

RCT03CC2503

带 PA 和 LNA 的 2.4G 无线数传模块

1.Description

RCT03CC2503 is a FSK/ASK/OOK/MSK Transceiver module. It provides extensive hardware support for packet handling, data buffering, burst transmissions, clear channel assessment, link quality indication and wake on radio. Its data stream can be Manchester coded by the modulator and decoded by the demodulator. It has a high performance and is easy to design your product. It can be used in 2400-2483.5MHz ISM/SRD band systems, Consumer Electronics, Wireless game controllers, Wireless audio and other wireless systems.

We support the frequency have 2400-2483.5MHz ISM Band modules now,

Features

Low current consumption.

Easy for application.

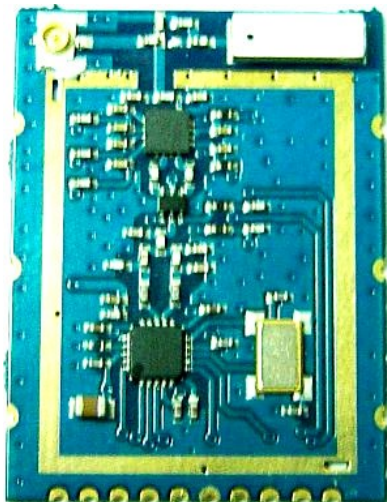
Efficient SPI interface

Operating temperature range

Operating voltage

Available frequency at

Programmable output power and high sensitivity



3. BOM list for the modules:

N/A

4. Schematic Diagram

