Boost and SEPIC evaluation kit

TLD6098-2ES

About this document

Product description

The TLD6098-2ES is a dual channel AEC qualified DC-DC boost controller, especially designed to drive LEDs. Each channel embeds:

- Built in diagnosis and protection features
- Pulse width modulator to implement a dimming function with reduced color shifting
- Coded faults to easily detect the root cause of load failures
- Voltage loop availability to implement constant output voltage power supply
- Spread spectrum modulator to improve the EMI performance

Scope and purpose

Scope of this user manual is to provide to the audience instructions on usage of TLD6098-2ES boost and SEPIC evaluation board.

Intended audience

This document is intended for engineers who need to perform measurements and check performance with TLD6098-2ES boost and SEPIC evaluation board.

Table of contents

1 Description

TLD6098-2ES Boost and SEPIC evaluation kit for high power LED application with TLD6098-2ES in boost and SEPIC topologies.

In the default configuration the board has the channel 1 in boost to ground topology and SEPIC on channel 2. Both the LED drivers are enabled without any additional features. In this configuration, the board can deliver up to 50 W (25 W per channel). Auxiliary circuits, to protect the DC-DC and the load during short to ground, are present and enabled.

Table 1 Performance summary

Parameter	Conditions	Value
Input supply voltage	Parameter degradation below 8 V	8 V to 27 V
Output current	Channel 1	0.5 A
	Channel 2	1.5 A
Overvoltage protection threshold	Channel 1	59 V
	Channel 2	44 V
Short to ground protection threshold	Channel 1	1.9 V
	Channel 2	1.26 V
Switching frequency	Spread spectrum “on”	400 kHz

- Output current on channel 1 is fixed by RFB1. Change this resistor if different output current is needed
- Overvoltage protection and the short to ground protection thresholds are defined by RIVCC1, RVFBH1 and RVFBL1
- Output current on channel 2 is fixed by RFB2. Change this resistor if different output current is needed
- Overvoltage protection and the short to ground protection thresholds are defined by RIVCC2, RVFBH2 and RVFBL2

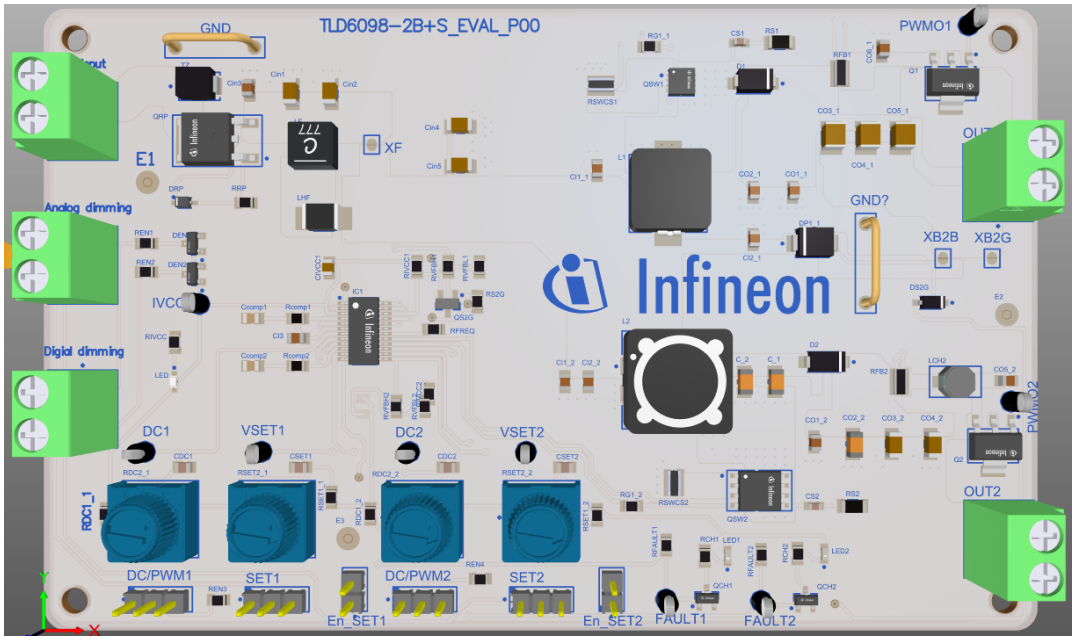

Figure 1 TLD6098 Boost and SEPIC Board

2 Quick start procedure

The default configuration of the board consists of two LED drivers
Channel 1 works in boost to ground topology
Channel 2 works in SEPIC topology
The jumpers are positioned as follows:

Table 2 Jumper position

Jumper number	Condition	Meaning
DC/PWMI1	Close 1-2	Internal biased to provide DC = 100% External dimming enabled
SET1	Close 2-3	Internal enabled (VSET = 5 V)
En SET1	Open	Output current analog adjustment disabled
DC/PWMI2	Close 1-2	Internal biased to provide DC = 100% External dimming enabled
SET2	Close 2-3	Internal enabled (VSET = 5 V)
En SET2	Open	Output current analog adjustment disabled

The default configuration is depicted below:

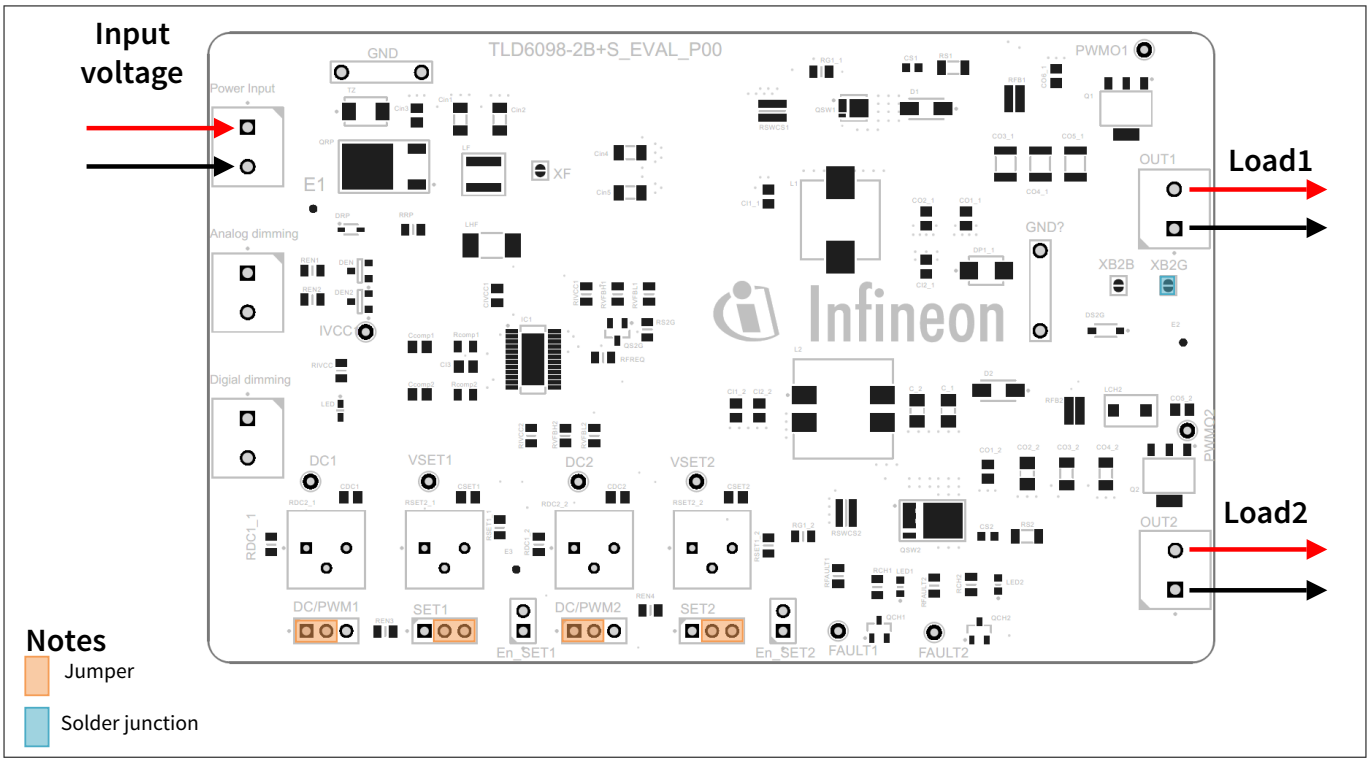

Figure 2 Default configuration of the board

3 Current adjustment

This feature can be enabled in each channel independently.
The output current adjustment is performed by programming the value of

- Trimmer RSET2_1 to adjust the channel 1
- Trimmer RSET2_2 to adjust the channel 2

The feature is enabled when the respective jumpers En_SET1 and En_SET2 are closed.
The output current can vary from 0 to 100% of the maximum output current.
Jumpers are positioned as follows:

Table 3 Jumper position

Jumper number	Condition	Meaning
DC/PWMI1	Close 1-2	Internal biased to provide DC = 100% External dimming enabled
SET1	Close 2-3	Internal enabled
En SET1	Close	Output current analog adjustment enabled
DC/PWMI2	Close 1-2	Internal biased to provide DC = 100% External dimming enabled
SET2	Close 2-3	Internal enabled
En SET2	Close	Output current analog adjustment enabled

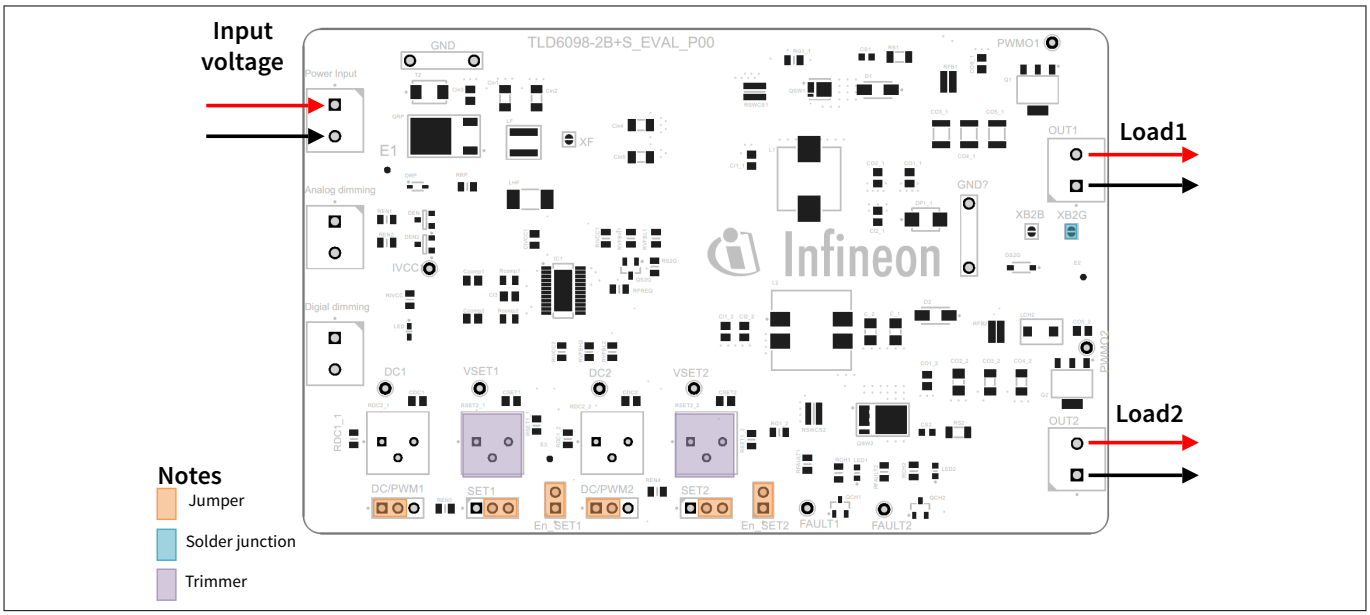

Figure 3 Current adjustment

4 Embedded PWM engine

This feature can be enabled in each channel independently.

The embedded PWM engine provides an internal PWM signal without any external dimming signal required.

To enable the feature, the respective jumpers DC/PWM1 and/or DC/PWM2 are closed in position 2-3. If jumpers are closed in position 1-2, a 100% DC is provided at output.

RDC2_1 and RDC2_2 trimmers adjust the dimming duty cycle by changing the voltage on the respective DC/PWMI pin.

The PWM dimming frequency is set to 410 Hz. If another PWM frequency is needed, the respective RPWM1 and/or RPWM2 must be changed to a proper value (please refer to the TLD6098-2ES datasheets for more information).

