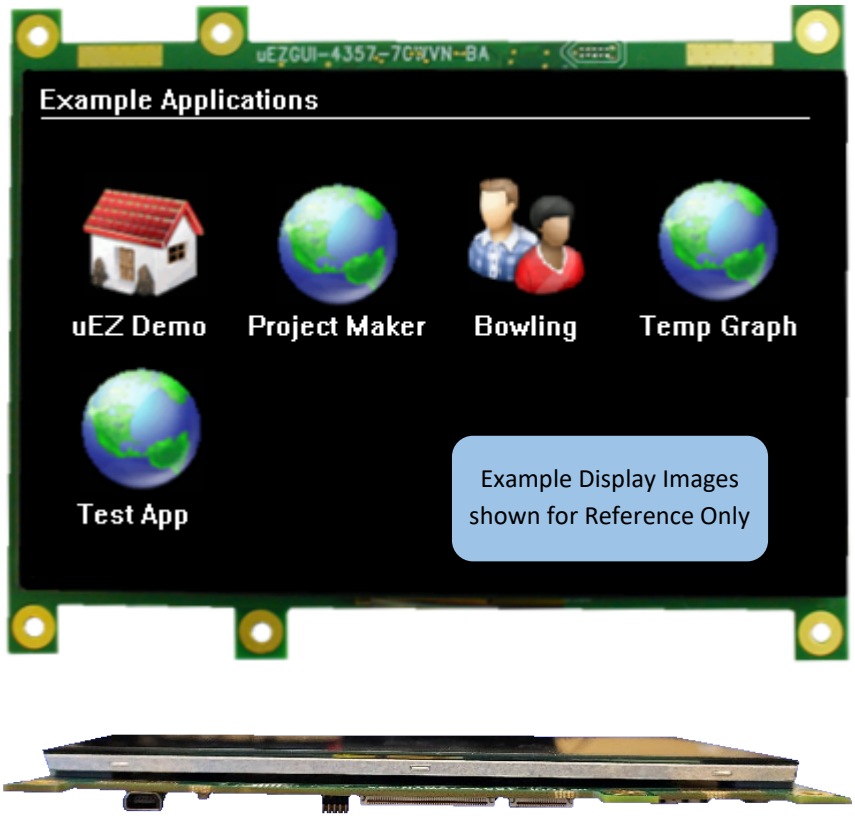
µEZ® GUI User's Manual

Covers the following products:

UEZGUI-4357-70WVN (Dev Kit)

UEZGUI-4357-70WVN-BA (Board Assembly)



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NOTE: The inclusion of vendor software products in this kit does not imply an endorsement of the product by Future Designs, Inc.

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1. Introduction

The UEZGUI-4357-70WVN-BA/UEZGUI-4357-70WVN (Dev Kit) provides a quick and easy solution for implementing a Graphical User Interface (GUI) based design by providing the basic functions necessary for most customer products.

2. Block Diagram

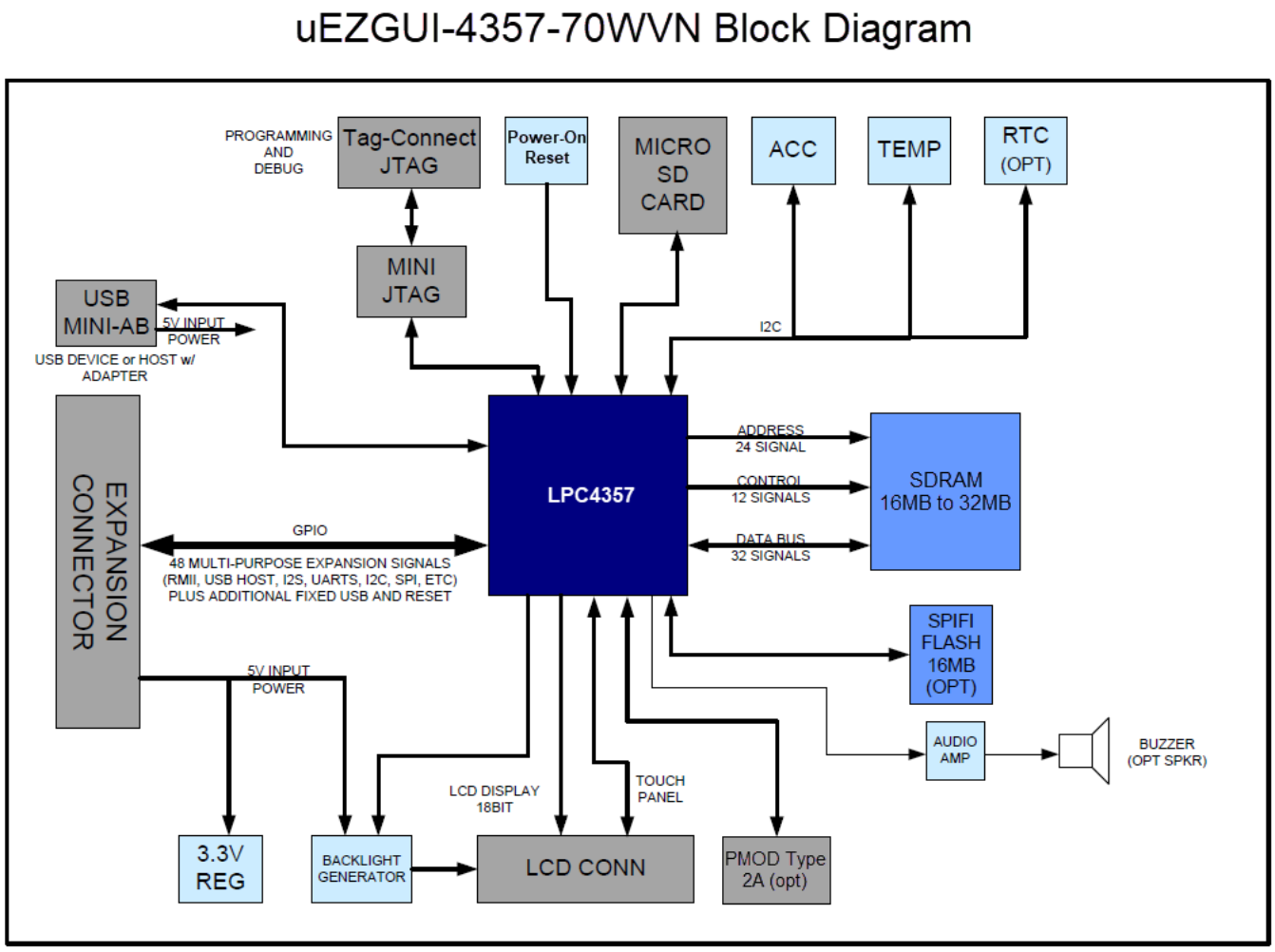


Figure 1 – UEZGUI-4357-70WVN-BA Block Diagram

3. Kit Contents for FDI PN: UEZGUI-4357-70WVN

- UEZGUI-4357-70WVN-BA module with 7.0" Capacitive Touch Screen LCD
- SEGGER J-Link Lite Cortex-M Debug Probe
  - 9 Pin Ribbon Cable (Keyed)
- Micro SD card
- USB Type A to USB Type Mini B Cable (2x)
- Universal AC to 5V USB plug Power Supply
- Quick Start Guide

4. Useful links

Complete Users Manuals, Schematics, and documentation are available on the Micro-SD card provided with the µEZ GUI Kit and are also available from the following websites (please refer to the websites for the latest updates):

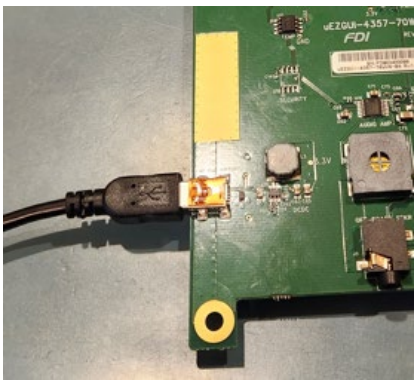
- Future Designs Support Page - http://www.teamfdi.com/support/
- µEZ Source Code, user's manuals, and quick start guides - https://sourceforge.net/projects/uez/
- SEGGER Mini-JTAG Debugger - http://www.SEGGER.com/cms/jlink-software.html
- Rowley CrossWorks IDE download for 30-day evaluation - http://www.rowley.co.uk/arm/index.htm

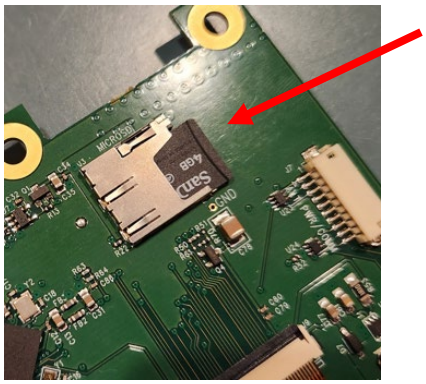
5. Functional Description

- LPC4357 204 MHz Cortex-M4 and -M0 Microcontrollers
- SDRAM 16MB, optional up to 32MB
- SPIFI Serial Flash 16MB
- Internal on-chip 4KB EEPROM
- RTC – Real Time Clock with Optional Super Capacitor backup
- Temperature Sensor
- 3-axis Accelerometer
- Speaker
- Micro-SD Card Socket for up to 64GB SDHC storage, microSD card included with kit only
- Mini JTAG connector
- PMOD Type 2A connector
- Power-on Reset Generator - power-on reset supervisor and voltage monitor (SW1)
- Expansion Connector for customer specific applications

6. Startup procedure

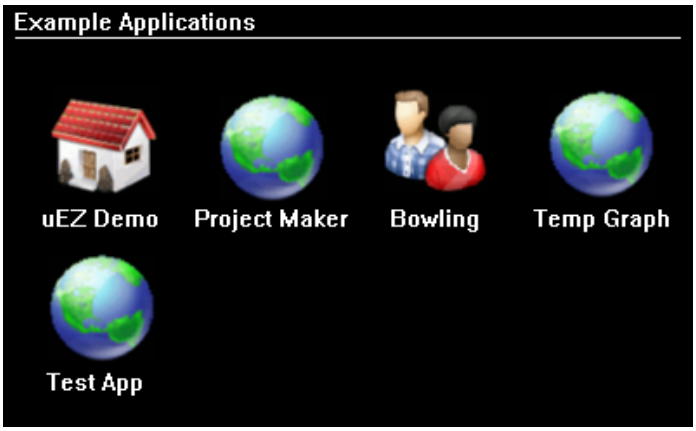
The µEZ GUI kit comes with a pre-installed micro-SD card that contains files required for the various demos to run. It also contains users' manuals, schematics, and documentation for the product.





Power is supplied via the USB cable provided in the kit. To power on the unit connect the USB cable to the USB power adapter provided in the kit and to P1, the mini-AB USB connector. DO NOT try to power the unit from a standard computer USB port. It does not provide enough power.

