

Hexagon Application Kit

For XMC4000 Family

CPU_44A-V2

CPU Board XMC4400 General Purpose

Board User's Manual

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Microcontroller

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Revision History

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Introduction

This document describes the features and hardware details of the CPU Board XMC4400 General Purpose (CPU_44A-V2) designed to work with Infineon's XMC4400 Microcontroller. This board is part of Infineon's Hexagon Application Kits.

1 Overview

The CPU board CPU_44A-V2 houses the XMC4400 Microcontroller and three satellite connectors (HMI, COM, ACT) for application expansion. The board along with satellite cards (e.g. HMI_OLED-V1, COM_ETH-V1, AUT_ISO-V1 boards) demonstrates the capabilities of the XMC4400. The main use case for this board is to demonstrate the generic features of the XMC4400 device including tool chain. The focus is safe operation under evaluation conditions. The board is neither cost nor size optimized and does not serve as a reference design.

1.1 Key Features

The CPU_44A-V2 board is equipped with the following features

- XMC4400 (ARM® Cortex™-M4-based) Microcontroller, 512 kByte on-chip Flash, LQFP-100
- Connection to satellite cards via the satellite connectors COM, HMI and ACT
- USB OTG Host/Device support via micro USB connector
- Debug options
 - On-board Debugger via the Debug USB connector
 - Cortex Debug connector 10-pin (0.05")
 - Cortex Debug+ETM connector 20-pin (0.05")
- Reset push button
- RGB LED connected to GPIOs P1.10, P1.11 and P5.7
- Boot option switch
- PowerScale Connector: Ready for power consumption analysis
- 7 LED's
 - 3 Power indicating LEDs
 - 2 User LEDs (P5.2 and P1.8)
 - 1 RESET LED
 - 1 Debug LED
- Two User Buttons connected to HIB_IO_0 and P0.10
- Potentiometer, connected to analog input P14.1
- Power supply
 - Via Micro-USB connector in USB device mode
 - Via satellite connector pins (COM/ACT satellites cards can supply power to CPU board)
 - Via Debug USB connector
 - RTC backup battery

1.2 Block Diagram

Figure 1 shows the functional block diagram of the CPU_44A-V2 board. For more information about the power supply please refer to chapter 2.1.

The CPU board has got the following building blocks:

- 3 Satellite Connectors (COM, HMI ACT)
- 2 User LEDs connected to GPIOs P5.2 and P1.8
- 2 User Buttons connected to HIB_IO_0 and P0.10
- RGB LED connected to GPIOs P1.10, P1.11 and P5.7
- 2 Cortex Debug Connectors
- Variable resistor (POTI) connected to GPIO P14.1
- USB On-The-Go Connector (Micro-USB)
- On-board Debugger via Debug USB connector (Micro-USB)

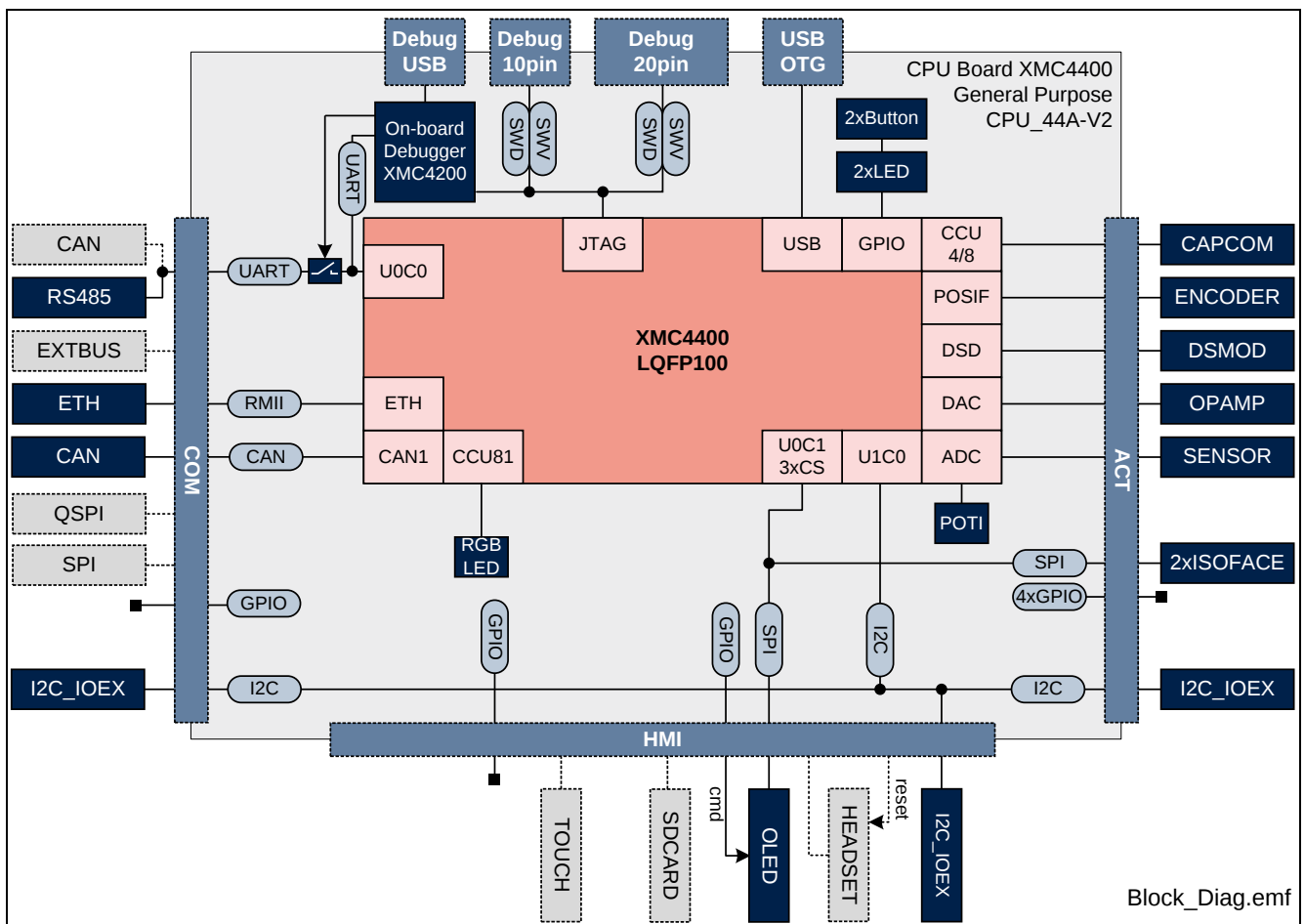


Figure 1 CPU_44A-V2 Board Block Diagram

2 Hardware Description

The following sections give a detailed description of the hardware and how it can be used.

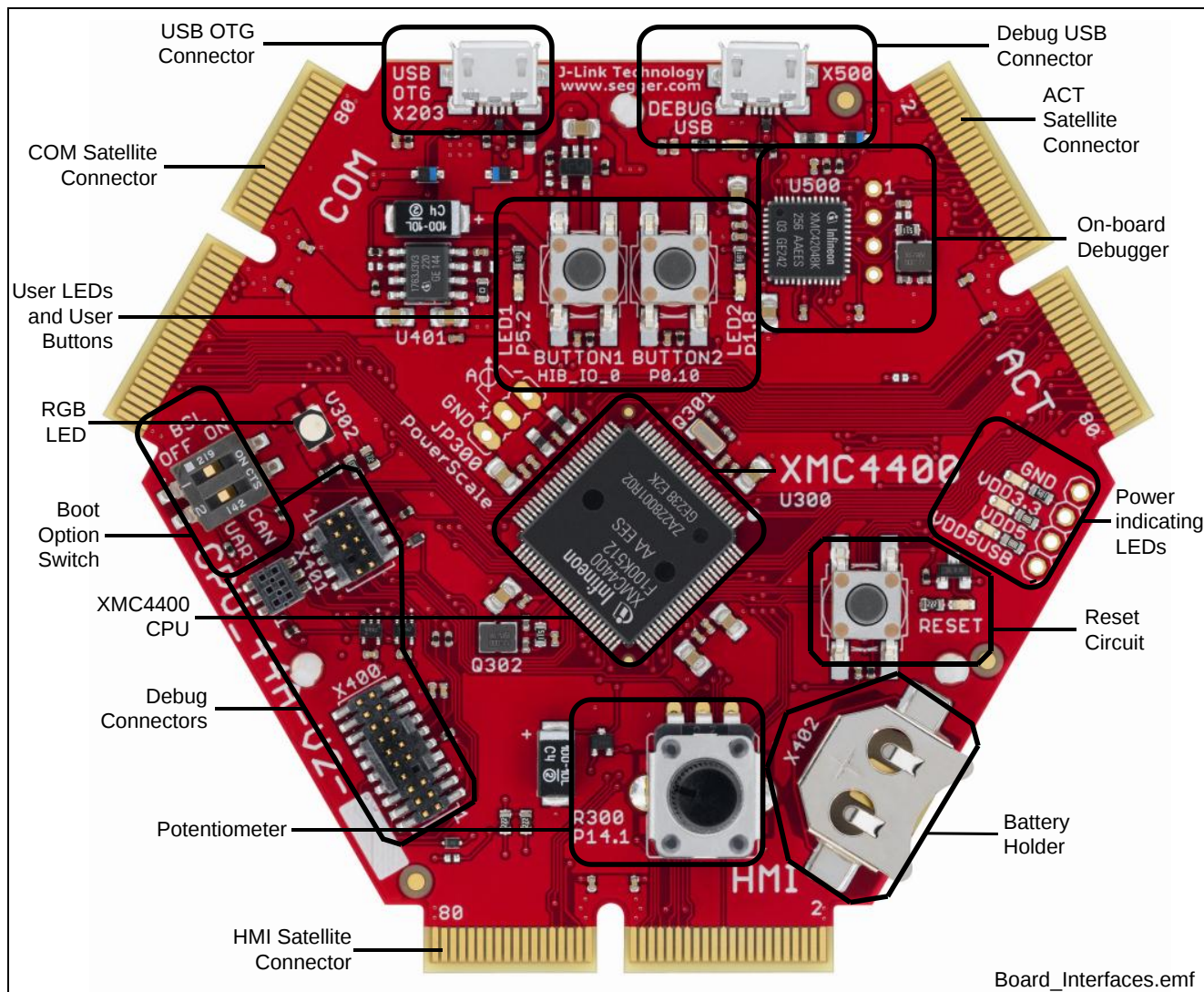


Figure 2 CPU Board XMC4400 General Purpose (CPU_44A-V2)

2.1 Power Supply

The CPU_44A-V2 board can be powered via either of the USB plugs (5 V); however, there is a current limit that can be drawn from the host PC through USB. If the CPU_44A-V2 board is used to drive other satellite cards e.g. MOT_GPDLV-V2 and the total system current required exceeds 500 mA, then the CPU_44A-V2 board needs to be powered by a satellite cards. These satellite cards support external power supply.

The typical current drawn by the CPU board without any satellite cards connected is about 190 mA (@5 V).

For powering the board through an USB interface, connect the USB cable provided with the kit to either of the Micro-USB connector on board as shown in Figure 3.

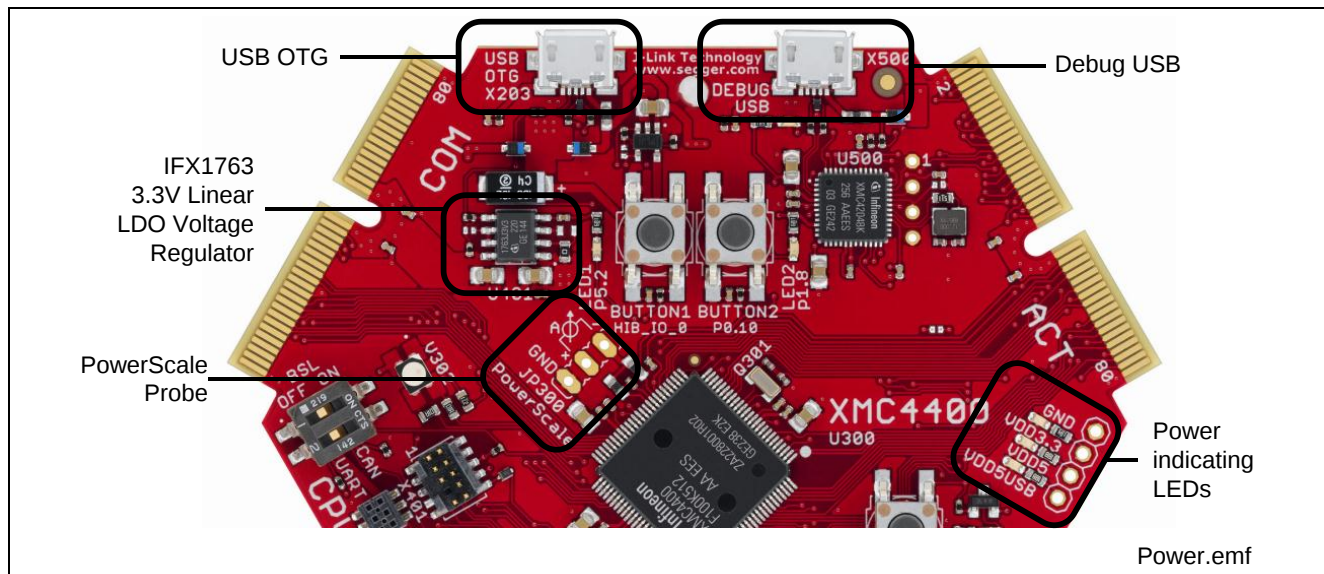


Figure 3 Powering Option

To indicate the power status of the CPU_44A-V2 board three power indicating LED's are provided on board (see Figure 3). The LED will be "ON" when the corresponding power rail is powered.

