UM1661
Evaluation Board
User's Guide
V1.0

Version	Date	Prvoider	Approve	Note
1.0	2011-08-16			Initial version.

Table of Contents

1 . Board Information

UM1661 is a high efficient LED driver chip, It can be used for LED constant current driver in battery-powered systems.UM1661 EVB board is a evaluation test platform. The board can be used for the chip performance test validation, to modify some components of the parameters, the user can verify the circuit characteristics and parameters, to ensure the practical application of user interests.UM1661 EVB board also can demonstrate the main function of the chip, allowing users to fully experience the advantages of using the chip.

1.1 Schematic

Fig 1.1 is UM1661 EVB board design schematic (without LED load).

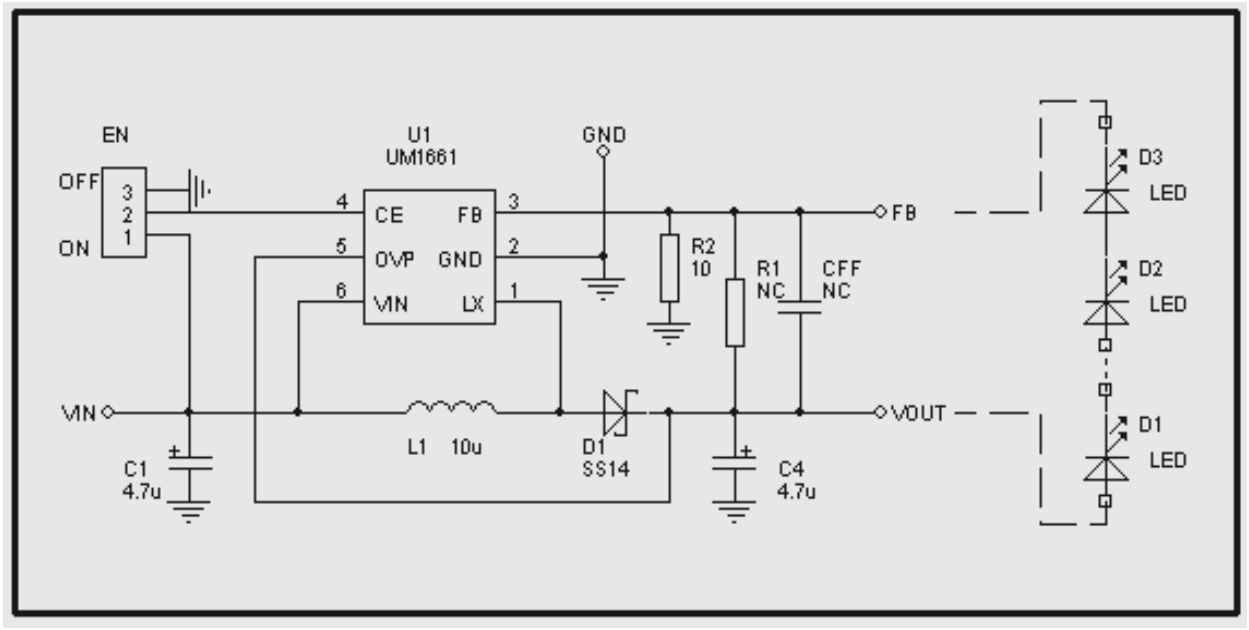

Fig 1.1 UM1661 EVB board schematic

1.2 PCB Layout

Fig 1.2, Fig 1.3 is PCB layout and components location diagram of UM1661 EVB board.

