Features

Embedded EEPROM
Very Easy Development with RFPDK
All Features Programmable
Frequency: 868 MHz FSK, GFSK and
OOK Demodulation Symbol Rate: 0.1
to 100 ksps
Sensitivity: -109 dBm @ 9.6 ksps, FSK, 868M Hz
4-wire SPI Interface
Direct, Buffer and Packet Mode Supported
Configurable Data Handler and 32-Byte FIFO
Manchester Decoding and Data De-Whitening
Supply Voltage: 1.8 to 3.6 V
Low Power Consumption: 5.7 mA
Low Sleep Current
60 nA when Sleep Timer Off
440 nA when Sleep Timer on
RoHS Compliant
Module Size:15*12.5*1.8mm

DL-RXC2219A/B

Applications

Low-Cost Consumer Electronics Applications
Home and Building Automation
Infrared Receiver Replacements
Industrial Monitoring and Controls
Remote Automated Meter Reading
Remote Lighting Control System
Wireless Alarm and Security Systems
Remote Keyless Entry (RKE)

Descriptions

The DL-RXC2219A/B is an ultra low power, high performance, OOK and (G)FSK receiver 868 MHz wireless applications. includes a complete line of transmitters, receivers and transceivers. All features can All features can be configured either by off-line EEPROM programming or on-line registers writing. The configuration file to be written , into the registers is generated by the smart RFPDK.

The DL-RXC2219A/B operates from a supply voltage of 1.8 V to 3.6V, when it is always on, it consumes only 5.7 mA current while achieving -109 dBm receiving sensitivity (FSK, 9.6 ksps symbol rate, 868.35 MHz), and only 60 nA sleep current for superior battery life. The device supports packet handling, 32-byte FIFO, Manchester decoding and data de-whitening for the received data processing. Besides the demodulated data and the sync clock, the device can also ， send out the power-on reset, the system clock, as well as 2 configurable interrupts for the external device.

DL-RXC2219A/B receiver together with the DL-TXC2119A/B transmitter enables a powerful RF link.

Abbreviations

Abbreviations used in this data sheet are described below.

ADC	Analog to Digital Converter
AFC	Automatic-Frequency-Control
AGC	Automatic Gain Control
AN	Application Notes
BER	Bit Error Rate
BOM	Bill of Materials
BSC	Basic Spacing between Centers
BT	bandwidth-time product
BW	Bandwidth
CRC	Cyclic Redundancy Check
DC	Direct Current
EEPROM	Electrically Erasable Programmable Read-Only Memory
ESD	Electro-Static Discharge
ESR	Equivalent Series Resistance
Ext	Extended
FIFO	First In First Out
FSK	Frequency-Shift Keying
GFSK	Gauss frequency Shift Keying
GPO	General Purpose Output
HEX	Hexadecimal
IF	Intermediate Frequency
LNA	Low Noise Amplifier
LO	Local Oscillator
LPOSC	Low Power Oscillator
Max	Maximum
MCU	Microcontroller Unit
Min	Minimum
MOQ	Minimum Order Quantity
NA	Not Applicable/Not Available
NP0	Negative-Positive-Zero
NC	Not Connected
OOK	On-Off Keying
PC	Personal Computer
PCB	Printed Circuit Board
PLL	Phase Lock Loop
PN9	Pseudorandom Noise 9
POR	Power On Reset
PUP	Power Up
QFN	Quad Flat No-lead
RESV	Reserved
RF	Radio Frequency
RFPDK	RF Products Development Kit
RoHS	Restriction of Hazardous Substances
RSSI	Received Signal Strength Indicator
Rx	Receiving, Receiver
SAR	Successive Approximation Register
SMD	Surface Mounted Devices
SPI	Serial Port Interface
SR	Symbol Rate
STBY	Standby
TH	Threshold
Tx	Transmission, Transmitter
Typ	Typical
USB	Universal Serial Bus
VCO	Voltage Controlled Oscillator
WOR	Wake-On Radio
XOSC	Crystal Oscillator
XTAL/Xtal	Crystal

1. Electrical Characteristics

VDD = 3.3 V, T_{OP} = 25 ℃, F_{RF} = 868.35 MHz, sensitivities are measured in receiving a PN9 sequence and matching to 50 Ω impedance, with the BER of 0.1%. All measurements are performed using the board DL-RXC2219A/B-EM V1.0, unless otherwise noted.

