

# 2.4GHZ CMOS WLAN / BLUETOOTH RFEIC WITH PA, LNA WITH BYPASS & SP3T SWITCH

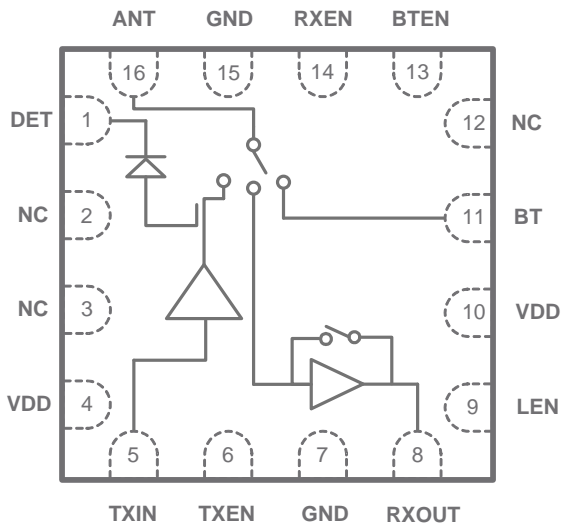
## DESCRIPTION

The RFX8422 is a fully integrated, single-chip, single-die RFEIC (RF Front-end Integrated Circuit) which incorporates all the RF functionality needed for dual-mode WLAN, Bluetooth operations including simultaneous WLAN and Bluetooth receive capability.

The RFX8422 architecture integrates a high-efficiency high-linearity PA, a directional Coupler and output Power Detector, impedance matching networks, harmonic filters, a LNA with Bypass and an SP3T Antenna Switch all in a single CMOS device.

This RFEIC is designed to be used in combined 802.11b/g/n and Bluetooth applications operating in the 2.4GHz band, and can be powered directly from the battery.

Combining superior performance, ultra-low power consumption, small form factor, and low cost, RFX8422 is the perfect solution for mobile, handheld, and portable devices with integrated WLAN and Bluetooth. RFX8422 is assembled in ultra-compact 2.5 x 2.5 x 0.45 mm 16L QFN package, and requires minimal external components and PCB footprint.



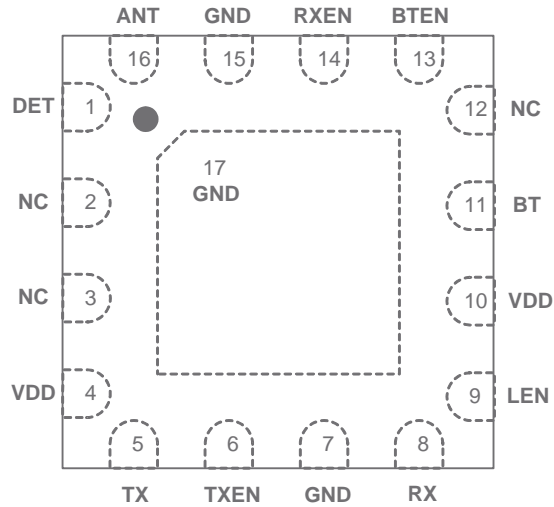
## FEATURES

- Combines 802.11b/g/n and Bluetooth applications
- High linearity PA for 802.11 b/g/n WLAN
- Simultaneous WLAN and Bluetooth receive mode
- Low Noise Figure WLAN Receive LNA with Bypass for Near Range Operation
- Supports direct battery operation
- Built in directional coupler based output power detector
- ESD Protection Circuitry on All Ports
- DC decoupled RF Ports and VDD / RF Isolation
- 2.5mmx2.5mmx0.45mm Small Outline 16L QFN Package with Exposed Ground Pad

## APPLICATIONS

- Smartphones, Feature Phones and MIDs with WLAN/Bluetooth
- WLAN/Bluetooth Platforms Requiring Shared Antenna
- Laptop / Netbook / Smartbook with Embedded WiFi & Bluetooth
- Portable Platforms with Integrated 802.11b/g/n and Bluetooth

**PACKAGE PIN OUT AND PIN DESCRIPTION**



(Top “See-Through” View)

Pin Number	Pin Name	Description
1	DET	PA Power Detector Output
2, 3, 12	NC	Not Connected Internally. Can be Grounded or Left Open
4, 10	VDD	DC Voltage Supply
5	TXIN	WLAN TX Signal Port from the Transceiver: DC Shorted to GND
6	TXEN	CMOS Logic Control to Enable WLAN Transmit
7, 15, Paddle	GND	Ground – Must be Connected to Ground
8	RXOUT	WLAN RX Signal Port to the Transceiver: DC Shorted to GND
9	LEN	CMOS Logic Control to Enable LNA. Use to switch between the LNA and Bypass modes
11	BT	RF signal Port from/to the Bluetooth Transceiver: DC Shorted to GND
13	BTEN	CMOS Logic Control to Enable Bluetooth
14	RXEN	CMOS Logic Control to Enable WLAN Receive
16	ANT	RF Signal Port to/from the Antenna: DC Shorted to GND