Table 1 Power status LED's

LED Reference	Power Rail	Voltage	Note
V401	VDD5	5 V	Must always be "ON"
V402	VDD5USB	5 V	"ON" if powered by USB OTG connector X203 "OFF" in all other supply cases
V403	VDD3.3	3.3 V	Must always be "ON"

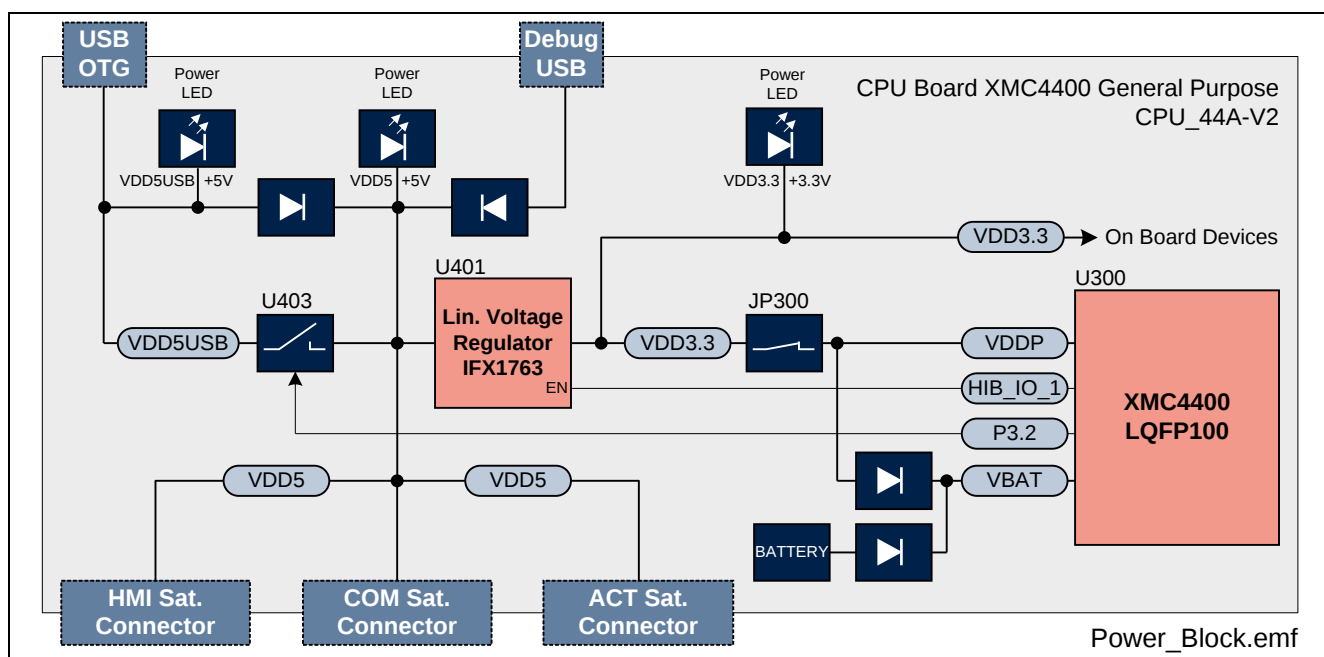


Figure 4 Block Diagram Of Power Supply

Hitex PowerScale probe is provided on the CPU_44A-V2 board to measure the power consumption of the XMC4400 device.

Table 2 **Power Measurement**

Jumper	Function	Description
JP300	PowerScale	A Hitex PowerScale probe can be connected for current sensing the VDD3.3 (CPU power source). Default: pos. 1-2 (closed) <i>Note: On the PCB there is a shorting trace between pin 1-2. This trace has to be cut first, before using PowerScale. Pin 3 is GND.</i>

2.2 Reset

A reset signal connected to the low-active PORST# pin of the target CPU (U300) can be issued by

- an on-board Reset Button (SW400, RESET)
- an on-board debug device (U500)
- an external debugger connected to either Cortex Debug connector X400 or X401

The RESET signal is routed to all satellite connectors. The reset circuit includes a red LED (V407) to indicate the reset status: The Reset LED (V407) will be "ON" during active reset state and will be "OFF" if reset is not active.

Be aware that PORST# is a bidirectional reset pin of the XMC4000 family which can also be pulled low by the XMC4000 device itself.

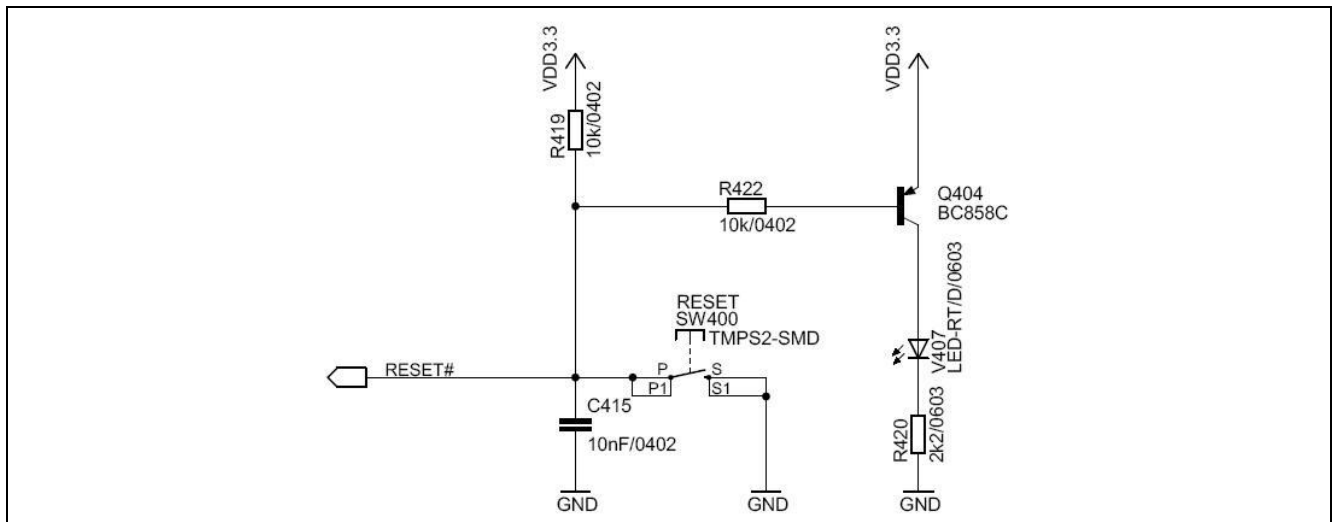


Figure 5 Reset Circuit

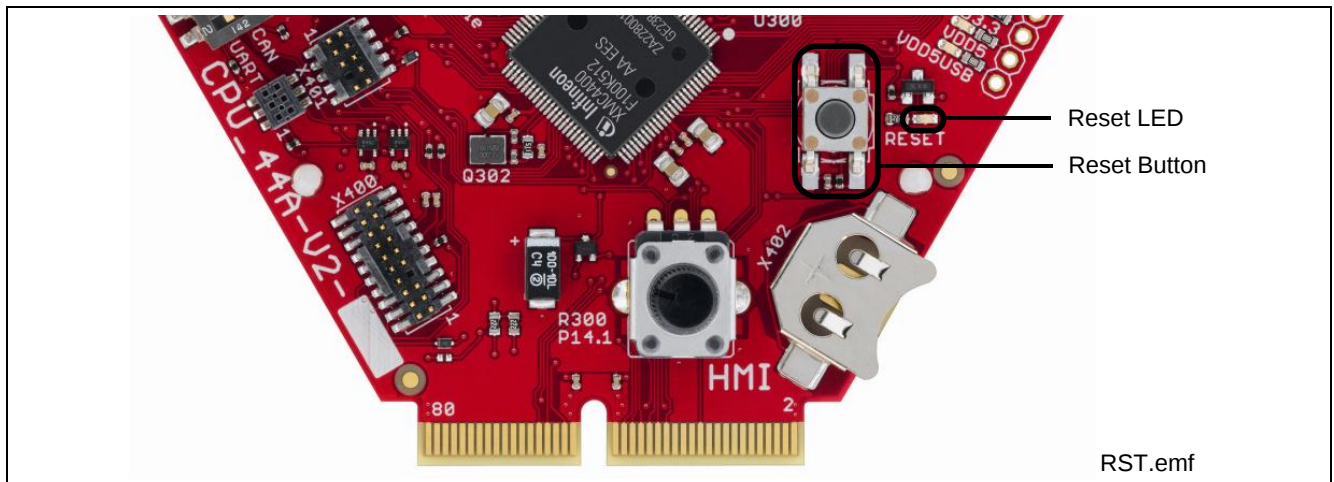


Figure 6 Reset LED and Reset Button

2.3 Clock Generation

An external 12 MHz crystal provides the clock signal to the XMC4400 microcontroller. The drive strength of the oscillator is set to maximum by software, in order to ensure a safe start-up of the oscillator even under worst case conditions. Therefore a serial 510 Ohm resistor will attenuate the oscillations during operations.

For the RTC clock a separate external 32.768 kHz crystal is used on board.

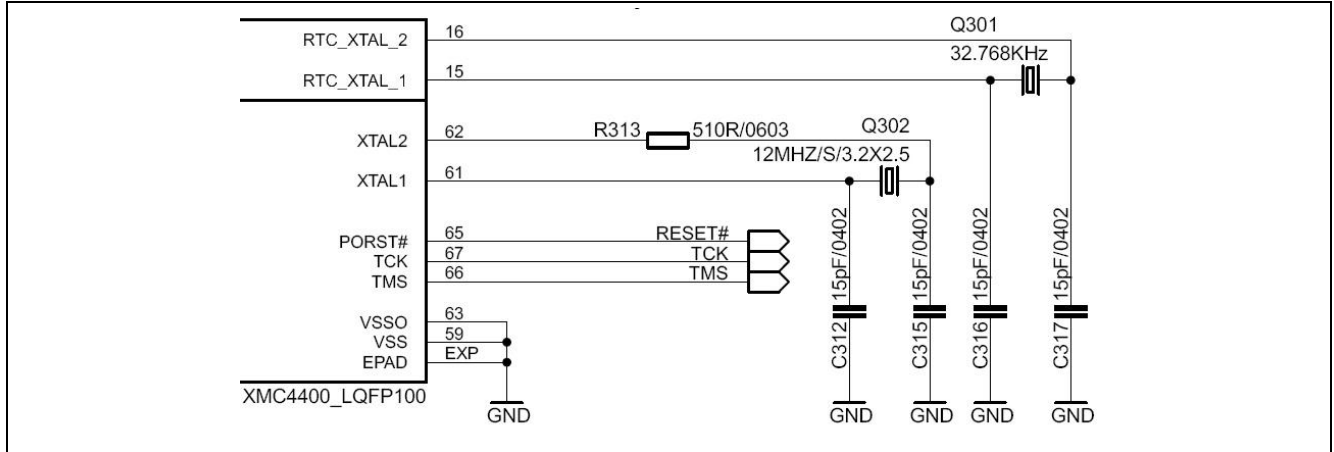


Figure 7 Clock Generation

2.4 Boot Option

During power-on-reset the XMC4400 latches the dip switch SW300 settings via the TCK and the TMS pin. Based on the values latched different boot options are possible.

