



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)

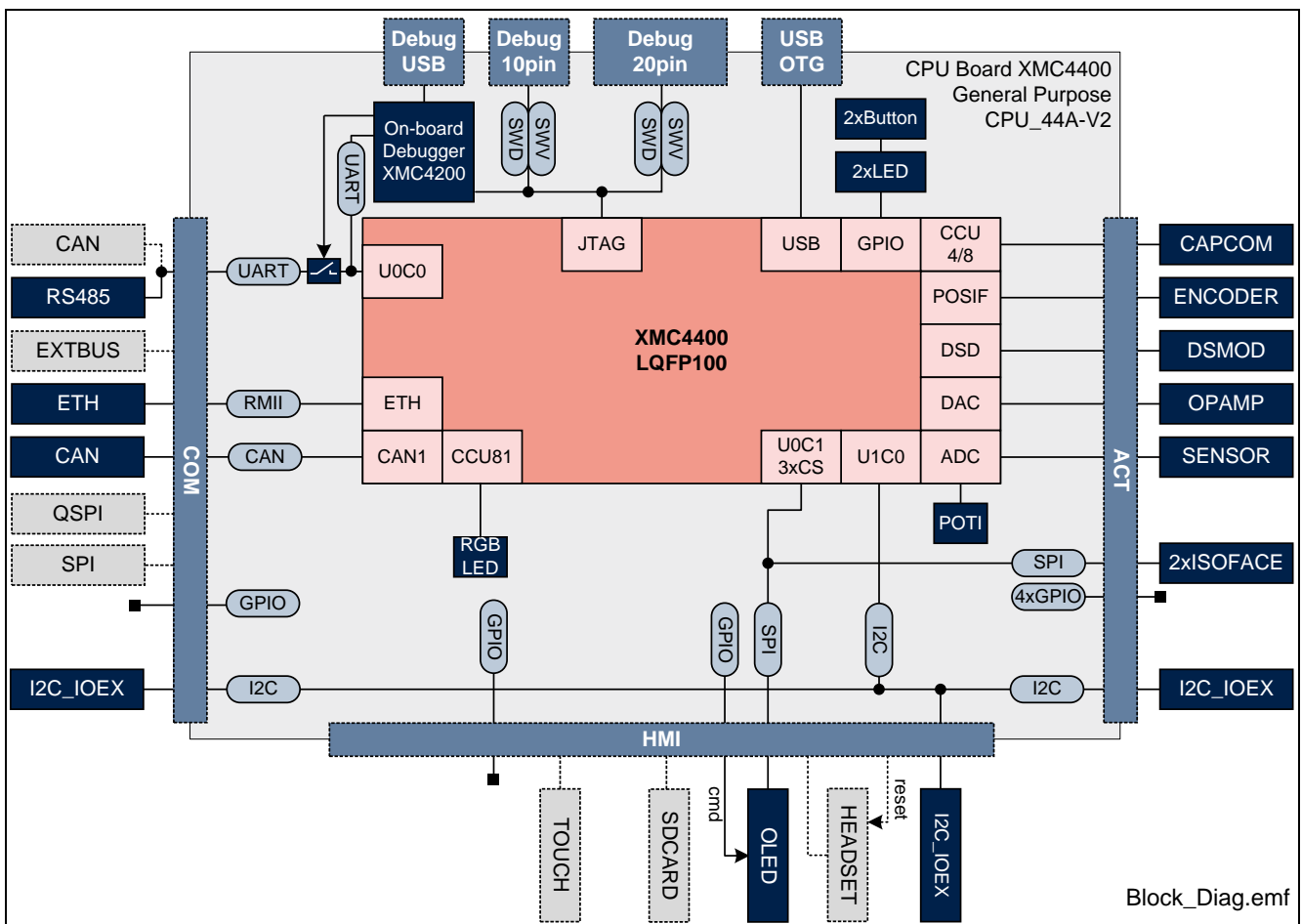


Figure 1 CPU_44A-V2 Board Block Diagram

2 Hardware Description

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

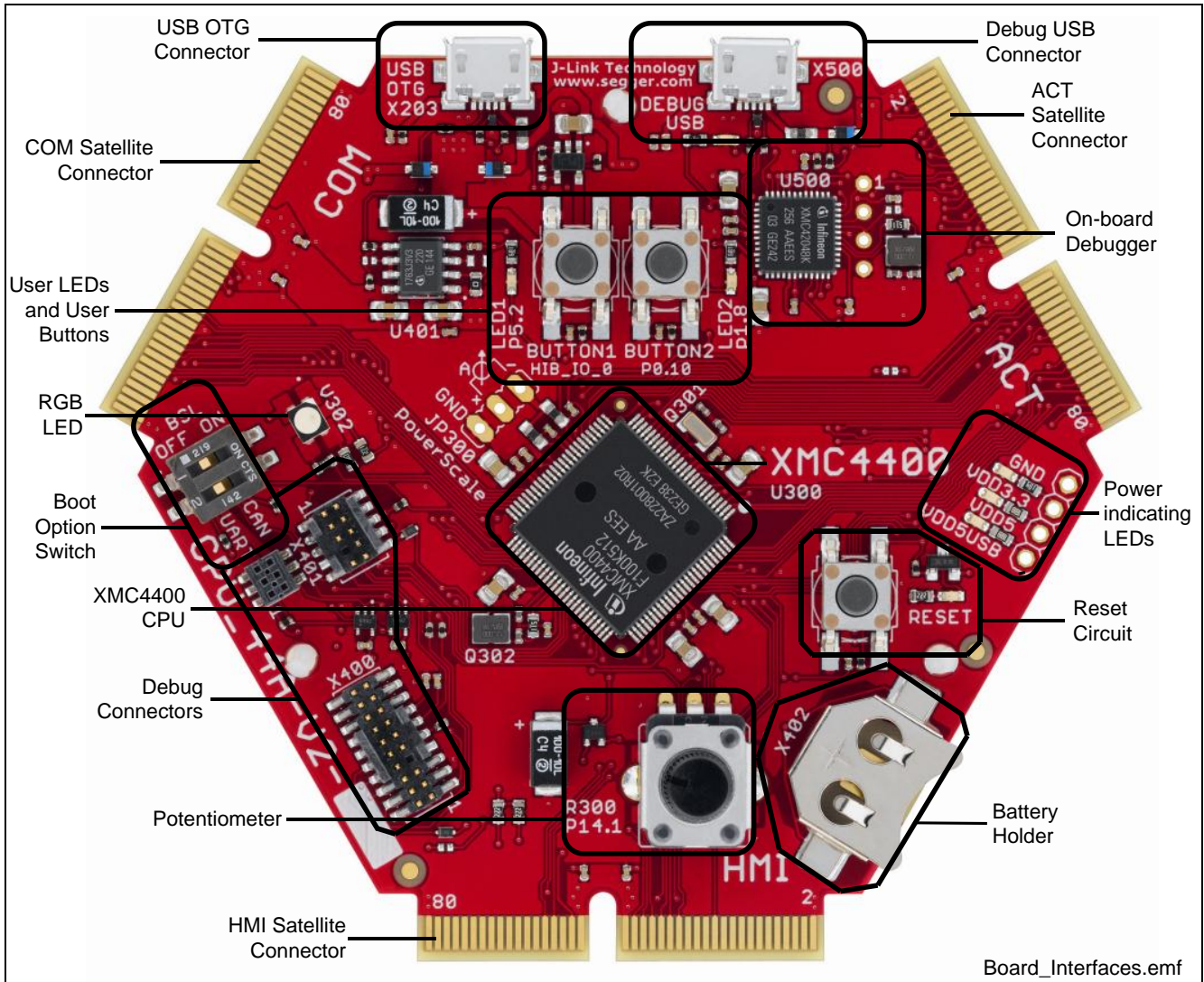


Figure 2 CPU Board XMC4400 General Purpose (CPU_44A-V2)

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.

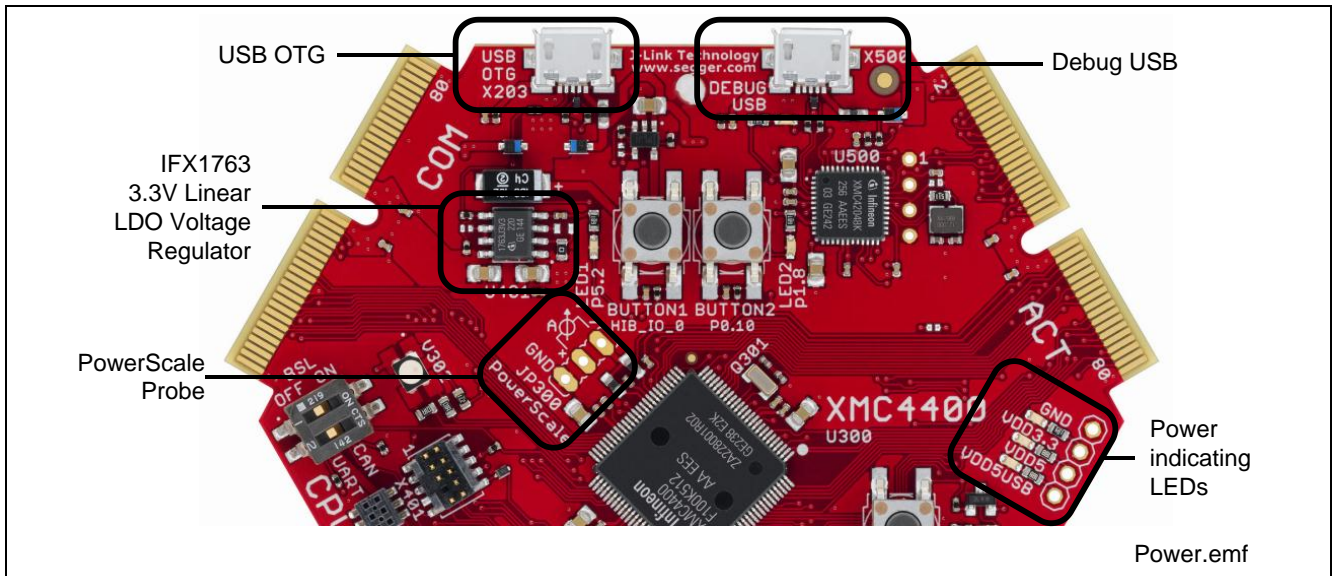


Figure 3 Powering Option

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"

