



### 8W-Non-Isolated LED Driver-Bulb Module

AC Input Voltage Range	LED DC Output Voltage/Current	Output Power
180V <sub>AC</sub> /50Hz ~ 285V <sub>AC</sub> /50Hz	52V/135mA	7W

#### Key Features

- Input from 180V<sub>AC</sub>/50Hz to 285V<sub>AC</sub>/50Hz, DC 52V/135mA output for LED tubes
- Fixed frequency mode and max. efficiency  $\geq 88\%$
- Dimension : 40mm x 19mm x 12mm

#### Introduction

This application note describes a compact module that is able to drive LED bulbs up to 7W @135mA . A demo board based on SQ9911, with dimension at L40mm \* W19mm\* 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 52V/135mA targeting to achieve high efficiency ( $\eta_{MAX} > 88\%$ ) for AC input voltage range 180V<sub>AC</sub> ~ 285V<sub>AC</sub>. 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 SQ9911 is able to achieve high efficiency. Figure 1 shows the circuit in details with all related components.

#### BOM

BOM is shown on Table 3.

#### PCB Layout

The PCB layout has dimension at 40mm x 19mm x 1.6mm in order to fit inside the bulb spacing.

#### 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 <sub>AC</sub>	180		285	V	
LED DC output voltage	V <sub>LED</sub>		52		V	
LED output current	I <sub>LED(SET)</sub>		135		mA	

**Table 2. Actual Performance**

AC Input	Input Power (W)	Output Current (I <sub>OUT</sub> , mA)	Output Voltage (V <sub>OUT</sub> , V)	Current Variation (%) <sup>(Note)</sup>	Efficiency (η, %)
180V <sub>AC</sub> /50Hz	7.79	134	52	-0.6	89.6
200V <sub>AC</sub> /50Hz	7.88	135	52	-0.2	88.9
220V <sub>AC</sub> /50Hz	8.00	136	52	0.5	88.2
240V <sub>AC</sub> /50Hz	8.13	137	52	1.3	87.4
264V <sub>AC</sub> /50Hz	8.31	138	52	2.3	86.4
285V <sub>AC</sub> /50Hz	8.52	140	52	3.3	85.1

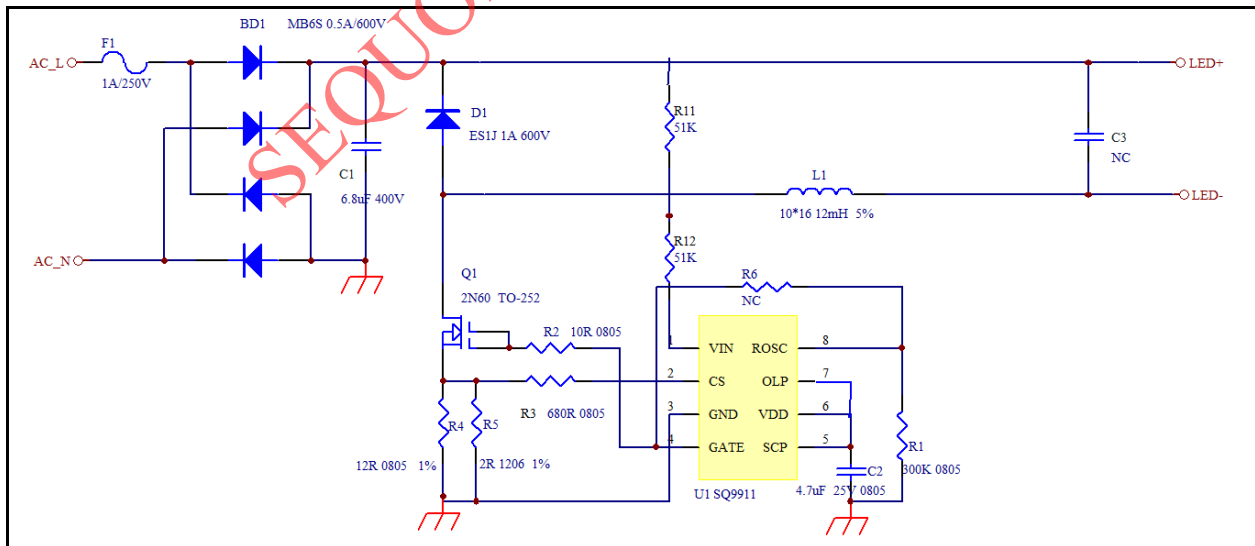
Note :

