CASAMBI

FC CE RoHS

Features

Casambi Lighting Control System:

- Wirelessly controllable with a Bluetooth 4.0 smart device
- No need for external gateway device
- Forms automatically a wireless mesh network
- Device firmware can be updated over-the-air
- Casambi cloud service available
- Extremely easy set-up

CBM-002A/B Features:

- Small form factor, 12,7 mm x 20,0 mm x 2,85 mm
- 12 pcs general purpose input/output pins
- SPI, TWI, UART, PWM (max. 4 ch)
- Integrated antenna, two different versions
- Up to 4 dBm output power and -93 dBm RX sensitivity
- Range up to 50 m in open air
- Can be mounted in horizontal or vertical position
- Delivered pre-loaded with Casambi firmware

Applications

- LED drivers, 1-4 channels
- Different lighting control applications
- Light fixtures
- Single and multicolor LED bulbs

1 Description

CBM-002A/B is a Class 2 embedded Bluetooth 4.0 module designed to be integrated into LED drivers, different lighting control applications, light fixtures and LED bulbs. It is pre-programmed with Casambi's proprietary firmware making it completely compatible with other Casambi enable devices.

CBM-002A/B is controlled wirelessly with Casambi smartphone and tablet applications using Bluetooth 4.0 protocol. Devices form automatically a self-healing and self-organizing wireless mesh network so that a large number of fixtures can be controlled from any point. No external gateway module is needed.

CBM-002A/B contains a powerful 32-bit ARM® Cortex™-M4 CPU and a 2.4 GHz transceiver with on-board antenna and optional matching circuitry. Different external components, such as motion detectors, ambient light sensors and PWM circuits, can be interfaced with the module by using its 12 general purpose I/O pins.

CBM-002A/B can be mounted both in horizontal and vertical position making it very versatile for projects with different form-factors.

2 Revision history

Date	Version	Description
March 2017	1.0	Original version
October 2017	1.1	Compliance information updated
November 2017	1.2	Compliance information updated

3 Ordering Information

Part Number	Description
CBM-002A	CBM-002 with on-board SMD chip antenna
CBM-002B	CBM-002 with on-board wire antenna

Table of Contents

4 Operation

Casambi CBM-002A/B is an embedded wireless module with a powerful 32-bit ARM® Cortex™-M4 CPU and a 2.4 GHz transceiver with on-board antenna and optional matching circuitry. It can be integrated, for example, into an LED driver, a light fixture or an LED bulb.

CBM-002A/B has total of 12 GPIO pins, which can be configured to perform various tasks, such as SPI, TWI (I²C compatible), UART, 4 channel PWM output and 3 channel Analog-to-Digital Converter input. Only the ADC input channels have fixed GPIO pins. Other functions can be freely configured to any GPIO pin.

CBM-002A/B is controlled wirelessly by a smart device with Casambi application. Multiple Casambi units form automatically a mesh network, which can be controlled from any point. The network communicates directly with the smart device using Bluetooth 4.0. No external gateway device or Wireless LAN network is needed.

CBM-002A/B has an integrated 2,4 GHz antenna. This will have to be taken into account when the device is integrated to any environment. See chapter "14.5 Mounting" for further instructions.

The module can be operated also from a traditional on/off wall switch. By flicking the switch on and off the user can select different pre-set modes. These modes can affect one or several devices on the network. This way the user does not have to have the smart device at hand all the time in order to select the desired settings or modes. This feature requires an external electrolytic capacitor to supply power during power-off stage as well as a power-on detection circuitry.

A large number of different setting of CBM-002A/B can be configured in Casambi Admin webpages and taken into use without a need to re-program the module. These settings include, for example, I/O pin mapping, PWM, push buttons, etc.

5 Block Diagram
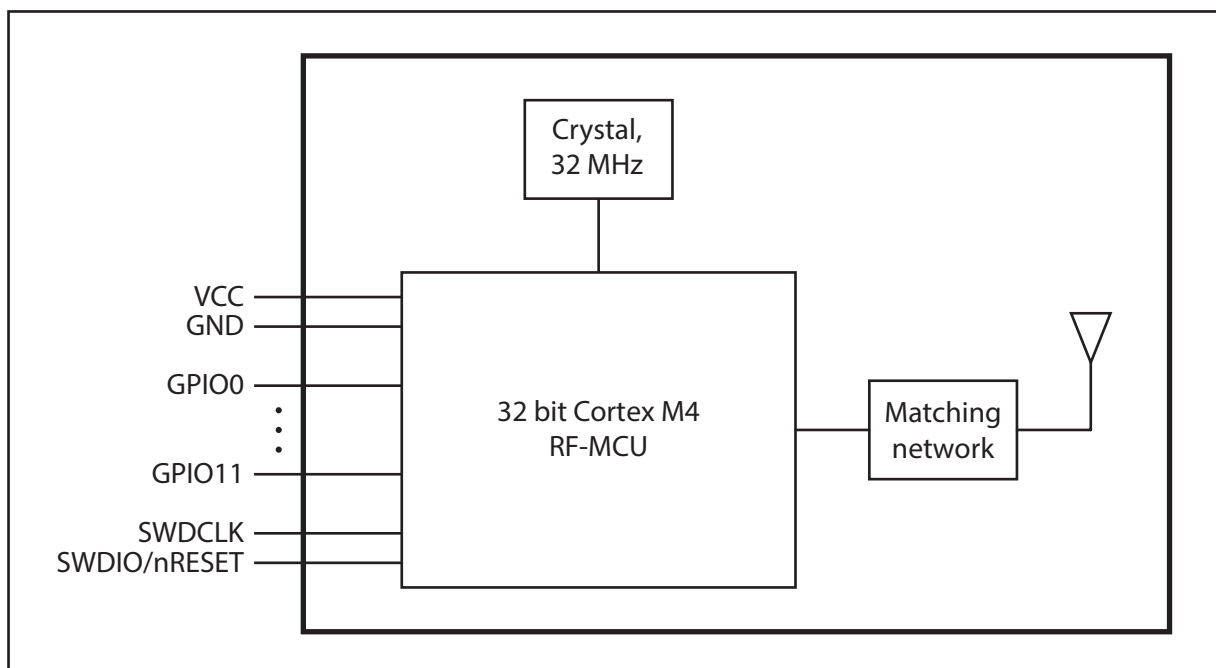
Picture 1. CBM-002A/B block diagram

6 System Blocks

6.1 General Purpose I/O (GPIO)

CBM-002A/B has 12 General Purpose I/O pins. Each GPIO can be accessed individually and each has the following features:

- Input/output direction
- Configurable output drive strength
- Internal pull-up and pull-down resistors
- Buffered inputs
- Trigger interrupt on all pins (rising edge, falling edge, any change)
- Serial interface and PWM output can be freely configured to each pin

GPIO pins 0-3 also supports analog input signals when an internal Analog-to-Digital Converter (ADC) is used.

6.2 Analog-to-Digital Converter (ADC)

The up to 12-bit Analog-to-Digital Converter enables sampling of up to 4 external signals (GPIOs 0-3) through a front-end multiplexer. The ADC has configurable input and reference prescaling, and sample resolution (8, 10, and 12-bit).

There are two options for the voltage reference:

- Internal 1,20 V reference
- VCC with 1/3 prescaling

Analog inputs can have a configurable gain of 1/6, 1/5, 1/4, 1/3, 1/2, 1, 2 and 4. The suitable voltage range for ADC input is 0 V - V_{CC}.

