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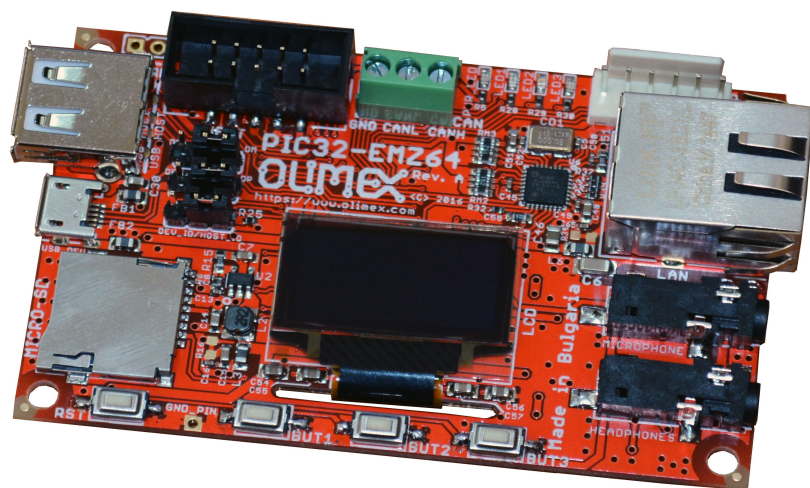
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PIC32-EMZ64
GENERAL-PURPOSE DEVELOPMENT BOARD

USER'S MANUAL

Document revision B, March 2017
Designed by OLIMEX Ltd, 2016

All boards produced by Olimex LTD are ROHS compliant

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Table of Contents

CHAPTER 1: INTRODUCTION

This document provides a user's guide for the PIC32-EMZ64 board, designed and assembled by Olimex Ltd. As an overview, this chapter gives the scope of this document, lists the board's features and the minimum requirements. The document's organization is then detailed.

The PIC32-EMZ64 board allows code development of applications running on the PIC32MZ2048 processor, designed and manufactured by Microchip Technology Inc from the U.S.A.

PIC32-EMZ64 board is an open-hardware project and all documents needed to manufacture the board are available to the customer.

Note that any software code written by the employees of Olimex LTD is released under GPL. However, the examples that we distribute are heavily based on the libraries and projects released by Microchip Technology Inc, which are non-GPL. Make sure that you are acquainted with Microchip's license agreement before using, publishing, or distributing any code based on the demo software released by Olimex LTD.

1.1 BOARD FEATURES

PIC32-EMZ64 board features a PIC32MZ2048EFH064 processor. It a very capable PIC32 processor with a lot of interfaces available (6 x UARTs; 4 x SPIs; 4 x I2Cs; 46 x IO pins; 24-channel ADC; two analog comparators; Ethernet; USB OTG; JTAG; TRACE; CAN 2.0B; DMA etc.) The board has several ready-to-use peripherals interfaces exposed and available on connectors: an OLED display; a MIC intput audio jack connector; a microSD card connector; micro USB connector (with OTG functionality); ICSP connector for programming and debugging; UEXT connector for extension modules; CAN connector; three user-programmable LED; three user-programmable button; etc.

The most notable board features are listed below:

- PIC32MZ2048EFH064-I/PT processor (2048KB flash; 512KB RAM)
- LCD OLED display – 128x64 pixels
- Ethernet interface 100Mb with connector
- microSD card interace with connector
- ICSP interface for debugging and programming
- Two USB connectors – USB type A and micro USB (USB OTG or USB host modes)
- Microphone jack (audio input interface)
- Headphones jack (audio output interface)
- CAN interface with driver and connector
- UEXT expansion connector
- Reset button and three user-programmable buttons
- Power-on LED and three user-programmable LEDs
- Power supply pads exposed
- GND pin exposed
- Mounting holes provided
- Board operating temperature: (0–70)°C ~ (32–158)°F

1.2 MINIMAL BOARD USE REQUIREMENTS

- **Hardware required for programming**

In order upload code on the board you would need a PIC32 compatible debugger or programmer. Older tools might lack support for PIC32 processor. Ensure your programmer/debugger is compatible with the PIC32MZ processor family. Ensure that the tool is supported in MPLAB X IDE (or the software tools that your are going to use).

The board has no bootloader loaded. You need either a debugger or a programmer tool to upload software to the board. The on-board ICSP interface is available at a 6-pin (1×6) 0.1" step connector.

- **Software required for programming**

You would need software environment that supports PIC32MZ family of processors. The most commonly used tool for software development for PIC32MZ applications is MPLAB X. The most used tool for binary upload to PIC32MZ is MPLAB IPE. Microchip provides a set of libraries and demo projects for the PIC32MZ family in their "Harmony Integrated Software Framework".

Note that MPLAB 8.xx does NOT support PIC32MZ.

- **(Optional) hardware to power the board.**

The board requires power supply. Typically, for research and development purposes your programmer tool can power the board via the ICSP connector. If your debugger/programmer is not capable of powering the board then you would need either: USB cable (1) or 5V external power supply (2).

(1) The board has both micro USB connector and USB type A connectors. Your cable should be able to fit the board's female connectors.
(2) There are only pads available on the board. You would need to use wires to establish a connection between the external power supply (adapter) and the board.

1.3 TARGET MARKET OF THE BOARD

PIC32-EMZ64 would attract PIC enthusiasts and veterans who want to evaluate the features of the PIC32MZ2048EF processor. Any experience with the development tools required for general-purpose development of code for boards featuring PIC32MZ boards is a great plus.

