TLD804KTRAVCB_EVAL board

User guide

About this document

The TLD804KTRAVCB_EVAL board is designed to drive and supply the Nichia light source NMAWA04KAT (composed of the Nichia LED matrix and the Infineon ASIC drive TLD804K). The NMAWA04KAT is a high-definition LED matrix light source featuring 16384 pixels, equipped with a built-in driver IC for LED drive. The brightness of each LED can be independently controlled. It can be used for high-definition ADB, ADAS-related information projection or message display for automotive headlights.

The light source can be tested on a load-board that is fully compatible with the TLD804KAURXCB_EVAL. To receive a load board with the light source already soldered, send a request to your Nichia sales representative (device: NMAWA04KAT).

The core of this board is an Infineon Traveo™ CYT3DLABAS, an automotive grade microcontroller with a 2D graphics engine, sound processing, an Arm® Cortex®-M7 CPU for primary processing and an Arm® Cortex®-M0+ CPU for peripheral and security processing. These devices contain embedded peripherals supporting the controller area network with flexible data rate (CAN FD), local interconnect network (LIN), clock extension peripheral interface (CXPI), and Ethernet. The CYT3DL core incorporates a low-power flash memory, multiple high-performance analog and digital peripherals, and establishes a secure computing platform.

The board is also equipped with two DC-DC converters to separately supply the power and logic stages of the light source.

Scope and purpose

The scope of this user guide is to provide instructions on the use of the TLD804KTRAVCB_EVAL board.

Intended audience

This document is intended for engineers who perform measurements and check performances with the TLD804KTRAVCB_EVAL board.

Evaluation board

This board is to be used during the design-in process for evaluating and measuring characteristic curves, and for checking datasheet specifications.

Note: *PCB and auxiliary circuits are NOT optimized for the final customer design.*

Important notice

“Evaluation Boards and Reference Boards” shall mean products embedded on a printed circuit board (PCB) for demonstration and/or evaluation purposes, which include, without limitation, demonstration, reference and evaluation boards, kits and design (collectively referred to as “Reference Board”).

Environmental conditions have been considered in the design of the Evaluation Boards and Reference Boards provided by Infineon Technologies. The design of the Evaluation Boards and Reference Boards has been tested by Infineon Technologies only as described in this document. The design is not qualified in terms of safety requirements, manufacturing and operation over the entire operating temperature range or lifetime.

The Evaluation Boards and Reference Boards provided by Infineon Technologies are subject to functional testing only under typical load conditions. Evaluation Boards and Reference Boards are not subject to the same procedures as regular products regarding returned material analysis (RMA), process change notification (PCN) and product discontinuation (PD).

Evaluation Boards and Reference Boards are not commercialized products, and are solely intended for evaluation and testing purposes. In particular, they shall not be used for reliability testing or production. The Evaluation Boards and Reference Boards may therefore not comply with CE or similar standards (including but not limited to the EMC Directive 2004/EC/108 and the EMC Act) and may not fulfill other requirements of the country in which they are operated by the customer. The customer shall ensure that all Evaluation Boards and Reference Boards will be handled in a way which is compliant with the relevant requirements and standards of the country in which they are operated.

The Evaluation Boards and Reference Boards as well as the information provided in this document are addressed only to qualified and skilled technical staff, for laboratory usage, and shall be used and managed according to the terms and conditions set forth in this document and in other related documentation supplied with the respective Evaluation Board or Reference Board.

It is the responsibility of the customer’s technical departments to evaluate the suitability of the Evaluation Boards and Reference Boards for the intended application, and to evaluate the completeness and correctness of the information provided in this document with respect to such application.

The customer is obliged to ensure that the use of the Evaluation Boards and Reference Boards does not cause any harm to persons or third party property.
The Evaluation Boards and Reference Boards and any information in this document is provided "as is" and Infineon Technologies disclaims any warranties, express or implied, including but not limited to warranties of non-infringement of third party rights and implied warranties of fitness for any purpose, or for merchantability.

Infineon Technologies shall not be responsible for any damages resulting from the use of the Evaluation Boards and Reference Boards and/or from any information provided in this document. The customer is obliged to defend, indemnify and hold Infineon Technologies harmless from and against any claims or damages arising out of or resulting from any use thereof.

Infineon Technologies reserves the right to modify this document and/or any information provided herein at any time without further notice.

Safety precautions

Note: Please note the following warnings regarding the hazards associated with development systems.

Table 1 Safety precautions

	**Warning**: *The evaluation or reference board contains DC bus capacitors which take time to discharge after removal of the main supply. Before working on the drive system, wait five minutes for capacitors to discharge to safe voltage levels. Failure to do so may result in personal injury or death. Darkened display LEDs are not an indication that capacitors have discharged to safe voltage levels.*
	**Warning:** *Remove or disconnect power from the drive before you disconnect or reconnect wires, or perform maintenance work. Wait five minutes after removing power to discharge the bus capacitors. Do not attempt to service the drive until the bus capacitors have discharged to zero. Failure to do so may result in personal injury or death.*
	**Caution:** *The heat sink and device surfaces of the evaluation or reference board may become hot during testing. Hence, necessary precautions are required while handling the board. Failure to comply may cause injury.*
	**Caution:** *Only personnel familiar with the drive, power electronics and associated machinery should plan, install, commission and subsequently service the system. Failure to comply may result in personal injury and/or equipment damage.*
	**Caution:** *The evaluation or reference board contains parts and assemblies sensitive to electrostatic discharge (ESD). Electrostatic control precautions are required when installing, testing, servicing or repairing the assembly. Component damage may result if ESD control procedures are not followed. If you are not familiar with electrostatic control procedures, refer to the applicable ESD protection handbooks and guidelines.*
	**Caution:** *A drive that is incorrectly applied or installed can lead to component damage or reduction in product lifetime. Wiring or application errors such as undersizing the motor, supplying an incorrect or inadequate AC supply, or excessive ambient temperatures may result in system malfunction.*
	**Caution:** *The evaluation or reference board is shipped with packing materials that need to be removed prior to installation. Failure to remove all packing materials that are unnecessary for system installation may result in overheating or abnormal operating conditions.*

Table of contents

1 The board at a glance

The TLD804KTRAVCB_EVAL board is a complete drive system for the TLD804KLVCNLB_EVAL load board.

The TLD804KLVCNLB_EVAL board is equipped with:

- A power EMI input filter to limit conducted emissions
- A P-MOS anti-reverse polarity of input supply
- A high-power controlled DC-DC to supply up to 12 A the power stage of light source (VDDP)
- A 5 V low-power DC-DC to supply the logic part of the light source (VDDL)
- A Configuration-UART over CAN-FD transmission bus, to communicate with the internal control of light source
- A Video-UART over LVDS transmission bus, to transmit image to be projected by the light source
- An HDMI input to send images to be projected
- An Ethernet input to communicate with the internal microcontroller
- An I^2C and a CAN-FD input
- A fan driver with speed control
- 12 digital and 2 analog auxiliary GPIOs

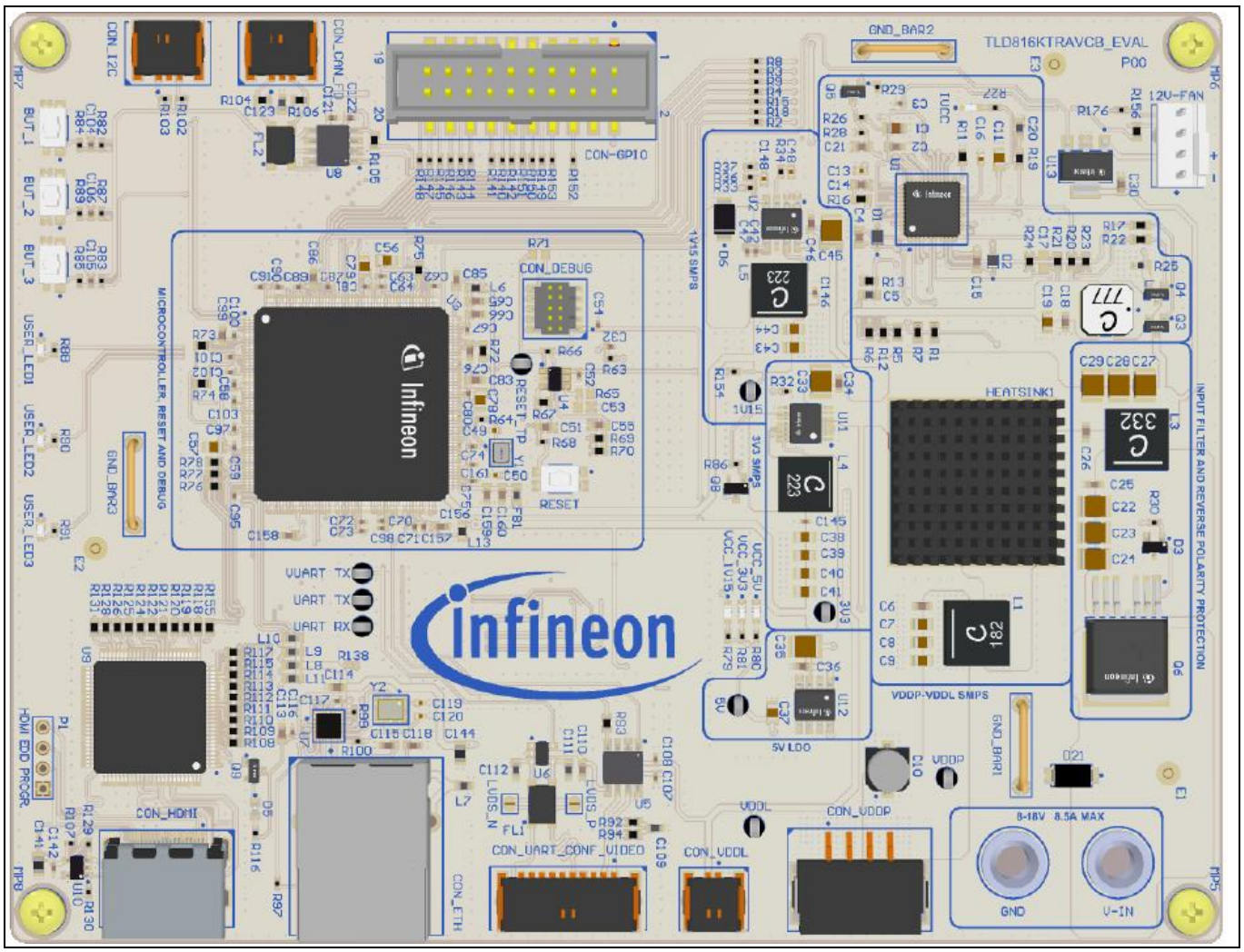

Figure 1 TLD804KTRAVCB_EVAL board

1.1 Block diagram

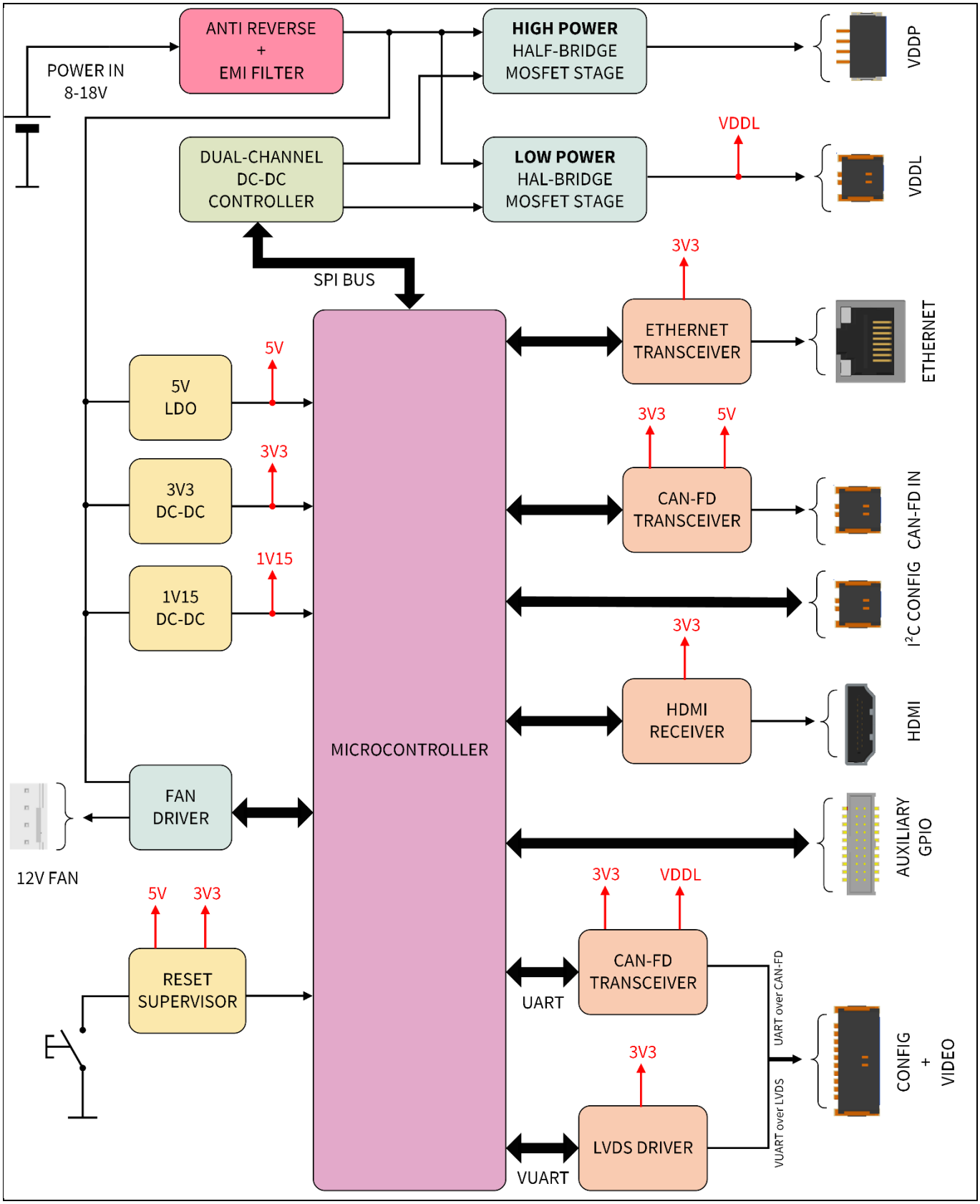

Figure 2 Block diagram

1.2 Main features

The main features of the board are:

- Versatile control board with integrated power supplies
- Automatic regulation of the power supply for LED matrix (VDDP) to minimize the power dissipation
- Several auxiliary digital/analog are GPIOs available
- Protected from short circuit, overload and reverse polarity
- High disturbance rejection on output UART and video-UART due to CAN/LVDS conversions

1.3 Board parameters and technical data

Table 2 Parameter

Parameter	Symbol	Conditions	Value	Unit
Nominal input voltage range	V in	Parameter degradation below 8 V	8 - 18	V
Peak input voltage	V in peak	Less than 1 s	27	V
Nominal input current	I in	V in = 12 V, IDDP = 12 A	5	A
Maximum input current	I in max	V in = 8 V, IDDP = 12 A	8.5	A
Power output voltage range	VDDP	Default: 4.5 V	0 - 5.1	V
Maximum power output current	IDDP	Continuous	12	A
Peak power output current	IDDP peak	Less than 1 s	25	A
Power output voltage range	VDDL	Default: 5 V	0 - 5	V
Maximum power output current	IDDL	Continuous	300	mA
Aux GPIO VDDL maximum current	I VDDL GPIO	-	100	mA
Aux GPIO 3V3 maximum current	I 3V3 GPIO	-	100	mA
Digital GPIO HIGH threshold	V GPIO HIGH	-	2.3	V
Digital GPIO LOW threshold	V GPIO LOW	-	1	V
Digital GPIO maximum voltage	V DGPIO max	-	3.8	V
Analog GPIO maximum voltage	V AGPIO max	-	3.6	V
LVDS output nominal voltage	V LVDS	-	3.3	V
LVDS output nominal speed	f LVDS	-	20	Mbaud
CAN-FD output nominal voltage	V CAN-FD	-	3.3	V
CAN-FD output nominal speed	f CAN-FD	-	1	Mbaud
Fan driver output voltage	V fan	-	V in	-
Fan driver output current	I fan	-	1	A
Maximum ambient temperature	T amb	With heatsink mounted	40	°C

2 System and functional description

2.1 Getting started

Connect a power supply with a voltage range between 8 V and 18 V to the metal banana connectors named V-IN and GND, as shown in Figure 3.

