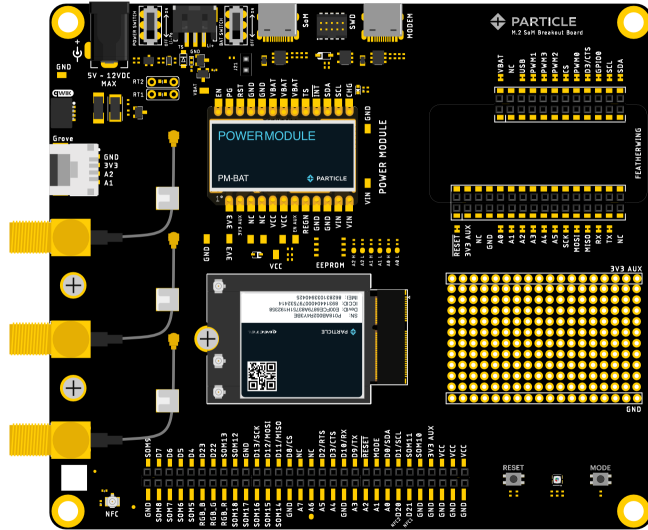


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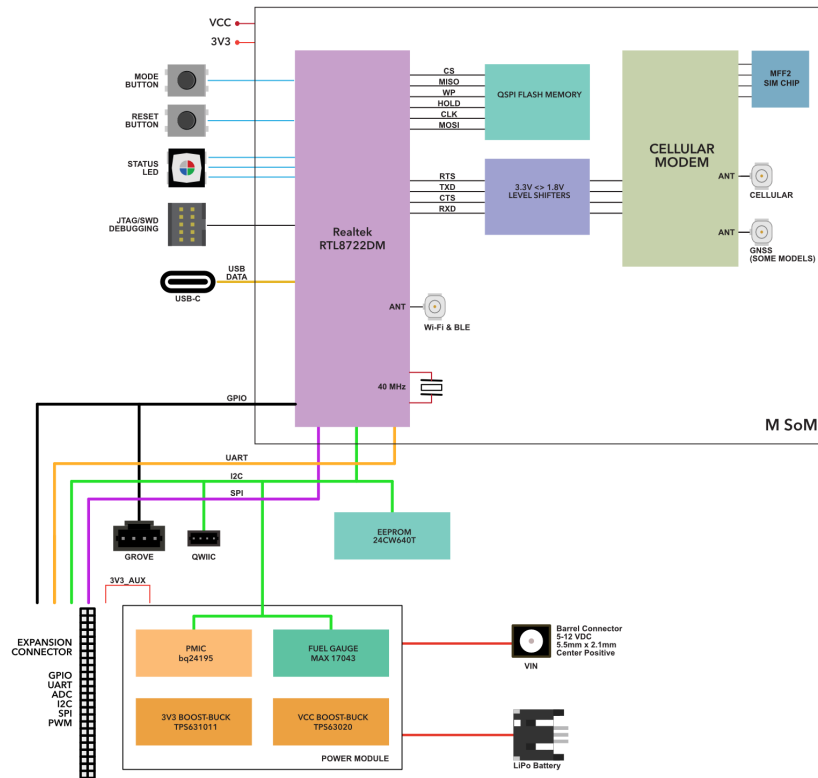
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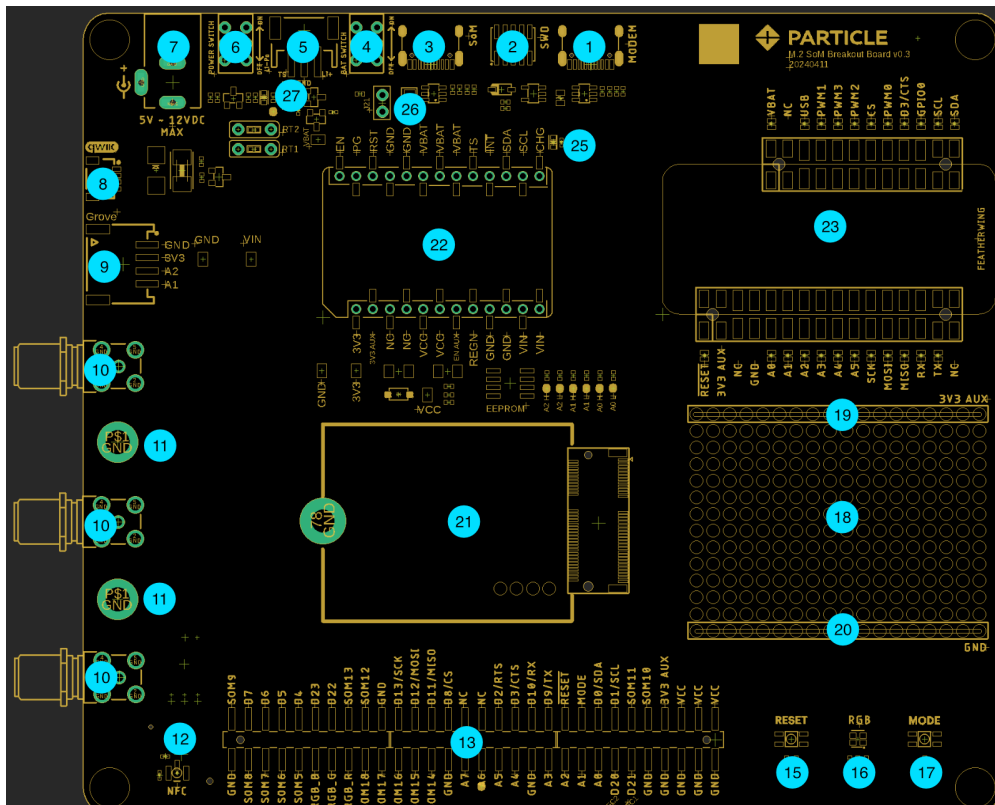
The M.2 breakout board is a convenient way to prototype with the B-SoM and M-SoM modules.



# Block diagram



# Board features



## Label Description

1	Cellular modem USB-C (not normally used)
2	SWD debugging connector
3	MCU USB-C (use this one)
4	LiPo battery power switch
5	LiPo battery connector (3-pin, with temperature sensor)
6	DC power switch
7	DC power barrel connector (5.5mm x 2.1mm, center positive)
8	QWIIC (3.3V I2C connector)
9	Grove expansion connector
10	U.FL to SMA connectors
11	Spare M.2 SoM screws
12	NFC U.FL connector (B-SoM only, not available on M-SoM)
13	Expansion connector
15	RESET button
16	RGB status LED
17	MODE button
18	Prototyping area
19	3V3_AUX
20	GND
21	M.2 SoM socket for B-SoM or M-SoM
22	Power module
23	Adafruit Feather connector (for accessories)
25	LiPo charge LED (yellow)
26	LiPo temperature sensor jumper (TS)



# Setup

## INSTALL THE SOM

---

The M.2 SoM breakout board requires a Particle M-SoM or B-SoM module. Install it in the M.2 socket (21) and secure it with a thumbscrew.

