TLD5190IVREG-EVAL evaluation board

User Manual

About this document

Product description

- TLD5190: H-Bridge DC-DC controller designed for automotive applications
- Constant current (LED) and constant voltage regulation
- High power, high efficiency buck-boost architecture
- EMC optimized device: Spread spectrum

Scope and purpose

Scope of this user manual is to provide to the audience instructions on usage of the TLD5190QV device evaluation board TLD5190IVREG-EVAL schematic version S01 PCB version P01.

The TLD5190IVREG-EVAL is an evaluation platform for the TLD5190QV, which can work as buck-boost LED driver, or as a voltage regulator.

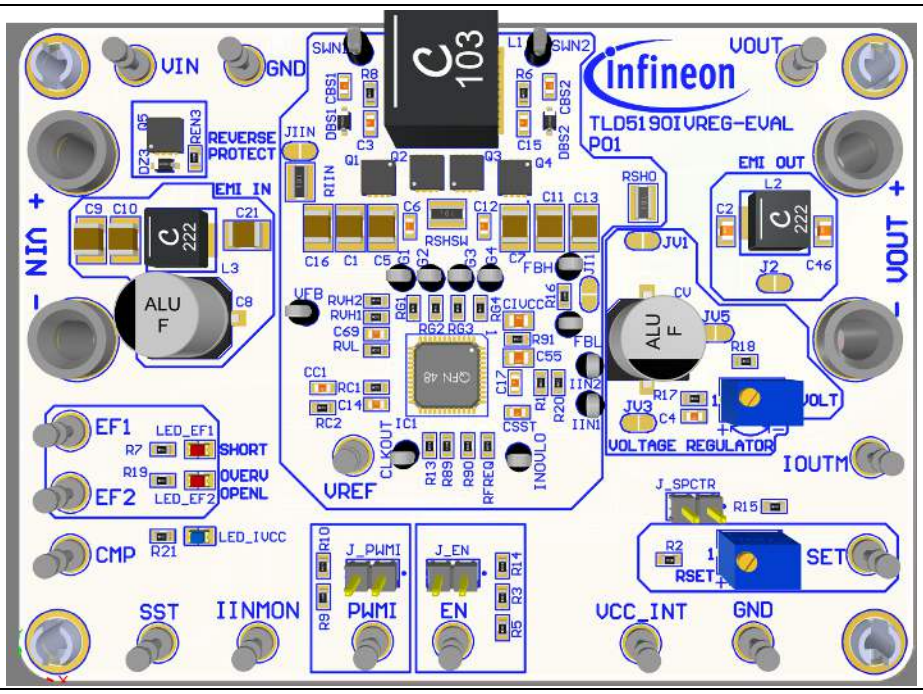

Figure 1 TLD5190IVREG-EVAL device evaluation board

Intended audience

Hardware engineers, software engineers, system architects

1 Table of contents

2 Description

The H-Bridge architecture is among the most efficient buck-boost topologies for high current applications. The TLD5190 provides digital and analog dimming control and 2 flags for diagnostic.

The TLD5190IVREG-EVAL is an evaluation platform for the TLD5190QV as LED driver or voltage regulator.

The default configuration is constant current LED driver with 1.5 A maximum output current. The output current can be increased up to 6 A by changing RSHO. If higher currents are needed, the output filter has to be bypassed.

