B524/B523 Datasheet ⁰¹¹



Functional description

OVERVIEW

The B Series System-on-a-Module (SoM) is a LTE Cat 1 cellular device with support for BLE (Bluetooth LE). It is based on the Nordic nRF52840 micro-controller.

The B Series is designed to be integrated into your circuit board design, plugging into a M.2 NGFF connector on your board, allowing the module to be changed or upgraded easily.

FEATURES

Features - B524

- Quectel EG91-E modem
- LTE category 1 module for EMEAA region
- 3GPP E-UTRA Release 13
- Cat 1 bands supported: 1, 3, 7, 8, 20, 28A
- 2G and 3G fallback (900, 1800, and 2100 MHz)
- Embedded Particle EtherSIM (B524)
- Support for Europe, Australia, and New Zealand (B524) at this time

Features - B523

- Quectel EG91-E modem
- LTE category 1 module for EMEAA region
- 3GPP E-UTRA Release 13
- Cat 1 bands supported: 1, 3, 7, 8, 20, 28A
- 2G and 3G fallback (900, 1800, and 2100 MHz)
- Embedded Particle SIM (B523)
- Support for Europe only

Features - All Models

- Nordic Semiconductor nRF52840 SoC
- ARM Cortex-M4F 32-bit processor @ 64MHz
- 1MB flash, 256KB RAM
- Bluetooth 5: 2 Mbps, 1 Mbps, 500 Kbps, 125 Kbps
- Supports DSP instructions, HW accelerated Floating Point Unit (FPU) calculations
- ARM TrustZone CryptoCell-310 Cryptographic and security module
- Up to +8 dBm TX power (down to -20 dBm in 4 dB steps)
- NFC-A tag
- On-module additional 8MB SPI flash
- 24 mixed signal GPIO (8 x Analog, 4 x PWM), UART, I2C, SPI
- USB 2.0 full speed (12 Mbps)
- JTAG (SWD) pins
- RGB status pins for LED
- Reset and Mode pins for buttons
- On-module MFF2 Particle SIM
- Two on-module U.FL connectors for external antennas
- M.2 interface
- CE certified
- RoHS compliant (lead-free)

Interfaces

BLOCK DIAGRAM



POWER

VCC

VCC is used to supply power to the Quectel EG91-E cellular module. The recommended input voltage range on this pin is between 3.6V to 4.3V DC. Make sure that the supply can handle currents of at least 2 A.

Note: The limit on the B402 (u-blox LTE Cat M1) is 4.2V, so you should limit VCC to 4.2V to preserve compatibility with both modules.

3V3

3V3 is used to supply power to nRF52840, logic ICs, memory, etc. and 3.3v is recommended. VCC input voltage range is between 3V to 3.6V DC. Make sure that the supply can handle currents of at least 150mA.

VBus

VBus is connected to the USB detect pin of nRF52840 to enables the USB interface. The recommended input voltage range is between 4.35V to 5.5V DC.

There are two radios on the B523 module. A BLE radio (nRF52840) and a cellular radio (Quectel). We have provided two u.FL connectors to plug in the cellular and BLE antenna. These are required if you wish to use the cellular and BLE. If you do not need BLE, you do not need to connect the BLE antenna.



Number	Label	Purpose
1	ВТ	Bluetooth antenna (optional)
2	CELL	Quectel cellular modem antenna
3	ANT_DIV	LTE cellular receive diversity antenna

The third connector is the LTE cellular receive diversity antenna. A second cellular antenna can be connected to this connector to improve performance when the device will be moving at high speeds. It is only used for LTE Cat 1 connections and is not supported when in 2G or 3G mode. This antenna is not necessary in most cases and is not included in evaluation kits. (The B402 does not have this connector as receive diversity is not supported in LTE Cat M1 mode.)

Certified Cellular Antenna

SKU	Description
ANTCW2EA	Particle Cellular Flex Antenna 2G/3G/LTE [x1]
ANTCW2TY	Particle Cellular Flex Antenna 2G/3G/LTE Tray of 50 [x50]

- Type: LTE Ultra Wide Band Flex Antenna
- Frequency/band: 698 MHz-2690 MHz
- RoHS Compliant
- Mechanical Specs:
 - o Dimensions: 97 x 21 x 0.2 mm
 - Mounting: 3M adhesive backed for application on non-metallic surfaces
 - o Connector type: FPC + IPEX connector
 - o Cable length: 210 mm

General Antenna Guidance

- The antenna placement needs to follow some basic rules, as any antenna is sensitive to its environment. Mount the antenna at least 10mm from metal components or surfaces, ideally 20mm for best radiation efficiency, and try to maintain a minimum of three directions free from obstructions to be able to operate effectively.
- Needs tuning with actual product enclosure and all components.
- For the BLE antenna, it is recommended to use a 2.4 GHz single-frequency antenna and not a 2.4 GHz + 5 GHz antenna, so as to avoid large gain at the frequency twice of 2.4 GHz which can cause the second harmonic radiation of 2.4 GHz to exceed standards.

PERIPHERALS AND GPIO

Peripheral Type	Qty	Input(I) / Output(O)
Digital	24 (max)	1/0
Analog (ADC)	8 (max)	I
UART	1	1/0
SPI	2	1/0
I2C	2	1/0
USB	1	1/0
PWM	7 (max)	0
NFC	1	0

There are some optional B523 module specific I/O:

- Quectel USB and VBUS (for modem firmware upgrades)
- Quectel Ring Indicator (RI) output

Note: All GPIOs are only rated at 3.3VDC max.

JTAG AND SWD

The B523 module has 4 pads at the bottom exposing the SWD interface of the nRF52840. This interface can be used to debug your code or reprogram your B523 bootloader, device OS, or the user firmware. We use 4 pogo-pins connecting to these pads during production for firmware flashing.



Memory map

NRF52840 FLASH LAYOUT OVERVIEW

- Bootloader (48KB, @0xF4000)
- User Application
 - \circ 256KB @ 0xB4000 (Device OS 3.1 and later)
 - o 128KB @ 0xD4000 (Device OS 3.0 and earlier)
- System (656KB, @0x30000)
- SoftDevice (192KB)

EXTERNAL SPI FLASH LAYOUT OVERVIEW (DFU OFFSET: 0X80000000)

- Reserved (4MB, @0x0040000)
- OTA (1500KB, @0x00289000)
- Reserved (420KB, @0x00220000)
- FAC (128KB, @0x00200000)
- LittleFS (2M, @0x0000000)

Pins and button definitions

PINOUT DIAGRAM

EG91-E CAT-1 SOM					
	H1	H3			
	H5				
vcc	2	1	GND		
vcc	4	3	GND		
vcc	6	5	GND		
vcc	8	7	GND		
3V3	10	9	GND		
3V3	12	11	USB D+		
RESERVED	14	13	USB D-		
VUSB	16	15	GND		
	18	17	NFC1		
SCL	20	19	NFC2		
SDA	22	21	GND		
	KEY	23	ADC0		
	KET				
MODE	32	33	ADC1		
RESET	34	35	ADC2		
TX	36	37	ADC3		
RX	38	39	AGND		
CTS	40	41	ADC4		
RTS	42	43	ADC5		
EG91 USB+	44	45	ADC6		
EG91 USB-	46	47	ADC7		
cs	48	49	AGND		
MISO	50	51	RESERVED		
MOSI	52	53	RESERVED		
SCK	54	55	RESERVED		
GND	56	57	RESERVED		
RESERVED	58	59	RESERVED		
RESERVED	60	61	RED		
GPI00	62	63	GREEN		
GPI01	64	65	BLUE		
PWM0	66	67	SIM_VCC		
PWM1	68	69	SIM_RST		
PWM2	70	71	SIM_CLK		
PWM3	72	73	SIM_DATA		
EG91 VBUS	74	75	EG91_RI		
	H2	H4			

Pins SOM0 to SOM9 will vary across various SoM modules. For example, cellular-specific pins exists in this range.

