

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 (~0.7)
- No electrolytic capacitor or selection for low output ripple

Applications

- Retrofit E12, E27, PAR3x bulb applications

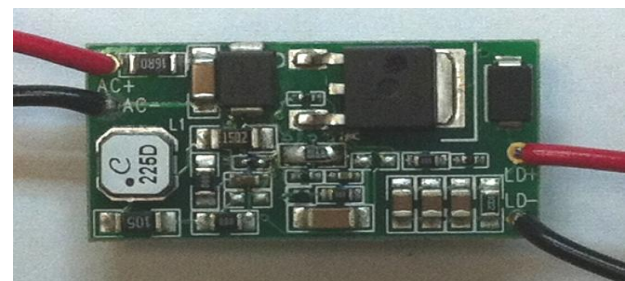
Specifications

| Parameter | Value |
|------------------|-----------------|
| AC Input Voltage | 190V – 240V |
| Output Power | 2W – 6W |
| LED Current | 130mA |
| LED Voltage | 30V |
| Efficiency | > 81% |
| Power Factor | ~0.7 |
| Output Ripple | <40% (p-p) |
| XY Dimension | 1.155" x 0.590" |
| ROHS Compliance | Yes |

Top-View Evaluation Board



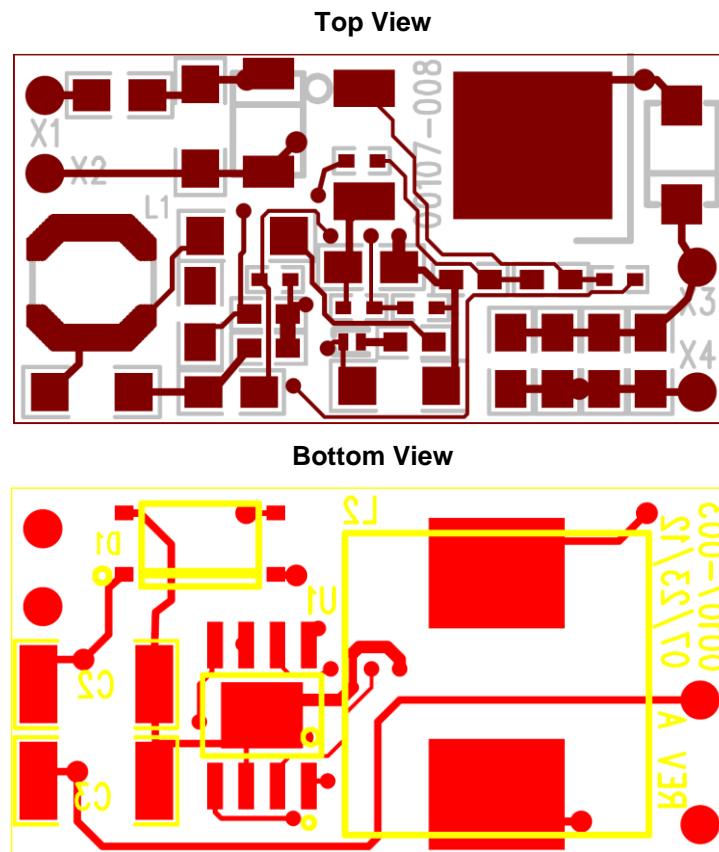
Bottom-View Evaluation Board



Connection Instructions:

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

Board Layout

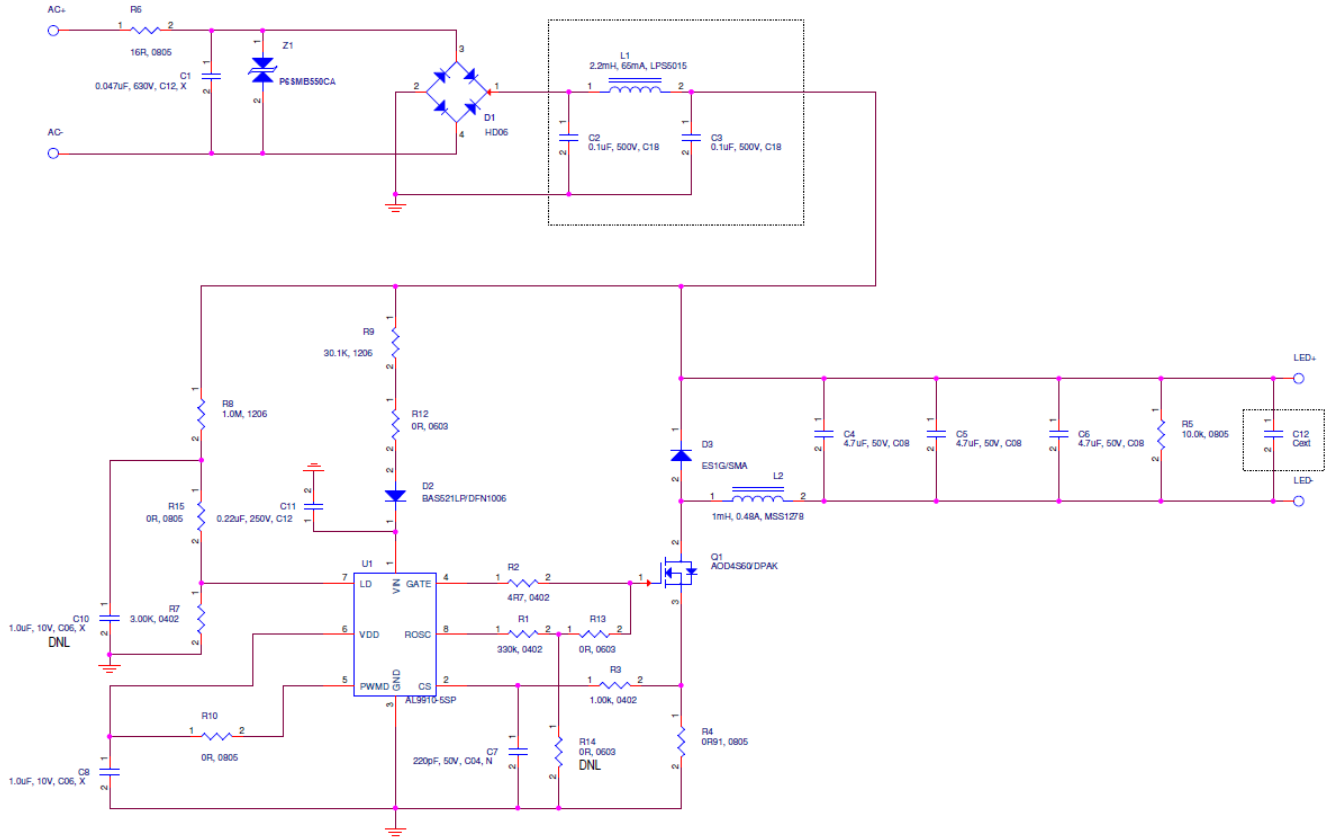


Evaluation Board Connection Setup and Power-up Procedure

1. Preset the isolated AC source to 230V_{AC}.
2. Ensure that the AC source is switched OFF or disconnected.
3. Connect the anode wire of the LED string to LD+ of the evaluation board.
4. Connect the cathode wire of the LED string to 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 AL9910EV10.230 is a non-isolated design. All terminals carry high voltage during operation!