6.3 PWM Output

Any GPIO pin can be configured to output PWM signal. Up to 4 PWM channels can be used simultaneously. PWM frequency can be determined freely up to 40 kHz. PWM frequency is the same with all PWM channels. The maximum resolution is 400-1600 steps and it depends on the PWM frequency.

The PWM signal is logic level (max. V_{CC}) and it has driving capacity from 4 mA (standard) up to 14 mA (high-drive). An adjustable analog voltage (0 V - V_{CC}) can be derived from the PWM signal by an external RC filter. A 10 kHz PWM signal together with a 10kΩ + 2,2 μF RC filter can be used as a starting point. Depending on the application, it may be necessary to use an operational amplifier as a buffer stage.
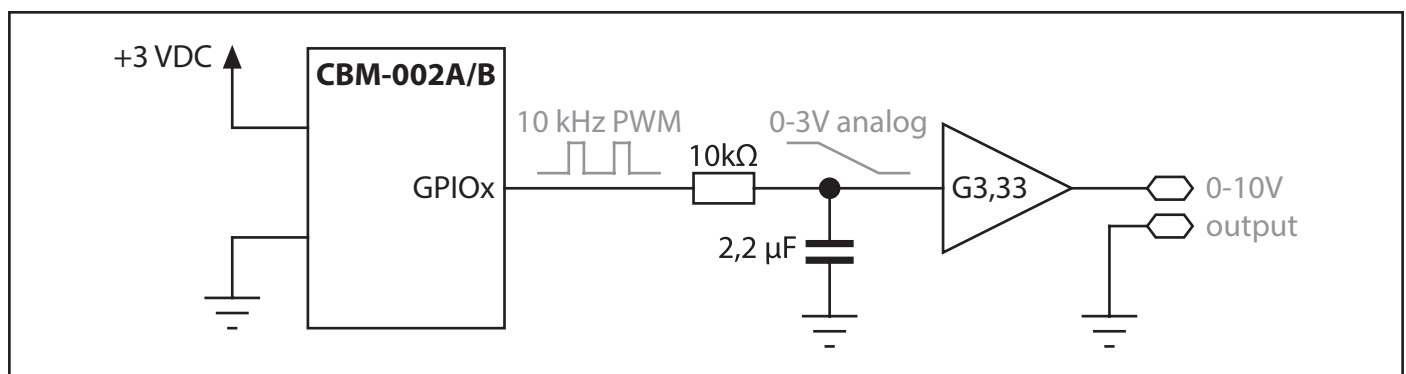
Picture 2. Adjustable 0-10V output from PWM signal.

7 Serial Interfaces

CBM-002A/B can be connected to an external MCU through its extension interface, which supports SPI, TWI and UART. Through this interface it is possible to, for example, gather information from sensors through Casambi network.

7.1 Serial Peripheral Interface (SPI)

CBM-002A/B supports a 3-wire (SCK, MISO, MOSI) bidirectional SPI bus with fast data transfers to and from multiple slaves. CBM-002A/B acts as a master and it provides a simple CPU interface which includes a TXD register for sending data and an RXD register for receiving data. These registers are double-buffered to enable some degree of uninterrupted data flow in and out of the SPI master.

Each of the slave devices requires an individual chip select signal which can be connected to any available GPIO pin. The SPI master does not implement support for chip select directly. Therefore, the correct slave must be selected independently of the SPI master.

The GPIOs used for each SPI interface line can be chosen from any GPIO on the module and are independently configurable. This enables great flexibility in module pinout and enables efficient use of printed circuit board space and signal routing.

The SPI peripheral supports SPI modes 0, 1, 2, and 3.

7.2 Two-Wire Interface (TWI)

The Two-Wire Interface (I^2C compatible) can interface a bidirectional wired-AND bus with two lines (SCL, SDA). The interface is capable of clock stretching and data rates of 100 kbps and 400 kbps are supported. The TWI transmitter and receiver are single buffered.

The GPIOs used for each Two-Wire Interface line can be chosen from any GPIO on the module and are independently configurable. This enables great flexibility in module pin-out and enables efficient use of board space and signal routing.

7.3 Universal Asynchronous Receiver/Transmitter (UART)

The Universal Asynchronous Receiver/Transmitter offers fast, full-duplex, asynchronous serial communication with built-in flow control support in HW up to 1 Mbps baud. Parity checking and generation for the 9th data bit are supported.
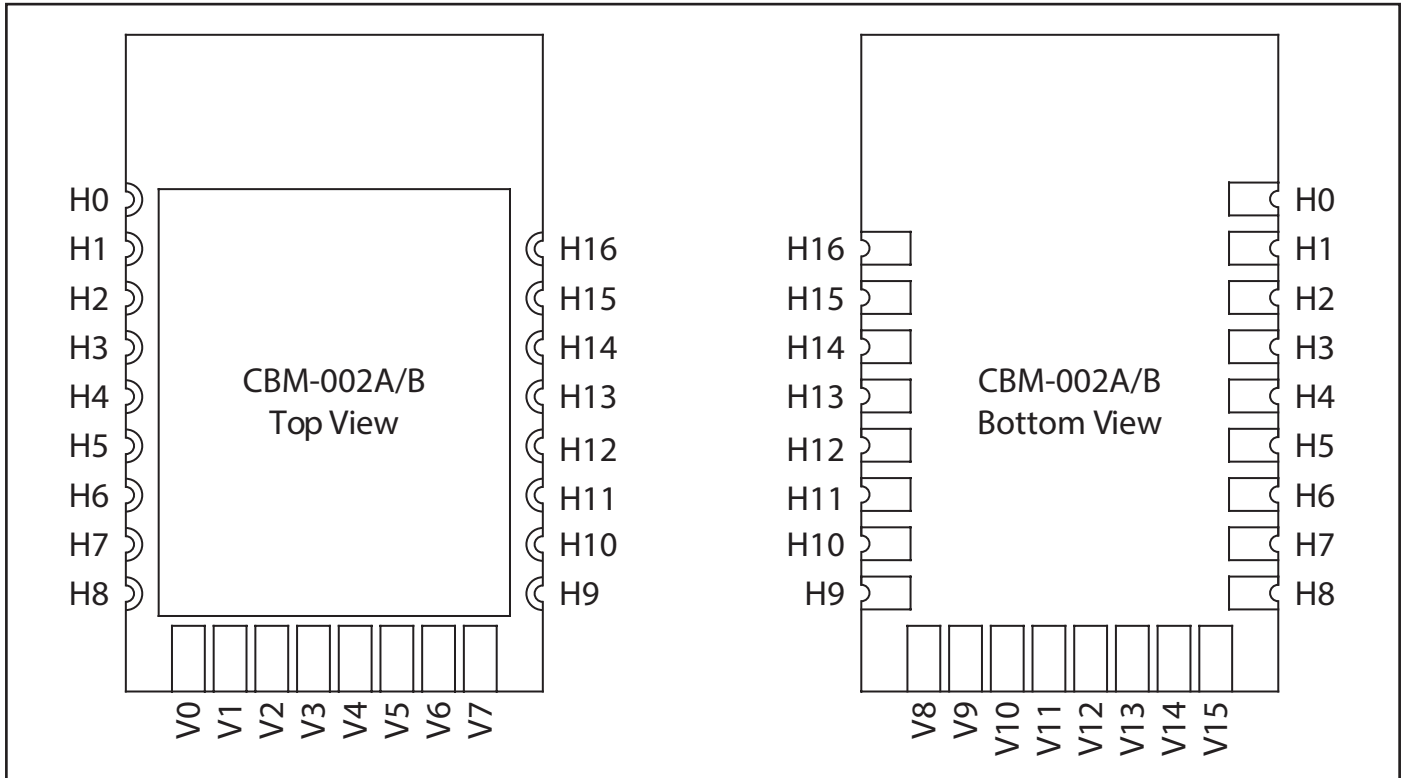
The GPIOs used for each UART interface line can be chosen from any GPIO on the module and are independently configurable. This enables great flexibility in module pinout and enables efficient use of board space and signal routing.

