

## Simblee™ RFD77101

## IoT for connecting Everyone and Everything



Only 7mm x 10mm

**Simblee™ Bluetooth® Smart Module RFD77101****DATASHEET****Features**

- Bluetooth® Smart Stack built-in
- Fully encapsulated and hermetically sealed
- Long range
- Simblee™ interference immunity
- 3ms latency
- 10us accuracy (jitter)
- Physical range adjustable from a few inches to hundreds of feet
- Build iPhone and Android apps without Xcode or the Android SDK
- Built in AES encryption engine
- 7mm x 10mm x 2.2mm
- 29 GPIOs (flexible pin configuration)
- <4uA ULP with clock running (run for years on a coin cell)
- 600nA ULP Sleep mode
- 8mA TX @ 0dBm, 12mA TX @ +4dBm
- 10mA RX
- -93dBm receiver sensitivity
- -55dBm to +4dBm TX power
- ARM Cortex M0 processor
- Flash code space available for user application (no need for external controller)
- 6x ADC inputs, 4x PWM outputs, 2x SPI master/slave, 2x I2C, 1 x UART
- Temperature sensor
- Battery/Supply voltage monitoring
- Onchip UART bootloader
- OTA programming (optional)
- Operating Voltage: 1.8 – 3.6V
- Integrated 16 MHz crystal and 32KHz precision crystal
- Integrated antenna
- Integrated shield
- CE, ETSI, IC, FCC Approved
- Easy to pick and place
- Patents Pending

## 1. Overview of the Simblee™ RFD77101

### 1.1 Introduction

The Simblee RFD77101 is a high performance, professional grade Bluetooth® Smart radio transceiver with a built-in ARM Cortex M0 microcontroller that can be programmed using the simple-to-use Arduino IDE using Simblee extensions.

Simblee is IoT for connecting Everyone and Everything (IoT4EE).

It incorporates Mobile, Bluetooth® Smart, Mesh, Cloud and other forms of wireless connectivity.

Simblee is high-quality, cutting-edge and performance focused.

Using the Simblee mobile browser on a phone or tablet, anyone can interact with Simblee enabled devices instantly without needing to download additional apps for each device.

In just hours you can create functional IoT applications using the Simblee development environment.

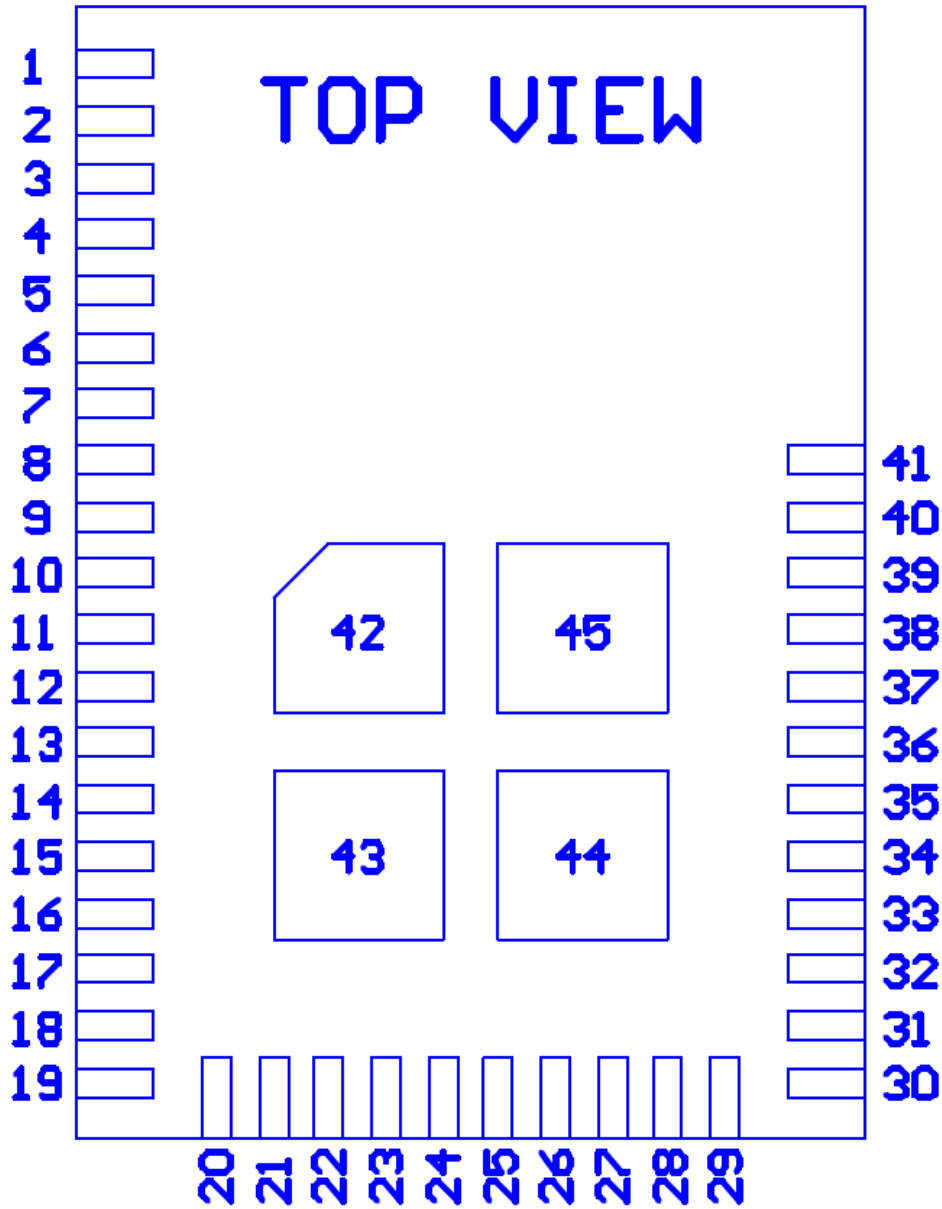
Developers can start developing mobile apps without having to first learn Xcode or Android SDKs.

### 1.2 Basic Operation

Simblee is programmed using the Arduino IDE. Code is loaded using the onchip UART bootloader or via OTA (over the air) programming.

## 2. Pinout

### 2.1 45-pin LGA 0.5mm pitch

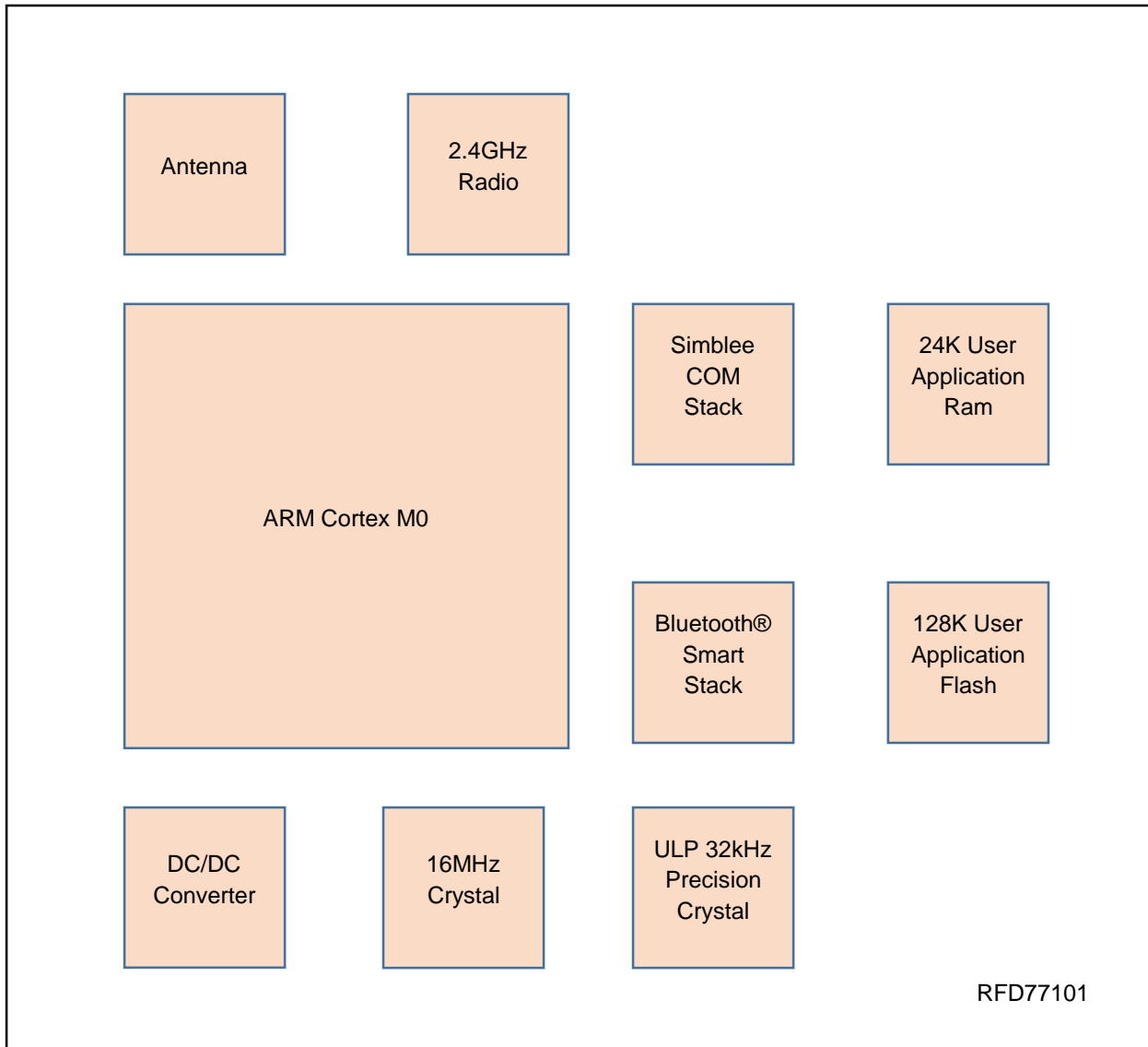


## 2.2 Pin Descriptions

Name	Pin	Type	Signal	Comments
1	GND	P	Supply ground	
2	GND	P	Supply ground	
3	DNC	X	DO NOT CONNECT	
4	GND	P	Supply ground	
5	DNC	X	DO NOT CONNECT	
6	GND	P	Supply ground	
7	VDD	P	1.8 – 3.6V Supply	
8	RST/SWDIO	I/O	Reset / SWDIO	
9	FACT/SWDCLK	I	Factory / SWDCLK	
10	DNC	X	DO NOT CONNECT	
11	P0.19	I/O	GPIO 19	
12	P0.17	I/O	GPIO 17	
13	P0.18	I/O	GPIO 18	
14	P0.16	I/O	GPIO 16	
15	P0.15	I/O	GPIO 15	
16	P0.12	I/O	GPIO 12	
17	P0.11	I/O	GPIO 11	
18	P0.09	I/O	GPIO 9	
19	GND	P	Supply ground	
20	P0.08	I/O	GPIO 8	
21	P0.05	I/O	GPIO 5 / ANALOG 6	
22	P0.03	I/O	GPIO 3 / ANALOG 4	
23	P0.01	I/O	GPIO 1 / ANALOG 2	
24	P0.02	I/O	GPIO 2 / ANALOG 3	
25	P0.00	I/O	GPIO 0 / AREF 0	
26	P0.07	I/O	GPIO 7	
27	P0.10	I/O	GPIO 10	
28	P0.13	I/O	GPIO 13	
29	P0.14	I/O	GPIO 14	
30	GND	P	Supply ground	
31	P0.06	I/O	GPIO 6 / AREF 1 / ANALOG 7	
32	P0.04	I/O	GPIO 4 / ANALOG 5	
33	P0.20	I/O	GPIO 20	
34	P0.23	I/O	GPIO 23	
35	P0.24	I/O	GPIO 24	
36	P0.21	I/O	GPIO 21	
37	P0.22	I/O	GPIO 22	
38	P0.25	I/O	GPIO 25	
39	P0.28	I/O	GPIO 28	
40	P0.29	I/O	GPIO 29	
41	P0.30	I/O	GPIO 30	
42	GND	P	Supply ground	
43	GND	P	Supply ground	
44	GND	P	Supply ground	
45	GND	P	Supply ground	

I Input only      O Output only, push-pull      I/O Input/output  
X DO NOT CONNECT      P Ground or power

