

# RDFC topology – benefits for audio applications



## An RDFC power controller for a wide range of audio products

- Low cost design enabling the meeting of new efficiency and no load power regulations
- No Y Caps below 20 W required reducing the possibility of mains hum
- Safety benefits with forward converter topology and controller features

## Overview

The C2470 series of power controllers offers a novel approach to offline AC:DC power conversion. These devices replace linear-type power supplies with a low cost switch-mode Resonant Discontinuous Forward Converter (RDFC) topology.

This new approach brings significant benefits over current linear or flyback supplies for audio applications including:

- Low cost
- Low EMI that produces no mains hum
- High pulse power and efficiency
- Enhanced Safety (against high immunity surges).

## Applications

Multiple audio applications include:



Radio alarm clocks, Hi-Fi units, “Boom Boxes”

## Low Cost

CamSemi's RDFC solution requires no feedback circuit, reducing the BoM by 1 optocoupler, 1 programmable zener and 10 passive components. The smoother switching behaviour also removes the need for a Y capacitor, reducing the BoM by around 13 components.'

## No Mains Hum

Mains hum, or power line hum is an audible oscillation at the frequency of the mains alternating current (50 or 60 Hz).

The cause in a linear power supply unit (PSU) is the ferromagnetic material used in the transformer core, minutely changing shape under the influence of the varying magnetic field generated by the alternating current flowing through the transformer coils. Also, over time, transformer components (laminations and

coils windings) can work loose causing a louder hum or buzz.

The RDFC does not have this problem because it operates at ultrasonic frequencies and has a smaller transformer than a linear unit, which is easier to manufacture into a mechanically stable component.

## Low EMI

The resulting low EMI is achieved due to the soft switching resonant waveform.

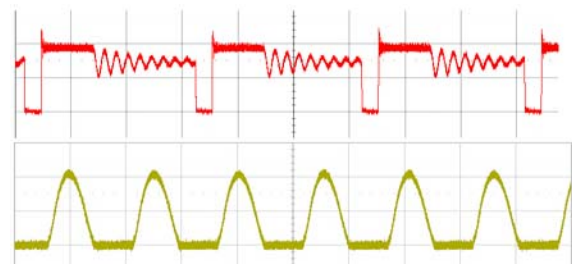


Figure 1: Top waveform showing the hard switching flyback waveform that generates significant EMI; the lower smooth resonant waveform minimises EMI.

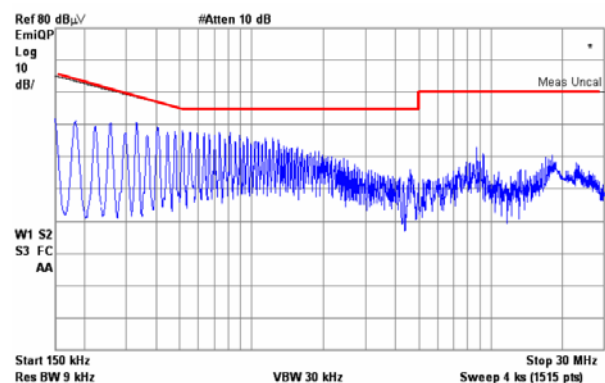


Figure 2: The red line is the EN55022 Class B quasi peak limit. The blue line shows typical RDFC EMI waveform.

## Efficiency & Low No Load Power

Power supplies based on CamSemi's new controller and RDFC topology can easily meet today's demanding efficiency and no load power regulations.

## Power Supply Safety Functions

Safety is paramount in consumer electronic products. However, unlike linear power converters, the controller has built-in safety features such as:

- Intelligent, self recovering protection against output overloads or short circuits
- Protection against over temperature
- Bipolar switch protection
- Input under-voltage protection

### Safety – No Y-cap or Control Circuit

To operate effectively, existing SMPS topologies need costly Y-capacitors (Y-cap) and opto-coupler detection circuits. These devices are located across the high voltage input and low voltage output circuits. However with CamSemi's RDFC topology and controller, EMI is low and the output is directly related to the turns ratio on the transformer making Y-capacitors and opto-couplers unnecessary.

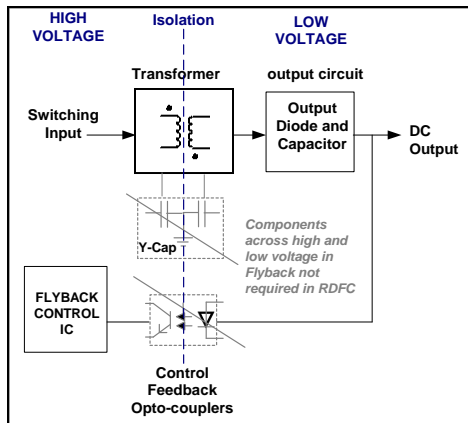


Figure 3: Y-Cap and opto-couplers are unnecessary

### Forward Topology – Further Safety Benefits

One of the benefits for both linear and RDFC power supplies is that they are inherently very safe due to the forward converter topology operation.

**Mains surge** – Any mains surge cannot pass through the transformer because it saturates and blows the input fuse.

**Over voltage** – The forward converter topology cannot pass on high voltage outputs onto the secondary side of the power supply as it is limited by the transformer turns ratio.

i.e. 110 V input with a 10:1 turns ratio would give 10 V output. If 160 V appeared from a fault on the input side, then it would still only deliver a safe 16 V output.

## High Pulse Power

A major benefit of RDFC is the ability to deliver high pulse powers without the need to increase component sizes. In other words for audio applications, to deliver high pulse power e.g. to spin up a CD or deliver a peak in audio output but with no additional costs.

## Small Size – Low Cost

One of the most significant cost benefits is a marked reduction in transformer size.

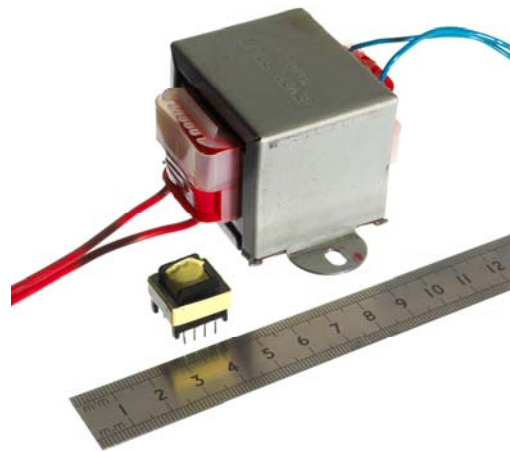


Figure 4: Linear transformer vs RDFC transformer for a 14 W midi hi-fi system. Scale in cm.

## Controller Series

The following controller options are available:

Part Number	Package
C2471LX2	SOT23-6
C2472PX2	SOT23-6

## For more Information

For details of our channel partners and information on future product, technology or corporate announcements, visit [www.camsemi.com](http://www.camsemi.com)

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