QUICK START GUIDE

Apollo3 Blue EVB

Ultra-Low Power Apollo SoC Family

A-SOCA3B-QSGA01EN v2.2



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Revision History

Revision	Date	Description
1.0	July 2018	Document initial public release
2.0	October 2019	Updated to include all board rev 1.7 features
2.1	July 2020	RF certification information added
2.2	September 15, 2022	Updated document template

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SECTION

1

Introduction

This document provides guidance in setting up the Apollo3 Blue Evaluation Board (EVB), part number AMA3BEVB, revision 1.7, to get started executing code examples, measuring power consumption in various configurations, and beginning software development.

RF Certification Information

Model PIN: AMA3BEVB

Product Name: AMA3BEVB

FCC ID: 2APPJ2102154166170

CMIIT ID: 2020DP3159(M)

TELEC No.: 201-200124

Ambiq Micro, Inc.

恩倍科（深圳）电子有限公司

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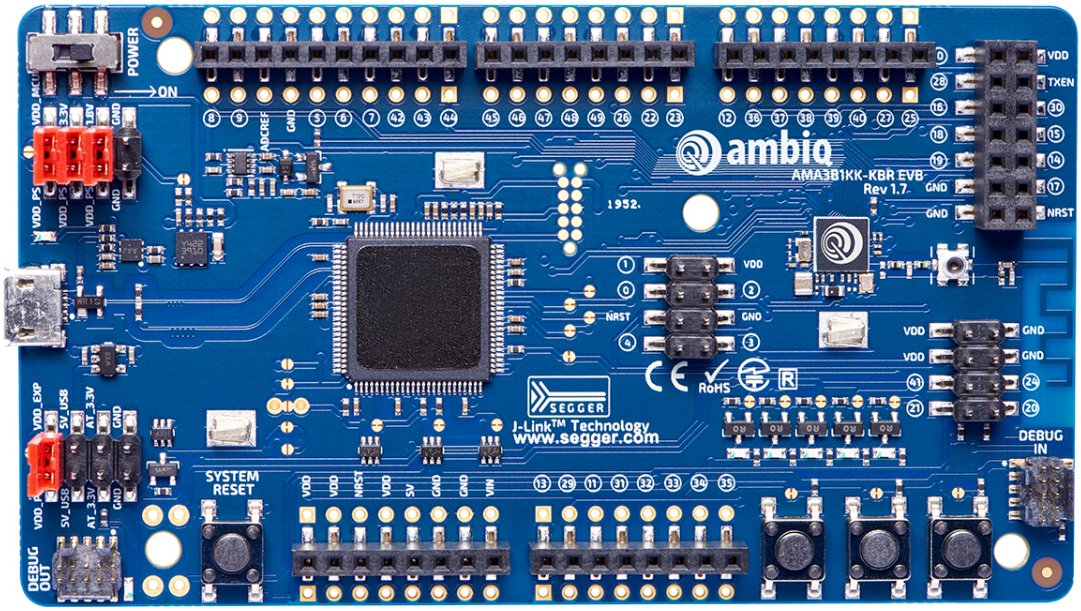
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Apollo3 Blue EVB

2.1 Overview

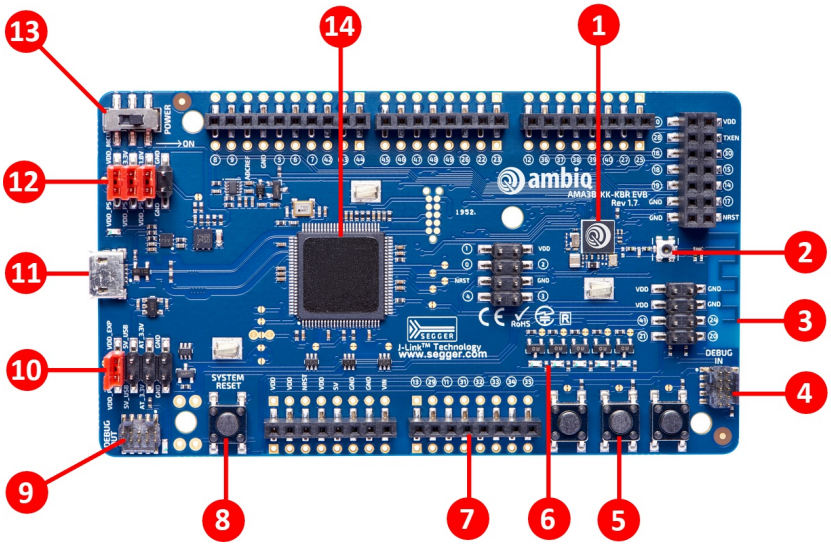
The Apollo3 Blue EVB features Arduino-compatible headers and an integrated J-Link debugger.

