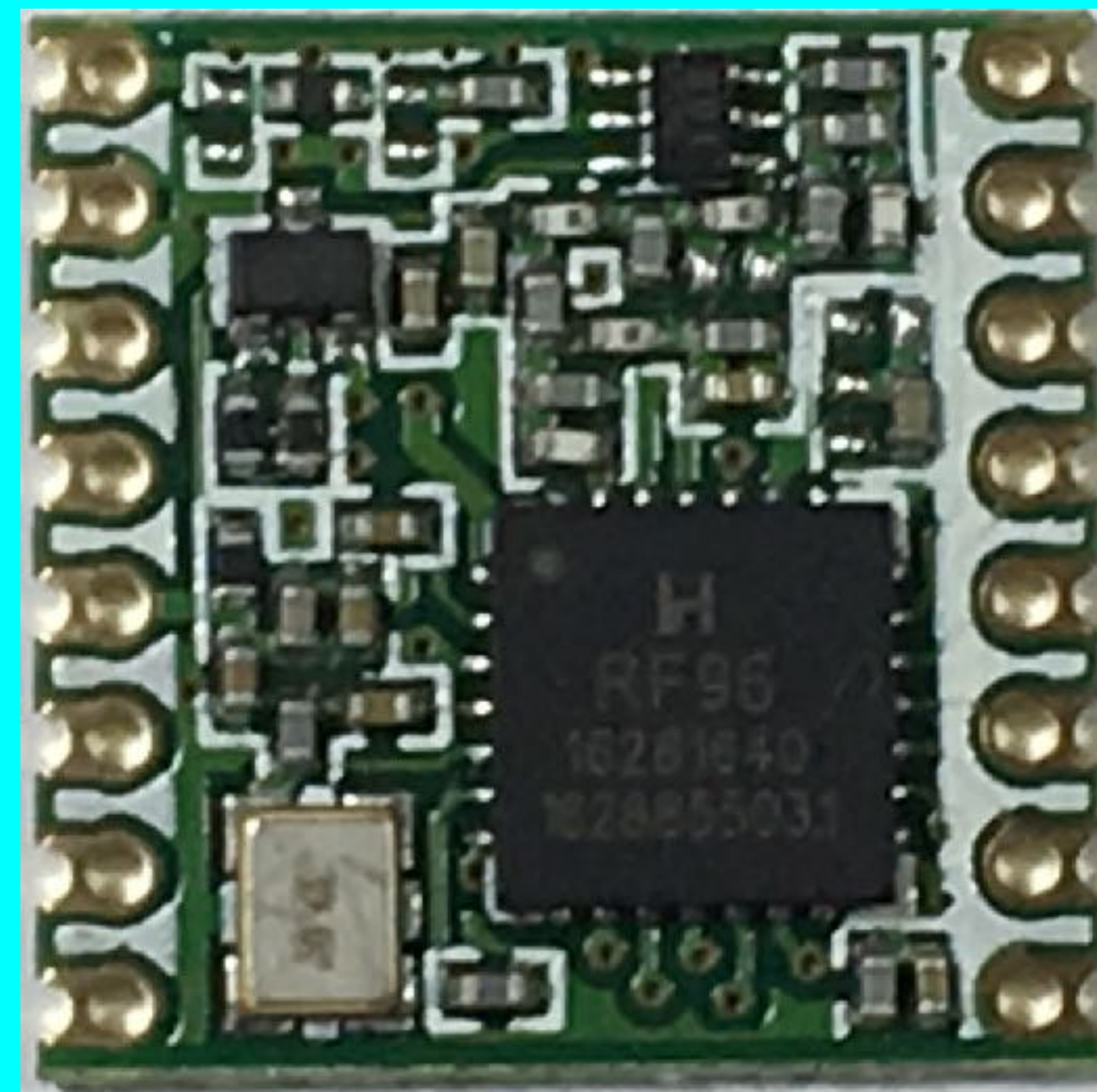


LORA / LORAWAN TUTORIAL 18

LoRa Chips



INTRO

- In this tutorial I will discuss the different LoRa chips.

