

LXT810

Spread Spectrum Digital Cordless Telephone Transceiver

General Description

The LXT 810 is a single chip spread spectrum RF transceiver designed for use in 900 MHz Spread Spectrum Digital Cordless Telephone (SSDCT) applications. The LXT 810 is fully compliant with the FCC Part 15 900 MHz ISM band spectrum regulations.

Based on CMOS technology, the LXT 810 integrates a complete spread spectrum RF Transceiver including all transmit and receive functions, and a complete TDD burst-mode controller optimized for SSDCT applications in a single integrated circuit.

The LXT 810 can be combined with an external uC and ADPCM CODEC to create a complete SSDCT terminal.

The LXT 810 performs all the multiplexing /demultiplexing and spreading/despreading functions required to transmit a 32kbps ADPCM voice signal and 4 kbps data channel over a 900 MHz radio link.

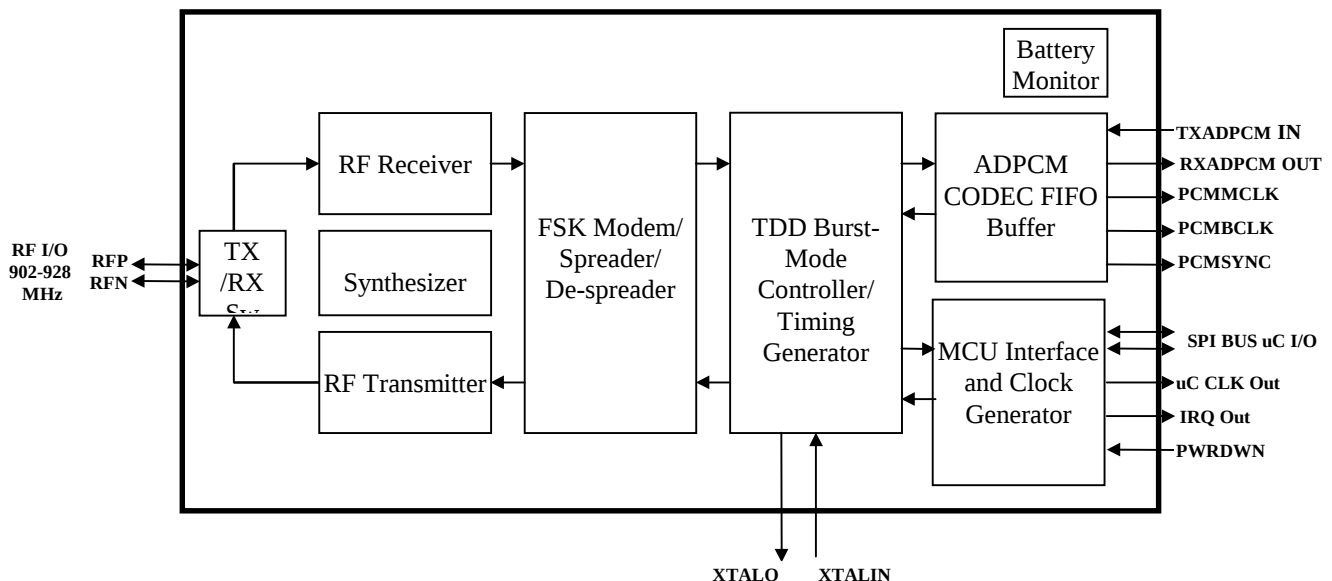
Applications

- Spread Spectrum Digital Cordless Telephones
- Wireless security and monitoring transceivers
- Wireless Spread Spectrum Data/Voice Transceivers

