



Hexagon Application Kit

For XMC4000 Family

CPU_45A-V2

CPU Board XMC4500 General Purpose

Board User's Manual

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Microcontroller

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Introduction

This document describes the features and hardware details of the CPU Board XMC4500 General Purpose (CPU_45A-V2) designed to work with Infineon's XMC4500 Microcontroller. This board is part of Infineon's Hexagon Application Kits.

1 Overview

The CPU board CPU_45A-V2 houses the XMC4500 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 XMC4500. The main use case for this board is to demonstrate the generic features of XMC4500 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_45A-V2 board is equipped with the following features

- XMC4500 (ARM® Cortex™-M4-based) Microcontroller, LQFP-144
- Connection to XMC4500 satellite cards via satellite connectors COM, HMI and ACT
- USB OTG Host/Device support via micro USB connector
- Debug options
 - Cortex Debug connector 10-pin (0.05")
 - Cortex Debug+ETM connector 20-pin (0.05")
 - DriveMonitor2 Stick connector 6pin (0.05")
- Reset push button
- 32MBit quad SPI flash memory
- Boot from Embedded Flash, UART or CAN
- Ready for power consumption analysis
- 5 LED's
 - 3 Power indicating LED's
 - 1 GPIO (P3.9) LED
 - 1 RESET LED
- 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)
 - RTC backup battery

1.2 Block Diagram

Figure 1 shows the functional block diagram of the CPU_45A-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)
- User LED (LED) connected to GPIO P3.9
- Quad SPI flash memory (EE) connected to USIC1 Channel1 with Chip-Select1
- 2 Cortex Debug Connectors
- DriveMonitor2 Connector, which disconnects the combined UART/CAN lines from the COM Satellite Connector, when the DriveMonitor2 is connected.
- Variable resistor (POTI) connected to GPIO P14.1
- USB On-The-Go Connector (Micro-USB)

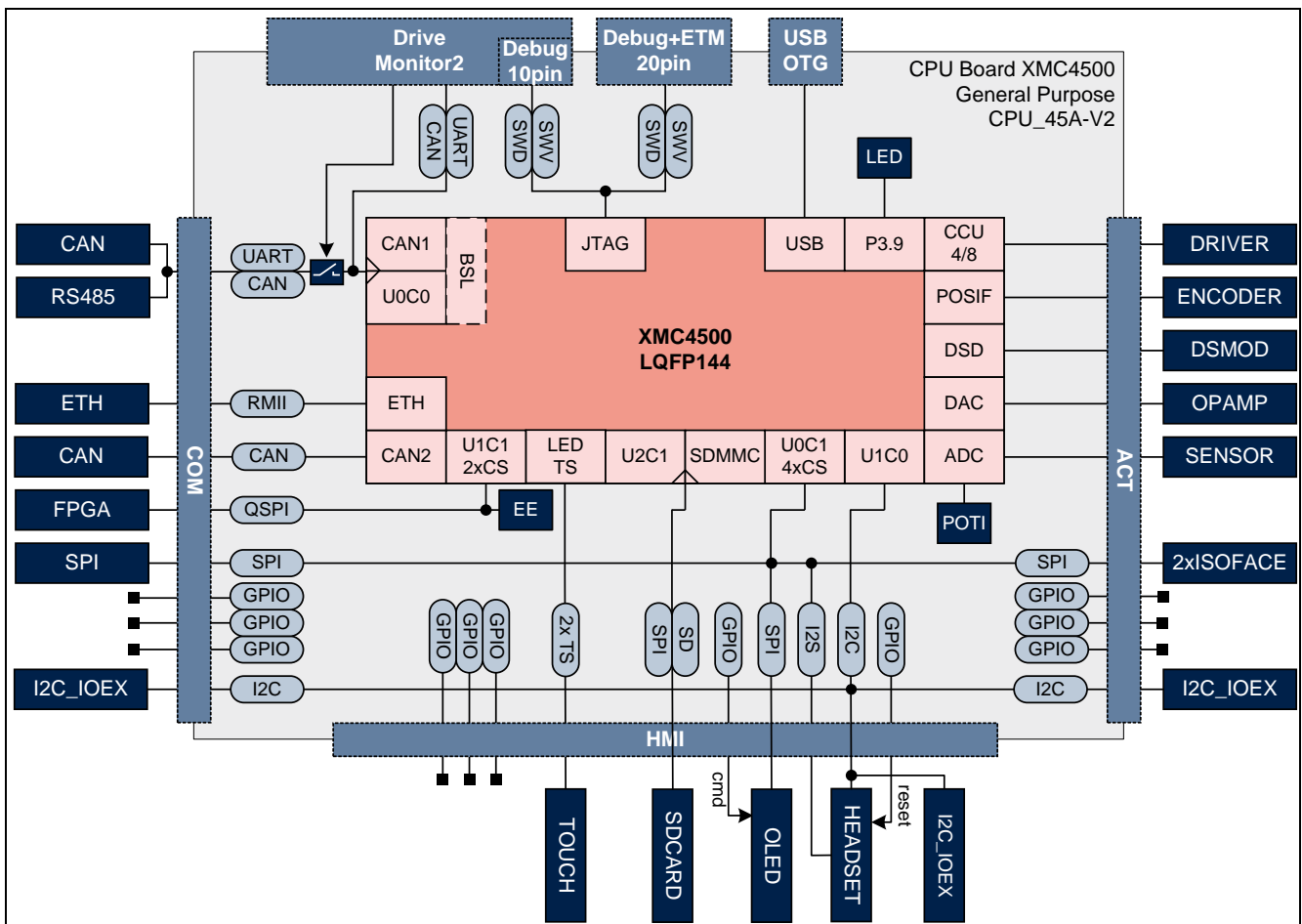


Figure 1 CPU_45A-V2 Board Block Diagram

2 Hardware Description

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

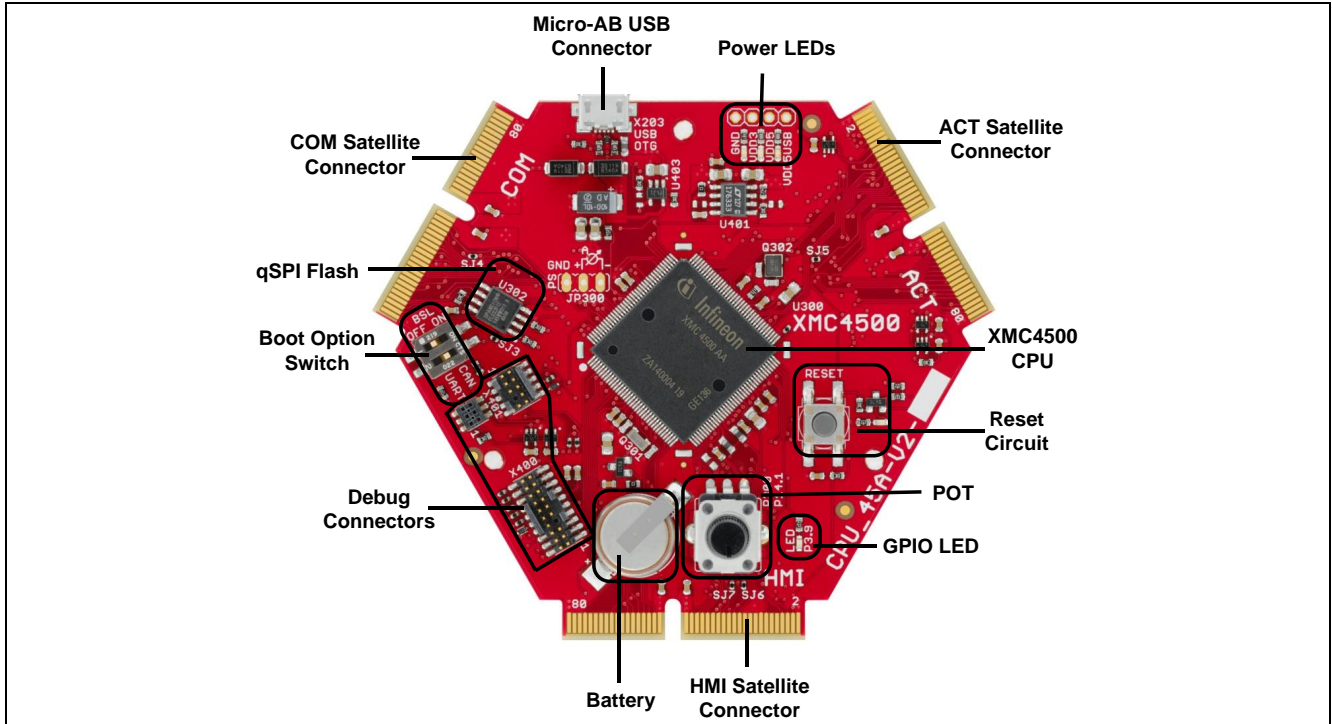


Figure 2 CPU Board XMC4500 General Purpose (CPU_45A-V2)

2.1 Power Supply

The CPU_45A-V2 board can be powered via the USB plug (5 V); however, there is a current limit that can be drawn from the host PC through USB. If the CPU_45A-V2 board is used to drive other satellite cards (e.g. AUT_ISO-V1 or MOT_GPDLV-V2) and the total current required exceeds 500 mA, then the board needs to be powered by either an external power supply connected to USB or by a satellite card, which supports external power supply like e.g. AUT_ISO-V1, MOT_GPDLV-V2, COM_ETH-V1.

For powering the board through USB interface, connect the USB cable provided with the kit to the Micro-USB connector on board.

