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32-Bit

Microcontroller

TriBoard TC176X/TC116X/TC1782/ TC1387

Hardware: TriBoard-LQFP176 V2.1
Hardware Manual

User's Manual

V 2.1 2009-06

Microcontrollers

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Page	Subjects (major changes since last revision)
–	change to actual manual template
–	add support for 1,3V VDD incl. updated schematic

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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 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 TC176X / TC116X / TC1782 / TC1387 please refer to the User Manual of the corresponding device.

2 TriBoard Features

The TriBoard TC176X/TC116X/TC1782/TC1387 is soldered with a device of the TC176X or TC116X or TC1782 or TC1387. This devices fits into all members of this product family so that there are no special TriBoards necessary.

2.1 Summary of Features

- Infineon's TC176X, TC116X, TC1782 or TC1387 Controller in LQFP176 Package
- FlexRay Transceivers (optional if not with TC1767 or TC1782 or TC1387)
- Safety device (optional if not with TC1387)
- High Speed CAN Transceivers
- USB to UART bridge
- Crystal 20MHz (default), Oscillator or External Clock
- USB miniWiggler 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 TC176X / TC116X / TC1782 / TC1387 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 (only TC1767, TC1782, TC1387)
- 2 x 10pin (2x5) Header for CAN High Speed Transceiver (CAN0 and CAN1)
- 2 x SUB-D9 Plug connector for FlexRay (optional if not with TC1767, TC1782, TC1387)
- 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 G
- Three LEDs to validate power supply (5Volt / 3,3 Volt / VCORE)
- LED indicating /HDRST (ESR0) active state
- LED indicating activ miniWiggler
- LED switched via DAS software
- Infineon's FlexRay Communication Controller SAK-CIC310 (optional if not with TC1767, TC1782, TC1387)
- 2x FlexRay Transceiver AS8221(AMS) or TJA1080 (NXP) (optional if not with TC1767, TC1782, TC1387)
- 2 x Infineon's High Speed CAN-Transceiver TLE 6250 GV33
- Infineon's Safety Device SAK-CIC61508(optional if not with TC1387)

- USB to UART bridge FT2232D (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

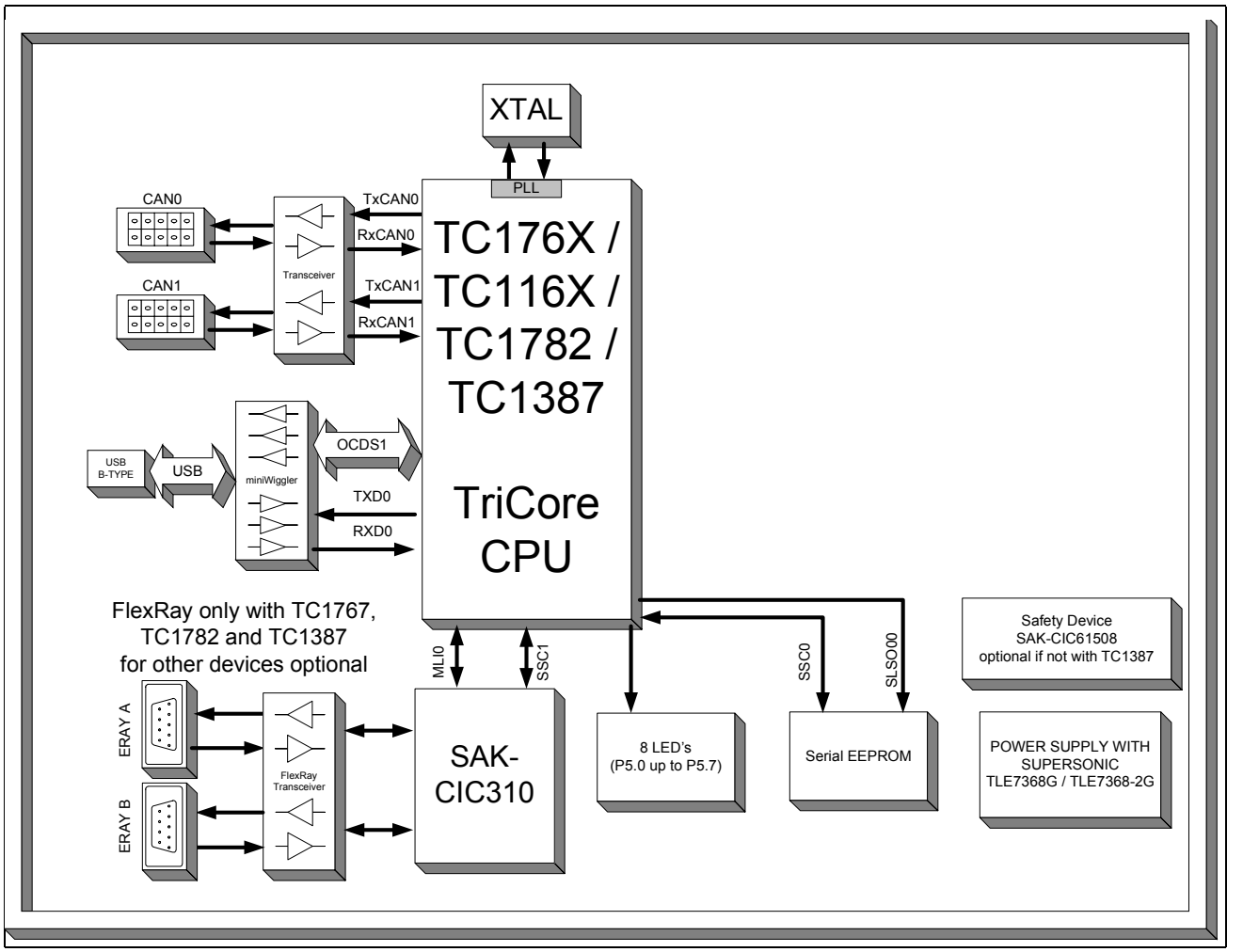

Figure 2-1 TriBoard Block Schematic

2.3 Placement

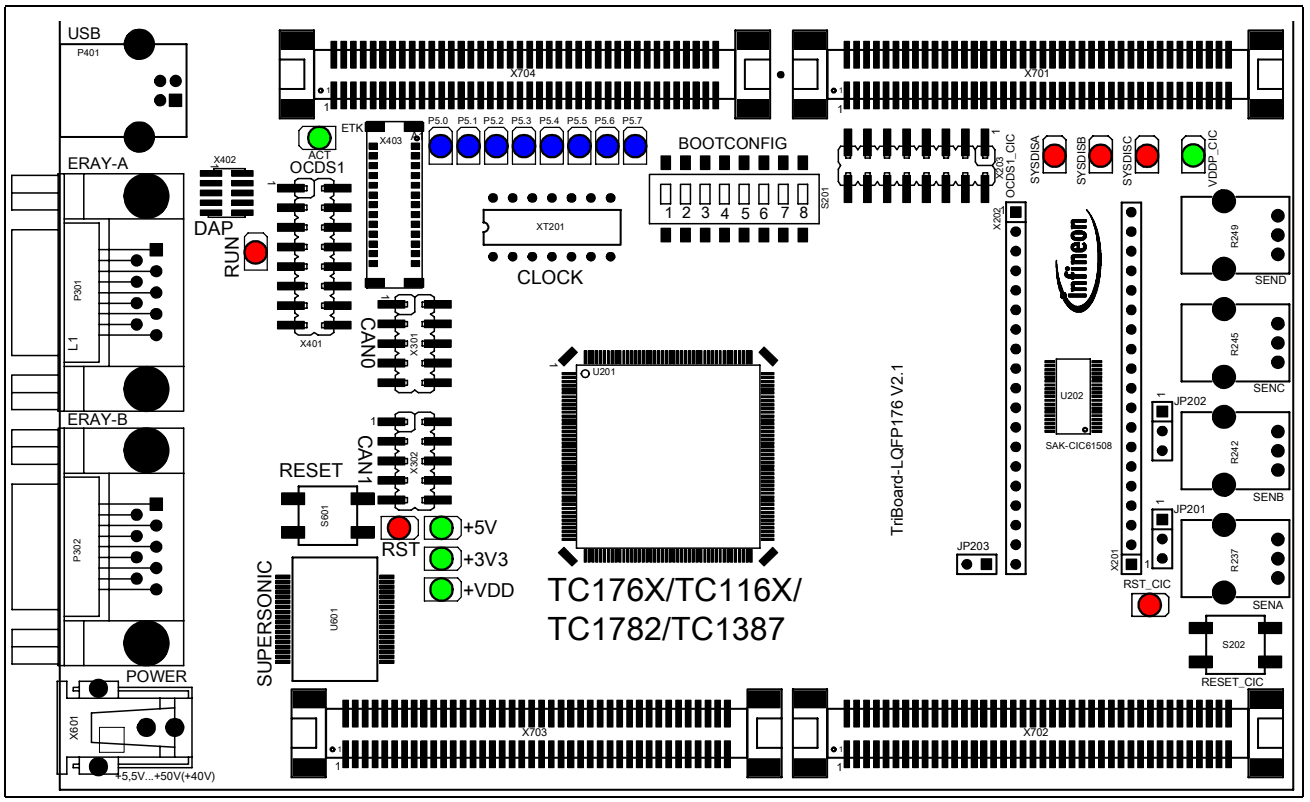

Figure 2-2 TriBoard LQFP176 V2.1 Placement

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, +VDD 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 (always with TC1387).

+VDD is +1,3V for TC1782, for all other devices +1,5V. NOTE: on first TC1782 device +VDD is +1,2V.

Applying a stable supply voltage causes the power on reset after a short period. The four LED's (+5V, +3.3V, +VDD) indicate the status of the on board generated voltage (if the LEDs are assembled).

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) -> toogle LEDs connected to P5.0 ... P5.7
- D604 RST (red) -> RESET LED indicate the reset state of the board
- D505 +VDD (green) -> +VDD power supply indication (+1.3V/+1.5V)
- D606 +3V3 (green) -> +3,3V power supply indication
- D607 +5V (green) -> +5V power supply indication
- D402 ACT (green) -> on board MiniWiggler is ACTIV
- D401 RUN (red) -> 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 XT301. It's possible to apply a 14pol DIP oscillator package or an 8pol DIP oscillator package.

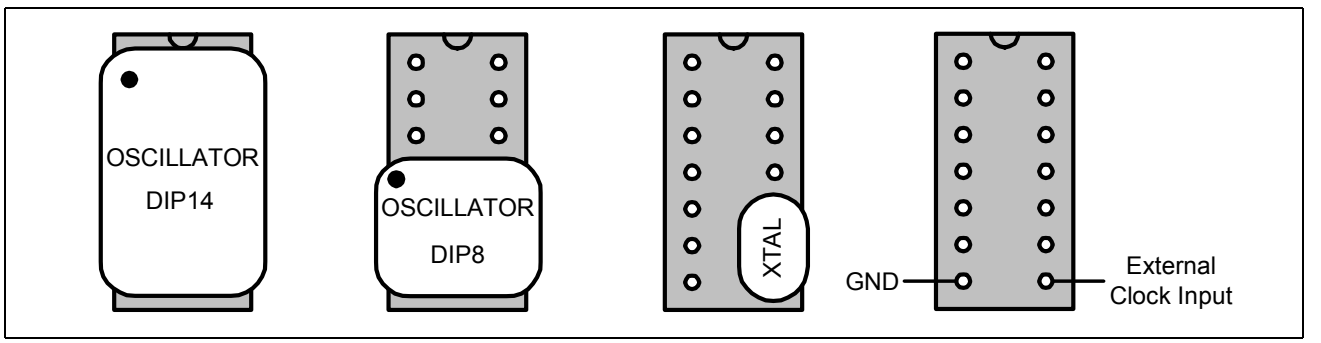

Figure 3-1 Clock socket usage (XT301)

3.4 USB Connector

The USB connector is used for connection to a PC. Via the USB it is possible to power the board, 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

MiniWiggler 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 JTAG over USB Chip. 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.

3.5 FlexRay / IFlex (optional if not with TC1767, TC1782 or TC1387)

The FlexRay devices are only assembled if the board is with TC1767, TC1782, TC1387 or with the FlexRay option.

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 to the FlexRay Communication Controller SAK-CIC310 (IFlex).

Normally the SAK-CIC310 is connected to MLI0 of the TriCore Controller but the IFlex can also be connected to SSC1.For using the IFlex with SSC see **Table 4-4**. As interrupts inputs of TC176X/TC116X are used P0.7, P0.11, P3.10 and P3.11 and in case of SSC1 connection you can also use P0.6.

For more information look in the user manual for TC176X/TC116X or SAK-CIC310 and the schematics **Figure 8-4**.

