



# UM10538

120 V 9 W 280 mA reference design using SSL21082

Rev. 1 — 18 April 2012

User manual

## Document information

Info	Content
<b>Keywords</b>	SSL21082, Reference design, LED driver, Buck converter
<b>Abstract</b>	This document describes the performance, technical data and the connection of the SSL21082 reference board. The SSL2108 series is an NXP Semiconductors driver IC intended to provide a low cost, small form factor LED driver design. This board is intended to operate at 120 V (AC), using an output voltage around 32 v.



## Revision history

Rev	Date	Description
v.1	20120418	first issue

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## 1. Introduction

### WARNING

#### Lethal voltage and fire ignition hazard



The non-insulated high voltages that are present when operating this product, constitute a risk of electric shock, personal injury, death and/or ignition of fire.

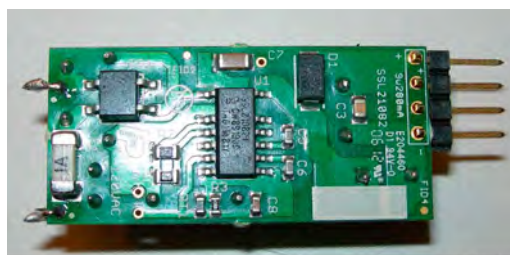
This product is intended for evaluation purposes only. It shall be operated in a designated test area by personnel qualified according to local requirements and labor laws to work with non-insulated mains voltages and high-voltage circuits. This product shall never be operated unattended.

The SSL21082 is a buck converter controller suitable for non-isolated, non-dimmable LED retrofit lamps. This SSL21082 reference design targets on high efficiency (> 90 %), high-power factor (> 0.9) with very low system cost. [Figure 1](#) shows populated views of the demo board.



aaa-002909

a. Top view



aaa-002911

b. Bottom view

Fig 1. SSL21082 demo board

## 2. Connecting to the board

The board is optimized for a 120 V (AC, 60 Hz) mains supply. In addition to the mains voltage optimization, the board is designed to work with multiple LEDs or an LED module.

Under the expected conditions, the output current is 280 mA when using an LED string with a VF 32 V. Resistors R1 and R2 (see [Figure 2](#)) can adjust the current.

J1 and J2 are the connections for the main voltage. J3 (LED+) and J4 (LED-) are connections for the LED load (See [Figure 2](#)).

