

OxTech Multi-Connectivity Module

Compatible with Amazon Sidewalk

Summary Datasheet

Document Status: Preliminary

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09/25/2023	0.9	Initial Release

Preliminary

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1. Introduction

The OxTech Multi-Connectivity Module (MCM) is outlined in this document. This covers its RF interfaces, hardware interfaces, serial commands, and provisioning details. It provides a convenient way to comprehend the module's interface specifications, electrical and mechanical aspects, and related information, facilitating the design and setup of applications using the module.

Preliminary

2. Product Overview



Figure 1: OxTech MCM module

2.1 General Description

The MCM is a highly efficient, low-power connectivity module designed for IoT applications that require reliable wireless connectivity and cloud integration. The module is fully capable of supporting multiple wireless communication protocols including Amazon Sidewalk, LoRaWAN, Bluetooth, Zigbee, Thread, Matter, Wi-SUN, and other proprietary standards.

The MCM embeds an EFR32MG24 microcontroller, with advanced security characteristics such as:

- Secure Bootloader
- Secure Vault
- Secure Debug

With a compact profile of 25.4 mm x 22.8 mm x 4.0 mm and powered by 3.3 V supply, the module embeds Semtech's SX126x sub-GHz radio transceiver that supports LoRa and FSK. It also includes an onboard Bluetooth Antenna which provides convenient and reliable connectivity. Onboard SPI eFlash can be shared between the host (via exposed SPI pins) and module for FUOTA or other data storage.

The proprietary Amazon Sidewalk co-processor solution, developed by Oxit, supports Firmware Upgrade Over-the-Air (FUOTA) capability.

2.2 Key Features

Features	Details
Power Supply	Supply Voltage range: 2.8-3.6 V Typical supply voltage: 3.3 V
Operating Frequency	<ul style="list-style-type: none"> LoRa/FSK: 863-928 MHz BLE: 2.402-2.480 GHz
LoRa/FSK Features	<ul style="list-style-type: none"> +22dBm or +15dBm high-efficiency PA Integrated DC-DC converter and LDO High sensitivity: down to -148dBm* Built-in bit synchronizer for clock recovery FSK, GFSK, MSK, GMSK, LoRa and Long Range FHSS modulations
Bluetooth Protocol	BLE 5.3
Bluetooth Operation Mode	BLE
Bluetooth Modulation	GFSK
Antenna Interfaces	<ul style="list-style-type: none"> U.FL antenna port for LoRa/FSK Trace antenna for BLE Antenna interface for LoRa/FSK (Pin 3) 50 Ω impedance
Physical Characteristics	<ul style="list-style-type: none"> Size: 25.4 mm x 22.8 mm x 4.0 mm 29 Pin SMD Module Weight: 2.8 g
Temperature Range	<ul style="list-style-type: none"> Operating temperature range: -30 °C to +85 °C Storage temperature range: -40 °C to +95 °C
Integrated SPI flash	1 MB

