Laird™

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Datasheet

Sentrius™ RG191-M2 Concentrator Card

Pluggable M2.COM LoRaWAN™ Adapter

CONTENTS

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1 Introduction

The Sentrius™ RG191-M2 LoRaWAN Concentrator Card combines Laird's long-standing expertise in optimized RF design with the emerging LoRaWAN ecosystem. The Sentrius™ RG191-M2 card enables OEMs to integrate a high-performance, certified LoRaWAN gateway interface to any Linux-based platform. Laird's optimum hardware solution expands upon Sentrius™ drivers and reference design for improved RF performance. Comprehensive integration and design services for a custom gateway are also available via Laird's dedicated Engineering Services team and qualified LoRa antenna solutions are available from Laird.

2 Overview

The module is designed around the Sentrius™ SX1301 digital baseband chip with an integrated LoRa concentrator IP, which is designed to perform high performance gateway function in the ISM band. The RF frontend consists of two of SX1257, high performance digital I and Q modulator/demodulator transceiver chips. The RF front-end is terminated with standard U.FL connector. The board form factor and connector pinout are designed to conform to M2.COM specifications. The card requires a single 5-volt supply and it generates its power supply requirements on-board. Standard SPI communication, reset, and power supply to the board are provided through a 75-position host interface connector.

3 Specification Summary

Category	Feature	Specification
General Radio	Semtech Radios	SX1301 and SX1257 (x2)
	Reference Design	Based on Semtech Rev 1.0 - SX1301 AP1
Connectors	Connector Type	M2.COM E Key - http://www.m2com-standard.org/en-us
	External Antenna	U.FL connector
Power	Consumption	TX (max) – 440 mA
		RX (all channels) – 340 mA
		Idle – 40 mA
Voltage Input	Input	5V (+/- 10%)
RF Characteristics	Frequency Range	RG191-M2: 902 to 928 MHz
	RX Sensitivity	Up to -140 dBm
	Max RF Output Power	Up to +27 dBm
Software	Host Interface	SPI
	Driver Support	https://github.com/Lora-net/lora_gateway (Laird testing done with Linux)
Temperature	Operating Range	-30°C to +85°C
Physical	Dimensions	75 x 53 x 3.8 mm
	Weight	<11 g
Regulatory	Certifications	FCC/IC/CE
Warranty	12 months	

