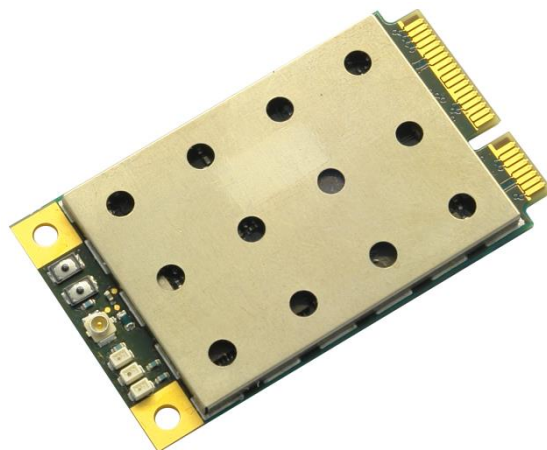


# iC280A

## DATASHEET



Preliminary

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## Aim of this Document

The aim of this document is to give a product description including interfaces, features and performance of the concentrator module iC280A.

**Note:** The iC280A does include a STM microcontroller with corresponding software. The basic hardware properties are given within this document. The respective software contained in the iC280A ultimately determines the capabilities and operating modes of the device. iC280A can be used as a LoRa<sup>®</sup> concentrator emulating LoRaWAN<sup>®</sup> on 2.4GHz. Depending on the software used within iC280A, additional operations are also possible.

Related hardware:

- LoRa<sup>®</sup> 2.4 GHz Radio Module: iM282A
- LoRa<sup>®</sup> Lite Gateway 2G4: LGW 2G4

Related software:

- LoRa<sup>®</sup> end node firmware: [GlobalLink24](#) or [Semtech LoRa 2.4GHz Stack](#)
- Hardware Abstraction Layer and Packet Forwarder: [Semtech HAL](#)

It is highly recommended to use the latest software provided.

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<sup>1</sup> LoRa is a registered trademark of Semtech Corporation.

LoRaWAN is a registered trademark of the LoRa Alliance.



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## 1. Introduction

The concentrator module iC280A is targeted for a huge variety of applications like Smart Metering, IoT and M2M applications. It is a multi-channel high performance transmitter/receiver module designed to receive several LoRa packets simultaneously using different spreading factors on multiple channels. The concentrator module iC280A can be easily integrated into a gateway as a complete RF front end. It provides the possibility to enable robust communication between a LoRa gateway and a huge amount of LoRa end-nodes like iM282A.

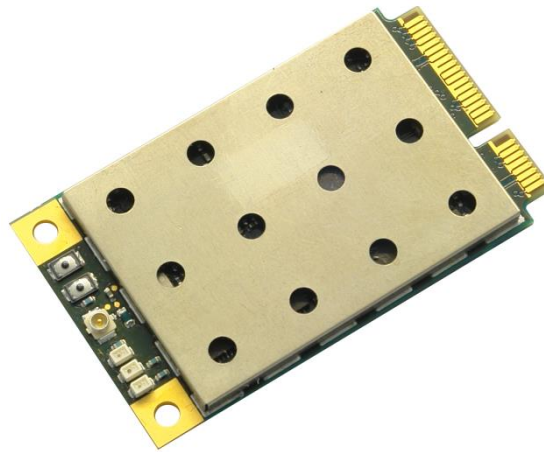


Figure 1-1: Picture of iC280A

The iC280A needs a host system for proper operation. This host system can be a PC or MCU that will be connected to iC280A via USB-Interface.

## 1.1 Key Features

- Compact size due to mPCIe form factor
- LoRa<sup>®</sup> modulation
- Frequency band 2400 to 2483.5 MHz
- Orthogonal spreading factors
- Sensitivity down to -134 dBm<sup>1</sup>
- USB interface
- Supply voltage 3.3 V, 5.0 V optional
- RF interface optimized to 50 Ω
- Output power level up to 11 dBm<sup>1</sup>
- Status LEDs
- Components only on top side of the board

## 1.2 Applications

- Smart Metering
- Wireless Star Networks
- Home-, Building-, Industrial automation
- Remote Control
- Wireless Sensors
- M2M, IoT
- Wireless Alarm and Security Systems
- ...

