# CEC1x02 Development Board

# User's Guide

*Microchip Direct Order #DM990013*

**Note the following details of the code protection feature on Microchip devices:**

- Microchip products meet the specification contained in their particular Microchip Data Sheet.

- Microchip believes that its family of products is one of the most secure families of its kind on the market today, when used in the intended manner and under normal conditions.

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# CEC1x02 Development Board User's Guide

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# User's Guide

# 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 web site (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 "DSXXXXXA", where "XXXXX" 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 CEC1x02 Development Board. Items discussed in this chapter include:

- Document Layout
- Conventions Used in this Guide
- The Microchip Web SiteThe Microchip Web Site
- Development Systems Customer Change Notification Service
- Customer Support
- Document Revision History

## DOCUMENT LAYOUT

This document describes how to use the CEC1x02 Development Board as a development tool. The manual layout is as follows:

- **Chapter 1. "Introduction"** – Shows a brief description of the CEC1x02 Development Board.
- **Chapter 2. "Features"** – Provides information on the layout of the CEC1x02 Development Board.
- **Chapter 3. "Recommended Tools and Accessories"** – Contains information about the CEC1x02 Development Board tools provided.
- **Chapter 4. "Powering the CEC1x02 Development Board"** – Provides information on powering the CEC1x02 Development Board.
- **Chapter 5. "Jumper Options"** – Summarizes several jumpers for the CEC1x02 Development Board.
- **Chapter 6. "Initial Hardware Setup"** – Includes detailed information on initial setup for the CEC1x02 Development Board.

- **Chapter 7. "Programming and Testing"** – Includes steps for programming and testing the CEC1x02 Development Board.
- **Chapter 8. "Schematics"** – CEC1x02 Development Board schematic diagrams.
- **Chapter 9. "Bill of Materials"** – Provides the CEC1x02 Development Board Bill of Materials (BOM).

## 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) { ... }` |

# CEC1x02 Development Board User's Guide

## THE MICROCHIP WEB SITE

Microchip provides online support via our web site at www.microchip.com. This web site is used as a means to make files and information easily available to customers. Accessible by using your favorite Internet browser, the web site contains the following information:

- **Product Support** – Data sheets and errata, application notes and sample programs, design resources, user's guides and hardware support documents, latest software releases and archived software
- **General Technical Support** – Frequently Asked Questions (FAQs), technical support requests, online discussion groups, Microchip consultant program member listing
- **Business of Microchip** – Product selector and ordering guides, latest Microchip press releases, listing of seminars and events, listings of Microchip sales offices, distributors and factory representatives

## DEVELOPMENT SYSTEMS CUSTOMER CHANGE NOTIFICATION SERVICE

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To register, access the Microchip web site at www.microchip.com, click on Customer Change Notification and follow the registration instructions.

The Development Systems product group categories are:
- **Compilers** – The latest information on Microchip C compilers, assemblers, linkers and other language tools. These include all MPLAB C compilers; all MPLAB assemblers (including MPASM assembler); all MPLAB linkers (including MPLINK object linker); and all MPLAB librarians (including MPLIB object librarian).
- **Emulators** – The latest information on Microchip in-circuit emulators.This includes the MPLAB REAL ICE and MPLAB ICE 2000 in-circuit emulators.
- **In-Circuit Debuggers** – The latest information on the Microchip in-circuit debuggers. This includes MPLAB ICD 4 in-circuit debuggers and PIC-kit 4 debug express.
- **MPLAB IDE** – The latest information on Microchip MPLAB IDE, the Windows Integrated Development Environment for development systems tools. This list is focused on the MPLAB IDE, MPLAB IDE Project Manager, MPLAB Editor and MPLAB SIM simulator, as well as general editing and debugging features.
- **Programmers** – The latest information on Microchip programmers. These include production programmers such as MPLAB REAL ICE in-circuit emulator, MPLAB ICD 4 in-circuit debugger and MPLAB PM3 device programmers. Also included are nonproduction development programmers such as PICSTART Plus and PIC-kit4.

## CUSTOMER SUPPORT

Users of Microchip products can receive assistance through several channels:

- Distributor or Representative
- Local Sales Office
- Field Application Engineer (FAE)
- Technical Support

Customers should contact their distributor, representative or field application engineer (FAE) 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 web site at:
http://www.microchip.com/support

## DOCUMENT REVISION HISTORY

| Revision | Section/Figure/Entry | Correction |
|---|---|---|
| DS50002727A (02-21-18) | Document Release | |

**CEC1x02 Development Board**
**User's Guide**

# Chapter 1. Introduction

The CEC1x02 Development Board is intended as a development, demonstration, and testing platform for Internet-of-Things applications using the CEC1702, a 32-bit ARM® Cortex®-M4-based microcontroller with additional security peripherals. The board features a variety of hardware options (including a power supply, user interface, serial communications, and expansion headers) that enable rapid prototyping and development of embedded, secure Internet-of-Things applications. In addition to the native hardware features provided by the CEC1x02 Development Board, hardware expansion is possible through the use of mikroBUS™ accessory boards.

