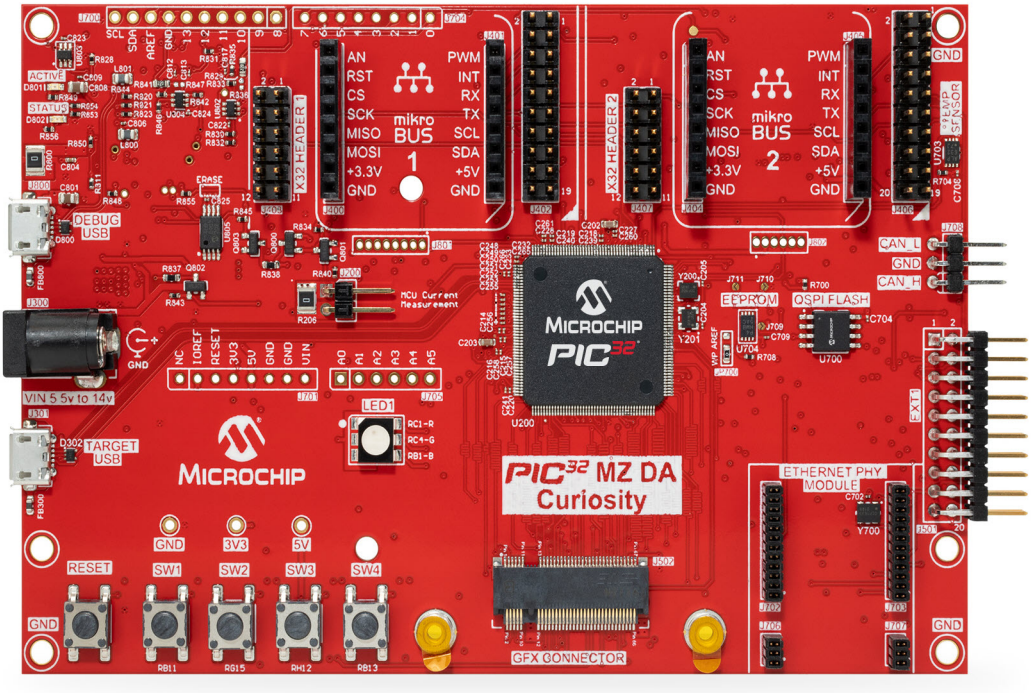
EV87D54A

PIC32MZ DA Curiosity User Guide

Preface

The Microchip Curiosity PIC32MZ DA Development Board (EV87D54A) includes an integrated programmer and debugger, which requires no additional hardware to get started. Users can expand functionality through MikroElectronika mikroBUS™ Click™ adapter boards, add Ethernet connectivity with the Microchip PHY daughter board, add Wi-Fi® connectivity capability using the Microchip expansions boards, and add audio input and output capability with Microchip audio daughter boards. With or without expansion boards, the Curiosity PIC32MZ DA development board provides the freedom to develop a variety of applications, including Bluetooth® audio, CAN, graphics/UI, Internet of Things (IoT), robotics development, and proof-of-concept designs. The figure below shows the Curiosity PIC32MZ DA development Board



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1. Introduction

The PIC32MZ DA Curiosity Development Board (EV87D54A) includes an integrated programmer and debugger. Additional hardware is not required to get started. Users can expand functionality through MikroElectronika mikroBUS™ Click™ adapter boards, add Ethernet connectivity with the Microchip PHY Daughter Board, add Wi-Fi™ connectivity capability using the Microchip expansions boards, and add audio input/output capability with Microchip audio daughter boards.

With or without expansion boards, the PIC32MZ DA Curiosity Development Board provides the freedom to develop for a variety of applications, including Bluetooth Audio, CAN, Graphics/UI, Internet of Things (IoT), robotics development, and proof-of-concept designs.

1.1 PIC32MZ DA Curiosity Features

- PIC32MZ2064DAR176-I/2J, 200 MHz, 2 MB Flash, 640 KB SRAM, 32 MB DDR2
- On-board debugger (PKoB4)
  - Real time programming and debugging
  - Virtual COM port (VCOM)
- Two mikroBUS™ interfaces
- Two X32 audio interfaces supporting Bluetooth and audio
- Ethernet interface
- Graphics interface
- Xplained pro extension compatible interface
- CAN interface
- User buttons
- User RGB LED
- 8MB QSPI memory
- I^2C EEPROM MAC, AT24MAC402 (external)
- I^2C Temperature Sensors, MCP9808 (external)
- Arduino Uno R3 compatible interface

1.2 Kit Contents

The kit contains the following:

- One PIC32 MZ DA Curiosity Development Board (EV87D54A)
- One 24-bit pass though Graphics Card (AC320213)
- **Note:** If any part of a kit is missing, contact a Microchip sales office for assistance. A list of Microchip offices for sales and service is provided on the last page of this document.

2. Development Board Functionality and Features

2.1 Development Board Feature Location

Figure 2-1. PIC32MZ DA Curiosity Development Board Layout (Top View)

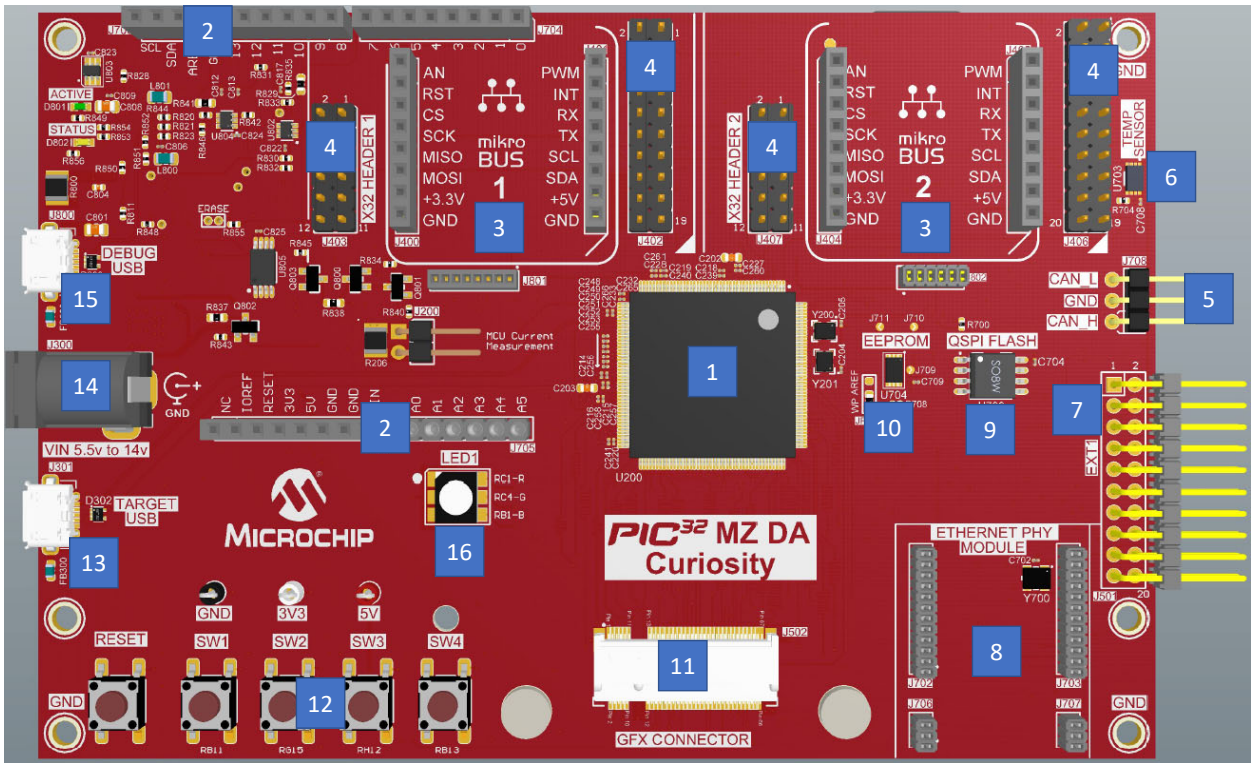


Figure 2-2. PIC32MZ DA Curiosity Development Board Layout (Bottom View)

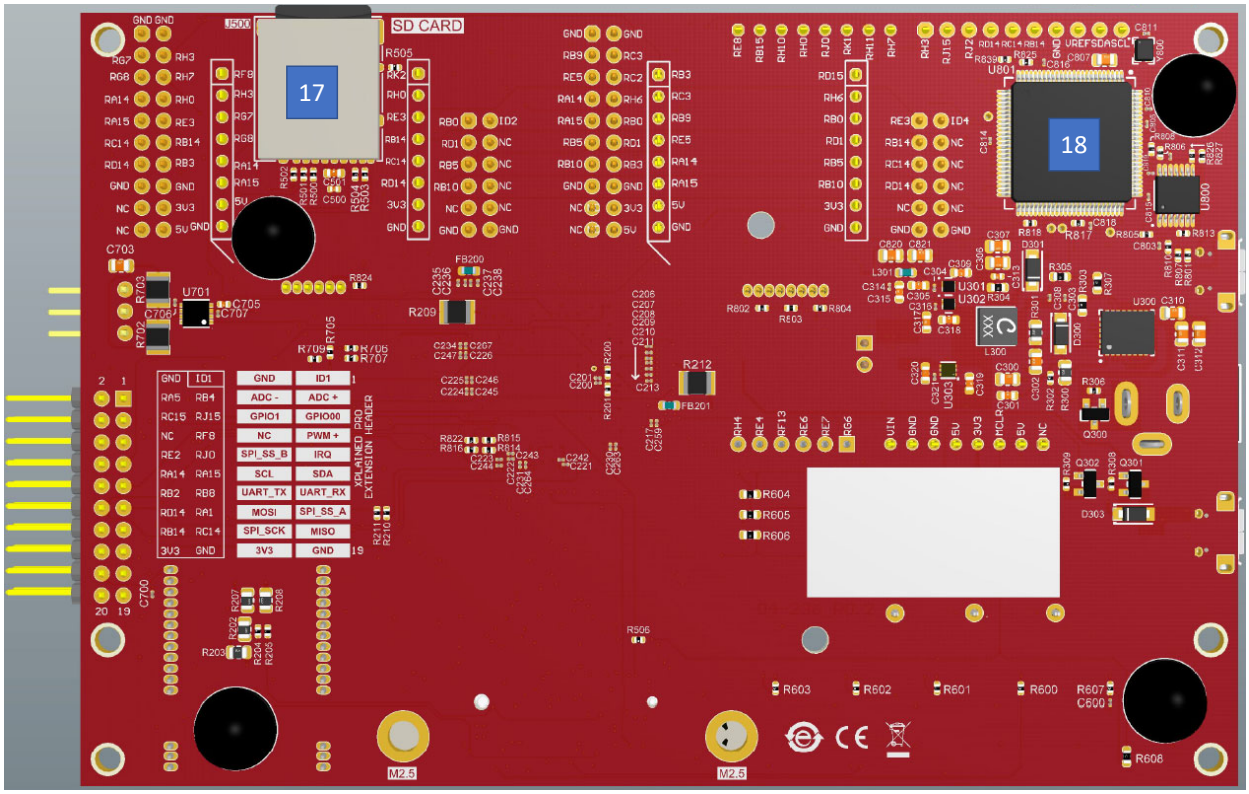


Table 2-1. Development Board Features and Location

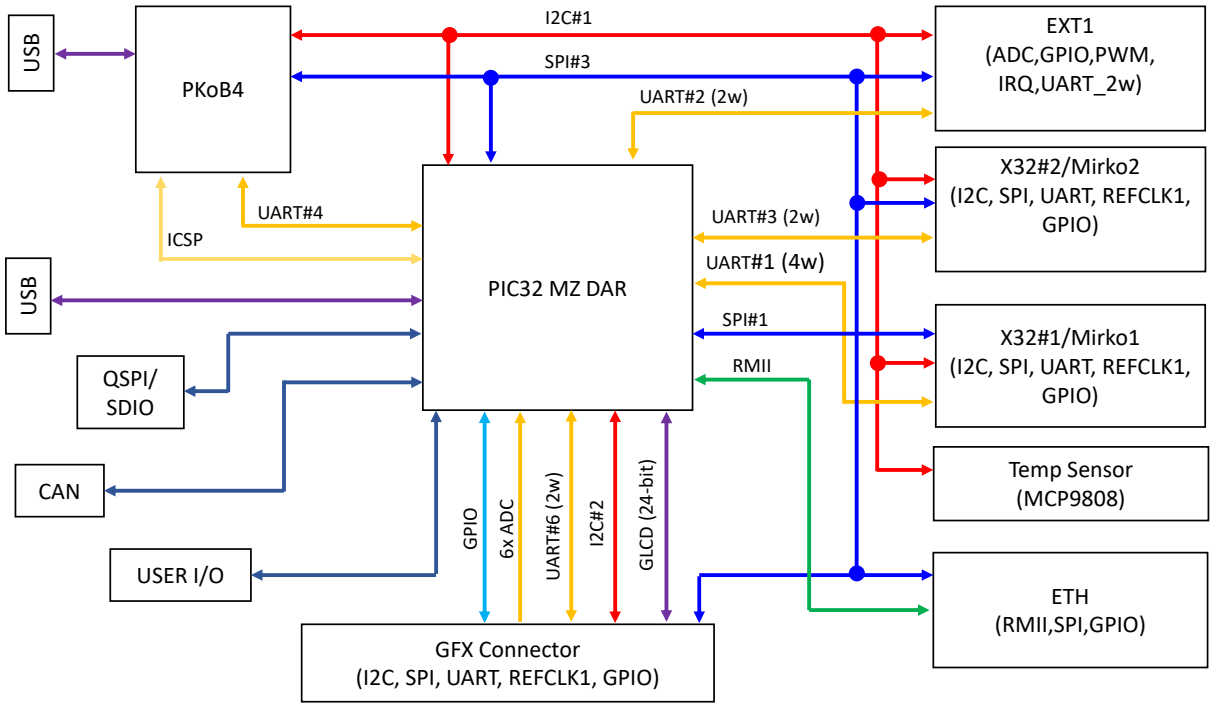
Number	Description of item
1	PIC32MZ2064DAR176-I/2J
2	Arduino Uno interface. Headers not populated
3	mikroBUS™ Click ™ interface. Two per board
4	X32 Audio interface. Two per board. Bluetooth and Audio CODECs sold separately
5	CAN interface
6	I²C Temperature Sensor, MCP9808
7	Xplained pro expansion compatible interface
8	Ethernet interface (RMII, SPI, GPIO). Ethernet PHY not included.
9	Quad SPI Memory 8 MB (64 Mb)
10	I²C EEPROM, AT24MAC402
11	Graphics Interface
12	Programmable user buttons
13	USB to PIC32MZ DA
14	2.5 mm barrel jack power input
15	USB to PKoB4 for debugging, power, virtual COM port
16	User Programmable RGB LED
17	Micro SD card socket

.....continued	
Number	**Description of item**
18	PIC Kit On-Board 4 (PKoB4)

2.2 System Block Diagram

The following figure shows a high-level block diagram with the major data bus routing.

