



CogniPower Compound Converter for PFC AC/DC

More Efficient, Smaller, Less Expensive

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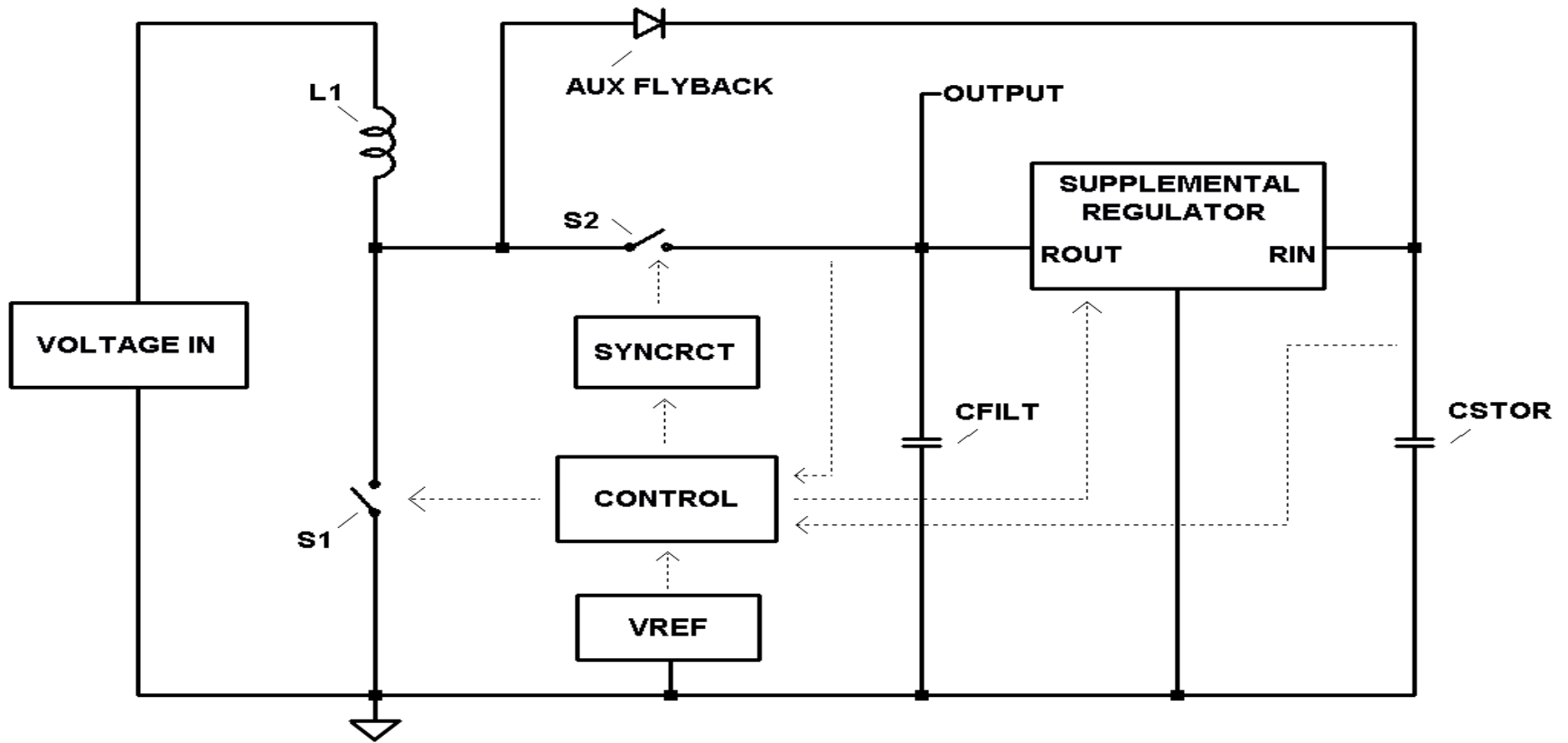
CogniPower Compound Converter

The Compound Converter is a new topology offering regulation of both input current and output voltage while the majority of power passes through only a single stage of power conversion.

Advantages include better Power Factor Correction (PFC), greater efficiency, smaller size, lower cost and ease of application.

The Compound Converter principle can be applied to almost any AC/DC converter, with main power stages that include flyback, boost, buck, forward or quasi-resonant.

Basic Compound Converter



Bipolar blocking switch S2 performs synchronous rectification.

When disabled by Control, inductive energy flows to CSTOR.

Compound Converter Operation

Switch S1 admits energy into the switched inductor.