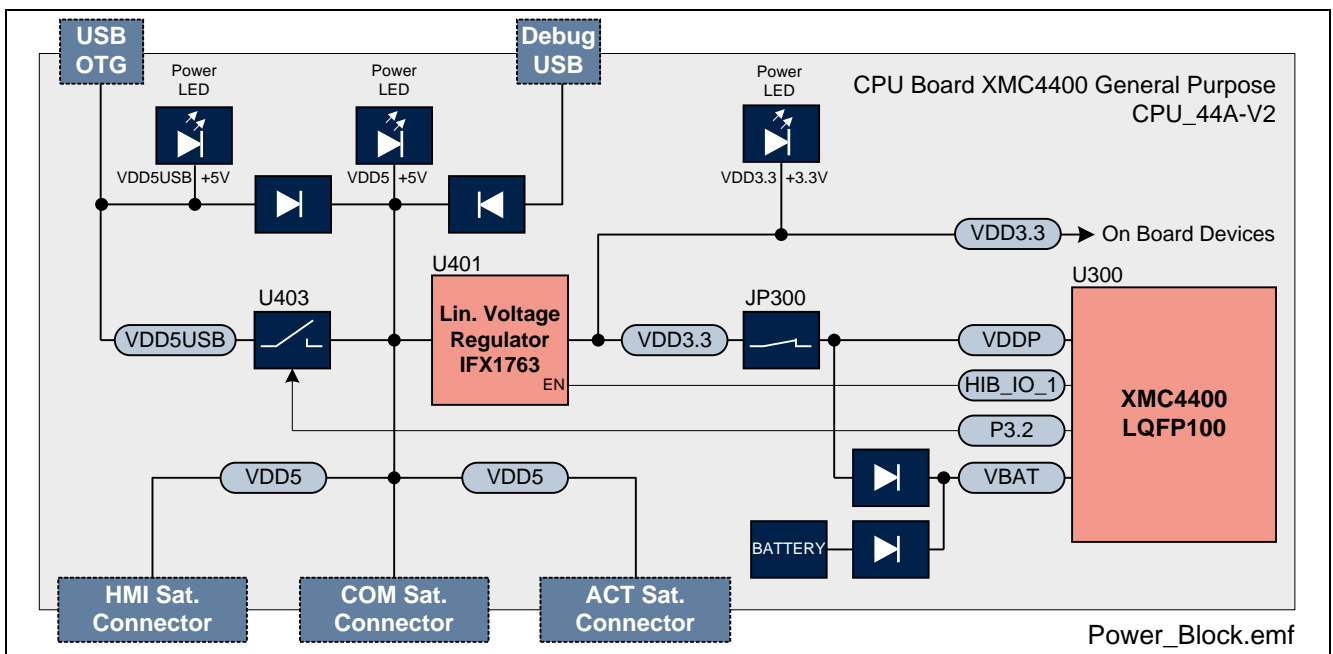


Figure 4 Block Diagram Of Power Supply

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.

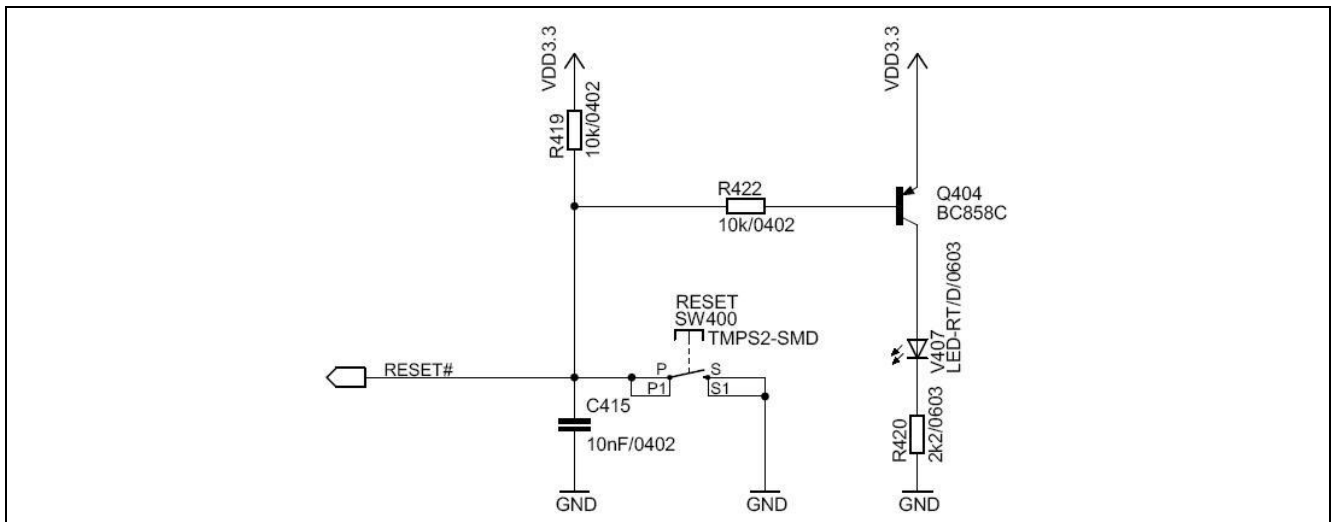


Figure 5 Reset Circuit

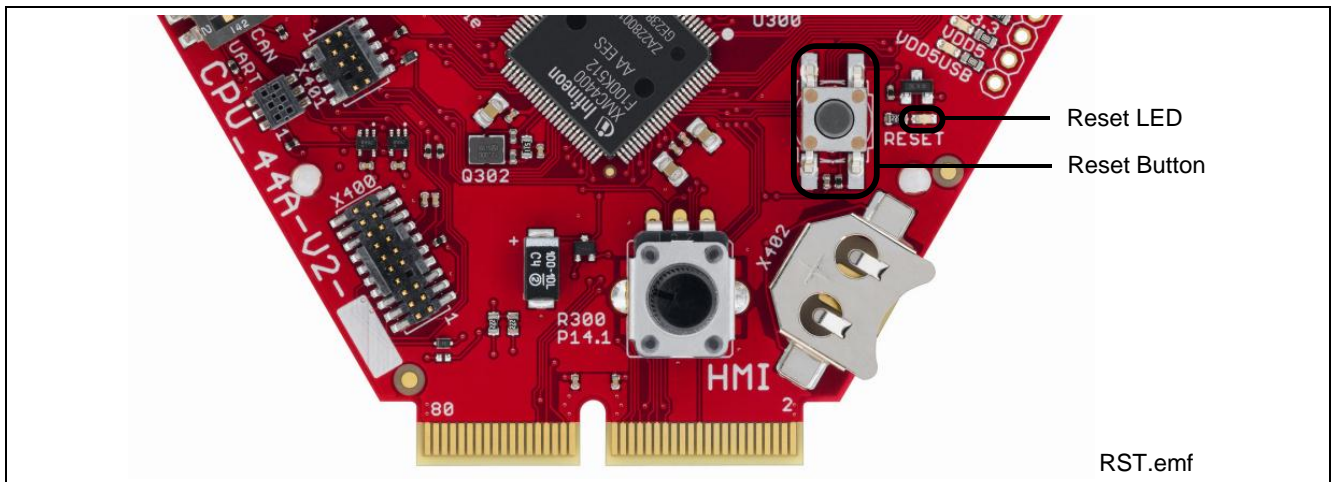


Figure 6 Reset LED and Reset Button

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.

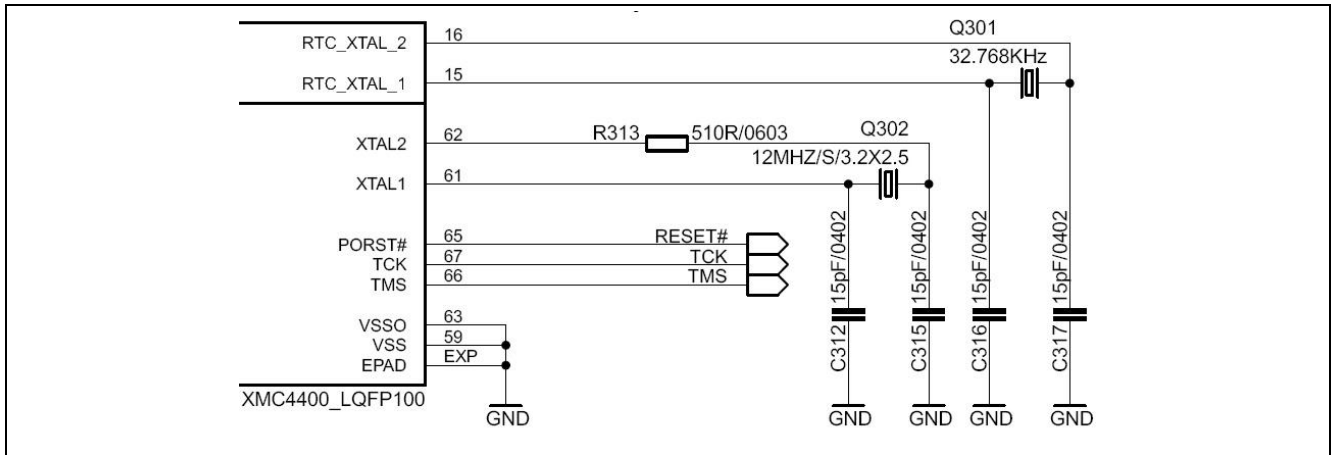


Figure 7 Clock Generation

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)

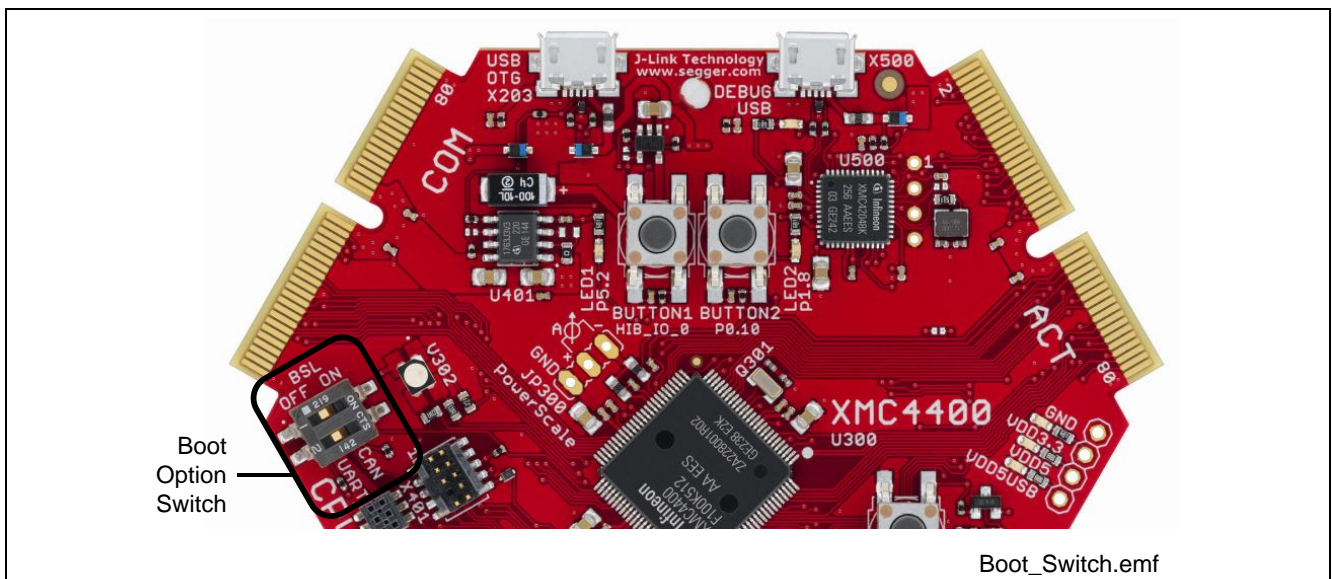


Figure 8 Boot Options Switch

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)