Table 1: Key features

Note: *These values are subject to change based on further testing

2.3 Functional Diagram

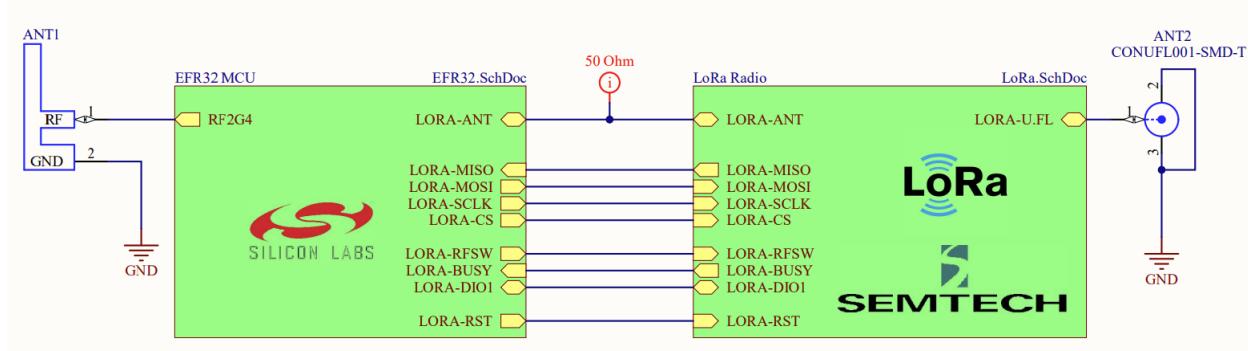


Figure 2: Functional diagram

2.4 EVB Kit

To help you develop applications with the module, Oxit supplies an evaluation board (MCM-S0-N1-X1L1-KIT) with accessories to control or test the module.

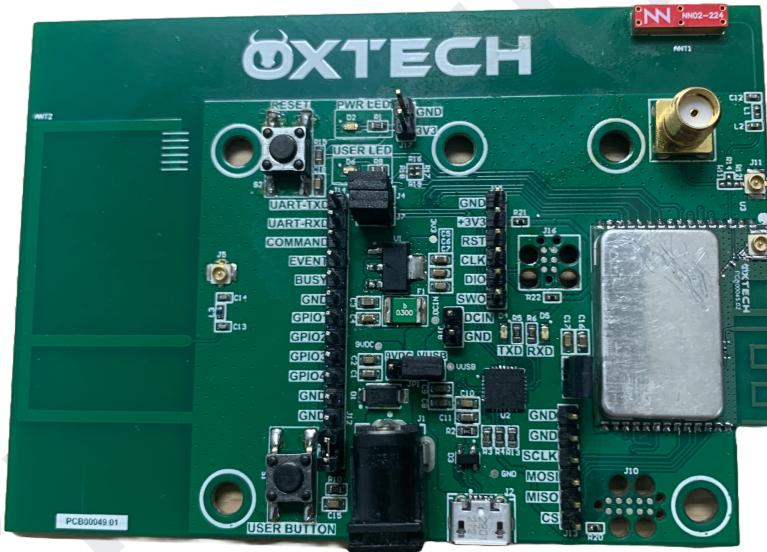


Figure 3: MCM evaluation board

3. MCM Pinout Interfaces

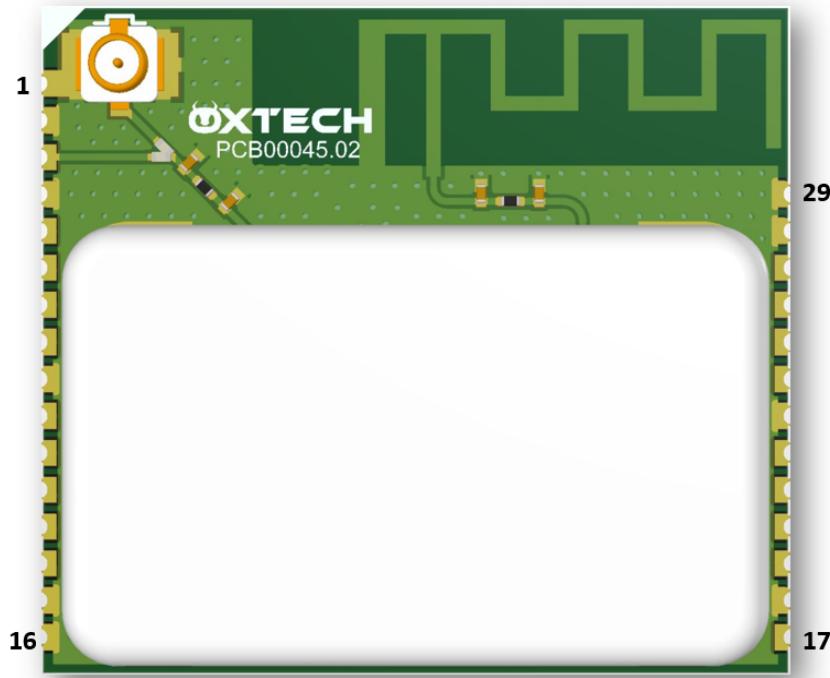


Figure 4: Pin assignment (Top View)

