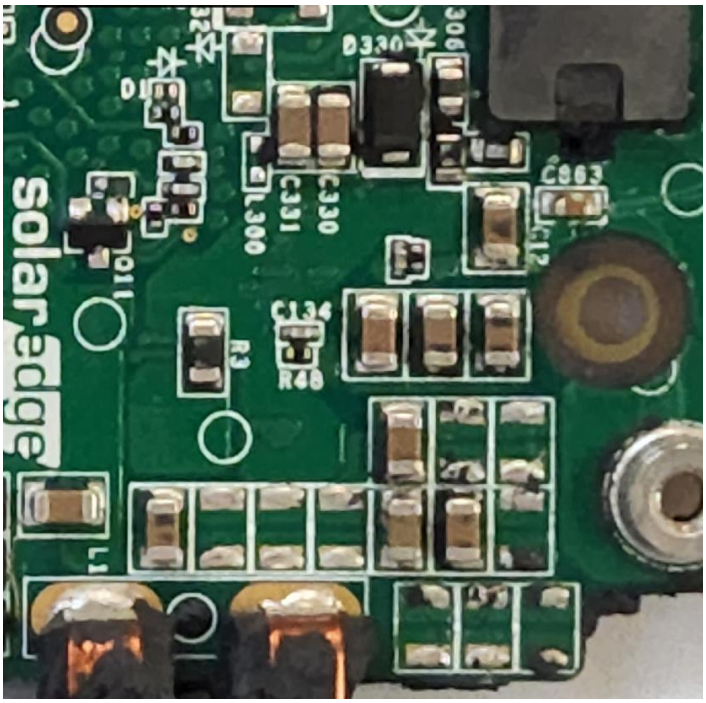


Fig. 5A

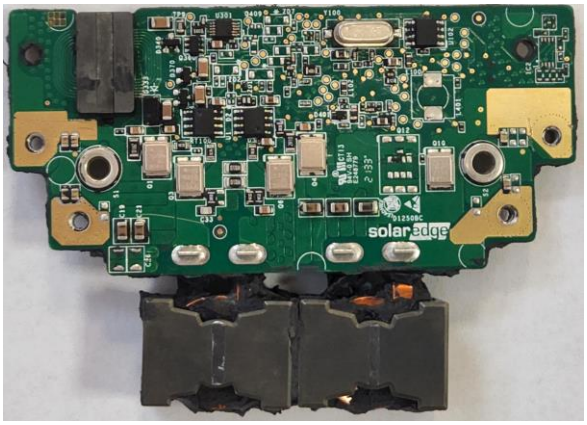
68. Figure 5A in the patent also identifies capacitors C1 and C2 as part of the buck and boost conversion circuitry. The P401 board contains many capacitors (typically marked with the prefix C), as shown for example in the close-up photo of a portion of the P401 board shown below. Discovery is needed to identify the specific capacitors used for this functionality; on information and belief at least two capacitors are acting as part of the boost and buck conversion circuitry in the P401 that corresponds to the circuit shown in Figure 5A of the patent.

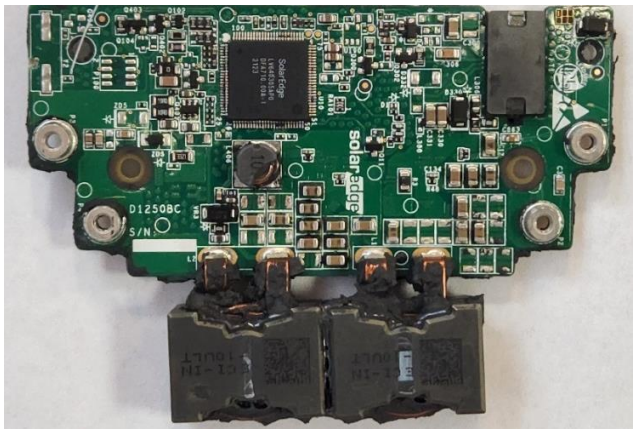


69. SolarEdge's "Concept of Orientation" provides an example of switchmode photovoltaic DC-DC converters modifying the voltage as necessary to maintain maximum efficiency.[9]

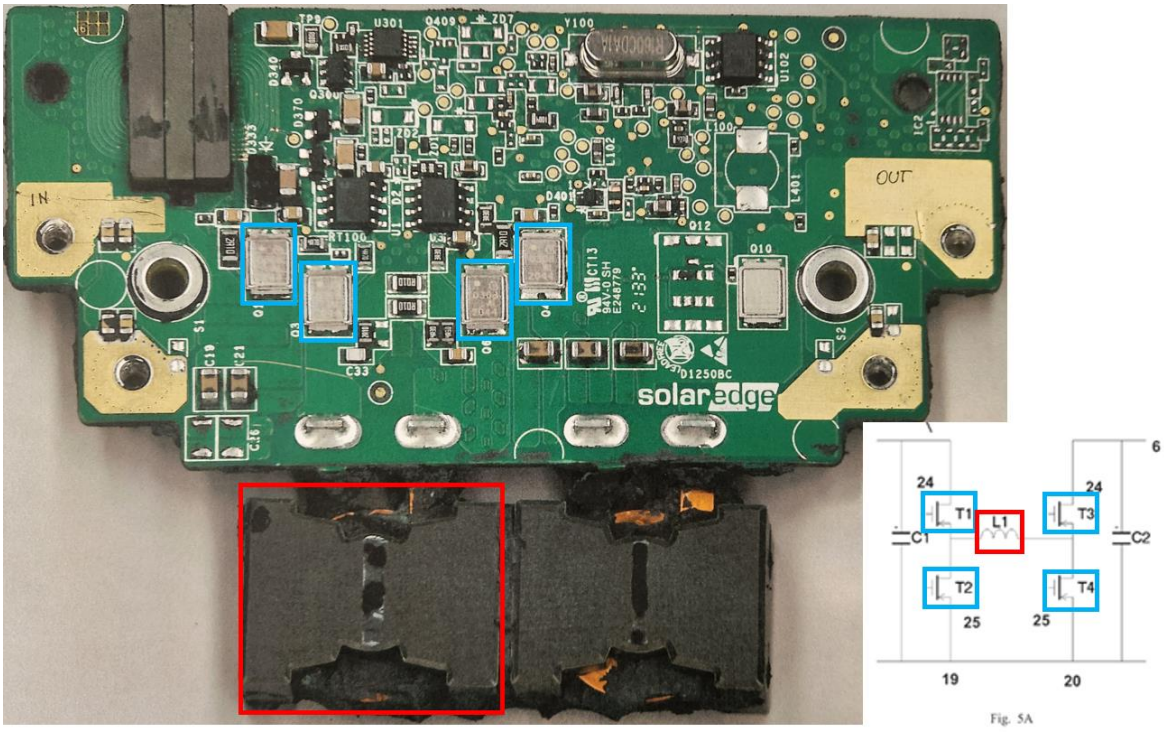
70. Further, SolarEdge does and will makes, uses, offers to sell, sells, and/or imports a system wherein feeding each of said high voltage, highly varying DC photovoltaic outputs through a photovoltaic voltage decrease modality of photovoltaic DC-DC power conversion (i.e., buck conversion) responsive to said photovoltaic voltage increase modality of photovoltaic DC-DC power conversion. A SolarEdge solar power system that includes a plurality of P401 power optimizers and an inverter such as the SE3800H-US contains a plurality of power converters (one in each P401 optimizer). On information and belief, each P401 optimizer uses a switchmode photovoltaic DC-DC converter that includes boost conversion circuitry and buck conversion circuitry. Front and back photographs of the circuit board in a P401 optimizer are shown below.

[9] https://www.solaredge.com/sites/default/files/se_application_fixed_string_voltage.pdf at 2.



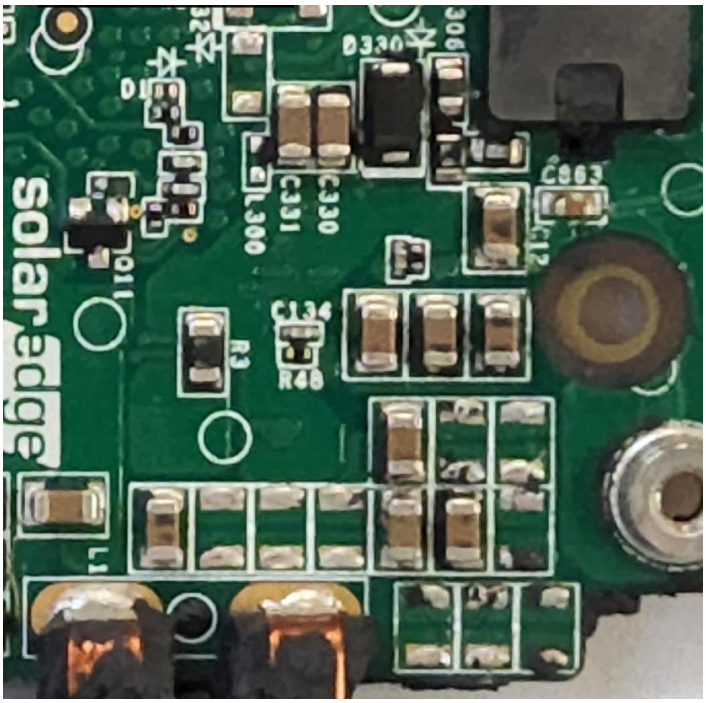


71. On information and belief, the item labeled on the P401 board as L1 (marked in red in the annotated photograph below) is an inductor as depicted in Figures 5A and 5B of the patent, and the transistors on the P401 board labeled as Q1, Q3, Q4, and Q6 (marked in blue in the annotated photograph below) correspond to the transistors marked as T1 – T4 in Figure 5A of the patent. As in the patent, these components are configured so that the P401's circuitry can use both a buck conversion circuit and a boost conversion circuit and alternate between them as needed.



72. Figure 5A in the patent also identifies capacitors C1 and C2 as part of the buck and

boost conversion circuitry. The P401 board contains many capacitors (typically marked with the prefix C), as shown for example in the close-up photo of a portion of the P401 board shown below. Discovery is needed to identify the specific capacitors used for this functionality; on information and belief at least two capacitors are acting as part of the boost and buck conversion circuitry in the P401 that corresponds to the circuit shown in Figure 5A of the patent.



73. SolarEdge's "Concept of Orientation" provides an example of switchmode photovoltaic DC-DC converters modifying the voltage as necessary to maintain maximum efficiency.[10]

74. Further, SolarEdge does and will makes, uses, offers to sell, sells, and/or imports a system where slavedly individual panel dedicated maximum photovoltaic power point DC-DC converting each of said high voltage, highly varying DC photovoltaic outputs. A SolarEdge solar power system that includes a plurality of P401 power optimizers and an inverter such as the SE3800H-

[10] https://www.solaredge.com/sites/default/files/se_application_fixed_string_voltage.pdf at 2.

US contains in each P401 optimizer controls such that each solar panel is separately maximum power point controlled to compensate for variation in DC photovoltaic output of individual solar panels, and that each P401 is slaved to the inverter.

75. SolarEdge's "Concept of Orientation" provides an example of a plurality of solar energy sources, where each source have varying DC outputs, which process is controlled by the power optimizer.[11]

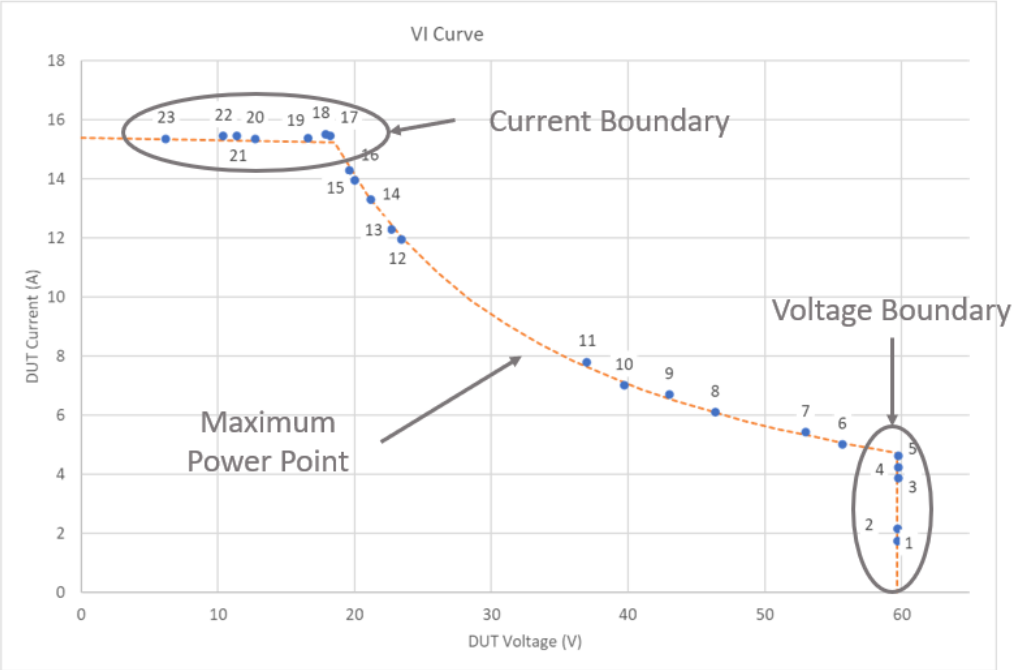
76. SolarEdge advertises that each of its solar panels operates at "its maximum ability" and is thus operating with varying DC photovoltaic outputs.[12]

77. Further, SolarEdge does and will makes, uses, offers to sell, sells, and/or imports a system where photovoltaic boundary condition control said plurality of switch elements within each of said individual high efficiency switchmode photovoltaic DC-DC converters. A SolarEdge solar power system that includes a plurality of P401 power optimizers and an inverter such as the SE3800H-US contains in each P401 optimizer a switch circuit configured and arranged to be sufficient to power said solar power system during operation of said solar power system to produce operational power, and while producing operational power to be capable of alternating between: maximum power point tracking, overcurrent boundary condition control of said converted photovoltaic DC output at other than maximum power point, and overvoltage boundary condition control of said converted photovoltaic DC output at other than said maximum power point.

78. Testing of the P401 optimizer in conjunction with a SolarEdge SE3800H-US Inverter and a Keysight Solar Array Simulator with five E4376A modules shows that it provides operational power at a maximum power point level, an overcurrent boundary level, and an overvoltage boundary

[11] https://www.solaredge.com/sites/default/files/se_application_fixed_string_voltage.pdf at 2.
[12] https://www.solaredge.com/sites/default/files/residential_catalogue_eng.pdf at 8.

level. The testing also shows that the overcurrent boundary and overvoltage boundary levels are different from the maximum power point level.



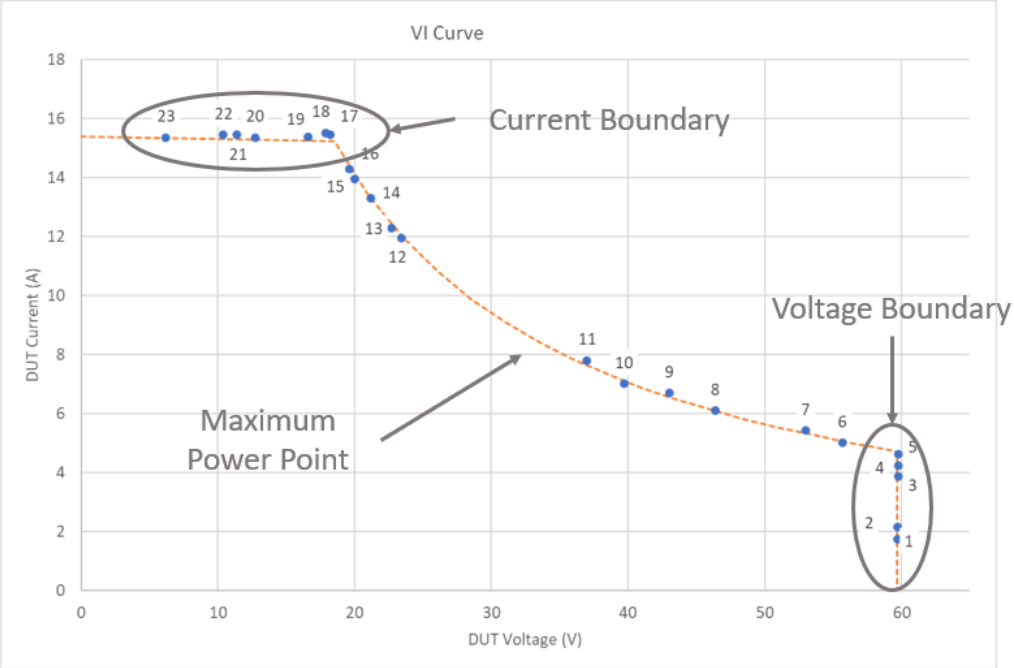
79. The SolarEdge datasheet further describes these boundary conditions:

OUTPUT DURING OPERATION (POWER OPTIMIZER CONNECTED TO OPERATING SOLAREDGE INVERTER)		
Maximum Output Current	15	Adc
Maximum Output Voltage	60	Vdc

https://www.solaredge.com/sites/default/files/se-P5-series-frame-mounted-power-optimizer-datasheet-na.pdf

80. Further, SolarEdge does and will makes, uses, offers to sell, sells, and/or imports a system that individually substantially power isomorphically converting each said high voltage, highly varying DC photovoltaic outputs into a plurality of converted DC photovoltaic outputs while accomplishing said step of individual dedicated maximum photovoltaic power point converting said DC photovoltaic input from each of said plurality of solar panels. A SolarEdge solar power system that includes a plurality of P401 power optimizers and an inverter such as the SE3800H-US contains in each P401 optimizer a control to convert a high voltage DC output into a plurality of converted DC outputs while providing maximum power point conversion of the input from each solar panel. The

maximum power point conversion is illustrated in the below figure.



81. Moreover, this conversion is substantially power isomorphic. SolarEdge advertises that the control circuitry that controls the switchmode photovoltaic DC-DC converter achieves "Superior efficiency (99.5%)," and makes clear that that no substantial portion of the energy is lost as heat energy. https://www.solaredge.com/sites/default/files/se-P5-series-add-on-power-optimizer-datasheet-na.pdf.

82. SolarEdge's website represents that the S-Series and P-Series optimizers have a maximum efficiency of 99.5% and a weighted efficiency of 98.8%. *See* https://www.solaredge.com/sites/default/files/application_note_solaredge_optimizers_efficiency.pdf.

83. Moreover, the SolarEdge website states its power optimizers are "highly efficient, maintaining over 98% conversion efficiency over a wide range of conditions." https://www.solaredge.com/sites/default/files/se_application_fixed_string_voltage.pdf.

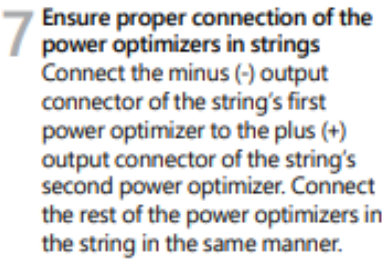
84. Further, SolarEdge does and will makes, uses, offers to sell, sells, and/or imports a system that serially connects said plurality of converted DC photovoltaic outputs to create a combined higher voltage converted DC photovoltaic output from said plurality of solar panels. A SolarEdge solar

power system that includes a plurality of P401 power optimizers and an inverter such as the SE3800H-US contains a plurality of DC-DC power converters (one in each P401 optimizer) wherein each DC-DC power converter is connected in series to at least one other DC-DC power converter (in another P401 optimizer). *See* https://youtu.be/oFDHqmDymrY.

85. SolarEdge's "Concept of Orientation" provides an example of a plurality of power optimizers connected in series.[13]

86. SolarEdge's design guideline also design guideline provides an example of a "valid use" that connects 20 optimizers to 20 x 345 DC Power Sources. *See* https://www.solaredge.com/sites/default/files/se-power-optimizer-single-string-design-application-note.pdf at 1; *see also id.* ("all power optimizers can be connected to a single string")

87. The SolarEdge installer guide confirms the power optimizers can be connected in series:


7 **Ensure proper connection of the power optimizers in strings**
Connect the minus (-) output connector of the string's first power optimizer to the plus (+) output connector of the string's second power optimizer. Connect the rest of the power optimizers in the string in the same manner.

https://www.solaredge.com/sites/default/files/se-installer-starter-guide-eng.pdf at 5.

88. Further, SolarEdge does and will makes, uses, offers to sell, sells, and/or imports a system that establishes said combined higher voltage converted DC photovoltaic output as a converted DC photovoltaic input to a high voltage, high power photovoltaic DC-AC inverter. A SolarEdge solar power system that includes a plurality of P401 power optimizers and an inverter such as the SE3800H-US contains a plurality of DC-DC power converters (one in each P401 optimizer) wherein each DC-

[13] https://www.solaredge.com/sites/default/files/se_application_fixed_string_voltage.pdf at 1.

DC power converter is connected in series to at least one other DC-DC power converter (in another P401 optimizer) and each power optimizer outputs power to a high power photovoltaic DC-AC inverter.

89. SolarEdge's "Concept of Orientation" provides an example of combined higher voltage converted DC photovoltaic output as a converted DC photovoltaic input to a high voltage, high power photovoltaic DC-AC inverter.[14]

90. Further, SolarEdge does and will makes, uses, offers to sell, sells, and/or imports a system with an inverter for inverting said converted DC photovoltaic input into a high power inverted AC photovoltaic output. A SolarEdge solar power system includes an inverter responsive to said converted photovoltaic DC outputs, such as the SE3800H-US inverter, which outputs high power inverted AC photovoltaic output.[15]

91. SolarEdge's inverters "efficiently converts DC power from the modules into AC power that can be fed into the main AC service of the site and from there to the grid." https://www.solaredge.com/sites/default/files/se-single-and-three-phase-inverter-user-manual-na.pdf.

92. SolarEdge's "Concept of Orientation" provides a description of an inverter responsive to a SolarEdge power optimizer.[16]

93. SolarEdge's datasheet describe the ability of its inverters to receive a DC input and output a high power inverted AC photovoltaic output:

[14] https://www.solaredge.com/sites/default/files/se_application_fixed_string_voltage.pdf at 2.
[15] *See* https://www.solaredge.com/sites/default/files/se-installer-starter-guide-eng.pdf; https://www.solaredge.com/sites/default/files/se-three-phase-inverter-setapp-480-datasheet-na.pdf.
[16] https://www.solaredge.com/sites/default/files/se_application_fixed_string_voltage.pdf at 1.

MODEL NUMBER	SE30KUS	SE40KUS	UNITS
APPLICABLE TO INVERTERS WITH PART NUMBER	SEXXK-USX8IXXXX		
OUTPUT			
Rated AC Power Output	30000	**40000**	W
Maximum apparent AC output power	30000	40000	VA
AC Output Line Connections	3W + PE, 4W + PE		
AC Output Voltage Minimum-Nominal-Maximum[2] (L-N)	244 - 277 - 305		Vac
AC Output Voltage Minimum-Nominal-Maximum[2] (L-L)	422.5 - 480 - 529		Vac
AC Frequency Min-Nom-Max[2]	59.3 - 60 - 60.5		Hz
Maximum Continuous Output Current (per Phase)	36.25	48.25	Aac
GFDI Threshold	1		A
Utility Monitoring, Islanding Protection, Country Configurable Set Points	Yes		
Total Harmonic Distortion	≤ 3		%
Power Factor Range	+/- 0.85 to 1		
INPUT			
Maximum DC Power (Module STC)	45000	60000	W
Transformer-less, Ungrounded	Yes		
Maximum Input Voltage DC+ to DC-	1000		Vdc
Operating Voltage Range	840 - 1000		Vdc
Maximum Input Current	36.25	48.25	Adc
Maximum Input Short Circuit Current	55		Adc
Reverse-Polarity Protection	Yes		
Ground-Fault Isolation Detection	167kΩ Sensitivity[3]		
CEC Weighted Efficiency	98.5		%
Night-time Power Consumption	<4		W

https://www.solaredge.com/sites/default/files/se-three-phase-inverter-setapp-480-datasheet-na.pdf.

94. Thus, on information and belief, SolarEdge's use of a solar power system that includes a package of P401 power optimizers and the SE3800H-US inverter infringes at least claim 1 of the '498 patent.

95. The full extent of SolarEdge's infringement is not presently known to Plaintiff. On information and belief, SolarEdge has made, used, sold, offered for sale, and/or imported products under different names or part numbers the use of which infringes the '498 patent in a similar manner. Plaintiff makes this preliminary identification of infringing products and infringed claims without the benefit of discovery or claim construction in this action, and expressly reserves the right to augment, supplement, and revise its identification based on additional information obtained through discovery or otherwise.

96. SolarEdge has had notice of and has been aware of the '498 patent and its infringement of the '498 patent since at least the filing of this Complaint.

97. In addition, since at least the above-mentioned date when SolarEdge was on notice of its infringement, SolarEdge has actively induced and continues to induce others to infringe one or more

of the claims of the '498 patent in violation of 35 U.S.C. § 271(b), as described below.

98. On information and belief, SolarEdge knowingly and intentionally induces users of one or more of the Accused Products to directly infringe one or more claims of the '498 patent by encouraging, instructing, and aiding one or more persons in the United States, including but not limited to end users, distributors, and installers to use the Accused Products in a manner that infringes the '498 patent.

99. For example, SolarEdge induces infringement by providing the Accused Products, contracting for the distribution of the Accused Products, by marketing the Accused Products, and by creating and/or distributing user manuals, web pages, marketing materials, and/or similar materials with instructions on using the Accused Products in an infringing manner. The use of the Accused Products in accordance with SolarEdge's instructions results in infringement of the asserted claims of the '498 patent.

100. On information and belief, the Accused Products are designed in such a way that when they are used for their intended purpose, the user infringes the '498 patent. SolarEdge knows and intends that its distributors, installers, and/or end users that purchase the Accused Products will use those products for their intended purpose.

101. On information and belief, SolarEdge was aware of the infringement of the '498 patent or acted with willful blindness as to its existence at least as a result of the filing of this Complaint.

102. Moreover, by continuing to make, use, sell, offer to sell, and/or import the Accused Products after SolarEdge first had notice of Ampt's allegations of infringement, SolarEdge has indirectly infringed and continues to indirectly infringe by contributing to the infringement of one or more claims of the '498 patent pursuant to 35 U.S.C. § 271(c), as described below.

103. On information and belief, SolarEdge has contributorily infringed, and continues to

contributorily infringe, the asserted claims by offering to sell, selling, and importing into the United States the Accused Products that perform the claimed methods for solar energy power creation, knowing that the Accused Products are especially made for use in infringing the '498 patent, and are not staple articles of commerce suitable for a substantial non-infringing use. In particular, the Accused Products are power optimizers and inverters that need to be set-up by SolarEdge's distributor and/or user in accordance with specific directions from SolarEdge in order to be operable for purpose of solar energy power creation. The Accused Products contain components, including control circuitry, that specifically implement the claimed methods for solar energy power creation. Indeed, these components are especially built to perform the accused functionalities. On information and belief, SolarEdge has performed and continues to perform these affirmative acts with knowledge of the '498 patent and with the intent, or willful blindness, that they cause the direct infringement of the '498 patent.

104. On information and belief, Ampt has suffered and continues to suffer damages as a result of SolarEdge's infringement of the '498 patent in an amount to be determined at trial.

105. SolarEdge's infringement of the '498 patent is causing irreparable harm for which Ampt has no adequate remedy at law unless SolarEdge is enjoined by this Court. Under 35 U.S.C. § 283, Ampt is entitled to a permanent injunction against further infringement of the '498 patent.

106. Ampt does not have an adequate remedy at law.

107. On information and belief, SolarEdge's infringement is willful and deliberate, entitling Ampt to increased damages under 35 U.S.C. § 284 and to attorneys' fees and costs incurred in prosecuting this action under 35 U.S.C. § 285.

COUNT II
(INFRINGEMENT OF U.S. PATENT NO. 7,719,140)

108. Plaintiff repeats and realleges paragraphs 1-107 as if fully set forth at length herein.

109. SolarEdge has and continues to infringe one or more claims of the '140 patent in this

judicial district and elsewhere in the United States.

110. Upon information and belief, SolarEdge makes, uses, sells, offers for sale, and/or imports into the United States the Accused Products.

111. SolarEdge directly infringes the '140 patent under 35 U.S.C. § 271(a), literally and/or under the doctrine of equivalents, by using the Accused Products in an infringing manner within the United States, including in installation, testing and demonstrating the Accused Products.

112. For example, SolarEdge directly infringes at least claim 1 of the '140 patent, either literally or under the doctrine of equivalents. The asserted claim(s) of the '140 patent are valid, enforceable, and currently in full force and effect.

113. Claim 1 of the '140 patent recites:

> A highly efficient method of series string solar energy power conversion comprising the steps of:
>
> establishing a plurality of solar energy sources, each providing a DC photovoltaic output;
>
> creating a plurality of high voltage highly varying DC photovoltaic outputs from said plurality of solar energy sources;
>
> individually establishing each of said high voltage, highly varying DC photovoltaic outputs as an individual DC photovoltaic input to a plurality of individual high efficiency switchmode photovoltaic DC-DC converters;
>
> individually high efficiency conversion duty cycle controlling operation of a plurality of switch elements within each of said individual high efficiency switchmode photovoltaic DC-DC converters;
>
> photovoltaic boundary condition controlling said plurality of switch elements within each of said individual high efficiency switchmode photovoltaic DC-DC converters;
>
> maximum photovoltaic power point controlling said plurality of switch elements within each of said individual high efficiency switchmode photovoltaic DC-DC converters slaved to said step of photovoltaic boundary condition controlling said plurality of switch elements;
>
> slavedly individual panel dedicated maximum photovoltaic power point DC-DC converting each of said high voltage, highly varying DC photovoltaic outputs;

boundary condition DC-DC converting said high voltage, highly varying DC photovoltaic outputs;

individually substantially power isomorphically converting each said high voltage, highly varying DC photovoltaic outputs into a plurality of converted DC photovoltaic outputs while accomplishing said step of individual dedicated maximum photovoltaic power point converting said DC photovoltaic input from each of said plurality of solar panels;

serially connecting said plurality of converted DC photovoltaic outputs to create a combined higher voltage converted DC photovoltaic output from said plurality of solar panels;

establishing said combined higher voltage converted DC photovoltaic output as a converted DC photovoltaic input to a high voltage, high power photovoltaic DC-AC inverter; and

inverting said converted DC photovoltaic input into a high power inverted AC photovoltaic output.

