CELLULAR

SARA-N2

Power-optimized NB-IoT (LTE Cat NB1) modules

Data Sheet

Abstract

Technical data sheet describing SARA-N2 Narrowband Internet of Things cellular modules. These modules are a complete and cost efficient solution offering single-band data transmission for the Internet of Things technology in a compact form factor.

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Initial Production	Early Prod. Information	Data from product verification. Revised and supplementary data may be published later.
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This document applies to the following products:

Name	Type number	Modem version	Application version	PCN reference	Product status
SARA-N200	SARA-N200-02B-00	06.57	A02.02	UBX-17056257	Engineering Sample
SARA-N201	SARA-N201-02B-00	06.57	A02.02	UBX-17056257	Engineering Sample
SARA-N210	SARA-N210-02B-00	06.57	A02.02	UBX-17056257	Engineering Sample
SARA-N211	SARA-N211-02B-00	06.57	A02.02	UBX-17056257	Engineering Sample
SARA-N280	SARA-N280-02B-00	06.57	A02.02	UBX-17056257	Engineering Sample

Contents

1 Functional description

1.1 Overview

SARA-N2 series modules are a Narrow Band Internet of Things (NB-IoT) solution coming in the miniature SARA LGA form factor (26.0 x 16.0 mm, 96-pin). The modules offer IoT data communication over an extended operating temperature range of –40 to +85 °C, with extremely low power consumption.

The SARA-N2 series includes variants supporting single-band and dual-band communication and designed to operate in the frequency range of the LTE bands 5, 8, 20 and 28. These products are ideally suited to battery-powered IoT applications characterized by occasional communications of small amounts of data.

SARA-N2 modules are the optimal choice for IoT devices designed to operate in locations with a very limited coverage and requiring low energy consumption to permit a very long operating life of the primary batteries. Examples of applications include and are not limited to: smart grids, smart metering, telematics, street lighting, environmental monitoring and control, security and asset tracking.

1.2 Product features

Module	Region	Bands			Positioning			Interfaces					Features								Grade		
		3GPP Release Baseline	3GPP Category	NB-IoT bandss	GNSS via modem	AssistNow Software	CellLocate®	UART	USB 2.0	SPI	DDC (I²C)	GPIO	Antenna supervisor	eDRX	Power Save Mode	SIM detection	Embedded UDP stack	Embedded FTP, HTTP, SMTP	FW update over AT (FOAT)	FW update over the air (FOTA)	Standard	Professional	Automotive
SARA-N200	Europe APAC	13	NB1	8	○			2			○	●	●	●	●		●		●	●		●	
SARA-N201	APAC	13	NB1	5	○			2			○	●	●	●	●		●		●	●		●	
SARA-N210	Europe	13	NB1	20	○			2			○	●	●	●	●		●		●	●		●	
SARA-N211	Europe	13	NB1	8,20	○			2			○	●	●	●	●		●		●	●		●	
SARA-N280	S.America APAC	13	NB1	28	○			2			○	●	●	●	●		●		●	●		●	