8 Pin Assignment

Picture 2. Pin assignment

Horizontal Pin	Vertical Pin	Pin Name	Pin Function	Description
H0	-	GND	Power	Ground
H1	V7	GPIO0 AIN0	Digital I/O Analog input	General purpose I/O pin ADC input 0
H2	V6	GPIO1 AIN1	Digital I/O Analog input	General purpose I/O pin ADC input 1
H3	V5	GPIO2 AIN2	Digital I/O Analog input	General purpose I/O pin ADC input 2
H4	V4	GPIO3 AIN3	Digital I/O Analog input	General purpose I/O pin ADC input 3
H5	V3	VCC	Power	Power supply
H6	V2	SWDCLK	Digital input	HW debug and flash programming I/O
H7	V1	SWDIO nRESET	Digital I/O Analog input	HW debug and flash programming I/O System reset (active low)
H8	V0	GND	Power	Ground
H9	V8	GPIO4	Digital I/O	General purpose I/O pin
H10	V9	GPIO5	Digital I/O	General purpose I/O pin
H11	V10	GPIO6	Digital I/O	General purpose I/O pin

Horizontal Pin	Vertical Pin	Pin Name	Pin Function	Description
H12	V11	GPIO7	Digital I/O	General purpose I/O pin
H13	V12	GPIO8	Digital I/O	General purpose I/O pin
H14	V13	GPIO9	Digital I/O	General purpose I/O pin
H15	V14	GPIO10	Digital I/O	General purpose I/O pin
H16	V15	GPIO11	Digital I/O	General purpose I/O pin

Table 1. Pin assignment

9 Electrical Specifications

9.1 Absolute Maximum Ratings

Maximum ratings are the extreme limits to which CBM-002A/B can be exposed without permanently damaging it. Exposure to absolute maximum ratings for prolonged periods of time may affect the reliability.

Absolute Maximum Ratings	Min.	Max.	Units
Supply voltage, V_{CC}	-0,3	+3,9	V
GND		0	V
I/O pin voltage, V_{IO}	-0,3	V_{CC} + 0,3	V
Storage temperature	-40	+125	°C
Operating temperature, T_A	-25	+85	°C

Table 2. Absolute maximum ratings

9.2 Power Supply Specifications

Power Supply Specifications	Min.	Typ.	Max.	Units
Supply voltage, V_{CC}	+2,5	+3,0	+3,6	V
Supply current, I_{CC}		7		mA

Table 3. Power supply specifications

9.3 General Purpose I/O Specifications

GPIO Specifications	Min.	Typ.	Max.	Units
Input high voltage, V_{IH}	0,7xVcc		Vcc	V
Input low voltage, V_{IL}	GND		0,3xVcc	V
Output high voltage, V_{OH}	Vcc-0,4		Vcc	V
Output low voltage, V_{OL}	GND		0,4	V
Source current, I_{GPIO_OUT}	1	2	14 [1]	mA
Sink current, I_{GPIO_IN}	1	2	15 [1]	mA
Pull-up resistance, R_{PU}	11	13	16	kΩ
Pull-down resistance, R_{PD}	11	13	16	kΩ

Table 4. GPIO specifications

1) If required source/sink current in any GPIO pin is more than 4 mA, corresponding GPIO pin must be configured as high-drive.

10 Environmental Conditions

Environmental Conditions	Min.	Typ.	Max.	Units
Storage temperature	-40		+125	°C
Operating temperature, T_A	-25	+25	+85	°C
Relative humidity, storage			90	%
Relative humidity, operating			80	%

Table 5. Environmental conditions

11 Radio Characteristics

11.1 General Radio Characteristics

General Radio Characteristics	Min.	Typ.	Max.	Units
Operating frequencies, f_{OP}, 1 MHz chann. spacing	2402		2483	MHz
PLL programming resolution, PLL_{res}		1		MHz
Frequency deviation, Δf_{BLE}	±225	±250	±275	kHz
On-air data rate, bps_{FSK}	1000		2000	kbps
Maximum output power, P_{RF}		+4		dBm
Sensitivity, P_{SENS}	-89		-93	dBm

Table 6. General radio characteristics

12 Communication Interface Characteristics

12.1 Bit Rates

Bit Rates	Min.	Typ.	Max.	Units
Bit rate for SPI, f_{SPI}	0,125		8	Mbps
Bit rates for TWI, f_{2W}	100		400	kbps
Baud rate for UART, f_{UART}	1,2		1000	kbps

Table 9. UART specifications

12.2 SPI Timing Parameters
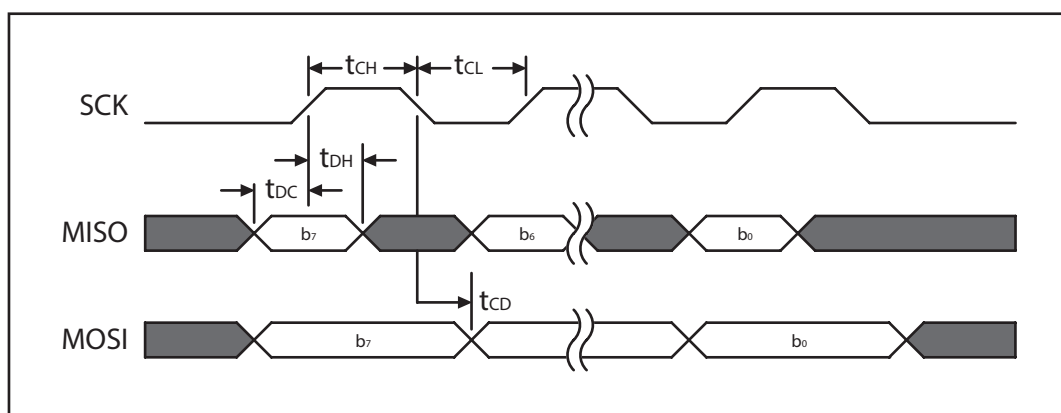
Picture 3. SPI timing diagram, one byte transmission, SPI mode 0

SPI Timing Parameters	Min.	Typ.	Max.	Units
Data to SCK setup, t_{DC}	10			ns
SCK to Data hold, t_{DH}	10			ns
SCK to Data valid, t_{CD}	60		80	ns
SCK High time, t_{CH}	40			ns
SCK Low time, t_{CL}	40			ns
SCK Frequency, f_{SCK}	0,125		8	MHz
SCK Rise and Fall time, t_R, t_F			100	ns

