

32-Bit

Microcontroller

TriBoard TC1728

Hardware: TriBoard-TC1728 V1.0

Hardware Manual

User's Manual

V 1.0 2011-02

Microcontrollers

Edition 2011-02

**Published by
Infineon Technologies AG
81726 Munich, Germany**

**© 2011 Infineon Technologies AG
All Rights Reserved.**

Legal Disclaimer

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics. With respect to any examples or hints given herein, any typical values stated herein and/or any information regarding the application of the device, Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind, including without limitation, warranties of non-infringement of intellectual property rights of any third party.

Information

For further information on technology, delivery terms and conditions and prices, please contact the nearest Infineon Technologies Office (www.infineon.com).

Warnings

Due to technical requirements, components may contain dangerous substances. For information on the types in question, please contact the nearest Infineon Technologies Office.

Infineon Technologies components may be used in life-support devices or systems only with the express written approval of Infineon Technologies, if a failure of such components can reasonably be expected to cause the failure of that life-support device or system or to affect the safety or effectiveness of that device or system. Life support devices or systems are intended to be implanted in the human body or to support and/or maintain and sustain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.

32-Bit

Microcontroller

TriBoard TC1728

Hardware: TriBoard-TC1728 V1.0



User's Manual

V 1.0 2011-02

TriBoard TC1728 User's Manual

Revision History: V 1.0 2011-02

Previous Versions: no

| Page | Subjects (major changes since last revision) |
|------|--|
| – | this is the first release |
| – | |
| – | |

Trademarks

TriCore® is a trademark of Infineon Technologies AG.

We Listen to Your Comments

Any information within this document that you feel is wrong, unclear or missing at all? Your feedback will help us to continuously improve the quality of this document. Please send your proposal (including a reference to this document) to:

mcdocu.comments@infineon.com



Table of Contents

| | | |
|----------|--|------------|
| 1 | Introduction | 1-1 |
| 2 | TriBoard Features | 2-1 |
| 2.1 | Summary of Features | 2-1 |
| 2.2 | Block Diagram | 2-3 |
| 2.3 | Placement | 2-4 |
| 3 | TriBoard Information | 3-1 |
| 3.1 | Power Supply | 3-1 |
| 3.2 | LEDs | 3-1 |
| 3.3 | Clock | 3-1 |
| 3.4 | USB Connector | 3-2 |
| 3.4.1 | Serial Connection to PC | 3-2 |
| 3.4.2 | miniWiggler JDS | 3-2 |
| 3.5 | FlexRay | 3-3 |
| 3.6 | Serial Eeprom | 3-3 |
| 3.7 | MultiCAN | 3-3 |
| 3.8 | Safety option with SAK-CIC61508 (optional) | 3-3 |
| 3.9 | Other peripherals | 3-3 |
| 3.10 | Toggle LED's | 3-4 |
| 3.11 | Debug System | 3-4 |
| 3.11.1 | OCDS1 | 3-4 |
| 3.11.2 | DAP | 3-4 |
| 4 | TriBoard Configuration | 4-1 |
| 4.1 | HW Boot Configuration TC1728 | 4-1 |
| 4.2 | Assembly Options | 4-3 |
| 5 | TriBoard Software | 5-1 |
| 5.1 | Requirements | 5-1 |
| 5.2 | Software Overview | 5-1 |
| 5.3 | Software Installation | 5-1 |
| 6 | Signal Description | 6-1 |
| 7 | Connector Pin Assignment | 7-1 |
| 7.1 | TC1728 Connector / Top View | 7-2 |
| 7.2 | Power connector pinout | 7-4 |
| 7.3 | USB connector pinout | 7-4 |
| 7.4 | Flexray Pinout | 7-4 |
| 7.5 | CAN connector pinout | 7-5 |
| 7.6 | OCDS connector pinout | 7-5 |
| 7.7 | DAP connector pinout | 7-5 |

| | | |
|----------|-----------------------------------|------------|
| 8 | Schematic and Layout | 8-1 |
| 8.1 | Schematic | 8-1 |
| 8.2 | Layout | 8-10 |
| 8.3 | Layout with Dimensioning | 8-12 |

List of Figures

| | | |
|-------------|--|------|
| Figure 2-1 | TriBoard Block Schematic | 2-3 |
| Figure 2-2 | TriBoard TC1728 V1.0 Placement | 2-4 |
| Figure 3-1 | Clock socket usage (XT301) | 3-2 |
| Figure 4-1 | HW Configuration TC1728 DIP-Switch | 4-1 |
| Figure 4-2 | Location of general optional resistors on Top Side | 4-4 |
| Figure 4-3 | Location of general optional resistors on Bottom Side. | 4-4 |
| Figure 4-4 | Location of peripheral resistors on Top Side | 4-5 |
| Figure 4-5 | Location of peripheral resistors on Bottom Side | 4-6 |
| Figure 4-6 | Location of resistors for safety device on Bottom Side | 4-7 |
| Figure 7-1 | Connector for TC1728 - Pinout (Part I, Top View) | 7-2 |
| Figure 7-2 | Connector for TC1728 - Pinout (Part II, Top View) | 7-3 |
| Figure 7-3 | Power connector pinout | 7-4 |
| Figure 7-4 | USB connector Pinout | 7-4 |
| Figure 7-5 | Flexray Pinout (SUBD-9 Plug) | 7-4 |
| Figure 7-6 | CAN connector pinout (IDC10) | 7-5 |
| Figure 7-7 | OCDS connector pinout (IDC16) | 7-5 |
| Figure 7-8 | DAP connector pinout (FTSH10) | 7-5 |
| Figure 8-1 | Schematic - Project | 8-2 |
| Figure 8-2 | Schematic - Config, Clock, JTAG and CIC61508 | 8-3 |
| Figure 8-3 | Schematic - Flexray, CAN and Eeprom | 8-4 |
| Figure 8-4 | Schematic - miniWiggler JDS, DAP and ETK | 8-5 |
| Figure 8-5 | Schematic - GPTA, MSC, MLI and ADC | 8-6 |
| Figure 8-6 | Schematic - Power Supply | 8-7 |
| Figure 8-7 | Schematic - Connectors (Plug) | 8-8 |
| Figure 8-8 | Schematic - Connectors (Socket) | 8-9 |
| Figure 8-9 | Component Plot Top Layer | 8-10 |
| Figure 8-10 | Component Plot Bottom Layer | 8-11 |
| Figure 8-11 | Dimensioning (mil) | 8-12 |
| Figure 8-12 | Dimensioning (mm) | 8-13 |

List of Tables

| | | |
|-----------|-------------------------------------|-----|
| Table 4-1 | User Startup Modes for TC1728 | 4-1 |
| Table 4-2 | General optional resistors | 4-3 |
| Table 4-3 | Resistors for peripherals | 4-5 |
| Table 4-4 | Resistors for safety device | 4-6 |
| Table 6-1 | Power Signals | 6-1 |
| Table 6-2 | Reset Signals | 6-1 |
| Table 6-3 | Interrupt Signals | 6-1 |
| Table 6-4 | Clock Signals | 6-2 |
| Table 6-5 | Debug Signals | 6-2 |
| Table 6-6 | Peripheral Signals | 6-2 |
| Table 6-7 | Safety device Signals | 6-4 |

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 kit also includes several sets of development tools, which are stored on the included Evaluation Board CD-ROM.

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 TC1728 please refer to the User Manual of the device.



2 TriBoard Features

2.1 Summary of Features

- Infineon's TC1728 Controller in LQFP176 Package
- FlexRay Transceivers
- Safety device (optional)
- High Speed CAN Transceivers
- USB to UART bridge
- Crystal 20MHz (default), Oscillator 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 TC1728 TriBoard offers a wide variety of connectors:

- Standard power connector
- USB connector for ASC Interface (ASC0) and miniWiggler
- 16-pin header for JTAG interface (OCDS)
- 10-pin header for DAP
- 2 x 10pin (2x5) Header for CAN High Speed Transceiver (CAN0 and CAN1)
- 2 x SUB-D9 Plug connector for FlexRay
- four 80-pin connectors (male) + four 80-pin connectors (female) with all I/O signals
- optional ETK connector

Components

- Infineon's Next generation micro controller supply TLE 7368-3E
- Three LEDs to validate power supply (5Volt / 3,3 Volt / 1,3 Volt)
- LED indicating /HDRST (ESR0) active state
- LED indicating activ miniWiggler JDS
- LED switched via DAS software
- 2x FlexRay Transceiver AS8221(AMS) or TJA1080 (NXP)
- 2 x Infineon's High Speed CAN-Transceiver TLE 6250 GV33
- Infineon's Safety Device SAK-CIC61508 (optional)
- USB to UART bridge FT2232HL (FTDI)
- SPI eeprom (Atmel)
- 8 general purpose LEDs
- Reset switch
- 8-pin Dip switch

Zero Ohm Bridges

Zero Ohm resistors give the flexibility to configure the systems functionality

2.2 Block Diagram

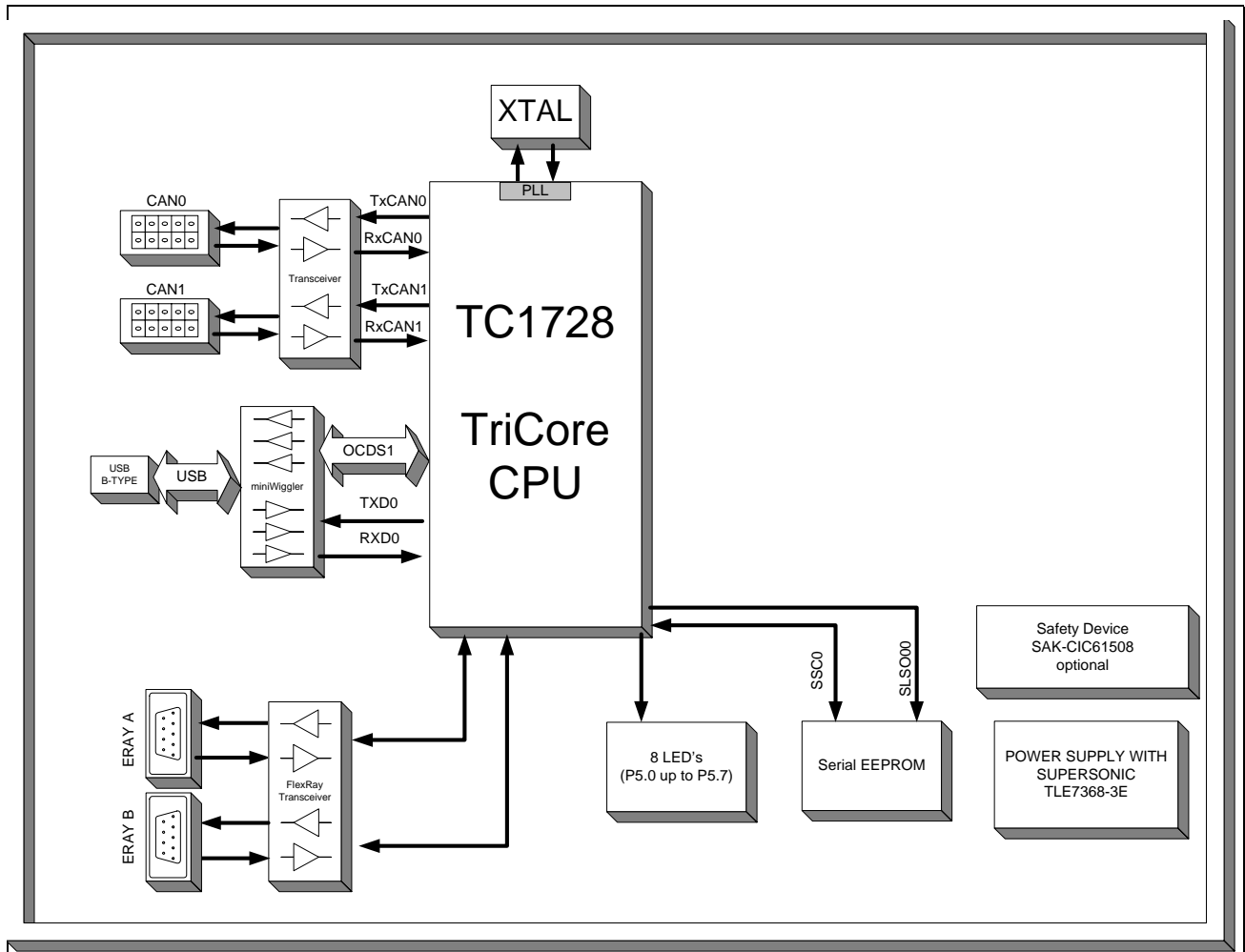


Figure 2-1 TriBoard Block Schematic

2.3 Placement

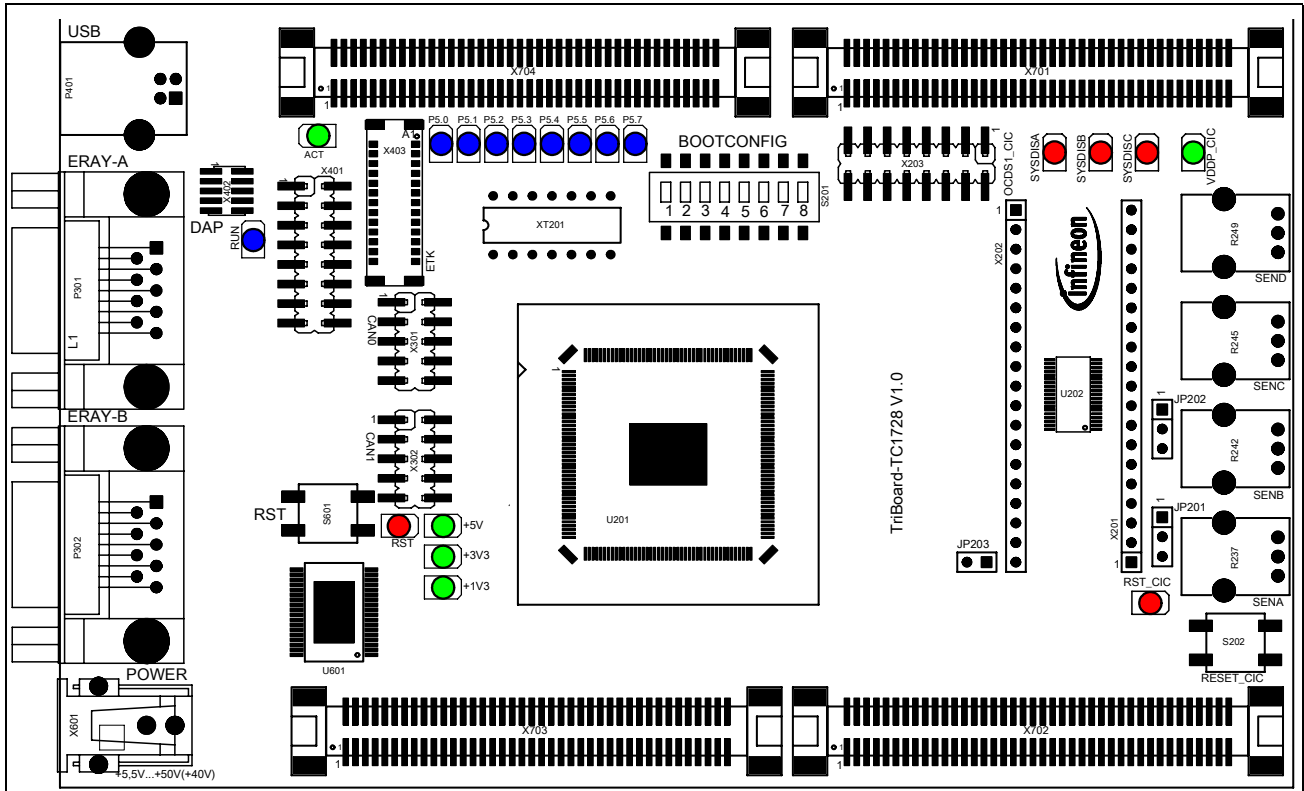


Figure 2-2 TriBoard TC1728 V1.0 Placement

3 TriBoard Information

3.1 Power Supply

The Board has to be connected to a +5,5V to +50V (+40V) DC power supply. The TriBoard generates internally +3.3V, +1V3 and +5V. The power consumption is not specified yet but a supply with 6V and 500mA should be sufficient. The pinout for the supply connector is shown in [Figure 7-3](#). There can be used any standard power pack with a connector where the positive line is surrounded by the ground line.

