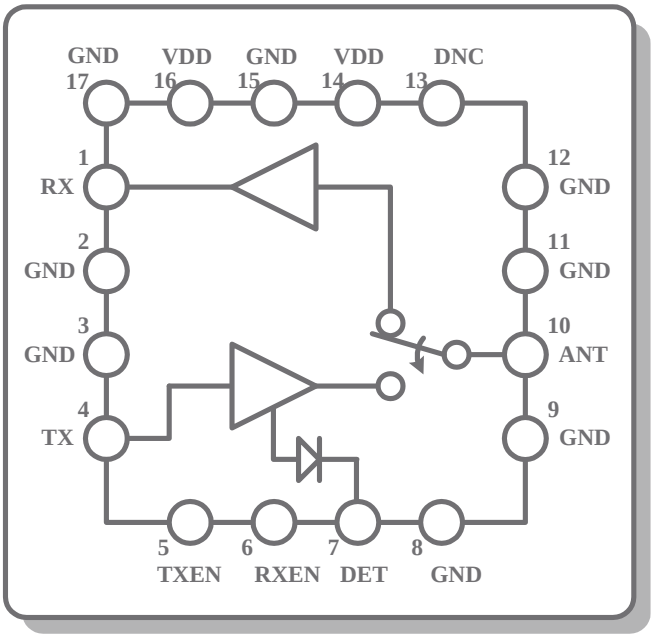
CMOS 2.4GHZ TRANSMIT/RECEIVE WLAN RFeIC



Description

The RFX2402E is a fully integrated, single-chip, single-die RFeIC (RF Front-end Integrated Circuit) which incorporates all the RF functionality needed for today's wireless communications.

The RFX2402E architecture integrates the PA, LNA, Transmit and Receive switching circuitry, the associated matching network, and a harmonic filter all in a CMOS single-chip device.

This RFeIC is designed for use in 802.11b/g/n/ac applications operating at 2.4GHz. Combining superior performance, high sensitivity and efficiency, low noise, small form factor, and low cost, the RFX2402E is the ideal solution for single antenna applications, and the ideal building block for MIMO applications.

The RFX2402E has simple and low-voltage CMOS control logic, and requires minimal external components for system implementation. The PA power detector circuit is also integrated.

Applications

- 802.11b/g/n/ac Multimedia Applications
- 802.11b/g/n/ac Embedded Applications
- 802.11b/g/n/ac Mobile Platforms
- 802.11b/g/n/ac NIC PC Card
- Other 2.4GHz ISM Radios
- 802.11b/g/n/ac Access Point

FEATURES

- 2.4GHz ISM, Single Chip, Single-Die RF Front-End IC
- Separate TX and RX Transceiver Port and Single Antenna Port
- 2.4GHz Power Amplifier with Low-Pass Harmonic Filter
- Low Noise Amplifier
- Transmit/Receive Switch Circuitry
- High Transmit Signal Linearity Meeting Standards for OFDM and CCK modulation
- Integrated Power Detector for Transmit Power Monitor and Control
- Compatible with Low Voltage (1.2V) CMOS Control Logic or levels up to VDD
- ESD Protection Circuitry on All Ports
- DC Decoupled RF Ports
- Internal RF Decoupling on All VDD Bias Pins
- Low Noise Figure for Receive Channels
- High Power Capability for Received Signals
- 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
- 3mm x 3mm x 0.55mm Small Outline 16L-QFN Package with Exposed Ground Pad

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Rev 2
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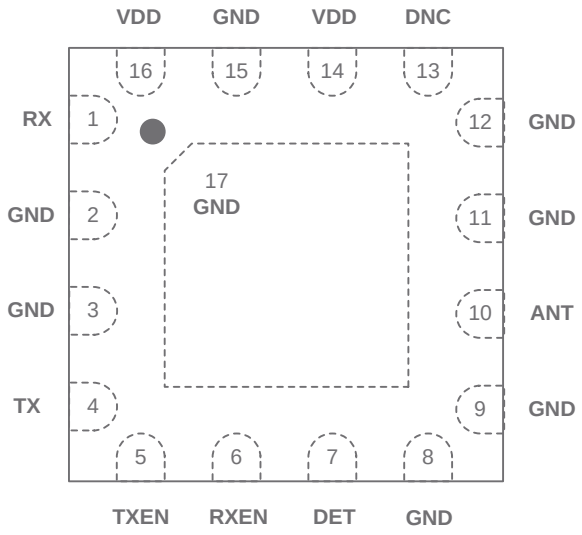
PIN ASSIGNMENTS:

Pin Number	Pin Name	Description
1	RX	Received RF Signal from the LNA to the Transceiver; DC Shorted to GND
2, 3, 8, 9, 11,12, 15, 17	GND	Ground – Must be connected to Ground in the Application Circuit
4	TX	Transmitted RF signal from the Transceiver to the PA: DC Shorted to GND
5	TXEN	CMOS Input to Enable the PA
6	RXEN	CMOS Input to Enable the LNA
7	DET	Analog Voltage Proportional to the PA Power Output
10	ANT	Antenna port RF Signal from the PA or RF Signal Applied to the LNA; DC Shorted to GND
13	DNC	Reserved pin, Do not connect in the Application Circuit
14, 16	VDD	Voltage Supply Connection

PINOUT DIAGRAM:



(Top "See-Through" View)

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ABSOLUTE MAXIMUM RATINGS:

Parameters	Units	Min	Max	Conditions
DC VDD Voltage Supply	V	0	4.5	All VDD Pins
DC Control Pin Voltage	V	0	3.6	Through 1Kohm resistor
DC VDD Current Consumption	mA		350	Through VDD Pins when TX is "ON"
DC Control Pin Current Consumption	µA		1	
TX RF Input Power	dBm		+10	All Operating Modes
ANT RF Input Power	dBm		+5	When RX is "ON"
Junction Temperature	^{o}C		+150	
Storage Ambient Temperature	^{o}C	-50	+150	No RF and DC Voltages Applied Appropriate care required according to JEDEC Standards

Note: Sustained operation at or above the Absolute Maximum Ratings for any one 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.

NOMINAL OPERATING CONDITIONS:

Parameters	Units	Min	Typ	Max	Conditions
DC VDD Voltage Supply	V	2.7	3.3	3.6	All VDD Pins
Control Voltage "High" (*Note 1*)	V	1.2			Through Series Resistor
Control Voltage "Low"	V			0.3	
DC Control Pin Current Consumption	uA		1		
DC Shutdown Current	uA		2		All Control Lines "Low"
PA Turn On/Off Time	usec		0.5		
LNA Turn On/Off Time	usec		0.8		
Shut-Down and "ON" State Switching Time	usec		0.5		
Operating Ambient Temperature	^{o}C	-40		+125	See note 2
θja	^{o}C/W		35		

Note 1: If control voltage can exceed 1.8V, a 1KΩ – 10KΩ series resistor is recommended for the application circuit on each control line.

Note2: For operation above +85 ^{o}C, use the θja as guidance for system design to assure the junction temperature will not exceed the maximum of +150 ^{o}C.