Additionally there are RESERVED³ pins, whose functions vary depending on the SoM. For example, nRF52 MCU-based modules use some of these pins for additional ADC and GPIO. They are able to be used as described on the B523, but their function may be be different on future modules.

For maximum cross-module flexibility, you should try to use only the common pins when possible.

PIN DESCRIPTION

#	Pin	Common	Function nRF52	Description
1	GND	GND	POWER	System ground.
2	VCC	VCC ⁵	POWER	System power in, connect to the +LiPo or supply a fixed 3.6-4.3v power.
3	GND	GND	POWER	System ground.
4	VCC	VCC	POWER	System power in, connect to the +LiPo or supply a fixed 3.6-4.3v power.
5	GND	GND	POWER	System ground.
6	VCC	VCC	POWER	System power in, connect to the +LiPo or supply a fixed 3.6-4.3v power.
7	GND	GND	POWER	System ground.
8	VCC	VCC	POWER	System power in, connect to the +LiPo or supply a fixed 3.6-4.3v power.
9	GND	GND	POWER	System ground.
10	3V3	3V3	POWER	System power in, supply a fixed 3.0-3.6v power.
11	USB D+	USB D+	Ю	Data+ pin of the NRF52840 USB port.

12						
	12	3V3	3V3	POWER		System power in, supply a fixed 3.0-3.6v power.
IS CND GND POWER System ground. 16 VUSB VUSB POWER System power in, USB detect pin for nRF52840. SV on this pin enables the USB interface. 17 NFCI SOM34 NPC input. POWER Leave unconnection. 18 NC RESERVED ¹ NC Leave unconnected. 19 NFC2 SOM44 NPC input. POWER NPC anterna connection. 20 D1 SCL 10 POWER VEX. SCL, and digital only GPIO. 21 CND CND POWER VEX. SCL, and digital only GPIO. 22 AD SDA 10 POWER VEX. SCL, and digital only GPIO. 23 AD ADCO 10 PO25 Connected to the MCDE Dutton input, and digital only GPIO. 24 RESET RESET 1 Active-low reset input. 35 A2 ADC2 10 PO24 Analog input ADC2 ² , and digital GPIO. 36 D9 TX 10 PO29 Analog input ADC2 ² , and digital GPIO.	13	USB D-	USB D-	Ю		Data- pin of the NRF52840 USB port.
16 VUSB VUSB POWER System power in, USB detect pin for nRF52840. SV on this pin enables the USB interface. 17 NFC1 30M33 NFC input POS NFC antenna connection. 18 NC RESERVED3 NC Leave unconnected. 19 NFC2 SOM43 NFC POS POS 20 D1 SCL IO PO24 ICC SCL, and digital only CPIO. 21 GND GND POWER System ground. 22 D0 SDA IO PO25 SCSCL, and digital only CPIO. 23 AO ADCO IO PO3 Asplad input ADCO ² , and digital GPIO. 24 MODE MODE IO PO25 Connected to the MODE button input, and digital only GPIO. 25 MODE MODE IO PO25 Connected to the MODE button input, and digital GPIO. 36 A2 ADCO IO PO26 Active-low reset input. 37 A3 ADCA IO PO26 Analog input ADCA ² , and digi	14	NC	RESERVED ³	NC		Leave unconnected.
	15	GND	GND	POWER		System ground.
NFC	16	VUSB	VUSB	POWER		
19 NFC2 SOM43 NFC input PO10 NFC antenna connection. 20 D1 SCL 10 PO27 IZC SCL, and digital only GPIO. 21 GND CND POWER System ground. 22 DO SDA ID P026 IZC SDA, and digital only GPIO. 23 AO ADC0 ID P025 CSDA, and digital GPIO. 23 AO ADC0 ID P025 Canneed to the MODE button input, and digital only GPIO. 33 A1 ADC1 ID P026 Canneed to the MODE button input, and digital only GPIO. 34 RESET RESET I Active-low reset input. 34 RESET RESET I Active-low reset input. 35 A2 ADC2 ID P028 Analog input ADC22, and digital GPIO. 36 D9 TX ID P028 Analog input ADC32, and digital GPIO. 38 D10 RS ID P038 RESERVED3 ID P130 <	17	NFC1	SOM3 ³		P0.9	NFC antenna connection.
19	18	NC	RESERVED ³	NC		Leave unconnected.
21 GND GND POWER System ground. 22 DO SDA IO P0.26 I2C SDA, and digital only GPIO. 23 AO ADCO IO P0.3 Analog input ADCO ² , and digital GPIO. 32 MODE MODE IO P0.4 Analog input ADCO ² , and digital GPIO. 33 AI ADCI IO P0.4 Analog input ADCO ² , and digital GPIO. 34 RESET RESET I Active-low reset input. 35 A2 ADC2 IO P0.28 Analog input ADCO ² , and digital GPIO. 36 D9 TX IO P0.29 Analog input ADCO ² , and digital GPIO. 37 A3 ADC3 IO P0.29 Analog input ADCO ² , and digital GPIO. 38 D10 RX IO P0.08 Primarily used as UART RX, but can also be used as a digital GPIO. 40 D3 RESERVED ³ IO P0.08 Primarily used as UART RX, but can also be used as a digital GPIO. 41 A4 RESERVED ³	19	NFC2	SOM4 ³		P0.10	NFC antenna connection.
DO	20	D1	SCL	Ю	P0.27	I2C SCL, and digital only GPIO.
23 AO ADCO IO P0.3 Analog input ADCO ² , and digital CPIO. 32 MODE MODE IO P0.25 Connected to the MODE button input, and digital only CPIO. 33 AI ADCI IO P0.4 Analog input ADCI ² , and digital GPIO. 34 RESET RESET I Active-low reset input. 35 A2 ADC2 IO P0.28 Analog input ADC2 ² , and digital GPIO. 36 D9 TX IO P0.29 Analog input ADC2 ² , and digital GPIO. 37 A3 ADC3 IO P0.29 Analog input ADC3 ² , and digital GPIO. 38 D10 RX IO P0.09 Primarily used as UART RX, but can also be used as a digital CPIO. 40 D3 RESERVED ³ IO P0.09 P0.00	21	GND	GND	POWER		System ground.
32 MODE MODE IO P0.25 Connected to the MODE button input, and digital only GPIO. 33 AI ADCI IO P0.4 Analog input ADCI ² , and digital GPIO. 34 RESET RESET I Active-low reset input. 35 A2 ADC2 IO P0.8 Primarily used as UART TX, but can also be used as a digital GPIO. 36 D9 TX IO P0.9 P0.00 Primarily used as UART TX, but can also be used as a digital GPIO. 38 D10 RX IO P0.00 P0.00 Primarily used as UART RX, but can also be used as a digital GPIO. 40 D3 RESERVED ³ IO P0.00 P1.00 UART flow control CTS, SCLI (Wirel), SPII MOSI, digital only GPIO. 41 A4 RESERVED ³ IO P0.00 Analog input ADC4 ² , and digital GPIO. 42 D2 RESERVED ³ IO P0.01 Data+ pin of the cellular modem USB port. 43 A5 RESERVED ³ IO P0.5 Analog input ADC6 ² , and digital GPIO. 45 A6	22	D0	SDA	Ю	P0.26	I2C SDA, and digital only GPIO.
33 AI ADCI IO P0.4 Analog input ADCI ² , and digital GPIO. 34 RESET RESET I Active-low reset input. 35 A2 ADC2 IO P0.28 Analog input ADC2 ² , and digital GPIO. 36 D9 TX IO P0.6 Primarily used as UART TX, but can also be used as a digital GPIO. 37 A3 ADC3 IO P0.92 Analog input ADC3 ² , and digital GPIO. 38 D10 RX IO P0.08 Primarily used as UART RX, but can also be used as a digital GPIO. 40 D3 RESERVED ³ IO P0.08 Primarily used as UART RX, but can also be used as a digital GPIO. 41 A4 RESERVED ³ IO P0.08 CPIO. 42 D3 RESERVED ³ IO P0.30 Analog input ADC4 ² , and digital GPIO. 43 A5 RESERVED ³ IO P0.31 Analog input ADC5 ² , and digital GPIO. 44 Quectel USB D+ SOM1 IO P0.5 Analog input ADC6 ² , and digital GPIO.	23	AO	ADC0	Ю	P0.3	Analog input ADCO ² , and digital GPIO.
34 RESET RESET I Active-low reset input. 35 A2 ADC2 IO P028 Analog input ADC2², and digital GPIO. 36 D9 TX IO P0.9 Primarily used as UART TX, but can also be used as a digital GPIO. 37 A3 ADC3 IO P0.99 Analog input ADC3², and digital GPIO. 38 D10 RX IO P0.08 Primarily used as UART RX, but can also be used as a digital GPIO. 39 AGND AGND POWER System analog ground. 40 D3 RESERVED3 IO P1.10 UART flow control CTS, SCL1 (Wirel), SPII MOSI, digital only GPIO. 41 A4 RESERVED3 IO P0.30 Analog input ADC4², and digital GPIO. 42 D2 RESERVED3 IO P0.31 Analog input ADC5², and digital GPIO. 43 A5 RESERVED3 IO P0.5 Analog input ADC6², and digital GPIO. 44 Quectel USB D+ SOMI IO P0.5 Analog input ADC6², and digital GPIO. 45	32	MODE	MODE	Ю	P0.25	Connected to the MODE button input, and digital only GPIO.
