



CMB100

Hardware Design Guide

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1 Applicability Table

Table 1: Applicability Table

Name	Product Variant	Part Number
CMB100A0-WW	LTE CAT4 + 3G + 2G	CMB100A0WW101B0200
CMB100B0-WW	LTE CAT1bis	CMB100B0WW101B0100
CMB100B1-WW	LTE CAT1bis GNSS	CMB100B1WW101B0100
CMB100C0-WW	LTE CATM1 +2G	CMB100C0WW101B0200
CMB100D0-WW	5G NR RED CAP	CMB100D0WW101B0100

Table 2: Reference Documents Table

Title	Reference
LE910Cx AT Command Guide	80502ST10950A
LE910Q1-WWG AT Command Guide	80798ST11194A
ME910G1-WW AT Command Guide	80617ST10991A
CMB100 Dev Kit Schematics	CS2300- Electric Diagrams.pdf
ME910G1 HW Design Guide	1VV0301593
LE910Cx HW Design Guide	1VV0301298
LE910Q1 HW Design Guide	1VV0301940
ME910 PSM Application Note	80617NT11830A

2 Introduction

2.1 Scope

This document introduces the CMB100 pre-certified module board and presents possible and recommended hardware solutions for the development of a product based on this application. All the features and solutions described in this document apply to all CMB100 variants listed in the applicability table.

This document cannot include every hardware solution or every product that can be designed. Where the suggested hardware configurations are not to be considered mandatory, the information provided should be used as a guide and starting point for the proper development of the product with the Telit module.

2.2 Audience

This document is intended for system integrators that are using the CMB100 pre-certified module board in their final products.

2.3 Contact Information, Support

For technical support and general questions, e-mail:

- TS-SOLUTIONS@telit.com

Alternatively, use: <https://www.telit.com/contact-us/>

For Product information and technical documents, visit: <https://www.telit.com>

2.4 Conventions

Note: Provide advice and suggestions that may be useful when integrating the module.

Danger: This information MUST be followed, or catastrophic equipment failure or personal injury may occur.

Warning: Alerts the user on important steps about the module integration.

All dates are in ISO 8601 format, that is YYYY-MM-DD.

2.5 Terms and Conditions

Refer to <https://www.telit.com/hardware-terms-conditions/>.

2.6 Disclaimer

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3 General Product Description

3.1 Overview

The CMB100 pre-certified module board is an application board that allows integrators to plan on availability for even the longest lifecycle applications, highly recommended for new designs specified for worldwide coverage.

In particular we offer three variants for this product:

- CMB100A0-WW → CAT4
- CMB100B0-WW → CAT1bis no GNSS
- CMB100B1-WW → CAT1bis with GNSS
- CMB100C0-WW → CATM1

The three variants are intended to cover any possible data stream need, from the CAT1bis to CATM1 and CAT4 for more high data exchange capabilities for final data application as metering, fleet tracking (thanks to the high precision GNSS embedded), fleet monitoring management.

All CMB100 variants include a buck-boost converter, thus extending power supply range from 1.8V to 5.5V. Their GPIOs and digital control signals operate at a adjustable voltage between 1.1 V and 3.6 V (see VIO on table 4), thus improving flexibility at user-application side, avoiding the need of level converter, optimizing power consumption and making it more suitable for applications with battery-powered devices.

3.2 Product Variants and Frequency Bands

Depending on the variant there are different combinations available:

Table 3: Product Variants and their Frequency Bands

Product	2G Band (MHz)	3G	LTE-FDD	LTE-TDD	GNSS
CMB100A0-WW	B2, B3, B5, B8	B1,B2,B4,B5,B8	LTE CAT4: B1, B2, B3, B4, B5, B7, B8, B9, B12, B13, B14, B18, B19, B20, B25, B26, B28	-	GNSS (GPS-GLONASS-Galileo- BeiDou-QZSS/SBAS)
CMB100B0-WW	-	-	LTE CAT1bis: B1, B2, B3, B4, B5, B7, B8, B12, B13, B18, B19, B20, B2	LTE CAT1bis: B34, B38, B39, B40, B41	

Product	2G Band (MHz)	3G	LTE-FDD	LTE-TDD	GNSS
CMB100B1-WW			LTE CAT1bis: B1, B2, B3, B4, B5, B7, B8, B12, B13, B18, B19, B20, B2	LTE CAT1bis: B34, B38, B39, B40, B41	GNSS (GPS-GLONASS-Galileo-BeiDou-QZSS/SBAS)
CMB100C0-WW	B2, B3, B5, B8	-	LTE CATM1: B1, B2, B3, B4, B5, B8, B12, B13, B18, B19, B20, B25, B26, B27, B28, B66, B71, B85	-	GNSS (GPS-GLONASS-Galileo-BeiDou-QZSS/SBAS)

For details information about frequencies and bands, refer to the [RF Section](#).

Note: Cellular technologies and frequency bands that are enabled may vary based on the firmware version and firmware configuration used.

3.3 Main Features

Table 4: Functional Features

Function	Features		
	CMB100A0	CMB100B0/B1	CMB100C0
Modem	- FDD, TDD LTE CAT4 @150Mbps (DL) and 50Mbps (UL) - WCDMA up to DC HSPA+, Rel.9	FDD, TDD LTE CAT1 bis @10Mbps (DL) and 5Mbps (UL)	- FDD, TDD LTE CATM1 @1Mbps (DL) and 588Kbps (UL) - SMS support (text and PDU) - Quad Band 2G
GNSS	State-of-the-art GNSS solution with GPS/GLONASS/Galileo/BeiDou/ QZSS/SBAS receiver		
Processor (Used for internal modem implementation)	- ARM Cortex A7 up to 1.3 GHz 256 KB L2 cache	- Arm Cortex-M3 up to 204 MHz 16 KB cache	- Arm Cortex-A7 up to 800 MHz 256 KB L2 cache
Interfaces	3xU.FL connectors: 2xcellular (MAIN+ DIV) + 1xGNSS 4FF Nano SIM card holder 1X 20-PIN header (Power supply, USB, UART, emergency reset, on-off, modem is on, 2x GPIO)		

3.4 Mechanical Specifications

3.4.1 Dimensions

The overall nominal dimensions of all three CMB100 versions are the same,

- Length: 36 mm
- Width: 30 mm
- Thickness: 11 mm (with pin header), 5.1 (w/o pin header)

3.4.2 Weight

The nominal weight of the CM100A0 is 10grams.

The nominal weight of the CM100B0 is 8 grams.

The nominal weight of the CM100C0 is 9 grams.

4 Pins Allocation

4.1 Pin-out

Table 5: Pin-out Information

Pin	Signal	I/O ⁽¹⁾	Characteristic	Function	Type	Comment
1	nRST_OUT	O	Open Collector Output	Application MCU SW reset		Leave open if unused
2	GND	PWR	PWR_GND	GND		Connect to GND
3	CTS_HOST	O	Low impedance output	UART OUTPUT FOR CTS TO DTE	CMOS @VIO	Leave open if unused Recommended to connect
4	DTR_HOST	I	PU (Active Low)	UART INPUT FOR DTR FROM DTE	CMOS @VIO	Leave open if unused
5	MDM_IsOn	O	Low impedance output	MODEM READY Indicator	CMOS @VIO	Leave open if unused
6	USB_D_N	I/O	USB negative differential	USB D-		Leave open if unused
7	VIO	PWR	GPIO/UART Power supply domain.	Input Output Reference Voltage		CMOS @VIO voltage supply: 1.1 V – 3.6 V. Recommended to connect
8	USB_D_P	I/O	USB positive differential	USB D+		Leave open if unused
9	GND	PWR	PWR_GND	GND		Connect to GND
10	VUSB	PWR	USB power sense	USB POWER IN		5V V _{USB} Leave open if unused
11	RTS_HOST	I	PU (Active Low)	UART INPUT FOR RTS FROM DTE	CMOS @VIO	Leave open if unused. Recommended to connect

Pin	Signal	I/O ⁽¹⁾	Characteristic	Function	Type	Comment
12	EM_OFF	I	PD (Active high)	EMERGENCY MODEM HW RESET	CMOS @VIO	Leave open if unused Recommended to connect.
13	IO1_HOSTI	I/O	PD/PU (customizable via AT command)	GPIO	CMOS @VIO	Leave open if unused
14	BOOT_HOST	O	Low impedance output (Active high)	Application MCU FORCE BOOT	CMOS @VIO	Leave open if unused
15	RING_HOST	O	Low impedance output (Active low)	OUTPUT FOR RING TO DTE	CMOS @VIO	Leave open if unused
16	TXD_HOST	I	PU (Active Low)	UART DATA INPUT (TXD) FROM DTE	CMOS @VIO	Leave open if unused. Recommended to connect
17	IO2_HOST	I/O	PD/PU (customizable via AT command)	GPIO	CMOS @VIO	Leave open if unused
18	RXD_HOST	O	Low impedance output (Active low)	UART DATA OUTPUT (RXD) TO DTE	CMOS @VIO	Leave open if unused. Recommended to connect
19	pOnOff	I	PD (Active high)	POWER ON/OFF		Leave open if unused. Recommended to connect
20	VIN	PWR		POWER SUPPLY IN		Main power supply: 1.8V to 5.5V

The direction of the inputs and outputs in the table indicates the flow from the CMB100 to the user application.

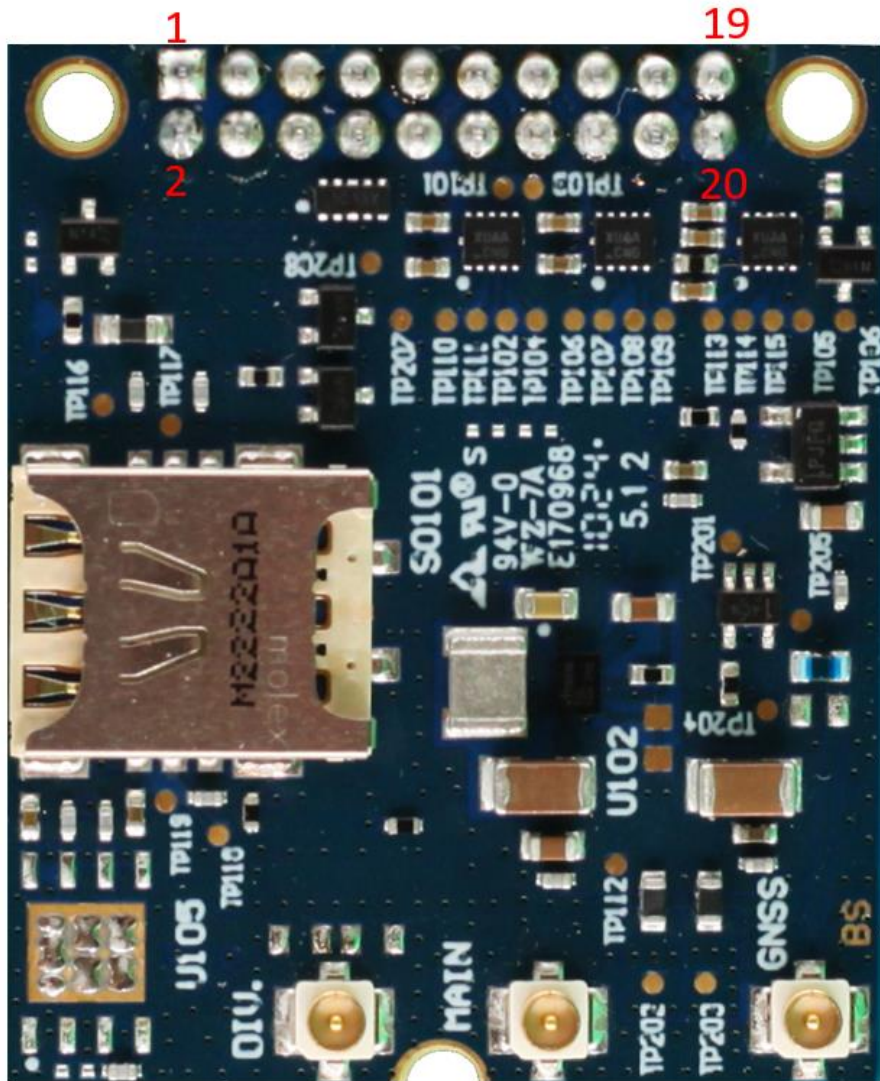


Figure 1 CMB100XX Pin Numbering

5 Power Supply

The power supply circuitry and the board layout are a fundamental part of the full product design and they strongly impact on the product's overall performance, so the following guidelines should be read carefully for a proper design.

The CMB100 has been designed with a onboard DC-DC capable to process any voltage in the range between 1.8-5.5V and grant proper current and voltage condition to the on board module for operating properly.

Note: On the Cat4 version, that support 3G and 2G fallback, to properly support 2G mode especially on bands B5 and B8, since the transmission on those bands requires high current we recommend to providing an input source above 2.8V. A lower voltage might limit the performance on 2G.

5.1 Power Supply Requirements

The CMB100 requires two power supply sources:

- 1 **VIN:** Main power supply
- 2 **VIO:** Reference IO logic level voltage setting for all *CMOS @VIO* type signals as per Table 4

The VIN power supply must be connected to connector pin 20 and must fulfil the following requirements:

Table 6: VIN Power Supply Requirements

VIN Power Supply	Value
Nominal Supply Voltage	3.8V
Standard Operating Voltage Range	2.6 V – 5.5 V
Extended ⁽¹⁾ Operating Voltage Range	1.8 V – 5.5 V
Standard Operating Current	1A (recommended)
Extended ⁽¹⁾ Operating Current	2A (full functionally and 2G fallback support) *

In the 1.8V to 2.6V supply range GSM operation mode is not supported. * Let's add in the text something like:

" Please use an appropriate power supply which is able to provide enough current. For full functionality 2A is recommended. Depending if 2G will be deactivated and/ or more capacitance are used in the design to minimize the periodic maximum peaks, the current demand can be optimized. For CAT M1 only use we recommend a minimum of 1A."

Note:

- The Operating nor the Extended Voltage Range MUST never be exceeded; the application's power supply section must be designed with care to avoid excessive voltage drops on supplying lines
- A voltage drop below the lower range limits may cause an unintentional CMB100 power off

Table 7: VIO Reference Logic Level for CMOS @VIO type signals

VIO Power Supply	Value
Typical	3.3V
Operating Voltage Range	1.1 V – 3.6 V
Typical Operating Current (@3.3V)	1.8 mA dynamic output current *, 10uA during Idle

*Typical dynamic output current period is around 3nS.

