# wireless

Ultimate Long-Range, Low-Power Solutions

# **Wireless & RF** Selector Guide

- Excels in harsh environments
- Long range > 2-mile range in dense urban environments
  Up to 30 miles outdoor LOS
- Multi-year battery operation up to 20 years
- Scalable network with tens of thousands of nodes per gateway

www.semtech.com/wireless-rf

SEMTECH

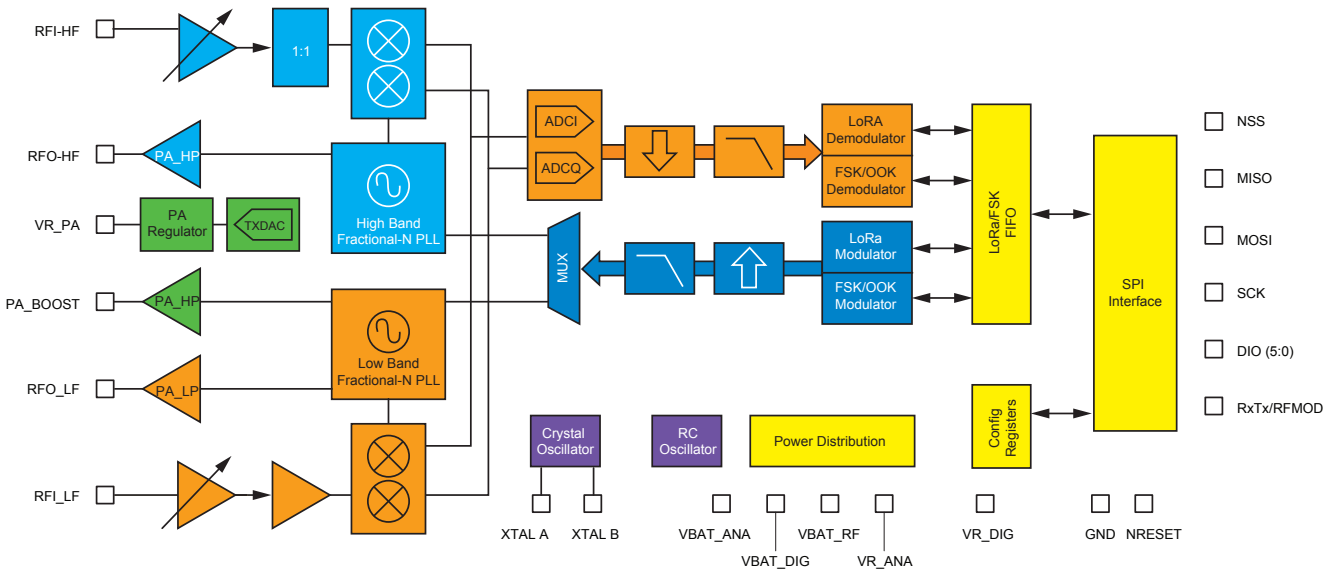
# LoRa® — The Ultimate Long-Range Solutions

## Ideal for eliminating repeaters, reducing infrastructure cost, extending battery lifetime, and improving network capacity

### LoRa PRODUCTS

- Long range of up to 30 miles outdoor line of sight
- Deep indoor coverage for hard to reach areas
- Bi-directional communication link with adaptive data rates
- Low power sensors with extended battery lifetime of up to 20 years
  - 100nA sleep mode
  - 9.7mA active receive mode
- LoRa, IEEE 802.15.4g and WMBus compliant.
- GFSK modes supported by a single radio
- Scalable, multi-channel, high-capacity gateways powered by SX1301
- Available for any environment
- LoRa modulation offers 30dB improvement over FSK for co-channel interference rejection
- Programmable registers for maximum flexibility
- Footprint-compatible ICs for global coverage
- Supported by over 400 members of LoRa Alliance™ that defines the open LoRaWAN protocol
- Large and growing online developer community for LoRa-based products
- Public, semi-private and private networks available worldwide