114. As one non-limiting example of said infringement, on information and belief, SolarEdge practices each and every step recited in claim 1 of the '140 patent by using a solar power system that includes a package of P401 power optimizers and the SE3800H-US inverter, as described below.

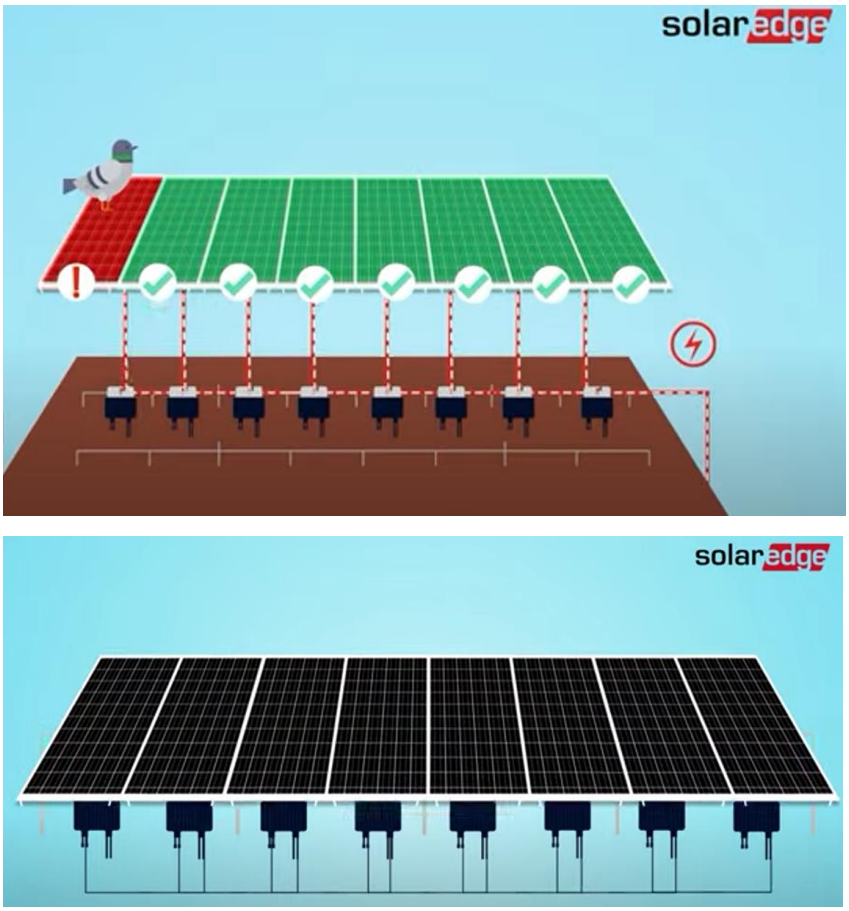
115. SolarEdge does and will make, use, offer to sell, sell, and/or import systems for series string solar energy power conversion. For example, SolarEdge and its distributers install, monitor and operate solar power conversion systems that includes an inverter such as the SE3800H-US and a plurality of P401 power optimizers that are designed and intended to be installed on solar panels mounted in a series string. *See, e.g.*, https://www.solaredge.com/us/products/power-optimizer#/.[17]

116. As depicted on SolarEdge's website, it offers for sale solar power systems, including those that include power optimizers such as the P401 an inverter such as the SE3800H-US. This

[17] *see also* https://www.solaredge.com/sites/default/files/se-P5-series-add-on-power-optimizer-datasheet-na.pdf; https://www.solaredge.com/sites/default/files/se-installer-starter-guide-eng.pdf; https://www.solaredge.com/sites/default/files/se-three-phase-inverter-setapp-480-datasheet-na.pdf.

includes providing directions on finding SolarEdge authorized installers.[18]

117. Further, SolarEdge does and will makes, uses, offers to sell, sells, and/or imports a system that establishes a plurality of solar energy sources, each providing a DC photovoltaic output. A SolarEdge solar power system that includes a plurality of P401 power optimizers and an inverter such as the SE3800H-US are connected to a plurality of solar energy sources (i.e., solar panels), each providing a DC photovoltaic output.



https://youtu.be/oFDHqmDymrY.

[18] https://www.solaredge.com/sites/default/files/se-hd-wave-single-phase-inverter-with-setapp-datasheet-na.pdf; https://www.solaredge.com/sites/default/files/se-installer-starter-guide-eng.pdf; https://www.solaredge.com/us/commercial-solutions-pv-professionals; https://www.solaredge.com/sites/default/files/se-three-phase-inverter-setapp-480-datasheet-na.pdf; https://www.solaredge.com/us/find-installer; https://www.solaredge.com/sites/default/files/residential_catalogue_eng.pdf.

118. SolarEdge's "Concept of Orientation" provides an example of a plurality of solar energy sources:

Scenario 1 – Ideal Conditions: Initially, we assume all the modules are exposed to full irradiance, each providing 200W of power. The power output of each solar module is maintained at the module's maximum power point by an input control loop within the corresponding power optimizer. This MPP loop dictates to the power optimizer an input current I_{in} and input voltage V_{in} that ensure the transfer of the entire 200W from the module to the DC bus. We assume an MPP voltage for each module (given perfectly matched modules for demonstration purposes) of V_{MPP} = 32V. This means the input voltage to the power optimizer is 32V, and the input current is 200W/32V = 6.25A. The input voltage to the inverter is controlled by a separate feedback loop. For simplicity, in this example the inverter requires a constant 400V. Since there are ten serially-connected modules, each providing 200W, the input current to the inverter is 2000W/400V = 5A. Thus, the DC bus current flowing through each of the power optimizers must be 5A. This means that each power optimizer in this example provides an output voltage of 200W/5A = 40V. In this case, the power optimizers are acting as up converters, converting the 32V input voltage to the target 40V output voltage. The various system currents and voltages in this case are illustrated in Figure 1.

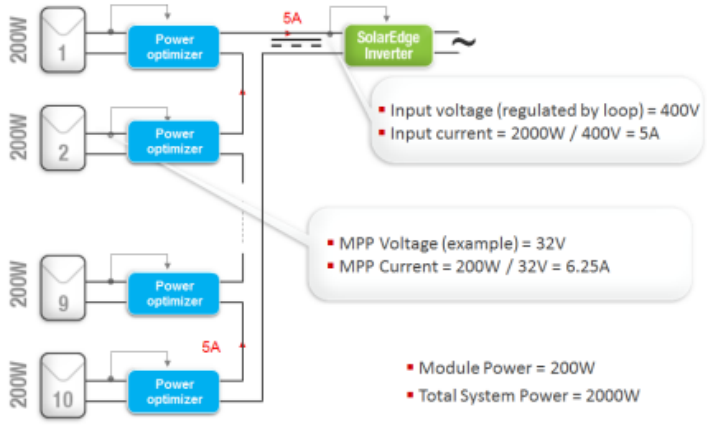


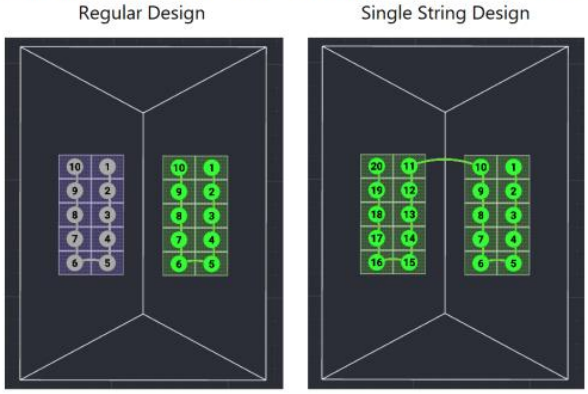
Figure 1: Operation under Ideal Conditions

https://www.solaredge.com/sites/default/files/se_application_fixed_string_voltage.pdf at 1.

119. SolarEdge's design guideline also provides an example of a "valid use" that connects 20 optimizers to 20 solar energy sources:

Example 1 – Valid Use

In a system with an SE5000H inverter installed with 20 x 345W modules connected to P370 (138% oversizing), the installed DC capacity will be 6.9kW STC. The inverter AC nameplate is 5kWac, which is lower than the maximum nominal string power of 5.7kW for P370 with single phase HD-Wave inverter (15Ax380V=5.7kW). In addition, 20 optimizers are smaller than the maximum allowed optimizers per string with a single phase inverter and the DC capacity of 6.9kW STC can be installed in one string. The inverter nameplate limit will ensure the maximum nominal string power is not exceeded.



https://www.solaredge.com/sites/default/files/se-power-optimizer-single-string-design-application-note.pdf at 1.

120. Further, SolarEdge does and will make, use, offer to sell, sell, and/or import a system that creates a plurality of high voltage highly varying DC photovoltaic outputs from said plurality of solar energy sources.

121. SolarEdge's "Concept of Orientation" provides an example of a plurality of solar energy sources, where each source has varying DC outputs:

Scenario 2 - Partial Shading: Next, we assume module #9 is shaded and consequently produces only 40W of power. The other 9 modules are not shaded and each still produces 200W of power. The power optimizer of the shaded module maintains that module at its maximum power point, which is now lowered due to the shading. Assuming V_{MPP} = 28V, the current is 40W/28V = 1.43A. The total power produced by the string is now 9x200W+40W = 1840W. Since the inverter still needs to maintain an input voltage of 400V, the input current to the inverter will now be 1840W/400V = 4.6A. This means that the DC bus current must be 4.6A. Therefore, the power optimizers of the 9 un-shaded modules will have an output of 200W/4.6A = 43.5V.

In contrast, the power optimizer attached to the shaded module will output 40W/4.6A = 8.7V. The input to the inverter can be obtained by summing 9 modules providing 43.5V and 1 module providing 8.7V, i.e. 9x43.5V+8.7V = 400V, as required by the inverter. In this case, the 9 power optimizers producing 200W each are essentially acting as up converters, converting the 32V input voltage to a 43.5V output voltage, whereas the power optimizer of module #9 is acting as a down converter, converting the 28V input voltage to an 8.7V output voltage.

The various system currents and voltages in this case are illustrated in Figure 2.

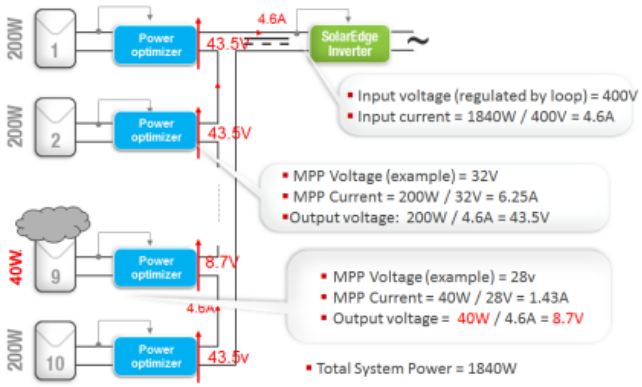
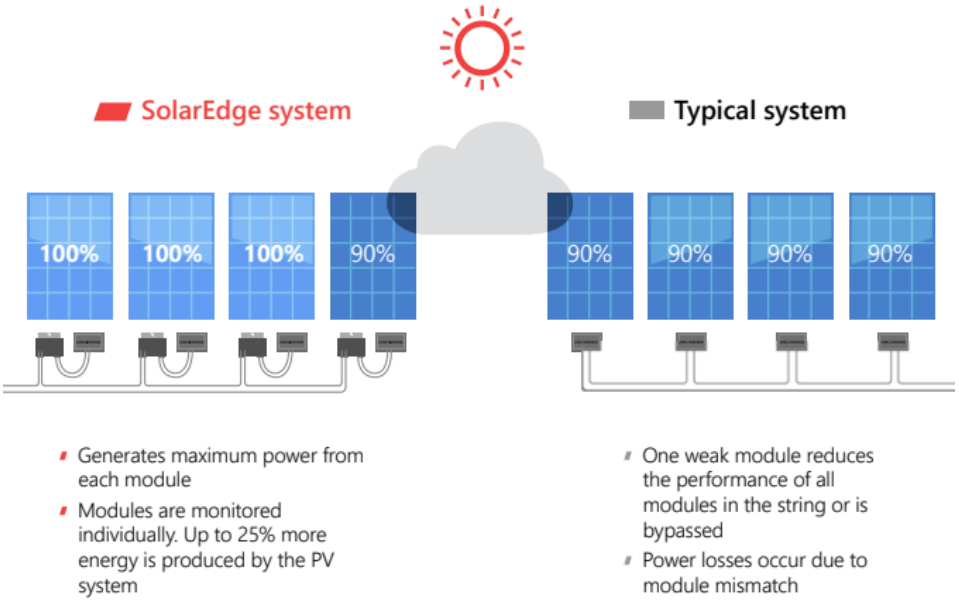


Figure 2: Operation with Partial Shading

https://www.solaredge.com/sites/default/files/se_application_fixed_string_voltage.pdf at 2.

122. SolarEdge advertises that each of its solar panels operates at "its maximum ability" and is thus operating with varying DC photovoltaic outputs:



https://www.solaredge.com/sites/default/files/residential_catalogue_eng.pdf at 8.

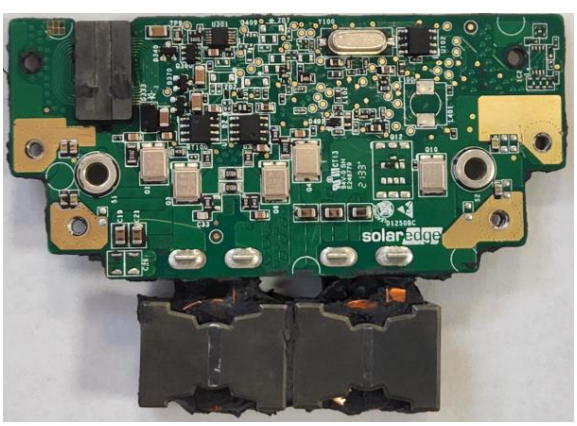
123. Further, SolarEdge does and will make, use, offer to sell, sell, and/or import a system that individually establishes each of said high voltage, highly varying DC photovoltaic outputs as an individual DC photovoltaic input to a plurality of individual high efficiency switchmode photovoltaic DC-DC converters. For example, a SolarEdge solar power system that includes a plurality of P401 power optimizers and an inverter such as the SE3800H-US contains plurality of individual high efficiency switchmode photovoltaic DC-DC converters (one in each P401 optimizer).[19]

124. SolarEdge's "Concept of Orientation" provides an example of each of said high voltage, highly varying DC photovoltaic outputs as an individual DC photovoltaic input to a plurality of individual high efficiency switchmode photovoltaic DC-DC converters.[20]

125. In addition, make, use, offer to sell, sell, and/or import a system a system wherein each photovoltaic DC-DC power converter comprises a boost and buck power conversion circuit in any order (i.e. switchmode photovoltaic DC-DC converters). A SolarEdge solar power system that includes

[19] *See* https://youtu.be/oFDHqmDymrY.
[20] *See* https://www.solaredge.com/sites/default/files/se_application_fixed_string_voltage.pdf at 2.

a plurality of P401 power optimizers and an inverter such as the SE3800H-US contains a plurality of power converters (one in each P401 optimizer). On information and belief, each P401 optimizer uses a switchmode photovoltaic DC-DC converter that includes boost conversion circuitry and buck conversion circuitry. Front and back photographs of the circuit board in a P401 optimizer are shown below.



126. On information and belief, the item labeled on the P401 board as L1 (marked in red in the annotated photograph below) is an inductor as depicted in Figures 5A and 5B of the patent, and the transistors on the P401 board labeled as Q1, Q3, Q4, and Q6 (marked in blue in the annotated photograph below) correspond to the transistors marked as T1 – T4 in Figure 5A of the patent. As in the patent, these components are configured so that the P401's circuitry can use both a buck conversion circuit and a boost conversion circuit and alternate between them as needed.

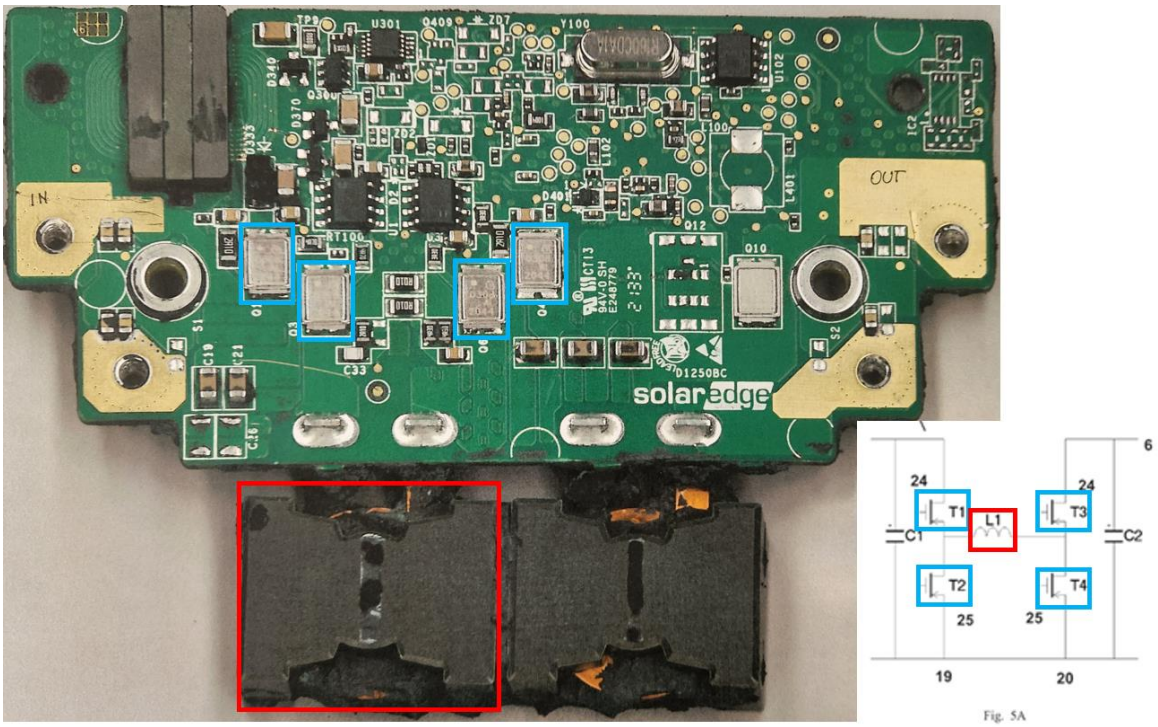
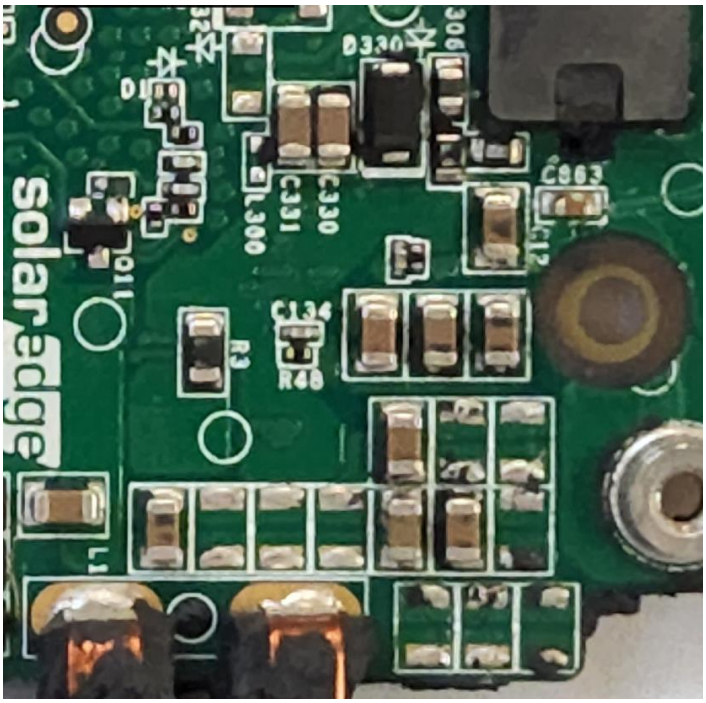


Fig. 5A

127. Figure 5A in the patent also identifies capacitors C1 and C2 as part of the buck and boost conversion circuitry. The P401 board contains many capacitors (typically marked with the prefix C), as shown for example in the close-up photo of a portion of the P401 board shown below. Discovery is needed to identify the specific capacitors used for this functionality; on information and belief at least two capacitors are acting as part of the boost and buck conversion circuitry in the P401 that corresponds to the circuit shown in Figure 5A of the patent.



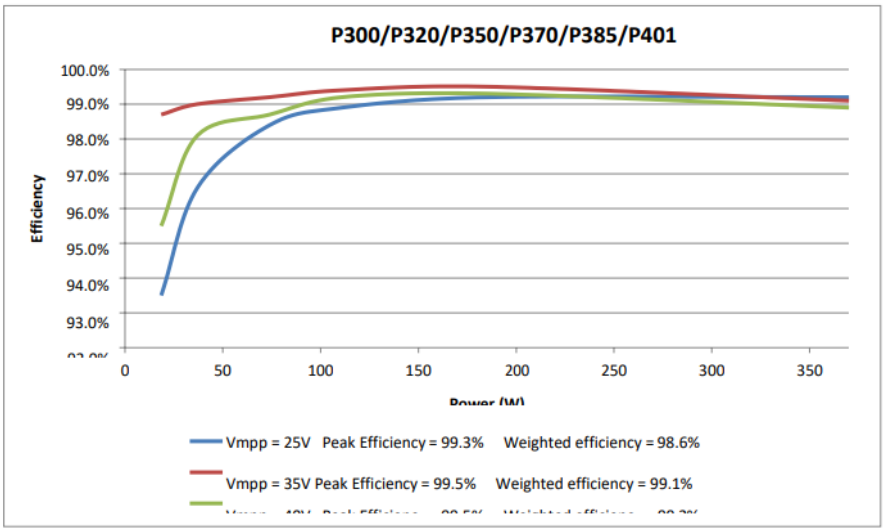
128. Further, SolarEdge does and will makes, uses, offers to sell, sells, and/or imports a system with individually high efficiency conversion duty cycle controlling operation of a plurality of switch elements within each of said individual high efficiency switchmode photovoltaic DC-DC converters. A SolarEdge solar power system that includes a plurality of P401 power optimizers and an inverter such as the SE3800H-US contains in each P401 optimizer converter functionality control circuitry that controls said at least one dual mode photovoltaic DC-DC converter to achieve, high efficiency conversion duty cycle controlling operation.

129. On information and belief, the SolarEdge power optimizers provide maximum power point tracking by duty cycle controlling switch elements (outlined in blue in the photographs above) within the switchmode photovoltaic DC-DC converters.

130. SolarEdge advertises that the control circuitry that controls the switchmode photovoltaic DC-DC converter achieves “Superior efficiency (99.5%),” and makes clear that that no

substantial portion of the energy is lost as heat energy.[21]

131. SolarEdge's website represents that the S-Series and P-Series optimizers have a maximum efficiency of 99.5% and a weighted efficiency of 98.8%.



https://www.solaredge.com/sites/default/files/application_note_solaredge_optimizers_efficiency.pdf at 2.

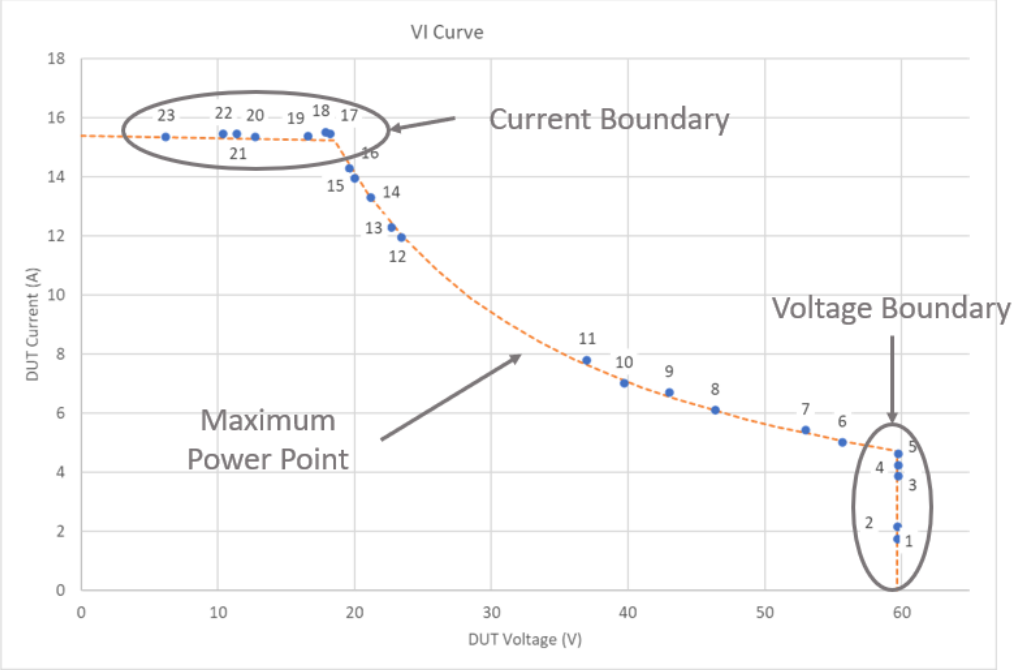
132. Moreover, the SolarEdge website states its power optimizers are "highly efficient, maintaining over 98% conversion efficiency over a wide range of conditions." *See* https://www.solaredge.com/sites/default/files/se_application_fixed_string_voltage.pdf.

133. Further, SolarEdge does and will makes, uses, offers to sell, sells, and/or imports a system where photovoltaic boundary condition control said plurality of switch elements within each of said individual high efficiency switchmode photovoltaic DC-DC converters. A SolarEdge solar power system that includes a plurality of P401 power optimizers and an inverter such as the SE3800H-US contains in each P401 optimizer a switch circuit configured and arranged to be sufficient to power said solar power system during operation of said solar power system to produce operational power, and while producing operational power to be capable of alternating between: maximum power point

[21] *See also* https://www.solaredge.com/sites/default/files/se-P5-series-add-on-power-optimizer-datasheet-na.pdf.

tracking, overcurrent boundary condition control of said converted photovoltaic DC output at other than maximum power point, and overvoltage boundary condition control of said converted photovoltaic DC output at other than said maximum power point.

134. Testing of the P401 optimizer in conjunction with a SolarEdge SE3800H-US Inverter and a Keysight Solar Array Simulator with five E4376A modules shows that it provides operational power at a maximum power point level, an overcurrent boundary level, and an overvoltage boundary level. The testing also shows that the overcurrent boundary and overvoltage boundary levels are different from the maximum power point level.



135. Further, SolarEdge does and will makes, uses, offers to sell, sells, and/or imports a system where photovoltaic boundary condition control said plurality of switch elements within each of said individual high efficiency switchmode photovoltaic DC-DC converters. A SolarEdge solar power system that includes a plurality of P401 power optimizers and an inverter such as the SE3800H-US contains in each P401 optimizer a plurality of switch elements (outlined in blue in the photographs above) configured and arranged with their associated circuitry to be sufficient to power said solar

power system during operation of said solar power system to produce operational power, and while producing operational power to be capable of alternating between: maximum power point tracking, overcurrent boundary condition control of said converted photovoltaic DC output at other than maximum power point, and overvoltage boundary condition control of said converted photovoltaic DC output at other than said maximum power point.

136. SolarEdge's website states that "The SolarEdge Power Optimizers increase energy output from PV systems by constantly tracking the maximum power point (MPPT) of each module individually." https://www.solaredge.com/us/products/power-optimizers#/.[22]

137. SolarEdge's "Concept of Orientation" provides a description of using circuitry to control said photovoltaic DC-DC power converter to produce operational power at a maximum power point level.[23]

138. As discussed above, testing of the P401 optimizer in conjunction with a SolarEdge SE3800H-US inverter and a Keysight Solar Array Simulator with five E4376A modules shows that it provides operational power at a maximum power point level.

139. Furthermore, the SolarEdge datasheets specifies a MPPT Operating Range, which is the Maximum Power Point Tracking Operating Range.

Optimizer Model (Typical Module Compatibility)	P320 (for high-power 60-cell modules)	P401 (for high-power 60/72-cell modules)	
INPUT			
Rated Input DC Power[1]	320	400	W
Absolute Maximum Input Voltage (Voc at lowest temperature)	48	60	Vdc
MPPT Operating Range	8 - 48	8 - 60	Vdc
Maximum Short Circuit Current (Isc)	11	11.75	Adc
Maximum Efficiency	99.5		%
Weighted Efficiency	98.8		%
Overvoltage Category	II		

https://www.solaredge.com/sites/default/files/se-P5-series-frame-mounted-power-optimizer-datasheet-na.pdf at 2.

[22] *See also* https://youtu.be/oFDHqmDymrY.
[23] https://www.solaredge.com/sites/default/files/se_application_fixed_string_voltage.pdf at 1.

140. Further, SolarEdge does and will makes, uses, offers to sell, sells, and/or imports a system where slavedly individual panel dedicated maximum photovoltaic power point DC-DC converting each of said high voltage, highly varying DC photovoltaic outputs. A SolarEdge solar power system that includes a plurality of P401 power optimizers and an inverter such as the SE3800H-US contains in each P401 optimizer controls such that each solar panel is separately maximum power point controlled to compensate for variation in DC photovoltaic output of individual solar panels, and that each P401 is slaved to the inverter.