1.1 Recommended Operation Conditions

Table 2. Recommended Operation Conditions

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Operation Voltage Supply	V_{DD}		1.8		3.6	V
Operation Temperature	T_{OP}		-40		85	℃
Supply Voltage Slew Rate			1			mV/us

1.2 Absolute Maximum Ratings

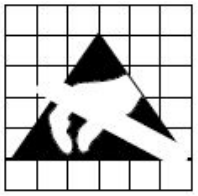
Table 3. Absolute Maximum Ratings[1]

Parameter	Symbol	Conditions	Min	Max	Unit
Supply Voltage	V_{DD}		-0.3	3.6	V
Interface Voltage	V_{IN}		-0.3	V_{DD} + 0.3	V
Junction Temperature	T_J		-40	125	℃
Storage Temperature	T_{STG}		-50	150	℃
Soldering Temperature	T_{SDR}	Lasts at least 30 seconds		255	℃
ESD Rating[2]		Human Body Model (HBM)	-2	2	kV
Latch-up Current		@ 85 ℃	-100	100	mA

Notes:

[1]. Stresses above those listed as "absolute maximum ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device under these conditions is not implied. Exposure to maximum rating conditions for extended periods may affect device reliability.

[2]. The RFM219S is high-performance RF integrated circuits with VCON/P pins having an ESD rating < 2 kV HBM. Handling and assembly of this device should only be done at ESD-protected workstations.



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

1.3 Receiver Specifications

Table 4. Receiver Specifications

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Frequency Range	F_{RF}		300		960	MHz
Symbol Rate	SR	OOK demodulation	0.1		40	ksps
		(G)FSK demodulation	0.1		100	ksps
Deviation	F_{DEV}	(G)FSK	1		200	kHz
Bandwidth-Time Product	BT		-	0.5	-	-
OOK Sensitivity	$S_{315\text{-}OOK}$	315 MHz, SR = 1 ksps		-114		dBm
	$S_{433.92\text{-}OOK}$	433.92 MHz, SR = 1 ksps		-113		dBm
	$S_{868.35\text{-}OOK}$	868.35 MHz, SR = 1 ksps		-110		dBm
	$S_{915\text{-}OOK}$	915 MHz, SR = 1 ksps		-109		dBm
(G) FSK Sensitivity	$S_{315\text{-}FSK}$	315 MHz, SR = 9.6 ksps, F_{DEV} = 19.2 kHz		-112		dBm
	$S_{433.92\text{-}FSK}$	433.92 MHz, SR = 9.6 ksps, F_{DEV} = 19.2 kHz		-111		dBm
	$S_{868.35\text{-}FSK}$	868.35 MHz, SR = 9.6 ksps, F_{DEV} = 19.2 kHz		-109		dBm
	$S_{915\text{-}FSK}$	915 MHz, SR = 9.6 ksps, F_{DEV} = 19.2 kHz		-109		dBm
Saturation Input Signal Level	P_{LVL}			10		dBm
OOK Working Current	$I_{DD\text{-}OOK}$	315 MHz, OOK		3.5		mA
		433.92 MHz, OOK		3.8		mA
		868.35 MHz, OOK		5.2		mA
		915 MHz, OOK		5.4		mA
FSK Working Current	$I_{DD\text{-}FSK}$	315 MHz, FSK		4.0		mA
		433.92 MHz, FSK		4.3		mA
		868.35 MHz, FSK		5.7		mA
		915 MHz, FSK		5.9		mA
Sleep Current	I_{SLEEP}	When sleep timer is turned on		440		nA
		When sleep timer is turned off		60		nA
Frequency Resolution	F_{RES}			24.8		Hz
Frequency Synthesizer Settle Time	T_{LOCK}	From XOSC settled		150		us
Blocking Immunity	BI	SR = 1 ksps, ±1 MHz offset, CW interference		52		dB
		SR = 1 ksps, ±2 MHz offset, CW interference		74		dB
		SR = 1 ksps, ±10 MHz offset, CW interference		75		dB
Image Rejection Ratio	IMR	IF = 280 kHz		35		dB
Input 3rd Order Intercept Point	IIP3	Two tone test at 1 MHz and 2 MHz offset frequency. Maximum system gain settings		-25		dBm
Receiver Bandwidth	BW		50		500	kHz
Receiver Start-up Time	$T_{START\text{-}UP}$	From power up to receive, in Always Receive Mode		7.3		ms
Receiver Wake-up Time	$T_{WAKE\text{-}UP}$	From sleep to receive, in Duty-Cycle Receive Mode		0.61		ms