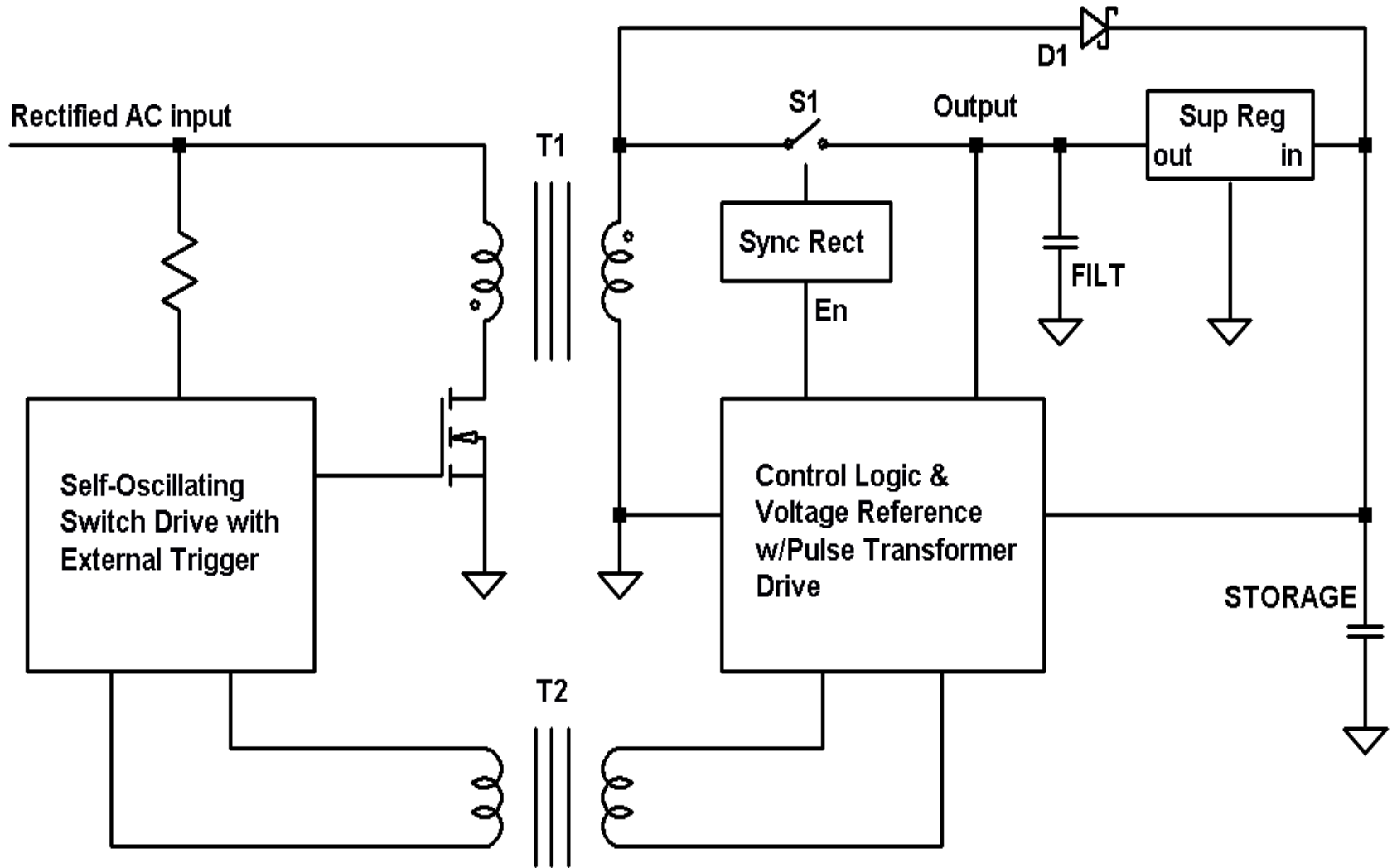
That energy will directly support the load, up to the regulation point.

Any excess energy flows through the flyback diode to the storage capacitor.

The load can also be supported by a supplemental regulator powered from the storage reservoir.

For AC/DC conversion with PFC, input current is kept in proportion to input voltage by maintaining a constant ON time for switch S1.

Simple, Isolated Compound Converter



Both PFC and Precise Output Regulation

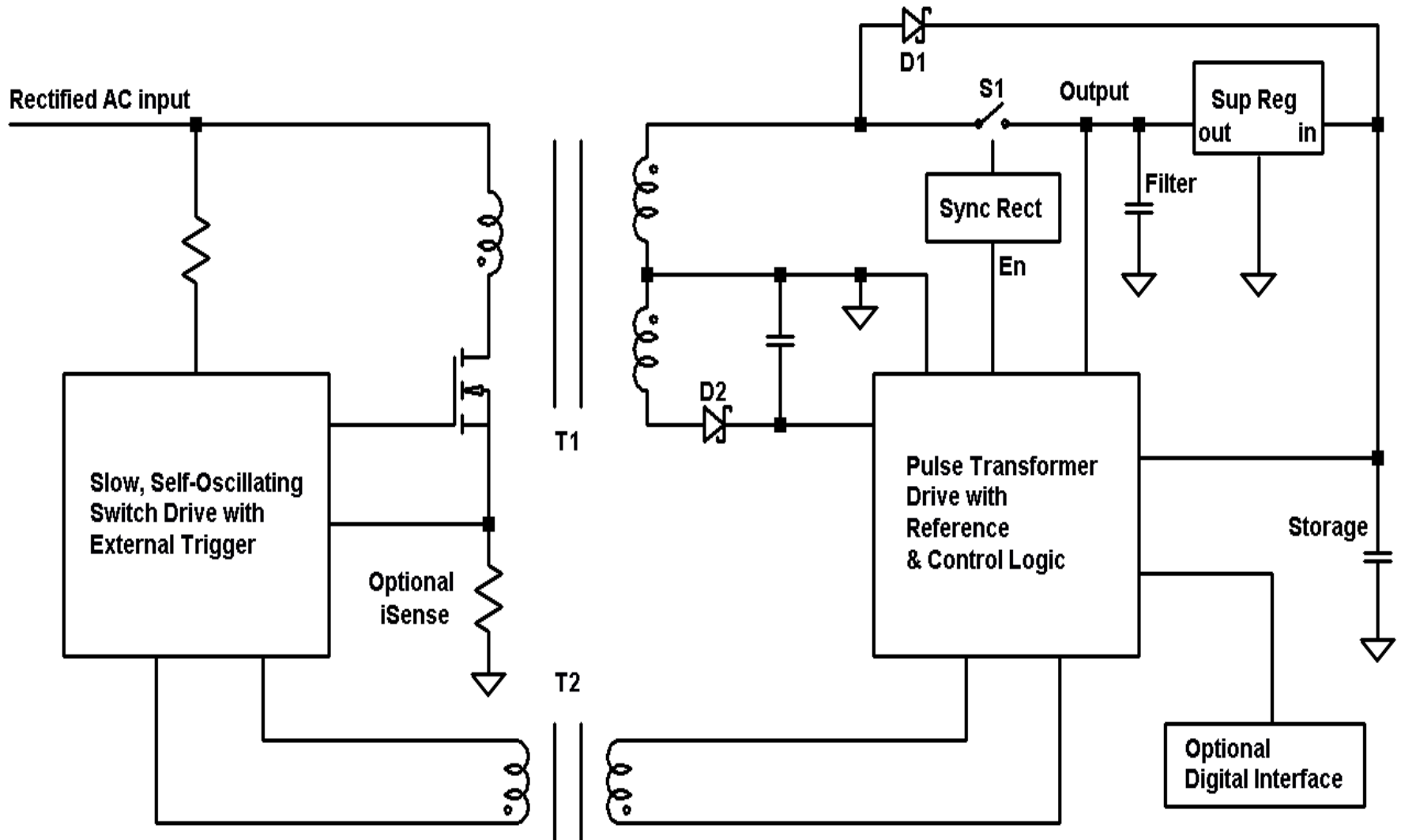
During peaks in the AC waveform, all the load energy moves through the main stage only, and any surplus energy is moved to storage.

