

CMOS 2.4GHZ ZIGBEE/ISM TRANSMIT/RECEIVE RFIC

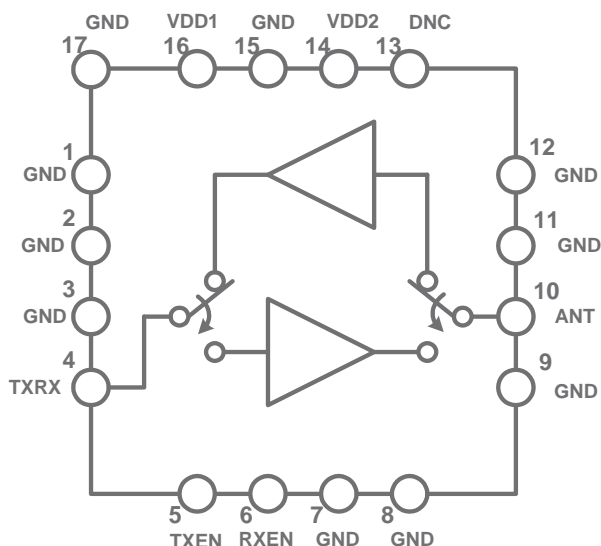
Description

The RFX2401C is a fully integrated, single-chip, single-die RFIC (RF Front-end Integrated Circuit) which incorporates all the RF functionality needed for IEEE 802.15.4/ZigBee, wireless sensor network, and any other wireless systems in the 2.4GHz ISM band. The RFX2401C architecture integrates the PA, LNA, Transmit and Receive switching circuitry, the associated matching network, and the harmonic filter all in a CMOS single-chip device.

Typical high power applications include home and industrial automation, smart power, and RF4CE among others. Combining superior performance, high sensitivity and efficiency, low noise, small form factor, and low cost, RFX2401C is the perfect solution for applications requiring extended range and bandwidth. RFX2401C has simple and low-voltage CMOS control logic, and requires minimal external components for system implementation.

Applications

- ▶ ZigBee Extended Range Devices
- ▶ ZigBee Smart Power
- ▶ Mobile and Battery ZigBee Systems
- ▶ Home and Industrial Automation
- ▶ RF4CE Remote Control
- ▶ Custom 2.4GHz Radio Systems



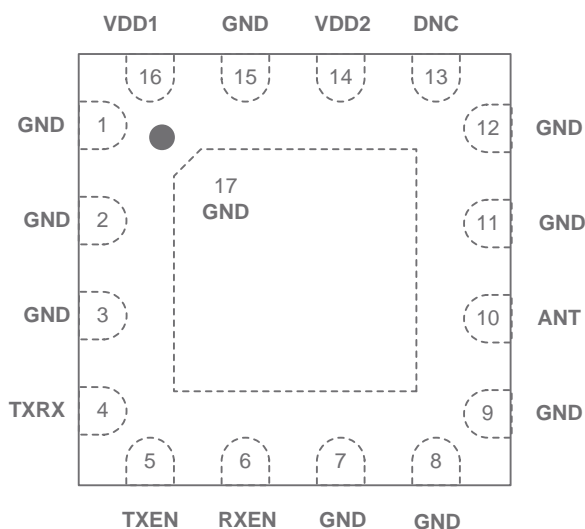
FEATURES

- ▶ 2.4GHz ZigBee High Power Single-Chip, Single-Die RF Front-End IC
- ▶ Combined TX / RX Transceiver Port and Single Antenna Port
- ▶ 2.4GHz Transmit High Power Amplifier with Low-Pass Harmonic Filter
- ▶ Low Noise Amplifier
- ▶ Transmit / Receive Switch Circuitry
- ▶ High Transmit Signal Linearity Meeting Standards for OQPSK Modulation
- ▶ Integrated Power Detector for Transmit Power Monitor and Control
- ▶ Low Voltage (1.2V) CMOS Control Logic
- ▶ ESD Protection Circuitry on All Ports
- ▶ DC Decoupled RF Ports
- ▶ Internal RF Decoupling on All VDD Bias Pins
- ▶ Low Noise Figure for the Receive Channel
- ▶ Very Low DC Power Consumption
- ▶ Full On-chip Matching and Decoupling Circuitry
- ▶ Minimal External Components Required
- ▶ 50-Ohm Input / Output Matching
- ▶ Market Proven CMOS Technology
- ▶ 3 x 3 x 0.5mm Small Outline QFN-16 Package with Exposed Ground Pad