Maximum power supply is reduced to +40V if the SAK-CIC61508 option is assembled . Applying a stable supply voltage causes the power on reset after a short period. The three LED's (+5V, +3.3V, +1V3) indicate the status of the on board generated voltage. A manual reset is executed by pressing the reset button.

3.2 LEDs

There are 14 or 19 LEDs on board:

- D501 up to D508 (blue) -> toggle LEDs connected to P5.0 ... P5.7
- D604 RST (red) -> RESET LED indicate the reset state of the board
- D505 +1V3 (green) -> +1,3V power supply indication
- D606 +3V3 (green) -> +3,3V power supply indication
- D607 +5V (green) -> +5V power supply indication
- D402 ACT (green) -> on board miniWiggler JDS is ACTIV
- D401 RUN (blue) -> Debug RUN mode (switched by DAS Server)
- D204 RST_CIC (red)-> RESET LED indicate that the CIC is in reset
- D205 +VDDP_CIC (green)-> +VDDP for CIC power supply indication (+3,3V)
- D201 SYSDISA (red)-> System Disable A (switched by CIC)
- D202 SYSDISB (red)-> System Disable B (switched by CIC)
- D203 SYSDISC (red)-> System Disable C (switched by CIC)

3.3 Clock

There are three possibilities to apply the CPU clock.

- Large oscillator circuit (DIP14)
- Small oscillator circuit (DIP8)
- Crystal oscillator (default with 20MHz)
- External clock generator

The crystal oscillator and the oscillator circuit use the socket XT201. It's possible to apply a 14pol DIP oscillator package or an 8pol DIP oscillator package.

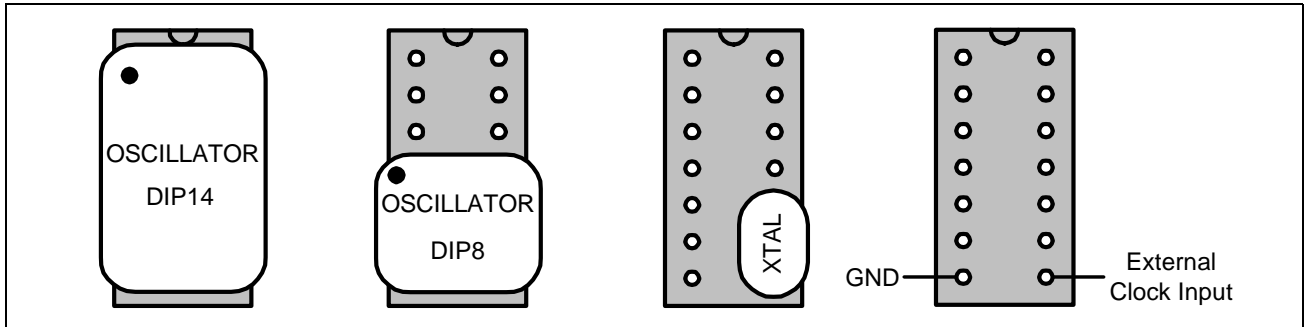


Figure 3-1 Clock socket usage (XT301)

3.4 USB Connector

The USB connector is used for connection to a PC. Via the USB it is possible to using the ASC0 as serial connection via USB and Debugging via DAS. For the pinout of USB socket see [Figure 7-4](#).

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 the

[*DAS website*](#)

3.4.1 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 ASC0 of the device (e.g. bootstrap loader).

3.4.2 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 preferred 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.

3.5 FlexRay

The board has 2 SUB-D connectors for FlexRay Communication with up to 10 Mbit/s. For the pinout of the plugs see [Figure 7-5](#).

The transceiver are connected directly to the TriCore device.

For more information look in the user manual for TC1728.

3.6 Serial Eeprom

The SSC0 of the TC1728 is connected to a serial EEPROM with a size of 128K (16.384 x 8). As chip select for this EEPROM is used the line SLSO00 (P3.5). To disconnect (disable) the EEPROM remove resistor R353.

3.7 MultiCAN

On the board are two CAN transceiver connected to the MultiCAN on TC1728 node 0 and 1. The transceivers are connected to two IDC10 plug. For the pinout of IDC10 plug see [Figure 7-6](#). 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.

3.8 Safety option with SAK-CIC61508 (optional)

The safety device is only assembled if the board is with TC1728 or with the safety option.

The SAK-CIC61508 is connected to the SSC0 of the microcontroller and use the line SLSO01 (P3.6) as chip select.

There are 4 LED's for indication the state of the safety device (SYSDISA, SYSDISB, SYSDISC, VDDP_CIC).

On this board exists 4 potentiometer to stimulate the sense inputs of the safety device.

Sensor inputs A and B can be connect to a potentiometer (JP201, JP202 , pos. 2-3) or to the core voltage of the microcontroller (JP201, pos. 1-2) for input A or to the port voltage of the microcontroller (JP202, pos. 1-2) for input B.

With switch S202 it is possible to reset the safety device. If JP203 is set, then with S202 is also reset the microcontroller and the safety device is reset by a power on reset of the microcontroller.

The safety device can be reprogrammed via JTAG and X203.

3.9 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 7-1](#).

Note: - SLSO00 is used as chip select for the serial eeprom on board.

3.10 Toggle LED's

Port 5pin 0 up to pin 7 are connected to single LED's (D501... D508) and can be controlled by Software. This status LED's are low active.

3.11 Debug System

3.11.1 OCDS1

The OCDS1 signals are connected to the IDC16 plug (X401). They work with the port supply of +3.3V. For pinout of the connector see [Figure 7-7](#). 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 R425 and R424 with a 0R resistor.

If you connect a debug hardware make sure that the miniWiggler JDS (see "[miniWiggler JDS](#)" on [Page 3-2](#)) 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.

3.11.2 DAP

The board comes with a DAP connector (X402). For pinout of this connector see [Figure 7-8](#). 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.

4 TriBoard Configuration

4.1 HW Boot Configuration TC1728

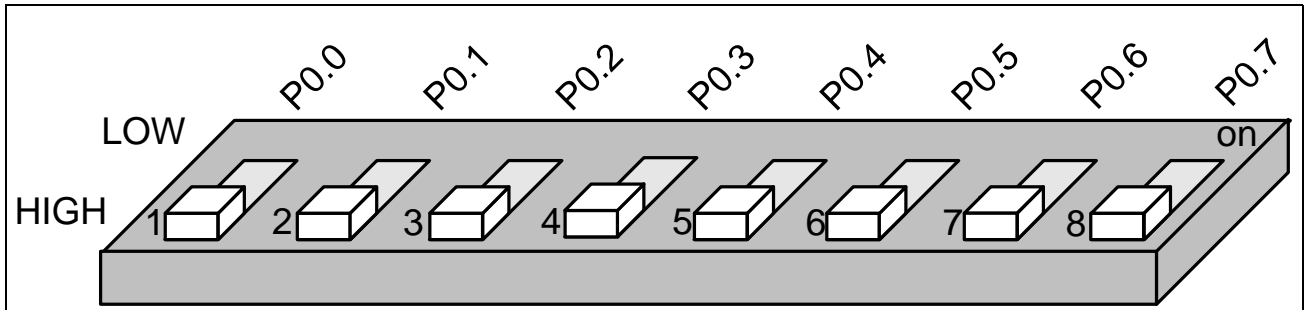


Figure 4-1 HW Configuration TC1728 DIP-Switch

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.

Table 4-1 User Startup Modes for TC1728

Note: The shadowed line indicates the default setting.

Note: 'x' represents the don't care state.

Note: 1 to 8 are the Dip Switch numbers

| HWCFG[7...0] | Type of Boot TC1728 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|--------------|--|---|---|---|---|---|---|---|---|
| 11XXXXXX | Internal Start from Flash | X | X | X | X | X | X | O | O |
| 01XXXXXX | Generic (CAN/ASC auto detected) Bootstrap Loader - P3[13:12] | X | X | X | X | X | X | O | O |
| 10XXXXXX | Alternate Boot Mode, Generic Bootloader on fail - P3[13:12] | X | X | X | X | X | X | O | O |
| 00XX10XX | ASC Bootstrap Loader - P3[1:0] | X | X | O | O | X | X | O | O |

Table 4-1 User Startup Modes for TC1728

Note: The shadowed line indicates the default setting.

Note: 'x' represents the don't care state.

Note: 1 to 8 are the Dip Switch numbers

| HWCFG[7...0] | Type of Boot TC1728 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---------------------|---|----------|----------|-------------|-------------|----------|----------|----------|----------|
| 00XX11XX | Alternate Boot Mode, ASC Bootloader on fail - P3[1:0] | X | X | O F F | O F F | X | X | O N | O N |
| all others | reserved; don't use this combination | | | | | | | | |

4.2 Assembly Options

Table 4-2 General optional resistors

| Component | Description |
|-----------|---|
| R205 | XTAL Rserial (default: assembled) |
| R206 | XTAL Rparallel (default: not assembled) |
| R423 | Connect /BRKOUT with miniWiggler JDS (default: not assembled) |
| R424 | Connect /BRKOUT with OCDS1 connector (default: not assembled) |
| R427 | Connect /BRKIN with USB1 of miniWiggler JDS (default: not assembled) |
| R429 | Connect /BRKIN with USB1 of DAP (default: not assembled) |
| R425 | Connect /BRKIN with OCDS1 connector(default: not assembled) |
| R428 | Connect /TESTMODE with USB1 of miniWiggler JDS (default: not assembled) |
| R430 | Connect /TESTMODE with USB1 of DAP (default: not assembled) |
| R426 | Connect /TESTMODE with OCDS1 connector(default: not assembled) |
| R432 | Connect debug reset with /PORST(default: assembled) |
| R431 | Connect debug reset with /HDRST (default: not assembled) |
| R510 | Connect +3,3V to all toggle LEDs (default: assembled) |
| R623 | Connect reset switch with /PORST(default: assembled) |
| R624 | Connect reset switch with /HDRST (default: not assembled) |
| R604 | Connect P1.10 with MONSTBY of power device (default: not assembled) |
| R606 | Connect P1.3 with WDO of power device (default: not assembled) |
| R609 | Connect P1.15 with WDI of power device (default: not assembled) |