During zero crossings, the load energy is provided by the supplemental regulator, powered from the storage reservoir.

The switch S1 ON time can slowly vary to pass the correct amount of energy, on average, over each AC input cycle.

Alternatively, the ON time can be entirely fixed, and the operating frequency can slowly vary.

Compound Converter with UPS Capability



Practical Design, with Unlimited Storage

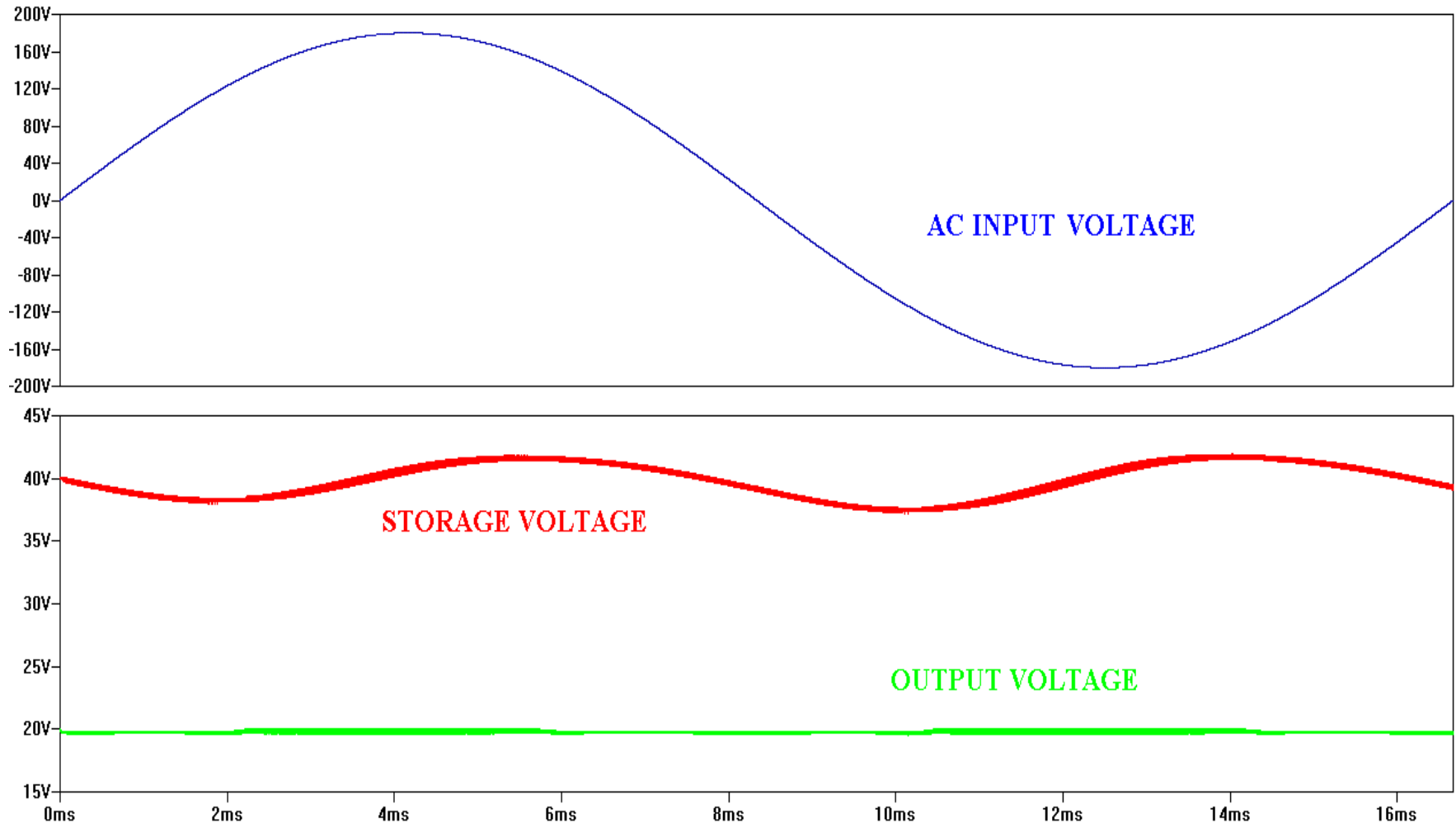
The additional secondary winding allows the isolated side control circuitry to power up independent of the output and storage voltages.

T2 can be a tiny, single-turn pulse transformer that isolates the control for the mains side switch.