The CEC1x02 Development Board features a Plug-In-Module (PIM), which has a CEC1702Q-B2 device without a programmed key so users can create their own private key to store into the CEC1702 for their end applications.
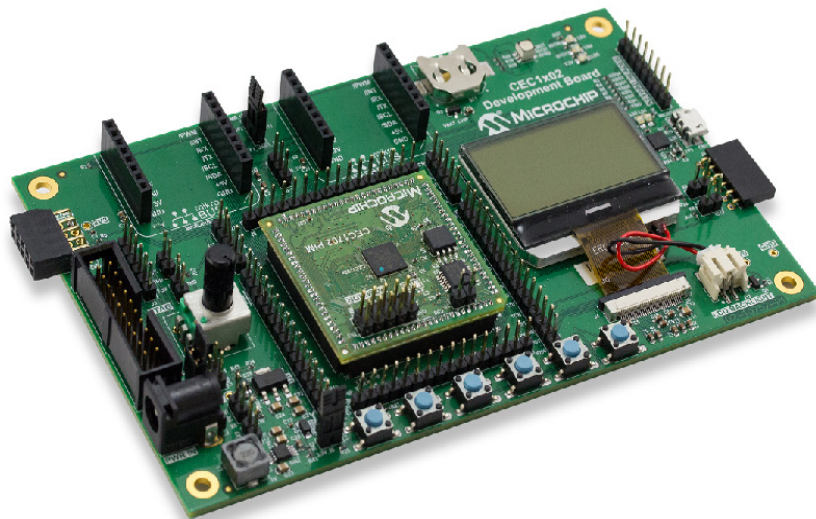
# Chapter 2.  Features

## 2.1    CEC1X02 DEVELOPMENT BOARD LAYOUT
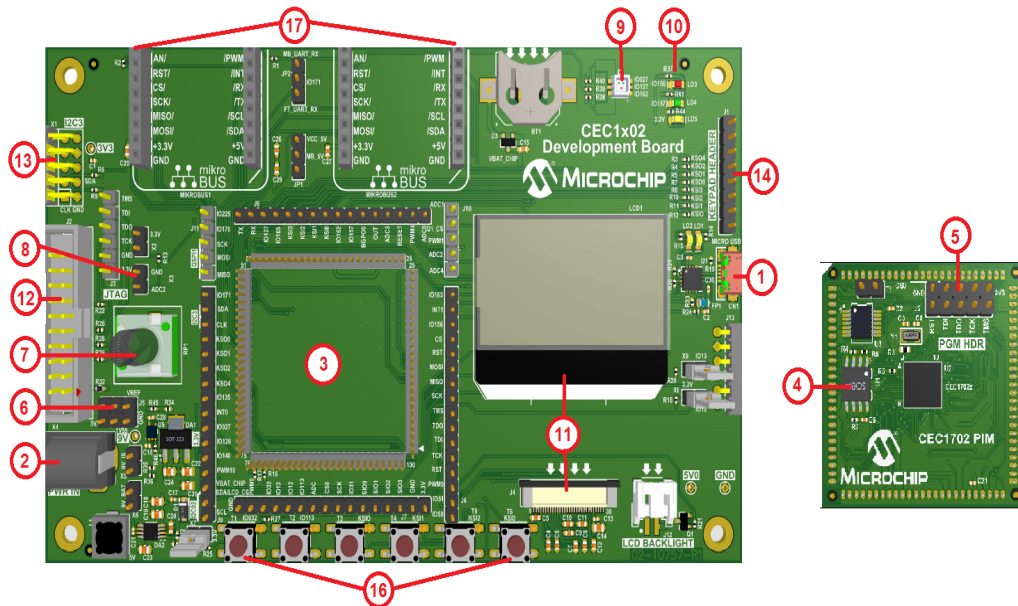
1.  USB micro-B connector — Provides power to the board and provides an interface for serial input/output or I2C using the Microchip MCP2221A USB-to-UART/I2C serial converter.
2.  Power Adapter Plug — Provides another way to apply power to the board by external power adapter from 6 V to 16 V, such as AC002014 - 9 V Wall Mount Power Supply.
3.  Connector for Plug-In Module (PIM) — Initially the board is supported with CEC1702PIM.
4.  SST26VF016B (on the CEC1702PIM) — Serial Quad I/O (SQI) flash to store the program image for the CEC1702 and provides additional persistent storage for application information.
5.  JTAG Debugger/SPI Flash Programming Header (on the CEC1702PIM) — Shared header design for SWD-mode JTAG or external SPI flash connection controlled by VCC_RST pin.
6.  eFuse programmability — Ability to evaluate, develop and program all aspects of the CEC1702, including the keys used for authentication.
7.  10 kΩ Potentiometer — Useful as an analog signal source for ADC demonstration or user interface purposes.
8.  Analog-to-Digital Converter expansion header — Provides an expansion header for variable-resistance circuit elements, such as a thermistor.
9.  Color LED — Full-color PWM-driven LED.

10. Status Indication LED — Output LED for the CEC1702's Blinking/Breathing LED hardware module.

11. 128x64 pixel LCD — EastRising ERC12864 SPI-interface LCD. Useful for displaying user application text/images.

12. JTAG Debugging headers — Provides a standard 20-pin header and a 1x6 header for flexibility.

13. I2C Expansion Header

14. 4x4 Keypad Header

15. GPIOs headers — Expansion headers to access all GPIOs of CEC1702.

16. 6x general-purpose pushbuttons

17. 2x mikroBUS™ Interfaces — Useful for attaching a wide array of hardware expansion boards to extend the functionality of the platform.