The following screen should appear once power has been applied to the kit:



At this point the unit is ready for software demonstrations and user operation.

7. Demonstration Software

Note: The Demonstration Software is subject to change at any time.

The following software demonstrations are available from the Main Menu:

a) Example Applications

- **uEZ Demo** – this will install the main µEZ GUI demo application, which demonstrates the capabilities of uEZ GUI to display slideshows, play videos, and store data. This will be covered in more detail below

- **Bowling** – This demonstration is an example of a bowling alley user interface.

- **Project Maker** – This is a demonstration example application developed using the Project Maker utility from Future Designs, Inc. Currently, this demonstration is a Temperature and Time/Date application.
  - **Sensors**
    Select the Sensor button to display on-board accelerometer readings and the temperature from the on-board temperature sensor. To return to the main menu, select 'Back'.
  - **Time and Date**
    Select this feature to display the current time and date from the internal real time clock (RTC).
    - To change the time or date:
      1. Select the field you want to change.
      2. Enter the numeric value.
      3. Select 'Enter'.
      4. Select 'Cancel' if you do not want to change the field. Or, wait until the entry screen times out and returns to the Time Date Settings screen.
    - If invalid values are entered, the software will default to the maximum valid value for the field.
    - Once set, an on-board super capacitor will back-up the time and date for several days (typically) while the unit is powered off.
    - Select 'Back' to return to the Settings Menu.

- **Temp Graph**
  The temp graph demonstrates the use of emWin and interfacing with the on-board temperature sensor and real time clock (RTC) to draw a graph of the device's temperature and the humidity level within the room, as well as show the time and date.
- **Test App**
  The test application is a simple GUI app for testing various uEZ GUI features, such as the SD card's storage using a slideshow, reading, and writing to a file, and the touchscreen.

b) uEZ Demo

- **Slideshow**

Selecting the film reel icon demonstrates the uEZGUI's capability to display a series of slides from different subfolders. The process for creating a slideshow is detailed in section 8 below.

- **Brightness**

Selecting the brightness icon under Settings shows a menu with color bars and a brightness adjustment slider.

- Move the slider up or down to adjust the brightness.
- Select 'Back' to return to the Settings Menu.

- **Time/Date**

Located under Apps, use this application to set the time and date from the internal real time clock (RTC). This is the time and date displayed in the Settings menu upper right corner.

- To change the time or date simply select the field you want to change:
  1. Enter the numeric value
  2. Select 'Enter'
  3. Select 'Cancel' if you do not want to change the field, or simply wait until the entry screen times out and returns to the Time Date Settings screen
- If invalid values are entered, the software will default to the maximum valid value for the field.
- Once set an on-board super capacitor will back-up the time and date for several days (typically) while the unit is powered off.
- Select 'Back' to return to the Settings Menu.

- **Video Player**

This feature demonstrates the uEZ GUI's capability to play videos. The process for creating a video for a uEZGUI is detailed below in section 9.

- **emWin Demo**

emWin is software used by uEZGUI for creating UI elements such as buttons, icons, etc.
This is a short, automated demo that gives the user a short example of the various GUI applications that emWin software can be used for

8. Setting up a Slideshow

We have created a document and included tools for creating your own slideshows for µEZ GUI units. Production module units require 24-bit uncompressed Targa (.TGA) format for all images. Development kit units require bitmap (.BMP) format for all slideshow images.

https://www.teamfdi.com/wp-content/uploads/Converting-a-PowerPoint-Slideshow-for-use-on-uEZGUI-Products-.zip

This guide also covers making speaker notes that can play alongside your slides.

9. Setting up a Video

Suggested procedures on creating videos for playback using the µEZ video player provided in µEZ v2.05 (and later) on supported µEZ GUI hardware, is available in the FDI Video Creation Guide (link below). This guide also suggests basic procedures for downloading videos from YouTube.
This guide assumes that a source video is available in AVI uncompressed format with a resolution of 480×272 or greater.

Video Creation Guide:
http://www.teamfdi.com/public_html/uez/Video/uEZ%20Auto%20Video%20Conversion%20Guide.pdf

10. µEZ Doxygen online HTML documentation

µEZ has built-in comment documentation that follows the Doxygen comment standard. This standard writes code comments and annotations in a certain manner so that it is compiled along with source code into HTML documentation.

FDI provides pre-compiled HTML documentation at this link: http://www.teamfdi.com/uez/docs/

In the µEZ source code, "uEZ/uEZDoxyfile" is the main project file for the Doxygen generator. When Doxygen is recompiled, the new Doxygen files will be found here: uEZ\Docs\ Doxygen_Documentation.html

FDI updates the documentation periodically. We recommend reviewing your device for updates to the documentation as you learn a new µEZ® release or drivers are added to the system.

For more information, see the Doxygen website: http://www.stack.nl/~dimitri/doxygen/

11. µEZ Bootloader

The uEZ bootloader allows users to install their own applications without the need for special tools like Jlink. All that is needed is an SD card or USB drive. The bootloader consists of two primary components: The Base Bootloader (BBL), which contains a base set of functions and never changes, and the Application Bootloader (ABL) that contains the intelligence needed to program internal and external flash memory and can be updated dynamically since it is loaded from local memory such as an SD card or USB drive.

Each time the unit is powered on or reset, the BBL will look to see if an application is already installed, and if so, control is passed to the ABL which then launches the application. If no application is found, the BBL will search for the

necessary files on an SD Card or USB drive, and if found, installs the ABL before passing control to it so the application may be installed and booted. If no application and no SD card/USB drive are found, the user is prompted to install an SD card/USB drive with the appropriate files.

The demo kit comes with an 8GB SD card on which are several demos for the user to try out. Out of box, the uEZGUI comes preinstalled with a unique 'bootloader application' that allows the user to select one of these demos to install.

The uEZ bootloader can be configured using the file named INSTALL.INI located in one of the demo applications' folders. When "rename=true", and after an application is installed, the file INSTALL.INI in the root of the SD card is renamed to INSTALL.FIN, which when viewed by the uEZ bootloader, will indicate that the application installation is final. At this point, every time the uEZGUI is powered on or reset, the bootloader will boot to the installed application.

This can be undone by renaming the INSTALL.FIN file back to INSTALL.INI. Doing so will allow the uEZ bootloader to boot back to the demo selection screen and permit the user to install a different application.

12. µEZ Project Maker

FDI has provided a project maker to help create new projects for µEZ GUI hardware. It is available for download at http://sourceforge.net/projects/uez/.

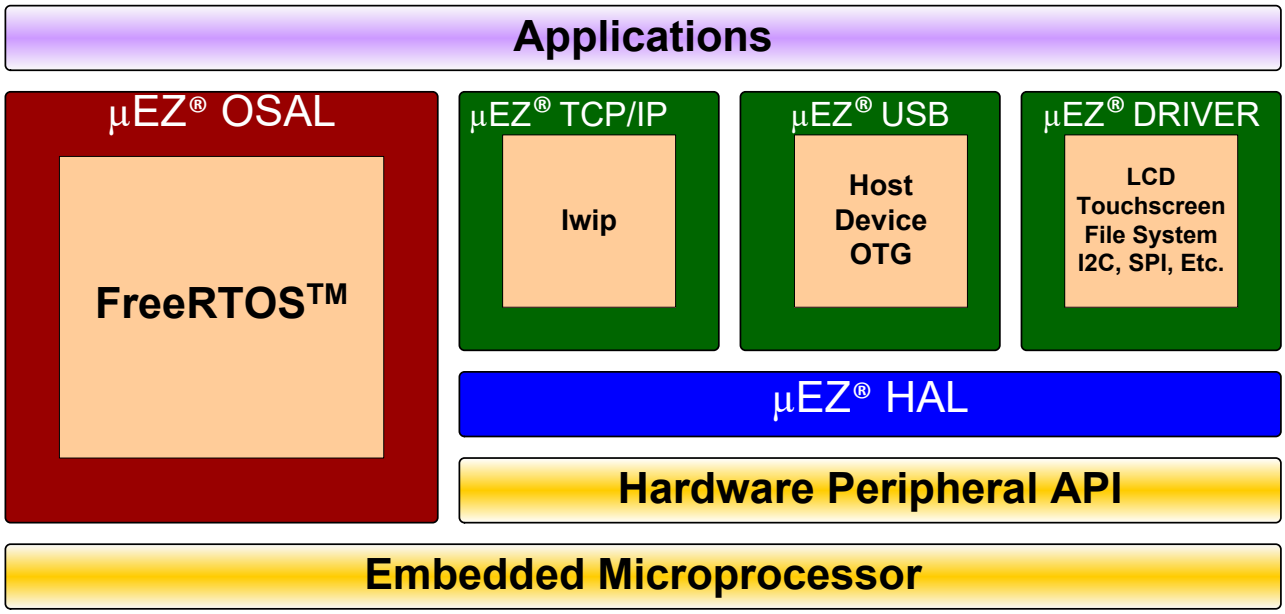
To create a new project, download the application, run the executable file, and follow the onscreen instructions. It will create a demo project using an emWin example GUI that will provide basic peripheral functionality. The project maker greatly speeds up the development process for new applications. Example projects are ready to be compiled and programmed onto µEZ GUI hardware using the included J-Link debugger, with no extra project configuration necessary.

13. Software

µEZ® takes its name from the Muses of Greek mythology. A Muse was a goddess who inspired the creation process for the arts and sciences. Like its ancient Greek namesake, the **µEZ®** platform inspires rapid development by supplying customers with an extensive library of open-source software, drivers, and processor support - all under a common framework. **µEZ®** development works on the premise of "design once, reuse many times". This provides an open-source standard for embedded developers to build upon and support. **µEZ®** allows companies to focus on innovation and on their own value-added applications while minimizing development time and maximizing software reuse.

The diagram below shows a typical embedded application stack. **µEZ®** has three primary categories of components that help simplify embedded application development:

1. **Operating System Abstraction Layer (µEZ® OSAL)**
2. **Sub-system drivers (µEZ® TCP/IP, µEZ® USB, µEZ® Driver)**
3. **Hardware Abstraction Layer (µEZ® HAL)**



The selection of an RTOS can be one of the most daunting aspects of an embedded system development. With **µEZ®** the primary features of common multi-tasking operating systems are abstracted, thus easing the transition to an open source or low-cost RTOS. The **µEZ®** OSAL provides applications access to the following features in an OS-independent fashion:

- Pre-emptive multitasking
- Stack overflow detection
- Unlimited number of tasks
- Queues
- Semaphores (binary, counting, mutex)

The **µEZ®** sub-system drivers utilize the OSAL functions to provide protected access to the processor peripherals. The sub-system driver API functions are typically protocol layer interfaces (TCP/IP, USB, etc.) designed as high-level access routines such as open, close, read, write, etc. where possible.

