TriBoard Manual TC3X6 ADAS

Hardware: TriBoard TC3X6 ADAS TH V1.0 and TriBoard TC3X6 ADAS V1.0

About this document

Scope and purpose

The User Manual provide information about using, configuration and connecting the TriBoard with Infineon AURIX™ TC3X6 ADAS device. The manual provide information for different hardware types. There exist different hardware with Through Hole socket (TriBoard TC3X6 ADAS TH) and soldered devices (TriBoard TC3X6 ADAS). The schematic is identically for the all boards if not other mentioned in chapter schematic. The placing on the boards is slightly different on bottom side around the TC3X6 ADAS itself dependent of the space (socket need more space and has through hole), but the most components are on the same location (only CB203 and CB520 are rotated and short shifted). All figures are valid for each board if not differently mentioned.

Intended audience

Design, verfication, test and software engineers will use this document to get an understanding of the functionality and connections of the TriBoard.

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1 Introduction

We congratulate you on your purchase of the TriCore Evaluation Board. This kit is a versatile tool, providing quick access to the capabilities of TriCore's powerful architecture.

Applications can be developed easily. The Evaluation Board is equipped with a variety of memories and peripherals for connection to the environment. There is also an interface for the On Chip Debugging Features (OCDS1 and DAP).

The Evaluation Board allows easily the development of TriCore applications with the corresponding tools.

Subsequently, the applications can be downloaded and can be tested with the powerful debugger software.

This TriBoard Hardware Manual familiarizes you with the TriCore Evaluation Board and guides you through the initial configuration of the TriBoard.

For detailed technical information about the TC3X6 ADAS (e.g. TC356) please refer to the User Manual of the used device.

2 Features

2.1 Summary of Features

- Infineon's TC3X6 ADAS (TC356, TC336DA) AURIX™ 2G Controller in LFBGA-180_ADAS Package
- FlexRay™ [1] Transceivers
- High Speed CAN Transceivers (CAN-FD capable)
- USB to UART bridge
- Ethernet Gigabit PHY
- Serial Eeprom
- LIN Transceiver
- Crystal 20MHz (default) or External Clock
- USB miniWiggler JDS for easy debugging
- 8 Low Power Status LEDs
- 8-DIP switches for configuration
- access to all pins of controller
- 100mm x 160mm (EURO-Board)

Connectors

The TC3X6 ADAS TriBoard offers a wide variety of connectors:

- Standard power connector
- Micro USB connector for ASC Interface (ASC0) and miniWiggler
- RJ45 connector for Ethernet
- 16-pin header for JTAG interface (OCDS)
- 2 x 10-pin header for DAP and DAP_SCR
- 10pin (2x5) Header for LIN Transceiver (LIN)
- 2 x 10pin (2x5) Header for CAN High Speed Transceiver (CAN0 and CAN1)
- 2 x 10pin (2x5) Header for FlexRay™ (ERAY-A and ERAY-B)
- 1 x 60pin (2x30) high speed connector for MMIC/RIF
- four 80-pin connectors (male) + four 80-pin connectors (female) with all I/O signals
- optional ETK connector

Components

- Infineon's Multi Voltage System Supply TLF30682QVS01
- Three LEDs to validate power supply (5Volt / 3,3 Volt / 1,25 Volt)
- LED indicating /HDRST (ESR0) active state
- LED indicating activ miniWiggler JDS
- LED switched via DAS software
- 2 x Infineon's FlexRay™ Transceiver TLE9221SX
- 2 x Infineon's High Speed CAN-Transceiver TLE9251VSJ
- Infineon's LIN-Transceiver TLE 7259-3GE
- USB to UART bridge FT2232HL (FTDI)
- Integrated 10/100/1000M Ethernet Precision Transceiver RTL8211FI-CG (Realtek)
- 8 general purpose LEDs
- 2K I^2C Serial Eeprom with EUI-48™ [2] Node Identity (MICROCHIP)

1) FlexRay™ is a trademark of FlexRay Consortium.
2) EUI-48™ is trademarked by IEEE

Features

- Reset switch
- Wakeup switch
- Generic switch
- 4-pin Dip switch

Zero Ohm Bridges

Zero Ohm resistors give the flexibility to configure the systems functionality.

2.2 Block Diagram

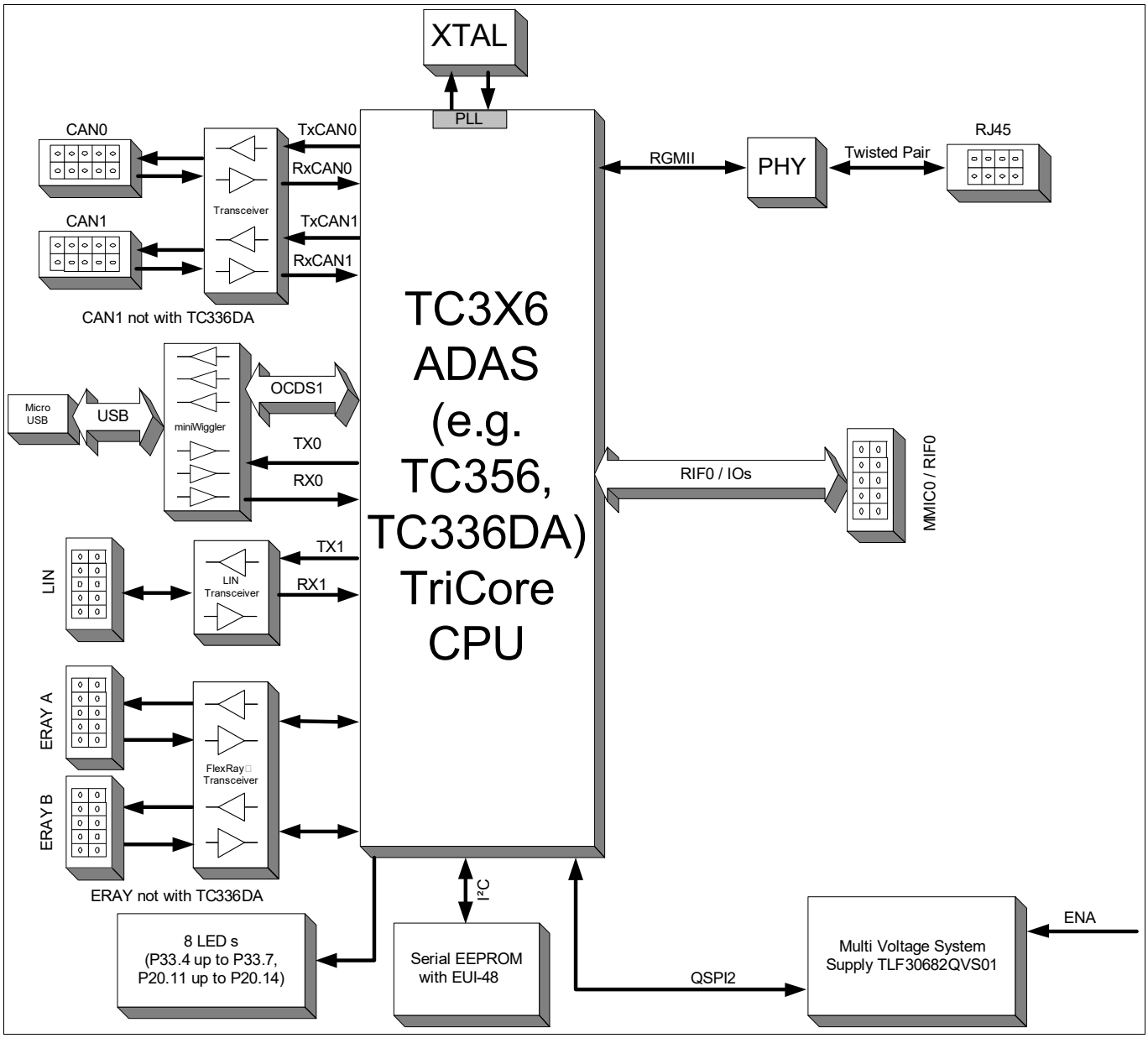

Figure 2-1 TriBoard Block Schematic

2.3 Placement

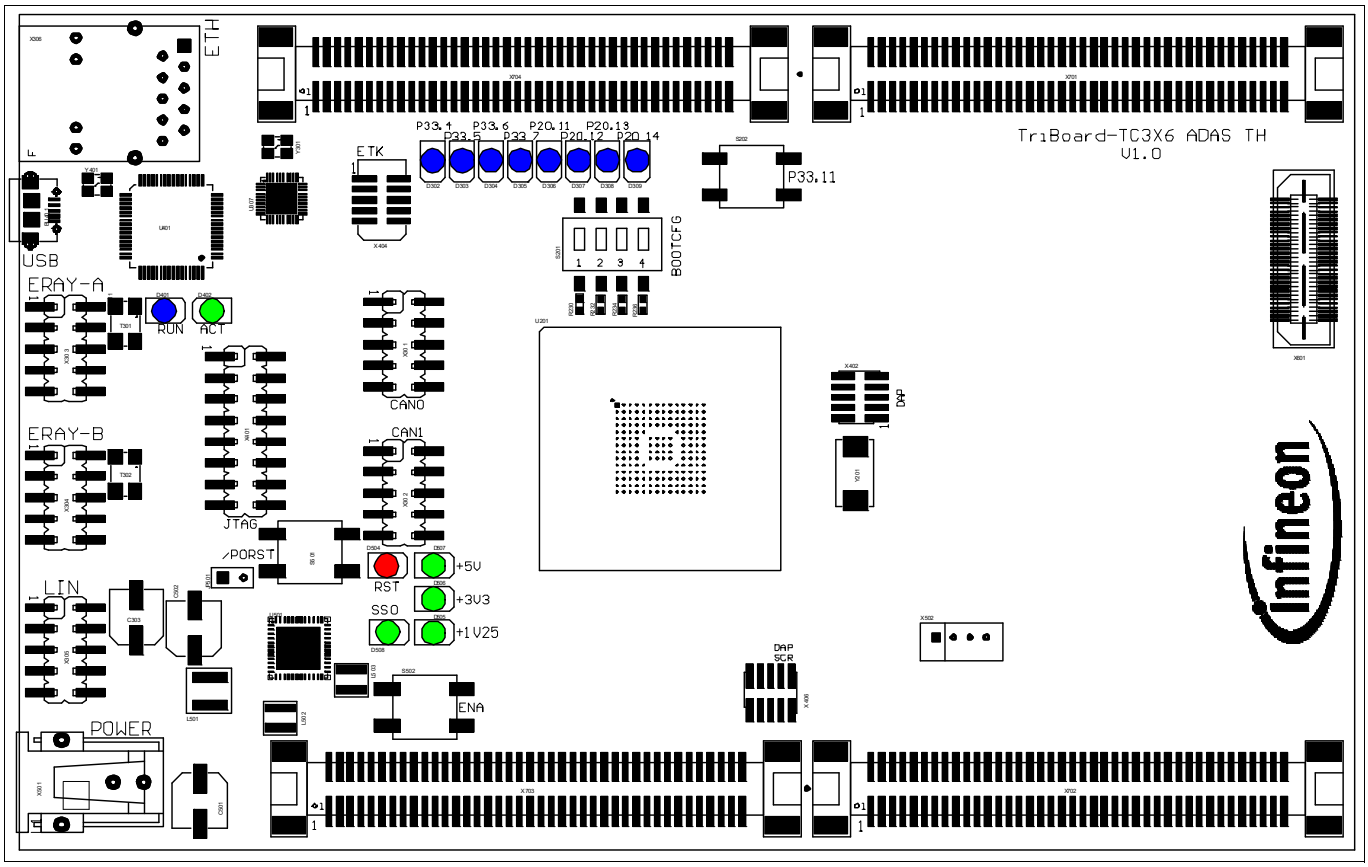

Figure 2-2 TriBoard TC3X6 ADAS (TH) V1.0 Placement

3 TriBoard Information

3.1 Soldered board

TriBoard TC3X6 ADAS V1.0 is the soldered board and will be available only with usable devices. Please see also chapter **Usable devices**.

3.2 Socketed board

TriBoard TC3X6 ADAS TH V1.0 is the socketed board.

3.2.1 Usable devices

Note: *Note: Please check always the latest manual for complete list of usable/tested devices.*

The board can be used with the following devices:

- TC356
- TC336DA

3.2.2 Restricted usable devices

- TC366
- TC336LP
  - RIF / MMIC not usable
  - Ethernet will not work
  - different pinning therefore following signals are different connected

Board signal name	TC366 signal name	TC336LP signal name
P00.0	AN17	NC
P02.0	AN32 / P40.4	AN32 / P40.4
P02.1	P00.1	P00.1
P02.2	AN38 / P40.8	AN38 / P40.8
P02.3	AN16	NC
P02.4	AN36 / P40.6	AN36 / P40.6
P02.5	AN37 / P40.7	AN37 / P40.7
P02.6	AN25 / P40.1	NC
P02.7	AN33 / P40.5	AN33 / P40.5
P02.8	AN24 / P40.0	NC
P10.1	P02.8	P02.8
P10.2	P00.2	P00.2
P10.3	P00.0	P00.0
P10.7	P00.5	P00.5
P10.8	P00.6	P00.6
P11.0	P13.0	P13.0
P11.1	P13.1	P13.1

Board signal name	TC366 signal name	TC336LP signal name
P11.3	P11.11	P11.11
P11.4	P11.3	P11.3
P11.5	P11.10	P11.10
P11.6	P11.9	P11.9
P11.7	P10.4	P10.4
P11.8	P10.1	P10.1
P11.9	P11.12	P11.12
P11.10	P10.2	P10.2
P11.11	P11.8	P11.8
P11.12	P10.0	NC
P11.13	P14.8	NC
P11.14	P13.3	P13.3
P11.15	P11.6	P11.6
P12.0	P14.10	NC
P12.1	P13.2	P13.2
P50.0	P02.1	P02.1
P50.1	P02.2	P02.2
P50.2	P02.5	P02.5
P50.3	P02.4	P02.4
P50.4	P02.6	P02.6
P50.5	P02.7	P02.7
P50.6	P00.4	P00.4
P50.7	P00.3	P00.3
P50.8	P00.8	P00.8
P50.9	P00.7	P00.7
P50.10	P00.12	P00.12
P50.11	P00.9	P00.9
AN0	AN4	AN4
AN10	AN7	AN7
AN12	AN10	AN10

3.3 Power Supply

All needed voltages are generated via Infineon's Multi Voltage System Micro Processor Supply TLF30682QVS01.

The TLF30682QVS01 provide the following voltages:

+3,3V for TriCore (connected to VEXT and VEVRSB) and Ethernet Phy

+5V supply (used by CAN and FlexRay™ transceivers and is connected to VDDM and VAREFx)

+1,25V for TriCore (connected to VDD)

Applying a stable supply voltage causes the power on reset after a short period. The three LED's (+5V, +3.3V, +1V25) indicate the status of the on board generated voltages.

A manual power on reset is executed by pressing the reset button.

The Board has to be connected to a +3,5V to +40V DC power supply.

The power consumption is not specified yet but a supply with 12V and 500mA is recommended. The pinout for the supply connector is shown in **Figure 6-5**. There can be used any standard power pack with a connector where the positive line is surrounded by the ground line.

Note: The TLF30682QVS01 has a programmable voltage for the core supply. The default value for core supply is 1,20V. This can and must be changed to 1,25 V by software to avoid problems with undervoltage on VDD. For more information please see the corresponding Target Datasheet of TLF30682.

3.3.1 Failsafe handling

In case that the device don't contains a program which disable or service the window watchdog of the TLF30682 then the TLF30682 is going to a FAILSAFE state where all supplies are switched off. This state can be left via reconnect the power plug or via the ENA/WAKE button (S502). In this case you must connect a debugger which is able to disable the window watchdog and error pin monitor to reprogram the microcontroller.

In the default state of the board the switching to FAILSAFE state is switched off via resistor R508 (0R).

If you will use/evaluate all safety features of the TLF30682 remove assembled R508. Make sure that you have a proper initialization of TLF30682 in your software. If needed you can assembled a 2,54mm jumper on JP501. With this jumper you can then enable the safety features (jumper open) or disable the safety features (jumper closed).

Resistor R508 and jumper JP501 are red marked in the following **Figure 3-1** and **Figure 3-2**:

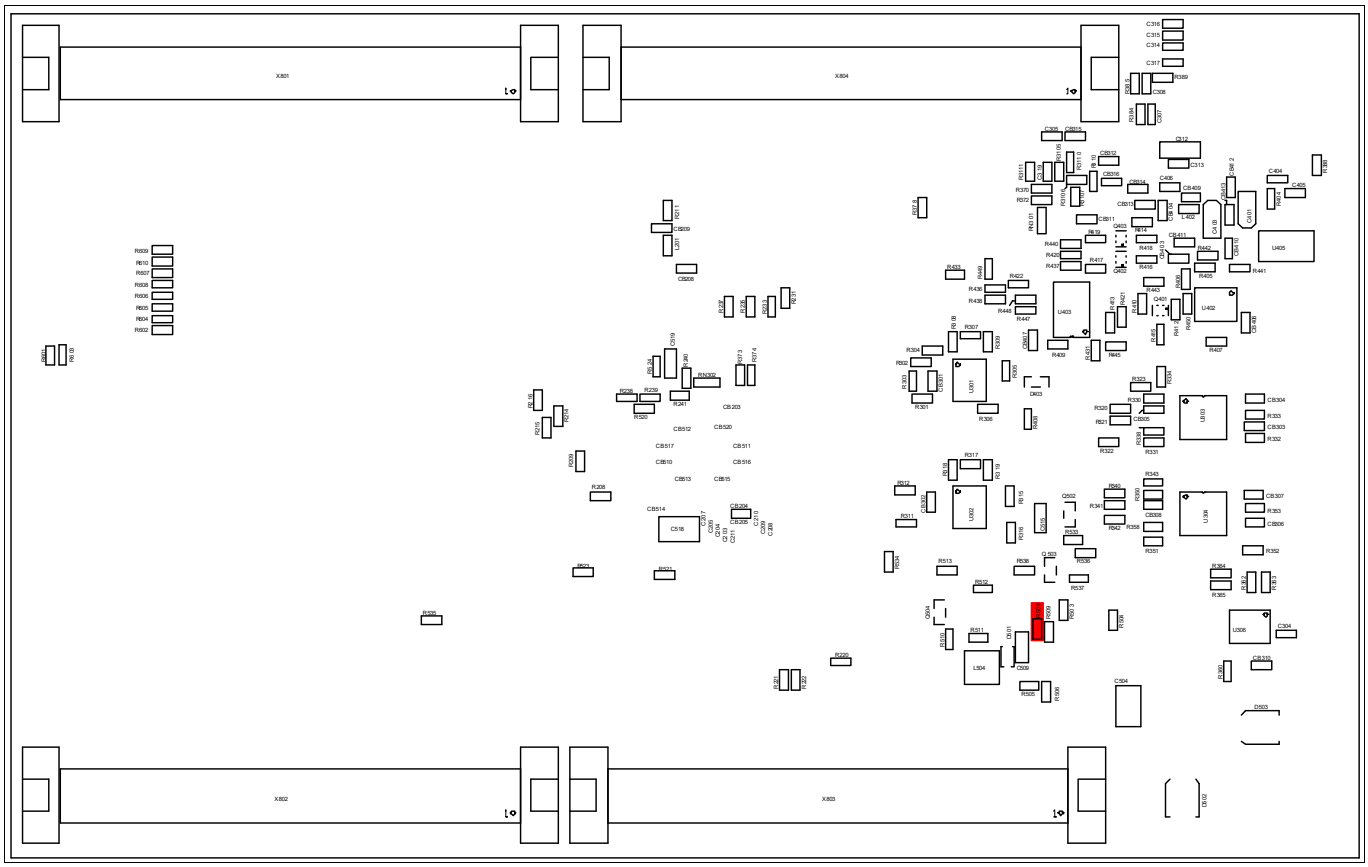

Figure 3-1 Resistor for TLF30682 Safety feature handling with switch on

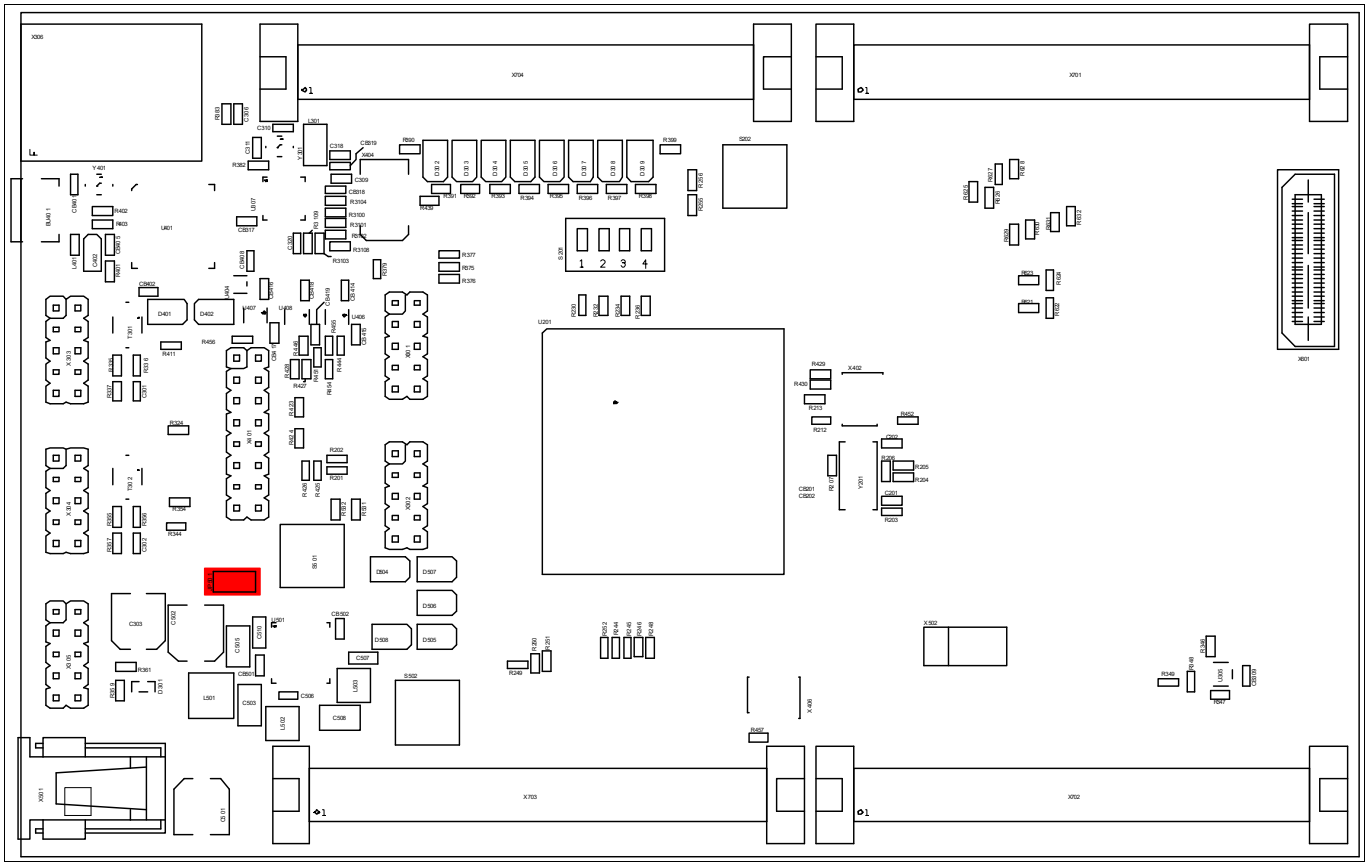

Figure 3-2 Jumper for TLF30682 Safety feature handling with switch on

3.4 LEDs

There are 15 LEDs on board:

- D302 up to D305 (blue) -> toogle LEDs connected to P33.4 ... P33.7
- D306 up to D309 (blue) -> toogle LEDs connected to P20.11 ... P20.14
- D504 RST (red) -> RESET LED indicate the reset state of the board (/ESR0)
- D505 +1V25 (green) -> +1V25 power supply indication
- D506 +3V3 (green) -> +3,3V power supply indication
- D507 +5V (green) -> +5V power supply indication
- D508 SSO (green) -> not usable, please ignore
- D402 ACT (green) -> on board miniWiggler JDS is ACTIV
- D401 RUN (blue) -> Debug RUN mode (switched by DAS Server)

3.5 MMIC / RIF

The board has 1High Speed Samtec QSH-030 connectors where you can connect a MMIC board. For the pinout of the connector see **Figure 6-11**. The description of the used port for the connector you can find in **Table 5-7**.