5.2 Power Consumption

Table8 provides general current consumption for the CMB100 at different input voltage levels and different user modes. GNSS current is listed as an adder to the overall current if/when enabled. The use of an active GNSS antenna will also impact the overall current draw. It should be measured in application for the specific active antenna being used.

Table 8: Operating Current

Idle Current (mA) CFUN=1	1.8VDC/2.5VDC	3.8VDC	5.5VDC
CMB100A0	87 mA	32 mA	22mA
CMB100B0	85 mA	30 mA	21 mA
CMB100B1	86mA	32 mA	23 mA
CMB100C0	80mA	29 mA	20mA
CMB100D0	TBD	TBD	TBD
Idle Current (mA) CFUN=4	1.8VDC	3.8VDC	5.5VDC
CMB100A0	81 mA	30mA	20 mA
CMB100B0	75mA	29mA	20mA
CMB100B1	75mA	29mA	20mA
CMB100C0	70mA	25mA	18mA
CMB100D0	TBD	TBD	TBD
Avg. Tx Current (mA) (Max Pwr)			
CMB100A0	1.2A @ 2.5V*	750 mA	530 mA
CMB100B0	902mA @ 2.5V*	564mA	397mA

Idle Current (mA) CFUN=1	1.8VDC/2.5VDC	3.8VDC	5.5VDC
CMB100B1	902mA @ 2.5V*	564mA	397mA
CMB100C0	672 mA @2.5V*	430 mA	250mA
CMB100D0	TBD	TBD	TBD
Pk Tx Current (mA)			
CMB100A0	1302mA	769mA	539mA
CMB100B0	916mA	570mA	404mA
CMB100B1	916mA	570mA	404mA
CMB100C0	827mA	502mA	381mA
CMB100D0	TBD	TBD	TBD
Avg GNSS Current (mA) - Acquisition	1.8V	3.8V	5V
CMB100A0	120mA	65mA	43mA
CMB100B0	N/A	N/A	N/A
CMB100B1	125mA	65mA	65mA
CMB100C0	165mA	75mA	78mA
Avg GNSS Current (mA) Navigation			
CMB100A0	90mA	40mA	30mA
CMB100B0	N/A	N/A	N/A
CMB100B1	90mA	40mA	30mA
CMB100C0	145mA	63mA	45mA
CMB100D0	TBD	TBD	TBD

***For GNSS current measurement, when an active antenna is used you have to consider 10mA more due to internal LNA.**

Note: More detailed power consumption can be found in the HW Design Guide for each specific Module.

Active GNSS antenna current data based on part number 2J4301MPGFthe draws 9 mA

5.3 General Design Rule

The main guidelines for the Power Supply Design include three different design steps:

- The electrical design of the power supply
- The PCB layout
- The thermal design

5.3.1 Electrical Design Guidelines

The input power supply electrical design is extremely important.

Let's consider three different cases:

- Power supply voltage falling in the Standard or Extended Power Supply Range
- Power supply voltage exceeding Standard or Extended Power Supply Range
- Power supply from a Li-Ion battery

5.3.1.1 Power supply in Standard or Extended Range Design Guidelines

- Optional Input filtering of high frequency noise at the input power pin (20) can be implemented using a BLM with a min. 3A rating is recommended. This can be bypassed if not needed in the application board.
- Low ESR bypass capacitors close to the input power pin (20) with adequate capacity should be provided to cut the current absorption peaks close to the CMB100. The recommended total capacitance is 100 μ F.
- In case of 2G the capacitance value need to be sized in relation to power supply lines length\thickness.
- Ensure the low ESR capacitors on the power supply output have a rating of at least 10V.

See schematic below:

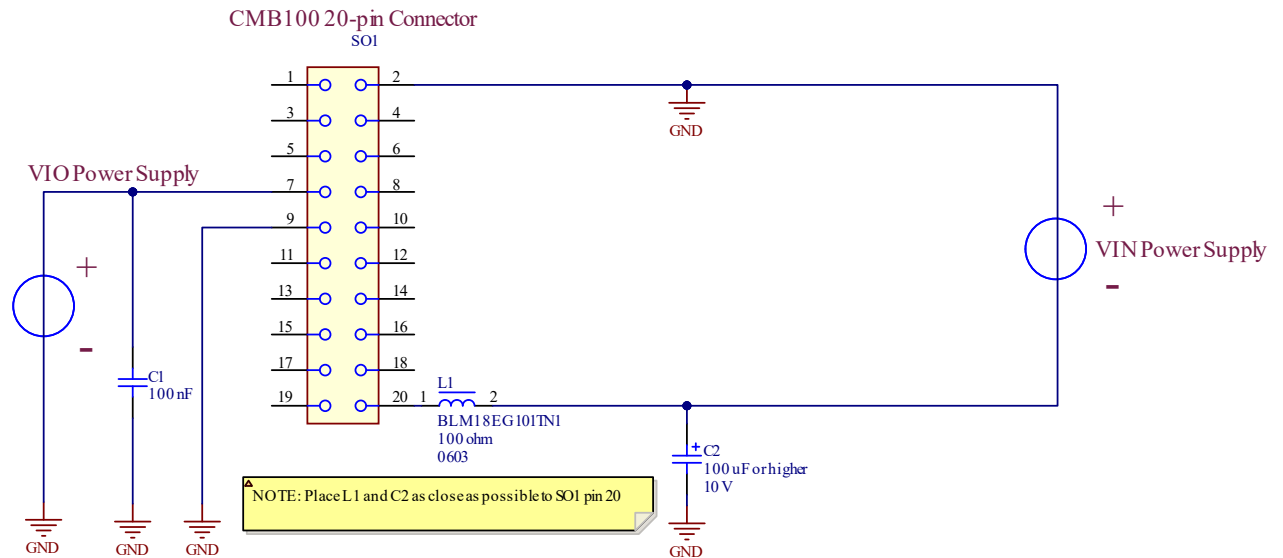


Figure 2: Recommended CMB100 power supplies guideline

5.3.1.2 Power supply beyond Standard or Extended Range Design Guidelines: 5.5V to 36V example

- Due to the potentially large difference between the system power supply voltage and the maximum CMB100 input voltage, a linear regulator is not recommended. A switching power supply is preferable because of its higher efficiency.
- When using a switching regulator, its switching frequency should be at least 500kHz, thus improving its transient response and requiring a smaller inductor size. This allows the regulator to efficiently respond to peak current absorption.
- Both the switching frequency and regulator design selection need to take the end design requirements into account since the switching frequency could also generate EMC interference.
- In case power is supplied by a car PB battery, its voltage can rise to 15.8V and this should be kept in mind during power circuit dimensioning: all components in the power supply must withstand that peak voltage value.
- For car applications, a spike protection diode should be inserted close to power input, clamping undesired supply spikes.

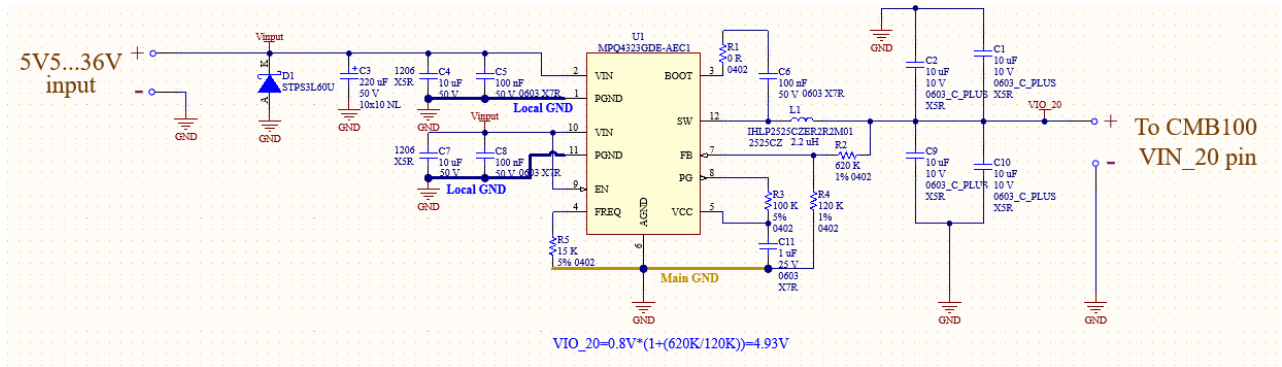


Figure 3: Example of Switching Regulator with 5V5 to 36V Input

5.3.1.3 Battery Source Power Supply Design Guidelines

The desired nominal power supply is 3.8V, so a single 3.7V Li-Ion cell battery type is suitable to supply power to the CMB100.

- Power line length between battery and CMB100 should be minimized.
- Low ESR bypass capacitors close to the input power pin (20) with adequate capacity should be provided to cut the current absorption peaks close to the CMB100. The recommended total capacitance is 100μF.
- Ensure the low ESR capacitors have a rating of at least 10V.
- A protection diode should be inserted close to the power input, to prevent CMB100 damage caused by power polarity inversion. Otherwise, the battery connector should be chosen to avoid polarity inversions when connecting the battery.
- The battery must be rated to supply peaks of current up to 0.8 A for LTE and 1.5 A for GSM.

Danger: DON'T CONNECT any Ni-Cd, Ni-MH, and Pb battery types directly to CMB100 due to possible overvoltage with consequent CMB100 possible damage. USE Li-Ion batteries ONLY.

5.3.2 Power Supply PCB Layout Guidelines

As recommended in the guidelines for the electrical design, the power supply should include a series of power BLM and low ESR capacitors on the VIN input to cut current peaks and to protect supply from spikes. The placement of these components is important for optimal performance.

- Connect a series power ferrite bead, e.g. Murata BLM18EG101TN1 or Taiyo Yuden P/N FBMH1608HM101, as close as possible to the VIN connector pin.

- Place low ESR bypass capacitors close to the series power BLM. In case of a switching power supply a second low ESR capacitor should be placed close to the application board DCDC inductor to cut the ripple, provided the PCB trace from the capacitor to the CMB100 (please check Figure 2) is wide enough to ensure a voltage drop less connection even during an 0.6 A (LTE) or 2A (GSM) current peak.
- A protection diode should be placed close to the input connector where the power source is drained.
- The PCB's traces from the input connector to the power regulator IC should be wide enough to ensure no voltage drops occur when a 2 A current peak is absorbed (especially in GSM mode).
- PCB power supply traces to the CMB100 must be wide and short enough to avoid significant voltage drops.
- To reduce DCDC switching EM noise, it is important to keep the inductor and both capacitors as close as possible to switching IC regulator.
- A dedicated ground for the switching regulator separated by the common ground plane is suggested. See for example **Local GND** net in Figure 2.

5.3.3 Thermal Design Guidelines

During prolonged data transfer, the CMB100 may experience significant heating. The worst case conditions tend to occur at long distances from a cell tower with the input voltage at the extremes as noted below:

- GSM maximum power transmission at both 2.6V and 5.5V cases
- UMTS maximum power transmission at both 1.8V and 5.5V cases
- LTE maximum power transmission at both 1.8V and 5.5V cases
- Supply voltage: both 1.8 V and 5.5 V cases.

The CMB100 is usually integrated into an enclosed end device. Sealed enclosures can limit airflow, leading to elevated internal temperatures. When designing with the CMB100, consider the deployment environment, the duration of module transmission, and any internal heating from other circuits. The cellular module on the CMB100 are equipped with thermal limiting circuits that will limit the RF performance (Mitigation) and shut down the module if overheating is detected. While this feature helps prevent permanent damage, it's important to implement strategies to manage thermal rise effectively:

- **Supply Voltage:** Whenever possible, provide a 3.8V input voltage to minimize thermal rise from the input regulator.
- **Ground Area:** Connect a larger ground area on your PCB to both GND pins 2 and 9 and VIN pin 20 of the CMB100.
- **Mounting:** Use metal standoffs and screws to mount the CMB100, which will enhance its thermal dissipation.

- **Thermal connectivity:** A possible way is to use a thermal pad between the host PCB and CMB100. Additionally, a heatsink can be used.

Finally, it is always recommended that thermal testing will be performed on the end device under the expected deployment conditions to verify the thermal performance.

6 Digital Section

CMB100 has four main operation states:

- **OFF state:** VIN is applied and RTC is running, only. Baseband is switched OFF and switching to ON state is possible only.
- **ON state:** baseband is fully switched on and CMB100 is ready to accept AT commands. CMB100 can be in idle or connected status.
- **Sleep mode state:** The main baseband processor is intermittently switched ON and AT commands can be processed with some latency. CMB100 is idle with low current consumption.
- **Deep sleep mode state:** PSM defined in 3GPP Release 12. Baseband is switched OFF most of the time.

Note: The CMB100 requires a sequence for power up and power down. Please refer to the flow chart in Figure 3. Please avoid interrupting the power up and power down sequences with e.g. power cuts.

6.1 Logic Levels

Table 9: Logic Levels Minimum and Maximum

Parameter	Min	Max
Absolute Maximum Ratings – Not Functional		
Input level on any digital pin (CMOS @VIO) related to ground	-0.5V	VIO + 0.5V
Operating Range - Interface levels (CMOS @VIO)		
Input high level @VIO = 1.10...1.40V	0.90 x VIO	VIO
Input high level @VIO = 1.40...2.30V	0.65 x VIO	VIO
Input high level @VIO = 2.30V...2.70V	1.60V	VIO
Input high level @VIO = 2.70V...3.60V	2.00V	VIO
Input low level @VIO = 1.10...1.40V	0V	0.10 x VIO
Input low level @VIO = 1.40...2.30V	0V	0.35 x VIO
Input low level @VIO = 2.30V...2.70V	0V	0.70V
Input low level @VIO = 2.70V...3.60V	0V	0.80V
Output high level	VIO – 0.4V	1.9V
Output low level	0V	0.4V

Table 10: Logic Levels Average

Parameter	AVG
Current Characteristics	
Output Current	1mA
Input Current	1uA

6.2 Software Ready Control: MDM_IsOn

CMB100xx pin 5 high logic state indicates CMB100 built-in modem is up and running (Software Ready).

MDM_IsOn is internally connected to modem general purpose pin **GPIO_08**.

