

**UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION**

SynQor, Inc.

Plaintiff,

v.

Ericsson, Inc.,
Cisco Systems, Inc., and
Vicor Corporation.

Defendants.

Civil Action No. 2:11-cv-54-TJW-CE

JURY TRIAL DEMANDED

**DECLARATION OF STEVEN B. LEEB, PH.D. IN SUPPORT OF SYNQOR'S MOTION
FOR A PRELIMINARY INJUNCTION**

I, Steven B. Leeb, state and declare as follows:

1. My qualifications are reflected in my Curriculum Vitae, attached as Exhibit A, and the following comments. I am a Professor with tenure in the Electrical Engineering and Computer Science Department at the Massachusetts Institute of Technology. I also have a joint appointment in the Department of Mechanical Engineering at the Massachusetts Institute of Technology, and I am appointed as a MacVicar Faculty Fellow. I earned a Bachelor of Science (B.S.) degree, a Master of Science (M.S.) degree, an Electrical Engineering (E.E.) degree and a Doctorate (Ph.D.) degree from the Massachusetts Institute of Technology ("MIT") in 1987, 1989, 1990 and 1993, respectively.

2. I have over 20 years of experience in the field of electrical engineering and computer science, with particular experience in the field of power electronics and embedded

control. I have designed dozens of power converters. I can trace several of these to the development of commercial projects. I have designed several power products that include microcontrollers and that employ advanced control techniques. Since 1995, I have lectured in several courses at MIT that teach the use of power electronics.

3. From 1987 to 1991, I worked part-time as a USAF Reservist at the Wright Research and Development Center at Wright Patterson Air Force Base in Ohio, in its avionics branch, developing and studying power supplies for use in advanced avionic systems.

4. I have taught graduate and undergraduate level courses at MIT in microcomputer control, power electronic circuit design, field theory, circuit analysis, signal processing, feedback control, and power systems. I also have supervised over 100 theses and advanced undergraduate projects since I joined the MIT faculty in 1993.

5. I have authored or co-authored more than 100 technical publications and 14 U.S. patents in the areas of power electronics, drives, and power systems design, analysis, monitoring, and control. My resume includes a sample list of these publications.

6. In 2007 I was named a Fellow of the IEEE. I received a National Science Foundation CAREER Award in 1996. I received the MIT Edgerton Faculty Award in 1998. In 1999, I was named Technology Review's TR100 Outstanding Young Innovator. I also was named the IEEE Outstanding Young Power Electronics Engineer in 1999. I have received two R&D 100 awards for products I have developed.

7. I provided expert testimony to the jury regarding infringement in the *SynQor v. Artesyn et al.* case, No. 2:07-cv-497-TJW-CE.

I. RETENTION AND SCOPE OF OPINIONS

8. I submit this declaration in support of SynQor, Inc. (“SynQor”)’s Motion for a Preliminary Injunction against Cisco Systems, Inc. (“Cisco”), Ericsson, Inc. (“Ericsson”) and Vicor Corporation (“Vicor”) (collectively “Defendants”) in the above case.

9. I have been retained by SynQor in this matter and asked, for purposes of this motion, to consider, based upon the publicly available information currently available to me for purposes of this case, whether Ericsson’s and Vicor’s unregulated and/or semi-regulated bus converters meet certain limitations of the asserted patents (what I will refer to as the ‘bus converter limitations’), whether Ericsson’s unregulated bus converters infringe certain claims of one of the asserted patents, whether the use of Ericsson’s and Vicor’s unregulated and semi-regulated bus converters in Cisco’s end products infringe certain claims of the asserted patents, whether there are substantial non-infringing uses for Ericsson’s and Vicor’s unregulated and semi-regulated bus converters, and whether Ericsson’s and Vicor’s marketing and sales activities encourage and/or promote infringing uses.

10. A summary of my opinions for purposes of this declaration, formed based upon my review of the publicly available information, is as follows:

(i) Each time Cisco incorporates Ericsson’s or Vicor’s unregulated or semi-regulated bus converters in an end product, the end product in which Cisco incorporates the bus converter(s) meets each of the limitations of at least one of the claims of SynQor’s patents-in-suit, and thus infringes when made, used, offered for sale or sold in the United States, or imported into the United States.

(ii) Ericsson and Vicor encourage and promote Cisco to commit that infringement, and were notified of SynQor’s patents-in-suit at least as early as July 2010 for Ericsson and for Vicor.

(iii) Certain of Ericsson’s unregulated bus converters meet all the limitations of at least one of the asserted claims of the ‘083 patent, and thus infringe when made, used, offered for sale or sold in the United States, or imported into the United States.

- (iv) There are no substantial non-infringing uses for Ericsson's and Vicor's unregulated and semi-regulated bus converters.

I reserve the right to supplement these opinions, if needed, once I am given access to Defendants' confidential information through discovery in this case.

II. ANALYSES AND BASES FOR OPINIONS

A. "Infringement" Legal Framework

11. I understand that an infringement analysis has two parts. First, the patent claims must be properly construed. Second, the accused products/methods must be compared to those properly construed claims. To directly infringe, every limitation of a claim must be met by a product that is made, used, offered for sale or sold in the United States or imported into the United States. To induce infringement by another, I understand that (1) another must directly infringe, (2) the inducer must induce direct infringement, for instance by encouraging or promoting directly infringing uses, and, (3) the inducer must have known or should have known that its actions would induce direct infringements. To prove that the inducer knew or should have known that its actions would induce actual infringements, the patentee must prove that the inducer had knowledge or notice of the patent, a standard that includes deliberately ignoring the risk that a protecting patent existed.

12. To contributorily infringe, I understand that (1) another must directly infringe, (2) the contributor must supply a component in the United States, (3) that has no substantial non-infringing uses, (4) with knowledge that the component was especially made or adapted for use in an infringing manner. To prove that the contributor knew the component was especially made or adapted for use in an infringing manner, the patentee must prove that the inducer had knowledge or notice of the patent, a standard that includes deliberately ignoring the risk that a protecting patent existed.

13. I further understand that a product may meet a claim limitation literally or under the doctrine of equivalents. I understand that equivalence may be found where the relevant part of the accused product performs substantially the same function in substantially the same way to achieve substantially the same result as the corresponding element in the patent claim.

Alternatively, equivalence may also be found where the differences between the relevant part of the accused product and the corresponding element in the patent claim are insubstantial.

B. Claims At Issue

14. I understand that SynQor is currently asserting the following five patents against Cisco, Ericsson and Vicor: U.S. Patent Nos. 7,072,190 (“the ’190 patent”), 7,272,021 (“the ’021 patent”), 7,558,083 (“the ’083 patent”), 7,564,702 (“the ’702 patent”) and 7,269,034 (“the ’034 patent”). (Attached as Exhibits B-F.) I further understand that, for purposes of this declaration, SynQor has selected the following list of claims it has asked me to address (although I understand that SynQor reserves the right to ultimately assert additional claims against Cisco, Ericsson and Vicor and I reserve the right to address additional claims at a later date as appropriate):

The ’190 Patent

2, 19

The ’021 Patent

21, 30

The ’083 Patent

1

The '702 Patent

56, 71

The '034 Patent

9

15. I have thus focused my analysis on those claims, and the claims from which they depend whose limitations are incorporated therein.

C. Claimed Inventions

16. The claimed inventions are generally directed to DC-DC power converter systems developed by Dr. Martin F. Schlecht, a former professor of Electrical Engineering at MIT and the founder of SynQor. These systems have become known as “Unregulated IBA” and “Semi-Regulated IBA.”

17. In the claimed “unregulated” IBA systems, DC power is provided to a first stage or converter that performs an isolation function (isolating the input from the output of the stage/converter) without performing a regulation function for the output voltage. The voltage from the first stage/ converter is then fed to an “intermediate bus” which feeds multiple non-isolating, regulating converters. These downstream converters then, in turn, provide regulated output at the voltages needed to drive logic circuitry. In the “semi-regulated” IBA systems, the isolation stage does not tightly regulate the output by measuring the output to provide a feedback control signal based on a comparison to an output setpoint. Rather, it provides “semi-regulation” by only sensing signals on the primary side of the transformer, compensating for input voltage variations. As in the unregulated systems, the output from the “semi-regulated” isolation stage is fed to an intermediate bus which feeds multiple non-isolating, regulating converters which provide tightly-regulated outputs to the load circuitry.

18. Today, the claimed inventions are widely used in equipment for computer and telecommunications systems, which are generally configured as large cabinets filled with racks containing printed circuit boards (also called “load boards”). The claimed inventions provide numerous benefits in such systems, which is why they have been widely adopted. The first stage/converter isolates the input from the output, providing such benefits as safety isolation and the reduction of ground noise. At the same time, because this converter/stage is unregulated and utilizes an efficient rectification scheme with controlled rectifiers synchronized to voltages in the converter/stage, the overall converter can be made highly efficient with superior power density, preserving board space and reducing unwanted power dissipation and heat. Also, because the output is not tightly regulated, the output has a “droop” characteristic that enables paralleling multiple converters and enhances bus stability. Semi-regulated converter/stages also provide benefits in these areas. Voltage from the first stage/converter then feeds two or more downstream converters that regulate the output without performing isolation a second time. The regulated output of these downstream converters can then power the various logic circuits on the load board, and they can be placed close to the loads so as to reduce the voltage and power that is lost when high current is transmitted over longer distances.

19. The ‘190 patent is directed to unregulated IBA power converter systems that include particular circuitry and characteristics. The ‘021 patent is directed to additional aspects of unregulated IBA power converter systems that include particular circuitry and characteristics. The ‘083 patent is directed to non-regulating isolating step-down DC-DC power converters that are used in unregulated IBA systems. The ‘702 patent is directed to further aspects of unregulated IBA power converter systems that include particular circuitry and characteristics.

The '034 patent is directed to semi-regulated IBA power converter systems that include particular circuitry and characteristics.

20. The claims of the four “system” patents – the '190, '021, '702 and '034 patents – can be divided into what I will call the bus converter limitations and the system limitations. For instance, below is claim 2 of the '190 patent. Claim 2 is dependent on claim 1, so it includes all limitations of claim 1. Together, claims 1 and 2 require that an infringing product have: (1) a DC power source, (2) a non-regulating isolation stage and (3) two or more non-isolated switching regulators. Generally, the non-regulating isolation stage limitations (highlighted in green) are what I will refer to as the bus converter limitations. The other limitations (highlighted in blue) are what I will refer to as the system limitations. All the claims of the four system patents include some version of the limitation regarding two or more non-isolated regulating stages/converters. In contrast, some claims include a DC power source or DC input limitation or limitations, and some do not:

1. A power converter system comprising:
 - a DC power source;
 - a non-regulating isolation stage comprising:
 - a primary transformer winding circuit having at least one primary winding connected to the source;
 - and a secondary transformer winding circuit having at least one secondary winding coupled to the at least one primary winding and having plural controlled rectifiers, each having a parallel uncontrolled rectifier and each connected to a secondary winding, each controlled rectifier being turned on and off in synchronization with the voltage waveform across a primary winding to provide an output, each primary winding having a voltage waveform with a fixed duty cycle and transition times which are short relative to the on-state and off-state times of the controlled rectifiers;
 - and a plurality of non-isolating regulation stages, each receiving the output of the isolation stage and regulating a regulation stage output while the fixed duty cycle of the isolation stage is maintained.

2. A power converter system as claimed in claim 1 wherein the regulation stages are switching regulators.

Ex. B, '190 Patent, claim 2 (color-coding added). Attached to this declaration as Exhibit G is a listing of the claims at issue, with the bus converter and system limitations highlighted as above.

D. Level of Skill in the Art

21. A person of ordinary skill in the art as of the 1997 priority date of the claimed inventions would have a Bachelor of Science degree in Electrical Engineering and a couple of years of graduate work or work experience in power electronics.

E. Claim Constructions

22. In reaching my conclusions presented in this report, I reviewed the Court's Markman Opinion in the *SynQor v. Artesyn et al.* case, No. 2:07-cv-497-TJW-CE, dated July 26, 2010 and the constructions adopted by the Court therein, and applied those constructions:

Claim Term(s)	Construction
"isolated output"	"an output that is isolated from the input"
"uncontrolled rectifier"	"diode (including MOSFET body diode) or other passive device used as a rectifier"
"primary winding circuit" / "primary transformer winding circuit"	"a circuit that includes a primary winding of a transformer"
"voltage value drops due to impedance of an output path"	"voltage whose decrease in value is due to increased current flowing through components (explicit or parasitic) having impedances in an output path"
"isolation" / "isolating" / "isolated"	"the absence of an electric path permitting the flow of DC current (other than a de minimus amount) between an input and an output of a particular stage, component, or circuit"
"regulated output"	"an output that is controlled towards a predefined value"

“regulated DC output”	“a DC output that is controlled towards a predefined value”
“regulating”	“controlling an output towards a predefined value”
“regulation”	“the act of controlling an output towards a predefined value”
“non-regulated output”	“an output that is not controlled towards a predefined value”
“non regulated, isolated DC output”	“an isolated DC output that is not controlled towards a predefined value”
“non-regulating”	“not controlling an output towards a predefined value”
“without regulation”	“the act of not controlling an output towards a predefined value”
“normal operation”	“a normal mode of operation that excludes start-up, shutdown, and fault conditions such as over-current conditions”
“non-regulated output” / “normally non-regulated output”	“non-regulated output that occurs during normal operation”
“normally non-regulated”	“non-regulating during normal operation”
“semi-regulation”	“the act of controlling an output towards a predefined value by sensing a voltage in the primary transformer winding circuit without sensing the isolated output voltage”
“semi-regulated, isolated output”	“an isolated output that is controlled towards a predefined value by sensing a voltage in the primary transformer winding circuit without sensing the isolated output voltage”
“connected”	“electrically connected, directly or indirectly”
“controlled rectifier”	“transistor or other active device used as a rectifier”
“each controlled rectifier”	“each controlled rectifier being turned from on to

being turned on and off in synchronization with the voltage waveform across a primary winding”	off or from off to on at the same time as a change of the voltage waveform across a primary winding”
“transition times”	“time periods during which a change of a voltage waveform occurs across a primary winding”
“transition times which are short relative to the on-state and off-state times of the controlled rectifiers”	“transition times which are less than 20% of the overall on-state and off-state times of the controlled rectifiers”
“down converter”	“a converter where the output voltage is lower than the input voltage”
“voltage whose value drops with increasing current flow”	No construction of the term is necessary.
“senses a voltage in the primary transformer winding circuit to provide a feedback control signal without bridging an isolation barrier between the primary and secondary transformer winding circuits”	“senses a voltage in the primary transformer winding circuit to provide a feedback signal that is used to control the duty cycle of a transistor in the primary transformer winding circuit without passing the feedback signal across the isolation barrier of the primary and secondary transformer winding circuits”
“multiple non-regulating isolating step down converters providing plural non-regulated, isolated DC outputs, plural of the non-isolating down-converter switching regulators receiving power from one of the non-regulated, isolated DC outputs”	“two or more non-regulating isolating step down converters, each providing a non-regulated, isolated DC output, wherein two or more of the non-isolating down-converter switching regulators receives power from one of the non-regulated, isolated DC outputs”
“transformer that is not driven into saturation”	“transformer that is connected in a manner such that the transformer’s magnetic flux density level is less than its saturation flux density level”

F. Ericsson and Vicor Bus Converters**1. Ericsson**

23. Below is a table listing Ericsson's unregulated and semi-regulated bus converters currently advertised for sale on its website. Based upon the available evidence, these products meet the isolation converter/stage limitations or semi-regulation/isolation converter/circuitry limitations (i.e., the bus converter limitations) of the claims at issue as indicated in the table.