● = supported by all product versions ○ = supported by future product versions

Table 1: SARA-N2 series main features summary

1.3 Block diagram

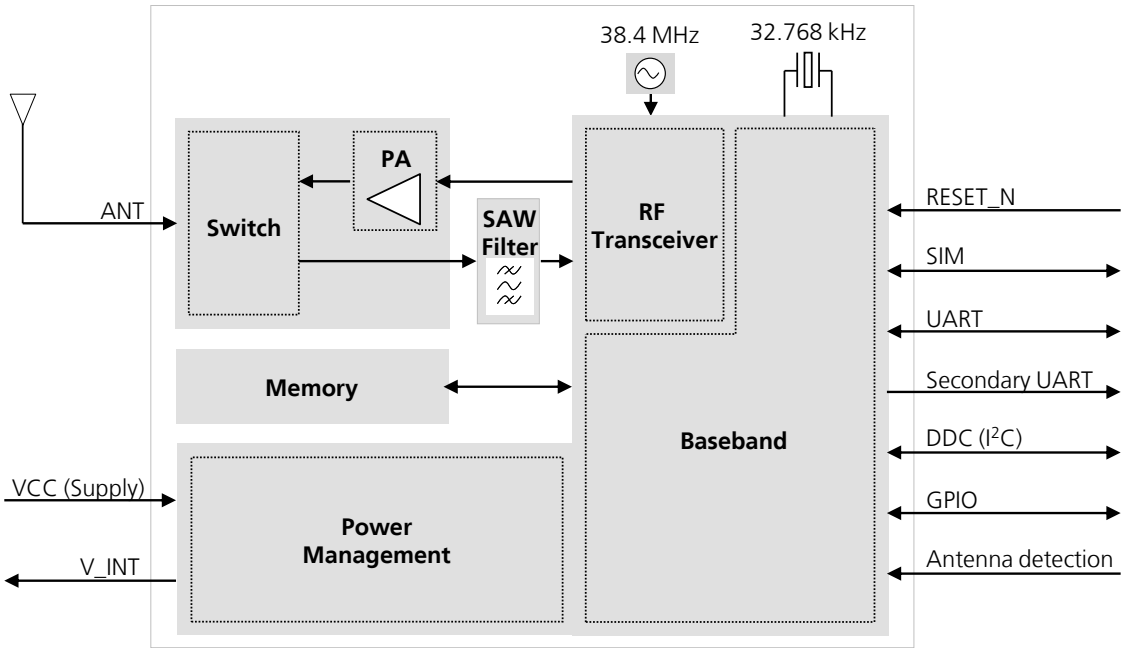

Figure 1: SARA-N2 series block diagram

1.4 Product description

Item	SARA-N200	SARA-N201	SARA-N210	SARA-N211	SARA-N280
NB-IoT protocol stack	3GPP Release 13	3GPP Release 13	3GPP Release 13	3GPP Release 13	3GPP Release 13
Operating band	Band 8	Band 5	Band 20	Band 8, 20	Band 28
Power Class	Class 3 (23 dBm)	Class 3 (23 dBm)	Class 3 (23 dBm)	Class 3 (23 dBm)	Class 3 (23 dBm)
Data rate	NB1 category: Up to 62.5 kb/s UL Up to 27.2 kb/s DL	NB1 category: Up to 62.5 kb/s UL Up to 27.2 kb/s DL	NB1 category: Up to 62.5 kb/s UL Up to 27.2 kb/s DL	NB1 category: Up to 62.5 kb/s UL Up to 27.2 kb/s DL	NB1 category: Up to 62.5 kb/s UL Up to 27.2 kb/s DL

Table 2: SARA-N2 series NB-IoT characteristics summary

1.5 Supported features

Feature	Description
Coverage Enhancement	NB-IoT system allows a 20 dB coverage enhancement over standard GSM systems
Deep-sleep power mode	SARA-N2 module can work in a deep-sleep mode using the internal 32 kHz clock and maintaining an extremely low current consumption. This optimizes the life time of the battery pack used to supply the system
eDRX	Extended mode DRX, based on 3GPP Rel.13, reduces the amount of signaling overhead decreasing the frequency of scheduled measurements and/or transmissions performed by the module. This in turn leads to a reduction in the module power consumption while maintaining a perpetual connection with the base station

Table 3: Some of the main features supported by SARA-N2 series modules

2 Interfaces

2.1 Power management

2.1.1 Module supply input (VCC)

SARA-N2 modules must be supplied through the **VCC** pins by a DC power supply with nominal voltage of 3.6 V. Voltage must be stable during module operation, taking into account that the current drawn from **VCC** pins may vary significantly based on the power consumption profile of the NB-IoT system.

2.1.2 Digital I/O interfaces supply output (V_INT)

SARA-N2 modules provide an internally generated supply rail output (**V_INT**) operating at 1.8 V. This can be used in place of an external discrete regulator to supply external digital interfaces.

The voltage level present at the **V_INT** pin depends on the module operating mode:

- When the radio is off, the voltage level is kept low (i.e. 0 V)
- When the radio is on, the voltage level is maintained high (i.e. 1.8 V)

Provide a test point connected to the **V_INT** pin for diagnostic purpose.

2.2 Antenna

2.2.1 Antenna RF interface (ANT)

The **ANT** pin has an impedance of 50 Ω and provides the RF antenna interface of SARA-N2 modules.

2.2.2 Antenna detection (ANT_DET)

The **ANT_DET** pin is an Analog to Digital Converter (ADC) input used to sense the antenna presence evaluating the resistance from the **ANT** pin to GND by means of an external antenna detection circuit implemented on the application board.

2.3 System functions

2.3.1 Module power-on

SARA-N2 modules can be switched on by a rising edge voltage applied to the **VCC** pins. See section 4.2.2 for more details about the valid supply voltage range.

2.3.2 Module power-off

An abrupt under-voltage shutdown occurs on SARA-N2 modules when the VCC supply voltage drops below the operating range minimum limit (see section 4.2.2).

2.3.3 Module reset

SARA-N2 modules can be reset applying a low voltage level on the **RESET_N** input pin, which is normally set high by an internal pull-up, for a valid time period (see the section 4.2.5). This causes an "external" or "hardware" reset of the module.

Provide a test point connected to the **RESET_N** pin for diagnostic purpose.

2.4 SIM interface

A SIM card interface is provided by the **VSIM**, **SIM_IO**, **SIM_CLK**, and **SIM_RST** pins of SARA-N2 modules, supporting 1.8 V SIM card/chip types.

The SIM driver supports the PPS (Protocol and Parameter Selection) procedure for baud-rate selection, according to the values proposed by the SIM card/chip.

2.5 Serial interfaces

2.5.1 Asynchronous serial interface (UART)

The UART interface is a 5-wire unbalanced asynchronous serial interface available for communication with an application host processor (AT commands and data communication) and for FW upgrade.

The main characteristics of the interface are the following:

- Serial port with RS-232 functionality working at the **VCC** voltage domain (0 V for low data bit or ON state and ~3.6 V, i.e. **VCC**, for high data bit or OFF state)
- Data lines (**RXD** as module data output, **TXD** as module data input)
- Hardware flow control lines (**CTS** as module output, **RTS** as module input)
- The following baud rates are supported: 4800, 9600 (default baud rate), 57600 and 115200 b/s.
- Fixed frame format: 8N1 (8 data bits, No parity, 1 stop bit)

The **CTS** line can be configured as the RING indicator pin to signal an incoming message received by the module or an URC event (for more details see u-blox SARA-N2 Series AT Commands Manual [1], +URING AT command).