35 A2 ADC2 IO P0.28 Analog input ADC22, and digital GPIO. 36 D9 TX IO P0.6 Primarily used as UART TX, but can also be used as a digital GPIO. 37 A3 ADC3 IO P0.29 Analog input ADC32, and digital GPIO. 38 DIO RX IO P0.08 Primarily used as UART RX, but can also be used as a digital GPIO. 39 AGND AGND POWER System analog ground. 40 D3 RESERVED3 IO P1.10 UART flow control CTS, SCL1 (Wirel), SPII MOSI, digital only GPIO. 41 A4 RESERVED3 IO P0.03 Analog input ADC42, and digital GPIO. 42 D2 RESERVED3 IO P0.03 Analog input ADC52, and digital GPIO. 43 A5 RESERVED3 IO P0.31 Analog input ADC52, and digital GPIO. 44 Quectel USB D4 SOMI IO P0.5 Analog input ADC62, and digital GPIO. 45 A6 RESERVED3 IO P0.5 Analog input ADC62, and digital GPIO.	33	A1	ADC1	Ю	P0.4	Analog input ADC1 ² , and digital GPIO.
36 D9 TX IO P0.6 CPIO. Primarily used as UART TX, but can also be used as a digital CPIO. 37 A3 ADC3 IO P0.29 Analog input ADC3², and digital CPIO. 38 D10 RX IO P0.08 Primarily used as UART RX, but can also be used as a digital CPIO. 39 AGND AGND POWER System analog ground. 40 D3 RESERVED3 IO P1.10 UART flow control CTS, SCL1 (Wirel), SPII MOSI, digital only CPIO. 41 A4 RESERVED3 IO P0.30 Analog input ADC4², and digital CPIO. 42 D2 RESERVED3 IO P0.02 UART flow control RTS, SDA1 (Wirel), SPII SCK, digital only CPIO. 43 A5 RESERVED3 IO P0.03 Analog input ADC5², and digital CPIO. 44 Quectel USB D+ SOM0 IO P0.5 Analog input ADC6², and digital GPIO. 45 A6 RESERVED3 IO P0.5 Analog input ADC6², and digital GPIO. 47 A7 RESERVED3 IO P0.2 Analog	34	RESET	RESET	ı		Active-low reset input.
36 D9 1X 10 P0.6 GPIO. 37 A3 ADC3 10 P0.29 Analog input ADC3², and digital GPIO. 38 D10 RX 10 P0.08 Primarily used as UART RX, but can also be used as a digital GPIO. 39 AGND AGND POWER System analog ground. 40 D3 RESERVED³ 10 P0.30 Analog input ADC4², and digital GPIO. 41 A4 RESERVED³ 10 P0.30 Analog input ADC4², and digital GPIO. 42 D2 RESERVED³ 10 P0.31 Analog input ADC4², and digital GPIO. 43 A5 RESERVED³ 10 P0.31 Analog input ADC5², and digital GPIO. 44 Quectel USB D+ SOMO 10 Data+ pin of the cellular modem USB port. 45 A6 RESERVED³ 10 P0.5 Analog input ADC6², and digital GPIO. 46 Quectel USB D- SOMI 10 Data+ pin of the cellular modem USB port. 47 A7 RESERVED³ 10 P0.2 Analog input ADC6², and digital GPIO. 48 D8 CS 10 P0.7 SPI interface CS, and digital GPIO. 49 AGND AGND POWER System analog ground. 50 D11 MISO 10 P1.8 SPI interface MISO, and digital only GPIO. 51 NC RESERVED³ NC Leave unconnected. 52 D12 MOSI 10 P1.9 SPI interface MOSI, and digital only GPIO. 53 NC RESERVED³ NC Leave unconnected. 54 D13 SCK 10 P0.11 SPI interface SCK, and digital only GPIO. 55 NC RESERVED³ NC Leave unconnected. 56 GND GND POWER System analog ground.	35	A2	ADC2	Ю	P0.28	Analog input ADC2 ² , and digital GPIO.
D10 RX IO PO.08 Primarily used as UART RX, but can also be used as a digital GPIO. AGND AGND POWER System analog ground. BESERVED ³ IO P1.10 UART flow control CTS, SCL1 (Wirel), SPI1 MOSI, digital only GPIO. A4 RESERVED ³ IO P0.30 Analog input ADC4 ² , and digital GPIO. BESERVED ³ IO P0.31 Analog input ADC4 ² , and digital GPIO. A5 RESERVED ³ IO P0.31 Analog input ADC5 ² , and digital GPIO. A6 Quectel USB D+ SOMO IO P0.51 Analog input ADC6 ² , and digital GPIO. A6 RESERVED ³ IO P0.5 Analog input ADC6 ² , and digital GPIO. A7 RESERVED ³ IO P0.5 Analog input ADC6 ² , and digital GPIO. A7 RESERVED ³ IO P0.5 Analog input ADC6 ² , and digital GPIO. A7 RESERVED ³ IO P0.7 SPI interface CS, and digital GPIO. BAGND AGND POWER System analog ground. BY AGND AGND POWER System analog ground. BY INTERFACE MISO, and digital only GPIO. ACK RESERVED ³ NC Leave unconnected. BAGND RESERVED ³ NC Leave unconnected. CHORALD RESERVED ³ NC Leave unconnected.	36	D9	TX	Ю	P0.6	_
38 DIO RX IO POOS GPIO. 39 AGND AGND POWER System analog ground. 40 D3 RESERVED ³ IO P110 UART flow control CTS, SCL1 (Wirel), SPI1 MOSI, digital only GPIO. 41 A4 RESERVED ³ IO P0.30 Analog input ADC4 ² , and digital CPIO. 42 D2 RESERVED ³ IO P1.02 UART flow control RTS, SDA1 (Wirel), SPI1 SCK, digital only GPIO. 43 A5 RESERVED ³ IO P0.31 Analog input ADC5 ² , and digital GPIO. 44 USB D+ SOMO IO Data+ pin of the cellular modem USB port. 45 A6 RESERVED ³ IO P0.5 Analog input ADC6 ² , and digital GPIO. 46 USB D- SOMI IO Data- pin of the cellular modem USB port. 47 A7 RESERVED ³ IO P0.2 Analog input ADC6 ² , and digital GPIO. 48 DB CS IO P0.7 SPI interface CS, and digital only GPIO. 49 AGND AGND POWER System analog ground. 50 D11 MISO IO P1.8 SPI interface MISO, and digital only GPIO. 51 NC RESERVED ³ NC Leave unconnected. 52 D12 MOSI IO P1.9 SPI interface SCK, and digital only GPIO. 53 NC RESERVED ³ NC Leave unconnected. 54 D13 SCK IO PO.11 SPI interface SCK, and digital only GPIO. 55 NC RESERVED ³ NC Leave unconnected. 56 GND GND POWER System analog ground.	37	A3	ADC3	Ю	P0.29	Analog input ADC3 ² , and digital GPIO.
40 D3 RESERVED³ IO P1.10 CHART flow control CTS, SCL1 (Wirel), SPI1 MOSI, digital only GPIO. 41 A4 RESERVED³ IO P0.30 Analog input ADC4², and digital GPIO. 42 D2 RESERVED³ IO P0.31 Analog input ADC5², and digital GPIO. 43 A5 RESERVED³ IO P0.31 Analog input ADC5², and digital GPIO. 44 Quectel USB D+ SOMO IO Data+ pin of the cellular modem USB port. 45 A6 RESERVED³ IO P0.5 Analog input ADC6², and digital GPIO. 46 Quectel USB D- SOMI IO Data- pin of the cellular modem USB port. 47 A7 RESERVED³ IO P0.2 Analog input ADC7², and digital GPIO. 48 D8 CS IO P0.7 SPI interface CS, and digital GPIO. 49 AGND AGND POWER System analog ground. 50 D11 MISO IO P1.8 SPI interface MISO, and digital only GPIO. 51 NC RESERVED³ NC Leave unconnected. 52 D12 MOSI IO P1.9 SPI interface MOSI, and digital only GPIO. 53 NC RESERVED³ NC Leave unconnected. 54 D13 SCK IO P0.11 SPI interface SCK, and digital only GPIO. 55 NC RESERVED³ NC Leave unconnected. 56 GND GND POWER System analog ground.	38	D10	RX	Ю	P0.08	
41 A4 RESERVED³ IO PI.10 GPIO. 41 A4 RESERVED³ IO PO.30 Analog input ADC4², and digital GPIO. 42 D2 RESERVED³ IO PI.02 CPIO. 43 A5 RESERVED³ IO PO.31 Analog input ADC5², and digital GPIO. 44 Quectel USB D+ 45 A6 RESERVED³ IO PO.5 Analog input ADC6², and digital GPIO. 46 Quectel USB D- 47 A7 RESERVED³ IO PO.5 Analog input ADC6², and digital GPIO. 48 DB CS IO PO.7 SPI interface CS, and digital GPIO. 49 AGND AGND POWER System analog ground. 50 D11 MISO IO P1.8 SPI interface MISO, and digital only GPIO. 51 NC RESERVED³ NC Leave unconnected. 52 D12 MOSI IO P1.9 SPI interface MOSI, and digital only GPIO. 53 NC RESERVED³ NC Leave unconnected. 54 D13 SCK IO PO.11 SPI interface SCK, and digital only GPIO. 55 NC RESERVED³ NC Leave unconnected. 56 GND GND POWER System analog ground.	39	AGND	AGND	POWER		System analog ground.