### SX1276 BLOCK DIAGRAM

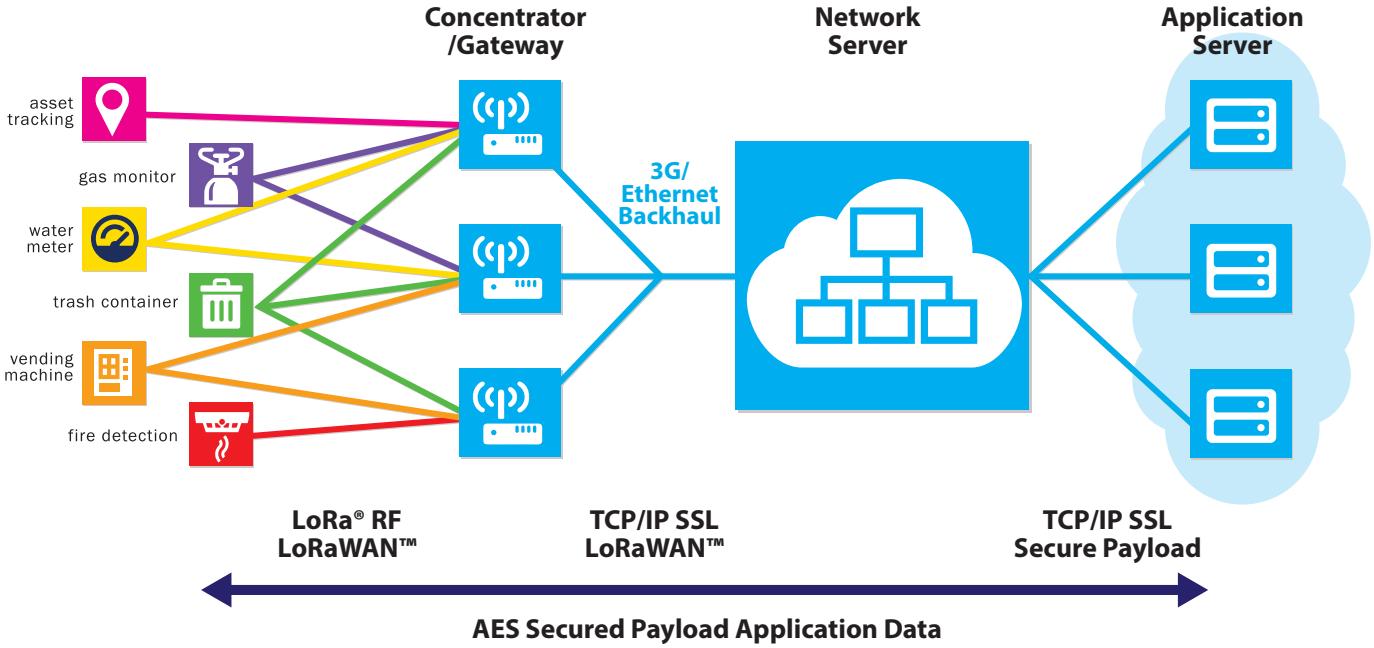



**LoRa Products**

| Part Number | Frequency Range (MHz) | Link Budget (dB) | RXCurrent (mA) | FSK Max DR (kbps) | LoRa DR (kbps) | Max Sensitivity (dBm) | TX Power (dBm) |
|---|---|---|---|---|---|---|---|
| SX1272 | 862–1020 | 158 | 10 | 300 | 0.3–40 | -138 | + 20 |
| SX1273 | 862–1020 | 150 | 10 | 300 | 1.7–40 | -130 | + 20 |
| SX1276 | 137–1020 | 168 | 11 | 300 | 0.018–40 | -148 | + 20 |
| SX1277 | 137–1020 | 158 | 11 | 300 | 1.7–40 | -138 | + 20 |
| SX1278 | 137–525 | 168 | 11 | 300 | 0.018–40 | -148 | + 20 |
| SX1279 | 137–960 | 168 | 11 | 300 | 0.018–40 | -148 | +20 |

# LoRa® Gateway/Concentrator Solution

## The ultimate long-range, high capacity solution for IoT and M2M networks




### KEY FEATURES OF SEMTECH'S LoRa WIRELESS RF TECHNOLOGY

| | |
|---|---|
| **Long Range** | Penetrates in dense urban and deep indoor environments, connecting to sensors up to 30 miles away in rural areas |
| **Low Power** | Designed specifically for low power consumption extending battery lifetime up to 20 years |
| **High Capacity** | Supports millions of messages per basestation |
| **Geolocation** | Enables GPS free, low power tracking applications |
| **Standardized** | LoRaWAN specification ensures global interoperability among applications, IoT solution providers and telecom operators |
| **Secure** | Embedded end-to-end AES-128 encryption of data for optimal privacy and protection |
| **Low Cost** | Reduces costs three ways: infrastructure investment, operating expenses and end-node sensors |

### PICOCELL SOLUTIONS

- LoRa Picocell Platforms are designed for a variety of indoor applications
- SX1308 picocell IC is coupled with a SX1255 or SX1257 LoRa RF transceiver, and is expected to help bring low cost LoRaWAN networks to market for consumers and private enterprises