The board is not suitable for complete beginners in electronics – the board can't be programmed via Arduino or Arduino-like environment. You need at least a PIC32-compatible programmer with 6-pin 0.1" step ICSP connector.

In case you are a complete beginner you might want to start with a board with bootloader which can be programmed via Arduino-like software tools and a USB cable. Consider PIC32 boards like PIC32-PINGUINO-OTG or DUINOMITE.

1.4 ELECTROSTATIC WARNING

The PIC32-EMZ64 board is shipped in protective anti-static packaging. The board must not be subject to high electrostatic potentials. General practice for working with static sensitive devices should be applied when working with this board. Be carefully when placing the board on conductive surfaces – it is always a good idea to use rubber cover between the board and the surface!

1.5 DOCUMENT ORGANIZATION

Each section in this document covers a separate topic, organized as follows:
   – Chapter 1 is an overview of the board usage and features
   – Chapter 2 contains the general board diagram and layout
   – Chapter 3 provides the schematics and the dimensions of the board
   – Chapter 4 provides a guide for quickly setting up the board and software notes
   – Chapter 5 describes the component that is the heart of the board: the Microchip's PIC32MZ2048EF processor
   – Chapter 6 is an explanation of the control circuitry associated with the processor
   – Chapter 7 covers the connector pinout, peripherals and jumper description
   – Chapter 8 contains the revision history, useful links and support information
   – Chapter 9 contains the warranty information

CHAPTER 2: BOARD DESCRIPTION

2.1 LAYOUT (TOP VIEW)

The picture below shows the top side of hardware revision A of the board and highlights the most important parts. Note that the exact layout and component placement might differ slightly between different hardware revisions.
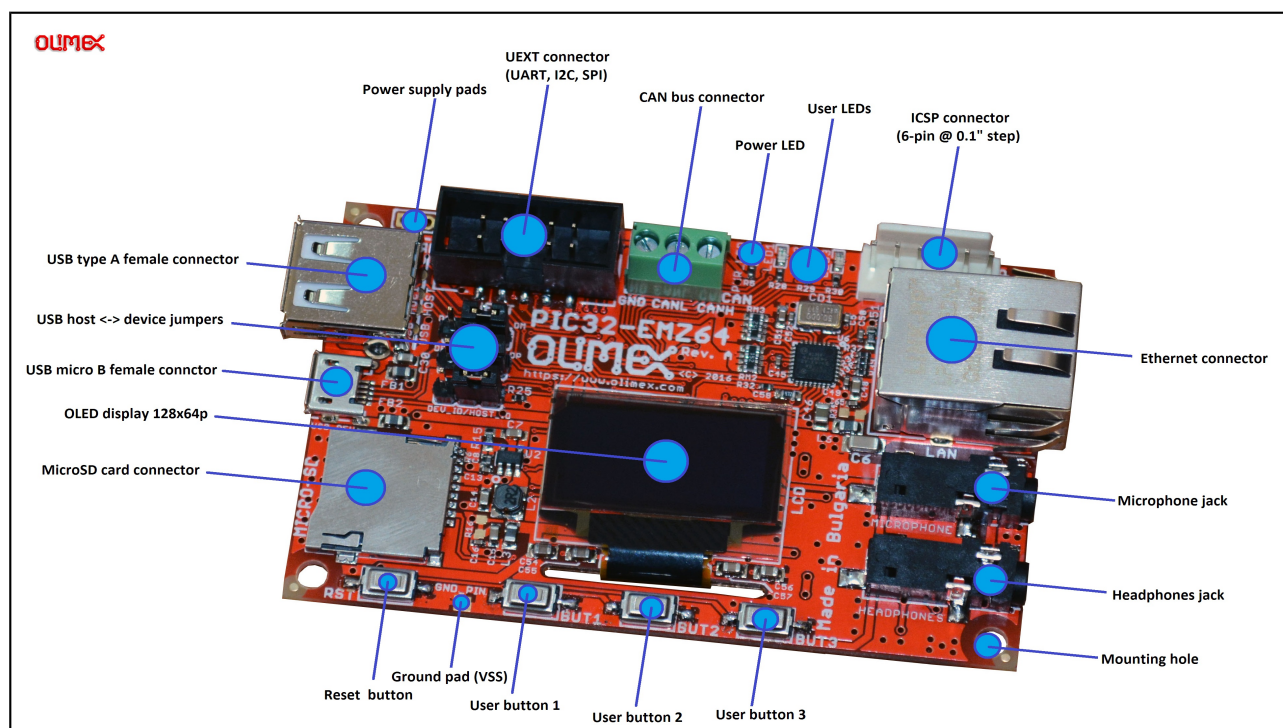
Hardware revision B of the board introduced a few changes to the layout:

1) The top left mounting hole was removed. The bottom left mounting hole was pushed left (next to the microSD card connector).
2) The "RST" button is now located rightmost of the group of four buttons (instead of leftmost).
3) The ground pad (VSS pad) is now located rightmost at the bottom of the board (instead of leftmost).
4) The microSD card connector was pushed down as much as possible. The USB type A female connector ("USB_HOST") was pushed up as much as possible. The power supply pads "PWR" are now located between the two USB connectors.

CHAPTER 3: BOARD SCHEMATIC AND DIMENSIONS

In this chapter you may find information about the schematics describing logically and physically PIC32-EMZ64.