µEZ® is ideally suited for Embedded Systems with standard features such as:

- Processor and Platform BSPs (Board Support Packages)
- Real Time Operating System (RTOS)
- Memory Management
- NAND/NOR Flash
- SDRAM and DDR Memory
- TCP/IP stack
- USB Device/Host Libraries
- Mass Storage Devices
- LCD Displays with Touch Screen
- Input / Output Devices

14. Configuring Micro SD Card for High Clock Frequency

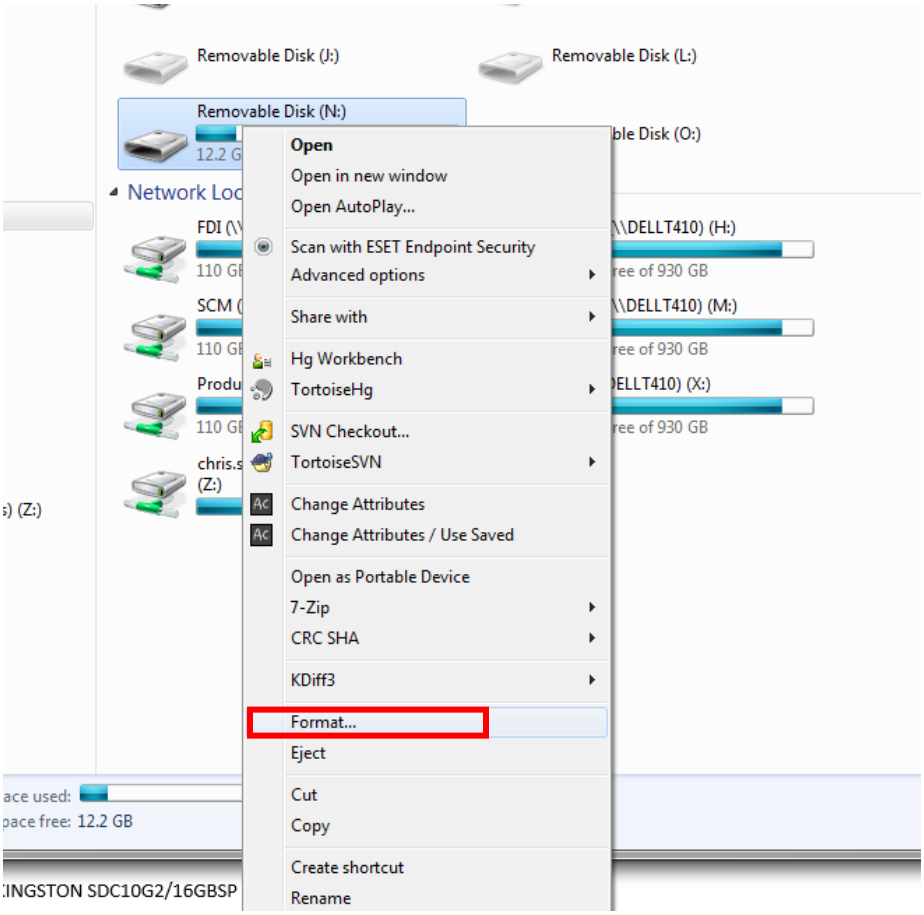
The LPC4357 can run the High-Speed SD Card Interface at a much higher speed, and the software is configured by default to do so. The cards should be of good quality and have at least a class 10 rating. Below are some examples of cards that FDI has tested and qualified.

- Kingston SDC10G2/16GBSP
- Kingston SDCA10/16GBSP

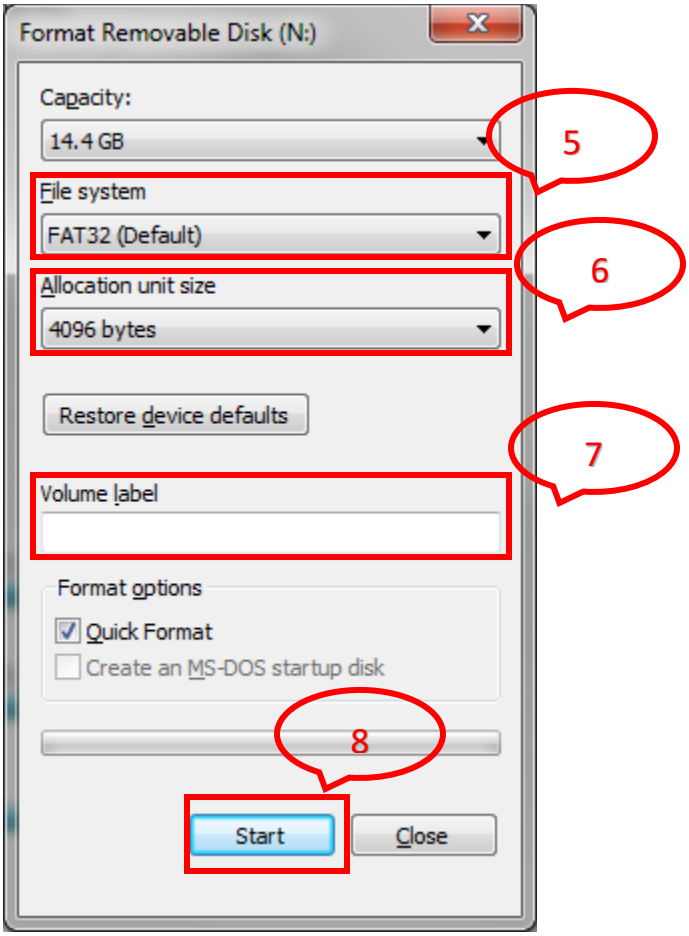
SD Card Formatting

For the best results the SD card should be formatted in a particular way, this is especially important when playing videos from the unit. Follow the steps below on a Windows based PC to format the SD Card.

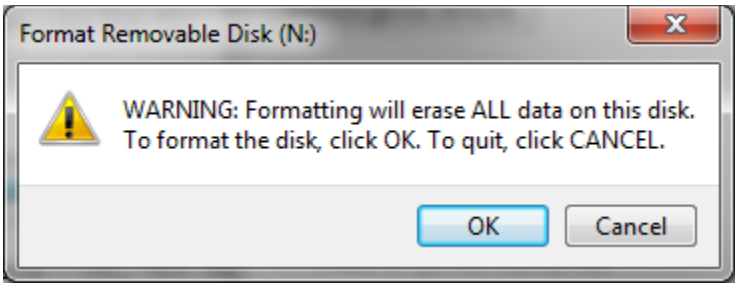
1. Insert the card into the PC.
2. Open My Computer.
3. Right click on the Removable Disk.
4. Select Format from the menu.



5. Change the File System to "Fat32" if not already selected.
6. Change Allocation unit size to "4096 bytes"
7. Enter a volume label if desired (optional)
8. Click <Start>.



9. Before Clicking <OK> in the warning dialog box be sure the card does not have importuning information on it.

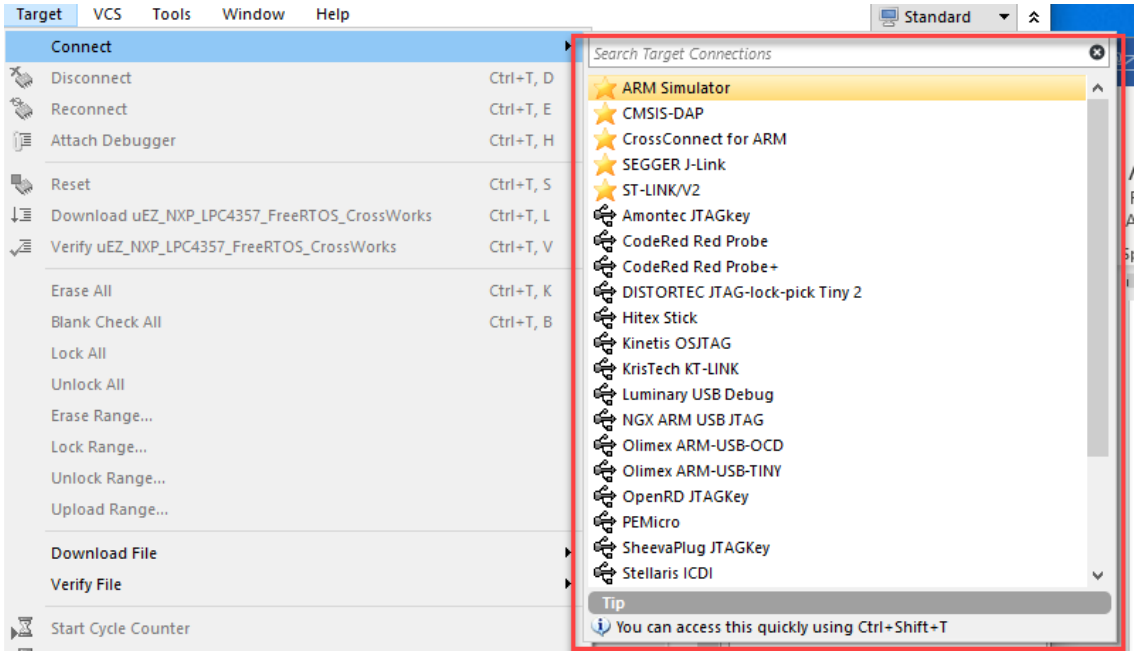


10. Click <OK> on the format complete dialog box.

The SD Card is now ready for use with the uEZGUI-4357-70WVN.

