

BT Classic and Low Energy Module **05010BTH**

Product Specification

| Document code | Date |
|--------------------|------------|
| FI020K0001v1040hUK | 14/04/2023 |

SYMBOLS



This symbol appears in the manual at points where warnings or particularly important instructions, essential for safe, correct operation of the device, are given.



This symbol appears in the manual at points where suggestions, additional information or other relevant notes are given.

REVISION TABLE

| Rev. | Date | Author | Reference | Description |
|------|------------|----------|---------------|--|
| 1000 | 28/04/2022 | DTP – SP | - | First emission |
| 1010 | 06/07/2022 | DTP – SF | - | Small corrections |
| 1020 | 20/12/2022 | DTP – SF | 4.1, 4.2, 4.3 | European Conformity to RED, FCC and ISSED regulation |
| 1030 | 24/01/2023 | DTP – SF | 3.9 | Cautions |
| | | | 4.2.1 | FCC Integration Instructions |
| 1040 | 14/04/2023 | DTP – SF | 2.3 | Case Marking |
| | | | 4.1 | Standards Updated |

PURPOSE AND AUDIENCE

This Product Specification provides details on the functional, operational and electrical characteristics of the CEIA 05010BTH module, model 117569.

The product is referred to as “the 05010BTH” or “the module” within this document.

Read this manual carefully before using the module. Any use different from the one described in this manual is forbidden.



CEIA reserves the right to make changes to the content and module described in this manual, at any time and without prior notice. Indications of sizes and designs of module, therefore, have no binding character, but are given for information purposes only.

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1 OVERVIEW

CEIA 05010BTH (model 117569) is a dual-mode BT Basic Rate (BR), Enhanced Data Rate (EDR) and Low Energy (LE) module solution.

The BT Classic radio (BR/EDR) is a low power radio that streams data over 79 channels in the 2.4GHz frequency band. BT Classic is mainly used to enable wireless audio streaming and has become the standard radio protocol behind wireless speakers and headphones. The BT Classic radio also enables data transfer applications.

The BT Low Energy radio (LE) is designed for very low power operation. Transmitting data over 40 channels in the 2.4GHz frequency band, the BT LE radio provides developers a tremendous amount of flexibility to build products that meet the unique connectivity requirements of their market.

This device is a Host Controlled Interface (HCI) BT Radio Frequency (RF) module that contains also a single channel PCM CODEC.

The 05010BTH is BT 5.1 compliant and it offers best-in-class RF performance.

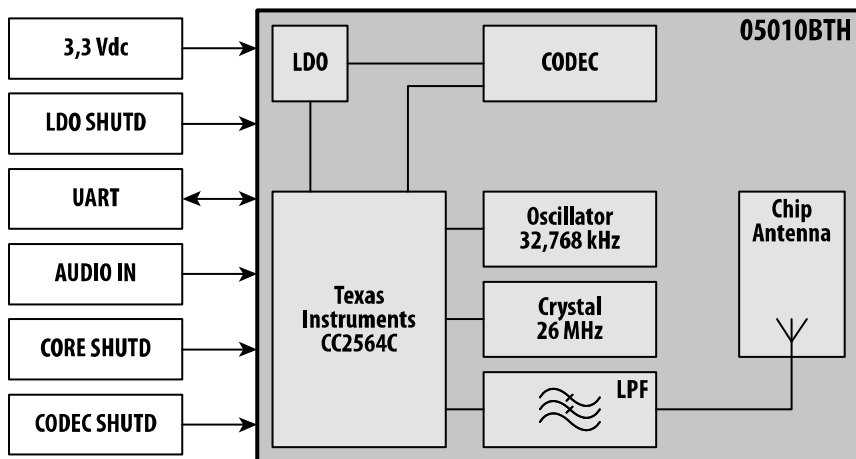
The CEIA module provides a complete wireless solution with integrated antenna and audio functionalities in a compact surface mount package.

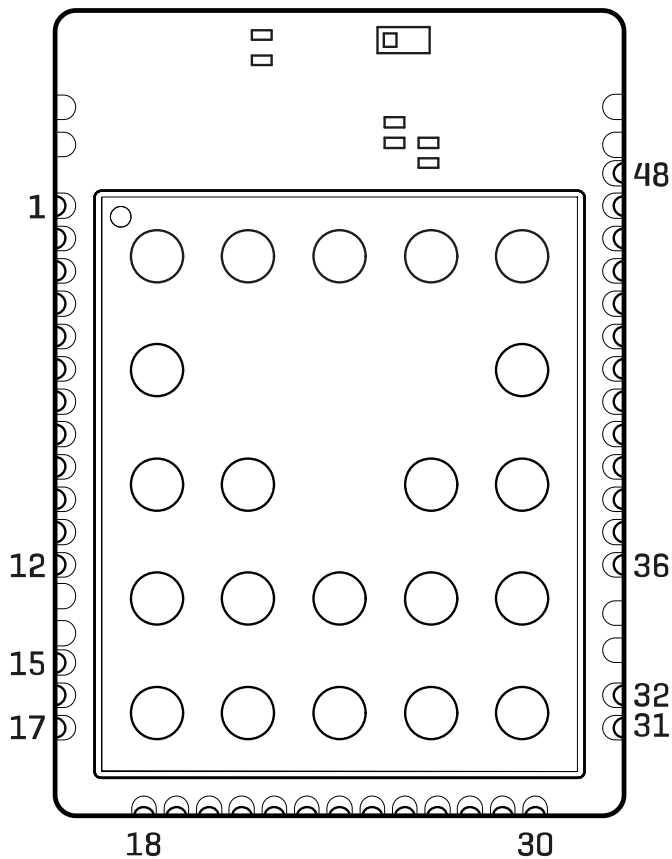
CEIA 05010BTH module does not contain any software ex works, i.e. software is provided by 3rd party suppliers only. The essential software resources can be found on the website of Texas Instruments <https://www.ti.com>.

