

BoT-CMA200

DATASHEET

V 1.0.0

History

Rev	Date	Description	Author
1.0.0	202X. XX. XX	- First release	Enoch

Table of Contents

1. General	5
1.1 Overview	5
1.2 Block Diagram	5
1.3 Features	6
1.4 Application	6
1.5 Pin Configuration	7
1.6 PIN Description	8
1.7 Dimensions	9
1.8 Land Pattern	10
2. Characteristics	11
2.1 Electrical Characteristics	11
2.2 RF Characteristics	13
2.2.1 Transmitter – Basic Data Rate	13
2.2.2 Receiver – Basic Data Rate	13
2.2.3 Transmitter – Enhanced Data Rate	14
2.2.4 Receiver – Enhanced Data Rate	14
3. Power Supply and clock	15
3.1 Power Scheme	15
3.2 Chip Power-up Reset	15
3.3 Crystal Oscillator	15
4. Boot Configurations	16
4.1 Chip Boot Mode Control	17
4.2 Internal LDO Voltage Control	17
4.3 U0TXD Printing Control	17
4.4 Timing Control of SDIO Salve	18
4.5 JTAG Signal Source control	18
5. Peripherals	19
5.1 UART	19
5.2 GPIO	19

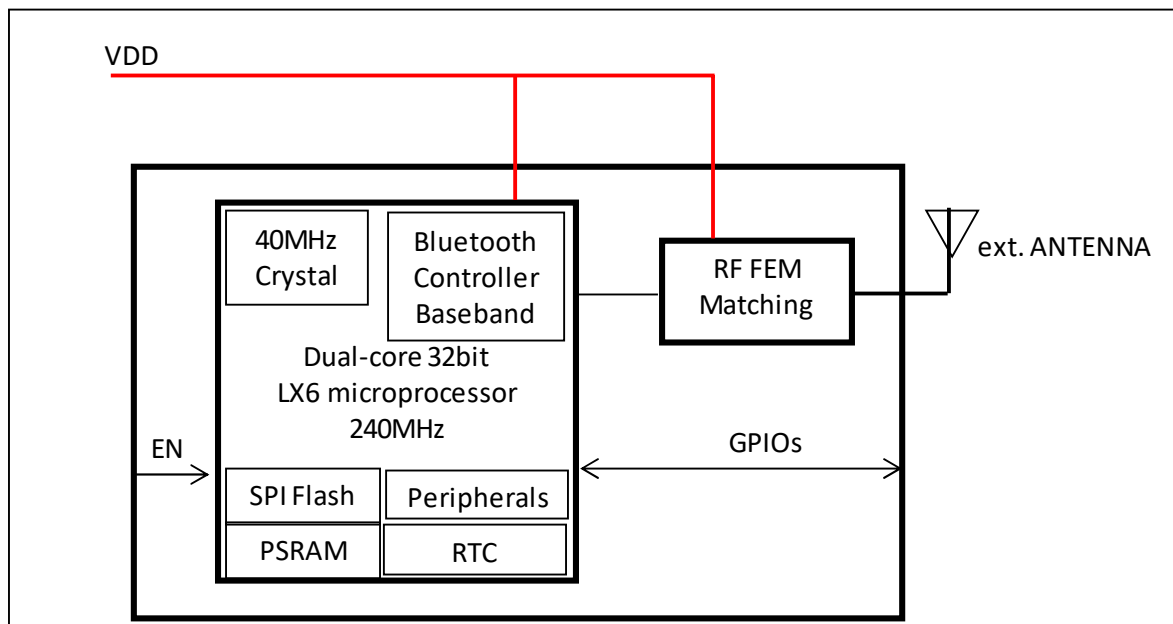
6. Product Handling.....	20
6.1 Reflow Temperature Profiles	20
6.2 Electrostatic Discharge (ESD).....	21
6.3 Ultrasonic Vibration	21
7. Application Schematic	22
8. Warranty Statement.....	23

1. General

1.1 Overview

BoT-CMA200 is general-purpose Bluetooth Classic MCU modules. The rich set of peripherals and a small size make the two modules an ideal choice for a wide variety of IoT applications, ranging from home automation, smart building, consumer electronics to industrial control, and they are suitable for intelligent speakers, speech recognition toys, intelligent gateway and Ethernet, etc. BoT-CMA200 feature an 8 MB in-package SPI flash and an additional 2 MB SPI Pseudo static RAM (PSRAM). The BoT-CMA200 module is designed to be scalable and adaptive. There are two CPU cores that can be individually controlled, and the CPU clock frequency is adjustable from 80MHz to 240MHz. You can power off the CPU and make use of the low-power coprocessor to constantly monitor the peripherals for changes or crossing of thresholds.

1.2 Block Diagram



BoT-CMA200 Block-Diagram

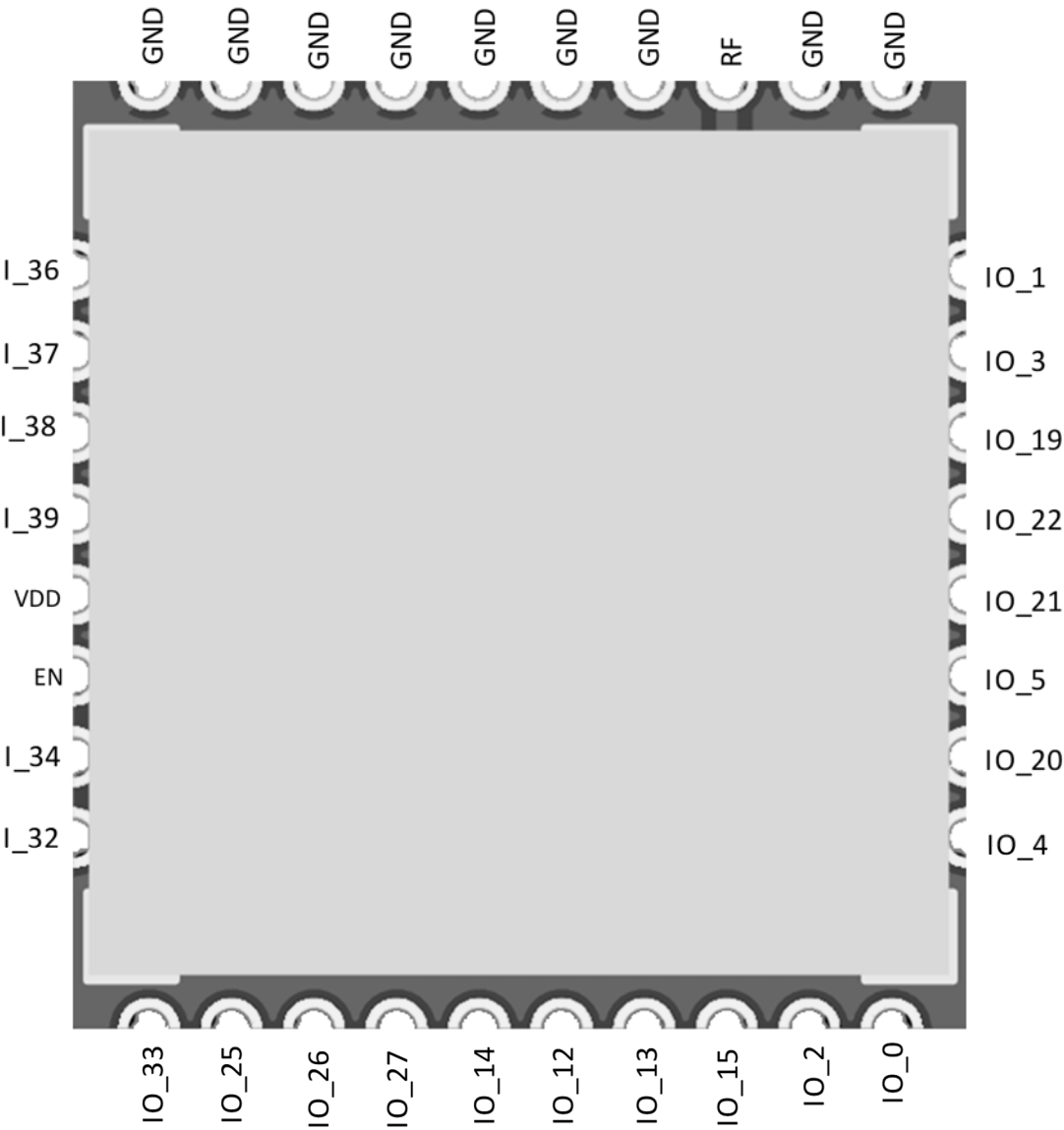
1.3 Features

- Bluetooth V4.2 BR/EDR, AFH support
- Built RF FEM and Band-pass Filter
- Xtensa dual-core 32-bit LX6 microprocessor, up to 240MHz
- 448 KB ROM for booting and core functions, 520 KB SRAM for data and instructions, 16 KB SRAM in RTC
- 8 MB SPI flash / 2 MB PSRAM
- RF Output Power: MAX +20 dBm (with E.I.R.P)
- RF Receive Sensitivity: -92.0 dBm @ 0.1% BER
- up to 24 GPIOs
- SD card, UART, SPI, SDIO, I2C, LED PWM, Motor PWM, I2S
- IR, pulse counter, GPIO, capacitive touch sensor, ADC, DAC
- TWAI® (compatible with ISO 11898-1, i.e. CAN Specification 2.0)
- Ethernet MAC
- Size: 13 mm x 14 mm x 2.4T
- Operating Voltage: 3.0V to 3.6V
- Operating Temperature: -40 to +85°C
- RoHS compliant

1.4 Application

- Smart Home
- Industrial Automation
- Health Care
- Consumer Electronics
- Smart Agriculture
- POS Machines
- Service Robot
- Generic Low-power IoT Sensor Hubs
- Generic Low-power IoT Data Loggers

1.5 Pin Configuration

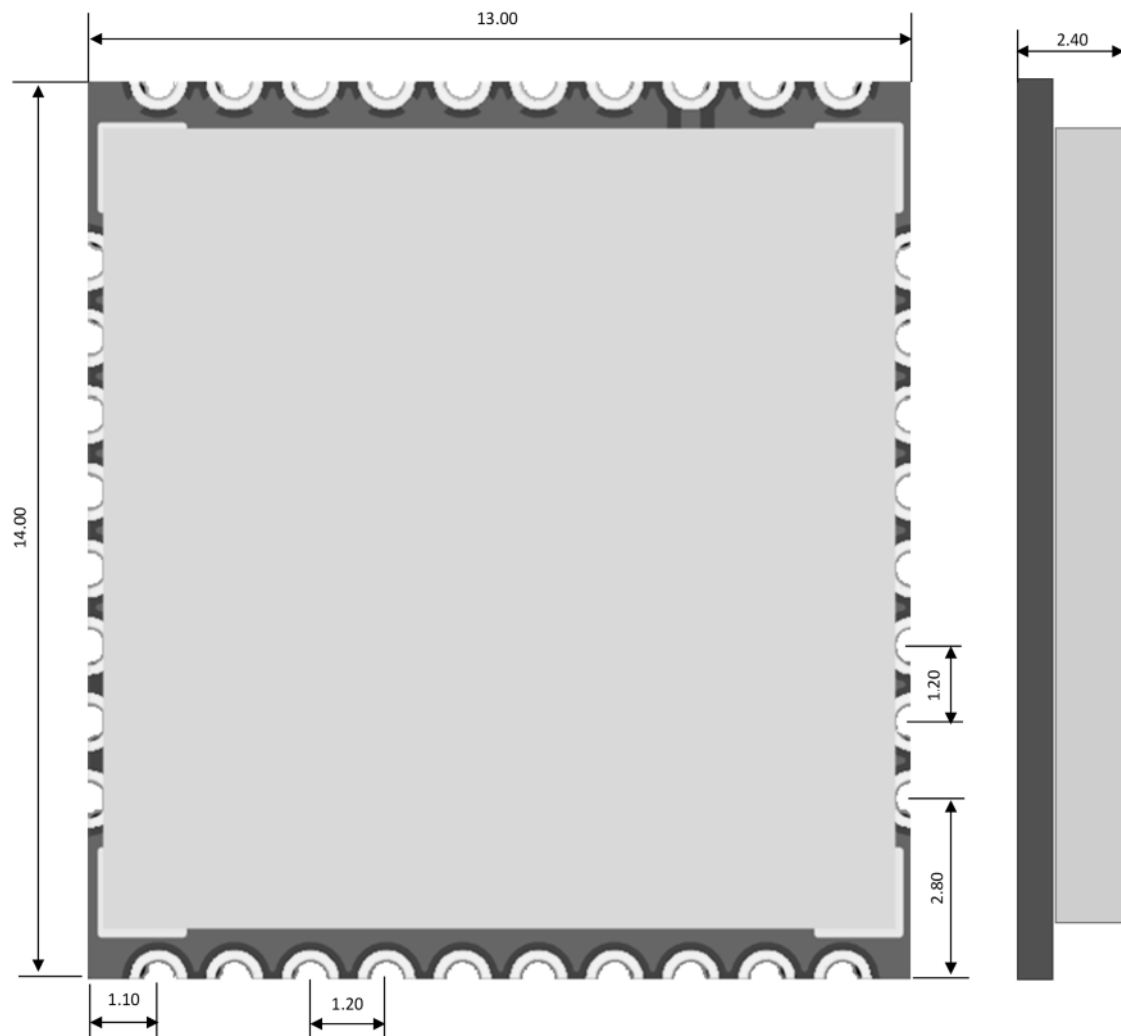


<TOP VIEW>

1.6 PIN Description

Pin No.	Pin Name	Pin Function	Description
1	I_36	DIGITAL INPUT	General purpose Input pin.
2	I_37	DIGITAL INPUT	General purpose Input pin.
3	I_38	DIGITAL INPUT	General purpose Input pin.
4	I_39	DIGITAL INPUT	General purpose Input pin.
5	VDD	POWER	Power supply pin.
6	EN	DIGITAL INPUT	High: On; enables the module Low: Off; the module shuts down Note: Do not leave EN pin floating
7	I_34	DIGITAL INPUT	General purpose Input pin.
8	I_33	DIGITAL INPUT	General purpose Input pin.
9	IO_33	DIGITAL I/O	General purpose Input / Output pin.
10	IO_25	DIGITAL I/O	General purpose Input / Output pin.
11	IO_26	DIGITAL I/O	General purpose Input / Output pin.
12	IO_27	DIGITAL I/O	General purpose Input / Output pin.
13	IO_14	DIGITAL I/O	General purpose Input / Output pin.
14	IO_12	DIGITAL I/O	General purpose Input / Output pin.
15	IO_13	DIGITAL I/O	General purpose Input / Output pin.
16	IO_15	DIGITAL I/O	General purpose Input / Output pin.
17	IO_2	DIGITAL I/O	General purpose Input / Output pin.
18	IO_0	DIGITAL I/O	General purpose Input / Output pin.
19	IO_4	DIGITAL I/O	General purpose Input / Output pin.
20	IO_20	DIGITAL I/O	General purpose Input / Output pin.
21	IO_5	DIGITAL I/O	General purpose Input / Output pin.
22	IO_21	DIGITAL I/O	General purpose Input / Output pin.
23	IO_22	DIGITAL I/O	General purpose Input / Output pin.
24	IO_19	DIGITAL I/O	General purpose Input / Output pin.
25	IO_3	DIGITAL I/O	General purpose Input / Output pin. U0RXD
26	IO_1	DIGITAL I/O	General purpose Input / Output pin. U0TXD
29	RF	RF IN / OUT PORT	RF 50Ω transmitter output / receiver input
27,28, 30-36,	GND	GROUND	Ground Pin.
37	T-PAD	GROUND	Ground Pin.

1.7 Dimensions

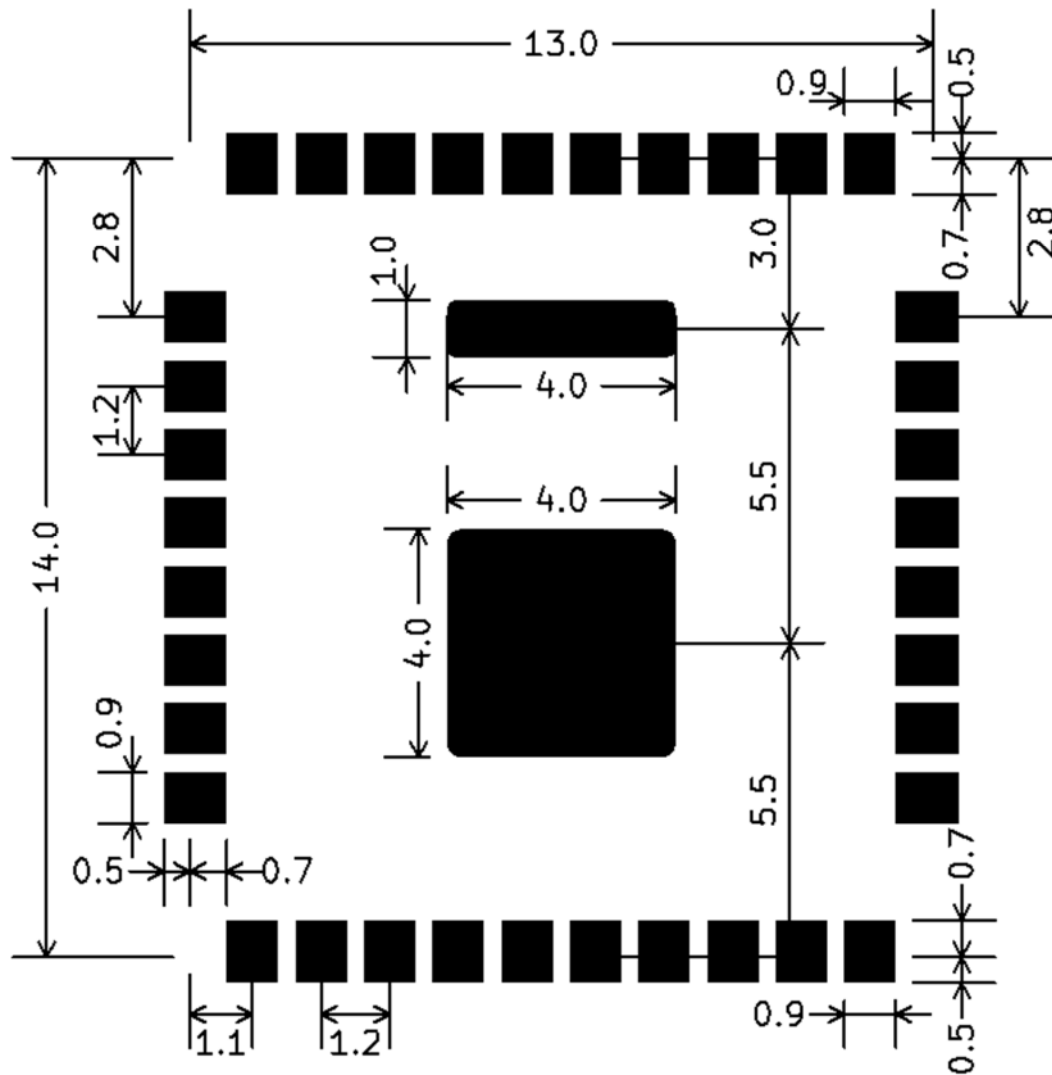


unit = mm

Weight = 0.8g

TOP VIEW

1.8 Land Pattern



Land Pattern (TOP VIEW)

2. Characteristics

2.1 Electrical Characteristics

Stresses above those listed in below Table 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 in Recommended Operating Conditions is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

▪ Absolute Maximum Ratings

Symbol	Parameter	Min.	Max.	Units
VDD		-0.3	+3.6	V
GND			0	V
Storage temperature		-40	+125	°C
Radio	RF Input Level		0	dBm
MSL	Moisture Sensitivity Level	3		
ESD HBM	Human Body Model ¹		2	kV
ESD CDM	Charged Device Model ²		500	V
Endurance	Flash Memory Endurance	100,000		Program/erase cycles
Retention	Flash Memory Retention	20 years		At 25 °C

1. JEDEC document JEP155 states that 500 V HBM allows safe manufacturing with a standard ESD control process.

2. JEDEC document JEP157 states that 250 V CDM allows safe manufacturing with a standard ESD control process

▪ Recommended Operating Conditions

Symbol	Parameter	Min.	Typ.	Max.	Units
VDD	Power supply voltage	3.0	3.3	3.6	V
TA	Operation temperature	-40	25	85	°C

▪ DC Characteristics

Symbol	Parameter (condition)	Min.	Typ.	Max.	Units
C _{IN}	Pin capacitance	-	2	-	pF
V _{IH}	High-level input voltage	0.75 X VDD		VDD + 0.3	V
V _{IL}	Low-level input voltage	-0.3		0.25 X VDD	V
I _{IH}	High-level input current	-	-	50	nA
I _{IL}	Low-level input current	-		50	nA
V _{OH}	High-level output voltage	0.8 x VDD		-	V
V _{OL}	Low-level output voltage	-	-	0.1 x VDD	V
I _{OH}	High-level source current (VDD = 3.3 V, V _{OH} ≥ 2.64 V, output drive strength set to the maximum)		40		mA
I _{OL}	Low-level sink current (VDD1 = 3.3 V, V _{OL} = 0.495 V, output drive strength set to the maximum)		28		mA
R _{PU}	Resistance of internal pull-up resistor		45		kΩ
R _{PD}	Resistance of internal pull-down resistor		45		kΩ
V _{IL_nRST}	Low-level input voltage of EN to shut-down the module			0.6	V

2.2 RF Characteristics

This section contains tables with RF characteristics of the BoT-CMA200 product.

The RF data is measured at the antenna port, where RF cable is connected, including the front-end loss. The external antennas used for the tests on the modules with external antenna connectors have an impedance of 50 Ω . Devices should operate in the center frequency range allocated by regional regulatory authorities. The target center frequency range and the target transmit power are configurable by software.

Unless otherwise stated, the RF tests are conducted with a 3.3 V ($\pm 5\%$) supply at 25 °C ambient temperature.

2.2.1 Transmitter – Basic Data Rate

Parameter	Conditions	Min.	Typ.	Max.	Units
RF transmit powre		-	16		dBm
Gain control step		-	3	-	dB
+20 dB bandwidth		-	0.9	-	MHz
$\Delta f_{1_{avg}}$		-	-	155	KHz
$\Delta f_{2_{max}}$		127	-	-	KHz
$\Delta f_{2_{avg}} / \Delta f_{1_{avg}}$			0.92		-
ICFT		-	-7	-	KHz
Drift rate		-	0.7	-	kHz/50us
Drift (DH1)			6		KHz
Drift (DH5)			6		KHz

2.2.2 Receiver – Basic Data Rate

Parameter	Conditions	Min.	Typ.	Max.	Units
Sensitivity @0.1% BER		-90	-89-	-88	dBm
Maximum received signal @0.1%		-		-10	dBm
Co-channel C/I		-	+7	-	dB
Out-of-band blocking performance	30 MHz ~ 2000 MHz	-10			dBm
	2000 MHz ~ 2400 MHz	-27			dBm
	2500 MHz ~ 3000 MHz	-27			dBm
	3000 MHz ~ 12.5 GHz	-10			dBm

2.2.3 Transmitter – Enhanced Data Rate

Parameter	Conditions	Min.	Typ.	Max.	Units
RF transmit powre		-	16	-	dBm
Gain control step		-	3	-	dB
$\pi/4$ DQPSK max $ w_i + w_0 $		-	-7.42	-	KHz
8DPSK max $ w_i + w_0 $		-	-10	-	KHz
$\pi/4$ DQPSK modulation accuracy	RMS DEVM		4.28		%
	99% DEVM		99.9		%
8 DPSK modulation accuracy	RMS DEVM		5.8		%
	99% DEVM		99.9		%
EDR differential phase coding			99.9		%

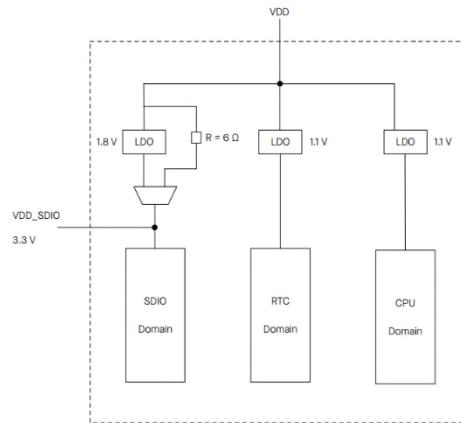
2.2.4 Receiver – Enhanced Data Rate

Parameter	Conditions	Min.	Typ.	Max.	Units
$\pi/4$ DQPSK					
Sensitivity @0.01% BER		-89	-88	-87	dBm
Maximum received signal @0.01%		-		-10	dBm
Co-channel C/I		-	+11	-	dB
8 DPSK					
Sensitivity @0.01% BER		-83	-82	-81	dBm
Maximum received signal @0.01%		-		-10	dBm
Co-channel C/I		-	+11	-	dB

3. Power Supply and clock

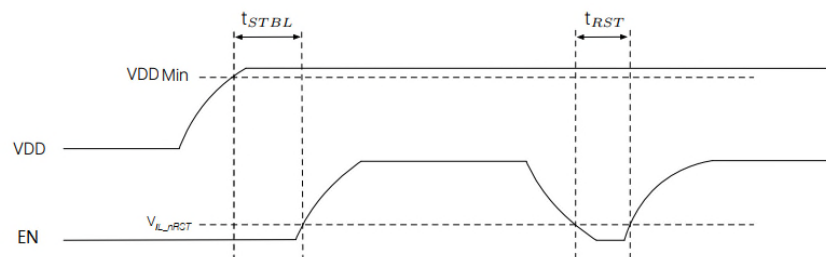
3.1 Power Scheme

The power scheme is shown in below Figure.



3.2 Chip Power-up Reset

Once the power is supplied to the module, its power rails need a short time to stabilize. After that, EN – the pin used for power-up and reset – is pulled high to activate the chip. For information on EN as well as power-up and reset timing, see below Figure and Table.



Parameter	Description	Min (us)
t_{STBL}	Time reserved for the 3.3 V rails to stabilize before the EN pin is pulled high to activate the module	50
t_{RST}	Time reserved for EN to stay below V_{IL_RST} to reset the module. (See the chapter 2.1 DC Characteristics)	50

3.3 Crystal Oscillator

The BoT-CMA200 have integrated 40MHz crystal oscillator. This integrates multiple clock sources for the CPU cores, the peripherals and the RTC. These clocks can be configured to meet different requirements.

4. Boot Configurations

BoT-CMA200 allows for configuring the following boot parameters through strapping pins and eFuse bits at power-up or a hardware reset, without microcontroller interaction.

- Chip boot mode
 - Strapping pin: GPIO0 and GPIO2
- Internal LDO (VDD_SDIO) Voltage
 - Strapping pin: GPIO12
 - eFuse bit: EFUSE_SDIO_FORCE and EFUSE_SDIO_TIEH
- U0TXD printing
 - Strapping pin: GPIO15
- Timing of SDIO Slave
 - Strapping pin: GPIO15 and GPIO5
- JTAG signal source
 - eFuse bit: EFUSE_DISABLE_JTAG

The default values of all the above eFuse bits are 0, which means that they are not burnt. Given that eFuse is one-time programmable, once an eFuse bit is programmed to 1, it can never be reverted to 0. For how to program eFuse bits, please contact to CHIPSEN.

The default values of the strapping pins, namely the logic levels, are determined by pins' internal weak pull-up/pull-down resistors at reset if the pins are not connected to any circuit, or connected to an external high-impedance circuit.

Strapping Pin	Default Configuration	Bit Value
GPIO0	Pull-up	1
GPIO2	Pull-down	0
GPIO12	Pull-down	0
GPIO15	Pull-up	1
GPIO5	Pull-up	1

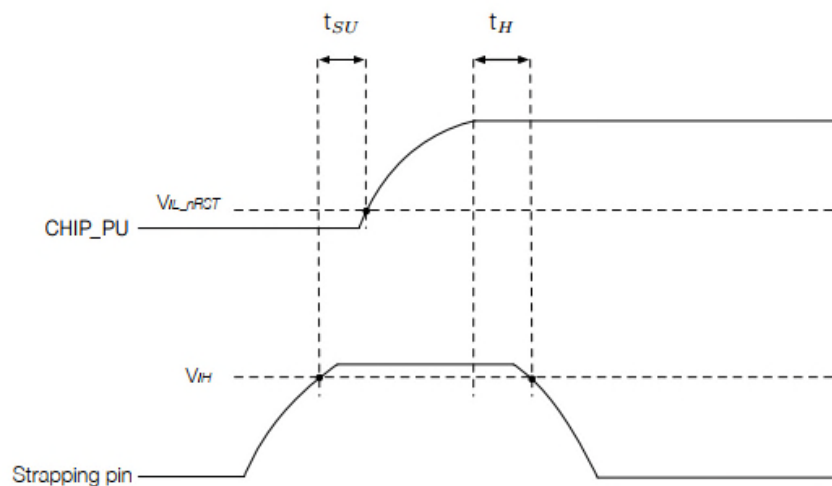
To change the bit values, the strapping pins should be connected to external pull-down/pull-up resistances. If the BoT-CMA200 is used as a device by a host MCU, the strapping pin voltage levels can also be controlled by the host MCU.

All strapping pins have latches. At system reset, the latches sample the bit values of their respective strapping pins and store them until the chip is powered down or shut down. The states of latches cannot be changed in any other way. It makes the strapping pin values available during the entire chip operation, and the pins are freed up to be used as regular IO pins after reset.

The timing of signals connected to the strapping pins should adhere to the setup time and hold

time specifications in below Table and Figure

Parameter	Description	Time (ms)
t_{SU}	Setup time is the time reserved for the power rails to stabilize before the CHIP_PU pin is pulled high to activate the chip	0
t_H	Hold time is the time reserved for the chip to read the strapping pin values after CHIP_PU is already high and before these pins start operating as regular IO pins	1



Visualization of Timing Parameters for the Strapping Pins

4.1 Chip Boot Mode Control

GPIO0 and GPIO2 control the boot mode after the reset is released. See Table 6 Chip Boot Mode Control.

Boot Mode	GPIO0	GPIO2
Normal Mode (default)	1	Any value
Download Boot Mode	0	0

4.2 Internal LDO Voltage Control

GPIO12 is used to select the internal VDD_SDIO power supply voltage at reset:

- GPIO12 = 0 (by default), internal VDD_SDIO is powered directly from internal VDD3P3_RTC. This voltage is 3.3V.

GPIO12 is it must be open or pull-down. If you wish to use logic high or any function, please contact to CHIPSEN.

4.3 U0TXD Printing Control

During booting, the strapping pin GPIO15 can be used to control the U0TXD Printing.

U0TXD Printing Control	GPIO15
Enable (default)	1
Disable	0

4.4 Timing Control of SDIO Salve

The strapping pin GPIO15 and GPIO5 can be used to control the timing of SDIO slave, if you use SDIO Slave, please contact to CHIPSEN.

4.5 JTAG Signal Source control

If you want to JTAG signals source control disable, please contact to CHIPSEN.

5. Peripherals

BoT-CMA200 module integrates a rich set of peripherals including SPI, I2S, UART, I2C, pulse count controller, TWAI®, ADC, DAC, touch sensor, etc.

To use and learn more about components, please contact to CHIPSEN.

5.1 UART

The UART in the BoT-CMA200 facilitates the transmission and reception of asynchronous serial data between the chip and external UART devices. It consists of two UARTs in the main system, and one low-power UART.

Feature List

- Programmable baud rate
- RAM shared by TX FIFOs and RX FIFOs
- Supports input baud rate self-check
- Support for various lengths of data bits and stop bits
- Parity bit support
- Asynchronous communication (RS232 and RS485) and IrDA support
- Supports DMA to communicate data in high speed
- Supports UART wake-up
- Supports both software and hardware flow control

5.2 GPIO

BoT-CMA200 has 24 GPIO pins which can be assigned various functions by programming the appropriate registers. There are several kinds of GPIOs: digital-only, analog-enabled, capacitive-touch-enabled, etc. Analog-enabled GPIOs and Capacitive-touch-enabled GPIOs can be configured as digital GPIOs.

Most of the digital GPIOs can be configured as internal pull-up or pull-down, or set to high impedance. When configured as an input, the input value can be read through the register. The input can also be set to edge-trigger or level-trigger to generate CPU interrupts. Most of the digital IO pins are bi-directional, non-inverting and tristate, including input and output buffers with tristate control. These pins can be multiplexed with other functions, such as the SDIO, UART, SPI, etc. For low-power operations, the GPIOs can be set to hold their states. (To use and learn more detail about components, please contact to CHIPSEN.)

6. Product Handling

6.1 Reflow Temperature Profiles

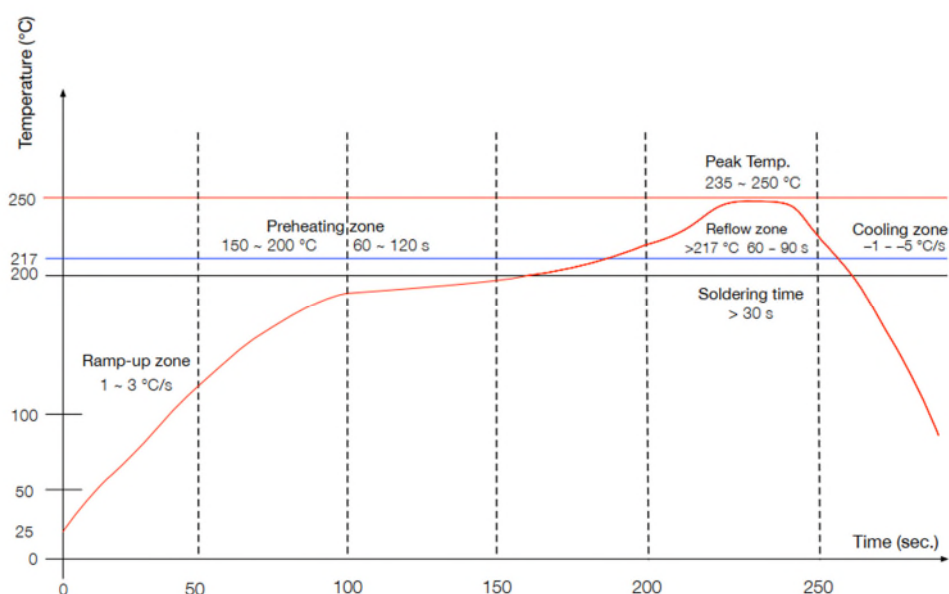
Recommended solder reflow profile are shown in below and follow the lead-free profile I accordance with JEDEC Std 20C.

Table lists the critical reflow temperatures.

Flux residue remaining from board assembly can contribute to electrochemical migration over time.

This depends on number of factors, including flux type, amount of flux residue remaining after reflow, and stress conditions during product use, such as temperature, humidity, and potential difference between pins.

Care should be taken in selecting production board/module assembly processes and materials, taking into account these factors.



Process Step	Description
Ramp-up zone	Temp.: 25 ~ 150 °C Time: 60 ~ 90 s Ramp-up rate: 1 ~ 3 °C/s
Preheating zone	Temp.: 150 ~ 200 °C Time: 60 ~ 120 s
Reflow zone	Temp.: >217 °C Time: 60 ~ 90 s;
Peak temperature	Peak Temp.: 235 ~ 250 °C Time: 30 ~ 70 s
Cooling zone	Peak Temp. ~ 180 °C Ramp-down rate: -1 ~ -5 °C/s
Solder	Sn-Ag-Cu (SAC305) lead-free solder alloy

WARNING : For BoT-CMA200

If you have reflow process multiple times in your product, you should be proceed this module in the final reflow process. If not the Shield-can will drop out.

6.2 Electrostatic Discharge (ESD)

- Human body model (HBM): ± 2000 V
- Charged-device model (CDM): ± 500 V

6.3 Ultrasonic Vibration

Avoid exposing BoT-CMA200 modules to vibration from ultrasonic equipment, such as ultrasonic welders or ultrasonic cleaners. This vibration may induce resonance in the in-module crystal and lead to its malfunction or even failure. As a consequence, the module may stop working or its performance may deteriorate.

8. Certifications

This section details the regulatory certification status of BoT-CMA200 modules in various regions.

8.1 Qualified Antennas

BoT-CMA200 modules have been tested and certified both with the built-in antenna and with an external antenna attached to the RF pin. Please contact to manufacture for details for the qualified antenna.

Any antenna of the same general type and of equal or less directional gain as listed in BoT-CMA200 Tested Report can be used in the regulatory areas that have a full modular radio approval (USA, Canada, Korea, Japan) as long as spot-check testing is performed to verify that no performance changes compromising compliance have been introduced. In countries applying the ETSI standards, like the EU countries, the radiated emissions are always tested with the end-product and the antenna type is not critical, but antennas with higher gain may violate some of the regulatory limits.

If an antenna of a different type (such as a chip antenna, a PCB trace antenna or a patch) with a gain less than or equal to 3.5dBi is needed, it can be added as a permissive change, requiring some radiated emission testing. Antenna types with more gain than 3.5dBi may require a fully new certification. Since the exact permissive change procedure is chosen on a case by case basis, please consult your test house and/or certification body for understanding the correct approach. You might also want or need to get in touch with manufacture for any authorization letter that your certification body might ask for.

8.2 CE

The BoT-CMA200 modules have been tested against the relevant harmonized/designated standards and are in conformity with the essential requirements and other relevant requirements of the Radio Equipment Directive (RED) (2014/53/EU) and of the Radio Equipment Regulations (RER) (S.I. 2017/1206).

Please notice that every end-product integrating a BoT-CMA200 module will need to perform the radio EMC tests on the whole assembly, according to the ETSI 301 489-x relevant standards.

Furthermore, it is ultimately the responsibility of the manufacturer to ensure the compliance of the end-product as a whole. The specific product assembly is likely to have an impact to RF radiated characteristics, when compared to the bare module. Hence, manufacturers should carefully consider RF radiated testing with the final product assembly, especially taking into account the gain of the external antenna if any, and the possible deviations in the PSD, EIRP and spurious emissions measurements, as defined in the ETSI 300 328 standard.

The modules are entitled to carry the CE and UKCA Marks, and a formal Declaration of Conformity (DoC) is available at the product manufacture web page.



8.3 FCC

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

CAUTION: 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, 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.

FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled

environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

OEM INTEGRATION INSTRUCTIONS:

This device is intended only for OEM integrators under the following conditions:

The module must be installed in the host equipment such that 20 cm is maintained between the antenna and users, and the transmitter module may not be co-located with any other transmitter or antenna. The module shall be only used with the internal on-board antenna that has been originally tested and certified with this module. External antennas are not supported. As long as these 3 conditions above are met, further transmitter test will not be required.

However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.). The end-product may need Verification testing, Declaration of Conformity testing, a Permissive Class II Change or new Certification. Please involve a FCC certification specialist in order to determine what will be exactly applicable for the end-product.

Validity of using the module certification:

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization for this module in combination with the host equipment is no longer considered valid and the FCC ID of the module cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization. In such cases, please involve a FCC certification specialist in order to determine if a Permissive Class II Change or new Certification is required.

Upgrade Firmware:

The software provided for firmware upgrade will not be capable to affect any RF parameters as certified for the FCC for this module, in order to prevent compliance issues.

End product labeling:

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: "Contains FCC ID: 2APB6-BOT-CMA200".

Information that must be placed in the end user manual:

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual.

8.4 Requirement per KDB996369 D03

8.4.1 List of applicable FCC rules

List the FCC rules that are applicable to the modular transmitter. These are the rules that specifically establish the bands of operation, the power, spurious emissions, and operating fundamental frequencies. DO NOT list compliance to unintentional-radiator rules (Part 15 Subpart B) since that is not a condition of a module grant that is extended to a host manufacturer. See also Section 2.10 below concerning the need to notify host manufacturers that further testing is required.³

Explanation: This module meets the requirements of FCC part 15C (15.247)

8.4.2 Summarize the specific operational use conditions

Describe use conditions that are applicable to the modular transmitter, including for example any limits on antennas, etc. For example, if point-to-point antennas are used that require reduction in power or compensation for cable loss, then this information must be in the instructions. If the use condition limitations extend to professional users, then instructions must state that this information also extends to the host manufacturer's instruction manual. In addition, certain information may also be needed, such as peak gain per frequency band and minimum gain, specifically for master devices in 5 GHz DFS bands.

Explanation: The EUT has RF PAD, and the module can be used for IoT applications with a maximum 1.5 dBi SMA type antenna.

8.4.3 Limited module procedures

If a modular transmitter is approved as a "limited module," then the module manufacturer is responsible for approving the host environment that the limited module is used with. The manufacturer of a limited module must describe, both in the filing and in the installation instructions, the alternative means that the limited module manufacturer uses to verify that the host meets the necessary requirements to satisfy the module limiting conditions.

A limited module manufacturer has the flexibility to define its alternative method to address the

conditions that limit the initial approval, such as: shielding, minimum signaling amplitude, buffered modulation/data inputs, or power supply regulation. The alternative method could include that the limited module manufacturer reviews detailed test data or host designs prior to giving the host manufacturer approval.

This limited module procedure is also applicable for RF exposure evaluation when it is necessary to demonstrate compliance in a specific host. The module manufacturer must state how control of the product into which the modular transmitter will be installed will be maintained such that full compliance of the product is always ensured. For additional hosts other than the specific host originally granted with a limited module, a Class II permissive change is required on the module grant to register the additional host as a specific host also approved with the module.

Explanation: The module is not a limited module.

8.4.4 Trace antenna design

For a modular transmitter with trace antenna designs, see the guidance in Question 11 of KDB Publication 996369 D02 FAQ – Modules for Micro-Strip Antennas and traces. The integration information shall include for the TCB review the integration instructions for the following aspects:

layout of trace design, parts list (BOM), antenna, connectors, and isolation requirements.

- a) Information that includes permitted variances (e.g., trace boundary limits, thickness, length, width, shape(s), dielectric constant, and impedance as applicable for each type of antenna);
- b) Each design shall be considered a different type (e.g., antenna length in multiple(s) of frequency, the wavelength, and antenna shape (traces in phase) can affect antenna gain and must be considered);
- c) The parameters shall be provided in a manner permitting host manufacturers to design the printed circuit (PC) board layout;
- d) Appropriate parts by manufacturer and specifications;
- e) Test procedures for design verification; and
- f) Production test procedures for ensuring compliance.

The module grantee shall provide a notice that any deviation(s) from the defined parameters of the antenna trace, as described by the instructions, require that the host product manufacturer must notify the module grantee that they wish to change the antenna trace design. In this case, a Class II permissive change application is required to be filed by the grantee, or the host manufacturer can take responsibility through the change in FCC ID (new application) procedure followed by a Class II permissive change application.

Explanation: This product is an RF PAD module designed to allow the host device manufacturer to implement an external trace antenna.

In accordance with FCC KDB 996369 D02, the trace antenna must follow the defined design

parameters, including trace length, width, thickness, shape, dielectric constant, and impedance. The host manufacturer shall design the PCB layout strictly following the provided Integration Guide.

Any deviation from the specified antenna trace parameters is considered a different antenna type under FCC rules.

If the host manufacturer modifies the trace antenna design, a Class II Permissive Change or a new FCC ID application followed by a Class II Permissive Change is required.

Therefore, when designing an external trace antenna, the host manufacturer must be aware that FCC re-testing and re-certification may be required to ensure compliance...

8.4.5 RF exposure considerations

It is essential for module grantees to clearly and explicitly state the RF exposure conditions that permit a host product manufacturer to use the module. Two types of instructions are required for RF exposure information: (1) to the host product manufacturer, to define the application conditions (mobile, portable – xx cm from a person's body); and (2) additional text needed for the host product manufacturer to provide to end users in their end-product manuals. If RF exposure statements and use conditions are not provided, then the host product manufacturer is required to take responsibility of the module through a change in FCC ID (new application).

Explanation: This module complies with FCC RF radiation exposure limits set forth for an uncontrolled environment, This equipment should be installed and operated with a minimum distance of 20 centimeters between the radiator and your body." This module is designed to comply with the FCC statement, FCC ID is: 2ABP6-BOT-CMA200.

8.4.6 Antenna

A list of antennas included in the application for certification must be provided in the instructions. For modular transmitters approved as limited modules, all applicable professional installer instructions must be included as part of the information to the host product manufacturer. The antenna list shall also identify the antenna types (monopole, PIFA, dipole, etc. (note that for example an "omni-directional antenna" is not considered to be a specific "antenna type")).

For situations where the host product manufacturer is responsible for an external connector, for example with an RF pin and antenna trace design, the integration instructions shall inform the installer that unique antenna connector must be used on the Part 15 authorized transmitters used in the host product. The module manufacturers shall provide a list of acceptable unique connectors.

Explanation: EUT has RF PAD and antenna specification is follow;

Type = SMA Antenna, Gain = 1.5 dBi.

This device is intended only for host manufacturers under the following conditions:

- The transmitter module may not be co-located with any other transmitter or antenna.
- The module shall be only used with the external antenna that has been originally tested and certified with this module.

As long as the conditions above are met, further transmitter test will not be required. However, the host manufacturer is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.).

8.4.7 Label and compliance information

Grantees are responsible for the continued compliance of their modules to the FCC rules. This includes advising host product manufacturers that they need to provide a physical or e-label stating "Contains FCC ID" with their finished product. See Guidelines for Labeling and User Information for RF Devices – KDB Publication 784748.

Explanation: The host system using this module, should have label in a visible area indicated the following texts: "Contains FCC ID: 2APB6-BOT-CMA200"

8.4.8 Information on test modes and additional testing requirements

Additional guidance for testing host products is given in KDB Publication 996369 D04 Module Integration Guide. Test modes should take into consideration different operational conditions for a stand-alone modular transmitter in a host, as well as for multiple simultaneously transmitting modules or other transmitters in a host product.

The grantee should provide information on how to configure test modes for host product evaluation for different operational conditions for a stand-alone modular transmitter in a host, versus with multiple, simultaneously transmitting modules or other transmitters in a host.

Grantees can increase the utility of their modular transmitters by providing special means, modes, or instructions that simulates or characterizes a connection by enabling a transmitter. This can greatly simplify a host manufacturer's determination that a module as installed in a host complies with FCC requirements.

Explanation: Top band can increase the utility of our modular transmitters by providing instructions that simulates or characterizes a connection by enabling a transmitter.

8.4.9 Additional testing, Part 15 subpart B disclaimer

The grantee should include a statement that the modular transmitter is only FCC authorized for the specific rule parts (i.e., FCC transmitter rules) listed on the grant, and that the host product

manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. If the grantee markets their product as being Part 15 Subpart B compliant (when it also contains unintentional-radiator digital circuitry), then the grantee shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

Explanation: The module without unintentional-radiator digital circuitry, so the module does not require an evaluation by FCC Part 15 Subpart B. Host manufacturer must perform test of radiated & conducted emission and spurious emission, etc., according to the actual test modes for a stand-alone modular transmitter in a host, as well as for multiple simultaneously transmitting modules or other transmitters in a host product. The host should be evaluated by the FCC Subpart B.

8.5 JAPAN-MIC

The BoT-CMA200 is certified in Japan.

Since September 1, 2014 it is allowed (and highly recommended) that a manufacturer who integrates a radio module in their host equipment places the certification mark and certification number on the outside of the host equipment. This combination of mark and number, and their relative placement, is depicted in Figure, and depending on the size of the module it might also appear on the top shield markings of the radio module. The certification mark and certification number must be placed close to the text in the Japanese language which is provided below. This change in the Radio Law has been made in order to enable users of the combination of host and radio module to verify if they are actually using a radio device which is approved for use in Japan.

Certification Text to be Placed on the Outside Surface of the Host Equipment:

当該機器には電波法に基づく、技術基準適合証明等を受けた特定無線設備を装着している。

Translation of the text:

"This equipment contains specified radio equipment that has been certified to the Technical Regulation Conformity Certification under the Radio Law."

The "Giteki" marking shown in the following figures must be affixed to an easily noticeable section



of the specified radio-enabled host equipment. Note that such section may be required to contain additional information if the end-device embedding the module is also subject to a telecom approval.

The manufacturer of the final product is also responsible to provide a Japanese language version of the User Manual and/or Installation Instructions as a companion document coming with the final product when placed on the market in Japan.

8.6 KC

The BoT-CMA200 have a RF certification for import and use in South Korea. Their certification number is R-C-csi-BoT-CMA200.

When integrating the RF-certified module, an end-product is exempted from doing the RF emission testing as long as the recommended design guidance is followed, and the approved antennas are used.

EMC testing, and any other relevant tests, might still be required for full compliance.



9. Warranty Statement

Warranty Policy

CHIPSEN warrants this product to be free from defects in material or workmanship under normal use. If a defect occurs during the warranty period, CHIPSEN will repair or replace the product free of charge at its sole discretion.

Warranty Period

1 year from the date of purchase.

(15 months from the date of manufacture if the purchase date is not confirmed)

Limitation of Liability

This device may receive or cause radio interference during use, possibly leading to delays or loss of data. Users should perform sufficient testing before use. Due to the nature of wireless operation, CHIPSEN makes no warranty and assumes no liability for accuracy, reliability, or completeness. CHIPSEN's liability shall not exceed the amount paid for this product.

This product is not a customized device and is intended to operate only in the form and manner specified by CHIPSEN. Refer to the user manual for functions. The use and application are solely the responsibility of the user. CHIPSEN does not provide any warranty or accept any responsibility beyond the above.

The technical information in this document only describes representative characteristics and example circuits. It does not grant any industrial or intellectual property rights or licenses.

This product and related documentation are subject to change without prior notice for performance improvements.

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