On CMB100B0/B1 and CMB100C0 only , if you need to updatede the firmware you have to send the command AT#GPIO=8,1,1,1 in order to reset the MODEM READY function. On CMB100A0 this is not need because the MODEM READY is ready by default settings

Pin Description

Table 11: MDM_IsOn Signal

Signal	Function	I/O	PIN
MDM_IsOn	MODEM READY	O	5

6.3 Power On: pOnOff

To turn on the CMB100 the pOnOff input on connector pin 19 must be pulled high to VIO level for at least 6 seconds and then released.

pOnOff input can provoke an asynchronous wakeup of the system from the Power Save Mode (PSM) before the scheduled event of timer T3412 expires (more information on PSM can be found on 80617NT11830A doc). To make an asynchronous exit from PSM mode pOnOff pin must be set to high for at least 6 seconds.

Pin Description

Table 12: pOnOff Signal

Signal	Function	I/O	PIN
pOnOff	POWER ON/OFF	I	19

Note: Do not use any pull-down resistor on pOnOff line. pOnOff is internally pulled down. To check if the device has turned on, MDM_IsOn should be monitored (see Paragraph 6.2 MDM_IsOn Control Output).

A flow chart showing the proper CMB100 Power-On procedure is displayed below:

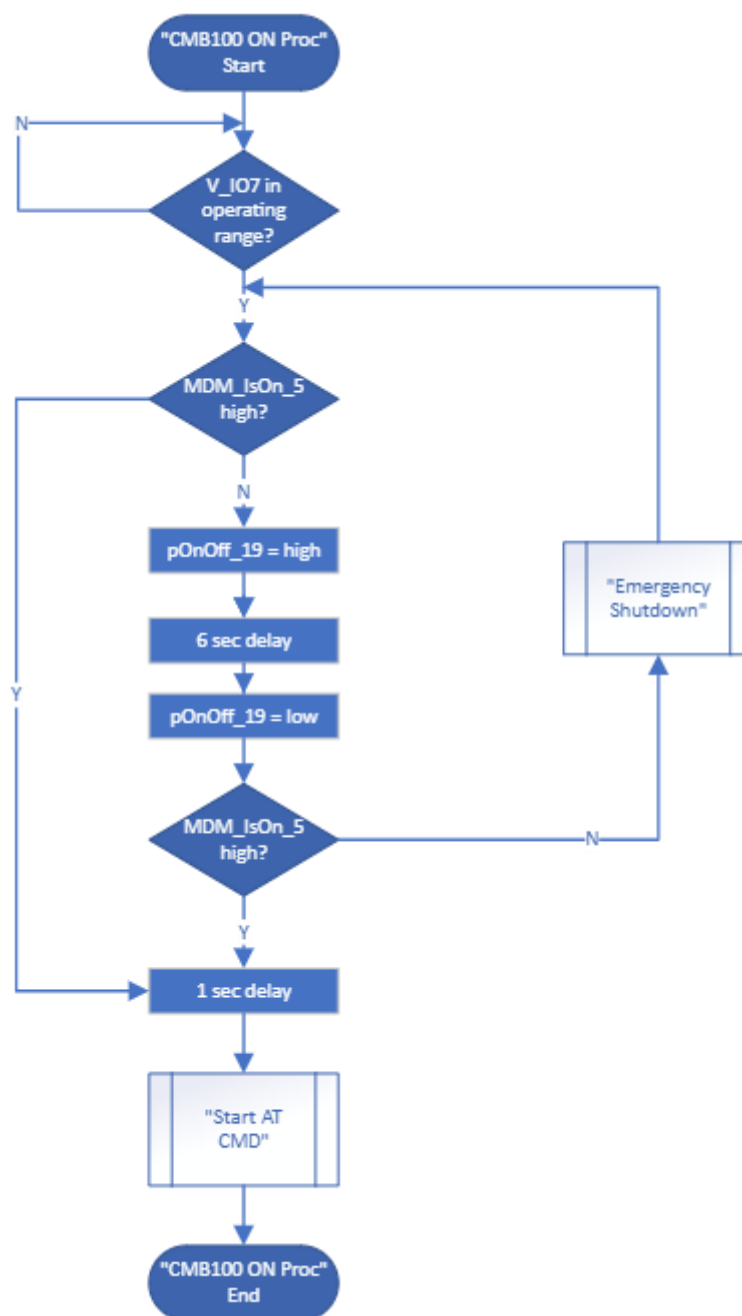


Figure 4: Power On Procedure Flow Chart

A flow chart showing the AT commands managing procedure is displayed below:

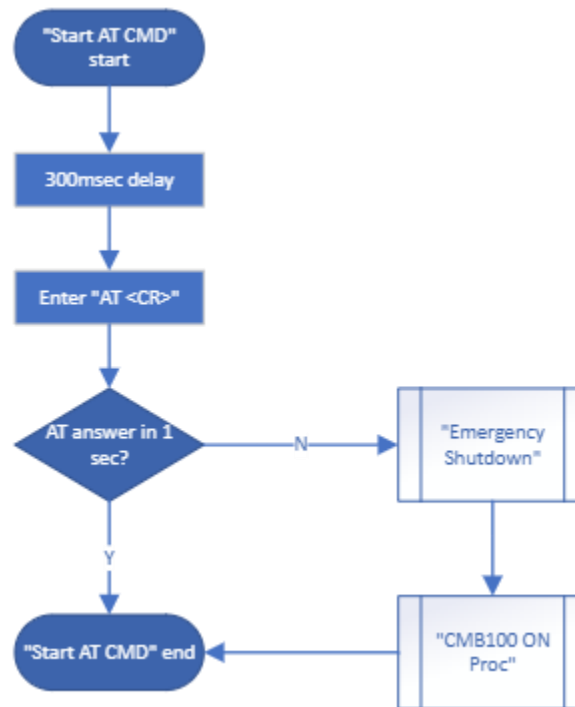


Figure 5: AT commands Managing Procedure Flow Chart

Note: To avoid any back-powering effect it is recommended to prevent any high logic level signal from being applied to CMB100 control pins when the module is powered off or during an ON-OFF transition.

6.4 Power Off

Turning off the device can be done in two ways:

- via AT command (see AT Commands Software User Guide, AT#SHDN)
- pulling up pOnOf_19 pin for at least 3 seconds

Either way, the device issues a detach request to the network informing that the device will not be reachable any more.

Note:

- To check if the device has been powered off or IN PSM mode, the MDM_IsOn pin must be monitored. The device is powered off when MDM_IsOn goes low. Refer to paragraph 6.2 MDM_IsOn Control Output.
- To avoid a back-powering effect it is recommended to prevent any HIGH logic level signal from being applied to the digital pins of the CMB100 when the module is powered off or during an ON-OFF transition.

Warning: Not following the recommended shut-down procedures might damage the device and consequently void the warranty.

The following flow chart shows the proper Power Off procedure:

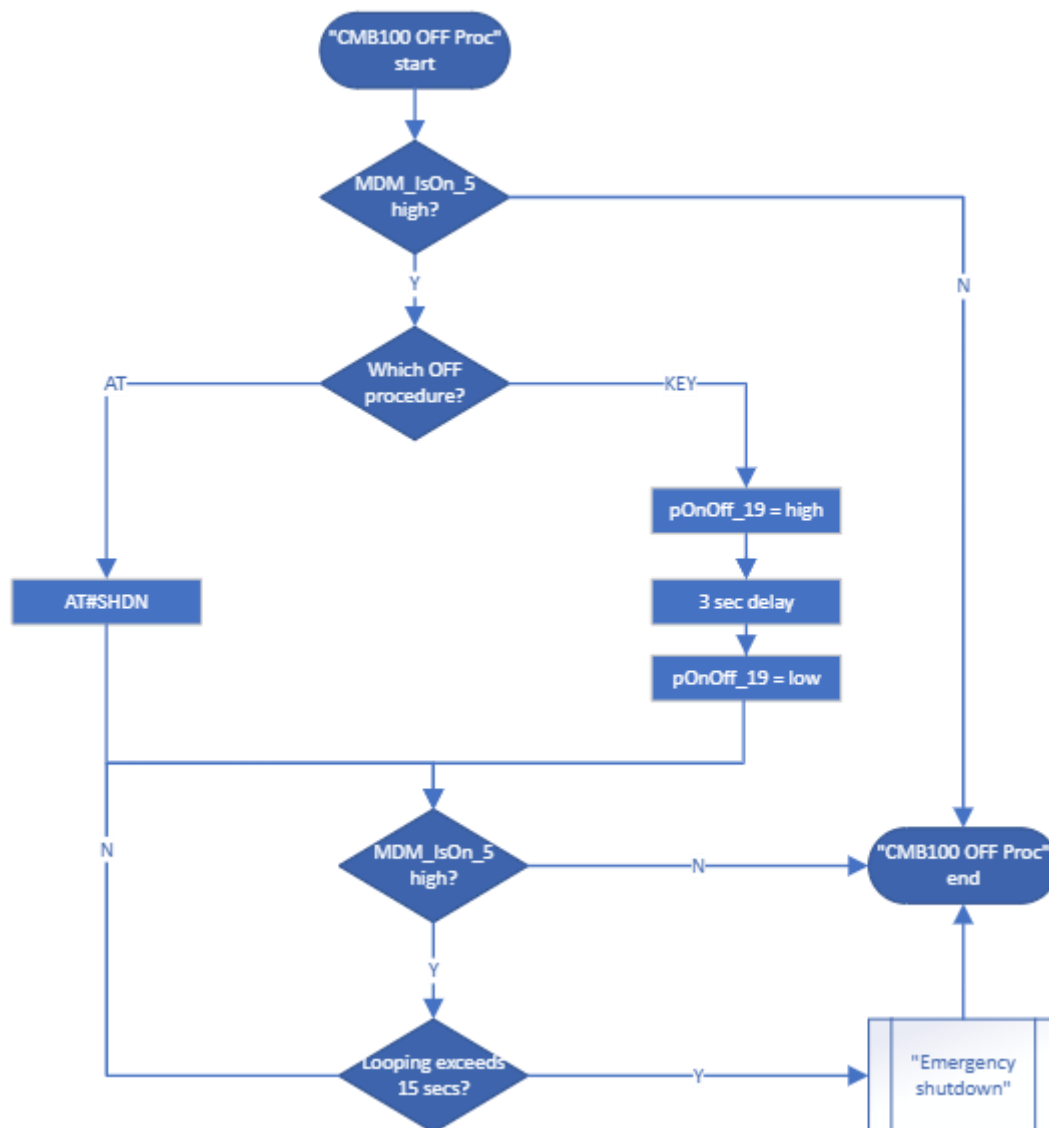


Figure 6: Power Off Procedure Flow Chart

6.5 Wake from Deep Sleep Mode

The CMB100 supports Power Saving Mode (PSM) functionality defined in 3GPP Release 12. When the Periodic Update Timer expires, CMB100 powers off until next scheduled wake-up time (more information on PSM can be found on 80617NT11830A doc).

The host may provoke an asynchronous wake up from deep sleep mode by asserting pOnOff pin HIGH for not less than 6 seconds.

The host can detect deep sleep mode by polling MDM_IsOn pin. Refer to paragraph 6.2 MDM_IsOn Control Output.

6.6 Emergency Shutdown: EM_OFF

EM_OFF input on connector pin 12 is used to unconditionally shut down the CMB100. Whenever this signal is pulled high, the CMB100 is reset, meaning CMB100 stops any operation. After the release of the line, the CMB100 is unconditionally shut down, without performing any disconnection from the network where it was registered right before shut down occurred. This behaviour is not a proper shutdown because any cellular device is requested to issue a detach request on turn off. During start-up the EM_OFF input is internally supervised in order to always achieve a proper power-on reset sequence, so there's no need to control this pin at start-up.

To unconditionally shut down the CMB100, EM_OFF pin must be tied high for not less than 200 milliseconds and then released.

The signal is internally pulled down. Leave it floating if not used.

Pin Description

Table 13: EM_OFF Signal

Signal	Function	I/O	PIN
EM_OFF	Emergency Modem HW Reset	I	12

Warning: EM_OFF must **NOT** be used during normal device operation as it does not disconnect the device from the network. It shall be considered as an emergency exit procedure.

The following flowchart shows the proper restart procedure:

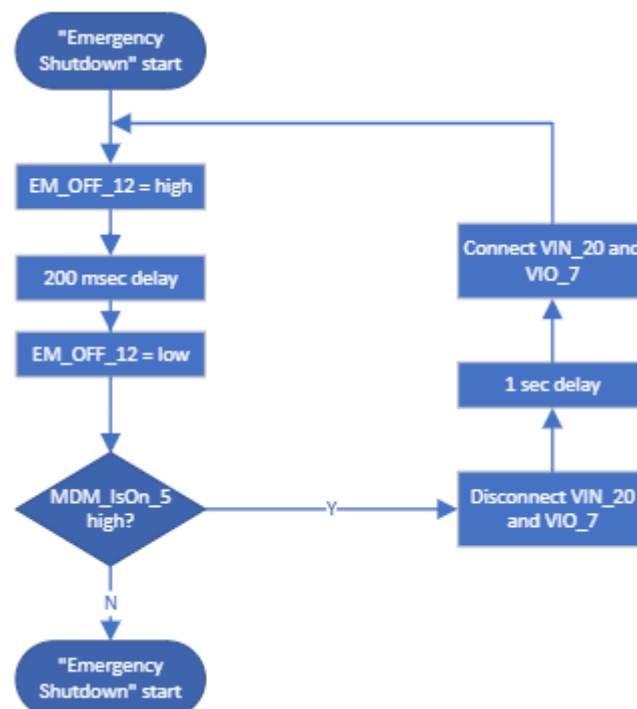


Figure 7: Restart Procedure Flow Chart

Note:

- To avoid a back-powering effect it is recommended to prevent any HIGH logic level signal from being applied to the digital pins of the CMB100 when the module is powered off or during an ON-OFF transition.
- No pull-down resistor on EM_OFF pin is needed: an internal pull-down is present. To correctly restart the module, refer to the [Power ON](#) section.
- The Emergency Hardware Shutdown must always be implemented on the boards and should be used as an emergency exit procedure only.

6.7 Fast Shut Down

The CMB100 power off procedure described in the [Power Off](#) section normally takes more than 1 second to detach from the network and make CMB100 internal filesystem properly closed.

In case of undesired supply voltage loss, the system can be switched off without any risk of filesystem data corruption by implementing the Fast Shut Down feature.

The Fast Shut Down feature reduces both current consumption and time-to-power off. This feature does support a cost efficient last gasp implementation.

This feature shall not be used frequently as the network might block the CMB100 from re-attach for a certain time.