Series	Part Numbers	Claims Whose Bus Converter Limitations Are Met
PKM-N	PKM 4202NG PI PKM 4303NF PI PKM 4402NG PI PKM 4402NG PIDP PKM 4502NG PIHSDP PKM 4503NG PIDP	'190: claims 2 and 19 '021: claims 21 and 30 '702: claim 71 PKM 4303NF PI – '083: claim 1 and '702: claim 56
PKB-NG	PKB 4102NH PKB 4302NG	'190: claims 2 and 19 '021: claims 21 and 30 '702: claim 71
PKU-B	PKU 4101B P1 PKU 4104B P1	'034: claim 9
PKB-B	PKB 4201B P1 PKB 4204B P1 PKB 4207LB P1	'034: claim 9
PKM-B / BMR 653	PKM 4204B P1 PKM 4304B PKM 4304B OA BMR 653 31/1 (2 stacked 1/4 bricks) BMR 653 31/45M (2 stacked 1/4 bricks)	'034: claim 9

24. While I understand discovery in this case has not begun, datasheets addressing technical characteristics of the Ericsson products are available on Ericsson's website (*see generally* Ericsson datasheets attached as Exhibits H-T) and I understand that SynQor was able

to obtain samples of the following Ericsson parts: for the PKM-N family, PKM4303NF and PKM4402NG; and, for the PKM-B family, PKM4204B.

25. I conducted testing of these bus converters. Pictures of the samples tested are included in this declaration. I was assisted at various times by a technician and/or engineer, who performed tasks such as soldering and scope capture. References to my testing in this declaration should be understood to include activities conducted under my supervision.

Equipment I used during testing includes but is not limited to:

- (1) Tektronix TDS3054 Oscilloscope
- (1) HP6010A DC Power Supply
- (2) HP6060B System DC electronic loads
- (1) HP34401A Multimeter
- (1) INSTEK PSP 603 DC power supply
- (1) Tektronix P5205 Differential Probe
- (1) Vision Lynx Dynascope
- (1) MBT Pace Solderstation
- Various hand tools and band saw

26. The testing was conducted in my power electronics lab at MIT. Test leads were connected to the samples to capture the input voltage waveforms, output voltage waveforms, primary winding voltage waveforms, gate drive voltage waveforms of the secondary MOSFETs and drain-to-source voltage waveforms of the secondary MOSFETs. Input voltage and appropriate enable/control signals were provided to the samples and loads were set on the outputs. A digital oscilloscope was used to record the results. The results of my testing are included and explained in this declaration.

27. PKM-N Family: Based upon my review of the available evidence, including analysis and testing of PKM4303NF and PKM4402NG samples, the PKM-N family of products meet all the bus converter limitations of at least claims 2 and 19 of the '190 patent, claims 21 and 30 of the '021 patent and claim 71 of the '702 patent. The publicly available information indicates that the PKM4303NF and PKM4402NG are representative of the other part numbers in

this family, and I therefore present my analysis of those two part numbers in detail below. For instance, the datasheets for this family indicate that the bus converters employ either a half-bridge or full-bridge topology and the PKM4303NF is shown to be a half-bridge and the PKM4402NG is shown to be a full-bridge.

28. *PKM4303NF*: As shown by the block diagram below from its datasheet and photographs from my analysis and other evidence, the PKM4303NF is a non-regulating isolation converter/stage that has (1) a primary transformer winding circuit with one primary winding connected to the input voltage pins of the bus converter, two power MOSFET switches on the primary side and a control circuit that controls the duty cycle; (2) a secondary transformer winding circuit with two secondary windings coupled to the primary winding; and (3) at least two controlled rectifiers (the MOSFETs on the secondary side), each with a parallel uncontrolled rectifier (the internal body diodes of the MOSFETs), and each connected to and in series with a secondary winding:

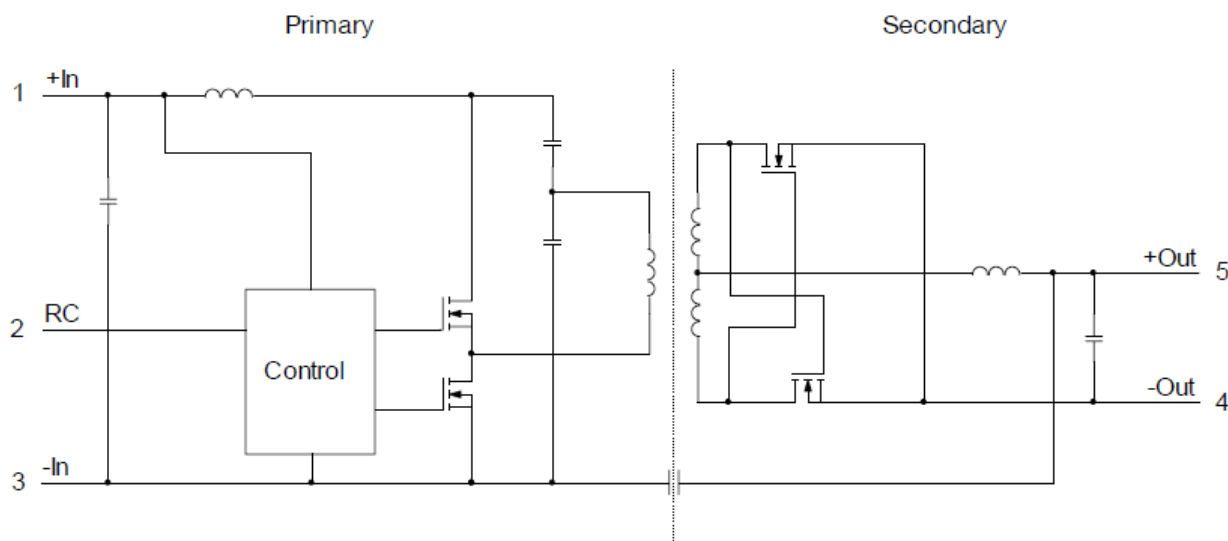
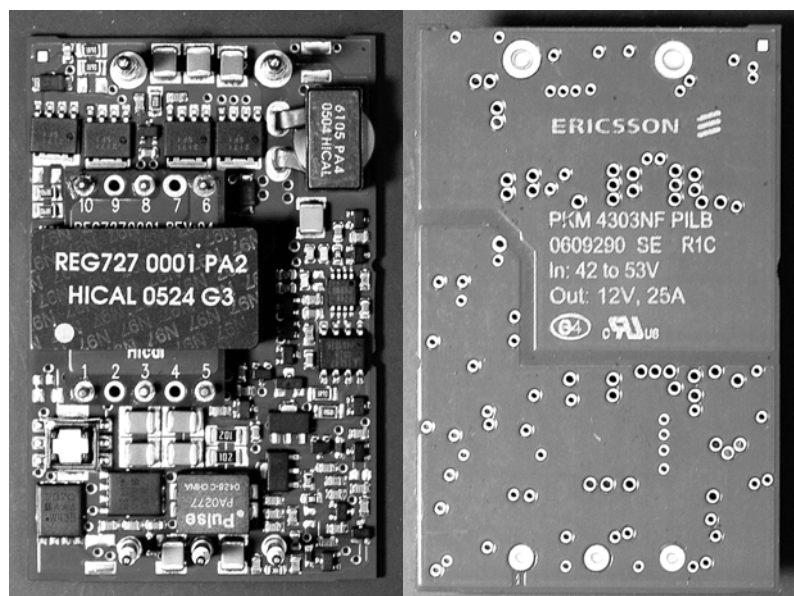
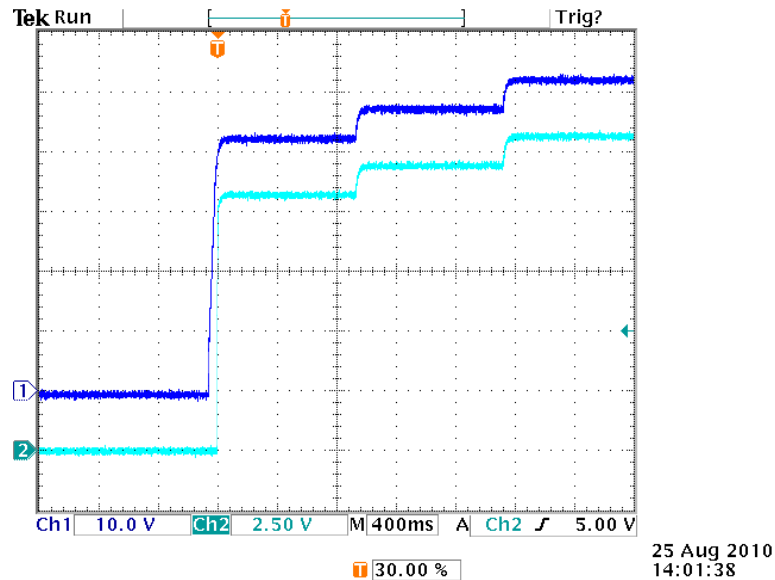


Exhibit I, PKM4303NF Datasheet at 4.

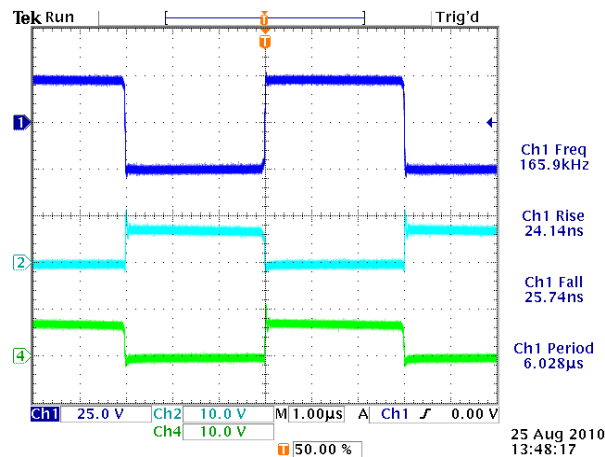


29. The PKM4303NF is isolated as shown by the isolation barrier depicted above and the lack of a path that allows the flow of DC current from the input to the output, and its datasheet's specifications stating it is isolated. Exhibit I, PKM4303NF Datasheet at 1, 4. It is non-regulating/normally non-regulating and steps-down the input voltage as shown by the input voltage ranges (42 to 53 volts DC) and output voltage ranges (9.6 to 13.45 volts DC) in its datasheet, Exhibit I, PKM4303NF Datasheet at 5 ("line regulation": $(V_{imax} - V_{imin})/4$), and the test results below showing the input and output voltages as the input voltage varies from a low to nominal to high value:

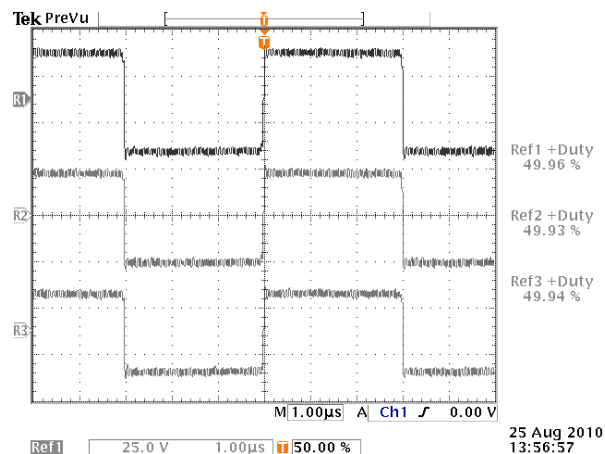


Channel 1 is the input voltage. Channel 2 is the output voltage. As the input voltage varies from a low value near the minimum rated value to the nominal value and then to a high value near the maximum rated value, the output voltage follows proportionally.

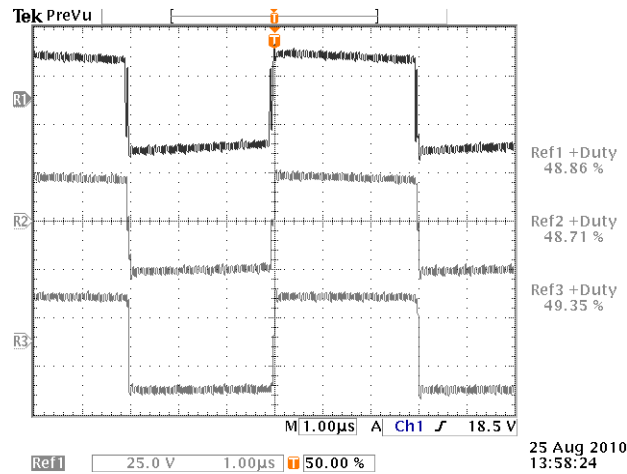
30. The test results below for the PKM4303NF show that: (a) the primary winding has a voltage waveform with a fixed duty cycle and transition times which are short relative to the on-state and off-state times of the controlled rectifiers; (b) the duty cycle causes substantially uninterrupted flow of power through the primary and secondary winding circuits during normal operation; (c) each controlled rectifier is turned on and off in synchronization with the voltage waveform across the primary winding to provide an output; and, (d) the output voltage drops with increasing current flow through the isolation stage:



The test results in the figure above show the waveform of the voltage across the primary winding (Channel 1) for the converter. As can be seen, transition times between the high value and the low value are short compared to the on-state and off-state times of the controlled rectifiers depicted by the gate drive voltages of the controlled rectifiers (Channels 2 and 3). They also show the gate drive waveforms for the controlled rectifiers being turned on and off in synchronization with the voltage waveform across the primary winding to provide the output for the converter.

