PIC32 WFI32 2.0 Curiosity HPC User's Guide

EV68D28A

Introduction

The PIC32 WFI32 2.0 Curiosity HPC Board enables the user to evaluate and demonstrate the functionality of the PIC32MZ2051W104 System-on-Chip (SoC) and the WFI32E04 Module with up to 200 MHz CPU clock frequency. The PIC32 WFI32 2.0 Curiosity HPC Board is a development platform that supports rapid prototyping using on-chip Microcontroller (MCU) peripherals. This board offers integrated programming/debugging features using the PICkit™ On- Board (PKOB4) debugger, which requires a USB Type-C® cable to power-up and program the board and another Micro-B cable for the USB Host/Device mode of operation. The PIC32 WFI32 2.0 Curiosity HPC Board supports a variety of applications, such as Internet of Things (IoT) and other Wi-Fi®-enabled applications.

Features

- Certified WFI32E04UC–Wi-Fi® Single Band (2.4 GHz) Module
- Two mikroBUS™ Socket to Expand Functionality Using MikroElectronika Click Boards or Microchip RN-Based Add-On Boards
- Support for Multiple Microchip Ethernet PHY Daughter Boards
- Two User LEDs
- Two User-Configurable Switches
- One Reset Switch
- Two GPIO Expansion Header
- On-Board USB-to-UART Serial Converter Based on the MCP2200
- On-Board Temperature Sensor
- On-Board 32 KHz Secondary Oscillator
- 20-Pin Xplained Pro (XPRO) Header to Interface QT7/QT8/T9 XPRO Kit to Integrate Touch Button Support and Demonstrate Touch Feature
- 32-Mb External SPI Serial Flash Memory
- PICkit On- Board 4 (PKOB4) Support
- In-Circuit Serial Programming™ (ICSP™) Header for External Debugger, such as MPLAB ICD 5, MPLAB PICkit 4, MPLAB PICkit 5 and MPLAB Snap

Table of Contents

1. Quick References

1.1 Reference Documentation

For further details, refer to the following:

- *MPLAB Snap In-Circuit Debugger Information Sheet* (DS50002787)
- *MPLAB XC32 C/C++ Compiler User's Guide* (DS50001686)
- *MPLAB X IDE User's Guide* (DS50002027)
- *PIC32MZ W1 MCU and WFI32 Module with Wi-Fi® and Hardware-Based Security Accelerator Data Sheet* (DS70005425)
- *PIC32MZ W1 MCU and WFI32 Module with Wi-Fi® and Hardware-Based Security Accelerator Errata* (DS80000912)
- *PIC32MZ-W1 Reference Design Evaluation Board* (DS50003205)
- *PIC32MZ W1 Software User's Guide* (DS50003034)
- *mikroBUS Specification* (www.mikroe.com/mikrobus)
- *Universal Serial Bus Specification and Associated Documents* (www.usb.org/)

1.2 Hardware Prerequisites

- PIC32 WFI32 2.0 Curiosity HPC Board kit
- Micro-A USB to Micro-B USB cable
- Any of the following in-circuit debugger or programmers:
  - MPLAB Snap
  - MPLAB PICkit 4/MPLAB PICkit 5
  - MPLAB ICD 5

1.3 Software Prerequisites

- MPLAB Integrated Development Environment (MPLAB X IDE) tool (version 6.20 or later)
- MPLAB XC32 compiler (version 4.35 or later)
- MPLAB Snap (PG164100)
- Out of Box (OOB) demo

1.4 Acronyms and Abbreviations

Table 1-1. Acronyms and Abbreviations

Acronyms and Abbreviations	Description
ADC	Analog-to-Digital Converter
BOM	Bill of Material
CAN	Controller Area Network
CVD	Capacitive Voltage Divider
DNP	Do Not Populate
GPIO	General Purpose Input Output
HPC	High Pin Count
I^2C/I2C	Inter-Integrated Circuit
ICD	In-Circuit Debugger
ICSP	In-Circuit Serial Programming
IoT	Internet of Things

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Acronyms and Abbreviations	Description
JTAG	Joint Test Action Group
LDO	Low-Dropout Regulator
LED	Light Emitting Diode
MCU	Microcontroller
NC	Not Connected
OOB	Out of Box
PCB	Printed Circuit Board
PKOB	PICKit™ On-Board
PPS	Peripheral Pin Select
PTA	Packet Traffic Arbitration
PWM	Pulse Width Modulation
RMII	Reduced Media Independent Interface
RTCC	Real Time Clock and Calendar
RX	Receiver
SCL	Serial Clock
SDA	Serial Data
SMD	Surface Mount Device
SoC	System-on-Chip
SPI	Serial Peripheral Interface
SQI	Serial Quad Interface
TX	Transmitter
UART	Universal Asynchronous Receiver-Transmitter
USB	Universal Serial Bus
XPRO	Xplained PRO Expansion Header

2. Kit Overview

The PIC32 WFI32 2.0 Curiosity HPC Board contains a WFI32E04UC Module. All the signals from the WFI32E04 Module are brought onto the Curiosity board, where they are connected to on-board peripherals or terminated onto headers for rapid prototyping or evaluation.

Figure 2-1. PIC32 WFI32 2.0 Curiosity HPC Board (EV68D28A) (Top View)

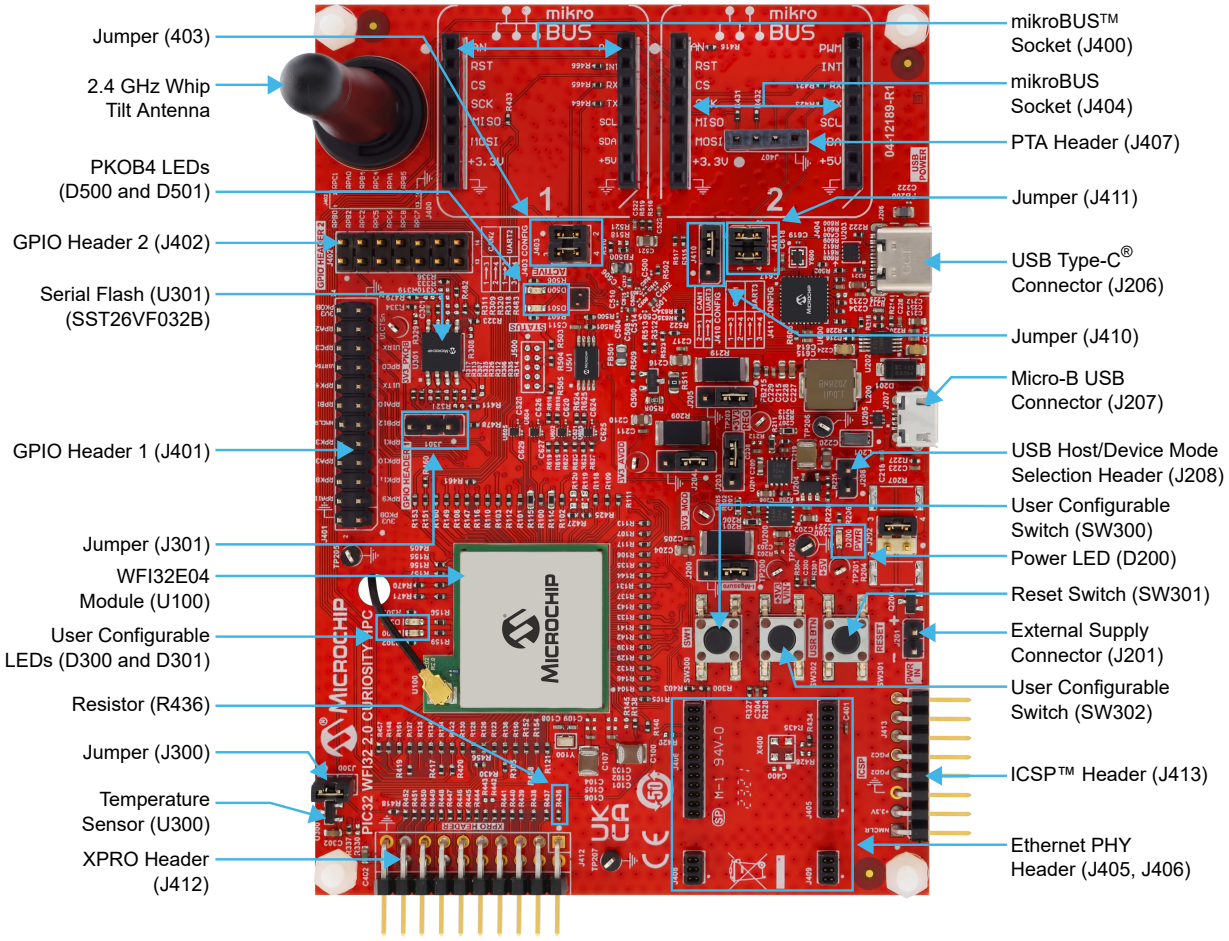
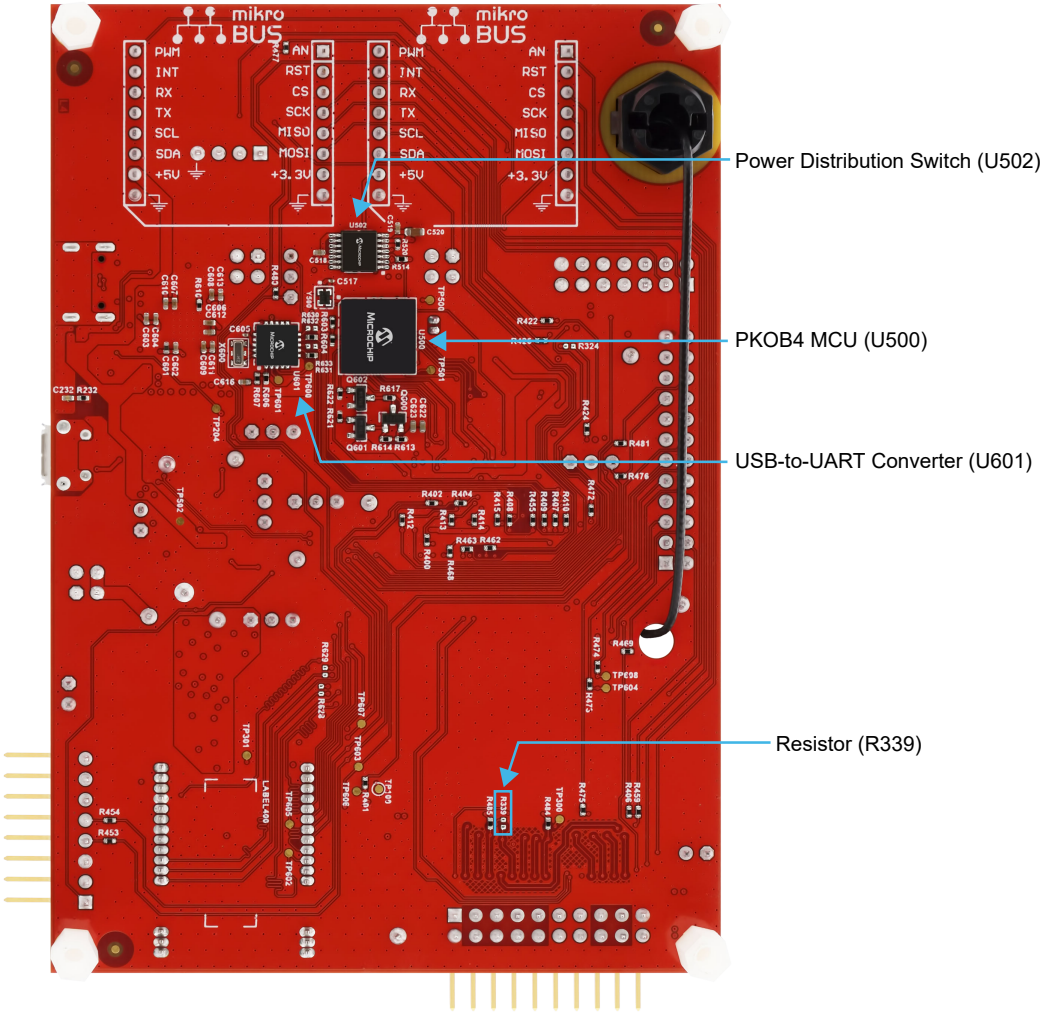


Figure 2-2. PIC32 WFI32 2.0 Curiosity HPC Board (EV68D28A) (Bottom View)



2.1 Kit Contents

The EV68D28A (PIC32 WFI32 2.0 Curiosity HPC Board) kit contains the following:

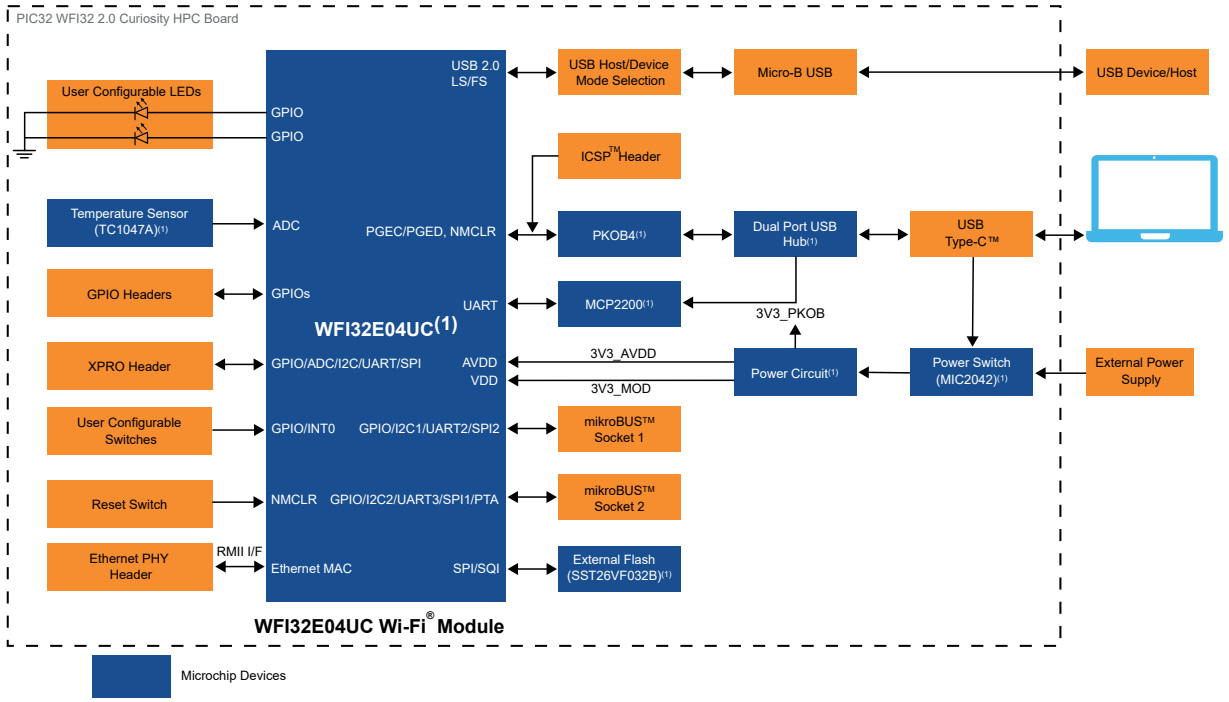
- A WFI32E04UC Module mounted on the PIC32 WFI32 2.0 Curiosity HPC Board
- Male USB Type-A cable to USB Type-C® cable
- A 2.4 GHz Whip Tilt Antenna (RFA-02-L2H1)

Note: If any of the above items are missing in the kit, go to support.microchip.com or contact your local Microchip sales office. A list of Microchip offices for sales and services is provided on the last page of this document.