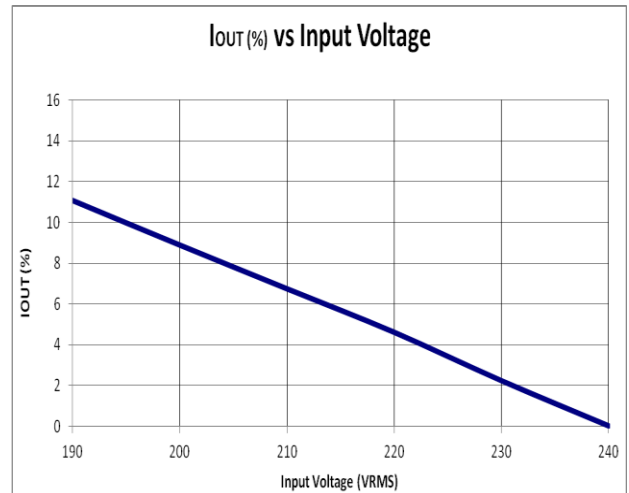
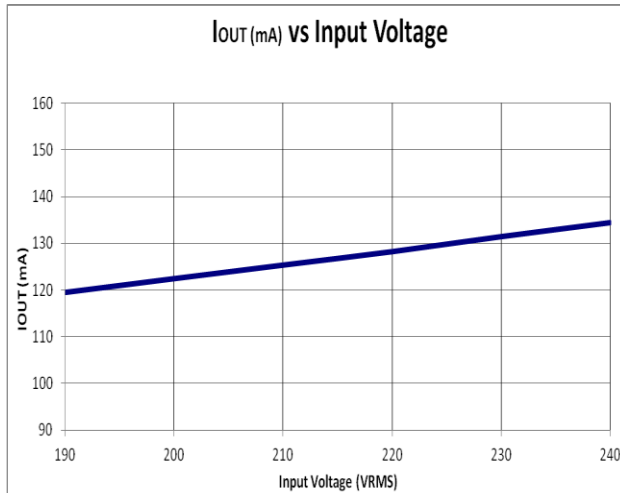
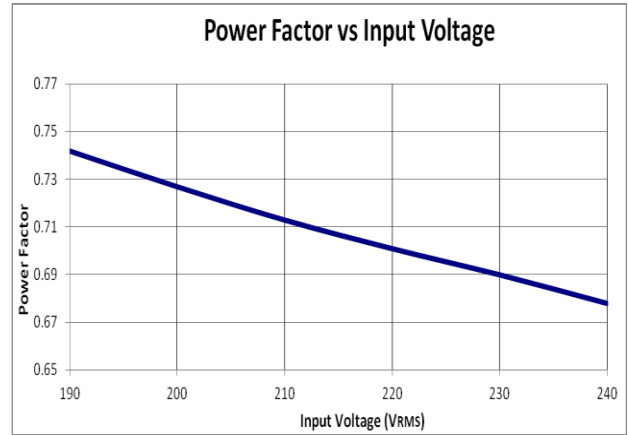
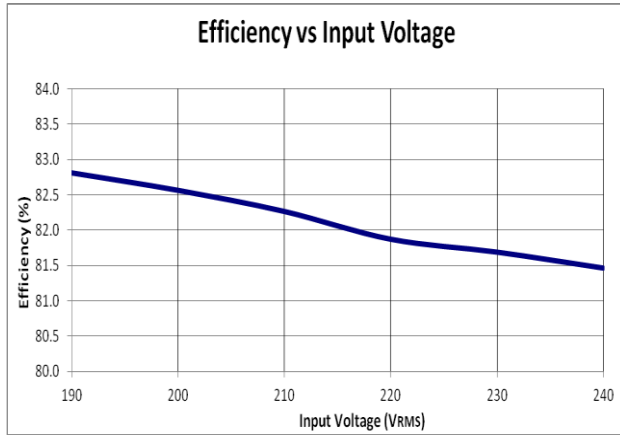
Schematic