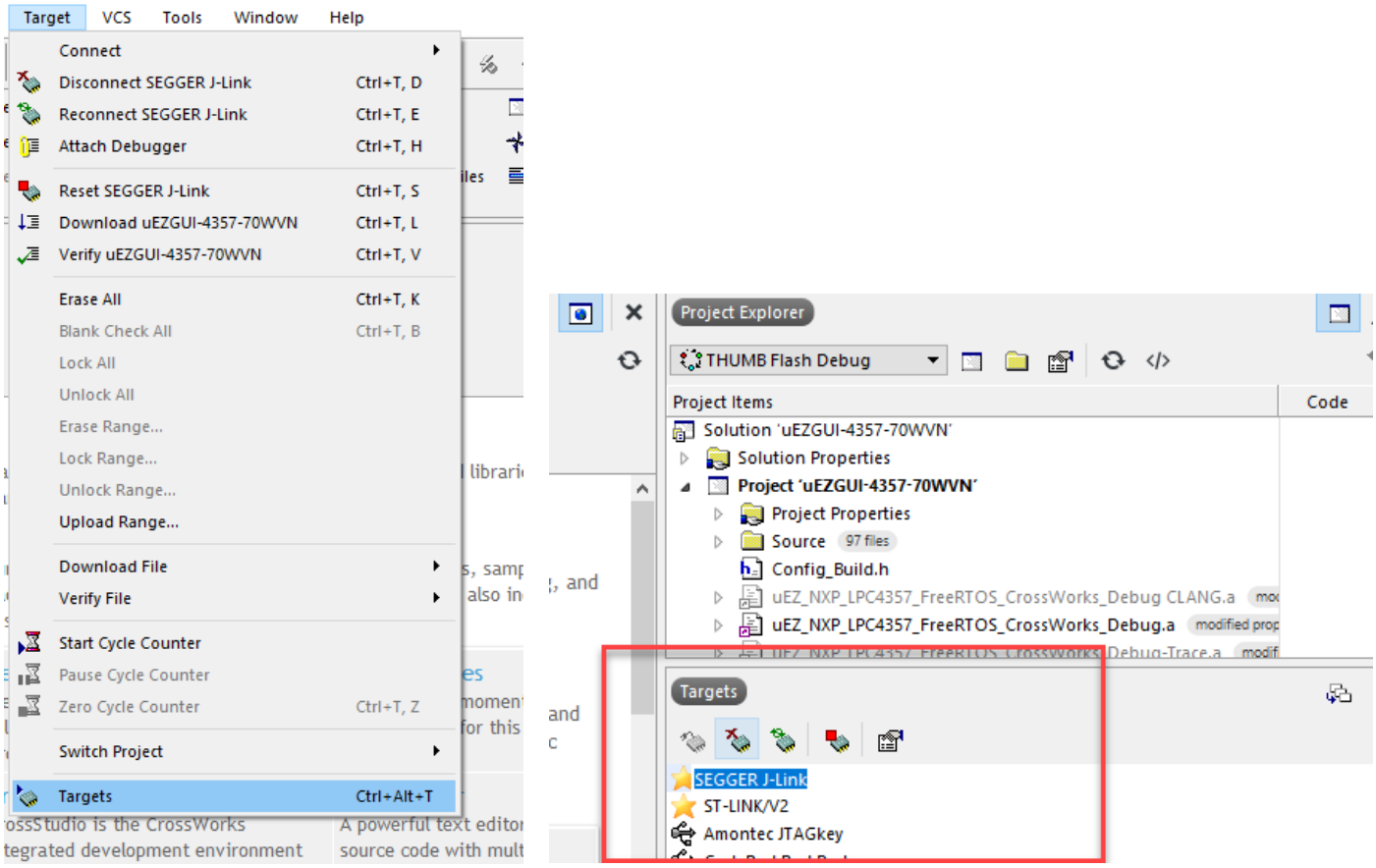
15. Configuring Rowley CrossWorks for ARM® for J-Link Flashing

1) See the document "uEZ® Software Quick Start Guide" for details on how to download the µEZ® source code and setup the Rowley CrossWorks compiler. (http://www.teamfdi.com/products/uez/manual/MA00015%20uEZ%20Software%20Quickstart%20Guide.pdf) software quick start guide
2) Plug in the J-Link device into the PC and install any drivers as directed. The SEGGER J-Link drivers can be found at http://www.SEGGER.com/cms/jlink-software.html with additional information at http://www.SEGGER.com/cms/development-tools.html.
3) Plug in the J-Link's JTAG connector to the µEZ GUI board at J1 with the JTAG adapter.
4) Select **Target** menu and choose **Connect**. The following list will appear to the right.

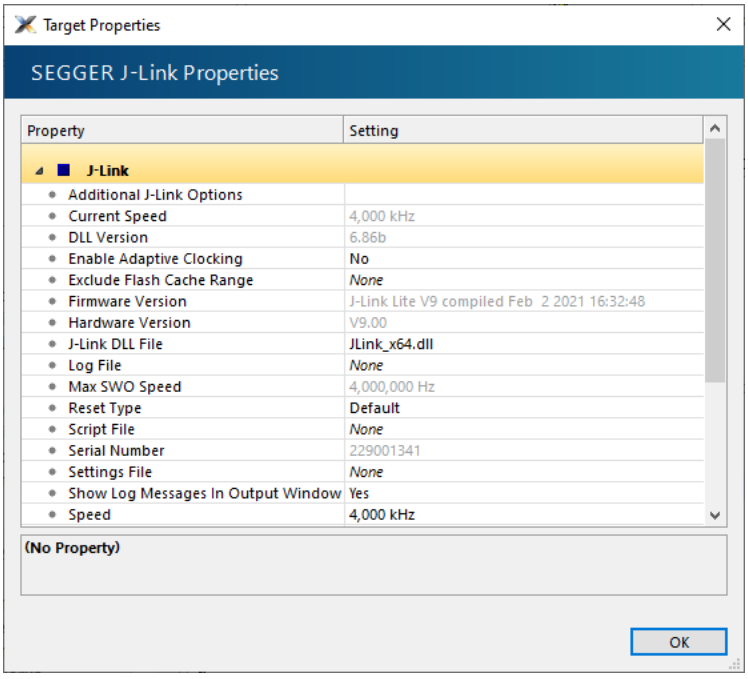


5) Click on "SEGGER J-Link".

6) Open the Targets view by clicking **Target > Targets**



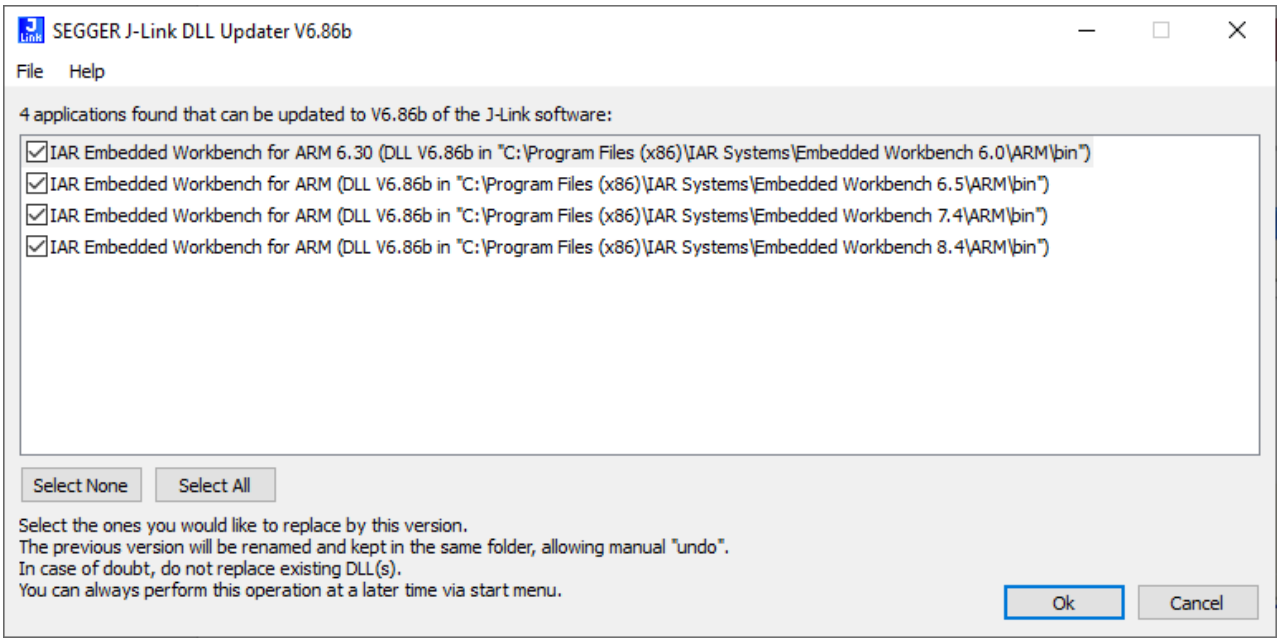
7) Right click on **SEGGER J-Link** and select **Properties.**



8) If programming a blank LPC4357 part, select a Speed of 100 kHz. If the part has already been programmed, select a Speed of 1000 kHz.
9) Press **OK.**

16. Configuring IAR EWARM v9.30.1 for J-Link Flashing

The IAR tools do not require any special configuration for configuring the J-Link tools. To update IAR's J-Link dll you just need to run SEGGER's J-Link DLL Updater (located in the SEGGER directory under Program Files) and select the IAR installation(s) you wish to update and click Ok.



17. Board Layout

The following figure illustrates the layout of the various components of the UEZGUI-4357-70WVN kit. They are for reference only and are subject to change.

