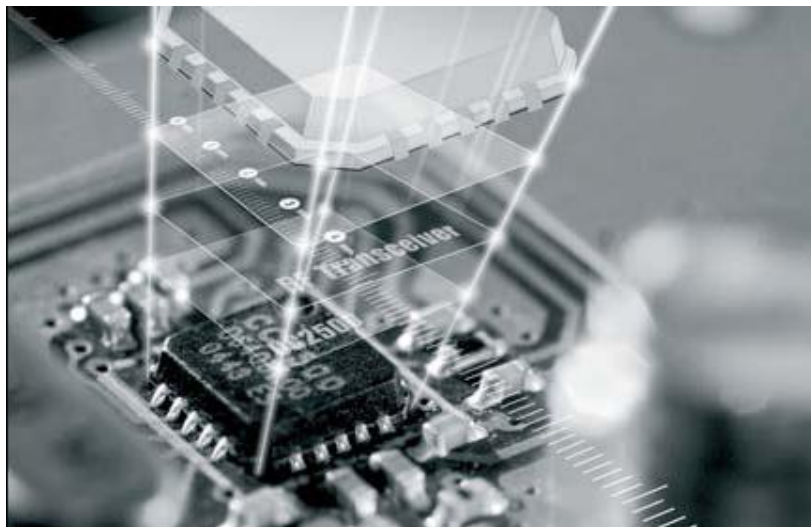




# SPECIFICATION

## 2.4-GHz IEEE 802.15.4 Compliant RF Transceiver Module

**RF4  
CE**



Model : **2.4-GHz IEEE 802.15.4 Soc Module**

Part No : TC2533-RF4CExx

Version : V2.0

Date : 2012.10.12

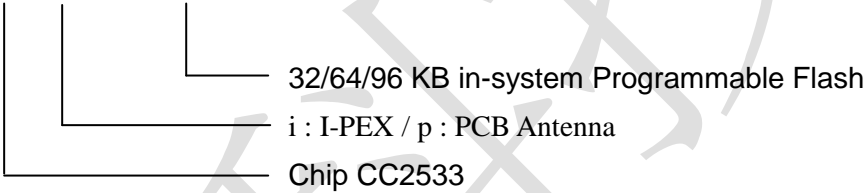
■ Applications

- ZigBee™ RF4CE Remote Control Target and Device
- 2.4-GHz IEEE 802.15.4 Systems Based on TIMAC or SimpliciTI™ Network Protocol
- Consumer Electronics
- Electronic Shelf Labeling

■ Selection Guide

Denomination : 2.4-GHz RF Module for ZigBee™ RF4CE

Part No. : TC2533- xRF4CExx



## ■ Absolute Maximum Ratings



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

		MIN	MAX	UNIT
Supply voltage	All supply pins must have the same voltage	-0.3	3.9	V
Voltage on any digital pin		-0.3	$V_{DD}+0.3$ $\leq 3.9$	V
Input RF level			10	dBm
Storage temperature range		-40	80	
ESD <sup>(2)</sup>	All pads, according to human-body model, JEDEC STD 22, method A114		2	kV
	According to charged-device model, JEDEC STD 22, method C101		500	V

- (1) Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions* is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- (2) CAUTION: ESD sensitive device. Precaution should be used when handling the device in order to prevent permanent damage.

## ■ General Specification

Parameter	TEST CONDITIONS	Min	Typ	Max	Units
<b>RADIO PART</b>					
Frequency range	Programmable in 1-MHz steps	2402		2480	MHz
Data rate and modulation format			250 K		Bps
Transmit power(Connect SMA antenna)			+3.5 ±0.5		dBm
Receiver sensitivity	Nominal		-97		
Module size	25.7 * 16.15 * 2.0				mm

## ■ Module interface

Interface	Description
Antenna	External Antenna 50 Ω
UART Interface	TX, RX ,RTS, CTS
SPI Interface	Synchronous Serial Interface
PIO Interface	19 terminals

## Electrical Specifications

### Current Consumption

Measured on Texas Instruments CC2533 EM reference design with  $T_A = 25^\circ\text{C}$  and  $V_{DD} = 3\text{ V}$ , unless otherwise noted.

**Boldface** limits apply over the entire operating range,  $T_A = -40^\circ\text{C}$  to  $125^\circ\text{C}$ ,  $V_{DD} = 2\text{ V}$  to  $3.6\text{ V}$ , and  $f_c = 2394\text{ MHz}$  to  $2507\text{ MHz}$ .