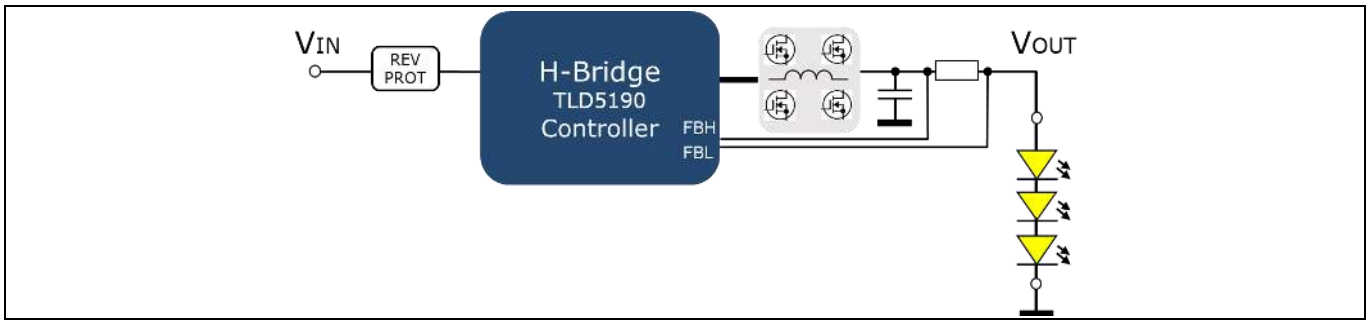

Figure 2 TLD5190QV as LED driver

By reconfiguring a few solder jumps, the board becomes a powerful voltage regulator.

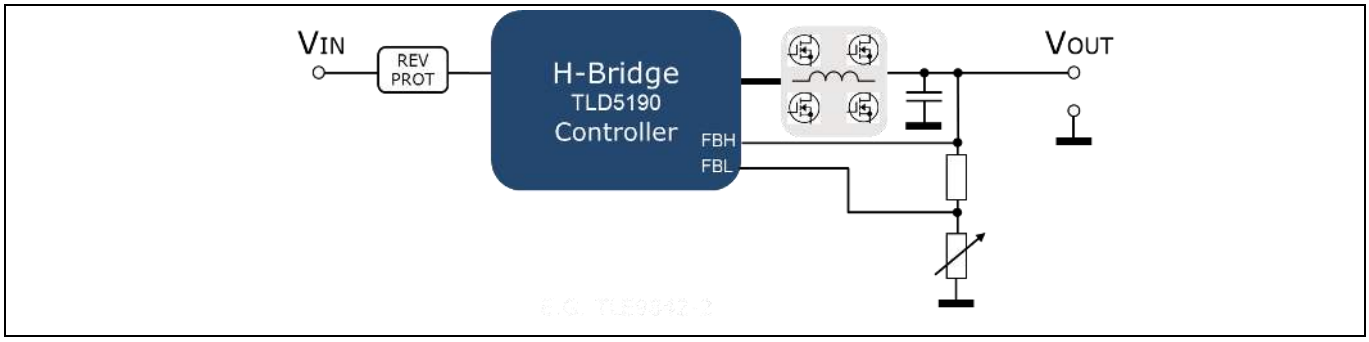

Figure 3 TLD5190QV as voltage regulator

On the board, in addition to the TLD5190QV device the following are present:

- Trimmer to adjust output voltage when set as voltage regulator
- Trimmer to adjust output current
- Two LEDs showing TLD5190QV faults status (EF1, EF2)

3 Quick start procedure

Below, step-by-step procedures are laid out for setup and running the TLD5190IVREG-EVAL in all available configurations.