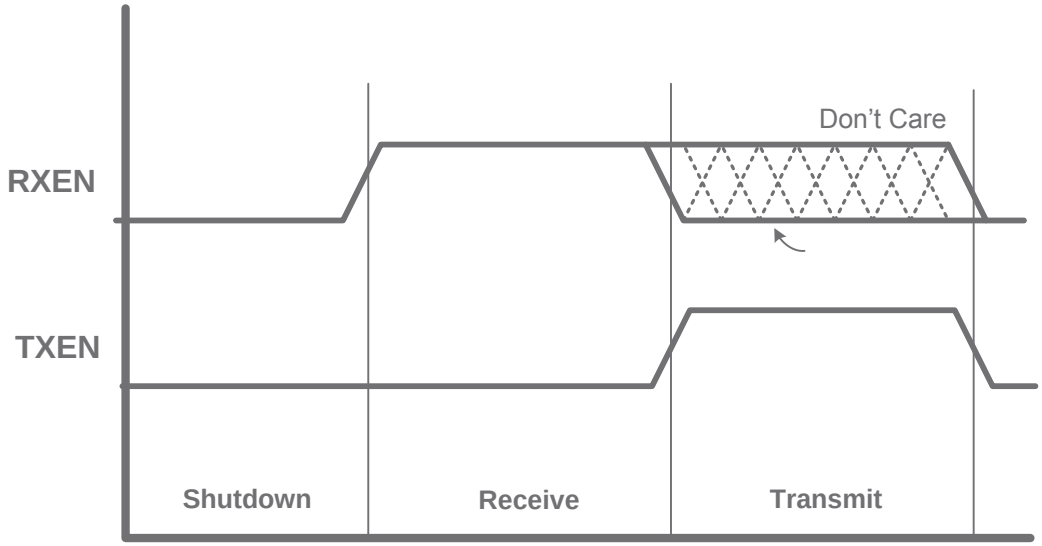
TRANSMIT TECHNICAL PARAMETERS (VDD=3.3V, T=+25 °C)

Parameters	Units	Min	Typ	Max	Conditions
Operating Frequency Band	GHz	2.4		2.5	All RF Pins Terminated by 50 Ohms
Output P1dB	dBm		+24		CW
Linear Output Power 802.11b	dBm		+21		1Mbps CCK, Mask Compliance
Linear Output Power 802.11n	dBm		+17		54Mbps OFDM, EVM< -33dB at ANT
Linear Output Power 802.11g	dBm		+18		54Mbps OFDM, EVM<-30 dB at ANT
Large-Signal Power Gain in All Modes	dB		28		P_{OUT} = +18dBm
Small-Signal Power Gain in All Modes	dB		28.5		P_{OUT} = 0dBm
TX Quiescent Current	mA		80		No RF Applied
TX Linear Current	mA		140		P_{OUT} = +18dBm
Power Detector Voltage Output	V		0.25-1.6		P_{OUT} = +5 to +20dBm
Second Harmonic (CW)	dBc		-30		P_{OUT} = +20dBm, CW at ANT Pin
Third Harmonic (CW)	dBc		-35		P_{OUT} = +20dBm, CW at ANT Pin
Modulated Second Harmonic	dBm/MHz		-26		P_{OUT} = +20dBm, 802.11n HT40
Modulated Third Harmonic	dBm/MHz		-30		P_{OUT} = +20dBm, 802.11n HT40
Input Return Loss	dB		-10		
Output Return Loss	dB		-12		
Input Output Impedance Single-Ended	Ohm		50		
TX Leakage to RX Port	dBm		-7		P_{OUT} = +20dBm at ANT

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 are Terminated by 50 Ohm
Gain	dB		11		
Noise Figure	dB		3		
Input Return Loss	dB		-12		
Output Return Loss	dB		-10		
RF Port Impedance	Ohm		50		
RX Quiescent Current	mA		9		No RF Applied
Input P_{1dB}	dBm		-5		

CONTROL SIGNAL DIAGRAM:

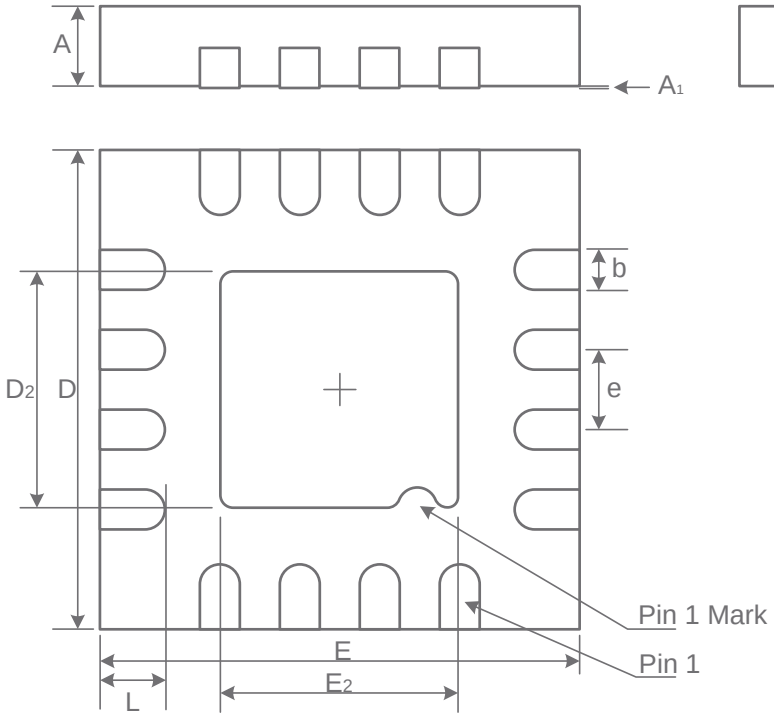


CONTROL LOGIC TRUTH TABLE:

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

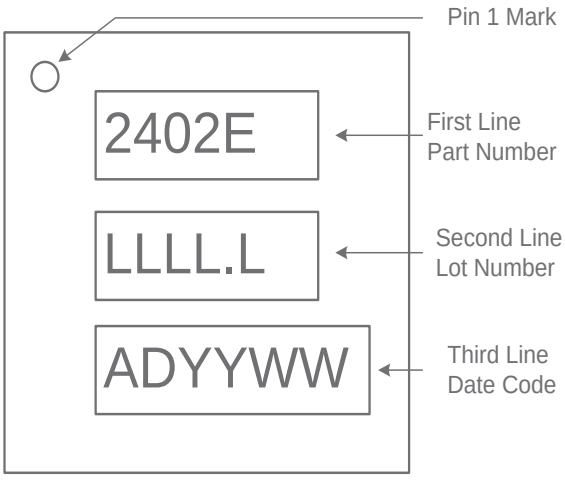
Note: "1" denotes high voltage state (> 1.2V)
"0" denotes low voltage stage (<0.3V) at Control Pins
"X" denotes the don't care state

PACKAGE DIMENSIONS:

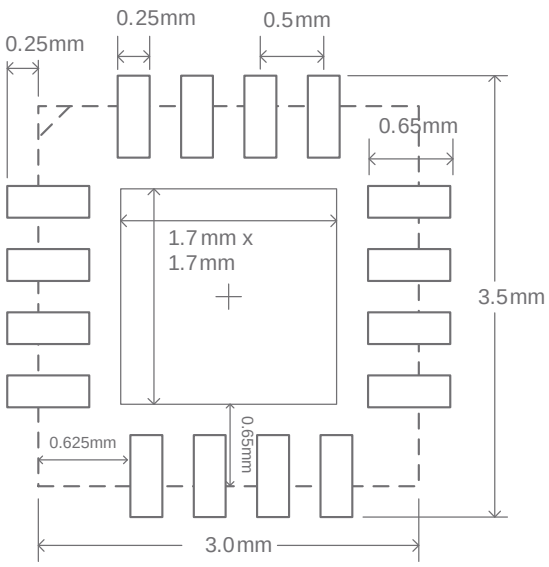


Dimensions (mm)			
	Min	Nom	Max
A	0.5	0.55	0.6
A_1	0.00	0.02	0.05
b	0.20	0.25	0.30
D	2.90	3.00	3.10
D_2	1.65	1.70	1.75
E	2.90	3.00	3.10
E_2	1.65	1.70	1.75
e	0.45	0.50	0.55
L	0.35	0.40	0.45