Jumpers are positioned as follows:

Table 4 Jumper position

Jumper number	Condition	Meaning
DC/PWMI1	Close 2-3	Internal biased
SET1	Close 2-3	Internal enabled (VSET = 5 V)
En SET1	Open	Output current analog adjustment disabled
DC/PWMI2	Close 2-3	Internal biased
SET2	Close 2-3	Internal enabled (VSET = 5 V)
En SET2	Open	Output current analog adjustment disabled

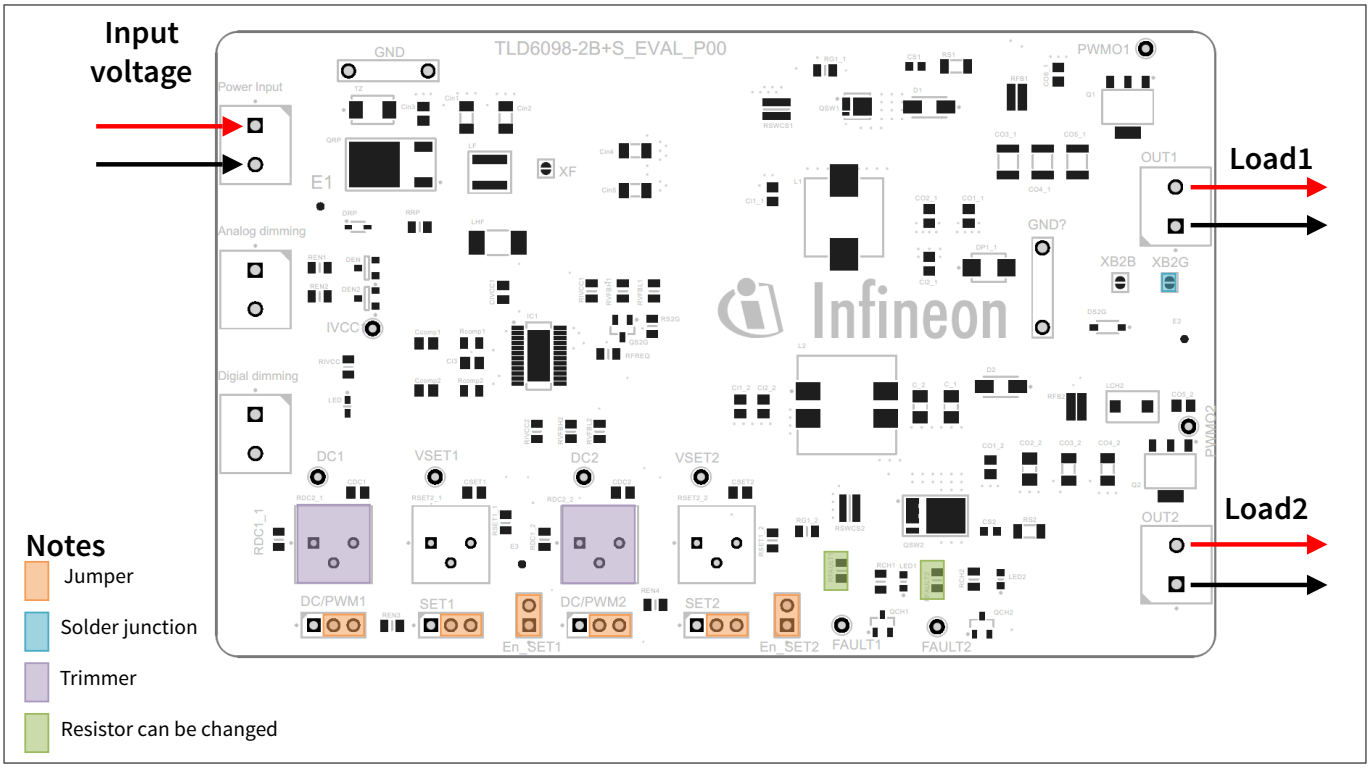

Figure 4 Embedded PWM engine

5 External dimming and output adjustment

The analog output adjustment and the dimming signals can be provided by external sources.
To enable the control from external sources the jumpers are positioned as follows:

Table 5 Jumper position

Jumper number	Condition	Meaning
DC/PWMI1	Close 1-2	External signal enabled
SET1	Close 1-2	External signal enabled
En SET1	Open	Output current analog adjustment disabled
DC/PWMI2	Close 1-2	External signal enabled
SET2	Close 1-2	External signal enabled
En SET2	Open	Output current analog adjustment disabled

