chorder®

RF2500
USER MANUAL

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PRODUCT DESCRIPTION

The RF2500 is a FSK /MSK 2.4GHz transceiver designed for very low–power wireless applications. The circuit is intended for the 2404-2483.5 MHz ISM (Industrial,Scientific and Medical) and SRD (Short Range Device) frequency band.

It provide extensive hardware support for packet handling ,data buffering , burst transmissions ,clear channel assessment, link quality indication and wake on radio . It ‘s data stream can be Manchester coded by the modulator and decoded by the demodulator .It has a high performance and easily to design your product.

The main operating parameters and the 64 byte transmit/receive FIFOs of RF2500 can be controlled via an SPI interface.

The Module’s frequency ,Output power,Sensitivity could be programming .And have a Digital RSSI function could be used.

APPLICATIONS

- 2400-2483.5MHz ISM/SRD band systems
- Consumer electronics
- Wireless game controllers
- Wireless audio
- Wireless keyboard and mouse
- RF enabled remote controls

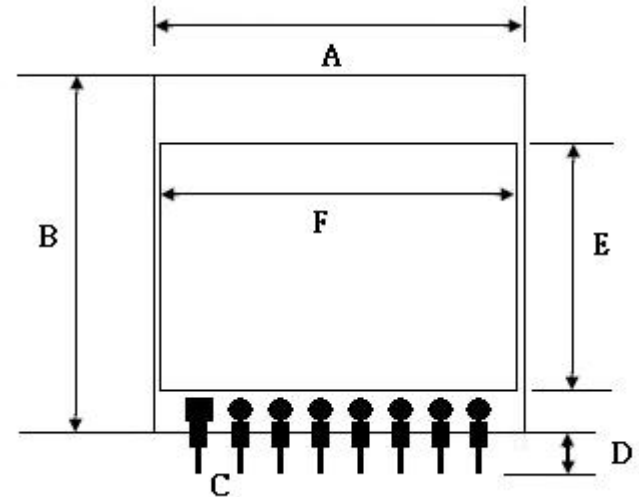
FEATURES

- Low current consumption
- Efficient SPI interface
- Operating temperature range : －40℃～＋85℃
- Operating voltage : 3.3 Volts (Input supply:3.4~24 Volts)
- Available frequency at : 2.404-2.480GHz
- Programmable output power and hi sensitivit

PIN DESCRIPTIONS

Pin No	Pin Name	Pin Type	Description
1	VCC	Power	Input supply:3.4~24 Volts LDO voltage regulators output:3.3 Volts
2	SI	Digital Input	Serial configuration interface,data input
3	SCLK	Digital Input	Serial configuration interface, clock input
4	SO	Digital Output	Serial configuration interface, data output.Optional general output pin when CSn is high
5	GDO2	Digital Output	Digital output pin for general use: ・Test signals ・FIFO status signals ・Clear Channel Indicator ・Clock output,down-divided from ・Serial output RX data
6	GND	Ground	GND
7	GDO0	Digital I/O	Digital output pin for general use: ・Test signals ・FIFO status signals ・Clear Channel Indicator ・Clock output,down-divided from ・Serial output RX data ・Serial input TX data Also used as analog test I/O for prototype/production testing
8	CSn	Digital Input	Serial configuration interface, chip select

PIN DIMENSION



Name	Dimension	Name	Dimension
A	21mm	F	19mm
B	26mm	G	4.8mm
C	2.0mm	H	1.5mm
D	5mm	I	3.3mm
E	16mm	J	1.0mm

ABSOLUTE MAXIMUM RATINGS

Under no circumstances must the absolute maximum ratings given in Table 1 be violated. Stress exceeding one or more of the limiting values may cause permanent damage to the device.

Caution! ESD sensitive device. Precaution should be used when handling the device in order to prevent permanent damage.

Parameter	Min	Max	Units	Condition
Supply voltage	3.4	24	V	Input supply to pin 1
Voltage on any digital pin	–0.3	VDD+0.3, max 3.6	V	
Voltage on the pins RF_P, RF_N and DCOUPL	–0.3	2.0	V	
Input RF level		TBD	dBm	
Storage temperature range	–50	150	°C	
Solder reflow temperature		260	°C	T = 10 s
ESD		2	kV	All pads (excluding RF) have 2kV HBM ESD protection

Table 1: Absolute Maximum Ratings

OPERATING CONDITIONS

Parameter	Min	Max	Unit
Operating temperature	-40	85	℃
Input supply voltage	3.4	24	V
Digital pin Operating voltage	3.3	3.3	V

Table 2:Operating Conditions

ELECTRICAL SPECIFICATIONS

Tc=25℃,VDD=3.0V if nothing else staed.Measured on TI CC2500 EM reference design.

Parameter	Min	Typ	Max	Unit	Condition
Current consumption		8.7		µA	Automatic RX polling once each second, using low-power RC oscillator, with 460Hz filter bandwidth and 250kbps data rate, PLL calibration every 4th wakeup. Average current with signal in channel *below* carrier sense level.
		35		µA	Same as above, but with signal in channel *above* carrier sense level, 1.9ms RX timeout, and no preamble/sync word found.
		1.4		µA	Automatic RX polling every 15th second, using low-power RC oscillator, with 460kHz filter bandwidth and 250kbps data rate, PLL calibration every 4th wakeup. Average current with signal in channel below carrier sense level.
		16		µA	Same as above, but with signal in channel *above* carrier sense level, 14ms RX timeout, and no preamble/sync word found.
		1.8		mA	Only voltage regulator to digital part and crystal oscillator running (IDLE state)
		7.6		mA	Only the frequency synthesizer running (after going from IDLE until reaching RX or TX states, and frequency calibration states)
		15.6		mA	Receive mode, input near sensitivity limit (RX state)
		13.3		mA	Receive mode, input 30dB above sensitivity limit (RX state)
		11.5		mA	Transmit mode, –12dBm output power (TX state)
		15.4		mA	Transmit mode, -6dBm output power (TX state)
		21.6		mA	Transmit mode, 0dBm output power (TX state)
Current consumption in power down modes		180		µA	Voltage regulator to digital part on, all other modules in power down (XOFF state)
		100		µA	Voltage regulator to digital part off, register values retained, XOSC running (SLEEP state with `MCSM0.OSC_FORCE_ON` set)
		900		nA	Voltage regulator to digital part off, register values retained, low-power RC oscillator running (SLEEP state with WOR enabled)
		500		nA	Voltage regulator to digital part off, register values retained (SLEEP state)

Table 3: Electrical Specifications

GENERAL CHARACTERISTICS

Parameter	Min	Typ	Max	Unit	Condition/Note
Frequency range	2400		2483.5	MHz	
Data rate	1.2		500	kbps	Modulation formats supported: (Shaped) MSK (differential offset QPSK, up to 500kbps) 2-FSK (up to 250kbps) OOK/ASK (up to 250kbps) Optional Manchester encoding (halves the data rate).

Table 4: General Characteristics

RF RECEIVE SECTION

Parameter	Min	Typ	Max	Unit	Condition/Note
Differential input impedance		200		Ω	Optimised for matching to both 50Ω single-ended load and PCB antennas with higher impedance.
Receiver sensitivity		TBD		dBm	500kbps data rate (MSK), 1% packet error rate, 16 bytes packet length, 650kHz digital channel filter bandwidth.
		–88		dBm	250kbps data rate (2-FSK), 1% packet error rate, 16 bytes packet length, 460kHz digital channel filter bandwidth.
		–98		dBm	10kbps data rate (2-FSK), 1% packet error rate, 16 bytes packet length, 232kHz digital channel filter bandwidth.
Saturation		–15		dBm	
Digital channel filter bandwidth	58		650	kHz	User programmable. The bandwidth limits are proportional to crystal frequency (given values assume a 26.0MHz crystal).
Adjacent channel rejection		20-25 (TBD)		dB	Desired channel 3dB above the sensitivity limit. Depends on channel spacing and digital channel filter bandwidth.
Alternate channel rejection		25-35 (TBD)		dB	Desired channel 3dB above the sensitivity limit. Depends on channel spacing and digital channel filter bandwidth.
Image channel rejection		30 (TBD)		dB	Desired channel 3dB above the sensitivity limit. Depends on intermediate frequency (IF), channel spacing and digital channel filter bandwidth. Image channel rejection can be limited by adjacent channel rejection or alternate channel rejection when using low IF (<100kHz). Optimum IF depends on data rate and related chip configurations provided by SmartRF® Studio software.
Selectivity at 1MHz offset		–27		dB	Desired channel at –80dBm.
Selectivity at 2MHz offset		–27		dB	Desired channel at –80dBm.
Selectivity at 5MHz offset		–36		dB	Desired channel at –80dBm. Compliant to ETSI EN 300 440 class 2 receiver requirements.
Selectivity at 10MHz offset		–51		dB	Desired channel at –80dBm. Compliant to ETSI EN 300 440 class 2 receiver requirements.
Selectivity at 20MHz offset		–54		dB	Desired channel at –80dBm. Compliant to ETSI EN 300 440 class 2 receiver requirements.
Selectivity at 50MHz offset		–55		dB	Desired channel at –80dBm. Compliant to ETSI EN 300 440 class 2 receiver requirements.
Spurious emissions			–57 –47	dBm dBm	25MHz – 1GHz Above 1GHz

Table 5: RF Receive Section

RF TRANSMIT SECTION

Tc=25℃, VDD=3.0V if nothing else staed. Measured on TI CC2500 EM reference design.