☞ For FW upgrade purposes, connect a test point to the **RXD** and **TXD** pins.

☞ Hardware flow control function is not supported by "02" product versions.

2.5.2 Secondary asynchronous serial interface (Secondary UART)

The secondary UART interface is a 2-wire unbalanced asynchronous serial interface available for diagnostic purpose, to capture trace diagnostic logs delivered by the module.

The main characteristics of the interface are:

- Serial port with RS-232 functionality working at the **V_INT** voltage domain (0 V for low data bit or ON state and 1.8 V, i.e. **V_INT**, for high data bit or OFF state)
- Data line (**GPIO1** as module data output)
- No flow control
- Fixed baud rate: 921600 b/s
- Fixed frame format: 8N1 (8 data bits, no parity, 1 stop bit)

☞ For diagnostic purposes, connect a test point to the **GPIO1** pin.

☞ The trace diagnostic log is temporarily stopped when the module is in deep-sleep mode.

2.5.3 DDC (I²C) interface

DDC interface: I²C compatible interface available on the **SCL** and **SDA** pins of the module for the communication with external chips and sensors. The interface provides master mode bi-directional bus communication at a bit-rate up to 100 kb/s. The I²C interface requires external pull-up resistors. The internal power domain used by the DDC (I²C) pins is **V_INT** (1.8 V).

☞ DDC interface is not supported by "02" product versions.

2.6 GPIO

SARA-N2 series modules provide two GPIO pins (**GPIO1** and **GPIO2**). The internal power domain used by the GPIO pins is **V_INT** (1.8 V).

☞ For diagnostic purposes, connect a test point to the **GPIO1** pin.

Function	Description	Default GPIO	Configurable GPIOs
Network status indication	Network status: registered home network, registered roaming, data transmission, no service	--	GPIO2
RING indicator	Indicates an incoming message received by the module or an URC event	--	GPIO2
Secondary UART	Secondary UART data output for diagnostic purpose, to capture diagnostic logs delivered by the module	GPIO1	GPIO1
Pin disabled	Tri-state with an internal active pull-down enabled	GPIO2	GPIO2

