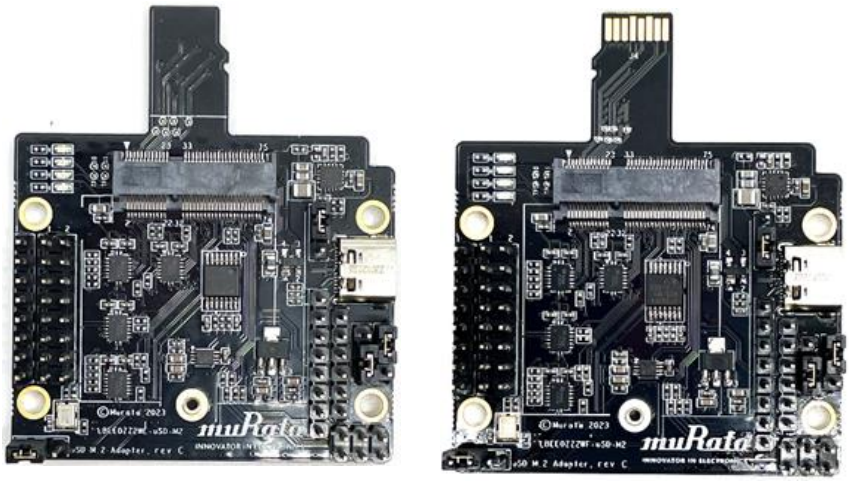
Datasheet

uSD-M.2 Adapter

Datasheet - Rev. 2.0



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About This Document

This datasheet describes 2WE and 2WF Rev C version of Murata's uSD-M.2 Adapter.

Audience & Purpose

This datasheet is intended for engineers interfacing the uSD-M.2 Adapter to their hardware.

Document Conventions

Table 1 describes the document conventions.

Table 1: Document Conventions

Conventions	Description
	**Warning Note** Indicates very important note. Users are strongly recommended to review.
	**Info Note** Intended for informational purposes. Users should review.
	**Menu Reference** Indicates menu navigation instructions. **Example**: Insert➔Tables➔Quick Tables➔Save Selection to Gallery 
	**External Hyperlink** This symbol indicates a hyperlink to an external document or website. **Example**: Embedded Artists AB  Click on the text to open the external link.
	**Internal Hyperlink** This symbol indicates a hyperlink within the document. **Example**: Appendix B: References  Click on the text to open the link.
`Console input/output or code snippet`	**Console I/O or Code Snippet** This text ***Style*** denotes console input/output or a code snippet.
`# Console I/O comment` `// Code snippet comment`	**Console I/O or Code Snippet Comment** This text ***Style*** denotes a console input/output or code snippet comment. • Console I/O comment (preceded by "#") is for informational purposes only and does not denote actual console input/output. • Code Snippet comment (preceded by "//") may exist in the original code.

1 Introduction to Murata uSD-M.2 Adapter Kit

Murata has partnered closely with Embedded Artists AB to provide a flexible Wi-Fi & Bluetooth solution for NXP Semiconductors' i.MX RT/6/7/8 Evaluation Kits. Murata's uSD-M.2 Adapter Kit with Embedded Artists' Wi-Fi/BT M.2 Modules enable users with a simple plug-in solution. The Embedded Artists' Wi-Fi/BT M.2 Modules are based on Murata modules using NXP Semiconductors' and Infineon Semiconductor's Wi-Fi/BT chipsets. Current Wi-Fi/BT M.2 EVB support includes Murata Type 2DS (NXP 88W8801), Type 1XK (NXP IW416), Type 1ZM (NXP 88W8987), Type 1YM [1] (NXP 88W8997 – WLAN-SDIO), Type 1XL [2] (NXP 88W8997 – WLAN-SDIO), Type 2XS [3] (NXP 88W8997 – WLAN-SDIO), Type 2DL (NXP IW611), Type 2EL (NXP IW612), Type 1YN (CYW43439), Type 1DX (CYW4343W), Type 1LV (CYW43012), Type 2AE (CYW4373E), Type 2BZ (CYW54590) , and Type 1MW (CYW43455).

All these M.2 EVBs use the WLAN-SDIO interface; this adapter does not support interfacing WLAN-PCIe configured modules such as Embedded Artists' Type 1XA (CYW54591), Type 2EA (CYW55573), Type 1YM (NXP 88W8997 – WLAN-PCIe), Type 1XL (NXP 88W8997 – WLAN-PCIe) and Type 2XS (NXP 88W8997 – WLAN-PCIe).

The uSD-M.2 Adapter provides the following interfaces to host MCU/MPU:

- microSD (uSD) interface for WLAN-SDIO (SD is an option with microSD-SD Adapter).
- Arduino Headers (i.MX RT/8) or Flat/Flex Connector (i.MX 6/7) for Bluetooth UART, Bluetooth PCM and WLAN/Bluetooth control signals.
- Optional power, debug, and clocking signals connect through Arduino Header or Micro-AB USB Connector.

Murata's uSD-M.2 Adapter uses a type 2230-xx-E M.2 Connector: this interface is essentially M.2 Key-E compliant with some enhancements to support additional debug signals and 3.3V VDDIO override[4] for Embedded Artists' Wi-Fi/BT M.2 Modules.

The 3.3V M.2 VDDIO operation is only recommended when 1.8V interface voltage cannot be supported by host. Refer to **Table 7**Table 7 for more details.

NXP platforms like 8M-MINI currently use the uSD Adapter 1WE in inverted position.
To avoid the inverted position for 8M-MINI, 2WF is created. Both 2WE and 2WF have SPI interfaces that will be used for testing 802.15.4.

To learn more details on configuring any of the Embedded Artists' Wi-Fi/BT M.2 modules for WLAN-SDIO configuration (i.e. 1YM, 1XL, 2XS) by modifying resistor strapping, please refer to the "Resources" tab for the corresponding datasheet at Embedded Artists' Wi-Fi/BT M.2 Modules.
WLAN-SDIO configuration is also covered in Murata documents (User Guide, Hardware Manual).

Given the limitations on Revision A of the 1WE uSD-M.2 Adapter, it is strongly recommended that customers switch to either 2WE or 2WF.

[1] Note that default strapping configuration on Type 1YM M.2 EVB (EAR00370) is for WLAN-PCIe and BT-UART.
[2] Note that default strapping configuration on Type 1XL M.2 EVB (EAR00387) is for WLAN-PCIe and BT-UART.
[3] Note that default strapping configuration on Type 2XS M.2 EVB (EAR00411) is for WLAN-PCIe and BT-UART.
[4] Note that 3.3V VDDIO override feature is currently only supported on Embedded Artists' 2DS, 1XK, 1YM, 1XL, 2XS, 1YN, 1DX, 2AE, and 1MW M.2 modules. The 1ZM, and 1LV M.2 modules only operate at 1.8V VIO only (chipset limitation).

2 Murata Kit Contents

The Murata uSD-M.2 Adapter Kit (Part No: LBEE0ZZ2WE-uSD-M2 and LBEE0ZZ2WF-uSD-M2) contents are shown in **Table 2** and **Table 3**.

Table 2: 2WE uSD Adapter Kit Contents

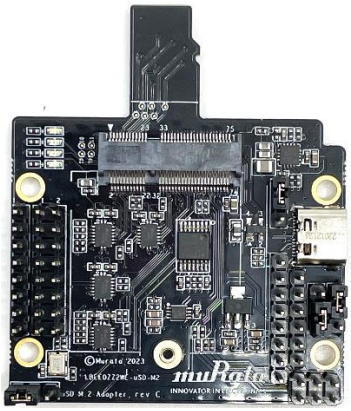
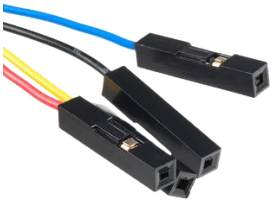
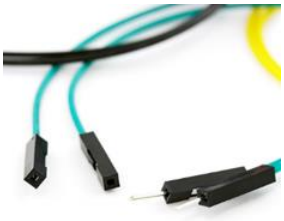
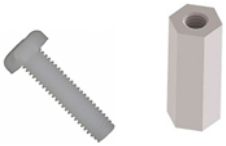
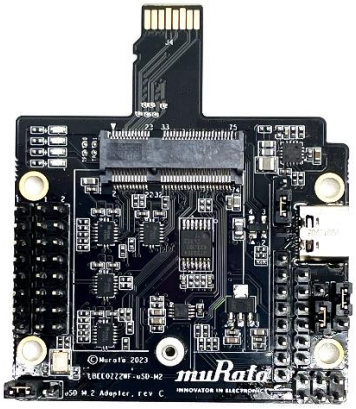
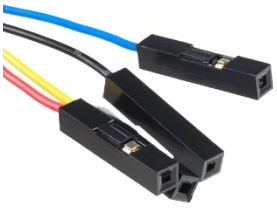
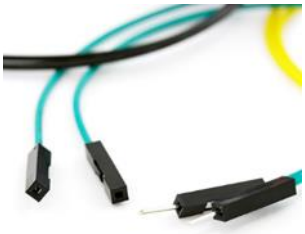
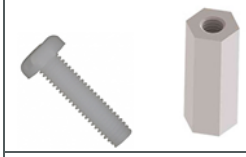
Picture of Contents	Description of Contents
	uSD-M.2 Adapter (Version 2WE, Rev. C)
	1 M.2 screw for attaching Wi-Fi/Bluetooth M.2 Evaluation Board (EVB)
	25 pieces 200 mm long female-to-female jumper cables (compatible with Arduino header).
	25 pieces 200 mm long male-to-female jumper cables (compatible with Arduino header).
	4 x 18 mm stand-off and screw sets in nylon.
	microSD to SD Card Adapter

Table 3: 2WF uSD Adapter Kit Contents

Picture of Contents	Description of Contents
	uSD-M.2 Adapter (Version 2WF, Rev. C)
	1 M.2 screw for attaching Wi-Fi/Bluetooth M.2 Evaluation Board (EVB)
	25 pieces 200 mm long female-to-female jumper cables (compatible with Arduino header).
	25 pieces 200 mm long male-to-female jumper cables (compatible with Arduino header).
	4 x 14 mm stand-off and screw sets in nylon.
	microSD to SD Card Adapter

3 uSD-M.2 Adapter High-Level Description

Figure 1, **Figure 2**, **Figure 3** and **Figure 5** highlight the Adapter features; with text explanation in **Table 4**. The uSD-M.2 Adapter supports additional signals to WLAN-SDIO using Arduino headers (J5, J8, and J9). The Arduino headers provide interconnect options to i.MX RT/8 Platforms. For more details on interconnecting with NXP's evaluation platforms, refer to Murata Wi-Fi/BT Solution for i.MX Hardware User Manual.