Current Variation is defined as follows :

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

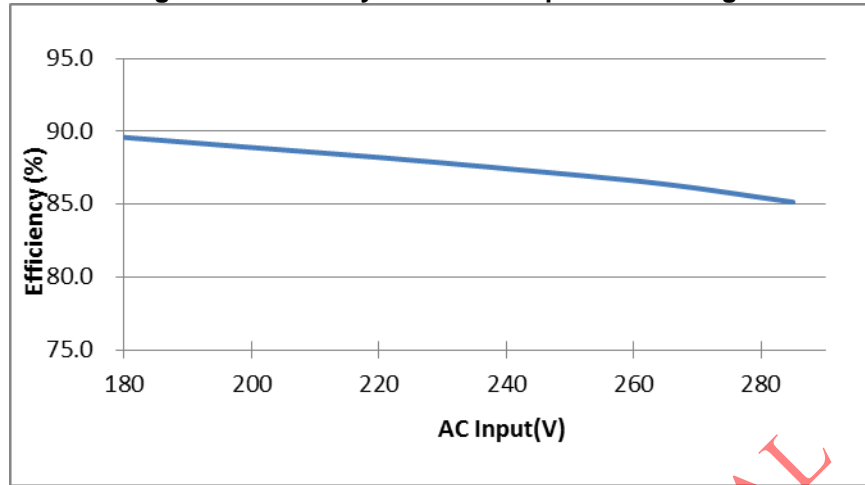
where I<sub>OUT(SET)</sub> = 135mA

**Figure 1. A Complete Application Circuit**

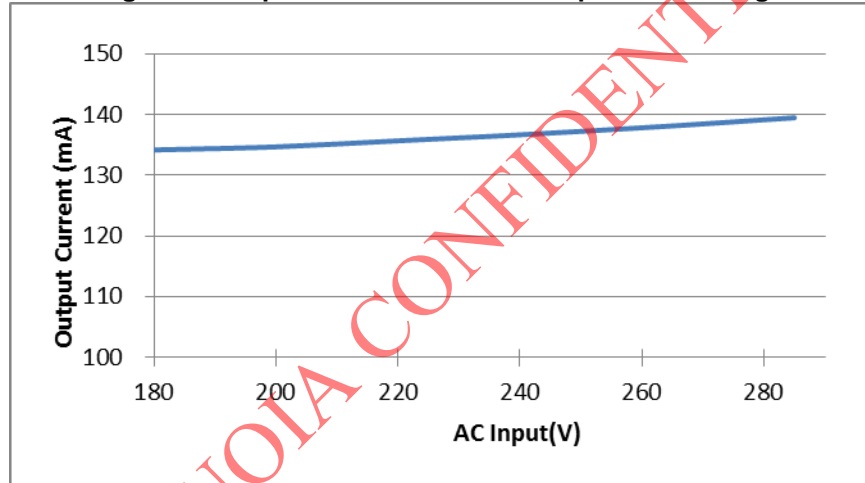




**Figure 2. Efficiency versus AC Input Line Voltage**



**Figure 3. Output Current versus AC Input Line Voltage**



**Figure 4. Current Variation versus AC Input Line Voltage**

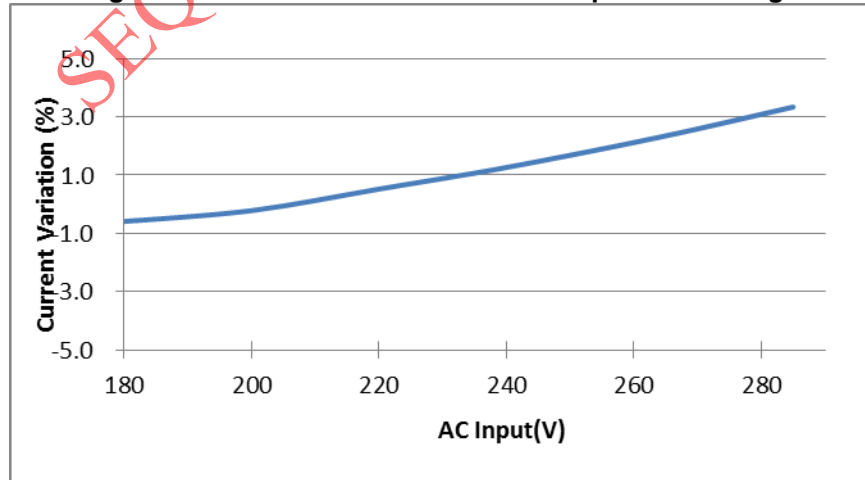




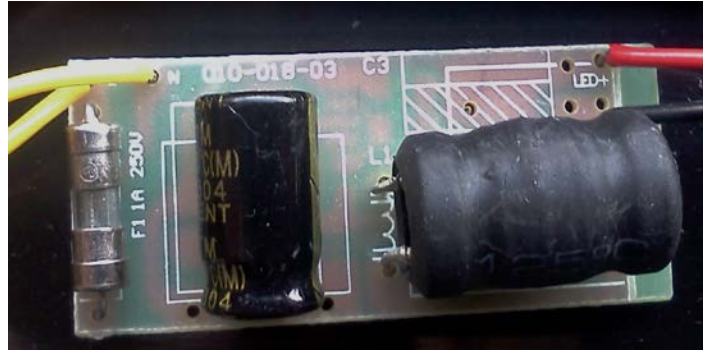
Table 2 : Bill of Material

Item	Symbol	Description	Category	Qty	Note
1	R1	300K/0805/F	RESISTOR	1	
2	R2	10R/1206/J	RESISTOR	1	
3	R3	680R/0805/J	RESISTOR	1	