Table 3 Boot Options Settings

BSL (TMS)	CAN/UART (TCK)	Boot Option
OFF (1)	UART (0)	Normal Mode (Boot from flash)
ON (0)	UART (0)	ASC BSL Enabled (Boot from UART)
OFF (1)	CAN (1)	BMI Customized Boot Enabled
ON (0)	CAN (1)	CAN BSL Enabled (Boot from CAN)

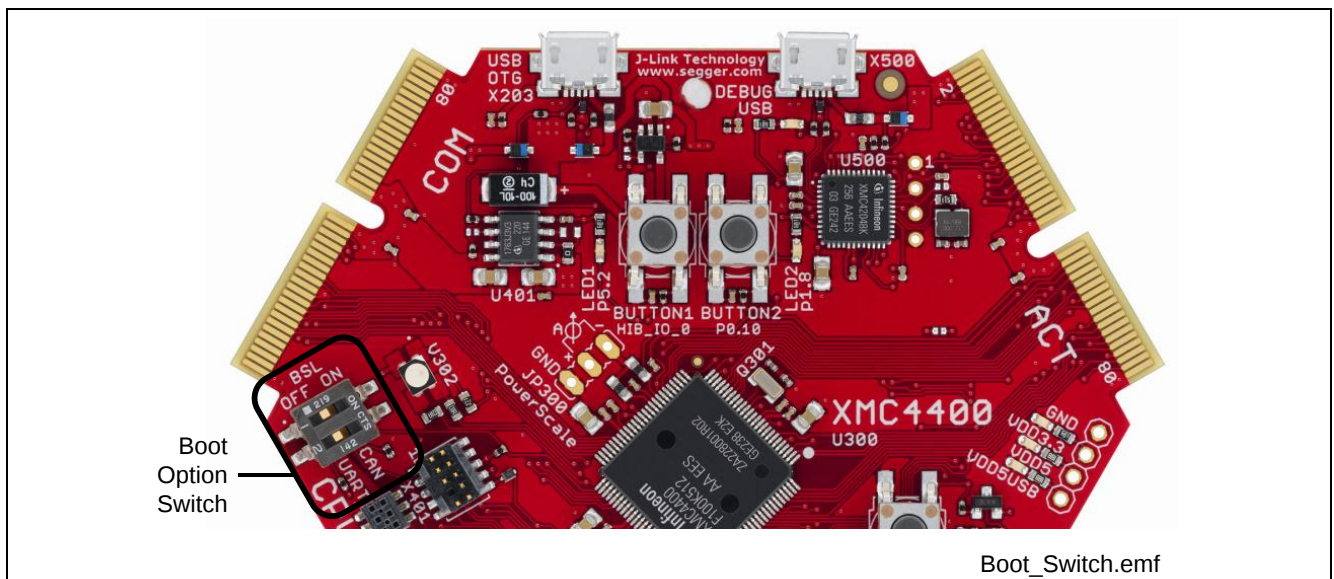


Figure 8 Boot Options Switch

2.5 Debug Interface

The CPU_44A-V2 board supports debugging via 3 different channels:

- On-board Debugger
- Cortex Debug Connector (10-pin)
- Cortex Debug+ETM Connector (20-pin)

The Hexagon Application Boards are designed to use “Serial Wire Debug” as debug interface. JTAG debug is not supported by default because the GPIO P0.7, where the required TDI function is mapped to also, is used by various Actuator boards connected to the ACT satellite connector.

Note: It is strongly recommended not to use JTAG debug mode, especially if satellites boards are connected, which uses the GPIO 0.7. For the same reason also do not use the on-board debugger in JTAG mode.

If you want to use the JTAG debug mode through the cortex debug connectors (X400, X401) anyway, enable the JTAG interface of the XMC device by assembling the pull-up resistor R427 (4k7 Ohm) and the resistor R410 (0 - 33 Ohm).

2.5.1 On-board USB Debugger

The on-board debugger [1] supports

- Serial Wire Debug
- Serial Wire Viewer
- Full Duplex UART communication via a USB Virtual COM

[1] Attention: Newer firmware versions of the on-board debugger require the latest J-Link driver (V4.62 or higher) and a Serial Port Driver (CDC driver) installed on your computer. Please check “Install J-Link Serial Port Driver” when installing the latest J-Link driver (see Figure 9)

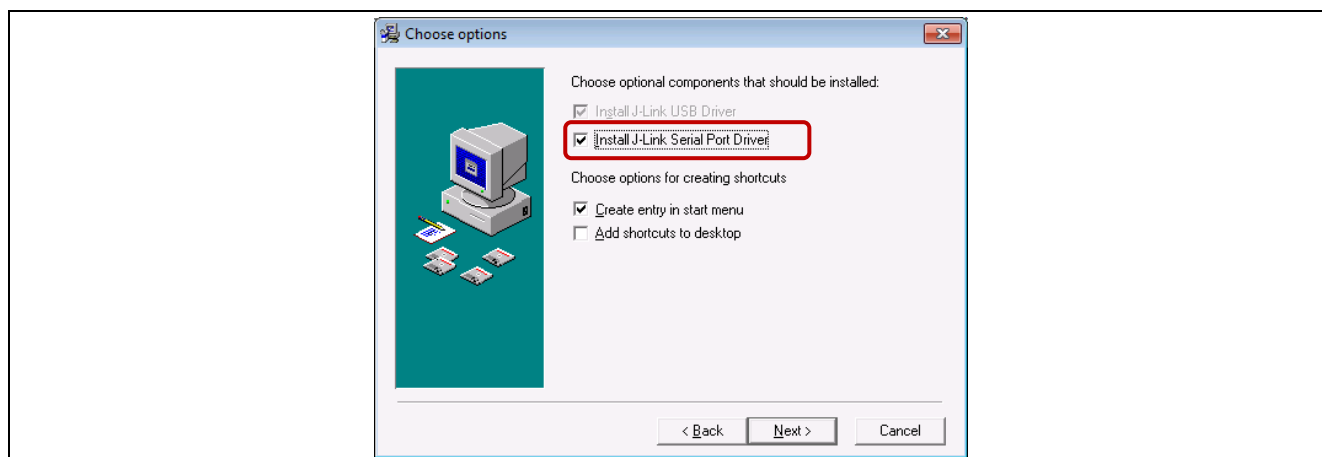


Figure 9 Installation of Serial Port Driver

The on-board debugger can be accessed through the Debug USB connector shown in Figure 10. The Debug LED V502 shows the status during debugging.

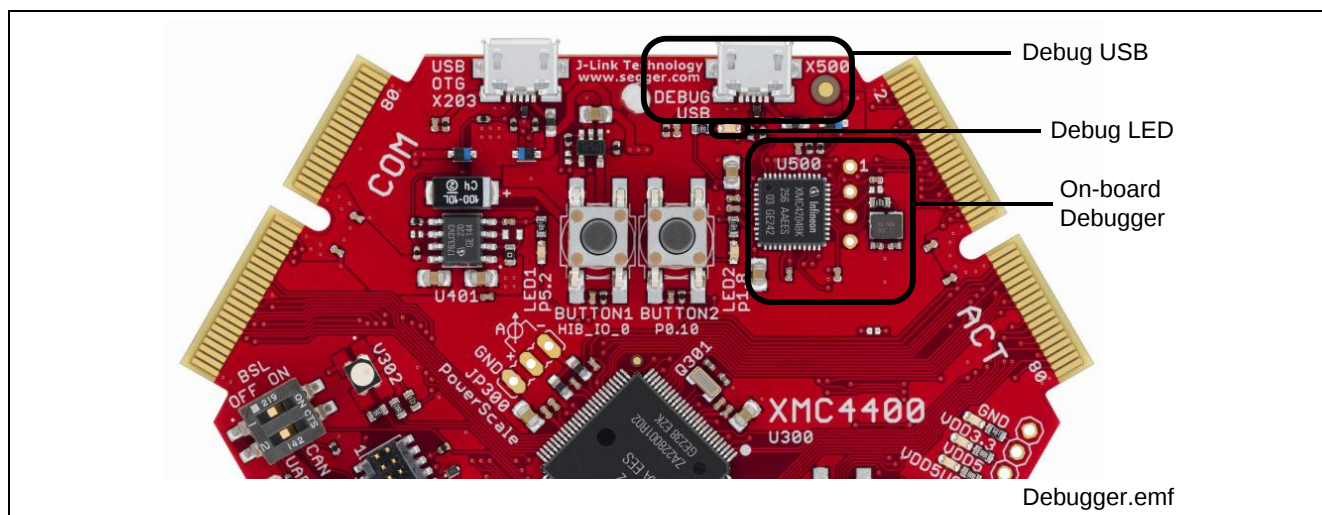


Figure 10 On-Board USB Debugger

When using an external debugger connected to the 10pin/20pin Cortex Debug Connector, the on-board debugger is switched off.

When using the USB virtual COM port function of the on-board debugger the UART interface to the COM satellite is disabled through the switches U301 and U303.

2.5.2 Cortex Debug Connector (10-pin)

The CPU_44A-V2 board supports Serial Wire Debug operation and Serial Wire Viewer operation (via the SWO signal when Serial Wire Debug mode is used) through the 10-pin Cortex Debug Connector.

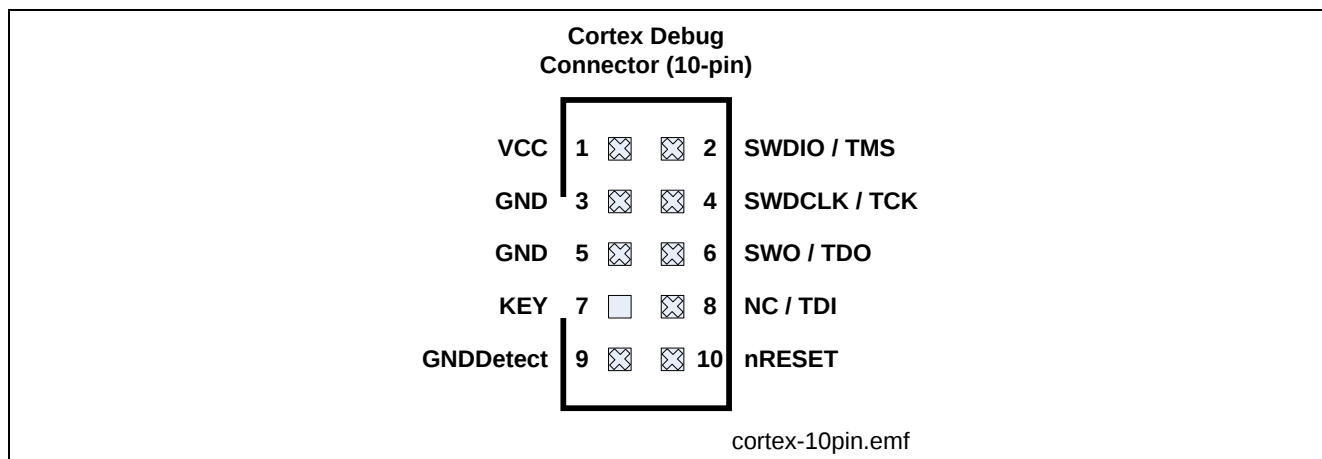


Figure 11 Cortex Debug Connector (10-pin)

Table 4 Cortex Debug Connector (10 Pin)

Pin No.	Signal Name	Serial Wire Debug	JTAG Debug
1	VCC	+3.3 V	+3.3 V
2	SWDIO / TMS	Serial Wire Data I/O	Test Mode Select
3	GND	Ground	Ground
4	SWDCLK / TCK	Serial Wire Clock	Test Clock
5	GND	Ground	Ground
6	SWO / TDO	Trace Data OUT	Test Data OUT
7	KEY	KEY	KEY
8	NC / TDI	Not connected	Test Data IN
9	GNDDetect	Ground Detect	Ground Detect
10	nRESET	Reset (Active Low)	Reset (Active Low)

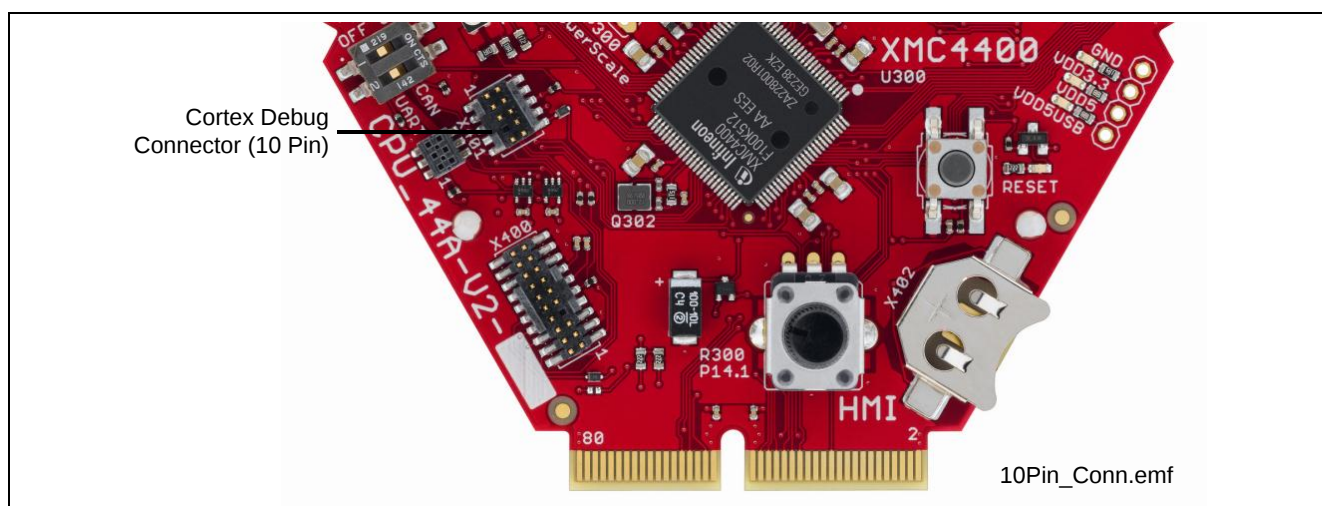


Figure 12 Cortex Debug Connector (10-pin) Layout

2.5.3 Cortex Debug+ETM Connector (20-pin)

The CPU_44A-V2 board supports Serial Wire Debug operation, Serial Wire Viewer operation (via SWO connection when Serial Wire Debug mode is used) through the 20-pin Cortex Debug+ETM Connector. The board does not support the Instruction Trace operation.