3.5.1 FlexRay as option

If the board comes without FlexRay (e.g. with TC1766) then you can add the FlexRay option by assembling the following parts:

- U301 with SAK-CIC310 (Infineon)
- U302 and U303 with AS8221 (AMS) or TJA1080 (NXP) (if with TJA1080 then resistors R366-R371 and capacitor CB312 and CB316 must be assembled with 0R and 100n, package 0603)
- Y301 with 20MHz crystal (5x3mm SMD, e.g. NDK NX5032GA)
- T301 and T302 with B82790-S513-N (Epcos)

3.6 Serial Eeprom

The SSC0 of the TC176X / TC116X / TC1782 / TC1387 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 TC176X / TC116X / TC1782 / TC1387 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 if not with TC1387)

The safety device is only assembled if the board is with TC1387 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 stimulare 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 5 pin 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 (see **"MiniWiggler" 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 JTAG over USB Chip and/or remove the USB connection to the PC.

3.11.2 DAP

If the board comes with a TC1767, TC1782 or TC1387 then the DAP connector (X402) is available. 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 is not activ (ACTIV LED is off) and a connected OCDS1 hardware is disconnected or tristated.

4 TriBoard Configuration

4.1 HW Boot Configuration TC1767, TC1782 and TC1387

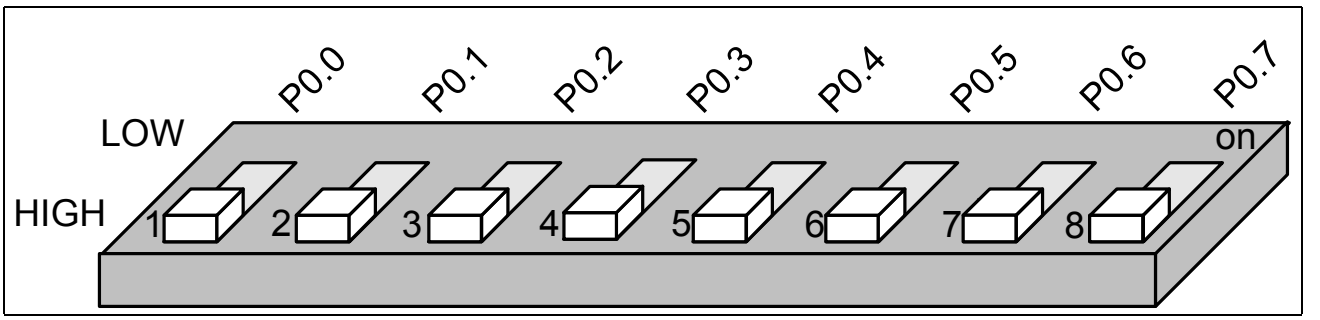

Figure 4-1 HW Configuration TC1767, TC1782, TC1387 DIP-Switch

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 TC1767, TC1782 and TC1387

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 TC1767, TC1782 and TC1387	1	2	3	4	5	6	7	8
11XXXXXX	Internal Start from Flash	X	X	X	X	X	X	OFF	OFF
010XXXX0	Bootstrap Loader Mode, Generic Bootloader at CAN pins	ON	X	X	X	X	ON	OFF	ON
10101XX0	Bootstrap Loader Mode, ASC Bootloader	ON	X	X	OFF	ON	OFF	ON	OFF
10100XX0	Alternate Boot Mode, ASC Bootloader on fail	ON	X	X	ON	ON	OFF	ON	OFF

Table 4-1 User Startup Modes for TC1767, TC1782 and TC1387

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 TC1767, TC1782 and TC1387	1	2	3	4	5	6	7	8
1011XXXX	Alternate Boot Mode, Generic Bootloader at CAN pins on fail	X	X	X	X	OFF	OFF	ON	OFF
all others	reserved; don't use this combination								

4.2 HW Boot Configuration all other TC176X / TC116X

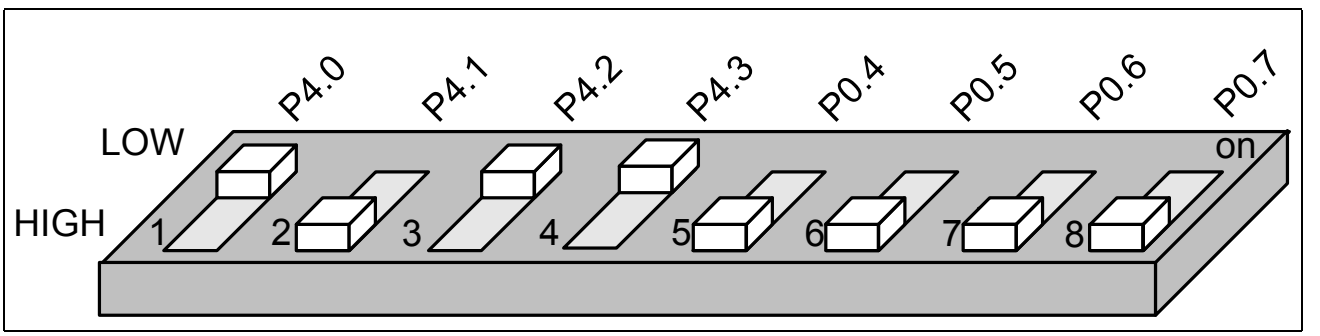

Figure 4-2 HW Configuration for all other TC176X / TC116X DIP-Switch

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 4-2**).

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

Table 4-2 HW Boot Configuration for all other TC176X / TC116X

Note: The shadowed line indicates the default setting.

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

Note: 1 to 8 are the Dip Switch number

P4[3...0]	P0[7...4]	Type of Boot TC176X / TC116X	1	2	3	4	5	6	7	8
0000	XXXX	Serial boot from ASC to PMI scratchpad via ASC pins, run loaded program	ON	ON	ON	ON	X	X	X	X
0001	XXXX	Serial boot from CAN to PMI scratchpad, run loaded program	OFF	ON	ON	ON	X	X	X	X

Table 4-2 HW Boot Configuration for all other TC176X / TC116X

Note: The shadowed line indicates the default setting.

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

Note: 1 to 8 are the Dip Switch number

P4[3...0]	P0[7...4]	Type of Boot TC176X / TC116X	1	2	3	4	5	6	7	8
0010	XXXX	Start from internal flash	ON	OFF	ON	ON	X	X	X	X
0011	XXXX	Alternate Boot Mode, Generic Boot Loader on fail depends on P0[2...0]	OFF	OFF	ON	ON	X	X	X	X
1000	XXXX	Boot from emulation memory (ED only)	ON	ON	ON	OFF	X	X	X	X
1111	XXXX	Serial boot from ASC to PMI scratchpad via CAN pins, run loaded program	OFF	OFF	OFF	OFF	X	X	X	X
all others	all others	reserved; don't use this combination								

4.3 Assembly Options

Table 4-3 General optional resistors

Component	Description
R205	XTAL Rserial (default: assembled)
R206	XTAL Rparallel (default: not assembled)
R423	Connect /BRKOUT with MiniWiggler (default: not assembled)
R424	Connect /BRKOUT with OCDS1 connector (default: not assembled)
R427	Connect /BRKIN with USR1 of MiniWiggler (default: not assembled
R429	Connect /BRKIN with USR1 of DAP (default: not assembled
R425	Connect /BRKIN with OCDS1 connector(default: not assembled)
R428	Connect /TESTMODE with USR1 of MiniWiggler (default: not assembled
R430	Connect /TESTMODE with USR1 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 P1.2 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