Table 11. SPI timing parameters

12.3 TWI Timing Parameters
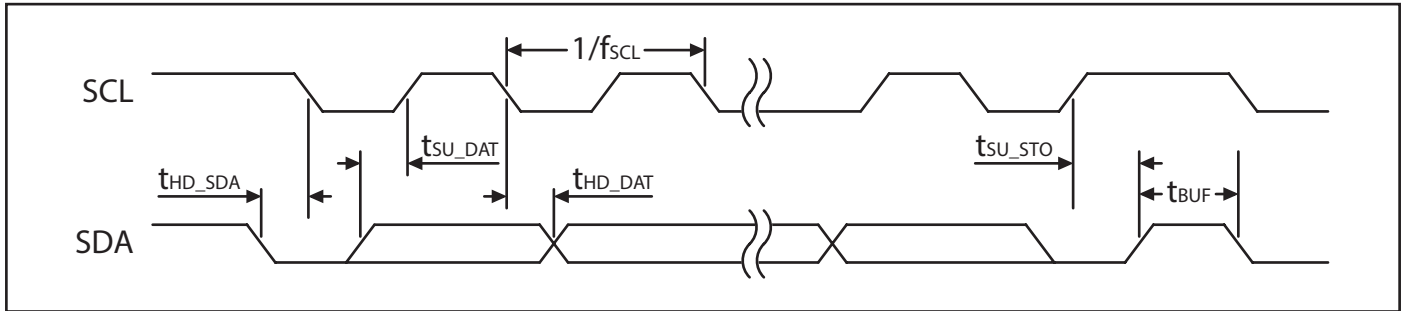
Picture 4. TWI SCL/SDA timing

TWI Timing Parameters	Standard		Fast		Units
	Min.	Max.	Min.	Max.	
SCL clock frequency, f_{SCL}		100		400	kHz
Hold time for START and repeated START condition, t_{HD_STA}	5200		1300		ns
Data setup time before positive edge on SCL, t_{SU_DAT}	300		300		ns
Data hold time after negative edge on SCL, t_{HD_DAT}	300		300		ns
Setup time from SCL goes high to STOP condition, t_{SU_STO}	5200		1300		ns
Bus free time between STOP and START conditions, t_{BUF}	4700		1300		ns

Table 13. TWI timing parameters

13 PWM Specifications

PWM Specifications	Min.	Typ.	Max.	Units
PWM frequency, f_{PWM}			40	kHz
PWM high output voltage, V_{PWM_H}	V_{CC}-0,4		V_{CC}	V
PWM low output voltage, V_{PWM_L}	GND		0,4	V
PWM sink/source current, I_{PWM}		2	14 [1]	mA
PWM resolution	400		1600	steps
PWM resolution @ f_{PWM} 10 kHz			1600	steps
PWM resolution @ f_{PWM} 20 kHz			800	steps
PWM resolution @ f_{PWM} 40 kHz			400	steps

Table 16. PWM specifications

[1] If required source/sink current in any GPIO pin is more than 4 mA, corresponding GPIO pin must be configured as high-drive.

14 Application Information

14.1 Smart Switching

Casambi has developed a solution for controlling lighting with only a traditional on/off wall switch. By default, the wall switch can be used to dim the lights, but different settings can be selected from Casambi App, such as selecting a pre-set mode. With Smart Switching feature, multiple lights can be controlled from a single switch. Smart Switching feature is used by flicking the wall switch quickly off and on.

Smart Switching is a function which requires an external electrolytic bypass capacitor and a power-on detection circuitry to work. The external electrolytic capacitor is needed to supply the necessary operating voltage for the module during power-off stage. It can be either an external capacitor just for the CBM-002A/B, or it can be a part of a larger power supply on the host board. If the capacitor is dedicated just for the CBM-002A/B, the minimum required capacitance is 1200 µF. It is advisable to connect the capacitor before any voltage regulation for larger voltage drop.

Even if Smart Switching feature is not used, the correct use of CBM-002A/B still requires the power-on detection and the external capacitor. These are needed so that the module can inform Casambi network when its power is cut off. The external capacitor will provide power to the module a short time after the power has been switched off. A suitable time for Smart Switching is 1,5 seconds and without Smart Switching 0,5 seconds. The external capacitor will have to be sized according to these requirements.

It is a good practice to use a capacitor with temperature range up to 105°C.
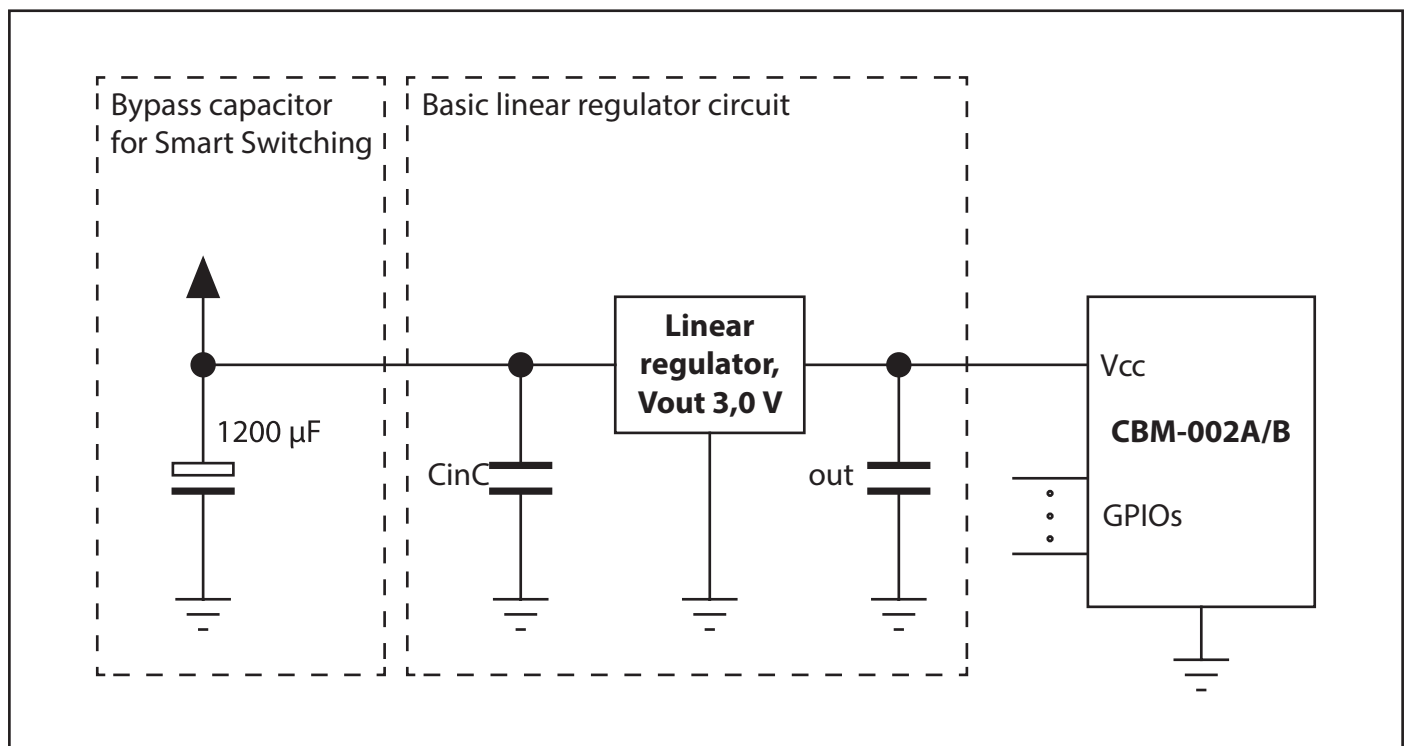
Picture 7. Powering CBM-002A/B with an external capacitor for Smart Switching

14.2 Power-On Detection

In order to operate correctly, the Casambi network will have to know if the power has been switched off from some unit. For this reason, the unit will have to know when its power has been switched off. This is done by a power-on detection together with an external capacitor (see previous chapter).