3. Hardware

This chapter describes the hardware features of the PIC32 WFI32 2.0 Curiosity HPC Board.

Figure 3-1. PIC32 WFI32 2.0 Curiosity HPC Board Block Diagram



Note:

1. Using Microchip's total system solution, which includes complementary devices, software drivers and reference designs, is highly recommended to ensure the proven performance of the PIC32 WFI32 2.0 Curiosity HPC Board. For more details, go to support.microchip.com or contact your local Microchip Sales office.

Table 3-1. Microchip Components used in PIC32 WFI32 2.0 Curiosity HPC Board

S.No.	Designator	Manufacturer Part Number	Description
1	Q500, Q601, Q602	TN2106K1-G	MCHP Analog MOSFET N-CH TN2106 60V 280 mA 360 mW 2.5R SOT23-3
2	U200, U201	MCP1727T-ADJE/MF	MCHP Analog LDO 0.8V-5V MCP1727T-ADJE/MF DFN-8
3	U202	MIC4721YMM-TR	IC REG BUCK ADJ 1.5A 10MSOP
4	U204	MIC2005A-1YM5-TR	MCHP Analog Power Switch 5.5V 500 mA MIC2005A-1YM5-TR SOT-23-5
5	U300	TC1047AVNBTR	MCHP Analog Temperature Sensor -40°C to +125°C TC1047AVNBTR SOT-23-3
6	U301	SST26VF032B-104I/SM	MCHP Memory Serial Flash SST26VF032B-104I/SM SOIJ-8
7	U500	ATSAME70N21B-CNT	MCHP MCU 32-BIT 300 MHz 2MB 384K x 8 ATSAME70N21B-CNT TFBGA-100
8	U501	24LC256T-E/ST	MCHP Memory Serial EEPROM 256k I2C 24LC256T-E/ST TSSOP-8
9	U502	MIC2042-1YTS	MCHP Analog Power SWITCH 5.5V 3A MIC2042-1YTS TSSOP-14
10	U600	USB2512B-I/M2	MCHP INTERFACE USB 2.0 HUB CTRLR USB2512B-I/M2 SQFN-36
11	U601	MCP2200-I/MQ	MCHP Interface USB UART MCP2200-I/MQ QFN-20

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S.No.	**Designator**	**Manufacturer Part Number**	**Description**
12	Y500	DSC6011JI1B-012.0000	MCHP Clock Oscillator Single 12.000 MHZ DSC6011JI1B-012.0000 VLGA
13	Y600	DSC6011HI1B-024.0000	MCHP CMOS Oscillator 24 MHz DSC6011HI1B-024.0000 SMD VFLGA-4
14	U100	WFI32E04UC-I	Wi-Fi® Module with U.FL Antenna, 2 MB Flash and ECC608 IC

3.1 Power Supply

The following are the list of sources to power the PIC32 WFI32 2.0 Curiosity HPC Board:

- External supply connector 5V (J201)
- USB Type-C® connector (J206)

The following table lists the power supply source details and its jumper positions.

Table 3-2. Power Supply Sources

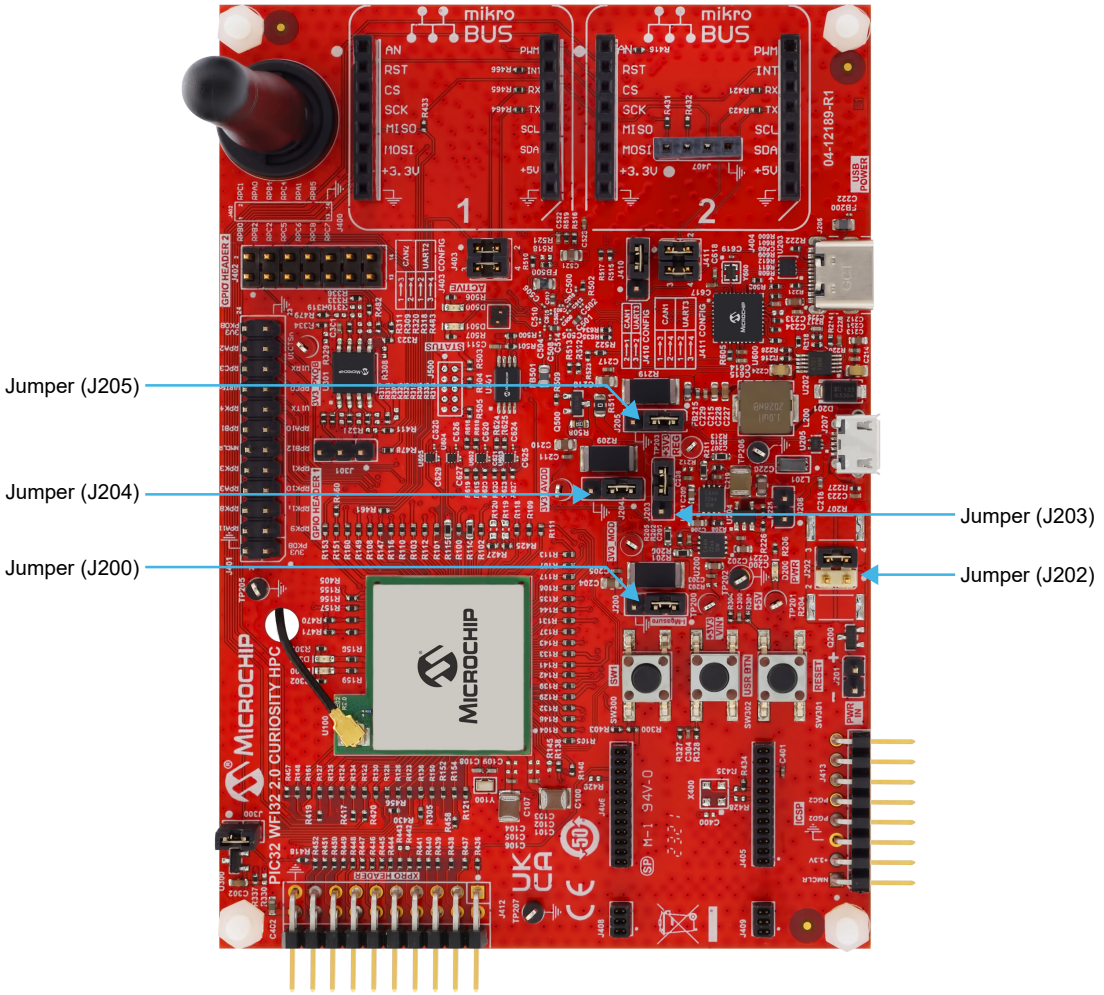
Power Input	Description	Jumper Position (J202)(1)
External supply connector 5V (J201)(2)	Connect the PIC32 WFI32 2.0 Curiosity HPC Board to an external 5V power supply	2-1
USB Type-C® connector (J206)	Connect the Micro-A male to USB Type-C cable to the USB debug port for power supply	4-3 (default)

Notes:

1. Jumper (J202) in Figure 3-3
2. The maximum input voltage from the external 5V supply must not exceed 5.5V. Applying a supply voltage higher than 5.5V can damage the board.

The following figure illustrates the jumper positions that power the PIC32 WFI32 2.0 Curiosity HPC Board.

Figure 3-2. Jumper Configuration for Power Input

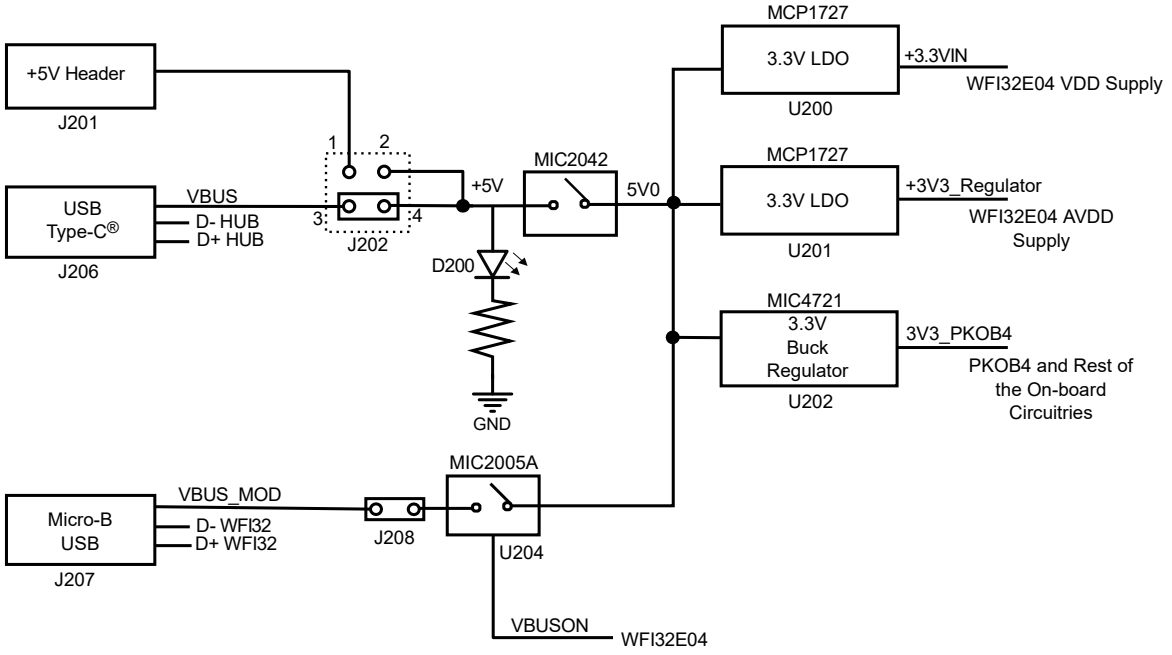


The following table provides details about the jumper configuration.

Table 3-3. Jumper Configuration

Jumper Reference Designator	Jumper Position	Remarks
J200	2-1	U200 as power source for 3V3_MOD
J202	4-3	USB VBUS as board power source (default)
	2-1	External power supply as board power source
J203	2-1	U201 as power source for 3V3_AVDD (default)
	3-2	U200 as power source for 3V3_AVDD
J204	2-1	U200/U201 as power source for 3V3_AVDD
J205	2-1	U202 as power source for 3V3_PKOB

Figure 3-3. Power Tree Diagram



3.2 On-board Clock Sources

PIC32 WFI32 2.0 Curiosity HPC Board has four on-board clock sources for various sections and applications.

Secondary Oscillator

RTCC operation for the WFI32E04 Module can be derived either through internal LPRC or external 32.768 kHz oscillator (SOSC) available on the PIC32 WFI32 2.0 Curiosity HPC Board. The 32.768 kHz crystal oscillator is connected to SOSC pins (SOSCI and SOSCO) of the WFI32E04 Module.

Table 3-4. Secondary Oscillator Specifications

Parameter	Attribute
Clock source	External crystal
Part number	FC-12M 32.7680KA-A5
Reference designator	Y100
Frequency	32.768 kHz
Tolerance	±20 ppm
Operating temperature range	-40°C to +85°C
ESR	90 kΩ
Load capacitance	12.5 pF
Drive level	0.5 uW (maximum)
Aging	±3 ppm per year (maximum)
Package	2-SMD, no lead (2.05 mm x 1.20 mm)

Ethernet Oscillator (X400)

By default, the WFI32E04 Module drives the Ethernet clock; however, the provision of an external 50 MHz crystal oscillator (X400) is provided on the PIC32 WFI32 2.0 Curiosity HPC Board.

Notes:

1. The user can configure the ETH_CLK_OUT signal of the WFI32E04 Module as a clock source to the Ethernet interface but not as an input to the WFI32E04 Module.
2. By default, the Ethernet oscillator (X400) is not populated on the PIC32 WFI32 2.0 Curiosity HPC Board.

PICkit® On-board 4 (PKOB4) Oscillator (Y500)

On-board ATSAME70N21B-CNT MCU requires an external 12 MHz oscillator. By default, this oscillator (Y500) is populated on the PIC32 WFI32 2.0 Curiosity HPC Board.

Table 3-5. PKOB4 Oscillator Specifications

Parameter	Attribute
Clock source	External CMOS oscillator
Part number	DSC6011JI1B-012.0000
Reference designator	Y500
Alternate part number	ECS-1633-120-BN-TR
Frequency	12 MHz
Tolerance	±50 ppm
Operating temperature range	-40°C to +85°C
Package	4-VLGA, (2.5 mm x 2 mm)

USB Hub Oscillator (Y600)

On-board two port USB Hub (USB2512B-I/M2) requires an external 24 MHz oscillator. By default, this oscillator (Y600) is populated on the PIC32 WFI32 2.0 Curiosity HPC Board.

Parameter	Attribute
Clock source	External CMOS oscillator
Part number	DSC6011HI1B-024.0000
Reference designator	Y600
Alternate part number	ASA-24.000 MHZ-L-T
Frequency	24 MHz
Tolerance	±50 ppm
Operating temperature range	-40°C to +85°C
Package	4-VLGA, (1.6 mm x 1.2 mm)

USB-to-UART Converter Oscillator (X600)

On-board two port USB Hub (USB2512B-I/M2) requires an external 24 MHz oscillator. By default, this oscillator (X600) is populated on the PIC32 WFI32 2.0 Curiosity HPC Board.

Parameter	Attribute
Part number	CSTNE12M0G550000R0
Reference Designator	X600
Frequency	12 MHz
Tolerance	±0.2%
Operating temperature range	-40℃ to +85℃
Package	3-SMD, Non-standard

3.3 In-Circuit Serial Programming™ (ICSP™) Header (J413)

The ICSP header (J413) is a standard 8-pin staggered header. It allows in-circuit emulation and debugging using Microchip's in-circuit emulator tools, and it allows direct programming of the WFI32E04 Module. The ICSP header supports external debuggers, such as MPLAB ICD 5, MPLAB

PICkit 4, MPLAB PICkit 5 and MPLAB Snap. Use the standard ICSP header to connect an MPLAB programmer or debugger to the PIC32 WFI32 2.0 Curiosity HPC Board. The following figure illustrates the connection between the ICSP header, external debuggers and the PIC32 WFI32 2.0 Curiosity HPC Board.

