User Guide

Ensemble E8 DevKit (DK-E8)

Version 1.0

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Introduction:

The Ensemble E8 DevKit (DK-E8) is a cost-effective, single-board solution that brings out all signals on the device to easily access pins for power and performance profiling, prototyping, and more. The DevKit can develop designs for the E4, E6, or E8 series MCU devices in the Ensemble family, with the superset E8 series device having two Cortex-M55 CPU cores, two Ethos-U55 + one Ethos-U85 neural network processor cores, and two Cortex-A32 MPU cores.

Hardware Setup:

Power to the board can come from the *PRG USB* or *MCU USB* USB-C connectors, but for initial development, you should use the *PRG USB* port, so you have access to the Secure Enclave using the SETOOLS over SEUART or an APP UART, based on position of the selector switch SW4.

Verify that the option jumpers are set in the default positions as shown below.

CAUTION: Do not move, remove, or install jumpers with power applied to the board.

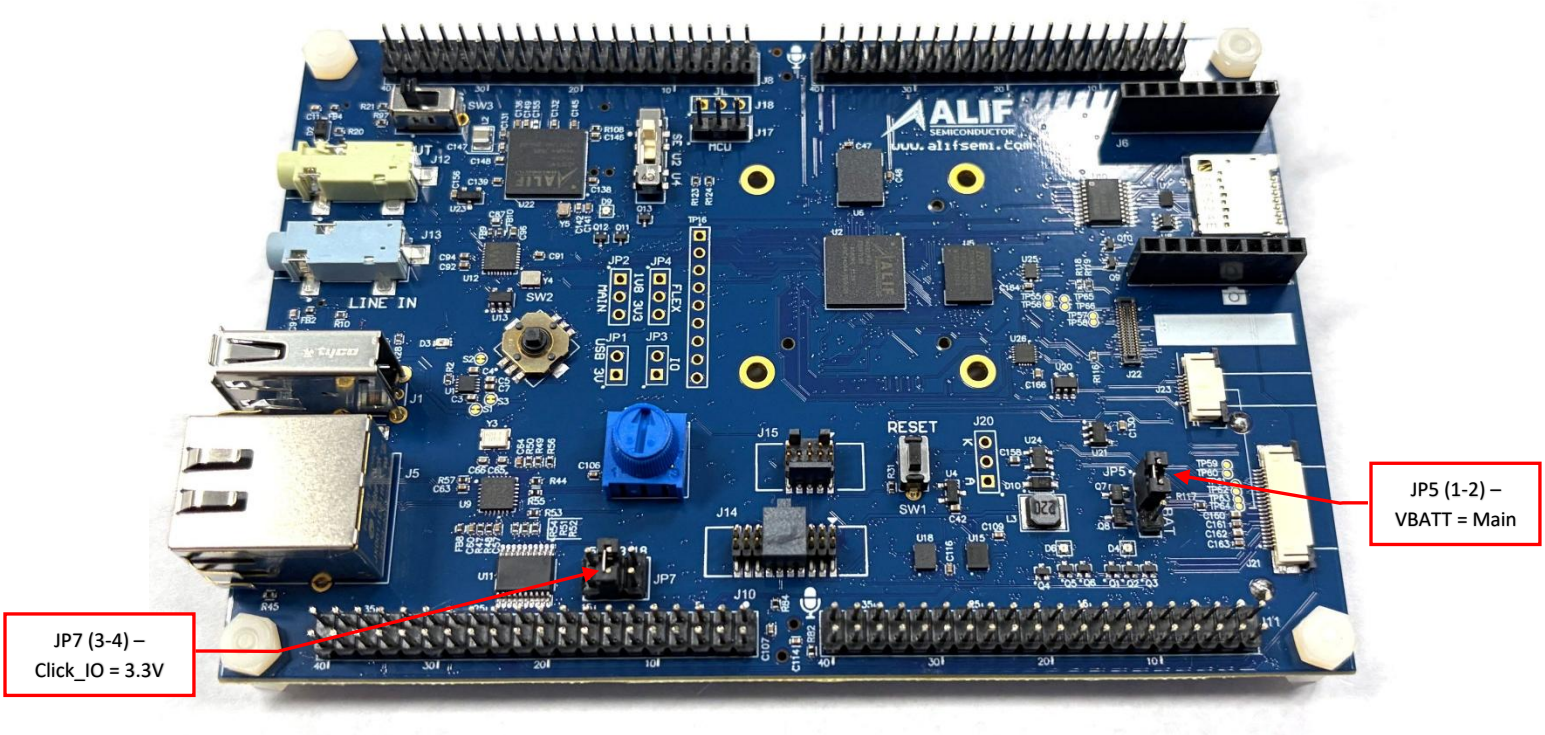
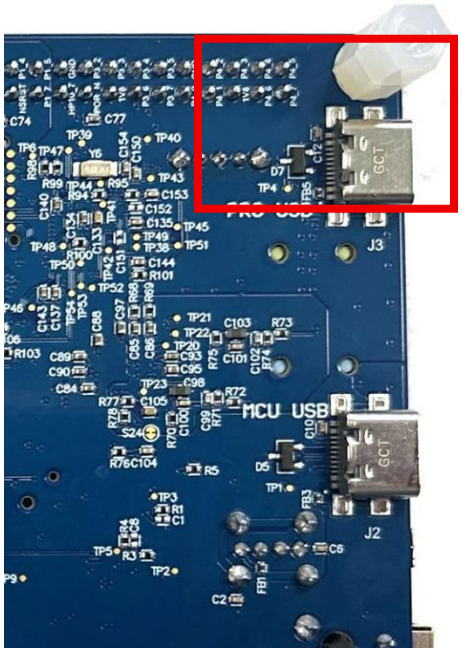
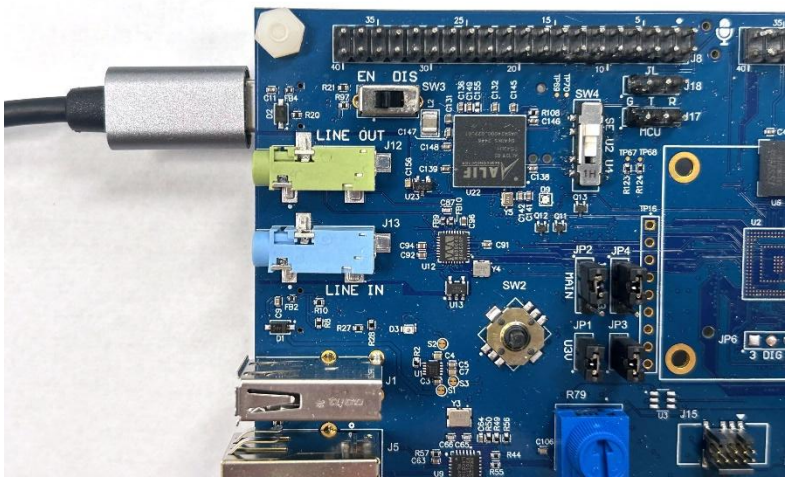


