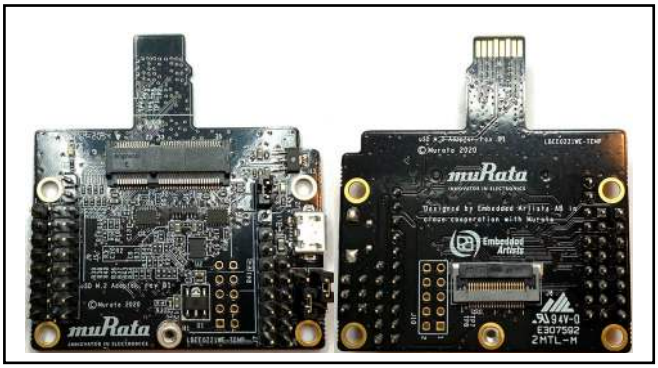
Murata uSD-M.2 Adapter Datasheet



Revision History

Revision	Date	Author	Change Description
1.0	04/15/2019	S. Kerr	Initial release
1.1	07/30/2020	TF	Updated reference section
2.0	11/17/2020	TF	Updated for Rev B1 Adapter
2.1	1/26/2020	TF	Update to correct Type 1YM WLAN-SDIO VIO (1.8V only).

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1 Murata uSD-M.2 Adapter Kit

1.1 Introduction

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 Cypress Semiconductor's and NXP Semiconductors' Wi-Fi/BT chipsets. Current Wi-Fi/BT M.2 EVB support includes Murata Type 1DX (CYW4343W), Type 1MW (CYW43455), Type 1LV (CYW43012), Type 1ZM (NXP 88W8987), and Type 1YM[1] (NXP 88W8997 – WLAN-SDIO strapping configuration). Note that all these M.2 EVB's use the WLAN-SDIO interface; this adapter **does not** support interfacing WLAN-PCIe configured modules such as Embedded Artists' Type 1CX (CYW4356), Type 1XA (CYW54591) and Type 1YM (NXP 88W8997 – WLAN-PCIe strapping configuration). 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[2] for Embedded Artists' Wi-Fi/BT M.2 Modules. Note that the 3.3V M.2 VDDIO operation is only recommended when 1.8V interface voltage cannot be supported by host. Refer to **uSD-M.2 Adapter: Pinout Definition** for more details.

This datasheet describes Rev B1 of the uSD-m.2 Adapter. It is backwards compatible with Rev A; and includes enhancements for BT UART and WLAN/BT control signal level shifting. If possible, customers are encouraged to transition to Rev B1 Adapter. Rev A datasheet is hosted on Murata website here.

To learn more details on configuring the Embedded Artists' Type 1YM M.2 EVB for WLAN-SDIO configuration – refer to "Murata Wi-Fi/BT (NXP) Solution for i.MX Linux User Guide" which can be found on Murata's i.MX Wireless Solutions Landing Page or Murata's Community Forum. In addition all the hardware configuration (resistor strapping) details on Type 1YM M.2 EVB are in the Hardware User Manual.

1.2 Acronyms

Refer to **Table 1** for various acronyms used in this document.

[1] Note that default strapping configuration on Type 1YM M.2 EVB (EAR00370) is for WLAN-PCIe and BT-UART.

[2] Note that 3.3V VDDIO override feature is currently only supported on Embedded Artists' 1DX, and 1MW M.2 modules. The 1LV, 1ZM, and 1YM-SDIO M.2 modules only operate at 1.8V VIO only (chipset limitation).

Table 1: Acronyms used in Adapter Datasheet

Acronym	Meaning
1YM-SDIO	Type 1YM 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 (www.pcisig.com).
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

1.3 References

1.3.1 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.

1.3.2 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.

1.3.3 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.

1.3.4 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.

1.3.5 uSD-M.2 Adapter Rev A Datasheet

This datasheet documents previous version of the Adapter. The current revision (B1) is backwards compatible with Rev A. Rev B1 provides additional interface capability with voltage level shifter for BT-UART and WLAN/BT control signals. Customers are encouraged to transition to latest version (B1) of Adapter.

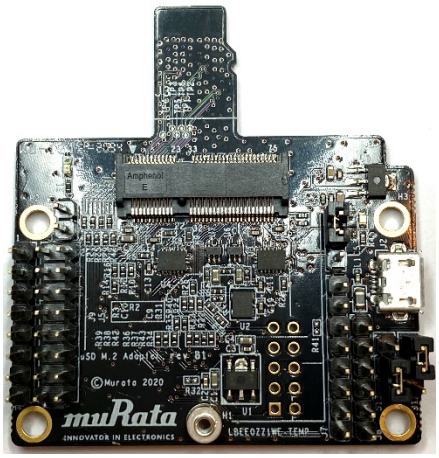
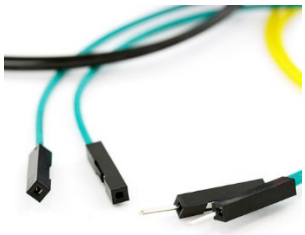
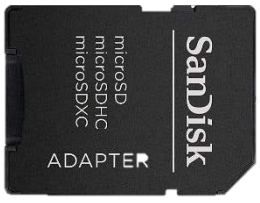
1.3.6 Murata Wi-Fi/BT Solution for i.MX Hardware User Manual

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

2 Murata Kit Contents

The Murata uSD-M.2 Adapter Kit (Part No: **LBEE0ZZ1WE-TEMP**) contents are shown in **Table 2**.

Table 2: uSD-M.2 Adapter Kit Contents

Picture of Contents	Description of Contents
	uSD-M.2 Adapter (Revision B1)
	M.2 screw for attaching Wi-Fi/Bluetooth M.2 Evaluation Board (EVB)
	75mm 20-pos, 0.5mm pitch flat/flex cable
	13 pieces 200mm long male-to-female jumper cables (compatible with Arduino header)
	4 x 19mm stand-offs in nylon and associated M3 screws
	microSD to SD Card Adapter

3 uSD-M.2 Adapter High-Level Description

Figure 1 and **Figure 2** highlight the Adapter features; with text explanation in **Table 3**. The uSD-M.2 Adapter supports additional signals to WLAN-SDIO using either Arduino headers (J5, J8, and J9) or 20 pin FFC connector (J6). The 20 pin FFC connector is currently supported by NXP's i.MX 6/7 Platforms. The Arduino headers provides 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 3: uSD-M.2 Adapter Features

