

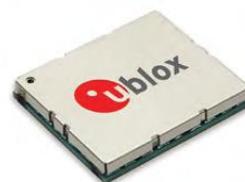
LARA-R2 series

LTE Cat 1 / EGPRS modules

Data Sheet

Abstract

Technical data sheet describing LARA-R2 series multi-mode cellular modules. The modules are a cost efficient and performance optimized LTE Cat 1 / GSM multi-mode solution covering up to three LTE bands and up to two GSM/EGPRS bands in the very small and compact LARA form factor.



Document Information

Title	LARA-R2 series	
Subtitle	LTE Cat 1 / EGPRS modules	
Document type	Data Sheet	
Document number	UBX-16005783	
Revision and date	R04	11-Oct-2016
Document status	Objective Specification	

Document status explanation

Objective Specification	Document contains target values. Revised and supplementary data will be published later.
Advance Information	Document contains data based on early testing. Revised and supplementary data will be published later.
Early Production Information	Document contains data from product verification. Revised and supplementary data may be published later.
Production Information	Document contains the final product specification.

This document applies to the following products:

Name	Type number	Modem version	Application version	PCN / IN
LARA-R204	LARA-R204-02B-00	31.11	A01.00	UBX-16023978
LARA-R211	LARA-R211-02B-00	30.18	A01.00	UBX-16024242

u-blox reserves all rights to this document and the information contained herein. Products, names, logos and designs described herein may in whole or in part be subject to intellectual property rights. Reproduction, use, modification or disclosure to third parties of this document or any part thereof without the express permission of u-blox is strictly prohibited.

The information contained herein is provided "as is" and u-blox assumes no liability for the use of the information. No warranty, either express or implied, is given, including but not limited, with respect to the accuracy, correctness, reliability and fitness for a particular purpose of the information. This document may be revised by u-blox at any time. For most recent documents, please visit www.u-blox.com. Copyright © 2016, u-blox AG.

u-blox® is a registered trademark of u-blox Holding AG in the EU and other countries.

Contents

Contents.....	3
1 Functional description.....	5
1.1 Overview	5
1.2 Product features	5
1.3 Block diagram.....	6
1.4 Product description.....	7
1.5 AT command support.....	8
1.6 Supported features.....	8
2 Interfaces	10
2.1 Power management	10
2.1.1 Module supply input (VCC)	10
2.1.2 RTC supply input / output (V_BCKP)	10
2.1.3 Generic digital interfaces supply output (V_INT).....	10
2.2 Antenna interfaces	10
2.2.1 Antenna RF interfaces	10
2.2.2 Antenna detection	10
2.3 System functions	11
2.3.1 Module power-on	11
2.3.2 Module power-off.....	11
2.3.3 Module reset.....	11
2.3.4 Module / host configuration selection	11
2.4 SIM.....	12
2.4.1 SIM interface.....	12
2.4.2 SIM detection.....	12
2.5 Serial communication	12
2.5.1 UART interface	12
2.5.2 USB interface	13
2.5.3 HSIC interface	14
2.5.4 DDC (I ² C) interface	15
2.5.5 SDIO interface	15
2.6 Audio	15
2.7 Clock output	15
2.8 GPIO.....	16
3 Pin definition	17
3.1 Pin assignment	17
4 Electrical specifications	22
4.1 Absolute maximum rating	22
4.1.1 Maximum ESD.....	22

4.2	Operating conditions	23
4.2.1	Operating temperature range	23
4.2.2	Supply/power pins	23
4.2.3	Current consumption	24
4.2.4	LTE RF characteristics	25
4.2.5	2G RF characteristics	26
4.2.6	ANT_DET pin	26
4.2.7	PWR_ON pin	27
4.2.8	RESET_N pin	27
4.2.9	SIM pins	27
4.2.10	USB pins	28
4.2.11	HSIC pins	28
4.2.12	DDC (I ² C) pins	29
4.2.13	Generic Digital Interfaces pins	29
5	Mechanical specifications	30
6	Qualification and approvals	31
6.1	Reliability tests	31
6.2	Approvals	31
7	Product handling & soldering	32
7.1	Packaging	32
7.1.1	Reels	32
7.1.2	Tapes	33
7.2	Moisture Sensitivity Levels	34
7.3	Reflow soldering	34
7.4	ESD precautions	34
8	Default settings	35
9	Labeling and ordering information	36
9.1	Product labeling	36
9.2	Explanation of codes	36
9.3	Ordering information	37
Appendix	38
A	Glossary	38
Related documents	39
Revision history	39
Contact	40

1 Functional description

1.1 Overview

The LARA-R2 series comprises LTE Cat 1 / 2G multi-mode modules in the very small LARA LGA form-factor (26.0 x 24.0 mm) that are easy to integrate in compact designs.

LARA-R2 series modules support up to three LTE bands and up to two 2G GSM/(E)GPRS bands for voice and/or data transmission.

LARA-R2 series modules are form-factor compatible with u-blox SARA, LISA and TOBY cellular module families: this facilitates easy migration from u-blox GSM/GPRS, CDMA, UMTS/HSPA, and LTE high data rate modules, maximizes the investments of customers, simplifies logistics, and enables very short time-to-market.

The modules are ideal for applications that are transitioning to LTE from 2G and 3G, due to the long term availability and scalability of LTE networks.

With a range of interface options and an integrated IP stack, the modules are designed to support a wide range of data-centric applications. The unique combination of performance and flexibility make these modules ideally suited for medium speed M2M applications, such as smart energy gateways, remote access video cameras, digital signage, telehealth and telematics.

LARA-R2 series modules support Voice over LTE (VoLTE) and voice service over 2G (CSFB) for applications that require voice, such as security and surveillance systems.

1.2 Product features

Model	Region	Radio Access Technology		Positioning	Interfaces						Audio	Features								Grade					
		LTE Bands	GSM Bands	GNSS via modem Assist Now Software CellLocate®	UART	USB 2.0	HSIC	SDIO	DDC (I ² C)	GPIOs	Analog audio	Digital audio	Network indication	Antenna supervisor	Rx Diversity	Jamming detection	Embedded TCP/UDP stack	Embedded HTTP,FTP,SSL	FOTA	eCall / ERA GLONASS	Dual stack IPv4/IPv6	Standard	Professional	Automotive	
LARA-R204	North America	4,13		• • •	• • •	• • •	• • •	• • •	• • •	• • •	•	•	• • • • • • • • • •	•											
LARA-R211	Europe, APAC	3,7,20	900,1800	• • •	• • •	• • •	• • •	• • •	• • •	• • •	•	•	• • • • • • • • • •	•											

Table 1: LARA-R2 series main features summary

1.3 Block diagram

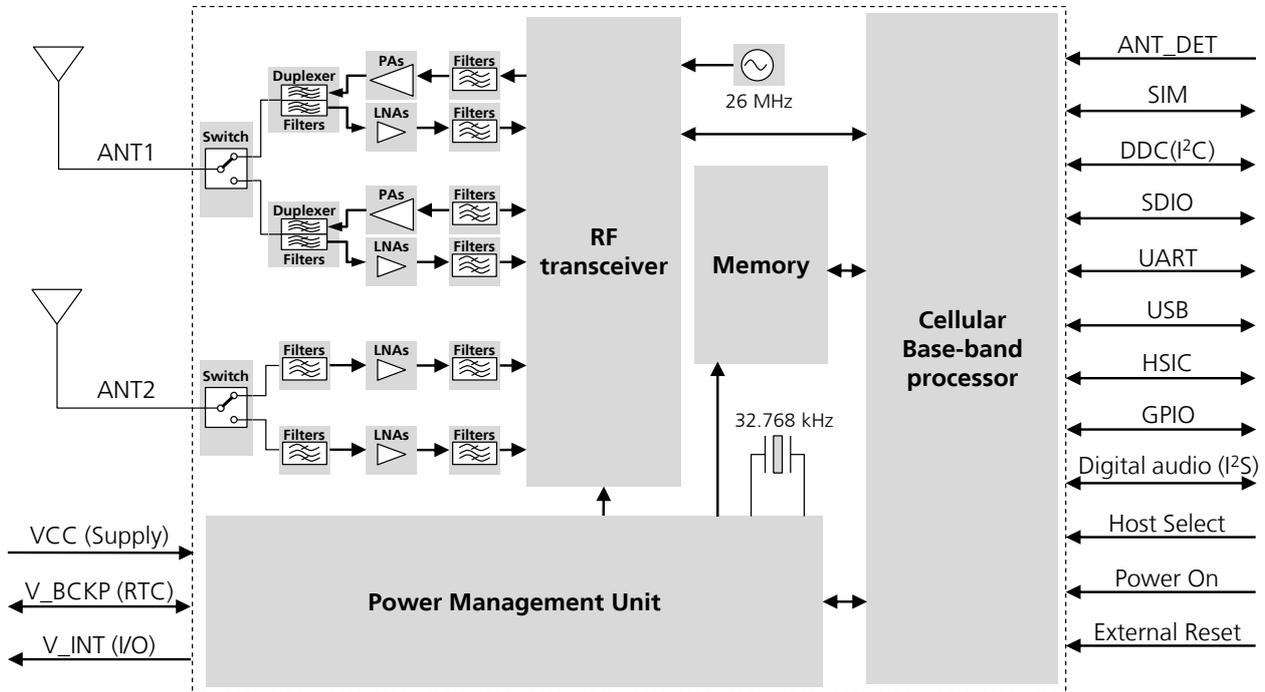


Figure 1: LARA-R2 series block diagram



The LARA-R204 module "02" product version (i.e. the LARA-R204-02B cellular module product version) does not support the following interfaces, which can be left unconnected and should not be driven by external devices:

- Digital audio interface
- HSIC interface
- SDIO interface
- HOST_SELECT pin



The LARA-R211 module "02" product version (i.e. the LARA-R211-02B cellular module product version) does not support the following interfaces, which can be left unconnected and should not be driven by external devices:

- HSIC interface
- SDIO interface
- HOST_SELECT pin

1.4 Product description

LARA-R2 series modules provide LTE Cat 1, GSM/(E)GPRS multi-mode technology:

- LARA-R204 is designed mainly for operation in America (on Verizon network)
- LARA-R211 is designed mainly for operation in Europe, Asia and other countries

4G LTE	2G GSM/GPRS/EDGE
3GPP Release 9 Long Term Evolution (LTE) Evolved Universal Terrestrial Radio Access (E-UTRA) Frequency Division Duplex (FDD) DL Rx diversity	3GPP Release 9 Enhanced Data rate GSM Evolution (EDGE) GSM EGPRS Radio Access (GERA) Time Division Multiple Access (TDMA) DL Advanced Rx Performance
Band support ¹ : <ul style="list-style-type: none"> • LARA-R204: <ul style="list-style-type: none"> • Band 13 (750 MHz) • Band 4 (1700 MHz) • LARA-R211: <ul style="list-style-type: none"> • Band 20 (800 MHz) • Band 3 (1800 MHz) • Band 7 (2600 MHz) 	Band support: <ul style="list-style-type: none"> • LARA-R211: <ul style="list-style-type: none"> • E-GSM 900 MHz • DCS 1800 MHz
LTE Power Class <ul style="list-style-type: none"> • Power Class 3 (23 dBm) 	GSM/GPRS (GMSK) Power Class <ul style="list-style-type: none"> • Power Class 4 (33 dBm) for E-GSM band • Power Class 1 (30 dBm) for DCS band EDGE (8-PSK) Power Class <ul style="list-style-type: none"> • Power Class E2 (27 dBm) for E-GSM band • Power Class E2 (26 dBm) for DCS band
Data rate <ul style="list-style-type: none"> • LTE category 1: up to 10.3 Mb/s DL, 5.2 Mb/s UL 	Data rate ² <ul style="list-style-type: none"> • GPRS multi-slot class 12³, CS1-CS4, up to 85.6 kb/s DL/UL • EDGE multi-slot class 12³, MCS1-MCS9, up to 236.8 kb/s DL/UL

Table 2: LARA-R2 series LTE and 2G characteristics

LARA-R2 modules provide Voice over LTE (VoLTE) as well as Circuit-Switched-Fall-Back (CSFB) audio capability⁴.