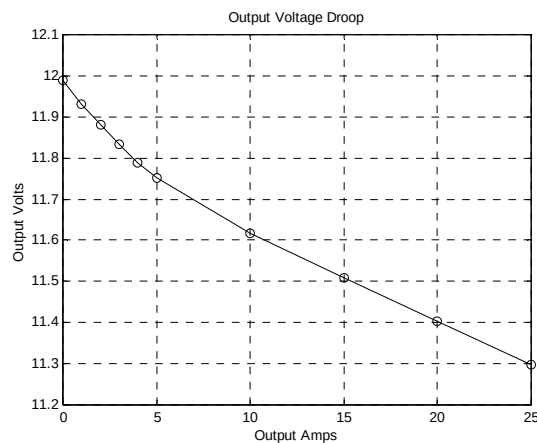


Primary Winding Voltage at 55Vin/0 Iout (top), 48Vin/0 Iout (middle), 36Vin/0 Iout.



Primary Winding Voltage at 100% $I_{out_max}/48V_{in}$ (top), 50% $I_{out_max}/48V_{in}$ (middle), 0% $I_{out_max}/48V_{in}$ (bottom).

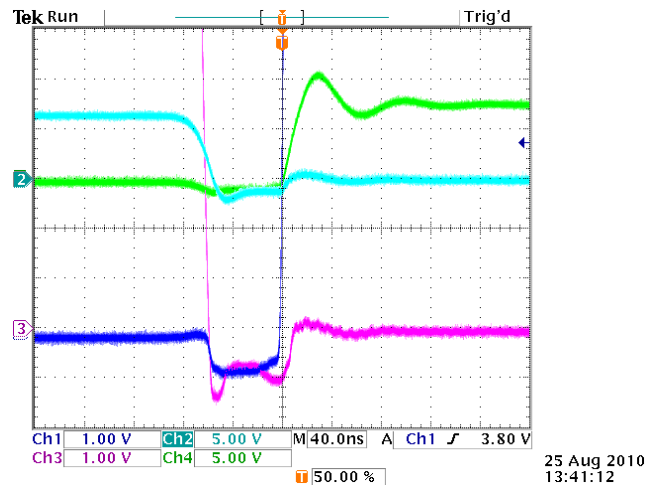
The test results in the two figures above show the voltage waveform of the primary winding for five different combinations of input voltage and output current for the converter. As can be seen, the duty cycle of the voltage waveform across the primary winding is fixed. Furthermore, the transition times and duty cycles shown in the three figures above demonstrate substantially uninterrupted flow of power through the primary and secondary windings.



The test results in the figure above show the output voltage dropping with increasing output current.

31. The topology of the PKM4303NF, a half-bridge topology, is one that is configured not to drive the transformer into saturation.

32. Furthermore, the test results below show that, for the PKM4303NF, there is a short time, during a transition between half-cycles, when both sets of controlled rectifiers are off and their corresponding uncontrolled rectifiers are conducting:



The test results in the figure above show both the drain-source voltages across a first controlled rectifier and its parallel uncontrolled rectifier (channel 1) and a second controlled rectifier and its parallel uncontrolled rectifier (channel 3) and the gate drive voltages across those controlled rectifiers (channels 2 and 4, respectively) during a transition between the portions. The controlled rectifiers and parallel uncontrolled rectifiers are the MOSFETs discussed above with their internal body diodes. As can be seen, there is a short time during the transition when the drain-source voltage for both the first and second MOSFETs is approximately less than – 500 mV, when the uncontrolled rectifiers are conducting, between the portions when one of the drain-source voltages is close to approximately 0 volts, when that MOSFET controlled rectifier is on. Similarly, the gate voltage waveforms show a short time during which the gate voltage of each is below the threshold value of the gate, when both MOSFET controlled rectifiers are off. Thus, at least the PKM4303NF also satisfies all the limitations of claim 1 of the '083 patent and the bus converter limitations of asserted claim 56 of the '702 patent.

33. *PKM4402NG*: As shown by the block diagram below from its datasheet and photographs from my analysis and other evidence, the PKM4402NG is a non-regulating isolation converter/stage that has (1) a primary transformer winding circuit with one primary winding connected to the input voltage pins of the bus converter, four power MOSFET switches on the primary side and a control circuit that controls the duty cycle; (2) a secondary transformer winding circuit with two center-tapped secondary windings coupled to the primary winding; and (3) at least two controlled rectifiers (the MOSFETs on the secondary side), each with a parallel uncontrolled rectifier (the internal body diodes of the MOSFETs), and each connected to and in series with a secondary winding:

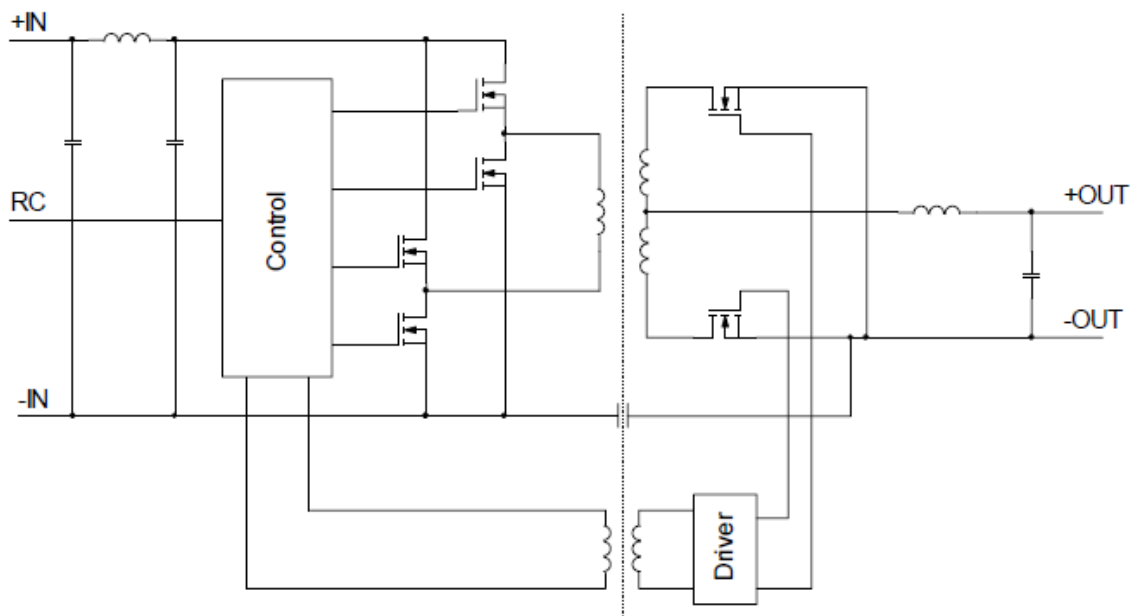
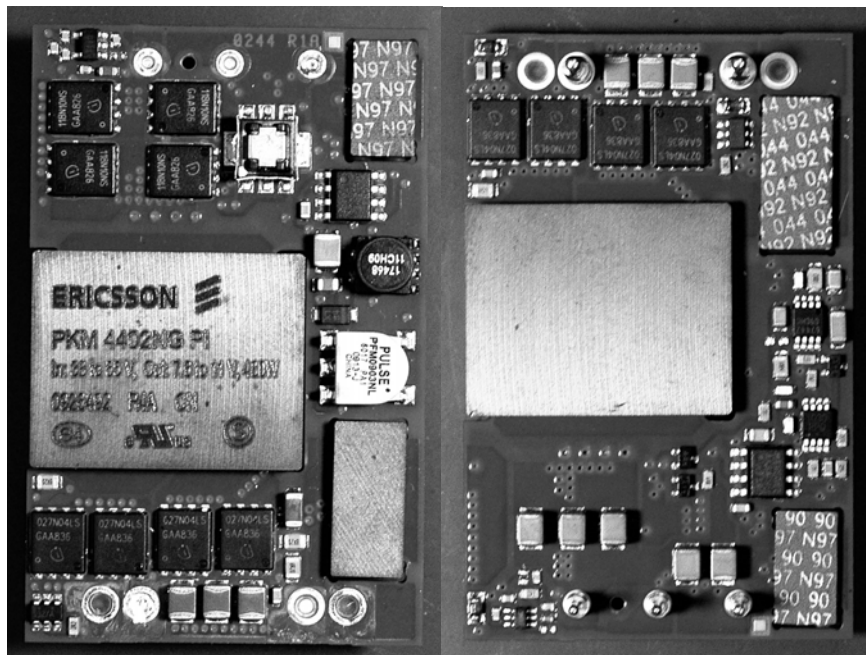
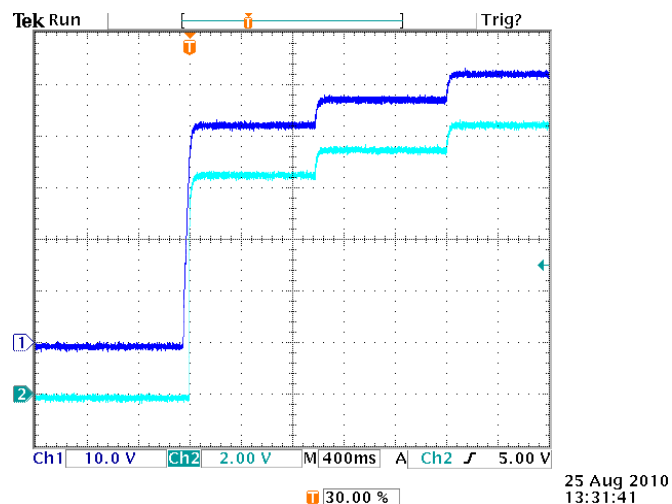


Exhibit J, PKM4402NG Datasheet at 4.

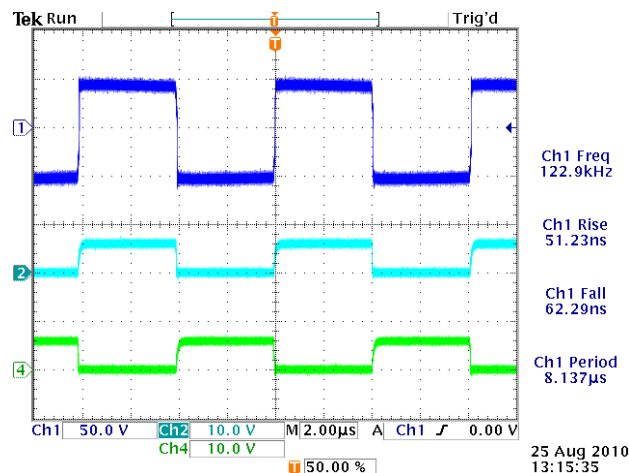


34. The PKM4402NG is isolated as shown by the isolation barrier depicted above and the lack of a path that allows the flow of DC current from the input to the output, and its datasheet's specifications stating it is isolated. Exhibit J, PKM4402NG Datasheet at 1, 4. It is non-regulating/normally non-regulating and steps-down the input voltage as shown by the input voltage ranges (38 to 55 volts DC) and output voltage ranges (7.08 to 11.10 volts DC) in its datasheet, Exhibit J, PKM4402NG Datasheet at 5, and the test results below showing the input and output voltages as the input voltage varies from a low to nominal to high value:

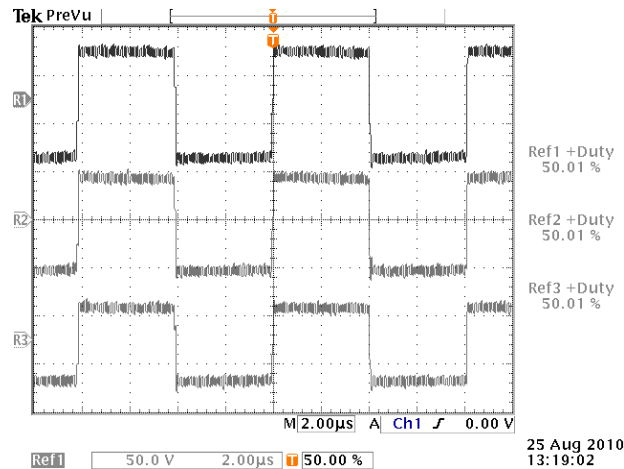


Channel 1 is the input voltage. Channel 2 is the output voltage. As the input voltage varies from a low value near the minimum rated value to the nominal value and then to a high value near the maximum rated value, the output voltage follows proportionally.

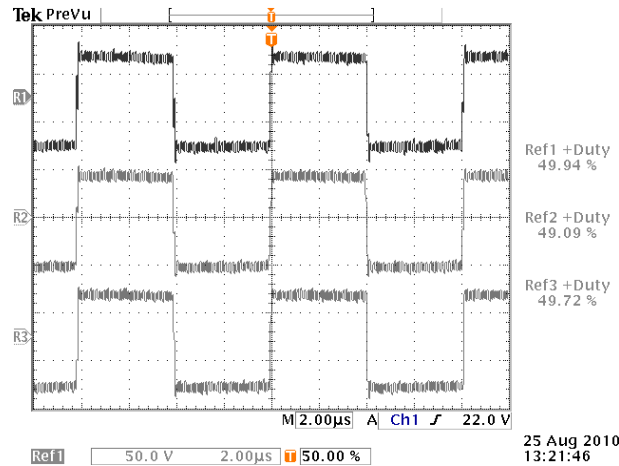
35. The test results below for the PKM4402NG show that: (a) the primary winding has a voltage waveform with a fixed duty cycle and transition times which are short relative to the on-state and off-state times of the controlled rectifiers; (b) the duty cycle causes substantially uninterrupted flow of power through the primary and secondary winding circuits during normal operation; (c) each controlled rectifier is turned on and off in synchronization with the voltage waveform across the primary winding to provide an output; and, (d) the output voltage drops with increasing current flow through the isolation stage:



The test results in the figure above show the waveform of the voltage across the primary winding (Channel 1) for the converter. As can be seen, transition times between the high value and the low value are short compared to the on-state and off-state times of the controlled rectifiers depicted by the gate drive voltages of the controlled rectifiers (Channels 2 and 3). They also show the gate drive waveforms for the controlled rectifiers being turned on and off in synchronization with the voltage waveform across the primary winding to provide the output for the converter.

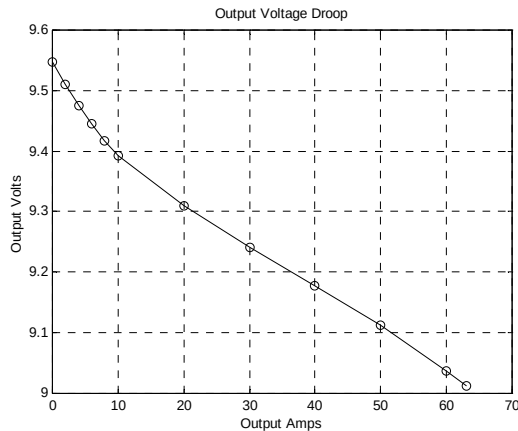


Primary Winding Voltage at 55Vin/0 Iout (top), 48Vin/0 Iout (middle), 36Vin/0 Iout.