Char	Description
A	microSD connector provides Power (VBAT, GND) and WLAN-SDIO
B	SDIO bus test points (CLK, CMD, DAT0, DAT1, DAT2, DAT3)
C	Power LED Indicator (green): if not illuminated then no power applied to M.2 EVB
D	J11 = Optional BT Disable Jumper for WLAN-Only Mode (close this jumper to drive BT_REG_ON low and disable Bluetooth Core; thereby optimizing power consumption)
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	Threaded mount for M.2 screw: 30mm distance from M.2 connector
H	Regulator to step down optional 5V VBAT from USB or Arduino header to 3.3V
I	External sleep clock input (32.768kHz)
J	J7 = Optional Arduino Header Power Supply (8 pin header; 5V or 3.3V VBAT)
K	J8 = BT UART RTS/CTS Signals (6 pin header)
L	J13 = Host IO Voltage: J13 in 1-2 pos for 3.3V VDDIO (default); J13 in 2-3 pos for 1.8V
M	J12 = M.2 IO Voltage: J12 in 1-2 pos for 1.8V VDDIO (default); J12 in 2-3 pos for 3.3V
N	J2 = Optional 5V USB Power Supply via Micro-AB USB Connector
O	LED2 = 3.3V M.2 IO Voltage Indicator (Blue) – not illuminated in default configuration
P	Regulator to provide optional 1.8V VIO to M.2 interface (M.2 EVB's 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: provides Power (VBAT, GND) and WLAN-SDIO
T	WLAN JTAG header (header pins not populated)
U	20 pin FFC connector (BT UART, BT PCM, WLAN/BT Control signals)
V	Additional test points from 20pin flat/flex connector

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

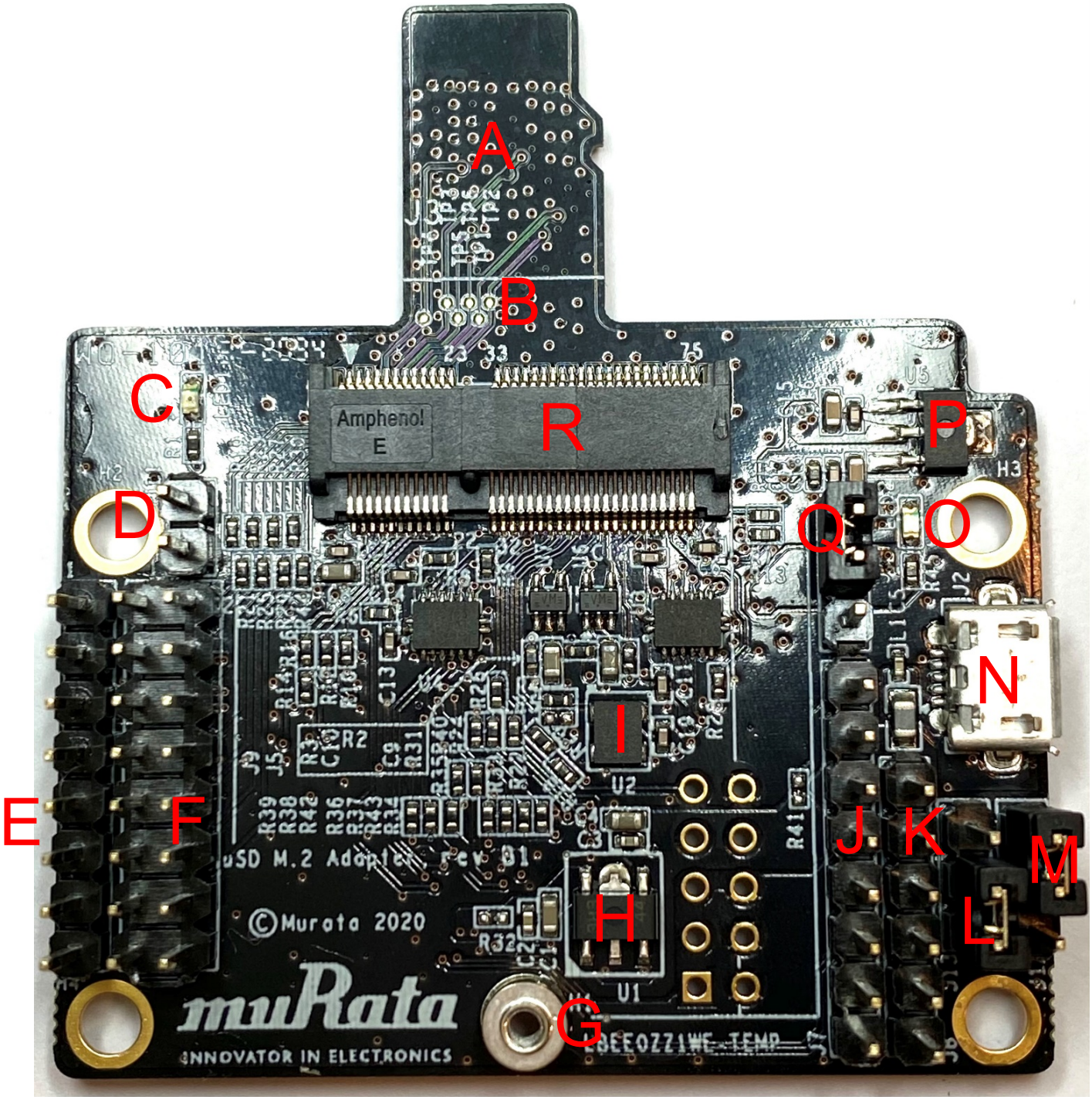
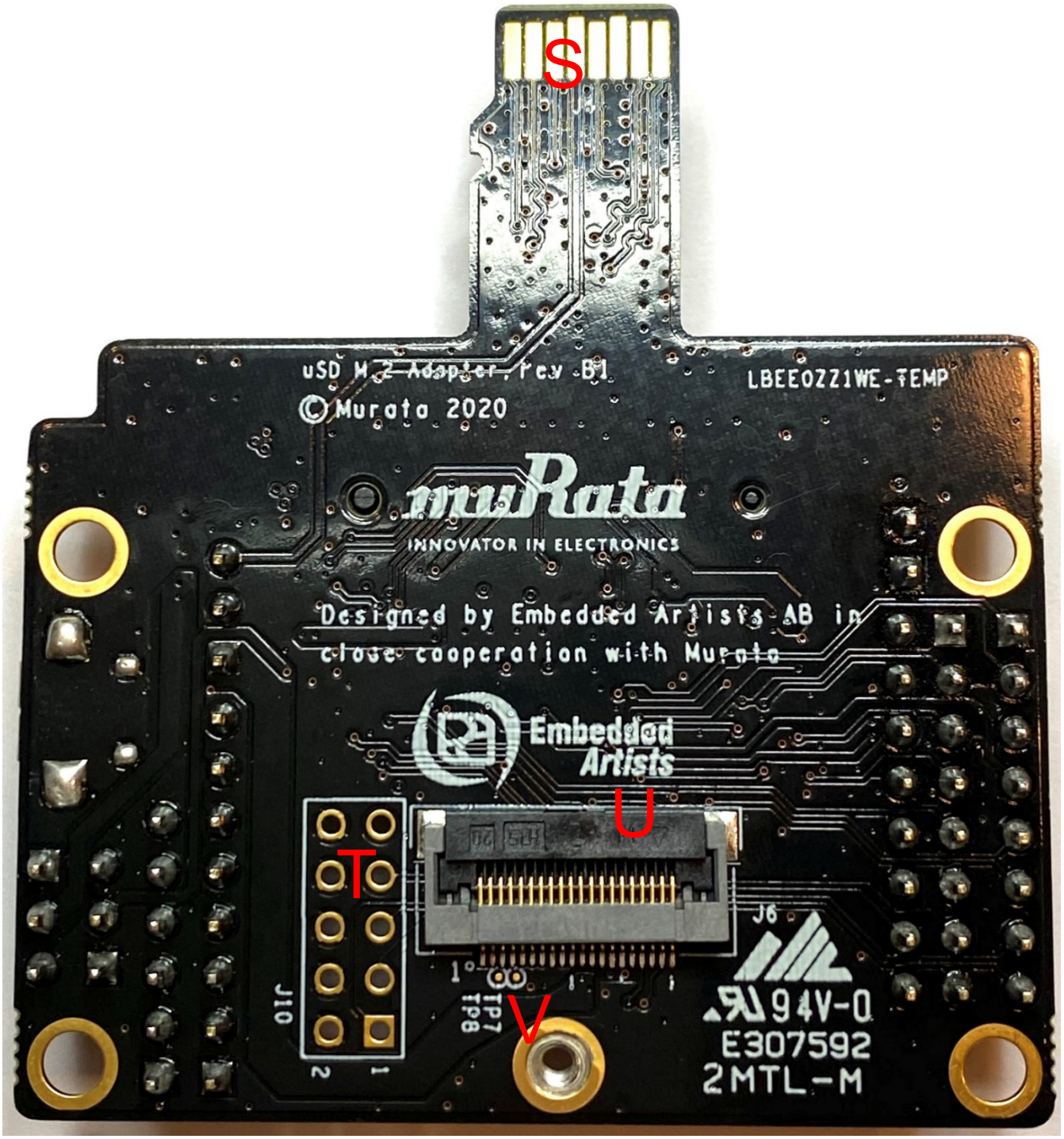


