

BOSCH PTM20R MirX2 Bluetooth Module



BOSCH PTM20R MirX2 Bluetooth Module User Guide

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BOSCH PTM20R MirX2 Bluetooth Module



Product Information

Specifications

- Wireless Specification: 2.4GHz
- Communication: UART Interface
- TI MCU: External Memory
- Electrical Interface: SPI Flash, VCC, Current Consumption, GND, JTAG, JTAG Reset, N Miraculix Wake-Up
- Mechanical Dimension: PCB dimension, PCB thickness, RF shield can, Total module thickness
- Operating Temperature: N/A

Product Usage Instructions

General Information

The PTM20R has the following key specifications:

- **Wireless Specification:** 2.4GHz
- **Communication:** UART Interface
- **TI MCU:** External Memory
- **Electrical Interface:** SPI Flash, VCC, Current Consumption, GND, JTAG, JTAG Reset, N Miraculix Wake-Up
- **Mechanical Dimension:** PCB dimension, PCB thickness, RF shield can, Total module thickness

PCBA Electrical Interface

The PCBA has a top view and a bottom view. The key components of the layout can be found on the top view.

RF Shield Marking

The RF shield will receive a laser marking with the DMC code, RB HW part number and revision of the MirX hardware, production week and year, as well as the received certification ID and approval numbers of FCC and IC. The BT- and CE symbols will be at the corners.

Module Placement Requirements on the Host PCBA (ELO)

When integrating the module into Bosch Power Tool products, the following requirements should be followed:

1. This module does not have a Real Time Clock (RTC). If ELO requires RTC functionality, it must be added separately.
2. When routing UART traces between ELO and MirX2, use R=0 Ohm in-line resistors placed side-by-side for the GND / TX / RX / VCC signals. This is important for test sample preparation during conductive and radiative RF tests.
3. The module can be soldered on the host board (ELO) with a clearance provided for the antenna. No routing or ground should be allowed in any layer within the clearance area. Placing the module at the edge of the host board is recommended for optimal RF performance.

Software Detail and Operation

System Layout

There is no information provided about the system layout in the given text extract.

UART Communication Interface

There is no information provided about the UART communication interface in the given text extract.

The product complies with the regulations and requirements of the Federal Communications Commission (FCC). The FCC ID and approval numbers are provided.

Canada Statement

The product complies with the regulations and requirements of Canada. The Canada ID is provided.

FAQs

No frequently asked questions (FAQ) are provided in the given text extract.