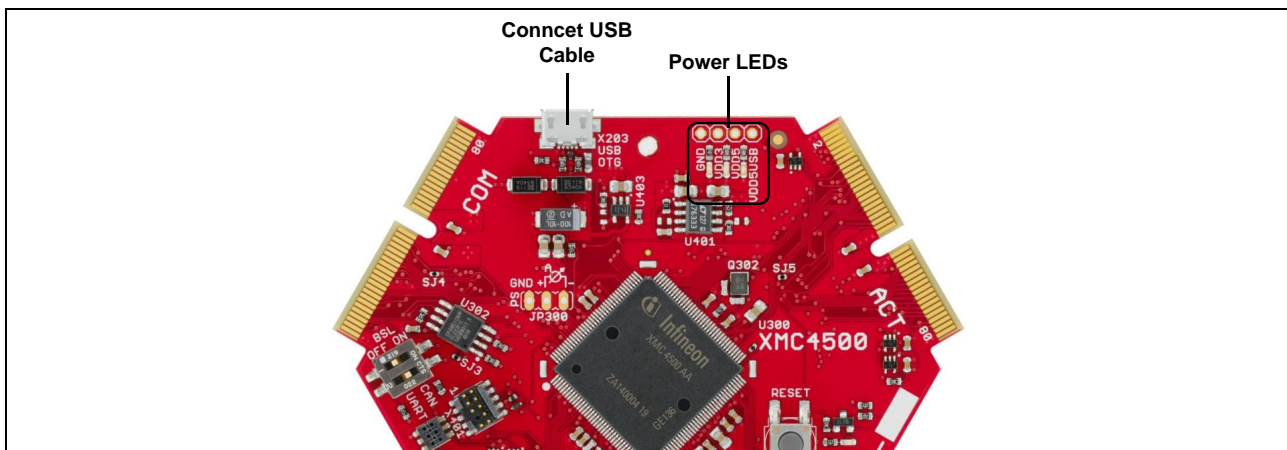


Figure 3 Powering option through USB interface (5 V)

To indicate the power status of CPU_45A-V2 board three LED's are provided on board (See Figure 3). The LED will be "ON" when the corresponding 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 plug
V403	VDD3.3	3.3 V	Must always be "ON"

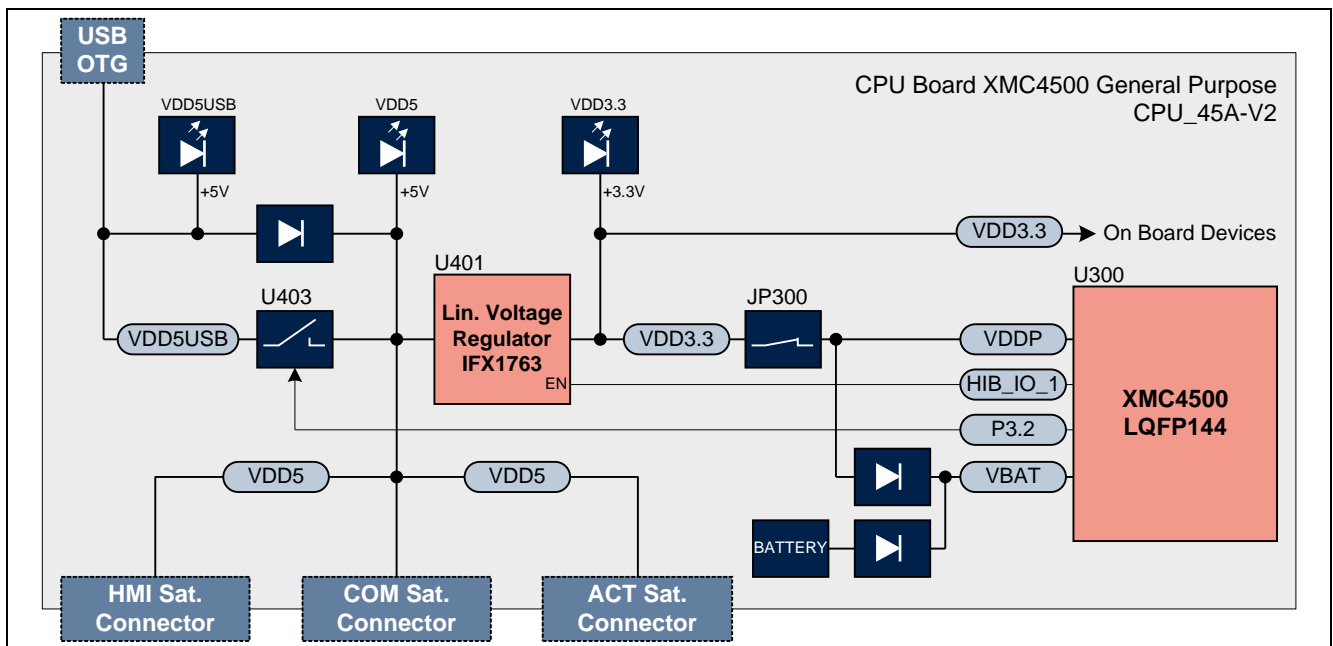


Figure 4 CPU_45A-V2 Board Power

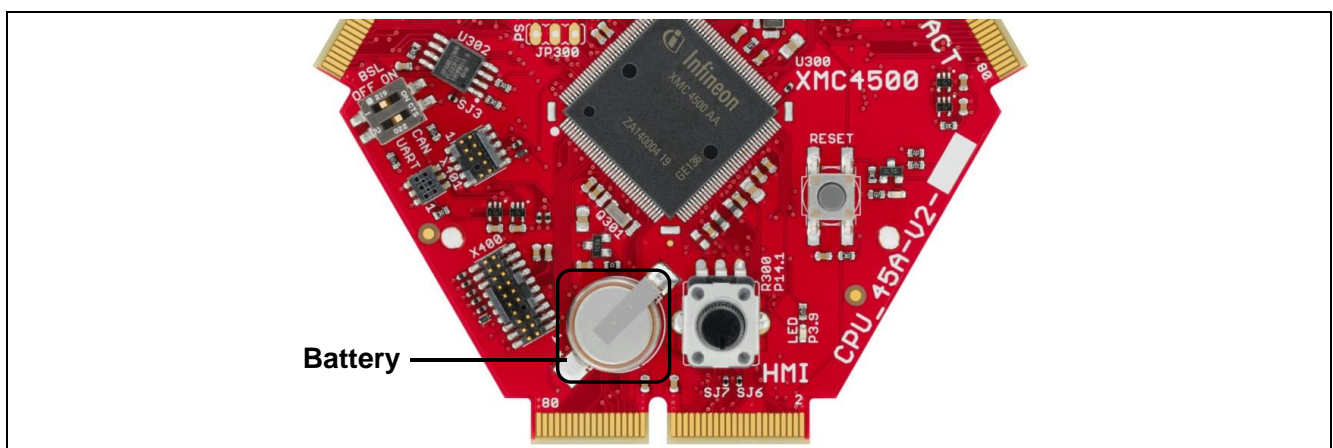


Figure 5 Battery (VBAT Supply)

Hitex PowerScale probe is provided on the CPU_45A-V2 board to measure the power consumption.

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>

The maximum current drawn by the CPU board without any satellite cards connected is about 150 mA.

2.2 Reset

A simple RC circuit on board ensures the Power-on-Reset. Additionally an on-board push button (SW400, RESET) supports a hard reset of the CPU. This signal is also routed to all satellite connectors. The reset circuit includes a red LED (V407) to indicate the status. LED (V407) will be "ON" during reset state and will be "OFF" during normal operation conditions.

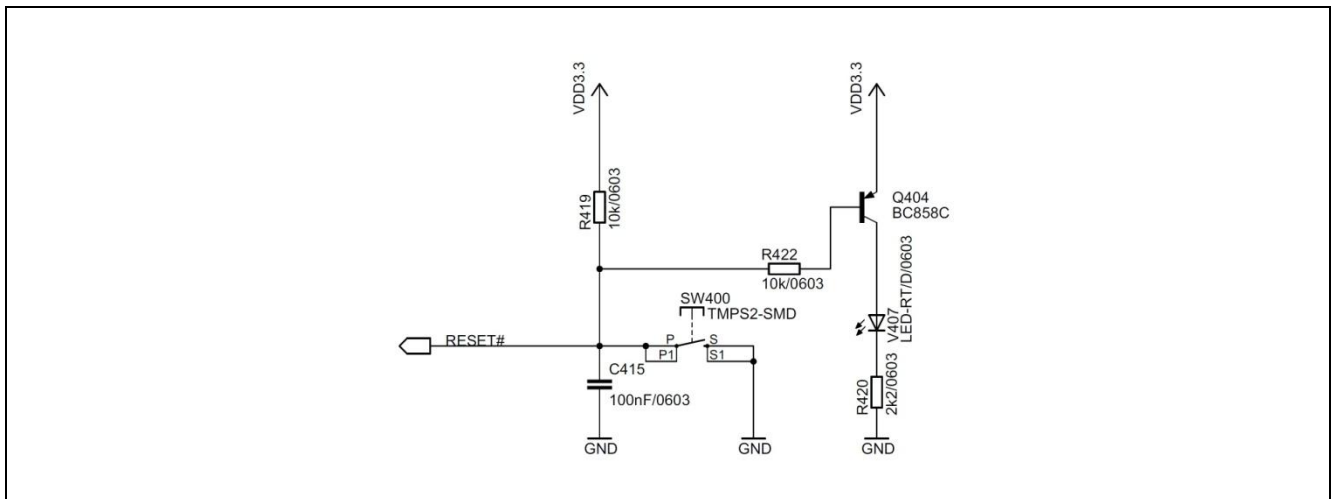


Figure 6 Reset



Figure 7 Reset LED and Reset Switch

2.3 Clock Generation

An external 12 MHz crystal provides the clock signal to the XMC4500 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. 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.