1.4 Crystal Oscillator

Table 5. Crystal Oscillator Specifications

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Crystal Frequency[1]	F_{XTAL}		26	26	26	MHz
Crystal Tolerance[2]				±20		ppm
Load Capacitance	C_{LOAD}		10	15	20	pF
Crystal ESR	Rm				60	Ω
XTAL Startup Time[3]	t_{XTAL}			400		us

Notes:

[1]. The RFM219S can directly work with external 26 MHz reference clock input to XIN pin (a coupling capacitor is required) with peak-to-peak amplitude of 0.3 to 0.7 V.

[2]. This is the total tolerance including (1) initial tolerance, (2) crystal loading, (3) aging, and (4) temperature dependence. The acceptable crystal tolerance depends on RF frequency and channel spacing/bandwidth.

[3]. This parameter is to a large degree crystal dependent.

1.5 LPOSC

Table 6. LPOSC Specifications

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Calibrated Frequency[1]	F_{LPOSC}			1		kHz
Frequency Accuracy		After calibration		1		%
Temperature Coefficient[2]				-0.02		%/°C
Supply Voltage Coefficient[3]				+0.5		%/V
Initial Calibration Time	$t_{LPOSC-CAL}$			4		ms

Notes:

[1]. The LPOSC is automatically calibrated to the crystal oscillator during the PUP state, and is periodically calibrated since then.

[2]. Frequency drifts when temperature changes after calibration.

[3]. Frequency drifts when supply voltage changes after calibration.

2. Pin Descriptions

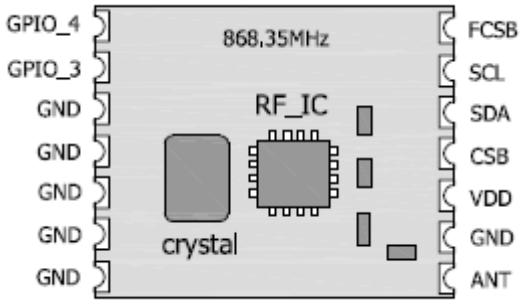


Figure 2. Pin Diagram

Table 7. Pin Descriptions

Pin Number	Name	I/O	Descriptions
1	ANT	I	RF signal input to the LNA
2	GND	I	Ground
3	VDD	I	Power supply input
4	CSB	I	3-wire SPI chip select input for EEPROM programming
5	SDA	I/O	3-wire SPI data input and output for EEPROM programming
6	SCL	I	3-wire SPI clock input for EEPROM programming
7	FCSB	I	
8	GPIO4(DATA)	O	Received data output
9	GPIO3	I/O	data output
10,11,12,13,14	GND	I	Ground