42 D2 RESERVED³ IO P1.02 CPIO. 43 A5 RESERVED³ IO P0.31 Analog input ADC5², and digital CPIO. 44 Quectel USB D+ SOMO IO Data+ pin of the cellular modem USB port. 45 A6 RESERVED³ IO P0.5 Analog input ADC6², and digital CPIO. 46 Quectel USB D- SOMI IO Data- pin of the cellular modem USB port. 47 A7 RESERVED³ IO P0.2 Analog input ADC6², and digital CPIO. 48 D8 CS IO P0.7 SPI interface CS, and digital only GPIO. 49 AGND AGND POWER System analog ground. 50 D11 MISO IO P1.8 SPI interface MISO, and digital only GPIO. 51 NC RESERVED³ NC Leave unconnected. 52 D12 MOSI IO P1.9 SPI interface MOSI, and digital only GPIO. 53 NC RESERVED³ NC Leave unconnected. 54 D13 SCK IO P0.11 SPI interface SCK, and digital only GPIO. 55 NC RESERVED³ NC Leave unconnected. 56 GND GND POWER System analog ground.	40	D3	RESERVED ³	Ю	P1.10	
AS RESERVED ³ IO PI.02 GPIO. 43 AS RESERVED ³ IO PO.31 Analog input ADC5 ² , and digital GPIO. 44 Quectel USB D+ SOMO IO Data+ pin of the cellular modem USB port. 45 A6 RESERVED ³ IO PO.5 Analog input ADC6 ² , and digital GPIO. 46 Quectel USB D- SOM1 IO Data- pin of the cellular modem USB port. 47 A7 RESERVED ³ IO PO.2 Analog input ADC7 ² , and digital GPIO. 48 D8 CS IO PO.7 SPI interface CS, and digital only GPIO. 49 AGND AGND POWER System analog ground. 50 D11 MISO IO P1.8 SPI interface MISO, and digital only GPIO. 51 NC RESERVED ³ NC Leave unconnected. 52 D12 MOSI IO P1.9 SPI interface MOSI, and digital only GPIO. 53 NC RESERVED ³ NC Leave unconnected. 54 D13 SCK IO PO.11 SPI interface SCK, and digital only GPIO. 55 NC RESERVED ³ NC Leave unconnected. 56 GND GND POWER System analog ground.	41	A4	RESERVED ³	Ю	P0.30	Analog input ADC4 ² , and digital GPIO.
44 Quectel USB D+ SOMO IO Data+ pin of the cellular modem USB port. 45 A6 RESERVED³ IO PO.5 Analog input ADC6², and digital GPIO. 46 Quectel USB D- SOM1 IO Data- pin of the cellular modem USB port. 47 A7 RESERVED³ IO PO.2 Analog input ADC7², and digital GPIO. 48 DB CS IO PO.7 SPI interface CS, and digital only GPIO. 49 AGND AGND POWER System analog ground. 50 DI1 MISO IO P1.8 SPI interface MISO, and digital only GPIO. 51 NC RESERVED³ NC Leave unconnected. 52 DI2 MOSI IO P1.9 SPI interface MOSI, and digital only GPIO. 53 NC RESERVED³ NC Leave unconnected. 54 DI3 SCK IO P0.11 SPI interface SCK, and digital only GPIO. 55 NC RESERVED³ NC Leave unconnected. 56 GND GND POWER System analog ground.	42	D2	RESERVED ³	Ю	P1.02	
44 USB D+ SOMO IO Data+ pin of the cellular modem USB port. 45 A6 RESERVED³ IO PO.5 Analog input ADC6², and digital GPIO. 46 Quectel USB D- SOM1 IO Data- pin of the cellular modem USB port. 47 A7 RESERVED³ IO PO.2 Analog input ADC7², and digital GPIO. 48 D8 CS IO PO.7 SPI interface CS, and digital only GPIO. 49 AGND AGND POWER System analog ground. 50 D11 MISO IO P1.8 SPI interface MISO, and digital only GPIO. 51 NC RESERVED³ NC Leave unconnected. 52 D12 MOSI IO P1.9 SPI interface MOSI, and digital only GPIO. 53 NC RESERVED³ NC Leave unconnected. 54 D13 SCK IO P0.11 SPI interface SCK, and digital only GPIO. 55 NC RESERVED³ NC Leave unconnected. 56 GND GND POWER System analog ground.	43	A5	RESERVED ³	Ю	P0.31	Analog input ADC5 ² , and digital GPIO.
46 Quectel USB D- SOM1 IO P0.2 Analog input ADC7 ² , and digital GPIO. 47 A7 RESERVED ³ IO P0.7 SPI interface CS, and digital only GPIO. 48 D8 CS IO P0.7 SPI interface CS, and digital only GPIO. 49 AGND AGND POWER System analog ground. 50 D11 MISO IO P1.8 SPI interface MISO, and digital only GPIO. 51 NC RESERVED ³ NC Leave unconnected. 52 D12 MOSI IO P1.9 SPI interface MOSI, and digital only GPIO. 53 NC RESERVED ³ NC Leave unconnected. 54 D13 SCK IO P0.11 SPI interface SCK, and digital only GPIO. 55 NC RESERVED ³ NC Leave unconnected. 56 GND GND POWER System analog ground.	44		SOM0	Ю		Data+ pin of the cellular modem USB port.
46 USB D- 47 A7 RESERVED³ IO P0.2 Analog input ADC7², and digital GPIO. 48 D8 CS IO P0.7 SPI interface CS, and digital only GPIO. 49 AGND AGND POWER System analog ground. 50 D11 MISO IO P1.8 SPI interface MISO, and digital only GPIO. 51 NC RESERVED³ NC Leave unconnected. 52 D12 MOSI IO P1.9 SPI interface MOSI, and digital only GPIO. 53 NC RESERVED³ NC Leave unconnected. 54 D13 SCK IO P0.11 SPI interface SCK, and digital only GPIO. 55 NC RESERVED³ NC Leave unconnected. 56 GND GND POWER System analog ground.	45	A6	RESERVED ³	Ю	P0.5	Analog input ADC6 ² , and digital GPIO.
48 D8 CS IO PO.7 SPI interface CS, and digital only GPIO. 49 AGND AGND POWER System analog ground. 50 D11 MISO IO P1.8 SPI interface MISO, and digital only GPIO. 51 NC RESERVED ³ NC Leave unconnected. 52 D12 MOSI IO P1.9 SPI interface MOSI, and digital only GPIO. 53 NC RESERVED ³ NC Leave unconnected. 54 D13 SCK IO P0.11 SPI interface SCK, and digital only GPIO. 55 NC RESERVED ³ NC Leave unconnected. 56 GND GND POWER System analog ground.	46		SOM1	Ю		Data- pin of the cellular modem USB port.
49 AGND AGND POWER System analog ground. 50 D11 MISO IO P1.8 SPI interface MISO, and digital only GPIO. 51 NC RESERVED ³ NC Leave unconnected. 52 D12 MOSI IO P1.9 SPI interface MOSI, and digital only GPIO. 53 NC RESERVED ³ NC Leave unconnected. 54 D13 SCK IO P0.11 SPI interface SCK, and digital only GPIO. 55 NC RESERVED ³ NC Leave unconnected. 56 GND GND POWER System analog ground.	47	A7	RESERVED ³	Ю	P0.2	Analog input ADC7 ² , and digital GPIO.
50 D11 MISO IO P1.8 SPI interface MISO, and digital only GPIO. 51 NC RESERVED ³ NC Leave unconnected. 52 D12 MOSI IO P1.9 SPI interface MOSI, and digital only GPIO. 53 NC RESERVED ³ NC Leave unconnected. 54 D13 SCK IO P0.11 SPI interface SCK, and digital only GPIO. 55 NC RESERVED ³ NC Leave unconnected. 56 GND GND POWER System analog ground.	48	D8	CS	Ю	P0.7	SPI interface CS, and digital only GPIO.
51 NC RESERVED ³ NC Leave unconnected. 52 D12 MOSI IO P1.9 SPI interface MOSI, and digital only GPIO. 53 NC RESERVED ³ NC Leave unconnected. 54 D13 SCK IO P0.11 SPI interface SCK, and digital only GPIO. 55 NC RESERVED ³ NC Leave unconnected. 56 GND GND POWER System analog ground.	49	AGND	AGND	POWER		System analog ground.
52 D12 MOSI IO P1.9 SPI interface MOSI, and digital only GPIO. 53 NC RESERVED³ NC Leave unconnected. 54 D13 SCK IO P0.11 SPI interface SCK, and digital only GPIO. 55 NC RESERVED³ NC Leave unconnected. 56 GND GND POWER System analog ground.	50	DII	MISO	Ю	P1.8	SPI interface MISO, and digital only GPIO.
53 NC RESERVED ³ NC Leave unconnected. 54 D13 SCK IO P0.11 SPI interface SCK, and digital only GPIO. 55 NC RESERVED ³ NC Leave unconnected. 56 GND GND POWER System analog ground.	51	NC	RESERVED ³	NC		Leave unconnected.
54 D13 SCK IO P0.11 SPI interface SCK, and digital only GPIO. 55 NC RESERVED ³ NC Leave unconnected. 56 GND GND POWER System analog ground.	52	D12	MOSI	Ю	P1.9	SPI interface MOSI, and digital only GPIO.
55 NC RESERVED ³ NC Leave unconnected. 56 GND GND POWER System analog ground.	53	NC	RESERVED ³	NC		Leave unconnected.
56 GND GND POWER System analog ground.	54	D13	SCK	Ю	P0.11	SPI interface SCK, and digital only GPIO.
56 GND GND POWER System analog ground.	55	NC	RESERVED ³	NC		Leave unconnected.

