Document Type	Datasheet
Product ID:	BLNFN100001 (20173009)
Product Name	BalenaFin
Product Version	1.1.0
Manufacturer Part Number	FIN0110-SX (where X is the storage size: 8/16/32/64)
Document Version	0.0.5
Author	Carlo Maria Curinga
State (Draft/Proposed/Approved)	Approved

Revision history

Date (dd/mm/yyyy)	Version	Author	Description
13/02/2019	0.0.1	Carlo Maria Curinga	First draft
21/02/2019	0.0.2	Carlo Maria Curinga	First release
22/02/2019	0.0.3	Carlo Maria Curinga	Update temperature range Minimum value
06/06/2019	0.0.4	Nicolas Tzovanis	Fixed HAT Header pinout for pin 13
24/06/2019	0.0.5	Nicolas Tzovanis	Improved description of USB header

1. Introduction

BalenaFin is a carrier board for the Raspberry Pi Compute Module 3 Lite and Compute Module 3+ Lite produced by the Raspberry Pi Foundation.

For more information about the Raspberry Pi Compute Module please refer to the following links:

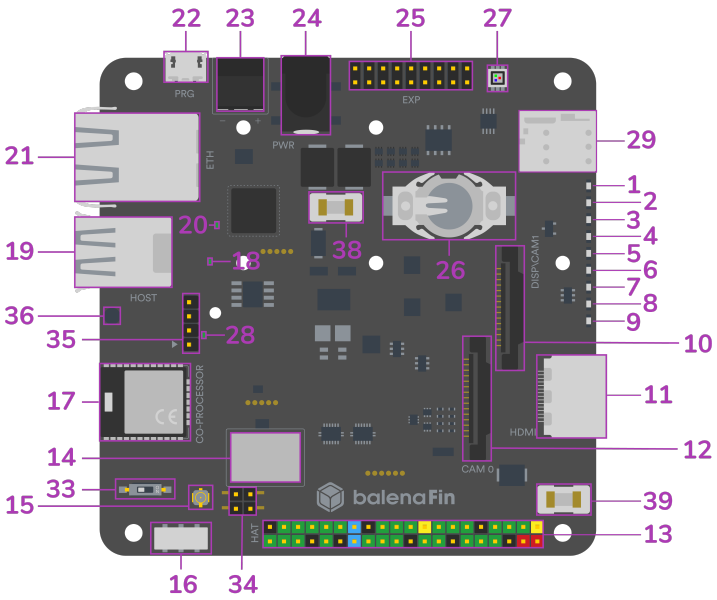
- Datasheet: https://www.raspberrypi.org/documentation/hardware/computemodule/datasheet.md
- Schematics: https://www.raspberrypi.org/documentation/hardware/computemodule/schematics.md

2. Continuity of supply

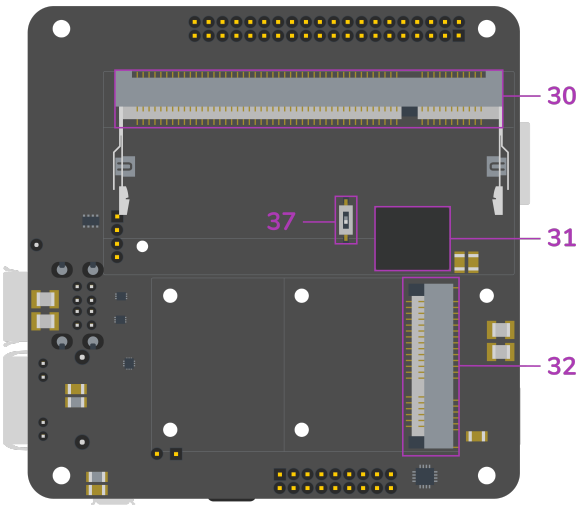
Availability of balenaFin in either the current version or a compatible later revision is guaranteed, on commercially reasonable basis, until January 2024.

