TLD5190 VOLT DEMO evaluation board

User Manual

About this document

Product description

TLD5190: H-Bridge buck-boost DC-DC controller designed for high power, high efficiency automotive applications

- Constant current (LED driver) and constant voltage regulation
- EMC optimized device: Spread spectrum

Scope and purpose

Scope of this user manual is to provide to the audience instructions on usage of the TLD5190 VOLT DEMO evaluation board schematic version V3.1, PCB version R2.

The TLD5190 VOLT DEMO is an evaluation platform for the TLD5190 set as compact voltage regulator.

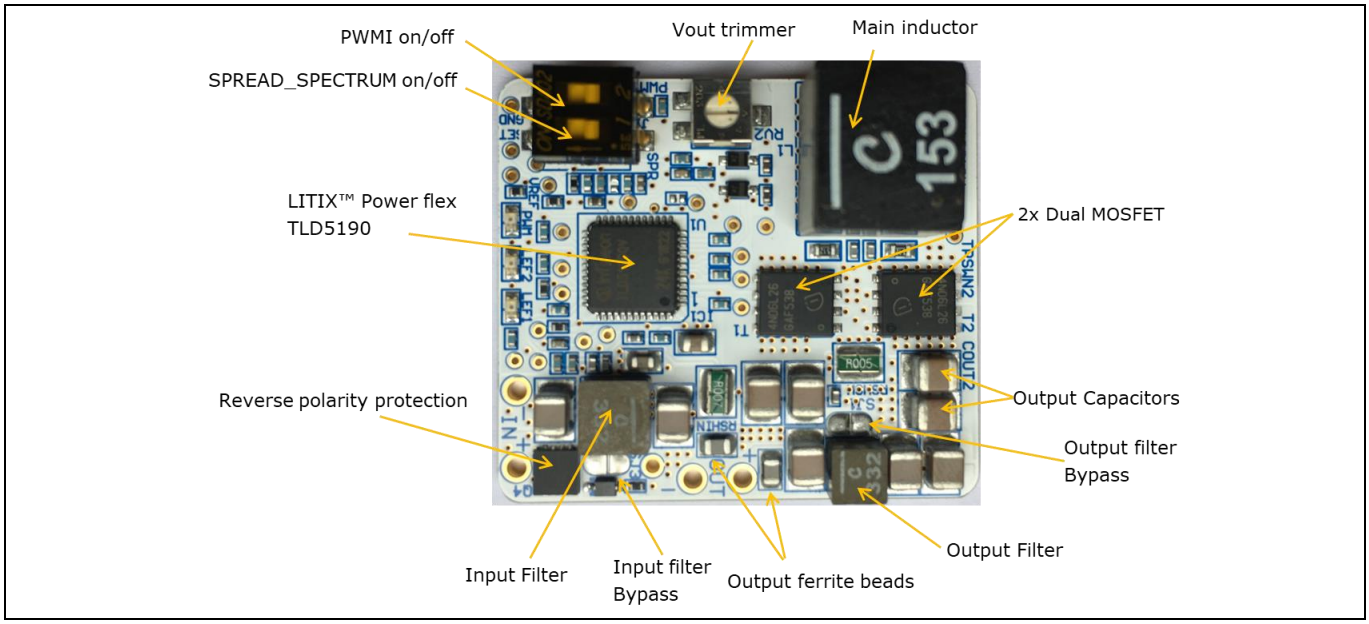

Figure 1 TLD5190 VOLT DEMO evaluation board

Intended audience

Hardware 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 can be configured as voltage regulator or LED driver.

The TLD5190 VOLT DEMO is an evaluation platform for the TLD5190 as voltage regulator. The PCB is extremely compact and can fit in to small applications enclosures for fast prototyping.

Note: *The board has been designed as voltage pre-regulator for rear lighting applications, so it will startup correctly only with output current > 100 mA. In case of startup with no load the soft-start capacitor has to be dimensioned accordingly with the application conditions (input and output voltage).*

The soft start enables DCM (Discontinuous Conduction Mode), this may prevent exact regulation at startup with no load. In case of startup without load the output voltage may rise above the target and the Comp capacitor to be discharged. After the soft start expires, the TLD5190 applies CCM, and the output voltage would be discharged producing a short circuit detection.

