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Preface

NOTICE TO CUSTOMERS

All documentation becomes dated, and this manual is no exception. Microchip tools and documentation are constantly evolving to meet customer needs, so some actual dialogs and/or tool descriptions may differ from those in this document. Please refer to our website (www.microchip.com) to obtain the latest documentation available.

Documents are identified with a "DS" number. This number is located on the bottom of each page, in front of the page number. The numbering convention for the DS number is "DSXXXXXXXXA", where "XXXXXXXX" is the document number and "A" is the revision level of the document.

For the most up-to-date information on development tools, see the MPLAB® IDE online help. Select the Help menu, and then Topics to open a list of available online help files.

INTRODUCTION

This chapter contains general information that will be useful to know before using the PIC24F LCD Curiosity Development Board. Items discussed in this chapter include:

- Document Layout
- Conventions Used in this Guide
- Recommended Reading
- The Microchip Website
- Product Change Notification Service
- Customer Support
- Document Revision History

DOCUMENT LAYOUT

This user's guide provides an overview of the PIC24F LCD Curiosity Development Board. The document is organized as follows:

- **Chapter 1. "Overview"** – This chapter introduces the PIC24F LCD Curiosity Development Board and provides a brief overview of its various features.
- **Chapter 2. "Board Power-up"** – This chapter describes how to power up the board and the main circuit elements of the board.
- **Chapter 3. "Getting Started"** – This chapter describes the modes of operation for the PIC24F LCD Curiosity Development Board.
- **Appendix A. "Schematics"** – This appendix provides schematic diagrams for the PIC24F LCD Curiosity Development Board.
- **Appendix B. "LCD Operation"** – This appendix describes the pin and LCD segment assignments.

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CONVENTIONS USED IN THIS GUIDE

This manual uses the following documentation conventions:

DOCUMENTATION CONVENTIONS

Description	Represents	Examples
Arial font:		
Italic characters	Referenced books	*MPLAB® IDE User's Guide*
	Emphasized text	...is the *only* compiler...
Initial caps	A window	the Output window
	A dialog	the Settings dialog
	A menu selection	select Enable Programmer
Quotes	A field name in a window or dialog	"Save project before build"
Underlined, italic text with right angle bracket	A menu path	*File>Save*
Bold characters	A dialog button	Click **OK**
	A tab	Click the **Power** tab
N'Rnnnn	A number in verilog format, where N is the total number of digits, R is the radix and n is a digit.	4'b0010, 2'hF1
Text in angle brackets < >	A key on the keyboard	Press <Enter>, <F1>
Courier New font:		
Plain Courier New	Sample source code	`#define START`
	Filenames	`autoexec.bat`
	File paths	`c:\mcc18\h`
	Keywords	`_asm, _endasm, static`
	Command-line options	`-Opa+, -Opa-`
	Bit values	`0, 1`
	Constants	`0xFF, 'A'`
Italic Courier New	A variable argument	*`file`*`.o`, where *`file`* can be any valid filename
Square brackets [ ]	Optional arguments	`mcc18 [options]` *`file`* `[options]`
Curly brackets and pipe character: { | }	Choice of mutually exclusive arguments; an OR selection	`errorlevel {0|1}`
Ellipses...	Replaces repeated text	`var_name [, var_name...]`
	Represents code supplied by user	`void main (void) { ... }`

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RECOMMENDED READING

This quick start guide describes how to use the PIC24F LCD Curiosity Development Board. The device-specific data sheet contains current information on programming the specific microcontroller devices. The following Microchip document is recommended as a supplemental reference resource:

PIC24FJ128GL306 Family Data Sheet (DS30010198)

Refer to this document for detailed information on the PIC24FJ128GL306 16-bit general purpose family of MCUs with integrated segmented LCD controller. Reference information found in this data sheet includes:

- Device memory maps
- Device pinout and packaging details
- Device electrical specifications
- List of peripherals included on the devices

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Users of Microchip products can receive assistance through several channels:

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- Embedded Solutions Engineer (ESE)
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Customers should contact their distributor, representative or Embedded Solutions Engineer (ESE) for support. Local sales offices are also available to help customers. A listing of sales offices and locations is included in the back of this document.

Technical support is available through the website at:

http://www.microchip.com/support.

