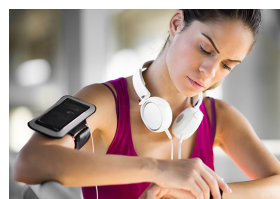




wireless



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

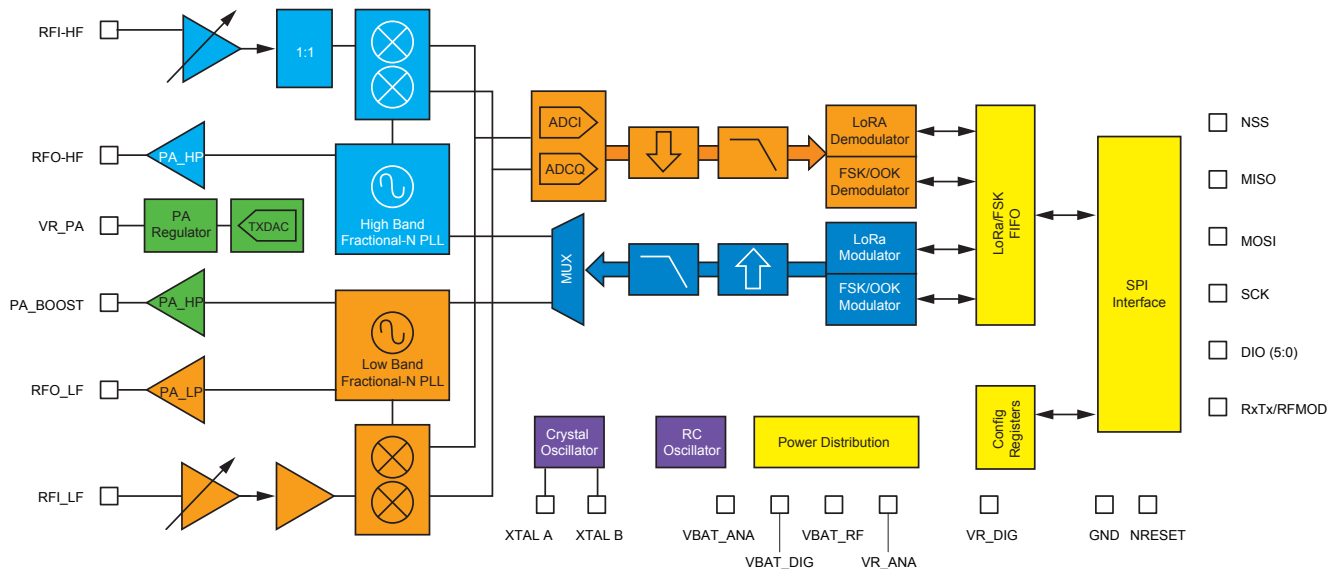
# LoRa® — The Ultimate Long-Range Solutions

