DLP-RFS1280

2.4GHz DATA RADIO

PRELIMINARY DOCUMENT-SUBJECT TO CHANGE

FEATURES:

- 2.40GHz - 2.48GHz Operation
- +11.5dBm Output Power
- 4+ Mile Range
- u.fl Antenna Connector for Exteral Antenna
- LORA, GFSKand FLRC Modulation Modes
- On-Board Chip Antenna
- FCC/IC/RED Modular Approvals (Pending)
- Single 3.3-Volt Supply
- Development Kit Available

APPLICATION AREAS:

- Real-Time Security
- Body-Worn Medical Telemetry
- Battery-Powered Home Automation
- Electric/Water/Gas Automated Meter Reading
- Industrial Monitoring and Control
- Active RFID
- Long Range, Battery-Powered, Multi-Hop Sensor Networks

1.0 INTRODUCTION

The DLP-RFS1231 is a low-cost module for transmitting and receiving digital data via radio frequency. All of the DLP-RFS1231's electronics (including an antenna) reside on a single PCB, and all operational power is derived from a single supply voltage.

The transceiver design consists of a Semtech SX1280 low-power, integrated UHF transceiver and an antenna switch for selecting between the on-board chip antenna and an optional external antenna. The hardware is designed for maximum range and optimum battery life.

2.0 ELECTRICAL SPECIFICATIONS

Supply Voltage	1.8-3.7V
Reader Frequency	2.402-2.48GHz
Output Power	14mW (+11.5dBm) MAX (conducted)
Range	Greater than 5 miles (antenna type dependant)
Protocol	Multiple
Communications Interface	SPI
Operational Power – Transmit	24mA
Operational Power – Receive	4.8mA - 5.6mA depending on the operating mode
Operational Power – Sleep	1uA deepest sleep mode
Antenna Connector	u.fl*
Operating Temperature	0-70°C

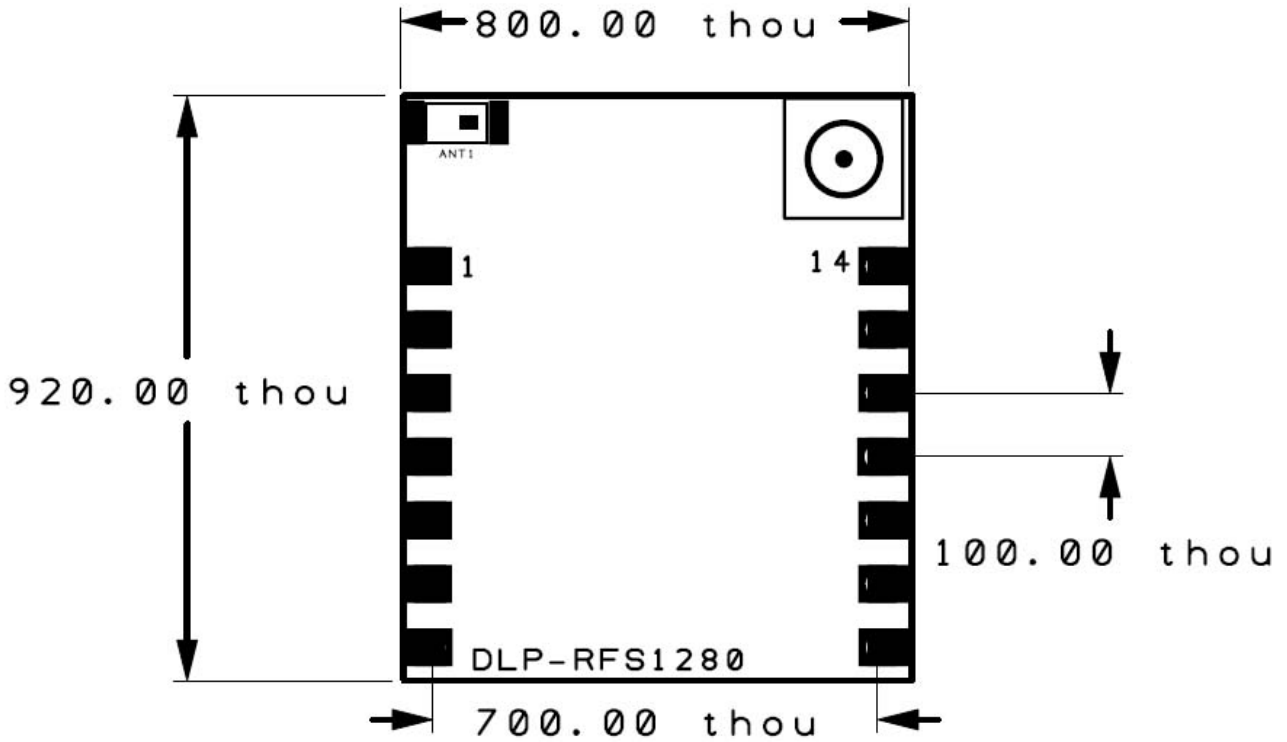*Please see the Antenna Section for important regulatory details.