### GATEWAY SOLUTIONS

- Multi-channel, multi-modem receiver including LoRa and FSK modems
- Inherent two-way communication
- Receives simultaneously different data rates on same channel

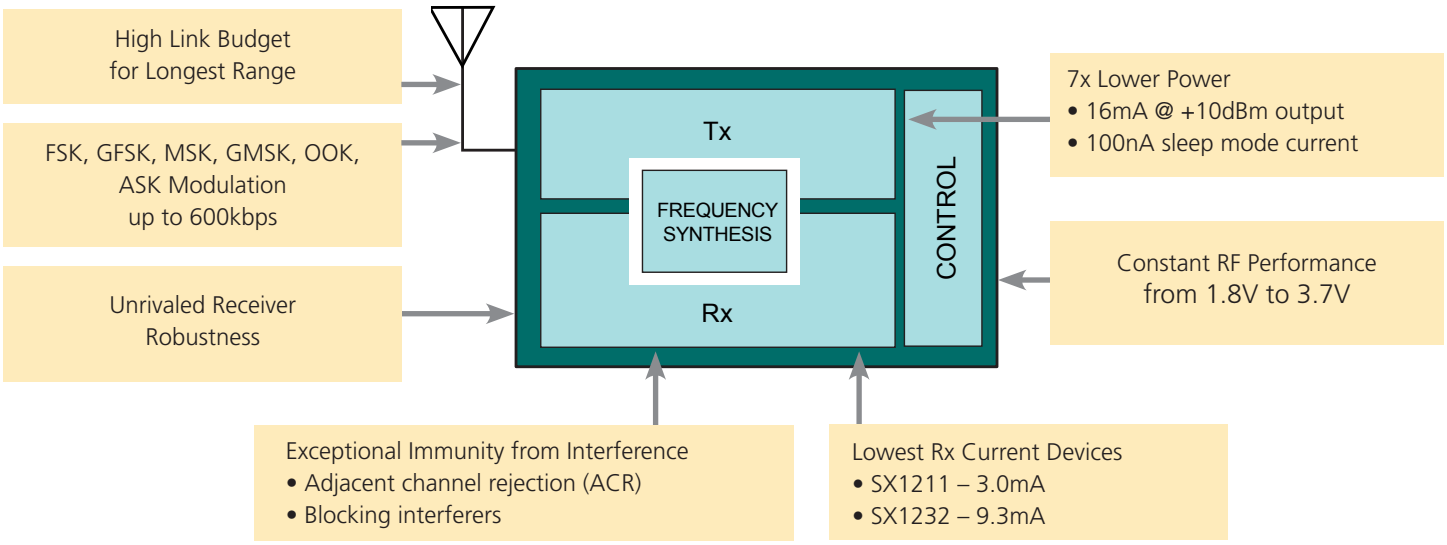
**RF ICs and for Gateway and Picocells**

| Part Number | Tx/Rx | Operating Temp. Range | LoRa Modem | FSK Modem | Capacity |
|---|---|---|---|---|---|
| SX1301 | Tx/Rx | -40– 85°C | 9 | 1 | Varies by application |
| SX1308 | Tx/Rx | 0–70°C | 9 | 1 | Varies by application |

**RF Transceivers**

| Part Number | Tx/Rx | Band (MHz) | Tx Power | NF |
|---|---|---|---|---|
| SX1257 | Tx/Rx | 860–1000 | -20–8 | 7 |
| SX1255 | Tx/Rx | 400–510 | -20–8 | 7 |