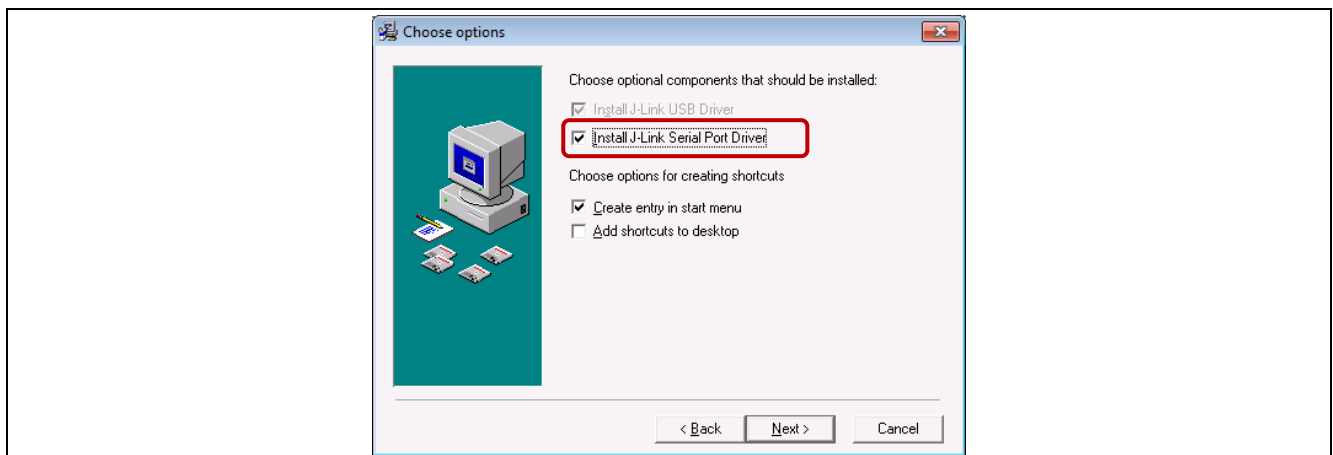


Figure 9 Installation of Serial Port Driver

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.

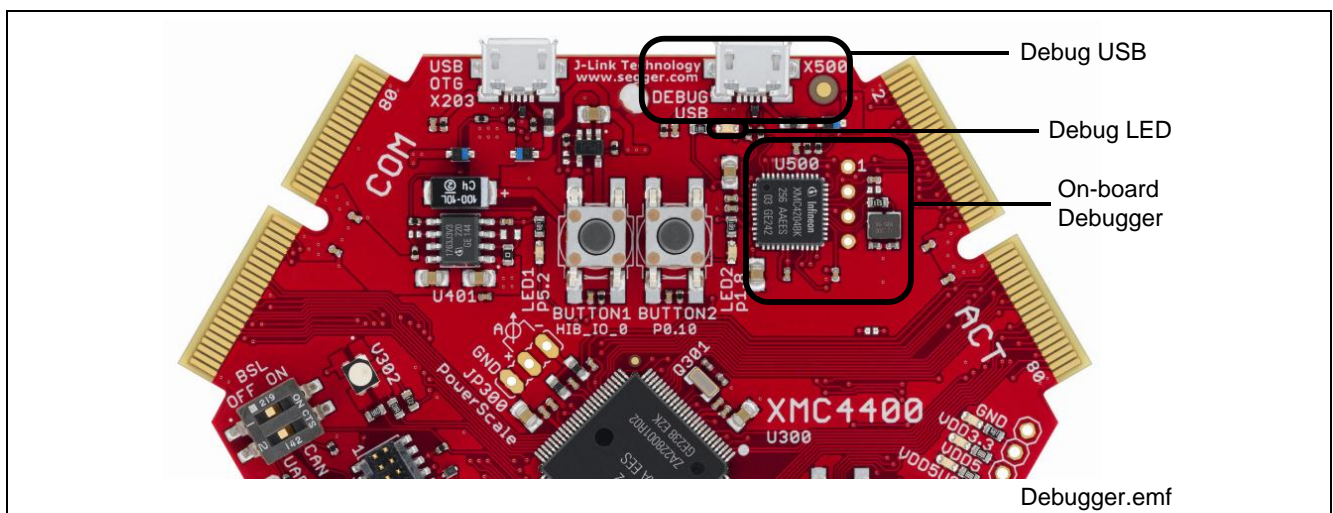


Figure 10 On-Board USB Debugger

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.

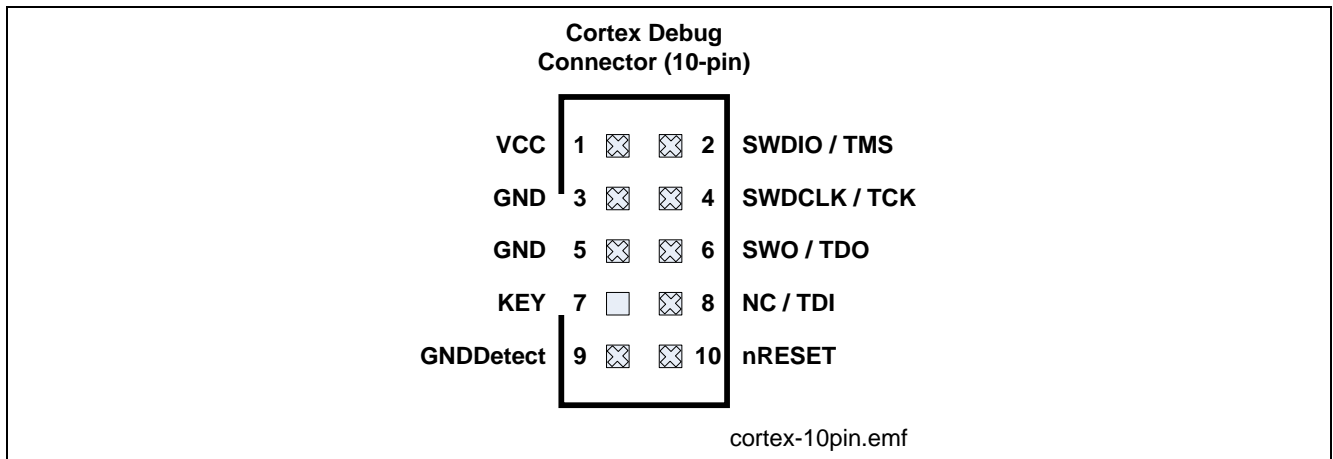


Figure 11 Cortex Debug Connector (10-pin)

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)

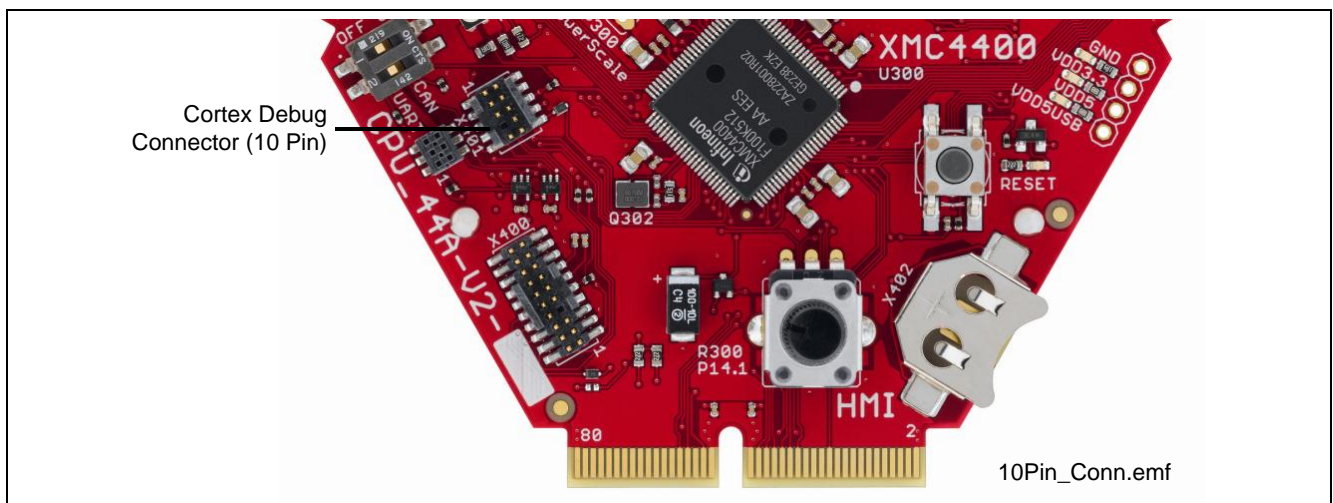


Figure 12 Cortex Debug Connector (10-pin) Layout

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.

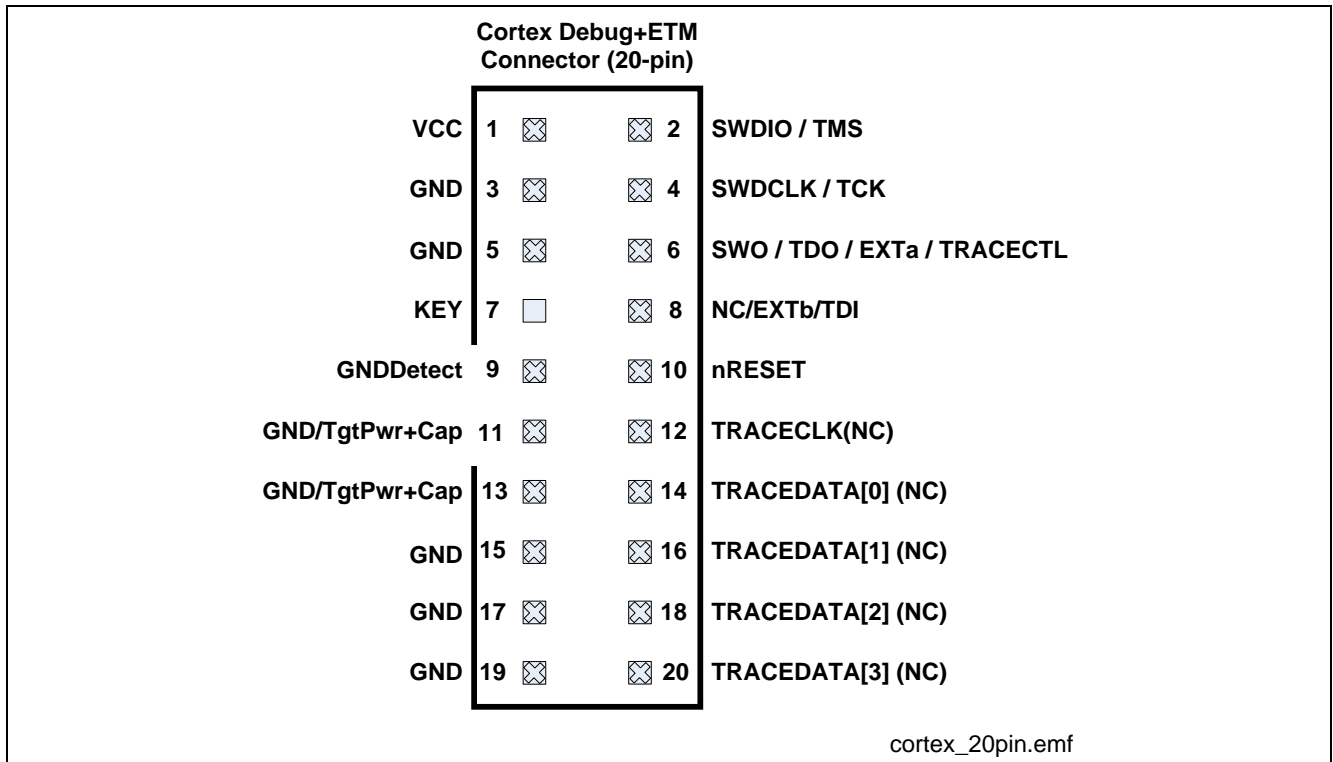


Figure 13 Cortex Debug+ETM Connector (20-pin)

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.

