

WiFly GSX 802.11 b/g Wireless LAN Module

Features

- Qualified 2.4GHz IEEE 802.11b/g transceiver
- High throughput, 1Mbps sustained data rate with TCP/IP and WPA2
- Ultra-low power - 4uA sleep, 40mA Rx, 210mA Tx (max)
- Small, compact surface mount module
- On board ceramic chip antenna and U.FL connector for external antenna
- 8 Mbit flash memory and 128 KB RAM
- UART hardware interface
- 10 general purpose digital I/O
- 8 analog sensor interfaces
- Real-time clock for wakeup and time stamping
- Accepts 3.3V regulated or 2-3V battery
- Supports Adhoc connections
- On board ECOS -OS, TCP/IP stacks
- Wi-Fi Alliance certified for WPA2-PSK
- FCC / CE/ ICS certified and RoHS compliant.
- Industrial (RN-131G) and commercial (RN-131C) grade temperature options

Applications

- Remote equipment monitoring
- Telemetry
- Industrial sensors and controls

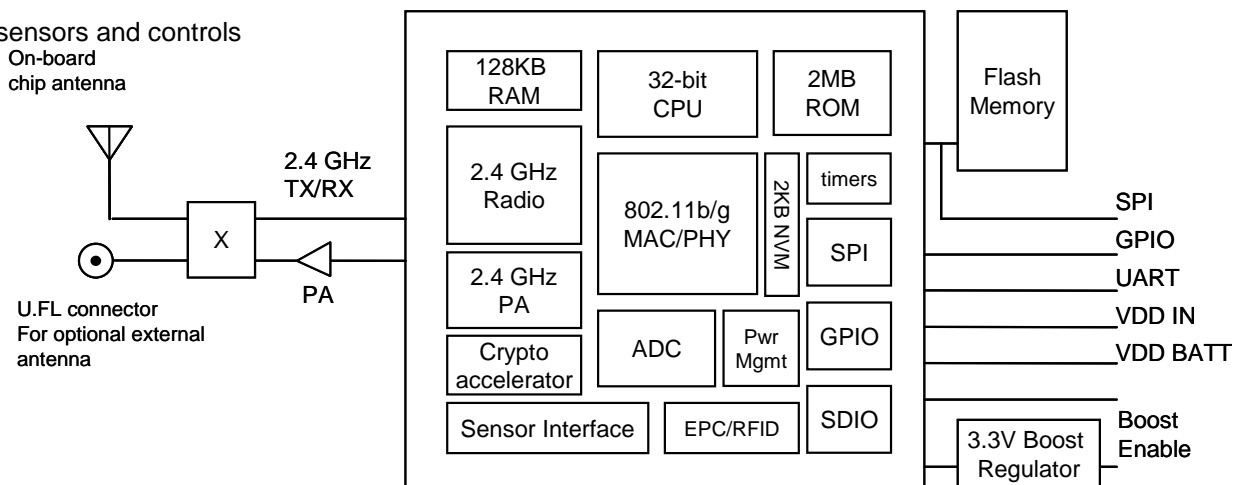


- Home Automation
- Medical device monitoring

Description

The WiFly GSX module is a stand alone, embedded wireless 802.11 networking module. Because of its small form factor and extremely low power consumption, the RN-131G is perfect for mobile wireless applications such as asset monitoring, GPS tracking and battery sensors. The WiFly GSX module incorporates a 2.4GHz radio, processor, TCP/IP stack, real-time clock, crypto accelerator, power management and analog sensor interfaces. This complete solution is preloaded with software to simplify integration and minimizes development of your application. In the simplest configuration the hardware only requires four connections (PWR, TX, RX, GND) to create a wireless data connection. Additionally, the sensor interface provides temperature, audio, motion, acceleration and other analog data without requiring additional hardware. The WiFly GSX module is programmed and controlled with a simple ASCII command language. Once the WiFly GSX is setup it can scan to find an access point, associate, authenticate and connect over any Wifi network.