## ABSOLUTE MAXIMUM RATINGS

Parameters	Min.	Max.	Unit	Conditions
DC VDD Voltage Supply	0	5	V	All VDD Pins
DC Control Pin Voltage	0	3.6	V	All Control Pins
DC current consumption		300	mA	TXEN = 1
Tx RF Input Power		+5	dBm	
ANT RF Input Power		+10	dBm	
BT TX RF Input Power		+20	dBm	
Operating Temperature	-40	+85	°C	
Storage Ambient Temperature	-40	+125	°C	Appropriate care required according to JEDEC Standards

*Note: Sustained operation at or above the Absolute Maximum Ratings for any single or combinations of the above parameters may result in permanent damage to the device and is not recommended.*

*All Maximum RF Input Power Ratings assume 50-Ohm terminal impedance.*

## NORMAL OPERATING CONDITIONS

Parameters	Min	Typ	Max	Unit	Conditions
VDD Voltage Supply (Note 1)	2.9	3.6	4.8	V	
RF Port Impedance		50		Ω	Single-Ended
Control Voltage "High" (Note 2)	1.2		3.6	V	
Control Voltage "Low"	0		0.3	V	
Control Pin Current		0.1		μA	
Shutdown Current		6		μA	All Operation Modes
PA Turn On/Off Time		0.5	1	μs	
θ <sub>ja</sub> (Note 3)		35		°C/W	
θ <sub>jc</sub> Top (Note 4)		15		°C/W	
Antenna Switch Speed		0.5	1	μs	

*Note 1: For normal operation of the RFX8422, VDD must be continuously applied to all VDD supply pins.*

*Note 2: If control voltage can exceed 1.8V, a 1KΩ series resistor is recommended for the application circuit on each control line.*

*Note 3: For operation above +85 °C, use the θ<sub>ja</sub> as guidance for system design to assure the junction temperature will not exceed the maximum of +150 °C. This rating is dependent on proper thermal design.*

*Note 4: For reference only. Contact RFAxis for details regarding thermal testing and PCB thermal configuration.*

TRANSMIT PATH CHARACTERISTICS (VDD=3.6V, T<sub>a</sub>=+25 °C)

Parameters	Min	Typ	Max	Unit	Conditions
Operating Frequency	2.4		2.5	GHz	
Linear Output Power 1		+18		dBm	EVM<3%, 802.11g 64QAM/54Mbps
Linear Output Power 2		+17.5		dBm	EVM<2.8%, 802.11n MCS7 HT40
Linear Output Power 3		+21		dBm	802.11b 1Mbps CCK Mask Compliance
TX Small Signal Gain		26		dB	
Current Consumption		170		mA	P <sub>OUT</sub> = +18dBm
Second Harmonics		-25		dBc	P <sub>OUT</sub> = +21dBm (CW)
Third Harmonics		-40		dBc	P <sub>OUT</sub> = +21dBm (CW)
Power Detector Voltage	200		1000	mV	P <sub>OUT</sub> = +5 to +21 dBm, 10kΩ load
Directional Coupler Directivity		20		dB	
Input Return Loss		-10		dB	
Output Return		-10		dB	
Load VSWR for Stability (CW, Fix Pin for Pout=+20dBm with 50Ω Load)	4:1	6:1		N/A	All non-harmonically related spurs less than -43dBm/MHz
Load VSWR for Ruggedness (CW, Fix Pin for Pout=+20dBm with 50 Ω Load)	8:1	10:1		N/A	No Damage