Figure 2-1: Apollo3 Blue EVB, Revision 1.7



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Figure 2-2: Apollo3 Blue EVB Parts Diagram



1. Apollo3 Blue SoC
2. RF Switch/Connector
3. Chip Antenna
4. Debug In Connector
5. User Switches (3x)
6. User LEDs (5x)
7. Arduino Headers (5x)
8. Reset Switch
9. Debug Out Connector
10. Power Configuration Header (P20)
11. USB Connector/Power In
12. Power Configuration Header (P19)
13. Power Switch
14. Debugger

The EVB has these additional features:

- Low power reference design
- Apollo3 Blue SoC in the BGA package (AMA3B1KK-KBR)
- Multiple power/clock options
- Micro USB connector for power/download/debug
- On-board PCB antenna
- FTDI USB-to-SPI adapter/interface
- RF switch/connector (J1 - Murata MM8430-2610RA1) for Bluetooth Low Energy PHY testing
- Segger J-Link debugger
- Debugger-in port
- Debugger-out port with connection-indication LED
- Five user-controlled LEDs
- Three push buttons for application use, plus a reset push button
- Power slide switch with LED power indicator
- Five 8-12 pin Arduino-style headers for pin/power access to shield board(s)
- Multiple test points for power measurements
- CE Mark and RoHS compliant

2.2 Secure Boot on the Apollo3 Blue SoC

Apollo3 Blue SoC parts from the Ambiq factory are preprogrammed with a Secure Bootloader and an uninitialized Customer InfoSpace, referred to as INFO0. Initial provisioning of the part would include programming a valid INFO0 and programming the main firmware image in the flash. The Apollo3 Blue EVB is shipped with the INFO0 configuration preprogrammed with optimal settings for the EVB layout.

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For your reference, the following settings are programmed into INFO0 on the Apollo3 Blue SoC resident on the EVB:

- Simo Buck is enabled, which provides lowest Apollo3 power consumption in both active and sleep modes.
- Secure Bootloader (SBL) interface is configured to UART using GPIO22 and GPIO23, which allows secure boot to be performed over the J-Link COM interface of the EVB.
- SBL override pin is configured to GPIO16 which is BTN1 on the EVB.
- All Flash and Debugger protection features are disabled.

For information on changing the INFO0 settings as well as using the Secure Bootloader, refer to the *Apollo3 Blue Getting Started Guide*, which can be found in the Ambiq SDK documentation and example scripts located in the **\tools\apollo3_blue_scripts** folder. This folder contains a number of python scripts to demonstrate generation of INFO0 settings, customer main images, and the creation of images for the Wired Update protocol over UART.