Figure 2: uSD-M.2 Adapter Features (Bottom View)



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

For more details on the headers and jumpers, refer to **Figure 3: uSD-M.2 Adapter - Left Headers/Jumpers**, and **Figure 4: uSD-M.2 Adapter - Right Headers/Jumpers.** Pin #1 location on J5 and J9 Arduino Headers are marked clearly on **Figure 3**. Regarding even/odd pins on J5, pin #2 is to the immediate right of pin #1: also seen referring to **Figure 7: uSD-M.2 Adapter Layout (top)**.

4.1 J1: Power Supply Selector

Referring to **Figure 4: uSD-M.2 Adapter - Right Headers/Jumpers** and **Figure 6: uSD-M.2 Adapter Schematic**, 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).

NOTE: the kit is shipped with default position of 2-3; thereby configuring the uSD-M.2 Adapter to pull power from the microSD connector.

4.2 J11: Optional Jumper to Disable Bluetooth for WLAN-Only Operation

Referring to **Figure 3: uSD-M.2 Adapter - Left Headers/Jumpers**, J11 **(see blue rectangle)** is an optional jumper to disable Bluetooth core. This option is provided to minimize current consumption when running WLAN-only mode. When J11 pins are not closed (i.e. jumper not installed), BT_REG_ON is driven active high (VDDIO = 1.8V default or 3.3V when J12 is installed in 2-3 position) when power is applied to the adapter. Referring to **Figure 6: uSD-M.2 Adapter Schematic**, R3 and C10 provide a simple resistor-capacitor power-on-reset signal for BT_REG_ON.

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

Referring to **Figure 3: uSD-M.2 Adapter - Left Headers/Jumpers**, J9 **(see orange rectangle)** is a 8-pin Arduino Header that provides connectors to Bluetooth UART TX/RX and WLAN/Bluetooth control signals. Referring to **Figure 6: uSD-M.2 Adapter Schematic**, 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). WL_REG_ON_HOST and BT_REG_ON_HOST signals are buffered via U6 and U7 respectively to 3.3V signals on Wi-Fi/BT M.2 Module.

Arduino Header signals connect with 200mm long male-to-female jumper cables (refer to **Table 2: uSD-M.2 Adapter Kit Contents**).

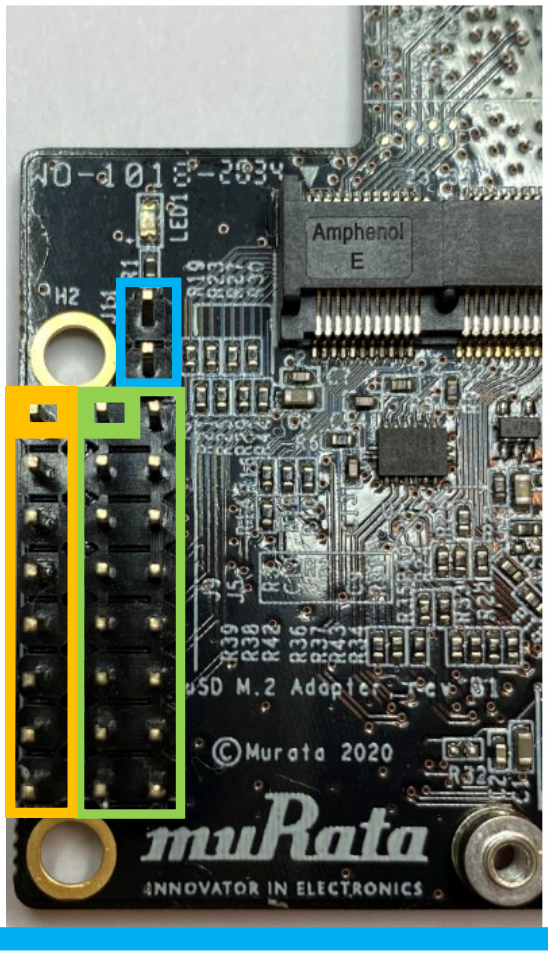
4.4 J5: Optional BT PCM and WLAN/BT Debug Signals

Referring to **Figure 3: uSD-M.2 Adapter - Left Headers/Jumpers** and **Figure 6: uSD-M.2 Adapter Schematic**, J5 **(see green rectangle)** is a 16-pin header that provides access to the following signals:

- Bluetooth PCM signals.
- WLAN and Bluetooth UART debug 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.

Note that the signals listed in **Figure 3** do not describe the seldomly used debug signals. Only specially enabled WLAN firmware or Bluetooth binaries will enable these optional debug pins.

Figure 3: uSD-M.2 Adapter - Left Headers/Jumpers



J11 = Optional BT Disable; Jumper for WLAN-Only Mode

- ➔ Jumper Installed = BT_REG_ON is Low (BT Core disabled)
- ➔ Not Installed = BT_REG_ON is driven active high by Adapter on-board circuitry (default); or driven by Host if Arduino cable installed (J9; Pin #4).

