

General Description

This demonstration board utilizes the AL9902 high voltage PWM LED Buck controller with integrated MOSFET providing a cost effective solution for offline high brightness LED applications. 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 (140mA) and the number of series connected LEDs that are driven.

Key Features

- Integrated 650V/2A MOSFET
- High output voltage, 50V
- ~ 86% efficiency
- <5% line regulation (100V_{AC} to 240V_{AC})
- Universal AC input voltage (100V_{AC} to 240V_{AC})
- No electrolytic capacitor
- Low BOM cost

Applications

- A60 Type LED light bulb
- Other LED lighting

AL9902 EV1 Specifications

Parameter	Value
Input Voltage	100 to 240V _{AC}
Output Power	6 – 8W
LED Current	160mA (Adjustable)
LED Voltage	51V
Efficiency	~86%
Number of LEDs	17 LEDs in series (Under Tested)
XYZ Dimension	0.6" x 2.4" x 0.6"
ROHS Compliance	Yes

Evaluation Board



Figure 1: Top View

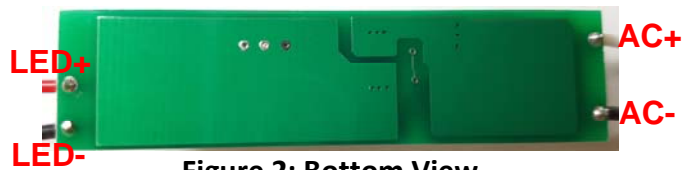


Figure 2: Bottom View

Connection Instructions

Input Voltage: 100 to 240V_{AC} (AC+, AC-)
 LED Outputs: LED+ (Red), LED- (Black)