General Information

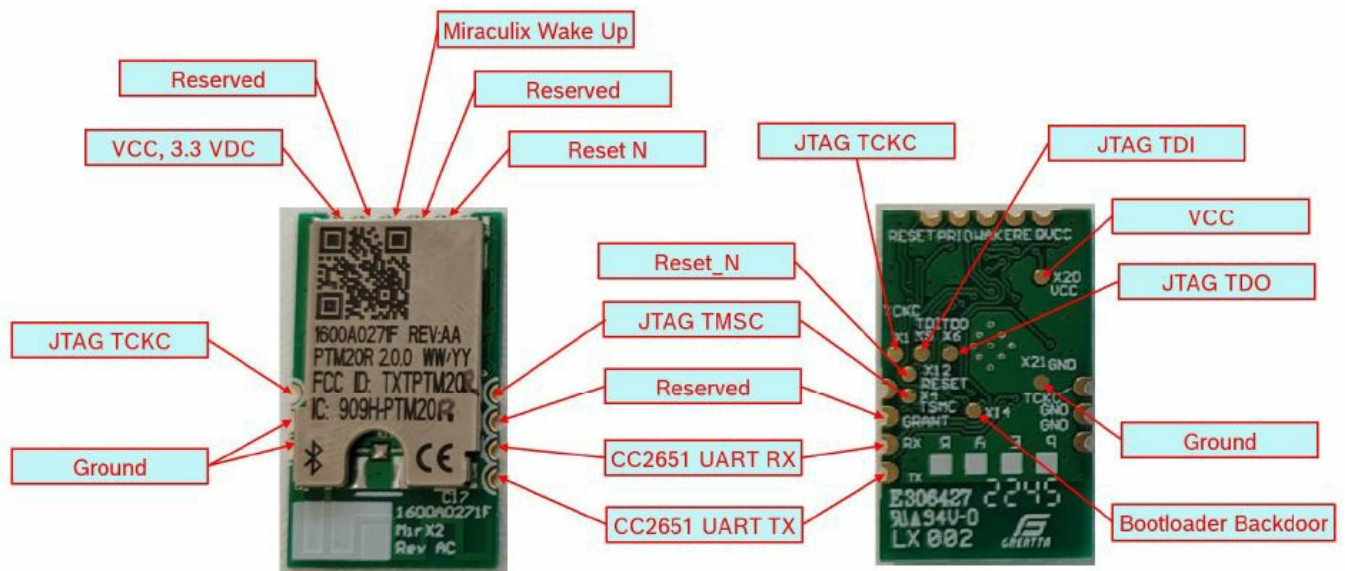
The PTM20R was designed to be integrated into products as combined equipment, not to be used independently. The nominal size of the Bluetooth module is 25.4mm x 15.0mm x 2.0 mm thick. The difference between PTM20R and PTM20 is the real-time clock (RTC) function. Both modules share the same PCB trace layout, electronic parts, physical connections arrangement and electrical characteristics except the real-time clock-related function, i.e. 32.768 kHz crystal. The R designation of the module name is the indication of the RTC function.

Key Specifications

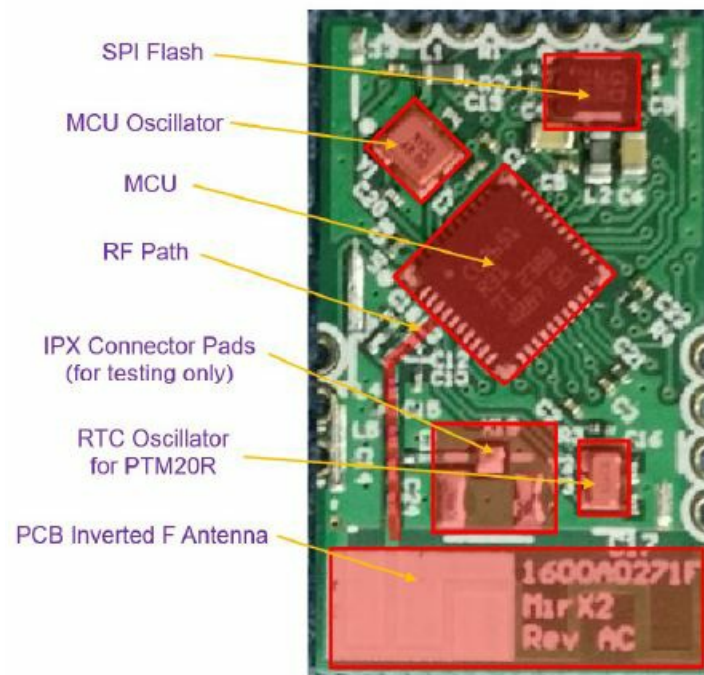
The following lists the key specifications of PTM20R