3.1 SCHEMATIC

The schematic of hardware revision B of PIC32-EMZ64 is available for reference on the next page.

The design files are available at the product's web-page.

If you are looking for a schematic of an older revision of the board and it isn't available at our web site you may request it by the support e-mail.

USB_Host/Dev

ICSP

POWER_SUPPLY

AUDIO

PIC32-EMZ64, hardware revision B

Oscillator

To be checked!!!

User LEDs

CAN

MICRO_SD

Ethernet

Designed by Olimex_LTD

UEXT

VOLTAGE_REFERENCE
Option!

LCD OLED 128x64
I2C slave address: 0111100b
Controller: SSD1306

PIC32-EMZ64, hardware revision B

Designed and assembled by Olimex Ltd., Bulgaria.

https://www.OLIMEX.com

BUTTONS

The PHY is setted up as follows:
MODE: All capabled(10/100Base).
Auto-negotiation enabled.
RMII Configuration
SMI address: 0x00

3.2 PHYSICAL DIMENSIONS

At the bottom of the page you can find some general physical dimensions of hardware revision B of the board. The designers used grids in different units – that is why some of the dimensions are in metric units while others are in imperial units.

Note that it is relatively easy to take every 2D dimension that you need with CadSoft's Eagle software (mainly since PIC32-EMZ64 is an open-hardware board and the hardware source files are available to you). You can download and open the hardware sources with the latest Eagle CAD software (the freeware version/license is enough) and take any measure with the "Draw a dimension" tool. The measurements should be done in the .brd file of the board design – a good idea would be to disable some of the layers for better visibility of the measurement (from Layer settings... -> Display and click to enable/disable layers until you find the optimal setup).

The archive with the hardware sources of PIC32-EMZ64 is available for download here: Eagle sources PIC32-EMZ64
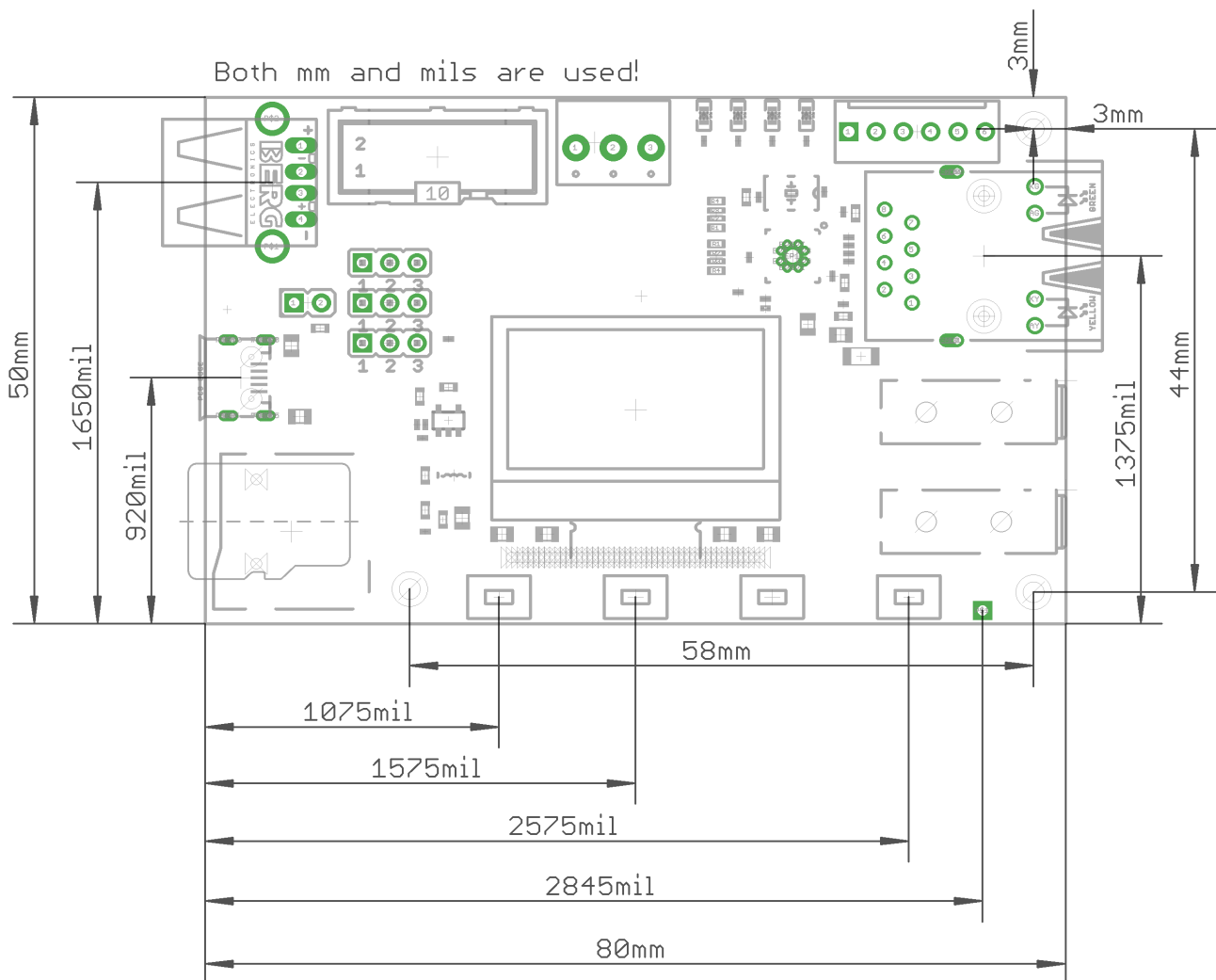
CHAPTER 4: PROCESSOR DETAILS

Some of the details about the main processor in the design of PIC32-EMZ64 (PIC32MZ2048EFH064) are mentioned in this chapter. It is highly recommended to refer to the original datasheet which might be downloaded from the Microchip's official web-side.

