

## OStream SX1280\_NPL\_DF v1.0 Documentation

### Features:

- 2.40GHz-2.48GHz Operation
- +12.5dBm Output Power
- U.FL Antenna Connector for External Antenna
- LORA, GFSK and FLRC Modulation Modes
- FCC/CE Modular Approvals in Place
- Single 3.3-Volt Power Supply

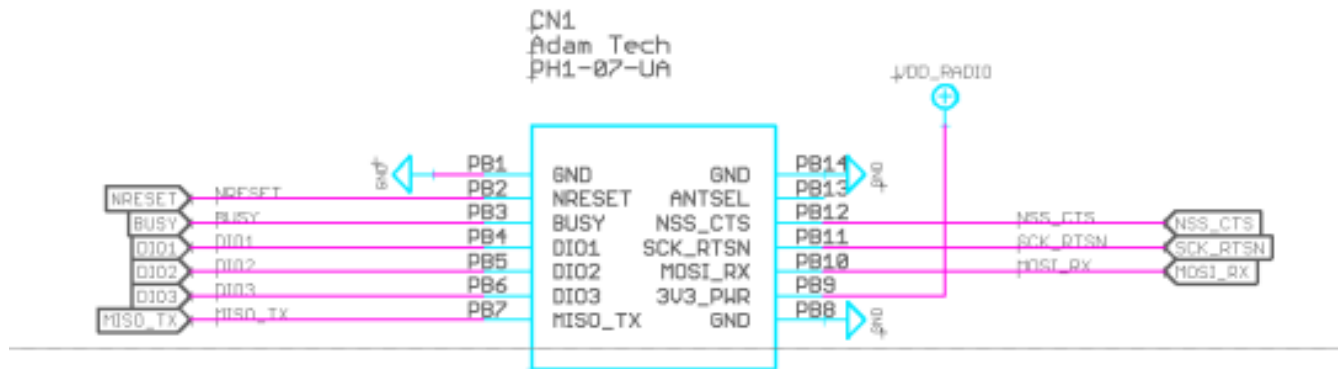
### 1. Introduction

- 1.1. The Ostream-SX1280 Radio module is a low-power module for transmitting and receiving digital data via radio frequency. All of the Ostream-SX1280 radio electronics (including an external IPEX/U.F.L antenna connector) reside on a single PCB, and all operational power is derived from a single supply voltage with a range from 1.8v to 3.7v. The transceiver design consists of a Semtech SX1280 low-power, integrated 2.4GHZ based transceiver supporting the following baseband modulations: LORA, GFSK and FLRC.

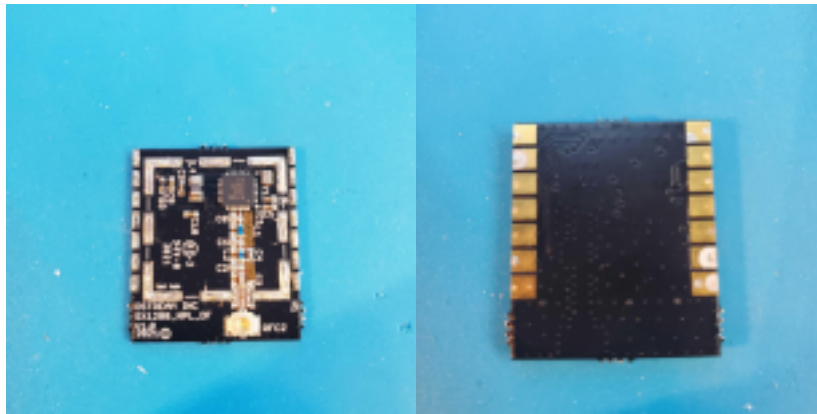
### 2. Electrical Specifications

Supply Voltage	1.8-3.7V
Frequency Range	2.402-2.48GHz
Output Power	17mW (+12.5dbm)
TX/RX Range	6+ Miles
Protocols	LoRa, GFSK, FLRC
Communications Interface	SPI
Number of Channels Used	48
Operational Power - Transmit	24mA
Operational Power - Receive	4.8mA-5.6mA
Operational Power – Sleep	1uA (Deepest Sleep Mode)
Antenna Connector	u.fl
Operating Temperature	-40C to +85°C

### 3. IO Pins



### 4. Images



### 5. Mounting Options

- 5.1. The SX1280\_NPL\_DF should be surface mounted to a printed circuit board or plugged into a matching Adam Tech PH1-07-UA connector.

### 6. Regulatory Agency Considerations

- 6.1. This device complies with Part 15.247 of the FCC Rules.
- 6.2. Compliance with the appropriate regulatory agencies is essential in the deployment of all transceiver devices. OStream Inc. has obtained modular approval for this RF product. As such, an OEM need only meet a few basic requirements in order to utilize their end product under this approval.
- 6.3. Corresponding agency identification numbers are listed below:
  - 6.3.1. US / FCC
    - 6.3.1.1. FCC ID: 2A3CJ-400102

#### 6.4. External Antennas

6.4.1. The SX1280\_NPL\_DF is pre-approved for use with the following external antennas:

Manufacturer	Part #	Type	Gain (dbi)
Linx Technologies	ANT-2.4-CW-RH-SMA	Helical Whip	-0.9
Linx Technologies	ANT-2.4-OC-LG-SMA	Dipole	4.0

#### 6.5. FCC Requirements for Modular Approval

6.5.1. Any modifications made to the SX1280\_NPL\_DF's printed circuit board or pre-approved external antenna could void the user's authority to operate this equipment. Other external antennas can be used with the SX1280\_NPL\_DF module so long as the antenna is of the same type and of equal or lesser gain than the authorized antennas.