Features

- Single chip wireless transceiver: RF in, Data out
- 900 MHz ISM band compliant 902 - 928 MHz
- Performs all RF transceiver functions on-chip:
 - RF Power Amplifier with 1 to 100 mW output
 - FSK Modulator/Spreader
 - Synthesizer/Oscillator
 - Transmit / Receive RF switch
 - LNA
 - All Channel Filtering
 - FSK Data Demodulator/Despreader
 - Receiver gain and RF Signal Quality Indicator
- Very low external component count (<30 discretes)
- 3.0 to 3.6 Volts operation, No Regulator Required
- Typical current consumption ~ 150 mA when active
- Allows for adaptive far end transmit power control
- 32 kbps VF data rate supports high-quality voice link
- 2ms TDD frame for reduced side-tone delay
- 4kbps data channel provides high speed supervisory link between base and handset
- Integrated battery monitor with programmable threshold
- Industry standard SPI bus for control of all functions
- 0 to 70 C temperature range
- Package: 52 pin TQFP

LXT 810 Block Diagram



LXT 810 Spread Spectrum Digital Cordless Telephone Transceiver

2. Introduction

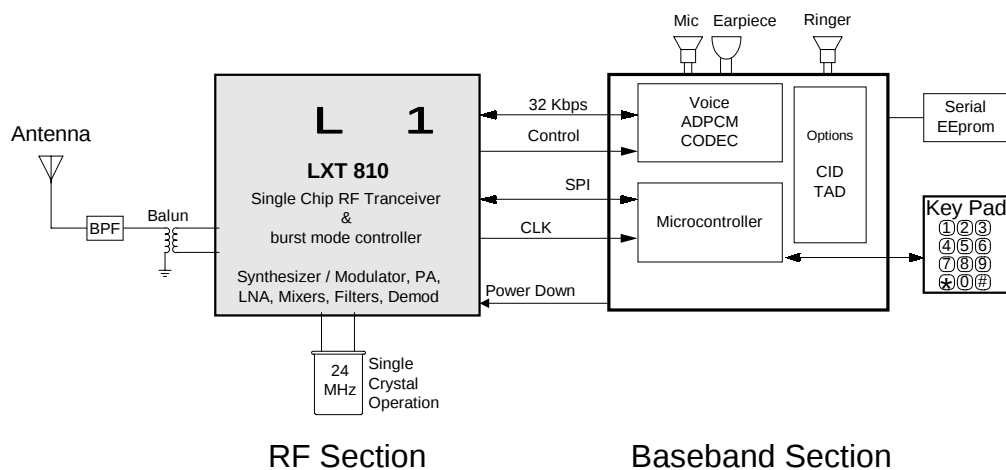
2.1 The LXT 810 Spread Spectrum Digital Cordless Telephone RF Transceiver

The LXT 810 is a fully integrated spread-spectrum RF Transceiver and TDD Burst-mode Controller within a single integrated circuit, which has been optimized for 900 MHz spread spectrum digital cordless telephone applications.

The LXT 810 integrates all the functionality of the LXT 809 and LXT 811 into a single device, and provides all the active radio transceiver and protocol control elements to produce an ISM Band FCC compliant cordless telephone solution.

Combining the LXT 810 and a standard “off the shelf” voice CODEC and micro-controller can implement a three-chip, single crystal SSDCT terminal.

2.1.1 Figure 1: Low Cost Handset/Base Configuration



2.2 Operation Overview

The LXT 810 burst-mode controller (BMC) block performs all spreading/despreading, framing/formatting, and time-division duplex (TDD) control required to implement a 900 MHz spread spectrum radio suitable for Spread Spectrum Digital Cordless Telephone applications. When combined with an external ADPCM voice CODEC and microcontroller (uC), the LXT 810 form a complete SSDCT terminal (base or handset)

The LXT 810 performs virtually all link layer processing required for SSDCT use. Once initialized, the LXT 810 is self-synchronizing, and uC intervention is only required for monitoring RF link performance, RF channel selection and setting TX power levels.

2.2.1 Transmit Operation

In the transmit direction, the LXT 810 combines a 32 kbps ADPCM data input with a 4 kbps data channel input, encapsulates the data in a TDD frame with a preamble and sync word, and uses direct sequence spreading to create a binary TX chipping sequence for output to the RF transmitter block.