CATEGORY	FEATURE	SPECIFICATION
Wireless Specification	Bluetooth®	5.2 Low Energy
	Frequency Band	2400 MHz to 2483.5 MHz
	Frequency Range	2402 MHz to 2480 MHz
	Support Function	2.4 GHz ISM Band
	Frequency Modulation	GFSK
	Number of Channels	40
	Channel Separation	2 MHz
	Maximum conducted average output power	5 dBm \pm 1 dBm
	Antenna Type	Integrate PCB, inverted F design
	Antenna Gain	-1.24 dBi
	Antenna Efficiency	-4.5 dB (TBC; coupling + radiation)
	Receiver Sensitivity	-104 dBm (125 kbps)
		-100 dBm (500 kbps)
		-97 dBm (1Mbps)
		-92 dBm (2Mbps)
Communication	UART Interface	Tx, Rx; Baud Rate 115200
TI MCU	2.4 GHz Wireless MCU	CC2561R3; output power up to +5 dBm
External Memory	SPI Flash	16 Mbit, 2.7 V – 3.6 V
Electrical Interface	VCC	2.7 VDC to 3.6 VDC
	Current Consumption	< 15 mA (RF transmission dependent)
	GND	
	JTAG	TCKC; TMS
	JTAG Reset N	Active low
	Miraculix Wake Up	active high
Mechanical Dimension	PCB dimension	-25.4 mm x 15.0 mm (-0.0 / + 0.1 mm)
	PCB thickness	0.8 mm, 2 layers
	RF shield can	1.2 mm overall thick (material wall thickness 0.15 mm)
	Total module thickness	2.0mm (-0.0 / +0.2 mm)
Environment	Operating Temperature	-10 °C to +50 °C

PCBA Electrical Interface



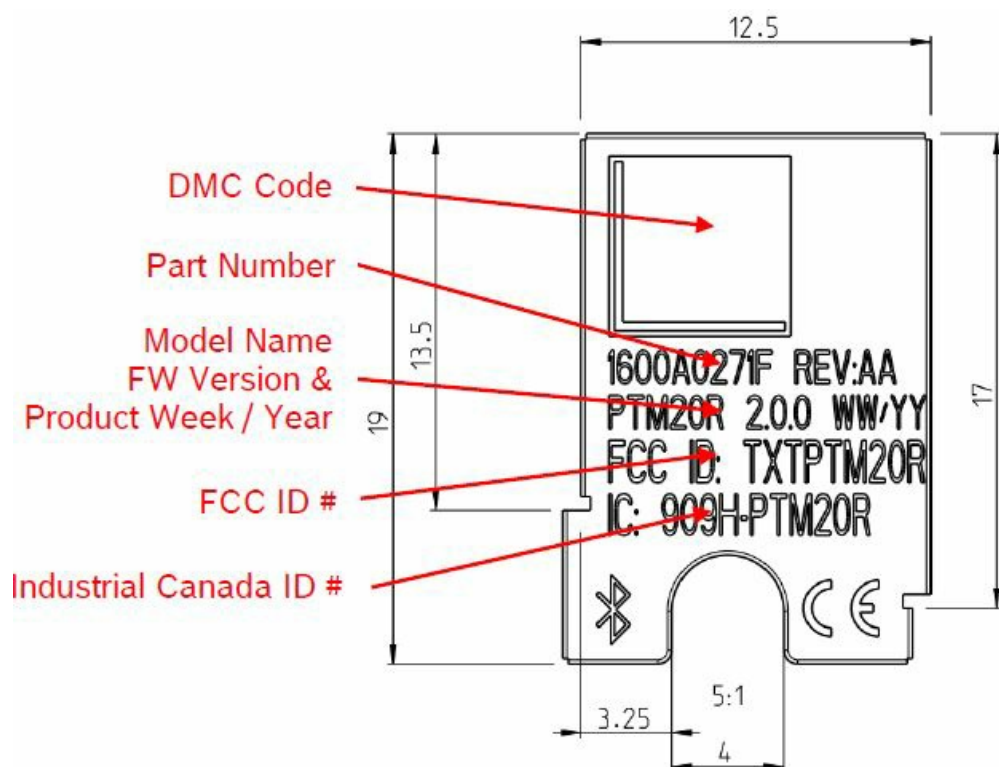
Top View Bottom View



Key components layout (Top View)