Primary Winding Voltage at 100% Iout_max/48Vin (top), 50% Iout_max/48Vin (middle), 0% Iout_max/48Vin (bottom).

The test results in the two figures above show the voltage waveform of the primary winding for five different combinations of input voltage and output current for the converter. As can be seen, the duty cycle of the voltage waveform across the primary winding is fixed. Furthermore, the transition times and duty cycles shown in the three figures above demonstrate substantially uninterrupted flow of power through the primary and secondary windings.



The test results in the figure above show the output voltage dropping with increasing output current.

36. The topology of the PKM4402NG, a full-bridge topology, is one that is configured not to drive the transformer into saturation.

37. PKB-NG Family: Based upon my review of the available evidence, the PKB-NG family of products meet all the bus converter limitations of claims 2 and 19 of the '190 patent, claims 21 and 30 of the '021 patent and claim 71 of the '702 patent. The publicly available information indicates that the PKB 4302NG is representative of the other part numbers in this family, and I therefore present my analysis of that part number in detail below.

38. *PKB 4302NG*: As shown by the block diagram below from its datasheet and other evidence, the PKB 4302NG is a non-regulating isolation converter/stage that has (1) a primary transformer winding circuit with one primary winding connected to the input voltage pins of the bus converter, four power MOSFET switches on the primary side and a control circuit that controls the duty cycle; (2) a secondary transformer winding circuit with two center-tapped secondary windings coupled to the primary winding; and (3) at least two controlled rectifiers (the MOSFETs on the secondary side), each with a parallel uncontrolled rectifier (the internal body diodes of the MOSFETs), and each connected to and in series with a secondary winding:

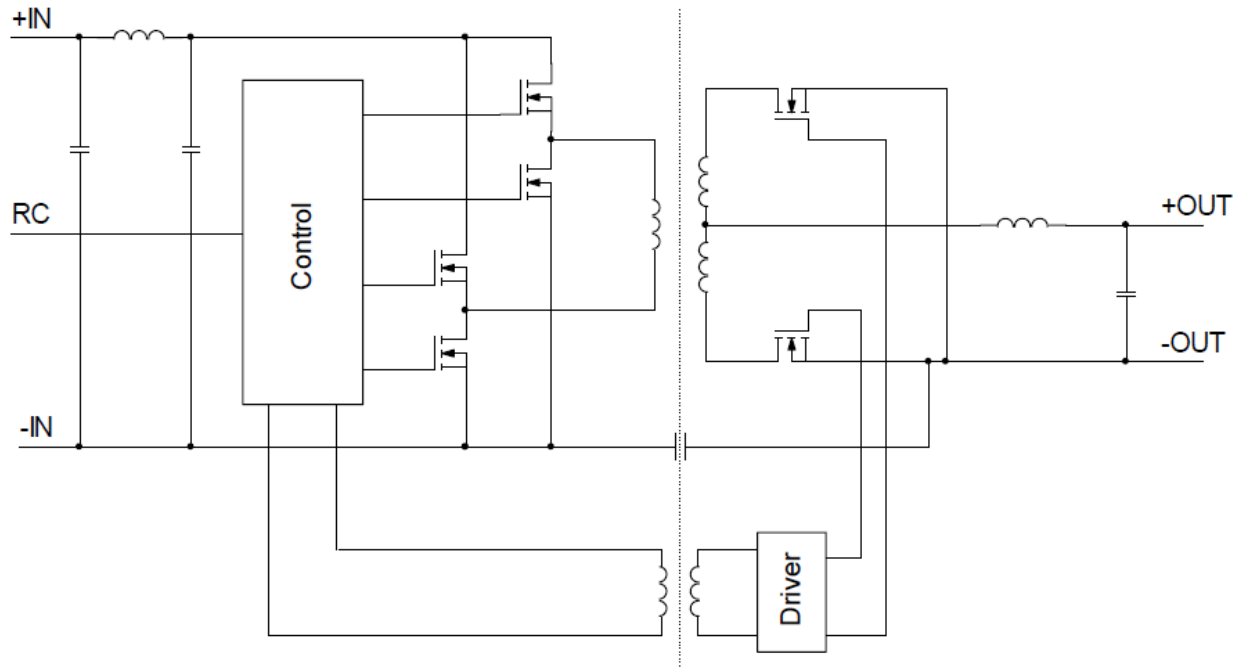


Exhibit O, PKB 4302NG Datasheet at 4.

39. The PKB 4302NG is isolated as shown by the isolation barrier depicted above and the lack of a path that allows the flow of DC current from the input to the output, and its datasheet's specifications stating it is isolated. Exhibit O, PKB 4302NG Datasheet at 1, 4. It is non-regulating/normally non-regulating and steps-down the input voltage as shown by the input voltage ranges (38 to 55 volts DC) and output voltage ranges (7.2 to 11.0 volts DC) in its datasheet, Exhibit O, PKB 4302NG Datasheet at 5 (" $V_O = V_I/5$ – load regulation").

40. While a sample of the PKB 4302NG is unavailable, the similarities between the tested PKM4402NG and the PKB 4302NG (specifically the illustrated topology and various technical characteristics in the datasheets) lead me to conclude that the test results above for the PKM4402NG are representative of the likely waveforms in the PKB 4302NG and, for the same reasons discussed above, show that, in the PKB 4302NG: (a) the primary winding has a voltage waveform with a fixed duty cycle and transition times which are short relative to the on-state and

off-state times of the controlled rectifiers; (b) the duty cycle causes substantially uninterrupted flow of power through the primary and secondary winding circuits during normal operation; (c) each controlled rectifier is turned on and off in synchronization with the voltage waveform across the primary winding to provide an output; and, (d) the output voltage drops with increasing current flow through the isolation stage.

41. The topology of the PKB 4302NG, a full-bridge topology, is one that is configured not to drive the transformer into saturation.

42. PKU-B Family: Based upon my review of the available evidence, the PKU-B family of products meet all the bus converter limitations of asserted claim 9 of the '034 patent. The publicly available information indicates that the PKU 4104B PI is representative of the other part numbers in this family, and I therefore present my analysis of that part number in detail below.

43. *PKU 4104B PI*: As shown by the block diagram below from its datasheet and other evidence, the PKU 4104B PI is a semi-regulating isolating converter that has: (1) a primary transformer winding circuit with one primary winding; (2) two power MOSFET switches on the primary side; (3) a control circuit that senses a voltage in the primary transformer winding circuit (the input voltage) without sensing the isolated output voltage to control the duty cycle of the power MOSFETs; (4) a secondary transformer winding circuit with two secondary windings coupled to the primary winding; and, (5) plural controlled rectifiers (the two MOSFETs on the secondary side), each with a parallel uncontrolled rectifier (the internal body diodes of the MOSFETs):

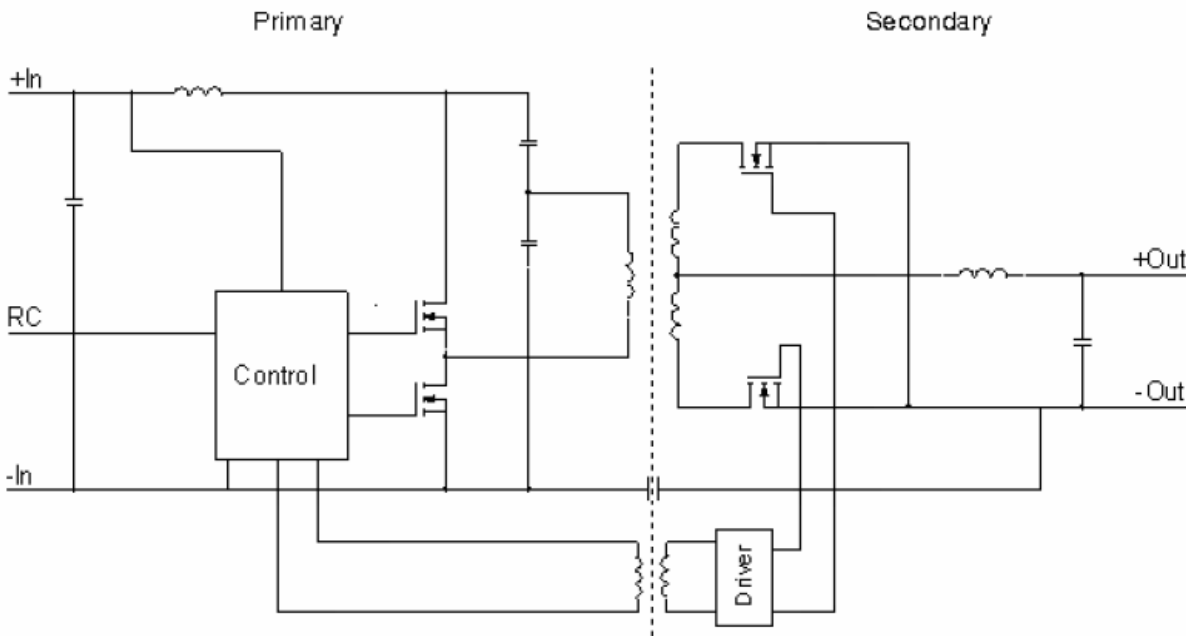


Exhibit P, PKU 4104B PI Datasheet at 1, 4.

44. The PKU 4104B PI is isolated as shown by the isolation barrier depicted above and the lack of a path that allows the flow of DC current from the input to the output, and its datasheet's specifications stating it is isolated. Exhibit P, PKU 4104B PI Datasheet at 1, 4. It is semi-regulating as shown by the output voltage range in its datasheet and the lack of a feedback control signal for the power MOSFETs provided from the secondary to the primary. Exhibit P, PKU 4104B PI Datasheet at 4, 8. *Compare* Exhibit U, PKM4000D Datasheet at 4 (depicting feedback from secondary in PKM4000D model).

45. The graph from the datasheet for the PKU 4104B below shows that the output voltage drops due to impedance of an output path, including for instance the MOSFET controlled rectifiers and output filter inductor:

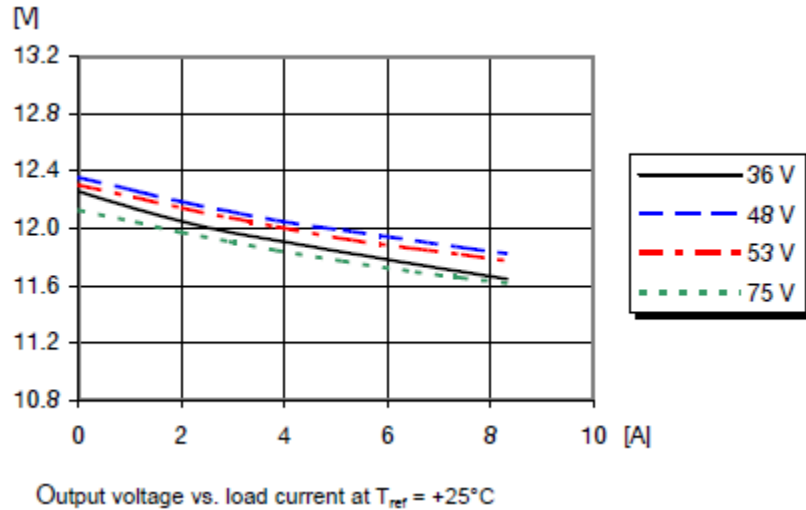


Exhibit P, PKU 4104B PI Datasheet at 9.

46. The nominal output voltage is 12 volts, and droops to 11 volts with increasing current and the corresponding drop due to impedances in the output path. Exhibit P, PKU 4104B PI Datasheet at 5.

47. PKB-B Family: Based upon my review of the available evidence, the PKB-B family of products meet all the bus converter limitations of asserted claim 9 of the '034 patent. The publicly available information indicates that the PKB 4204B PI is representative of the other part numbers in this family, and I therefore present my analysis of that part number in detail below.

48. *PKB 4204B PI*: As shown by the block diagram below from its datasheet and other evidence, the PKB 4204B PI is a semi-regulating isolating converter that has: (1) a primary transformer winding circuit with one primary winding; (2) four power MOSFET switches on the primary side; (3) a control circuit that senses a voltage in the primary transformer winding circuit (the input voltage) without sensing the isolated output voltage to control the duty cycle of the

power MOSFETs;¹ (4) a secondary transformer winding circuit with two secondary windings coupled to the primary winding; and, (5) plural controlled rectifiers (the two MOSFETs on the secondary side), each with a parallel uncontrolled rectifier (the internal body diodes of the MOSFETs):

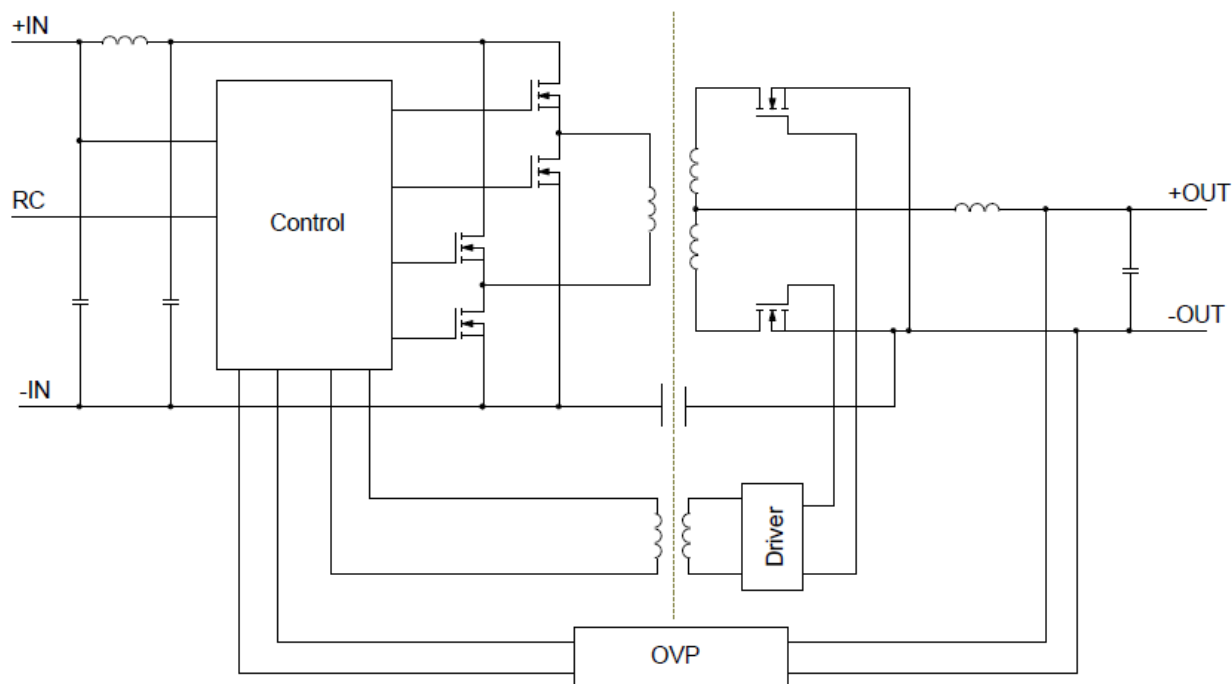


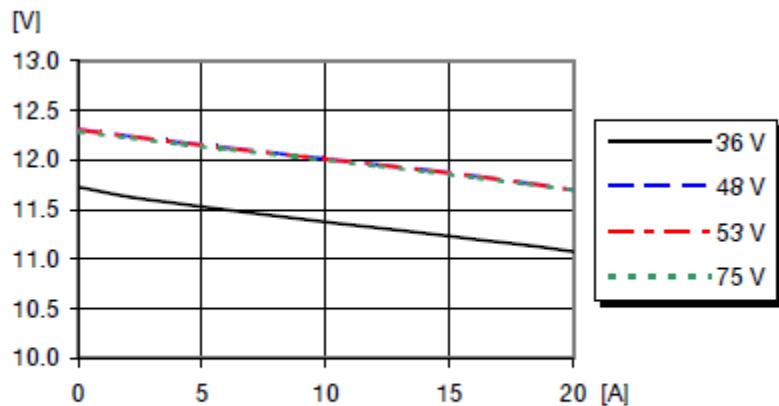
Exhibit Q, PKB 4204B PI Datasheet at 1, 4.