3.5.1 Measurement RIF signals

The RIF signales (P50) are also connected to X701 and X801. If they make problems (e.g. many reflections on the lines) then you can disconnect the X701 and X801 and the signals are only usable/available on the MMIC/RIF connector.

On the TC3X6 ADAS Triboard this resistors are R621 up to R632 for P50 (RIF0). This resistors needs to be removed (red marked in **Figure 3-3**).

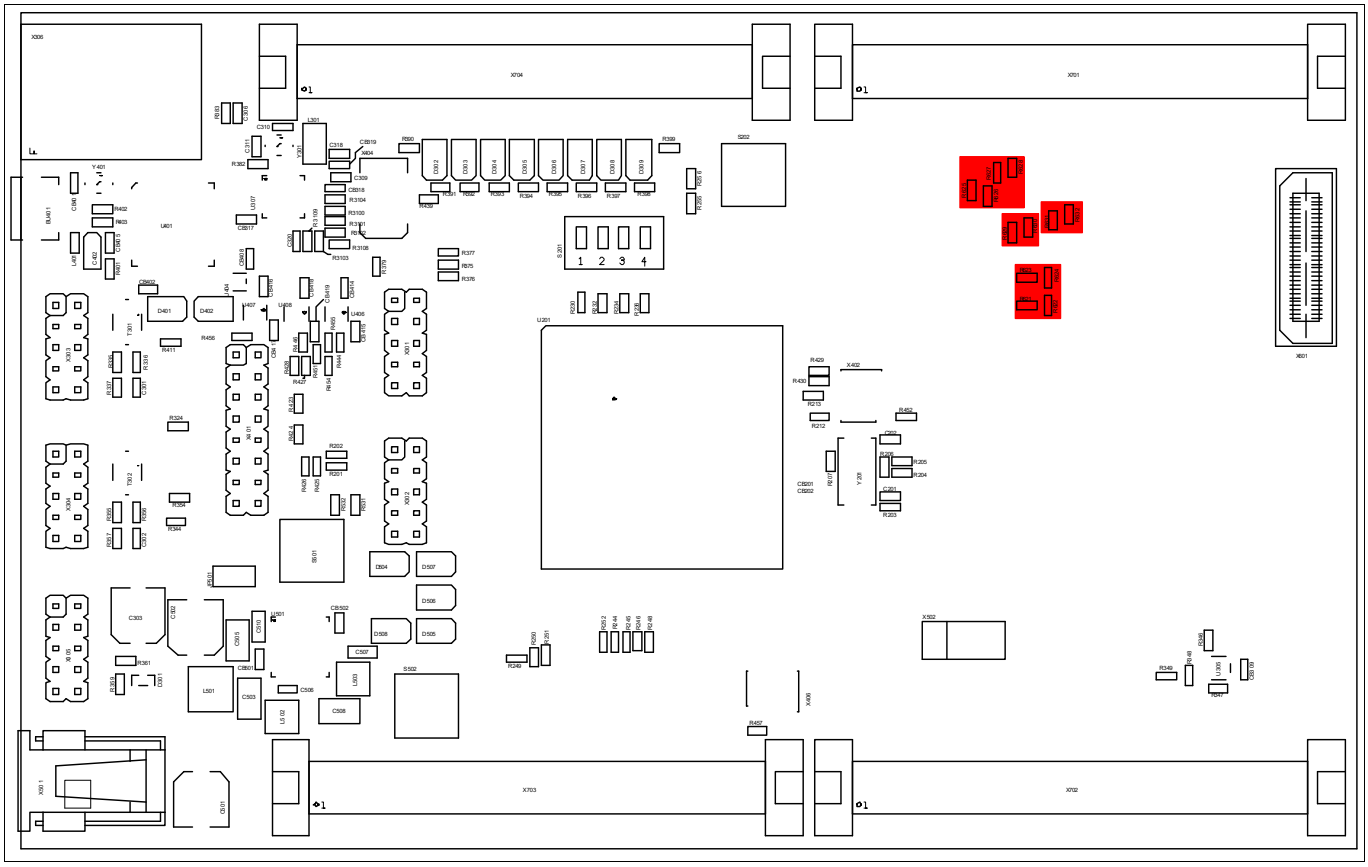

Figure 3-3 Resistors for measurement RIF signals on TriBoard TC3X6 ADAS (TH) V1.0

3.6 Clock

On the board is a fixed crystal with 20MHz assembled. You can change this by replacing Y101 (soldered).

3.7 USB Connector

The USB connector is used for connection to a PC. Via the USB it is possible to power the board, using the ASCLIN0 as serial connection via USB and Debugging via DAS. For the pinout of USB socket see **Figure 6-6**.

NOTE: Before connecting the board to the PC, make sure that the actual DAS software is installed on the PC. For actual DAS software please contact your local FAE.

The software can also be found on:

DAS website

3.7.1 Serial Connection to PC

After the first connection of USB to a PC the needed driver will be installed automatically. During this there will be created a new COM port on PC. This COM port can be used to communicate with the board via ASCLIN0 of the device. Per default the ASCLIN0 is used on P14.0 and P14.1 (e.g. Generic Bootstrap Loader) . In case you will use the Generic Bootstrap Loader via CAN or ASCLIN0 via P15.2 and P15.3 you must:

- remove R436 and R437 (this disconnect the serial connection from P14.0 and P14.1)
- remove R301 and R302 (this disconnect the CAN0 transceiver from P20.7 and P20.8)
- assemble R438 and R440 with 0R resistor (size 0603) to connect P15.2 and P15.3 to serial connection
- assemble R303 and R304 with 0R resistor (size 0603) to connect P14.0 and P14.1 to CAN0 transceiver

The mentioned resistors are red marked in **Figure 3-4**.

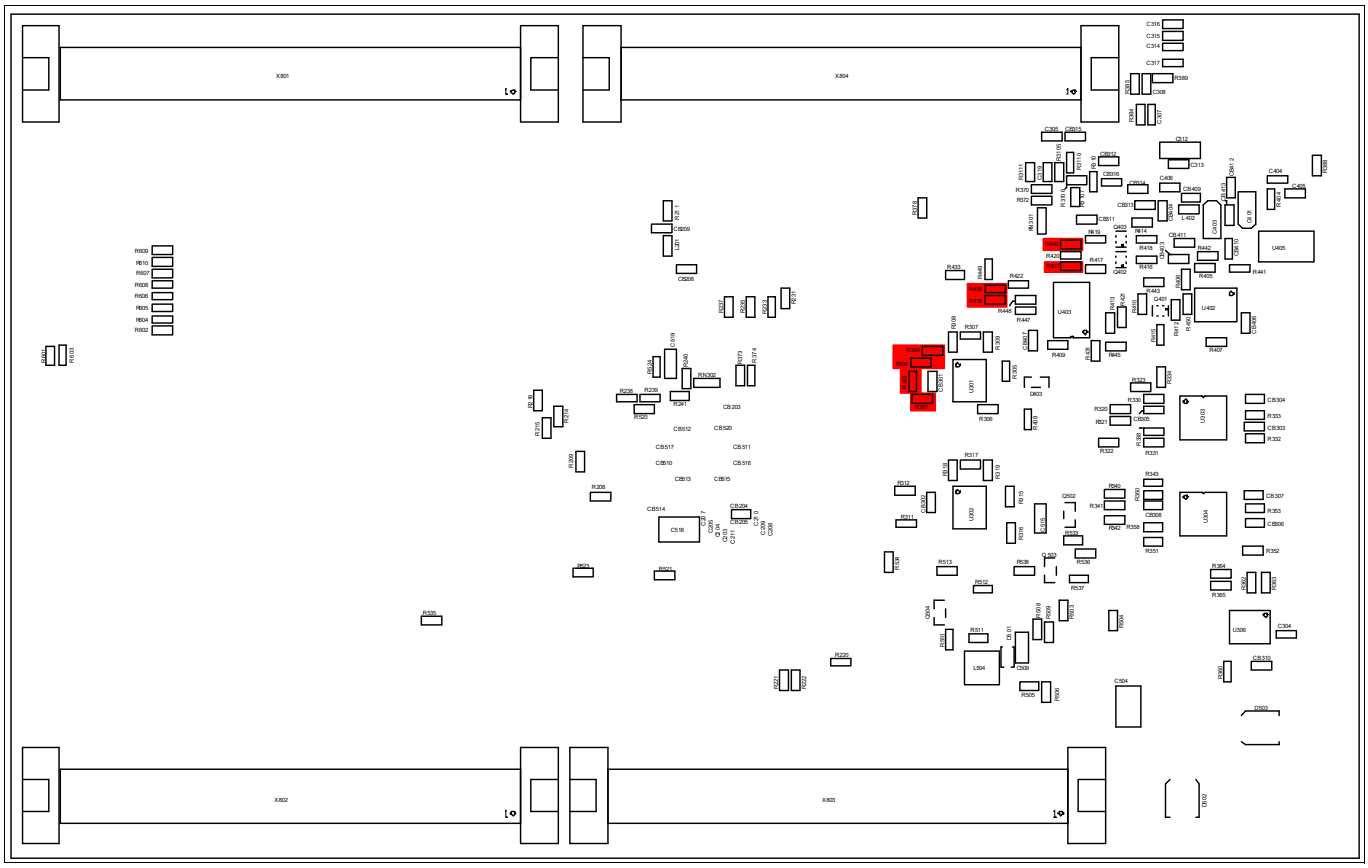

Figure 3-4 Resistors for ASC connection (ASC0)

3.7.2 miniWiggler JDS

The miniWiggler JDS is a low cost debug tool which allows you access to the JTAG of the device. Make sure that you have the latest DAS release. Debugging is possible via the DAS Server ‘UDAS‘. Please contact your prefered debug vendor for support of DAS.

If you have connected the board to the PC and there runs the DAS server, then a working connection is visible via the green ACTIV LED.

The status RUN LED is switched on/off through the DAS Server, depending on the used debugger (client).

IMPORTANT: Make sure that there is no or a tristated connection on X401 (OCDS1) and X402 (DAP) if the ACTIV LED is on.

Per default the miniWiggler is connected to the DAP. It is possible to change the connection to DAPE (DAP of emulation device if available). If resistors R214, R215 and R216 assembled (default) then the standard DAP is connected to miniWiggler. If all this resistors are not assembled then the miniWiggler can’t be used. In this case only the DAP connector X402 can be used. See **Figure 3-8**.

3.8 FlexRay™ (E-RAY)

The board has 2 IDC10 plugs for FlexRay™ Communication (channel A and B) with up to 10 Mbit/s. For the pinout of the plugs see **Figure 6-7**. You can use a IDC female connector with crimpconnector, flat cable and SUB-D 9 plug with crimpconnector to have a 1:1 adapter to SUB-D 9.

The transceiver are connected to the TriCore device via zero ohm resistors (R325 up to R329 and R340 up to R344) which must be removed to use the ports outside.

ERAY-A can be connected to P02.0, P02.1 and P02.4. Transceiver for channel A can be enabled/disabled via P10.1. The error state of transceiver channel A can be read out via P10.2.

ERAY-B is connected to P02.2, P02.3 and P02.5. Transceiver for channel A can be enabled/disabled via P20.10. The error state of transceiver channel A can be read out via P20.9.

For more information look in the user manual for TC3X6.

Note: TC336DA don't support FlexRay™.

3.9 Serial Eeprom

Note: TC336DA don't have I2C module. Access to the eeprom only with simulation of I2C protocol via bit banging possible.

The I^2C via P15.4 and P15.5 of the TC3X6 is connected to a serial EEPROM with a size of 2KBit (2 x 128 x 8). The slave address of this EEPROM is 0x50. The upper half of the array (80h-FFh) is permanently write-protected. Write operations to this address range are inhibited. Read operations are not affected. This upper half contains a pre-programmed EUI-48™ node address which can be used as MAC ID for Ethernet. The other 128 bytes are writable by customer.

To disconnect (disable) the EEPROM remove resistor R348 and R349.

3.10 MultiCAN

On the board are two CAN transceiver connected to the CAN0 and CAN1 of TC3X6. The transceivers are connected to two IDC10 plug. For the pinout of IDC10 plug see **Figure 6-8**. You can use a IDC female connector with crimpconnector, flat cable and SUB-D 9 plug with crimpconnector to have a 1:1 adapter to SUB-D 9.

The transceiver are connected to the TriCore device via zero ohm resistors (R301 up to R304 and R311 up to R312) which must be removed to use the ports outside.

CAN0 can be used via P20.7 and P20.8 (node 0, default) or P14.0 and P14.1 (node 1). CAN1 can be used via P10.7 and P10.8 (node 2).

Note: CAN1 is not usable with TC336DA.

3.11 LIN

On the board is one LIN transceiver connected to the ASCLIN1 on TC3X6 (P15.0 and P15.1). The transceiver are connected to one IDC10 plug. For the pinout of IDC10 plug see **Figure 6-9**. You can use a IDC female connector with crimpconnector, flat cable and SUB-D 9 plug with crimpconnector to have a 1:1 adapter to SUB-D 9.

To disconnect the LIN remove resistor R364 and R365.

The LIN can be used in master and in slave mode. For the master mode there is per default a pull-up of 1K (R360) and a capacitor of 1nF (C304) on the BUS assembled. For using the LIN in slave mode the pull-up resistor R360 must be removed and maybe the capacitor changed to a smaller value (e.g. 220pF).

The mentioned resistor and capacitor are red marked in **Figure 3-5**

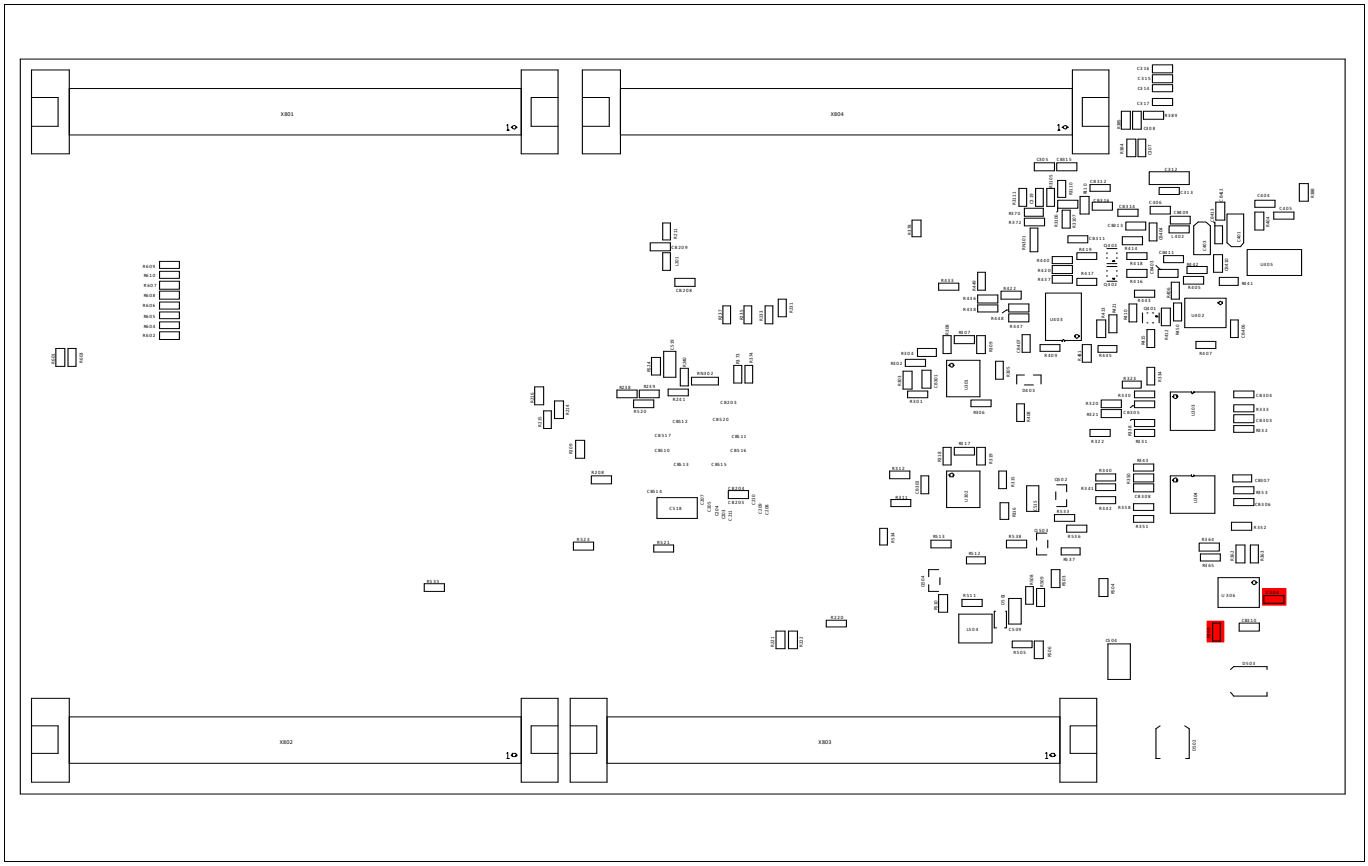

Figure 3-5 Components for LIN Master Mode

Ethernet

The TriBoard provide a RJ45 connector (X306) for twisted pair ethernet connections.The TriBoard use a Realtek Integrated 10/100/1000M Ethernet Precision Transceiver RTL8211FI-CG as physical interface device. For more information about the ethernet modul see TC3X9 User's Manual, about the PHY see the RTL8211F datasheet. For the pinout of RJ45 see **Figure 6-10**.

The PHY is connected to the TriCore device via resistors and resistor arrays (R370 up to R374 and RN301 up to RN302).

For the connection between TriCore and PHY is used RGMII.

Note: Please note that the used signals for RGMII (P11.0 up to P11.12) are not connected to any connector.

3.12 ADC

On this boards are 8 ADC channels prepared with a low pass filter. On pin AN0, AN1, AN2, AN3, AN8, AN10, AN11 and AN12 is assembled a capacitor of 47nF and a serial resistor of 4,7K. The filter components are red marked in the following figures (**Figure 3-6** and **Figure 3-7**).