141. SolarEdge's "Concept of Orientation" provides an example of a plurality of solar energy sources, where each source has varying DC outputs, which process is controlled by the power optimizer.[24]

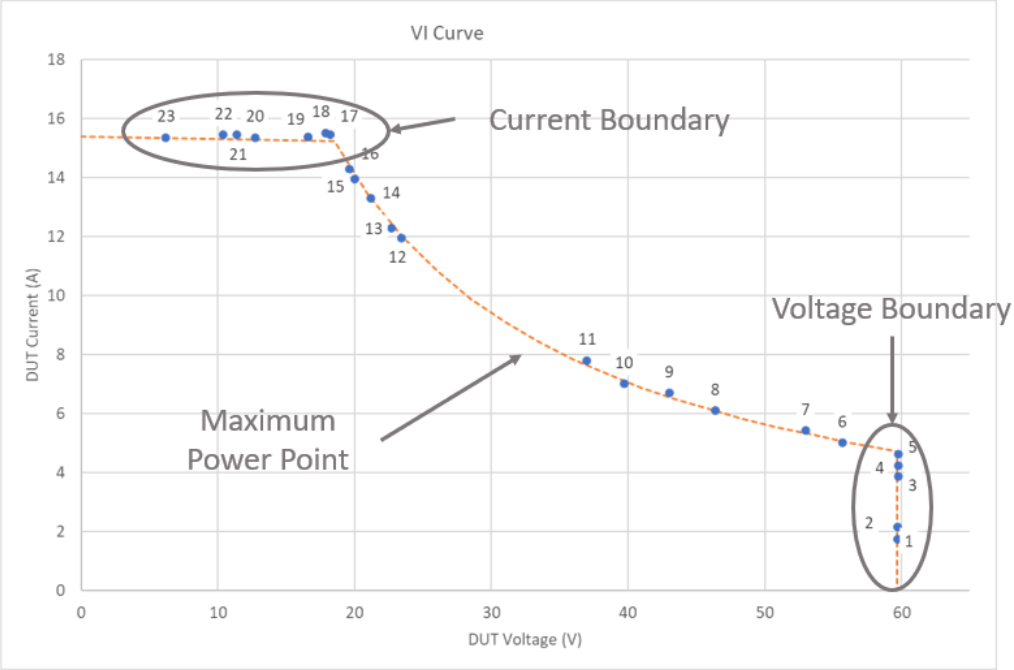
142. SolarEdge advertises that each of its solar panels operates at "its maximum ability" and is thus operating with varying DC photovoltaic outputs.[25]

143. Further, SolarEdge does and will makes, uses, offers to sell, sells, and/or imports a system where photovoltaic boundary condition control said plurality of switch elements within each of said individual high efficiency switchmode photovoltaic DC-DC converters. A SolarEdge solar power system that includes a plurality of P401 power optimizers and an inverter such as the SE3800H-US contains in each P401 optimizer a switch circuit configured and arranged to be sufficient to power said solar power system during operation of said solar power system to produce operational power, and while producing operational power to be capable of alternating between: maximum power point tracking, overcurrent boundary condition control of said converted photovoltaic DC output at other than maximum power point, and overvoltage boundary condition control of said converted

[24] https://www.solaredge.com/sites/default/files/se_application_fixed_string_voltage.pdf at 2.
[25] https://www.solaredge.com/sites/default/files/residential_catalogue_eng.pdf at 8.

photovoltaic DC output at other than said maximum power point.

144. Testing of the P401 optimizer in conjunction with a SolarEdge SE3800H-US Inverter and a Keysight Solar Array Simulator with five E4376A modules shows that it provides operational power at a maximum power point level, an overcurrent boundary level, and an overvoltage boundary level. The testing also shows that the overcurrent boundary and overvoltage boundary levels are different from the maximum power point level.



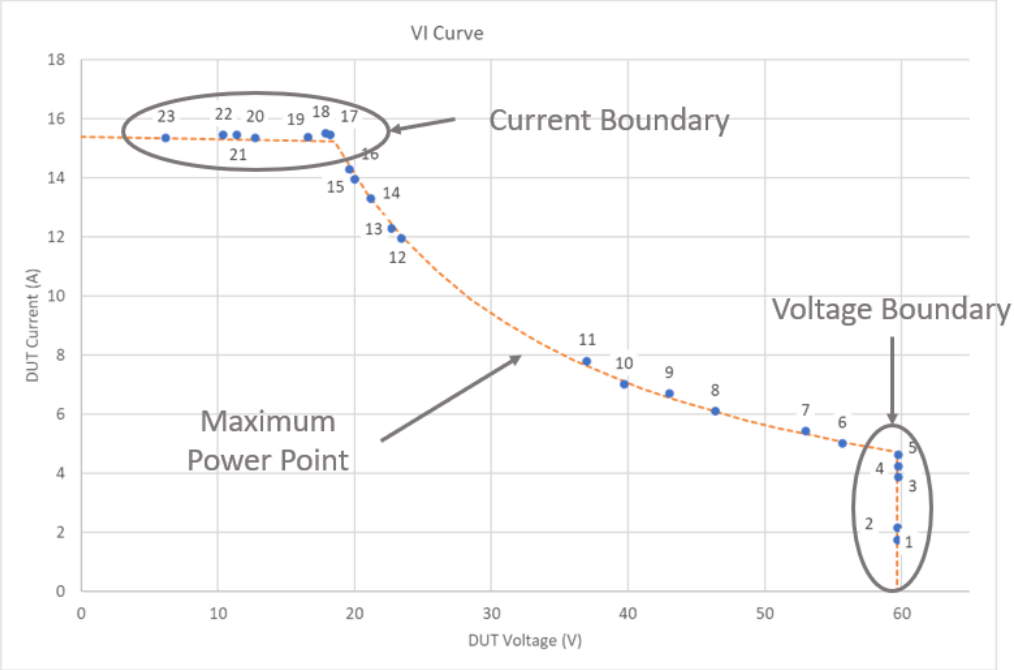
145. The SolarEdge datasheet further describes these boundary conditions:

OUTPUT DURING OPERATION (POWER OPTIMIZER CONNECTED TO OPERATING SOLAREDGE INVERTER)		
Maximum Output Current	15	Adc
Maximum Output Voltage	60	Vdc

https://www.solaredge.com/sites/default/files/se-P5-series-frame-mounted-power-optimizer-datasheet-na.pdf.

146. Further, SolarEdge does and will makes, uses, offers to sell, sells, and/or imports a system that individually substantially power isomorphically converting each said high voltage, highly varying DC photovoltaic outputs into a plurality of converted DC photovoltaic outputs while accomplishing said step of individual dedicated maximum photovoltaic power point converting said

DC photovoltaic input from each of said plurality of solar panels. A SolarEdge solar power system that includes a plurality of P401 power optimizers and an inverter such as the SE3800H-US contains in each P401 optimizer a control to convert a high voltage DC output into a plurality of converted DC outputs while providing maximum power point conversion of the input from each solar panel. The maximum power point conversion is illustrated in the below figure.



147. Moreover, this conversion is substantially power isomorphic. SolarEdge advertises that the control circuitry that controls the switchmode photovoltaic DC-DC converter achieves "Superior efficiency (99.5%)," and makes clear that that no substantial portion of the energy is lost as heat energy. https://www.solaredge.com/sites/default/files/se-P5-series-add-on-power-optimizer-datasheet-na.pdf.

148. SolarEdge's website represents that the S-Series and P-Series optimizers have a maximum efficiency of 99.5% and a weighted efficiency of 98.8%. *See* https://www.solaredge.com/sites/default/files/application_note_solaredge_optimizers_efficiency.pdf.

149. Moreover, the SolarEdge website states its power optimizers are "highly efficient, maintaining over 98% conversion efficiency over a wide range of conditions."

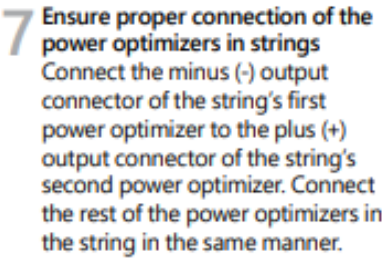
https://www.solaredge.com/sites/default/files/se_application_fixed_string_voltage.pdf.

150. Further, SolarEdge does and will makes, uses, offers to sell, sells, and/or imports a system that serially connects said plurality of converted DC photovoltaic outputs to create a combined higher voltage converted DC photovoltaic output from said plurality of solar panels. A SolarEdge solar power system that includes a plurality of P401 power optimizers and an inverter such as the SE3800H-US contains a plurality of DC-DC power converters (one in each P401 optimizer) wherein each DC-DC power converter is connected in series to at least one other DC-DC power converter (in another P401 optimizer). *See* https://youtu.be/oFDHqmDymrY.

151. SolarEdge's "Concept of Orientation" provides an example of a plurality of power optimizers connected in series.[26]

152. SolarEdge's design guideline also provides an example of a "valid use" that connects 20 optimizers to 20 x 345 DC Power Sources. https://www.solaredge.com/sites/default/files/se-power-optimizer-single-string-design-application-note.pdf at 1; *see also id.* ("all power optimizers can be connected to a single string").

153. The SolarEdge installer guide confirms the power optimizers can be connected in series:


7 **Ensure proper connection of the power optimizers in strings**
Connect the minus (-) output connector of the string's first power optimizer to the plus (+) output connector of the string's second power optimizer. Connect the rest of the power optimizers in the string in the same manner.

https://www.solaredge.com/sites/default/files/se-installer-starter-guide-eng.pdf at 5.

154. Further, SolarEdge does and will makes, uses, offers to sell, sells, and/or imports a

[26] https://www.solaredge.com/sites/default/files/se_application_fixed_string_voltage.pdf at 1.

system that establishes said combined higher voltage converted DC photovoltaic output as a converted DC photovoltaic input to a high voltage, high power photovoltaic DC-AC inverter. A SolarEdge solar power system that includes a plurality of P401 power optimizers and an inverter such as the SE3800H-US contains a plurality of DC-DC power converters (one in each P401 optimizer) wherein each DC-DC power converter is connected in series to at least one other DC-DC power converter (in another P401 optimizer) and each power optimizer outputs power to a high power photovoltaic DC-AC inverter.

155. SolarEdge's "Concept of Orientation" provides an example of combined higher voltage converted DC photovoltaic output as a converted DC photovoltaic input to a high voltage, high power photovoltaic DC-AC inverter[27]

156. Further, SolarEdge does and will makes, uses, offers to sell, sells, and/or imports a system with an inverter for inverting said converted DC photovoltaic input into a high power inverted AC photovoltaic output. A SolarEdge solar power system includes an inverter responsive to said converted photovoltaic DC outputs, such as the SE3800H-US inverter, which outputs high power inverted AC photovoltaic output.[28]

157. SolarEdge's inverters "efficiently converts DC power from the modules into AC power that can be fed into the main AC service of the site and from there to the grid." https://www.solaredge.com/sites/default/files/se-single-and-three-phase-inverter-user-manual-na.pdf.

158. SolarEdge's "Concept of Orientation" provides a description of an inverter responsive to a SolarEdge power optimizer.[29]

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[27] https://www.solaredge.com/sites/default/files/se_application_fixed_string_voltage.pdf at 2.
[28] *See, e.g.*, https://www.solaredge.com/sites/default/files/se-installer-starter-guide-eng.pdf; https://www.solaredge.com/sites/default/files/se-three-phase-inverter-setapp-480-datasheet-na.pdf.
[29] https://www.solaredge.com/sites/default/files/se_application_fixed_string_voltage.pdf at 1.

159. SolarEdge's datasheet describe the ability of its inverters to receive a DC input and output a high power inverted AC photovoltaic output:

MODEL NUMBER	SE30KUS	SE40KUS	UNITS
APPLICABLE TO INVERTERS WITH PART NUMBER	SEXXK-USX8IXXXX		
OUTPUT			
Rated AC Power Output	30000	**40000**	W
Maximum apparent AC output power	30000	40000	VA
AC Output Line Connections	3W + PE, 4W + PE		
AC Output Voltage Minimum-Nominal-Maximum[2] (L-N)	244 - 277 - 305		Vac
AC Output Voltage Minimum-Nominal-Maximum[2] (L-L)	422.5 - 480 - 529		Vac
AC Frequency Min-Nom-Max[2]	59.3 - 60 - 60.5		Hz
Maximum Continuous Output Current (per Phase)	36.25	48.25	Aac
GFDI Threshold	1		A
Utility Monitoring, Islanding Protection, Country Configurable Set Points	Yes		
Total Harmonic Distortion	≤ 3		%
Power Factor Range	+/- 0.85 to 1		
INPUT			
Maximum DC Power (Module STC)	45000	60000	W
Transformer-less, Ungrounded	Yes		
Maximum Input Voltage DC+ to DC-	1000		Vdc
Operating Voltage Range	840 - 1000		Vdc
Maximum Input Current	36.25	48.25	Adc
Maximum Input Short Circuit Current	55		Adc
Reverse-Polarity Protection	Yes		
Ground-Fault Isolation Detection	167kΩ Sensitivity[3]		
CEC Weighted Efficiency	98.5		%
Night-time Power Consumption	<4		W

https://www.solaredge.com/sites/default/files/se-three-phase-inverter-setapp-480-datasheet-na.pdf at 2.

160. Thus, on information and belief, SolarEdge's use of a solar power system that includes a package of P401 power optimizers and the SE3800H-US inverter infringes at least claim 1 of the '140 patent.

161. The full extent of SolarEdge's infringement is not presently known to Plaintiff. On information and belief, SolarEdge has made, used, sold, offered for sale, and/or imported products under different names or part numbers the use of which infringes the '140 patent in a similar manner. Plaintiff makes this preliminary identification of infringing products and infringed claims without the benefit of discovery or claim construction in this action, and expressly reserves the right to augment, supplement, and revise its identification based on additional information obtained through discovery or otherwise.

162. SolarEdge has had notice of and have been aware of the '140 patent and its infringement of the '140 patent since at least the filing of this Complaint.

163. In addition, since at least the above-mentioned date when SolarEdge was on notice of its infringement, SolarEdge has actively induced and continues to induce others to infringe one or more of the claims of the '140 patent in violation of 35 U.S.C. § 271(b), as described below.

164. On information and belief, SolarEdge knowingly and intentionally induces users of one or more of the Accused Products to directly infringe one or more claims of the '140 patent by encouraging, instructing, and aiding one or more persons in the United States, including but not limited to end users, distributors, and installers to use the Accused Products in a manner that infringes the '140 patent.

165. For example, SolarEdge induces infringement by providing the Accused Products, contracting for the distribution of the Accused Products, by marketing the Accused Products, and by creating and/or distributing user manuals, web pages, marketing materials, and/or similar materials with instructions on using the Accused Products in an infringing manner. The use of the Accused Products in accordance with SolarEdge's instructions results in infringement of the asserted claims of the '140 patent.

166. On information and belief, the Accused Products are designed in such a way that when they are used for their intended purpose, the user infringes the '140 patent. SolarEdge knows and intends that its distributors, installers and/or end users that purchase the Accused Products will use those products for their intended purpose.

167. On information and belief, SolarEdge was aware of the infringement of the '140 patent or acted with willful blindness as to its existence at least as a result of the filing of this Complaint.

168. Moreover, by continuing to make, use, sell, offer to sell, and/or import the Accused Products after SolarEdge first had notice of Ampt's allegations of infringement, SolarEdge has indirectly infringed and continues to indirectly infringe by contributing to the infringement of one or

more claims of the '140 patent pursuant to 35 U.S.C. § 271(c), as described below.

169. On information and belief, SolarEdge has contributorily infringed, and continues to contributorily infringe, the asserted claims by offering to sell, selling, and importing into the United States the Accused Products that perform the claimed methods for solar energy power creation, knowing that the Accused Products are especially made for use in infringing the '140 patent, and are not staple articles of commerce suitable for a substantial non-infringing use. In particular, the Accused Products are power optimizers and inverters that need to be set-up by SolarEdge's distributor and/or user in accordance with specific directions from SolarEdge in order to be operable for purpose of solar energy power creation. The Accused Products contain components, including control circuitry, that specifically implement the claimed methods for solar energy power creation. Indeed, these components are especially built to perform the accused functionalities. On information and belief, SolarEdge has performed and continues to perform these affirmative acts with knowledge of the '140 patent and with the intent, or willful blindness, that they cause the direct infringement of the '140 patent.

170. On information and belief, Ampt has suffered and continues to suffer damages as a result of SolarEdge's infringement of the '140 patent in an amount to be determined at trial.

171. SolarEdge's infringement of the '140 patent is causing irreparable harm for which Ampt has no adequate remedy at law unless SolarEdge is enjoined by this Court. Under 35 U.S.C. § 283, Ampt is entitled to a permanent injunction against further infringement of the '140 patent.

172. Ampt does not have an adequate remedy at law.

173. On information and belief, SolarEdge's infringement is willful and deliberate, entitling Ampt to increased damages under 35 U.S.C. § 284 and to attorneys' fees and costs incurred in prosecuting this action under 35 U.S.C. § 285.

COUNT III
(INFRINGEMENT OF U.S. PATENT NO. 9,673,630)

174. Plaintiff repeats and realleges paragraphs 1-173 as if fully set forth at length herein.

175. SolarEdge has and continues to infringe one or more claims of the ’630 patent in this judicial district and elsewhere in the United States.

176. Upon information and belief, SolarEdge makes, uses, sells, offers for sale, and/or imports into the United States the Accused Products.

177. SolarEdge directly infringes the ’630 patent under 35 U.S.C. § 271(a), literally and/or under the doctrine of equivalents, by making, using, offering for sale, selling, and/or importing the Accused Products in the United States.

178. For example, SolarEdge directly infringes at least claim 1 of the ’630 patent, literally and/or under the doctrine of equivalents, through its making, using, offering for sale, selling, and/or importing the Accused Products. The asserted claim(s) of the ’630 patent are valid, enforceable, and currently in full force and effect.

179. Claim 1 of the ’630 patent recites:

> A solar power system, comprising:
>
> DC power from a solar energy source;
>
> at least one dual mode photovoltaic DC-DC converter to which said DC power is input;
>
> converter functionality control circuitry that controls said at least one dual mode photovoltaic DC-DC converter to achieve, at least some times, conversion of said DC power at from 97% efficiency up to wire transmission loss, transistor on-state loss, and synchronous duty cycle switch loss maximum photovoltaic power point conversion efficiency;
>
> a converted DC output from said at least one dual mode photovoltaic DC-DC converter; and
>
> a load to which said converted DC output is input,
>
> wherein said converter functionality control circuitry comprises photovoltaic boundary condition converter control circuitry capable of achieving, at least some times during operation of said solar power system, a power producing boundary condition for converter operation including a converter DC output overcurrent limit, a converter DC output overvoltage limit, or both.

180. As one non-limiting example of said infringement, on information and belief, a SolarEdge solar power system that includes a package of P401 power optimizers and an inverter such as the SE3800H-US meets each and every limitation recited in claim 1 of the '630 patent, as described below.

181. On information and belief, a SolarEdge solar power system that includes a package of P401 power optimizers and an inverter such as the SE3800H-US is designed and intended to be installed and used with a plurality of power sources that produce DC power from solar energy (i.e., solar panels). *See* https://www.solaredge.com/us/products/power-optimizer#/.[30]

182. As depicted on SolarEdge's website, it offers for sale solar power systems, including those that include power optimizers such as the P401 an inverter such as the SE3800H-US.[31]

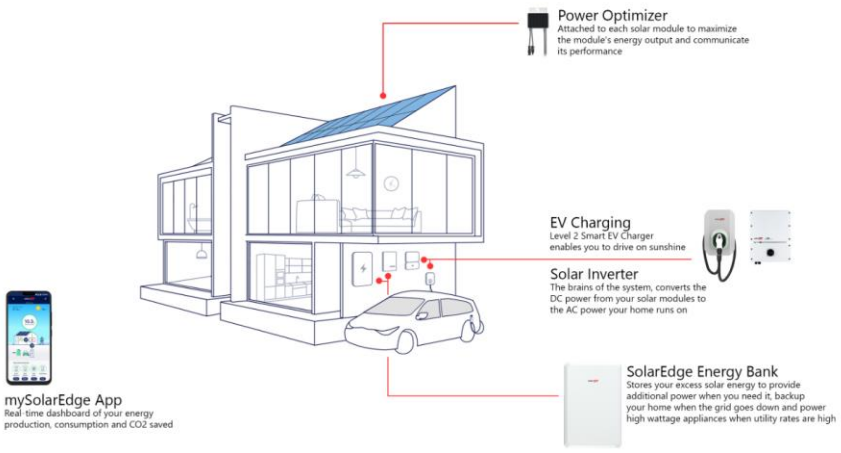
183. Further, as discussed above, a SolarEdge solar power system that includes a package of P401 power optimizers and an inverter such as the SE3800H-US is designed and intended to be installed and used with a plurality of power sources that produce DC power from solar energy (i.e., solar panels). For example, SolarEdge's datasheet states that the P401 is compatible with "high power 60 and 72-cell modules" rated for "DC input."

[30] *See also* https://www.solaredge.com/sites/default/files/se-P5-series-add-on-power-optimizer-datasheet-na.pdf; https://www.solaredge.com/sites/default/files/se-installer-starter-guide-eng.pdf; https://www.solaredge.com/sites/default/files/se-three-phase-inverter-setapp-480-datasheet-na.pdf.
[31] *See, e.g.*, https://www.solaredge.com/sites/default/files/se-hd-wave-single-phase-inverter-with-setapp-datasheet-na.pdf; https://www.solaredge.com/sites/default/files/se-installer-starter-guide-eng.pdf; https://www.solaredge.com/us/commercial-solutions-pv-professionals; https://www.solaredge.com/sites/default/files/se-three-phase-inverter-setapp-480-datasheet-na.pdf.

Optimizer model (typical module compatibility)	P370 (for higher-power 60 and 72-cell modules)	P400 (for 72 & 96-cell modules)	P401 (for high power 60 and 72 cell modules)	P485 (for high-voltage modules)	P505 (for higher current modules)
INPUT					
Rated Input DC Power[1]	370	400	430	485	505
Absolute Maximum Input Voltage (Voc at lowest temperature)	60	80	60	125[2]	83[2]
MPPT Operating Range	8 - 60	8 - 80	8-60	12.5 - 105	12.5 - 83
Maximum Short Circuit Current (Isc)	11	10.1	12.5	11	14
Maximum DC Input Current	13.75	12.5	14.65	12.5	17.5
Maximum Efficiency	99.5				
Weighted Efficiency	98.8				
Overvoltage Category	II				

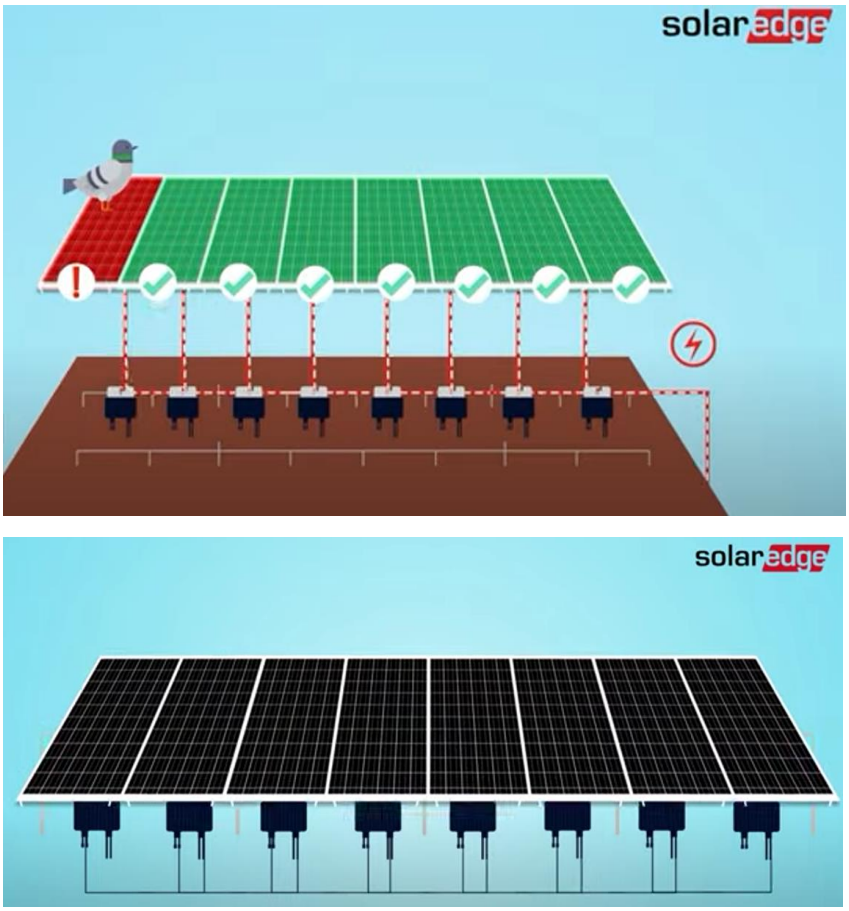
https://www.solaredge.com/sites/default/files/se-P5-series-add-on-power-optimizer-datasheet-na.pdf at 2.

184. SolarEdge's website has indicated that the power optimizer is "[a]ttached to each solar module to maximize the module's energy output and communicate its performance."



https://www.solaredge.com/us/homeowner-new.

185. Further, a SolarEdge solar power system that includes a plurality of P401 power optimizers and an inverter such as the SE3800H-US contains a plurality of photovoltaic DC-DC converters (one in each P401 optimizer) to which said DC power is input.

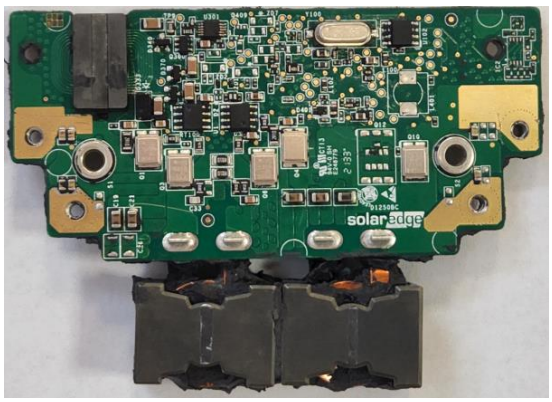


https://youtu.be/oFDHqmDymrY.

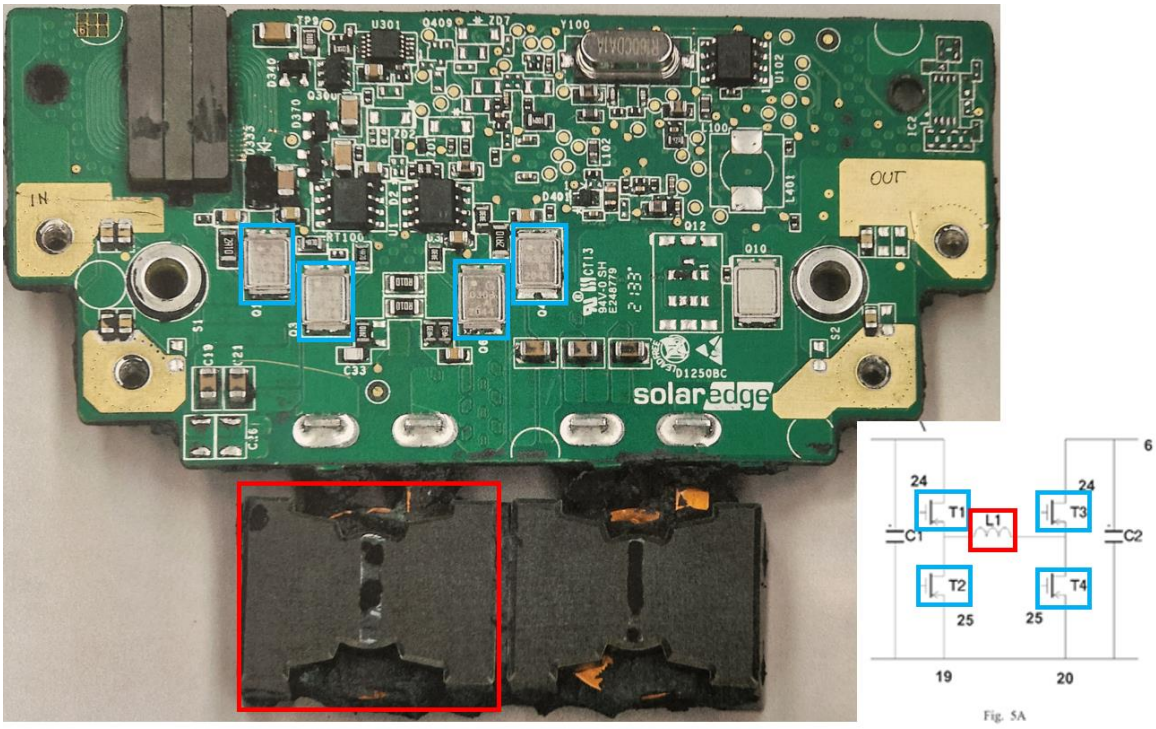
186. SolarEdge's website states that its optimizers are "DC/DC converter[s]" that are connected to solar panels for the purpose of receiving DC power: "The SolarEdge Power Optimizer is a DC/DC converter which is connected by installers to each solar module." https://www.solaredge.com/us/products/power-optimizers#/.

187. For example, the rated DC input on the P401 optimizer is 430W. *See* https://www.solaredge.com/sites/default/files/se-P5-series-add-on-power-optimizer-datasheet-na.pdf.

188. In addition, on information and belief, each P401 optimizer contains a dual-mode photovoltaic DC-DC converter that includes a boost power conversion circuit and a buck power conversion circuit. Front and back photographs of the circuit board in a P401 optimizer are shown below.