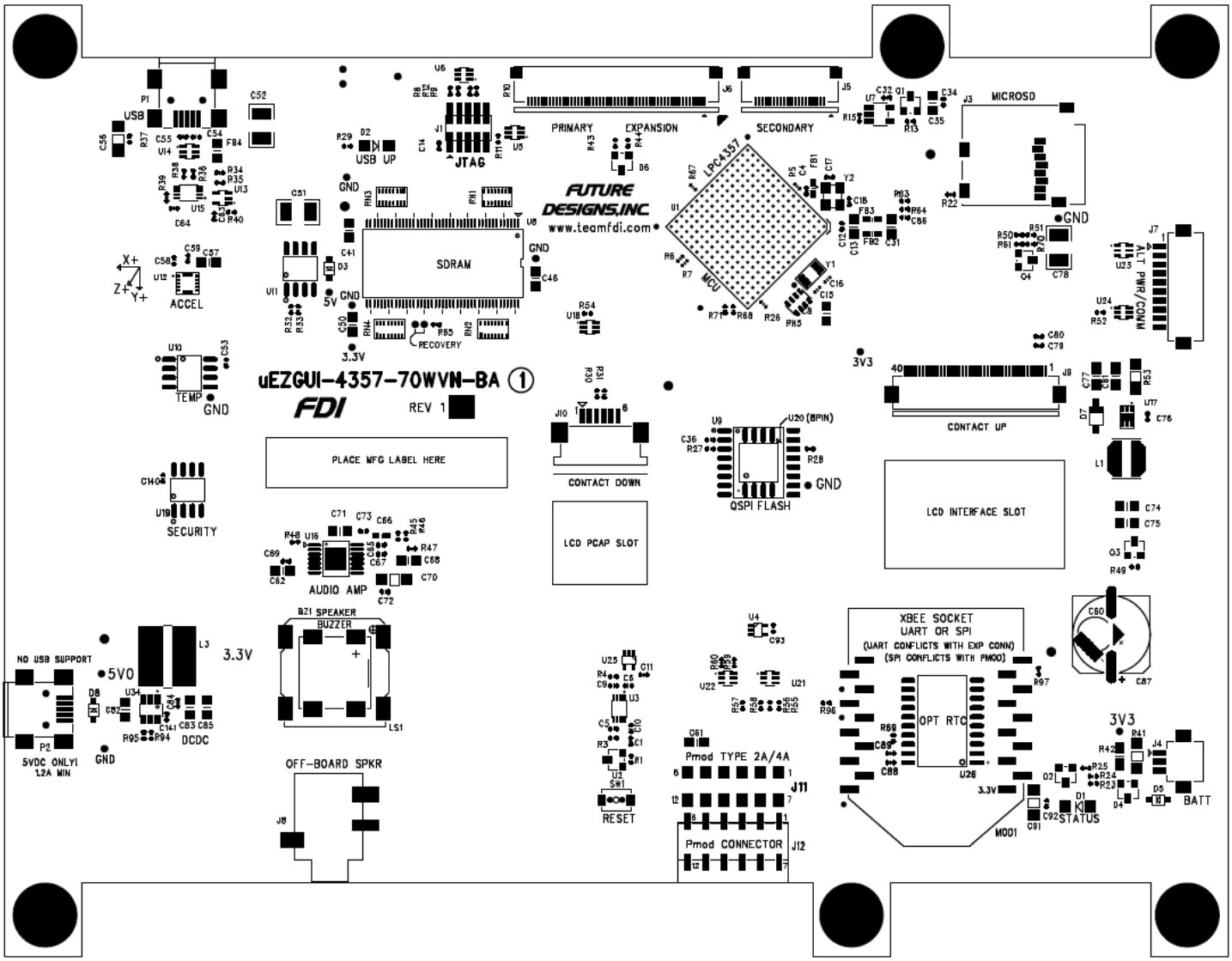


Figure 2 – UEZGUI-4357-70WVN-BA Component View

18. I/O Connector Descriptions

J1 - JTAG Connector

The UEZGUI-4357-70WVN-BA uses a reduced size JTAG connector based on a 0.050" Header. This smaller connector provides 100% of the functionality of the standard 20-pin JTAG connector but utilizes 70% less board space. The connector is a standard part available from most major vendors.

Pin Number	Description	Pin Number	Description
1	3.3V	2	TMS
3	Ground	4	TCK
5	Ground	6	TDO
7	No Connect	8	TDI
9	No Connect	10	RESETn

The connector part number is PN: SAMTEC FTSH-105-01. Kits come with the SEGGER J-Link Lite Cortex-M shown below, and no adapter will be needed.

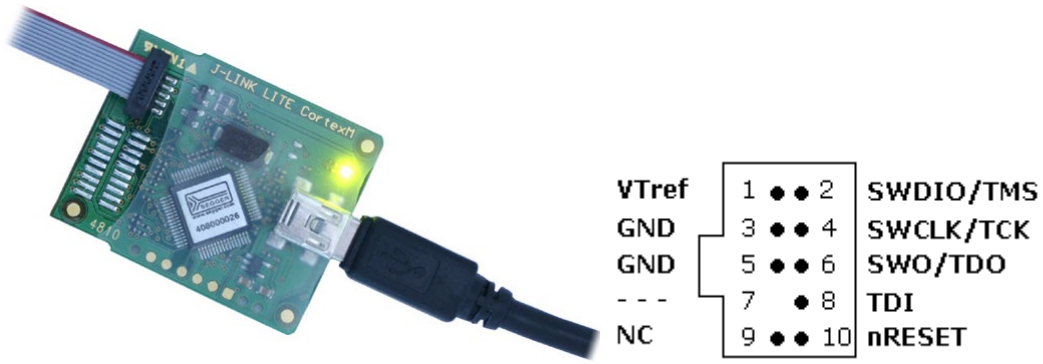


Figure 3 – SEGGER J-Link Lite Cortex-M 9-Pin JTAG with pinout (Rev 2.X+)

SEGGER and OLIMEX both provide adapters to convert the standard 20-pin JTAG to the new ARM 9-pin JTAG. The SEGGER adapter also allows for connecting TRST using a solder bridge if needed. These adapters have female pins and are only compatible with 20-pin JTAG units that have male pins. Both adapters come with the required cable.

- SEGGER 9-pin adapter - http://www.SEGGER.com/jlink-adapters.html#CM_9pin
- OLIMEX 9-pin adapter - https://www.olimex.com/Products/ARM/JTAG/ARM-JTAG-20-10/

J2 - Tag Connect

The UEZGUI-4357-70WVN-BA also includes the ability to JTAG and program using the Tag-Connect TC2050-ARM2010 ARM 20-pin to TC2050 Adapter.

- Adapter: http://www.tag-connect.com/TC2050-ARM2010
- Cable with legs: http://www.tag-connect.com/TC2050-IDC
- Cable with no legs: http://www.tag-connect.com/TC2050-IDC-NL
- Holding clip for no-legs cable version: http://www.tag-connect.com/TC2050-CLIP

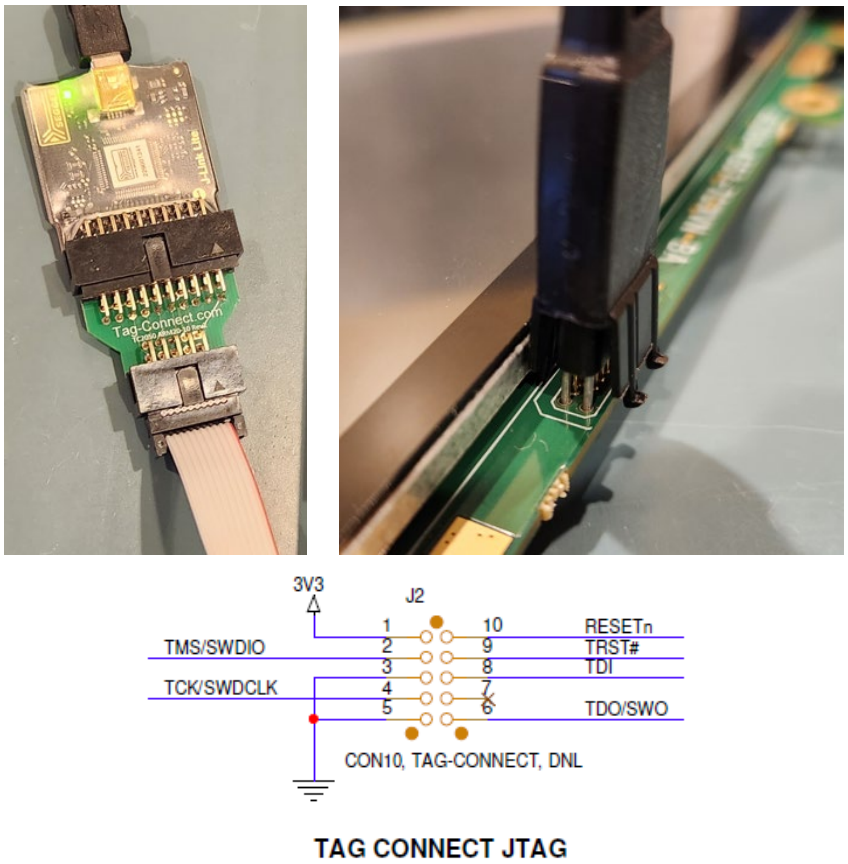


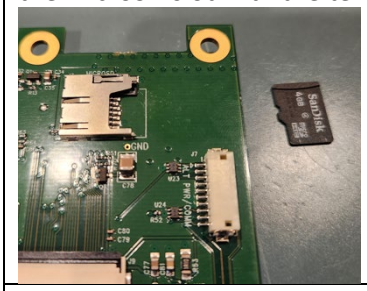
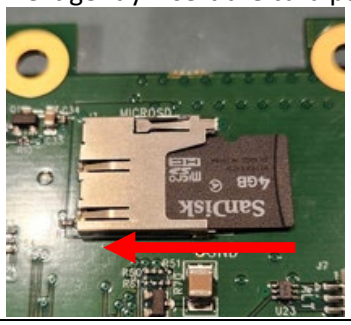
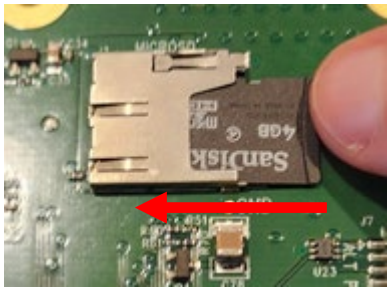
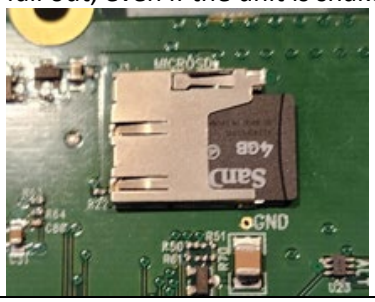
Figure 4 – Tag-Connect JTAG adapter, cables, and pinout for 10-pin TC2050

J3 - MicroSD Socket

When connected to the USB Host port on a PC, the UEZGUI-4357-70WVN-BA will appear as a USB Flash Drive to the PC, allowing the user to read and write files directly to the MicroSD card. The unit uses a MicroSD Socket for flexible mass storage capability. µEZ™ supports MicroSDHC and SDHC Cards up to 64GB. This interface uses 4-wire SD mode.

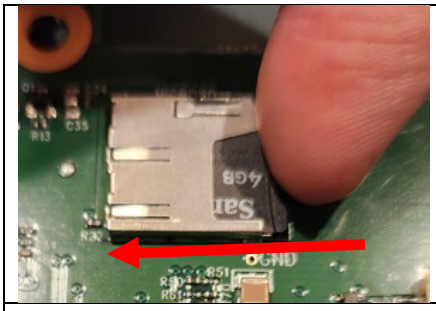
Pin Number	Description
1	Micro SD DAT2
2	Micro SD DAT3
3	Micro SD CMD
4	3.3V
5	Micro SD SCLK
6	Ground
7	Micro SD DAT0
8	Micro SD DAT1
9	Micro SD CD
10	Micro SD CD
11	Ground
12	Ground

WARNING: The microSD card must only be removed using the spring loaded "push-pull" mechanism on the microSD socket. Improper forceful removal of the microSD card will result in permanent damage to the socket that is not covered under warranty. To insert the card, just push it into the socket until a "click" sound is heard.

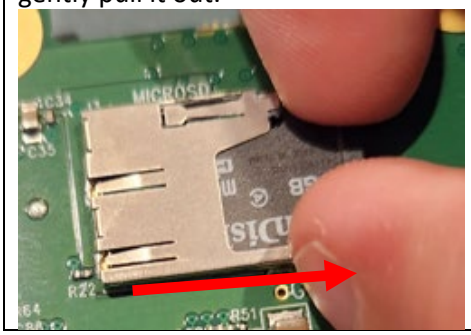
Start with the microSD card in this position relative to the microSD slot with the text and "lip" facing up. 	Next gently insert the card partially into the socket. 
Use your figure to gently push the card into the socket until it clicks. 	At this point the microSD card is fully inserted. It should not fall out, even if the unit is shaken vigorously. 