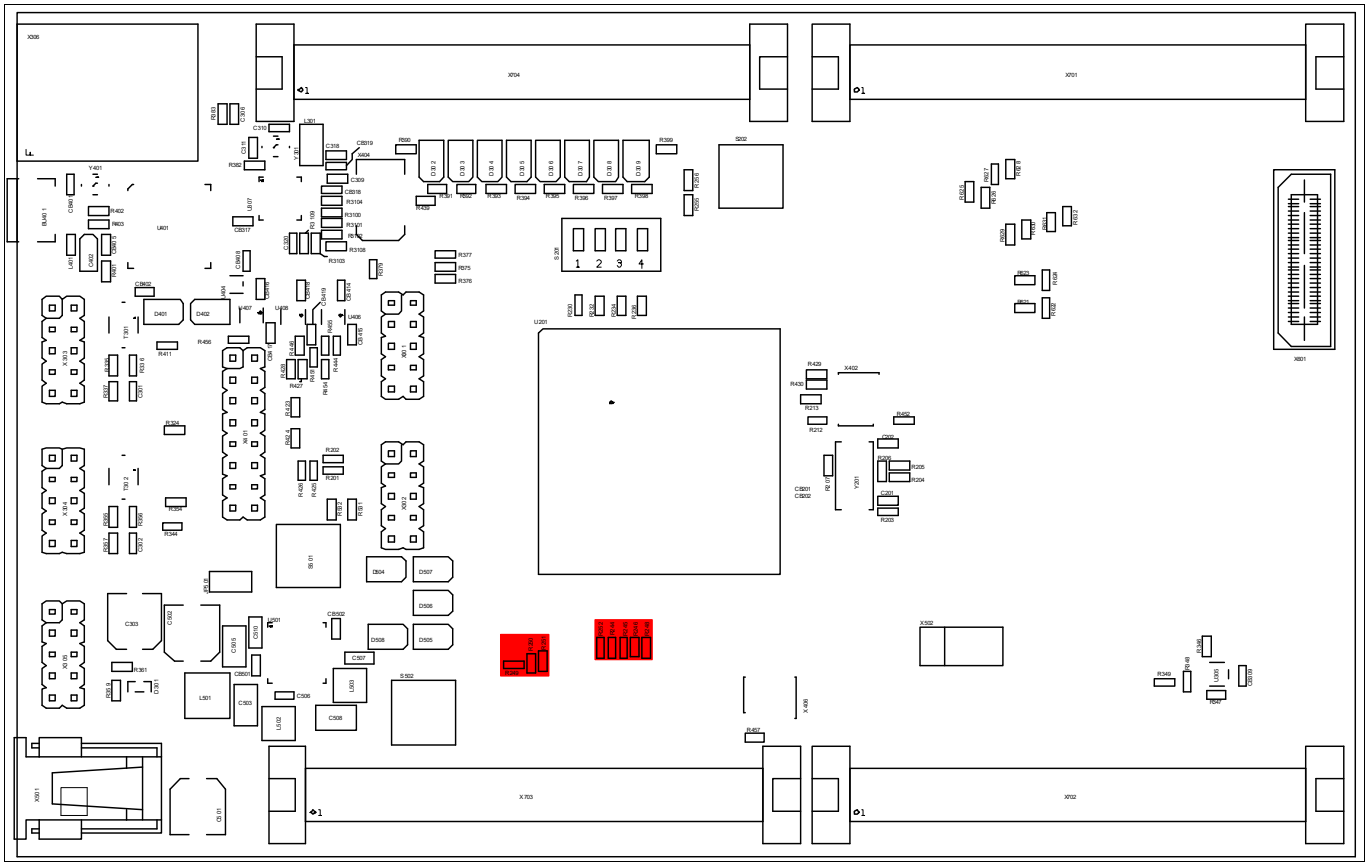

Figure 3-6 Filter components of ADC channels on Top Side

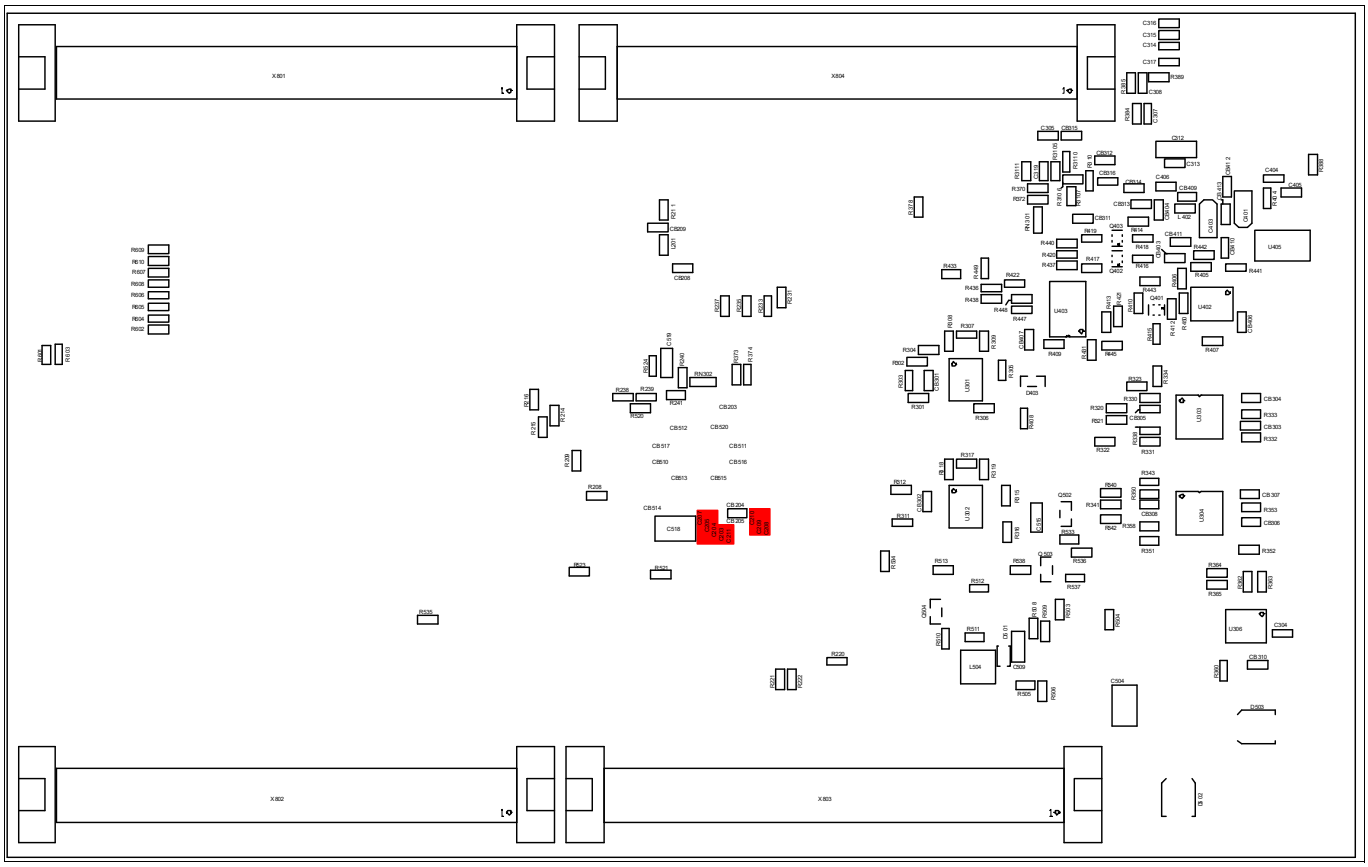

Figure 3-7 Filter components of ADC channels on Bottom Side

3.13 Other peripherals

For all other peripherals there are no special plugs on the board. The peripheral signals are available on the different connectors. See **"Connector Pin Assignment" on Page 6-1**.

3.14 Toggle LED's

The status LED's are low active and can be controlled by Software.

Port 20 pin 11 up to pin 14 are connected to single LED's (D306... D309) and powered by the normal microcontroller voltage.

Port 33 pin 4 up to pin 7 are connected to single LED's (D302... D305) and also powered by the normal microcontroller voltage because VEVRSB is connected to 3,3V (port 33 is powered by VEVRSB pin which is connected to 3,3V of TLF30682).

3.15 Buttons

On the board are three buttons.

The reset button (S501) will apply a warm power on reset to the device.

The ENA/WAKE button (S502) will be used to enable/wakeup the TLF30682.

The P33.11 button (S202) can be used by software as input.

3.16 Debug System

3.16.1 OCDS1

The OCDS1 signals are connected to the IDC16 plug (X401). They work with the port supply of Microcontroller (+3,3V). For pinout of the connector see **Figure 6-12**. You can connect any debugger to this connector.

The signals /BRKIN and /BRKOUT are not connected per default. If you need this signals in the connector then assemble R424 and R425 or R426 with a 0R resistor.

If you connect a debug hardware make sure that the miniWiggler JDS (see **"miniWiggler JDS" on Page 3-6**) is not activ (ACTIV LED is off) and on the DAP connector (X402) is no hardware connected or the hardware is tristated.

If the ACTIV LED is on, then stop the active DAS Server 'UDAS' and/or remove the USB connection to the PC.

If R214 up to R216 not assembled then the connector is not usable.

3.16.2 DAP

The board comes with a DAP connector (X402). For pinout of this connector see **Figure 6-13**. You can connect a DAP hardware here. If you use this connector make sure that the miniWiggler JDS is not activ (ACTIV LED is off) and a connected OCDS1 hardware is disconnected or tristated.

3.16.3 DAP_SCR

Additional DAP connector (X406) is connected to DAP_SCR. This DAP can be used as private DAP connection to the standby controller. For pinout of this connector see **Figure 6-13**. You can connect a DAP hardware here. This DAP use P33.6 and P33.7 which are connected to LED on the board. Maybe it is necessary to remove R393 and R394 if the speed of the connection is not fast enough.

3.17 High speed with DAP

For use the DAP connection with 160 MHz you need to remove 3 resistors to have a very short connection between device and connector. On the TC3X6 ADAS Triboard this 3 resistors are R214, R215 and R216 for DAP (red marked in **Figure 3-8**). This resistors needs to be removed.

I**mportant: When the resistors are removed then only the DAP connector on the board can be used. The on board wiggler and the OCDS1 connector couldn't be use (are disconnected) in this case, also the ETK connector couldn't be used.**

All resistors are red marked in the following figures:

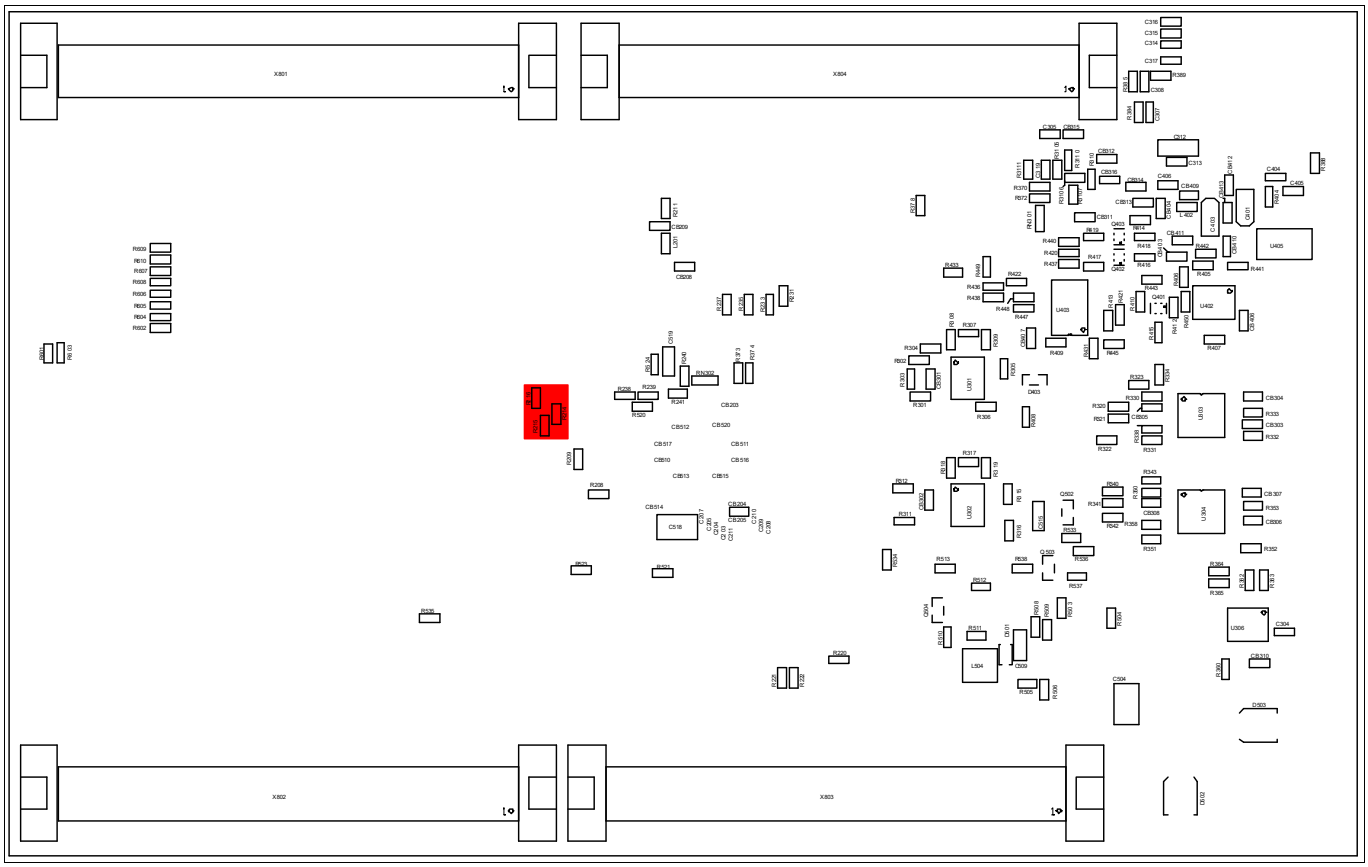

Figure 3-8 Location of DAP resistors on Bottom Side

3.17.1 ETK connector (optional)

The TriBoard provide a 10 pin samtec connector (X404) for connecting to an ETK. This connector should be assembled by your self if needed.

For the pinout of connector see **Figure 6-14**.

The needed Samtec connector is: TFM-105-02-A.

3.17.2 EmW Power (optional)

The TriBoard provide the 4 pin power connector (X502) for the Ethernet miniWiggler (EmW). This connector should be assembled by your self if needed.

For the pinout of connector see **Figure 6-15**.

The needed Samtec connector is the JST B4B-PH-K.

TriBoard Information

The connector provide the input voltage to the Ethernet miniWiggler and an enable/wakeup signal connected to TLF30682 and a standby voltage of +1,25V which is not connected to the device on this board.

4 TriBoard Configuration

4.1 HW Boot Configuration

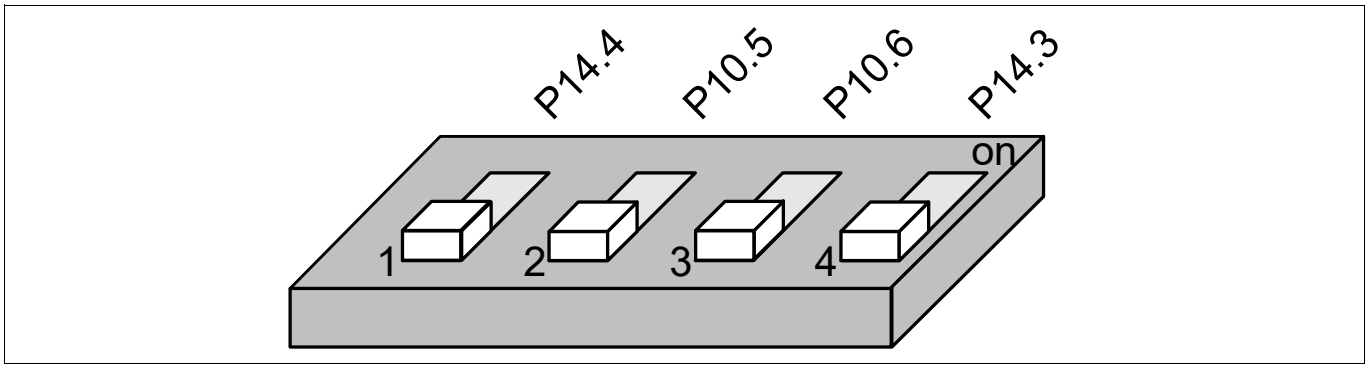

Figure 4-1 HW Configuration DIP-Switches

The picture above shows the definition of the boot HW configuration switch. The meaning of the switches will be described in the following table (**Table 4-1**).

Note: The ON position of the switch is equal to a logical LOW at the dedicated pin.

4.1.1 Default Pad State

P14.4 / HWCFG6 is used to select the Default Pad State. Dipswitch 1 used to select this.

In case that dispswitch1 is set to ON then all I/O pins are in tristate otherwise the internal pull-up devices are enabled on the I/O pins. Please note that after change Dipswitch 1 you must make a power cycle (switch off -> switch on) to use the new configuration.

In case that TriState is selected (Dipswitch 1 is set to ON) then the I/O pins are floating. If you need a specific level on different pins during startup (e.g. driver pins) then you must add the needed pull device (up or down). Some pins (especially the HWCFG pins) haven always the needed external pull-up and/or pull-down resistor assembled on the board.

4.1.2 Bootmode

Table 4-1 User Startup Modes [1)2)3)]

HWCFG[5...3]	Type of Boot	2	3	4
XX1	Start-up mode is selected by Boot Mode Index	X	X	OFF
110	Internal Start from Flash	OFF	OFF	ON
100	Alternate Boot Mode, Generic Bootstrap Loader on fail (P14.0/P14.1)	ON	OFF	ON
010	Alternate Boot Mode, ASC Bootstrap Loader on fail (P15.2/P15.3)	OFF	ON	ON
000	Generic Bootstrap Loader (P14.0/P14.1)	ON	ON	ON

1) The shadowed line indicates the default setting.
2) 'x' represents the don't care state.
3) 2 to 4 are the Dip Switch numbers.

4.2 Assembly Options

4.2.1 General optional resistors

Table 4-2 General optional resistors (default assembly in brackets)

Component	Description
R202	Connect P20.2 (/TESTMODE) to GND (not assembled)
R203	XTAL1 Rload (50 Ohm) (not assembled)
R206	XTAL Rparallel (not assembled)
R207	XTAL2 Rserial (assembled)
R238	Switch off EVRC (assembled)
R240	Switch off EVR33 (assembled)
R390	Connect +3V3 to toggle LEDs D302...D305 (assembled)
R399	Connect +3V3 to toggle LEDs D306...D309 (assembled)
R423	Connect P20.0 with miniWiggler JDS (not assembled)
R424	Connect P20.0 with OCDS1 connector (not assembled)
R425	Connect P21.7 with OCDS1 connector (not assembled)
R426	Connect P20.2 with OCDS1 connector (not assembled)
R427	Connect P21.7 with USR1 of miniWiggler JDS (not assembled)
R428	Connect P20.2 with USR1 of miniWiggler JDS (not assembled)
R429	Connect P21.6 (DAP3) with USR1 of DAP (assembled)
R430	Connect P20.2 with USR1 of DAP (not assembled)
R433	Connect P21.7 with ETK connector (not assembled)
R439	Connect P21.7 with ETK connector (not assembled)
R508	Connect pin MPS of TLF30682 to +3V3 (assembled)
R524	Connect VDDP3 to +3V3 (assembled)

Note: All resistors are red marked in the following figures.

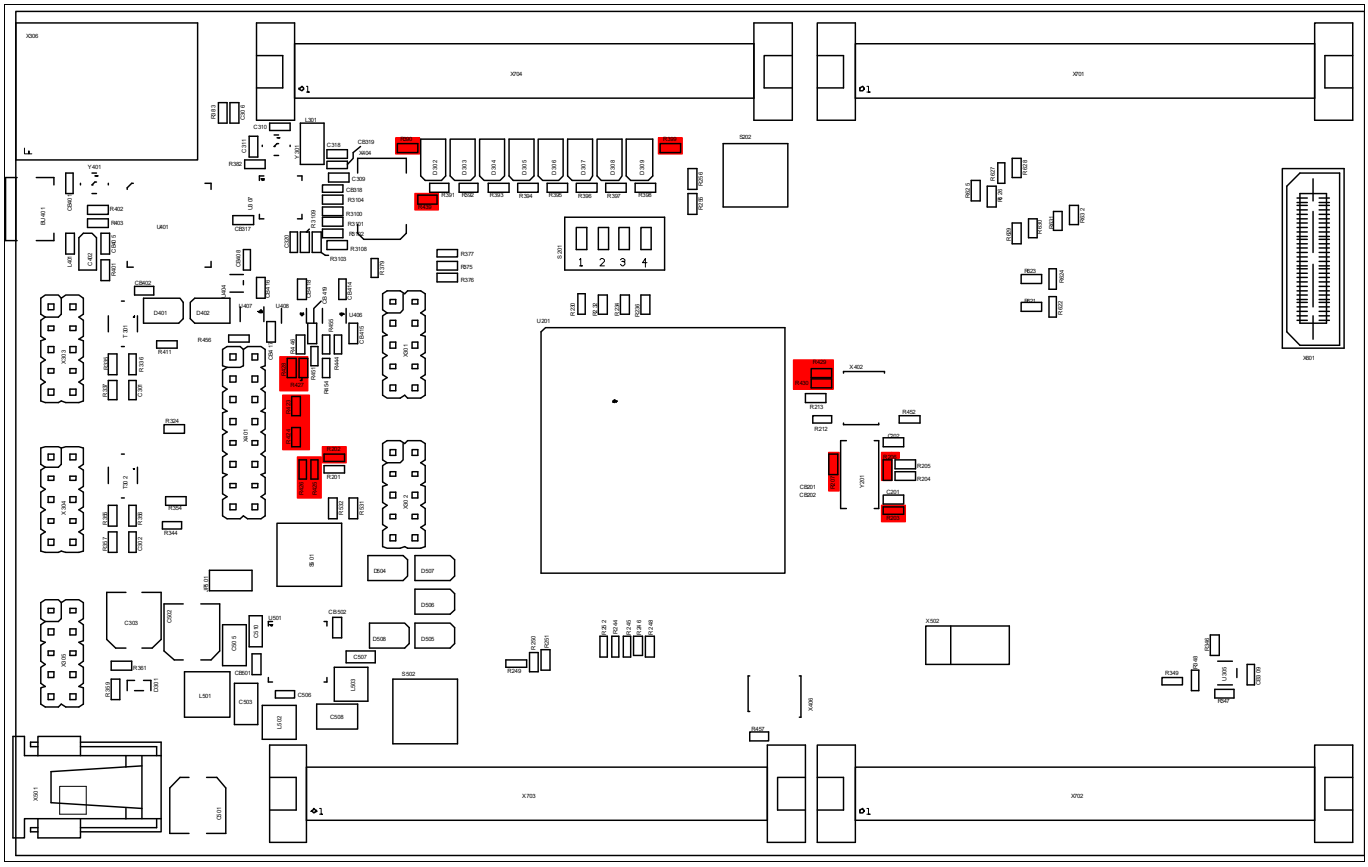

Figure 4-2 Location of general optional resistors on Top Side

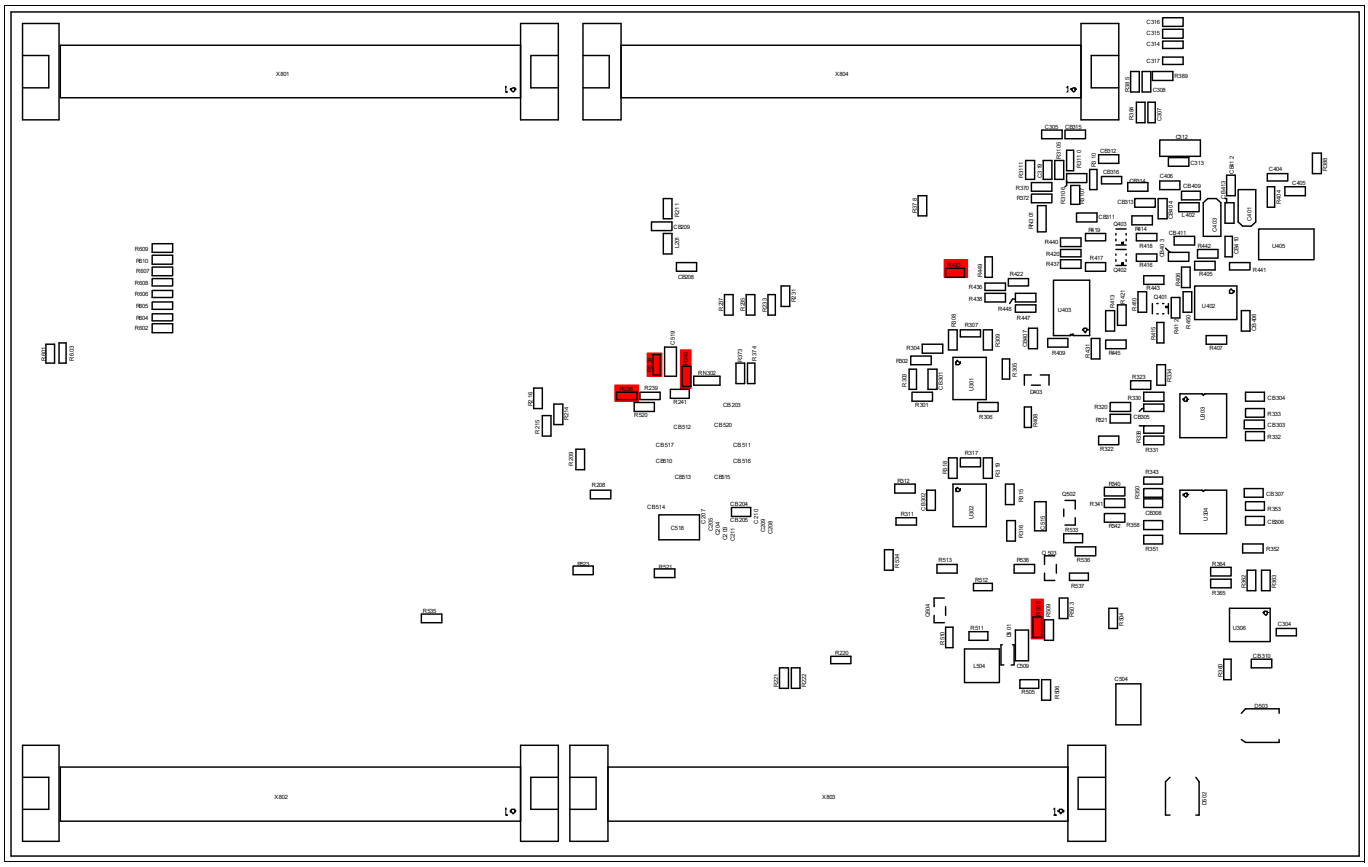

Figure 4-3 Location of general optional resistors on Bottom Side

4.2.2 Resistors for peripherals

Table 4-3 Resistors for peripherals (default assembly in brackets)