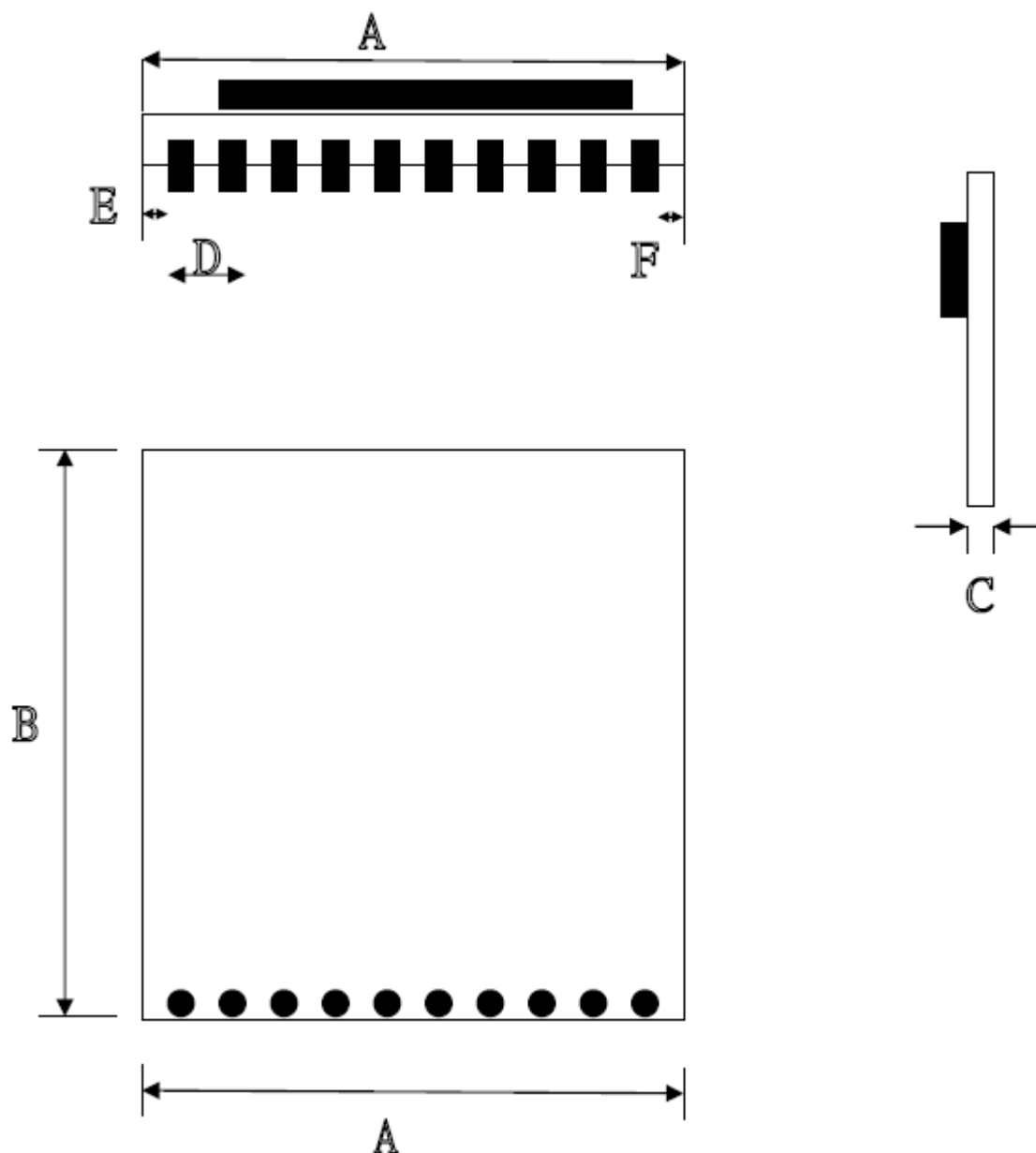
N/A

5. Pin Descriptions

Pin No	Pin Name	Pin Type	Description
1	VCC	Power	1.8V-3.6V power
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: <ul style="list-style-type: none"> • Test signals • FIFO status signals • Clear Channel Indicator • Clock output, down-divided from XOSC • Serial output RX data
6	GND	Ground	GND
7	GDOo	Digital O/I	Digital output pin for general use: <ul style="list-style-type: none"> • Test signals • FIFO status signals • Clear Channel Indicator • Clock output, down-divided from XOSC • Serial output RX data Serial input RX data
8	CSn	Digital Input	Serial configuration interface, chip select
9	PA_EN	Digital Input	When TX status set "1", RX set "0"
10	LNA_EN	Digital Input	When RX status set "1", TX set "0"

Absolute Maximum Ratings

Package Description



Name	Dimension	Name	Dimension
A	25.5mm+/-0.2mm	D	2.0mm
B	34mm+/-0.2mm	E	3.6mm
C	1mm	F	3.6mm+/-0.2mm