Note: The wires used to make the power supply connection should have a cross section of 2.5 mm² (or AWG 13) minimum.

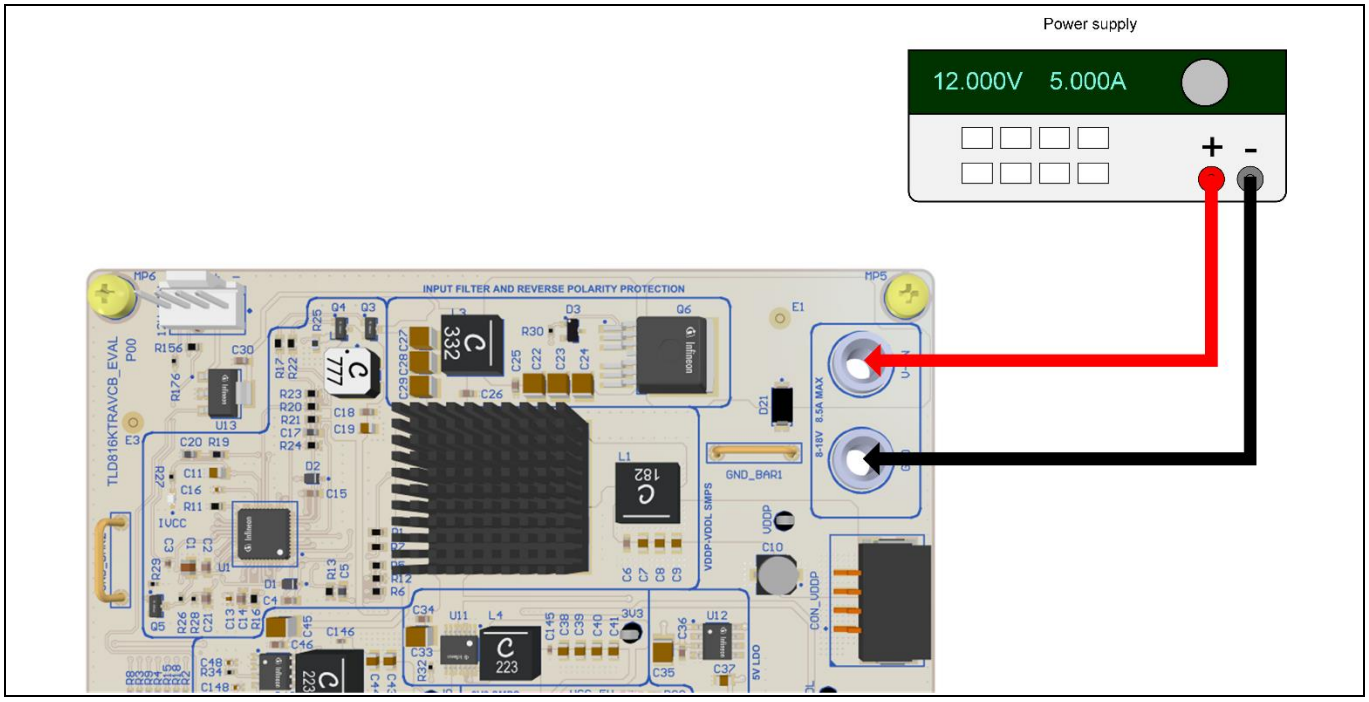

Figure 3 Power supply connection

Connect the load board by using three cables with the following codes and specifications, as shown in Figure 4.

Table 3 VDDP cable specification

Terminations	Cable type
TE Connectivity ERNI 4P MaxiBridge mod. 384453-E or 524689-E (housing) TE Connectivity ERNI mod. 464772-E or 464763-E (terminal)	4 x AWG 20 (0.5 mm²)

Table 4 VDDL and CONFIG + VIDEO cables specification

Cable	Terminations	Cable type
VDDL	TE Connectivity ERNI 2P MiniBridge mod. 224397-E or 224393-E	Ribbon cable AWG 26 Pitch 1.27 mm
CONFIG+VIDEO	TE Connectivity ERNI 8P MiniBridge mod. 214159-E or 224400-E	
CONFIG+VIDEO	TE Connectivity ERNI 10P MiniBridge mod. 234472-E or 234465-E	

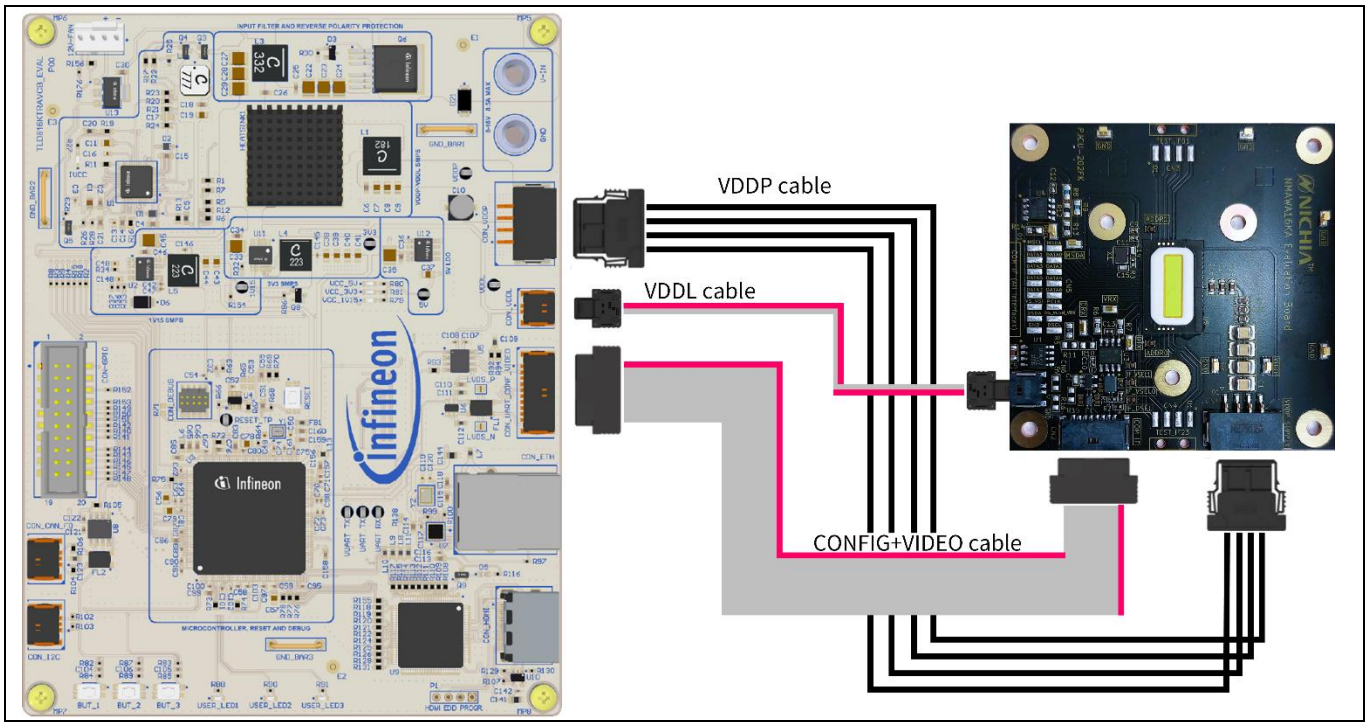

Figure 4 Connection to load board

2.2 Description of the functional blocks

Figure 5 shows that the board is composed of 21 blocks.

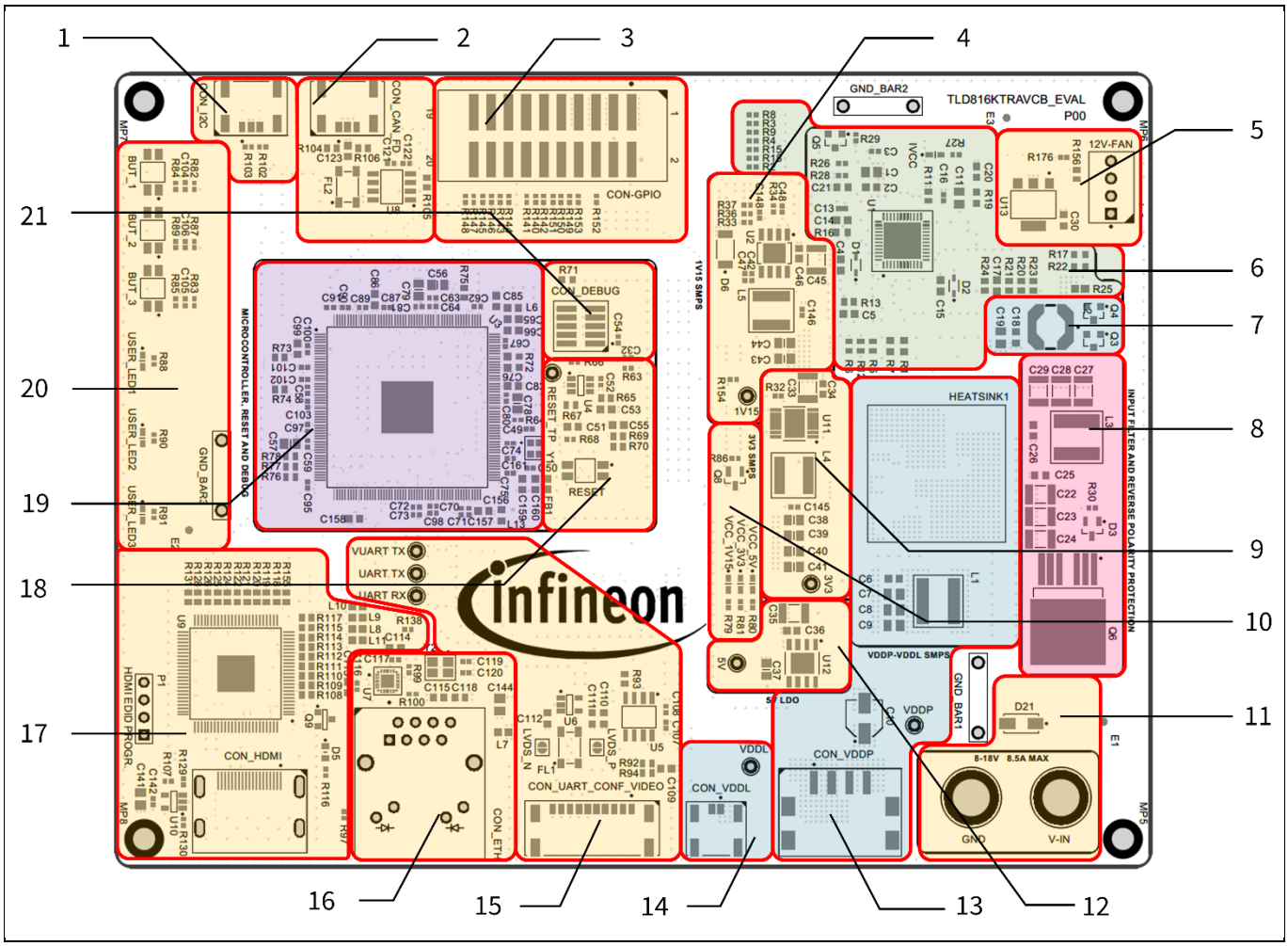

Figure 5 Blocks of the board

Table 5

Block number	Description
1	I^2C INPUT Enables communication with the microcontroller and can be used to configure the light source directly. The microcontroller must be configured for this purpose.
2	CAN-FD INPUT Enables communication with the microcontroller and can be used to configure the light source directly. The microcontroller must be configured for this purpose. The CAN-FD transceiver is the Infineon TLE9350XSJ. The TLE9350XSJ is a high-speed CAN transceiver. It is used in HS CAN systems for automotive applications and industrial applications. It is designed to fulfill the requirements of ISO 11898-2:2016 physical layer specification as well as SAE J1939 and SAE J2284. Fail-safe features, such as overtemperature protection, output current limitation or the TxD time-out feature are designed to protect the TLE9350SJ and the external circuitry from being damaged.

Block number	Description
3	GENERAL PURPOSE CONNECTOR At this connector, there are 12 digital GPIOs and 2 ADC inputs connected to microcontroller. All these terminals are protected with a 1 kΩ resistor in series. There is a 3.3 V line from the 3V3 DC-DC (max 100 mA) and a VDDL line (ma 100 mA).
4	1V15 POWER SUPPLY This power supply is used to supply the core of microcontroller, it can source up to 1.8 A and it is based on the Infineon TLE8366EV. The TLE8366EV is a PWM step-down DC-DC converter with an integrated 1.8 A power switch. The switching frequency of a nominal 370 kHz allows the use of small and cost-effective inductors and capacitors, resulting in a low, predictable output ripple and in minimized consumption of board space. It includes safety features such as a cycle-by-cycle current limitation, overtemperature shutdown, and input-under-voltage lockout. This power supply is enabled by the microcontroller, after that the internal 1V15 LDO of the microcontroller has turned on the core.
5	FAN DRIVER This block includes a protected switch, the Infineon BTS4142N to control the fan. The output voltage is the same applied as the power input of the board. The maximum current that can be sunk is 1 A. A pull-up input at the fan connector is available. It can be connected at the open-collector output of the fan, indicating the rotating speed. An output from the microcontroller drives the fan at the desired speed.
6	DUAL-CHANNEL DC-DC CONTROLLER This controller, based on Infineon TLD5501-2QV, pilots both DC-DC power stages that source VDDP and VDDL to supply the load board. The TLD5501-2QV is an AEC-qualified dual-sync buck controller with an SPI, specifically designed to be used as voltage or current regulator. It features an SPI for diagnostics and control, maximum efficiency for all conditions (up to 96%), a limp home function (fail safe mode), EMC-optimized device with auto spread spectrum, overvoltage, short-to-ground, overcurrent, open feedback, and overtemperature protections. The switching frequency of both channels is 400 kHz.
7	VDDL HALF-BRIDGE MOSFET STAGE Built with automotive-grade Infineon low-power MOSFET BSS306N, it is controlled by channel 2 of TLD5501-2QV.
8	REVERSE POLARITY PROTECTION AND EMI FILTER Made with an automotive grade power Infineon OptiMOS™ IPB180P04P4-03 (40 V - 180 A - 2.8 mΩ) avoids any wrong connection of the input power by offering a high-impedence input when the power supply is connected with the opposite polarity. The EMI filter is made with a PI inductive-capacitive low pass filter tuned at a roll-off frequency of 40 kHz (one-tenth of the switching frequencies of DC-DC converters). Its purpose is to reduce the conducted disturbances produced by DC-DC converters on the board.
9	3V3 POWER SUPPLY Used to supply the microcontroller, the Ethernet transceiver, LVDS driver, the HDMI receiver and the 3V3 output of the GPIO connector. It can source up to 2 A and it is based on the Infineon OPTIREG™ automotive switching regulator TLS4120D0EPV33. This is a PWM step-down DC-DC converter with an integrated synchronous power stage. The switching frequency is 440 kHz and it allows the use of small and cost-effective inductors

Block number	Description
	and capacitors, resulting in a low, predictable output ripple and in minimized consumption of board space. It includes safety features such as current limitation, overvoltage protection, temperature shutdown and input under voltage lockout.
10	POWER SUPPLIES MONITOR If all three LEDs are on, all of the power supplies for logic parts (3V3, 5V, 1V15) are working correctly. The DC-DC controller of VDDP and VDDL converters has its own signaling LED.
11	INPUT CONNECTORS Connect a power supply with a voltage between 8 and 18 V. A TVS diode is present to clamp overvoltages higher than 28 V.
12	5V POWER SUPPLY It is used to supply the input CAN-FD transceiver and the reset supervisor. It is built with an Infineon TLS810B1EJV50. The TLS810B1EJ V50 is a linear voltage regulator featuring wide input voltage range, low drop out voltage and ultra-low quiescent current. It features an accuracy of 2% and output current capability up to 100 mA and it is protected against overload, overtemperature, and short circuit.
13	VDDP HALF-BRIDGE MOSFET STAGE Built with automotive grade Infineon high-power OptiMOS™ IAUC100N04S6L025 (40 V - 100 A - 2.5 mΩ), it is controlled by channel 1 of TLD5501-2QV. These MOSFETs ensure the highest efficiency of the power stage, reducing heat and stress for components.
14	VDDL OUTPUT CONNECTOR
15	CONFIGURATION AND VIDEO OUTPUT This stage converts Control UART and Video UART into differential signals (respectively CAN-FD and LVDS), to increase the signal-to-noise ratio of the outsourcing signals and to reduce transmission errors due to electromagnetic disturbances. It consists of two parts: • A CAN-FD transceiver made with the Infineon TLE9350XSJ. The TLE9350XSJ is a high-speed CAN transceiver used for automotive applications and industrial applications. It is designed to fulfill the requirements of ISO 11898-2:2016 physical layer specification as well as SAE J1939 and SAE J2284. Fail-safe features including overtemperature protection, output current limitation and TxD time-out feature are designed to protect the TLE9350SJ and the external circuitry from irreparable damage. • An LVDS driver to convert the Video UART in LVDS differential signal. The main chip is an NBA3N011SSNT1G made by ON Semiconductors.
16	ETHERNET INPUT STAGE
17	HDMI INPUT STAGE
18	RESET SUPERVISOR A stage that maintains the microcontroller reset until the power supply conditions are good enough to supply correctly to the microcontroller. It is based on the TI chip, TPS3808G01DBVR.
19	MICROCONTROLLER The core of this block is an Infineon Traveo™ CYT3DLABAS, an automotive grade microcontroller with 2D Graphics engine, Sound Processing, an Arm® Cortex®-M7 CPU for primary processing and an Arm® Cortex®-M0+ CPU for peripheral and security processing. These devices contain embedded peripherals supporting Controller Area Network with Flexible Data rate (CAN FD), Local Interconnect Network (LIN), Clock Extension Peripheral

Block number	Description
	Interface (CXPI), and Ethernet. CYT3DL incorporates a low-power flash memory, multiple high-performance analog and digital peripherals, and enables the creation of a secure computing platform.
20	AUXILIARY BUTTONS AND LEDs
21	DEBUG CONNECTOR Used to debug and upload application software in the microcontroller.