# Chapter 3. Recommended Tools and Accessories

For development with the CEC1702 Development Board, we have enabled multiple tools options as shown below:

1. Recommended - Microchip Development Tools - MPLAB®X v4.10 or later, XC32 Compiler v2.05 or later, and ICD 4 or Segger J-Link debugger.
2. Keil® µVision® IDE and the MDK-ARM® Standard Cortex®-M compiler license, and Keil uLinkPro/2/Me or Segger J-Link debugger.
3. IAR Embedded Workbench® for Arm v7.70 or later, and I-JET debugger.
4. MikroElektronika mikroC PRO for ARM® IDE v5.0 or later, and mikroProg™ for CEC debugger/programmer.
5. GNU ARM® Embedded Toolchain or others similar that can support Cortex-M4F.

Microchip provides several free firmware projects and libraries that are compatible with the CEC1x02 Development Board. These demos show the basic functionality of the CEC1x02 Development Board and the CEC1702. Details on the usage of these example projects can be found in the documentation accompanying the projects.

The CEC1x02 Development Board's mikroBUS™ expansion headers allow interfacing with a wide variety of click boards™. A list of boards that may facilitate application development is available from MikroElektronika.

MikroElektronika is a trusted third-party tool provider.

# Chapter 4. Powering the CEC1x02 Development Board

The CEC1x02 Development Board can be powered directly through the USB micro-B port of the USB-Serial converter (CN1). The 5 V input from the USB voltage rail is regulated to 3.3 V by an MCP1755S voltage regulator.

Optionally, the CEC1x02 Development Board can be powered by an external power supply through the Power Plug (X4). The 6 V to 16 V input from the external power voltage rail is regulated to 5 V by an MCP16312 voltage regulator. Then the 5 V is regulated to 3.3 V, which is the same as using USB micro-B port.

A shunt diode (D1) can be used to allow measurement of the total system power consumption when using the USB micro-B port or a jumper (X5) is provided to allow measurement of the total system power consumption when using an external power supply. A jumper (X7) is provided to allow current measurement on the 3.3 V rail.

# Chapter 5. Jumper Options

The CEC1x02 Development Board has several jumpers, summarized as follows:

| Jumper | Description | Details |
|---|---|---|
| J1 | KeyPad Header | Connect to an external keypad up to 4x4 |
| J2 | JTAG Header | Standard 20 pin ARM®-JTAG Connector. |
| J3 | JTAG Header | 1x6 JTAG Connector. |
| J5 | Voltage Reference Input Select | Selects the positive voltage input to the VREF_ADC pin. Shorting the pin 1-2 to "VREF" will provide a Vdd/3.3V reference. Shorting the center pin 3-4 to "VPP" will provide a reference voltage of ~1.59 V; this voltage is required by the CEC1702's EFUSE programming sequence. See the "CEC1702 Data Sheet EFUSE" chapter for additional information. |
| J6, J7, J8, J9, J10, J11 | GPIO Expansion Header | Connect to CEC1702 GPIO pins. |
| J12 | LCD Backlight Power | Connect to LCD display power cable. |
| J13 | MCP2221A I2C Header | Connect to external I2C device(s) to the MCP2221A. |
| JP1 | MB_5V, VCC_5V Select | Selects between MB_5V or VCC_5V |
| JP2 | GPIO171/UART_RX Select | Selects between MikroBUS™ UART_RX and USB-UART device UART_RX |
| X1 | I2C Expansion Header | Connect to external I2C device(s). |
| X2 | ADC Header Pull-up | Enables a 3.3 V pull-up for the Analog-to-Digital Converter expansion header. |
| X3 | ADC Header | Connect to an external ADC device. |
| X5 | VIN Connection | Can be used for total system power consumption measurement when using external power supply. |
| X6 | BATT 9V | Optional header to support 9V battery for portable environment where need. |
| X7 | 3.3V Current Sense | Provides a test point to measure the power consumption on the 3.3 V rail. Removing this jumper will also hard-reset the board. |
| X8, X9 | MCP2221A I2C signals pull-high | Pull-up the MCP2221A I2C signals. |

The CEC1702PIM has several jumpers, summarized as follows:

| Jumper | Description | Details |
|---|---|---|
| J2 | JTAG/SPI Header | Shared header design is mated with MikroE's mikroProg for CEC programming/debugger device |
| T1 | VCC_RST Grounded | Put CEC1702 in reset for SPI flash programming if jumper wires to an external SPI flash programmer such as Dediprog SF100. |

# Chapter 6. Initial Hardware Setup

The **CEC1x02 Development Board** should have all the required jumpers installed for power up through the USB micro-B port (CN1). You can plug-in the USB micro-B Cable from the PC to the board and +3.3V power LED (LD5) should be turned on.

**eFuse Programming:**

Please note that the CEC1702PIM is populated with the Bx "blank" version of device which will stay in factory automatic test equipment (ATE) mode, which means the boot ROM will not load any firmware from the external SPI flash device until eFuse programming is completed. However, the JTAG port is enabled in this mode, so using the JTAG debugger to download code into SRAM for execution will work fine.