6. Electrical Specifications

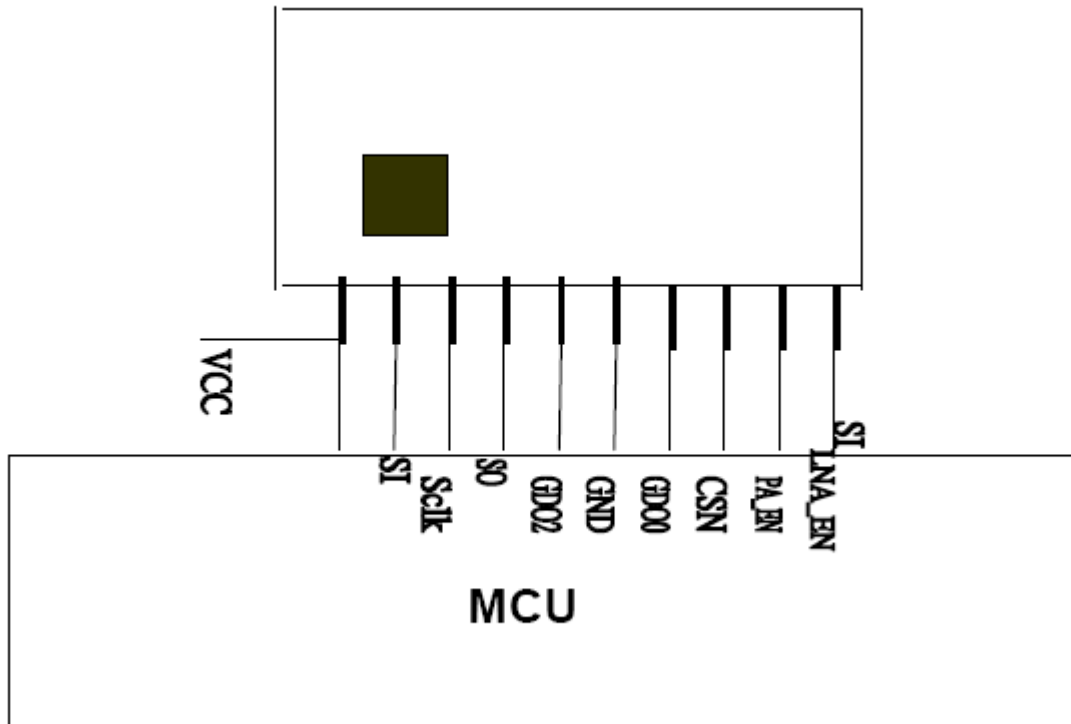
Tc = 25°C, VDD = 3.0V

Parameter	Min	Typ	Max	Unit	Condition
Current consumption,		150		mA	Transmit mode, +17dBm output power

General Characteristics

Parameter	Min	Typ	Max	Unit	Condition/Note
Frequency range 频率范围	2400		2483	MHz	
Data rate	1.2		500	kbps	FSK
	1.2		500	kbps	GFSK and OOK
	2.6		500	kbps	(Shaped) MSK (also known as differential offset QPSK)
					Optional Manchester encoding (halves the data rate).

Application Circuit



6.1 RF receiver section RF

Tc = 25°C, VDD = 3.0V

Parameter	Min	Typ	Max	Unit	Condition/Note
Receiver sensitivity 接收灵敏度		-112		dBm	2-FSK, 2.4kbps, 38kHz deviation, , 1% packet error rate, 20 bytes packet length, 203 kHz digital channel filter bandwidth
		-105		dBm	10 kbps data rate, FSK, 1% packet error rate, 20 bytes packet length, 232 kHz digital channel filter bandwidth
		-95		dBm	250kbps, MSK, 1% packet error rate, 20 bytes packet length, 540 kHz digital channel filter bandwidth
		-89		dBm	500Kbps, MSK, 1% packet error rate, 20 bytes packet length, 812 kHz digital channel filter bandwidth
Saturation输入饱和度		-13		dBm	
Digital channel filter bandwidth数字通道滤波器带宽	58		650	kHz	User programmable. The bandwidth limits are proportional to crystal frequency (given values assume a 26.0MHz crystal).

6.2 RF Transmit Section RF

Tc = 25°C, VDD = 3.0V

Parameter	Min	Typ	Max	Unit	Condition/Note
Differential load impedance差分负载阻抗		80 + j74		Ω	Differential impedance as seen from the RF-port (RF_P and RF_N) towards the antenna. Follow the CC2500EM reference design available from the TI and Chipcon websites.
Output power, highest setting最大输出功率		18.5	22	dBm	Output power is programmable, and full range is available in all frequency bands. Delivered to a 50 Ω single-ended load via Chipcon reference RF matching network.

7. Measurement setup and testing procedures:

The interface for the localized RCT03CC2503 module cannot plug directly to SmartRF04EB board so there is an

adaptor to convert it to standard EM interface as follows:

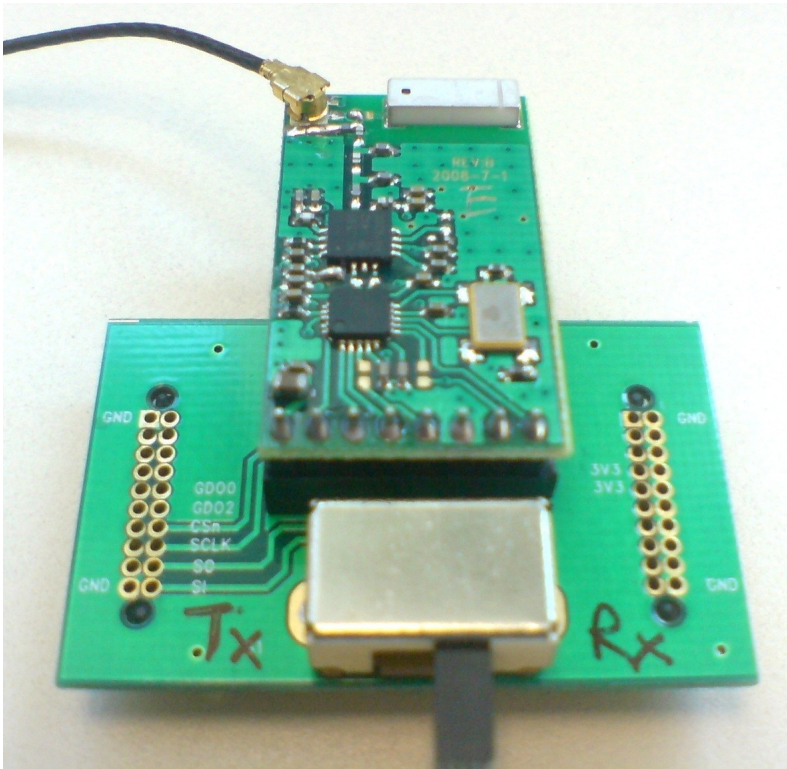


Figure 3.1 Connection for RCT03CC2503 module to SmartRF04EB.

7.1 Measurement setup:

Module can then plugged into SmartRF04EB as below and further measurement.

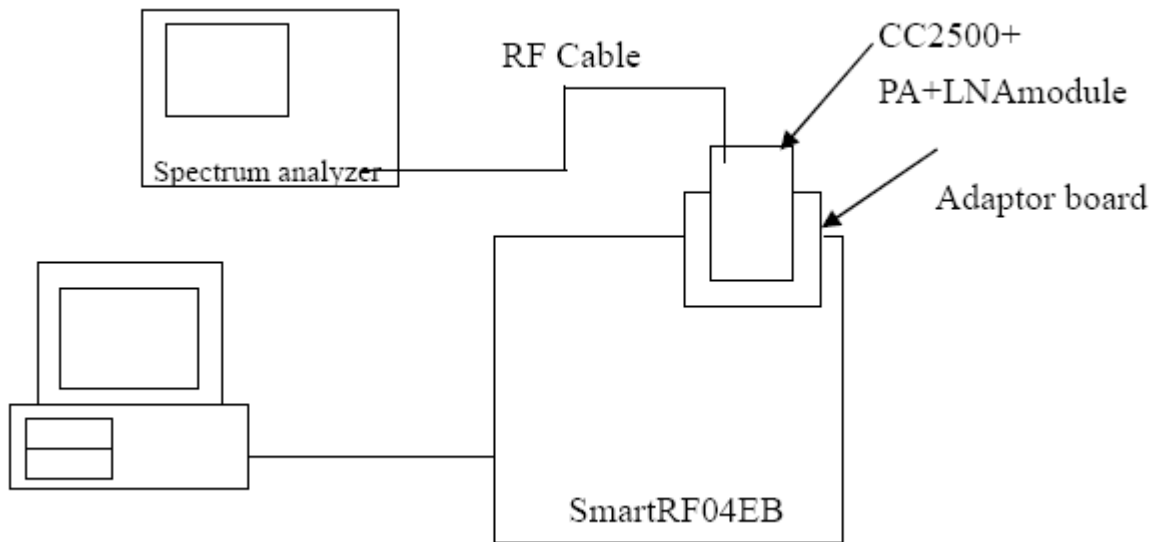


Figure 3.2 Setup for RCT03CC2503 module on SmartRF04EB.

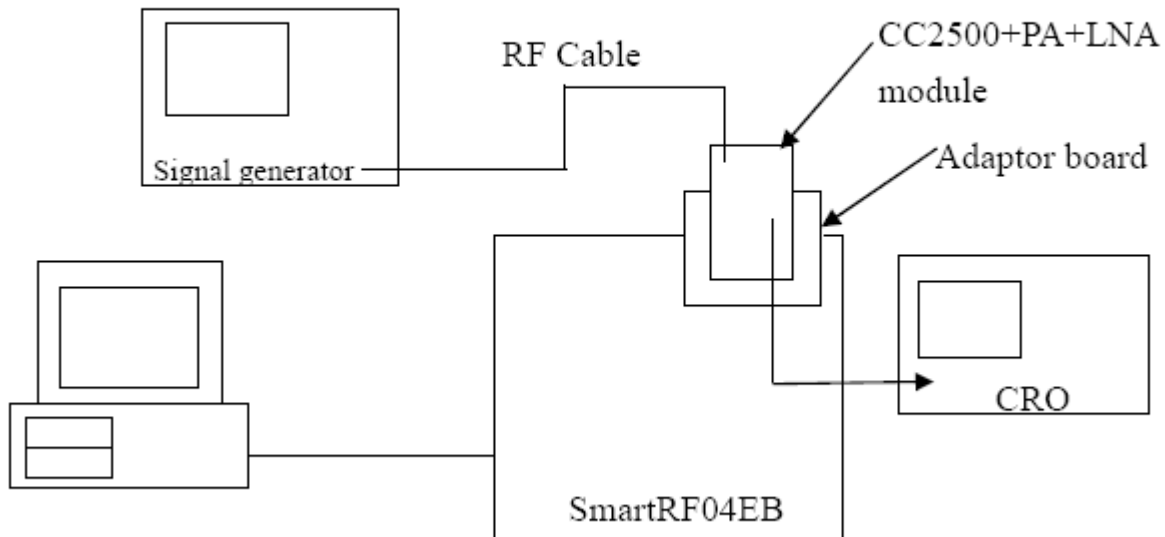
In addition, the module can be operated by SmartRF studio through SmartRF04EB. However, SmartRF studio software cannot control the Tx / Rx switch for PA+LNA; so it should be done manually by switching the Tx / Rx on the adaptor board. Tx / Rx control is just simple switching the switch located at adaptor board (see Figure 2.1).