Please visit our web site [www.wireless-solutions.de](http://www.wireless-solutions.de) for further information.

## 1.3 Supported Radio Settings

The iC280A LoRa concentrator module uses the mini-PCIe form factor and is therefore easy to integrate into existing network equipment. In combination with the Semtech software it is able to receive up to 3 LoRa<sup>®</sup> packets simultaneously sent on different frequencies. The used spreading factor (DR) of each receiver can be configured within the corresponding HAL software.

Modulation	Bandwidth [kHz]	Channel Frequency [MHz]	Data Rate	Duty Cycle
LoRa	812	2403 2425 2479	DR0 to DR7	< 1%
Note: In terms of hardware, the iC280A card supports significantly more operating modes and settings. The above given settings are limited by the software and represent the possible LoRaWAN regional parameter settings for 2.4GHz. In addition, compliance with the duty cycle requirement is not mandatory.				

For further information on LoRa at 2.4 GHz, please refer to:

<https://lora-developers.semtech.com/documentation/tech-papers-and-guides/physical-layer-proposal-2.4ghz/>

<sup>1</sup> RF performance (sensitivity, output power) depends on the used software. Related to the certification of the device 10 dBm max EIRP is allowed.

## 2. Module Overview

The concentrator module is currently available as “iC280A”.

### 2.1 Block Diagram

The iC280A is equipped with one STM controller and four Semtech Sx1280 transceivers.

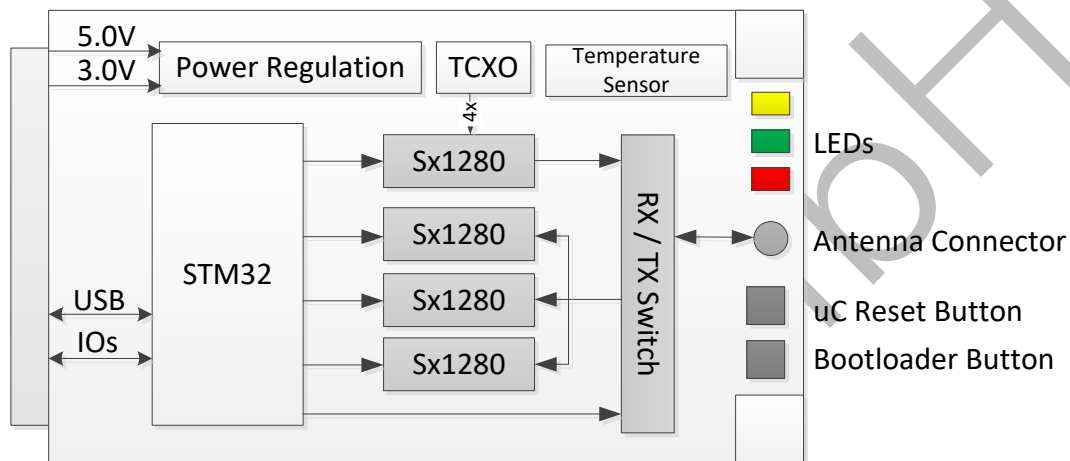


Figure 2-1: Block Diagram of iC280A

## 2.2 Interfaces

For easy integration into a target system (e.g. router, gateway) the iC280A LoRa concentrator module uses the mini-PCIe form factor. Detailed information on pin-out is given in chapter 4.1.

### 2.2.1 USB Interface

The preferred interface for communication with a host system is the USB interface.

### 2.2.2 RF Interface

The iC280A supports an RF interface for the 2.4 GHz frequency band. The concentrator card provides a standard U.FI antenna connector with a characteristic impedance of 50 Ohm.

In addition, the following interfaces exist.

- USB
- Digital IOs
- RESET Switch
- Boot Switch
- LEDS
- Power Supply

### 3. Electrical Characteristics & Timing Specifications

In the following different electrical characteristics of the iC280A are listed. Furthermore, details and other parameter ranges are available on request.

**Note:** Stress exceeding of one or more of the limiting values listed under "Absolute Maximum Ratings" may cause permanent damage to the radio module.