DOCUMENT REVISION HISTORY

Revision A (June 2019)

This is the initial release of this document.

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Chapter 1. Overview

1.1 INTRODUCTION

The PIC24F LCD Curiosity Development Board (DM240017) is a demonstration, development and experimentation platform based on the PIC24FJ128GL306 low-power, low-cost microcontroller featuring integrated segmented LCD controller. The board has a built-in programmer/debugger and provides all the hardware necessary to get started developing a complete embedded application. Some key features of the board include:

- PIC24FJ128GL306 16-bit microcontroller with 128-Kbyte Flash, 8-Kbyte RAM and up to 256 segments
- PICkit™ On-Board (PKOB) circuit implements basic programming/debugging ability
- On-board 5-character LCD panel with backlight (8 commons, 56 segments)
- $\overline{\text{MCLR}}$ Reset button plus two general purpose push buttons
- Red/Green/Blue (RGB) LED plus two general purpose indicator LEDs
- Digital temperature sensor (TC77)
- 10k potentiometer
- 32.768 kHz Secondary Oscillator (SOSC) for RTCC
- Female headers for access to microcontroller I/O pins
- Coin cell battery socket and reverse battery protection for optional battery operation
- USB-UART serial communication bridge (MCP2221A) to interface with USB host/PC

Note: The USB-UART connector does not power the board.

- Two mikroBUS™ interfaces for hardware expansion:
  - Supports a wide variety of add-on click boards™ from MikroElektronica (www.mikroe.com)

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Chapter 2. Board Power-up

2.1 POWERING UP THE BOARD

The board is intended to be powered through the Micro-B USB connector (USB1) in the upper left of the board. The USB-UART USB connector does not power the board. A MIC5528 linear regulator (U5) generates the +3.3V rail used by the PIC24FJ128GL306 microcontroller. The board can be powered by a CR2032 coin cell inserted into the B1 battery housing. Default jumper J9 setup is 2 and 3; this configuration can be left for power switching between the USB and the battery operation modes.

To measure the power consumption of the board, a meter can be placed between pins 2 and 3 of jumper J9 (that goes to the battery housing). To measure the current of the CPU, cut the trace on the bottom of the board under jumper J1 and place a meter between the two pins.

Note: The USB-UART USB connector does not power the board.

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Chapter 3. Getting Started

3.1 GETTING STARTED WITH THE PIC24F LCD CURIOSITY DEVELOPMENT BOARD

The preprogrammed “out-of-box” demo project for the PIC24F LCD Curiosity Development Board has two main modes of operation: USB powered and battery-powered.

3.1.1 USB Powered Mode

In USB Powered mode, via the upper left micro-USB port, there are several different Display modes. Pressing the S2 button will cycle between each of the Display modes during USB operation. The Display modes are listed below.

1. Toggles between the text, “PIC24” and “LCD”. Toggling is done automatically by the LCD module using the Alternate Display mode of the module.
2. Displays the 12-bit value of the potentiometer.
3. Displays the build time of the project. Note that this is the build time of the `build_time.c` file. A clean/build will update the time.
4. Displays the current temperature measured by the TC77 on the board. LCD Alternate Display mode toggles between Celsius and Fahrenheit.

Note: The backlight only operates while in USB mode.

The potentiometer will change the intensity of the RGB LED channel that is currently active. Switch S1 will change which channel is currently active.

A COM port can be opened to view the data through the USB/UART bridge. All the above data are displayed on the screen (time, temperature, potentiometer, etc.). The serial port needs to be set to 19200 baud, 8-bit, no parity, one stop, no flow control.

3.1.2 Battery-Powered Mode

If the USB power is disconnected, the board can run from a battery backup and will go into Battery-Powered mode. In order to run in Battery-Powered mode, a CR2032 needs to be inserted in the B1 battery housing and jumper J9 needs to short between pins 2 and 3. Minimal external components are necessary to enable Battery mode, while one built-in software function will enable Sleep mode.

In Battery-Powered mode, the moon icon is displayed to indicate that it is in Battery-Powered mode. The battery status icon indicates the current battery status.

The time will be displayed on the screen. The “:” blinks using the LCD module’s blink feature, while the core is still in Sleep mode. The CPU does not need to wake-up to update the screen for the “:”.

The CPU wakes up once a minute in this mode to update the time on the screen. LED1 will blink while the CPU is awake. The CPU will also wake-up when the USB power is detected.