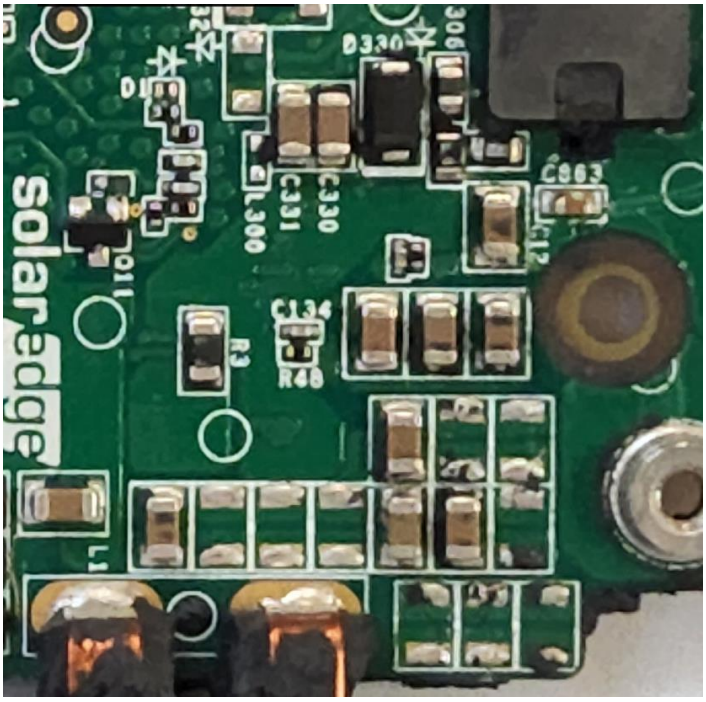


189. On information and belief, the item labeled on the P401 board as L1 (marked in red in the annotated photograph below) is an inductor as depicted in Figures 5A and 5B of the ’630 patent, and the transistors on the P401 board labeled as Q1, Q3, Q4, and Q6 (marked in blue in the annotated photograph below) correspond to the transistors marked as T1 – T4 in Figure 5A of the patent. As in the patent, these components are configured so that the P401’s circuitry can use both a buck conversion circuit and a boost conversion circuit and alternate between them as needed.



190. Figure 5A of the ’630 patent also identifies capacitors C1 and C2 as part of the buck and boost conversion circuitry. The P401 board contains many capacitors (typically marked with the

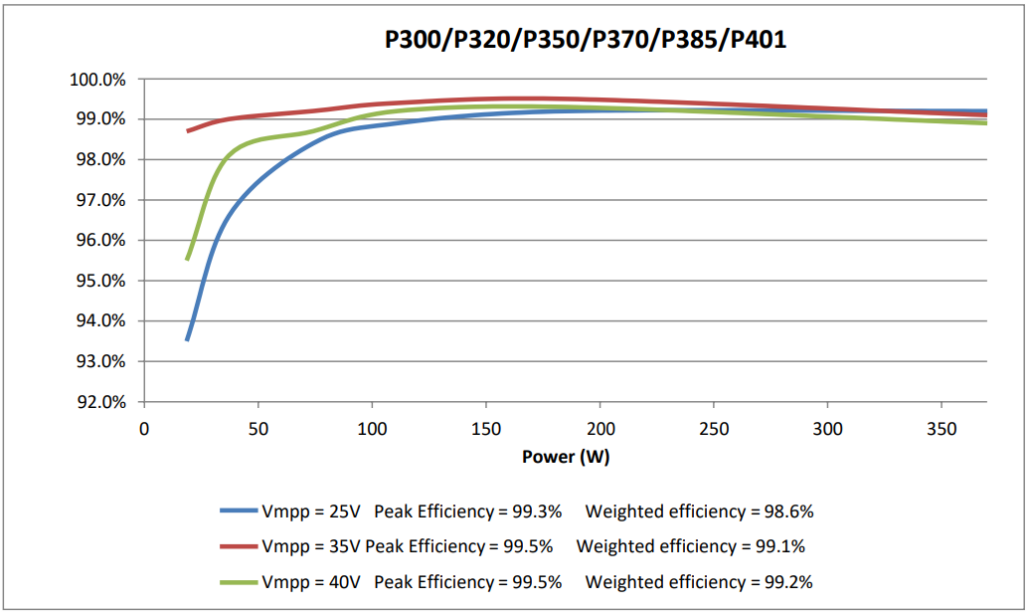
prefix C), as shown for example in the close-up photo of a portion of the P401 board shown below. Discovery is needed to identify the specific capacitors used for this functionality; on information and belief at least two capacitors are acting as part of the boost and buck conversion circuitry in the P401 that corresponds to the circuit shown in Figure 5A of the patent.



191. Further, a SolarEdge solar power system that includes a plurality of P401 power optimizers and an inverter such as the SE3800H-US contains in each P401 optimizer converter functionality control circuitry that controls said at least one dual mode photovoltaic DC-DC converter to achieve, at least some times, conversion of said DC power at from 97% efficiency up to wire transmission loss, transistor on-state loss, and synchronous duty cycle switch loss maximum photovoltaic power point conversion efficiency.

192. SolarEdge advertises that the control circuitry that controls the dual mode photovoltaic DC-DC converter achieves "Superior efficiency (99.5%)," and makes clear that that no substantial portion of the energy is lost as heat energy. *See* https://www.solaredge.com/sites/default/files/se-P5-series-add-on-power-optimizer-datasheet-na.pdf.

193. SolarEdge's website represents that the S-Series and P-Series optimizers have a maximum efficiency of 99.5% and a weighted efficiency of 98.8%. *See* https://www.solaredge.com/sites/default/files/application_note_solaredge_optimizers_efficiency.pdf at 1.



Id. at 2.

194. SolarEdge's website further states its power optimizers are "highly efficient, maintaining over 98% conversion efficiency over a wide range of conditions." *See* https://www.solaredge.com/sites/default/files/se_application_fixed_string_voltage.pdf at 1.

195. Further, a SolarEdge solar power system that includes a plurality of P401 power optimizers and an inverter such as the SE3800H-US produces (from each P401 optimizer) a converted DC output from said at least one dual mode photovoltaic DC-DC converter.

196. During operation, the P401 optimizer has a maximum output voltage of 60 Vdc. https://www.solaredge.com/sites/default/files/se-P5-series-add-on-power-optimizer-datasheet-na.pdf at 2.

197. SolarEdge's "Concept of Orientation" provides an example of a converted DC output

from said at least one dual mode photovoltaic DC-DC converter:

Scenario 1 – Ideal Conditions: Initially, we assume all the modules are exposed to full irradiance, each providing 200W of power. The power output of each solar module is maintained at the module's maximum power point by an input control loop within the corresponding power optimizer. This MPP loop dictates to the power optimizer an input current I_{in} and input voltage V_{in} that ensure the transfer of the entire 200W from the module to the DC bus. We assume an MPP voltage for each module (given perfectly matched modules for demonstration purposes) of V_{MPP} = 32V. This means the input voltage to the power optimizer is 32V, and the input current is 200W/32V = 6.25A. The input voltage to the inverter is controlled by a separate feedback loop. For simplicity, in this example the inverter requires a constant 400V. Since there are ten serially-connected modules, each providing 200W, the input current to the inverter is 2000W/400V = 5A. Thus, the DC bus current flowing through each of the power optimizers must be 5A. This means that each power optimizer in this example provides an output voltage of 200W/5A = 40V. In this case, the power optimizers are acting as up converters, converting the 32V input voltage to the target 40V output voltage. The various system currents and voltages in this case are illustrated in Figure 1.

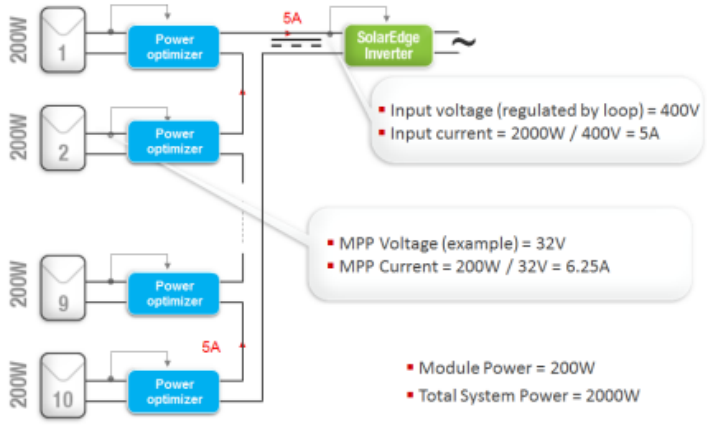


Figure 1: Operation under Ideal Conditions

https://www.solaredge.com/sites/default/files/se_application_fixed_string_voltage.pdf at 1-2.

198. Further, a SolarEdge solar power system that includes a plurality of P401 power optimizers and an inverter such as the SE3800H-US includes a load to which said converted DC output is input.

199. For example, the P401 optimizer datasheet says that it is "[s]pecifically designed to work with SolarEdge Inverters." https://www.solaredge.com/sites/default/files/se-P5-series-add-on-power-optimizer-datasheet-na.pdf at 1.

200. The P401 optimizer datasheet also describes the maximum converted DC output that can be supplied to the inverter:

OUTPUT DURING OPERATION (POWER OPTIMIZER CONNECTED TO OPERATING SOLAREDGE INVERTER)			
Maximum Output Current	15		Adc
Maximum Output Voltage	60	80	Vdc

https://www.solaredge.com/sites/default/files/se-P5-series-add-on-power-optimizer-datasheet-na.pdf at 2.

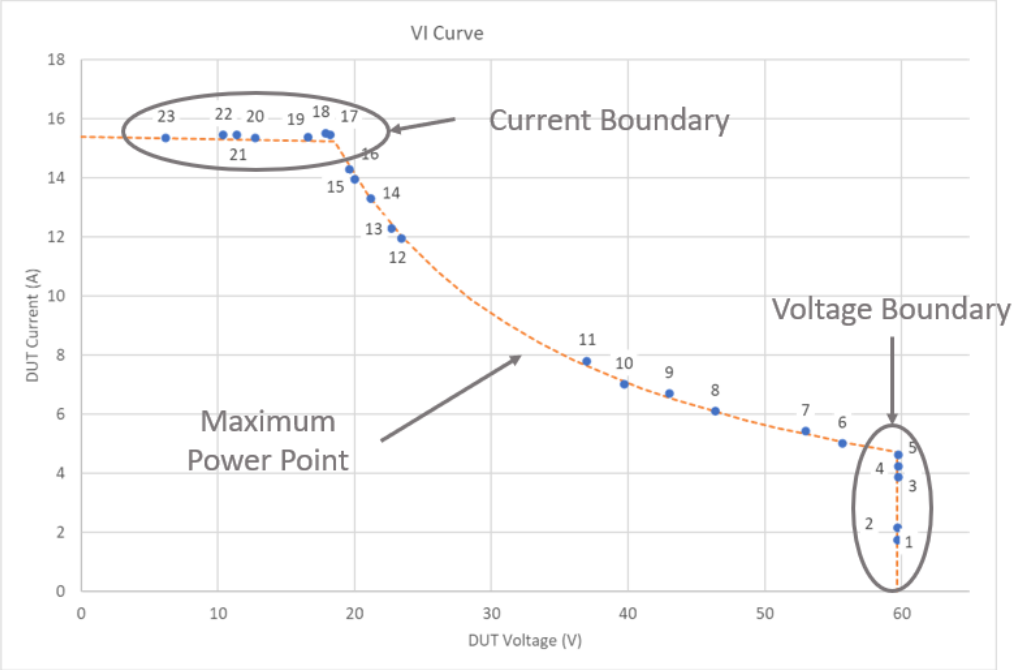
201. SolarEdge's "Concept of Orientation" provides an example of a converted DC output from said at least one dual mode photovoltaic DC-DC converter being input into an inverter. *See* https://www.solaredge.com/sites/default/files/se_application_fixed_string_voltage.pdf at 1-2.[32]

202. Further, a SolarEdge solar power system that includes a plurality of P401 power optimizers and an inverter such as the SE3800H-US contains in each P401 optimizer converter functionality control circuitry wherein said converter functionality control circuitry comprises photovoltaic boundary condition converter control circuitry capable of achieving, at least some times during operation of said solar power system, a power producing boundary condition for converter operation including a converter DC output overcurrent limit, a converter DC output overvoltage limit, or both. *See* https://youtu.be/oFDHqmDymrY.

203. SolarEdge's website states that "The SolarEdge Power Optimizers increase energy output from PV systems by constantly tracking the maximum power point (MPPT) of each module individually." https://www.solaredge.com/us/products/power-optimizers#/.[33]

204. Testing of a set of ten P401 optimizers in conjunction with a SolarEdge SE3800H-US Inverter and a Keysight Solar Array Simulator with five E4376A modules shows that it provides operational power at a maximum power point level, an overcurrent boundary level, and an overvoltage boundary level. The testing also shows that the overcurrent boundary and overvoltage boundary levels are different from the maximum power point level.

[32] *See also* https://youtu.be/oFDHqmDymrY.
[33] *See also* https://youtu.be/oFDHqmDymrY.



205. SolarEdge's "Concept of Orientation" provides a description of using circuitry to control said photovoltaic DC-DC power converter to produce operational power at a maximum power point level. https://www.solaredge.com/sites/default/files/se_application_fixed_string_voltage.pdf at 1-2.

206. Thus, on information and belief, a SolarEdge solar power system that includes a package of P401 power optimizers and an inverter such as the SE3800H-US comprises DC power from a solar energy source; at least one dual mode photovoltaic DC-DC converter to which said DC power is input; converter functionality control circuitry that controls said at least one dual mode photovoltaic DC-DC converter to achieve, at least some times, conversion of said DC power at from 97% efficiency up to wire transmission loss, transistor on-state loss, and synchronous duty cycle switch loss maximum photovoltaic power point conversion efficiency; a converted DC output from said at least one dual mode photovoltaic DC-DC converter; and a load to which said converted DC output is input, wherein said converter functionality control circuitry comprises photovoltaic boundary condition converter control circuitry capable of achieving, at least some times during operation of said

solar power system, a power producing boundary condition for converter operation including a converter DC output overcurrent limit, a converter DC output overvoltage limit, or both.

207. The full extent of SolarEdge's infringement is not presently known to Plaintiff. On information and belief, SolarEdge has made, used, sold, offered for sale, and/or imported products under different names or part numbers that infringe the '630 patent in a similar manner. Plaintiff makes this preliminary identification of infringing products and infringed claims without the benefit of discovery or claim construction in this action, and expressly reserves the right to augment, supplement, and revise its identification based on additional information obtained through discovery or otherwise.

208. SolarEdge has had notice of and have been aware of the '630 patent and its infringement of the '630 patent since at least the filing of this Complaint.

209. In addition, since at least the above-mentioned date when SolarEdge was on notice of its infringement, SolarEdge has actively induced and continues to induce others to infringe one or more of the claims of the '630 patent in violation of 35 U.S.C. § 271(b), as described below.

210. On information and belief, SolarEdge knowingly and intentionally induces users of one or more of the Accused Products to directly infringe one or more claims of the '630 patent by encouraging, instructing, and aiding one or more persons in the United States, including but not limited to end users, distributors, and installers, to make, use, sell, offer to sell, import and/or install one or more of the Accused Products in a manner that infringes the '630 patent.

211. For example, SolarEdge induces infringement by creating and distributing datasheets, manuals, brochures, and similar documentation and materials related to the installation and use of the Accused Products, and by configuring its devices to require installers to authorize those devices with SolarEdge before they can be used. SolarEdge also offers its cloud-based monitoring platform (PV Monitoring Platform) that allows residential and commercial end users the ability to monitor their solar

power systems' technical performance when that system is installed according to SolarEdge's requirements.

212. On information and belief, the Accused Products are designed in such a way that when they are used for their intended purpose, the user infringes the '630 patent. SolarEdge knows and intends that its distributors, installers and/or end users that purchase the Accused Products will use those products for their intended purpose.

213. On information and belief, SolarEdge was aware of the infringement of the '630 patent or acted with willful blindness as to its existence at least as a result of the filing of this Complaint.

214. Moreover, by continuing to make, use, sell, offer to sell, and/or import the Accused Products after SolarEdge first had notice of Ampt's allegations of infringement, SolarEdge has indirectly infringed and continues to indirectly infringe by contributing to the infringement of one or more claims of the '630 patent pursuant to 35 U.S.C. § 271(c), as described below.

215. On information and belief, SolarEdge's affirmative acts of manufacturing, selling, offering for sale, and/or importing the Accused Products, in this District and elsewhere in the United States, contribute to SolarEdge's customers and end-users directly infringing the '630 patent with the Accused Products. The Accused Products are not a staple article or commodity of commerce, have no substantial non-infringing uses, and are known by SolarEdge to be especially made and/or especially adapted for use in infringement of the '630 patent. SolarEdge has performed and continues to perform these affirmative acts with knowledge of the '630 patent and with the intent, or willful blindness, that they cause the direct infringement of the '630 patent.

216. On information and belief, Ampt has suffered and continues to suffer damages as a result of SolarEdge's infringement of the '630 patent in an amount to be determined at trial.

217. SolarEdge's infringement of the '630 patent is causing irreparable harm for which

Ampt has no adequate remedy at law unless SolarEdge is enjoined by this Court. Under 35 U.S.C. § 283, Ampt is entitled to a permanent injunction against further infringement of the '630 patent.

218. Ampt does not have an adequate remedy at law.

219. On information and belief, SolarEdge's infringement is willful and deliberate, entitling Ampt to increased damages under 35 U.S.C. § 284 and to attorneys' fees and costs incurred in prosecuting this action under 35 U.S.C. § 285.

COUNT IV
(INFRINGEMENT OF U.S. PATENT NO. 10,608,437)

220. Plaintiff repeats and realleges paragraphs 1-219 as if fully set forth at length herein.

221. SolarEdge has and continues to infringe one or more claims of the '437 patent in this judicial district and elsewhere in the United States.

222. Upon information and belief, SolarEdge makes, uses, sells, offers for sale, and/or imports into the United States the Accused Products.

223. SolarEdge directly infringes the '437 patent under 35 U.S.C. § 271(a), literally and/or under the doctrine of equivalents, by making, using, offering for sale, selling, and/or importing the Accused Products in the United States.

224. For example, SolarEdge directly infringes at least claim 1 of the '437 patent, literally and/or under the doctrine of equivalents, through its making, using, offering for sale, selling, and/or importing the Accused Products. The asserted claim(s) of the '437 patent are valid, enforceable, and currently in full force and effect.

225. Claim 1 of the '437 patent recites:

A grid powering solar power system comprising:

a plurality of DC power sources;

a plurality of power converters, each of said power converters coupled to a different, corresponding one or more of said plurality of DC power sources, wherein each power converter comprises a boost and buck power conversion circuit;

converter functionality control circuitry that, during operation of said grid powering solar power system to produce operational power that is sufficient to power the grid, is capable of alternating between:

maximum power point tracking,

overcurrent boundary condition control of converter DC output at other than maximum power point, and

overvoltage boundary condition control of said converter DC output at other than said maximum power point, and

wherein each of the plurality of power converters is connected in series to at least one other power converter of the plurality of power converters.

226. As one non-limiting example of said infringement, on information and belief, a SolarEdge solar power system that includes a package of P401 power optimizers and an inverter such as the SE3800H-US meets each and every limitation recited in claim 1 of the '437 patent, as described below.

227. On information and belief, a SolarEdge solar power system that includes a package of P401 power optimizers and an inverter such as the SE3800H-US is designed and intended to be installed and used with a plurality of power sources that produce DC power from solar energy (i.e., solar panels) and provide that power to the grid. *See* https://www.solaredge.com/us/products/power-optimizer#/.[34]

228. As depicted on SolarEdge's website, it offers for sale solar power systems, including those that include power optimizers such as the P401 an inverter such as the SE3800H-US.[35]

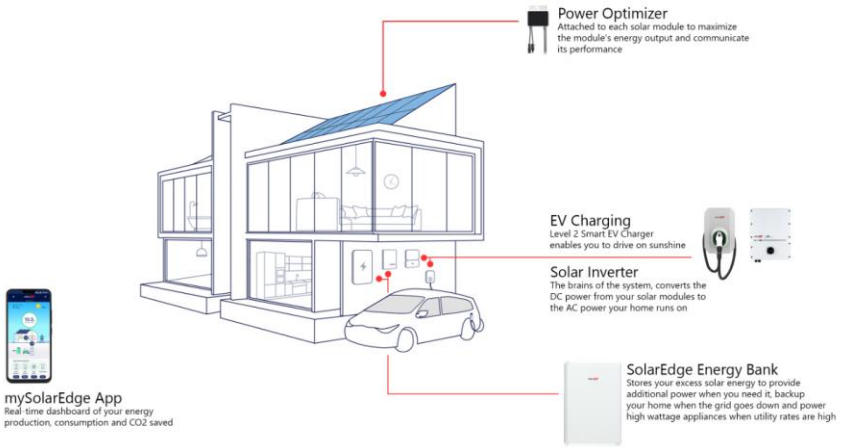
[34] *See also* https://www.solaredge.com/sites/default/files/se-P5-series-add-on-power-optimizer-datasheet-na.pdf; https://www.solaredge.com/sites/default/files/se-installer-starter-guide-eng.pdf; https://www.solaredge.com/sites/default/files/se-three-phase-inverter-setapp-480-datasheet-na.pdf.
[35] *See, e.g.*, https://www.solaredge.com/sites/default/files/se-hd-wave-single-phase-inverter-with-setapp-datasheet-na.pdf; https://www.solaredge.com/sites/default/files/se-installer-starter-guide-

229. Further, on information and belief, a SolarEdge solar power system that includes a plurality of P401 power optimizers and an inverter such as the SE3800H-US is designed and intended to be installed and used with a plurality of power sources that produce DC power from solar energy (i.e., solar panels). *See* https://youtu.be/oFDHqmDymrY. For example, SolarEdge's datasheet states that the P401 is compatible with "high power 60 and 72-cell modules" rated for "DC input."

Optimizer model (typical module compatibility)	P370 (for higher-power 60 and 72-cell modules)	P400 (for 72 & 96-cell modules)	P401 (for high power 60 and 72 cell modules)	P485 (for high-voltage modules)	P505 (for higher current modules)
INPUT					
Rated Input DC Power[1]	370	400	430	485	505
Absolute Maximum Input Voltage (Voc at lowest temperature)	60	80	60	125[2]	83[2]
MPPT Operating Range	8 - 60	8 - 80	8-60	12.5 - 105	12.5 - 83
Maximum Short Circuit Current (Isc)	11	10.1	12.5	11	14
Maximum DC Input Current	13.75	12.5	14.65	12.5	17.5
Maximum Efficiency	99.5				
Weighted Efficiency	98.8				
Overvoltage Category	II				

https://www.solaredge.com/sites/default/files/se-P5-series-add-on-power-optimizer-datasheet-na.pdf at 2.

230. SolarEdge's website has indicated that the power optimizer is "[a]ttached to each solar module to maximize the module's energy output and communicate its performance."

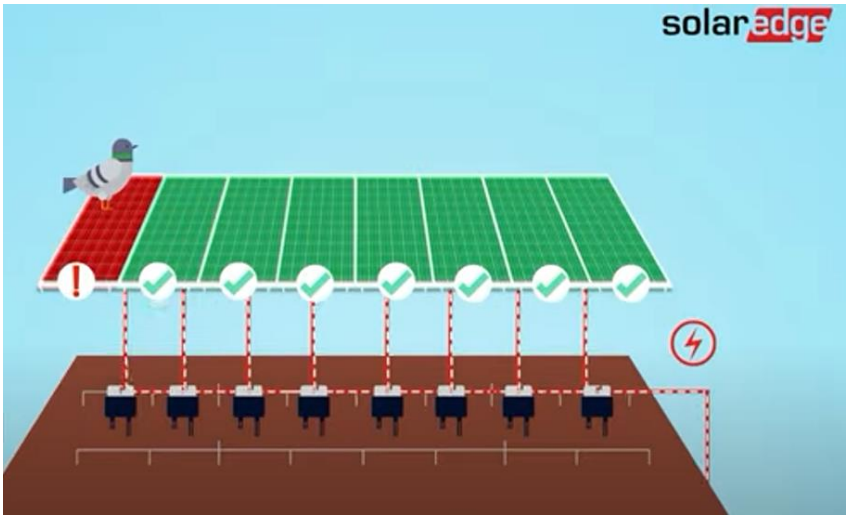


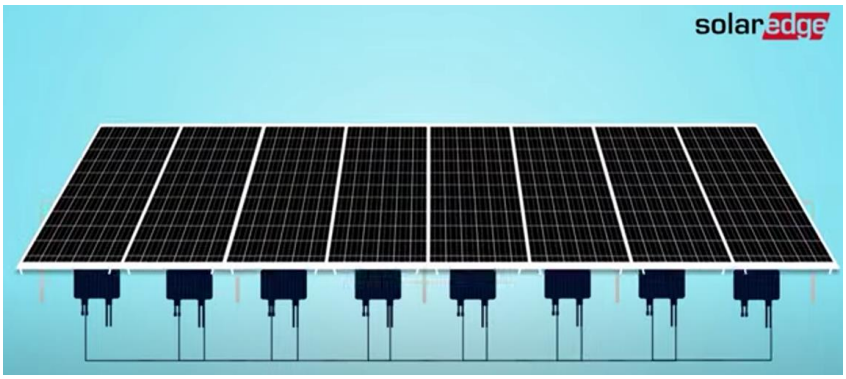
https://www.solaredge.com/us/homeowner-new.

231. Further, a SolarEdge solar power system that includes a plurality of P401 power

eng.pdf; https://www.solaredge.com/us/commercial-solutions-pv-professionals; https://www.solaredge.com/sites/default/files/se-three-phase-inverter-setapp-480-datasheet-na.pdf.

optimizers and an inverter such as the SE3800H-US contains a plurality of power converters (one in each P401 optimizer), each of said power converters coupled to a different, corresponding one or more of said plurality of DC power sources, wherein each power converter comprises a boost and buck power conversion circuit.





https://youtu.be/oFDHqmDymrY.

232. SolarEdge's "Concept of Orientation" provides an example of a plurality of power converters (P401 optimizers) coupled to a plurality of DC power sources (solar panels):

Scenario 1 – Ideal Conditions: Initially, we assume all the modules are exposed to full irradiance, each providing 200W of power. The power output of each solar module is maintained at the module's maximum power point by an input control loop within the corresponding power optimizer. This MPP loop dictates to the power optimizer an input current I_{in} and input voltage V_{in} that ensure the transfer of the entire 200W from the module to the DC bus. We assume an MPP voltage for each module (given perfectly matched modules for demonstration purposes) of V_{MPP} = 32V. This means the input voltage to the power optimizer is 32V, and the input current is 200W/32V = 6.25A. The input voltage to the inverter is controlled by a separate feedback loop. For simplicity, in this example the inverter requires a constant 400V. Since there are ten serially-connected modules, each providing 200W, the input current to the inverter is 2000W/400V = 5A. Thus, the DC bus current flowing through each of the power optimizers must be 5A. This means that each power optimizer in this example provides an output voltage of 200W/5A = 40V. In this case, the power optimizers are acting as up converters, converting the 32V input voltage to the target 40V output voltage. The various system currents and voltages in this case are illustrated in Figure 1.

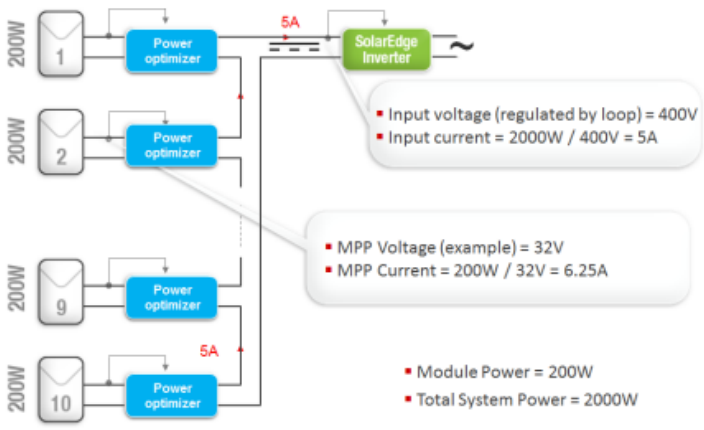
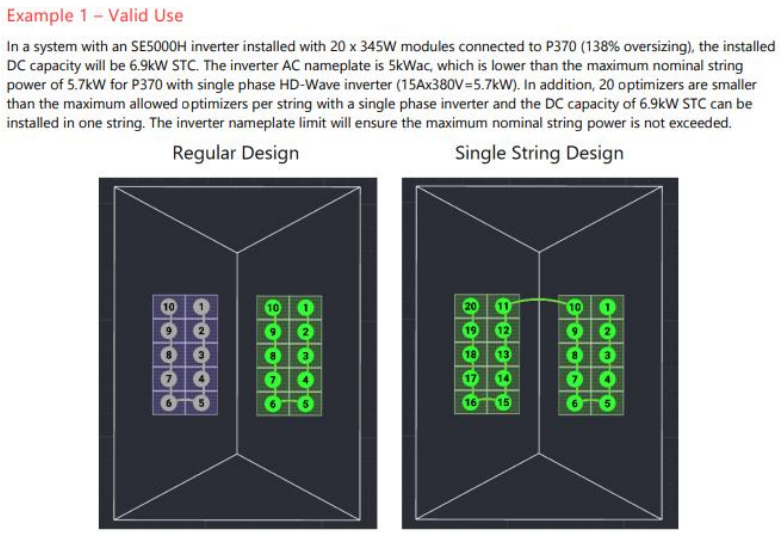


Figure 1: Operation under Ideal Conditions

https://www.solaredge.com/sites/default/files/se_application_fixed_string_voltage.pdf at 1-2.

233. SolarEdge's design guideline also provides an example of a "valid use" that connects 20 optimizers to 20 x 345 DC Power Sources:

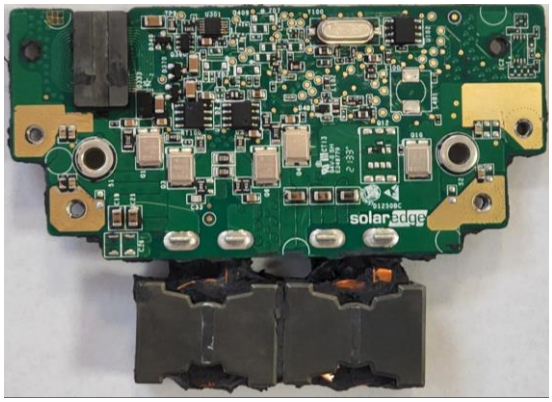


https://www.solaredge.com/sites/default/files/se-power-optimizer-single-string-design-application-note.pdf at 1.

234. SolarEdge's website confirms that each P401 optimizer is designed and intended to be installed connected to a DC power source: "The SolarEdge Power Optimizer is a DC/DC converter ***which is connected by installers to each solar module***, turning them into smart modules." https://www.solaredge.com/us/products/power-optimizers#/ (emphasis added).

