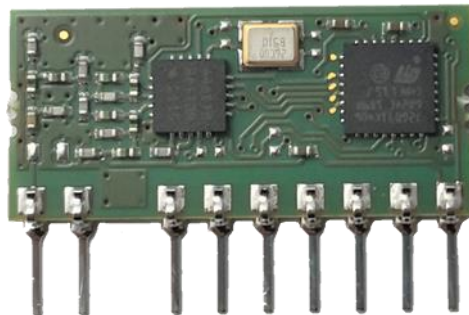


Wireless Transparent Modules

32001536

DUAL MODE 900 MHz TRANSCEIVER

Datasheet



Overview

Dual-mode transceiver operating in the 900 MHz SRD band with extremely compact dimensions. The module operates as an independent device that can be controlled through external control lines.

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1. Product Features

Mechanical highlights:

- ✓ Compact dimensions
(25.5 mm x 12.5 mm)

RF performances:

- ✓ -91 dBm Sensitivity
- ✓ +10 dBm Output power

Low power characteristics:

- ✓ Sleep current consumption 50 nA

Additional features:

- ✓ Configurable RF parameters

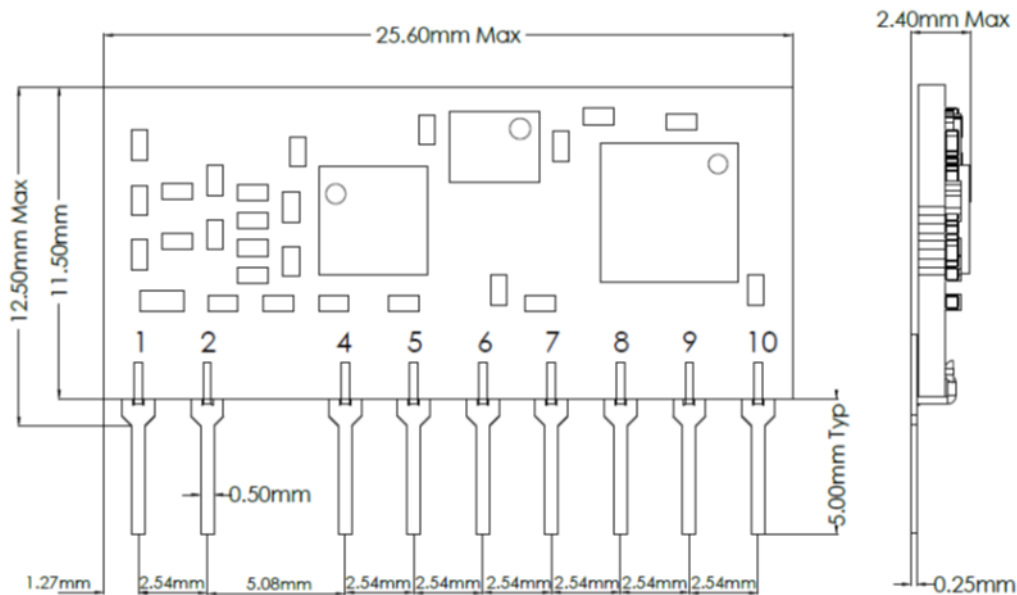
Two operating modes available on the device:

Normal mode: The TRX module operates as a dual channel (913.7 – 919.0 MHz) 2-FSK transceiver. Through the external pins, the user can control the operation mode (TX, RX, Sleep Mode) and the channel frequency.

Extended Mode: Through a predefined sequence of serial commands sent on the module, the user can customize it. Configurable parameters are the output power, the channel frequency and an advanced low-power mode.

Standard supply voltage range from 2.1 to 3.6 V. The module meets all the requirements in the industrial temperature range -40 / +85 °C.

2. Mechanical Dimensions



3. Pin Definition

Pin	Name	Type
1	RF I/O	RF
2	GND	S
4	DATA OUT	O
5	EN	I
6	TX/RX	I/O
7	GND	S
8	CHSEL	I
9	DATA IN	I
10	VDD	S

LEGEND: S = Power supply, O = Output, I = Input, RF = Antenna port

4. Electrical Characteristics

4.1. Absolute Maximum Ratings

Parameter	Max.	Unit
Supply Voltage (VDD)	3.9	V
Max voltage on pins 4, 5, 6, 8, 9	VDD + 0.3	V
Storage Temperature	-40 to 100	°C
Operating Temperature	-40 to 85	°C
Radio Frequency Input, pin 2	10	dBm

4.2. Operating Condition

Note: All parameters measured with RF input (pin 1) connected to a 50-Ω impedance signal source or load, VDD @ 3.0 V.