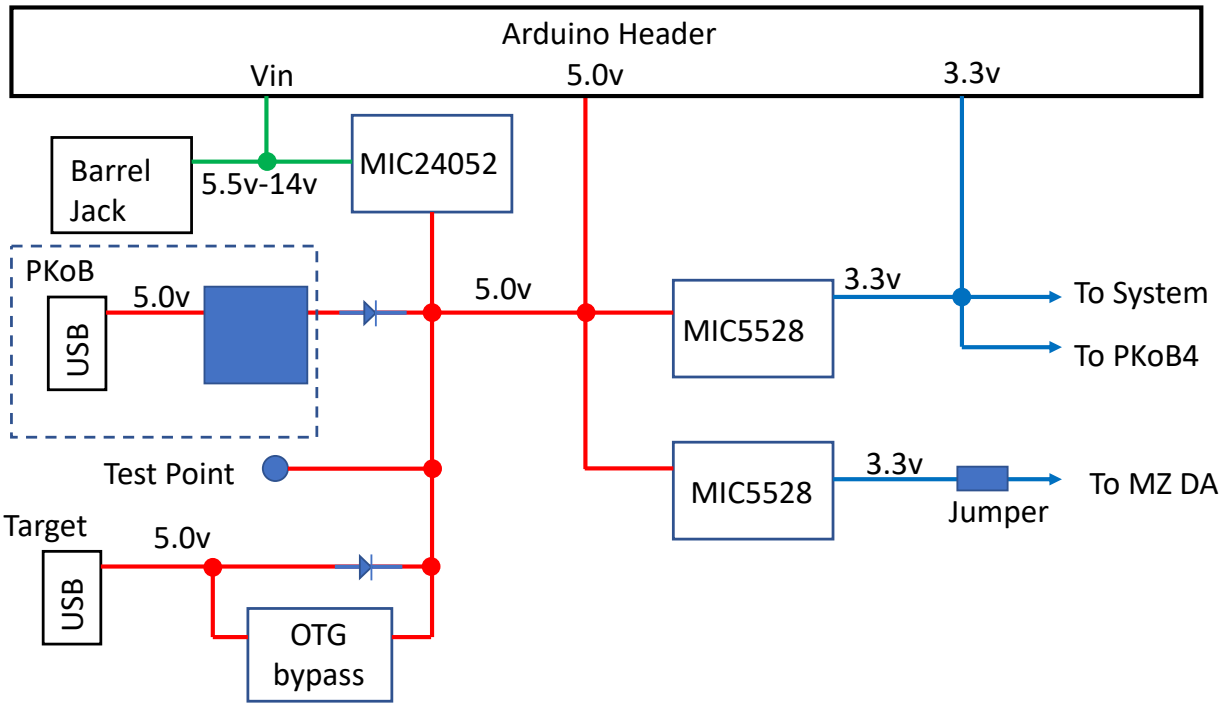
Figure 2-3. System Block Diagram



2.3 Power Block Diagram

The following figure is a high-level block diagram of the power system on the PIC32MZ DA Curiosity board. The PIC32MZ DA Curiosity board has several power sub systems that allow it to accept up to 16v. The barrel jack is a 2.1 mm center positive connector. The power can also be connected through the Arduino header, this input is before the reverse voltage protection.

Figure 2-4. Power Block Diagram



2.4 PICKit™ On-Board 4

MPLAB® PICkit™ On-Board 4 (PKoB4) is a new generation of in-circuit debugger. The MPLAB PKoB4 programs faster than its predecessor and is designed to use a high-speed 2.0 USB interface providing a feature rich debugging experience through one USB cable. The PKoB4 is intended to support programming, debugging, and Data Gateway interface.

The MPLAB PKoB4 In-Circuit Debugger is compatible with these platforms:

- Microsoft Windows® 7 or later
- Linux®
- macOS™

The MPLAB PKoB4 In-Circuit Debugger system provides the following advantages:

Features/Capabilities:

- Connects to computer through high-speed USB 2.0 (480 Mbits) cable
- Programs devices using MPLAB X IDE or MPLAB X IPE
- Supports multiple hardware and software breakpoints, stopwatch, and source code file debugging
- Debugs the application in real time
- Sets breakpoints based on internal events
- Monitors internal file registers
- Debugs at full speed
- Configures pin drivers
- Field-upgradeable through an MPLAB X IDE firmware download
- Adds new device support and features by installing the latest version of MPLAB X IDE (available as a free download at https://www.microchip.com/mplabx/)
- Indicates debugger status through on-board LEDs

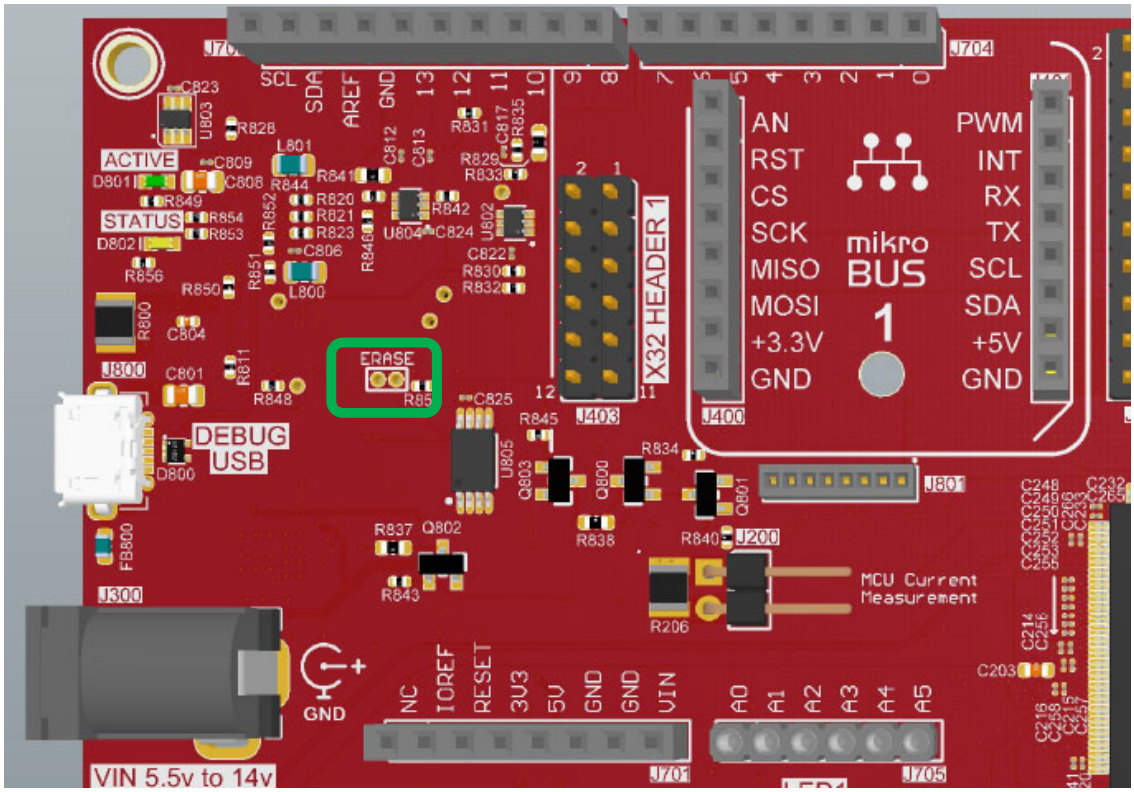
Performance/Speed:

- More and faster memory
- A Real-Time Operating System (RTOS)
- No firmware download delays incurred when switching devices
- A 32-bit MCU running at 300 MHz

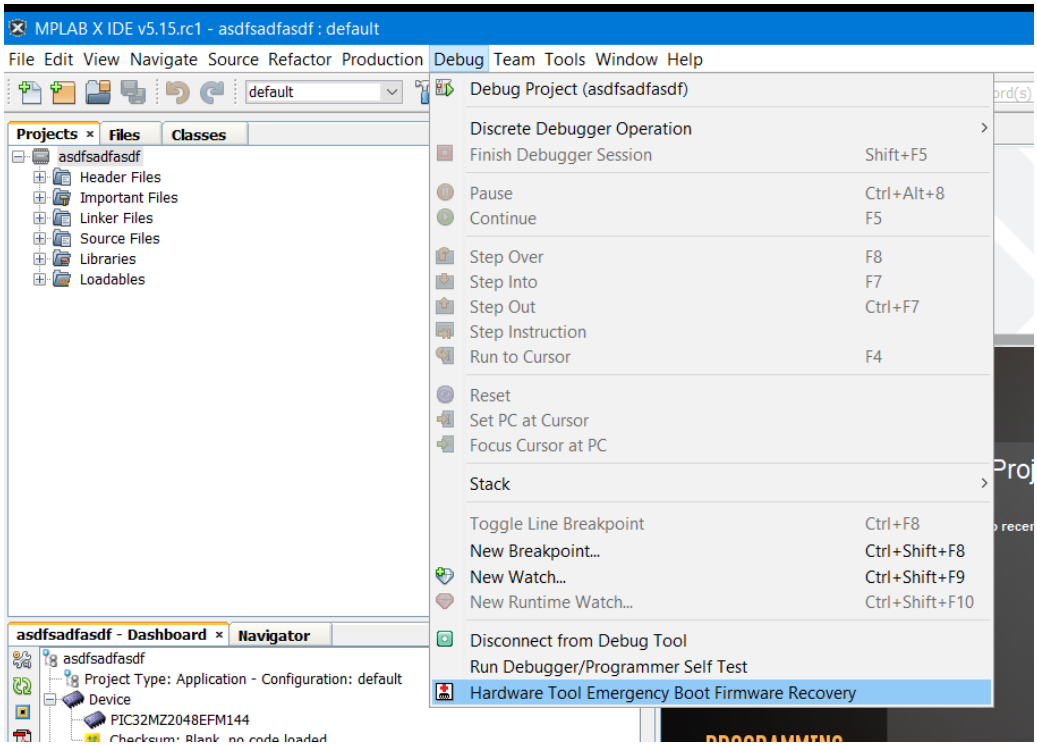
2.4.1 Recovery Method

When PKoB4 becomes unresponsive, users can recover the tool by following these recovery process.

1. With the PIC32MZ DA Curiosity Development board still powered, short the 2 pads for approximately 10 seconds.



2. Open the latest version of MPLAB X IDE.
3. Select *Debug* > *Hardware Tool Emergency Boot Firmware Recovery*.



4. Follow the instructions displayed on the screen to bring the tool back to factory condition.

For additional information on PKoB4, refer to the MPLAB PICkit™ 4 User Guide: http://ww1.microchip.com/downloads/en/DeviceDoc/MPLAB%20PICkit%204%20ICD%20Users%20Guide%20DS50002751C.pdf

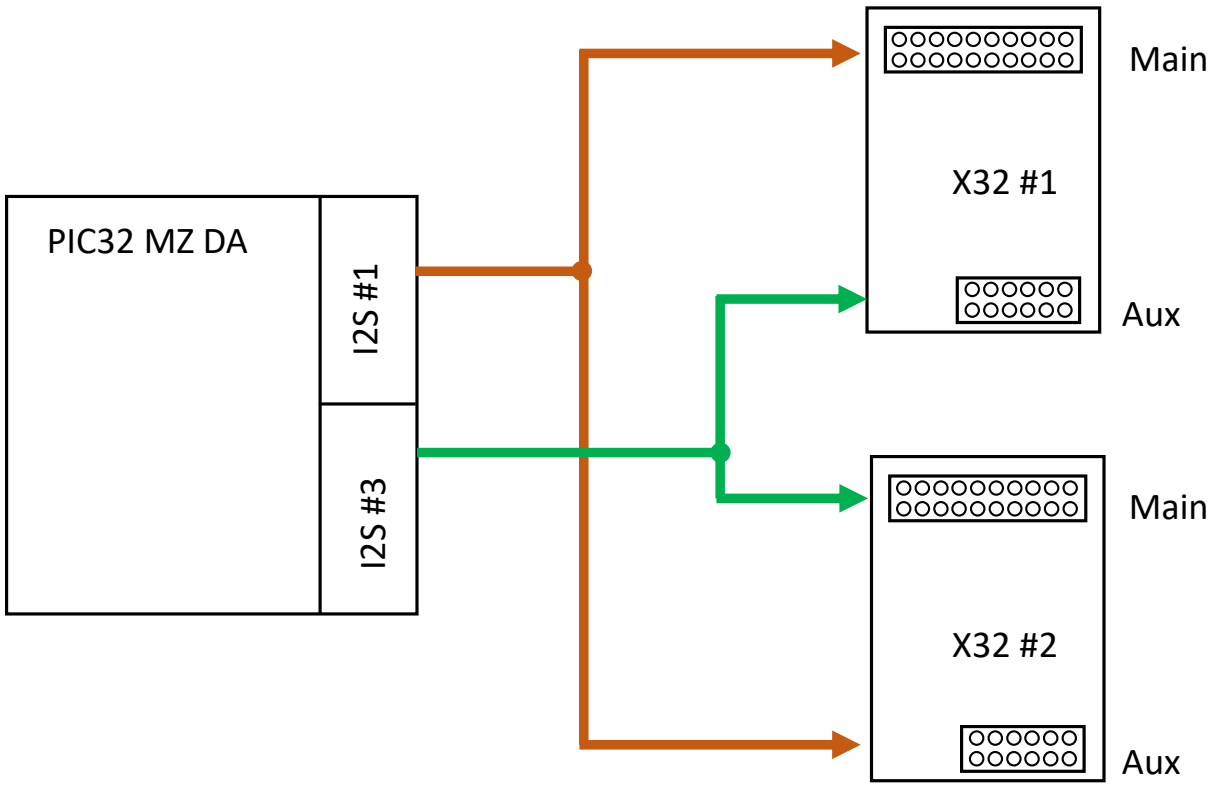
2.5 X32 Audio Interface

There are two X32, 32-pin interfaces to the board to support audio CODEC/DACs and Bluetooth radios. This interface has audio supply I^2S as well as other control lines and data interfaces.

2.5.1 Block Diagram

The PIC32MZ DA Curiosity board has two X32 interfaces that share two I^2S signals. The following figure shows the relation between the I^2S signals and the X32 daughter board interface.

Figure 2-5. Block Diagram



2.5.2 Pinout

The following table describes the pinout for the X32 Audio interface. Refer to the Schematics for additional information.