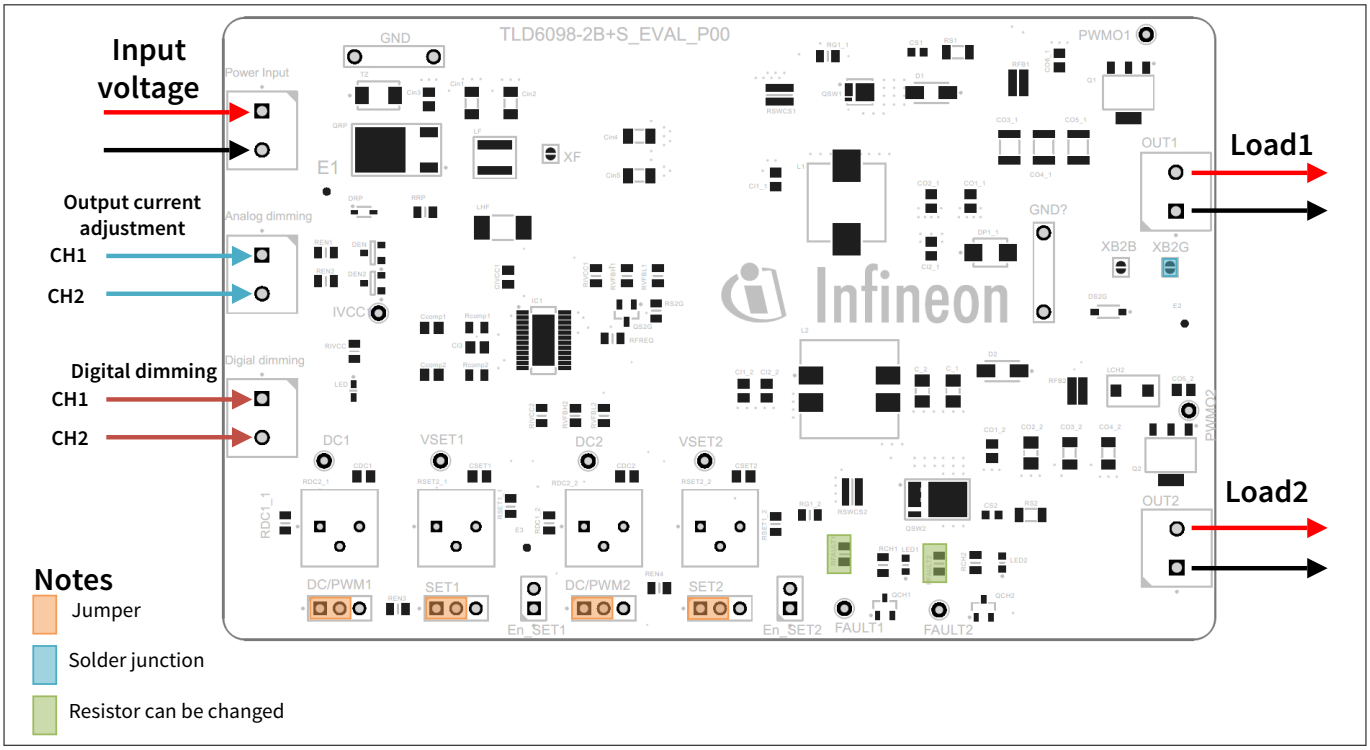

Figure 5 External dimming and output adjustment

6 Constant output voltage

To enable the voltage loop just replace the respective RFAULT1 or RFAUL2 with a resistor in 1.8 kΩ to 9 kΩ range.

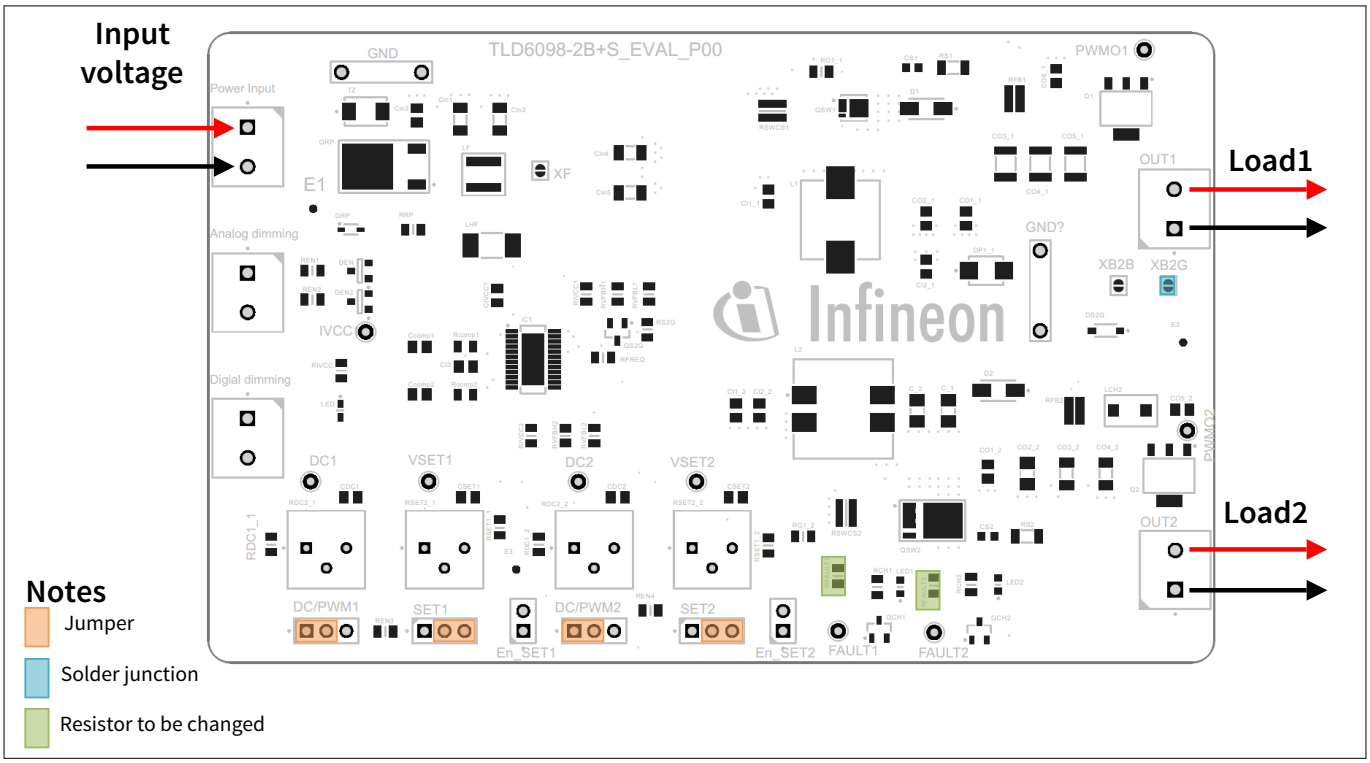

Figure 6 Constant output voltage

7 Fault report

The system has been designed to use hard threshold for overvoltage detection. With this option, once the threshold is reached, the gate driver is disabled until the output voltage goes below the reset threshold.

This behavior is selected with a resistor on FPWM/FAULT1,2 pins in range 18 kΩ to 90 kΩ.

In this case each fault type is reported by the FPWM/FAULT1,2 pins with a dedicated PWM waveform. Typical values for these waveforms are reported in the following table.

Table 6 Coded PWM pulses on FPWM/FAULT pin

	PWM period	DC (ON time)
Overtemperature	10 ms	100% (10 ms)
Short to ground	10 ms	80% (8 ms)
Overvoltage on FBH pin	10 ms	60% (6 ms)
Overvoltage on VFB pin	10 ms	40% (4 ms)
Output overcurrent (> 200%)	10 ms	20% (2 ms)

8 Boost to battery

The first channel on the TLD6098-2ES_2B+S Eval board has been designed to work in boost to ground or boost to battery. The choice of the topology can be done by a solder jumpers XB2B and XB2G.