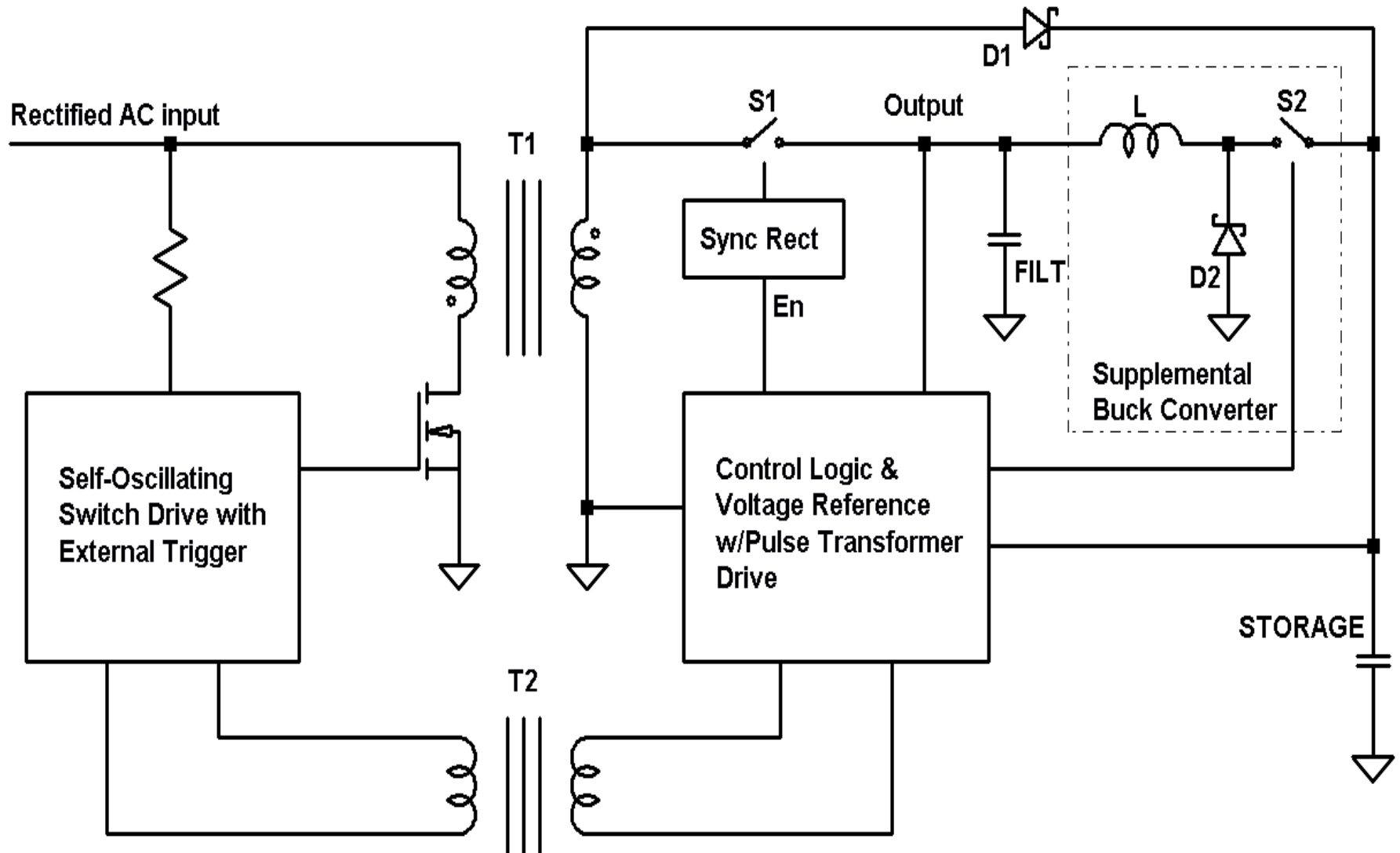
The mains side switch driver self-oscillates at a very low frequency to power up the controller on the isolated side.

Once the control logic is running, it takes over operation of the mains side switch through T2.

