

MAGNETIC AMPLIFIER WITH LPR30 CONTROLLER

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Proper regulation is important in multiple output power supplies where the individual outputs must be tightly controlled.

The continuing need for more compact and reliable switching power supplies has aroused renewed interest in a well founded control technique: THE MAGNETIC AMPLIFIER.

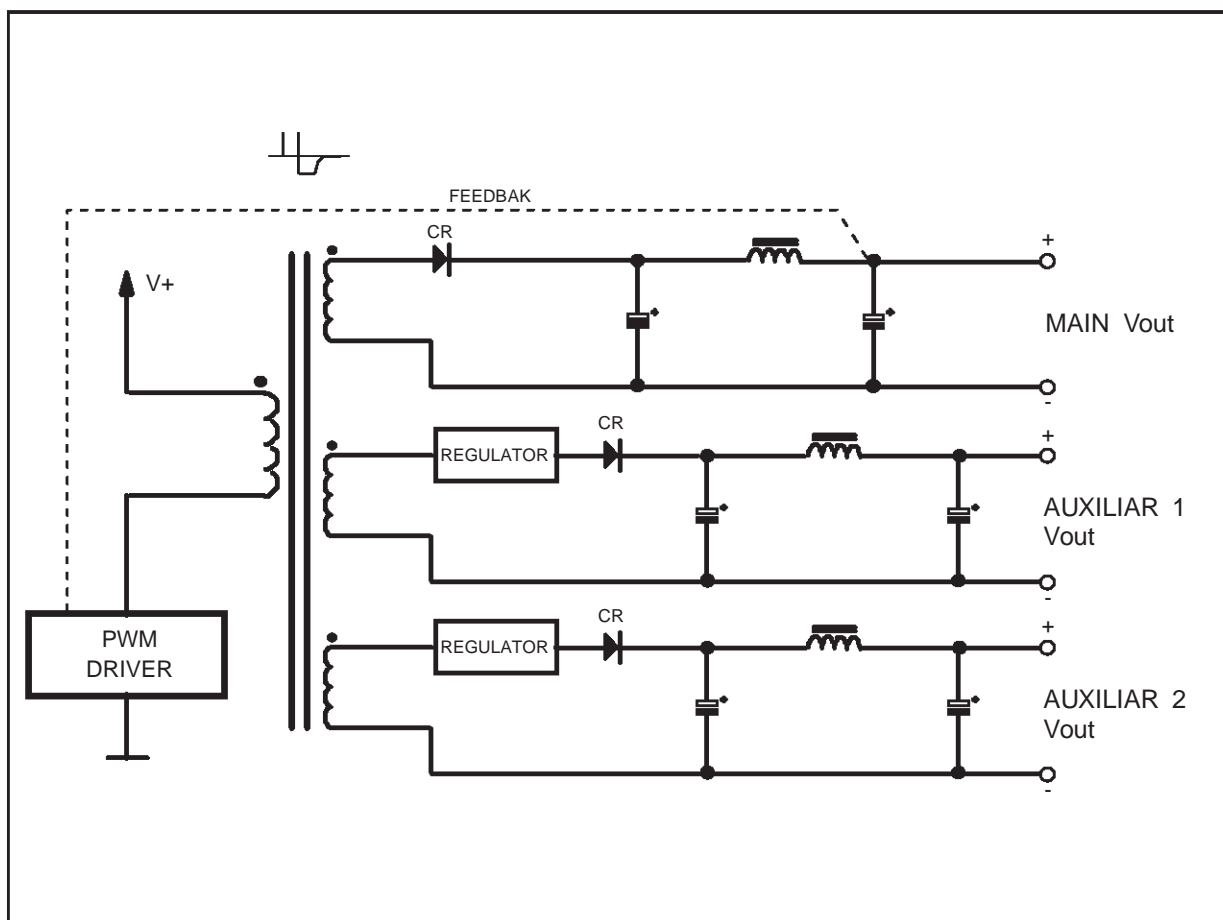
THE MAGNETIC AMPLIFIER (shortly written MAG -AMP), means higher density, simpler control circuit and higher running frequency in Switching Power Supply.

The MAG AMP is suitable for controlling individual outputs ranging from a few watts to over 100 watts in power converters whose frequencies range from 20KHz to several hundred KHz.

Picture 1 shows the best application of the MAG AMP is in the Switched - Mode Power Supplies .

By using such a square - loop core to provide a controllable delay at the leading edge of the pulses at the secondary of the transformer, one or more outputs can be independently and precisely regulated without the losses inherent in linear regulators or the complexity of conventional switching regulators. In cases where the load currents of the subordinate outputs are high (more than 2 - 3 Amps), the advantages of the saturable regulators become more significant.

Figure 1. Multiple-Output Switched-Mode Power Supplies.



The diagram illustrates a current-mode controlled buck converter. The input is a transformer-coupled AC source connected to a bridge rectifier. The positive output of the rectifier is connected to an SR (Schottky Rectifier) diode. The output of the SR diode is connected to the VIN pin of the LPR30 IC. The LPR30 IC is a current-mode controller with pins for VIN, LBA- (3), LIM+ (2), ERR- (7), ERR+ (8), VREF (4), and GND (5). The output of the LPR30 IC is connected to the gate of a MOSFET. The MOSFET's source is connected to ground, and its drain is connected to the positive output of the buck converter. The positive output is connected to the L+ pin of the LPR30 IC. The negative output is connected to the L- pin of the LPR30 IC. The LPR30 IC also has a feedback network consisting of a resistor and a capacitor connected to the LIM+ pin. The output voltage is labeled Vout. The current-mode control is implemented using the LPR30 IC, which includes a current sense resistor (Rsense) and a current sense amplifier (CSA) block. The CSA block is connected to the L+ and L- pins and provides feedback to the LPR30 IC. The LPR30 IC also includes a reference voltage (VREF) and a feedback network (LBA- and LIM+ pins).

Using the LPR30 like controller (as shown in fig.2) , in the PWM (Auxiliary Outputs) the pulse width is controlled by sensing the output voltage comparing it (pin 6) to the internal reference (pin 4) and using the Error signal to adjust the pulse duration. Without any MAG AMP plus controller, in the Auxiliary circuits the outputs would be " semi - regulated ", since the primary control loop would provide line regulation. But the other output would vary with load and temperature.

It is always active and together with MAG AMP provides an exceptionally smooth transition as the output is loaded beyond the current limit and then returned to normal load condition.

This means that when the voltage to the R_{SENSE} is more than 50mV, the CURRENT LIMIT AMPLIFIER recognises that the current is more than the nominal one generating then an error signal that is applied to the MAG AMP RESET TRANSISTOR.

The increase in reset current decreases the pulses width at the output of the MAG AMP and thus opposes the increase in current which was sensed by R_{SENSE} .

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