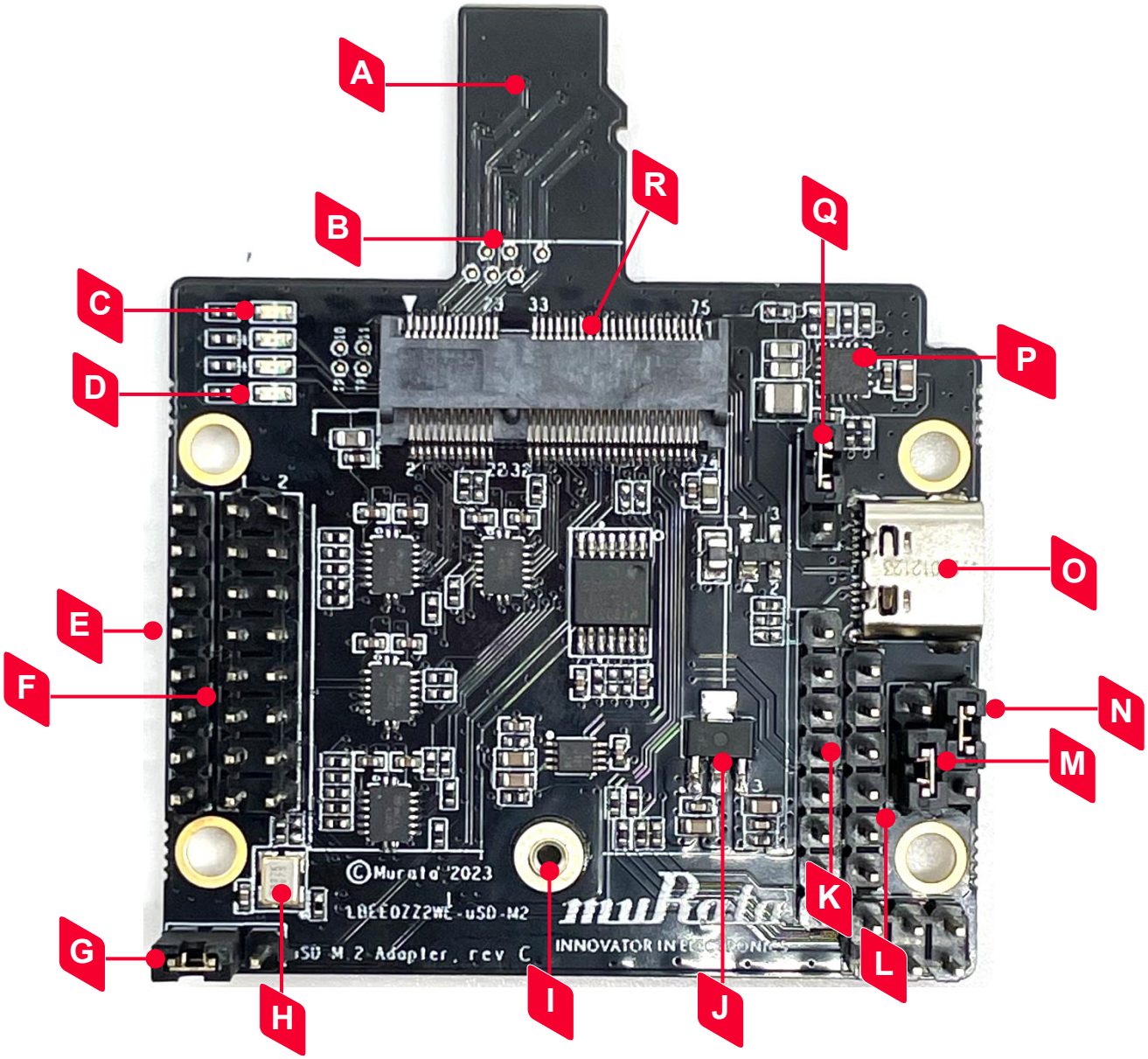
Table 4: uSD-M.2 Adapter Features

Clear	Description
A	microSD connector provides Power (VBAT, GND) and WLAN-SDIO
B	SDIO bus test points (CLK, CMD, DAT0, DAT1, DAT2, DAT3)
C	**LED2** = 3.3V M.2 IO Voltage Indicator (Blue) – not illuminated in default configuration
D	Power LED Indicator (green): if not illuminated then no power applied to M.2 EVB
E	**J9** = BT UART TX/RX and WLAN/BT Control Signals (8 pin header)
F	**J5** = Optional BT PCM and WLAN/BT Debug Signals (2x8 pin header)
G	**J14** = M.2 VDDIO: J14 in 1-2 pos for M2 PIN64 M2 VDDIO (default); J14 in 2-3 pos for M2 VDDIO
H	External sleep clock input (32.768 kHz)
I	Threaded mount for M.2 screw: 30 mm distance from M.2 connector
J	Regulator to step down optional 5V VBAT from USB or Arduino header to 3.3V
K	**J7** = Optional Arduino Header Power Supply (8 pin header; 5V or 3.3V VBAT)
L	**J8** = BT UART RTS/CTS Signals (6 pin header)
M	**J13** = Host IO Voltage: J13 in 1-2 pos for 3.3V VDDIO (default); J13 in 2-3 pos for 1.8V
N	**J12** = M.2 IO Voltage: J12 in 1-2 pos for 1.8V VDDIO (default); J12 in 2-3 pos for 3.3V
O	**J2** = Optional 5V USB Power Supply via Micro-AB USB Connector
P	Regulator to provide optional 1.8V VIO to M.2 interface (M.2 EVBs have own 1.8V onboard)
Q	**J1** = Power Supply Selector Jumper must be installed to power Adapter (unless J5 Arduino Header Pins #15/16 are connected to external GND/3.3V VBAT). **Position 1-2:** 5V/3.3V VBAT supply from micro-USB (J2); or Arduino (J7) **Position 2-3:** VBAT supply (typical 3.1 ~ 3.3V) from microSD connector
R	M.2 Connector: type 2230-xx-E
S	microSD connector pins provide Power (VBAT, GND) and WLAN-SDIO
T	**JP1** = Slider Switch Setting **1** = DIR1_CTRL: OPEN = WL_WAKE_IN (input to M.2); CLOSED/ON = SPI_RXD_HOST (output to M.2) **2** = DIR2_CTRL: OPEN = PCM_SYNC is an input to M.2 (host is I2S master); CLOSED/ON = PCM_SYNC is an output to M.2 (host is I2S slave) **3** = DIR3_CTRL: OPEN = PCM_CLK is an input to M.2 (host is I2S master); CLOSED/ON = PCM_CLK is an output to M.2 (host is I2S slave) **4** = BT_IND_RST_HOST: OPEN = BT independent reset controlled by M.2 pin 54; CLOSED/ON = BT interface placed in reset, i.e., is disabled

3.1 uSD-M.2 Adapter Features – 2WE (Top View)

Figure 1 describes the parts (Top View) of the uSD-M.2 Adapter (Version 2WE). Refer to **Table 4** for feature descripts denoted by alphabets.

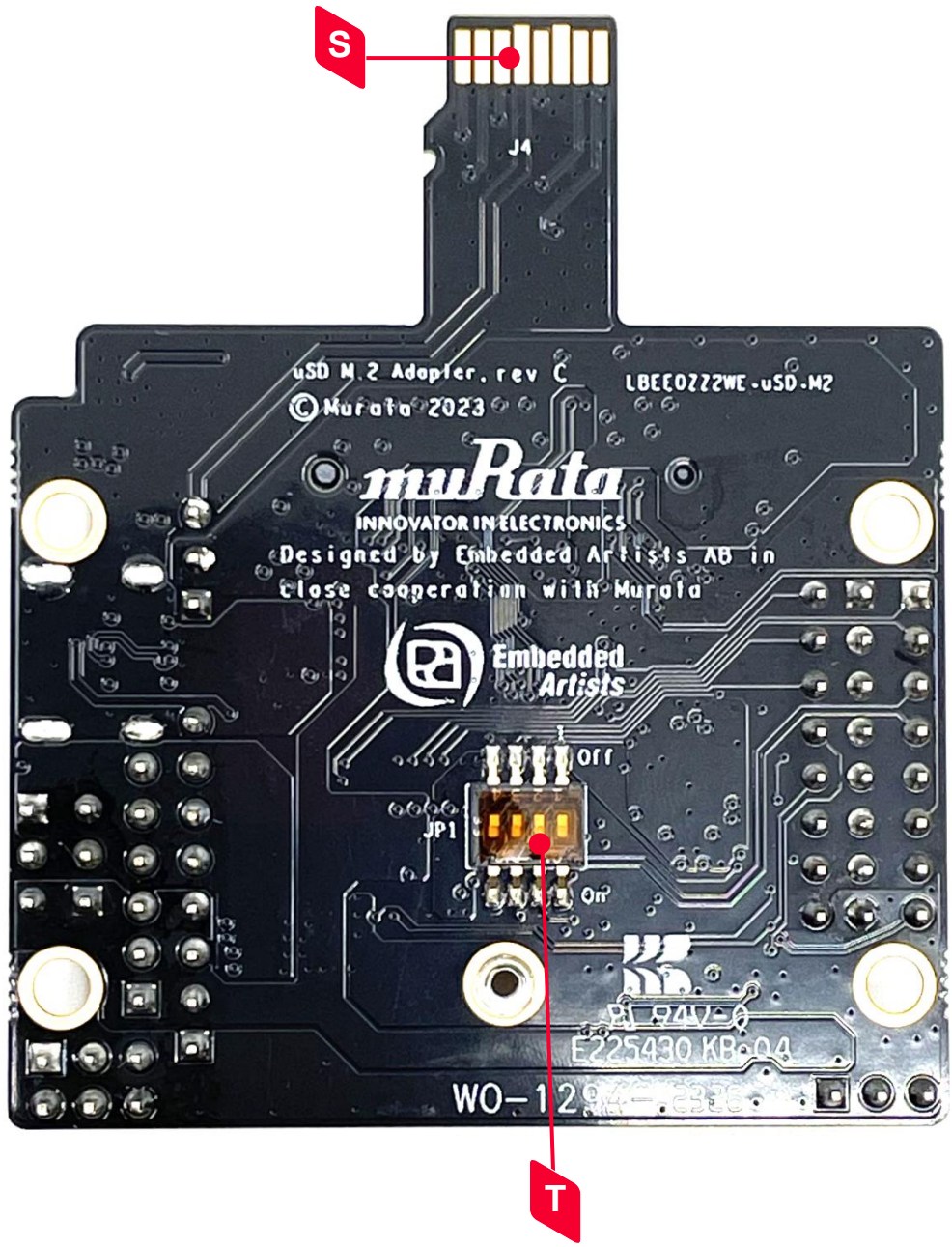
Figure 1: uSD-M.2 Adapter Features – 2WE (Top View)



3.2 uSD-M.2 Adapter Features – 2WE (Bottom View)

Figure 2 describes the parts (Bottom View) of the uSD-M.2 Adapter (Version 2WE). Refer to **Table 4** for feature descripts denoted by alphabets.

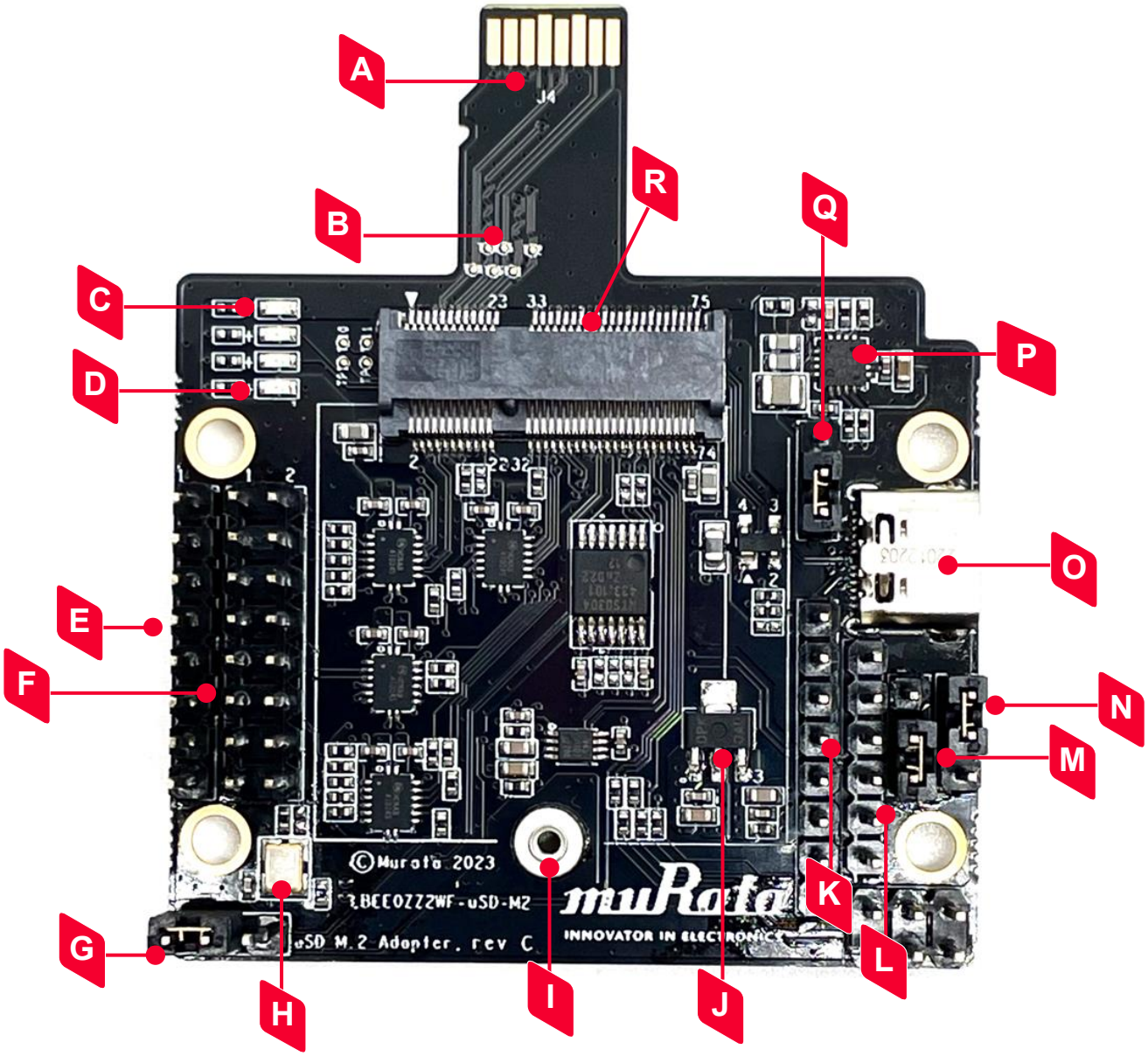
Figure 2: uSD-M.2 Adapter Features – 2WE (Bottom View)



3.3 uSD-M.2 Adapter Features – 2WF (Top View)

Figure 3 describes the parts (Top View) of the uSD-M.2 Adapter (Version 2WF). Refer to **Table 4** for feature descripts denoted by alphabets.