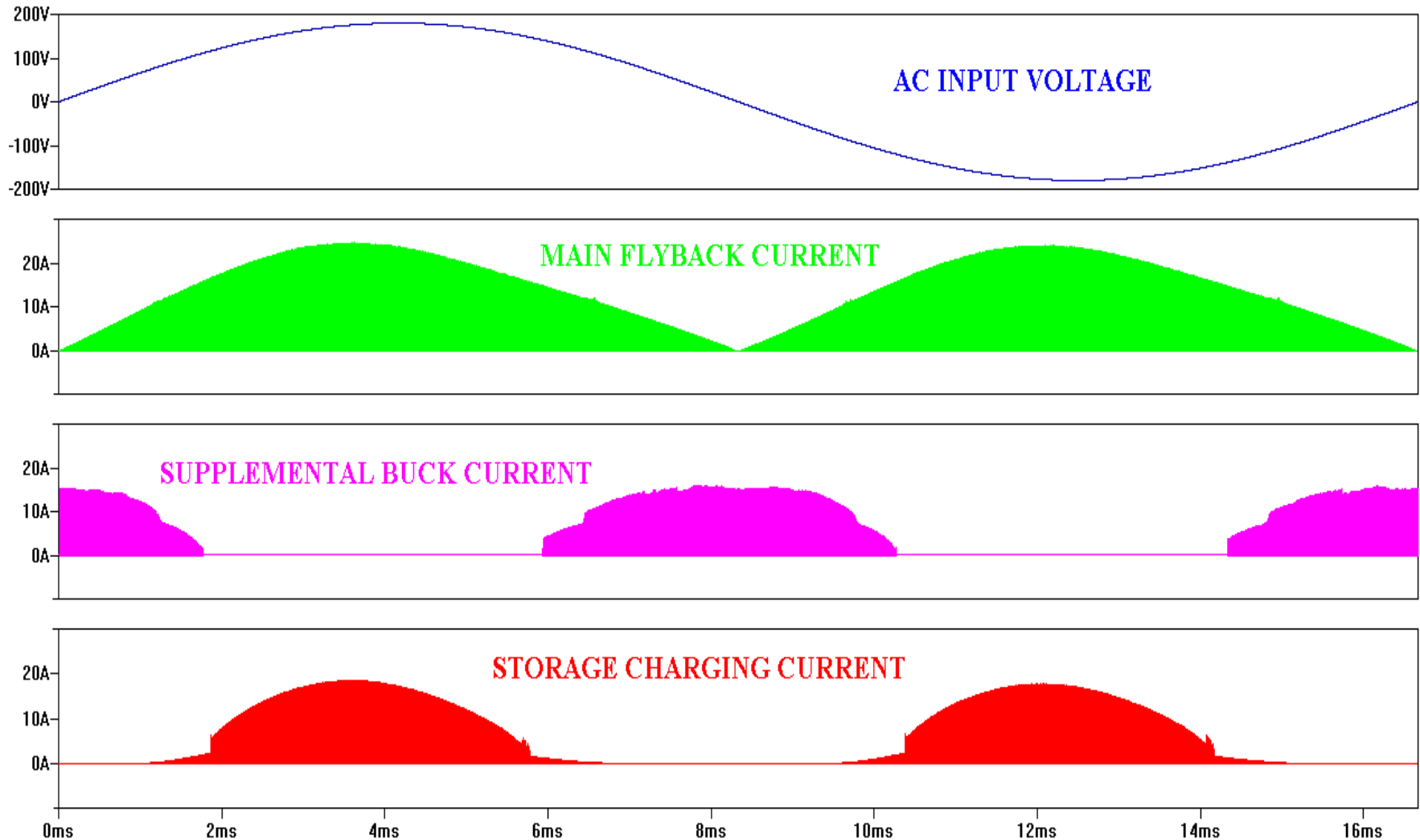
Compound Converter Waveforms



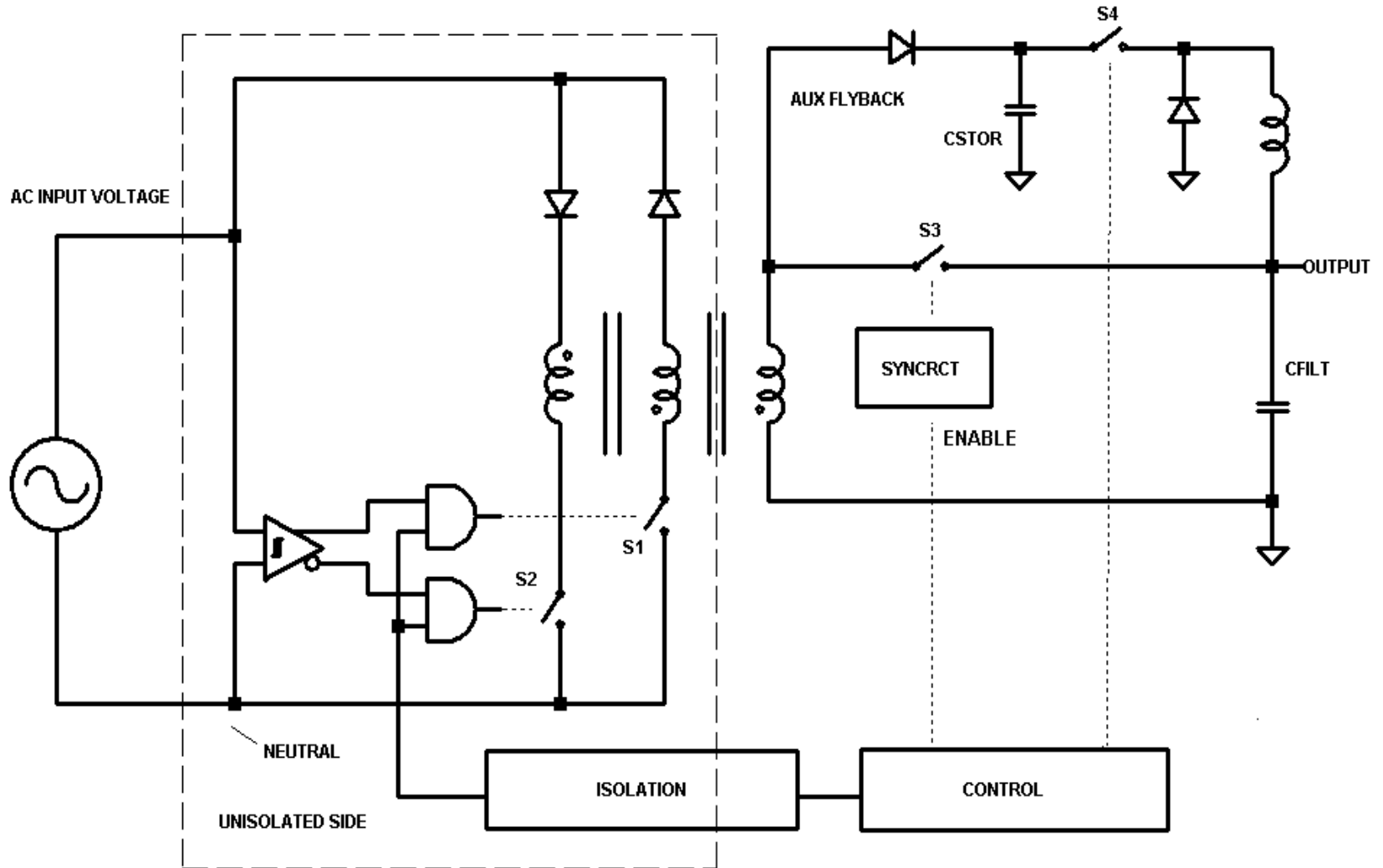
