

## Association of Input Power and Output voltage for closing the loop in Quasi-Resonant Converter

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### Abstract

The Quasi Resonant Converters are addressing the RFI concern in the low power energy conversion arena. Associated with the flyback structure they offer an excellent compromise for achieving a friendly environmental power supply system. The side difficulty appearing with concept is linked to the dependence between the maximum power limitation and the input voltage level.

A novel technique is presented in this paper that takes into account the effective input power in the regulation closed loop. A dedicated way is shown that uses the combination of the output voltage together with the measured input power without the use of an additional terminal in the integrated device. This concept using the Power for the output voltage regulation is called PMODE.

This novel PMODE technique is an extension of the well known IMODE technique. The advantages of the IMODE are still valid such as first order transfer function and feed-forward action. The introduction of the Power information in the loop allows a precise over power clamping while the output voltage regulation is achieved with an improved dynamic performance.

The paper presents the global principle shown on the figure 1 and then extends its use to a specific arrangement allowing the implementation of a very low pin count driver.

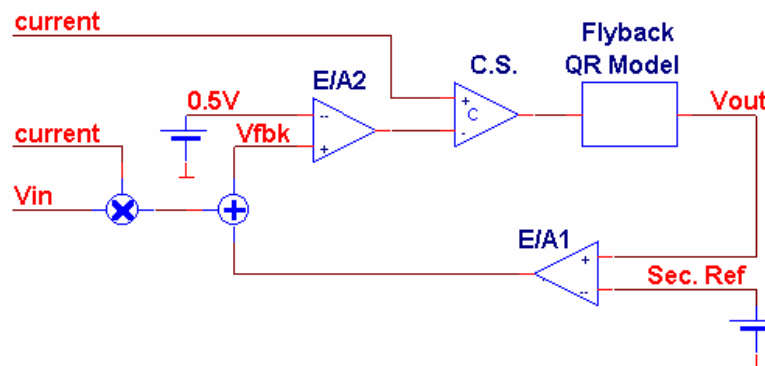


Figure 1 – Closed Loop using PMODE

The figure 2 plots the power limitation performance using the PMODE concept. These plots are theoretical. In the paper bench measurement results are presented.

## PMODE controlled QR Flyback

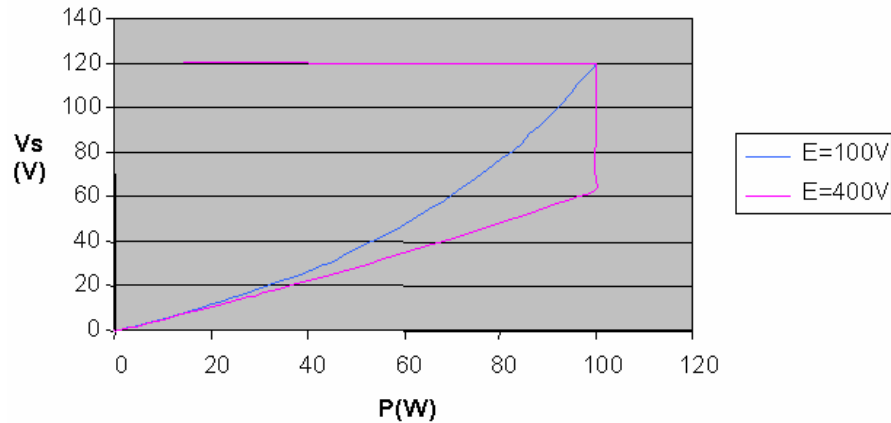


Figure 2 - Output voltage vs effective input power

The figure 3 shows a PMODE power supply load transient reaction. The measurements are made on a 100V output with a 60% load variation. The output voltage deviation is in the magnitude range of the output voltage ripple at full load.

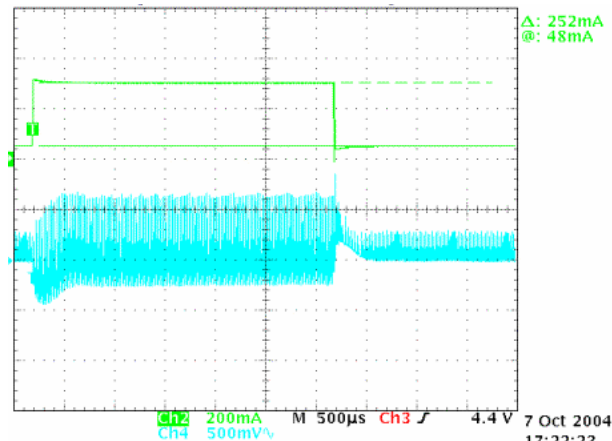


Figure 3 – Closed loop dynamic response

The transfer function is discussed and the gain phase Bode plots are presented in the paper.

A integrated device arrangement is also described including a power calculation block using a one quadrant multiplier and a specific way to marry the power information together with the feedback information on a single terminal.

The PMODE concept and implementation is patent protected.

