

### General Description

This demonstration board utilizes the AL9910 high voltage PWM LED driver-controller providing a cost effective solution for offline high brightness LED applications that do not require triac dimming. This user-friendly evaluation board provides users with quick connection to their different types LEDs string. The demonstration board can be modified to adjust the LED output current and the number of series connected LEDs that are driven.

A bill of materials is included that describes the parts used on this demonstration board. A schematic and layout have also been included along with measured performance characteristics. These materials can be used as a reference design for your products improving your product's time to market.

### Key Features

- Selectable 2W-6W output power
- Active PFC with power factor >0.9
- No electrolytic capacitor or selection for low output ripple

### Applications

- Retrofit E12, E27, PAR3x bulb applications

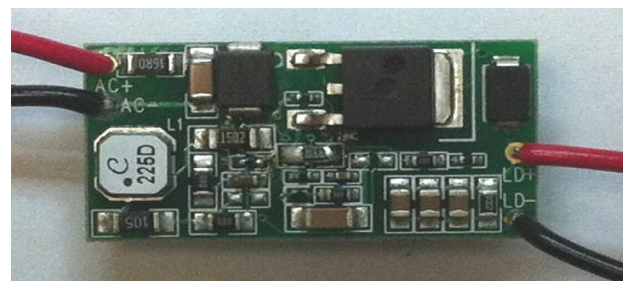
### Specifications

Parameter	Value
AC Input Voltage	90V – 140V
Output Power	2W – 6W
LED Current	130mA
LED Voltage	30V
Efficiency	> 85%
Power Factor	>0.9
Output Ripple	<45% (p-p)
XY Dimension	1.155" x 0.590"
ROHS Compliance	Yes

### Top-View Evaluation Board



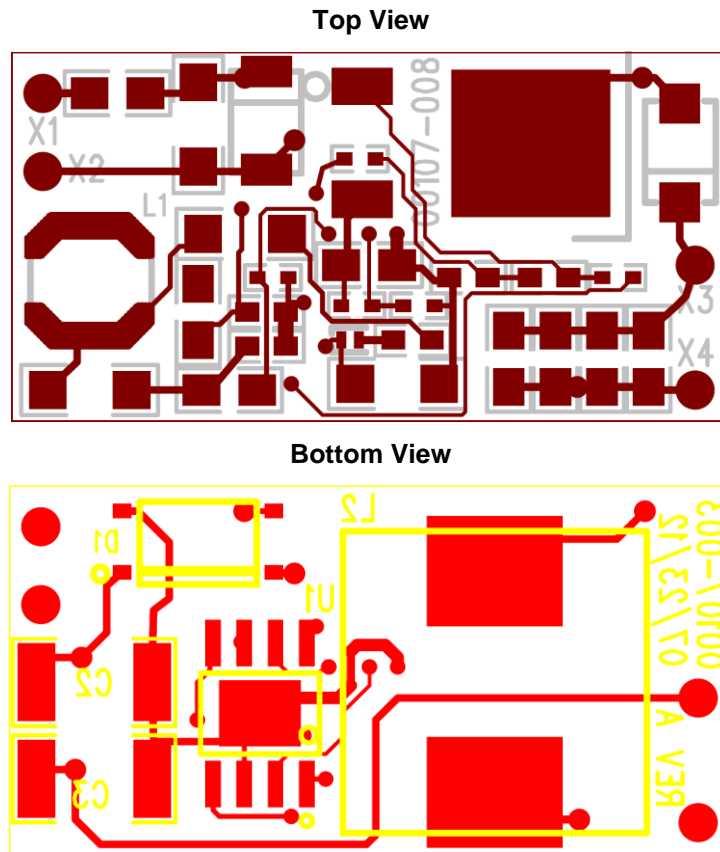
### Bottom-View Evaluation Board



### Connection Instructions:

- AC+ Input: Red – Hot
- AC- Input: Black – Neutral
- DC LED+ Output: LD+ (Red)
- DC LED- Output: LD- (Black)