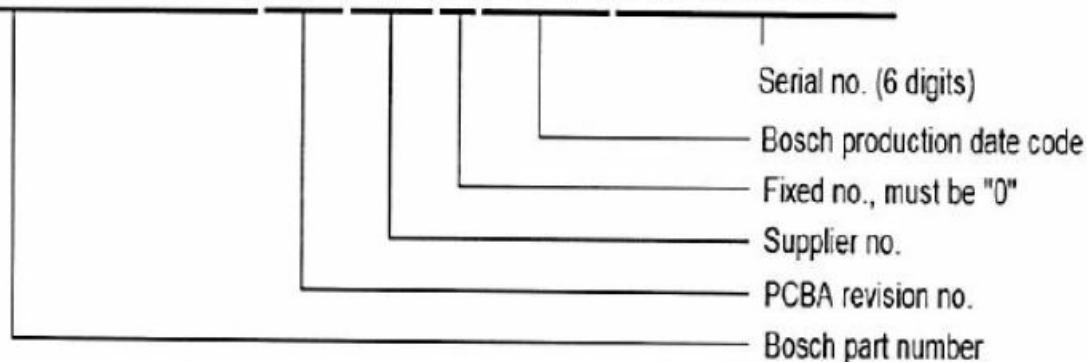
RF Shield Marking

The RF shield will receive a laser marking with the DMC code, the RB HW part number and revision of the MirX hardware, production week and year, as well as the received certification ID and approval numbers of FCC and IC. The BT- and CE-symbol will be at the corners.



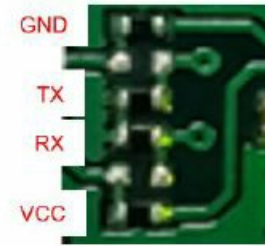
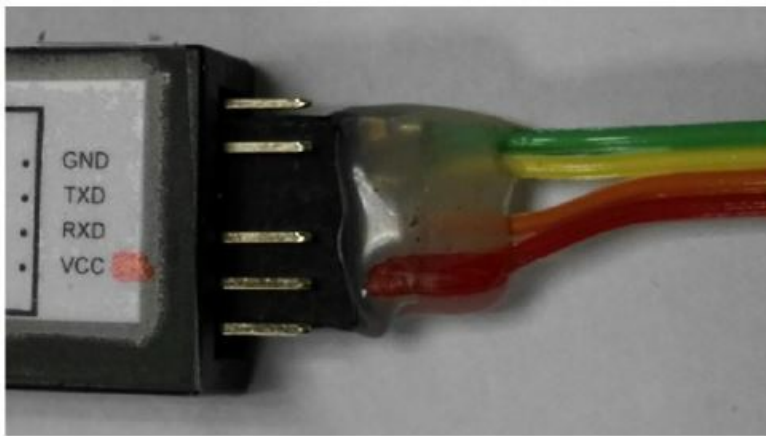
DMC code unit (24 digits) :

1	6	0	X	X	X	X	X	X	X	A	A	X	Y	0	Z	Z	Z	9	9	9	9	9
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---