3.1 Modem Pins

Pin No	Terminal Name	Type	Description
1	GND	Power	Ground
2	GND	Power	Ground
3	ANT	RF	LoRa RF path for application board antenna
4	GND	Power	Ground
5	JTAG-SWO	O	Debug Serial Wire Output
6	JTAG-SWIO	I/O	Debug Serial Wire I/O
7	JTAG-SWCLK	CLK	Debug Serial Wire Clock
8	RESET	I	Sidewalk Application MCU Reset

10	UART TX	O	UART TX, Module to host
11	UART RX	I	UART RX, Host to Module
12	COMMAND	I	Module Command input
13	EVENT	O	Module Event Out
14	BUSY	O	Module Busy Out
15	GND	Power	Ground
16	GND	Power	Ground
17	VDD	POWER	Module VDD Supply
18	GND	Power	Ground
19	EXT_GPIO4	I/O	General Purpose Input/Output
20	EXT_GPIO1	I/O	General Purpose Input/Output
21	EXT_GPIO2	I/O	General Purpose Input/Output
22	EXT_GPIO3	I/O	General Purpose Input/Output
23	GND	Power	Ground
24	FLASH_SCLK	CLK	Module/eFlash SPI Clock
25	FLASH_MOSI	I	Module/eFlash SPI Master Out Slave In
26	FLASH_MISO	O	Module/eFlash SPI Master In Slave Out
27	FLASH_CS	I	Module/eFlash SPI Chip Select
28	GND	Power	Ground
29	GND	Power	Ground

Table 2: Pinout

3.2 Modem Interface

Parameter	Value
Baud Rate	115,200 bps
Data Bits	8
Stop Bits	1
Parity	None

Table 3: Modem interface

3.3 Modem Operating Voltage

Symbol	Description	Min	Typ	Max	Unit
VDD	Supply Voltage, Applied to VDD and GND	2.8	3.3	3.6	V

Table 4: Operating voltages

3.4 GPIO Signaling Lines - Network Co-Processor (NCP) Mode

3.4.1 COMMAND Line

Active-low, GPIO input line

This line is used to signal to the MCM that the Application MCU is about to transmit a command. After driving the line low, the host has to wait until the BUSY line goes low before sending the first character. This allows the module to wake up and start reception. After the command is sent, the line must be driven high, at which point the Modem will process the command. If a valid command was received, the Modem will transmit its response.

3.4.2 BUSY Line

Active-high, GPIO output line

This line signals whether the module is busy or ready to receive commands. It is high while the Modem is busy and will go low as soon as the module is ready to receive a command. The BUSY line will go high again after the command has been received and the COMMAND line has been released.

3.4.3 EVENT Line

Active-high, GPIO output line

This line signals to the Application MCU that the module has event data pending. The Application MCU can use the *GetEvent* command to retrieve such data.

3.4.4 RESET Line

Active-low, RESET input line

The Application MCU uses this line to perform a hardware reset on the MCM.

4. RF Antenna Interfaces

4.1 RF Antenna Pin Description

The MCM has a U.FL connector for LoRa/FSK and a PCB antenna for BLE operation. However, the LoRa/FSK signal can be steered to either the U.FL connector or to the Pin 3 of the module via the steering resistor.