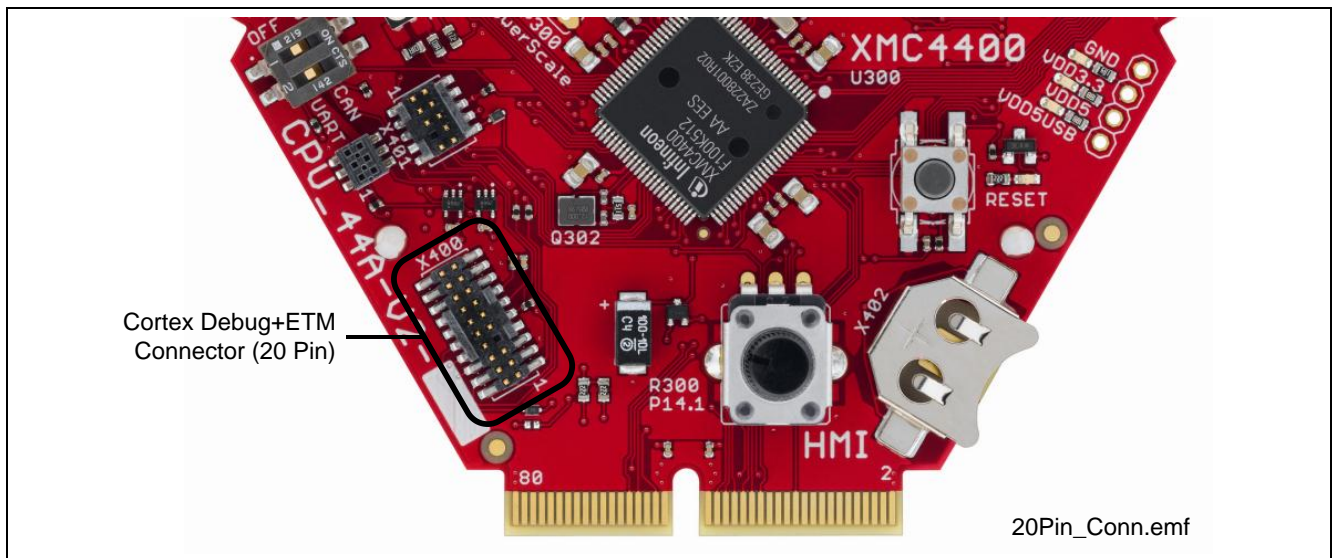


Figure 14 Cortex Debug+ETM Connector (20-pin) Layout

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

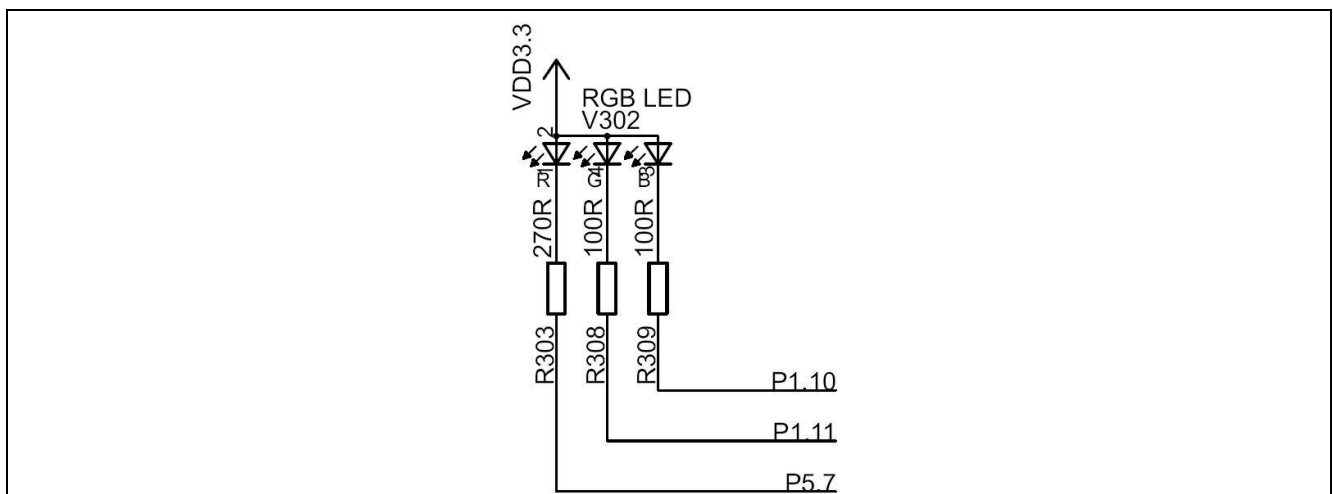


Figure 15 RGB LED

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.

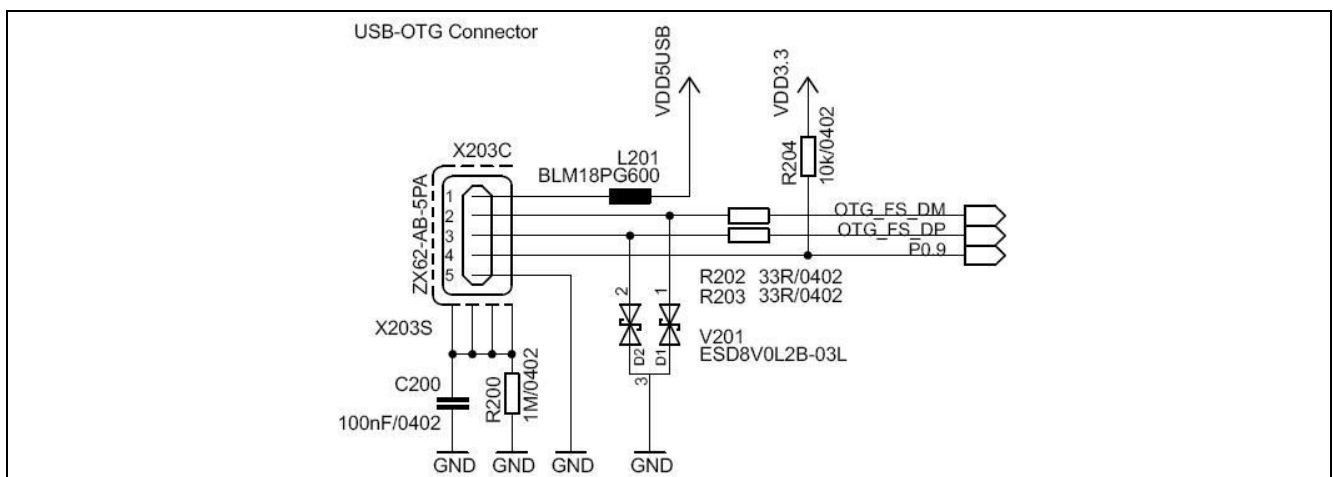


Figure 16 USB Connector

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

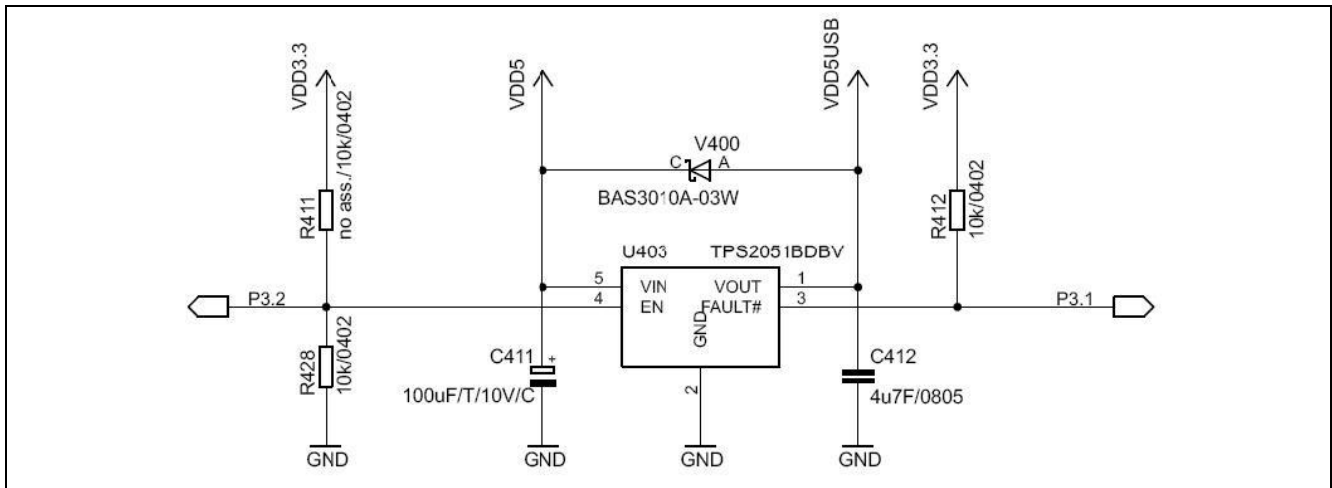


Figure 17 USB power generation - Host/OTG mode

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.