Table 2-2. X32 Audio Interface Pinout

Pin Number	Name	Description	Interface
1	GND	Ground	Power
2	GND	Ground	Power
3	UART RX	UART RX, receive to MCU from DB	UART
4	UART CTS	UART Clear to send	UART
5	UART TX	UART TX, transmit from MCU to DB	UART
6	UART RTS	UART Ready to send	UART
7	I2C SCL	Clock line for I^2C interface.	I^2C
8	STBY/RST	Standby/Reset control	GPIO
9	I2C SDA	Data line for I^2C interface.	I^2C
10	Audio WS/LRCLK	Audio Word Select/ Left Right Clock	I^2S
11	Audio In	Audio into MCU, out from CODEC	I^2S
12	Audio CLK	Audio clock	I^2S
13	Audio out	Audio out of MCU, in to CODEC/DAC	I^2S

.....continued			
Pin Number	**Name**	**Description**	**Interface**
14	REFCLK/MCK	Reference clock #1	REFCLK
15	GND	Ground	Power
16	GND	Ground	Power
17	NC	Legacy hold over	-
18	+3.3v	VDD	Power
19	NC	Legacy hold over	-
20	+5.0v	VDD	Power
21 (1)	Audio WS/ Audio LRCLK	Audio Word Select/ Left Right Clock	I^2S
22 (2)	ADC/Card ID pin	Analog-to-Digital Converter to read voltage on the daughter card	ADC
23 (3)	Audio CLK	Audio Clock	I^2S
24 (4)	NC		
25 (5)	Audio IN	Audio into MCU, out from CODEC	I^2S
26 (6)	NC		
27 (7)	Audio OUT	Audio out of MCU, in to CODEC/DAC	I^2S
28 (8)	NC		
29 (9)	REFCLK2/MCK2	Reference clock #2	REFCLK
30 (10)	NC		
31 (11)	GND	Ground	Power
32 (12)	GND	Ground	Power

2.5.3 Port Connections

The following table shows the port and connections to the X32 Audio interface. The I^2S signals listed are the main signals, both signals are available at each interface, see the X32 Block Diagram for clarification.

Table 2-3. Port Connections

Interface	X32#1	X32#2
UART RX	RPB9	RPG7
UART TX	RPE5	RPG8
UART RTS	RPC2	RPH7(1)
UART CTS	RPC3	RPH3(1)
I^2C SDA	RA15	RA15
I^2C SCL	RA14	RA14
Reset	RH6	RH0
REFCLK	RPB3	RPB3
SPI SCK (I^2S Clock)	RPD1	RPB14
SPI MOSI (I^2S Audio Out)	RPB10	RPD14

.....continued		
Interface	**X32#1**	**X32#2**
SPI MISO (I^2S Audio In)	RPB5	RPC14
SPI CS (I^2S LRCLK)	RPB0	RPE3
ADC	AN33	AN11

Note:

1. Implemented as GPIO only.

2.6 mikroBUS™

The mikroBUS™ interface allows for the use of additional click™ boards. For additional information and to see the boards which can be used with this development board, visit https://www.mikroe.com/.

Table 2-4. Pin Description

Pin Number	Name	Function
1	GND	Ground
2	+5V	+5.0V
3	SDA	I^2C SDA
4	SCL	I^2C SCL
5	TX	UART TX transmit from MCU to DB
6	RX	UART RX receive to MCU from DB
7	INT	Interrupt request line
8	PWM	Pulse width modulation
9	GND	Ground
10	+3.3V	Ground
11	MOSI	**M**aster **O**ut **S**lave **I**n line of serial peripheral interface.
12	MISO	**M**aster **I**n **S**lave **O**ut line of serial peripheral interface.
13	SCK	Clock for serial peripheral interface
14	CS	Chip Select for serial peripheral interface (Active low)
15	RST	Reset
16	AN	Analog-to-digital converter.

2.6.1 Port Connections

The following table shows the port and connections for the mikroBUS interface. The mikroBUS is nested inside of the X32 Audio interface, due to mechanical interference either a mikroBUS or Audio interface can be used in the same socket. The mikroBUS interface shares signals with the X32 Audio interface. Refer to the Pinout for pinout or signal probing.

Table 2-5. Port and Connections

Interface	mikroBUS #1	mikroBUS #2
UART RX	RPB9	RPG7
UART TX	RPE5	RPG8

.....continued		
Interface	**mikroBUS #1**	**mikroBUS #2**
INT/IRQ	RPC3	RPH3
I2C SDA	RA15	RA15
I2C SCL	RA14	RA14
Reset	RH6	RH0
PWM	RPB3	RPF8
SPI Clock	RPD1	RPB14
SPI MOSI	RPB10	RPC14
SPI MISO	RPB5	RPD14
SPI SS	RPB0	RPE3
ADC	AN33	AN11

2.7 Control Area Network (CAN) Bus Interface

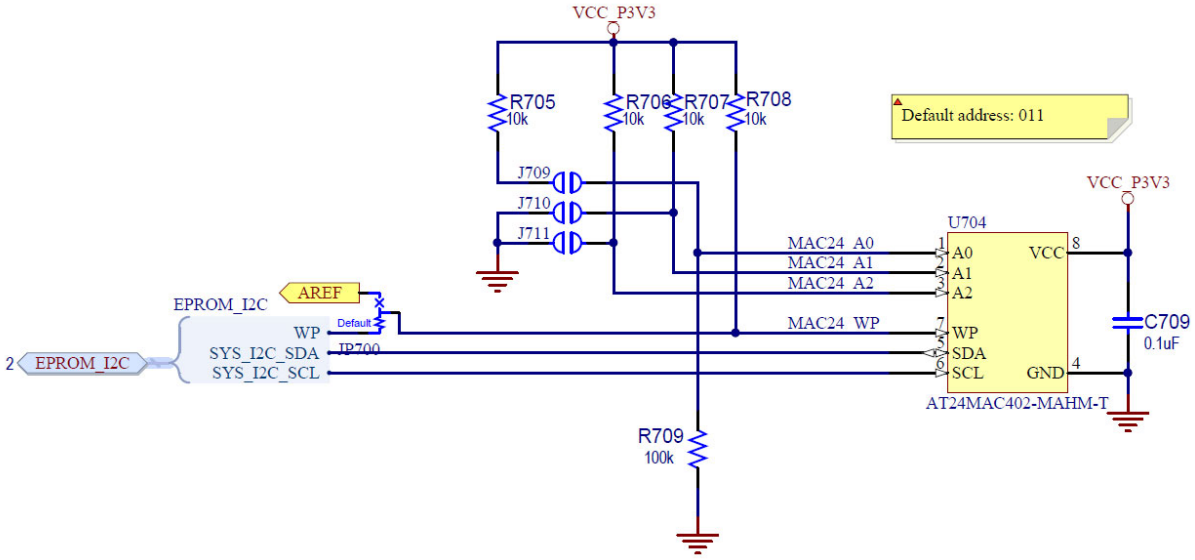
The PIC32MZ DA Curiosity board provides access to a CAN interface that is post transceiver. The on-board CAN transceiver is an ATA6561, allowing the application to be used with any CAN bus compliant interface.

Table 2-6. CAN Pin Description

Pin Number	Name	Description	Port
1	CAN_H	CAN High Signal	-
2	GND	Ground	-
3	CAN_L	CAN Low Signal	-
-	CAN2_TX	CAN Transmit	RPF2
-	CAN2_RX	CAN Receive	RPE2

2.7.1 Schematic

Figure 2-6. Can Interface



2.8 Ethernet

The PIC32MZ DA Curiosity board has a modular Ethernet PHY system that allows for different PHYs to be plugged into the board. This interface is set up to use a Reduced Media-independent interface (RMII interface) as well as a SPI bus interface with GPIO.

Figure 2-7. Ethernet PHY Header Configuration

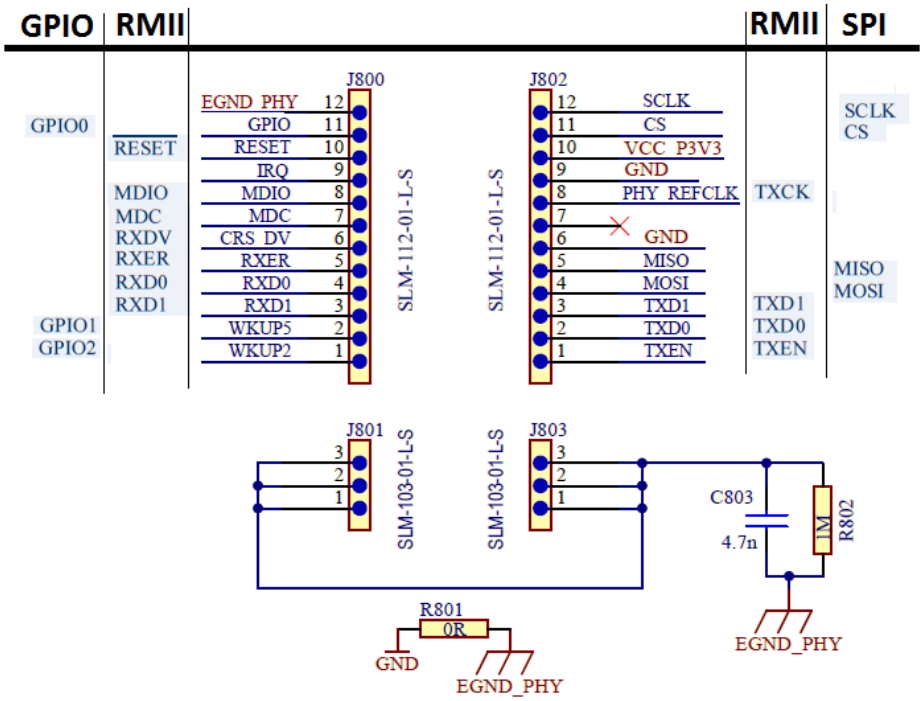


Table 2-7. Pinout and Description of the Ethernet Interface

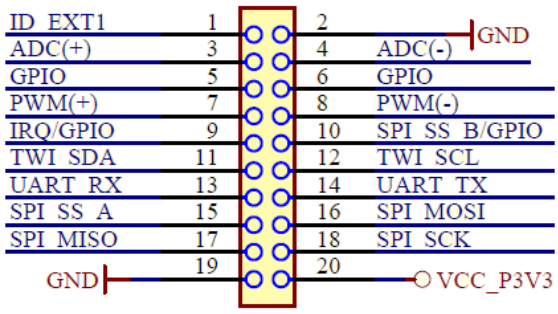
Pin Number	Name	Description	Port
1	GPIO	General purpose I/O	RK1
2	GPIO	General purpose I/O	RD7
3	RXD1	Receive Data 1	RH5
4	RXD0	Receive Data 0	RH8
5	RXER	Receive Error	RF3
6	RXDV	Receive Data Valid	RH13
7	MDC	Ethernet Management Data Clock	RD11
8	MDIO	Ethernet Management Data	RJ1
9	IRQ	Interrupt request line	RJ2
10	RESET	Reset control to the Ethernet PHY	RJ0
11	GPIO	General purpose I/O	RH11
12	EGND	Shield Ground	-
13 (1)	TXEN	Transmit Enable	RD6
14 (2)	TXD0	Transmit Data	RJ8
15 (3)	TDX1	Transmit Data	RJ9
16 (4)	MOSI	**M**aster **O**ut **S**lave **I**n line of serial peripheral interface.	RD14
17 (5)	MISO	**M**aster **I**n **S**lave **O**ut line of serial peripheral interface	RC14
18 (6)	GND	Ground	-
19 (7)	NC	No Connect	-
20 (8)	REFCLK (in)	Reference Clock input (50MHz)	RJ11
21 (9)	GND	GND	-
22 (10)	+3.3v VDD	+3.3V VDD	-
23 (11)	CS	Chip Select for serial peripheral interface	RJ2
24 (12)	SCK	Clock for serial peripheral interface	RB14
25 -30	EGND	Shield Ground	-

2.9 Xplained Pro Standard Extension Header

The PIC32MZ DA Curiosity board has an Xplained Pro compatible interface that allows for the use of existing expansion boards. This interface consists of a dual row, 20-pin, 100 mil, 90 degree extension male headers, while Xplained Pro extensions have their female counterparts. The extension headers can be used to connect a variety of Xplained Pro extension boards or to access the pins of the target MCU directly.

Note: All pins are not always connected.

Figure 2-8. Xplained Pro Pins



All connected pins follow the defined pinout description in the following table.

Table 2-8. Pinout

Pin number	Name	Description	Port
1	ID	Communication line to the ID chip on an extension board	Connected to PKoB4
2	GND	Ground	-
3	ADC(+)	Analog-to-digital converter, alternatively positive part of differential ADC	RB4/AN2
4	ADC(-)	Analog-to-digital converter, alternatively negative part of differential ADC	RA5/AN7
5	GPIO1	General purpose I/O	RJ15
6	GPIO2	General purpose I/O	RC15
7	PWM(+)	Pulse width modulation, alternatively positive part of differential PWM	RF8
8	PWM(-)	Pulse width modulation, alternatively negative part of differential PWM	No Connect
9	IRQ/INT/GPIO	Interrupt request line and/or general purpose I/O	RJ0
10	SPI SS B/GPIO	SPI Slave Select or General purpose I/O	RE2
11	I2C SDA	Data line for I^2C interface. Always implemented, bus type	RA15
12	I2C SCL	Clock line for I^2C interface. Always implemented, bus type.	RA14
13	UART RX	Receiver line of target device UART	RPB1
14	UART TX	Transmitter line of target device UART.	RPB2
15	SPI SS A/GPIO	SPI Slave Select or General purpose I/O	RA1
16	SPI MOSI	**M**aster **O**ut **S**lave **I**n line of serial peripheral interface. Always implemented, bus type.	RPD14
17	SPI MISO	**M**aster **I**n **S**lave **O**ut line of serial peripheral interface. Always implemented, bus type.	RPC14
18	SPI SCK	Clock for serial peripheral interface. Always implemented, bus type	RPB14
19	GND	Ground	-
20	VCC	Power for extension boards (3.3V)	-

2.10 Graphics Connector/GFX Card Interface

The PIC32MZ DA Curiosity board has a new graphics interface to allow for use with different graphics cards to support different graphic support models. The PIC32MZ DA is intended to drive a 24-bit RGB panel natively with the internal LCD controller and GPU.