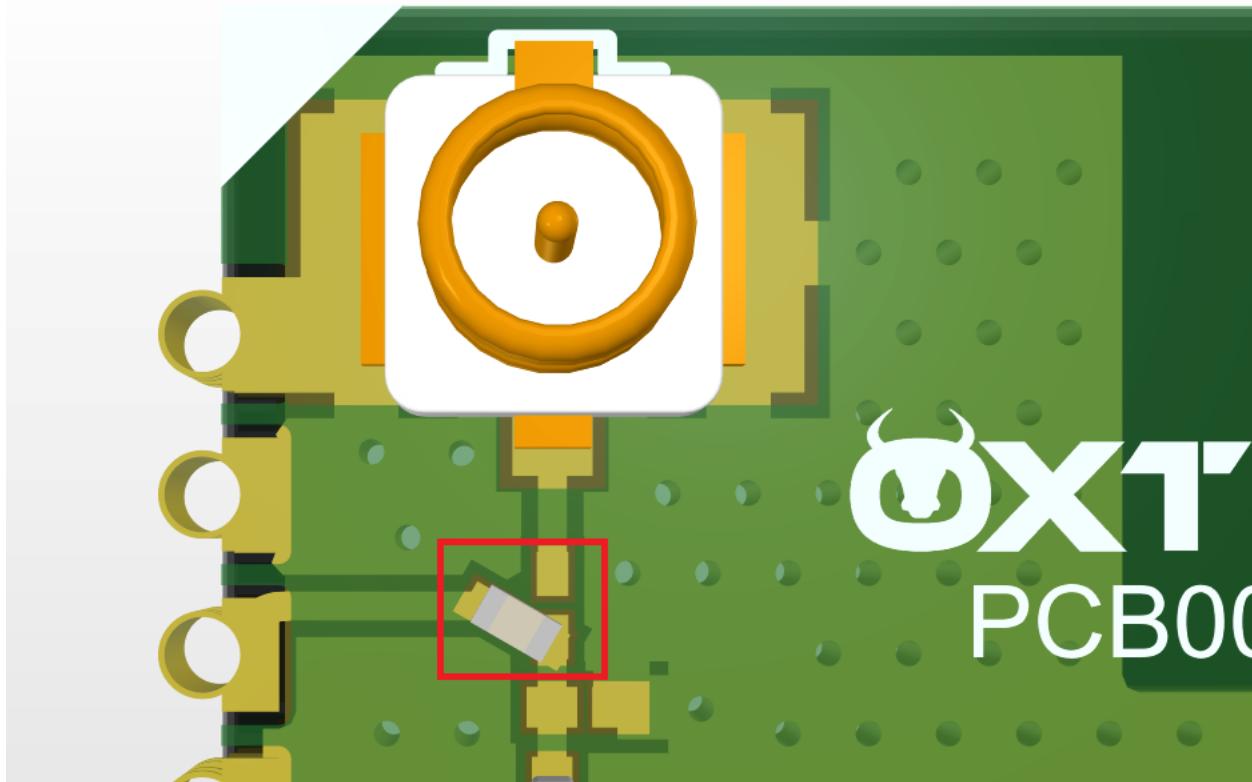


Figure 5: RF Steering resistor in Red Box. Configured towards the castellation as depicted

4.2 Operating Frequency

Mode	Frequency	Unit
LoRa/FSK	863-928	MHz
BLE	2.402-2.480	GHz

Table 5: Operating RF frequencies

4.3 RF Connector

The module has a U.FL connector for antenna connection.

