MMB Thread Border Router

When developing a custom IoT ecosystem, time to market and ease of development are critical. Leveraging Thread technology and over a decade of experience in IoT product development, the MMB Thread Border Router allows users to create a local Thread Mesh network and connect your Thread devices directly to the Internet.

When optionally configured as a Thread Mesh Extender, it allows users to expand their network for large scale deployments. It is the ideal platform for customers looking to deploy their own Thread-based IoT solution for consumer or commercial applications. With minimal development effort, the MMB Thread Border Router can be configured to form a network, connect to other devices, and communicate data to the cloud, all while supporting your custom applications.

Simple Path to Market

Reduce budget uncertainty and engineering time.

Pre-certified and tested, low cost OpenThread-compliant solution.

Go from proof of concept to scaled manufacturing with white label friendly enclosure and packaging options.

Focus on building unique features for your customers, leave the connectivity to MMB.

Better Performance

Create a great customer experience with a secure, wired or wireless end-to-end ecosystem.

Maximum network range with minimal energy consumption.

Read sensor and telemetry data in the cloud with powerful local control and processing.

Compatible with existing onsite 802.11 b/g/n and Ethernet network connectivity backbones.
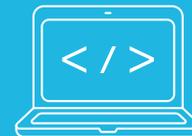
Developer Friendly

Work in your own dev environment with an off the shelf Gateway based on the popular and well-supported Espressif ESP32.

Friendly and easy to work with, with a large and engaged developer community.

Pull in more features to increase market share and functionality by leveraging on board MMB and open source libraries.

CONTENTS:

1. General Information

This is a Preliminary Datasheet and all specifications are subject to change. The MMB Thread Border Router/Thread Mesh Extender leverage Silicon Labs' industry leading EFR32MG21 Thread SoC and Espressif Systems' ESP32 WiFi/Bluetooth enabled MCU.

The Border Router provides IoT connectivity for Thread end devices and enables communication via Thread, BLE/Bluetooth, Wi-Fi, and 10/100 Ethernet. The Mesh Extender increases the range of Thread communication to bridge more distant endpoints to a Border Router or other device.

2. Processor and Memory

Processor	RAM	Flash Memory
ESP32 Host MCU processor	8MB	16MB
EFR32MG21 802.15.4 / OpenThread SoC	64Kb	512KB

3. Electrical Specifications

3.1 | Absolute Maximum Ratings

Parameter	Minimum	Typical	Maximum	Units
AC input voltage (power supply)	90		264	Vac
DC supply voltage (device)[1]	0		5.3	Vdc
Storage Temperature (device)	-40		105	°C
Storage Temperature (power supply)	-30		70	°C

Notes:

[1] The MMB Thread Border Router and Thread Mesh Extender are shipped with an AC-DC power adapter included in the box. The power adapter generates the required DC voltage from an AC input.

3.2 | Recommended Operating Conditions

Parameter	Minimum	Typical	Maximum	Units
AC input voltage (power supply)	100		240	Vac
AC input frequency (power supply)	47		63	Hz
Operating Temperature (device)	-25	25	85	°C
Operating Temperature (power supply)	0	25	40	°C

3.3 | DC Electrical Characteristics

Parameter	Test Condition	Minimum	Typical	Maximum	Units
DC power supply voltage	Included power adapter	4.75	5	5.25	Vdc
DC current consumption	Idle mode Benchmark mode		130 412	1000	mA mA
Current Consumption	Idle mode Benchmark mode		0.68 2.16	5	W W

3.4 | AC Electrical Characteristics

Parameter	Test Condition	Minimum	Typical	Maximum	Units
Ethernet data rate	Using Cat. 5E or better cable			100	Mbps

4. RF Specifications

4.1 | Thread Radio Specifications

Parameter	Test Condition	Min	Typical	Max	Units
Frequency		2405		2480	MHz
Transmit power for North American applications (FCC limit)	Channels 11-25	18	19.6		dBm
	Channel 26		9.9		dBm
Transmit power for European applications (CE limit)	Channels 11-26		11.2		dBm
Receive Sensitivity	IEEE 802.15.4 O-QPSK 250 kbps		-104.4	-103	dBm