Note: All resistors are red marked in the following figures

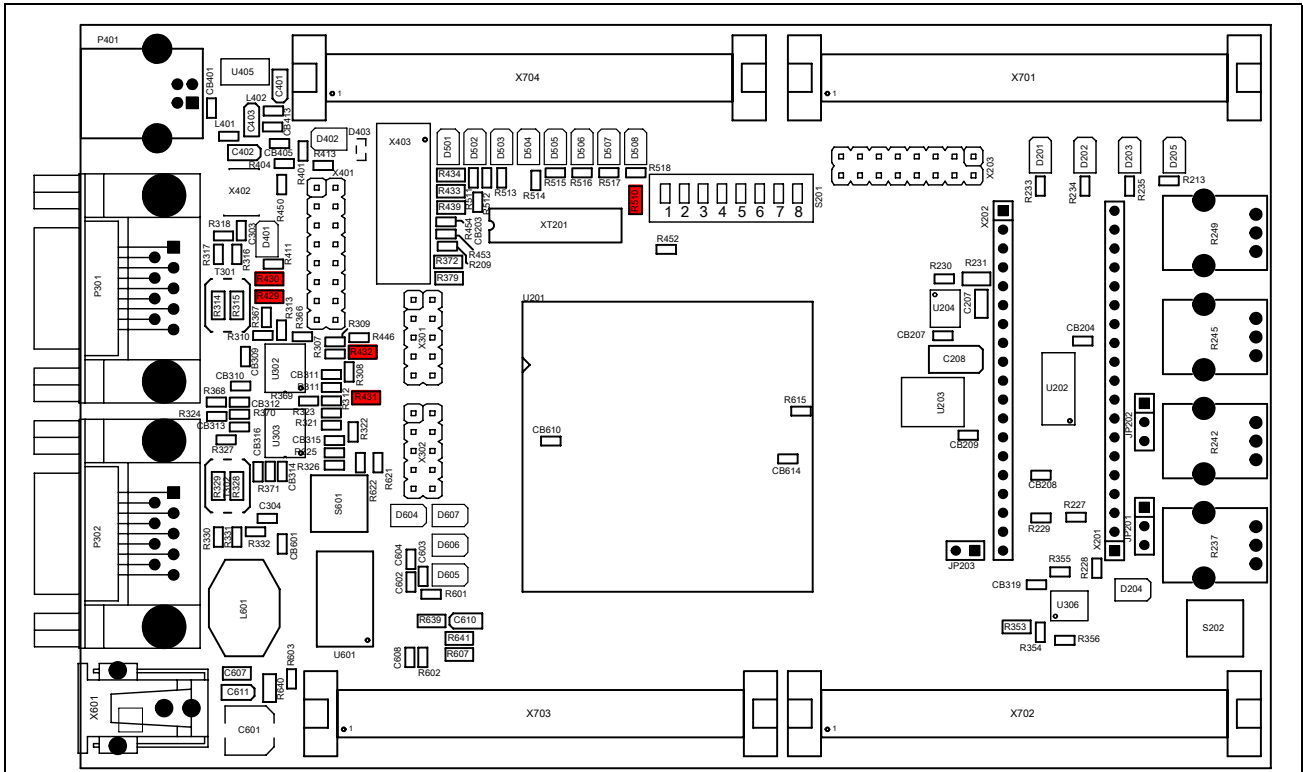


Figure 4-2 Location of general optional resistors on Top Side

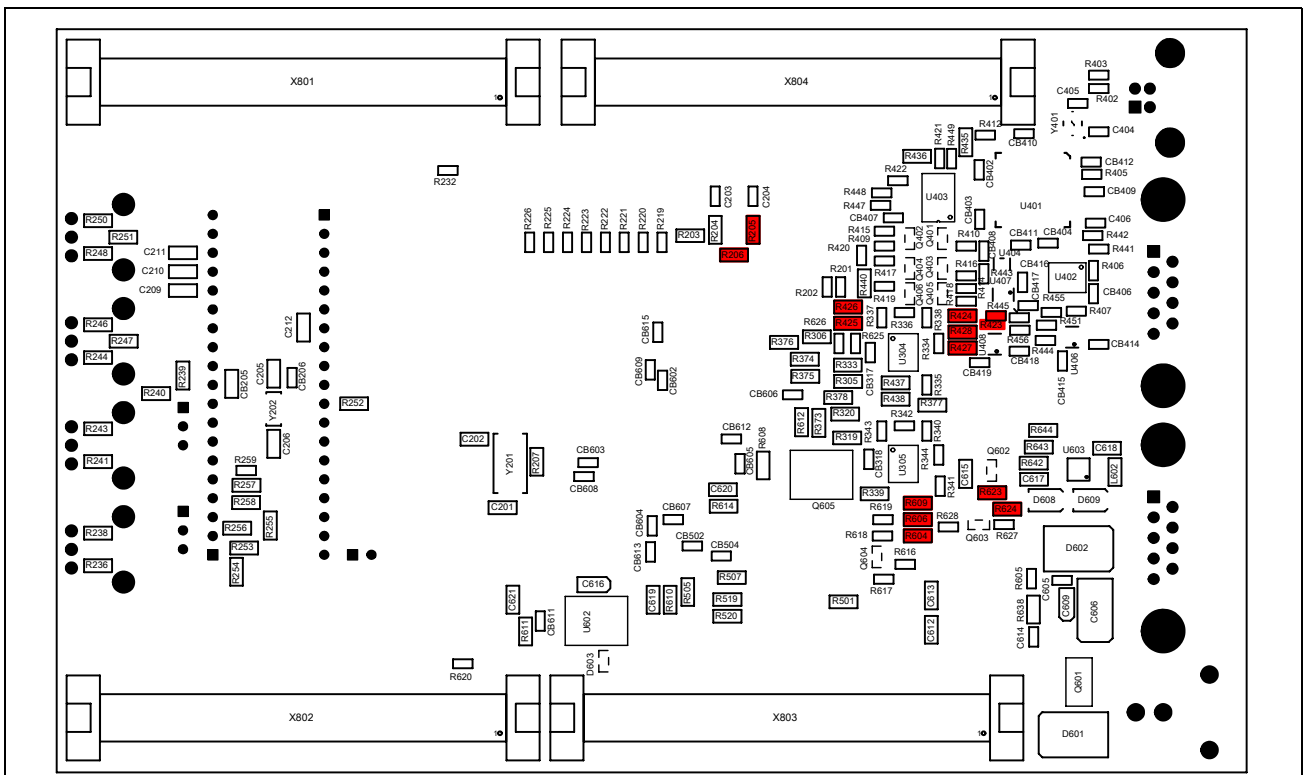


Figure 4-3 Location of general optional resistors on Bottom Side

Table 4-3 Resistors for peripherals

| Component | Description |
|-----------|---|
| R333 | Connect P3.12 with RXD of CAN0 transceiver (default: assembled) |
| R339 | Connect P3.14 with RXD of CAN1 transceiver (default: assembled) |
| R353 | Connect P3.5 (SLSO00) with /CS of Eeprom (default: assembled) |
| R440 | Connect P3.0 with TXD of USB to UART (default: assembled) |
| R505 | Connect VAREF0 with VDDM (default: assembled) |
| R507 | Connect VAGND0 with VSSM (default: assembled) |
| R519 | Connect +5V with VDDM (default: assembled) |
| R520 | Connect +3,3V with VDDM (default: not assembled) |

Note: All resistors are red marked in the following figures

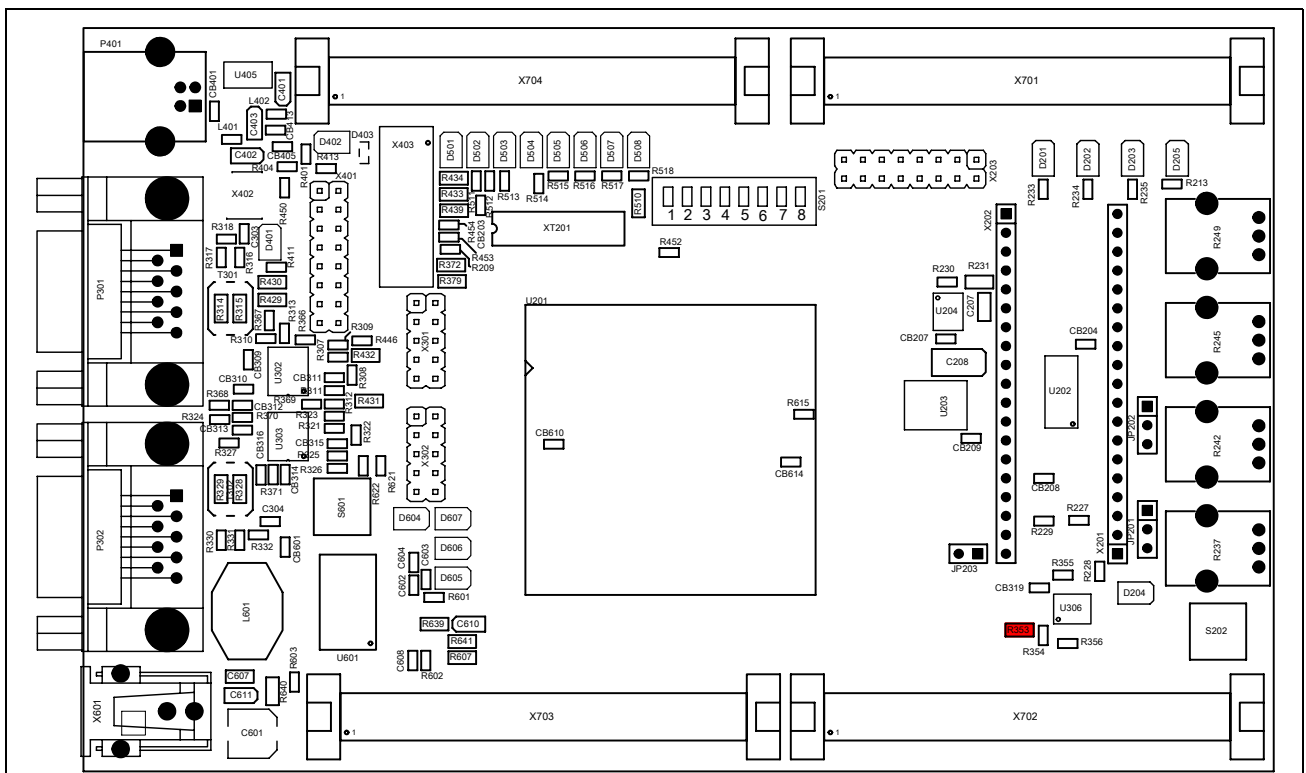


Figure 4-4 Location of peripheral resistors on Top Side

TriBoard Configuration

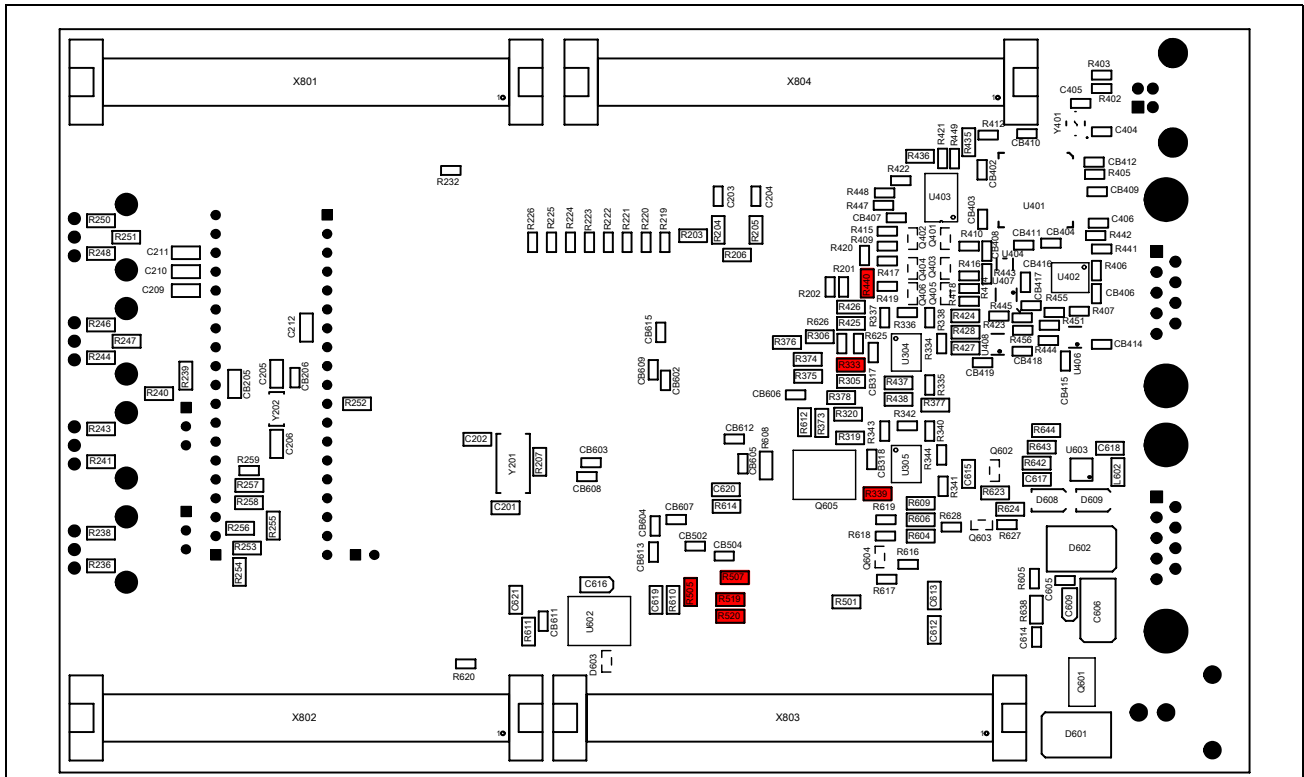


Figure 4-5 Location of peripheral resistors on Bottom Side

Table 4-4 Resistors for safety device

| Component | Description |
|-----------|--|
| R247 | Connect potentiometer to sensor input C (default: assembled) |
| R251 | Connect potentiometer to sensor input D (default: assembled) |
| R239/R240 | Voltage divider to adapt VDDP to VAREF of safety device (default: assembled) |
| R252 | Connect P3.6 (SLSO01) with /CS of safety device (default: assembled) |
| R253 | Connect P3.2 (SSC0) to SCLK of safety device (default: assembled) |
| R254 | Connect P2.11 (SSC1) to SCLK of safety device (default: not assembled) |
| R255 | Connect P3.4 (SSC0) to MTSR of safety device (default: assembled) |
| R256 | Connect P2.12 (SSC1) to MTSR of safety device (default: not assembled) |
| R257 | Connect P3.3 (SSC0) to MRST of safety device (default: assembled) |
| R258 | Connect P2.10 (SSC1) to MRST of safety device (default: not assembled) |

Note: All resistors are red marked in the following figures

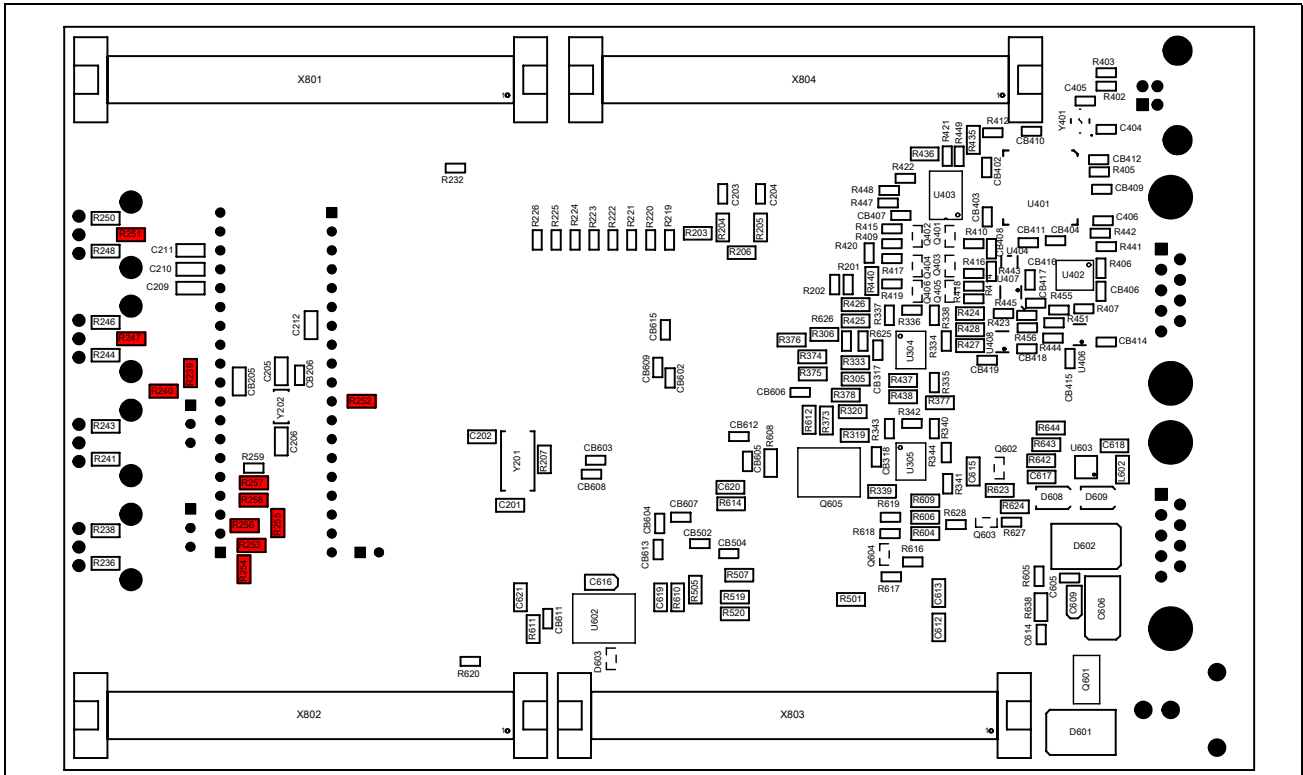


Figure 4-6 Location of resistors for safety device on Bottom Side



5 TriBoard Software

5.1 Requirements

To install the software from your TriBoard CD you need a PC with Windows95/98/ME, Windows 2000, Windows XP, Windows Vista or Windows 7.