2.3 Basic operations

The board includes 3 buttons:

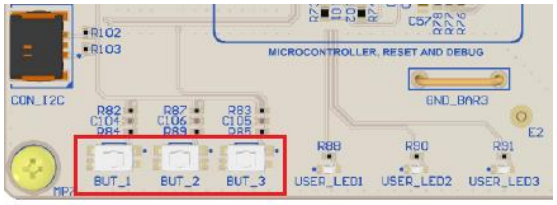

Figure 6 Buttons on board

Table 6 Button functions

Button	Function
BUT_1	When HDMI is not used: Select an image from the internal memory When HDMI is used: Move selected area UP
BUT_2	When the beam image is selected: change between low-high-mask beam When HDMI is used: Move selected area DOWN
BUT_3	Video source selecting: switch the video signal between internal memory and HDMI

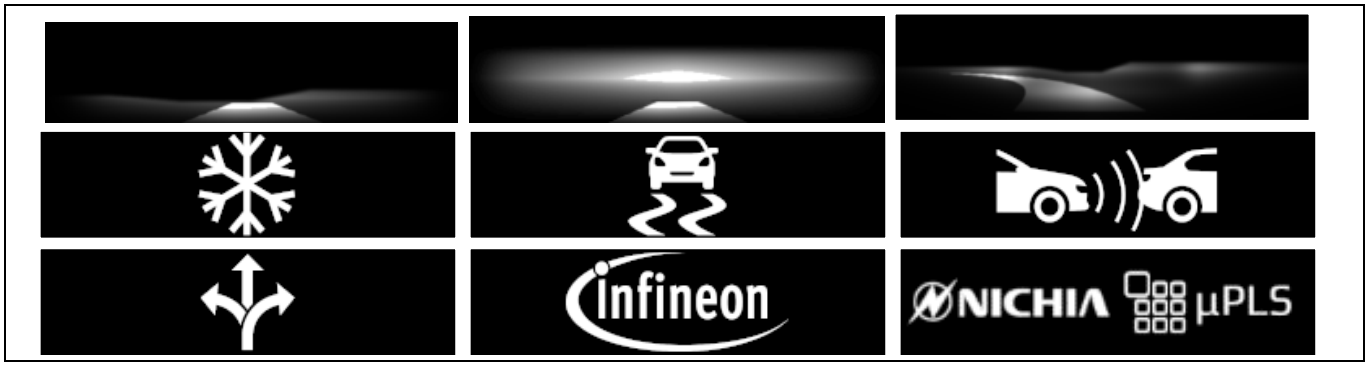

Figure 7 Images stored in the internal memory

If the cable HDMI is connected, press BUT_3 to read from this source.

In most cases, the image transmitted cannot fit with the dimensions of the light source (4:1). To help the user in projecting the desired portion of the image, a virtual rectangle must be displayed over the original image, as shown in Figure 8.

As shown in Figure 8, only the portion of image inside the rectangle is sent to the light source (light source light output, filtered with dark screen). To move the rectangle UP and DOWN, press BUT_1 and BUT_2.

Note: To project to a target, the image on the light source is mirrored.

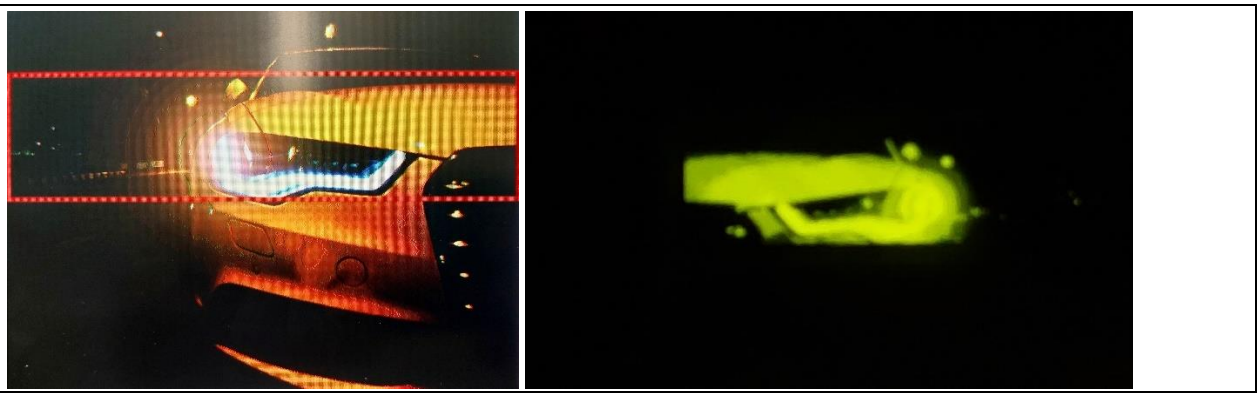

Figure 8 Selected area to be projected (left) and filtered light source output (right)

2.4 Download "IAR Embedded Workbench for ARM"

1. Visit the web page https://www.iar.com/infineon and download the IDE suite named "IAR Embedded Workbench for ARM"
2. Open "IAR Embedded Workbench for ARM". Download the "IAR Library Source for ARM". To do this, click "Help" menu, then "License Manager…"

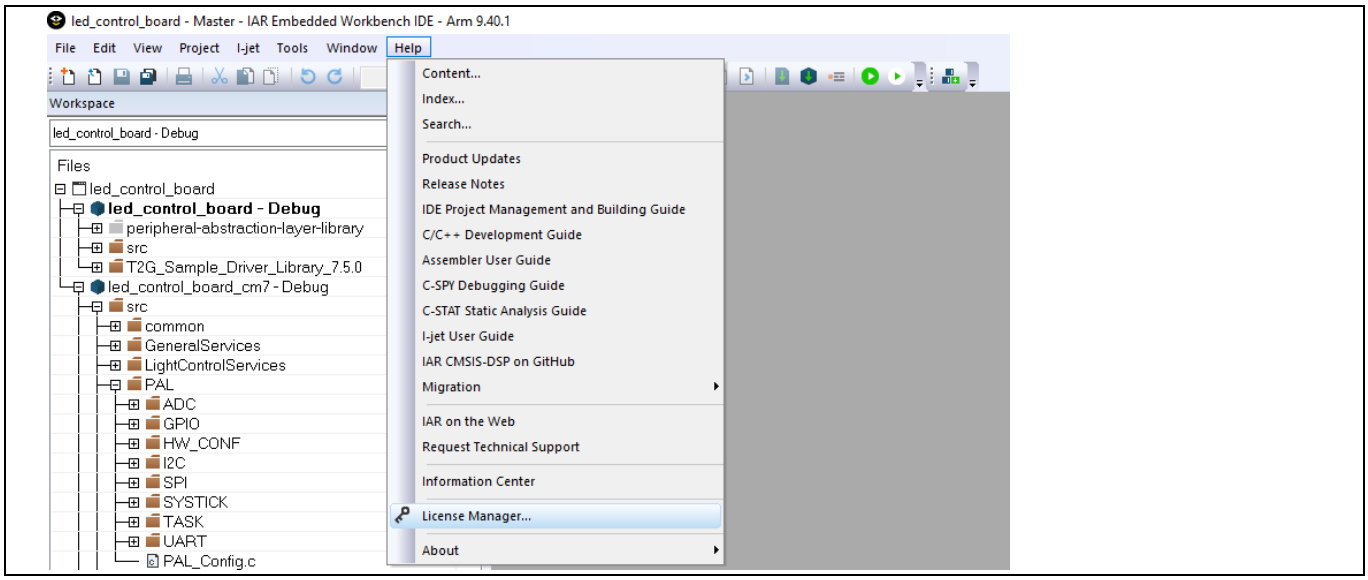

Figure 9 IAR license manager menu

3. From the new window, select "Tool", then "Extract Optional Packages" and then "IAR Library Source for ARM"

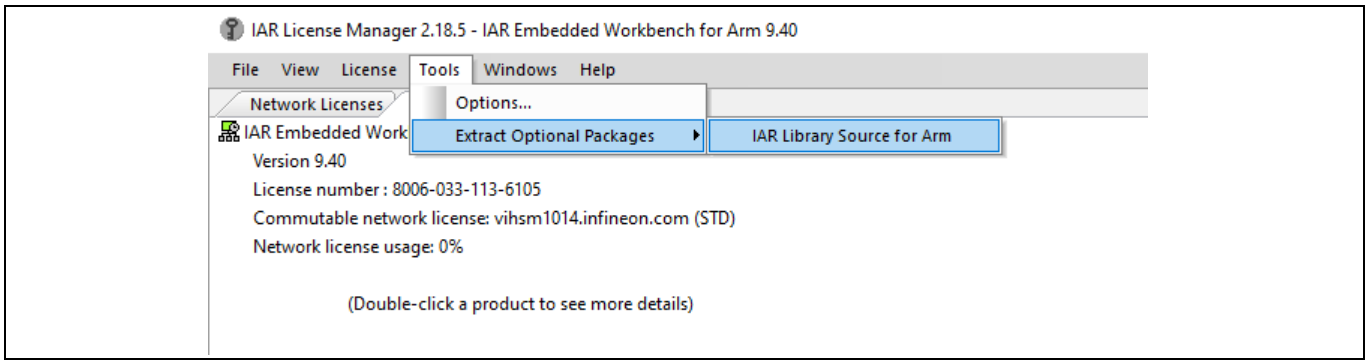

Figure 10 Add IAR library source

2.5 Uploading application software

Save the application software to be uploaded on your PC, then open "IAR Embedded Workbench for ARM".

Select "File" and then "Open Workspace…"

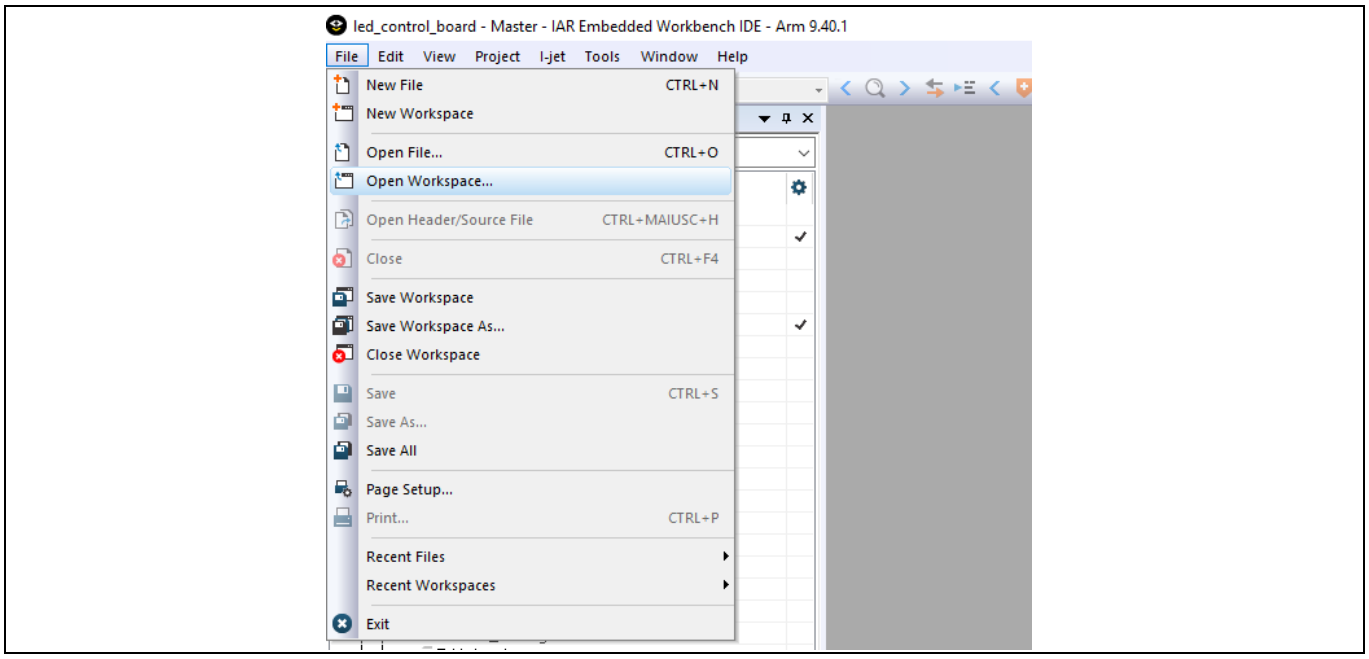

Figure 11 Open Workspace

The Traveo™ microcontroller has two cores, therefore the application software is always composed of two parts. When uploading the first part, the second part will be uploaded automatically.

Figure 12 shows an example of the two parts of application software correctly loaded on the suite:

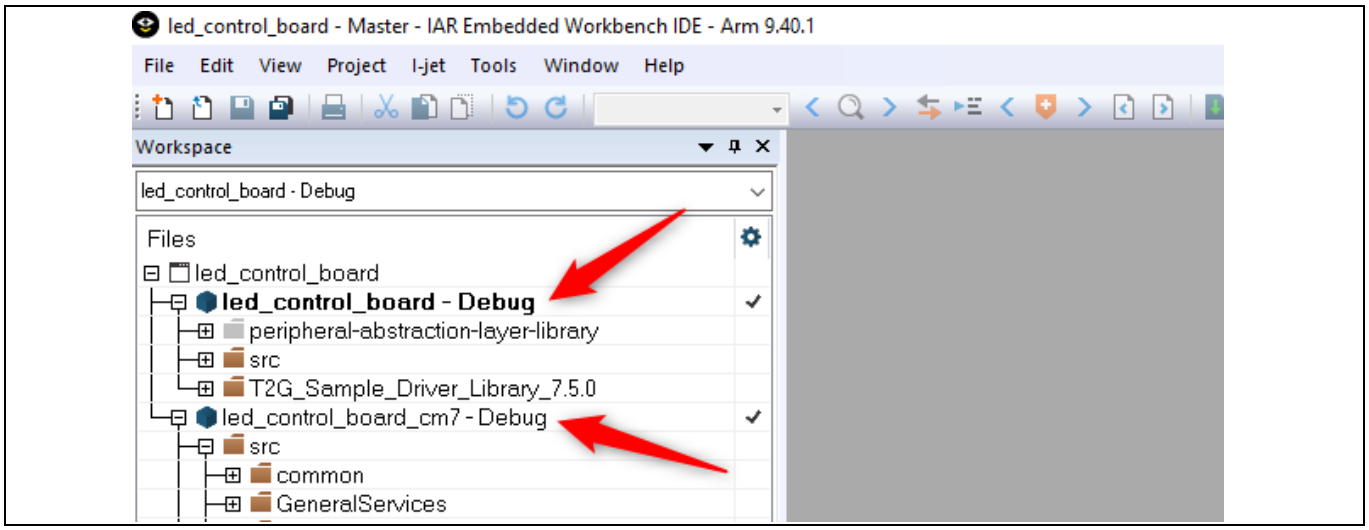

Figure 12 Project structure - Cortex M0 and M7

Each of these parts needs to be compiled. To compile, right click over each one and select "Make".

A black flag will appear at the right of the application software to confirm that it has been compiled correctly.