- When XB2G is closed and XB2B is open the channel works in boost to ground
- When XB2G is open and XB2B is closed the channel works in boost to battery

9 Schematics

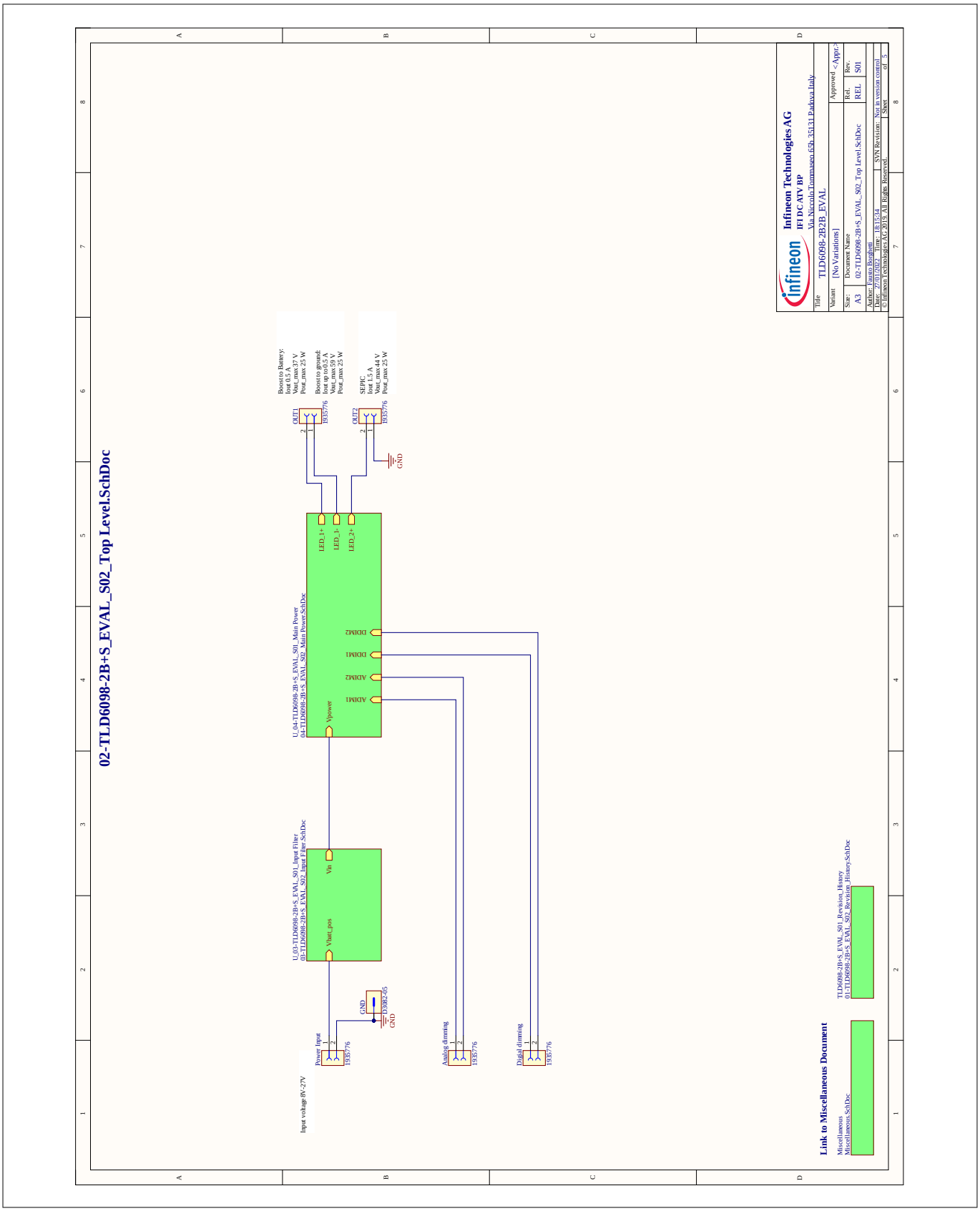

Figure 7 Top level

9 Schematics

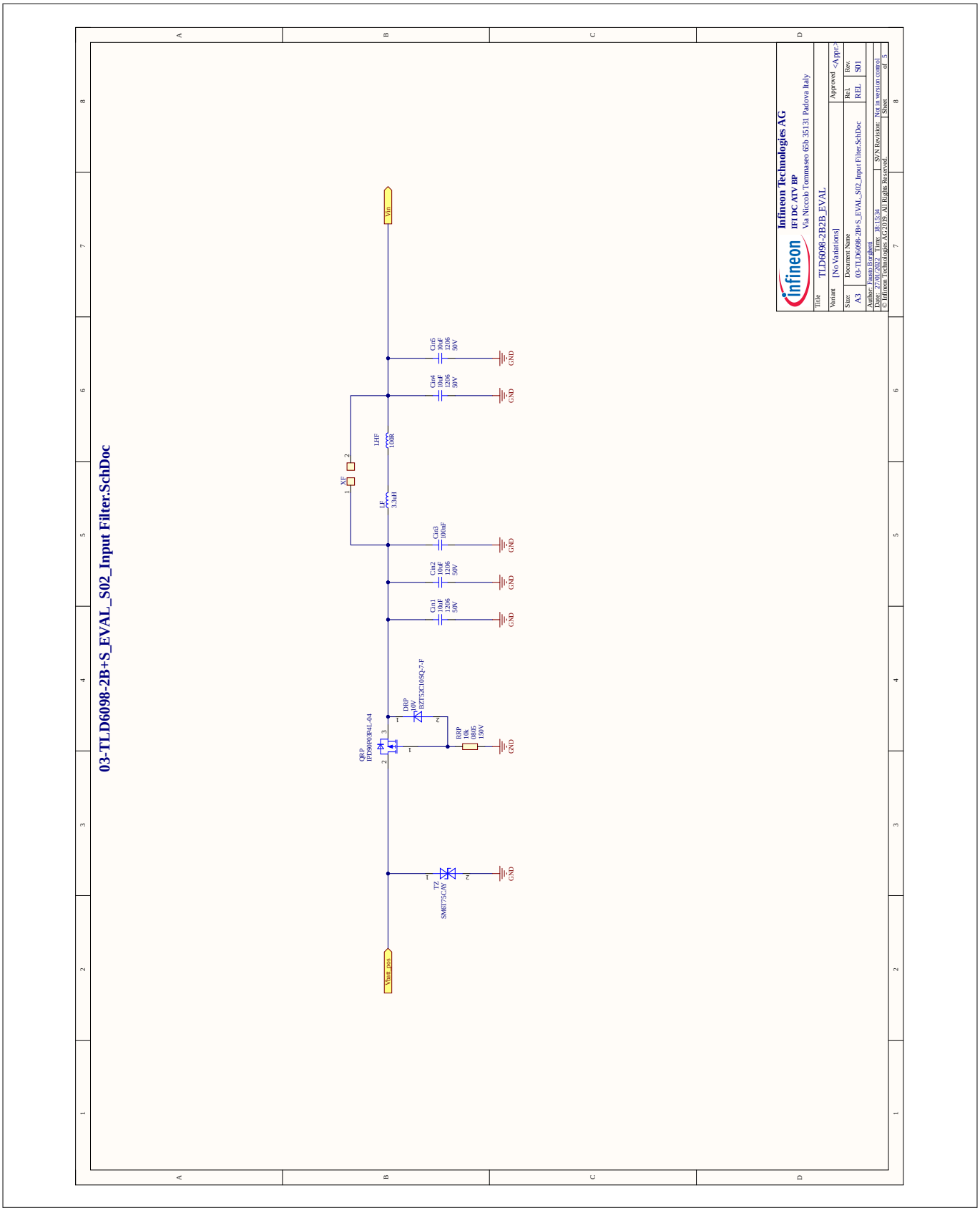

Figure 8 Input filter

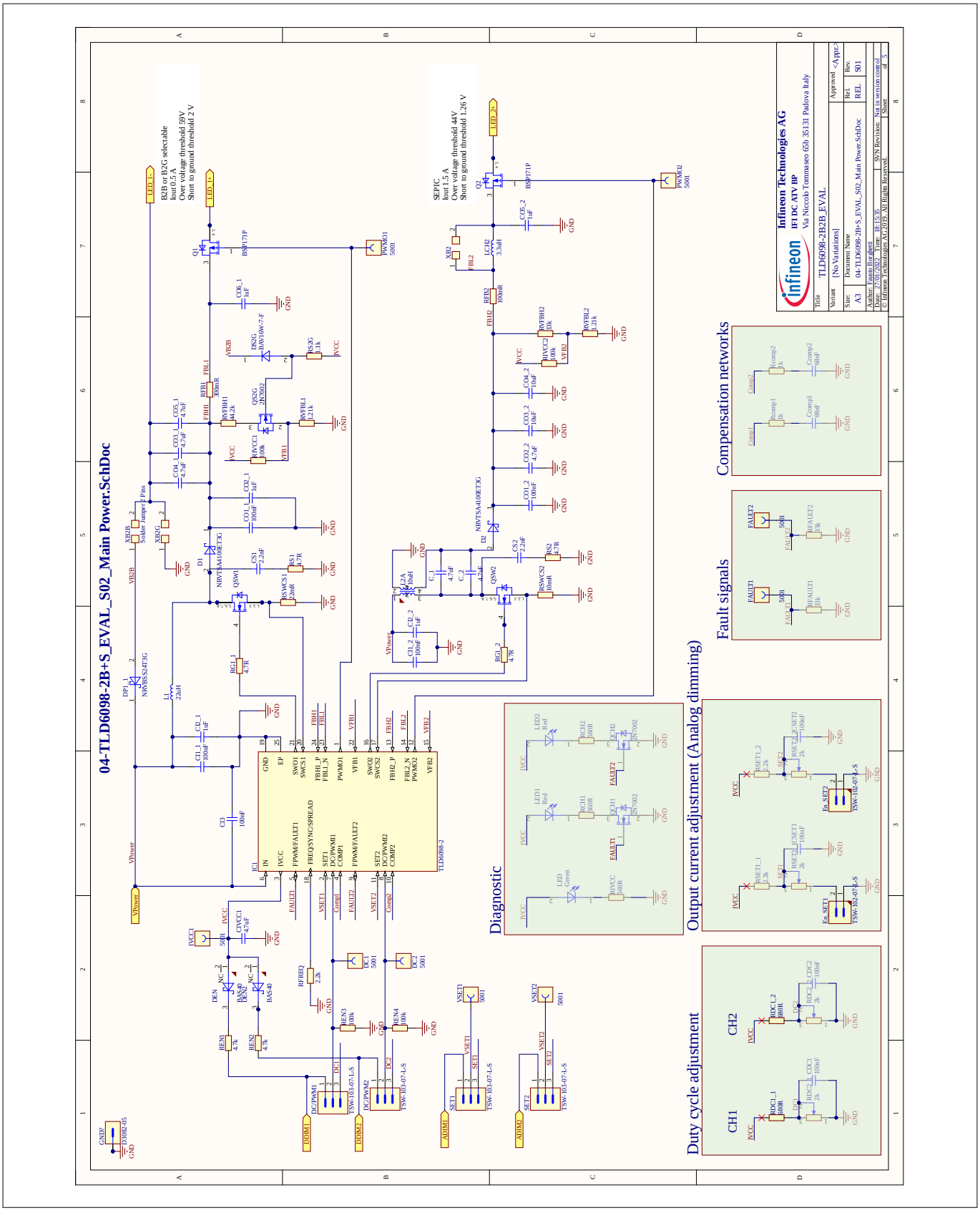

Figure 9 Main power

10 PCB layout

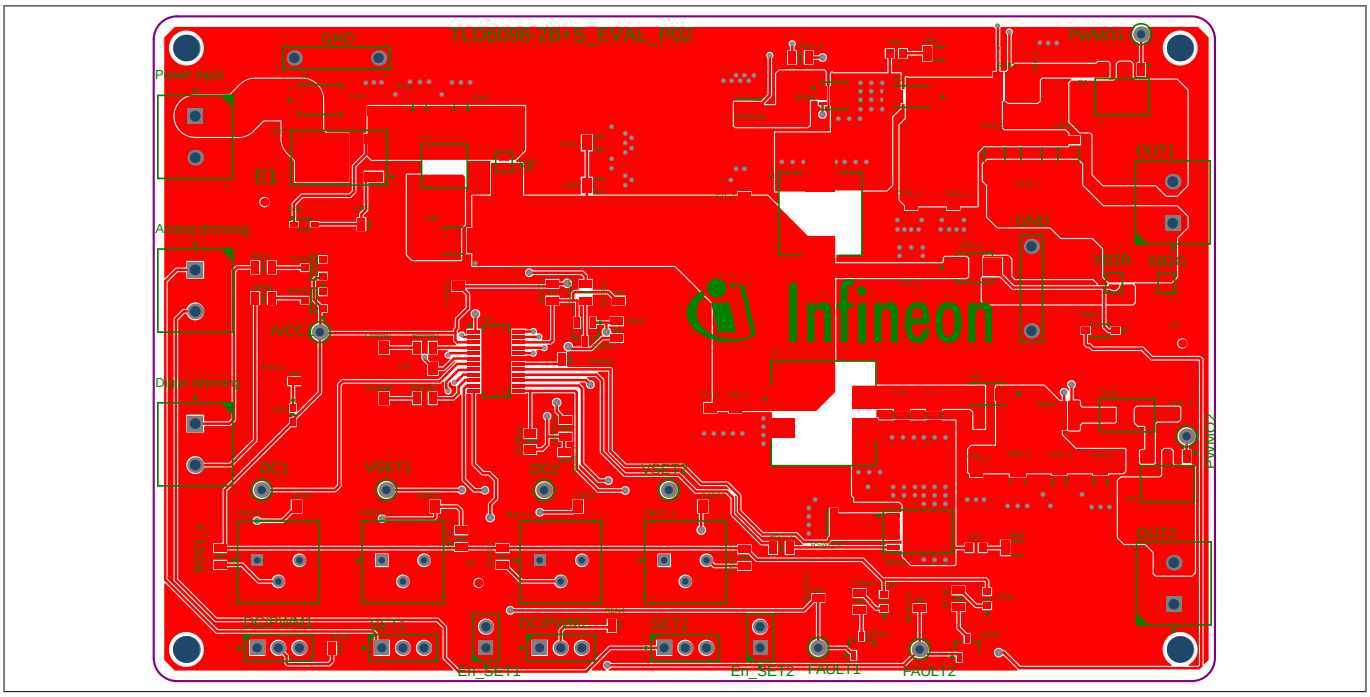

Figure 10 PCB layout top view

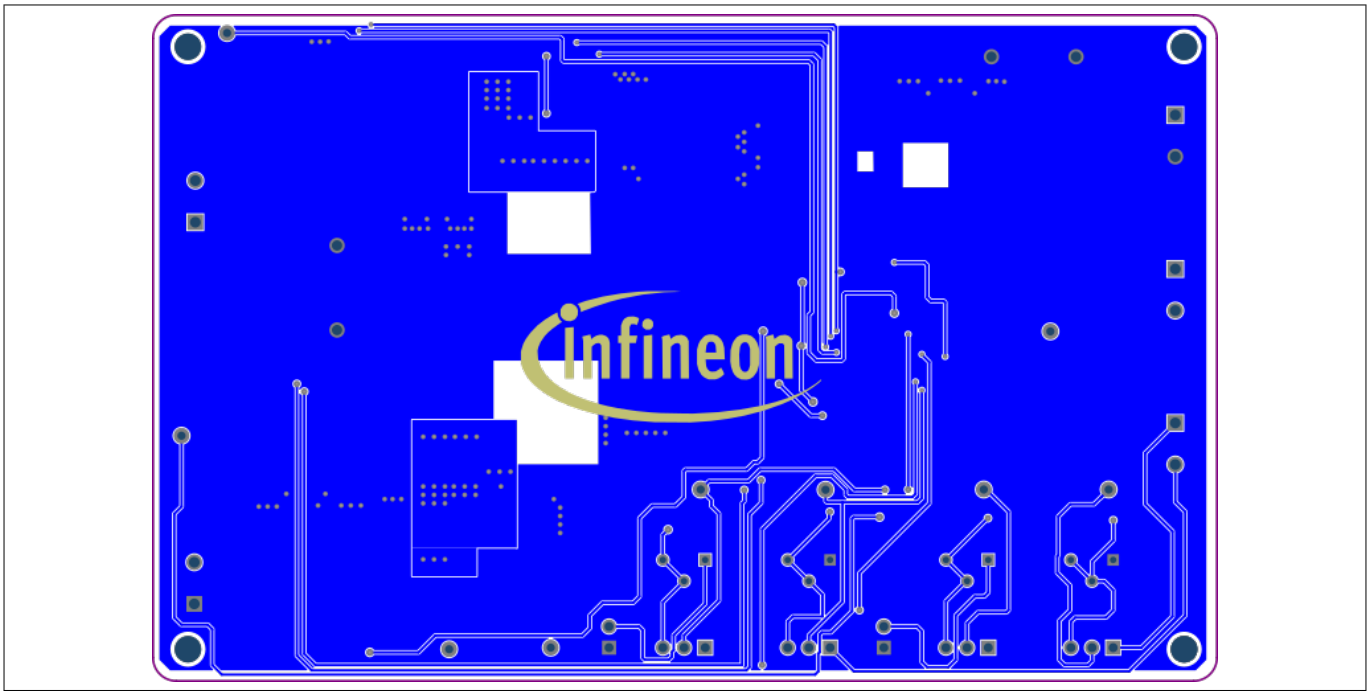

Figure 11 PCB layout bottom view

11 Bill of material

Quantity	Designator	Value	Description	Manufacturer