## Board Layout

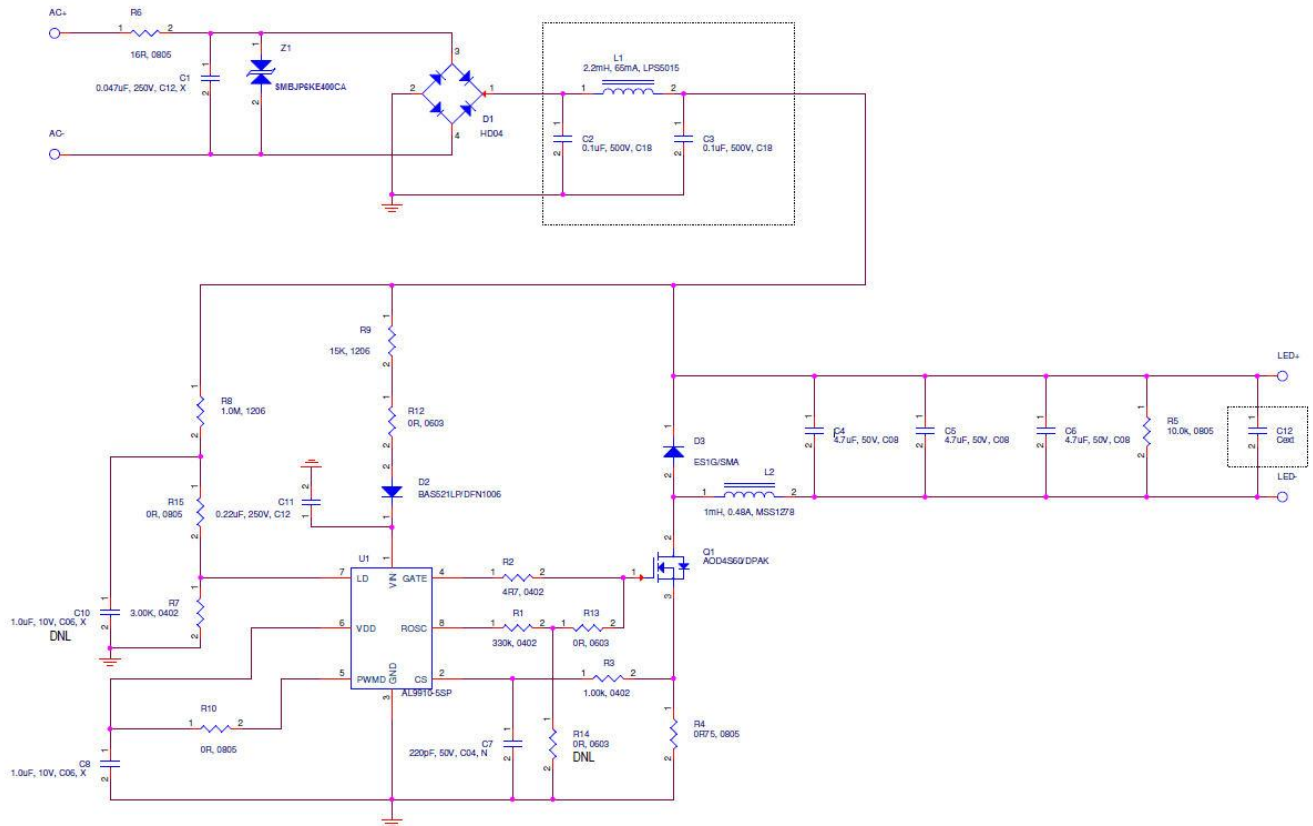


## Evaluation Board Connection Setup and Power-up Procedure

1. Preset the isolated AC source to 120V<sub>AC</sub>.
2. Ensure that the AC source is switched OFF or disconnected.
3. Connect the anode wire of the LED string to the LD+ of the evaluation board.
4. Connect the cathode wire of the LED string to the LD - terminal of the evaluation board.
5. Connect two AC line wires to the AC+ and AC- terminals on the evaluation board.
6. Ensure that the area around the board is clear and safe, and preferably that the board and LEDs are enclosed in a transparent safety cover.
7. Turn on the main switch. LED string should light up with LED.  
DO NOT TOUCH THE BOARD, LEDs OR BARE WIRING.