In case of CBM-002A/B the power-on detection is a signal that is connected to any GPIO pin. The signal can be one of the following four types:

- constant high signal when power is present, low signal when power is absent
- constant low signal when power is present, high signal when power is absent
- 50/60/100/120 Hz square wave signal when power is present, constant low signal when power is absent
- 50/60/100/120 Hz square wave signal when power is present, constant high signal when power is absent

The power-on signal can be derived from either DC voltage or AC mains voltage. If the host application is mains powered, so called Zero Detect circuitry shall be designed. The Zero Detect circuitry is connected to mains voltage and it detects when the voltage crosses the zero point. This information is needed to determine when the wall switch has been switched off and when it is switched back on. In mains voltage powered application, CBM-002A/B requires one or two Zero Detect pulses on each mains cycle, so the mains voltage can be half- or full-wave rectified. Also the use of a schmitt trigger is strongly advised in order to get clean pulses.

No application schematics of the Zero Detect circuitry is provided on this datasheet. This is because the application and the surrounding electronics may vary greatly which makes it impossible to provide a solution that works on every application. The designer of the host system will have to design a suitable Zero Detect circuitry. If the host system power supply is isolated, the Zero Detect signal will have to be isolated as well. Extreme caution will have to be used when working with Zero Detect since potentially lethal mains voltages are involved.

The voltage level of the Zero Detect signal will have to be suitable for CBM-002A/B. Zero Detect signal can be connected to any free GPIO pin on CBM-002A/B.

Use of the external capacitor and Zero Detect circuitry is strongly advised. In addition to Smart Wall Switch feature they enable faster response to the power-off condition. When the mains voltage is cut out from the device with CBM-002A/B, the capacitor supplies enough power for the module to send status update to the network. This way the status of the module is immediately updated to offline on the Casambi application.

If the external capacitor and Zero Detect circuitry is omitted, the module will have to send status information to the network periodically which causes a delay to the status update on the application as well as unnecessary traffic on the network.

14.3 Antenna Versions

CBM-002A/B is available in two different antenna versions. CBM-002A is equipped with an on-board SMD chip antenna and CBM-002B is equipped with a 1/4 wavelength dipole antenna. Usually CBM-002B offers better range, but CBM-002A is more compact solution.

CBM-002B is delivered with the antenna detached, so the antenna will have to be soldered in place before taking the module into use. This is because the antenna can be soldered in vertical or horizontal position. The host device application determines which antenna orientation is more suitable. Read 14.5 CBM-002B Antenna for more information.
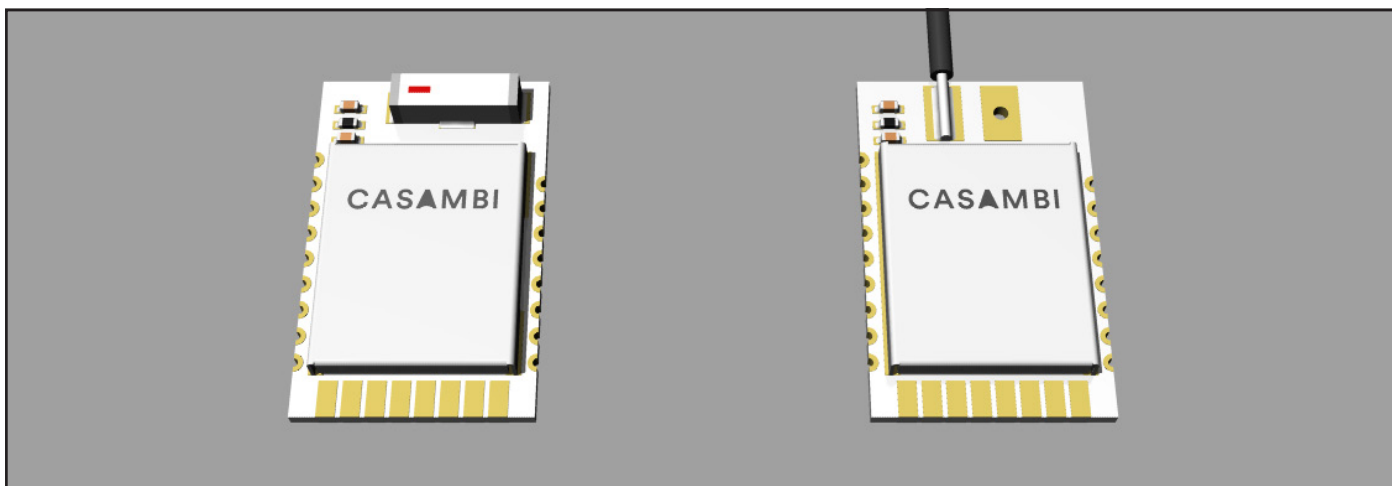
Picture 7. CBM-002A on left and CBM-002B on right

14.3.1 CBM-002B Antenna

CBM-002B is delivered with the antenna detached. The antenna is a 27 mm long single strand copper wire and it can be soldered in horizontal or vertical orientation, depending on the best suitability for the host application.

The antenna can be bent to fit the host application better. However, there are some guidelines that need to be taken into consideration.

1. Make sure that antenna is not in contact with any kind of metal.
2. The antenna should be places as far away from any metal structures as possible.
3. The tip of the antenna is especially sensitive for close by metals.
4. The less bending is done on the antenna, the smaller impact it haves on the range.
4. Do not use any other kind of antenna, or do not cut or otherwise modify the delivered antenna.

The antenna is soldered onto the left side solder pad (the pad closer to the antenna matching components). When soldering the antenna in horizontal position, for correct operation, place the antenna so that it fills the whole length of the soldering pad. This way the antenna extents over the edge of the module by 23,5-24,0 mm.

When the antenna is soldered in vertical position, solder it so that the antenna rises 23,5-24,0 mm over the PCB surface. Cut the antenna wire from the bottom side to the desired length. This cutting does not affect the performance or approvals.

