Innovation, Sciences et
Développement économique Canada
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Economic Development Canada
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(12) BREVET CANADIEN
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Field

[illegible] in Fig. 1 [illegible]

Embodiments may be for use with a DC-DC converter selected from a flyback converter, a resonant converter, a Buck converter, a Buck-boost converter, and a forward converter.

In one embodiment the power converter further comprises a DC-DC converter that receives the DC bus voltage and outputs a controlled DC voltage. The DC-DC converter may comprise a flyback converter, a resonant converter, a Buck converter, a Buck-boost converter, or a forward converter. In one embodiment the DC-DC converter comprises a flyback converter. In one embodiment the DC-DC converter comprises a resonant converter.

According to another aspect of the invention there is provided a method for implementing a power converter, comprising: providing a rectifier circuit having first and second input terminals that receive an AC input voltage, and first and second output terminals that

output a DC bus voltage; connecting a series circuit across the first and second output terminals

In various embodiments, the method comprises using a DC-DC converter to receive the DC bus voltage and output a controlled DC voltage. In various embodiments, the DC-DC converter comprises a flyback converter, a resonant converter, a Buck converter, a Buck-boost

[illegible]

the input terminals of the subsequent DC-DC converter stage, and no further capacitors are

connected in parallel, thereby avoiding any possible current spike when the auxiliary switch is activated and the need for a current limiting inductor. In implementations such as that shown in

[illegible]

$$\Delta t = \pi - \theta \qquad (2)$$

$$\theta = \cos^{-1}\left(\frac{V_{bus\_valley}}{V_{bus\_peak}}\right) \qquad (3)$$

If the capacitor value is large enough so that the voltage drop (i.e., V_{bus_peak} - V_{bus_valley}) can be neglected, then the capacitor discharging time is approximately $1/2f_{line}$. Based on this assumption, the DC voltage range on C_{in} at different AC voltages may be calculated. For example, Fig. 3 shows the DC voltages on a 100 μF capacitor for 60 W power at different AC voltages from 100-240 VAC. As one example, when the input voltage VAC is about 100 Vrms, the DC voltage across the 100 μF capacitor will vary from about 100 to 141 VDC. When the

Performance Comparison

A simulation was conducted using PSIM (Powersim Inc., Rockville, MD, USA) to determine the required capacitance value of C_{in} for a line power extension embodiment and a conventional full bridge, for designs based on different V_{bus_min} and a 60 W load. Fig. 8 shows simulation results.

As shown in Fig. 8, when V_{bus_min} is set at 50 V, then a 37 μF capacitance should be

used for a conventional full bridge diode rectifier, while only 15 μF is needed for a line power

Table 1. Design parameters.

Equivalents

While the invention has been described with respect to illustrative embodiments thereof [illegible]

It will be understood that [illegible]

1. A power converter circuit, comprising:

5. The power converter circuit of claim 1, wherein the rectifier circuit comprises a full bridge rectifier having four diodes.

6. The power converter circuit of claim 1, for use with a DC-DC converter selected from a flyback converter, a resonant converter, a Buck converter, a Buck-boost converter, and a forward converter.

7. The power converter circuit of claim 1, further comprising a DC-DC converter that receives the DC bus voltage and outputs a controlled DC voltage.

8. The power converter circuit of claim 7, wherein the DC-DC converter comprises a [illegible]

17. The method of claim 16, wherein the DC-DC converter comprises a flyback converter, a resonant converter, a Buck converter, a Buck-boost converter, or a forward converter.