Component	Description
R220	Connect +5V with VDDM (assembled)
R221	Connect +3V3 with VDDM (not assembled)
R222	Connect VAREF1 with VDDM (assembled)
R301	Connect P20.7 with RXD of CAN0 transceiver (assembled)
R302	Connect P20.8 with TXD of CAN0 transceiver (assembled)
R303	Connect P14.1 with RXD of CAN0 transceiver (not assembled)
R304	Connect P14.0 with TXD of CAN0 transceiver (not assembled)
R311	Connect P10.8 with RXD of CAN1 transceiver (assembled)
R312	Connect P10.7 with TXD of CAN1 transceiver (assembled)
R320	Connect P02.0 with TXD of ERAY-A transceiver (assembled)
R321	Connect P02.4 with TXDEN of ERAY-A transceiver (assembled)
R322	Connect P02.1 with RXD of ERAY-A transceiver (assembled)
R323	Connect P10.1 with EN of ERAY-A transceiver (assembled)
R324	Connect P10.2 with ERRN of ERAY-A transceiver (assembled)
R340	Connect P02.2 with TXD of ERAY-B transceiver (assembled)
R341	Connect P02.5 with TXDEN of ERAY-B transceiver (assembled)
R342	Connect P02.3 with RXD of ERAY-B transceiver (assembled)
R343	Connect P20.10 with EN of ERAY-B transceiver (assembled)
R344	Connect P20.9 with ERRN of ERAY-B transceiver (assembled)
R348	Connect P15.4 with SCL of I2C Eeprom (assembled)
R349	Connect P15.5 with SDA of I2C Eeprom (assembled)
R364	Connect P15.1 with RXD of LIN1 transceiver (assembled)
R365	Connect P15.0 with TXD of LIN1 transceiver (assembled)
R310	Connect P11.5 with CLOCKOUT of Ethernet PHY (assembled)
R370	Connect P11.12 with RXC of Ethernet PHY (assembled)
R372	Connect P11.11 with RXCTL of Ethernet PHY (assembled)
R373	Connect P11.4 with TXC of Ethernet PHY (assembled)
R374	Connect P11.6 with TXCTL of Ethernet PHY (assembled)
R375	Connect P12.1 with MDIO of Ethernet PHY (assembled)
R376	Connect P12.0 with MDC of Ethernet PHY (assembled)
R377	Connect P10.3 with MDINT of Ethernet PHY (not assembled)
RN301	Connect P11.7...10 with RDX3...0 of Ethernet PHY (assembled)
RN302	Connect P11.0...3 with TDX3...0 of Ethernet PHY (assembled)
R436	Connect P14.0 with RXD of USB to UART (assembled)
R437	Connect P14.1 with TXD of USB to UART (assembled)

Table 4-3 Resistors for peripherals (default assembly in brackets) (continued)

Component	Description
R438	Connect P15.2 with RXD of USB to UART (not assembled)
R440	Connect P15.3 with TXD of USB to UART (not assembled)

Note: All resistors are red marked in the following figures

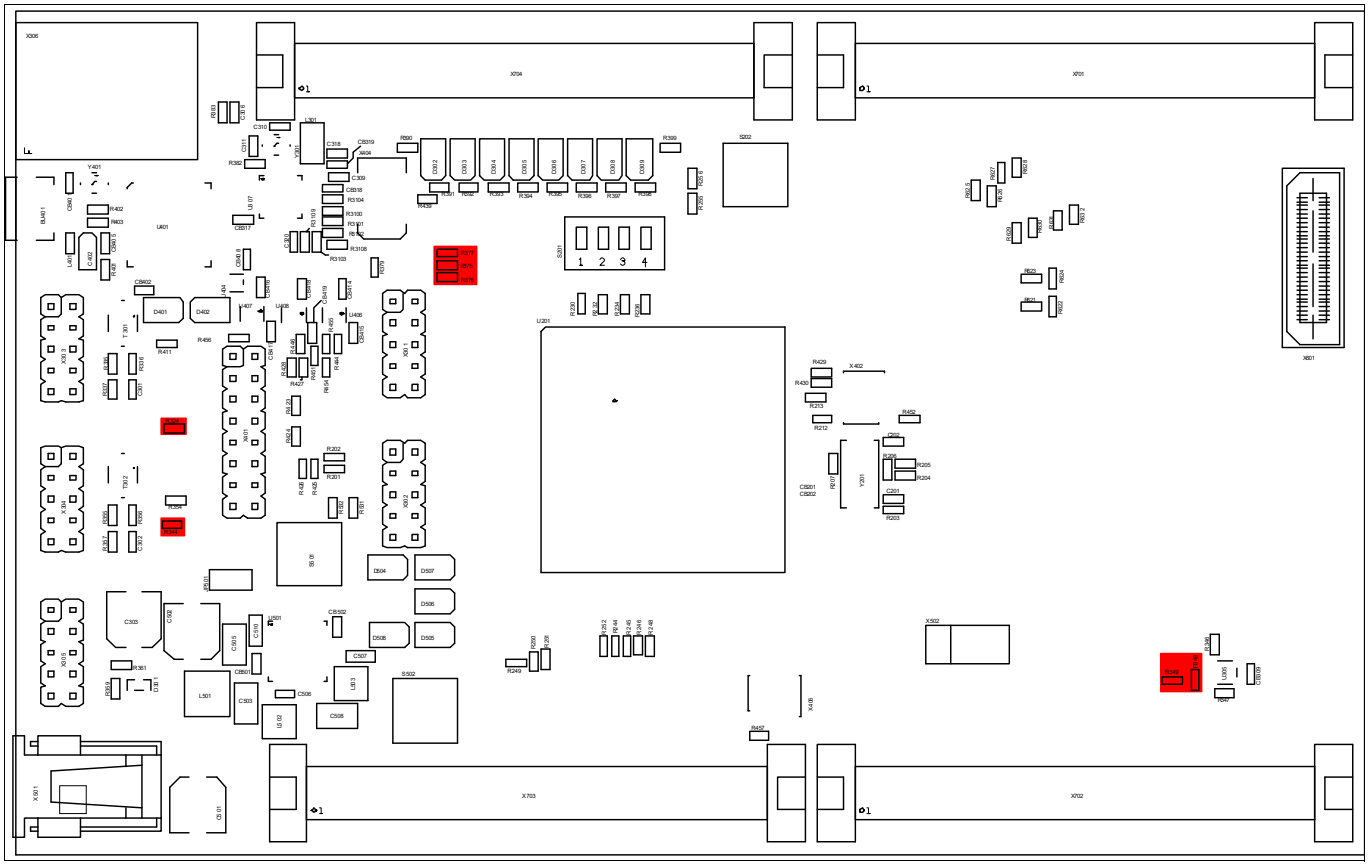

Figure 4-4 Location of peripheral resistors on Top Side

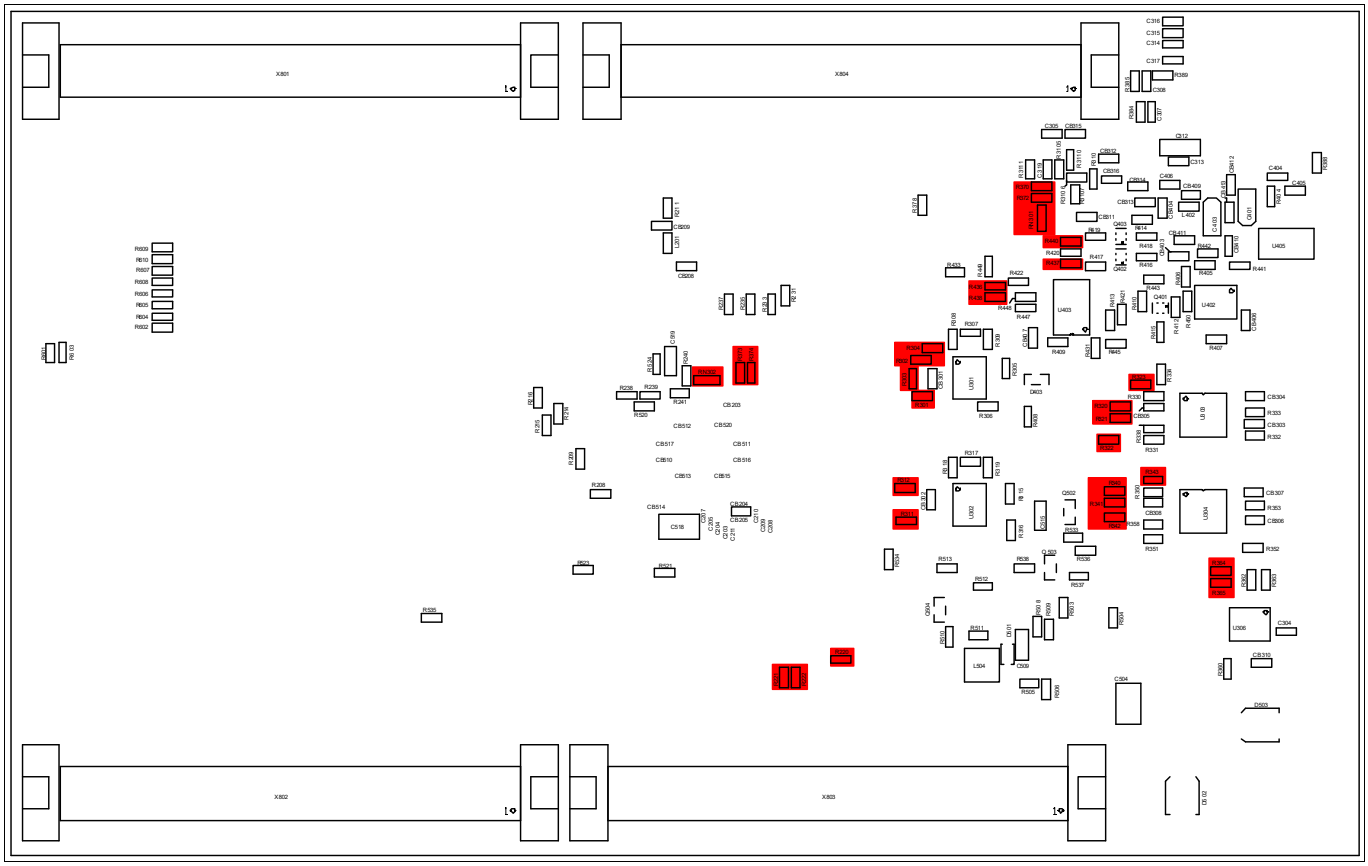

Figure 4-5 Location of peripheral resistors on Bottom Side

4.2.3 Resistors for MMIC

Table 4-4 Resistors for MMIC (default assembly in brackets)

Component	Description
R601	Connect P33.3 to MMIC0_IO8 (assembled)
R602	Connect P33.2 to MMIC0_IO7 (assembled)
R603	Connect P33.1 to MMIC0_IO6 (assembled)
R604	Connect /ESR0 to MMIC0_RESET_N (assembled)
R605	Connect P21.5 to MMIC0_IO5 (assembled)
R606	Connect P21.4 to MMIC0_IO4 (assembled)
R607	Connect P33.0 to MMIC0_IO2 (assembled)
R608	Connect P21.2 to MMIC0_OK (assembled)
R609	Connect P21.3 to MMIC0_IO3 (assembled)
R610	Connect P20.0 to MMIC0_IO1 (assembled)

Note: All resistors are red marked in the following figures

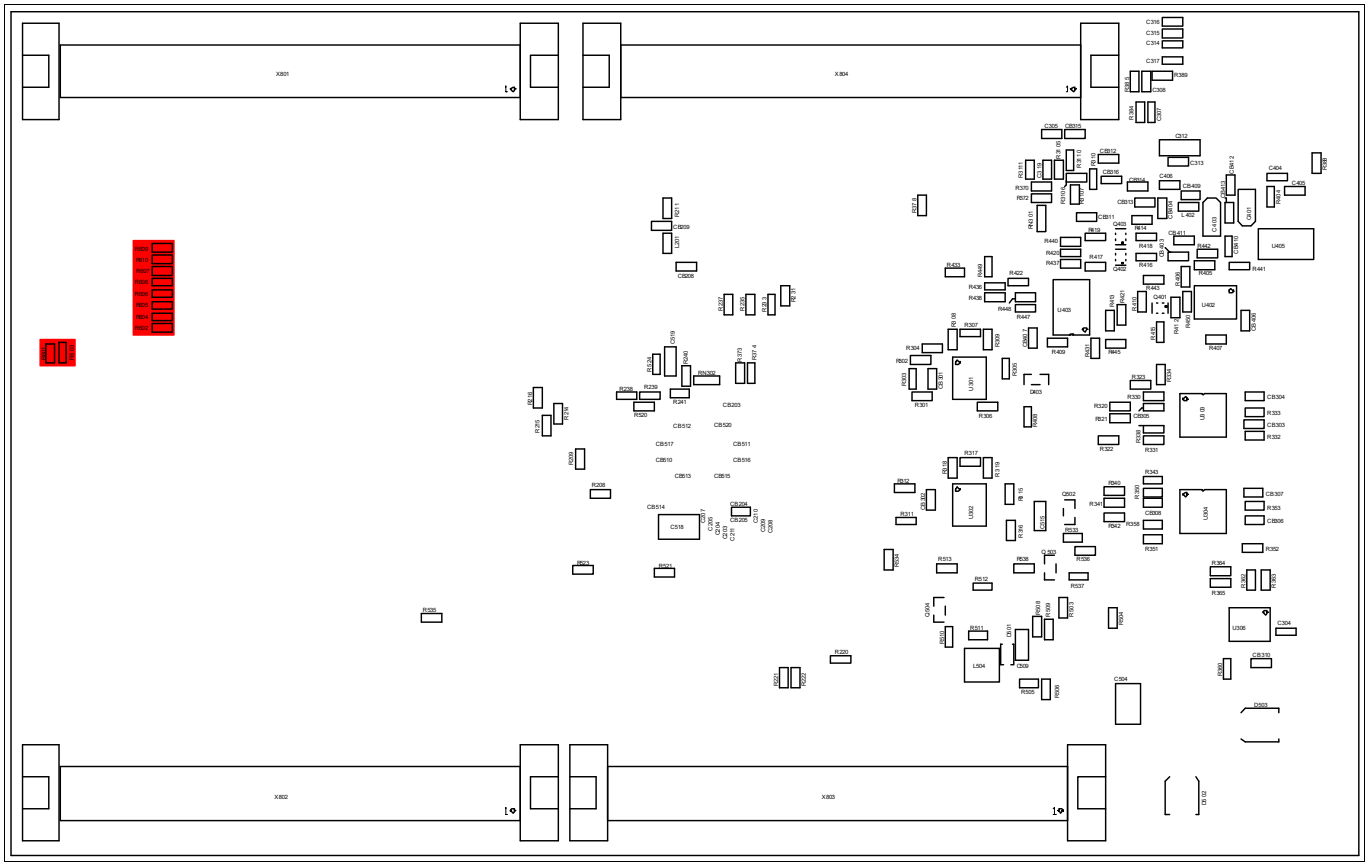

Figure 4-6 Location of MMIC resistors

5 Signal (on board used) Description

For more information about the signals please see the user manual/datasheet for TC3X6 ADAS and/or the schematics of the board.

All not mentioned signals are not used on the board and can be used outside. Optional marked signals are used only if they are connected (default is that they are not used on the board).

5.1 Power Signals

Table 5-1 Power Signals

Short name	Description
VCC_IN	Supply Input (3,5V...40V)
VIN	Input Voltage of Power Supply Device
GND	Ground
+3V3	Microcontroller Supply Voltage (VEXT and VDDP3) and Peripherals Supply
+5V	Communication Supply Voltage (CAN, FLEXRAY) and ADC Supply Voltage
VDD	Core Supply Voltage (1,25V)
VDDP3	Flash Power Supply Voltage (3,3V)
VFLEX	Flexport Supply Voltage (3,3V)
VEXTOSC	Oscillator Port Supply Voltage (3,3V)
VDDOSC	Oscillator Core Supply Voltage (1,25V)
VSSOSC	Oscillator Ground
VDDM	ADC Analog Part Supply Voltage (5V or 3,3V selectable via 0R resistors)
VAREF1	ADC Reference Voltage 1 (VDDM)
VDD_USB	Supply Voltage from USB (5V)
VDD_FT	Supply Voltage FT2232HL device (3,3V)

5.2 Reset Signals

Table 5-2 Reset Signals

Short name	Description
/PORST	Power On Reset
/DBG_PORST	Power On Reset from debug connectors
/ESR0	External Service Request 0 (Hardware Reset)
/ESR1	External Service Request 1 (Non Maskable Interrupt)

5.3 Config Signals

Table 5-3 Config Signals

Short name	Description
P14.5	HWCFG1 (EVR33OFF / EVR33ON)
P14.2	HWCFG2 (EVRCOFF / EVRCON)

Table 5-3 Config Signals (continued)

Short name	Description
P14.4	HWCFG6 (Pins in tristate / Pins with pull-up)
P14.3	HWCFG3 (Boot from pins / Boot from Flash BMI)
P10.5	HWCFG4 (see boot configuration **Table 4-1**)
P10.6	HWCFG5 (see boot configuration **Table 4-1**)

5.4 Clock Signals

Table 5-4 Clock Signals

Short name	Description
XTAL1	Crystal Oscillator Input
XTAL2	Crystal Oscillator Output

5.5 Debug Signals

Table 5-5 Debug Signals

Short name	Description
/TRST	Test Reset
DAP0	Device Access Port Line 0 / Test Data Clock (TCK)
DAP1	Device Access Port Line 1 / Test Data Select (TMS)
DAP2	Device Access Port Line 2 / Test Data Output (TDO)
P21.6	Test Data Input (TDI)
DAP0_A	DAP0 / TCK from debug connectors
DAP1_A	DAP1 / TMS from debug connectors
P21.7	DAP2 / TDO from debug connectors
P20.2	Test Mode Select Input
P20.0	TriCore Breakpoint Output

5.6 Peripheral Signals

Table 5-6 Peripheral Signals

Short name	Description
P14.1	ASCLIN0 Receive Input A CAN01 Receive Input B (optional)
P14.0	ASCLIN0 Transmit Output CAN01 Transmit Output (optional)
P15.3	ASCLIN0 Receive Input B (optional)
P15.2	ASCLIN0 Transmit Output (optional)
P15.1	ASCLIN1 Receive Input A
P15.0	ASCLIN1 Transmit Output
P15.4	I2C0 Serial Clock

Table 5-6 Peripheral Signals (continued)

Short name	Description
P15.5	I2C0 Serial Data Input C und Output
P20.7	CAN00 Receive Input B
P20.8	CAN00 Transmit Output
P10.8	CAN12 Receive Input B
P10.7	CAN12 Transmit Output
P02.0	E-Ray Channel A Transmit Data Output
P02.4	E-Ray Channel A Transmit Data Output enable
P02.1	E-Ray Channel A Receive Data Input 2
P10.1	E-Ray Channel A Enable Output
P10.2	E-Ray Channel A Error Input
P02.2	E-Ray Channel B Transmit Data Output
P02.5	E-Ray Channel B Transmit Data Output enable
P02.2	E-Ray Channel B Receive Data Input 2
P20.10	E-Ray Channel B Enable Output
P20.9	E-Ray Channel B Error Input
TXD3	Ethernet TXD3 Output (P11.0)
TXD2	Ethernet TXD2 Output (P11.1)
TXD1	Ethernet TXD1 Output (P11.2)
TXD0	Ethernet TXD0 Output (P11.3)
TXCLK	Ethernet TXCLK Output (P11.4)
REFCLK	Ethernet GREFCLK Input (P11.5)
TCTL	Ethernet TCTL Output (P11.6)
RXD3	Ethernet RXD3 Input A (P11.7)
RXD2	Ethernet RXD2 Input A (P11.8)
RXD1	Ethernet RXD1 Input A (P11.9)
RXD0	Ethernet RXD0 Input A (P11.10)
RCTL	Ethernet RCTL Input A (P11.11)
RXCLK	Ethernet RXCLK Input A (P11.12)
P12.0	Ethernet Management Data Clock Output (MDC)
P12.1	Ethernet Management Data Input/Output (MDIO)
P10.3	Ethernet MD Interrupt Input (optional)
P14.6	QSPI2 Slave Select Output 2 for SCS of TLF30682
P15.3	QSPI2 Master Clock Output for SCL of TLF30682
P15.6	QSPI2 Master Transmit Output for SDI of TLF30682
P15.2	QSPI2 Master Receive Input E for SDO from TLF30682
P02.7	Output for Watchdog Input of TLF30682
P33.8	Connected to TM2 (pin 44) of TLF30682 (invalid connection)
P33.9	Connected to NC (pin 2) of TLF30682 (invalid connection)

Table 5-6 Peripheral Signals (continued)

