



### 11.33W-Non-Isolated LED Driver for LED bulbs

AC Input Voltage Range	LED DC Output Voltage/Current	Output Power
90V <sub>AC</sub> /60Hz ~ 260V <sub>AC</sub> /50Hz	33V/285mA	9.41W

#### Key Features

- Universal input from 90V<sub>AC</sub>/60Hz to 260V<sub>AC</sub>/50Hz, DC 33V/285mA output for LED bulbs
- Built-in EMI solution circuit
- Fixed frequency mode and max. efficiency  $\geq 83\%$
- Dimension : 45mm×24mm×18mm

#### Introduction

This application note describes a compact module that is able to drive LED bulbs up to 9.4W @285mA with EMI approval. A demo board based on SQ9910, with dimension at L45mm \* W24mm\* T18mm, is presented in terms of schematics, PCB diagram, Bill of Materials (BOM) and typical performance characteristics.

#### Specification

The Table 1 below represents related specification that can be achieved. Actual performance is described in the results section.

#### Performance

It is to drive output at 33V/285mA targeting to achieve high efficiency ( $\eta_{MAX} > 83\%$ ) for AC universal input voltage range 90V<sub>AC</sub> ~ 260V<sub>AC</sub>. Actual performance is shown on Figure 2 and 3 depict efficiency and current variation versus input line voltage for this module that system designer can adopt it to achieve corresponding performance.

#### Components

Based on non-isolation buck topology, the SQ9910 is able to achieve high efficiency. Figure 1 explains the circuit in details with all related components.

#### BOM

BOM is shown on Table 2 on page 4.

#### PCB Layout

The PCB layout has dimension at 44mm×23mm×1.6mm in order to fit A19 bulb retrofit space.

#### Power Module Photo

Top and bottom view of this power module are shown in Figure 5 ~ 6.



Table 1. Related Specification

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
AC input voltage	$V_{AC}$	90		260	V	
LED DC output voltage	$V_{LED}$		33		V	
LED output current	$I_{LED(SET)}$		285		mA	