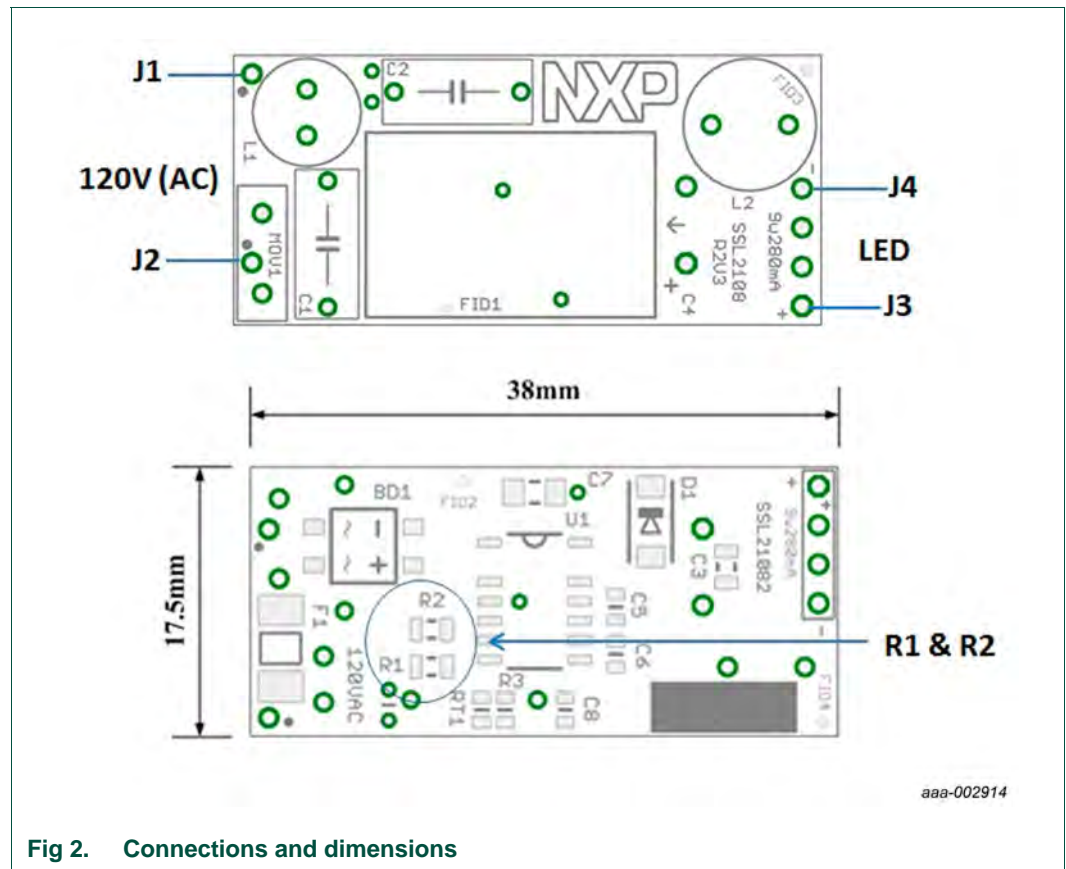


Fig 2. Connections and dimensions

## 3. Specifications

Table 1. Demo board performance and specification

Parameter	Value	Comment
AC line input voltage	108 V (AC) to 132 V (AC)	optimized for 120 V (AC), 60 Hz
output voltage	32 V (DC)	minimum: 15 V; maximum: 35 V
output current	280 mA	
LED power	9 W	
efficiency	> 90 %	
power factor	> 0.9	

Table 1. Demo board performance and specification ...continued

Parameter	Value	Comment
board dimensions	17.5 mm × 38 mm	
output current regulation	±5 %	line voltage = 108 V to 132 V
IEC55015	yes	