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

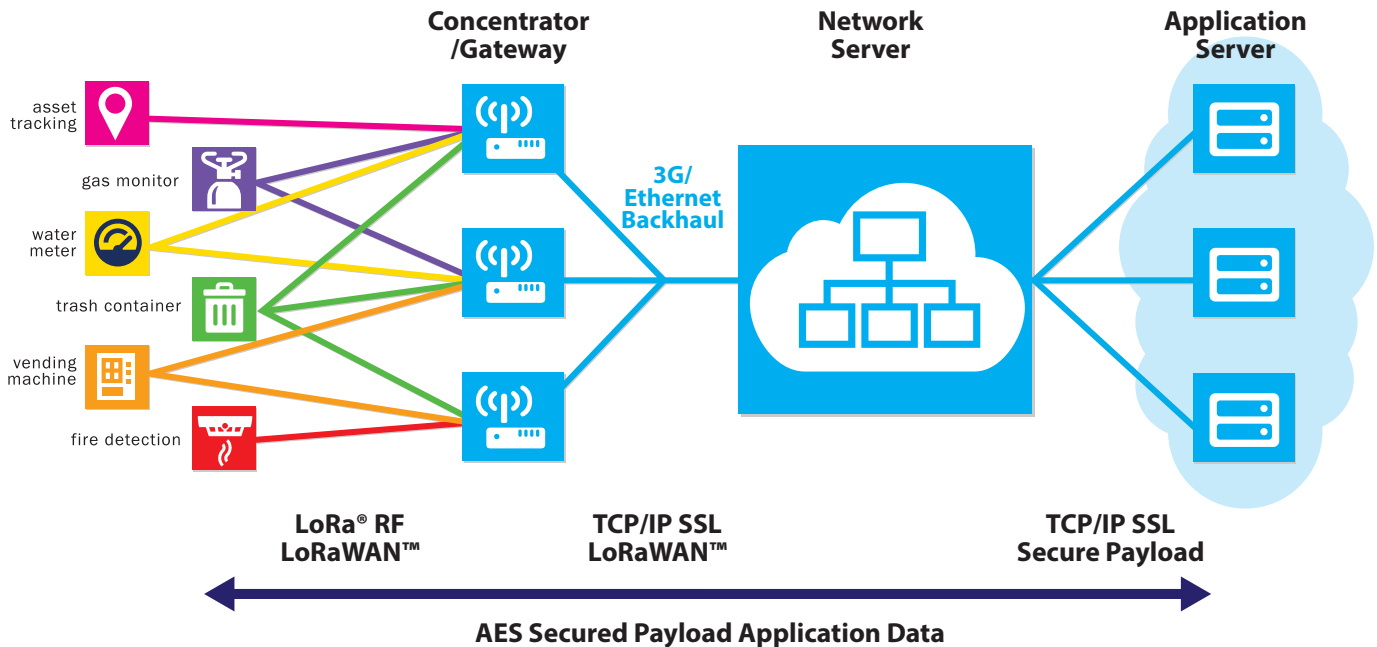
## SX1276 BLOCK DIAGRAM



| 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

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

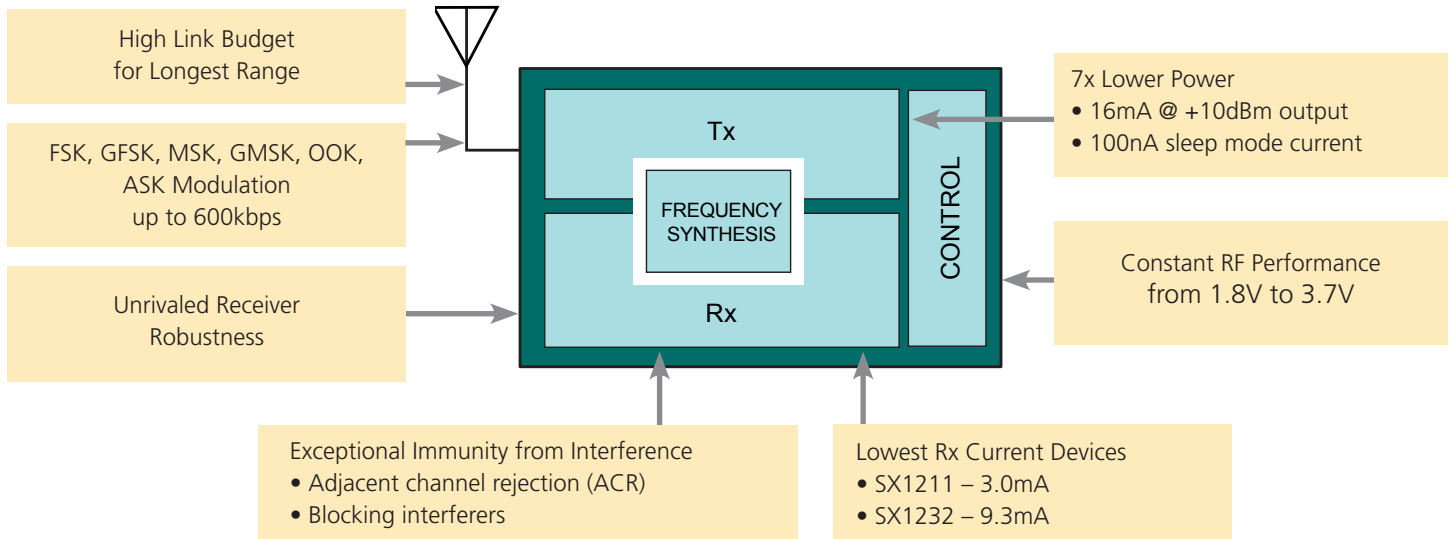
## GATEWAY SOLUTIONS

- 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

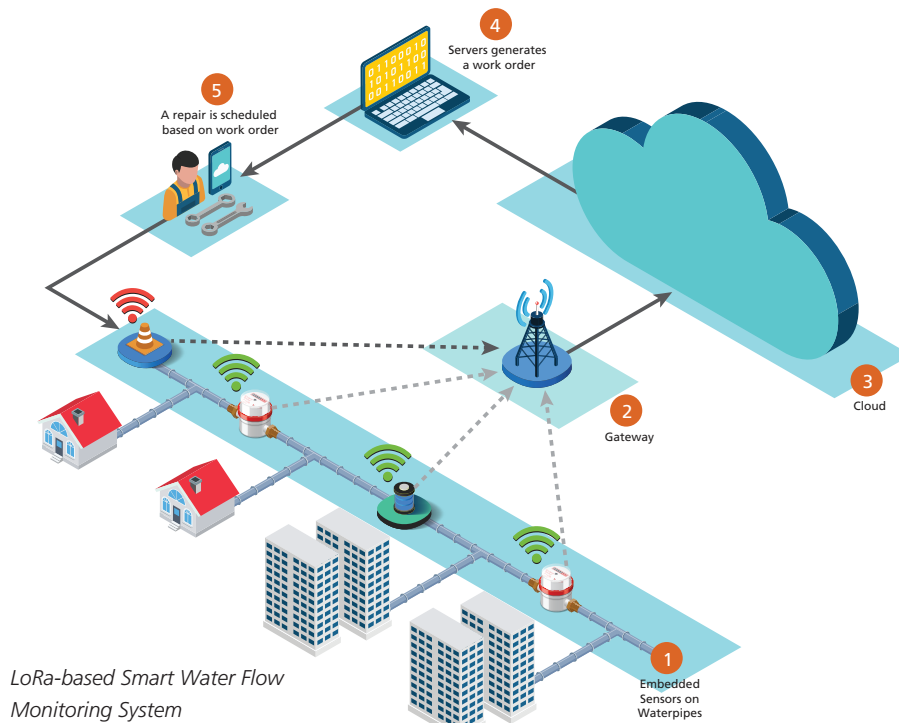
| Part Number         | Tx/Rx | Band (MHz) | Tx Power (dBm) | Modulation    | Max Bit Rate                    | Rx Sensitivity (dBm) | Link Budget (dB) | Tx Current    | Rx Current (mA) |
|---------------------|-------|------------|----------------|---------------|---------------------------------|----------------------|------------------|---------------|-----------------|
| SX1230              | Tx    | 290–1000   | -20 ~ 17       | G/F/MSK & OOK | 300kbps (FSK)<br>32.7kbps (OOK) | -                    | -                | 33mA @ 10dBm  | -               |
| SX1243              | Tx    | 310–928    | 10             | G/F/MSK & OOK | 100kbps (FSK)<br>10kbps (OOK)   | -                    | -                | 15mA @ 10dBm  | -               |
