TriBoard Manual TC3X2

Hardware: TriBoard TC3X2 TH V1.0 and TriBoard TC3X2 V1.0

About this document

Scope and purpose

The User Manual provide information about using, configuration and connecting the TriBoard with Infineon AURIX™ TC3X2 TQFP device (0.4mm pitch). The manual provide information for different hardware types. There exist different hardware with Through Hole socket (TriBoard TC3X2 TH) and soldered devices (TriBoard TC3X2). The schematic is identically for the all boards if not other mentioned in chapter schematic. The placing on the boards is the same, all components are on the same location.

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 TC3X2 TQFP (e.g. TC332, TC322) please refer to the User Manual of the used device.

2 Features

2.1 Summary of Features

- Infineon's TC3X2 (TC332, TC322) AURIX™ 2G Controller in TQFP-80 Package (0.4mm pitch)
- FlexRay™ [1] Transceivers
- High Speed CAN Transceivers (CAN-FD capable)
- USB to UART bridge
- 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 TC3X2 TriBoard offers a wide variety of connectors:

- Standard power connector
- Micro USB connector for ASC Interface (ASC0) and miniWiggler
- 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)
- four 80-pin connectors (male) + four 80-pin connectors (female) with all I/O signals
- optional ETK connector
- optional 6pin (IEEE1394) Socket for HSCT

Components

- Infineon's Multi Voltage Safety Micro Processor Supply TLF35584QV
- Three LEDs to validate power supply (5Volt / 3,3 Volt / 1,25 Volt)
- LED indicating safe state signal 2 from TLF35584
- 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)
- 8 general purpose LEDs
- 2K SPI Bus Serial Eeprom (MICROCHIP)
- Reset switch
- Enable switch
- Generic switch

1) FlexRay™ is a trademark of FlexRay Consortium.

Features

– 4-pin Dip switch

Zero Ohm Bridges

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

2.2 Block Diagram

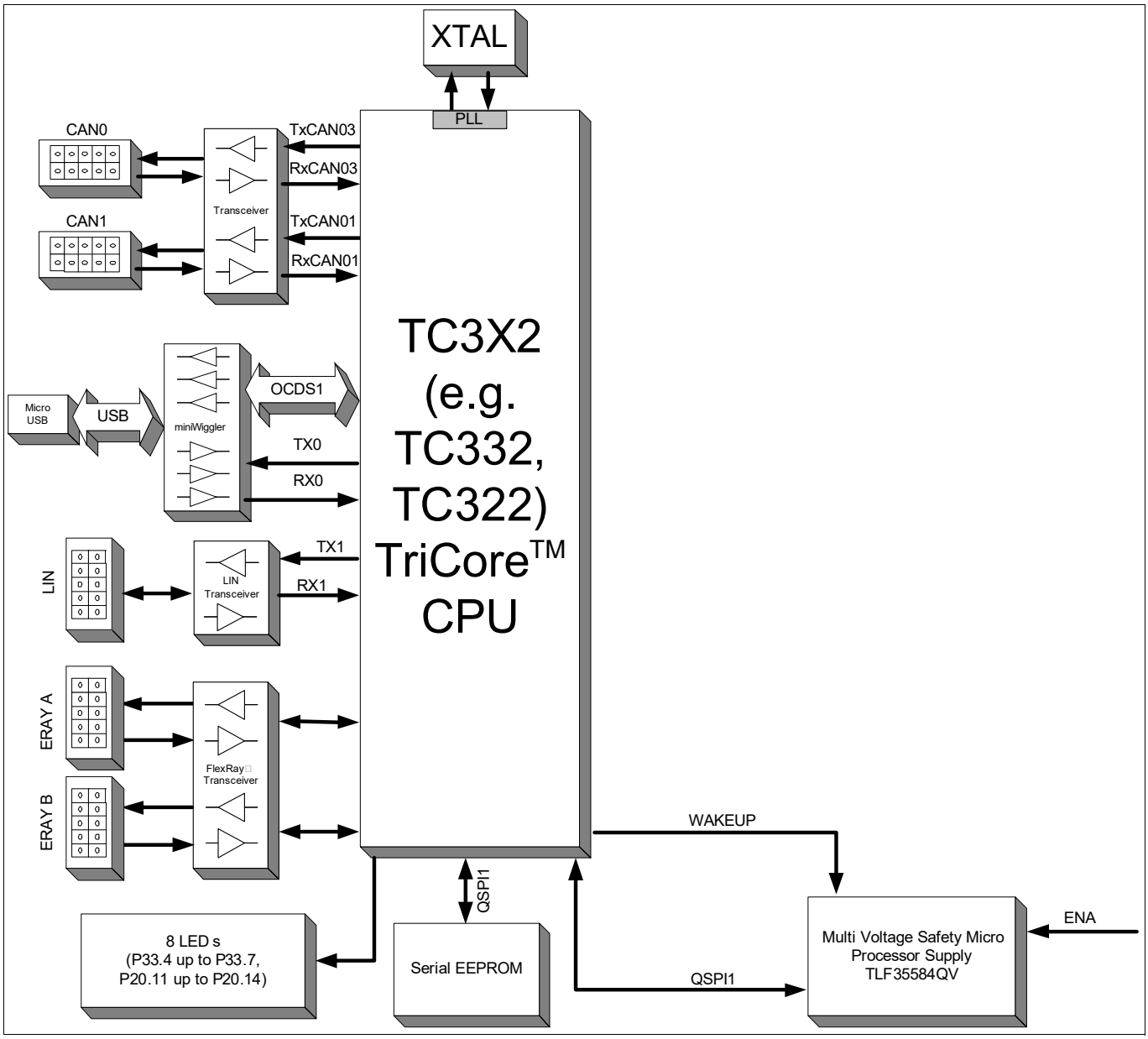

Figure 2-1 TriBoard Block Schematic

2.3 Placement

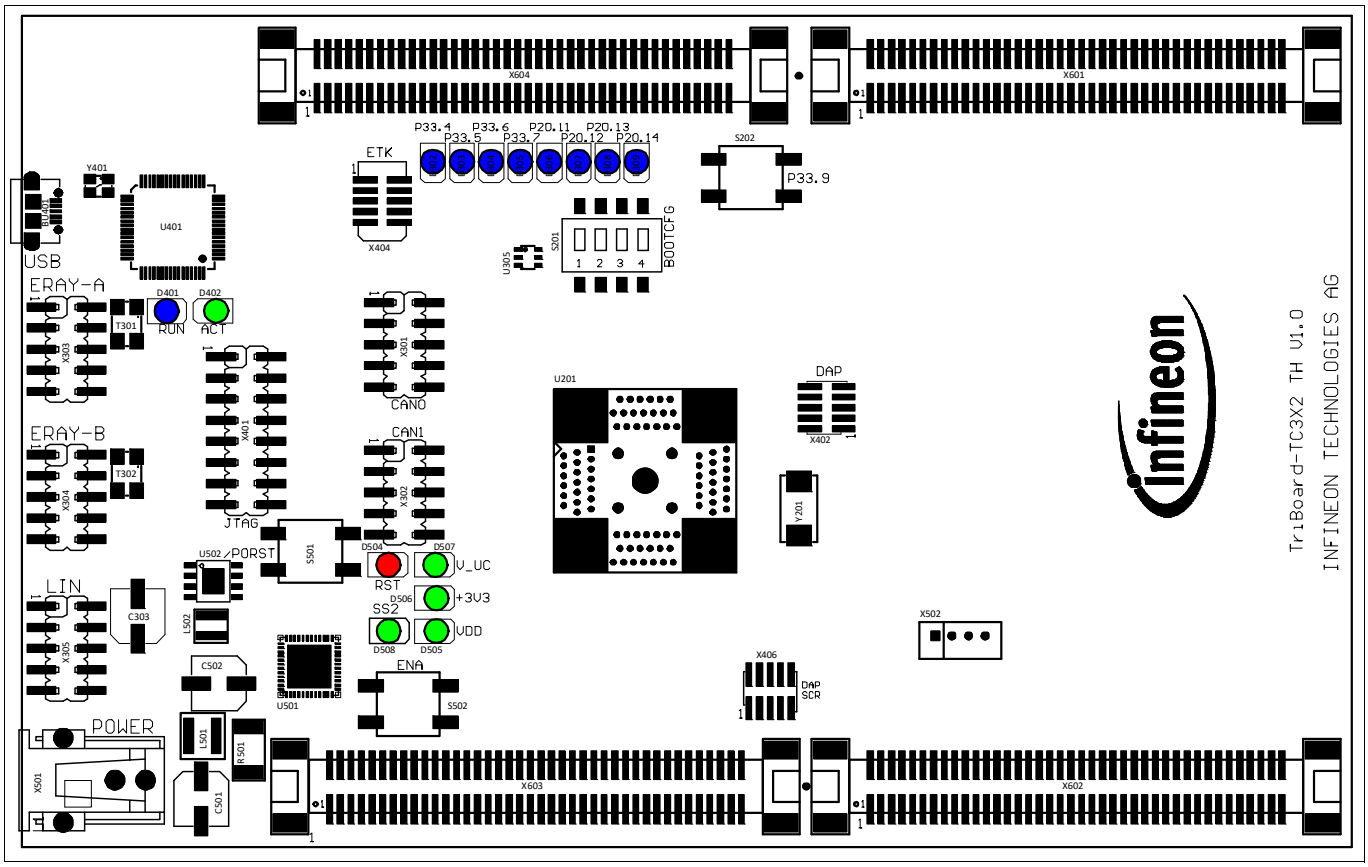

Figure 2-2 TriBoard TC3X2 (TH) V1.0 Placement

3 TriBoard Information

3.1 Soldered board

TriBoard TC3X2 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 TC3X2 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:

- TC332
- TC322 (planned, not yet tested)

3.2.2 Restricted usable devices

- None

3.3 Power Supply

All needed voltages are generated via Infineon's Multi Voltage Safety Micro Processor Supply TLF35584QV and via the microcontroller itself (+1,25V).

The supply device is available as two different devices:

TLF35584QVVS1 -> +5V standby voltage, +5V TriCore™ supply (V_UC)

TLF35584QVVS2 -> +3,3V standby voltage, +3,3V TriCore™ supply (V_UC)

Dependent of the assembled device the board works with 5V or 3,3V IO.

The TLF35584QV provide the following voltages:

+3,3V or +5V for standby (connected to VEVRSB)

+3,3V or +5V for TriCore™ (connected to VEXT)

+5V communcation supply (used by CAN and FlexRay™ transceivers)

+5V voltage reference (connected to VDDM and VAREFx)

+3,3V via LDO directly from pre regulator

Applying a stable supply voltage causes the power on reset after a short period. The three LED's (V_UC, +3.3V, VDD) 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 6-3**. There can be used any standard power pack with a connector where the positive line is surrounded by the ground line.

3.3.1 Failsafe handling

In case that the device don't contains a program which disable or service the window watchdog and error pin monitor of the TLF35584 then the TLF35584 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 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.

If you will use/evaluate all safety features of the TLF35584 make sure that R509 is assembled and R508 is not assembled. Make sure that you have a proper initialization of TLF35584 in your softare.

Resistor R508 and R509 are red marked in the following **Figure 3-1**:

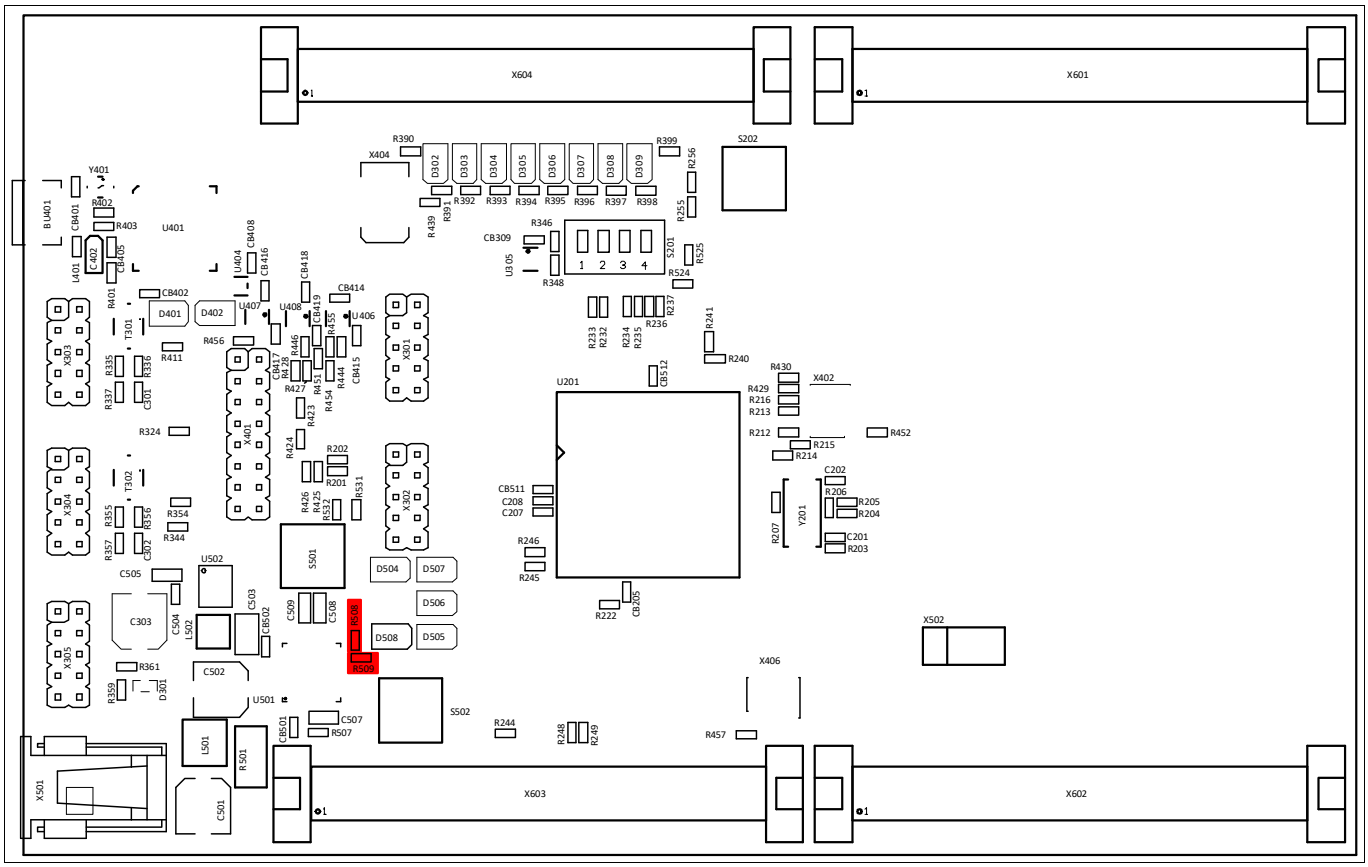

Figure 3-1 Resistors for TLF35584 Safety feature handling with switch on

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 VDD (green) ->VDD (+1,25V) power supply indication
- D506 +3V3 (green) -> +3,3V power supply indication
- D507 V_UC (green) -> +5V/+3,3V power supply indication
- D508 SS2 (green) -> safe state signal 2 indication
- D402 ACT (green) -> on board miniWiggler JDS is ACTIV
- D401 RUN (blue) -> Debug RUN mode (switched by DAS Server)

3.5 Clock

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

3.6 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 6-4**.