Figure 1 – Configuration Jumpers

Connecting Power to the Board

Power to the board is through the USB-C connector labeled PRG USB. It is located on the bottom side of the board in the corner (see below). Connect a USB-C cable from your computer to this connector. The picture on the right shows this connection from the top of the board.





When you apply power to the board, a green LED will illuminate next to the E1 device and the UART selection switch at SW4.

Determining UART Port Assignments

The Ensemble E8 DevKit has a USB-to-UART adapter on-board. ~~By default,~~ This allows you to ~~it is~~ connect~~ed~~ to the SEUART that is used by the SETOOLS applications to query device status and program images into the MRAM. It can also be connected to either the UART2 or UART4 user-app serial port on the E8 device by switching the position ~~using an alternate switch setting~~ of SW4.

The optional UART port assignments are discussed in a later section.

SETOOLS Port Discovery

The first time you execute one of the SETOOLS functions, you will be prompted for the required serial port. When the ports are presented, just enter the port name and press [ENTER].

This port data is saved in a local configuration file (isp_config_data.cfg). The next time a command is invoked and this configuration file is present, it will use the parameters from this file.

To override this setting, simply use the -d option:

```
c:\app-release-exec>maintenance.exe -d
Discover
COM ports detected = 1
-> COM11
Enter port name:COM11
[INFO] COM11 open Serial port success
[INFO] baud rate 55000

Available options:

 1 - Device Control
 2 - Device Information
 3 - MRAM
 4 - Utilities
 5 - Setting capabilities
 6 - ROM

Select an option (Enter to exit):
```

This will force a rediscovery of the Serial ports. If there are no other serial port devices plugged into your system, the COM port shown will be the DevKit port. If there are other COM ports shown, select the one that appears when you plug in the DevKit USB-C power cable.