3. Typical Performance Characteristics

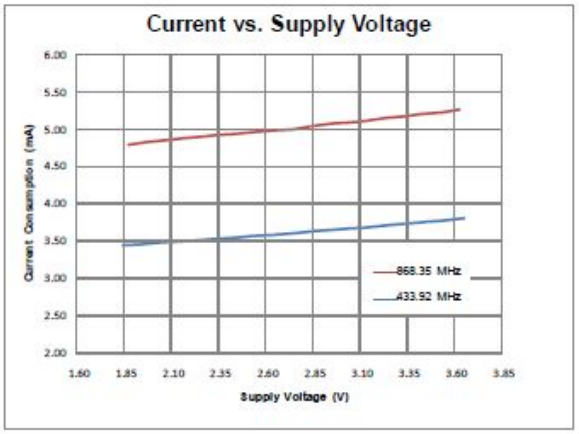


Figure 3. Current vs. Voltage, F_{RF} = 433.92 / 868.35 MHz, OOK, SR = 1 ksps

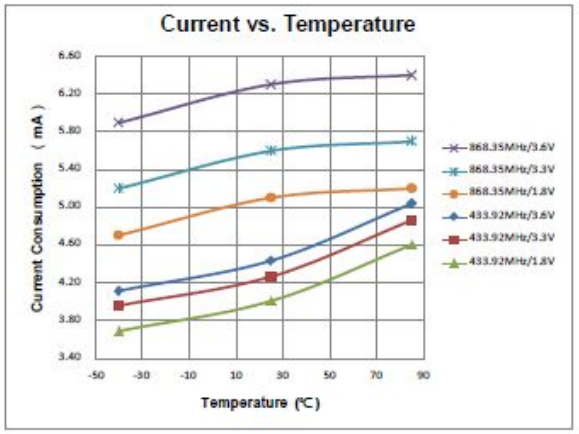


Figure 4. Current vs. Temperature, F_{RF} = 433.92 / 868.35 MHz, FSK, SR = 1 ksps

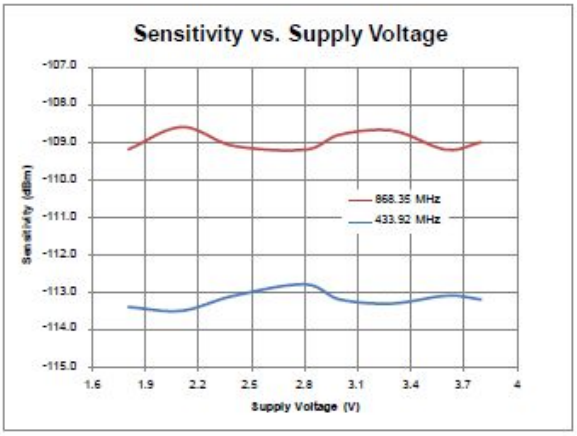


Figure 5. Sensitivity vs. Supply Voltage, SR = 1 ksps, OOK, BER = 0.1%

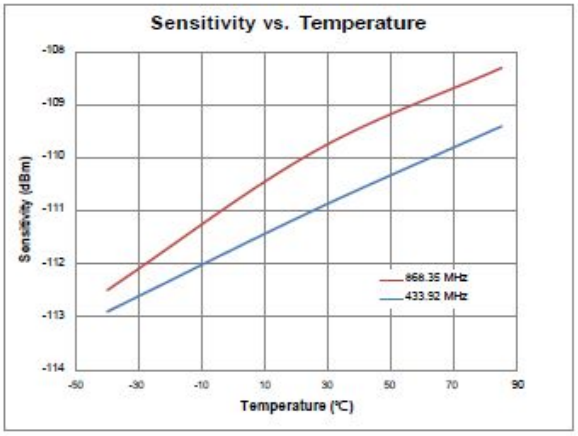


Figure 6. Sensitivity vs. Temperature, F_{RF} = 433.92 / 868.35 MHz, FSK, V_{DD} = 3.3 V, SR = 1 ksps, BER = 0.1%

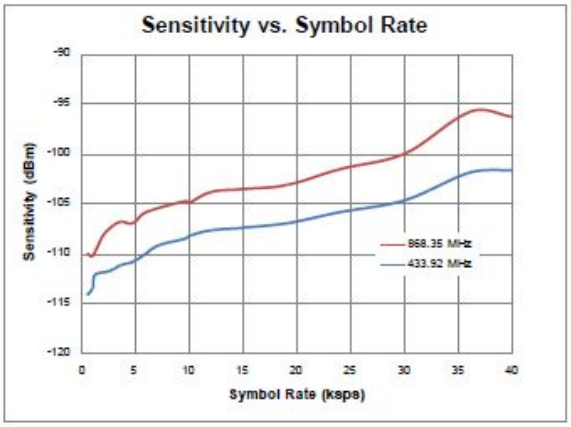


Figure 7. Sensitivity vs. SR, F_{RF} = 433.92 / 868.35 MHz, OOK, V_{DD} = 3.3 V, BER = 0.1%