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

3.6.1 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 P11.10 and P11.12)
- 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 3-2**.

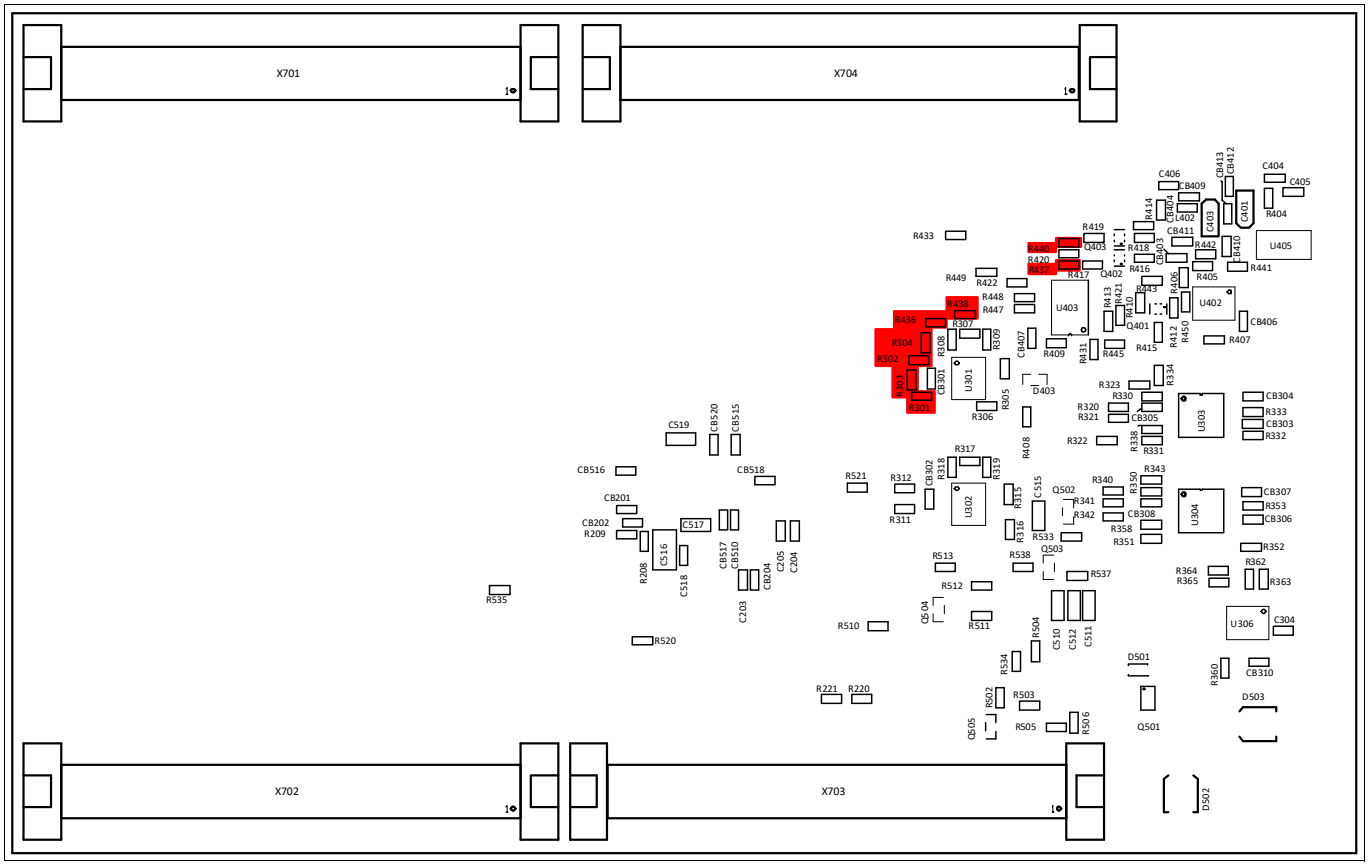

Figure 3-2 Resistors for ASC connection (ASC0)

3.6.2 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. 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 connectors X402 and X406 can be used. See **Figure 3-6**.

3.7 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 6-5**. 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 (R320 up to R324 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 P20.8. The error state of transceiver channel A can be read out via P20.9.

ERAY-B is connected to P02.2, P02.3 and P02.5. Transceiver for channel B can be enabled/disabled via P02.6. The error state of transceiver channel A can be read out via P02.7.

For more information look in the user manual for TC3X2 TQFP.

3.8 Serial EEPROM

The QSPI1 of the TC3X2 TQFP is connected to a serial EEPROM with a size of 2KBit (256 x 8). As chip select for this EEPROM is used the port pin P23.1. P23.1 has no chip select functionality of QSPI. Therefore the software must generate the chip select manual via bit banging. To disconnect (disable) the EEPROM remove resistor R348.

3.9 MultiCAN

On the board are two CAN transceiver connected to the CAN0 and CAN1 of TC3X2 TQFP. The transceivers are connected to two IDC10 plug. For the pinout of IDC10 plug see **Figure 6-6**. 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 R314) which must be removed to use the ports outside.

CAN0 can be used via P11.10 and P11.12 (CAN0 node 3, default) or P14.0 and P14.1 (CAN0 node 1). CAN1 can be used via P15.2 and P15.3 (CAN0 node 1, default).

3.10 LIN

On the board is one LIN transceiver connected to the ASCLIN1 on TC3X2 TQFP (P15.0 and P15.1). The transceiver are connected to one IDC10 plug. For the pinout of IDC10 plug 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.

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 3-3**

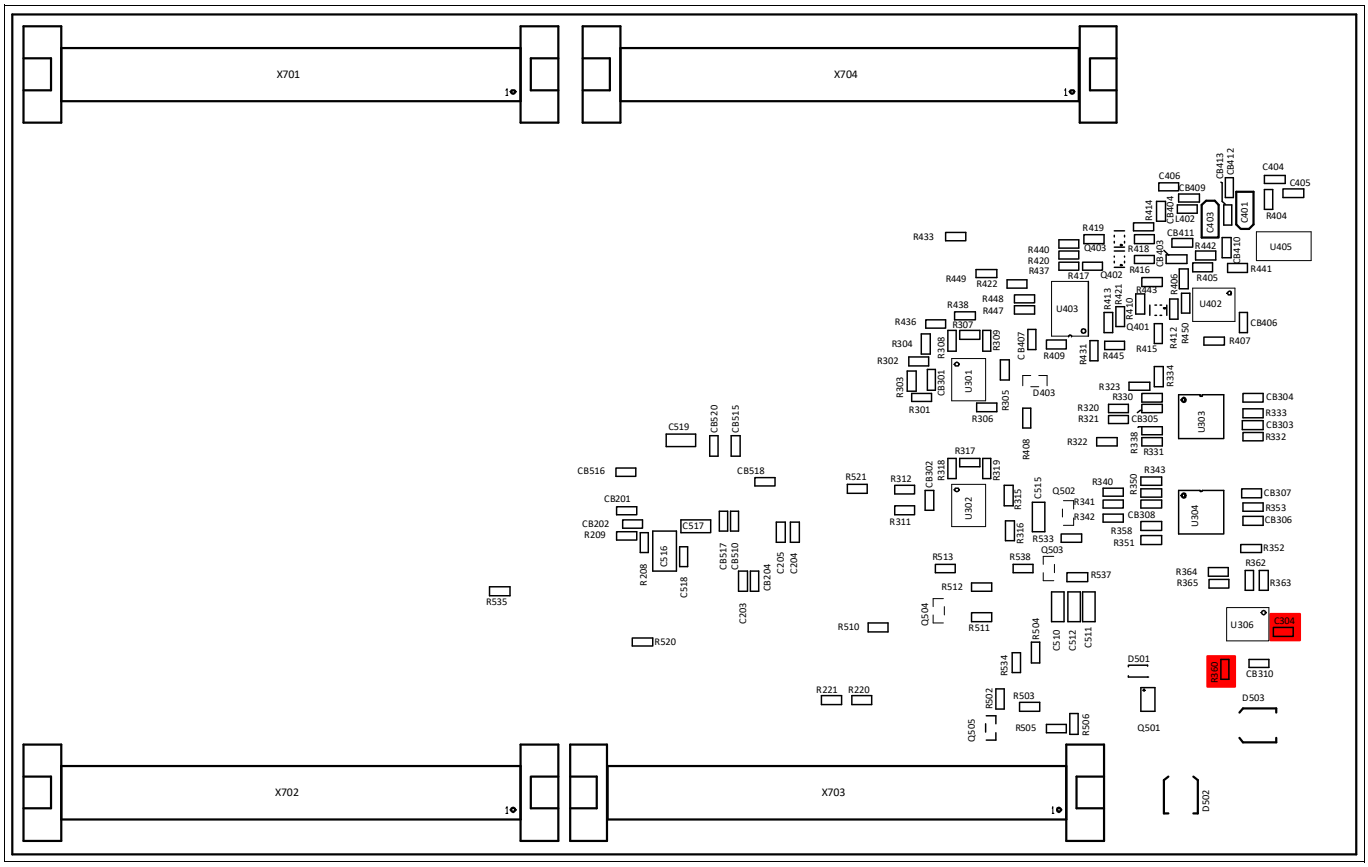

Figure 3-3 Components for LIN Master Mode

3.11 ADC

On this boards are 5 ADC channels prepared with a low pass filter. On pin AN5, AN11, AN12, AN32 and AN33 is assembled a capacitor of 47nF and a serial resistor of 4,7K. The filter components are red marked in the following figures (**Figure 3-4** and **Figure 3-5**).

