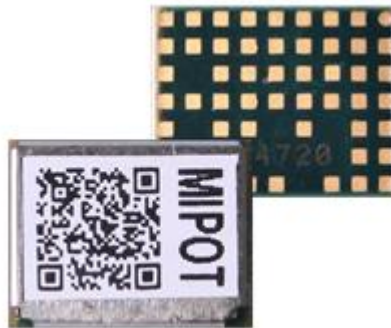


Wireless Protocol Modules MiP Series

32001505BUS

Stand Alone LoRaWAN™ Module

Datasheet



Overview

The 32001505BUS is a transceiver operating in the 915 MHz SRD Band optimized for very long range, low power applications, suitable for LPWA networks. Based on LoRa® RF Technology and LoRaWAN™ protocol, it provides ultra-long range spread spectrum communication and high interference immunity.

Thanks to its small LGA form factor (11.3 x 8.9 mm only) and its low current consumption, this module allows the implementation of highly integrated low power (battery operated) solutions for Internet of Things (IoT) applications, security systems, sensor networks, metering, smart buildings, agriculture, supply chain.

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1. Product Features

Mechanical highlights:

- ✓ Extremely compact dimensions
- ✓ LGA pattern

Low power characteristics:

- ✓ power down current consumption 1.5 μ A
- ✓ 11 mA in RX mode

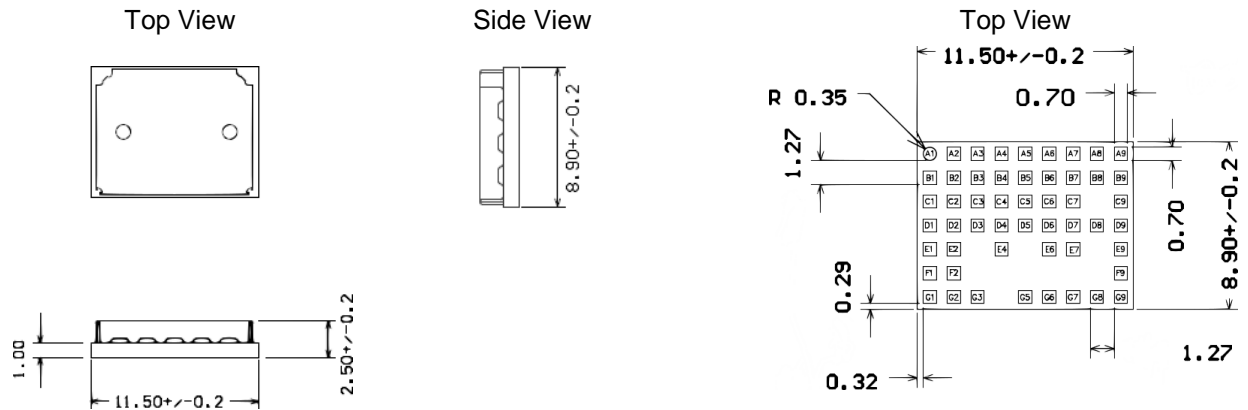
RF performances:

- ✓ -135 dBm sensitivity @LoRa®
- ✓ +20 dBm Output power

Protocol and interfaces:

- ✓ LoRaWAN™ version 1.0.3
- ✓ Smart peripheral interfaces selector (UART, LPUART, SPI, I²C)