| SX1239              | Rx    | 290–1000   | -20 ~ 17       | G/F/MSK & OOK | 300kbps (FSK)<br>32.7kbps (OOK) | -120                 | -                | -             | 16              |
| SX1231              | Tx/Rx | 290–1000   | -20 ~ 17       | G/F/MSK & OOK | 300kbps (FSK)<br>32.7kbps (OOK) | -120                 | 137              | 33mA @ 10dBm  | 16              |
| SX1231H             | Tx/Rx | 290–1000   | -20 ~ 20       | G/F/MSK & OOK | 600kbps (FSK)<br>32.7kbps (OOK) | -120                 | 140              | 120mA @ 20dBm | 16              |
| SX1232              | Tx/Rx | 860–1000   | -20 ~ 20       | G/F/MSK & OOK | 300kbps (FSK)<br>32.7kbps (OOK) | -123                 | 143              | 120mA @ 20dBm | 9.3             |
| SX1236              | Tx/Rx | 137–1020   | -20 ~ 20       | G/F/MSK & OOK | 300kbps (FSK)<br>32.7kbps (OOK) | -123                 | 143              | 120mA @ 20dBm | 9.9             |
| SX1233              | Tx/Rx | 290–1000   | -20 ~ 17       | G/F/MSK & OOK | 600kbps (FSK)<br>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)<br>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.