## CONNECT ANTENNAS

---

The M.2 breakout board can be used with the standard flexible Particle antennas or the SMA adapters included on the breakout board.

- Plug the cellular antenna into the U.FL connector labeled **CELL** on the SoM. Remember never to power up this board without the antenna being connected. There is potential to damage the transmitter of the u-blox module if no antenna is connected.
- If you are planning to use BLE, connect the 2.4 GHz antenna (the smaller one) to the **BT** U.FL connector on the SoM.
- The flexible Particle cellular and BLE antennas should be included in the M.2 SoM package, not the breakout board package.
- SMA antennas are not included with the M.2 breakout board. If used in a product, additional certification would be required to use a SMA antenna.

## INSTALL A POWER MODULE

---

The M.2 breakout board includes two power modules; select and install the module you wish to use and install it in the power module socket (22).

Note the position of the notch to make sure the power module is installed in the correct orientation and make sure all of the pins are aligned with the socket on the breakout board.

### PM-BAT power module

The [PM-BAT power module](#) allows the Particle SoM to be powered by a LiPo battery or DC adapter.

- Install the PM-BAT module in the power module socket (22).
- Connect the LiPo battery (2).
- Optionally connect the AC power adapter to VIN (7). With PM-BAT, VIN must be 5 - 12 VDC.
- You must use the LiPo battery, AC power adapter, or both, when using PM-BAT. You cannot power by USB only.
- The LiPo battery can be only be charged by VIN, it cannot be charged from USB.

### PM-DC power module

The [PM-DC power module](#) allows the Particle SoM to be powered by an AC power adapter or external DC power source.

- Install the PM-DC module in the power module socket (22).
- Connect the power adapter to VIN (7). When powering PM-DC by VIN (barrel connector), 5 - 12 VDC is required at 12 watts.
- Power on the VIN barrel connector is required when using PM-DC; you cannot power the breakout board only by USB power.

## POWER ON DEVICE

---

Turn on the appropriate power switches (4, 6).

The RGB status LED should turn on. Typically it will blink white once, then blink green though it may display a different pattern.

#### **DEVICE SETUP AND CLAIMING**

---

Connect the USB connector (3) to your computer. This is needed only for setup.

Visit <https://setup.particle.io/> to finish setting up your device.



# Onboard peripherals

## QWIIC (8)

The SparkFun Qwiic system provides an easy way to expand and test various sensors, input devices, and displays. Multiple peripherals can be daisy-chained to a single port. The Adafruit Stemma QT are compatible with Qwiic and can be mixed and matched as well.

For more information, see [Qwiic](#).

## GROVE CONNECTOR (9)

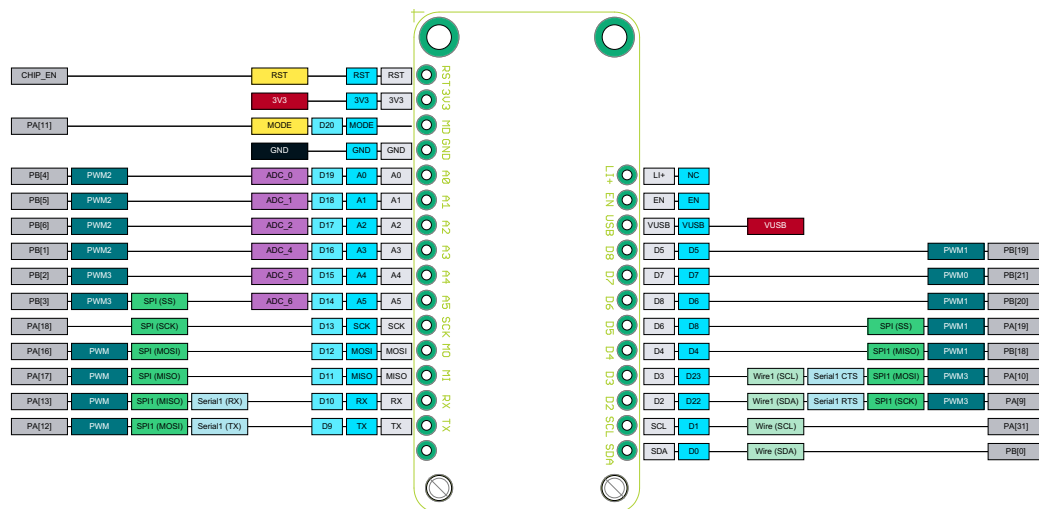
Additionally, Grove system of sensors and peripherals from Seeed Systems is another easy way to add peripheral devices. The M.2 breakout board has one Grove connectors connected to pins A1 and A2 that can be used as GPIO or analog inputs. This port cannot be used with I2C or Serial Grove peripherals.

| J11 | SoM Pin | SoM Pin Number | | :---: | :---: | :---: | :---: | | GND | | | 3V3 | | | ADC2 | A2 | 35 | | ADC1 | A1 | 33 |

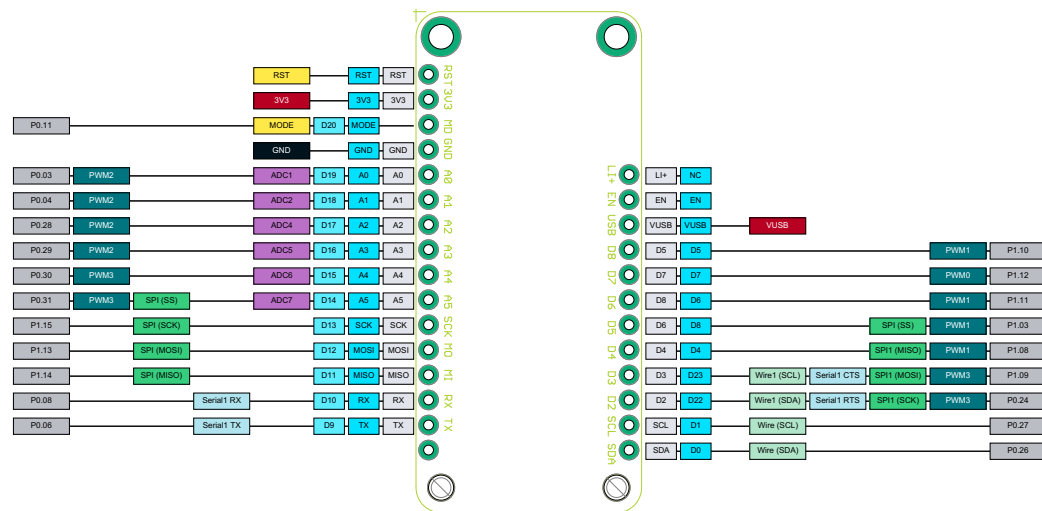
## FEATHER CONNECTOR (21)

The Feather connector can be used for Adafruit FeatherWings, such as displays, sensors, and Ethernet. You cannot plug a Feather MCU into this socket!