Figure 1. A Complete Application Circuit

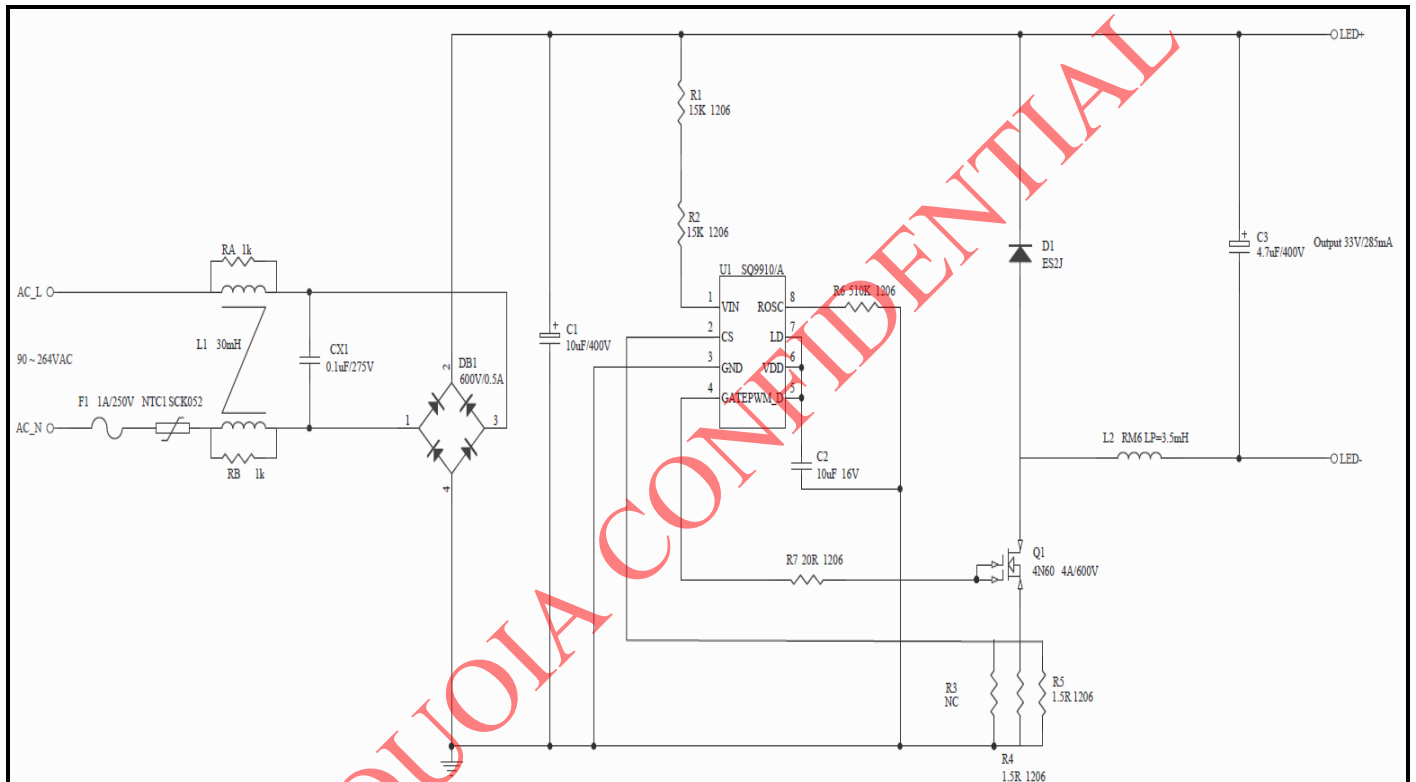




Figure 2. Efficiency versus AC Input Line Voltage

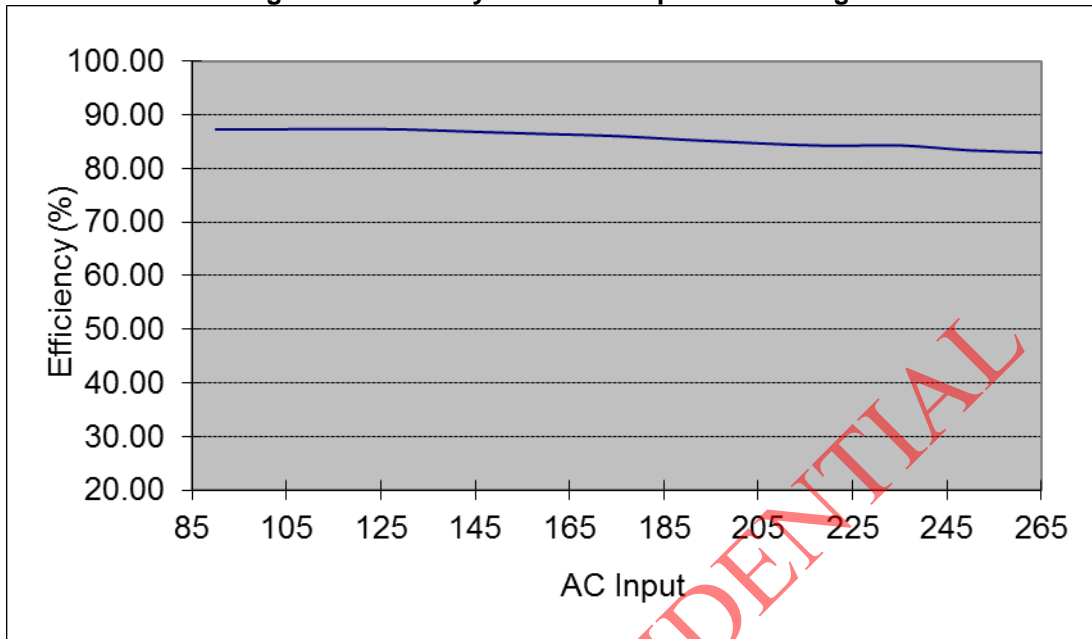


Figure 3. Current Variation versus AC Input Line Voltage

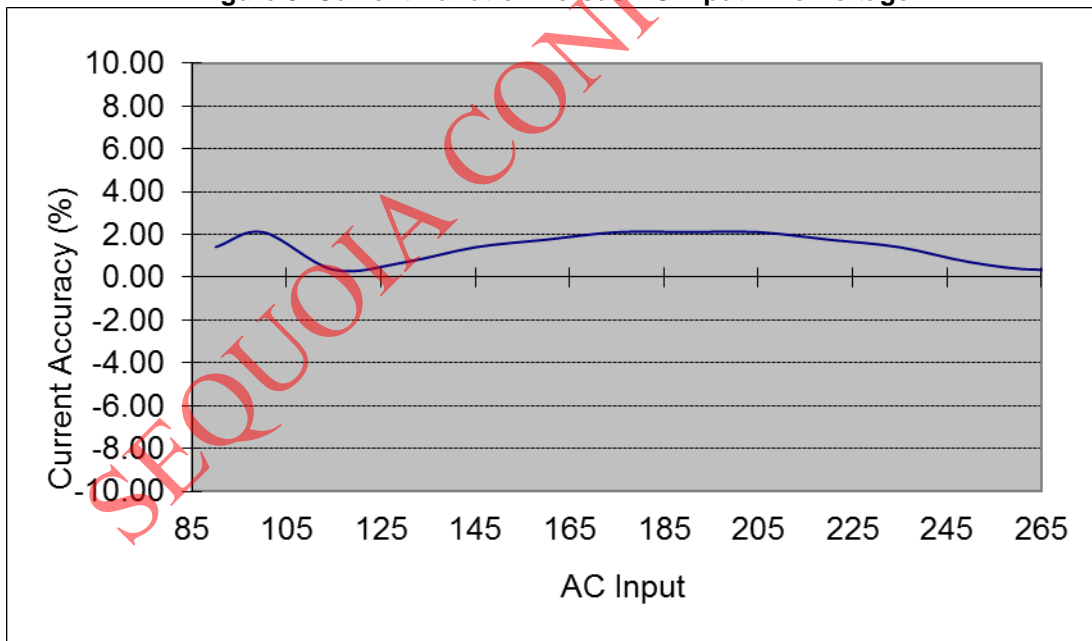




Table 2 : Bill of Material

Item	Symbol	Description	Category	Qty	Note
No.	Location	Specifications	Category	Quantity	
1	RA,RB	1K	RESISTOR	2	
2	R1	15K/1206/F	RESISTOR	1	
3	R2	15K/1206/F	RESISTOR	1	
4	R4	1.5R/1206/J	RESISTOR	1	
5	R5	1.5R /1206/J	RESISTOR	1	
6	R6	510k /1206/F	RESISTOR	1	
7	R7	20R /1206/F	RESISTOR	1	
8	NTC1	SCK052	RESISTOR	1	
9	CX1	104/275V X2	CAPACITOR	1	
10	C1	SK 10uF/400V	CAPACITOR	1	
