PMP6007
TPS92074
230Vac Non Dimmable 10W LED Driver Reference Design

October, 2013

230Vac Non Dimmable 10W LED Driver Reference Design

1 Introduction

This TPS92074 reference design presents the TPS92074 controller driving a 75V string of LEDs at 110mA in a buck configuration. It is a non dimmable reference design.

2 Description

This reference design provides a high-brightness LED driver based on the TPS92074. It is designed to operate with an input voltage in the range of 180VAC to 277VAC with a 230-VAC nominal input voltage. This design is set up for an 8W output power with an output voltage range of 50 V to 100 V.

2.1 Typical Applications

This converter design describes an application of the TPS92074 as an LED driver with the specifications listed below. For applications with a different output voltage or current range refer to the TPS92074 datasheet.

2.2 Features

2.2.1 Connector Description

This section describes the connectors of the reference design board.

2.2.1.1 J8

This connector is for the AC input to the board. Use the screw down terminal to connect Line and Neutral to the circuit.

2.2.1.2 J5

This connector is for the LED load. Use the screw down terminal to connect the LED anode to the pin marked LED+ and connect the LED cathode to the pin marked LED-.

3 Electrical Performance Specifications

Table 1: TPS92074 230Vac Non Dimmable Buck Electrical Performance Specifications

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Input Characteristics					
Voltage range	Normal operation	180	230	277	VAC
Maximum input current	At 230VAC 50Hz input voltage		0.06		A
Output Characteristics					
Output voltage, VOUT		50	75	100	V
Output load current, IOUT	Input voltage = 230V 50Hz, Load = 75V LED	100	110	120	mA
Output current regulation	Input voltage = 230V 50Hz, Load = 75V LED		< ±5		%
Output current ripple	Input voltage = 230V 50Hz, Load = 75V LED		<40		mApp
Output current line regulation	Input voltage 208V to 254V 50Hz, Load = 75V LED		< ±5		%
Output current line regulation	Input voltage 180V to 277V 50Hz, Load = 75V LED		< ±10		%
Systems Characteristics					
Switching frequency	Input voltage = 230V 50Hz, Load = 75V LED		75		kHz
Power Factor	Input voltage = 230V 50Hz, Load = 75V LED		0.9		
Efficiency	Input voltage = 230V 50Hz, Load = 75V LED		89		%