The RF transmitter accepts the spread data from the BMC block and FSK modulates an internal ISM band synthesizer. The FSK signal is power amplified and sent out of the RF I/O port.

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2.2.2 Receive Operation

For reception, the spread spectrum received signal is amplified, down converted and demodulated. The LXT 810 de-spreads, de-frames, stores and reproduces continuous 32Kbps voice encoded data.

In the receive direction, the BMC block accepts a binary 1.5Mchip/s output from the RF receiver block, which is then de-spread, and demultiplexed into the 32 kbps ADPCM voice data and 4kbps data channel signals.

The LXT 810 provides radio link diagnostic information to the uC for active link management capabilities (adaptive power control and channel hopping algorithms)

2.2.3 LXT 810 TDD Frame Format

The LXT 810 uses the TDD Frame format shown in Figure 2

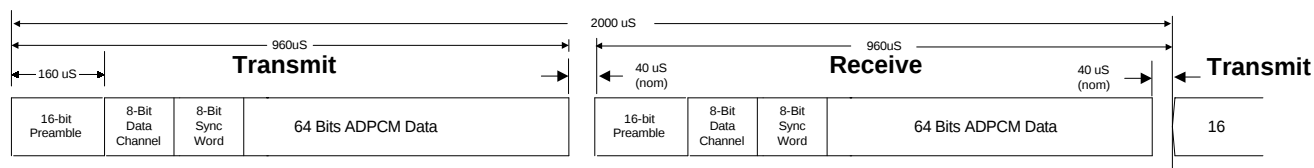
The TDD frame is 2mS in length, and is composed of two symmetrical 960 uS TX and RX subframes. Each subframe contains 96 bits of 10uS duration, with 40 uS guard times between both TX and RX subframes.

Each subframe consists of the following four fields:

- A 16-bit Preamble field
- An 8-bit Data Channel field
- An 8-bit Sync Word
- A 64-bit ADPCM Payload

Each of the first three fields (preamble, data channel, and sync word) is programmable via the uC interface. See the register descriptions that follow for details.

Figure 3: LXT 810 TDD Frame Format



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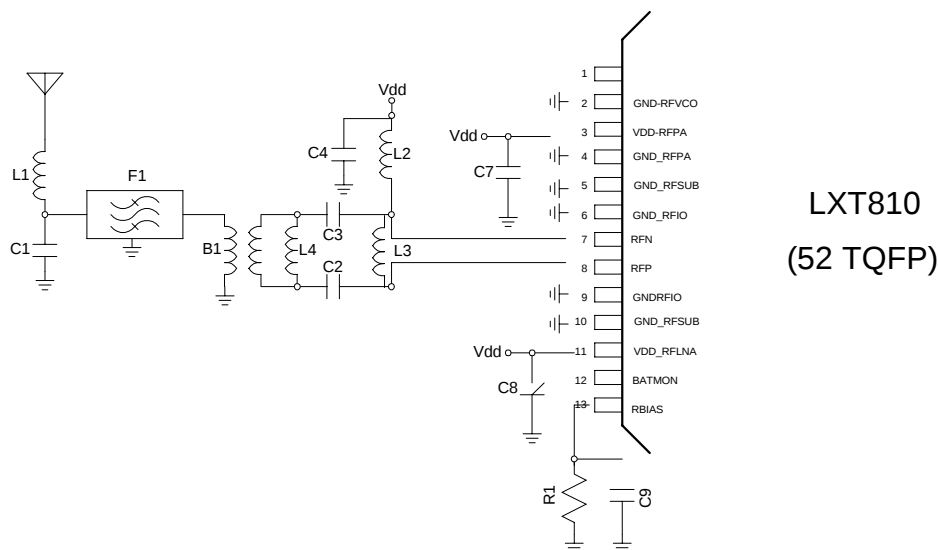
During either the **Ready Mode** or **Power Down Mode** both RFIO and RFION revert to a high impedance state.