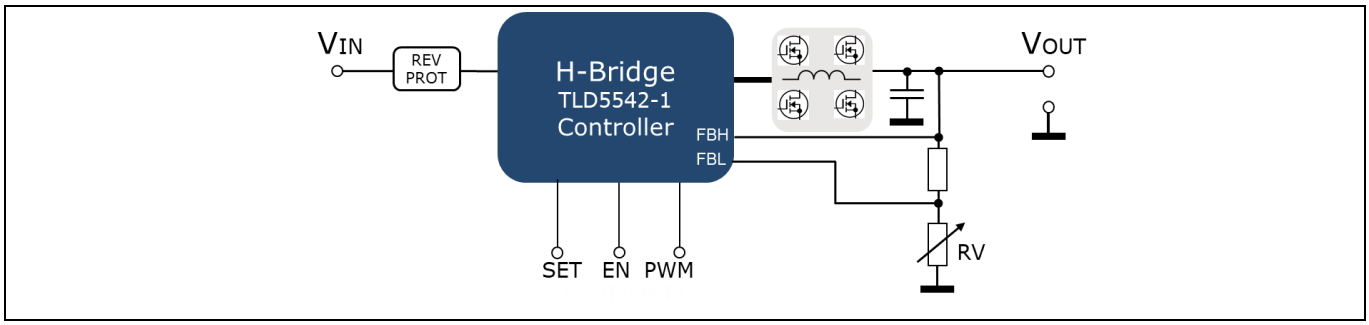

Figure 2 TLD5190 as voltage regulator

On the board, in addition there are 3 LEDs to indicate PWMI and error flags status, and 2 switches to activate spread spectrum and PWMI.

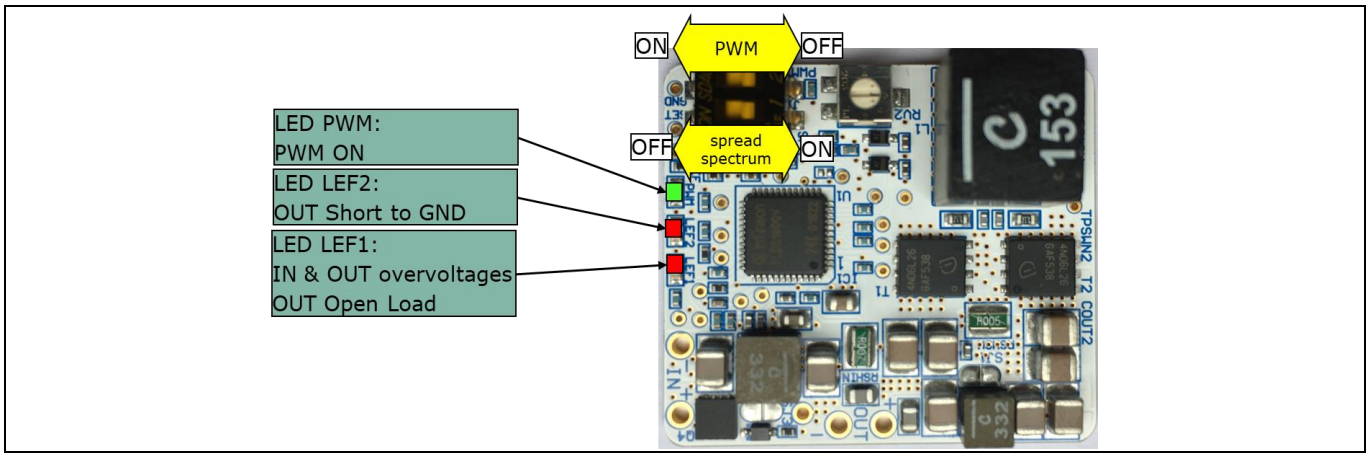

Figure 3 TLD5190 VOLT DEMO LEDs signals

3 Quick start procedure

Below, step by step procedures are laid out for setup and running the TLD5190 VOLT DEMO.