#### 3.1 Absolute Maximum Ratings

Parameter	Condition	Max	Unit
Supply Voltage (VDD)	Via mPCIe-Pin 2, 24, 39, 41, 52	3.6	V
	Via mPCIe-Pin 23, 25	6.5	V
RF Input Power		+7	dBm
VSWR on any RF connector		6:1	

Table 3-1: Absolute Maximum Ratings

#### 3.2 Global Electrical Characteristics

T = 25°C, VDD = 3.3 V (typ.) if nothing else stated

Parameter	Condition	Min	Typ.	Max	Unit
Supply Voltage (VDD) <sup>Note 1</sup>	Via mPCIe-Pin 2, 24, 39, 41, 52	2.7	3.3	3.6	V
	Via mPCIe-Pin 23, 25	4.5	5.0	5.5	V
Operating Temperature		-40°		+85°	°C
Total Operating Current				150	mA

Notes:

- (1) Recommended supply is via 3.3 V domain, as these pins are specified by mPCIe specification. Using the 5 V domain is reference design specific.

Table 3-2: General Characteristics





### 3.3 RF Characteristics

The transmitter RF characteristic of iC280A is summarized within the following table.

T = 25°C, VDD = 3.3 V (typ.) if nothing else stated

Parameter	Condition	Min	Typ.	Max	Unit
Frequency Range		2400		2483.5	MHz
Modulation Techniques	LoRa				
TX Power	Power Setting 13 (max)		+10.0		dBm
	Power Setting 10, Note 1		+7.1		dBm
TX Power Variation vs. Frequency			+/- 0.8		dB
TX Power Variation vs. Temperature	-40°C to +85°C		+/- 0.5		dB
TX Current Consumption ( $\mu$ C in sleep mode)	Power Setting 13 (max)		48		mA
	Power Setting 10		43		mA
Note: (1) ETSI EN 300 328 limits to +10 dBm EIRP for non-FHSS or not adaptive equipment. Considering typical antenna gain of 2 dBi, power setting 10 can be used under typical conditions. Final peak radiation need to be tested with the final device.					

Table 3-3: Transmitter RF Characteristics

T = 25°C, VDD = 3.3 V (typ.), 2441 MHz if nothing else stated

Parameter	Condition	Min	Typ.	Max	Unit
Frequency Range		2400		2483.5	MHz
Modulation Techniques	LoRa				
Sensitivity	BW: 200kHz, SF12		-134		dBm
	BW: 200kHz, SF5		-112		dBm
	BW: 800kHz, SF12		-129		dBm
	BW: 800kHz, SF5		-107		dBm
	BW: 1600kHz, SF12		-124		dBm
	BW: 1600kHz, SF5		-102		dBm
Notes: Please note that within the current regional parameter setting for LoRa 2.4GHz only 800kHz band width is supported.					