Short name	Description
P20[11...14]	On board LED's
P33[4...7]	On board LED's

5.7 MMIC / RIF Signals

Table 5-7 MMIC / RIF Signals

Short name	Description
RIF0_D1_N / P50.0	RIF0 Data Bit Channel 1 Negative Input
RIF0_D1_P / P50.1	RIF0 Data Bit Channel 1 Positive Input
RIF0_D2_N / P50.2	RIF0 Data Bit Channel 2 Negative Input
RIF0_D2_P / P50.3	RIF0 Data Bit Channel 2 Positive Input
RIF0_D3_N / P50.9	RIF0 Data Bit Channel 3 Negative Input
RIF0_D3_P / P50.8	RIF0 Data Bit Channel 3 Positive Input
RIF0_D4_N / P50.11	RIF0 Data Bit Channel 4 Negative Input
RIF0_D4_P / P50.10	RIF0 Data Bit Channel 4 Positive Input
RIF0_CLK_N / P50.4	RIF0 Serial Clock Negative Input
RIF0_CLK_P / P50.5	RIF0 Serial Clock Positive Input
RIF0_FR_N / P50.7	RIF0 Frameclock Negative Input
RIF0_FR_P / P50.6	RIF0 Frameclock Positive Input
P20.3	QSPI2 Slave Select Output 9
P20.6	QSPI2 Slave Select Output 8
P33.13	QSPI2 Slave Select Output 6
P15.3	QSPI2 Master Clock Output
P15.6	QSPI2 Master Transmit Output
P15.2	QSPI2 Master Receive Input E

6 Connector Pin Assignment

The TriBoard will be shipped with four male (plug) connectors on top layer and four female (socket) connectors on bottom layer. The default connectors are 80-pol. Board to Board connectors from Samtec:

http://www.samtec.com

Plug:
FTSH-140-02-L-DV-ES-A

Socket:
FLE-140-01-G-DV-A

6.1 On Board only used signals

Following port pins are only used on board and are not connected to any connector also not via resistor:

Table 6-1 On Board only used Signals

Short name	Description
P32.0	Not yet used
P32.1	Not yet used
P14.2	Used as HWCFG2
P14.4	Used as HWCFG6
P14.5	Used as HWCFG1
P14.6	Used as Slave Select Output (SLSO22) to TLF30682
P11.0	Used as Gigabit Transmit Data Output 3 for RGMII
P11.1	Used as Gigabit Transmit Data Output 2 for RGMII
P11.2	Used as Gigabit Transmit Data Output 1 for RGMII
P11.3	Used as Gigabit Transmit Data Output 0 for RGMII
P11.4	Used as Gigabit Transmit Clock Output for RGMII
P11.5	Used as Gigabit Reference Clock input for RGMII (125 MHz high precision)
P11.6	Used as Gigabit Transmit Control Output for RGMII
P11.7	Used as Gigabit Receive Data Input 3 for RGMII
P11.8	Used as Gigabit Receive Data Input 2 for RGMII
P11.9	Used as Gigabit Receive Data Input 1 for RGMII
P11.10	Used as Gigabit Receive Data Input 0 for RGMII
P11.11	Used as Gigabit Receive Data Control Input for RGMII
P11.12	Used as Gigabit Receive Clock Input for RGMII

6.2 TC356 Connector / Top View

RIF (X701,X801)					PERIPHERALS (X702,X802)			
GND	1	2	GND	GND	1	2	GND
GND	3	4	GND	GND	3	4	GND
	5	6	P21.6	VCC_IN	5	6	VCC_IN
	7	8	P21.7	VCC_IN	7	8	VCC_IN
P50.0	9	10			9	10	
P50.1	11	12			11	12	
P50.2	13	14			13	14	
P50.3	15	16		/ESR1	15	16	/ESR0
P50.4	17	18			17	18	
P50.5	19	20		GND	19	20	GND
P50.6	21	22			21	22	/PORST
P50.7	23	24		P10.5	23	24	
P50.8	25	26			25	26	
P50.9	27	28		P10.2	27	28	P23.1
P50.10	29	30			29	30	
P50.11	31	32			31	32	
	33	34			33	34	
	35	36			35	36	
	37	38		P20.9	37	38	P20.10
	39	40		P20.13	39	40	
	41	42		P33.5	41	42	P20.6
	43	44		P20.3	43	44	P20.2
	45	46		P00.0	45	46	
	47	48			47	48	
	49	50	P21.2	GND	49	50	GND
	51	52	P21.3	XTAL1	51	52	P32.4
	53	54	P21.4	XTAL2	53	54	
	55	56	P21.5	P15.3	55	56	P15.5
	57	58		P15.2	57	58	P15.4
	59	60		P14.1	59	60	P15.1
	61	62		P14.0	61	62	P15.0
	63	64		P20.11	63	64	
	65	66		P20.14	65	66	
	67	68		P20.12	67	68	
	69	70		P20.7	69	70	P20.8
	71	72	P20.0		71	72	P10.8
	73	74		P10.7	73	74	P10.3
	75	76			75	76	GND
	77	78		+3V3	77	78	+3V3
P21.0	79	80		+3V3	79	80	+3V3

Figure 6-1 Connector for TC356 - Pinout (Part I, Top View)

Connector Pin Assignment

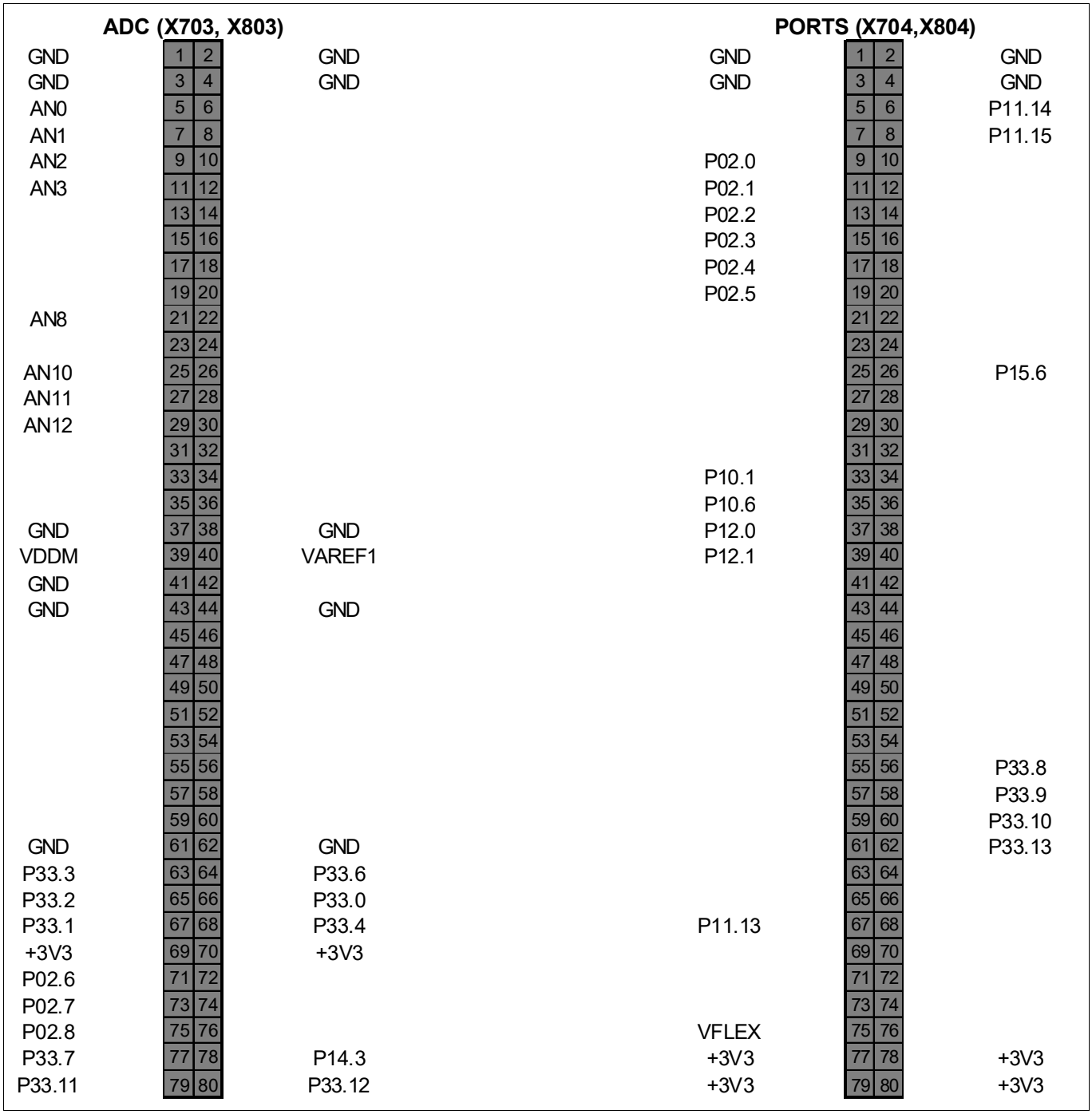

Figure 6-2 Connector for TC356 - Pinout (Part II, Top View)

6.3 TC336DA Connector / Top View

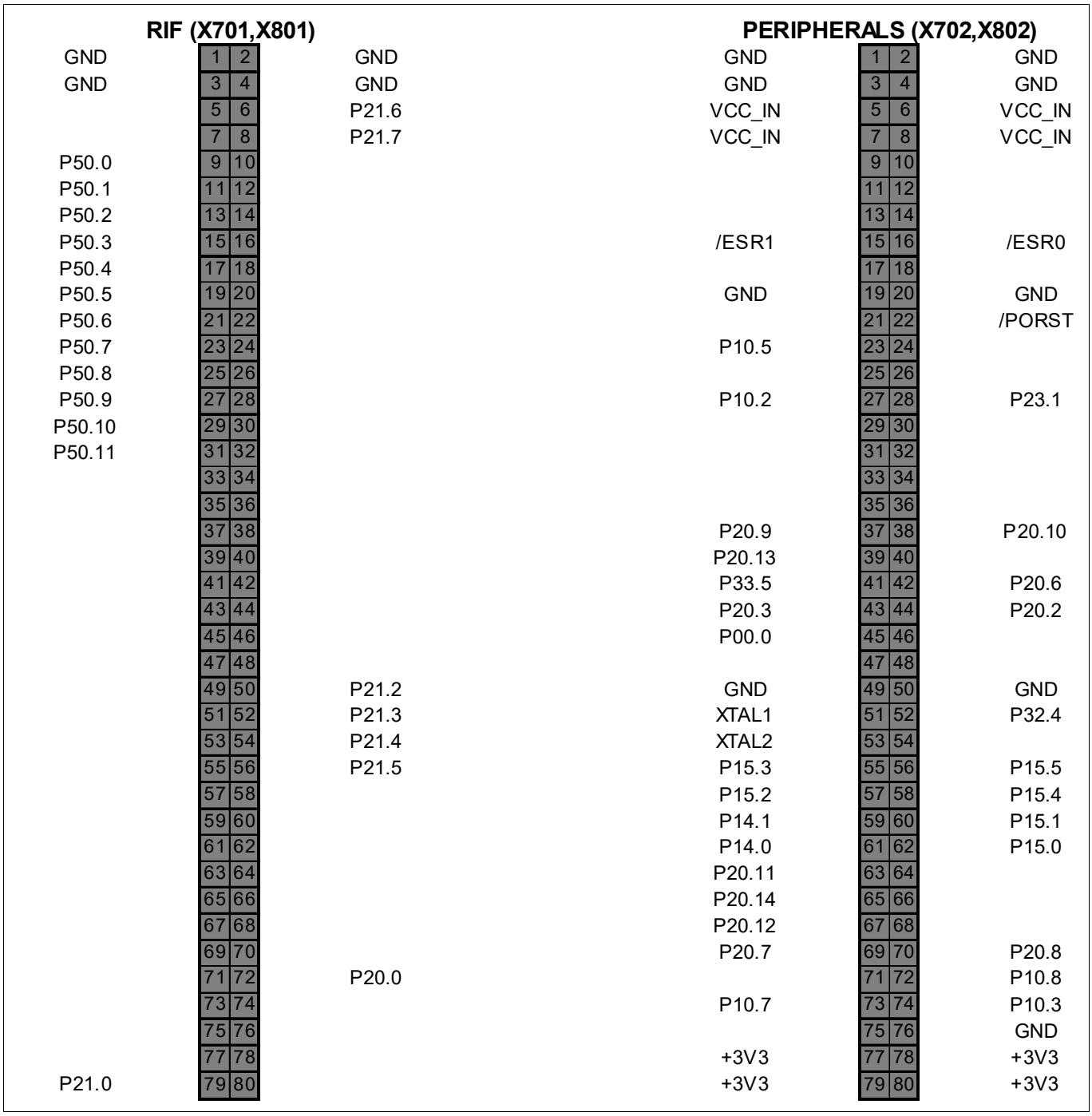

Figure 6-3 Connector for TC336DA - Pinout (Part I, Top View)

Connector Pin Assignment

ADC (X703, X803)

GND	1	2	GND		
GND	3	4	GND		
AN0	5	6	AN16		
AN1	7	8	AN17		
AN2	9	10			
AN3	11	12			
AN4	13	14	AN20		
AN5	15	16	AN21		
	17	18			
	19	20			
AN8	21	22			
AN9	23	24			
AN10	25	26			
AN11	27	28			
AN12	29	30			
AN13	31	32			
AN14	33	34			
AN15	35	36			
GND	37	38	GND		
VDDM	39	40	VAREF1		
GND	41	42			
GND	43	44	GND		
	45	46			
	47	48			
	49	50			
	51	52			
	53	54			
	55	56			
	57	58			
	59	60			
GND	61	62	GND		
P33.3	63	64	P33.6		
P33.2	65	66	P33.0		
P33.1	67	68	P33.4		
+3V3	69	70	+3V3		
P02.6	71	72			
P02.7	73	74			
P02.8	75	76			
P33.7	77	78	P14.3		
P33.11	79	80	P33.12		

PORTS (X704,X804)

GND	1	2	GND		
GND	3	4	GND		
	5	6	P11.14		
	7	8	P11.15		
P02.0	9	10			
P02.1	11	12			
P02.2	13	14			
P02.3	15	16			
P02.4	17	18			
P02.5	19	20			
	21	22			
	23	24			
	25	26	P15.6		
	27	28			
	29	30			
	31	32			
P10.1	33	34			
P10.6	35	36			
P12.0	37	38			
P12.1	39	40			
	41	42			
	43	44			
	45	46			
	47	48			
	49	50			
	51	52			
	53	54			
	55	56	P33.8		
	57	58	P33.9		
	59	60	P33.10		
	61	62	P33.13		
	63	64			
	65	66			
P11.13	67	68			
	69	70			
	71	72			
	73	74			
VFLEX	75	76			
+3V3	77	78	+3V3		
+3V3	79	80	+3V3		

Figure 6-4 Connector for TC336DA - Pinout (Part II, Top View)

6.4 Power connector pinout

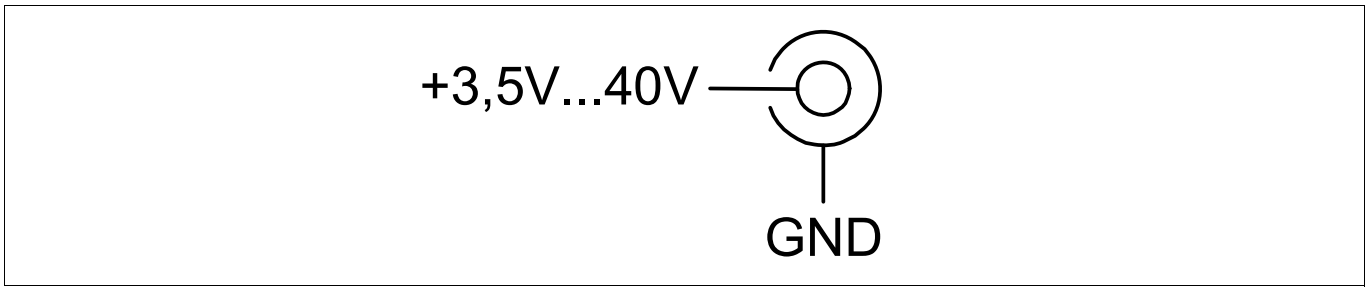

Figure 6-5 Power connector pinout (Roka 520 2550)

6.5 USB connector pinout

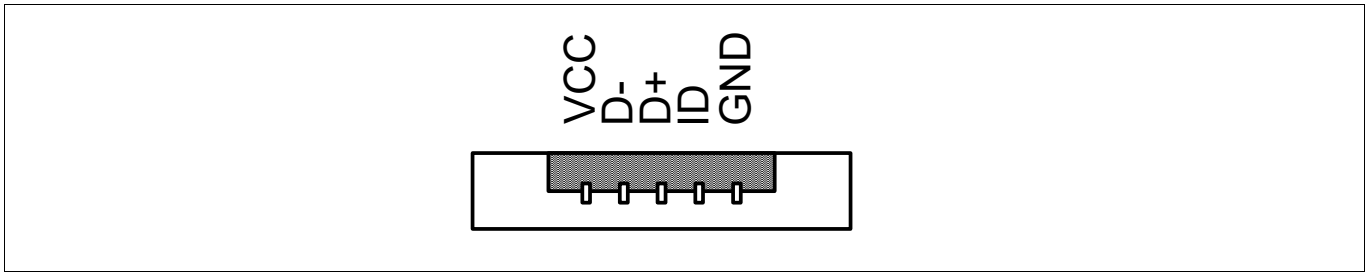

Figure 6-6 USB connector pinout (Micro USB B-type)

6.6 FlexRay™ (ERAY) connector pinout

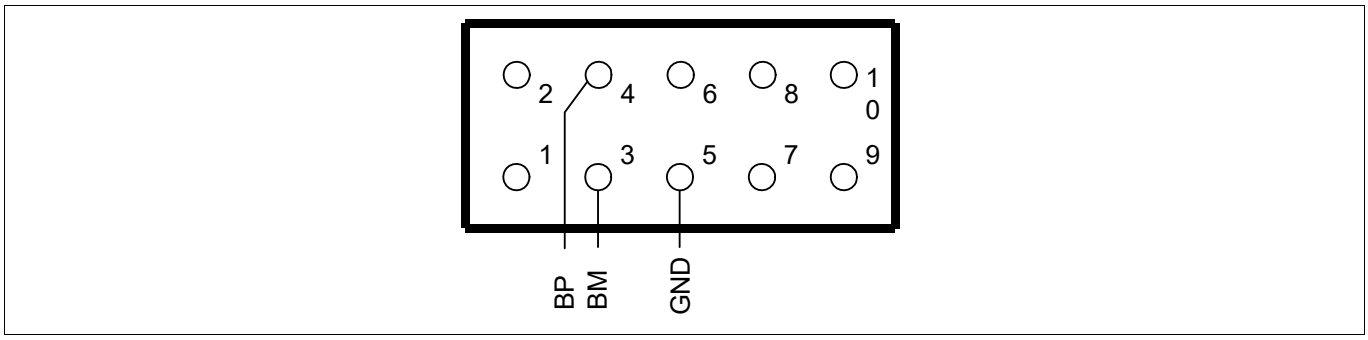

Figure 6-7 FlexRay™ (ERAY) connector pinout (IDC10)

6.7 CAN connector pinout

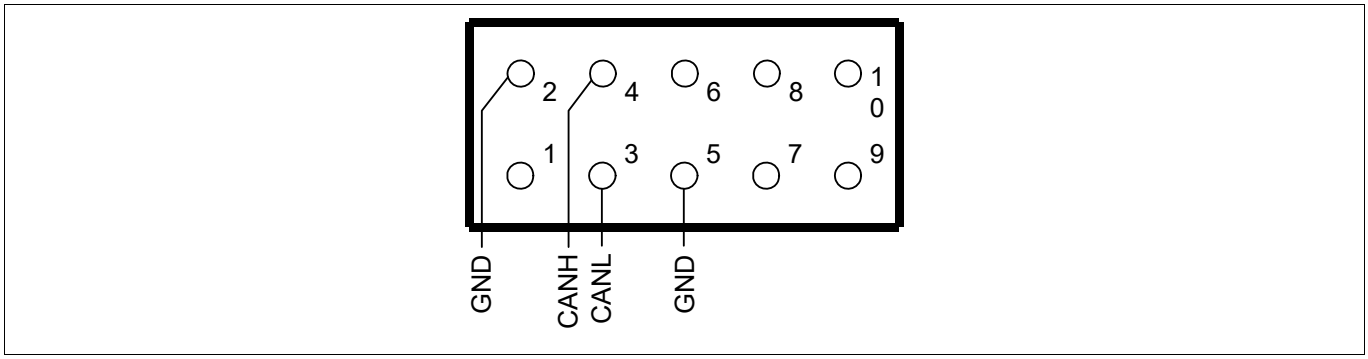

Figure 6-8 CAN connector pinout (IDC10)

6.8 LIN connector pinout

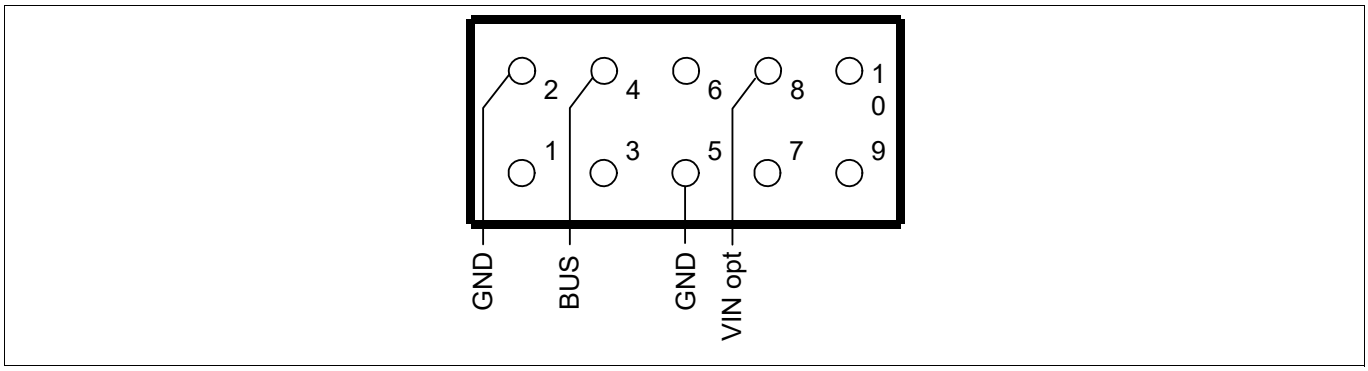

Figure 6-9 LIN connector pinout (IDC10)

