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POWER CONVERTER AND SYSTEM INCLUDING A POWER CONVERTER, AND METHOD OF OPERATING THE SAME

Abstract

A power converter is provided, including a first primary side circuit including a first input configured to receive a first input voltage, a first primary side winding of a transformer, and a first switch coupled between the first input and the first primary side winding, a second primary side circuit including a second input configured to receive a second input voltage, a second primary side winding of the transformer, and a second switch coupled between the second input and the first primary side winding, and a secondary side winding of the transformer coupled to an output of the power converter, wherein the first switch and the second switch are configured to be switched concurrently.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATION
[0001] This application claims priority to Germany Patent Application No. 102024103740.7 filed on Feb. 9, 2024, the content of which is incorporated by reference herein in its entirety.
TECHNICAL FIELD
[0002] The present application relates to power converters and to systems including such power converters and methods of operating the same.
BACKGROUND
[0003] Power converters are devices which convert an input electrical power to an output electrical power. For example, a power converter may convert an input voltage to an output voltage. The output voltage may have a predefined magnitude suitable for a particular application.
[0004] In some applications, power converters are also used in a system to provide power for a controller of a further power converter. For example, the supply voltage for the controller may be generated based on an input voltage of the further power converter.
[0005] Some power converters may be bidirectional power converters, where each side of the power converter may serve as an input or as an output. In this case, providing a supply for a controller of such a power converter may be a challenge as the input voltage may be provided at either side.
SUMMARY
[0006] A power converter as defined in claim **1**, a system as defined in claim **12** and a method as defined in claim **13** are provided. The dependent claims define further implementations.
[0007] According to an implementation, a power converter is provided, including: a first primary side circuit including a first input configured to receive a first input voltage, a first primary side winding of a transformer, and a first switch (Q**1**) coupled between the first input and the first primary side winding, a second primary side circuit including a second input configured to receive a second input voltage, a second primary side winding of the transformer, and a second switch (Q**2**) coupled between the second input and the second primary side winding, and a secondary side winding of the transformer coupled to an output of the power converter, wherein the first switch (Q**1**) and the second switch (Q**2**) are configured to be switched concurrently. For example, a controller may be provided configured to switch the first switch (Q**1**) and the second switch (Q**2**) concurrently.
[0008] According to another implementation, a system is provided, including: a bidirectional power converter having a first terminal and a second terminal, wherein the bidirectional power converter is configured to selectively generate a second voltage at the second terminal based on a first voltage at the first terminal or generate the first voltage at the first terminal based on the second voltage at the second terminal, a bidirectional power converter controller configured to control the bidirectional power converter, and the power converter as mentioned above, wherein the first input of the power converter is coupled to the first terminal, a second input of the power converter to the second terminal, and the output of the power converter is coupled to a supply terminal of the bidirectional power converter controller.
[0009] According to a further implementation, a method is provided, including: providing a power converter as mentioned above, and operating the first switch (Q**1**) and the second switch (Q**2**) of the power converter concurrently to generate an output voltage at an output of the power converter.
[0010] The above summary merely gives a brief overview over some implementations and is not to

be construed as limiting in any way, as other implementations may include different features than the ones explained above.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] FIG. **1** is a circuit diagram of a power converter according to an implementation.

[0012] FIG. **2** is a schematic diagram of a controller for the power converter of FIG. **1**.

[0013] FIG. **3** shows example signals of the power converter of FIG. **1** and the controller of FIG. **2**.

[0014] FIG. **4** is a block diagram of a system according to an implementation.

[0015] FIGS. **5**A and **5**B are circuit diagrams illustrating supply of a controller of a power converter according to an implementation.

[0016] FIGS. **6**A to **6**D illustrate circuit diagrams for initially supplying a controller of a power converter according to some implementations.

[0017] FIGS. **7**A and **7**B are circuit diagrams illustrating generation of a current sense signal according to some implementations.

[0018] FIG. **8** is a flowchart illustrating a method according to an implementation.

DETAILED DESCRIPTION

[0019] In the following, various implementations, which are not to be construed as limiting, will be described referring to the attached drawings.

