

Programmable-Current 120VAC LED Driver with PWM Dimming

Introduction

The Supertex HV9925DB1 demo board is a complete LED power driver to supply a string of LEDs using the HV9925, an integrated, high-voltage, buck regulator IC featuring programmable output current and PWM dimming. The HV9925 includes a 500V switching MOSFET and can operate directly from rectified AC line voltages of 80 to 135VAC.

The current in the LED string is externally programmed to 50mA ±10% by a single resistor RS. The HV9925DB1 is ideally suited for driving strings of LEDs having forward voltage from 20V to 60V at high efficiency.

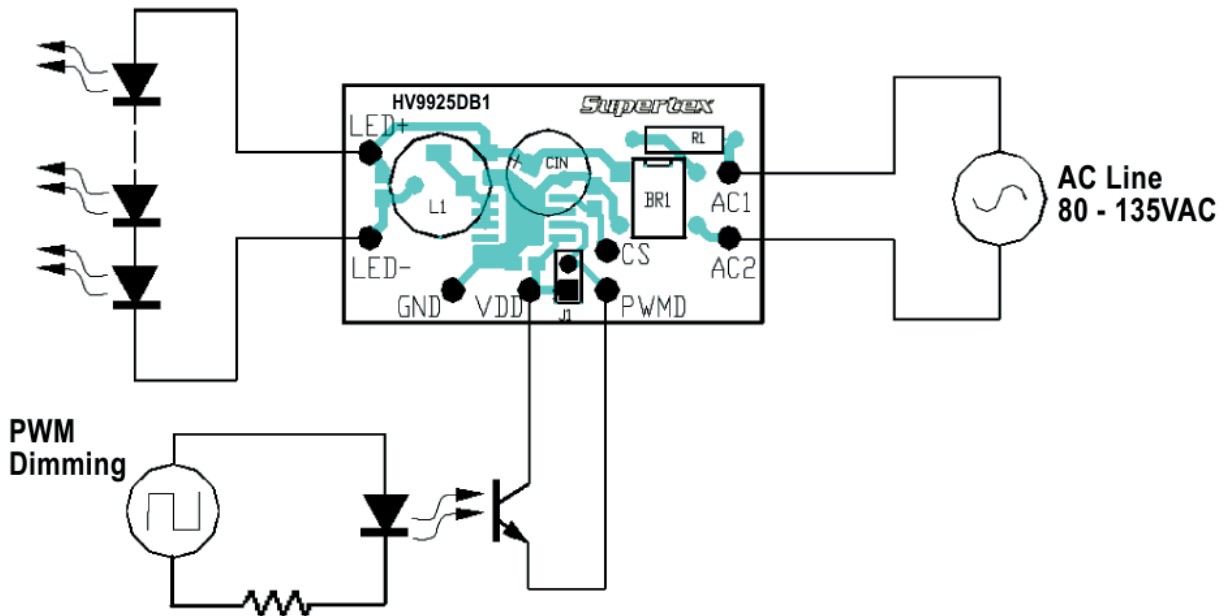
The HV9925DB1 is a peak current-controlled buck converter operating with a fixed off-time of 10.5µs. Its' fixed off-time control scheme provides good stability and tight regulation of the LED current throughout the input AC line voltage range. As its switching frequency varies over the AC line cycle, the HV9925 inherently introduces frequency dither and simplifies the compliance with EMI regulations.

Specifications	
Input Voltage Range	80 to 135VAC
Load Current	50mA ± 10%
LED String Voltage	20~60V
Conducted EMI	CISPR15
Efficiency	82% typ.



Actual Size: 40mm x 23mm x 16mm

Board Layout and Connection Diagram



Instructions:

HV9925DB1 Pinout

LED+: Connect the Anode of the LED string to this pin.

LED-: Connect the Cathode of the LED string to this pin.

AC1, AC2: Connect AC Line to these pins.

Note: The Board is not protected from output open/short circuit condition. Damage to the Demo Board may occur if the output load is not properly connected.

PWM Dimming HV9925DB1

Remove the jumper J1 and connect to an output of the square-wave signal generator using an opto-isolator.