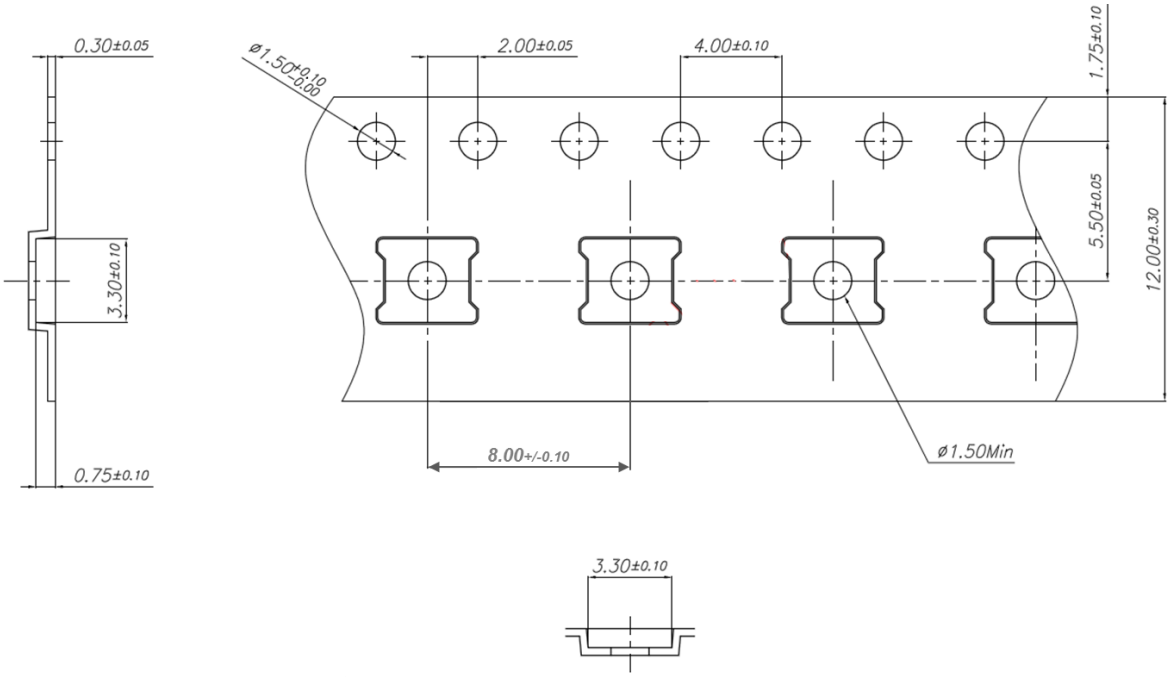
PACKAGE MARKING

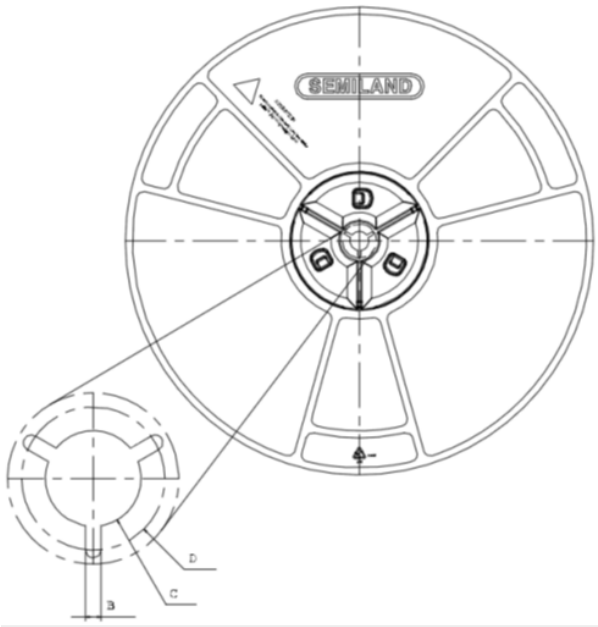


PCB LAND PATTERN



TAPE AND REEL INFORMATION:





Size	12mm
A	330 +0.2 -2.0
B	1.5min
C	13.0 +0.5 -0.2
D	20.2min
N	100 +2.0 -0.0
W1	12.4 +3.0 -0.0
W2	12.4 +3.0 -0.0
W3	16.4 +2.0 -2.0
PART#	SRL-12134H