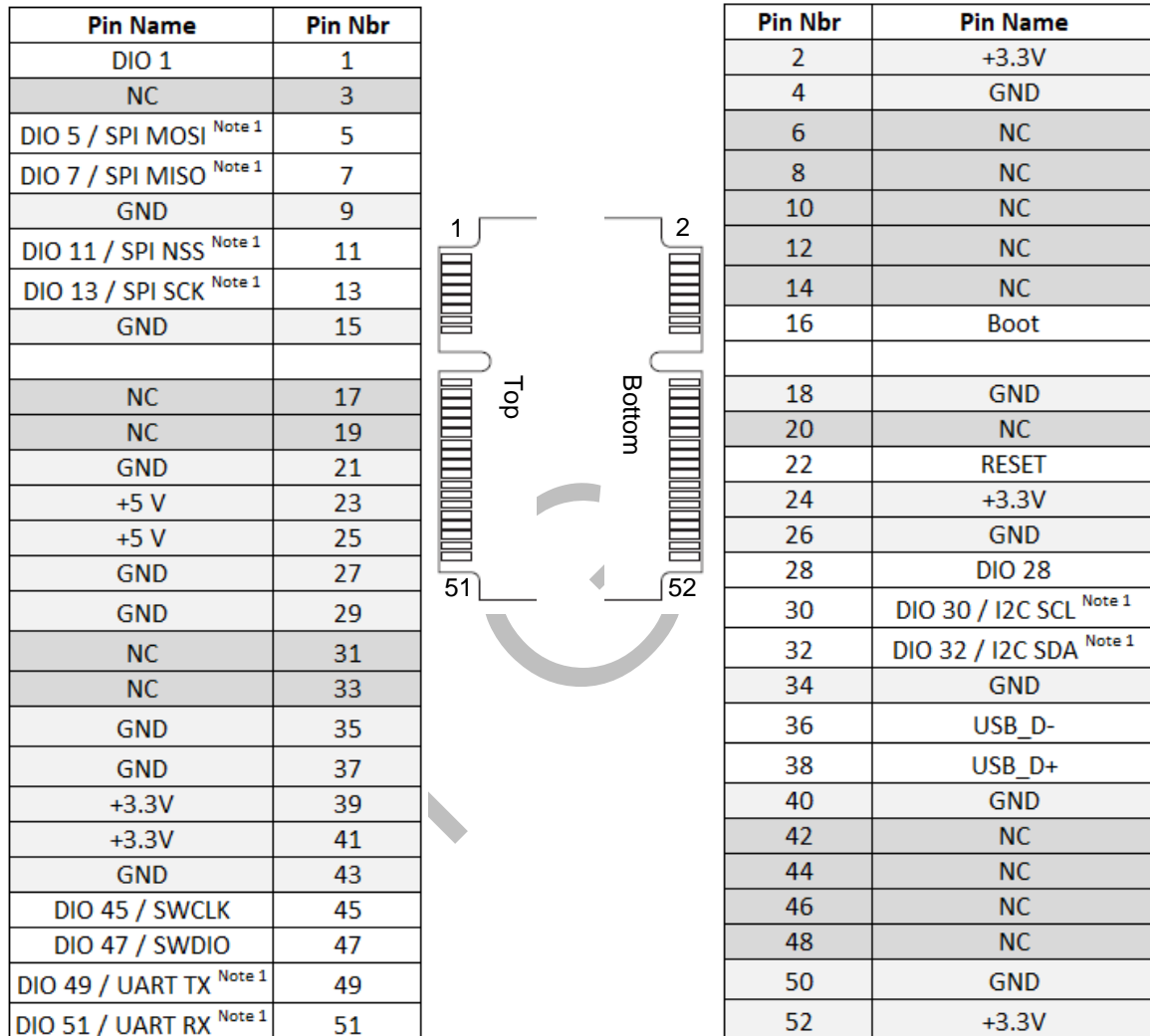
Table 3-4: Receiver RF Characteristics

## 4. Module Package

In the following the iC280A module package is described. This description includes the iC280A pinout as well as the modules dimensions.

### 4.1 Pinout Description

The iC280A provides a mPCIe connector with the Pinout described by Figure 4-1



Note 1: Interfaces are not supported by typical firmware

Figure 4-1: Pinout of the iC280A

## 4.2 Module Dimensions

The outer dimensions of the iC280A are given by 50.95 mm x 30.00 mm x 3.3 mm. The iC280A provide two drills for screwing the PCB to another unit each with a drill diameter of 3 mm.