[0020] Implementations described in the following relate to power converters which may receive two different input voltages to generate an output voltage. For example, in the implementation of FIG. **1**, the power converter shown may receive a first input voltage Up, a second input voltage Us, or both a first input voltage Up and a second input voltage Us, to generate an output voltage Vo. In other words, when the power converter of FIG. **1** is operated to generate the output voltage Vo, both Up and Us may be present, or only one of Up or Us may be present.

[0021] First input voltage Up is symbolized as being generated by a voltage source **10**, and second input voltage Us is symbolized as being generated by a voltage source **11**. Voltage sources **10**, **11** may be representing any kind of circuit delivering the respective voltage. In some instances, as will be explained further below for FIG. **4**, input voltages Up and Us may be voltages on two different sides of a bidirectional power converter.

[0022] First input voltage Up is received by a first primary side circuit including a resistor **12**, a diode D**1**, a first primary side winding **14**A of a transformer **14**, and a first switch Q**1**, in the implementation of FIG. **1** implemented as a field effect transistor switch having a body diode. Resistor **12** may be a resistor explicitly provided, may represent internal resistances of other circuit elements (e.g., the electrical connections shown), or may be omitted.

[0023] Furthermore, an inductor Lm is explicitly shown, which in many flyback converter implementations is realized by an airgap in a core of transformer **14** and which is the main inductor for storing energy in the first primary side circuit. As this inductor Lm is usually implemented in transformer **14** (e.g., by providing an airgap), it will not be explicitly shown in implementations discussed further below. To measure a current Isense**1** in the first primary side circuit, a current measurement device Am**1** is provided. For current measurement, any conventional technique may be used, for example measuring a voltage drop across a low-ohmic resistor, using an inductive measurement or using a magnetoresistive measurement capturing a magnetic field generated by the current, the latter two providing a galvanic isolation to the measurement, which may be desirable in some implementations.

[0024] Second input voltage Us is provided to a second primary side circuit, which comprises a resistor **13**, a diode D**2**, a second primary side winding **14**B of transformer **14**, a second switch Q**2**, and an inductor Lm**1**. Furthermore, a current measurement device Am**2** for measuring a current

Isense**2** in the second primary side circuit is provided. The second primary side circuit may be implemented corresponding to the first primary side circuit, and the explanations regarding the various elements for the first primary side circuit also apply to the corresponding elements of the second primary side circuit.

[0025] Furthermore, the power converter of FIG. **1** comprises a secondary side circuit including a secondary side winding **14**C of transformer **14**, an output capacitor **15** across which an output voltage Vo is provided, and an output resistor **16** symbolizing a load receiving the output voltage Vo. On the secondary side, a voltage sensor **17** may capture the output voltage Vo and output a measured Vo at a terminal **18**. The measured output voltage Vo may be used for controlling the power converter of FIG. **1**, e.g., for regulating the output voltage Vo to a target output voltage. While in FIG. **1** a single secondary side circuit is shown, in other implementations a plurality of secondary side circuits may be provided, to provide a plurality of output voltages.

[0026] The power converter of FIG. **1** essentially is a flyback converter which, however, has two primary side circuits. In the implementation of FIG. **1**, switch Q**1** of the first primary side circuit and switch Q**2** of the second primary side circuit are configured to be operated concurrently (e.g., switched on and off essentially at the same time), for example, as shown in FIG. **1**, configured to receive the same control signal pwm. In implementations, control signal pwm is generated by a controller based on a feedback from the secondary side circuit indicating the output signal Vo and based on the currents Isense**1**, Isense**2**. An example implementation of a controller for the power converter of FIG. **1** is shown in FIG. **2**. The control signal pwm may be a pulse width modulation (PWM) signal.