Figure 3-4. Connection Diagram

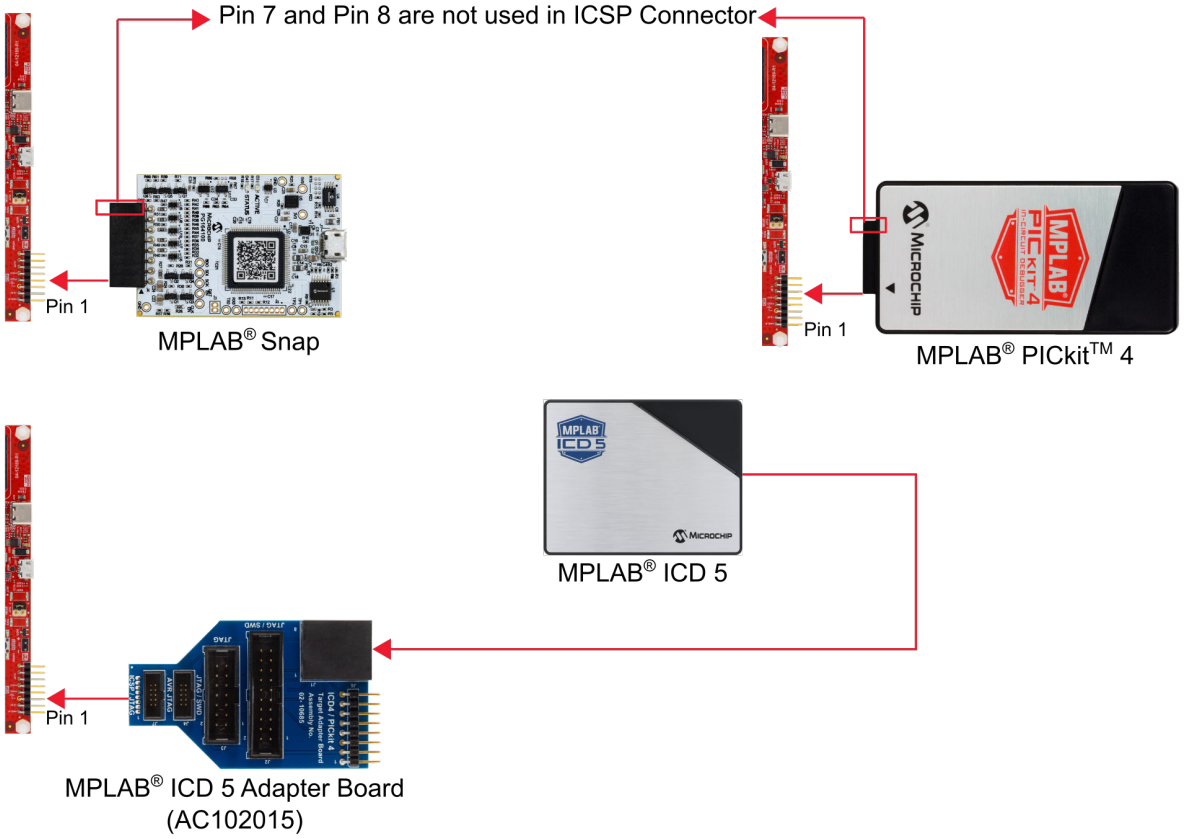
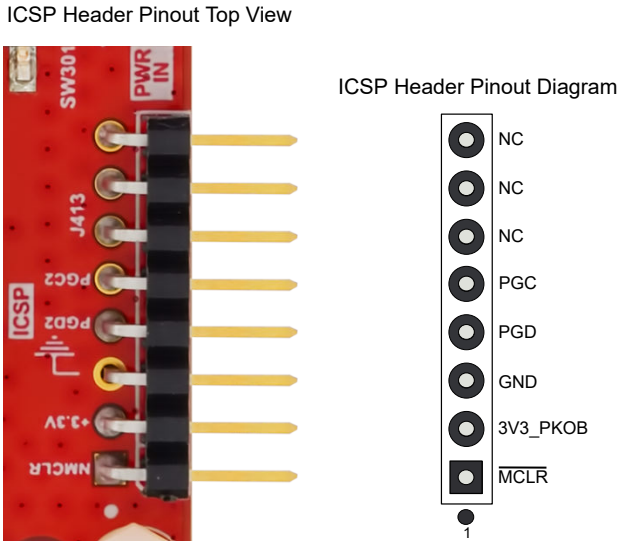


Figure 3-5. ICSP™ Header (J413) Pinout



The following table provides the pin details and descriptions of the ICSP header.

Table 3-6. ICSP™ Header Pin Description – J413

Pin Number	Pin on ICSP™ Header	Pin Description of ICSP Header	Pin on the WFI32E04 Module(1)
J413-1	$\overline{\text{MCLR}}$	Reset pin	$\overline{\text{MCLR}}$
J413-2	3V3_PKOB	3.3V power supply	NC
J413-3	GND	Ground	GND
J413-4	PGD	ICSP programming data	PGD2/AN5/CVD5/CVDR5/ CVDT2/RTCC/ RPB5/RB5
J413-5	PGC	ICSP programming clock	PGC2/AN4/CVD4/CVDR4/ CVDT3/ RPB4/RB4
J413-6	NC	Not connected	NC
J413-7	NC	Not connected	NC
J413-8	NC	Not connected	NC

Notes:

1. For more details on the WFI32E04 pins, refer to the *PIC32MZ W1 MCU and WFI32 Module with Wi-Fi® and Hardware-Based Security Accelerator Data Sheet* (DS70005425).
2. Use an external debugger such as MPLAB ICD 5 or MPLAB Snap for the best programming and debugging experience.

3.4 USB Connectivity

The WFI32E04 Module has an integrated USB peripheral that supports both low-speed and full-speed modes. This feature enables the user to implement USB functionality through the Micro-B USB connector (J207) on the PIC32 WFI32 2.0 Curiosity HPC Board. Connect the board using any one of these modes:

- Device mode:
  a. The user must power-up the PIC32 WFI32 2.0 Curiosity HPC Board using any of the two power sources before using the USB interface. For more details, refer to Power Supply.
  b. Connect the host PC to the Micro-B USB connector (J207) using a male USB Type-A cable to Micro-B male USB cable.
  Notes:
    - Do not place the jumper on the USB Host/Device mode selection header (J208)
    - By default, jumper is not placed on J208 header
- Host mode:
  a. The user must power-up the PIC32 WFI32 2.0 Curiosity HPC Board using any of the two power sources before using the USB interface. For more details, refer to Power Supply.
  b. Connect the USB device to the Micro-B USB connector (J207) using a female USB Type-A cable to Micro-B male USB cable.
  c. Place a jumper in the USB Host/Device mode selection header (J208) to drive the VBUS line in the Host mode.
  Note: USB Type-A cable to Micro-B male USB cable is not available in the PIC32 WFI32 2.0 Curiosity HPC Board kit.

3.5 mikroBUS™ Sockets (J400 and J404)

There are two mikroBUS™ sockets (J400 and J404) that expands the functionality of the PIC32 WFI32 2.0 Curiosity HPC Board using the MikroElektronika click adapter boards and Microchip RN-based add-on boards.

The mikroBUS connector consists of:

- Pair of 1x8 female headers with proprietary pin configuration and silkscreen markings
- The pinout consists of three groups of communications pins:
  - Serial Peripheral Interface (SPI)
  - Universal Asynchronous Receiver/Transmitter (UART)
  - Inter-Integrated Circuit (I^2C)
- Two power groups
  - 3.3V, Ground line
  - 5V, Ground line
- Four additional pins
  - Pulse Width Modulation (PWM)
  - Reset Pin (RST)
  - Interrupt
  - Analog

Note: For a complete listing of the click boards, refer to www.mikroe.com/click.

In addition to all the mikroBUS socket (J400) interfaces, the mikroBUS socket (J404) has an additional PTA header (J407) to interface with RN-based add-on boards. The following table provides the pinout details of the mikroBUS sockets (J400 and J404).

Figure 3-6. mikroBUS™ Pinout Diagram

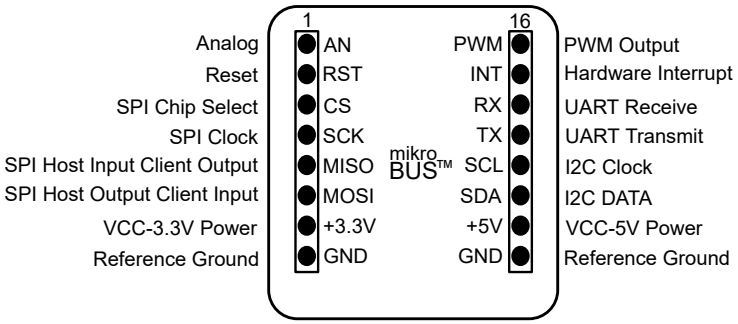


Table 3-7. mikroBUS™ Socket Pin Description – J400

Pin Number	Pin on mikroBUS™ Socket	Pin Description of mikroBUS Socket	Pin on the WFI32E04 Module(1)
J400-1	AN	Analog input	AN14/ANN0/CVD14/CVDR14/RPA14/RA14
J400-2	$\overline{RST}$	Reset	TMS/AN6/CVD6/CVDR6/RPB6/RB6
J400-3	$\overline{CS}$	SPI Chip Select (CS)	TDO/AN7/CVD7/CVDR7/RPB7/RB7
J400-4	SCK	SPI clock	SCK2/RPA11/RA11
J400-5	MISO	SPI Host Input Client Output	PTA_WLAN_ACTIVE/RPK5/RK5(5)
J400-6	MOSI	SPI Host Input Client Input	BT_CLK_OUT/RPK4/RK4
J400-7	+3.3V	3.3V power	NC
J400-8	GND	Ground	GND
J400-9	GND	Ground	GND
J400-10	+5V	5V power	NC
J400-11	SDA	I^2C data	SDA1/RPA5/RA5
J400-12	SCL	I^2C clock	SCL1/RPA4/RA4
J400-13	TX	UART/CAN transmit	PTA_BT_ACTIVE/RPK7/RK7(5) or PGD4/AN9/CVD9/CVDR9/RPB9/RB9(2, 3)
J400-14	RX	UART/CAN receive	PGD4/AN9/CVD9/CVDR9/RPB9/RB9 or PTA_BT_ACTIVE/RPK7/RK7(2, 3, 4)
J400-15	$\overline{INT}$	Hardware interrupt	PTA_BT_PRIO/RPK6/RK6(5)
J400-16	PWM	PWM output	ANA0/RPB12/RB12

Notes:

1. For more details on the WFI32E04 pins, refer to the *PIC32MZ W1 MCU and WFI32 Module with Wi-Fi® and Hardware-Based Security Accelerator Data Sheet* (DS70005425).
2. For UART operation, the user must mount the jumper (J403) between pin 1-2 and 3-4.
3. For CAN operation, the user must mount the jumper (J403) between pin 2-4 and 1-3.
4. The user must ensure not to simultaneously use the UART-based MikroElectronika click boards on the mikroBUS socket (J400) and the QT7/QT8/T9 XPRO kit on the XPRO header (J412).
5. For more details about PTA signals, refer to the *PIC32MZ W1 MCU and WFI32 Module with Wi-Fi® and Hardware-Based Security Accelerator Data Sheet* (DS70005425).

Table 3-8. mikroBUS™ Socket Pin Description – J404

Pin Number	Pin on mikroBUS™ Socket	Pin Description of mikroBUS Socket	Pin on the WFI32E04 Module(1)
J404-1	AN	Analog input	AN0/RPB0/RB0
J404-2	RST	Reset	TMS/AN6/CVD6/CVDR6/CVDT1/RPB6/RB6

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Pin Number	Pin on mikroBUS™ Socket	Pin Description of mikroBUS Socket	Pin on the WFI32E04 Module(1)
J404-3	$\overline{CS}$	SPI Chip Select (CS)	AN10/CVD10/CVDR10/RPB10/RB10
J404-4	SCK	SPI clock	SCK1/RPC6/RC6
J404-5	MISO	SPI Host Input Client Output	SDI1/RPC7/RC7
J404-6	MOSI	SPI Host Input Client Input	SDO1/RPC8/RC8
J404-7	+3.3V	3.3V power	NC
J404-8	GND	Ground	GND
J404-9	GND	Ground	GND
J404-10	+5V	5V power	NC
J404-11	SDA	I2C data	SDA2/RPA3/RA3
J404-12	SCL	I2C clock	SCL2/RPA2/RA2
J404-13	TX	UART/CAN transmit	RPK9/RK9 or AN16/CVD16/CVDR16/ RPA12/RA12(2, 3)
J404-14	RX	UART/CAN receive	AN16/CVD16/CVDR16/RPA12/RA12 or USBID/AN2/CVD2/CVDR2/CVDT5/ RPB2/RB2(2, 3)
J404-15	INT	Hardware interrupt	ANN1/CVD15/CVDR15/RPA13/RA13
J404-16	PWM	PWM output	ANA0/RPB12/RB12

Notes:

1. For more details on the WFI32E04 pins, refer to the *PIC32MZ W1 MCU and WFI32 Module with Wi-Fi® and Hardware-Based Security Accelerator Data Sheet* (DS70005425).
2. For UART operation, the user must mount the jumper (J410) between pin 3-2 and the jumper (J411) between pin 1-2 and 3-4.
3. For CAN operation, the user must mount the jumper (J410) between pin 1-2 and the jumper (J411) between pin 2-4 and 1-3.

The mikroBUS socket (J404) also offers support to interface with Microchip RN-based boards. The following table provides the pinout details of the PTA header (J407) on the mikroBUS socket (J404).

Figure 3-7. PTA Header (J407) Pinout

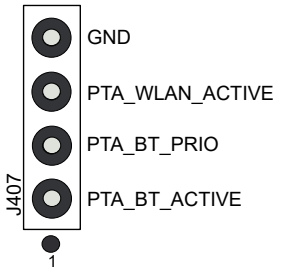


Table 3-9. PTA Header with mikroBUS™ Socket (J404) – J407 Pinout Details

Pin Number	Pin on PTA Header	Pin Description of PTA Header	Pin on the WFI32E04 Module
J407-1	PTA_BT_ACTIVE	Packet Traffic Arbitration (PTA) Three-Wire interface for Wi-Fi® and Bluetooth® co-existence	PTA_BT_ACTIVE/RPK7/RK7(1)
J407-2	PTA_BT_PRIO		PTA_BT_PRIO/RPK6/RK6(1)
J407-3	PTA_WLAN_ACTIVE		PTA_WLAN_ACTIVE/RPK5/RK5(1)
J407-4	GND	Ground	GND

.....continued			
Pin Number	**Pin on PTA Header**	**Pin Description of PTA Header**	**Pin on the WFI32E04 Module**

Note:

1. For more details about PTA signals, refer to the *PIC32MZ W1 MCU and WFI32 Module with Wi-Fi® and Hardware-Based Security Accelerator Data Sheet* (DS70005425).

3.6 Switches

The following switches are available on the PIC32 WFI32 2.0 Curiosity HPC Board:

- User-configurable switch (SW300)
- User-configurable switch (SW302)
- Reset switch (SW301) – Connected with $\overline{\text{MCLR}}$ signal of the WFI32E04 Module

In the Idle state, the level of the user-configurable switch is pulled high (+3.3V), and, after pressing the switch, it drives the I/O line to low (GND).

Table 3-10. Switches Description

Switch Name	Description	Pin on WFI32E04 Module
SW300	User configurable switch (SW300)	INT0/AN17/CVD17/CVDR17/RPA10/RA10
SW302	User configurable switch (SW302)	PGC4/TCK/AN8/CVD8/CVDR8/RPB8/RB8
$\overline{\text{MCLR}}$	Reset switch (SW301)	$\overline{\text{MCLR}}$

Note: By default, the resistor (R339) is DNP on the PIC32 WFI32 2.0 Curiosity HPC Board. If using the user configurable switch (SW302), the user must mount the resistor (R339) on the PIC32 WFI32 2.0 Curiosity HPC Board. While using the QT7/QT8/T9 XPRO kit, the user must demount the resistor (R339).

3.7 LEDs

The on-board LEDs are categorized into three types:

- Power LED:
  - 5V Green (D200)
- User configurable LEDs:
  - Red LED (D300)
  - Green LED (D301)
- PKOB4 LEDs
  - Green Active LED (D500)
  - Yellow Status LED (D501)

The following table provides details about the list of LEDs that the user can turn ON or OFF while using the connected GPIO pins:

Table 3-11. LEDs Description

Function	Description	Pin on the WFI32E04 Module
Red LED (D300)	Remappable peripheral/PORTK digital I/O	RPK1/RK1
Green LED (D301)	Remappable peripheral/PORTK digital I/O	RPK3/RK3

3.8 Ethernet Interface

The PIC32 WFI32 2.0 Curiosity HPC Board includes headers to mount different Ethernet PHY daughter boards to implement a complete Ethernet node for networking. The PIC32 WFI32 2.0 Curiosity HPC Board uses the LAN8720A PHY daughter board (AC320004-3) as an example to demonstrate the Ethernet functionality.