PIN ASSIGNMENTS:

Pin Number	Pin Name	Description
4	TXRX	RF signal to / from the Transceiver: DC shorted to GND
5	TXEN	CMOS Input to Control TX Enable
6	RXEN	CMOS Input to Control RX Enable
10	ANT	RF Signal from the PA or RF Signal Applied to the LNA; DC Shorted to GND
1, 2, 3, 7, 8, 9, 11, 12, 15, 17	GND	Ground – Must be connected to Ground in the Application Circuit
13	DNC	Reserved – Do Not Connect in the Application Circuit
14	VDD2	Voltage Supply Connection for the PA
16	VDD1	Voltage Supply Connection for the LNA

PIN-OUT DIAGRAM:



ABSOLUTE MAXIMUM RATINGS:

Parameters	Units	Min	Max	Conditions
DC VDD Voltage Supply	V	0	4.5	
DC Control Pin Voltage	V	0	4.5	
DC VDD Current Consumption	mA		350	Through VDD Pins when TX is "ON"
TX RF Input Power	dBm		+5	All Operating Modes
ANT RF Input Power	dBm		+5	When RX is "ON"
Storage Ambient Temperature	°C	-50	+125	No RF and DC Voltages Applied Appropriate care required according to JEDEC Standards

Sustained operation at the Absolute Maximum Ratings will result in damage to the device and is not recommended.

RECOMENDED OPERATING CONDITIONS:

Parameters	Units	Min	Typ	Max	Conditions
DC VDD Voltage Supply (<i>Note 1</i>)	V	2.0	3.3	3.6	All VDD Pins
Control Voltage "High"	V	1.2		VDD	
Control Voltage "Low"	V	0		0.3	
DC Control Pin Current Consumption	μA		1		
DC Shutdown Current	μA		0.05		
Transmit-Receive Switching Time	nsec			400	
Shut-Down and "ON" State Switching Time	nsec			400	
Operating Ambient Temperature	°C	-40		+85	

Note 1 – For normal operation of the RFX2401C, VDD must be continuously applied to all VDD supply pins.

TRANSMIT TECHNICAL PARAMETERS (VDD=3.3V; T=+25 °C)

Parameters	Units	Min	Typ	Max	Conditions
Operating Frequency Band	GHz	2.4		2.5	All RF Pins Terminated by 50 Ohm
Saturated Output Power	dBm		+22		
Small-Signal Gain	dB		25		
Power Detector Voltage in All Modes	mV	20		2000	P _{out} = +5 to +20dBm
Second Harmonic	dBm/MHz		-15		P _{OUT} = +20dBm, IEEE 802.15.4 OQPSK modulation signal
Third Harmonic	dBm/MHz		-20		P _{OUT} = +20dBm, IEEE 802.15.4 OQPSK modulation signal
Input Return Loss	dB		-10		
Output Return Loss	dB		-8		
Input / Output Impedance Single-Ended	Ohm		50		
TX Quiescent Current	mA		17		No RF Applied
TX High Power Current	mA		100		P _{OUT} = +20dBm
Load VSWR for Stability (P _{out} =20dBm)	N/A		6:1		All Non-Harmonically Related Spurs Less than -43dBm/MHz
Load VSWR for Ruggedness (P _{out} =20dBm)	N/A		10:1		No Damage

RECEIVE TECHNICAL PARAMETERS (VDD=3.3V; T=+25 °C)