4	R4	12R/1206/F	RESISTOR	1	
5	R5	2R/1206/F	RESISTOR	1	
6	R11	51K/1206/J	RESISTOR	1	
7	R12	51K/1206/J	RESISTOR	1	
8	C2	4.7uF 0805 16V	CAPACITOR	1	
9	BD1	MB6S 0.5A 600V	BRIDGE	1	
10	D1	ES1J 1A/600V SMB	DIODE	1	
11	Q1	mosfet 2A/600V TO-252	MOSFET	1	
12	C1	6.8uF/400V 8*14 105°C	CAPACITOR	1	
13	L1	DR10*16 12mH	INDUCTANCE	1	
14	F1	1A/250V 3.6*10	FUSE	1	
15	U1	SQ9911 SOT-8	IC	1	
16	PCB	FR-4 010-018-03	PCB	1	
		Total		16	

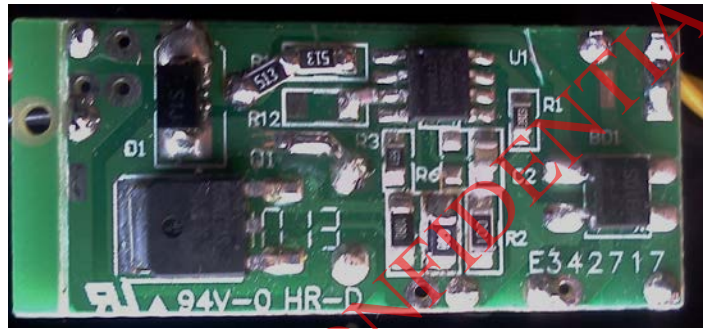
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**Figure 5. Top View of this Power Module**



**Figure 6. Bottom View of this Power Module**



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