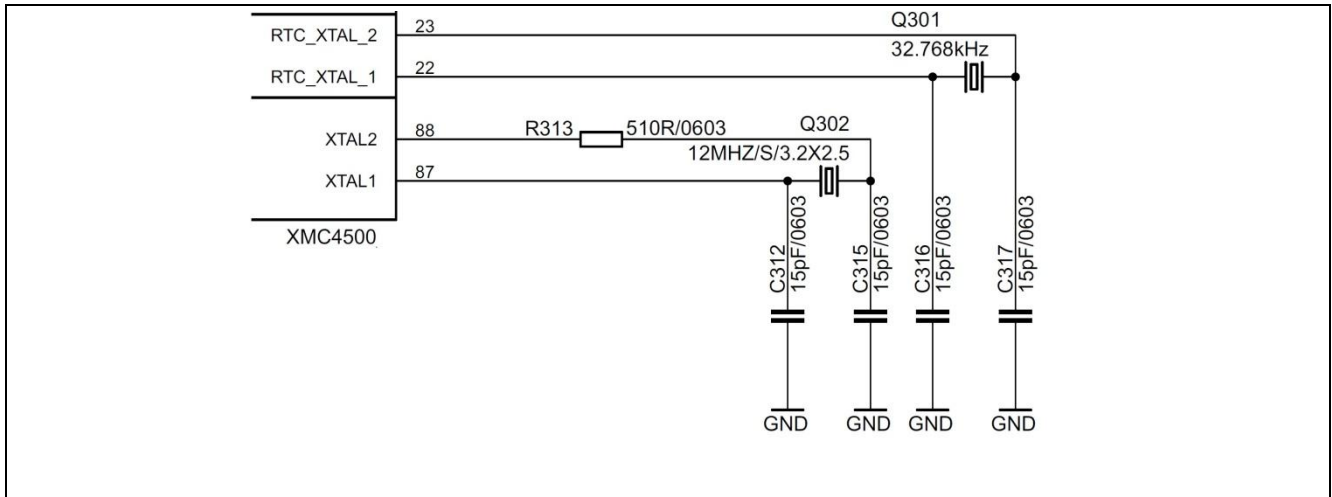


Figure 8 Clock Generation

2.4 Boot Option

During power-on-reset the XMC4500 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 9 Boot Options Switch

The board supports boot/debug from Infineon's DriveMonitor2 Stick or COM satellite card (via UART or CAN). If a DriveMonitor2 Stick is attached to the CPU_45A-V2 board via the DriveMonitor2 Connector the DM2PRES#

signal will be set to low. The switches U301 and U306 will be disabled in this case. The communication to and from the COM satellite card via UART/CAN will be disconnected. This means P1.4 and P1.5 of the XMC4500 will be disconnected from the COM satellite card and is connected to the DriveMonitor2 Connector only.

If the DriveMonitor2 is not present the switch U301 and U306 is enabled. Communication to and from a COM satellite card via UART/CAN is possible. This means P1.4 and P1.5 of the XMC4500 will be connected to both the COM satellite card and the DriveMonitor2 Connector.

This implementation automatically takes care of switching between DriveMonitor2 Stick and COM satellite card for boot/debug and XMC4500 is not able to detect whether COM satellite card or DriveMonitor2 Stick is communicating.

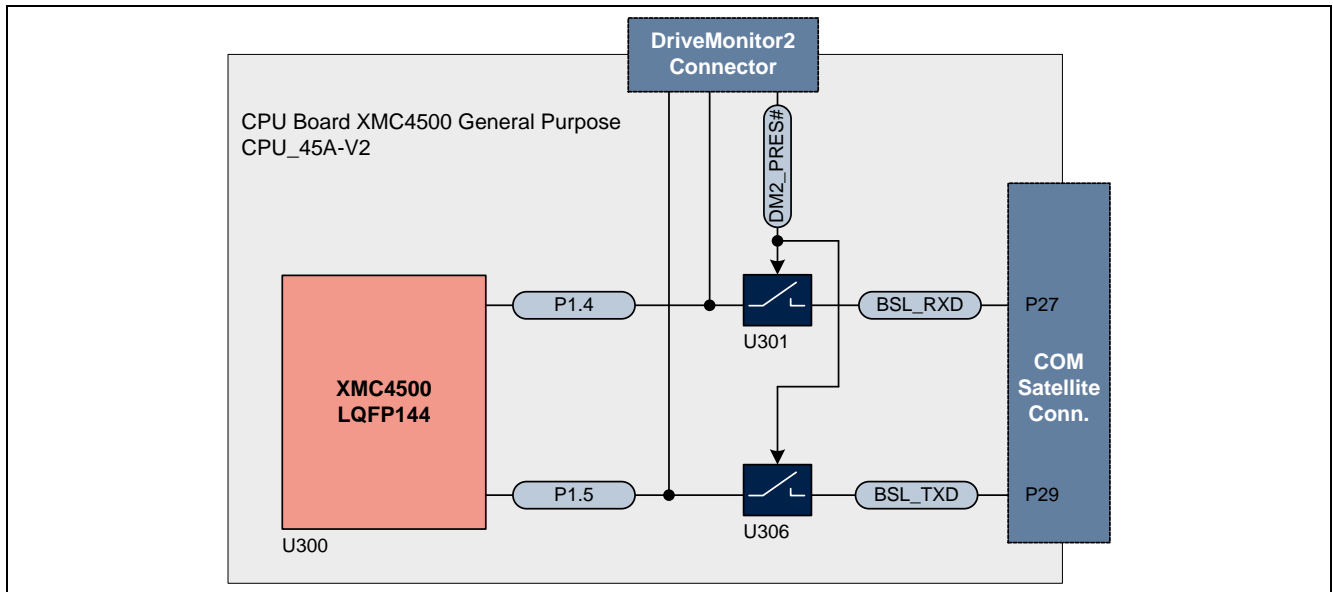


Figure 10 Boot Strap Signal Switching

2.5 Debug Interface

The CPU_45A-V2 board supports JTAG debug via 3 different connectors.

- Cortex Debug Connector (10-pin)
- Cortex Debug+ETM Connector (20-pin)
- DriveMonitor2 Connector

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

If you want to use JTAG 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 Cortex Debug Connector (10-pin)

The CPU_45A-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.

Cortex Debug Connector (10-pin) - pinout			
VCC	1	2	SWDIO / TMS
GND	3	4	SWDCLK / TCK
GND	5	6	SWO / TDO
KEY	7	8	NC / TDI
GNDDetect	9	10	nRESET

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)

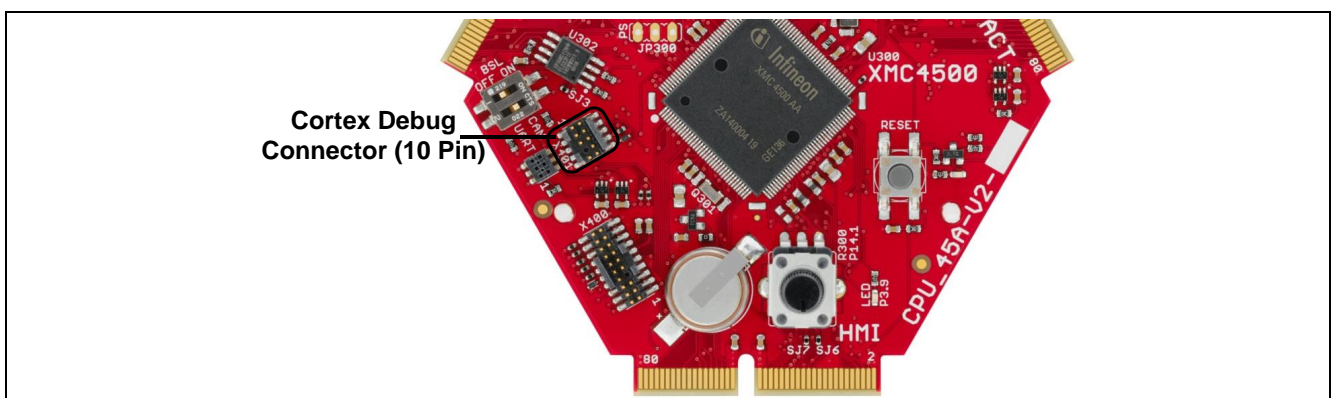


Figure 12 Cortex Debug Connector (10-pin) Layout

2.5.2 Cortex Debug+ETM Connector (20-pin)

The CPU_45A-V2 board supports Serial Wire debug operation, Serial Wire viewer operation (via SWO connection when Serial Wire debug mode is used) and Instruction Trace operation through the 20-pin Cortex Debug+ETM Connector.

JTAG 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 the Actuator boards connected to the ACT satellite connector.

Cortex Debug+ETM Connector (20-pin) - pinout			
VCC	1	2	SWDIO / TMS
GND	3	4	SWDCLK / TCK
GND	5	6	SWO / TDO / EXTa / TRACECTL
KEY	7	8	NC/EXTb/TDI
GNDDetect	9	10	nRESET
GND/TgtPwr+Cap	11	12	TRACECLK
GND/TgtPwr+Cap	13	14	TRACEDATA[0]
GND	15	16	TRACEDATC[1]
GND	17	18	TRACEDATA[2]
GND	19	20	TRACEDATA[3]

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	Trace Clock	Trace Clock
13	GND/TgtPwr+Cap	Ground	Ground
14	TRACEDATA[0]	Trace Data 0	Trace Data 0
15	GND	Ground	Ground
16	TRACEDATA[1]	Trace Data 1	Trace Data 1
17	GND	Ground	Ground
18	TRACEDATA[2]	Trace Data 2	Trace Data 2
19	GND	Ground	Ground
20	TRACEDATA[3]	Trace Data 3	Trace Data 3

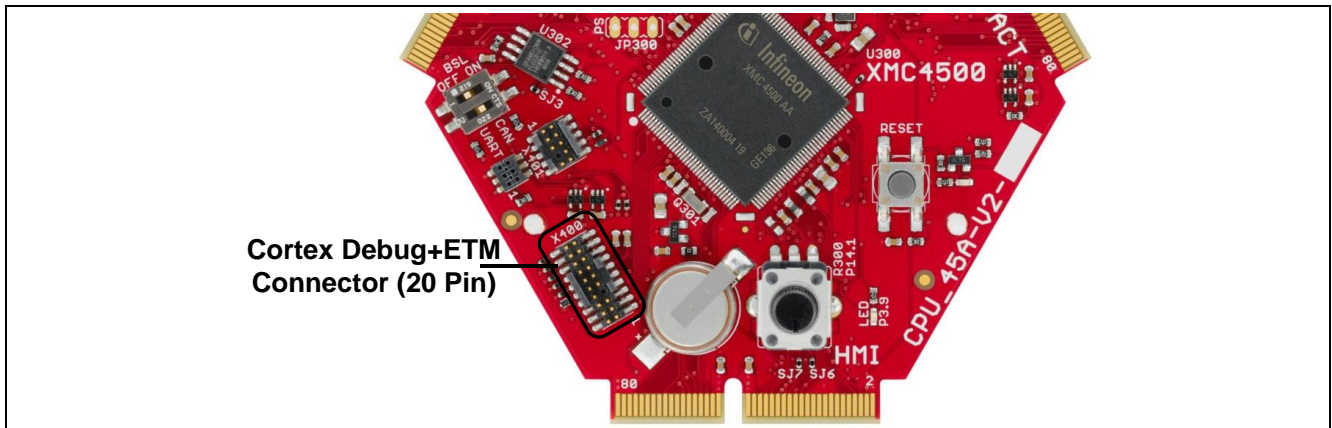


Figure 14 Cortex Debug+ETM Connector (20-pin) Layout

2.5.3 DriveMonitor2 Connector

The 10-pin Cortex Debug Connector explained in chapter 2.5.1 together with a small 6-pin connector on board works as DriveMonitor2 Connector. DriveMonitor2 adapter card interfaces DriveMonitor2 Stick to these connectors.