Note:

- The Fast Power Down can be triggered by AT command.
- Refer to AT command reference guide for further information (Fast power down - #FASTSHDN).

6.8 Communication Ports

6.8.1 USB 2.0 HS

The CMB100 includes one integrated universal serial bus (USB 2.0 HS) transceiver.

The following table lists the available signals:

Table 14: Available Signals

PIN	Signal	I/O	Function	NOTE
8	USB_D_P	I/O	USB differential Data (+)	
6	USB_D_N	I/O	USB differential Data (-)	
10	VUSB	PWR	Power sense for the internal USB transceiver.	Accepted range: 3.0V to 5.5V 100K pull down

The USB_D_P and USB_D_N signals have a clock rate of 480 MHz, therefore signal traces should be routed carefully. Trace lengths, number of vias and capacitive loading should

be minimized. The characteristic impedance value should be as close as possible to 90 ohms differential.

A low capacitive ESD protection can be added to USB D+/D- lines in case the lines can be touched by a human.

6.8.2 Serial Port

The CMB100 module is equipped with an Asynchronous serial port (UART).

Note: As per almost any other digital signals on the CMB100 20 pin connector, UART logic level is defined by the reference voltage applied to connector pin 7 (VIO). Refer to Table 4: Pin-out Information.

The CMB100 UART is a DCE (Data Communication Equipment) type. According to V.24, TXD, RTS and DTR are CMB100 inputs. Oppositely, RXD, CTS and RING are CMB100 outputs. Refer to table 15.

The CMB100 UART signals are as follows:

Table 15: UART Signals

RS232 Pin	Signal	Name	Usage
18	RXD_HOST	UART DATA OUTPUT	CMB100 Output Data Transmit
16	TXD_HOST	UART DATA INPUT	CMB100 Input Data Receive
4	DTR_HOST	DATA TERMINAL READY INPUT	CMB100 Input that controls the DTE READY condition
11	RTS_HOST	REQUEST TO SEND INPUT	CMB100 Input that controls the Hardware flow control
3	CTS_HOST	CLEAR TO SEND OUTPUT	CMB100 Output that controls the Hardware flow control
15	RING_15	RING INDICATOR OUTPUT	CMB100 Output that indicates the incoming call condition

A typical connection diagram with an application MCU is depicted below

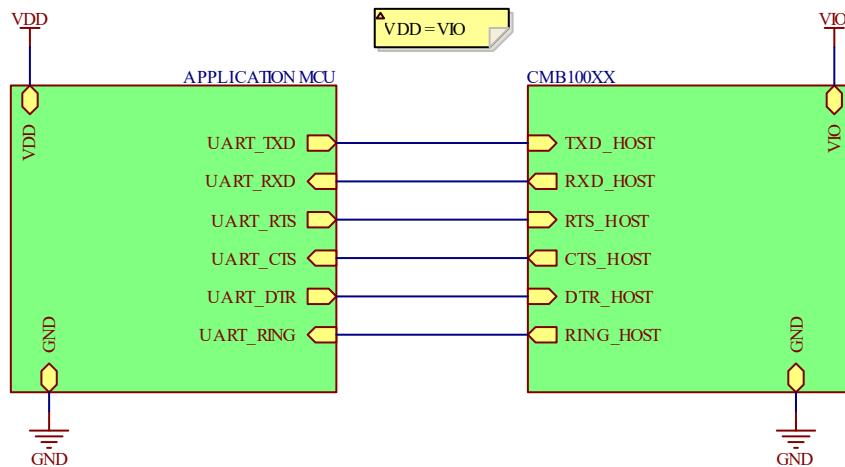


Figure 8: CMB100 UART connection

Note: A minimum UART implementation is possible when software flow control is implemented: TXD and RXD lines are used. Other UART lines can be left disconnected.

For power saving means and robustness we recommend to use at least RTS/CTS.

The default configuration is 115200 baud 8N1.

To avoid a back-powering effect it is recommended to prevent any HIGH logic level signal from being applied to the digital pins of the CMB100 when the module is powered off or during an ON/OFF transition

6.9 General Purpose I/O

The CMB100 device is provided with 2 Configurable Digital Input / Output pins at user-definable VIO logic levels. Input pins can only be read; they report the digital value (high or low) present on the pin at the time of reading. The Output pins can only be written or queried and set the value of the pin output.

IO1_HOST is internally connected to modemmodem general purpose pin GPIO_01.

IO2_HOST is internally connected to modemmodem general purpose pin GPIO_09.

An alternate function pin is internally controlled by the CMB100 firmware and acts according to the implemented function.

The following table shows the available GPIOs on the CMB100:

Table 16: CMB100 GPIOs

PIN	Signal	I/O	Output Drive Strength	Default State	NOTE
13	IO1_HOST	I/O	1mA	INPUT	
17	IO2_HOST	I/O	1mA	INPUT	

6.9.1 Using a GPIO as an INPUT

The GPIO pins, when used as inputs, can be connected to a digital output of another device and report its status, provided that this device has interface levels compatible with the VIO voltage level applied to connector pin 7.

Note: Avoid pull up or pull down resistors on input GPIOs so to assure proper CMB100 internal voltage converter operation.

To avoid a back-powering effect it is recommended to prevent any high logic level signal from being applied to the digital pins of the CMB100 when the module is powered off or during an ON/OFF transition. For GPIO pins configuration, refer to AT command reference guide.

6.9.2 Using a GPIO as an OUTPUT

The GPIO pins, when used as outputs, can drive VIO voltage level compatible digital devices. When set as outputs, the pins have a push-pull output.

Note: Avoid pull up or pull down resistors on output GPIOs so to assure proper CMB100 internal voltage converter operation.

6.10 Reset and Boot Controls: nRST_OUT and BOOT_HOST

nRST_OUT is an open collector pin, present at CMB100 connector pin 1. It is internally connected to modem general purpose pin GPIO_02. It may be used to reset the user application microcontroller.

BOOT_HOST is a totem-pole output pin, present at CMB100 connector pin 14. It is internally connected to modem general purpose pin GPIO_03. It may be used to set in Boot mode user application microcontroller while resetting it by means of nRST_OUT. The combination of both nRST_OUT and BOOT_HOST may permit a microcontroller re-flashing on-the-air.

nRST_OUT is internally connected to modem general purpose pin GPIO_02. An internal BJT inverts its logic.

BOOT_HOST is internally connected to modem general purpose pin GPIO_03. An internal level converter make BOOT_HOST VIO voltage level compliant.

Table 17: nRST_OUT and BOOT_HOST Information

Pin	Signal	I/O	Function	Type	Comment
1	nRST_OUT	O	Application MCU SW reset		Open Collector
14	BOOT_HOST	O	Application MCU FORCE BOOT	CMOS @VIO	

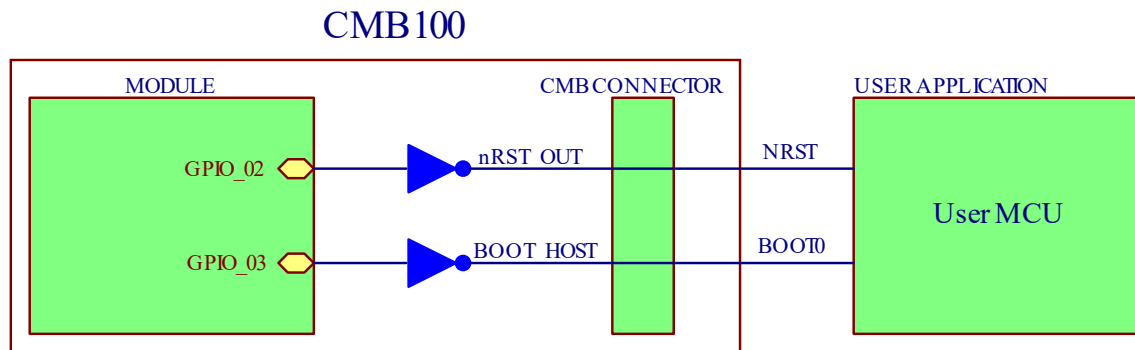


Figure 9: Reset and Boot control usage example with STM32H562VGT6

6.11 nanoSIM Holder

For proper operation a nanoSIM must be inserted into CMB100 on-board nanoSIM holder.

Note:

- Please note that no SIM communication signals are connected to CMB100 10-pin connector.
- Connection to an external SIM is thus not possible.

CMB100 SIM interface related circuitry is depicted below:

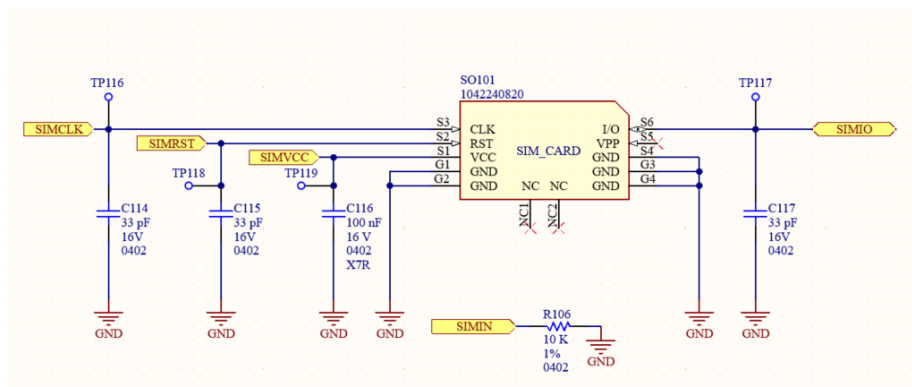


Figure 10: CMB100 nanoSIM holder circuitry

CMB100 integrates required RF filtering and voltage-leveling capacitors.

As previously state in the Note, no SIM interface signal:

- SIMCLK

- SIMRST
- SIMVCC
- SIMIO
- SIMIN

Is led to CMB100 interface connector

CMB100 SIM circuitry supports both Class B (3V) and Class C (1V8) 4FF nano SIMs. It offers a 5 MHz max clock rate, as per 3GPP USIM specification.

6.12 Forced USB Boot

The force USB boot mechanism is only required in case of the need to recover the cellular module.

The FORCED_USB_BOOT signal must be set to 1.8V during CMB100 power-on.

The FORCED_USB_BOOT signal is not connected to the CMB100 20-pin connector.

The signal is available at Test Point TP208 as depicted in red ellipse:

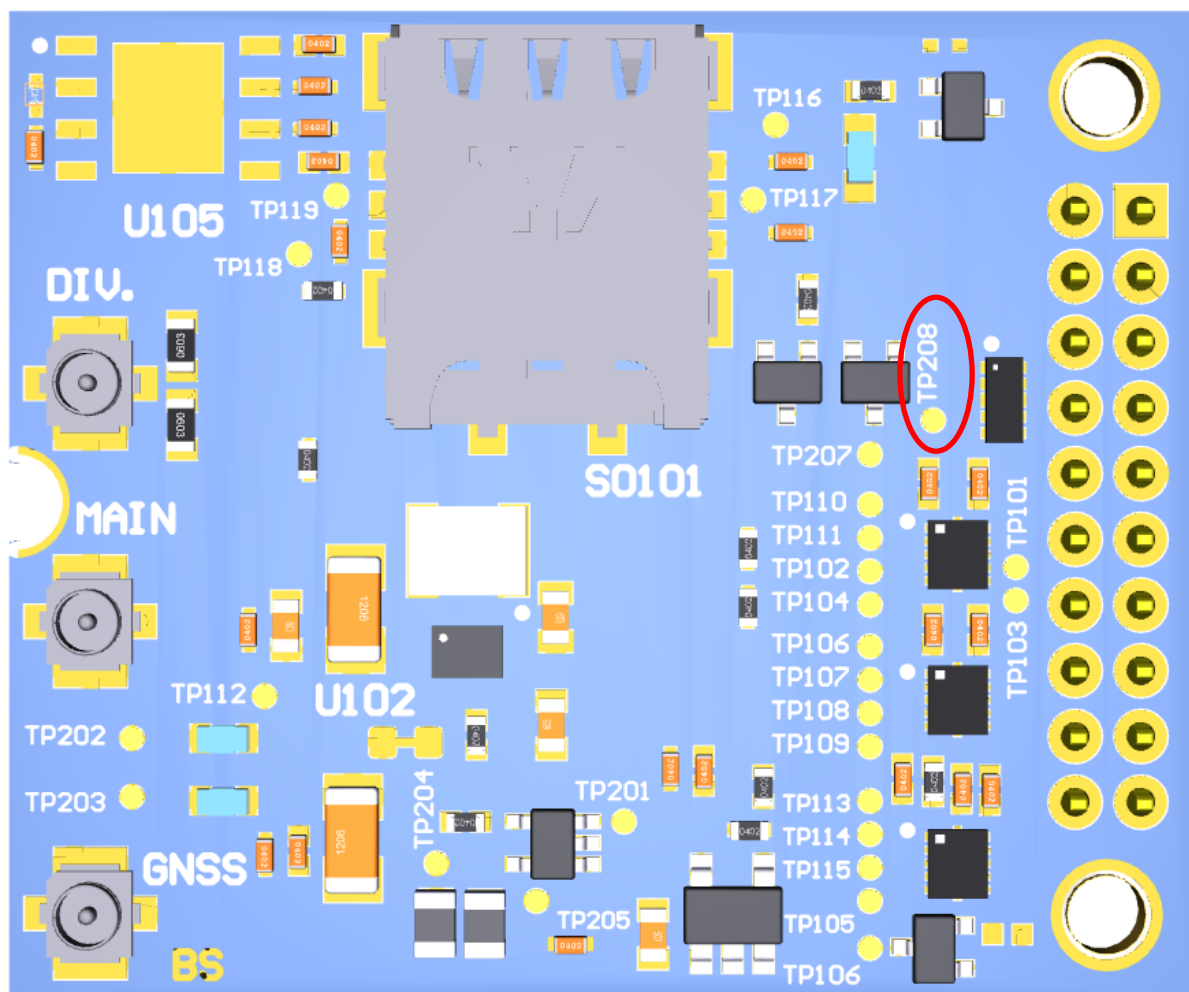
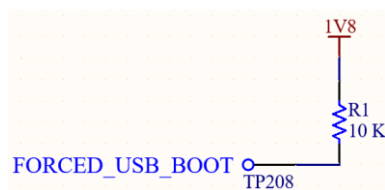


Figure 11: TP208 (FORCED_USB_BOOT) Position

The FORCED_USB_BOOT input leakage current is very low, so a 10K pull up to 1.8V can be used to keep this pin in the HI state.