LORA RF MODULES

- LoRa chips can be divided into two types:
 - Chips which are used in gateways.
 - Chips which are used in end nodes.
- Semtech owns the LoRa Intellectual Property (IP), but has licensed the IP to other chip manufacturers like Microchip, STMicroelectronics and HopeRF.

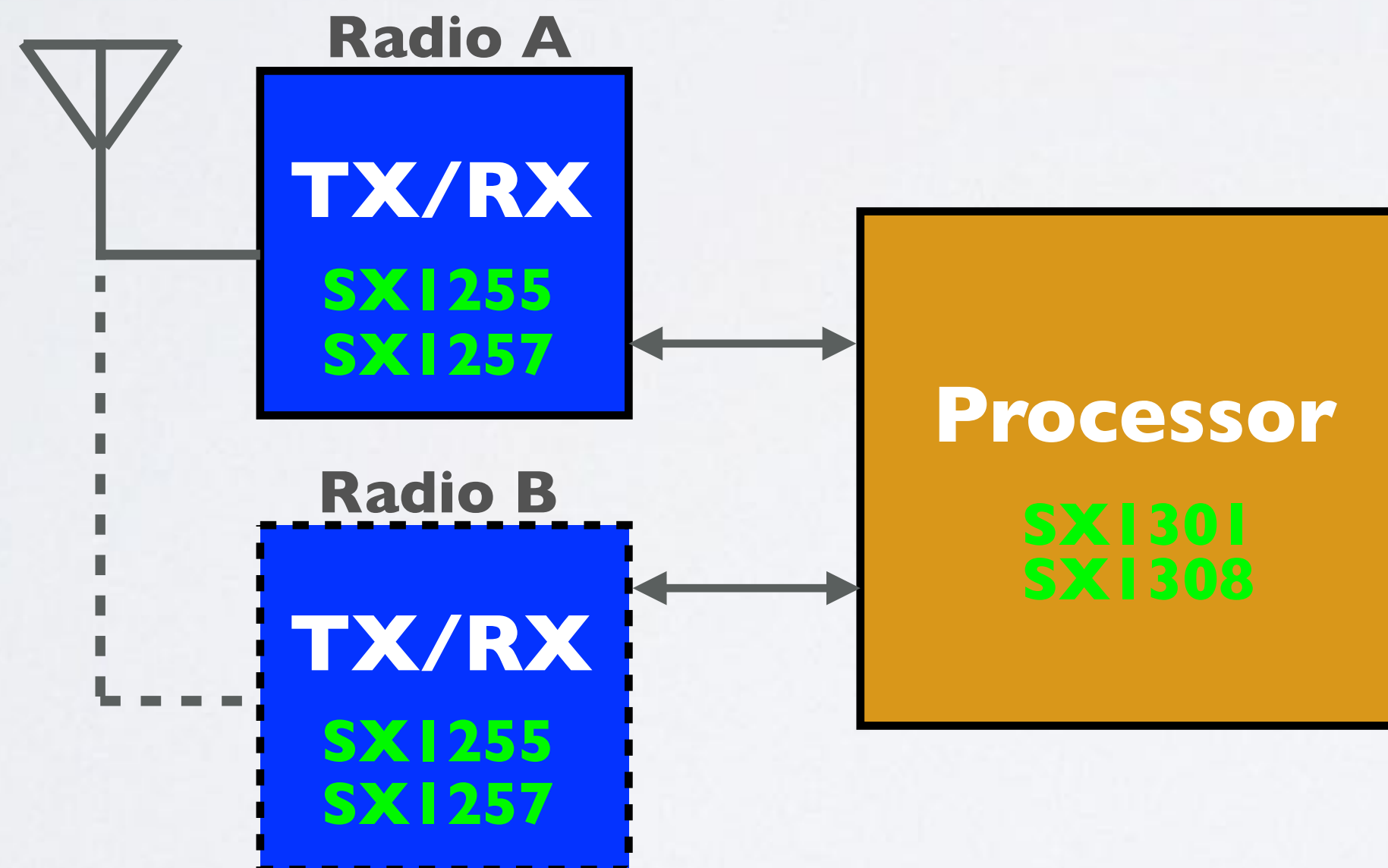
LORA CHIPS IN END NODES

Values taken from corresponding data sheets (Oct 10, 2018), see: <https://www.semtech.com/lora/lora-products>