235. In addition, on information and belief, each P401 optimizer uses a dual-mode

photovoltaic DC-DC converter that includes a boost power conversion circuit and a buck power conversion circuit. Front and back photographs of the circuit board in a P401 optimizer are shown below:



236. On information and belief, the item labeled on the P401 board as L1 (marked in red in the annotated photograph below) is an inductor as depicted in Figures 5A and 5B of the ’437 patent, and the transistors on the P401 board labeled as Q1, Q3, Q4, and Q6 (marked in blue in the annotated photograph below) correspond to the transistors marked as T1 – T4 in Figure 5A of the patent. As in the patent, these components are configured so that the P401’s circuitry can use both a buck conversion circuit and a boost conversion circuit and alternate between them as needed.

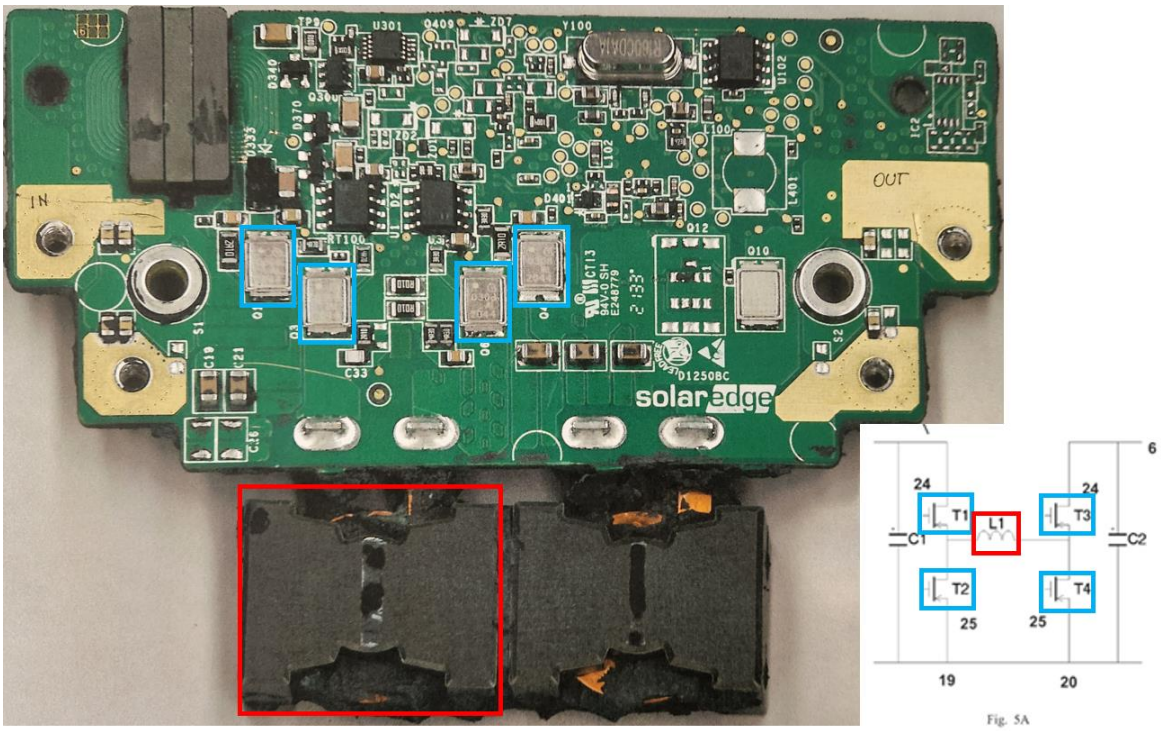
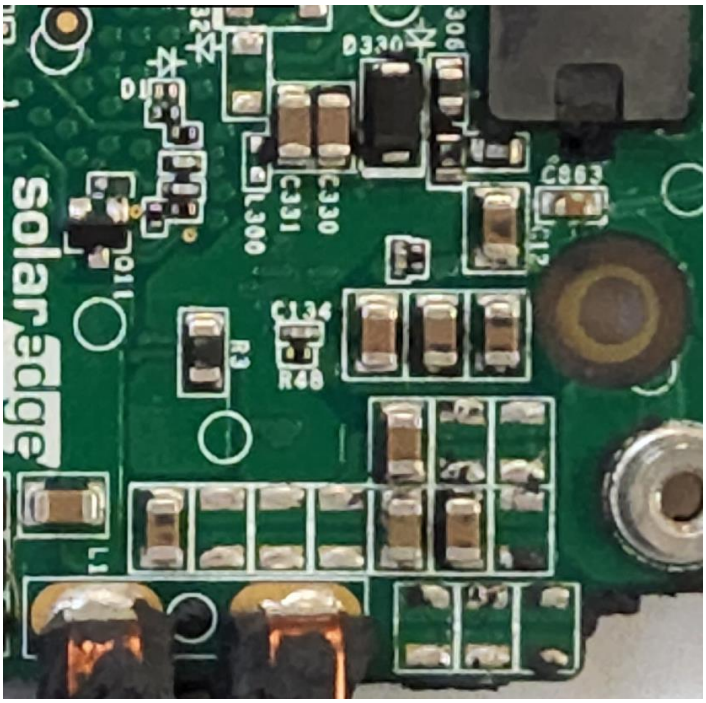


Fig. 5A

237. Figure 5A in the ’437 patent also identifies capacitors C1 and C2 as part of the buck and boost conversion circuitry. The P401 board contains many capacitors (typically marked with the prefix C), as shown for example in the close-up photo of a portion of the P401 board shown below. Discovery is needed to identify the specific capacitors used for this functionality; on information and belief at least two capacitors are acting as part of the boost and buck conversion circuitry in the P401 that corresponds to the circuit shown in Figure 5A of the patent.



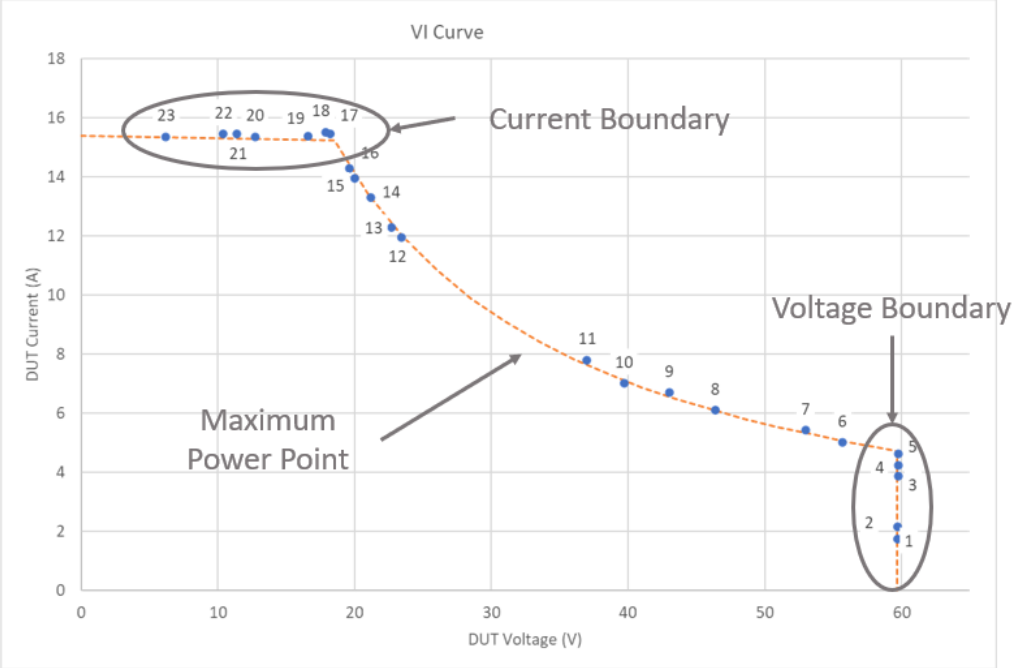
238. Further, a SolarEdge solar power system that includes a plurality of P401 power optimizers and an inverter such as the SE3800H-US contains in each P401 optimizer converter functionality control circuitry that, during operation of said grid powering solar power system to produce operational power that is sufficient to power the grid, is capable of alternating between maximum power point tracking, overcurrent boundary condition control of converter DC output at other than maximum power point, and overvoltage boundary condition control of said converter DC output at other than said maximum power point.

239. SolarEdge's website states that "The SolarEdge Power Optimizers increase energy output from PV systems by constantly tracking the maximum power point (MPPT) of each module individually." https://www.solaredge.com/us/products/power-optimizers#/.[36]

240. Testing of a set of ten P401 optimizers in conjunction with a SolarEdge SE3800H-US Inverter and a Keysight Solar Array Simulator with five E4376A modules shows that the P401

[36] *See also* https://youtu.be/oFDHqmDymrY.

optimizer provides operational power at a maximum power point level, an overcurrent boundary level, and an overvoltage boundary level. The testing also shows that the overcurrent boundary and overvoltage boundary levels are different from the maximum power point level.



241. SolarEdge's "Concept of Orientation" provides a description of using circuitry to control said photovoltaic DC-DC power converter to produce operational power at a maximum power point level. https://www.solaredge.com/sites/default/files/se_application_fixed_string_voltage.pdf at 1-2.

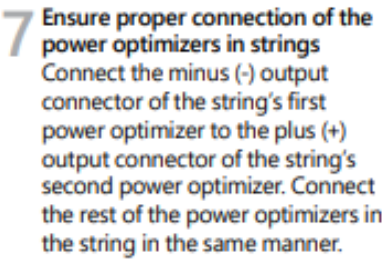
242. Further, a SolarEdge solar power system that includes a plurality of P401 power optimizers and an inverter such as the SE3800H-US contains a plurality of power converters (P401 optimizers) wherein each of the plurality of power converters is connected in series to at least one other power converter of the plurality of power converters. *See* https://youtu.be/oFDHqmDymrY.

243. SolarEdge's "Concept of Orientation" provides an example of a plurality of power

converters connected in series.[37]

244. SolarEdge's design guideline also provides an example of a "valid use" that connects 20 power optimizers to 20 x 345 DC Power Sources. https://www.solaredge.com/sites/default/files/se-power-optimizer-single-string-design-application-note.pdf at 1; *see also id*. ("all power optimizers can be connected to a single string").

245. The SolarEdge installer guide confirms the power optimizers can be connected in series:


7 **Ensure proper connection of the power optimizers in strings**
Connect the minus (-) output connector of the string's first power optimizer to the plus (+) output connector of the string's second power optimizer. Connect the rest of the power optimizers in the string in the same manner.

https://www.solaredge.com/sites/default/files/se-installer-starter-guide-eng.pdf at 5.

246. Thus, on information and belief, a SolarEdge solar power system that includes a package of P401 power optimizers and an inverter such as the SE3800H-US comprises a plurality of DC power sources; a plurality of power converters, each of said power converters coupled to a different, corresponding one or more of said plurality of DC power sources, wherein each power converter comprises a boost and buck power conversion circuit; converter functionality control circuitry that, during operation of said grid powering solar power system to produce operational power that is sufficient to power the grid, is capable of alternating between: maximum power point tracking, overcurrent boundary condition control of converter DC output at other than maximum power point, and overvoltage boundary condition control of said converter DC output at other than said maximum power point, and wherein each of the plurality of power converters is connected in series to at least one

[37] *See* https://www.solaredge.com/sites/default/files/se_application_fixed_string_voltage.pdf at 1-2.

other power converter of the plurality of power converters.

247. The full extent of SolarEdge's infringement is not presently known to Plaintiff. On information and belief, SolarEdge has made, used, sold, offered for sale, and/or imported products under different names or part numbers that infringe the '437 patent in a similar manner. Plaintiff makes this preliminary identification of infringing products and infringed claims without the benefit of discovery or claim construction in this action, and expressly reserves the right to augment, supplement, and revise its identification based on additional information obtained through discovery or otherwise.

248. SolarEdge has had notice of and have been aware of the '437 patent and its infringement of the '437 patent since at least the filing of this Complaint.

249. In addition, since at least the above-mentioned date when SolarEdge was on notice of its infringement, SolarEdge has actively induced and continues to induce others to infringe one or more of the claims of the '437 patent in violation of 35 U.S.C. § 271(b), as described below.

250. On information and belief, SolarEdge knowingly and intentionally induces users of one or more of the Accused Products to directly infringe one or more claims of the '437 patent by encouraging, instructing, and aiding one or more persons in the United States, including but not limited to end users, distributors, and installers, to make, use, sell, offer to sell, import and/or install one or more of the Accused Products in a manner that infringes the '437 patent.

251. For example, SolarEdge induces infringement by creating and distributing datasheets, manuals, brochures, and similar documentation and materials related to the installation and use of the Accused Products, and by configuring its devices to require installers to authorize those devices with SolarEdge before they can be used. SolarEdge also offers its cloud-based monitoring platform (PV Monitoring Platform) that allows residential and commercial end users the ability to monitor their solar power systems' technical performance when that system is installed according to SolarEdge's

requirements.

252. On information and belief, the Accused Products are designed in such a way that when they are used for their intended purpose, the user infringes the '437 patent. SolarEdge knows and intends that its distributors, installers and/or end users that purchase the Accused Products will use those products for their intended purpose.

253. On information and belief, SolarEdge was aware of the infringement of the '437 patent or acted with willful blindness as to its existence at least as a result of the filing of this Complaint.

254. Moreover, by continuing to make, use, sell, offer to sell, and/or import the Accused Products after SolarEdge first had notice of Ampt's allegations of infringement, SolarEdge has indirectly infringed and continues to indirectly infringe by contributing to the infringement of one or more claims of the '437 patent pursuant to 35 U.S.C. § 271(c), as described below.

255. On information and belief, SolarEdge's affirmative acts of manufacturing, selling, offering for sale, and/or importing the Accused Products, in this District and elsewhere in the United States, contribute to SolarEdge's customers and end-users directly infringing the '437 patent with the Accused Products. The Accused Products are not a staple article or commodity of commerce, have no substantial non-infringing uses, and are known by SolarEdge to be especially made and/or especially adapted for use in infringement of the '437 patent. SolarEdge has performed and continues to perform these affirmative acts with knowledge of the '437 patent and with the intent, or willful blindness, that they cause the direct infringement of the '437 patent.

256. On information and belief, Ampt has suffered and continues to suffer damages as a result of SolarEdge's infringement of the '437 patent in an amount to be determined at trial.

257. SolarEdge's infringement of the '437 patent is causing irreparable harm for which Ampt has no adequate remedy at law unless SolarEdge is enjoined by this Court. Under 35 U.S.C. §

283, Ampt is entitled to a permanent injunction against further infringement of the '437 patent.

258. Ampt does not have an adequate remedy at law.

259. On information and belief, SolarEdge's infringement is willful and deliberate, entitling Ampt to increased damages under 35 U.S.C. § 284 and to attorneys' fees and costs incurred in prosecuting this action under 35 U.S.C. § 285.

COUNT V
(INFRINGEMENT OF U.S. PATENT NO. 10,886,746)

260. Plaintiff repeats and realleges paragraphs 1-259 as if fully set forth at length herein.

261. SolarEdge has and continues to infringe one or more claims of the '746 patent in this judicial district and elsewhere in the United States.

262. Upon information and belief, SolarEdge makes, uses, sells, offers for sale, and/or imports into the United States the Accused Products.

263. SolarEdge directly infringes the '746 patent under 35 U.S.C. § 271(a), literally and/or under the doctrine of equivalents, by making, using, offering for sale, selling, and/or importing the Accused Products in the United States.

264. For example, SolarEdge directly infringes at least claim 1 of the '746 patent, literally and/or under the doctrine of equivalents, through its making, using, offering for sale, selling, and/or importing the Accused Products. The asserted claim(s) of the '746 patent are valid, enforceable, and currently in full force and effect.

265. Claim 1 of the '746 patent recites:

> A solar power system comprising:
>
> a plurality of photovoltaic DC-DC power converters, wherein each photovoltaic DC-DC power converter comprises a boost and buck power conversion circuit in any order, and is connected in series to at least one other photovoltaic DC-DC power converter of the plurality of photovoltaic DC-DC power converters, each having a converted photovoltaic DC output;

a switch circuit configured and arranged to be sufficient to power said solar power system during operation of said solar power system to produce operational power, and while producing operational power to be capable of alternating between:

maximum power point tracking,

overcurrent boundary condition control of said converted photovoltaic DC output at other than maximum power point, and

overvoltage boundary condition control of said converted photovoltaic DC output at other than said maximum power point; and

an inverter responsive to said converted photovoltaic DC outputs.

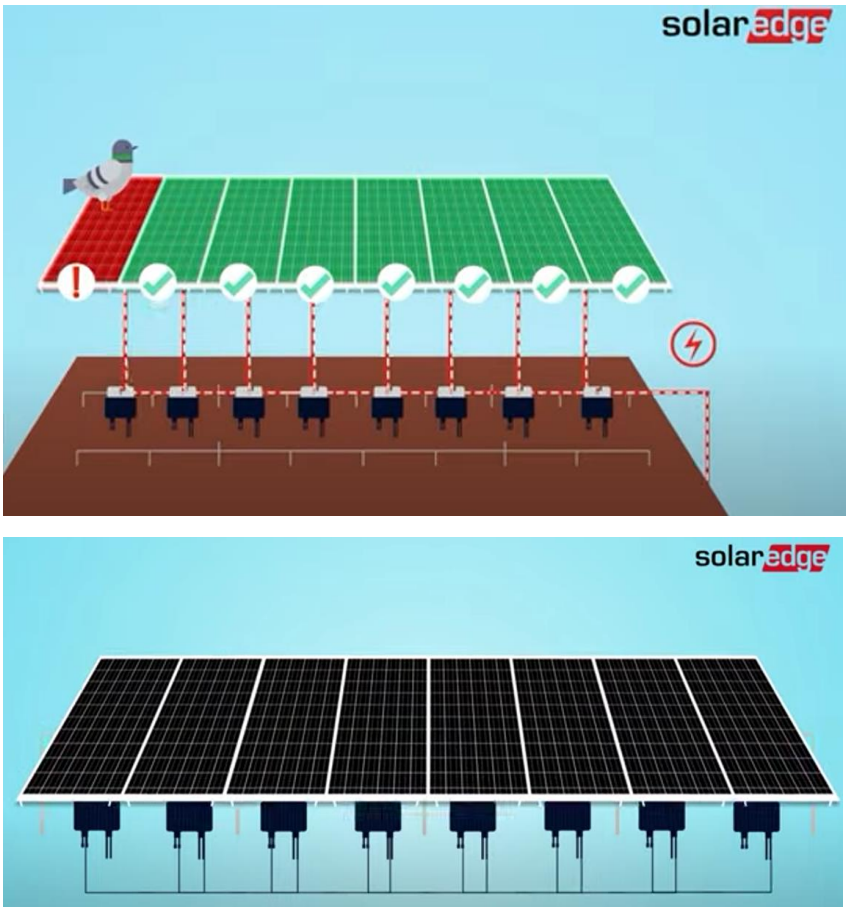
266. As one non-limiting example of said infringement, on information and belief, a SolarEdge solar power system that includes a package of P401 power optimizers and an inverter such as the SE3800H-US meets each and every limitation recited in claim 1 of the '746 patent, as described below.

267. On information and belief, a SolarEdge solar power system that includes a package of P401 power optimizers and an inverter such as the SE3800H-US is designed and intended to be installed and used with a plurality of power sources that produce DC power from solar energy (i.e., solar panels). *See* https://www.solaredge.com/us/products/power-optimizer#/.[38]

268. As depicted on SolarEdge's website, it offers for sale solar power systems, including those that include power optimizers such as the P401 an inverter such as the SE3800H-US.[39]

269. Further, a SolarEdge solar power system that includes a plurality of P401 power optimizers and an inverter such as the SE3800H-US contains a plurality of DC-DC power converters (one in each P401 optimizer).

[38] *See also* https://www.solaredge.com/sites/default/files/se-P5-series-add-on-power-optimizer-datasheet-na.pdf; https://www.solaredge.com/sites/default/files/se-installer-starter-guide-eng.pdf; https://www.solaredge.com/sites/default/files/se-three-phase-inverter-setapp-480-datasheet-na.pdf.
[39] *See, e.g.*, https://www.solaredge.com/sites/default/files/se-hd-wave-single-phase-inverter-with-setapp-datasheet-na.pdf; https://www.solaredge.com/sites/default/files/se-installer-starter-guide-eng.pdf; https://www.solaredge.com/us/commercial-solutions-pv-professionals; https://www.solaredge.com/sites/default/files/se-three-phase-inverter-setapp-480-datasheet-na.pdf.



https://youtu.be/oFDHqmDymrY.

270. SolarEdge's "Concept of Orientation" provides an example of a plurality of power converters coupled to a plurality of DC power sources:

Scenario 1 – Ideal Conditions: Initially, we assume all the modules are exposed to full irradiance, each providing 200W of power. The power output of each solar module is maintained at the module's maximum power point by an input control loop within the corresponding power optimizer. This MPP loop dictates to the power optimizer an input current I_{in} and input voltage V_{in} that ensure the transfer of the entire 200W from the module to the DC bus. We assume an MPP voltage for each module (given perfectly matched modules for demonstration purposes) of V_{MPP} = 32V. This means the input voltage to the power optimizer is 32V, and the input current is 200W/32V = 6.25A. The input voltage to the inverter is controlled by a separate feedback loop. For simplicity, in this example the inverter requires a constant 400V. Since there are ten serially-connected modules, each providing 200W, the input current to the inverter is 2000W/400V = 5A. Thus, the DC bus current flowing through each of the power optimizers must be 5A. This means that each power optimizer in this example provides an output voltage of 200W/5A = 40V. In this case, the power optimizers are acting as up converters, converting the 32V input voltage to the target 40V output voltage. The various system currents and voltages in this case are illustrated in Figure 1.

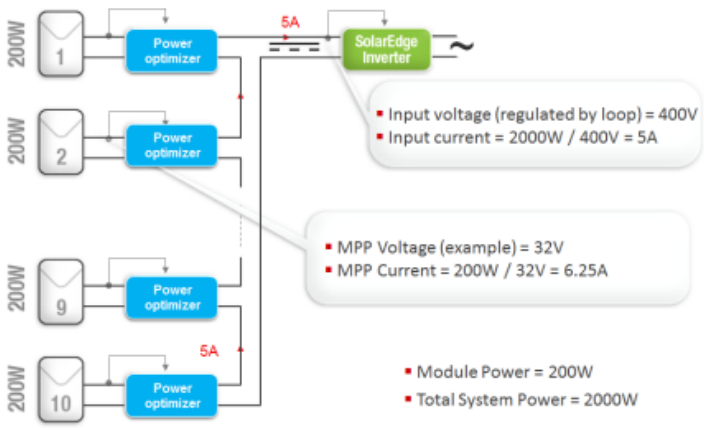
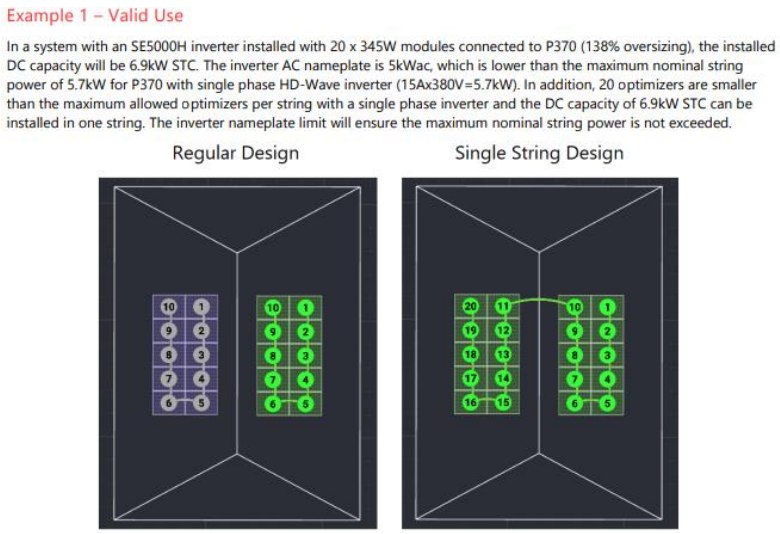


Figure 1: Operation under Ideal Conditions

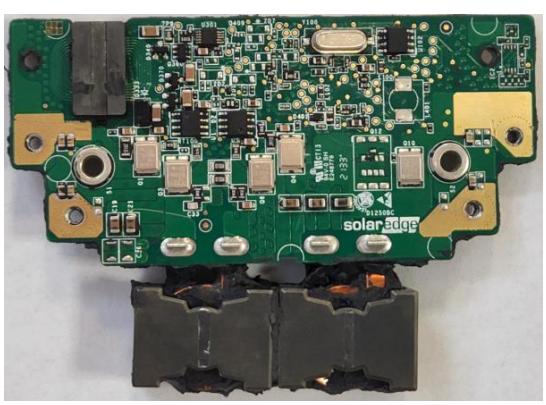
https://www.solaredge.com/sites/default/files/se_application_fixed_string_voltage.pdf at 1-2.

271. SolarEdge's design guideline also provides an example of a "valid use" that connects 20 optimizers to 20 x 345 DC Power Sources:

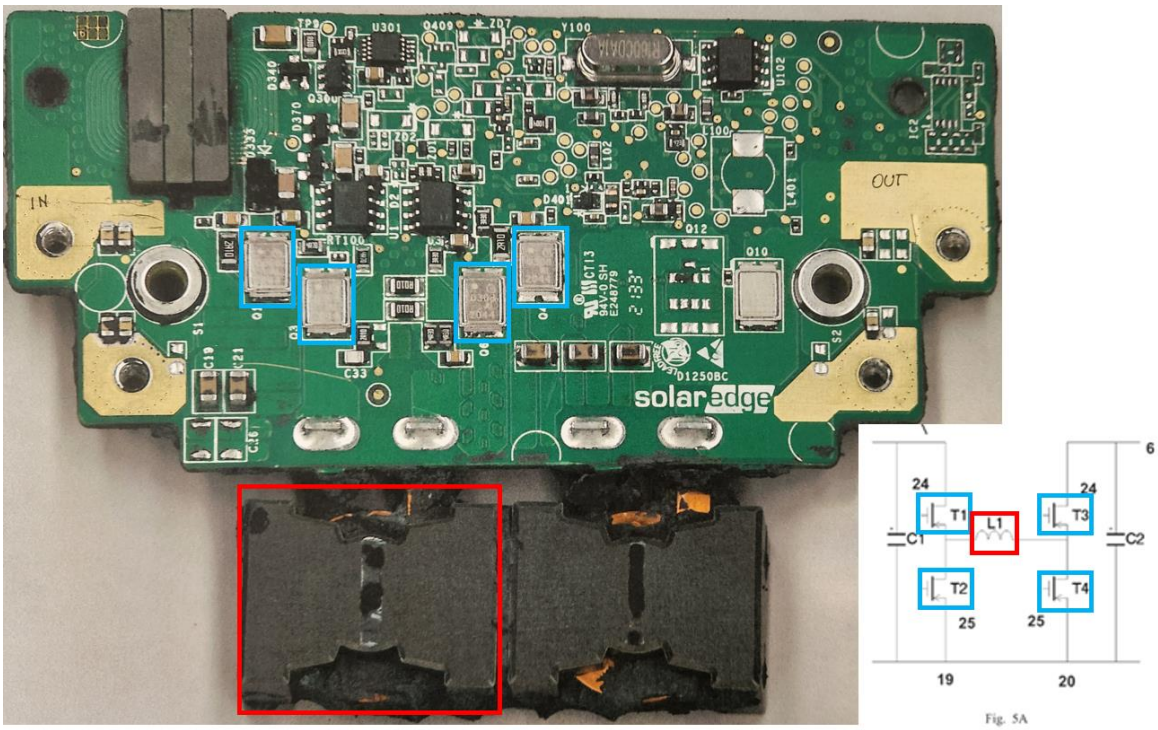


https://www.solaredge.com/sites/default/files/se-power-optimizer-single-string-design-application-note.pdf at 1.

272. Further, a SolarEdge solar power system that includes a plurality of P401 power optimizers and an inverter such as the SE3800H-US contains a plurality of power converters (one in each P401 optimizer). On information and belief, each P401 optimizer uses a dual-mode photovoltaic DC-DC converter that includes boost conversion circuitry and buck conversion circuitry. Front and back photographs of the circuit board in a P401 optimizer are shown below.

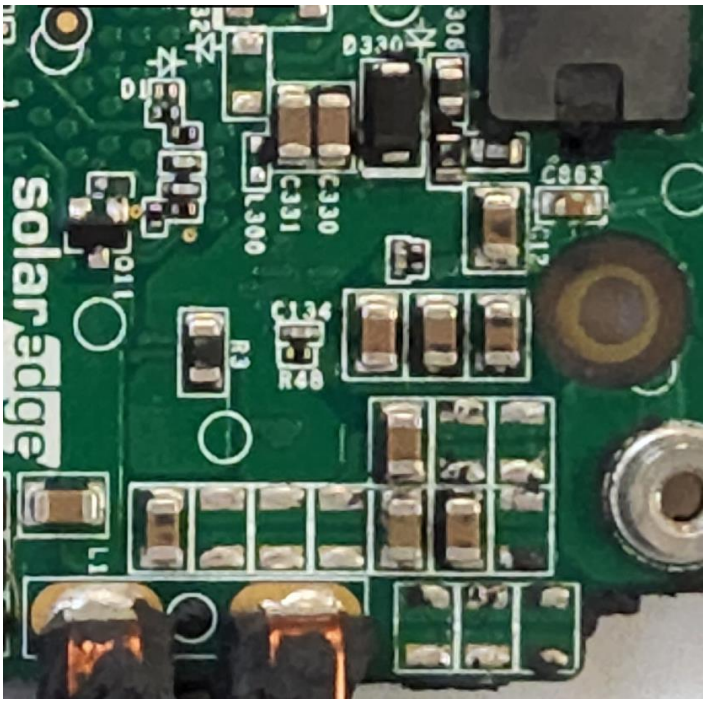


273. On information and belief, the item labeled on the P401 board as L1 (marked in red in the annotated photograph below) is an inductor as depicted in Figures 5A and 5B of the '746 patent, and the transistors on the P401 board labeled as Q1, Q3, Q4, and Q6 (marked in blue in the annotated photograph below) correspond to the transistors marked as T1 – T4 in Figure 5A of the patent. As in the patent, these components are configured so that the P401's circuitry can use both a buck conversion circuit and a boost conversion circuit and alternate between them as needed.