## 4. Performance

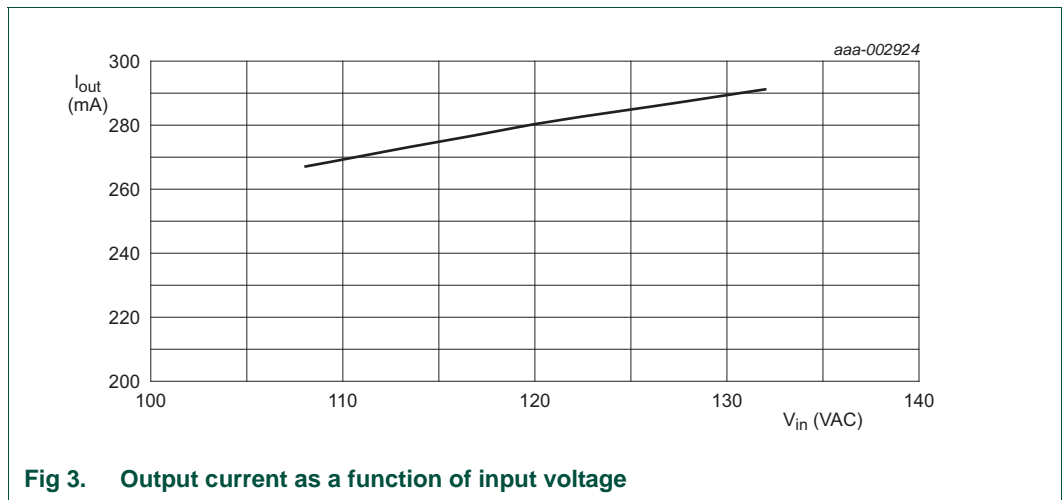


Fig 3. Output current as a function of input voltage

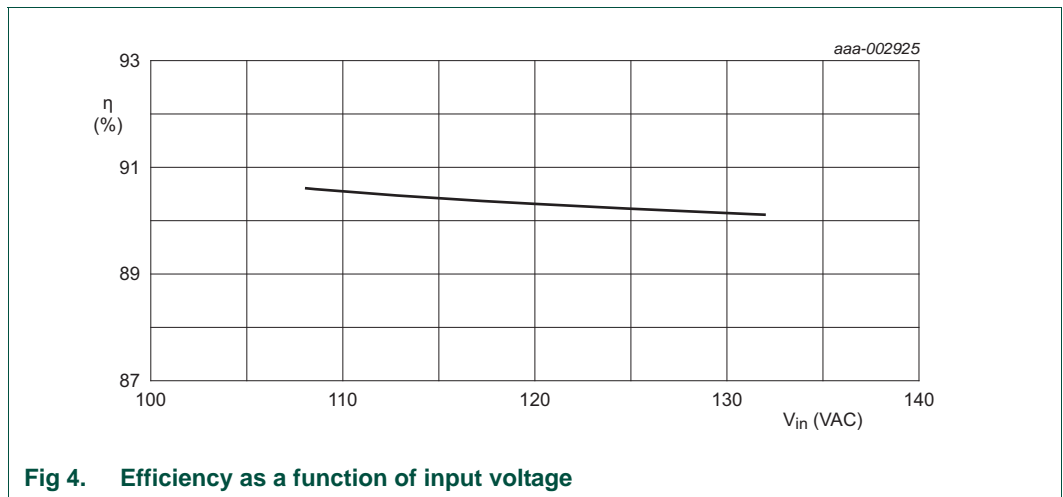
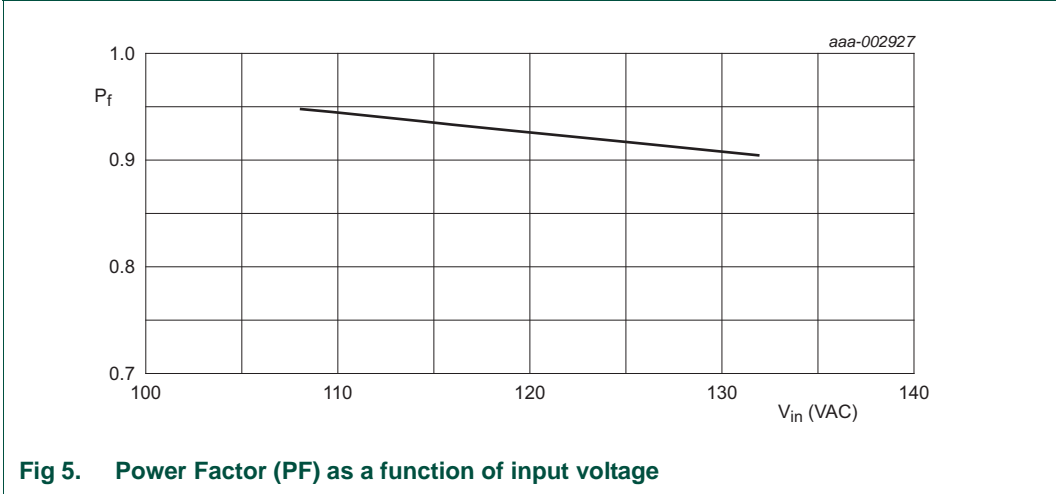


Fig 4. Efficiency as a function of input voltage



## 5. ElectroMagnetic Interference (EMI) performance

The SSL21082 demo board is pre-compliant to EMI regulation (see [Figure 6](#)).