**Caution: The AL9910EV10.120 is a non-isolated design. All terminals carry high voltage during operation!**

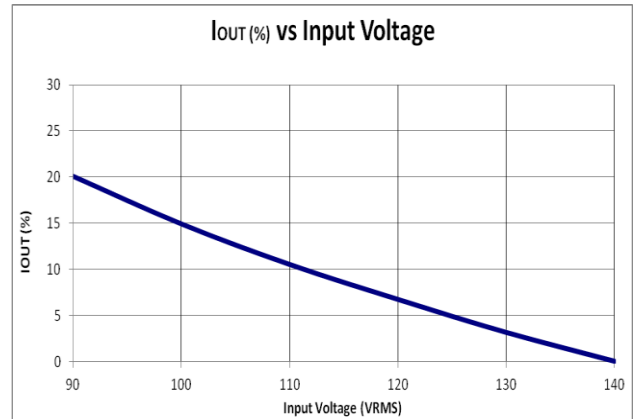
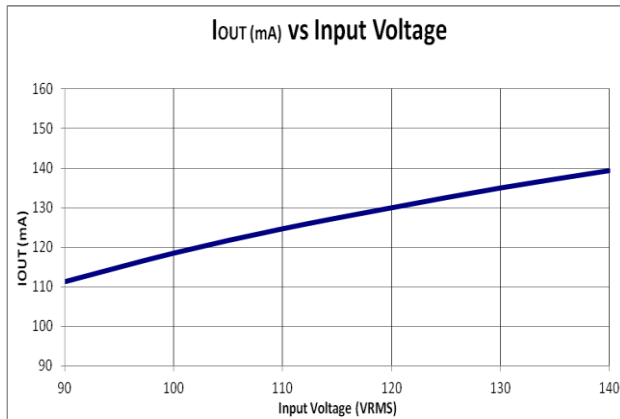
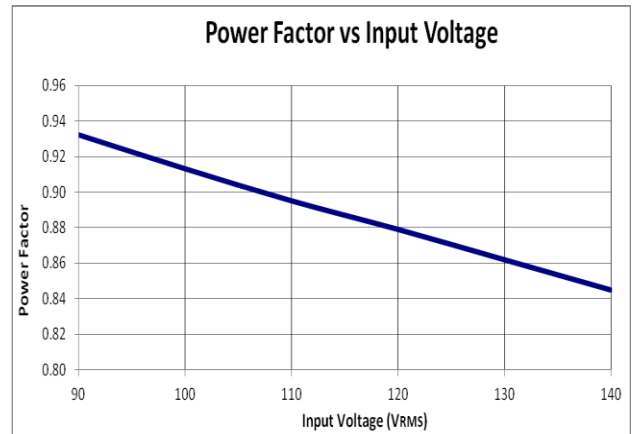
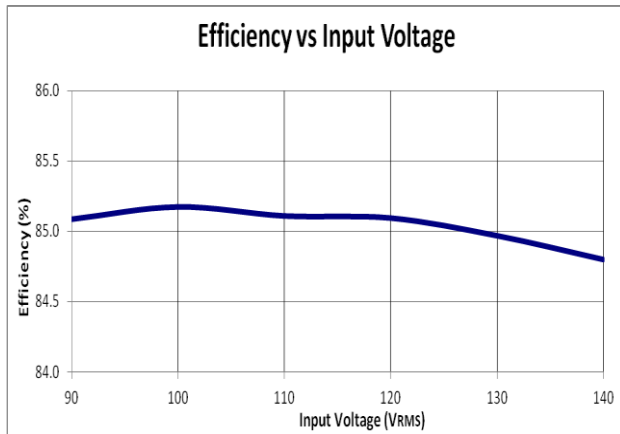
### Schematic