Note: FORCED_USB_BOOT pin must be pullup-ed during firmware upgrade operation only. Leave it disconnected otherwise.



7 RF Section

7.1 Bands Variants

Table 18: Bands Variant

Product	Bands
CMB100A0	B1,B2,B3,B4,B5,B7,B8,B9,B12,B13,B14,B18,B19,B20,B25,B26,B28,GSM850, GSM900, DCS1800, PCS1900
CMB100B0/B1	B1,B2,B3,B4,B5,B7,B8,B12,B13,B18,B19,B20,B25,B26,B28,B66,B34,B38,B39,B40,B41
CMB100C0	B1,B2,B3,B4,B5,B8,B12,B13,B18,B19,B20,B25,B26,B27,B28,B66,B71,B85,B86 ⁽¹⁾ ,B8_39d ⁽¹⁾ ,GSM 850, GSM900, DCS1800, PCS1900

⁽¹⁾ B85 and B8_39d are not 3GPP bands

7.2 TX Output Power

Table 19: CMB100A0 TX Output Power

Band	Mode	Class	RF power (dBm) ⁽²⁾
all bands	(LTE) CAT-M1	3	23
all bands	(LTE) CAT-NB1	3	23
GSM850, GSM900	GPRS (GMSK)	4	33
GSM850, GSM900	EDGE (8PSK)	E2	27
DCS1800, PCS1900	GPRS (GMSK)	1	30
DCS1800, PCS1900	EDGE (8PSK)	E2	26

Table 20: CMB100B0/B1 TX Output Power

Band	Mode	Class	RF power (dBm)
B1,B2,B3,B4,B5,B7,B8,B12,B13,B18,B19,B20,B25,B26,B28,B66	LTE FDD CAT1bis	3	23 (+-2dB)
B34, B38, B39, B40, B41	LTE TDD CAT1bis	3	23 (+-2 dB)

Table 21: CMB100C0 TX Output Power

Band	Mode	Class	RF power (dBm) ⁽²⁾
B1,B2,B3,B4,B5,B8,B12,B13,B18,B19,B20,B25,B26,B27,B28,B66, B85,B8_39d	(LTE) CAT-M1	3	23
B1,B2,B3,B4,B5,B8,B12,B13,B18,B19,B20,B25,B26,B28,B66,B85, B86,B8_39d	(LTE) CAT-NB2	3	23
B71	(LTE) CAT-NB2	5	21
GSM850, GSM900	GSM/GPRS	4	32.5
GSM850, GSM900	EGPRS	E2	27
DCS1800, PCS1900	GSM/GPRS	1	29.5
DCS1800, PCS1900	EGPRS	E2	26

(1) Max output power tolerance range according to 3GPP TS 36.521-1 and 3GPP TS 51.010-1 or better

7.3 RX Sensitivity

Measurement setup

Table 22: CMB100x0 RX Sensitivity Measurement Setup

Mode	Value
(LTE) CAT M1	Throughput >95%, According to 3GPP 36.521-1
(LTE) CAT NB1	Throughput >95%, According to 3GPP 36.521-1
GPRS	BLER <10%, CS2, According to 3GPP 51.010-1

7.4 Main Antenna Requirements

The Main antenna connection (see MAIN U.FL connector on CMB100) is the most important aspect of the full product design as it strongly affect the general performance of the product, so read carefully and follow the requirements and the guidelines for a proper design.

The Main antenna connection to the CMB100 shall fulfil the following requirements:

Table 23: CMB100 Antenna Recommendations

Item	Value
Frequency range	Depending on the frequency band(s) provided by the network operator, the customer shall use the most suitable antenna for that/those band(s)
Bandwidth	250 MHz in LTE Band 1 140 MHz in LTE Band 2, PCS1900 170 MHz in LTE Band 3, DCS1800 445 MHz in LTE Band 4 70 MHz in LTE Band 5, GSM850 80 MHz in LTE Band 8, GSM900 47 MHz in LTE Band 12 41 MHz in LTE Band 13 60 MHz in LTE Band 18 60 MHz in LTE Band 19 71 MHz in LTE Band 20 145 MHz in LTE Band 25 80 MHz in LTE Band 26 62 MHz in LTE Band 27 100 MHz in LTE Band 28 490 MHz in LTE Band 66 81 MHz in LTE Band 71 48 MHz in LTE Band 85
Impedance	50 ohm
Input power	> 33dBm Average power
VSWR absolute max	≤ 10:1 (limit to avoid permanent damage)
VSWR recommended	≤ 2:1 (limit to fulfil all regulatory requirements)

7.4.1 Antenna Installation Guidelines

- Install the antenna in a place covered by the LTE signal with CAT-M1 support.
- The Antenna must not be installed inside metal cases.
- The Antenna must be installed according to the Antenna manufacturer's instructions.
- The Antenna integration should optimize the Radiation Efficiency. Efficiency values > 50% are recommended on all frequency bands.
- The Antenna integration should not perturb the radiation pattern described in the documentation of the Antenna manufacturer.
- It is preferable to get an omnidirectional radiation pattern.
- The Antenna Gain must not exceed the values indicated in regulatory requirements, where applicable, to meet the related EIRP limitations. The Typical antenna Gain in most M2M applications does not exceed 2dBi.
- If the device antenna is located farther than 20cm from the human body and there are no co-located transmitters, then the Telit FCC/IC approvals can be re-used by the end product.
- If the device antenna is located closer than 20cm from the human body or there are co-located transmitters, then additional FCC/IC testing may be required for the end product (Telit FCC/IC approvals cannot be reused).

7.5 Diversity Antenna Requirements

- For Diversity antenna installation (see DIV U.FL connector on CMB100) follow the recommendations at 7.4.1.

8 GNSS Section

CMB100(A0,B1,C0,D0) includes a state-of-art receiver that can simultaneously search and track satellite signals from multiple satellite constellations. This multi-GNSS receiver uses the entire spectrum of GNSS systems available: GPS, GLONASS, BeiDou, Galileo and QZSS.

8.1 GNSS U.FL input and 3.1V LDO

CMB100 provides a GNSS input (see GNSS U.FL connector on CMB100). CMB100 includes a 3.1 V LDO as well as a 40mA current limiter for supplying amplified GNSS antenna. By default those devices are disabled. Both LDO and current limiter may be enabled with the AT command:

AT\$GPSP=1

Now at GNSS U.FL connector a 3.1 Vdc voltage should be present, thus a suitable GNSS active antenna (i.e., with integrated LNA) can be used.

Note: GNSS antenna power supply is current limited to 40mA, thus preventing antenna amplifier damage in case of incorrect antenna mounting (i.e. its hot pole shorted to GND).

8.1.1 Guidelines for GNSS Antenna

- Make sure that the antenna line impedance is 50 ohm.
- Place EM noisy devices as far as possible from the antenna.
- Do not place the cellular antenna close to the GNSS antenna.

8.1.2 Hardware-Based Solution for GNSS and LTE Coexistence

When a stand-alone GNSS receiver is present in the user application, the LTE transmission may desensitize the GNSS receiver in particular if the decoupling between the LTE and GNSS antennas is low. A SAW filter can be added on the LTE side, to protect the GNSS receiver from LTE out-of-band emissions.

When the GNSS receiver embedded in the CMB100 is used, there is no condition for degradation, since the LTE part and the GNSS part are never active simultaneously, therefore filtering on the LTE side is not needed.

8.2 GNSS Antenna Requirements

An active GNSS antenna should be used or integrated into the application. Some examples of GNSS antennas are: 2J4301MPGFz or 2J4301MPGFy 28 dB Active Gain / Mid-Filter 14 dB Active Gain / Pre-Filter



8.2.1 GNSS Antenna Specification

Table 24: GNSS Antenna specification

Item	Value
Frequency range	1559.0 ~ 1610.0 MHz
Gain	15 ~ 30dB
Impedance	50 hm
Noise Figure of LNA	< 1.5 (recommended)
DC supply voltage	DC 3.1V
VSWR	≤ 3:1 (recommended)

Note: A 15 dB antenna gain is sufficient when GNSS antenna is placed close to the module. Otherwise, gain must be increased up to 30 dB.

8.2.2 GNSS Antenna – Installation Guidelines

- The antenna must be installed according to the antenna manufacturer's instructions to obtain maximum performance from the GNSS receiver.
- The position of the antenna must be carefully evaluated if operating in conjunction with any other antenna or transmitter.
- The antenna must not be installed inside metal cases or near any obstacle that may degrade features such as antenna lobes and gain.
- Keep the GNSS antenna away from MAIN and DIV antennas. Shielding GNSS antenna from the other twos may lead to satisfying results.

8.3 GNSS Characteristics

The table below specifies the GNSS characteristics and expected performance.

Table 25: GNSS Characteristics

Parameters	Performance	Typical Measurement
Sensitivity	Tracking Sensitivity	-159 dBm
	Navigation	-155 dBm
	Cold Start	-144 dBm
Min Navigation update rate		1Hz

9 Mechanical Design

9.1 Enclosure

The CMB100 should not come into direct contact with any corrosive liquids or water. It should be housed in a protective enclosure to safeguard it from any exposure. The housing should also provide a mechanism to capture the SIM card. If this is not possible then an alternate method of securing the SIM card is recommended to keep it from jarring free when exposed to shock or vibration.

9.2 Host Connector And Fasteners

The CMB100 uses a 2 row 20-pin 2.0mm pitch header, part number BF050-20-A-B-0600-0300-L-G from GCT - GLOBAL CONNECTOR TECH. The recommended mating connector is part number 2MM-R-D10-VT-01-F-TBP from TE connectivity with a height of 4.5mm once mounted on PCB. When using a mating connector of the given height the following threaded metal spacers and screws may be used to fasten the CMB100 to the application board. It is recommended for the host application to be tested over the anticipated shock and vibration levels to ensure the mating connector and fasteners will meet the end deployment requirements.

For screws please use two M2 screws with minimum length of 20mm M2x20 ISO7047 with head diameter of 3.6 mm , please consider a maximum head room of 4.5mm

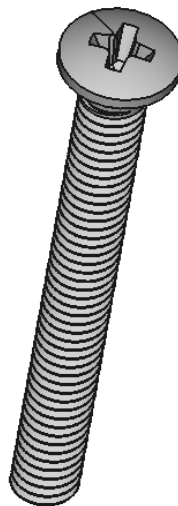


Figure 12: Recommended Screws

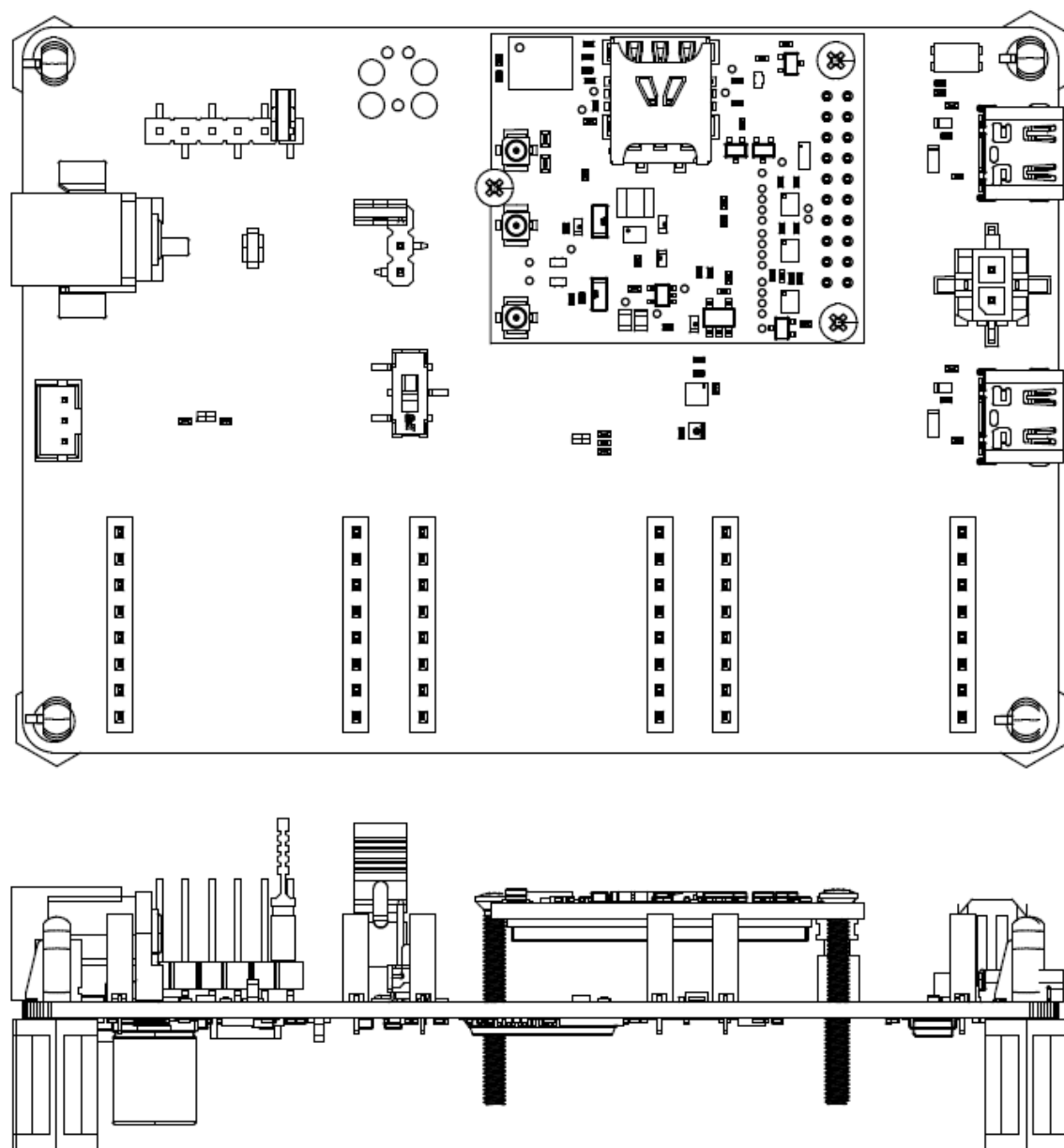


Figure 13: example of application board (DEV KIT) with screws

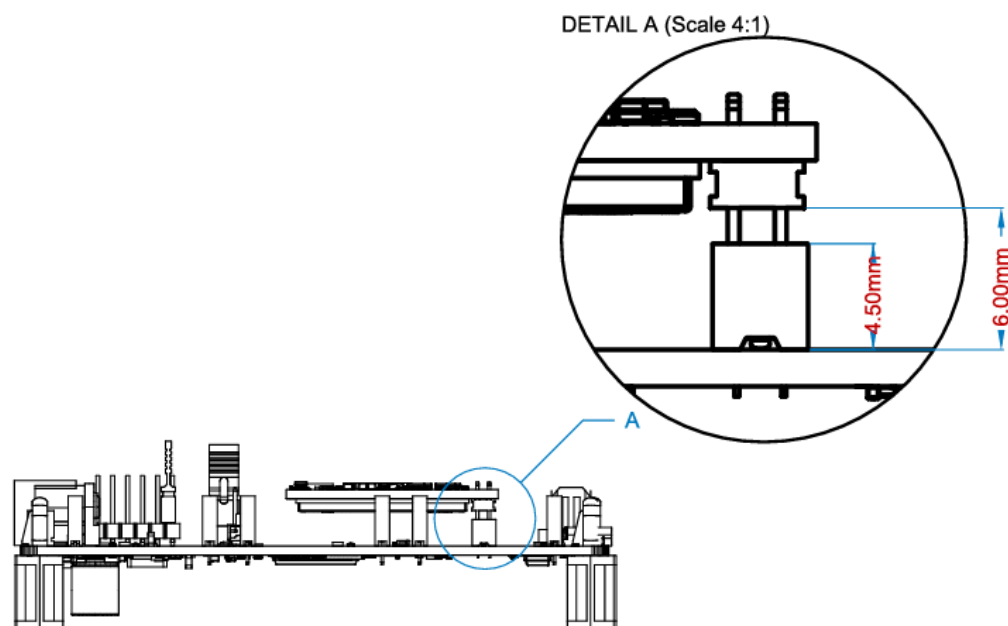


Figure 14: suggested connectors pairing (0600-0300-L-G from GCT (CMB100100);
2MM-R-D10-VT-01-F-TBP (Application Board))