UART Errors

There is only one SE-UART on the device. When running the SETOOLS, please ensure you have no other Tera term or Putty sessions using the same SE-UART. The following shows the output if the SE-UART is already being used by another program:

```
c:\app-release-exec-65>maintenance -d
COM ports detected = 2
-> COM6
-> COM8
Enter port name:COM6
[ERROR] openSerial could not open port 'COM6': PermissionError(13, 'Access is denied.', None, 5)
[ERROR] isp openSerial failed for COM6

c:\app-release-exec-65>
```

Software:

You will need to download specific versions of the Alif Security Toolkit (SETOOLS), CMSIS Device Family Pack (DFP), and the VS Code template for your Ensemble E8 DevKit.

SETOOLS v1.109.000

Go to the Alif Software & Tools page at https://alifsemi.com/support/software-tools/ensemble/ and download the appropriate SETOOLS V1.109.000 archive for your platform to a directory on your local machine. This is a version of the SETOOLS that supports the Ensemble E4, E6, and E8 devices in addition to other Ensemble or Balletto devices.
Point the tools to this folder for your development by editing the VS Code settings.json file entry for “alif.setools.root”.

Open a terminal window in this SETOOLS directory and run “updateSystemPackage.exe -d”.
Select the lowest-numbered COM port.
When the tools are installed, they default to an Ensemble E8 device such as the one used on the DK-E8 Ensemble DevKit, but if you have used this version of the tools on another board, the selected device might be different. If the tool detects the Ensemble E8 device on your board and asks if you want to set it as the default. Reply with “y”.

```
c:\app-release-exec-102>updateSystemPackage
Burning: System Package in MRAM
Selected Device:
Part# E7 (AE722F80F55D5LS) - 5.5 MRAM / 13.5 SRAM - Rev: B4

Connecting to the target device...
[INFO] baud rate  55000
[INFO] dynamic baud rate change  Enabled
[INFO] COM6 open Serial port success
Bootloader stage: SERAM
[INFO] Detected Device:
Part# AB1C1F4M51820PH - Rev: A0
- MRAM Base Address: 0x801cd000
Connected target is not the default Part#
Connected target is not the default Revision
Do you want to set this part as default? (y/n): y
```

Go to the Segger website and download the latest version of the Segger tools. Debugging designs on the E8 DevKit has been tested using SEGGER J-Link GDB server V8.88 and the VS Code setting.json file entry for “cortex-debug.JLinkGDBServerPath” should point to this new version. If you have version 8.42 or later of the Segger tools installed, running JLink.exe (J-Link Commander) should automatically detect if the firmware in the J-Link On-Board E1 device needs to be updated. You should perform this step before trying to program a new image into the device to ensure the proper serial port drivers are installed in the J-Link On-Board E1 device.

Install Visual Studio Code and The Alif Project Template

Begin by going to the Alif VS Code template at **alif_vscode-template** on the Alif Github site.
This is a simple CMSIS-Pack-based example to set up and test a VS Code development environment for Alif Ensemble kits. For bug reports or questions, please use the ticket system on the alifsemi.com web page. Start with the README file, which references a longer Getting Started Guide.

Once you have installed VS Code and the template, and have enabled Alif SE tools and J-link debugging support by adding the following entries to VS Code user settings.json (Press F1 and start typing 'User')

```
{
   "alif.setools.root" : "C:/alif-se-tools/app-release-exec",
   "cortex-debug.JLinkGDBServerPath": "C:/Program Files/SEGGER/JLink/JLinkGDBServerCL.exe"
}
```

Make sure E8 is selected as the Active Target in the CMSIS Manage Solution menu. To access the CMSIS Manage Solution menu, select the CMSIS icon in the left column, then click the gear icon at the top of

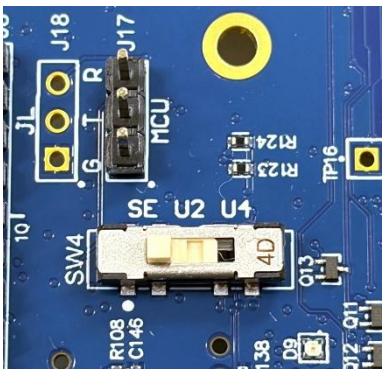
the CMSIS: ALIF column. Select “blinky” as the Active Project in the CMSIS Manage Solution menu and click on the Build (hammer) icon to build the solution.

Go to the Segger website and download the latest version of the Segger tools. Debugging designs on the E8 DevKit has been tested using SEGGER J-Link GDB server V8.40 and the VS Code setting.json file entry for “cortex-debug.JLinkGDBServerPath” points to this new version. If you have **version 8.42 or later** of the Segger tools installed, running JLink.exe (J-Link Commander) from a command prompt should automatically detect if the firmware in the J-Link On-Board E1 device needs to be updated. You should perform this step before trying to program a new image into the device to ensure the proper serial port drivers are installed in the J-Link On-Board E1 device.