¹ LARA-R2 series modules support all the E-UTRA channel bandwidths for each operating band according to 3GPP TS 36.521-1 [11].

² GPRS/EDGE multi-slot class determines the number of timeslots available for upload and download and thus the speed at which data can be transmitted and received, with higher classes typically allowing faster data transfer rates.

³ GPRS/EDGE multi-slot class 12 implies a maximum of 4 slots in DL (reception) and 4 slots in UL (transmission) with 5 slots in total.

⁴ Not supported by LARA-R204 module "02" product version.

1.5 AT command support

The LARA-R2 series modules support AT commands according to 3GPP standards TS 27.007 [7], TS 27.005 [8] and the u-blox AT command extension.



For the complete list of all supported AT commands and their syntax, see the u-blox AT Commands Manual [1].

RIL (Radio Interface Layer) software for Android and Embedded Windows is available for LARA-R2 series modules free of charge; see the Android RIL Production delivery [3] application note for the supported software deliveries and more information.

1.6 Supported features

Table 3 lists some of the main features supported by LARA-R2 modules. For more details see LARA-R2 series System Integration Manual [2] and u-blox AT Commands Manual [1].

Feature	Description
Network Indication	GPIO configured to indicate the network status: registered home network, registered roaming, voice or data call enabled, no service. The feature can be enabled through the +UGPIOC AT command.
Antenna Detection	The ANT_DET pin provides antenna presence detection capability, evaluating the resistance from ANT1 and ANT2 pins to GND by means of an external antenna detection circuit implemented on the application board. The antenna detection feature can be enabled through the +UANTR AT command.
Jamming detection ⁵	Detects "artificial" interference that obscures the operator's carriers entitled to give access to the radio service and reports the start and stop of such conditions to the application processor that can react accordingly.
Embedded TCP and UDP stack	Embedded TCP/IP and UDP/IP stack including direct link mode for TCP and UDP sockets. Sockets can be set in Direct Link mode to establish a transparent end to end communication with an already connected TCP or UDP socket via serial interface.
FTP, FTPS	File Transfer Protocol as well as Secure File Transfer Protocol (SSL encryption of FTP control channel) functionalities are supported by means of AT commands.
HTTP, HTTPS	Hyper-Text Transfer Protocol as well as Secure Hyper-Text Transfer Protocol (SSL encryption) functionalities are supported via AT commands. HEAD, GET, POST, DELETE and PUT operations are available.
Embedded TLS 1.2	With the support of X.509 certificates, Embedded TLS 1.2 provides server and client authentication, data encryption, data signature and enables TCP/IP applications like HTTPS and FTPS to communicate over a secured and trusted connection.
DNS	Support for DNS functionality
IPv4/IPv6 dual-stack	Capability to move between IPv4 and dual stack network infrastructures. IPv4 and IPv6 addresses can be used.
BIP	Bearer Independent Protocol for Over-the-Air SIM provisioning. The data transfer to/from the SIM uses either an already active PDP context or a new PDP context established with the APN provided by the SIM card.
Multiple PDP contexts	Up to 8 PDP contexts can be activated, and multi secondary PDP contexts be associated to a primary PDP context
VoLTE and CSFB audio capability ⁶	Voice over LTE (VoLTE) feature allows voice service over LTE bearer, via embedded IP Multimedia Subsystem (IMS) Circuit Switched Fall-Back (CSFB) feature allows voice service over circuit switched infrastructure (2G)
Firmware update Over AT commands (FOAT)	Firmware module update over AT command interfaces.
Firmware update Over The Air (FOTA)	Embedded FOTA client to enable the Firmware module update over the cellular air interface.

⁵ Not supported by "02" product versions.

⁶ Not supported by LARA-R204 module "02" product version.

Feature	Description
LTE Rx Diversity	Improved cellular link quality and reliability on all operating bands, by means of 2 receiving antenna inputs.
GNSS via modem ⁷	Full access to u-blox positioning chips and modules is available through a dedicated DDC (I ² C) interface. This means that from any host processor a single serial port can control the cellular module and the positioning chip or module. For more details see the GNSS Implementation Application Note [4].
Embedded AssistNow Software ⁷	Embedded AssistNow Online and AssistNow Offline clients are available to provide better GNSS performance and faster Time-to-First-Fix. An AT command can enable / disable the clients.
CellLocate ^{®7}	Enables the estimation of device position based on the parameters of the mobile network cells visible to the specific device based on the CellLocate [®] database: <ul style="list-style-type: none"> • Normal scan: only the parameters of the visible home network cells are sent • Deep scan: the parameters of all surrounding cells of all mobile operators are sent CellLocate [®] is available via a set of AT commands for CellLocate [®] service configuration and position request.
Hybrid Positioning ⁷	The current module position is provided by a u-blox positioning chip or module or the estimated position from CellLocate [®] depending on which method provides the best and fastest solution according to the user configuration. Hybrid positioning is available via a set of AT commands that allow the configuration and the position request.
Wi-Fi via modem ⁷	Full access to Wi-Fi modules is available through a dedicated SDIO interface. This means that from any host processor a single serial port can control the cellular module and the short range communication module.
In-Band Modem ⁷	In-Band modem solution for eCall and ERA-GLONASS emergency call applications over cellular networks implemented according to the 3GPP TS 26.267 specification [10] When activated, the in-vehicle eCall / ERA-GLONASS system (IVS) creates an emergency call carrying both voice and data (including vehicle position data) directly to the nearest Public Safety Answering Point (PSAP) to determine whether rescue services should be dispatched to the known position.
Smart Temperature Supervisor	Constant monitoring of the module board temperature: <ul style="list-style-type: none"> • Warning notification when the temperature approaches an upper or lower predefined threshold • Shutdown notified and forced when the temperature value is outside the specified range (shutdown suspended in case of an emergency call in progress) The Smart Temperature Supervisor feature can be enabled and configured through the +USTS AT command.  The sensor measures board temperature, which can differ from ambient temperature.
Power saving	The power saving configuration is by default disabled, but it can be enabled and configured using the +UPSV AT command. When the power saving is enabled, the module automatically enters the low power idle-mode whenever possible, reducing current consumption. During idle-mode, the module processor core runs with the RTC 32 kHz reference clock, which is generated by the internal 32 kHz oscillator.
Fast Dormancy	The Fast Dormancy feature, defined in 3GPP Rel.8, allows reduction of current consumption and network utilization during periods of data inactivity. It can be activated and configured by +UFDAC and +UDCONF=61 AT commands.
LTE cDRX	Both the Long DRX Cycle and the Short DRX cycle are supported for LTE Connected Discontinuous Reception, allowing reduction of current consumption and LTE network utilization during periods of data inactivity
Power Saving Mode (PSM) as specified in 3GPP Release 12 ⁷	The Power Saving Mode (PSM) feature, defined in 3GPP Rel.12, allows further reduction of the module current consumption by decreasing the signaling load between the module and the network on non-access stratum level during periods of data inactivity. It can be activated and configured by dedicated AT commands.

Table 3: Some of the main features supported by LARA-R2 series modules


u-blox is extremely mindful of user privacy. When a position is sent to the CellLocate[®] server u-blox is unable to track the SIM used or the specific device.

⁷ Not supported by "02" product versions.

2 Interfaces

2.1 Power management

2.1.1 Module supply input (VCC)

LARA-R2 series modules must be supplied through the three **VCC** pins by a DC power supply. Voltage must be stable, because during operation the current drawn from **VCC** can vary by some order of magnitude, especially due to the surging consumption profile of the GSM system (described in the LARA-R2 series System Integration Manual [2]). It is important that the system power supply circuit is able to support peak power.

LARA-R211 modules provide separate supply inputs over the three **VCC** pins:

- **VCC** pins #52 and #53 represent the supply input for the internal RF power amplifier, demanding most of the total current drawn of the module when RF transmission is enabled during a voice/data call
- **VCC** pin #51 represents the supply input for the internal baseband Power Management Unit and the internal transceiver, demanding minor part of the total current drawn of the module when RF transmission is enabled during a voice/data call

2.1.2 RTC supply input / output (V_BCKP)

When **VCC** voltage is within the valid operating range, the internal Power Management Unit (PMU) supplies the Real Time Clock (RTC) and the same supply voltage is available on the **V_BCKP** pin. If the **VCC** voltage is under the minimum operating limit (e.g. during not powered mode), the **V_BCKP** pin can externally supply the RTC.

2.1.3 Generic digital interfaces supply output (V_INT)

LARA-R2 series modules provide a 1.8 V supply rail output on the **V_INT** pin, which is internally generated when the module is switched on. The same voltage domain is used internally to supply the generic digital interfaces of the modules. The **V_INT** supply output can be used in place of an external discrete regulator.

2.2 Antenna interfaces

2.2.1 Antenna RF interfaces

The modules have two RF pins with a characteristic impedance of 50 Ω . The primary antenna pin (**ANT1**) supports both Tx and Rx, providing the main antenna interface, while the secondary antenna pin (**ANT2**) supports Rx only for the LTE Rx diversity configuration.

2.2.2 Antenna detection

The **ANT_DET** pin is an Analog to Digital Converter (ADC) input with a current source provided by LARA-R2 modules to sense the antenna(s) presence (as an optional feature). It evaluates the resistance from **ANT1** and **ANT2** pins to GND by means of an external antenna detection circuit implemented on the application board. (For more details, see LARA-R2 series System Integration Manual [2] and u-blox AT Commands Manual [1].)

2.3 System functions

2.3.1 Module power-on

LARA-R2 series can be switched on in one of the following ways:

- Rising edge on the **VCC** pin to a valid voltage for module supply, i.e. applying module supply
- Low pulse on the **PWR_ON** pin, which is normally set high by an internal pull-up, for a valid time period (see section 4.2.7), when the **VCC** voltage is within the valid operating range. The **PWR_ON** line should be driven by open drain, open collector or contact switch.
- Rising edge on the **RESET_N** pin, i.e. releasing the pin from the low level, normally set high by an internal pull-up, when the **VCC** voltage is within the valid operating range. The **RESET_N** line should be driven by open drain, open collector or contact switch.
- RTC alarm, i.e. pre-programmed scheduled time by AT+CALA command, when the **VCC** voltage is within the valid operating range.

2.3.2 Module power-off

LARA-R2 series can be properly switched off by:

- AT+CPWROFF command (see the u-blox AT Commands Manual [1]). The current parameter settings are saved in the module's non-volatile memory and a proper network detach is performed.

An abrupt under-voltage shutdown occurs on LARA-R2 series modules when the **VCC** supply is removed. If this occurs, it is not possible to store the current parameter settings in the module's non-volatile memory or to perform the proper network detach.

An abrupt shutdown occurs on LARA-R2 series modules when a low level is applied on the **RESET_N** pin, which is normally set high by an internal pull-up. If this occurs, it is not possible to store the current parameter settings in the module's non-volatile memory and to perform the proper network detach.

An over-temperature or an under-temperature shutdown occurs on LARA-R2 modules when the temperature measured within the cellular module reaches the dangerous area, if the optional Smart Temperature Supervisor feature is enabled and configured by the dedicated AT command. For more details see the LARA-R2 series System Integration Manual [2] and the u-blox AT Commands Manual [1], +USTS AT command.

2.3.3 Module reset

LARA-R2 series modules can be reset (rebooted) by:

- AT+CFUN command (see the u-blox AT Commands Manual [1]). This causes an "internal" or "software" reset of the module. The current parameter settings are saved in the module's non-volatile memory and a proper network detach is performed.