### Bill of Material

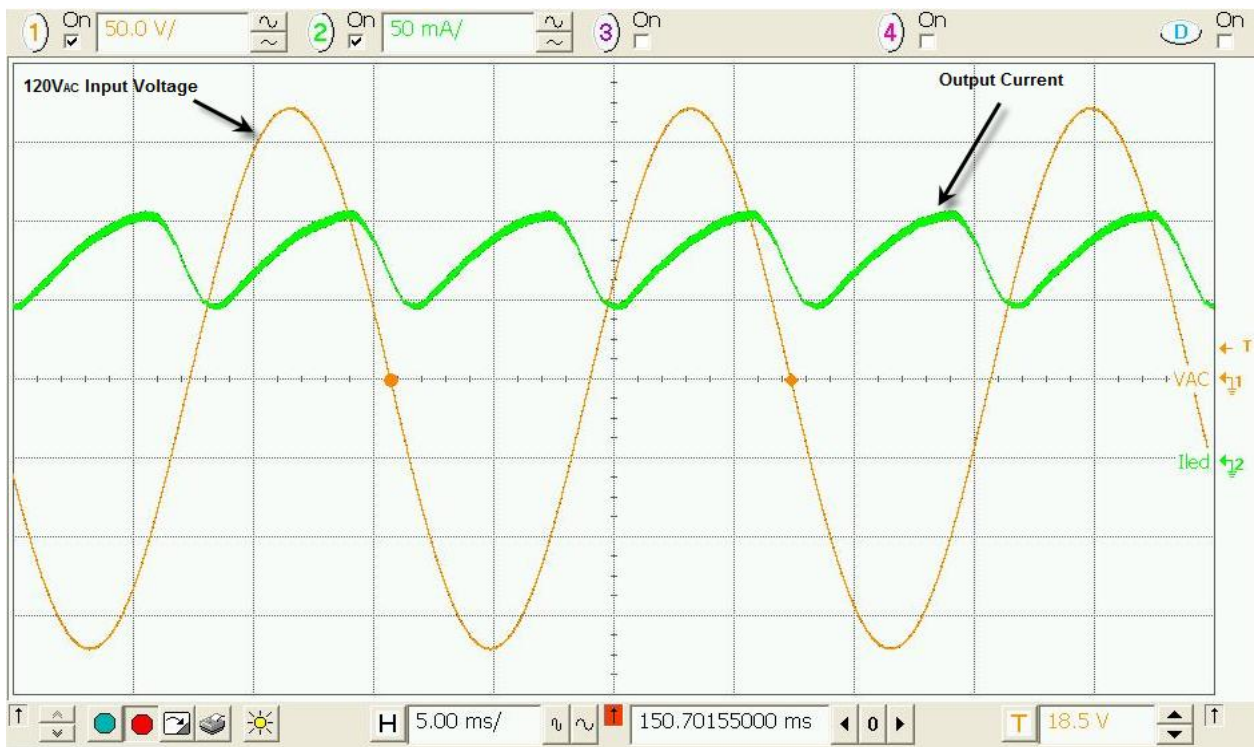
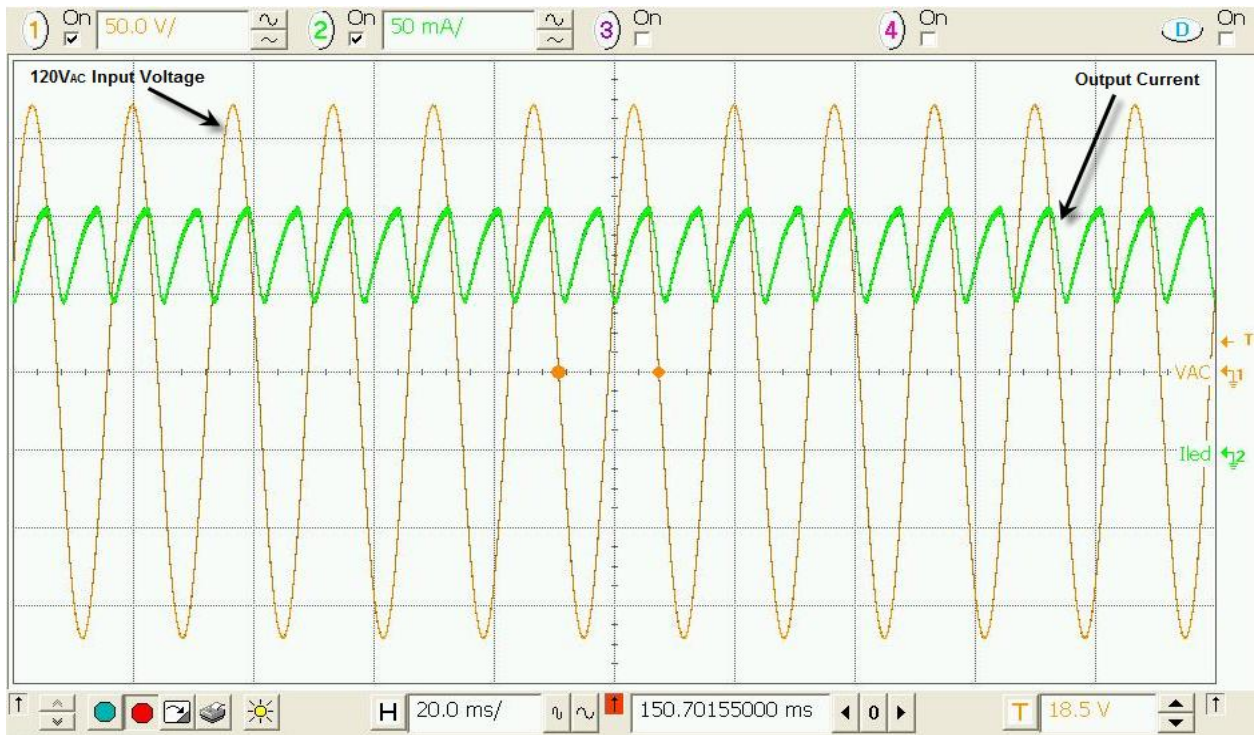
#	Name	Quantity	Part number	Manufacturer	Description
1	U1	1	AL9910-5SP-13	Diodes Inc	Universal High Voltage LED Driver in SO-8EP package
2	D1	1	HD04-T	Diodes Inc	RECT BRIDGE GP 400V 0.8A MINIDIP
3	D2	1	BAS521	Diodes Inc	High Voltage Switching Diode 300V
4	D3	1	ES1G-13-F	Diodes Inc	DIODE SUPER FAST 1A 400V SMA
5	Q1	1	AOD4S60	Alpha Omega	MOSFET N-CH 600V 4A DPAK
6	Z1	1	P6KE400CA	Littelfuse Inc	TVS Bidirectional Diode 600W 400V
7	C1	1	C3216X7R2E473K	TDK	Multilayer Ceramic Capacitor (1206) 0.047 $\mu$ F 250V 10%
8	C2, C3	2	VJ1812Y104KXETW1BC	Vishay	CAP Multilayer Cer (MLCC) - SMD/ SMT 1812 0.1 $\mu$ F 500volts X7R 10%
9	C4, C5, C6	3	C2012X5R1H475K	TDK	Multilayer Ceramic Capacitors (0805) 4.7 $\mu$ F 50V 10%
10	C7	1	GRM15571H221JA01J	Murata	Multilayer Ceramic Capacitors (0402) 220pF 50V 50%
11	C8	1	C1608X7R1A105K	TDK	CAP CER 1.0 $\mu$ F 10V X7R 0603
12	C11	1	C3216X7T2E224K	TDK	Multilayer Ceramic Capacitors (1206) 0.22 $\mu$ F 250V 10%