5.2 Software Overview

The CD does not contain any tool. For the availability for Demo Versions of the different Tools, please contact the toolvendor directly (e.g. Tasking, Hitex, Lauterbach, GreenHills, HighTec...). To install tools for compiling and debugging use separat CD's from Toolvendors. There are also some application notes and software examples. The data sheets of all used parts can be found in the "TriBoard_Components" directory. The manuals for the microcontrollers and the Easy Kit are located in the "Manual" folder. Some useful tools like Acrobat Reader are stored in the "Utilities" directory.

The current Errata Sheet can be found in the directory "Errata Sheet". To make sure you have always the most recent one, please contact your local FAE.

Note: For more details see the file ReadMe.txt.

5.3 Software Installation

To install tools for the TriCore insert the CD from the Toolvendor and start the file "setup.exe" if the CD is not automatically started. Follow the instructions of the installationprogram.



6 Signal Description

For more information about the signals please see the user manuals for TC1728 and/or the schematics of the board.

Table 6-1 Power Signals

| Short Name | Description |
|------------|---|
| VCC_IN | Supply Input (5,5V...50V(40V)) |
| VIN | Input voltage of power supply device |
| GND | Ground |
| VDD | Core Supply Voltage (1,3V) |
| VDDP | Port Supply Voltage (3,3V) |
| V5 | EVR Supply Voltage (5V) |
| VDDESB | Emulation Stand-by SRAM Supply Voltage (1,3V) |
| VSSM | ADC Analog Part Ground |
| VDDM | ADC Analog Part Supply Voltage (5V) |
| VAGND0 | ADC Reference Ground |
| VAREF0 | ADC0 Reference Voltage (VDDM) |
| VDDP_CIC | Port Supply Voltage safety device (3,3V) |
| VAGND_CIC | ADC Reference Ground safety device |
| VAREF_CIC | ADC Reference Voltage safety device (2,5V) |

Table 6-2 Reset Signals

| Short Name | Description |
|--------------|---|
| /PORST | Power On Reset |
| /ESR0_/HDRST | External Service Request 0 (Hardware Reset) |
| /RESET_CIC | Reset safety device |

Table 6-3 Interrupt Signals

| Short Name | Description |
|--------------------------|---|
| /ESR1_/NMI | External Service Request 1 (Non Maskable Interrupt) |
| REQ[0...1] / P3[10...11] | External Trigger Input 0...1 |
| REQ[2...3] / P0[6...7] | External Trigger Input 2...3 |
| REQ[4...5] / P0[14...15] | External Trigger Input 4...5 |

Table 6-3 Interrupt Signals

| | |
|--------------|---------------------------|
| REQ9 / P0.11 | External Trigger Input 9 |
| REQ15 / P1.0 | External Trigger Input 15 |

Table 6-4 Clock Signals

| Short Name | Description |
|------------|---|
| XTAL1 | Crystal Oscillator Input |
| XTAL2 | Crystal Oscillator Output |
| XTAL1_CIC | Crystal Oscillator Input safety device |
| XTAL2_CIC | Crystal Oscillator Output safety device |

Table 6-5 Debug Signals

| Short Name | Description |
|------------|---|
| /TRST | Test Reset |
| TCLK | Test Clock |
| TMS | Test Mode Select |
| TDI | Test Data Input |
| TDO | Test Data Output |
| /TESTMODE | Test Mode Select Input |
| /BRKIN | TriCore Breakpoint Input |
| /BRKOUT | TriCore Breakpoint Output |
| TCLK_CIC | Test Clock safety device |
| TMS_CIC | Test Mode Select safety device |
| TDI_CIC | Test Data Input safety device |
| TDO_CIC | Test Data Output safety device |
| MBC_CIC | Monitor & Bootstrap loader Control line safety device |

Table 6-6 Peripheral Signals

| Short Name | Description |
|--------------|--------------------|
| P3.0 | Receive Data ASC0 |
| P3.1 | Transmit Data ASC0 |
| P3.9 | Receive Data ASC1 |
| P3.8 | Transmit Data ASC1 |
| SCLK0 / P3.2 | Clock Line SSC0 |

Table 6-6 Peripheral Signals

| | |
|---------------|--|
| MRST0 / P3.3 | Master Receive / Slave Transmit SSC0 |
| MTRS0 / P3.4 | Master Transmit / Slave Receive SSC0 |
| SLSOX0 / P3.5 | Slave Select Output 0 (SSCX) |
| SLSOX1 / P3.6 | Slave Select Output 1 (SSCX) |
| SLSOX2 / P3.7 | Slave Select Output 2(SSCX) |
| P2.11 | Clock Line SSC1 |
| P2.10 | Master Receive / Slave Transmit SSC1 |
| P2.12 | Master Transmit / Slave Receive SSC1 |
| P3.13 | CAN Transmitter Output 0 |
| P3.12 | CAN Receiver Input 0 |
| P3.15 | CAN Transmitter Output 1 |
| P3.14 | CAN Receiver Input 1 |
| P4.1 | CAN Transmitter Output 2 |
| P4.0 | CAN Receiver Input 2 |
| P0 [0...7] | General Purpose I/O Port 0 (HWCFG) |
| P5 [0...7] | General Purpose I/O Port 5 (used for LED's) |
| P5.8 | E-Ray Channel A transmit Data Output |
| P5.10 | E-Ray Channel A transmit Data Output enable |
| P5.14 | E-Ray Channel A Receive Data Input 0 |
| P5.9 | E-Ray Channel B transmit Data Output |
| P5.11 | E-Ray Channel B transmit Data Output enable |
| P5.15 | E-Ray Channel B Receive Data Input 0 |
| P2.4 | MLI0 receive channel clock |
| P2.5 | MLI0 receive channel ready output |
| P2.6 | MLI0 receive channel valid input |
| P2.7 | MLI0 receive channel data input |
| P2.0 | MLI0 transmit channel clock |
| P2.1 | MLI0 transmit channel ready input |
| P2.2 | MLI0 transmit channel valid output |
| P2.3 | MLI0 transmit channel data output |
| P6.1 / FCLP0A | MSC0 differential driver clock output positive A |

Table 6-6 Peripheral Signals

| | |
|--------------|--|
| P6.0 / FCLN0 | MSC0 differential driver clock output negative |
| P6.3 / SOP0A | MSC0 differential driver serial data output positive A |
| P6.2 / SON0 | MSC0 differential driver serial data output negative |
| AN[0...35] | Analog Inputs |
| P1[12...14] | ADC0 External Multiplexer Control |
| P0[0...15] | General Purpose I/O Port 0 |
| P1[0...15] | General Purpose I/O Port 1 |
| P2[0...13] | General Purpose I/O Port 2 |
| P3[0...15] | General Purpose I/O Port 3 |
| P4[0...3] | General Purpose I/O Port 4 |
| P5[0...15] | General Purpose I/O Port 5 |
| P6[0...3] | General Purpose I/O Port 6 |
| P8[0...14] | General Purpose I/O Port 8 |
| P9[2...8] | General Purpose I/O Port 9 |
| P10[0...3] | General Purpose I/O Port 10 |
| P11[0...15] | General Purpose I/O Port 11 |

Table 6-7 Safety device Signals

| Short Name | Description |
|------------|--|
| SENA | Sensor Input A |
| SENB | Sensor Input B |
| SENC | Sensor Input C |
| SEND | Sensor Input D |
| SCLK_CIC | Clock Line SAK-CIC61508 |
| MRST_CIC | Master Receive / Slave Transmit SAK-CIC61508 |
| MTSR_CIC | Master Transmit / Slave Receive SAK-CIC61508 |
| /CS_CIC | Slave Select Input SAK-CIC61508 |
| SYSDISA | System Disable Output A |
| SYSDISB | System Disable Output B |
| SYSDISC | System Disable Output C |

7 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

Connector Pin Assignment

7.1 TC1728 Connector / Top View

| BUS EXPANSION (X801,X901) | | | | PERIPHERALS (X802,X902) | | | |
|---------------------------|----|----|-----|-------------------------|----|----|------------------|
| GND | 1 | 2 | GND | GND | 1 | 2 | GND |
| GND | 3 | 4 | GND | GND | 3 | 4 | GND |
| | 5 | 6 | | VCC_IN | 5 | 6 | VCC_IN |
| | 7 | 8 | | 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 | | | 23 | 24 | |
| | 25 | 26 | | EN00 / P2.8 | 25 | 26 | EN01 / P2.9 |
| | 27 | 28 | | SDI0 / P2.13 | 27 | 28 | |
| | 29 | 30 | | FCLP0A / P6.1 | 29 | 30 | P1.15 |
| | 31 | 32 | | FCLN0 / P6.0 | 31 | 32 | P9.5 |
| | 33 | 34 | | SOP0A / P6.3 | 33 | 34 | P9.6 |
| | 35 | 36 | | SON0 / P6.2 | 35 | 36 | |
| | 37 | 38 | | | 37 | 38 | |
| | 39 | 40 | | | 39 | 40 | SLSI1 / P2.13 |
| | 41 | 42 | | SLSO00_10 / P3.5 | 41 | 42 | SLSO01_11 / P3.6 |
| | 43 | 44 | | SLSO02_12 / P3.7 | 43 | 44 | SLSO03_13 / P2.1 |
| | 45 | 46 | | SLSO04_14 / P2.8 | 45 | 46 | SLSO05_15 / P2.9 |
| | 47 | 48 | | SLSO06 / P3.8 | 47 | 48 | SLSO17 / P1.10 |
| | 49 | 50 | | GND | 49 | 50 | GND |
| | 51 | 52 | | XTAL1 | 51 | 52 | SYSCLK / P4.3 |
| | 53 | 54 | | XTAL2 | 53 | 54 | |
| | 55 | 56 | | RXD0 / P3.0 | 55 | 56 | RXD1 / P3.9 |
| | 57 | 58 | | TXD0 / P3.1 | 57 | 58 | TXD1 / P3.8 |
| | 59 | 60 | | RXDCAN0 / P3.12 | 59 | 60 | RXDCAN1 / P3.14 |
| | 61 | 62 | | TXDCAN0 / P3.13 | 61 | 62 | TXDCAN1 / P3.15 |
| | 63 | 64 | | SCLK0 / P3.2 | 63 | 64 | SCLK1 / P2.11 |
| | 65 | 66 | | MTSR0 / P3.4 | 65 | 66 | MTSR1 / P2.12 |
| | 67 | 68 | | MRST0 / P3.3 | 67 | 68 | MRST1 / P2.10 |
| | 69 | 70 | | | 69 | 70 | |
| | 71 | 72 | | REQ0 / P3.10 | 71 | 72 | REQ1 / P3.11 |
| | 73 | 74 | | REQ2 / P0.6 | 73 | 74 | REQ3 / P0.7 |
| | 75 | 76 | | VDDESB | 75 | 76 | GND |
| | 77 | 78 | | 3V3 | 77 | 78 | 3V3 |
| | 79 | 80 | | 3V3 | 79 | 80 | 3V3 |

Figure 7-1 Connector for TC1728 - Pinout (Part I, Top View)