[0027] The controller depicted in FIG. **2** receives the output signal Vo or any indication thereof (for example indication via an optocoupler if the controller is provided on the primary side) and subtracts the output signal Vo from a reference voltage Vref provided in a block **20**. The reference voltage Vref is the voltage the power converter is intended to output. One or more proportional/integral (PI) controllers **22** process the output of subtractor **20** to generate a reference value Iref. Other types of controllers instead of PI controllers **22** may also be used, e.g., type I compensators, type II compensators or type III compensators. Furthermore, the maximum of Isense**1** and Isense**2** is formed by a block **24** to generate a value Isense. Isense and Iref are processed by a current controller **23** to generate signal pwm controlling switches Q**1**, Q**2**. Apart from processing two measured currents Isense**1**, Isense**2** from two primary side circuits the controller may essentially operate like any conventional flyback controller, and apart from the peak current control illustrated in FIG. **2** other conventional flyback controller schemes may also be used. For example, the power converter may be implemented as a quasi-resonant flyback converter, and corresponding control schemes may be used for driving switches Q**1** and Q**2**, in case of an implementation as transistors gate drivers may be used to drive the switches in accordance with signal pwm. Such gate drivers may include a galvanic isolation (e.g., via a transformer) if the controller is referenced to a different ground than the switch to be driven (e.g., if the controller is on the secondary side of the power converter of FIG. **1**).

[0028] FIG. **3** shows simulated example signals for Isense**1**, Isense**2**, Isense and pwm in an example operation. Here, only a current Isense**1** flows, whereas Isense**2** is zero. Generally, although the two switches Q**1**, Q**2** are commonly controlled, current will flow in only one of the primary side circuits in the implementation of FIG. **1**, depending on a ratio R=Up/Us between the first input voltage Up and the second input voltage Us and a turns ratio RT between primary side windings **14**A, **14**B. Assuming that RT=1 (equal number of turns in windings **14**A and **14**B), if Up>Us (R>1), then D**1** will conduct, and through transformer **14** the voltage Up will be mirrored to the second primary side winding, leading diode D**2** to block. Conversely, if Us>Up (R<1), D**2** conducts and D**1** will be blocking. In the first case (Up>Us) power to the secondary side circuit and to the output voltage Vo will be supplied via the first primary side circuit, e.g., supplied by Up, and in the second case conversely the output voltage will be supplied by Us. If RT≠1, the above situation is modified by the turns ratio, e.g., then the ratio R determining whether power is supplied from the first or second primary side circuit is equal to (Up/Us)*RT.

[0029] For example, in the simulation result of FIG. **3**, Up is higher than Us, and therefore Isense**1** can flow, but not Isense**2**. If Up is equal to Us and RT=1 (or, more generally, when the above ratio R=1), power will be supplied to the secondary side both from the first primary side circuit and from the second primary side circuit.

[0030] The power converter of FIG. **1** may for example be used to supply power to a controller of a bidirectional power converter, referred to as bidirectional power converter controller in the following. This is only an example, and the power converter may alternatively or additionally also be used to supply power to other components, for example fans or relays. FIG. **4** shows a corresponding system. The system of FIG. **4** comprises a bidirectional DC/DC converter **40** as a bidirectional power converter, which converts between a first voltage Up with respect to ground GND_P and a second voltage Us with respect to a respective ground GND_S. In other words, either Up or Us may serve as an input voltage, and be converted to the respective other voltage by bidirectional DC/DC power converter **40**. Bidirectional DC/DC power converter **40** is controlled by a bidirectional power converter controller **42**, which may for example control gate drivers **41**A, **41**B driving switches of bidirectional DC/DC power converter **40**. Bidirectional DC/DC power converter **40** may be implemented in any conventional manner.

[0031] Bidirectional power converter controller **42** is supplied with power by a power converter **43** according to an implementation, for example the power converter illustrated in FIG. **1**, where based on the first input voltage Up or the second input voltage Us the output voltage Vo is generated, which in the example of FIG. **4** then supplies power to bidirectional power converter controller **43**. In conventional solutions two power converters are needed for supplying power to bidirectional power converter controller **42**. In such a conventional solution, a first power converter is required to provide power to the bidirectional power converter controller when the bidirectional converter is operated in a first direction, e.g., Up->Us, where the first power converter is powered from the same input voltage Up, and a second power converter is required to provide power to the bidirectional power converter controller when the bidirectional converter is operated in the second direction, e.g., Us->Up, where the second power converter is powered from the same input voltage Us. In contrast thereto, in the implementation of FIG. **1** only a single power converter having two primary side circuits is needed.