Parameter	Min	Typ	Max	Unit	Condition/Note
Differential load impedance		200		Ω	Optimised for matching to both 50Ω single-ended load and PCB antennas with higher impedance.
Output power, highest setting		1		dBm	Output power is programmable. Delivered to 50Ω single-ended load via Chipcon reference RF matching network.
Output power, lowest setting		–30		dBm	Output power is programmable. Delivered to 50Ω single-ended load via Chipcon reference RF matching network.
Adjacent channel power		–26		dBc	The given values are for 1MHz channel spacing (±1MHz from carrier) and 500kbps MSK.
Alternate channel power		–45		dBc	The given values are for 1MHz channel spacing (±2MHz from carrier) and 500kbps MSK.
Spurious emissions			–36	dBm	25MHz – 1GHz
			–54	dBm	47-74, 87.5-118, 174-230,470-862MHz
			–47	dBm	1800MHz-1900MHz (restricted band in Europe)
			–41	dBm	At 2·RF and 3·RF (restricted bands in USA)
			–30	dBm	Otherwise above 1GHz

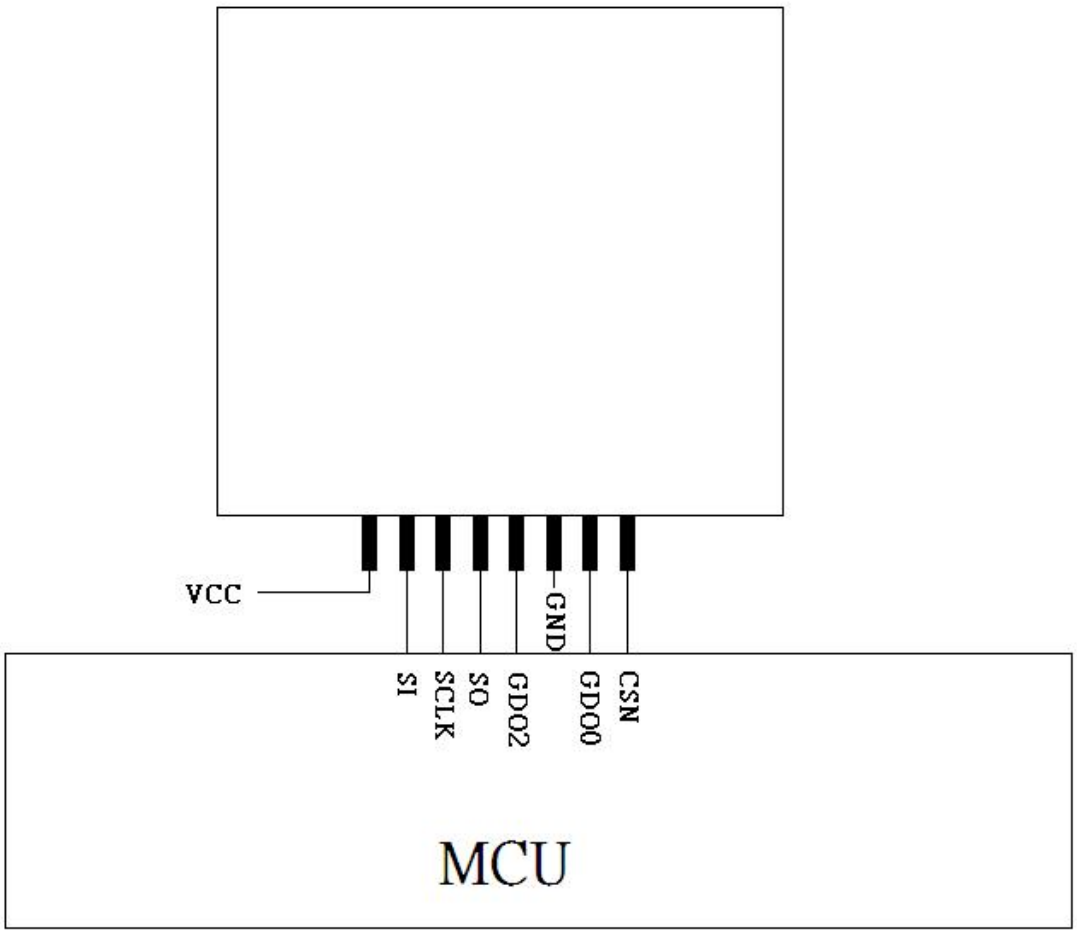
Table 6: RF Transmit Parameters

Mark:

1. About Detail Specifications,Pls see CC2500 Data sheet.

http://www.ti.com/

APPLICATION CIRCUIT



FEDERAL COMMUNICATIONS COMMISSION(FCC) STATEMENT

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15.21
You are cautioned that changes or modifications not expressly approved by the part responsible for compliance could void the user's authority to operate the equipment.

15.105(b)
This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

-Reorient or relocate the receiving antenna.
-Increase the separation between the equipment and receiver.

-Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
-Consult the dealer or an experienced radio/TV technician for help.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
1) this device may not cause harmful interference and
2) this device must accept any interference received, including interference that may cause undesired operation of the device.

A label with the following statements must be attached to the host end product:
This device contains FCC ID:YKFRF2500