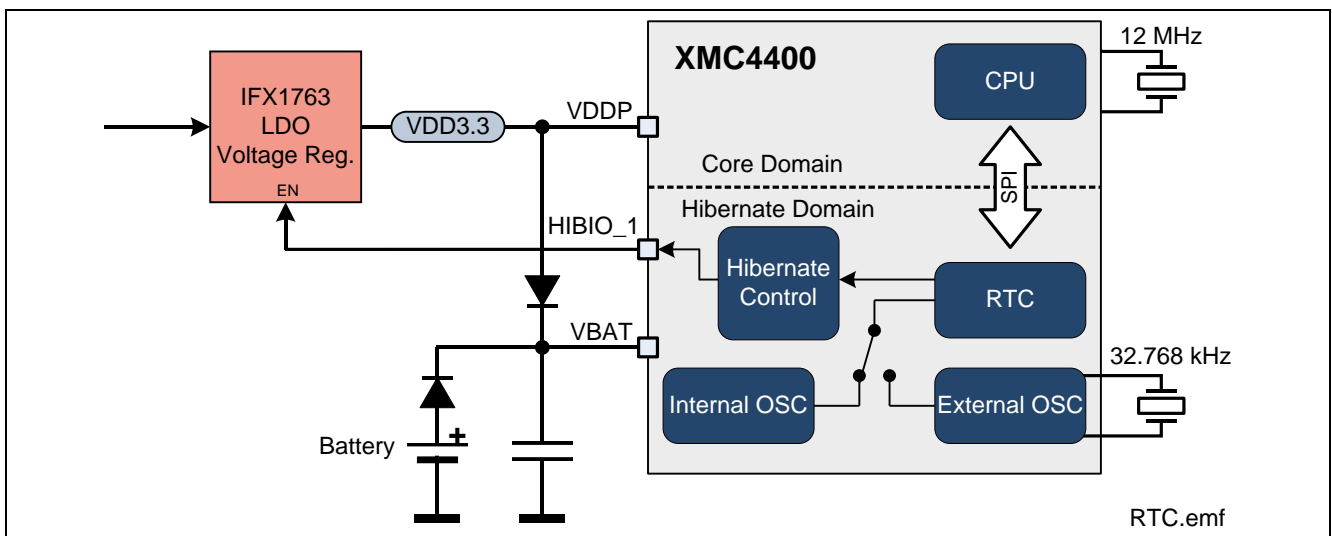


Figure 19 XMC4400 Power Domains and Real Time Clock

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

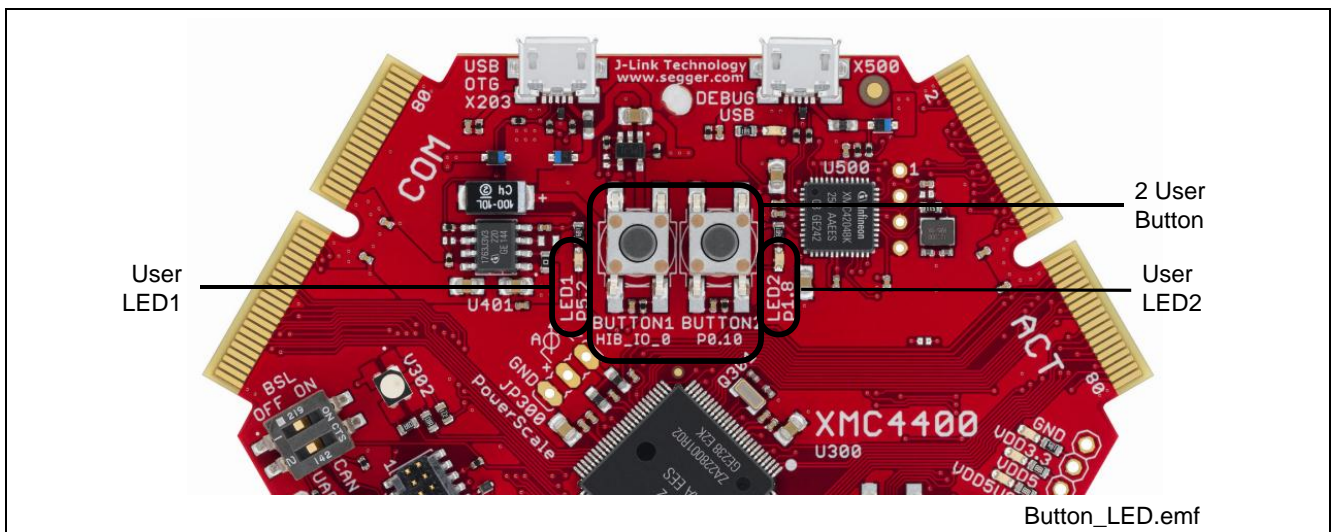


Figure 20 User LEDs and User Buttons

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)