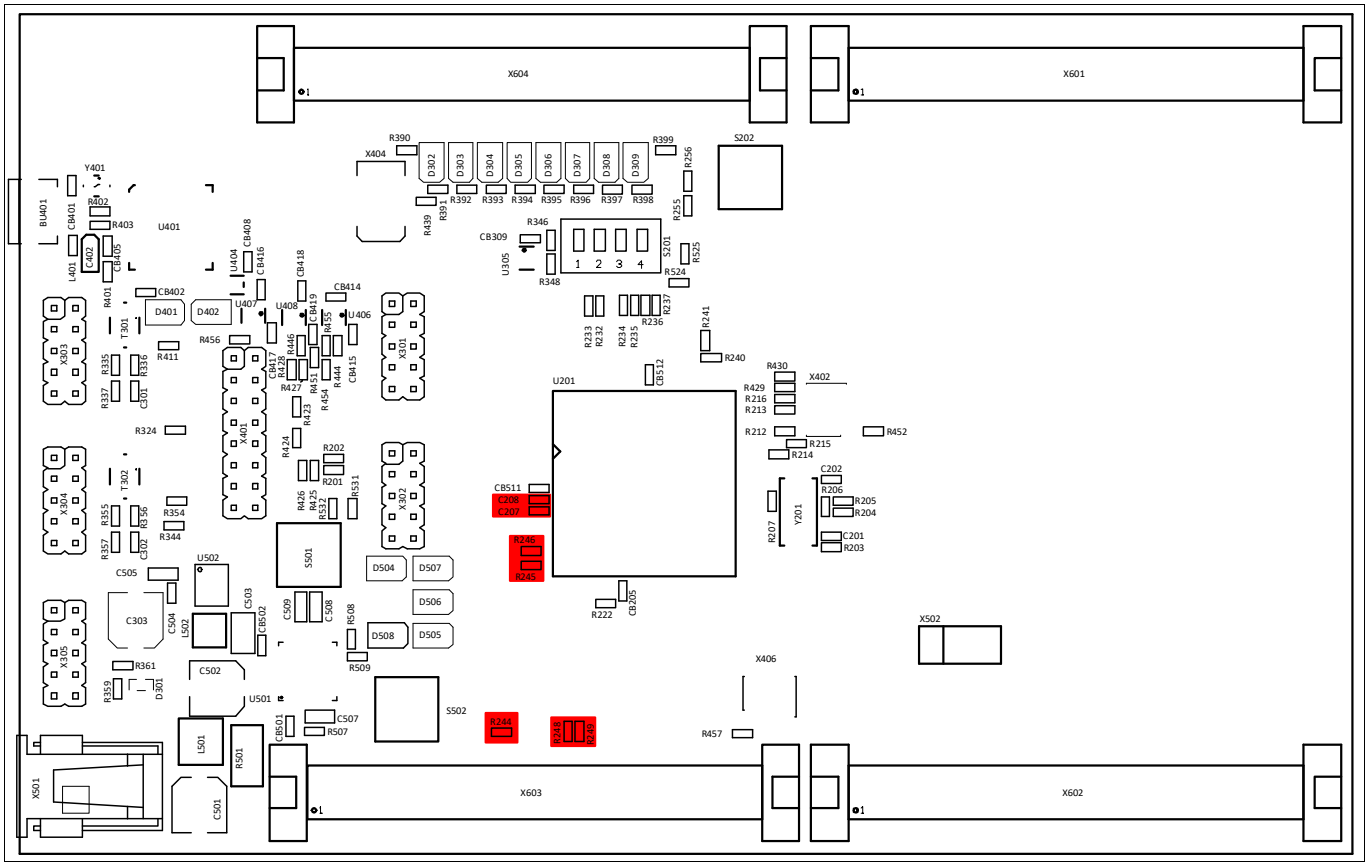

Figure 3-4 Filter components of ADC channels on Top Side

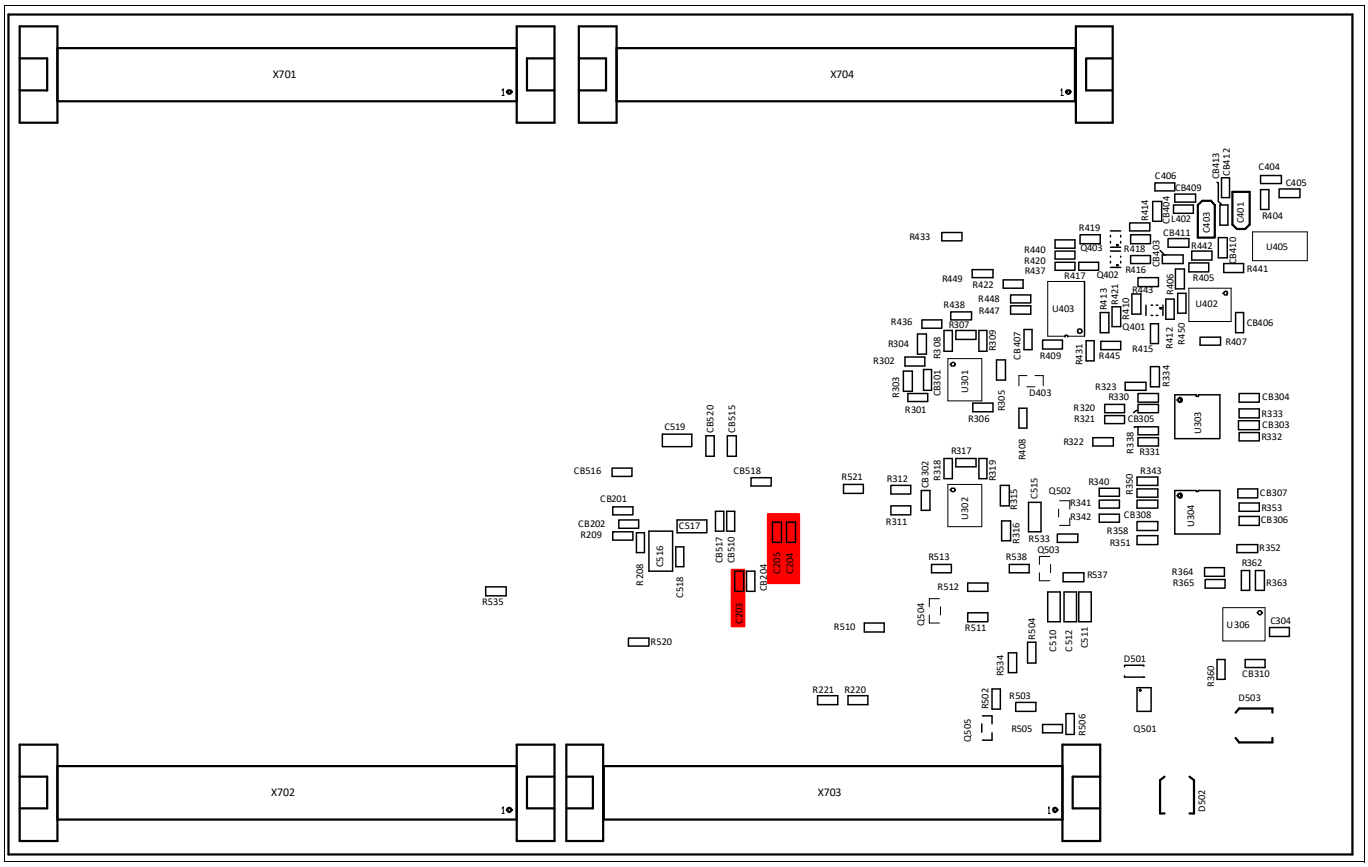

Figure 3-5 Filter components of ADC channels on Bottom Side

3.12 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.

3.13 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 powered by the standby voltage. This means that this LED's can be are activ also when the board is in standby mode and only the standby voltage available (port 33 is powered by VEVRSB pin which is connected to standby supply of TLF35584). In this case the port pins are controlled by the standby controller if available.

3.14 Buttons

On the board are three buttons.

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

The ENA button (S502) will be used to enable/wakeup the TLF35584.

The P33.9 button (S202) can be used by software as input. Also can this button used by the standby controller to react on an event when only standby supply is available (e.g. wakeup the TLF35584 via P33.10).

3.15 Debug System

3.15.1 OCDS1

The OCDS1 signals are connected to the IDC16 plug (X401). They work with the port supply of Microcontroller (+5V default or +3,3V). For pinout of the connector see **Figure 6-8**. 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 3-4**) 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.

3.15.2 DAP

The board comes with a DAP connector (X402). For pinout of this connector see **Figure 6-9**. 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.

3.15.3 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 6-9**. 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.

3.15.4 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 TC3X2 Triboard this 3 resistors are R214, R215 and R216 for DAP (red marked in **Figure 3-6**). This resistors needs to be removed.

Important: 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 DAP/JTAG part of the ETK connector couldn't be used.

All resistors are red marked in the following figure:

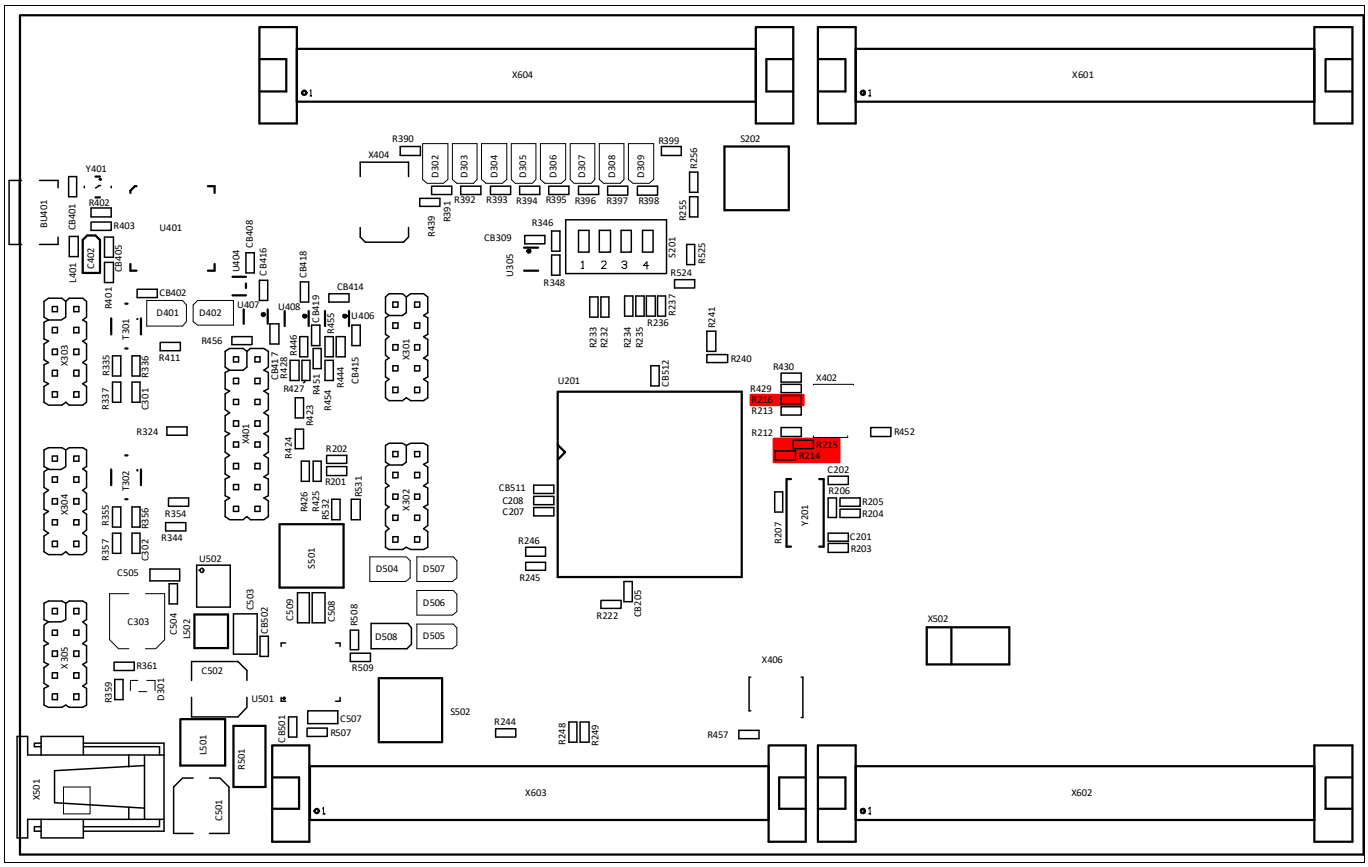

Figure 3-6 Location of DAP resistors on Top Side

3.15.5 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 6-10**.

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

3.15.6 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 6-11**.

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

The connector provide the input voltage to the Ethernet miniWiggler and an enable/wakeup signal connected to TLF35584.

TriBoard Information

Because the device don’t have a VDDSB pin the 1,25V standby supply pin of the connector is not connected on this board.

4 TriBoard Configuration

4.1 HW Boot Configuration

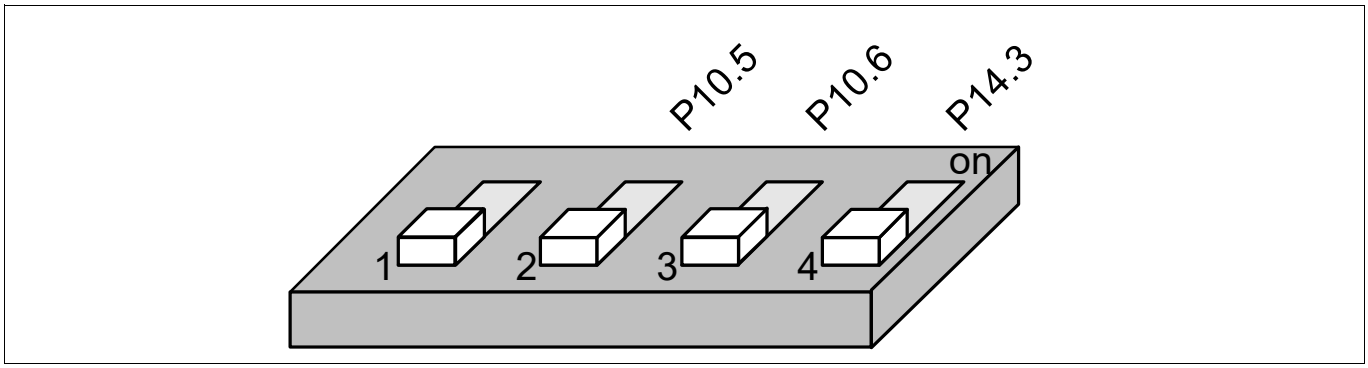

Figure 4-1 HW Configuration DIP-Switches

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 (not assembled)
R240	Switch off EVR33 (not assembled)
R390	Connect V_STBY to toggle LEDs D302...D305 (assembled)
R399	Connect V_UC 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 TLF35584 to V_CO (not assembled)
R509	Connect pin MPS of TLF35584 to Ground (assembled)
R524	Connect VDDP3 to V_UC (not assembled)
R525	Connect VDDP3 to +3V3 (not assembled)