1.1 Features

- Qualified for BT 5.1 specification
- IC Antenna onboard
 - *TDK Chip antenna ANT016008LCS2442MA1 (Frequency band 2.4 GHz, Gain +1.6 dBi)*
- Class 1 TX Out Power
- Shutdown to minimize Power Consumption
- Integrated LDO Regulator
- RoHS Compliant
- Profiles Supported: SPP-A2DP-AVRCP-HFP-HID-GATT-
Several BLE profiles and services
- Based upon Texas Instruments CC2564C (refer to Texas Instruments document SWRS199B)
- Dimensions: 17.42 mm x 24.69 mm x 4.0 mm

1.2 Block diagram



OVERVIEW**1.3 Pin Configuration****1.3.1 Pin Assignment***Top view*

1.3.2 Pin functions

| No. | Pin Name | Pull at Reset | Def. Dir. ¹ | I/O Type ² | Description |
|-------|-------------|---------------|------------------------|-----------------------|-------------------------------------|
| 1 | 3,3 Vdc | | I | | Main LDO input |
| 2 | GND | | | | Connect to Ground |
| 3 | | | | | |
| 4 | | | | | |
| 5-8 | | | | | Not connected |
| 9 | CODEC_SHUTD | PD | I | | CODEC Shutdown input (active low) |
| 10 | LDO_SHUTD | PU | I | | LDO Shutdown input (active low) |
| 11-14 | | | | | Not connected |
| 15 | HCI_RX | PU | I | 8 mA | HCI UART data receive |
| 16 | HCI_TX | PU | O | 8 mA | HCI UART data transmit |
| 17 | | | | | Not connected |
| 18 | GND | | | | Connect to Ground |
| 19 | CORE_SHUTD | PD | I | | CC2564C Shutdown input (active low) |
| 20 | HCI_RTS | PU | O | 8 mA | HCI UART request-to-send |
| 21 | HCI_CTS | PU | I | 8 mA | HCI UART clear-to-send |
| 22-30 | | | | | Not connected |
| 31 | GND | | | | Connect to Ground |
| 32-38 | | | | | Not connected |
| 39 | GND | | | | Connect to Ground |
| 40-42 | | | | | Not connected |
| 43 | GND | | | | Connect to Ground |
| 44 | AUDIO_IN | | I | | Analogic audio input |
| 45-47 | | | | | Not connected |
| 48 | GND | | | | Connect to Ground |

¹ I=Input; O=Output; I/O=bidirectional; P=power; PU=pulled up; PD=pulled down

² I/O Type: Digital I/O cells, HY=input hysteresis, current=typ. output current

1.4 BT features

- BT 5.1 compliant
- Up to seven active devices
- Scatternet: up to three piconets simultaneously, one as master and two as slaves
- Up to two Synchronous Connection Oriented (SCO) links on the same piconet
- Support for all voice Air-Coding – Continuosuly Variable Slope Delta (CVSD), A-law, μ -law, modified Subband Coding (mSBC), and transparent (uncoded)
- Provide an assisted mode for Handset Profile (HFP) 1.6 Wideband Speech (WBS) profile or Advanced Audio Distribution Profile (A2DP) profile to reduce host processing and power
- Support of multiple BT profiles with enhanced QoS
- Multiple sniff instances tightly coupled to achieve minimum power consumption
- Independent buffering for LE allows large numbers of multiple connections without affecting BR or EDR performance
- Built-in coexistence and prioritization handling for BR, EDR and LE
- Capabilities of link layer topology scatternet – can act concurrently as peripheral and central
- Network support for up to 10 devices
- Time line optimization algorithms to achieve maximum channel utilization

1.5 Interfaces

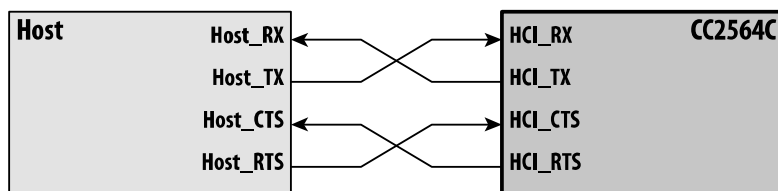
1.5.1 Host Controller Interface (HCI)

The CC2564C2 incorporates one UART module dedicated to the HCI transport layer. The HCI interface transports commands, events, ACL and synchronous data between the BT device and its host using HCI data packets. The device supports H4 (4-wires) protocol with hardware flow control. The maximum baud rate of the module is 4 Mbps.

After power up the baud rate is set for 115.2 kbps, irrespective of fast clock frequency. The baud rate can thereafter be changed with a vendor specific command. The device responds with a Command Complete Event (still at 115.2 kbps), after which the baud rate change occurs. The UART device includes the following features:

- Receiver detection of break, idle, framing, FIFO overflow and parity error conditions
- Transmitter underflow detection
- CTS/RTS hardware flow control (H4 protocol)

The UART interface includes four signals: TXD, RXD, CTS and RTS. Flow control between the host and the CC2564C is byte-wise by hardware.



OVERVIEW

When the UART Rx buffer of the CC2564C passes the “flow control” threshold, it will set the signal UART_RTS high to stop transmission from the host.

When the UART_CTS is set high, the CC2564C will stop its transmission on the interface. In case UART_CTS is set high in the middle of transmitting a byte, the CC2564C will finish transmitting the byte and stop the transmission.

1.5.2 Audio/Voice CODEC interface

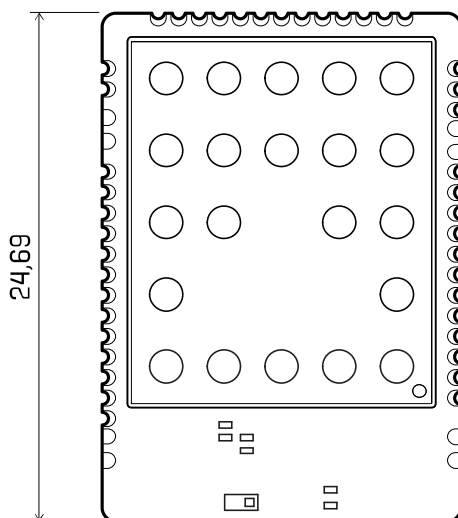
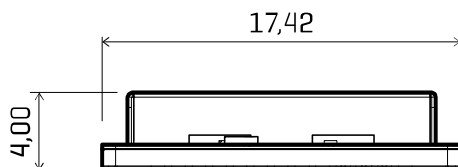
The internal CODEC is a single channel PCM CODEC. It includes Band limiting filter, A/D converter and Power Down function.