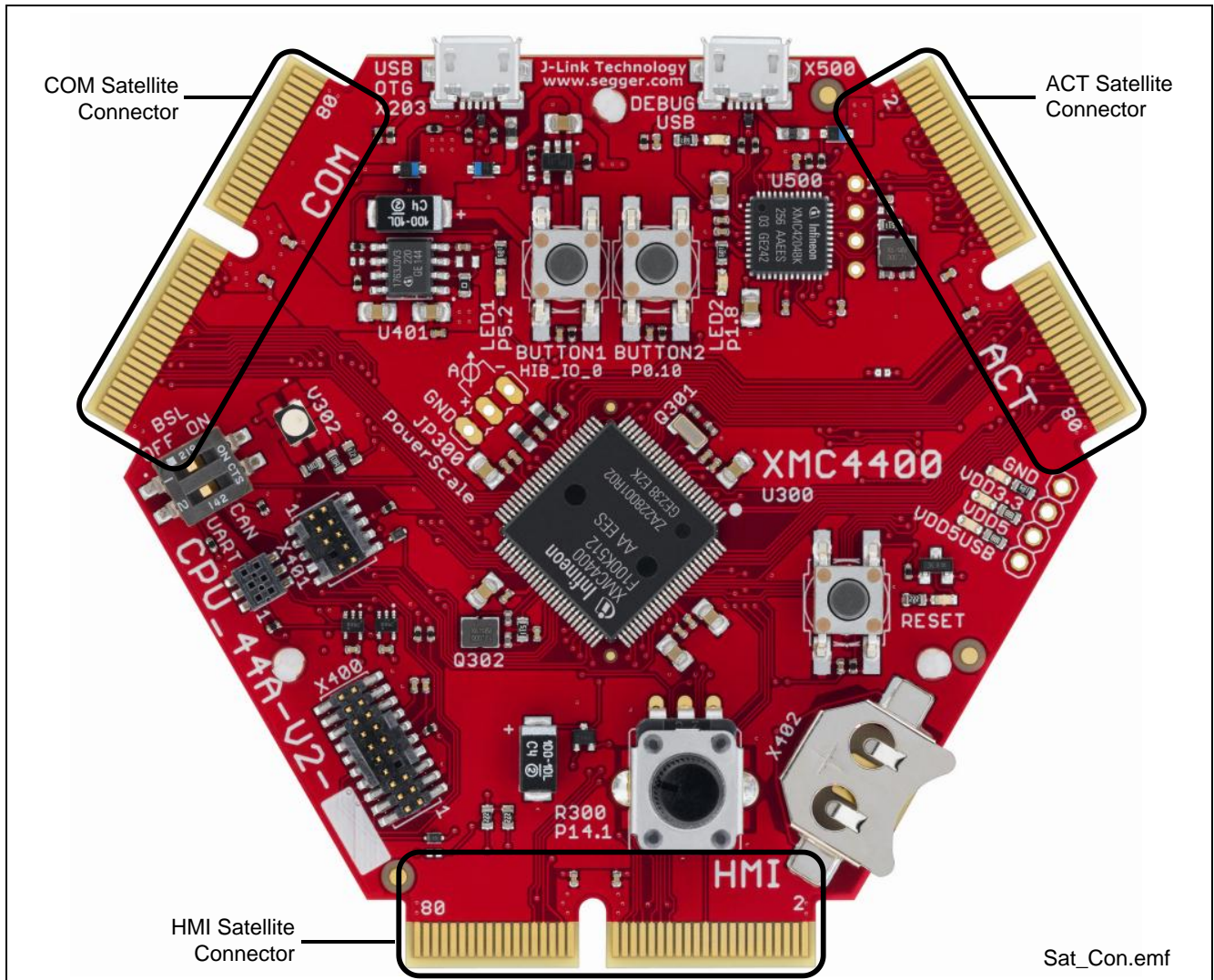


Figure 21 Satellite Connectors

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
		COM			
		1	GND	46	VDD5
		2	GND	47	VDD5
		3	qSPI_SCLK	48	EBU_ADV
		4	qSPI_D0	49	EBU_WR
		5	qSPI_D1	50	EBU_RD
		6	qSPI_D2	51	EBU_AD
		7	qSPI_D3	52	EBU_AD
		8	qSPI_CS	53	EBU_AD
		9	qSPI_CS	54	EBU_AD
		10	RSVD	55	EBU_AD
		11	RSVD	56	EBU_AD
		12	RSVD	57	EBU_CS
		13	RSVD	58	EBU_CS
		14	ETH_RMII	59	EBU_CS
		15	ETH_RMII	60	EBU_CS
		16	ETH_RMII	61	GND
		17	ETH_RMII	62	EBU_A
		18	ETH_RMII	63	EBU_A
		19	ETH_RMII	64	EBU_A
		20	ETH_RMII	65	EBU_A
		21	ETH_RMII	66	EBU_A
		22	ETH_RMII	67	EBU_A
		23	ETH_RMII	68	EBU_A
		24	GND	69	EBU_A
		25	RSVD	70	EBU_A
		26	RSVD	71	EBU_A
		27	CAN_TXD	72	EBU_A
		28	CAN_TXD	73	EBU_A
		29	CAN_RXD	74	EBU_A
		30	CAN_RXD	75	EBU_A
		31	SPI_MTSR	76	EBU_A
		32	SPI_MTSR	77	EBU_A
		33	SPI_MRST	78	EBU_A
		34	SPI_MRST	79	EBU_A
		35	SPI_SCLK	80	GND
		36	SPI_SCLK	81	GND
		37	I2C_SCL	82	GND
		38	I2C_SCL	83	GND
		39	GPIO	84	GND
		40	GPIO	85	GND
		41	RESET	86	GND
		42	RESET	87	GND
		43	VDD5	88	GND
		44	VDD5	89	GND
		45	VDD5	90	GND
		46	VDD5	91	GND
		47	EBU_AD	92	GND
		48	EBU_AD	93	GND
		49	EBU_AD	94	GND
		50	EBU_AD	95	GND
		51	EBU_AD	96	GND
		52	EBU_AD	97	GND
		53	EBU_AD	98	GND
		54	EBU_AD	99	GND
		55	EBU_AD	100	GND
		56	EBU_AD	101	GND
		57	EBU_AD	102	GND
		58	EBU_AD	103	GND
		59	EBU_AD	104	GND
		60	EBU_AD	105	GND
		61	GND	106	GND
		62	EBU_AD	107	GND
		63	EBU_AD	108	GND
		64	EBU_AD	109	GND
		65	EBU_AD	110	GND
		66	EBU_AD	111	GND
		67	EBU_AD	112	GND
		68	EBU_AD	113	GND
		69	EBU_AD	114	GND
		70	EBU_AD	115	GND
		71	EBU_AD	116	GND
		72	EBU_AD	117	GND
		73	EBU_AD	118	GND
		74	EBU_AD	119	GND
		75	EBU_AD	120	GND
		76	EBU_AD	121	GND
		77	EBU_AD	122	GND
		78	EBU_AD	123	GND
		79	EBU_AD	124	GND
		80	GND	125	GND
		81	GND	126	GND
		82	GND	127	GND
		83	GND	128	GND
		84	GND	129	GND
		85	GND	130	GND
		86	GND	131	GND
		87	GND	132	GND
		88	GND	133	GND
		89	GND	134	GND
		90	GND	135	GND
		91	GND	136	GND
		92	GND	137	GND
		93	GND	138	GND
		94	GND	139	GND
		95	GND	140	GND
		96	GND	141	GND
		97	GND	142	GND
		98	GND	143	GND
		99	GND	144	GND
		100	GND	145	GND
		101	GND	146	GND
		102	GND	147	GND
		103	GND	148	GND
		104	GND	149	GND
		105	GND	150	GND
		106	GND	151	GND
		107	GND	152	GND
		108	GND	153	GND
		109	GND	154	GND
		110	GND	155	GND
		111	GND	156	GND
		112	GND	157	GND
		113	GND	158	GND
		114	GND	159	GND
		115	GND	160	GND
		116	GND	161	GND
		117	GND	162	GND
		118	GND	163	GND
		119	GND	164	GND
		120	GND	165	GND
		121	GND	166	GND
		122	GND	167	GND
		123	GND	168	GND
		124	GND	169	GND
		125	GND	170	GND
		126	GND	171	GND
		127	GND	172	GND
		128	GND	173	GND
		129	GND	174	GND
		130	GND	175	GND
		131	GND	176	GND
		132	GND	177	GND
		133	GND	178	GND
		134	GND	179	GND
		135	GND	180	GND
		136	GND	181	GND
		137	GND	182	GND
		138	GND	183	GND
		139	GND	184	GND
		140	GND	185	GND
		141	GND	186	GND
		142	GND	187	GND
		143	GND	188	GND
		144	GND	189	GND
		145	GND	190	GND
		146	GND	191	GND
		147	GND	192	GND
		148	GND	193	GND
		149	GND	194	GND
		150	GND	195	GND
		151	GND	196	GND
		152	GND	197	GND
		153	GND	198	GND
		154	GND	199	GND
		155	GND	200	GND
		156	GND	201	GND
		157	GND	202	GND
		158	GND	203	GND
		159	GND	204	GND
		160	GND	205	GND
		161	GND	206	GND
		162	GND	207	GND
		163	GND	208	GND
		164	GND	209	GND
		165	GND	210	GND
		166	GND	211	GND
		167	GND	212	GND
		168	GND	213	GND
		169	GND	214	GND
		170	GND	215	GND
		171	GND	216	GND
		172	GND	217	GND
		173	GND	218	GND
		174	GND	219	GND
		175	GND	220	GND
		176	GND	221	GND
		177	GND	222	GND
		178	GND	223	GND
		179	GND	224	GND
		180	GND	225	GND
		181	GND	226	GND
		182	GND	227	GND
		183	GND	228	GND
		184	GND	229	GND
		185	GND	230	GND
		186	GND	231	GND
		187	GND	232	GND
		188	GND	233	GND
		189	GND	234	GND
		190	GND	235	GND
		191	GND	236	GND
		192	GND	237	GND
		193	GND	238	GND
		194	GND	239	GND
		195	GND	240	GND
		196	GND	241	GND
		197	GND	242	GND
		198	GND	243	GND
		199	GND	244	GND
		200	GND	245	GND
		201	GND	246	GND
		202	GND	247	GND
		203	GND	248	GND
		204	GND	249	GND
		205	GND	250	GND
		206	GND	251	GND
		207	GND	252	GND
		208	GND	253	GND
		209	GND	254	GND
		210	GND	255	GND
		211	GND	256	GND
		212	GND	257	GND
		213	GND	258	GND
		214	GND	259	GND
		215	GND	260	GND
		216	GND	261	GND
		217	GND	262	GND
		218	GND	263	GND
		219	GND	264	GND
		220	GND	265	GND
		221	GND	266	GND
		222	GND	267	GND
		223	GND	268	GND
		224	GND	269	GND
		225	GND	270	GND
		226	GND	271	GND
		227	GND	272	GND
		228	GND	273	GND
		229	GND	274	GND
		230	GND	275	GND
		231	GND	276	GND
		232	GND	277	GND
		233	GND	278	GND
		234	GND	279	GND
		235	GND	280	GND
		236	GND	281	GND
		237	GND	282	GND
		238	GND	283	GND
		239	GND	284	GND
		240	GND	285	GND
		241	GND	286	GND
		242	GND	287	GND
		243	GND	288	GND

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	HMI 1	GND	VAGND	GND
nc	nc	2	MMC_CLK	nc	nc
nc	nc	3	MMC_rRST	nc	nc
nc	nc	4	MMC_DATA0	nc	nc
nc	nc	5	MMC_DATA1	nc	nc
nc	nc	6	MMC_DATA2	nc	nc
nc	nc	7	MMC_DATA3	nc	nc
nc	nc	8	MMC_DATA4	nc	nc
nc	nc	9	MMC_DATA5	nc	nc
nc	nc	10	MMC_DATA6	nc	nc
nc	nc	11	MMC_DATA7	nc	nc
nc	nc	12	MMC_CMD	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_WA	nc	nc
nc	nc	26	I2S_MTSR	nc	nc
nc	nc	27	I2S_MCLK	nc	nc
nc	nc	28	I2S_MRST	nc	nc
nc	nc	29	I2S_SCLK	nc	nc
P1.13	U0C1_SELO3	30	I2S_SYNCCLK	nc	nc
nc	nc	31	SPI_CSH0	nc	nc
nc	nc	32	SPI_MTSR	P3.5	U0C1_DOUT0
nc	nc	33	SPI_CSH1	P4.0	U0C1_DX0E
nc	nc	34	SPI_MRST	P3.6	U0C1_SCLKOUT
nc	nc	35	SPI_CSH2	P0.11	U0C1_SCLKOUT
P2.14	U1CO_DX0D/DOUT0	36	SPI_SCLK	P0.6	P0.6
nc	nc	37	I2C_SDA	RESET	RESET#
nc	nc	38	I2C_SCL	VDD5	VDD5
nc	nc	39	HMI_GPIO1	VDD5	VDD5
nc	nc	40	HMI_GPIO0	VDD5	VDD5
nc	nc	41	HMI_GPIO0	VDD5	VDD5
nc	nc	42	HMI_GPIO0	VDD5	VDD5
nc	nc	43	VDD5	VDD5	VDD5
VAGND	AGND	HMI 45	VDD5	VAGND	AGND
nc	nc	46	VDD5	nc	nc
nc	nc	47	AREF	nc	nc
nc	nc	48	VAREF	nc	nc
nc	nc	49	DAC1/ADCO	nc	nc
nc	nc	50	ADC2/DACREF	P14.4	VADC_G0CH4
P14.12	VADC_G1CH4	51	ADC3/ORCO	P14.3	VADC_G0CH3
nc	nc	52	ADC15	nc	nc
nc	nc	53	ADC14	nc	nc
nc	nc	54	ADC16	nc	nc
nc	nc	55	ADC17	nc	nc
nc	nc	56	ADC18	nc	nc
nc	nc	57	ADC19	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	COL0	nc	nc
nc	nc	71	COL1	nc	nc
nc	nc	72	COL2	nc	nc
nc	nc	73	COL3	nc	nc
nc	nc	74	COL4	nc	nc
nc	nc	75	COL5	nc	nc
nc	nc	76	COL6	nc	nc
nc	nc	77	COL7	nc	nc
VSS	GND	HMI 79	GND	VSS	GND
		80	GND		

Figure 23 Satellite Connector Type HMI

2.11.3 ACT Satellite Connector

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

CPU_44A-V2		Satellite Connector		CPU_44A-V2	
XMC Pin	XMC Function	Function	Pin	Function	XMC Pin
VSS	GND	GND	1	GND	VSS
P14.7	PIFO_IN0B	PIFOIN1	2	PIFOIN1	P14.7
P14.6	PIFO_IN1B	PIFOIN2	4	PIFOIN2	P14.6
P14.5	PIFO_IN2B	PIFOIN3	5	PIFOIN3	P14.5
nc	nc	DSDIN0	6	DSDIN0	nc
P5.0	PWMN	PWMP	7	PWMP	P5.0
P5.1	PWMP	PWMP	8	PWMP	P5.1
nc	nc	DSDIN1	9	DSDIN1	nc
nc	nc	DSDIN2	10	DSDIN2	nc
P1.9	DSD_MCLK0	DSDCLK0	11	DSDCLK0	P1.9
nc	nc	DSDCLK1	12	DSDCLK1	nc
nc	nc	RSVD	13	RSVD	nc
nc	nc	RSVD	14	RSVD	nc
nc	nc	CC_IN0	15	CC_IN0	nc
nc	nc	CC_IN1	16	CC_IN1	nc
nc	nc	CC_IN2	17	CC_IN2	nc
nc	nc	ENA_A	18	ENA_A	nc
P0.7 (L16)	CCU80_IN0A	TRAP_A	19	TRAP_A	P0.7 (L16)
P1.3	CCU40_IN0A	TRAP_B	20	TRAP_B	P1.3
P3.4	CCU42_IN2A	TRAP_X	21	TRAP_X	P3.4
P1.14	U0C1_SELO2	SPI_CS_A0	22	SPI_CS_A0	P1.14
P4.1	U0C1_SELO0	SPI_CS_A1	23	SPI_CS_A1	P4.1
nc	nc	SPI_CS_A2	24	SPI_CS_A2	nc
P2.14	U1C0_DX0C/DOU0	I2C_SDA	25	I2C_SDA	P2.14
nc	nc	ACT_GPI01	26	ACT_GPI01	nc
nc	nc	ACT_GPI00	27	ACT_GPI00	nc
nc	nc	VDD5	28	VDD5	nc
VAGND	AGND	VDD5	29	VDD5	VAGND
P14.9	VADC_G1CH1	AGND	30	AGND	P14.9
nc	nc	DAC0/ADC1	31	DAC0/ADC1	nc
P14.0	VADC_G0CH0 (4)	ADC3/ORC0	32	ADC3/ORC0	P14.0
P14.14	VADC_G1CH6	ADC5/ORC2	33	ADC5/ORC2	P14.14
P15.3	VADC_G2CH3	ADC7	34	ADC7	P15.3
P14.13	VADC_G1CH5	ADC9	35	ADC9	P14.13
nc	nc	ADC11	36	ADC11	nc
nc	nc	ADC13	37	ADC13	nc
nc	nc	PWM80_H	38	PWM80_H	nc
nc	nc	PWM80_L	39	PWM80_L	nc
nc	nc	PWM81_H	40	PWM81_H	nc
nc	nc	PWM81_L	41	PWM81_L	nc
nc	nc	PWM82_H	42	PWM82_H	nc
nc	nc	PWM82_L	43	PWM82_L	nc
nc	nc	PWM83	44	PWM83	nc
VSS	GND	GND	45	GND	VSS
VAREF	VAREF	VAREF	46	VAREF	VAREF
P14.8	VADC_G1CH0	DAC1/ADC0	47	DAC1/ADC0	P14.8
P14.4	VADC_G0CH4	ADC2/DACREF	48	ADC2/DACREF	P14.4
nc	nc	ADC4/ORC1	49	ADC4/ORC1	nc
P14.15	VADC_G1CH7	ADC6/ORC3	50	ADC6/ORC3	P14.15
P14.2	VADC_G0CH2	ADC8	51	ADC8	P14.2
P15.2	VADC_G2CH2	ADC10	52	ADC10	P15.2
nc	nc	ADC12	53	ADC12	nc
P0.5 (6)	CCU80_OUT00	PWMA0_H	54	PWMA0_H	P0.5 (6)
P0.2 (6)	CCU80_OUT01	PWMA0_L	55	PWMA0_L	P0.2 (6)
P0.4 (6)	CCU80_OUT10	PWMA1_H	56	PWMA1_H	P0.4 (6)
P0.1	CCU80_OUT11	PWMA1_L	57	PWMA1_L	P0.1
P0.3 (6)	CCU80_OUT20	PWMA2_H	58	PWMA2_H	P0.3 (6)
P0.0	CCU80_OUT21	PWMA2_L	59	PWMA2_L	P0.0
P3.3	CCU42_OUTF3	PWMA0	60	PWMA0	P3.3
P3.0	CCU42_OUT0	PWMA1	61	PWMA1	P3.0
VSS	GND	GND	62	GND	VSS