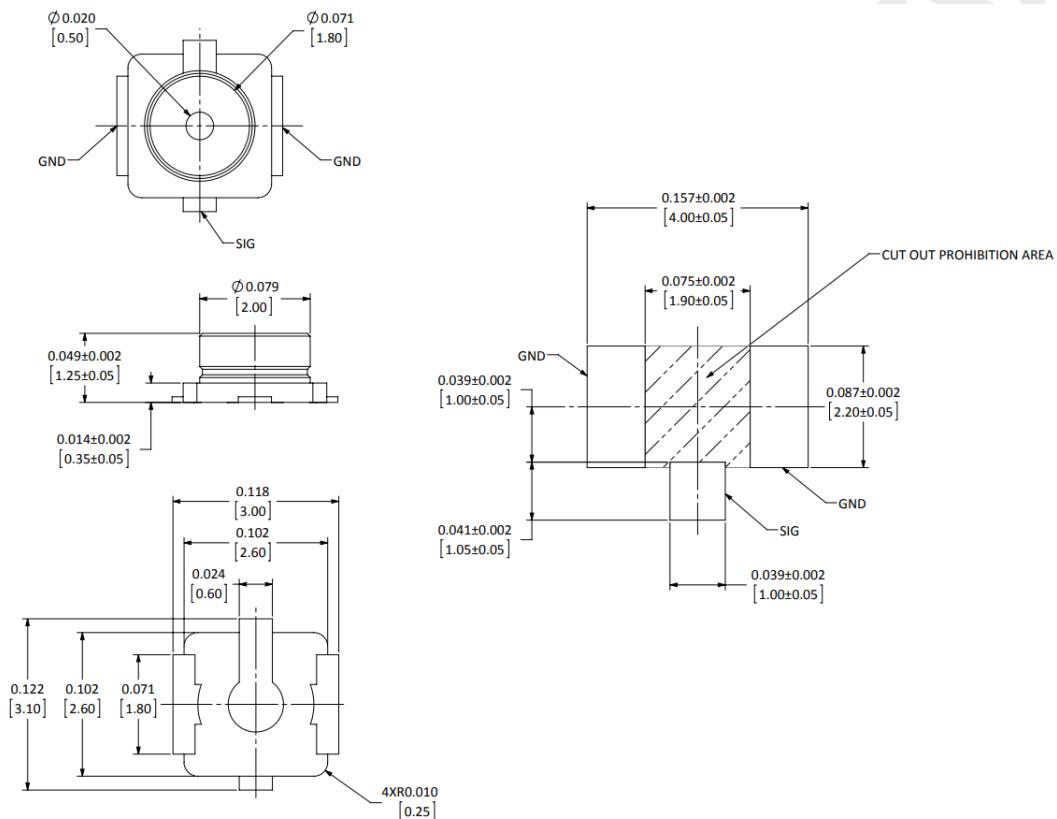


Figure 6: Dimensions of the receptacle (Unit: mm)

5. Electrical Characteristics & Reliability

5.1 Absolute Maximum Ratings

Absolute maximum ratings and recommended operating conditions for power supply and voltage on digital and analog pins of the module are listed in the following table.

Symbol	Min	Typ	Max	Unit
VDD	2.8	3.3	3.6	V
Voltage at Digital Pins	-0.3	-	VDD+0.3	V

Table 6: Absolute maximum rating

5.2 Power Consumption

Operating Mode	Operating State	Current Draw*	Unit
LoRa	Idle Mode Sleep Tx @ 22 dBm Rx	4-6 15-40 130-150 6-12	mA uA mA mA
FSK	Idle Mode Sleep Tx @ 22dBm Rx	4-6 15-40 130-150 6-12	mA uA mA mA
BLE	Idle Mode Sleep Tx @ 10 dBm Rx	4-6 15-40 19.5 10.66	mA uA mA mA

Table 7: Power consumption in different scenarios

Note: *These values are subject to change based on further testing

5.3 RF Performance

The following table summarizes the transmitting and receiving performance of the module.

Operating Mode	Output Power (Typ.)*	Scenario*	Receive Sensitivity (dBm)*
LoRa (863-928 MHz)	22	BW = 125 kHz, SF=7 BW= 125 kHz, SF=12 BW = 500 kHz, SF=7 BW = 500 kHz, SF=12	-124 -137 -117 -129
FSK (863-928 MHz)	22	4.8 kbps 38.4 kbps 250 kbps	-118 -109 -104
BLE	10	1Mbps 2Mbps	-96 -93.3

Table 8: RF performance

Note: *These values are subject to change based on further testing

5.4 Operating and Storage Temperatures

Parameter	Min	Max	Unit
Operating Temperature Range	-30	+85	C
Storage Temperature Range	-40	+95	C

Table 9: Temperature rating

6. Mechanical Information

This section describes the mechanical dimensions of the module. All dimensions are measured in millimeters (mm), and the dimensional tolerances are ± 0.2 mm unless otherwise specified.