4 Schematic

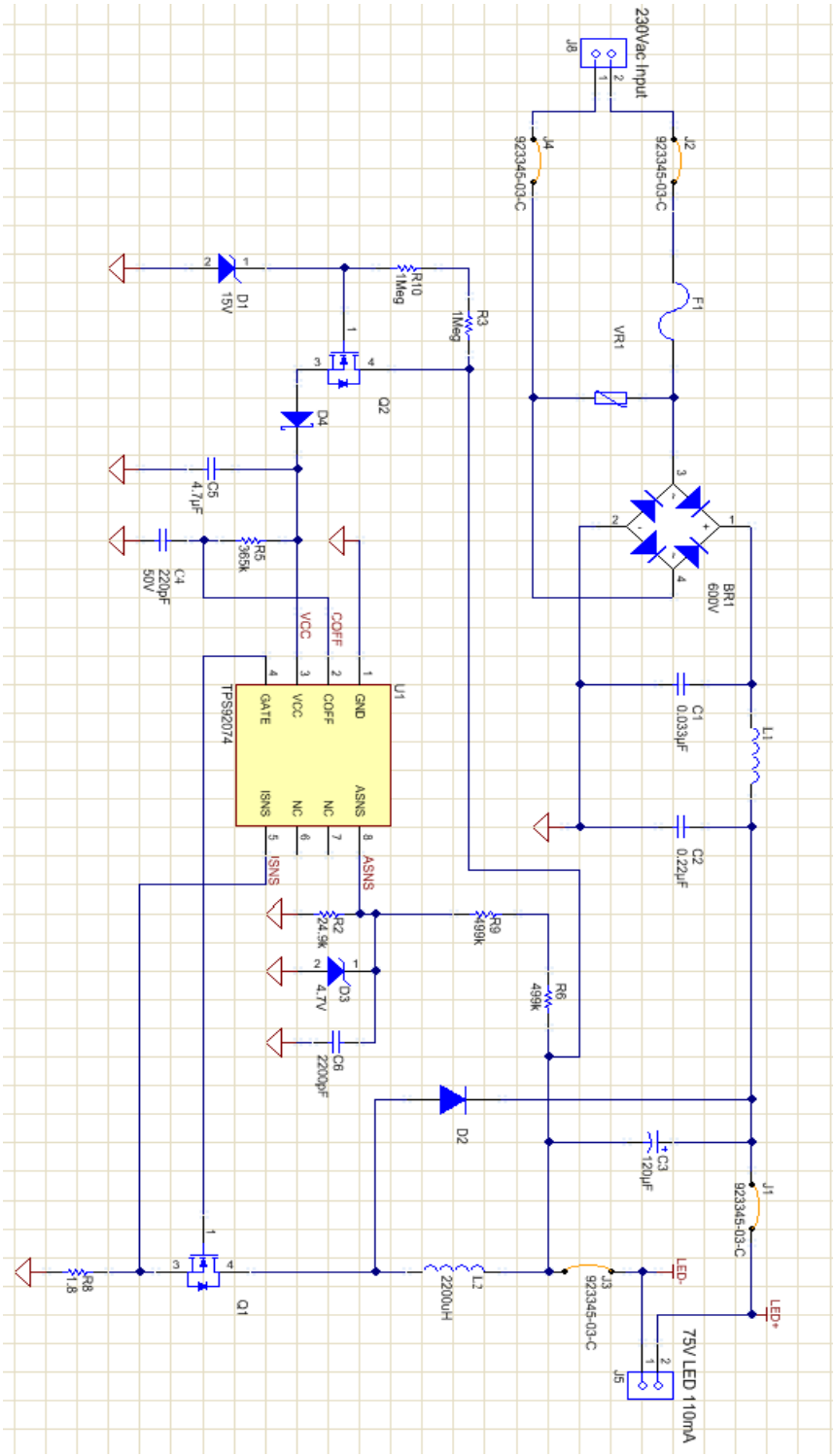

Figure 1: TPS92074 230Vac Non Dimmable 10W LED Driver Schematic

5 Performance Data and Typical Characteristic Curves

Figures 2 through 12 present typical performance curves for TPS92074 230Vac Non Dimmable 10W LED Driver