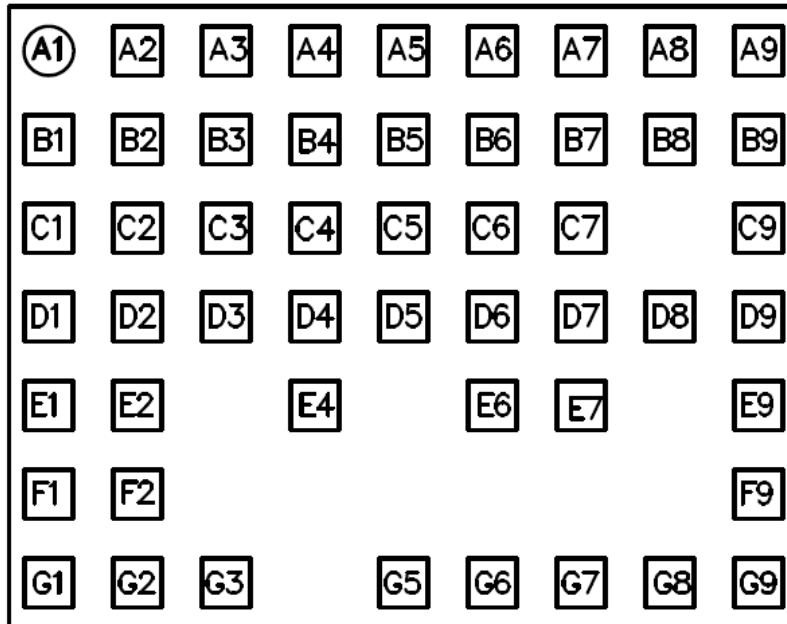
2. Mechanical Dimensions



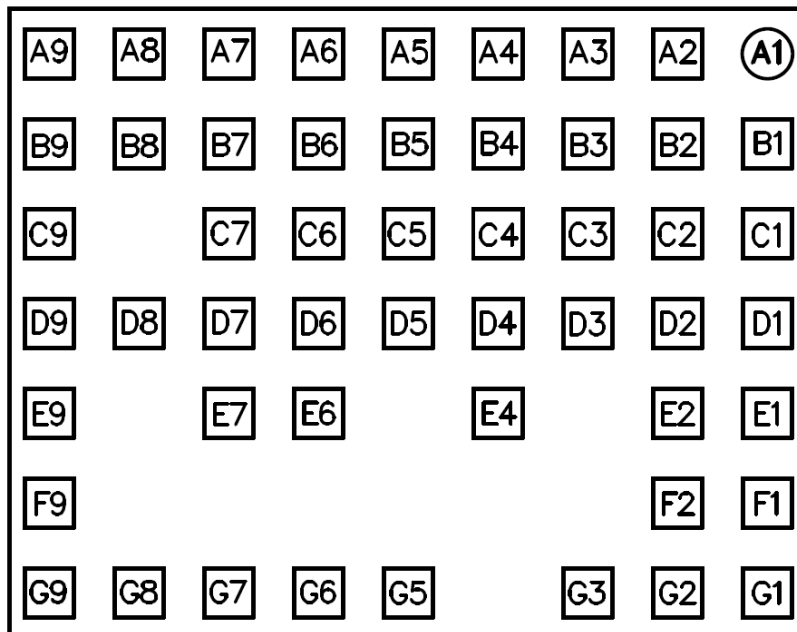
Note: all dimensions are in millimetres (mm)

3. Pinout

Top View



Bottom View



Pin	Name	Type	Pin	Name	Type
A1	SPI1_MISO	I/O	D1	GND	S
A2	SPI1_SCK	I/O	D2	NC	-
A3	SPI1_NSS	I/O	D3	NC	-
A4	LPUART1_TX	I/O	D4	GND	S
A5	LPUART1_RX	I/O	D5	NC	-
A6	SPI1_MOSI	I/O	D6	NC	-
A7	I2C1_SCL	I/O	D7	VBAT	S
A8	I2C1_SDA	I/O	D8	NC	-
A9	VDD	S	D9	SPI2_MISO	I/O
B1	NC	-	E1	GND	S
B2	NC	-	E2	GND	S
B3	USART2_TX	I/O	E4	NC	-
B4	USART2_RX	I/O	E6	NC	-
B5	USART1_TX	I/O	E7	NC	-
B6	USART1_RX	I/O	E9	SPI2_MOSI	I/O
B7	NC	-	F1	ANT	RF I/O
B8	VDDA	S	F2	GND	S
B9	VDD	S	F9	SPI2_NSS	I/O
C1	BOOT0	I/O	G1	GND	S
C2	NC	-	G2	GND	S
C3	NC	-	G3	GND	S
C4	GND	S	G5	NC	-
C5	NC	-	G6	NC	-
C6	NC	-	G7	NC	-
C7	VREF+	S	G8	NC	-
C9	GND	S	G9	SPI2_SCK	I/O

Note: NC means “do not connect”, leave the pin floating.