Note: All resistors are red marked in the following figures

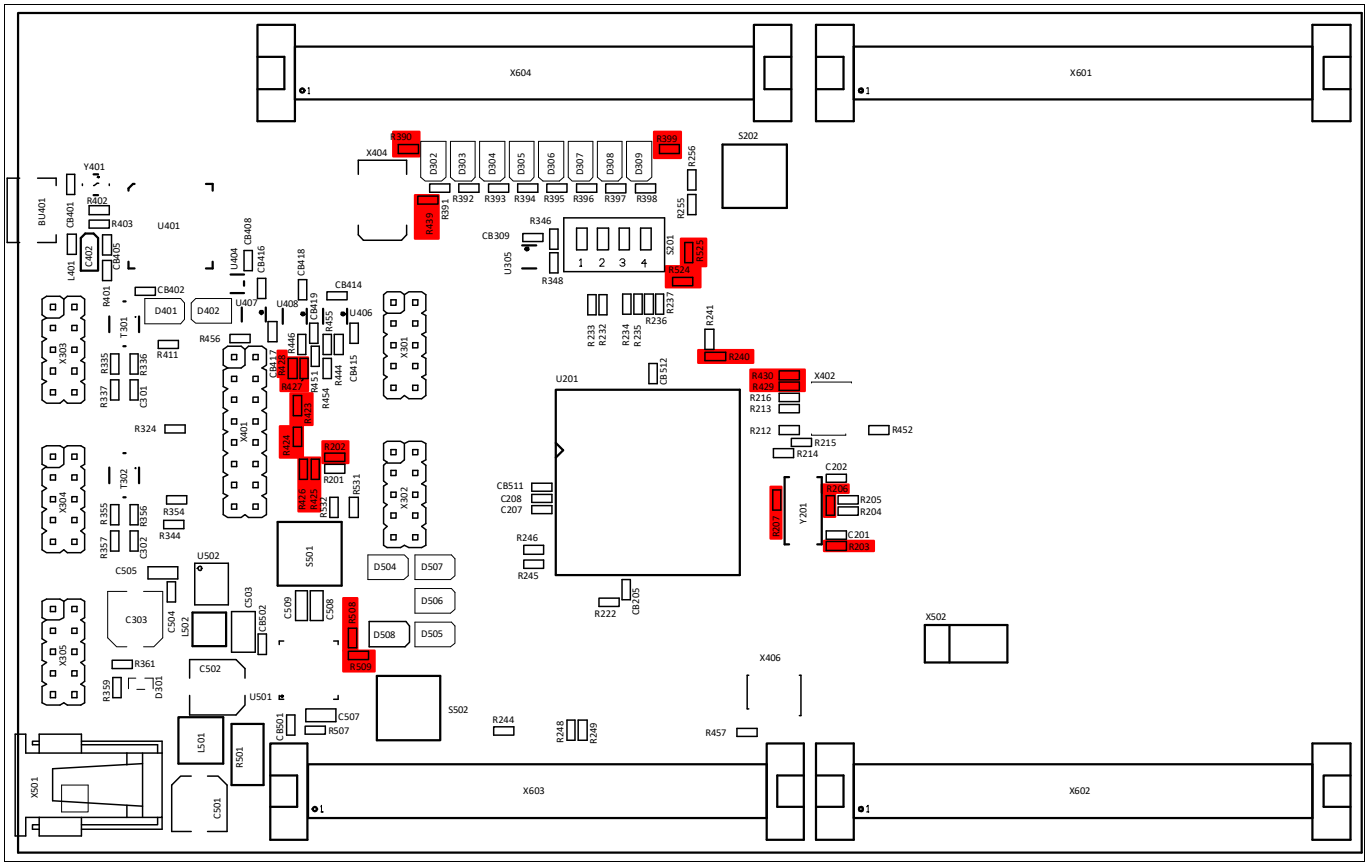

Figure 4-2 Location of general optional resistors on Top Side

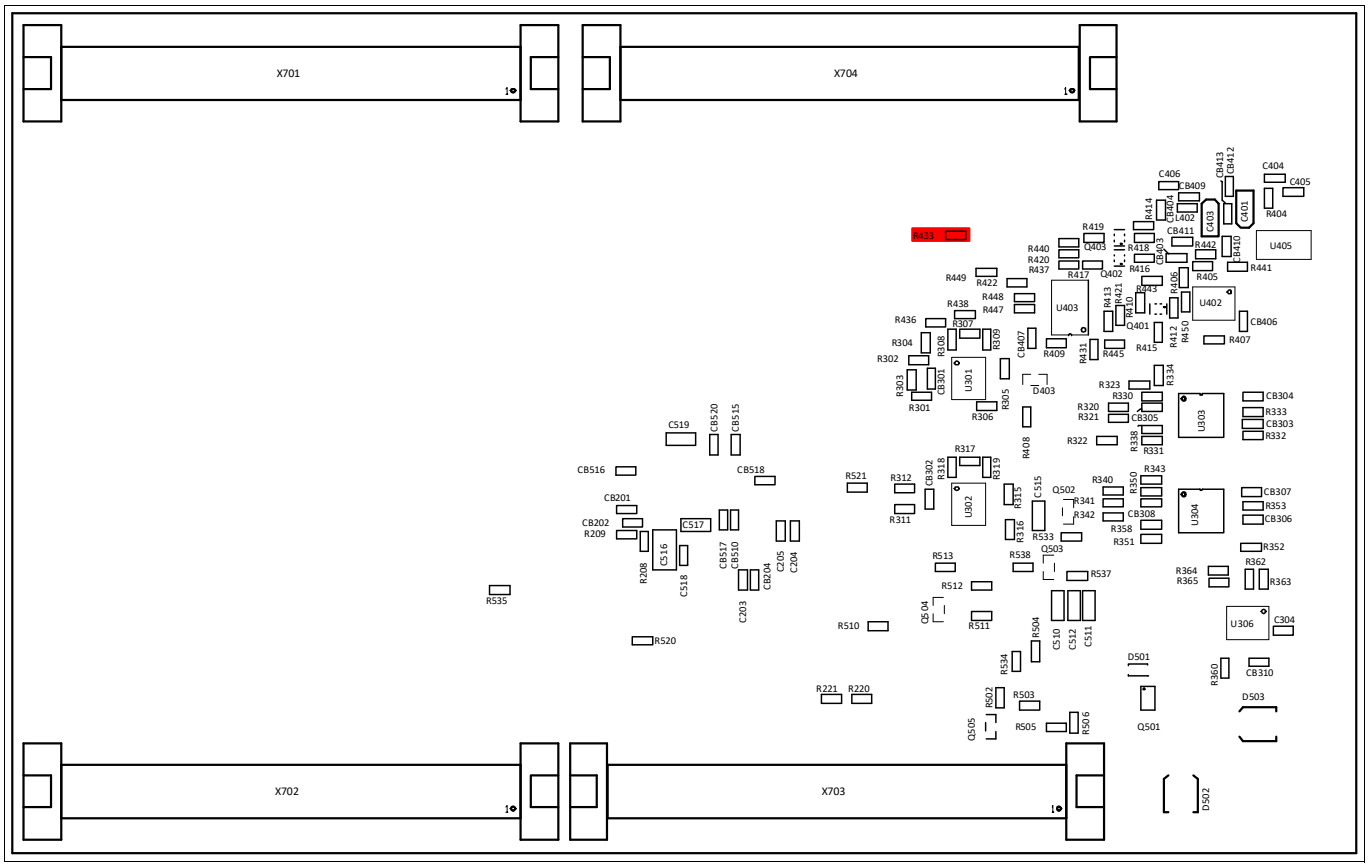

Figure 4-3 Location of general optional resistors on Bottom Side

4.2.2 Resistors for peripherals

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

Component	Description
R220	Connect V_VR with VDDM (assembled)
R221	Connect +3V3 with VDDM (not assembled)
R222	Connect VAREF1 with VDDM (assembled)
R301	Connect P11.10 with RXD of CAN0 transceiver (assembled)
R302	Connect P11.12 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 P15.3 with RXD of CAN1 transceiver (assembled)
R312	Connect P15.2 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 P20.8 with EN of ERAY-A transceiver (assembled)
R324	Connect P20.9 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 P02.6 with EN of ERAY-B transceiver (assembled)
R344	Connect P02.7 with ERRN of ERAY-B transceiver (assembled)
R348	Connect P23.1 with CS of SPI Eeprom (assembled)
R364	Connect P15.1 with RXD of LIN1 transceiver (assembled)
R365	Connect P15.0 with TXD of LIN1 transceiver (assembled)
R436	Connect P14.0 with RXD of USB to UART (assembled)
R437	Connect P14.1 with TXD of USB to UART (assembled)
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

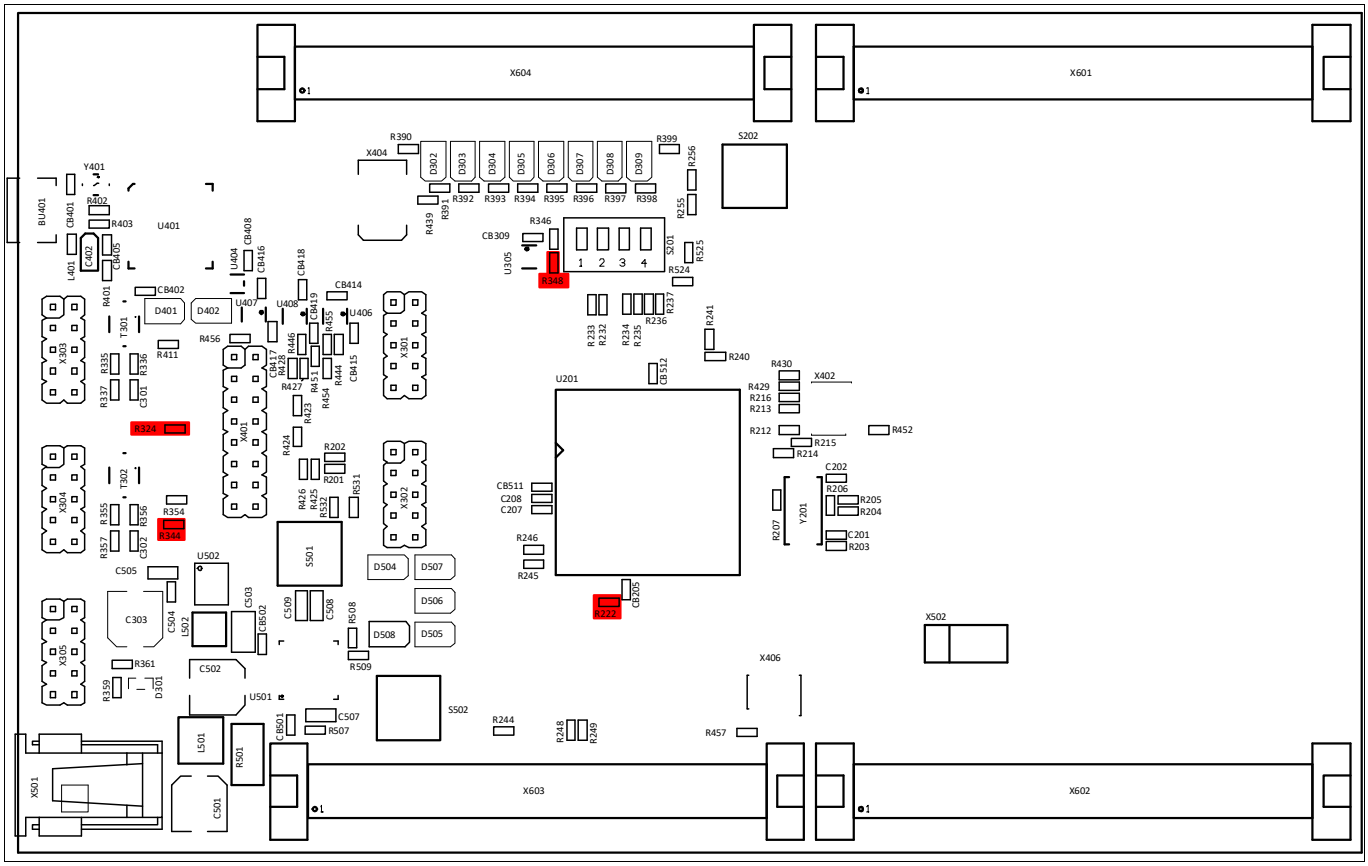

Figure 4-4 Location of peripheral resistors on Top Side

Figure 4-5 Location of peripheral resistors on Bottom Side

5 Signal (on board used) Description

For more information about the signals please see the user manual/datasheet for TC3X2 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
V_PREPEG	Pre Regulator Voltage (~5,8V)
V_UC	Microcontroller Supply Voltage (5V or 3,3V depends on assembled TLF35584)
V_CO	Communication Supply Voltage (5V)
V_VR	Reference Supply Voltage (5V)
V_STBY	Standby Supply Voltage (5V or 3,3V depends on assembled TLF35584)
VDD	Core Supply Voltage (1,25V)
VDDSB	Emulation Stand-by SRAM Supply Voltage (1,25V)
VDDP3	Flash Power Supply Voltage (3,3V)
VFLEX	Flexport Supply Voltage (3,3V)
VEXTOSC	Oscillator Port Supply Voltage (5V or 3,3V depends on assembled TLF35584)
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)
P14.3	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 / TriCore™ Breakpoint Input
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	CAN01 Receive Input A ASCLIN0 Receive Input B (optional)

Table 5-6 Peripheral Signals (continued)

Short name	Description
P15.2	CAN01 Transmit Output ASCLIN0 Transmit Output (optional)
P15.1	ASCLIN1 Receive Input A
P15.0	ASCLIN1 Transmit Output
P11.10	CAN03 Receive Input D
P11.12	CAN03 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
P20.8	E-Ray Channel A Enable Output
P20.9	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
P02.3	E-Ray Channel B Receive Data Input 2
P02.6	E-Ray Channel B Enable Output
P02.7	E-Ray Channel B Error Input
P23.1	Slave Select Output for CS of eeprom 25LC020A
P11.6	QSPI1 Master Clock Output for SCL of TLF35584 and SCK of eeprom 25LC020A
P11.9	QSPI1 Master Transmit Output for SDI of TLF35584 and SI of eeprom 25LC020A
P11.3	QSPI1 Master Receive Input B for SDO from TLF35584 and SO of eeprom 25LC020A
P11.11	QSPI1 Slave Select Output 4 for SCS of TLF35584
P11.2	Output for Watchdog Input of TLF35584
P33.8	SMU_FSP0 Output for Error Signal Input of TLF35584
P02.8	Input for Safe State Signal 1 from TLF35584
P33.10	Output for Wake/Inhibit Input of TLF35584
P20.0	HSCT System Clock
P21.2	HSCT Data Negative Input
P21.3	HSCT Data Positive Input
P21.4	HSCT Data Negative Output
P21.5	HSCT Data Positive Output
P20[11...14]	On board LED’s
P33[4...7]	On board LED’s (standby voltage supplied)

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
VCAP0	Used as VCAP0 for EVRC
VCAP1	Used as VCAP1 for EVRC
P14.5	Used as HWCFG1

6.2 TC3X2 Connector / Top View

BUS EXPANSION (X601,X701)				PERIPHERALS (X602,X702)			
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
	9	10			9	10	
	11	12			11	12	
	13	14			13	14	
	15	16		/ESR1	15	16	/ESR0
	17	18			17	18	
	19	20		GND	19	20	GND
	21	22			21	22	/PORST
	23	24		P10.5	23	24	
	25	26			25	26	
	27	28			27	28	P23.1
	29	30			29	30	
	31	32			31	32	
	33	34			33	34	
	35	36			35	36	
	37	38		P20.9	37	38	
	39	40		P20.13	39	40	
	41	42		P33.5	41	42	
	43	44			43	44	P20.2
	45	46		P00.0	45	46	
	47	48			47	48	
	49	50		GND	49	50	GND
	51	52		XTAL1	51	52	
	53	54		XTAL2	53	54	
	55	56		P15.3	55	56	
	57	58		P15.2	57	58	
	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			69	70	P20.8
	71	72			71	72	
	73	74			73	74	
	75	76			75	76	GND
	77	78		VEXT	77	78	+3V3
	79	80		VEXT	79	80	+3V3

Figure 6-1 Connector for TC3X2 - Pinout (Part I, Top View)

Connector Pin Assignment

ADC (X603, X703)					GTM / PORTS (X604,X704)			
GND	1	2	GND		GND	1	2	GND
GND	3	4	GND		GND	3	4	GND
	5	6				5	6	
	7	8	AN8			7	8	
	9	10			P02.0	9	10	
	11	12			P02.1	11	12	
AN4	13	14	AN9		P02.2	13	14	
AN5	15	16			P02.3	15	16	
	17	18			P02.4	17	18	
	19	20			P02.5	19	20	
	21	22	AN11			21	22	
	23	24	AN12			23	24	
	25	26	AN13			25	26	
	27	28	AN14			27	28	
	29	30	AN15			29	30	
	31	32				31	32	
	33	34				33	34	
	35	36			P10.6	35	36	
GND	37	38	GND			37	38	
VDDM	39	40	VAREF1			39	40	
GND	41	42				41	42	
GND	43	44	GND			43	44	
AN32	45	46			P11.2	45	46	
AN33	47	48			P11.3	47	48	
AN34	49	50				49	50	
	51	52				51	52	
	53	54			P11.6	53	54	
	55	56				55	56	P33.8
	57	58				57	58	P33.9
	59	60			P11.9	59	60	P33.10
GND	61	62	GND		P11.10	61	62	
	63	64	P33.6		P11.11	63	64	
	65	66			P11.12	65	66	
	67	68				67	68	
VEXT	69	70	+3V3			69	70	
P02.6	71	72				71	72	
P02.7	73	74				73	74	
P02.8	75	76			VEXT	75	76	
P33.7	77	78	P14.3		VEXT	77	78	+3V3
	79	80			VEXT	79	80	+3V3

Figure 6-2 Connector for TC3X2 - Pinout (Part II, Top View)