An abrupt "external" or "hardware" reset occurs when a low level is applied to the **RESET_N** pin, which is normally set high by an internal pull-up, for a valid time period (see the section 4.2.8). This causes an "external" or "hardware" reset of the entire module, including the integrated power management unit, except for the RTC internal block: the **V_INT** generic digital interfaces supply is switched off and all the digital pins are tri-stated, but the **V_BCKP** supply and the RTC block are enabled. The current parameter settings are not saved in the module's non-volatile memory and a proper network detach is not performed. The **RESET_N** line should be driven by open drain, open collector or contact switch.

2.3.4 Module / host configuration selection



Selection of module / host configuration over **HOST_SELECT** is not supported by "02" product versions.

The modules include one pin (**HOST_SELECT**) to select the module / host application processor configuration: the pin is available to select, enable, connect, disconnect and subsequently re-connect the HSIC interface.

2.4 SIM

2.4.1 SIM interface

A SIM card interface is provided on the **VSIM**, **SIM_IO**, **SIM_CLK**, **SIM_RST** pins: the high-speed SIM/ME interface is implemented as well as the automatic detection of the required SIM supporting voltage.

Both 1.8 V and 3 V SIM types are supported (1.8 V and 3 V ME). Activation and deactivation with automatic voltage switch from 1.8 V to 3 V is implemented, according to ISO-IEC 7816-3 specifications. The SIM driver supports the PPS procedure for baud-rate selection, according to the values proposed by the SIM card/chip.

2.4.2 SIM detection

LARA-R2 series modules provide the SIM detection function over the **GPIO5** pin to sense the SIM card physical presence (as an optional feature) when the pin of the module is properly connected to the mechanical switch of the SIM card holder (for more details see the LARA-R2 series System Integration Manual [2]).

2.5 Serial communication

LARA-R2 series modules provide the following serial communication interfaces:

- UART interface: Universal Asynchronous Receiver/Transmitter serial interface available for the communication with a host application processor (AT commands, data communication, FW update by means of FOAT), for FW update by means of the u-blox EasyFlash tool and for diagnostic.
- USB interface: Universal Serial Bus 2.0 compliant interface available for the communication with a host application processor (AT commands, data communication, FW update by means of the FOAT feature), for FW update by means of the u-blox EasyFlash tool and for diagnostic.
- HSIC interface: High-Speed Inter-Chip USB compliant interface available for the communication with a host application processor (AT commands, data communication, FW update by means of the FOAT feature), for FW update by means of the u-blox EasyFlash tool and for diagnostic.
- DDC interface: I²C bus compatible interface available for the communication with u-blox GNSS positioning chips/modules and with external I²C devices as an audio codec.
- SDIO interface: Secure Digital Input Output interface available for the communication with compatible u-blox short range radio communication Wi-Fi modules.

2.5.1 UART interface

LARA-R2 series modules include a 9-wire unbalanced Universal Asynchronous Receiver/Transmitter serial interface (UART) for communication with an application host processor (AT commands, data communication, FW update by means of the FOAT feature), for FW update by means of the u-blox EasyFlash tool and for diagnostic.

UART features are:

- Complete serial port with RS-232 functionality conforming to the ITU-T V.24 Recommendation [13], with CMOS compatible signal levels (0 V for low data bit or ON state and 1.8 V for high data bit or OFF state)
- Data lines (**RXD** as output, **TXD** as input), hardware flow control lines (**CTS** as output, **RTS** as input), modem status and control lines (**DTR** as input, **DSR** as output, **DCD** as output, **RI** as output) are provided
- Hardware flow control (default value), software flow control, or none flow control are supported
- Power saving indication available on the hardware flow control output (**CTS** line): the line is driven to the OFF state when the module is not prepared to accept data by the UART interface
- Power saving control over the **RTS** input or the **DSR** input can be enabled via AT+UPSV command (for more details see u-blox AT Commands Manual [1] and LARA-R2 series System Integration Manual [2])

- The following baud rates are supported: 9600, 19200, 38400, 57600, 115200 (default baud rate when autobauding is disabled), 230400, 460800, 921600, 3000000, 3250000, 6000000 and 6500000 b/s
- One-shot autobauding is supported and it is by default enabled: automatic baud rate detection is performed only once, at module start up. After the detection, the module works at the fixed baud rate (the detected one) and the baud rate can only be changed via AT command (see u-blox AT Commands Manual [1], +IPR).
- The following frame formats are supported: 8N2, 8N1 (default format when automatic frame recognition is disabled), 8E1, 8O1, 7E1 and 7O1
- One-shot automatic frame recognition is supported and it is by default enabled in conjunction with automatic baud rate detection (autobauding): the detection is performed only once, at module start up. After the detection, the module works at the detected frame format and it can only be changed via AT command (see u-blox AT Commands Manual [1], +ICF).

UART serial interface can be conveniently configured through AT commands: see the u-blox AT Commands Manual [1] (+IPR, +ICF, +IFC, &K, \Q, +UPSV AT commands) and LARA-R2 series System Integration Manual [2].

2.5.1.1 Multiplexer protocol

LARA-R2 series modules include multiplexer functionality as per 3GPP TS 27.010 [9] on the UART physical link.

This is a data link protocol which uses HDLC-like framing and operates between the module (DCE) and the application processor (DTE), allowing a number of simultaneous sessions over the physical link (UART): the user can concurrently use AT interface on one MUX channel and data communication on another MUX channel.

The following virtual channels are available (for more details, see the Mux Implementation Application Note [5]):

- Channel 0: Multiplexer control
- Channel 1 – 5: AT commands / data connection
- Channel 6: GNSS data tunneling



The GNSS data tunnelling channel is not supported by "02" product versions.

2.5.2 USB interface

LARA-R2 series modules include a USB High-Speed 2.0 compliant interface with maximum 480 Mb/s data rate according to the Universal Serial Bus Specification Revision 2.0 [14]. The module itself acts as a USB device and can be connected to any compatible USB host.

The USB interface is available for the communication with a host application processor (AT commands, data communication, FW update by means of the FOAT feature), for FW update by means of the u-blox EasyFlash tool and for diagnostic.

The **USB_D+** / **USB_D-** lines carry the USB data and signaling. The USB interface is automatically enabled by an external valid USB VBUS supply voltage (5.0 V typical) applied on the **VUSB_DET** pin.

The USB interface of LARA-R2 series modules makes available different USB functions with various capabilities and purposes, such as:

- CDC-ACM for AT commands and data communication
- CDC-ACM for GNSS tunneling
- CDC-ACM for SAP (SIM Access Profile)
- CDC-ACM for Diagnostic log
- CDC-NCM for Ethernet-over-USB



CDC-ACM for GNSS tunneling, CDC-ACM for SAP, and CDC-NCM for Ethernet-over-USB are not supported by "02" product versions.

The USB interface provides the following set of USB functions:

- 6 CDC-ACM modem COM ports enumerated as follows:
 - USB1: AT and data
 - USB2: AT and data
 - USB3: AT and data
 - USB4: GNSS tunneling
 - USB5: SAP (SIM Access Profile)
 - USB6: Diagnostic log

The user can concurrently use the AT command interface on one CDC, and Packet-Switched / Circuit-Switched Data communication on another CDC.

For more details regarding USB capabilities, see the LARA-R2 series System Integration Manual [2].

USB drivers are available for the following Windows and Windows Embedded operating system platforms:

- Windows 7
- Windows 8
- Windows 8.1
- Windows 10
- Windows Embedded CE 6.0
- Windows Embedded Compact 7
- Windows Embedded Compact 2013

LARA-R2 series modules are compatible with standard Linux/Android USB kernel drivers.

2.5.3 HSIC interface



The HSIC interface is not supported by “02” modules product versions except for diagnostic purposes.

LARA-R2 series modules include a USB High-Speed Inter-Chip compliant interface with maximum 480 Mb/s data rate according to the High-Speed Inter-Chip USB Electrical Specification Version 1.0 [15] and USB Specification Revision 2.0 [14]. The module itself acts as a device and can be connected to any compatible host.

The HSIC interface is available for the communication with a host application processor (AT commands, data communication, FW update by means of the FOAT feature), for FW update by means of the u-blox EasyFlash tool and for diagnostic.

The HSIC interface consists of a bi-directional DDR data line (**HSIC_DATA**) for transmitting and receiving data synchronously with the bi-directional strobe line (**HSIC_STRB**).

The modules include also the **HOST_SELECT** pin to select the module / host application processor configuration: the pin is available to select, enable, connect, disconnect and subsequently re-connect the HSIC interface.

2.5.4 DDC (I²C) interface



Communication with u-blox GNSS receivers over DDC (I²C) is not supported by “02” product versions.

LARA-R2 series modules include an I²C-bus compatible DDC interface (**SDA, SCL**) available to communicate with a u-blox GNSS receiver and with external I²C devices as an audio codec: the LARA-R2 module acts as an I²C master which can communicate with I²C slaves in accordance with the I²C bus specifications [16].

For more details regarding the DDC (I²C) interface usage and the integration with a u-blox GNSS receiver see the LARA-R2 series System Integration Manual [2], the GNSS Implementation Application Note [4], and the I²C and GNSS AT commands description in the u-blox AT Commands Manual [1].

2.5.5 SDIO interface



The SDIO interface is not supported by “02” modules product versions.

LARA-R2 series modules include a 4-bit Secure Digital Input Output interface (**SDIO_D0, SDIO_D1, SDIO_D2, SDIO_D3, SDIO_CLK, SDIO_CMD**) designed to communicate with external compatible u-blox short range radio communication Wi-Fi modules.

2.6 Audio



Audio is not supported by LARA-R204 module “02” product version.

LARA-R2 series modules support Voice over LTE (VoLTE) as well as Circuit-Switched Fall-Back (CSFB) from LTE to 2G radio bearer for providing audio services.

LARA-R2 series modules include a 4-wire I²S digital audio interface (**I2S_TXD, I2S_RXD, I2S_CLK, I2S_WA**) that can be configured by AT command in PCM mode (short synchronization signal) or in normal I²S mode (long synchronization signal) to transfer digital audio data to/from an external device as an audio codec.

For more details regarding internal audio processing system capabilities, I²S digital audio interface possible configurations, usage and guideline for the integration with an external digital audio device as an audio codec see LARA-R2 series System Integration Manual [2] and audio sections in u-blox AT Commands Manual [1].

2.7 Clock output

LARA-R2 series modules provide master digital clock output functionality on the **GPIO6** pin, which can be configured to provide a 13 MHz or 26 MHz square wave. This is mainly designed to feed the master clock input of an external audio codec, as the clock output can be configured in “Audio dependent” mode (generating the square wave only when the audio path is active), or in “Continuous” mode.

For more details see the LARA-R2 series System Integration Manual [2] and u-blox AT Commands Manual [1], +UMCLK AT command.

2.8 GPIO

LARA-R2 series modules include 9 pins (**GPIO1-GPIO5**, **I2S_TXD**, **I2S_RXD**, **I2S_CLK**, **I2S_WA**) that can be configured as general purpose input/output or to provide custom functions as summarized in Table 4 (for further details see LARA-R2 series System Integration Manual [2] and GPIO section in u-blox AT Commands Manual [1]).