# Robust, Low-Power Communications For Next-Generation ISM-Band Applications




## Complete Line of Semtech G/F/MSK & OOK RF ICs

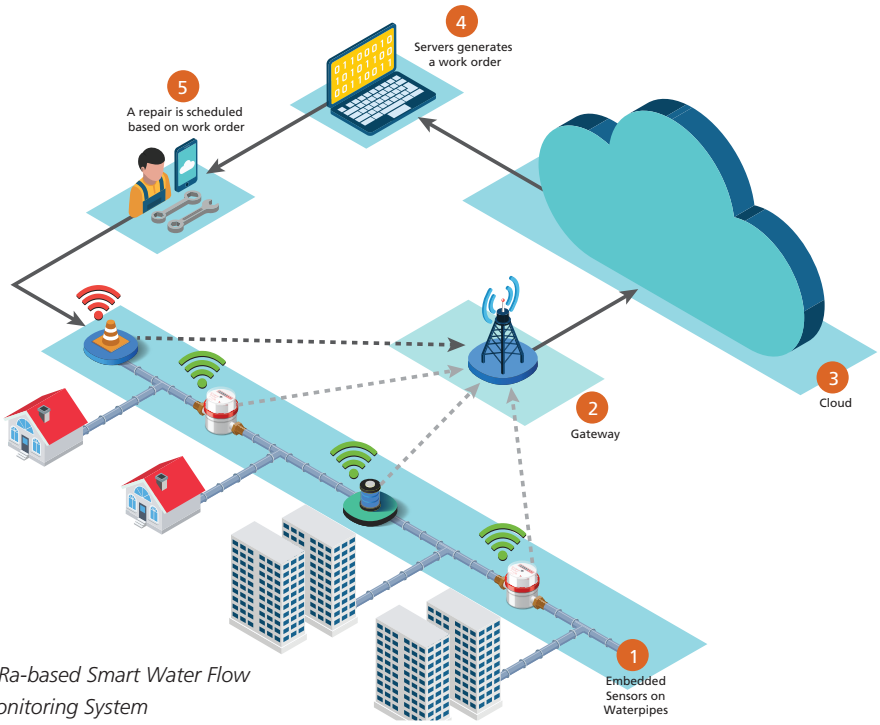
| Part Number | Tx/Rx | Band (MHz) | Tx Power (dBm) | Modulation | Max Bit Rate | Rx Sensitivity (dBm) | Link Budget (dB) | Tx Current | Rx Current (mA) |
|---|---|---|---|---|---|---|---|---|---|
| SX1230 | Tx | 290–1000 | -20 ~ 17 | G/F/MSK & OOK | 300kbps (FSK) 32.7kbps (OOK) | - | - | 33mA @ 10dBm | - |
| SX1243 | Tx | 310–928 | 10 | G/F/MSK & OOK | 100kbps (FSK) 10kbps (OOK | - | - | 15mA @ 10dBm | - |
| SX1239 | Rx | 290–1000 | -20 ~ 17 | G/F/MSK & OOK | 300kbps (FSK) 32.7kbps (OOK) | -120 | - | - | 16 |
| SX1231 | Tx/Rx | 290–1000 | -20 ~ 17 | G/F/MSK & OOK | 300kbps (FSK) 32.7kbps (OOK) | -120 | 137 | 33mA @ 10dBm | 16 |
| SX1231H | Tx/Rx | 290–1000 | -20 ~ 20 | G/F/MSK & OOK | 600kbps (FSK) 32.7kbps (OOK) | -120 | 140 | 120mA @ 20dBm | 16 |
| SX1232 | Tx/Rx | 860–1000 | -20 ~ 20 | G/F/MSK & OOK | 300kbps (FSK) 32.7kbps (OOK) | -123 | 143 | 120mA @ 20dBm | 9.3 |
| SX1236 | Tx/Rx | 137–1020 | -20 ~ 20 | G/F/MSK & OOK | 300kbps (FSK) 32.7kbps (OOK) | -123 | 143 | 120mA @ 20dBm | 9.9 |
| SX1233 | Tx/Rx | 290–1000 | -20 ~ 17 | G/F/MSK & OOK | 600kbps (FSK) 32.7kbps (OOK) | -120 | 137 | 33mA @ 10dBm | 16 |
| ETSI Class 1 SX1235 | Tx/Rx | 860–1000 | -20 ~ 20 | G/F/MSK & OOK | 300kbps (FSK) | -123 | 143 | 120mA @ 20dBm | 9.3 |
| SX1211 | Tx/Rx | 862–960 | -8.5 ~ +12.5 | FSK/OOK/ASK | 200kbps (FSK) 32.7kbps (OOK) | -107 | 120 | 25mA @ 10dBm | 3 |

## High Tx Power Devices

| Part Number | Tx/Rx | Band (MHz) | Tx Power (dBm) | Modulation | Max Bit Rate | Rx Sensitivity (dBm) | Link Budget (dB) | Tx Current | Rx Current (mA) |
|---|---|---|---|---|---|---|---|---|---|
| SX1238 | Tx/Rx | 902 – 928 | +27 | G/F/MSK & OOK | 300kbps | -124 | 151 | 408mA @ 27dBm | +20 |

# Transform the Grid with LoRa-based Smart Meters and Smart Sensors

With over 20 years of experience providing RF communications and sensing ICs for battery-operated water and gas meters. Semtech offers the widest range of RF ICs for ultra long range, narrow-band, and wide-band machine-to-machine (M2M) communications.