Table 3-12. Ethernet PHY Daughter Board

Daughter Board	Part Number
LAN8720A PHY daughter board	AC320004-3

The Microchip LAN8720A PHY daughter board is populated with a small footprint RMII 10/100 Ethernet transceiver (LAN8720A). This daughter board enables Ethernet communication with a variety of Microchip development boards. The following table provides the pin details and descriptions of the Ethernet PHY daughter board header (J405 and J406).

Figure 3-8. Ethernet PHY Daughter Board Header (J405, J406) Pinout

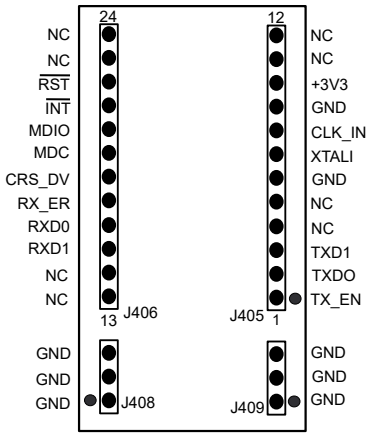


Table 3-13. Ethernet PHY Daughter Board Header Pin Description – J405 and J406

Pin Number	Pin on Ethernet PHY Daughter Board Header	Pin Description of Ethernet PHY Daughter Board Header	Pin on WFI32E04 Module(1)(2)
J405-1	TX_EN	Ethernet Transmit Enable	CVDT11/ETXEN/RPC13/RC13
J405-2	TXDO	Ethernet Transmit Data 0	CVDT13/ETXD0/RPC15/RC15
J405-3	TXD1	Ethernet Transmit Data 1	CVDT12/ETXD1/RPC14/RC14
J405-4	NC	Not connected	NC
J405-5	NC	Not connected	NC
J405-6	GND	Ground	GND
J405-7	XTALI	Clock output	NC
J405-8	CLK_IN	Clock input	ETH_CLK_OUT/CVDT10/RPC12/RC12
J405-9	GND	Ground	GND
J405-10	+3V3	Input power supply	NC
J405-11	NC	Not connected	NC
J405-12	NC	Not connected	NC
J406-13	NC	Not connected	NC
J406-14	NC	Not connected	NC
J406-15	RXD1	Ethernet Receive Data 1	CVDT8/ERXD1/RPC10/RC10
J406-16	RXD0	Ethernet Receive Data 0	CVDT9/ERXD0/RPC11/RC11
J406-17	RX_ER	Ethernet Receive Error	CVDT7/ERXERR/RPC9/RC9
J406-18	CRS_DV	Ethernet Carrier Sense – Rx Data Valid Input	CVDT14/ERXDV/RPK12/RK12
J406-19	MDC	Ethernet Management Data Clock Output	CVDT16/EMDC/RPK14/RK14
J406-20	MDIO	Ethernet Management Data Input Output	CVDT15/EMDIO/RPK13/RK13
J406-21	$\overline{INT}$	Interrupt output	PTA_BT_PRIO/RPK6/RK6
J406-22	$\overline{RST}$	System Reset	AN14/ANN0/CVD14/CVDR14/RPA14/RA14
J406-23	NC	Not connected	NC
J406-24	NC	Not connected	NC

Notes:

1. These are Peripheral Pin Select (PPS) pins. The user can configure them for any of the supported peripheral functions based on the end user application.
2. For more details on the WFI32E04 pins, refer to the *PIC32MZ W1 MCU and WFI32 Module with Wi-Fi® and Hardware-Based Security Accelerator Data Sheet* (DS70005425).

3.9 GPIO Header (J401 and J402)

The PIC32 WFI32 2.0 Curiosity HPC Board has two GPIO headers (J401 and J402) that provide access to some of the GPIO pins on the WFI32E04 Module. The $\overline{MCLR}$ Reset signal is also available on GPIO header 1 (J401). The following table lists the details of the GPIO header.

Figure 3-9. GPIO Header 1 (J401) Pinout

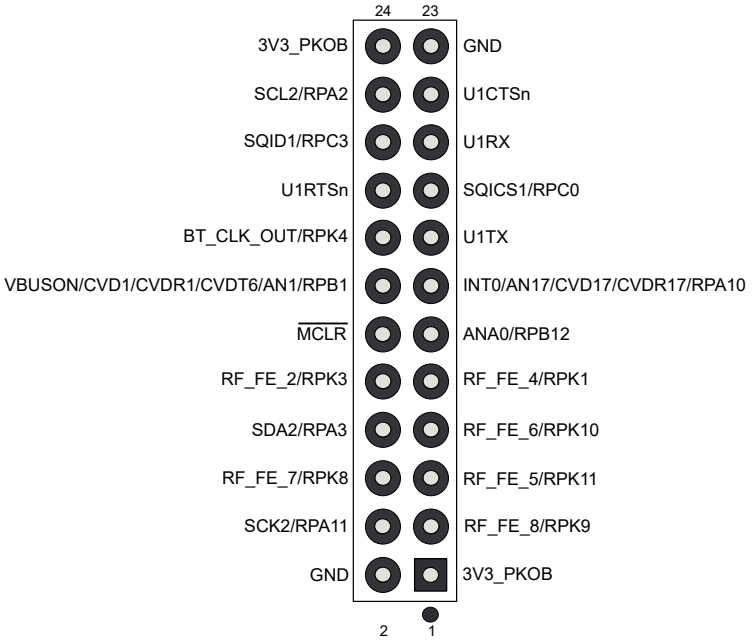


Table 3-14. GPIO Header 1 Pin Description – J401

Pin Number	Pin on GPIO Header	Pin Description of GPIO Header	Pin on the WFI32E04 Module(1)(2)
J401-1	3V3_PKOB	VCC	NC
J401-2	GND	Ground	GND
J401-3	RF_FE_8/RPK9	GPIO	RF_FE_8/RPK9/RK9
J401-4	SCK2/RPA11	GPIO	SCK2/RPA11/RA11
J401-5	RF_FE_5/RPK11	GPIO	RF_FE_5/RPK11/RK11
J401-6	RF_FE_7/RPK8	GPIO	RF_FE_7/RPK8/RK8
J401-7	RF_FE_6/RPK10	GPIO	RF_FE_6/RPK10/RK10
J401-8	SDA2/RPA3	GPIO	SDA2/RPA3/RA3
J401-9	RF_FE_4/RPK1	GPIO	RF_FE_4/RPK1/RK1
J401-10	RF_FE_2/RPK3	GPIO	RF_FE_2/RPK3/RK3
J401-11	ANA0/RPB12	GPIO	ANA0/RPB12/RB12
J401-12	$\overline{\text{MCLR}}$	Reset pin	$\overline{\text{MCLR}}$
J401-13	INT0/AN17/CVD17/ CVDR17/RPA10	GPIO	INT0/AN17/CVD17/CVDR17/RPA10/RA10
J401-14	VBUSON/CVD1/CVDR1/ CVDT6/AN1/RPB1	GPIO	VBUSON/CVD1/CVDR1/CVDT6/AN1/RPB1/RB1
J401-15	U1TX	UART1 transmit output	U1TX/RA9
J401-16	BT_CLK_OUT/RPK4	GPIO	BT_CLK_OUT/RPK4/RK4
J401-17	SQICS1/RPC0	GPIO	SQICS1/RPC0/RC0
J401-18	U1RTSn	UART1 request to send handshaking signal	U1RTSn/RA7
J401-19	U1RX	UART1 receive input	U1RX/RA8
J401-20	SQID1/RPC3	GPIO	SQID1/RPC3/RC3
J401-21	U1CTSn	UART1 Clear-to-Send handshaking signal	U1CTSn/RA6

.....continued			
Pin Number	**Pin on GPIO Header**	**Pin Description of GPIO Header**	**Pin on the WFI32E04 Module(1)(2)**
J401-22	SCL2/RPA2	GPIO	SCL2/RPA2/RA2
J401-23	GND	Ground	GND
J401-24	3V3_PKOB	VCC	NC

Notes:

1. These are PPS pins that can be configured for any of the supported peripheral functions based on the end user application.
2. For more details on the WFI32E04 pins, refer to the *PIC32MZ W1 MCU and WFI32 Module with Wi-Fi® and Hardware-Based Security Accelerator Data Sheet* (DS70005425).

Figure 3-10. GPIO Header 2 (J402) Pinout

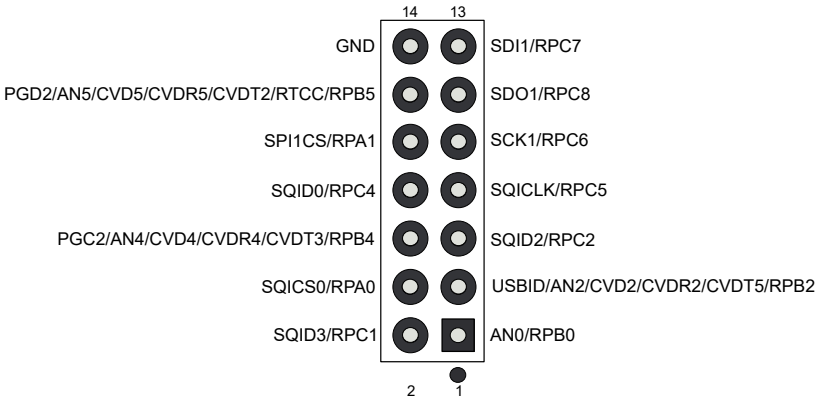


Table 3-15. GPIO Header 2 Pin Description – J402

Pin Number	Pin on GPIO Header	Pin Description of GPIO Header	Pin on WFI32E04 Module(1)(2)
J402-1	AN0/RPB0	GPIO	AN0/RPB0/RB0
J402-2	SQID3/RPC1	GPIO	SQID3/RPC1/RC1
J402-3	USBID/AN2/CVD2/CVDR2/ CVDT5/RPB2	GPIO	USBID/AN2/CVD2/CVDR2/CVDT5/RPB2/RB2
J402-4	SQICS0/RPA0	GPIO	SQICS0/RPA0/RA0
J402-5	SQID2/RPC2	GPIO	SQID2/RPC2/RC2
J402-6	PGC2/AN4/CVD4/CVDR4/ CVDT3/RPB4	GPIO	PGC2/AN4/CVD4/CVDR4/CVDT3/RPB4/RB4
J402-7	SQICLK/RPC5	GPIO	SQICLK/RPC5/RC5
J402-8	SQID0/RPC4	GPIO	SQID0/RPC4/RC4
J402-9	SCK1/RPC6	GPIO	SCK1/RPC6/RC6
J402-10	SPI1CS/RPA1	GPIO	SPI1CS/RPA1/RA1
J402-11	SDO1/RPC8	GPIO	SDO1/RPC8/RC8
J402-12	PGD2/AN5/CVD5/CVDR5/ CVDT2/RTCC/RPB5	GPIO	PGD2/AN5/CVD5/CVDR5/CVDT2/RTCC/RPB5/RB5
J402-13	SDI1/RPC7	GPIO	SDI1/RPC7/RC7
J402-14	GND	Ground	GND

.....continued			
Pin Number	**Pin on GPIO Header**	**Pin Description of GPIO Header**	**Pin on WFI32E04 Module(1)(2)**

Notes:

1. These are PPS pins that can be configured for any of the supported peripheral functions based on the end user application.
2. For more details on the WFI32E04 pins, refer to the *PIC32MZ W1 MCU and WFI32 Module with Wi-Fi® and Hardware-Based Security Accelerator Data Sheet* (DS70005425).

3.10 XPRO Header (J412)

The PIC32 WFI32 2.0 Curiosity HPC Board includes one XPRO standard extension male header (XPRO header (J412)) to connect to the Microchip QT7/QT8/T9 XPRO kit. The following table provides details of the XPRO header pins.

Figure 3-11. XPRO Header (J412) Pinout

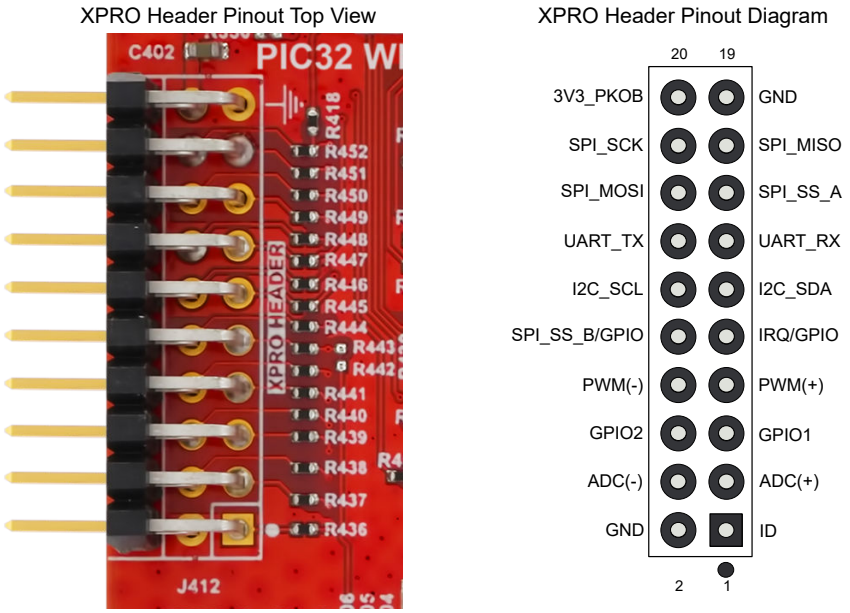


Table 3-16. XPRO Header Pin Description – J412

Pin Number	Pin on XPRO Header	Pin Description of XPRO Header	Pin on WFI32E04 Module(1)(2)
J412-1	ID(3)	Communication line to the ID chip on an extension board	ANB0/RPB11/RB11
J412-2	GND	Ground	GND
J412-3	ADC(+)	Analog-to-Digital converter, alternatively positive part of differential ADC	AN3/CVD3/CVDR3/CVDT4/RPB3/RB3
J412-4	ADC(-)	Analog-to-Digital converter, alternatively negative part of differential ADC	TDO/AN7/CVD7/CVDR7/CVDT0/RPB7/RB7
J412-5	GPIO1	General purpose I/O	PGD4/TDI/AN9/CVD9/CVDR9/RPB9/RB9
J412-6	GPIO2	General purpose I/O	ANN1/CVD15/CVDR15/RPA13/RA13
J412-7	PWM(+)	Pulse width modulation, alternatively positive part of differential PWM	PGC4/TCK/AN8/CVD8/CVDR8/RPB8/RB8(5)
J412-8	PWM(-)	Pulse width modulation, alternatively negative part of differential PWM	AN11/CVD11/CVDR11/RPB13/RB13

.....continued

Pin Number	Pin on XPRO Header	Pin Description of XPRO Header	Pin on WFI32E04 Module(1)(2)
J412-9	IRQ/GPIO	Interrupt request line and/or general purpose I/O	ANN0/CVD14/CVDR14/RPA14/RA14
J412-10	SPI_SS_B/GPIO	Client select for SPI and/or general purpose I/O	AN16/CVD16/CVDR16/RPA12/RA12
J412-11	I2C_SDA	Data line for I^2C interface	SDA1/RPA5/RA5
J412-12	I2C_SCL	Clock line for I^2C interface	SCL1/RPA4/RA4
J412-13	UART_RX(4)	Receiver line of target device UART	RPK9/RK9
J412-14	UART_TX(4)	Transmitter line of target device UART	PTA_BT_ACTIVE/RPK7/RK7
J412-15	SPI_SS_A	Client select for SPI. This pin must be preferably unique	AN10/CVD10/CVDR10/RPB10/RB10
J412-16	SPI_MOSI	Host-out, Client-in line of serial peripheral interface	AN12/CVD12/CVDR12/RPB14/RB14
J412-17	SPI_MISO	Host-in, Client-out line of serial peripheral interface	AN13/CVD13/CVDR13/RPA15/RA15
J412-18	SPI_SCK	Clock for serial peripheral interface	TMS/AN6/CVD6/CVDR6/CVDT1/RPB6/RB6
J412-19	GND	Ground	GND
J412-20	3V3_PKOB	Power for extension board	NC

Notes:

1. These are PPS pins that can be configured for any of the supported peripheral functions based on the end user application.
2. For more details on the WFI32E04 pins, refer to the *PIC32MZ W1 MCU and WFI32 Module with Wi-Fi® and Hardware-Based Security Accelerator Data Sheet* (DS70005425).
3. Remove the jumper (J300) and mount resistor (R436) to use the ID feature.
4. The user must not simultaneously use the UART-based MikroElectronika click boards on the mikroBUS socket (J400) and the QT7/QT8/T9 XPRO kit on the XPRO header (J412).
5. Out of the box, the resistor (R339) is not mounted on the PIC32 WFI32 2.0 Curiosity HPC Board. If the user wants to use the XPRO header (J412), do not mount the resistor (R339) on the PIC32 WFI32 2.0 Curiosity HPC Board.