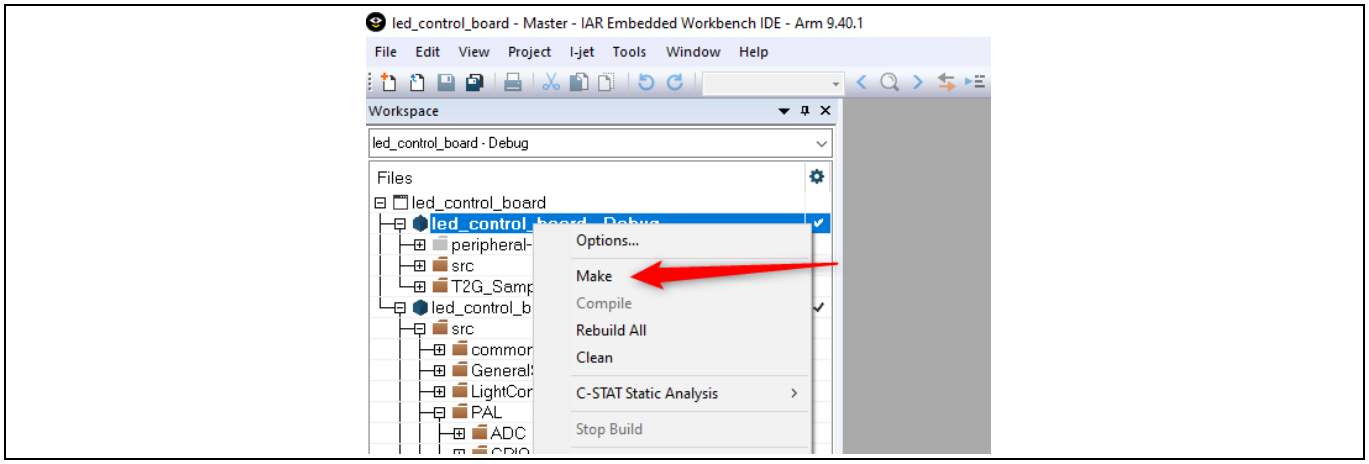

Figure 13 Make the first Cortex M0

Take the JTAG ARM debugging probe called I-JET made by IAR Systems Software Inc. and connect the ribbon cable termined with a 2 x 5 pin P1.27 connector.

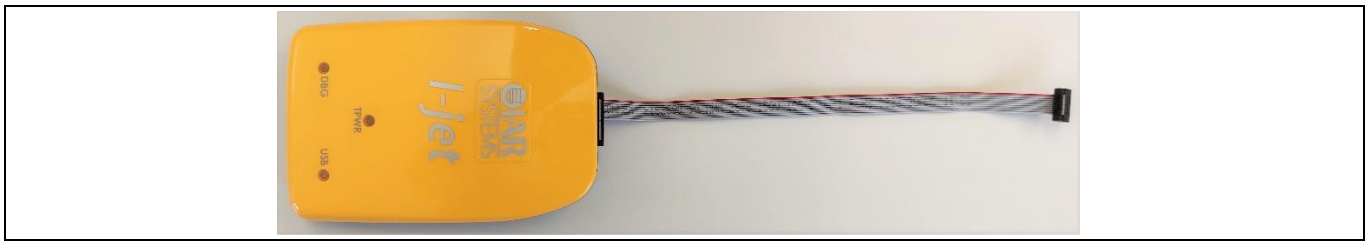

Figure 14 The I-JET

Connect I-JET to the CON_DEBUG connector of the board, and then connect a power supply (12 V) to the board, as shown in Figure 15:

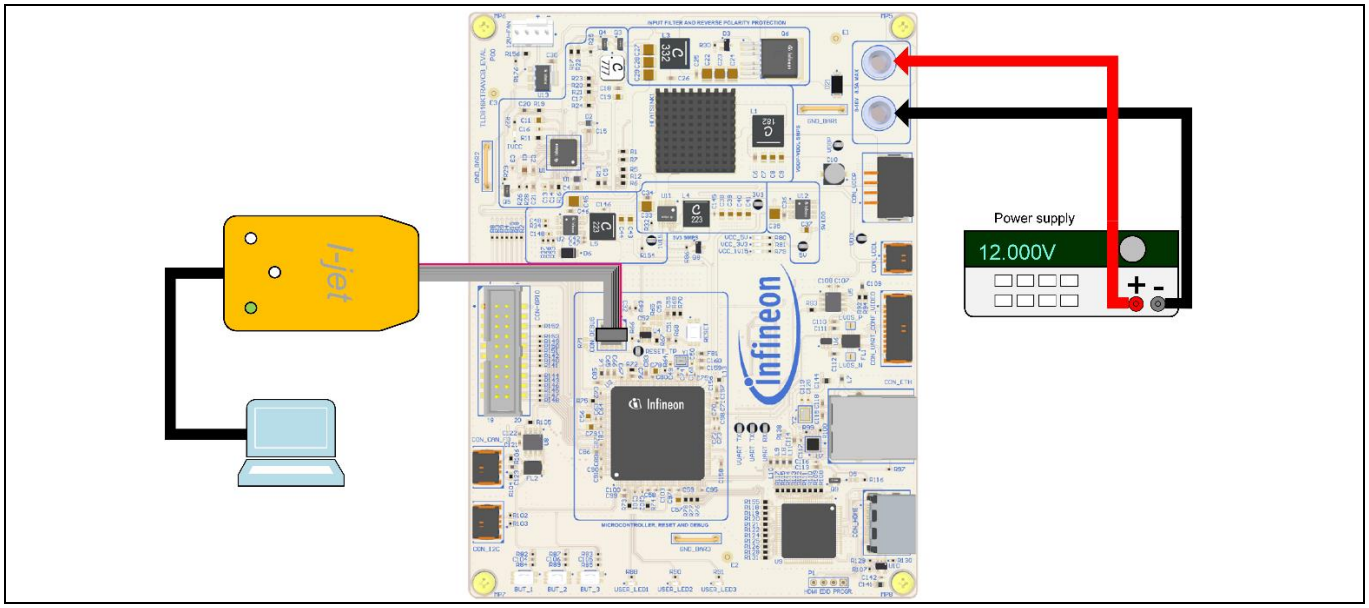

Figure 15 I-JET and supply connection

Turn on the power supply. Traveo™ microcontroller supply must be correct during the application software upload.

Next, upload the application software on the board by selecting "Project", then "Download" and "Download active application" as shown in the image below:

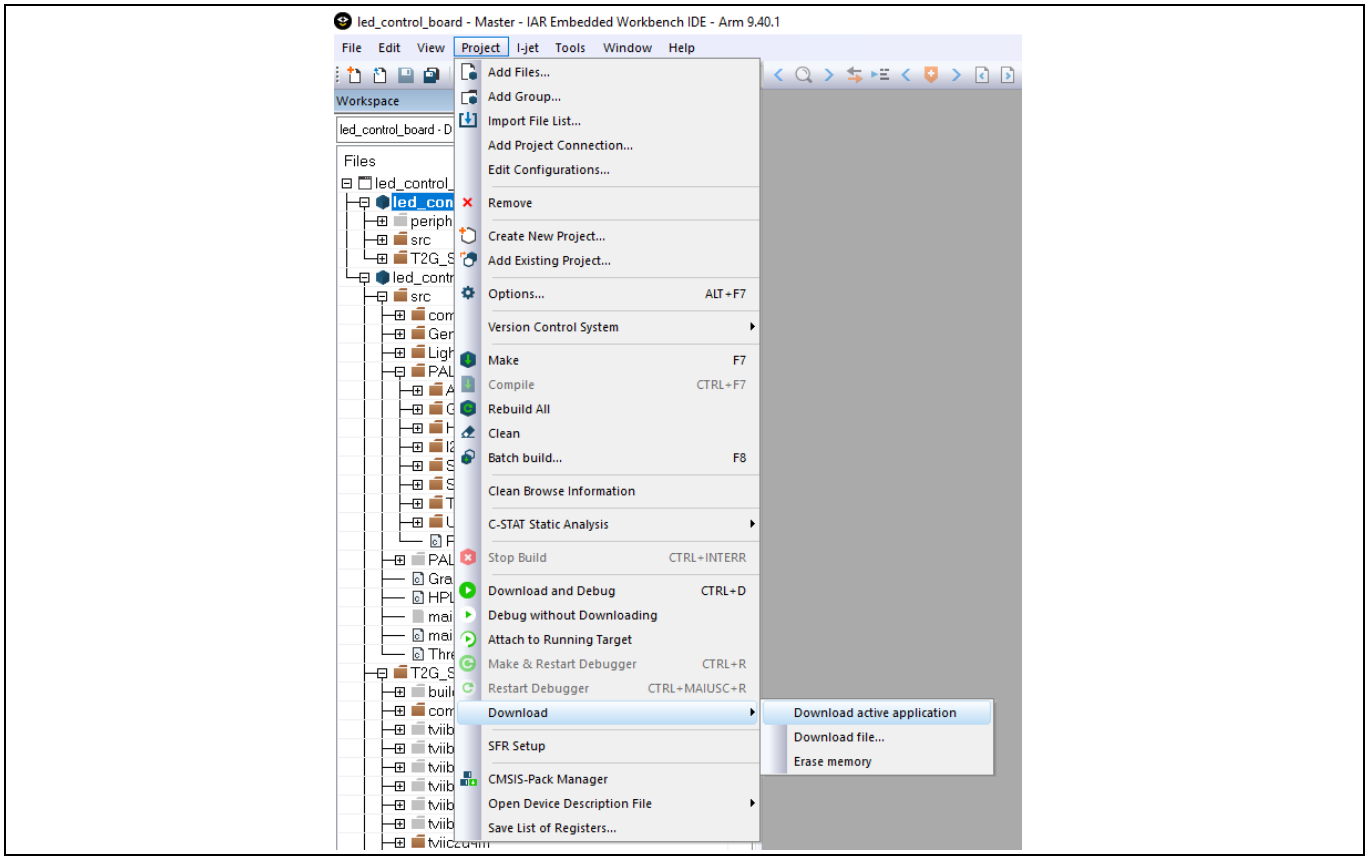

Figure 16 Download active application

After uploading, the Traveo™ microcontroller will be stuck. Press the RESET button. If the uploading process ended correctly, Traveo™ will restart with the new application software.