## FEATHER PIN MAPPING - M-SOM



## FEATHER PIN MAPPING - B-SOM



## JUMPERS (22)

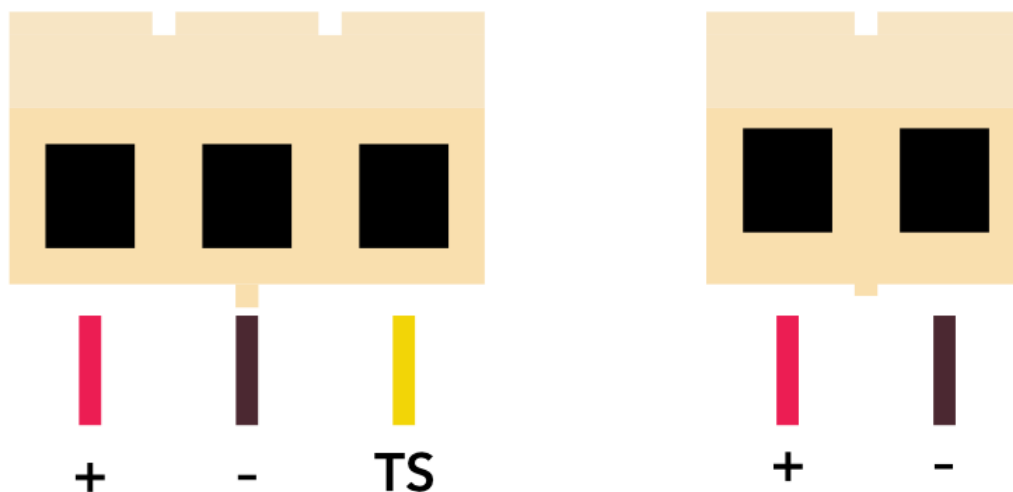
These jumpers connect the Feather A pin side to the M.2 connector. They can also be used to remap pins by using jumper wires instead of solid jumpers.

## JUMPERS (23)

These jumpers connect the Feather D pin side to the M.2 connector. They can also be used to remap pins by using jumper wires instead of solid jumpers.

## LIPO CONNECTOR

Note that the M.2 breakout board includes a 3-pin JST-PH connector (left), not the 2-pin JST-PH connector on some other Particle devices (right). The TS pin is expected to be connected to a 10K NTC thermistor in the battery pack. The TS jumper (26) must be installed for normal operation with a temperature sensor.



Looking at the exposed end of the connector attached to the battery

If you wish to use a battery without a temperature sensor, remove the TS jumper (26) and use a 3-pin to 2-pin JST-PH adapter, or change the shell of your JST-PH 2-pin connector to a 3-pin shell. The pin can be swapped without cutting, soldering, or crimping. See the [battery guide](#) for more information.

If purchasing a LiPo battery from a 3rd-party supplier, beware as the polarity of the JST-PH

connector is not standardized and may be reversed. Permanent damage to the breakout board can occur if powered by reverse polarity on the JST connector. See the [battery guide](#) for additional information.

The included battery is a 3100 mAh 3.7V LiPo battery with temperature sensor. [Battery datasheet](#).

### 3V3\_AUX POWER

---

Both the PM-BAT and PM-DC power modules support an auxiliary 3.3V power supply. This is used to power the Feather socket 3V3 and the 3V3\_AUX rail.

Power module	SoM Pin	SoM Pin Number
EN_AUX	D23 / GPIO1	50

3V3\_AUX is powered from 3V3 via a load switch (TPS22918). It can supply up to the full 2A of 3V3. It defaults to off due to a pull-down resistor on EN\_AUX. EN\_AUX is connected to pin D23; set this pin to output high to enable 3V3\_AUX.

```
// Enable 3V3_AUX
pinMode(D23, OUTPUT);
digitalWrite(D23,
HIGH);
```

Devices using the [Particle Power Module](#) include a 3V3\_AUX power output that can be controlled by a GPIO. On the M.2 SoM breakout board, this powers the Feather connector. On the Muon, it powers the Ethernet port, LoRaWAN module, 40-pin expansion hat connector, and QWIIC connector.

The main reason for this is that until the PMIC is configured, the input current with no battery connected is limited to 100 mA. This is insufficient for the M-SoM to boot when using a peripheral that requires a lot of current, like the WIZnet W5500 Ethernet module. The system power manager prevents turning on 3V3\_AUX until after the PMIC is configured and the PMIC has negotiated a higher current from the USB host (if powered by USB).

This setting is persistent and only needs to be set once. In fact, the PMIC initialization normally occurs before user firmware is run. This is also necessary because if you are using Ethernet and enter safe mode (breathing magenta), it's necessary to enable 3V3\_AUX so if you are using Ethernet, you can still get OTA updates while in safe mode.

After changing the auxiliary power configuration you must reset the device.

### PM-BAT INTERFACE

---

The M.2 breakout board can be used with the [PM-BAT power module](#) that includes the bq24195 PMIC and MAX17043 fuel gauge chips which interface by the pins below

Power module	SoM Pin	SoM Pin Number
FUEL_INT	A6	45
SDA	D0	22
SCL	D1	20

### USING ETHERNET

---

The M.2 breakout board does not contain Ethernet like the previous B-Series Eval board. You can, however, add it using the [Adafruit Ethernet FeatherWing](#) in the Feather socket.

Be sure to connect the nRESET and nINTERRUPT pins (on the small header on the short side) to pins D3 and D4 with jumper wires. These are required for proper operation.

The default mapping for the B-SoM and the original B-SoM eval board is listed below, but you may want to use [Ethernet pin remapping](#) to reassign the pins.

Particle Pin	M.2 Pin	Ethernet Pin
D8	CS	ETH_CS
A7	RESERVED	ETH_RESET
SCK	SCK	ETH_CLK
MISO	MISO	ETH_MISO
MOSI	MOSI	ETH_MOSI
D22	GPIO0	ETH_INT

---

## FIRMWARE EXAMPLE

The following code can be used to enable Ethernet on the M.2 SoM breakout board. This only needs to be done once and the device must be reset after configuration for the changes to take effect. It requires Device OS 5.9.0 or later.

```
// Enable 3V3_AUX
SystemPowerConfiguration powerConfig = System.getPowerConfiguration();
powerConfig.auxiliaryPowerControlPin(D23).interruptPin(A6);
System.setPowerConfiguration(powerConfig);

// Enable Ethernet
if_wiznet_pin_remap remap = {};
remap.base.type = IF_WIZNET_DRIVER_SPECIFIC_PIN_REMAP;

System.enableFeature(FEATURE_ETHERNET_DETECTION);
remap.cs_pin = D5;
remap.reset_pin = PIN_INVALID;
remap.int_pin = PIN_INVALID;
auto ret = if_request(nullptr, IF_REQ_DRIVER_SPECIFIC, &remap, sizeof(remap),
nullptr);
```

---

## USING SD CARD

The M.2 breakout board does not contain a Micro SD card socket as the previous B-Series Eval board did. You can, however, add it using the Adafruit Feather connector.