6.3 Power connector pinout

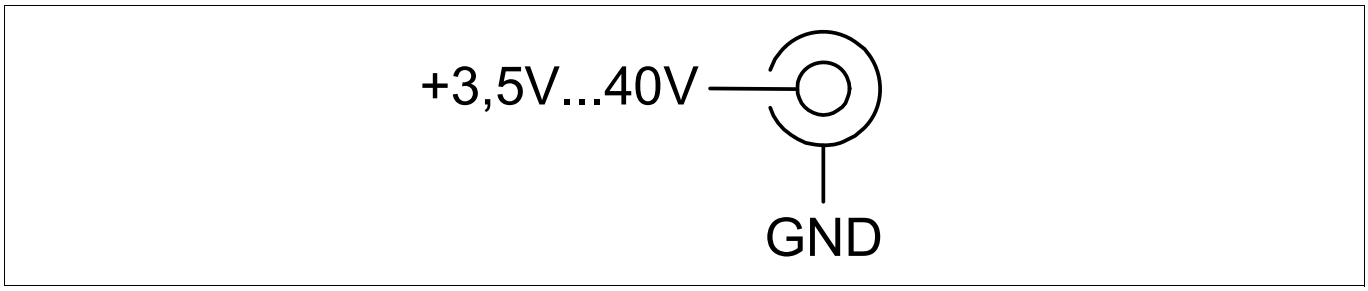

Figure 6-3 Power connector pinout (Roka 520 2550

6.4 USB connector pinout

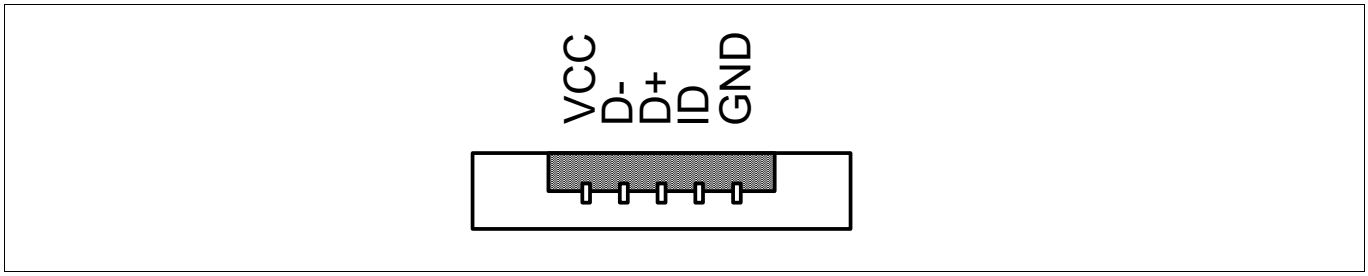

Figure 6-4 USB connector pinout (Micro USB B-type)

6.5 FlexRay™ (ERAY) connector pinout

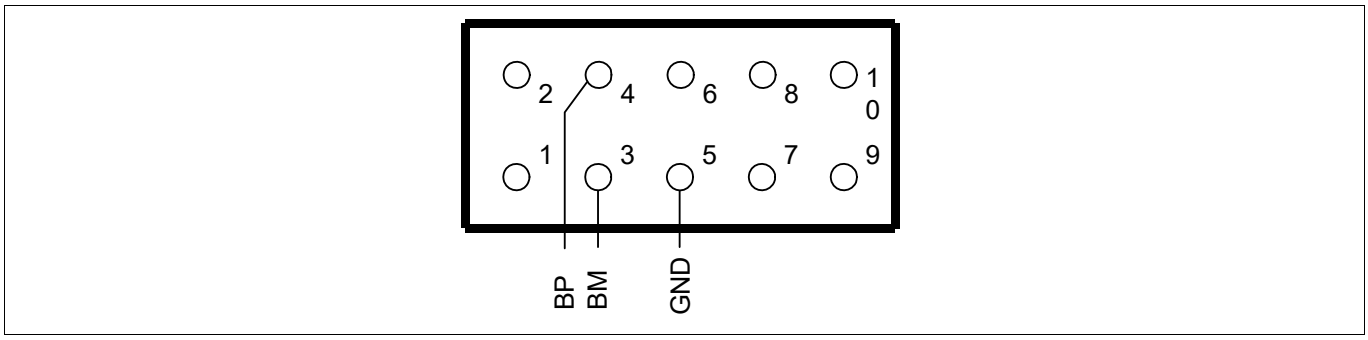

Figure 6-5 FlexRay™ (ERAY) connector pinout (IDC10)

6.6 CAN connector pinout

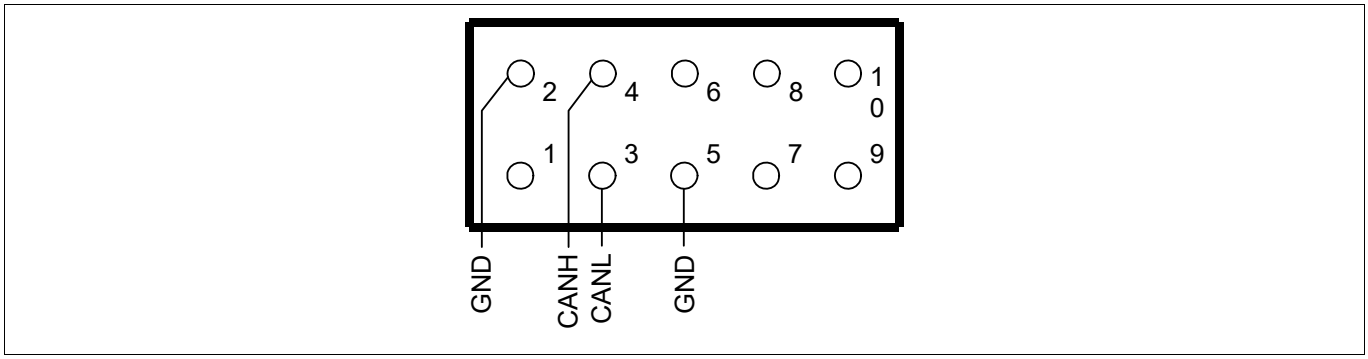

Figure 6-6 CAN connector pinout (IDC10)

6.7 LIN connector pinout

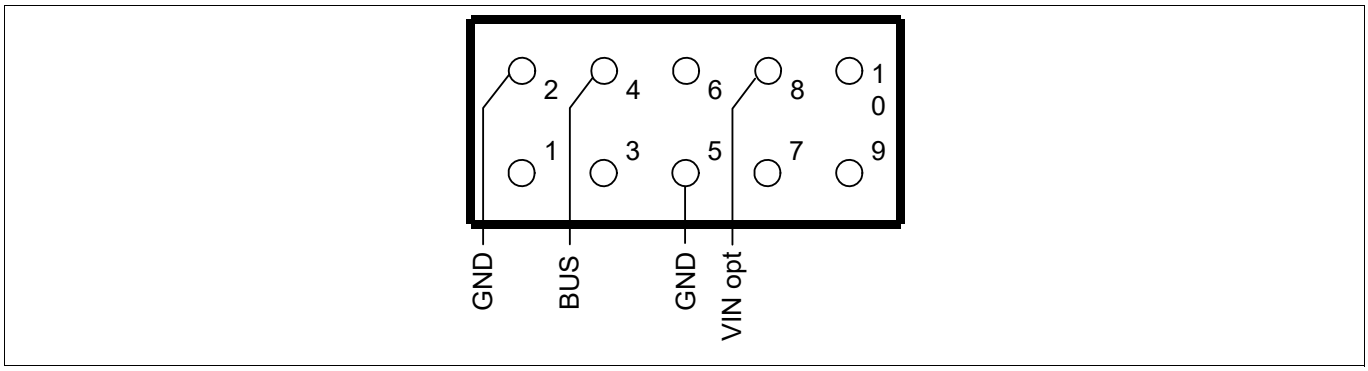

Figure 6-7 LIN connector pinout (IDC10)

6.8 OCDS1 connector pinout

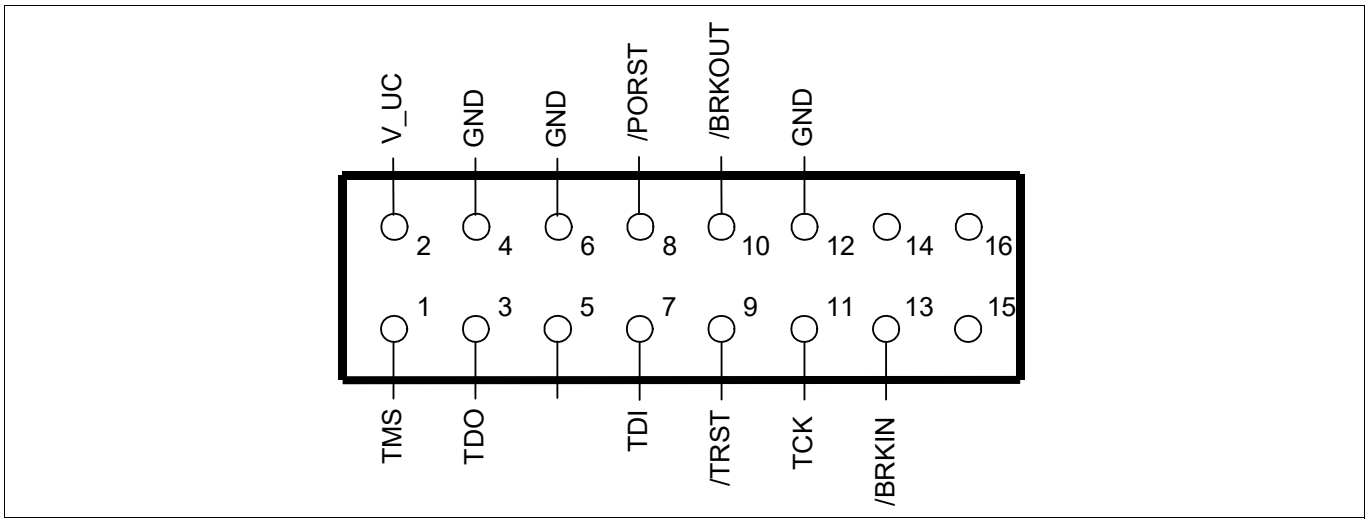

Figure 6-8 OCDS1 connector pinout (IDC16)

6.9 DAP connector pinout

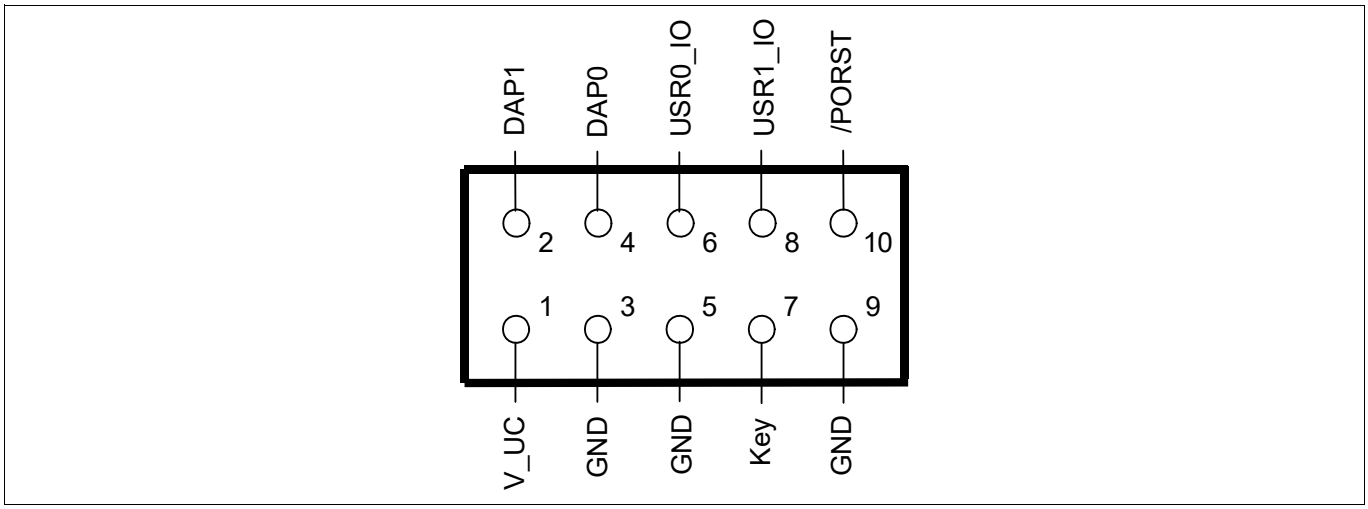

Figure 6-9 DAP connector pinout (Samtec FTSH10)

6.10 ETK connector pinout

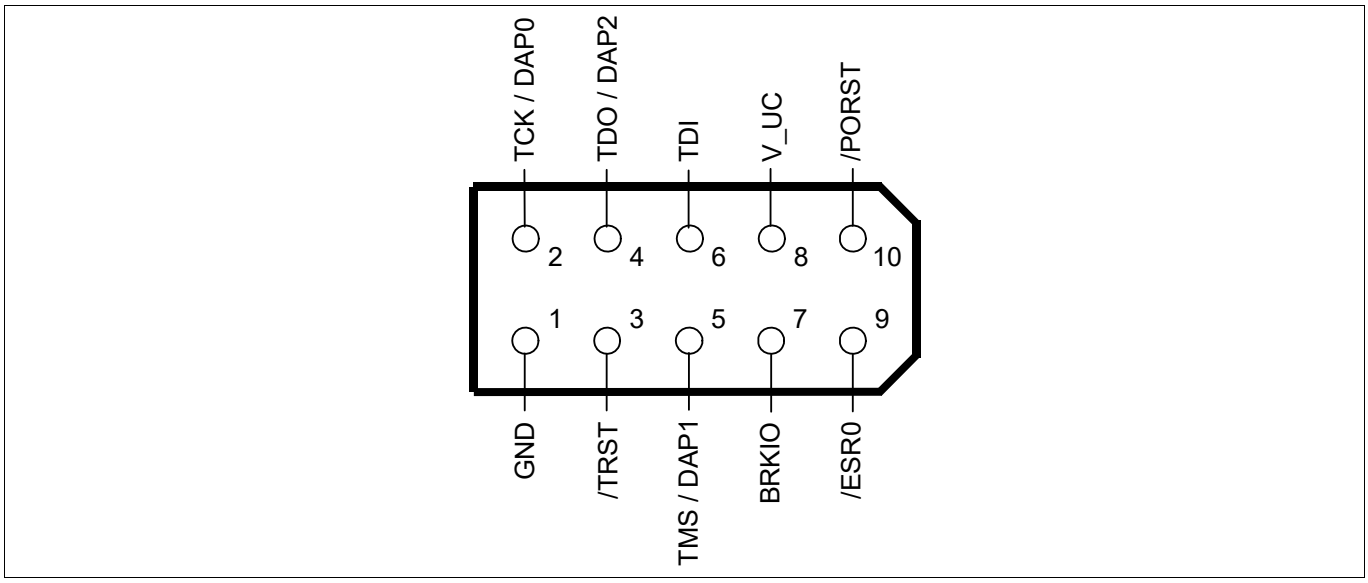

Figure 6-10 ETK connector pinout (Samtec TFM-105)

6.11 Ethernet miniWiggler power connector pinout

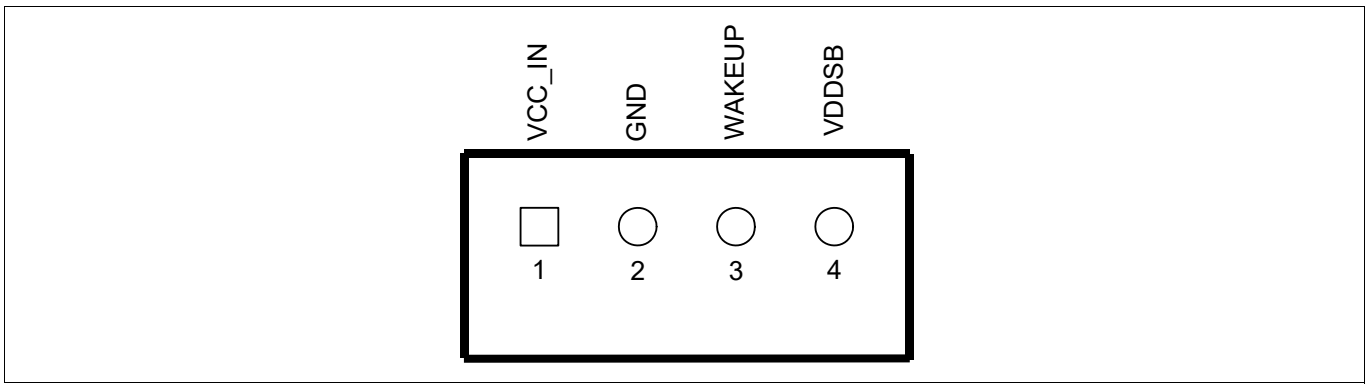

Figure 6-11 Ethernet miniWiggler connector pinout (JST B4B-PH)

7 Schematic and Layout

7.1 Known problems

7.1.1 Known problems on TriBoard TC3X2 TH V1.0

No problems known.