Table 2-9. Pinout

Pin Number	Name	Description	Port
1	GND	Ground	-
2	GND	Ground	-
3	MCLR	Master Clear, Controlled by the debugger(s). allows for a complete system reboot	-
4	IRQ1 (LCD Touch)	Interrupt request line for cap touch device	RH14
5	5.0v VCC	5.0v	-
6	IRQ2 (Q Touch)	Interrupt request line for Q touch devices	RH1
7	LCDEN	LCD Data Enable	
8	IRQ3 (Display Controllers)	Interrupt request line for external display controllers	RH9
9	LCDHSYNC	LCD Horizontal Sync	RJ5
10	IRQ4 (Resistive touch)	Interrupt request line for resistive touch controllers	No Connect
11	LCDVSYNC	LCD Vertical Sync or Write enable (active low)	RJ4
12	5.0v VCC	+5.0v	-
13	LCDPCK	LCD pixel Clock or Read Enable (active low)	RJ6
14	I2C SDA	Data line for I^2C interface. Always implemented, bus type	RA3
15	LCD D0	LCD Data bit 0	R
16	I2C SCL	Clock line for I^2C interface. Always implemented, bus type.	RA2
17	LCD D1	LCD Data bit 1	RA3
18	SPI SCK	Clock for serial peripheral interface. Always implemented, bus type	RB14
19	LCD D2	LCD Data bit 2	RD9
20	SPI MOSI	**M**aster **O**ut **S**lave **I**n line of serial peripheral interface.	RD14
21	LCD D3	LCD Data bit 3	RG0
22	SPI MISO	**M**aster **I**n **S**lave **O**ut line of serial peripheral interface.	RC14
23	LCD D4	LCD Data bit 4	RG1
24	SPI SS	SPI Slave Select	RB12
25	LCD D5	LCD Data bit 5	RF1
26	UART RX	Receiver line of target device. (from MCU to GFX card)	RE8

.....continued

Pin Number	Name	Description	Port
27	LCD D6	LCD Data bit 6	RF0
28	UART TX	Transmitter line of target device UART. (from MCU to GFX card)	RB15
29	LCD D7	LCD Data bit 7	RD12
30	UART RTS	UART Ready To Send (from MCU to GFX card) (Not Implemented on this design)	No Connect
31	LCD D8	LCD Data bit 8	RJ14
32	UART CTS	UART Clear To Send (from MCU to GFX card) (Not Implemented on this design)	No Connect
333	LCD D9	LCD Data bit 9	RJ12
34	LCD PWM	LCD PWM back light control	RD0/OC?
35	LCD D10	LCD Data bit 10	RD2
36	PWM2	Pulse width modulation	RB3
37	LCD D11	LCD Data bit 11	RD3
38	GPIO1	General purpose I/O	RKH11
39	LCD D12	LCD Data bit 12	RD12
40	GPIO2	General purpose I/O	RK1
41	LCD D13	LCD Data bit 13	RD13
42	GPIO3	General purpose I/O	RH10
43	LCD D14	LCD Data bit 14	RD2
44	STBY/RST/GPIO4	Standby/reset or General purpose I/O. for resetting devices attached to the GFX connector	RD10
45	LCD D15	LCD Data bit 15	RK6
46	STBY/RST/GPIO5	Standby2/Reset2 or General purpose I/O(not Implemented on this design)	No Connect
47	LCD D16	LCD Data bit 16	RF5
48	ID pin	Communication line to the ID chip on an extension board	Connected to PKoB4
49	LCD D17	LCD Data bit 17	RF4
50	ADC 0	Analog-to-digital converter to MCU	AN14
51	LCD D18	LCD Data bit 18	RJ10
52	ADC1	Analog-to-digital converter to MCU	AN15
53	LCD D19	LCD Data bit 19	RK19
54	ADC2	Analog-to-digital converter to MCU	AN16
55	LCD D20	LCD Data bit 20	RJ3
56	ADC3	Analog-to-digital converter to MCU	AN17
57	LCD D21	LCD Data bit 21	RH15

.....continued			
Pin Number	**Name**	**Description**	**Port**
58	ADC4	Analog-to-digital converter to MCU	AN18
59	LCD D22	LCD Data bit 22	RD13
60	ADC5	Analog-to-digital converter to MCU	AN20
61	LCD D23	LCD Data bit 23	RK0
62	ADC6	Analog-to-digital converter to MCU (Not Implemented on this design)	No Connect
63	3.3V VCC	+3.3V VCC	-
64	ADC7	Analog-to-digital converter to MCU (Not Implemented on this design)	No Connect
65	GND	Ground	-
66	3.3V VCC	+3.3V VCC	-
67	GND	Ground	-
68	GND TAB	Mounting Tab	-
69	GND TAB	Mounting Tab	-

2.11 I²C Temperature Sensor MCP9808

The PIC32MZ DA Curiosity board has a Microchip MCP9808 I²C temperature sensor on board. This sensor is attached to the I²C bus and has a dedicated IRQ pin. The behavior of this pin can be programmed through the I²C by following the data sheet of this device.

Table 2-10. Function and Port

Function	Description	Type	Port
Alert IRQ	Notifies the PIC32 MZ DA curiosity that a I²C message or event is ready	Input	RA9
SYS_I2C_SDA	System I²C Data	Bidirectional	RA15
SYS_I2C_SCL	System I²C Clock	Clock	RA14

The MCP9808 on the PIC32MZ DA Curiosity has a fixed address as shown in the table below:

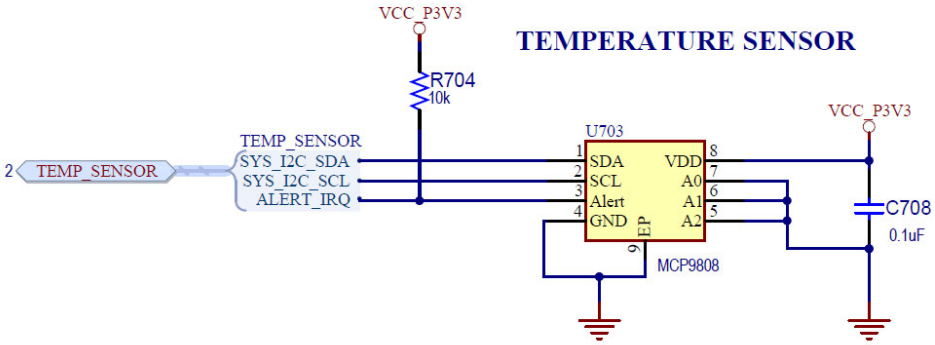
Table 2-11. Fixed Address

Device	Address Code				Slave Address		
	A6	A5	A4	A3	A2	A1	A0
MCP9808	0	0	1	1	0	0	0

For more information on this device, refer to *MCP9808 Data sheet* which is available for download at https://www.microchip.com/wwwproducts/en/en556182.

2.11.1 Schematic

Figure 2-9. Temperature Sensor



2.12 I²C MAC48 EEPROM

The PIC32MZ DA Curiosity Board has an on board I²C Serial EEPROM with a unique 48-bit MAC address. This device is located on the system I²C bus.

Table 2-12. Port and Function

Function	Description	Type	Port
Write Protect	Write protect pin, a high value (logic 1) protects the device from write. A low value (logic 0) means normal read/write	Output	RA10
SYS_I2C_SDA	System I²C Data	Bidirectional	RA15
SYS_I2C_SCL	System I²C Clock	Clock	RA14

The PIC32MZ DA Curiosity Board provides the ability to change the I²C slave address through the solder pads. The default address for user stored information is as follows:

Device	Address Code				Slave Address (default)		
	A6	A5	A4	A3	A2	A1	A0

AT24MAC402 (Standard User space)	1	0	1	0	1	1	0

Device	Address Code				Slave Address (default)		
	A6	A5	A4	A3	A2	A1	A0
AT24MAC402 (Extended space, read only)	1	0	1	1	1	1	0

2.12.1 EUI-48

The EUI-48 address is stored in the last six bytes of the AT24MAC402's extended memory block as shown in the table below. This is a read only address.

	48-Bit EUI					
	24-bit OUI			24-bit Extended ID		
Memory Address (Hex)	9A	9B	9C	9D	9E	9F
EUI Value (Hex)	FC	C2	3D	Byte 1	Byte 2	Byte 3

The first three bytes of the EUI read-only address field are called the Organizationally Unique Identifier (OUI) and the IEEE® Registration Authority has assigned FCC23Dh as the Microchip/Atmel, OUI.

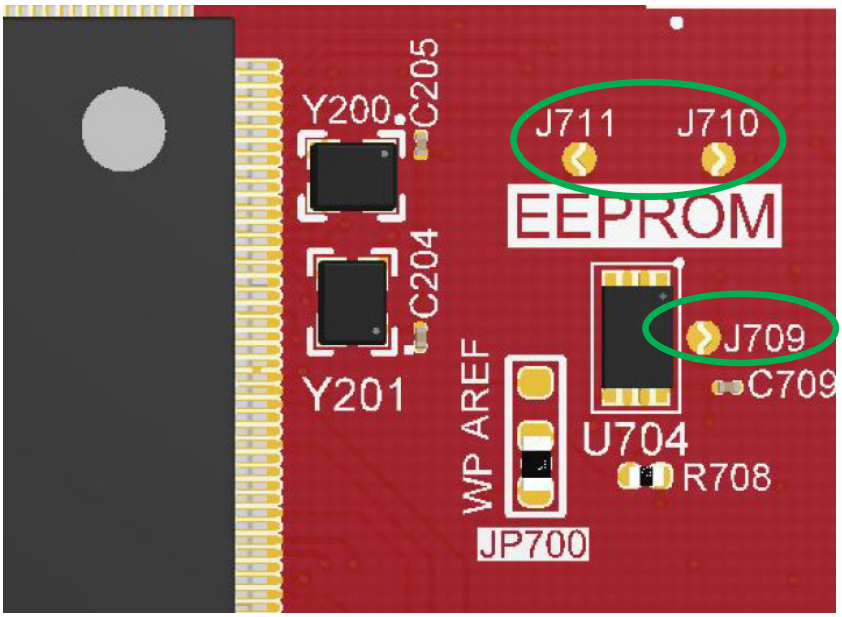
Following the OUI, the remaining bytes are called the Extension Identifier and will be either three bytes or five bytes depending on if it is an EUI-48 address (AT24MAC402). Microchip/Atmel generates this unique 24-bit data value along with the OUI to guarantee a globally unique EUI address value and programs it at the factory before permanently locking the extended memory region.

The unique 128-bit serial number is located in the extended range of the part, this unique information starts at the register 0x80 (0x80-0x8F).

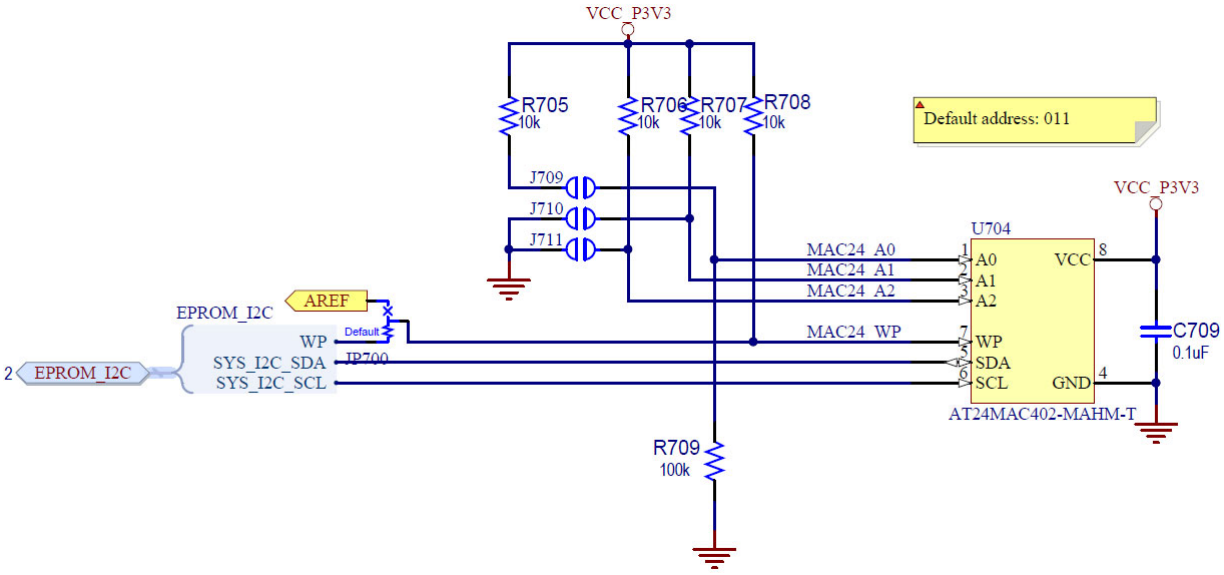
For more information, visit https://www.microchip.com/wwwproducts/en/AT24MAC402.

Changing the default I^2C address can be done by electrically shorting the exposed pads on the board.

Figure 2-10. Board Location



2.12.2 Schematic

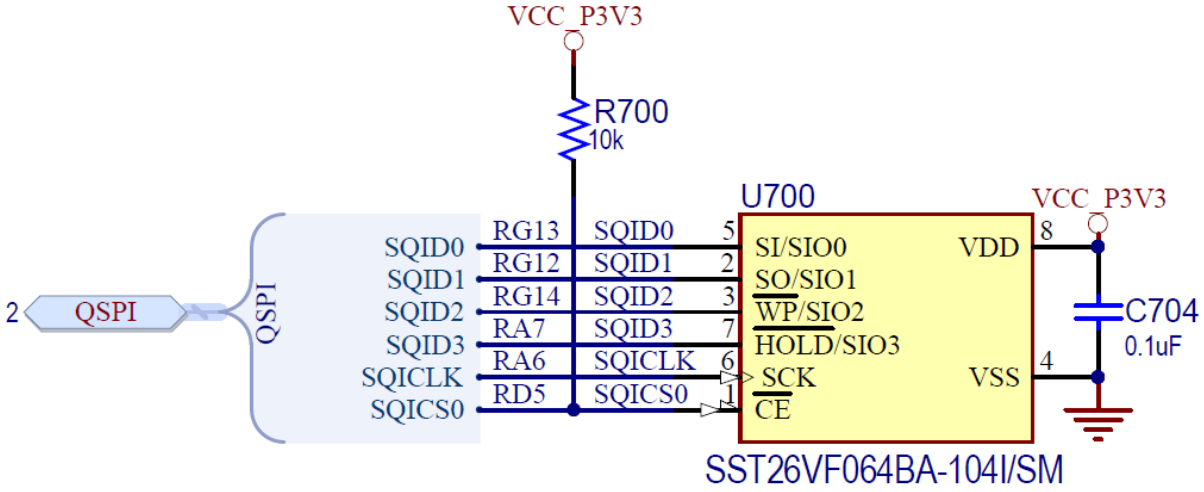


2.13 QSPI/SQI Flash Memory

The PIC32MZ DA Curiosity has an on-board 8 megabyte (64 megabit) Flash memory for users to store information or project assets in. The device is a SST26VF064BA.

For more information, visit https://www.microchip.com/wwwproducts/en/SST26VF064BA.

Figure 2-11. Schematic



2.14 Buttons and LEDs

The PIC32MZ DA Curiosity Board offers several user buttons and LEDs. Some of the LEDs can be used with PWM (Output Compare). The following table shows the function, description, and port on the MCU.

Table 2-13. Function and Port

Function	Description	Type	Port
SW1	Users switch	Input	RB11
SW2	Users switch	Input	RG15
SW3	Users switch	Input	RH12
SW4	Users switch	Input	RB13
RESET	Hard reset of the PIC32	Input	MCLR
LED4 (Red)	RGB LED Red channel	GPIO or PWM	RPC1 or OC
LED4 (Green)	RGB LED Green Channel	GPIO or PWM	RPC4 or OC
LED4 (Blue)	REB LED Blue Channel	GPIO or PWM	RPB1 or OC

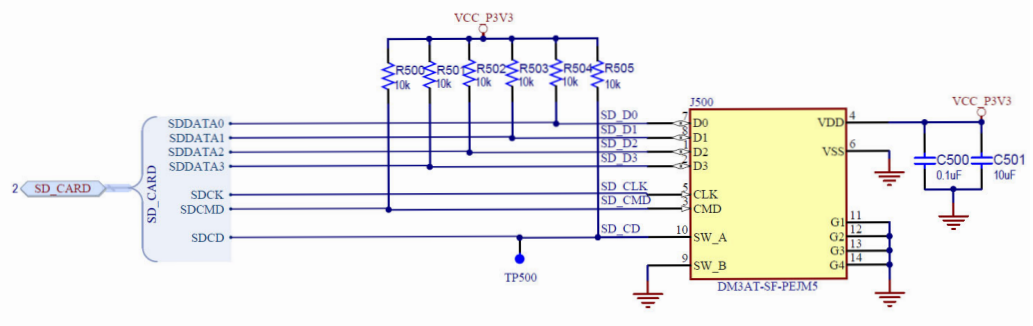
2.15 Micro SD Card

The PIC32MZ DA Curiosity provides an on-board SD card interface that is connected to the PIC32MZ DA internal SDIO interface. This bus is shared with the QSPI/SQI interface. Each device has it own chip select to allow for simultaneous use in the user application.