Connector Pin Assignment

| ADC (X803, X903) | | | GPTA / MLI (X804,X904) | | |
|------------------|-------|--------------|------------------------|-------|----------------|
| VSSM | 1 2 | VSSM | GND | 1 2 | GND |
| VSSM | 3 4 | VSSM | GND | 3 4 | GND |
| AN0 | 5 6 | AN16 | P0.0 | 5 6 | P5.8 |
| AN1 | 7 8 | AN17 | P0.1 | 7 8 | P5.9 |
| AN2 | 9 10 | AN18 | P0.2 | 9 10 | P5.10 |
| AN3 | 11 12 | AN19 | P0.3 | 11 12 | P5.11 |
| AN4 | 13 14 | AN20 | P0.4 | 13 14 | P5.12 |
| AN5 | 15 16 | AN21 | P0.5 | 15 16 | P5.13 |
| AN6 | 17 18 | AN22 | P0.6 | 17 18 | P5.14 |
| AN7 | 19 20 | AN23 | P0.7 | 19 20 | P5.15 |
| AN8 | 21 22 | AN24 | P0.8 | 21 22 | P5.0 |
| AN9 | 23 24 | AN25 | P0.9 | 23 24 | P5.1 |
| AN10 | 25 26 | AN26 | P0.10 | 25 26 | P5.2 |
| AN11 | 27 28 | AN27 | P0.11 | 27 28 | P5.3 |
| AN12 | 29 30 | AN28 | P0.12 | 29 30 | P5.4 |
| AN13 | 31 32 | AN29 | P0.13 | 31 32 | P5.5 |
| AN14 | 33 34 | AN30 | P0.14 | 33 34 | P5.6 |
| AN15 | 35 36 | AN31 | P0.15 | 35 36 | P5.7 |
| VSSM | 37 38 | VSSM | P1.0 | 37 38 | |
| VDDM | 39 40 | VDDM | P1.1 | 39 40 | |
| | 41 42 | | P1.2 | 41 42 | P9.2 |
| VAGND0 | 43 44 | VAGND0 | P1.3 | 43 44 | P9.3 |
| VAREF0 | 45 46 | | P1.4 | 45 46 | P9.4 |
| VSSM | 47 48 | VSSM | P1.5 | 47 48 | P9.7 |
| AN32 | 49 50 | | P1.6 | 49 50 | P9.8 |
| AN33 | 51 52 | | P1.7 | 51 52 | P8.0 |
| AN34 | 53 54 | | P1.8 | 53 54 | P8.1 |
| AN35 | 55 56 | | P1.9 | 55 56 | P8.2 |
| | 57 58 | | P1.10 | 57 58 | EMGSTOP / P1.4 |
| | 59 60 | | P1.11 | 59 60 | P8.3 |
| VSSM | 61 62 | VSSM | P4.0 | 61 62 | P8.4 |
| P8.8 | 63 64 | P8.9 | P4.1 | 63 64 | P8.5 |
| P8.10 | 65 66 | P8.11 | P4.2 | 65 66 | P8.6 |
| P8.12 | 67 68 | P8.13 | P4.3 | 67 68 | P8.7 |
| 3V3 | 69 70 | 3V3 | TCLK0 / P2.0 | 69 70 | RDATA0 / P2.7 |
| AD0EMUX0 / P1.12 | 71 72 | P10.0 | TREADY0 / P2.1 | 71 72 | RVALID0 / P2.6 |
| AD0EMUX1 / P1.13 | 73 74 | P10.1 | TVALID0 / P2.2 | 73 74 | RREADY0 / P2.5 |
| AD0EMUX2 / P1.14 | 75 76 | P10.2 | TDATA0 / P2.3 | 75 76 | RCLK0 / P2.4 |
| | 77 78 | REQ4 / P0.14 | 3V3 | 77 78 | 3V3 |
| REQ5 / P0.15 | 79 80 | P10.3 | 3V3 | 79 80 | 3V3 |

Figure 7-2 Connector for TC1728 - Pinout (Part II, Top View)

7.2 Power connector pinout

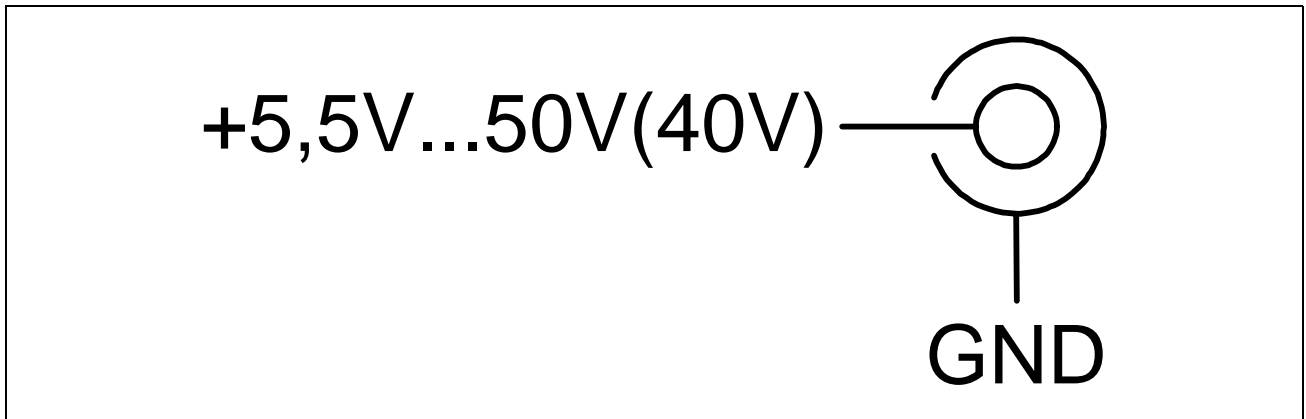


Figure 7-3 Power connector pinout

7.3 USB connector pinout

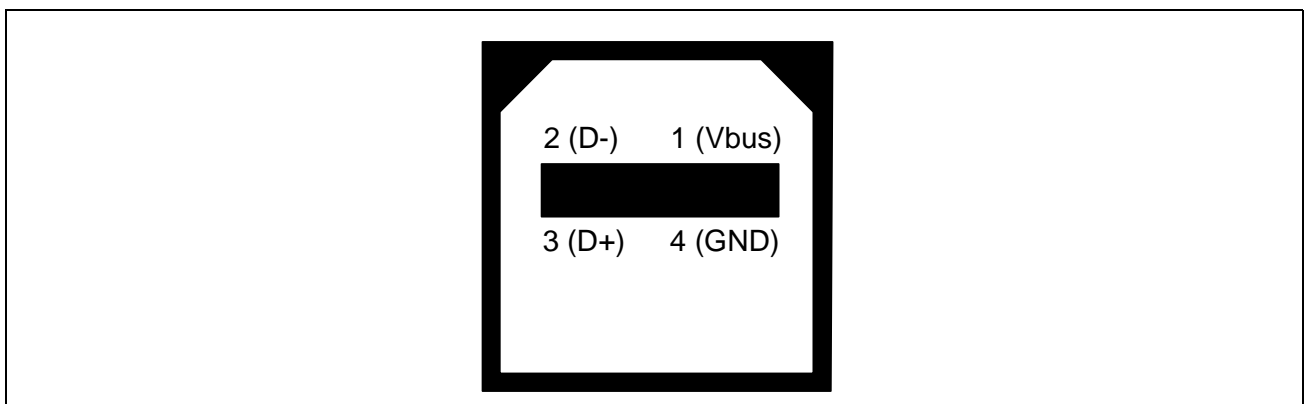


Figure 7-4 USB connector Pinout

7.4 Flexray Pinout

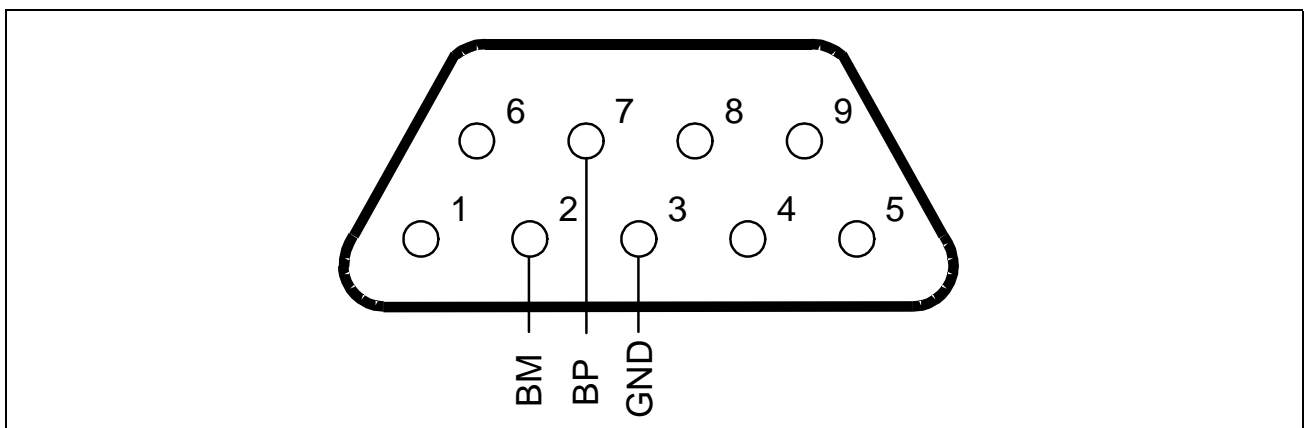


Figure 7-5 Flexray Pinout (SUBD-9 Plug)

7.5 CAN connector pinout

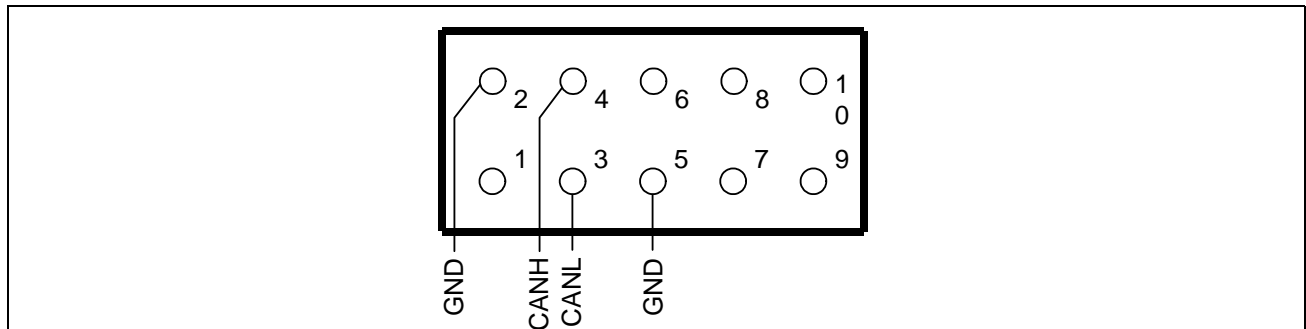


Figure 7-6 CAN connector pinout (IDC10)

7.6 OCDS connector pinout

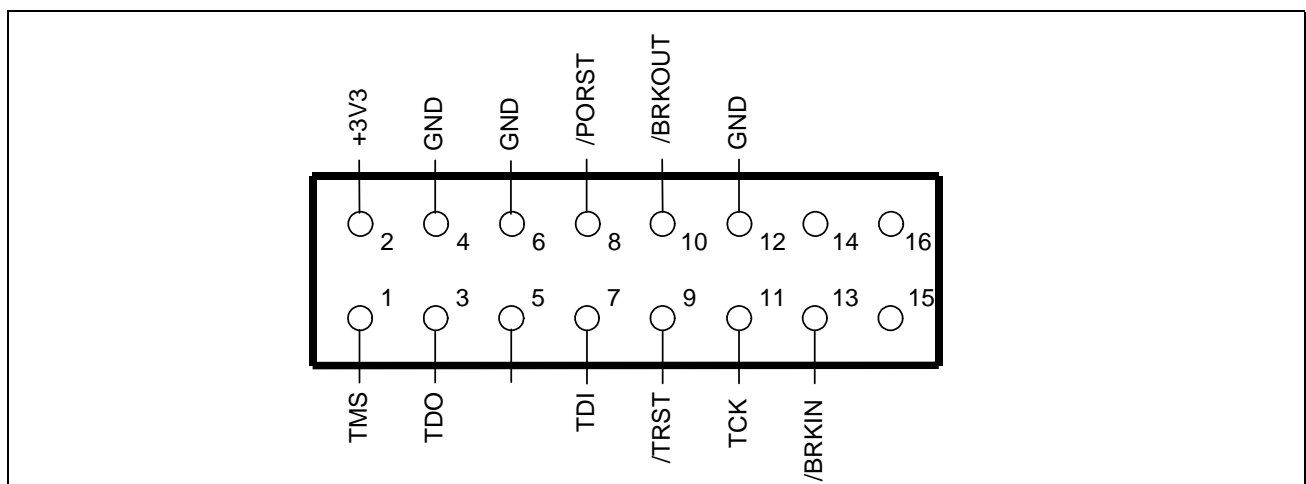


Figure 7-7 OCDS connector pinout (IDC16)

7.7 DAP connector pinout

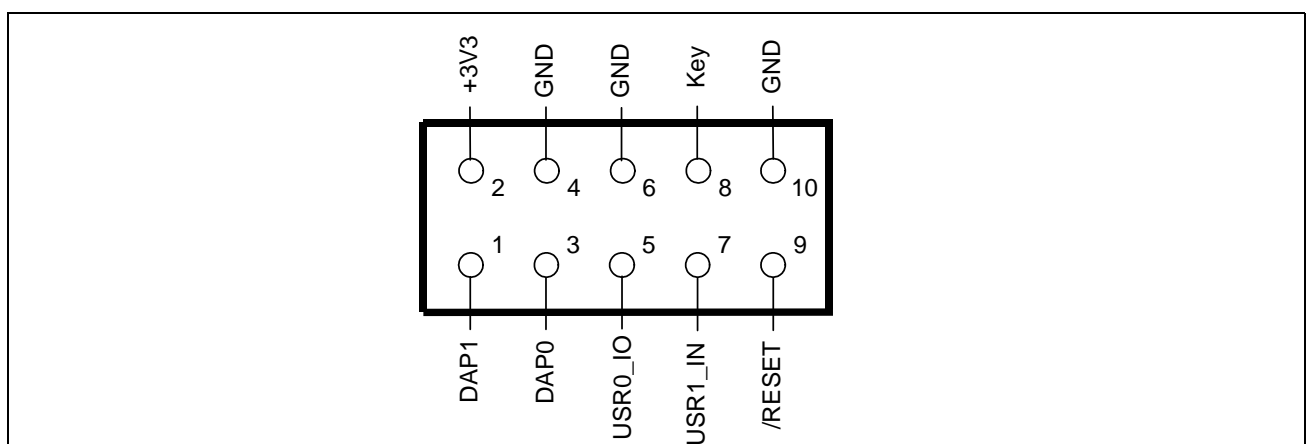


Figure 7-8 DAP connector pinout (FTSH10)