11	C2	10uF/16V 1206	CAPACITOR	1	
12	C3	SK 4.7uF/400V	CAPACITOR	1	
13	BD1	MB6S 0.5A/600V	BRIDGE	1	
14	D1	ES2J 1A/400V	DIODE	1	
15	Q1	mosfet 4A/600V TO-252	MOSFET	1	
16	U1	SQ9910 SOT-8	IC	1	
17	L1	EE13.5 30mH	INDUCTANCE	1	
18	L2	RM6 LP:3.5mH	INDUCTANCE	1	
19	F1	1A/250V P=2.5MM	FUSE	1	
20	L,N ,LED-	UL1007 20# black L=60mm Stripping tinned at both ends each is 5mm	LINE	3	
21	LED+	UL1007 20# red L=60mm Stripping tinned at both ends each is 5mm	LINE	1	
22	PCB	PCB : FR-4 Double panel 44.5*25mm T1.6mm	PCB	1	
23		TOTAL		24	



Figure 4. Picture of PCB Layout

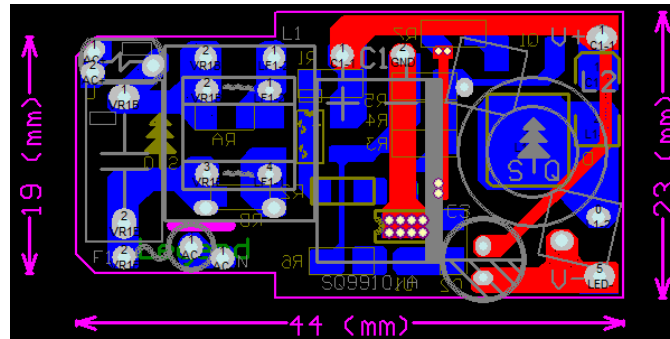


Figure 5. Top View of this Power Module



Figure 6. Bottom View of this Power Module