Note: Do not use Cortex Debug+ETM connector (20-pin) and DriveMonitor2 Connector at the same time.

6 Pin Connector - pinout					
VCC	1	⊗	⊗	2	UART_TX
GND	3	⊗	⊗	4	UART_RX
GND	5	⊗	⊗	6	nRESET

Figure 15 6-Pin Connector

Table 6 6-pin Connector

Pin No.	Signal Name	Description
1	VCC	3.3 V
2	UART_TX	Transmit Data
3	GND	Ground
4	UART_RX	Receive Data
5	GND	Ground
6	nRESET	Reset (Active low)

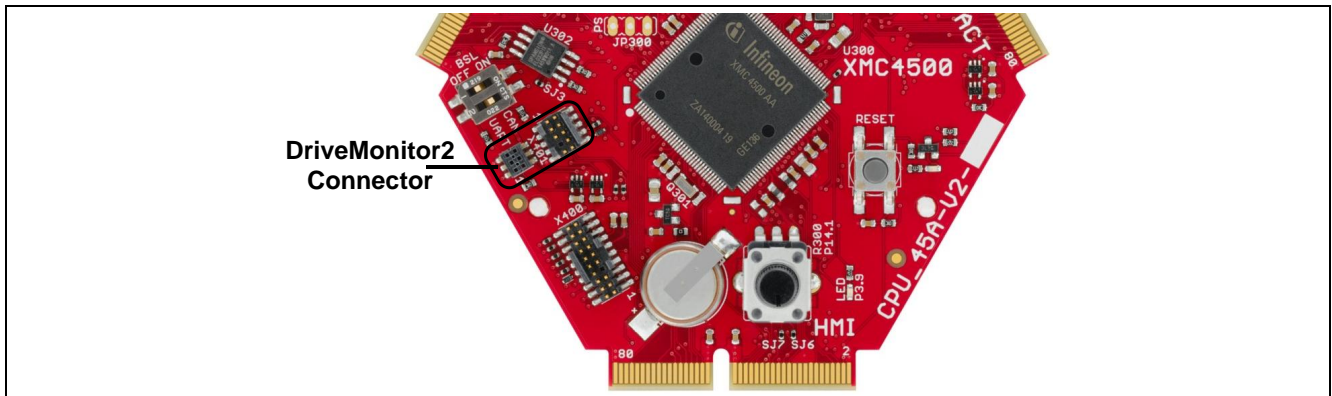


Figure 16 DriveMonitor2 Connector

2.6 Serial Flash Memory

The CPU_45A-V2 board has 32Mbit serial flash memory interfaced to XMC4500 through a SPI interface. The SPI interface can be configured as single, dual or quad SPI.

Table 7 Quad SPI Signals

Pin No.	Pin Description	Signal Name	Signal Description
P0.13	U1C1_SCLKOUT	CLK	Clock
P3.3	U1C1_SELO1	CS#	Active Low Chip Select
P3.15	U1C1_DOUT0	DI	Data Input of Flash (MTSI)
P3.14	U1C1_DX0B	DO	Data Output of Flash (MRST)
P0.14	U1C1_HOUT3/DWIN3	Data I/O	Data Input/Output
P0.15	U1C1_HOUT3/DWIN3	Data I/O	Data Input/Output

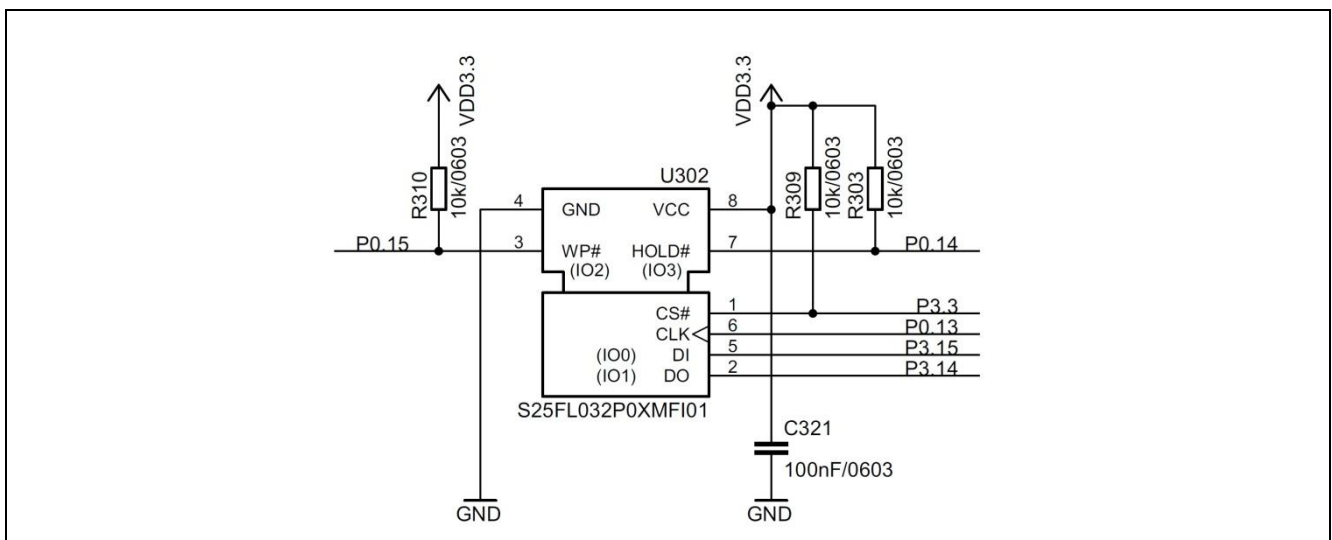


Figure 17 Quad SPI Flash Interface

2.7 USB

The XMC4500 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) from an external host (e.g. PC). When the current is more 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.

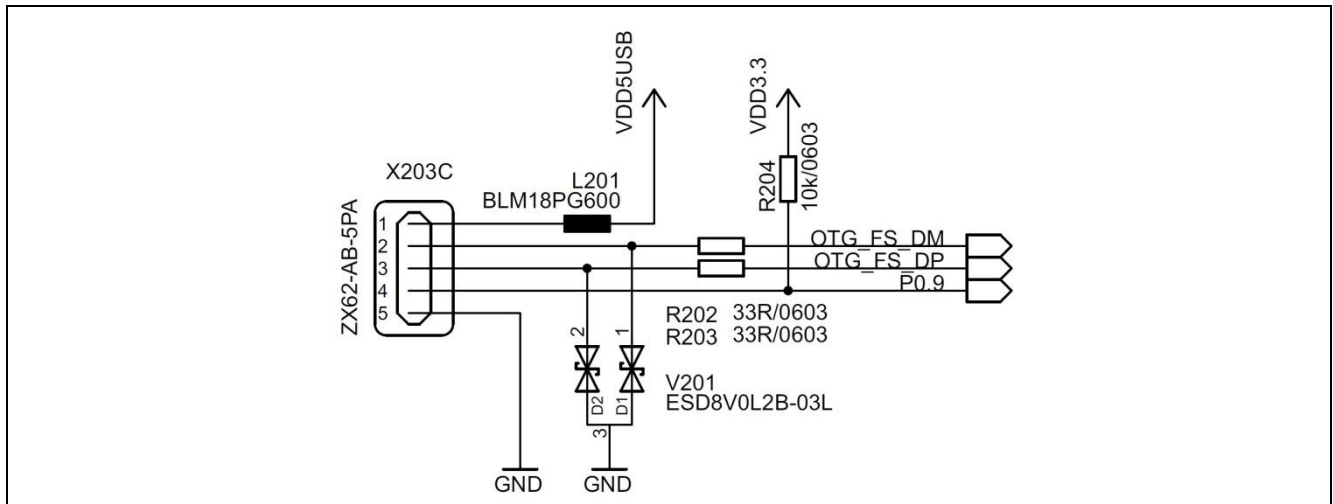


Figure 18 USB Connector

Port P0.9 of XMC4500 is connected to the USB ID pin (pin 4). An OTG device will detect whether a USB 3.0 Micro-A or Micro-B plug is inserted by checking the ID pin. When the ID = FALSE, Micro-A connector is plugged and when ID = TRUE a Micro-B connector is plugged in. When ID is true the XMC4500 acts as USB host else as USB device.

Table 8 USB micro AB connector Pinout

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

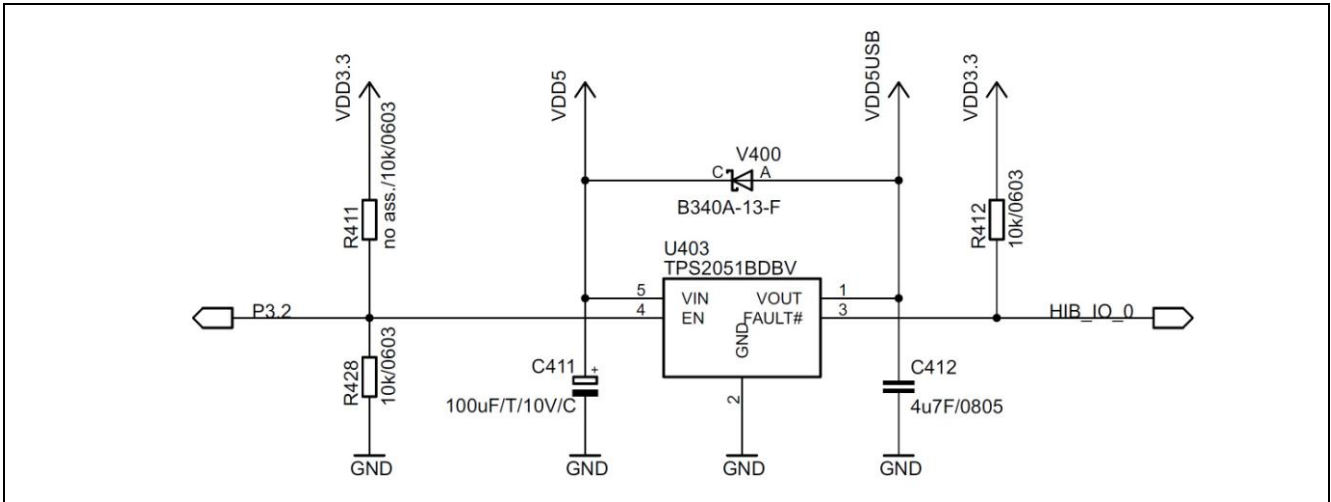


Figure 19 USB power generation - Host/OTG mode

In the host only mode and OTG mode the CPU_45A-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 XMC4500. Port P3.2 (active high) is used for this purpose. In the Host/OTG mode a low active FAULT signal indicates to XMC4500 via HIB_IO_0 signal, if more than 500 mA current is drawn by the external device. HIB_IO_0 signal is used as general purpose input pin for this implementation.