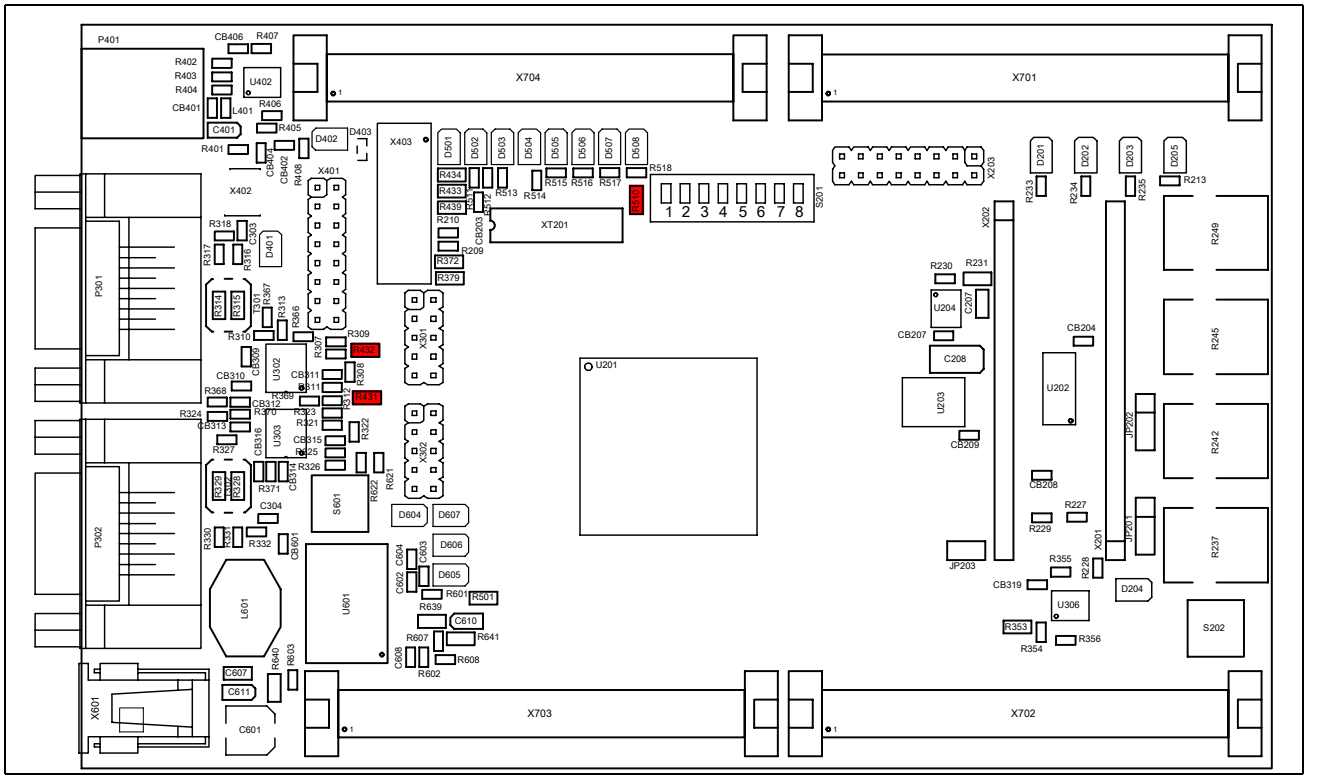

Figure 4-3 Location of general optional resistors on Top Side

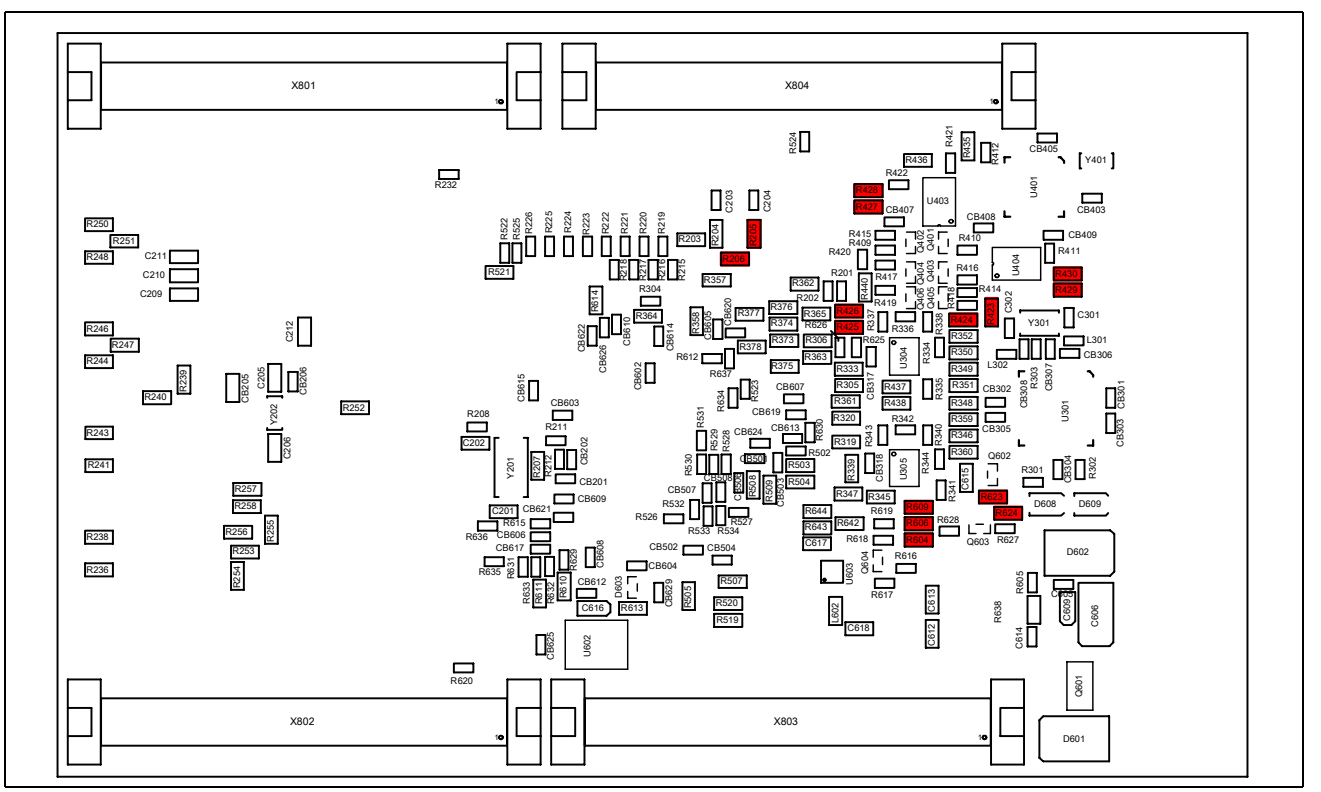

Figure 4-4 Location of general optional resistors on Bottom Side

Table 4-4 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)
R345	Connect P2.3 (MLI0) with IFlex (default: assembled)
R346	Connect P2.0 (MLI0) with IFlex (default: assembled)
R347	Connect P2.2 (MLI0) with IFlex (default: assembled)
R348	Connect P2.1 (MLI0) with IFlex (default: assembled)
R349	Connect P2.7 (MLI0) with IFlex (default: assembled)
R350	Connect P2.4 (MLI0) with IFlex (default: assembled)
R351	Connect P2.6 (MLI0) with IFlex (default: assembled)
R352	Connect P2.5 (MLI0) with IFlex (default: assembled)
R357	Connect P2.12 (SSC1) with IFlex (default: not assembled)
R358	Connect P2.10 (SSC1) with IFlex (default: not assembled)
R359	Connect P3.6 (SSC1) with IFlex (default: not assembled)
R361	Connect P2.11 (SSC1) with IFlex (default: not assembled)
R360	Connect P0.6 (REQ2) with IFlex (default: not 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)
R508	Connect VFAREF with VDDMF (default: assembled if not with TC1387)
R509	Connect VFAGND with VSSMF (default: assembled if not with TC1387)
R519	Connect +5V with VDDM (default: assembled on TC1767, TC1782 and TC1387)
R520	Connect +3,3V with VDDM (default: assembled if not TC1767, TC1782 or TC1387)

Note: All resistors are red marked in the following figures

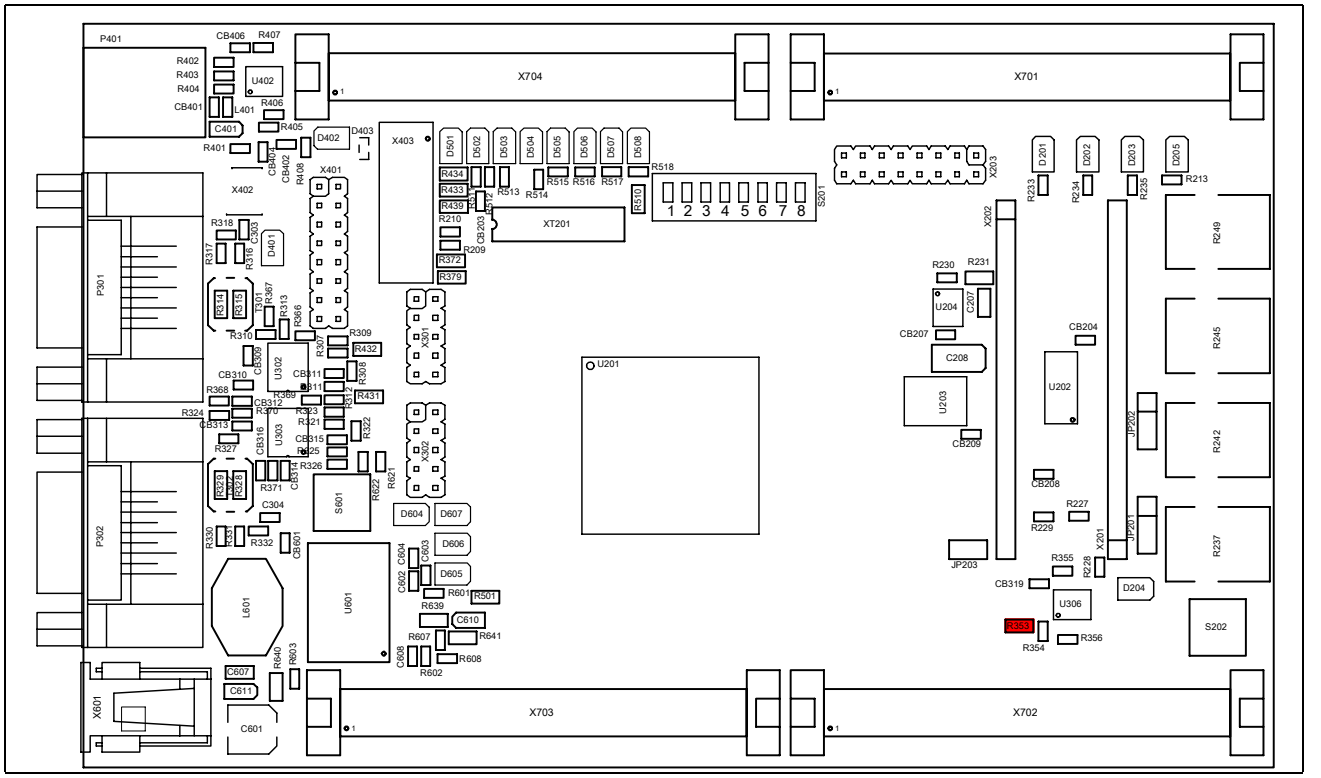

Figure 4-5 Location of peripheral resistors on Top Side

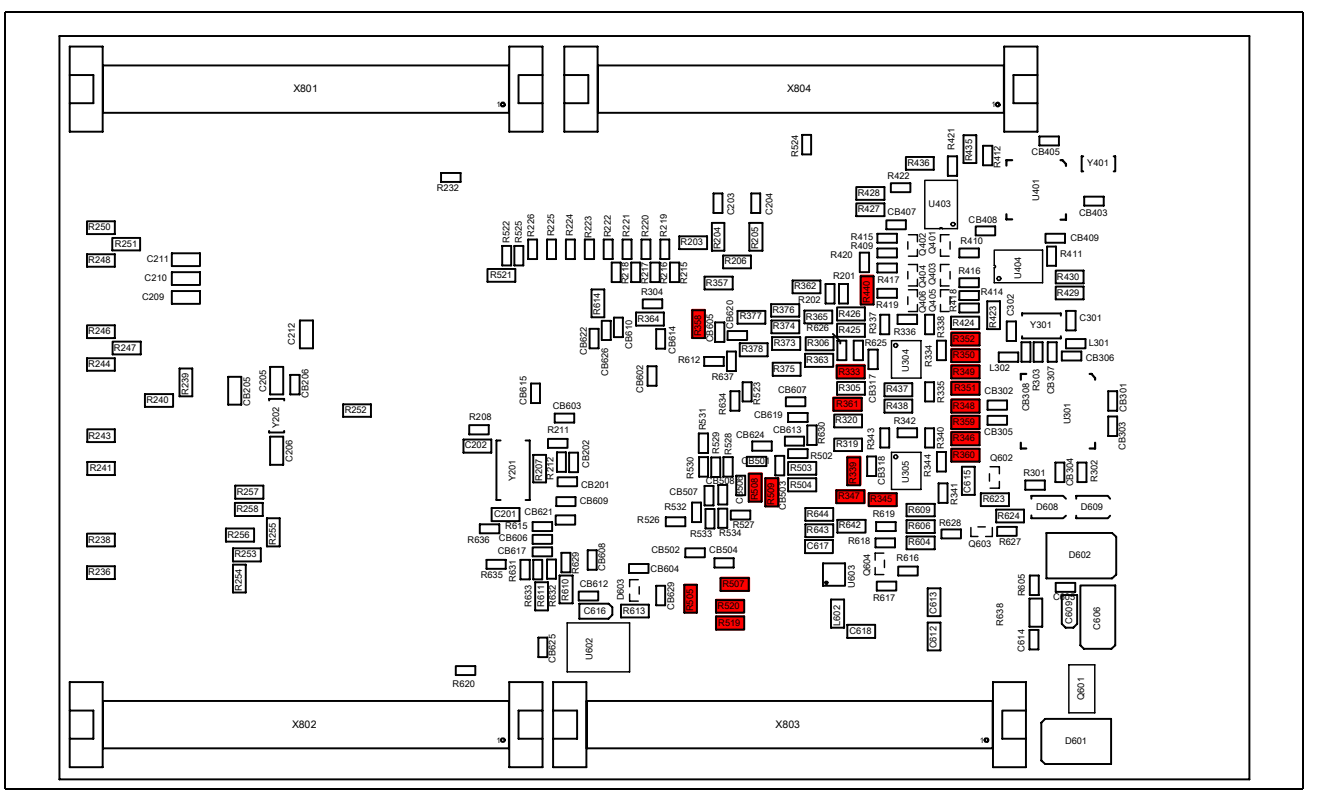

Figure 4-6 Location of peripheral resistors on Bottom Side

Table 4-5 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: not assembled)
R258	Connect P2.10 (SSC1) to MRST of safety device (default: not assembled)

Note: All resistors are red marked in the following figures

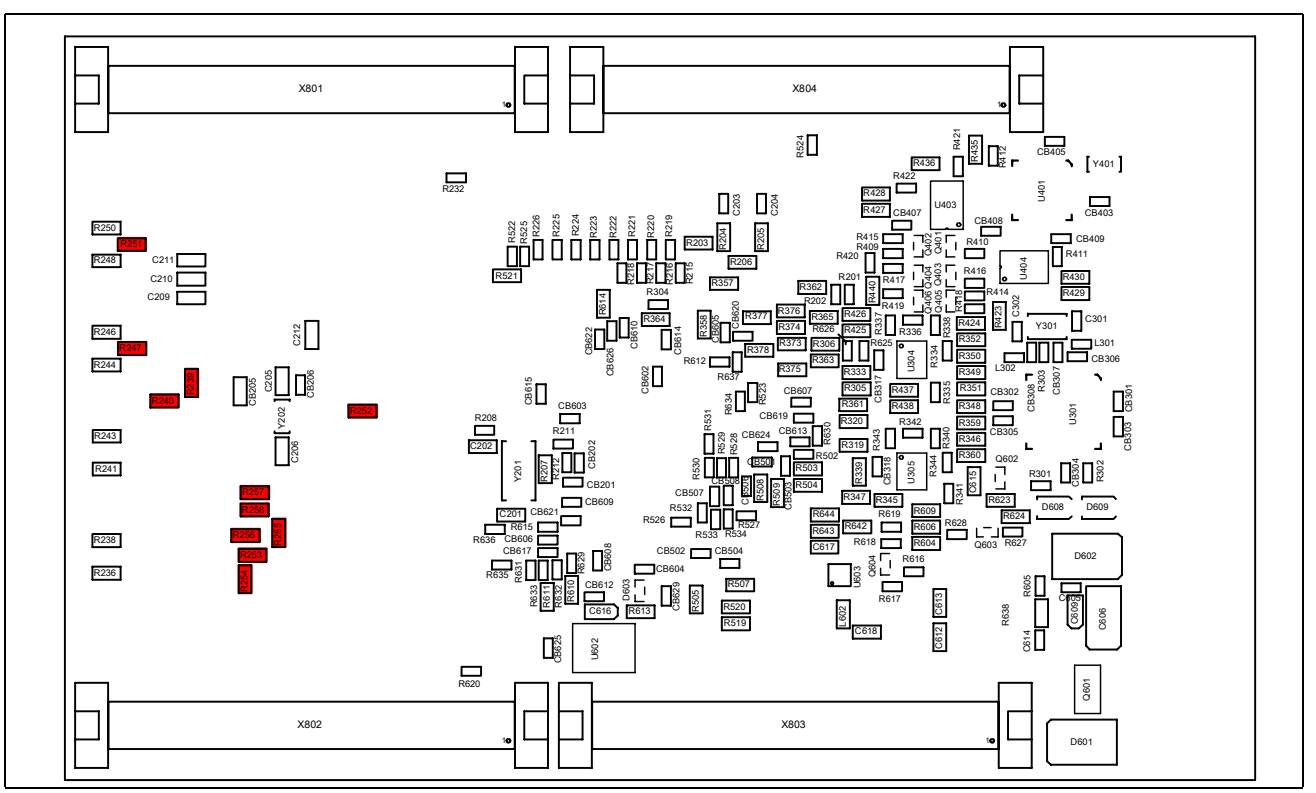

Figure 4-7 Location of resistors for safety device on Bottom Side

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 or Windows Vista.