Please refer to "CEC1702" Product Page for User's Guide & Utility.

**Note:** Before performing eFuse programming on CEC1x02 development board, you must jumper-wire J5 pin 3-4 to connect 1.59 V to the VREF_ADC pin.

**Using JTAG for development:**

Without performing the eFuse programming, the CEC1702 Bx "blank" device JTAG port is enabled. You can connect the selected JTAG debugger to the JTAG header, using the selected IDE development tools to select the CEC1702 device and configure the debugger settings accordingly and then click on the 'debug' option to download the compiled application firmware into the SRAM for execution.

**For End-Product Evaluation - Building SPI Flash Image & Programming to external SPI flash:**

Please refer to the product page sample projects. Depending on which IDE you have selected, building the SPI image by an external utility may be required. The details are included in the corresponding sample projects. After building a correct 2 MB size SPI image, you should use external SPI flash programmer to flash the image into the external SPI flash on the CEC1702PIM. Finally, power cycle the board to see if the firmware is being executed as expected.

# Chapter 7. **Programming and Testing**

## 7.1    PROGRAMMING

1. Ensure the CEC1702PIM is installed into the **CEC1x02 Development Board.**
2. Install jumper X7 is installed.
3. Programming the SPI Flash with **mikroProg**™:
   a) Connect the mikroProg to J2 on CEC1702 PIM board.
   b) Launch the mikroProg suite.
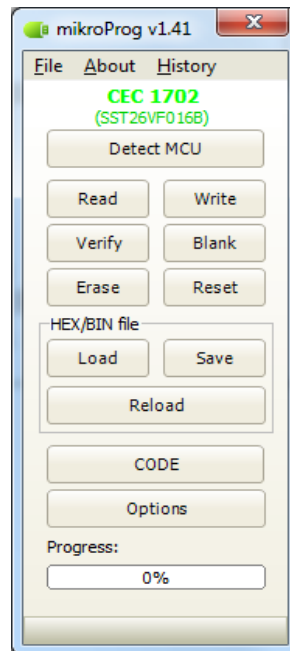


   c) Click on **Detect MCU** to display: CEC1702.
   d) Click on **Load** to load the binary file to program to SPI Flash.
   e) Click on **Write** to write binary file to SPI Flash.

4. Programming the SPI Flash with **DediProg SF100**:
   a) Connect the Dediprog SF100 to J2 on CEC1702 PIM board as follows:

| DediProg SF100 | CEC1702 PIM |
|---|---|
| VCC | <1> VCC_3.3V |
| MOSI | <2> JTAG_TMS/SHD_SIO0 |
| SCK | <4> JTAG_TCK/SHD_SCK |
| MISO | <6> JTAG_TDO/SHD_SIO1 |
| CS | <7> SHD_CS0 |
| GND | <9> GND |

   b) Install jumper T1 on CEC1702 PIM board before programming.
   c) Open the Dediprog Software then select the SPI Flash chip ID: 26VF016B. Click **OK**.

**Note:** Please install SFv6.0.4.41 or later, older versions may not able to detect the device.
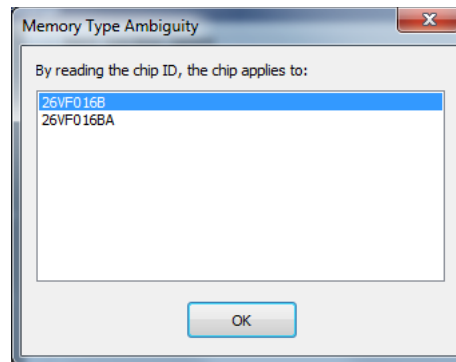


   d) Options settings: Press the **Config** button.
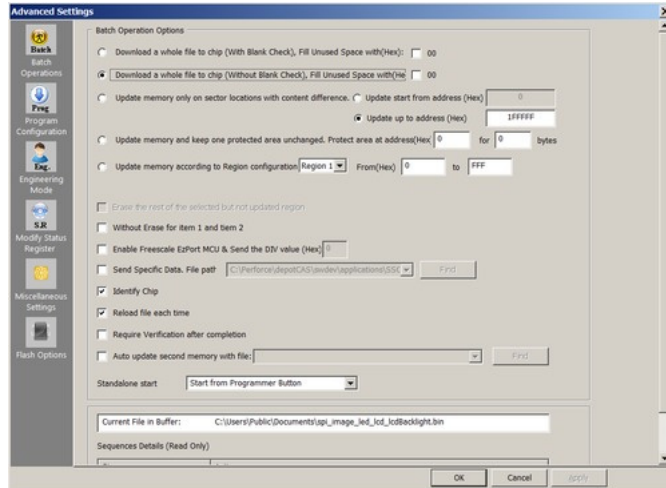
e) Click on **File** to select test binary, for example: spi_image_led_lcd_lcdBacklight.bin from the sample project.
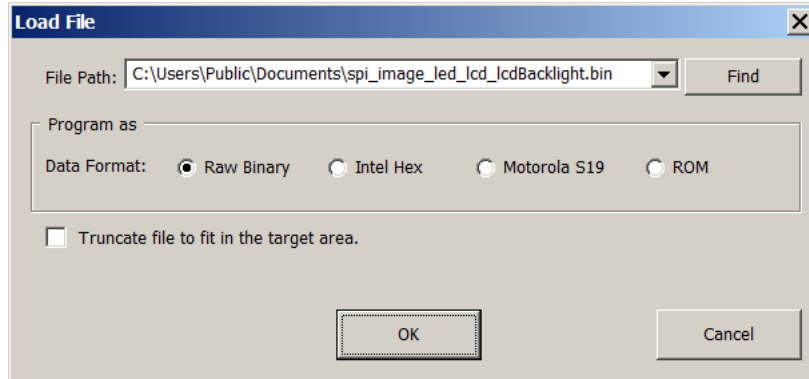


f) Click **Batch** and it will start 'erase and program'.