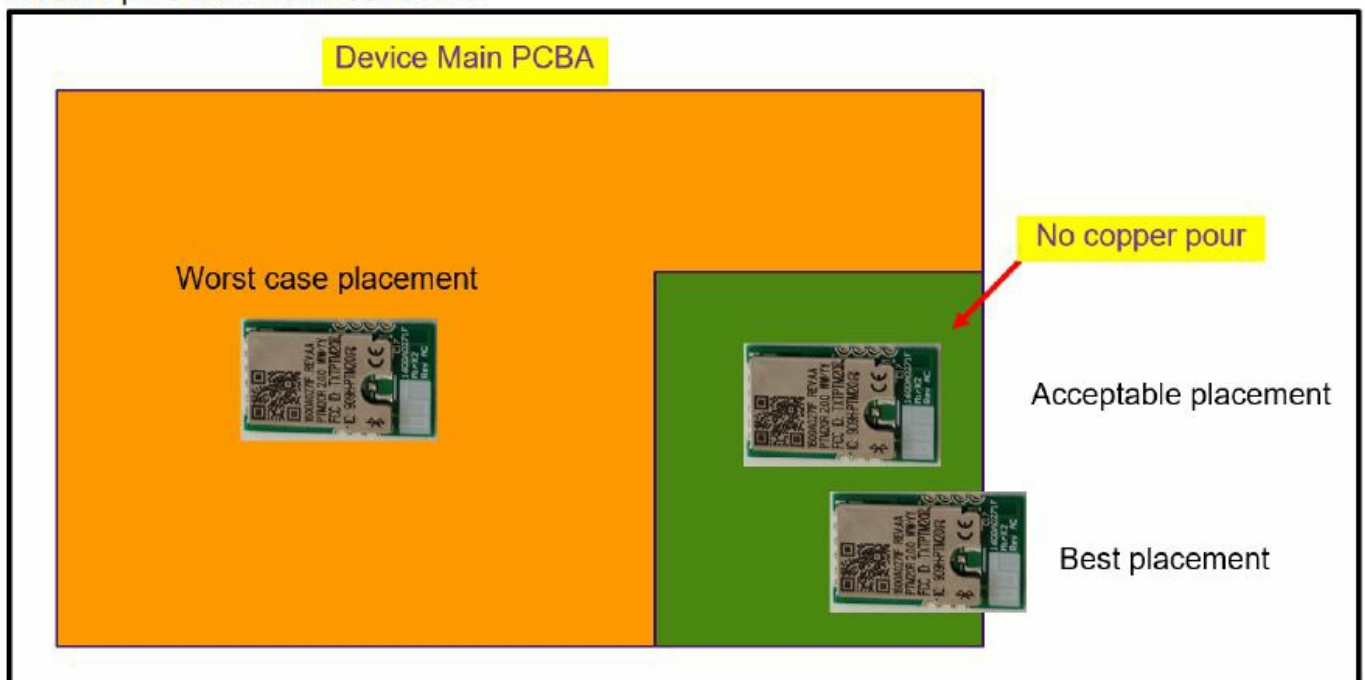
Module Placement Requirements on the Host PCBA (ELO)

1. This module was designed to be integrated into Bosch Power Tool products to support connectivity functions.
2. There is no Real Time Clock (RTC) on MirX2. Therefore, if ELO has RTC needs, the RTC function must be added by ELO.
3. When routing UART traces between ELO and MirX2, R=0 Ohm in-line resistors should be used and placed side-by-side as shown below of the GND / TX / RX / VCC signal. This is to aid test sample preparation as the MirX2 UART bus must be disconnected from the ELO and connected to the test PC during conductive and radiative RF tests.



4. For better TX/RX performance, a high pass filtering capacitor (1 – 2 pF) can be placed between the TX line and GND or RX line and GND on the ELO PCBA just outside the MirX2 soldering pads.
5. The module can be soldered on the host board (ELO) and a clearance must be provided for the antenna where no routing or ground is allowed in any layer. Here is an example of a module placed in a host board. Placing the module at the edge is recommended as it gives the best RF performance and does not require any clearance surrounding the antenna.

Module placement on host board:



Guidelines for Enclosure and Ground Plane

- The type label of the end product must carry a label stating “Contains FCC ID: TXTPTM20R” for products sold in the US.
- The type label of the end product must carry a label stating “Contains IC:909H-PTM20R” for products sold in Canada.
- FCC ID: TXTPTM20R must be on the same line on the type label must be at least 4pt (or 1.41 mm high) and must be legible.
- There should not be any ground directly below the antenna
- Ensure that there is no component, mounting screw, or ground plane near the tip of the antenna or the length of the antenna. No large components should be placed near the antenna.