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

2.8 RTC

The XMC4500 CPU has two power domains, core power domain and hibernate domain. The core power domain (VDDP pins) is connected to VDD3.3 rail. An on-board LDO generates VDD3.3 (3.3 V) from VDD5 (5 V). The hibernate domain is powered via the auxiliary supply VBAT. A 3 V lithium coin cell on board or 3.3 V (VDD3.3) provides power to the auxiliary supply pin VBAT.

The RTC is located in the hibernate domain. The XMC4500 uses HIB_IO_1 signal (Active low) to shutdown the LDO which generates VDD3.3 (core domain). Even if the core domain is not powered the Hibernate Domain will operate if VBAT is available. 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 domain by setting HIB_IO_1 to high.

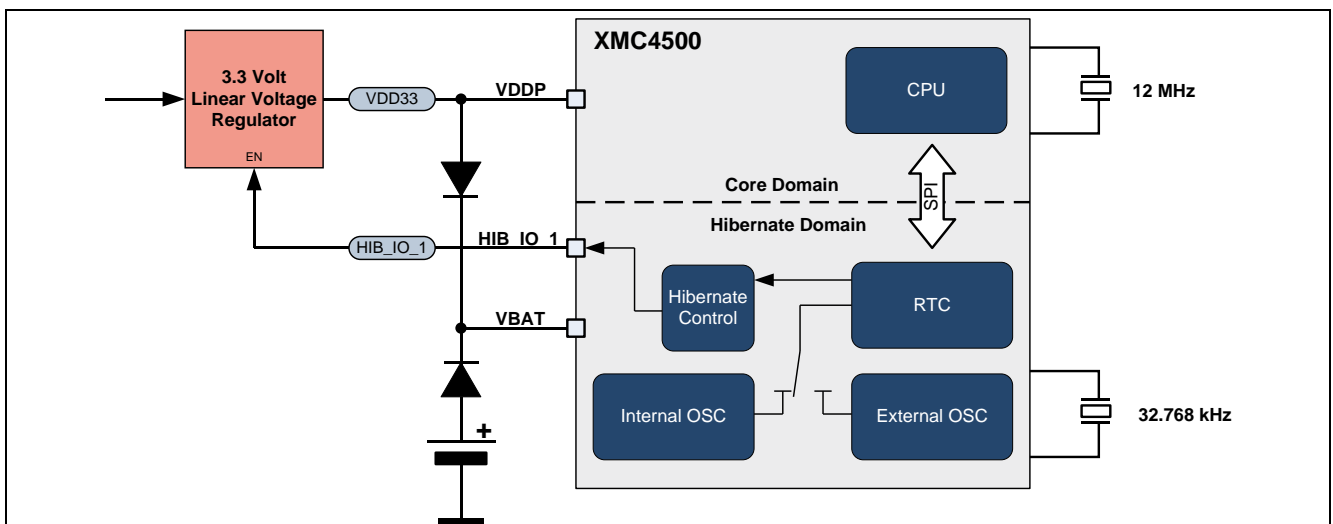


Figure 20 RTC

2.9 LED

The port pin P3.9 of XMC4500 on the CPU_45A-V2 board is connected to LED V300. More user LED's are available through I2C GPIO expander on most of the satellite cards.

Table 9 GPIO LED

LED	Connected to Port Pin
V300	GPIO P3.9

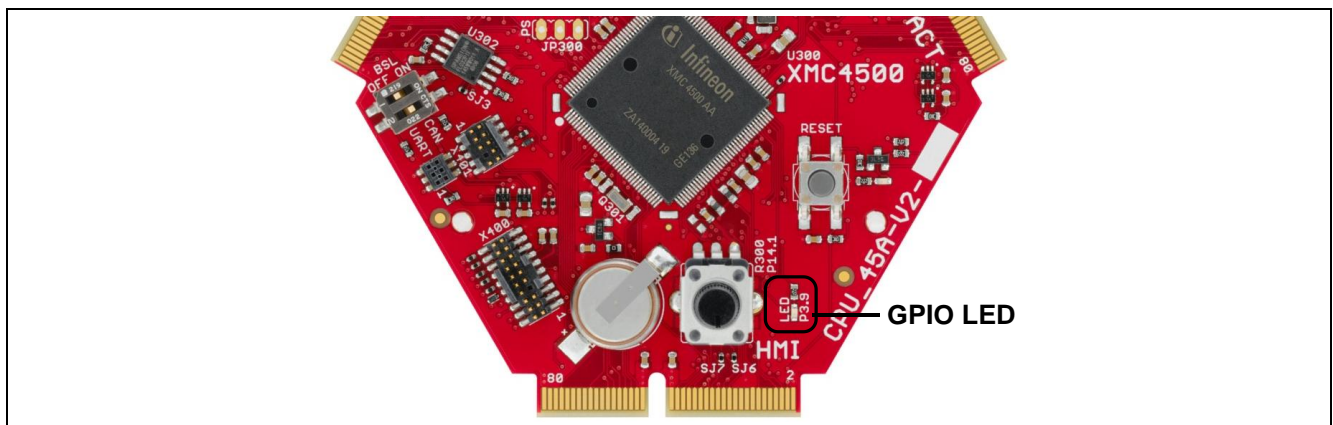


Figure 21 GPIO LED

2.10 Potentiometer

The CPU_45A-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.

2.11 Satellite Connectors

The CPU_45A-V2 board has three satellite connector types

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

The satellite connector interfaces the satellite cards to the CPU board.

Note: Only respective application satellite cards shall be connected to the respective satellite connectors.

(For e.g. COM satellite cards shall be connected to COM satellite connector only)

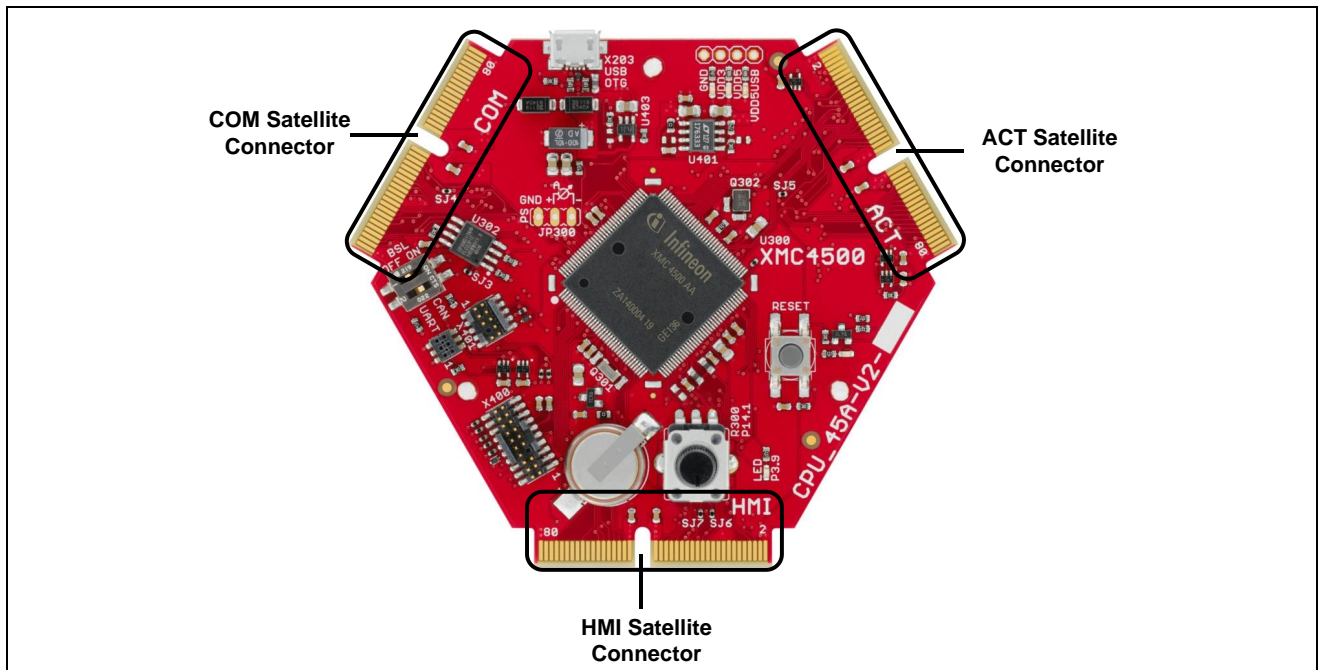


Figure 22 Satellite Connectors

2.11.1 COM Connector

The COM satellite connector on the CPU_45A-V2 board allows interface expansion through COM satellite cards (e.g. COM_ETH-V1)