274. Figure 5A in the '746 patent also identifies capacitors C1 and C2 as part of the buck

and boost conversion circuitry. The P401 board contains many capacitors (typically marked with the prefix C), as shown for example in the close-up photo of a portion of the P401 board shown below. Discovery is needed to identify the specific capacitors used for this functionality; on information and belief at least two capacitors are acting as part of the boost and buck conversion circuitry in the P401 that corresponds to the circuit shown in Figure 5A of the patent.



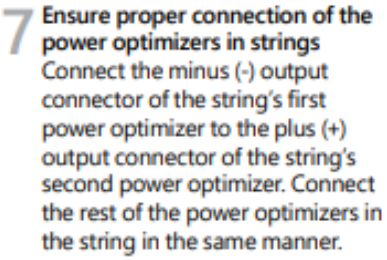
275. Further, a SolarEdge solar power system that includes a plurality of P401 power optimizers and an inverter such as the SE3800H-US contains a plurality of DC-DC power converters (one in each P401 optimizer) wherein each DC-DC power converter is connected in series to at least one other DC-DC power converter (in another P401 optimizer) each having a converted photovoltaic DC output. *See* https://youtu.be/oFDHqmDymrY.

276. SolarEdge's "Concept of Orientation" provides an example of a plurality of power optimizers connected in series.[40]

[40] *See* https://www.solaredge.com/sites/default/files/se_application_fixed_string_voltage.pdf at 1-2.

277. SolarEdge's design guideline also provides an example of a "valid use" that connects 20 optimizers to 20 x 345 DC Power Sources. *See* https://www.solaredge.com/sites/default/files/se-power-optimizer-single-string-design-application-note.pdf; *see also id.* ("all power optimizers can be connected to a single string").

278. The SolarEdge installer guide confirms the power optimizers can be connected in series:


7 **Ensure proper connection of the power optimizers in strings**
Connect the minus (-) output connector of the string's first power optimizer to the plus (+) output connector of the string's second power optimizer. Connect the rest of the power optimizers in the string in the same manner.

https://www.solaredge.com/sites/default/files/se-installer-starter-guide-eng.pdf at 5.

279. In addition, the P401 has a converted photovoltaic DC output. For example, the maximum output voltage is 60 Vdc. *See* https://www.solaredge.com/sites/default/files/se-P5-series-add-on-power-optimizer-datasheet-na.pdf at 2.

280. SolarEdge's "Concept of Orientation" provides an example of a converted DC output from each photovoltaic DC-DC power converter.[41]

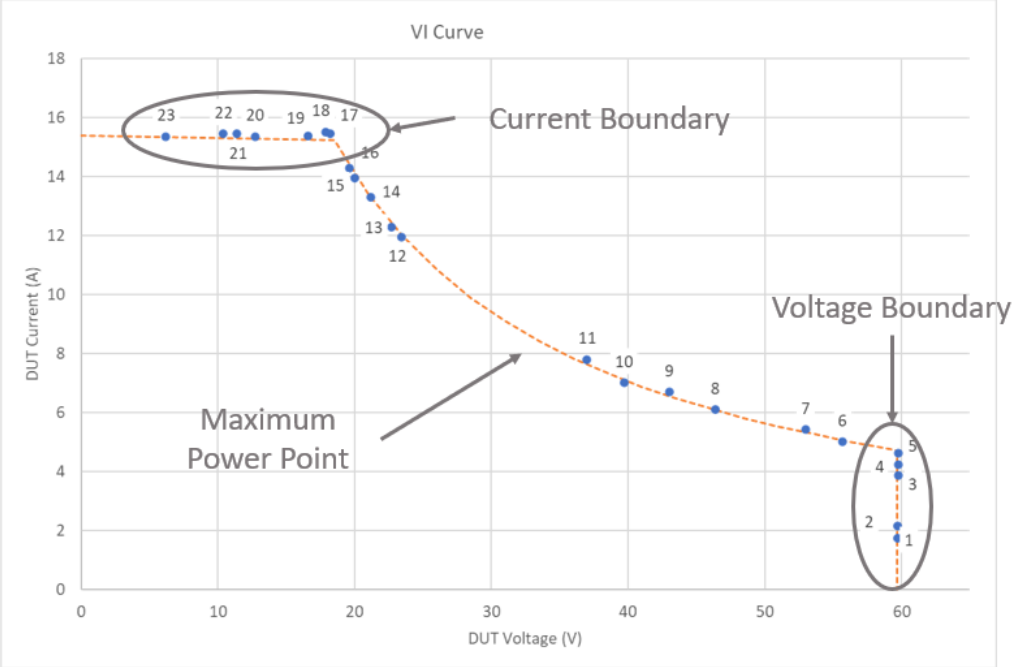
281. Further, a SolarEdge solar power system that includes a plurality of P401 power optimizers and an inverter such as the SE3800H-US contains in each P401 optimizer a switch circuit configured and arranged to be sufficient to power said solar power system during operation of said solar power system to produce operational power, and while producing operational power to be capable of alternating between: maximum power point tracking, overcurrent boundary condition control of said converted photovoltaic DC output at other than maximum power point, and overvoltage boundary

[41] *See* https://www.solaredge.com/sites/default/files/se_application_fixed_string_voltage.pdf at 1-2.

condition control of said converted photovoltaic DC output at other than said maximum power point.

282. SolarEdge's website states that "The SolarEdge Power Optimizers increase energy output from PV systems by constantly tracking the maximum power point (MPPT) of each module individually." https://www.solaredge.com/us/products/power-optimizers#/.[42]

283. Testing of the P401 optimizer in conjunction with a SolarEdge SE3800H-US Inverter and a Keysight Solar Array Simulator with five E4376A modules shows that it provides operational power at a maximum power point level, an overcurrent boundary level, and an overvoltage boundary level. The testing also shows that the overcurrent boundary and overvoltage boundary levels are different from the maximum power point level.



284. SolarEdge's "Concept of Orientation" provides a description of using circuitry to control said photovoltaic DC-DC power converter to produce operational power at a maximum power point level. https://www.solaredge.com/sites/default/files/se_application_fixed_string_voltage.pdf at

[42] *See also* https://youtu.be/oFDHqmDymrY.

1-2.

285. Further, a SolarEdge solar power system includes an inverter responsive to said converted photovoltaic DC outputs, such as the SE3800H-US inverter.[43]

286. SolarEdge's inverters "efficiently converts DC power from the modules into AC power that can be fed into the main AC service of the site and from there to the grid." https://www.solaredge.com/sites/default/files/se-single-and-three-phase-inverter-user-manual-na.pdf.

287. SolarEdge's "Concept of Orientation" provides a description of an inverter responsive to a SolarEdge power optimizer.[44]

288. Thus, on information and belief, a SolarEdge solar power system that includes a package of P401 power optimizers and an inverter such as the SE3800H-US comprises a plurality of photovoltaic DC-DC power converters, wherein each photovoltaic DC-DC power converter comprises a boost and buck power conversion circuit in any order, and is connected in series to at least one other photovoltaic DC-DC power converter of the plurality of photovoltaic DC-DC power converters, each having a converted photovoltaic DC output; a switch circuit configured and arranged to be sufficient to power said solar power system during operation of said solar power system to produce operational power, and while producing operational power to be capable of alternating between: maximum power point tracking, overcurrent boundary condition control of said converted photovoltaic DC output at other than maximum power point, and overvoltage boundary condition control of said converted photovoltaic DC output at other than said maximum power point; and an inverter responsive to said converted photovoltaic DC outputs.

289. The full extent of SolarEdge's infringement is not presently known to Plaintiff. On

[43] *See* https://www.solaredge.com/sites/default/files/se-installer-starter-guide-eng.pdf; https://www.solaredge.com/sites/default/files/se-three-phase-inverter-setapp-480-datasheet-na.pdf.
[44] *See* https://www.solaredge.com/sites/default/files/se_application_fixed_string_voltage.pdf at 1-2.

information and belief, SolarEdge has made, used, sold, offered for sale, and/or imported products under different names or part numbers that infringe the '746 patent in a similar manner. Plaintiff makes this preliminary identification of infringing products and infringed claims without the benefit of discovery or claim construction in this action, and expressly reserves the right to augment, supplement, and revise its identification based on additional information obtained through discovery or otherwise.

290. SolarEdge has had notice of and have been aware of the '746 patent and its infringement of the '746 patent since at least the filing of this Complaint.

291. In addition, since at least the above-mentioned date when SolarEdge was on notice of its infringement, SolarEdge has actively induced and continues to induce others to infringe one or more of the claims of the '746 patent in violation of 35 U.S.C. § 271(b), as described below.

292. On information and belief, SolarEdge knowingly and intentionally induces users of one or more of the Accused Products to directly infringe one or more claims of the '746 patent by encouraging, instructing, and aiding one or more persons in the United States, including but not limited to end users, distributors, and installers, to make, use, sell, offer to sell, import and/or install one or more of the Accused Products in a manner that infringes the '746 patent.

293. For example, SolarEdge induces infringement by creating and distributing datasheets, manuals, brochures, and similar documentation and materials related to the installation and use of the Accused Products, and by configuring its devices to require installers to authorize those devices with SolarEdge before they can be used. SolarEdge also offers its cloud-based monitoring platform (PV Monitoring Platform) that allows residential and commercial end users the ability to monitor their solar power systems' technical performance when that system is installed according to SolarEdge's requirements.

294. On information and belief, the Accused Products are designed in such a way that when

they are used for their intended purpose, the user infringes the '746 patent. SolarEdge knows and intends that its distributors, installers and/or end users that purchase the Accused Products will use those products for their intended purpose.

295. On information and belief, SolarEdge was aware of the infringement of the '746 patent or acted with willful blindness as to its existence at least as a result of the filing of this Complaint.

296. Moreover, by continuing to make, use, sell, offer to sell, and/or import the Accused Products after SolarEdge first had notice of Ampt's allegations of infringement, SolarEdge has indirectly infringed and continues to indirectly infringe by contributing to the infringement of one or more claims of the '746 patent pursuant to 35 U.S.C. § 271(c), as described below.

297. On information and belief, SolarEdge's affirmative acts of manufacturing, selling, offering for sale, and/or importing the Accused Products, in this District and elsewhere in the United States, contribute to SolarEdge's customers and end-users directly infringing the '746 patent with the Accused Products. The Accused Products are not a staple article or commodity of commerce, have no substantial non-infringing uses, and are known by SolarEdge to be especially made and/or especially adapted for use in infringement of the '746 patent. SolarEdge has performed and continues to perform these affirmative acts with knowledge of the '746 patent and with the intent, or willful blindness, that they cause the direct infringement of the '746 patent.

298. On information and belief, Ampt has suffered and continues to suffer damages as a result of SolarEdge's infringement of the '746 patent in an amount to be determined at trial.

299. SolarEdge's infringement of the '746 patent is causing irreparable harm for which Ampt has no adequate remedy at law unless SolarEdge is enjoined by this Court. Under 35 U.S.C. § 283, Ampt is entitled to a permanent injunction against further infringement of the '746 patent.

300. Ampt does not have an adequate remedy at law.

301. On information and belief, SolarEdge's infringement is willful and deliberate, entitling Ampt to increased damages under 35 U.S.C. § 284 and to attorneys' fees and costs incurred in prosecuting this action under 35 U.S.C. § 285.

COUNT VI
(INFRINGEMENT OF U.S. PATENT NO. 11,070,062)

302. Plaintiff repeats and realleges paragraphs 1-301 as if fully set forth at length herein.

303. SolarEdge has and continues to infringe one or more claims of the '062 patent in this judicial district and elsewhere in the United States.

304. Upon information and belief, SolarEdge makes, uses, sells, offers for sale, and/or imports into the United States the Accused Products.

305. SolarEdge directly infringes the '062 patent under 35 U.S.C. § 271(a), literally and/or under the doctrine of equivalents, by making, using, offering for sale, selling, and/or importing the Accused Products in the United States.

306. For example, SolarEdge directly infringes at least claim 1 of the '062 patent, literally and/or under the doctrine of equivalents, through its making, using, offering for sale, selling, and/or importing the Accused Products. The asserted claim(s) of the '062 patent are valid, enforceable, and currently in full force and effect.

307. Claim 1 of the '062 patent recites:

> A solar power system comprising:
>
> a plurality of DC-DC power converters, wherein each one of said DC-DC power converters:
>
> is connected in series to at least one other DC-DC power converter of said DC-DC power converters, and
>
> comprises boost conversion circuitry and buck conversion circuitry; and
>
> converter functionality control that is capable of individually controlling an operational point of said each one of said DC-DC power converters during operation of said solar

power system to produce operational power, by alternating said operational point of said each one of said DC-DC power converters between:

maximum power point for said each one of said DC-DC power converters,

an overcurrent boundary on DC output of said each one of said DC-DC power converters, wherein said overcurrent boundary is at other than said maximum power point, and

an overvoltage boundary on said DC output of said each one of said DC-DC power converters, wherein said overvoltage boundary is at other than said maximum power point.

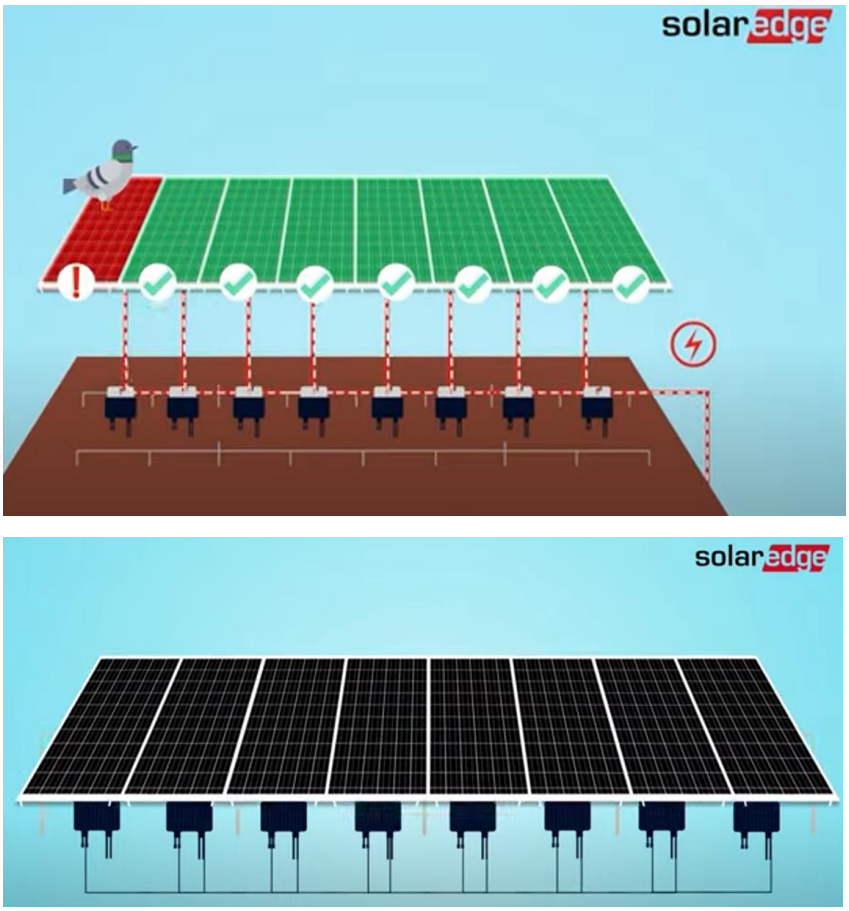
308. As one non-limiting example of said infringement, on information and belief, a SolarEdge solar power system that includes a package of P401 power optimizers and an inverter such as the SE3800H-US meets each and every limitation recited in claim 1 of the '062 patent, as described below.

309. On information and belief, a SolarEdge solar power system that includes a package of P401 power optimizers and an inverter such as the SE3800H-US is designed and intended to be installed and used with a plurality of power sources that produce DC power from solar energy (i.e., solar panels). *See* https://www.solaredge.com/us/products/power-optimizer#/.[45]

310. As depicted on SolarEdge's website, it offers for sale solar power systems, including those that include power optimizers such as the P401 an inverter such as the SE3800H-US.[46]

311. Further, a SolarEdge solar power system that includes a plurality of P401 power optimizers and an inverter such as the SE3800H-US contains a plurality of DC-DC power converters (one in each P401 optimizer).

[45] *See also* https://www.solaredge.com/sites/default/files/se-P5-series-add-on-power-optimizer-datasheet-na.pdf; https://www.solaredge.com/sites/default/files/se-installer-starter-guide-eng.pdf; https://www.solaredge.com/sites/default/files/se-three-phase-inverter-setapp-480-datasheet-na.pdf.
[46] *See, e.g.*, https://www.solaredge.com/sites/default/files/se-hd-wave-single-phase-inverter-with-setapp-datasheet-na.pdf; https://www.solaredge.com/sites/default/files/se-installer-starter-guide-eng.pdf; https://www.solaredge.com/us/commercial-solutions-pv-professionals; https://www.solaredge.com/sites/default/files/se-three-phase-inverter-setapp-480-datasheet-na.pdf.



https://youtu.be/oFDHqmDymrY.

312. SolarEdge's "Concept of Orientation" provides an example of a plurality of power converters coupled to a plurality of DC power sources:

> **Scenario 1 – Ideal Conditions:** Initially, we assume all the modules are exposed to full irradiance, each providing 200W of power. The power output of each solar module is maintained at the module's maximum power point by an input control loop within the corresponding power optimizer. This MPP loop dictates to the power optimizer an input current I_{in} and input voltage V_{in} that ensure the transfer of the entire 200W from the module to the DC bus. We assume an MPP voltage for each module (given perfectly matched modules for demonstration purposes) of V_{MPP} = 32V. This means the input voltage to the power optimizer is 32V, and the input current is 200W/32V = 6.25A. The input voltage to the inverter is controlled by a separate feedback loop. For simplicity, in this example the inverter requires a constant 400V. Since there are ten serially-connected modules, each providing 200W, the input current to the inverter is 2000W/400V = 5A. Thus, the DC bus current flowing through each of the power optimizers must be 5A. This means that each power optimizer in this example provides an output voltage of 200W/5A = 40V. In this case, the power optimizers are acting as up converters, converting the 32V input voltage to the target 40V output voltage. The various system currents and voltages in this case are illustrated in Figure 1.

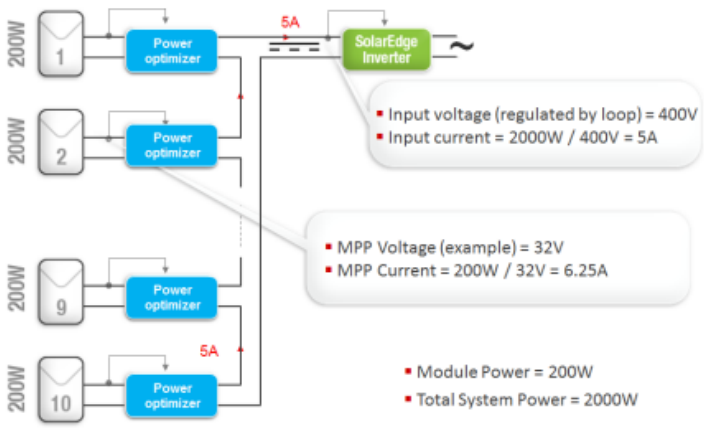
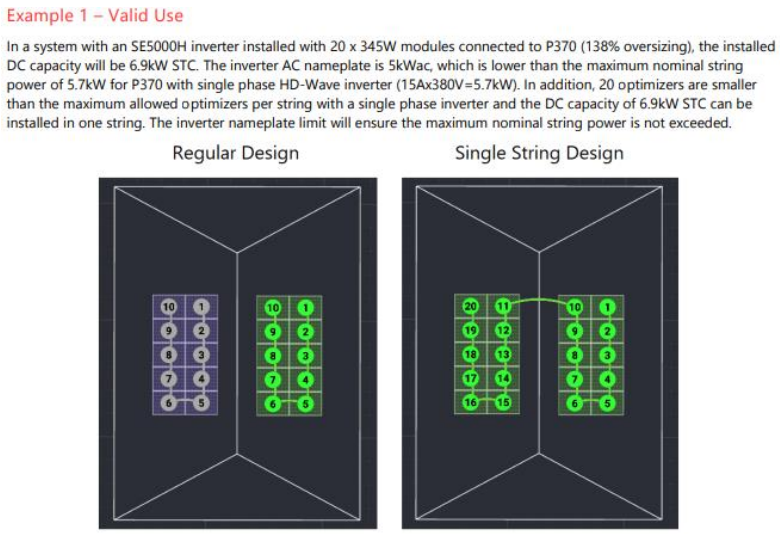


Figure 1: Operation under Ideal Conditions

https://www.solaredge.com/sites/default/files/se_application_fixed_string_voltage.pdf at 1-2.

313. SolarEdge's design guideline also provides an example of a "valid use" that connects 20 optimizers to 20 x 345 DC Power Sources:



https://www.solaredge.com/sites/default/files/se-power-optimizer-single-string-design-application-note.pdf at 1.

314. Further, a SolarEdge solar power system that includes a plurality of P401 power optimizers and an inverter such as the SE3800H-US contains a plurality of DC-DC power converters (one in each P401 optimizer) wherein each DC-DC power converter is connected in series to at least one other DC-DC power converter (in another P401 optimizer). *See* https://youtu.be/oFDHqmDymrY.

315. SolarEdge's "Concept of Orientation" provides an example of a plurality of power

optimizers connected in series.[47]

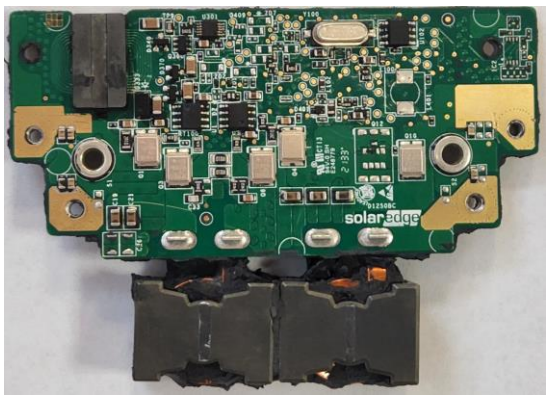
316. SolarEdge's design guideline also provides an example of a "valid use" that connects 20 optimizers to 20 x 345 DC Power Sources. *See* https://www.solaredge.com/sites/default/files/se-power-optimizer-single-string-design-application-note.pdf at 1; *see also id*. ("all power optimizers can be connected to a single string").

317. The SolarEdge installer guide confirms the power optimizers can be connected in series:

> **7 Ensure proper connection of the power optimizers in strings**
> Connect the minus (-) output connector of the string's first power optimizer to the plus (+) output connector of the string's second power optimizer. Connect the rest of the power optimizers in the string in the same manner.

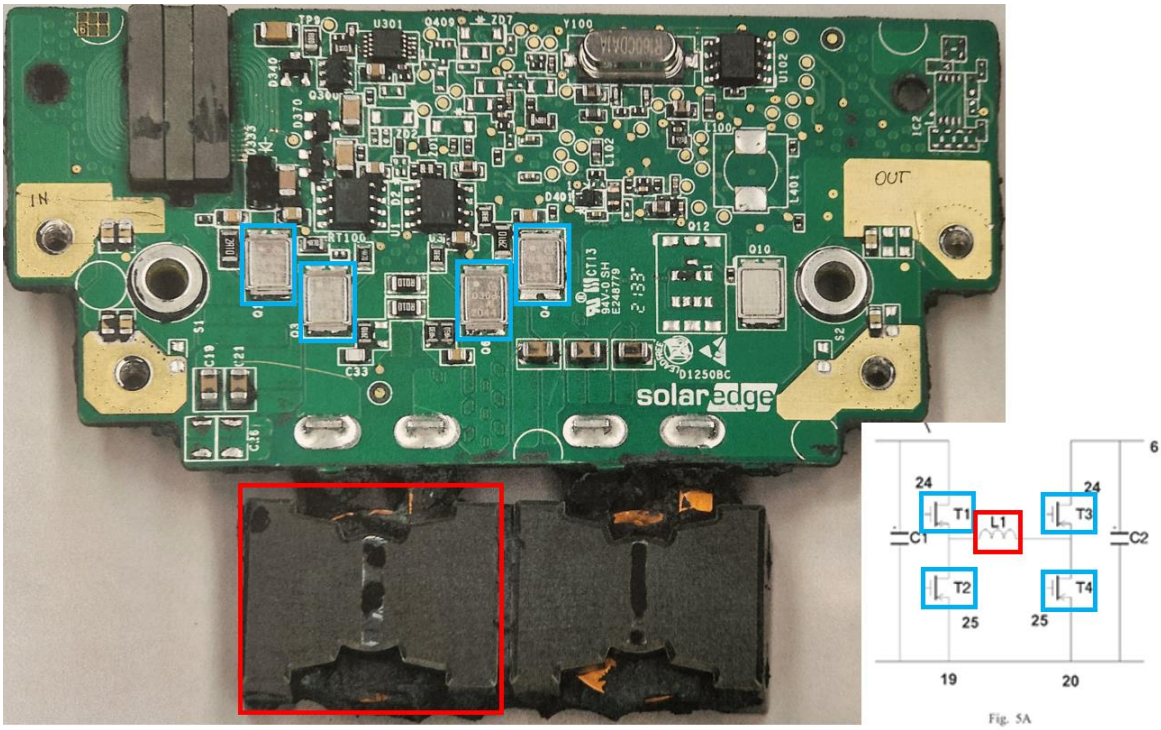
https://www.solaredge.com/sites/default/files/se-installer-starter-guide-eng.pdf.

318. Further, a SolarEdge solar power system that includes a plurality of P401 power optimizers and an inverter such as the SE3800H-US contains a plurality of power converters (one in each P401 optimizer). On information and belief, each P401 optimizer uses a dual-mode photovoltaic DC-DC converter that includes boost conversion circuitry and buck conversion circuitry. Front and back photographs of the circuit board in a P401 optimizer are shown below.

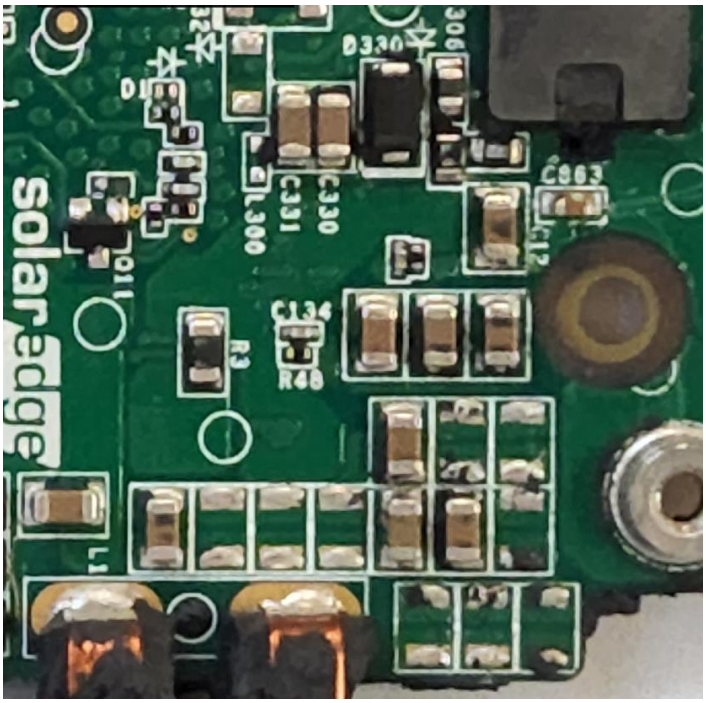


[47] *See* https://www.solaredge.com/sites/default/files/se_application_fixed_string_voltage.pdf at 1-2.

319. On information and belief, the item labeled on the P401 board as L1 (marked in red in the annotated photograph below) is an inductor as depicted in Figures 5A and 5B of the '062 patent, and the transistors on the P401 board labeled as Q1, Q3, Q4, and Q6 (marked in blue in the annotated photograph below) correspond to the transistors marked as T1 – T4 in Figure 5A of the patent. As in the patent, these components are configured so that the P401's circuitry can use both a buck conversion circuit and a boost conversion circuit and alternate between them as needed.



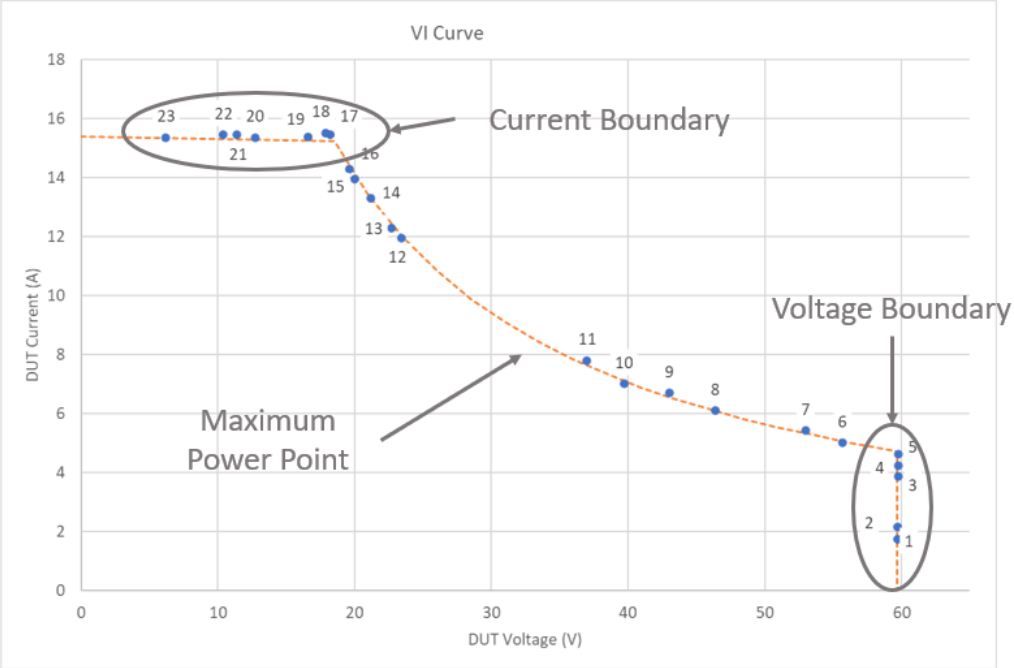
320. Figure 5A in the '062 patent also identifies capacitors C1 and C2 as part of the buck and boost conversion circuitry. The P401 board contains many capacitors (typically marked with the prefix C), as shown for example in the close-up photo of a portion of the P401 board shown below. Discovery is needed to identify the specific capacitors used for this functionality; on information and belief at least two capacitors are acting as part of the boost and buck conversion circuitry in the P401 that corresponds to the circuit shown in Figure 5A of the patent.