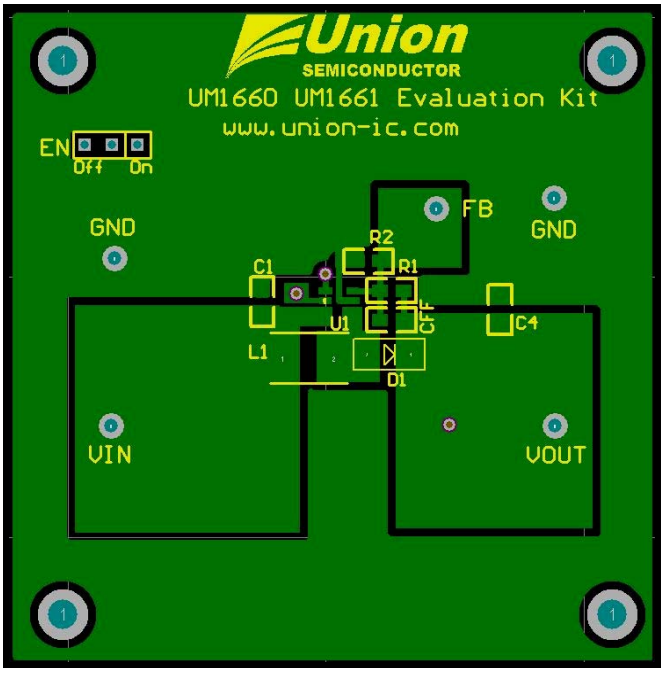

Fig 1.2 UM1661 EVB board PCB top layer

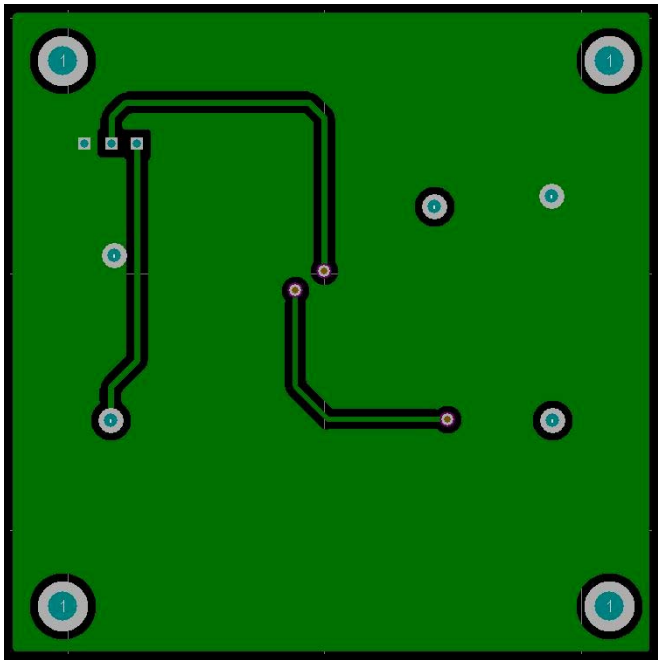

Fig 1.3 UM1661 EVB board PCB bottom layer

1.3 Interface Define

Tab 1.1 is the directions of UM1661 EVB board interface signals

Tab 1.1 UM1661 EVB board interface

Interface	Function	Note
VIN	Power supply input .	2.0V -- 6.0V power supply.
GND	Ground.	
EN	Chip enable/disable option.	EN=ON (1): enable. EN=OFF (0): disable.
VOUT	The board output.	LED drive output.
FB	The output feedback.	

2 . Board Operation

Use UM1661 EVB board, you need to properly connect an external power supply and external LED load, set EN signal. When these condition is good ,the output and LX pin have Fig 2.1 waveform diagram (VIN=3.6V, 3 pcs LED load).Fig 2.2 is current waveform diagram in inductor (voltage on 1Ohm).