4.2 | WLAN Radio Specifications

Parameter	Test Condition	Min	Typical	Max	Units
Frequency		2412		2484	MHz
Transmit Power	802.11b at 11Mbps	16	18		dBm
	802.11g at 54Mbps	10.5	12		dBm
	802.11n at HT20 MCS7	9.5	11		dBm
Receive Sensitivity	802.11b 1Mbps		-96	-93	dBm
	802.11g 54Mbps		-75	-74	dBm
	802.11n HT20 MCS7		-72	-70	dBm

4.3 | Bluetooth Low Energy Radio Specifications

Parameter	Test Condition	Min	Typical	Max	Units
Operating Frequency		2402		2480	MHz
Maximum Transmit Power		6	8.2		dBm
Receive Sensitivity for 1Mbps GFSK	Channels 0-38		-96	-91	dBm
	Channel 39		-93.5	-85	dBm

Figure 5.1 Hardware Architecture

Functional block diagram of the MMB-OTBR/OTME devices:

HW Block Diagram v1.1

MMB-OTBR

MMB-OTME

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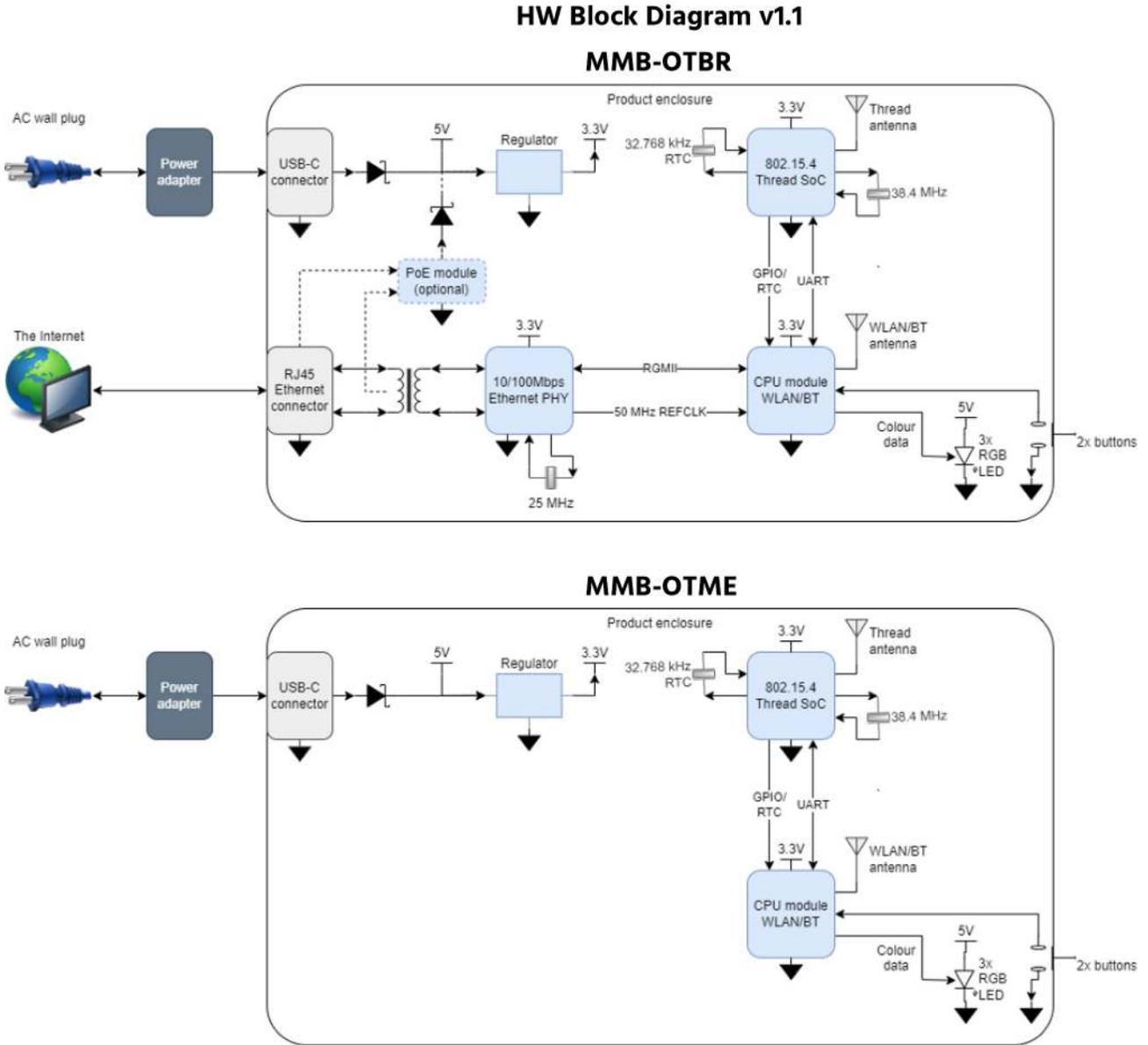
6. Functional Descriptions