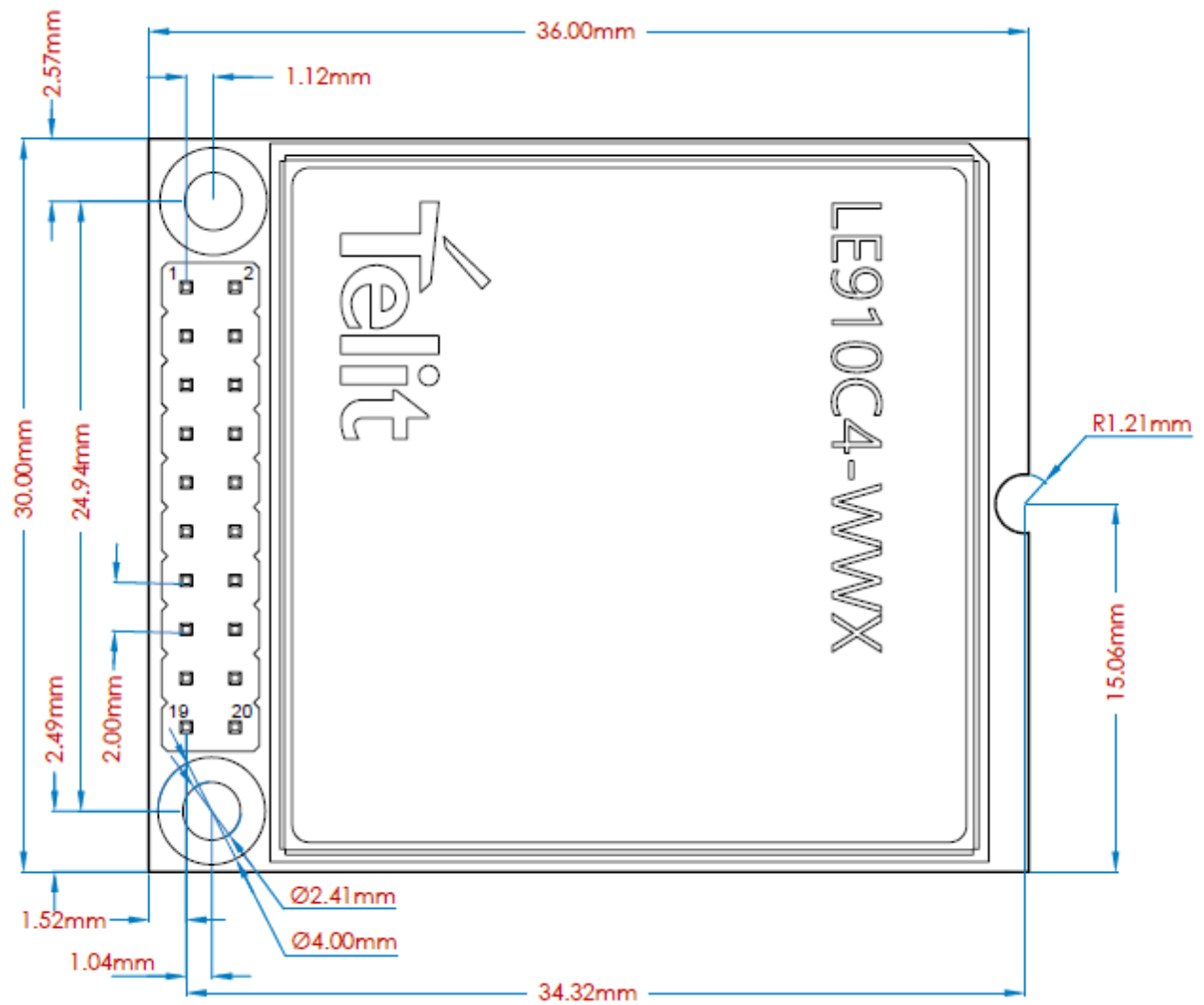


Figure 15: CMB100 Mechanical Drawing TOP VIEW

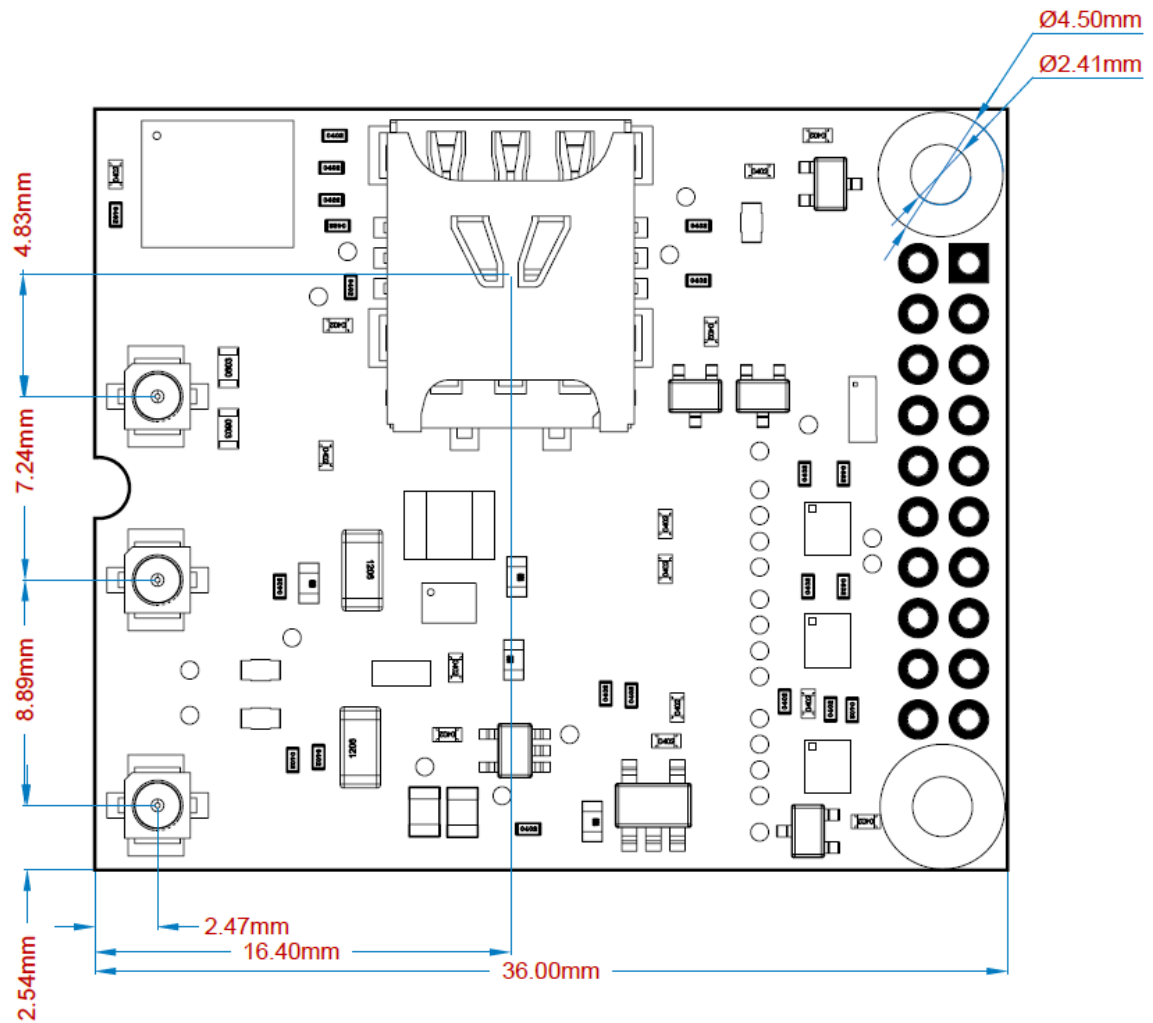


Figure 16: CMB100 Mechanical Drawing BOTTOM VIEW

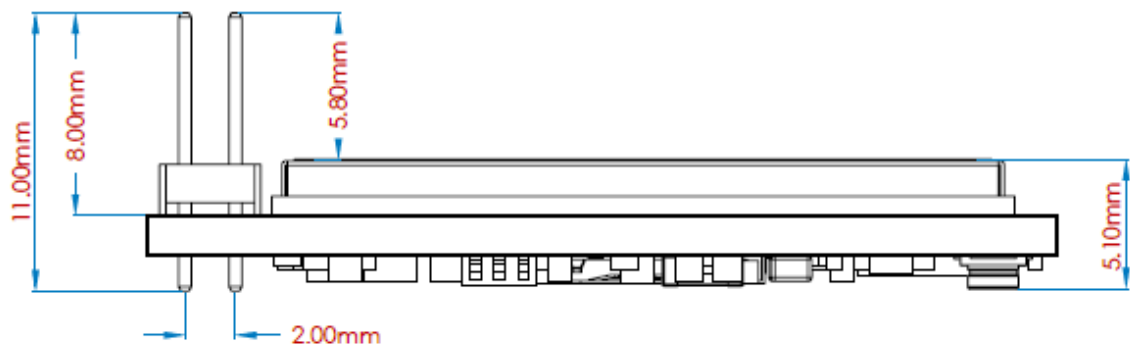


Figure 17: CMB100 Mechanical Drawing SIDE VIEW

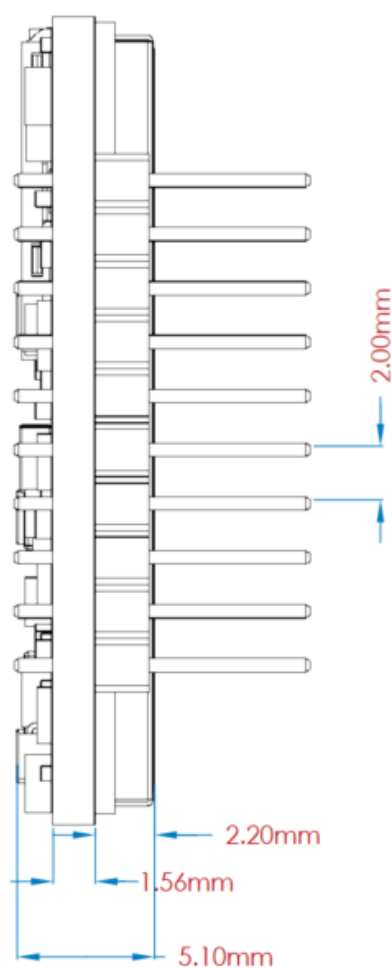
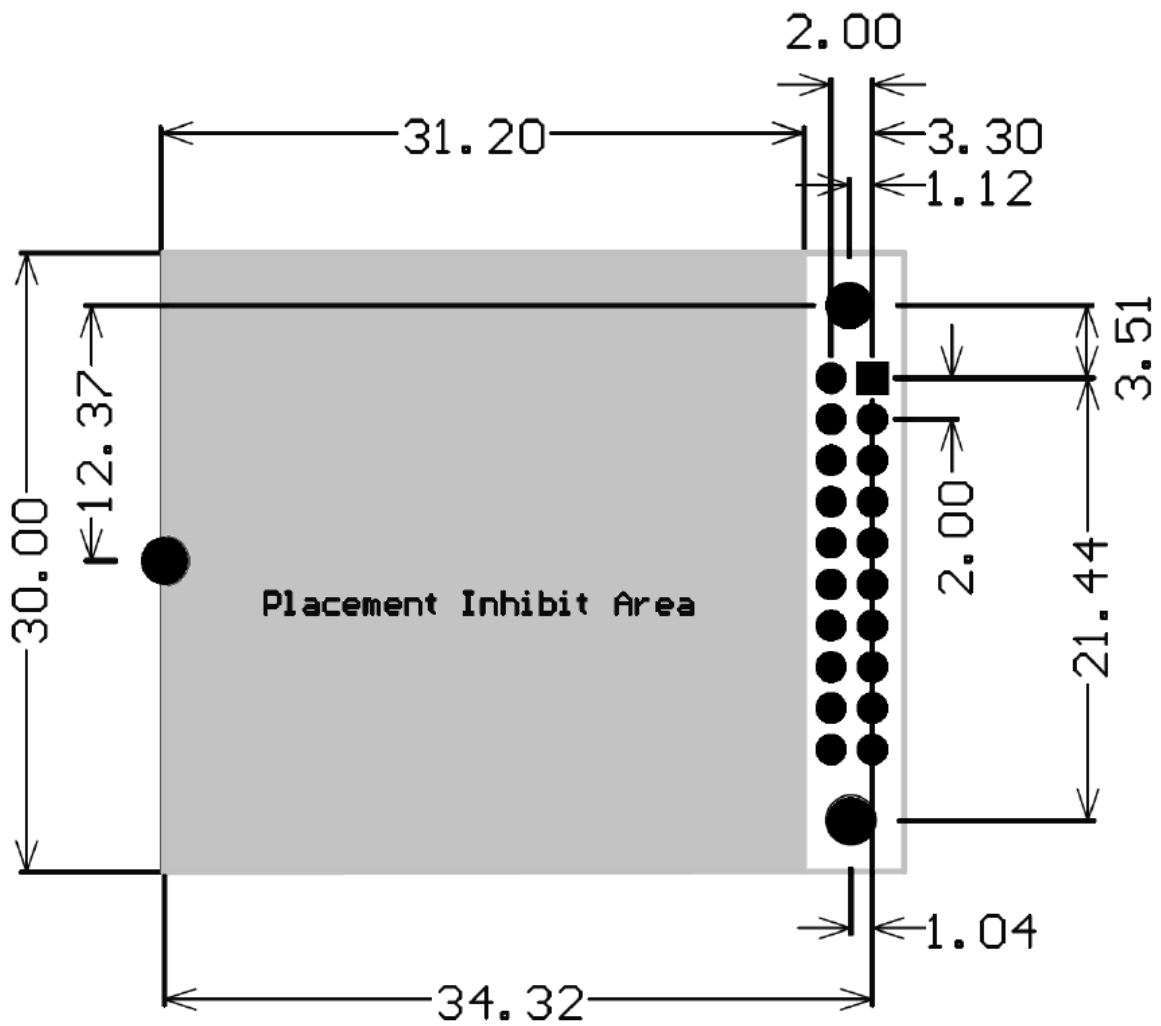