3.1 Setup as LED driver

1. Configure solder jumper for LED driver configuration: Figure 4
2. J_EN (Enable) and J_PWMI jumpers

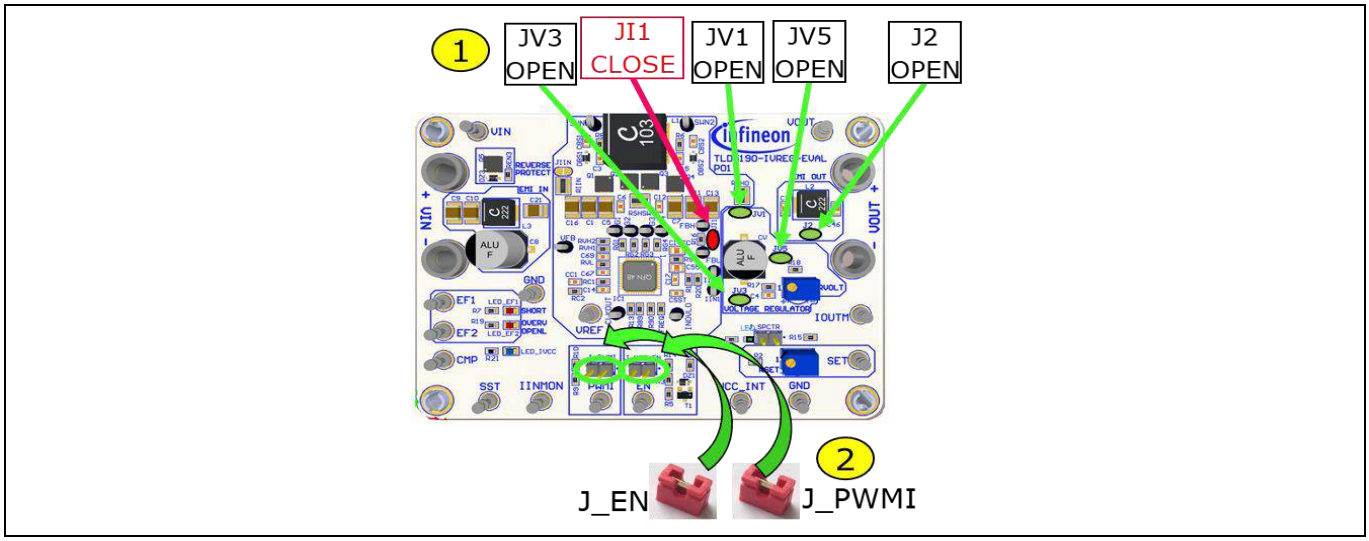

Figure 4 Connect loads and set jumpers

3. Connect the LED load
4. Connect a 12 V power supply to the V_{IN} connector → the blue LED should turn on indicating I_{VCC} present
5. Adjust I_{OUT} with RSET (>150 mA suggested for better accuracy and transient response)

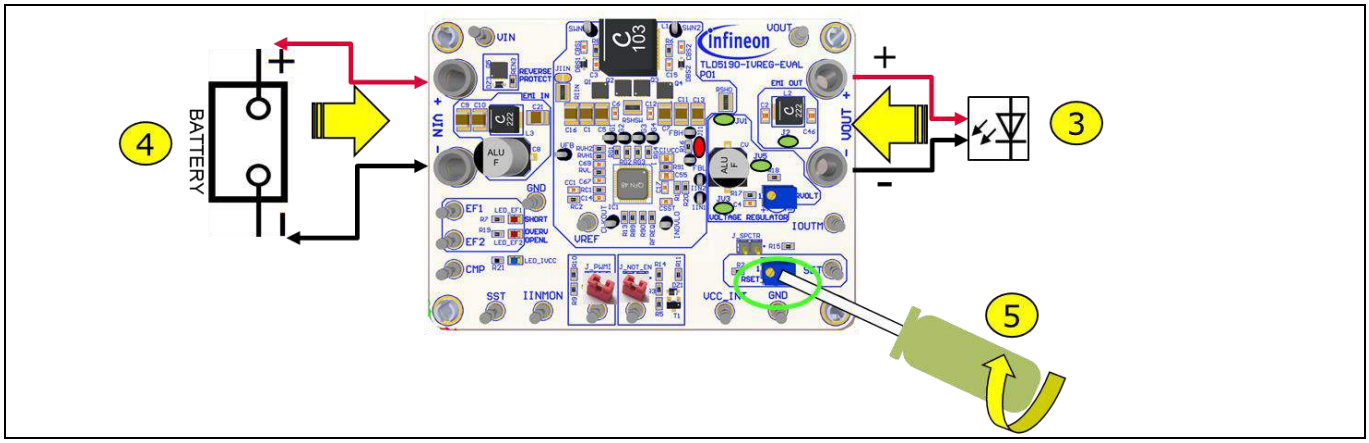

Figure 5 Connect power supply and adjust LED current

3.2 Set up as voltage regulator

1. Configure solder jumper for VREG (Figure 6), if I_{OUT} > 3 A bypass RSHO with a solder joint on the resistor top
2. Connect J_EN and PWMI jumpers