6.9 Ethernet connector pinout

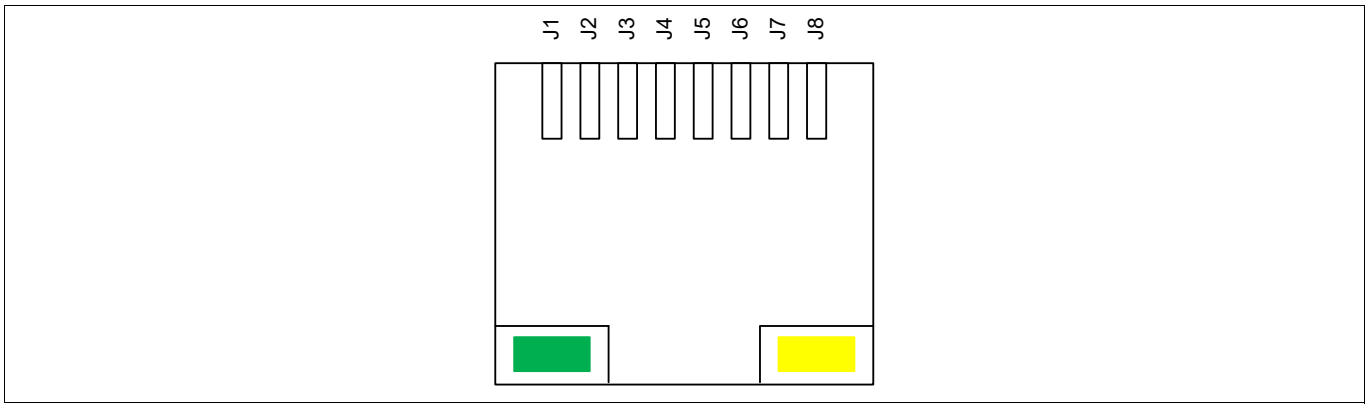

Figure 6-10 Ethernet connector pinout (RJ45)

6.10 MMIC / RIF connector pinout

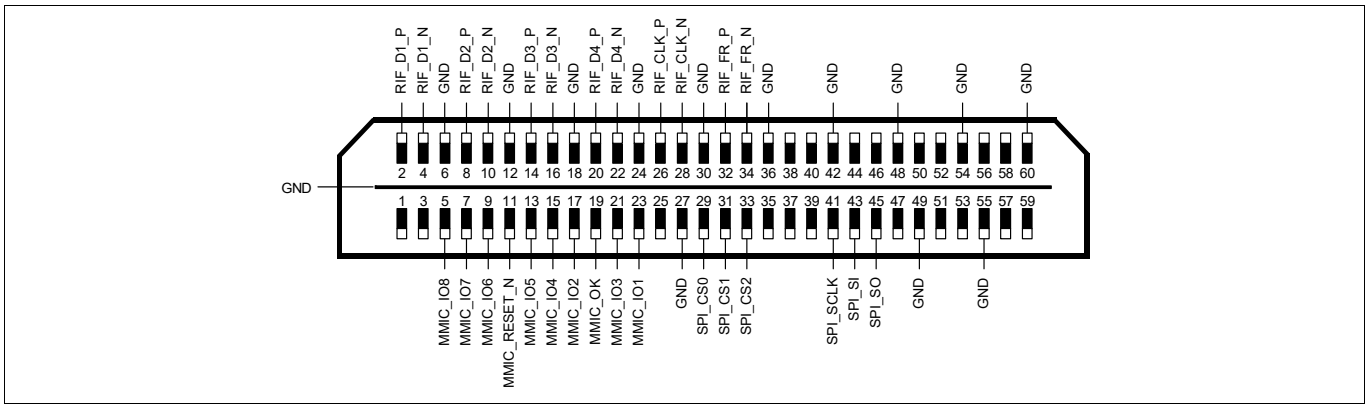

Figure 6-11 MMIC / RIF connector pinout (Samtec QSH-030)

6.11 OCDS1 connector pinout

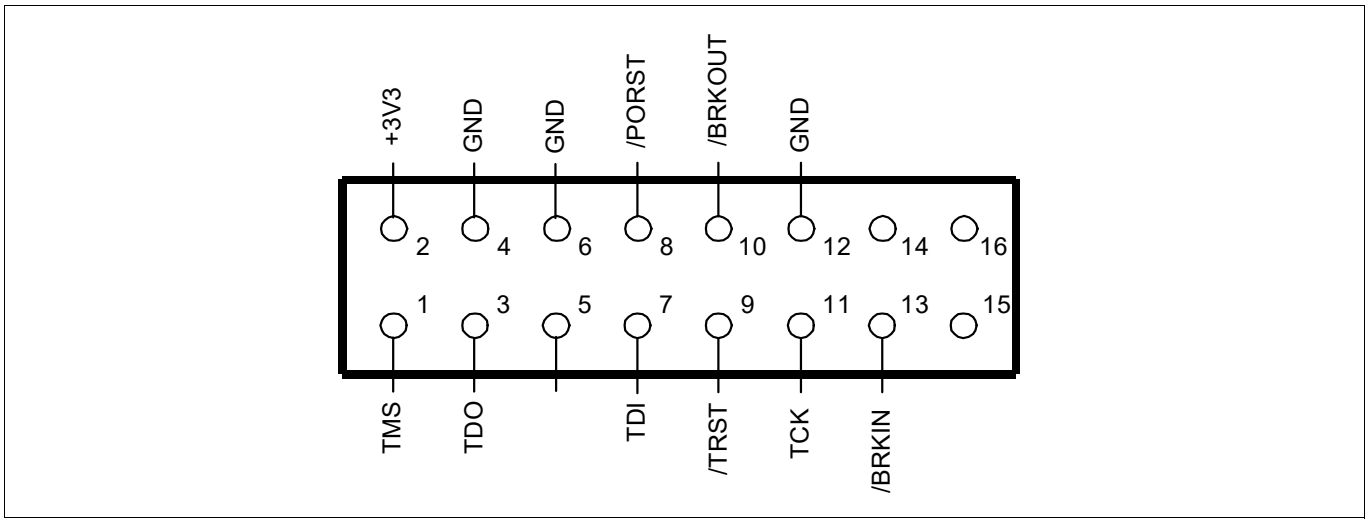

Figure 6-12 OCDS1 connector pinout (IDC16)

6.12 DAP connector pinout

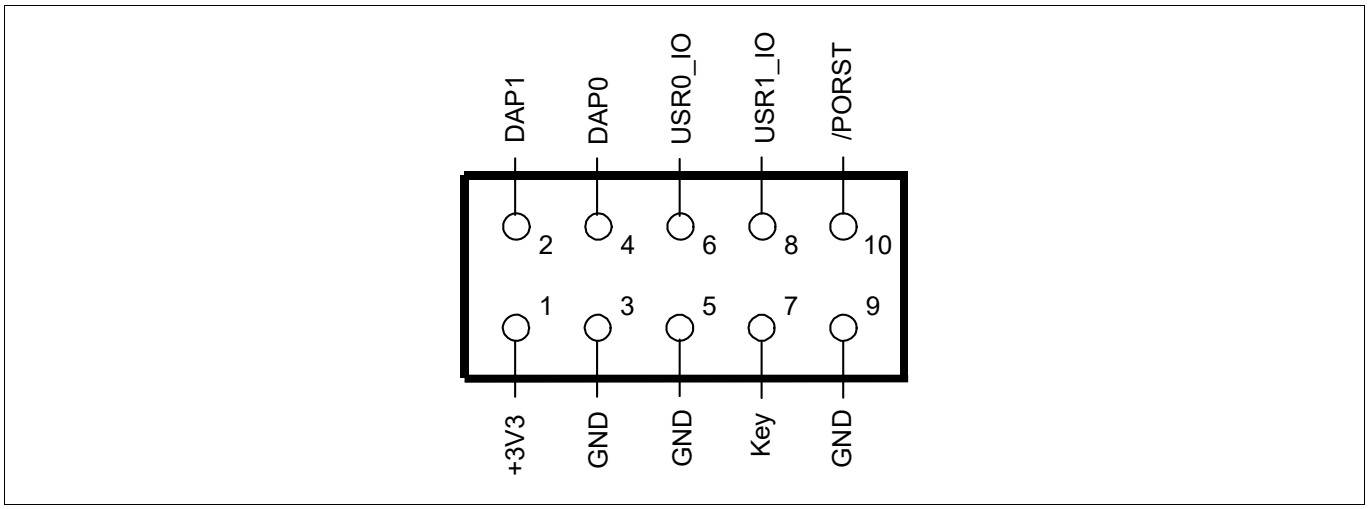

Figure 6-13 DAP connector pinout (Samtec FTSH10)

6.13 ETK connector pinout

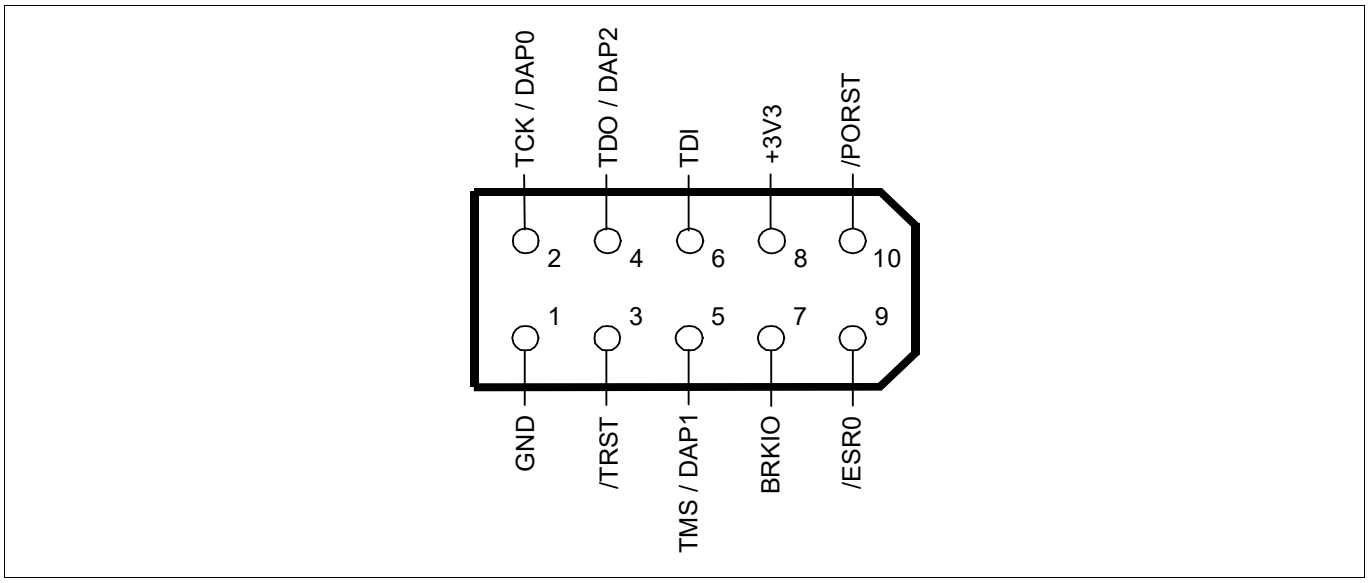

Figure 6-14 ETK connector pinout (Samtec TFM-105)

6.14 Ethernet miniWiggler power connector pinout

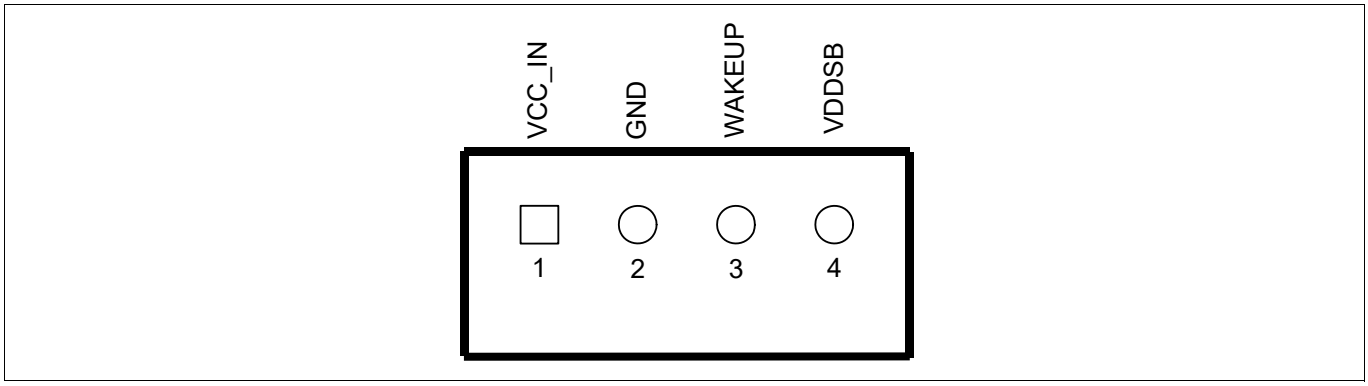

Figure 6-15 Ethernet miniWiggler connector pinout (JST B4B-PH)

7 Schematic and Layout

7.1 Known problems

7.1.1 Known problems (TriBoard TC3X6 ADAS TH V1.0)

No problems known.

7.1.2 Known problems (TriBoard TC3X6 ADAS V1.0)

No problems known.

7.2 Schematic

7.2.1 Hint about used TLF30682

Schematic was prepared for another device which will not be available. Therefore some names in the symbol of U501 don’t match with the pin names of TLF30682 and should be changed (no functional issue if not other mentioned, only name change):

Pin 1 from AGS1 to AG5

Pin 2 from SSO to NC (don’t connect any signal to this pin)

Pin 3 from AGS2 to AG6

Pin 5 from AG1 to NC (don’t connect any signal to this pin)

Pin 17 from AG2 to AG1

Pin 18 from GST to AG2

Pin 30 from R3PG2 to R3PG1

Pin 32 from FRE to TM1

Pin 44 from ERR to TM2 (connect this pin directly to ground)