3.11 Temperature Sensor (U300)

The PIC32 WFI32 2.0 Curiosity HPC Board has an on-board temperature sensor (Microchip TC1047A, U300) interfaced over ADC. To enable the temperature sensor, short the jumper (J300).

Note: The user must not to short the jumper (J300) or mount the resistor (R436) while using the QT7/QT8/T9 XPRO kit and vice-versa.

3.12 Serial Flash (U301)

The PIC32 WFI32 2.0 Curiosity HPC Board has an on-board 32 Mb external Serial Flash (SST26VF032B) (U301) memory for storage of data. This Serial Flash (U301) can be interfaced with the WFI32E04 Module either over the SPI or SQI by selecting the available resistor jumper options. The following tables provide the details of the Serial Flash pin connection over SPI1 and SQI.

Table 3-17. Serial Flash Interface Over SPI Pin Description – U301

Pin Number	Pin on SPI Serial Flash (SST26VF032B)	Pin Description of Serial Flash	Pin on the WFI32E04 Module(1)
U301-1	$\overline{CE}$	Chip Enable	$\overline{SPI1CS}$/RPA1/RA1
U301-2	SO	Serial Data Output for SPI mode	SDI1/RPC7/RC7
U301-3	$\overline{WP}$	Write-Protect	NC
U301-4	VSS	Ground	GND
U301-5	SI	Serial Data Input for SPI mode	SDO1/RPC8/RC8

.....continued			
Pin Number	**Pin on SPI Serial Flash (SST26VF032B)**	**Pin Description of Serial Flash**	**Pin on the WFI32E04 Module(1)**
U301-6	SCK	Serial clock	SCK1/RPC6/RC6
U301-7	$\overline{\text{HOLD}}$	Hold	NC
U301-8	VDD	Input power supply	NC

Note:

1. For more details on the WFI32E04 pins, refer to the *PIC32MZ W1 MCU and WFI32 Module with Wi-Fi and Hardware-Based Security Accelerator Data Sheet* (DS70005425).

Table 3-18. Serial Flash Interface Over SQI Pin Description – U301

Pin Number	Pin on Serial Flash (SST26VF032B)	Pin Description of Serial Flash	Pin on the WFI32E04 Module(1)
U301-1	$\overline{\text{CE}}$	Chip Enable	$\overline{\text{SQICS0}}$/RPA0 or $\overline{\text{SQICS1}}$/RPC0/RC0(2)
U301-2	SIO1	Serial Data Output for SPI mode	SQID1/RPC3/RC3
U301-3	SIO2	Write-Protect	SQID2/RPC2/RC2
U301-4	VSS	Ground	GND
U301-5	SIO0	Serial Data Input for SPI mode	SQID0/RPC4/RC4
U301-6	SCK	Serial clock	SQICLK/RPC5/RC5
U301-7	SIO3	Hold	SQID3/RPC1/RC1
U301-8	VDD	Input power supply	NC

Notes:

1. For more details on the WFI32E04 pins, refer to the *PIC32MZ W1 MCU and WFI32 Module with Wi-Fi and Hardware-Based Security Accelerator Data Sheet* (DS70005425).
2. Mount the jumper (J301) between pins 1-2 to use SQICS0 or between pin 2 and pin 3 to use SQICS1.

The following table provides the details about the resistor mounting instructions for the selection of either the SPI or SQI.

Table 3-19. Resistor Mounting Instruction for Selection of Either SPI or SQI

SPI (Default)		SQI	
Mount	**Remove**	**Mount**	**Remove**
R313, R318	R320, R324	R320, R324	R313, R318
R323, R325	R326. R319, R321	R326, R319, R321	R323, R325

4. PIC32 WFI32 2.0 Curiosity HPC Board Out of Box Demo

The Out of Box (OOB) demo connects to the cloud and allows the user to control the Curiosity board via a web-based interface. For the firmware and documentation related to the OOB demo, go to github.com/MicrochipTech/PIC32MZ2051W1_FF_Curiosity_OOB.

For more details on applications demo and harmony code examples, go to MPLAB Harmony.