With Supplemental Buck Converter



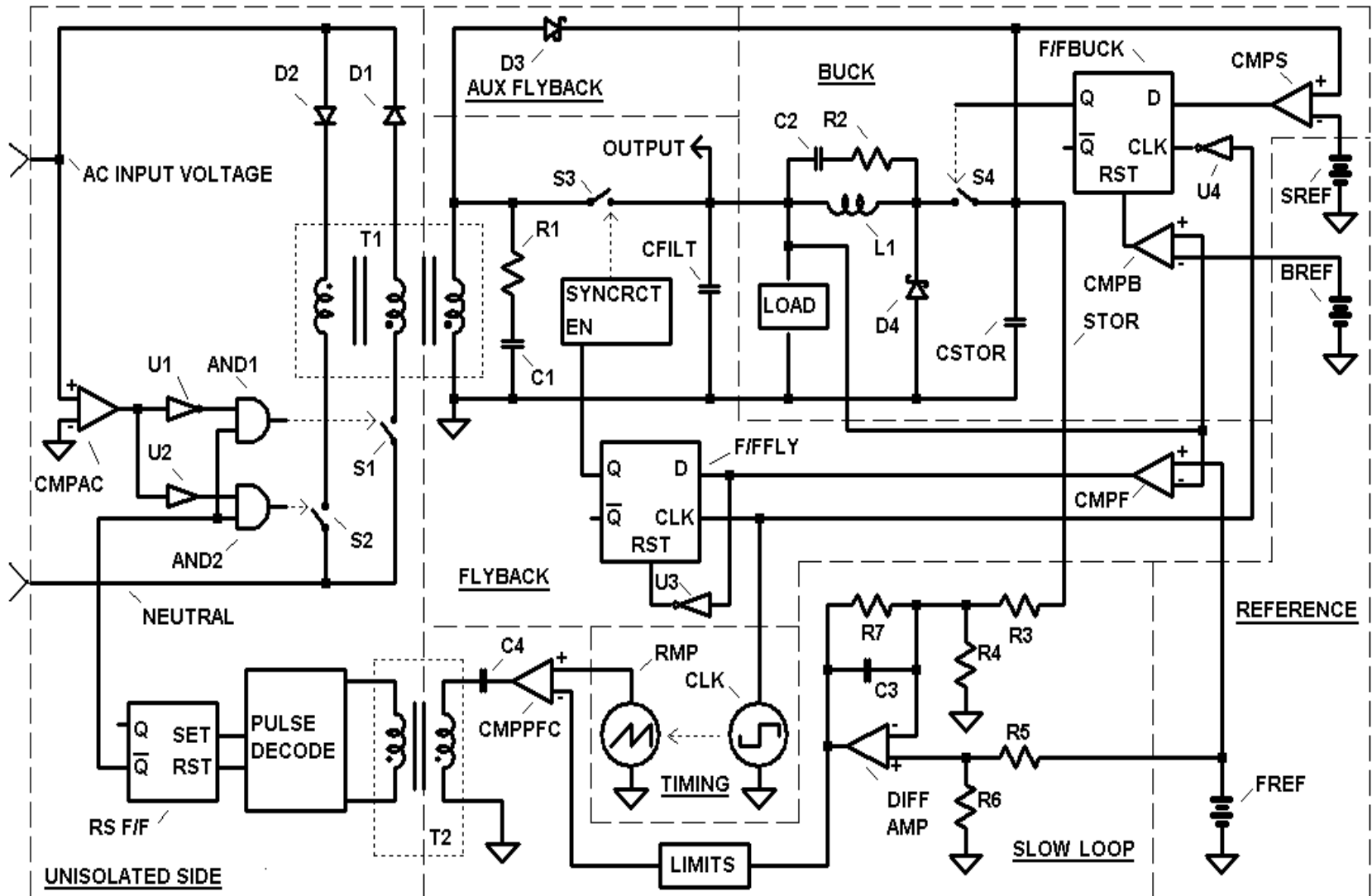
Compound Converter w/Buck Waveforms