5.1 Efficiency

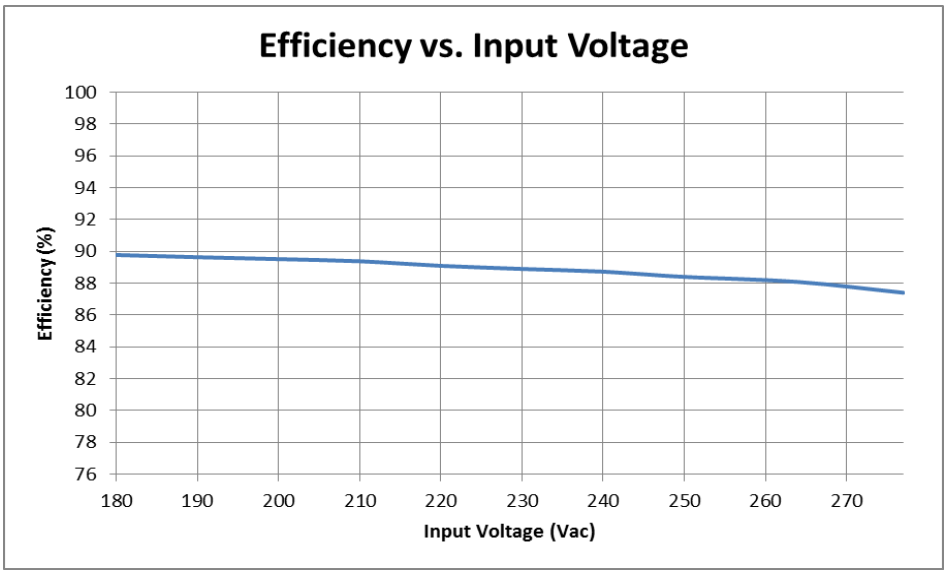

Figure 2: Efficiency with 75V LED stack

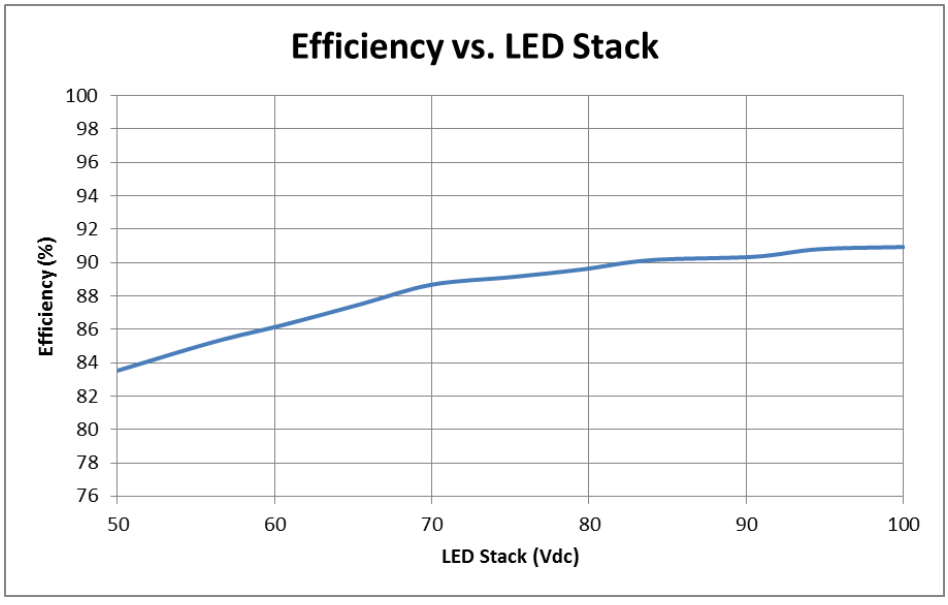

Figure 3: Efficiency at 230Vac 50Hz input

5.2 Current Regulation

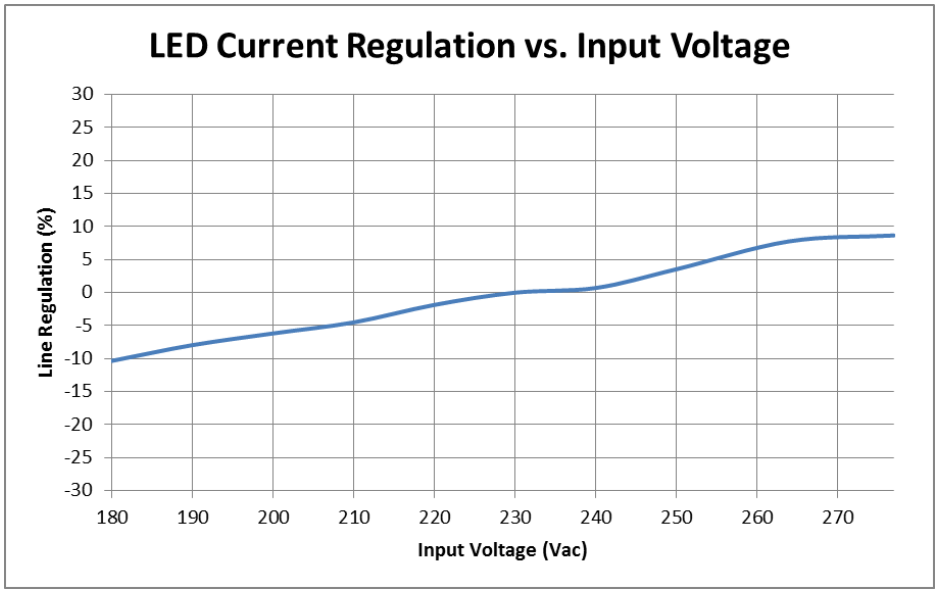