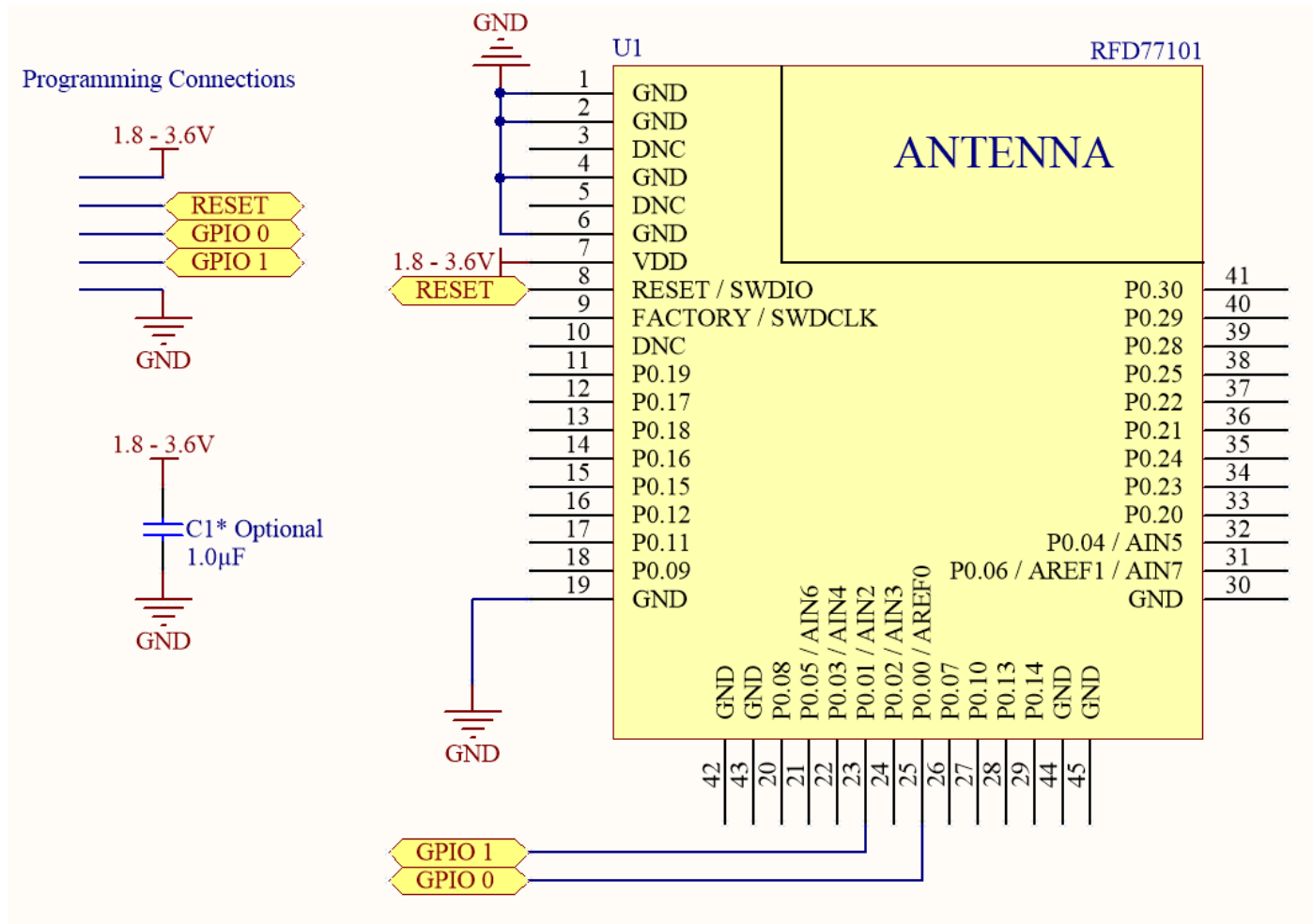
### 3. Block Diagram



RFD77101

## 4. Example Circuit Diagrams

### 4.1 Basic Circuit with programming interface



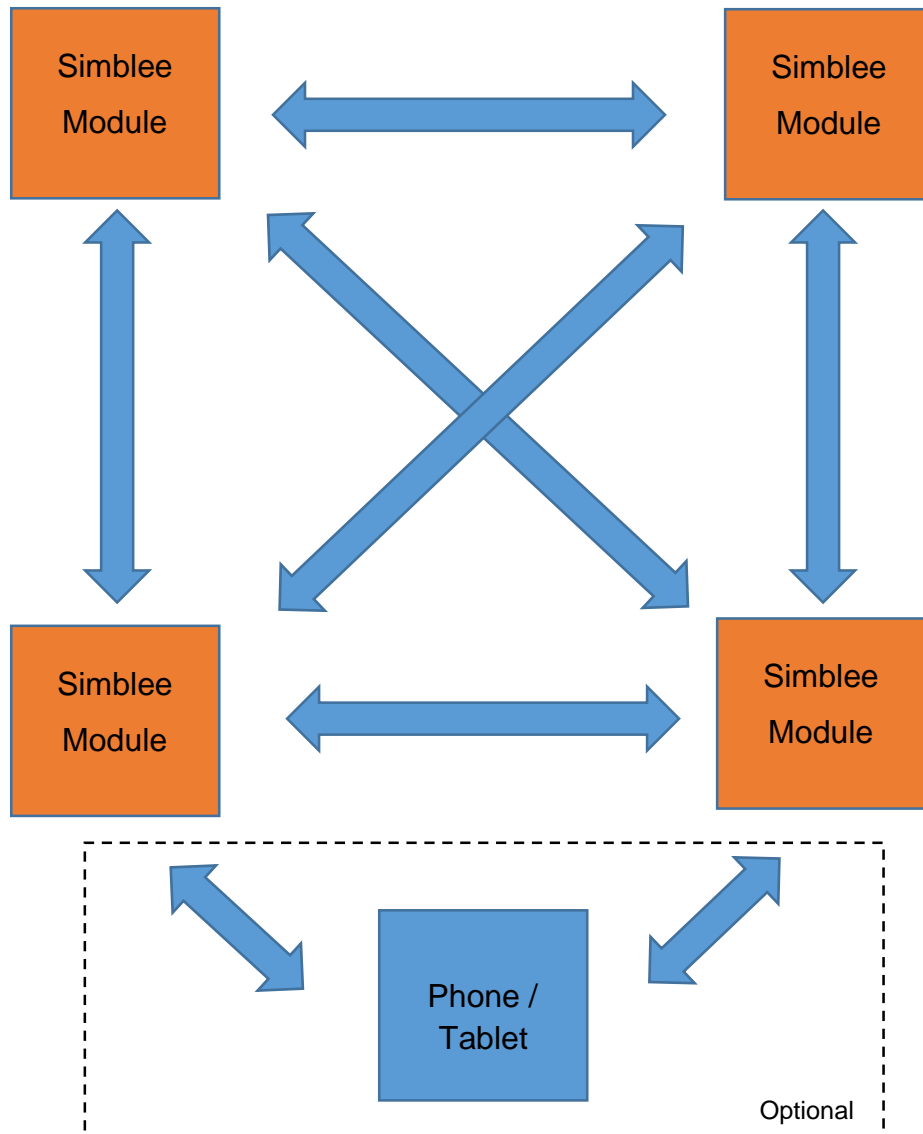
Note: A bypass capacitor C1 is recommended and should be placed close to pin 7.

## 5. Modes of Use

Bluetooth Low Energy bi-directional communication with smart phone or tablet



Simblee COMM ad-hoc bi-directional communication between any number of devices



## 6. Specifications

### 6.1 Absolute Maximum Specifications

V<sub>DD</sub> **0 to +3.7 V**

Max continuous pin current, any control or drive pin	±5 mA
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**CAUTION: Maximum ratings are the extreme limits the chip can be exposed to without causing permanent damage. Exposure to absolute maximum ratings for prolonged periods of time may affect the reliability of the chip.**

### 6.2 Recommended Operating Conditions

V<sub>DD</sub> **+1.8 to 3.6 V**

Operating temperature	-40°C to +85°C
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Power supply rise time (0V to V <sub>DD</sub> )	100ms maximum
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### 6.3 Radio Specifications

Parameter	Description	Min	Typ	Max	Units	Notes
F <sub>OP</sub>	Operating Frequency	2400		2481	MHz	1 MHz channel spacing