g) After the programming has completed successfully, remove jumper T1 on CEC1702 PIM board.

h) Unplug SF100 from J2.

## 7.2 TESTING

1. Plug-in USB micro-B Cable to CN1.
2. LEDs (D2, LD3, LD4) should all blink if the application firmware was loaded and executed as expected.
3. The LCD Display should show the Microchip Logo.
4. Test Done!

# Chapter 8. **Schematics**

## 8.1 CEC1X02 DEVELOPMENT BOARD
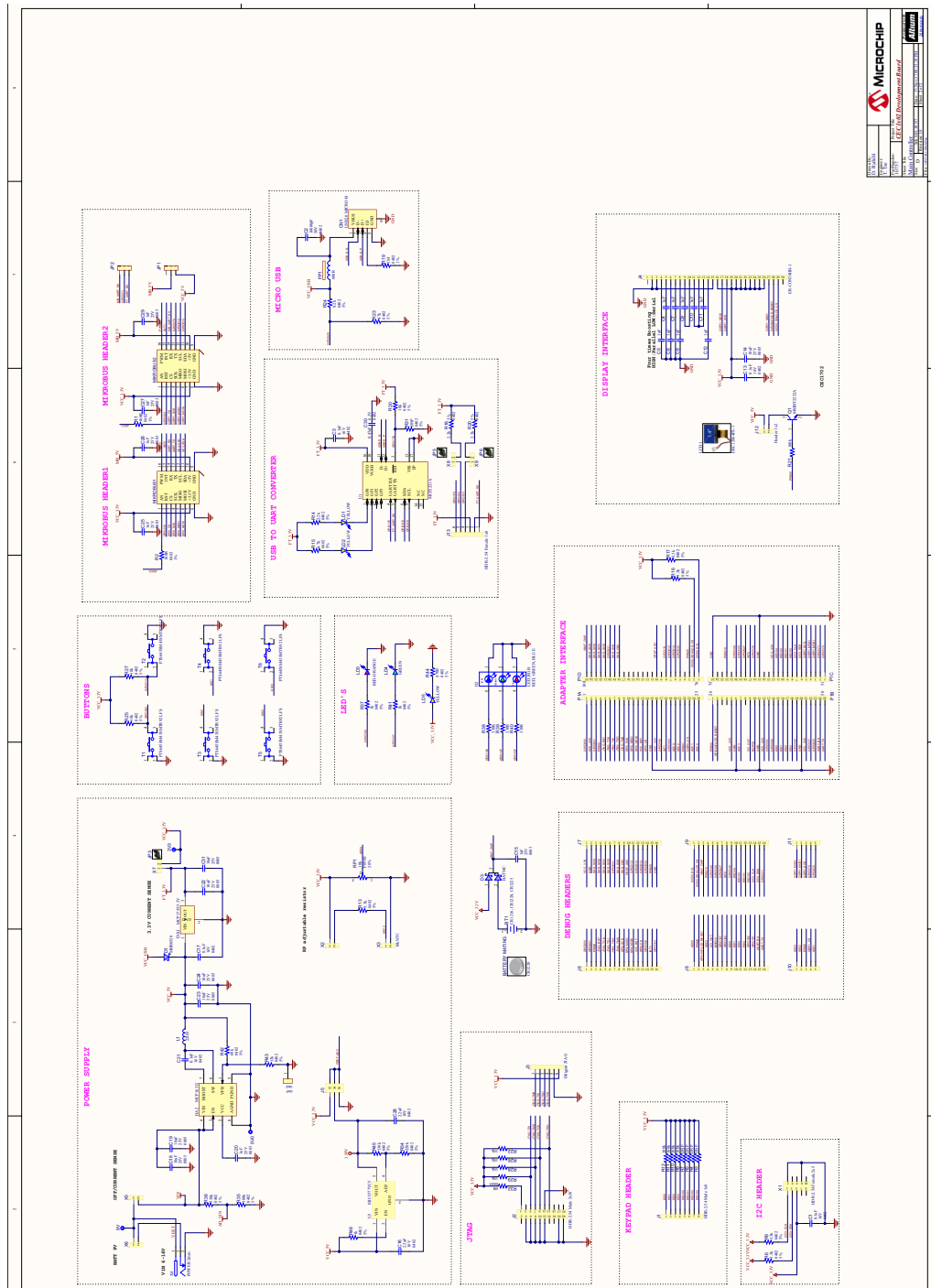
## 8.2    CEC1702PIM

# Chapter 9.  Bill of Materials

## 9.1    CEC1X02 DEVELOPMENT BOARD

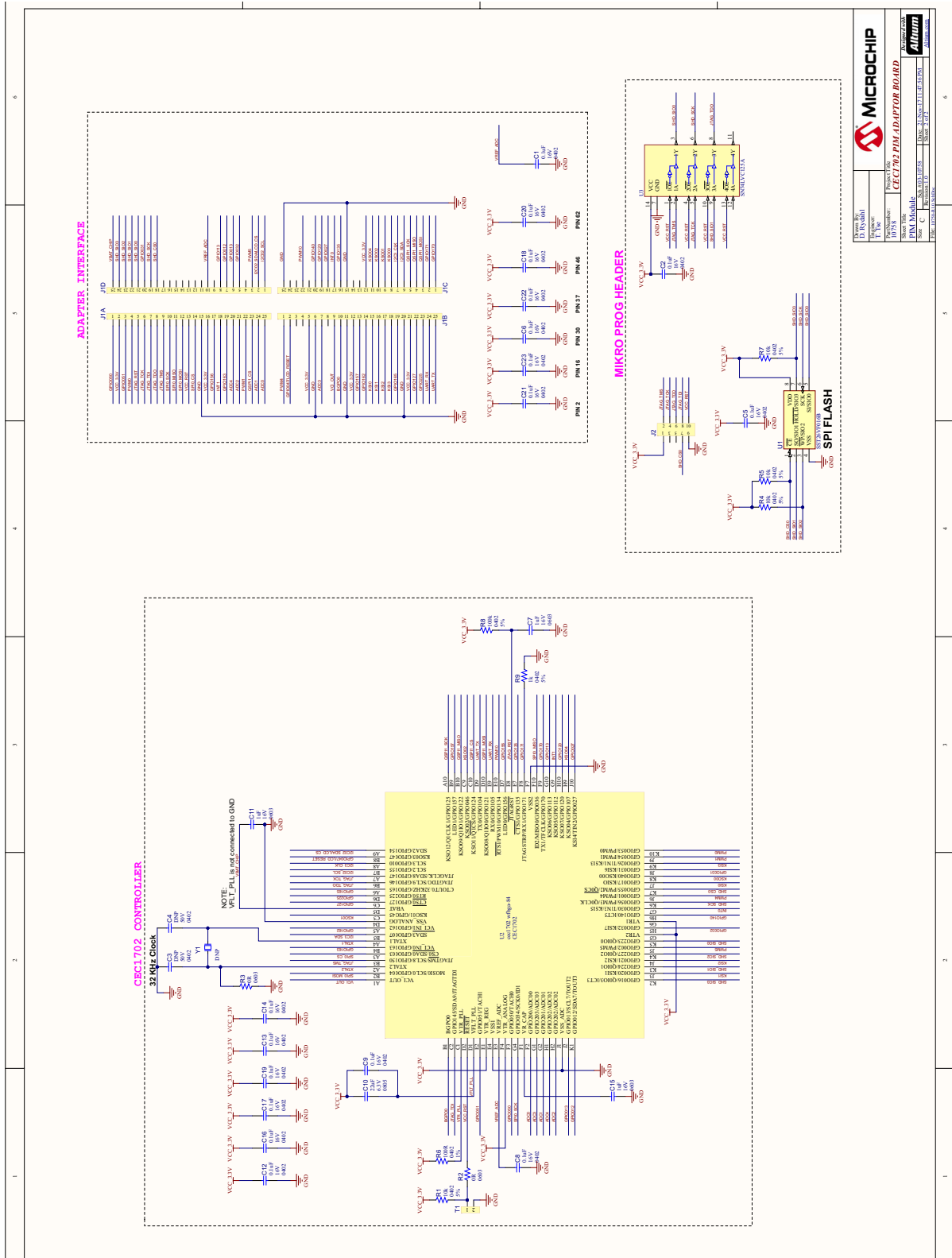| Reference | Description | Manufacturer | Manufacturer Part Number |
|---|---|---|---|
| BATTERY MATING | BATTERY LITHIUM 3 V COIN 12.5 mm | Panasonic | CR1220 |
| BT1 | HOLDER BATTERY COIN 12 mm DIA THM | MPD | BK-885-TR |
| C1,C3,C13,C17,C21 | CAP CER 0.1 µF 10 V X5R 0402 | Murata | GRM155R71C104KA88D |
| C2 | CAP CER 10000 pF 50 V 10% X7R SMD 0402 | Murata | GRM155R71E103KA01D |
| C4,C5,C6,C7,C8, C9,C10,C11,C12,C15, C20,C25,C26,C27,C29 | CAP CER 1 µF 25 V 10% X7R SMD 0603 | TDK | CGA3E1X7R1E105K080 AC |
| C14,C18,C19,C22,C23, C24, C31 | CAP CER 10 µF 25 V 10% X5R SMD 0805 | Murata | GRM21BR61E106KA73L |