Figure 4: Line Regulation 75V LED stack

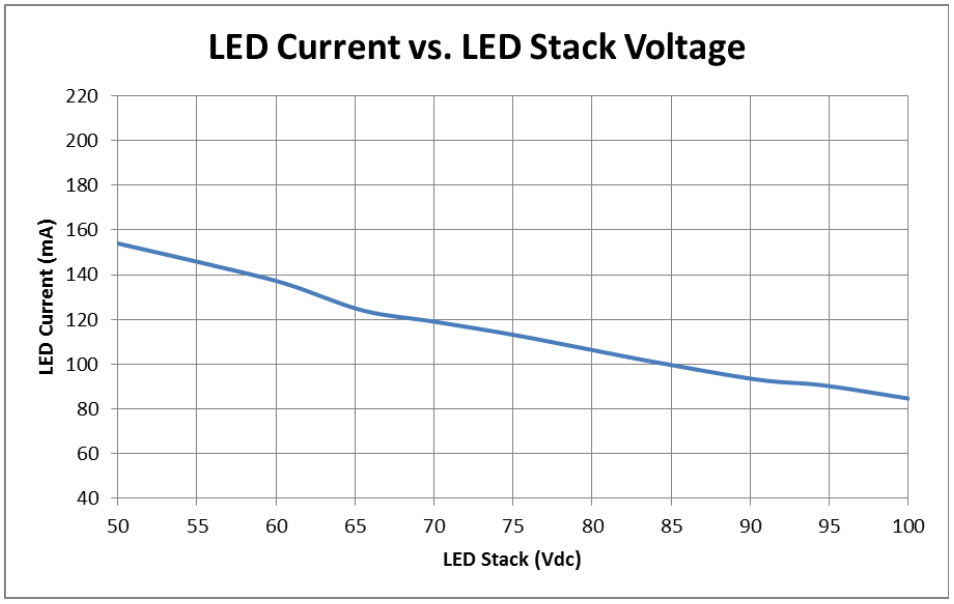

Figure 5: LED Current vs. LED stack voltage 230Vac 50Hz input

5.3 Power Factor

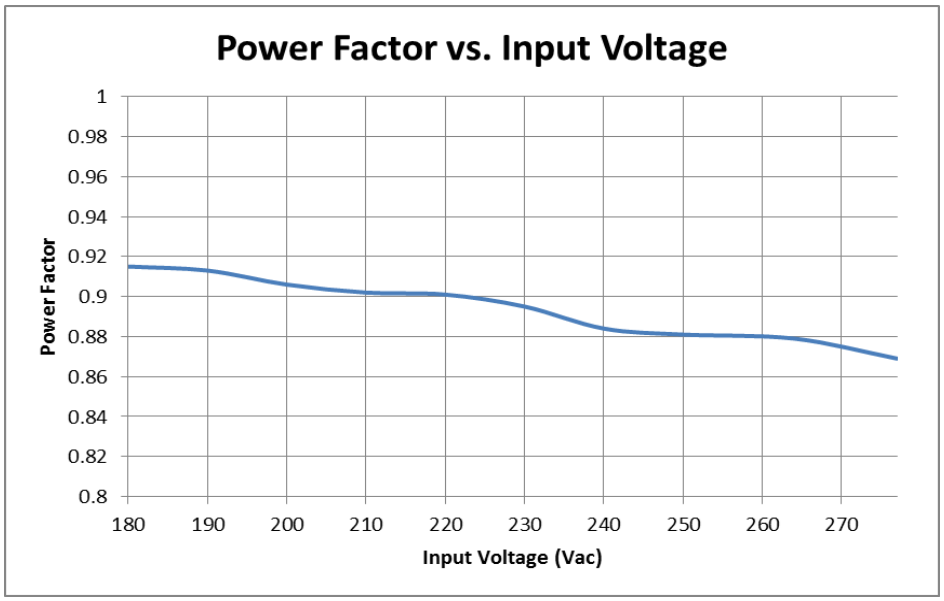