7.1.2 Known problems on TriBoard TC3X2 V1.0

No problems known.

7.2 Schematic

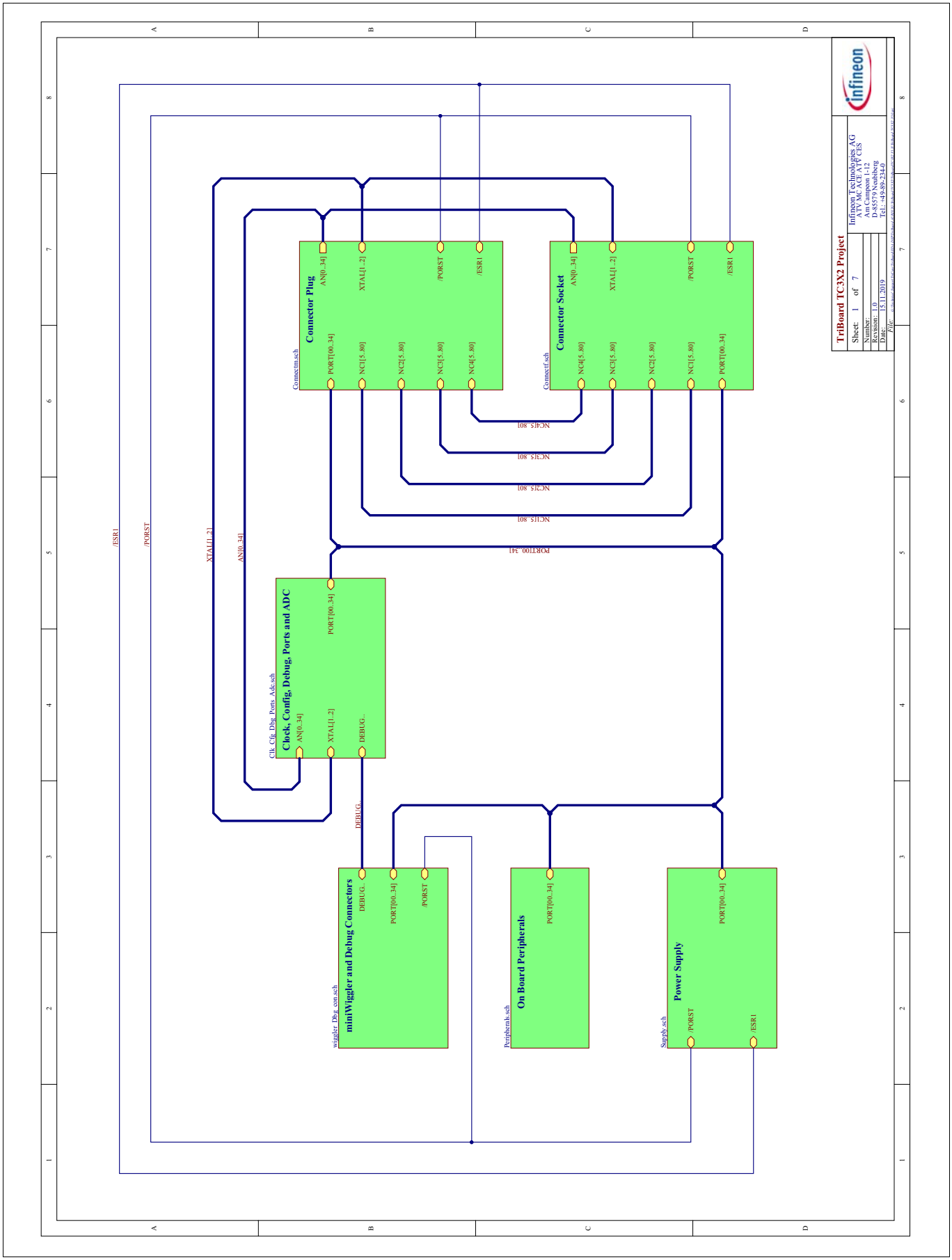

Figure 7-1 Schematic - Project

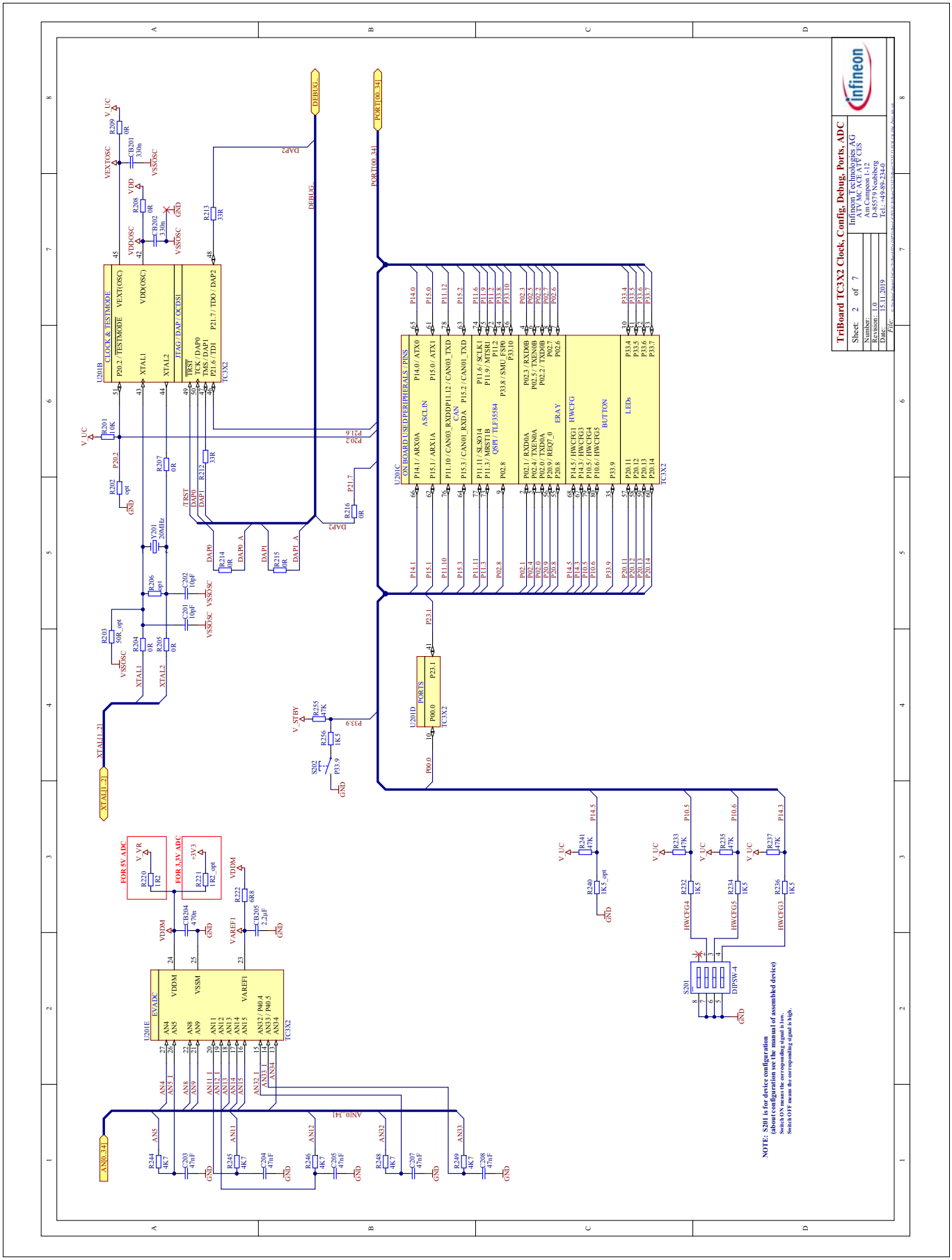

Figure 7-2 Schematic - Clock, Config, Debug, Ports and ADC

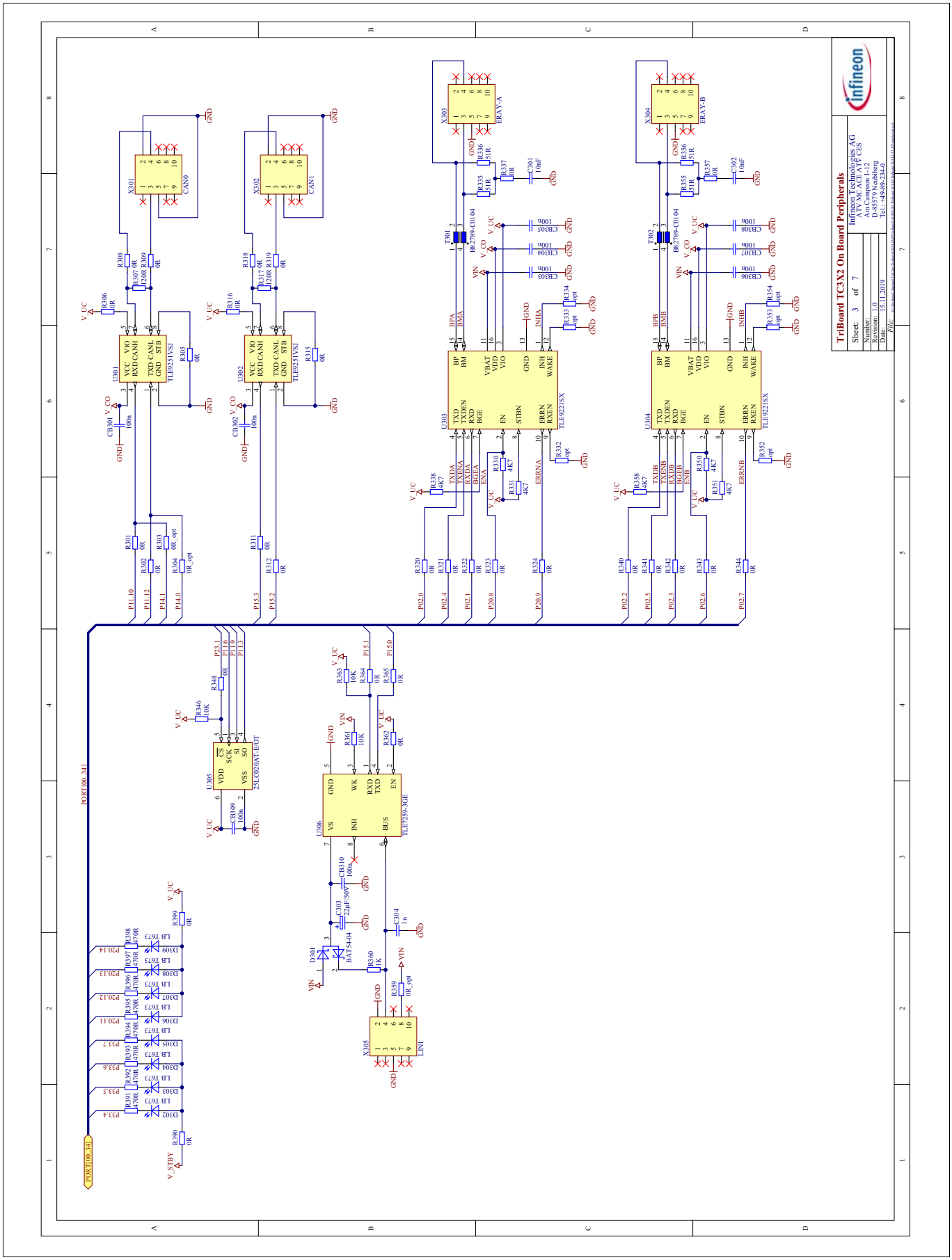

Figure 7-3 Schematic - On Board Peripherals