JTAG Debug operation additionally would require the TDI (P0.7) signal. By default the TDI signal is disconnected from the Cortex Debug Connectors by a not assembled resistor R410, because the pin P0.7 is used by some Actuator boards connected to the ACT satellite connector.

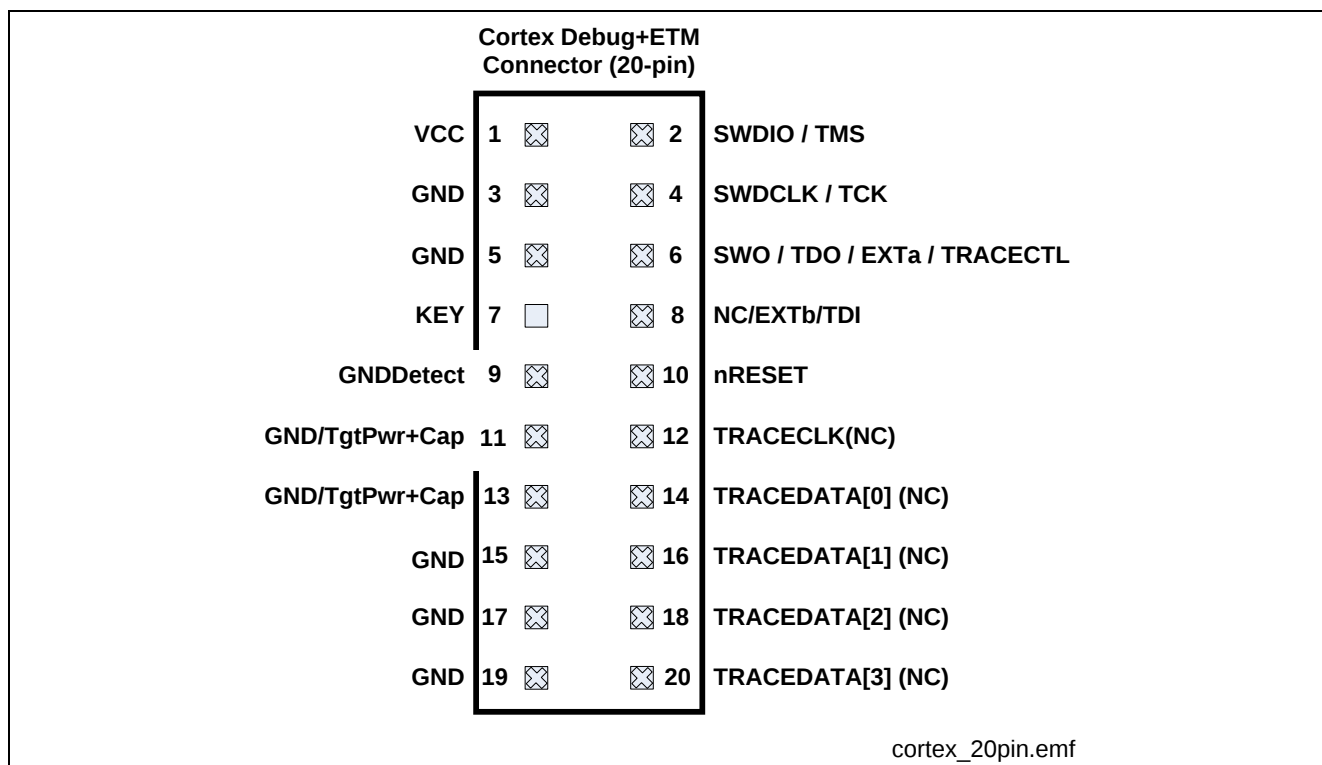


Figure 13 Cortex Debug+ETM Connector (20-pin)

Table 5 Cortex Debug+ETM Connector (20 Pin)

Pin No.	Signal Name	Serial Wire Debug	JTAG Debug
1	VCC	+3.3 V	+3.3 V
2	SWDIO / TMS	Serial Wire Data I/O	Test Mode Select
3	GND	Ground	Ground
4	SWDCLK / TCK	Serial Wire Clock	Test Clock
5	GND	Ground	Ground
6	SWO / TDO	Trace Data OUT	Test Data OUT
7	KEY	KEY	KEY
8	NC / TDI	Not connected	Test Data IN
9	GNDDetect	Ground Detect	Ground Detect
10	nRESET	Reset (Active Low)	Reset (Active Low)
11	GND/TgtPwr+Cap	Ground	Ground
12	TRACECLK*	TRACECLK*	TRACECLK*
13	GND/TgtPwr+Cap	Ground	Ground
14	TRACEDATA[0]*	TRACEDATA[0]*	TRACEDATA[0]*
15	GND	Ground	Ground

Table 5 Cortex Debug+ETM Connector (20 Pin)

Pin No.	Signal Name	Serial Wire Debug	JTAG Debug
16	TRACEDATA[1]*	TRACEDATA[1]*	TRACEDATA[1]*
17	GND	Ground	Ground
18	TRACEDATA[2]*	TRACEDATA[2]*	TRACEDATA[2]*
19	GND	Ground	Ground
20	TRACEDATA[3]*	TRACEDATA[3]*	TRACEDATA[3]*

Note: * Not connected on the CPU_44A-V2 board.

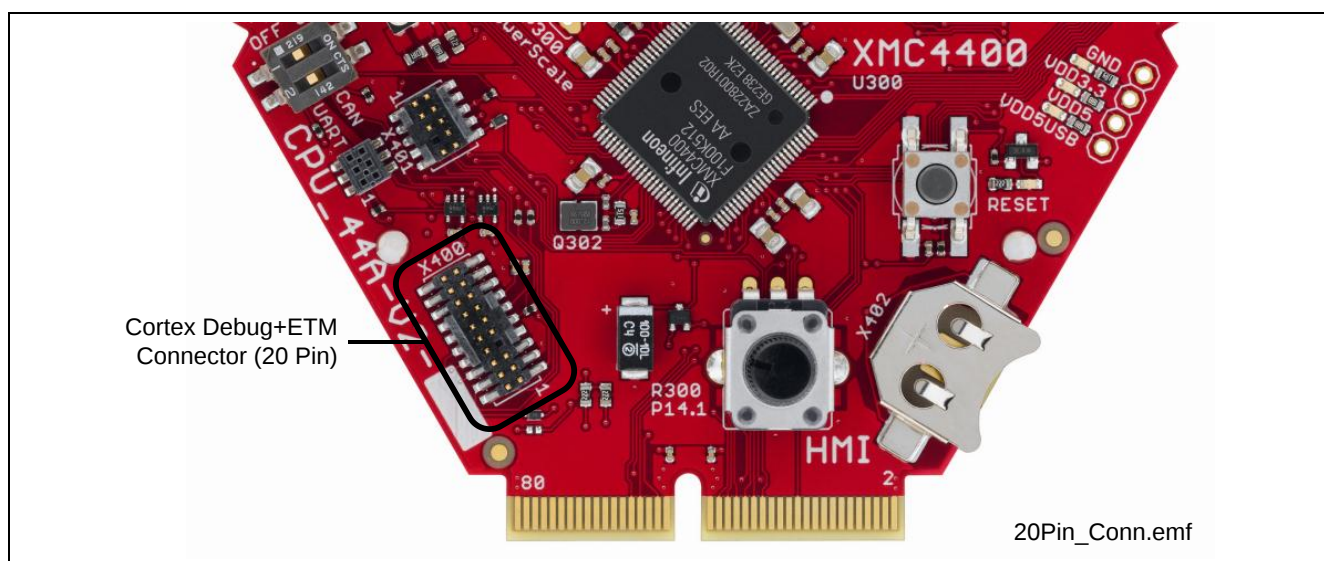


Figure 14 Cortex Debug+ETM Connector (20-pin) Layout

2.6 RGB LED

The CPU_44A-V2 board has a tricolored LED. The LED glows with either Red/Blue/Green colors as controlled by the GPIO pins given below.

Table 6 RGB LED Connections

Pin No. / Function	LED Color
P5.7 / CCU81.OUT02	RED
P1.11 / CCU81.OUT11	GREEN
P1.10 / CCU81.OUT21	BLUE

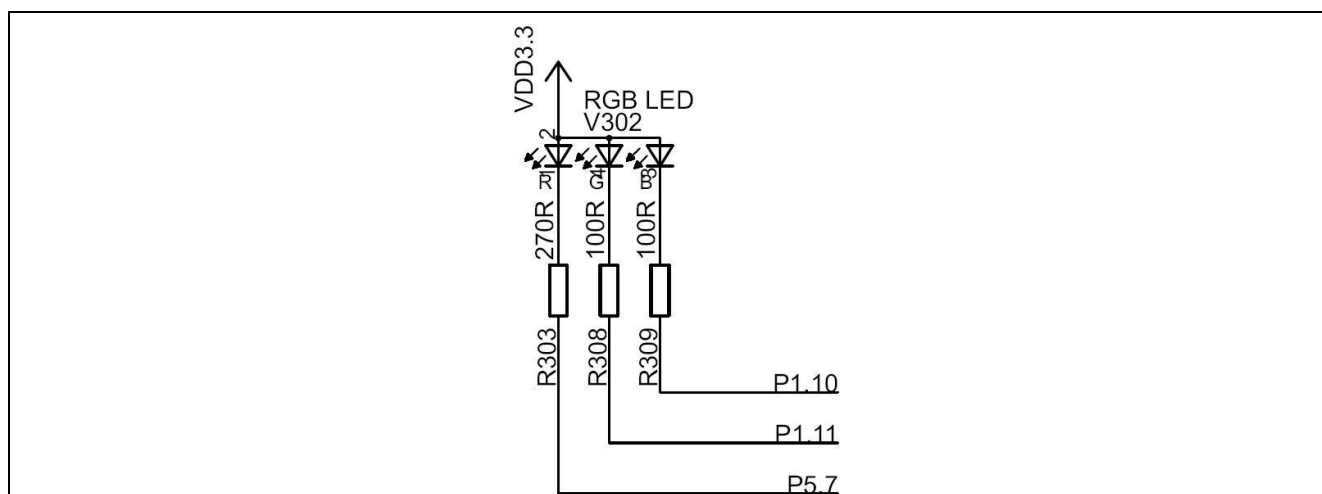


Figure 15 RGB LED

2.7 USB

The XMC4400 supports USB interface in host only mode, device only mode or as an OTG Dual Role Device (DRD). In USB device mode, power is expected through VBUS (pin 1 of X203C) from an external host (e.g. PC). When the current consumption of the application running on the Hexagon Application system is higher than 500 mA, power from an external source through satellite cards shall be used.

Note: Some PCs, notebooks or hubs have a weak USB supply which is not sufficient for proper supply. In this case use an external 5 Volt power supply or a powered USB hub.