7.2 Parameters measurement:

For transmitted power measurement, it can connect the boards as follows and then set the SmartRF studio to Simple Tx with proper channels (say 2441MHz with 2.4kbps from preferred setting) and then read the Tx power, spectrum and spurious from spectrum analyzer.



7.3 For sensitivity measurement, it can connect those boards as follows:



Please set the signal generator to match the modulation setting at SmartRF studio and then set it to Simple Rx for reception. Because the GDO pin of CC2500 does not layout to the SmartRF04EB, it should tie the signal from the following pin.

8. Program

8.1. Configuration Software

RCT03CC2503 can be configured using the SmartRF® Studio software, available for download from <http://www.chipcon.com>. The SmartRF® Studio software is highly recommended for obtaining optimum register settings, and for evaluating performance and functionality.

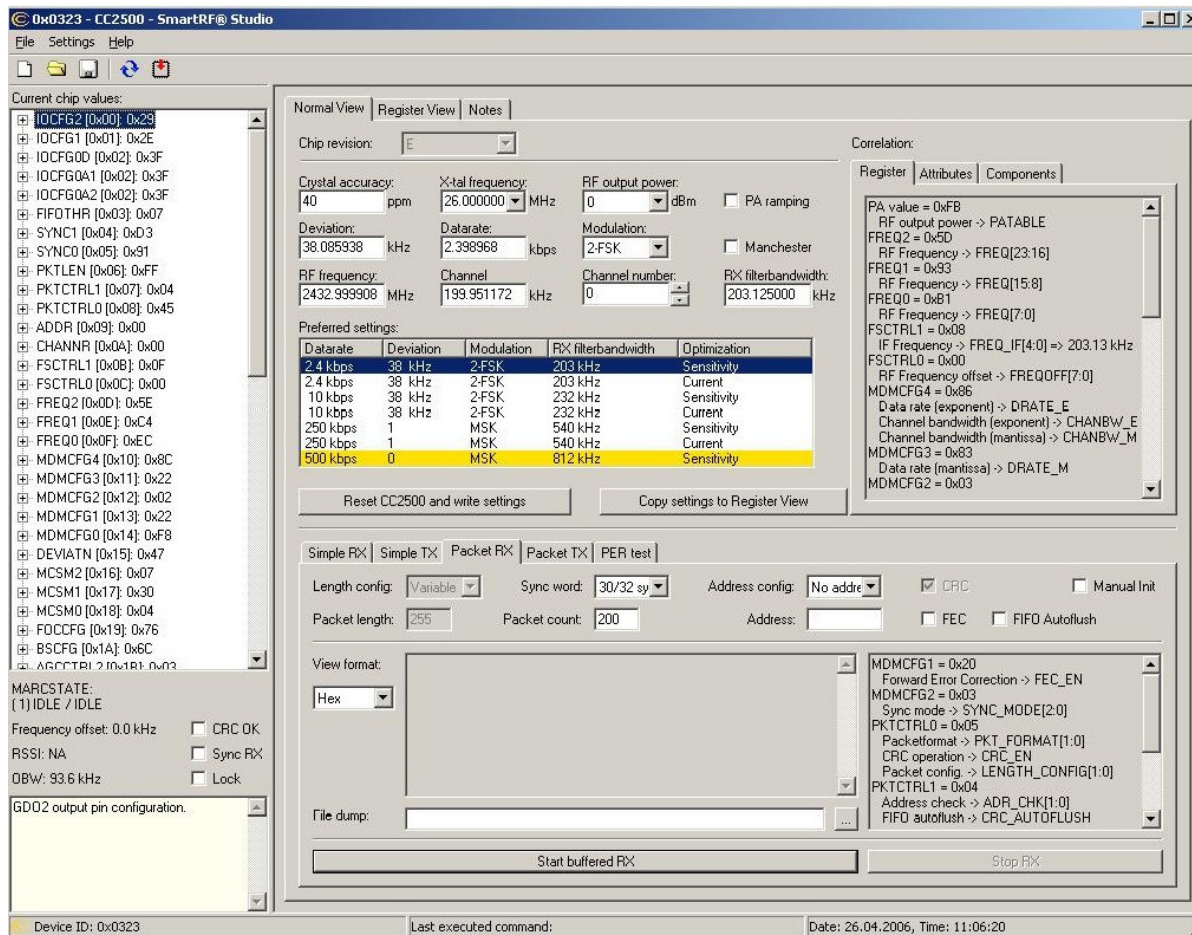


Figure 6: SmartRF® Studio user interface

8.2. 4-wire Serial Configuration and Data Interface

RCT03CC2503 is configured via a simple 4-wire SPI compatible interface (SI, SO, SCLK and CSn) where RCT03CC2503 is the slave. This interface is also used to read and write buffered data. All address and data transfer on the SPI interface is done most significant bit first.