J9 = BT UART TX/RX and WLAN/BT CTRL Arduino Header

Pin#	J9 Signal		Pin#	J9 Signal
1	BT_UART_TXD_HOST		5	WL_HOST_WAKE_HOST
2	BT_UART_RXD_HOST		6	BT_HOST_WAKE_OD_M2
3	WL_REG_ON_HOST		7	WL_DEV_WAKE_HOST
4	BT_REG_ON_HOST		8	BT_DEV_WAKE_HOST

J5 = Optional BT PCM and WLAN/BT Debug Signals

Pin#	J5 Signal		Pin#	J5 Signal
1	BT_PCM_IN_M2		14	LPO_IN_3V3
3	BT_PCM_OUT_M2		15	GND
5	BT_PCM_SYNC_M2		16	USD_3V3
7	BT_PCM_CLK_M2			

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 4: uSD-M.2 Adapter - Right Headers/Jumpers** and **Figure 6: uSD-M.2 Adapter Schematic**, Jumper J12 (see yellow rectangle) default setting is 1-2 position for 1.8V VDDIO on M.2 interface. This setting works for all M.2 Modules (currently 1DX, 1MW, 1LV, 1ZM, and 1YM). Per M.2 interface, WLAN SDIO/BT UART/BT PCM interfaces operate at a default 1.8V. The M.2 EVB's 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. **NOTE**: this will only work on select M.2 Modules such as Type 1DX, and 1MW. Type 1LV, 1ZM, and 1YM-SDIO M.2 Modules **only support 1.8V VIO**.

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 4: uSD-M.2 Adapter - Right Headers/Jumpers** and **Figure 6: uSD-M.2 Adapter 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 4: uSD-M.2 Adapter - Right Headers/Jumpers** and **Figure 6: uSD-M.2 Adapter 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 Section 4.1**) to disconnect microSD power and enable J7 header. Powering options include the following (J1 in position 1-2):

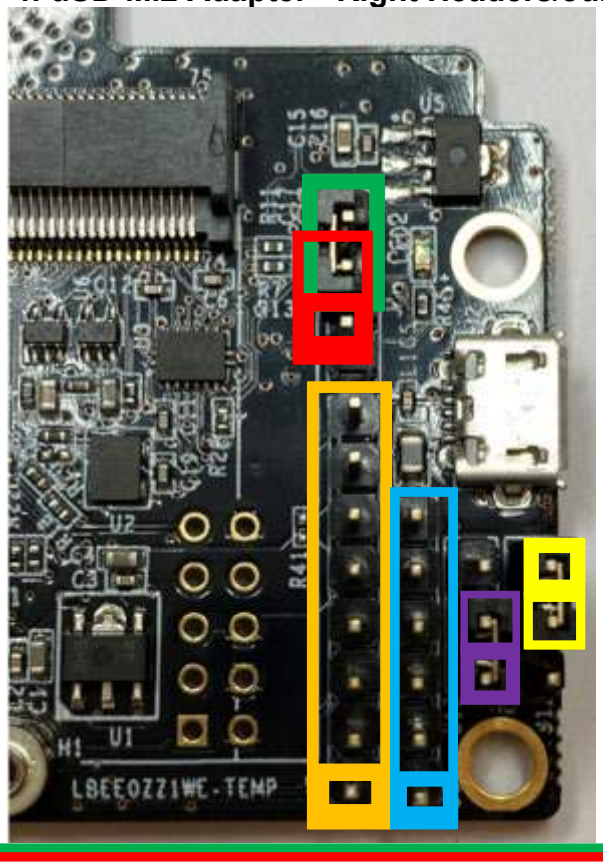
- Connect J7 Pins #2 and/or #4 to 3.3V VBAT; and Pin #6 and/or #7 to GND.
- Connect J7 Pins #5 to 5V VBAT; and Pin #6 and/or #7 to GND.

4.8 J8: BT UART RTS/CTS Arduino Header

Referring to **Figure 4: uSD-M.2 Adapter - Right Headers/Jumpers** and **Figure 6: uSD-M.2 Adapter Schematic**, J8 Arduino Header **(see blue rectangle)** provides Bluetooth RTS and CTS connections. Default configuration for the Murata module (1DX/1MW/1LV/1ZM/1YM) is to require flow control (i.e. not just TX/RX). 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.

NOTE: BT_UART_CTS_HOST (UART CTS) is an input signal, and BT_UART_RTS_HOST (UART RTS) is an output. For complete details on the pin/signal definitions, refer to **Table 5: uSD-M.2 Adapter Pinout Definition.**

Figure 4: uSD-M.2 Adapter - Right Headers/Jumpers



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			

J8 = BT UART RTS/CTS Arduino Header

Pin#	J8 Signal		Pin#	J8 Signal
3	BT_UART_RTS_HOST		4	BT_UART_CTS_HOST

5 HOST/M.2 VDDIO Voltage Settings

Table 4 summarizes J13/J12 jumper settings, indicating what Host and M.2 VIO voltages are being configured. **Figure 5** 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.

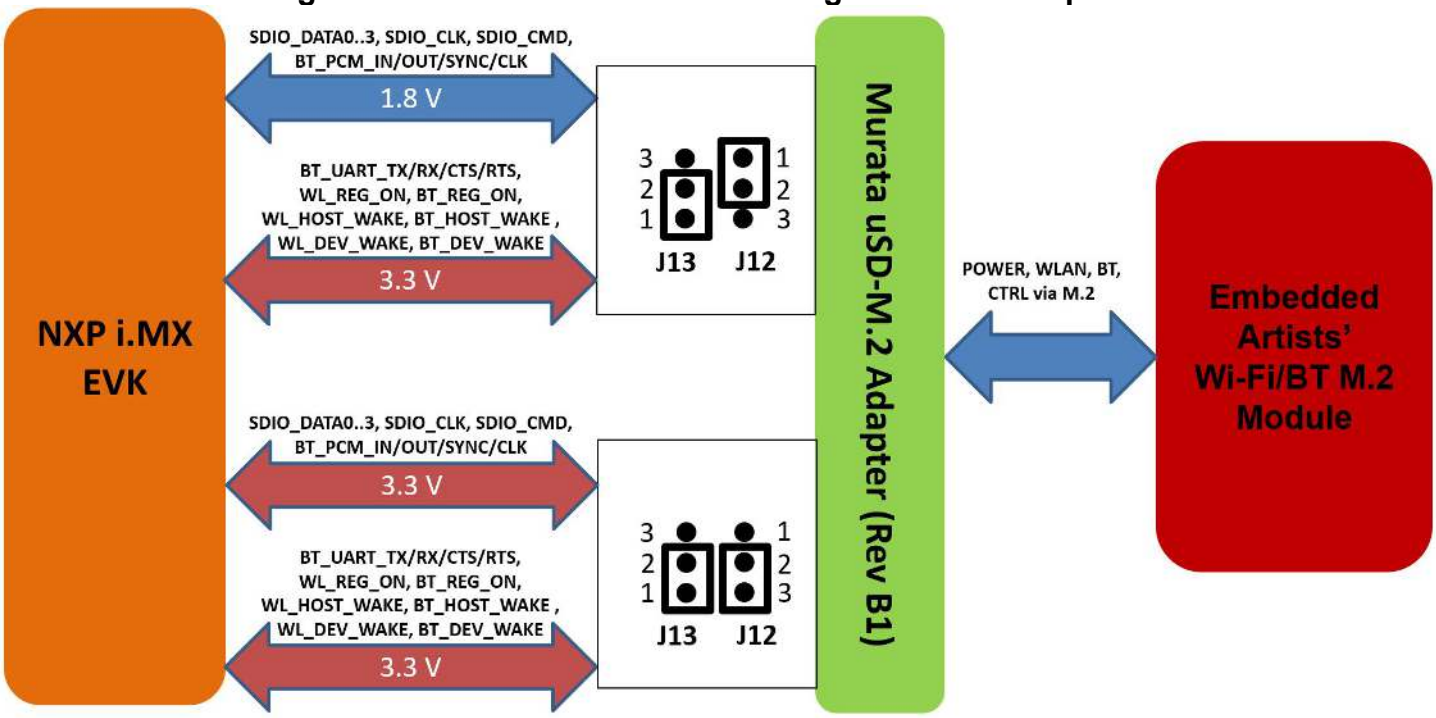
The “3.3V Override” configuration is used when the Host MPU/MCU platform ***can only support 3.3V VIO signaling on WLAN-SDIO interface***. This override feature ***only*** works with select M.2 EVB’s as previously documented in this datasheet. The J13/J12 settings for this override mode are 1-2/2-3 respectively 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. Note the Rev A of the uSD-M.2 Adapter “3.3V Override” configuration is configured by connecting Jumper J12.