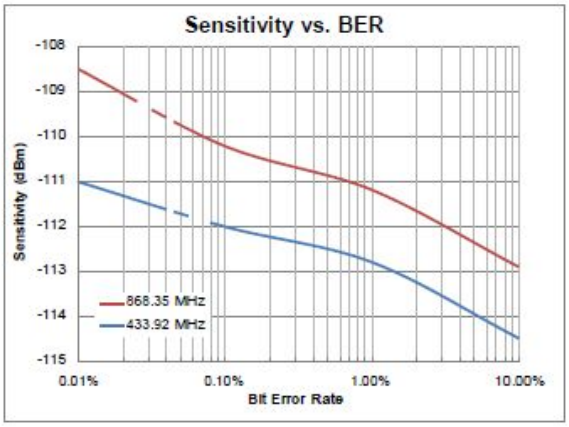


Figure 8. Sensitivity vs. BER, F_{RF} = 433.92 / 868.35 MHz, V_{DD} = 3.3 V, SR = 1 ksps

4. Typical Application Schematic

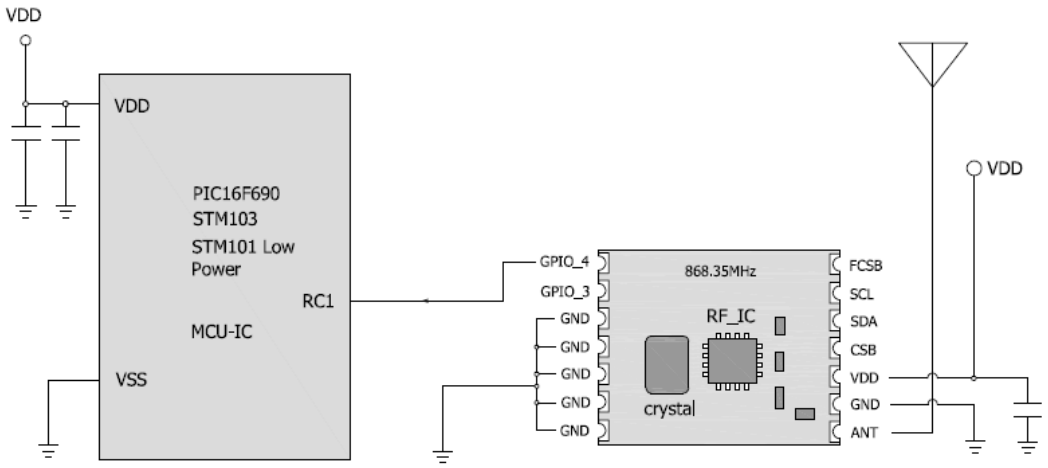


Figure 9: Typical Application Schematic

5. Functional Descriptions

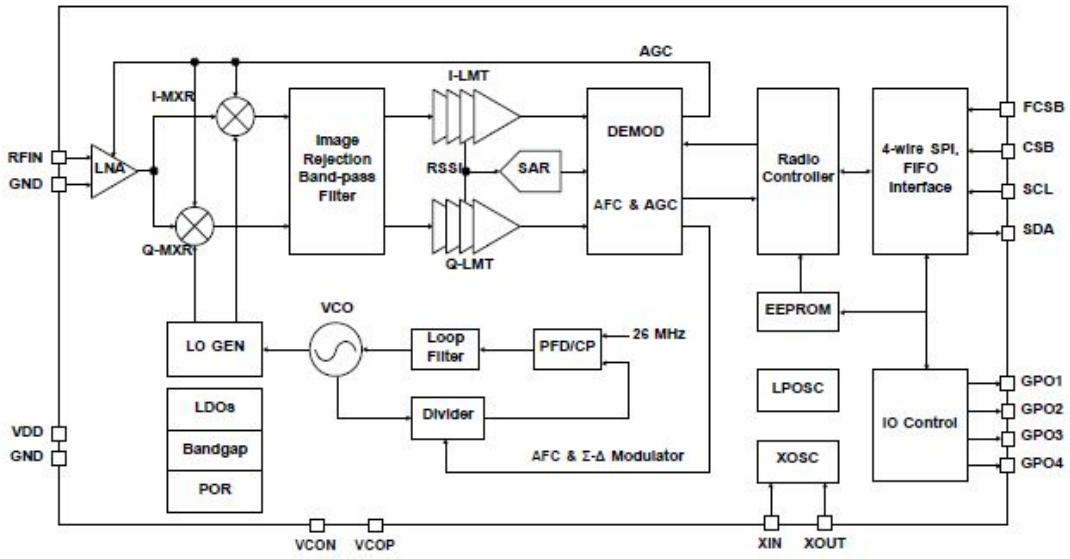


Figure 10. Functional Block Diagram

6. Package Outline