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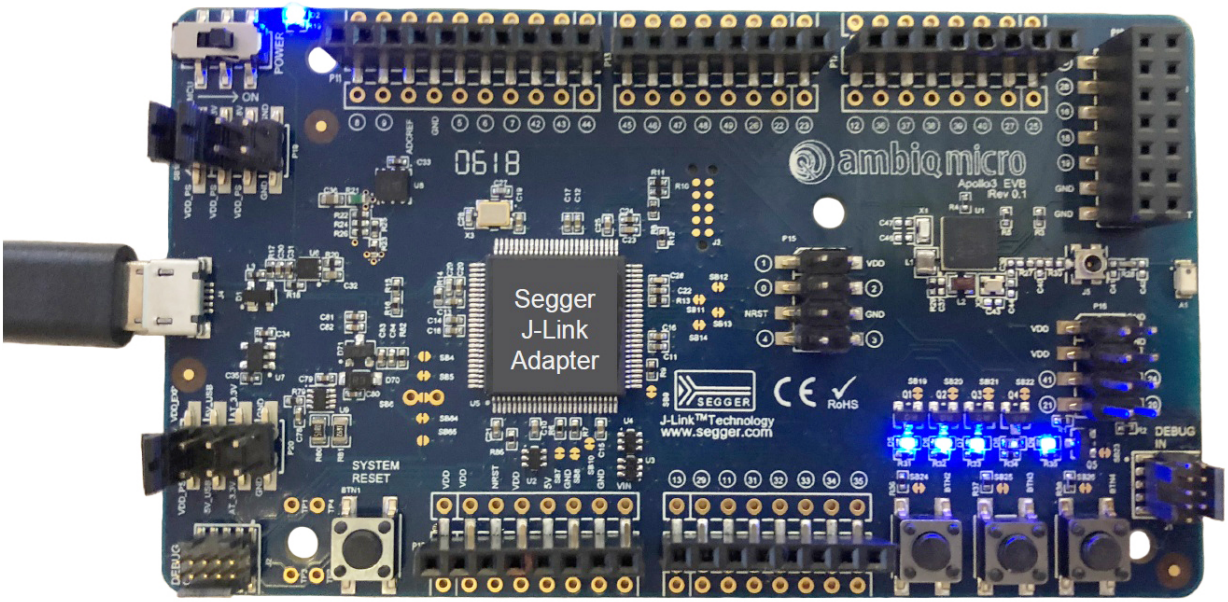
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3

Debug Interface

Figure 3-1 shows the Apollo3 Blue EVB set up for standard debug using the on-board J-Link debugger and on-board power supply configured for 3.3V.

Figure 3-1: Apollo3 Blue EVB's using On-board J-Link Debugger



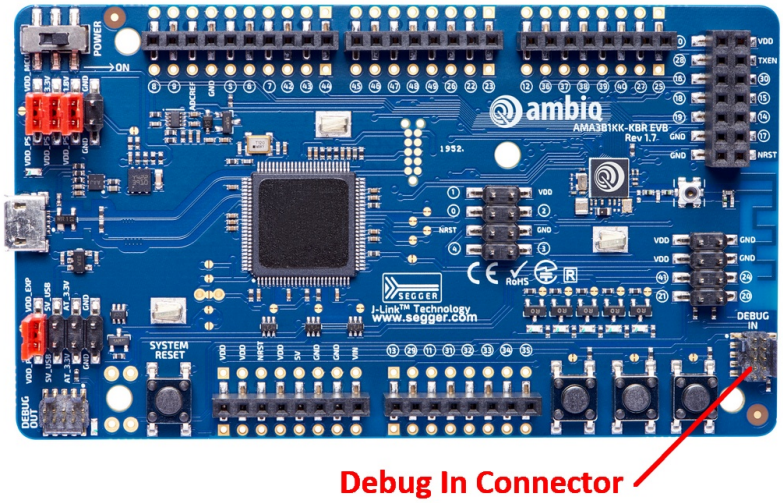
The debug interface is supported by standard J-Link drivers from Segger. Refer to *Section 4 Software Development Tools on page 12* for more details on J-Link debug support.

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3.1 Use of External Debugger

This EVB also supports the use of an external Cortex SWD debug interface through a standard 10-pin debug header (DEBUG IN - J1) as shown in Figure 3-2.

Figure 3-2: Apollo3 Blue EVB's Cortex DEBUG IN Header (J1)

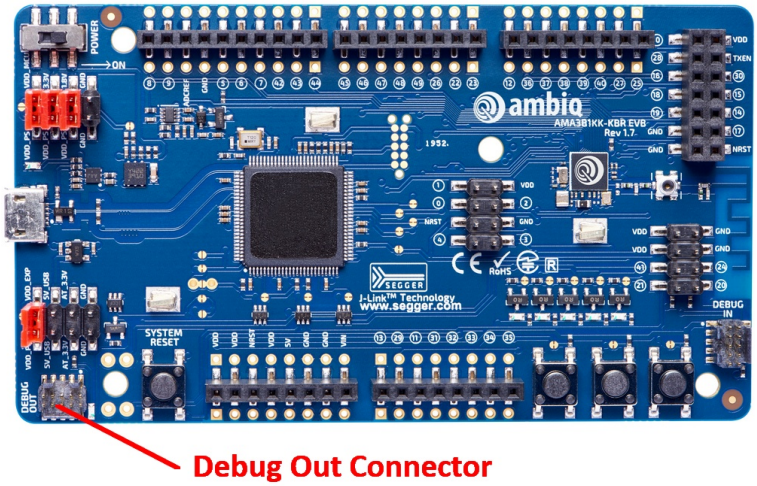


No jumper changes are required to use an external debug adapter. Simply connect the external debug adapter with a 10-pin ribbon cable connector to the **DEBUG IN** header.

3.2 Use of J-Link Adapter as an External Target Board Debugger

The EVB also offers the ability to be used as a J-Link debug adapter for any target board that has an Apollo family SOC.

Figure 3-3: Apollo3 Blue EVB's DEBUG OUT Header (J2)

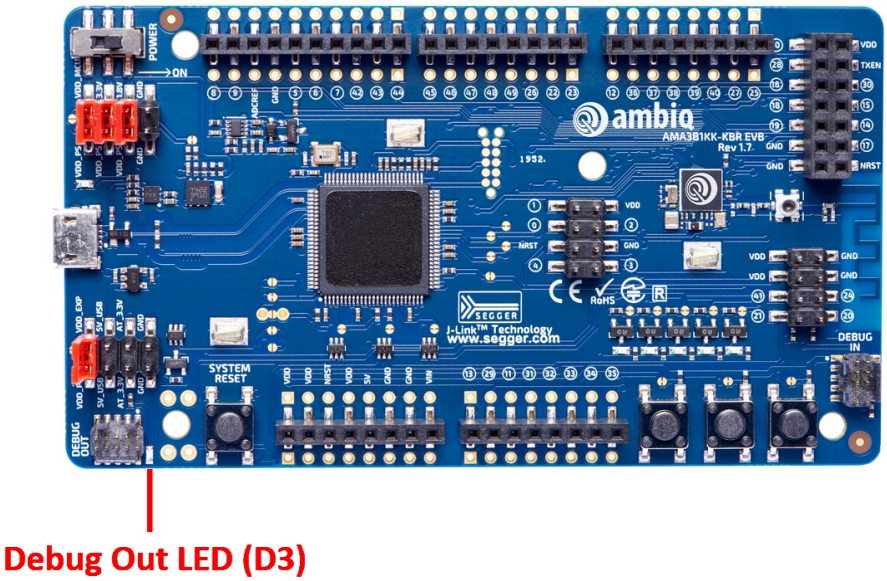


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To utilize this functionality, use a 10-pin low-pitch standard debug connector to connect the **DEBUG OUT** header (J2) on the EVB to the debug header on the target board. The EVB will automatically detect when the **DEBUG OUT** header is connected to another target board and reconfigure the integrated J-Link to connect to this external board rather than the on-board Apollo3 Blue.

Note: A voltage on pin 1 of the J2 header is required for the above mentioned automatic switch to occur. Also, if the target VDD does not match the on-board voltage (either 3.3V or 1.8V), and to avoid possible voltage level conflicts on the debug I/O port, VDDIO of the J-Link processor may need to be changed to the target voltage by cutting SB5 and shorting SB6.

Figure 3-4: Apollo3 Blue EVB's DEBUG OUT LED (D3)



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4

Software Development Tools

The standard Segger J-Link debug interface is used on the Apollo3 Blue Plus EVB. Install the latest Segger J-Link software, and configure your preferred development IDE (Keil, IAR, or Eclipse) to use J-Link debug interface.