Important!
CBM-002B has been certified with the supplied antenna and modifying it beyond the instructions given in this datasheet will void the certification.
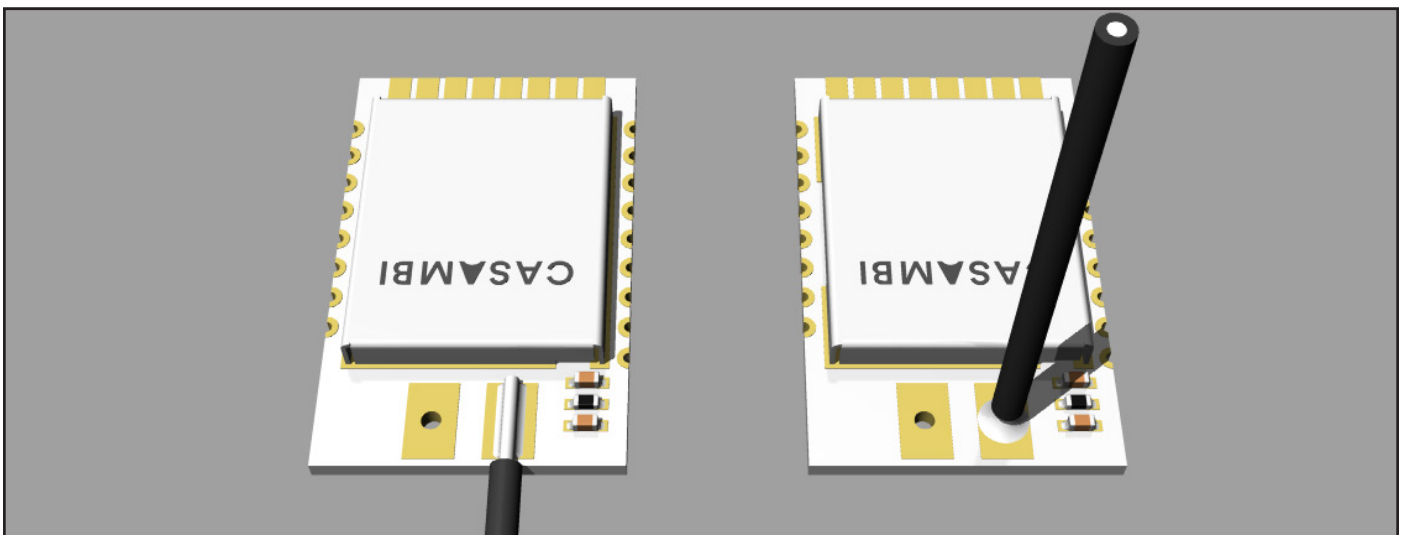
Picture 9. Soldered CBM-002B antennas.

14.4 Mounting

CBM-002A/B has two sets of soldering pads, which allow it to be mounted both in horizontal and vertical position. In some application, such as LED drivers, there are large components which could affect the antenna performance greatly if the module is mounted at the bottom of the device horizontally on the main PCB. Also, horizontally mounted module has much larger footprint compared to vertically mounted module.

For such cases the module can be mounted in vertical position, either by soldering it to a 1,27 mm pitch 2-row pin header, or by soldering the module directly into a routed slot on the main PCB.

When mounted in horizontal position there will have to be two keep-out areas; one for the antenna area and one for the unused pads used for vertical assembly.

14.4.1 Horizontal Mounting

When CBM-002A/B is mounted in a horizontal position it is soldered in by using the soldering pads on both long sides of the module. The soldering pads are designed so that the module can be both hand and reflow soldered.

When mounted in a horizontal position, there are two mandatory keep-out areas involved. One is for antenna and the other is for bottom side soldering pads at the narrow end of the module. These pads are used for vertical assembly.

For the CBM-002A, the antenna keep-out applies to all layers of the mother board. There shall not be any components, traces, pads or copper areas in any layer within the keep-out area. The same applies to other metals as well, such as the enclosure of the product, fixing screws, etc.

The keep-out area for the soldering pads applies only to the outer surface of the mother board.
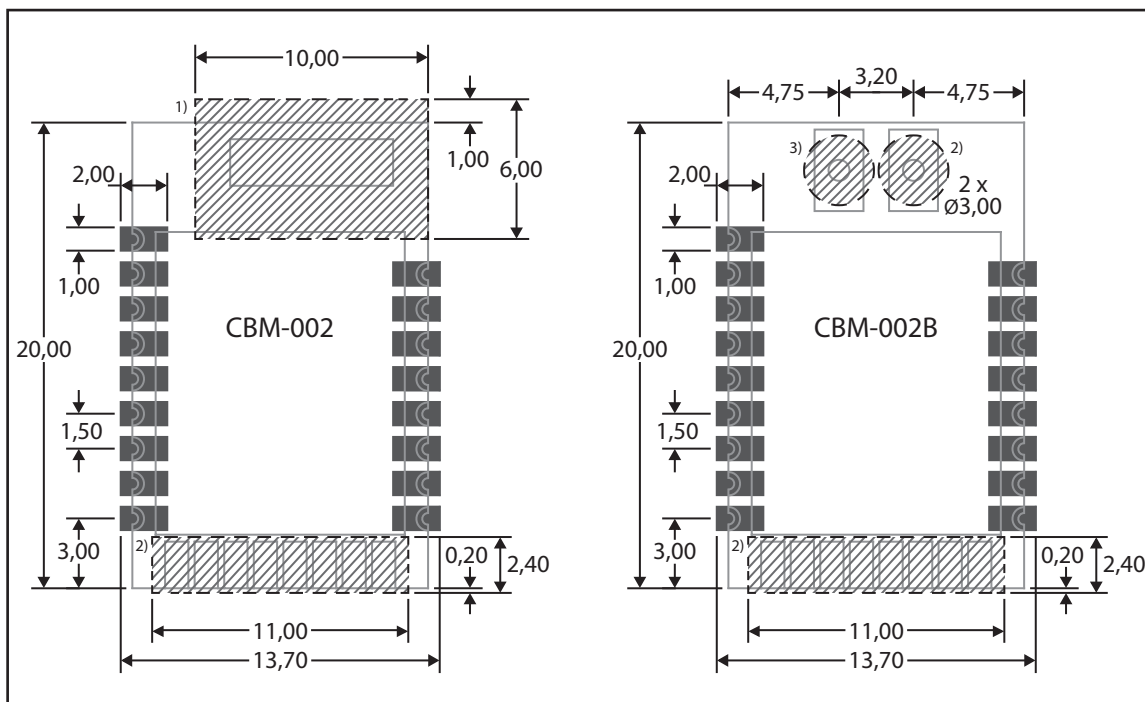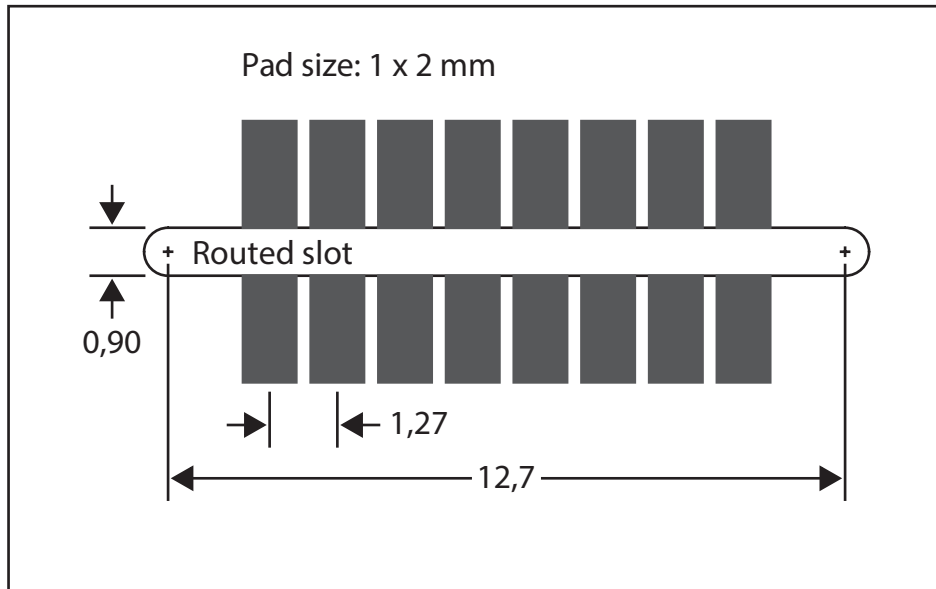

Picture 9. Recommended land pattern for horizontal assembly and required keep-out areas

1) This keep-out area will have to be kept clear from any parts, traces and copper on all layers.
2) This keep-out area applies only to the layer closest to the module.
3) If CBM-002B antenna is soldered vertically, this keep-out area will have to be a hole. Otherwise keep-out area applies only to the layer closest to the module.

