SGS-THOMSON MICROELECTRONICS

AN904
APPLICATION NOTE

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.

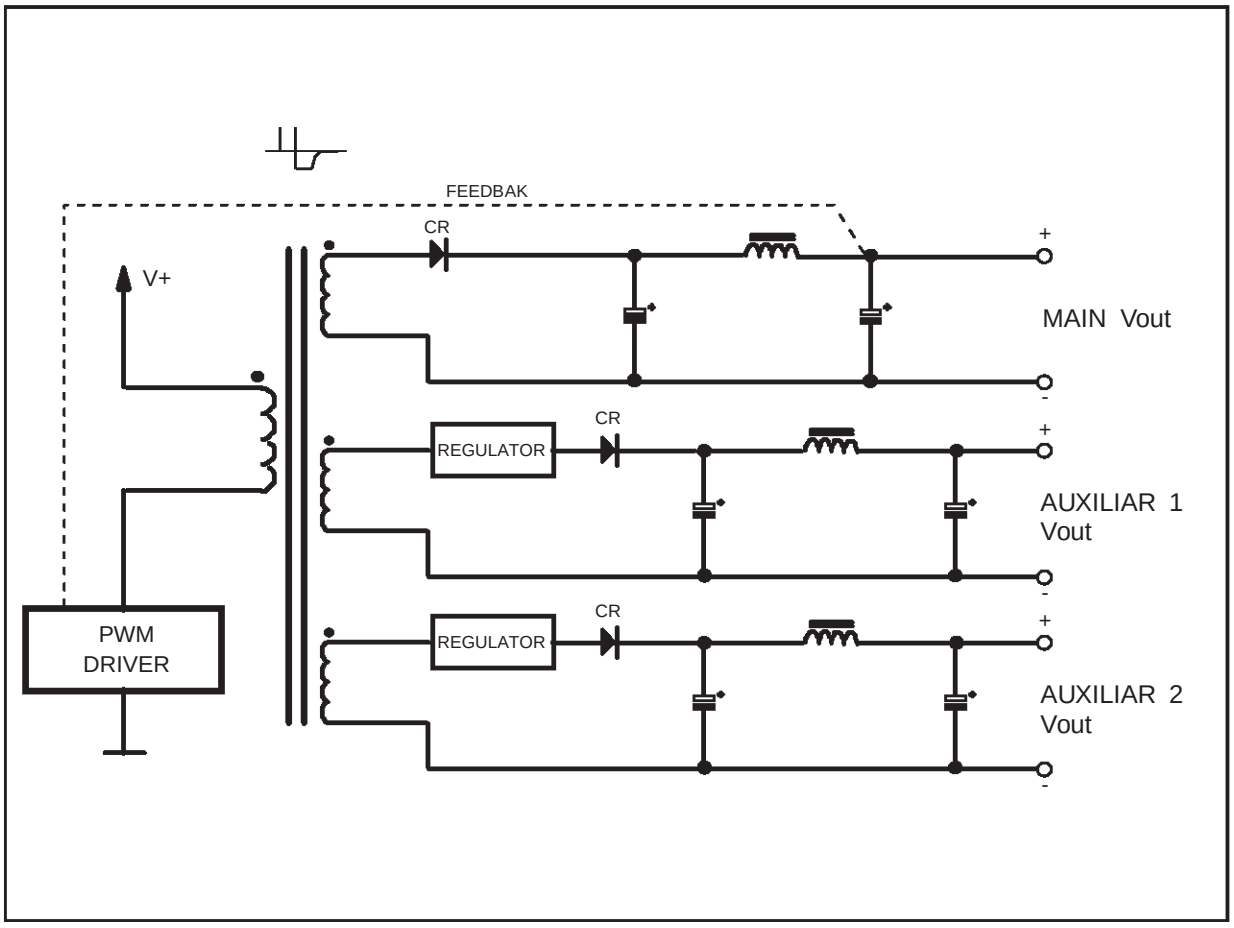


Figure 2.