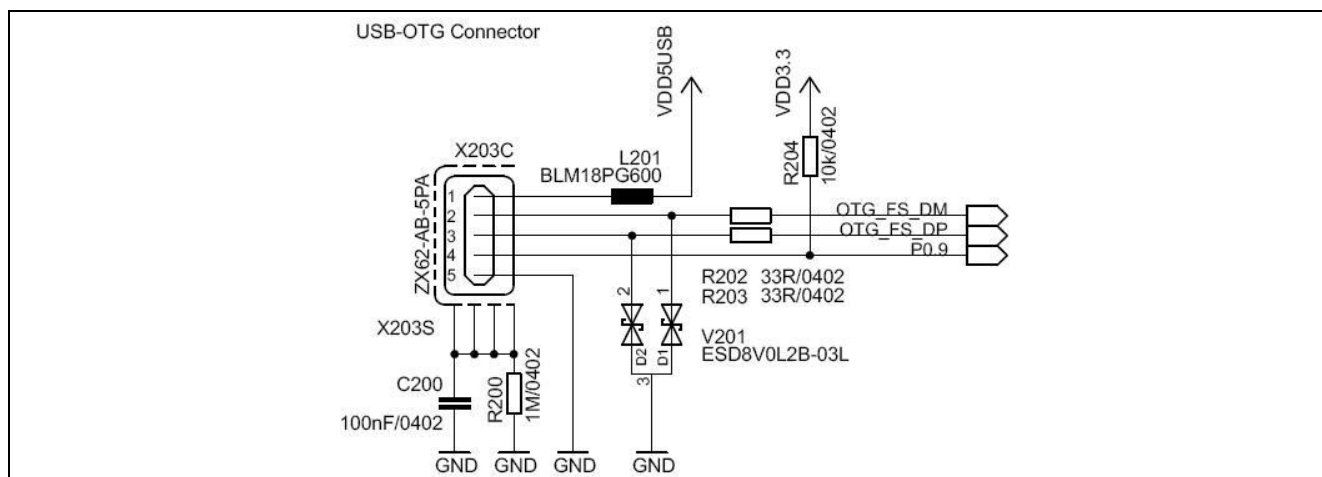


Figure 16 USB Connector

USB ID pin of the USB connector (pin 4 of X203C) is connected to the port pin P0.9 of the XMC4400. On this port pin the USD identification signal (USB.ID) of XMC4000 USB module is mapped to. An OTG device will detect whether a USB Micro-A or Micro-B plug is inserted by checking the ID pin. When the ID = FALSE a Micro-A connector is plugged in and when ID = TRUE a Micro-B connector is plugged in. When the ID is true the XMC4400 acts as a USB host else as a USB device.

Table 7 USB micro AB connector Pinot

Pin No.	Pin Name	Pin Description
1	VBUS	5 V
2	D-	Data Minus
3	D+	Data Plus
4	ID	Identification
5	GND	Ground

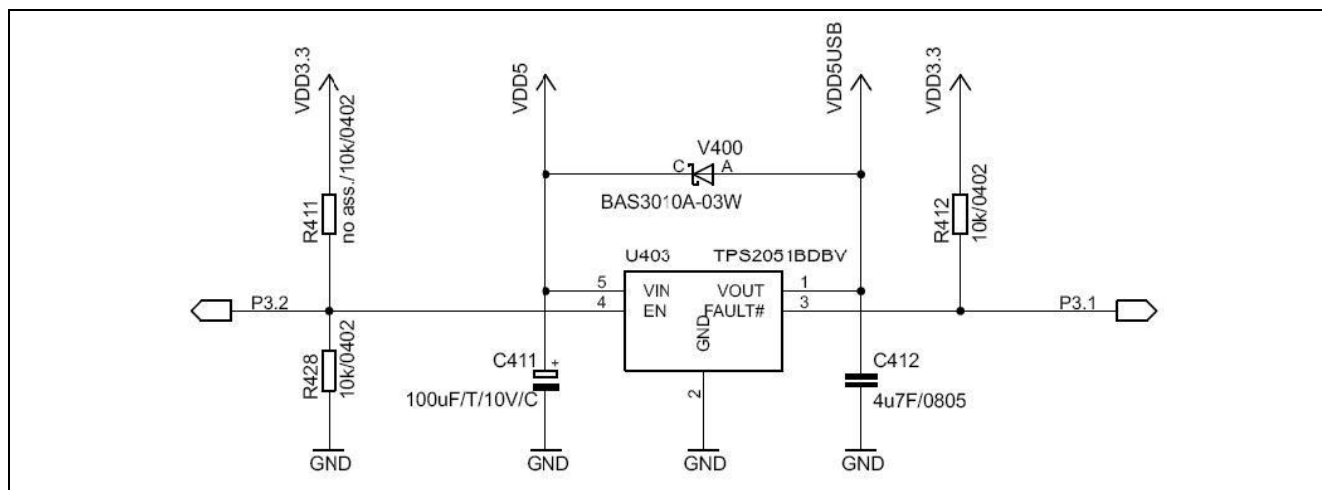


Figure 17 USB power generation - Host/OTG mode

In the host only mode and OTG mode the CPU_44A-V2 board is capable of supplying power to the connected device (e.g. USB mouse). The board has a power-switch which is controlled by the USB.BUSDRIVE signal of the XMC4400. The USB.BUSDRIVE signal is mapped to port pin P3.2 (active high).

In the Host/OTG mode a low active FAULT signal indicates to the port pin P3.1 of the XMC4400, if more than 500 mA current is drawn by the external device.

Diode V400 will allow powering the board through USB in all USB modes via e.g. a PC.

2.8 RTC

The XMC4400 CPU has two power domains, the Core Domain and Hibernate Domain.

The Core Domain (VDDP pins) is connected to the VDD3.3 rail. An on-board LDO voltage regulator generates VDD3.3 (3.3 V) from VDD5 (5 V).

The Hibernate Domain is powered via the auxiliary supply pin VBAT, which is supplied by either a 3 V coin cell (size 1216, 1220, 1225) plugged into the battery holder or 3.3 V (VDD3.3) generated by the on-board voltage regulator.

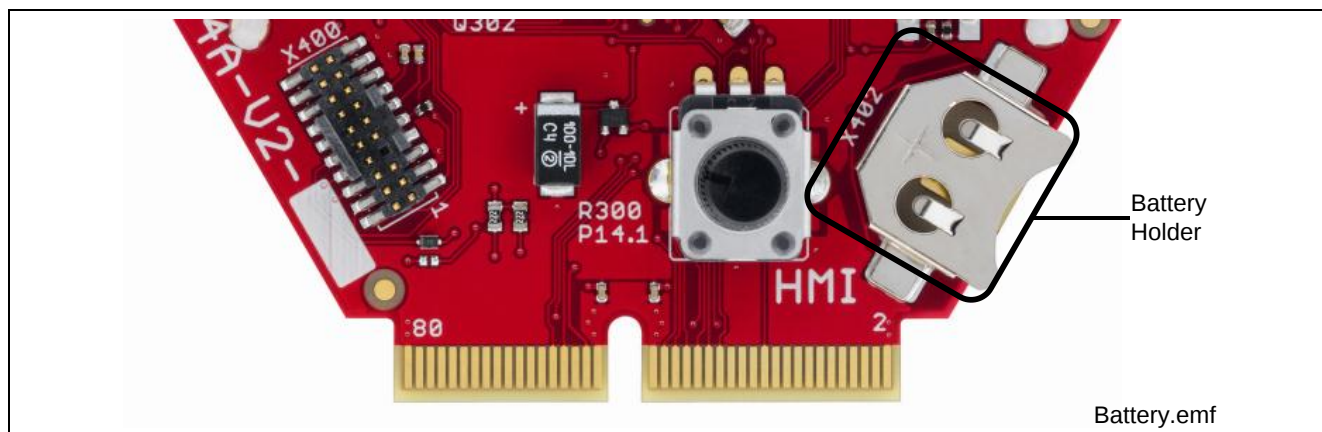


Figure 18 Battery Holder for Coin Cells

The Real Time Clock (RTC) is located in the hibernate domain. The XMC4400 uses the HIB_IO_1 signal (active low) to shut down the external LDO voltage regulator which generates the VDD3.3 (Core Domain). Even if the Core Domain is not powered the Hibernate Domain will operate if VBAT is available. The RTC keeps running as long as the Hibernate Domain is powered via the auxiliary supply VBAT. The RTC is capable to wake-up the whole system from Hibernate mode by setting HIB_IO_1 to high.

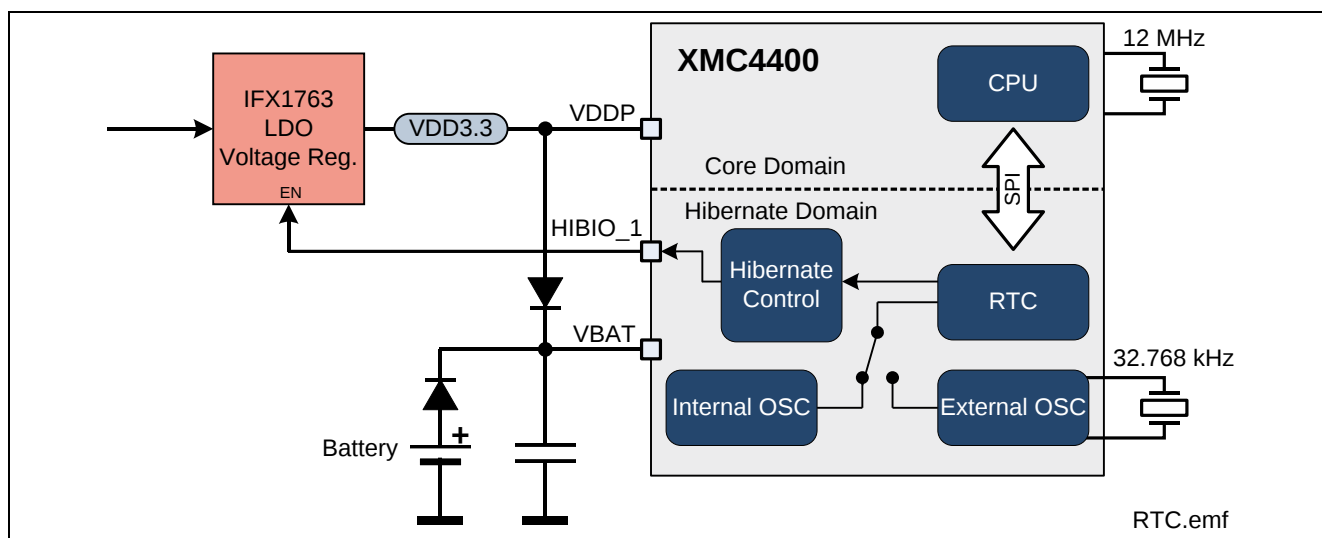


Figure 19 XMC4400 Power Domains and Real Time Clock

2.9 User LEDs and User Buttons

The port pins P5.2 and P1.8 of the XMC4400 are connected to the LEDs V300 and V301 respectively. More User LED's are available through the I2C GPIO expander on most of the satellite cards.

Table 8 User LEDs

LED	Connected to Port Pin
V300	GPIO P5.2
V301	GPIO P1.8

Two User Buttons, SW301 and SW302 are connected to P0.10 and HIB_IO_0 of XMC4400.

Table 9 User Buttons

Button	Connected to Port Pin
BUTTON1 / SW301	HIB_IO_0
BUTTON2 / SW302	P0.10

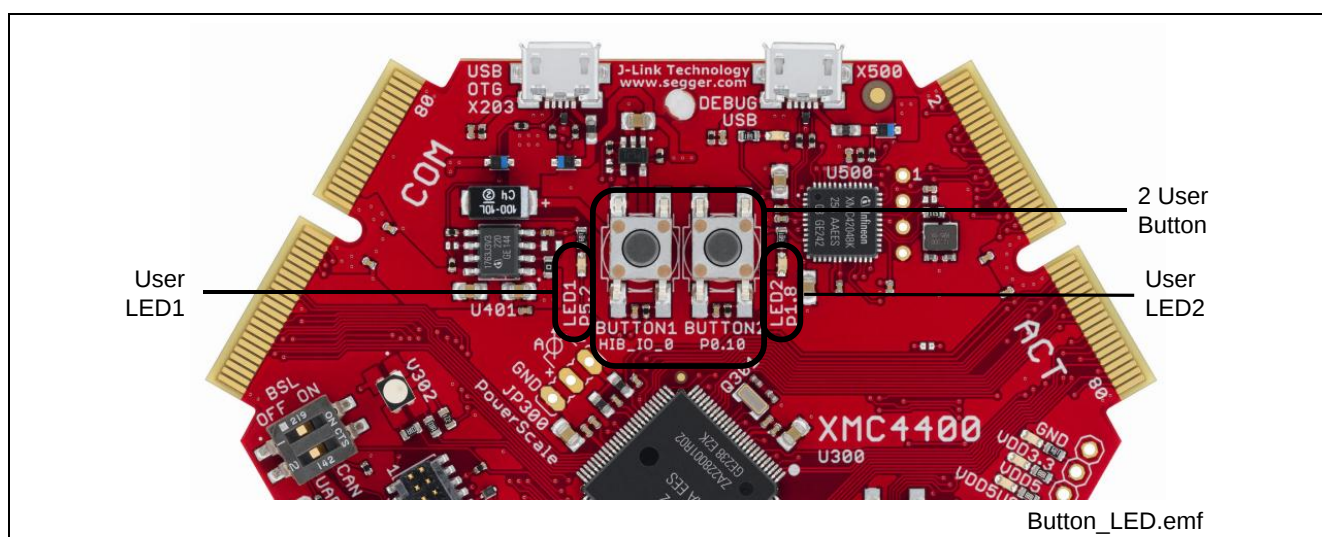


Figure 20 User LEDs and User Buttons

2.10 Potentiometer

The CPU_44A-V2 board provides a potentiometer POT1 for ease of use and testing of the on-chip analog to digital converter. The potentiometer is connected to the analog input G0_CH1 (P14.1). The analog output of the potentiometer ranges from 0 V to 3.3 V.