Block Diagram



Overview

- Host Data Rate up to 1 Mbps for UART
- Intelligent, built-in power management with programmable wakeup
- Can be powered from regulated 3.3-3.7V source or 2.0-3.0V batteries
- Real time clock for time stamping, auto-sleep and auto-wakeup
- Configuration over UART using simple ASCII commands
- Telnet configuration over WiFi
- Over the air firmware upgrade (FTP)
- Memory 128 KB RAM, 2MB ROM, 2 KB battery-backed memory, 8 Mbit Flash.
- Secure WiFi authentication WEP-128, WPA-PSK (TKIP), WPA2-PSK (AES)
- Built in networking applications DHCP, UDP, DNS, ARP, ICMP, TCP, sockets
- 802.11 power save and roaming functions

Environmental Conditions

Parameter	RN-131G	RN-131C
Temperature Range (Operating)	-30 °C ~ +85 °C	0 °C ~ +70 °C
Temperature Range (Storage)	-40 °C ~ +85 °C	-40 °C ~ +85 °C
Relative Humidity (Operating)	≤90%	≤90%
Relative Humidity (Storage)	≤90%	≤90%

Electrical Characteristics

Supply Voltage	Min	Typ.	Max.	Unit
Supply Voltage VDD	3.0	3.3	3.7	VDC
Supply Voltage (VBATT option)	2.0	3.0	3.3	VDC
Pin 21 switched 3.3V output			150	ma
Digital Input				
Input logic HIGH VIH	2.3V			VDC
Input logic LOW VIL			1.0V	VDC
Digital Output drive				
PIO 4,5,6,7,8		24		ma
PIO 9,10,11,12,13		8		ma
Power consumption				
Sleep		4		uA
Standby (doze)	-	15	-	mA
Connected (idle, RX)		40		mA
Connected (TX)		140	212	mA