*LoRa-based Smart Water Flow Monitoring System*

### High-Link Budget

- 30dB higher than competing devices when using a low-cost BOM

### High Rx Sensitivity Solutions

### 7x Lower Power Consumption

- 100nA sleep
- 2.5mA Rx
- 27mA @ +13dBm Tx

### Support for Major Wireless Communications Protocols

- IEEE 802.15.4g
- Wireless M-Bus
- 6LoWPAN

### Ultra-low Rx Current Consumption

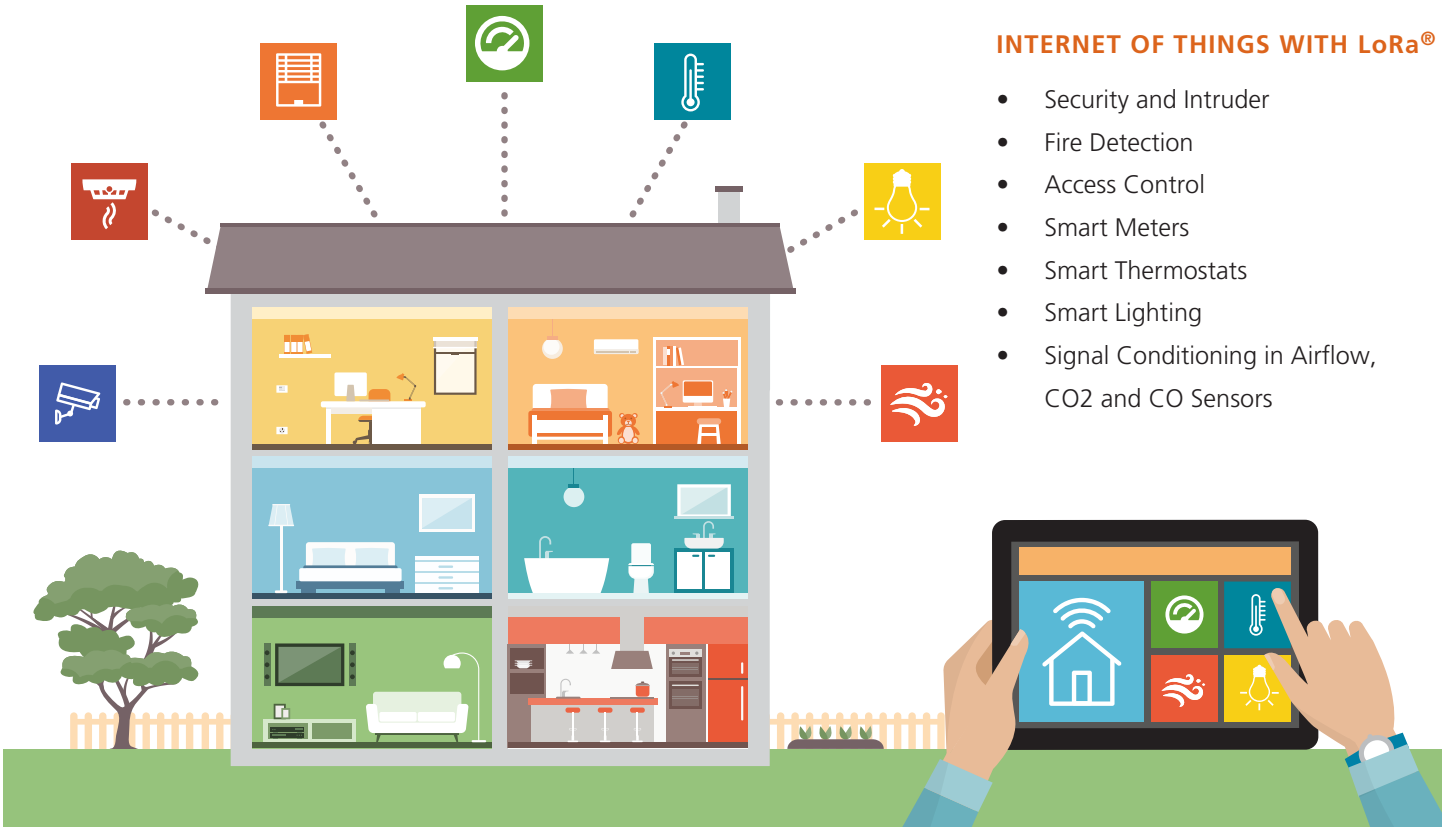
- <3mA
- Up to 7x lower than competing devices