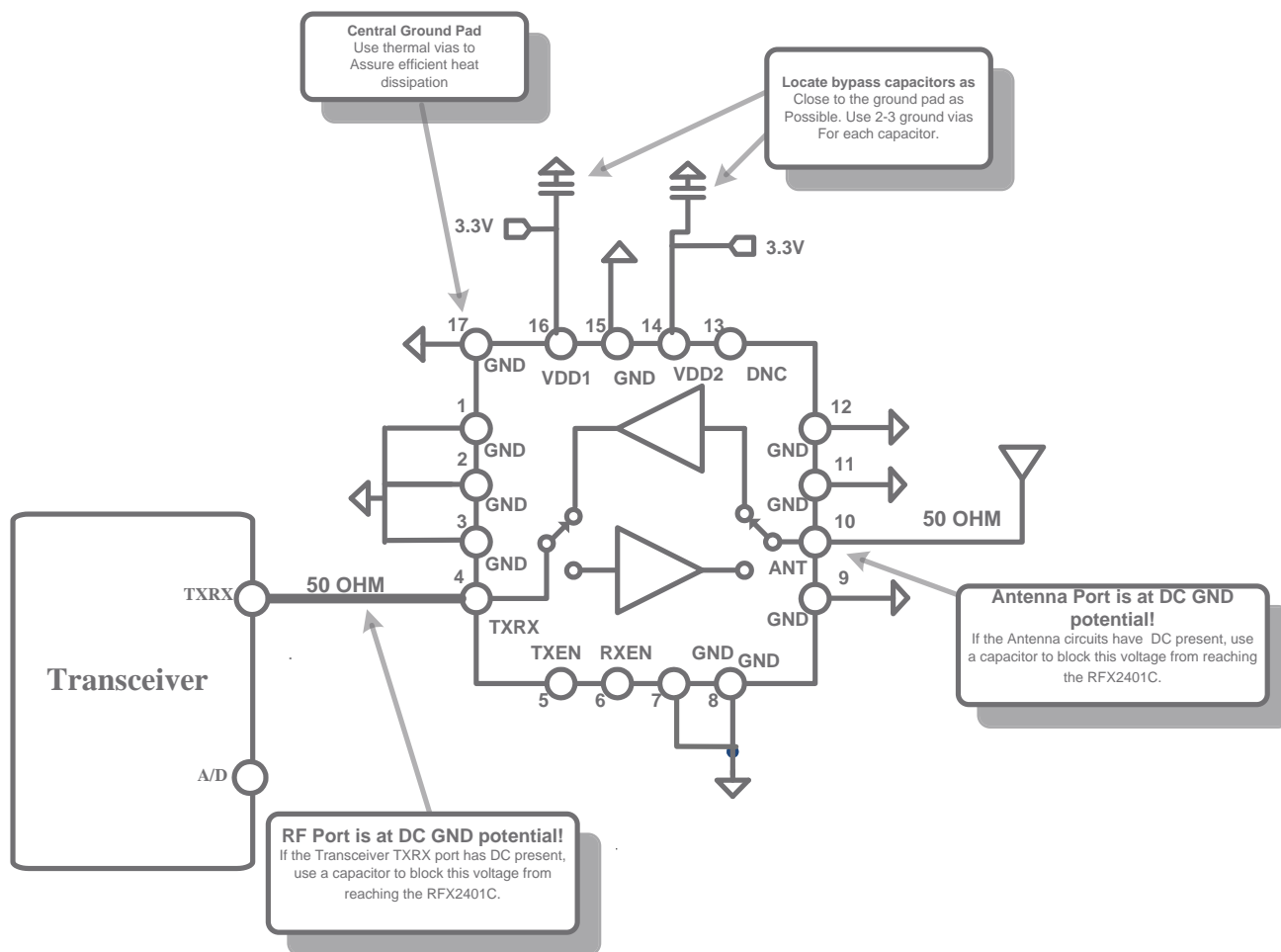
Parameters	Units	Min	Typ	Max	Conditions
Operating Frequency Band	GHz	2.4		2.5	All RF Pins Terminated by 50 Ohm
Gain	dB		12		
Noise Figure	dB		2.4		
Input Return Loss	dB		-12		
Output Return Loss	dB		-15		
RF Port Impedance	Ohm		50		
RX Quiescent Current	mA		10		No RF Applied
Input P_{1dB}	dBm		-8		At ANT Pin