BPS <sub>Fsk</sub>	On-Air data rate	250		2000	kbps	
TX <sub>power</sub>	TX Power	-55		+4	dBm	
TX <sub>IDC+4dBm</sub>	TX Current at +4dBm w/ DC/DC		12		mA	
TX <sub>I+4dBm</sub>	TX Current at +4dBm w/o DC/DC		16		mA	
RX <sub>IDC</sub>	RX Current w/ DC/DC		10		mA	
RX <sub>I</sub>	RX Current w/o DC/DC		13		mA	
RX <sub>s250</sub>	Receiver sensitivity at 250kbps		-96		dBm	
RX <sub>s1000</sub>	Receiver sensitivity at 1000kbps		-90		dBm	
RX <sub>s2000</sub>	Receiver sensitivity at 2000kbps		-85		dBm	
RX <sub>sBLE</sub>	Receiver sensitivity at BLE		-93		dBm	



## 6.4 Simblee COM Specifications

Parameter	Description	Min	Typ	Max	Units	Notes
<b>RF<sub>T1</sub></b>	End-to-end latency high speed		3		ms	
<b>RF<sub>T2</sub></b>	End-to-end latency long range		12		ms	
<b>RF<sub>J</sub></b>	Jitter / Accuracy		10		us	

## 6.5 GPIO Specifications

Parameter	Description	Min	Typ	Max	Units	Notes
<b>V<sub>IH</sub></b>	Input high voltage	0.7VDD		VDD	V	
<b>V<sub>IL</sub></b>	Input low voltage	VSS		0.3VDD	V	
<b>GPIO<sub>IHD</sub></b>	GPIO high drive sink/source		5		mA	3 pins max
<b>GPIO<sub>ISD</sub></b>	GPIO standard drive sink/source		0.5		mA	
<b>R<sub>PU</sub></b>	Internal pull-up resistance	11	13	16	kΩ	
<b>R<sub>PD</sub></b>	Internal pull-down resistance	11	13	16	kΩ	

## 6.6 ADC Specifications

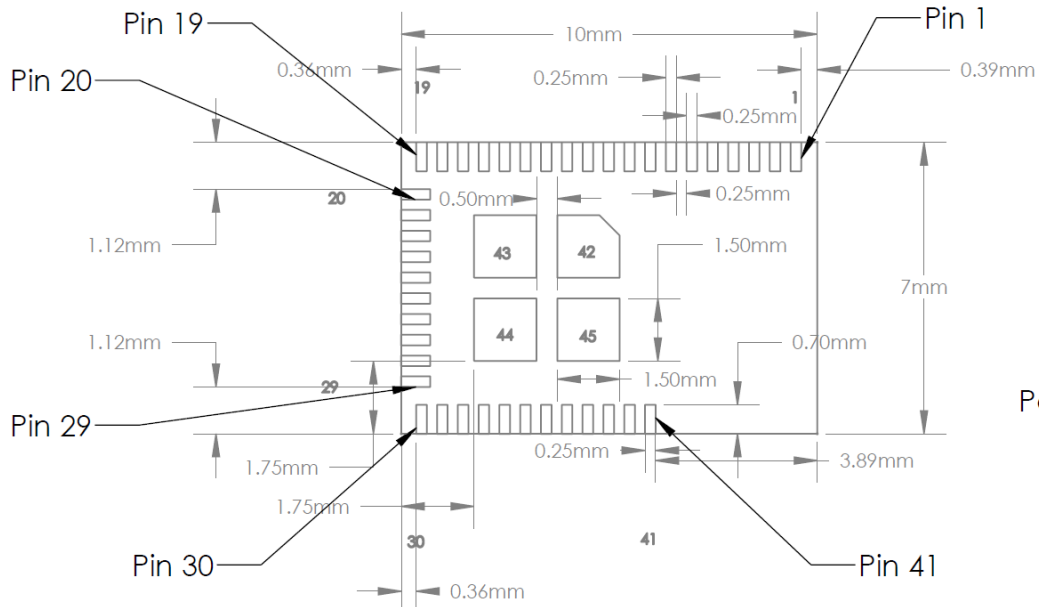
Parameter	Description	Min	Typ	Max	Units	Notes
<b>ADC<sub>enob</sub></b>	ADC bits		10		bit	
<b>ADC<sub>ose</sub></b>	Offset error	-2		+2	%	
<b>ADC<sub>ge</sub></b>	Gain error	-2		+2	%	
<b>ADC<sub>ref</sub></b>	Internal Band Gap reference error	-1.5		+1.5	%	1.2V Band Gap voltage
<b>ADC<sub>rev_ext</sub></b>	External reference voltage	0.83	1.2	1.3	V	
<b>ADC<sub>t10</sub></b>	Conversion time for 1 sample		68		us	10bit sample

## 6.7 I2C, SPI and UART Specifications

Parameter	Description	Min	Typ	Max	Units	Notes
<b>I2C<sub>rate</sub></b>	I2C bit rate	100		400	kbps	
<b>SPI<sub>rate</sub></b>	SPI master bit rate	0.125		4	Mbps	
<b>SPIS<sub>rate</sub></b>	SPI slave bit rate	0.125		2	Mbps	
<b>UART<sub>rate</sub></b>	UART bit rate	1.2		1000	kbps	