All other functionality from the USB mode is disabled.

Note: The backlight only operates while in USB mode.

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Appendix A. Schematics

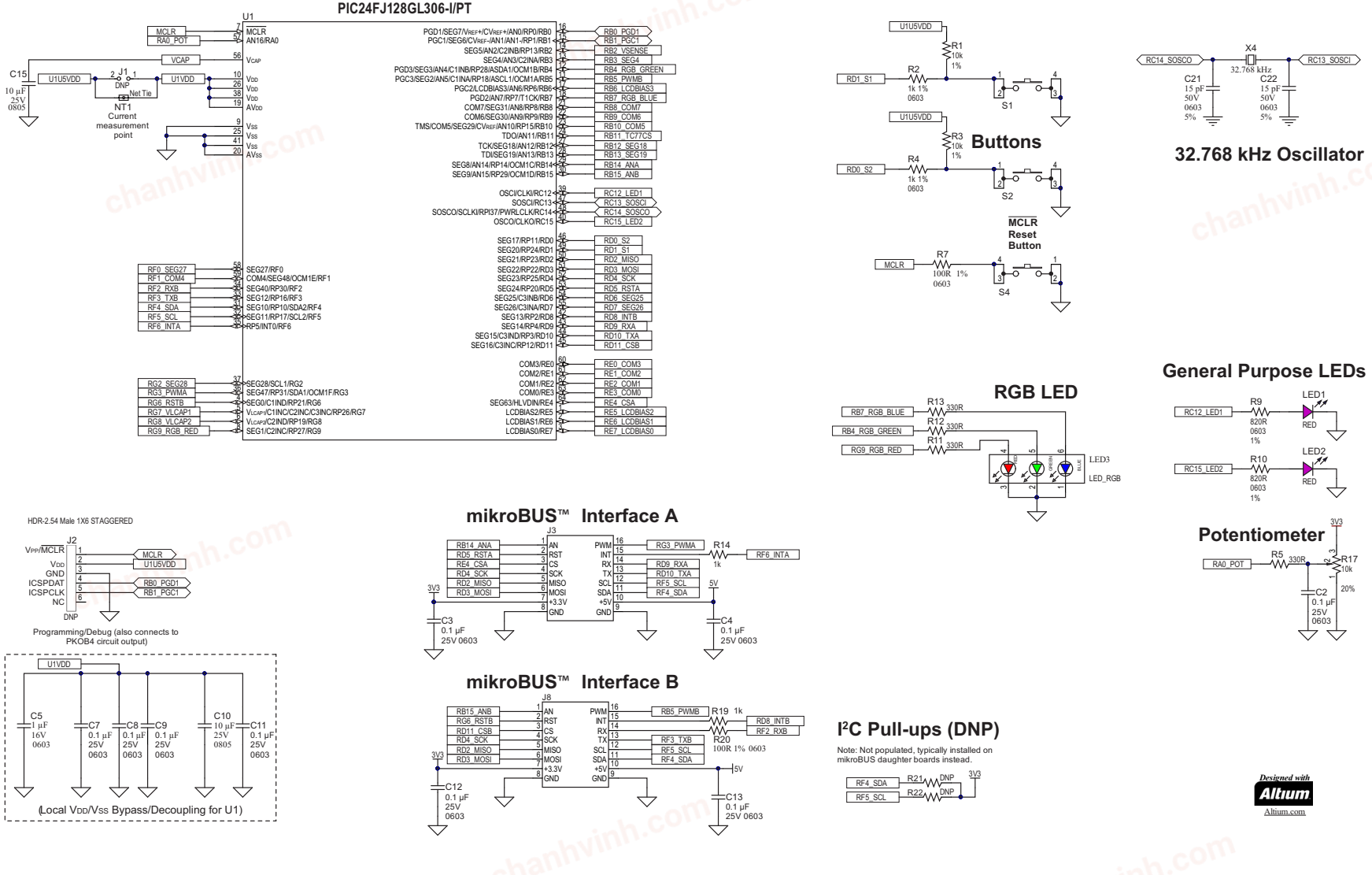
A.1 PIC24F LCD CURIOSITY DEVELOPMENT BOARD SCHEMATICS

The schematics for the PIC24F LCD Curiosity Development Board are shown in Figure A-1 (Microcontroller), Figure A-2 (I/O Access), Figure A-3 (Programmer/Debugger) and Figure A-4 (PKOB Buffers).