18. The method of claim 16, wherein the DC-DC converter comprises a flyback converter or a resonant converter.

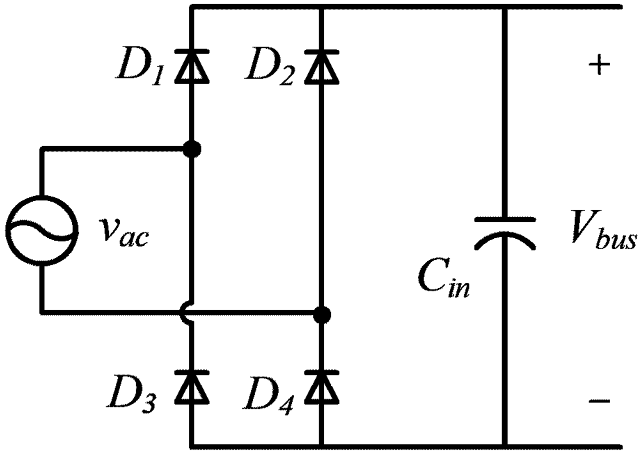
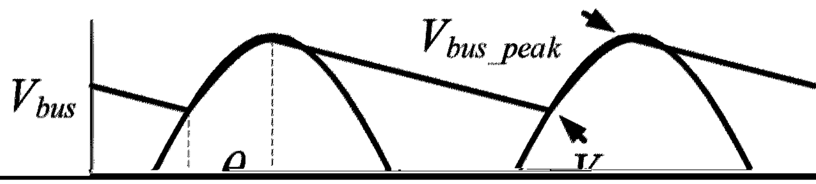
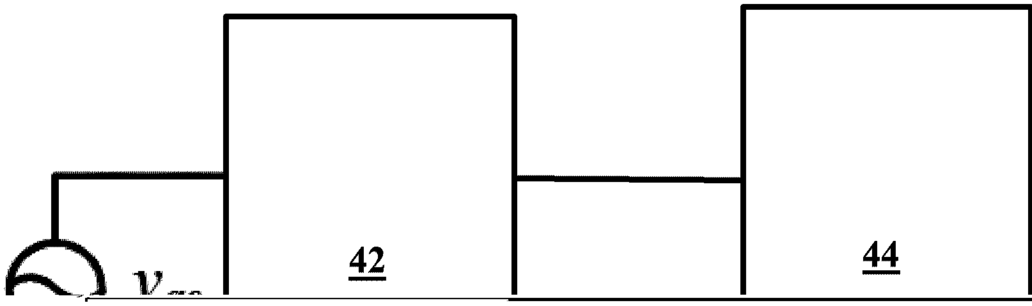


Fig. 1 (Prior Art)