6.1 Mechanical Dimensions

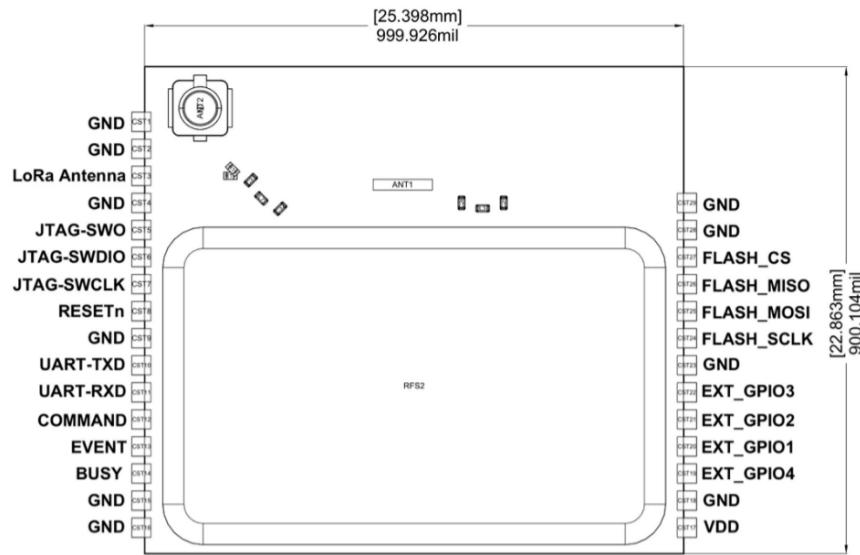


Figure 7: Top and Side Dimensions

6.2 Top and Bottom Views

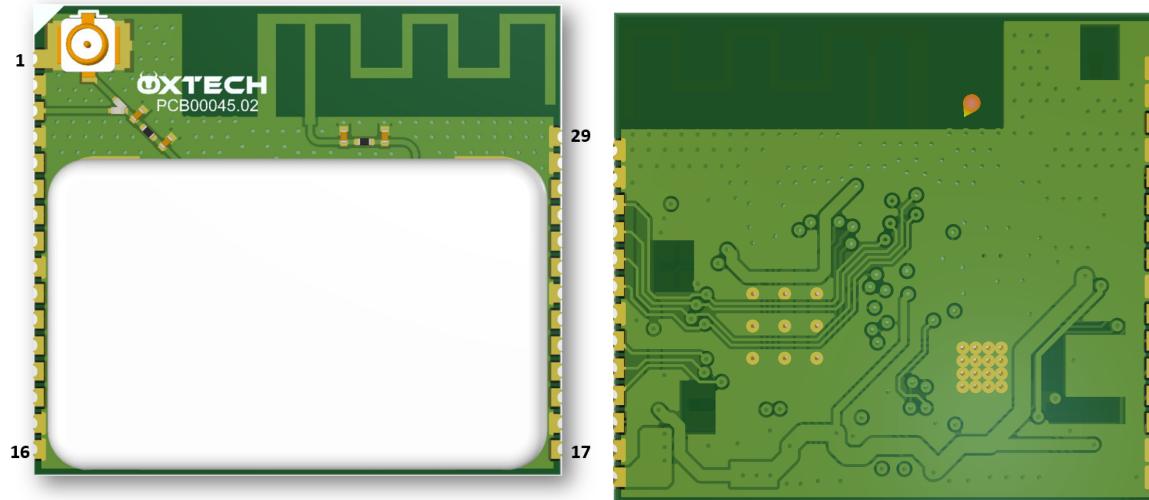


Figure 8: Top and bottom view of the module

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