Figure 6: Power Factor 230Vac 50Hz input 75V LED stack

5.4 Waveforms

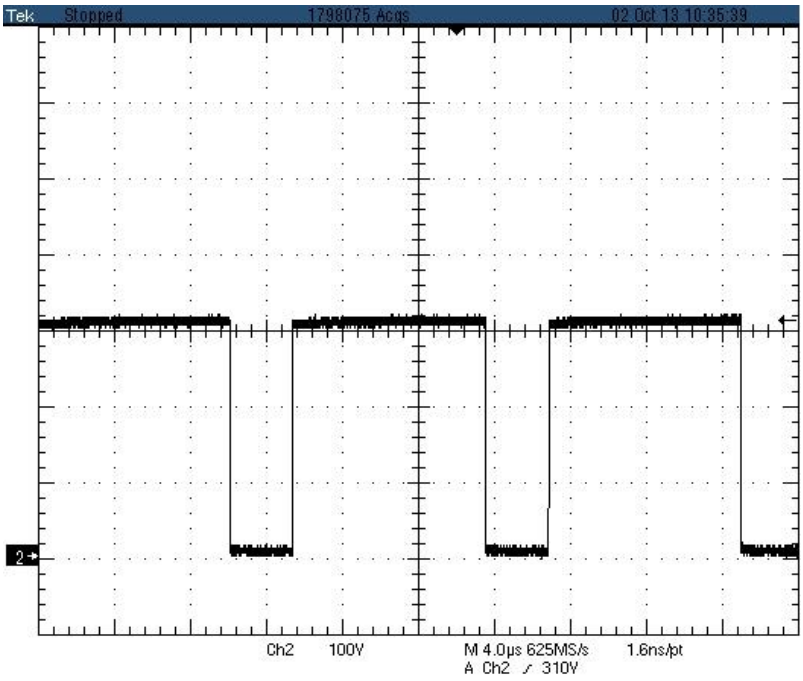

Figure 7: Q1 Drain Waveform at 230Vac 50Hz input

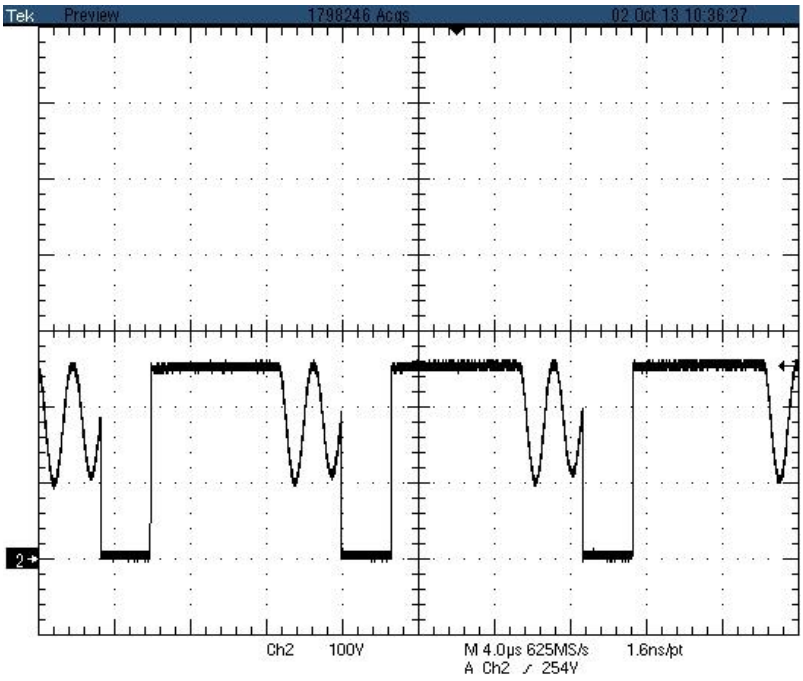

Figure 8: Q1 Drain Waveform at 230Vac 50Hz input