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4 HARDWARE SPECIFICATIONS

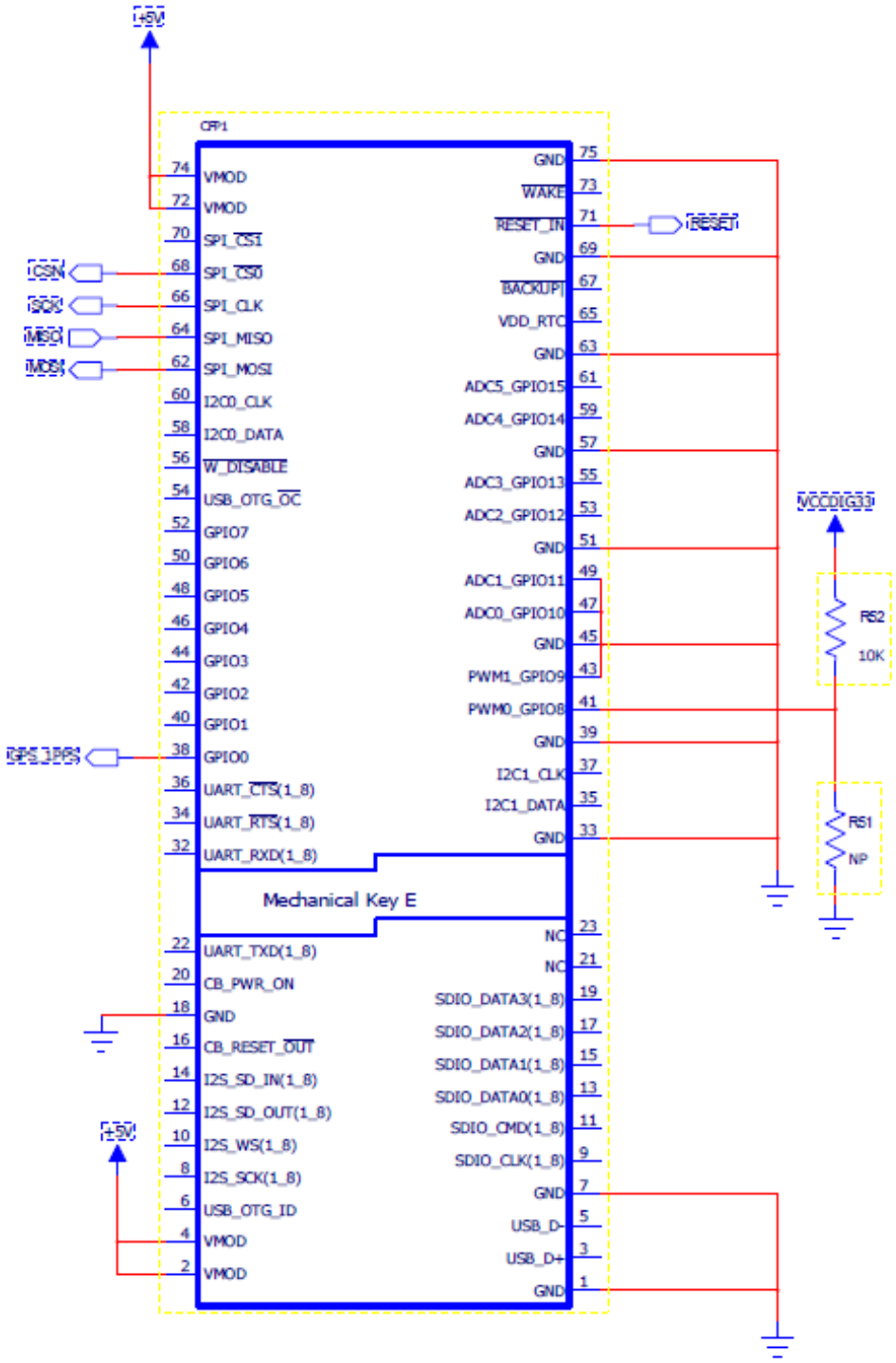

Figure 1: Schematic

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5 Pin Definitions

Table 1: Pin definitions

Pin #	Pin Name	Laird RG191-M2 Pinout	Comment
1	GND	Populated	
2	VCC	Populated	+5V
3	USB_D+		
4	VCC	Populated	+5V
5	USB_D-		
6	USB_OTG_ID		
7	GND	Populated	
8	I2S_SCK		
9	SDIO_CLK		
10	I2S_WS		
11	SDIO_CMD		
12	I2S_SD_OUT		
13	SDIO_DATA0		
14	I2S_SD_IN		
15	SDIO_DATA1		
16	CB_RESET_OUT#		
17	SDIO_DATA2		
18	GND	Populated	
19	SDIO_DATA3		
20	CB_PWR_ON		
21	SDIO_WAKE#		
22	UART0_TXD		
23	SDIO_RESET#		
24	CONNECTOR KEY		
25	CONNECTOR KEY		
26	CONNECTOR KEY		
27	CONNECTOR KEY		
28	CONNECTOR KEY		
29	CONNECTOR KEY		
30	CONNECTOR KEY		
31	CONNECTOR KEY		
32	UART0_RXD		
33	GND	Populated	
34	UART0_RTS		
35	I2C1_DATA		
36	UART0_CTS		
37	I2C1_CLK		
38	GPIO_0	Populated	1 PPS signal from a GPS receiver
39	GND	Populated	-
40	GPIO_1		

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Pin #	Pin Name	Laird RG191-M2 Pinout	Comment
41	PWM0/GPIO_8	Populated	GARD ID [1=US; 0=EU]
42	GPIO_2		
43	PWM1/GPIO_9	Populated	RESERVED
44	GPIO_3		
45	GND	Populated	-
46	GPIO_4		
47	ADC_0/GPIO_10	Populated	RESERVED
48	GPIO_5		
49	ADC_1/GPIO_11	Populated	RESERVED
50	GPIO_6		
51	GND	Populated	-
52	GPIO_7		
53	ADC_2/GPIO_12		
54	USB_OTG_OC#		
55	ADC_3/GPIO_13		
56	SIO_25/W_DISABLE#		
57	GND	Populated	-
58	I2C0_DATA		
59	ADC_4/GPIO_14		
60	I2C0_CLK		
61	ADC_5/GPIO_15		
62	SPI_MOSI	Populated	SPI MOSI
63	GND	Populated	-
64	SPI_MISO	Populated	SPI MISO
65	VDD_RTC		
66	SPI_CLK	Populated	SPI CLOCK
67	BUCKUP#		
68	SPI_CS0#	Populated	SPI CHIP SELECT
69	GND	Populated	-
70	SPI_CS1#		
71	RESET_IN#	Populated	RESET [ACTIVE LOW]
72	VCC	Populated	+5V
73	WAKE#		
74	VCC	Populated	+5V
75	GND	Populated	-

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6 FCC AND IC REGULATORY STATEMENTS

Model	US/FCC	CANADA/IC
RG191-M2	SQG-1001	3147A-1001

The OEM must follow the regulatory guidelines and warnings listed below to inherit Laird' modular approval.

The RG191-M2 holds full modular approvals and has been certified for integration to products only by OEM integrators under the following conditions:

1. *The antenna(s) must be installed such that a minimum separation distance of 20 cm is always maintained between the radiator (antenna) and all persons.*
2. *The transmitter module must not be operating in conjunction with any other antenna or transmitter, except in accordance with FCC multi-transmitter product procedures.*

If the two conditions above 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 requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.).

IMPORTANT NOTE: If these conditions cannot be met (for certain configurations or co-location with another transmitter), then the FCC and Industry Canada authorizations are no longer considered valid and the FCC ID and IC Certification Number cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC and Industry Canada authorization.

6.1 Power Exposure Information

Federal Communication Commission (FCC) Radiation Exposure Statement:

To comply with FCC RF exposure limits for general population/uncontrolled exposure, the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and operating in conjunction with any other antenna or transmitter.