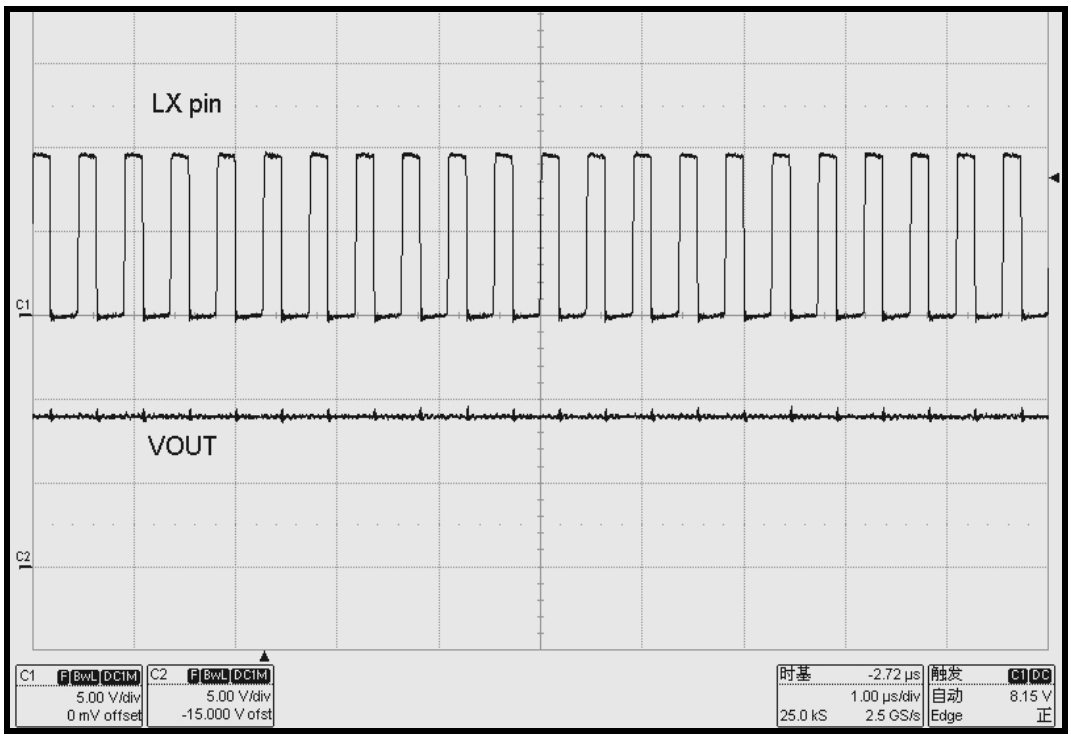

Fig 2.1 Output waveform diagram (Vin=3.6V, 3 pcs LED load)