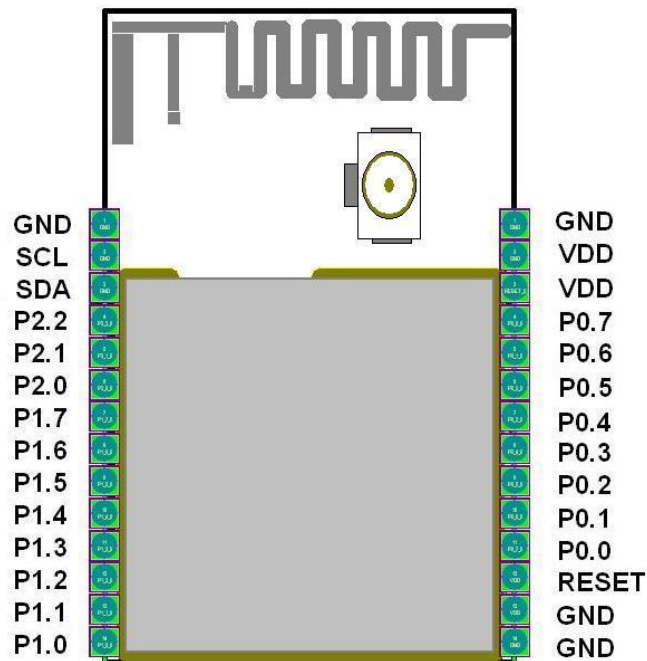
PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>I<sub>core</sub></b> Core current consumption	Power mode 1. Digital regulator on; 16-MHz RCOSC and 32-MHz crystal oscillator off; 32.768-kHz XOSC, POR, BOD and sleep timer active; RAM and register retention		235		uA
	Power mode 2. Digital regulator off; 16-MHz RCOSC and 32-MHz crystal oscillator off; 32.768-kHz XOSC, POR, and sleep timer active; RAM and register retention		0.9		uA
	Power mode 3. Digital regulator off; no clocks; POR active; RAM and register retention		0.4		uA
	Low MCU activity: 32-MHz XOSC running. No radio or peripherals. No flash access, no RAM access.		6.7		mA
<b>I<sub>peri</sub></b> Peripheral current consumption (Adds to core current I <sub>core</sub> for each peripheral unit activated)	Timer 1. Timer running, 32-MHz XOSC used		90		uA
	Timer 2. Timer running, 32-MHz XOSC used		90		uA
	Timer 3. Timer running, 32-MHz XOSC used		60		uA
	Timer 4. Timer running, 32-MHz XOSC used		70		uA
	Sleep timer, including 32.753-kHz RCOSC		0.6		uA

## General Characteristics

$T_A = 25^\circ\text{C}$  and  $V_{DD} = 3\text{ V}$ , unless otherwise noted.

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
<b>WAKE-UP AND TIMING</b>					
Power mode 1 → active	Digital regulator on, 16-MHz RCOSC and 32-MHz crystal oscillator off. Start-up of 16-MHz RCOSC		<b>4</b>		μs
Power mode 2 or 3 → active	Digital regulator off, 16-MHz RCOSC and 32-MHz crystal oscillator off. Start-up of regulator and 16-MHz RCOSC		<b>0.1</b>		ms
Active → TX or RX	Initially running on 16-MHz RCOSC, with 32-MHz XOSC OFF		<b>0.6</b>		ms
	With 32-MHz XOSC initially on		<b>192</b>		μs
RX/TX turnaround			<b>192</b>		μs
<b>RADIO PART</b>					
RF frequency range	Programmable in 1-MHz steps, 5 MHz between channels for compliance with [1]	<b>2394</b>	<b>2507</b>		MHz

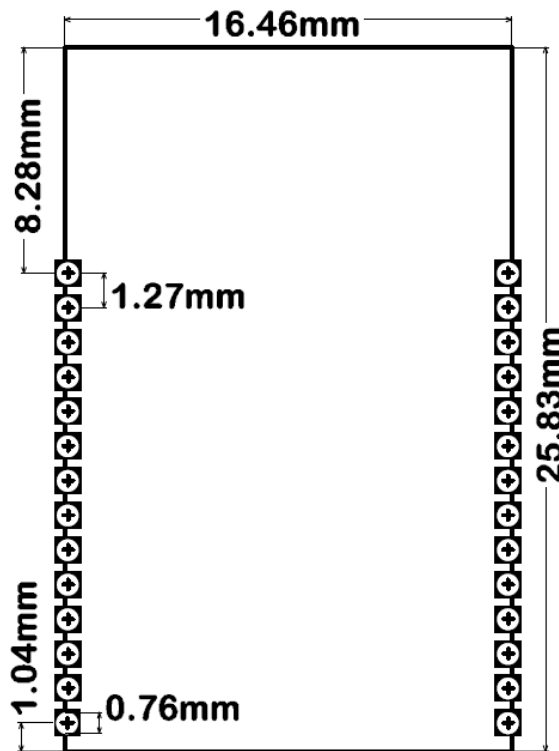
TC2533-xRF4CExx RF Module Pin Configuration