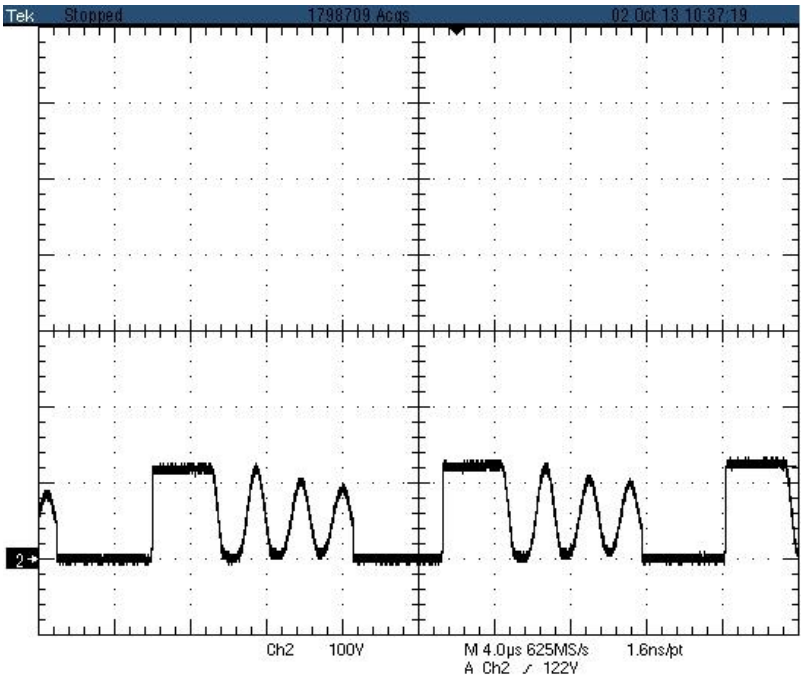

Figure 9: Q1 Drain Waveform at 230Vac 50Hz input

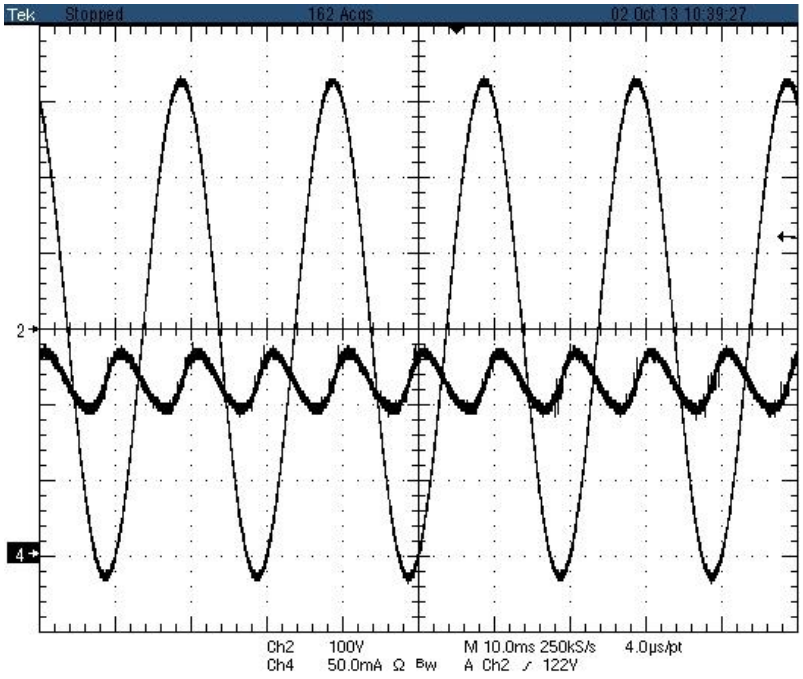

Figure 10: Ch2 Input AC Voltage Ch4 Output LED Current
230Vac 50Hz input 75V LED stack

