

## 2.4GHz FSK/MSK/ASK/OOK TRANSCEIVER MODULE

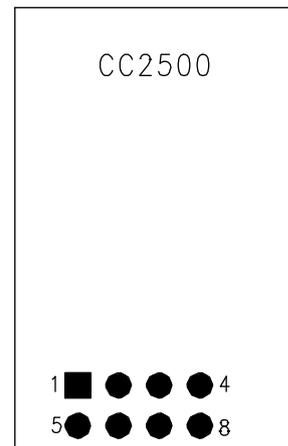
### Description

MO-CC2500 is a FSK /MSK Transceiver module. 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. It can be used in 2400-2483.5MHz ISM/SRD band systems, Consumer Electronics, Wireless game controllers, Wireless audio wireless vKB/Mouse and others wireless svstems.

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

### 2.4GHz FSK/MSK TRANSCEIVER



1. 3.3V
2. GD02
3. GD00
4. CSN
5. SCLK1
6. SO(GD01)
7. SI
8. GND

### Features

- Low current consumption.
- Easy for application.
- Efficient SPI interface
- Operating temperature range : - 40°C ~ +85°C
- Operating voltage :1.8~ 3.6 Volts. Available
- frequency at : 2.4-2.483GHz Programmable
- output power and hi sensitivity

### Applications

- 2400-2483.5MHz ISM/SRD band systems
- Consumer Electronics
- Wireless game controllers
- Wireless audio
- Wireless keyboard and mouse

### Absolute Maximum Ratings

Parameter	Rating	Units
Suppl y Vol tage	3	VDC
Operati ng Temperature	-40 to +85	°C

## Pin Descriptions

Pin No	Pin Name	Pin Type	Description
1	VCC	Power	1.8V-3.6V digital power supply for digital I/O's and for the digital core voltage regulator
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"> <li>• Test signals</li> <li>• FIFO status signals</li> <li>• Clear Channel Indicator</li> <li>• Clock output, down-divided from</li> <li>• Serial output RX data</li> </ul>
6	GND	Ground	GND
7	GDO0	Digital I/O	Digital output pin for general use: <ul style="list-style-type: none"> <li>• Test signals</li> <li>• FIFO status signals</li> <li>• Clear Channel Indicator</li> <li>• Clock output, down-divided from XOSC</li> <li>• Serial output RX data</li> <li>• Serial input TX data</li> </ul> Also used as analog test I/O for prototype/production testing
8	CSn	Digital Input	Serial configuration interface, chip select

## 2 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	-0.3	3.6	V	All supply pins must have the same voltage
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

## 3 Operating Conditions

The operating conditions for **CC2500** are listed Table 2 in below.

Parameter	Min	Max	Unit	Condition
Operating temperature	-40	85	°C	
Operating supply voltage	1.8	3.6	V	All supply pins must have the same voltage

Table 2: Operating Conditions

## 4 Electrical Specifications

T<sub>c</sub> = 25°C, VDD = 3.0V if nothing else stated. Measured on Chipcon's **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 460kHz filter bandwidth and 250kbps data rate, PLL calibration every 4 <sup>th</sup> wakeup. Average current with signal in channel <i>below</i> carrier sense level.
		35		μA	Same as above, but with signal in channel <i>above</i> carrier sense level, 1.9ms RX timeout, and no preamble/sync word found.
		1.4		μA	Automatic RX polling every 15 <sup>th</sup> second, using low-power RC oscillator, with 460kHz filter bandwidth and 250kbps data rate, PLL calibration every 4 <sup>th</sup> wakeup. Average current with signal in channel <i>below</i> carrier sense level.
		16		μA	Same as above, but with signal in channel <i>above</i> 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 MCSMO.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

## 5 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		$\Omega$	Optimised for matching to both 50 $\Omega$ 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

## 7 RF Transmit Section

T<sub>c</sub> = 25°C, VDD = 3.0V if nothing else stated. Measured on Chipcon's *CC2500* EM reference design.

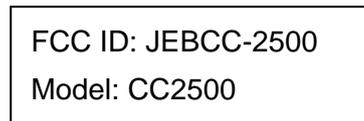
Parameter	Min	Typ	Max	Unit	Condition/Note
Differential load impedance		200		Ω	Optimised for matching to both 50Ω single-ended load and PCB antennas with higher impedance.
Output power, highest setting		1		dBm	Output power is programmable. Delivered to 50Ω single-ended load via Chipcon reference RF matching 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**

**Notice:** The user should not modify or change this equipment without written approval from Mascot Electric Co., Ltd. Modification could void authority to use this equipment.

Label for end product must include “Contains FCC ID: JEBCC-2500” or “A RF transmitter inside, FCC ID: JEBCC-2500”.

FCC ID Label Graph:



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.

Note:

If the product is too small to make so many text labels, only need to indicate the FCC ID number on the label, but the above text will be printed in the manual or packaging box.

**IMPORTANT NOTE:** To comply with the FCC RF exposure compliance requirements, no change to the antenna or the device is permitted. Any change to the antenna or the device could result in the device exceeding the RF exposure requirements and void user’s authority to operate the device.