5. Appendix A: Reference Circuit

5.1 PIC32 WFI32 2.0 Curiosity HPC Board Reference Schematics

Figure 5-1. WFI32E04 Module Pinouts

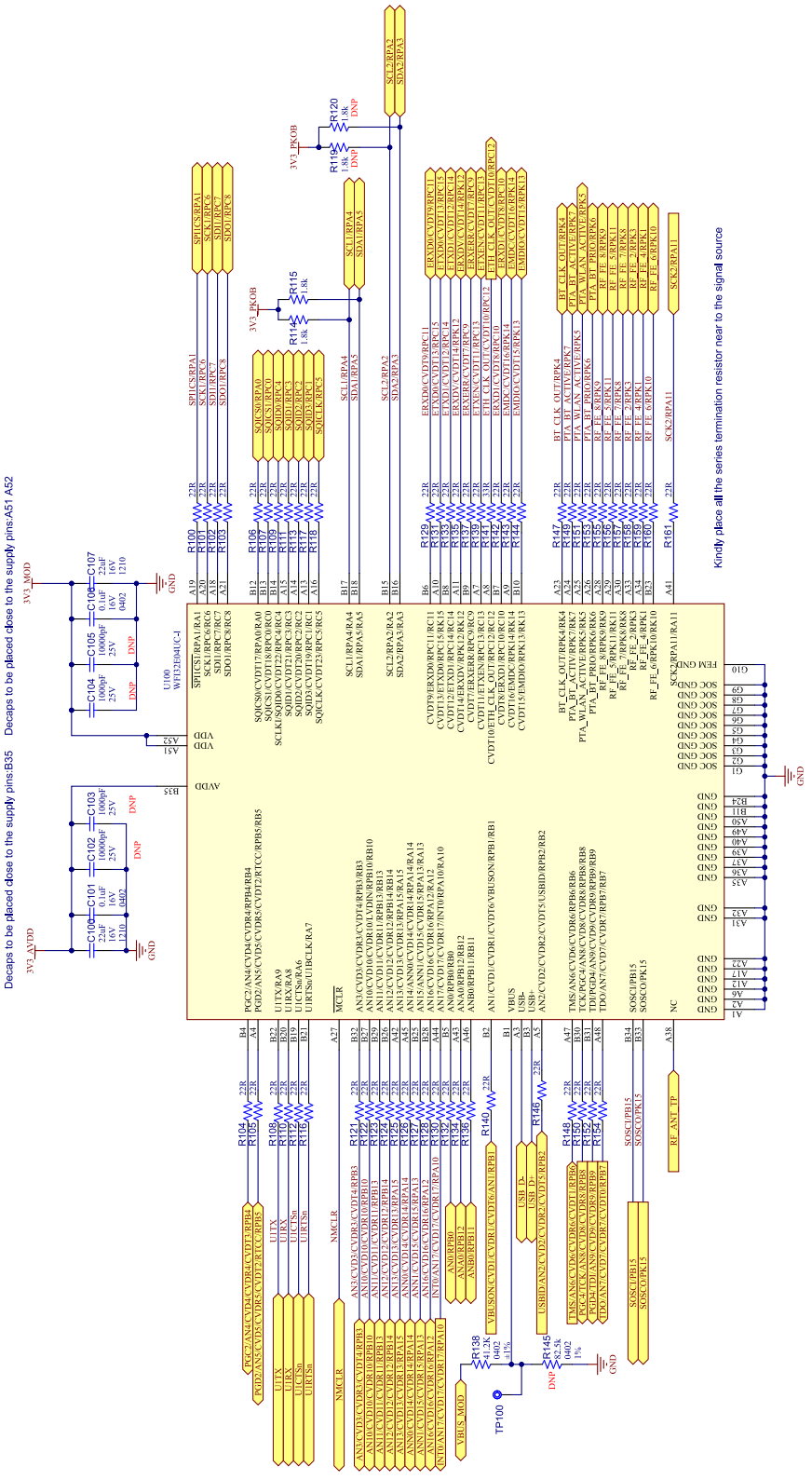


Figure 5-2. Board Power Supply

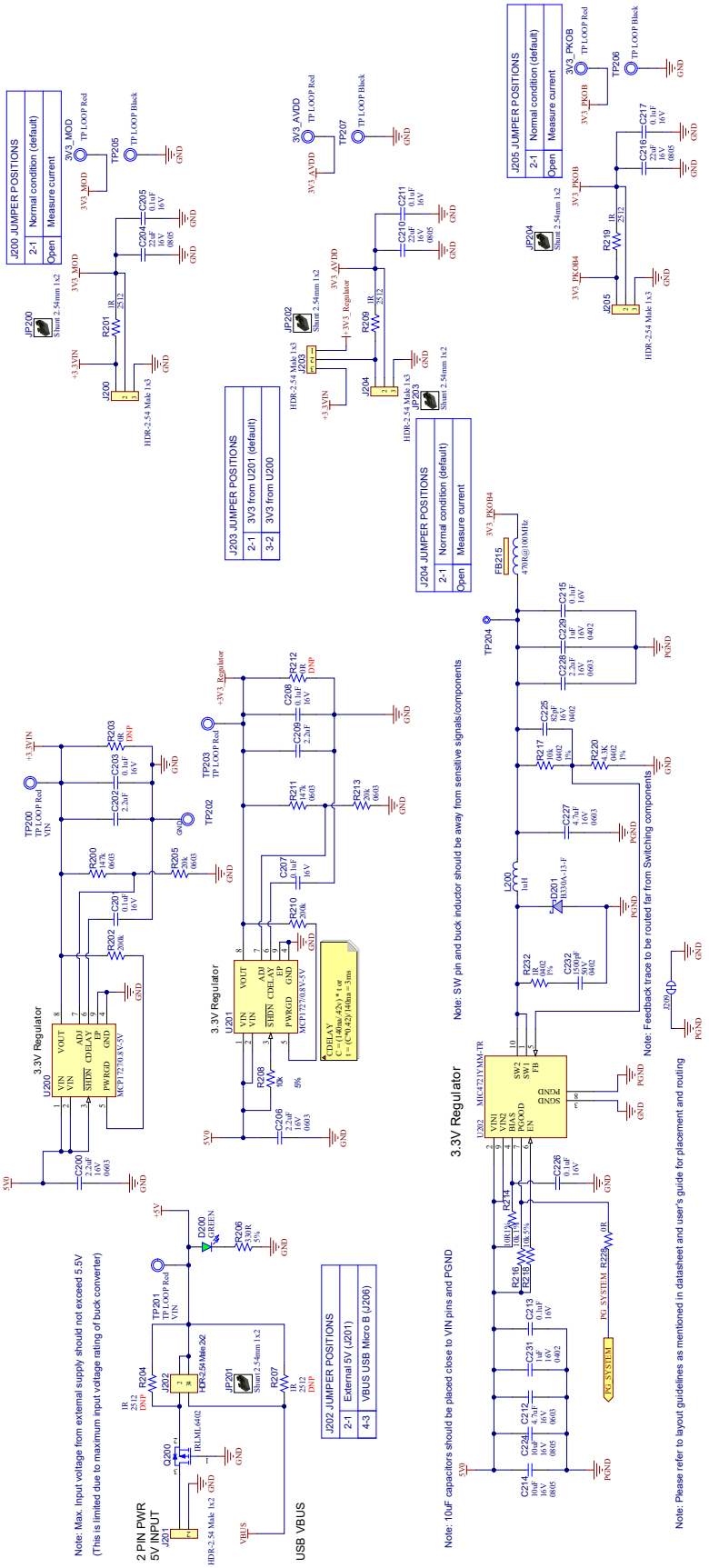


Figure 5-3. SOSC Crystal

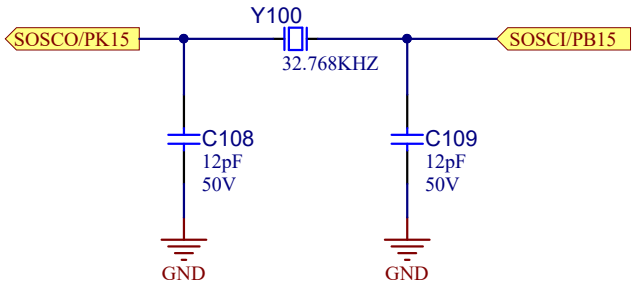


Figure 5-4. Module USB Interface

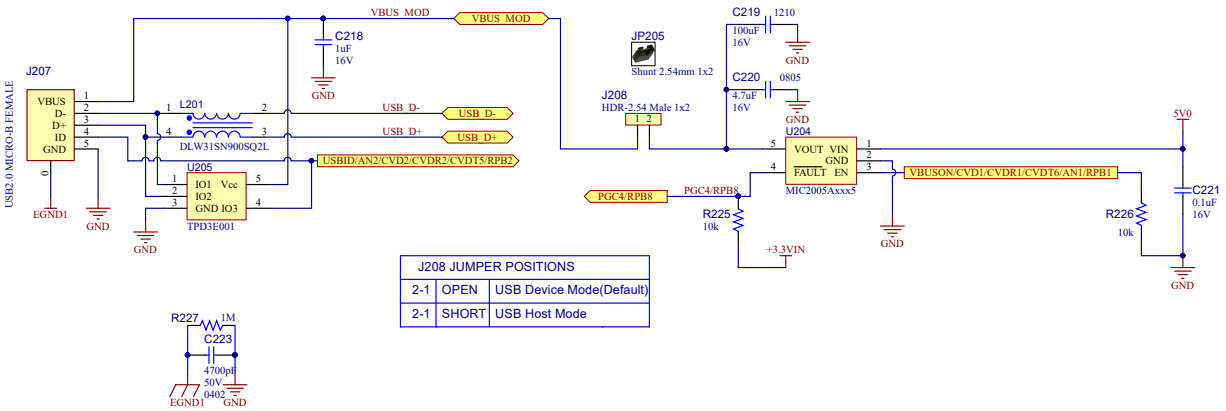


Figure 5-5. USB Type-C Connector

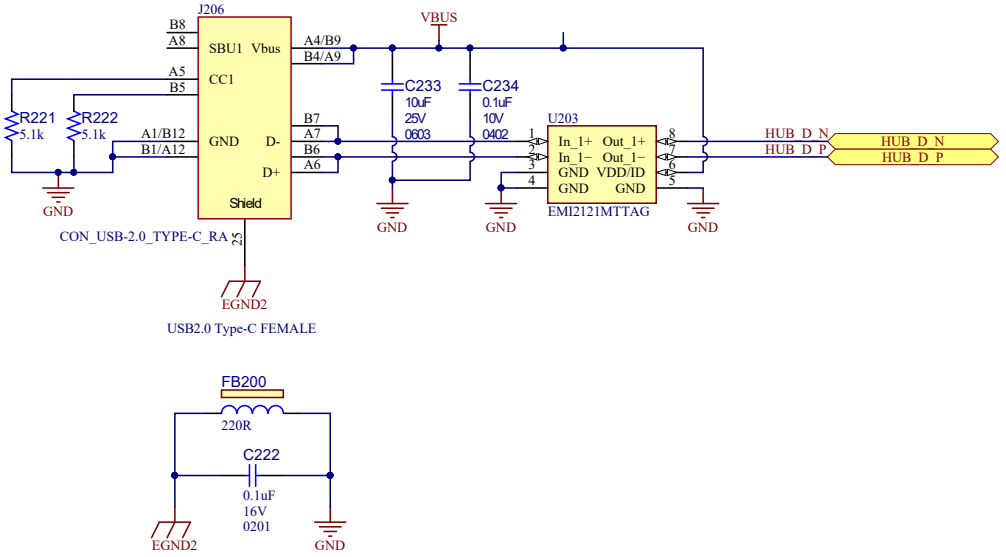


Figure 5-6. User LEDs

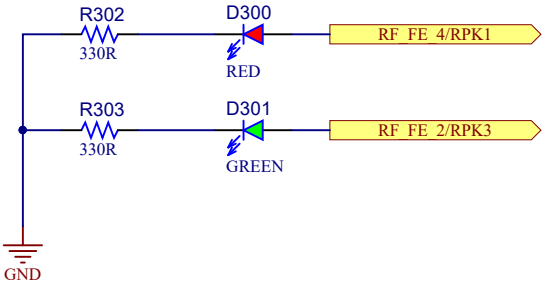


Figure 5-7. Switches

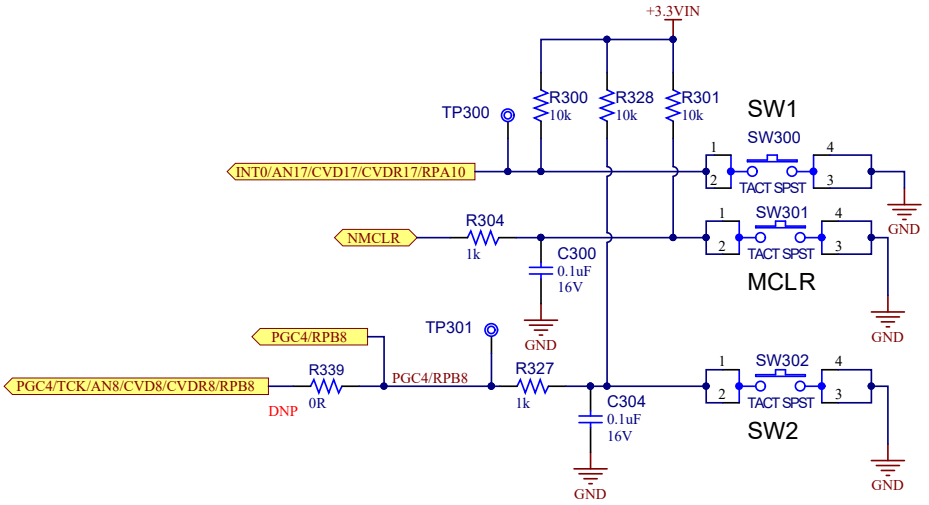


Figure 5-8. Serial Flash Memory with Interface Selection

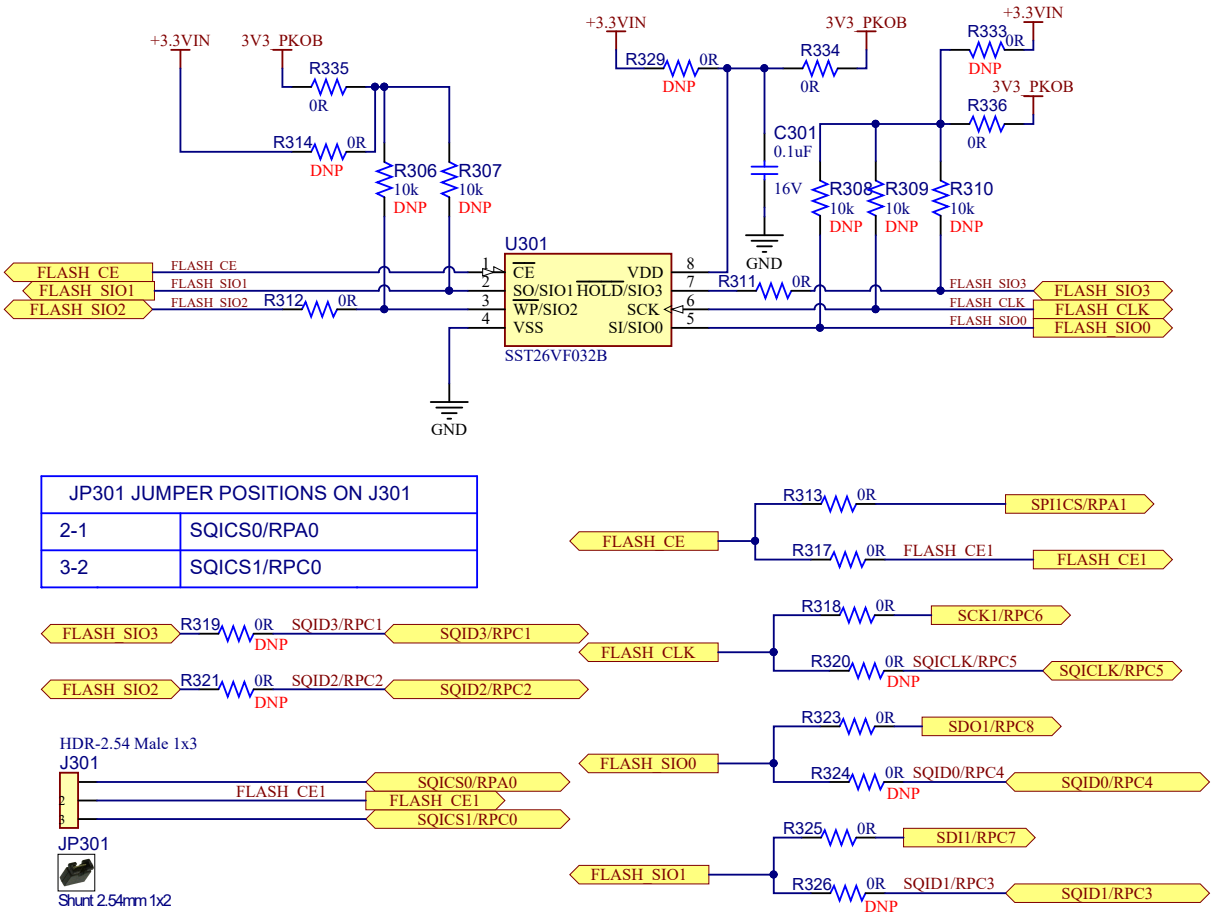


Figure 5-9. Temperature Sensor

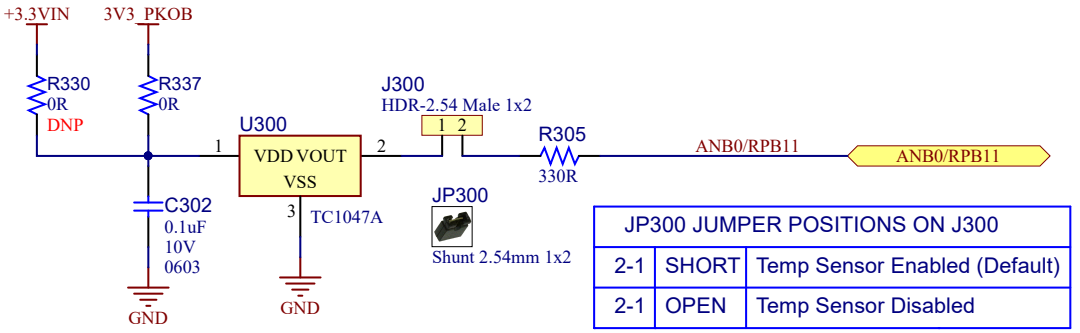


Figure 5-10. GPIO Header 1

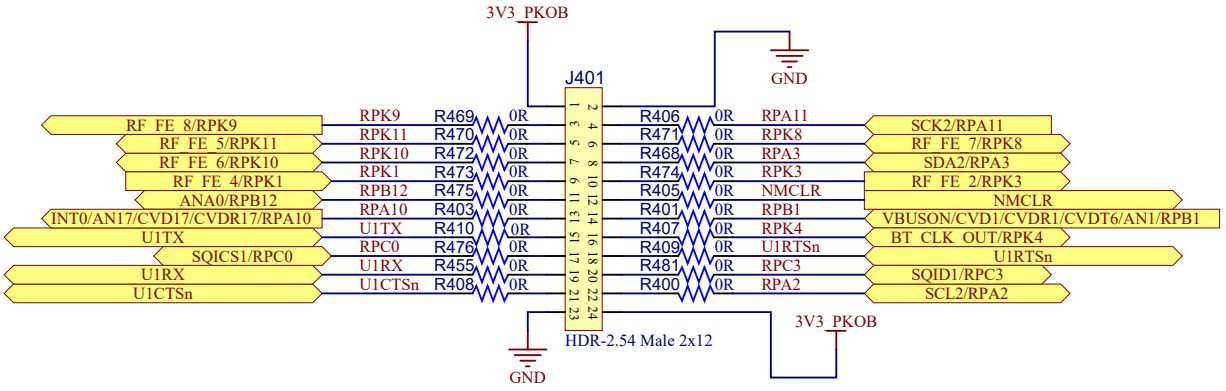


Figure 5-11. GPIO Header 2

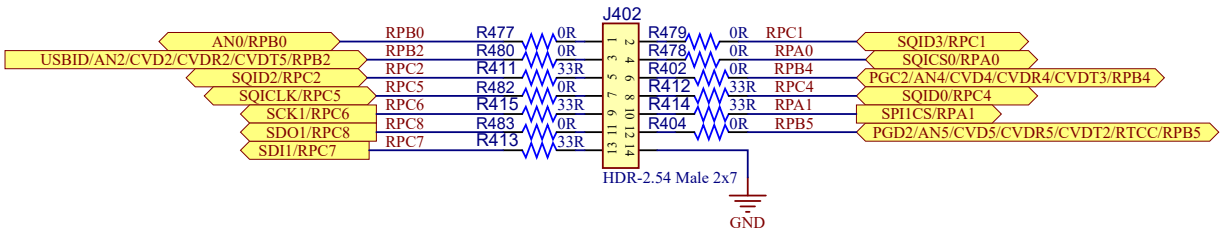


Figure 5-12. MikroBUS Socket 1

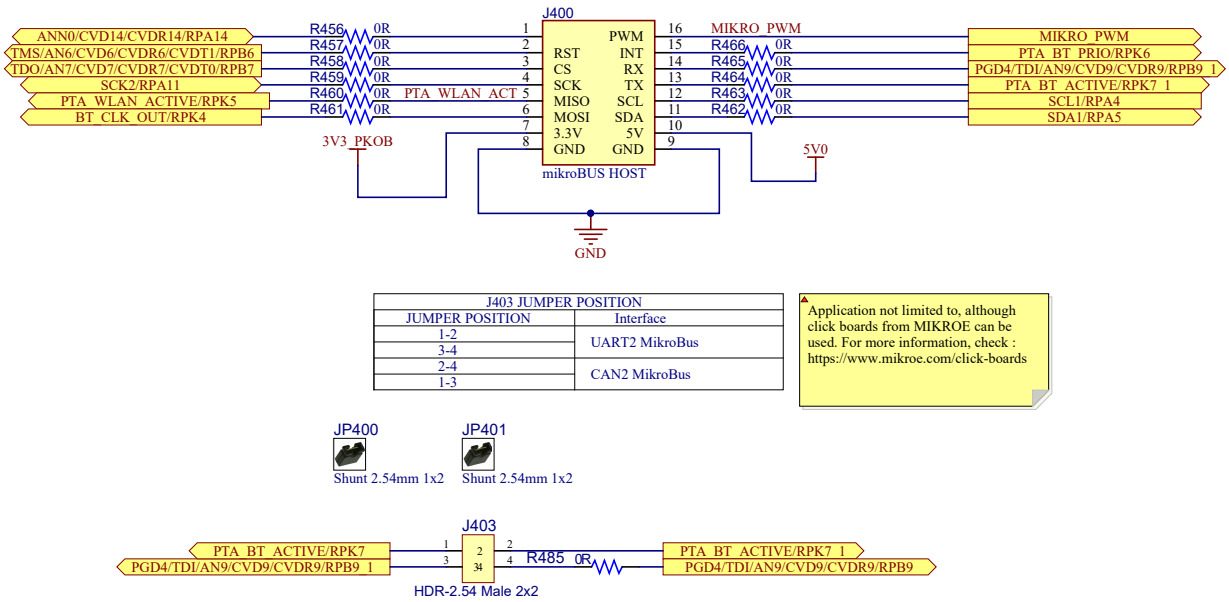


Figure 5-13. MikroBUS Socket 2 with PTA Header

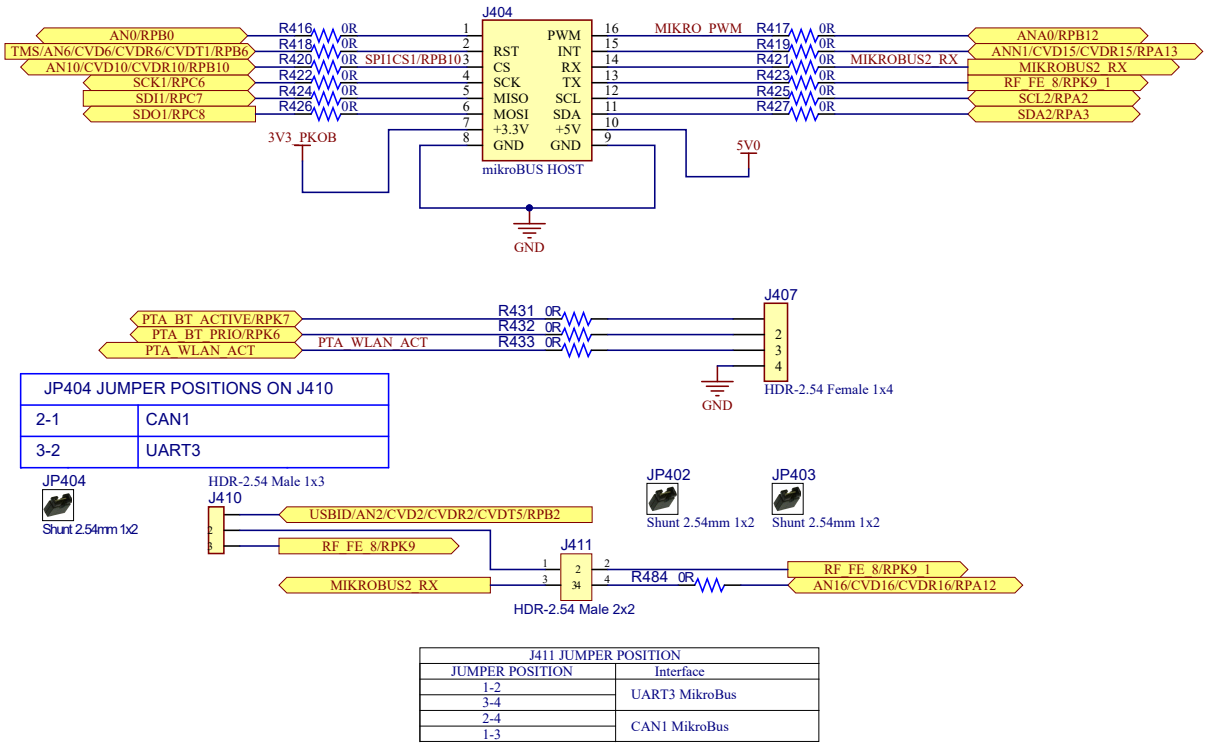


Figure 5-14. PHY Daughter Board Header

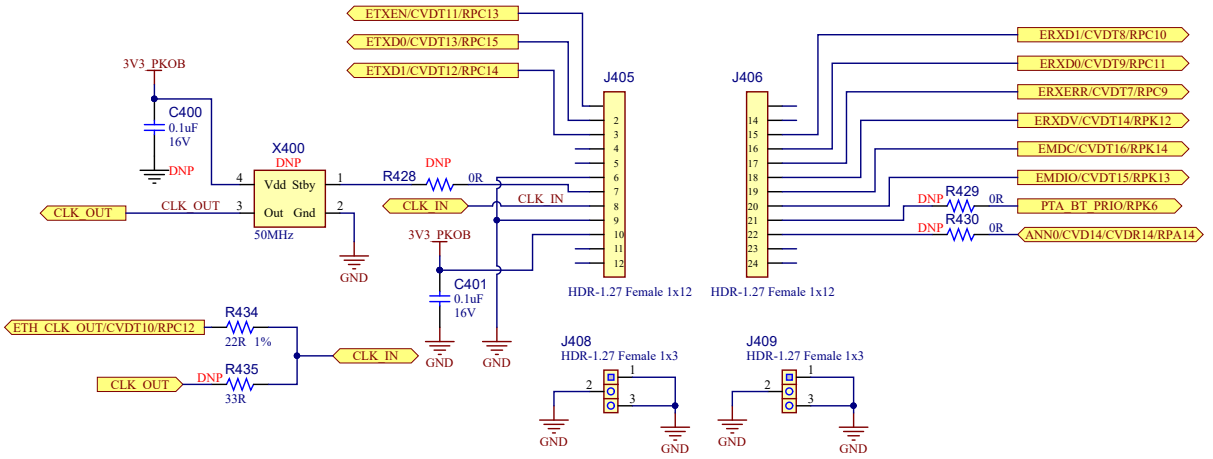


Figure 5-15. XPRO Header

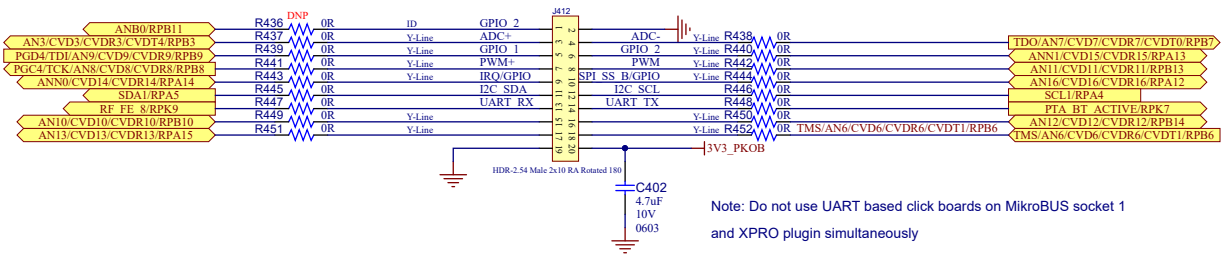


Figure 5-16. ICSP™ Header

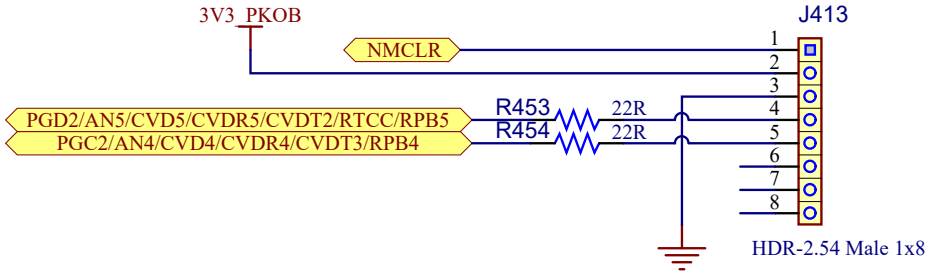


Figure 5-17. 2.4 GHz Whip Tilt Antenna, USB Cables and Mechanicals/Miscellaneous

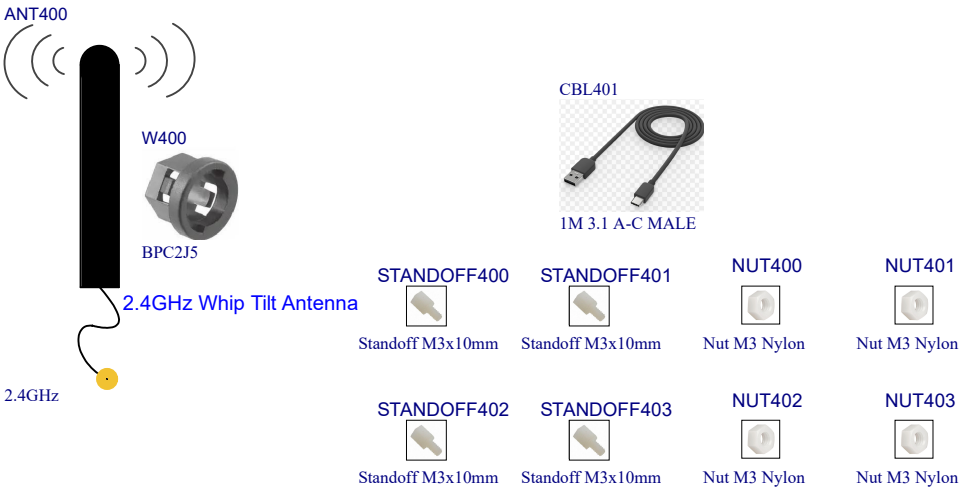


Figure 5-18. PKoB4 Main Controller

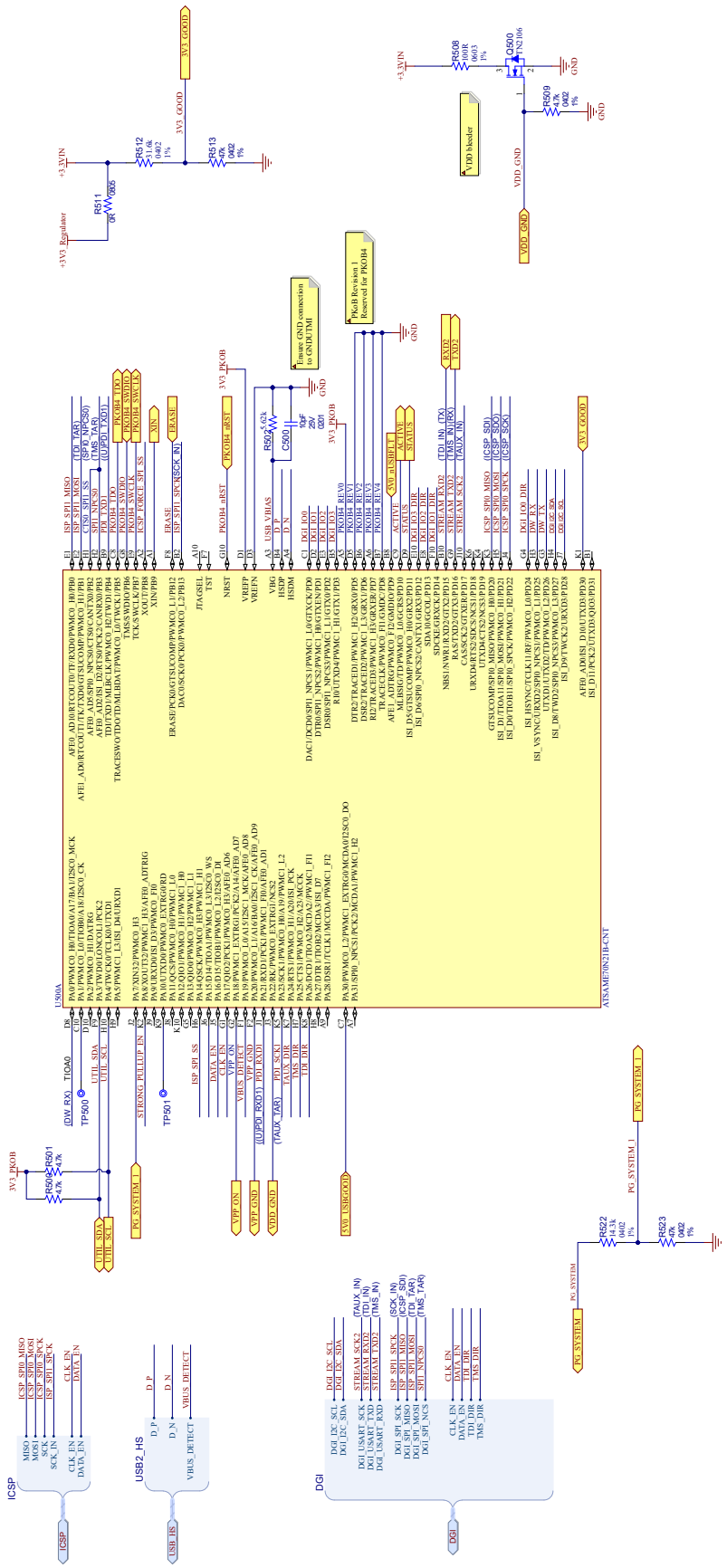


Figure 5-19. Power Distribution Switch

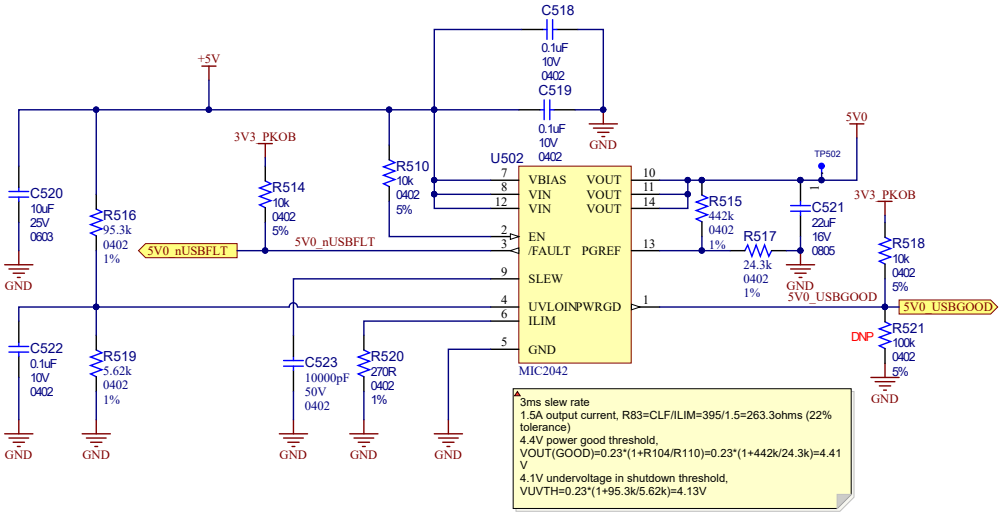


Figure 5-20. PKoB4 Debug Header

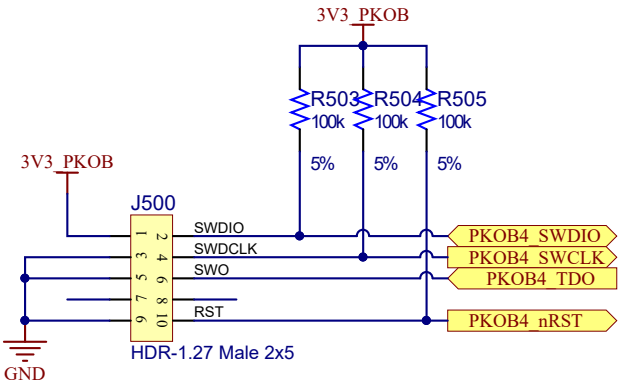


Figure 5-21. PKoB4 Miscellaneous

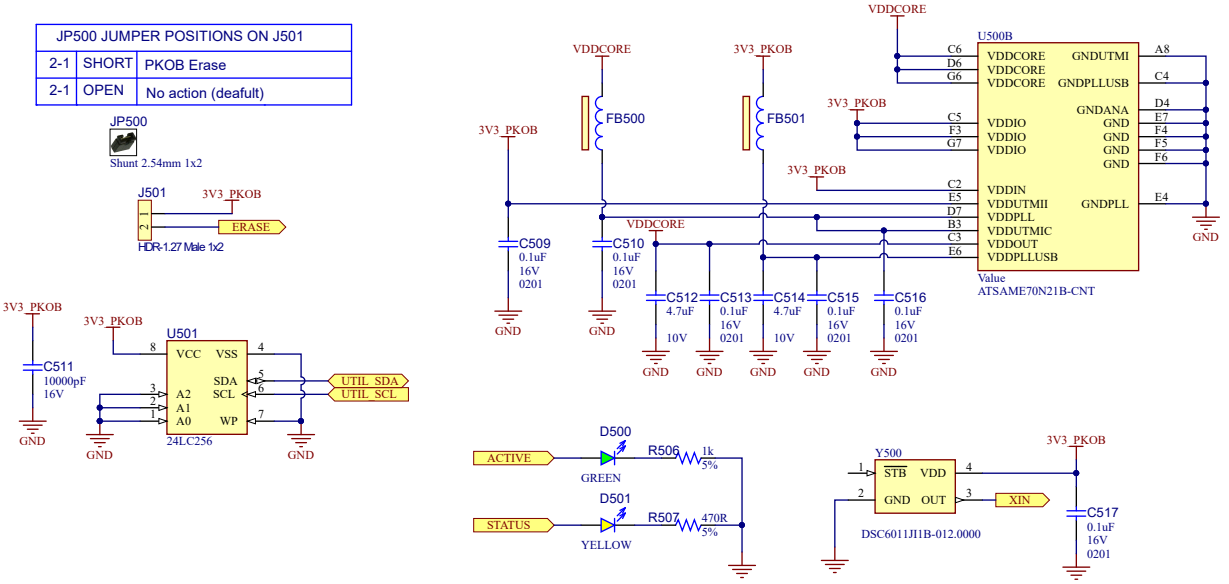


Figure 5-22. VDDIN Cap

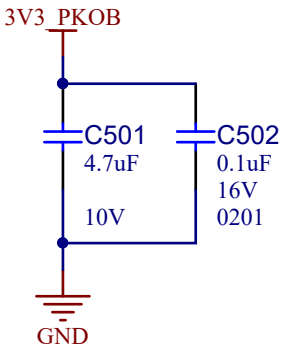


Figure 5-23. VDDIO Bypass Caps

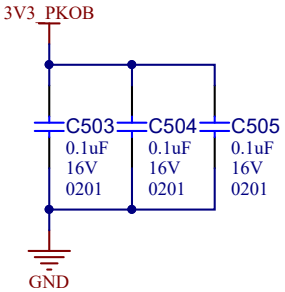


Figure 5-24. VDDCORE Bypass Caps

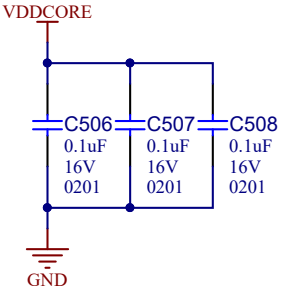


Figure 5-25. USB High Speed Hub

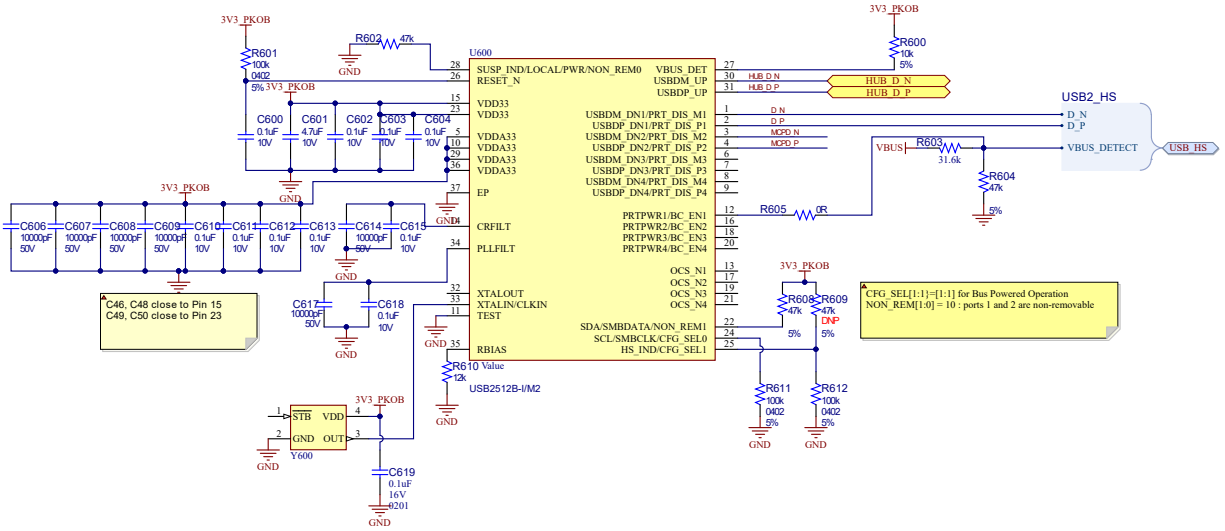


Figure 5-26. MCP2200 USB – UART Converter

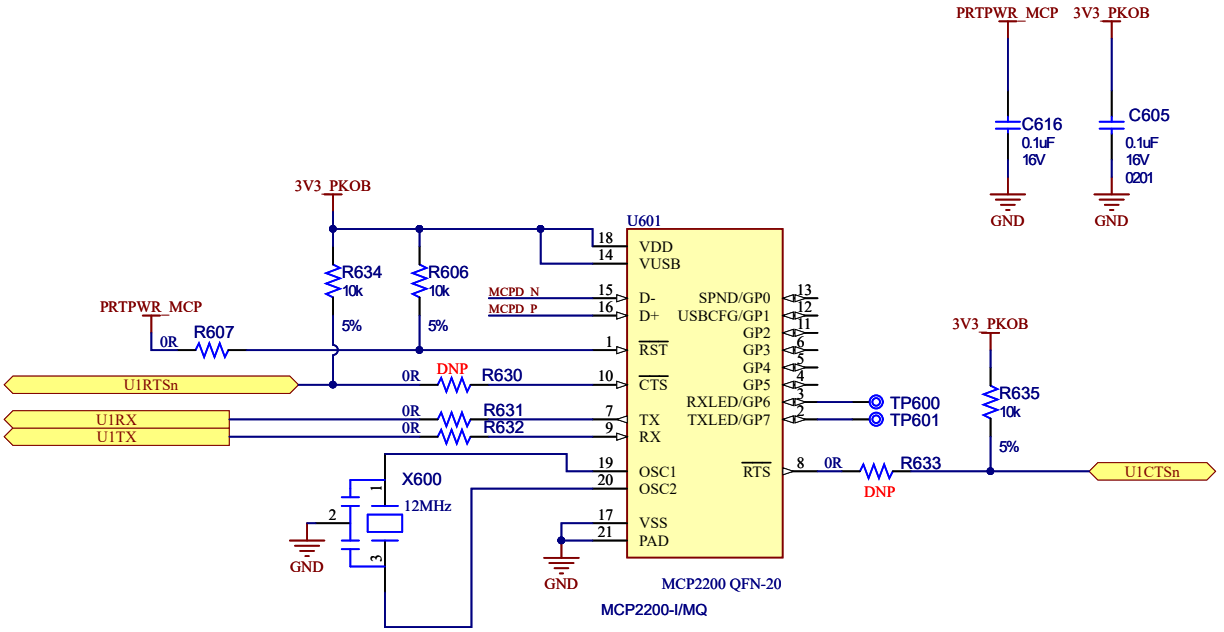


Figure 5-27. ICSP

