

Off-Line Current Source Controller

Introduction

The HV9906DB4 provides a constant current of 750mA. It contains all circuitry necessary to demonstrate the features of the HV9906 second order power supply controller. A power converter of the demo board consists of an input buck-boost stage and an output buck stage. The output voltage polarity is negative. Due to its unique quadratic input-to-output DC voltage transfer ratio, the converter can operate directly off AC line to produce low-voltage output without need for electrolytic capacitors. The HV9906 is designed for optimally controlling this type of power converter or other types of two-stage multi-converters.

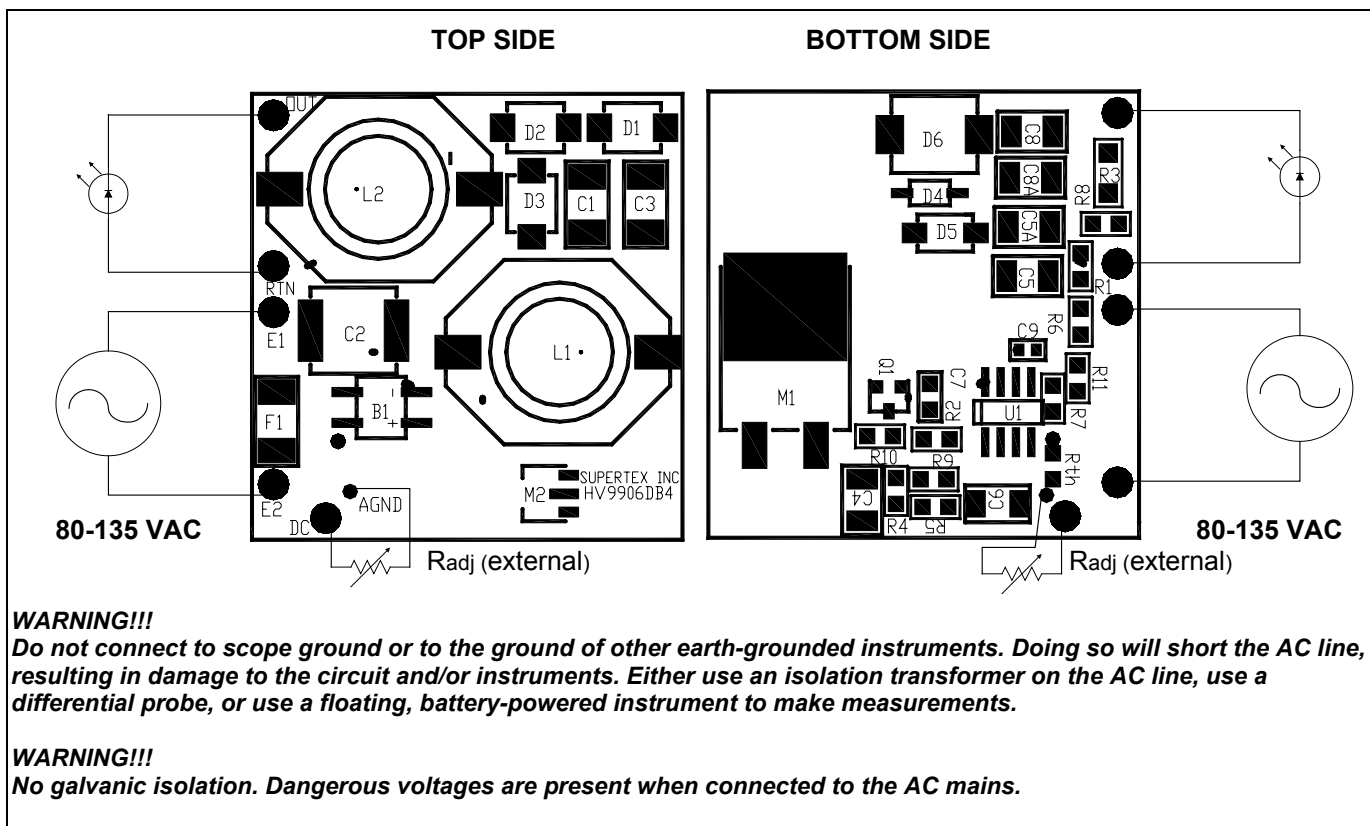
The board is optimized for driving a 10V-20V, 750mA load. However, it may be modified to meet custom requirements (up to 80V or 1.5A).

HV9906DB4 demo board features passive power factor correction to PF>0.95, open circuit protection and under voltage lockout.

Specification

| | |
|----------------|-----------------------------|
| Input Voltage | 80 to 135VAC, 60Hz |
| Output Current | 750mA \pm 10% |
| Output Voltage | 20V Max |
| Efficiency | 64% at Io=750mA, Vin=100VAC |

Board Layout and Connections



Instructions

OUT, RTN

Connect your LED to these terminals: negative to OUT, positive to RTN.