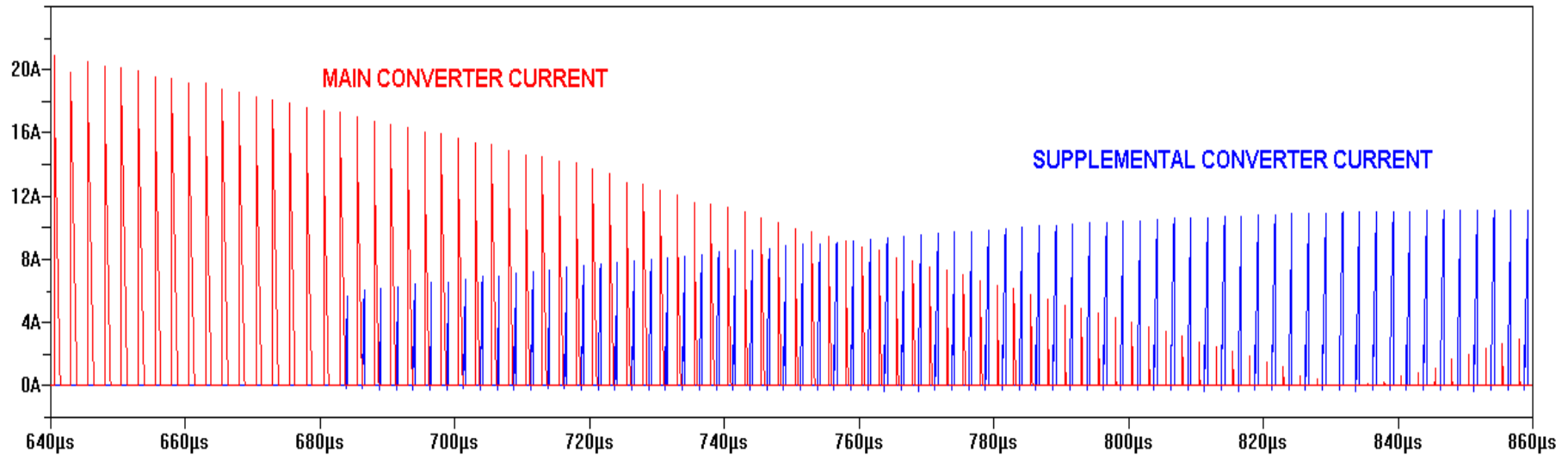
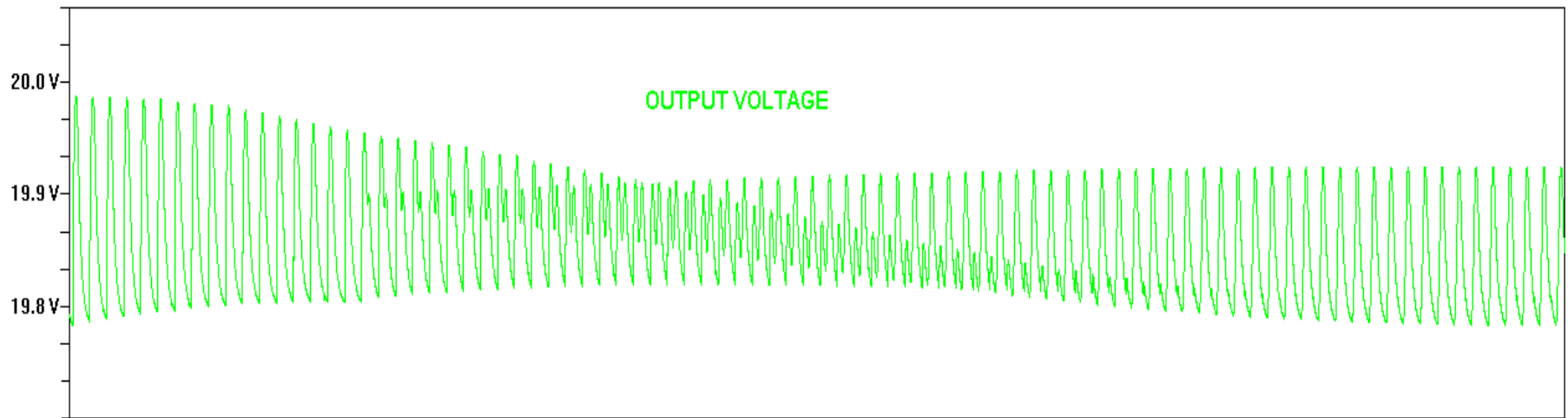
Split Primary Eliminates Diode Bridge