3 System design

3.1 Schematics

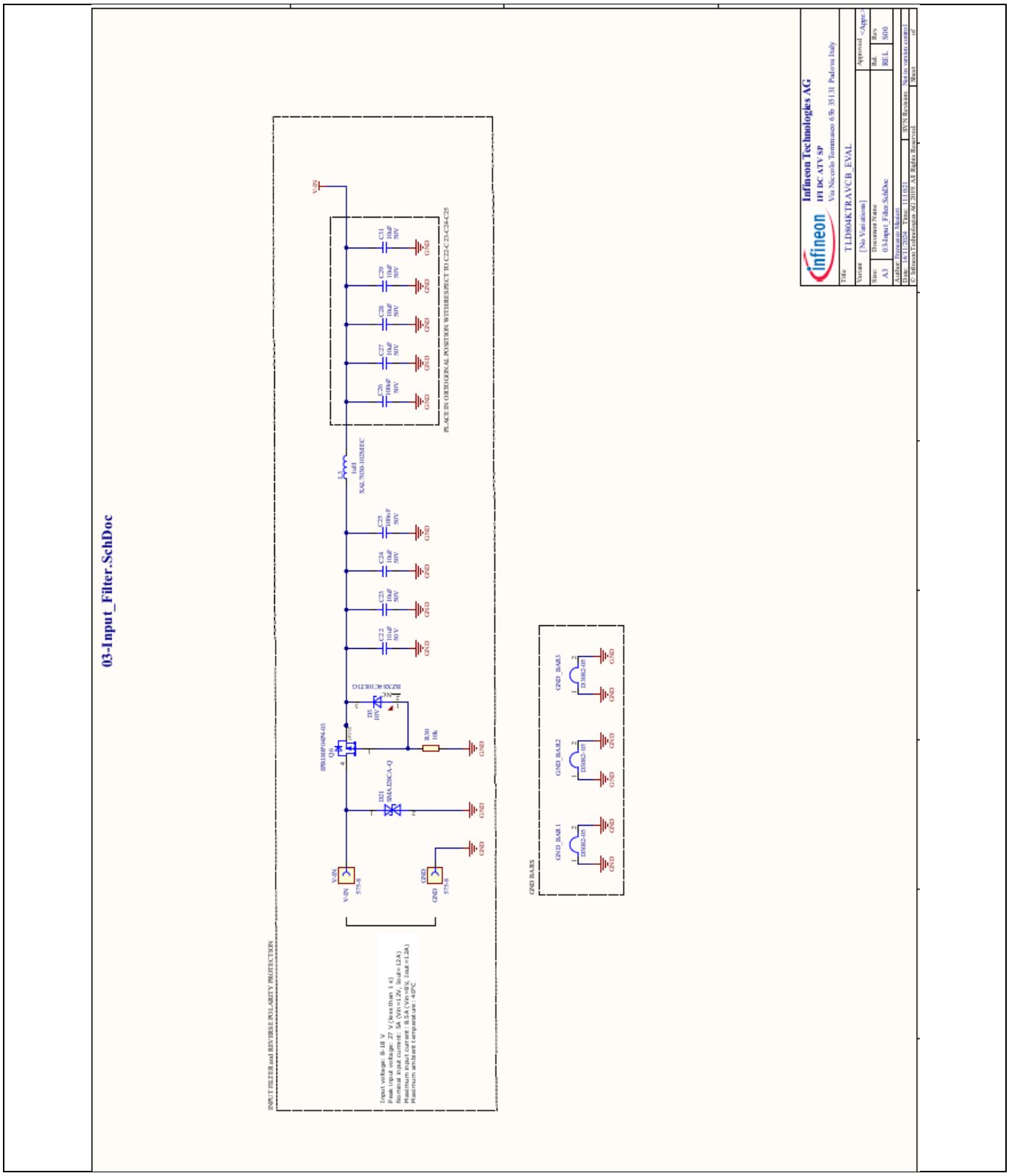

Figure 17 Input filter schematic

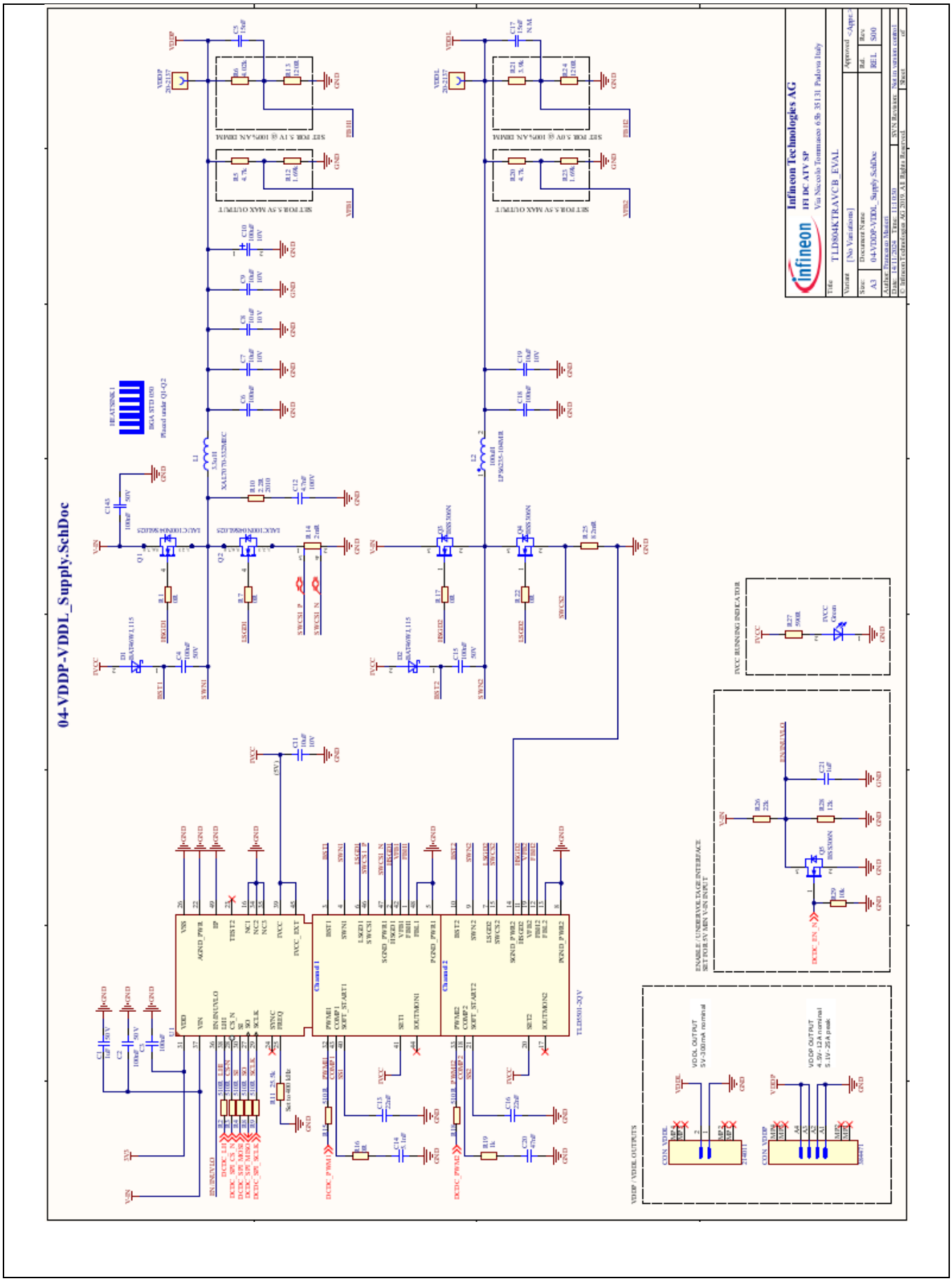

Figure 18 VDDL-VDDL supply schematic

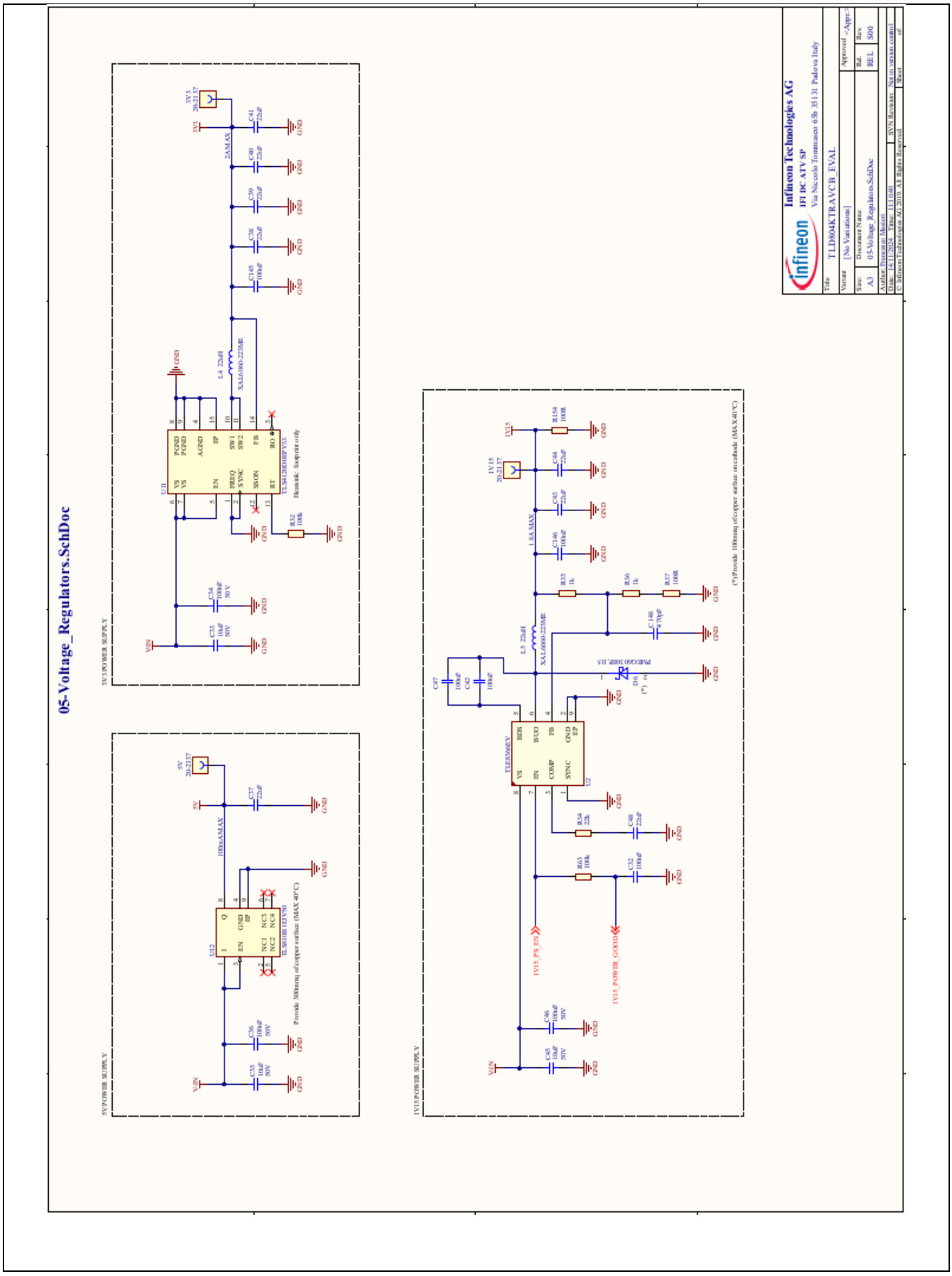

Figure 19 Voltage regulators schematic

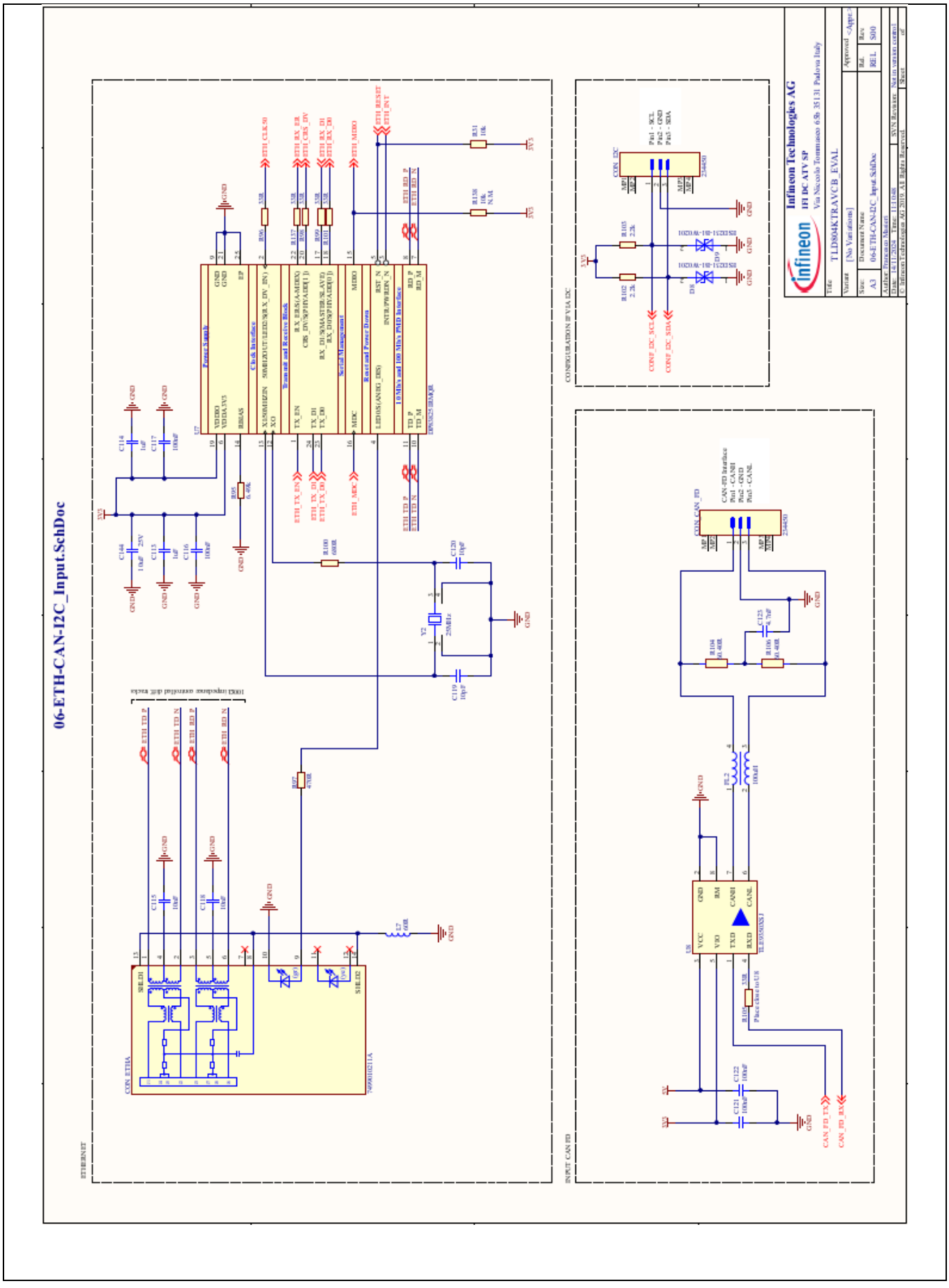

Figure 20 ETH-CAN-I2C input schematic

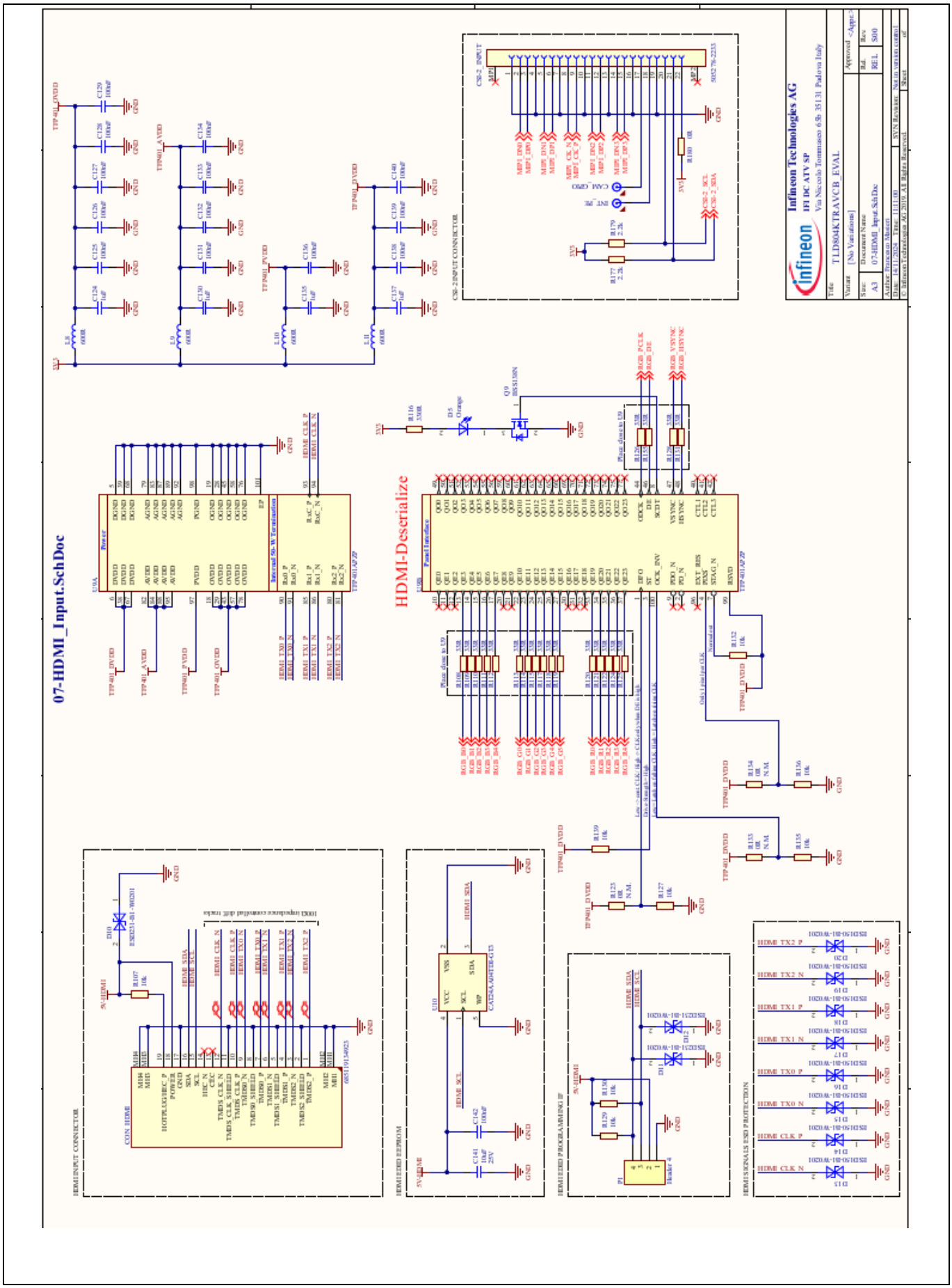

Figure 21 HDMI input schematic