1. Connect a dummy load at the OUT terminals which could withstand the Max V_{OUT}
   a. Example: 10W 47 Ω resistor
2. Connect the power supply at the IN terminals

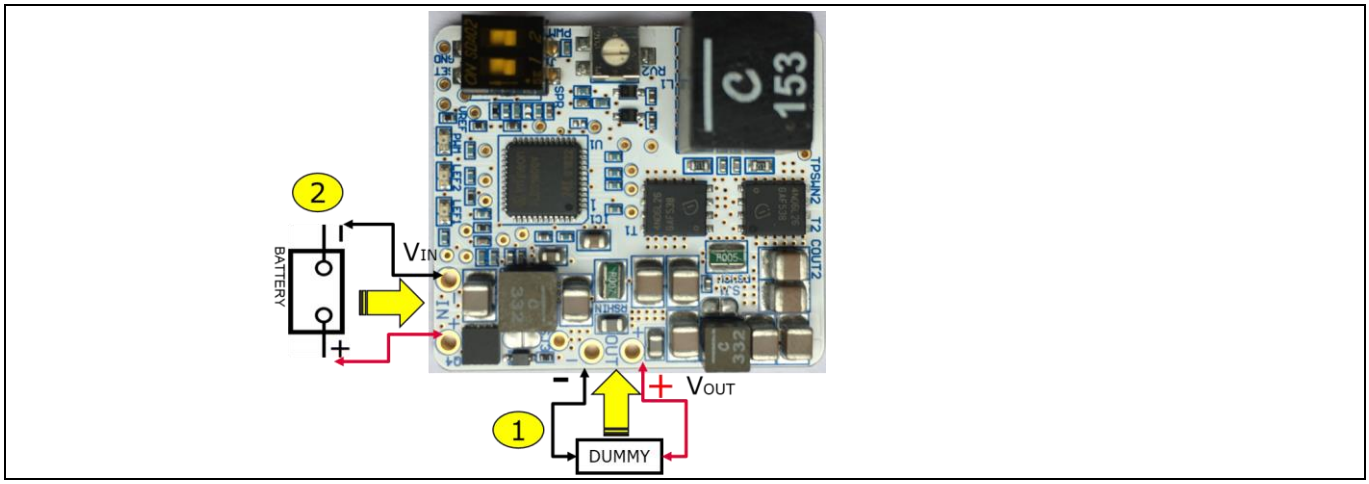

Figure 4 Connect the load and the power supply

3. Set J1-PWMI DIP switch to ON → the green PWMI LED should light up
4. Set the output voltage to the desired value by rotating RV2