Figure 24 Satellite Connector Type ACT

- (1) P0.7 can also be used for JTAG Debugging (TDI)
- (2) P0.8 is used as TRST in order to enable JTAG Debug
- (3) This pin is connected with the satellite connector via an analog switch
- (4) This ADC input does not support "Out of Range Detection"
- (5) This pin must be "enabled" by a solder jump.
- (6) Support High Resolution PWM

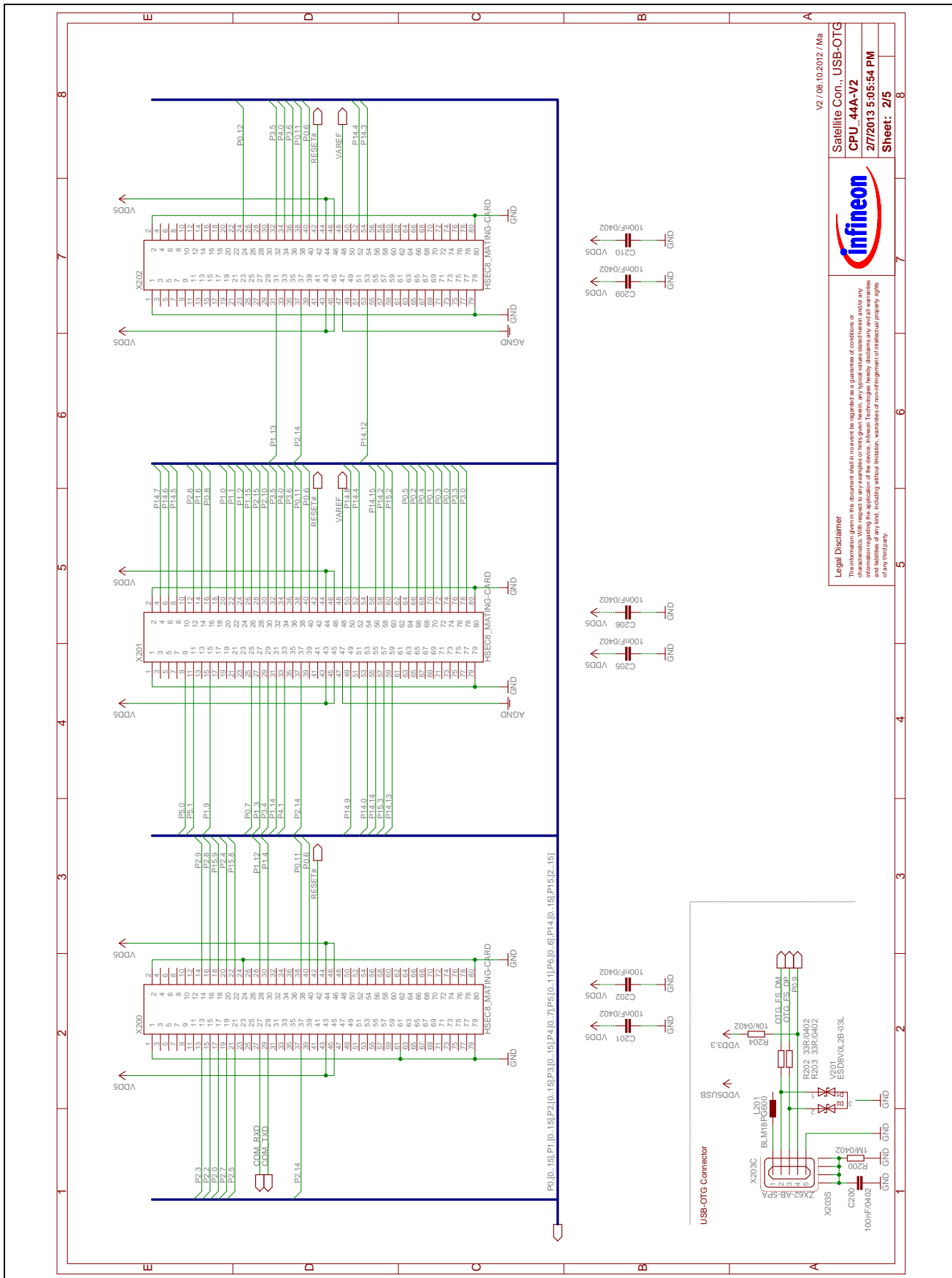
3 Production Data

3.1 Schematics

This chapter contains the schematics for the CPU board:

- Satellite Connectors, USB-OTG
- XMC4400
- Power, Debug Connectors, Reset
- On-board Debugger

The board has been designed with Eagle. The full PCB design data of this board can also be downloaded from www.infineon.com/xmc-dev.

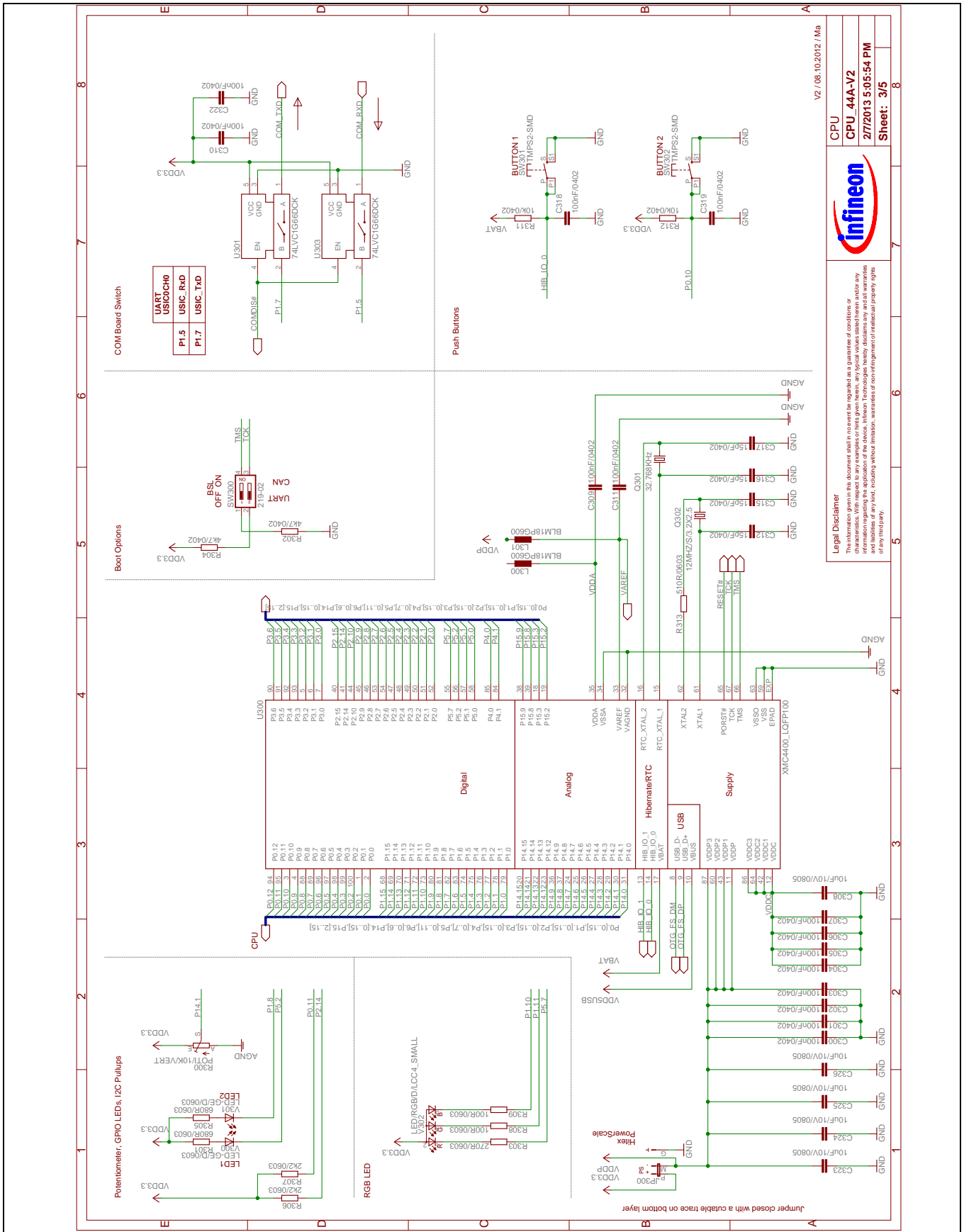


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Figure 25 Satellite Connectors, USB-OTG