5	Analog dimming, Digital dimming, OUT1, OUT2, Power Input	–	Terminal Block, 2 pin 5mm Pitch	–
3	C_1, C_2, CO2_2	4.7uF	MLCC - 1206 - 50 V	TDK Corporation
2	Ccomp1, Ccomp2	68nF	MLCC - 0805 - 50 V	TDK Corporation
10	CI1_1, CI1_2, CI3, Cin3, CO1_1, CO1_2 CDC1, CDC2, CSET1, CSET2	100nF	MLCC - 0805 - 50 V	TDK Corporation
5	CI2_1, CI2_2, CO2_1, CO5_2, CO6_1	1uF	MLCC - 0805 - 50 V	TDK Corporation
6	Cin1, Cin2, Cin4, Cin5, CO3_2, CO4_2	10uF	MLCC - 1206 - 50 V	TDK Corporation
4	CO3_1, CO4_1, CO5_1 CIVCC1	4.7uF	MLCC - 1210 - 100 V	TDK Corporation
2	CS1, CS2	2.2nF	MLCC - 0805 - 50 V	TDK Corporation
2	D1, D2	NRVTSA4100ET3G	Schottky Diode 100 V 4 A	
9	DC1, DC2, FAULT1, FAULT2, IVCC1, PWMO1, PWMO2, VSET1, VSET2	–	Test Point	–
4	DC/PWM1, DC/PWM2, SET1, SET2	TSW-103-07-L-S	2,54 mm Pin strip, 3 pin, single row	–
2	DEN, DEN2	BAS40	Schottky Diode	Infineon Technologies
1	DP1_1	NRVBSS24T3G	Schottky Power Rectifier	ON Semiconductor
1	DRP	10V	ZENER DIODE	–
1	DS2G	BAV16W-7-F	Fast Switching Diode	Diodes Incorporated
2	En_SET1, En_SET2	–	2,54 mm Pin strip, 2 pin, single row	–
2	GND	–	Uninsulated Link, 10.16mm Pitch, Vertical	–
1	IC1	–	LITIX™ Power TLD6098-2ES	Infineon Technologies
1	L1	22uH	Inductor,10mm X 10mm X 4mm	Coilcraft
1	L2	10uH	Inductor Shielded, 5.65 A	Coilcraft
1	LCH2	3.3uH	Inductor, 4.00mm X 4.00mm X 2.20mm	Coilcraft
1	LED	–	Green LED	–