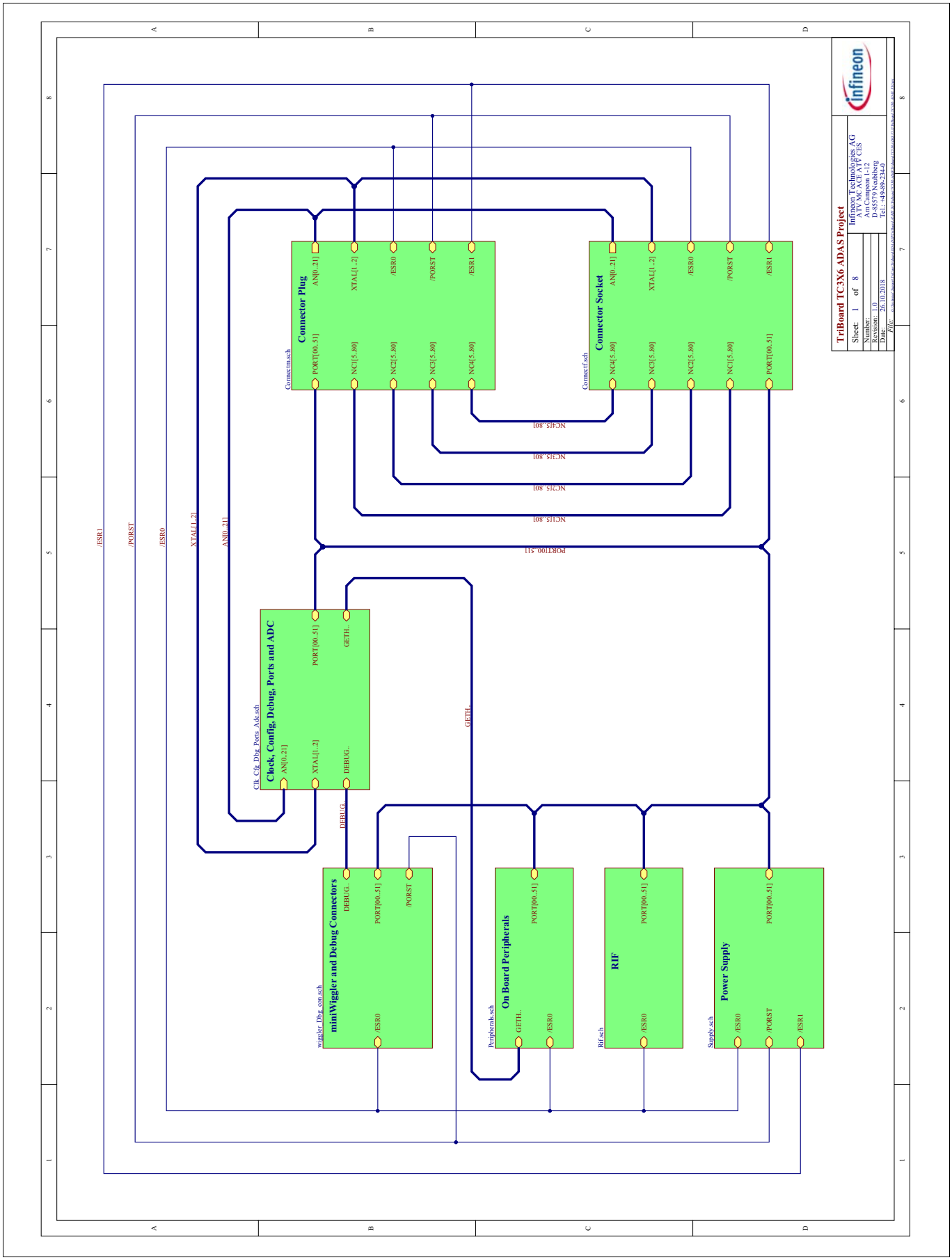

Figure 7-1 Schematic - Project

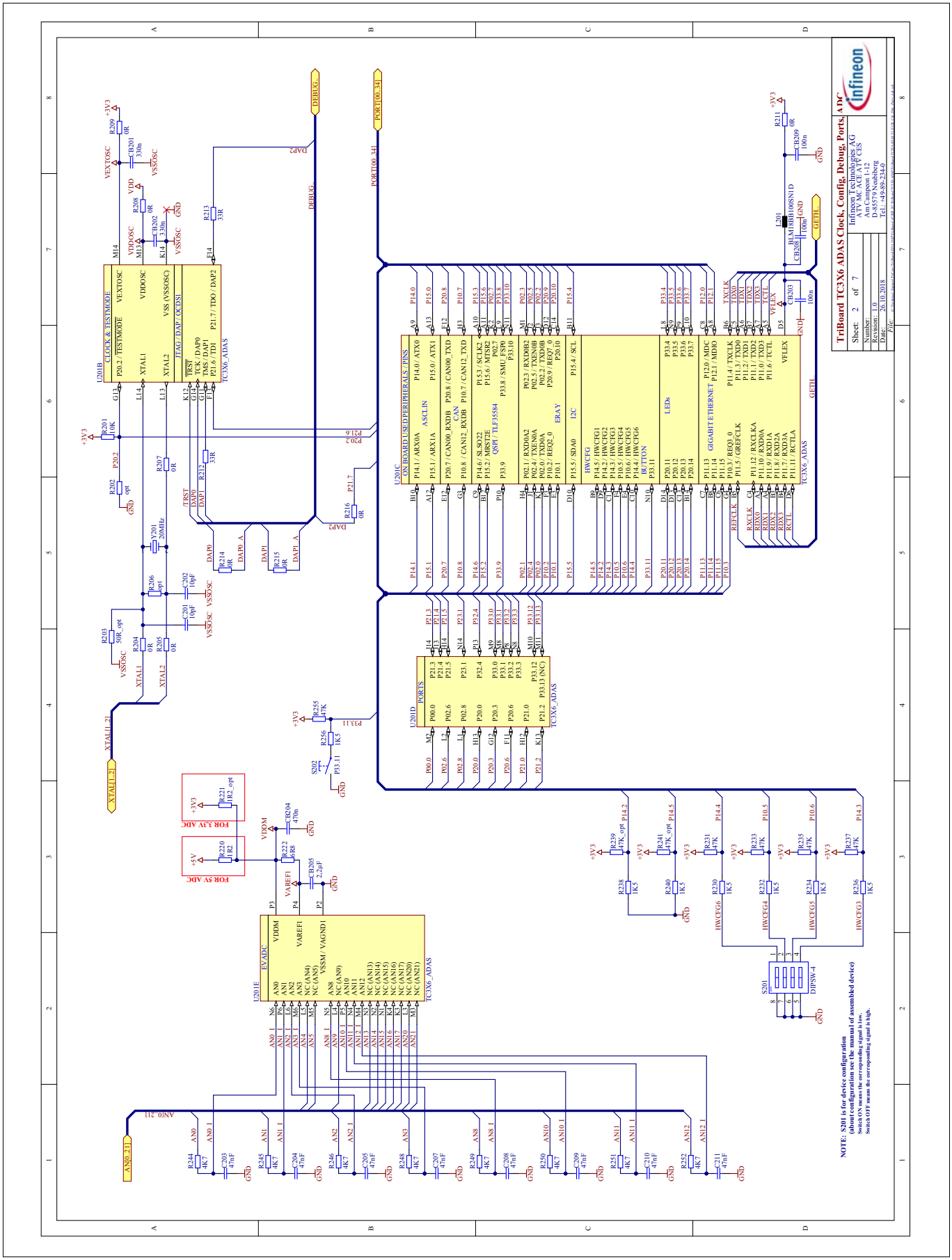

Figure 7-2 Schematic - Clock, Config, Debug, Ports and ADC

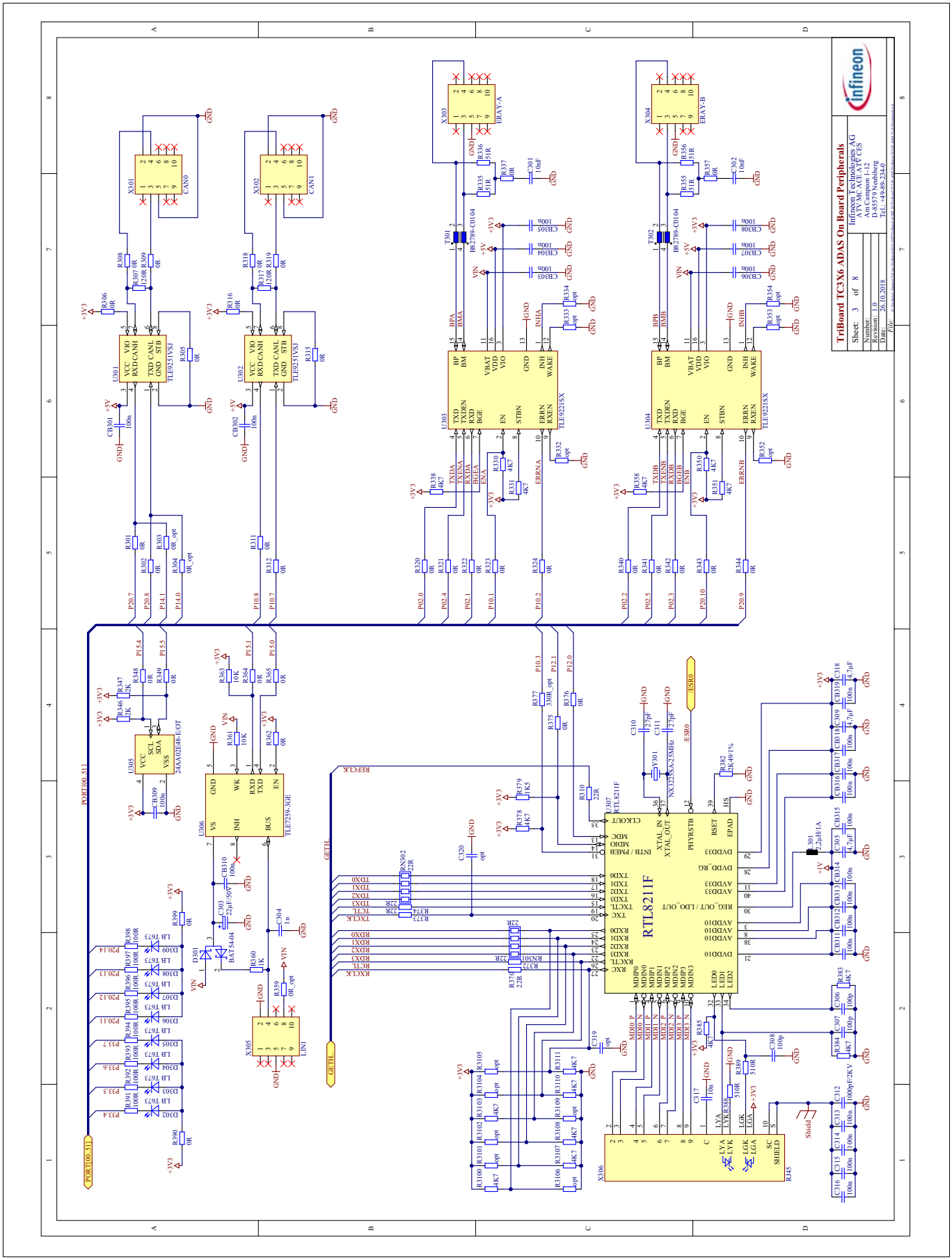

Figure 7-3 Schematic - On Board Peripherals

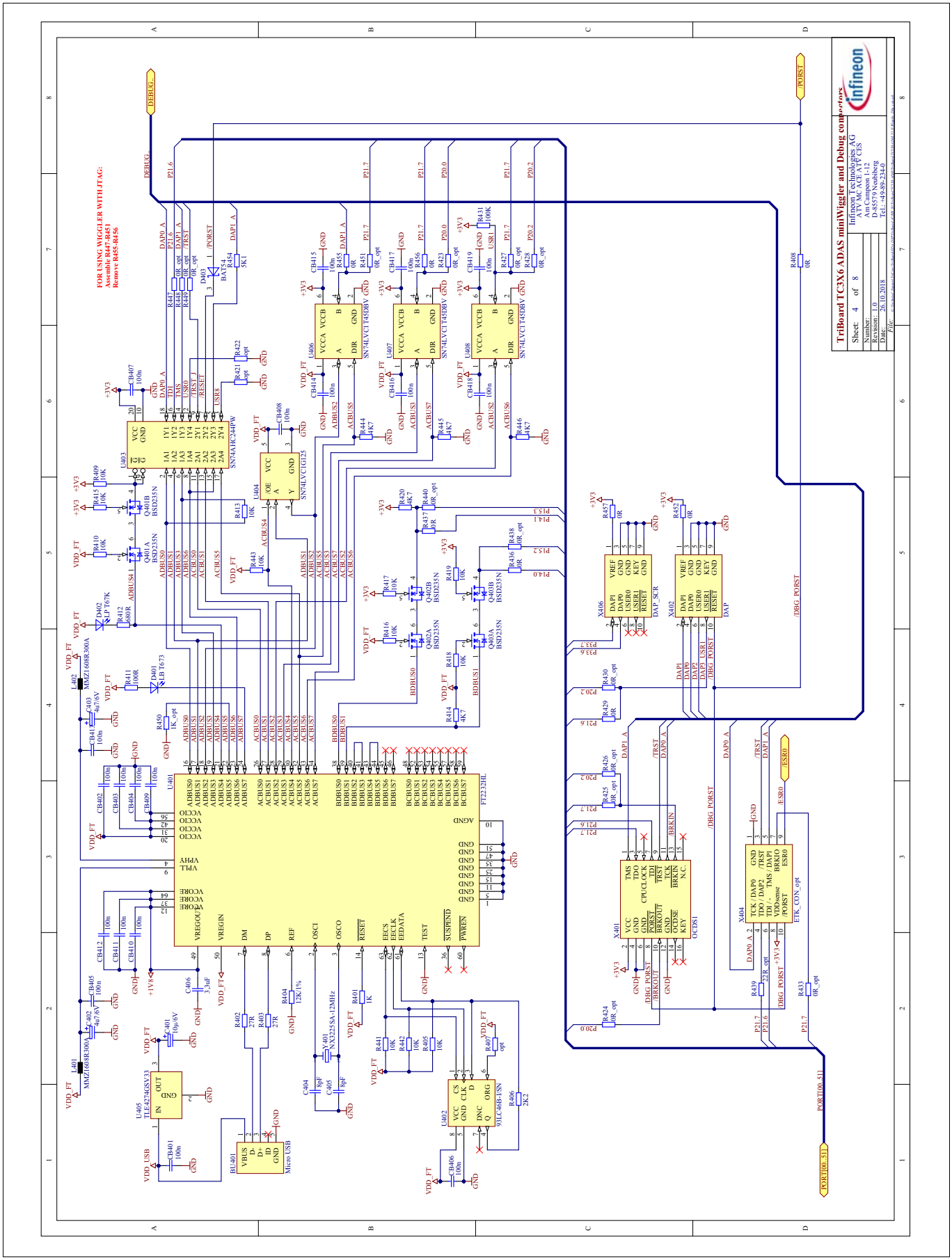

Figure 7-4 Schematic - miniWiggler JDS and Debug connectors

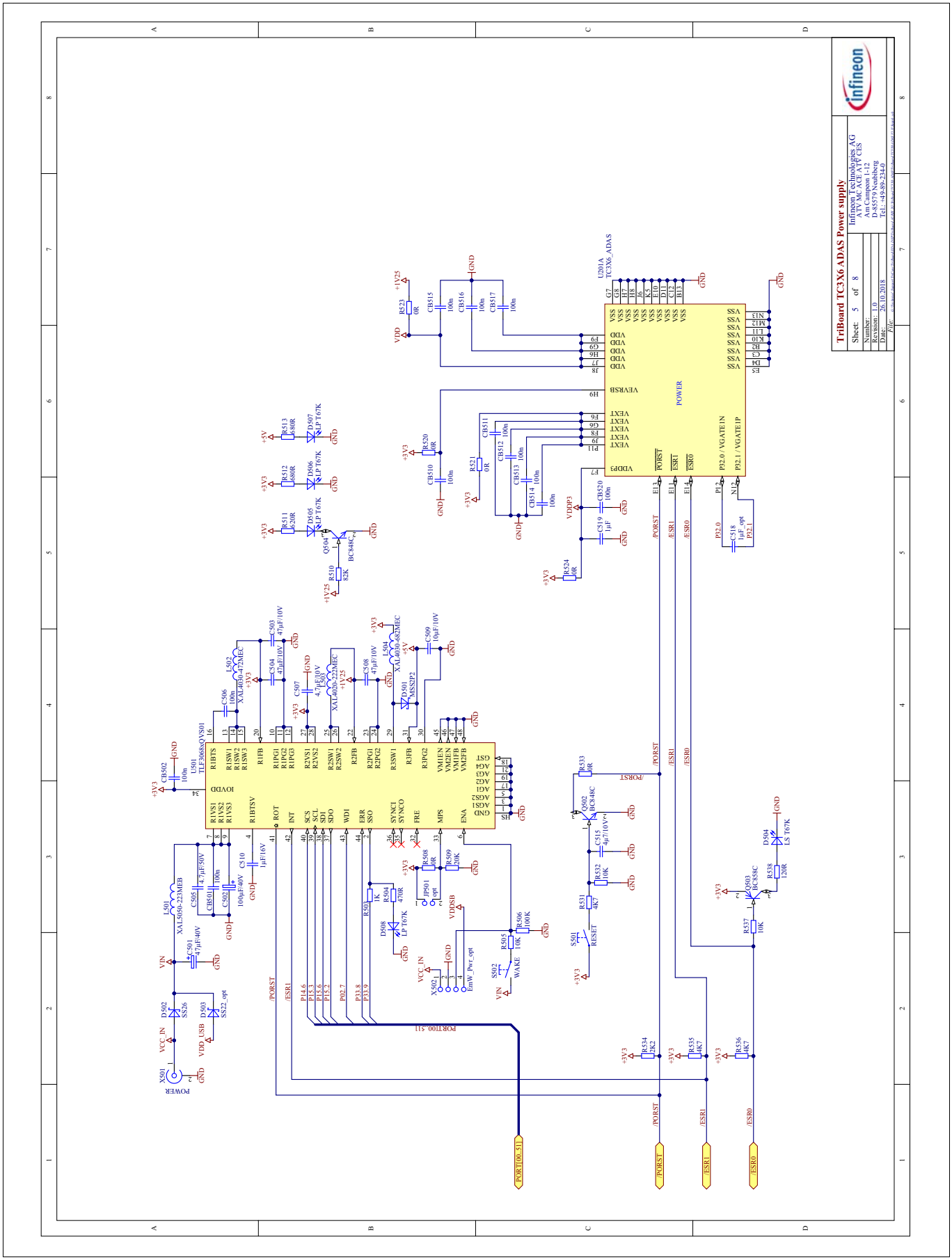

Figure 7-5 Schematic - Power Supply

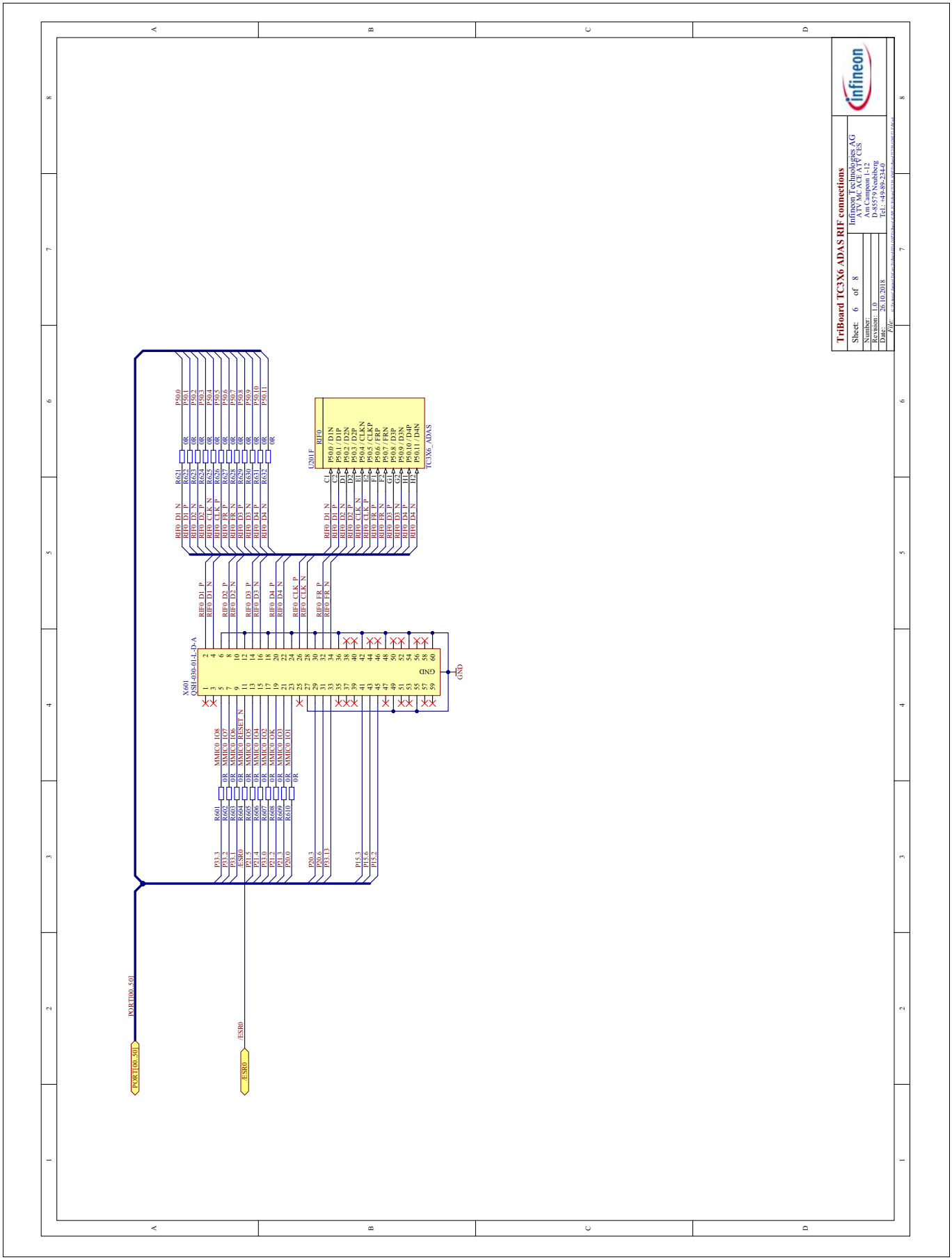

Figure 7-6 Schematic - MMIC / RIF connections

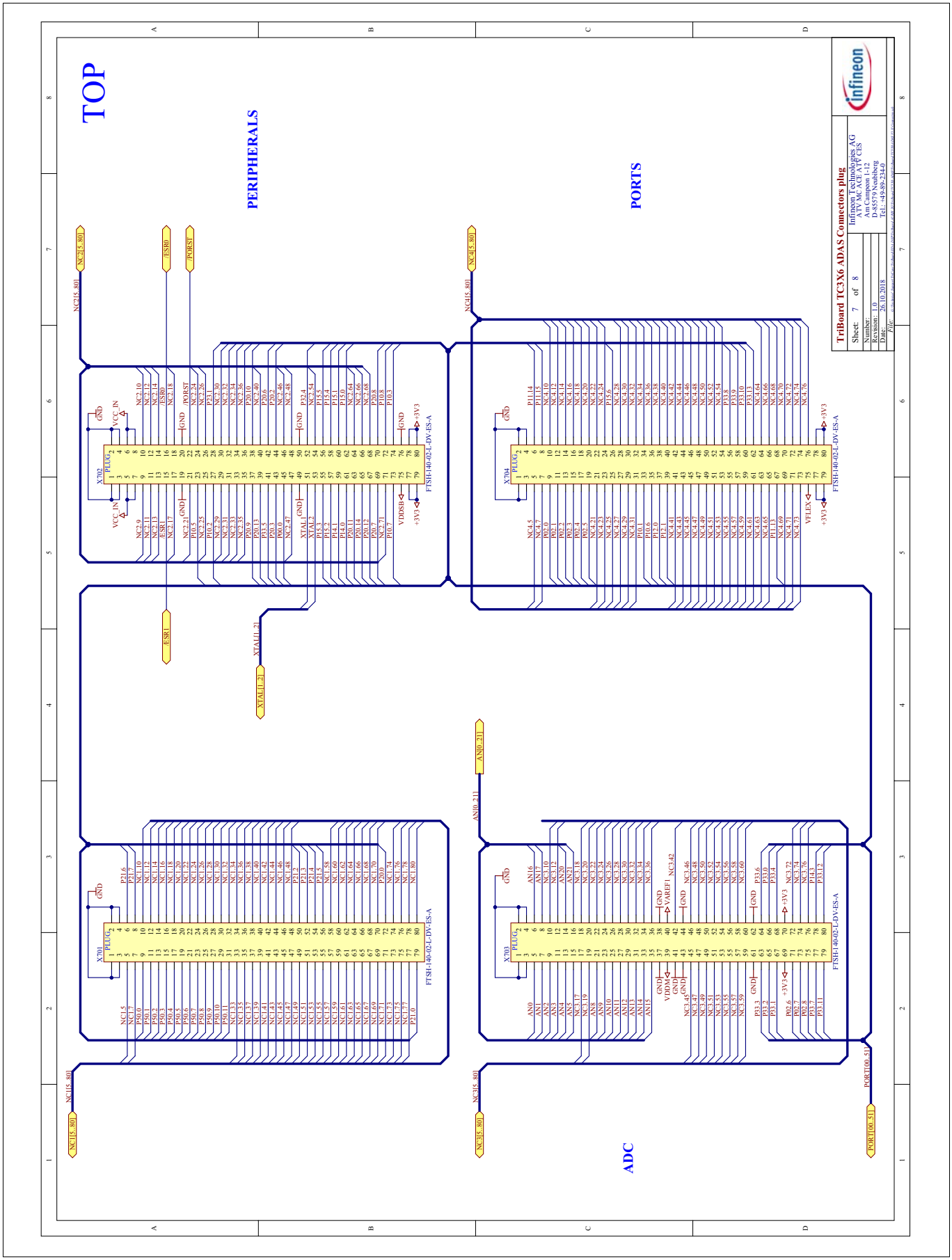

Figure 7-7 Schematic - Connectors (Plug)

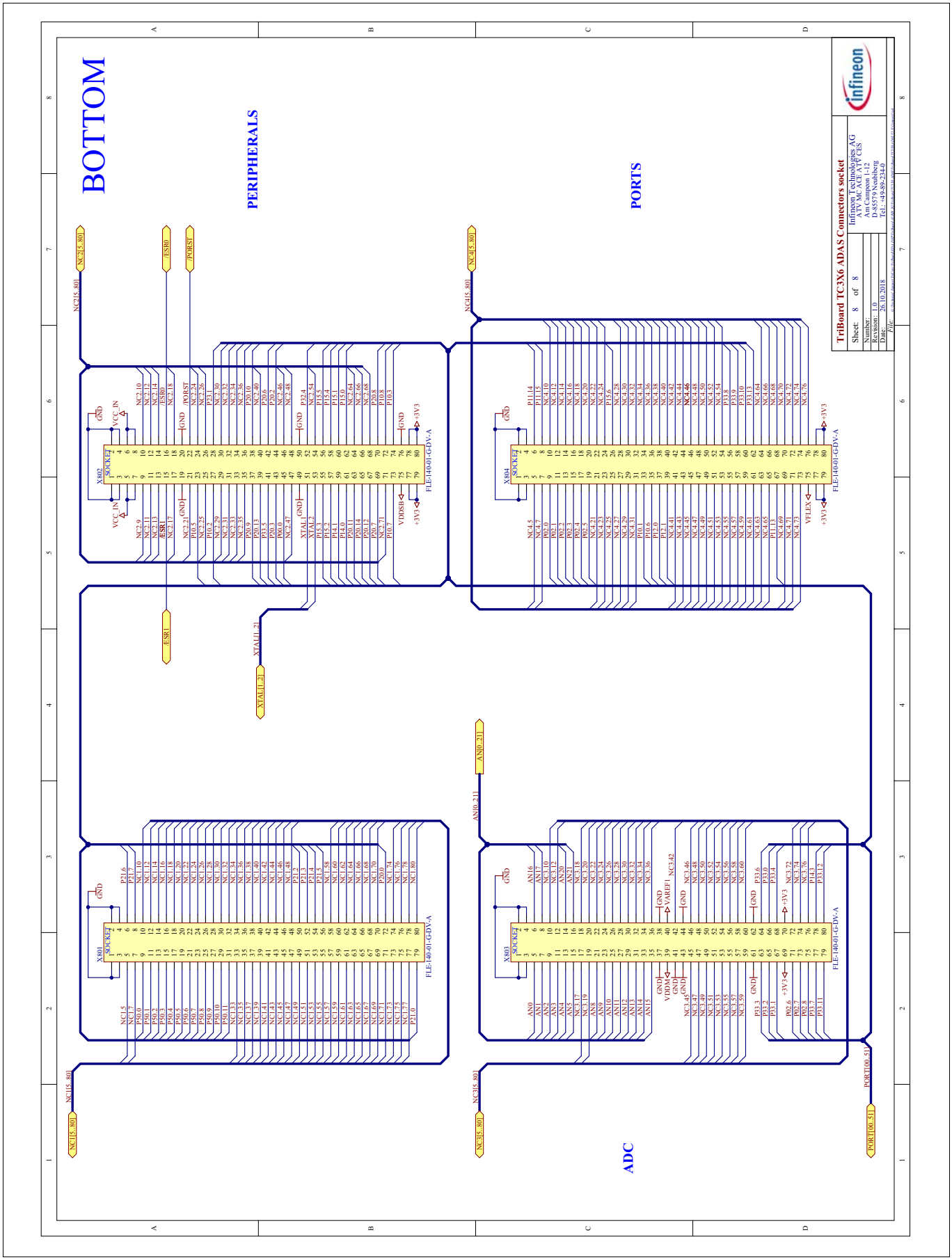

Figure 7-8 Schematic - Connectors (Socket)