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FIGURE A-1: MICROCONTROLLER SCHEMATIC

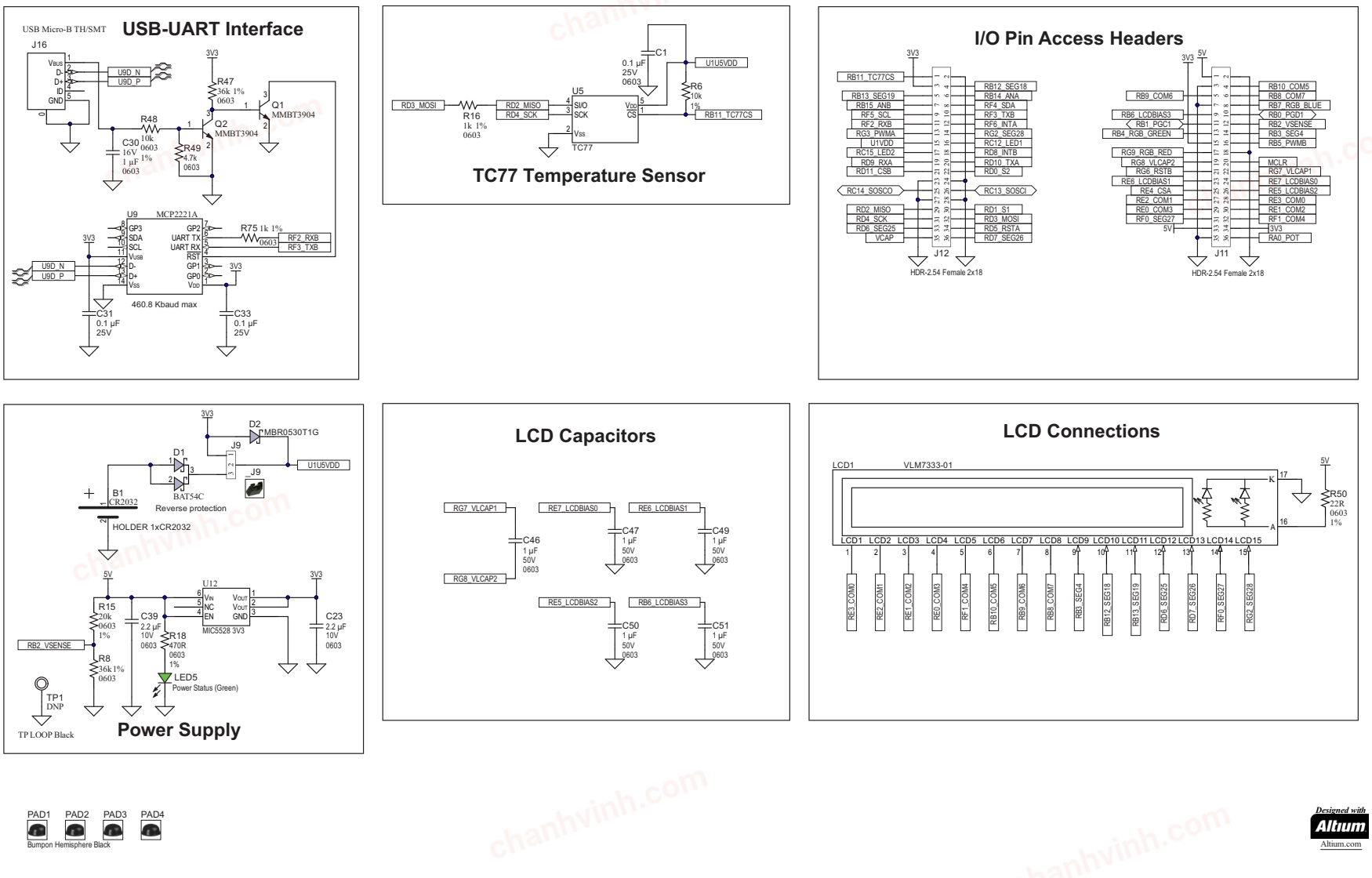