4.1.1 Balanced RF Input and Output

Negative side RFION, Pin 6

Positive side RFIO, Pin 7

The LXT 810 connects to an antenna through a network of balanced matching components, a Balun, a 50 Ohm ISM band pass filter and a single ended 50 Ohm to antenna impedance matching network



4.1.2 Figure 5: RF Input and Output

Inductors L2 and L3 (47nH) act as RF chokes to allow DC bias current to flow into the RFN and RFP balanced RF I/O port. C4 and C5 (22pF) are used to provide for a RF ground at the Vdd terminals to L2 and L3.

Components C2, C3 (8.2pF) and L4 (8.2nH) convert the complex impedance looking into RFN and RFP into 50 Ohms when monitored differentially across L4.

A balanced to unbalanced transformer (balun) is used to convert the 50 Ohm differential signal to a 50 Ohm single ended signal. A 50 Ohm ISM band two pole ceramic resonator filter is used to help reject out of band signals. Matching components L1 and C1 convert the antenna impedance to 50 Ohm. Components L1 and C1 depend strongly on the type of antenna used and the size and shape of the printed circuit board ground plane.

4.1.3 RFIO Port, Notes

It is possible to use etched printed circuit board inductors and Balun for lower cost.

Other implementations, such as, fully differential antenna, filter and impedance circuits are possible.

When combined with external active components such as low noise amplifiers, power amplifiers and PIN diode RF switches, it is possible to decrease the system noise figure and increase the available system output power, however, this is not recommended for low cost systems.

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6. Register Descriptions

The LXT 810 register set includes a total of 28 - 8 bit registers.

6.1 Table 6: LXT 810 Register Map

Address	Register Name
0	PN Code Word Register 1
1	PN code Word Register 2
2	Preamble Word 1
3	Power Down Control
4	Sync Word 1
5	Sync Word 2
6	TX data channel register
7	RX data channel register
8	Reserved
9	Reserved
A	Reserved
B	TX frame format control
C	RX Frame Format control
D	RX Correlator Control Register
E	RX Frame Lock Control Register
F	Clock Generator control Register
10	Auto-mute control register
11	Link Quality Flag Threshold Register
12	Link Quality Monitor
13	Receiver Status
14	PLL Ctrl - Reserved for Test
15	Offset Control - Reserved for Test
16-4C	Reserved
4D	Receiver Gain Register A
4E	Receiver Register B
4F-5C	Reserved
5D	"A" Counter Set
5E	"M" Counter Set
5F	"A" and "M" Counter Set
60-64	Reserved
65	Transmit Power Setting

Note: Registers marked "Reserved" are for factory device testing purposes, and should not be accessed.

L 1

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6.2 PN Code Word 1

Register Name: PNREG1
Address: 00
Default: 1110 1000 Hex: E8
Access: Read/Write

PNREG1 programs the 8 LSB's of the 15-bit PN code word used by the PN mixer

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
PN[7]	PN[6]	PN[5]	PN[4]	PN[3]	PN[2]	PN[1]	PN[0]

6.3 PN Code Word 2

Register Name: PNREG2
Address: 01
Default: 0101 1001 Hex: 59
Access: Read/Write

PNREG2 programs the 7 MSB's of the 15-bit PN code word used by the PN mixer

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reserved	PN[15]	PN[14]	PN[13]	PN[12]	PN[11]	PN[10]	PN[9]

Bit 7 Reserved
Bits 6-0 Most significant byte (7-bits) of PN code word.

6.4 Preamble Word 1

Address: 02
Default: 1010 1010 Hex: AA
Access: Read/Write

PREAMB1 programs the 8 LSB's of the 16-bit Preamble inserted at the beginning of each TX Frame

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
PREAMBLE[7:0]							