4.2.1. GENERAL ELECTRICAL CHARACTERISTICS @ 25 °C

Parameter	Min.	Typ.	Max.	Unit	Notes
Supply Voltage (VDD)	2.1	3.0	3.6	V	
TX Current consumption	-	26	-	mA	1
RX Current consumption	-	15	-	mA	2
Sleep Mode Current consumption	-	50	-	μA	
Operating Band	902	-	928	MHz	
Operating frequency Channel 1	-	913.7	-	MHz	4, 5
Operating frequency Channel 2	-	919.0	-	MHz	4, 5
Operating Channel Width	-	500	-	kHz	
2-FSK deviation	-	±250	-	kHz	
Data Rate	-	19200	-	bit/s	
V _{low} on I/O pins	0		0.3xVDD	V	
V _{high} on I/O pins	0.7xVDD	-	VDD	V	
Output load on pin 4	2	-	-	kΩ	

4.2.2. RECEIVER ELECTRICAL CHARACTERISTICS @ 25 °C

Parameter	Min.	Typ.	Max.	Unit	Notes
Sensitivity	-	-91	-	dBm	3
Bandwidth	-	500	-	kHz	
Spurious Radiated level	-	-	-36	dBm	7

4.2.3. TRANSMITTER ELECTRICAL CHARACTERISTICS @ 25 °C

Parameter	Min.	Typ.	Max.	Unit	Notes
Output Power	-	10	-	dBm	5
Occupied Bandwidth	-	500	-	kHz	6
Frequency Tolerance	-	25	-	ppm	

4.2.4. TIMINGS @ 25 °C

Parameter	Min.	Typ.	Max.	Unit	Notes
Time between power on and valid data reception	-	40	-	ms	
Time between power on and valid data transmission	-	40	-	ms	
Time by Sleep Mode to RX	-	1	-	ms	
Time by Sleep Mode to TX	-	1	-	ms	
Time by TX to RX	-	400	-	μs	
Time by RX to TX	-	400	-	μs	
RX Time by CH1 to CH2	-	700	-	ms	
RX Time by CH2 to CH1	-	700	-	ms	
TX Time by CH1 to CH2	-	700	-	ms	
TX Time by CH2 to CH1	-	700	-	ms	

Notes:

- 1) TX Current consumption measured with unmodulated carrier @ 10dBm.
- 2) RX Current consumption measured with pseudo-random bit sequence code NRZ demodulated, 19200 bit/s, BER $\leq 10^{-3}$.
- 3) Test signal 2-FSK, deviation ± 250 kHz, with pseudo-random bit sequence code NRZ @ 19200 bit/s. Results @ BER $\leq 10^{-3}$.
- 4) The frequency values described are the default ones. Each channel is configurable between the following frequencies: 903.0 MHz, 905.0 MHz, 907.0 MHz, 910.0 MHz, 913.7 MHz, 917.0 MHz, 919.0 MHz, 921.0 MHz, 923.0 MHz, 925.0 MHz and 927.0 MHz. For further information see the document **32001536_Command_Reference.pdf**.
- 5) Extended Mode programmable parameters. For further information, see the document **32001536_Command_Reference.pdf**.
- 6) Measured as per FCC part 15.247, "Operation within the bands 902-928 MHz".
- 7) Measured as per FCC part 15.209, "Radiated emission limits".