4.1 FEATURES

PIC32-EMZ64 board uses MCU PIC32MZ2048EFH064-I/PT from Microchip Technology. The main processor of the board is one of the biggest processors of the PIC32MZ family and has a dedicated Floating Point Unit (FPU). It has the following features that distinguish it from the rest of the family:

- **Programmable memory (KB): 2048**
- **Data memory (KB): 512**
- **Pin count: 64**
- **I/O pins: 46**
- **Reprogrammable pins: 34**
- **ADC channels: 24**
- **Floating Point Unit: Yes**
- **Ethernet interface: Yes**
- **CAN interface: Yes**
- **UART interfaces: 6**
- **I2C interfaces: 4**
- **SPI/I2S interfaces: 4**
- **Processor operating temperature: -40ºC to +85ºC**

The PIC32M2048EF processor that we used packs the following set of features:

Operating Conditions of the industrial version of the chip:
- 2.1V to 3.6V, -40ºC to +85ºC, DC to 200 MHz

Core: 200 MHz (up to 330 DMIPS) M-Class
- 16 KB I-Cache, 4 KB D-Cache
- FPU for 32-bit and 64-bit floating point math
- MMU for optimum embedded OS execution
- microMIPS™ mode for up to 35% smaller code size
- DSP-enhanced core:
    - Four 64-bit accumulators
    - Single-cycle MAC, saturating, and fractional math
    - IEEE 754-compliant
- Code-efficient (C and Assembly) architecture

Clock Management
- Programmable PLLs and oscillator clock sources
- Fail-Safe Clock Monitor (FSCM)
- Independent Watchdog Timers (WDT) and Deadman Timer (DMT)

- Fast wake-up and start-up
- Power Management
- Low-power modes (Sleep and Idle)
- Integrated Power-on Reset (POR) and Brown-out Reset (BOR)

Memory Interfaces
- 50 MHz Serial Quad Interface (SQI)

Audio and Graphics Interfaces
- Graphics interfaces: PMP
- Audio data communication: I2S, LJ, and RJ
- Audio control interfaces: SPI and I2C
- Audio master clock: Fractional clock frequencies with USB synchronization

High-Speed (HS) Communication Interfaces (with Dedicated DMA)
- USB 2.0-compliant Hi-Speed On-The-Go (OTG) controller
- 10/100 Mbps Ethernet MAC with MII and RMII interface

Security Features
- Advanced memory protection:
  - Peripheral and memory region access control

Direct Memory Access (DMA)
- Eight channels with automatic data size detection
- Programmable Cyclic Redundancy Check (CRC)

Advanced Analog Features
- 12-bit ADC module:
  - 18 Msps with up to six Sample and Hold (S&H) circuits (five dedicated and one shared)
  - 24 analog inputs
  - Can operate during Sleep and Idle modes
  - Multiple trigger sources
  - Six Digital Comparators and six Digital Filters
- Two comparators with 32 programmable voltage references
- Temperature sensor with ±2ºC accuracy

Communication Interfaces
- Two CAN modules (with dedicated DMA channels):
  - 2.0B Active with DeviceNet™ addressing support
- Six UART modules (25 Mbps):
  - Supports up to LIN 2.1 and IrDA® protocols
- Six 4-wire SPI modules (up to 50 MHz)
- SQI configurable as an additional SPI module (50 MHz)
- Four I2C modules (up to 1 Mbaud) with SMBus support
- Parallel Master Port (PMP)
- Peripheral Pin Select (PPS) to enable function remap

Timers/Output Compare/Input Capture

- Nine 16-bit or up to four 32-bit timers/counters
- Nine Output Compare (OC) modules
- Nine Input Capture (IC) modules
- Real-Time Clock and Calendar (RTCC) module

Input/Output
- 5V-tolerant pins with up to 32 mA source/sink
- Selectable open drain, pull-ups, pull-downs, and slew rate controls
- External interrupts on all I/O pins
- PPS to enable function remap

Debugger Development Support
- In-circuit and in-application programming
- 4-wire MIPS® Enhanced JTAG interface
- Unlimited software and 12 complex breakpoints
- IEEE 1149.2-compatible (JTAG) boundary scan
- Non-intrusive hardware-based instruction trace

Software and Tools Support
- C/C++ compiler with native DSP/fractional and FPU support
- MPLAB® Harmony Integrated Software Framework
- TCP/IP, USB, Graphics, and mTouch™ middleware
- MFi, Android™, and Bluetooth® audio frameworks
- RTOS Kernels: Express Logic ThreadX, FreeRTOS™, OPENRTOS®, Micriµm® µC/OS™, and SEGGER embOS®

4.2 MICROCONTROLLER BLOCK DIAGRAM

A block diagram with main functional parts of the microcontroller as seen in the official Microchip documentation.