6.1 | Buttons

Number of Buttons: 2
1. Button A (WIFI ON/OFF)
2. Button B (Thread Join)

6.2 | Status LEDs

Number of LEDs: 3
LED Type: Red, Green, Yellow (tri-color)

1. LED A (Status): Colors - Red, Green, Yellow
2. LED B (WIFI): Colors - Red, Green, Yellow
3. LED C (Thread): Colors - Red, Green, Yellow
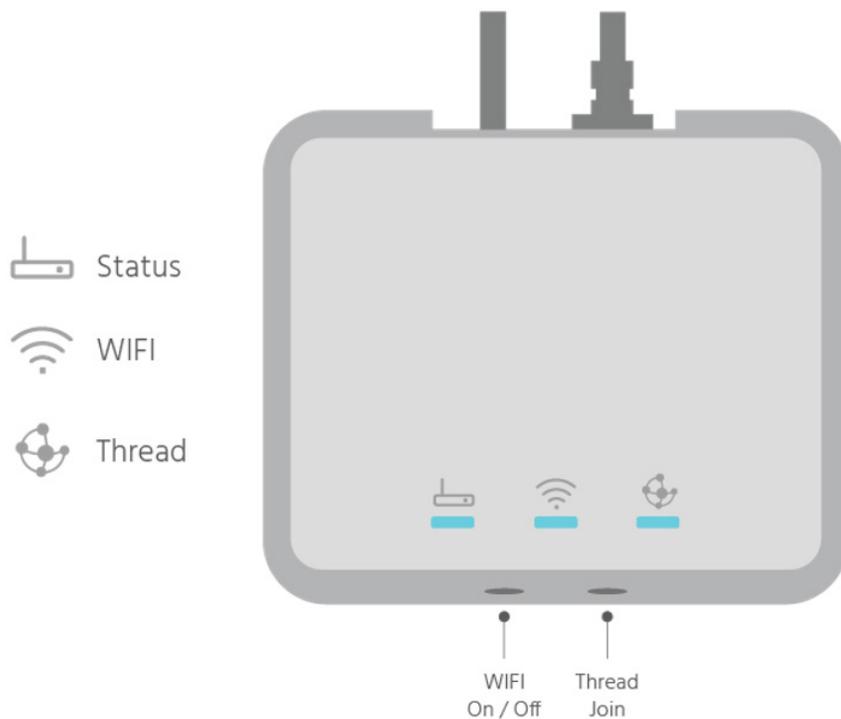
6.3 | WiFi

The MMB-OTBR device includes an 802.11b/g/n WiFi radio which operates on the 2.4 GHz WiFi band. The WiFi antenna is internal to the device. The BRD21-TME device does not support WiFi.

6.4 | Ethernet

The MMB-OTBR device includes a 10/100 Mbps Ethernet PHY. The PHY supports 10BASE-T (IEEE802.3i) and 100BASE-TX (IEEE802.3u) ethernet protocols. The MMB-OTME device does not support Ethernet.

6.5 Power Over Ethernet (PoE)

The MMB-OTBR design may be adapted for Power over Ethernet (PoE) applications. For further information please contact MMB Networks.

6.6 | USB-C

The MMB-OTBR/OTME devices are powered from the built-in USB-C port. The recommended power supply capability is 5V/1A.

6.7 | Real-Time Clock

The MMB-OTBR/OTME devices include a simple Real Time Clock to help maintain accurate system time in the absence of a network connection. The accuracy of the RTC is ±20 parts-per-million (ppm).