Table 4: 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)	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)				Do not select. Not a valid combination.

Figure 5: Common Host/M.2 IO Voltage Level Shift Options



6 uSD-M.2 Adapter: Pinout Definition

Table 5: uSD-M.2 Adapter Pinout Definition

J#	Pin #	Name	I/O	V	Description
J1	1-2	USD_3V3	N/A	3.3	5V/3.3V VBAT supply from micro-USB (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)
J2	1-5	USB micro-B	N/A	5.0	Optional 5V USB Power Supply via Micro-AB USB 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	8	BT_PCM_CLK_M2	I/O	1.8	Bluetooth PCM Clock
J3	9	USD_CLK_M2	I	1.8	SDIO Clock
J3	10	BT_PCM_SYNC_M2	I/O	1.8	Bluetooth PCM Sync
J3	11	USD_CMD_M2	I/O	1.8	SDIO Command
J3	12	BT_PCM_OUT_M2	O	1.8	Bluetooth PCM Output
J3	13	USD_DATA0_M2	I/O	1.8	SDIO DATA0
J3	14	BT_PCM_IN_M2	I	1.8	Bluetooth PCM Input
J3	15	USD_DATA1_M2	I/O	1.8	SDIO DATA1
J3	17	USD_DATA2_M2	I/O	1.8	SDIO DATA2

J3	19	USD_DATA3_M2	I/O	1.8	SDIO DATA3
J3	20	BT_HOST_WAKE_OD_M2	O	3.3	Bluetooth Host Wake: Active Low
J3	21	WL_HOST_WAKE_M2	O	1.8	WLAN Host Wake: Active Low
J3	22	BT_UART_TXD_M2	O	1.8	Bluetooth UART Transmit
J3	32	BT_UART_RXD_M2	I	1.8	Bluetooth UART Receive
J3	34	BT_UART_RTS_M2	O	1.8	Bluetooth UART Request-To-Send
J3	36	BT_UART_CTS_M2	I	1.8	Bluetooth Clear-To-Send
J3	38	M2_PIN38-JTAG_TDO	I/O	1.8	Optional JTAG Debug signal
J3	40	M2_PIN40	I/O	1.8	Optional M.2 signal
J3	42	BT_DEV_WAKE_M2	I	1.8	Bluetooth Device Wake
J3	44	M2_PIN44-JTAG_TDI_OR_TRST	I/O	1.8	Optional JTAG Debug signal
J3	46	M2_PIN46-JTAG_TCK	I/O	1.8	Optional JTAG Debug signal
J3	48	M2_PIN48-JTAG_TMS	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_REG_ON_3V3	I	3.3	Enables/Disables Bluetooth core: Active High
J3	56	WL_REG_ON_3V3	I	3.3	Enables/Disables WLAN core: Active High
J3	59	M2_PIN59	I/O	1.8	Optional M.2 signal
J3	61	M2_PIN61	I/O	1.8	Optional M.2 signal
J3	62	M2_PIN62	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	65	M2_PIN65	I/O	1.8	Optional M.2 signal
J3	66	WL_DEV_WAKE_M2	I	1.8	WLAN Device Wake
J3	67	M2_PIN67	I/O	1.8	Optional M.2 signal
J3	68	M2_PIN68	I/O	1.8	Optional M.2 signal
J3	70	M2_PIN70	I/O	1.8	Optional M.2 signal
J3	71	M2_PIN71	I/O	1.8	Optional M.2 signal
J3	73	M2_PIN73	I/O	1.8	Optional M.2 signal
J4	1	USD_DATA2_M2	I/O	1.8	microSD SDIO DATA2
J4	2	USD_DATA3_M2	I/O	1.8	microSD SDIO DATA3
J4	3	USD_CMD_M2	I/O	1.8	microSD SDIO Command
J4	4	VCC	N/A	3.0~3.3	VBAT supply from microSD
J4	5	USD_CLK_M2	O	1.8	microSD SDIO Clock
J4	6	GND	N/A	N/A	microSD Ground
J4	7	USD_DATA0_M2	I/O	1.8	microSD DATA0
J4	8	USD_DATA1_M2	I/O	1.8	microSD DATA1