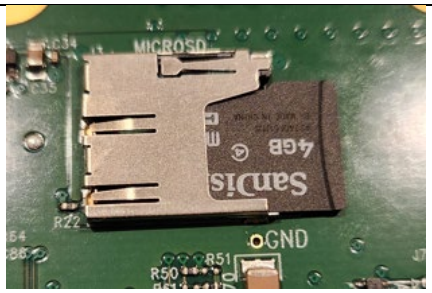
To remove the microSD card, press the card back into the socket until another "click" sound is heard, then release pressure on the card. At this point, the card should be partially ejected from the socket. Finally grab the card and gently pull to remove it. See the following pictures for proper micro-SD removal:

To remove the microSD card, gently push it into the socket again until it "clicks", and then release your figure.	At this point, the microSD card should partially stick out of the socket.

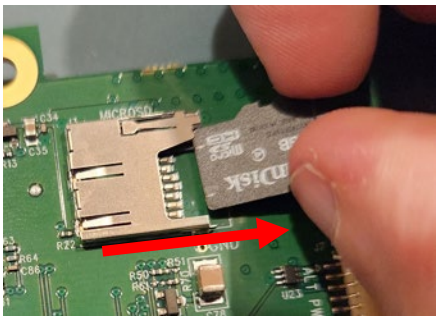


Carefully grab the edges or sides of the microSD card and gently pull it out.

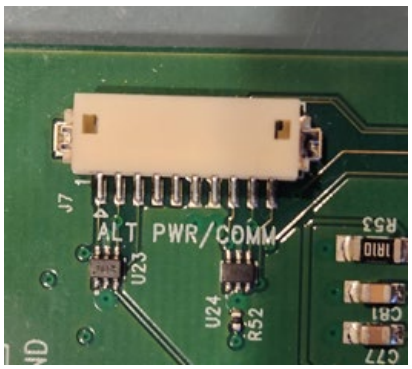




At this point the microSD card is fully removed from the socket.



J7 - Alternate Power and communication

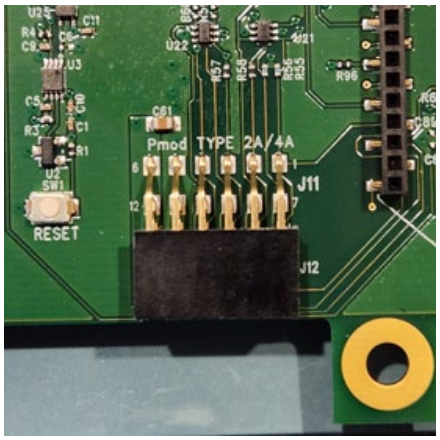


The UEZGUI-4357-70WVN-BA includes an alternate power and communication header. This header provides access to UART 3, I2C Channel 1, SPI Channel 0, GPIO, Counter/Timer Input/Output, as well as a 5V power input. This connector is a 1.25mm Hirose male, shrouded connector. The Hirose Part Number is: DF13A-10P-1.25H (20) (Digikey PN: H3375-ND). Refer to the schematic for specific connectivity.

Pin Number	Description	Pin Number	Description
1	GPIO4.13/MISO0	6	Ground
2	GPIO4.14/MOSI0	7	Ground
3	SSP0SCK (1)	8	GPIO5.4/RXD3/SCL1/CTIN0
4	5V Input	9	GPIO5.3/TXD3/SDA1/CTIN0
5	5V Input	10	GPIO2.4/DAC/CTOUT2

Note (1) – this signal is not GPIO capable

J11 - PMOD Type 2A Connector

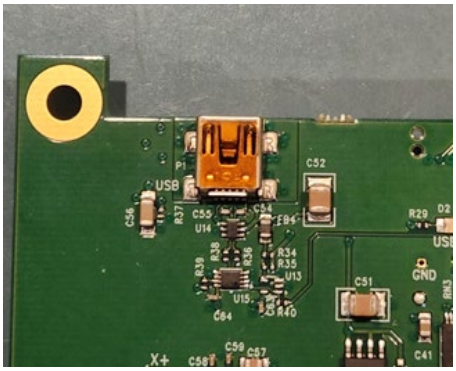


The UEZGUI-4357-70WVN-BA includes a PMOD Type 2A (SPI) connection to an expansion board. Refer to the schematic for specific connectivity.

Pin Number	Description	Pin Number	Description
1	SPI Chip Select	7	Interrupt Request
2	SPI MOSI	8	Reset
3	SPI MISO	9	Optional I2C SCL (1)
4	SPI Clock	10	Optional I2C SDA (1)
5	Ground	11	Ground
6	3.3V	12	3.3V

Note (1) – These signals are not available in the standard configuration

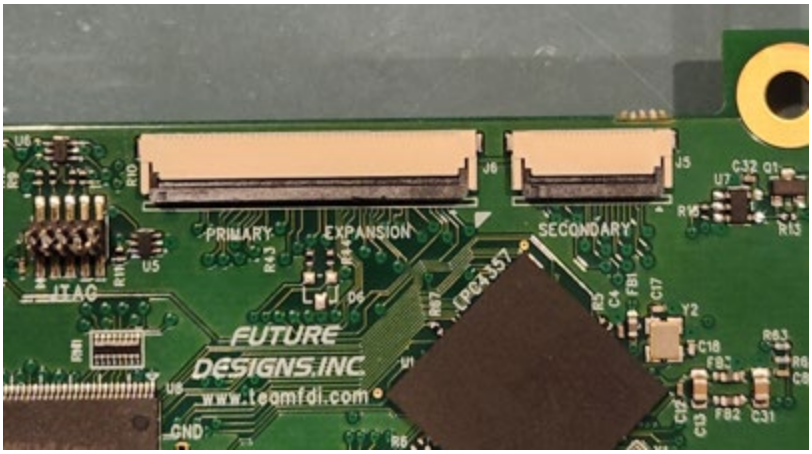
P1 – USB mini-AB port and USB Power Input 5VDC



The UEZGUI-4357-70WVN-BA has a mini-AB USB connector for host or device mode. By using a USB OTG adapter (with a Mini-A plug) it will short the ID pin 4 to ground. This can be used for host mode detection in the application. The UEZGUI-4357-70WVN-BA is normally powered via P1 with the included 5V USB Wall Supply or via a standard 500mA powered USB port. This power supply is only included in the development kit and is not included with the UEZGUI-4357-70WVN -BA.

Pin Number	Description
1	5V
2	D-
3	D+
4	ID
5	Ground

J5 & J6 - Expansion Connectors



The UEZGUI-4357-70WVN-BA includes two expansion connectors that provide a wide variety of capabilities for user expansion, ranging from 10/100 Ethernet to USB Host, etc. **Please Note:** When using I/O signals on the µEZ GUI Expansion Connectors (J5 & J6) to connect via the customers Expansion Board to external connectors or signals, ***it is the customer's responsibility to provide adequate ESD protection and filtering to prevent damage to any pins that are not directly protected on the µEZ GUI. Any damage caused by improper connectivity is not covered under warranty.***

The tables below provide the pinout and signal names available on these connectors:

J6 Signal Details

Pin	Pin Name	Pin Description	
1	Ground (GND)		Power
2	GPIO5.4/I2C1_SCL/RXD3/CTIN0/ T3_MAT1	GPIO5.4 – General Purpose I/O	I/O
		I2C1_SCL – I2C Channel 1 Serial Clock	I/O
		RXD3 – UART Channel 3 Receive Data	I
		CTIN0 – SCT Input 0 of timer 0, 1, 2, 3	I
		T3_MAT1 – Match Output 1 of timer 3	O
3	GPIO5.3/I2C1_SDA/TXD3/CTIN1/ T3_MAT0	GPIO5.3 – General Purpose I/O	I/O
		I2C1_SDA – I2C Channel 1 Serial Data	I/O
		TXD3 – UART Channel 3 Transmit Data	O
		CTIN1 – SCT Input 1 of timer 0, 1, 2, 3	I
		T3_MAT0 – Match Output 0 of timer 3	O
4	GPIO4.12/SSP0_SSEL	GPIO4.12 – General Purpose I/O	I/O
		SSP0_SSEL – SPI Channel 0 Slave Select	I/O
5	GPIO3.8/CT_OUT14	GPIO3.8 – General Purpose I/O	I/O
		CT_OUT14 – SCT output 14, Match output 2 of timer 3	O
6	GPIO6.2/RTS1/ADC1.0	GPIO6.2 – General Purpose I/O	I/O
		RTS1 – UART Channel 1 Request to Send	O
		ADC1.0 – ADC Channel 1 input 0	I
7	GPIO6.1/CTS1	GPIO6.1 – General Purpose I/O	I/O
		CTS1 – UART Channel 1 Clear to Send Input	I
8	GPIO6.13/RXD1	GPIO6.13 – General Purpose I/O	I/O
		RXD1 – UART Channel 1 Receive Data	I
9	GPIO6.12/TXD1	GPIO6.12 – General Purpose I/O	I/O