FIGURE :   PIC32MZ EF FAMILY BLOCK DIAGRAM
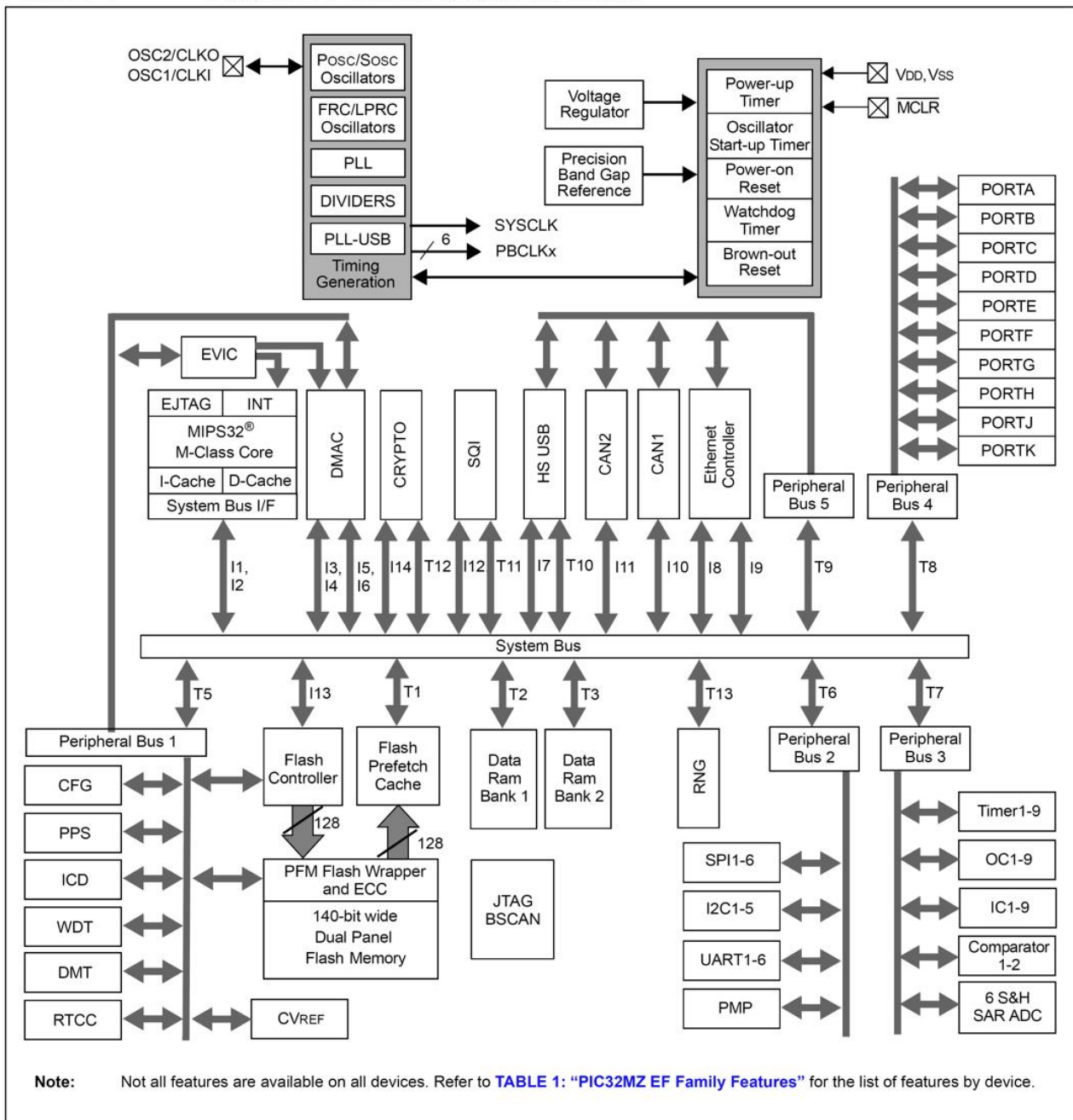
4.3 MICROCONTROLLER MEMORY MAP

The microcontroller's memory regions as seen in the official Microchip documentation.

FIGURE: MEMORY MAP FOR DEVICES WITH 2048 KB OF PROGRAM MEMORY[1,2]

Virtual Memory Map

Address	Region	Segment
0xFFFFFFFF	Reserved	KSEG3[4] (not cacheable)
0xF4000000		
0xF3FFFFFF	External Memory via SQI	
0xF0000000		
0xE4000000	Reserved	
0xE3FFFFFF	External Memory via EBI	
0xE0000000		
0xD4000000	Reserved	KSEG2[4] (cacheable)
0xD3FFFFFF	External Memory via SQI	
0xD0000000		
0xC4000000	Reserved	
0xC3FFFFFF	External Memory via EBI	
0xC0000000		
0xBFFFFFFF	Reserved	KSEG1 (not cacheable)
0xBFC74000		
0xBFC73FFF	Boot Flash (see Figure 4-5)	
0xBFC00000		
0xBF900000	Reserved	
0xBF8FFFFF	SFRs (see Table 4-1)	
0xBF800000		
0xBD200000	Reserved	
0xBD1FFFFF	Program Flash	
0xBD000000		
0xA0080000	Reserved	
0xA007FFFF	RAM[3]	
0xA0000000		
0x9FC74000	Reserved	KSEG0 (cacheable)
0x9FC73FFF	Boot Flash (see Figure 4-5)	
0x9FC00000		
0x9D200000	Reserved	
0x9D1FFFFF	Program Flash	
0x9D000000		
0x80080000	Reserved	
0x8007FFFF	RAM[3]	
0x80000000		
0x00000000	Reserved	