J5	1	BT_PCM_IN_M2	I	1.8~3.3	Bluetooth PCM Input
J5	2	M2_PIN59	I/O	1.8~3.3	Optional M.2 signal
J5	3	BT_PCM_OUT_M2	O	1.8~3.3	Bluetooth PCM Output
J5	4	M2_PIN61	I/O	1.8~3.3	Optional M.2 signal
J5	5	BT_PCM_SYNC_M2	I/O	1.8~3.3	Bluetooth PCM Sync
J5	6	M2_PIN65	I/O	1.8~3.3	Optional M.2 signal
J5	7	BT_PCM_CLK_M2	I/O	1.8~3.3	Bluetooth PCM Clock
J5	8	M2_PIN67	I/O	1.8~3.3	Optional M.2 signal
J5	9	M2_PIN62	I/O	1.8~3.3	Optional M.2 signal
J5	10	M2_PIN71	I/O	1.8~3.3	Optional M.2 signal
J5	11	M2_PIN68	I/O	1.8~3.3	Optional M.2 signal
J5	12	M2_PIN73	I/O	1.8~3.3	Optional M.2 signal
J5	13	M2_PIN70	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.
J6	1	WL_REG_ON_HOST	I	1.8~3.3	Enables/Disables WLAN core: Active High
J6	2	WL_HOST_WAKE_HOST	O	1.8~3.3	WLAN Host Wake: Active Low (OOB IRQ)
J6	5	WL_DEV_WAKE_HOST	I	1.8~3.3	WLAN Device Wake
J6	6	BT_REG_ON_HOST	I	1.8~3.3	Enables/Disables Bluetooth Core: Active High
J6	7	BT_HOST_WAKE_OD_M2	O	1.8~3.3	Bluetooth Host Wake: Active Low
J6	8,20	GND	N/A	N/A	Ground
J6	9	BT_PCM_CLK_M2	I/O	1.8~3.3	Bluetooth PCM Clock
J6	10	BT_PCM_SYNC_ M2	I/O	1.8~3.3	Bluetooth PCM Sync
J6	11	BT_PCM_OUT_ M2	O	1.8~3.3	Bluetooth PCM Output
J6	12	BT_PCM_IN_ M2	I	1.8~3.3	Bluetooth PCM Input
J6	13	BT_DEV_WAKE_HOST	I	1.8~3.3	Bluetooth Device Wake
J6	14,15	3V3	N/A	3.3	Alternative VBAT supply for Adapter
J6	16	BT_UART_RXD_HOST	I	1.8~3.3	Bluetooth UART Receive
J6	17	BT_UART_CTS_ HOST	I	1.8~3.3	Bluetooth UART Clear-To-Send

J6	18	BT_UART_TXD_ HOST	O	1.8~3.3	Bluetooth UART Transmit
J6	19	BT_UART_RTS_ HOST	O	1.8~3.3	Bluetooth UART Request-To-Send
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 R41.
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
J9	3	WL_REG_ON_ HOST	I		Enables/Disables WLAN core: Active High
J9	4	BT_REG_ON_ HOST	I	1.8~3.3	Enables/Disables Bluetooth Core: Active High
J9	5	WL_HOST_WAKE_ HOST	O	1.8~3.3	WLAN Host Wake: Active Low (OOB IRQ)
J9	6	BT_HOST_WAKE_OD_M2	O	1.8~3.3	Bluetooth Host Wake: Active Low
J9	7	WL_DEV_WAKE_ HOST	I	1.8~3.3	WLAN Device Wake
J9	8	BT_DEV_WAKE_ HOST	I	1.8~3.3	Bluetooth Device Wake
J10	2,4,6,8,10	GND	N/A	N/A	Ground
J10	1	M2_PIN40	I/O	1.8~3.3	Optional M.2 signal
J10	3	M2_PIN44-JTAG_TDI_OR_TRST	I/O	1.8~3.3	Optional JTAG Debug signal
J10	5	M2_PIN38-JTAG_TDO	I/O	1.8~3.3	Optional JTAG Debug signal
J10	7	M2_PIN48-JTAG_TMS	I/O	1.8~3.3	Optional JTAG Debug signal
J10	9	M2_PIN46-JTAG_TCK	I/O	1.8~3.3	Optional JTAG Debug signal
J11	1	BT_REG_ON_HOST	N/A	N /A	Enables/Disables Bluetooth Core: Active High; J11 provides option to disable Bluetooth core
J11	2	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.

7 uSD-M.2 Adapter Schematic and Layout

For more specifics on adapter circuit and layout refer to **Figure 6: uSD-M.2 Adapter Schematic**, **Figure 7: uSD-M.2 Adapter Layout (top)**, and **Figure 8: uSD-M.2 Adapter Layout (bottom)**.

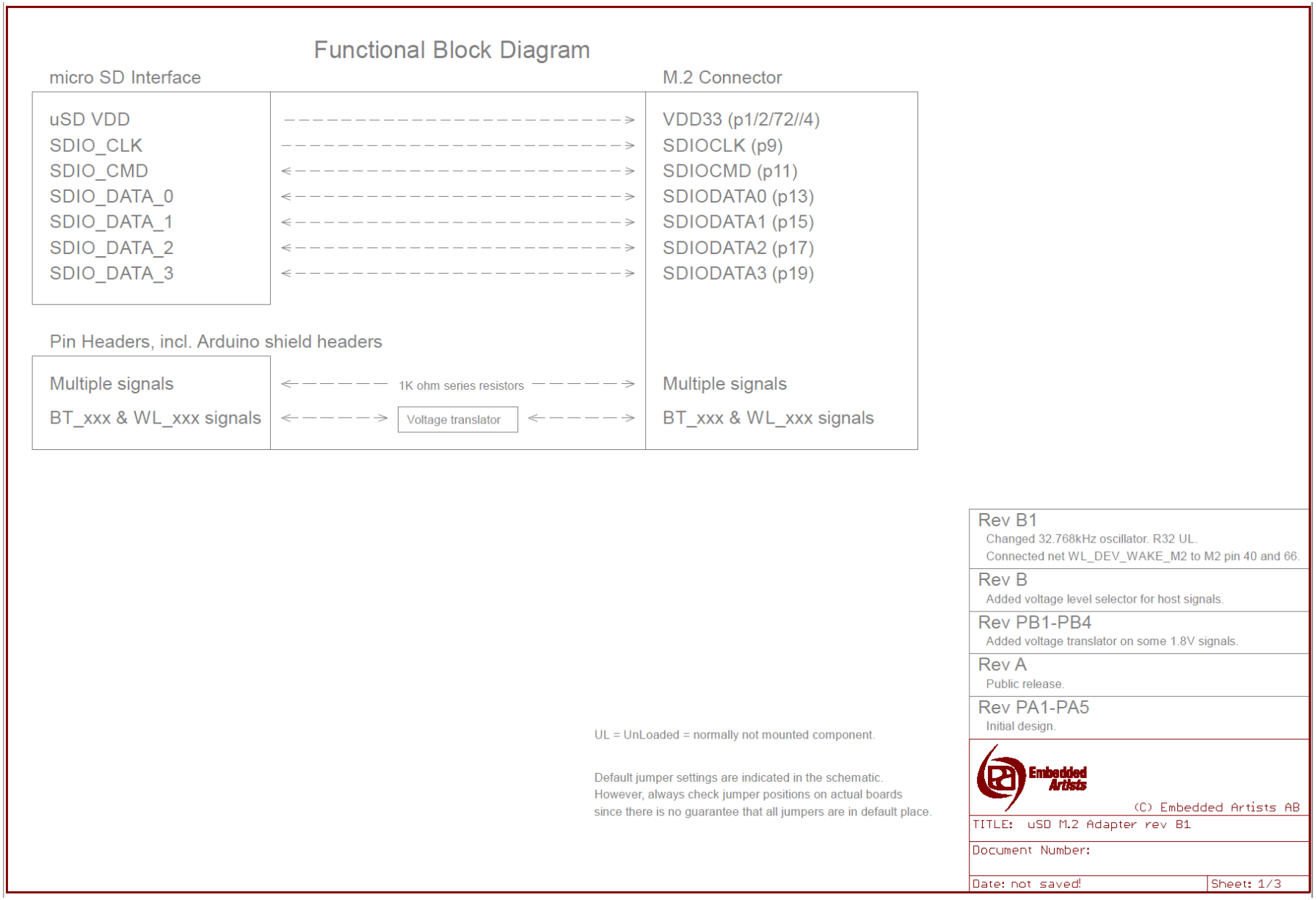
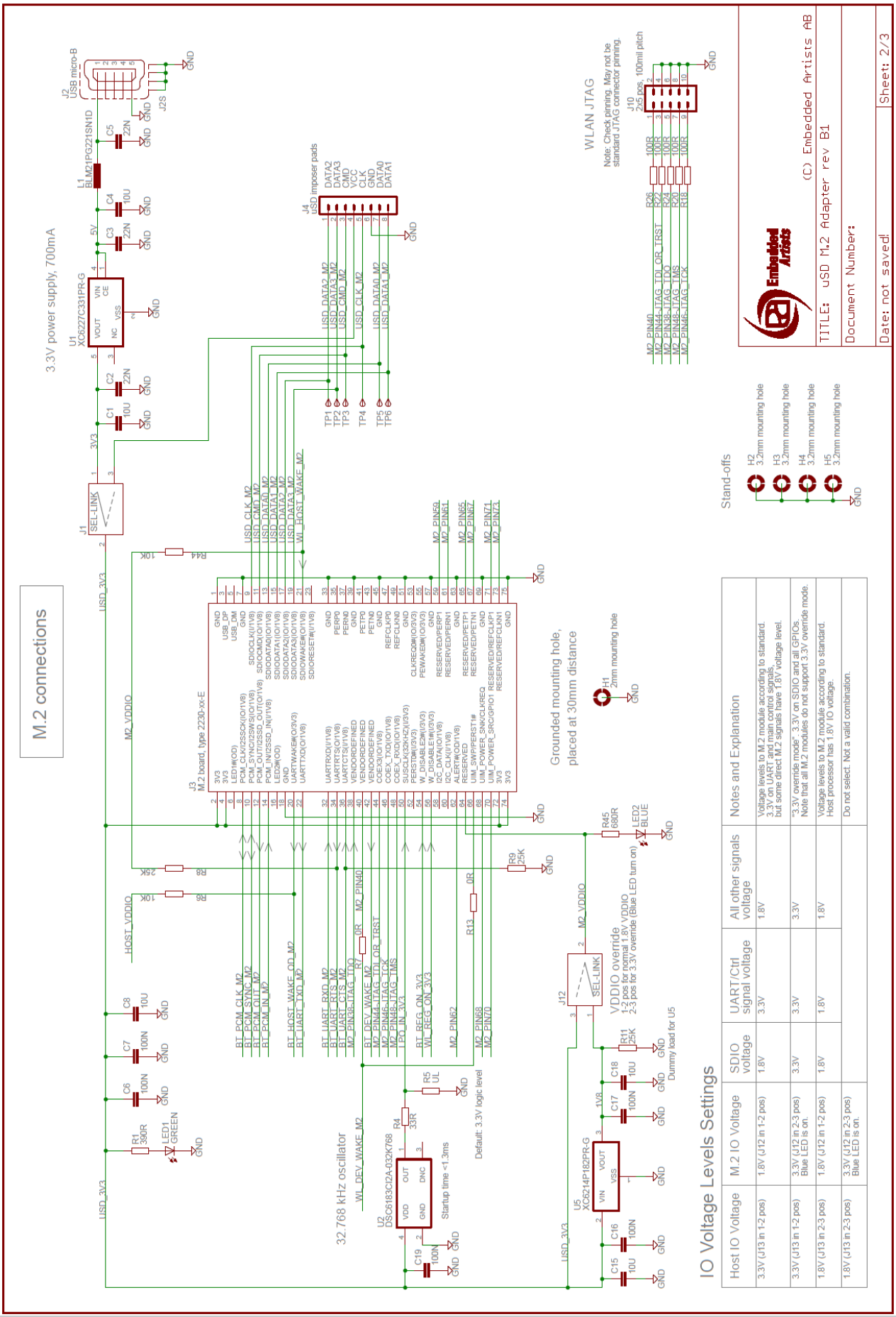


Figure 6: uSD-M.2 Adapter Schematic

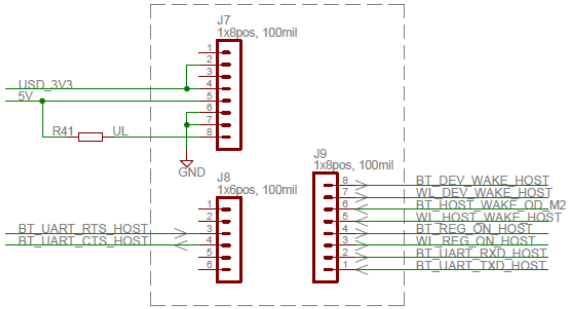


IO Voltage Levels Settings

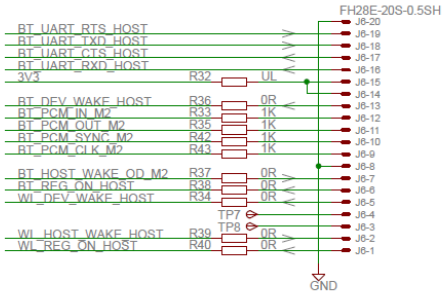
Host IO Voltage	M.2 IO Voltage	SDIO voltage	UART/Ctrl signal voltage	All other signals voltage	Notes and Explanation
3.3V (J13 in 1-2 pos)	1.8V (J12 in 1-2 pos)	1.8V	3.3V	1.8V	Voltage levels to M.2 module according to standard. 3.3V on UART and main control signals, but some direct M.2 signals have 1.8V 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.

M.2 connections

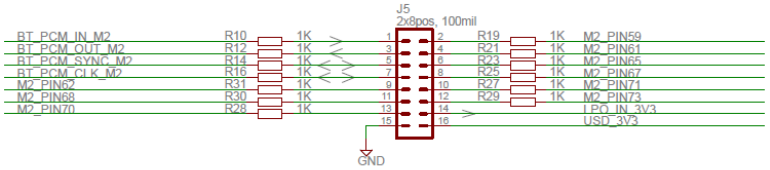
Arduino Shield receptacles



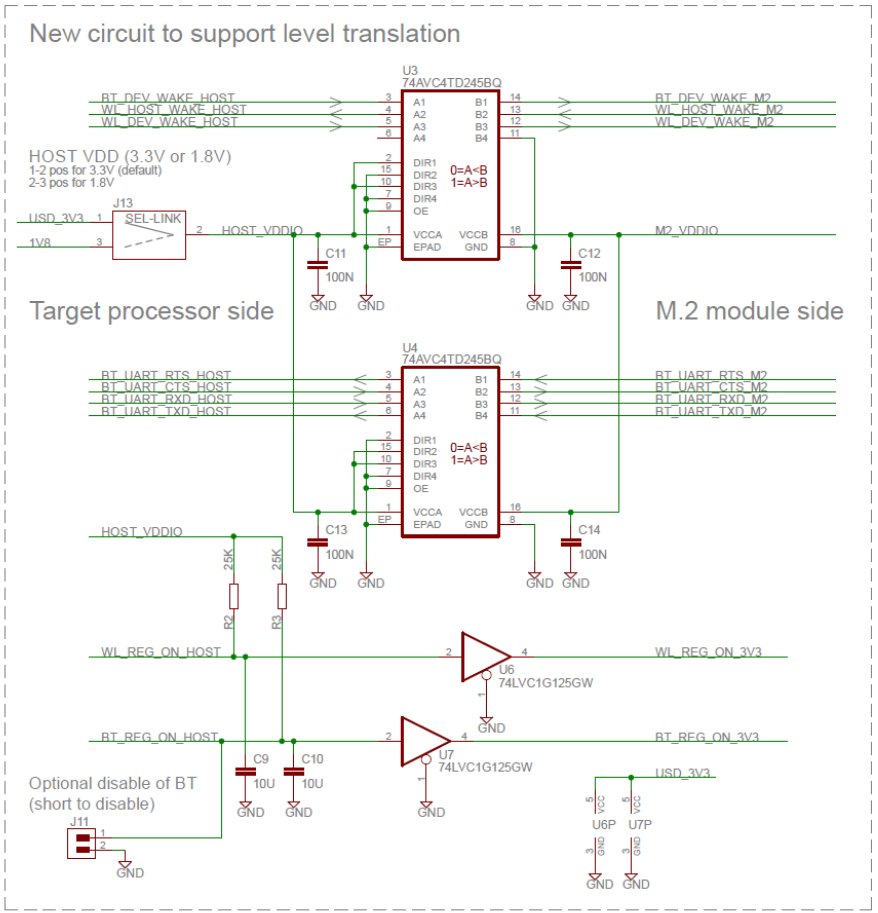
FPC connector to Sabre boards



Pin header to access ctrl signals



New circuit to support level translation



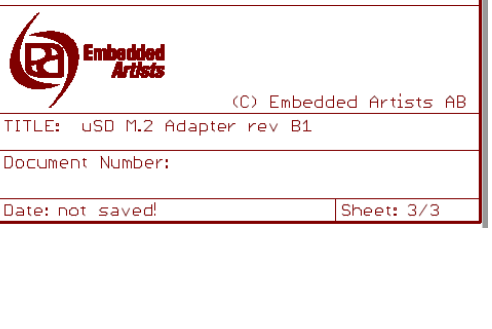


Figure 7: uSD-M.2 Adapter Layout (top)

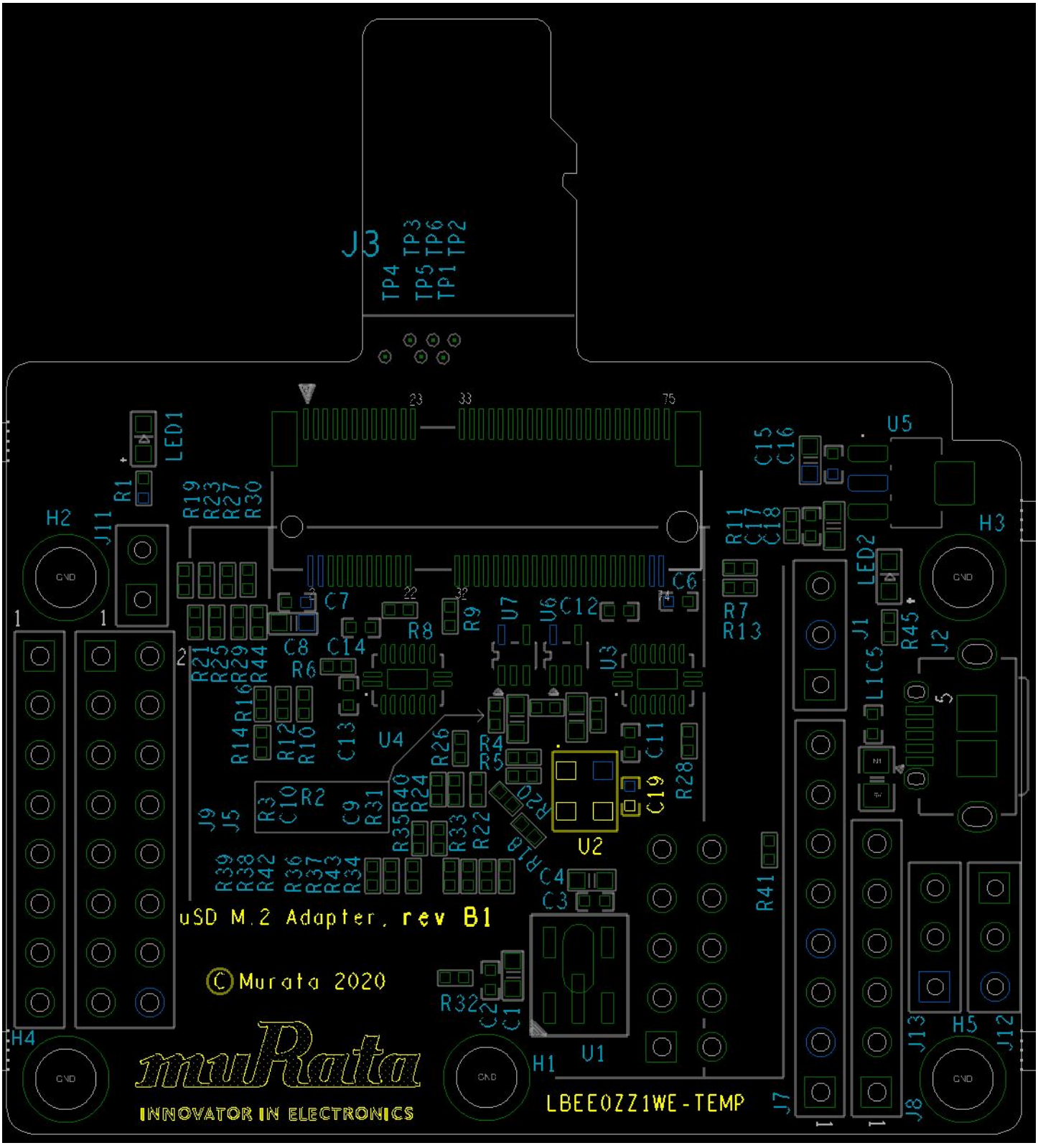


Figure 8: uSD-M.2 Adapter Layout (bottom)