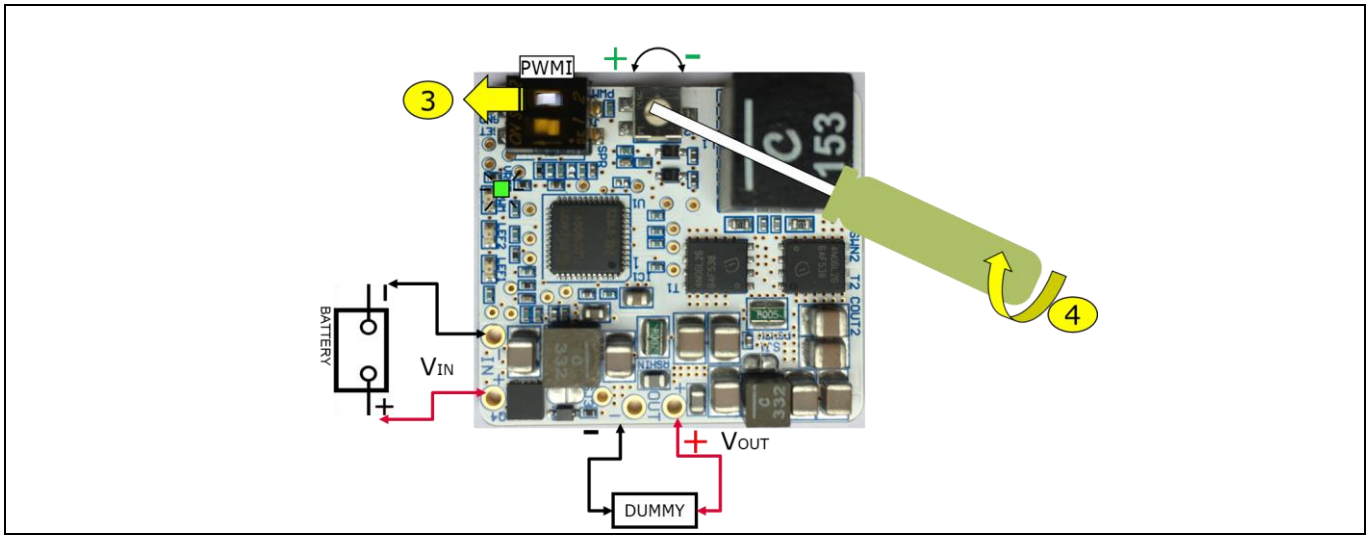

Figure 5 Set PWMI to ON and trim V_{OUT} to the desired value

5. Now that V_{OUT} has been trimmed to the right value, connect the real load at the OUT terminals

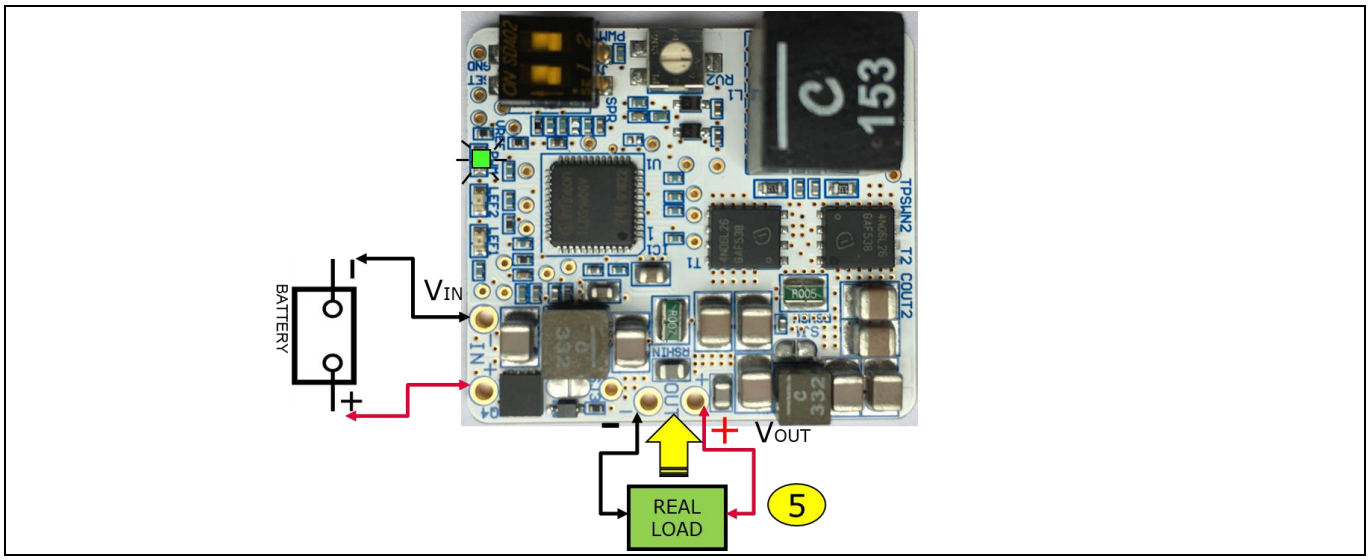

Figure 6 Connect the real load

4 Operating range and power derating

The TLD5190 VOLT DEMO has very high efficiency, so it can deliver up to 40 W at the output without a heat sink at T_A = 25°C, V_{IN} = 12 V I_{OUT} < *3 A* (see Figure 7 for power-derating curve).