CONTROL LOGIC TRUTH TABLE

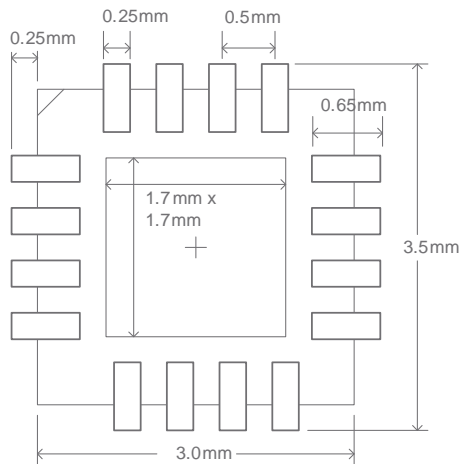
TXEN	RXEN	Operating Conditions
1	X	TX Active
0	1	RX Active
0	0	Chip is Shut-down

Note: "1" denotes high voltage state (> 1.2V)
 "0" denotes low voltage stage (<0.3V) at Control Pins
 "X" denotes do not care: either "1" or "0" can be applied

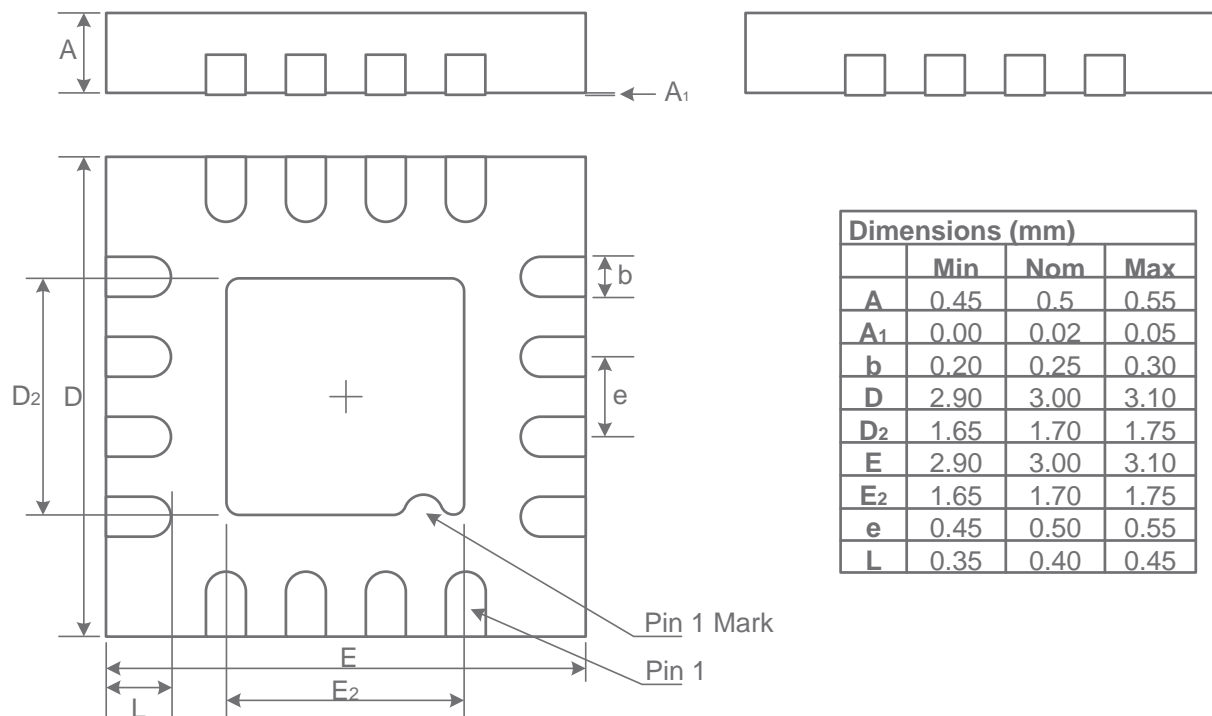
APPLICATION CIRCUIT GUIDELINES



PCB LAND PATTERN



PACKAGE DIMENSIONS:



PACKAGE MARKING:

