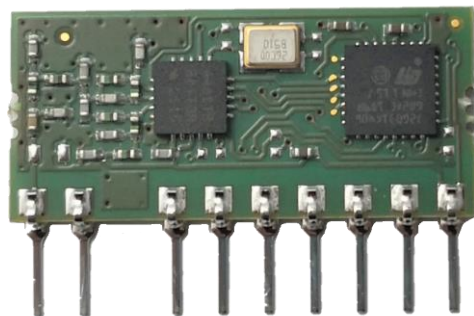


Wireless Transparent Modules Datasheet

32001538

447 MHz TRANSCEIVER

Datasheet



Overview

Transceiver operating in the 447 MHz SRD band with extremely compact dimensions.

The module operates as an independent device that can be controlled through external control lines.

Contents

1.	Product Features.....	3
2.	Mechanical Dimensions.....	4
3.	Pin Definition	4
4.	Electrical Characteristics	5
4.1	Absolute Maximum Ratings	5
4.2	Operating Condition.....	5
5	I/O Pins Status and Control in Standard Mode	9
6	I/O Pins Status and Control in Extended Mode	11
7	Temperature Range Curves.....	12
7.1	Receiver:	12
8	Application Notes	14
9	Regulatory Approvals.....	14
10	Revision History	14

I. Product Features

Mechanical highlights:

- ✓ Compact dimensions

RF performances:

- ✓ -109 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:

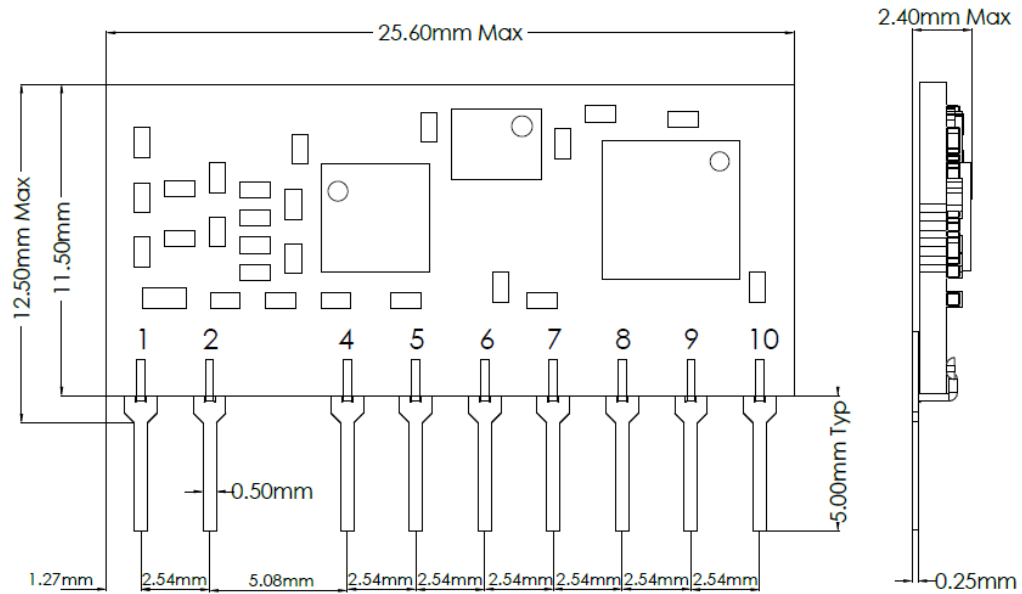
Normal mode: The TRX module operates as a dual channel (447.850 – 447.875 MHz) 2-FSK transceiver. Through the external pins, the user can control the operation mode (Tx, Rx, Sleep Mode) and the channel frequency. Supports data rates of 2400 bit/s.

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 2.3 to 3.6 V. The module meets all the requirements in the industrial temperature range -40 / +85 °C.

Compliant with RoHS directives.

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

GENERAL ELECTRICAL CHARACTERISTICS @ 25 °C

Parameter	Min.	Typ.	Max.	Unit	Notes
Supply Voltage (VDD)	2.3	3.0	3.6	V	
Tx Current consumption, channel 1	-	16	18	mA	1,5
Tx Current consumption, channel 2	-	21	23	mA	1,5
Rx Current consumption	-	15	17	mA	2
Sleep Mode Current consumption	-	3	-	μA	6
Operating Band	447.6000	-	447.9875	MHz	
Operating frequency Channel 1	-	447.850	-	MHz	4
Operating frequency Channel 2	-	447.875	-	MHz	4
Operating Channel Width	-	8	-	kHz	
2-FSK deviation	-	±2.4	-	kHz	
Data Rate	-	2400	-	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	