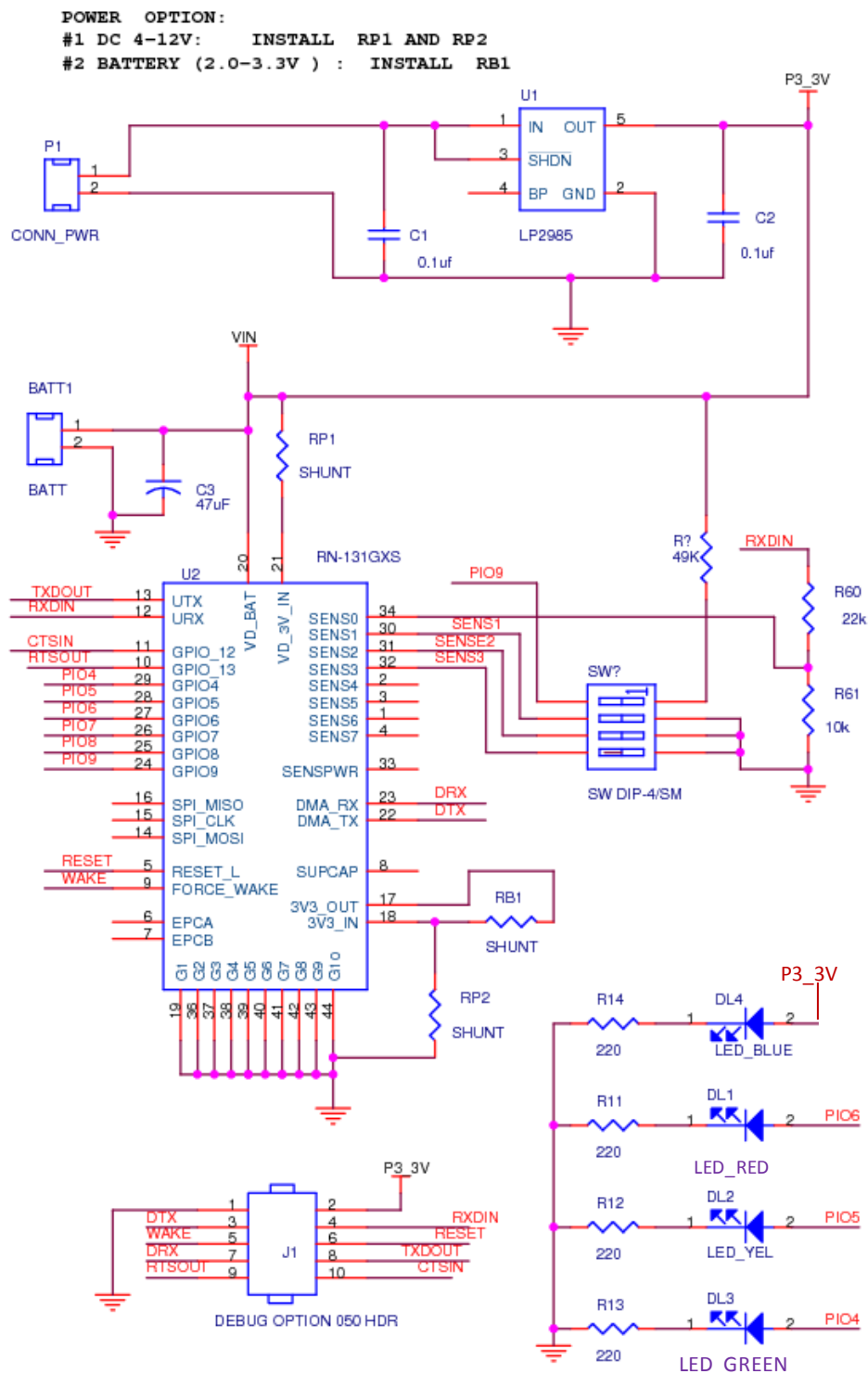
Analog Sensor Inputs

Parameter	Value
Sense 0,1,2,3 wakeup detect threshold	500mV
AD sense 0-7 measurement range	0-400mV
Precision	14 bits = 12uV
Accuracy	5% un-calibrated, .01% calibrated
Minimum conversion time	35uS (5kHz over wifi)
Sensor Power (pin 33) output resistance 3.3V	10 ohms, max current = 50mA

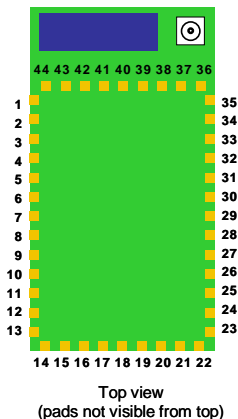
Radio Characteristics

Parameter	Specifications
Frequency	2402 ~ 2480MHz
Modulation	802.11b compatibility : DSSS(CCK-11, CCK-5.5, DQPSK-2, DBPSK-1) 802.11g : OFDM (default)
Channel intervals	5MHz
Channels	1 - 14
Transmission rate (over the air)	1 – 11Mbps for 802.11b / 6 – 54Mbps for 802.11g
Receive sensitivity	-85dBm typ.
Output level (Class1)	+18dBm
Maximum RF input to U.FL connector	10 dBm