49. The PKB 4204B PI is isolated as shown by the isolation barrier depicted above and the lack of a path that allows the flow of DC current from the input to the output, and its datasheet's specifications stating it is isolated. Exhibit Q, PKB 4204B PI Datasheet at 1, 4. It is semi-regulating as shown by the output voltage range in its datasheet and the lack of a feedback control signal for the power MOSFETs provided from the secondary to the primary. Exhibit Q,

¹ I note that it appears to have an overvoltage protection circuit that bridges the isolation barrier, but not a feedback control signal that bridges the isolation barrier to vary the duty cycle of the primary MOSFETs to control the output voltage to a setpoint / predefined value.

PKB 4204B PI Datasheet at 4, 8. *Compare* Exhibit U, PKM4000D Datasheet at 4 (depicting feedback from secondary in PKM4000D model).

50. The graph from the datasheet for the PKB 4204B PI below shows that the output voltage drops due to impedance of an output path, including for instance the MOSFET controlled rectifiers and output filter inductor:



Output voltage vs. load current at $T_{ref} = +25\text{ }^{\circ}\text{C}$

Exhibit Q, PKB 4204B PI Datasheet at 9.

51. The nominal output voltage is 12 volts, and droops to 11.1 volts with increasing current and the corresponding drop due to impedances in the output path. Exhibit Q, PKB 4204B PI Datasheet at 8.

52. PKM-B / BMR 653 Family: Based upon my review of the available evidence, including analysis and testing of a PKM4204B sample, the PKM-B / BMR 653 family of products meet all the bus converter limitations of asserted claim 9 of the '034 patent. The publicly available information indicates that the PKM4204B is representative of the other part numbers in this family, and I therefore present my analysis of that part number in detail below.

53. *PKM4204B*: As shown by the block diagram below from its datasheet, photographs from my analysis and other evidence, the PKM4204B is a semi-regulating isolating

converter that has: (1) a primary transformer winding circuit with one primary winding; (2) four power MOSFET switches on the primary side; (3) a control circuit that senses a voltage in the primary transformer winding circuit (the input voltage) without sensing the isolated output voltage to control the duty cycle of the power MOSFETs; (4) a secondary transformer winding circuit with two secondary windings coupled to the primary winding; and, (5) plural controlled rectifiers (the two MOSFETs on the secondary side), each with a parallel uncontrolled rectifier (the internal body diodes of the MOSFETs):

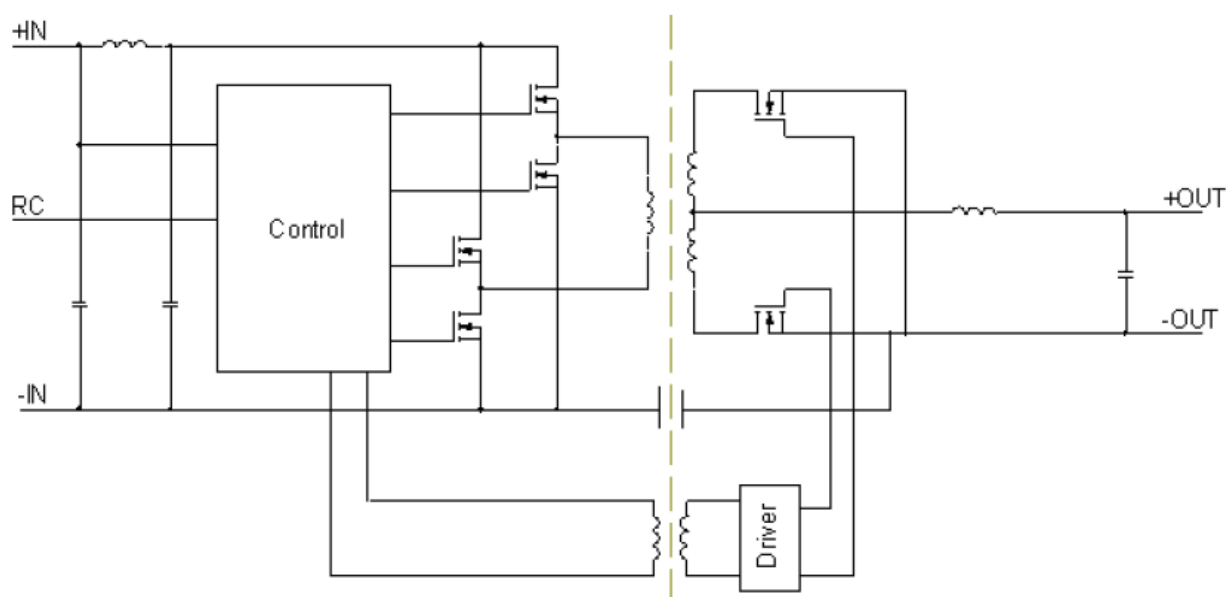
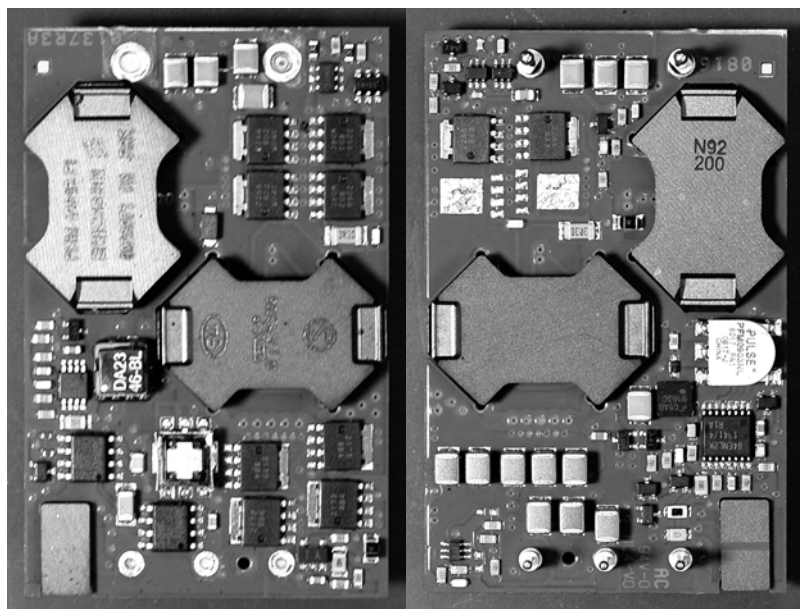
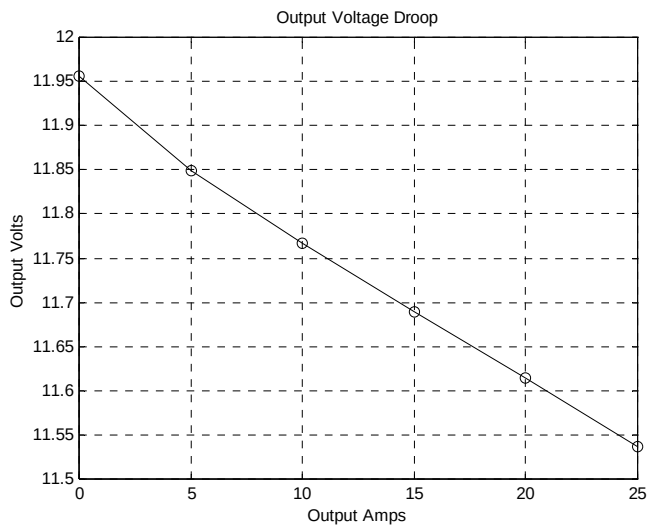


Exhibit R, PKM4204B Datasheet at 1, 4.



54. The PKM4204B is isolated as shown by the isolation barrier depicted above and the lack of a path that allows the flow of DC current from the input to the output, and its datasheet's specifications stating it is isolated. Exhibit R, PKM4204B Datasheet at 1, 4. It is semi-regulating as shown by the output voltage range in its datasheet and the lack of a feedback control signal for the power MOSFETs provided from the secondary to the primary. Exhibit R, PKM4204B Datasheet at 4. Compare Exhibit U, PKM4000D Datasheet at 4 (depicting feedback from secondary in PKM4000D model).

55. The test results below show that the output voltage of the PKM4204B drops due to impedance of an output path, including for instance the MOSFET controlled rectifiers and output filter inductor:



See also Exhibit R, PKM4204B Datasheet at 6.

56. The nominal output voltage is 11.9 volts, and droops to 11 volts with increasing current and the corresponding drop due to impedances in the output path. Exhibit R, PKM4204B Datasheet at 5.

2. Vicor

57. Below is a table listing Vicor's unregulated bus converters currently advertised for sale on its website. Based upon the available evidence, these products meet the isolation converter/stage limitations (i.e., the bus converter limitations) of the claims at issue as indicated in the table.

Series	Part Numbers	Claims Whose Bus Converter Limitations Are Met
VI Chip BCM Bus Converter	B048F080T24 B048F096T24 B048F120T30 BCM48BH120T120A00	'190: claims 2 and 19 '021: claims 21 and 30 '702: claim 71
VI Brick BCM Bus Converter	BC048A080T024FP BC048A096T024FP BC048A120T030FP	'190: claims 2 and 19 '021: claims 21 and 30 '702: claim 71
VI Brick IBC Module	IB048E096T40N1-00 IB048E096T48N1-00 IB048E120T40N1-00	'190: claims 2 and 19 '021: claims 21 and 30 '702: claim 71

58. Datasheets for the Vicor products are available on Vicor's website (*see generally* Vicor datasheets attached as Exhibits V-EE) and I understand that SynQor was able to obtain samples of the following Vicor part: B048F120T30. One of Vicor's patents, U.S. Patent No. 7,145,786 ("the '786 patent") (Exhibit FF), describing (according to the Vicor products' datasheets) the topologies used in the Vicor unregulated bus converters, is also publicly available. A white paper (Exhibit GG) about the Vicor products is also available on Vicor's website.

59. Based upon my review of the publicly available evidence, including analysis and testing of B048F120T30 samples obtained by SynQor, all of the Vicor unregulated bus converters meet all of the isolation converter/stage limitations of at least claims 2 and 19 of the '190 patent, claims 21 and 30 of the '021 patent and claim 71 of the '702 patent. The publicly available information indicates that the Vicor unregulated bus converters, including their datasheets, all employ a version of what Vicor calls the Sine Amplitude Converter ("SAC") technology disclosed in the '786 patent. The B048F120T30 sample indicates that those products employ a full bridge version of the SAC technology disclosed in the '786 patent. The BCM48BH120T120A00 datasheet indicates that those products employ a half-bridge version of

the SAC technology disclosed in the '786 patent.² See generally Vicor datasheets attached as Exhibits V-EE. See also Exhibit HH, Vicor Press Release re: VI Brick IBC Module (indicating using same technology). I therefore present my analysis of the B048F120T30 product and its SAC technology in detail below as representative of all the Vicor unregulated bus converters.

60. *B048F120T30*: I have reviewed the disclosure of the '786 patent (that discloses the SAC technology the Vicor datasheets identify as the topology of the products), the datasheets for the products, a Vicor white paper for the products, a Vicor press release for the products and samples obtained by SynQor of the B048F120T30 products, one of which was etched by an independent laboratory (Analytical Answers, Inc. in Woburn, MA.) to remove the encapsulant and used to determine attachment points for leads to measure voltage waveforms across the primary windings and the gate-source voltage of the MOSFET rectifiers in another of the samples that were then connected by removing the encapsulant at the appropriate points of that sample. I understand engineers for SynQor performed those lead attachments at SynQor's facilities. I examined the etched sample, and the other available evidence, and confirmed the lead attachments on the sample I tested. I conducted testing of the sample consistent with the procedures and equipment described above for the Ericsson bus converters.