13	R1	1	CRCW0402330KFCTD	Vishay	RES 330K $\Omega$ 1/16W 1% 0402 SMD
14	R2	1	CRCW04024R70FKED	Vishay	RES 4.7 $\Omega$ 1/16W 1% 0402 SMD
15	R3	1	CRCW04021K00FKED	Vishay	RES 1.0K $\Omega$ 1/16W 1% 0402 SMD
16	R4	1	RL0805FR-070R75L	Vishay	RES 0.75 $\Omega$ 1/8W 1% 0805 SMD
17	R5	1	ERJ-6ENF1002V	Panasonic-ECG	RES 10K $\Omega$ 1/8W 1% 0805 SMD
18	R6	1	CRCW120616R0FKEA	Vishay	RES 16.0 $\Omega$ 1/4W 1% 1206 SMD
19	R7	1	RC0402FR-073K01L	Yageo	RES 3.01K $\Omega$ 1/16W 1% 0402 SMD
20	R8	1	CRCW12061M00JNEA	Vishay	RES 1M $\Omega$ 1/4W 5% 1206 SMD
21	R9	1	ESR18EZPJ153	Rohm Semiconductor	RES 15K $\Omega$ 1/3W 5% 1206 SMD
22	R10	2	CRCW08050000Z0EA	Vishay	RES 0.0 $\Omega$ 1/8W 1% 0805 SMD
23	R12, R13, R15	3	CRCW06030000Z0EA	Vishay	RES 0.0 $\Omega$ 1/8W 1% 0603 SMD
24	L1	1	LPS5015-225ML	Coilcraft	2.2mH 64mA
25	L2	1	MSS1278T-105KLB	Coilcraft	IND Power 1mH SMT (12.5x12.5x8)
26	C12	1	ECA-1HHG221	Panasonic	EXT CAP ALUM 220 $\mu$ F 50V 20% Radial

### Functional Performance





### Functional Waveforms (with output E-Capacitor for Low Output Ripple)



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