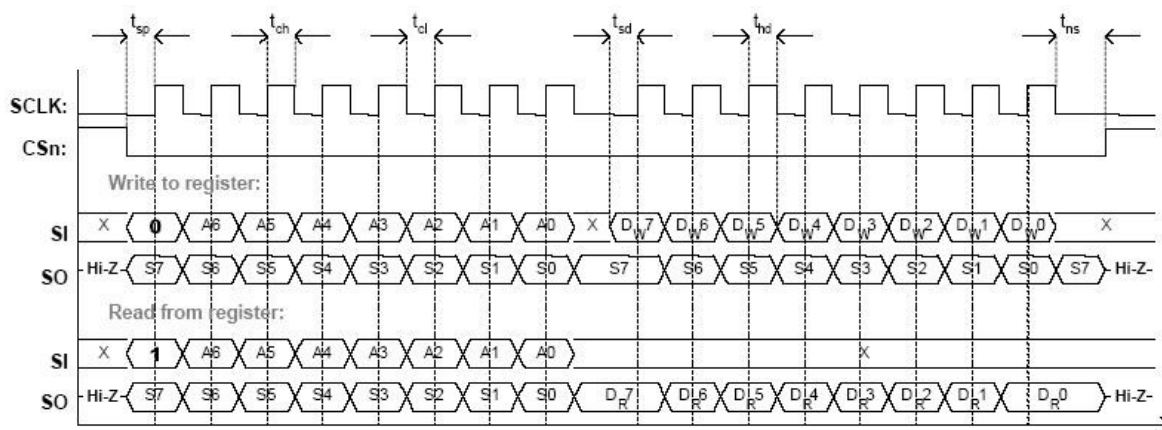


Figure 6: Configuration registers write and read operations

寄存器读写操作如下图：

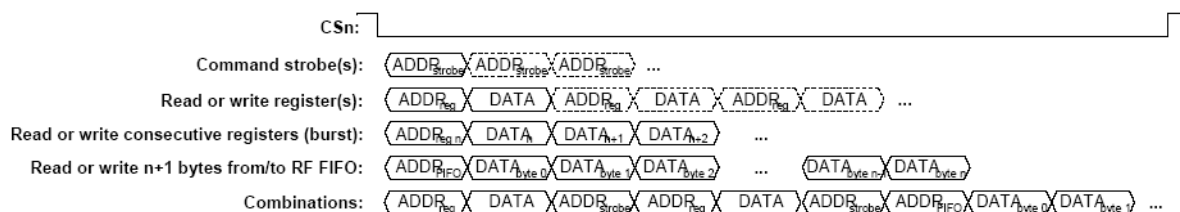


Figure 7: Register access types

8.3. 数据包格式：

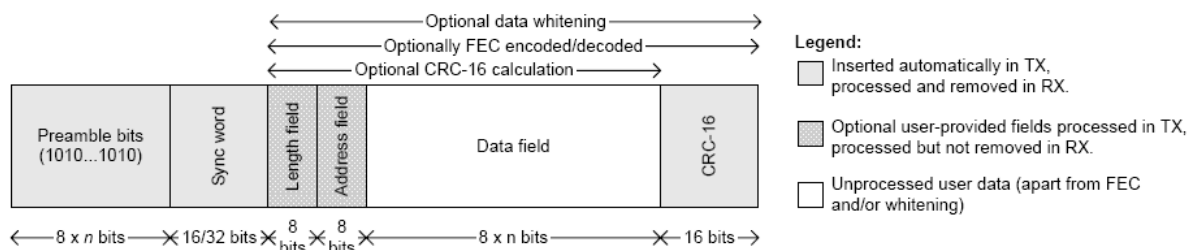


Figure 8: Packet Format

8.4. Power on start-up sequence

The power-up sequence is as follows (see Figure 11):

- Set SCLK=1 and SI=0, to avoid potential problems with pin control mode .
- Strobe CSn low / high.
- Hold CSn high for at least 40μs.
- Pull CSn low and wait for SO to go low (CHIP_RDYn).
- Issue the SRES strobe.
- When SO goes low again, reset is complete and the chip is in the IDLE state.

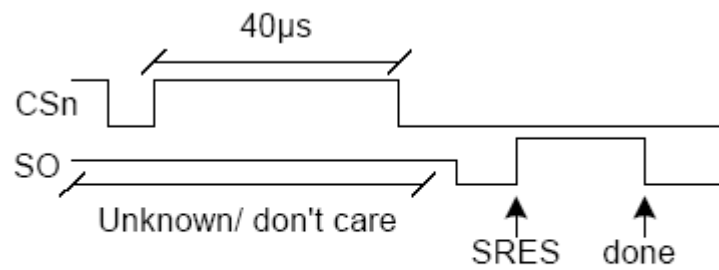


Figure 11: Power-up with SRES

8.5.WOR 模式

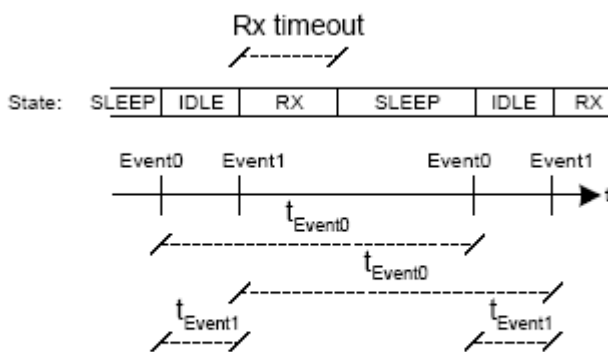


Figure 18: Event 0 and Event 1 relationship

8.6.TIMING

Description	XOSC periods	26 MHz crystal
IDLE to RX, no calibration	2298	88.4 μ s
IDLE to RX, with calibration	~21037	809 μ s
IDLE to TX/FSTXON, no calibration	2298	88.4 μ s
IDLE to TX/FSTXON, with calibration	~21037	809 μ s
TX to RX switch	560	21.5 μ s
RX to TX switch	250	9.6 μ s
RX or TX to IDLE, no calibration	2	0.1 μ s
RX or TX to IDLE, with calibration	~18739	721 μ s
Manual calibration	~18739	721 μ s

