RDFC Topology - Safety Benefits

A high safety margin for off-line power conversion

- Forward topology ensures protection against mains surge and over voltage
- Self protection against under voltage, short circuits and high temperatures
- Does not require an opto-coupler or Y-capacitor that sits across high and low-voltage rails

Overview

CamSemi C2470 controller and the Resonant Discontinuous Forward Converter (RDFC) power supply topology have several built-in safety features.

Forward Topology – Inherent Over Voltage Protection

One of the benefits of both linear and RDFC power supplies is their inherent safety. This is because both use a forward converter topology which protects against:

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 because it is limited by the transformer turns ratio.

- i.e. 110 V input with a 10:1 turns ratio would give 11 V output. If 160 V were to appear due to a fault on the input, you would still only see a safe 16 V on the output.

CamSemi Controller

A power management IC brings extra self-protection features that are unavailable in other topologies (e.g. linear power supply or ringing choke converters).

The new CamSemi controller has inbuilt:

Input under-voltage protection

The controller is prevented from operating if the input (mains) supply is inadequate.

Over-temperature protection

Temperature sensing is integrated within the controller. If the temperature of the die rises above the shutdown temperature, it stops switching the power supply by inhibiting the external transistor switch. It then restarts once the temperature has fallen below the shutdown temperature.

External transistor over-voltage protection

To protect the primary switch from excessive power dissipation, the on-state voltage of the primary switching transistor is limited by the controller.

External transistor over-current protection

To protect the external switching transistor, the controller turns it off by reducing the drive current if it detects the transistor switching current rising too steeply.

Short-circuit/overload protection with auto restart function

The short circuit over-voltage protection is explained in Figure 1. When the output current exceeds a certain level, the controller automatically goes into standby mode.

From standby mode, the controller enters burst mode at periodic intervals to provide maximum power for a set number of cycles. If at the end of the burst the load is not excessive, the controller reverts to normal mode. If the load is excessive, the controller returns to standby mode.

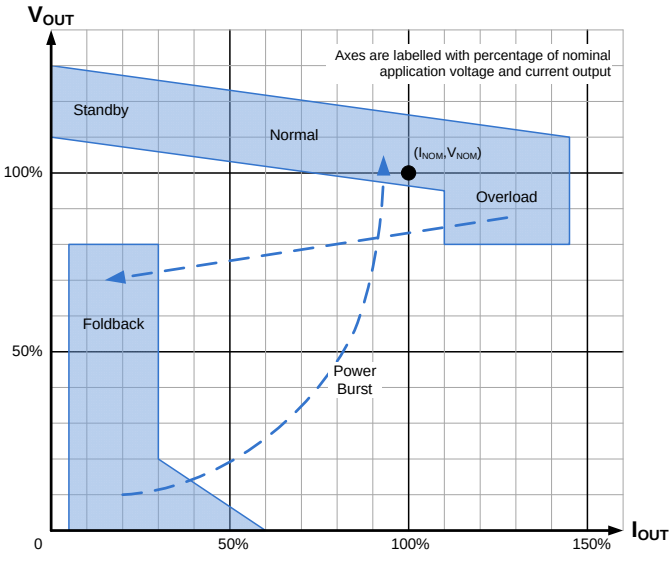

Figure 1: Automatic short-circuit or overload protection

Removal of components bridging ac input and dc output of PSU

In most flyback and Ringing Choke Converter SMPS designs one or more devices sit across the high voltage mains ac input (i.e. 115 V or 230 V) and low voltage dc output side of the power supply.(i.e 5 V, 12 V etc).

An opto-coupler is normally used to provide feedback from the secondary side of the transformer to the circuit or controller and for voltage regulation control, but also to protect the output from over-voltage conditions.

The Y-capacitor is used to reduce EMI generated within the circuit.

Removing any device that bridges the high and low voltage sides in a power supply has considerable safety benefits.

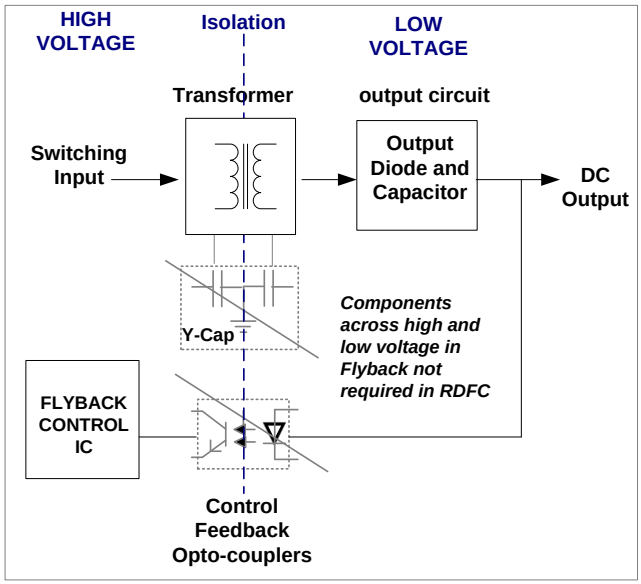

Figure 2: No Y-capacitor or opto-coupler required

Why RDFC does not need an opto-coupler

The primary side sensing techniques used by the C2470 controller avoids the need for an opto-coupler.

Why RDFC does not need a Y-capacitor

RDFC operates with a smooth switching resonant waveform. This waveform does not generate EMI, so there is no need for a Y-cap or equivalent for applications typically up to 20 W.

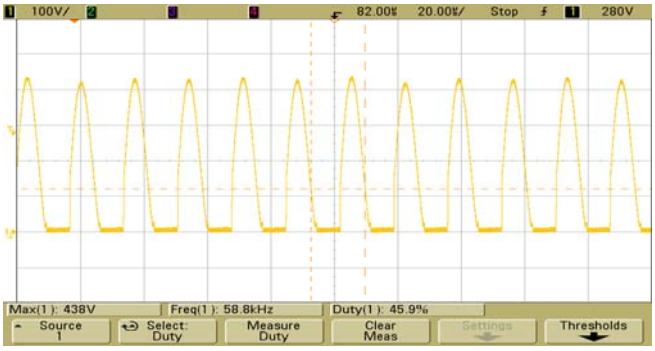

***Figure 3:* Smooth resonant switching waveform means no need for Y-Capacitors**

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

Contact Information

European Design Centre

CamSemi
St Andrews House
St Andrews Road
Cambridge, CB4 1DL
United Kingdom

Tel: +44 1223 446450

Taiwan Design Centre

CamSemi
6F, No.58, Zhouzi St.,
Neihu District,
Taipei City 114,
Taiwan (R.O.C.)

Tel: +886 2 8178 1010

China Design Centre

Room 201, 2F
Shenzhen Academy of Aerospace Technology,
Tower B, 10th Kejinan Rd.
Nanshan District,
Shenzhen, China 518057

Tel: +86 755 8611 7778

Korea Design Centre

No. 808 KOFOMO Tower,
16-2 Sunae-Dong, Bundang-GU,
Sungnam-Si, Kyunggi-Do,
463-825,
SOUTH KOREA

Tel: +82 31 711 1415