Function	Description	Default GPIO	Configurable GPIOs
Network status indication	Network status: registered home network, registered roaming, data transmission, no service	--	GPIO1-GPIO4
GNSS supply enable ⁸	Enable/disable the supply of u-blox GNSS receiver connected to the cellular module	--	GPIO1-GPIO4
GNSS data ready ⁸	Sense when u-blox GNSS receiver connected to the module is ready for sending data by the DDC (I ² C)	--	GPIO3
GNSS RTC sharing ⁸	RTC synchronization signal to the u-blox GNSS receiver connected to the cellular module	--	GPIO4
SIM card detection	External SIM card physical presence detection	GPIO5	GPIO5
SIM card hot insertion/removal	Enable / disable SIM interface upon detection of external SIM card physical insertion / removal	--	GPIO5
I ² S digital audio interface ⁹	I ² S digital audio interface	I2S_RXD, I2S_TXD, I2S_CLK, I2S_WA	I2S_RXD, I2S_TXD, I2S_CLK, I2S_WA
Wi-Fi control ⁸	Control of an external Wi-Fi chip or module	--	--
General purpose input	Input to sense high or low digital level	--	All
General purpose output	Output to set the high or the low digital level	GPIO4	All
Pin disabled	Tri-state with an internal active pull-down enabled	GPIO1-GPIO3	All

Table 4: GPIO custom functions configuration

⁸ Not supported by "02" product versions.

⁹ Not supported by LARA-R204 module "02" product version.

3 Pin definition

3.1 Pin assignment

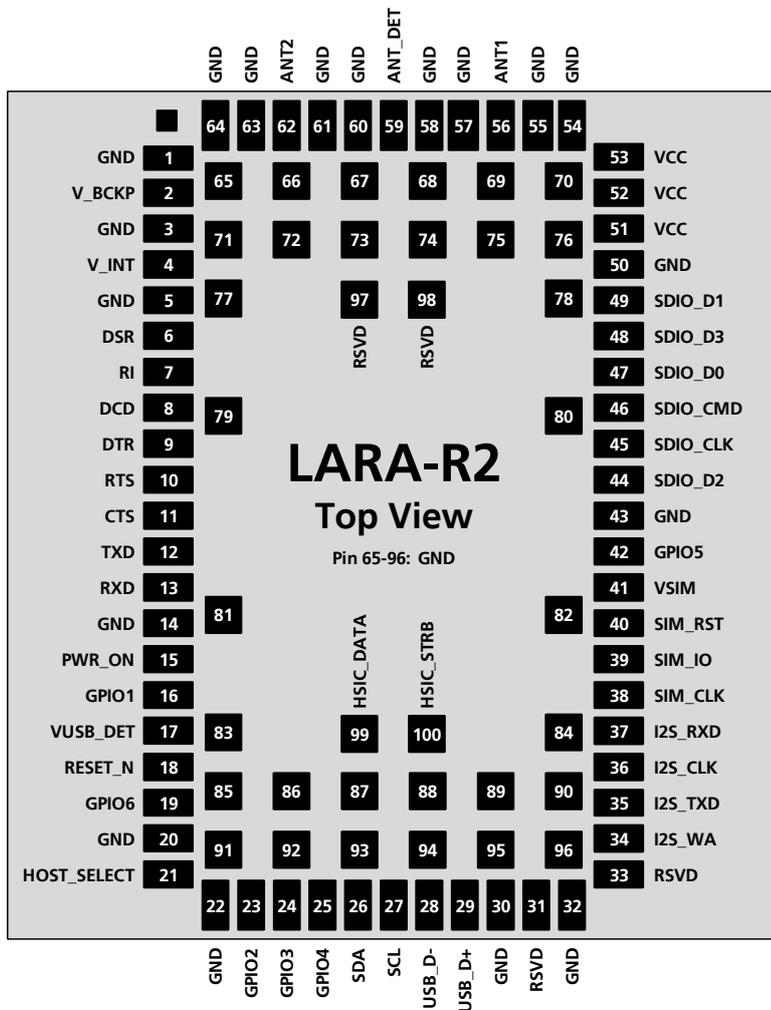


Figure 2: LARA-R2 series pin assignment (top view)

No	Name	Power domain	I/O	Description	Remarks
1	GND	-	N/A	Ground	All the GND pins must be connected to ground
2	V_BCKP	-	I/O	Real Time Clock supply input/output	V_BCKP = 1.8 V (typical) generated by the module to supply the RTC when VCC voltage is within valid operating range. See section 4.2.2 for detailed electrical specs.
3	GND	-	N/A	Ground	All the GND pins must be connected to ground
4	V_INT	-	O	Generic Digital Interfaces supply output	V_INT = 1.8 V (typical) generated by the module when it is switched-on and with the RESET_N pin is not forced low. See section 4.2.2 for detailed electrical specs.
5	GND	-	N/A	Ground	All the GND pins must be connected to ground
6	DSR	GDI	O	UART data set ready	Circuit 107 (DSR) in ITU-T V.24. Output driver class A. PU/PD class a. Value at internal reset: T/PU. See section 4.2.13 for detailed electrical specs.
7	RI	GDI	O	UART ring indicator	Circuit 125 (RI) in ITU-T V.24. Output driver class A. PU/PD class a. Value at internal reset: T/PD. See section 4.2.13 for detailed electrical specs.
8	DCD	GDI	O	UART data carrier detect	Circuit 109 (DCD) in ITU-T V.24. Output driver class A. PU/PD class a. Value at internal reset: T/PD. See section 4.2.13 for detailed electrical specs.
9	DTR	GDI	I	UART data terminal ready	Circuit 108/2 (DTR) in ITU-T V. 24. Internal active pull-up to V_INT enabled. PU/PD class a. Value at internal reset: T/PU. See section 4.2.13 for detailed electrical specs.
10	RTS	GDI	I	UART ready to send	Circuit 105 (RTS) in ITU-T V.24. Internal active pull-up to V_INT enabled. PU/PD class a. Value at internal reset: T/PU. See section 4.2.13 for detailed electrical specs.
11	CTS	GDI	O	UART clear to send	Circuit 106 (CTS) in ITU-T V.24. Output driver class A. PU/PD class a. Value at internal reset: T/PU. See section 4.2.13 for detailed electrical specs.
12	TXD	GDI	I	UART data input	Circuit 103 (TxD) in ITU-T V.24. Internal active pull-up to V_INT enabled. PU/PD class a. Value at internal reset: T/PD. See section 4.2.13 for detailed electrical specs.
13	RXD	GDI	O	UART data output	Circuit 104 (Rx) in ITU-T V.24. Output driver class A. PU/PD class a. Value at internal reset: T/PU. See section 4.2.13 for detailed electrical specs.
14	GND	-	N/A	Ground	All the GND pins must be connected to ground
15	PWR_ON	POS	I	Power-on input	Internal 10 k Ω pull-up resistor to V_BCKP. See section 4.2.7 for detailed electrical specs.
16	GPIO1	GDI	I/O	GPIO	GPIO configurable as described in section 2.8. Output driver class A. PU/PD class b. Value at internal reset: T/PD. See section 4.2.13 for detailed electrical specs.
17	VUSB_DET	VBUS	I	VBUS USB detect input	VBUS (5 V typical) USB supply generated by the host must be connected to this input pin to enable the USB interface. See section 4.2.10 for detailed electrical specs.
18	RESET_N	ERS	I	External reset input	Internal 10 k Ω pull-up resistor to V_BCKP. See section 4.2.8 for detailed electrical specs.
19	GPIO6	GDI	O	Clock output	Configurable clock output (see section 2.7). Output driver class A. PU/PD class a. Value at internal reset: T/PD. See section 4.2.13 for detailed electrical specs.

No	Name	Power domain	I/O	Description	Remarks
20	GND	-	N/A	Ground	All the GND pins must be connected to ground
21	HOST_SELECT	GDI	I/O	Selection of module / host processor configuration	Not supported by "02" product versions. Output driver class A. PU/PD class a. Value at internal reset: T/PD. See section 4.2.13 for detailed electrical specs.
22	GND	-	N/A	Ground	All the GND pins must be connected to ground
23	GPIO2	GDI	I/O	GPIO	GPIO configurable as described in section 2.8. Output driver class A. PU/PD class a. Value at internal reset: T/PD. See section 4.2.13 for detailed electrical specs.
24	GPIO3	GDI	I/O	GPIO	GPIO configurable as described in section 2.8. Output driver class A. PU/PD class a. Value at internal reset: T/PD. See section 4.2.13 for detailed electrical specs.
25	GPIO4	GDI	I/O	GPIO	GPIO configurable as described in section 2.8. Output driver class A. PU/PD class a. Value at internal reset: T/PD. See section 4.2.13 for detailed electrical specs.
26	SDA	DDC	I/O	I ² C bus data line	Fixed open drain. See section 4.2.12 for detailed electrical specs.
27	SCL	DDC	O	I ² C bus clock line	Fixed open drain. See section 4.2.12 for detailed electrical specs.
28	USB_D-	USB	I/O	USB Data Line D-	90 Ω nominal differential characteristic impedance. Pull-up, pull-down and series resistors as required by the USB 2.0 specifications [14] are part of the USB pin driver, and need not be provided externally. See section 4.2.10 for detailed electrical specs.
29	USB_D+	USB	I/O	USB Data Line D+	90 Ω nominal differential characteristic impedance. Pull-up, pull-down and series resistors as required by the USB 2.0 specifications [14] are part of the USB pin driver, and need not be provided externally. See section 4.2.10 for detailed electrical specs.
30	GND	-	N/A	Ground	All the GND pins must be connected to ground
31	RSVD	-	N/A	RESERVED pin	Leave unconnected.
32	GND	-	N/A	Ground	All the GND pins must be connected to ground
33	RSVD	-	N/A	RESERVED pin	This pin has special function: it must be connected to GND to allow module to work properly.
34	I2S_WA	GDI	I/O / I/O	I ² S word alignment / GPIO	Configurable as I ² S word alignment, or as GPIO (see 2.8). I ² S not supported by "02" product version of LARA-R204. Output driver class A. PU/PD class a. Value at internal reset: T/PD. See section 4.2.13 for detailed electrical specs.
35	I2S_TXD	GDI	O / I/O	I ² S transmit data / GPIO	Configurable as I ² S transmit data out, or as GPIO (see 2.8). I ² S not supported by "02" product version of LARA-R204. Output driver class A. PU/PD class a. Value at internal reset: T/PD. See section 4.2.13 for detailed electrical specs.
36	I2S_CLK	GDI	I/O / I/O	I ² S clock / GPIO	Configurable as I ² S clock, or as GPIO (see 2.8). I ² S not supported by "02" product version of LARA-R204. Output driver class A. PU/PD class a. Value at internal reset: T/PD. See section 4.2.13 for detailed electrical specs.
37	I2S_RXD	GDI	I / I/O	I ² S receive data / GPIO	Configurable as I ² S receive data input, or as GPIO (see 2.8). I ² S not supported by "02" product version of LARA-R204. Output driver class A. PU/PD class a. Value at internal reset: T/PD. See section 4.2.13 for detailed electrical specs.