[0032] Moreover, as in the power converter of FIG. **1** switches Q**1**, Q**2** are controlled concurrently, no separate control circuitry for two power converters is needed. For power converters according to implementations discussed herein, only one control loop for controlling this power converter generating a single control signal pwm is needed, which reduces the complexity of control of the power converter.

[0033] Next, some possible implementation details for the power converter of FIGS. **1** and **2** are described. While these implementation details show specific circuit implementations, other implementations may also be used.

[0034] FIGS. **5**A and **5**B illustrate examples for supplying power to a controller **52** for the power converter of FIG. **1**, for example the controller shown in FIG. **2**. It should be noted that this controller **52** is not to be confused with controller **42** of FIG. **4**. Bidirectional power converter controller **42** of FIG. **4** controls bidirectional DC/DC power converter **40** of FIG. **4**, while the controller shown in FIG. **2** controls the power converter of FIG. **1** or for example power converter **43** of FIG. **4**.

[0035] In the examples of FIG. **5**A and FIG. **5**B, controller **52** for a power converter **50**A or **50**B, which essentially correspond to the power converter of FIG. **1**, is supplied with power via an auxiliary winding of transformer **14**. In FIGS. **5**A and **5**B, auxiliary winding **51** is provided on the primary side of transformer **14** and is coupled in a loop with a diode D**4**, a resistor R**1** and a capacitor C**1** as shown. A supply voltage for the controller is provided at capacitor C**1** in each case.

[0036] FIG. **5**A shows an example where controller **52** is provided at the output side referenced to the output ground DGND. An auxiliary winding **51**A is provided at the secondary side of transformer **14** and is coupled in a loop with a diode D**4**, a resistor R**1** and a capacitor C**1** as shown. A supply voltage for controller **52** with respect to DGND is provided at capacitor C**1**. Controller **52** may be implemented as shown in FIG. **2** and receive Isense**1**, Isense**2** and Vo to generate control signal pwm for first and second switches Q**1**, Q**2**.

[0037] In this case, the current measurement of Isense**1** and Isense**2** may be made using a galvanic isolation to the primary side, in the example of FIG. **5**A using transformers T**2**, T**3**, where Isense**1** and Isense**2** are tapped on a secondary side. GND_P indicates the ground of the first primary side circuit, and GND_S refers to the ground of the second primary side circuit. In case input and output is referenced to the same ground, no such galvanic isolation for current measurements is needed.

[0038] In case of FIG. **5**B, the controller is provided on the primary side referenced to ground GND_P of the first primary side circuit. In this case, an auxiliary winding **51**B is provided at the primary side of transformer **14** and, similar to auxiliary winding **51**A of FIG. **5**A, coupled in a loop with diode D**4**, resistor R**1** and capacitor C**1** as shown. Controller **52** is supplied with power by a voltage at capacitor **51** against GND_P. In this case, for measuring Isense**1**, a simple measurement resistor R**2** may be used, whereas for Isense**2** still a transformer is used where in this case the secondary winding is referenced to GND_P.

[0039] It should be noted that in other implementations, the controller for the power converter of FIG. **1** or power converter **50**A, **50**B may be supplied with power by some other power source in a corresponding system.

[0040] When supplying power to the controller via auxiliary winding **51**A or **51**B, the power converter has to operate to provide power to the controller, and for the power converter to operate, the controller requires power to control the power converter accordingly. Thus, the circuits including auxiliary winding **51**A or **51**B provide a power supply after startup. Additional start-up circuitry may be provided which provides an isolated power supply at start-up for the controller. Examples for such isolated power supplies are shown in FIGS. **6**A to **6**D.

[0041] FIGS. **6**A and **6**B show examples of power supply circuits for generating an output power at a respective output capacitor C**5**, where the implementations of FIGS. **6**A and **6**B differ in a rectification provided on a secondary side. A respective transformer T**1** provides galvanic isolation. The power supply circuits are controlled by a control chip **60**. Control chip **60** is a time chip configured to generate the control signal pwm with a desired frequency.