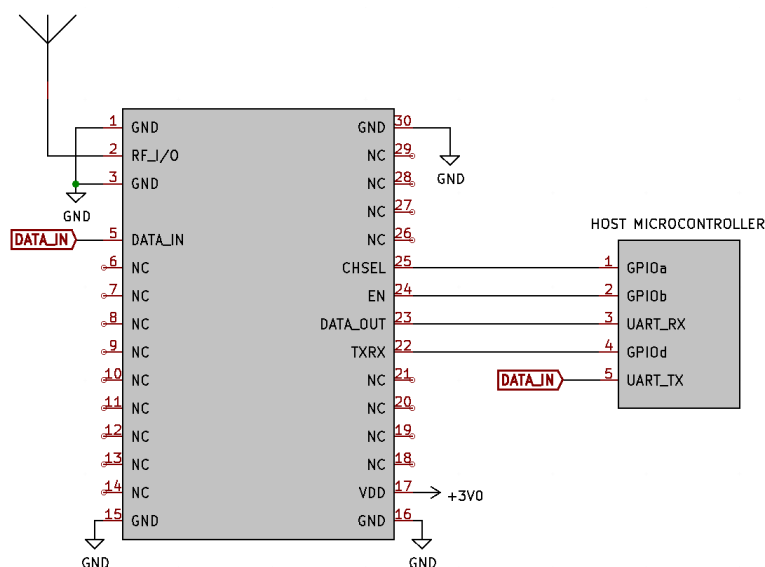
5. I/O Pins Status and Control

5.1. Standard Mode

The default mode behaves as a transparent device with respect to the data stream.

5.1.1. Control via UART

DATA IN and DATA OUT pins of the transceiver are connected to the UART communication peripheral of the microcontroller.

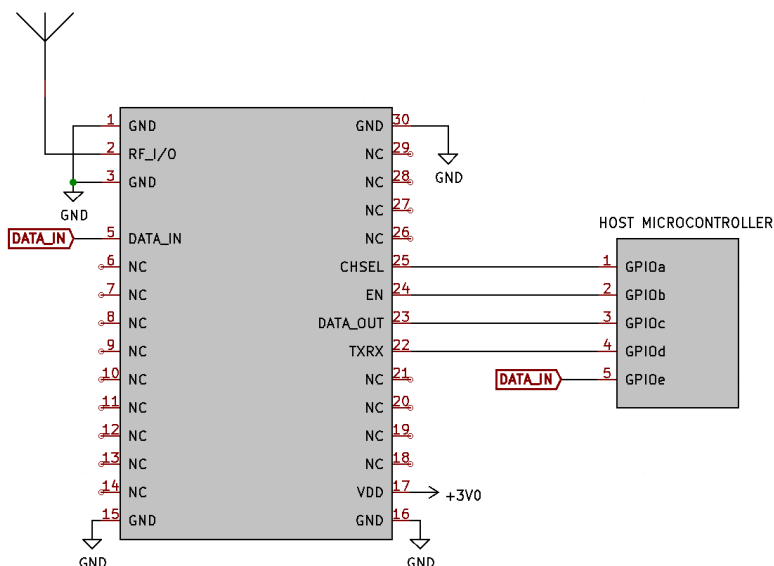


In this mode the control pins on the microcontroller side must be configured as follow:

Pin	Pin name	Configuration	Control
1	GPIOa	DIGITAL OUTPUT	Channel selection pin. <ul style="list-style-type: none"> 0: module operating on channel 1 (913.7 MHz) 1: module operating on channel 2 (919.0 MHz)
2	GPIOb	DIGITAL OUTPUT	Enable pin. Allow to activate or set in Sleep Mode the module, according to the following logic: <ul style="list-style-type: none"> 0: power down (module in Sleep Mode) 1: enable (module operative)
3	UART_RX	UART data RX	RX data stream to the host microcontroller.
4	GPIOd	DIGITAL OUTPUT	Operating mode selection pin. <ul style="list-style-type: none"> 0: module in reception (RX mode) 1: module in transmission (TX mode)
5	UART_TX	UART data TX	TX data stream to the radio module

5.1.2. Control via GPIO

DATA IN and DATA OUT pins of the module are sampled with the host microcontroller general purpose input-output peripheral.



In this mode the control pins on the microcontroller side must be configured as follow:

Pin	Pin name	Configuration	Control
1	GPIOa	DIGITAL OUTPUT	Channel selection pin. <ul style="list-style-type: none"> 0: module operating on channel 1 (913.7 MHz) 1: module operating on channel 2 (919.0 MHz)
2	GPIOb	DIGITAL OUTPUT	Enable pin. Allow to activate or set in Sleep Mode the module, according to the following logic: <ul style="list-style-type: none"> 0: power down (module in Sleep Mode) 1: enable (module operative)
3	GPIOc	DIGITAL INPUT	RX data stream to the host microcontroller.
4	GPIOd	DIGITAL OUTPUT	Operating mode selection pin. <ul style="list-style-type: none"> 0: module in reception (RX mode) 1: module in transmission (TX mode)
5	GPIOe	DIGITAL OUTPUT	TX data stream to the radio module

5.2. Extended Mode

In Extended Mode, user can enter various configuration and then customize the module. The following radio parameters can be changed:

Power level:

- +10 dBm (Default)
- +7 dBm
- +4 dBm
- +1 dBm
- -2 dBm
- -5 dBm

Shutdown mode:

- 50 nA of current consumption

Channel frequency:

- 903.0 MHz
- 905.0 MHz
- 907.0 MHz
- 910.0 MHz
- 913.7 MHz (Default for Channel 1)
- 917.0 MHz
- 919.0 MHz (Default for Channel 2)
- 921.0 MHz
- 923.0 MHz
- 925.0 MHz
- 927.0 MHz

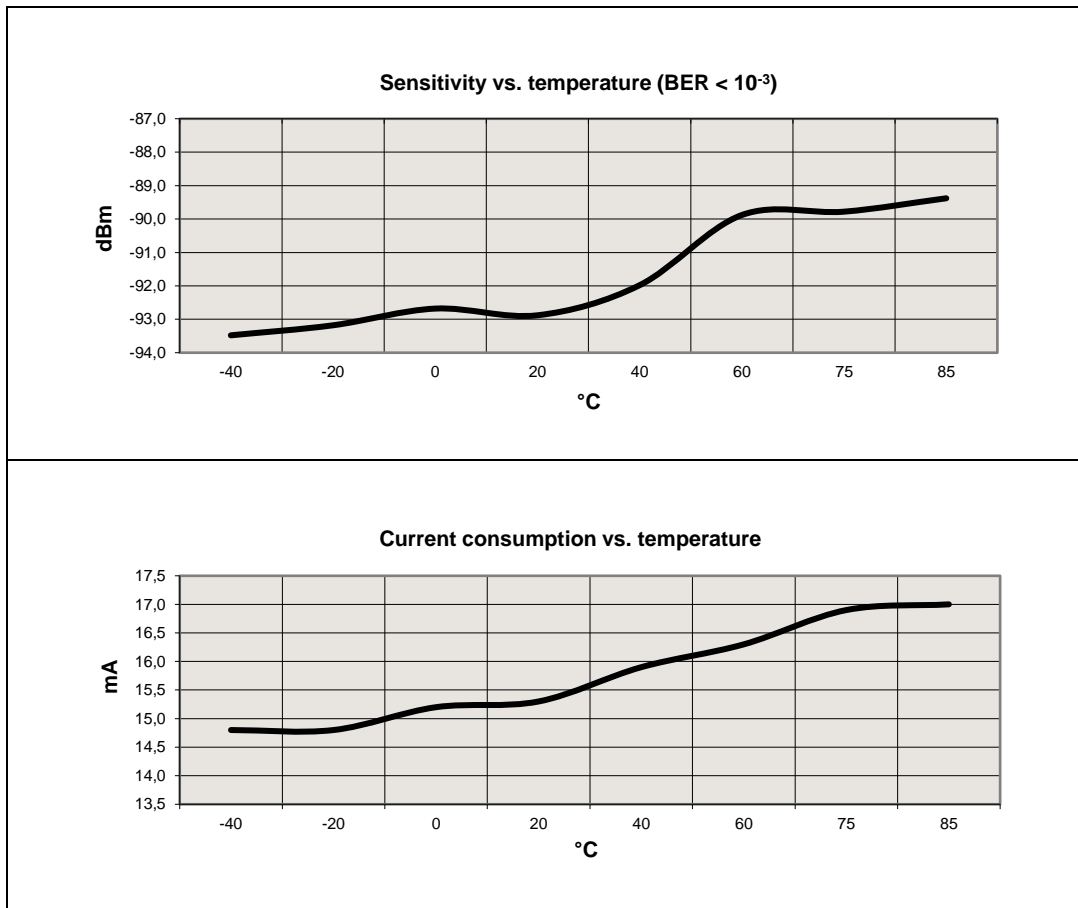
In addition to the standard configuration, for the extended use, the control pins on microcontroller side must have the following capabilities:

Pin	Pin name	Configuration	Control
3	GPIOc	DIGITAL INPUT INTERNAL PULL UP	Extended Mode operation: Module is capable of returning a feedback in case of successful programming. For a detailed description how to implement it, see the document 32001536_Command_Reference.pdf .
4	GPIOd	UART TX DIGITAL INPUT DIGITAL OUTPUT	Extended Mode operation: Host microcontroller sends data frames to setup the transceiver. For a detailed description how to implement it, see the document 32001536_Command_Reference.pdf .