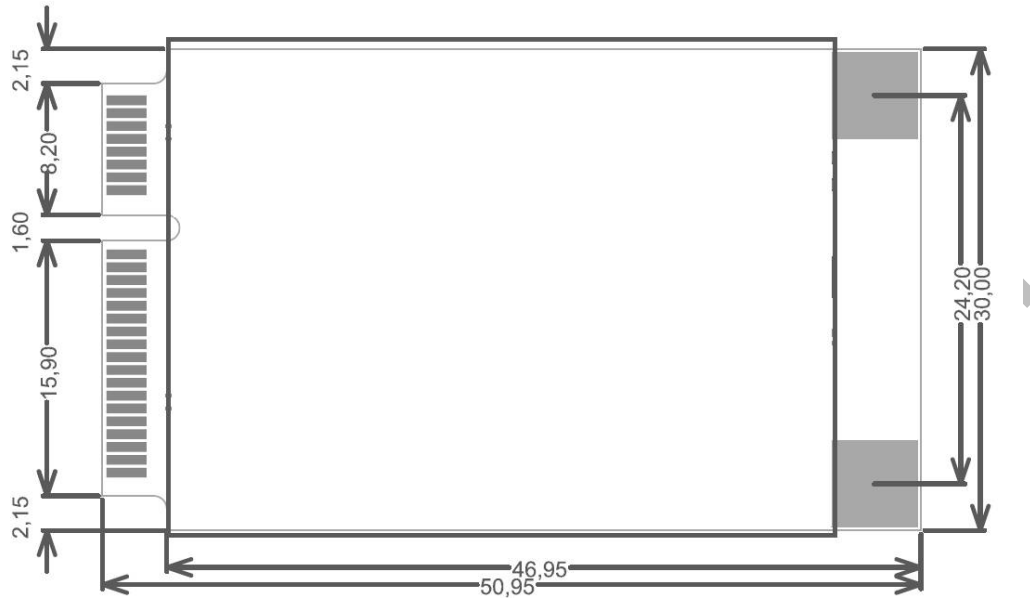


Figure 4-2: iC280A electromechanical specification (top view) in mm

## 5. Ordering Information

Ordering Part Number	Description	Distributor
iC280A	Concentrator Module LoRa 2.4 GHz	shop.imst.de

Table 5-1: Ordering Information

## 6. Certification and Compliancy Restrictions

This component has been designed to comply with the European Union's RE-Directive (Radio Equipment Directive) 2014/53/EC. As the product is a component only, the assessment is done on EMC (EN 301 489-1/-17) and ERM (EN 300 328) only. A declaration of conformity for this component will be available from IMST GmbH on request.

National laws and regulations, as well as their interpretation can vary with the country. In case of uncertainty, it is recommended to contact either IMST's accredited Test Center or to consult the local authorities of the relevant countries.

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## 7. Restrictions and Limitations

### Hardware Restrictions and Limitations

The characteristic values given by the present document are typically obtained by measurements based on evaluation kits of the entitled device. Using other carrier boards or connected equipment might lead to different characteristics. Subject to given measurement results the characteristic values might show the best performance of the entitled device, independent from any compliancy restriction of final operation purposes.

### Software Restrictions and Limitations

The present document is a datasheet of the entitled device which intentional use is to provide information about basic characteristics related to the device hardware. Typically all described characteristic values require software for obtaining them accordingly. All features of the available software are subject to changes without claim to be complete at any time. Characteristically values might also be provided based on datasheets of the appropriate key components unless there are test results available based on the available software. For more information regarding current supported features of the available software refer to [www.wireless-solutions.de](http://www.wireless-solutions.de).

### Compliancy Restrictions and Limitations

The entitled device has been designed to comply with the standards namely given in the present document. The intentional operation shall be in so called ISM bands, which can be used free of charge within the European Union and typically licences free all over the world. Nevertheless, restrictions such as maximum allowed radiated RF power or duty cycle may apply which might result in a reduction of these parameters accordingly.

In addition, the use of radio frequencies might be limited by national regulations which requirements also need to be met.

In case the entitled device will be embedded into other products (referred as "final products"), the manufacturer for this final product is responsible to declare the conformity to required standards accordingly. A proof of conformity for the entitled device is available from IMST GmbH on request. Beside the entitled device the conformity also considers software as well as supporting hardware characteristics which might also have an impact accordingly.

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## 8. Appendix

### 8.1 List of Abbreviations

AFA	Adaptive Frequency Agility
BER	Bit Error Rate
BSC	Basic Spacing between Centers
GND	Ground
GPIO	General Purpose Input/Output
GPS	Global Positioning System
HAL	Hardware Abstraction Layer
IF	Intermediate Frequency
IoT	Internet of Things
ISM	Industrial, Scientific and Medical
LBT	Listen Before Talk
M2M	Machine to Machine
MAC	Medium Access Control
MCU	Microcontroller Unit
MPSSE	Multi-Protocol Synchronous Serial Engine (FTDI)
PCB	Printed Circuit Board
PPS	Pulse Per Second
RAM	Random Access Memory
RF	Radio Frequency
SMT	Surface Mounted Technology
SNR	Signal to Noise Ratio
SPI	Serial Peripheral Interface
TRX	Transceiver
USB	Universal Serial Bus



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## 8.4 References



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