58	NC	RESERVED ³	NC		Leave unconnected.
59	NC	RESERVED ³	NC		Leave unconnected.
60	NC	RESERVED ³	NC		Leave unconnected.
61	RGBR	RED	Ю	P0.16	Red pin of the RGB LED.
62	D22	GPIO0	Ю	P1.1	GPIO0, digital only.
63	RGBG	GREEN	Ю	P0.15	Green pin of the RGB LED.
64	D23	GPIO1	Ю	P1.3	GPIO1, digital only.
65	RGBB	BLUE	Ю	P0.14	Blue pin of the RGB LED.
66	D4	PWM0	Ю	P0.12	SPII MISO, Digital only GPIO, and PWM0.
67	SIM_VCC ¹	SOM5 ³	POWER		Leave unconnected, 1.8V/3V SIM Supply Output from cellular modem.
68	D5	PWM1	Ю	P0.24	Digital only GPIO, and PWM1.
69	SIM_RST ¹	SOM6 ³	Ю		Leave unconnected, 1.8V/3V SIM Reset Output from cellular modem.
70	D6	PWM2	Ю	P1.4	Digital only GPIO, and PWM2.
71	SIM_CLK ¹	SOM7 ³	Ю		Leave unconnected, 1.8V/3V SIM Clock Output from cellular modem.
72	D7	PWM3	Ю	P0.13	Digital only GPIO, and PWM3.
73	SIM_DATA ¹	SOM8 ³	Ю		Leave unconnected, 1.8V/3V SIM Data I/O of cellular modem with internal 4.7 k pull-up.
74	Quectel VBUS	SOM2 ³	Ю		USB detect pin for cellular modem. 5V on this pin enables the Quectel USB interface.