5.2 Software Overview

The CD does not contain any tool. For the availablity 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 seperat 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 from TC176X/TC116X/TC1782/TC1387 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 or 1,5V)
VDDP	Port Supply Voltage (3,3V)
VDDFL3	Flash Supply Voltage (3,3V)
VDDESB	Emulation Stand-by SRAM Supply Voltage (1,3V or 1,5V)
VDDOSC	Main Oscillator Supply Voltage (1,3V or 1,5V)
VDDOSC3	Main Oscillator Supply Voltage (3,3V)
VSSOSC	Main Oscillator Ground
VSSM	ADC Analog Part Ground
VDDM	ADC Analog Part Supply Voltage (5V for TC1767, TC1782 and TC1387 other 3,3V)
VSSMF	FADC Analog Part Ground
VDDMF	FADC Analog Part Supply Voltage (3,3V)
VDDAF	FADC Analog Part Logic Supply Voltage (1,3V or 1,5V)
VAGND0	ADC0 Reference Ground
VAREF0	ADC0 Reference Voltage (VDDM)
VFAGND	FADC Reference Ground
VFAREF	FADC Reference Voltage (VDDMF)
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
/HDRST (ESR0)	Hardware Reset

Table 6-3 Interrupt Signals

Short Name	Description
/NMI (ESR1)	Non Maskable Interrupt
/RESET_CIC	Reset safety device

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 Outpu safety device
MBC_CIC	Monitor & Bootstrap loader Control line safety device

Table 6-6 Peripheral Signals

Short Name	Description
P3.1	Transmit Data ASC0
P3.0	Receive Data ASC0
P3.8	Transmit Data ASC1
P3.9	Receive Data ASC1

Table 6-6 Peripheral Signals

P3.2	Clock Line SSC0
P3.3	Master Receive / Slave Transmit SSC0
P3.4	Master Transmit / Slave Receive SSC0
P3.5	Slave Select Output 0 (SSC0)
P3.13	CAN Transmitter Output 0
P3.12	CAN Receiver Input 0
P3.15	CAN Transmitter Output 1
P3.14	CAN Receiver Input 1
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
P2.11	Clock Line SSC0
P2.10	Master Receive / Slave Transmit SSC0
P2.12	Master Transmit / Slave Receive SSC0
P3.6	Slave Select Output 1 (SSC1)
P0 [0...7]	General Purpose I/O Port 0 (HWCFG on TC1767, TC1782 and TC1387 else SWOPT)
P0 [8...15]	General Purpose I/O Port 0 (SWOPT if not TC1767, TC1782 or TC1387)
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 (HWCFG if not TC1767, TC1782 or TC1387)
P5[0...7]	General Purpose I/O Port 5 (used for LEDs)
P5[8...15]	General Purpose I/O Port 5
AN[0...35]	Analog Inputs

Table 6-6 Peripheral Signals

P6.1 / FCLP0A	MSC0 differential driver clock output positive A
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

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

Alternative there can be used the Board to Board System from Robinson Nugent:

http://www.robinsonnugent.com

Plug:

P50L-80P-AS-TGF

Socket:

P50L-80S-AS-TGF

Note: All connectors are pincompatible with the previous versions of TriBoard TC176X.

7.1 TC176X/TC116X 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	
	31	32		FCLN0 / P6.0	31	32	
	33	34		SOP0A / P6.3	33	34	
	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 TC176X/TC116X/TC1782/TC1387 - Pinout (Part I, Top View)

ADC (X803, X903)

VSSM	1	2	VSSM
VSSM	3	4	VSSM
AN0	5	6	AN16
AN1	7	8	AN17
AN2	9	10	AN18
AN3	11	12	AN19
AN4	13	14	AN20
AN5	15	16	AN21
AN6	17	18	AN22
AN7	19	20	AN23
AN8	21	22	AN24
AN9	23	24	AN25
AN10	25	26	AN26
AN11	27	28	AN27
AN12	29	30	AN28
AN13	31	32	AN29
AN14	33	34	AN30
AN15	35	36	AN31
VSSM	37	38	VSSMF
VDDM	39	40	VDDMF
VFAGND	41	42	VFAREF
VAGND0	43	44	VAGND0
VAREF0	45	46	
VSSM	47	48	VSSM
AN32	49	50	
AN33	51	52	
AN34	53	54	
AN35	55	56	
	57	58	
	59	60	
VSSM	61	62	VSSM
	63	64	
	65	66	
	67	68	
3V3	69	70	3V3
AD0EMUX0 / P1.12	71	72	
AD0EMUX1 / P1.13	73	74	
AD0EMUX2 / P1.14	75	76	
	77	78	REQ4 / P0.14
REQ5 / P0.15	79	80	

GPTA / MLI (X804,X904)

GND	1	2	GND
GND	3	4	GND
GPTA0 / P0.0	5	6	GPTA32 / P2.0
GPTA1 / P0.1	7	8	GPTA33 / P2.1
GPTA2 / P0.2	9	10	GPTA34 / P2.2
GPTA3 / P0.3	11	12	GPTA35 / P2.3
GPTA4 / P0.4	13	14	GPTA36 / P2.4
GPTA5 / P0.5	15	16	GPTA37 / P2.5
GPTA6 / P0.6	17	18	GPTA38 / P2.6
GPTA7 / P0.7	19	20	GPTA39 / P2.7
GPTA8 / P0.8	21	22	GPTA40 / P5.0
GPTA9 / P0.9	23	24	GPTA41 / P5.1
GPTA10 / P0.10	25	26	GPTA42 / P5.2
GPTA11 / P0.11	27	28	GPTA43 / P5.3
GPTA12 / P0.12	29	30	GPTA44 / P5.4
GPTA13 / P0.13	31	32	GPTA45 / P5.5
GPTA14 / P0.14	33	34	GPTA46 / P5.6
GPTA15 / P0.15	35	36	GPTA47 / P5.7
GPTA16 / P1.0	37	38	
GPTA17 / P1.1	39	40	
GPTA18 / P1.2	41	42	
GPTA19 / P1.3	43	44	
GPTA20 / P1.4	45	46	
GPTA21 / P1.5	47	48	
GPTA22 / P1.6	49	50	
GPTA23 / P1.7	51	52	
GPTA24 / P1.8	53	54	
GPTA25 / P1.9	55	56	
GPTA26 / P1.10	57	58	EMGSTOP / P1.4
GPTA27 / P1.11	59	60	
GPTA28 / P4.0	61	62	
GPTA29 / P4.1	63	64	
GPTA30 / P4.2	65	66	
GPTA31 / P4.3	67	68	
TCLK1 / P5.11	69	70	RDATA1 / P5.12
TREADY1 / P5.10	71	72	RVALID1 / P5.13
TVALID1 / P5.9	73	74	RREADY1/ P5.14
TDATA1 / P5.8	75	76	RCLK1 / P5.15
3V3	77	78	3V3
3V3	79	80	3V3

Figure 7-2 Connector for TC176X/TC116X/TC1782/TC1387 - Pinout (Part II, Top View)

7.2 Power connector pinout

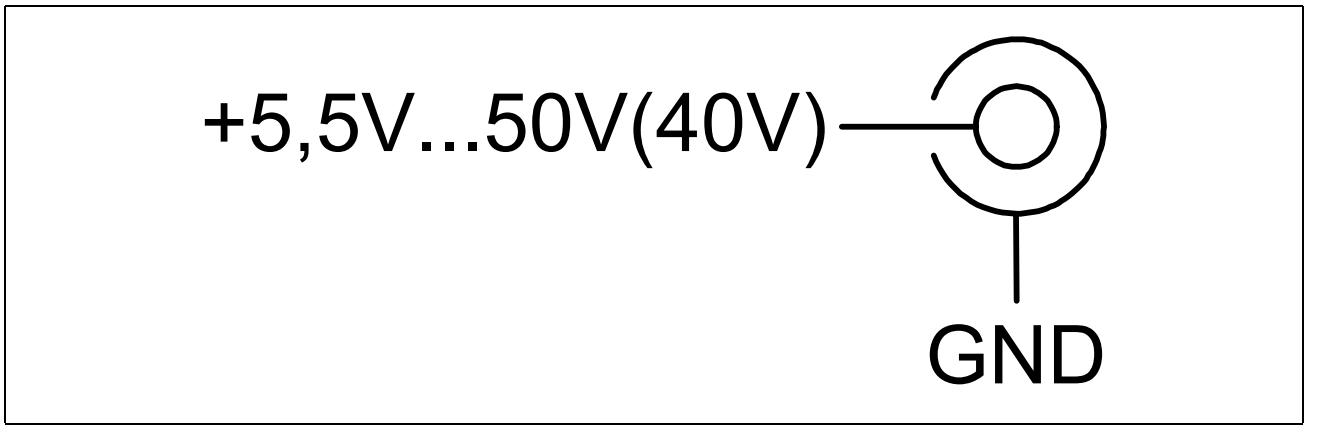

Figure 7-3 Power connector pinout

7.3 USB connector pinout

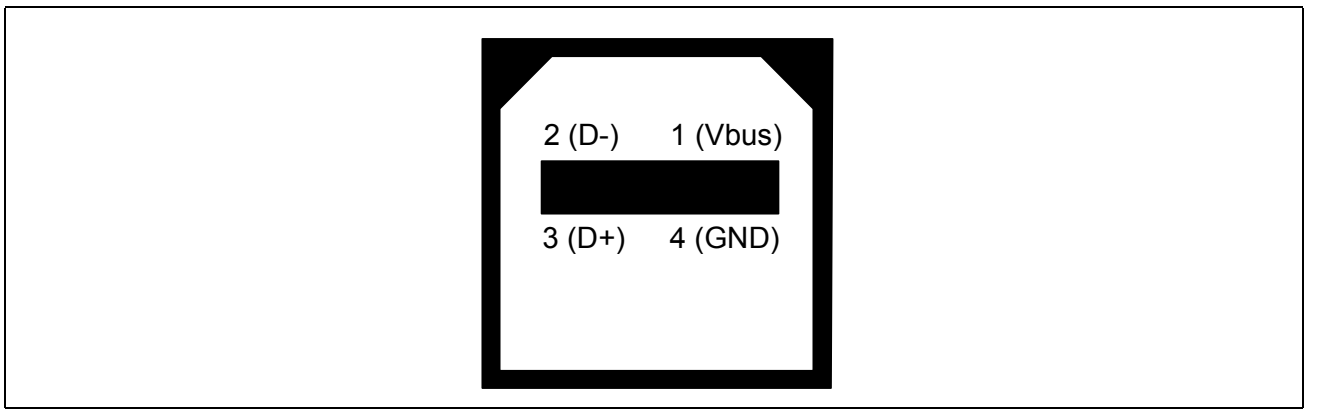

Figure 7-4 USB connector Pinout

7.4 Flexray Pinout

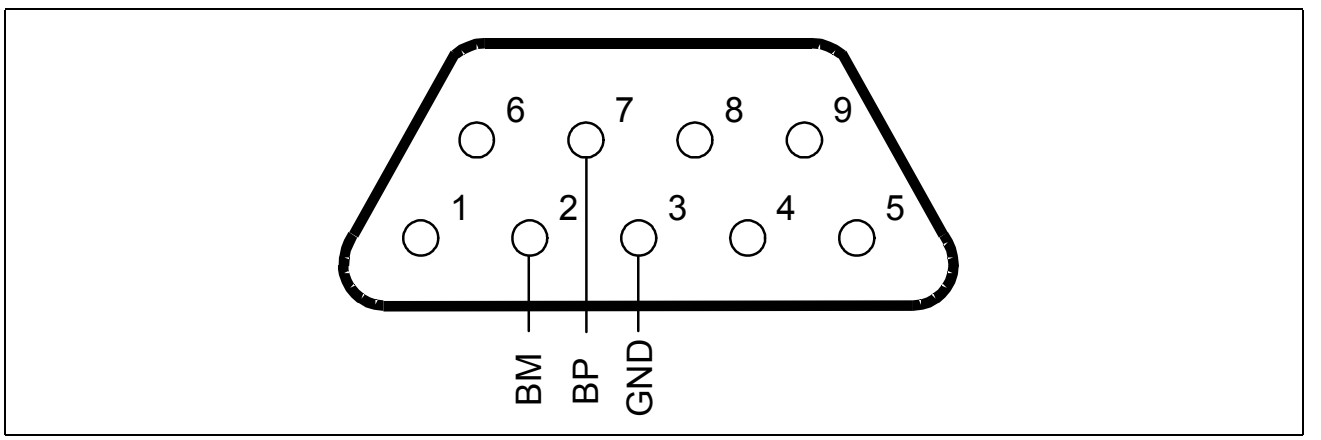

Figure 7-5 Flexray Pinout (SUBD-9 Plug)