CPU_45A-V2		Satellite Connector		CPU_45A-V2	
XMC Pin	XMC Function	Function	Pin	Function	XMC Pin
VSS	GND	GND	1	GND	VSS
P0.13	UI1CL_SCLKOUT	qSPI_SCLK	2	qSPI_D0	P3.15
P0.12	UI1CL_SEL00	qSPI_CS	3	qSPI_D1	P3.14
P3.3	UI1CL_SEL01	qSPI_CS	4	qSPI_D2	P0.15
nc	nc	RSVD	5	qSPI_D3	P0.14
nc	nc	RSVD	6	RSVD	nc
P2.3	ETH0_RXD0A	ETH_RMII	7	ETH_RMII	P2.9
P2.2	ETH0_RXD0A	ETH_RMII	8	ETH_RMII	P2.8
P2.0	ETH0_MDO	ETH_RMII	9	ETH_RMII	P15.9
P2.7	ETH0_MDC	ETH_RMII	10	ETH_RMII	P5.3
P5.9	ETH0_TX_EN	ETH_RMII	11	ETH_RMII	P15.8
nc	nc	RSVD	12	GND	VSS
P3.10	P3.10	ASC_DIR	13	ASC_DIR	nc
P1.4 (3)	U0C0_DX0B	ASC_RXD	14	CAN_TXD	CAN_N2_TXD
P1.5 (3)	U0C0_D0U0T0	ASC_TXD	15	CAN_RXD	CAN_N2_RXDA
P5.5	P5.5	SPI_CS0	16	SPI_MSTR	U0C1_D0U0T0
P3.1	U0C1_SEL00	SPI_CS0	17	SPI_MSTR	U0C1_DX0B
nc	nc	SPI_CS1	18	SPI_SCLK	P3.13
P2.14	U1C0_D0U0T0/DX0D	I2C_SDA	19	I2C_SCL	P5.8
P14.13	P14.13	COM_GPH01	20	COM_GPH01	P0.6
P3.7	P3.7	COM_GPH00	21	COM_GPH00	PORST
		VDD5	22	VDD5	
		VDD5	23	VDD5	
		EBU_ADV	24	EBU_ADV	nc
		EBU_WR	25	EBU_WR	nc
		EBU_RD	26	EBU_RD	nc
		EBU_BC	27	EBU_BC	nc
		EBU_CS	28	EBU_CS	nc
		GND	29	GND	nc
		EBU_A	30	EBU_A	nc
		EBU_A	31	EBU_A	nc
		EBU_A	32	EBU_A	nc
		EBU_A	33	EBU_A	nc
		EBU_A	34	EBU_A	nc
		EBU_A	35	EBU_A	nc
		EBU_A	36	EBU_A	nc
		EBU_A	37	EBU_A	nc
		EBU_A	38	EBU_A	nc
		EBU_A	39	EBU_A	nc
		EBU_A	40	EBU_A	nc
		EBU_A	41	EBU_A	nc
		EBU_A	42	EBU_A	nc
		EBU_A	43	EBU_A	nc
		GND	44	GND	VSS
		GND	45	GND	VSS

Figure 23 Satellite Connector Type COM

(3) This pin is connected with the satellite connector via an analog switch

2.11.2 HMI Connector

The HMI satellite connector on the CPU_45A-V2 board allows interface expansion through HMI satellite cards.

CPU_45A-V2		Satellite Connector		CPU_45A-V2	
XMC Pin	XMC Function	Function	Pin	Function	XMC Pin
VSS	GND	GND	1	GND	VSS
P3.6	MMC_CLK_OUT	MMC_CLK	2	MMC_RST	P0.11
P1.6	MMC_DATA1_OUT	MMC_DATA1	3	MMC_DATA0	P4.0
P4.1	MMC_DATA3_OUT	MMC_DATA3	4	MMC_DATA2	P1.7
nc	nc	MMC_DATA5	5	MMC_DATA4	nc
nc	nc	MMC_DATA7	6	MMC_DATA6	nc
VSS	GND	MMC_BUSPOW	7	MMC_CMD	P3.5
nc	nc	MMC_nSDCD	8	MMC_LED	VSS
nc	nc	RSVD	9	RSVD	nc
nc	nc	RSVD	10	RSVD	nc
nc	nc	RSVD	11	RSVD	nc
P2.10	P2.10	AudioRST	12	OLED_CMD	P5.11
P3.1	U0C1_SEL00	I2S_WA	13	I2S_MSTR	U0C1_D0U0T0
nc	nc	I2S_MCLK	14	I2S_MRST	U0C1_DX0B
nc	nc	I2S_SYNCCLK	15	I2S_SCLK	U0C1_SCLKOUT
P3.12	U0C1_SEL01	SPI_CSH0	16	SPI_MSTR	U0C1_D0U0T0
P3.1	U0C1_SEL00	SPI_CSH1	17	SPI_MSTR	U0C1_DX0B
P3.8	U0C1_SEL03	SPI_CSH2	18	SPI_SCLK	U0C1_SCLKOUT
P2.14	U1C0_DX0D/D0U0T0	I2C_SDA	19	I2C_SCL	P5.8
P15.5	P15.5 Input	HMI_GPH01	20	GPI0	P0.6
P5.6	P5.6	HMI_GPH00	21	RESET	PORST
		VDD5	22	VDD5	
		VDD5	23	VDD5	
VAGND	AGND	AGND	24	VAREF	VAREF
P14.9	VADC_G1CH1	DA0/ADCL	25	VADC_G1CH0	P14.8
P14.6	VADC_G0CH6	ADC3/ORC0	26	VADC_G0CH4	P14.4
P14.12	VADC_G1CH4	ADC15	27	VADC_G0CH3	P14.3
P15.13	VADC_G3CH5	ADC16	28	VADC_G2CH3	P15.3
P15.12	VADC_G3CH4	ADC17	29	VADC_G2CH2	P15.2
nc	nc	RSVD	30	RSVD	nc
nc	nc	RSVD	31	RSVD	nc
nc	nc	RSVD	32	RSVD	nc
nc	nc	TP7	33	LEDTS0_TSIN7A	P5.10
nc	nc	TP6	34	TP6	nc
nc	nc	TP5	35	TP5	nc
nc	nc	TP4	36	TP4	nc
nc	nc	COL3	37	COL3	nc
nc	nc	COL2	38	COL2	nc
nc	nc	COL1	39	COL1	nc
P0.10	LEDTS0_COL1	COL0	40	LEDTS0_TSIN2A	P2.4
P5.7	LEDTS0_COLA	COLA	41	nc	nc
VSS	GND	GND	42	GND	VSS
		GND	43	GND	VSS

Figure 24 Satellite Connector Type HMI

2.11.3 ACT Satellite Connector

The ACT satellite connector on the CPU_45A-V2 board allows interface expansion through ACT satellite cards.

CPU_45A-V2		Satellite Connector		CPU_45A-V2	
XMC Pin	XMC Function	Function	Pin	Function	XMC Pin
VSS	GND	GND	1	GND	VSS
nc	nc	PIF0_IN0	2	GND	P1.3
nc	nc	PIF0_IN1	3	PIF0_IN1	P1.3
nc	nc	PIF0_IN2	4	PIF0_IN2	P1.2
nc	nc	PIF0_IN3	5	PIF0_IN3	P1.1
P1.0	DSD_PWMN	PWMN	6	DSD_IN0	P0.8 (2)
P5.1	DSD_PWMN	PWMN	7	DSD_IN1	P2.6
P1.7	DSD_MCLK2A	PWMP	8	DSD_IN2	P1.6
P3.4	DSD_MCLK3B	DSDCLK0	9	DSD_IN3	P6.5 (3)
nc	nc	DSDCLK1	10	RSVD	nc
P4.3	CCU43_IN3A	RSVD	11	CC_IN0	P4.6
P5.2	CCU81_IN1B	CC_IN3	12	CC_IN1	P4.5
P5.4	CCU81_IN3B	CC_IN4	13	CC_IN2	P4.4
P0.7 (1)	CCU80_IN0A	CC_IN5	14	ENA_A	P2.13
P5.0	CCU81_IN0A/1A/2A/3A	TRAP_A	15	ENA_B	P2.12
P4.7	CCU43_IN0C	TRAP_B	16	ENA_X	P6.4
P3.11	U0CL_SELO2	TRAP_X	17	SPI_MSTR	P3.13
P3.8	U0CL_SELO3	SPI_CSA0	18	SPI_MSTR	P2.5
nc	nc	SPI_CSA1	19	SPI_SCLK	P3.0
P2.14	U100_D0XDY/D0UJ0	SPI_CSA2	20	I2C_SCL	P5.8
P15.4	P15.4 Input	I2C_SDA	21	GPIO	P0.6
P4.2	P4.2	ACT_GPI01	22	RESET	PO_RST
		ACT_GPI00	23	VDD5	
		VDD5	24	VDD5	
VAGND	AGND	VDD5	25	VDD5	
P14.9	VADC_G1CH1	AGND	26	VDD5	
P14.6	VADC_G0CH6	AGND/ADC1	27	VDD5	
P14.7	VADC_G0CH7	DAC0/ADC1	28	VDD5	
P14.0	VADC_G0CH0	ADC3/OR00	29	VDD5	
P14.5	VADC_G2CH1	ADC3/OR02	30	VDD5	
P15.14	VADC_G3CH6	ADC5/ORC2	31	VDD5	
P15.15	VADC_G3CH7	ADC5/ORC7	32	VDD5	
P1.15	CCU81_OUT00	ADC7	33	VDD5	
P1.12	CCU81_OUT10	ADC9	34	VDD5	
P1.14	CCU81_OUT10	ADC11	35	VDD5	
P1.11	CCU81_OUT11	ADC13	36	VDD5	
P1.13	CCU81_OUT20	PWMBO_H	37	VDD5	
P.10	CCU81_OUT21	PWMBO_L	38	VDD5	
P6.0 (3)	CCU81_OUT31	PWMB1_H	39	VDD5	
P6.1 (3)	CCU81_OUT30	PWMB1_L	40	VDD5	
VSS	GND	PWMB2_H	41	VDD5	
		PWMB2_L	42	VDD5	
		PWMX2	43	VDD5	
		PWMX3	44	VDD5	
		GND	45	VDD5	
		GND	46	VDD5	
		GND	47	VDD5	
		GND	48	VDD5	
		GND	49	VDD5	
		GND	50	VDD5	
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		GND	52	VDD5	
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		GND	62	VDD5	
		GND	63	VDD5	
		GND	64	VDD5	
		GND	65	VDD5	
		GND	66	VDD5	
		GND	67	VDD5	
		GND	68	VDD5	
		GND	69	VDD5	
		GND	70	VDD5	
		GND	71	VDD5	
		GND	72	VDD5	
		GND	73	VDD5	
		GND	74	VDD5	
		GND	75	VDD5	
		GND	76	VDD5	
		GND	77	VDD5	
		GND	78	VDD5	
		GND	79	VDD5	
		GND	80	VDD5	
		GND	ACT	VDD5	