**RF ICs for Smart Energy Meters and Smart Sensors**

| Part Number | Description | Link Budget (dB) | Rx Current (mA) | Evaluation Kit |
|---|---|---|---|---|
| SX1232 | 860–11020MHz Low Power G/FSK/OOK/ASK RF Transceiver | 143 | 9.3 | SX1232-32SKA868/915 |
| SX1272 | 860–11020MHz Long Range LoRa G/FSK Transceiver | 158 | 10 | SX1272DVK1BAS (868MHz)<br>SX1272DVK1CAS (915MHz) |
| SX1273 | 860–11020MHz Long Range LoRa G/FSK Transceiver | 150 | 10 | SX1272DVK |
| SX1276 | 138–11020MHz Long Range LoRa G/FSK Transceiver | 168 | 9.9 | SX1276DVK1IAS (169/868MHz)<br>SX1276DVK1IAS (433/868MHz)<br>SX1276DVK1IAS (490/915MHz) |
| SX1277 | 138–11020MHz Long Range LoRa G/FSK Transceiver | 158 | 9.9 | SX1276DVK |
| SX1278 | 138–1510MHz Long Range LoRa G/FSK Transceiver | 168 | 9.9 | SX1276DVK |
| SX1279 | 138–1960MHz Long Range LoRa G/FSK Transceiver | 168 | 9.9 | SX1276DVK |
| SX1231 | 290–11000MHz G/FSK/OOK/ASK RF Transceiver | 140 | 16 | SX1231SKB433/868/915 |
| SX1233 | 290–11000MHz G/FSK/OOK/ASK RF Transceiver | 140 | 16 | SX1233-33SKA868/915 |
| SX1211 | 862–1960 MHz Low Power FSK/OOK/ASK RF Transceiver | 125 | 3 | SX1211SKA868/915 |
| SX1212 | 310–510 MHz Low Power FSK/OOK/ASK RF Transceiver | 122.5 | 3 | SX1212SKA868/915 |

# Green Solutions for Smart Homes and Buildings

Semtech breaks the cost and quality of service entry barriers for smart, energy-efficient residential and commercial buildings with 7x lower power consumption and unrivaled RF link robustness.



### INTERNET OF THINGS WITH LoRa®

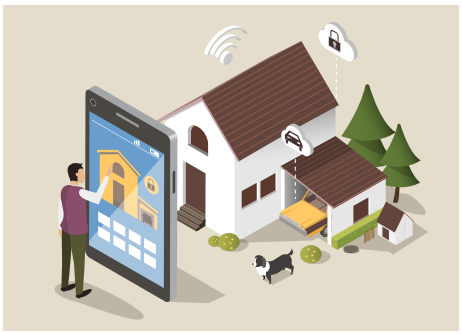
- Security and Intruder
- Fire Detection
- Access Control
- Smart Meters
- Smart Thermostats
- Smart Lighting
- Signal Conditioning in Airflow, CO2 and CO Sensors

**RF ICs for Residential and Commercial Building Applications**

| Part Number | Description | Package (mm) | Evaluation Kit |
|---|---|---|---|
| SX1230 | 290MHz–11GHz FSK/OOK/ASK RF Transmitter | QFN 4x4 | SX1230SKA433/868/915 |
| SX1243 | 310MHz–1928MHz Low Cost FSK/OOK/ASK RF Transmitter | DFN 2x3 | SX1243SKA433/868/915 |
| SX1239 | 290MHz–11GHz FSK/OOK/ASK RF Receiver | QFN 5x5 | SX1231SKB433/868/915 |
| SX1231 | 290MHz–11GHz FSK/OOK/ASK RF Transceiver | QFN 5x5 | SX1231SKB433/868/915 |
| SX1231H | 290MHz–11GHz FSK/OOK/ASK RF Transceiver | QFN 5x5 | SX1231SKB433/868/915 |
| SX1232 | 868MHz & 915MHz FSK/OOK/ASK RF Transceiver | QFN 5x5 | SX1232-32SKA868/915 |
| SX1233 | 290MHz–11GHz FSK/OOK/ASK RF Transceiver | QFN 5x5 | SX1233-33SKA868/915 |
| SX1236 | 137–11000 Dual band/RF Input Transceiver | QFN 6x6 | SX1276DVK1JAS SX1276DVK1KAS |
| SX1211 | 862MHz–1960MHz FSK/OOK/ASK RF Transceiver | QFN 5x5 | SX1211SKA868/915 |
| SX1212 | 310MHz–1510MHz FSK/OOK/ASK RF Transceiver | QFN 5x5 | SX1212SKA433 |
| SX1208 | 290MHz–1510MHz GFSK/GMSK/OOK RF Transceiver | QFN 5x5 | - |

# Design Ultra-Low Power, Highly-Secure RKE and Active RFID Systems

Semtech offers highly-integrated, cost-effective, turn-key RF solutions for emerging wireless applications requiring ultra-low power consumption, very high link budgets and secure data transmission.