7.5 CAN connector pinout

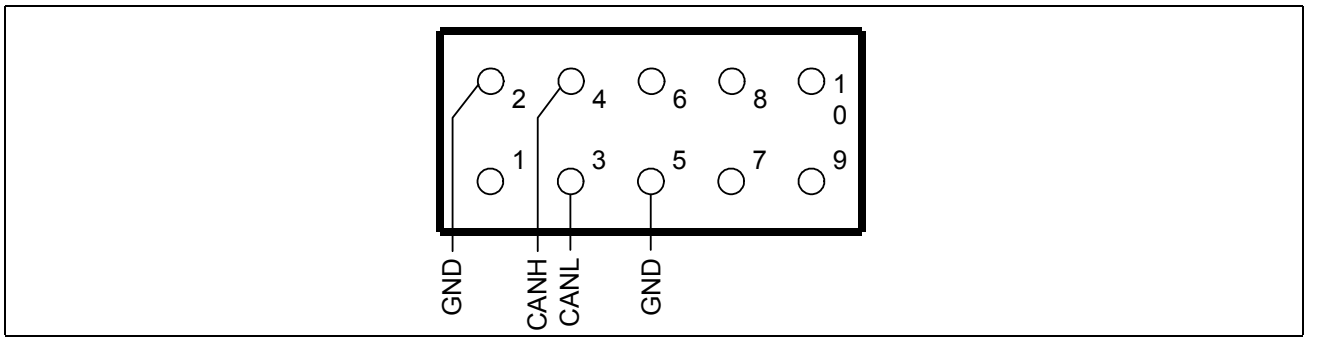

Figure 7-6 CAN connector pinout (IDC10)

7.6 OCDS connector pinout

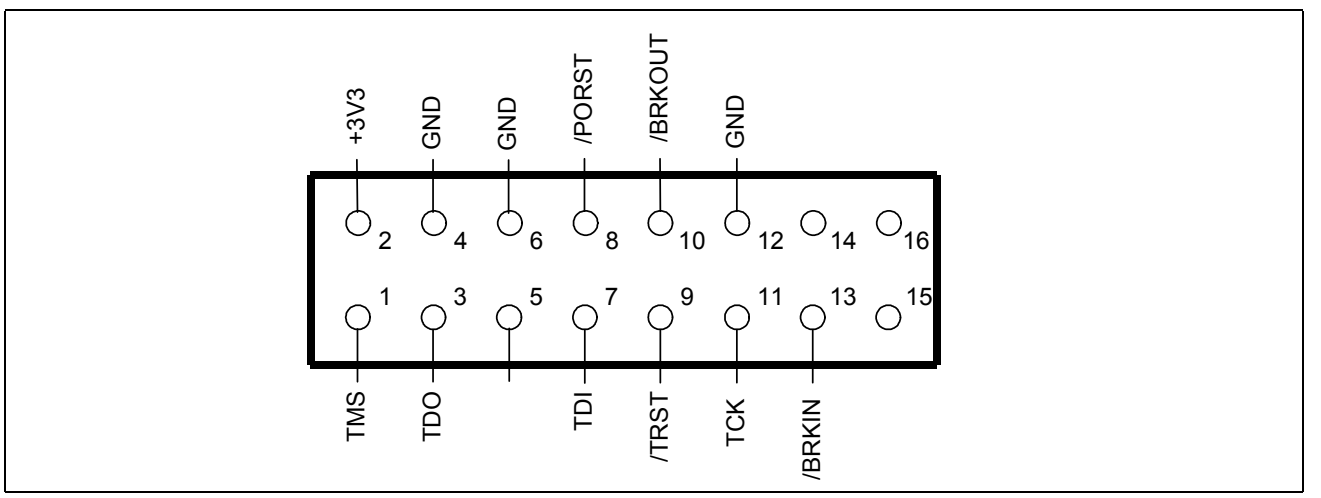

Figure 7-7 OCDS connector pinout (IDC16)

7.7 DAP connector pinout (only with TC1767, TC1782, TC1387)

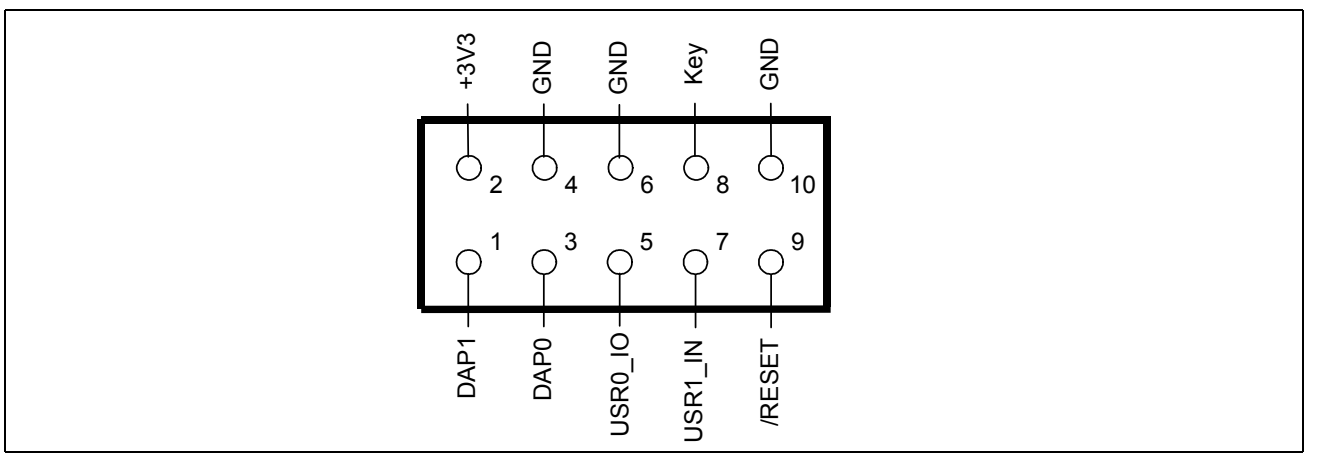

Figure 7-8 DAP connector pinout (FTSH10) - only with TC1767, TC1782, TC1387

8 Schematic and Layout

8.1 Schematic

8.1.1 New and changes on schematic version V2.1 to TriBoard TC176X/TC116X/TC1782/TC1387 V2.0

- add other power regulator for +1,3V core voltage on TC1782 (other devices not affected