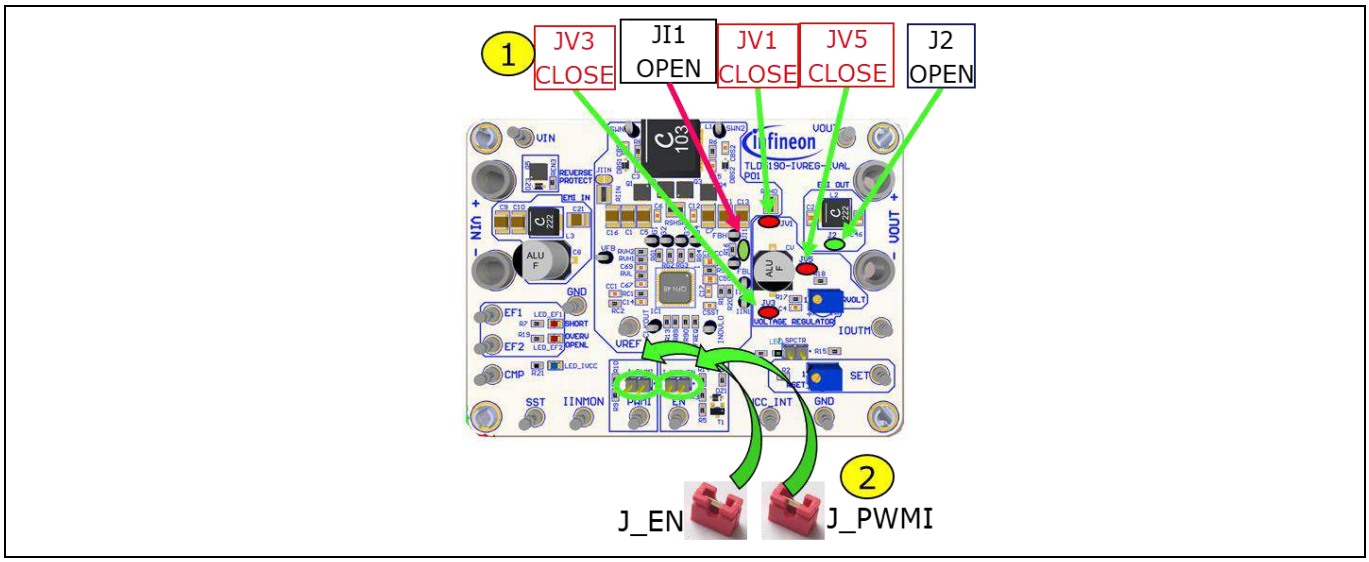

Figure 6 Voltage regulator: set EN jumpers, populate solder jumps

3. Connect a 12 V power supply to the V_{IN} connector
4. Rotate RSET trimmer fully clockwise (100% analog dimming, improves transient response and accuracy)