Table 2-14. Function and Port

Function	Description	Port
SDCD	SD Card Card Detect, High (logic 1) = no Card present. Low (Logic 0) = card present	RA0
SDCK	SD Card Clock	RA6
SDCMD	SD Card Command	RD4
SDDATA0	SD Card Data 0	RG13
SDDATA1	SD Card Data 1	RG12
SDDATA2	SD Card Data 2	RG14
SDDATA3	SD Card Data 3	RA7

Figure 2-12. Micro SD card Schematic



2.16 USB

The PIC32MZ DA Curiosity Board has a high-speed USB 2.0 connection. This port can act as either a device class or host class.

For Device class use the USB cable which can be plugged into the target USB. Refer to Board Feature Location for the location.

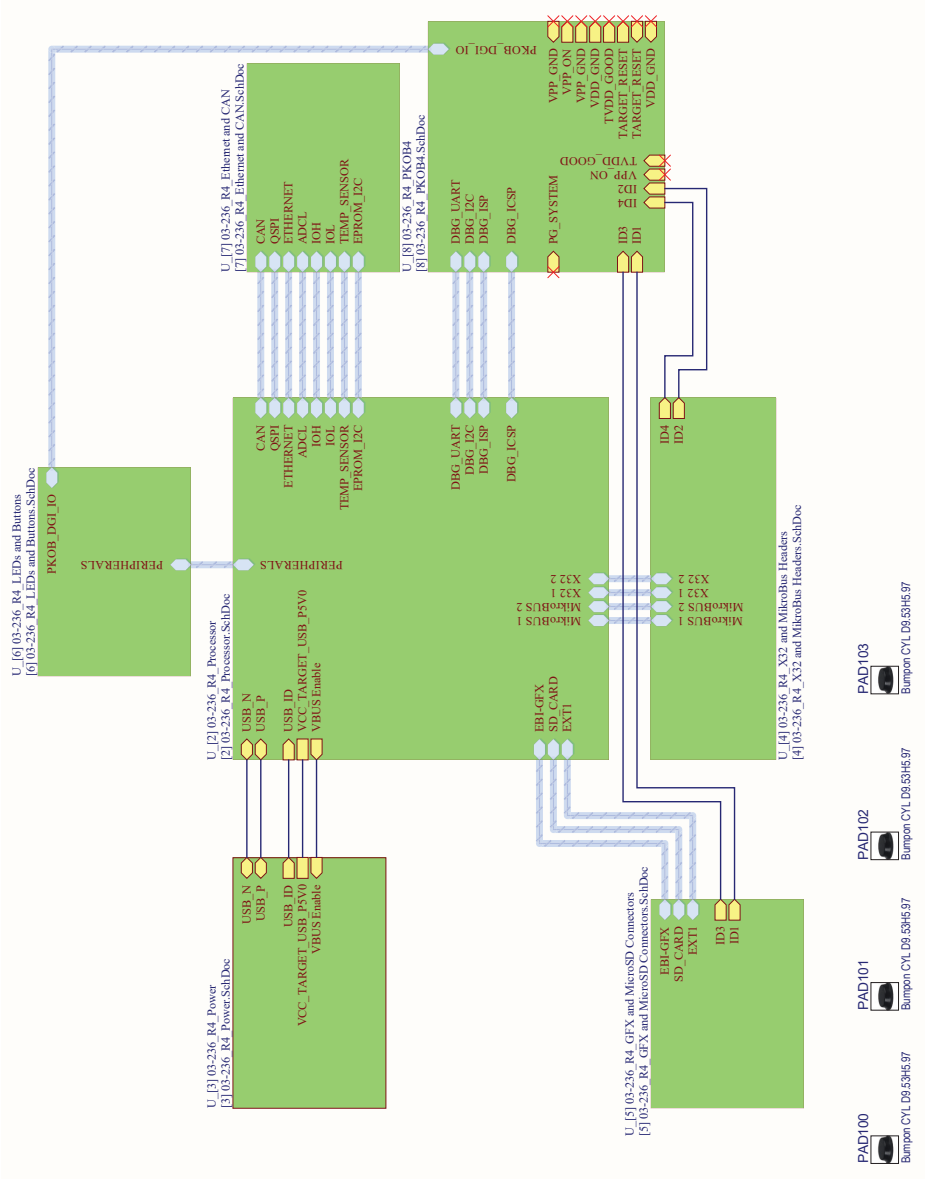
For Host device class operation, a USB OTG cable is needed. To enable power from the PIC32MZ DA Curiosity Board the user must control the VBUS Enable pin. The PIC32MZ DA Curiosity Board must be powered through an external source, Vin, PKoB4, or barrel jack.

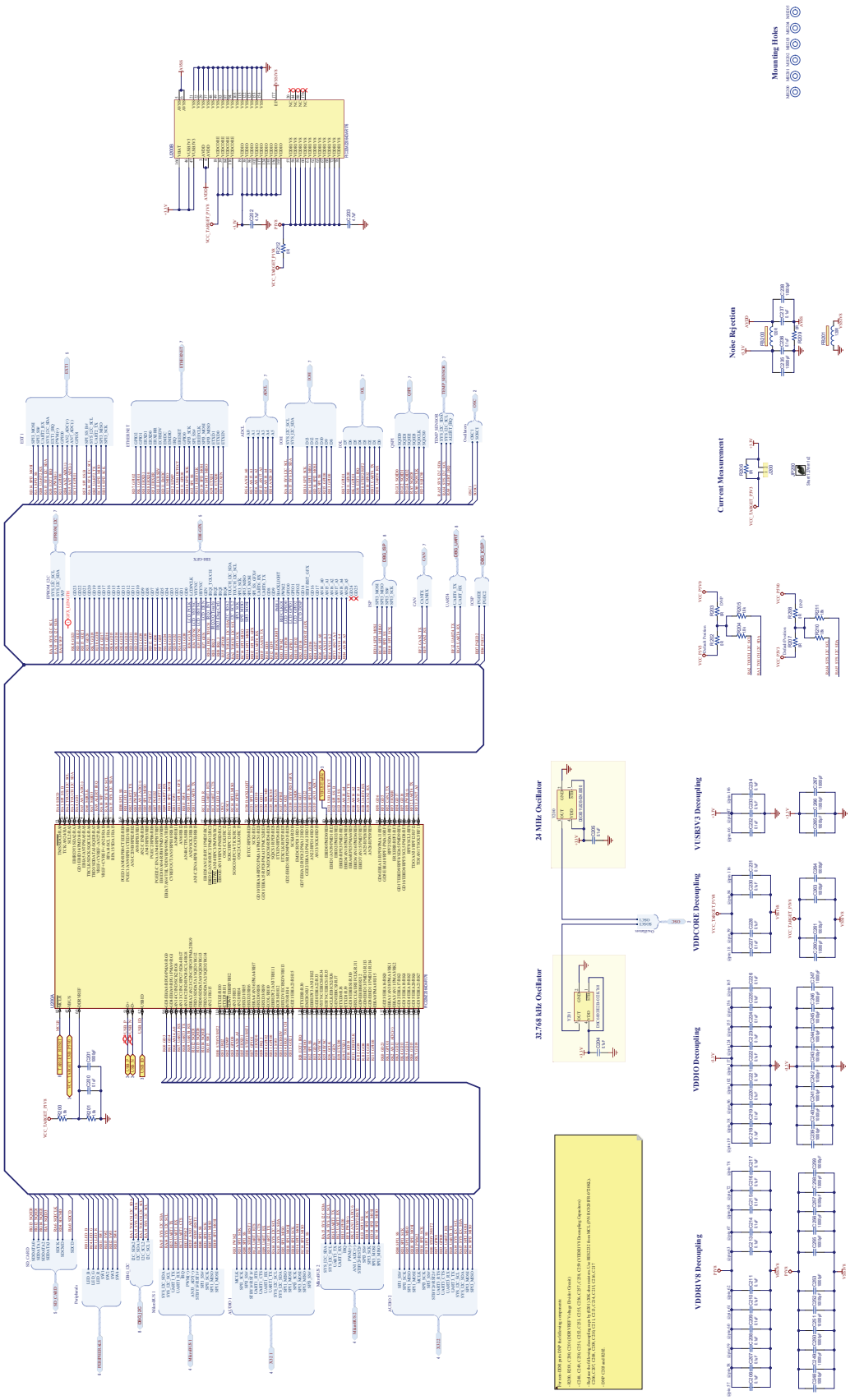
Table 2-15. Function and Port

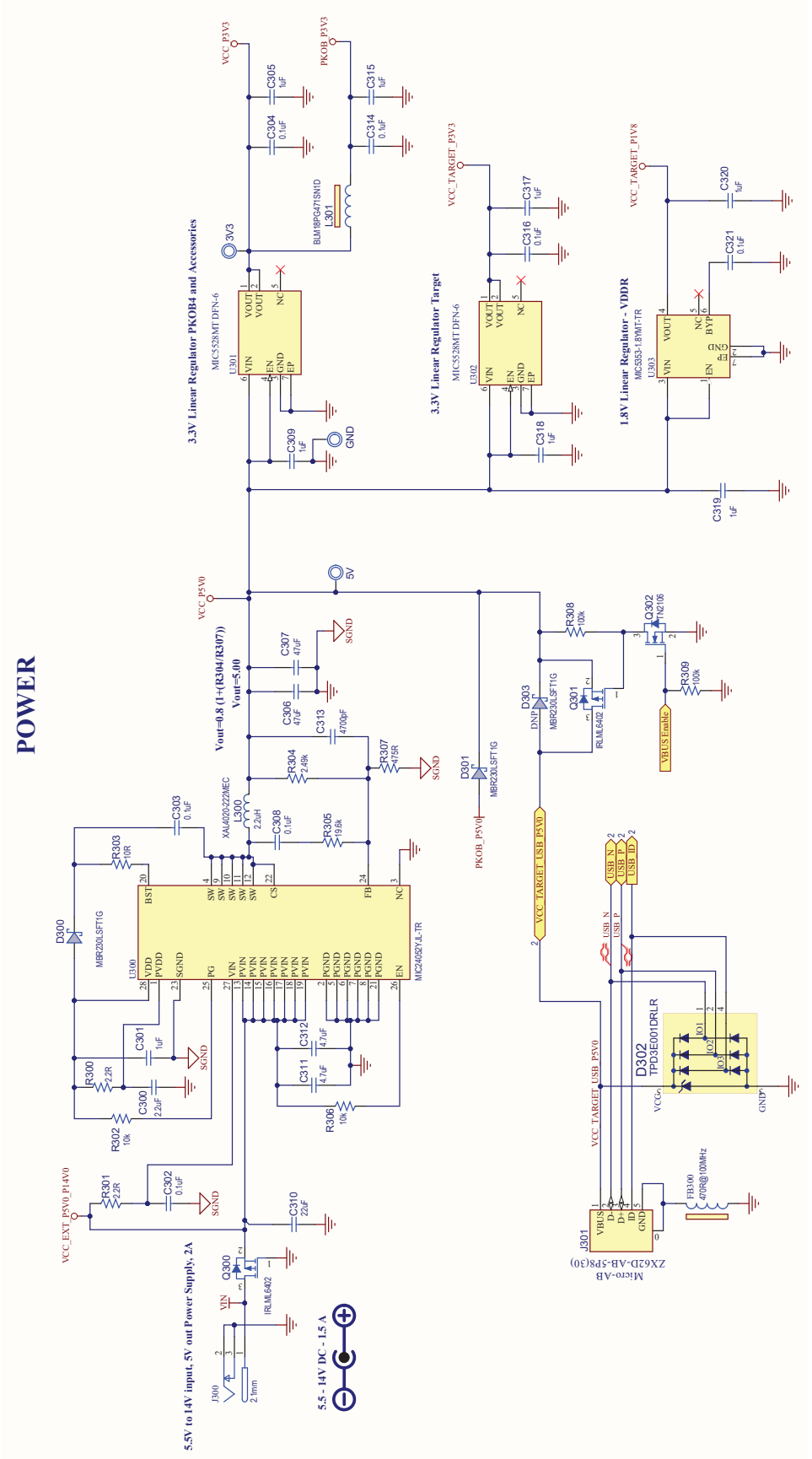
Function	Description	Port
VBUS Enable	Enable power control to USB devices attached to the PIC32MZ DA Curiosity board	RJ13

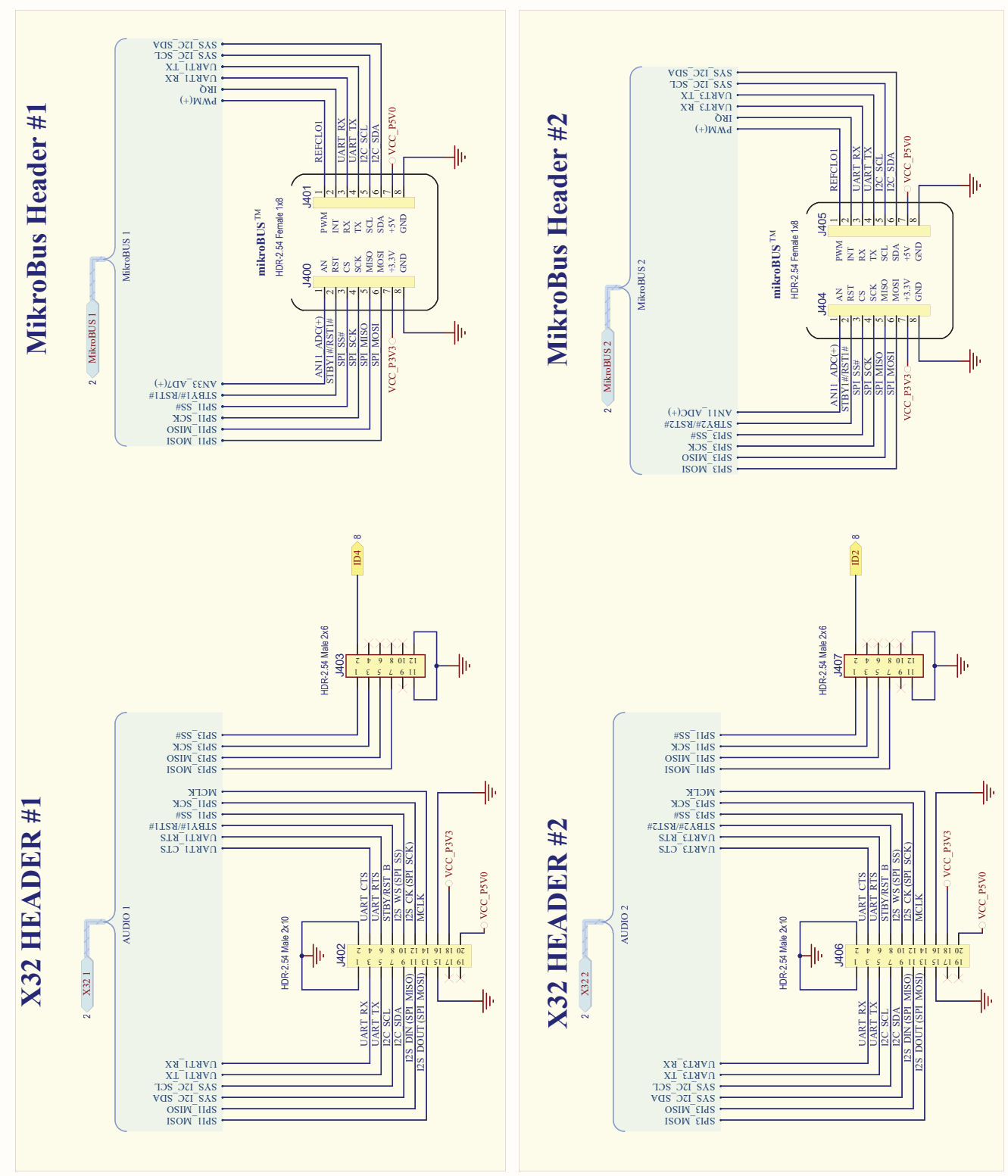
3. Hardware

3.1 Schematics

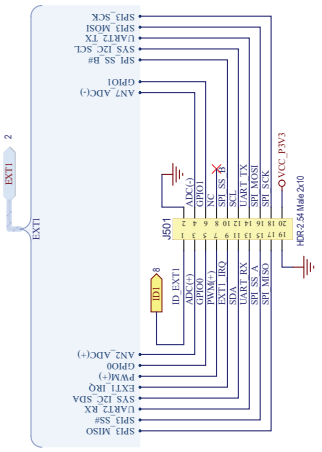



Mounting Holes
Noise Rejection
Current Measurement
24 MHz Oscillator
32.768 kHz Oscillator
VUSB3V3 Decoupling
VDDCORE Decoupling
VDDIO Decoupling
VDDRLV8 Decoupling