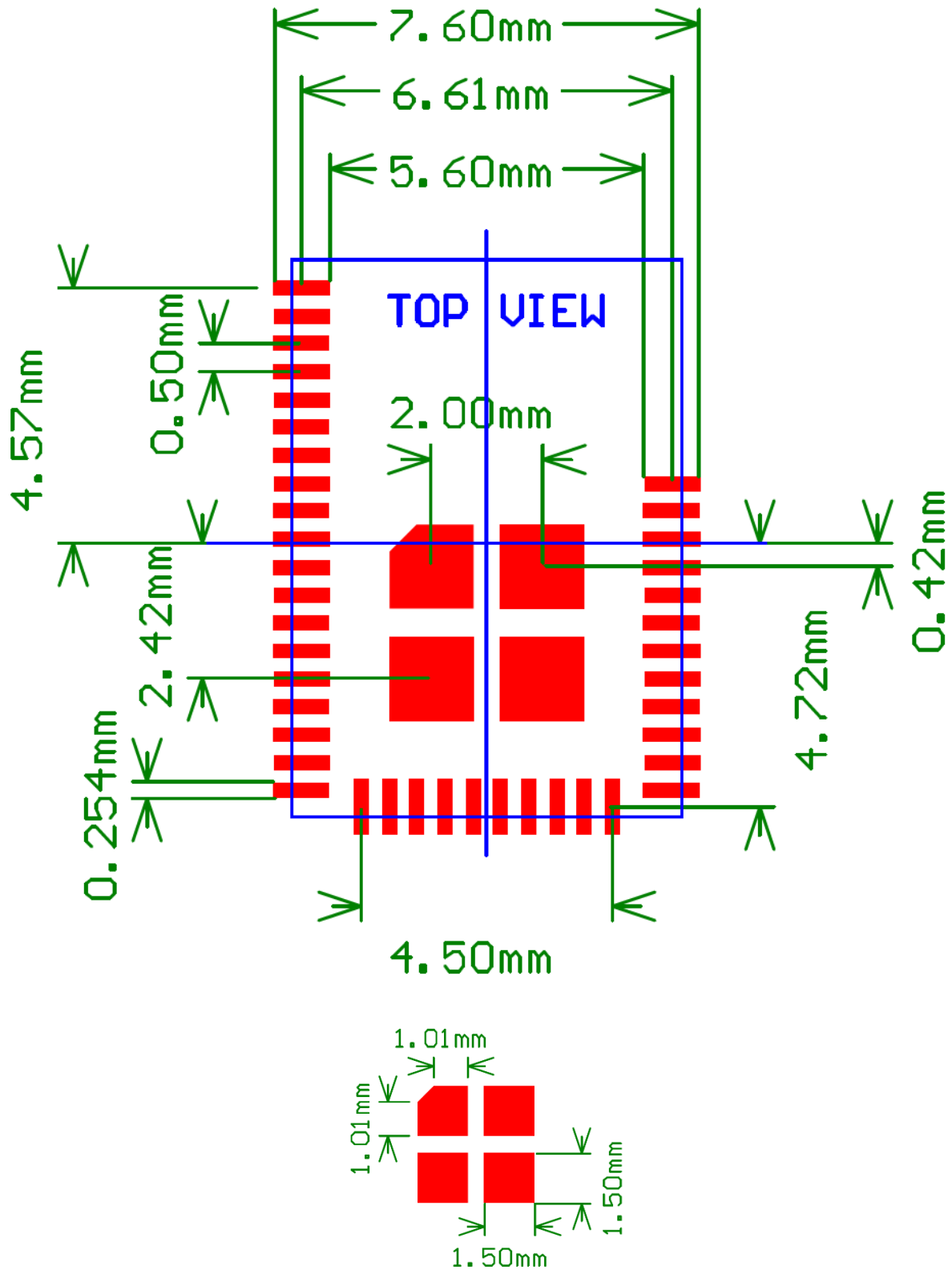
## 7. Mechanical Specifications

### 7.1 Physical Dimension

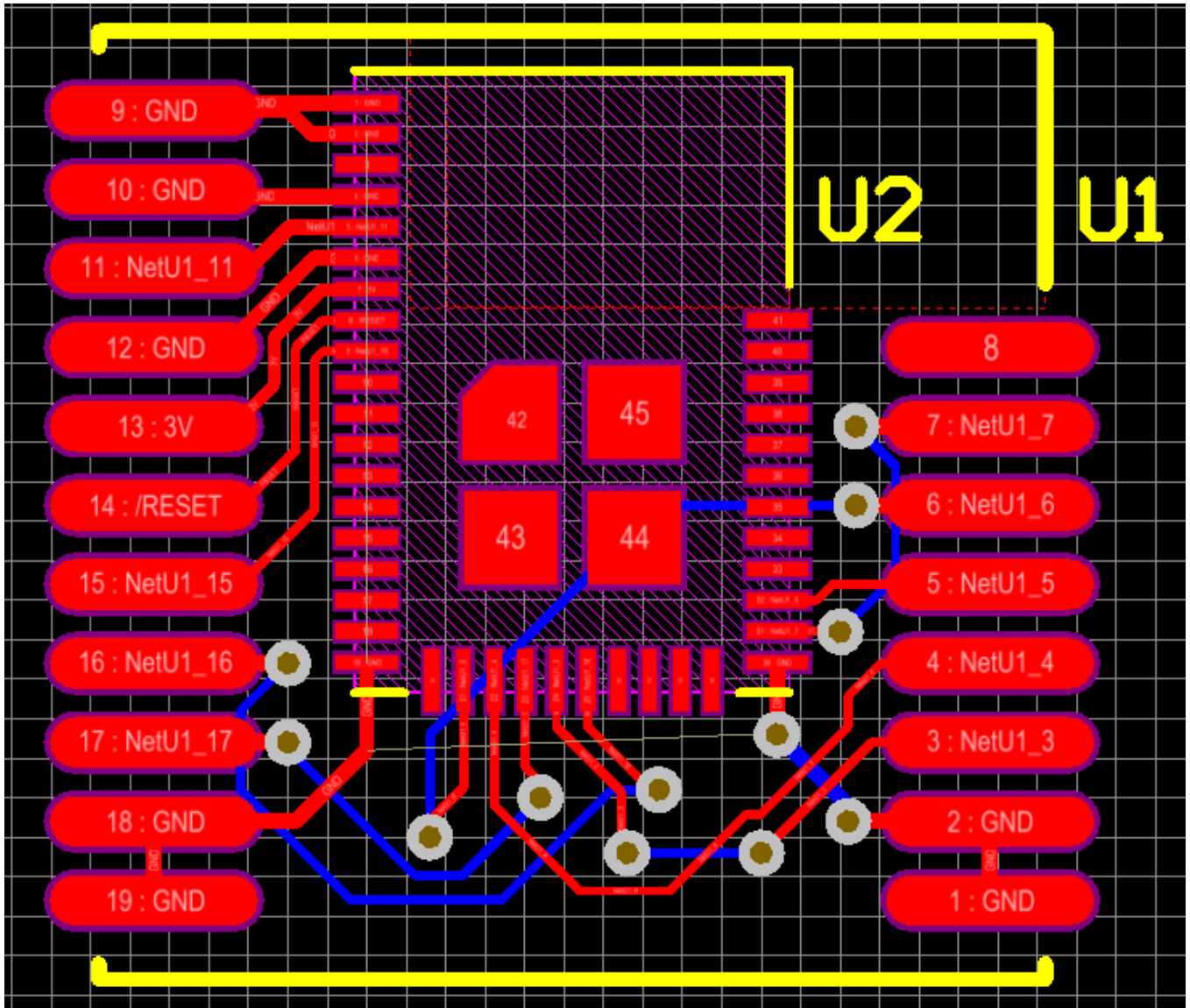


TOP VIEW  
All dimension in mm  
Package height - 2.2 mm

7.2 PCB Land Pattern



7.3 For RFduino users, Simblee / RFduino dual footprint



## 8. Miscellaneous

### 8.1 Ordering information

Part Number	Description
RFD77101	Simblee Radio Module

### 8.2 Assembly information

MSL Rating	Peak Body Temperature	Specifications
TBD	260°C	IPC/JEDEC J-STD-020

### 8.3 Associated Documents

For additional information, visit [www.simblee.com](http://www.simblee.com)

### 8.4 Certifications

Certification	Date	Status
IC	08.14.2015	Approved
FCC	09.29.2915	Approved
CE. ETSI	Pending	In Process
MIC, TELEC	Pending	In Process

## Industry Canada Information

*This device complies with Industry Canada licence-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.*

*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.*

IC LABEL Relating to Model Number R71 (RFD Part Number: RFD77101) The unit should have a permanently attached label in a conspicuous location with the following statement:

**Contains IC:6992A-71**

NOTES: 1. Industry Canada does not specify the size of the label or the lettering thereon. The only requirement is that the text be legible.