E1, E2

Connect 80 to 135VAC, 60Hz line source to these terminals: line to E2, neutral to E1. The input is protected with a 0.5A fuse.

DC, AGND

Leave DC, AGND open if dimmer control is not required. Connect DC and AGND with an adjustable

Resistor R_{adj} can change the output current. The output current is:

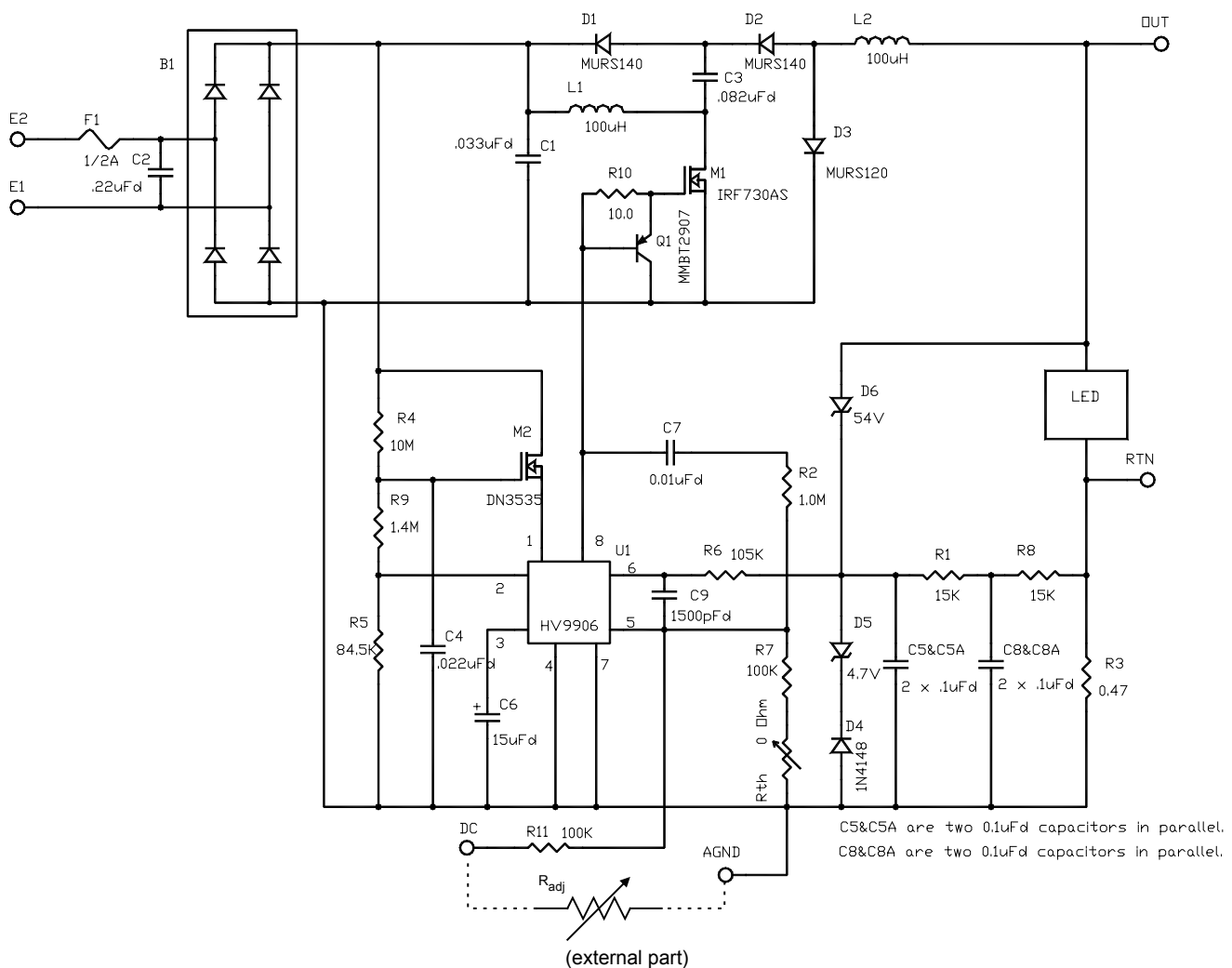
$$I_{out} = \frac{R1 + R6 + R8 - R7 // (R11 + R_{adj})}{R7 // (R11 + R_{adj}) \cdot R3} \cdot 1V$$

Setting Output Current (without Dimmer Control)