61. As shown by figures 9 and 12 of the '786 patent, photographs from my analysis of the B048F120T30, the datasheet for the BCM48BH120T120A00 and other evidence, the B048F120T30 and other Vicor unregulated bus converters are non-regulating isolation converters/stages that have (1) a primary transformer winding circuit with at least one primary winding connected to the input voltage pins of the bus converter (for instance, the B048F120T30 has two power transformers, each with a primary winding), power MOSFET switches (for

² The BCM48BH120T120A00 products used to be called the VIB0101THJ products. Exhibit Y, BCM48BH120T120A00 datasheet at 1.

instance, the B048F120T30 sample has four and the BCM48BH120T120A00 datasheet shows two) on the primary side and a control circuit that controls the duty cycle; (2) a secondary transformer winding circuit with two secondary windings coupled to the primary winding; and (3) at least two controlled rectifiers (MOSFETs are on the secondary side rather than the depicted diodes in figures 9 and 12; for instance, the B048F120T30 has eight MOSFETs), each with a parallel uncontrolled rectifier (the internal body diodes of the MOSFETs), and each connected to and in series with a secondary winding:

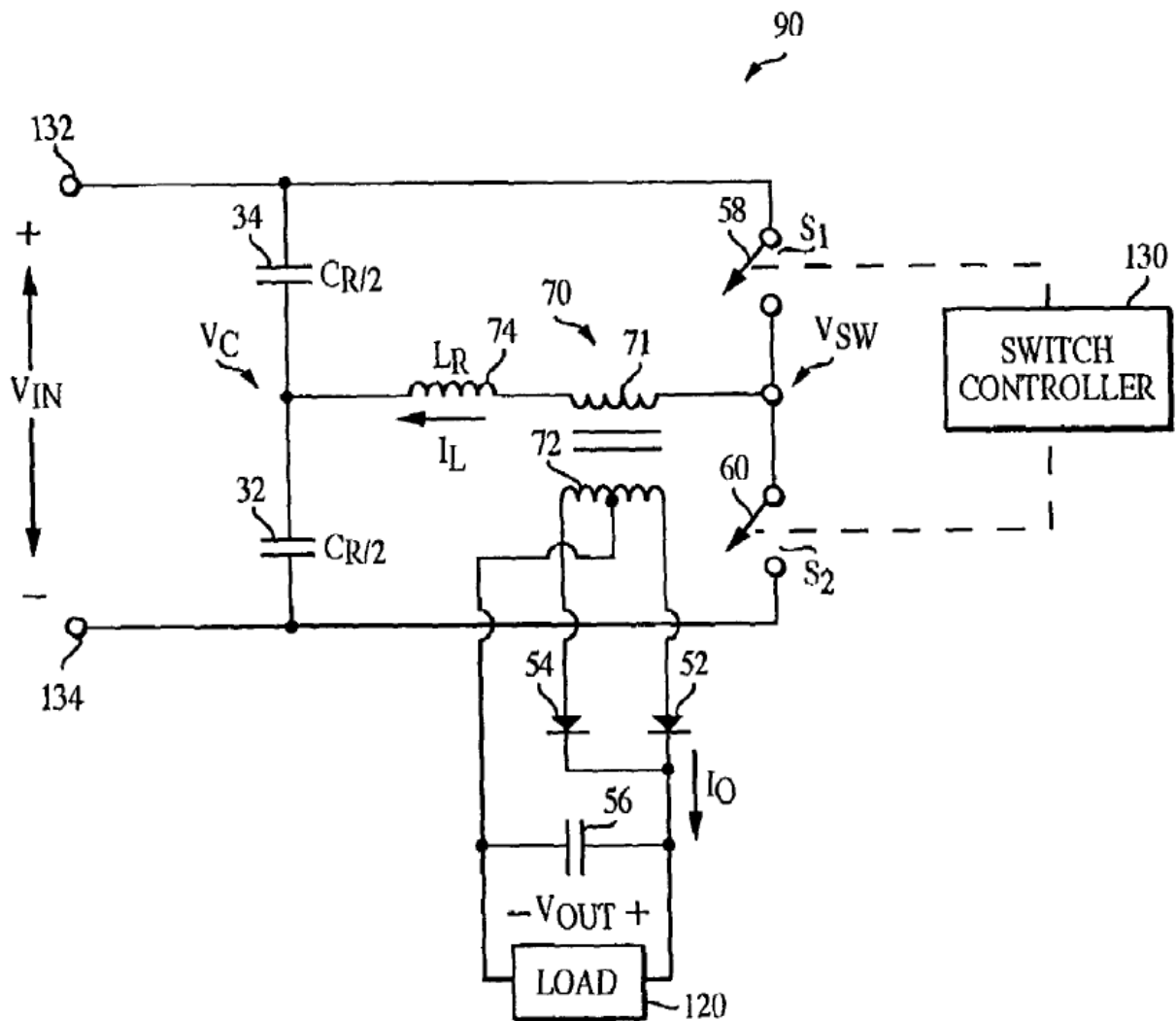


FIG. 9

Exhibit FF, '786 Patent at Figure 9.

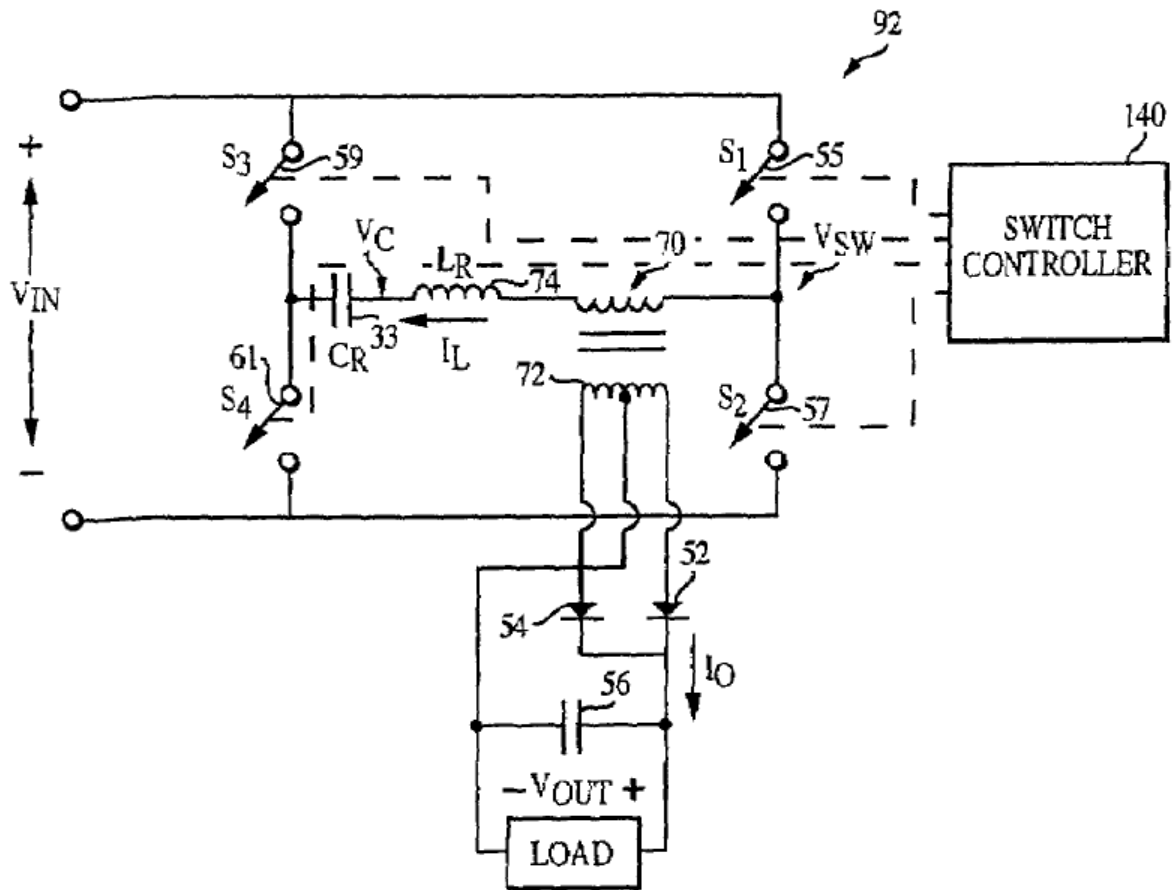


FIG. 12

Exhibit FF, '786 Patent at Figure 12.

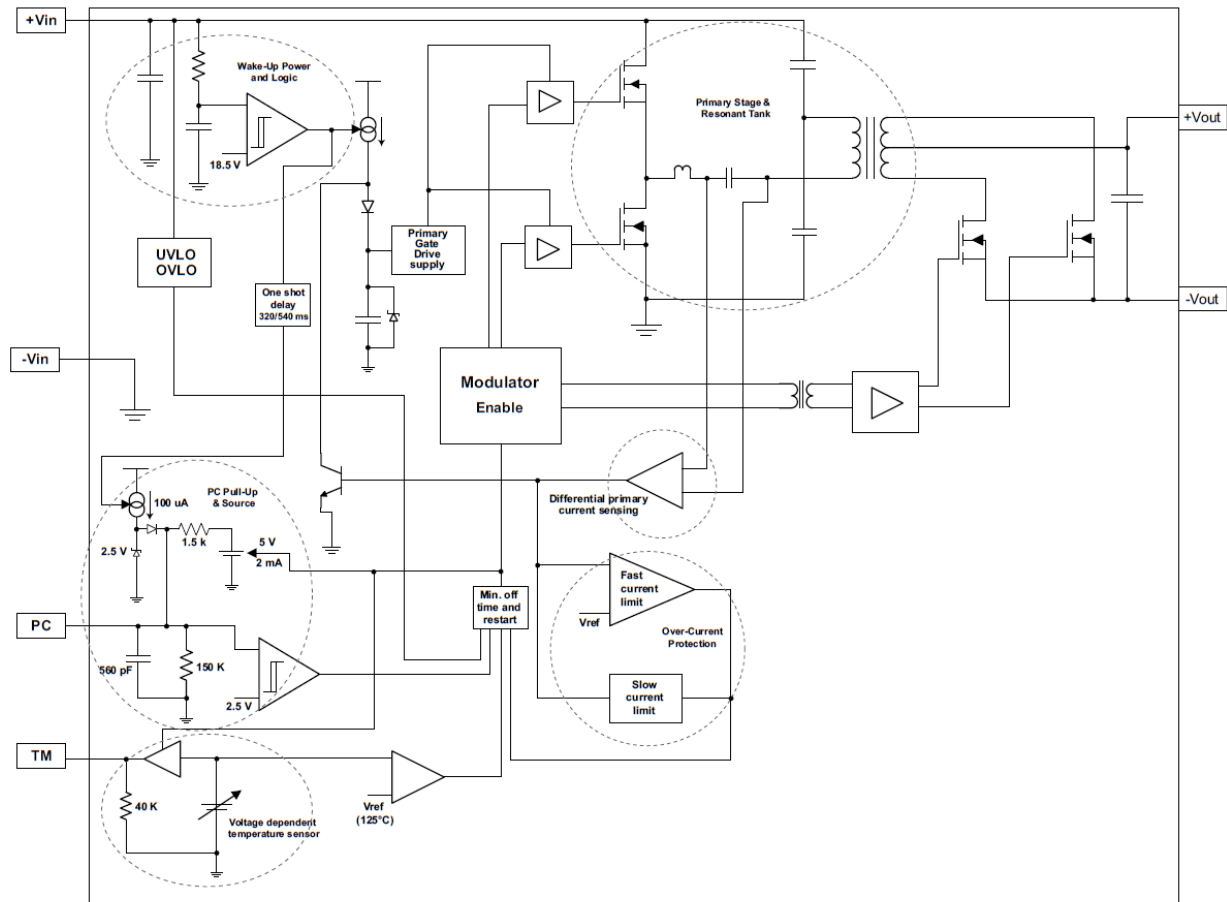
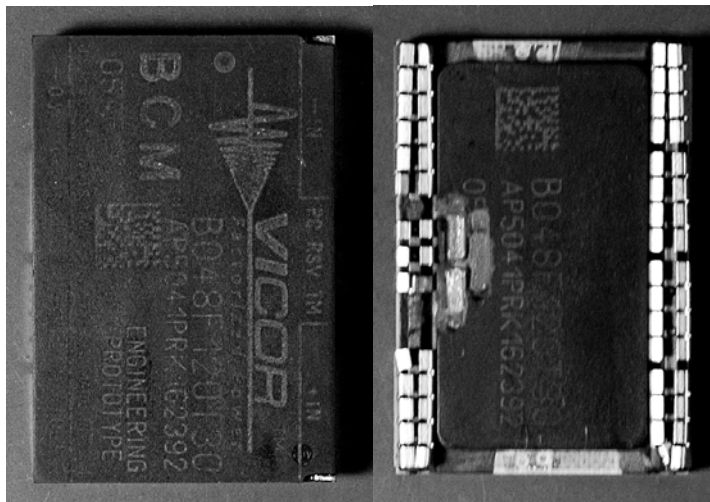
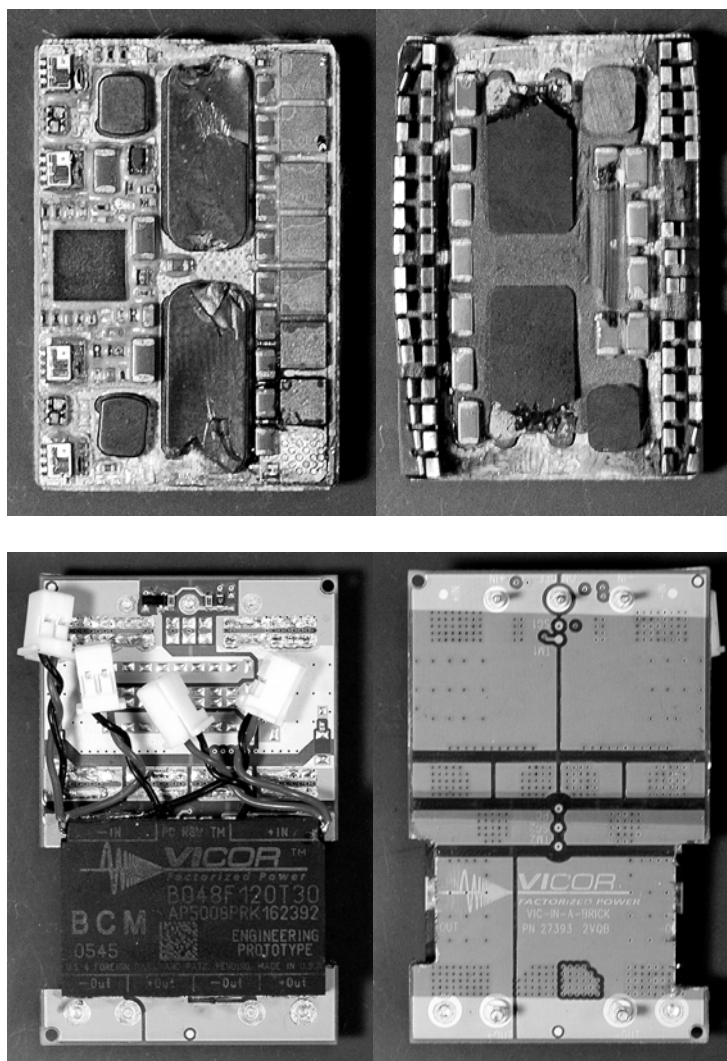


Exhibit Y, BCM48BH120T120A00 Datasheet at 15.