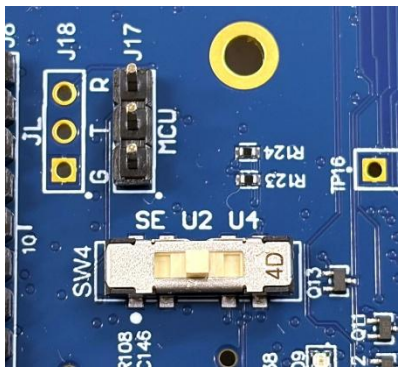
To program the blinky application on the DK-E8 board, run Program with Security Toolkit (select COM port) VSCode Task.
F1 -> Tasks:Run Task -> Program with Security Toolkit (select COM port)

Select the appropriate COM port (this needs to be done only once. Subsequent times, you can run the *Program with Security Toolkit* VSCode task instead.

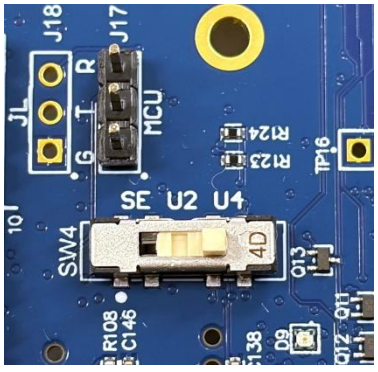
With the default switch setting for SW4, the COM port connection will be to the SEUART. If it is desired to connect to a user UART, the other switch positions can select UART2 or UART4. The pictures below show the alternate UART selections.



SEUART



UART2



UART4

If you need help getting your design environment configured, file a technical support ticket at https://alifsemi.com/support/technical-support/