14.4.2 Vertical Mounting

CBM-002A/B can be mounted in vertical position by using the soldering pads on the narrow end of the module. There are two methods of soldering the module in vertical position. It can be either soldered between pin rows of a 2-row 1,27 mm pin header (2 x 8P) or it can be soldered in a 0,9 mm slot routed on the main board with soldering pads at the edge of the slot. The thickness of the module printed circuit board is 0,85 mm.

Picture 11. Suggested land pattern for vertical mounting in a slot

15 Mechanical Specifications
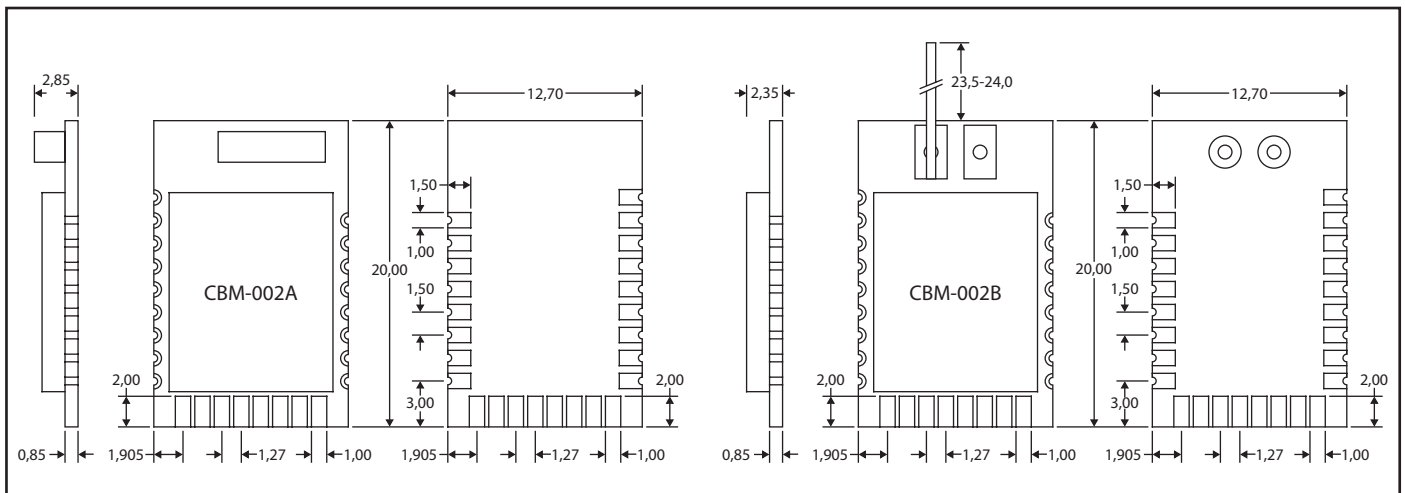
Picture 14. Mechanical dimensions

16 Soldering

16.1 Leaded Reflow Soldering
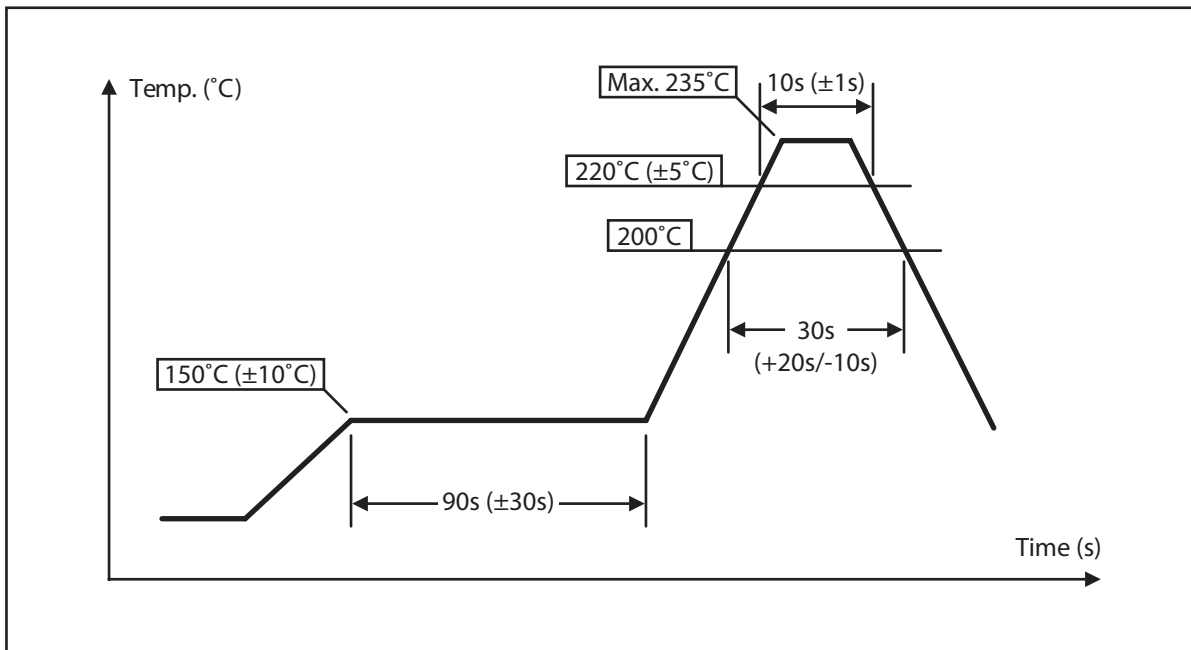
Picture 12. Recommended temperature profile for leaded reflow soldering

16.2 Leadfree Reflow Soldering

Picture 13. Recommended temperature profile for leadfree reflow soldering

Maximum number of reflow cycles: 2
Opposite side reflow is prohibited due to the module's weight. (i.e. you must not place the module on the bottom / underside of your PCB and reflow).