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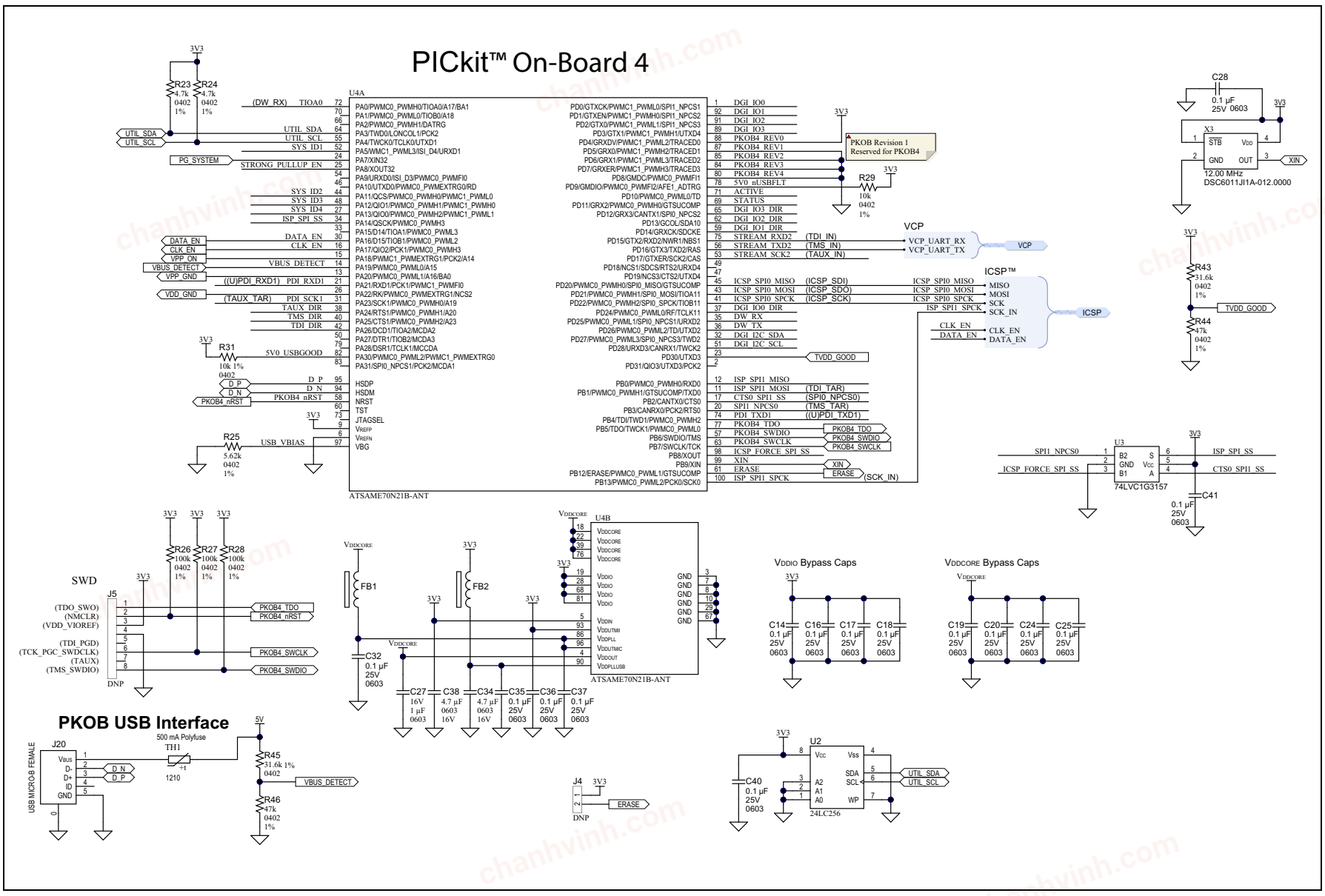
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FIGURE A-2: I/O ACCESS SCHEMATIC