8 Schematic and Layout

8.1 Schematic

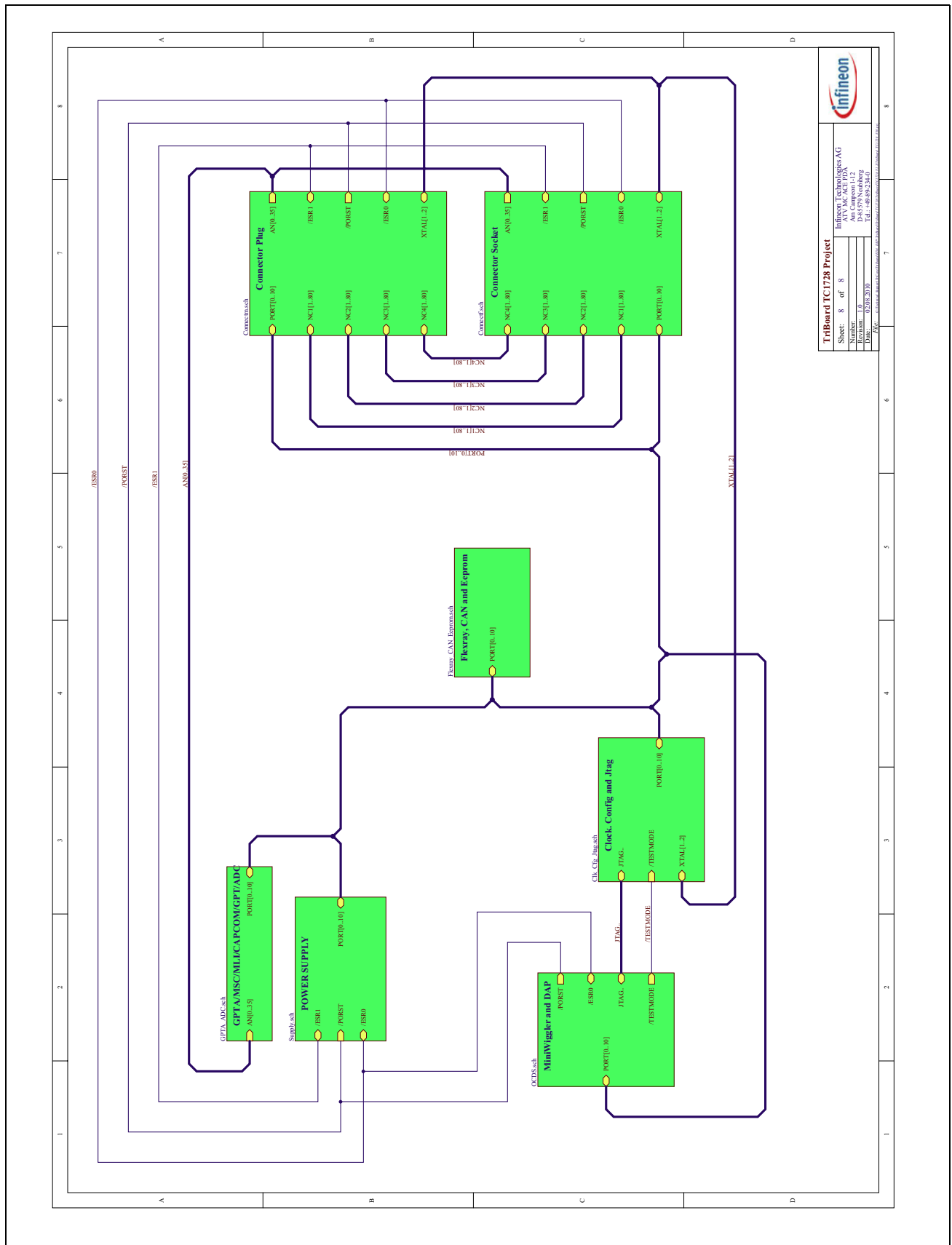


Figure 8-1 Schematic - Project

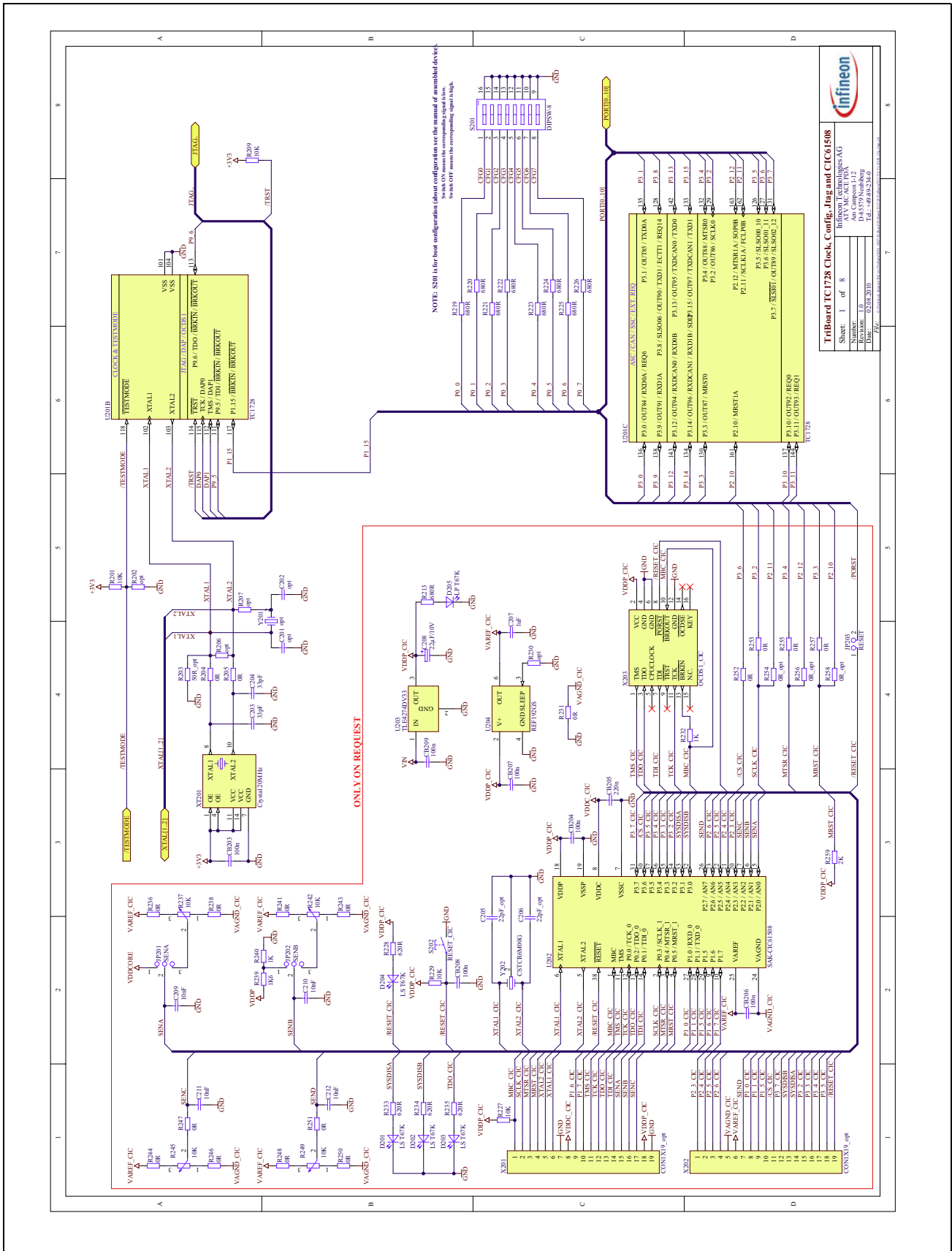


Figure 8-2 Schematic - Config, Clock, JTAG and CIC61508

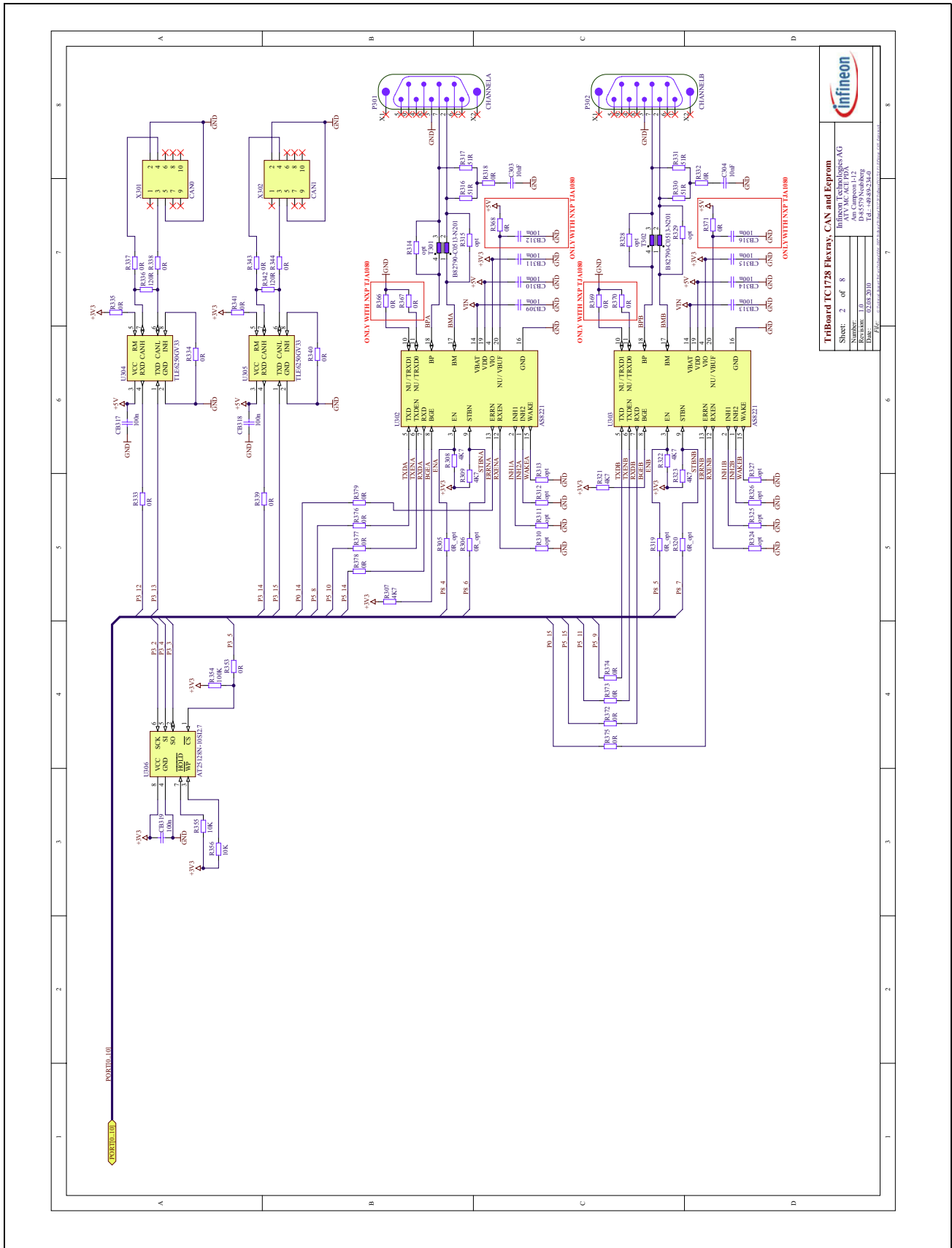
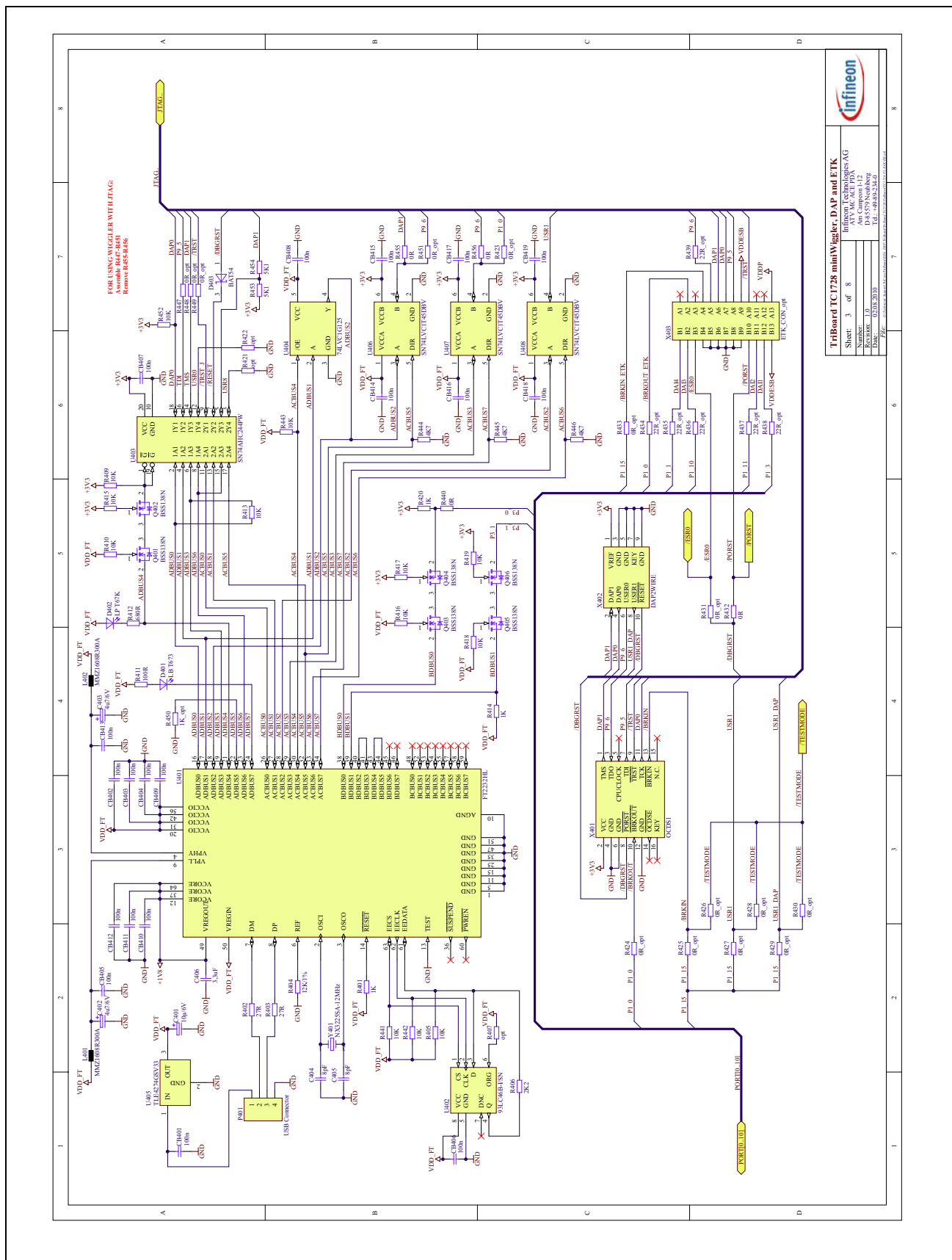


Figure 8-3 Schematic - Flexray, CAN and Eeprom



| TriBoard TC1728 miniWiggler, DAP and ETK | |
|--|--------------|
| Number: | 02.008.20.00 |
| Version: | 1.0 |
| Drawn: | 02.08.2010 |
| Part: | |