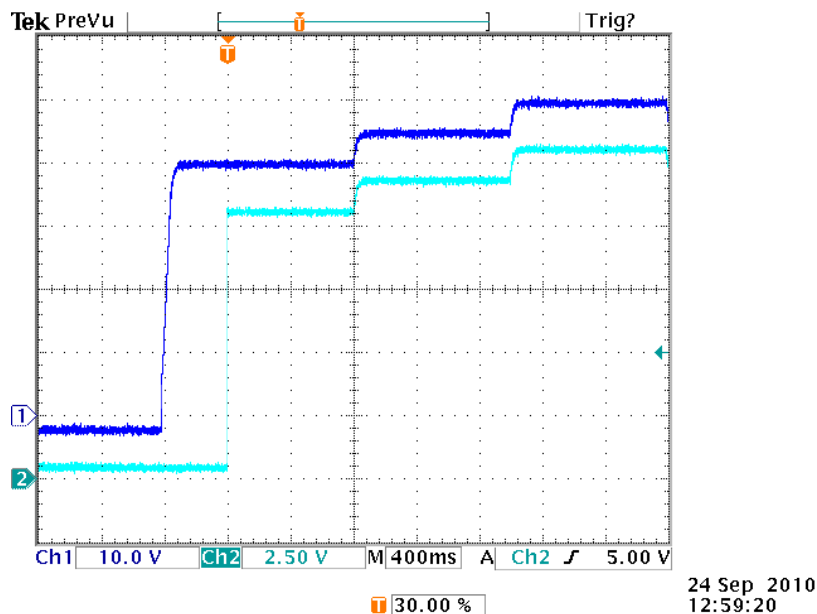




See also Exhibit II, GWS12N30 Datasheet (apparent secondary side MOSFET datasheet).

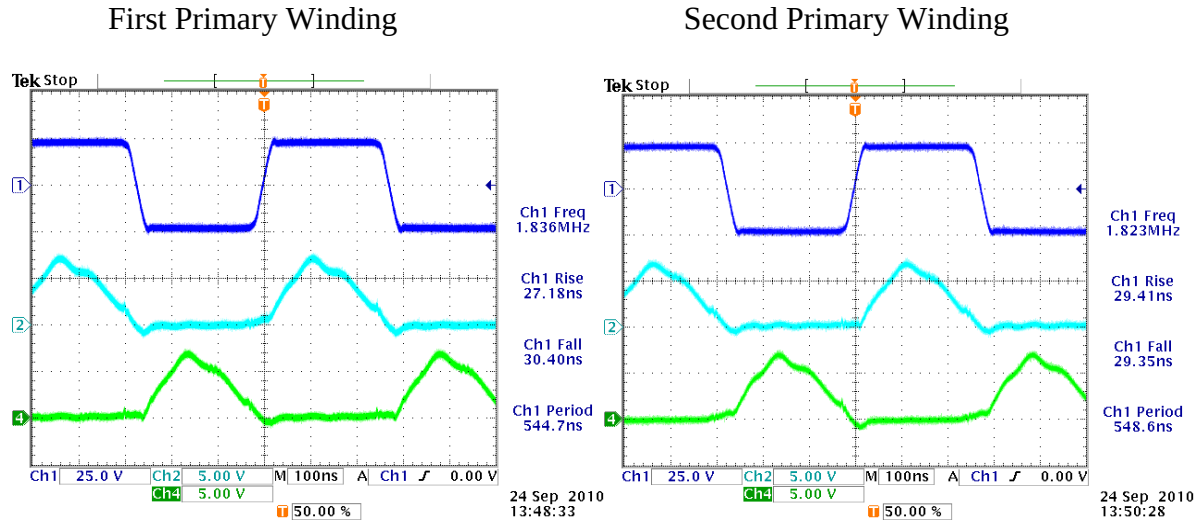
62. The B048F120T30 and other Vicor unregulated bus converters are isolated as shown, for instance, by the isolation barrier depicted above and the lack of a path that allows the flow of DC current from the input to the output, and their datasheets' specifications stating they are isolated. Exhibit X, B048F120T30 datasheet at 1. They are non-regulating/normally non-regulating and step-down the input voltage as shown by the input voltage ranges (e.g., 38 to 55 volts DC) and output voltage ranges (e.g., 9.5 to 13.8 volts DC at no load) in their datasheets, as well the Vicor white paper, Exhibit GG, Vicor White Paper at 1; Exhibit X, B048F120T30

datasheet at 1-3, and the test results below for the B048F120T30 showing the input and output voltages as the input voltage varies from a low to nominal to high value:



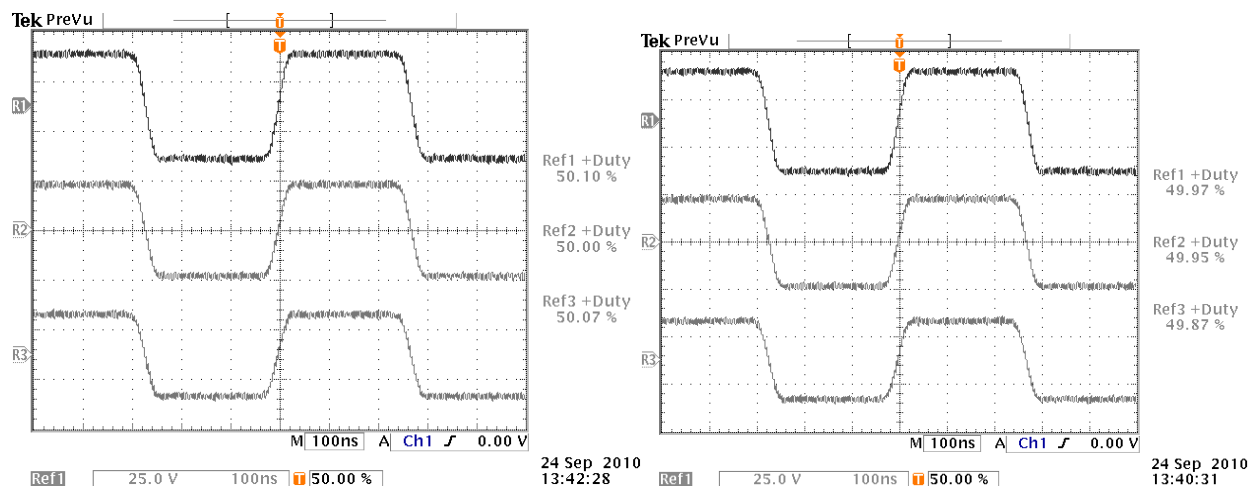
Channel 1 is the input voltage. Channel 2 is the output voltage. As the input voltage varies from a low value near the minimum rated value to the nominal value to a high value near the maximum rated value, the output voltage follows proportionally.

63. The test results below for the B048F120T30, along with the disclosures of the ‘786 patent (including the waveforms of figure 10), show that, for the Vicor unregulated bus converters (while these are test results of the B048F120T30, the publicly available evidence suggests they should be representative of at least the other Vicor unregulated bus converters): (a) the primary windings have a voltage waveform with a fixed duty cycle and transition times which are short relative to the on-state and off-state times of the controlled rectifiers; (b) the duty cycle causes substantially uninterrupted flow of power through the primary and secondary winding circuits during normal operation; (c) each controlled rectifier is turned on and off in synchronization with the voltage waveform across the primary winding to provide an output; and, (d) the output voltage drops with increasing current flow through the isolation stage:

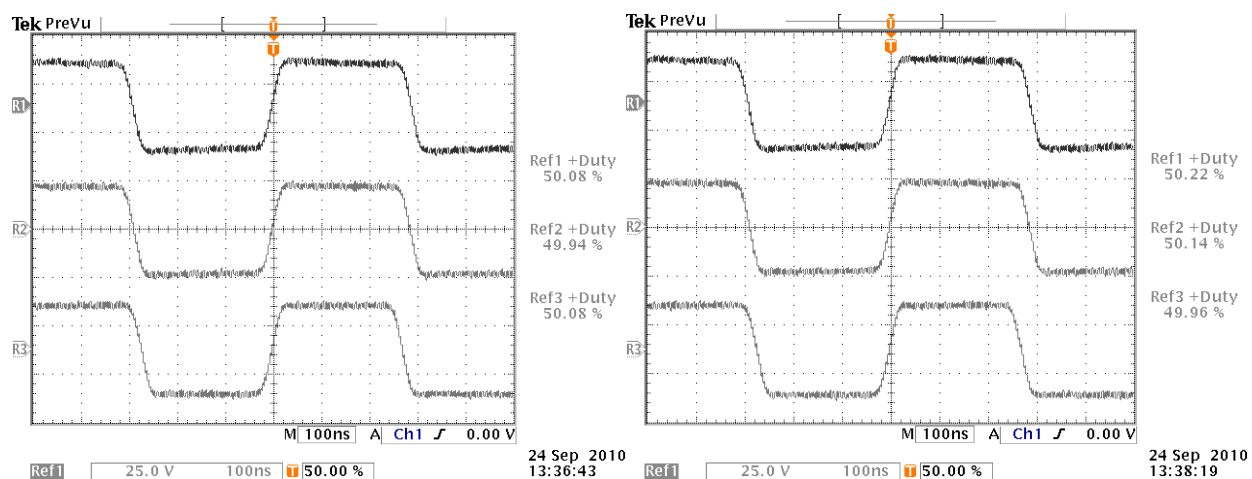


(Top traces: Primary voltage. Middle traces: Controlled rectifier gate drive. Bottom traces: Alternate controlled rectifier gate drive.)

The test results in the figures above show the waveforms of the voltages across the primary windings (Channel 1) for the converter. As can be seen, transition times between the high value and the low value are short compared to the on-state and off-state times of the controlled rectifiers depicted by the gate drive voltages of the controlled rectifiers (Channels 2 and 3). They also show the gate drive waveforms for the controlled rectifiers being turned on and off in synchronization with the voltage waveform across the primary winding to provide the output for the converter. See also Exhibit II GWS12N30 Datasheet at 2 (datasheet for apparent MOSFET rectifiers showing threshold voltages of 1.3 to 1.9 volts). For instance, as illustrated above, the change in polarity of the voltage on the primary windings at the end of each half-cycle is accomplished in short transition times. Moreover, to the extent there are any differences as compared to the claim elements, they are insubstantial.

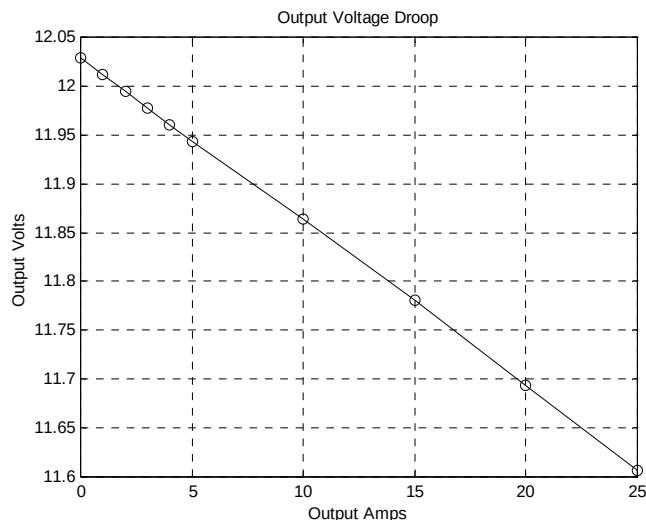


(Primary voltages, from top to bottom: high, nominal and low input voltages at zero output current)



(Primary voltages, from top to bottom: full, 50% and zero output current at nominal input voltage)

The test results in the figures above show the voltage waveform of each of the primary windings for five different combinations of input voltage and output current for the converter. As can be seen, the duty cycle of the voltage waveform across the primary windings is fixed. Furthermore, the transition times and duty cycles shown in the six figures above demonstrate substantially uninterrupted flow of power through the primary and secondary windings.



The test results in the figure above show the output voltage dropping with increasing output current.

64. The topology of the B048F120T30 and other Vicor unregulated bus converters, Vicor's SAC topology, is one that is configured not to drive the power transformers into saturation.

G. Inducement of Infringement by Ericsson and Vicor and Direct Infringement By Cisco

65. Each of the claims at issue of the '190, 021, '702 and '034 patents is directed to unregulated or semi-regulated IBA systems utilizing components with certain characteristics. I explained above how Ericsson's and Vicor's unregulated and semi-regulated bus converters meet the corresponding bus converter limitations of the claims at issue. Below I explain how Ericsson and Vicor encourage and/or promote the use of their unregulated and semi-regulated bus converters in the unregulated or semi-regulated IBA systems of the claims at issue, and how Cisco does in fact use Ericsson's and Vicor's unregulated and semi-regulated bus converters in the unregulated and semi-regulated IBA systems of the claims at issue.

1. Ericsson's and Vicor's Datasheets, Articles and Other Marketing Efforts Teach and Encourage Direct Infringement

66. Ericsson and Vicor instruct and encourage their customers to use their unregulated and semi-regulated bus converters in ways that infringe the claims of SynQor's asserted patents, illustrated by, for instance, the datasheets for their accused products, as well as other marketing materials and publicly available evidence as discussed in more detail below.

a. Ericsson

67. Ericsson promotes and instructs its customers on unregulated and semi-regulated bus converters through various means, including datasheets, product selection guides, design notes, technical papers and its website. Those documents indicate that Ericsson encourages and instructs customers to incorporate and use its unregulated and semi-regulated bus converters in IBA systems that infringe SynQor's patents. Exhibit H (datasheet identifying products as "Intermediate Bus Converters"); Exhibits I-T (similar); Exhibit JJ, 2010 Ericsson Selection Guide ("Ericsson Power Modules' products cover a power range up to 700 W. The input voltage ranges cover 3.3 V- 5 V and 12 V for Intermediate Bus Architectures..."); Exhibit KK, Ericsson Power Module Webpage ("We offer a wide range of board-mounted DC/DC converters and intermediate bus converters based on industry-standard formats and specifications."); Exhibit LL, Ericsson Isolated Power Module Webpage ("Stacked product in Quarter Brick footprint. Designed to power an intermediate bus voltage requiring 9.5 V or 12 V at 60 A, in an application where board space is the most critical parameter."); Exhibit MM, Ericsson Design Note 023, Selection of Architecture for Systems using Bus Converters and POL Converters at Abstract and Figure 2 ("Recently, non-isolated point-of-load (POL) converters have seen more widespread usage. These POL converters are designed to operate from a lower input voltage, usually between 3 and 15 volts and offer fast dynamic response. They are often used in conjunction with

an isolated unregulated intermediate bus converter (IBC) that is employed to supply the input voltage for the POL converters at a voltage level that allows for their efficient operation. POL converters can also be used in conjunction with a conventional isolated and regulated DC/DC converter. System designers are often conflicted about which of these two architectures (unregulated bus converter or regulated bus converter) to use in any given application. Efficiency, dynamic response, circuit board area and cost are often the primary criteria to be optimized. The purpose of this design note is to describe the characteristics of the two approaches and to provide comparisons between the two that will be helpful for power system architects when making this design/decision.”).