3.0 IO PINS
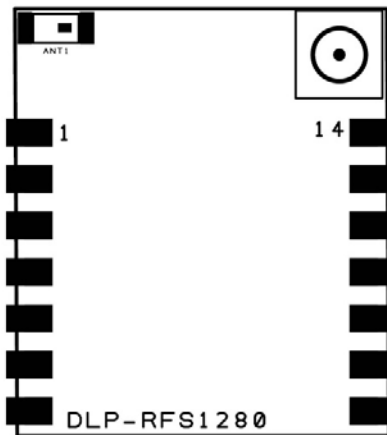
IO Pin Definitions	
1	Ground
2	NRESET
3	BUSY
4	DIO1
5	DIO2
6	DIO3
7	MISO_TX
8	GROUND
9	3.3V POWER SUPPLY
10	MOSI_RX
11	SCK_RTSN
12	NSS_CTS
13	ANTSEL
14	GROUND

4.0 MECHANICAL

4.1 MECHANICAL DRAWING (Overall dimensions: 0.8 x 0.92 x 0.135 Inches)

Note: thou = mils or 0.001 inches.

4.2 MOUNTING OPTIONS

The DLP-RFS1280 module can be either surface mounted to a printed circuit board or connected using 0.1-inch spaced headers (0.025 sq-inch posts).

5.0 APPLICATION DEVELOPMENT

Demonstration source code written in the C programming language is available for free download upon purchase of the DLP-RFS1280 or DLP-RFS1280ACT demonstration platform. The code was developed using Keil uVision for the STMicrocontroller Nucleo microcontroller development module.

Additional information on the operation of the Semtech SX1280 transceiver IC is available in the datasheet for the SX1280.

6.0 DEMONSTRATION HARDWARE - EDK

This section describes how to operate the DLP-RFS1280ACT demonstration hardware. This hardware includes a DLP-RFS1280 transceiver module, allows the operator to easily verify normal operation of the transceiver and assists in learning the operational firmware.

NOTE: The NUCLEO-L476RG module is not included with the DLP-RFS1280ACT and must be purchased separately.

NOTE: Flow diagrams for the demonstration code can be found at the end of this datasheet. Source code for the Demonstration EDK is made available upon purchase of the DLP-RFS1280 or DLP-RFS1280ACT.

Power for this test platform can be provided by a cell phone charging battery pack or a PC USB port using a USB cable (purchased separately).

For normal mode Press RESET. The system will be in receive mode waiting for packets to arrive. After each mode listed below press RESET to return to idle state before proceeding to the next test mode.

6.1 For CW mode - no modulation

    6.1.1 Press Button 1 until LORA mode is selected:

6.1.2 Press and hold button 1. While holding button 1 press and release RESET. Continue to hold button 1 until you hear the beep. Release button 1 and the system will be transmitting at 2.4GHz on the internal chip antenna with no modulation.

**** Be sure to turn the volume up (blue knob next to speaker) if you cannot hear the beep.

**** You can change to the external antenna by pressing button 2 - ANT-SEL. The display will show C for chip antenna and W for whip antenna.

**** You can change the carrier frequency to 2.44GHz by pressing button 5 (L-M-H). Repeatedly pressing the L-M-H button will cycle through the Low (2.41GHz), Medium (2.44GHz) and High (2.48GHz) carrier frequencies.

6.2 For CW mode - <u>with modulation</u> - LORA mode

6.2.1 Press Button 1 until LORA mode is selected:

ME:17480 SF LORA
YU:16422 12 CL

6.2.2 Press and hold button 3. While holding button 3 press and release RESET. Continue to hold button 3 until you hear the beep. Release button 3 and the system will be transmitting at 2.4GHz on the internal chip antenna with LORA modulation.

6.3 For CW mode - <u>with modulation</u> - FLRC mode

6.3.1 Press Button 1 until FLRC mode is selected:
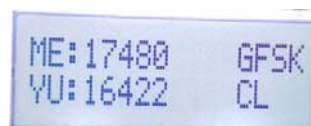
ME:17480   FLRC
YU:16422   CL

6.3.2 Press and hold button 3. While holding button 3 press and release RESET. Continue to hold button 3 until you hear the beep. Release button 3 and the system will be transmitting at 2.4GHz on the internal chip antenna with FLRC modulation.
6.4 For CW mode - <u>with modulation</u> - GFSK mode

6.4.1 Press Button 1 until GFSK mode is selected:

ME:17480   GFSK
YU:16422   CL

6.4.2 Press and hold button 3. While holding button 3 press and release RESET. Continue to hold button 3 until you hear the beep. Release button 3 and the system will be transmitting at 2.4GHz on the internal chip antenna with GFSK modulation.
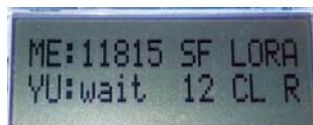
6.5 For range test mode with two paired transceivers where transceiver A makes transceiver B beep with each packet sent.