321. Further, a SolarEdge solar power system that includes a plurality of P401 power optimizers and an inverter such as the SE3800H-US contains in each P401 optimizer converter functionality control that is capable of individually controlling an operational point of said each one of said DC-DC power converters during operation of said solar power system to produce operational power, by alternating said operational point of said each one of said DC-DC power converters between: maximum power point for said each one of said DC-DC power converters, an overcurrent boundary on DC output of said each one of said DC-DC power converters, wherein said overcurrent boundary is at other than said maximum power point, and an overvoltage boundary on said DC output of said each one of said DC-DC power converters, wherein said overvoltage boundary is at other than said maximum power point.

322. SolarEdge's website states that "The SolarEdge Power Optimizers increase energy output from PV systems by constantly tracking the maximum power point (MPPT) of each module

individually." https://www.solaredge.com/us/products/power-optimizers#/.[48]



323. SolarEdge's "Concept of Orientation" provides a description of using circuitry to control said photovoltaic DC-DC power converter to produce operational power at a maximum power point level. https://www.solaredge.com/sites/default/files/se_application_fixed_string_voltage.pdf at 1-2.

324. Thus, on information and belief, a SolarEdge solar power system that includes a package of P401 power optimizers and an inverter such as the SE3800H-US comprises a plurality of DC-DC power converters, wherein each one of said DC-DC power converters: is connected in series to at least one other DC-DC power converter of said DC-DC power converters, and comprises boost conversion circuitry and buck conversion circuitry; and converter functionality control that is capable of individually controlling an operational point of said each one of said DC-DC power converters during operation of said solar power system to produce operational power, by alternating said

[48] *See also* https://youtu.be/oFDHqmDymrY.

operational point of said each one of said DC-DC power converters between: maximum power point for said each one of said DC-DC power converters, an overcurrent boundary on DC output of said each one of said DC-DC power converters, wherein said overcurrent boundary is at other than said maximum power point, and an overvoltage boundary on said DC output of said each one of said DC-DC power converters, wherein said overvoltage boundary is at other than said maximum power point.

325. The full extent of SolarEdge's infringement is not presently known to Plaintiff. On information and belief, SolarEdge has made, used, sold, offered for sale, and/or imported products under different names or part numbers that infringe the '062 patent in a similar manner. Plaintiff makes this preliminary identification of infringing products and infringed claims without the benefit of discovery or claim construction in this action, and expressly reserves the right to augment, supplement, and revise its identification based on additional information obtained through discovery or otherwise.

326. SolarEdge has had notice of and have been aware of the '062 patent and its infringement of the '062 patent since at least the filing of this Complaint.

327. In addition, since at least the above-mentioned date when SolarEdge was on notice of its infringement, SolarEdge has actively induced and continues to induce others to infringe one or more of the claims of the '062 patent in violation of 35 U.S.C. § 271(b), as described below.

328. On information and belief, SolarEdge knowingly and intentionally induces users of one or more of the Accused Products to directly infringe one or more claims of the '062 patent by encouraging, instructing, and aiding one or more persons in the United States, including but not limited to end users, distributors, and installers, to make, use, sell, offer to sell, import and/or install one or more of the Accused Products in a manner that infringes the '062 patent.

329. For example, SolarEdge induces infringement by creating and distributing datasheets, manuals, brochures, and similar documentation and materials related to the installation and use of the

Accused Products, and by configuring its devices to require installers to authorize those devices with SolarEdge before they can be used. SolarEdge also offers its cloud-based monitoring platform (PV Monitoring Platform) that allows residential and commercial end users the ability to monitor their solar power systems' technical performance when that system is installed according to SolarEdge's requirements.

330. On information and belief, the Accused Products are designed in such a way that when they are used for their intended purpose, the user infringes the '062 patent. SolarEdge knows and intends that its distributors, installers and/or end users that purchase the Accused Products will use those products for their intended purpose.

331. On information and belief, SolarEdge was aware of the infringement of the '062 patent or acted with willful blindness as to its existence at least as a result of the filing of this Complaint.

332. Moreover, by continuing to make, use, sell, offer to sell, and/or import the Accused Products after SolarEdge first had notice of Ampt's allegations of infringement, SolarEdge has indirectly infringed and continues to indirectly infringe by contributing to the infringement of one or more claims of the '062 patent pursuant to 35 U.S.C. § 271(c), as described below.

333. On information and belief, SolarEdge's affirmative acts of manufacturing, selling, offering for sale, and/or importing the Accused Products, in this District and elsewhere in the United States, contribute to SolarEdge's customers and end-users directly infringing the '062 patent with the Accused Products. The Accused Products are not a staple article or commodity of commerce, have no substantial non-infringing uses, and are known by SolarEdge to be especially made and/or especially adapted for use in infringement of the '062 patent. SolarEdge has performed and continues to perform these affirmative acts with knowledge of the '062 patent and with the intent, or willful blindness, that they cause the direct infringement of the '062 patent.

334. On information and belief, Ampt has suffered and continues to suffer damages as a result of SolarEdge's infringement of the '062 patent in an amount to be determined at trial.

335. SolarEdge's infringement of the '062 patent is causing irreparable harm for which Ampt has no adequate remedy at law unless SolarEdge is enjoined by this Court. Under 35 U.S.C. § 283, Ampt is entitled to a permanent injunction against further infringement of the '062 patent.

336. Ampt does not have an adequate remedy at law.

337. On information and belief, SolarEdge's infringement is willful and deliberate, entitling Ampt to increased damages under 35 U.S.C. § 284 and to attorneys' fees and costs incurred in prosecuting this action under 35 U.S.C. § 285.

COUNT VII
(INFRINGEMENT OF U.S. PATENT NO. 11,070,063)

338. Plaintiff repeats and realleges paragraphs 1-337 as if fully set forth at length herein.

339. SolarEdge has and continues to infringe one or more claims of the '063 patent in this judicial district and elsewhere in the United States.

340. Upon information and belief, SolarEdge makes, uses, sells, offers for sale, and/or imports into the United States the Accused Products.

341. SolarEdge directly infringes the '063 patent under 35 U.S.C. § 271(a), literally and/or under the doctrine of equivalents, by using the Accused Products in an infringing manner within the United States, including in installation, testing and demonstrating the Accused Products.

342. For example, SolarEdge directly infringes at least claim 1 of the '063 patent, either literally or under the doctrine of equivalents. The asserted claim(s) of the '063 patent are valid, enforceable, and currently in full force and effect.

343. Claim 1 of the '063 patent recites:

A method of solar energy power creation comprising the steps of:

accepting DC input to each of a plurality of photovoltaic DC-DC power converters, wherein each photovoltaic DC-DC power converter comprises a boost and buck power conversion circuit in any order, and is connected in series to at least one other photovoltaic DC-DC power converter of said plurality of photovoltaic DC-DC power converters;

converting said DC input into a converted photovoltaic DC output by each of said plurality of photovoltaic DC-DC power converters;

controlling each of said plurality of photovoltaic DC-DC power converters to alternate, while producing operational power, between:

maximum power point tracking,

overcurrent boundary condition control of said converted photovoltaic DC output at other than maximum power point, and

overvoltage boundary condition control of said converted photovoltaic DC output at other than said maximum power point; and

inverting said converted photovoltaic DC outputs.

344. As one non-limiting example of said infringement, on information and belief, SolarEdge practices each and every step recited in claim 1 of the ’063 patent by using a solar power system that includes a package of P401 power optimizers and the SE3800H-US inverter, as described below.

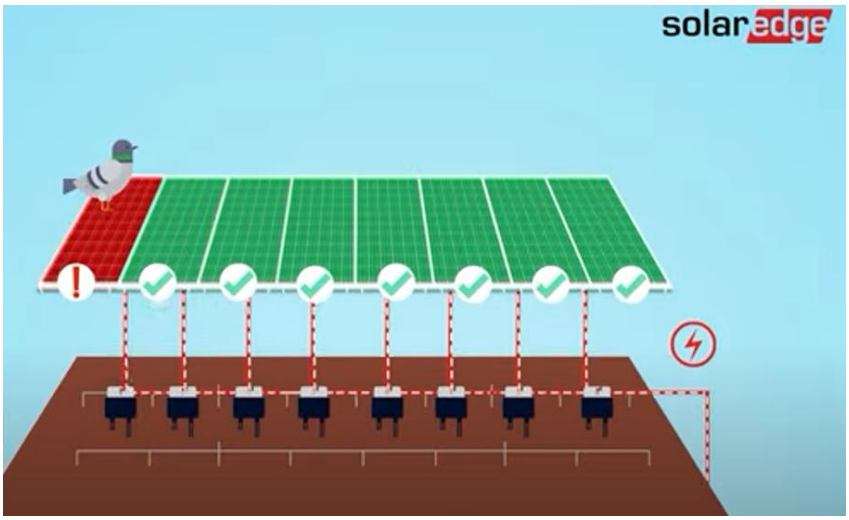
345. SolarEdge makes, uses, offers to sell, sells, and/or imports a system for solar energy power creation. For example, on information and belief, SolarEdge and its distributers install, monitor and operate solar power system that includes a package of P401 power optimizers and an inverter such as the SE3800H-US that is designed and intended to be installed and used with a plurality of power sources that produce DC power from solar energy (i.e., solar panels). *See* https://www.solaredge.com/us/products/power-optimizer#/.[49]

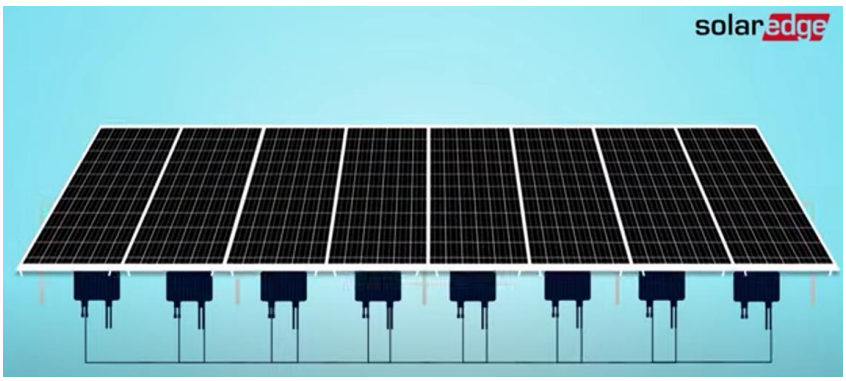
346. As depicted on SolarEdge’s website, it offers for sale solar power systems, including

[49] *See also* https://www.solaredge.com/sites/default/files/se-P5-series-add-on-power-optimizer-datasheet-na.pdf; https://www.solaredge.com/sites/default/files/se-installer-starter-guide-eng.pdf; https://www.solaredge.com/sites/default/files/se-three-phase-inverter-setapp-480-datasheet-na.pdf.

those that include power optimizers such as the P401 and an inverter such as the SE3800H-US. This includes providing directions on finding SolarEdge authorized installers.[50]

347. Further, SolarEdge does and will make, use, offer to sell, sell, and/or import a system that accepts a DC input to each of a plurality of photovoltaic DC-DC power converters. A SolarEdge solar power system that includes a plurality of P401 power optimizers and an inverter such as the SE3800H-US contains a plurality of DC-DC power converters (one in each P401 optimizer).





https://youtu.be/oFDHqmDymrY.

[50] *See, e.g.*, https://www.solaredge.com/sites/default/files/se-hd-wave-single-phase-inverter-with-setapp-datasheet-na.pdf; https://www.solaredge.com/sites/default/files/se-installer-starter-guide-eng.pdf; https://www.solaredge.com/us/commercial-solutions-pv-professionals; https://www.solaredge.com/sites/default/files/se-three-phase-inverter-setapp-480-datasheet-na.pdf; https://www.solaredge.com/us/find-installer; https://www.solaredge.com/sites/default/files/residential_catalogue_eng.pdf.

348. SolarEdge's "Concept of Orientation" provides an example of a plurality of power converters coupled to a plurality of DC power sources, each of which is capable of accepting a DC input:

Scenario 1 – Ideal Conditions: Initially, we assume all the modules are exposed to full irradiance, each providing 200W of power. The power output of each solar module is maintained at the module's maximum power point by an input control loop within the corresponding power optimizer. This MPP loop dictates to the power optimizer an input current I_{in} and input voltage V_{in} that ensure the transfer of the entire 200W from the module to the DC bus. We assume an MPP voltage for each module (given perfectly matched modules for demonstration purposes) of V_{MPP} = 32V. This means the input voltage to the power optimizer is 32V, and the input current is 200W/32V = 6.25A. The input voltage to the inverter is controlled by a separate feedback loop. For simplicity, in this example the inverter requires a constant 400V. Since there are ten serially-connected modules, each providing 200W, the input current to the inverter is 2000W/400V = 5A. Thus, the DC bus current flowing through each of the power optimizers must be 5A. This means that each power optimizer in this example provides an output voltage of 200W/5A = 40V. In this case, the power optimizers are acting as up converters, converting the 32V input voltage to the target 40V output voltage. The various system currents and voltages in this case are illustrated in Figure 1.

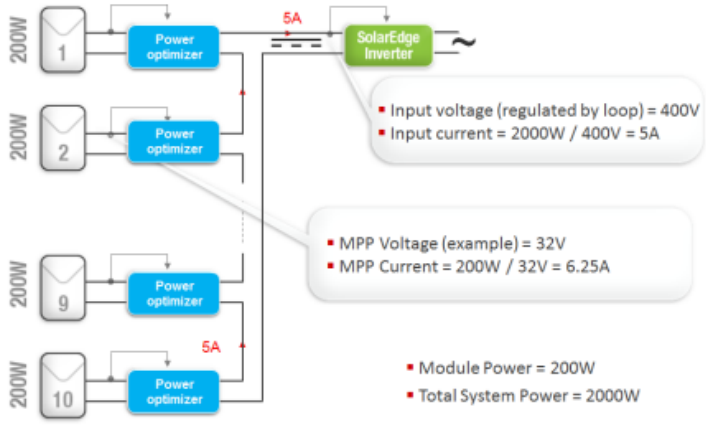


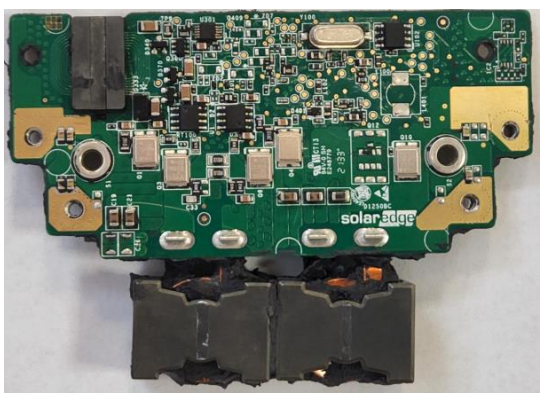
Figure 1: Operation under Ideal Conditions

https://www.solaredge.com/sites/default/files/se_application_fixed_string_voltage.pdf at 1-2.

349. SolarEdge's design guideline also provides an example of a "valid use" that connects 20 optimizers to 20 x 345 DC Power Sources:

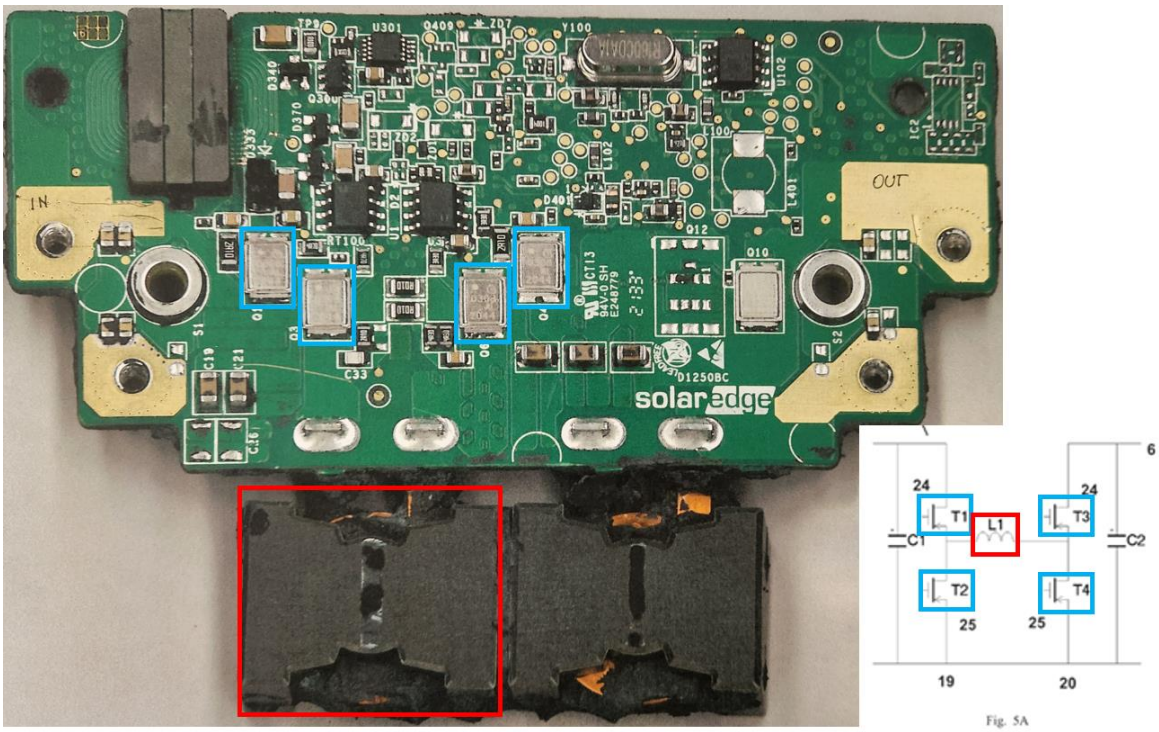
https://www.solaredge.com/sites/default/files/se-power-optimizer-single-string-design-application-note.pdf at 1.

350. Further, SolarEdge does and will make, use, offer to sell, sell, and/or import a system wherein each photovoltaic DC-DC power converter comprises a boost and buck power conversion circuit in any order. A SolarEdge solar power system that includes a plurality of P401 power optimizers and an inverter such as the SE3800H-US contains a plurality of power converters (one in each P401 optimizer). On information and belief, each P401 optimizer uses a dual-mode photovoltaic DC-DC converter that includes boost conversion circuitry and buck conversion circuitry. Front and back photographs of the circuit board in a P401 optimizer are shown below.

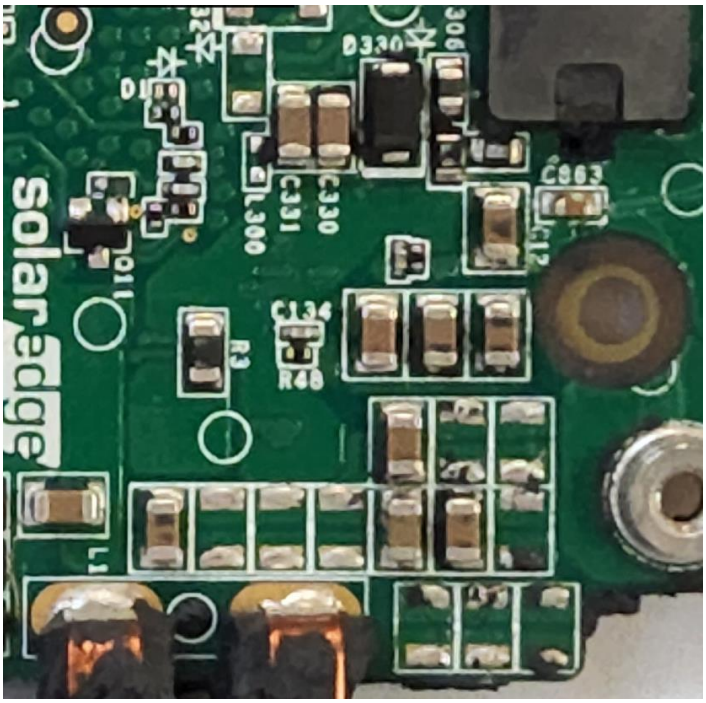


351. On information and belief, the item labeled on the P401 board as L1 (marked in red in

the annotated photograph below) is an inductor as depicted in Figures 5A and 5B of the ’063 patent, and the transistors on the P401 board labeled as Q1, Q3, Q4, and Q6 (marked in blue in the annotated photograph below) correspond to the transistors marked as T1 – T4 in Figure 5A of the patent. As in the patent, these components are configured so that the P401’s circuitry can use both a buck conversion circuit and a boost conversion circuit and alternate between them as needed.



352. Figure 5A in the ’063 patent also identifies capacitors C1 and C2 as part of the buck and boost conversion circuitry. The P401 board contains many capacitors (typically marked with the prefix C), as shown for example in the close-up photo of a portion of the P401 board shown below. Discovery is needed to identify the specific capacitors used for this functionality; on information and belief at least two capacitors are acting as part of the boost and buck conversion circuitry in the P401 that corresponds to the circuit shown in Figure 5A of the patent.



353. Further, SolarEdge does and will make, use, offer to sell, sell, and/or import a system wherein each photovoltaic DC-DC power converter is connected in series to at least one other photovoltaic DC-DC power converter of said plurality of photovoltaic DC-DC power converters. A SolarEdge solar power system that includes a plurality of P401 power optimizers and an inverter such as the SE3800H-US contains a plurality of DC-DC power converters (one in each P401 optimizer) wherein each DC-DC power converter is connected in series to at least one other DC-DC power converter (in another P401 optimizer). *See* https://youtu.be/oFDHqmDymrY.

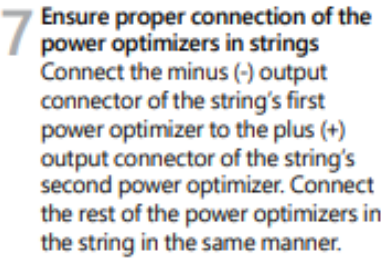
354. SolarEdge's "Concept of Orientation" provides an example of a plurality of power optimizers connected in series.[51]

355. SolarEdge's design guideline also provides an example of a "valid use" that connects 20 optimizers to 20 x 345 DC Power Sources. *See* https://www.solaredge.com/sites/default/files/se-power-optimizer-single-string-design-application-note.pdf; *see also id*. ("all power optimizers can be

[51] *See* https://www.solaredge.com/sites/default/files/se_application_fixed_string_voltage.pdf at 1-2.

connected to a single string").

356. The SolarEdge installer guide confirms the power optimizers can be connected in series:


7 **Ensure proper connection of the power optimizers in strings**
Connect the minus (-) output connector of the string's first power optimizer to the plus (+) output connector of the string's second power optimizer. Connect the rest of the power optimizers in the string in the same manner.

https://www.solaredge.com/sites/default/files/se-installer-starter-guide-eng.pdf at 5.

357. Further, SolarEdge does and will make, use, offer to sell, sell, and/or import a system wherein each photovoltaic DC-DC power converter converts said DC input into a converted photovoltaic DC output. A SolarEdge solar power system that includes a plurality of P401 power optimizers and an inverter such as the SE3800H-US contains a plurality of DC-DC power converters (one in each P401 optimizer) wherein each DC-DC power converter receives a DC input and provides a DC output.

358. During operation, the P401 optimizer has a maximum output voltage of 60 Vdc. *See* https://www.solaredge.com/sites/default/files/se-P5-series-add-on-power-optimizer-datasheet-na.pdf at 2.

359. SolarEdge's "Concept of Orientation" provides an example of converting said DC input into a converted photovoltaic DC output from said at least one dual mode photovoltaic DC-DC converter. *See* https://www.solaredge.com/sites/default/files/se_application_fixed_string_voltage.pdf at 1-2.

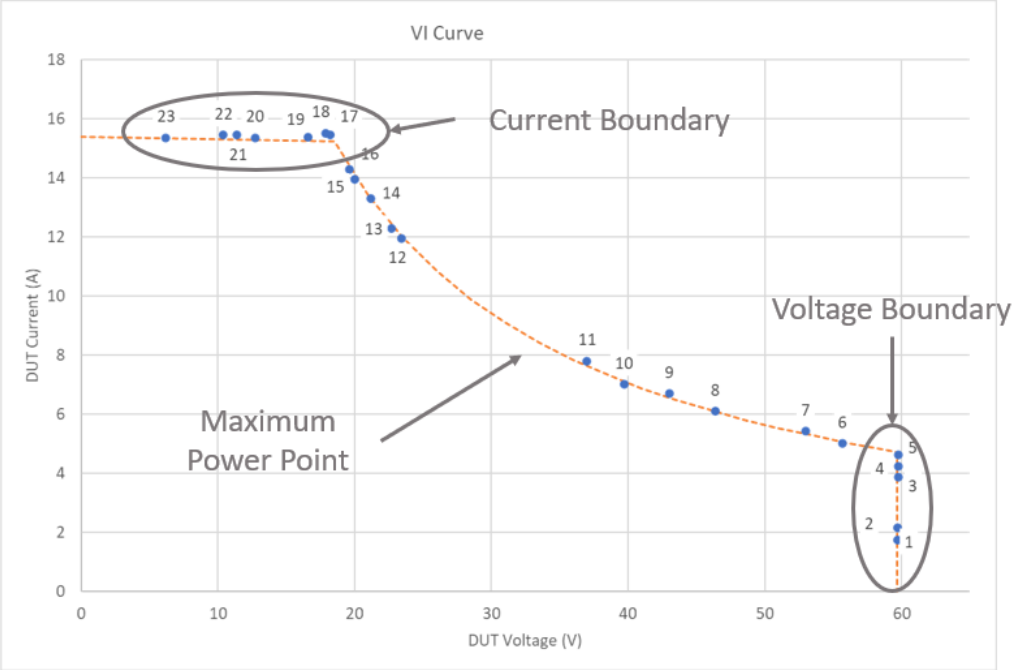
360. Further, SolarEdge does and will make, use, offer to sell, sell, and/or import a system where each photovoltaic DC-DC power converters is controlled to alternate, while producing operational power, between, maximum power point tracking, overcurrent boundary condition control

of said converted photovoltaic DC output at other than maximum power point, and overvoltage boundary condition control of said converted photovoltaic DC output at other than said maximum power point. A SolarEdge solar power system that includes a plurality of P401 power optimizers and an inverter such as the SE3800H-US contains in each P401 optimizer a switch circuit configured and arranged to be sufficient to power said solar power system during operation of said solar power system to produce operational power, and while producing operational power to be capable of alternating between: maximum power point tracking, overcurrent boundary condition control of said converted photovoltaic DC output at other than maximum power point, and overvoltage boundary condition control of said converted photovoltaic DC output at other than said maximum power point.

361. SolarEdge's website states that "The SolarEdge Power Optimizers increase energy output from PV systems by constantly tracking the maximum power point (MPPT) of each module individually." https://www.solaredge.com/us/products/power-optimizers#/.[52]

362. Testing of the P401 optimizer in conjunction with a SolarEdge SE3800H-US Inverter and a Keysight Solar Array Simulator with five E4376A modules shows that it provides operational power at a maximum power point level, an overcurrent boundary level, and an overvoltage boundary level. The testing also shows that the overcurrent boundary and overvoltage boundary levels are different from the maximum power point level.

[52] *See also* https://youtu.be/oFDHqmDymrY.



363. SolarEdge's "Concept of Orientation" provides a description of using circuitry to control said photovoltaic DC-DC power converter to produce operational power at a maximum power point level. https://www.solaredge.com/sites/default/files/se_application_fixed_string_voltage.pdf at 1-2.

364. Further, SolarEdge does and will make, use, offer to sell, sell, and/or import a system with an inverter for inverting said converted photovoltaic DC outputs. A SolarEdge solar power system includes an inverter responsive to said converted photovoltaic DC outputs, such as the SE3800H-US inverter.[53]

365. SolarEdge's inverters "efficiently converts DC power from the modules into AC power that can be fed into the main AC service of the site and from there to the grid." https://www.solaredge.com/sites/default/files/se-single-and-three-phase-inverter-user-manual-na.pdf.

366. SolarEdge's "Concept of Orientation" provides a description of an inverter responsive

[53] *See* https://www.solaredge.com/sites/default/files/se-installer-starter-guide-eng.pdf; https://www.solaredge.com/sites/default/files/se-three-phase-inverter-setapp-480-datasheet-na.pdf.

to a SolarEdge power optimizer.[54]

367. Thus, on information and belief, SolarEdge's use of a solar power system that includes a package of P401 power optimizers and the SE3800H-US inverter infringes at least claim 1 of the '063 patent .

368. The full extent of SolarEdge's infringement is not presently known to Plaintiff. On information and belief, SolarEdge has made, used, sold, offered for sale, and/or imported products under different names or part numbers the use of which infringes the '063 patent in a similar manner. Plaintiff makes this preliminary identification of infringing products and infringed claims without the benefit of discovery or claim construction in this action, and expressly reserves the right to augment, supplement, and revise its identification based on additional information obtained through discovery or otherwise.

369. SolarEdge has had notice of and have been aware of the '063 patent and its infringement of the '063 patent since at least the filing of this Complaint.

370. In addition, since at least the above-mentioned date when SolarEdge was on notice of its infringement, SolarEdge has actively induced and continues to induce others to infringe one or more of the claims of the '063 patent in violation of 35 U.S.C. § 271(b), as described below.