Table 4: GPIO custom functions configuration

3 Pin definition

3.1 Pin assignment

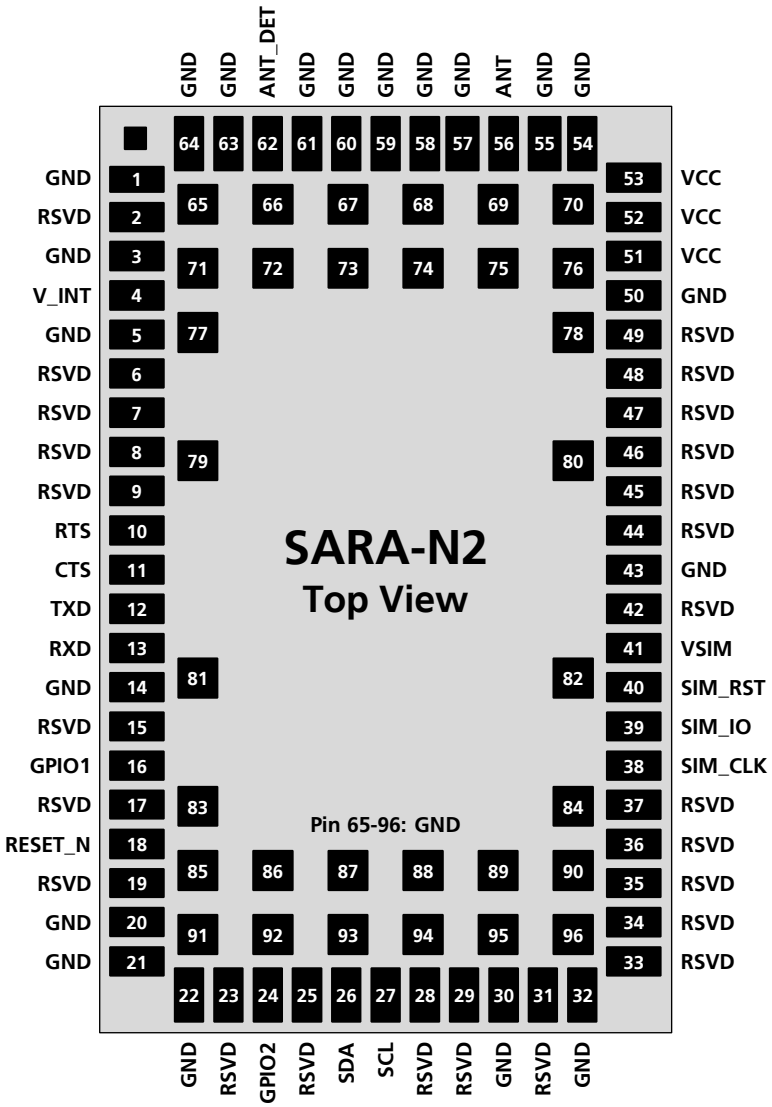

Figure 2: SARA-N2 series modules pin assignment

No	Name	Power domain	I/O	Description	Remarks
1	GND	GND	N/A	Ground	All GND pads must be connected to ground.
2	RSVD	-	N/A	RESERVED pin	Leave unconnected.
3	GND	GND	N/A	Ground	All GND pads must be connected to ground.
4	V_INT	-	O	Digital I/O Interfaces supply output	V_INT = 1.8 V (typical) supply output generated by the module when the radio is on. See section 4.2.2 for detailed electrical characteristics. For diagnostic purposes, connect a test point to this pin.
5	GND	GND	N/A	Ground	All GND pads must be connected to ground.
6	RSVD	-	N/A	RESERVED pin	Leave unconnected.
7	RSVD	-	N/A	RESERVED pin	Leave unconnected.
8	RSVD	-	N/A	RESERVED pin	Leave unconnected.
9	RSVD	-	N/A	RESERVED pin	Leave unconnected.
10	RTS	UART	I	UART ready to send	See section 4.2.7 for detailed electrical characteristics.
11	CTS	UART	O	UART clear to send	See section 4.2.7 for detailed electrical characteristics.
12	TXD	UART	I	UART data input	See section 4.2.7 for detailed electrical characteristics.
13	RXD	UART	O	UART data output	See section 4.2.7 for detailed electrical characteristics.
14	GND	GND	N/A	Ground	All GND pads must be connected to ground.
15	RSVD	-	N/A	RESERVED pin	Leave unconnected.
16	GPIO1	GDI	I/O	GPIO	Secondary UART data output. See section 4.2.8 for detailed electrical characteristics. For diagnostic purposes, connect a test point to this pin.
17	RSVD	-	N/A	RESERVED pin	Leave unconnected.
18	RESET_N	ERS	I	External reset input	See section 4.2.5 for detailed electrical characteristics. For diagnostic purposes, connect a test point to this pin.
19	RSVD	-	N/A	RESERVED pin	Leave unconnected.
20	GND	GND	N/A	Ground	All GND pads must be connected to ground.
21	GND	GND	N/A	Ground	All GND pads must be connected to ground.
22	GND	GND	N/A	Ground	All GND pads must be connected to ground.
23	RSVD	-	N/A	RESERVED pin	Leave unconnected.
24	GPIO2	GDI	I/O	GPIO	See section 4.2.8 for detailed electrical characteristics.
25	RSVD	-	N/A	RESERVED pin	Leave unconnected.
26	SDA	GDI	I/O	I2C bus data line	No internal pull-up. See section 4.2.8 for detailed electrical characteristics.
27	SCL	GDI	O	I2C bus clock line	No internal pull-up. See section 4.2.8 for detailed electrical characteristics.
28	RSVD	-	N/A	RESERVED pin	Leave unconnected.
29	RSVD	-	N/A	RESERVED pin	Leave unconnected.
30	GND	GND	N/A	Ground	All GND pads must be connected to ground.
31	RSVD	-	N/A	RESERVED pin	Leave unconnected. For diagnostic purposes, connect a test point to this pin.
32	GND	GND	N/A	Ground	All GND pads must be connected to ground.
33	RSVD	-	N/A	RESERVED pin	Leave unconnected.
34	RSVD	-	N/A	RESERVED pin	Leave unconnected.
35	RSVD	-	N/A	RESERVED pin	Leave unconnected.
36	RSVD	-	N/A	RESERVED pin	Leave unconnected.
37	RSVD	-	N/A	RESERVED pin	Leave unconnected.
38	SIM_CLK	SIM	O	SIM clock	See section 4.2.6 for detailed electrical specs.
39	SIM_IO	SIM	I/O	SIM data	See section 4.2.6 for detailed electrical specs.
40	SIM_RST	SIM	O	SIM reset	See section 4.2.6 for detailed electrical specs.
41	VSIM	-	O	SIM supply output	VSIM = 1.80 V typical generated by the module. See section 4.2.2 for detailed electrical characteristics.
42	RSVD	-	N/A	RESERVED pin	Leave unconnected.
43	GND	GND	N/A	Ground	All GND pads must be connected to ground.
44	RSVD	-	N/A	RESERVED pin	Leave unconnected.

No	Name	Power domain	I/O	Description	Remarks
45	RSVD	-	N/A	RESERVED pin	Leave unconnected.
46	RSVD	-	N/A	RESERVED pin	Leave unconnected.
47	RSVD	-	N/A	RESERVED pin	Leave unconnected.
48	RSVD	-	N/A	RESERVED pin	Leave unconnected.
49	RSVD	-	N/A	RESERVED pin	Leave unconnected.
50	GND	GND	N/A	Ground	All GND pads must be connected to ground.
51	VCC	VCC	I	Module supply input	All VCC pins must be connected to external supply. See 4.2.2 and 4.2.3 for detailed electrical characteristics.
52	VCC	VCC	I	Module supply input	All VCC pins must be connected to external supply. See 4.2.2 and 4.2.3 for detailed electrical characteristics.
53	VCC	VCC	I	Module supply input	All VCC pins must be connected to external supply. See 4.2.2 and 4.2.3 for detailed electrical characteristics.
54	GND	GND	N/A	Ground	All GND pads must be connected to ground.
55	GND	GND	N/A	Ground	All GND pads must be connected to ground.
56	ANT	ANT	I/O	RF antenna	50 Ω nominal characteristic impedance. See section 4.2.4 for detailed RF characteristics.
57	GND	GND	N/A	Ground	All GND pads must be connected to ground.
58	GND	GND	N/A	Ground	All GND pads must be connected to ground.
59	GND	GND	N/A	Ground	All GND pads must be connected to ground.
60	GND	GND	N/A	Ground	All GND pads must be connected to ground.
61	GND	GND	N/A	Ground	All GND pads must be connected to ground.
62	ANT_DET	ADC	I	Antenna detection	
63	GND	GND	N/A	Ground	All GND pads must be connected to ground.
64	GND	GND	N/A	Ground	All GND pads must be connected to ground.
65-96	GND	GND	N/A	Ground	All GND pads must be connected to ground.