2 DESCRIPTION

2.1 Dimensions

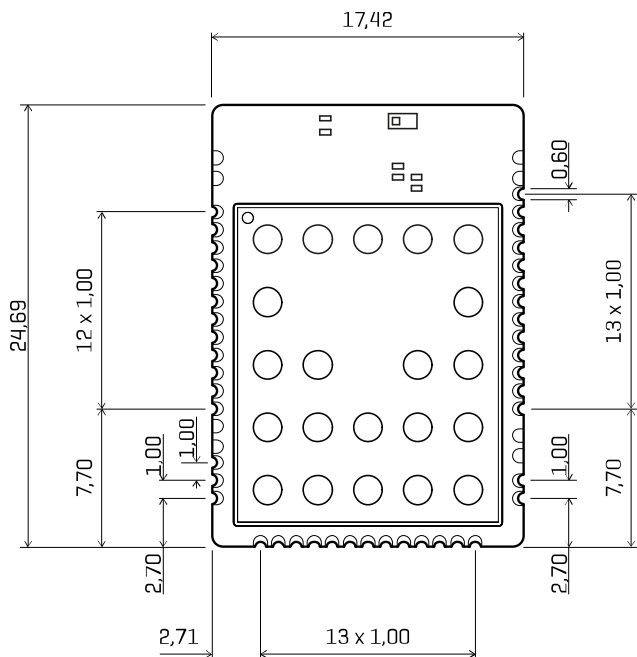


All dimensions are in millimetres.

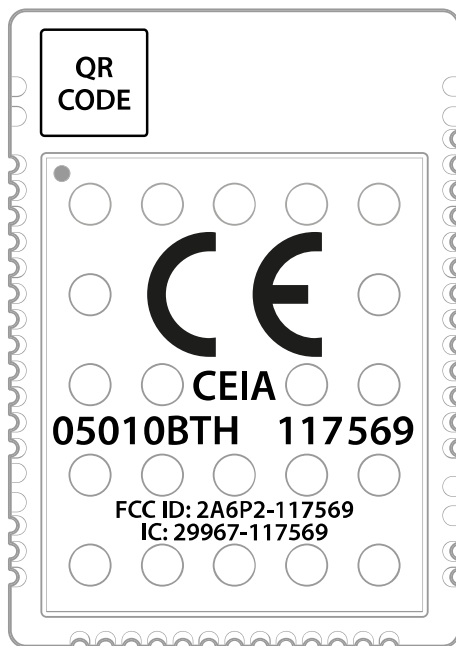


2.2 Footprint

All dimensions are in millimetres.



2.3 Case Marking



Marking on the device is made by laser engraving on the metal shield of the device itself

3 SPECIFICATION



All specifications are over temperature and process, unless indicated otherwise.

3.1 Default Test Conditions

- Temperature: 25°C ±10°C
- Humidity: 40 to 85 % RH
- Supply voltage: 3.3V

3.2 Absolute Maximum Ratings



The maximum ratings may not be exceeded under any circumstances, not even momentarily or individually, as permanent damage to the module may result.



All parameters are measured as follows unless stated otherwise: $V_{in} = 3.3V$

| No. | See ³ | Min. | Max. | Unit |
|-----|--|------|----------|------|
| 1 | V_{IN} (Pin 1) | -0.5 | 4.6 | V |
| 2 | Audio_IN (Pin 44) | -0.3 | V_{IN} | V |
| 3 | Input voltage to RF ⁴ | -0.5 | 2.1 | V |
| 4 | Storage temperature range | -40 | +125 | °C |
| 5 | ESD: Human Body Model (HBM). JEDEC 22-A114 | | 500 | V |

³ Stresses beyond those listed under “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 under “recommended operating conditions” is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

⁴ The module has an embedded antenna. If necessary an external connector can be soldered.

3.3 Recommended Operating Conditions

| Symbol | Parameter | Condition | Min. | Max. | Unit |
|----------|-------------------------------------|-----------|----------------------|----------------------|------|
| V_{IN} | Power Supply Voltage | | 3 | 3.6 | V |
| V_{IH} | High-Level Input Voltage | Default | $0.65 \times V_{IN}$ | V_{IN} | V |
| V_{IL} | Low-Level Input Voltage | Default | 0 | $0.35 \times V_{IN}$ | V |
| | Operating ambient temperature range | | -40 | +85 | °C |

3.4 Static Current Consumption

| No. | Characteristics | Min. | Typ. | Max. | Unit |
|-----|---|------|------|------|---------|
| 1 | Current consumption in Shutdown Mode | | 1 | 7 | μA |
| 2 | Current consumption in Deep Sleep Mode | | 40 | 700 | μA |
| 3 | Total I/O current consumption for Active Mode | | | 1 | mA |
| 4 | Current consumption during transmit DH5 full throughput | | 40 | | mA |

3.5 Shutdown Requirements

| Pin Name | Symbol | Parameter | Min. | Max. | Unit |
|--------------------------|----------|----------------------|------|----------|------|
| CORE_SHUTD ⁵ | V_{IH} | Operation Mode Level | 2 | V_{IN} | V |
| | V_{IL} | Shutdown Mode Level | 0 | 0.8 | V |
| CODEC_SHUTD ⁵ | V_{IH} | Operation Mode Level | 2 | V_{IN} | V |
| | V_{IL} | Shutdown Mode Level | 0 | 0.8 | V |
| LDO_SHUTD ⁶ | V_{IH} | Operation Mode Level | 0.85 | 2 | V |
| | V_{IL} | Shutdown Mode Level | 0.2 | 0.45 | V |

⁵ An internal pull down retains shutdown mode when no external signal is applied to this pin.

⁶ An internal pull up retains operation mode when no external signal is applied to this pin.

