

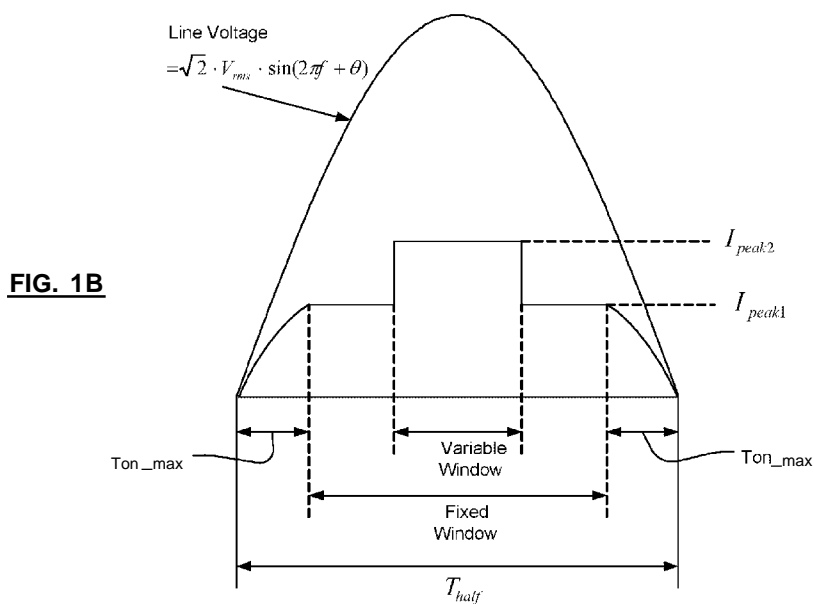


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[Continued on nextpage]

(54) **Title:** TWO-PEAK CURRENT CONTROL FOR FLYBACK VOLTAGE CONVERTERS



(57) **Abstract:** A current control in a Flyback converter. The converter input is a rectified pulsating (sinusoidal) voltage. The output current peak is limited to different levels at different time instants of the sinusoidal fundamental.

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## AMENDED CLAIMS

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## CLAIMS

What is claimed is:

1. A system comprising:

5 a switch configured to supply power to a load in response to the switch being turned on by pulse width modulation pulses;

a first comparator configured to compare a first current through the switch to a first threshold and generate a first output in response to the first current being greater than or equal to the first threshold;

10 a second comparator configured to compare the first current through the switch to a second threshold and generate a second output in response to the first current being greater than or equal to the second threshold, wherein the second threshold is greater than the first threshold; and

15 a current control module configured to select the first output or the second output, turn off the switch based on the first output or the second output, and adjust a duration for which the second output is selected based on a difference between an estimated current through the load and  
20 a desired current through the load.

2. The system of claim 1, wherein:

the power is generated based on an AC voltage, and

25 the adjustment of the duration for which the second output is selected prevents variation of a second current through the load due to an imbalance in the AC voltage.

3. The system of claim 1, wherein:

the power is generated based on an AC voltage having a predetermined period, and

5 the current control module is configured to reduce a total harmonic distortion in a second current through the load by limiting the duration for which the second output is selected to (i) greater than or equal to one-fifth of half the predetermined period and (ii) less than or equal to one-third of half the predetermined period.

4. The system of claim 1, further comprising a current estimating  
10 module configured to determine the estimated current through the load based on the first current through the switch.

5. The system of claim 1, further comprising:

a pulse width modulation controller configured to generate the pulse width modulation pulses; and

15 a multiplexer configured to receive as inputs (i) the first output of the first comparator and (ii) the second output of the second comparator,

wherein the current control module is configured generate a control signal to control the multiplexer based on the difference between the estimated current through the load and the desired current through the  
20 load,

wherein the multiplexer is configured to output (i) the first output of the first comparator or (ii) the second output of the second comparator based on the control signal, and

25 wherein the pulse width modulation controller is configured to turn off the switch based on (i) the first output of the first comparator or (ii) the second output of the second comparator output by the multiplexer.

6. The system of claim 1, further comprising:

a bridge rectifier configured to convert an AC voltage into a DC voltage;

a transformer configured to couple the DC voltage to the load,  
5 wherein the switch is connected in series with a primary winding of the transformer, and wherein the load is connected across a secondary winding of the transformer;

a current estimating module configured to determine the estimated current through the load based on the first current through the switch;

10 a pulse width modulation controller configured to generate the pulse width modulation pulses; and

a multiplexer configured to receive as inputs (i) the first output of the first comparator and (ii) the second output of the second comparator,

15 wherein the current control module is configured generate a control signal to control the multiplexer based on the difference between the estimated current through the load and the desired current through the load,

20 wherein the multiplexer is configured to output (i) the first output of the first comparator or (ii) the second output of the second comparator based on the control signal, and

wherein the pulse width modulation controller is configured to turn off the switch based on (i) the first output of the first comparator or (ii) the second output of the second comparator output by the multiplexer.

7. A method comprising:

25 supplying power to a load through a switch in response to the switch being turned on by pulse width modulation pulses;

comparing a first current through the switch to a first threshold and generating a first output in response to the first current being greater than or equal to the first threshold;

comparing the first current through the switch to a second threshold and generating a second output in response to the first current being greater than or equal to the second threshold, wherein the second threshold is greater than the first threshold;

- 5                   select the first output or the second output,  
                  turning off the switch based on the first output or the second output;  
and  
                  adjusting a duration for which the second output is selected based  
on a difference between an estimated current through the load and a  
10               desired current through the load.

8.     The method of claim 7, further comprising:  
          generating the power based on an AC voltage; and  
          preventing variation of a second current through the load due to an  
imbalance in the AC voltage by adjusting the duration for which the  
15           second output is selected.

9.     The method of claim 7, further comprising:  
          generating the power based on an AC voltage having a  
predetermined period; and  
          reducing a total harmonic distortion in a second current through the  
20           load by limiting the duration for which the second output is selected to (i)  
greater than or equal to one-fifth of half the predetermined period and (ii)  
less than or equal to one-third of half the predetermined period.

10.    The method of claim 7, further comprising determining the estimated  
current through the load based on the first current through the switch.

- 25    11.   The method of claim 7, further comprising:  
          converting an AC voltage into a DC voltage;  
          coupling the DC voltage to the load by a transformer;

connecting the switch in series with a primary winding of the transformer;

connecting the load across a secondary winding of the transformer;

5 determining the estimated current through the load based on the first current through the switch; and

generating the pulse width modulation pulses.

12. The system of claim 1, wherein in response to the estimated current through the load being less than the desired current through the load,  
10 based on difference between the estimated current through the load and the desired current through the load, the current control module is configured to:

increase the duration for which the second output is selected, and

15 turn off the switch when the first current through the switch becomes greater than or equal to the second threshold and not when the first current through the switch becomes greater than or equal to the first threshold.

13. The system of claim 1, wherein in response to the estimated current through the load being greater than the desired current through the load,  
20 based on difference between the estimated current through the load and the desired current through the load, the current control module is configured to:

decrease the duration for which the second output is selected, and

25 turn off the switch when the first current through the switch becomes greater than or equal to the second threshold.