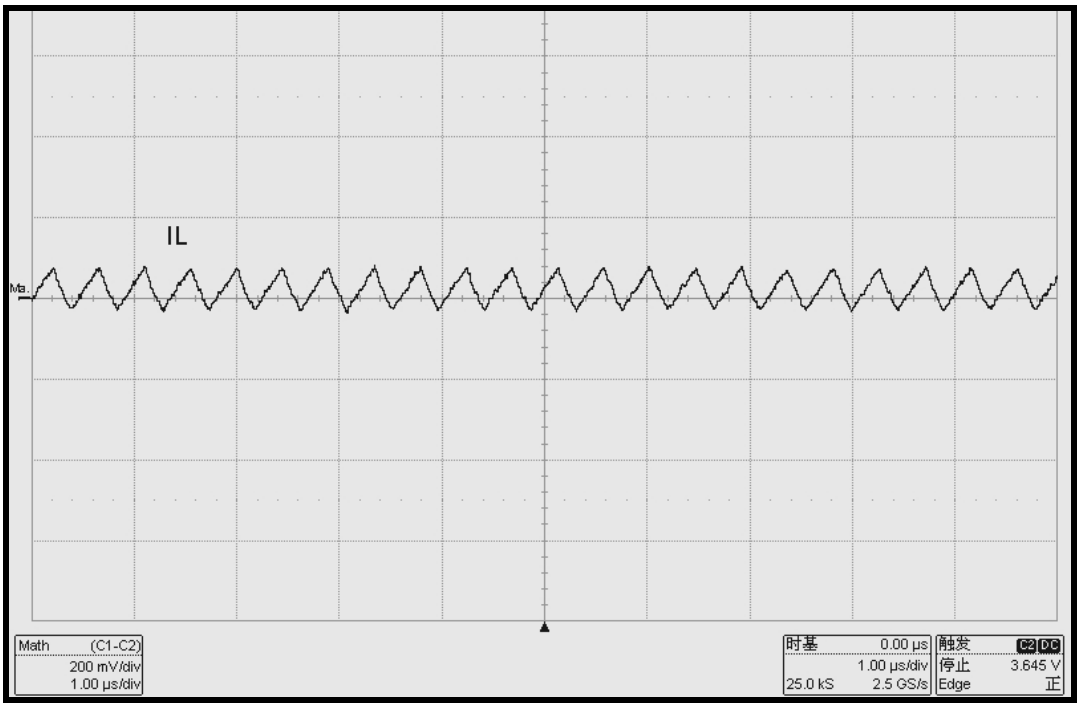

Fig 2.2 Inductor current waveform diagram

2.1 Power Supply

UM1661 EVB board's input supply voltage VIN range: 2.0V - 6.0V, can use the power supply or Li battery and so on.

Power supply when using, you need to confirm there is sufficient margin with the current limit set. Input power cable should be thicker to reduce the loss of input voltage when the load current is larger.

2.2 Enable

EN signal should be set to ON, UM1661 EVB board is in normal working condition.

2.3 LED Load

LED load can use white LED. If using the other type LED, some circuit parameters need to re-calculate.

UM1661 EVB board to set the drive current of 20mA, can drive a string or two strings LED load. Driving more LED strings, need to adjust the resistance value of R2, improving LED brightness.

The EVB board can drive following LED load if no change R2.

- 1 string white LED: (1 x 3) pcs to (1 x 7) pcs
- 2 strings white LED: (2 x 3) pcs to (2 x 7) pcs

3. Board Component

Tab 3.1 is the BOM list of UM1661 EVB board.

Tab 3.1 UM1661 EVB board BOM list

Reference	Description	Part No.
U1	LED Driver Chip.	UM1661
C1	Capacitor,4.7uF,10V,Ceramic,0805.	
C4	Capacitor,4.7uF,50V,Ceramic,0805.	
L1	Inductor,10uH,500mA,SMT.	
D1	Schottky diode,SS14,SMT.	SS14
R2	Resistor,10Ohm,0603.	
R1,CFF	(No used.)	
EN	Option jumper	

3.1 Capacitor

The input current is discontinuous during UM1661 switching on-off, and therefore an input capacitor is necessary to ensure the VIN does not drop excessively. The recommended input capacitance is 2.2uF to 22uF depending on the application. The EVB board use a 4.7uF capacitor.

A low ESR capacitor is required to reduce the noise and increase stability. The surface mount multilayer ceramic capacitors (MLCC) have very low ESR and are strongly recommended to use .The X5R, X7R type MLCC are good choices for input capacitors, the tantalum and low-ESR electrolytic capacitors may also suffice.

The output capacitor is required to maintain output voltage low ripple. The recommended output capacitor is 4.7uF minimum.

The ESR characteristics of the output capacitor also affect the stability of system, and a low ESR capacitor is necessary. Like input capacitor, recommended to use the X5R, X7R type MLCC for output capacitor. For the tantalum and electrolytic type, the ESR need less than 50mOhm.

When a string load have a lot of LED light, the output voltage is higher, and the output capacitor operating voltage require to double check for MLCC type.

3.2 Inductor

The inductor maintain a continuous current to the output load. The inductor value determines the input ripple. The value increase will decrease the input ripple current.

The recommended inductor vale is 10uH, suit to the load current less than 200mA.If the load current is increase, the value should be decreased.
When selecting an inductor, make sure that it is capable of supporting the peak input current without saturating. Inductor staturation will result in a sudden reduction in inductance and prevent the regulator from operating correctly. The inductor saturation current is recommended 1.3 to 1.5 time of the peak input current.

3.3 Schottky Diode

During the switch off, the schottky diode conducts current.
The schottky diode reverse voltage require greater than maximum VOUT. The recommended reverse voltage is 1.2 to 1.5 time of the maximum VOUT. The schottky diode peak forward current require greater than maximum output current. The recommended value is 1.5 time of the peak output current.
In the demo board, SS14, RB551, MBR0530 can be use.