## Relating to Model Number R71 (RFD Part Number: RFD77101)

**INSTRUCTION TO THE USER** (if device DOES NOT contain a digital device) The user is cautioned that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

**INSTRUCTION TO THE USER** (if device contains a digital device) 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 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 manufacturer could void the user's authority to operate this equipment.

## FCC LABEL Relating to Model Number R71 (RFD Part Number: RFD77101)

The unit should have a permanently attached label in a conspicuous location with the following statement:

### **Contains FCC ID: UYI71**

- (1) This device may not cause harmful interference and**
- (2) This device must accept any interference received, including interference that may cause undesired operation.**

NOTES: 1. The FCC does not specify the size of the label or the lettering thereon. The only requirement is that the text be legible. 2. If the entire label can not be placed on the unit due to space constraint, only FCC ID may be displayed on the unit. In such cases, the compliance statement will have to be included in the "user's manual". NOTE: Device must be smaller than a man's palm. \*\* If the unit also interfaces with phone line, it requires additional information on the label - refer to part 68 information \*\*

**Important:** To comply with FCC RF exposure requirements, this device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter.

## 8.5 Revision History

Revision No.	Date	Notes
1.0	11.07.2015	Layout Revisions
0.2	09.09.2015	Compliance info
0.11	07.22.2015	Grammatical correction
0.1	03.27.2015	Initial release

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