16.3 Hand Soldering
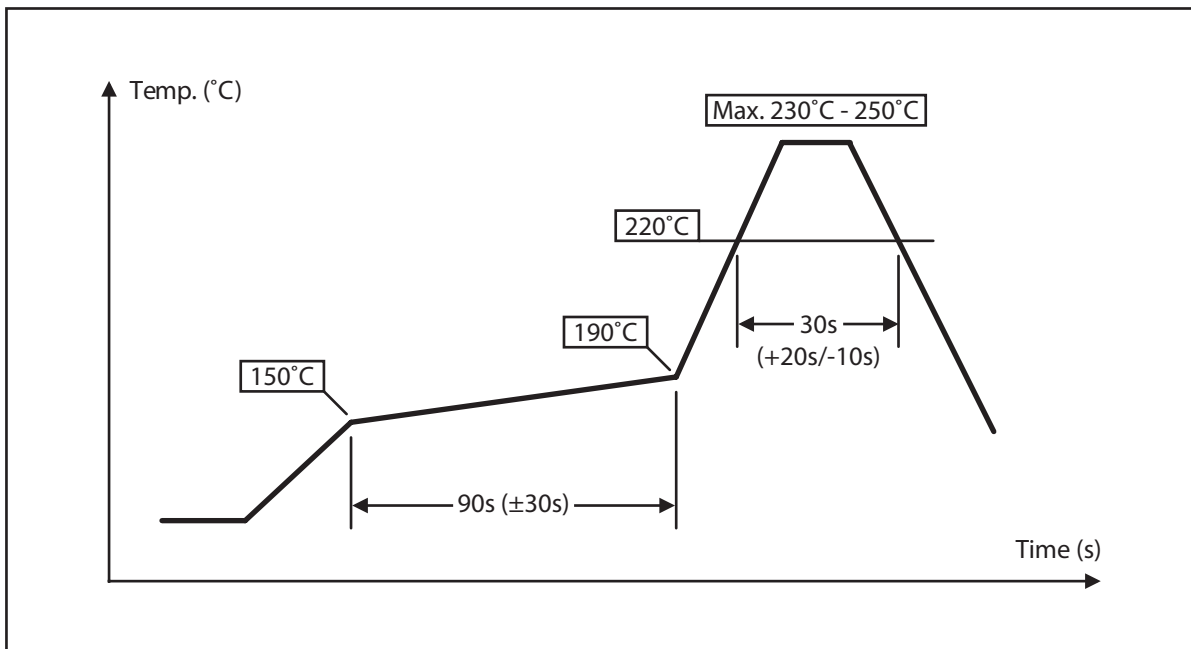
Hand soldering is possible. When using a soldering iron, follow IPC recommendations (reference document IPC-7711).

16.4 Rework

The module can be unsoldered from the host board. Use of a hot air rework tool should be programmable and the solder joint and module should not exceed the maximum peak reflow temperature of 250°C.

If temperature ramps exceed the reflow temperature profile, module and component damage may occur due to thermal shock. Avoid overheating. Never attempt a rework on the module itself, (e.g. replacing individual components).

16.5 Cleaning

In general, cleaning the populated modules is strongly discouraged. Residuals under the module cannot be easily removed with any cleaning process. Use of "No Clean" soldering paste is strongly recommended, as it does not require cleaning after the soldering process.

17 Compliance Information

Compliance Information		
Radio	USA (not yet approved)	FCC Part 15 Subpart C
	FCC ID (CBM-002A):	2ALA3-CBM002A
	FCC ID (CBM-002B):	2ALA3-CBM002B
	Canada (not yet appr.)	RSS-247
	IC (CBM-002A):	22496-CBM002A
	IC (CBM-002B):	22496-CBM002B
	Europe	ETSI EN 300 328 v2.1.1
Environmental	RoHS	RoHS compilant
	REACH	REACH compilant

Table 18. Compliance information

17.1 Federal Communications Commission (FCC) Statement

Compliance Statement
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.

Warning
Changes or modifications not expressly approved by Casambi Technologies Oy could void the user's authority to operate the equipment.

FCC Interference Statement
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 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.

It is the host manufacturer's responsibility to ensure continued compliance with FCC requirements once the module has been installed in to the host product.

17.2 Innovation, Scientific and Economic Development Canada (ISED) Statement

Radiation Exposure Statement for Canada
This device complies with Industry Canada's licence-exempt RSSs. 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.

This equipment is exempt from the routine RF exposure evaluation requirements of RSS-102. This equipment should be installed and operated with a minimum distance of 20 cm between the antenna and the user or bystanders.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

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

Ce matériel n'est pas sujet à l'évaluation habituelle d'exposition RF selon RSS102. Ce matériel devrait être installé et exploité en gardant une distance minimale de 20 cm entre l'antenne et l'utilisateur ou les spectateurs.

Antenna Warning
CBM-002B radio transmitter has been approved by ISED to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

L'émetteur radio CBM-002B est approuvé par les indicateurs du développement énergétique durable pour fonctionner avec les types d'antennes énumérés ci-dessous avec la valeur maximale de gain autorisée indiquée. L'utilisation des types d'antennes exclus de cette liste, ayant un gain plus élevé que la valeur maximale de gain indiquée pour le type en question, est strictement interdite avec cet appareil.

> **Approved antenna:**
> 27 mm long solid copper wire with conductor diameter of 0,6 mm soldered in place according to the instruction given in this document (see chapter 14.4.1 CBM-002B Antenna). Maximum permissible antenna gain is 2,0 dBi.
>
> Le fil de cuivre 27 mm de long avec un diamètre conducteur de 0,6 mm soudé en place conformément aux instructions contenues dans ce document (voir chapitre 14.4.1 Antenne CBM-002B). Valeur maximale permise pour gain d'antenne est de 2,0 dBi.

Under ISED regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by ISED. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Sous les règlements des indicateurs du développement énergétique durable, cet émetteur radio peut seulement fonctionner en utilisant un type d'antenne avec une valeur maximale (ou moindre) de gain approuvée pour l'émetteur par les indicateurs du développement énergétique durable. Afin de réduire la possible interférence radio avec les autres utilisateurs, le type d'antenne et son gain doivent être sélectionnés afin que la puissance isotrope rayonnée équivalente ne soit pas supérieure à ce qui est nécessaire pour une communication réussie.

End Product Labeling

CBM-002 has been labeled with its own FCC ID and IC Certification Number. The end product manufacturer must ensure that FCC and ISED labeling requirements are met. If the FCC ID and IC Certification Number of CBM-002 are not visible when the module is installed inside another device, then the device must have a clearly visible label containing the following information:

CBM-002 a été identifié avec son propre numéro d'identification de la FCC ainsi que son numéro de certification IC. Le fabricant du produit final doit assurer que les obligations d'identification de la FCC et des indicateurs du développement énergétique durable soient satisfaites. Si le numéro d'identification de la FCC et le numéro de certification IC pour CBM-002 ne sont pas visibles lors de l'installation du module dans un autre appareil, une étiquette claire et visible avec les informations ci-après devra alors être apposée sur l'appareil:

CBM-002A:

> Contains FCC ID: 2ALA3-CBM002A
> Contains IC: 22496-CBM002A

CBM-002B:

> Contains FCC ID: 2ALA3-CBM002B
> Contains IC: 22496-CBM002B

It is the host manufacturer's responsibility to ensure continued compliance with ISED Canada requirements once the module has been installed in to the host product.

It is the host manufacturer's responsibility to ensure continued compliance with ISED Canada requirements once the module has been installed in to the host product.

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End Product User Manual

User manual for end product with CBM-002A or CBM-002B module inside shall contain the following or equivalent notice in a conspicuous location in the user manual or alternatively on the device or both:

Le mode d'emploi pour le produit fini avec le module CBM-002A ou CBM-002B installé devra contenir les informations ci-après ou un avis équivalent dans un endroit bien en vue du mode d'emploi ou, alternativement, sur l'appareil, ou aux deux endroits:

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.

This device complies with Industry Canada's license-exempt RSSs. Operation is subject to the following two conditions:

(1) This device may not cause interference; and
(2) This device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

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

17.3 CE Declaration of Conformity

Hereby, Casambi Technologies Oy declares that the radio equipment types CBM-002A and CBM-002B are in compliance with Directive 2014/53/EU.

The full text of the EU declaration of conformity is available at the following internet address:

https://casambi.com/static/datasheets/CBM-002-DoC.pdf

CE Regulatory Information
When integrating a radio module into an end product the integrator becomes the manufacturer of the final product and is therefore responsible for demonstrating compliance of the final product with the essential requirements of the Radio Equipment Directive (RED).

Some additional certification processes are required before placing the product on the market in EU member states to make the end product fully comply with relative EU standards.