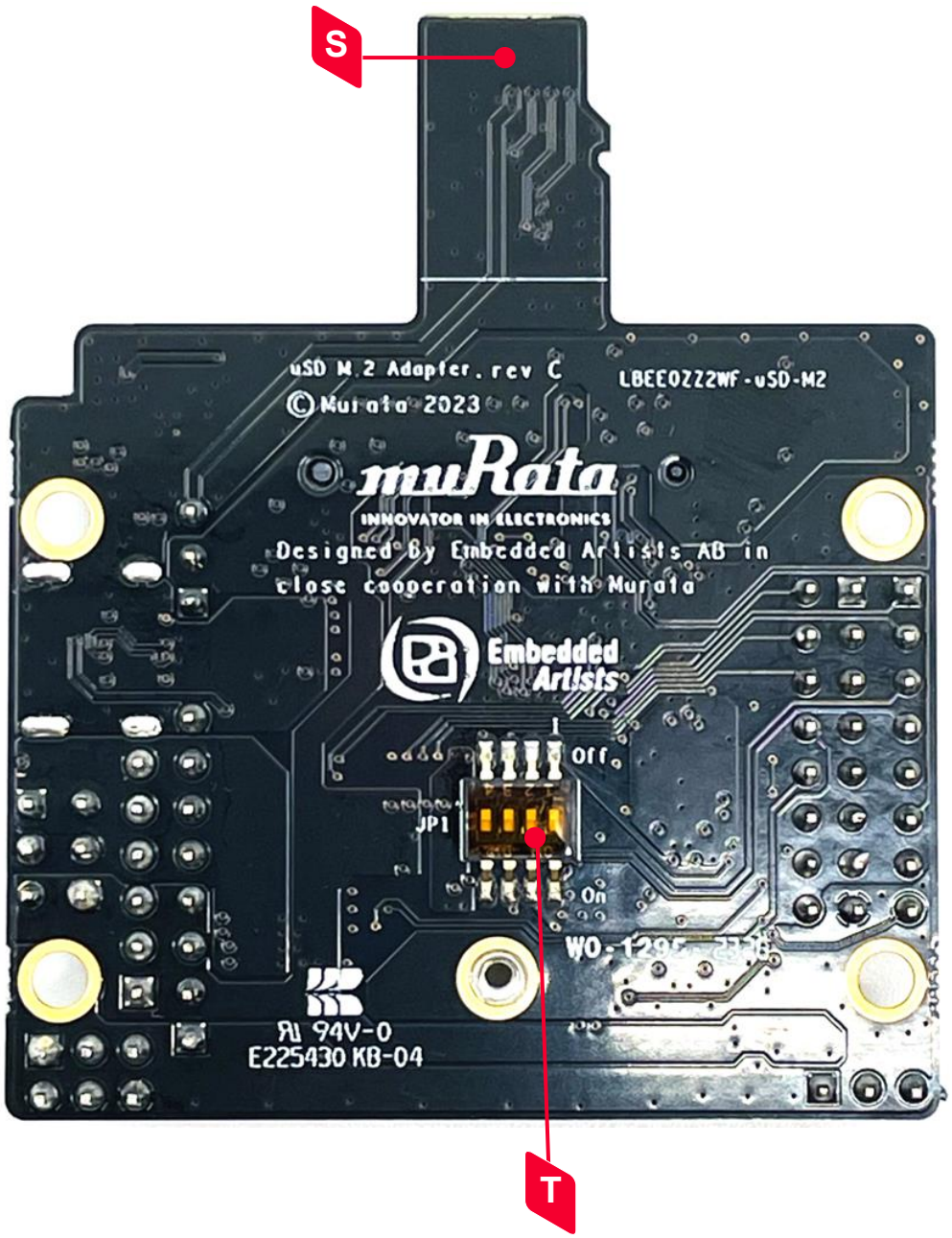
Figure 3: uSD-M.2 Adapter Features – 2WF (Top View)



3.4 uSD-M.2 Adapter Features – 2WF (Bottom View)

Figure 4 describes the parts (Bottom View) of the uSD-M.2 Adapter (Version 2WF). Refer to **Table 4** for feature descripts denoted by alphabets.

Figure 4: uSD-M.2 Adapter Features – 2WF (Bottom View)



4 uSD-M.2 Adapter: Headers/Jumpers in Detail

For more details on the headers and jumpers, refer to **Figure 5**, and **Figure 6**. Pin #1 location on J5 and J9 Arduino Headers are marked clearly on **Figure 5**. Regarding even/odd pins on J5, pin #2 is to the immediate right of pin #1: also seen referring to **Figure 11** (adapter layout).

4.1 J1: Power Supply Selector

Referring to **Figure 6**Figure 6 and **Figure 10**Figure 10, the J1 Jumper is used to select the power source for the adapter. This jumper must be installed to power Adapter (unless J5 Arduino Header Pins #15/16 are connected to external GND/3.3V VBAT). There are only two options/positions:

- **Position 1-2:** 5V/3.3V VBAT supply from micro-USB (J2) or Arduino Header (J7).
- **Position 2-3:** VBAT supply (typical 3.1 ~ 3.3V) from microSD connector (default).

The kit ships with J1 in default position of 2-3; configuring VBAT supply from microSD connector.

4.2 J14: M.2 VDDIO Selector

Referring to **Figure 5** and **Figure 10** (schematic)**,** J14 (see **blue rectangle**) is an optional jumper to select between M.2 VDDIO and M.2 Pin 64 M.2 VDDIO. Jumper J14 default setting is 1-2 position to enable the SPI interface. Pin 64 of the M.2 interface is used as SPI-SSEL. Currently only valid for the 2EL M.2. With J14 Installed in 2-3 position, VDDIO use pin #64 on M.2 interface to enable VDDIO voltage override. Valid for many, but not all, M.2 boards and certainly not the 2EL M.2. J12 selects the VDDIO override voltage; J12 1-2 pos: standard 1.8V (i.e., no VDDIO override). J12 2-3 pos: 3.3V VDDIO override.

4.3 J9: Bluetooth UART TX/RX and WLAN/Bluetooth Control Arduino Header

Referring to **Figure 5**, J9 (see **orange rectangle**) is an 8-pin Arduino Header that provides connectors to Bluetooth UART TX/RX and WLAN/Bluetooth control signals. Referring to **Figure 10,** level shifters U3 and U4 handle translation from 3.3V VIO signals to 1.8V VIO signals on Wi-Fi/BT M.2 Module (when J12/J13 jumpers are configured to default 1-2 setting). MODULE_PWR_EN_HOST and BT_IND_RST_HOST signals are buffered via U11 respectively to 3.3V signals on Wi-Fi/BT M.2 Module.

4.4 J5: Optional BT PCM and WLAN/BT Debug Signals

Referring to **Figure 5** and **Figure 10**, J5 (see **green rectangle**) is a 16-pin header that provides access to the following signals:

- Bluetooth PCM signals.
- I2C and SPI interface signals.
- Optional slow clock (LPO_IN_3V3) connection. If the user wants to bypass the onboard slow clock provided by U2 (i.e., remove R4), then this pin allows direct injection of the signal to M.2 Module.

- Optional 3.3V VBAT and GND power option: this is the only way to power the uSD-M.2 Adapter with J1 jumper removed.

The signals listed in **Figure 5** do not describe the seldomly used debug signals. Only specially enabled WLAN firmware or Bluetooth binaries will enable these optional debug pins.

Figure 5: uSD-M.2 Adapter - Left Headers/Jumpers

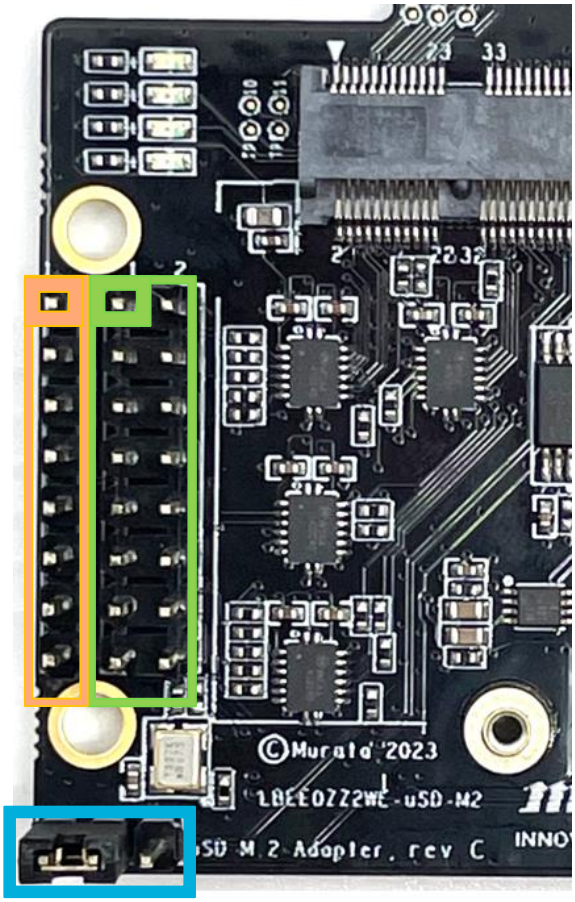


Table 5: uSD-M.2 Adapter - Left Headers/Jumpers Detail

uSD Adapter Header Jumper Detail			
J14 = M.2 VDDIO			
• Jumper installed in 1-2 position = SPI interface shall be enabled because then the SPI-SSEL signal is routed to pin 64 of the M.2 connector. Currently, this is only relevant for the 2EL M.2. • Jumper installed in 2-3 position = The VDDIO voltage override option is enabled. This VDDIO override option is not valid for all M.2 boards (and definitely not the 2EL M.2).			
J9 = BT UART TX/RX and WLAN/BT CTRL Arduino Header			
Pin#	J9 Signal	Pin#	J9 Signal
1	BT_UART_TXD_HOST	5	WL_WAKE_OUT_HOST
2	BT_UART_RXD_HOST	6	BT_WAKE_OUT_M2_3V3
3	MODULE_PWR_EN_HOST	7	WL_WAKE_IN_SPI_RXD_HOST
4	BT_IND_RST_HOST	8	BT_WAKE_IN_SPI_CLK_HOST
J5 = Optional BT PCM and I2C and SPI Interface Signals			
Pin#	J5 Signal	Pin#	J5 Signal
1	BT_PCM_IN_HOST	8	SPI_SSEL_HOST

uSD Adapter Header Jumper Detail			
2	I2C_SDA_HOST	10	SPI_TXD_HOST
3	BT_PCM_OUT_HOST	12	WL_IND_RST_HOST
4	I2C_SCL_HOST	14	LPO_IN_3V3
5	BT_PCM_SYNC_HOST	15	GND
6	SPI_INT_HOST	16	USD_3V3
7	BT_PCM_CLK_		

4.5 J12: M.2 IO Voltage: J12 in 1-2 pos for 1.8V VDDIO; J12 in 2-3 pos for 3.3V

Referring to **Figure 6**Figure 6 (jumper setting) and **Figure 10**Figure 10 (schematic), Jumper J12 (**see yellow rectangle**) default setting is 1-2 position for 1.8V VDDIO on M.2 interface. Per M.2 interface, WLAN SDIO/BT UART/BT PCM interfaces operate at a default 1.8V. The M.2 EVBs level shift remaining WLAN/BT (3.3V) control signals.