Table 10 Potentiometer

Potentiometer	Connected to Port Pin
R300	P14.1 / G0_CH1 (Group 0, channel 1)

2.11 Satellite Connectors

The CPU_44A-V2 board provides three satellite connectors for application extension by satellite cards:

- COM satellite connector (Communication)
- HMI satellite connector (Human Machine Interface)
- ACT satellite connector (Actuator)

Note: Satellite cards shall be connected to their matching satellite connectors only. (For e.g. COM satellite cards shall be connected to COM satellite connector only)

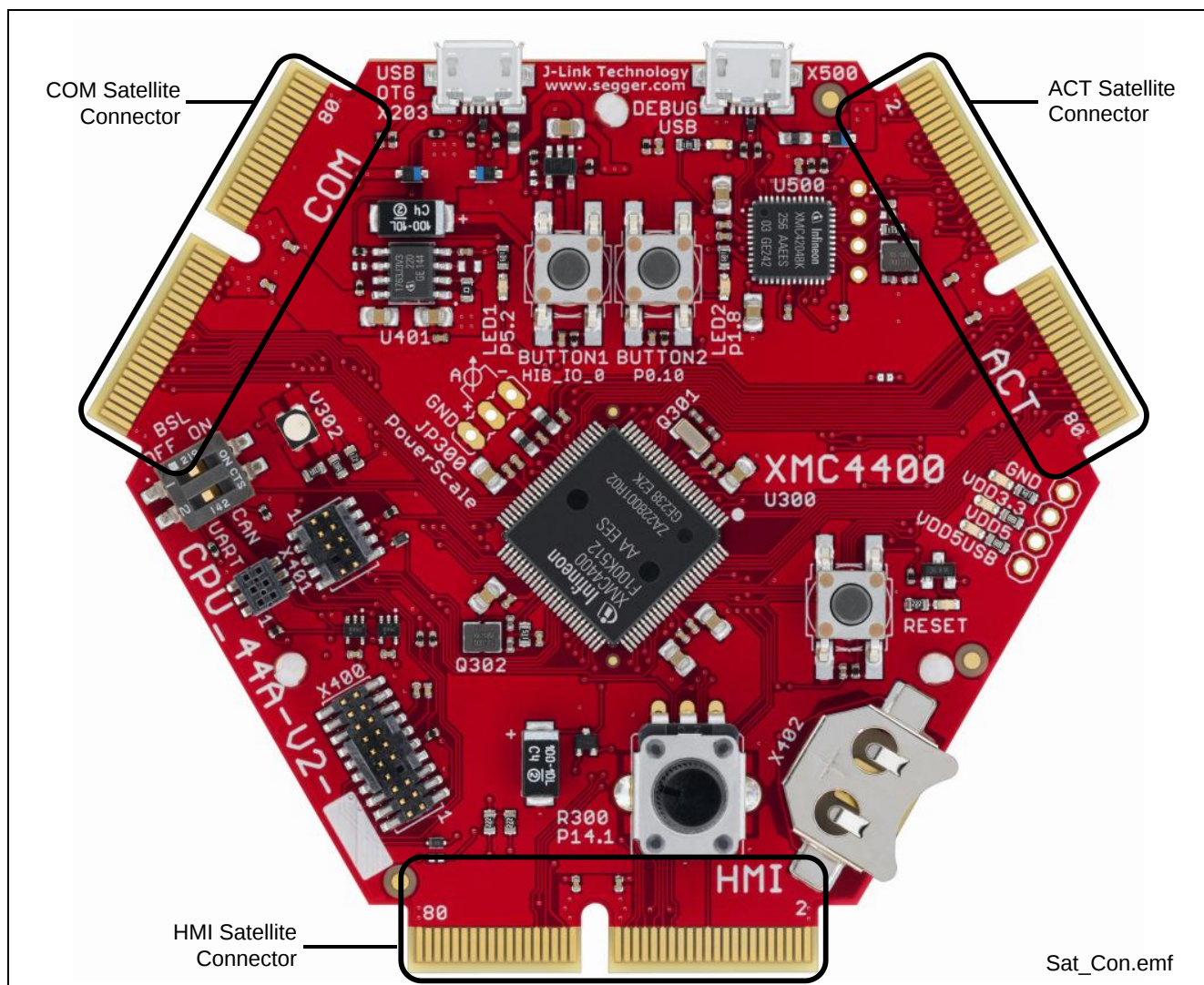


Figure 21 Satellite Connectors

2.11.1 COM Connector

The COM satellite connector on the CPU_44A-V2 board allows interface expansion through COM satellite cards (e.g. COM_ETH-V1)

CPU_44A-V2		Satellite Connector		CPU_44A-V2	
XMC Pin	XMC Function	Pin	Function	XMC Pin	XMC Function
VSS	GND	1	GND	VSS	GND
nc	nc	2	qSPI_D0	nc	nc
nc	nc	3	qSPI_D1	nc	nc
nc	nc	4	qSPI_D2	nc	nc
nc	nc	5	qSPI_D3	nc	nc
nc	nc	6	RSVD	nc	nc
nc	nc	7	RSVD	nc	nc
nc	nc	8	RSVD	nc	nc
nc	nc	9	RSVD	nc	nc
nc	nc	10	RSVD	nc	nc
nc	nc	11	RSVD	nc	nc
P2.3	ETH0_RXD1A	12	ETH_RMII	P2.3	ETH0_TXD1
P2.2	ETH0_RXD0A	13	ETH_RMII	P2.2	ETH0_TXD0
P2.0	ETH0_MDO	14	ETH_RMII	P2.0	ETH0_CRS_DVC
P2.7	ETH0_MDC	15	ETH_RMII	P2.7	ETH0_RXERA
P2.5	ETH0_TX_EN	16	ETH_RMII	P2.5	ETH0_CLK_RMIIIC
nc	nc	17	ETH_RMII	P15.8	GND
nc	nc	18	ETH_RMII	VSS	GND
nc	nc	19	ETH_RMII	nc	nc
nc	nc	20	ETH_RMII	nc	nc
nc	nc	21	ETH_RMII	nc	nc
nc	nc	22	ETH_RMII	nc	nc
nc	nc	23	RSVD	nc	nc
nc	nc	24	ASC_DIR	nc	nc
nc	nc	25	ASC_RXD	nc	nc
P1.5	U0CO_DX0A	26	CAN_TXD	P1.12	CAN_N1_TXD
P1.7	U0CO_DOUT0	27	CAN_RXD	P1.4	CAN_N1_RXDC
nc	nc	28	ASC_TXD	nc	nc
nc	nc	29	SPI_CSC0	nc	nc
nc	nc	30	SPI_CSC1	nc	nc
nc	nc	31	SPI_CSC2	nc	nc
nc	nc	32	SPI_CSC2	nc	nc
nc	nc	33	SPI_CSC2	nc	nc
nc	nc	34	SPI_CSC2	nc	nc
P2.14	U1CO_DX0B/DOUT0	35	I2C_SDA	P0.11	U1CO_SCLKOUT
nc	nc	36	COM_GPIOT1	P0.6	P0.6
nc	nc	37	COM_GPIOT0	RESET	RESET#
nc	nc	38	COM_GPIOT0	VDD5	VDD5
nc	nc	39	COM_GPIOT0	VDD5	VDD5
nc	nc	40	COM_GPIOT0	VDD5	VDD5
nc	nc	41	COM_GPIOT0	VDD5	VDD5
nc	nc	42	COM_GPIOT0	VDD5	VDD5
nc	nc	43	COM_GPIOT0	VDD5	VDD5
nc	nc	44	COM_GPIOT0	VDD5	VDD5
nc	nc	45	COM_GPIOT0	VDD5	VDD5
nc	nc	46	COM_GPIOT0	VDD5	VDD5
nc	nc	47	COM_GPIOT0	VDD5	VDD5
nc	nc	48	COM_GPIOT0	VDD5	VDD5
nc	nc	49	COM_GPIOT0	VDD5	VDD5
nc	nc	50	COM_GPIOT0	VDD5	VDD5
nc	nc	51	COM_GPIOT0	VDD5	VDD5
nc	nc	52	COM_GPIOT0	VDD5	VDD5
nc	nc	53	COM_GPIOT0	VDD5	VDD5
nc	nc	54	COM_GPIOT0	VDD5	VDD5
nc	nc	55	COM_GPIOT0	VDD5	VDD5
nc	nc	56	COM_GPIOT0	VDD5	VDD5
nc	nc	57	COM_GPIOT0	VDD5	VDD5
nc	nc	58	COM_GPIOT0	VDD5	VDD5
nc	nc	59	COM_GPIOT0	VDD5	VDD5
VSS	GND	60	GND	VSS	GND
nc	nc	61	EBU_AD	nc	nc
nc	nc	62	EBU_AD	nc	nc
nc	nc	63	EBU_AD	nc	nc
nc	nc	64	EBU_AD	nc	nc
nc	nc	65	EBU_AD	nc	nc
nc	nc	66	EBU_AD	nc	nc
nc	nc	67	EBU_AD	nc	nc
nc	nc	68	EBU_AD	nc	nc
nc	nc	69	EBU_AD	nc	nc
nc	nc	70	EBU_AD	nc	nc
nc	nc	71	EBU_AD	nc	nc
nc	nc	72	EBU_AD	nc	nc
nc	nc	73	EBU_AD	nc	nc
nc	nc	74	EBU_AD	nc	nc
nc	nc	75	EBU_AD	nc	nc
nc	nc	76	EBU_AD	nc	nc
nc	nc	77	EBU_AD	nc	nc
VSS	GND	78	GND	VSS	GND
		79	GND		
		80	GND		
		COM			

Figure 22 Satellite Connector Type COM

2.11.2 HMI Connector

The HMI satellite connector on the CPU_44A-V2 board allows interface expansion through HMI satellite cards.

CPU_44A-V2		Satellite Connector		CPU_44A-V2	
XMC Pin	XMC Function	Pin	Function	XMC Pin	XMC Function
VSS	GND	1	GND	VSS	GND
nc	nc	2	MMC_nRST	nc	nc
nc	nc	3	MMC_DATA0	nc	nc
nc	nc	4	MMC_DATA1	nc	nc
nc	nc	5	MMC_DATA2	nc	nc
nc	nc	6	MMC_DATA3	nc	nc
nc	nc	7	MMC_DATA4	nc	nc
nc	nc	8	MMC_DATA5	nc	nc
nc	nc	9	MMC_DATA6	nc	nc
nc	nc	10	MMC_DATA7	nc	nc
nc	nc	11	MMC_CMD	nc	nc
nc	nc	12	MMC_LED	nc	nc
nc	nc	13	MMC_nSDCD	nc	nc
nc	nc	14	RSVD	nc	nc
nc	nc	15	RSVD	nc	nc
nc	nc	16	RSVD	nc	nc
nc	nc	17	RSVD	nc	nc
nc	nc	18	RSVD	nc	nc
nc	nc	19	RSVD	nc	nc
nc	nc	20	RSVD	nc	nc
nc	nc	21	RSVD	nc	nc
nc	nc	22	RSVD	nc	nc
nc	nc	23	AudioRST	nc	nc
nc	nc	24	OLED_CMD	nc	nc
nc	nc	25	I2S_MTSR	nc	nc
nc	nc	26	I2S_WA	nc	nc
nc	nc	27	I2S_MCLK	nc	nc
nc	nc	28	I2S_MRST	nc	nc
nc	nc	29	I2S_SYNCCLK	nc	nc
P1.13	U0C1_SELO3	30	I2S_SCLK	P3.5	U0C1_DOUT0
nc	nc	31	SPI_MTSR	nc	nc
nc	nc	32	SPI_CSH0	nc	nc
nc	nc	33	SPI_CSH1	P4.0	U0C1_DX0E
nc	nc	34	SPI_MRST	nc	nc
nc	nc	35	SPI_SCLK	nc	nc
P2.14	U1CO_DX0D/DOUT0	36	SPI_SCLK	nc	nc
nc	nc	37	I2C_SDA	P0.11	U1CO_SCLKOUT
nc	nc	38	I2C_SCL	nc	nc
nc	nc	39	HMI_GPIO1	P0.6	PO.6
nc	nc	40	HMI_GPIO0	nc	nc
nc	nc	41	RESET	nc	nc
nc	nc	42	RESET	nc	nc
nc	nc	43	VDD5	nc	nc
nc	nc	44	VDD5	nc	nc
VAGND	AGND	45	VDD5	VAGND	AGND
nc	nc	46	VDD5	nc	nc
nc	nc	47	AREF	nc	nc
nc	nc	48	DAC1/ADCO	VAREF	VAREF
nc	nc	49	DAC0/ADC1	nc	nc
nc	nc	50	ADC3/ORCO	nc	nc
P14.12	VADC_G1CH4	51	ADC2/DACREF	VADC_G0CH4	P14.4
nc	nc	52	ADC15	VADC_G0CH3	P14.3
nc	nc	53	ADC17	nc	nc
nc	nc	54	ADC19	nc	nc
nc	nc	55	RSVD	nc	nc
nc	nc	56	RSVD	nc	nc
nc	nc	57	RSVD	nc	nc
nc	nc	58	RSVD	nc	nc
nc	nc	59	RSVD	nc	nc
nc	nc	60	RSVD	nc	nc
nc	nc	61	RSVD	nc	nc
nc	nc	62	RSVD	nc	nc
nc	nc	63	RSVD	nc	nc
nc	nc	64	TPx1	nc	nc
nc	nc	65	TPx0	nc	nc
nc	nc	66	COL3	nc	nc
nc	nc	67	COL2	nc	nc
nc	nc	68	COL1	nc	nc
nc	nc	69	COL0	nc	nc
nc	nc	70	COLA	nc	nc
nc	nc	71	COLA	nc	nc
nc	nc	72	COLA	nc	nc
nc	nc	73	COLA	nc	nc
nc	nc	74	COLA	nc	nc
nc	nc	75	COLA	nc	nc
nc	nc	76	COLA	nc	nc
nc	nc	77	COLA	nc	nc
VSS	GND	78	GND	VSS	GND
		79	GND		
		80	GND		