Table 5: SARA-N2 series modules pin-out

For an explanation of abbreviations and terms used, see Appendix A.

4 Electrical specification

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 section (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		4.25	V
GDI	Generic digital interfaces	Input DC voltage at Generic digital interfaces pins		2.1	V
SIM	SIM interface	Input DC voltage at SIM interface pins		2.1	V
UART	UART interface	Input DC voltage at UART interface pins		4.25	V
ERS	External reset signal	Input DC voltage at RESET_N pin		4.25	V
Rho_ANT	Antenna ruggedness	Output RF load mismatch ruggedness at ANT pins		10:1	VSWR
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			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
Operating temperature range	-40		+85	°C	
	-20		+85	°C	Normal operating temperature range
	-40		-20	°C	Extended operating temperature range

Table 8: Environmental conditions

4.2.1.1 Normal operating temperature range

The module is fully functional and meets the 3GPP specification across the specified temperature range.

4.2.1.2 Extended operating temperature range

The module is fully functional across the specified temperature range. Occasional deviations from the 3GPP specification may occur.

4.2.2 Supply/power pins

Pin Name	Parameter	Min	Typ	Max	Unit
VCC	Module supply normal operating input voltage[1]	3.1	3.6	4.0	V
	Module supply extended operating input voltage[2]	2.9		4.2	V

Table 9: Input characteristics of Supply/Power pins

Pin Name	Parameter	Min	Typ	Max	Unit
VSIM	SIM supply output voltage		1.80		V
V_INT	Generic Digital Interfaces supply output voltage		1.80		V
I_INT	Generic Digital Interfaces supply output current capability			80	mA

Table 10: Output characteristics of Supply/Power pins

[1] Input voltage at **VCC** pins must be above the normal operating range minimum limit to switch-on the module.
[2] Occasional deviations from the 3GPP specifications may occur. The RF power transmitted by the module may be few dB lower than expected when operating below the minimum value of the normal operating range. Ensure that input voltage at **VCC** never drops below the extended operating range minimum limit during module operation to avoid possible module switch-off events.

4.2.3 Current consumption

Mode	Band	Condition	Tx power	Min	Typ[3]	Max	Unit
Deep-sleep mode	-	Averaged current over a 10-second period			3		µA
Active mode	-	Averaged current over a 10-second period			6		mA
Rx-mode	All	Averaged current over a 10-second period			46		mA
Tx-mode	All	Averaged current over a 2-second period	-40 dBm		74		mA
			-7 dBm		75		mA
			3 dBm		78		mA
			13 dBm		100		mA
			23 dBm		220		mA

Table 11: VCC current consumption[4]

4.2.4 RF characteristics

Parameter		Min	Max	Unit	Remarks
Frequency range Band 5	Uplink	824	849	MHz	Module transmit
	Downlink	869	894	MHz	Module receive
Frequency range Band 8	Uplink	880	915	MHz	Module transmit
	Downlink	925	960	MHz	Module receive
Frequency range Band 20	Uplink	832	862	MHz	Module transmit
	Downlink	791	821	MHz	Module receive
Frequency range Band 28	Uplink	703	748	MHz	Module transmit
	Downlink	758	803	MHz	Module receive

Table 12: Operating RF frequency bands

Parameter	Min.	Typical	Max.	Unit	Remarks
Maximum output power		23.0		dBm	Uplink BPSK/QPSK modulation

Condition: 50 Ω output load

Table 13: Transmitter maximum output power

Parameter	Min.	Typical	Max.	Unit	Remarks
Receiver input sensitivity		-135		dBm	Downlink RF level @ BLER MCS-1 < 10 %

Table 14: Receiver sensitivity performance

[3] Typical values with a matched antenna.
[4] Module current consumption through **VCC** input pins, in the listed modes/conditions.