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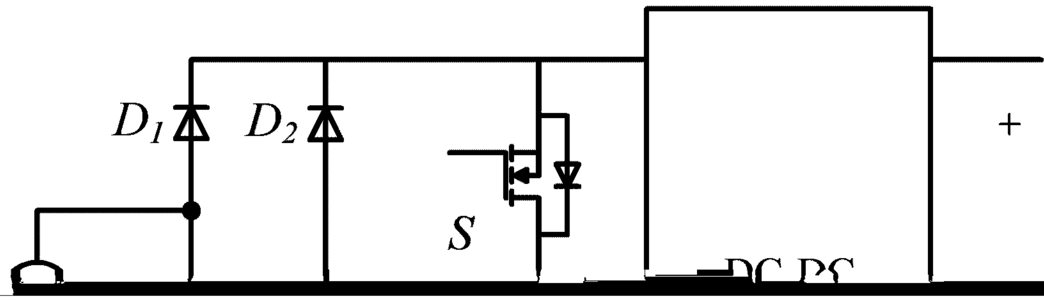
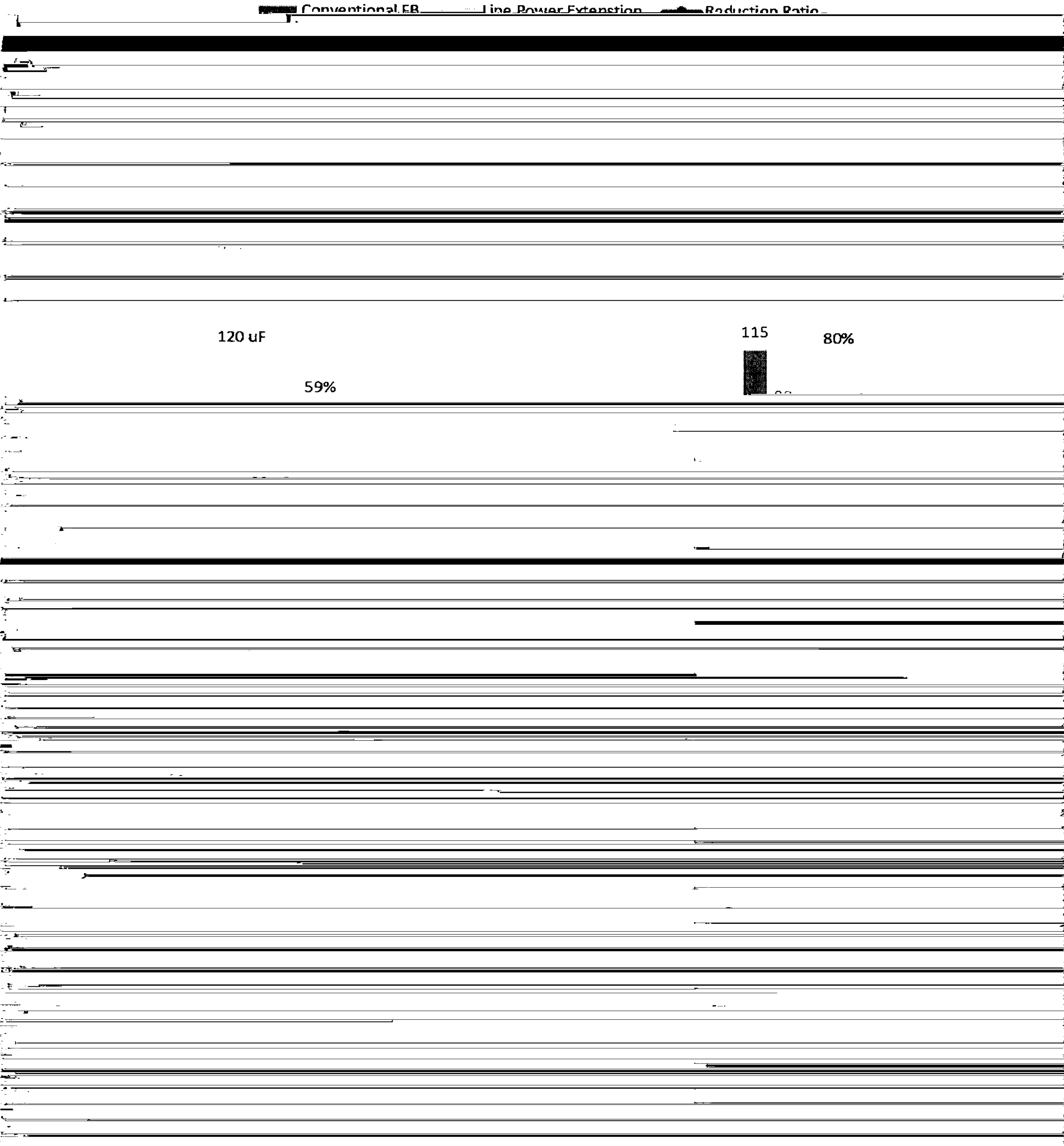
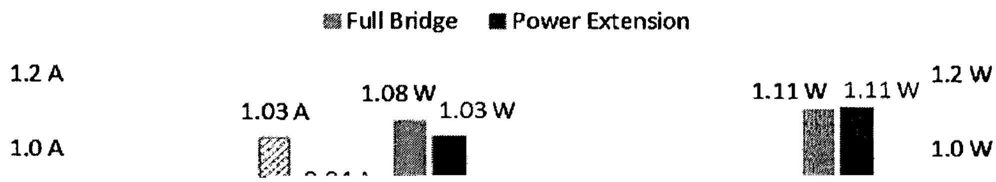

D_1
D_2
S
+

Vo 


Conventional FB
Line Power Extenstion
Reduction Ratio
120 uF
59%
115
80%


Full Bridge
Power Extension
1.2 A
1.0 A
1.03 A
1.08 W
1.03 W
1.11 W
1.11 W
1.2 W
1.0 W

[illegible]

Abstract

A power converter circuit includes a rectifier

terminals that receive an AC input voltage and first and second output terminals that output a DC