[0042] The power supply circuits of FIGS. **6**A and **6**B rely on Up as an input power. In case of a bidirectional power converter system as in FIG. **4**, at start-up either Up or Us may be present. In this case, as shown in FIGS. **6**C and **6**D, for start-up, a power supply circuit may be provided which may operate on both Us and Up.

[0043] FIG. **6**C shows an example where the power converter is provided referenced to GND_P of Up (similar to the situation of FIG. **5**B). In this case, no isolation is needed for Up, but for Us a circuit as in FIG. **6**A or **6**B is provided as a power supply circuit. The two parts are then matched such that their outputs are added. FIG. **6**D shows a case where the power controller is provided at the output side (similar to the situation of FIG. **5**A, may be combined with the power supply of FIG. **5**A), where circuits as in FIGS. **6**A and **6**B are provided for both Up and Us. In FIG. **6**C, the controller will be supplied with power by the higher one of the voltages at C**6** and C**5**, and in FIG. **6**D the controller will be supplied with power by the higher one of voltages at C**5** and C**10**. Note that the circuits of FIGS. **6**A to **6**D are configured to supply power at the start-up when there is still a light load condition, and later in operation the supply may be provided via an auxiliary winding as explained with references to FIGS. **5**A and **5**B.

[0044] FIGS. **7**A and **7**B show two example circuits how signals Isense**1**, Isense**2** may be added to arrive at signal Isense. The circuit of FIG. **7**A may be used when the controller is at the first primary side circuit referenced to GND_P. In this case, the signal Isense**2** is provided via a diode,

and the signal Isense**1** is provided directly to generate Isense. FIG. **7**B shows an example where the controller is at the secondary side, where both Isense**1** and Isense**2** are tapped using a galvanic isolation, as shown in FIG. **5**A. Other circuits for generating Isense may also be used.
[0045] FIG. **8** is a flowchart of a method according to an implementation.
[0046] At **1000**, the method comprises providing a power converter, for example as shown in FIG. **1**, having a first primary side circuit including a first switch (Q**1**) and a first primary side circuit and a second switch (Q**2**) in the second primary side circuit. At **1001**, the method comprises operating the first switch (Q**1**) and the second switch (Q**2**) concurrently, as explained above for the power converter of FIG. **1**.
ASPECTS
[0047] Some implementations are defined by the following aspects:
[0048] Aspect 1: A power converter, comprising: a first primary side circuit comprising a first input configured to receive a first input voltage, a first primary side winding of a transformer, and a first switch coupled between the first input and the first primary side winding, a second primary side circuit comprising a second input configured to receive a second input voltage, a second primary side winding of the transformer, and a second switch coupled between the second input and the second primary side winding, and a secondary side winding of the transformer coupled to an output of the power converter, wherein the first switch and the second switch are configured to be switched concurrently.
[0049] Aspect 2: The power converter of aspect 1, wherein the first primary side circuit comprises a first diode coupled between the first input and the first primary side winding, and the second primary side circuit comprises a second diode coupled between the second input and the second primary side winding.
[0050] Aspect 3: The power converter of aspect 1 or 2, further comprising a controller configured to switch the first switch and the second switch concurrently.
[0051] Aspect 4: The power converter of aspect 3, further comprising: a first current sensor configured to measure a first current in the first primary side circuit, a second current sensor configured to measure a second current in the second primary side circuit, wherein the controller is configured to control the first switch and the second switch based on the first current and the second current.
[0052] Aspect 5: The power converter of aspect 4, wherein at least one of the first current sensor or the second current sensor comprises a galvanic isolation.
[0053] Aspect 6: The power converter of aspect 4 or 5, wherein the controller is configured to control the first switch and the second switch further based on a voltage at the output of the power converter.
[0054] Aspect 7: The power converter of any one of aspects 3 to 6, further comprising an auxiliary winding of the transformer provided at one of the primary side of the transformer or the secondary side of the transformer, wherein the auxiliary winding is coupled to a supply input of the controller.
[0055] Aspect 8: The power converter of any one of aspects 3 to 7, further comprising a startup power supply circuit configured to supply power to the controller at startup based on one of the first input voltage or the second input voltage.
[0056] Aspect 9: The power converter of aspect 8, wherein the startup power supply circuit comprises a galvanic isolation.
[0057] Aspect 10: The power converter of aspect 8 or 9, wherein the startup power supply circuit is configured to supply power to the controller at startup based on the higher one of the first input voltage and the second input voltage.
[0058] Aspect 11: The power converter of any one of aspects 3 to 10, wherein the power converter is configured to drive the first switch and/or the second switch via a galvanic isolation.
[0059] Aspect 12: A system, comprising: a bidirectional power converter having a first terminal and a second terminal, wherein the bidirectional power converter is configured to selectively generate a

