



19.6W-Non-Isolated LED Driver- Tubelight /T8

AC Input Voltage Range	LED DC Output Voltage/Current	Output Power
180V _{AC} /50Hz ~ 285V _{AC} /50Hz	75V/240mA	18W

Key Features

- Input from 180V_{AC}/60Hz to 285V_{AC}/50Hz, DC 75V/240mA output for LED tubes
- Fixed frequency mode and max. efficiency $\geq 92\%$
- Dimension : 38mm×17mm×12mm

Introduction

This application note describes a compact module that is able to drive LEDs up to 18W @240mA. A demo board based on SQ9910, with dimension at L38mm * W17mm* T12mm, 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 70V/240mA targeting to achieve high efficiency ($\eta_{MAX} > 92\%$) for AC input voltage range 180V_{AC} ~ 285V_{AC}. Actual performance is shown on Figure 2,3 and 4 respectively depict efficiency, output current 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 shows the circuit in details with all related components.

BOM

BOM is shown in Table 3.

PCB Layout

The PCB layout has dimension at 38mm×17mm×1.6mm in order to fit T8 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}	180		285	V	
LED DC output voltage	V _{LED}		75		V	
LED output current	I _{LED(SET)}		240		mA	

Table 2. Actual Performance

AC Input	Input Power (W)	Output Current (I _{OUT} , mA)	Output Voltage (V _{OUT} , V)	Current Variation (%) ^(Note)	Efficiency (η, %)
180V _{AC} /50Hz	20.00	249	75	3.6	93.2
200V _{AC} /50Hz	19.32	241	75	0.2	93.4
220V _{AC} /50Hz	19.51	240	75	0.0	92.3
240V _{AC} /50Hz	18.78	232	75	-3.3	92.7
264V _{AC} /50Hz	18.70	231	75	-3.9	92.5
285V _{AC} /50Hz	18.90	230	75	-4.0	91.4

Note :

Current Variation is defined as follows :