Figure 18: CMB100 Mechanical Drawing SIDE VIEW



20 pins: diameter holes 0.9mm; diameter pad 1.6mm
 3 mech. holes: diameter holes 2.413mm;

Figure 19: Recommended Footprint

10 Packaging

10.1 Tray

The CMB100 modules are packaged on trays that can be used in SMT processes for pick & place handling. The mass production units of CMB100 will be shipped according to the following drawings:

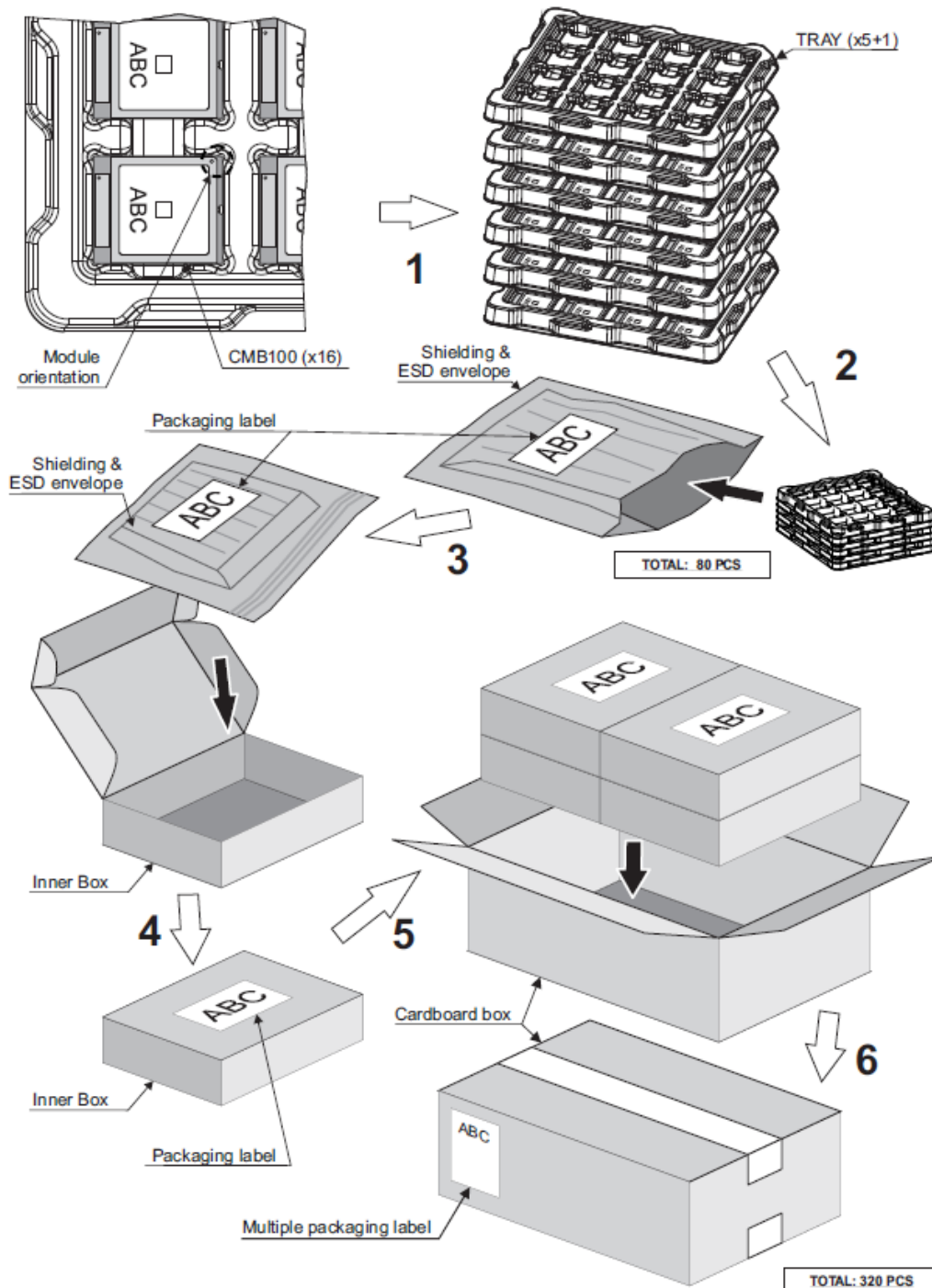


Figure 20: Tray Packaging

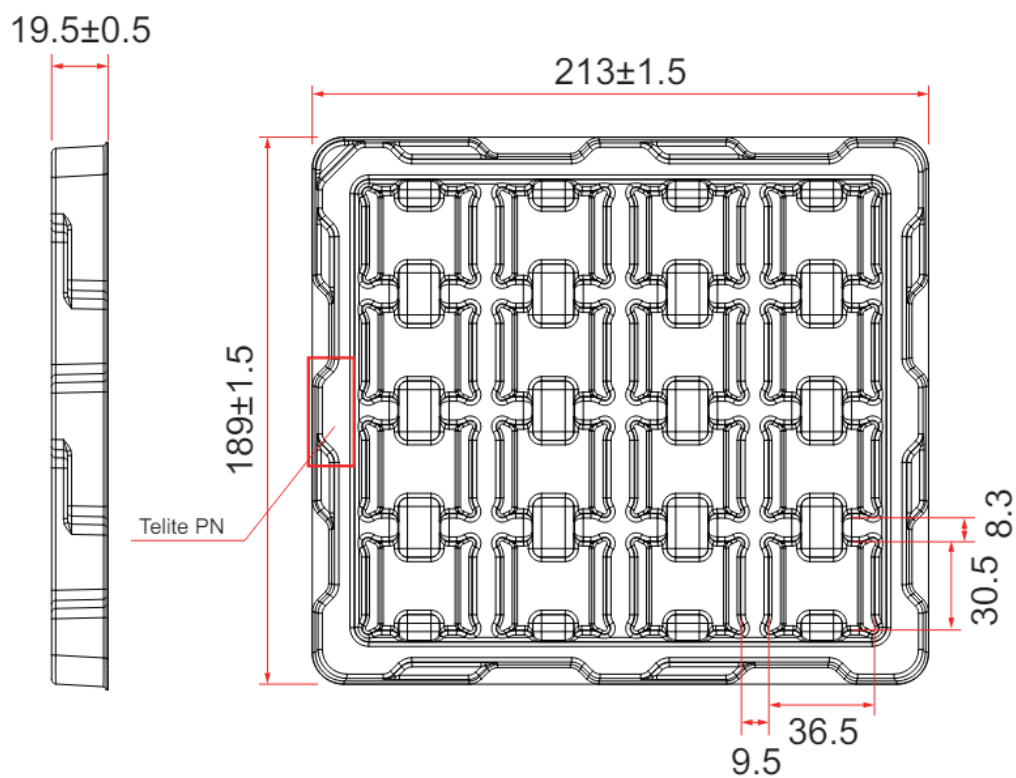


Figure 21: Tray Dimensions

11 Conformity Assessment Issues

11.1 Approvals Compliance Summary

Table 26: EMEA Compliance Summary

Region	EMEA	
Country & Type Approval	EU RED	UK UKCA
CMB100A0-WW		
CMB100B0-WW		
CMB100B1-WW		
CMB100C0-WW		

Table 27: Americas Compliance Summary

Region	Americas	
Country & Type Approval	CA ISED	US FCC
CMB100A0-WW		
CMB100B0-WW		
CMB100B1-WW		
CMB100C0-WW		

	The equipment is compliant
	Type approval is in progress
	The equipment is not compliant

Note: For approvals not included in the above, please contact Telit support.

11.2 EMEA Approvals

11.2.1 EU RED

11.2.1.1 RED Declaration of Conformity

In accordance with the above Approval Compliance Summary table, where applicable (green ball), hereby, Telit Communications S.p.A declares that the equipment is in compliance with the Directive 2014/53/EU.

The full text of the EU declaration of conformity is available at the following internet address: <https://www.telit.com/red>

Text of 2014/53/EU Directive (RED) requirements can be found here:

<https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32014L0053>

11.2.1.2 RED Antennas

This radio transmitter has been approved under RED to operate with the antenna types listed below with the maximum permissible gain indicated. The usage of a different antenna in the final hosting device may need a new assessment of host conformity to RED.

Table 28: Antenna Type used for RED module type approval

Model	Antenna Type
CMB100A0-WW	Omnidirectional Atel-Cab T-AT305 Antenna Gain 2.14 dBi in all bands
CMB100B0-WW	
CMB100B1-WW	
CMB100C0-WW	

Table 29: Maximum Antenna Gain for RED to respect MPE limits

	Max Gain for RED to respect MPE limits (dBi)			
Band	CMB100A0-WW	CMB100B0-WW	CMB100B1-WW	CMB100C0-WW
GSM 900	6.00	---	---	---
DCS 1800	11.80	---	---	---
GPRS/EGPRS 900	6.00	---	---	5.47
GPRS/EGPRS 1800	11.80	---	---	9.34
WCDMA Band VIII	8.90	---	---	---
WCDMA Band I	12.30	---	---	---
FDD 1	11.83	11.85	11.85	11.84
FDD 3	---	11.35	11.35	11.33
FDD 7	13.00	11.96	11.96	---
FDD 8	9.40	8.46	8.46	8.45
FDD 20	9.20	8.23	8.23	8.20
FDD 28	9.30	7.49	7.49	7.47
FDD 34	---	11.96	11.96	---
FDD 38	---	11.96	11.96	---
FDD 40	---	11.96	11.96	---
FDD 41	---	11.96	11.96	---

UK UKCA

11.2.1.3 UKCA Declaration of Conformity

In accordance with the above Approval Compliance Summary table, where applicable (green ball), hereby, Telit Communications S.p.A declares that the equipment is in compliance with the Radio Equipment Regulations 2017 for UKCA.

The full text of the UKCA declaration of conformity is available at the following internet address: <https://www.telit.com/ukca>

The UKCA requirements can be found here:

<https://www.gov.uk/guidance/using-the-ukca-marking>

11.2.1.4 UK CA Antennas

This radio transmitter has been approved under UK CA to operate with the antenna types listed below with the maximum permissible gain indicated. The usage of a different antenna in the final hosting device may need a new assessment of host conformity to UK CA.

Table 30: Antenna Type used for UKCA module type approval

Model	Antenna Type
CMB100A0-WW	Omnidirectional Atel-Cab T-AT305 Antenna Gain 2.14 dBi in all bands
CMB100B0-WW	
CMB100B1-WW	
CMB100C0-WW	

Table 31: Maximum Antenna Gain for UKCA to respect MPE limits

	Max Gain for UKCA to respect MPE limits (dBi)			
Band	CMB100A0-WW	CMB100B0-WW	CMB100B1-WW	CMB100C0-WW
GSM 900	6.00	---	---	---
DCS 1800	11.80	---	---	---
GPRS/EGPRS 900	6.00	---	---	5.47
GPRS/EGPRS 1800	11.80	---	---	9.34
WCDMA Band VIII	8.90	---	---	---
WCDMA Band I	12.30	---	---	---
FDD 1	11.83	11.85	11.85	11.84
FDD 3	---	11.35	11.35	11.33
FDD 7	13.00	11.96	11.96	---
FDD 8	9.40	8.46	8.46	8.45
FDD 20	9.20	8.23	8.23	8.20

	Max Gain for UKCA to respect MPE limits (dBi)			
FDD 28	9.30	7.49	7.49	7.47
FDD 34	---	11.96	11.96	---
FDD 38	---	11.96	11.96	---
FDD 40	---	11.96	11.96	---
FDD 41	---	11.96	11.96	---

11.3 Americas Approvals

11.4 USA FCC

11.4.1.1 FCC Certificates

The FCC Certificate is available here: <https://www.fcc.gov/oet/ea/fccid>

11.4.1.2 Applicable FCC rules

Table 32 Applicable FCC and ISED rules

Model <i>Modèle</i>	Applicable FCC Rules
CMB100A0-WW	47 CFR Part 2, 22, 24, 27, 90
CMB100B0-WW	47 CFR Part 2, 22, 24, 27, 90
CMB100B1-WW	47 CFR Part 2, 22, 24, 27, 90
CMB100C0-WW	47 CFR Part 2, 22, 24, 27, 90

11.4.1.3 FCC Regulatory notices

INTEGRATION INSTRUCTIONS

This module is intended for OEM integrators only. Per FCC KDB 996369 D03 OEM Manual, the following conditions must be strictly followed when using this certified module.

List of applicable FCC rules

Please refer to the Table 32.

Modification Statement

Telit has not approved any changes or modifications to this device by the user. Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

Interference Statement (if it is not placed in the device)

This device complies with Part 15 of the FCC Rules. 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.