4.2.5 RESET_N pin

Parameter	Min.	Typical	Max.	Unit	Remarks
Internal supply for External Reset Input Signal		VCC		V	Module supply input (VCC)
Schmitt Trigger Low to High Threshold Point (V_{T+})		0.52*VCC		V	
Schmitt Trigger High to Low Threshold Point (V_{T-})		0.36*VCC		V	
Pull-up resistance		78		kΩ	Internal active pull-up to VCC
Low-level input current			-10	µA	
RESET_N low-level time	500			ns	Low time to reset the module

Table 15: RESET_N pin characteristics

4.2.6 SIM interface pins

Parameter	Min.	Typical	Max.	Unit	Remarks
Internal supply for SIM domain		1.8		V	Generic Digital Interface supply output (VSIM)
Low-level input	-0.1*VSIM		0.2*VSIM	V	
High-level input	0.7*VSIM		1.1*VSIM	V	
Low-level output		0.0		V	
High-level output		VSIM		V	
Internal pull-up on SIM_IO		4.7		kΩ	Internal pull-up to VSIM
Clock frequency on SIM_CLK		4.8		MHz	
Input / Output leakage current			±10	µA	

Table 16: SIM pins characteristics

4.2.7 UART interface pins

Parameter	Min.	Typical	Max.	Unit	Remarks
Internal supply for UART domain		VCC		V	Module supply input (VCC)
Low-level input	-0.1*VCC		0.2*VCC	V	
High-level input	0.7*VCC		1.1*VCC	V	
Low-level output		0.0		V	
High-level output		VCC		V	
Input / Output leakage current			±10	µA	

Table 17: UART pins characteristics

4.2.8 Generic Digital Interface pins

Parameter	Min.	Typical	Max.	Unit	Remarks
Internal supply for GDI domain		1.8		V	Generic Digital Interface supply output (V_INT)
Low-level input	-0.1*V_INT		0.2*V_INT	V	
High-level input	0.7*V_INT		1.1*V_INT	V	
Low-level output		0.0		V	
High-level output		V_INT		V	
Input / Output leakage current			±10	µA	

Table 18: Generic Digital Interface (GDI) pins characteristics

5 Mechanical specifications

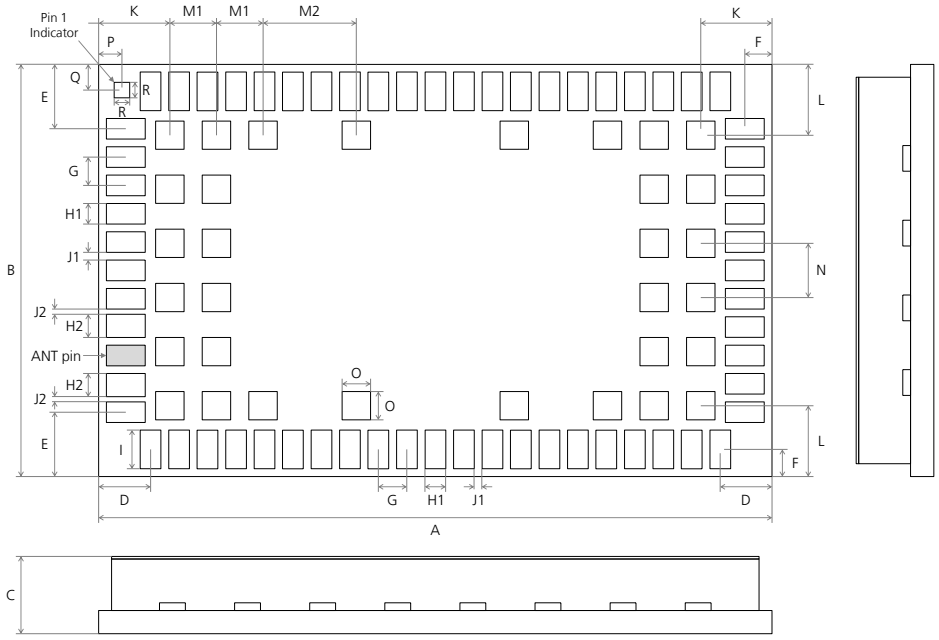

Figure 3: SARA-N2 series dimensions (bottom and sides views)

Parameter	Description	Typical		Tolerance	
A	Module Height [mm]	26.0	(1023.6 mil)	+0.20/-0.20	(+7.9/-7.9 mil)
B	Module Width [mm]	16.0	(629.9 mil)	+0.20/-0.20	(+7.9/-7.9 mil)
C	Module Thickness [mm]	2.4	(94.5 mil)	+0.25/-0.15	(+9.8/-5.9 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]	2.5	(98.4 mil)	+0.20/-0.20	(+7.9/-7.9 mil)
F	Edge to Lateral Pin Pitch [mm]	1.05	(41.3 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]	2.75	(108.3 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]	1.0	(39.4 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]	< 3			

Table 19: SARA-N2 series dimensions

Module Height tolerance 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 SARA-N2 series System Integration Manual [2].

6 Qualification and approvals

6.1 Reliability tests

Tests for product family qualifications are 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).

SARA-N2 series modules are RoHS compliant.

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

Table 20 lists the scheduled approvals for SARA-N2 series modules.

Certification Scheme	SARA-N200	SARA-N201	SARA-N210	SARA-N211	SARA-N280
CE (European Conformity)	•		•	•	
GCF (Global Certification Forum)				•	
GMA (Global M2M Association)				•	
CCC (China Compulsory Certification)	•	•			
SRRC (State Radio Regulation of China)	•	•			
NCC (Taiwanese National Communications Commission)	•			•	•
Anatel (Agência Nacional de Telecomunicações Brazil)					•
RCM (Australia Regulatory Compliance Mark)					•
ATEX (Atmosphere Explosive)				•	

Table 20: SARA-N2 series main certification approvals

☞ For all the certificates of compliancy and for the complete list of approvals (including countries' and network operators' approvals) of SARA-N2 series modules, see our website (http://www.u-blox.com/) or please contact the u-blox office or sales representative nearest you.