## 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

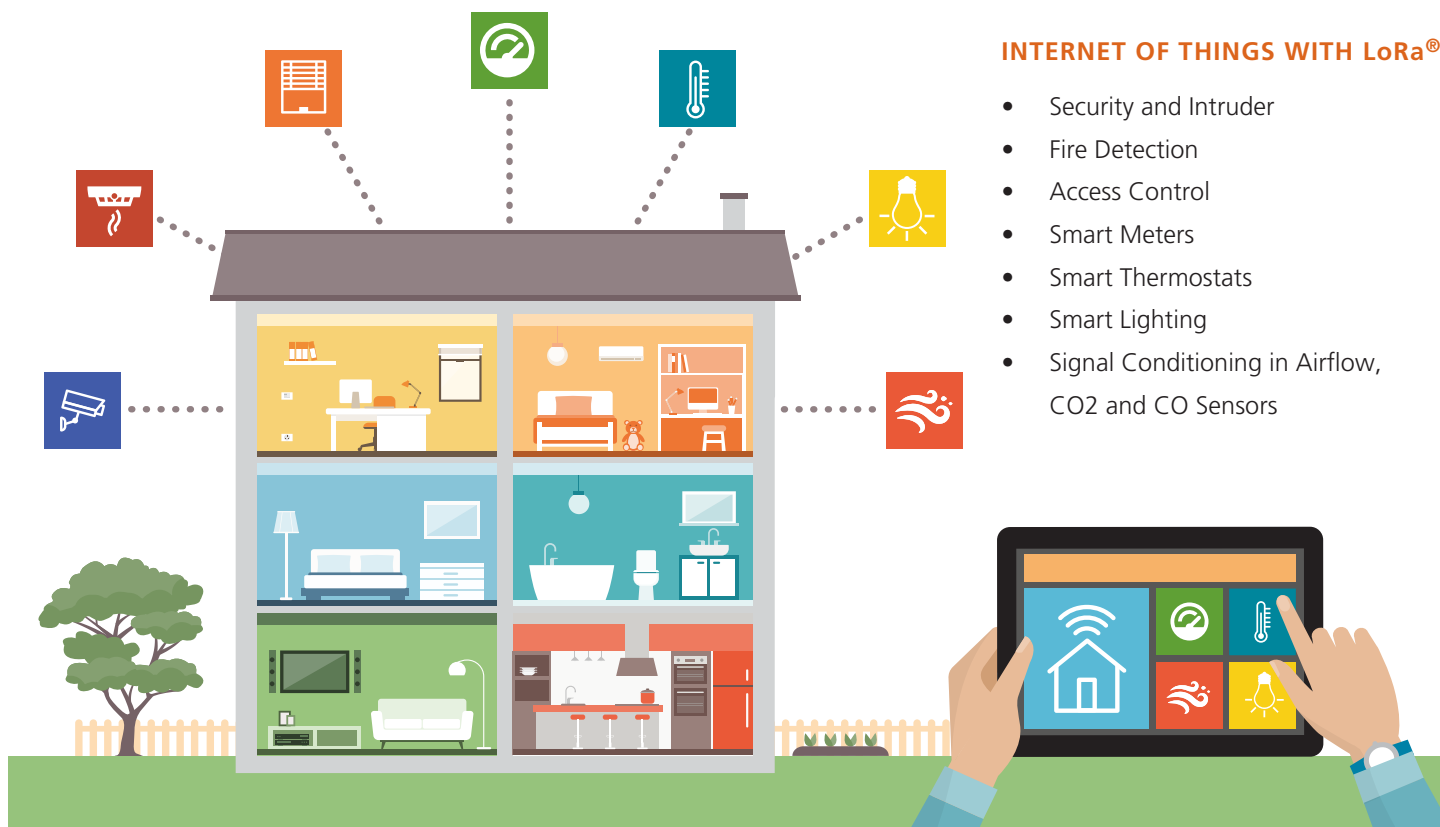
- <3mA
- Up to 7x lower than competing devices