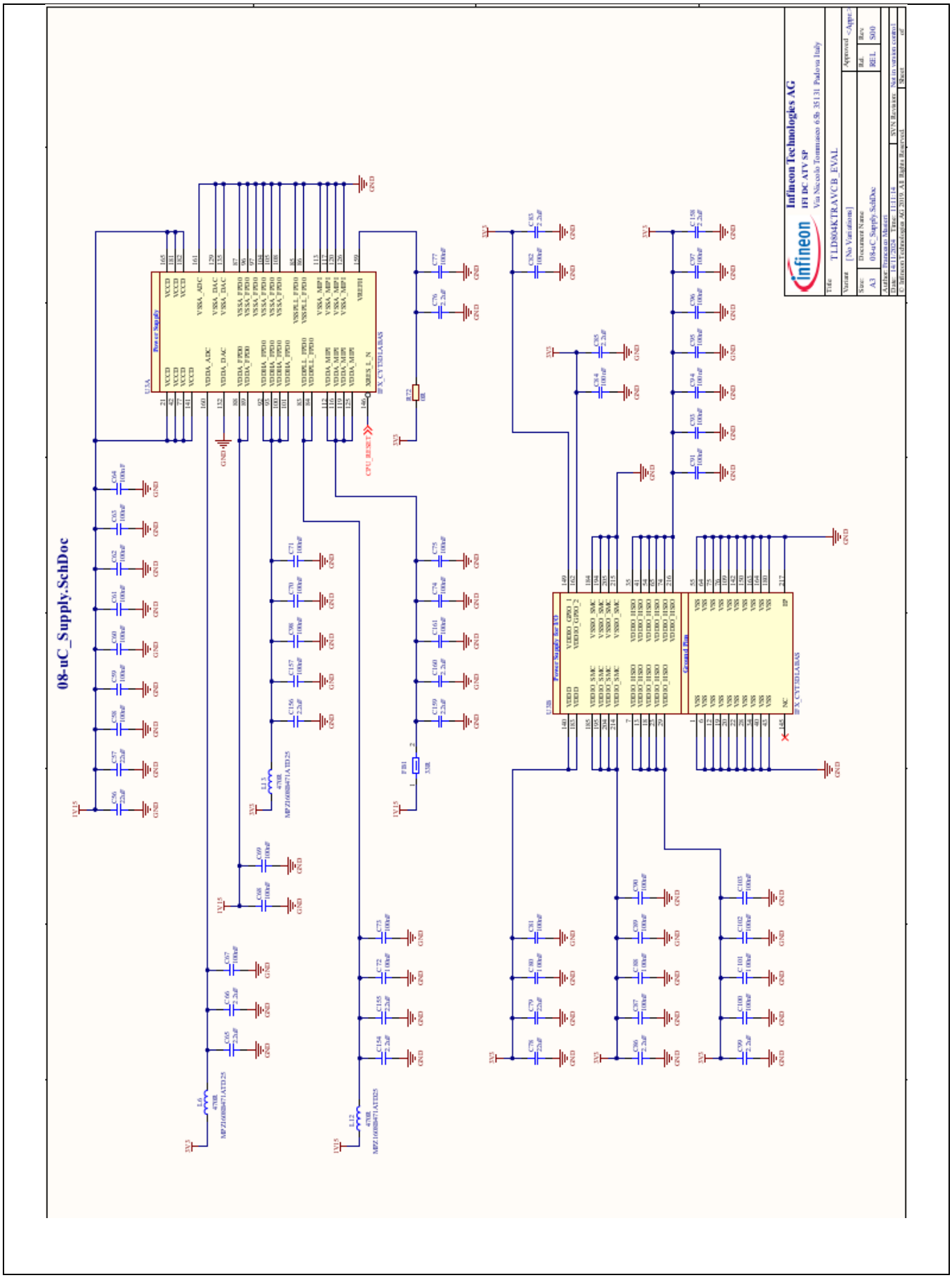

Figure 22 Microcontroller supply schematic

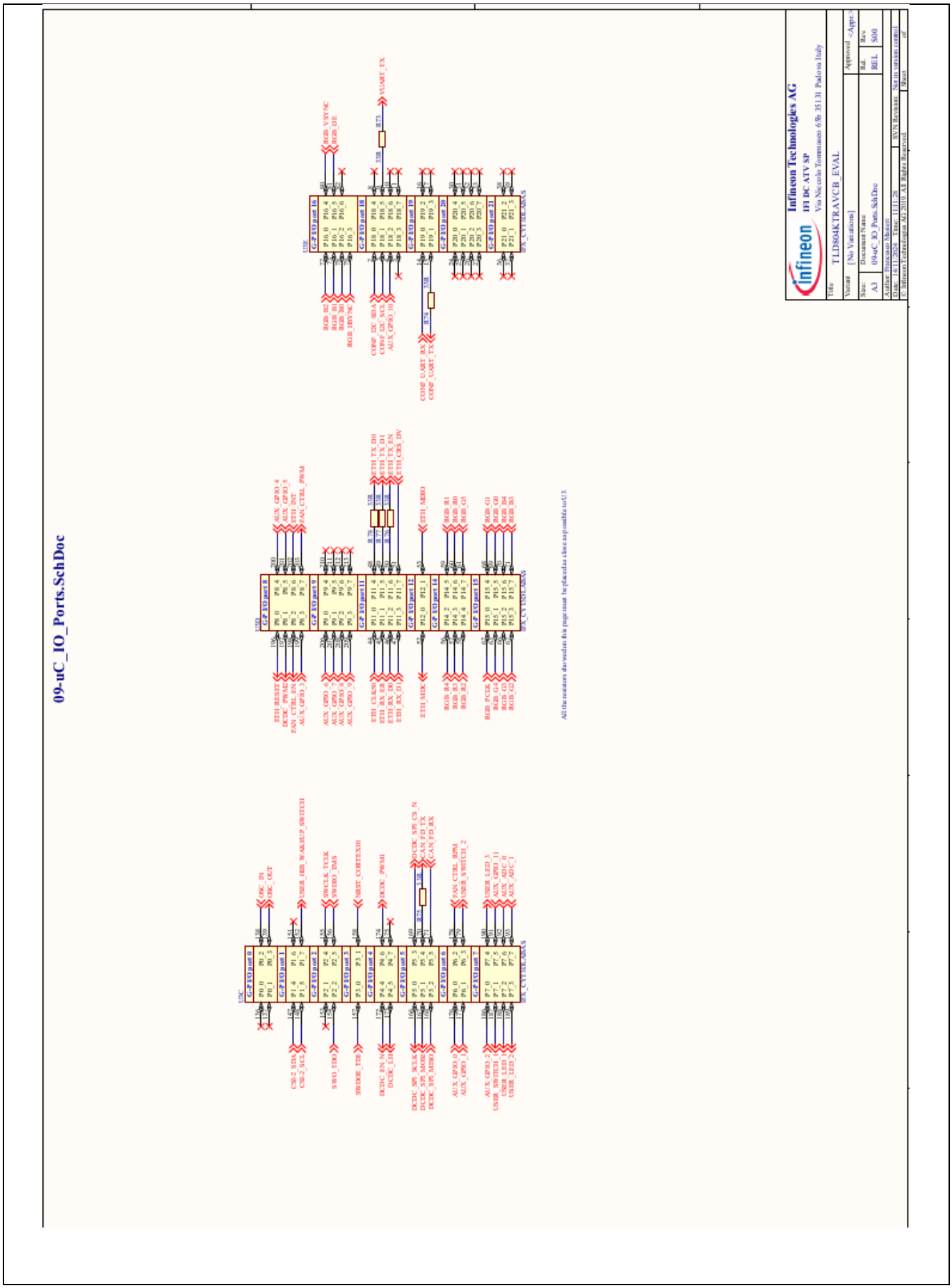

Figure 23 Microcontroller input/output ports schematic

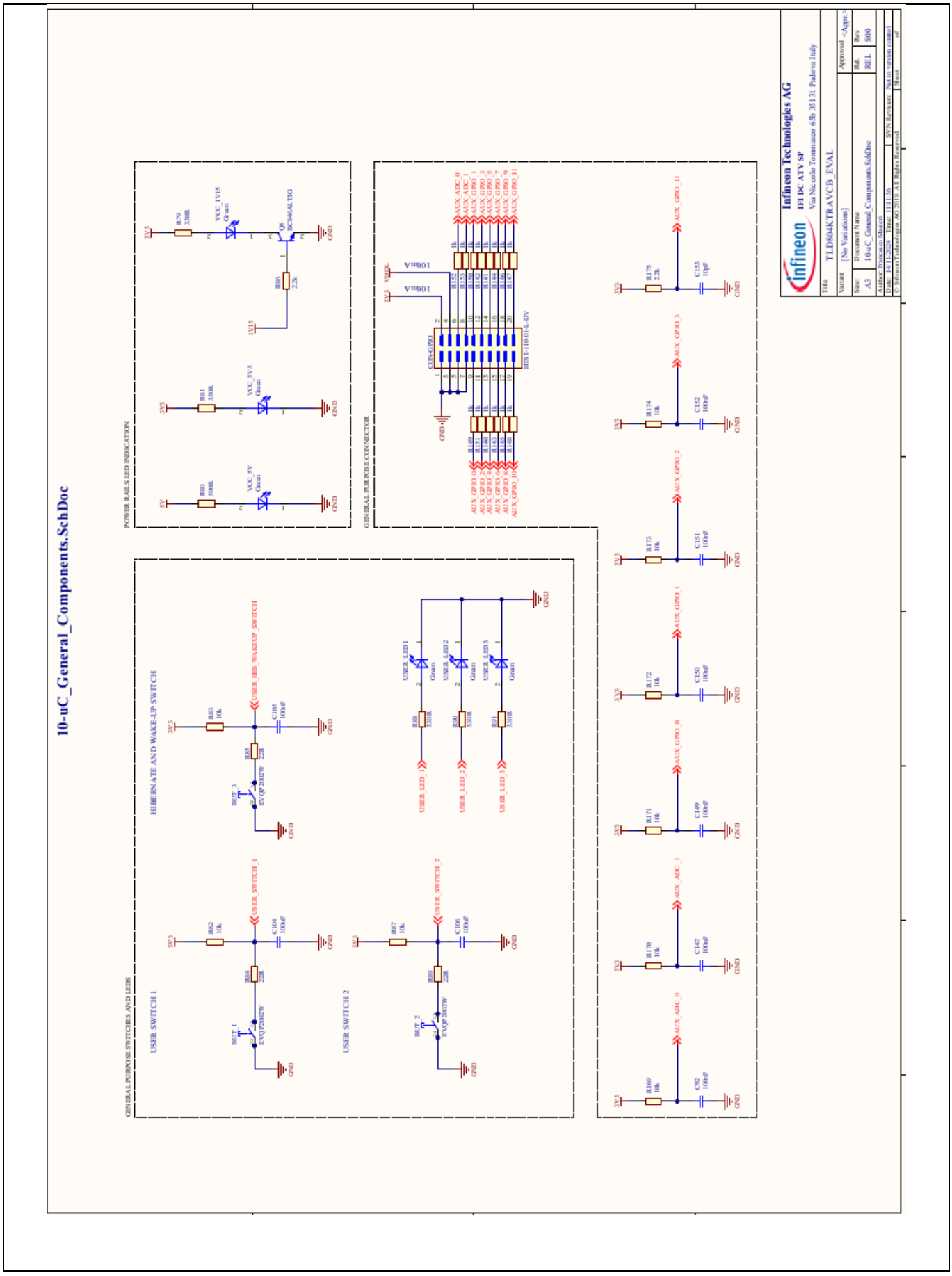

Figure 24 General components of the microcontroller schematic

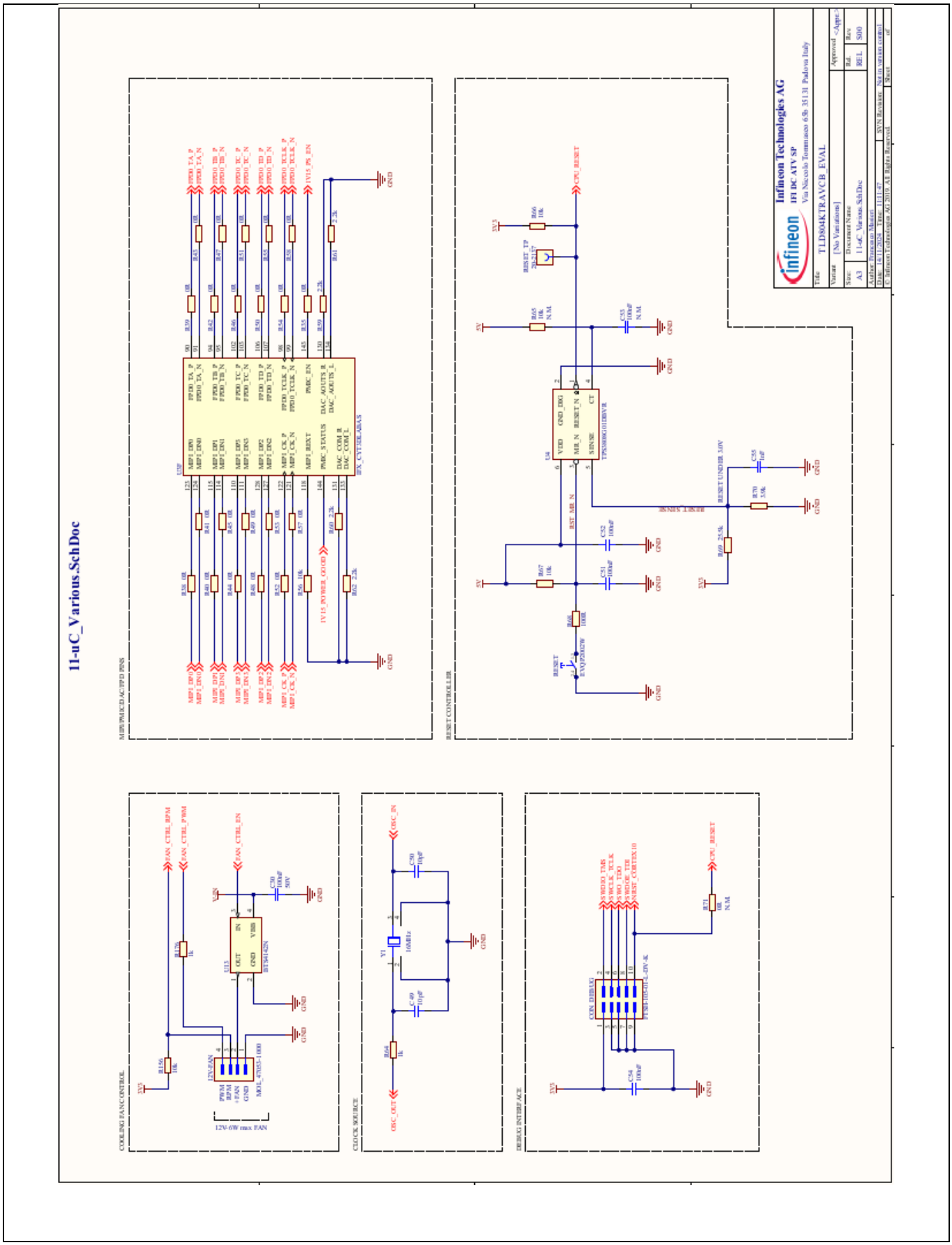

Figure 25 Components of the microcontroller: MIPI input, Crystal, global reset, debug, fan controller schematic