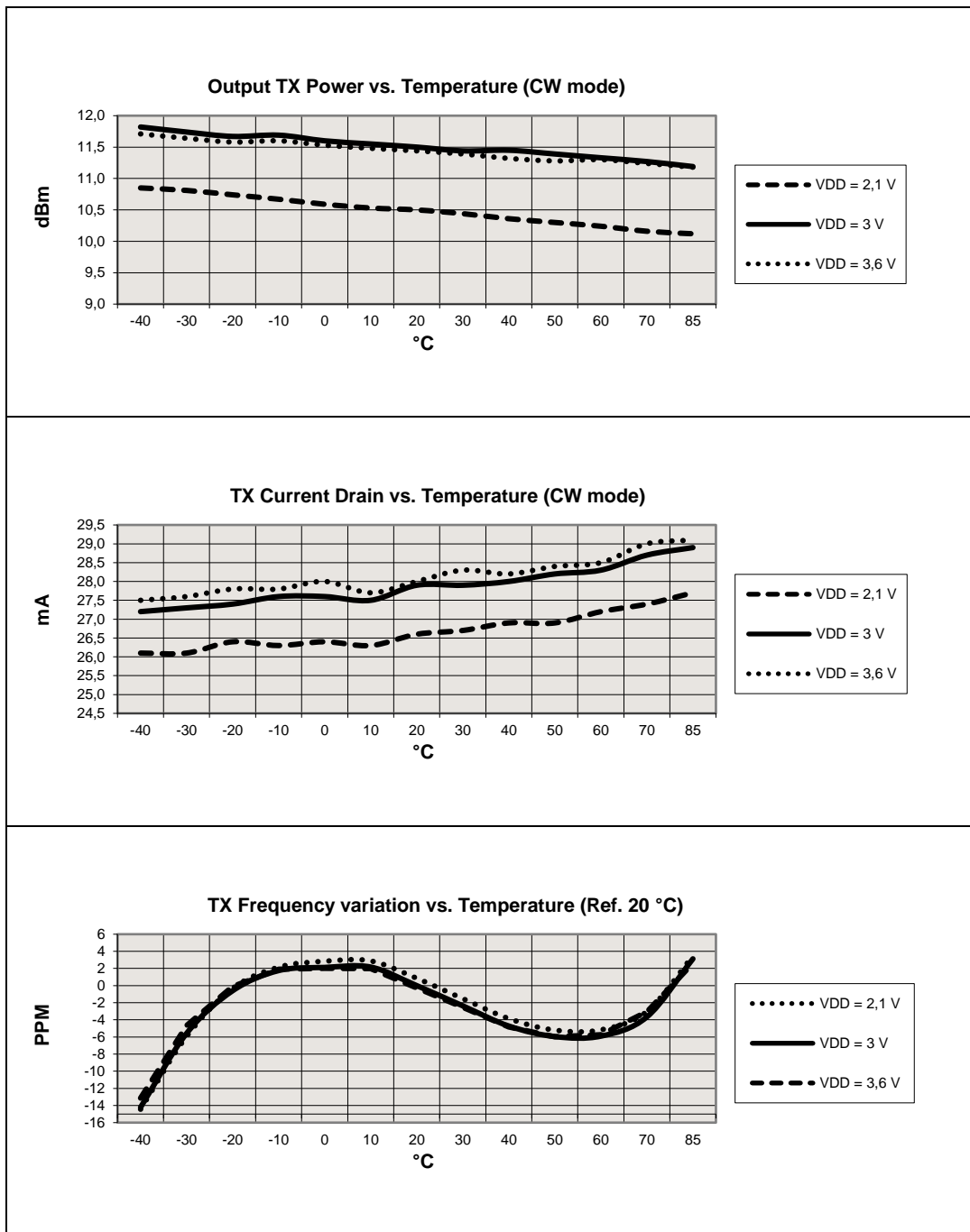
6. Temperature Range Curves

Note: All parameters measured with RF input (pin 1) connected to a 50 Ω impedance signal source or load.

6.1. Receiver



6.2. Transmitter



7. Application Notes

Title	Description	Document
Command Reference Manual	Description of all commands	32001536_Command_Reference.pdf
PCB Layout Guidelines	Hints on how to make for a good RF design	AN_RF_002.pdf

8. Regulatory Approvals

Title	Description	Document
-	-	-

9. Revision History

Revision	Date	Description
0.0	28.03.2022	Draft
1.0	28.06.2024	First release. Updated temperature range curves