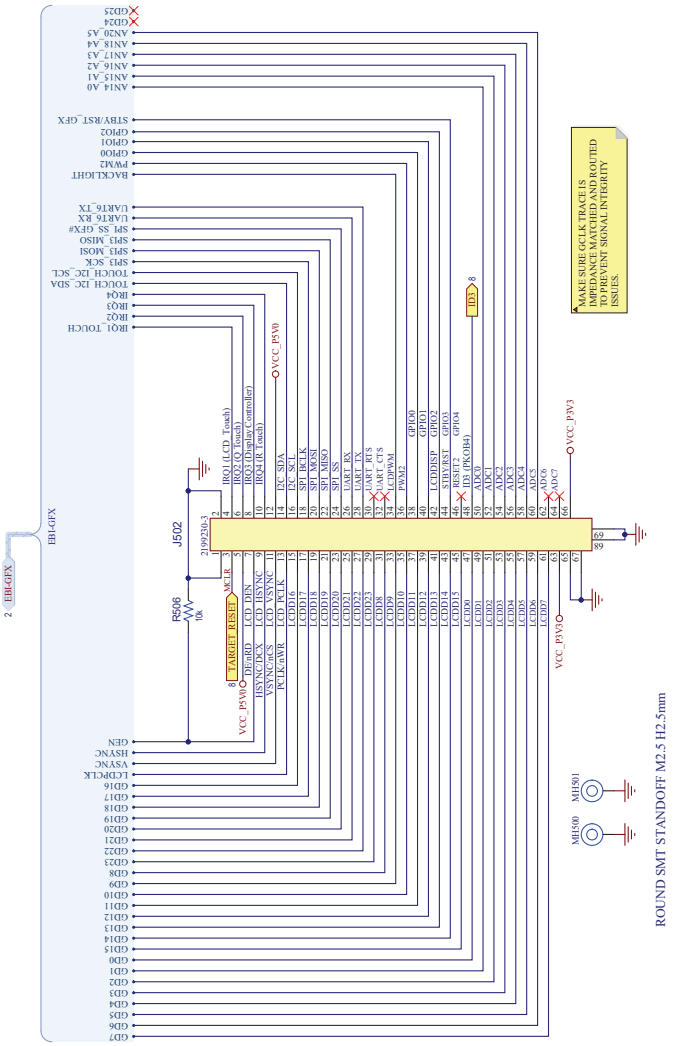

POWER
3.3V Linear Regulator PKOB4 and Accessories
3.3V Linear Regulator Target
1.8V Linear Regulator - VDDR
Vout=0.8 (1+(R304/R307))
Vout=5.00
5.5V to 14V input, 5V out Power Supply, 2A
5.5 - 14V DC - 1.5 A
VCC_P3V3
PKOB_P3V3
VCC_TARGET_P3V3
VCC_TARGET_P1V8
VCC_P5V0
VCC_EXT_P5V0_P14V0
VCC_TARGET_USB_P5V0
PKOB_P5V0
3V3
5V
GND
SGND
VIN
VBUS Enable
USB_N
USB_P
USB_TP
USB_TN
USB_ID
MIC5528MT DFN-6
MIC5353-1.8YMT-TR
MIC24052YJL-TR
MBR230LSFT1G
IRLML6402
TPD3E001DRLR
ZX62D-AB-5P8(30)
Micro-AB
BLM18PG471SN1D
XAL4020-222MEC
L301
L300
U301
U302
U303
U300
D300
D301
D302
D303
Q300
Q301
Q302
J300
J501
FB300
C300
C301
C302
C303
C304
C305
C306
C307
C308
C309
C310
C311
C312
C313
C314
C315
C316
C317
C318
C319
C320
C321
R300
R301
R302
R303
R304
R305
R306
R307
R308
R309


MikroBus Header #1
MikroBUS 1
mikroBUS™
HDR-2.54 Female 1x8
J400
J401
REFCLO1
PWM
INT
RX
CS
SCK
MISO
SDA
+5V
GND
AN
RST
TX
SCL
MOSI
+3.3V
UART_RX
UART_TX
I2C_SCL
I2C_SDA
VCC_P5V0
VCC_P3V3
AN11_ADC(+)
STBY1#/RST1#
SPI_SS#
SPI_SCK
SPI_MISO
SPI_MOSI
AN33_AD7(+)
STBY1#/RST1#
SPI1_SS#
SPI1_SCK
SPI1_MISO
SPI1_MOSI
PWM(+)
IRQ
UART1_RX
UART1_TX
SYS_I2C_SCL
SYS_I2C_SDA
MikroBus Header #2
MikroBUS 2
J404
J405
AN11_ADC(+)
STBY2#/RST2#
SPI3_SS#
SPI3_SCK
SPI3_MISO
SPI3_MOSI
UART3_RX
UART3_TX
X32 HEADER #1
X32 1
AUDIO 1
J402
J403
HDR-2.54 Male 2x10
HDR-2.54 Male 2x6
ID4
UART_CTS
UART_RTS
STBY/RST_B
I2S_WS(SPI_SS)
I2S_CK_(SPI_SCK)
MCLK
I2S_DIN_(SPI_MISO)
I2S_DOUT_(SPI_MOSI)
UART1_CTS
UART1_RTS
X32 HEADER #2
X32 2
AUDIO 2
J406
J407
ID2
UART3_CTS
UART3_RTS
STBY2#/RST2#

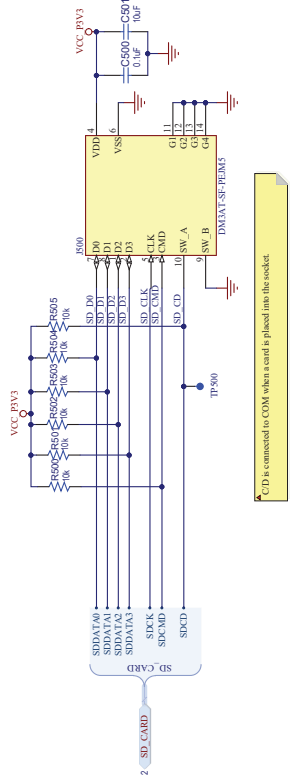
EXT1 Extension Header

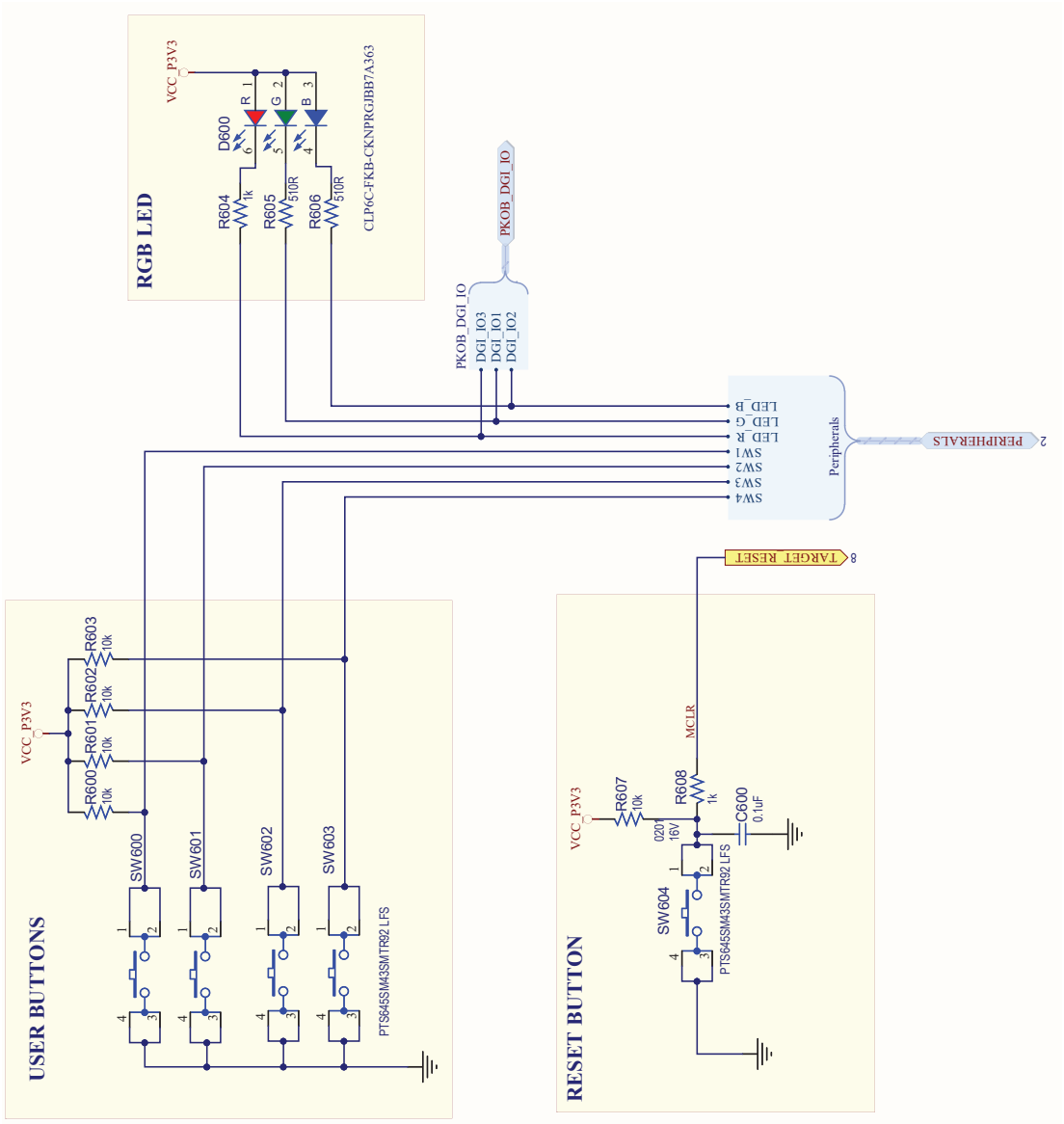


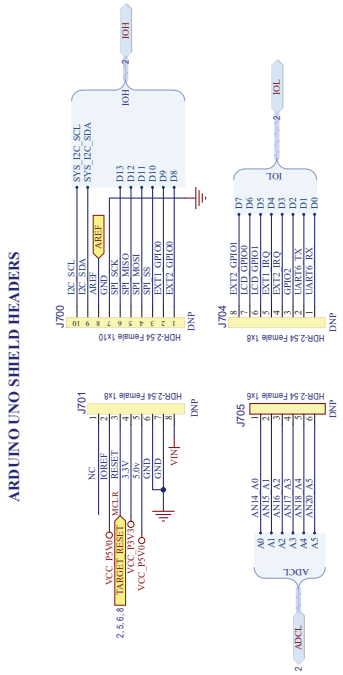
GFX CONNECTOR

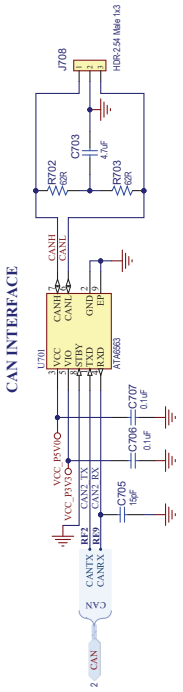


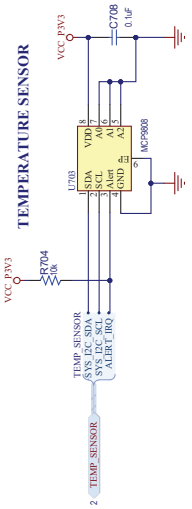
MicroSD

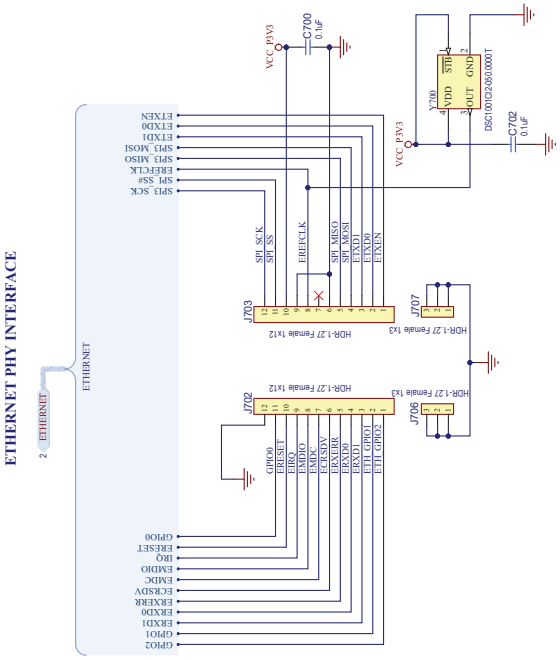


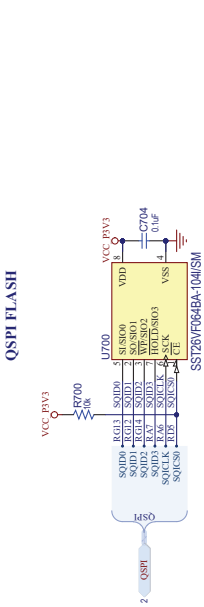

RGB LED
VCC_P3V3
D600
R_1
G_2
B_3
R604
1k
R605
510R
R606
510R
CLP6C-FKB-CKNPRGJBB7A363
PKOB_DGI_IO
PKOB_DGI_IO
DGI_IO3
DGI_IO1
DGI_IO2
LED_B
LED_G
LED_R
SW1
SW2
SW3
SW4
Peripherals
PERIPHERALS
2
TARGET_RESET
8
USER BUTTONS
VCC_P3V3
R603
10k
R602
10k
R601
10k
R600
10k
SW600
SW601
SW602
SW603
PTS645SM43SMTR92 LFS
RESET BUTTON
VCC_P3V3
R607
10k
R608
1k
MCLR
C600
0.1uF
0201
16V
SW604
PTS645SM43SMTR92 LFS