Physical Memory Map

Region	Address
Reserved	0xFFFFFFFF
	0x34000000
External Memory via SQI	0x33FFFFFF
	0x30000000
Reserved	0x24000000
External Memory via EBI	0x23FFFFFF
	0x20000000
Reserved	0x1FC74000
Boot Flash (see Figure 4-5)	0x1FC73FFF
	0x1FC00000
Reserved	0x1F900000
SFRs (see Table 4-1)	0x1F8FFFFF
	0x1F800000
Reserved	0x1D200000
Program Flash	0x1D1FFFFF
	0x1D000000
Reserved	0x00080000
RAM[3]	0x0007FFFF
	0x00000000

Note 1: Memory areas are not shown to scale.
2: The Cache, MMU, and TLB are initialized by compiler start-up code.
3: RAM memory is divided into two equal banks: RAM Bank 1 and RAM Bank 2 on a half boundary.
4: The MMU must be enabled and the TLB must be set up to access this segment.

CHAPTER 5: CONTROL CIRCUITRY

5.1 POWER SUPPLY CIRCUIT

You have three options for powering PIC32-EMZ64. You can power the board from:

- **Programmer or debugger tool – 3.3V DC on the ICSP connector**

PIC32-EMZ64 can be powered by your debugger (programmer) tool, as long as the tool is capable of powering targets. You would need to set and enable the powering voltage to 3.3V in the software options of MPLAB.

- **USB cable – 5V on one of the USB connectors ("USB_HOST", "USB_DEV")**

You can power the board from your personal computer via an USB cable; the USB ports of a personal computer typically provide around 5V of voltage and 500mA of current.

Avoid using USB cables longer than 2 meters. Avoid the cheapest cables with high inner resistance.

- **External power supply – 5V to the provided pads ("PWR")**

The board can be powered by external power supply (adapter) capable of providing 5V of voltage. You should connect the 5V wire to the pad with the "+" sign of the PWR connector. You also need to connect the ground wire to pad "-" of the same (PWR) connector. The signs of the pins are printed on the board for customer's convenience.

Different methods of powering would lead to different maximum current available. Consider powering the board with an external power supply connected to PWR pads if you need extra current (in case you have to power additional hardware via PIC32-EMZ64).

It is not recommended to apply multiple types of powering to the board simultaneously. For example, if you want to power the board from the PWR pads using an external power adapter, first ensure that your debugger tool doesn't provide power to the ICSP connector.

With no extra peripherals connected, the board's current consumption is about 150mA at 5V when running the default demo program.

5.2 RESET CIRCUIT

PIC32-EMZ64's reset signal (processor pin #9, "#MCLR") can be found on the pads of the ICSP connector (connector pin #1); and it is also connected to a button.

The reset circuit of the button consists of RC group R56 – 4.7kΩ and C61 – 100nF. Serial resistor R57 – 330Ω is used to prevent fast C61 charge and discharge when PIC32MZ2048 is being programmed.

Manual reset is possible via the RESET button.

5.3 CLOCK CIRCUIT

The board uses crystal oscillators to ensure the proper board clocks.

Oscillator CD1 handles the clock required for the Ethernet. This 50MHz oscillator is connected to pin #5 of the Ethernet transceiver LAN8710A.

Oscillator CD2 provides 24MHz for the PIC32 chip. It is connected to PIC32MZ2048ECG144's pin #31 (OSCI/CLKI/RC12).

CHAPTER 6: JUMPERS, CONNECTORS AND INTERFACES

In this chapter you will find the description of the jumpers and what signals might be found on the different connectors.

6.1 JUMPER DESCRIPTION

Jumpers are used to alter the default hardware configuration of the board. PIC32-EMZ64 uses both PTH and SMT jumpers.

6.1.1 USB connector jumpers

On the top of the board there are three easy to re-configure PTH jumpers named "DEV_DM/HOST_DM"; "DEV_DP/HOST_DP"; "DEV_ID/HOST_ID". Changing the jumpers changes the routing of the D-, D+ and USB_ID signals. The position of these jumpers determines whether the USB_HOST or the USB_DEV connectors would be enabled. Only one of the USB connectors can be enabled at a time (or if all jumpers are removed both USB connectors would be disabled). You can't have both USB_HOST and USB_DEV enabled simultaneously.

Important! The three jumpers have to me moved together! There are only three valid configurations – all jumpers to right position (to enable USB type A connector "USB_HOST"), all jumpers to left position (to enable micro USB connector "USB_DEV"), or all jumper removed (to disable both USB connectors).

By default the jumpers are set to right positions – the USB type A connector is enabled.

6.1.2 CAN_T jumper

CAN_T jumper is an SMT jumper located at the bottom of the board. It configures whether to have a 120 Ohm termination resistor connected between CANL and CANH signal lines.

By default CAN_T is open – the 120 Ohm termination resistor between CANL and CANH is disconnected.

Note that changing SMT jumpers requires soldering. To close such a jumper solder the pads together. To disconnect an SMT jumper – remove any solder and/or cut between the pads (in case the jumper is closed by default).

6.1.3 5V/3.3V jumper

This is another SMT jumper. It is related to the powering of the MCP2551 CAN transceiver. By default it is set to 5V operating voltage since MCP2551 requires 5V. This jumper was added for future design compatibility with other CAN transceivers that work at 3.3V.