## REMOTE KEYLESS ENTRY (RKE) SYSTEMS

- One-way and two-way, non-line-of-sight systems
- Garage door openers
- Car alarms and remote starters

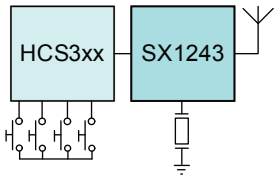
## DASH7 SUPPORT FOR ACTIVE RFID SYSTEMS

- Container shipment and asset tracking systems
- Patient monitoring systems
- Social alarms

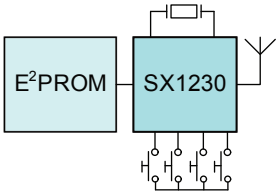
## DESIGN SUPPORT TOOLS AND PARTNER SOLUTIONS

- Microchip RKE reference design
- Semtech wireless remote control energy harvesting reference design

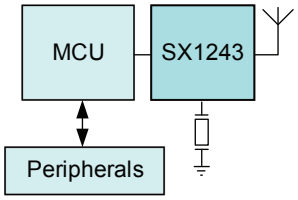
## SEMTECH TURN-KEY RF SOLUTIONS BALANCE DESIGN COST AND FLEXIBILITY NEEDS (SX1243)



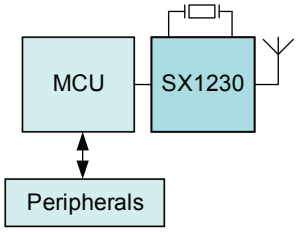

Rolling Code Reference Design




Static Payload Reference Design




Low-Cost Tx Solution




Fully Programable Digital Tx

**RF ICs for Remote Keyless Entry and Active RFID Systems**

| Part Number | Description | Application | Package (mm) | Evaluation Kit |
|---|---|---|---|---|
| SX1230 | 290MHz–11GHz FSK/OOK/ASK RF Transmitter | 1-way remote control (MCU-less mode) | QFN 4x4 | SX1230SKA433/868/915 |
| SX1243 | 310MHz–1928MHz Low Cost FSK/OOK/ASK RF Transmitter | 1-way remote control | DFN 2x3 | SX1243SKA433/868/915 |
| SX1239 | 290MHz–11GHz FSK/OOK/ASK RF Receiver | 1-way remote control | QFN 5x5 | SX1231SKB433/868/915 |
| SX1231 | 290MHz–11GHz FSK/OOK/ASK RF Transceiver | 2-way remote control | QFN 5x5 | SX1231SKB433/868/915 |
| SX1231H | 290MHz–11GHz FSK/OOK/ASK RF Transceiver | 2-way remote control | QFN 5x5 | SX1231SKB433/868/915 |
| SX1212 | 310MHz–1510MHz FSK/OOK/ASK RF Transceiver | DASH7 Technology | QFN 5x5 | SX1212-DK7A433 |

# Application-Specific RF Evaluation Kits

## Tx/Rx Kits with LoRa®

| Part Number | Description | Frequency band | Kit contents | Evaluation Kit |
|---|---|---|---|---|
| SX1272 | Low-Power RF Transceiver 860–1020MHz with LoRa Modem | 868MHz/915MHz | 2 SX1272 Demo units, PER | SX1272DVK1BAS (868MHz)<br>SX1272DVK1CAS (915MHz) |
| SX1273 | Low-Power RF Transceiver 860–1020MHz with LoRa Modem | 868MHz/915MHz | 2 SX1272 Demo units, PER | Use SX1272 kit (SX1272 is a superset) |
| SX1276 | Low-Power RF Transceiver 138–1020MHz with LoRa Modem | 137MHz–1020MHz | 2 SX1276 Demo units, PER | SX1276DVK1IAS<br>(169MHz and 868MHz) |
| | Low-Power RF Transceiver 138–1020MHz with LoRa Modem | 137MHz–1020MHz | 2 SX1276 Demo units, PER | SX1276DVK1JAS<br>(433MHz and 868MHz) |
| | Low-Power RF Transceiver 138–1020MHz with LoRa Modem | 137MHz–1020MHz | 2 SX1276 Demo units, PER | SX1276DVK1KAS<br>(490MHz and 915MHz) |
| SX1277 | Low-Power RF Transceiver 138–1020MHz with LoRa Modem | 137MHz–1020MHz | 2 SX1276 Demo units, PER | Use SX1276 kit (SX1276 is a superset) |
| SX1278 | Low-Power RF Transceiver 138–510MHz with LoRa Modem | 137MHz–510MHz | 2 SX1276 Demo units, PER | Use SX1276 kit (SX1276 is a superset) |