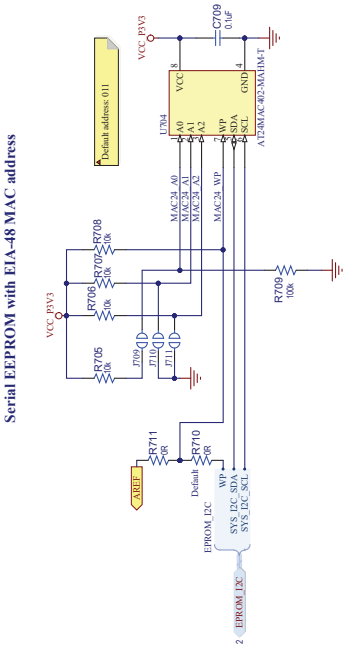

ARDUINO UNO SHIELD HEADERS
J700
J701
J704
J705
IOH
IOL
ADCL
SYS_I2C_SCL
SYS_I2C_SDA
AREF
SPI_SCK
SPI_MISO
SPI_MOSI
SPI_SS
EXT1_GPIO0
EXT2_GPIO0
EXT2_GPIO1
LCD_GPIO0
LCD_GPIO1
EXT1_IRQ
GPIO2
UART6_TX
UART6_RX
NC
IOREF
RESET
3.3V
5V
GND
VIN
TARGET_RESET
VCC_P5V0
VCC_P3V3
HDR-2.54 Female 1x10
HDR-2.54 Female 1x8
HDR-2.54 Female 1x6
DNP

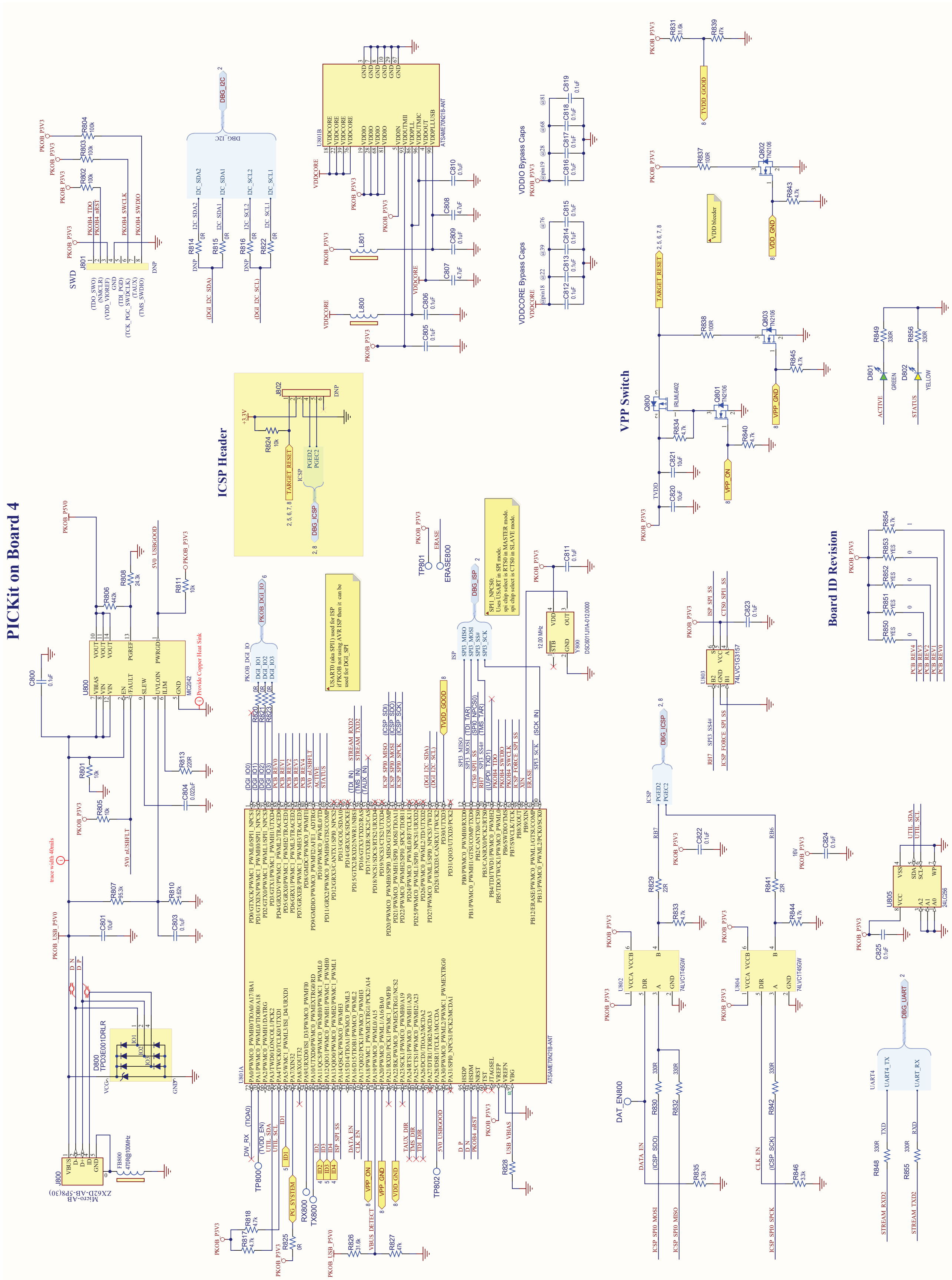

CAN INTERFACE
J708
HDR-2.54 Male 1x3
R702
R703
C703
4.7uF
U701
ATA6563
CANH
CANL
GND
EP
VCC
VIO
STBY
TXD
RXD
C707
C706
C705
0.1uF
10pF
RF2
RF9
CANTX
CANRX
CAN
VCC_P5V0
VCC_P3V3


TEMPERATURE SENSOR
U1701
MCP9808
VDD
SDA
SCL
Alert
GND
A0
A1
A2
R704
10k
C708
0.1uF
TEMP_SENSOR
SYS_I2C_SDA
SYS_I2C_SCL
ALERT_IRQ
VCC_P3V3


ETHERNET PHY INTERFACE
ETHERNET
J702
J703
J706
J707
HDR-1.27 Female 1x12
HDR-1.27 Female 1x3
Y700
DSC1001CI2.0063.0T
C700
C702
0.1uF
VCC_P3V3
SPI_SCK
SPI_SS
SPI_MISO
SPI_MOSI
EREFCLK
ETXD0
ETXD1
ETXEN
GPIO9
ERESET
ECRS
EMDIO
EMDC
ECOL
ERXD0
ERXD1
ERXERR
ECRSDV
ERXCLK
GPIO1
GPIO2

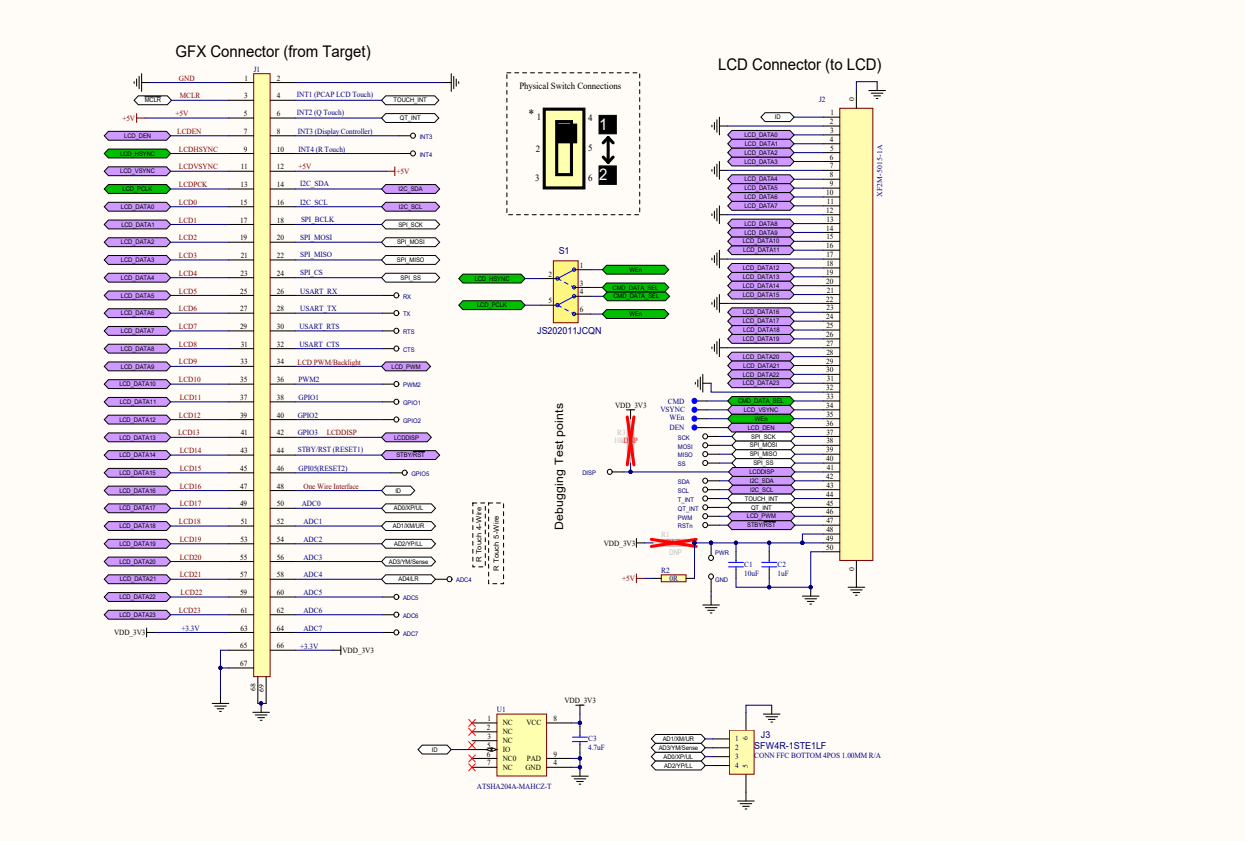

QSPI FLASH
U700
SST26VF064BA-104I/SM
SUSIO0
SUSIO1
SUSIO2
SUSIO3
SCK
CE
SQID0
SQID1
SQID2
SQID3
SQICLK
SQICS0
C704
0.1uF
R700
10k
VCC_P3V3
QSPI
QSPI


Serial EEPROM with EIA-48 MAC address
Default address: 011
U704
A12-MAC-402-MA1M-T
MAC24_A0
MAC24_A1
MAC24_A2
MAC24_WP
R705
R706
R707
R708
R709
10k
100k
C709
0.1uF
R710
R711
0R
J709
J710
J711
AREF
Default
EPROM_I2C
SYS_I2C_SDA
SYS_I2C_SCL
WP
VCC_P3V3



3.2 Schematics

Figure 3-1. Graphics card schematics



3.3 Bill of Materials

Quantity	Designator	Description	Manufacturer	Manufacturer Part Number
30	C201, C235, C238, C239, C240, C241, C242, C243, C244, C245, C246, C247, C248, C249, C250, C251, C252, C253, C255, C256, C257, C258, C259, C260, C261, C263, C264, C265, C266, C267	CAP CER 10000pF 10V 10% X7R SMD 0201	Murata	490-3194-2-ND
2	C202, C203	CAP CER 4.7uF 10V 10% X7S SMD 0603	Murata Electronics	GRM188C71A475KE11D
1	C300	CAP CER 2.2uF 16V 10% X7R SMD 0805	Murata	GRM21BR71C225KA12L
8	C301, C305, C309, C315, C317, C318, C319, C320	CAP CER 1uF 16V 10% X7R SMD 0603	Wurth Electronics Inc	885012206052
1	C302	CAP CER 0.1UF 50V X7R 0805	KEMET	C0805C104K5RACTU
2	C306, C307	CAP CER 47uF 10V 20% X5R SMD 0805	TDK Corporation	C2012X5R1A476M125AC
1	C310	CAP CER 22uF 25V 20% X5R SMD 0805	Murata Electronics North America	GRT21BR61E226ME13L
5	C311, C312, C703, C807, C808	CAP CER 4.7UF 25V X7R 0805	TDK Corporation	C2012X7R1E475K125AB
1	C313	CAP CER 4700pF 50V 10% X7R SMD 0402	Murata Electronics North America	GRM155R71H472KA01J