Pin	Pin Name	Pin Description	
		TXD1 – UART Channel 1 Transmit Data	O
10	Ground (GND)		Power
11	USB1_DM	USB_D- 1 - USB port 1 bidirectional D- line.	I/O
12	USB1_DP	USB_D+1 - USB port 1 bidirectional D+ line.	I/O
13	GPIO5.5/CTIN2/T3_MAT2/USB1_VBUS	GPIO5.5 – General Purpose I/O	I/O
		CTIN2 – SCT input 2. Capture input 2 of timer 0	I
		T3_MAT2 – Match output 2 of timer 3	O
		USB1_VBUS – USB Channel 1 VBus input	I
14	GPIO4.11/MCOB1/USB1H_OVC/RXD0	GPIO4.11 – General Purpose I/O	I/O
		MCOB1 – Motor Control PWM Channel 1 output B	O
		USB1H_OVC – USB Channel 1 Power Fault (same as USB1_PWR_FAULT)	I
		RXD0 – UART Channel 0 Receive Data	I
15	GPIO5.18/MCOA1/USB1H_PPWR/TXD0	GPIO5.18 – General Purpose I/O	I/O
		MCOA1 – Motor Control PWM Channel 1 output A	O
		USB1H_PPWM – USB Channel 1 Host VBus Drive Signal	O
		TXD0 – UART Channel 0 Transmit Data	O
16	GPIO4.14/MCOB2/I2STX_SDA/MOSI0	GPIO4.14 – General Purpose I/O	I/O
		MCOB2 – Motor Control PWM Channel 2 output B	O
		I2STX_SDA – I2S Audio Transmit Serial Data	I/O
		MOSI – SPI Channel 0 Master Output, Slave Input Serial Data	I/O
17	GPIO4.13/MCOA2/I2STX_WS/MISO0	GPIO4.13 – General Purpose I/O	I/O
		MCOA2 – Motor Control PWM Channel 0 output A	O
		I2STX_WS – I2S Audio Transmit Word Select	I/O
		MISO0 – SPI Channel 0 Master Input, Slave Output Serial Data	I/O
18	I2STX_SCK/SSP0SCK	Connected to pin F13 of LPC4357 BGA (P3_0)	I/O
		I2STX_SCK – I2S Audio Transmit Clock	I/O
		SSP0SCK – SPI Channel 0 Serial Clock	I/O
19	GPIO5.9/I2SRX_SDA/CAN0TD	GPIO5.9 – General Purpose I/O	I/O
		I2SRX_SDA – I2S Audio Receive Serial Data	I/O
		CAN0TD – CAN Channel 0 Transmit Data	O
20	GPIO5.8/I2SRX_WS/CAN0RD	GPIO5.8 – General Purpose I/O	I/O
		I2SRX_WS – I2S Audio Receive Word Select	I
		CAN0RD – CAN Port 0 Receive Data	I
21	I2SRX_SCK	Connected to pin M12 of LPC4357 BGA (P6_0) I2SRX_SCK – I2S Audio Receive Clock	I
22	Ground (GND)		Power
23	RESET_INn	External reset input: A LOW on this pin resets the device, causing I/O ports and peripherals to take on their default states, and processor execution to begin at address 0. TTL with hysteresis, 5 V tolerant	I
24	RESET_OUTn	RSTOUT - This is a 3.3 V pin. LOW on this pin indicates LPC4357 being in Reset state	O
25	GPIO2.4/DAC/CTOUT2	GPIO2.4 – General Purpose I/O	I/O
		DAC – DAC Output	O
		CTOUT2 – SCT Output 2, Match output 2 of timer 0	O
26	GPIO2.1/ADC0.1/CTOUT1	GPIO2.1 – General Purpose I/O	I/O
		ADC0.1 – ADC0 & ADC1, input channel 1	I
		CTOUT1 – SCT Output 1, Match output 3 of timer 3	O
27	GPIO0.12/ENET_MDIO/U2_UCLK/ T0_CAP3/CAN1_TD	GPIO0.12 – General Purpose I/O	I/O
		ENET_MDIO – Ethernet MIIM data input and output	I/O
		U2_UCLK – UART Channel 2 Serial Clock input/output	I/O
		T0_CAP3 – Capture input 3 of timer 0	I
		CAN1_TD – CAN Channel 1 Transmit Data	O
28	GPIO6.0/ENET_MDC/T3_CAP0/U1_RI	GPIO6.0 – General Purpose I/O	I/O

Pin	Pin Name	Pin Description	
		ENET_MDC – Ethernet MIIM Clock	O
		T3_CAP0 – Capture input 0 of timer 3	I
		U1_RI – UART Channel 1 Ring Indicator	I
29	Ground (GND)		Power
30	ENET_REFCLK/SSP1_SCK	ENET_REFCLK – Ethernet RMII Reference Clock	I
		SSP1_SCK – SPI Channel 1 Serial Clock	I/O
31	GPIO6.8/ENET_RX_ER/T3_MAT2	ENET_RX_ER – Ethernet Receive Error (MII Interface)	I
		T3_MAT2 – Match Output 2 of Timer 3	O
32	3v3 volts	3.3 volts	Power
33	GPIO0.0/ENET_RXD1/SSPI1_MISO	GPIO0.0 – General Purpose I/O	I/O
		ENET_RXD1 – Ethernet RMII Receive Data 1	I
34	GPIO0.2/ENET_RXD0/U2_TXD/ T0_MAT1	GPIO0.2 – General Purpose I/O	I/O
		ENET_RXD0 – Ethernet RMII Receive Data 0	I
		U2_TXD – UART Channel 2 Transmit Data	O
		T0_MAT1 – Match output 1 of timer 0	O
35	GPIO0.3/ENET_CRSDV/U2_RXD/ T0_MAT0	GPIO0.3 – General Purpose I/O	I/O
		ENET_CRSDV – Ethernet RMII Data Valid	I
		U2_RXD – UART Channel 2 Receive Data	I
		T0_MAT0 – Match output 0 of timer 0	O
36	GPIO0.1/ENET_TXEN/SSP1_MOSI	GPIO0.1 – General Purpose I/O	I/O
		ENET_TXEN – Ethernet RMII Transmit Enable	O
		SSP1_MOSI – SPI Channel 1 Master Output/Slave Input	I/O
37	GPIO0.15/ENET_TXD1/SSP1_SEL/ T0_CAP2	GPIO0.15 – General Purpose I/O	I/O
		ENET_TXD1 – Ethernet RMII Transmit Data 1	O
		SSP1_SEL – SPI Channel 1 Slave Select	I/O
		T0_CAP2 – Capture input 2 of timer 0	I
38	GPIO0.13/ENET_TXD0/U2_DIR/ T0_MAT3/CAN1_RD	GPIO0.13 – General Purpose I/O	I/O
		ENET_TXD0 – Ethernet RMII Transmit Data 0	O
		U2_DIR – UART Channel 2 RS485 putout enable/direction control	I/O
		T0_MAT3 – Match output 3 of timer 0	O
		CAN1_RD – CAN Channel 1 Receive Data	I
39	Ground (GND)		Power
40	GPIO7.4/NMI	GPIO7.4 – General Purpose I/O	I/O
		NMI – Non-maskable Interrupt	I
41	GPIO7.25/RXD0	GPIO7.25 – General Purpose I/O	I/O
		RXD0 – UART Channel 0 Receive Data	I
42	GPIO7.24/TXD0	GPIO7.24 – General Purpose I/O	I/O
		TXD0 – UART Channel 0 Transmit Data	O
43	USBD_DP	USB_D+2 - USB port 2 bidirectional D+ line	I/O
44	USBD_DM	USB_D-2 - USB port 2 bidirectional D- line	I/O
45	USBD_VBUS	VBUS - Monitors the presence of USB bus power. Note: This signal must be HIGH for USB reset to occur.	I
46	5volts (5VO)	5.0 Volts	Power
47	5volts (5VO)	5.0 Volts	Power
48	5volts (5VO)	5.0 Volts	Power
49	3v3 volts (3V3)	3.3 Volts	Power
50	3v3 volts (3V3)	3.3 Volts	Power

J5 Signal Details

Pin	Pin Name	Pin Description	
1	Ground (GND)		Power
2	GPIO6.30/CTOUT12	GPIO6.30 – General Purpose I/O	I/O
		CTOUT12 – SCT output 12, Match output 3 of timer 3	O
3	GPIO4.10/QEI_PHA	GPIO4.10 – General Purpose I/O	I/O
		Quadrature Encoder Interface Phase A Input	I
4	GPIO6.28/CTOUT11	GPIO6.28 – General Purpose I/O	I/O
		CTOUT11 - SCT output 11. Match output 3 of timer 2.	O
5	GPIO6.27/CTOUT13	GPIO6.27 – General Purpose I/O	I/O
		CTOUT13 - SCT output 13. Match output 3 of timer 3.	O
6	GPIO6.26/CTOUT10	GPIO6.26 – General Purpose I/O	I/O
		CTOUT10 - SCT output 10. Match output 3 of timer 3.	O
7	GPIO6.25/CTOUT14	GPIO6.25 – General Purpose I/O	I/O
		CTOUT14 – SCT Output 14, Match output 2 of timer 3	O
8	GPIO6.24/CTIN1	GPIO6.24 – General Purpose I/O	I/O
		CTIN1 – SCT Input 1, Capture input 1 of timer 0, Capture input 1 of timer 2	I
9	GPIO5.17/MCOB0/RXD3	GPIO5.17 – General Purpose I/O	I/O
		MCOB0 – Motor Control PWM Channel 0, output B	O
		RXD3 – UART Channel 3 Receive Data	I
10	GPIO4.15/MCOA0/TXD3	GPIO4.15 – General Purpose I/O	I/O
		MCOA0 – Motor Control PWM Channel 0, output A	O
		TXD3 – UART Channel 3 Transmit Data	O
11	GPIO4.9/QEI_PHB/RXD2	GPIO4.9 – General Purpose I/O	I/O
		Quadrature Encoder Interface Phase B Input	I
		RXD2 – UART Channel 2 Receive Data	I
12	GPIO4.8/QEI_IDX/TXD2	GPIO4.8 – General Purpose I/O	I/O
		Quadrature Encoder Interface INDEX Input	I
		TXD2 – UART Channel 2 Transmit Data	O
13	5volts(5VO)	5.0 Volts	Power
14	Ground (GND)		Power
15	GPIO3.13/CTOUT12/ADC0.3	GPIO3.13 – General Purpose I/O	I/O
		CTOUT12 – SCT output 12, Match output 0 of timer 3	O
		ADC0.3 – ADC0 Channel 3 input	I
16	GPIO3.12/CTOUT13/ADC0.4	GPIO3.12 – General Purpose I/O	I/O
		CTOUT13 – SCT output 13, Match output 1 of timer 3	O
		ADC0.4 – ADC0 Channel 4 input	I
17	GPIO7.22/ADC0.2/U0_CLK/CTIN2	GPIO7.22 – General Purpose I/O	I/O
		ADC0.2 – ADC0 Channel 2 input	I
		U0_CLK – UART Channel 0 Synchronous Clock I/O	I/O
18	GPIO7.20/ADC1.3/U3_DIR/SSP1_MISO	GPIO7.20 – General Purpose I/O	I/O
		ADC1.3 – ADC1 Channel 3 input	I
		U3_DIR – UART Channel 3 RS485 output enable/direction	I/O
		SSP1_MISO – SPI Channel 1 Master Input/Slave Output	I/O
19	GPIO7.19/ADC1.4/U3_UCLK/SSP1_SSEL	GPIO7.19 – General Purpose I/O	I/O
		ADC1.4 – ADC1 Channel 4 input	I
		U3_CLK – UART Channel 3 Synchronous Clock I/O	I/O
		SSP1_SSEL – SPI Channel 1 Slave Select	I/O
20	Ground (GND)		Power

J5 & J6 - Expansion Connector Cable Details

The maximum length for the expansion connector cables is as follows:
General Purpose IO, TTL, Serial, 6" recommended maximum, 8" absolute maximum

Ethernet, high-speed IO, 3" recommended maximum, 4" absolute maximum

The following table provides example part numbers for the expansion cables:

Description	MFG	MFGPN	Digi-Key PN
3" 20-pin 0.5mm	Molex	21020-0209	WM10226-ND
6" 20-pin 0.5mm	Molex	21020-0215	WM10218-ND
3" 50-pin 0.5mm	Molex	21020-7650	WM10231-ND
6" 50-pin 0.5mm	Molex	21020-0548	WM10223-ND

Note: These lengths are only recommendations. The actual lengths utilized will be dependent on the expansion board circuitry, layouts and general environment of the application. It is up to the customer to test and validate the functional operation and use of the expansion connectors.