3.6 BT Wireless

BT Receiver: In-Band Signals

| Characteristics | Condition | Min. | Typ. | Max. | Unit |
|--|---|----------------|------|------|------|
| Operation frequency range | | 2402 | | 2480 | MHz |
| Channel spacing | | | 1 | | MHz |
| Sensitivity, Dirty Tx on ⁷ | GFSK, BER=0,1% | | -90 | | dBm |
| | $\pi/4$ -DQPSK, BER=0,01% | | -90 | | |
| | 8DPSK, BER=0,01% | | -82 | | |
| BER error floor at sensitivity +10dB, dirty Tx off | $\pi/4$ -DQPSK | 1E-6 | 1E-7 | | |
| | 8DPSK | 1E-6 | | | |
| Maximum usable input power | GFSK, BER=0,1% | -5 | | | dBm |
| | $\pi/4$ -DQPSK, BER=0,1% | -10 | | | |
| | 8DPSK, BER=0,1% | -10 | | | |
| Intermodulation characteristics | Level of interferers (for n=3, 4 and 5) | -36 | -30 | | dBm |
| C/I performance ⁸ image = -1 MHz | GFSK, cochannel | | 8 | 10 | dBm |
| | EDR, cochannel | $\pi/4$ -DQPSK | 9.5 | 11 | |
| | | 8DPSK | 16.5 | 20 | |
| | GFSK, adjacent ± 1 MHz | | -10 | -5 | |
| | EDR, adjacent ± 1 MHz, (image) | $\pi/4$ -DQPSK | -10 | -5 | |
| | | 8DPSK | -5 | -1 | |
| | GFSK, adjacent +2 MHz | | -38 | -35 | |
| | EDR, adjacent +2 MHz | $\pi/4$ -DQPSK | -38 | -35 | |
| | | 8DPSK | -38 | -30 | |
| | GFSK, adjacent -2 MHz | | -28 | -20 | |
| | EDR, adjacent -2 MHz | $\pi/4$ -DQPSK | -28 | -20 | |
| | | 8DPSK | -22 | -13 | |
| | GFSK, adjacent $\geq \pm 3 $ MHz | | -45 | -43 | |
| | EDR, adjacent $\geq \pm 3 $ MHz | $\pi/4$ -DQPSK | -45 | -43 | |
| | | 8DPSK | -44 | -36 | |

⁷ Sensitivity degradation up to 3 dB may occur for minimum and typical values where the BT frequency is a harmonic of the fast clock.

⁸ Numbers show ratio of desired signal to interfering signal. Smaller numbers indicate better C/I performance.

| Characteristics | Condition | Min. | Typ. | Max. | Unit |
|--------------------|---|------|------|------|------|
| Rx mode LO leakage | Fr _f = (received RF – 0.6 MHz) | | -63 | -58 | dBm |

BT Receiver: General Blocking

| Characteristics | Condition | Typ. | Unit |
|--|------------------|------|------|
| Blocking performance over full range, according to BT specification ⁹ | 30 to 2000 MHz | -6 | dBm |
| | 2000 to 2399 MHz | -6 | dBm |
| | 2484 to 3000 MHz | -6 | dBm |
| | 3 to 12.75 GHz | -6 | dBm |

BT Transmitter: GFSK

| Characteristics | Min. | Typ. | Max. | Unit |
|---|------|------|------|------|
| Maximum RF output power ¹⁰ | | 8 | 10 | dBm |
| Power variation over BT band | -1 | | 1 | dB |
| Power variation over temperature (-40°C – 85°C) | -0.5 | | 0.5 | dB |
| Power variation over power supply (3V – 3.6V) | -0.1 | | 0.1 | dB |
| Gain control range | | 30 | | dB |
| Power control step | | 5 | | dB |
| Adjacent channel power M-N =2 | | -45 | | dBm |
| Adjacent channel power M-N >2 | | -50 | | dBm |

BT Transmitter: EDR

| Characteristics | Min. | Typ. | Max. | Unit |
|---|----------------|------|------|------|
| EDR output power ¹¹ | $\pi/4$ -DQPSK | 6 | 10 | dBm |
| | 8DPSK | | | |
| EDR relative power | -2 | | 1 | dB |
| Power variation over BT band | -1 | | 1 | dB |
| Power variation over temperature (-40°C – 85°C) | -0.5 | | 0.5 | dB |
| Power variation over power supply (3V – 3.6V) | -0.1 | | 0.1 | dB |
| Gain control range | | 30 | | dB |
| Power control step | | 5 | | dB |
| Adjacent channel power M-N =1 | | -36 | | dBc |

⁹ Exceptions are taken out of the total 24 allowed in the BT specification.

¹⁰ To modify maximum output power, use an HCI VS command.

¹¹ To modify maximum output power, use an HCI VS command.

| Characteristics | Min. | Typ. | Max. | Unit |
|----------------------------------|------|------|------|------|
| Adjacent channel power $ M-N =2$ | | -30 | | dBm |
| Adjacent channel power $ M-N >2$ | | -42 | | dBm |

BT Modulation: GFSK

| Characteristics | Condition | Min. | Typ. | Max. | Unit |
|--|--|------|------|------|--------------------|
| -20 dB bandwidth | GFSK | | 925 | | kHz |
| F1 avg | $\Delta f1_{avg}$ Mod data=4 1s, 4 0s: 111100001111... | | 165 | | kHz |
| F2 max | $\Delta f2_{max} \geq$ limit for at least 99.9% of all $\Delta f2_{max}$ | | 130 | | kHz |
| | $\Delta f2_{avg}, \Delta f1_{avg}$ | | 88 | | % |
| Absolute carrier frequency drift | DH1 | -25 | | 25 | kHz |
| | DH3 and DH5 | -35 | | 35 | |
| Drift rate | | | | 15 | kHz/ 50 μ s |
| Initial carrier frequency tolerance | | -75 | | 75 | kHz |

BT Modulation – EDR

| Characteristics | Condition | Min. | Typ. | Max. | Unit |
|-------------------------------------|----------------|------|------|----------|------|
| Carrier frequency stability | | | | ± 5 | kHz |
| Initial carrier frequency tolerance | | | | ± 75 | kHz |
| RMS DEVM ¹² | $\pi/4$ -DQPSK | | 6% | | |
| | 8DPSK | | 6% | | |
| 99% DEVM ¹² | $\pi/4$ -DQPSK | | | 30% | |
| | 8DPSK | | | 20% | |
| Peak DEVM ¹² | $\pi/4$ -DQPSK | | 14% | | |
| | 8DPSK | | 16% | | |

¹² Maximum performance refers to maximum TX power.