Figure 25 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

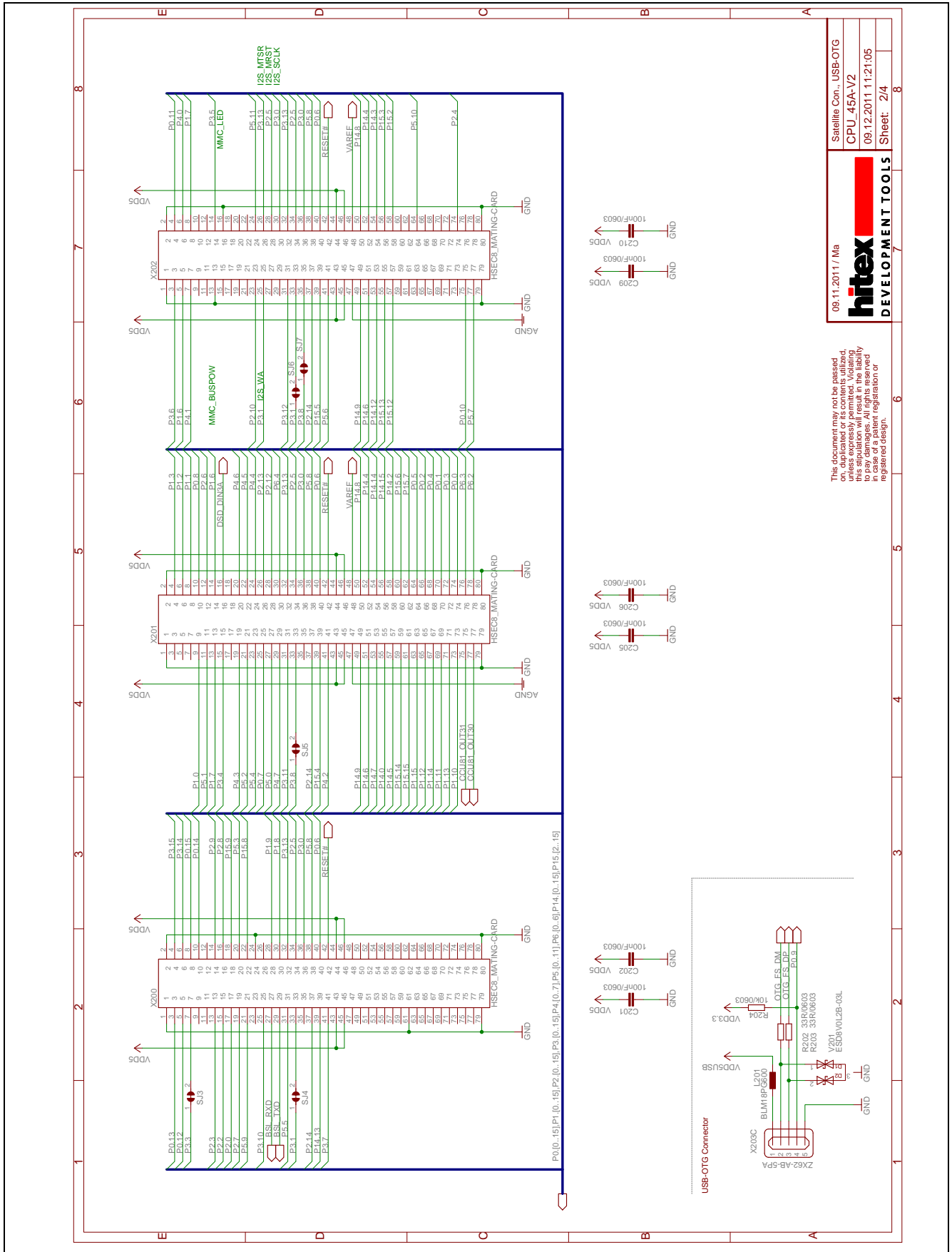
3 Production Data

3.1 Schematics

This chapter contains the schematics for the CPU board:

- Satellite Connectors, USB-OTG
- XMC4500
- Power, Debug

The board has been designed with EagleThe full PCB design data of this board

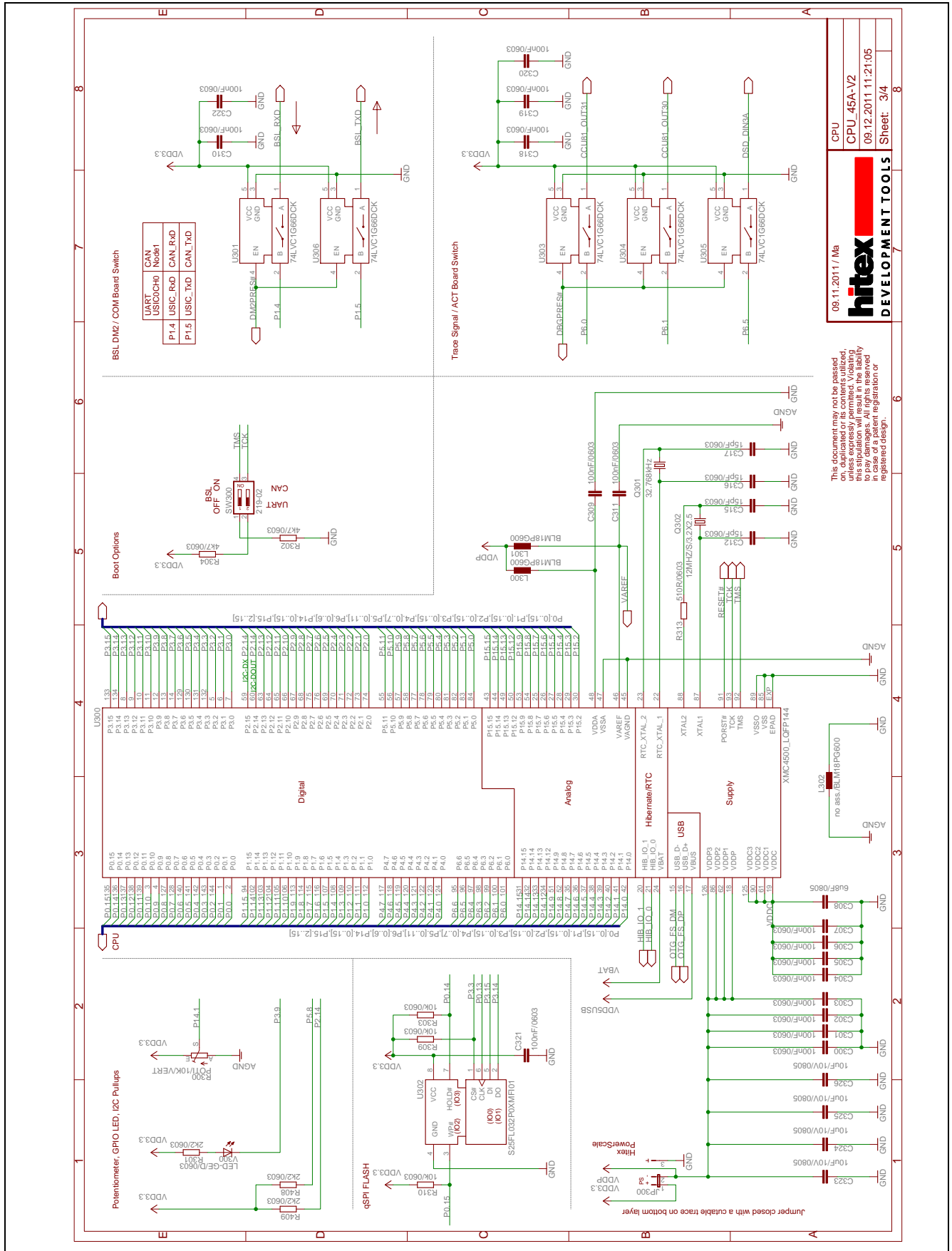


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Figure 26 Satellite Connectors, USB-OTG



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 CPU_45A-V2
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Figure 27 XMC4500