| C16,C28 | CAP CER 2.2 µF 10 V 10% X5R SMD 0402 | Murata | GRM155R61A225KE95D |
| C30 | CAP CER 0.47 µF 6.3 V 10% X5R SMD 0402 | Murata | GRM155R60J474KE19D |
| CN1 | CON USB2.0 MICRO-B FEMALE SMD R/A | FCI | 10104110-0001LF |
| D1 | DIODE SCHOTTKY 20 V 500 mA SOD123 | Fairchild | MBR0520L |
| D2 | LED RGB DIFFUSED 6SMD | Cree Inc | CLX6A-FKB-CJNN-RFJBB7A363 |
| D3 | Diode Schottky 30 V 0.2 A 3-Pin SOT-23 T/R | Fairchild | BAT54C |
| DA1 | IC REG LIN 3.3 V 300 mA SOT223-3 | MICROCHIP | MCP1755S-3302E/DB |
| DA2 | IC REG BUCK ADJ 1A SYNC 8MSOP | MICROCHIP | MCP16312-E/MS |
| FP1 | FERRITE BEAD 600 OHM 1206 1LN | TDK | MPZ2012S601AT000 |
| J1 | CON HDR-2.54 Male 1x8 Gold 5.84 mH TH | FCI | 68001-108HLF |
| J2 | CON HDR-2.54 Male 2x10 Gold Shroud 6.35 mH TH VERT | Samtec | TST-110-01-G-D |
| J3 | CON HDR-2.54 Male 1x6 Gold 5.84 mH TH VERT | FCI | 68001-106HLF |
| J4 | CON FFC/FPC ER-CON30HB-1 0.5 mm 30P Female SMD R/A | EastRising | ER-CON30HB-1 |
| J5 | CON HDR-2.54 Male 2x3 Gold 5.84 mH TH VERT | Samtec | TSW-103-07-S-D |
| J6,J7,J8,J9 | CON HDR-2.54 Male 1x16 Gold 5.84 mH TH VERT | Samtec | TSW-116-07-G-S |
| J10,J11 | CON HDR-2.54 Male 1x5 Gold 5.84 mH TH VERT | Samtec | TSW-105-07-S-S |