BT LE Receiver: In-Band Signals

| Characteristics | Condition | Min. | Typ. | Max. | Unit |
|---|--|------|------|------|------|
| Operation frequency range | | 2402 | | 2480 | MHz |
| Channel spacing | | | 2 | | MHz |
| Sensitivity, Dirty Tx on ¹³ | PER=30.8%; dirty Tx on | | -92 | | dBm |
| Maximum usable input power | GMSK, PER=30.8% | -5 | | | dBm |
| Intermodulation characteristics | Level of interferers (for n=3, 4 and 5) | | -30 | | dBm |
| C/I performance ¹⁴ Image = -1 MHz | GMSK, cochannel | | 8 | | dB |
| | GMSK, adjacent ± 1 MHz | | -5 | | |
| | GMSK, adjacent ± 2 MHz | | -45 | | |
| | GMSK, adjacent -2 MHz | | -22 | | |
| | GMSK, adjacent $\geq \pm 3 $ MHz | | -47 | | |
| Rx mode LO leakage | Fr _f = (received RF: 0.6 MHz) | | -63 | | dBm |

BT LE Receiver: General Blocking

| Characteristics | Condition | Typ. | Unit |
|--|------------------|------|------|
| Blocking performance over full range, according to BT LE specification ¹⁵ | 30 to 2000 MHz | -15 | dBm |
| | 2000 to 2399 MHz | -15 | |
| | 2484 to 3000 MHz | -15 | |
| | 3 to 12.75 GHz | -15 | |

BT LE Transmitter

| Characteristics | Typ. | Max. | Unit |
|---|------|------|------|
| RF output power ¹⁶ | 8 | 10 | dBm |
| Power variation over BT LE band | | 1 | dB |
| Power variation over temperature (-40°C – 85°C) | | 0.5 | dB |
| Power variation over power supply (3V – 3.6V) | | 0.1 | dB |
| Adjacent channel power M-N =2 | -45 | | dBm |
| Adjacent channel power M-N >2 | -50 | | dBm |

¹³ Sensitivity degradation up to 3 dB may occur where the BT LE frequency is a harmonic of the fast clock.

¹⁴ Numbers shows wanted signal-to-interfering signal ratio. Smaller numbers indicate better C/I performance.

¹⁵ Exceptions are taken out of the total 10 allowed in the BT LE specification.

¹⁶ To modify maximum output power, use an HCI VS command

BT LE Modulation

| Characteristics | | Condition | | Min. | Typ. | Max. | Unit | |
|-------------------------------------|----------------------------|--|---|------|------|------|--------------|--|
| $\Delta f1$ avg | Modulation characteristics | $\Delta f1$ avg | Mod data=4 1s, 4 0s: 111100001111... | 240 | 250 | 260 | kHz | |
| $\Delta f2$ max | | $\Delta f2$ max \geq limit for at least 99.9% of all $\Delta f2$ max | Mod data=1010101... | 185 | 210 | | kHz | |
| | | $\Delta f2$ avg, $\Delta f1$ avg | | | 0.85 | 0.9 | | |
| Absolute carrier frequency drift | | | | -25 | | 25 | kHz | |
| Drift rate | | | | | | 15 | kHz/ 50ms | |
| Initial carrier frequency tolerance | | | | -75 | | 75 | kHz | |

3.7 CODEC Requirements

Absolute Gain

| Parameter | | Conditions | Min. | Typ. | Max. | Unit |
|------------------------|-----------------------|--------------|------|-------|------|------|
| Analog input level | VFTN \rightarrow DX | 0dBm0@1020Hz | | 0.460 | | Vrms |
| Absolute transmit gain | | | -0.6 | | 0.6 | dB |
| Maximum overload level | | 3.14dBm0 | | 0.660 | | Vrms |

Frequency response

| Parameter | | Conditions | Min. | Typ. | Max. | Unit |
|--|--|-----------------|-------|------|------|------|
| Transmit frequency response (A \rightarrow D) VFTN \rightarrow DX | Relative to: -10dBm0 1020Hz Tone | -55dBm0~-50dBm0 | -1.2 | | 1.2 | dB |
| | | -50dBm0~-40dBm0 | -0.4 | | 0.4 | dB |
| | | -40dBm0~ 3dBm0 | -0.2 | | -0.2 | dB |
| | Relative to: 0dBm0 @1020Hz | 0.05kHz | | | -30 | dB |
| | | 0.06kHz | | | -26 | dB |
| | | 0.2kHz | -1.8 | | 0 | dB |
| | | 0.3~3.0kHz | -0.15 | | 0.15 | dB |
| | | 3.4kHz | -0.8 | | 0 | dB |
| | | 4.0kHz | | | -14 | dB |

Distortion (A-law, μ -law)

| Parameter | Conditions | Min. | Typ. | Max. | Unit |
|--|-------------|-----------------|------|------|------|
| Transmit signal to Distortion (A \rightarrow D) VFTN \rightarrow DX | 1020Hz Tone | -40dBm0~-45dBm0 | 25 | | dB |
| | | -30dBm0~-40dBm0 | 30 | | dB |
| | | -40dBm0~-30dBm0 | 36 | | dB |

Distortion (Linear PCM)

| Parameter | Conditions | Min. | Typ. | Max. | Unit |
|--|----------------------------------|------|------|------|------|
| Transmit signal to Distortion (A \rightarrow D) VFTN \rightarrow DX | 1020Hz Tone 0dBm0 (C-message) | | 78 | | dB |

Noise

| Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---------------------|------|------|------|-------|
| Idle channel noise (A \rightarrow D) ¹⁷ VFTN \rightarrow DX | u-law, C-message | | 12 | 17 | dBmC0 |
| | A-law, Psophometric | | -78 | -73 | dBm0p |
| | Linear, C-message | | 12 | 17 | dBmC0 |

Crosstalk

| Parameter | Conditions | Min. | Typ. | Max. | Unit |
|--|----------------------------------|------|------|------|------|
| Transmit to receive VFTN \rightarrow VR | VFTN 0dBm0@1020Hz DR = 0-code | | | -75 | dB |