¹These pins are connected to the internal MFF2 SIM and should be left open.

By default, the Tinker application firmware enables the use of the bq24195 PMIC and MAX17043 fuel gauge. This in turn uses I2C (D0 and D1) and pin A6 (PM_INT). If you are not using the PMIC and fuel gauge and with to use these pins for other purposes, be sure to disable system power configuration. This setting is persistent, so you may want to disable it with your manufacturing firmware only.

System.setPowerConfiguration(SystemPowerConfiguration());

If you are using Ethernet with the B Series SoM, the following pins are used by Ethernet:

Device OS Pin	M.2 Pin	Ethernet Pin
MISO	50	SPI MISO
MOSI	52	SPI MOSI
SCK	54	SPI SCK

²A0-A7 are 12-bit Analog-to-Digital (A/D) inputs (0-4095).

³SoM-specific and Reserved pins will vary depending on module. They are able to be used on the B523, but their function may be be different on future modules.

⁴RI is available on the B523 (Quectel) but not on the B402 (u-blox LTE M1)

⁵The VCC maximum is 4.3V on the B523 (Quectel) but is 4.2V on the B402 (u-blox LTE M1). For compatibility across modules, limit this to 4.2V.

A7	47	nRESET
D22	62	nINTERRUPT
D8	48	nCHIP SELECT

LED STATUS

System RGB LED

Unlike the Boron, the B523 module does not have an on-module RGB system status LED. We have provided its individual control pins for you to connect an LED of your liking. This will allow greater flexibility in the end design of your products.

A detailed explanation of different color codes of the RGB system LED can be found here.

Technical specifications

ABSOLUTE MAXIMUM RATINGS [1]

Supply voltages

Parameter	Symbol	Min Typ	Max	Unit
Supply voltages				
Supply Input Voltage	VCC	-0.3	+4.7	V
Supply Input Voltage	3V3	-0.3	+3.9	V
VBUS USB supply voltage	VUSB	-0.3	+5.8	V
I/O pin voltage				
VI/O, VDD ≤ 3.6 V	Ю	-0.3	VDD + 0.3	V
VI/O, VDD > 3.6 V	Ю	-0.3	+3.9	V
NFC antenna pin current				
I _{NFC1/2}	NFC1/NFC2		80	mA
Radio				
BT RF input level (52840)			10	dBm
Environmental				
Storage temperature		-40	+85	°C

[1] Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under recommended operating conditions is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Min	Тур	Max	Unit
Supply voltages					
Supply Input Voltage	VCC	+3.6	+3.8	+4.3	V
Supply Input Voltage	3V3	+3.0	+3.3	+3.6	V
VBUS USB supply voltage	VUSB	+4.35	+5.0	+5.5	V
Environmental					
Normal operating temperature ¹		-20	+25	+75 ³	°C
Extended operating temperature ²		-40		+85	°C
Humidity Range Non condensing, relative humidity				95	%

Notes:

¹ Normal operating temperature range (fully functional and meet 3GPP specifications).

² Extended operating temperature range (RF performance may be affected outside normal operating range, though module is fully functional)

 $^{^3}$ The maximum operating temperature is 75°C on the B523 (Quectel) but is 65°C on the B402 (ublox LTE M1). For compatibility across modules, limit this to 65°C.