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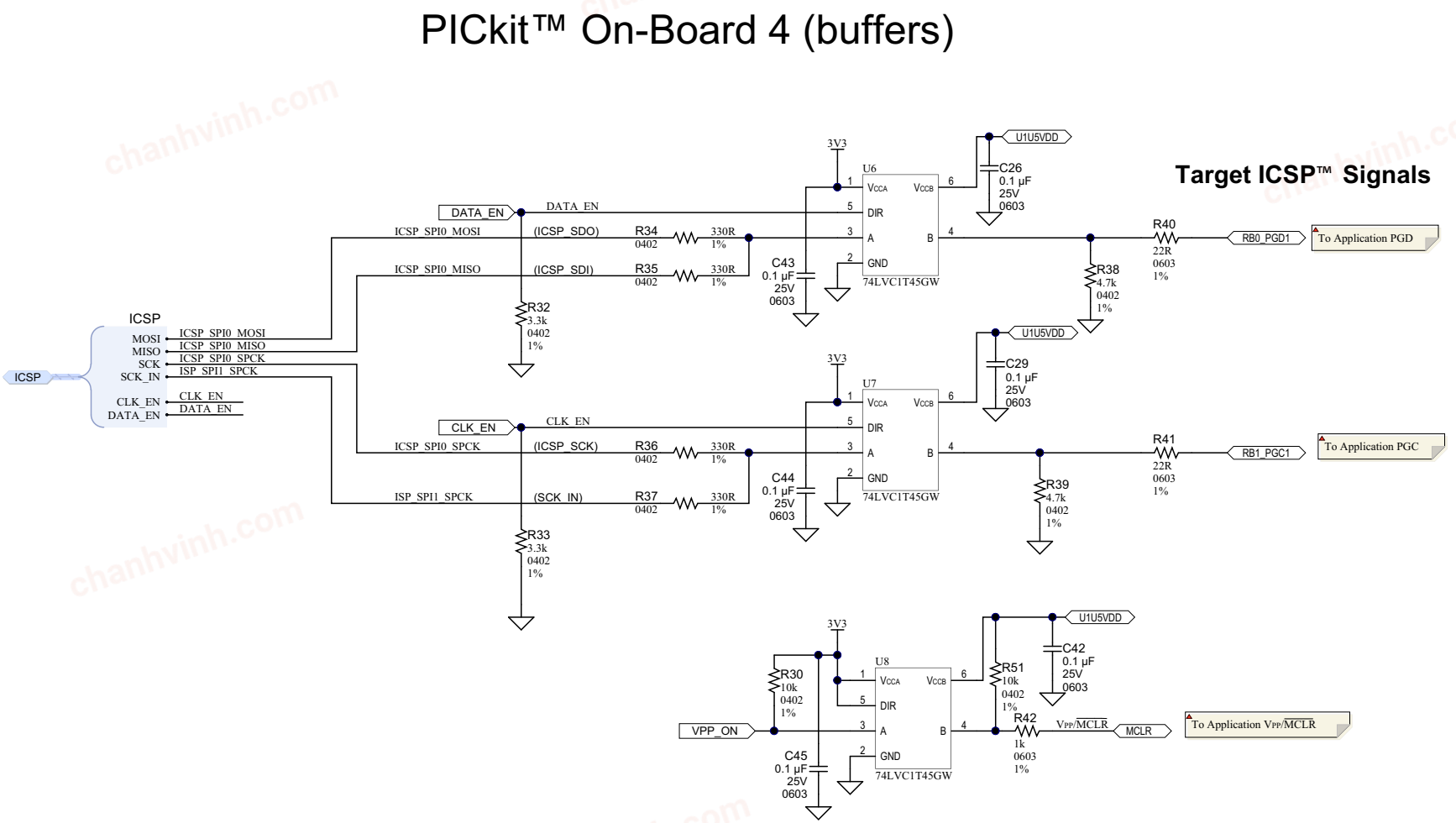
FIGURE A-3: PROGRAMMER/DEBUGGER SCHEMATIC



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FIGURE A-4: PICkit™ ON-BOARD (PKOB) BUFFERS SCHEMATIC