5.5 EMI Performance

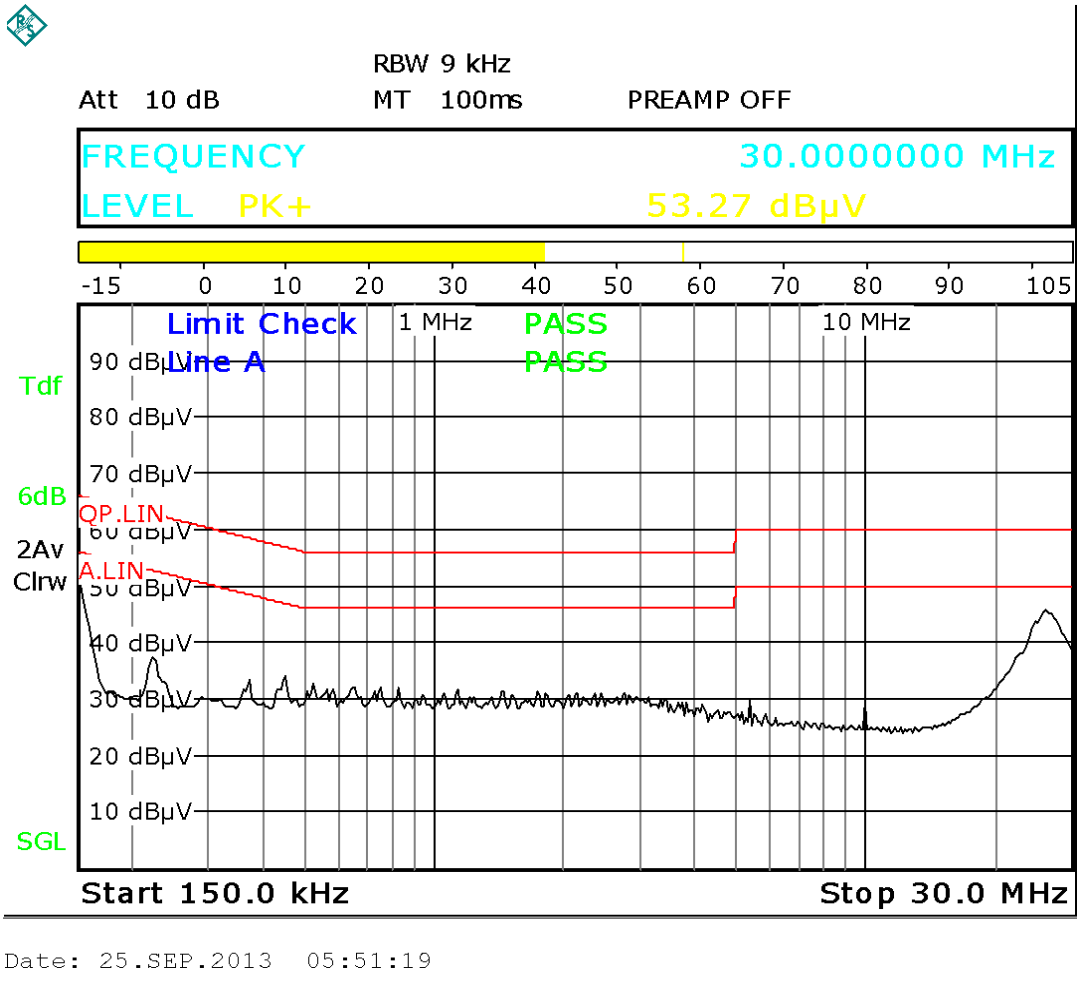

Figure 11: 230VAC Line-Conducted Average EMI Scan

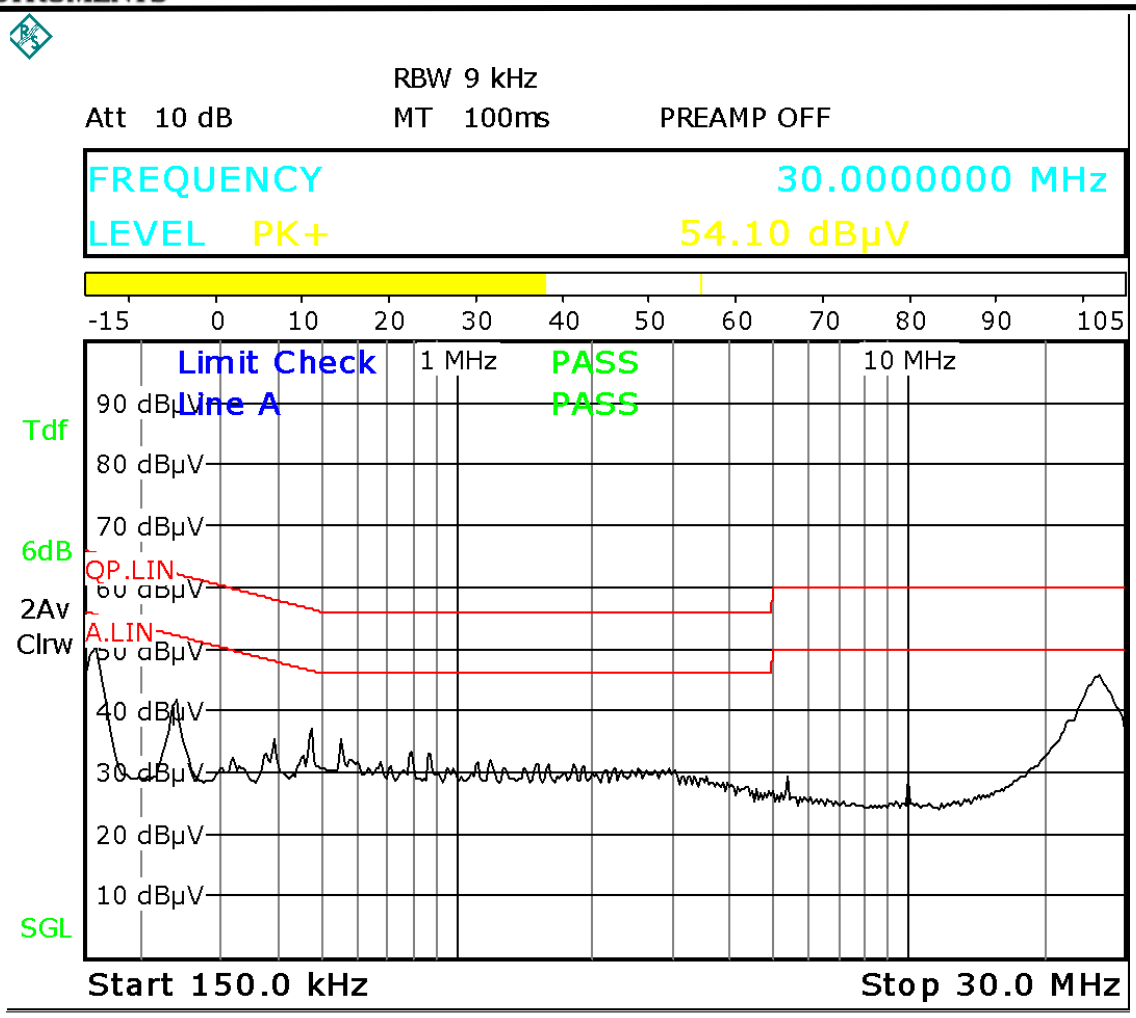

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Figure 12: 230VAC Neutral-Conducted Average EMI Scan

6 TPS92074 230Vac Non Dimmable 10W LED Driver Reference Design PCB layout

The following figures (Figure 10 through Figure 11) show the design of the printed circuit board.