Wireless Notice

This device complies with FCC radiation exposure limits set forth for an uncontrolled environment and meets the FCC radio frequency (RF) Exposure Guidelines. This transmitter must not be co-located or operate in conjunction with any other antenna or transmitter. The antenna should be installed and operated with a minimum distance of 20 cm between the radiator and your body

FCC Class B digital device notice

This equipment has been tested and found to comply with the limits for a Class B digital device, according to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used per 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 taking one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment 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.

Information for the OEMs and Integrators

The following statement must be included with all versions of this document supplied to an OEM or integrator but should not be distributed to the end user.

- 1 This device is intended for OEM integrators only.
- 2 Please see the full Grant of Equipment document for other restrictions

Manual Information to the End User

The OEM integrator should be aware not to provide information to the end user on 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 shown in this manual

Information on test modes and additional testing requirement

The module has been evaluated in mobile stand-alone conditions. For operational conditions other than a stand-alone modular transmitter in a host (multiple, simultaneously transmitting modules or other transmitters in a host), additional testing may be required (collocation, retesting...). If this module is intended for use in a portable device, you are responsible for separate approval to satisfy the SAR requirements of FCC Part 2.1093.

Additional testing, Part 15 Subpart B disclaimer

The modular transmitter is only authorized by the FCC for the specific rule parts (for example, 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.

This transmitter module is tested as a subsystem and its certification does not cover the FCC Part 15 Subpart B (unintentional radiator) rule requirement applicable to the final host. The final host will still need to be reassessed for compliance to this portion of rule requirements if applicable.

As long as all 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.

IMPORTANT NOTE:

Note: In the event that these conditions can not be met (for example collocation with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID can not 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.

Trace antenna designs

See section 7.3 for antenna and RF trace guidelines.

EMI Considerations

Please follow the guidance provided for host manufacturers in KDB publications 996369 D02 and D04.

How to make changes

Only Grantees are permitted to make permissive changes. Please contact us should the host integrator expect the module to be used differently than as granted:

Grantee code: RI7

Grantee name: Telit Communications S.p.A.

Mailing address: Viale Stazione di Prosecco 5/b, 34010 Sgonico – Trieste, Italy

Website: <https://www.telit.com/>

Support contact: TS-EMEA@telit.com

11.4.1.4 FCC Antenna info

This radio transmitter is sold without an antenna, and the antenna selection is up to the host device manufacturer.

This radio transmitter has been tested for FCC radio rules with the following antenna..

Table 33 Antenna Type used for FCC module type approval

Model	Antenna Type
CMB100A0-WW	Omnidirectional Atel-Cab T-AT305 Antenna Gain 2.14 dBi in all bands
CMB100B0-WW	
CMB100B1-WW	
CMB100C0-WW	

This radio transmitter has been approved by FCC to operate with the antenna types listed below with the maximum allowable gain indicated. Antenna types not included in this list, with a gain greater than the maximum gain indicated for that type, are strictly prohibited from use with this device. The antenna must be installed such that 20 cm can be maintained between the antenna and users.

Table 34 Maximum antenna gain for FCC (dBi) to meet ERP limits

Max Gain for FCC to meet MPE limits (dBi)				
Band	CMB100A0-WW	CMB100B0-WW	CMB100B1-WW	CMB100C0-WW
GSM 850	3.62	---	---	---
GSM 1900	8.51	---	---	---
GPRS/EGPRS 850	3.62	---	---	6.9
GPRS/EGPRS 1900	8.51	---	---	2.5
FDD 2	8.51	8.00	8.00	8.0
FDD 4	5.50	5.00	5.00	5.0
FDD 5	6.91	9.41	9.41	9.4
FDD 7	9.01	8.00	8.00	---
FDD 8	9.91	9.78	9.78	9.1
FDD 12	9.70	8.70	8.70	8.7
FDD 13	9.91	9.16	9.16	9.1
FDD 14	9.91	---	---	---
FDD 25	8.51	8.00	8.00	8.0
FDD 26	6.91	9.36 / 9.41	9.36 / 9.41	9.3
FDD 38	---	8.00	8.00	---
FDD 41	---	8.00	8.00	---
FDD 66	---	5.00	5.00	5.0
FDD 71	---	---	---	11.4
FDD 85	---	---	---	8.6

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

11.4.1.5 Labelling requirements for the host device

The host device shall be properly labelled to identify the modules within the host device. The certification label of the module shall be clearly visible at all times when installed in the host device, otherwise the host device must be labelled to display the FCC ID of the module, preceded by the words "Contains transmitter module", or the word "Contains", or similar wording expressing the same meaning, as in the below table.

Table 35: FCC Labelling requirements for the host device

Model	Host device FCC label
CMB100A0-WW	Contains FCC ID: RI7LE910CXWWX
CMB100B0-WW	Contains FCC ID: RI7
CMB100B1-WW	Contains FCC ID: RI7
CMB100C0-WW	Contains FCC ID: RI7ME910G1WW

11.5 Canada ISED

11.5.1.1 ISED Database

The products ISED certified can be found here:

Les produits certifiés ISED peuvent être trouvés ici :

<https://sms->

[sgs.ic.gc.ca/equipmentSearch/searchRadioEquipments?execution=e1s1&lang=en](https://sms-sgs.ic.gc.ca/equipmentSearch/searchRadioEquipments?execution=e1s1&lang=en)

11.5.1.2 Applicable ISED Rules

Table 36 Applicable FCC and ISED rules

Model <i>Modèle</i>	Applicable ISED Rules <i>Règles ISDE applicables</i>
CMB100A0-WW	RSS: 130 Issue 2, 132 Issue 4, 133 Issue 7, 139 Issue 4, 140 Issue 1, 199 Issue 4. RSS-Gen Issue 5
CMB100B0-WW	RSS-130 Issue 2, RSS-132 Issue 4, RSS-133 Issue 7, RSS-139 Issue 4, RSS-199 Issue 4; RSS-Gen Issue 5
CMB100B1-WW	RSS-130 Issue 2, RSS-132 Issue 4, RSS-133 Issue 7, RSS-139 Issue 4, RSS-199 Issue 4; RSS-Gen Issue 5
CMB100C0-WW	RSS: 130 Issue 2, 132 Issue 4, 133 Issue 7, 139 Issue 4 RSS-Gen Issue 5

11.5.1.3 ISED Regulatory Notices / Avis réglementaires de ISDE

Modification Statement / Déclaration de modification

Telit has not approved any changes or modifications to this device by the user. Any changes or modifications could void the user's authority to operate the equipment.

Telit n'approuve aucune modification apportée à l'appareil par l'utilisateur, quelle qu'en soit la nature. Tout changement ou modification peuvent annuler le droit d'utilisation de l'appareil par l'utilisateur.

Interference Statement / Déclaration d'interférence

This device complies with Industry Canada licence-exempt RSS standard(s). 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 applicables RSS standards d'Industrie Canada. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Radio Exposure Notice / Avis d'exposition radio

This device complies with ISED radiation exposure limits set forth for an uncontrolled environment and meets the RSS-102 of the ISED radio frequency (RF) Exposure rules. Antenna gain must be less than the values reported in the table below:

Le présent appareil est conforme à l'exposition aux radiations FCC / ISED définies pour un environnement non contrôlé et répond aux directives d'exposition de la fréquence de la FCC radiofréquence (RF) et RSS-102 de la fréquence radio (RF) ISED règles d'exposition. Gain de l'antenne doit être ci-dessous:

Table 37 Max Gain for ISED to meet ERP limits (dBi) / Gain d'antenne maximal pour ISDE pour respecter les limites ERP (dBi)

Band	Max Gain for ISED to meet ERP limits (dBi) / Gain d'antenne maximal pour ISDE pour respecter les limites ERP (dBi)			
	CMB100A0-WW	CMB100B0-WW	CMB100B1-WW	CMB100C0-WW
GSM 850	3.62	---	---	---
GSM 1900	8.51	---	---	---
GPRS/EGPRS 850	3.62	---	---	3.6
GPRS/EGPRS 1900	8.51	---	---	2.5
FDD 2	8.51	8.00	8.00	8.0
FDD 4	5.50	5.00	5.00	5.0
FDD 5	6.91	6.12	6.12	6.1
FDD 7	9.01	8.00	8.00	---
FDD 12	6.64	5.63	5.63	5.6
FDD 13	6.64	5.95	5.95	5.9
FDD 14	6.64	---	---	---
FDD 25	8.51	8.00	8.00	8.0

FDD 26	6.91	6.12	6.12	6.0
FDD 38	---	8.00	8.00	---
FDD 41	---	8.00	8.00	---
FDD 66	---	5.00	5.00	5.0
FDD 71	---	---	---	8.4
FDD 85	---	---	---	5.6

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

L'émetteur ne doit pas être colocalisé ni fonctionner conjointement avec à autre antenne ou autre émetteur.

This equipment must be installed and operated in accordance with provided instructions and the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. End-users and installers must be provided with antenna installation instructions and consider removing the no-collocation statement.

Cet équipement doit être installé et utilisé conformément aux instructions fournies et la ou les antennes utilisées pour cet émetteur doivent être installées pour fournir une distance de séparation d'au moins 20 cm de toutes les personnes et ne doivent pas être co-localisées ou fonctionner en conjunction avec toute autre antenne ou émetteur. Les utilisateurs finaux et les installateurs doivent recevoir les instructions d'installation de l'antenne et envisager de supprimer la déclaration de non-collocation.

ISED Antenna info

This radio transmitter is sold without an antenna, and the antenna selection is up to the host device manufacturer.

Cet émetteur radio est vendu sans antenne et le choix de l'antenne appartient au fabricant de l'appareil hôte.

This radio transmitter has been tested with the following antenna.

Cet émetteur radio a été testé avec l'antenne suivante.

Table 38: Antenna Type used for ISED module type approval / Type d'antenne utilisé pour l'approbation de type de module ISDE

Model	Antenna Type
CMB100A0-WW	Omnidirectional Atel-Cab T-AT305 Antenna Gain 2.14 dBi in all bands
CMB100B0-WW	
CMB100B1-WW	
CMB100C0-WW	

Trace antenna designs

See 7.3 section for antenna and RF trace guidelines.

Voir la section 7.3 pour les directives relatives à l'antenne et au tracé RF.

Information on test modes and additional testing requirement / Informations sur les modes de test et exigences de test supplémentaires

The module has been evaluated in mobile stand-alone conditions. For operational conditions other than a stand-alone modular transmitter in a host (multiple, simultaneously transmitting modules or other transmitters in a host), additional testing may be required (collocation, retesting...) If this module is intended for use in a portable device, you are responsible for separate approval to satisfy the SAR requirements IC RSS-102.

Le module a été évalué dans des conditions mobiles autonomes. Pour des conditions de fonctionnement autres qu'un émetteur modulaire autonome dans un hôte (plusieurs modules transmettant simultanément ou d'autres émetteurs dans un hôte), des tests supplémentaires peuvent être nécessaires (colocalisation, retest...) Si ce module est destiné à être utilisé dans un appareil portable, vous êtes responsable de l'approbation séparée pour satisfaire aux exigences SAR IC RSS-102.

11.5.1.4 Labelling requirements for the host device / Exigences d'étiquetage pour le périphérique hôte

The host device shall be properly labelled to identify the modules within the host device. The certification label of the module shall be clearly visible at all times when installed in the host device, otherwise the host device must be labelled to display the IC of the module, preceded by the words "Contains transmitter module", or the word "Contains", or similar wording expressing the same meaning, as in the following table.

L'appareil hôte doit être étiqueté comme il faut pour permettre l'identification des modules qui s'y trouvent. L'étiquette de certification du module donné doit être posée sur l'appareil hôte à un endroit bien en vue en tout temps. En l'absence d'étiquette, l'appareil hôte doit porter une étiquette donnant le IC du module, précédé des mots « Contient un module d'émission », du mot « Contient » ou d'une formulation similaire exprimant le même sens, comme en tableau suivant.

Table 39: ISED Labelling requirements for the host device / ISDE étiquetage pour le périphérique hôte

Model	Host device FCC label
CMB100A0-WW	Contains IC: 5131A-LE910CXWWX
CMB100B0-WW	Contains IC: 5131A-LE910Q1WW
CMB100B1WW	Contains IC: 5131A-LE910Q1WWG
CMB100C0-WW	Contains IC: 5131A-ME910G1WW

CAN ICES-3 (B) / NMB-3 (B)

This Class B digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de classe B est conforme à la norme canadienne ICES-003.

11.6 RoHS and REACH info

11.6.1 RoHS info

Any requests on information related to RoHS certifications can be addressed to Chemical.Certifications@telit.com.

11.6.2 REACH info

Any requests on information related to REACH certifications can be addressed to Chemical.Certifications@telit.com.

12 Acronyms and Abbreviations

Table 40: Acronyms and Abbreviation

Acronym	Definition
TTSC	Telit Technical Support Centre
USB	Universal Serial Bus
HS	High Speed
DTE	Data Terminal Equipment
UMTS	Universal Mobile Telecommunication System
WCDMA	Wideband Code Division Multiple Access
HSDPA	High Speed Downlink Packet Access
HSUPA	High Speed Uplink Packet Access
UART	Universal Asynchronous Receiver Transmitter
HSIC	High Speed Inter Chip
SIM	Subscriber Identification Module
SPI	Serial Peripheral Interface
ADC	Analog – Digital Converter
DAC	Digital – Analog Converter
I/O	Input Output
GPIO	General Purpose Input Output
CMOS	Complementary Metal – Oxide Semiconductor
MOSI	Master Output – Slave Input
MISO	Master Input – Slave Output
CLK	Clock
MRDY	Master Ready
SRDY	Slave Ready
CS	Chip Select
RTC	Real Time Clock
PCB	Printed Circuit Board
ESR	Equivalent Series Resistance
VSWR	Voltage Standing Wave Ratio
VNA	Vector Network Analyzer

13 Related Documents

For current documentation and downloads, refer to <https://dz.telit.com/>.

Table 41: Related Documents

S.no	Doc Code	Document Title
1	1VW0301974	CMB100 Quick Start Guide
2	1VW0301976	CMB100 Video Guide

14 Document History

Table 42: Document History

Revision	Date	Changes
0	2024-06-21	Initial release
1	2024-07-15	Preliminary release
2	2024-11-19	First review added SIM holder description
2.1	2025-02-18	Added CMB100B1 with LE910Q1-WWG
3	2025-03-11	Updated the number from 2.1 to 3
4	2025-05-22	Updated values for CMB100B0/B1
5	2025-07-24	Updated Table 37 on B0 FDD2, minus fix on ref table for FCC rules

From Mod.0818 Rev.15

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