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STEVAL-ISA005V1

1.8W buck topology power supply evaluation board with VIPer12AS

Data Brief

Features

- Switch mode general purpose power supply
- Input: 85 to 264Vac @ 50/60Hz
- Output: 15V, 100mA @ 50/60Hz
- Output power (pick): 1.6W
- Second output through linear regulator: 5V / 60 or 20mA

Description

This evaluation board is an auxiliary power supply based on the VIPer12AS monolithic device with rather low output power required. It is a buck (step-down) converter with a positive output voltage referenced to the common ground based on the monolithic device VIPer12AS, which is a device that incorporates the PWM controller together with the vertical Power MOSFET switch in a SO-8 package.



ST Components

- VIPer12AS Off-line SMPS Primary
- L78L05CD or L78M05CDT positive voltage regulator for optional 5V second output

1 General circuit description

Input capacitor C1 is charged from line via a one way rectifier consisting of diodes D1 and D2. Two diodes in series are used for EMI reasons to sustain burst pulses of 2kV.

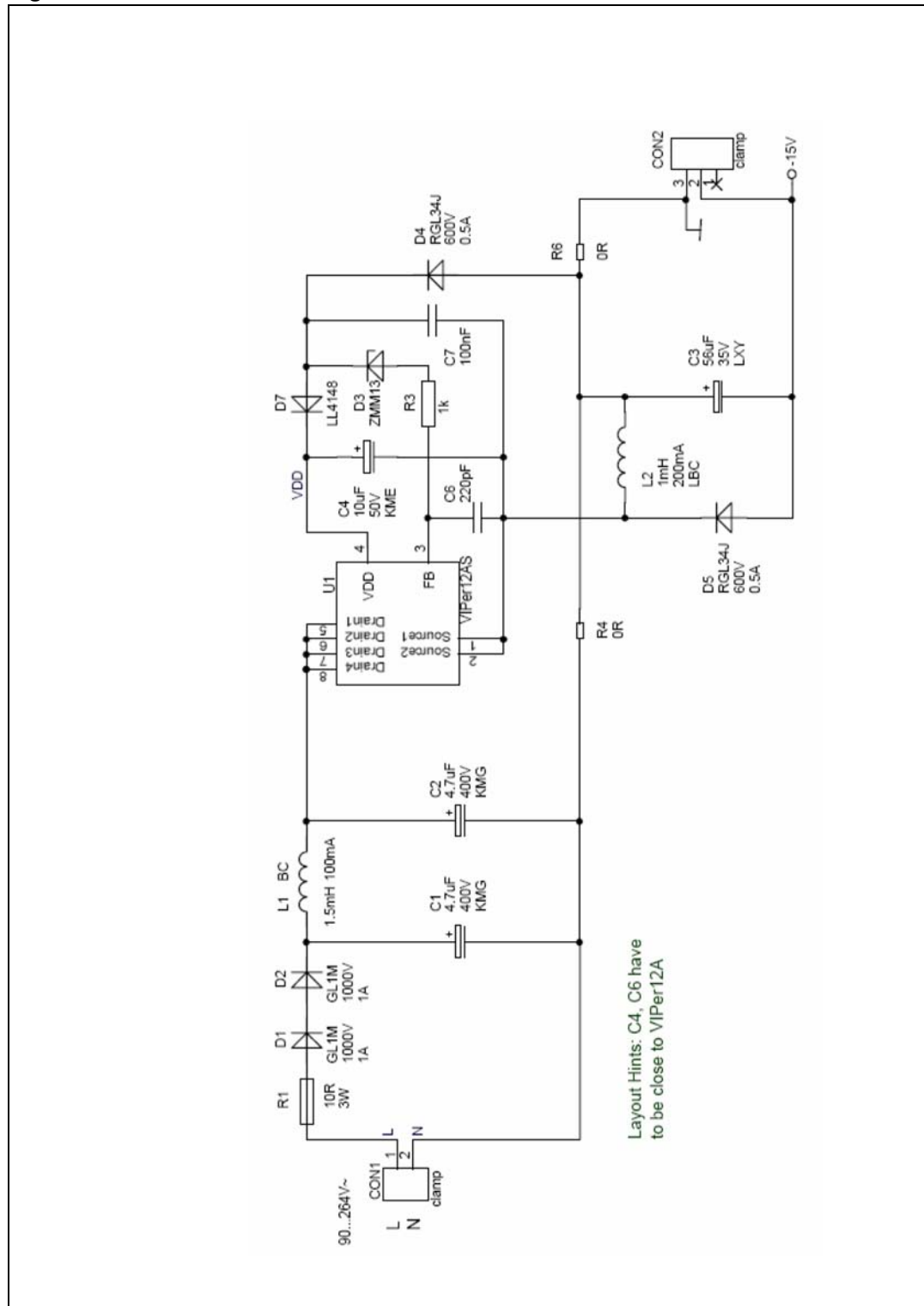
Capacitor C1 together with capacitor C2 and inductor L1 forms an EMI filter. The DC voltage at C2 is then applied to the VIPer12 that works as a high side switch. It means that the IC and corresponding supply and feedback loop circuitry is floating. The IC supply circuit consists of the high voltage diode D4, ceramic capacitor C7, low voltage diode D7 and capacitor C4. The voltage feedback loop is provided via zener diode D3, resistor R3 and capacitor C6. The diode D7 between capacitor C7 and C4 ensures proper start-up of the converter.

Thanks to this diode the feedback loop circuit is separated from the supply circuit. The VIPer12 internal start-up current source charges the IC supply capacitor C4 to a specified start-up threshold voltage of about 16V. As soon as the voltage of C4 reaches the start-up threshold, the internal 60kHz oscillator sets the internal flipflop and the internal highside Power MOSFET is turned on through the output driver. The Power MOSFET applies the bulk capacitor C1 and C2 high voltage to the power diode cathode and to one terminal of the inductor. Since the voltage at the output capacitor C3 connected to the inductor's second terminal is much lower than the input bulk capacitor voltage, inductor current will ramp-up. As soon as the inductor current ramp reaches the VIPer's internal set-point defined by the feedback loop, the internal power switch turns off. The inductor keeps the direction of the current flowing and it reverses the voltage at C3. The inductor current then flows through the forward biased D5 diode and charges output capacitor C3.

In this switch-off phase the VIPer12 source terminal sees a negative level of the forward biased D5 (when referenced to ground) so it can be considered as grounded. This allows the inductor current to flow also through D4, supply the VIPer12 and give the feedback information concerning the output voltage. The converter output voltage at the 15V terminal is determined by the voltage drop across zener diode D3 together with the voltage drop across the resistor R3 and FB pin voltage. Resistor R3 limits the feedback current to a safe value lower than the maximum rating specified in the datasheet. Capacitor C6 protects the FB input against EMI. Regulator U2 accommodated in a DPAK or SO-8 package is optional and can be assembled if the power supply for a microcontroller or logic part is required. The DPAK package version of U2 is dedicated for 60mA output current option while the U3 in SO-8 package provides a maximum output current of 20mA.

2 Board Schematic

Figure 1. Scheme



3 Revision history

Table 1. Document revision history

Date	Revision	Changes
23-Jul-2007	1	Initial release.

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