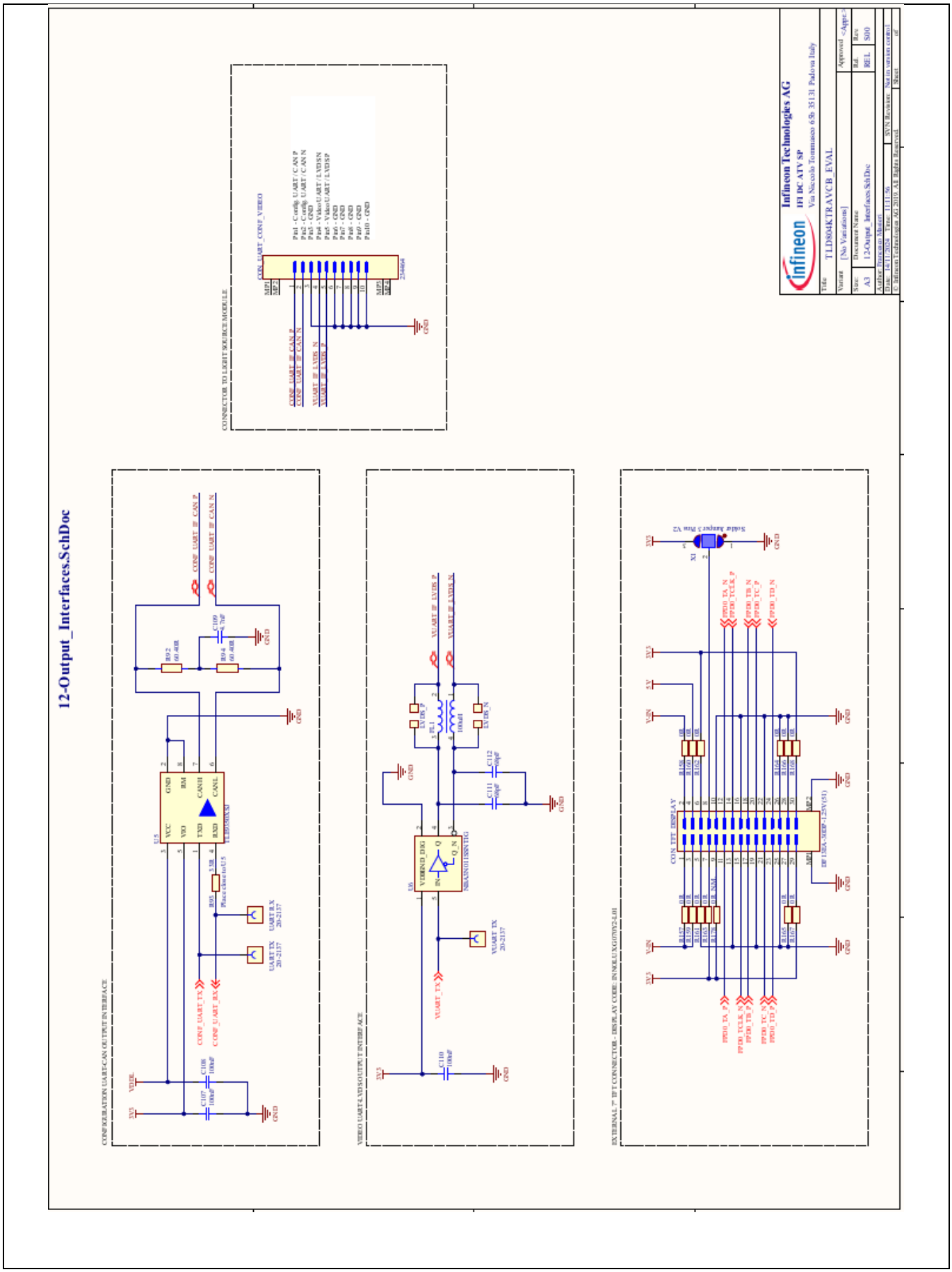

Figure 26 Output interfaces schematic

3.2 Layout

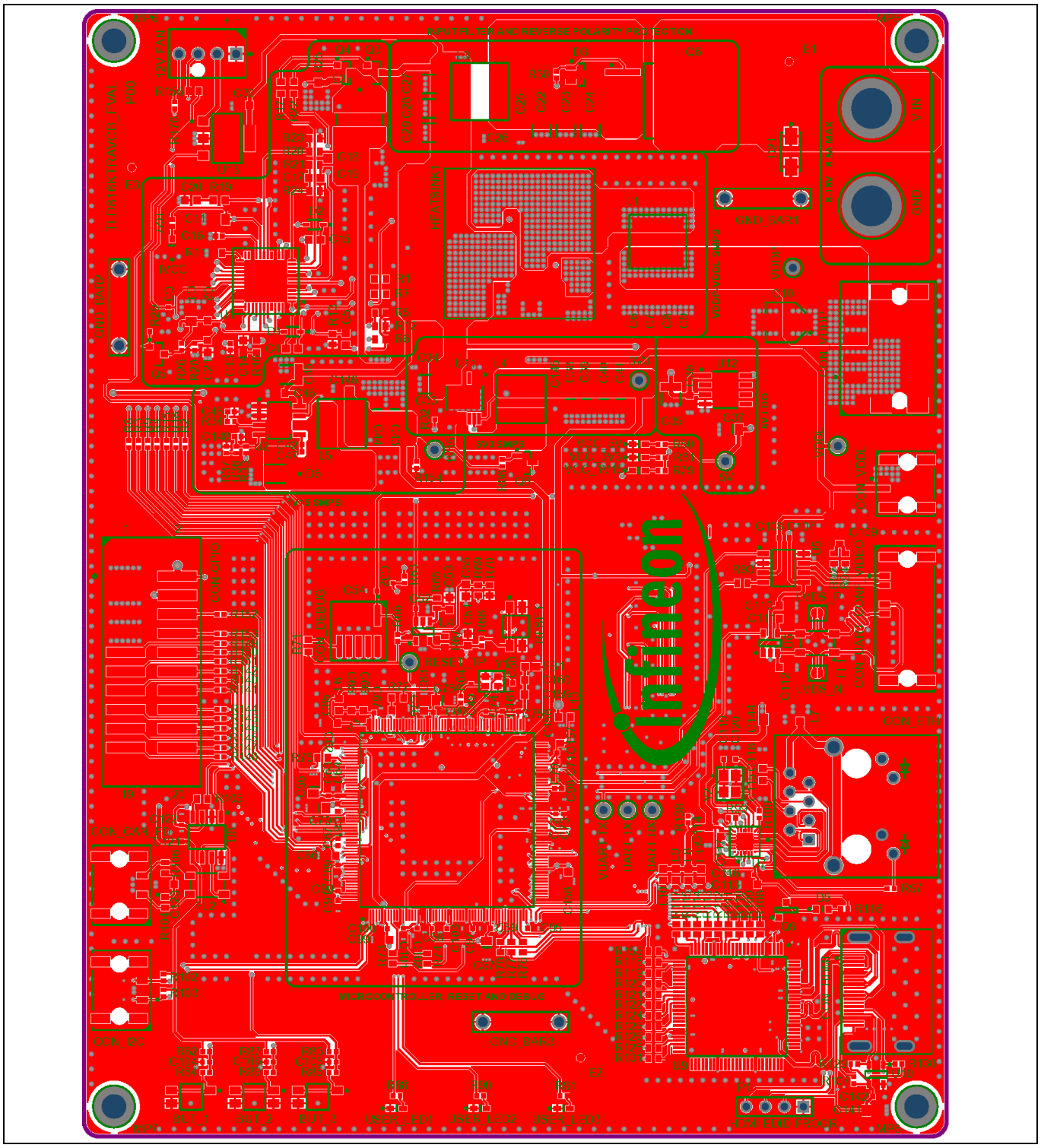

Figure 27 Top layer

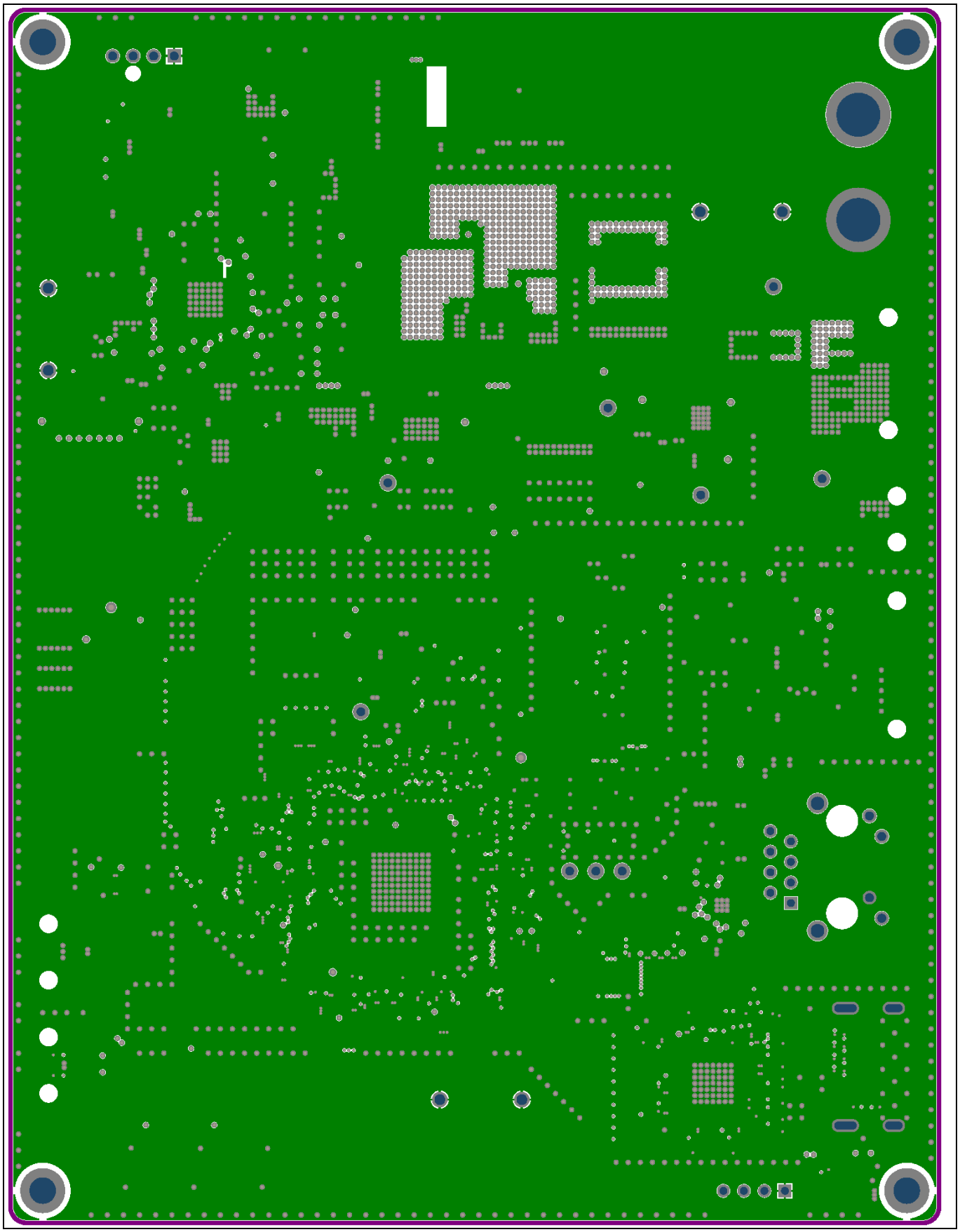

Figure 28 Internal layer (L2)

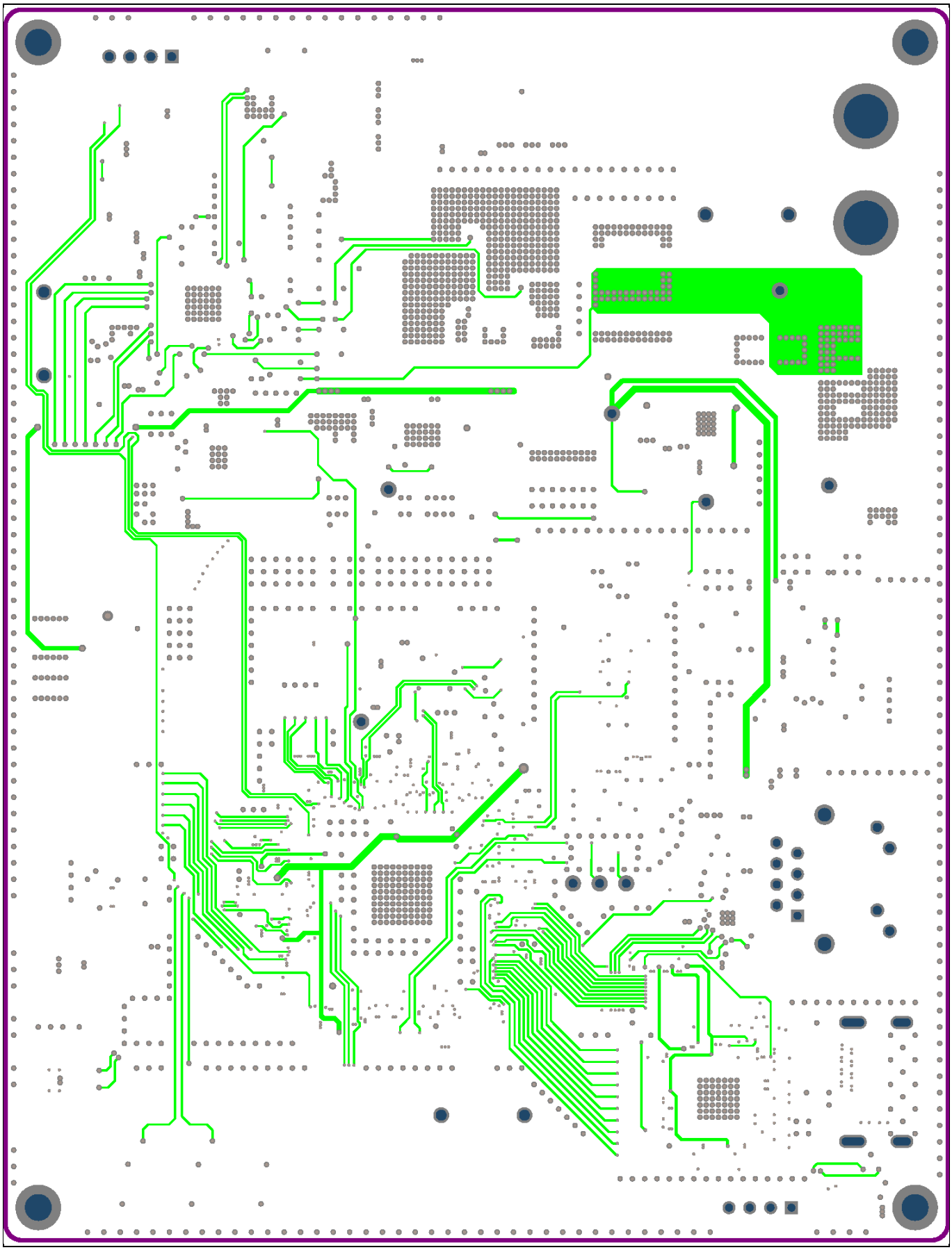

Figure 29 Internal layer (L3)

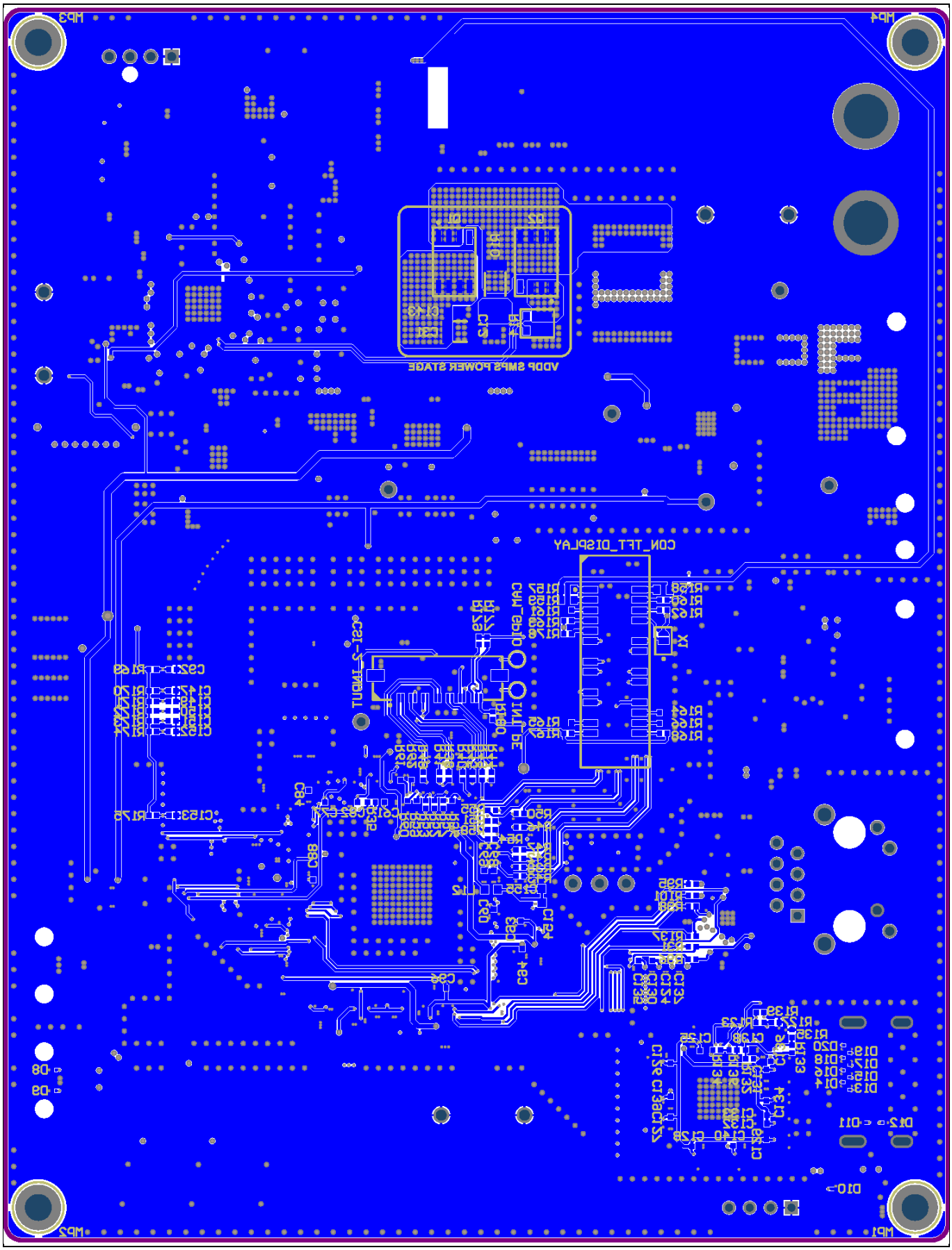

Figure 30 Bottom layer

3.3 Bill of material

Table 7 Bill of material

Designator	Value	Manufacturer	Manufacturer order number
1V15, 3V3, 5V, RESET_TP, UART RX, UART TX, VDDL, VDDP, VUART TX	20-2137	Vero Technologies	20-2137
12V-FAN	MOL_47053-1000	MOLEX Incorporated	47053-1000
BUT_1, BUT_2, BUT_3, RESET	EVQP2002W	Panasonic	EVQP2002W
C1	1 µF	TDK Corporation	CGA4J3X7R1H105K125AB
C2, C4, C6, C15, C18, C25, C26, C30, C51, C110, C143	100 nF	AVX, MuRata	06035C104K4Z2A, GCM188R71C104JA37
C3, C32, C42, C47, C52, C54, C58, C59, C60, C61, C62, C63, C64, C67, C68, C69, C70, C71, C72, C73, C74, C75, C77, C80, C81, C82, C84, C87, C88, C89, C90, C91, C92, C93, C94, C95, C96, C97, C98, C100, C101, C102, C103, C104, C105, C106, C107, C108, C116, C117, C121, C122, C125, C126, C127, C128, C129, C131, C132, C133, C134, C136, C138, C139, C140, C142, C145, C146, C147, C149, C150, C151, C152, C157, C161	100 nF	TDK Corporation	CGA2B1X7R1C104K050BC
C5	15 nF	Kemet	C0603C153K4RAC
C7, C8, C9, C11, C19	10 µF	MuRata	GCM21BR71A106KE22
C10	100 µF	Nichicon	PCG1A101MCL1GS
C12	4.7 nF	MuRata	GCM216R72A472MA37
C13, C16, C48	22 nF	MuRata	GCM155R71E223KA55
C14	5.1 nF	MuRata	GRM188R71E512JA01
C17	15 nF	Kemet	C0603C153K4RAC
C20	47 nF	Kemet	C0603C473J5RACAUTO
C21, C113, C114	1 µF	MuRata	GCM188R71E105KA64
C22, C23, C24, C27, C28, C29, C31, C33, C35, C45	10 µF	MuRata	GRM32ER71H106MA12
C34, C36, C46	100 nF	Samsung	CL10B104KB8WPNC
C37, C38, C39, C40, C41, C43, C44, C56, C57, C78, C79	22 µF	MuRata	GRM21BR61C226ME44