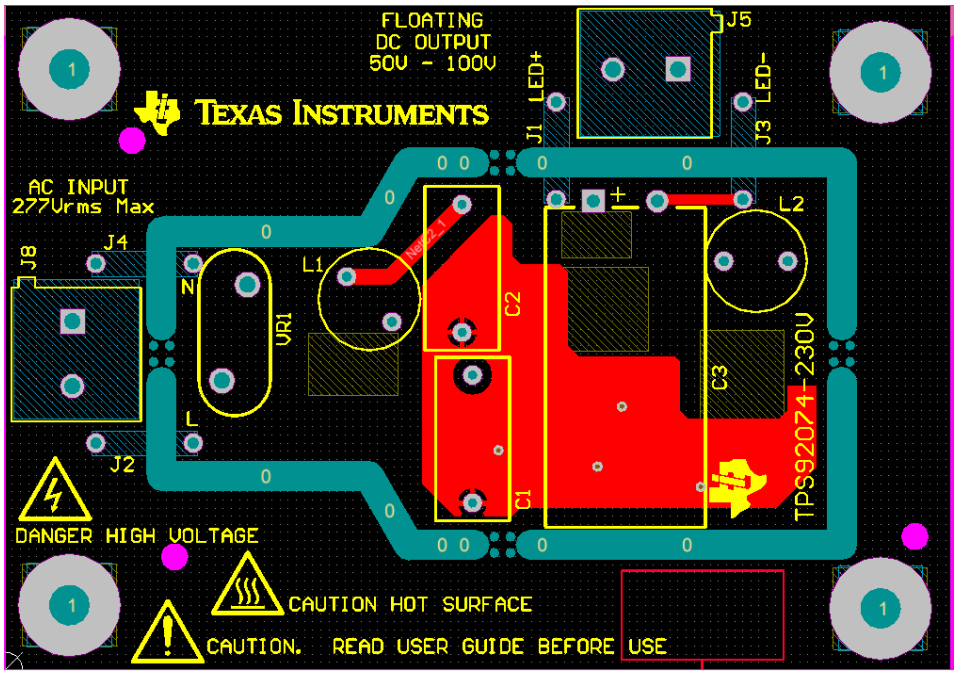

Figure 13: Top Layer and Top Overlay (Top view)

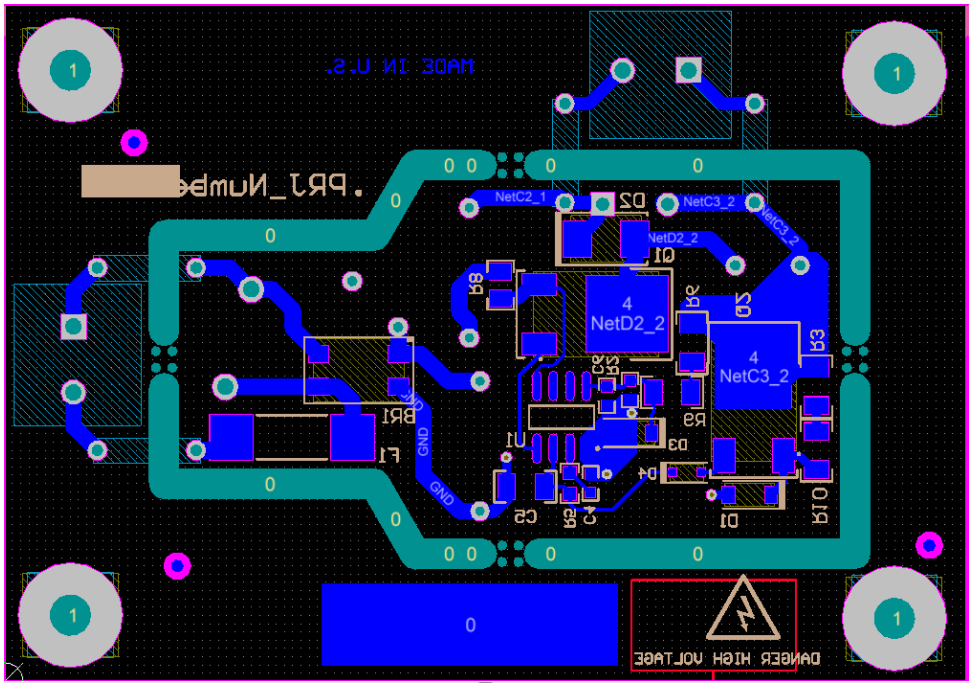

Figure 14: Bottom Layer and Bottom Overlay (Bottom view)

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