68. Ericsson was notified of the *SynQor v. Artesyn et al.* case in July 2010 when Lineage Power Corp. served a subpoena upon Ericsson in that case. One of skill in the art in this highly competitive industry served with this subpoena would be expected to have learned of SynQor’s patents in suit when responding thereto. Exhibit NN, Ericsson Subpoenas and attachments.

69. The evidence discussed above demonstrating that Ericsson encourages and instructs its customers to use its bus converters in infringing IBA systems is also evidence that Ericsson knows that its customers do so. There are also more specific indications that Ericsson knows how its bus converters are used in infringing end products. In particular, Cisco representatives testified at the permanent injunction hearing in the *SynQor v. Artesyn et al.* case that Cisco has qualified and is qualifying Ericsson’s bus converters for the same internal Cisco bus converter part numbers as for which the *SynQor v. Artesyn et al.* Defendants’ bus converters are qualified. The Cisco representative estimated Ericsson bus converters were qualified for 40-60% of those internal Cisco bus converter part numbers. Exhibit OO, Jan. 19 Hearing Tr. at 180-

82. The jury in the *SynQor v. Artesyn et al.* case concluded that the Cisco end products infringe SynQor's patents and that jury verdict has been publicized through, among other things, SynQor's own press release regarding the verdict. Exhibit YY, SynQor Press Release.

b. Vicor

70. Vicor promotes and instructs its customers on unregulated bus converters through various means, including datasheets, white papers, application notes and its website. Those documents indicate that Vicor encourages and instructs customers to incorporate and use its unregulated bus converters in IBA systems that infringe SynQor's patents. Exhibit X (datasheet stating: "The BCM may be used to power non-isolated POL converters"); Exhibits V-W, Y-EE (similar); Exhibit GG, Vicor White Paper, Innovative Power Design to Support Intermediate Bus Architecture Designs ("Intermediate Bus Architecture incorporating Sine Amplitude Converter based BCMs and off-the-shelf niPOL converters can be efficient and cost effective power solutions."); Exhibit PP, Vicor Application Note AN:001, Configuring the Vicor BCM with Low Power ni-POLs ("This Application Note describes basic design practices for using Vicor's BCM Bus Converter as an Intermediate Bus Converter (IBC), providing a bus voltage to non-isolated Point-of-Load converters (niPOLs)."); Exhibit HH, Vicor Press Release (encouraging customers of Defendants in the *SynQor v. Artesyn et al.* case to switch to Vicor's bus converters as drop-in replacements).

71. Vicor was notified of the *SynQor v. Artesyn et al.* case in July 2010 when Lineage Power Corp. served a subpoena upon Vicor in that case. One of skill in the art in this highly competitive industry served with this subpoena would be expected to have learned of SynQor's patents in suit when responding thereto. Exhibit QQ, Vicor Subpoenas and attachments.

72. The evidence discussed above demonstrating that Vicor encourages and instructs its customers to use its bus converters in infringing IBA systems is also evidence that Vicor knows that its customers do so. There are also more specific indications that Vicor knows how its bus converters are used in end products. In particular, Cisco representatives testified at the permanent injunction hearing in the *SynQor v. Artesyn et al.* case that Cisco is qualifying Vicor's bus converters for the same internal Cisco bus converter part numbers as for which the *SynQor v. Artesyn et al.* Defendants' bus converters are qualified. Exhibit OO, Jan. 19 Hearing Tr. at 115-19. As explained above, the jury in the *SynQor v. Artesyn et al.* case concluded that the Cisco end products infringe SynQor's patents and that jury verdict has been publicized through, among other things, SynQor's own press release regarding the verdict. Exhibit YY, SynQor Press Release. And Vicor is encouraging its customers to use Vicor's bus converters as drop in replacements for the converters found to infringe SynQor's patents in the *SynQor v. Artesyn et al.* case. Exhibit HH. Moreover, Vicor, in its declaratory judgment complaint against SynQor in the U.S. District Court for the District of Massachusetts, admitted: "Vicor's bus converters are used by Vicor customers in Intermediate Bus Architectures." Exhibit RR, Vicor Complaint at ¶11.

2. Cisco's End Products Incorporating Ericsson's and Vicor's Unregulated and Semi-Regulated Bus Converters Directly Infringe

73. At trial in the *SynQor v. Artesyn et al.* case, No. 2:07-cv-497-TJW-CE ("the '497 Case"), the deposition of Cisco's corporate representative, Mr. Ballenger, was played, during which Mr. Ballenger confirmed that, each time Cisco uses an unregulated bus converter:

the input voltage pins of the bus converter are connected to a DC bus on the board to which it is mounted; and,
the output of that unregulated bus converter is provided to two or more non-isolated, regulated DC-DC converters that are each switching regulators that regulate their output voltage and produce an output voltage of 5 volts or less.

Exhibit SS, Dec. 14 (Afternoon) Tr. at 114-15.

74. At trial in the '497 Case, I testified that the DC bus is "a DC power source" for the unregulated bus converter, as called for by some of the claims at issue, and is the "rectified source of power that is a DC input" for the unregulated bus converter, as called for by some of the claims at issue. I also testified that the DC bus provided a voltage within the range 36-75 volts, as called for by some of the claims at issue. E.g., Exhibit TT, Dec. 15 (Morning) Trial Tr. at 81, 83-84, 101-104. Before trial, the Court concluded that it was undisputed that the accused end products, including the Cisco end products incorporating unregulated or semi-regulated bus converters, met the various "non-isolating regulation stages" limitations of claims 2 and 19 of the '190 patent and claims 21 and 30 of the '021 patent and the various "non-isolating down-converter switching regulators" limitations of claim 71 of the '702 patent. '497 Case Dkt Nos. 752, 753, 754, 760, 838. I so testified at trial, Exhibit TT, Dec. 15 (Morning) Trial Tr. at 79-81, 84, 88-89, 117-20, and the Court provided an appendix to the jury so indicating (for all defendants for the '190 patent and for the Fish defendants and Bel Fuse for the '021 and '702 patents), Exhibit UU, '497 Case Dkt No. 889-1, Jury Appendix. I also testified at trial that the accused end products, including the Cisco end products incorporating semi-regulated bus converters, met the various "non-isolating switching regulators" limitations of claim 9 of the '034 patent. Exhibit TT, Dec. 15 (Morning) Trial Tr. at 144-45. Furthermore, I testified that each and every time an unregulated or semi-regulated bus converter was used in an end product it fed its output to two or more non-isolated switching regulators, Exhibit TT, Dec. 15 (Morning) Trial Tr. at 146-50, Exhibit VV, Dec. 15 (Afternoon) at 168, and infringed one or more of the asserted claims in the '497 Case, Exhibit TT, Dec. 15 (Morning) Trial Tr. at 146-50.

75. At the '497 Case trial, I testified that every end product that Cisco disclosed during discovery in that case which used an unregulated or semi-regulated bus converter met all of the limitations of one or more of the claims at issue in this case and infringed to the extent made, used or sold in, or imported into, the United States. Specifically, I testified that the following end products incorporating the following unregulated bus converters (both internal Cisco part number and corresponding '497 Case Defendants' part number listed) infringed claims 2 and 19 of the '190 patent, claims 21 and 30 of the '021 patent and claim 71 of the '702 patent:

TwinPeaks/341-0224-01 (ArtesynIBC60AQN4896)
 TwinPeaks/341-0224-01 (Delta Q48SB9R650)
 TwinPeaks/341-0224-01 (Power-One QTS48T67096)
 Kings/34-2280-01 (BelFuse 07CM-36S10L)
 Kings/34-2280-01 (MPS QUS28096)
 Kings/34-2280-01 (Lineage QUK240S9R041)
 Kings/34-2280-01 (Power-One QTS48T38096)
 Constellation/34-2359-01 (BelFuse 07CR-18S08L)
 Constellation/34-2359-01 (MPS EUS30-080)
 Taquila/34-2360-01 (BelFuse 07CR-25S10L)
 Taquila/34-2360-01 (MPS EUS25-096)
 Taquila/34-2360-01 (Power-One SQT48T27096)
 Taquila/34-2360-01 (Power-One SQT48T38096)
 Oahu/34-2387-01 (MPS QUS40-096)
 Oahu/34-2387-01 (Power-One QTS48T46096)
 Anaconda/34-2415-01 (MPS EUS34-096) [2]
 Anaconda/34-2415-01 (Lineage EUK240S9R041) [2]
 Anaconda/34-2415-01 (Power-One SQT48T38096) [2]
 Estoril/34-2439-01 (AstecALD17Q50N)
 Estoril/34-2439-01 (BelFuse SRCA-16S10L)
 Drawing no. 92/34-2483-01 (ArtesynIBC60AQN4896) [2]
 Drawing no. 92/34-2483-01 (Delta Q48SB9R650) [2]
 Drawing no. 92/34-2483-01 (Power-One QTS48T67096) [2]
 Copperbelly/34-2206-01 (BelFuse 07CM-20S12L)
 Copperbelly/34-2206-01 (Power-One QTS48T25120)
 Const. Classic Supx: Lobos_05/34-2343-01 (BelFuse 07CM-38S10L) [2]
 Const. Classic Supx: Lobos_05/34-2343-01 (Lineage QUK240S9R041) [2]

Exhibit WW, '497 Case Dkt No. 991-Exhibit C, Leeb Trial Slides at 18, 27, 49; Exhibit TT, Jan. 15 (Morning) Trial Tr. at 79-86, 87-90, 116-22.

76. I also testified that the following end products incorporating the following semi-regulated bus converters (both internal Cisco part number and corresponding '497 Case Defendants' part number listed) infringed claim 9 of the '034 patent:

Itasca/34-2264-01 (Lineage QBK025A0B741)
Sashimi/34-2427-01(Artesyn IBC28AQW4812)
Nala Jacket Card/34-2432-01 (Lineage QBK033A0B7641)
NAXOS Jacket Card/34-2471-01 (Lineage QBK033A0B7641)

Exhibit WW, '497 Case Dkt No. 991-Exhibit C, Leeb Trial Slides at 55; Exhibit TT, Jan. 15 (Morning) Trial Tr. at 143-44.

77. The jury agreed and found that all Cisco's products incorporating unregulated or semi-regulated bus converters infringed when finding in favor of SynQor on all counts and awarding SynQor all the monetary damages it requested. Exhibit XX, '497 Case Jury Verdict.

78. During the permanent injunction hearing in the '497 Case, Cisco's representatives testified that Cisco has qualified and is qualifying Ericsson's bus converters for at least some of the same internal Cisco bus converter part numbers as for which the *SynQor v. Artesyn et al.* Defendants' bus converters are qualified. The Cisco representative estimated Ericsson bus converters were qualified for 40-60% of those internal Cisco bus converter part numbers. Exhibit OO, Jan. 19 Hearing Tr. at 180-82. He also testified that Cisco has bought them and intends to continue to buy them for use in those same Cisco end products. *Id.* The Cisco representatives also testified at the permanent injunction hearing that Cisco is qualifying Vicor's bus converters for the same internal Cisco bus converter part numbers as for which the *SynQor v. Artesyn et al.* Defendants' bus converters are qualified. Exhibit OO, Jan. 19 Hearing Tr. at 115-19. Moreover, Vicor, in its declaratory judgment complaint against SynQor in the U.S. District

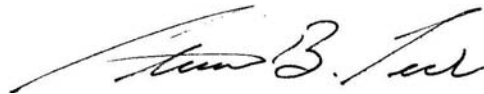
Court for the District of Massachusetts, admitted: “Vicor’s bus converters are used by Vicor customers in Intermediate Bus Architectures.” Exhibit RR, Vicor Complaint at ¶11.

79. Based on the above, at least each Cisco end product identified above into which Cisco incorporates one of the Ericsson or Vicor unregulated bus converters addressed in this declaration meets each of the limitations of each of claims 2 and 19 of the ‘190 patent, claims 21 and 30 of the ‘021 patent and claim 71 of the ‘702 patent for each of the incorporated bus converters in each end product (that is, the Ericsson and/or Vicor bus converter would meet the bus converter limitations highlighted in green in Exhibit G for those claims and the remaining limitations, the system limitations highlighted in blue, would be met by the rest of the Cisco end product load board) and therefore infringes those claims to the extent made, used or sold in, or imported into, the United States. In addition, at least each Cisco end product identified above into which Cisco incorporates one of the Ericsson PKM 4303NF PI unregulated bus converters addressed in this declaration also meets (in addition to the claims identified in the preceding sentence) each of the limitations of claim 1 of the ‘083 patent and claim 56 of the ‘702 patent for each of the incorporated bus converters in each end product and therefore infringes those claims to the extent made, used or sold in, or imported into, the United States. Furthermore, at least each Cisco end product identified above into which Cisco incorporates one of the Ericsson semi-regulated bus converters addressed in this declaration meets each of the limitations of claim 9 of the ‘034 patent for each of the incorporated bus converters in each end product (that is, the Ericsson bus converter would meet the bus converter limitations highlighted in green in Exhibit G for that claim and the remaining limitations, the system limitations highlighted in blue, would be met by the rest of the Cisco end product load board), and therefore infringes that claim to the extent made, used or sold in, or imported into, the United States.

H. No Known Substantial Non-Infringing Uses of the Ericsson or Vicor Bus Converters

80. At trial in the '497 Case, I testified that each and every time an unregulated or semi-regulated bus converter was used in an end product it fed its output to two or more non-isolated switching regulators, Exhibit TT, Dec. 15 (Morning) Trial Tr. at 146-50, Exhibit VV, Dec. 15 (Afternoon) at 168, and infringed one or more of the asserted claims in the '497 Case, Exhibit TT, Dec. 15 (Morning) Trial Tr. at 146-50. And I testified that there are no substantial non-infringing uses for the types of bus converters at issue in the '497 Case, Exhibit TT, Dec. 15 (Morning) Trial Tr. at 146-51, that are of the same types at issue this declaration. The jury in the '497 Case necessarily agreed when finding in favor of SynQor on all contributory infringement counts and awarding SynQor all the monetary damages it requested. Exhibit XX, '497 Case Jury Verdict. I am aware of no substantial non-infringing uses for the Ericsson or Vicor bus converters at issue in this declaration, and it is my opinion that there are none.

I declare under penalty of perjury that the foregoing is true and correct. Executed this 4th day of February, 2011 at Boston, Massachusetts.



Steven B. Leeb