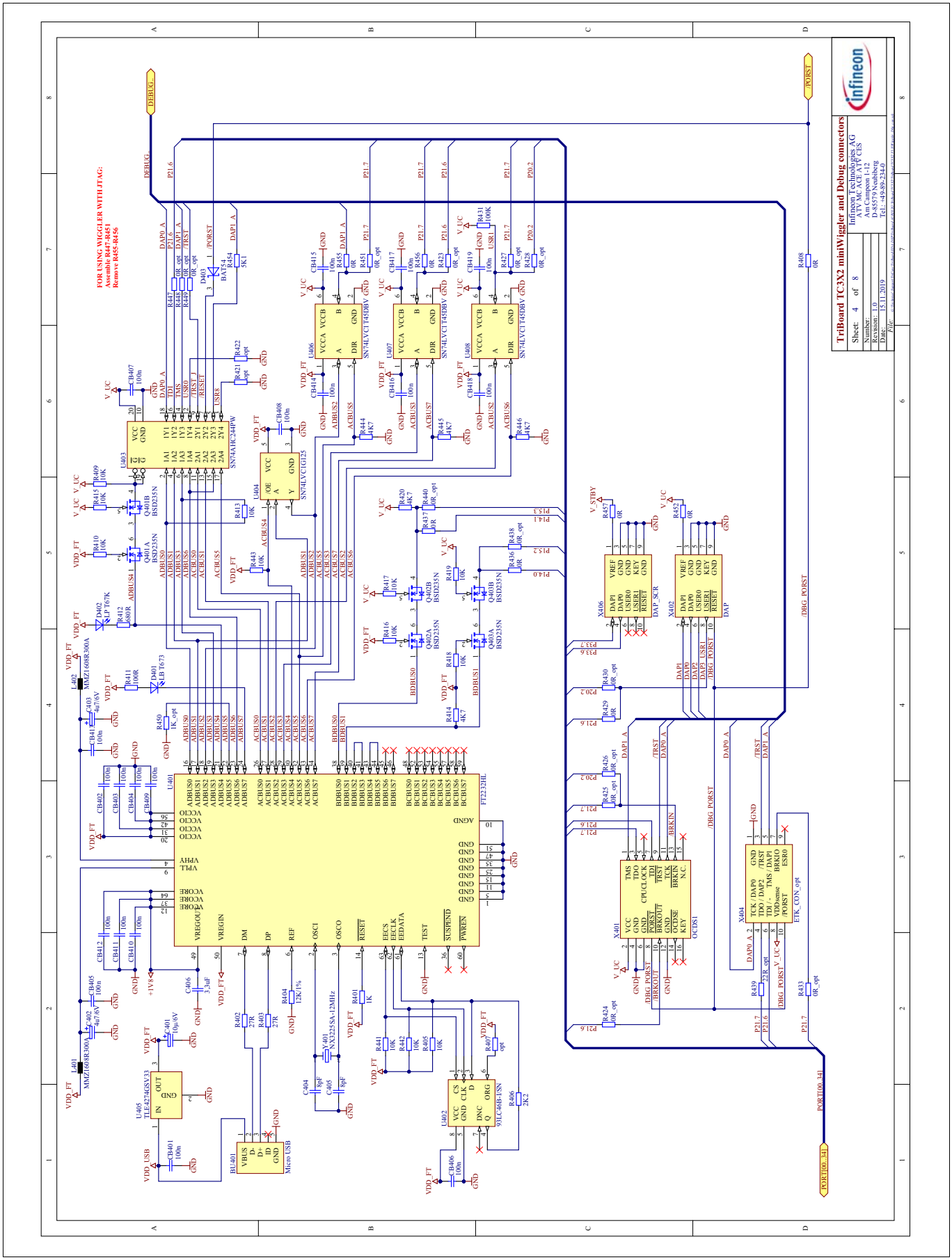

Figure 7-4 Schematic - miniWiggler JDS and Debug connectors

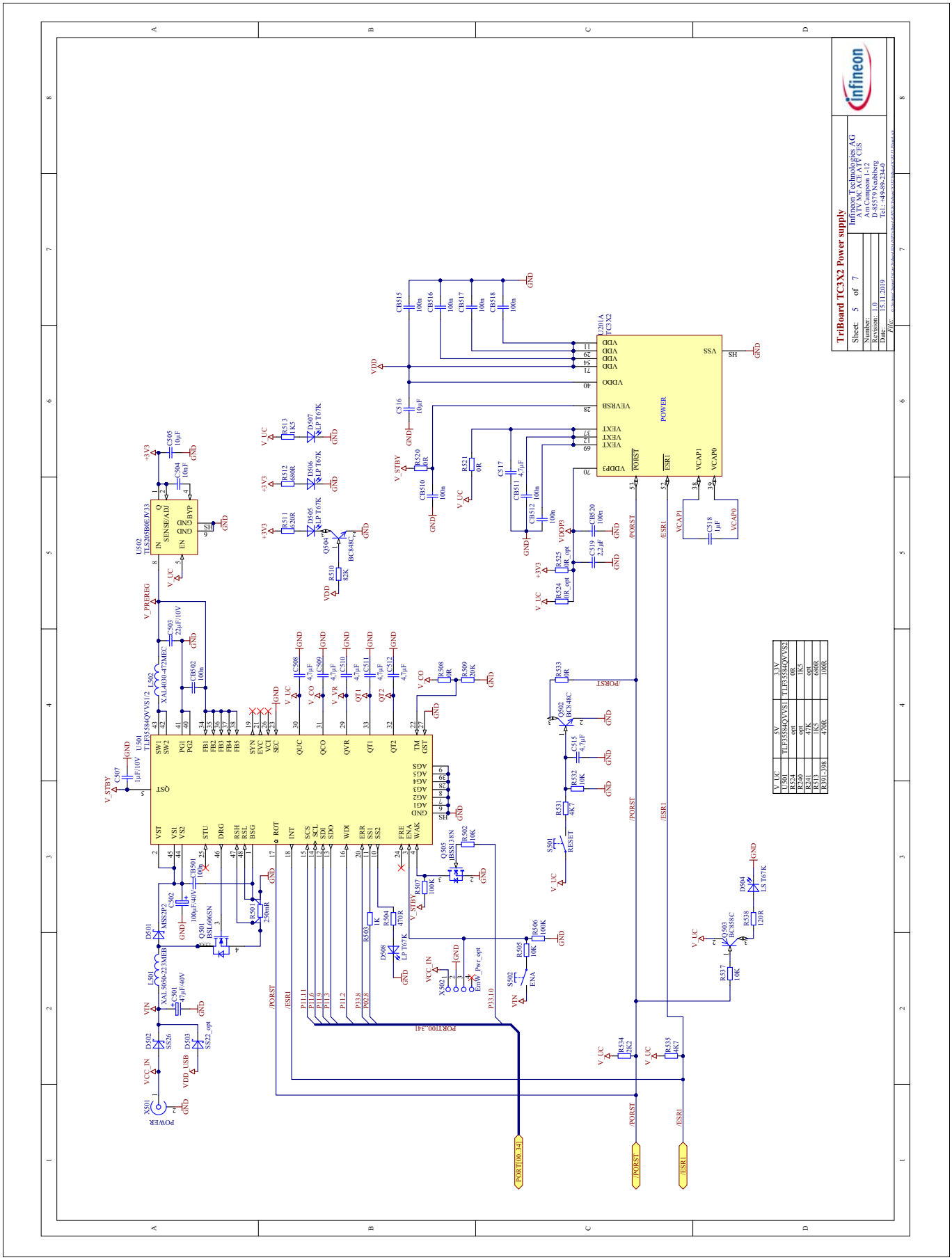

Figure 7-5 Schematic - Power Supply

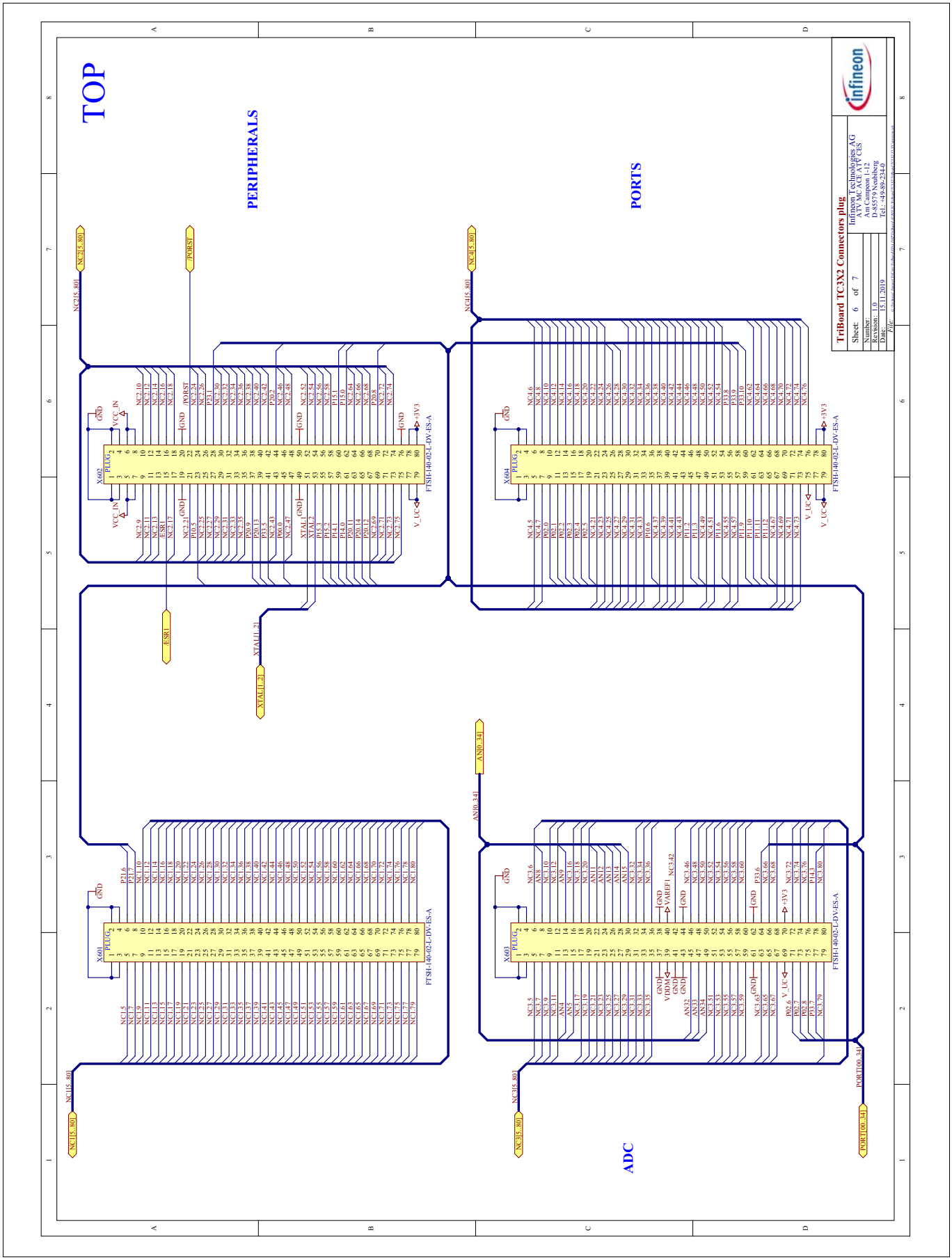

Figure 7-6 Schematic - Connectors (Plug)

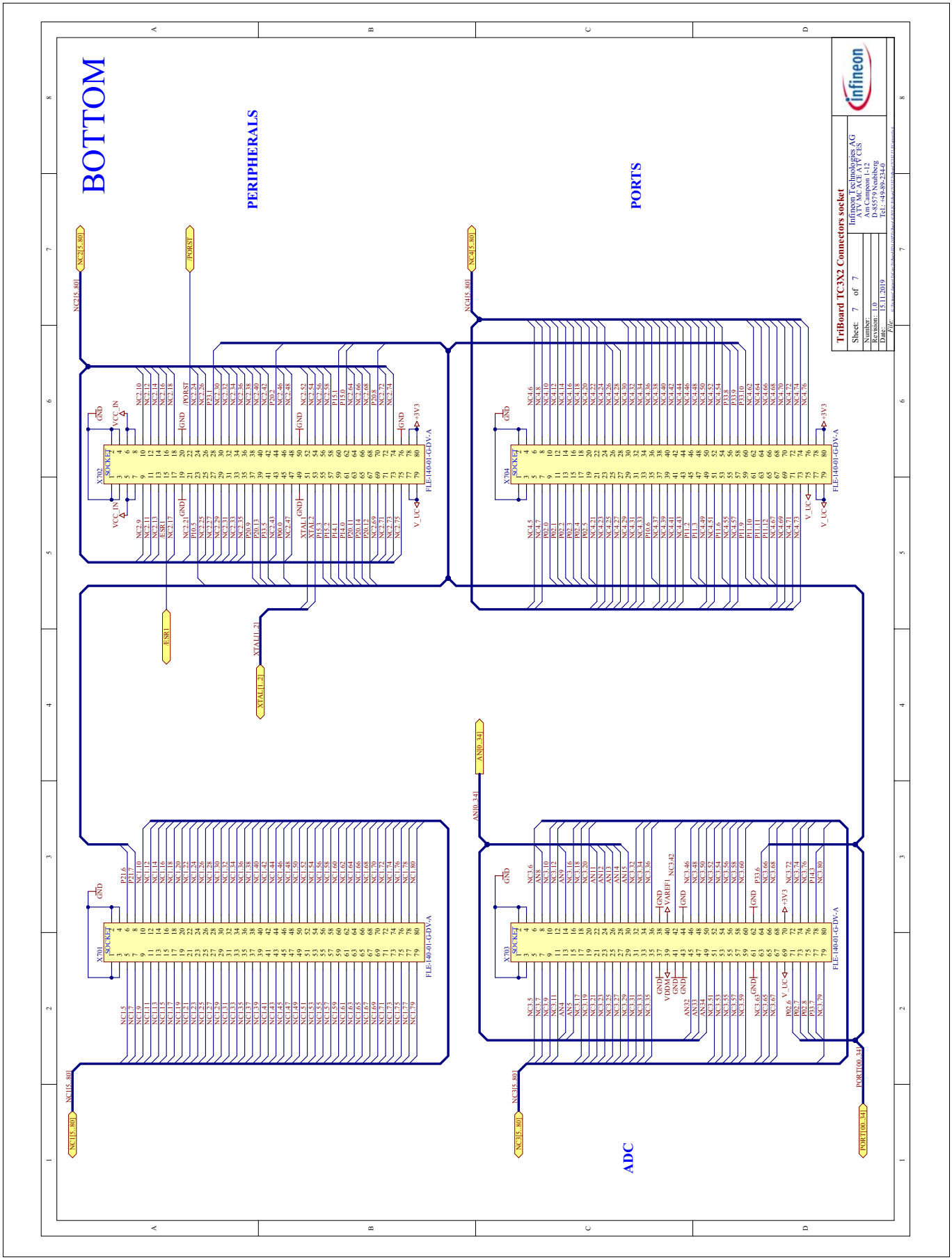

Figure 7-7 Schematic - Connectors (Socket)