#### 6.6. Instruction to the User

6.6.1. This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential or commercial installation. This equipment generates, uses and can radiate radio frequency energy and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- \* Reorient or relocate the receiving antenna.
- \* Increase the separation between the equipment and receiver.
- \* Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- \* Consult the dealer or an experienced radio/TV technician for help.

In order to maintain compliance with FCC regulations, shielded cables must be used with this equipment. Operation with non-approved equipment or unshielded cables is likely to result in interference to radio and TV reception. The user is cautioned that changes and modifications made to the equipment without the approval of the manufacturer could void the user's authority to operate this equipment.

#### 6.7. Warnings

6.7.1. This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions:

- 6.7.1.1. This device may not cause harmful interference
- 6.7.1.2. This device must accept any interference received, including interference that may cause undesirable operation

6.7.2. This device is intended for use under the following conditions:

- 6.7.2.1. Indoors or Outdoors
- 6.7.2.2. Stationary Installation

- 6.7.2.3. Temperature Range: -40 to 85 Celsius
  - 6.7.2.4. Use 1 of the approved antennas
  - 6.7.2.5. The module has been approved using the FCC's "unlicensed modular transmitter approval" method.
- 6.7.3. As long as these conditions are met, further transmitter testing will not be required. However, the OEM integrator is still responsible for testing their end product for any additional compliance measures necessitated by the installation of this module (i.e. digital device emissions, PC peripheral requirements, etc.).
- 6.7.4. In the event that these conditions cannot be met, then the FCC authorization is no longer valid, and the corresponding FCC ID may not be used on the final product. Under these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.
- 6.8. OEM Product Labeling
  - 6.8.1. The end product containing the SX1280\_NPL\_DF must be labeled in a visible area with the following text:

"Contains FCC ID: 2A3CJ-400102"
  - 6.8.2. The grantee's FCC ID can be used only when all FCC compliance requirements are met.
- 6.9. OEM Integrators - End Product Manual Provided to the End User
  - 6.9.1. The OEM integrator shall not provide information to the end user regarding how to install or remove this RF module in the end product user manual. The end user manual must include all required regulatory information and warnings as outlined in 6.10.1.1 and 6.10.1.2.
- 6.10. RF Exposure
  - 6.10.1. This equipment complies with FCC and IC RSS-102 radiation-exposure limits set forth for an uncontrolled environment. This equipment is intended only for OEM integrators under the following conditions:
    - 6.10.1.1. It must be installed in a mobile application and operated with a minimum distance of 20cm between the radiator and a human body.
    - 6.10.1.2. This equipment must not be co-located or operating in conjunction with any other antenna or transmitter.
  - 6.10.2. As long as the two conditions above are met, additional transmitter testing will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required for the installed module.
  - 6.10.3. In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the Federal Communications Commission of the U.S. Government (FCC) Government authorization is no longer considered valid and the FCC ID cannot be used on the final product. In these circumstances, the OEM integrator shall be responsible for re-evaluating the end-product (including the transmitter) and obtaining a separate FCC authorization in the U.S.
- 6.11. Testing

- 6.11.1. Testing of the host product with all the transmitters installed – referred to as the composite investigation test- is recommended, to verify that the host product meets all the applicable FCC rules. The radio spectrum is to be investigated with all the transmitters in the final host product functioning to determine that no emissions exceed the highest limit permitted for any one individual transmitter as required by Section 2.947(f). The host manufacturer is responsible to ensure that when their product operates as intended it does not have any emissions present that are out of compliance that were not present when the transmitters were tested individually.
- 6.11.2. The following provides general guidance and suggestions to host product manufacturers when installing a certified modular transmitter, on how they may verify the intentional radiator (transmitter) compliance of the composite-system end product:
  - 6.11.2.1. If the modular transmitter has been fully tested by the module grantee on the required number of channels, modulation types, and modes, it should not be necessary for the host installer to re-test all the available transmitter modes or settings. It is recommended that the host product manufacturer, installing the modular transmitter, perform some investigative measurements to confirm that the resulting composite system does not exceed the spurious emissions limits or band edge limits.
  - 6.11.2.2. The testing should check for emissions that may occur due to the intermixing of emissions with the other transmitters, digital circuitry, or due to physical properties of the host product (i.e. enclosure). This investigation is especially important when integrating multiple modular transmitters where the certification is based on testing each of them in a stand-alone configuration. It is important to note that host product manufacturers should not assume that because the modular transmitter is certified that they do not have any responsibility for final product compliance.
  - 6.11.2.3. If the investigation indicates a compliance concern the host product manufacturer is obligated to mitigate the issue. Host products using a modular transmitter are subject to all the applicable individual technical rules as well as to the general conditions of operation in Sections 15.5, 15.15, and 15.29 to not cause interference. The operator of the host product will be obligated to stop operating the device until the interference has been corrected.
- 6.11.3. The modular transmitter is only FCC authorized for the specific rule parts listed in Section 6.1, and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification.

7. Disclaimer

- 7.1. Neither the whole nor any part of the information contained herein nor the product described in this datasheet may be adapted or reproduced in any material or electronic form without the prior written consent of the copyright holder. This product and its documentation are supplied on an as-is basis, and no warranty as to their suitability for any particular purpose is either made or implied. OStream Inc. will not accept any claim for damages whatsoever arising as a result of the use or failure of this product. Your statutory rights are not affected. This product or any variant of it is not intended for use in any medical appliance, device or system in which the failure of the product might reasonably be expected to result in personal injury. This document provides preliminary information that may be subject to change without notice.