Evaluation Board Schematic

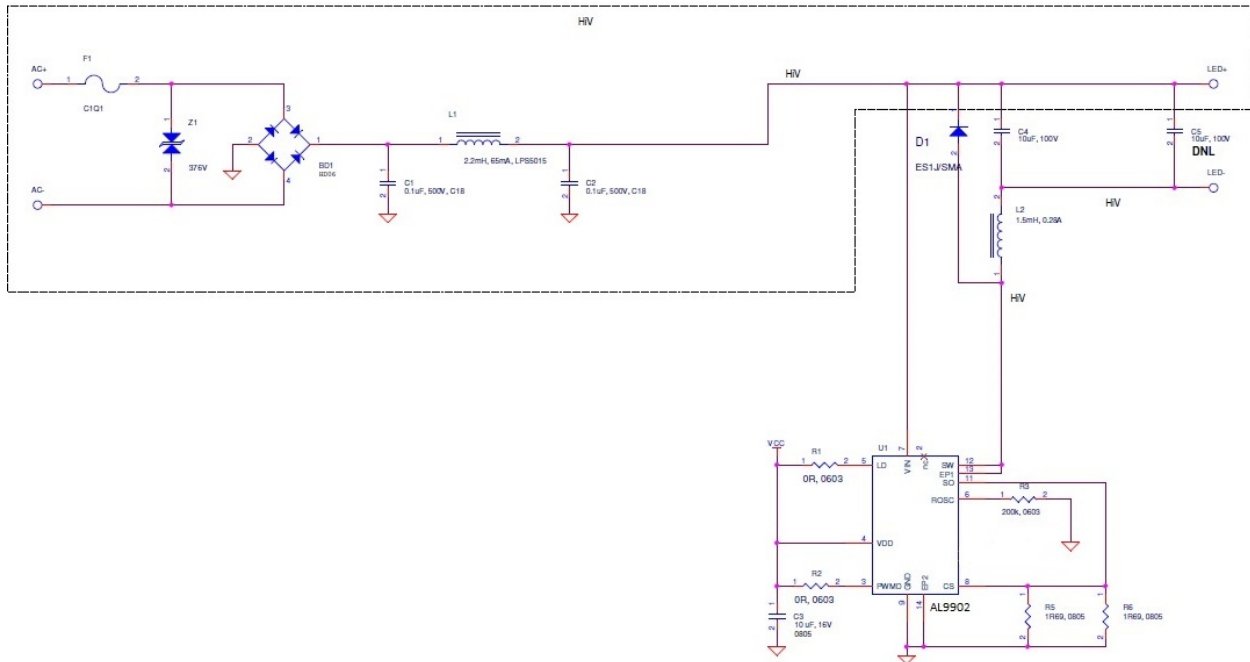


Figure 3: Evaluation Board Schematic

Evaluation Board Layout

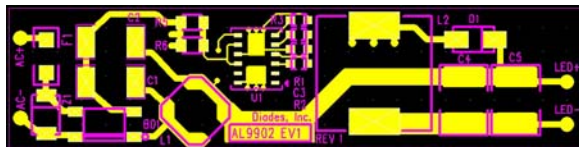


Figure 4: PCB Board Layout Top View



Figure 5: PCB Board Layout Bottom View

Quick Start Guide

1. By default, the evaluation board is preset at 140mA LED Current by R5 and R6. Non-Dimmable by R2, remove R2 to allow PWM Dimming input.
2. Ensure that the AC source is switched OFF or disconnected.
3. Connect the AC line wires of power supply to "AC+ and AC-" on the left side of the board.
4. Connect the anode wire of external LED string to LED+ output test point.
5. Connect the cathode wire of external LED string to LED- output test point.
6. Turn on the main switch. LED string should light up.

Bill of Material

#	Name	QTY	Part number	Manufacturer	Description
1	U1	1	AL9902DFN6040-12	Diodes Inc	LED Driver
2	BD1	1	HD06-T	Diodes Inc	Bridge Rectifiers 0.8A 600V
3	D1	1	ES1G-13-F	Diodes Inc	DIODE Super FAST 1A 400V SMA
4	Z1	1	SMBJP6KE440CA	Diodes Inc	TVS bidirectional diode 600W 602V
5	L1	1	LPS5015-225ML	Coilcraft	2.2mH 64mA
6	L2	1	13R155C	Murata	IND Power 1.5mH
7	C1, C2	2	VJ1812Y104KXEAT5Z	Vishay	CAP CER (MLCC) - SMD/SMT 1812 0.1uF 500V X7R 10%
8	C3	1	C1608X5R1C106M080AB	TDK	CAP CER 10uF 16V X5R 0603
9	C4	1	CGA9N3X7S2A106M230KB	TDK	Multilayer Ceramic Capacitors (2220) 10µF 100V X7R 20%
10	C5	0	Not Fitted		
11	R1,R2	2	RC0603JR-070RL	Yageo	JMPR 0.0Ω 1/4W 0603 SMD
12	R3	1	RC0603FR-07200KL	Yageo	RES 200KΩ 1/10W 1% 0603 SMD
13	R5, R6	2	RL0805FR-071R69L	Yageo	RES 1.69Ω 1/8W 1% 0805 SMD
14	F1	1	2410SFV1.00FM/125-2	Bel Fuse	Fuse, 1A, 250V, 1810

Functional Performance (No Electrolytic Capacitor across output LEDs)

Board Type	VIN (VAC)	PFC	IIN (mA)	PIN (W)	VLED (V)	ILED (mA)	PLED (W)	ILED Ripple (%)	Efficiency (%)	Athd (%)
AL9902EV1 Module Board	100	0.563	157.73	8.88	48.77	160.3	7.82	28	88.03	43.35
	110	0.539	152.97	9.04	48.82	163.8	7.99	28	88.43	51.11
	120	0.516	147.70	9.16	48.86	165.0	8.06	28	88.02	58.68
	130	0.498	143.65	9.30	48.90	168.2	8.22	28	88.42	60.55
	200	0.391	126.33	9.90	49.12	176.3	8.66	28	87.52	94.07
	210	0.379	125.48	9.98	49.11	176.9	8.69	28	87.06	99.90
	220	0.365	124.77	9.99	49.12	177.7	8.73	28	87.32	100.61
	230	0.351	124.07	10.03	49.10	178.4	8.76	28	87.35	101.60
	240	0.340	124.02	10.12	49.10	179.3	8.80	28	86.98	110.10