Designator	Value	Manufacturer	Manufacturer order number
C49, C50, C119, C120, C153	10 pF	MuRata	GCM1555C1H100RA16
C53	100 nF	MuRata	GCM188R71E104JA57
C55	1 nF	MuRata	GCM188R71E102JA37
C65, C66, C76, C83, C85, C86, C99, C154, C155, C156, C158, C159, C160	2.2 µF	MuRata	GRM188R61C225KAAD
C109, C123	4.7 nF	Kemet	C0603C472M4GACAUTO
C111, C112	68 pF	Kemet	C0603C680K4GAC
C115, C118	10 nF	MuRata	GCM188R91H103KA37D
C124, C130, C135, C137	1 µF	MuRata	GCM155C71A105KE38D
C141, C144	10 µF	Taiyo Yuden	TMK212BBJ106KGHT
C148	470 pF	MuRata	GCM155R72A471MA37
CAM_GPIO, INT_PE			
CON_CAN_FD, CON_I2C	234450	ERNI	234450
CON_DEBUG	FTSH-105-01-L-DV-K	Samtec	FTSH-105-01-L-DV-K
CON_ETH	7499010211A	Wurth Elektronik	7499010211A
CON_HDMI	6.85119E+11	Wurth Elektronik	6.85119E+11
CON_TFT_DISPLAY	DF13EA-30DP-1.25V (51)	Hirose Connectors	DF13EA-30DP-1.25V (51)
CON_UART_CONF_VIDEO	234464	ERNI	234464
CON_VDDL	214011	ERNI	214011
CON_VDDP	384471	ERNI	384471
CON-GPIO	HTST-110-01-L-DV	Samtec	HTST-110-01-L-DV
CSI-2_INPUT	505278-2233	Molex	505278-2233
D1, D2	BAT46WJ,115	Nexperia	BAT46WJ,115
D3	10V	ON Semiconductor	BZX84C10LT1G
D5	Orange	Vishay	TLMO1100-GS08
D6	PMEG6030EP,115	Nexperia	PMEG6030EP,115
D8, D9, D10, D11, D12	ESD231-B1-W0201	Infineon Technologies	ESD231-B1-W0201
D13, D14, D15, D16, D17, D18, D19, D20	ESD150-B1-W0201	Infineon Technologies	ESD150-B1-W0201
D21	SMAJ28CA-Q	Bourns	SMAJ28CA-Q
FB1	33 Ω	MuRata	BLM18PG330SN1D
FL1, FL2	100 µH	Epcos	ACT45B-101-2P-TL003
GND, V-IN	575-8	Keystone Electronics Corp.	575-8
GND_BAR1, GND_BAR2, GND_BAR3	D3082-05	Harwin	D3082-05
HEATSINK1	BGA STD 050	ABL Components	BGA STD 050
IVCC, USER_LED1, USER_LED2, USER_LED3,	Green	LiteOn Optoelectronics	LTST-C191KGKT

Designator	Value	Manufacturer	Manufacturer order number
VCC_1V15, VCC_3V3, VCC_5V			
L1	3.3 µH	Coilcraft	XAL7070-332MEC
L2	100 µH	Coilcraft	LPS6235-104MR
L3	1 µH	Coilcraft	XAL7030-102MEC
L4, L5	22 µH	Coilcraft	XAL6060-223ME
L6, L12, L13	470 Ω	TDK Corporation	MPZ1608B471ATD25
L7	60 Ω	MuRata	BLM18PG600SN1D
L8, L9, L10, L11	600 Ω	MuRata	BLM18HE601SN1D
LVDS_N, LVDS_P	Solder Jumper 2 Pins	Infineon Technologies	Solder Jumper 2 Pins
MP1, MP2, MP3, MP4	970250321	Wurth Elektronik	970250321
MP5, MP6, MP7, MP8	MP006555	Multicomp	MP006555
P1			
Q1, Q2	IAUC100N04S6L025	Infineon Technologies	IAUC100N04S6L025
Q3, Q4, Q5	BSS306N	Infineon Technologies	BSS306N
Q6	IPB180P04P4-03	Infineon Technologies	IPB180P04P4-03
Q8	BC846ALT1G	ON Semiconductor	BC846ALT1G
Q9	BSS138N	Infineon Technologies	BSS138N
R1, R7, R16, R17, R22, R72, R157, R158, R159	0 Ω	Yageo	AC0603JR-070RL
R2, R3, R4, R8, R9, R15, R18	510 Ω	Panasonic	ERJ2RKF5100X
R5, R20	4.7 kΩ	Vishay	CRCW06034K70FK
R6	4.02 kΩ	Vishay	CRCW06034K02FK
R10	2.2 Ω	Vishay	CRCW20102R20FK
R11, R69	25.5 kΩ	Vishay	CRCW060325K5FK
R12, R23	1.69 kΩ	Vishay	CRCW06031K69FK
R13, R24	120 Ω	Vishay	CRCW0603120RFK
R14	2 mΩ	Vishay	WSKW06122L000FEA
R19	1 kΩ	ROHM Semiconductors	ESR03EZPF1001
R21, R70	3.9 kΩ	Vishay	CRCW06033K90FK
R25	82 mΩ	Panasonic	ERJ-3BWFR082V
R26, R34	22 kΩ	Vishay	CRCW040222K0FK
R27, R80	590 Ω	Vishay	CRCW0402590RFK

Designator	Value	Manufacturer	Manufacturer order number
R28	12 kΩ	Vishay	CRCW040212K0FK
R29, R30, R31, R56, R66, R82, R83, R87, R107, R127, R129, R130, R132, R135, R136, R139, R169, R170, R171, R172, R173, R174	10 kΩ	Vishay	CRCW040210K0FK
R32, R63	100 kΩ	Vishay	CRCW0402100KFK
R33, R36, R64, R140, R141, R142, R143, R144, R145, R146, R147, R148, R149, R150, R151, R152, R153, R176	1 kΩ	Vishay	CRCW04021K00FK
R35, R38, R39, R40, R41, R42, R43, R44, R45, R46, R47, R48, R49, R50, R51, R52, R53, R54, R55, R57, R58, R160, R161, R162, R163, R164, R165, R166, R167, R168	0 Ω	Vishay	CRCW04020000Z0
R37, R68, R154	100 Ω	Vishay	CRCW0402100RFK
R59, R60, R61, R62, R86, R102, R103, R175, R177, R179	2.2 kΩ	Vishay	CRCW04022K20FK
R65	10 kΩ	Vishay	CRCW060310K0FKEA
R67, R156	10 kΩ	Vishay	CRCW060310K0FKEA
R71	0 Ω	Yageo	AC0603JR-070RL
R73, R74, R75, R76, R77, R78, R93, R105, R108, R109, R110, R111, R112, R113, R114, R115, R117, R118, R119, R120, R121, R122, R124, R125, R126, R128, R131, R155	33 Ω	Vishay	CRCW060333R0FKEA
R79, R81, R88, R90, R91, R116	330 Ω	Vishay	CRCW0402330RFK
R84, R85, R89	22 Ω	Vishay	CRCW040222R0FK
R92, R94, R104, R106	60.40 Ω	Vishay	CRCW060360R4FK
R95	6.49 kΩ	Vishay	CRCW04026K49FK
R96, R98, R99, R101, R137	33 Ω	Vishay	CRCW040233R0FK
R97	470 Ω	Vishay	CRCW0402470RFK
R100	680 Ω	Vishay	CRCW0402680RFK

Designator	Value	Manufacturer	Manufacturer order number
R123, R133, R134, R178	0 Ω	ROHM Semiconductors	SFR01MZPJ000
R138	10 kΩ	Vishay	CRCW040210K0FK
R180	0 Ω	ROHM Semiconductors	SFR01MZPJ000
U1	TLD5501-2QV	Infineon Technologies	TLD5501-2QV
U2	TLE8366EV	Infineon Technologies	TLE8366EV
U3	IFX_CYT3DLABAS	Infineon Technologies	CYT3DLABAS
U4	TPS3808G01DBVR	Texas Instruments	TPS3808G01DBVR
U5, U8	TLE9350XSJ	Infineon Technologies	TLE9350XSJ
U6	NBA3N011SSNT1G	ON Semiconductor	NBA3N011SSNT1G
U7	DP83825IRMQR	Texas Instruments	DP83825IRMQR
U9	TFP401APZP (or TFP401PZP)	Texas Instruments	TFP401APZP (or TFP401PZP)
U10	CAT24AA04TDI-GT3	ON Semiconductor	CAT24AA04TDI-GT3
U11	TLS4120D0EPV33	Infineon Technologies	TLS4120D0EPV33
U12	TLS810B1EJV50	Infineon Technologies	TLS810B1EJV50
U13	BTS4142N	Infineon Technologies	BTS4142N
X1	Solder Jumper 3 Pins V2	Infineon Technologies	Solder Jumper 3 Pins V2
Y1	16 MHz	Abracon Corporation	ABM10-16.000MHZ-D30-T3
Y2	25 MHz	Epson	FA-238 25.0000MB-C3

3.4 Connector details

Table 8 CON_VDDL (VDDL power connector)

PIN	Label	Function
1	GND	-
2	VDDL (Default: 5 V)	Power supply for the load board logic

Table 9 CON_VDDP (VDDP power connector)

PIN	Label	Function
1+2	GND	-
3+4	VDDP (Default: 4.5 V)	Power supply for the load board LED matrix

Table 10 12V-FAN (Cooling fan connector)

PIN	Label	Function
1	GND	-

2	+FAN	Power output for the cooling fan motor (equal to V in)
3	RPM	Connect the open collector of fan for speed measure
4	PWM	Digital signal 0 - 3.3V to control via the fan speed

Table 11 CON_DEBUG (Debug-Upload application software connector)

PIN	Label	Function
1	3V3	3.3V Power supply
2	SWDIO_TMS	JTAG test mode select - Serial wire data in-out
3	GND	Ground
4	SWCLK_TCLK	Serial wire clock
5	GND	Ground
6	SWO_TDO	JTAG test data output - Serial wire output
7	GND	Ground
8	SWDOE_TDI	JTAG test data input
9	GND	Ground
10	NRST_CORTEX10	Reset

Table 12 CON_GPIO (GPIOs and power supply connector)

PIN	Label	Function
1	GND	Ground
2	3V3	3.3V Power supply
3	GND	Ground
4	VDDL	VDDL Power supply
5	GND	Ground
6	AUX_ADC_0	Analog or Digital Input. Connected to pin P7.6 of µC.
7	GND	Ground
8	AUX_ADC_1	Analog or Digital Input. Connected to pin P7.7 of µC.
9	AUX_GPIO_0	Digital Input/Output. Connected to pin P6.0 of µC.
10	AUX_GPIO_1	Digital Input/Output. Connected to pin P6.1 of µC.
11	AUX_GPIO_2	Digital Input/Output. Connected to pin P7.0 of µC.
12	AUX_GPIO_3	Digital Input/Output. Connected to pin P8.3 of µC.
13	AUX_GPIO_4	Digital Input/Output. Connected to pin P8.4 of µC.
14	AUX_GPIO_5	Digital Input/Output. Connected to pin P8.5 of µC.
15	AUX_GPIO_6	Digital Input/Output. Connected to pin P9.0 of µC.
16	AUX_GPIO_7	Digital Input/Output. Connected to pin P9.1 of µC.
17	AUX_GPIO_8	Digital Input/Output. Connected to pin P9.2 of µC.
18	AUX_GPIO_9	Digital Input/Output. Connected to pin P9.3 of µC.
19	AUX_GPIO_10	Digital Input/Output. Connected to pin P18.2 of µC.
20	AUX_GPIO_11	Digital Input/Output. Connected to pin P7.5 of µC.

Table 13 CON_UART_CONF_VIDEO

PIN	Label	Function
1	CONF_UART_IF_CAN_P	Configuration UART over CAN. Positive signal.
2	CONF_UART_IF_CAN_N	Configuration UART over CAN. Negative signal.
3	GND	Ground
4	VUART_IF_LVDS_N	Video UART over LVDS. Low signal.
5	VUART_IF_LVDS_P	Video UART over LVDS. High signal.
6	GND	Ground
7	GND	Ground
8	GND	Ground
9	GND	Ground
10	GND	Ground

Table 14 CON_I2C (Configuration interface via I^2C)

PIN	Label	Function
1	CONF_I2C_SCL	I^2C Clock signal
2	GND	Ground
3	CONF_I2C_SDA	I^2C Data signal

Table 15 CON_CAN_FD (Configuration interface via CAN)

PIN	Label	Function
1	CAN H	CAN signal Positive
2	GND	Ground
3	CAN H	CAN signal Negative

3.5 Test points

Table 16 Test point overview

Number	Label	Function
1	VDDP	Output of VDDP DC-DC power supply
2	VDDL	Output of VDDL DC-DC power supply
3	3V3	Output of 3.3 V DC-DC power supply
4	5V	Output of 5 V linear power supply
5	1V15	Output of 1.15 V DC-DC power supply
6	RESET_TP	Reset signal on the microcontroller XRES_L_N pin
7	VUART TX	Video UART output from microcontroller
8	UART TX	Configuration UART output from microcontroller
9	UART RX	Configuration UART input to microcontroller

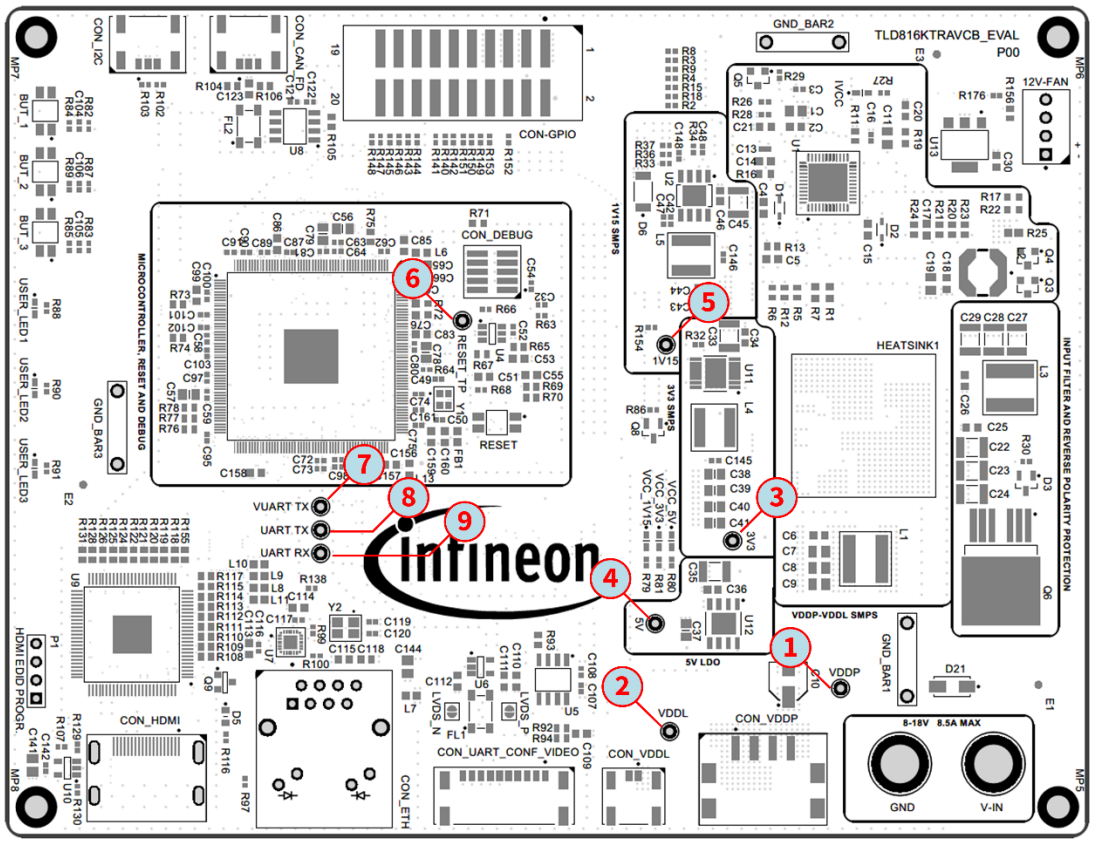

Figure 31 Test point map

Revision history

Document revision	Date	Description of changes
Rev. 01.00	2025-01-14	Initial version

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

Edition 2024-06-21

Published by

Infineon Technologies AG

81726 Munich, Germany

Do you have a question about this document?

Email: erratum@infineon.com

Document reference

Z8F80744778

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.