It is not recommended to change the default position of this 5V/3.3V jumper, unless you also change MCP2551 with another CAN transceiver that requires only 3.3V.

6.2 HARDWARE INPUT/OUTPUT

The board has a number of LEDs and buttons. Not all of them can be used as input. The board has:

- programmable user buttons BUT1, BUT2, BUT3:

BUT1 – connected to PIC32MZ's pin #27 (TCK/AN7/PMA11/RB12).
BUT2 – connected to PIC32MZ's pin #28 (TDI/AN8/RB13).
BUT3 – connected to PIC32MZ's pin #29 (AN9/RPB14/SCK3/PMA1/RB14).

- non-programmable reset button RST – connected to PIC32MZ's pin #9 (#MCLR).

- programmable user LEDs LED1, LED2, LED3:

LED1 (green) – connected to PIC32MZ's pin #21 (RB8).
LED2 (yellow) – connected to PIC32MZ's pin #22 (AN49/RPB9/PMA7/RB9).
LED3 (red) – connected to PIC32MZ's pin #23 (TMS/CVREFOUT/AN5/RPB10/PMA13/RB10).

- non-programmable power supply red LED PWR – indicates if 5V voltage is applied. Cannot be programmed.

6.3 EXTERNAL CONNECTOR DESCRIPTION

In this sub-chapter you would find the pinout of peripherals and the connectors on the board. It is also a good idea to refer to the latest schematic.

6.3.1 ICSP CONNECTOR

The ICSP connector is used for serial programming. It is the place where most common PIC32-compatible programmers and debuggers are connected. The pins have 0.1" step. If your programmer/debugger has only the smaller 0.05" connector you might need an adapter or you should use jumper wires.

Pin #	Signal name
1	RESET
2	3.3V
3	GND
4	PGED2
5	PGEC2
6	NC
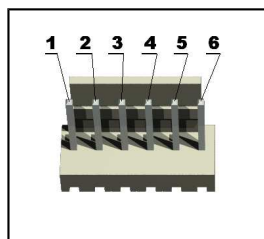
PGED2 conducts I/O operations for the "Program Data" signal. Serial data for programming.
PGEC2 serves only as input for the "Program Clock" signal. Clock used for transferring the serial data (output from ICSP, input for the MCU).

Wrongfully mirroring the pins is a very common problem. If you have problems during programming trace each wire separately.

6.3.2 CAN

The board has a CAN transceiver MCP2551 and a three pin connector. The names of the signals available at each pin are also printed near the connector.

Pin #	Signal name
1	GND
2	CANL
3	CANH

Note that you can enable a termination resistor between CANL and CANH. CAN_T jumper is an SMT jumper located at the bottom of the board. It configures whether to have a 120 Ohm termination resistor connected between CANL and CANH signal lines. By default CAN_T is open – the 120 Ohm termination resistor between CANL and CANH is disconnected.

6.3.3 USB

The board has two USB connectors. USB_HOST is a type A female connector and USB_DEV is a micro USB connector. However, only one of them can be connected to the processor at a time. By default the USB_HOST connector is active. You can disable USB_HOST and enable USB_DEV connector by modifying the position of the three nearby PTH jumpers.

By default the jumpers are set to positions: HOST_DM; HOST_DP; HOST_ID. In this case USB_HOST connector is enabled. USB_HOST is a female USB type A connector and the pinout is visible below:

Pin #	Signal name	Processor pin #
1	+5V_HOST_PWR	-
2	USB_HOST_DM	36
3	USB_HOST_DP	37
4	GND	-

In this setup of jumpers – USB_ID is connected to ground via 10K resistor.

USB_DEV is a female micro B USB connector. In order to enable USB_DEV connector change all jumpers to the opposite position: DEV_DM; DEV_DP; DEV_ID. Doing so would also disable USB_HOST. The pinout of the micro USB is visible below:

Pin #	Signal name	Processor pin
1	+5V_HOST_PWR	-
2	USB_HOST_DM	36
3	USB_HOST_DP	37
4	USB_DEV_ID	38
5	GND	-
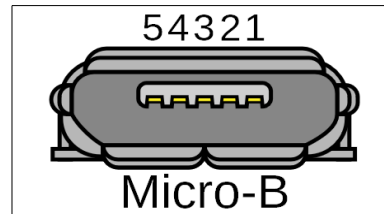
Leaving all three jumpers open simultaneously would disable both USB connectors. This might be faster way to disable an active USB connection in some cases.

6.3.3 UEXT

The 10-pin UEXT connectors are typically mounted on Olimex boards. They pack three common interfaces in a single connector – UART, I2C and SPI. You can use the UEXT connector to access this interfaces easier (via jumper wires, for example).

You can also connect expansion modules to the UEXT connectors. More on UEXT might be found here: https://www.olimex.com/Products/Modules/UEXT/

Note that you should not provide power to the UEXT connector. Pin #1 of the UEXT (3.3V) is output.

| Pin #	Wire name	Function
1	3.3V	Power output
2	GND	Power output
3	RD4/U4TX	UART
4	RD0/U4RX	UART
5	RG8/SCL4	I2C
6	RG7/SDA4	I2C
7	RD11/SDI4(MISO4)	SPI
8	RD5/SDO4(MOSI4)	SPI
9	RD10/SCK4	SPI
10	RD9/#SS4	SPI
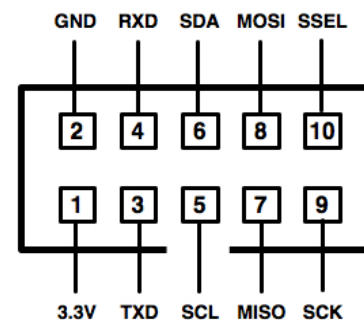
The design includes several pull up resistors on the data lines available at the UEXT:

1) a 10K pull up on the UART RD line (pin #4). There is also Schottky diode on the same line.