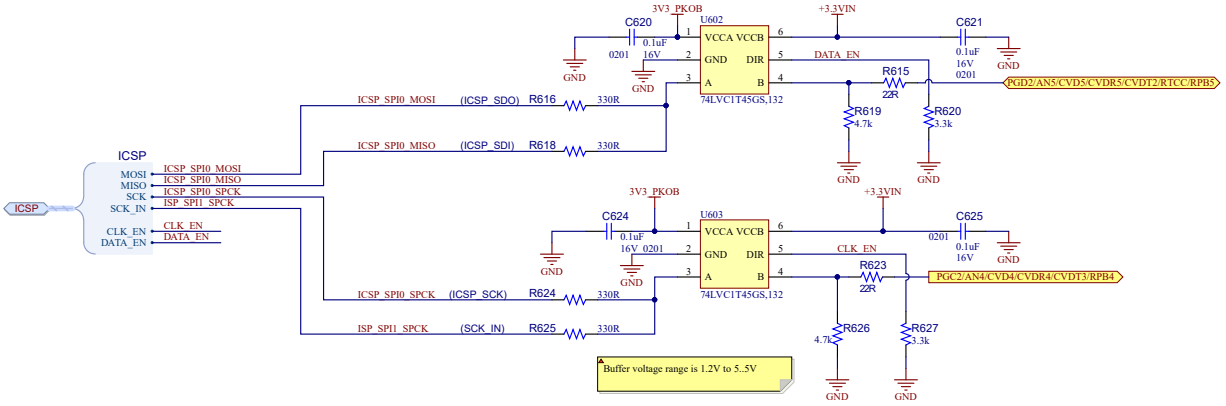


Figure 5-28. VPP Switch

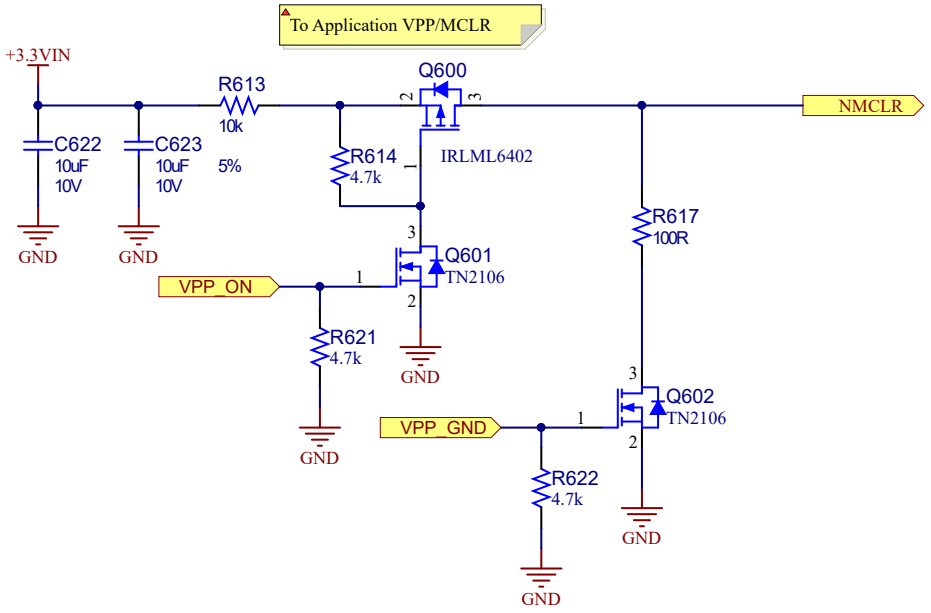


Figure 5-29. UART

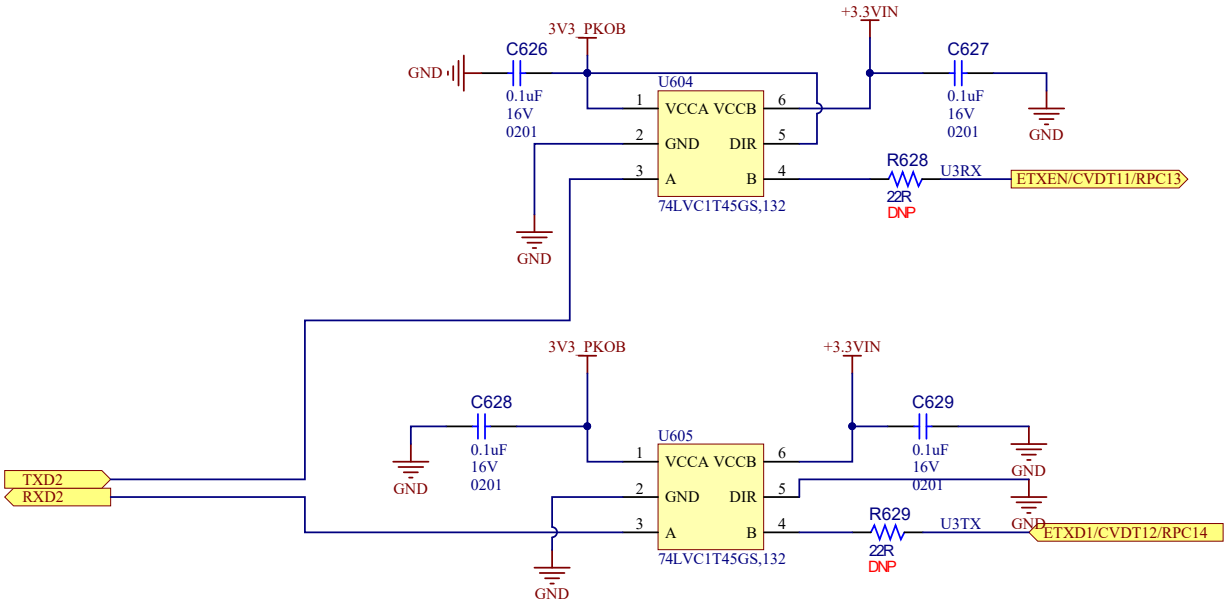
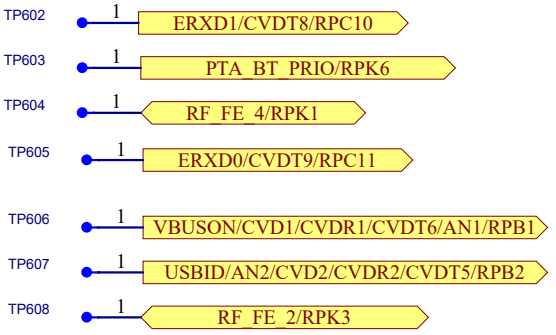


Figure 5-30. Test Points



5.2 PIC32 WFI32 2.0 Curiosity HPC Board Bill of Materials

For the Bill of Materials (BOM) of the PIC32 WFI32 2.0 Curiosity HPC Board, go to the EV68D28A product web page.

6. Appendix B: Regulatory Approval

This equipment (PIC32 WFI32 2.0 Curiosity HPC Board/EV68D28A) is an evaluation kit and not a finished product. It is intended for laboratory evaluation purposes only. It is not directly marketed or sold to the general public through retail; it is only sold through authorized distributors or through Microchip. Using this requires a significant engineering expertise towards understanding of the tools and relevant technology, which can be expected only from a person who is professionally trained in the technology.

Regulatory compliance settings have to follow the WFI32E04UC module certifications. The following regulatory notices are to cover the requirements under the regulatory approval.

6.1 United States

The PIC32 WFI32 2.0 Curiosity HPC Board (EV68D28A) contains the WFI32E04UC module, which has received Federal Communications Commission (FCC) CFR47 Telecommunications, Part 15 Subpart C “Intentional Radiators” single-modular approval in accordance with Part 15.212 Modular Transmitter approval.

Contains FCC ID: 2ADHKWFI32E02

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Important: FCC Radiation Exposure Statement
This equipment complies with FCC radiation exposure limits set forth for uncontrolled environment. The antenna(s) used for this transmitter must be installed to provide a separation distance of at least 8 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. This transmitter is restricted for use with the specific antenna(s) tested in this application for certification.

CAUTION Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

6.2 Canada