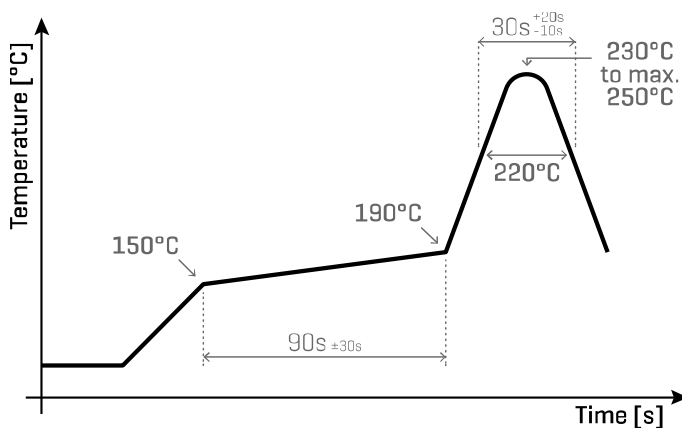
Analog input op-amp characteristics: AMPT

| Parameter | Conditions | Min. | Typ. | Max. | Unit |
|------------------|--|------|------|------|------------|
| Load resistance | AC load, including feedback resistance | 10 | | | k Ω |
| Load capacitance | | | | 50 | pF |
| Gain | Inverting amplifiers | -6 | | 20 | dB |

¹⁷ Analog input is set to the analog ground level.

3.8 Recommended Soldering Profile

- Reflow permissible cycles: 2
- Opposite side reflow is prohibited due to module weight
- More than 75% of the soldering area shall be coated by solder
- The soldering profiles should be adhered to in order to prevent electrical or mechanical damage
- Soldering profile assumes lead-free soldering



3.9 Cautions



Failure to follow the guidelines set forth in this document may result in degrading of the module functions and damage to the module.

3.9.1 Design Notes

- Follow the conditions written in this specification, especially the control signals of this module.
- The supply voltage should abide by the maximum ratings.
- The supply voltage must be free of AC ripple voltage (for example from a battery or a low noise regulator output).
- This module should not be mechanically stressed when installed.
- Keep this module away from heat.
- Keep this module away from other high frequency circuits.
- Refer to the recommended pattern when designing a board.

3.9.2 Installation Notes

- Reflow soldering is possible twice based on the conditions set forth in [3.8 Recommended Soldering Profile](#). Set up the temperature at the soldering portion of this module according to this reflow profile.
- Carefully position the module so that the heat will not burn into printed circuit boards or affect other components that are susceptible to heat.
- Carefully locate the module, to avoid an increased temperature caused by heat generated by neighboring components.
- This module should not be mechanically stressed or vibrated when reflowed.

3.9.3 Usage Condition Notes

- Take measures to protect the module against static electricity.
- Follow the recommended condition ratings about the power supply applied to this module.
- These modules are intended for general purpose and standard use in general electronic equipment.

4 REGULATORY & CERTIFICATION



Manufacturers of devices incorporating this module shall evaluate compliance with applicable conducted emission and immunity tests.

4.1 European Conformity According to RED (2014/53/EU)

CEIA 05010BTH Module described in this Product Specification comply with the standards according to the following regulation with RED (2014/53/EU) articles:

3.1a Safety/Health: EN IEC 62368-1:2020 + A11:2020
EN IEC 62311:2020

3.1b EMC: ETSI EN 301 489-1 V2.2.3
Draft ETSI EN 301 489-17 V3.2.5

3.2 Radio: EN 300 328 V2.2.2 (2019-07)



The notified body IMQ S.p.A. (identification number 0051) performed the EU-type examination in compliance to Annex III Module B of the 2014/53/EU Directive and issued the EU-type examination Certificate No. 0051-RED-0136.

As a result of the conformity assessment procedure described in 2014/53/EU Directive, the end customer equipment should be labelled as follows:



CEIA 05010BTH Module in the specified reference design can be used in all countries of the European Economic Area (Member States of the EU, European Free Trade Association States [Iceland, Liechtenstein, Norway]), Monaco, San Marino, Andorra, and Turkey.

4.2 FCC Regulation



The 05010BTH Module complies with Part 15 of the FCC Rules.

The device meets the requirements for modular transmitter approval as detailed in FCC public Notice DA00-1407.

The transmitter 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.



The FCC requires the user to be notified that any changes or modifications made to this device that are not expressly approved by CEIA may void the user's authority to operate the equipment.

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.



The OEM must ensure that FCC labelling requirements are met. This includes a clearly visible label on the outside of the OEM enclosure specifying the appropriate FCC identifier for this product as well as the FCC Notice above.

The FCC identifier is **FCC ID: 2A6P2-117569**.

This FCC identifier is valid for the 05010BTH Module.

The end product must in any case be labelled on the exterior with:

"Contains FCC ID: 2A6P2-117569".



In accordance with FCC Regulation, the end customer has to assure that the device has a distance of more than 20 mm from the human body under all circumstances.

4.2.1 Integration Instructions for Host Product Manufacturers According to “KDB 996369 D03”

| Section | Topic and comment |
|-------------|---|
| 2.2 | List of applicable FCC rules FCC part 15.247 operation within the bands 902 MHz to 928 MHz, 2400 MHz to 2483.5 MHz, and 5725 MHz to 5850 MHz |
| 2.3 | Specific operational use conditions Please refer to 3.9 Cautions . |
| 2.4 | Limited module procedures Not applicable. The module has a single-modular transmitter approval. |
| 2.5 | Trace antenna designs Not applicable. The module has a fixed ceramic chip antenna. |
| 2.6 | RF exposure considerations This device complies with FCC RF radiation exposure limit set forth for an uncontrolled environment. Please refer to 4.2 FCC Regulation . The host product manufacturer would provide the relative information to end user in their end-product manuals. |
| 2.7 | Antennas TDK chip antenna ANT016008LCS2442MA1 Frequency Band 2.4GHz, Gain +1.6dBi. |
| 2.8 | Label and compliance information For guidance regarding the required labeling please refer to 4.2 FCC Regulation . |
| 2.9 | Information on test modes and additional testing requirements Please study Design Guide for the 05010BTH carefully. For the Design Guide please refer to 5 REFERENCE DESIGN and 6 PLACEMENT RECOMMENDATIONS . |
| 2.10 | Additional testing, Part 15 Subpart B disclaimer The 05010BTH is only FCC authorized for the specific rule FCC part 15.247. 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. The final host product still requires Part 15 Subpart B compliance testing with the 05010BTH installed. |

4.3 ISED Regulation

The 05010BTH Module is licensed to meet the regulatory requirements of ISED.