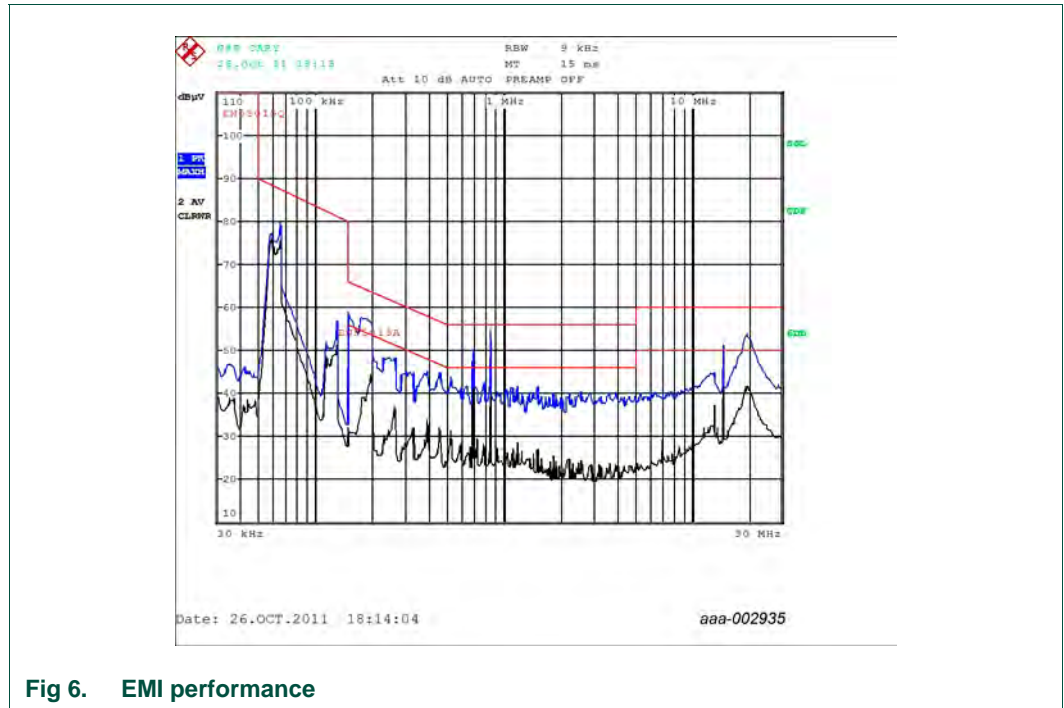


Fig 6. EMI performance

## 6. External OverTemperature Protection (OTP)

The SSL2108 series supports external OTP by adding an external Negative Temperature Coefficient (NTC) resistor. This feature is delivered by detecting a voltage on pin NTC. Pin NTC has an integrated current source. The resistance of the NTC resistor is decreased as the temperature is raised. When the NTC temperature rises and the voltage on pin NTC falls below 0.5 V, the SSL2108 lowers the threshold level for detecting peak current in the inductor. Decreasing the peak current in the inductor causes the power current to decrease. The output current is regulated to the point where a balance between temperature and output current can be retained (thermal management).

If the temperature on NTC increases continuously and the voltage on the pin drops below 0.3 V, the SSL2108 starts the NTC time-out timer. If the voltage on pin NTC pin does not drop below 0.2 V within the time-out, the SSL2108 detects an abnormal condition and stops switching. If the voltage reaches 0.2 V within the time-out period, a Pulse Width Modulation (PWM) signal is assumed.

An NTC resistor can be directly connected to pin NTC. It is also possible to tune the protection temperature by adding a resistor in parallel or in series with the NTC. One NTC and one resistor are installed on the reference board. The values of these components can be changed depending on the protection temperature requirements and component availability.

Mount the NTC in thermal contact with the LED string.