The PIC32 WFI32 2.0 Curiosity HPC Board (EV68D28A) contains the WFI32E04UC module, which has been certified for use in Canada under Innovation, Science and Economic Development Canada (ISED, formerly Industry Canada) Radio Standards Procedure (RSP) RSP-100, Radio Standards Specification (RSS) RSS-Gen and RSS-247.

Contains IC: 20266-WFI32E02

This device contains license-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's license-exempt RSS(s). Operation is subject to the following two conditions:

1. This device may not cause interference;
2. This device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

1. L'appareil ne doit pas produire de brouillage;
2. L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

⚠ WARNING

This equipment complies with radio frequency exposure limits set forth by Innovation, Science and Economic Development Canada for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20 cm between the device and the user or bystanders.

Cet équipement est conforme aux limites d'exposition aux radiofréquences définies par d'Innovation, Sciences et Développement économique Canada pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 20 cm de distance entre le dispositif et l'utilisateur ou des tiers.

6.3 Europe

This equipment (EV68D28A) has been assessed under the Radio Equipment Directive (RED) for use in European Union countries. The product does not exceed the specified power ratings, antenna specifications and/or installation requirements as specified in the user manual. A Declaration of Conformity is issued for each of these standards and kept on file as described in Radio Equipment Directive (RED).

Simplified EU Declaration of Conformity

Hereby, Microchip Technology Inc. declares that the radio equipment type [EV68D28A] is in compliance with Directive 2014/53/EU.

The full text of the EU declaration of conformity is available at EV68D28A (See *Conformity Documents*).

7. Document Revision History

The revision history describes the changes that were implemented in the document. The changes are listed by revision, starting with the most current publication.

Table 7-1. Document Revision History

Revision	Date	Section	Description
A	10/2024	Document	Initial revision

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