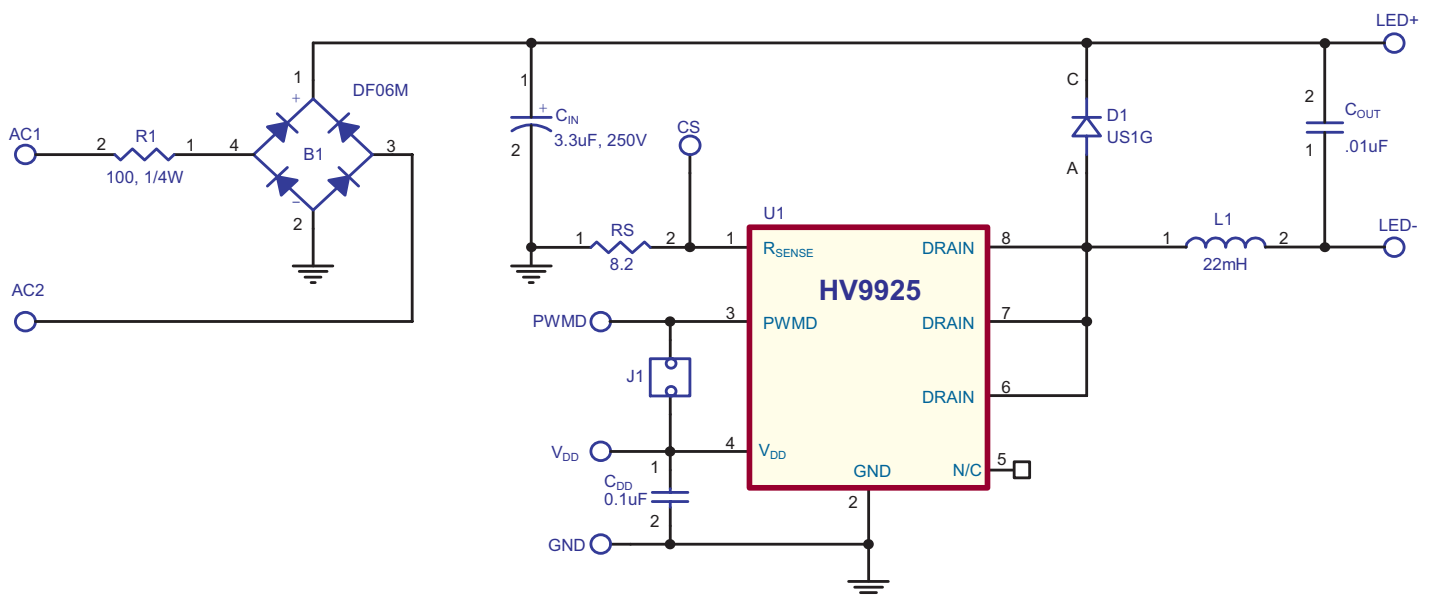
Note: The HV9925DB1 circuit is not isolated from AC mains. Connecting external devices to J1 without using opto-isolators can be hazardous and may cause equipment damage.

Testing the HV9925DB1

Connect the LED string to the output terminals.

Check the polarity of the LED connection. The anode end of the string should be connected to the positive output, and the cathode should be connected to the negative output. Connect the AC input to the input terminals. Apply the AC voltage at the input terminals and the LED string should start to glow. The HV9925DB1 will regulate constant 50mA current in the LED. An ammeter can be connected in series with the LED(s) to measure the output current.