second voltage at the second terminal based on a first voltage at the first terminal, or generate the first voltage at the first terminal based on the second voltage at the second terminal, a bidirectional power converter controller configured to control the bidirectional power converter, the power converter of any one of aspects 1 to 11, wherein the first input of the power converter is coupled to the first terminal, the second input of the power converter is coupled to the second terminal, and the output of the power converter is coupled to a supply terminal of the bidirectional power converter controller.

[0060] Aspect 13: A method, comprising: providing the power converter of any one of aspects 1 to 11, and operating the first switch and the second switch concurrently to generate an output voltage at an output of the power converter.

[0061] Aspect 14: The system of Aspect 12, wherein the bidirectional power converter is a bidirectional DC/DC converter.

[0062] Aspect 15: The system of Aspect 12, wherein the first primary side circuit comprises a first diode coupled between the first input and the first primary side winding, and wherein the second primary side circuit comprises a second diode coupled between the second input and the second primary side winding.

[0063] Aspect 16: The system of Aspect 12, further comprising: a controller configured to switch the first switch and the second switch concurrently such that the first switch and the second switch are switched on substantially at the same time, and such that the first switch and the second switch are switched off substantially at the same time.

[0064] Aspect 17: The system of Aspect 16, further comprising: a first current sensor configured to measure a first current in the first primary side circuit, a second current sensor configured to measure a second current in the second primary side circuit, wherein the controller is configured to control the first switch and the second switch based on a measurement of the first current and a measurement of the second current provided by the first current sensor and the second current sensor, respectively.

[0065] Aspect 18: The system of Aspect 17, wherein at least one of the first current sensor or the second current sensor comprises a galvanic isolation.

[0066] Aspect 19: The system of Aspect 17, wherein the controller is configured to control the first switch and the second switch further based on a voltage at the output of the power converter.

[0067] Aspect 20: The system of Aspect 16, further comprising: an auxiliary winding of the transformer provided at one of the primary side of the transformer or the secondary side of the transformer, wherein the auxiliary winding is coupled to a supply input of the controller.

[0068] Although specific implementations have been illustrated and described herein, it will be appreciated by those of ordinary skill in the art that a variety of alternate and/or equivalent implementations may be substituted for the specific implementations shown and described without departing from the scope of the present implementation. This application is intended to cover any adaptations or variations of the specific implementations discussed herein. Therefore, it is intended that this implementation be limited only by the claims and the equivalents thereof.

Claims

1. A power converter, comprising: a first primary side circuit comprising a first input configured to receive a first input voltage, a first primary side winding of a transformer, and a first switch coupled between the first input and the first primary side winding; a second primary side circuit comprising a second input configured to receive a second input voltage, a second primary side winding of the transformer, and a second switch coupled between the second input and the second primary side winding; and a secondary side winding of the transformer coupled to an output of the power converter, wherein the first switch and the second switch are configured to be switched concurrently.