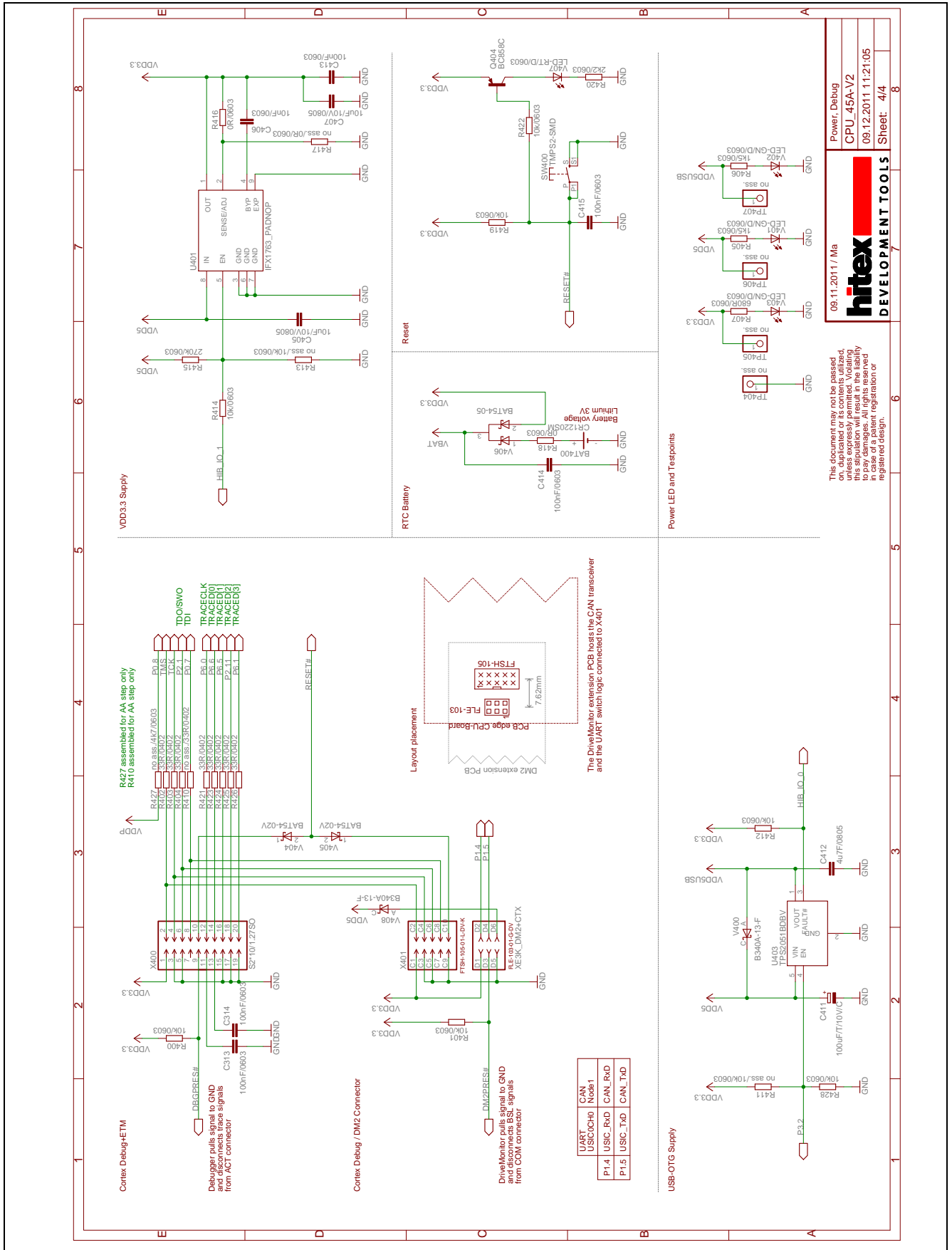


Figure 28 Power, Debug

3.2 Layout and Geometry

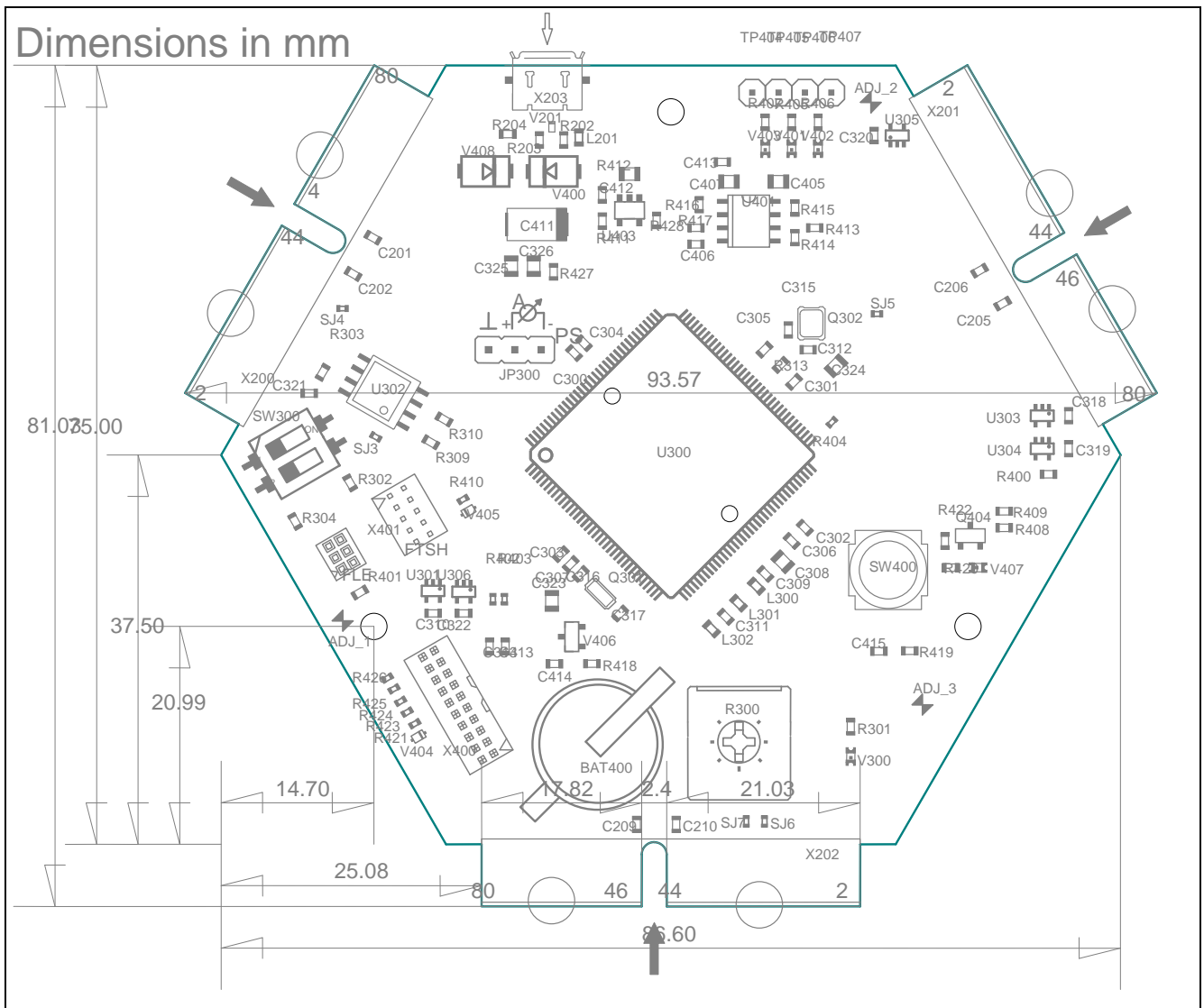


Figure 29 CPU_45A-V2 Board Layout

3.3 List of Material (LOM)

Table 10 CPU_45A-V2 Board LOM

Pos. No.	Quantity	Value	Device	Reference Des.
1	5	0 R/0402	Resistor	SJ3, SJ4, SJ5, SJ6, SJ7
2	2	0 R/0603	Resistor	R416, R418
3	2	1 k5/0603	Resistor	R405, R406
4	4	2 k2/0603	Resistor	R301, R408, R409, R420
5	2	4 k7/0603	Resistor	R302, R304
6	1	4 u7F/0805	Capacitor	C412
7	1	6 u8F/0805	Capacitor	C308
8	11	10 k/0603	Resistor	R204, R303, R309, R310, R400, R401, R412, R414, R419, R422, R428
9	1	10 nF/0603	Capacitor	C406
10	6	10 uF/10 V/0805	Capacitor	C323, C324, C325, C326, C405, C407
11	1	12 MHz/S/3.2X2.5	Crystal, 12 MHz, 3.2x2.5 mm	Q302
12	4	15 pF/0603	Capacitor	C312, C315, C316, C317
13	1	32.768 kHz	Crystal, 32.768 KHz, 3.2x1.5 mm	Q301
14	8	33 R/0402	Resistor	R402, R403, R404, R421, R423, R424, R425, R426
15	2	33 R/0603	Resistor	R202, R203
16	5	74LVC1G66DCK	IC, Texas Instruments, SN74LVC1G66DCK	U301, U303, U304, U305, U306
17	27	100 nF/0603	Capacitor	C201, C202, C205, C206, C209, C210, C300, C301, C302, C303, C304, C305, C306, C307, C309, C310, C311, C313, C314, C318, C319, C320, C321, C322, C413, C414, C415
18	1	100 uF/T/10 V/C	Capacitor	C411
19	1	219-02	Dual DIP-Switch, 0.1"pitch	SW300
20	1	270 k/0603	Resistor	R415
21	1	510 R/0603	Resistor	R313
22	1	680 R/0603	Resistor	R407
23	2	B340A-13-F	Diode, B340A-13-F Diodes Inc.	V400, V408
24	2	BAT54-02V	Diode, BAT54-02V SC79, Infineon Technologies	V404, V405
25	1	BAT54-05	Diode, BAT54-05 SOT23-3, Infineon technologies	V406
26	1	BC858C	Transistor, BC858C PNP SOT23-3	Q404
27	3	BLM18PG600	Ferrite Bead, Murata	L201, L300, L301

Table 10 CPU_45A-V2 Board LOM

Pos. No.	Quantity	Value	Device	Reference Des.
28	1	CR1220SM	Battery, 3 V Li-Ion coin cell	BAT400
29	1	ESD8V0L2B-03L	ESD8V0L2B-03L Infineon Technologies	V201
30	1	IFX1763_PADNOP	LDO, IFX1763SJV33 Infineon Technologies	U401
31	1	LED-GE/D/0603	LED	V300
32	3	LED-GN/D/0603	LED Green	V401, V402, V403
33	1	LED-RT/D/0603	LED	V407
34	1	POTI/10 K/VERT	Potentiometer, ALPS RK09K1130A8G	R300
35	1	S2*10/1.27SO	Connector, FTSH-110-01-L-DV-K-P Samtec, without pin 7	X400
36	1	S25FL032P0XMF101	IC, Flash memory, Spansion	U302
37	1	TMPS2-SMD	FSM2JSMATR TEconn.	SW400
38	1	TPS2051BDBV	IC, TPS2051BDBV, Texas Instruments	U403
39	1	XE3K_DM2+CTX	Connector, FTSH-105-01-LM-DV-K Samtec, without pin 7 FLE-103-01-G-DV Samtec	X401
40	1	XMC4500_LQFP144	IC, XMC4500, Infineon Technologies	U300
41	1	ZX62-AB-5PA	Connector, ZX62-AB-5PA Hirose	X203
42	4	no ass.	Pinheader, 0.1" TH	TP404, TP405, TP406, TP407
43	1	no ass./0 R/0603	Resistor	R417
44	1	no ass./4 k7/0603	Resistor	R427
45	2	no ass./10 k/0603	Resistor	R411, R413
46	1	no ass./33 R/0402	Resistor	R410
47	1	no ass. / BLM18PG600	Ferrite Bead, Murata	L302
48	1	no ass.	Pinheader, 0.1" TH, Hitex PowerScale	JP300
49	3	no ass.	Edgecard connector	X200, X201, X202

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