371. On information and belief, SolarEdge knowingly and intentionally induces users of one or more of the Accused Products to directly infringe one or more claims of the '063 patent by encouraging, instructing, and aiding one or more persons in the United States, including but not limited to end users, distributors, and installers to use the Accused Products in a manner that infringes the '063 patent.

372. For example, SolarEdge induces infringement by providing the Accused Products,

[54] *See* https://www.solaredge.com/sites/default/files/se_application_fixed_string_voltage.pdf at 1-2.

contracting for the distribution of the Accused Products, by marketing the Accused Products, and by creating and/or distributing user manuals, web pages, marketing materials, and/or similar materials with instructions on using the Accused Products in an infringing manner. The use of the Accused Products in accordance with SolarEdge's instructions results in infringement of the asserted claims of the '063 patent.

373. On information and belief, the Accused Products are designed in such a way that when they are used for their intended purpose, the user infringes the '063 patent. SolarEdge knows and intends that its distributors, installers and/or end users that purchase the Accused Products will use those products for their intended purpose.

374. On information and belief, SolarEdge was aware of the infringement of the '063 patent or acted with willful blindness as to its existence at least as a result of the filing of this Complaint.

375. Moreover, by continuing to make, use, sell, offer to sell, and/or import the Accused Products after SolarEdge first had notice of Ampt's allegations of infringement, SolarEdge has indirectly infringed and continues to indirectly infringe by contributing to the infringement of one or more claims of the '063 patent pursuant to 35 U.S.C. § 271(c), as described below.

376. On information and belief, SolarEdge has contributorily infringed, and continues to contributorily infringe, the asserted claims by offering to sell, selling, and importing into the United States the Accused Products that perform the claimed methods for solar energy power creation, knowing that the Accused Products are especially made for use in infringing the '063 patent, and are not staple articles of commerce suitable for a substantial non-infringing use. In particular, the Accused Products are power optimizers and inverters that need to be set-up by SolarEdge's distributor and/or user in accordance with specific directions from SolarEdge in order to be operable for purpose of solar energy power creation. The Accused Products contain components, including control circuitry, that

specifically implement the claimed methods for solar energy power creation. Indeed, these components are especially built to perform the accused functionalities. On information and belief, SolarEdge has performed and continues to perform these affirmative acts with knowledge of the '063 patent and with the intent, or willful blindness, that they cause the direct infringement of the '063 patent.

377. On information and belief, Ampt has suffered and continues to suffer damages as a result of SolarEdge's infringement of the '063 patent in an amount to be determined at trial.

378. SolarEdge's infringement of the '063 patent is causing irreparable harm for which Ampt has no adequate remedy at law unless SolarEdge is enjoined by this Court. Under 35 U.S.C. § 283, Ampt is entitled to a permanent injunction against further infringement of the '063 patent.

379. Ampt does not have an adequate remedy at law.

380. On information and belief, SolarEdge's infringement is willful and deliberate, entitling Ampt to increased damages under 35 U.S.C. § 284 and to attorneys' fees and costs incurred in prosecuting this action under 35 U.S.C. § 285.

COUNT VIII
(INFRINGEMENT OF U.S. PATENT NO. 11,289,917)

381. Plaintiff repeats and realleges paragraphs 1-380 as if fully set forth at length herein.

382. SolarEdge has and continues to infringe one or more claims of the '917 patent in this judicial district and elsewhere in the United States.

383. Upon information and belief, SolarEdge makes, uses, sells, offers for sale, and/or imports into the United States the Accused Products.

384. SolarEdge directly infringes the '917 patent under 35 U.S.C. § 271(a), literally and/or under the doctrine of equivalents, by making, using, offering for sale, selling, and/or importing the Accused Products in the United States.

385. For example, SolarEdge directly infringes at least claim 1 of the '917 patent, literally

and/or under the doctrine of equivalents, through its making, using, offering for sale, selling, and/or importing the Accused Products. The asserted claim(s) of the '917 patent are valid, enforceable, and currently in full force and effect.

386. Claim 1 of the '917 patent recites:

> A photovoltaic power module comprising:
>
> a photovoltaic DC-DC power converter comprising two power conversion circuit topologies, wherein each of said two power conversion circuit topologies is a boost conversion circuit or a buck conversion circuit;
>
> a connector to receive power from at least one photovoltaic panel;
>
> a connector to output power from said photovoltaic DC-DC power converter; and
>
> circuitry to control said photovoltaic DC-DC power converter to produce operational power at an operational power level, and further to alternate said operational power level between:
>
> a maximum power point level,
>
> an overcurrent boundary level, wherein said overcurrent boundary level is at other than said maximum power point level, and
>
> an overvoltage boundary level, wherein said overvoltage boundary level is at other than said maximum power point level.

387. As one non-limiting example of said infringement, on information and belief, the P401 power optimizer is a "photovoltaic power module" that meets each and every limitation recited in claim 1 of the '917 patent, as described below.

388. On information and belief, the P401 power optimizer is designed and sold for use in solar power systems. For example, SolarEdge's website states: "Each power optimizer is equipped with the unique SafeDC™ feature, which is designed to automatically reduce modules' DC voltage to a safe level whenever the inverter or grid power is shut down (unless connected to a SolarEdge inverter operating in backup mode)." https://www.solaredge.com/us/products/power-optimizer#/.[55]

[55] *See also* https://www.solaredge.com/sites/default/files/se-P5-series-add-on-power-optimizer-datasheet-na.pdf; https://www.solaredge.com/sites/default/files/se-installer-starter-guide-eng.pdf.

389. As depicted on SolarEdge's website, it offers for sale solar power systems, including those that include power optimizers such as the P401. *See* https://www.solaredge.com/us/commercial-solutions-pv-professionals.

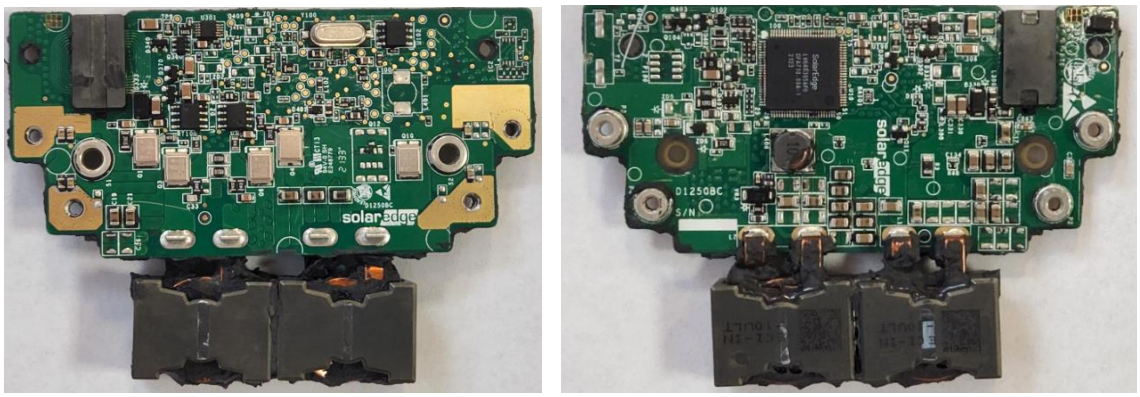
390. Further, the P401 power optimizer is a photovoltaic DC-DC power converter comprising two power conversion circuit topologies, wherein each of said two power conversion circuit topologies is a boost conversion circuit or a buck conversion circuit.

391. SolarEdge's website states that its optimizers are DC-DC power converters that are connected to solar panels for the purpose of receiving DC power: "The SolarEdge Power Optimizer is a DC/DC converter which is connected by installers to each solar module." *See* https://www.solaredge.com/us/products/power-optimizers#/.

392. SolarEdge's website contains a "concept of operation" description that states all PB, OP and P series optimizers contain two power conversion circuit topologies.[56]

393. On information and belief, the P401 optimizer comprises two power conversion circuit topologies wherein each of said two power conversion circuit topologies is a boost conversion circuit or a buck conversion circuit. As shown by the front and back photographs of the circuit board in a P401 optimizer, an inspection of the P401 device indicates that it is configured to operate in both boost conversion and buck conversion modes.

[56] *See* https://www.solaredge.com/sites/default/files/se_application_fixed_string_voltage.pdf; https://investors.solaredge.com/static-files/80b8d94d-06b2-4bf3-b059-2e4c4e609af7.



394. On information and belief, the transistors on the P401 board labeled as Q1, Q3, Q4, and Q6 (marked in blue in the annotated photograph below) correspond to the transistors marked as T1 – T4 in Figure 5A of the '917 patent, and as in the patent are configured so that the P401's circuitry can use both buck and boost conversion modes of operation as needed. The item labeled on the P401 board as L1 (highlighted red) is an inductor as depicted in Figures 5A and 5B.

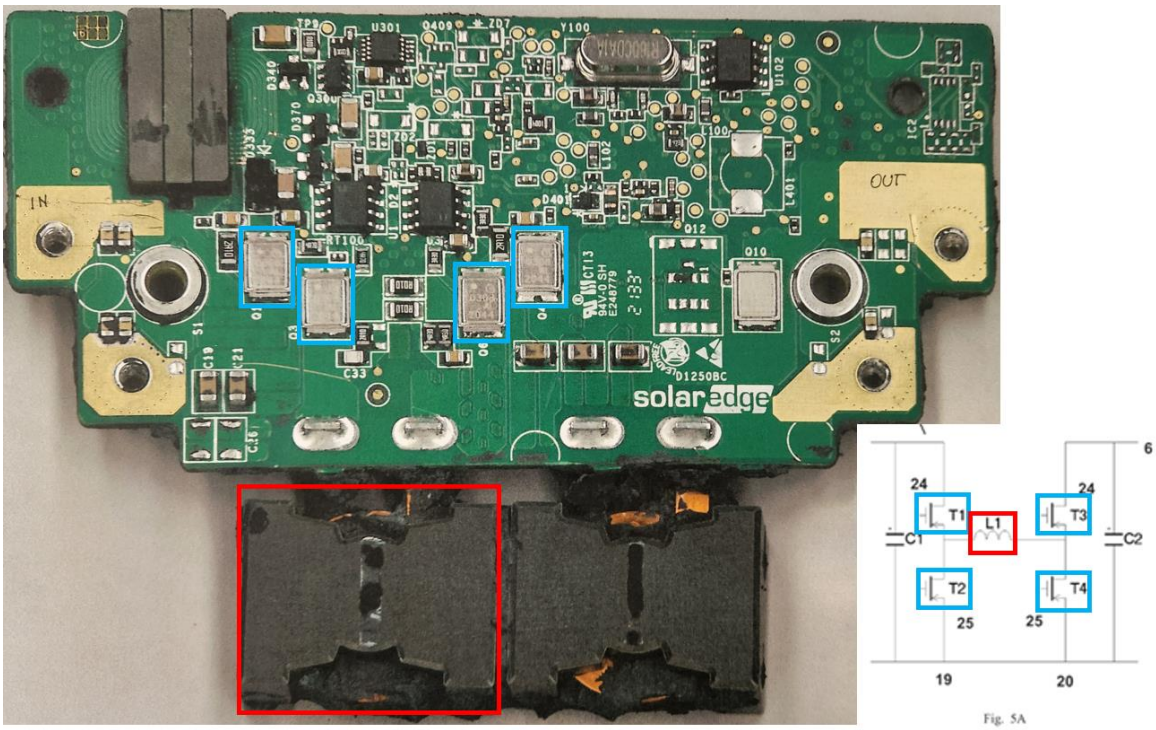
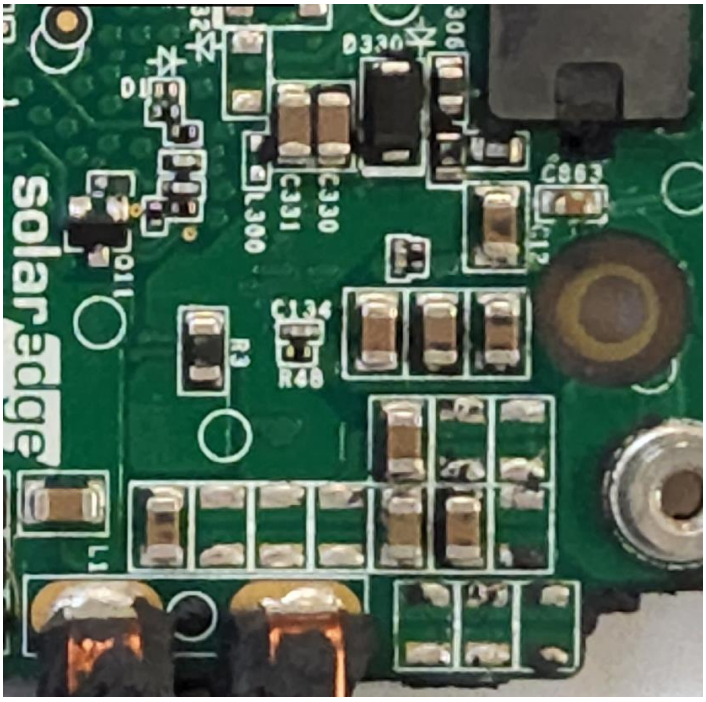


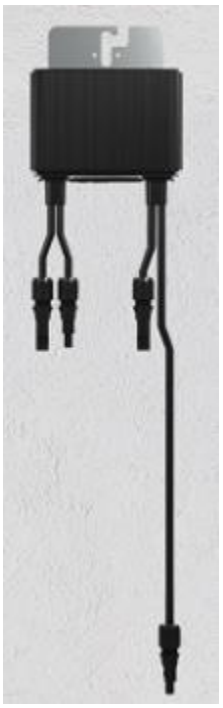
Fig. 5A

395. Figure 5A also identifies capacitors C1 and C2 as part of the buck and boost conversion circuitry. The P401 board contains many capacitors (typically marked with the prefix C), as shown for

example in the close-up photo of a portion of the P401 board shown below. Discovery is needed to identify the specific capacitors used for this functionality; on information and belief at least two are acting as part of the boost and buck conversion circuitry in the P401 that corresponds to the circuit shown in Figure 5A.

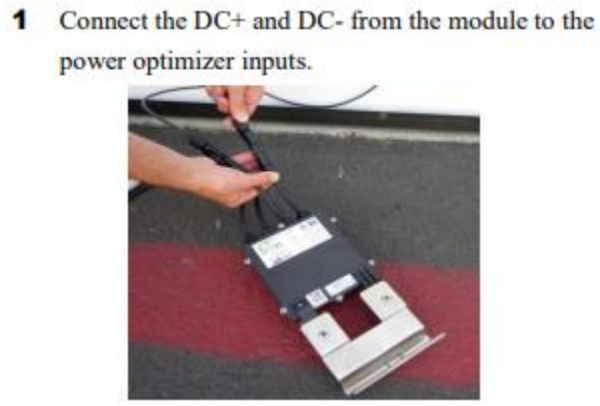


396. Further, the P401 power optimizer has a connector to receive power from at least one photovoltaic panel. *See* https://youtu.be/oFDHqmDymrY; *see also*:



https://www.solaredge.com/us/products/power-optimizers#/.

397. SolarEdge's mounting instructions describe connecting its power optimizers, including the P401, to a solar panel to receive power:



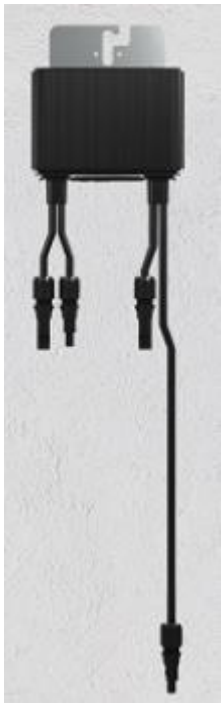
https://www.solaredge.com/sites/default/files/se_installation_guide_zep_compatible.pdf at 1.

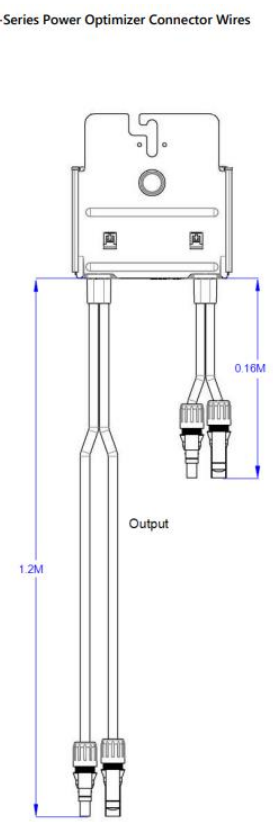
398. SolarEdge's datasheet confirms that the P401 can be connected to a solar panel for the purpose of receiving power, stating that its rated DC power input is 400 watts:

Optimizer Model (Typical Module Compatibility)	P320 (for high-power 60-cell modules)	P401 (for high-power 60/72-cell modules)	
INPUT			
Rated Input DC Power[1]	320	400	W
Absolute Maximum Input Voltage (Voc at lowest temperature)	48	60	Vdc
MPPT Operating Range	8 - 48	8 - 60	Vdc
Maximum Short Circuit Current (Isc)	11	11.75	Adc
Maximum Efficiency	99.5		%
Weighted Efficiency	98.8		%

https://www.solaredge.com/sites/default/files/se-P5-series-frame-mounted-power-optimizer-datasheet-na.pdf at 2.

399. Further, the P401 power optimizer has a connector to output power from said photovoltaic DC-DC power converter. *See* https://youtu.be/oFDHqmDymrY; *see also*:





https://www.solaredge.com/us/products/power-optimizers#/; https://www.solaredge.com/sites/default/files/se_power_optimizer_s_series_specifications_and_connections.pdf at 2.

400. The SolarEdge datasheet confirms that the P401 can be connected to an inverter to output power:

OUTPUT DURING OPERATION (POWER OPTIMIZER CONNECTED TO OPERATING SOLAREDGE INVERTER)		
Maximum Output Current	15	Adc
Maximum Output Voltage	60	Vdc

https://www.solaredge.com/sites/default/files/se-P5-series-frame-mounted-power-optimizer-datasheet-na.pdf at 2.

401. SolarEdge's "Concept of Orientation" provides an example of the connections to and from the power optimizer:

Scenario 1 – Ideal Conditions: Initially, we assume all the modules are exposed to full irradiance, each providing 200W of power. The power output of each solar module is maintained at the module's maximum power point by an input control loop within the corresponding power optimizer. This MPP loop dictates to the power optimizer an input current I_{in} and input voltage V_{in} that ensure the transfer of the entire 200W from the module to the DC bus. We assume an MPP voltage for each module (given perfectly matched modules for demonstration purposes) of V_{MPP} = 32V. This means the input voltage to the power optimizer is 32V, and the input current is 200W/32V = 6.25A. The input voltage to the inverter is controlled by a separate feedback loop. For simplicity, in this example the inverter requires a constant 400V. Since there are ten serially-connected modules, each providing 200W, the input current to the inverter is 2000W/400V = 5A. Thus, the DC bus current flowing through each of the power optimizers must be 5A. This means that each power optimizer in this example provides an output voltage of 200W/5A = 40V. In this case, the power optimizers are acting as up converters, converting the 32V input voltage to the target 40V output voltage. The various system currents and voltages in this case are illustrated in Figure 1.

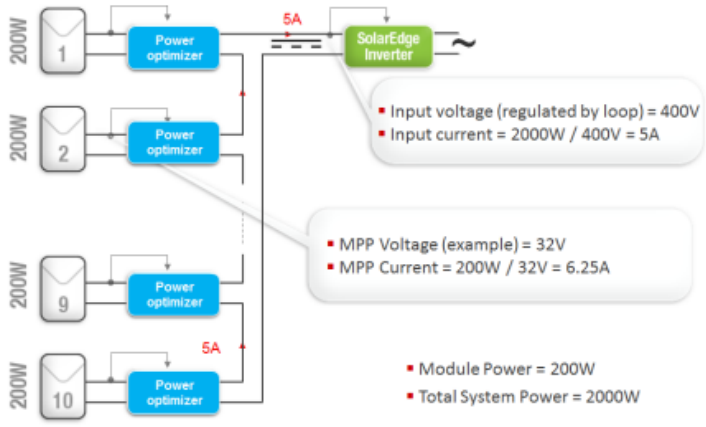


Figure 1: Operation under Ideal Conditions

https://www.solaredge.com/sites/default/files/se_application_fixed_string_voltage.pdf at 1-2.

402. Further, the P401 power optimizer has circuitry to control said photovoltaic DC-DC power converter to produce operational power at an operational power level.

403. SolarEdge's website states that "The SolarEdge Power Optimizers increase energy output from PV systems by constantly tracking the maximum power point (MPPT) of each module individually." https://www.solaredge.com/us/products/power-optimizers#/.

404. SolarEdge's "Concept of Orientation" provides a description of using circuitry to

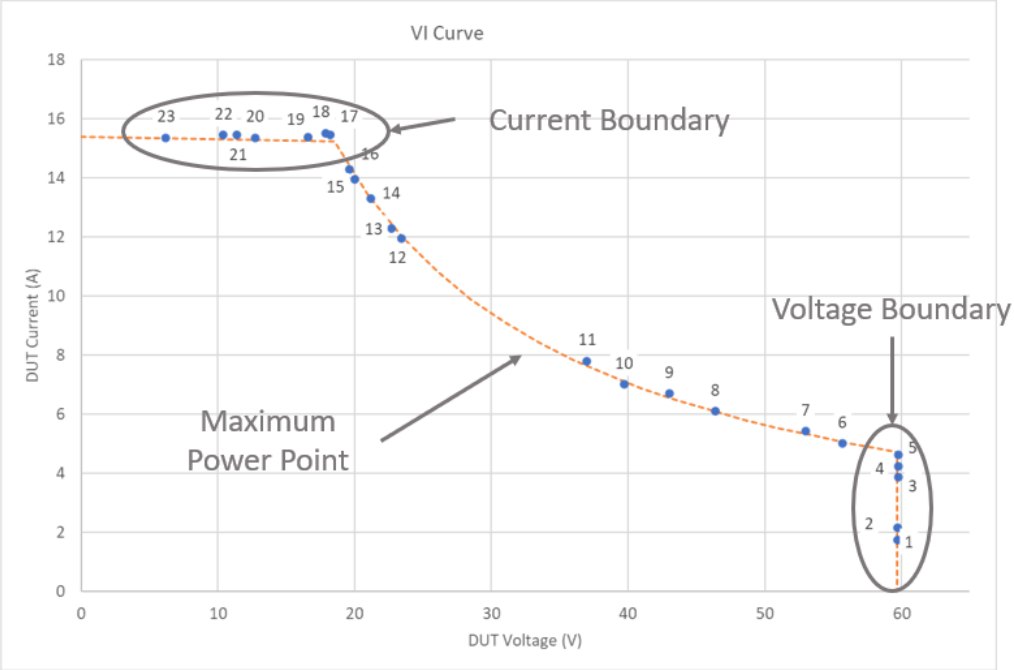
control the photovoltaic DC-DC power converter to produce operational power at an operational power level. *See* https://www.solaredge.com/sites/default/files/se_application_fixed_string_voltage.pdf at 1-2.

405. Further, the P401 power optimizer circuitry can alternate said operational power level between: a maximum power point level, an overcurrent boundary level, wherein said overcurrent boundary level is at other than said maximum power point level, and an overvoltage boundary level, wherein said overvoltage boundary level is at other than said maximum power point level.

406. SolarEdge's website states that "The SolarEdge Power Optimizers increase energy output from PV systems by constantly tracking the maximum power point (MPPT) of each module individually." https://www.solaredge.com/us/products/power-optimizers#/.[57]

407. Testing of the P401 optimizer in conjunction with a SolarEdge SE3800H-US Inverter and a Keysight Solar Array Simulator with five E4376A modules shows that it provides operational power at a maximum power point level, an overcurrent boundary level, and an overvoltage boundary level. The testing also shows that the overcurrent boundary and overvoltage boundary levels are different from the maximum power point level.

[57] *See also* https://youtu.be/oFDHqmDymrY.



408. SolarEdge's "Concept of Orientation" provides a description of using circuitry to control said photovoltaic DC-DC power converter to produce operational power at a maximum power point level. https://www.solaredge.com/sites/default/files/se_application_fixed_string_voltage.pdf at 1-2.

409. Thus, on information and belief, the P401 power optimizer is a photovoltaic power module that comprises a photovoltaic DC-DC power converter comprising two power conversion circuit topologies, wherein each of said two power conversion circuit topologies is a boost conversion circuit or a buck conversion circuit; a connector to receive power from at least one photovoltaic panel; a connector to output power from said photovoltaic DC-DC power converter; and circuitry to control said photovoltaic DC-DC power converter to produce operational power at an operational power level, and further to alternate said operational power level between: a maximum power point level, an overcurrent boundary level, wherein said overcurrent boundary level is at other than said maximum power point level, and an overvoltage boundary level, wherein said overvoltage boundary level is at other than said maximum power point level.

410. The full extent of SolarEdge's infringement is not presently known to Plaintiff. On information and belief, SolarEdge has made, used, sold, offered for sale, and/or imported products under different names or part numbers that infringe the '917 patent in a similar manner. Plaintiff makes this preliminary identification of infringing products and infringed claims without the benefit of discovery or claim construction in this action, and expressly reserves the right to augment, supplement, and revise its identification based on additional information obtained through discovery or otherwise.

411. SolarEdge has had notice of and have been aware of the '917 patent and its infringement of the '917 patent since at least the filing of this Complaint.

412. In addition, since at least the above-mentioned date when SolarEdge was on notice of its infringement, SolarEdge has actively induced and continues to induce others to infringe one or more of the claims of the '917 patent in violation of 35 U.S.C. § 271(b), as described below.

413. On information and belief, SolarEdge knowingly and intentionally induces users of one or more of the Accused Products to directly infringe one or more claims of the '917 patent by encouraging, instructing, and aiding one or more persons in the United States, including but not limited to end users, distributors, and installers, to make, use, sell, offer to sell, import and/or install one or more of the Accused Products in a manner that infringes the '917 patent.

414. For example, SolarEdge induces infringement by creating and distributing datasheets, manuals, brochures, and similar documentation and materials related to the installation and use of the Accused Products, and by configuring its devices to require installers to authorize those devices with SolarEdge before they can be used. SolarEdge also offers its cloud-based monitoring platform (PV Monitoring Platform) that allows residential and commercial end users the ability to monitor their solar power systems' technical performance when that system is installed according to SolarEdge's requirements.

415. On information and belief, the Accused Products are designed in such a way that when they are used for their intended purpose, the user infringes the '917 patent. SolarEdge knows and intends that its distributors, installers and/or end users that purchase the Accused Products will use those products for their intended purpose.

416. On information and belief, SolarEdge was aware of the infringement of the '917 patent or acted with willful blindness as to its existence at least as a result of the filing of this Complaint.

417. Moreover, by continuing to make, use, sell, offer to sell, and/or import the Accused Products after SolarEdge first had notice of Ampt's allegations of infringement, SolarEdge has indirectly infringed and continues to indirectly infringe by contributing to the infringement of one or more claims of the '917 patent pursuant to 35 U.S.C. § 271(c), as described below.

418. On information and belief, SolarEdge's affirmative acts of manufacturing, selling, offering for sale, and/or importing the Accused Products, in this District and elsewhere in the United States, contribute to SolarEdge's customers and end-users directly infringing the '917 patent with the Accused Products. The Accused Products are not a staple article or commodity of commerce, have no substantial non-infringing uses, and are known by SolarEdge to be especially made and/or especially adapted for use in infringement of the '917 patent. SolarEdge has performed and continues to perform these affirmative acts with knowledge of the '917 patent and with the intent, or willful blindness, that they cause the direct infringement of the '917 patent.

419. On information and belief, Ampt has suffered and continues to suffer damages as a result of SolarEdge's infringement of the '917 patent in an amount to be determined at trial.

420. SolarEdge's infringement of the '063 patent is causing irreparable harm for which Ampt has no adequate remedy at law unless SolarEdge is enjoined by this Court. Under 35 U.S.C. § 283, Ampt is entitled to a permanent injunction against further infringement of the '063 patent.

421. Ampt does not have an adequate remedy at law.

422. On information and belief, SolarEdge's infringement is willful and deliberate, entitling Ampt to increased damages under 35 U.S.C. § 284 and to attorneys' fees and costs incurred in prosecuting this action under 35 U.S.C. § 285.

JURY DEMAND

Plaintiff hereby requests a trial by jury pursuant to Rule 38 of the Federal Rules of Civil Procedure.

PRAYER FOR RELIEF

Plaintiff respectfully requests that the Court find in its favor and against SolarEdge and that the Court grant Plaintiff the following relief:

a. A judgment that SolarEdge has directly infringed the Asserted Patents as alleged herein;

b. A judgment that SolarEdge has indirectly infringed the Asserted Patents as alleged herein;

c. A permanent injunction against SolarEdge and their affiliates, subsidiaries, assignees, employees, agents or anyone acting in privity or concert with them from infringing the Asserted Patents, including enjoining the making, offering to sell, selling, using, or importing into the United States products claimed in any of the claims of the Asserted Patents; using or performing methods claimed in any of the claims of the Asserted Patents; inducing others to use and perform methods that infringe any claim of the Asserted Patents; or contributing to others using and performing methods that infringe any claim of the Asserted Patents, until the expiration of the Asserted Patents.

d. A judgment for an accounting of all damages, past and future, including lost profits, sustained by Plaintiff as a result of the acts of infringement by SolarEdge;

e. A judgment and order requiring SolarEdge to pay Plaintiff damages under 35 U.S.C. § 284, including up to treble damages as provided by 35 U.S.C. § 284, and any royalties determined to be appropriate;

f. A judgment and order requiring SolarEdge to pay Plaintiff pre-judgment and post-judgment interest on the damages awarded;

g. A judgment and order finding this to be an exceptional case and requiring SolarEdge to pay the costs of this action (including all disbursements) and attorneys' fees as provided by 35 U.S.C. § 285; and

h. Such other and further relief as the Court deems just and equitable.

Dated: July 28, 2022

Respectfully submitted,

/s/ Benjamin Schladweiler

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