Key Components

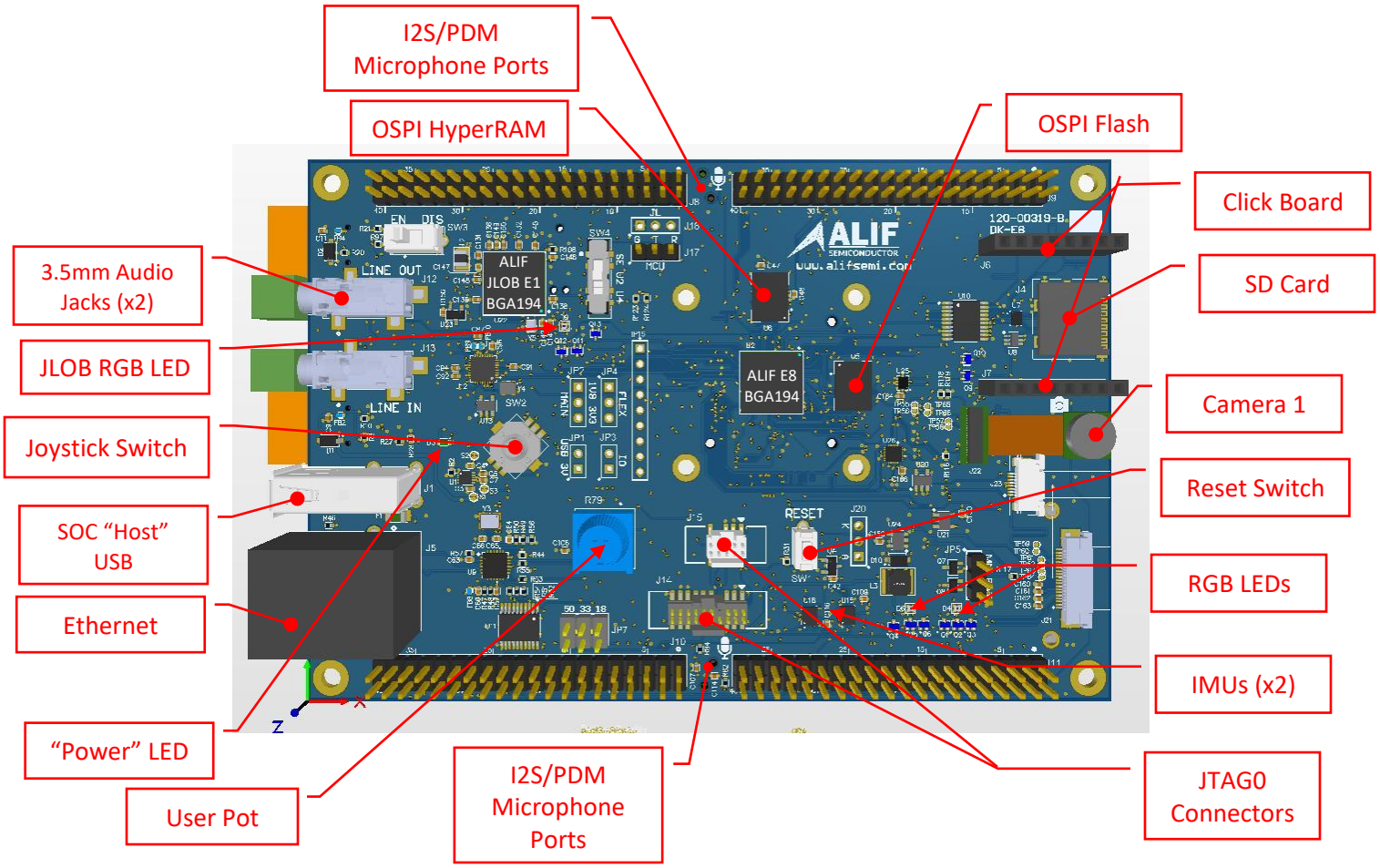


Figure 2A – Key Components (Top Side)

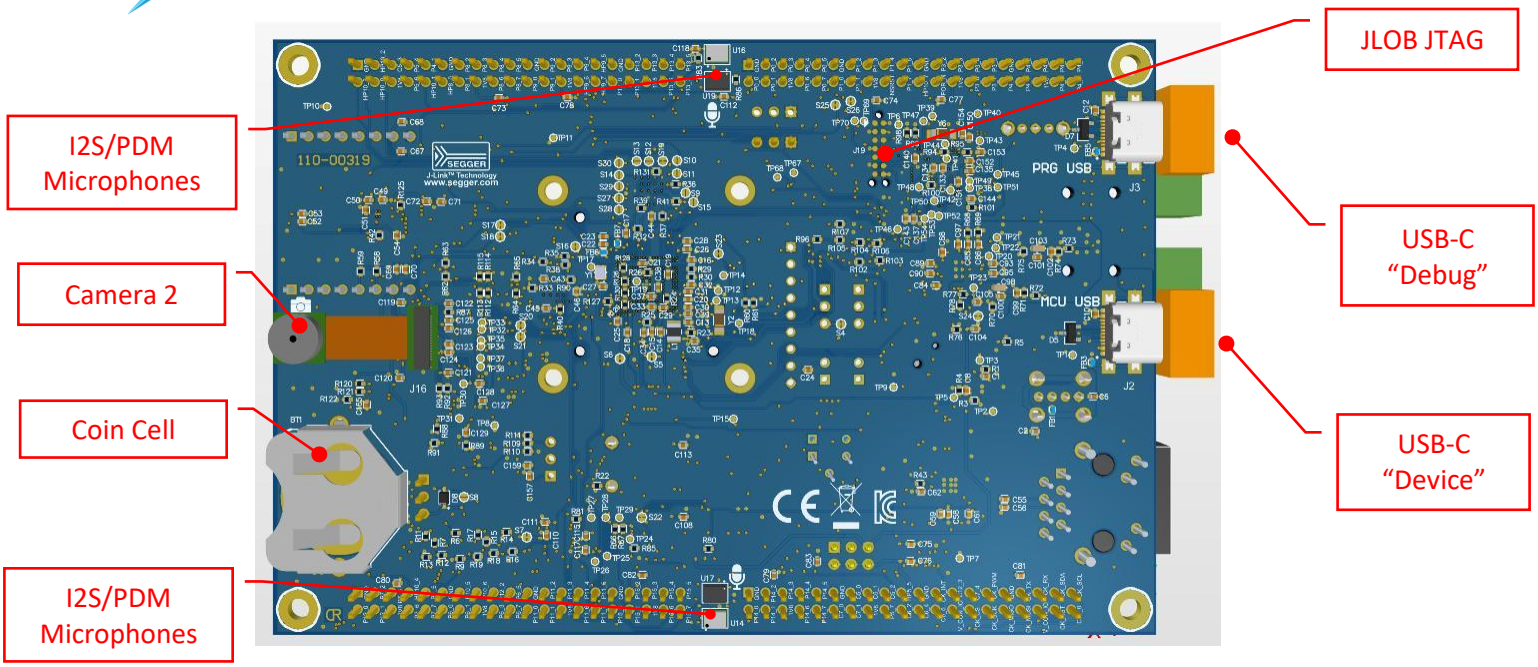


Figure 2B – Key Components (Bottom Side)