The [Adalogger FeatherWing - RTC + SD Add-on For All Feather Boards](#) contains a Micro SD card socket.

SD Card Pin	Feather Pin	Description
SCK	SCK	SPI Clock
MOSI	MOSI	Data (MCU to SD card)
MISO	MISO	Data (SD card to MCU)
SDCS	D5	Chip select

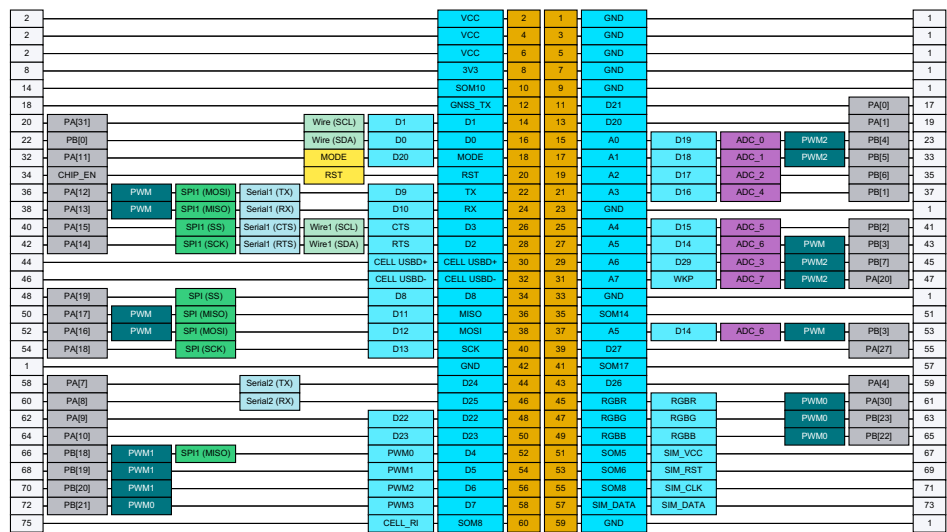
It is also possible to cut the a trace jumper for SDCS and use a different pin for SDCS. Note that this

will use `SPI` (primary SPI) but the B-Series Eval board use `SPI1` so your SD card initialization code will be different.

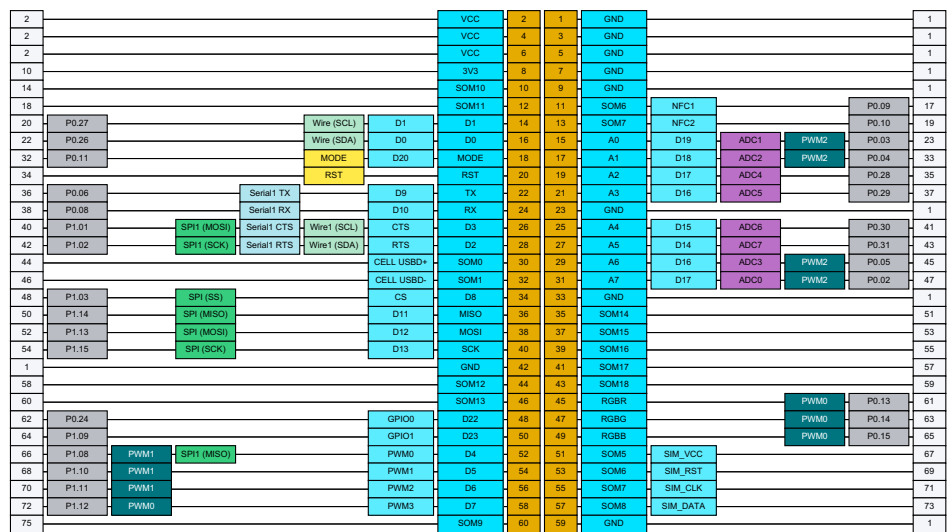
See the [Adafruit tutorial](#) for additional information.

# Expansion header

## EXPANSION HEADER - M-SOM



## EXPANSION HEADER - B-SOM



## FULL PIN LISTING

[Skip past this section](#) (the full pin listing is long)

### Module Pin 1 (GND)

Unchanged between B-SoM and M-SoM

Pin Number	1
Pin Name	GND

Description	Ground.
M.2 connector pin number	1
SoM Common Pin Name	GND

#### Module Pin 2 (VCC)

Unchanged between B-SoM and M-SoM	
Pin Number	2
Pin Name	VCC
Description	Cellular modem power. Typically 3.9V, can be 3.6V to 4.2V
M.2 connector pin number	2
SoM Common Pin Name	VCC

#### Module Pin 3 (GND)

Unchanged between B-SoM and M-SoM	
Pin Number	3
Pin Name	GND
Description	Ground.
M.2 connector pin number	1
SoM Common Pin Name	GND

#### Module Pin 4 (VCC)

Unchanged between B-SoM and M-SoM	
Pin Number	4
Pin Name	VCC
Description	Cellular modem power. Typically 3.9V, can be 3.6V to 4.2V
M.2 connector pin number	2
SoM Common Pin Name	VCC

#### Module Pin 5 (GND)

Unchanged between B-SoM and M-SoM	
Pin Number	5
Pin Name	GND
Description	Ground.
M.2 connector pin number	1
SoM Common Pin Name	GND

#### Module Pin 6 (VCC)

Unchanged between B-SoM and M-SoM	
Pin Number	6
Pin Name	VCC
Description	Cellular modem power. Typically 3.9V, can be 3.6V to 4.2V
M.2 connector pin number	2
SoM Common Pin Name	VCC

#### Module Pin 7 (GND)

Unchanged between B-SoM and M-SoM	
Pin Number	7
Pin Name	GND
Description	Ground.
M.2 connector pin number	1
SoM Common Pin Name	GND

### Module Pin 8 (3V3)

	B-SoM	M-SoM
Pin Number	8	8
Pin Name	3V3	3V3
Description	3.3V used to power MCU	3.3V used to power MCU
Δ M.2 connector pin number	10	8
Δ SoM Common Pin Name	3V3	VCC

### Module Pin 9 (GND)

Unchanged between B-SoM and M-SoM	
Pin Number	9
Pin Name	GND
Description	Ground.
M.2 connector pin number	1
SoM Common Pin Name	GND

### Module Pin 10 (SOM10)

Unchanged between B-SoM and M-SoM	
Pin Number	10
Pin Name	SOM10
Description	Not currently used, leave unconnected.
M.2 connector pin number	14
SoM Common Pin Name	RESERVED

### Module Pin 11 (SOM6 / D21)

	B-SoM	M-SoM
Pin Number	11	11
Δ Pin Name	SOM6	D21
Δ Pin Alternate Name	NFC1	n/a
Δ Description	NFC Antenna 1.	D21 GPIO. Is NFC1 on B-SoM.
Δ Supports digitalRead	n/a	Yes
Δ Supports digitalWrite	n/a	Yes
Δ Supports attachInterrupt	n/a	Yes
Δ I2S interface	n/a	I2S RX
Δ Internal pull resistance	n/a	22K. No internal pull up or pull down in HIBERNATE sleep mode.
M.2 connector pin number	17	17
Δ SoM Common Pin Name	SOM3	RESERVED