$$\% = \frac{I_{OUT} - I_{OUT(SET)}}{I_{OUT(SET)}} \times 100\%$$

where I_{OUT(SET)} = 240mA

Figure 1. A Complete Application Circuit

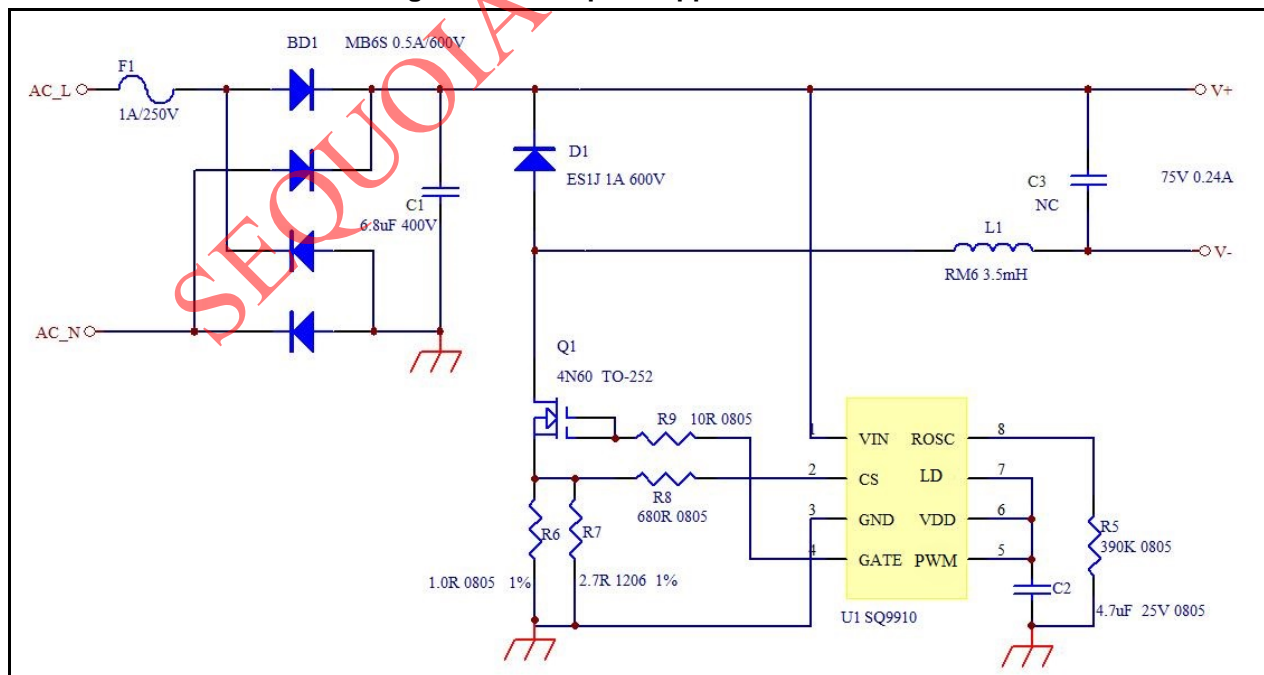




Figure 2. Efficiency versus AC Input Line Voltage

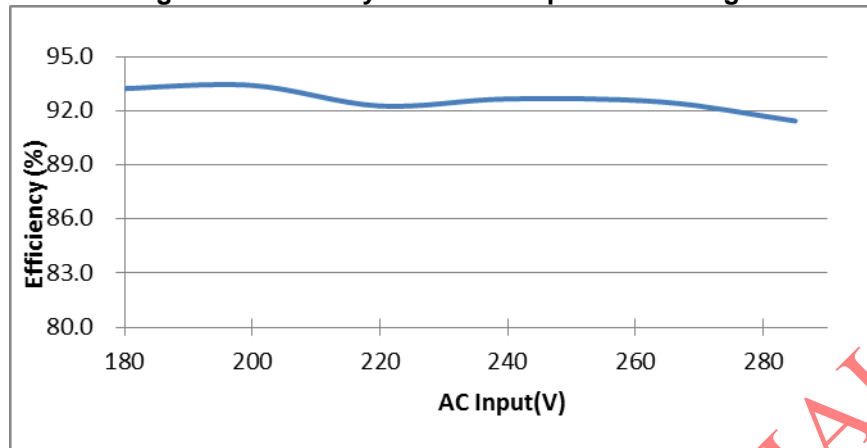


Figure 3. Output Current versus AC Input Line Voltage

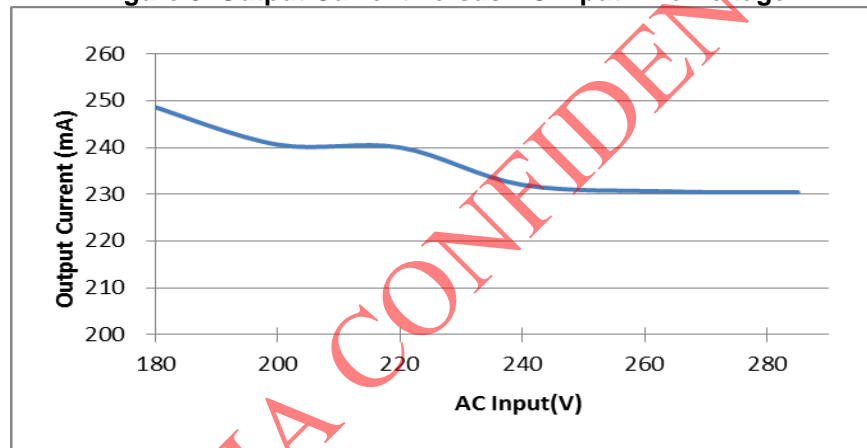


Figure 4. Current Variation versus AC Input Line Voltage

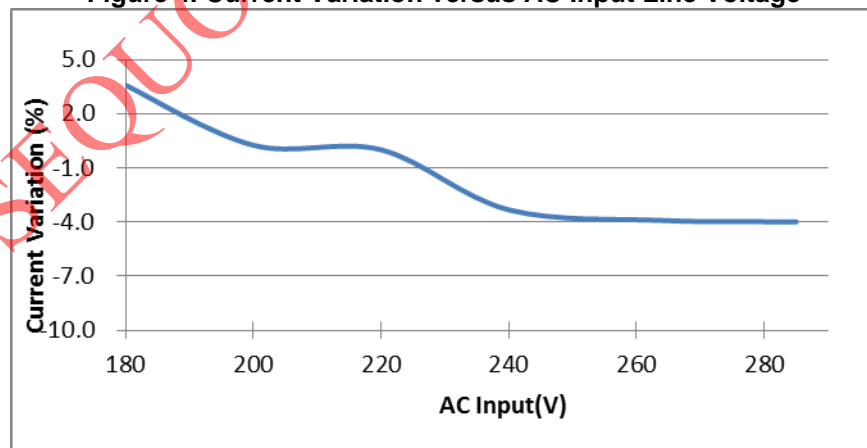




Table 3 : Bill of Material

Item	Symbol	Description	Category	Qty	Note
1	R5	390K/0805/F	Resistor	1	
2	R6	2.7R/1206/F	Resistor	1	
3	R7	1.0R/1206/F	Resistor	1	
4	R8	680R/0805/J	Resistor	1	
5	R9	10R/1206/J	Resistor	1	
6	C2	4.7uF 0805 16V	Capacitor	1	
7	C1	6.8uF/400V 8*14mm 105°C ±20%	Capacitor	1	
8	BD1	MB6S 1A 600V	Diode	1	
9	D1	ES1J 1A/600V SMA	Diode	1	
10	Q1	MOSFET 4N60 4A/600V TO-252	MOSFET	1	
11	L1	RM6 ϕ 0.27mm 3.5mH±5%	Choke	1	
12	F1	1A/250V Slow 3.6*10	FUSE	1	
13	PCB	010-017-02 FR-4	PCB	1	
14	U1	SQ9910 SOT-8	IC	1	
		Total		14	

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Figure 5. Top View of this Power Module



Figure 6. Bottom View of this Power Module