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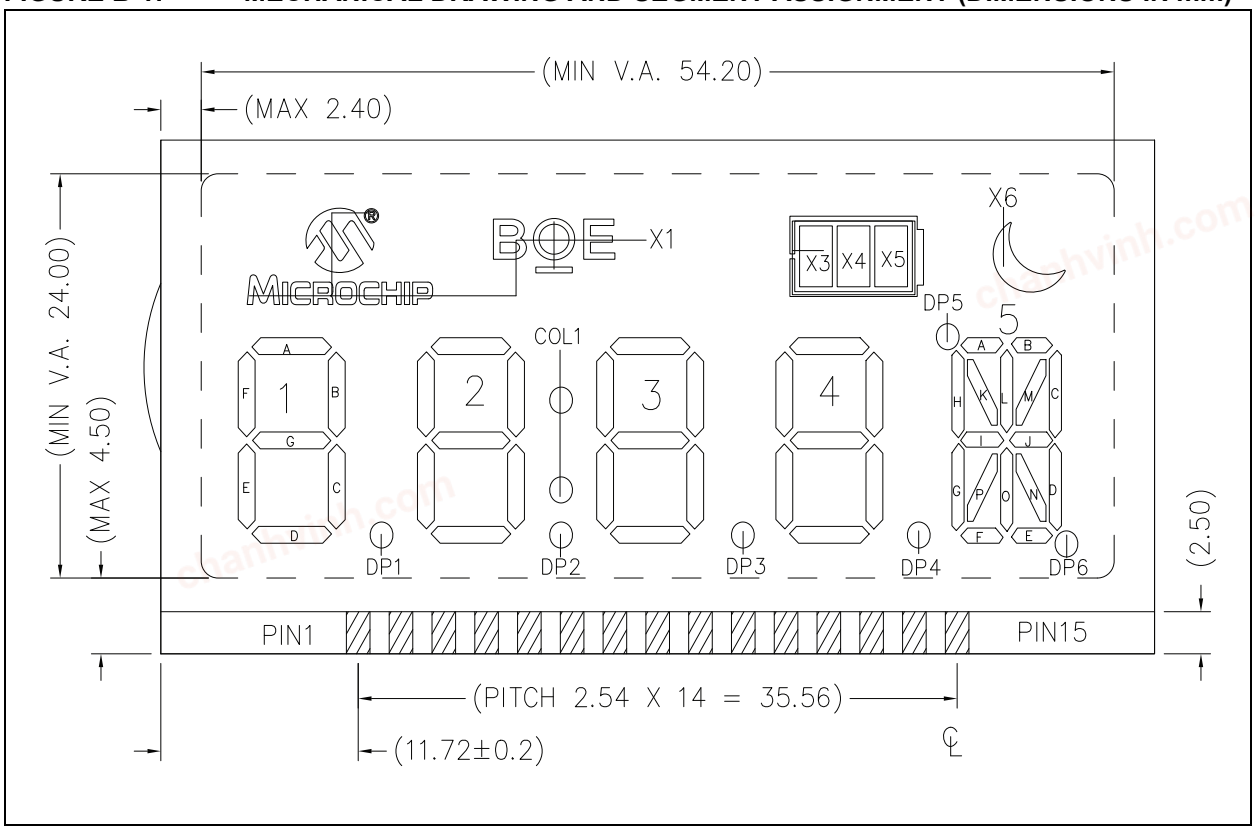
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Appendix B. LCD Operation

Backlight operation is dependent on the USB-5V supply; the LCD backlight is disabled during Battery-Operated mode.

Pin assignment and LCD segment assignment are shown in Figure B-1.

FIGURE B-1: MECHANICAL DRAWING AND SEGMENT ASSIGNMENT (DIMENSIONS IN mm)



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LCD panel pin and segment assignment is shown in Table B-1.

TABLE B-1: LCD PANEL PIN AND SEGMENT ASSIGNMENT

PIN	COM1	COM2	COM3	COM4	COM5	COM6	COM7	COM8
1	COM1	—	—	—	—	—	—	—
2	—	COM2	—	—	—	—	—	—
3	—	—	COM3	—	—	—	—	—
4	—	—	—	COM4	—	—	—	—
5	—	—	—	—	COM5	—	—	—
6	—	—	—	—	—	COM6	—	—
7	—	—	—	—	—	—	COM7	—
8	—	—	—	—	—	—	—	COM8
9	1A	1F	1E	1D	2A	2F	2E	2D
10	1B	1G	1C	DP1	2B	2G	2C	DP2
11	4A	4F	4E	DP3	3A	3F	3E	COL1
12	4B	4G	4C	4D	3B	3G	3C	3D
13	X4	X1	DP5	5H	5G	5P	5F	DP4
14	X5	5A	5K	5L	5I	5O	5N	5E
15	X3	X6	5B	5M	5C	5J	5D	DP6

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