Figure 23 Satellite Connector Type HMI

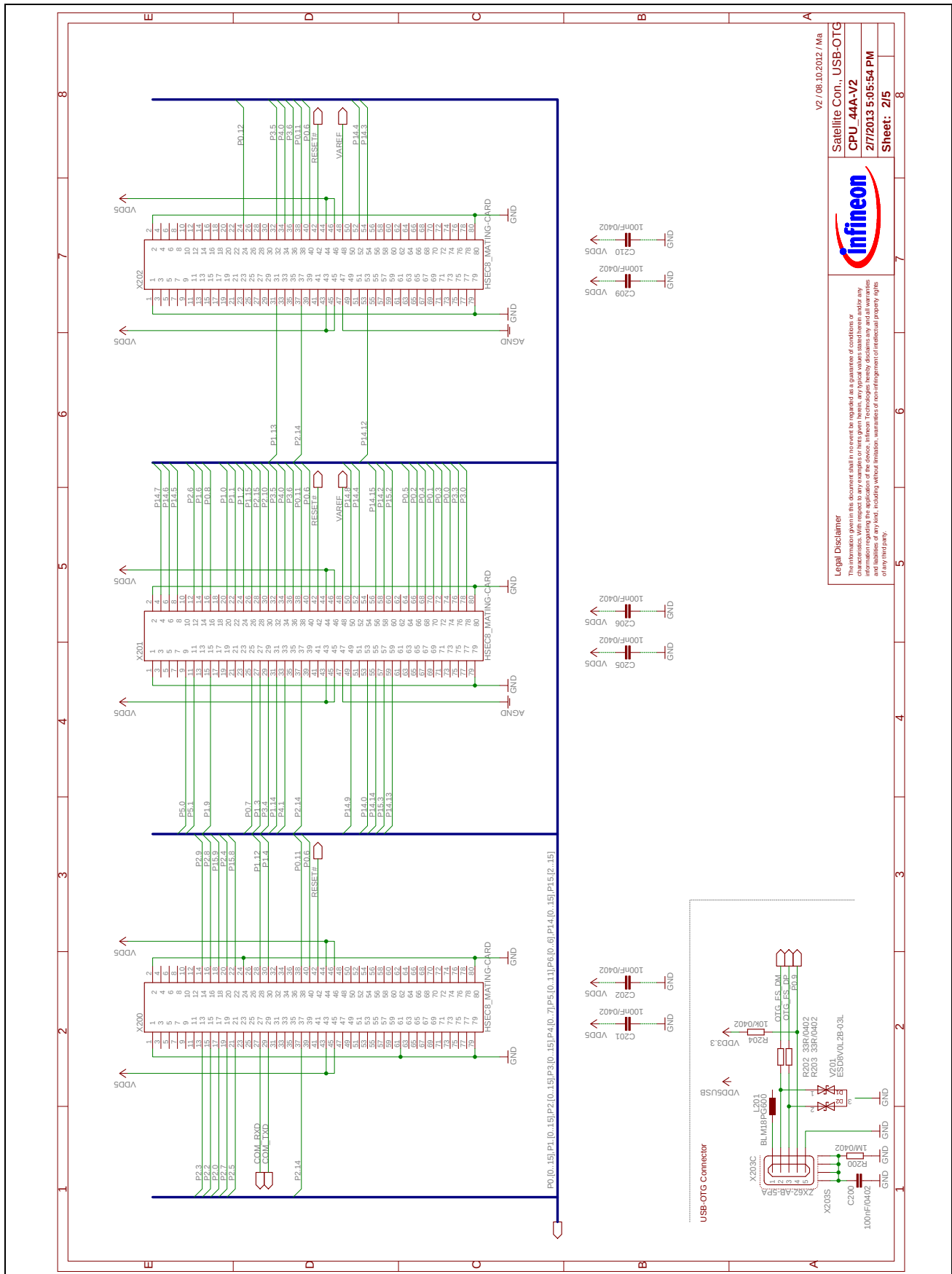


Figure 25 Satellite Connectors, USB-OTG

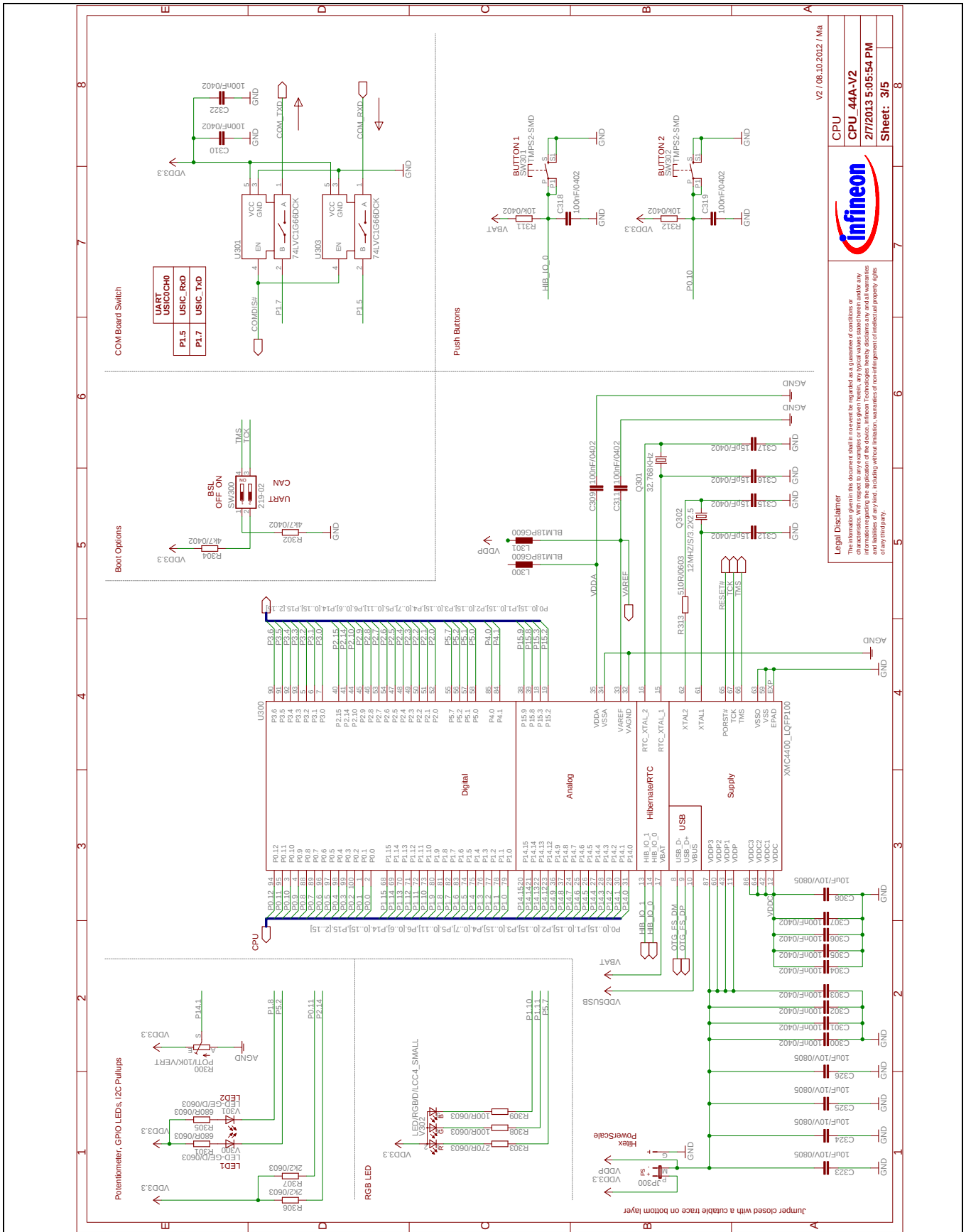


Figure 26 XMC4400

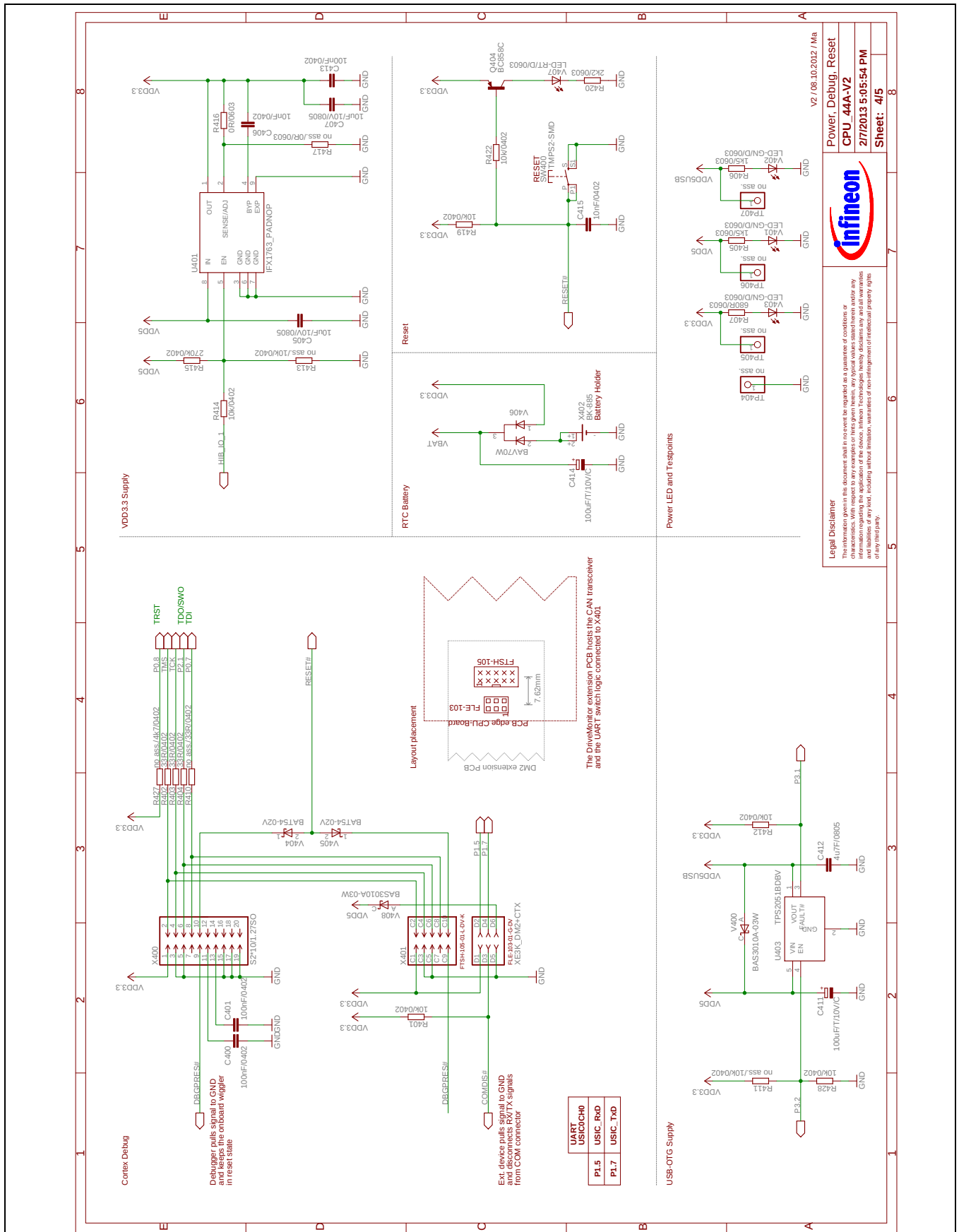


Figure 27 Power, Debug Connectors, Reset

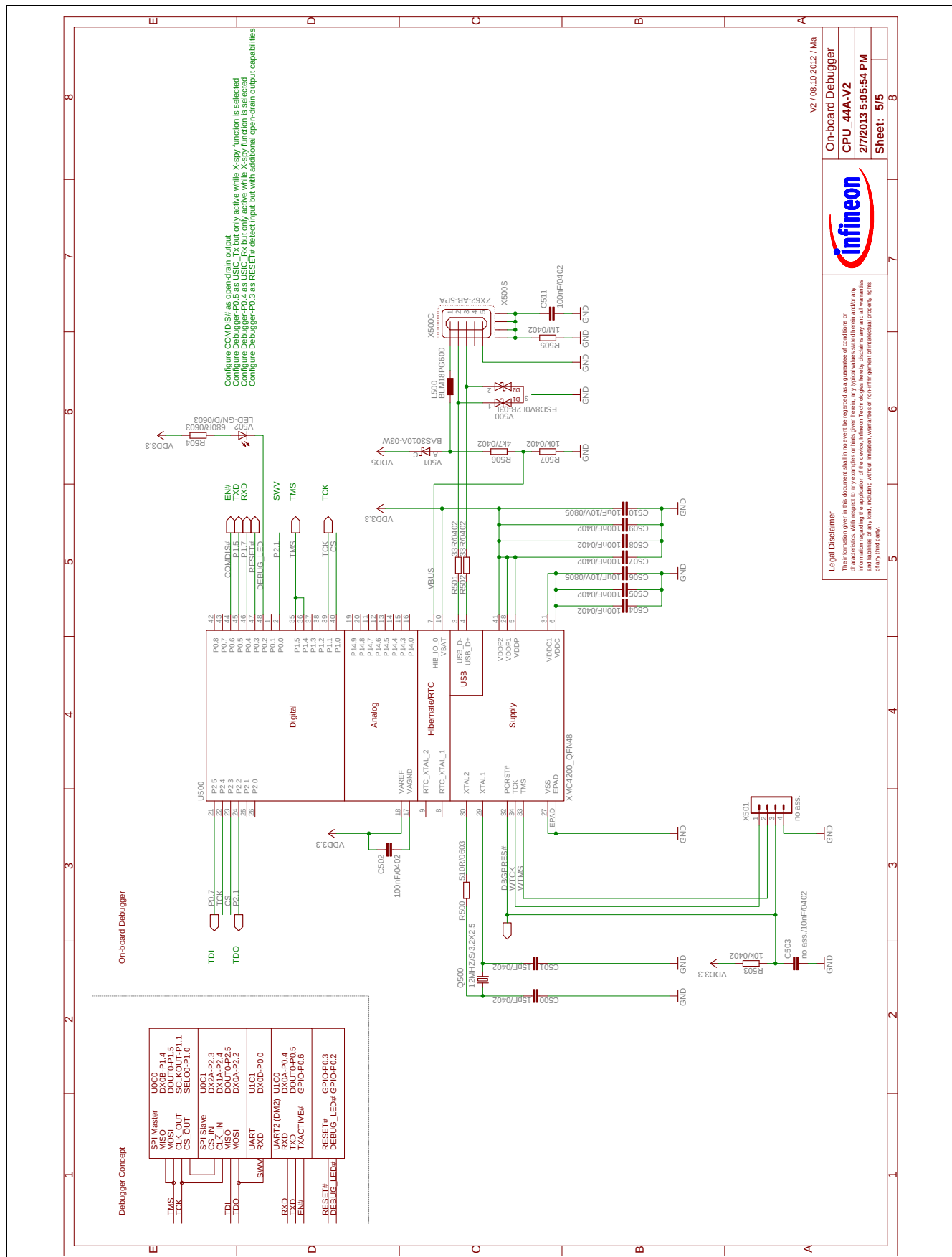


Figure 28 On-board Debugger

3.2 Component Placement and Geometry

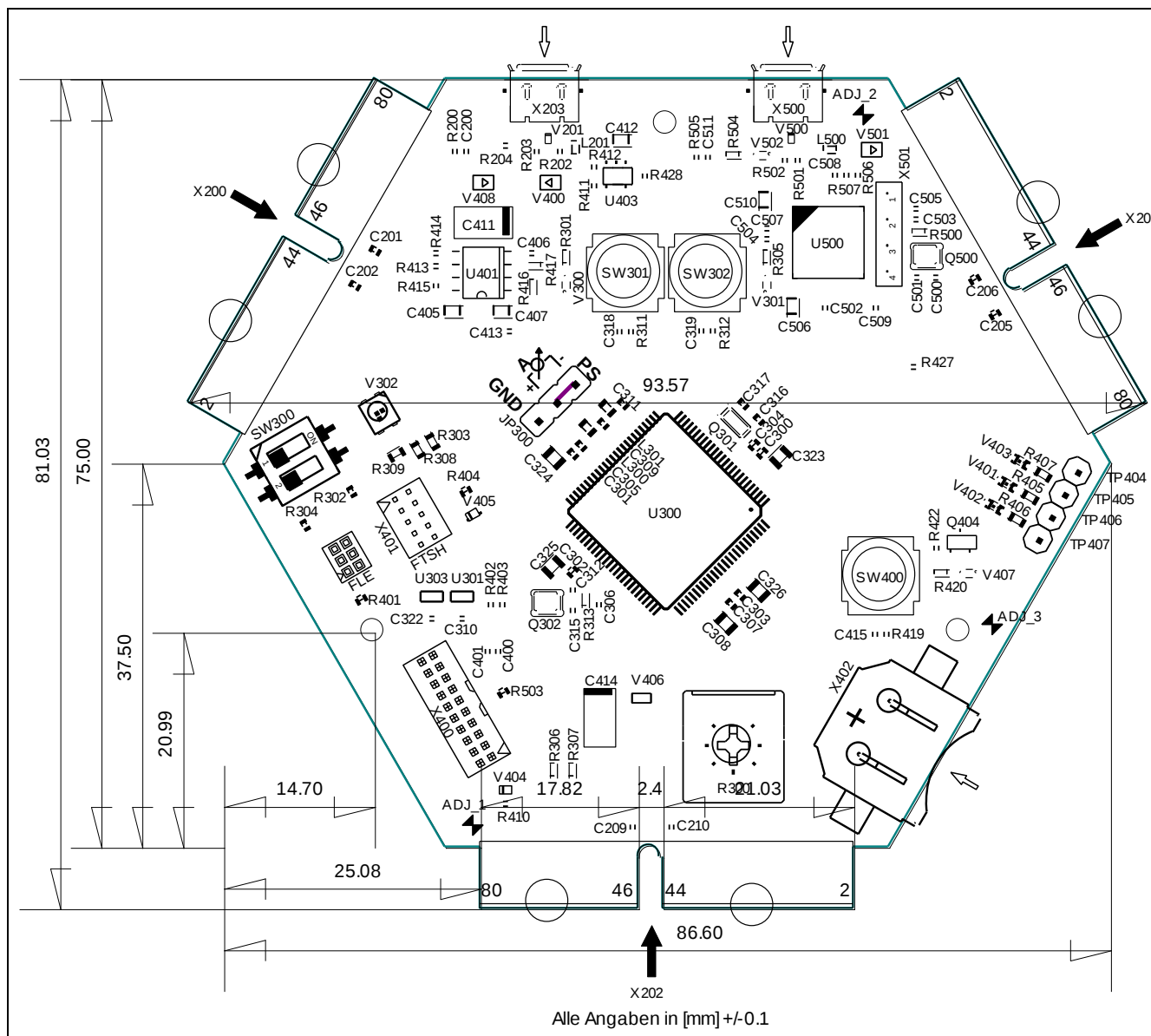


Figure 29 Component Placement and Geometry

3.3 Bill of Material (BOM)

Table 11 BOM of CPU_44A-V2 Board

Pos. No.	Qty	Value	Device	Reference Des.
1	1	0R/0603	Resistor	R416
2	2	1M/0402	Resistor	R200, R505
3	2	1k5/0603	Resistor	R405, R406
4	3	2k2/0603	Resistor	R306, R307, R420
5	3	4k7/0402	Resistor	R302, R304, R506
6	1	4u7F/0805	Capacitor, ceramic	C412
7	11	10k/0402	Resistor	R204, R311, R312, R401, R412, R414, R419, R422, R428, R503, R507
8	2	10nF/0402	Capacitor	C406, C415
9	9	10uF/10V/0805	Capacitor, ceramic	C308, C323, C324, C325, C326, C405, C407, C506, C510
10	2	12MHZ/S/3.2X2.5	Crystal, NX3225GD, NDK	Q302, Q500
11	6	15pF/0402	Capacitor	C312, C315, C316, C317, C500, C501
12	1	32.768KHz	Crystal, NX3215SA, NDK	Q301
13	5	33R/0402	Resistor	R402, R403, R404, R501, R502
14	2	33R/0402	Resistor	R202, R203
15	2	74LVC1G66DCK	IC, Single Analog Switch	U301, U303
16	2	100R/0603	Resistor	R308, R309
17	31	100nF/0402	Capacitor	C200, C201, C202, C205, C206, C209, C210, C300, C301, C302, C303, C304, C305, C306, C307, C309, C310, C311, C318, C319, C322, C400, C401, C413, C502, C504, C505, C507, C508, C509, C511
18	2	100uF/T/10V/C	Capacitor, bipolar	C411, C414
19	1	219-02	Dual DIP-Switch, 0.1" SMD	SW300
20	1	270R/0603	Resistor	R303
21	1	270k/0402	Resistor	R415
22	2	510R/0603	Resistor	R313, R500