No	Name	Power domain	I/O	Description	Remarks
38	SIM_CLK	SIM	O	SIM clock	See section 4.2.8 for detailed electrical specs.
39	SIM_IO	SIM	I/O	SIM data	Internal 4.7 kΩ pull-up resistor to VSIM. See section 4.2.8 for detailed electrical specs.
40	SIM_RST	SIM	O	SIM reset	See section 4.2.8 for detailed electrical specs.
41	VSIM	-	O	SIM supply output	VSIM = 1.80 V typical or 2.90 V typical generated by the module according to the external SIM card/chip type. See section 4.2.2 for detailed electrical specs.
42	GPIO5	GDI	I/O	GPIO	Configurable for SIM card detection, or as GPIO (see 2.8). Output driver class A. PU/PD class a. Value at internal reset: T/PD. See section 4.2.13 for detailed electrical specs.
43	GND	-	N/A	Ground	All the GND pins must be connected to ground
44	SDIO_D2	GDI	I/O	SDIO serial data [2]	SDIO not supported by "02" product versions. Output driver class A. PU/PD class a. Value at internal reset: T/PD. See section 4.2.13 for detailed electrical specs.
45	SDIO_CLK	GDI	O	SDIO serial clock	SDIO not supported by "02" product versions. Output driver class A. PU/PD class a. Value at internal reset: T/PD. See section 4.2.13 for detailed electrical specs.
46	SDIO_CMD	GDI	I/O	SDIO command	SDIO not supported by "02" product versions. Output driver class A. PU/PD class a. Value at internal reset: T/PD. See section 4.2.13 for detailed electrical specs.
47	SDIO_D0	GDI	I/O	SDIO serial data [0]	SDIO not supported by "02" product versions. Output driver class A. PU/PD class a. Value at internal reset: T/PD. See section 4.2.13 for detailed electrical specs.
48	SDIO_D3	GDI	I/O	SDIO serial data [3]	SDIO not supported by "02" product versions. Output driver class A. PU/PD class a. Value at internal reset: T/PD. See section 4.2.13 for detailed electrical specs.
49	SDIO_D1	GDI	I/O	SDIO serial data [1]	SDIO not supported by "02" product versions. Output driver class A. PU/PD class a. Value at internal reset: T/PD. See section 4.2.13 for detailed electrical specs.
50	GND	-	N/A	Ground	All the GND pins must be connected to ground
51	VCC	-	I	Module supply input	Supply for BB part on LARA-R211. Supply for BB part and RF PA on LARA-R204. All VCC pins must be connected to external supply. See sections 4.2.2 and 4.2.3 for detailed specs.
52	VCC	-	I	Module supply input	Supply for RF PA on LARA-R211. Supply for BB part and RF PA on LARA-R204. All VCC pins must be connected to external supply. See sections 4.2.2 and 4.2.3 for detailed specs.
53	VCC	-	I	Module supply input	Supply for RF PA on LARA-R211. Supply for BB part and RF PA on LARA-R204. All VCC pins must be connected to external supply. See sections 4.2.2 and 4.2.3 for detailed specs.
54	GND	-	N/A	Ground	All the GND pins must be connected to ground
55	GND	-	N/A	Ground	All the GND pins must be connected to ground
56	ANT1	ANT	I/O	Primary antenna	50 Ω nominal characteristic impedance. Main Tx / Rx antenna interface. See section 4.2.4 / 4.2.5 for details.
57	GND	GND	N/A	Ground	All GND pins must be connected to ground.
58	GND	GND	N/A	Ground	All GND pins must be connected to ground.

No	Name	Power domain	I/O	Description	Remarks
59	ANT_DET	ADC	I	Antenna detection	Antenna presence detection function. See section 4.2.6 for detailed electrical specs.
60	GND	GND	N/A	Ground	All GND pins must be connected to ground.
61	GND	GND	N/A	Ground	All GND pins must be connected to ground.
62	ANT2	ANT	I	Secondary antenna	50 Ω nominal characteristic impedance. Rx only for Down-Link Rx diversity. See section 4.2.4 for details.
63	GND	-	N/A	Ground	All the GND pins must be connected to ground
64	GND	-	N/A	Ground	All the GND pins must be connected to ground
65-96	GND	-	N/A	Ground	All the GND pins must be connected to ground
97	RSVD	-	N/A	RESERVED pin	Leave unconnected.
98	RSVD	-	N/A	RESERVED pin	Leave unconnected.
99	HSIC_DATA	HSIC	I/O	HSIC USB data line	HSIC USB not supported by "02" product versions. 50 Ω nominal characteristic impedance. See section 4.2.11 for detailed electrical specs.
100	HSIC_STRB	HSIC	I/O	HSIC USB strobe line	HSIC USB not supported by "02" product versions. 50 Ω nominal characteristic impedance. See section 4.2.11 for detailed electrical specs.

Table 5: LARA-R2 series pin-out


For more information about the pin-out, see the LARA-R2 series System Integration Manual [2].



See Appendix A for an explanation of abbreviations and terms used.

4 Electrical specifications

Stressing the device above one or more of the ratings listed in the Absolute Maximum Rating section may cause permanent damage. These are stress ratings only. Operating the module at these or at any conditions other than those specified in the Operating Conditions sections (section 4.2) of the specification should be avoided. Exposure to Absolute Maximum Rating conditions for extended periods may affect device reliability.

Operating condition ranges define those limits within which the functionality of the device is guaranteed.

Where application information is given, it is advisory only and does not form part of the specification.

4.1 Absolute maximum rating

Limiting values given below are in accordance with the Absolute Maximum Rating System (IEC 134).

Symbol	Description	Condition	Min.	Max.	Unit
VCC	Module supply voltage	Input DC voltage at VCC pin	-0.30	5.00	V
V_BCKP	RTC supply voltage	Input DC voltage at V_BCKP pin	-0.15	2.00	V
VUSB_DET	USB detection pin	Input DC voltage at VUSB_DET pin	-0.15	5.50	V
USB	USB D+/D- pins	Input DC voltage at USB_D+ and USB_D- pins	-1.00	5.50	V
GDI	Generic digital interfaces	Input DC voltage at Generic digital interfaces pins	-0.30	3.60	V
HSIC	HSIC interface	Input DC voltage at HSIC interface pins	-0.30	3.60	V
DDC	DDC interface	Input DC voltage at DDC interface pins	-0.30	3.60	V
SIM	SIM interface	Input DC voltage at SIM interface pins	-0.30	3.60	V
ERS	External reset signal	Input DC voltage at RESET_N pin	-0.30	2.10	V
POS	Power-on input	Input DC voltage at PWR_ON pin	-0.30	2.10	V
Tstg	Storage Temperature		-40	85	°C

Table 6: Absolute maximum ratings

The product is not protected against overvoltage or reversed voltages. If necessary, voltage spikes exceeding the power supply voltage specification, given in table above, must be limited to values within the specified boundaries by using appropriate protection devices.

4.1.1 Maximum ESD

Parameter	Min	Typical	Max	Unit	Remarks
ESD sensitivity for all pins except ANT1 / ANT2 pins			1000	V	Human Body Model according to JESD22-A114
ESD sensitivity for ANT1 / ANT2 pins			1000	V	Human Body Model according to JESD22-A114

Table 7: Maximum ESD ratings

u-blox cellular modules are Electrostatic Sensitive Devices and require special precautions when handling. See section 7.4 for ESD handling instructions.

4.2 Operating conditions



Unless otherwise indicated, all operating condition specifications are at an ambient temperature of 25°C.



Operation beyond the operating conditions is not recommended and extended exposure beyond them may affect device reliability.

4.2.1 Operating temperature range

Parameter	Min.	Typical	Max.	Unit	Remarks
Normal operating temperature	-20	+25	+65	°C	Normal operating temperature range (fully functional and meet 3GPP specifications)
Extended operating temperature	-40		+85	°C	Extended operating temperature range (RF performance may be affected outside normal operating range, though module is fully functional)

Table 8: Environmental conditions

4.2.2 Supply/power pins

Symbol	Parameter	Min.	Typical	Max.	Unit
VCC	Module supply normal operating input voltage ¹⁰	3.30	3.80	4.40	V
	Module supply extended operating input voltage ¹¹	3.00	3.80	4.50	V
V_BCKP	Real Time Clock supply input voltage	1.00	1.80	1.90	V
I_BCKP	Real Time Clock supply average current consumption, at V_BCKP = 1.8 V		2.00		µA

Table 9: Input characteristics of Supply/Power pins

Symbol	Parameter	Min.	Typical	Max.	Unit
VSIM	SIM supply output voltage, with external 1.8 V SIM		1.80		V
	SIM supply output voltage, with external 3.0 V SIM		2.90		V
V_BCKP	Real Time Clock supply output voltage		1.80		V
I_BCKP	Real Time Clock supply output current capability			3	mA
V_INT	Generic Digital Interfaces supply output voltage		1.80		V
I_INT	Generic Digital Interfaces supply output current capability			70	mA

Table 10: Output characteristics of Supply/Power pins

¹⁰ RF performance may be affected when the input voltage at **VCC** is outside the herein stated normal operating range limits, though module is still fully functional when the input voltage at **VCC** is inside the extended operating range limits.

¹¹ Input voltage at **VCC** must be above the herein stated extended operating range minimum limit to switch-on the module. The cellular module may switch-off when the **VCC** voltage value drops below the herein stated extended operating range minimum limit.

4.2.3 Current consumption

Mode	Condition	Tx power	Min	Typ ¹²	Max ¹³	Unit
Idle-Mode (Power Saving enabled by AT+UPSV, module in low power idle-mode, equivalent to airplane mode)	Averaged current value over a 100-ms period, USB not connected			0.9		mA
	Averaged current value over a 100-ms period, USB connected and suspended			1.1		mA
Cyclic Idle/Active-Mode (Power Saving enabled by AT+UPSV, Module registered with network)	Averaged current value over a 10-minute period, USB not connected			1.4		mA
	Averaged current value over a 10-minute period, USB connected and suspended			1.6		mA
Active-Mode (Power Saving disabled by AT+UPSV, Module registered with network)	Averaged current value over a 10-minute period, USB not connected			11.1		mA
	Averaged current value over a 10-minute period, USB connected and not suspended			29.5		mA
2G Connected Mode (Tx / Rx call enabled)	Pulse current during a 1-slot GMSK Tx burst, 900 MHz band	Maximum		1.9	2.5	A
		Minimum		50		mA
	Averaged current value over a 10-second period, 2G GMSK call, 1 Tx + 1 Rx slot, 900 MHz	Maximum		275		mA
		Minimum		50		mA
	Averaged current value over a 10-second period, 2G GMSK call, 1 Tx + 1 Rx slot, 1800 MHz	Maximum		215		mA
		Minimum		185		mA
LTE Connected Mode (Tx / Rx call enabled)	Averaged current value over a 10-second period	0 dBm		200		mA
		12 dBm		245		mA
		18 dBm		365		mA
		Maximum		540		mA
		Minimum		185		mA

Table 11: Module VCC current consumption

¹² Typical values with a matched antenna

¹³ Maximum values with a mismatched antenna

4.2.4 LTE RF characteristics

The LTE bands supported by each LARA-R2 series module are defined in Table 2, while the following Table 12 describes the Transmitting and Receiving frequencies for each LTE band according to 3GPP TS 36.521-1 [11].

Parameter		Min.	Max.	Unit	Remarks
Frequency range Band 13 (750 MHz)	Uplink	777	787	MHz	Module transmit
	Downlink	746	756	MHz	Module receive
Frequency range Band 20 (800 MHz)	Uplink	832	862	MHz	Module transmit
	Downlink	791	821	MHz	Module receive
Frequency range Band 4 (1700 MHz)	Uplink	1710	1755	MHz	Module transmit
	Downlink	2110	2155	MHz	Module receive
Frequency range Band 3 (1800 MHz)	Uplink	1710	1785	MHz	Module transmit
	Downlink	1805	1880	MHz	Module receive
Frequency range Band 7 (2600 MHz)	Uplink	2500	2570	MHz	Module transmit
	Downlink	2620	2690	MHz	Module receive

Table 12: LTE operating RF frequency bands

LARA-R2 series modules include a UE Power Class 3 LTE transmitter (see Table 2), with output power and characteristics according to 3GPP TS 36.521-1 [11].

LARA-R2 series modules LTE receiver characteristics are compliant to 3GPP TS 36.521-1 [11], with LTE conducted receiver sensitivity performance described in Table 13.