**RECEIVE PATH CHARACTERISTICS (VDD=3.6V, T<sub>a</sub>=+25 °C)**

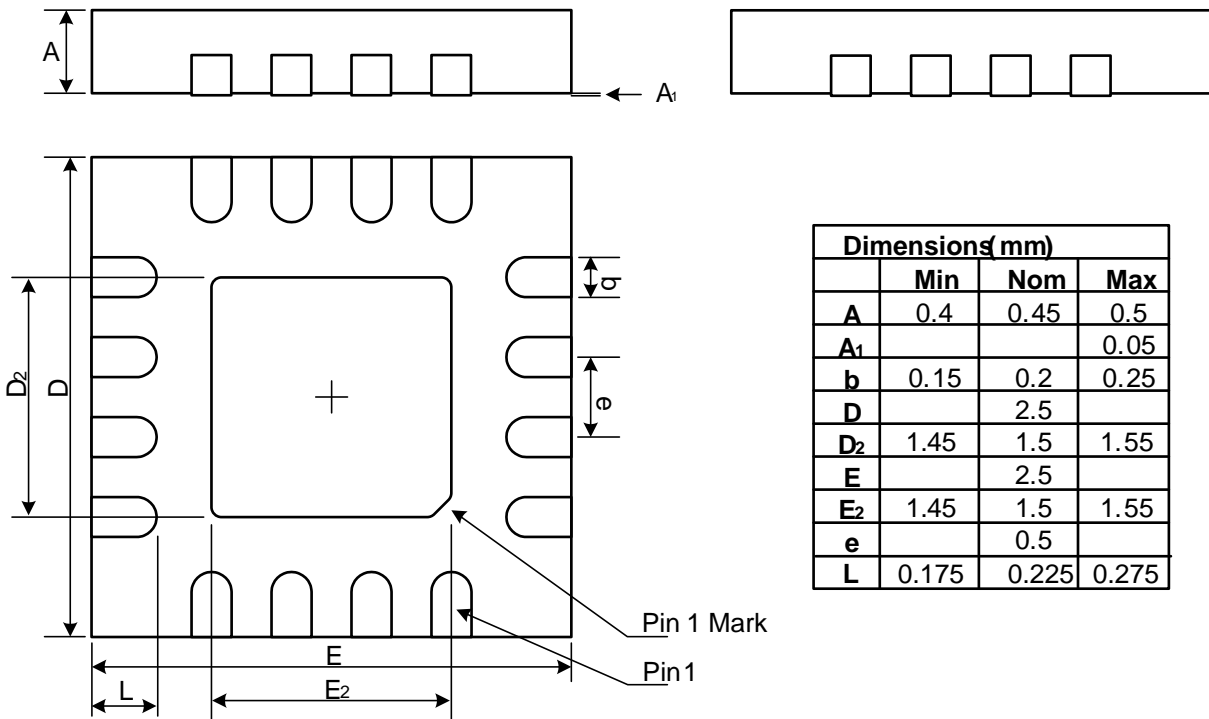
Parameters	Min	Typ	Max	Unit	Conditions
Operating Frequency	2.4		2.5	GHz	
Small-Signal Gain (High Gain Mode)		11		dB	Between ANT and RX pins; RX/LEN = High
Noise Figure (High Gain Mode)		3		dB	At ANT pin
LNA 2 <sup>nd</sup> Harmonic		-30		dBc	At Input P1dB
LNA 3 <sup>rd</sup> Harmonic		-30		dBc	At Input P1dB
Insertion Loss (Bypass Mode)		10		dB	Between ANT and RX pins; LEN = Low
Insertion Loss (BT)		1.2		dB	Between ANT and BT pins

**TRUTH TABLE**

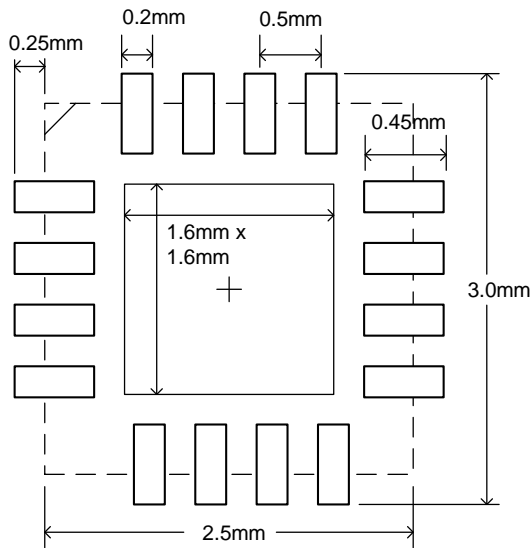
TXEN	BTEN	RXEN	LEN	Mode of Operating
0	0	0	0	Shutdown Mode
1	0	0	0	WLAN Transmit Mode
0	0	1	1	WLAN Receive. High Gain Mode
0	0	1	0	WLAN Receive. Bypass Mode
0	1	0	0	Bluetooth Transmit/Receive Mode

Note: "1" denotes high voltage state (> 1.2V) at Control Pins  
 "0" denotes low voltage state (< 0.3V) at Control Pins  
 1KΩ series resistor may be required for each control line

PACKAGE DIMENSIONS



PCB LAND PATTERN



PACKAGE MARKING