License ID: **IC: 29967-117569**

Manufacturers of mobile, fixed or portable devices incorporating this module are advised to clarify any regulatory questions and ensure compliance for SAR and/or RF exposure limits. Users can obtain Canadian information on RF exposure and compliance from www.ic.gc.ca.



The 05010BTH Module complies with Canada RSS-GEN Rules. The device meets the requirements for modular transmitter approval as detailed in RSS-Gen.

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.



The OEM must ensure that IC labelling requirements are met. This includes a clearly visible label on the outside of the OEM enclosure specifying the appropriate IC identifier for this product as well as the IC Notice above. The IC identifier is **IC: 29967-117569**.



In accordance with the Radio Standard Specification RSS-102 (Issue 5 - March 2015), the end customer has to assure that the device has a distance of more than 20 mm from the human body under all circumstances.

4.4 RoHS and REACH Declaration

The latest declaration of environmental compatibility (Restriction of Hazardous Substances, RoHS and Registration, Evaluation, Authorisation and Restriction of Chemicals, REACH) for supplied products is available on request.

4.5 EU Declaration of Conformity

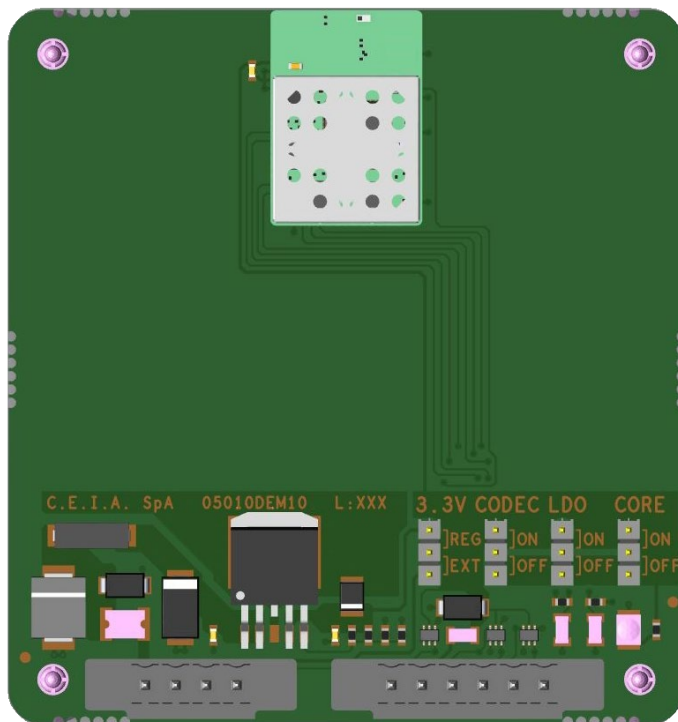
| EU DECLARATION OF CONFORMITY (In accordance with EN ISO/IEC 17050-1:2010) | |
|---|--|
| <p>DECLARATION DE CONFORMITE UE (conformément à la norme EN ISO/IEC 17050-1:2010) EU-KONFORMITÄTSERKLÄRUNG (nach EN ISO/IEC 17050-1:2010) DECLARAZIONE DI CONFORMITÀ UE (secondo EN ISO/IEC 17050-1:2010) DICHIARAZIONE DI CONFORMITÀ UE (in conformità con EN ISO/IEC 17050-1:2010) <i>This declaration of conformity is issued under the sole responsibility of the manufacturer / La présente déclaration de conformité est émise sous la seule responsabilité du fabricant / Die alleinige Verantwortung für die Ausstellung dieser Konformitätserklärung trägt der Hersteller / La presente declaración de conformidad se expide bajo la exclusiva responsabilidad del fabricante / La presente dichiarazione di conformità è rilasciata sotto la responsabilità esclusiva del fabbricante</i></p> | |
| <p>Manufacturer: Fabricant / Hersteller / Fabricante / Costruttore:</p> | <p>COSTRUZIONI ELETTRONICHE INDUSTRIALI AUTOMATISMI CEIA S.p.A. Zona industriale Vicomaggio 54 52041 Vicomaggio Arezzo – ITALY</p> |
| <p>Declares that the product <i>déclare que ce produit / erklärt, daß das Produkt / dichiara che il prodotto / dichiara che il prodotto:</i></p> | |
| <p>Description Description / Beschreibung Descrizione / descrizione</p> | <p>2.4 GHz radio module Module radio 2.4 GHz / 2.4-GHz-Funkmodul Módulo de radio de 2.4 GHz / Módulo radio 2.4 GHz</p> |
| <p>Product name: Nom du produit / Produktname Nombre del producto / Nome:</p> | <p>05010BTH</p> |
| <p>Model: Modél / Modell / Modelo / Modello:</p> | <p>117569</p> |
| <p>Product Options: Options / opzioni: Opzioni / opzioni:</p> | <p>This declaration covers all options <i>Cette déclaration est valide pour toutes les options / Diese Erklärung ist gültig für alle options</i> <i>Esta declaración es válida para todas las opciones / Questa dichiarazione è valida per tutte le opzioni</i></p> |
| <p>conforms to the following Product Specifications <i>est conforme aux spécifications suivantes / folgenden Produktspezifikationen entspricht</i> <i>es conforme a las siguientes especificaciones / è conforme alle seguenti specifiche di prodotto:</i></p> | |
| <p>Radio Equipment Directive (RED) 2014/53/EU Art. 3.1(a) EN 62368-1:2014 + EN 62368-1:2014/A11:2017 + EN 62368-1:2014/AC:2015 Audio/video, information and communication technology equipment - Part 1: Safety requirements EN 62311:2008 Assessment of electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (0 Hz - 300 GHz) Art. 3.1(b) EN 301 489-1 v1.9.2 ElectroMagnetic compatibility and Radio spectrum Matters (ERM) - ElectroMagnetic Compatibility (EMC) standard for radio equipment and services - Part 1: Common technical requirements EN 301 489-17 v3.2.4 ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 17: Specific conditions for Broadband Data Transmission Systems; Harmonised Standard for ElectroMagnetic Compatibility Art. 3.2 EN 300 328 V2.2.2 Wideband transmission systems; Data transmission equipment operating in the 2.4 GHz band; Harmonised Standard for access to radio spectrum Art. 3.3 Not applicable <i>This product complies with the requirements of the Radio Equipment Directive (RED) 2014/53/EU.</i> <i>Le produit est conforme aux dispositions de la directive 2014/53/UE concernant les équipements radioélectriques.</i> <i>Das Produkt entspricht den Bestimmungen der Richtlinie 2014/53/EU über Funkanlagen.</i> <i>Il prodotto cumple con las disposiciones de la Directiva 2014/53/UE sobre equipos de radio.</i> <i>Il prodotto è conforme ai requisiti della direttiva RED 2014/53/UE sulle apparecchiature radio.</i></p> | |
| <p>RoHS Directive 2011/65/EU This product complies with the requirements of the RoHS Directive 2011/65/EU (RoHS 2) + (UE) 2015/863 (RoHS 3). <i>Le produit ci-dessus répond aux exigences de la Directive 2011/65/UE (RoHS 2) + (UE) 2015/863 (RoHS 3) concernant les RoHS.</i> <i>Dieses Produkt entspricht den Anforderungen der RoHS-Norm 2011/65/EU (RoHS 2) + (UE) 2015/863 (RoHS 3).</i> <i>El producto indicado cumple los requisitos de la Directiva RoHS 2011/65/UE (RoHS 2) + (UE) 2015/863 (RoHS 3).</i> <i>Il prodotto è conforme alle norme della direttiva RoHS 2011/65/UE (RoHS 2) + (UE) 2015/863 (RoHS 3).</i> <i>For parts and materials in CEIA products procured from external suppliers, we rely on the representation of our suppliers regarding the presence of RoHS substance in the parts and material. Our supplier contracts require compliance with our chemical substance restrictions.</i> <i>CEIA also has internal system in place to ensure ongoing compliance and all laws and regulations. These system include standard operating procedures that ensure that product safety, EMC and environmental compliance requirements are followed as internal auditing process to ensure compliance with all standard operating procedures.</i> The notified body IMQ S.p.A. (identification number 0051) performed the EU-type examination in compliance to Annex III Module B of the 2014/53/EU Directive and issued the EU-type examination Certificate No. 0051-RED-xxxx <i>L'organismo notifico IMQ S.p.A. (numero di identificazione 0051) a effettuato l'esame UE di tipo conformemente a l'annex III modulo B de la directive 2014/53/UE et a délivré le certificat d'examen UE de type n° 0051-RED-xxxx</i> <i>Die benannte Stelle IMQ S.p.A. (Identifikationsnummer 0051) hat die EU-Baumusterprüfung gemäß Anhang III Modul B der Richtlinie 2014/53/EU durchgeführt und die EU-Baumusterprüfbescheinigung Nr. 0051-RED-xxxx ausgestellt</i> <i>El organismo notificado IMQ S.p.A. (número de identificación 0051) realizó el examen UE de tipo de conformidad con el Anexo III Módulo B de la Directiva 2014/53/UE y emitió el Certificado de examen UE de tipo No. 0051-RED-xxxx</i> <i>L'organismo notifico IMQ S.p.A. (codice identificativo 0051) ha effettuato l'esame UE del tipo in conformità all'Allegato III Modulo B della Direttiva 2014/53/UE e ha rilasciato il Certificato di esame UE del tipo n. 0051-RED-xxxx</i> Signed for and on behalf of: / Signé par et au nom de: / Unterzeichnet für und im Namen von: / Firmado por y en nombre de: / Firmato in vece e per conto di: CEIA S.p.A. Zona industriale Vicomaggio 54 52041 Vicomaggio Arezzo – ITALY</p> | |
| <p>Arezzo, 2022-10-26</p> <p> SpA</p> <p>Ing. Enrico Sorini</p> <p> Lab. EMC Person in charge <i>Resp. Laboratorio EMC / Verantwortlicher für EMC-Labor</i> <i>Resp. Laboratorio EMC / Resp. Lab. EMC</i></p> | |

Doc. N° 117569 rev 4

Mod. F0401-0025 rev 0

5 REFERENCE DESIGN

The CEIA card 05010DEM allows simplified evaluation of the key features of the module.



6 PLACEMENT RECOMMENDATIONS

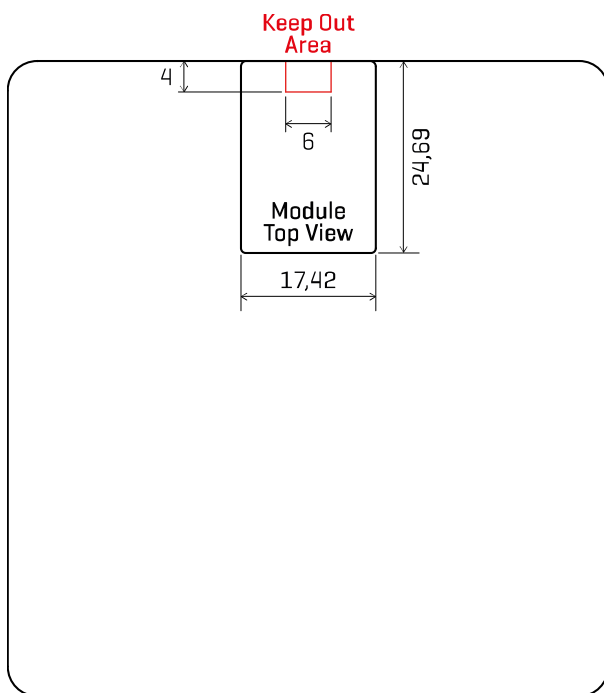


Do not place any ground plane under the red marked antenna area in any layer. The materials surrounding the module can affect the radiation pattern of the antenna.



Use a ground plane in the area surrounding the module wherever possible.

All dimensions are in millimetres.



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