Chip	Freq. range MHz	RF output power dBm	Max Link Budget dBm	Max Rx Sensitivity dBm	Remark
SX1261	150-960	15	170	-148	Support all major sub GHz ISM bands
SX1262	150-960	22	170	-148	Support all major sub GHz ISM bands
SX1268	410-810	22	170	-148	Chinese support of 490 & 780 MHz
SX1272	860-1020	20	157	-137	
SX1273	860-1020	20	157	-130	
SX1276	137-1020	20	168	-148	Support all major sub GHz ISM bands
SX1277	137-1020	20	168	-139	Support all major sub GHz ISM bands
SX1278	137-525	20	168	-148	
SX1279	137-960	20	168	-148	Support all major sub GHz ISM bands

LORA GATEWAYS

- Every LoRa gateway has the following two components:
 - A processor, for example to demodulate a signal.
 - One or two TX/RX radio's.



LORA GATEWAYS

- A LoRa gateway using SX1301 or SX1308 chip, supports up to 10000 end nodes and it has 10 programmable reception channels.

Channel	Radio	SF	BW kHz	Remark
0-7	A/B	7-12	125	
8	A/B	7-12	125,250,500	
9				For legacy FSK or GFSK formatted signals

LORA GATEWAYS

- The SX1301 or SX1308 chip can:
 - Scan all 8 channels (0-7) simultaneously for preambles of all data rates.
 - Demodulate simultaneously up to 8 packets, for example:
 1. SF7 packet on channel 0
 2. SF12 packet on channel 7
 - : Max. 8 packets simultaneously
 4. SF11 packet on channel 6
 8. SF8 packet on channel 5
- Note: It can not do both preamble detection and demodulation process at the same time.

LORA CHIPS IN GATEWAYS

Values taken from corresponding data sheets (Oct 10, 2018), see: <https://www.semtech.com/lora/lora-products>

Chip	Freq. range MHz	Max Rx Sensitivity dBm	Remark
SX1255	400-510		Radio A/B
SX1257	860-1000		Radio A/B
SX1258	779-787		Radio A/B For Chinese license-exempt freq. bands
SX1301		-142.5 (SX1257) -139.5 (SX1255)	Outdoor usage. Operating temperature: -40°C - +85°C
SX1308		-139 (SX1255, SX1257)	Indoor usage. Operating temperature: 0°C - +70°C

HOPERF LORA CHIPS

- The company HopeRF made several LoRa compatible chips.
- These chips are RFM95/96/98(W)
- More information see:
http://www.hoperf.com/upload/rf/RFM95_96_97_98W.pdf
http://www.hoperf.com/rf_transceiver/lora/
- These chips can be found in many LoRa modules and can be purchased at Chinese webshops.