RECEIVER ELECTRICAL CHARACTERISTICS @ 25 °C

Parameter	Min.	Typ.	Max.	Unit	Notes
Sensitivity	-	-109	-	dBm	3
-3 dB RF Bandwidth	-	6.5	8	kHz	3

TRANSMITTER ELECTRICAL CHARACTERISTICS @ 25 °C

Parameter	Min.	Typ.	Max.	Unit	Notes
Output Power channel 1	-	4.5	5	dBm	5
Output Power channel 2	-	9.5	10	dBm	5
2-FSK Occupied Bandwidth	-	4.6	-	kHz	
Unwanted spurious emission	-	-	-48	dBm	
Out-of-band emissions	-	-	-36	dBm	
Frequency accuracy	-	200	-	Hz	

TIMINGS @ 25 °C / VDD = 3.0 V

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	-	1.5	-	ms	
Time by Sleep Mode to TX	-	1.5	-	ms	
Time by TX to RX	-	800	-	μs	
Time by RX to TX	-	800	-	μs	
RX Time by CH1 to CH2	-	1	-	ms	
RX Time by CH2 to CH1	-	1	-	ms	
TX Time by CH1 to CH2	-	1	-	ms	
TX Time by CH2 to CH1	-	1	-	ms	

Notes:

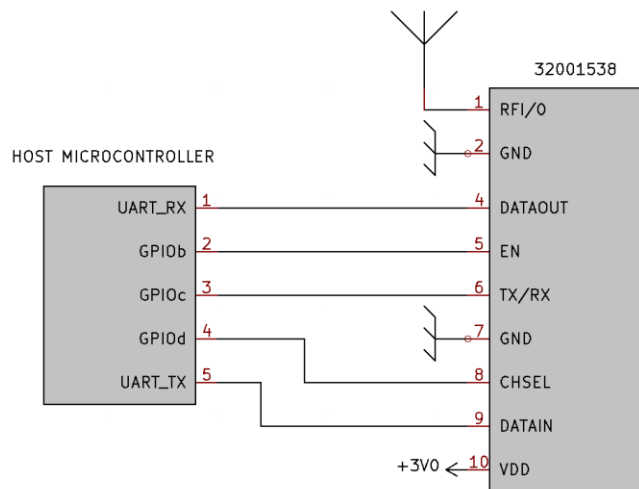
- Note 1:** TX Current consumption measured with unmodulated TX carrier.
- Note 2:** RX Current consumption measured with 2400 bit/s NRZ pseudo-random bit sequence code demodulated, BER $\leq 10^{-3}$.
- Note 3:** Test signal 2-FSK 2400 bit/s NRZ pseudo-random bit sequence code (dev. ± 2.4 kHz).
Results @ BER $\leq 10^{-3}$.
- Note 4:** The frequency values described are the default ones. Each channel is configurable between the following frequencies: 447.825 MHz, 447.850 MHz, 447.875 MHz, 447.900 MHz, 447.925 MHz.
For further information see the document [32001538_Command_Reference.pdf](#).
- Note 5:** The maximum TX power for the 447.825 MHz and 447.850 MHz channel is +5 dBm.
The maximum TX power for the 447.875 MHz, 447.900 MHz and 447.925 MHz channel is +10 dBm.
The output power is programmable in Extended Mode.
For further information see the document [32001538_Command_Reference.pdf](#).
- Note 6:** Current consumption can be decreased up to 50 nA. For further information, see the document [32001538_Command_Reference.pdf](#).

5 I/O Pins Status and Control in Standard Mode

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

5.1 Control in UART Mode

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

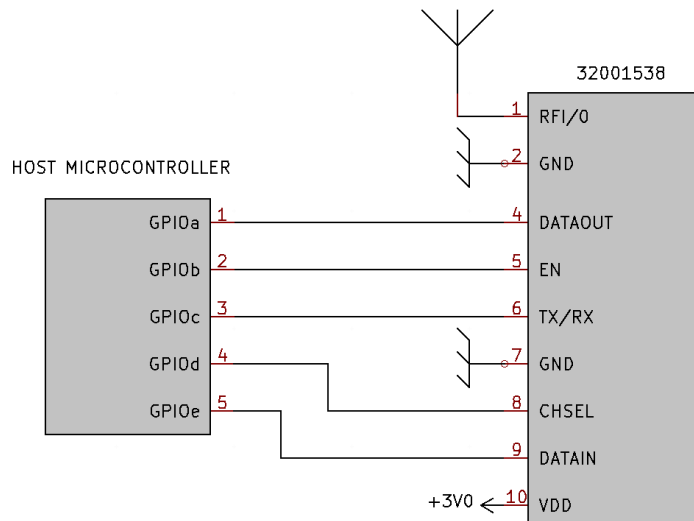


In this mode the control pins on the microcontroller side must be configured as follow:

Pin	Pin name	Configuration	Control
1	UART_RX	UART data RX	RX data stream to the host microcontroller.
2	GPIOb	DIGITAL OUTPUT	Enable pin. Allow to activate or set in Sleep Mode the module, according to the following logic: 0: power down (module in Sleep Mode) 1: enable (module operative)
3	GPIOc	DIGITAL OUTPUT	Operating mode selection pin. 0: module in reception (RX mode) 1: module in transmission (TX mode)
4	GPIOd	DIGITAL OUTPUT	Channel selection pin. 0: module operating on channel 1 (447.850 MHz) 1: module operating on channel 2 (447.875 MHz)
5	UART_TX	UART data TX	TX data stream to the radio module

5.2 Control in GPIO Mode

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



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

Pin	Pin name	Configuration	Control
1	GPIOa	DIGITAL INPUT	RX data stream to the host microcontroller.
2	GPIOb	DIGITAL OUTPUT	Enable pin. Allow to activate or set in power down the module, according to the following logic: 0: power down (module in Sleep Mode) 1: enable (module operative)
3	GPIOc	DIGITAL OUTPUT	Operating mode selection pin. 0: module in reception (RX mode) 1: module in transmission (TX mode)
4	GPIOd	DIGITAL OUTPUT	Channel selection pin. 0: module operating on channel 1 (447.850 MHz) 1: module operating on channel 2 (447.875 MHz)
5	GPIOe	DIGITAL OUTPUT	Host microcontroller sends data in transmission mode.

6 I/O Pins Status and Control in Extended Mode

In Extended Mode, user can enter various configuration and then customize the module. It is possible to set the output power, the frequency of the channel (selectable for each channel between 447.8250, 447.850, 447.8750, 447.90, 447.9250 MHz) and an advanced low-power mode.

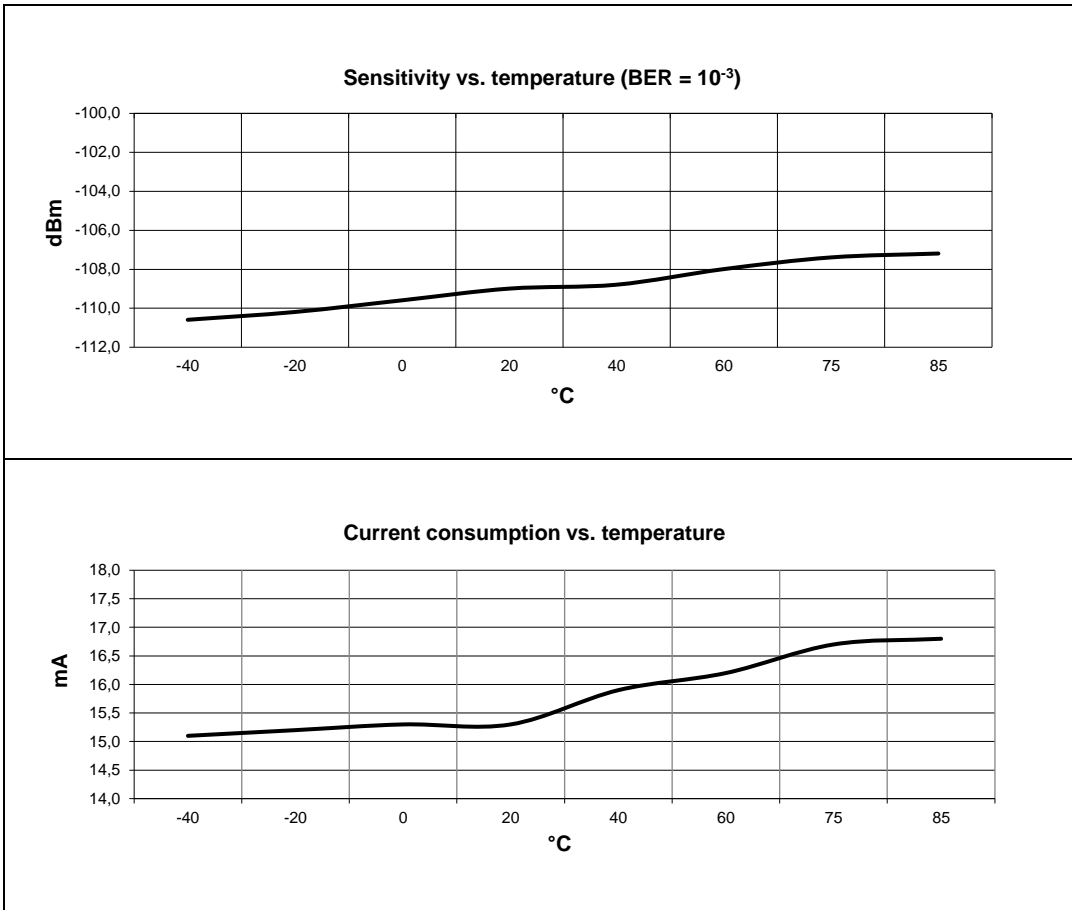
For the extended use the control pins on microcontroller side must have, In addition to the standart configuration, the following capabilities:

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 application note <i>32001538_Command_Reference.pdf</i> .
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 application note <i>32001538_Command_Reference.pdf</i> .