7. Schematic

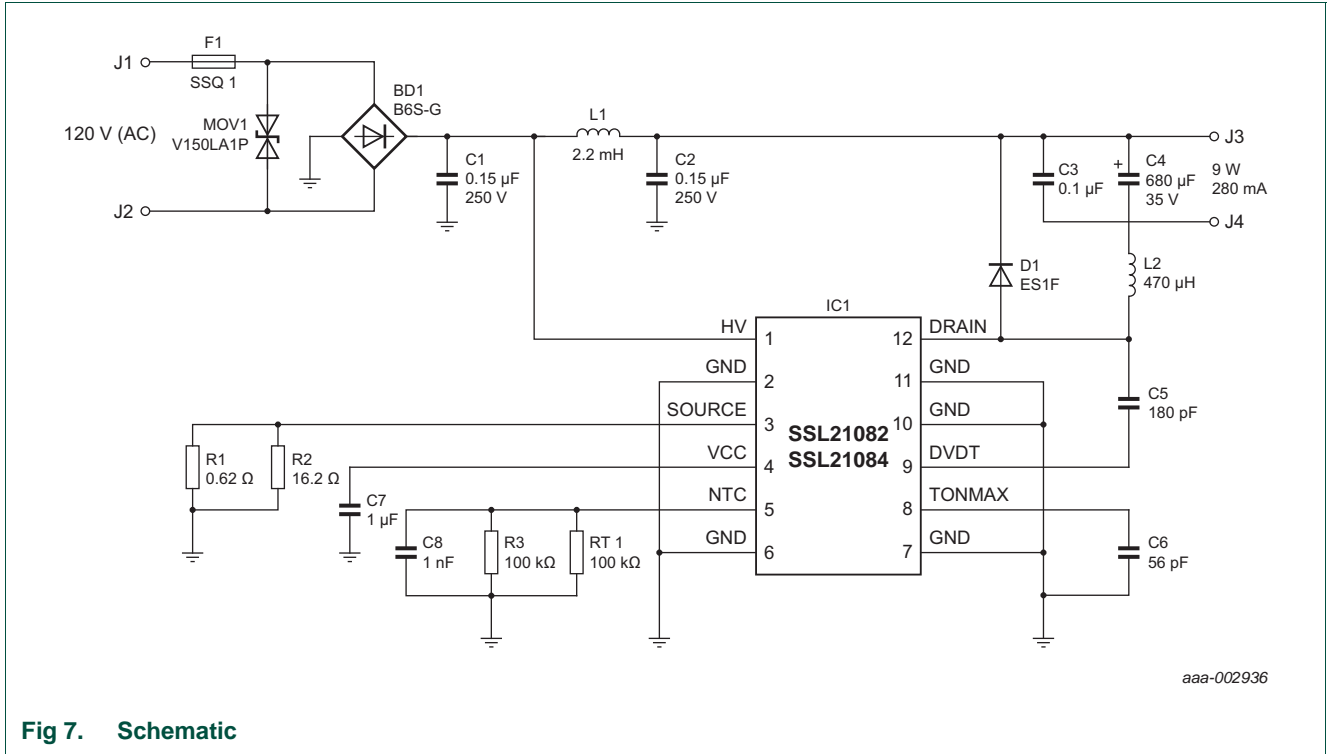


Fig 7. Schematic

8. Bill of materials

Table 2. Bill of materials

Reference	Component	Package	Quantity	Manufacturer	Part number
C1, C2	capacitor: 0.15 µF, 250 V	TH	2	Panasonic - ECG	ECQ-E2154KF
C3	capacitor: 100 nF, 50 V, X7R	0805	1	AVX Corporation	08055C104KAT2A
C4	capacitor: 680 µF, 35 V	TH	1	United Chemi-Con	EKZE350ELL681MK20S
C5	capacitor: 180 pF, 250 V, C0G	0603	1	TDK	CGA3E3C0G2E181J
C6	capacitor: 56 pF, 50 V, C0G	0603	1	TDK	C1608C0G1H560J
C7	capacitor: 1 µF, 25 V, X7R	1206	1	TDK	C3216X7R1E105M/0.85
C8	capacitor: 1 nF, 50 V, X7R	0603	1	Murata	GRM188R71H102KA01D
BD1	bridge rectifier; 600 V, 0.8 A	MBS	1	Comchip	B6S-G
D1	diode: 1 A, 300 V	DO214AC	1	Fairchild	ES1F
L1	inductor: 2.2 mH	TH	1	Renco	RL5480-2-2200
L2	inductor: 470 µH, 0.8 A	TH	1	Bourns	RLB9012-471KL
R1	resistor: 0.62 Ω	0805	1	ROHM	MCR10EZHFLLR620
R2	resistor: 16.2 Ω	0805	1	Panasonic - ECG	ERJ-6ENF16R2V
R3	resistor: 100 kΩ	0603	1	Panasonic - ECG	ERJ-3GEYJ104V
RT1	thermistor: 100 kΩ	0603	1	Murata	NCP18WF104J03RB