2. The power converter of claim 1, wherein the first primary side circuit comprises a first diode coupled between the first input and the first primary side winding, and wherein the second primary side circuit comprises a second diode coupled between the second input and the second primary side winding.
3. The power converter of claim 1, further comprising: a controller configured to switch the first switch and the second switch concurrently.
4. The power converter of claim 3, further comprising: a first current sensor configured to measure a first current in the first primary side circuit, a second current sensor configured to measure a second current in the second primary side circuit, wherein the controller is configured to control the first switch and the second switch based on a measurement of the first current and a measurement of the second current provided by the first current sensor and the second current sensor, respectively.
5. The power converter of claim 4, wherein at least one of the first current sensor or the second current sensor comprises a galvanic isolation.
6. The power converter of claim 4, wherein the controller is configured to control the first switch and the second switch further based on a voltage at the output of the power converter.
7. The power converter of claim 3, further comprising: an auxiliary winding of the transformer provided at one of the primary side of the transformer or the secondary side of the transformer, wherein the auxiliary winding is coupled to a supply input of the controller.
8. The power converter of claim 3, further comprising: a startup power supply circuit configured to supply power to the controller at startup of the power converter based on one of the first input voltage or the second input voltage.
9. The power converter of claim 8, wherein the startup power supply circuit comprises a galvanic isolation.
10. The power converter of claim 8, wherein the startup power supply circuit is configured to supply power to the controller at startup of the power converter based on the higher one of the first input voltage and the second input voltage.
11. The power converter of claim 3, wherein the power converter is configured to drive at least one of the first switch or the second switch via a galvanic isolation.
12. A system, comprising: a bidirectional power converter having a first terminal and a second terminal, wherein the bidirectional power converter is configured to selectively generate a second voltage at the second terminal based on a first voltage at the first terminal, or generate the first voltage at the first terminal based on the second voltage at the second terminal; a bidirectional power converter controller configured to control the bidirectional power converter; and a power converter comprising: a first primary side circuit comprising a first input configured to receive a first input voltage, a first primary side winding of a transformer, and a first switch coupled between the first input and the first primary side winding; a second primary side circuit comprising a second input configured to receive a second input voltage, a second primary side winding of the transformer, and a second switch coupled between the second input and the second primary side winding; and a secondary side winding of the transformer coupled to an output of the power converter, wherein the first switch and the second switch are configured to be switched concurrently, wherein the first input of the power converter is coupled to the first terminal, the second input of the power converter is coupled to the second terminal, and the output of the power converter is coupled to a supply terminal of the bidirectional power converter controller.
13. A method, comprising: providing the power converter, the power converter comprising: a first primary side circuit comprising a first input configured to receive a first input voltage, a first primary side winding of a transformer, and a first switch coupled between the first input and the first primary side winding; a second primary side circuit comprising a second input configured to receive a second input voltage, a second primary side winding of the transformer, and a second switch coupled between the second input and the second primary side winding; and a secondary

side winding of the transformer coupled to an output of the power converter, wherein the first switch and the second switch are configured to be switched concurrently; and operating the first switch and the second switch concurrently to generate an output voltage at an output of the power converter.

14. The system of claim 12, wherein the bidirectional power converter is a bidirectional DC/DC converter.

15. The system of claim 12, wherein the first primary side circuit comprises a first diode coupled between the first input and the first primary side winding, and wherein the second primary side circuit comprises a second diode coupled between the second input and the second primary side winding.

16. The system of claim 12, further comprising: a controller configured to switch the first switch and the second switch concurrently such that the first switch and the second switch are switched on substantially at the same time, and such that the first switch and the second switch are switched off substantially at the same time.

17. The system of claim 16, further comprising: a first current sensor configured to measure a first current in the first primary side circuit, a second current sensor configured to measure a second current in the second primary side circuit, wherein the controller is configured to control the first switch and the second switch based on a measurement of the first current and a measurement of the second current provided by the first current sensor and the second current sensor, respectively.

18. The system of claim 17, wherein at least one of the first current sensor or the second current sensor comprises a galvanic isolation.

19. The system of claim 17, wherein the controller is configured to control the first switch and the second switch further based on a voltage at the output of the power converter.

20. The system of claim 16, further comprising: an auxiliary winding of the transformer provided at one of the primary side of the transformer or the secondary side of the transformer, wherein the auxiliary winding is coupled to a supply input of the controller.