

### 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.

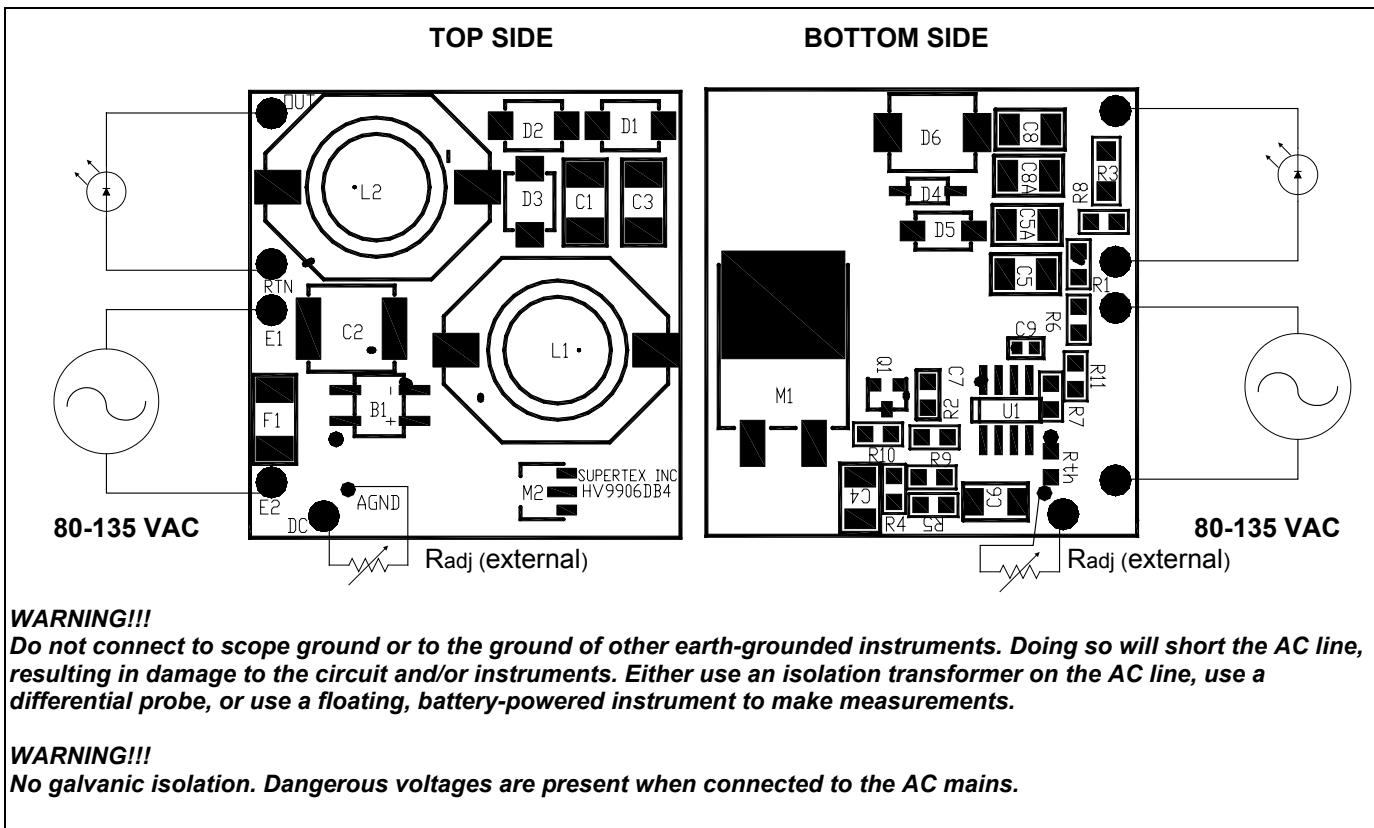
The board is optimized for driving a 10V-20V, 750mA load. However, it may be modified to meet custom requirements (up to 80V or 1.5A).