Note: *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.*

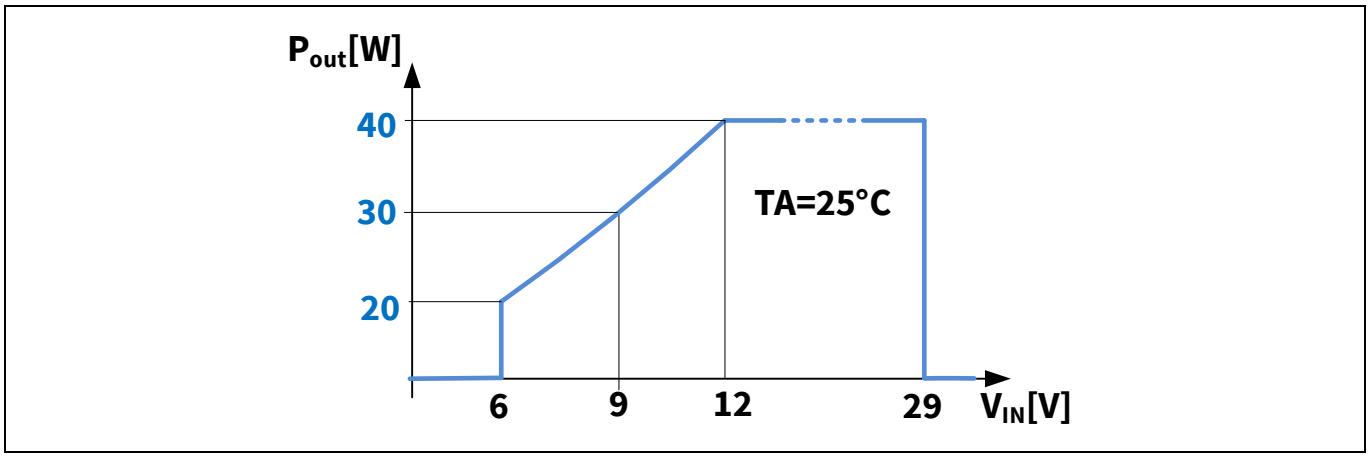

Figure 7 Output power derating curve (T_A = 25°C, I_{OUT} < *3 A*)

5 Electrical characteristics

Table 1 TLD5190 VOLT DEMO schematic version V3.1 – Electrical characteristics

Parameter	Symbol	Value			Unit	Note/Test Condition
		Min.	Typ.	Max.		
Input voltage	V_{IN}	5	–	29	V	–
Output voltage	V_{OUT}	3	–	21	V	RV2 trimmer could set V_{OUT} as low as 1.5 V , but short to GND would be detected
Output current	I_{OUT}	0	–	3	A	–
Input current limit	I_{IN_MAX}	–	7	–	A	–
Output power	P_{OUT}	–	40	–	W	V_{IN} 12 V to 28 V, I_{OUT} < 3 A, T_A = 25°C see Figure 7 for power derating curve
Switching frequency	Switching frequency	–	290	–	kHz	Spread spectrum deviation is present
System efficiency	Eff	–	94	–	%	–