Functional Performance

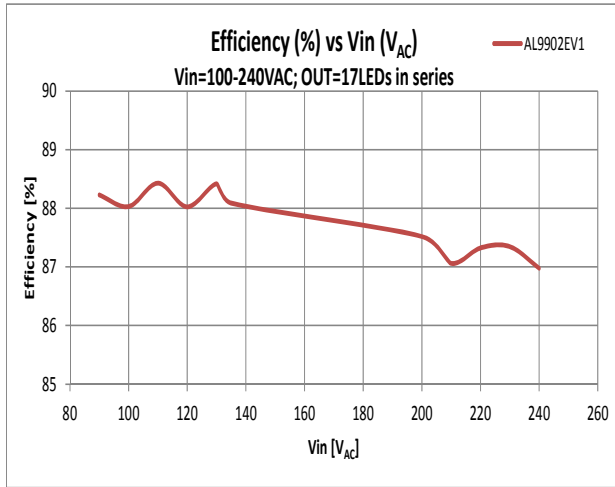


Figure 1. Efficiency vs. Vin

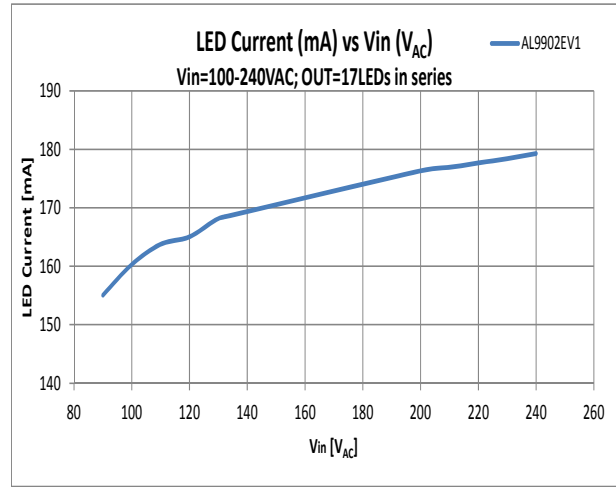


Figure 2. LED Current vs. Vin

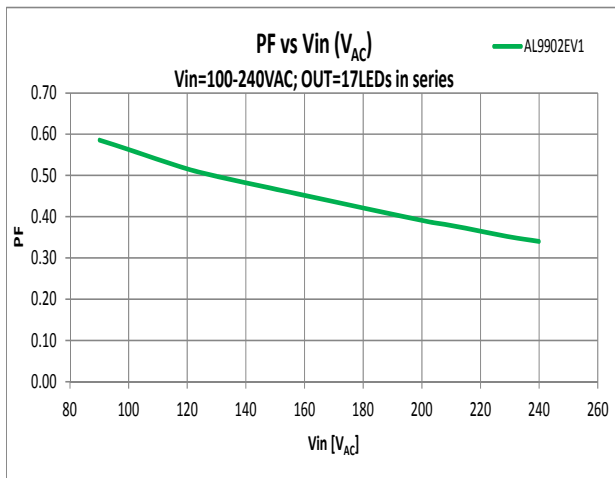
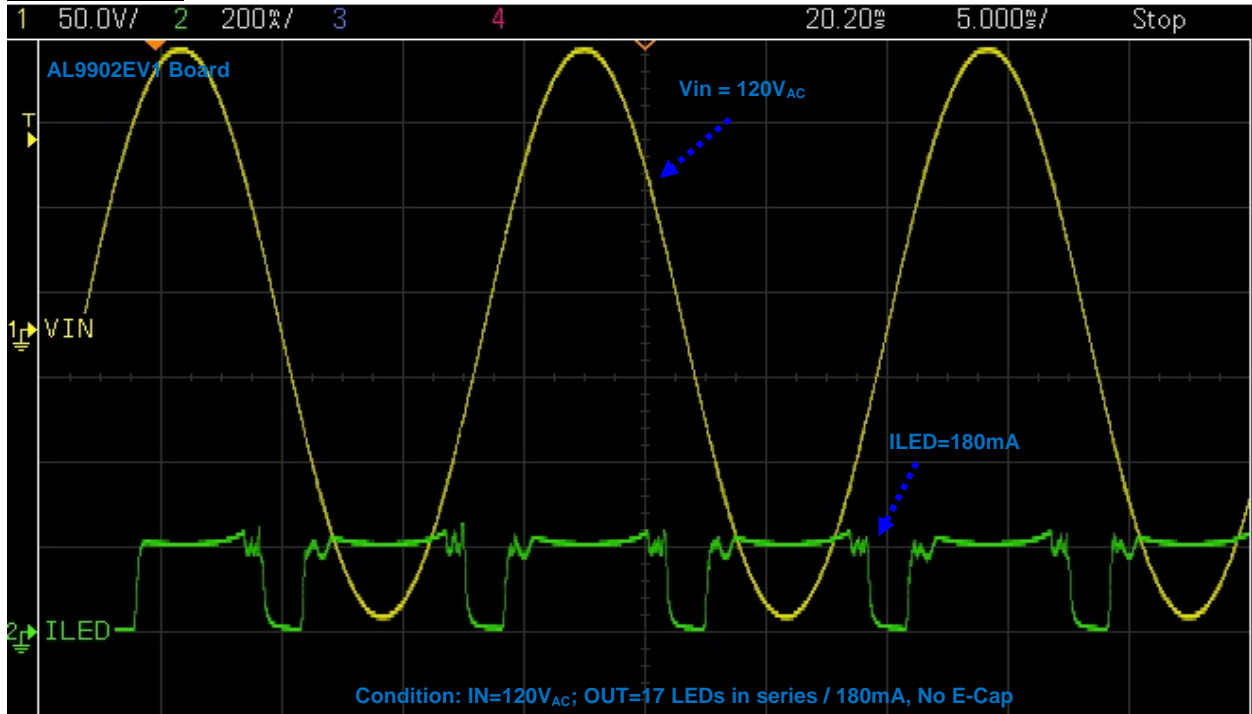