Parameter	Min.	Typical	Max.	Unit	Remarks
Receiver input sensitivity Band 13 (750 MHz)		-104.5		dBm	Channel bandwidth = 5 MHz
		-102.0		dBm	Channel bandwidth = 10 MHz
Receiver input sensitivity Band 20 (800 MHz)		-103.0		dBm	Channel bandwidth = 5 MHz
		-97.0		dBm	Channel bandwidth = 20 MHz
Receiver input sensitivity Band 4 (1700 MHz)		-110.5		dBm	Channel bandwidth = 1.4 MHz
		-104.5		dBm	Channel bandwidth = 5 MHz
Receiver input sensitivity Band 3 (1800 MHz)		-99.0		dBm	Channel bandwidth = 20 MHz
		-110.0		dBm	Channel bandwidth = 1.4 MHz
Receiver input sensitivity Band 7 (2600 MHz)		-104.5		dBm	Channel bandwidth = 5 MHz
		-99.0		dBm	Channel bandwidth = 20 MHz
Receiver input sensitivity Band 7 (2600 MHz)		-102.5		dBm	Channel bandwidth = 5 MHz
		-97.0		dBm	Channel bandwidth = 20 MHz

Condition: 50 Ω source, Throughput > 95%, dual receiver, QPSK modulation, Other settings as per 3GPP TS 36.521-1 [11]

Table 13: LTE receiver sensitivity performance

4.2.5 2G RF characteristics

The 2G bands supported by each LARA-R2 series module are defined in Table 2, while the following Table 14 describes the Transmitting and Receiving frequencies for each 2G band according to 3GPP TS 51.010-1 [12].

Parameter		Min.	Max.	Unit	Remarks
Frequency range E-GSM 900	Uplink	880	915	MHz	Module transmit
	Downlink	925	960	MHz	Module receive
Frequency range DCS 1800	Uplink	1710	1785	MHz	Module transmit
	Downlink	1805	1880	MHz	Module receive

Table 14: 2G operating RF frequency bands

LARA-R2 series modules include a GMSK Power Class 4 transmitter for E-GSM 900 band, GMSK Power Class 1 transmitter for DCS 1800 band, 8-PSK Power Class E2 transmitter for all 2G bands (see Table 2), with output power and characteristics according to 3GPP TS 51.010-1 [12].

LARA-R2 series modules 2G receiver characteristics are compliant to 3GPP TS 51.010-1 [12], with conducted receiver sensitivity performance described in Table 15.

Parameter	Min.	Typical	Max.	Unit	Remarks
Receiver input sensitivity E-GSM 900	-110.0			dBm	Downlink RF level @ BER Class II < 2.4 %
Receiver input sensitivity DCS 1800	-109.0			dBm	Downlink RF level @ BER Class II < 2.4 %

Condition: 50 Ω source, other settings as per 3GPP TS 51.010-1 [12]

Table 15: 2G receiver sensitivity performance

4.2.6 ANT_DET pin

Pin Name	Parameter	Min.	Typical	Max.	Unit	Remarks
ANT_DET	Output DC current pulse value		9		μ A	Generated by means of the AT+UANTR command
	Output DC current pulse time length		330		μ s	Generated by means of the AT+UANTR command

Table 16: ANT_DET pin characteristics

4.2.7 PWR_ON pin

Pin Name	Parameter	Min.	Typical	Max.	Unit	Remarks
PWR_ON	Internal supply for Power-On Input Signal		1.80		V	RTC supply (V_BCKP)
	Low-level input	-0.30		0.54	V	
	High-level input	1.26		2.10	V	
	Pull-up resistance		10		kΩ	Internal active pull-up to V_BCKP
	Low-level input current		-180		μA	
	PWR_ON low pulse time	50			μs	Low pulse time to switch-on the module

Table 17: PWR_ON pin characteristics

4.2.8 RESET_N pin

Pin Name	Parameter	Min.	Typical	Max.	Unit	Remarks
RESET_N	Internal supply for External Reset Input Signal		1.80		V	RTC supply (V_BCKP)
	Low-level input	-0.30		0.54	V	
	High-level input	1.26		2.10	V	
	Pull-up resistance		10		kΩ	Internal active pull-up to V_BCKP
	Low-level input current		-180		μA	
	RESET_N low pulse time	50			ms	Low pulse time to reset the module

Table 18: RESET_N pin characteristics

4.2.9 SIM pins

The SIM pins are a dedicated interface to the external SIM card/chip. The electrical characteristics fulfill regulatory specification requirements. The values in Table 19 are for information only.

Parameter	Min.	Typical	Max.	Unit	Remarks
Low-level input	0.00		0.35	V	VSIM = 1.80 V
	0.00		0.57	V	VSIM = 2.90 V
High-level input	1.29		3.30	V	VSIM = 1.80 V
	2.07		3.30	V	VSIM = 2.90 V
Low-level output		0.00	0.35	V	VSIM = 1.80 V, Max value at I _{OL} = +1.0 mA
		0.00	0.35	V	VSIM = 2.90 V, Max value at I _{OL} = +1.0 mA
High-level output	1.26	1.80		V	VSIM = 1.80 V, Min value at I _{OH} = -1.0 mA
	2.03	2.90		V	VSIM = 2.90 V, Min value at I _{OH} = -1.0 mA
Input / Output leakage current			0.7	μA	0.2V < V _{in} < 3.3V
Clock frequency on SIM_CLK		3.25		MHz	
Internal pull-up resistor on SIM_IO		4.7		kΩ	Internal pull-up to VSIM supply

Table 19: SIM pins characteristics

4.2.10 USB pins

USB data lines (**USB_D+** / **USB_D-**) are compliant with the USB 2.0 high-speed specification. See the Universal Serial Bus Specification Revision 2.0 [14] for detailed electrical characteristics. The values in Table 20 related to USB 2.0 high-speed physical layer specifications are for information only.

Parameter	Min.	Typical	Max.	Unit	Remarks
VUSB_DET pin, High-level input	4.40	5.00	5.25	V	
High-speed squelch detection threshold (input differential signal amplitude)	100		150	mV	
High speed disconnect detection threshold (input differential signal amplitude)	525		625	mV	
High-speed data signaling input common mode voltage range	-50		500	mV	
High-speed idle output level	-10		10	mV	
High-speed data signaling output high level	360		440	mV	
High-speed data signaling output low level	-10		10	mV	
Chirp J level (output differential voltage)	700		1100	mV	
Chirp K level (output differential voltage)	-900		-500	mV	

Table 20: USB pins characteristics

4.2.11 HSIC pins

The HSIC USB lines (**HSIC_DATA** / **HSIC_STRB**) are compliant with the High-Speed Inter-Chip USB specification. See High-Speed Inter-Chip USB Electrical Specification Version 1.0 [15] and USB Specification Revision 2.0 [14] for detailed electrical characteristics. The values in Table 21 related to the High-Speed Inter-Chip USB electrical specifications are for information only.

Parameter	Min	Typical	Max	Unit	Remarks
Internal supply for HSIC domain		1.20		V	
Low-level input	-0.30		0.42	V	
High-level input	0.78		1.50	V	
Low-level output		0.00	0.30	V	Max value at $I_{OL} = +2.0$ mA
High-level output	0.90	1.20		V	Min value at $I_{OH} = -2.0$ mA
Input/output leakage current			0.7	μ A	$0.2V < V_{IN} < 1.5V$

Table 21: HSIC pins characteristics

4.2.12 DDC (I²C) pins

DDC (I²C) lines (**SCL** and **SDA**) are compliant with the I²C-bus standard mode specification. See the I²C-Bus Specification [16] for detailed electrical characteristics. The values in Table 22 related to I²C-bus standard mode specifications are for information only.

Parameter	Min	Typical	Max	Unit	Remarks
Internal supply for GDI domain		1.80		V	Digital I/O Interfaces supply (V_INT)
Low-level input	-0.20		0.36	V	
High-level input	1.26		2.00	V	
Low-level output		0.00	0.35	V	Max value at I _{OL} = +1.0 mA
Clock frequency on SCL		100		kHz	

Table 22: DDC (I²C) pins characteristics

4.2.13 Generic Digital Interfaces pins

Parameter	Min	Typical	Max	Unit	Remarks
Internal supply for GDI domain		1.80		V	Digital I/O Interfaces supply (V_INT)
Low-level input	-0.20		0.36	V	
High-level input	1.26		2.00	V	
Low-level output		0.00	0.35	V	Max value at I _{OL} = +6.0 mA for driver class A
High-level output	1.45	1.80		V	Min value at I _{OH} = -6.0 mA for driver class A
Internal pull-up input current			-240	μA	PU class a
			-110	μA	PU class b
Internal pull-down input current			240	μA	PD class a
			100	μA	PD class b
Input/output leakage current			0.7	μA	0.2V < V _{IN} < 2.0V

Table 23: GDI pins characteristics

5 Mechanical specifications

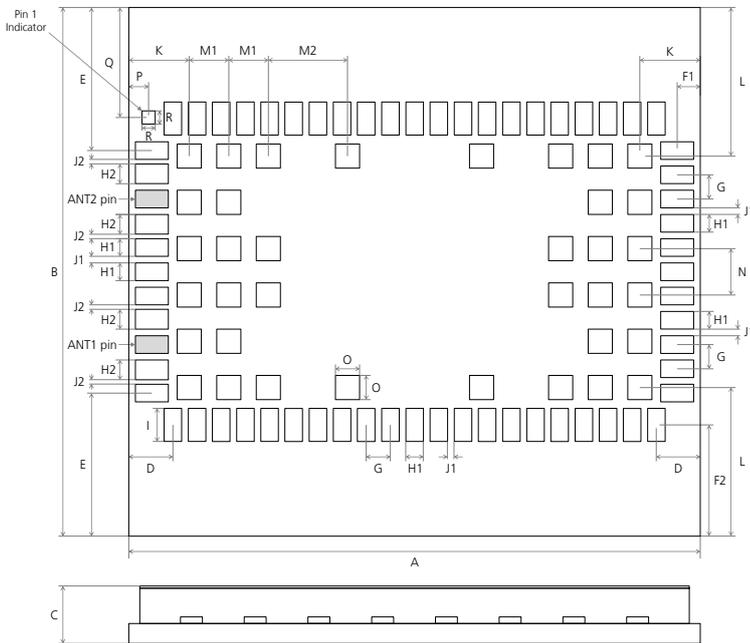


Figure 3: LARA-R2 series dimensions (bottom and sides views)

Parameter	Description	Typical	Tolerance
A	Module Height [mm]	26.0 (1401.6 mil)	+0.20/-0.20 (+7.9/-7.9 mil)
B	Module Width [mm]	24.0 (976.4 mil)	+0.20/-0.20 (+7.9/-7.9 mil)
C	Module Thickness [mm]	2.6 (102.4 mil)	+0.27/-0.17 (+10.6/-6.7 mil)
D	Horizontal Edge to Lateral Pin Pitch [mm]	2.0 (78.7 mil)	+0.20/-0.20 (+7.9/-7.9 mil)
E	Vertical Edge to Lateral Pin Pitch [mm]	6.5 (255.9 mil)	+0.20/-0.20 (+7.9/-7.9 mil)
F1	Edge to Lateral Pin Pitch [mm]	1.05 (41.3 mil)	+0.20/-0.20 (+7.9/-7.9 mil)
F2	Edge to Lateral Pin Pitch [mm]	5.05 (198.8 mil)	+0.20/-0.20 (+7.9/-7.9 mil)
G	Lateral Pin to Pin Pitch [mm]	1.1 (43.3 mil)	+0.02/-0.02 (+0.8/-0.8 mil)
H1	Lateral Pin Height [mm]	0.8 (31.5 mil)	+0.02/-0.02 (+0.8/-0.8 mil)
H2	Lateral Pin close to ANT Height [mm]	0.9 (35.4 mil)	+0.02/-0.02 (+0.8/-0.8 mil)
I	Lateral Pin Width [mm]	1.5 (59.1 mil)	+0.02/-0.02 (+0.8/-0.8 mil)
J1	Lateral Pin to Pin Distance [mm]	0.3 (11.8 mil)	+0.02/-0.02 (+0.8/-0.8 mil)
J2	Lateral Pin to Pin close to ANT Distance [mm]	0.2 (7.9 mil)	+0.02/-0.02 (+0.8/-0.8 mil)
K	Horizontal Edge to Central Pin Pitch [mm]	2.75 (108.3 mil)	+0.20/-0.20 (+7.9/-7.9 mil)
L	Vertical Edge to Central Pin Pitch [mm]	6.75 (265.7 mil)	+0.20/-0.20 (+7.9/-7.9 mil)
M1	Central Pin to Pin Horizontal Pitch [mm]	1.8 (70.9 mil)	+0.02/-0.02 (+0.8/-0.8 mil)
M2	Central Pin to Pin Horizontal Pitch [mm]	3.6 (141.7 mil)	+0.02/-0.02 (+0.8/-0.8 mil)
N	Central Pin to Pin Vertical Pitch [mm]	2.1 (82.7 mil)	+0.02/-0.02 (+0.8/-0.8 mil)
O	Central Pin Height and Width [mm]	1.1 (43.3 mil)	+0.02/-0.02 (+0.8/-0.8 mil)
P	Horizontal Edge to Pin 1 Indicator Pitch [mm]	0.9 (35.4 mil)	+0.20/-0.20 (+7.9/-7.9 mil)
Q	Vertical Edge to Pin 1 Indicator Pitch [mm]	5.0 (196.9 mil)	+0.20/-0.20 (+7.9/-7.9 mil)
R	Pin 1 Indicator Height and Width [mm]	0.6 (23.6 mil)	+0.02/-0.02 (+0.8/-0.8 mil)
Weight	Module Weight [g]	4	