HOPERF LORA CHIPS

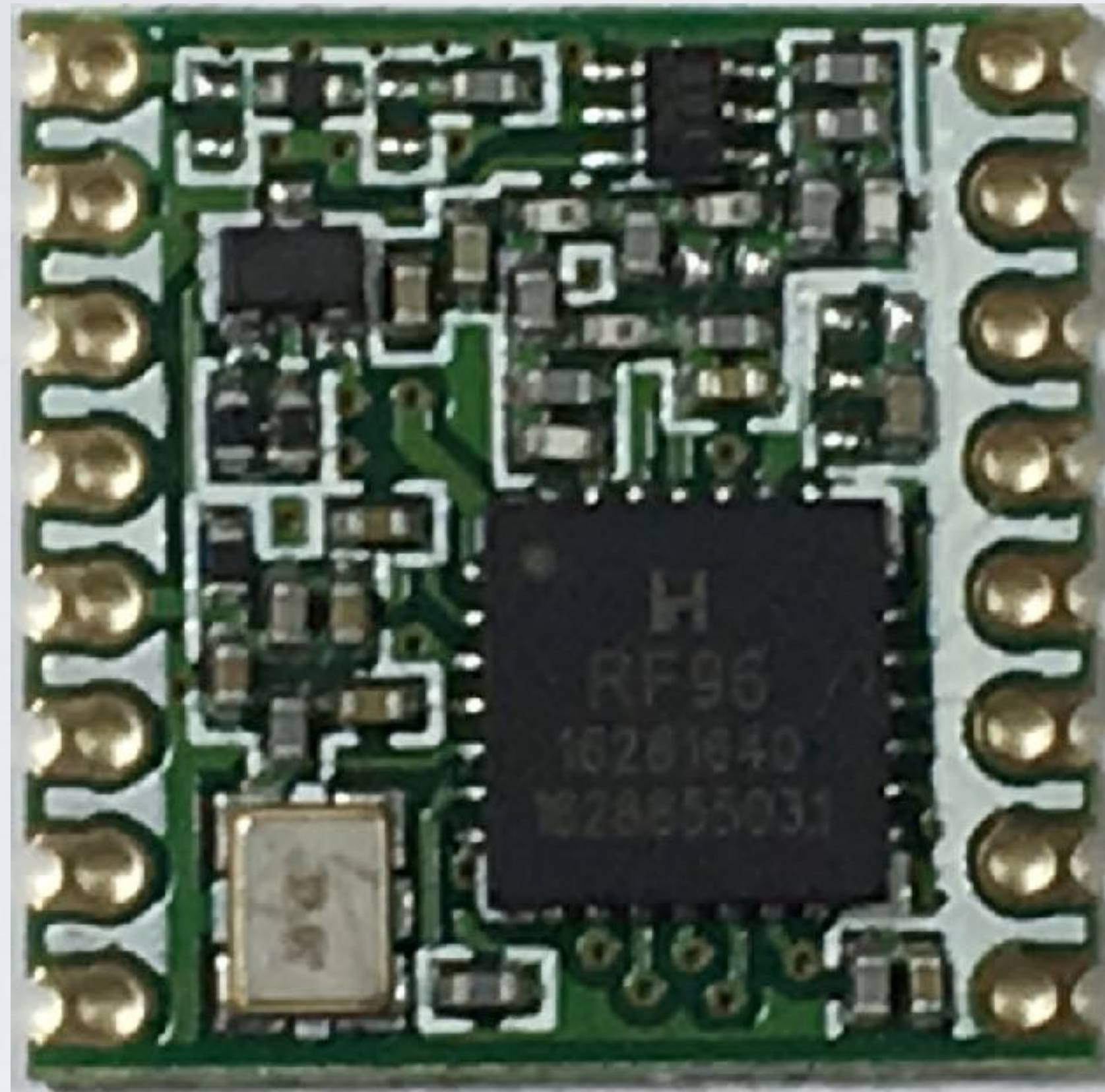
Values taken from corresponding data sheets (Oct 10, 2018), see: http://www.hoperf.com/rf_transceiver/lora/

Chip	Freq. range MHz	RF output power dBm	Max Link Budget dBm	Max Rx Sensitivity dBm	Compatible With	Chip Marking	Available in Freq. MHz
RFM95(W)	868-915	20	168	-148	SX1276	RF96	868, 915
RFM96(W)	433-470	20	168	-148	SX1276	RF96	433
RFM98(W)	433-470	20	168	-148	SX1278	RF98	433

Note:

The marking “W” means CE/FCC version for overseas market and without “W” are meant for Chinese market.

HOPERF LORA CHIPS



This chip is compatible with SX1276 and can be used in the EU863-870 ISM band