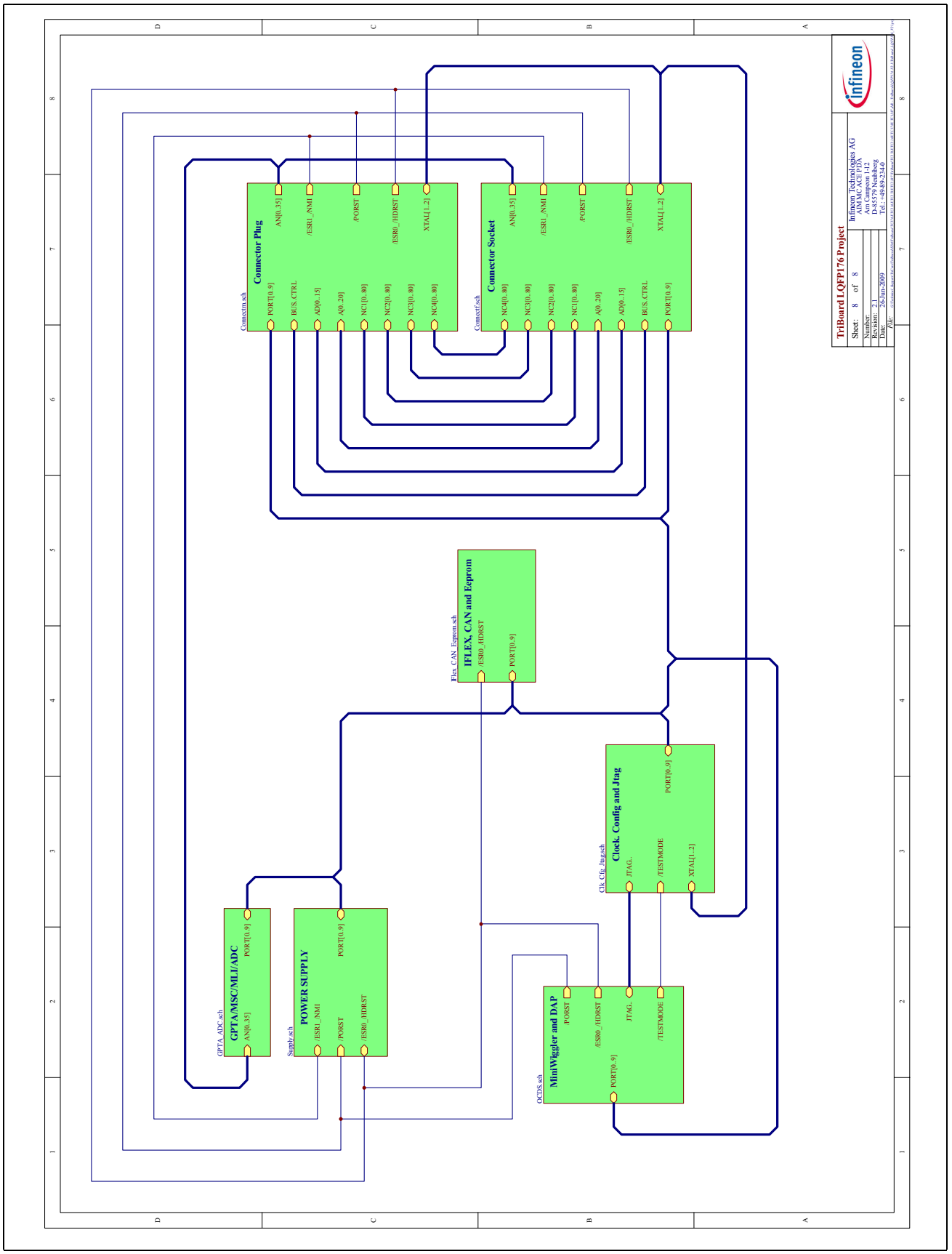

Figure 8-1 Schematic - Project

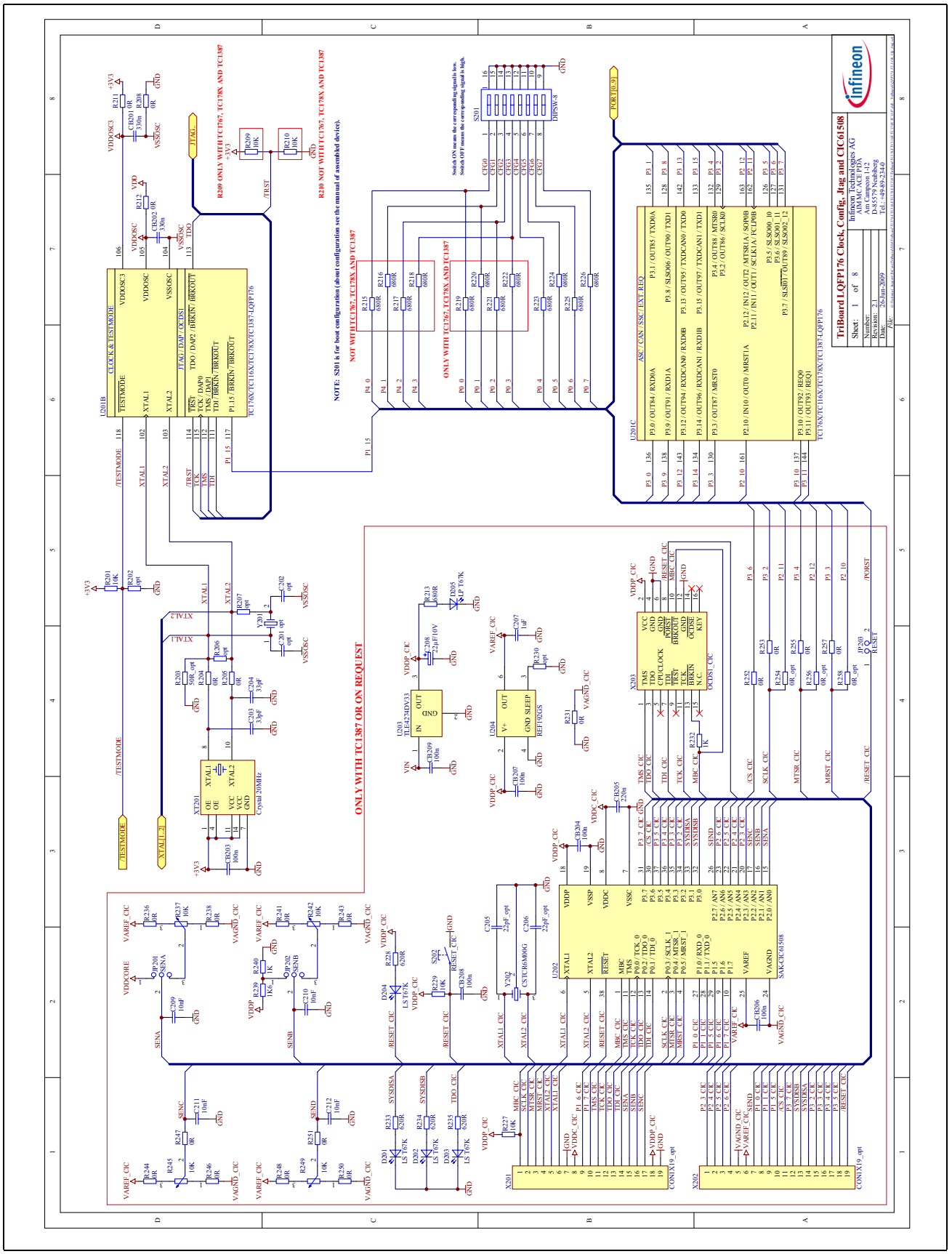

Figure 8-2 Schematic - Config, Clock and CIC61508

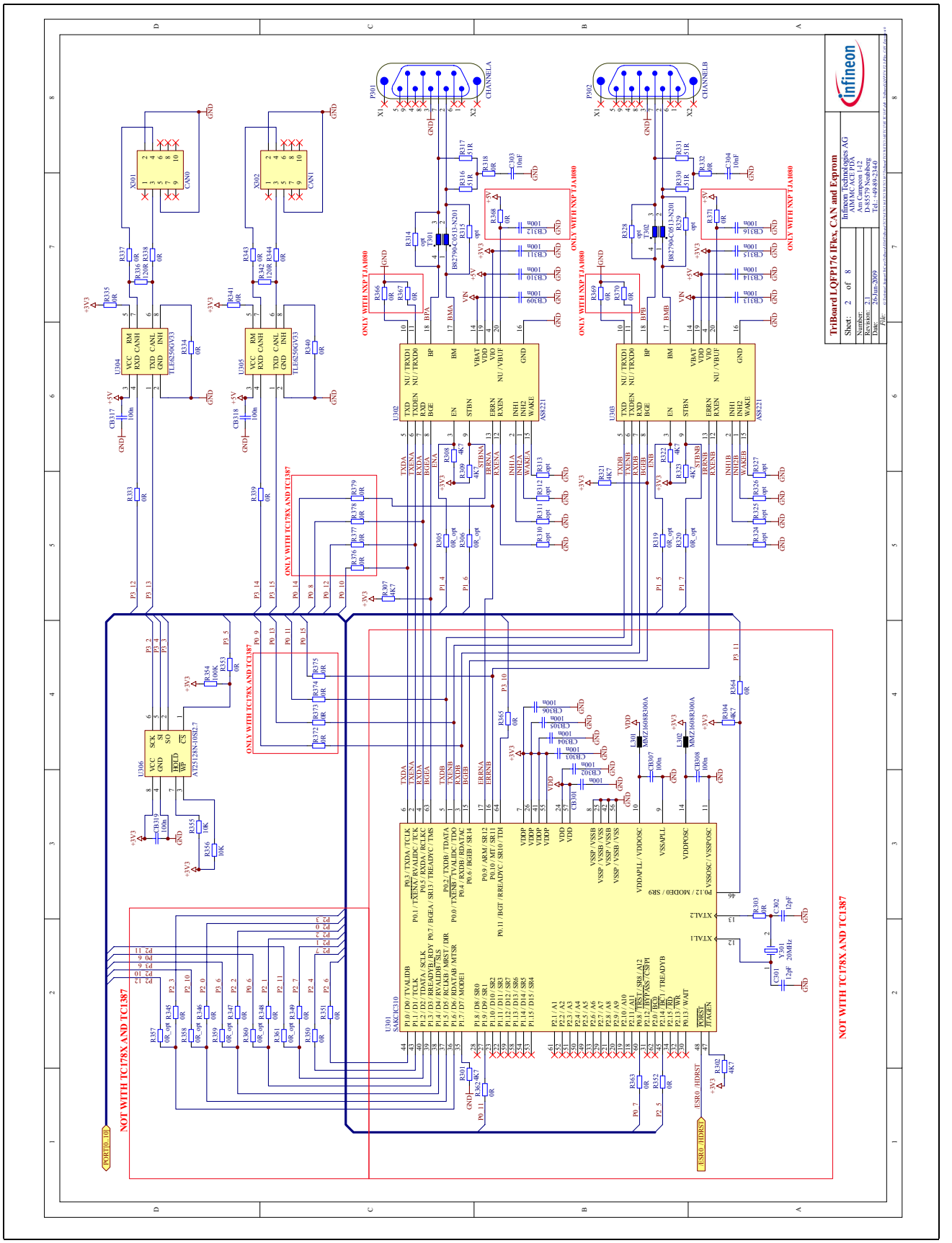

Figure 8-3 Schematic - IFlex, CAN and Eeprom

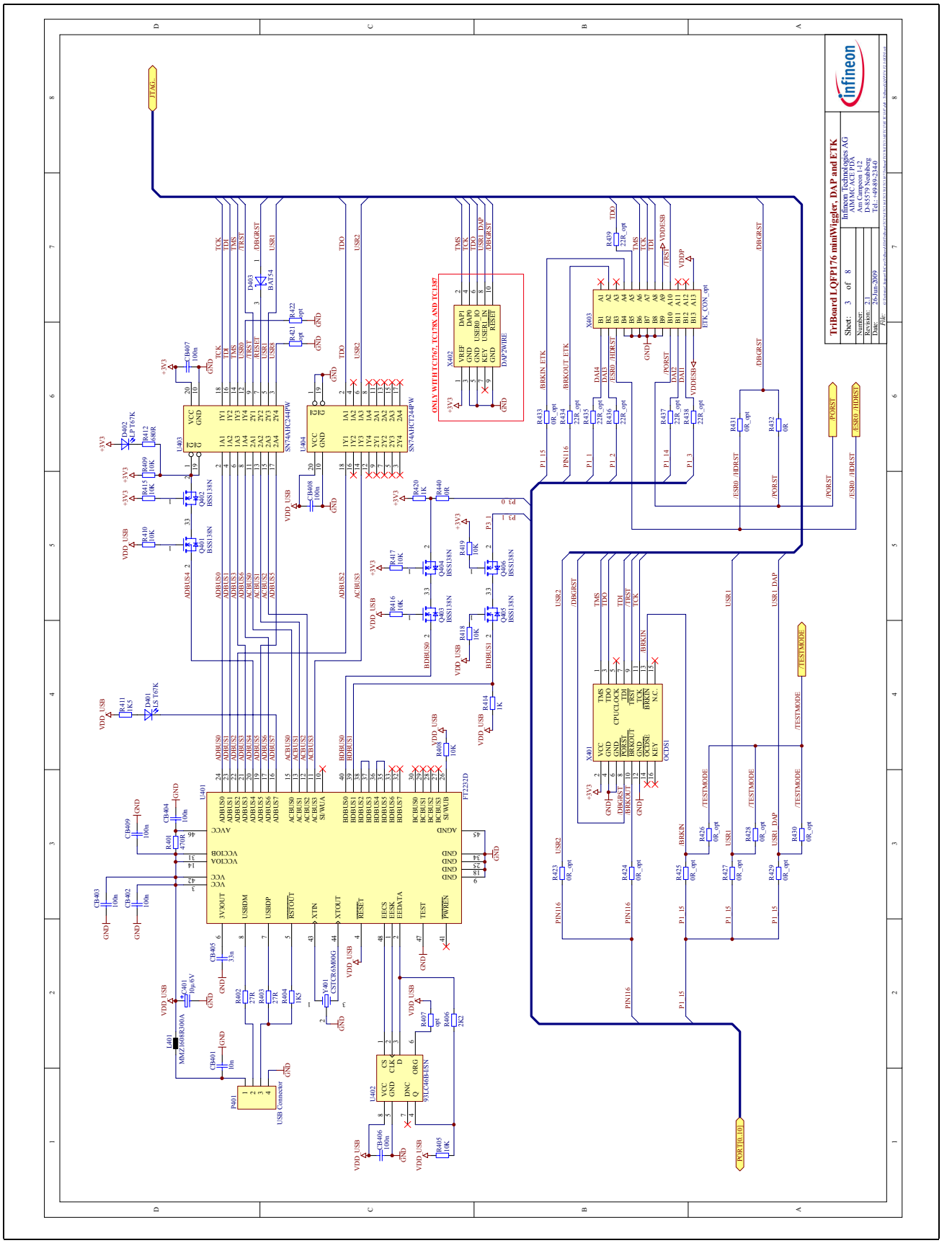

Figure 8-4 Schematic - MiniWiggler, DAP and ETK