Figure 8-4 Schematic - miniWiggler JDS, DAP and ETK

Schematic and Layout

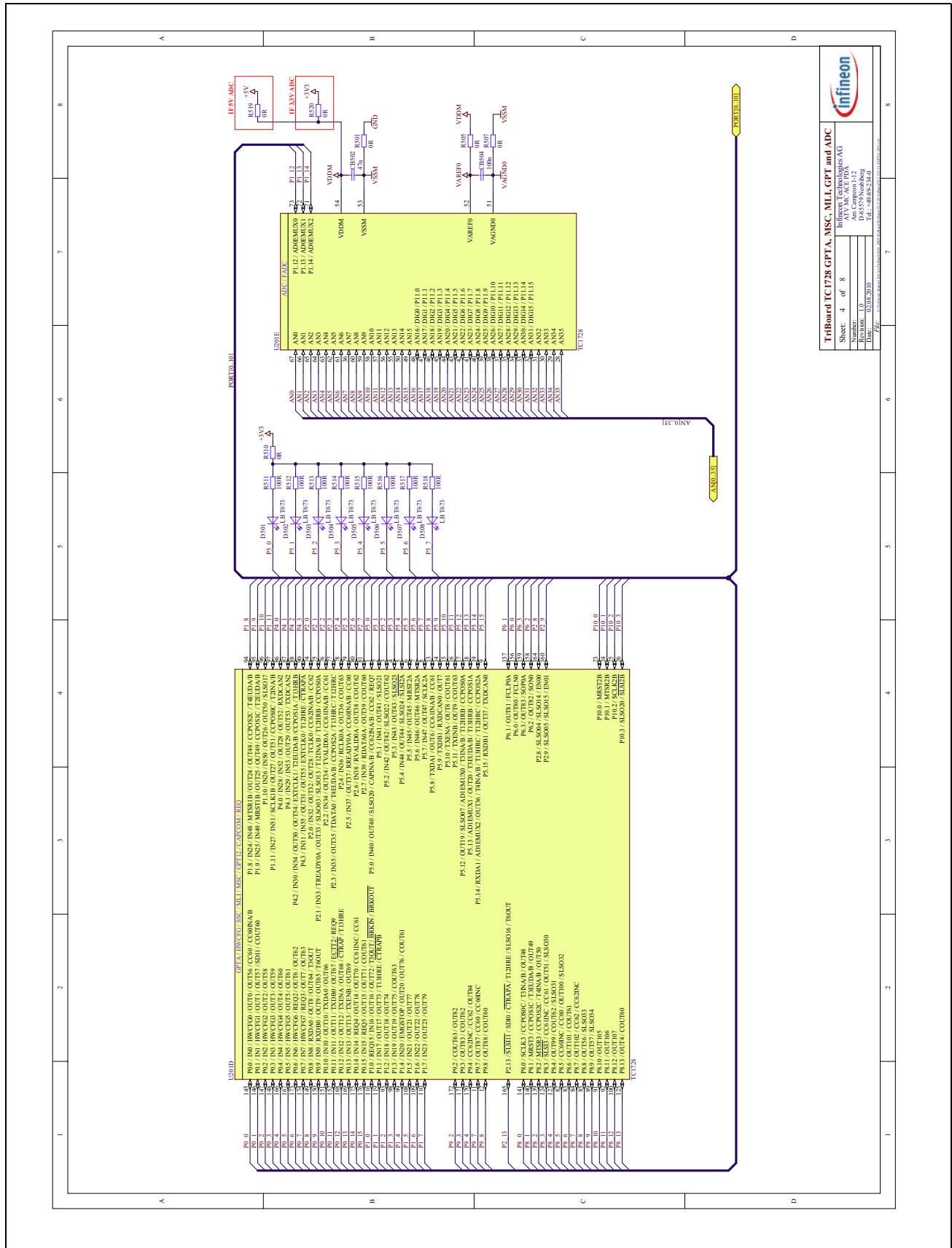


Figure 8-5 Schematic - GPTA, MSC, MLI and ADC

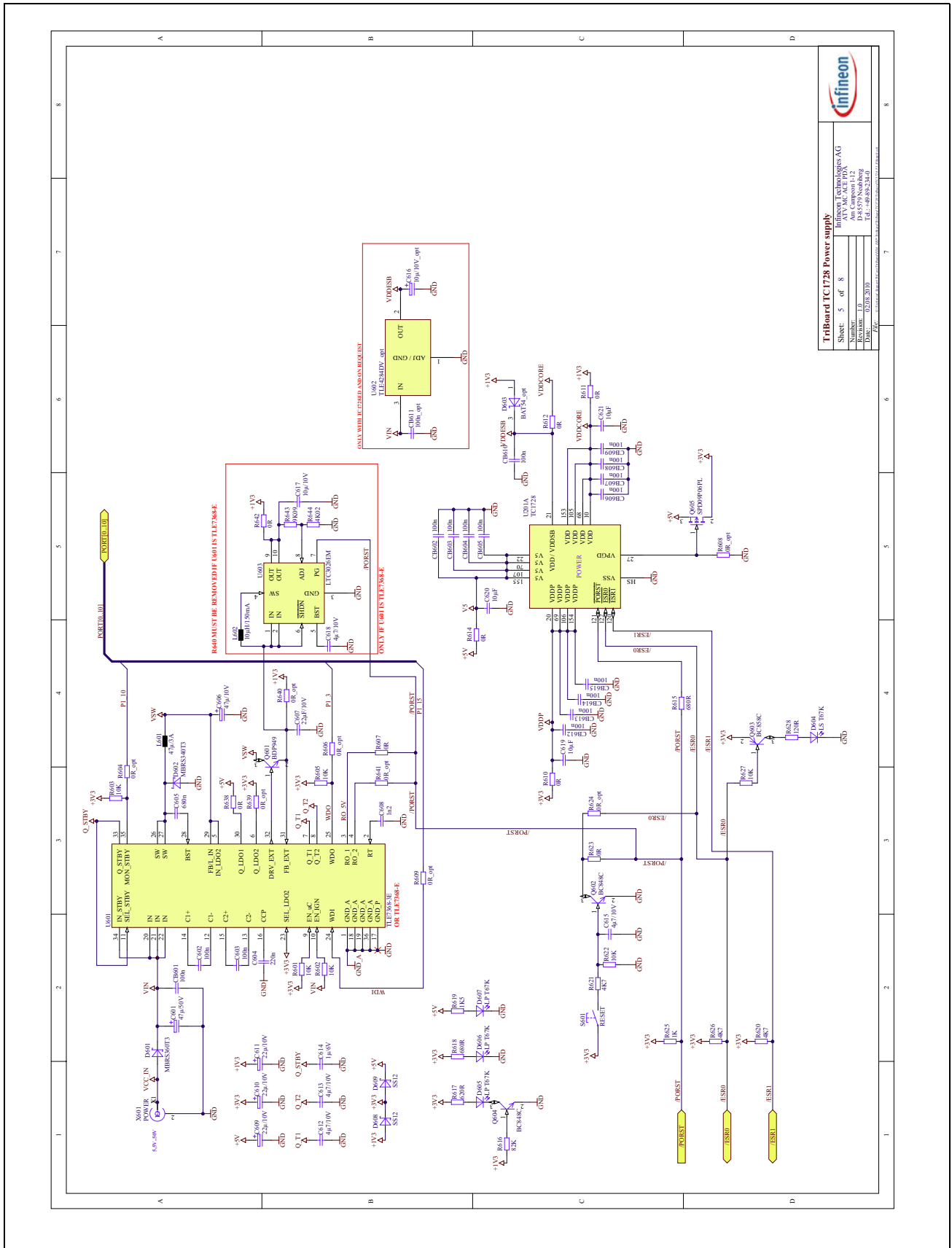


Figure 8-6 Schematic - Power Supply

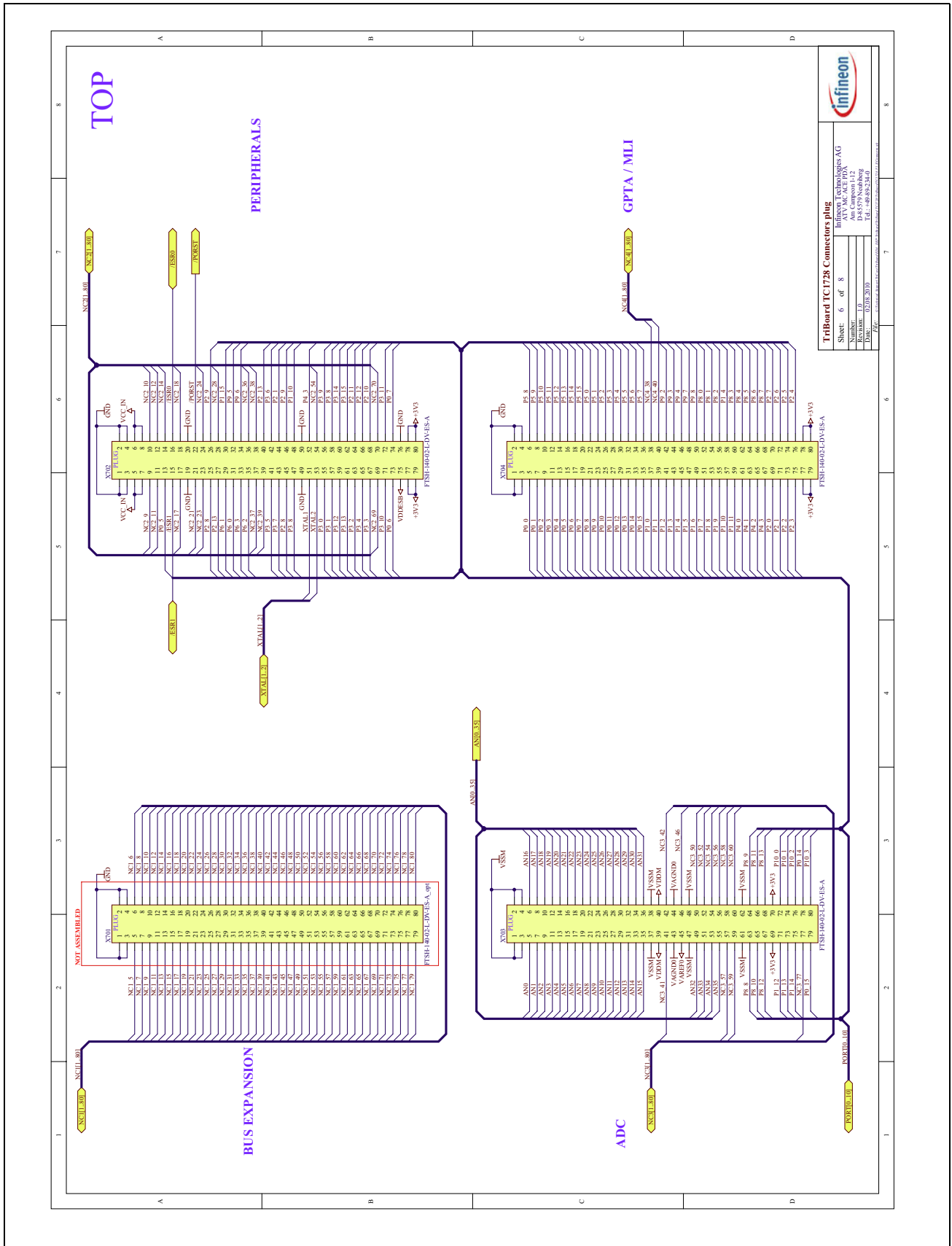


Figure 8-7 Schematic - Connectors (Plug)