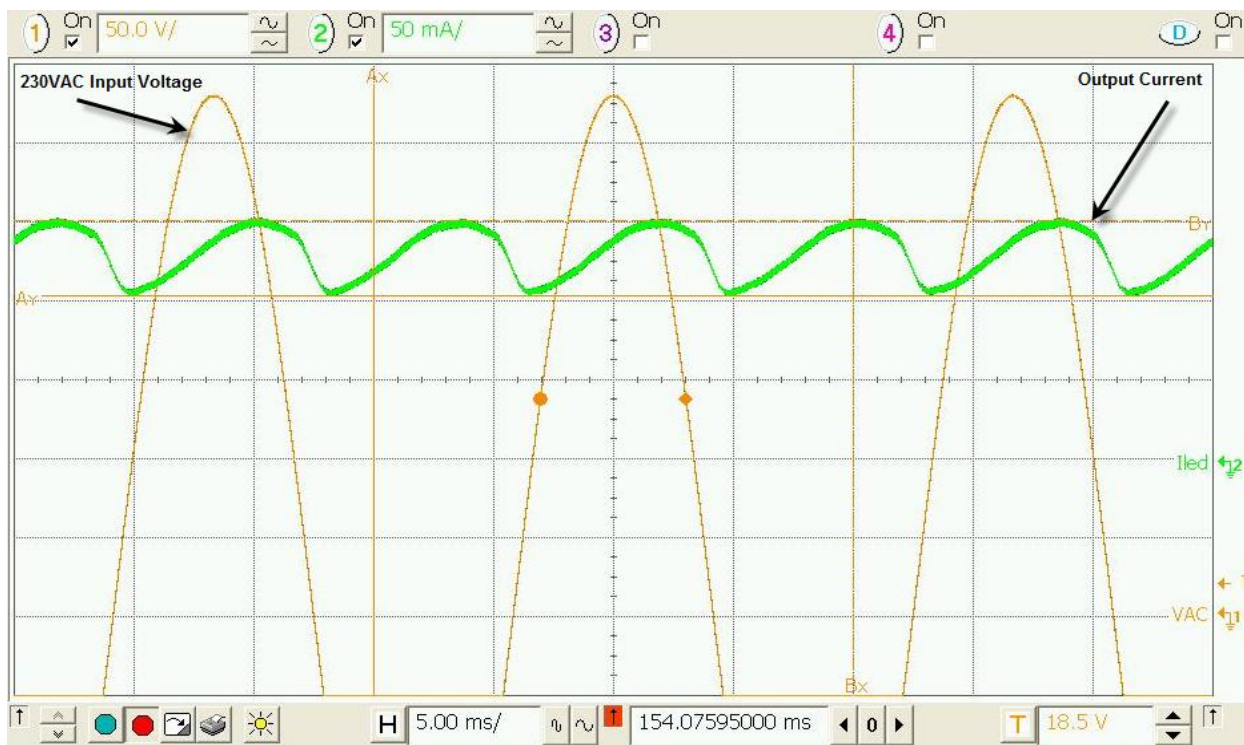
Bill of Material

| # | 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 | HD06-T | Diodes Inc | RECT BRIDGE GP 600V 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 | P6SMB550CA | Diodes Inc | TVS Bidirectional Diode 600W 550V |
| 7 | C1 | 1 | C3216X7T2J473M | TDK | Multilayer Ceramic Capacitor (1206) 0.047 μ F 630V 10% |
| 8 | C2, C3 | 2 | VJ1812Y104KXETW1BC | Vishay | CAP Multilayer Cer (MLCC) - SMD/SMT 1812 0.1 μ F 500V X7R 10% |
| 9 | C4, C5, C6 | 3 | C2012X5R1H475K | TDK | Multilayer Ceramic Capacitors (0805) 4.7 μ F 50V 10% |
| 10 | C7 | 1 | GRM15571H221JA01J | Murata | Multilayer Ceramic Capacitors (0402) 220pF 50V 50% |
| 11 | C8 | 1 | C1608X7R1A105K | TDK | CAP CER 1.0 μ F 10V X7R 0603 |
| 12 | C11 | 1 | C3216X7T2E224K | TDK | Multilayer Ceramic Capacitors (1206) 0.22 μ F 250V 10% |
| 13 | R1 | 1 | CRCW0402330KFCTD | Vishay | RES 330K Ω 1/16W 1% 0402 SMD |
| 14 | R2 | 1 | CRCW04024R70FKED | Vishay | RES 4.7 Ω 1/16W 1% 0402 SMD |
| 15 | R3 | 1 | CRCW04021K00FKED | Vishay | RES 1.0K Ω 1/16W 1% 0402 SMD |
| 16 | R4 | 1 | RL0805FR-070R91L | Vishay | RES 0.91 Ω 1/8W 1% 0805 SMD |
| 17 | R5 | 1 | ERJ-6ENF1002V | Panasonic-ECG | RES 10K Ω 1/8W 1% 0805 SMD |
| 18 | R6 | 1 | CRCW120616R0FKEA | Vishay | RES 16.0 Ω 1/4W 1% 1206 SMD |
| 19 | R7 | 1 | RC0402FR-073K01L | Yageo | RES 3.01K Ω 1/16W 1% 0402 SMD |
| 20 | R8 | 1 | CRCW12061M00JNEA | Vishay | RES 1M Ω 1/4W 5% 1206 SMD |
| 21 | R9 | 1 | ERJ-P08J303V | Rohm Semiconductor | RES 30K Ω 1/3W 5% 1206 SMD |
| 22 | R10 | 2 | CRCW08050000Z0EA | Vishay | RES 0.0 Ω 1/8W 1% 0805 SMD |
| 23 | R12, R13, R15 | 3 | CRCW06030000Z0EA | Vishay | RES 0.0 Ω 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 μ F 50V 20% Radial |

Functional Performance



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



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