Connectors

Four, 2x20 (GPIO Expansion)
Click Board
microSD Flash
Two, "IAS" MIPI Camera OnSemi Flat Flex
One each on top and bottom sides of the board
Coin Cell Holder (CR2032 size)
MIPI LCD Display Flat Flex (E43RB-FW405-C)
Touch Screen Flat Flex
3.5mm Audio Jacks
USB-C Programming SEUART + UART2 or UART4)
USB Type-A (Host)
USB-C (Device)
Ethernet 10/100 RJ-45 with LEDs
Two, E8 JTAG0 Connectors, 2x5 and 2x10 in Parallel
E1 JLOB JTAG Connector, 14 pin "Plug-Of-Nails"

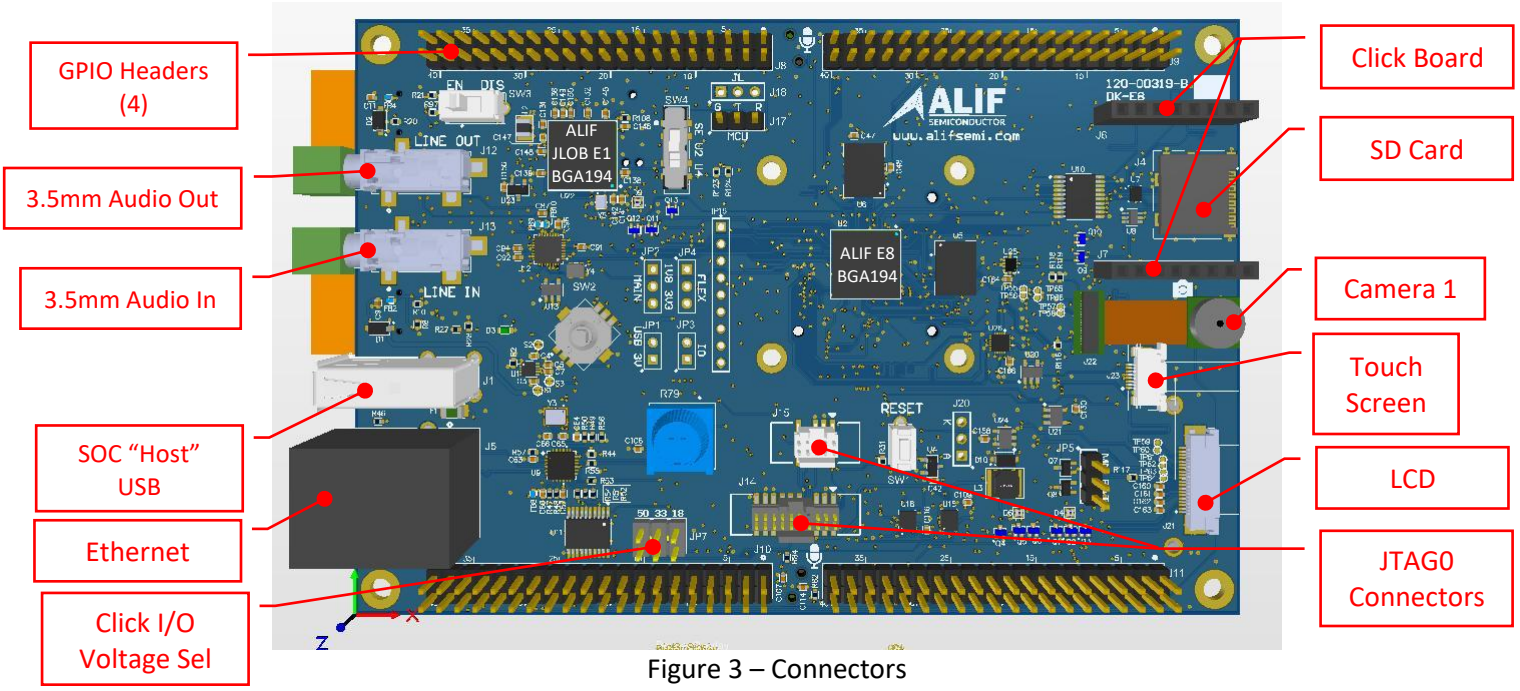


Figure 3 – Connectors

See Figure 2B for Bottom Side Connectors

Configuration Jumpers

All Configuration Jumpers are male headers, 2.54mm pin spacing.