| Reference | Description | Manufacturer | Manufacturer Part Number |
|---|---|---|---|
| J12 | CON HDR-2 Male 1x2 SHROUDED LOCK SMD RA | EastRising | ER-CON2.0-2P-SMD |
| J13 | CON HDR-2.54 Female 1x6 Gold TH R/A | Sullins | PPPC061LGBN-RC |
| JP1,JP2 | CON HDR-2.54 Male 1x3 Tin 5.84 mH TH VERT | Samtec | TSW-103-07-T-S |
| JP3,JP5,JP6 | MECH HW JUMPER 2.54 mm 1x2 Handle Gold | TE Connectivity | 881545-2 |
| L1 | INDUCTOR 22UH 1.65 A 96 MOHM SMD 7.3X7.3X4.5 | Bourns Inc. | SRR0745A-220M |
| LCD1 | DISPLAY LCD MODULE COG GRAPHIC 128x64 DISPLAY | EastRising | ERC12864FS-1 |
| LD1, LD2, LD5 | DIO LED YELLOW 1.8 V 30 mA 70mcd Clear SMD 0805 | Lite On Inc. | LTST-C170KSKT |
| LD3 | DIO LED RED ORANGE 2 V 10 mA 2mcd Clear SMD 0805 | Lite On Inc. | LTST-C170EKT |
| LD4 | DIO LED GREEN 2 V 30 mA 35mcd Clear SMD 0805 | Lite On Inc. | LTST-C170KGKT |
| MIKROBUS1, MIKRO-BUS2 | mikroBUS HOST | Sullins Connector Solutions | PPTC081LFBN-RC |
| P1A,P1B,P1C,P1D | CON HDR-1.27 Male 1x25 Gold 5.84 mH TH VERT | Samtec | TMS-125-01-G-S |
| Q1 | TRANS BJT NPN MMBT2222A 40 V 1 A 350 mW SOT-23 | Fairchild | MMBT2222A |
| R1,R2 | RES TKF 100R 1% 1/10 W SMD 0402 | Panasonic | ERJ-2RKF1000X |
| R3,R4,R5,R7,R8, R10,R11,R12,R21 | RES TKF 100 k 1% 1/10 W SMD 0402 | Panasonic | ERJ-2RKF1003X |
| R14 | RES TKF 2.2 k 5% 1/16 W SMD 0402 | Vishay Dale | CRCW04022K20JNED |
| R15 | RES TKF 4.7 k 5% 1/10 W SMD 0402 | Panasonic | ERJ-2GEJ472X |
| R18,R20 | RES TKF 2.2 k 5% 1/10 W SMD 0402 | Panasonic | ERJ-2GEJ222X |
| R19 | RES TKF 1M 1% 1/10 W SMD 0402 | Panasonic | ERJ-2RKF1004X |
| R22,R26,R28,R29,R30 | RES TKF 10 k 5% 1/16 W SMD 0402 | Vishay | CRCW040210K0JNED |
| R23 | RES TKF 47 k 5% 1/10 W SMD 0402 | Panasonic | ERJ-2GEJ473X |
| R24 | RES TKF 8.2 k 5% 1/10 W SMD 0402 | Panasonic | ERJ-2GEJ822X |
| R25,R27 | RES TKF 10 k 5% 1/10 W SMD 0402 | Panasonic | ERJ-2GEJ103X |
| R31 | RES TKF 10 k 5% 1/16 W SMD 0402 | Vishay | CRCW040210K0JNED |
| R32 | RES TKF 0R 1/10 W SMD 0603 | Panasonic | ERJ-3GSY0R00V |
| R34 | RES TKF 220 k 5% 1/10 W SMD 0402 | Panasonic | ERJ-2GEJ224X |
| R35 | RES TKF 100 k 5% 1/10 W SMD 0402 | Panasonic | ERJ-2GEJ104X |
| R36 | RES TKF 330 k 5% 1/10 W SMD 0402 | Panasonic | ERJ-2GEJ334X |
| R37,R41,R46 | RES TKF 1 k 5% 1/16 W SMD 0402 | Panasonic | ERJ-2GEJ102X |
| R38,R39,R40 | RES TKF 330R 5% 1/10 W SMD 0402 | Panasonic | ERJ-2GEJ331X |
| R42 | RES TKF 68 k 5% 1/10 W SMD 0402 | Panasonic | ERJ-2GEJ683X |
| R43 | RES TKF 13 k 5% 1/10 W SMD 0402 | Panasonic | ERJ-2GEJ133X |
| R44 | RES TKF 470R 5% 1/16 W SMD 0402 | Yageo | RC0402JR-07470RL |
| R45 | RES TKF 130 k 5% 1/10 W SMD 0402 | Panasonic | ERJ-2GEJ134X |
| R6,R9,R13,R16,R17 | RES TKF 3.3 k 5% 1/10 W SMD 0402 | Panasonic | ERJ-2GEJ332X |
| RP1 | Res Variable 10 k 20% TH P090S | TT ELECTRONICS/BI | P090S-04F20BR10K |