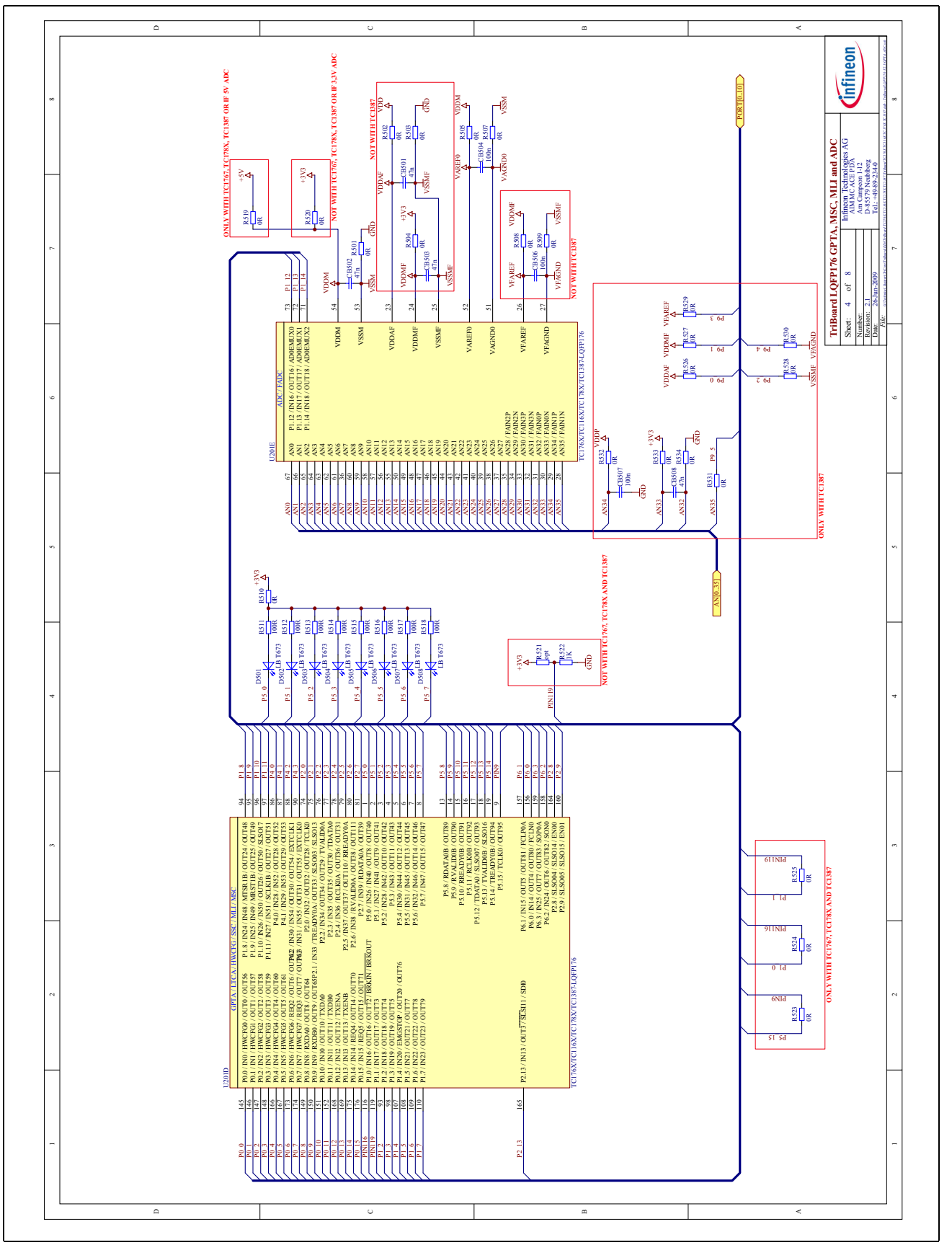

Figure 8-5 Schematic - GPTA, MSC, MLI and ADC

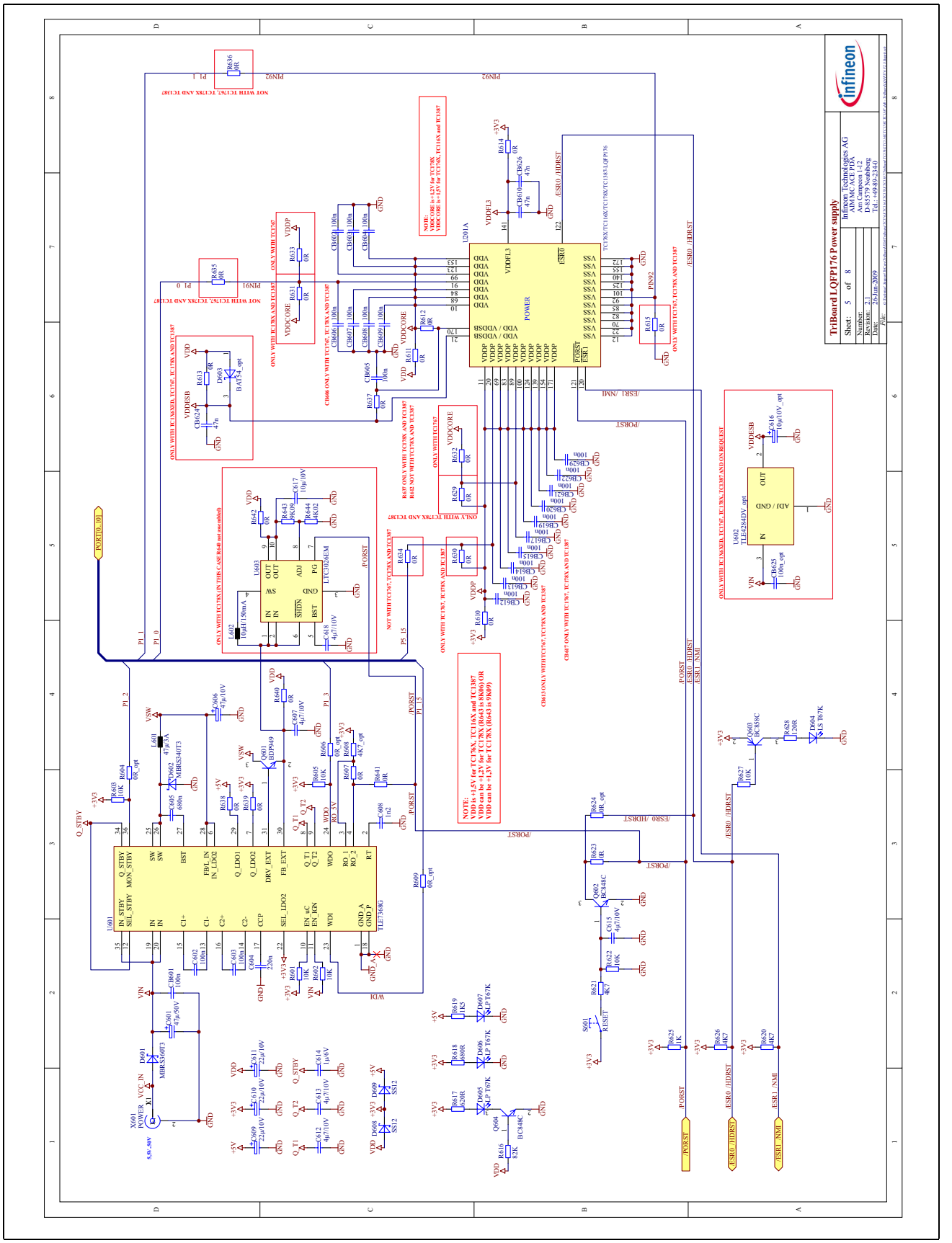

Figure 8-6 Schematic - Power Supply

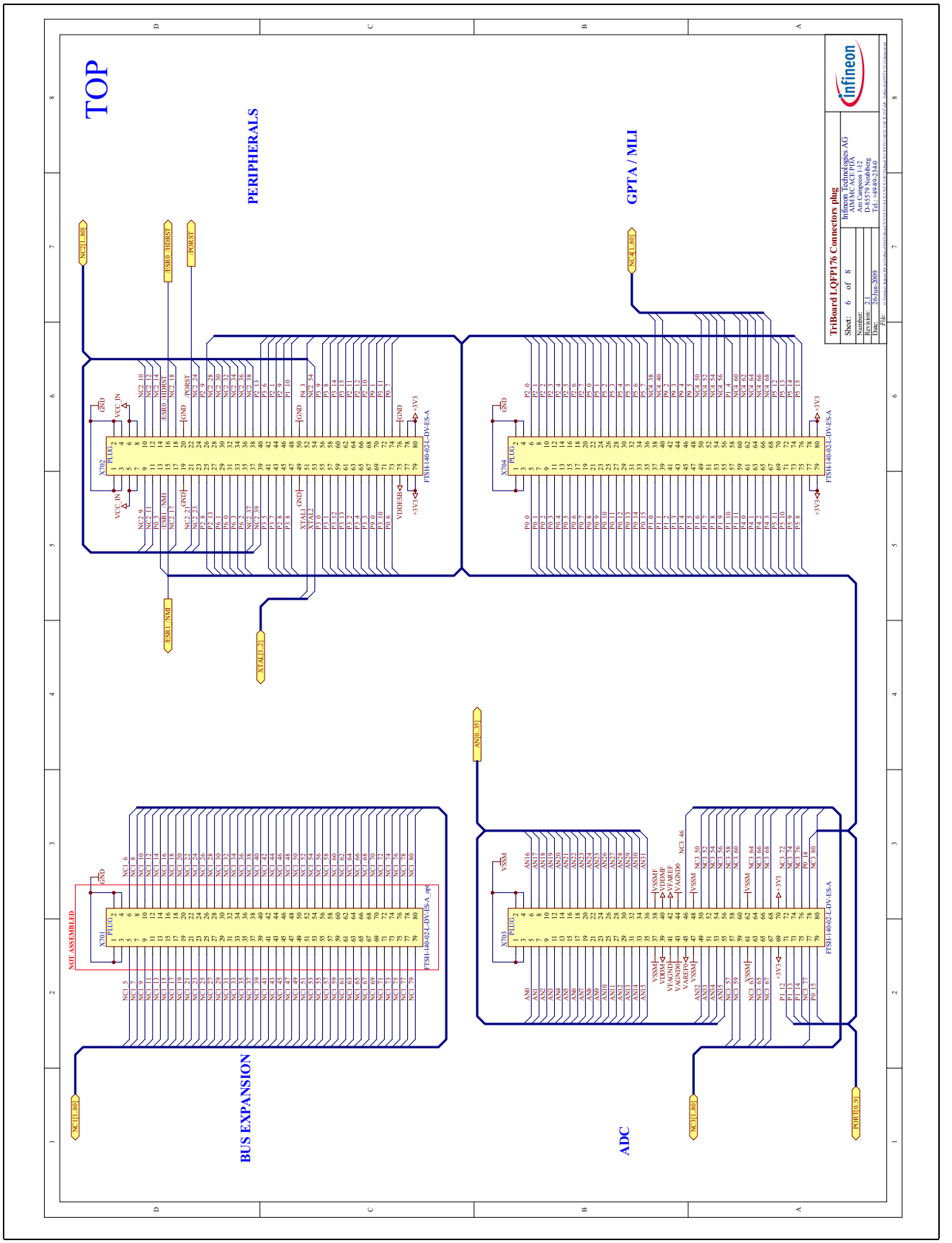

Figure 8-7 Schematic - Connectors (Plug)

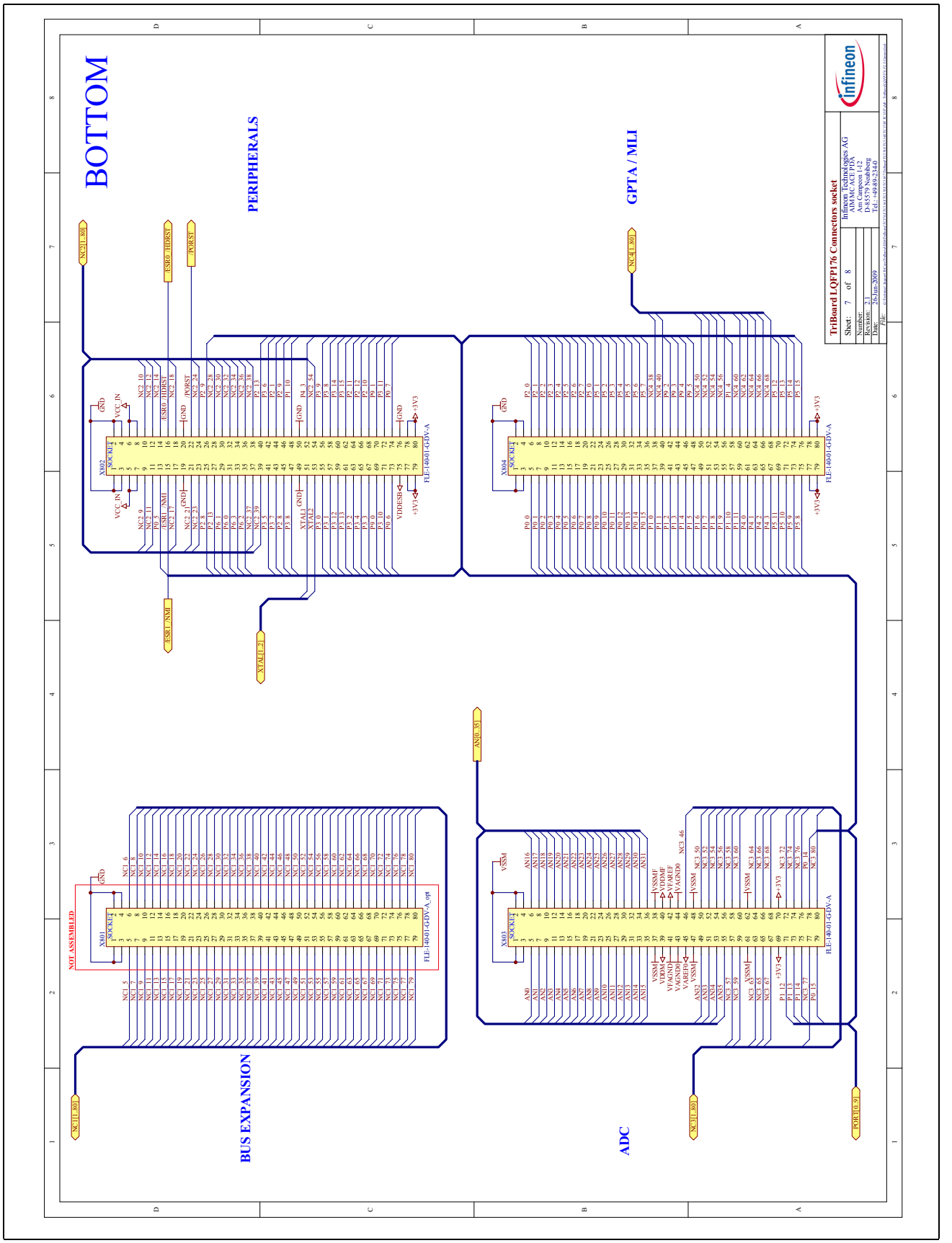

Figure 8-8 Schematic - Connectors (Socket)

8.2 Layout

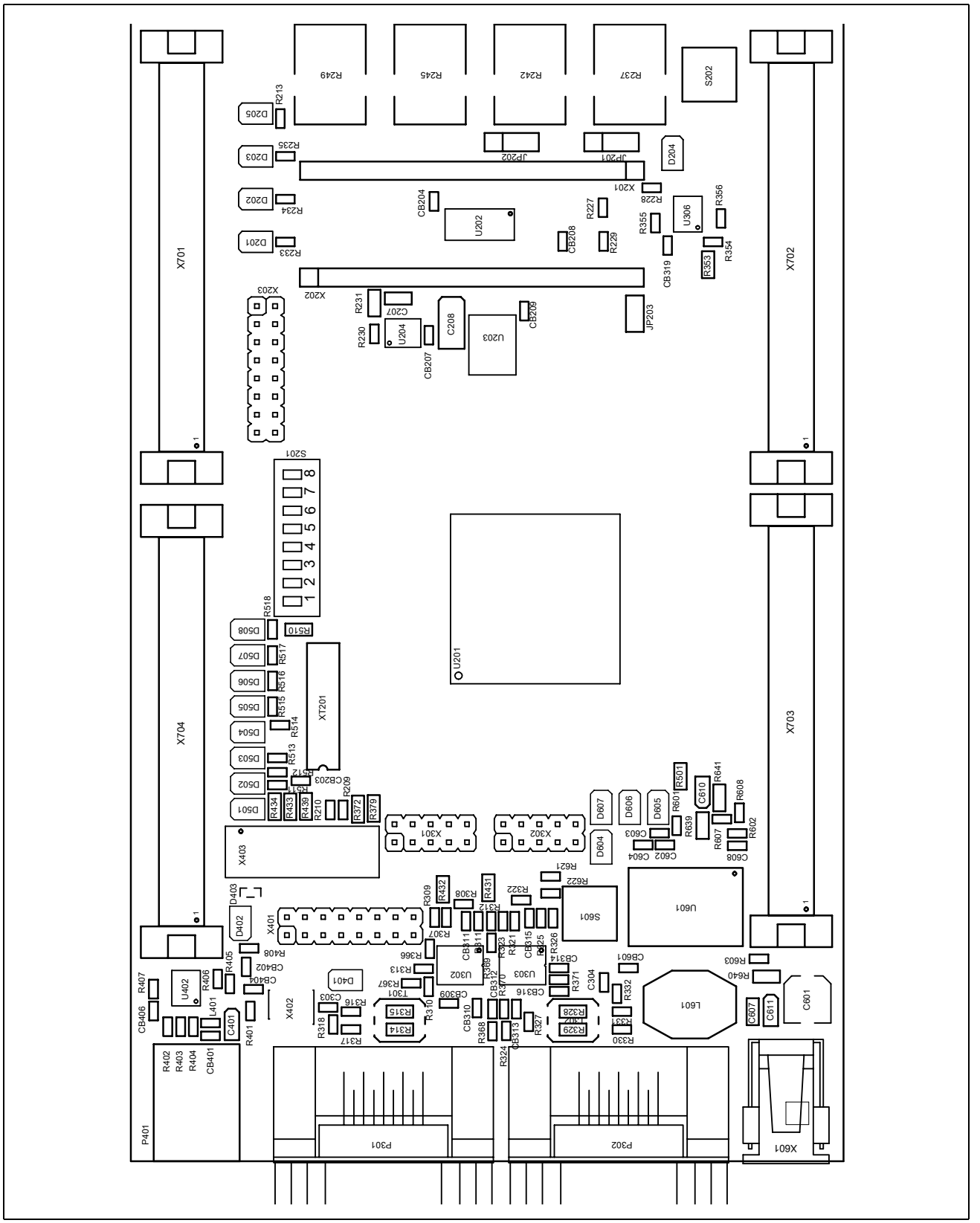

Figure 8-9 Component Plot Top Layer

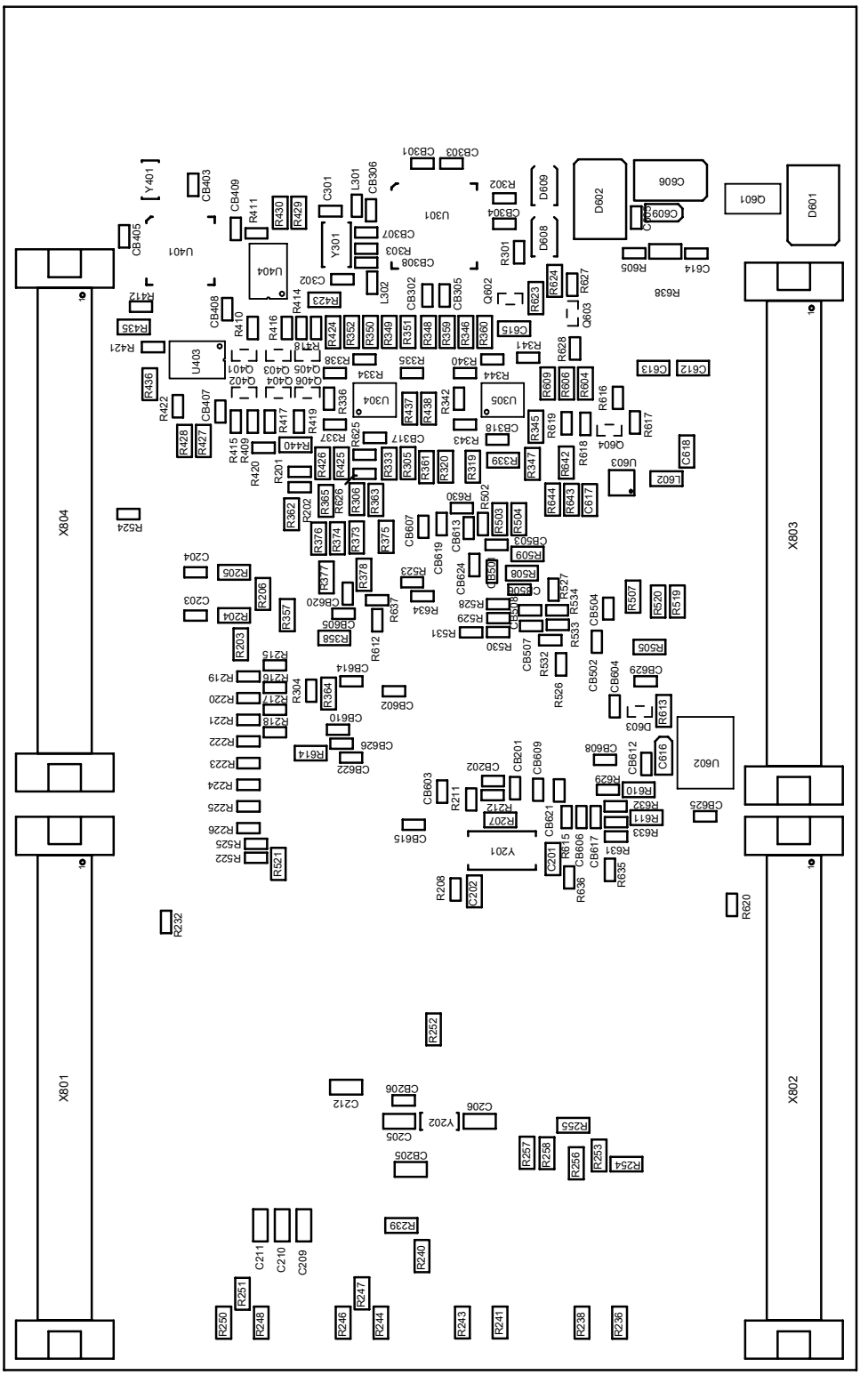

Figure 8-10 Component Plot Bottom Layer

8.3 Layout with Dimensioning

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

Note: these are the pictures from the TriBoard TC10GP. Connectors X801...X804 are on the same place.

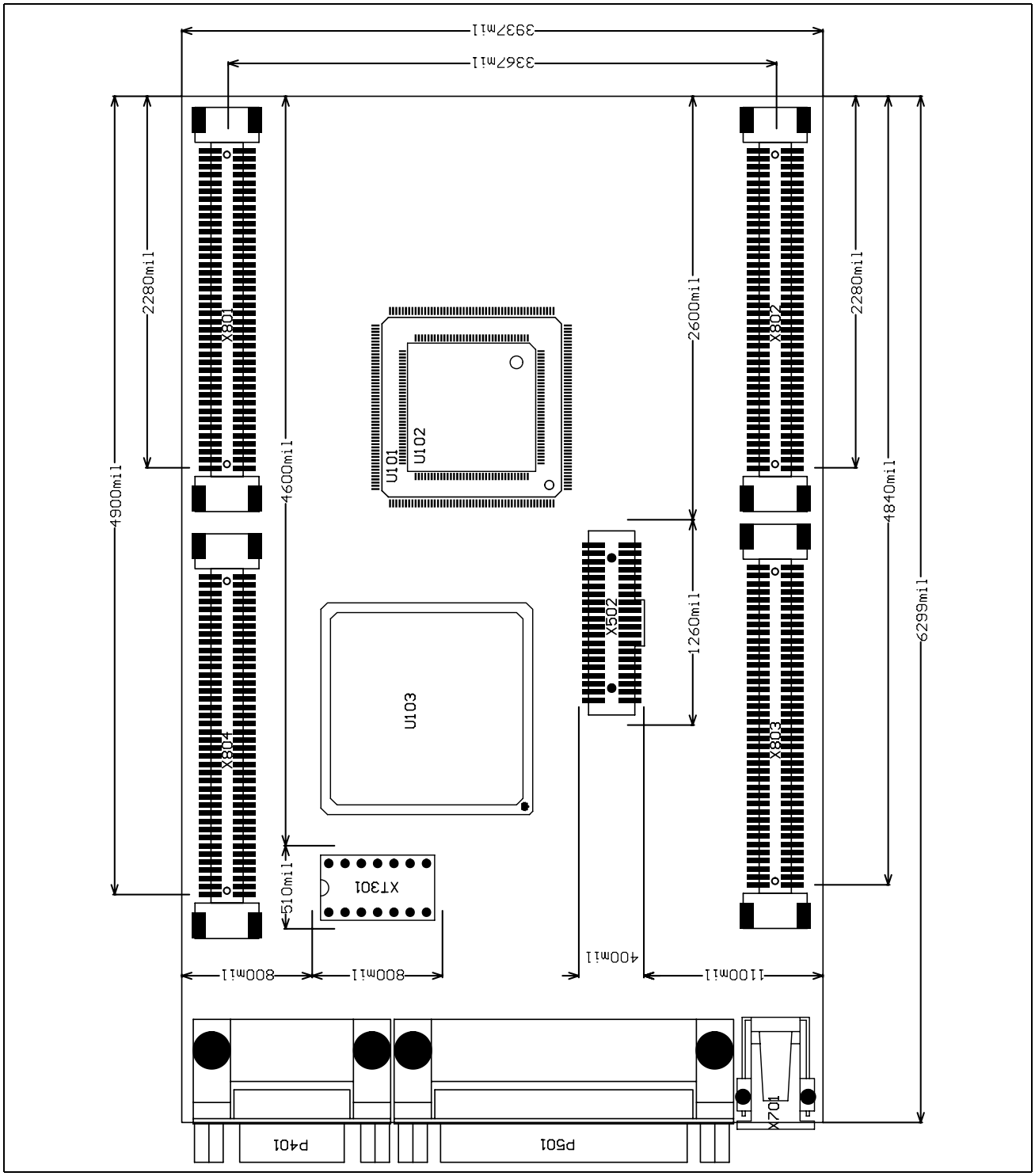

Figure 8-11 Dimensioning (mil)

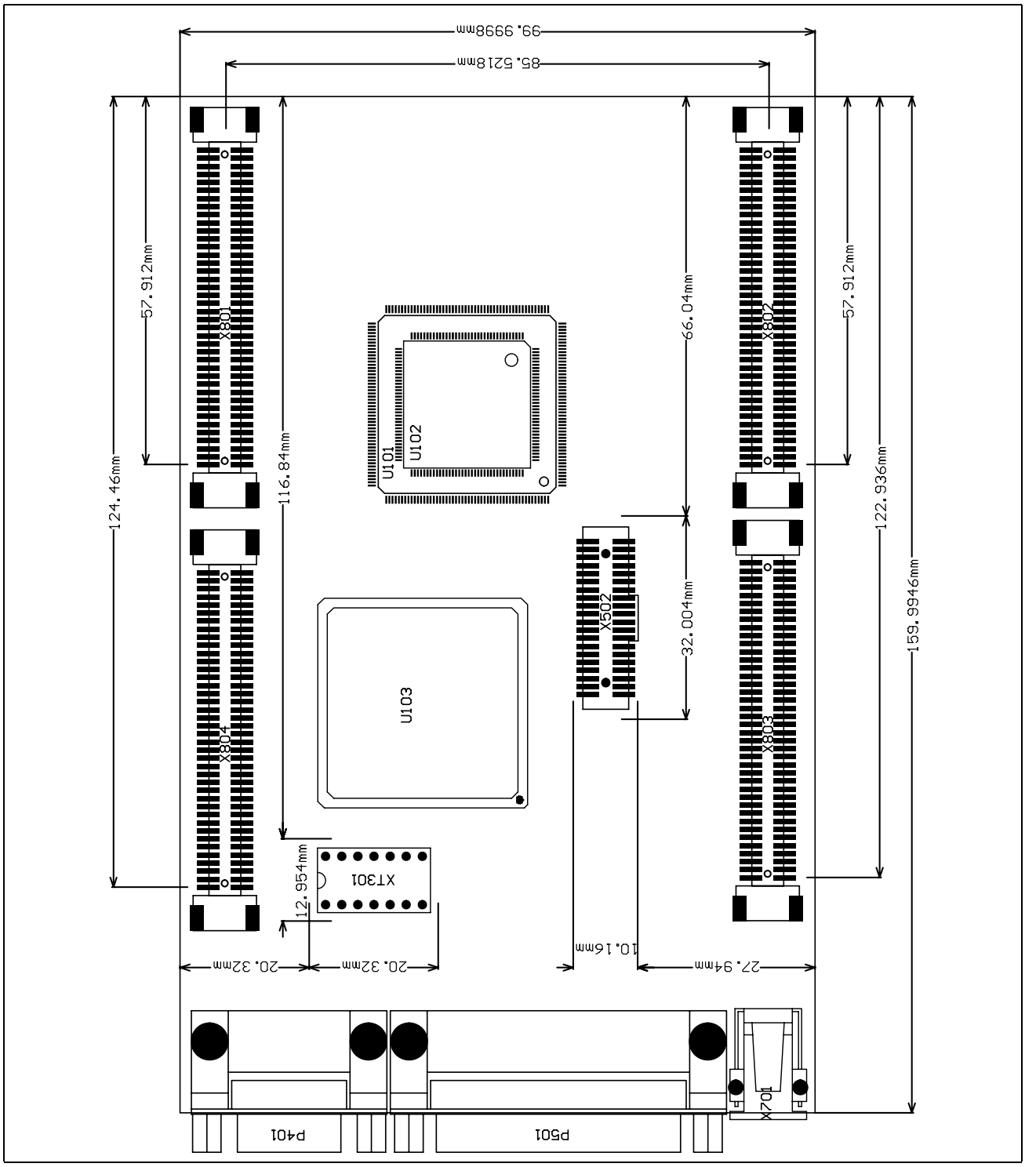

Figure 8-12 Dimensioning (mm)

Keyword Index

S

T

U

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