With J12 Installed in 2-3 position, VDDIO changes to 3.3V using pin #64 on M.2 interface to drive this M.2 IO Voltage setting. LED2 (blue) illuminates when 3.3V VDDIO setting is selected.

The VDDIO override option is only enabled if J14 is in 2-3 position. The 3.3V VDDIO (J12 in 2-3 position) will only work on select M.2 Modules such as 1XK or 2AE. Please consult Embedded Artists' Wi-Fi/BT M.2 module datasheet at Embedded Artists' Wi-Fi/BT M.2 Modules for specifics on supported VIO signaling.

4.6 J13: HOST IO Voltage: J13 in 1-2 pos for 3.3V VDDIO; J13 in 2-3 pos for 1.8V

Referring to **Figure 6**Figure 6 (jumper setting) and **Figure 10** (schematic), Jumper J13 (see **purple rectangle**) default setting is 1-2 position for 3.3V Host IO voltage. This VIO setting applies to all signals except WLAN SDIO, BT PCM, and WLAN/BT debug.

If J13 setting is 2-3 position, then Host IO voltage is configured for 1.8V. This jumper setting is only valid when J12 is configured for 1-2 (1.8V VIO) as well.

4.7 J7: Optional Arduino Header Power Supply (can connect either 5V or 3.3V VBAT)

Referring to **Figure 6** (jumper setting) and **Figure 10** (schematic), J7 Arduino Header (see **orange rectangle**) is used to provide optional power supply to microSD connector. Jumper J1 must be in 1-2 position (see J1: Power Supply Selector) to disconnect microSD power and enable J7 header. Powering options include the following (J1 in position 1-2):

- Connect J7 Pins #2 and/or #4 to 3.3V VBAT; and Pin #6 and/or #7 to GND.
- Connect J7 Pins #5 to 5V VBAT; and Pin #6 and/or #7 to GND.

4.8 J8: BT UART RTS/CTS Arduino Header

Referring to **Figure 6** and **Figure 10**, J8 Arduino Header (see **blue rectangle**) provides Bluetooth RTS and CTS connections. Default configuration for the Murata modules is to require flow control (i.e., not just TX/RX/GND). As such, both RTS/CTS signals need to be connected to host MCU/MPU to provide correctly functioning BT UART connection using H4 UART transport.

BT_UART_CTS_HOST (UART CTS) is an output "from the Host CPU" and an input "to the M.2 board", and BT_UART_RTS_HOST (UART RTS) is an input "to the Host CPU" and an output "from the M.2 board". For complete details on the pin/signal definitions, refer to **Table 8**.

Figure 6: uSD-M.2 Adapter - Right Headers/Jumpers

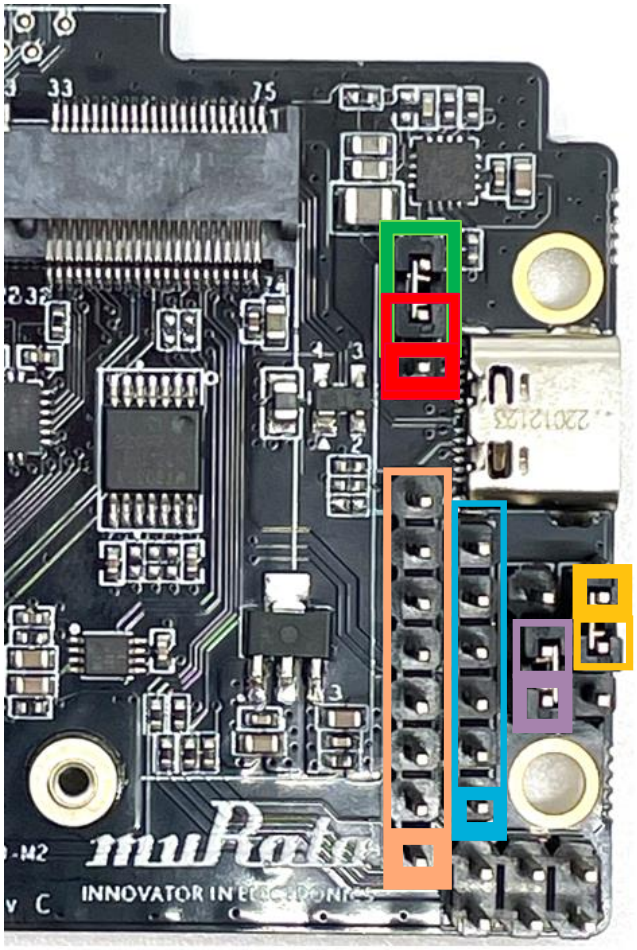


Table 6: uSD-M.2 Adapter - Right Headers/Jumpers Detail

uSD Adapter Header Jumper Detail			
J1 = Power Supply Selector Jumper must be installed to power Adapter. • **Position 1-2: 5V/3.3V VBAT supply from micro-USB (J2) or Arduino (J7)** • **Position 2-3: VBAT supply (typical 3.1 ~ 3.3V) from microSD connector**			
J12 = M.2 IO Voltage in 1-2 pos for 1.8V VDDIO; and 2-3 pos for 3.3V			
• Jumper Installed in 1-2 pos = M.2 VIO set to 1.8V (default) • Jumper Installed in 2-3 pos = M.2 VIO set to 3.3V; LED2 (Blue) illuminates			
J13 = HOST IO Voltage in 1-2 pos for 3.3V VDDIO; and 2-3 pos for 1.8V			
• Jumper Installed in 1-2 pos = HOST VIO set to 3.3V (default) • Jumper Installed in 2-3 pos = HOST VIO set to 1.8V			
J7 = Optional Arduino Header Power Supply			
Pin#	**J7 Signal**	**Pin#**	**J7 Signal**
2	USD_3V3	6	GND
4	USD_3V3	7	GND
5	5V	8	5V
J8 = BT UART RTS/CTS Arduino Header			

uSD Adapter Header Jumper Detail			
Pin#	**J8 Signal**	**Pin#**	**J8 Signal**
3	BT_UART_RTS_HOST	4	BT_UART_CTS_HOST

5 HOST/M.2 VDDIO Voltage Settings

Table 7 summarizes J13/J12 jumper settings, indicating what Host and M.2 VIO voltages are being configured. **Figure 7** describes the two most common voltage settings in a block diagram.

The default configuration for J13/J12 (Host/M.2 VIO) is setting both jumpers in 1-2 position. This configures the M.2 VIO for WLAN-SDIO (and optional PCM) at 1.8 volts. The BT-UART and select WLAN-BT CTRL signals are level shifted from Host 3.3V to M.2 1.8V as necessary to adhere to the M.2 specification.

The “3.3V Override” configuration is used when the Host MPU/MCU platform can only support 3.3V VIO signaling on WLAN-SDIO interface. This override feature only works with select M.2 EVBs as previously documented in this datasheet. The J13/J12 settings for this override mode are 1-2/2-3 respectively as shown in the block diagram.

Revision A of the uSD-M.2 Adapter does not support level shifting on BT-UART nor on select WLAN/BT CTRL signals. The limitation with the Rev A Adapter is that the Host and/or M.2 interface may over-drive certain pins at 3.3V VIO which are configured for 1.8V input. This limitation has been corrected with Revision B1. The Rev B2 of the uSD-M.2 Adapter was backwards compatible with Rev B1; and included slightly modified sleep clock. In addition to all the features from Rev B1 adapter, versions 2WE and 2WF have SPI interfaces that will be used for testing 802.15.4.

Given the limitations on Revision A of the 1WE uSD-M.2 Adapter, it is strongly recommended that customers switch to either Version 2WE or 2WF of Revision C.

Table 7: Host/M.2 IO Voltage Level Setting

Host IO Voltage	M.2 IO Voltage	SDIO Voltage	UART/Ctrl Signal Voltage	All Other Signals Voltage	Notes and Explanation
3.3V (J13 in 1-2 pos)	1.8V (J12 in 1-2 pos)	1.8V	3.3V	1.8V	Voltage levels to M.2 module according to standard. 3.3V on UART and main control signals, but some direct M.2 signals have 1.8V voltage level.
3.3V (J13 in 1-2 pos)	3.3V (J12 in 2-3 pos) Blue LED is on.	3.3V	3.3V	3.3V	"3.3V override mode". 3.3V on SDIO and all GPIOs. Note that all M.2 modules do not support 3.3V override mode.
1.8V (J13 in 2-3 pos)	1.8V (J12 in 1-2 pos)	1.8V	1.8V	1.8V	Voltage levels to M.2 module according to standard. Host processor has 1.8V IO voltage.
1.8V (J13 in 2-3 pos)	3.3V (J12 in 2-3 pos) Blue LED is on.				Do not select. Not a valid combination.

Figure 7: Common Host/M.2 IO Voltage Level Shift Options

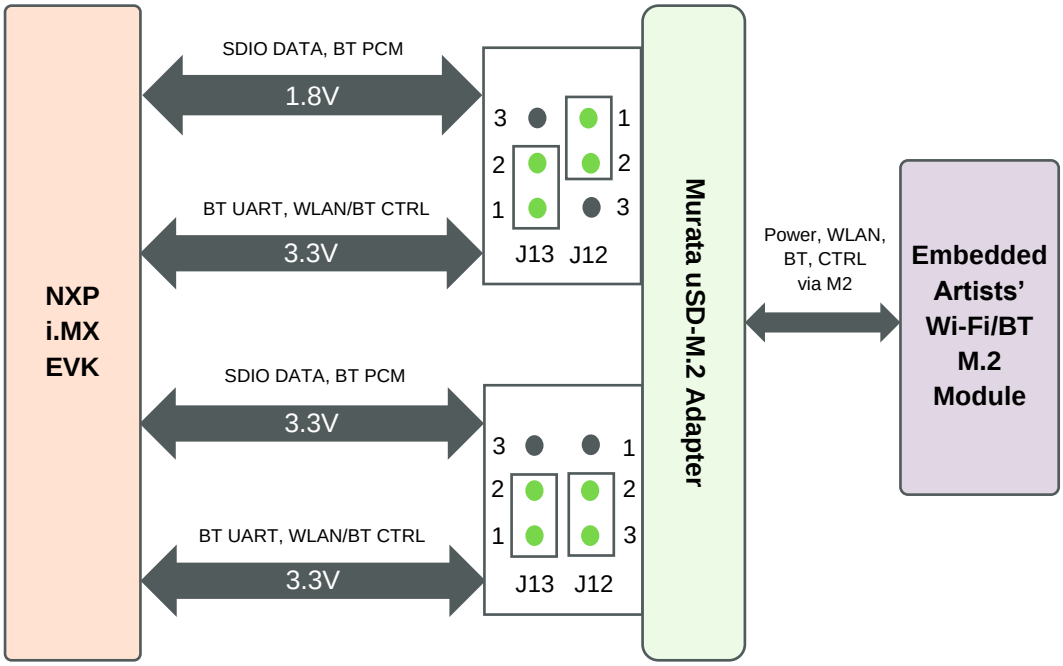


Table 8: uSD-M.2 Adapter Pinout Definition

J#	Pin #	Name	I/O	V	Description
J1	1-2	USD_3V3	N/A	3.3	3.3V VBAT supply from USB-C (J2) or Arduino Header (J7)
J1	2-3	USD_3V3	N/A	3.0~3.3	VBAT supply (typical 3.1 ~ 3.3V) from microSD connector (default). This is supplied by host.
J2	-	USB-C Interface Connector	N/A	5.0	Optional +5V powering and the USB interface is actually connected to the M.2 connector
J3	1,7,18,33,39,45, 51,57,63,69,75	GND	N/A	N/A	M.2 Ground connections
J3	2,4,72,74	VBAT	N/A	3.3~3.6	M.2 VBAT supply
J3	3	USB_DP			
J3	4	USB_DN			
J3	6,16	LED4, LED3	N/A	3.3	None of the M.2 boards will drive these LEDs. Maybe future firmware revisions will drive them. The LEDs were included just to follow the M.2 standard, and these may, or may not, be used in the future.
J3	8	BT_PCM_CLK_M2_VDDIO	I/O	1.8	Bluetooth PCM Clock
J3	9	SDIO_CLK_M2_VDDIO	I	1.8	SDIO Clock
J3	10	BT_PCM_SYNC_M2_VDDIO	I/O	1.8	Bluetooth PCM Sync
J3	11	SDIO_CMD_M2_VDDIO	I/O	1.8	SDIO Command
J3	12	BT_PCM_OUT_M2_VDDIO	O	1.8	Bluetooth PCM Output
J3	13	SDIO_DATA0_M2_VDDIO	I/O	1.8	SDIO DATA0
J3	14	BT_PCM_IN_M2_VDDIO	I	1.8	Bluetooth PCM Input
J3	15	SDIO_DATA1_M2_VDDIO	I/O	1.8	SDIO DATA1
J3	17	SDIO_DATA2_M2_VDDIO	I/O	1.8	SDIO DATA2
J3	19	SDIO_DATA3_M2_VDDIO	I/O	1.8	SDIO DATA3
J3	20	BT_WAKE_OUT_M2_3V3	O	3.3	Bluetooth Host Wake: Active Low
J3	21	WL_WAKE_OUT_M2_VDDIO	O	1.8	WLAN Host Wake: Active Low
J3	22	BT_UART_TXD_M2_VDDIO	O	1.8	Bluetooth UART Transmit
J3	23	WL_IND_RST_M2_VDDIO	I	1.8	WLAN SDIO Reset
J3	32	BT_UART_RXD_M2_VDDIO	I	1.8	Bluetooth UART Receive

J#	Pin #	Name	I/O	V	Description
J3	34	BT_UART_RTS_M2_VDDIO	O	1.8	Bluetooth UART Request-To-Send
J3	36	BT_UART_CTS_M2_VDDIO	I	1.8	Bluetooth Clear-To-Send
J3	38	M2_PIN38_M2_VDDIO	I/O	1.8	Optional JTAG Debug signal
J3	40	M2_PIN40_M2_VDDIO	I/O	1.8	Optional M.2 signal
J3	42	M2_PIN42_M2_VDDIO	I	1.8	Bluetooth Device Wake
J3	44	M2_PIN44-COEX3_M2_VDDIO	I/O	1.8	Optional JTAG Debug signal
J3	46	M2_PIN46-COEX2_M2_VDDIO	I/O	1.8	Optional JTAG Debug signal
J3	48	M2_PIN48-COEX1_M2_VDDIO	I/O	1.8	Optional JTAG Debug signal
J3	50	LPO_IN_3V3	I	3.3	External Sleep Clock (32.768 kHz) – used in deep sleep mode
J3	54	BT_IND_RST_3V3	I	3.3	Enables/Disables Bluetooth core: Active High
J3	56	MODULE_PWR_EN_3V3	I	3.3	Enables/Disables WLAN core: Active High
J3	58	M2_PIN58_M2_VDDIO	I/O	1.8	Optional M.2 signal
J3	60	M2_PIN60_M2_VDDIO	I/O	1.8	Optional M.2 signal
J3	62	M2_PIN62_M2_VDDIO	I/O	1.8	Optional M.2 signal
J3	64	VDDIO override	I	1.8~3.3	Overrides default 1.8V VDDIO; forces 3.3V operation on some M.2 Modules
J3	66, 68, 70	TP9, TP10, TP11			Test pads just to be able to access M.2 interface pins 66/68/70 in future. Currently, they have no use.
J4	1	SDIO_DATA2_M2_VDDIO	I/O	1.8	microSD SDIO DATA2
J4	2	SDIO_DATA3_M2_VDDIO	I/O	1.8	microSD SDIO DATA3
J4	3	SDIO_CMD_M2_VDDIO	I/O	1.8	microSD SDIO Command
J4	4	SDIO_VCC_3V3	N/A	3.0~3.3	VBAT supply from microSD
J4	5	SDIO_CLK_M2_VDDIO	O	1.8	microSD SDIO Clock
J4	6	GND	N/A	N/A	microSD Ground
J4	7	SDIO_DATA0_M2_VDDIO	I/O	1.8	microSD DATA0
J4	8	SDIO_DATA1_M2_VDDIO	I/O	1.8	microSD DATA1
J5	1	BT_PCM_IN_HOST	I	1.8~3.3	Bluetooth PCM Input
J5	2	I2C_SDA_HOST	I/O	1.8~3.3	Optional M.2 signal
J5	3	BT_PCM_OUT_HOST	O	1.8~3.3	Bluetooth PCM Output
J5	4	I2C_SCL_HOST	I/O	1.8~3.3	Optional M.2 signal
J5	5	BT_PCM_SYNC_HOST	I/O	1.8~3.3	Bluetooth PCM Sync
J5	6	SPI_INT_HOST	I/O	1.8~3.3	Optional M.2 signal
J5	7	BT_PCM_CLK_HOST	I/O	1.8~3.3	Bluetooth PCM Clock
J5	8	SPI_SSEL_HOST	I/O	1.8~3.3	Optional M.2 signal
J5	10	SPI_TXD_HOST	I/O	1.8~3.3	Optional M.2 signal
J5	12	WL_IND_RST_HOST	I/O	1.8~3.3	Optional M.2 signal
J5	14	LPO_IN_3V3	I	3.3	External Sleep Clock (32.768 kHz) – used in deep sleep mode. Optional input to drive signal directly on this pin – or can be used to measure/check clock signal. If driving this pin with external clock; remove R4. Another option is to ground the clock input signal (install R5 and remove R4).
J5	15	GND	N/A	N/A	Ground connection; used for external power (i.e. lab bench power supply).
J5	16	USD_3V3	N/A	3.3	3.3V VBAT external power supply (i.e. lab bench power supply). Need to disconnect/remove Jumper J1.
J7	2,4	USD_3V3	N/A	3.3	Alternative VBAT supply for Adapter
J7	5, (8)	5V	N/A	5.0	Alternative VBAT supply for Adapter: to connect Pin #8, populate R49.
J7	6,7	GND	N/A	N/A	Ground
J8	3	BT_UART_RTS_HOST	O	1.8~3.3	Bluetooth UART Request-To-Send
J8	4	BT_UART_CTS_HOST	I	1.8~3.3	Bluetooth UART Clear-To-Send
J9	1	BT_UART_TXD_HOST	O	1.8~3.3	Bluetooth UART Transmit
J9	2	BT_UART_RXD_ HOST	I	1.8~3.3	Bluetooth UART Receive

J#	Pin #	Name	I/O	V	Description
J9	3	MODULE_PWR_EN_HOST	I		Enables/Disables WLAN core: Active High
J9	4	BT_IND_RST_ HOST	I	1.8~3.3	Enables/Disables Bluetooth Core: Active High
J9	5	WL_WAKE_ OUT_HOST	O	1.8~3.3	WLAN Host Wake: Active Low (OOB IRQ)
J9	6	BT_WAKE_OUT_M2_3V3	O	1.8~3.3	Bluetooth Host Wake: Active Low
J9	7	WL_WAKE_ IN-SPI_RXD_HOST	I	1.8~3.3	WLAN Device Wake
J9	8	BT_WAKE_ IN-SPI_CLK_HOST	I	1.8~3.3	Bluetooth Device Wake
J10	1	WL_WAKE_ IN-SPI_RXD_HOST	I/O	1.8~3.3	Optional M.2 signal
J10	2	M2_PIN44-COEX3_M2_VDDIO			
J10	3	SPI_TXD_HOST	I/O	1.8~3.3	Optional JTAG Debug signal
J10	4	M2_PIN48-COEX1_M2_VDDIO			
J10	5	M2_PIN46-COEX2_M2_VDDIO	I/O	1.8~3.3	Optional JTAG Debug signal
J10	6	GND	N/A	N/A	Ground
J12	1-2	M2_VDDIO	N/A	1.8	J12: Jumper Pins 1-2 to configure M.2 IO Voltage to 1.8V (default)
J12	2-3	M2_VDDIO	N/A	3.3	J12: Jumper Pins 2-3 to configure M.2 IO Voltage to 3.3V
J13	1-2	HOST_VDDIO	N/A	3.3	J13: Jumper Pins 1-2 to configure HOST IO Voltage to 3.3V (default)
J13	2-3	HOST_VDDIO	N/A	1.8	J13: Jumper Pins 2-3 to configure HOST IO Voltage to 1.8V.
J14	1-2	M2_PIN64_M2_VDDIO	N/A	3.3	J14: Jumper Pins 1-2 to enable the SPI interface. Pin 64 of the M.2 interface is used as SPI-SSEL. Currently only valid for the 2EL M.2 (default).
J14	2-3	M2_VDDIO	N/A	1.8	J14: Jumper Pins 2-3 to enable VDDIO voltage override. Valid for many, but not all, M.2 boards and certainly not the 2EL M.2.

Please change the jumper setting of J14 to 1-2 if it is set to 2-3 position. When SPI interface is in use, set J14 to 1-2.

6 uSD-M.2 Adapter with M.2 Modules

Figure 8 shows picture of the NXP module 2EL (IW612) with the Murata uSD-M.2 adapter. **Figure 9** shows picture of the IFX modules 2EA (CYW55573) with Murata uSD-M.2 adapter.

Figure 8: 2WE uSD-M.2 Adapter with 2EL Module

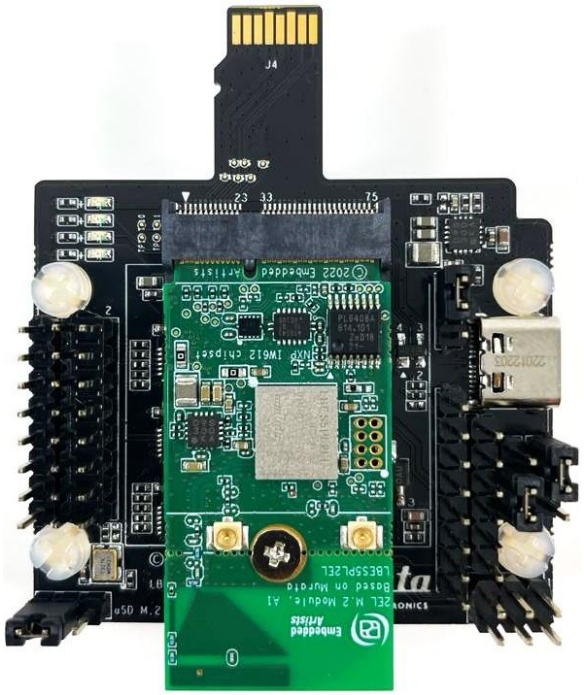
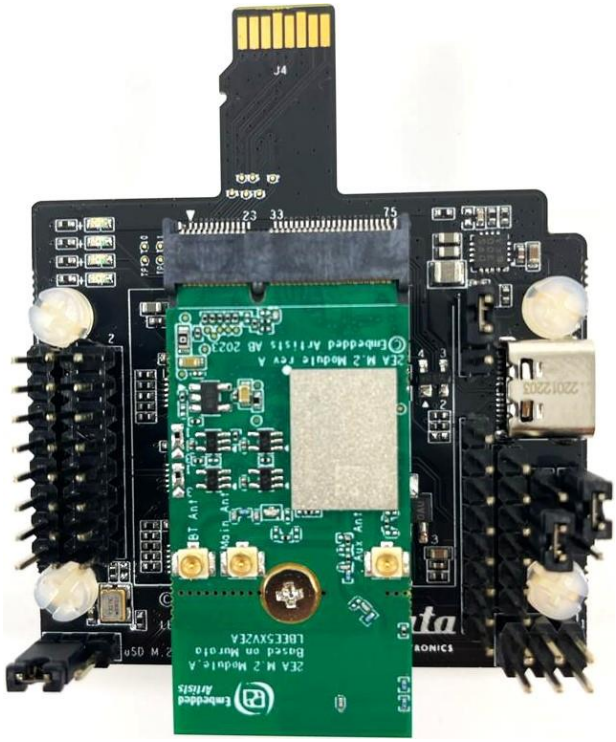


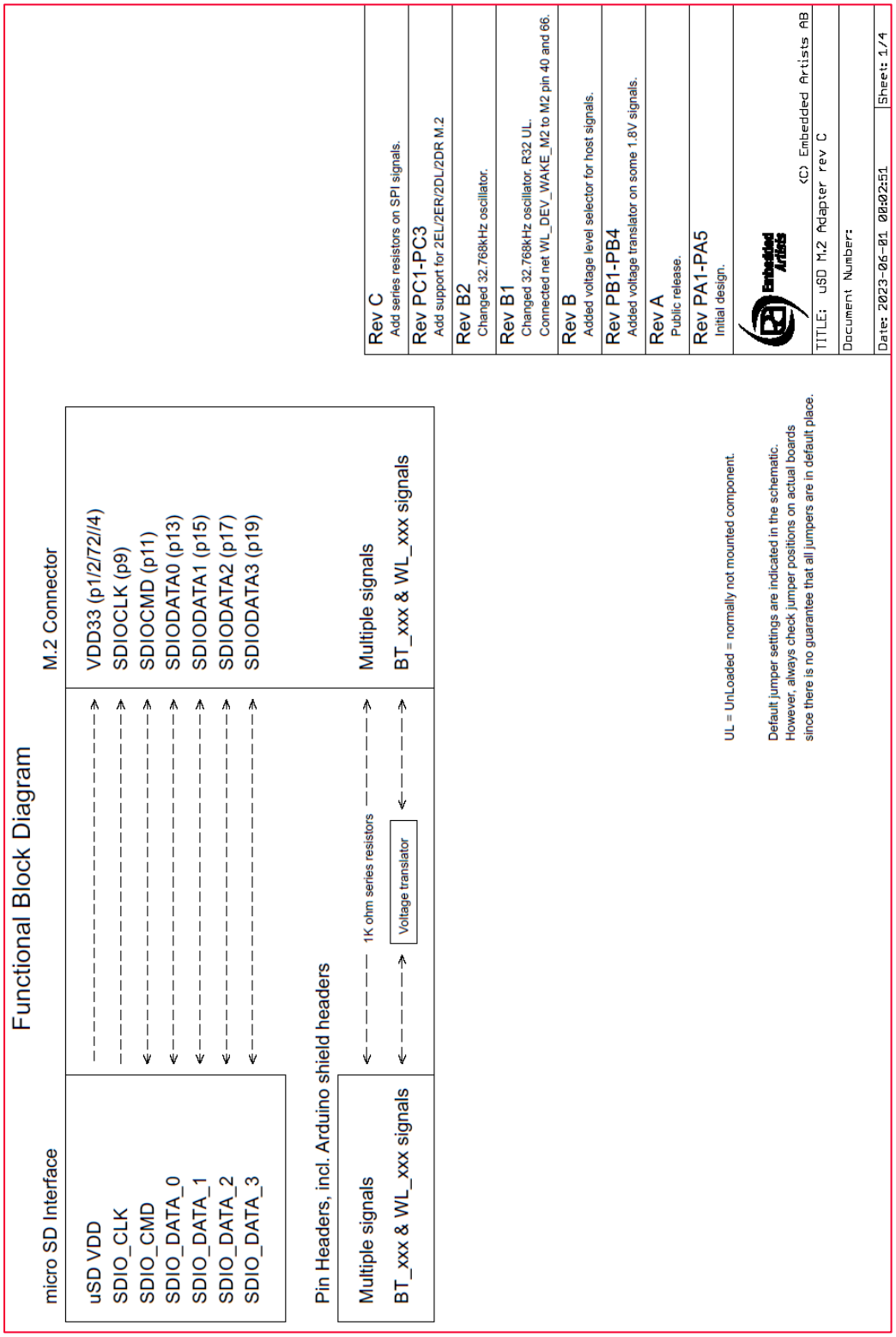
Figure 9: 2WE uSD-M.2 Adapter with 2EA Module

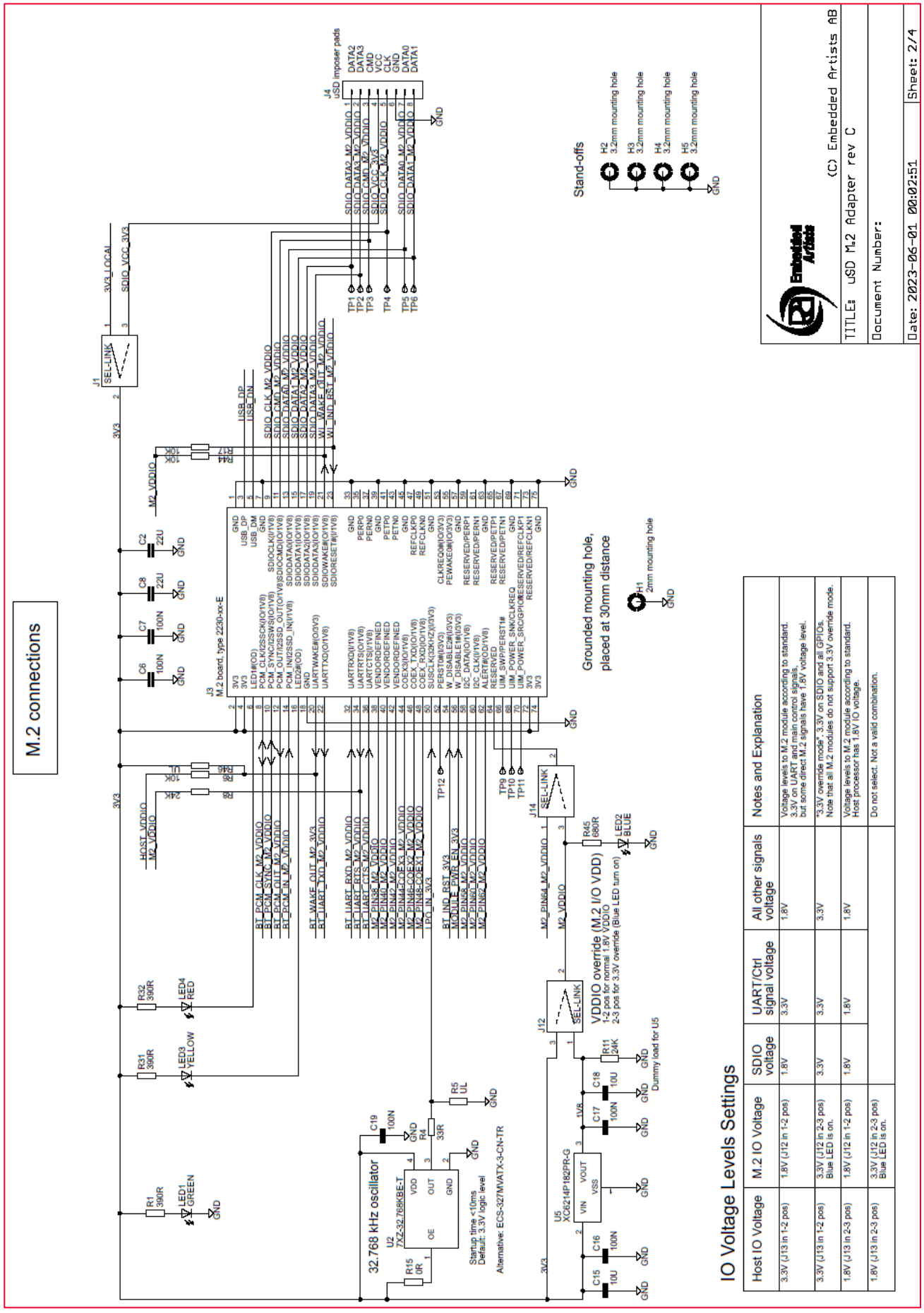


7 uSD-M.2 Adapter Schematic and Layout

For more specifics on adapter circuit and layout refer to **Figure 10**, **Figure 11**, **Figure 12**, **Figure 13**, and **Figure 14**.

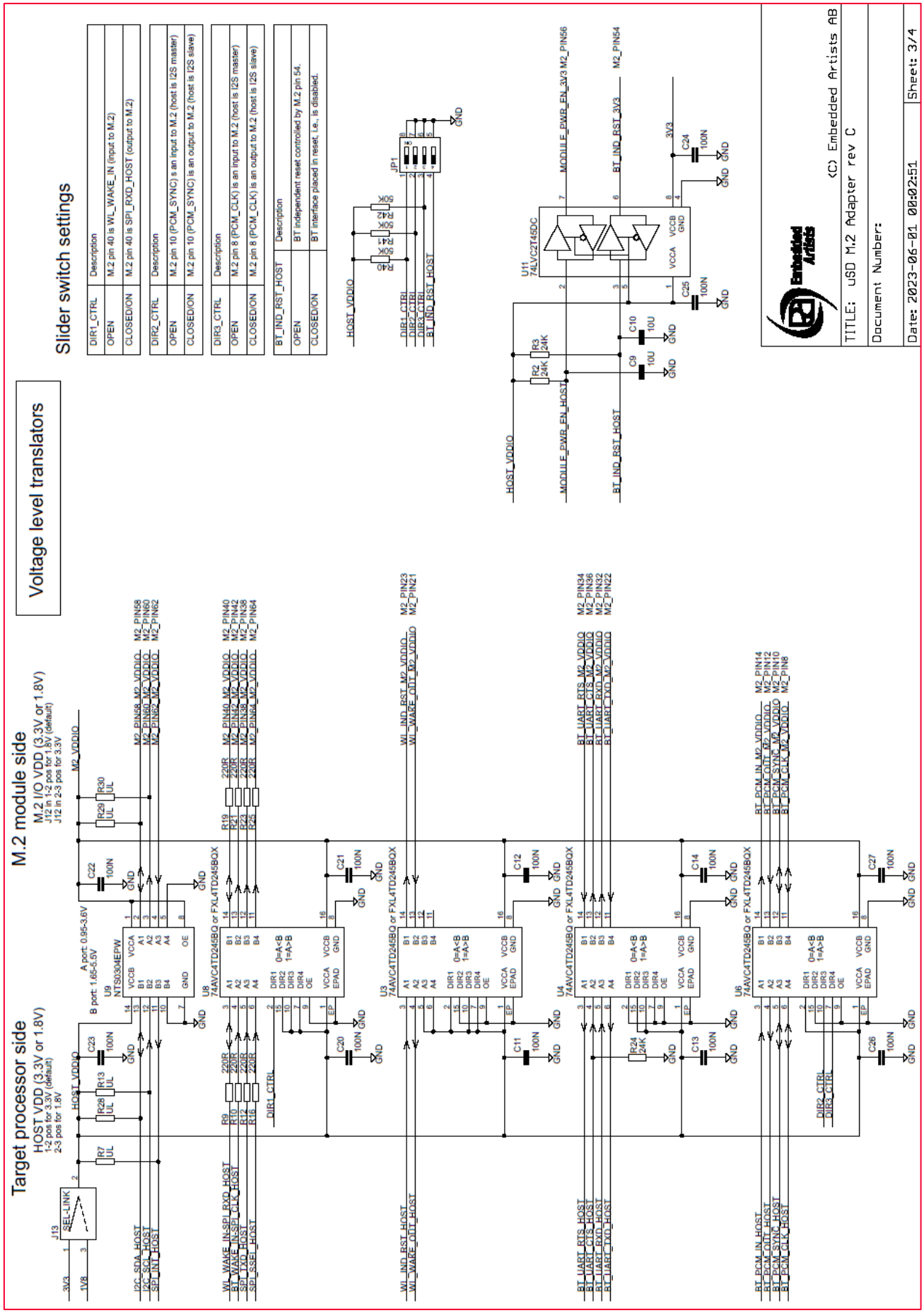
Figure 10: uSD-M.2 Adapter Schematic





IO Voltage Levels Settings

Host IO Voltage	M.2 IO Voltage	SDIO voltage	UART/Ctrl signal voltage	All other signals voltage	Notes and Explanation
3.3V (J13 in 1-2 pos)	1.8V (J12 in 1-2 pos)	1.8V	3.3V	1.8V	Voltage levels to M.2 module according to standard. 3.3V on UART and main control signals, but some direct M.2 signals have 1.8V voltage level.
3.3V (J13 in 1-2 pos)	3.3V (J12 in 2-3 pos) Blue LED is on.	3.3V	3.3V	3.3V	"3.3V override mode", 3.3V on SDIO and all GPIOs. Note that all M.2 modules do not support 3.3V override mode.
1.8V (J13 in 2-3 pos)	1.8V (J12 in 1-2 pos)	1.8V	1.8V	1.8V	Voltage levels to M.2 module according to standard. Host processor has 1.8V IO voltage.
1.8V (J13 in 2-3 pos)	3.3V (J12 in 2-3 pos) Blue LED is on.				Do not select. Not a valid combination.


Target processor side
HOST VDD (3.3V or 1.8V)
1-2 pos for 3.3V (default)
2-3 pos for 1.8V
M.2 module side
M.2 I/O VDD (3.3V or 1.8V)
J12 in 1-2 pos for 1.8V (default)
J12 in 2-3 pos for 3.3V
Voltage level translators
Slider switch settings
DIR1_CTRL
OPEN
CLOSED/ON
M.2 pin 40 is WL_WAKE_IN (input to M.2)
M.2 pin 40 is SPI_RXD_HOST (output to M.2)
DIR2_CTRL
M.2 pin 10 (PCM_SYNC) is an input to M.2 (host is I2S master)
M.2 pin 10 (PCM_SYNC) is an output to M.2 (host is I2S slave)
DIR3_CTRL
M.2 pin 8 (PCM_CLK) is an input to M.2 (host is I2S master)
M.2 pin 8 (PCM_CLK) is an output to M.2 (host is I2S slave)
BT_IND_RST_HOST
BT independent reset controlled by M.2 pin 54.
BT interface placed in reset, i.e., is disabled.
(C) Embedded Artists AB
TITLE: uSD M.2 Adapter rev C
Document Number:
Date: 2023-06-01 00:02:51
Sheet: 3/4

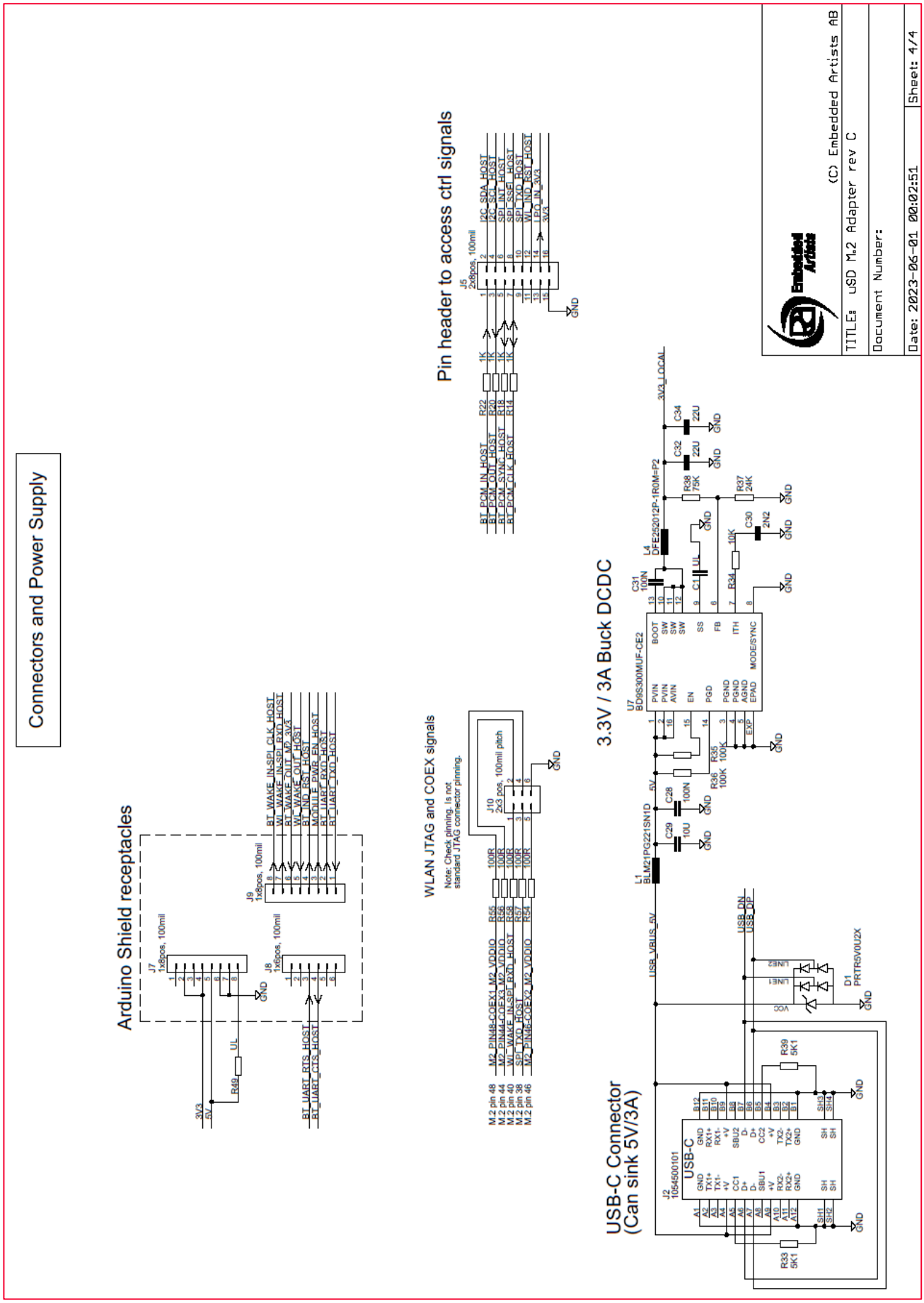

Connectors and Power Supply
Arduino Shield receptacles
Pin header to access ctrl signals
WLAN JTAG and COEX signals
3.3V / 3A Buck DCDC
USB-C Connector
(Can sink 5V/3A)
(C) Embedded Artists AB
TITLE: uSD M.2 Adapter rev C
Document Number:
Date: 2023-06-01 00:02:51
Sheet: 4/4

Figure 11: 2WE uSD-M.2 Adapter Layout (Top)

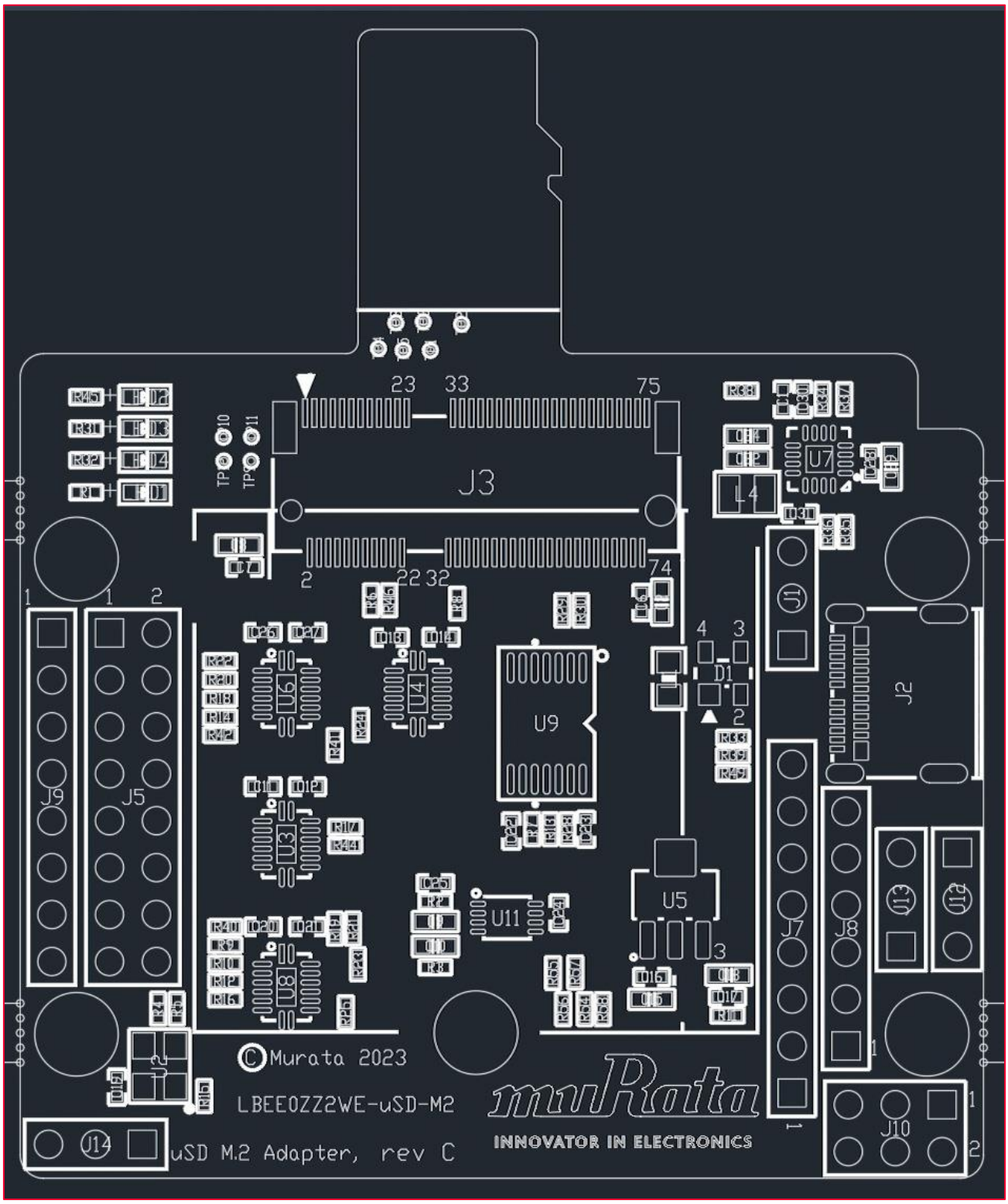


Figure 12: 2WE uSD-M.2 Adapter Layout (Bottom)

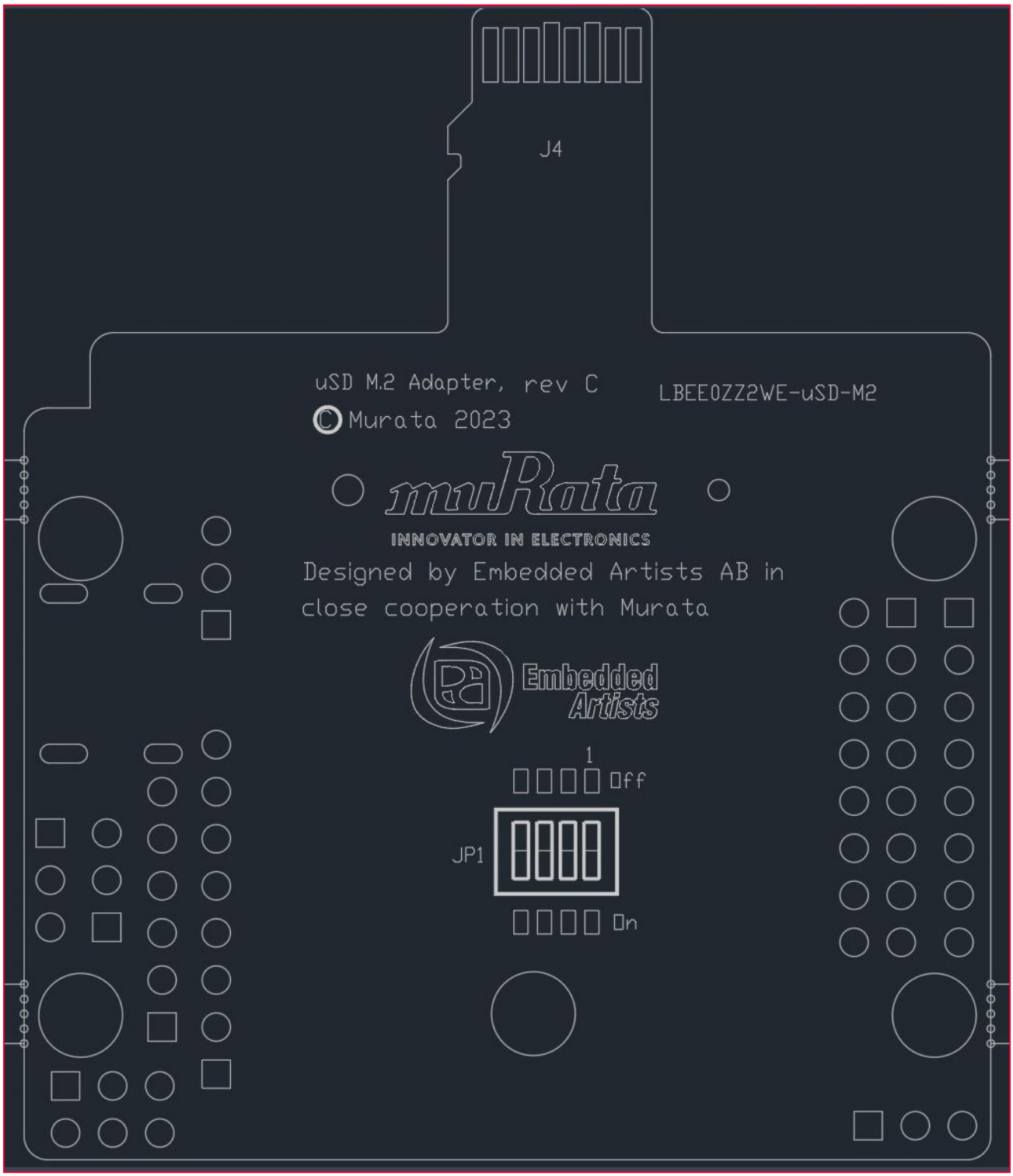


Figure 13: 2WF uSD-M.2 Adapter Layout (Top)

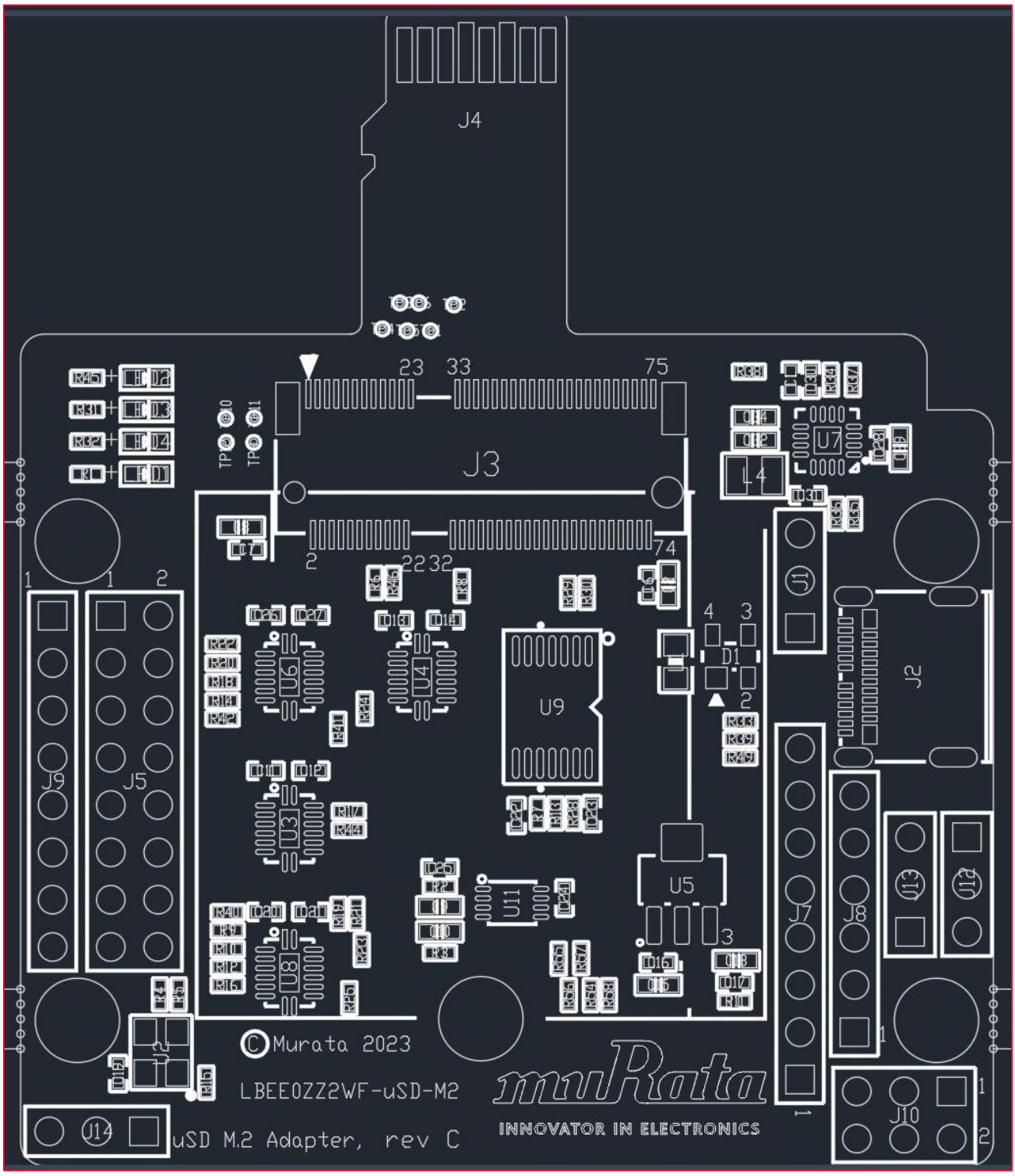
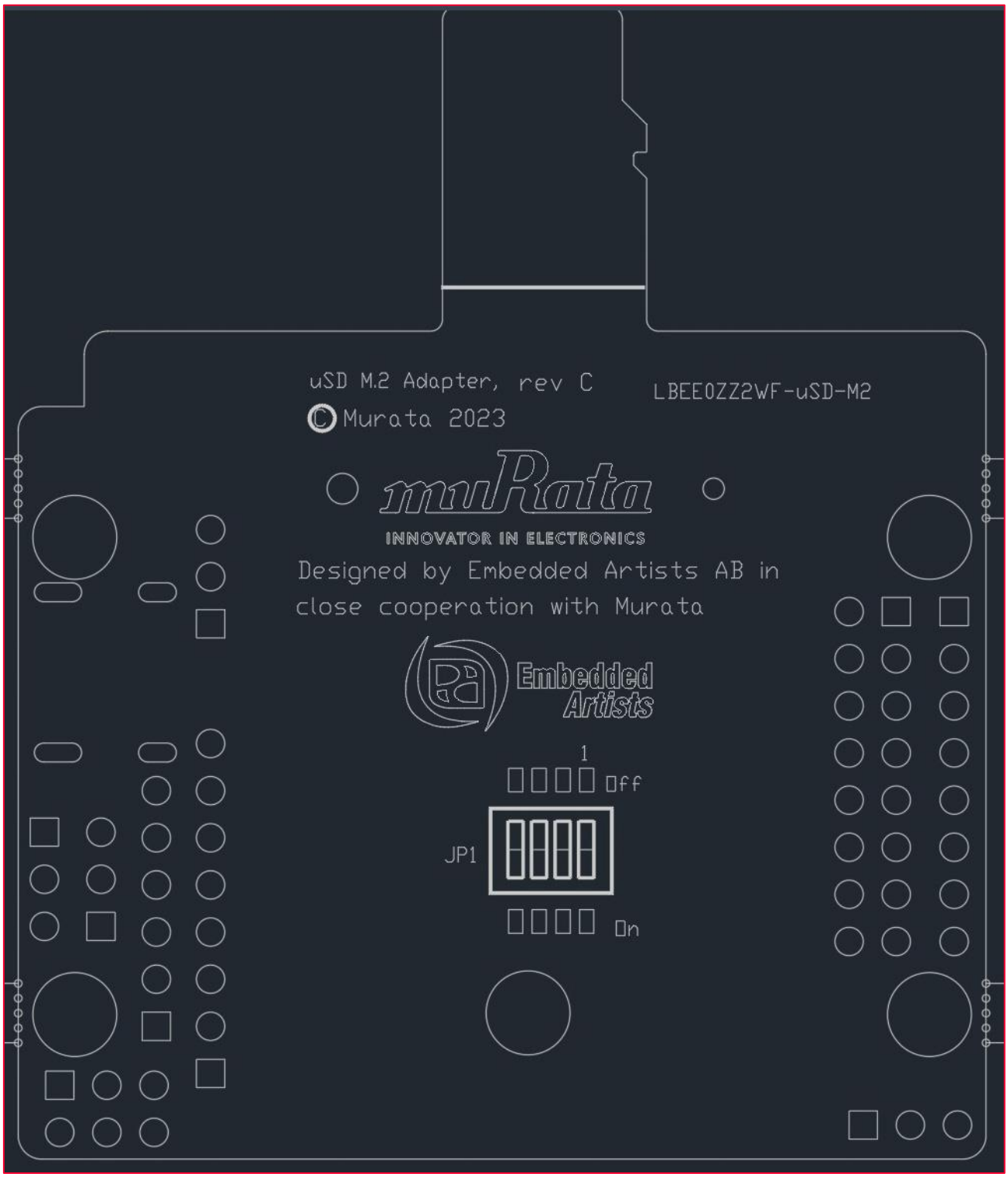


Figure 14: 2WF uSD-M.2 Adapter Layout (Bottom)



8 Appendix A: Acronyms

Table 9 describes the acronyms in this document.

Table 9: Acronyms

Acronyms	Meaning
1YM-SDIO	Type 1YM M.2 EVB configured (strapped) for WLAN-SDIO operation.
1XL-SDIO	Type 1XL M.2 EVB configured (strapped) for WLAN-SDIO operation.
2XS-SDIO	Type 2XS M.2 EVB configured (strapped) for WLAN-SDIO operation.
BT	Bluetooth
CTRL	Control
CTS	Clear to Send
EVB	Evaluation Board
EVK	Evaluation Kit
FFC	Flat Flexible Cable
GND	Ground
GPIO	General Purpose Input Output
JTAG	Joint Test Action Group
LED	Light-emitting Diode
M.2	Formerly known as the Next Generation Form Factor (NGFF), is a specification for internally mounted computer expansion cards and associated connectors. The M.2 specification is defined by PCI-SIG.
OOB IRQ	Out of Band Interrupt Request Line
PCIe	Peripheral Component Interconnect Express
PCM	Pulse Code Modulation
RTS	Request to Send
RX	Receive
SD	Secure Digital
SDIO	Secure Digital Input Output
TX	Transmit
UART	Universal Asynchronous Receiver/Transmitter
USB	Universal Serial Bus
uSD	microSD
VBAT	Voltage of Battery
VDDIO	Voltage used by signals on memory bus
VIO	Input Offset Voltage
Wi-Fi	Wireless LAN: “Wi-Fi” is a registered trademark of Wi-Fi Alliance
WLAN	Wireless Local Area Network

9 Appendix B: References

For further information refer to the below.

9.1 Murata's uSD-M.2 Adapter Landing Page

This website landing page provides latest/comprehensive information on Murata's adapter including links to where it can be purchased.

9.2 Embedded Artists' M.2 Modules Landing Page

This website landing page provides latest/comprehensive information on Embedded Artists' M.2 Evaluation Boards which enable Murata Wi-Fi/BT modules for easy evaluation.

9.3 Murata's i.MX Wireless Solutions Landing Page

This website landing page provides latest/comprehensive information on Murata's i.MX Wireless solutions which use the uSD-M.2 Adapter as a key enabler so customers can easily evaluate Murata's modules on i.MX processors.

9.4 Murata's Community Forum Support

Murata's Community provides online support for the uSD-M.2 Adapter. Refer to this link for the Forum's main Wi-Fi/Bluetooth landing page.

9.5 uSD-M.2 Adapter Rev B2 Datasheet

This datasheet documents previous version of the Adapter.

9.6 Murata uSD-M.2 Adapter Datasheet (legacy Rev A)

This datasheet documents the legacy version of the Murata' uSD-M.2 adapter hardware and its interfacing options. This adapter version is no longer manufactured.

9.7 Murata Wi-Fi/BT Solution for i.MX Hardware User Manual

This manual describes the Murata uSD-M.2 Adapter hardware. All interface signals to the NXP i.MX RT, 6, 7, and 8 EVKs are described. Specifics on interfacing each i.MX EVK to Murata uSD-M.2 Adapter are provided.

Revision History

Revision	Date	Author	Change Description
1.0	05/15/2023	TF	Initial release.
2.0	09/27/2023	TF	Updated information for the Rev. C 2WE and 2WF adapter