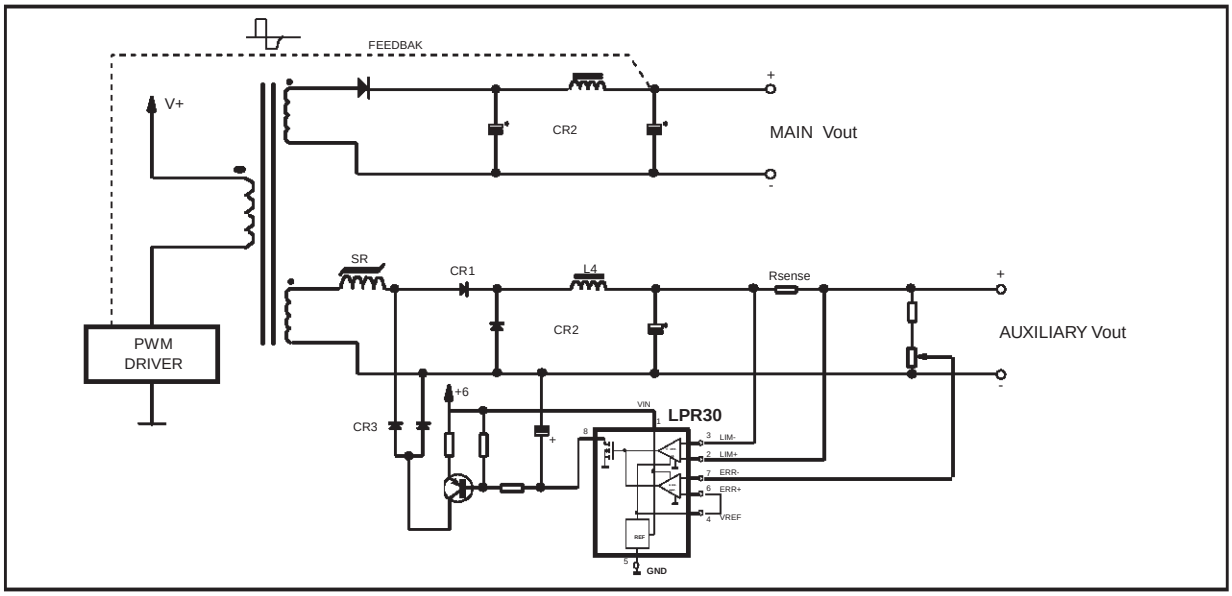
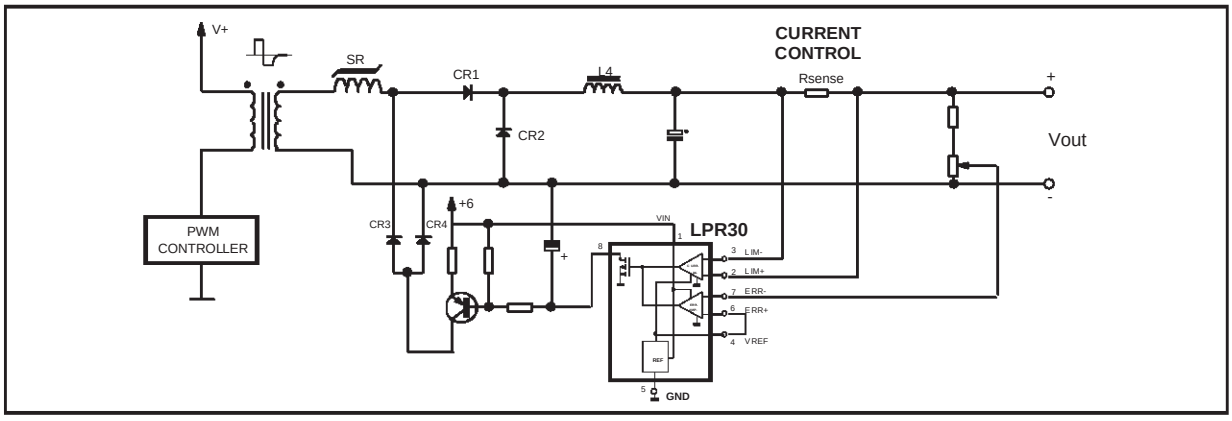


Figure 3.



LPR30 CONTROLLER

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.

Besides, the LPR30 controller plus MAG AMP is particularly advantageous when independent current limiting for the auxiliary outputs is desired, due to the fact the LPR30 is able to monitor even the current.

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

To do this job, the LPR30 uses its second internal comparator (CURRENT LIMIT AMPLIFIER , pin 2 and pin 3 see fig.3) that has an artificial offset of 50mV.

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} .