OEM Responsibilities

WARNING: The OEM must ensure that FCC and Industry Canada labelling requirements are met. This includes a clearly visible label on the outside of the OEM enclosure specifying the appropriate Laird FCC identifier for this product.

Contains FCC ID: SQG-1001
Contains IC: 3147A-1001

The OEM of the RG191-M2 module must only use the approved antenna(s) listed above (TBD), which have been certified with this module. The OEM integrator must not provide information to the end user regarding how to install or remove this RF module or change RF related parameters in the user manual of the end-product.

The user manual for the end-product must also include the following information in a prominent location:

To comply with FCC and Industry Canada RF exposure limits for general population/uncontrolled exposure, the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and operating in conjunction with any other antenna or transmitter, except in accordance with FCC multi-transmitter product procedures.

If the size of the end product is larger than 8x10cm, then the following FCC part 15.19 statement has to also be available on visible on outside of device:

The enclosed device complies with Part 15 of the FCC Rules. 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 undesired operation

Label and text information should be in a size of type large enough to be readily legible, consistent with the dimensions of the equipment and the label. However, the type size for the text is not required to be larger than eight point.

CAUTION: The OEM should have their device which incorporates the RG191-M2 tested by a qualified test house to verify compliance with FCC Part 15 Subpart B limits for unintentional radiators.

WARNING: Changes or modifications not expressly approved by Laird could void the user's authority to operate the equipment.

FCC Interference Statement

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 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 an 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 correct the interference by one or more of the following measures:

- Re-orient or relocate the receiving antenna
- Increase the separation between the equipment and the receiver
- Connect the equipment to 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.

FCC Warning:

"THIS DEVICE COMPLIES WITH PART 15 OF THE FCC RULES 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 UNDESIRED OPERATION.

Industry Canada (IC) Warning:

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

French equivalent is:

Le présent appareil est conforme aux CNR d'Industrie Canada applicable 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.

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IC Radiation Exposure Statement
To comply with Industry Canada RF exposure limits for general population / uncontrolled exposure, the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be operating in conjunction with any other antenna or transmitter.

REMARQUE IMPORTANTE
Déclaration IC d'exposition aux radiations
Pour se conformer à Industrie Canada RF limites d'exposition pour la population générale / exposition non contrôlée, l'antenne utilisée pour ce transmetteur doit être installée pour fournir une distance d'au moins 20 cm de toutes les personnes et ne doit pas fonctionner en conjonction avec toute autre antenne ou transmetteur.

Modular Approval

OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.).

Approbation modulaire
OEM intégrateur est toujours responsable de tester leur produit final pour les exigences de conformité supplémentaires nécessaires à ce module installé (par exemple, les émissions de périphériques numériques, les exigences de périphériques PC, etc.)

Antennas
This radio transmitter RG191-M2 has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

This device has been designed to operate with the antenna listed below, and having a maximum gain of 2.0 dBi (LSR 900 MHz Dipole). Antennas not included in this list or having a gain greater than 2.0 dBi are strictly prohibited for use with this device. The required antenna impedance is 50 ohms.

List of all Antennas Acceptable for use with the Transmitter

1) LSR 001-0002 center-fed 900 MHz dipole antenna and LSR 080-0001 U.FL to Reverse Polarity SMA connector cable.

Antennes
Cet émetteur radio RG191-M2 a été approuvé par Industrie Canada pour fonctionner avec les types d'antennes listés ci-dessous avec le gain maximal admissible indiqué. Les types d'antenne non inclus dans cette liste, ayant un gain supérieur au gain maximal indiqué pour ce type, sont strictement interdits pour être utilisés avec ce périphérique.

Cet appareil a été conçu pour fonctionner avec l'antenne indiquée ci-dessous, et ayant un gain maximal de 2,0 dBi (Dipole LSR 900 MHz). Les antennes non comprises dans cette liste ou ayant un gain supérieur à 2,0 dBi sont strictement interdites pour être utilisées avec cet appareil. L'impédance d'antenne requise est de 50 ohms.
Liste de toutes les antennes Acceptables pour l'utilisation avec l'émetteur

1) LSR 001-0002 antenne dipôle de 900 MHz alimentée au centre et LSR 080-0001 U.FL à la Polarité Inverse SMA Câble de connexion.

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IMPORTANT NOTE

If these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the Canada authorization is no longer considered valid and the IC ID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end-product (including the transmitter) and obtaining a separate Canada authorization.

NOTE IMPORTANTE

Dans le cas où ces conditions ne peuvent être satisfaites (par exemple pour certaines configurations d'ordinateur portable ou de certaines co-localisation avec un autre émetteur), l'autorisation du Canada n'est plus considéré comme valide et l'ID IC ne peut pas être utilisé sur le produit final. Dans ces circonstances, l'intégrateur OEM sera chargé de réévaluer le produit final (y compris l'émetteur) et l'obtention d'une autorisation distincte au Canada.

Le produit final doit être étiqueté dans un endroit visible avec l'inscription suivante: " RG191-M2 Contient des IC: 3147A-1001".

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