Table 2. Bill of materials

Reference	Component	Package	Quantity	Manufacturer	Part number
MOV1	varistor: 284 V, 1.2 kA	TH	1	Littelfuse	V150LA1P
U1	LED driver IC: SSL21082	SO12	1	NXP Semiconductors	SSL21082
F1	fuse: 1 A, 125 V (AC)	TH	1	Bel Fuse Inc.	SSQ 1

## 9. Board layout

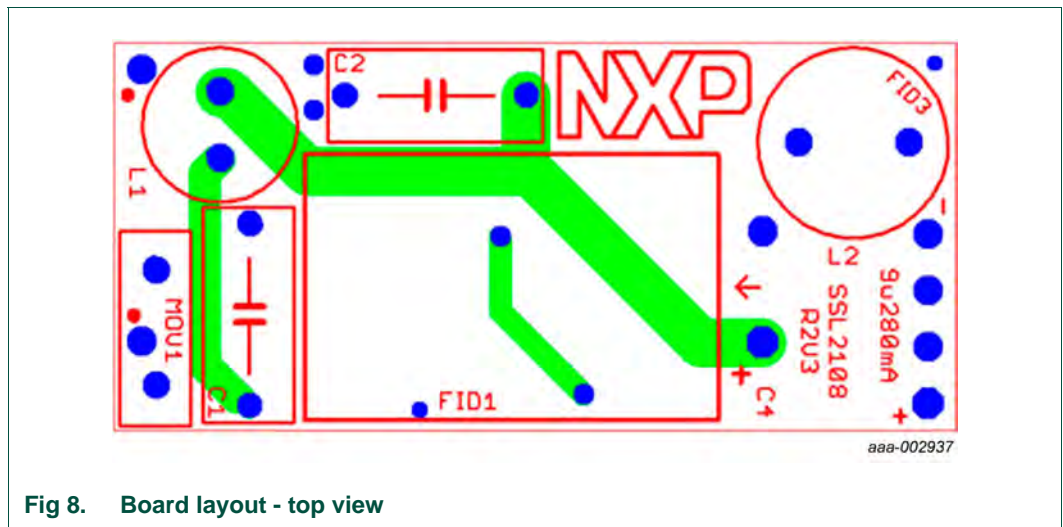
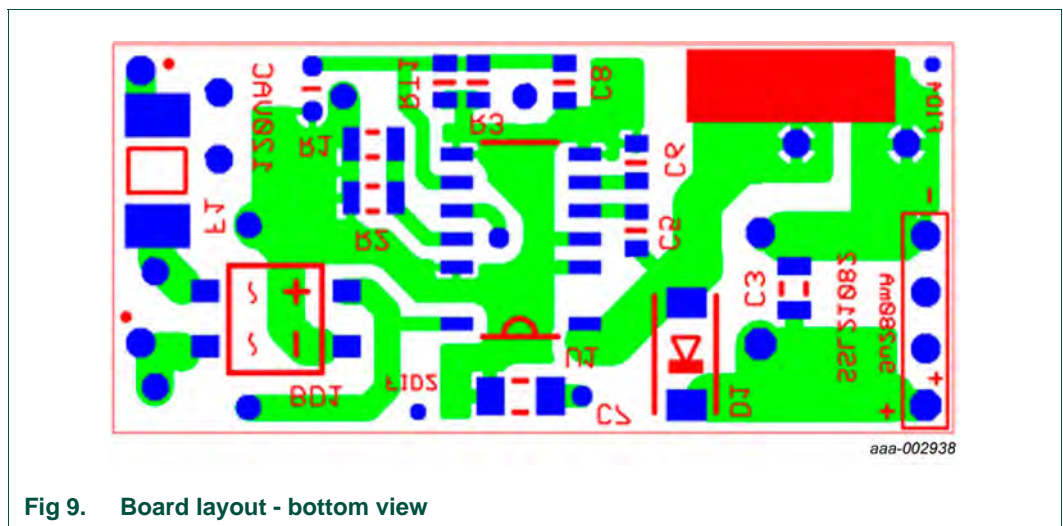


Fig 8. Board layout - top view



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