19. Schematics, Documentation, and Support

Please see the product information tabs at https://www.teamfdi.com/product-details/uezgui-4357-70wvn for support and documentation.

20. Temperature Range

UEZGUI-4357-70WVN-BA board w/o LCD: -30°C to +80°C

UEZGUI-4357-70WVN-BA with LCD: -20°C to +70°C

21. ESD Warning

The UEZGUI-4357-70WVN-BA kit is shipped in a protective anti-static package. The kit must not be subjected to high electrostatic potential. Damage may occur to the boards that will not be covered under warranty. General practice for working with static sensitive devices should be followed when working with the kit.

22. Real Time Clock Backup Time

The µEZ GUI's Real Time Clock is backed up with a Seiko Super Capacitor to allow the time to be preserved when external power is removed. The calculated backup time is shown below.

Super Capacitor	Typical Voltage	Stop Voltage	Maximum Current	Typical Backup Time
XH414HG	3.0 V	2.0 V	10µA	5.5 hrs.

23. Power Requirements

Power is supplied into the mini-USB connector (P1) via the USB cable and power supply provided in the kit. The power supply provides 5VDC output at 1.2A (min) and has input voltage range of 100-240VAC with standard U.S. 2-prong plug. The following typical power requirements were measured at room temperature with LPC4357 at 120MHz clock rate:

Voltage	µEZ Demo Screen	Observed Max	Maximum Allowed
5V	735 mA	1 A	Up to 1.5A through power connectors

µEZ GUI USB Input Port Power Requirements:

- +5VDC ±5% is the input power range specification. However, since the 5VDC input has reverse diode protection, it may be necessary to provide a higher input voltage level of 5VDC input to ensure that the µEZ GUI 5VDC output level retains the specified tolerance. If the µEZ GUI input level drops to 4.75VDC, then the µEZ GUI +5VDC output level to either the Expansion Board or the USB Host connector may be lower than 4.75VDC since the worst case drop from input to output is typically 0.25V.

- For reference on the USB output port from the µEZ GUI, the following are the specifications:
  - USB High Power Specifications are 500mA maximum, and 4.75V to 5.25V standard.
  - USB Low Power Specifications are 100mA maximum, and 4.4V to 5.25V standard.

- The µEZ GUI can provide a maximum of 300mA of 3.3V power for "external use" over the expansion connectors. If more than 300mA of 3.3V is needed for an expansion board;
    - Then the primary power input (i.e. 5V) should be located on the expansion board rather than on the µEZ GUI.
    - The expansion board should be designed with a separate 3.3V voltage regulator.
    - Ensure the 3.3V voltage rails of the µEZ GUI & Expansion Board are not connected.
    - The µEZ GUI should be powered using 5V from the expansion board over the 70-pin breakout, instead of powering the expansion board from the µEZ GUI unit.
- The UEZGUI-4357-70WVN may also optionally be powered via the following connectors;
    - Alternate Power/Communication Connector, J7, with a maximum of 2A 5V input
    - Expansion Connector(s) J5 and/or J6 – refer to the expansion connector section for details

24. Mechanical Details

The following illustrations show the mechanical details of the UEZGUI-4357-70WVN-BA PCB.

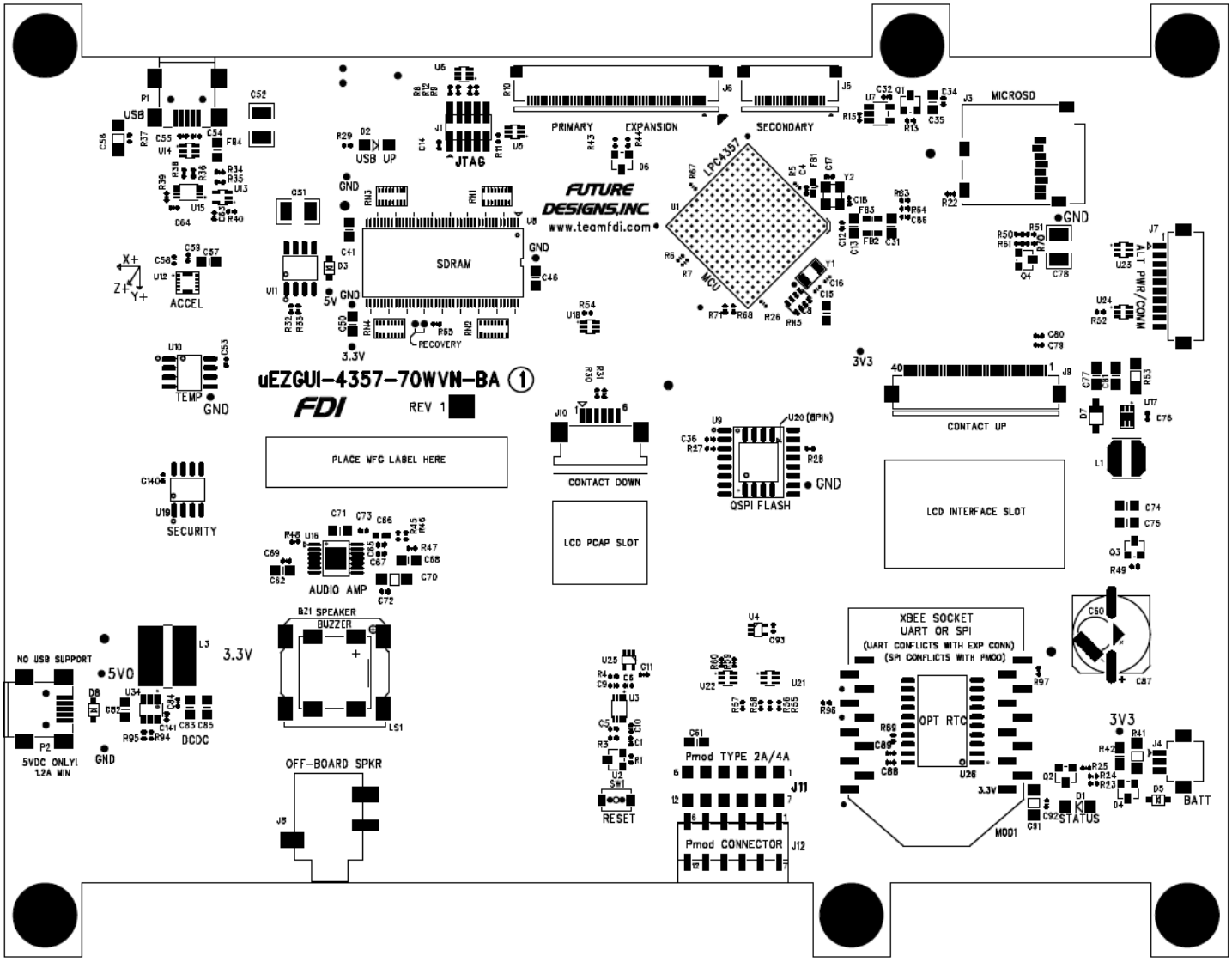


Figure 5 –Mechanical Dimensions (Component View)

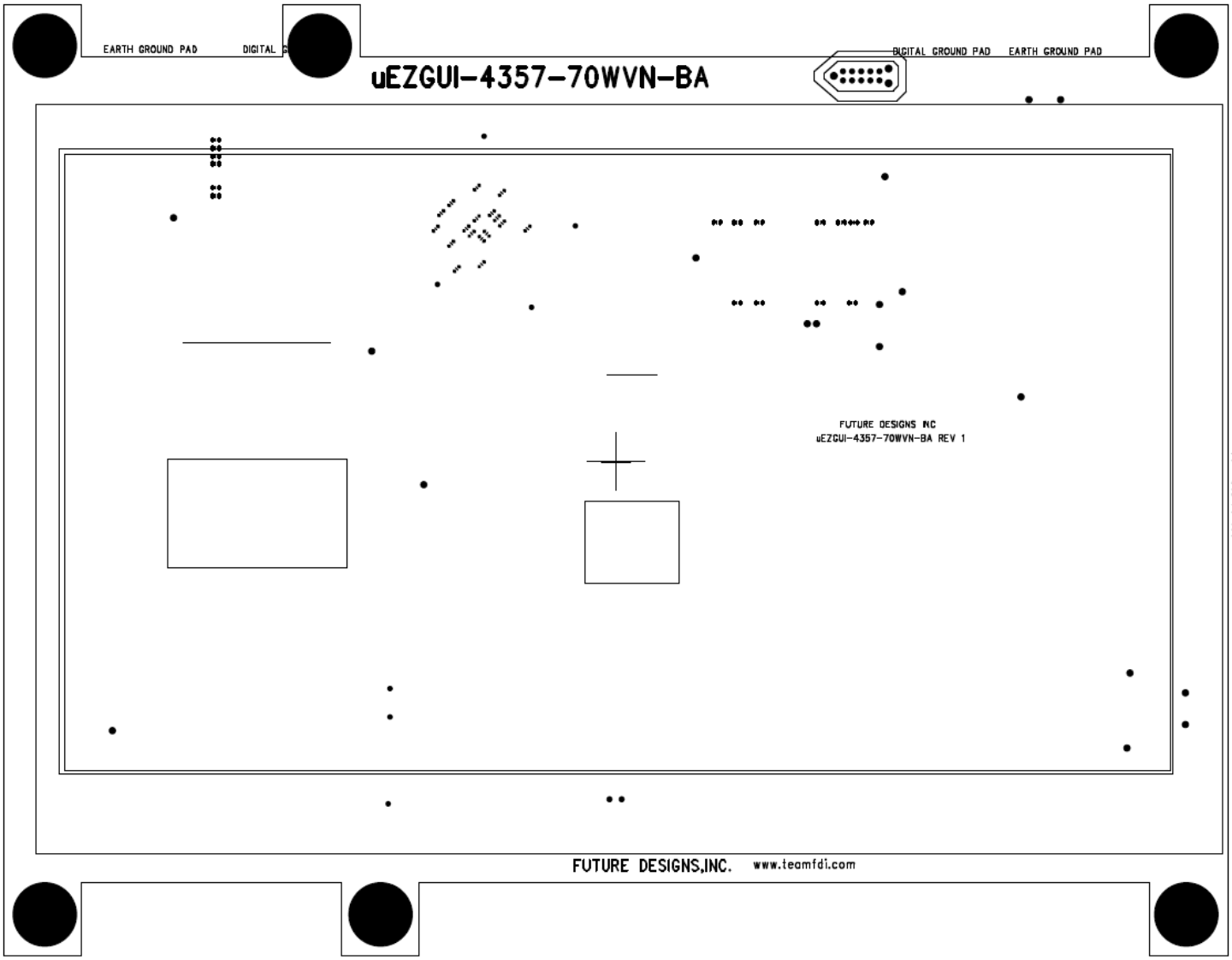


Figure 6 –Mechanical Dimensions (LCD Module View and Side View)