Links to development tools that support Apollo3 Blue:

- SEGGER J-Link Software (6.48b Beta or later):
  https://www.segger.com/downloads/jlink
- KEIL uVision 5 (MDK5.25 or later):
  https://www.keil.com/demo/eval/arm.htm
- New Keil Pack (Also used by Eclipse):
  http://www.keil.com/dd2/pack/#/third-party-download-dialog
- IAR Version (8.10.1 or later):
  https://www.iar.com/iar-embedded-workbench/tools-for-arm/arm-cortex-medition/
- GCC 5.3.1:
  https://gcc.gnu.org

Regardless of preferred IDE, install the Segger J-Link software. All of the above development environments support J-Link, but you must have the latest J-Link software installed. Most alternate development environments also are supported by J-Link.

Refer to the *AmbiqSuite Getting Started Guide* for more details on setting up development IDEs to use J-Link.

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5

Power Supply Options and Measuring Current

There are three power supply options for the Apollo3 Blue EVB:

- Operate at 3.3V as provided by the on-board power supply
- Operate at 1.8V as provided by the on-board power supply
- Provide externally supplied power

Figure 5-1 shows header P19 which is used to select a power configuration through jumper installations, as well as the option to measure the supply current to the SoC with an ammeter. Solder bridge SB15 can be filled instead of jumpering from pin 1 to pin 2 if current measuring is of no interest.

Figure 5-1: Voltage Selection on Header P19

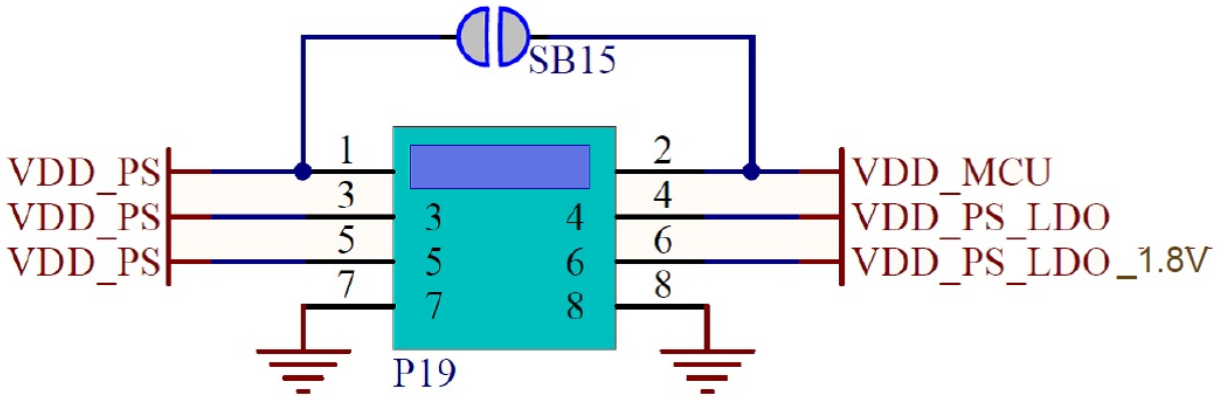


Table 5-1 on page 14 shows valid jumper configurations for P19. All other configurations are invalid. Note that a jumper across pins 7 and 8 is not necessary and does not do anything - the pins are available only for easy access to ground.