23	4	680R/0603	Resistor	R301, R305, R407, R504
24	3	BAS3010A-03W	Diode, SOD323, Infineon	V400, V408, V501
25	2	BAT54-02V	Diode, SC79, Infineon	V404, V405
26	1	BAV70W	Diode, SOT323, Infineon	V406
27	1	BC858C	Transistor, SOT23-3, Infineon	Q404
28	1	BK-885	Battery Holder, 12mm Coin Cell	X402
29	4	BLM18PG600	Ferrite Bead, 0603, Murata	L201, L300, L301, L500
30	2	ESD8V0L2B-03L	Diode, TSLP-3-1, Infineon	V201, V500
31	3	FIDUCIAL	FIDUCIAL	ADJ_1, ADJ_2, ADJ_3
32	3	HSEC8_MATING-CARD	Connector, Edgecard, Samtec	X200, X201, X202
33	1	IFX1763-3.3	Voltage Regulator, 3.3V LDO, Infineon	U401
34	2	LED-GE/D/0603	LED, yellow	V300, V301
35	4	LED-GN/D/0603	LED, green	V401, V402, V403, V502
36	1	LED-RT/D/0603	LED, red	V407
37	1	LED/RGB/D/LCC4_SMALL	LED, RGB, LCC4_SMALL	V302
38	1	POTI/10K/VERT	Potentiometer, K09K1130A8G, ALPS	R300
39	1	S2*10/1.27SO	Connector, FTSH-110-01-L-DV-K-P, Samtec	X400

Table 11 BOM of CPU_44A-V2 Board

Pos. No.	Qty	Value	Device	Reference Des.
40	3	TMPS2-SMD	Switch, tactile	SW301, SW302, SW400
41	1	TPS2051BDBV	IC, Power Switch	U403
42	1	XE3K_DM2+CTX	Connector, FTSH-105-01-LM-DV-K, without pin 7, Samtec Connector, FLE-103-01-G-DV, Samtec	X401
43	1	XMC4200_QFN48	IC, XMC4200, QFN48, Infineon	U500
44	1	XMC4400_LQFP100	IC, XMC4400, LQFP100, Infineon	U300
45	2	ZX62-AB-5PA	Connector, Micro-USB, Hirose	X203, X500
46	1	no ass.	Pinheader, 4-pin, 0.1" TH	X501
47	4	no ass.	Pinheader, 1-pin, 0.1" TH	TP404, TP405, TP406, TP407
48	1	no ass./0R/0603	Resistor	R417
49	1	no ass./4k7/0402	Resistor	R427
50	2	no ass./10k/0402	Resistor	R411, R413
51	1	no ass./10nF/0402	Capacitor	C503
52	1	no ass./33R/0402	Resistor	R410
53	1	no ass.	Pinheader, 3-pin, 0.1" TH, Hitex PowerScale	JP300

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