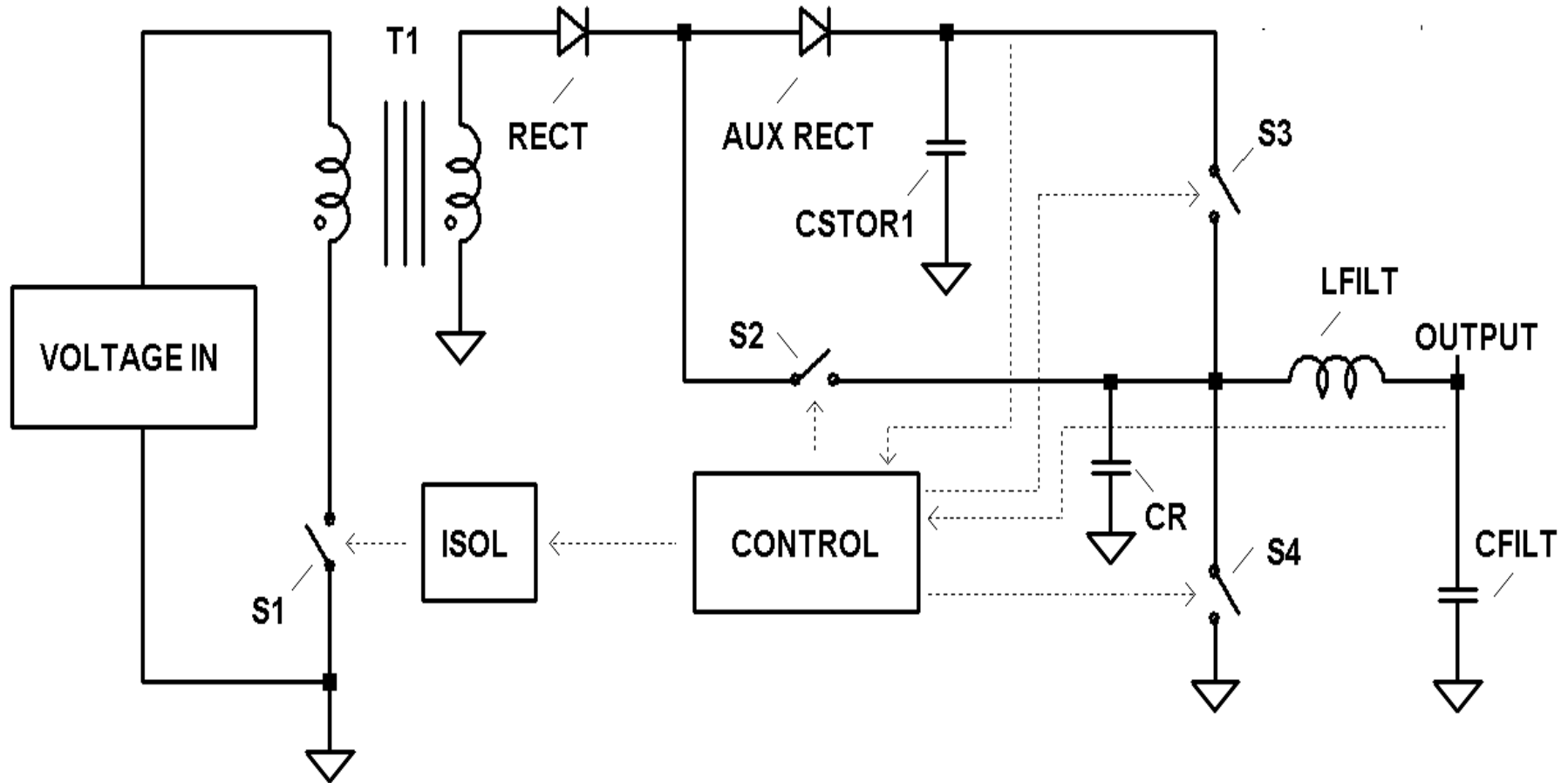
SPICE Showing Comparator Controls



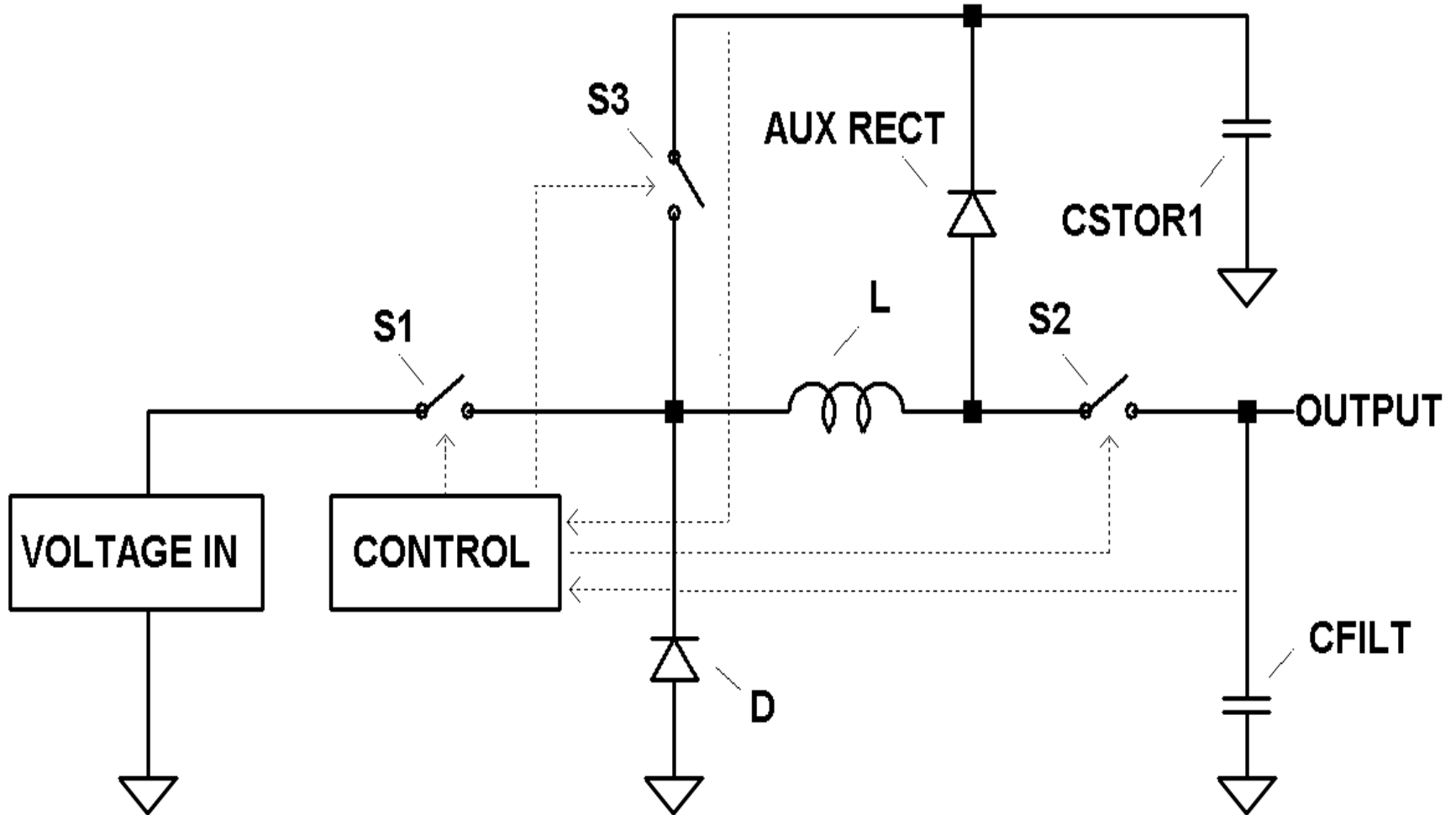
Regulation Detail of Converter Above



Quasi-Resonant Compound Converter



Re-using One Inductor for Both Functions



Compound Converter CATV Application

A CATV company needed better power supplies to speed up an existing power and space-constrained network.

After failing for two years to meet stricter PFC, size, efficiency, and cost goals using conventional methods, they tried the Compound Converter topology.

A few months later, they had exceeded their targets and were preparing pre-production units for qualification.

The Compound Converter is simple to implement because it is largely a rearrangement of existing elements.

Other Applications

Any AC/DC converter is a candidate for the Compound Converter architecture.

Because they are smaller and less expensive than two-stage systems, Compound Converters will find their way into smaller power supplies.

Companies now using premium products for the more demanding European market can save by consolidation.

The possibilities include office equipment, laptops, flat screen displays, LED lighting, and mobile device chargers, to name only a few.

Other CogniPower New Technology

Predictive Energy Balancing (PEB)

PEB is a superior method for controlling switched mode power. Simple, real-time energy calculations take the drama out of stabilizing just about any power converter.

Low-Load Efficient Wall Adapters

These can achieve under 5 mw no-load power, and 85% efficiency at 2% of full load. These adapters are smaller and less expensive than existing designs. Electrolytic output filter capacitors are not needed.

Patent Pending

Our Compound Converter patent application has been ruled allowable by the European Patent Office.

The way is now clear for this very broad patent to issue in a great many countries.

It will join CogniPower's 9 issued patents, and 3 more patents that are in the process of issuing at this writing.

Including pending patents, the portfolio is presently up to 20 patents.

At this time, many licensing or sale opportunities remain for various technologies.

Questions?

Come see us in Booth #215.

Thank You

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