| Reference | Description | Manufacturer | Manufacturer Part Number |
|---|---|---|---|
| T1,T2,T3,T4,T5,T6 | SWITCH TACT SPST 12 V 50 mA PTS645SM43SMTR92 LFS SMD | Wurth Electronics Inc | 430182043816 |
| U1 | MCHP INTERFACE USB I2C/UART MCP2221A-I/ML QFN-16 | MICROCHIP | MCP2221A-I/ML |
| U5 | IC REG LDO ADJ 0.15 A SC70-5 | MICROCHIP | MIC5377YC5-TR |
| X1 | CON HDR-2.54 Female 2x5 GOLD TH R/A | Samtec | SSQ-105-02-G-D-RA |
| X2,X3,X5,X6,X7, X8,X9 | CON HDR-2.54 Male 1x2 Tin 6.75 mH TH VERT | Molex | 0901200122 |
| X4 | CON POWER 2 mm 5.5 mm SWITCH TH R/A | CUI Inc. | PJ-002AH |

## 9.2    CEC1702PIM DEVELOPMENT BOARD

| Reference | Description | Manufacturer | Manufacturer Part Number |
|---|---|---|---|
| C1,C2,C5,C6,C8, C9,C12,C13,C14,C16, C17,C18,C19,C20,C21, C22,C23 | CAP CER 0.1 µF 16 V 10% X7R SMD 0402 | Murata | GRM155R71C104KA88D |
| C10 | CAP CER 22 µF 6.3 V 20% X5R SMD 0805 | Murata | GRM21BR60J226ME39L |
| C7,C11,C15 | CAP CER 1 µF 16 V 10% X5R SMD 0603 | AVX | 0603YD105KAT2A |
| J1A,J1B,J1C,J1D | CON HDR-1.27 Female 1x25 TH VERT | Preci-Dip | 851-87-025-10-001101 |
| J2 | CON HDR-2.54 Male 2x5 0.100" (2.54 mm) TH VERT | Samtec | TSW-105-07-G-D |
| R1,R4,R5,R7 | RES TKF 10 k 5% 1/10 W SMD 0402 | Panasonic | ERJ-2GEJ103X |
| R2,R3 | RES TKF 0R 1/10 W SMD 0603 | Panasonic | ERJ-3GSY0R00V |
| R6 | RES TKF 100R 1% 1/10 W SMD 0402 | Panasonic | ERJ-2RKF1000X |
| R8 | RES TKF 100 k 5% 1/10 W SMD 0402 | Panasonic | ERJ-2GEJ104X |
| R9 | RES TKF 1 k 5% 1/16 W SMD 0402 | Panasonic | ERJ-2GEJ102X |
| T1 | CON HDR-2.54 Male 1x2 Tin 6.75 mH TH VERT | Molex | 0901200122 |
| U1 | MCHP MEMORY SERIAL FLASH 16M 104 MHz SST26VF016B-104I/SM SOIJ-8 | MICROCHIP | SST26VF016B-104I/SM |
| U2 | CRYPTO EMBEDDED CONTROLLER 480 K CEC1702Q-C2-I/SX | MICROCHIP | SST26VF016B-104I/SM |
| U3 | IC LOGIC SN74LVC125ADBR Quad Bus Buffer Gate SSOP-14 | TI | CEC1702Q-C2-I/SX |
| Y1 (DNP) | CRYSTAL 32.768 kHz 12.5 pF SMD ABS07 | Seiko | SC32S-12.5PF20PPM |
| C3,C4 (DNP) | CAP CER 10 pF 50 V 5% NP0 SMD 0402 | Murata | GRM1555C1H100JZ01D |

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