Table 24: LARA-R2 series dimensions



Module Height tolerance ± 0.20 mm may be exceeded close to the corners of the PCB due to the cutting process. In the worst case, the height could be $+0.40$ mm more than the typical value.



For information regarding Footprint and Paste Mask recommended for the application board integrating the cellular module, see LARA-R2 series System Integration Manual [2].

6 Qualification and approvals

6.1 Reliability tests

Tests for product family qualifications according to ISO 16750 "Road vehicles - Environmental conditions and testing for electrical and electronic equipment", and appropriate standards.

6.2 Approvals



Products marked with this lead-free symbol on the product label comply with the "Directive 2002/95/EC of the European Parliament and the Council on the Restriction of Use of certain Hazardous Substances in Electrical and Electronic Equipment" (RoHS).

LARA-R2 series modules are RoHS compliant.

No natural rubbers, hygroscopic materials, or materials containing asbestos are employed.

Table 25 summarizes the main approvals for LARA-R2 series modules.

Certification Scheme	LARA-R204	LARA-R211
GCF (Global Certification Forum)	•	•
R&TTE / RED (Radio & Telecommunications Terminal Equipment EU Directive)		•
Notified Body number		1588
CE (Conformité Européenne)		•
Notified Body number		1588
FCC (United States Federal Communications Commission)	•	
FCC identification number	XPY1EIQN2NN	
IC (Industry Canada)	•	
IC certification number	8595A-1EIQN2NN	
Verizon (US network operator)	•	

Table 25: LARA-R2 series main certification approvals summary

For the complete list of approvals and for specific details on all country and network operators' certifications, see our website www.u-blox.com or please contact the u-blox office or sales representative nearest you.

7 Product handling & soldering

7.1 Packaging

LARA-R2 series modules are delivered as hermetically sealed reeled tapes, to enable efficient production, production lot set-up and tear-down.

For more information about packaging, see the u-blox Package Information User Guide [6].

7.1.1 Reels

LARA-R2 series modules are deliverable in quantities of 150 pieces on a reel. The modules are delivered using the reel Type B2 described in the Figure 4 and in the u-blox Package Information Guide [6].

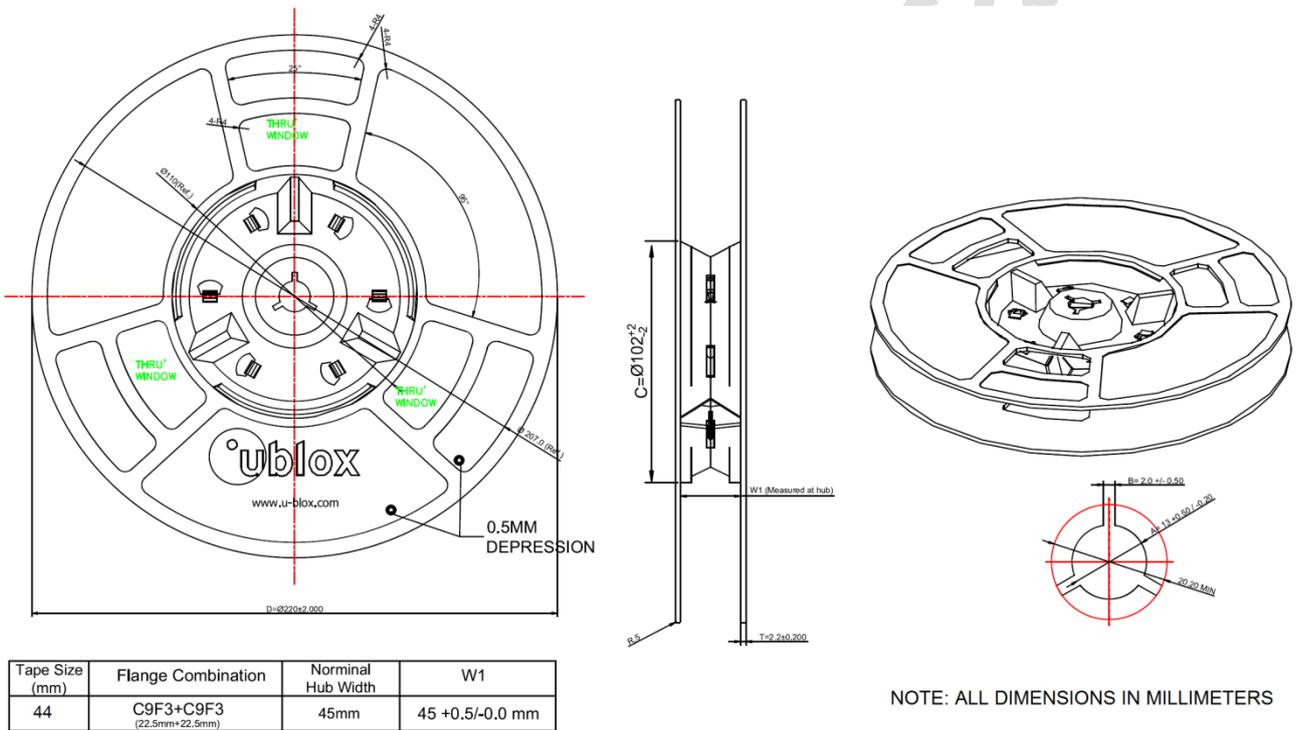


Figure 4: LARA-R2 series modules reel

Parameter	Specification
Reel Type	B2
Delivery Quantity	150

Table 26: Reel information for LARA-R2 series modules

Quantities of less than 150 pieces are also available. Contact u-blox for more information.

7.1.2 Tapes

Figure 5 shows the position and the orientation of LARA-R2 modules as they are delivered on the tape, while the Figure 6 and Table 27 specify the tape dimensions.

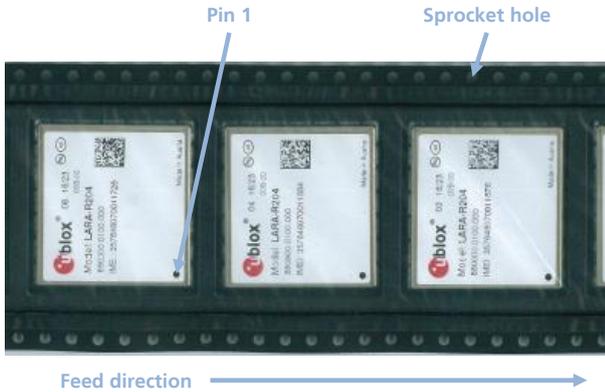


Figure 5: Orientation for LARA-R2 series modules on tape

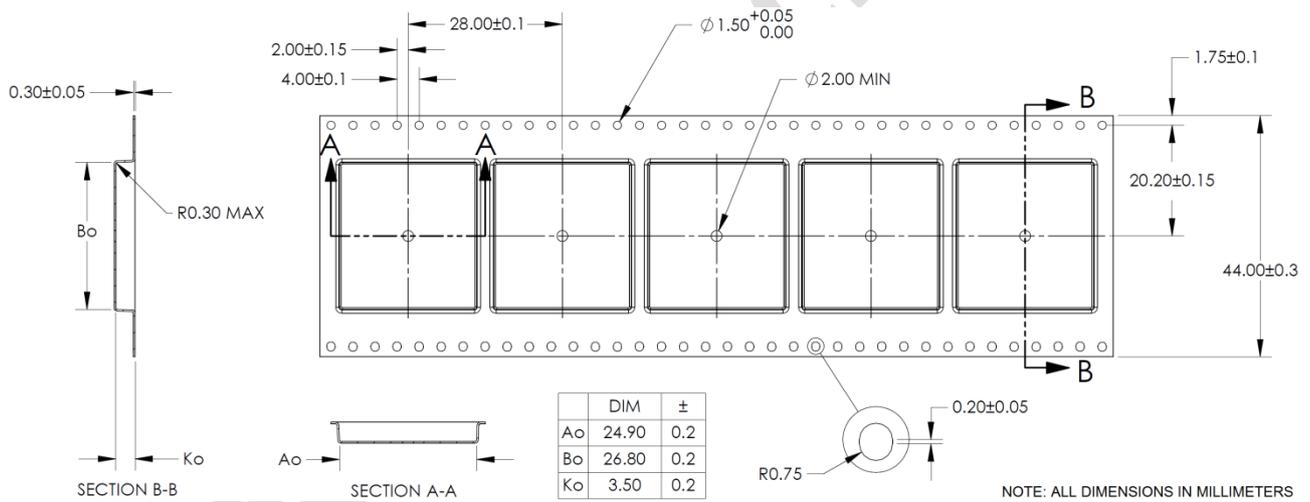


Figure 6: LARA-R2 series modules tape dimensions

Parameter	Typical Value	Tolerance	Unit
A ₀	24.9	0.2	mm
B ₀	26.8	0.2	mm
K ₀	3.5	0.2	mm

Table 27: LARA-R2 series modules tape dimensions

- 10 sprocket hole pitch cumulative tolerance ± 0.2 mm.
- Pocket position relative to sprocket hole measured as true position of pocket, not pocket hole.
- A₀ and B₀ are measured on a plane at a distance “R” above the bottom of the pocket.

7.2 Moisture Sensitivity Levels

 **LARA-R2 series modules are Moisture Sensitive Devices (MSD) in accordance to the IPC/JEDEC specification.**

The Moisture Sensitivity Level (MSL) relates to the packaging and handling precautions required. LARA-R2 series modules are rated at MSL level 4. For more information regarding moisture sensitivity levels, labeling, storage and drying see the u-blox Package Information Guide [6].

 For MSL standard see IPC/JEDEC J-STD-020 (can be downloaded from www.jedec.org).

7.3 Reflow soldering

Reflow profiles are to be selected according to u-blox recommendations (see LARA-R2 series System Integration Manual [2]).

 **Failure to observe these recommendations can result in severe damage to the device!**

7.4 ESD precautions

 **LARA-R2 series modules contain highly sensitive electronic circuitry and are Electrostatic Sensitive Devices (ESD). Handling LARA-R2 series modules without proper ESD protection may destroy or damage them permanently.**

LARA-R2 series modules are Electrostatic Sensitive Devices (ESD) and require special ESD precautions typically applied to ESD sensitive components.