4. Electrical characteristics

4.1 Absolute Maximum Ratings

Parameter	Max.	Unit
Supply voltage, +Vdd, pin A9, B9:	3.9	V
Radio Frequency Input Level, pin F1:	0	dBm
Voltage Standing Wave Ratio (VSWR) at RF Input, ANT, pin F1:	10:1	
Max pins voltage with respect to GND	Vdd+0.3	V
Storage Temperature:	-40 ÷ 100	°C
Operating Temperature:	-40 ÷ 85	°C

4.2 Operating Condition

GENERAL ELECTRICAL CHARACTERISTICS @ 25 °C

Parameter	Min.	Typ.	Max.	Unit	Notes
Supply Voltage (VDD)	2.1	3.0	3.6	V	
VDDA	0	-	3.6	V	
VBAT	1.55		3.6	V	
VIN	-0.3		VDD+0.3	V	
Sleep DC Current	-	2.2	-	µA	

RECEIVER ELECTRICAL CHARACTERISTICS @ 25 °C

Parameter	Min.	Typ.	Max.	Unit	Notes
DC Current drain	-	-	11	mA	See note 6
Sleep DC Current	-	1.5	-	µA	
Operating Frequency	902.0	-	928.0	MHz	
Channel Frequency Precision	-	±15	-	kHz	
Sensitivity, 2-FSK	-	-115	-	dBm	See notes 2,3,5

Sensitivity, LoRa®	-	-135	-	dBm	See notes 2,4,5
Image Frequency Rejection	-	54	-	dB	
Spurious radiated level	-	-	-48	dBm	
Data Rate, LoRa®	0.98	-	21.9	kbit/s	
Output Logic low	GND	-	0.05	V	
Output Logic high	VDD-0.2	-	VDD	V	

TRANSMITTER ELECTRICAL CHARACTERISTICS @ 25 °C

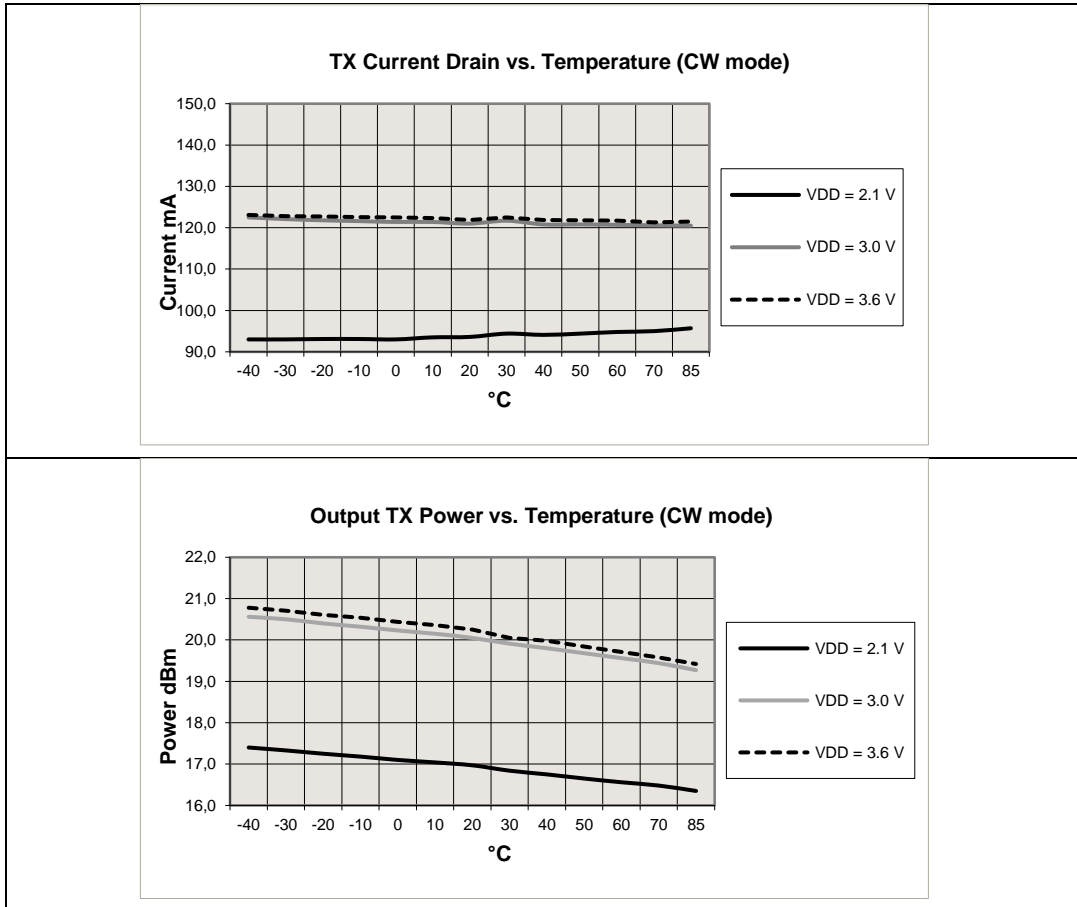
Parameter	Min.	Typ.	Max.	Unit	Notes
Current Drain	-	138	-	mA	See notes 1,2
Operating frequency	902.0	-	928.0	MHz	
Occupied Bandwidth LoRa® DTS	500	-	-	kHz	
Occupied Bandwidth LoRa® FHSS	-	125	-	kHz	See note 8
Operating Channel Width LoRa® DTS	-	600	-	kHz	
Operating Channel Width LoRa® FHSS	-	200	-	kHz	See note 8
Output power (on 50 Ω load)	-	20	-	dBm	See notes 1,2,7
Output Impedance	-	50	-	Ω	
Data Rate, LoRa®	0.98	-	21.9	kbit/s	
Input Logic low	GND	-	0.05	V	
Input Logic high	VDD-0.2	-	VDD	V	