7.3 Layout

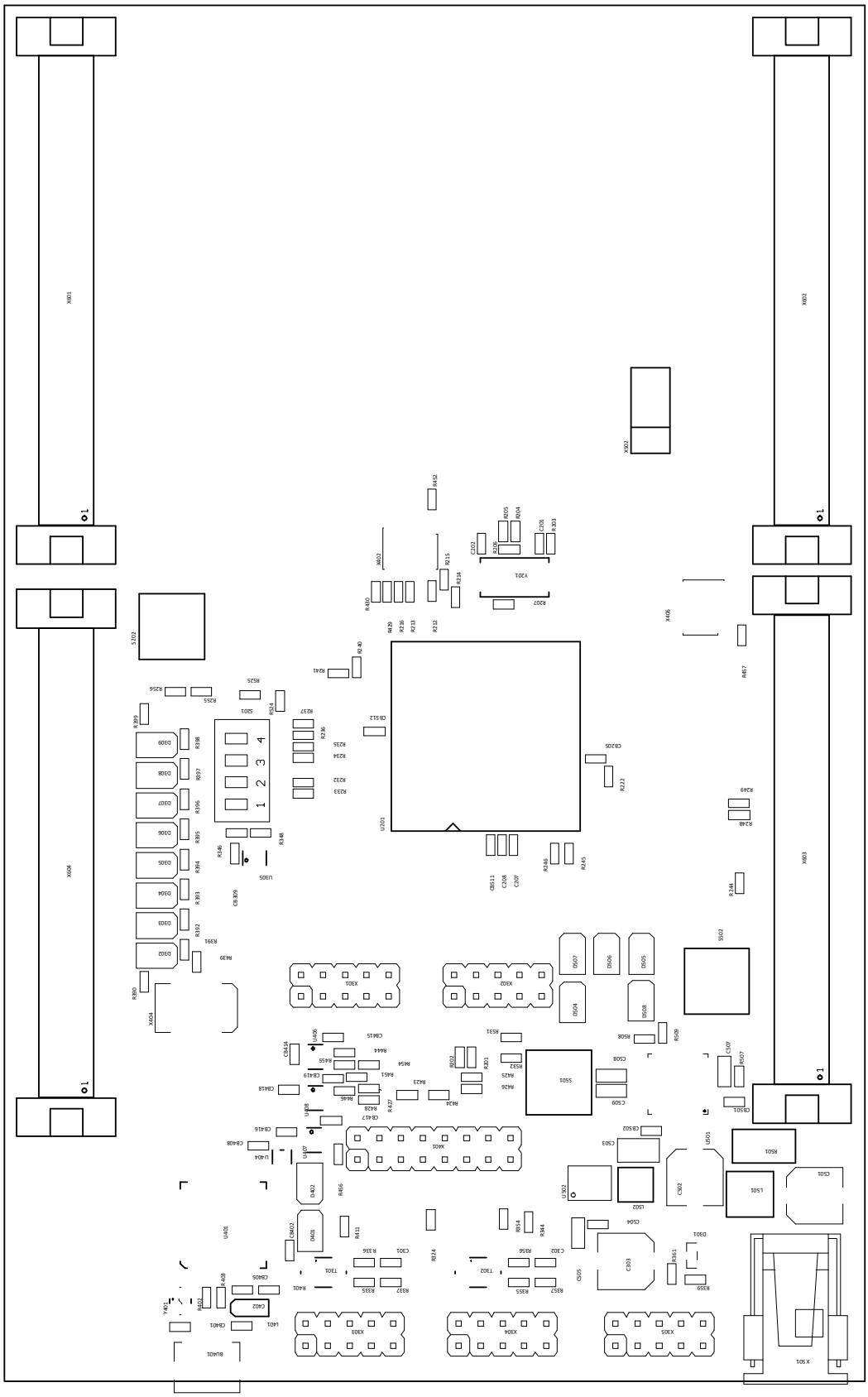

Figure 7-8 Component Plot Top Layer

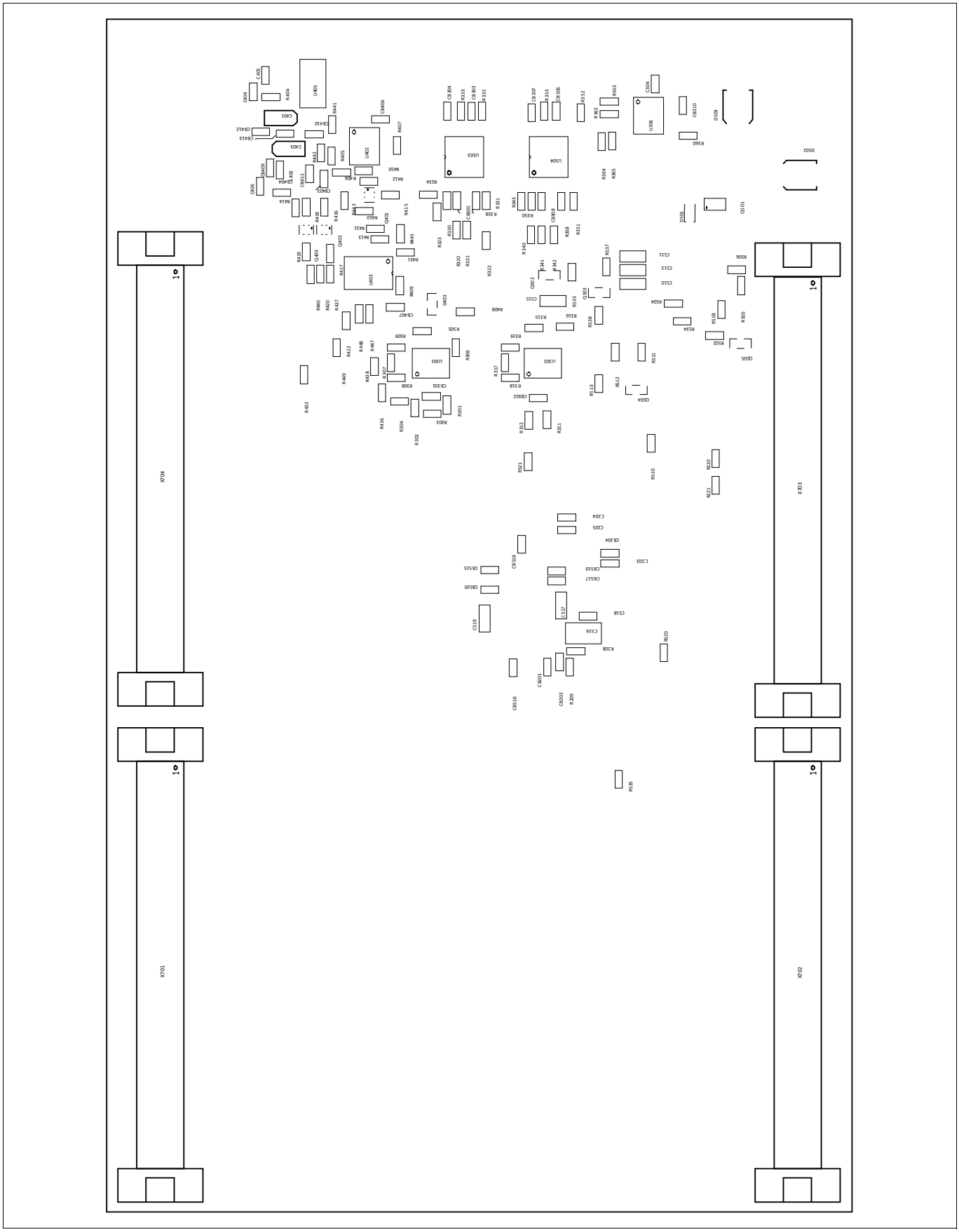

Figure 7-9 Component Plot Bottom Layer

7.4 Layout with Dimensioning

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

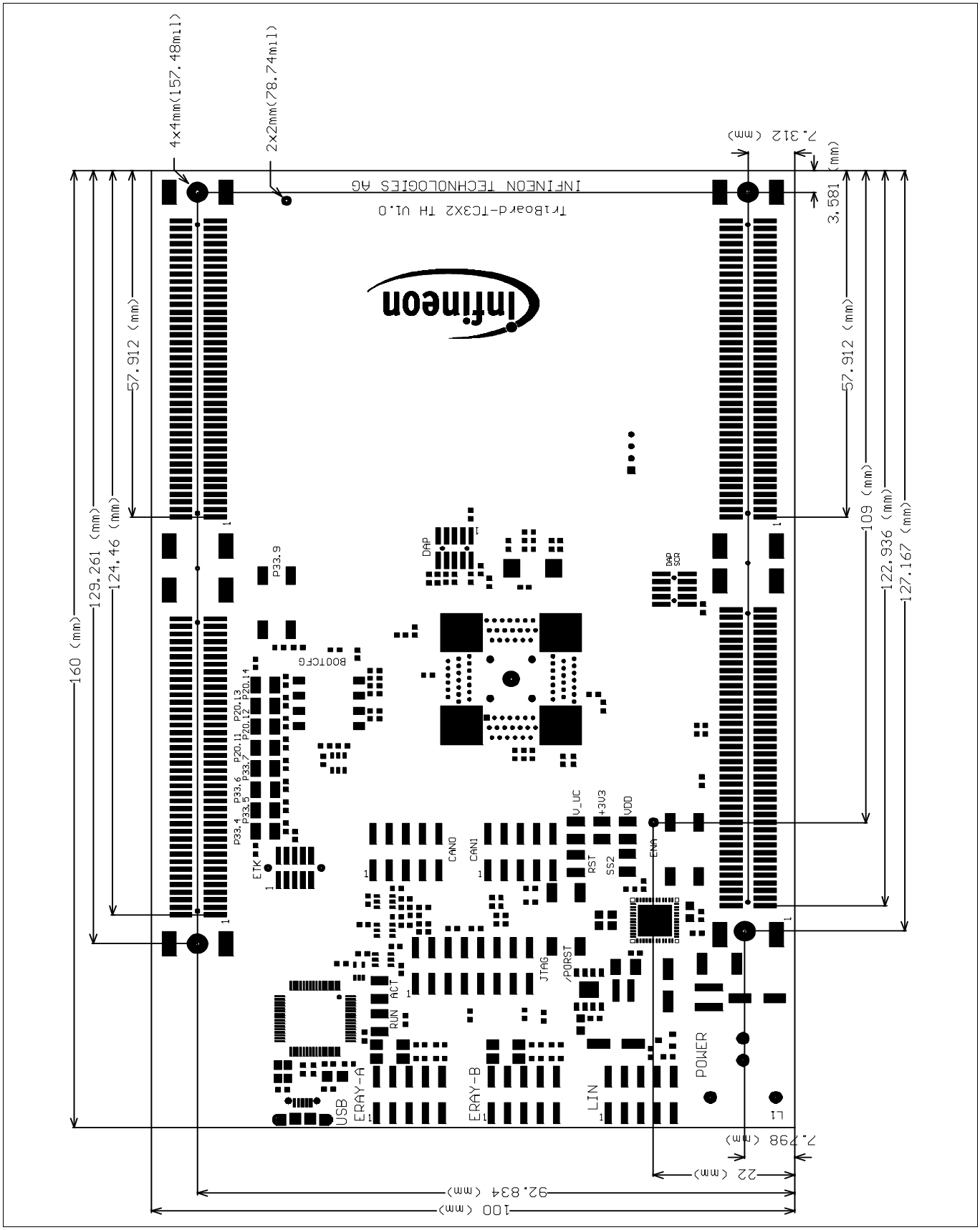

Figure 7-10 Dimensioning (mm)

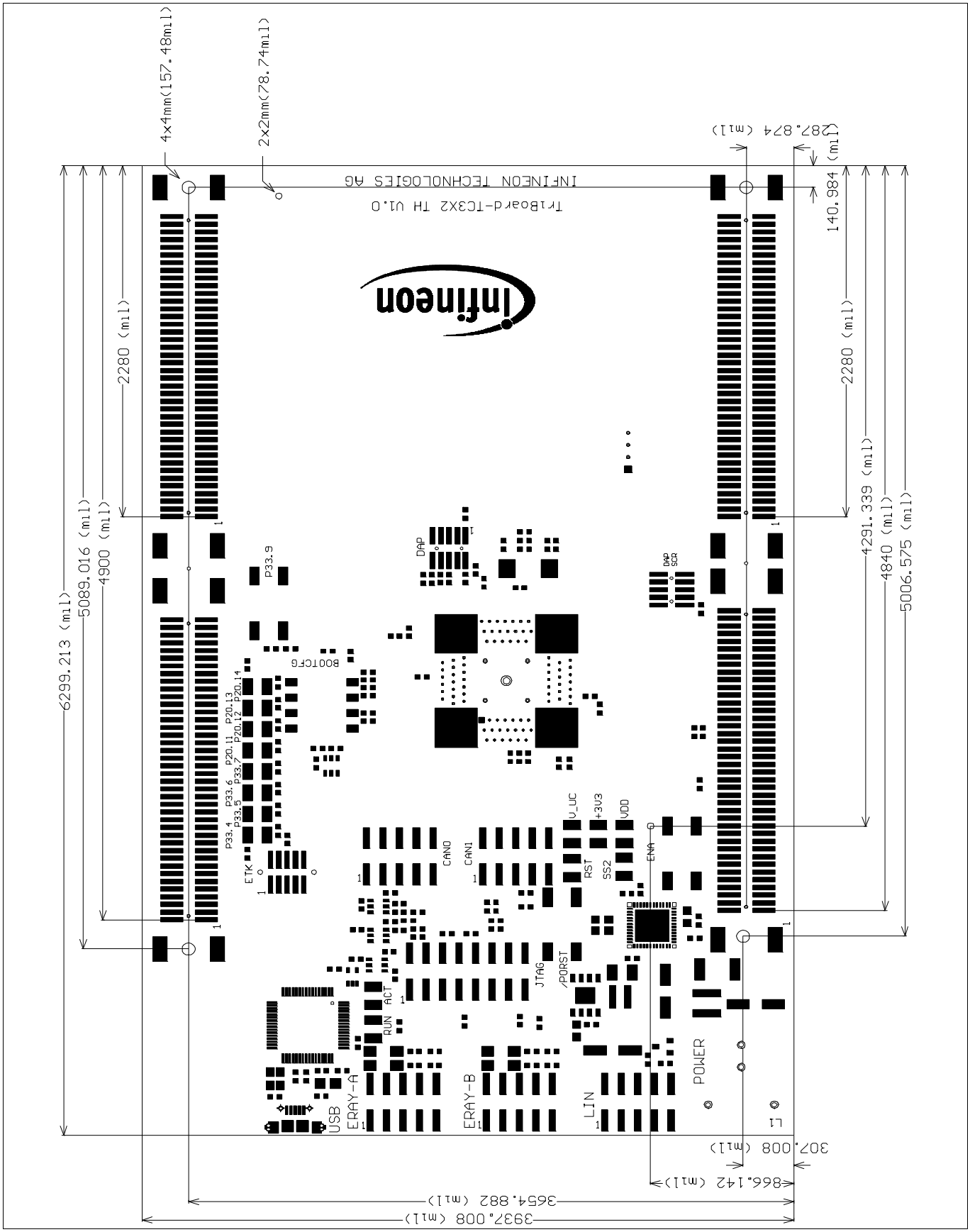

Figure 7-11 Dimensioning (mil)

The dimensioning is valid for all TriBoards.

Revision History	
Page or Item	**Subjects (major changes since previous revision)**
V1.0, 2020-05	
	First version

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