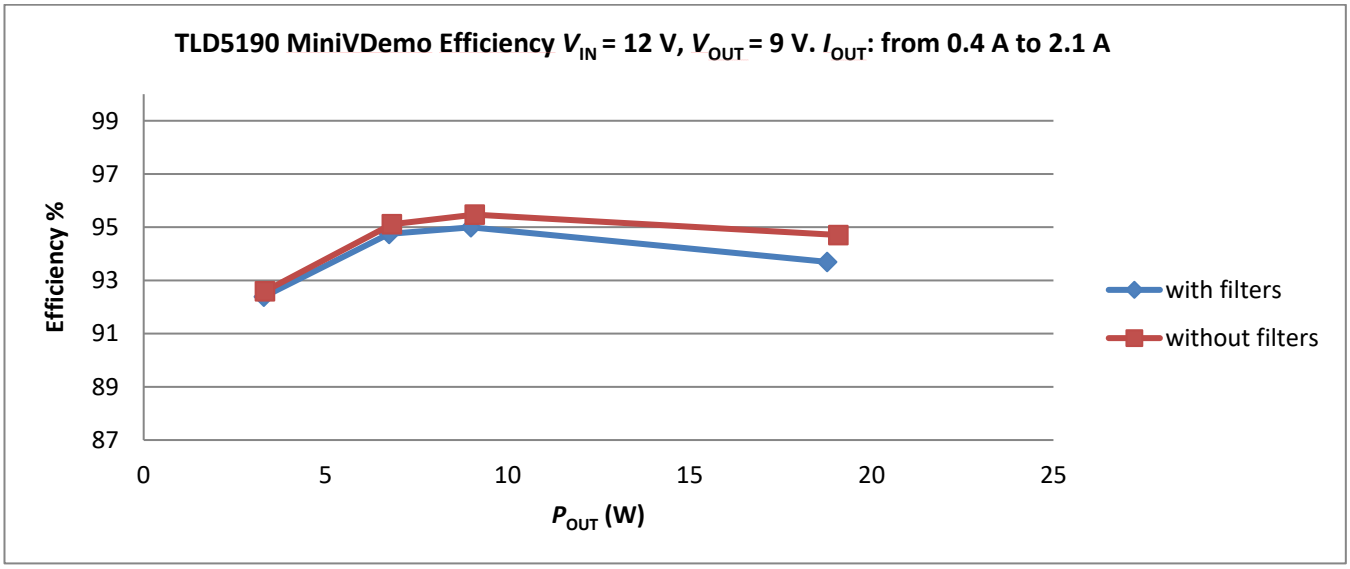

Figure 8 TLD5190 VOLT DEMO Efficiency

6 PCB - component placement

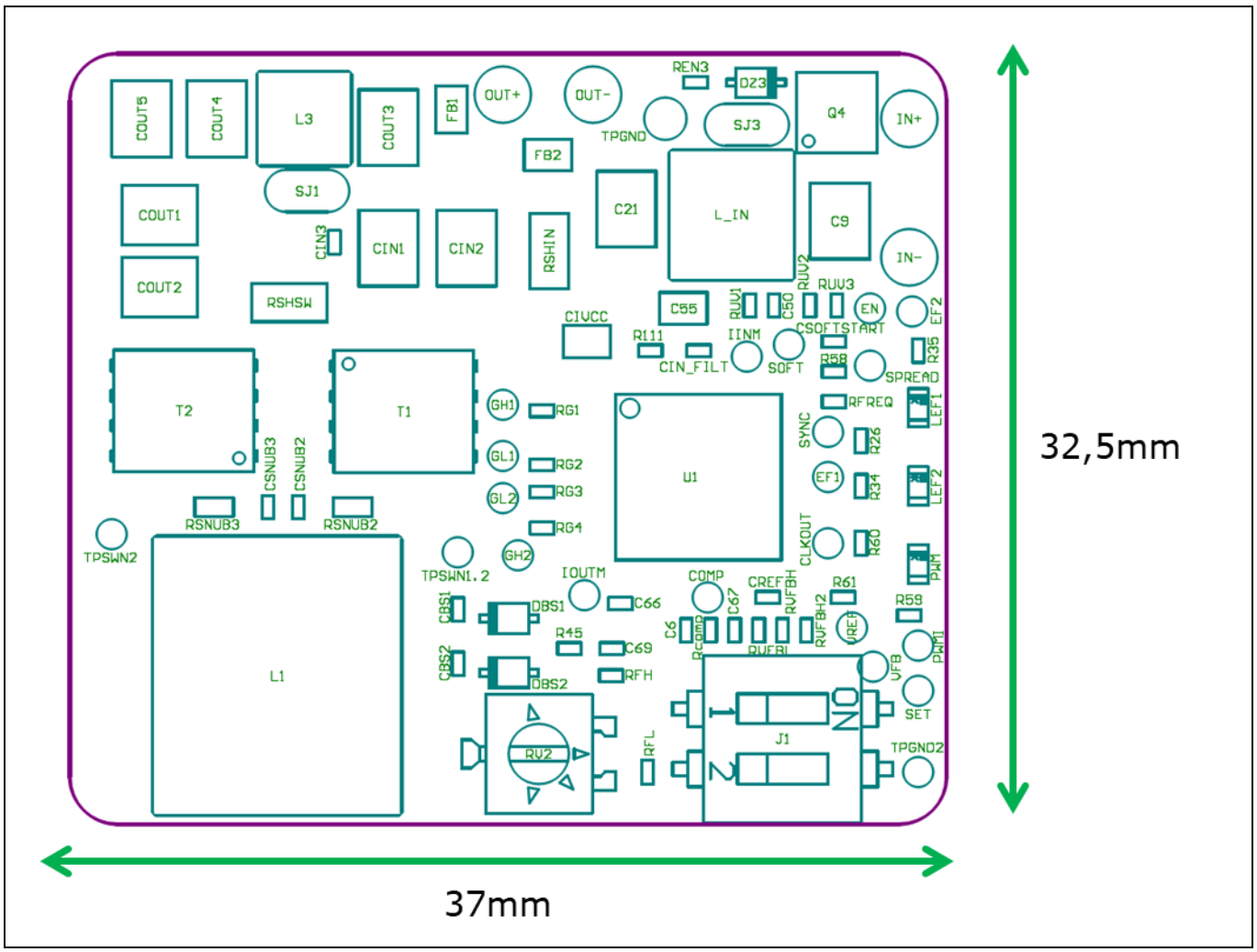

Figure 9 PCB dimensions and component placement - top view

7 Schematic

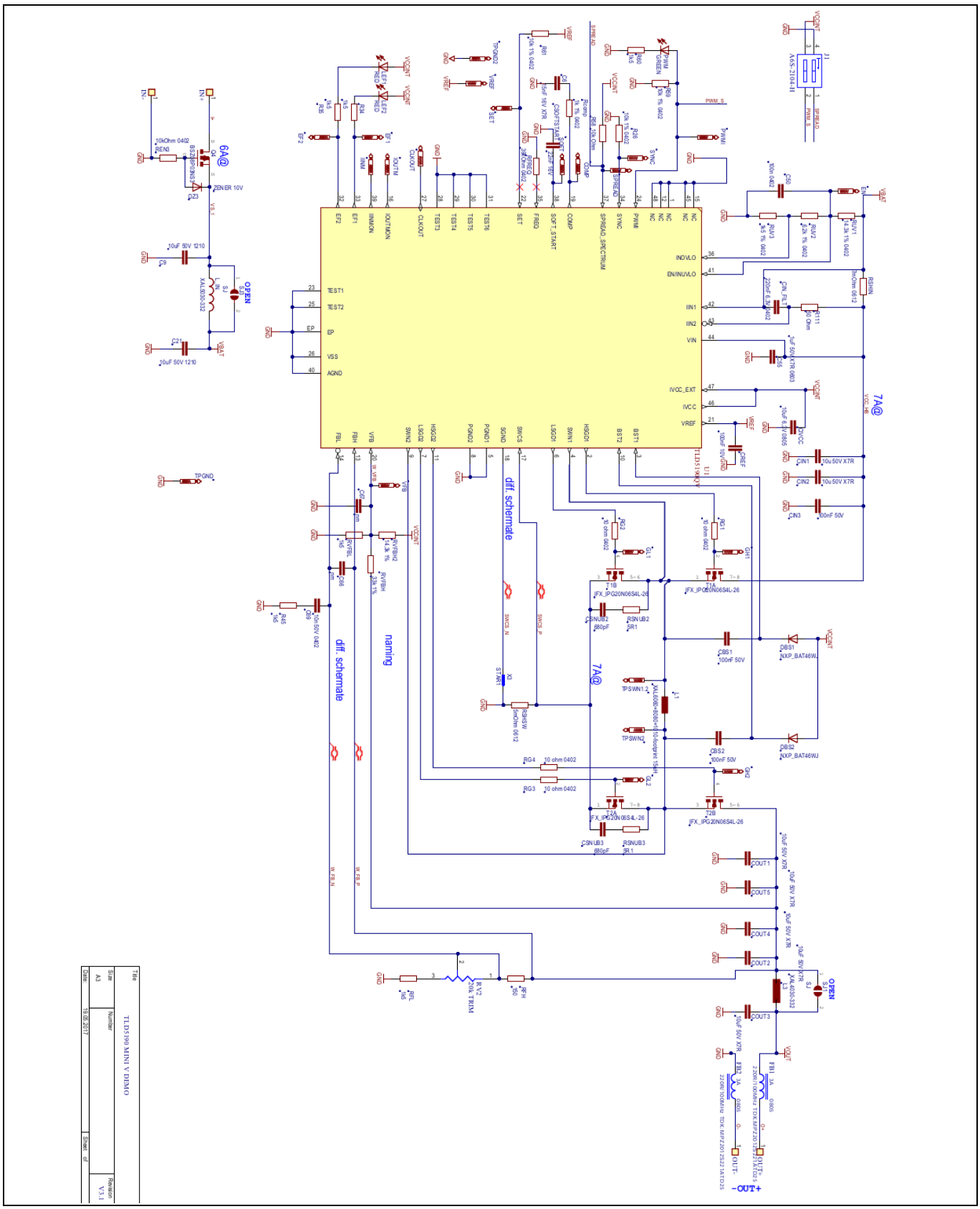

Figure 10 Schematic

8 BoM

Table 2 BoM TLD5190 microVBoard

BoM: TLD5190 - microVBoard R2 Configuration: Voltage mode		
Designator	**Comment**	**Footprint**
C6	15nF 16V X7R	C0402
C9,C21,CIN1,CIN2,COUT1,COUT2,COUT3,COUT4,COUT5	10uF 50V 1210	C1210
C50	100n 0402	C0402
C55	1uF 50V X7R 0603	C0805
C66	nm	C0402
C67	nm	C0402
C69	10n 50V 0402	C0402
CBS1,CBS2,CIN3,CREF	100nF 50V	C0402
CIN_FILT	220nF 6.3V 0402	C0402