8.2 Layout

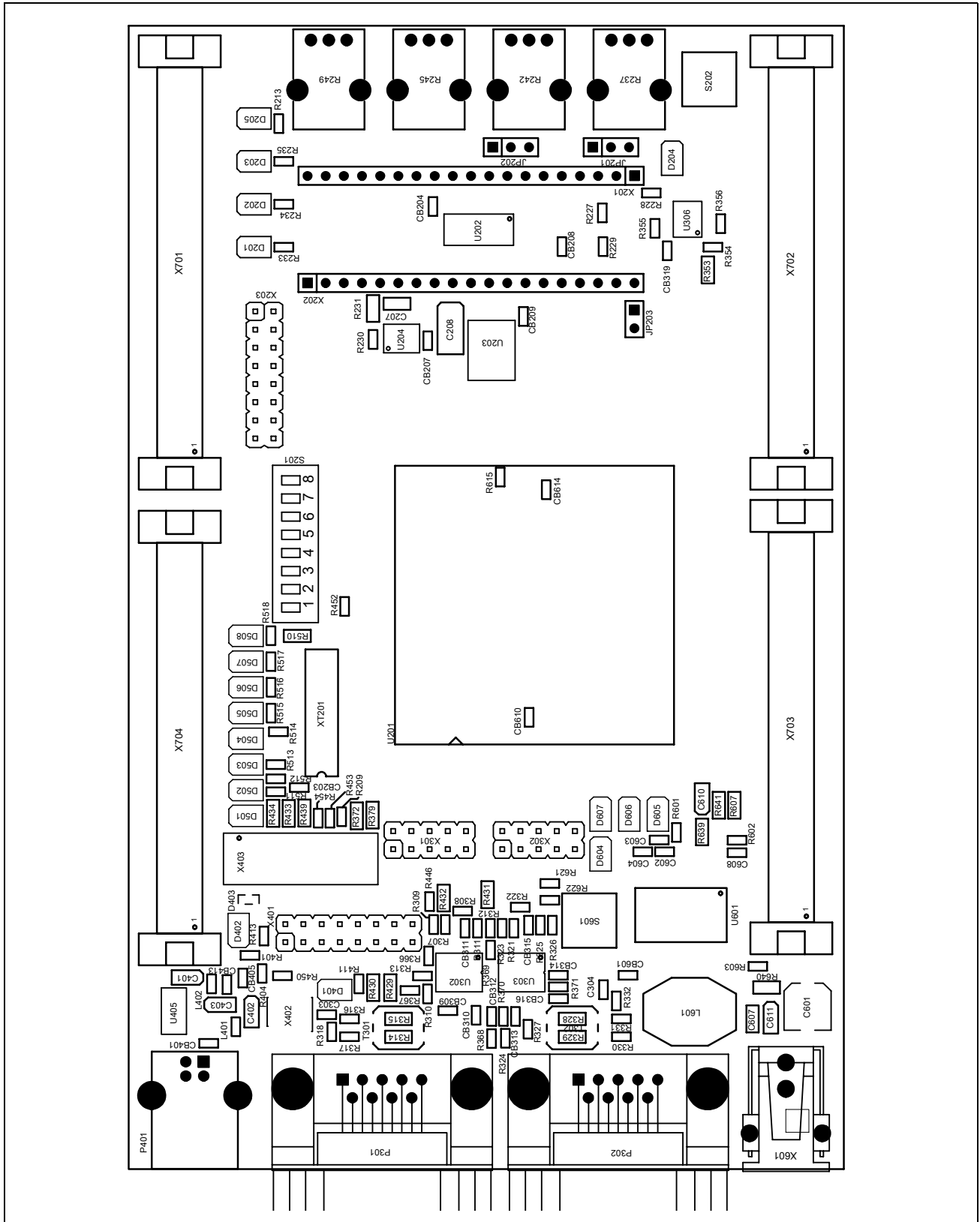


Figure 8-9 Component Plot Top Layer

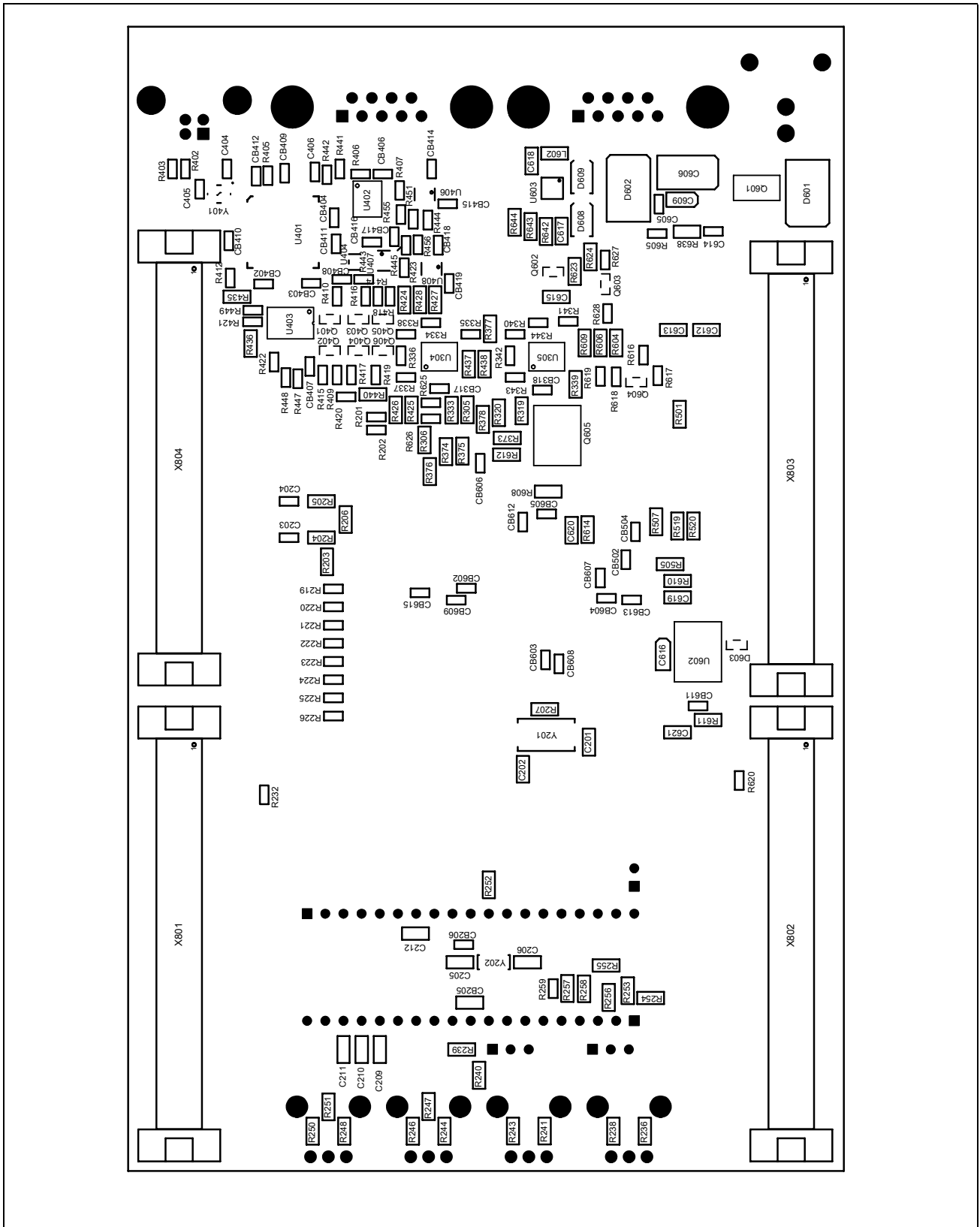


Figure 8-10 Component Plot Bottom Layer

8.3 Layout with Dimensioning

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

Note: these are the pictures from the TriBoard TC1798. Connectors X801...X804 are on the same place.

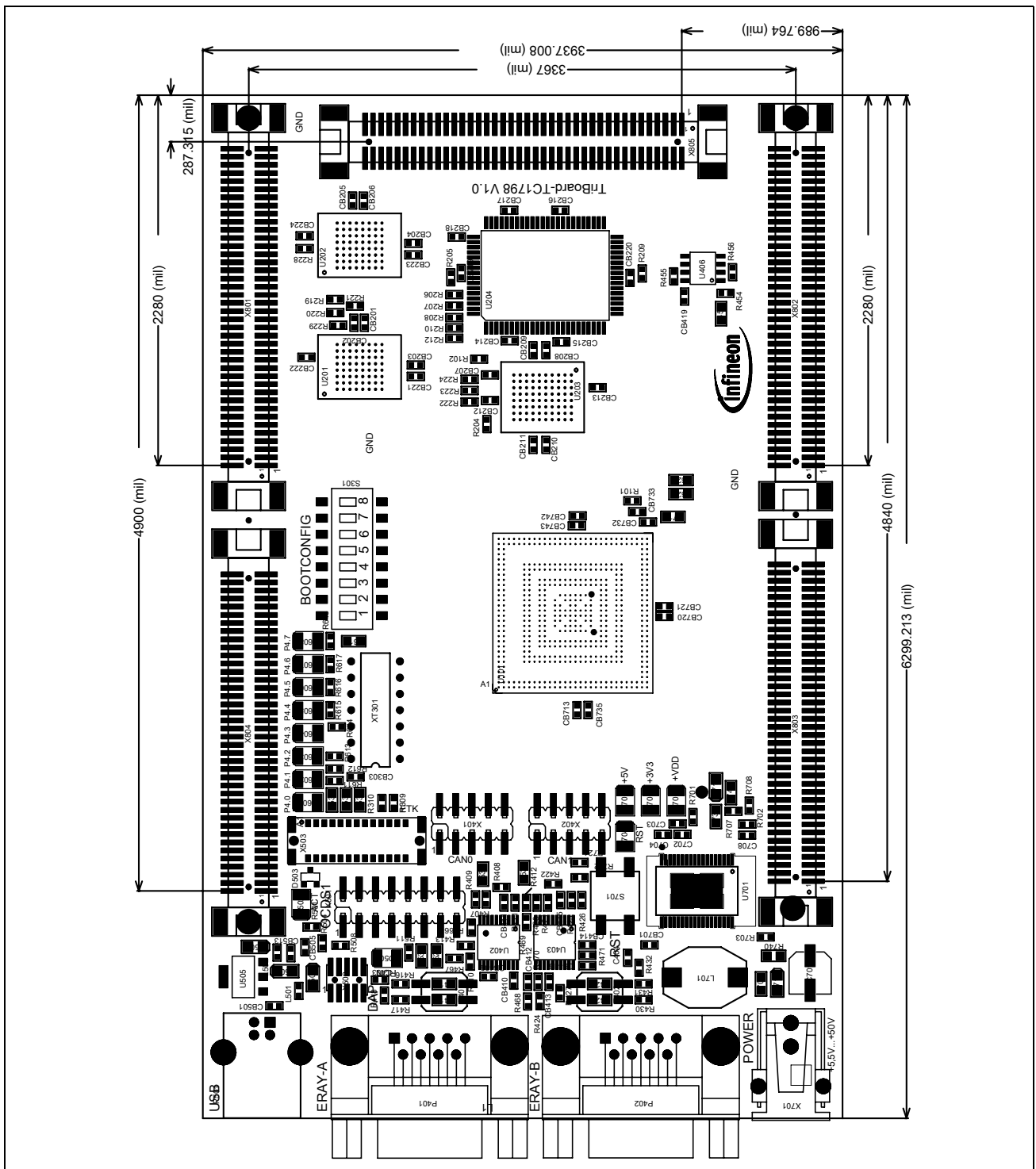


Figure 8-11 Dimensioning (mil)

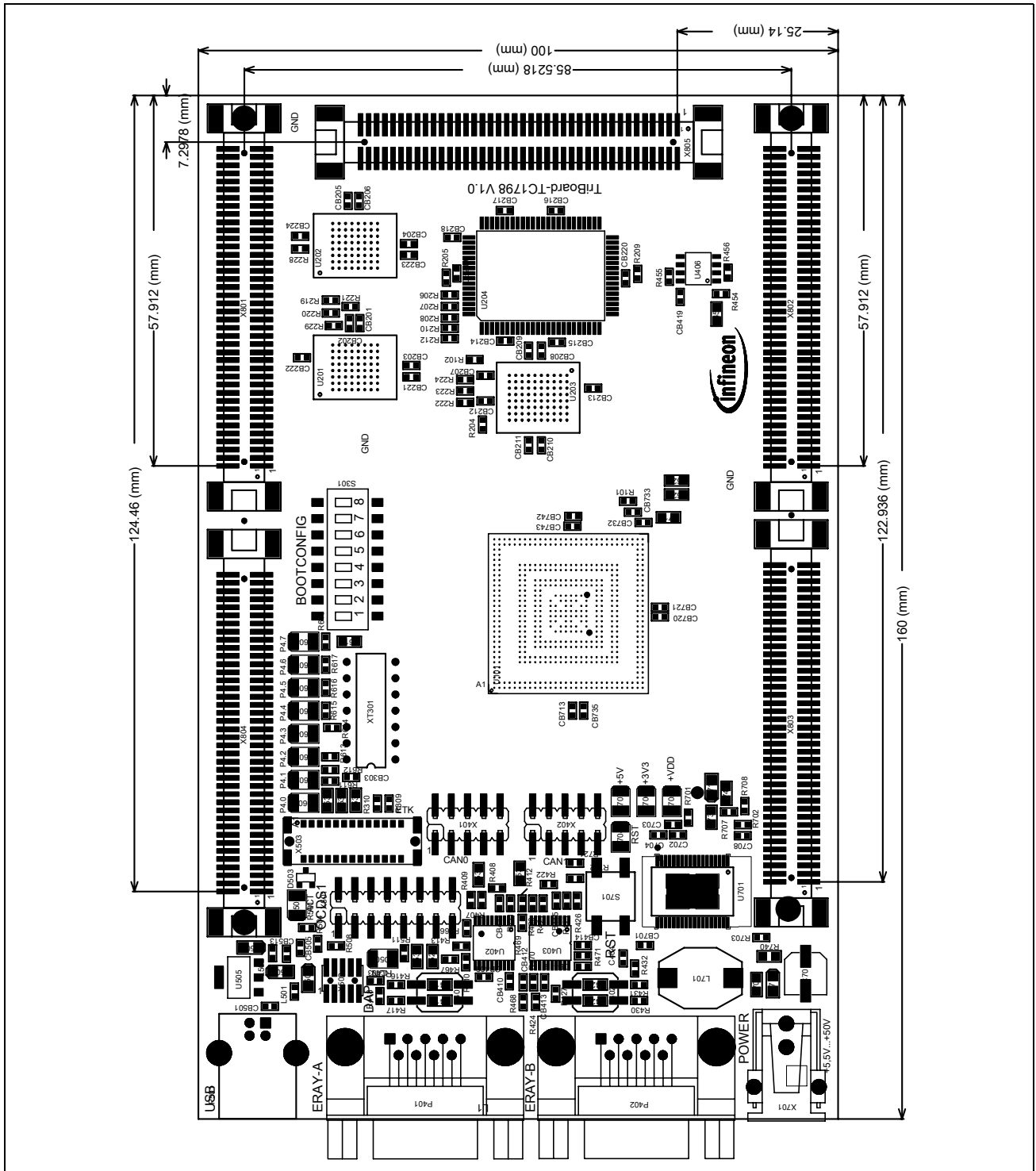


Figure 8-12 Dimensioning (mm)

Keyword Index

A

ACTIV LED 3-2
Assembly Options 4-3

C

CAN connector pinout 7-5
Clock 3-1
Clock Signals 6-2
Connector for TC1728 7-2
Connector Pin Assignment 7-1
CPU clock 3-1
Crystal oscillator 3-1

D

DAP 3-4
DAP connector pinout 7-5
Debug Signals 6-2
Debug System 3-4
Dimensioning 8-12

E

External clock 3-1

F

Flexray Pinout 7-4

G

General optional resistors 4-3

H

HW Boot Configuration 4-1
HWCFG 4-1

I

Interrupt Signals 6-1

L

Layout 8-10
LEDs 3-1
Location of general optional resistors on

Bottom Side 4-4

Location of general optional resistors on
Top Side 4-4

Location of peripheral resistors on Bottom
Side 4-6

Location of peripheral resistors on Top
Side 4-5

Location of resistors for safety device on
Bottom Side 4-7

M

manual reset 3-1
miniWiggler JDS 3-2
MultiCAN 3-3

O

OCDS connector pinout 7-5
OCDS1 3-4
oscillator circuit 3-1
Other peripherals 3-3

P

Peripheral Signals 6-2
Power connector pinout 7-4
Power Signals 6-1
power supply 3-1

R

reset 3-1
Reset Signals 6-1
Resistors for peripherals 4-5
Resistors for safety device 4-6
RUN LED 3-2

S

Safety device Signals 6-4
Safety option 3-3
Samtec 7-1
Schematic 8-1
Schematic and Layout 8-1
Serial Connection to PC 3-2

Serial EEPROM 3-3
Serial Eeprom 3-3
Signal Description 6-1
Software 5-1
status LED 3-4
Supply 3-1

T

Toggle LED's 3-4
TriBoard Software 5-1
TriBoard TC1728 V1.0 Placement 2-4
Type of Boot TC1728 4-1

U

USB Connector 3-2
USB connector pinout 7-4

www.infineon.com

Published by Infineon Technologies AG