3.4 Sampling Resistor

When UM1661 is running normally, the feed back voltage FB is feeded back to inside for LED constant current control. The feed back voltage is 200mV.
The LED load current Iout is determined by the sampling resistor R2's value. When LED current is given, the resistor R2's value is:

$$R2\ (Ohm) = 200\ (mV) / Iout\ (mA).$$

In the EVB board,R2's value is 10 Ohm, the LED load current is 20mA.

4. Circuit Protect

4.1 Over Voltage Protect

When the output voltage exceeds 24V,OVP feedback signal make the chip into the protected status with the output off.
If you do not use the OPV protection, output voltage can exceed 24V. In general, the maximum should be used to about 30V, driving a string LED load with 9 to 10 pcs LED. In this application, It will lead to the risk of damage of the chip when there is no OVP protection

4.2 Over Current Protect

OCP can effectively protect the on-chip MOS unit, output will be closed when LED load current is too large. For the high current caused by output short, OCP have no the function of protecting.

5. Other Application

5.1 Muti-string LED Application

Fig 5.1 is the application circuit of UM1661 EVB board diving multi-string LED load.

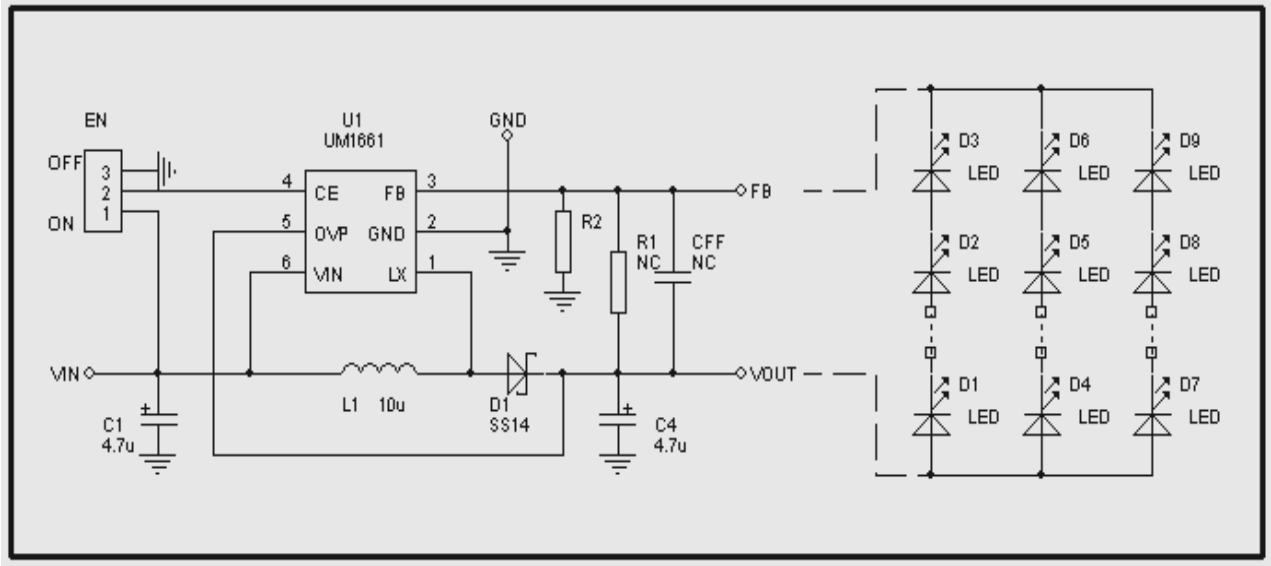

Fig 5.1 UM1661 EVB board driver multi-string LED

In this application, the relationship between single-string LED current lout1 and the resistance value of R2:

$$R2\ (Ohm) = 200\ (mV) / (n * Iout1\ (mA)).$$

Where, n is the number of LED load string.

5.21 Dimming Control Application

Please find the LED dimming control information in UM1661 datasheet R01.