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 $I_o = 750\text{mA}$ , $V_{in} = 100\text{VAC}$

#### Board Layout and Connections



#### WARNING!!!

***Do not connect to scope ground or to the ground of other earth-grounded instruments. Doing so will short the AC line, resulting in damage to the circuit and/or instruments. Either use an isolation transformer on the AC line, use a differential probe, or use a floating, battery-powered instrument to make measurements.***

#### WARNING!!!

***No galvanic isolation. Dangerous voltages are present when connected to the AC mains.***

## 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:

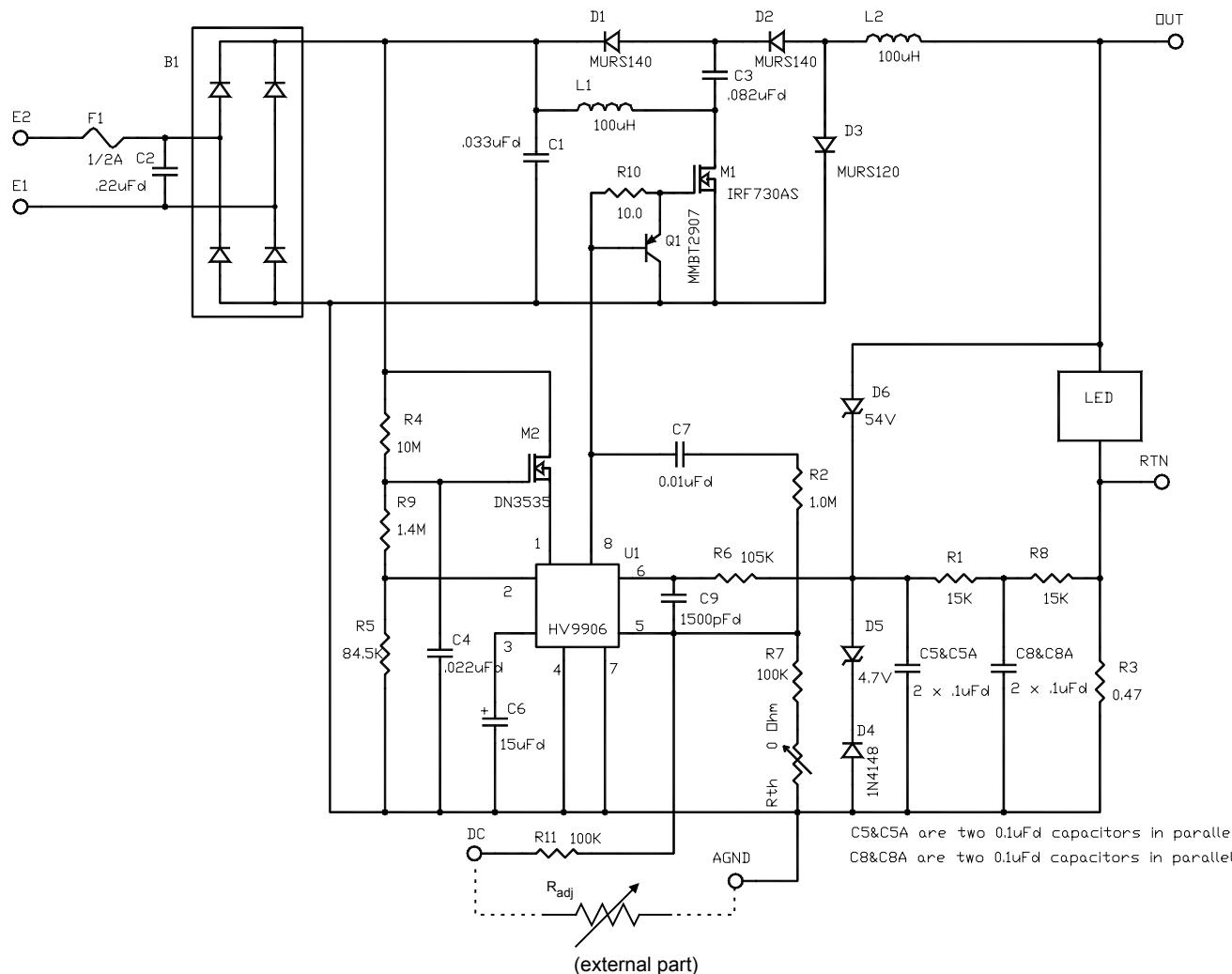
$$I_{out} = \frac{R1 + R6 + R8 - R7 // (R11 + R_{adj})}{R7 // (R11 + R_{adj}) \cdot R3} \cdot 1V$$

### 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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