CIVCC	10uF 6.3V 0805	C0805
CSNUB2,CSNUB3	680pF	C0402
CSOFTSTART	22nF 16V	C0402
DBS1,DBS2	NXP_BAT46WJ	SOD323F
DZ3	ZENER 10V	SOD323
FB1, FB2	IND 220R/100MHz	IND SMD 0805
J1	A6S-2104-H	DIP SW 2 SMD SDA02H0SB
L1	XAL1010-153	IND SMD XAL1010+XAL8080
L3	XAL4030-332	IND SMD XAL4030
LEF1,LEF2	RED LED	LED 0603 RED
L_IN	XAL5030-332	IND SMD XAL5030
PWM	GREEN LED	LED 0603 GREEN
Q4	BSZ08P03NS3	PG-TSDSON-8 SGD
R26	10k 1% 0402	R0402
R34,R35,R45	1k5	R0402
R58,R59,R61	10kΩ1%	R0402
R60	1k5	R0402
R111	50Ω	R0402
Rcomp	1k 1% 0402	R0402
REN3	10kΩ 0402	R0402
RFH	150	R0402
RFL	1k5	R0402
RFREQ	39kΩ 0402	R0402
RG1,RG2,RG3,RG4	10 Ω	R0402
RSHIN	7mΩ 0612	R0612
RSHSW	5mΩ 0612	R0612
RSNUB2,RSNUB3	5.1Ω	R0603
RUV1	14.3k 1% 0402	R0402
RUV2	6.2k 1% 0402	R0402
RUV3	1k5 1% 0402	R0402
RV2	20k TRIM	TRIMMER SMD 23B
RVFBH	33k 1%	R0402
RVFBH2	14.3k 1%	R0402
RVFBL	1k5	R0402
SJ1,SJ2	SOLDER JUMP	
T1,T2	IFX_IPG20N06S4L-26	PG-TDSON-8-4
U1	TLD5190QV	VQFN48 7X7 P05

Revision history

Document version	Date of release	Description of changes
Rev. 1.00	2020-06-05	Initial User Manual

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Edition 2020-06-05

Published by

Infineon Technologies AG

81726 München, Germany

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Document reference

UM **TLD5190 VOLT DEMO**

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