2) 2.2K pull ups on the I2C lines (pins #5 and #6)

3) a 10K pull up on the SPI SS line (pin #10)

6.3.4 MICROSD CARD

Standard push-push microSD card connector with the following pinout:

Pin #	Wire name
1	MCIDAT2
2	RG9/#SS2
3	RD2/SDO2(MOSI2)
4	VDD
5	RG6/SCK2
6	GND
7	RD3/SDI2(MISO2)
8	MCIDAT1
9	RF0(SD_CP)
10	Pull up for SD_CP
11	Pull up for SD_CP
12	Pull up for SD_CP
13	Pull up for SD_CP
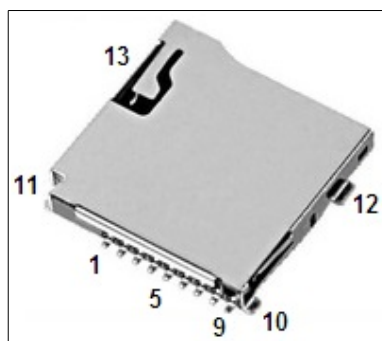
6.3.5 Ethernet

The Ethernet is handled by Microchip's 10BASE-T/100BASE-TX transceiver LAN8710A. The board is equipped with standard RJ45 connector.

The RJ45 connector has two LEDs. The green indicates whether a proper 100Mb Ethernet connection is established and the yellow LED indicates whether there is activity on the port.

LED	Color	Usage
Right	Green	Link status
Left	Yellow	Activity status

The Ethernet chip uses a number of processor pins. To avoid confusion inspect the schematic.

Important! The LAN8710A is configured as follows:

- Mode: All capable(10/100Base). Auto-Negotiation enabled.
- Configuration: RMII.
- SMI address: 0x00.

6.3.6 Audio input and audio output

The board has microphone input and headphone output available on 3.5mm audio jack connectors.

The processor pin associated with the data received by the MICROPHONE connector is pin #12 – AN4/C1INB/RPB2/RB4.

The processor pin associated with the data sent to the HEADPHONES connector is pin #13 – AN3/C2INA/RPB3/RB3.

6.3.7 Display

The board has a 128x64 pixels OLED display which uses SSD1306 driver. The I2C slave address of the display is 0111100b.

The SSD1306 embeds with contrast control, display RAM and oscillator, which reduces the number of external components and power consumption. It has 256-step brightness control.
Data/Commands are sent from general MCU through the hardware selectable 6800/8000 series compatible Parallel Interface, I2C interface or Serial Peripheral Interface. It is suitable for many compact portable applications, such as mobile phone sub-display, MP3 player and calculator, etc.

CHAPTER 7: AVAILABLE DEMO SOFTWARE

The demo projects should be downloaded from the official product page of PIC32-EMZ64. There are three examples available – a general purpose example; a web-server demo that also uses the microSD card; and audio loopback demo. These example demonstrate several features of the board: LEDs, buttons, UART, RTC, SD card, USB.

The EMZ64 board comes with web server demo. In order to perform the full demo there are several requirements. Download the archive containing the demo and refer to the "README.txt" file inside for more details on how to proceed and use the project (either re-compiling it or using the pre-built files).

Each of the three examples provided has a README.txt file inside the archive that contains expected behavior of the code and specific instructions! Make sure to first check the README.txt file before attempt to use or re-compile the examples!

Build info (tested with):

Integrated Development Environment: MPLAB X 3.20
Compiler: XC32 1.40
Framework: Microchip Harmony 1.06.02

You can either build the project and program the board with MPLAB X IDE, or use MPLAB IPE and the prebuilt files.

It is recommended to use the same compiler if you decide to compile the project! Else you would have build errors.

CHAPTER 8: ORDERING INFORMATION AND REVISIONS

You can purchase directly from our online shop or from any of our distributors. Note that usually it is faster and cheaper to purchase Olimex products from our distributors. List of confirmed Olimex LTD distributors and resellers: https://www.olimex.com/Distributors.

Please visit https://www.olimex.com/ for more info.

Trouble finding a product mentioned above? Product name of the board discussed in this document:

PIC32-EMZ64 – fully assembled and tested.

Below are listed some of the related products (you can type the name of a product in the search box of our web site to find it easily):

PIC-KIT3 – PIC32-EMZ64-compatible debugger, works fine with MPLAB X, MPLAB IPE. Fits the 6-pin on-board connector.

BATTERY-LIPO1400 – a standard Li-Po battery equipped with a connector that fits the one located on PIC32-HMZ144. Olimex sells a range of such batteries with different capacity.

JW-200x10 – jumper wires with male-male connectors and 240mm of length; perfect for breadboarding; there are different lengths and configurations of connectors (m-m; f-m; f-f).

You can also find a big number of extension boards that can be connected to the UEXT of the board and also some of the components (if damage occurs and you want to replace the part yourself).

8.1 DOCUMENT REVISION

Document revision	Changes	Modified page
A, 20.05.16	Initial manual release	All
B, 28.03.17	Added information about the default demo	24