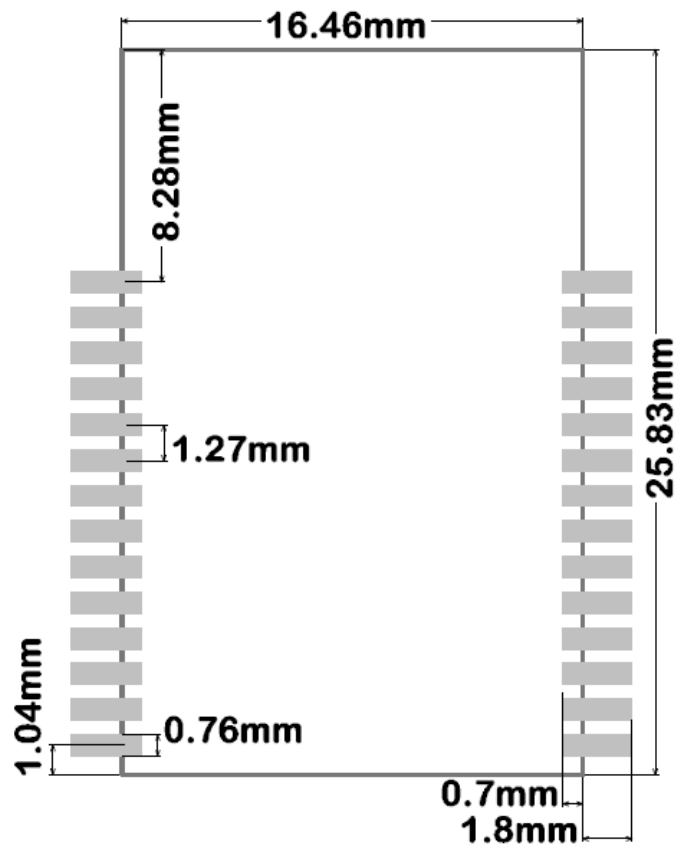
Pin #.	Pin Name	Pin Type	Description
1	GND	GND	Ground
2	SCL	I2C clock or digital I/O	Can be used as I2C clock pin or digital I/O. Leave floating if not used. If grounded disable pull up
3	SDA	I2C clock or digital I/O	Can be used as I2C data pin or digital I/O. Leave floating if not used. If grounded disable pull up
4	P2.2	Digital IO	Port 2.2
5	P2.1	Digital IO	Port 2.1
6	P2.0	Digital IO	Port 2.0
7	P1.7	Digital IO	Port 1.7
8	P1.6	Digital IO	Port 1.6
9	P1.5	Digital IO	Port 1.5
10	P1.4	Digital IO	Port 1.4
11	P1.3	Digital IO	Port 1.3
12	P1.2	Digital IO	Port 1.2
13	P1.1	Digital IO	Port 1.1
14	P1.0	Digital IO	Port 1.0
15	GND	GND	Ground
16	GND	GND	Ground

17	RESET	Digital Input	Reset, Active Low
18	P0.0	Analog / Digital IO	Port 0.0
19	P0.1	Analog / Digital IO	Port 0.1
20	P0.2	Analog / Digital IO	Port 0.2
21	P0.3	Analog / Digital IO	Port 0.3
22	P0.4	Analog / Digital IO	Port 0.4
23	P0.5	Analog / Digital IO	Port 0.5
24	P0.6	Analog / Digital IO	Port 0.6
25	P0.7	Analog / Digital IO	Port 0.7
26	VDD	Power	2.0V ~ 3.7V Power Supply
27	VDD	Power	2.0V ~ 3.7V Power Supply
28	GND	GND	Ground

■ TC2533-xRF4CExx RF Module Description



■ Recommended PCB layout for Module



## Document History

Revision	Date	Description/Changes
1.0	2012.10.15	First release

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