Note: Except for JP5 & JP7, all jumpers are DNI. A shunt is placed in parallel with the JP. If a mode change or current measurement on a specific JP is required, the shunt must be first cut, then a header soldered at the desired JP. A 2.54mm shunt can be added once the current measurements are finished.

JP1 – VDD_USB_3V3 Current Measurement
JP2 – VDD_MAIN & VDD_BUCK Voltage Selection
Pin 1-2 FLEXIO = 1.8V
Pin 2-3 FLEXIO = 3.3V
JP3 – VDDIO Current Measurement
JP4 – FLEXIO Voltage Selection
Pin 1-2 FLEXIO = 1.8V
Pin 2-3 FLEXIO = 3.3V
JP5 – VBATT Voltage Selection
Pin 1-2 VBATT = VDD_MAIN
Pin 2-3 VBATT = 3.3V / Coin-Cell
JP7 – Click Board and a Few Other GPIOs Voltage selection
Pins 1-2 Click I/O = 1.8V
Pins 3-4 Click I/O = 3.3V
Pins 5-6 Click I/O = 5.0V

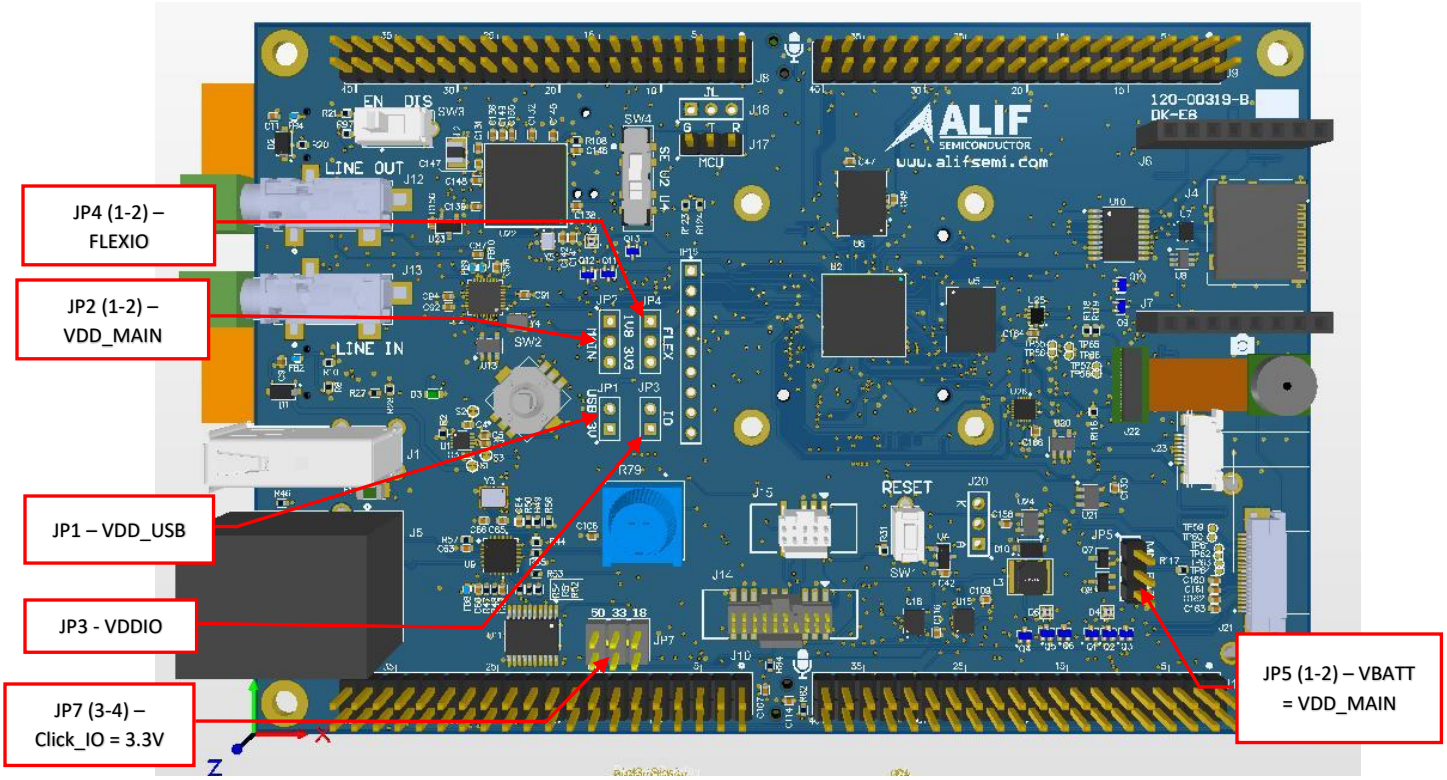