Table 7 reports the maximum ESD ratings of the LARA-R2 series modules.

Proper ESD handling and packaging procedures must be applied throughout the processing, handling and operation of any application that incorporates LARA-R2 series module.

ESD precautions should be implemented on the application board where the module is mounted, as described in the LARA-R2 series System Integration Manual [2].

 **Failure to observe these recommendations can result in severe damage to the device!**

8 Default settings

Interface	AT settings	Comments
UART interface	AT interface enabled	AT command mode is enabled by default on the UART physical interface
	AT+IPR=0	One-shot automatic baud rate detection enabled
	AT+ICF=3,1	Frame format: 8 bits, no parity, 1 stop bit  Since AT+IPR=0 is the default value (one-shot automatic baud rate detection enabled), the AT+ICF value in the profile is not applied (AT+IPR=0 overrules the AT+ICF setting) and the one-shot automatic frame detection is active.
	AT&K3	HW flow control enabled
	AT&S1	DSR line set ON in data mode and set OFF in command mode
	AT&D1	Upon an ON-to-OFF transition of DTR, the module enters online command state and issues an OK result code
	AT&C1	Circuit 109 changes in accordance with the Carrier detect status; ON if the Carrier is detected, OFF otherwise
	MUX disabled	Multiplexing mode can be enabled by AT+CMUX command providing following channels: <ul style="list-style-type: none"> Channel 0: Multiplexer control Channel 1 – 5: AT commands / data connection Channel 6: GNSS data tunneling¹⁴
USB interface	Enabled	6 USB CDCs (Communications Device Class) by default available: <ul style="list-style-type: none"> USB1: AT and data USB2: AT and data USB3: AT and data USB4: GNSS tunneling¹⁴ USB5: SAP (SIM Access Profile)¹⁴ USB6: Primary Log (diagnostic purpose)
	AT&K3	HW flow control enabled
	AT&S1	DSR line set ON in data mode and set OFF in command mode
	AT&D1	Upon an ON-to-OFF transition of DTR, the module enters online command state and issues an OK result code
	AT&C1	Circuit 109 changes in accordance with the Carrier detect status; ON if the Carrier is detected, OFF otherwise
	Power saving	AT+UPSV=0
Network registration	AT+COPS=0	Self network registration

Table 28: LARA-R2 series default settings

See the u-blox AT Commands Manual [1] and the LARA-R2 series System Integration Manual [2] for information about further settings and factory-programmed values.

¹⁴ Not supported by "02" product versions.

9 Labeling and ordering information

9.1 Product labeling

The labels of LARA-R2 series series modules include important product information as described in this section. Figure 7 illustrates the label of all the LARA-R2 series modules, and includes: u-blox logo, production lot, Pb-free marking, product type number, IMEI number, certification numbers, CE marking with the Notified Body number (if applicable), and production country.

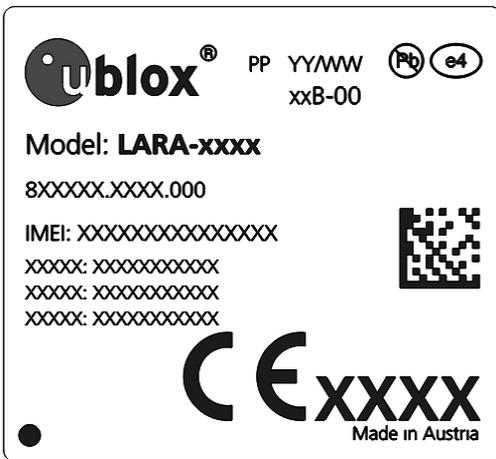


Figure 7: LARA-R2 series module label

9.2 Explanation of codes

Three different product code formats are used. The **Product Name** is used in documentation such as this data sheet and identifies all the u-blox products, independent of packaging and quality grade. The **Ordering Code** includes options and quality, while the **Type Number** includes the hardware and firmware versions. Table 29 details these 3 different formats:

Format	Structure
Product Name	PPPP-TGVV
Ordering Code	PPPP-TGVV-MMQ
Type Number	PPPP-TGVV-MMQ-XX

Table 29: Product Code Formats

Table 30 explains the parts of the product code.

Code	Meaning	Example
PPPP	Form factor	LARA
TG	Platform (Technology and Generation) <ul style="list-style-type: none"> • Dominant technology: G: GSM; U: HSUPA; C: CDMA 1xRTT; N: NB-IoT; R: LTE low data rate (Cat 1 and below); L: LTE high data rate (Cat.3 and above) • Generation: 1...9 	R2
VV	Variant function set based on the same platform [00...99]	04
MM	Major product version [00...99]	02
Q	Product grade <ul style="list-style-type: none"> • B = professional • A = automotive 	B
XX	Minor product version (not relevant for certification)	Default value is 00

Table 30: Part identification code

9.3 Ordering information

Ordering No.	Product
LARA-R204-02B	Module supporting LTE Cat 1 bands 4 / 13. Mainly designed for operation in America, with Verizon mobile network operator approval. 26.0 x 24.0 x 2.6 mm, 150 pcs/reel
LARA-R211-02B	Module supporting LTE Cat 1 bands 3 / 7 / 20, (E)GPRS bands 900 / 1800. Mainly designed for operation in Europe, Asia and other countries. 26.0 x 24.0 x 2.6 mm, 150 pcs/reel

Table 31: Product ordering codes

Appendix

A Glossary

Name	Definition
8-PSK	8 Phase-Shift Keying modulation
ADC	Analog to Digital Converter
CSFB	Circuit Switched Fall-Back
DDC	Display Data Channel (I ² C compatible) Interface
DL	Down-link (Reception)
DNS	Domain Name System
ERS	External Reset Input Signal
ESD	Electrostatic Discharge
FOAT	Firmware update Over AT commands
FOTA	Firmware update Over The Air
FW	Firmware
GDI	Generic Digital Interfaces (power domain)
GMSK	Gaussian Minimum-Shift Keying modulation
GND	Ground
GNSS	Global Navigation Satellite System
GPIO	General Purpose Input Output
GPS	Global Positioning System
H	High
HSDPA	High Speed Downlink Packet Access
HSIC	High Speed Inter Chip
HSUPA	High Speed Uplink Packet Access
I	Input (means that this is an input port of the module)
I ² C	Inter-Integrated Circuit Interface
I ² S	Inter-IC Sound Interface
IMEI	International Mobile Equipment Identity
IMS	IP Multimedia Subsystem
L	Low
LGA	Land Grid Array
LTE	Long Term Evolution
N/A	Not Applicable
O	Output (means that this is an output port of the module)
OD	Open Drain
PCN / IN	Product Change Notification / Information Note
PD	Pull-Down
POS	Power-On Input Signal
PU	Pull-Up
RMC	Reference Measurement Channel
SDIO	Secure Digital Input Output
T	Tristate
TBD	To Be Defined
UL	Up-link (Transmission)
UMTS	Universal Mobile Telecommunications System
VoLTE	Voice over LTE

Table 32: Explanation of abbreviations and terms used

Related documents

- [1] u-blox AT Commands Manual, Docu No UBX-13002752
- [2] u-blox LARA-R2 series System Integration Manual, Docu No UBX-16010573
- [3] u-blox Android RIL Production delivery Application note, Docu No UBX-13002041
- [4] u-blox GNSS Implementation Application Note, Docu No UBX-13001849
- [5] u-blox Mux Implementation Application Note, Docu No UBX-13001887
- [6] u-blox Package Information User Guide, Docu No UBX-14001652
- [7] 3GPP TS 27.007 - AT command set for User Equipment (UE)
- [8] 3GPP TS 27.005 - Use of Data Terminal Equipment - Data Circuit terminating Equipment (DTE - DCE) interface for Short Message Service (SMS) and Cell Broadcast Service (CBS)
- [9] 3GPP TS 27.010 - Terminal Equipment to User Equipment (TE-UE) multiplexer protocol
- [10] 3GPP TS 26.267 - Technical Specification Group Services and System Aspects; eCall Data Transfer; In-band modem solution; General description
- [11] 3GPP TS 36.521-1 - Evolved Universal Terrestrial Radio Access; User Equipment conformance specification; Radio transmission and reception; Part 1: Conformance Testing
- [12] 3GPP TS 51.010-1 - Mobile Station conformance specification; Part 1: Conformance specification
- [13] ITU-T Recommendation V24, 02-2000. List of definitions for interchange circuits between Data Terminal Equipment (DTE) and Data Connection Equipment (DCE)
- [14] Universal Serial Bus Specification, Revision 2.0, http://www.usb.org/developers/docs/usb20_docs/
- [15] High-Speed Inter-Chip USB Specification, Version 1.0, http://www.usb.org/developers/docs/usb20_docs/
- [16] I²C-bus specification and user manual - Rev. 5 - 9 October 2012 - NXP Semiconductors, http://www.nxp.com/documents/user_manual/UM10204.pdf



For regular updates to u-blox documentation and to receive product change notifications please register on our homepage (www.u-blox.com).

Revision history

Revision	Date	Name	Status / Comments
R01	03-Mar-2016	sses	Initial release
R02	31-May-2016	sses	Document applicability updated to LARA-R204 and LARA-R211. Improved description of VCC, Power-on, Reset, Host select, UART, USB, HSIC, GPIO pins
R03	15-Jul-2016	sses	Added description of reels and tapes. Added current consumption and RF performance figures. Updated description of Power-on, Reset, UART, USB pins.
R04	11-Oct-2016	sses	Updated audio support. Updated PWR_ON, ANT_DET, GPIO and Clock Output description. Added 2G current consumption figures and remark in mechanical.

Contact

For complete contact information visit us at www.u-blox.com

u-blox Offices

North, Central and South America

u-blox America, Inc.

Phone: +1 703 483 3180
E-mail: info_us@u-blox.com

Regional Office West Coast:

Phone: +1 408 573 3640
E-mail: info_us@u-blox.com

Technical Support:

Phone: +1 703 483 3185
E-mail: support_us@u-blox.com

Headquarters

Europe, Middle East, Africa

u-blox AG

Phone: +41 44 722 74 44
E-mail: info@u-blox.com
Support: support@u-blox.com

Asia, Australia, Pacific

u-blox Singapore Pte. Ltd.

Phone: +65 6734 3811
E-mail: info_ap@u-blox.com
Support: support_ap@u-blox.com

Regional Office Australia:

Phone: +61 2 8448 2016
E-mail: info_auz@u-blox.com
Support: support_ap@u-blox.com

Regional Office China (Beijing):

Phone: +86 10 68 133 545
E-mail: info_cn@u-blox.com
Support: support_cn@u-blox.com

Regional Office China (Chongqing):

Phone: +86 23 6815 1588
E-mail: info_cn@u-blox.com
Support: support_cn@u-blox.com

Regional Office China (Shanghai):

Phone: +86 21 6090 4832
E-mail: info_cn@u-blox.com
Support: support_cn@u-blox.com

Regional Office China (Shenzhen):

Phone: +86 755 8627 1083
E-mail: info_cn@u-blox.com
Support: support_cn@u-blox.com

Regional Office India:

Phone: +91 80 4050 9200
E-mail: info_in@u-blox.com
Support: support_in@u-blox.com

Regional Office Japan (Osaka):

Phone: +81 6 6941 3660
E-mail: info_jp@u-blox.com
Support: support_jp@u-blox.com

Regional Office Japan (Tokyo):

Phone: +81 3 5775 3850
E-mail: info_jp@u-blox.com
Support: support_jp@u-blox.com

Regional Office Korea:

Phone: +82 2 542 0861
E-mail: info_kr@u-blox.com
Support: support_kr@u-blox.com

Regional Office Taiwan:

Phone: +886 2 2657 1090
E-mail: info_tw@u-blox.com
Support: support_tw@u-blox.com