**Module Pin 12 (SOM11 / GNSS\_TX)**

	B-SoM	M-SoM
Pin Number	12	12
Δ Pin Name	SOM11	GNSS_TX
Δ Description	Not currently used, leave unconnected.	Cellular modem GNSS UART TX
M.2 connector pin number	18	18
SoM Common Pin Name	RESERVED	RESERVED

**Module Pin 13 (SOM7 / D20)**

	B-SoM	M-SoM
Pin Number	13	13
Δ Pin Name	SOM7	D20
Δ Pin Alternate Name	NFC2	n/a
Δ Description	NFC Antenna 2. NFC2 is the center pin.	D20 GPIO. Is NFC2 on B-SoM.
Δ Supports digitalRead	n/a	Yes
Δ Supports digitalWrite	n/a	Yes
Δ Supports attachInterrupt	n/a	Yes
Δ I2S interface	n/a	I2S TX
Δ Internal pull resistance	n/a	???
M.2 connector pin number	19	19
Δ SoM Common Pin Name	SOM4	RESERVED

**Module Pin 14 (D1)**

	B-SoM	M-SoM
Pin Number	14	14
Pin Name	D1	D1
Pin Alternate Name	D1	D1
Description	I2C SCL. Cannot be used as GPIO.	I2C SCL. Cannot be used as GPIO.
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
Δ I2C interface	SCL. Use Wire object.	SCL. Use Wire object. Use 1.5K to 10K external pull-up resistor.
Δ Supports attachInterrupt	Yes. You can only have 8 active interrupt pins.	Yes
Δ Internal pull resistance	13K	???
M.2 connector pin number	20	20
SoM Common Pin Name	SCL	SCL

**Module Pin 15 (A0)**

	B-SoM	M-SoM
Pin Number	15	15
Pin Name	A0	A0
Pin Alternate Name	D19	D19

Description	A0 Analog in, GPIO, PWM	A0 Analog in, GPIO, PWM
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
Supports analogRead	Yes	Yes
Supports analogWrite (PWM)	Yes	Yes
Δ Supports tone	A0, A1, A6, and A7 must have the same frequency.	Yes
Δ Supports attachInterrupt	Yes. You can only have 8 active interrupt pins.	Yes
Δ Internal pull resistance	13K	42K
M.2 connector pin number	23	23
SoM Common Pin Name	ADC0	ADC0

### Module Pin 16 (D0)

	B-SoM	M-SoM
Pin Number	16	16
Pin Name	D0	D0
Pin Alternate Name	D0	D0
Description	I2C SDA. Cannot be used as GPIO.	I2C SDA. Cannot be used as GPIO.
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
Δ I2C interface	SDA. Use Wire object.	SDA. Use Wire object. Use 1.5K to 10K external pull-up resistor.
Δ Supports attachInterrupt	Yes. You can only have 8 active interrupt pins.	Yes
Δ Internal pull resistance	13K	???
M.2 connector pin number	22	22
SoM Common Pin Name	SDA	SDA

### Module Pin 17 (A1)

	B-SoM	M-SoM
Pin Number	17	17
Pin Name	A1	A1
Pin Alternate Name	D18	D18
Description	A1 Analog in, GPIO, PWM	A1 Analog in, GPIO, PWM
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
Supports analogRead	Yes	Yes
Supports analogWrite (PWM)	Yes	Yes
Δ Supports tone	A0, A1, A6, and A7 must have the same frequency.	Yes
Δ Supports attachInterrupt	Yes. You can only have 8 active interrupt pins.	Yes
Δ Internal pull resistance	13K	???
M.2 connector pin number	33	33
SoM Common Pin Name	ADC1	ADC1

### Module Pin 18 (MODE)

	B-SoM	M-SoM
Pin Number	18	18
Pin Name	MODE	MODE
Pin Alternate Name	D20	D20
Δ Description	MODE button, has internal pull-up	MODE button. Pin number constant is BTN. External pull-up required!
Δ Supports attachInterrupt	n/a	Yes
M.2 connector pin number	32	32
SoM Common Pin Name	MODE	MODE

### Module Pin 19 (A2)

	B-SoM	M-SoM
Pin Number	19	19
Pin Name	A2	A2
Pin Alternate Name	D17	D17
Description	A2 Analog in, GPIO	A2 Analog in, GPIO
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
Supports analogRead	Yes	Yes
Δ Supports attachInterrupt	Yes. You can only have 8 active interrupt pins.	Yes
Δ Internal pull resistance	13K	22K
M.2 connector pin number	35	35
SoM Common Pin Name	ADC2	ADC2

### Module Pin 20 (RST)

	B-SoM	M-SoM
Pin Number	20	20
Pin Name	RST	RST
Δ Description	Hardware reset, active low.	Hardware reset, active low. External pull-up required.
M.2 connector pin number	34	34
SoM Common Pin Name	RESET	RESET

### Module Pin 21 (A3)

	B-SoM	M-SoM
Pin Number	21	21
Pin Name	A3	A3
Pin Alternate Name	D16	D16
Δ Description	A3 Analog in, GPIO	A3 Analog in, PDM CLK, GPIO
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
Supports analogRead	Yes	Yes
Δ Supports attachInterrupt	Yes. You can only have 8 active interrupt pins.	Yes
Δ Internal pull resistance	13K	2.1K

M.2 connector pin number	37	37
SoM Common Pin Name	ADC3	ADC3

## Module Pin 22 (TX)

	B-SoM	M-SoM
Pin Number	22	22
Pin Name	TX	TX
Pin Alternate Name	D9	D9
Δ Description	Serial TX, GPIO	Serial TX, PWM, GPIO, SPI1 MOSI
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
Δ Supports analogWrite (PWM)	No	Yes
Δ Supports tone	No	Yes
UART serial	TX. Use Serial1 object.	TX. Use Serial1 object.
Δ SPI interface	n/a	MOSI. Use SPI1 object.
Δ Supports attachInterrupt	Yes. You can only have 8 active interrupt pins.	Yes
Δ I2S interface	n/a	I2S MCLK
Δ Internal pull resistance	13K	2.1K
M.2 connector pin number	36	36
SoM Common Pin Name	TX	TX

## Module Pin 23 (GND)

### Unchanged between B-SoM and M-SoM

Pin Number	23
Pin Name	GND
Description	Ground.
M.2 connector pin number	1
SoM Common Pin Name	GND

## Module Pin 24 (RX)

	B-SoM	M-SoM
Pin Number	24	24
Pin Name	RX	RX
Pin Alternate Name	D10	D10
Δ Description	Serial RX, GPIO	Serial RX, PWM, GPIO, SPI1 MISO
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
Δ Supports analogWrite (PWM)	No	Yes
Δ Supports tone	No	Yes
UART serial	RX. Use Serial1 object.	RX. Use Serial1 object.
Δ SPI interface	n/a	MISO. Use SPI1 object.
Δ Supports attachInterrupt	Yes. You can only have 8 active interrupt pins.	Yes
Δ Internal pull resistance	13K	2.1K
M.2 connector pin number	38	38