Output current is preset to 750mA for this board. Output current can be re-programmed according to the following equation:

$$I_{out} = \frac{R1 + R6 + R8 - R7}{R7 \cdot R3} \cdot 1V$$

Schematic Diagram



Parts List

| Item | REF | Part | Package | Manufacturer | Part No. |
|------|-----|----------------------|-------------|---------------------------|---------------|
| 1 | B1 | Diode Bridge | BRIDGE-RH06 | Diodes Incorporated | RH06 or HD06 |
| 2 | C1 | 0.033 uFd, 250V, 10% | SMD1913 | Panasonic Pen Film | ECW-U2333KC9 |
| 3 | C2 | 0.22uFd, 250V, 10% | SMD2825 | Panasonic Pen Film | ECW-U2224KCV |
| 4 | C3 | 0.082 uFd, 100V, 10% | SMD1913 | Panasonic Pen Film | ECW-U2333KC9 |
| 5 | C4 | 0.022uFd, 50V, 5% | SMD1210 | Panasonic PPS Film | ECH-U1H223JB5 |
| 6 | C5 | 0.1uFd, 16V, 5% | SMD1210 | Panasonic PPS Film | ECH-U1C104JB5 |
| 7 | C5A | 0.1uFd, 16V, 5% | SMD1210 | Panasonic PPS Film | ECH-U1C104JB5 |
| 8 | C6 | 15uFd, 16V, Tantalum | SMD3528 | Kemet or equivalent | ECS-TICX156R |
| 9 | C7 | 0.01uFd, 50V | SMD0805 | Panasonic or equivalent | ECJ-2VB1H103K |
| 10 | C8 | 0.1uFd, 16V, 5% | SMD1210 | Panasonic PPS Film | ECH-U1C104JB5 |
| 11 | C8A | 0.1uFd, 16V, 5% | SMD1210 | Panasonic PPS Film | ECH-U1C104JB5 |
| 12 | C9 | 1500pFd, X7R, 50V | SMD0603 | Panasonic or equivalent | ECJ-1VB1H152K |
| 13 | D1 | Ultra Fast, 400V, 1A | SMB | On Semi or equivalent | MURS140T3 |
| 14 | D2 | Ultra Fast, 400V, 1A | SMB | On Semi or equivalent | MURS140T3 |
| 15 | D3 | Ultra Fast, 200V, 1A | SMB | On Semi or equivalent | MURS120T3 |
| 16 | D4 | 1N4148 | SOD123 | On Semi or equivalent | 1N4148 |
| 17 | D5 | Zener, 4.7V | SMD DL-35 | Diodes Inc. or equivalent | ZMM5230B-7 |
| 18 | D6 | TVS, 1.5KW 54V | SMC | Diodes Inc. or equivalent | SMCJ54A-13 |
| 19 | F1 | 1/2A, Slow Blow | SMD2410 | Littlefuse | R452.500 |
| 20 | L1 | 100uH | PM5022 | J.W. Miller or Coilcraft | PM5022-101M |
| 21 | L2 | 100uH | PM5022 | J.W. Miller or Coilcraft | PM5022-101M |
| 22 | M1 | MOSFET, 400V | D2-Pak | International Rectifier | IRF730AS |
| 23 | M2 | MOSFET, 350V | SOT-89 | Supertex | DN3535N8 |
| 24 | Q1 | BJT, PNP | SOT23 | On Semi or equivalent | FMMT2907 |
| 25 | R1 | 15K ohm, 1% | SMD0805 | Panasonic or equivalent | |
| 26 | R2 | 1.0M Ohm, 1% | SMD0805 | Panasonic or equivalent | |
| 27 | R3 | 0.47 ohm, 1% | SMD1206 | Panasonic or equivalent | |
| 28 | R4 | 10.0M Ohm, 1% | SMD0805 | Panasonic or equivalent | |
| 29 | R5 | 84.6K ohm, 1% | SMD0805 | Panasonic or equivalent | |
| 30 | R6 | 105K ohm, 1% | SMD0805 | Panasonic or equivalent | |
| 31 | R7 | 100K ohm, 1% | SMD0805 | Panasonic or equivalent | |
| 32 | R8 | 15K ohm, 1% | SMD0805 | Panasonic or equivalent | |
| 33 | R9 | 1.4M Ohm, 1% | SMD0805 | Panasonic or equivalent | |
| 34 | R10 | 10.0 Ohm, 1% | SMD0805 | Panasonic or equivalent | |
| 35 | R11 | 100K Ohm, 1% | SMD0805 | Panasonic or equivalent | |
| 36 | Rth | 0 Ohm | SMD0805 | Panasonic or equivalent | |
| 37 | U1 | PWM/PFM IC | SOIC8 | Supertex, Inc. | HV9906 |

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