## 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.

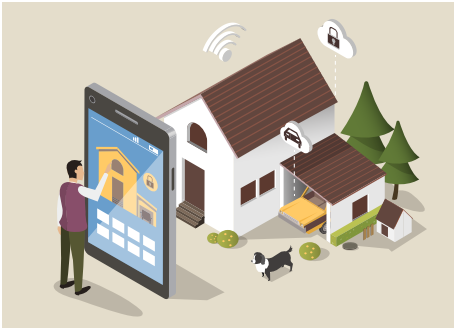


## RF ICs for Residential and Commercial Building Applications

| 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

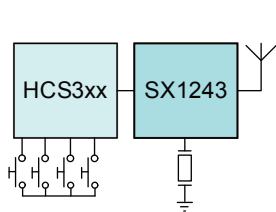
- Container shipment and asset tracking systems
- Patient monitoring systems
- Social alarms



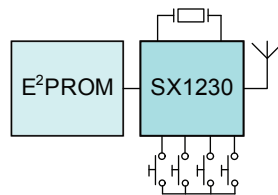
## DESIGN SUPPORT TOOLS AND PARTNER SOLUTIONS

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

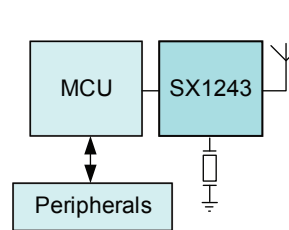
## SEMTECH TURN-KEY RF SOLUTIONS BALANCE DESIGN COST AND FLEXIBILITY NEEDS (SX1243)



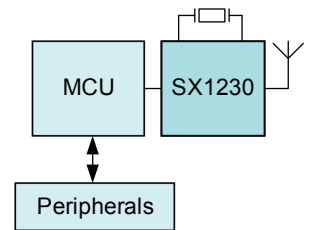
Rolling Code Reference Design



Static Payload Reference Design



Low-Cost Tx Solution



Fully Programmable 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 (169MHz and 868MHz)                |
|                       | Low-Power RF Transceiver 138–1020MHz with LoRa Modem    | 137MHz–1020MHz           | 2 SX1276 Demo units, PER        | SX1276DVK1JAS (433MHz and 868MHz)                |
|                       | Low-Power RF Transceiver 138–1020MHz with LoRa Modem    | 137MHz–1020MHz           | 2 SX1276 Demo units, PER        | SX1276DVK1KAS (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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## Данный компонент на территории Российской Федерации

**Вы можете приобрести в компании MosChip.**

Для оперативного оформления запроса Вам необходимо перейти по данной ссылке:

<http://moschip.ru/get-element>

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

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