7.3 Layout

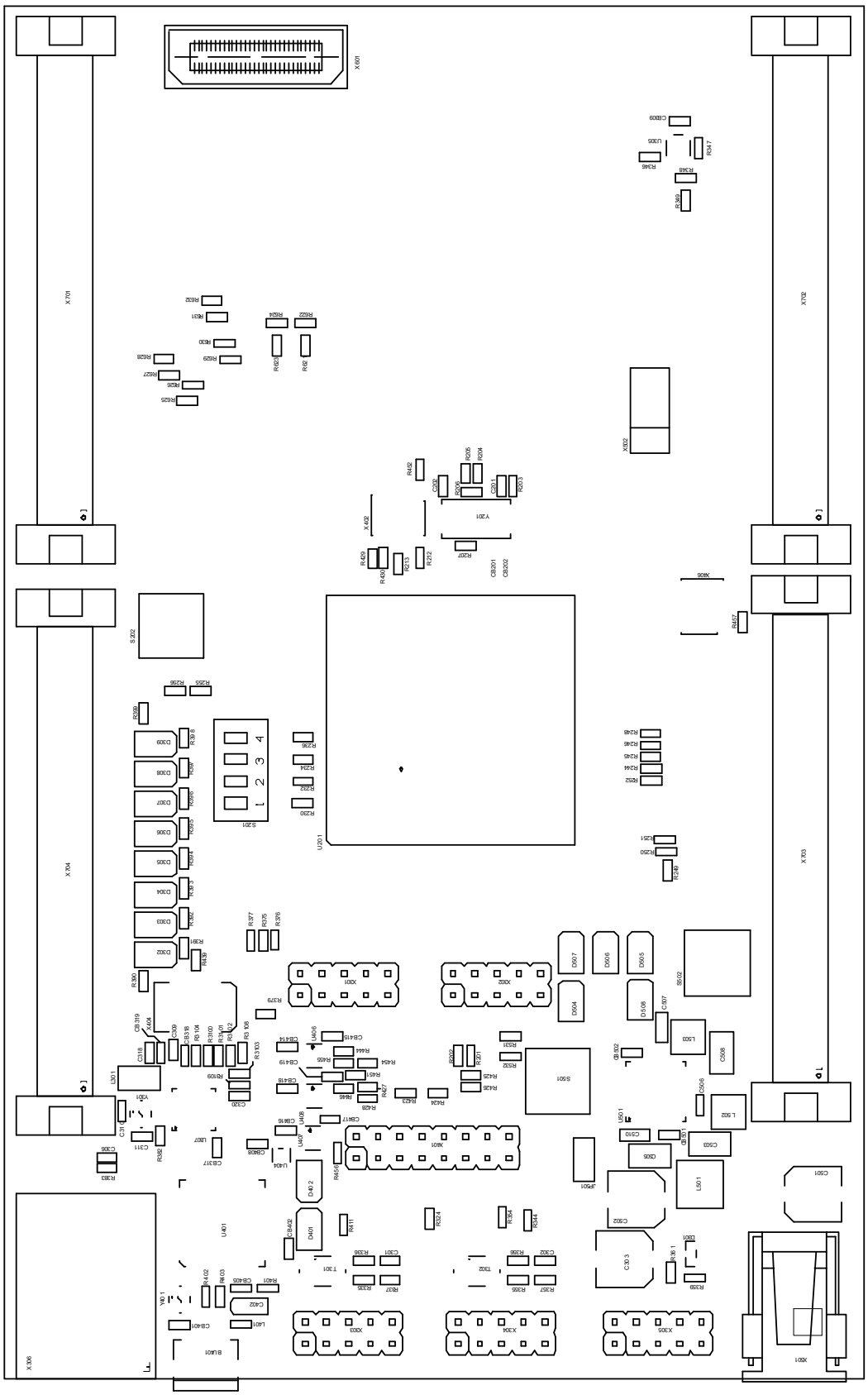

Figure 7-9 Component Plot Top Layer TriBoard TC3X6 ADAS TH

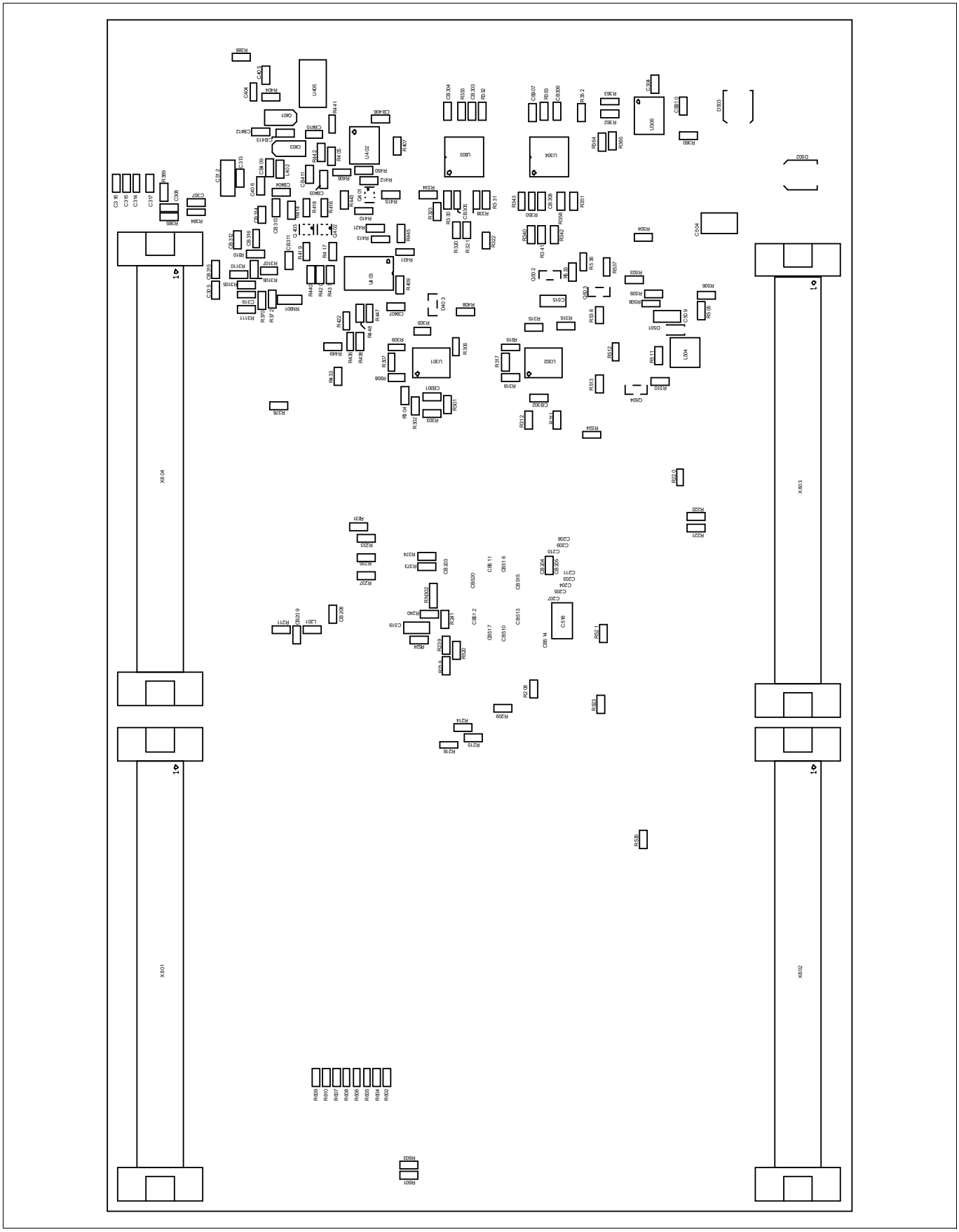

Figure 7-10 Component Plot Bottom Layer TriBoard TC3X6 ADAS TH

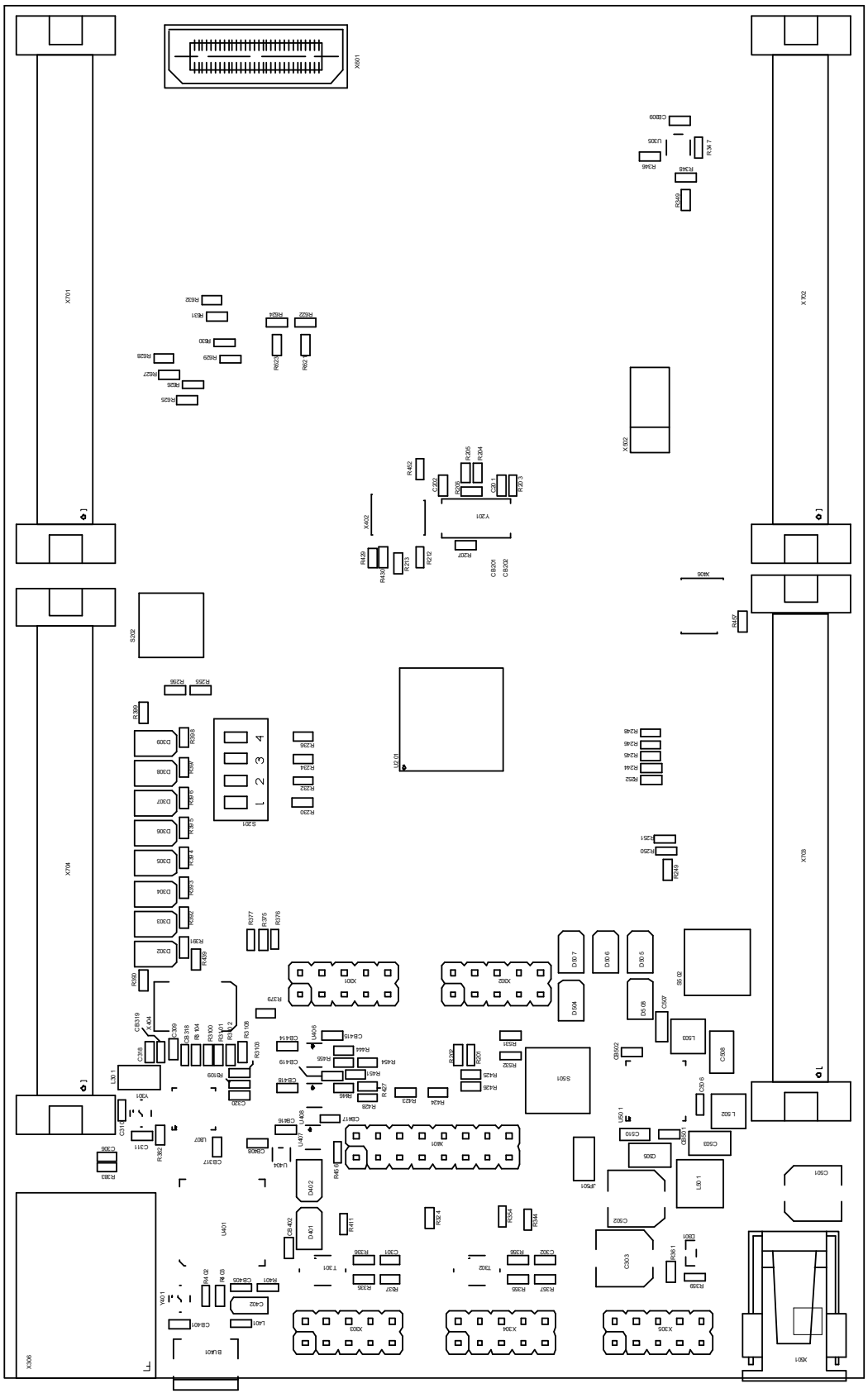

Figure 7-11 Component Plot Top Layer TriBoard TC3X6 ADAS

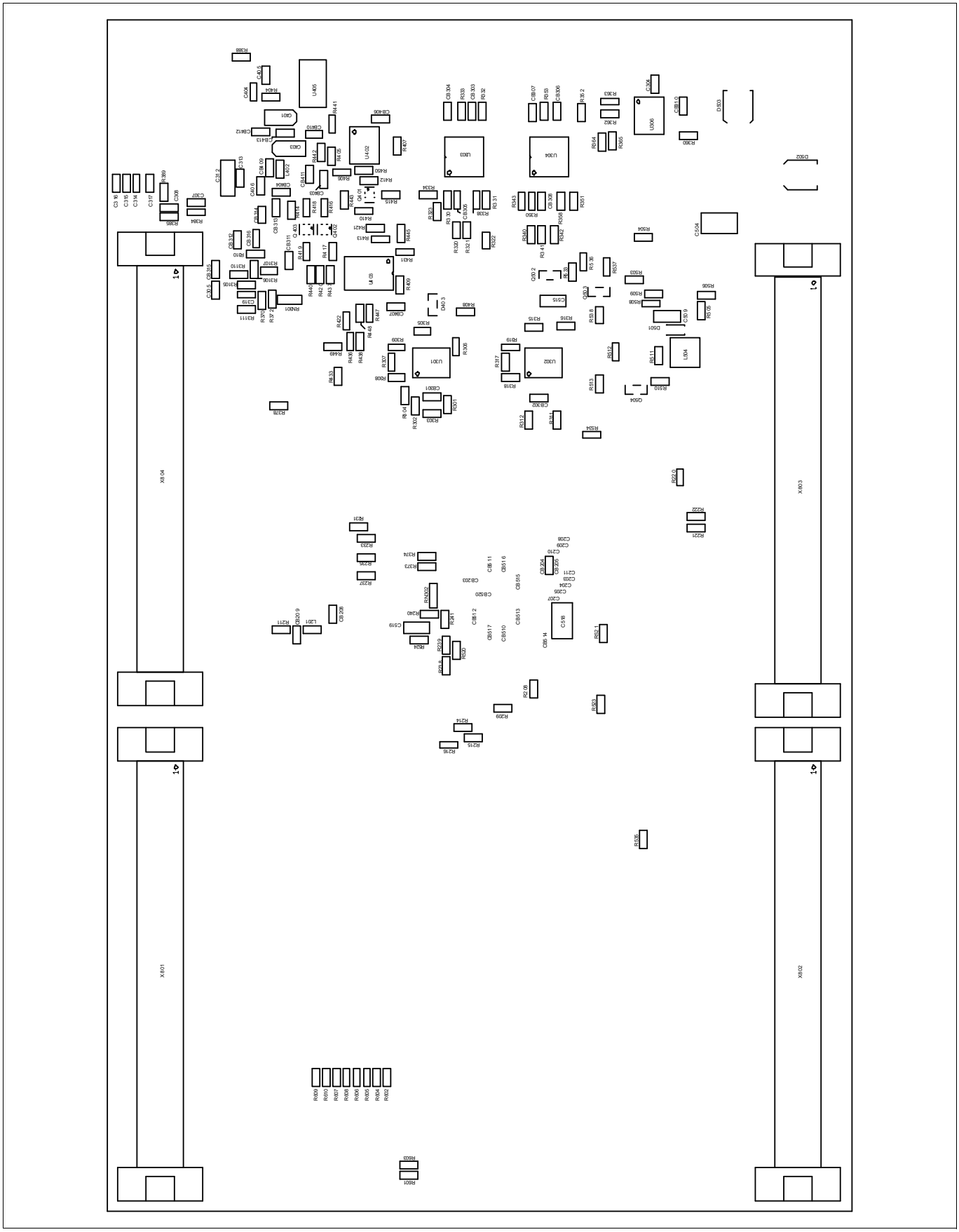

Figure 7-12 Component Plot Bottom Layer TriBoard TC3X6 ADAS

Layout with Dimensioning

The following dimensions should be used for development of extension boards.

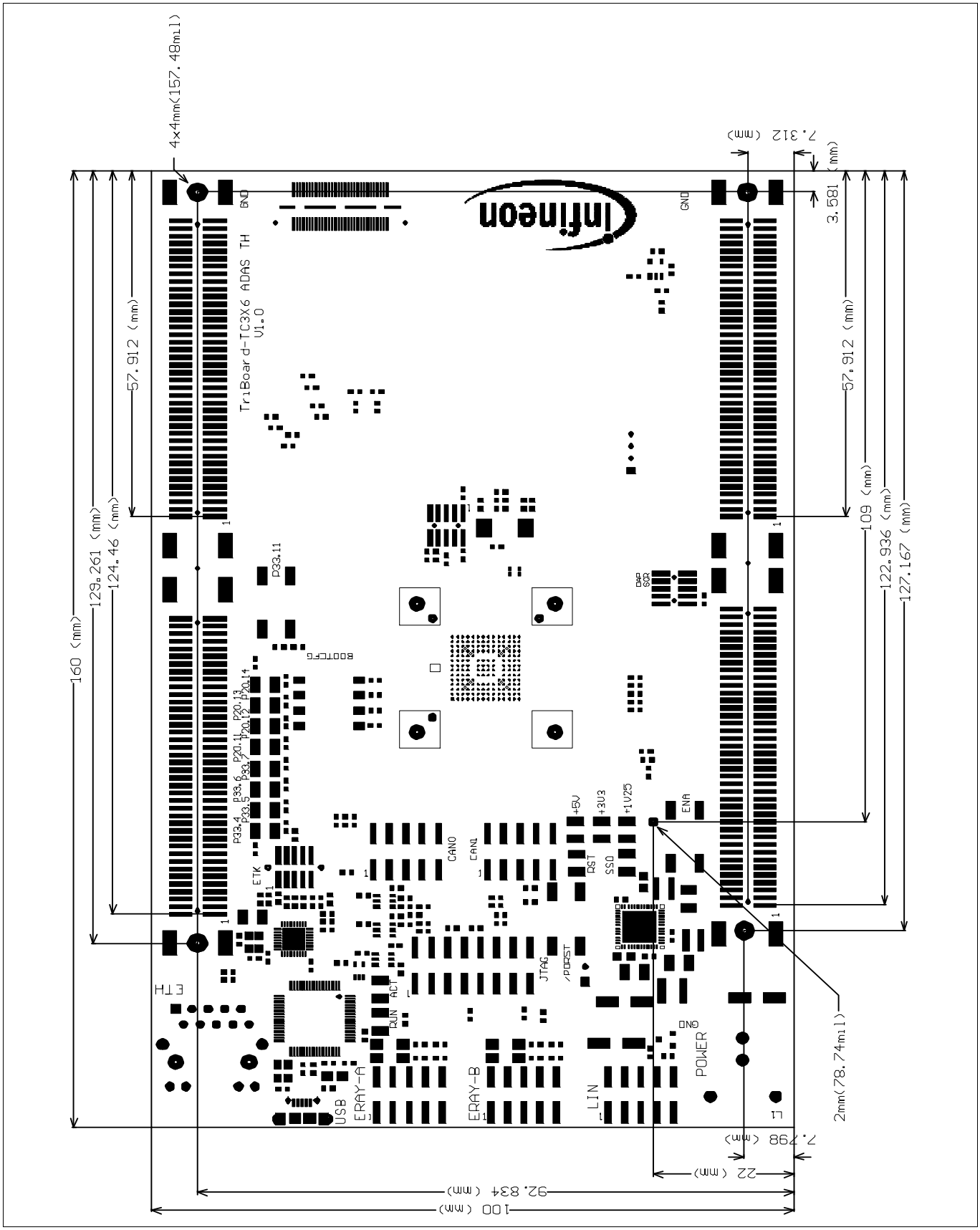

Figure 7-13 Dimensioning (mm)

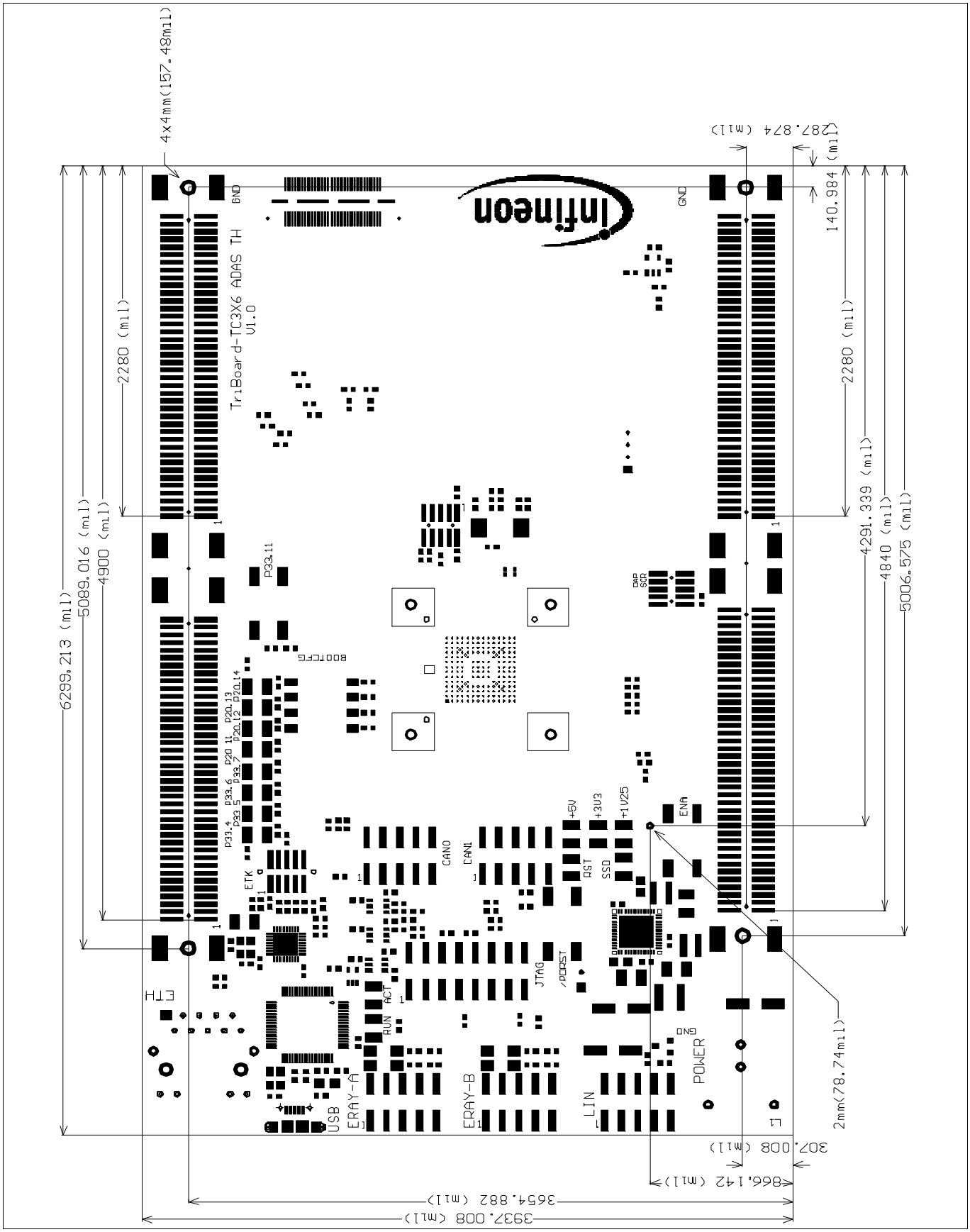

Figure 7-14 Dimensioning (mil)

The dimensioning is valid for all TriBoards.

Revision History

Page or Item	Subjects (major changes since previous revision)
V1.2, 2020-02	
all	Name of supply IC from TLF3068X to TLF30682 changed and unavailable device (684) removed
chapter 2.1	Unusable safe state LED removed, TC336DA added
chapter 2.2	Figure 2-1 corrected (WAKEUP from CPU to power supply removed), TC336DA added, add hint ERAY and CAN1 not with TC336DA
chapter 3.2.1	hint (planned, not yet tested) removed for TC336DA
chapter 3.4	Description for SSO changed
chapter 3.3.1 and 3.16	Name of S502 corrected from WAKE to ENA/WAKE
chapter 3.9	add hint for eeprom access with TC336DA (no I2C module)
chapter 3.10	add hint that CAN1 is not usable with TC336DA
chapter 3.11	add description for LIN master and slave changes
chapter 5.6	Connection description for P33.8 and P33.9 updated
chapter 6	add separat connector layout for TC336DA
chapter 7.2	Hint about power supply devcice added
Revision History	add complete history of all previous versions
V1.1, 2019-07	
chapter 3	add detailed description of usable devices/restricted devices
V1.0, 2019-02	
all	first version

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