.....continued

Quantity	Designator	Description	Manufacturer	Manufacturer Part Number
1	C500	CAP CER 0.1uF 16V 10% X7R SMD 0402	Wurth Electronics Inc	885012205037
1	C501	CAP CER 10uF 10V 10% X5R SMD 0603	Samsung Electro-Mechanics	CL10A106KP8NNNC
1	C705	CAP CER 15pF 50V 5% NP0 SMD 0402	Murata	GRM1555C1H150JA01D
3	C801, C820, C821	CAP CER 10uF 25V 10% X5R SMD 0805	TDK Corporation	C2012X5R1E106K125AB
1	C804	CAP CER 0.022uF 16V 10% X7R SMD 0402	Samsung Electro-Mechanics America, Inc	CL05B223KO5NNNC
2	D300, D301	DIO SCTKY MBR230LSFT1G 430mV 2A 30V SMD SOD-123FL	ON Semiconductor	MBR230LSFT1G
2	D302, D800	TVS DIODE LOW-CAP 3-CH ESD	Texas Instruments	TPD3E001DRLR
1	D600	DIO LED TRI RGB 2V 3.2V 3.2V 50mA 50mA 50mA SMD PLCC-6	Cree Inc.	CLP6C-FKB-CM1Q1H1BB7R3R3
1	D801	DIO LED GREEN 2V 30mA 35mcd Clear SMD 0603	Lite-On Inc	LTST-C191KGKT
1	D802	DIO LED YELLOW 2.1V 20mA 6mcd Clear SMD 0603	Lite-On	LTST-C190YKT
2	FB200, FB201	FERRITE BEAD 120 OHM 0603 1LN	Murata	BLM18PG121SN1D
3	FB300, FB800, L301	FERRITE 470R@100MHz 1A SMD 0603	Murata Electronics North America	BLM18PG471SN1D
1	J200	CON HDR-2.54 Male 1X2 Gold 6mm MH TH R/A	Wurth Electronics Inc.	61300211021
1	J300	CON POWER 2.1mm 5.5mm Switch Slotted TH R/A	MPD (Memory Protection Devices)	EJ508A
2	J301, J800	CON USB2.0 Micro-AB Female ZX62D-AB-5P8(30) TOP MOUNT TH R/A	Hirose Connector	ZX62D-AB-5P8(30)
4	J400, J401, J404, J405	CON HDR-2.54 Female 1x8 Tin TH VERT	Sullins	PPTC081LFBN-RC
2	J402, J406	CON HDR 2.54 MALE 2x10 3u" GOLD IN CONTACT AREA MATTE TIN ON TAIL 5.84MH TH VERT	Samtec	TSW-110-07-F-D
2	J403, J407	CON HDR-2.54 Male 2x6 Gold 5.84MH TH VERT	Samtec	TSW-106-07-G-D
1	J500	CONN MICRO SD CARD PUSH-PUSH R/A	Hirose Electric Co Ltd	DM3AT-SF-PEJM5
1	J501	CON HDR-2.54 Male 2x10 Gold 5.84MH TH R/A	Samtec	TSW-110-08-S-D-RA
1	J502	CONN EDGE DUAL FMALE 67POS 0.020	TE Connectivity	2199230-3
2	J702, J703	CON STRIP-1.27 Female 1x12 Gold TH VERT	Samtec	SLM-112-01-L-S
2	J706, J707	CON STRIP-1.27 Female 1x3 Gold TH VERT	Samtec	SLM-103-01-G-S
1	J708	CON HDR-2.54 Male 1x3 Tin 6.2MH TH R/A	Molex Inc	0022288030
1	JP200	MECH HW JUMPER 1.27mm 1x2 GOLD	Sullins Connector Solutions	NPB02SVAN-RC
1	JP700	RES TKF 0R SMD 3P JUMPER 0603	Panasonic	ERJ-3GEY0R00V
1	L300	INDUCTOR 2.2uH 5.5A 20% SMD L4W4H2.1	Coilcraft	XAL4020-222MEC
2	L800, L801	FERRITE 2A 600R SMD 0805	TDK Corporation	MPZ2012S601AT000
2	MH500, MH501	RND STNDFF M2.5X0.45 STEEL 2.5MM	Wurth Elektronik	9774025151R
3	Q300, Q301, Q800	TRANS FET P-CH IRLML6402 -20V -3.7A 1.3W SOT-23-3	International Rectifier	IRLML6402TRPBF
6	R200, R201, R204, R205, R210, R211	RES TKF 1.8k 1% 1/10W SMD 0402	Panasonic Electronic Components	ERJ-2RKF1801X
2	R202, R207	RES TKF 0R 1/16W SMD 0805	Stackpole Electronics Inc	RMCF 1/10 0 R
2	R206, R209	RES TKF 0R 1/3W SMD 1210	Stackpole Electronics Inc.	RMCF1210ZT0R00
1	R212	RES SMD 0 OHM JUMPER 1/2W 1210	Vishay Dale	CRCW12100000Z0EA
2	R300, R301	RES TKF 2.2R 1% 1/8W SMD 0805 AEC-Q200	Vishay Dale	CRCW08052R20FKEA

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Quantity	Designator	Description	Manufacturer	Manufacturer Part Number
24	R302, R306, R500, R501, R502, R503, R504, R505, R506, R600, R601, R602, R603, R607, R700, R704, R705, R706, R707, R708, R801, R805, R811, R824	RES TKF 10k 1% 1/10W SMD 0402	Panasonic	ERJ-2RKF1002X
1	R303	RES 10 OHM 1% 1/10W 0603	Stackpole Electronics Inc	RMCF0603FT10R0
1	R304	RES TKF 2.49k 1% 1/10W SMD 0603	Panasonic	ERJ-3EKF2491V
1	R305	RES TKF 19.6k 1% 1/10W SMD 0603	Yageo	RC0603FR-0719K6L
1	R307	RES TKF 475R 1% 1/10W SMD 0603	Panasonic Electronic Components	ERJ-3EKF4750V
6	R308, R309, R709, R802, R803, R804	RES TKF 100k 1% 1/10W SMD 0402	Panasonic	ERJ-2RKF1003X
2	R604, R608	RES TKF 1k 1% 1/10W SMD 0603	Panasonic	ERJ-3EKF1001V
2	R605, R606	RES TKF 510R 1% 1/10W SMD 0603	Vishay Dale	CRCW0603510RFKEA
2	R702, R703	RES TKF 62R 1% 1/2W SMD 1210 AEC-Q200	Panasonic	ERJ-14NF62R0U
1	R806	RES SMD 442K OHM 1% 1/10W 0402	Panasonic Electronic Components	ERJ-2RKF4423X
1	R807	RES TKF 95.3k 1% 1/16W SMD 0402	Rohm Semiconductor	MCR01MRTF9532
1	R808	RES TKF 24.3k 1% 1/16W SMD 0402	Samsung	RC1005F2432CS
2	R810, R828	RES TKF 5.62k 1% 1/16W SMD 0402	Vishay Dale	CRCW04025K62FKED
1	R813	RES TKF 220R 1% 1/16W SMD 0402	Yageo	RC0402FR-07220RL
6	R815, R820, R821, R822, R823, R825	RES TKF 0R 1/16W SMD 0402	Yageo	RC0402JR-070RL
13	R817, R818, R833, R834, R840, R843, R844, R845, R850, R851, R852, R853, R854	RES TKF 4.7k 1% 1/16W SMD 0402	Yageo	RC0402FR-074K7L
2	R826, R831	RES TKF 31.6k 1% 1/10W SMD 0402	Panasonic	ERJ-2RKF3162X
2	R827, R839	RES TKF 47k 5% 1/10W SMD 0402	Panasonic	ERJ-2GEJ473X
2	R829, R841	RES TKF 22 OHM 1% 1/10W SMD 0603	Yageo	RC0603FR-0722RL
7	R830, R832, R842, R848, R849, R855, R856	RES TKF 330R 1% 1/16W SMD 0402	Yageo	RC0402FR-07330RL
2	R835, R846	RES TKF 3.3k 5% 1/10W SMD 0402	Panasonic - ECG	ERJ-2GEJ332X
2	R837, R838	RES TKF 100R 5% 1/10W SMD 0603	Vishay	CRCW0603100RJNEA
5	SW600, SW601, SW602, SW603, SW604	SWITCH TACT SPST 12V 50mA PTS645SM43SMTR92 LFS SMD	Wurth Electronics Inc	430182043816
2	U802, U804	IC TRANSCEIVER 74LVC1T45GW Single Bit Voltage Translator SOT-363	NXP USA Inc.	74LVC1T45GW,125
1	U803	IC SWITCH SPDT 74LVC1G3157 SC-70-6	Texas Instruments	SN74LVC1G3157DCKR
4	Q302, Q801, Q802, Q803	MCHP ANALOG MOSFET N-CH TN2106 60V 280mA 360mW 2.5R SOT23-3	Microchip Technology	TN2106K1-G
1	U200	MCHP MCU 32-BIT 200MHz 1024kB 640kB PIC32MZ1064DAA176-I/2J LQFP-176	Microchip Technology	PIC32MZ2064DAR176-I/2J
1	U300	MCHP ANALOG SWITCHER Buck 12V 6A MIC24052YJL-TR QFN-28	Microchip Technology	MIC24052YJL-TR
2	U301, U302	MCHP ANALOG LDO 3.3V MIC5528-3.3YMT-TR 6-TDFN	Microchip Technology	MIC5528-3.3YMT-TR
1	U303	MCHP ANALOG LDO 1.8V 500mA MIC5353-1.8YMT-TR MLF-6	Microchip Technology	MIC5353-1.8YMT-TR
1	U700	MCHP SERIAL FLASH SST26VF064BA-104I SOIJ-8	Microchip Technology	SST26VF064BA-104I/SM

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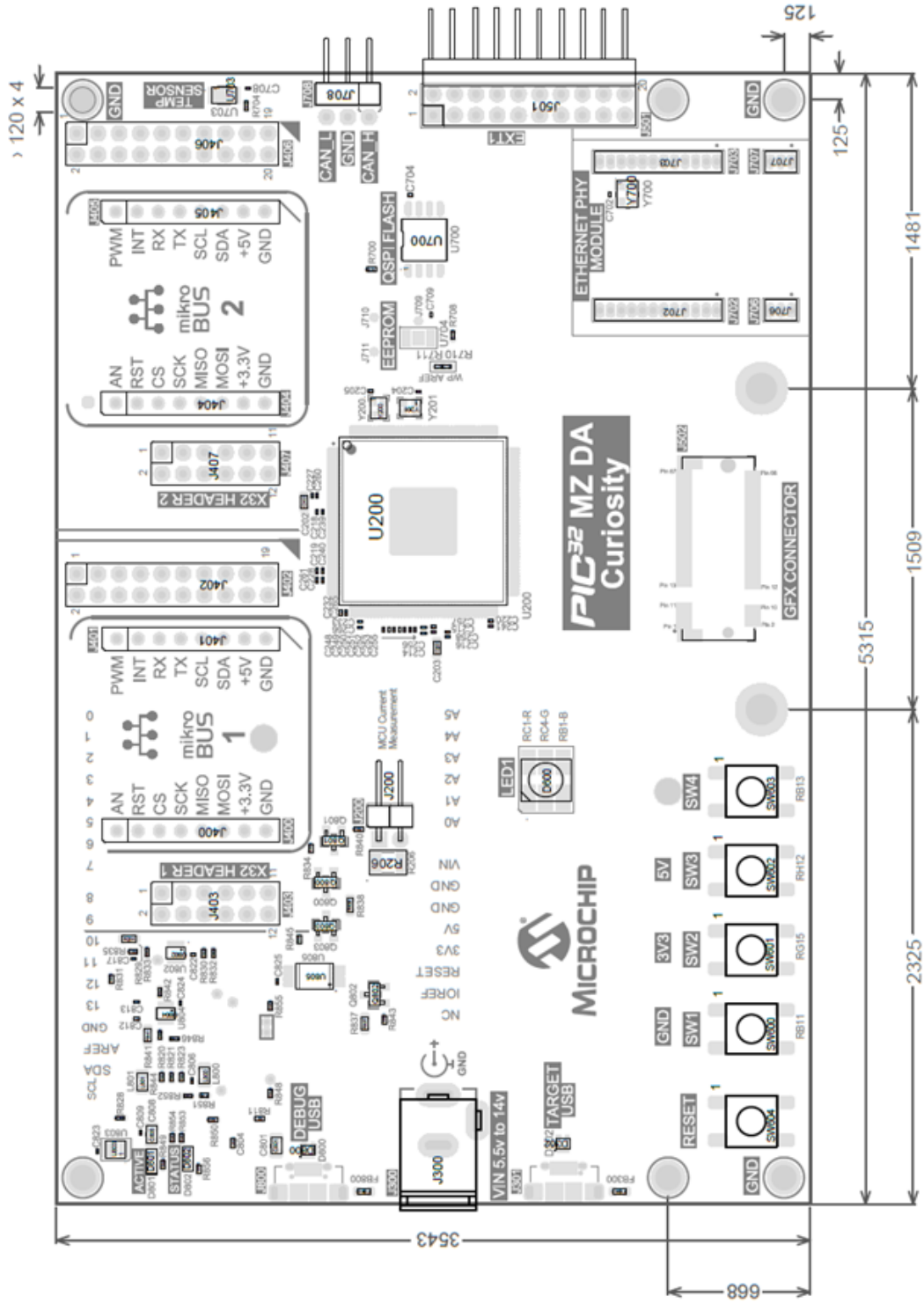
Quantity	Designator	Description	Manufacturer	Manufacturer Part Number
1	U701	MCHP INTERFACE CAN ATA6563-GBQW1 VDFN-8	Microchip Technology	ATA6563-GBQW1
1	U703	MCHP ANALOG TEMPERATURE SENSOR -40C to +125C MCP9808T-E/MC DFN-8	Microchip Technology	MCP9808T-E/MC
1	U704	IC EEPROM 2K I2C 1MHZ 8UDFN	Microchip Technology	AT24MAC402-MAHM-T
1	U800	MCHP ANALOG POWER SWITCH 5.5V 3A MIC2042-1YTS TSSOP-14	Microchip Technology	MIC2042-1YTS
1	U801	MCHP MCU 32-BIT 300MHz 2MB 384kB ATSAME70N21B-ANT LQFP-100	Microchip Technology	ATSAME70N21B-ANT
1	U805	MCHP MEMORY SERIAL EEPROM 256k I2C 24LC256T-E/ST TSSOP-8	Microchip Technology	24LC256T-E/ST
1	Y200	MCHP CLOCK OSCILLATOR SINGLE 24.000MHZ DSC6011JI2B-024.0000 VLGA	Microchip Technology	DSC6011JI2B-024.0000
1	Y800	MCHP CLOCK OSCILLATOR SINGLE 12.000MHZ DSC6011JI1A-012.0000 VLGA	Microchip Technology	DSC6011JI1A-012.0000
1	Y201	MCHP CLOCK OSCILLATOR SINGLE 32.768KHz DSC6003JE2B-032K768 SMD VLGA	Microchip Technology	DSC6003JE2B-032K768
1	Y700	MCHP CLOCK OSCILLATOR 50MHz DSC1001CI2-050.0000T DFN-4	Microchip Technology	DSC1001CI2-050.0000T
4	PAD100, PAD101, PAD102, PAD103	MECH HW RUBBER PAD CYLINDRICAL D9.53H5.97	3M 3M	SJ61A2
DNP	3V3	MISC, TEST POINT MULTI PURPOSE MINI WHITE	Keystone	5002
DNP	5V	MISC, TEST POINT MULTI PURPOSE MINI RED	Keystone	5000
DNP	C200, C204, C205, C206, C207, C208, C209, C210, C211, C213, C214, C215, C216, C217, C218, C219, C220, C221, C222, C223, C224, C225, C226, C227, C228, C230, C231, C232, C233, C234, C236, C237, C303, C304, C308, C314, C316, C321, C600, C700, C702, C704, C706, C707, C708, C709, C800, C803, C805, C806, C809, C810, C811, C812, C813, C814, C815, C816, C817, C818, C819, C822, C823, C824, C825	CAP CER 0.1µF 16V 10% X5R SMD 0201	Murata Electronics North America	GRM033R61C104KE84D
DNP	D303	DIO SCTKY MBR230LSFT1G 430mV 2A 30V SMD SOD-123FL	ON Semiconductor	MBR230LSFT1G
DNP	GND	MISC, TEST POINT MULTI PURPOSE MINI BLACK	Keystone	5001
DNP	J701, J704	CON HDR-2.54 Female 1x8 Tin TH VERT	Sullins	PPTC081LFBN-RC
DNP	J700	CON HDR-2.54 Female 1x10 Gold TH VERT	Sullins Connector Solutions	PPPC101LFBN-RC
DNP	J705	CON HDR-2.54 Female 1x6 Gold TH	Sullins Connector Solutions	801-43-006-10-001000
DNP	J801	CON HDR-1.27 Female 1x8 TH VERT	Greenconn	FSEA120-0802A002B1AB
DNP	J802	CON HDR-1.27 Female 1x6 Gold TH VERT	Samtec	SLM-106-01-G-S
DNP	R203, R208	RES TKF 0R 1/16W SMD 0805	Stackpole Electronics Inc	RMCF 1/10 0 R
DNP	R814, R816	RES TKF 0R 1/16W SMD 0402	Yageo	RC0402JR-070RL

3.4 Board Dimensions

The PIC32MZ DA Curiosity board has the following dimensions and mounting holes. These units are in imperial units (mil).



4. Revision History

Revision A - 08/2020
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