11 Bill of material

Quantity	Designator	Value	Description	Manufacturer
2	LED1, LED2	–	Red LED	–
1	LF	3.3uH	Shielded Power Inductor	Coilcraft
1	LHF	100R	Ferrite Bead	Würth Elektronik
2	Q1, Q2	BSP171P	SIPMOS Small Signal P-Channel MOSFET	Infineon Technologies
2	QCH1, QCH2	2N7002	OptiMOS™ Small-Signal N-Channel MOSFET	Infineon Technologies
1	QRP	IPD90P03P4L-04	OptiMOS™ - P2 P-channel MOSFET	Infineon Technologies
1	QS2G	2N7002	Small Signal N-Channel MOSFET	
1	QSW1	IAUZ40N08S5N100	OptiMOS™-5 N-Channel Power-Transistor	Infineon Technologies
1	QSW2	IAUC28N08S5L230	OptiMOS™5 N-Channel Power-Transistor	Infineon Technologies
3	RCH1, RCH2, RIVCC	560R	Chip Resistor 0805	–
2	Rcomp1, Rcomp2	1k	Chip Resistor 0805	–
2	RDC1_1, RDC1_2	680R	Chip Resistor	–
4	RDC2_1, RDC2_2, RSET2_1, RSET2_2	2k	Single Turn Cermet Trimmer	–
2	REN1, REN2	4.7k	Chip Resistor 0805	–
4	REN3, REN4, RIVCC1, RIVCC2	100k	Chip Resistor 0805	–
2	RFAULT1, RFAULT2	33k	Chip Resistor 0805	–
1	RFB1	300mR	Chip Resistor 0612	–
1	RFB2	100mR	Chip Resistor 0612	–
3	RFREQ, RSET1_1, RSET1_2	2.2k	Chip Resistor 0805	–
2	RG1_1, RG1_2	4.7R	Chip Resistor 0805	–
1	RRP	10k	Chip Resistor 0805	–
2	RS1, RS2	4.7R	Chip Resistor 1206	–
2	RS2G, RVFBL1	1.1k	Chip Resistor 0805	–
1	RSWCS1	22mR	Chip Resistor 0612	–
1	RSWCS2	10mR	Chip Resistor 0612	–
1	RVFBH1	39.2k	Chip Resistor 0805	–
1	RVFBH2	33k	Chip Resistor 0805	–
1	RVFBL2	1.21k	Chip Resistor 0805	–
1	TZ	SM6T75CAY	TVS Diode	STMicroelectronics
3	XB2B, XB2G, XF	–	Solder Jumper 2 Pins	–

Revision history

Document version	Date of release	Description of changes
Rev.1.10	2022-06-22	• Replaced Figure 3 • Corrected typo in schematics
Rev.1.00	2022-02-02	First release - User guide related to evalboard S02_P02

Trademarks

All referenced product or service names and trademarks are the property of their respective owners.

Edition 2022-06-22

Published by

Infineon Technologies AG

81726 Munich, Germany

Do you have a question about any aspect of this document?

Email: erratum@infineon.com

Document reference
IFX-qpg1642061390515

Important notice

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics ("Beschaffenheitsgarantie").

With respect to any examples, hints or any typical values stated herein and/or any information regarding the application of the product, Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind, including without limitation warranties of non-infringement of intellectual property rights of any third party.

In addition, any information given in this document is subject to customer's compliance with its obligations stated in this document and any applicable legal requirements, norms and standards concerning customer's products and any use of the product of Infineon Technologies in customer's applications.

The data contained in this document is exclusively intended for technically trained staff. It is the responsibility of customer's technical departments to evaluate the suitability of the product for the intended application and the completeness of the product information given in this document with respect to such application.

Warnings

Due to technical requirements products may contain dangerous substances. For information on the types in question please contact your nearest Infineon Technologies office.

Except as otherwise explicitly approved by Infineon Technologies in a written document signed by authorized representatives of Infineon Technologies, Infineon Technologies' products may not be used in any applications where a failure of the product or any consequences of the use thereof can reasonably be expected to result in personal injury.

X-ON Electronics

Largest Supplier of Electrical and Electronic Components

Click to view similar products for Power Management IC Development Tools ***category:***

Click to view products by Infineon ***manufacturer:***

Other Similar products are found below :

EVB-EP5348UI ISLUSBI2CKIT1Z ISL8002AEVAL1Z ISL91108IIA-EVZ AP62250WU-EVM SAMPLEBOXILD8150TOBO1 AP61100Z6-EVM AP62300Z6-EVM BTS7030-2EPA LTC3308AIV#WTRPBF BTS71033-6ESA EV13N91A EV55W64A Si8285_86v2-KIT AP33772S-EVB TDINV3000W50B-KIT NCP1681CCM1KWGEVB APEK89303KET-01-T NCP1681MM500WGEVB SI83401BAA-KIT SI83402BAA-KIT SI83411BAA-KIT SI83412BAA-KIT MIKROE-5294 MIKROE-5451 MIKROE-5374 APEK49406GES-01-T MIKROE-5019 BTG70902EPLDAUGHBRDTOBO1 5650 TAB-48017 APEK89307KET-01-T MIKROE-5510 64010 EVAL6EDL04I065PRTOBO1 LT8648SJV#WPBF LT8648SEV#WPBF EVB81340-100W RTKA489EPRDK0010BU DC3107A EVL4248-QV-00A EVQ4371-V-1000-00A EVL28167-B-Q-00A NEVB-NID1100UL EV6631B-L-00A EVL1608C-TL-00A EVAL-LTPA-KIT EVALKITTLE9189QUWTOBO1 EVALKITTLE9189QVWTOBO1 EVINVHPD2SICFS0108TOBO2