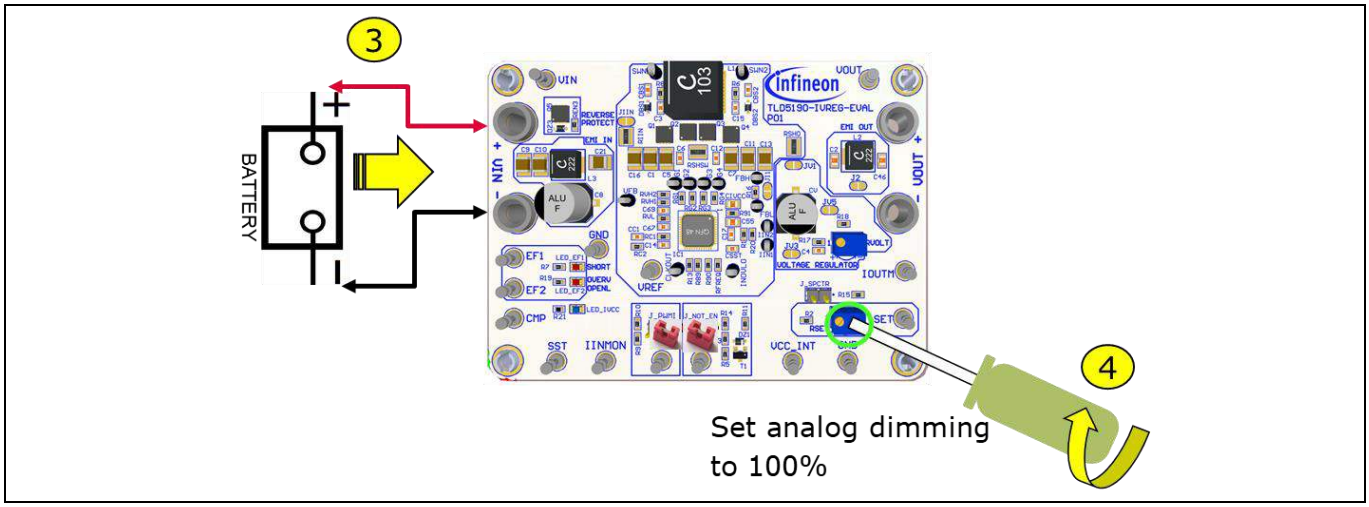

Figure 7 Voltage regulator: connect power supply

5. Rotate RVOLT trimmer to obtain the desired V_{OUT}

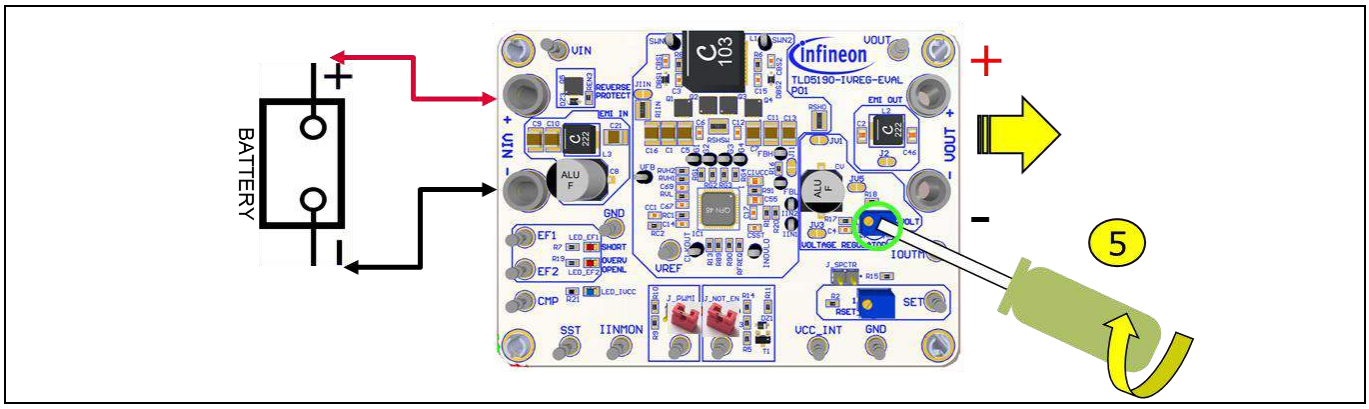

Figure 8 Adjust V_{OUT} using RVOLT

6. Connect the load

NOTE:
It is possible to adjust output voltage from 0 to full scale (previously set by RVOLT) by rotating RSET, but the best transient response is obtained when analog dimming is set to 100%.

4 Operating range and power derating

The TLD5190IVREG-EVAL has very high efficiency, so it can deliver up to 60 W at the output without a heat sink at T_A = 25°C, V_{IN} = 12 V (see Figure 10 for power-derating curve).

Please note that the module does not implement thermal protection, so ensure proper cooling when output power exceeds the power-derating curve. The heat sink has to be positioned below the switching MOSFETs as shown in Figure 9.