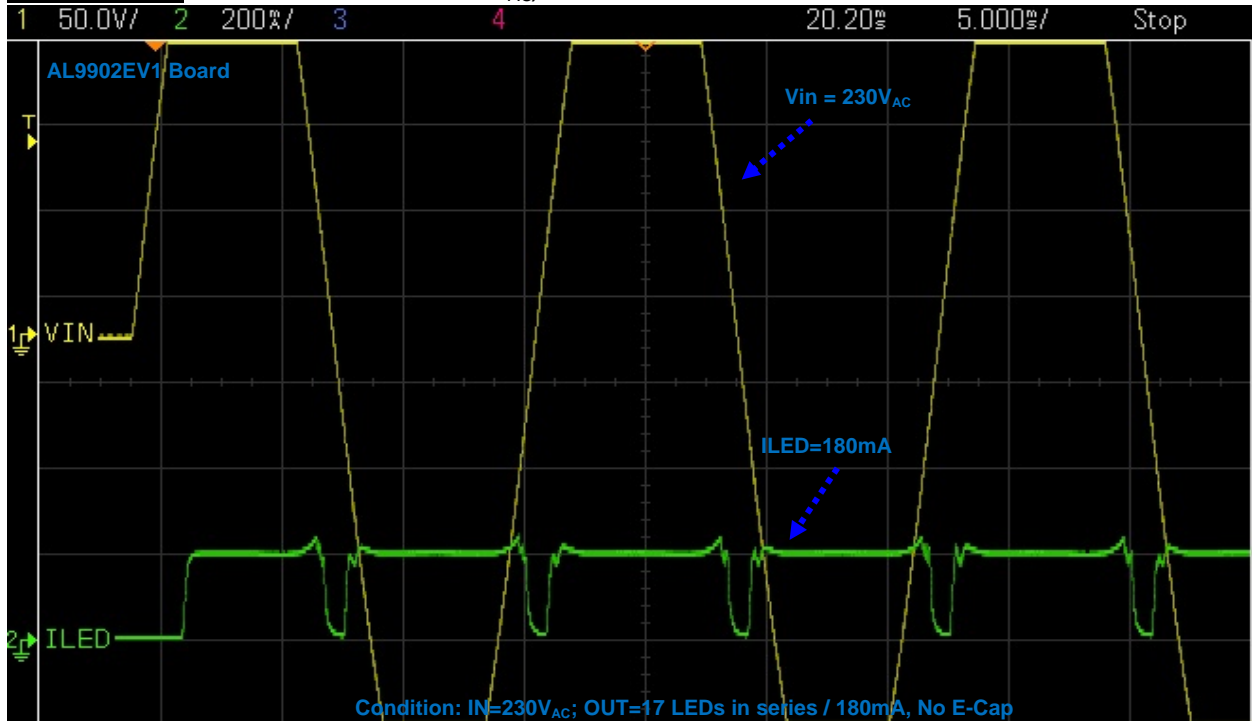


Figure 3. PFC vs. Vin

Waveform #1=> Channel 1: Vin = 120V_{AC}, Channel 2: ILED



Waveform #2=> Channel 1: Vin = 230V_{AC}, Channel 2: ILED



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