SoM Common Pin Name	RX	RX
---------------------	----	----

### Module Pin 25 (A4)

	B-SoM	M-SoM
Pin Number	25	25
Pin Name	A4	A4
Pin Alternate Name	D15	D15
Δ Description	A4 Analog in, GPIO	A4 Analog in, PDM DAT, GPIO
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
Supports analogRead	Yes	Yes
Δ Supports attachInterrupt	Yes. You can only have 8 active interrupt pins.	Yes
Δ Internal pull resistance	13K	2.1K
M.2 connector pin number	41	41
SoM Common Pin Name	RESERVED	RESERVED

### Module Pin 26 (D3)

	B-SoM	M-SoM
Pin Number	26	26
Pin Name	D3	D3
Pin Alternate Name	CTS	CTS
Δ Description	SPI1 MOSI, Serial1 CTS, GPIO, Wire1 SCL	D3 GPIO, Serial1 CTS flow control (optional), SPI1 SS
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
UART serial	CTS. Use Serial1 object.	CTS. Use Serial1 object.
Δ SPI interface	MOSI. Use SPI1 object.	SS. Use SPI1 object.
I2C interface	SCL. Use Wire1 object.	SCL. Use Wire1 object.
Δ Supports attachInterrupt	Yes. You can only have 8 active interrupt pins.	Yes
Δ Internal pull resistance	13K	???
M.2 connector pin number	40	40
Δ SoM Common Pin Name	RESERVED	CTS

### Module Pin 27 (A5)

	B-SoM	M-SoM
Pin Number	27	27
Pin Name	A5	A5
Pin Alternate Name	D14	D14
Δ Description	A5 Analog in, GPIO	A5 Analog in, PWM, GPIO, shared with pin 53
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
Supports analogRead	Yes	Yes

Δ Supports analogWrite (PWM)	No	Yes
Δ Supports tone	No	Yes
Δ Supports attachInterrupt	Yes. You can only have 8 active interrupt pins.	Yes
Δ Internal pull resistance	13K	???
Δ SWD interface	n/a	SWCLK. 40K pull-down at boot.
Δ Signal used at boot	n/a	SWCLK. 40K pull-down at boot.
M.2 connector pin number	43	43
SoM Common Pin Name	RESERVED	RESERVED

### Module Pin 28 (D2)

	B-SoM	M-SoM
Pin Number	28	28
Pin Name	D2	D2
Pin Alternate Name	RTS	RTS
Δ Description	SPI1 SCK, Serial1 RTS, PWM, GPIO, Wire1 SDA	D2 GPIO, Serial RTS flow control (optional), SPI1 SCK
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
UART serial	RTS. Use Serial1 object.	RTS. Use Serial1 object.
SPI interface	SCK. Use SPI1 object.	SCK. Use SPI1 object.
I2C interface	SDA. Use Wire1 object.	SDA. Use Wire1 object.
Δ Supports attachInterrupt	Yes. You can only have 8 active interrupt pins.	Yes
Δ Internal pull resistance	13K	???
M.2 connector pin number	42	42
Δ SoM Common Pin Name	RESERVED	RTS

### Module Pin 29 (A6)

	B-SoM	M-SoM
Pin Number	29	29
Pin Name	A6	A6
Δ Pin Alternate Name	D16	D29
Δ Description	A6 Analog in, PWM, GPIO	A6 Analog in, GPIO, PWM, M.2 eval PMIC INT
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
Supports analogRead	Yes	Yes
Supports analogWrite (PWM)	Yes	Yes
Δ Supports tone	A0, A1, A6, and A7 must have the same frequency.	Yes
Δ Supports attachInterrupt	Yes. You can only have 8 active interrupt pins.	Yes
Δ Internal pull resistance	13K	???

M.2 connector pin number	45	45
SoM Common Pin Name	RESERVED	RESERVED

### Module Pin 30 (SOM0 / CELL USBD+)

	B-SoM	M-SoM
Pin Number	30	30
Δ Pin Name	SOM0	CELL USBD+
Pin Alternate Name	CELL USBD+	CELL USBD+
Δ Description	Cellular Modem USB Data+	Cellular Modem USB Data+
Input is 5V Tolerant	Yes	Yes
M.2 connector pin number	44	44
SoM Common Pin Name	SOM0	SOM0

### Module Pin 31 (A7)

	B-SoM	M-SoM
Pin Number	31	31
Pin Name	A7	A7
Δ Pin Alternate Name	D17	WKP
Δ Description	A7 Analog in, GPIO	A7 Analog In, WKP, GPIO D28
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
Supports analogRead	Yes	Yes
Δ Supports analogWrite (PWM)	Yes	No
Δ Supports tone	A0, A1, A6, and A7 must have the same frequency.	No
Δ Supports attachInterrupt	Yes. You can only have 8 active interrupt pins.	Yes
Δ Internal pull resistance	13K	???
M.2 connector pin number	47	47
SoM Common Pin Name	RESERVED	RESERVED

### Module Pin 32 (SOM1 / CELL USBD-)

	B-SoM	M-SoM
Pin Number	32	32
Δ Pin Name	SOM1	CELL USBD-
Pin Alternate Name	CELL USBD-	CELL USBD-
Δ Description	Cellular Modem USB Data-	Cellular Modem USB Data-
Input is 5V Tolerant	Yes	Yes
M.2 connector pin number	46	46
SoM Common Pin Name	SOM1	SOM1

### Module Pin 33 (GND)

Unchanged between B-SoM and M-SoM		
Pin Number	33	

Pin Name	GND
Description	Ground.
M.2 connector pin number	1
SoM Common Pin Name	GND

### Module Pin 34 (D8)

	B-SoM	M-SoM
Pin Number	34	34
Pin Name	D8	D8
Δ Pin Alternate Name	CS	D8
Δ Description	GPIO, SPI SS	D8 GPIO, SPI SS
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
Δ SPI interface	SS. Use SPI object. This is only the default SS/CS pin, you can use any GPIO instead.	Default SS for SPI.
Δ Supports attachInterrupt	Yes. You can only have 8 active interrupt pins.	Yes
Δ Internal pull resistance	13K	2.1K
M.2 connector pin number	48	48
SoM Common Pin Name	CS	CS

### Module Pin 35 (SOM14)

Unchanged between B-SoM and M-SoM	
Pin Number	35
Pin Name	SOM14
Description	M.2 pin 51. Not currently used, leave unconnected.
M.2 connector pin number	51
SoM Common Pin Name	RESERVED

### Module Pin 36 (MISO)

	B-SoM	M-SoM
Pin Number	36	36
Pin Name	MISO	MISO
Pin Alternate Name	D11	D11
Δ Description	SPI MISO, GPIO	D11 GPIO, PWM, SPI MISO
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
Δ Supports analogWrite (PWM)	No	Yes
Δ Supports tone	No	Yes
SPI interface	MISO. Use SPI object.	MISO. Use SPI object.
Δ Supports attachInterrupt	Yes. You can only have 8 active interrupt pins.	Yes
Δ Internal pull resistance	13K	2.1K
M.2 connector pin number	50	50



SoM Common Pin Name	MISO	MISO
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### Module Pin 37 (SOM15 / A5)

	B-SoM	M-SoM
Pin Number	37	37
Δ Pin Name	SOM15	A5
Δ Pin Alternate Name	n/a	D14
Δ Description	M.2 pin 53. Not currently used, leave unconnected.	A5 Analog in, PWM, GPIO, SWCLK, shared with pin 43
Δ Supports digitalRead	n/a	Yes
Δ Supports digitalWrite	n/a	Yes
Δ Supports analogRead	n/a	Yes
Δ Supports analogWrite (PWM)	n/a	Yes
Δ Supports tone	n/a	Yes
Δ Supports attachInterrupt	n/a	Yes
Δ Internal pull resistance	n/a	42K
Δ SWD interface	n/a	SWCLK. 40K pull-down at boot.
Δ Signal used at boot	n/a	SWCLK. 40K pull-down at boot.
M.2 connector pin number	53	53
Δ SoM Common Pin Name	RESERVED	SWD_CLK

### Module Pin 38 (MOSI)

	B-SoM	M-SoM
Pin Number	38	38
Pin Name	MOSI	MOSI
Pin Alternate Name	D12	D12
Δ Description	SPI MOSI, GPIO	D12 GPIO, PWM, SPI MOSI
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
Δ Supports analogWrite (PWM)	No	Yes
Δ Supports tone	No	Yes
SPI interface	MOSI. Use SPI object.	MOSI. Use SPI object.
Δ Supports attachInterrupt	Yes. You can only have 8 active interrupt pins.	Yes
Δ Internal pull resistance	13K	2.1K
M.2 connector pin number	52	52
SoM Common Pin Name	MOSI	MOSI

### Module Pin 39 (SOM16 / D27)

	B-SoM	M-SoM
Pin Number	39	39
Δ Pin Name	SOM16	D27
Δ Description	M.2 pin 55. Not currently used, leave unconnected.	D27 GPIO, SWDIO (SWD_DATA), do not pull down at boot

Δ Supports digitalRead	n/a	Yes
Δ Supports digitalWrite	n/a	Yes
Δ Supports attachInterrupt	n/a	Yes
Δ Internal pull resistance	n/a	42K
Δ SWD interface	n/a	SWDIO. 40K pull-up at boot.
Δ Signal used at boot	n/a	SWDIO. 40K pull-up at boot. Low at boot triggers MCU test mode.
M.2 connector pin number	55	55
Δ SoM Common Pin Name	RESERVED	SWD_DATA

### Module Pin 40 (SCK)

	B-SoM	M-SoM
Pin Number	40	40
Pin Name	SCK	SCK
Pin Alternate Name	D13	D13
Δ Description	SPI SCK, GPIO	D13 GPIO, SPI SCK
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
SPI interface	SCK. Use SPI object.	SCK. Use SPI object.
Δ Supports attachInterrupt	Yes. You can only have 8 active interrupt pins.	Yes
Δ Internal pull resistance	13K	2.1K
M.2 connector pin number	54	54
SoM Common Pin Name	SCK	SCK

### Module Pin 41 (SOM17)

Unchanged between B-SoM and M-SoM	
Pin Number	41
Pin Name	SOM17
Description	M.2 pin 57. Not currently used, leave unconnected.
M.2 connector pin number	57
SoM Common Pin Name	RESERVED

### Module Pin 42 (GND)

Unchanged between B-SoM and M-SoM	
Pin Number	42
Pin Name	GND
Description	Ground.
M.2 connector pin number	1
SoM Common Pin Name	GND

### Module Pin 43 (SOM18 / D26)

	B-SoM	M-SoM
Pin Number	43	43
Δ Pin Name	SOM18	D26
Δ Description	M.2 pin 59. Not currently used, leave unconnected.	D26 GPIO
Δ Supports digitalRead	n/a	Yes
Δ Supports digitalWrite	n/a	Yes
Δ Supports attachInterrupt	n/a	Yes
Δ I2S interface	n/a	I2S WS
Δ Internal pull resistance	n/a	???
M.2 connector pin number	59	59
SoM Common Pin Name	RESERVED	RESERVED

#### Module Pin 44 (SOM12 / D24)

	B-SoM	M-SoM
Pin Number	44	44
Δ Pin Name	SOM12	D24
Δ Description	M.2 pin 58. Not currently used, leave unconnected.	D24 GPIO, Serial2 TX, do not pull down at boot
Δ Supports digitalRead	n/a	Yes
Δ Supports digitalWrite	n/a	Yes
Δ UART serial	n/a	TX. Use Serial2 object.
Δ Supports attachInterrupt	n/a	Yes
Δ Internal pull resistance	n/a	42K
Δ Signal used at boot	n/a	Low at boot triggers ISP flash download
M.2 connector pin number	58	58
SoM Common Pin Name	RESERVED	RESERVED

#### Module Pin 45 (RGBR)

	B-SoM	M-SoM
Pin Number	45	45
Pin Name	RGBR	RGBR
Δ Pin Alternate Name	n/a	RGBR
Description	RGB LED Red	RGB LED Red
Δ Signal used at boot	n/a	Low at boot triggers trap mode
M.2 connector pin number	61	61
SoM Common Pin Name	RED	RED

#### Module Pin 46 (SOM13 / D25)

	B-SoM	M-SoM
Pin Number	46	46
Δ Pin Name	SOM13	D25
Δ Description	M.2 pin 60. Not currently used, leave unconnected.	GPIO25, Serial2 RX
Δ Supports digitalRead	n/a	Yes

Δ Supports digitalWrite	n/a	Yes
Δ UART serial	n/a	RX. Use Serial2 object.
Δ Supports attachInterrupt	n/a	Yes
Δ Internal pull resistance	n/a	42K
Δ Signal used at boot	n/a	Goes high at boot
M.2 connector pin number	60	60
SoM Common Pin Name	RESERVED	RESERVED

#### Module Pin 47 (RGBG)

	B-SoM	M-SoM
Pin Number	47	47
Pin Name	RGBG	RGBG
Δ Pin Alternate Name	n/a	RGBG
Description	RGB LED Green	RGB LED Green
M.2 connector pin number	63	63
SoM Common Pin Name	GREEN	GREEN

#### Module Pin 48 (D22)

	B-SoM	M-SoM
Pin Number	48	48
Pin Name	D22	D22
Δ Pin Alternate Name	GPIO0	D22
Δ Description	GPIO D22	D22 GPIO
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
Δ Supports attachInterrupt	Yes. You can only have 8 active interrupt pins.	Yes
Δ Internal pull resistance	13K	???
M.2 connector pin number	62	62
SoM Common Pin Name	GPIO0	GPIO0