7 Product handling

7.1 Packaging

SARA-N2 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 Guide [3].

Figure 4: Reeled SARA-N2 modules

7.1.1 Reels

SARA-N2 series modules are deliverable in quantities of 250 pieces on a reel. SARA-N2 series modules are delivered using reel Type B2 as described in the u-blox Package Information Guide [3].

Parameter	Specification
Reel type	B2
Delivery quantity	250

Table 21: Reel information for SARA-N2 series modules

☞ Quantities of less than 250 pieces are also available. Contact u-blox for more information.

7.1.2 Tapes

Figure 5 specifies the dimensions and orientations of the tapes for SARA-N2 series module.

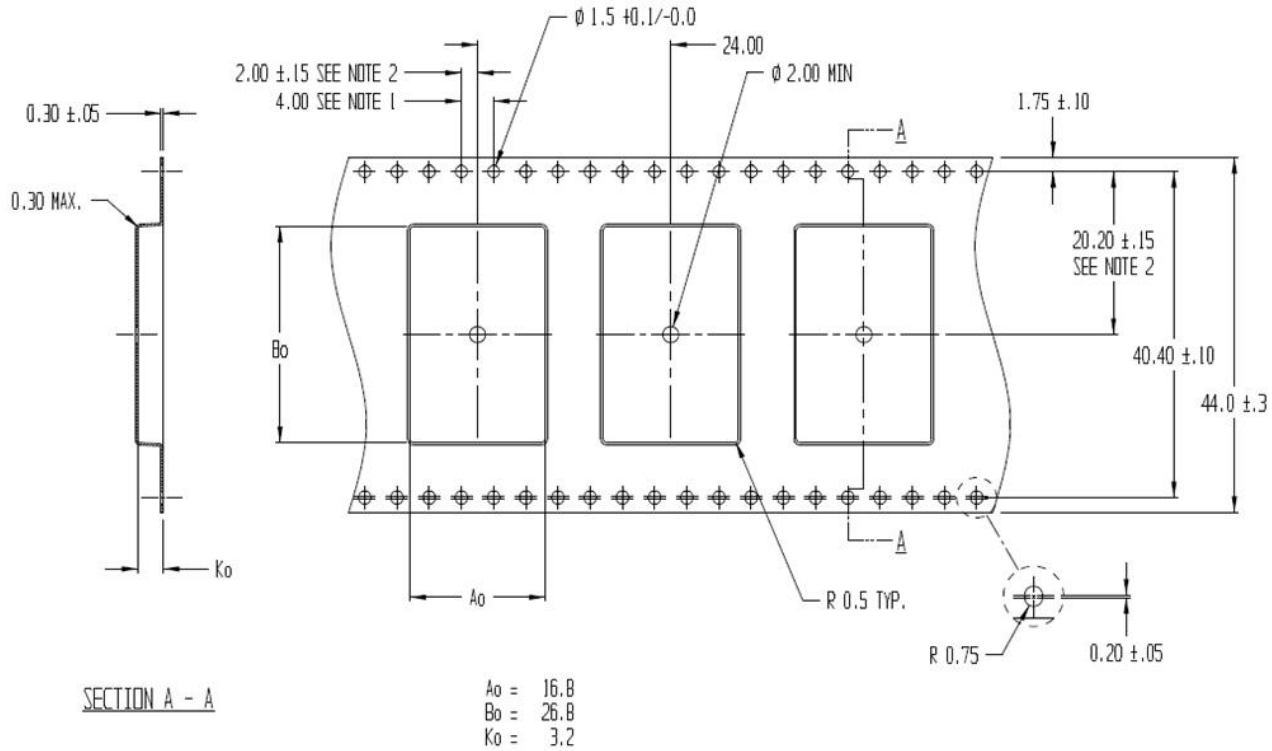

Figure 5: Dimensions for SARA-N2 series on tape

Parameter	Value
A_0	16.8
B_0	26.8
K_0	3.2

Table 22: SARA-N2 tape dimensions (mm)

Note 1: 10 sprocket hole pitch cumulative tolerance ± 0.2.

Note 2: Pocket position relative to sprocket hole measured as true position of pocket, not pocket hole.

Note 3: A_0 and B_0 are calculated on a plane at a distance "R" above the bottom of the pocket.

7.2 Moisture Sensitivity Levels

SARA-N2 modules are Moisture Sensitive Devices (MSD) in accordance to IPC/JEDEC specification

The Moisture Sensitivity Level (MSL) relates to the packaging and handling precautions required. SARA-N2 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 [3].

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 SARA-N2 series System Integration Manual [2]).

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

7.4 ESD precautions

SARA-N2 modules contain highly sensitive electronic circuitry and are Electrostatic Sensitive Devices (ESD). Handling SARA-N2 modules without proper ESD protection may destroy or damage them permanently.

SARA-N2 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 SARA-N2 modules.