- No battery cable, microphone cable, or any trace should cross the antenna trace on the PCB on the same side of the antenna.
- The antenna should not be covered by a metallic enclosure completely. If the product has a metallic casing or a shield, the casing should not cover the antenna. No metal is allowed in the antenna near the field.
- Ensure the paint on the plastic enclosure is nonmetallic near the antenna for best performance.
- The orientation of the antenna should be in line with the final product orientation so that the radiation is maximized in the desired direction. The polarization of the receive antenna and the position of the receive antenna should be taken into account to orient the module in a way that maximum radiation occurs.
- Keep away from the antenna, as far as possible, large metal objects to avoid electromagnetic field blocking
- Keep any components that may radiate noise or signals within the 2.4GHz – 2.5GHz frequency band far away from the antenna or better yet, shield the components that are generating the noise. Any noise radiated from the customer PCB in this frequency band will degrade the sensitivity of the module.

Software Detail and Operation

PTM20R System Layout

The MirX2 system is a combination of hardware and software components.

The system is built on the HW foundation of the TI CC2651R3 chip including an external SPI flash.

The SW components are the TI Bootloader, the Bluetooth lower energy stack and the Robert Bosch PT-MT MirX2 Application SW.

PTM20R UART Communication Interface

The module needs to be initialized with some basic information to make BLE advertising. The control of the modules is through the UART interface using Bosch PT-MT proprietary protocol, e.g. Miraculix Manager.

Regulatory and Certification Information

FCC STATEMENT

Federal Communications Commission (FCC) Statement

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

- List of applicable FCC rules
This device complies with FCC Part 15.247
- Limited module procedures

Not applicable

- Summarize the specific operational use conditions
- This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter. And the module should be installed at a minimum distance of 20 cm away from a person nearby. The host product manufacturer should state this information in the host instruction manual.

Trace antenna designs

- Not applicable.

RF exposure considerations

This modular complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. This modular must be installed and operated with a minimum distance of 20 cm between the radiator and the user body.

Antennas

- Antenna Type: PCB Antenna
- Antenna Gain: -1.24 dBi @ 2400-2480 MHz

Label and compliance information

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.

Caution: The user is cautioned that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Note

This equipment has been tested and found to comply with the limits for a Class B digital device, according 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 under 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 the receiver.
- Connect the equipment to 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.

If the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains Transmitter Module FCC ID: TXTPTM20R or Contains FCC ID: TXTPTM20R".

Information on test modes and additional testing requirements

Any final host product with the modular transmitter installed should be under test according to the guidance given in KDB 996369 D04. To enter test mode for a module, SmartRF Studio 7.exe production kit software and command is necessary. When something wrong happens in configuring test modes for the host product with a module, the host product manufacturer should coordinate with the module manufacturer for technical support. It is recommended that some investigative measurements should be taken to confirm that the host product with the module installed does not exceed the spurious emissions limits or band edge limits.

Additional testing, Part 15 Subpart B disclaimer

The modular transmitter is only FCC authorized for the specific rule parts (FCC Part 15.247) listed on the grant, and the host product manufacturer is responsible for compliance with any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. The final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed when contains digital circuitry.

Canada Statement

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
3. This equipment should be installed and operated with a minimum distance of 7.9 inches (20 cm) between the radiator & your body.


The end product must carry a label stating "Contains IC: 909H-PTM20R" or shall use e-labeling.

The device meets the exemption from the routine evaluation limits in section 2.5 of RSS 102 and compliance with RSS-102 RF exposure, users can obtain Canadian information on RF exposure and compliance.

CONTACT

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- Germany
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- 70771 Leinfelden-Echt-erdingen
- www.bosch-pt.com.

Documents / Resources

	<p>BOSCH PTM20R MirX2 Bluetooth Module [pdf] User Guide PTM20R MirX2 Bluetooth Module, PTM20R, MirX2 Bluetooth Module, Bluetooth Module, Modul e</p>
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References

- [User Manual](#)

[Manuals+](#). [Privacy Policy](#)

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