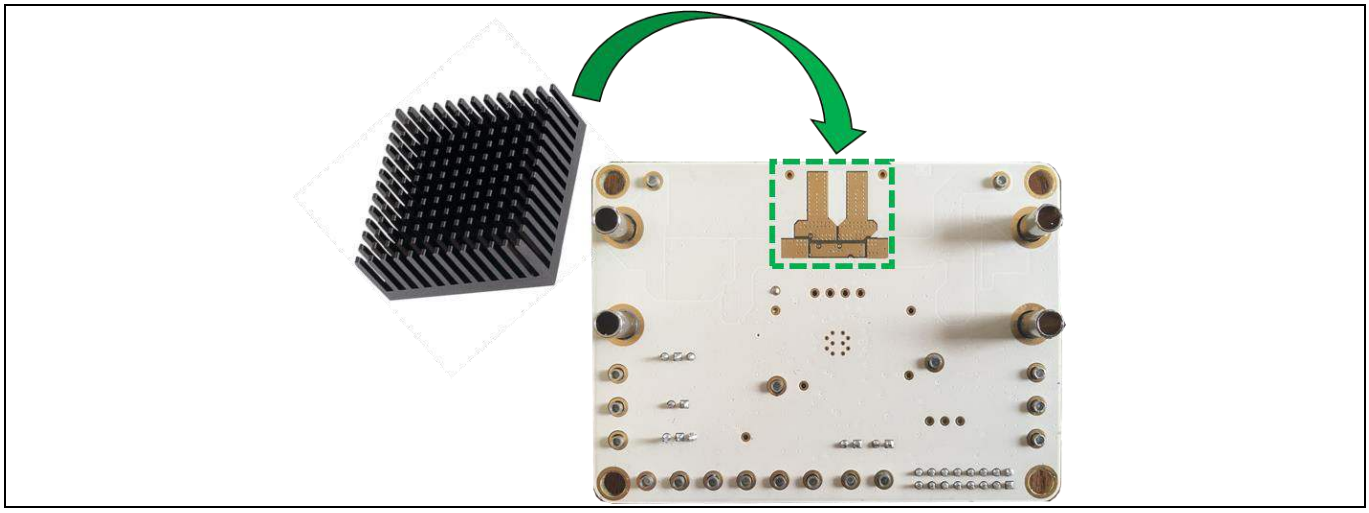

Figure 9 Heat sink placement (optional for Pout exceeding power derating curve)

The heat sink shall be electrically insulated from the PCB, by means of a thermal pad.

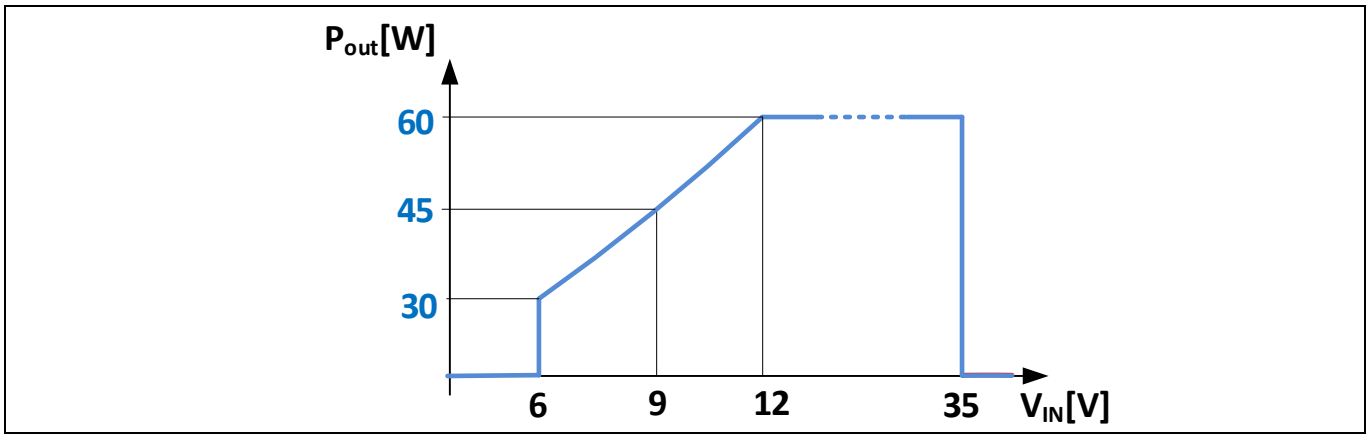

Figure 10 Output power derating curve (T_A = 25°C, JIIN closed)

NOTE:

In order to reach 60 W output power, the input current limiter RIIN shunt has to be bypassed by closing JIIN, otherwise the input current would be limited to 5 A by the input current limiter features.

5 Electrical characteristics

Table 1 TLD5190IVREG-EVAL version S01 P01 – electrical characteristics

Parameter	Symbol	Value			Unit	Note/Test Condition
		Min.	Typ.	Max.		
Input voltage	V_{IN}	5.5	-	35	V	Power derating may occur for V_{IN} < 12 V
Out voltage	V_{OUT}	5.5 5.5	–	41,8 22.5	V	LED driver mode Voltage mode
Output current	I_{OUT}	150 0	– –	1500 6	mA A	LED driver mode (up to 6 A by changing RSHO) Voltage mode
Output power	P_{OUT}	–	–	60 50	W W	V_{IN} 12 V to 35 V, T_A = 25°C JIIN closed JIIN open (input current limiter ON) see Figure 10 for power derating curve
Switching frequency	Switching frequency	–	385	–	kHz	Spread spectrum deviation is present
PWM frequency	PWM_{freq}	100	–	500	Hz	
System efficiency	Eff	–	95	–	%	Measured in voltage mode V_{IN} = 12 V, V_{OUT} = 15 V, I_{OUT} = 3 A