3. BalenaFin images and mapping

Top



Bottom



#	Name	Notes/Description
1	5V Status LED	Indicates 5V current flow
2	3V3 Status LED	Indicates 3.3V current flow; this is the same as the red LED on the Raspberry Pi 3 Model B
3	ACT Status LED	CM3L Activity LED; this is the same as the green LED on the Raspberry Pi 3 Model B
4	SPD Status LED	Ethernet Speed LED; off when in 10-Mbps mode, on when in 100-Mbps mode
5	FDX Status LED	Ethernet Full-Duplex indicator
6	LNK Status LED	Ethernet Link/Activity LED
7	PAN Status LED	If supported by the mPCIE (32) card connected, indicates PAN network activity
8	LAN Status LED	If supported by the mPCIE (32) card connected, indicates LAN network activity
9	WAN Status LED	If supported by the mPCIE (32) card connected, indicates WAN network activity

#	Name	Notes/Description
10	DSI/CAM1 connector	Standard full-size Raspberry Pi MIPI connector that can be configured as Display or secondary Camera (cam1) connector; selection is made via the DSI/CAM1 switch (37)
11	HDMI	Full-size HDMI Type A with CEC support
12	CSI connector	Standard full-size Raspberry Pi Camera (cam0) connector
13	HAT connector	40-pin Raspberry Pi HAT (Hardware Attached on Top) standard connector
14	WiFi/BT combo chip	802.11ac/a/b/g/n 2.4 & 5GHz WiFi + Bluetooth 4.2
15	WiFi/BT uFL antenna connector	If the RF switch (33) is set on the external position, the antenna attached to this connector will become the main radio antenna for the WiFi/BT combo chip (14)
16	WiFi/BT embedded antenna	Embedded high-performance SMD antenna covering both 2.4 and 5GHz frequencies; it is the default antenna selected for the WiFi/BT combo chip (14)
17	Co-processor	Silicon Labs BGM111 MCU
18	USB1 ON Status LED	The green LED stays on as long as there is enough current flowing on the top USB port; when this LED is off, it means a fault or under-voltage is happening on the top USB port
19	USB	2 x USB Type-A
20	USB2 ON Status LED	The green LED stays on as long as there is enough current flowing on the bottom USB port; when this LED is off, it means a fault or under-voltage is happening on the bottom USB port
21	Ethernet	10/100 ethernet RJ45 connector
22	PRG - Programming port	micro-USB connector that allows flashing of the eMMC from a host computer using balenaEtcher or usbboot. If the device is powered via a cable connected to this port, it will enter a programming mode exposing its eMMC as mass-storage to a host computer (via balenaEtcher or usbboot). **balenaFin can only be booted into flash mode via this port**
23	Phoenix power in	Industry standard 2-POS Phoenix type connector for 6-24V input power; polarity is denoted on PCB silkscreen
24	Barrel Jack power in	2.1 / 5.5 mm barrel jack type connector for 6-24V input power. Positive polarity (Positive tip, Negative sleeve) - Denoted by symbol on the bottom PCB silkscreen.
25	Co-Processor I/O connector	8 x GPIO / ADC, 1 x SPI, 1 x I2C, 1 x Debug UART

#	Name	Notes/Description
26	CR122 RTC coin-cell battery socket	This allows the embedded RTC to keep track of time while the device is powered off
27	RGB LED	Connected to a PCA9633 controller that allows standard linux sysfs LED control
28	USB3 ON Status LED	The green LED stays on as long as there is enough current flowing on the 4-pin header USB port; when this LED is off, it means a fault or under-voltage is happening on the 4-pin header USB port
29	nano-SIM socket	This allows the use of a wide portfolio of cellular modems via the mPCIe socket (32)
30	CM3L socket	SODIMM-200 socket for the Raspberry Pi Compute Module 3/3+ Lite
31	eMMC	8/16/32/64 GB class 5.1 industrial eMMC - main storage for the CM3L (30). Positioned under the CM3L (30)
32	mPCIe	Mini PCI Express socket
33	Antenna switch	2 position switch - when set to OFF (labeled in silkscreen as "INT"), the WiFi/BT combo chip (14) uses the WiFi/BT embedded antenna (16). When set to ON (labeled in silkscreen as "EXT"), the WiFi/BT combo chip (14) uses the WiFi/BT uFL antenna connector (15)
34	PoE HAT headers	exposes the incoming voltage from the RJ45 (21) port for PoE HATs that step down and flow 5V to the 5V HAT (13) pins
35	USB 2.0 4-pin header	Exposes a USB 2.0 port via male headers. Pin 1 is the one closest to the coprocessor. Pinout: 1->VCC; 2->D-; 3->D+; 4->GND
36	GND probe interface	Exposes a GND probe interface for easy debugging
37	DSI/CAM1 switch	Switches the full-size Raspberry Pi MIPI connector (10) between Display or secondary Camera (cam1) mode - when set to OFF (labeled in silkscreen as "DISP"), the full-size Raspberry Pi MIPI connector (#10) exposes the DSI (disp1) interface. When set to ON (labeled in silkscreen as "CAM1") the full-size Raspberry Pi MIPI connector (10) exposes the secondary CSI (cam1) interface
38	POWER IN Fuse (on 23 & 24)	3A 125VAC/VDC fuse - MPN: 0154003.DR
39	HAT 5V Fuse	3A 125VAC/VDC fuse - MPN: 0154003.DR