4.2.1 Notes:

- Note 1:** VDD = 3.6 V.
- Note 2:** All RF parameters measured with input (pin F1, ANT) connected to 50 Ω impedance signal source or load.
- Note 3:** Pseudo random code NRZ, 2-FSK BER (bit error rate) = 0.1 % or better, 2-level FSK modulation without pre-filtering, Bit Rate = 4.8 Kbit/s, frequency deviation = 5 kHz, filter bandwidth = 20 kHz
- Note 4:** LoRa[®] PER (packet error rate) = 1 %, packet of 64 bytes, preamble of 8 bytes, error correction code CR = 4/5, CRC on payload enabled, no reduced encoding, no implicit header
- Note 5:** Sensitivities given using highest LNA gain step
- Note 6:** Power consumption measured with -140 dBm signal and AGC ON
- Note 7:** In order to not exceed the maximum power permitted by the FCC PART 15 regulation, choose an appropriate antenna system and power supply.
- Note 8:** Single hop OBW and OCW.

4.3 Temperature Range Curves

Note: All RF parameters measured with input (pin 3) connected to a 50 Ω impedance signal source or load.



5. Application Notes

Title	Description	Doc
Command Reference Manual	Description of all commands	32001505BUS_Com_Ref
Manufacturing Process Information for LGA MiP Series Modules	Packaging information, Tape & Reel Specification, Reflow soldering information	AN_MNF002

6. Ordering Information

Part Number	Description	Region
32001505BUS	MiP-Lw-1C128N-US	United States

7. Regulatory Approvals

Doc	Title	Description
DoC	NA	NA
FCC Approval	NA	NA

8. Revision History

Revision	Date	Description
0.0	18.01.2021	Draft
0.9	28.02.2021	Preliminary
0.10	28.04.2021	<ul style="list-style-type: none"> - Pin C4 is GND - Pin C3 is TIM2_CH2 - Added pin D4 (GND) - Bottom view of the pinout - Added TX OBW and TX OCW
0.11	08.09.2021	<ul style="list-style-type: none"> - Corrected "power down current" to "sleep current" in Product Features - V_{DD} min set to 2.1 V
1.0	11.11.2021	<ul style="list-style-type: none"> - Corrected temperature curves parameter according V_{DD} min. - Added Top view
1.1	21.12.2021	<ul style="list-style-type: none"> - Corrected OBW and OCW - Corrected bit rate