6 PCB layout

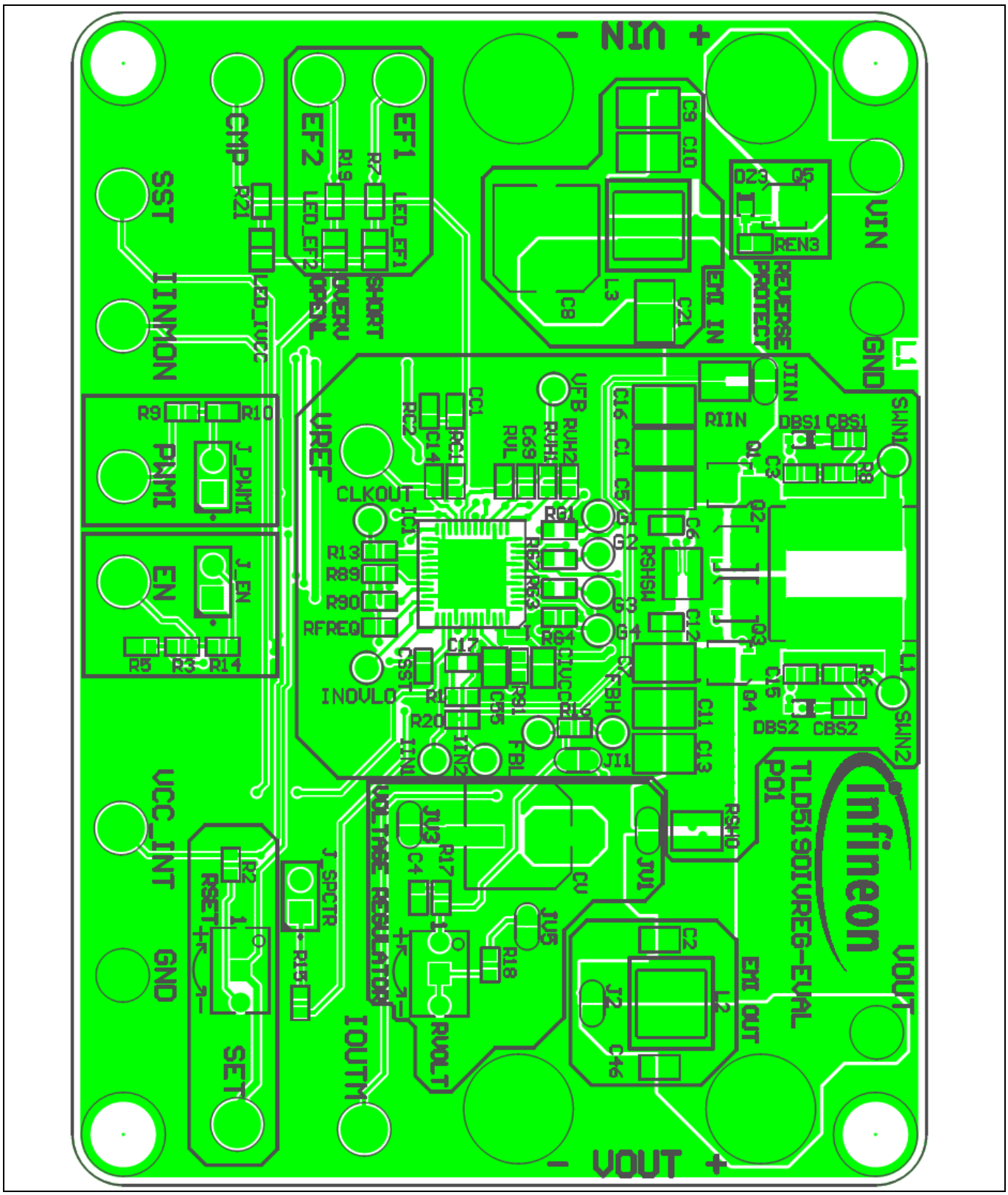

Figure 11 PCB layout top view

7 Schematic

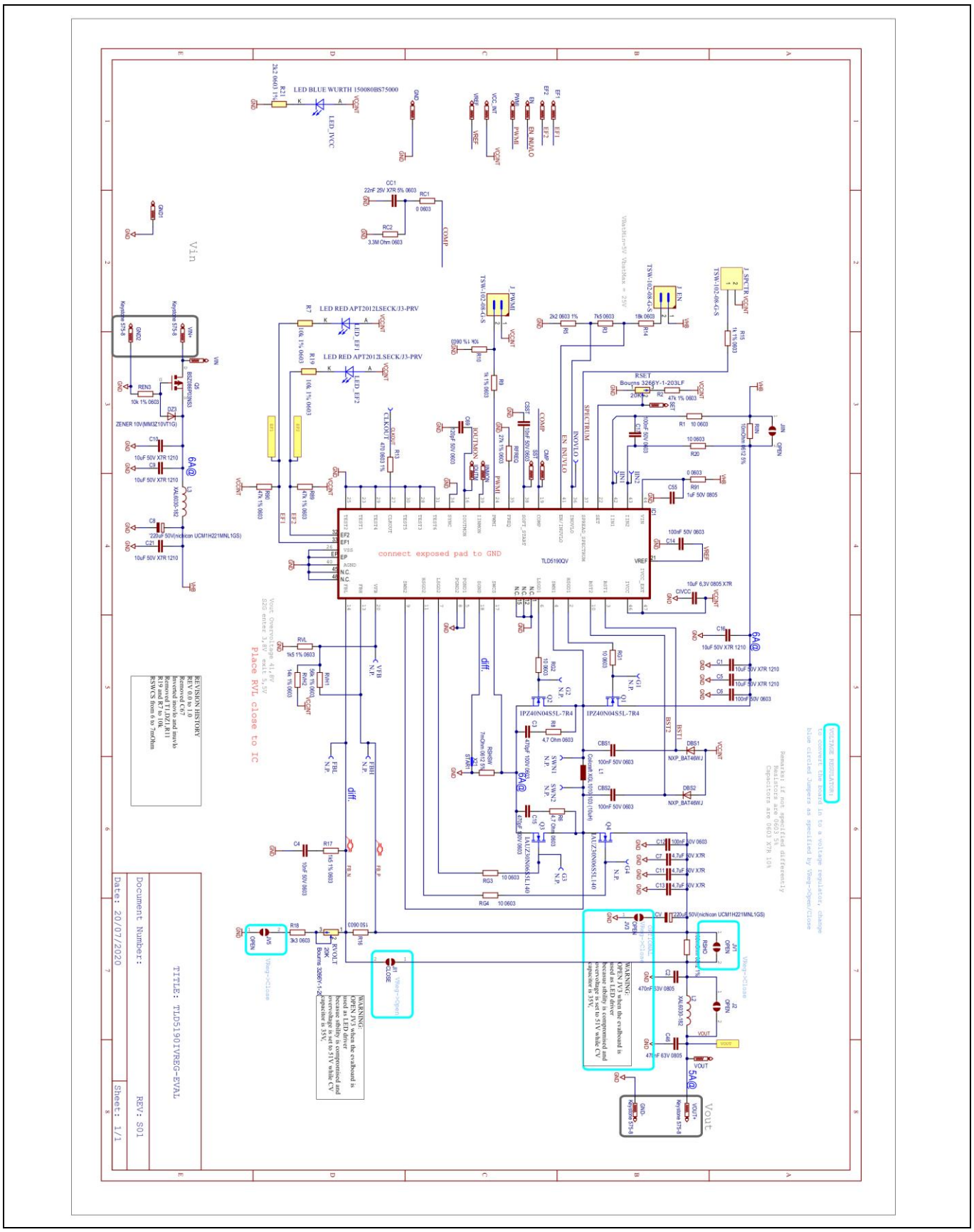

Figure 12 Schematic

Revision history

Document version	Date of release	Description of changes
Rev. 1.00	2020-07-22	Initial User Manual

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