Parameter	Symbol	Min	Тур	Peak	Unit
Operating Current (uC on, peripherals and radio disabled)	lidle	4.47	4.48	4.51	mA
Operating Current (uC on, cellular on but not connected)	l _{cell_idle}	17.5	34.2	744	mA
Operating Current (uC on, cellular connecting to tower)	I _{cell_conn_twr}	17.9	72.3	711	mA
Operating Current (uC on, cellular connecting to cloud)	I _{cell_conn_cloud}	23.0	93.6	669	mA
Operating Current (uC on, cellular connected but idle)	I _{cell_cloud_idle}	22.9	26.8	149	mA
Operating Current (uC on, cellular connected and transmitting)	I _{cell_cloud_tx}	113	139	519	mA
STOP mode sleep, GPIO wake-up	I _{stop_gpio}	323	538	916	uA
STOP mode sleep, analog wake-up	I _{stop_analog}	272	537	948	uA
STOP mode sleep, RTC wake-up	I _{stop_intrtc}	264	537	947	uA
STOP mode sleep, BLE wake-up, advertising	I _{stop_ble_adv}		604	2260	uA
STOP mode sleep, BLE wake-up, connected	I _{stop_ble_conn}		619	1700	uA
STOP mode sleep, serial wake-up	I _{stop_usart}	327	537	912	uA
STOP mode sleep, cellular wake-up	I _{stop_cell}	18.7	23.1	140	mA
ULP mode sleep, GPIO wake-up	l _{ulp_gpio}		53.6	446	uA
ULP mode sleep, analog wake-up	l _{ulp_analog}		55.8	420	uA
ULP mode sleep, RTC wake-up	I _{ulp_intrtc}		54.8	444	uA
ULP mode sleep, BLE wake-up, advertising	l _{ulp_ble_adv}		139	2430	uA
ULP mode sleep, BLE wake-up, connected	l _{ulp_ble_conn}		162	1090	uA
ULP mode sleep, serial wake-up	I _{ulp_usart}	317	537	938	uA
ULP mode sleep, cellular wake-up	I _{ulp_cell}	18.4	22.8	149	mA
HIBERNATE mode sleep, GPIO wake-up	I _{hib_gpio}		29.7	430	uA
HIBERNATE mode sleep, analog wake-up	lhib_analog		30.8	441	uA

¹The min, and particularly peak, values may consist of very short transients. The typical (typ) values are the best indicator of overall power consumption over time. The peak values indicate the absolute minimum capacity of the power supply necessary, not overall consumption.

Boron has two radio modules.

nRF52840

- Bluetooth® 5, 2.4 GHz
 - o 95 dBm sensitivity in 1 Mbps Bluetooth® low energy mode
 - \circ 103 dBm sensitivity in 125 kbps Bluetooth® low energy mode (long range)
 - \circ 20 to +8 dBm TX power, configurable in 4 dB steps

4G LTE cellular characteristics for EG91-E

Parameter	Value
Protocol stack	3GPP Release 13
RAT	LTE Cat 1
LTE FDD Bands	Band 28A (700 MHz)
	Band 20 (800 MHz)
	Band 8 (900 MHz)
	Band 3 (1800 MHz)
	Band 1 (2100 MHz)
	Band 7 (2600 MHz)
WCDMA Bands	Band 8 (900 MHz)
	Band 1 (2100)
GSM Bands	EGSM900 (900 MHz)
	DCS1800 (1800 MHz)
Power class	Class 4 (33dBm ± 2dB) for EGSM900
	Class 1 (30dBm ± 2dB) for DCS1800
	Class E2 (27dBm ± 3dB) for EGSM900 8-PSK
	Class E2 (26dBm ± 3dB) for DCS1800 8-PSK
	Class 3 (24dBm ± 3dB) for WCDMA bands
	Class 3 (23dBm ± 2dB) for LTE FDD bands

These specifications are based on the nRF52840 datasheet.

Symbol	Parameter	Min	Тур	Max	Unit
VIH	Input high voltage	0.7 xVDD		VDD	V
VIL	Input low voltage	VSS		0.3 xVDD	V
VOH,SD	Output high voltage, standard drive, 0.5 mA, VDD ≥1.7	VDD - 0.4		VDD	V
VOH,HDH	Output high voltage, high drive, 5 mA, VDD \geq 2.7 V	VDD - 0.4		VDD	V
VOH,HDL	Output high voltage, high drive, 3 mA, VDD \geq 1.7 V	VDD - 0.4		VDD	V
VOL,SD	Output low voltage, standard drive, 0.5 mA, VDD \geq 1.7	VSS		VSS + 0.4	V
VOL,HDH	Output low voltage, high drive, 5 mA, VDD \geq 2.7 V	VSS		VSS + 0.4	V
VOL,HDL	Output low voltage, high drive,3 mA, VDD \geq 1.7 V	VSS		VSS + 0.4	V
IOL,SD	Current at VSS+0.4 V, output set low, standard drive, VDD≥1.7	1	2	4	mA
IOL,HDH	Current at VSS+0.4 V, output set low, high drive, VDD >= 2.7V	6	10	15	mA
IOL,HDL	Current at VSS+0.4 V, output set low, high drive, VDD >= 1.7V	3			mA
IOH,SD	Current at VDD-0.4 V, output set high, standard drive, VDD≥1.7	1	2	4	mA
IOH,HDH	Current at VDD-0.4 V, output set high, high drive, VDD >= 2.7V	6	9	14	mA
IOH,HDL	Current at VDD-0.4 V, output set high, high drive, VDD \geq 1.7V	3			mA
tRF,15pF	Rise/fall time, standard drivemode, 10-90%, 15 pF load ¹		9		ns
tRF,25pF	Rise/fall time, standard drive mode, 10-90%, 25 pF load ¹		13		ns
tRF,50pF	Rise/fall time, standard drive mode, 10-90%, 50 pF load ¹		25		ns
tHRF,15pF	Rise/Fall time, high drive mode, 10-90%, 15 pF load ¹		4		ns
tHRF,25pF	Rise/Fall time, high drive mode, 10-90%, 25 pF load ¹		5		ns
tHRF,50pF	Rise/Fall time, high drive mode, 10-90%, 50 pF load ¹		8		ns
RPU	Pull-up resistance	11	13	16	kΩ
RPD	Pull-down resistance	11	13	16	kΩ
CPAD	Pad capacitance		3		pF
CPAD_NFC	Pad capacitance on NFC pads		4		pF
INFC_LEAK	Leakage current between NFC pads when driven to different states		1	10	μΑ

- Rise and fall times based on simulations
- GPIO default to standard drive (2mA) but can be reconfigured to high drive (9mA) in Device OS 2.0.0 and later using the pinSetDriveStrength() function.

Mechanical specifications

DIMENSIONS AND WEIGHT

Parameters	Value	Unit
Width	30	mm
Height	42	mm
Thickness	5.5	mm
Weight	6.2	grams

MECHANICAL DRAWING



Dimensions are in millimeters.

The mating connector is a an M.2 (NGFF) type 4. Note that there are several different key configurations for the M.2, and type 4 is different than is commonly used on SSDs.

One compatible connector is the <u>TE 2199230-4</u>. It is widely available including at suppliers such as <u>DigiKey</u>.