3.1 HAT connector pinout

Pin #	Name	Notes/Description	Pin #	Name	Notes/Description

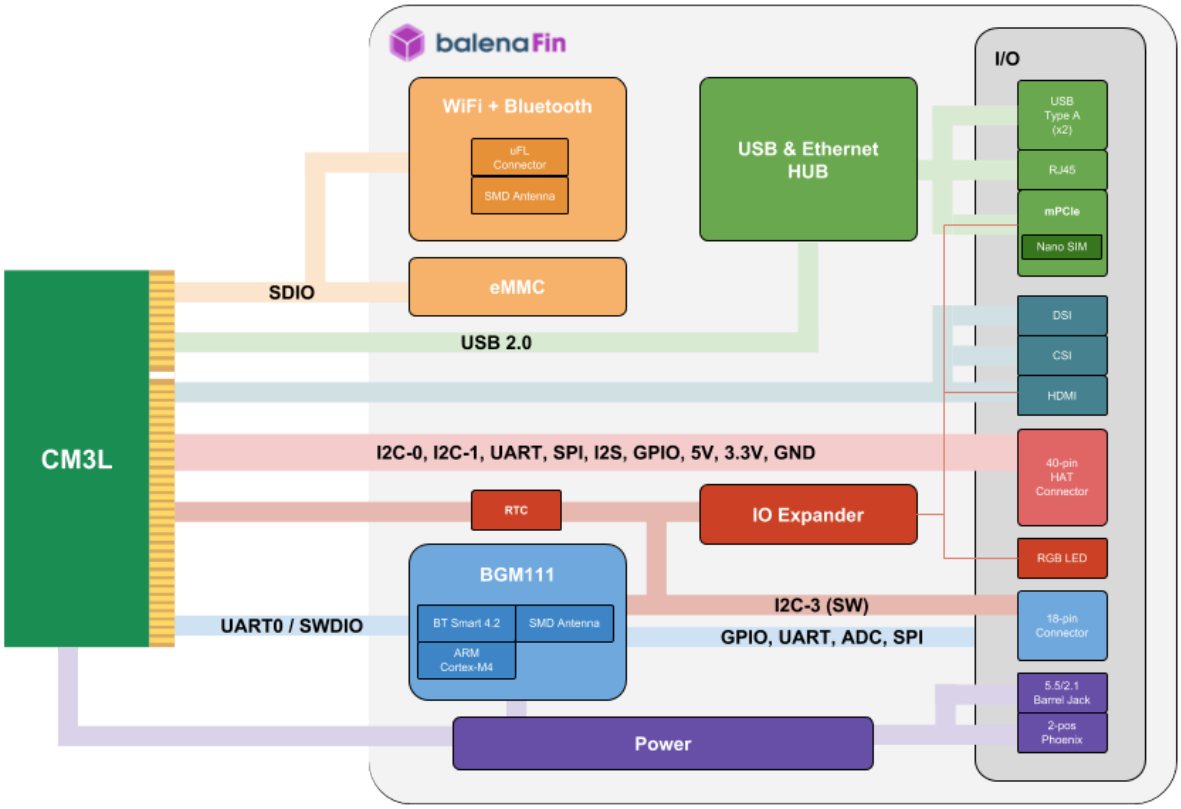
Pin #	Name	Notes/Description	Pin #	Name	Notes/Description
1	3V3	3.3V rail, shared with CM	2	5V	5V rail, from regulator
3	I2C1_SDA	Compute Module I2C1 Data	4	5V	5V rail, from regulator
5	I2C1_SCL	Compute Module I2C1 Clock	6	GND	Ground
7	GPIO4	Compute Module GPIO_4	8	GPIO14	Compute Module GPIO_14
9	GND	Ground	10	GPIO15	Compute Module GPIO_15
11	GPIO17	Compute Module GPIO_17	12	GPIO18	Compute Module GPIO_18
13	GPIO27	Compute Module GPIO_27	14	GND	Ground
15	GPIO22	Compute Module GPIO_22	16	GPIO23	Compute Module GPIO_23
17	3V3	3.3V rail, shared with CM	18	GPIO24	Compute Module GPIO_24
19	GPIO10	Compute Module GPIO_10	20	GND	Ground
21	GPIO9	Compute Module GPIO_9	22	GPIO25	Compute Module GPIO_25
23	GPIO11	Compute Module GPIO_11	24	GPIO8	Compute Module GPIO_8
25	GND	Ground	26	GPIO7	Compute Module GPIO_7
27	I2C0_SDA	Compute Module I2C0 Data	28	I2C0_SCL	Compute Module I2C0 Clock
29	GPIO5	Compute Module GPIO_5	30	GND	Ground
31	GPIO6	Compute Module GPIO_6	32	GPIO12	Compute Module GPIO_12
33	GPIO13	Compute Module GPIO_13	34	GND	Ground
35	GPIO19	Compute Module GPIO_19	36	GPIO16	Compute Module GPIO_16
37	GPIO26	Compute Module GPIO_26	38	GPIO20	Compute Module GPIO_20
39	GND	Ground	40	GPIO21	Compute Module GPIO_21