## G/F/MSK & OOK Kits

| | | | | |
|---|---|---|---|---|
| SX1211 | Ultra-Low Power RF Transceiver 862–960MHz | 868MHz/915MHz | Single USB dongle | SX1211SKA868/SX1211SKA915 |
| | Ultra-Low Power RF Transceiver 862–960MHz | 868MHz/915MHz | 2 USB dongle, PER | SX1211-11SKA868/SX1211-11SKA915 |
| | Ultra-Low Power RF Transceiver 862–960MHz | 868MHz/915MHz | 1 SM module | SM1211E868/SM1211E915 |
| SX1212 | Ultra-Low Power RF Transceiver 310–510MHz | 433MHz | Dash7 dev kit | SX1212-DK7A433 |
| | Ultra-Low Power RF Transceiver 310–510MHz | 433MHz | Single USB dongle | SX1212SKA433 |
| | Ultra-Low Power RF Transceiver 310–510MHz | 433MHz | 2 USB dongle, PER | SX1212-12SKA433 |
| | Ultra-Low Power RF Transceiver 310–510MHz | 433MHz | 1 SM module | SM1212E433 |
| SX1231 | Low-Power Integrated RF Transceiver 290–1000MHz | 433MHz/868MHz/ 915MHz | 1 SM module | SM1231E433A/SM1231E868A / SM1231E915A |
| | Low-Power Integrated RF Transceiver 290–1000MHz | 433MHz/868MHz/ 915MHz | 1 SM module + interface board | SX1231SKB433/SX1231SKB868/ SX1231SKB915 |
| | Low-Power Integrated RF Transceiver 290–1000MHz | 433MHz/868MHz/ 915MHz | 2 SM modules + interface boards | SX1231-31SKB433/SX1231-31SKB868/ SX1231-31SKB915 |
| SX1232 | Low-Power Integrated RF Transceiver 868/915MHz | 868MHz/915MHz | 2 SM modules + interface boards | SX1232-32SKA868/SX1232-32SKA915 |
| SX1233 | Low-Power Integrated RF Transceiver 290–1000MHz | 868MHz/915MHz | 1 SM module | SM1233E868B/SM1233E915B |
| | Low-Power Integrated RF Transceiver 290–1000MHz | 868MHz/915MHz | 1 SM module + interface board | SX1233SKA868/SX1233SKA915 |
| | Low-Power Integrated RF Transceiver 290-1000MHz | 868MHz/915MHz | 2 SM modules + interface boards | SX1233-33SKA868/SX1233-33SKA915 |
| SX1239 | Low-Power Integrated RF Receiver 290–1000MHz | 433MHz/868MHz/ 915MHz | 1 SM module | SM1231E433A / SM1231E868A / SM1231E915A |
| | Low-Power Integrated RF Receiver 290–1000MHz | 433MHz / 868MHz / 915MHz | 1 SM module + interface board | SX1231SKB433/SX1231SKB868 / SX1231SKB915 |
| | Low-Power Integrated RF Receiver 290–1000MHz | 433MHz/868MHz/ 915MHz | 2 SM modules + interface boards | SX1231-31SKB433/SX1231-31SKB868/ SX1231-31SKB915 |
| SX1243 | Low-Cost, Low-Current Integrated Transmitter 310–928MHz | 433MHz/868MHz/ 915MHz | USB Dongle with SM module | SX1243SKA433/SX1243SKA868/ SX1243SKA915 |

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Адрес: 105318, г.Москва, ул.Щербаковская д.3, офис 1107

**Данный компонент на территории Российской Федерации**

**Вы можете приобрести в компании MosChip.**

Для оперативного оформления запроса Вам необходимо перейти по данной ссылке:

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Вы можете разместить у нас заказ для любого Вашего проекта, будь то серийное производство или разработка единичного прибора.

В нашем ассортименте представлены ведущие мировые производители активных и пассивных электронных компонентов.

Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

**Офис по работе с юридическими лицами:**

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: info@moschip.ru

Skype отдела продаж:
moschip.ru
moschip.ru_4
moschip.ru_6
moschip.ru_9