7. Mechanical Specifications

All dimensions in mm.
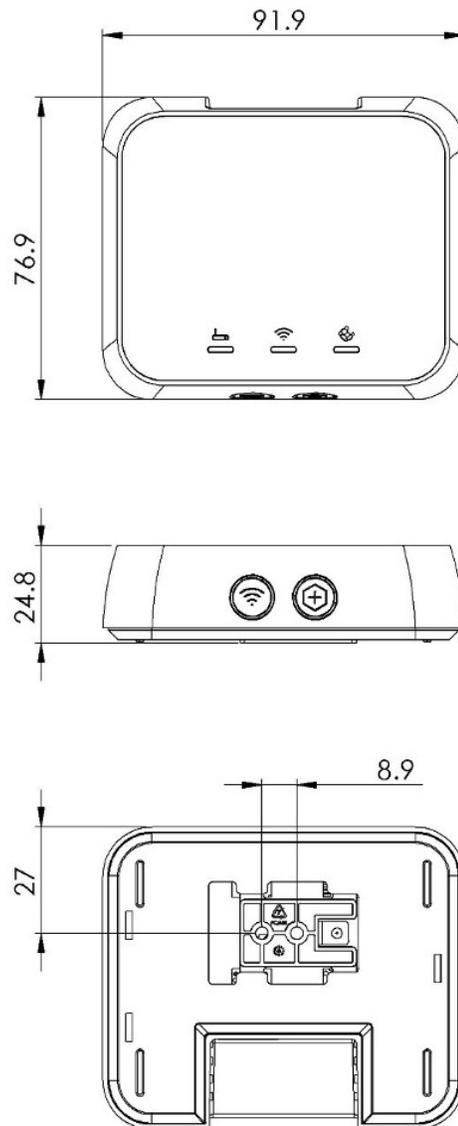
8. Regulatory Approvals

8.1 | Federal Communications Commission (FCC - US)

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 not cause harmful interference to radio or television reception, which can be determined by turning the equipment on and on, the user is encouraged to try to correct the interference by one or more of the following measures: (1) re-orient or re-locate the receiving antenna. (2) Increase the separation between the equipment and receiver. (3) Connect the equipment into an outlet on a circuit different from that to which the receiver is connected. (4) Consult the dealer or an experienced radio/TV technician for help.

Federal Communications Commission (FCC-US): This device complies with Part 15 of the FCC 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. To comply with FCC RF Exposure requirements, users of this device must ensure that the device be installed and/or configured to operate with a separation distance of 20cm or more from all persons. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

8.2 | Innovation, Science and Economic Development Canada (ISED)

This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada's licence-exempt RSS(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.

To comply with ISED RF Exposure requirements, users of this device must ensure that the device be installed and/or configured to operate with a separation distance of 20cm or more from all persons.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

1. L'appareil ne doit pas produire de brouillage;
2. L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Pour se conformer aux exigences d'exposition RF ISED, les utilisateurs de cet appareil doivent s'assurer que l'appareil est installé et/ou configuré pour fonctionner avec une distance de séparation de 20 cm ou plus de toutes les personnes.

8.3 | RoHS Compliance

This device (BRD21) does not contain any substances in excess of the maximum concentration allowed by Directive 2002/95/EC.

8.4 European Health and Safety Compliance (CE)

The MMB Thread Border Router has been tested against the relevant harmonized/designated standards and are in conformity with the essential requirements and other relevant requirements of the EMC-Directive (2014/30/EU) and the Radio Equipment Directive (RED) (2014/53/EU).

The products are entitled to carry the CE Mark and a formal Declaration of Conformity (DoC) is available at the product web page which is reachable starting from https://www.mmbnetworks.com/mmb-tbr.

8.5 UK Conformity Assessment (UKCA)

The MB Thread Border Router has been tested against the relevant harmonized/designated standards and are in conformity with the essential requirements and other relevant requirements of SI 2016 No. 1091 ("The Electromagnetic Compatibility Regulations 2016") and SI 2017 No. 1206 ("The Radio Equipment Regulations 2017").

The products are entitled to carry the UKCA Mark and a formal Declaration of Conformity (DoC) is available at the product web page which is reachable starting from https://www.mmbnetworks.com/mmb-tbr.

9. Revision History

Revision	Date	Comments
1.0	2022/06/20	Initial release
1.1	2023/02/16	Final release

10. Ordering Information

Product Order Number / SKU	Ordering Information
MMB-OTBR	MMB Thread Border Router
MMB-OTME	MMB Thread Mesh Extender

The above table provides the HW SKU which forms the first part of the complete part number.
The complete part number requires a three digit programming code (xxx)

The MMB Thread Border Router ships with the required power adapter included.

Contact your local MMB sales representative to determine the correct programming code for your application.

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