#### Module Pin 49 (RGBB)

	B-SoM	M-SoM
Pin Number	49	49
Pin Name	RGBB	RGBB
Δ Pin Alternate Name	n/a	RGBB
Description	RGB LED Blue	RGB LED Blue
M.2 connector pin number	65	65
SoM Common Pin Name	BLUE	BLUE

#### Module Pin 50 (D23)

	B-SoM	M-SoM
Pin Number	50	50
Pin Name	D23	D23
Δ Pin Alternate Name	GPIO1	D23
Δ Description	GPIO D23	D23 GPIO

Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
Δ Supports attachInterrupt	Yes. You can only have 8 active interrupt pins.	Yes
Δ Internal pull resistance	13K	???
M.2 connector pin number	64	64
SoM Common Pin Name	GPIO1	GPIO1

### Module Pin 51 (SOM5)

	B-SoM	M-SoM
Pin Number	51	51
Pin Name	SOM5	SOM5
Pin Alternate Name	SIM_VCC	SIM_VCC
Δ Description	Leave unconnected. External SIM support is not available on B-SoM.	Leave unconnected, 1.8V/3V SIM Supply Output from R410M.
M.2 connector pin number	67	67
SoM Common Pin Name	SOM5	SOM5

### Module Pin 52 (D4)

	B-SoM	M-SoM
Pin Number	52	52
Pin Name	D4	D4
Pin Alternate Name	PWM0	PWM0
Δ Description	SPI1 MISO, PWM, GPIO D4	D4 GPIO, PWM
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
Supports analogWrite (PWM)	Yes	Yes
Δ Supports tone	D4, D5, and D6 must have the same frequency.	Yes
SPI interface	MISO. Use SPI1 object.	MISO. Use SPI1 object.
Δ Supports attachInterrupt	Yes. You can only have 8 active interrupt pins.	Yes
Δ Internal pull resistance	13K	???
M.2 connector pin number	66	66
SoM Common Pin Name	PWM0	PWM0

### Module Pin 53 (SOM6)

	B-SoM	M-SoM
Pin Number	53	53
Pin Name	SOM6	SOM6
Pin Alternate Name	SIM_RST	SIM_RST
Δ Description	Leave unconnected. External SIM support is not available on B-SoM.	Leave unconnected, 1.8V/3V SIM Reset Output from cellular modem.
M.2 connector pin number	69	69
SoM Common Pin Name	SOM6	SOM6

**Module Pin 54 (D5)**

	B-SoM	M-SoM
Pin Number	54	54
Pin Name	D5	D5
Pin Alternate Name	PWM1	PWM1
Δ Description	PWM, GPIO D5	D5 GPIO, PWM
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
Supports analogWrite (PWM)	Yes	Yes
Δ Supports tone	D4, D5, and D6 must have the same frequency.	Yes
Δ Supports attachInterrupt	Yes. You can only have 8 active interrupt pins.	Yes
Δ I2S interface	n/a	I2S TX
Δ Internal pull resistance	13K	???
M.2 connector pin number	68	68
SoM Common Pin Name	PWM1	PWM1

**Module Pin 55 (SOM7 / SOM8)**

	B-SoM	M-SoM
Pin Number	55	55
Δ Pin Name	SOM7	SOM8
Pin Alternate Name	SIM_CLK	SIM_CLK
Δ Description	Leave unconnected, 1.8V/3V SIM Clock Output from R410M.	Leave unconnected, 1.8V/3V SIM Clock Output from cellular modem.
M.2 connector pin number	71	71
SoM Common Pin Name	SOM7	SOM7

**Module Pin 56 (D6)**

	B-SoM	M-SoM
Pin Number	56	56
Pin Name	D6	D6
Pin Alternate Name	PWM2	PWM2
Δ Description	PWM, GPIO D6	D6 GPIO, PWM
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
Supports analogWrite (PWM)	Yes	Yes
Δ Supports tone	D4, D5, and D6 must have the same frequency.	Yes
Δ Supports attachInterrupt	Yes. You can only have 8 active interrupt pins.	Yes
Δ I2S interface	n/a	I2S CLK
Δ Internal pull resistance	13K	???
M.2 connector pin number	70	70
SoM Common Pin Name	PWM2	PWM2

**Module Pin 57 (SOM8 / SIM\_DATA)**

	B-SoM	M-SoM
Pin Number	57	57
Δ Pin Name	SOM8	SIM_DATA
Pin Alternate Name	SIM_DATA	SIM_DATA
Δ Description	Leave unconnected. External SIM support is not available on B-SoM.	Leave unconnected, 1.8V/3V SIM Data I/O of cellular modem with internal 4.7 k pull-up.
M.2 connector pin number	73	73
SoM Common Pin Name	SOM8	SOM8

### Module Pin 58 (D7)

	B-SoM	M-SoM
Pin Number	58	58
Pin Name	D7	D7
Pin Alternate Name	PWM3	PWM3
Δ Description	PWM, GPIO D7, Blue LED	D7 GPIO, PWM
Supports digitalRead	Yes	Yes
Supports digitalWrite	Yes	Yes
Δ Supports analogWrite (PWM)	PWM is shared with the RGB LED, you can specify a different duty cycle but should not change the frequency.	Yes
Δ Supports tone	No	Yes
Δ Supports attachInterrupt	Yes. You can only have 8 active interrupt pins.	Yes
Δ I2S interface	n/a	I2S WS
Δ Internal pull resistance	13K	???
M.2 connector pin number	72	72
SoM Common Pin Name	PWM3	PWM3

### Module Pin 59 (GND)

Unchanged between B-SoM and M-SoM	
Pin Number	59
Pin Name	GND
Description	Ground.
M.2 connector pin number	1
SoM Common Pin Name	GND

### Module Pin 60 (SOM9 / SOM8)

	B-SoM	M-SoM
Pin Number	60	60
Δ Pin Name	SOM9	SOM8
Δ Pin Alternate Name	n/a	CELL_RI

Δ Description	M.2 pin 75. Not currently used, leave unconnected.	CELL_RI, ring indicator output, leave unconnected.
M.2 connector pin number	75	75
SoM Common Pin Name	SOM9	SOM9



# Schematics

To be provided at a later date.

# Mechanical specifications

Parameter	Value
Operating temperature	-20°C to 65°C

## DIMENSIONS AND WEIGHT

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To be provided at a later date.

# Revision history

Revision	Date	Author	Comments
pre	2024-03-18	RK	Initial Release (based on board v0.2 20240315)
	2024-03-19	RK	USB-C power limitations
	2024-04-16	RK	Description of TS jumper was backwards
1	2024-05-22	RK	Public release
2	2024-05-29	RK	Descriptions for labels 1 and 3 were reversed
3	2024-08-08	RK	Input voltage is 5 - 12 VDC, not 24
4	2024-09-18	RK	Add firmware settings