Schematic Diagram



Typical Performance Characteristics

HV9925DB1

Fig. 1. Typical Efficiency at $V_{OUT} = 50V$

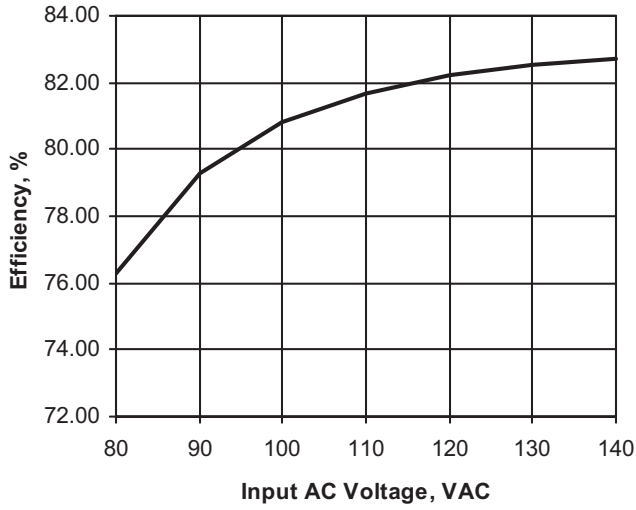


Fig. 2. AC Line Regulation of LED Current at $V_{OUT} = 50V$

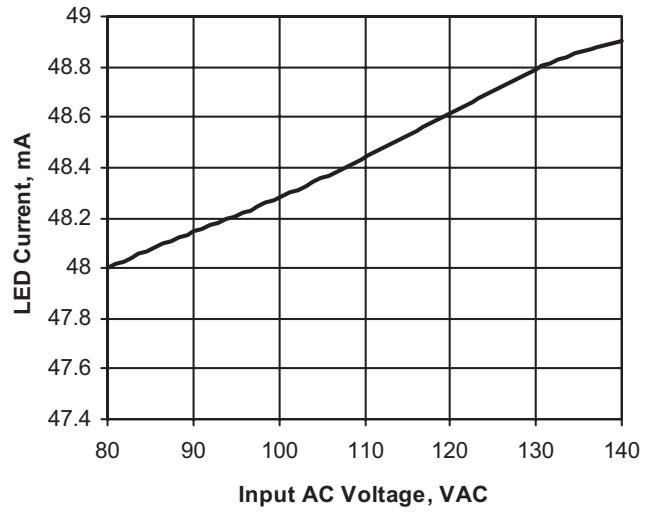


Fig. 3. Load Regulation of LED Current at $V_{AC} = 120VAC$

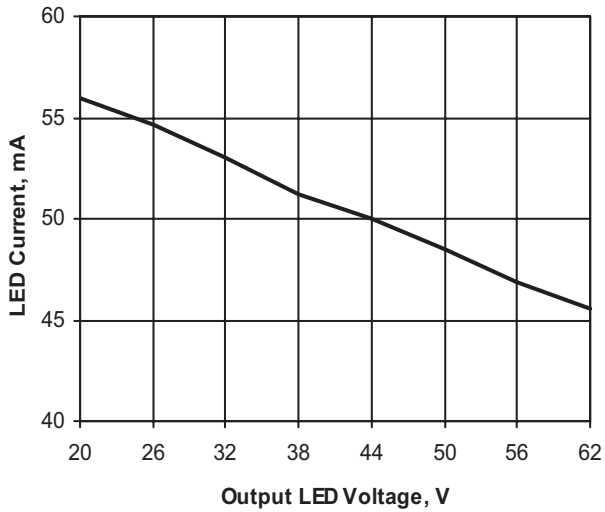
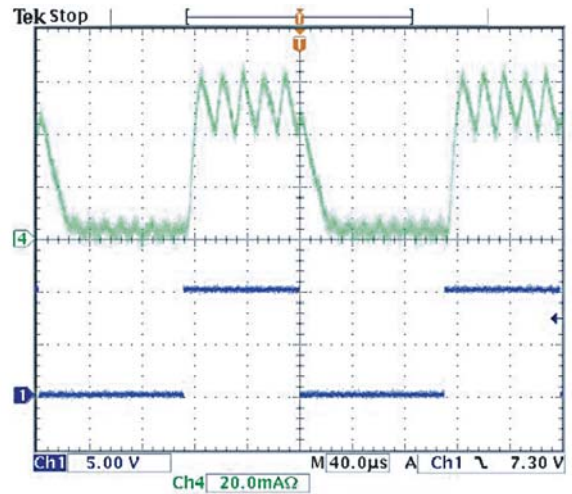


Fig. 4. PWM Dimming ($40\mu s/div.$). Ch1: PWMD, Ch4: I_{OUT}



Bill of Materials

HV9925DB1

Reference	Description	Manufacturer	Manufacturer's Part Number
RS	8.2Ω 1/4W MF Resistor	N/A	N/A
R1	100Ω 1/4W Fusible Resistor	N/A	N/A
C _O	0.01μF, 100V, X7R, MLCC	N/A	N/A
C _{DD}	0.1μF, 50V, X7R, MLCC	N/A	N/A
C _{IN}	3.3μF, 250V, Aluminum Elec. Capacitor	Panasonic	ECQ-E4104KF
L1	22mH, 60mA, Mini-Drum	Renco Electronics	RL-5480-3-22000
D1	Diode, UF 400V 1A 50ns	On Semiconductor	US1G
B1	Diode Bridge, 600V 1A	Diodes, Inc	DF06M
U1	LED Driver IC	Supertex, Inc	HV9925N3

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Supertex inc.

1235 Bordeaux Drive, Sunnyvale, CA 94089
TEL: (408) 222-8888 / FAX: (408) 222-4895

www.supertex.com