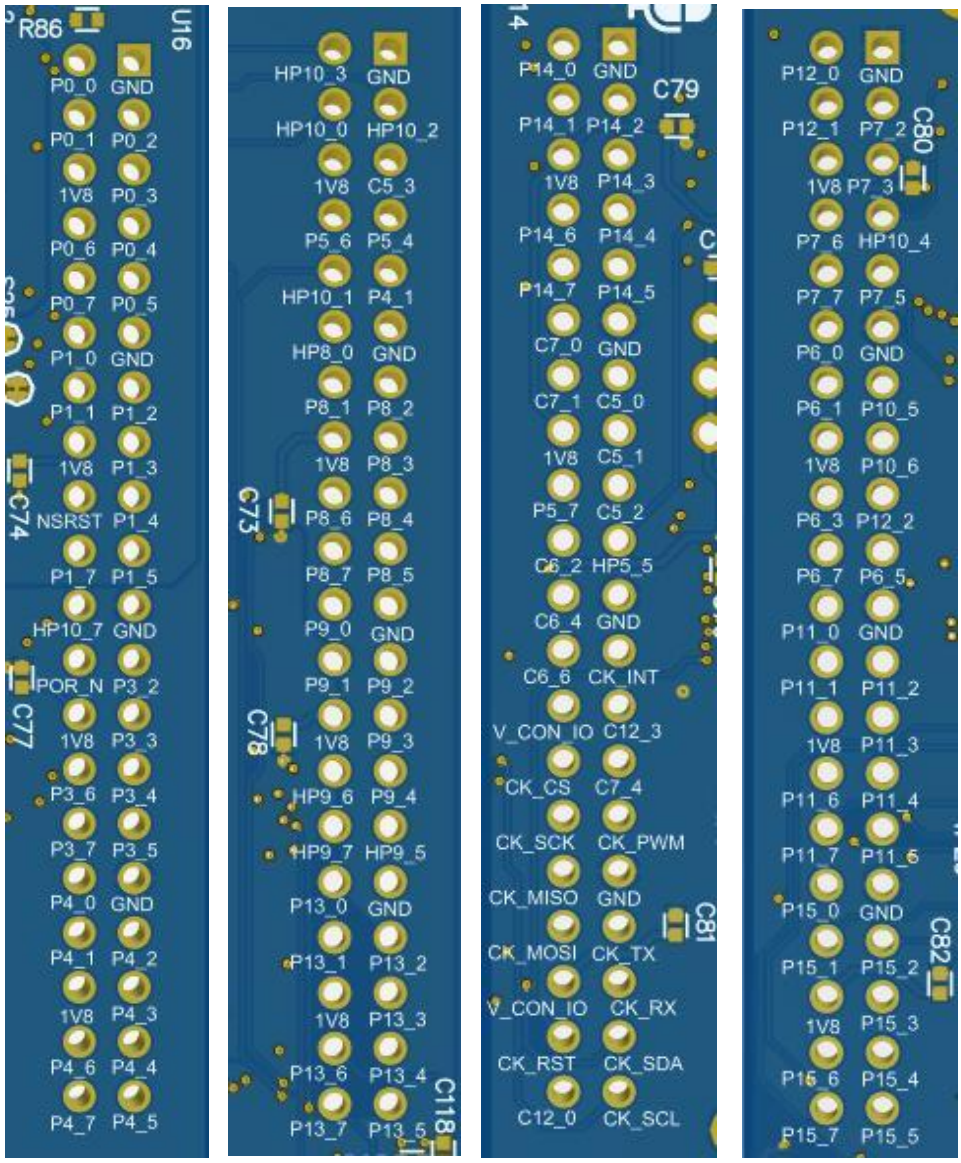
Figure 3 – Configuration Jumpers

Measuring DK-E8 DevKit Power

In order to measure power on the DK-E8 DevKit, it is necessary to cut jumper traces on the back side of the board and install heading pins in order to insert an ammeter into the various power doman circuits. For details, please refer to the application note “Power Measurements On the Ensemble E8 DevKit (DK-E8)” which is available here: https://alifsemi.com/download/AAPN0042

Generic Header Test Points

All Header Test Points are male headers, 2.54mm pin spacing. They carry most, but not all of the GPIO signals. See schematic for details.



J8 **J9** **J10** **J11**

2 x 20 GPIO Extension Headers (Bottom Side View)

Document History

Version	Change Log
1.0	Initial public release