Proper ESD handling and packaging procedures must be applied throughout the processing, handling and operation of any application that incorporates SARA-N2 module.

ESD precautions should be implemented on the application board where the module is mounted, as described in the SARA-N2 series System Integration Manual [2].

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

8 Labeling and ordering information

8.1 Product labeling

SARA-N2 module labels include important product information. Figure 6 illustrates the label and includes: u-blox logo, production lot, Pb-free marking, product Type Number, module IMEI number, regulatory certification info, and production country.

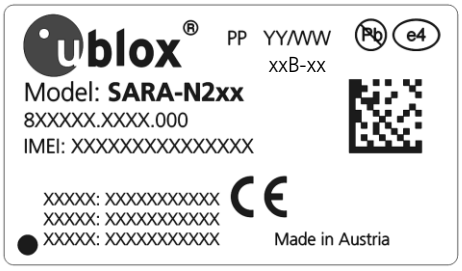

Figure 6 Location of product type number on SARA-N2 series module label

8.2 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 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 23 below details these three different formats:

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

Table 23: Product code formats

Table 24 explains the parts of the product code.

Code	Meaning	Example
TG	Platform (Technology and Generation): • 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	N2
VV	Variant function set based on the same platform [00…99]	00
MM	Major product version [00…99]	02
Q	Product grade: • B = professional • A = automotive	B
XX	Minor product version (not relevant for certification)	00

Table 24: Part identification code

8.3 Ordering codes

Ordering No.	Product
SARA-N200-02B	Narrowband IoT module supporting Band 8, full 3GPP range of Tx power, FOTA, FOAT, antenna supervisor 26.0 x 16.0 x 2.4 mm, 250 pcs/reel
SARA-N201-02B	Narrowband IoT module supporting Band 5, full 3GPP range of Tx power, FOTA, FOAT, antenna supervisor 26.0 x 16.0 x 2.4 mm, 250 pcs/reel
SARA-N210-02B	Narrowband IoT module supporting Band 20, full 3GPP range of Tx power, FOTA, FOAT, antenna supervisor 26.0 x 16.0 x 2.4 mm, 250 pcs/reel
SARA-N211-02B	Narrowband IoT module supporting Band 8 and 20, full 3GPP range of Tx power, FOTA, FOAT, antenna supervisor 26.0 x 16.0 x 2.4 mm, 250 pcs/reel
SARA-N280-02B	Narrowband IoT module supporting Band 28, full 3GPP range of Tx power, FOTA, FOAT, antenna supervisor 26.0 x 16.0 x 2.4 mm, 250 pcs/reel

Table 25: Product ordering codes

☞ Product changes affecting form, fit or function are documented by u-blox. For a list of Product Change Notifications (PCNs) see our website.

Appendix

A Glossary

Name	Definition
ADC	Analog to Digital Converter
DDC	Display Data Channel (I^2C compatible) Interface
DL	Down-link (Reception)
ERS	External Reset Input Signal
GDI	Generic Digital Interfaces (power domain)
GND	Ground
GNSS	Global Navigation Satellite System
GPIO	General Purpose Input Output
GSM	Global System for Mobile Communication
GMSK	Gaussian Minimum Shift Keying
I^2C	Inter-Integrated Circuit Interface
LGA	Land Grid Array
PCN	Product Change Notification / Information Note / Sample Delivery Note
PSK	Phase Shift Keying
NB-IoT	Narrow Band – Internet of Things
SIM	Subscriber Identity Module
SPI	Serial Peripheral Interface
TBD	To Be Defined
UART	Universal Asynchronous Receiver-Transmitter serial interface
UL	Up-link (Transmission)

Table 26: Explanation of abbreviations and terms used

Related documents

[1] u-blox SARA-N2 series AT Commands Manual, Docu No UBX-16014887

[2] u-blox SARA-N2 series System Integration Manual, Docu No UBX-17005143

[3] u-blox Package Information Guide, Docu No UBX-14001652

☞ For regular updates to u-blox documentation and to receive product change notifications please register on our homepage.

Revision history

Revision	Date	Name	Comments
R01	09-Dec-2015	sfal	Initial release
R02	23-Feb-2016	sfal	Document aligned with features supported by the first FW delivery. AT command section added
R03	15-Apr-2016	sfal	Document aligned with features supported by FW V100R100C00B100
R04	20-Jun-2016	sfal	Voltage extended operating range values added. AT commands section removed
R05	31-Oct-2016	sfal	Document updated to product version "01"
R06	13-Dec-2016	sfal	Added additional requirements on the secondary UART. Updates on data rates, secondary UART baud rate and supported features.
R07	22-Feb-2017	sfal	Extended document applicability to SARA-N280-01B. Changed UL/DL data rates
R08	24-Mar-2017	sfal	Document applicability extended to product version "02" and added SARA-N200-02B. Removed SPI interface (not supported)
R09	22-May-2017	sfal / sses	Document updated for Prototypes of "02"product version
R10	01-Aug-2017	sfal / lpah	Updated disclaimer restriction Updated product status for "01B" product version Updated current consumption in Rx mode
R11	09-Oct-2017	sses	Updated VCC, V_INT, RESET_N and GPIO description Updated main certification approvals

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