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Figure 26 XMC4400

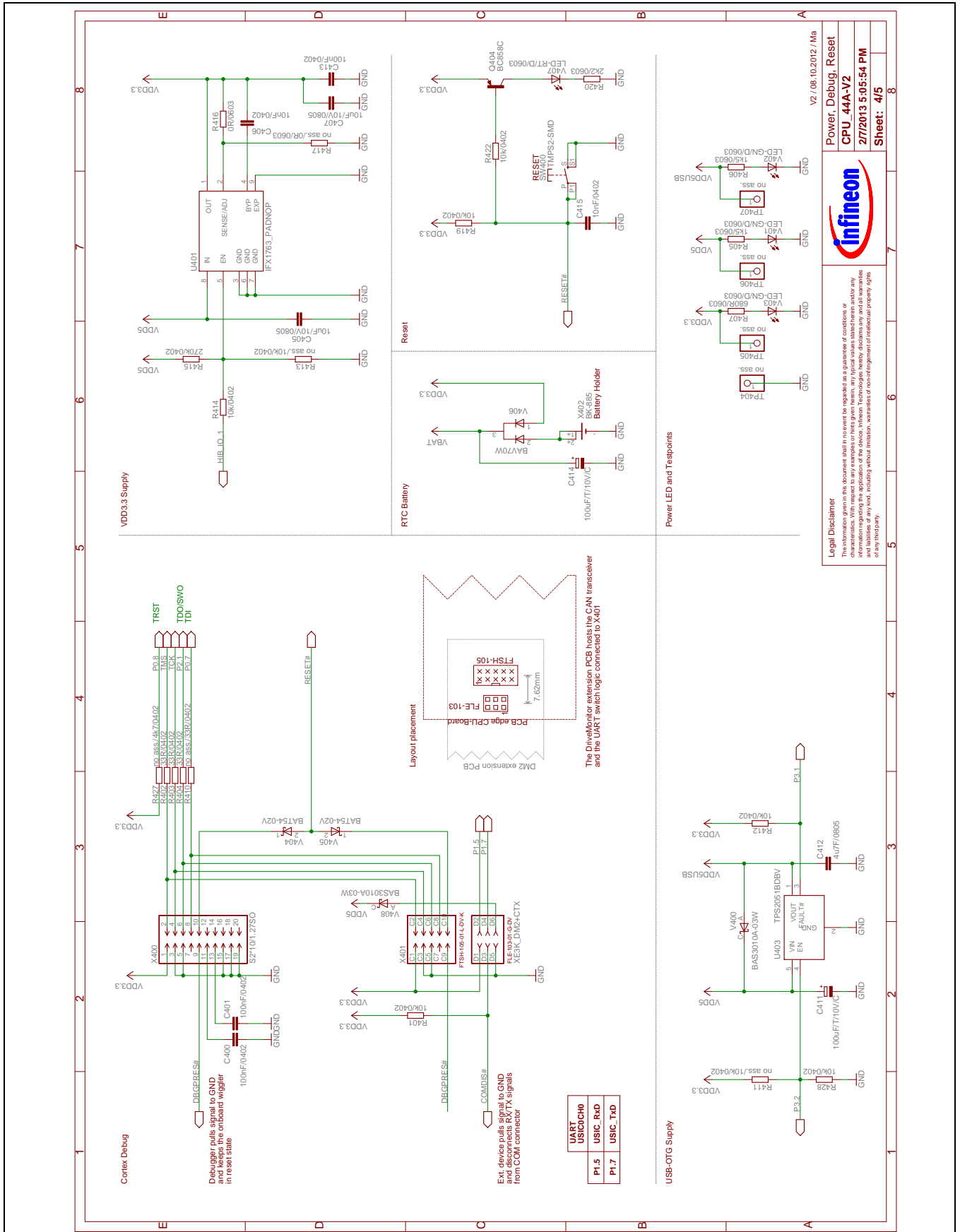


Figure 27 Power, Debug Connectors, Reset

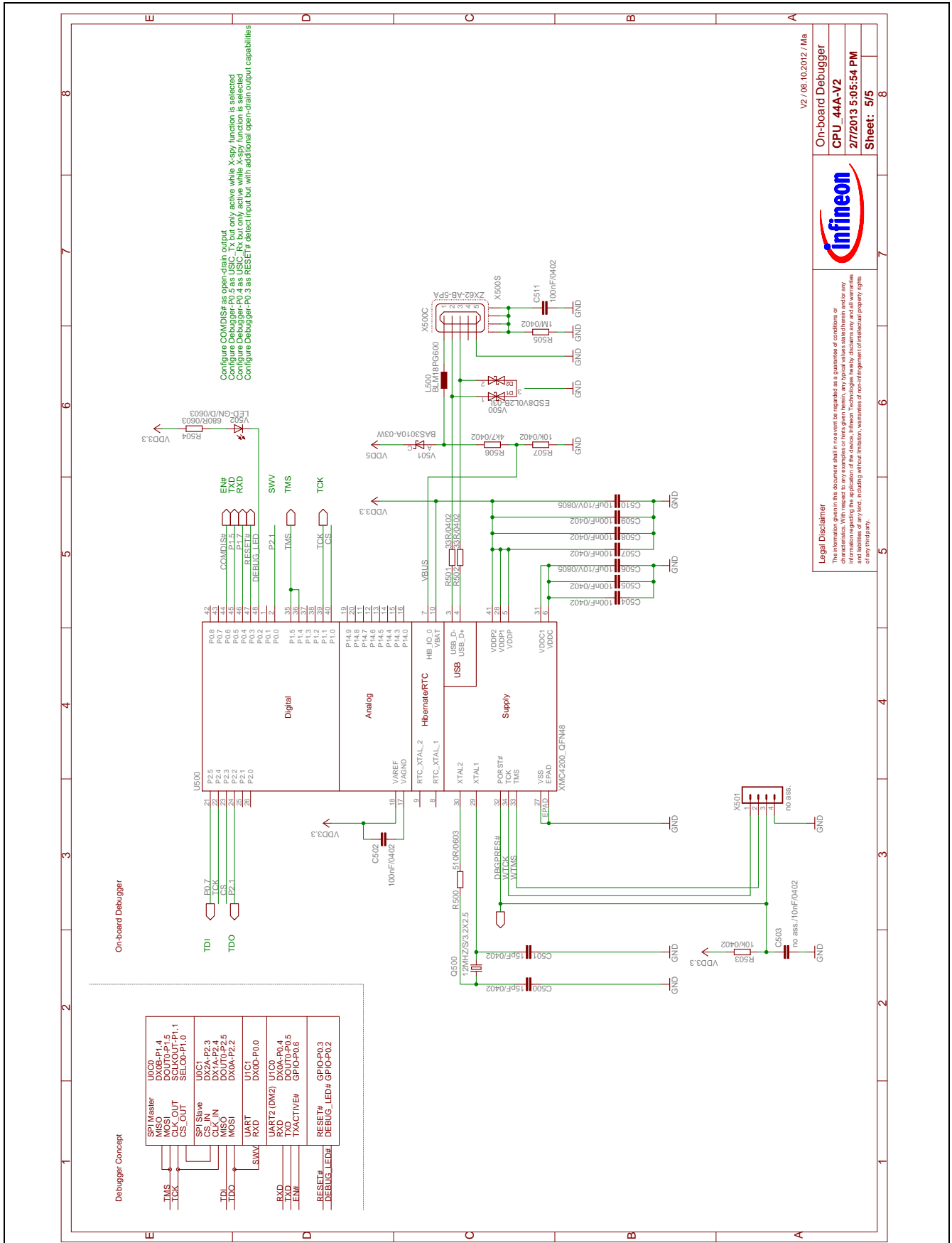


Figure 28 On-board Debugger

3.2 Component Placement and Geometry

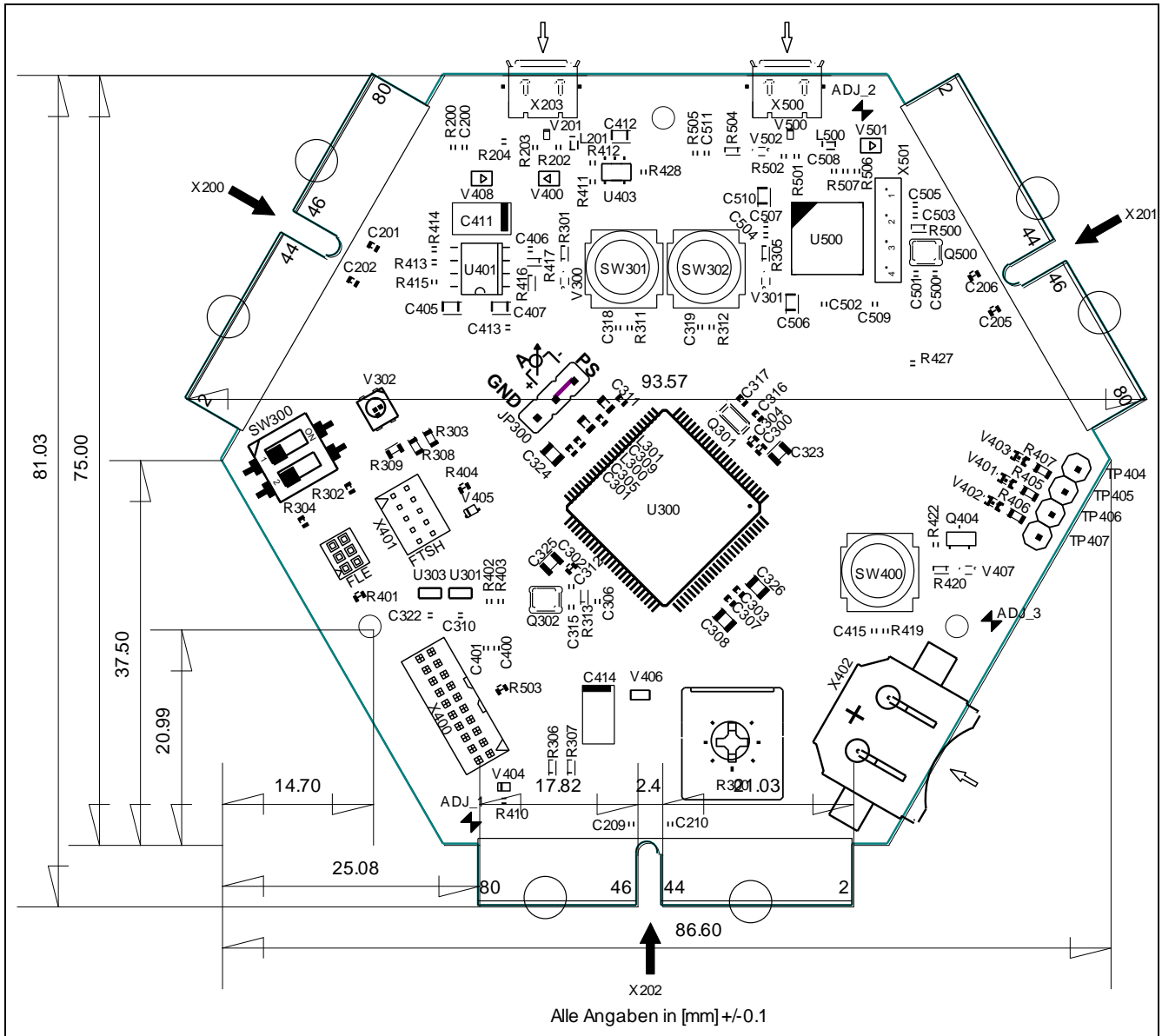


Figure 29 Component Placement and Geometry

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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