6.5.1 Press Button 1 until LORA mode is selected on both transceivers:

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ME:17480 SF LORA
YU:16422 12 CL
```

6.5.2 Pair the transceivers: on transceiver 1, Press and hold button 4. While holding button 4 press and release RESET. Continue to hold button 4 until you hear a beep. Release button 4 and the transceiver will be waiting for the ID from transceiver 2 and "wait" will be shown in the display.

```
ME:11815 SF LORA
YU:wait  12 CL R
```

6.5.3 On transceiver 2, press and release RESET. Every time a transceiver is RESET it will transmit its ID immediately after reset on a specific RF frequency using specific modulation parameters.   The display on transceiver 1 will then show the ID for transceiver 2.

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ME:11815 SF LORA
YU:15684 12 CL R
```

6.5.4 On transceiver 2, Press and hold button 4. While holding button 4 press and release RESET. Continue to hold button 4 until you hear a beep. Release button 4 and the transceiver will be waiting for the ID from transceiver 1 and "wait" will be shown in the display.

6.5.5 On transceiver 1, press and release RESET. The display on transceiver 2 will then show the ID for transceiver 1. At this point the transceivers are paired. Additional RESETs or power cycles will not change the pairing.

6.5.6 Enter Range Test: Press Button 1 until LORA mode is selected on both transceivers:

6.5.7 On transceiver 1, press and hold button 5. While holding button 5 press and release RESET. Continue to hold button 5 until you hear a beep then release button 5. Press and release RESET on transceiver 2. At this point transceiver 1 will be transmitting

packets to transceiver 2 which will beep with each received packet. Be sure to turn the volume up (blue knob next to speaker) if you cannot hear the beep.

7.0 REGULATORY AGENCY CONSIDERATIONS

7.1 AGENCY IDENTIFICATION NUMBERS

This device complies with Part 15 of the FCC Rules.

Compliance with the appropriate regulatory agencies is essential in the deployment of all transceiver devices. DLP Design 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. Corresponding agency identification numbers are listed below:

PART NUMBER	US / FCC	CANADA / IC
DLP-RFS1280	SX9RFS2	5675A-RFS2

7.2 EXTERNAL ANTENNAS

The DLP-RFS1280 is preapproved for use with both its on-board chip antenna and an external antenna (Part No. ANT-2.4-PML-UFL made by Antenna Factor / Linx). Connection to the external antenna is made via a u.fl connector.

7.3 FCC/IC REQUIREMENTS FOR MODULAR APPROVAL

Any changes or modifications to the DLP-RFS1280's printed circuit board, on-board antenna or pre-approved external antenna could void the user's authority to operate the equipment. Other external antennas can be used with the DLP-RFS1280 module so long as the maximum legal radiated power limit is not exceeded.

7.4 WARNINGS

Operation is subject to the following two conditions: (1) This device may not cause harmful interference; and (2), this device must accept any interference received, including interference that may cause undesirable operation.

This device is intended for use under the following conditions:

1. The transmitter module may not be co-located with any other transmitter or antenna; and,

2. The module will be approved using the FCC's "unlicensed modular transmitter approval" method.

As long as these two 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.).

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio

exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Note: In the event that these conditions cannot be met (i.e. co-location with another transmitter), 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.

7.5 OEM PRODUCT LABELING

The final end product must be labeled in a visible area with the following text:

"Contains FCC ID: SX9RFS2"

L'étiquette d'homologation d'un module d'Innovation, Sciences et Développement économique Canada devra être posée sur le produit hôte à un endroit bien en vue, en tout temps. En l'absence d'étiquette, le produit hôte doit porter une étiquette sur laquelle figure le numéro d'homologation du module d'Innovation, Sciences et Développement économique Canada, précédé du mot « contient », ou d'une formulation similaire allant dans le même sens et qui va comme suit :

Contient IC : 5675A-RFS2 est le numéro d'homologation du module.

7.6 RF EXPOSURE

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.

In order to comply with FCC RF exposure requirements, the antenna used for this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

7.7 ADDITIONAL INFORMATION FOR OEM INTEGRATORS

The end user should not be provided with any instructions on how to remove or install the DLP-RFS1280. This device will be pre-certified to operate with the antenna models listed below:

- On-board Chip Antenna
- Antenna Factor / Linx ANT-2.4-PML-UFL

8.0 DISCLAMER

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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. DLP Design 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.

9.0 CONTACT INFORMATION

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