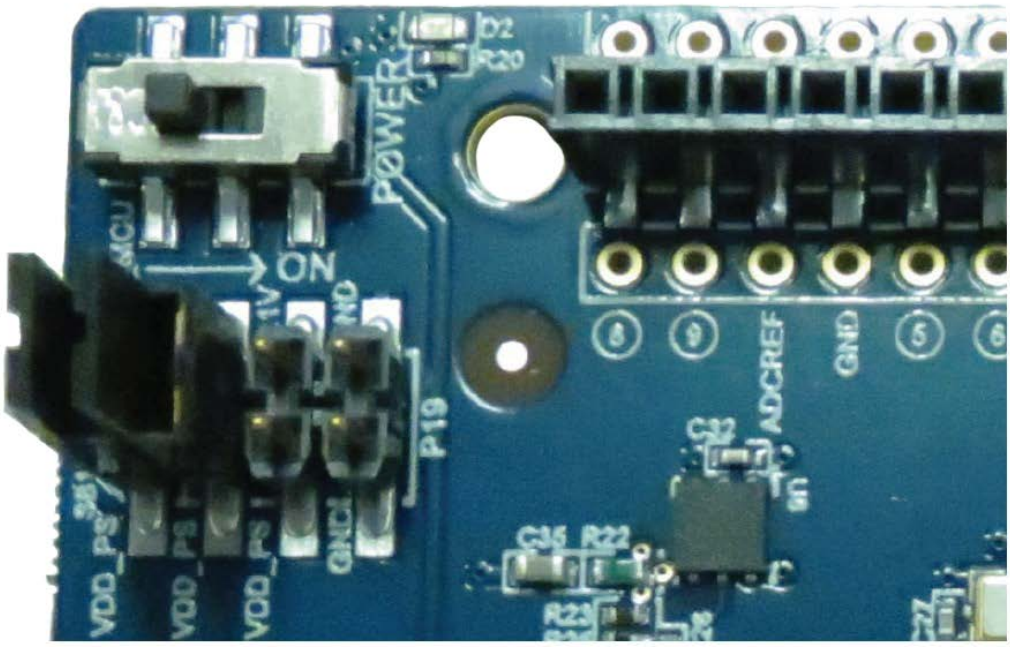
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Table 5-1: Jumper Configuration for Power Selections

Jumper 1-2	Jumper 3-4	Jumper 5-6	Power Source
In	In	Out	3.3V operation from internal regulator
In	In	In	1.8V operation from internal regulator
Out	In	Out	Intended for current measuring across pins 1 and 2 during 3.3V operation from internal regulator
Out	In	In	Intended for current measuring across pins 1 and 2 during 1.8V operation from internal regulator
In	Out	Out	Externally-provided supply voltage within the allowable range (1.755-3.60V) on pin 3 or 5
Out	Out	Out	Intended for current measuring across pins 1 and 2 during externally-provided supply voltage within the allowable range (1.755-3.60V) on pin 3 or 5

As an example for setting the jumpers on P19, Figure 5-2 shows the EVB configured for 3.3V operation with jumper across **VDD_PS** and **VDD_MCU** for no current measurement.

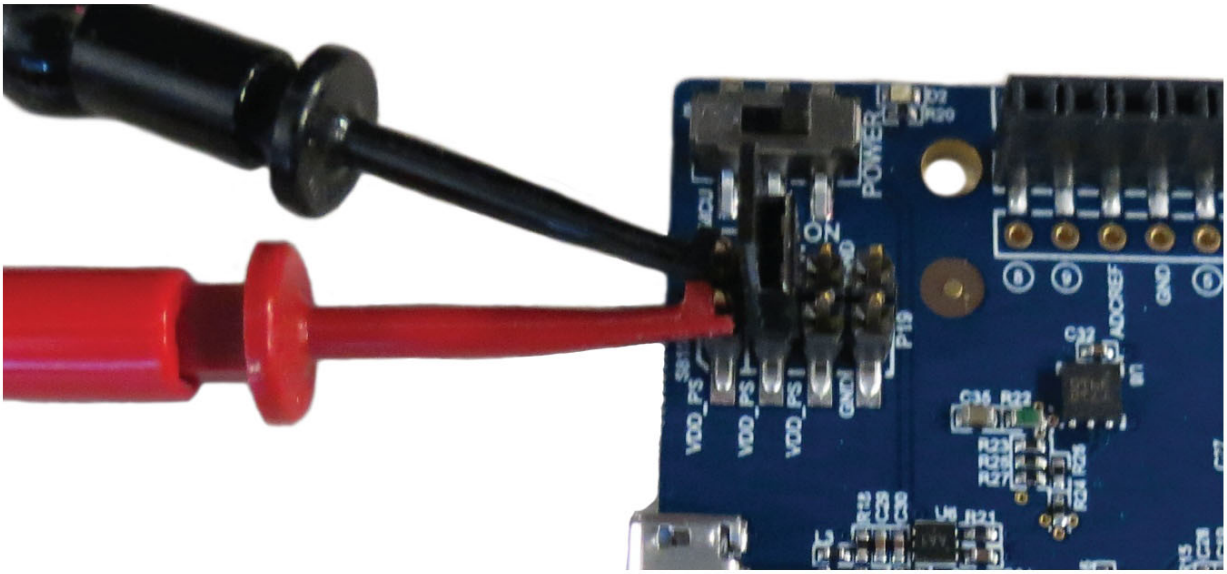
Figure 5-2: Header P19 Configured for 3.3V Operation - No Current Measurement



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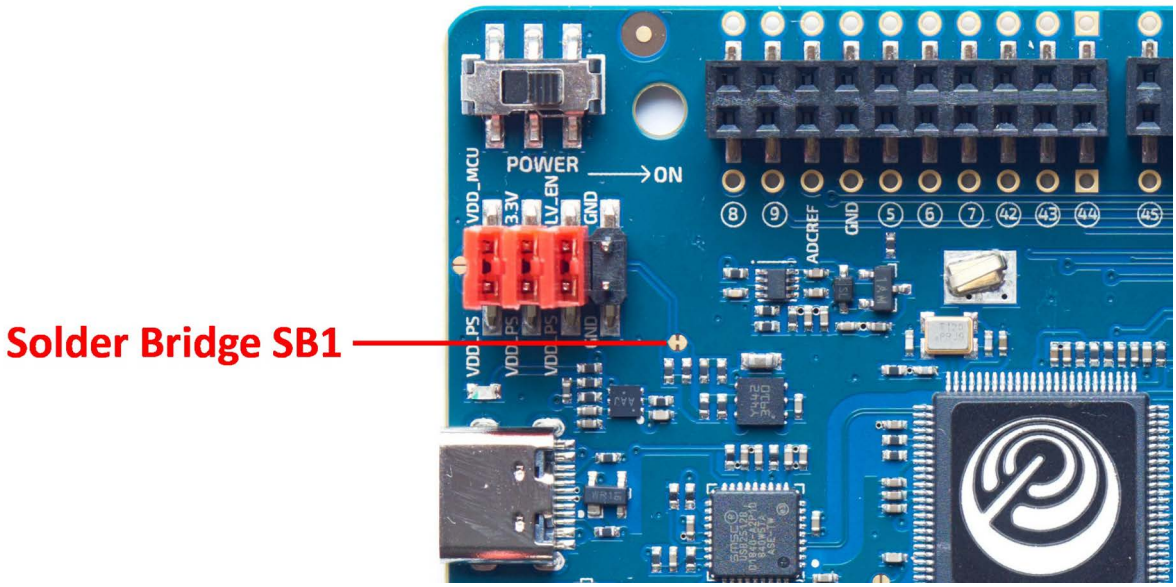
Figure 5-3 shows the EVB configured for 3.3V operation with current measuring leads across **VDD_PS** and **VDD_MCU** for current measurement.

Figure 5-3: Header P19 Configured for 3.3V Operation - With Current Measurement



Measuring the current consumption of the target MCU on the board using equipment with a sensing resistor will create a burden voltage over the resistor on **VDD_MCU**. In some cases the burden voltage may be too high and may cause a brown-out event on the target MCU at 1.8V. SB1 on the board can be cut to make U8 (**VDD_PS_LDO** generator) output 1.9V instead of 1.8V in the low-voltage configuration. This will enable current consumption measuring using equipment with a sensing resistor, such as a digital multimeter.

Figure 5-4: Solder Bridge SB1



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FTDI Interface

The on-board FTDI chip (FT4222H) is a SPI to USB data streaming interface from the Apollo3 Blue Plus to the connected PC. Transfer speed can exceed 200KBytes/sec, and the user can send generic data and audio data to the PC over the interface at same time. Audio data is supported in raw PCM (16bit/16Khz), SPP and OPUS formats. Complete instructions for using the interface with provided software can be found in an article in the Ambiq Support Community Knowledge Base: **https://support.ambiq.com/hc/en-us/articles/360037829251**

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