3.2 Silicon Labs BGM111 connector pinout

Pin #	Name	Notes/Description	Pin #	Name	Description
1	MCU_GPIO0	Co-processor GPIO_0	2	3V3	3.3V rail, from regulator
3	MCU_GPIO1	Co-processor GPIO_1	4	SPI_MCU_CS-CON_EXT	
5	MCU_GPIO2	Co-processor GPIO_2	6	SPI_MCU_CS-SCLK_EXT	
7	MCU_GPIO3	Co-processor GPIO_3	8	SPI_MCU_CS-MOSI_EXT	

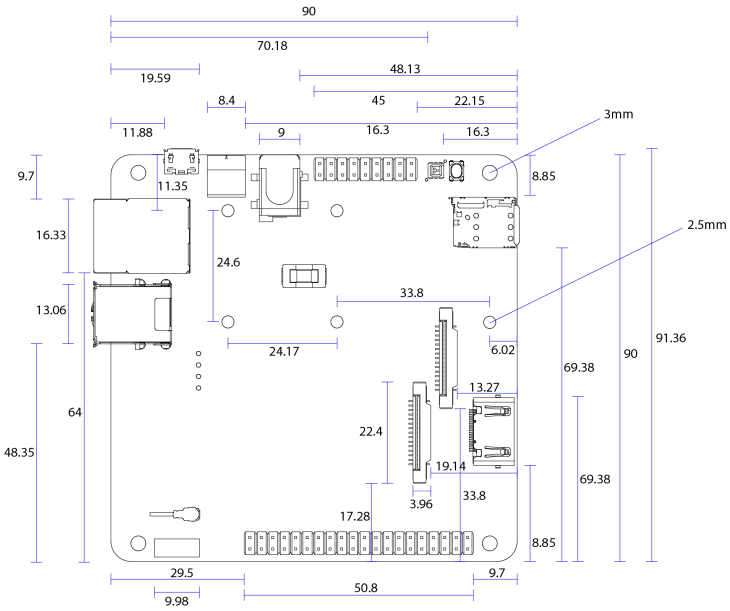
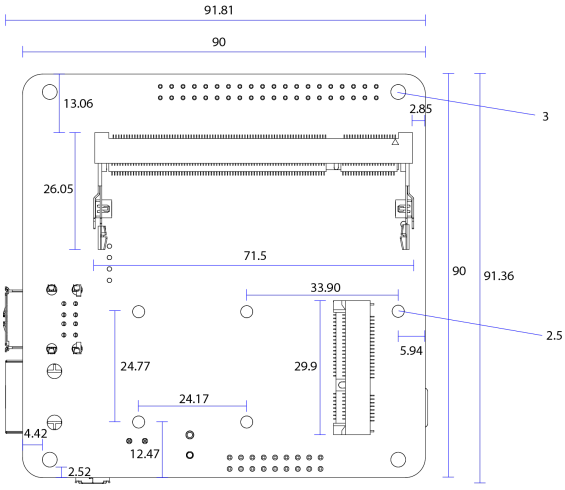
Pin #	Name	Notes/Description	Pin #	Name	Description
9	MCU_GPIO4	Co-processor GPIO_4	10	SPI_MCU_CS-MISO_EXT	
11	MCU_GPIO5	Co-processor GPIO_5	12	DBG_uP-RX_DEV-TX_EXT	
13	MCU_GPIO6	Co-processor GPIO_6	14	DBG_uP-TX_DEV-RX_EXT	
15	MCU_GPIO7	Co-processor GPIO_7	16	MCU_GPIO8	Co-processor GPIO_8
17	GND	Ground	18	MCU_GPIO9	Co-processor GPIO_9

4. Block diagram



5. Mechanical specifications (mm)

Top	Bottom

Top	Bottom
	

6. General specifications

Parameter	Minimum	Typical	Maximum	Conditions
Power input via power connectors	6V	-	24V	12.5W
Power input via HAT connector	5V	5V	5V	12.5W
Operation temperature	-25 celsius	-	70 celsius	

7. Radio specifications

7.1 Frequency range

Description	Min.	Typ.	Max.	Unit
11b / g / n (HT20/HT40)	2412	-	2472	MHz
11a / ac (HT80)	5180	-	5825	MHz
BT / BLE (main)	2402	-	2480	MHz
BT / BLE (secondary, co-processor)	2400	-	2483.5	MHz

7.2 TX Output Power

Description	Min.	Typ.	Max.	Unit
11b/11g/11n-2G(20TH/40TH)	10 / 10 / 10	12 / 12 / 12	14/ 14/ 14	dBm
11a/11n-5G20TH/40TH/11ac	10 / 10 / 8 / 6	12 / 12 / 10 / 8	14 / 14 / 12 / 10	dBm

Description	Min.	Typ.	Max.	Unit
BT / BLE (main)	-6	0	4	dBm
BT / BLE (secondary, co-processor)	-26	-	8	dBm

7.3 RX Sensitivity

Description	Min.	Typ.	Max.	Unit
11b/11g/11n-2G(20TH/40TH)	-	-87/-73/-69/-66	-76 / -65 / -64/-61	dBm
11a/11n-5G(20TH/40TH)/11ac	-	-71/-68/-65/-57	-65 / -64/-61 /-51	dBm
BT / BLE (main)	-	-86/-86	-70 / -70	dBm
BT / BLE (secondary, co-processor)	-	-55.2/-47.2	-	dBm

8. Certification

Certification	Country / Region	Identifier(s)
RoHS	N/A	N/A
CE	Europe	RE-18071303
FCC	USA	2APW6-FIN0110-CM2
IC	Canada	24038-BLNFN100001
MIC	Japan	R-208-180131

8.1 Labelling

The end product must be labeled, in a visible area, with the following:

- *Contains FCC ID: 2APW6-FIN0110-CM2 IC: 24038-BLNFN100001*
- *Contains FCC ID: QOQBGM111 IC: 5123A-BGM111*

8.2 Regulatory Insert

8.1.1 FCC Compliance Statement (USA)

This device complies with Part 15 rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and

2. This device must accept any interference received, including interference that may cause undesired operation.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates,

uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Non-modification Warning

Any changes or modifications to this device not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

RF Exposure Statement

This equipment complies with FCC/IC radiation exposure limits set forth for an uncontrolled environment and meets the FCC radio frequency (RF) Exposure Guidelines and RSS-102 of the IC radiofrequency (RF) Exposure rules. This equipment should be installed and operated keeping the radiator at least 20cm or more away from person's body.

Cet équipement est conforme aux limites d'exposition aux rayonnements énoncées pour un environnement non contrôlé et respecte les règles les radioélectriques (RF) de la FCC lignes directrices d'exposition dans et d'exposition aux fréquences radioélectriques (RF) CNR-102 de l'IC. Cet équipement doitêtre installé et utilisé en gardant une distance de 20 cm ou plus entre le dispositif rayonnant et le corps

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

8.1.2 Canadian DOC Compliance Statement

Cet appareil numerique de la classe B est conforme a la norme NMB-003 du Canada. This Class B digital apparatus complies with Canadian ICES-003.

Industry Canada (IC) Warning

Le present appareil est conforme aux CNR d Industrie Canada applicables aux appareils radio exempts de licence. L exploitation est autorisee aux deux conditions suivantes : (1) appareil ne doit pas produire de brouillage, et (2) l utilisateur de l appareil doit accepter tout brouillage radioelectrique subi, meme si le brouillage est susceptible n compromettre le fonctionnement.

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: 1) This device may not cause interference., 2) This device must accept any interference, including interference that may cause undesired operation of the device.