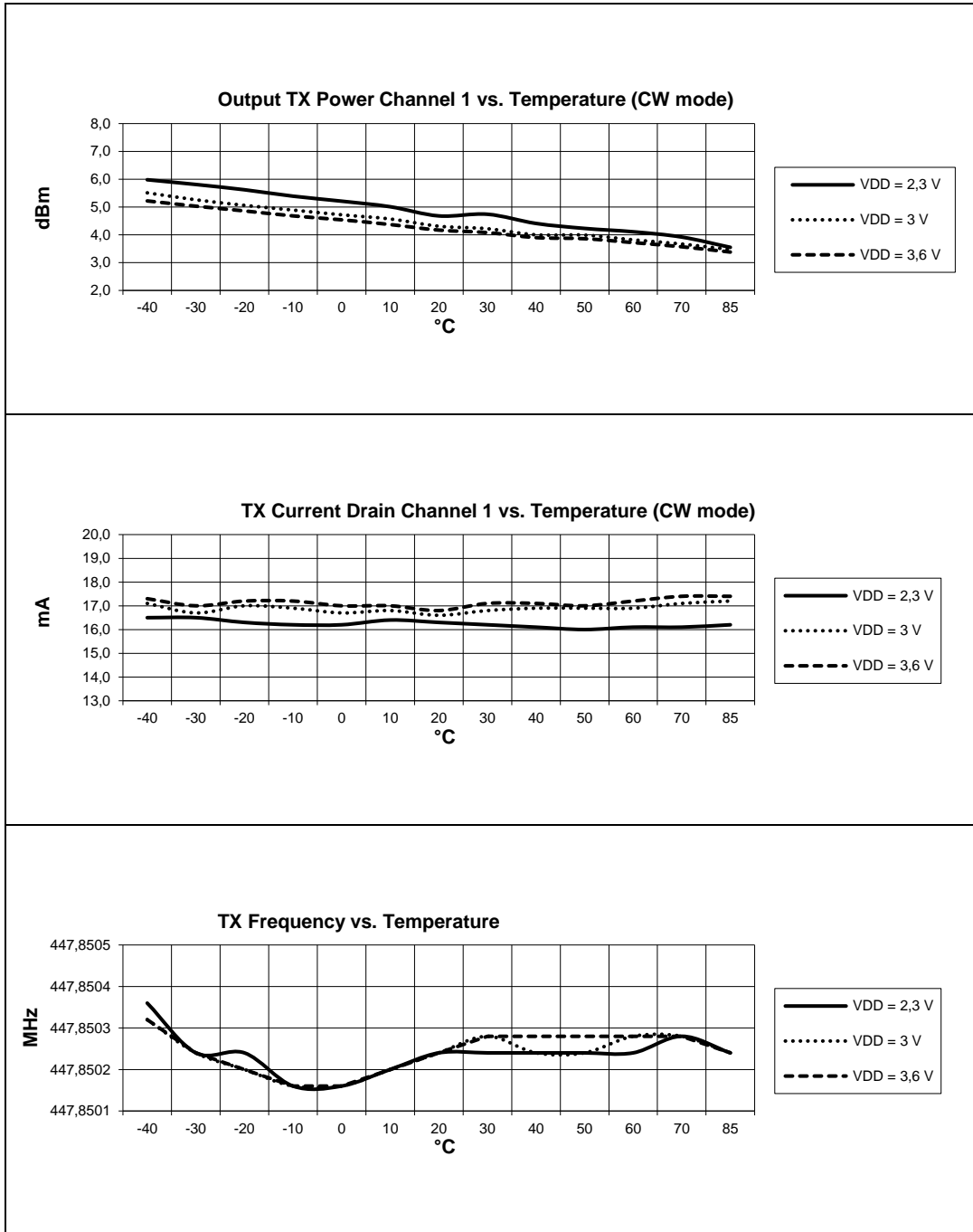
7 Temperature Range Curves

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

7.1 Receiver:



7.2 Transmitter:



8 Application Notes

Title	Description	Doc
Command Reference Manual	Description of all commands	32001538_Command_Reference.pdf
PCB Layout Guidelines	Hints how to make for a good RF design	AN_RF_001.pdf

9 Regulatory Approvals

Doc	Title	Description
-	-	-

10 Revision History

Revision	Date	Description
0.0	21.03.2022	Draft