We recommend this screw assembly to securely affix the B series SoM to your circuit board. From top to bottom:

- M3 screw, 3mm long
- M3 washer
- M3 standoff, 2.45mm



• Mounting hole, 2.6 mm metal hole, 3.1mm metal ring diameter (picture is of the bottom side of the circuit board)



- An <u>alternative design</u> uses a <u>JAE SM3ZS067U410-NUTI-R1200</u> standoff. It's reflow soldered to your base board and has a threaded hole for a M2*3 screw to hold down the SoM. This may be easier to obtain.
- Note that a hold-down screw is required because the M.2 connector does not have integrated locks and the SoM will pop up if not attached to the base board.

DESIGN CONSIDERATIONS

We strongly recommend against placing components under the SOM board because there is not enough height.



Product Handling

ESD PRECAUTIONS

The B series contains highly sensitive electronic circuitry and is an Electrostatic Sensitive Device (ESD). Handling an B series without proper ESD protection may destroy or damage it permanently. Proper ESD handling and packaging procedures must be applied throughout the processing, handling and operation of any application that incorporates the B series module. ESD precautions should be implemented on the application board where the B series is mounted. Failure to observe these precautions can result in severe damage to the B series!

CONNECTORS

The U.FL antenna connector is not designed to be constantly plugged and unplugged. The antenna pin is static sensitive and you can destroy the radio with improper handling. A tiny dab of glue (epoxy, rubber cement, liquid tape or hot glue) on the connector can be used securely hold the plug in place.

The M.2 edge connector is static sensitive and should be handled carefully. The M.2 connector is not designed for repeated removal and insertion of the module.

Schematics

MICROCONTROLLER



QUECTEL CELLULAR MODEM



M.2 CONNECTOR



Note: The labels for CTS and RTS are reversed in this schematic.

SIM AND FLASH



BUFFERS





Default settings

The B series comes pre-programmed with a bootloader and a user application called Tinker. This application works with an iOS and Android app also named Tinker that allows you to very easily toggle digital pins, take analog and digital readings and drive variable PWM outputs.

The bootloader allows you to easily update the user application via several different methods, USB, OTA, Serial Y-Modem, and also internally via the Factory Reset procedure. All of these methods have multiple tools associated with them as well.

Country compatibility

Country	Model	Technologies	Carriers
Albania	B524	2G, 3G, Cat1	ALBtelecom, Telekom, Vodafone
Australia	B524	3G, Cat1	Optus, Telstra, Vodafone
Austria	B524	2G, 3G, Cat1	3 (Drei), A1, T-Mobile
Belarus	B524	2G, 3G, Cat1	Al
Belgium	B524	2G, 3G, Cat1	Base, Orange, Proximus
Bosnia and Herzegovina	B524	2G, 3G	BH Telecom, HT Eronet
Bulgaria	B524	2G, 3G	A1, Telenor, Vivacom
Croatia	B524	2G, 3G, Cat1	Hrvatski Telekom, Tele2
Czechia	B524	2G, 3G, Cat1	O2, T-Mobile, Vodafone
Denmark	B524	2G, 3G, Cat1	3 (Tre), TDC, Telenor, Telia
Estonia	B524	2G, 3G, Cat1	Elisa, Tele2, Telia
Faroe Islands	B524	2G, 3G	Faroese Telecom, Vodafone
Finland	B524	2G, 3G, Cat1	DNA, Elisa, Telia
France	B524	2G, 3G, Cat1	Bouygues, Free Mobile, Orange, SFR
Germany	B524	2G, 3G, Cat1	O2, Telekom, Vodafone
Gibraltar	B524	2G, 3G, Cat1	Gibtel
Greece	B524	2G, 3G, Cat1	Cosmote, Vodafone, Wind
Hungary	B524	2G, 3G, Cat1	Magyar Telekom, Telenor, Vodafone
Iceland	B524	2G, 3G, Cat1	Nova, Siminn, Vodafone
Ireland	B524	2G, 3G, Cat1	3 (Tre), Meteor, O2, Vodafone
Italy	B524	2G, 3G, Cat1	TIM, Vodafone, Wind
Latvia	B524	2G, 3G, Cat1	Bite, LMT, Tele2
Liechtenstein	B524	2G, 3G, Cat1	Mobilkom, Orange
Lithuania	B524	2G, 3G, Cat1	Bite, Omnitel, Tele2
Luxembourg	B524	2G, 3G, Cat1	Orange, POST, Tango
Malta	B524	2G, 3G, Cat1	Go Mobile, Vodafone
Moldova	B524	2G, 3G, Cat1	Moldcell, Orange
Montenegro	B524	2G, 3G, Cat1	Mtel, T-Mobile, Telenor
Netherlands	B524	2G, 3G, Cat1	KPN, T-Mobile, Vodafone
New Zealand	B524	2G, 3G, Cat1	2degrees, Spark, Vodafone
Norway	B524	2G, 3G, Cat1	TDC, Telenor, Telia
Poland	B524	2G, 3G, Cat1	Orange, Play, Plus, T-Mobile
Portugal	B524	2G, 3G, Cat1	NOS, TMN, Vodafone
Romania	B524	2G, 3G, Cat1	DigiMobil, Orange, Telekom Romania, Vodafone
Serbia	B524	2G, 3G, Cat1	Telenor, VIP
Slovakia	B524	2G, 3G, Cat1	O2, Orange, Telekom
Slovenia	B524	2G, 3G, Cat1	Al, Mobitel
Spain	B524	2G, 3G, Cat1	Orange, Telefonica, Vodafone, Yoigo
Sweden	B524	2G, 3G, Cat1	3 (Tre), Tele2, Telenor, Telia
Switzerland	B524	3G, Cat1	Salt, Sunrise, Swisscom
United Kingdom	B524	2G, 3G, Cat1	3, EE, Manx, O2, Sure, Vodafone

Ordering information

SKU	Description	Region	Modem	EtherSIM	Lifecycle	Replacement
B524MEA	B Series LTE CAT-1/3G/2G (Europe) [x1]	EMEAA	EG91-E	✓	GA	
B524MTY	B Series LTE CAT-1/3G/2G (Europe), Tray [x50]	EMEAA	EG91-E	✓	GA	
B523MEA	B Series LTE CAT-1/3G/2G (Europe) [x1]	EMEAA	EG91-E		NRND	B524MEA
B523MTY	B Series LTE CAT-1/3G/2G (Europe), Tray [x50]	EMEAA	EG91-E		Deprecated	B524MTY

Revision history

Revision	Date	Author	Comments
001	27 Apr 2020	RK	First Release
002	30 Jul 2020	RK	Added explanation of DIV connector
003	16-Sep-2020	RK	Added power consumption information
004	04-Jan-2021	RK	Fix incorrect pin number on pogo pin diagram
005	15-Mar-2021	RK	Updated model, carrier, ordering information
006	23-Mar-2021	RK	Pins 40 and 42 functions were reversed
007	26-Apr-2021	RK	Added B524 model number
800	14-May-2021	RK	Pins 40 and 42 were not actually reversed
009	19-May-2021	RK	List Ethernet reserved pins
010	28-Jun-2021	RK	Added Device OS 3.1 memory map information
011	10-Sep-2021	RK	Changed wording of peak vs. max current