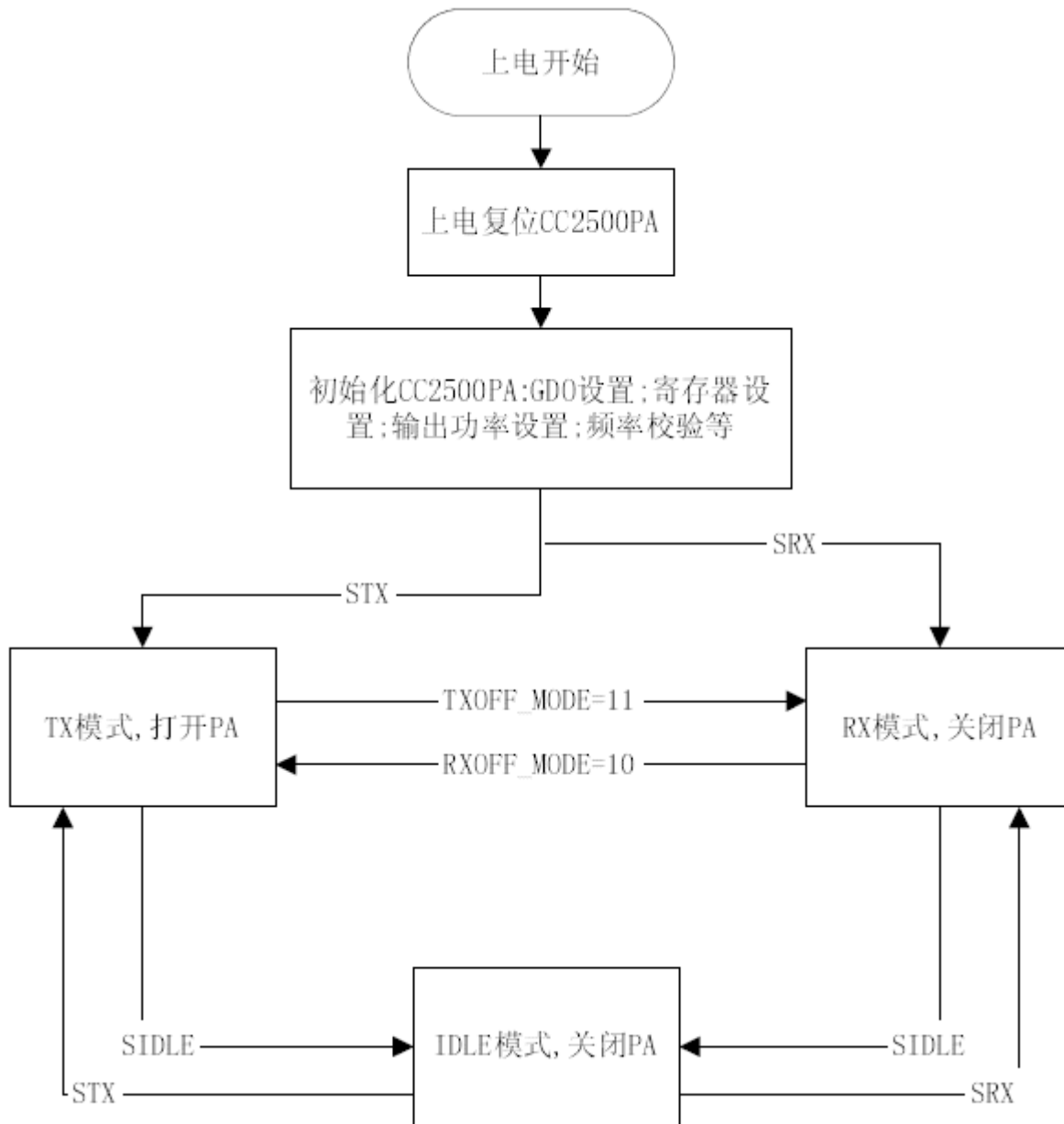
Table 28: State transition timing

9. OUTPUT POWER

Output power [dBm]	Setting	Current consumption, typ. [mA]
(-55 or less)	0x00	8.9
-30	0x44	10.1
-28	0x41	10.0
-26	0x4C	11.7
-24	0x53	11.1
-22	0x83	10.9
-20	0x46	10.5
-18	0x4A	11.7
-16	0x86	11.0
-14	0x66	12.9
-12	0xC6	11.5
-10	0x69	14.1
-8	0x99	13.6
-6	0x7F	15.4
-4	0xAA	16.7
-2	0xBF	18.5
0	0xFB	21.6
1	0xFF	21.9

Table 22: Optimum PATABLE settings for various output power levels (subject to changes)

10. FLOW CHART



Mark:

1. About Detail Specifications , Pls see CC2500 Data sheet .
www.ti.com