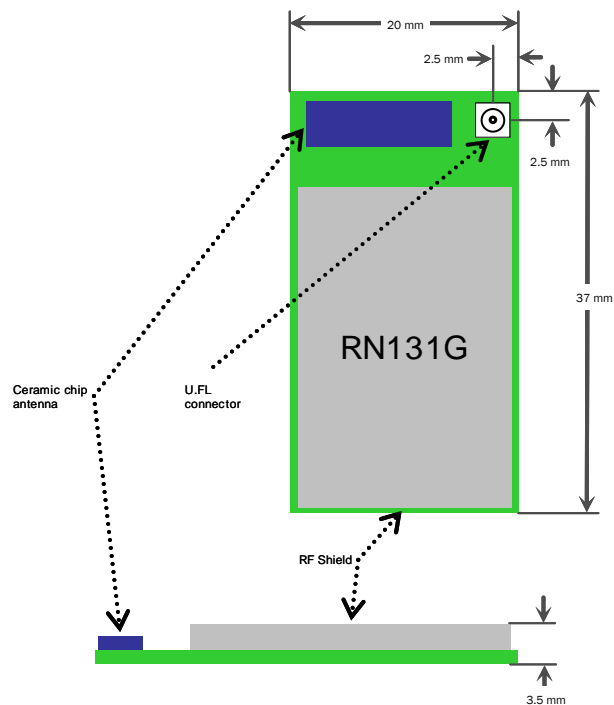
Typical Application Schematic



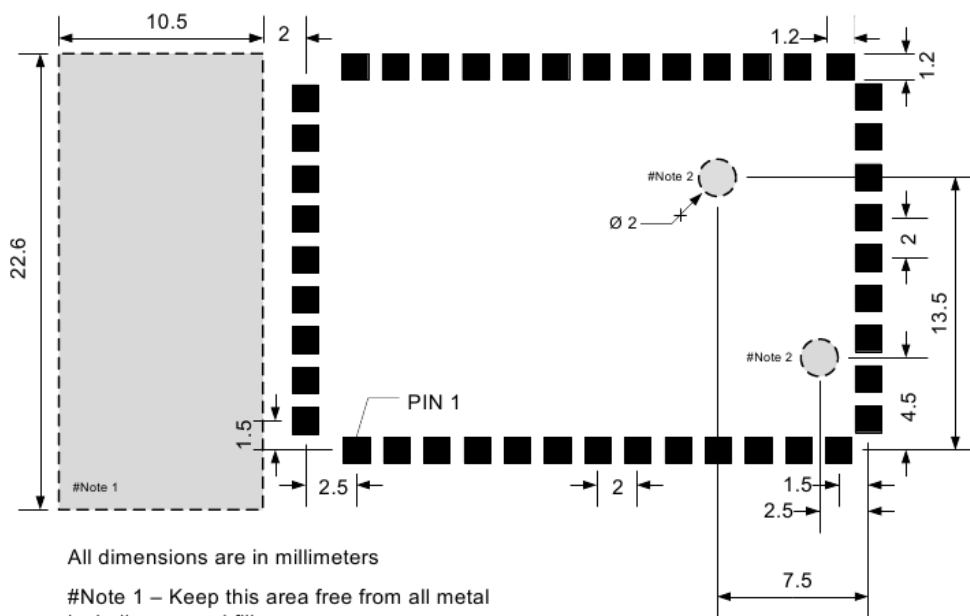
Pin Description



Pin	Name	Description	Default
1	SENSOR-6	Sensor interface, analog input to module, 1.2V	No connect
2	SENSOR-4	Sensor interface, Analog input to module, 1.2V	No connect
3	SENSOR-5	Sensor interface, Analog input to module, 1.2V	No connect
4	SENSOR-7	Analog input to module, 1.2V	No connect
5	RESET	Module reset, Active Low, reference to VDD-BATT, 160 usec pulse	Pull up
6	EPC-ANT-A	EPC port, RFID antenna A	No connect
7	EPC-ANT-B	EPC port, RFID antenna B	No connect
8	SUPERCAP	Balance center pin voltage on stacked super capacitors, Analog 3.3V	No connect
9	FORCE_AWAKE	Force the module to wakeup, input to module, 250us min. pulse.3.3V	
10	GPIO-13	UART RTS flow control, 8mA drive, 3.3V tolerant	
11	GPIO-12	UART CTS flow control, 8mA drive, 3.3V tolerant	
12	UART-RX	INPUT: RX in to the module, 3.3V tolerant	
13	UART-TX	OUTPUT: TX out from the module, 8mA drive, 3.3V tolerant	
14	SPI-MOSI	SPI master data out (Contact Roving Networks for details)	No connect
15	SPI-CLK	SPI clock, (Contact Roving Networks for details)	No connect
16	SPI-MISO	SPI master data in (Contact Roving Networks for details)	No connect
17	3.3V-REG-OUT	boost regulator control output, connect to 3.3V-REG-IN to enable	No connect
18	3.3V-REG-IN	boost regulator control input, connect to 3.3V-REG-OUT to enable	GND to disable
19	GND	Ground	
20	VDD-BATT	Battery input, 2.0-3.3V with boost regulator in use, 3.0-3.7V otherwise	
21	VDD-IN	3.3 to 3.7 voltage, do not connect when boost regulator is in use	
22	DMA-TX	Debug port *(apply 100K pulldown if ultra low sleep power reqd)	HIGH Z
23	DMA-RX	Debug port	No connect
24	GPIO-9	Restore factory resets/Enter Adhoc mode, 8mA drive, 3.3V tolerant	INPUT
25	GPIO-8	GPIO, 24mA drive, 3.3V tolerant	GP output
26	GPIO-7	GPIO, 24mA drive, 3.3V tolerant	GP output
27	GPIO-6	Association STATUS, 24mA drive, 3.3V tolerant	LED_RED output
28	GPIO-5	Data transfer STATUS, 24mA drive, 3.3V tolerant	LED_YELLOW output
29	GPIO-4	Connection STATUS, 24mA drive, 3.3V tolerant	LED_GREEN output
30	SENSOR-1	Sensor interface, analog input to module, 1.2V	
31	SENSOR-2	Sensor interface, analog input to module, 1.2V	
32	SENSOR-3	Sensor interface, analog input to module, 1.2V	
33	SENSE-PWR	Voltage output from module to power external sensors, 3.3V	
34	SENSOR-0	Wakeup from external condition	
35	NO CONNECT		No connect
36-44	GND	Must be connected for proper antenna performance	



Physical Dimensions



All dimensions are in millimeters

#Note 1 – Keep this area free from all metal including ground fill.

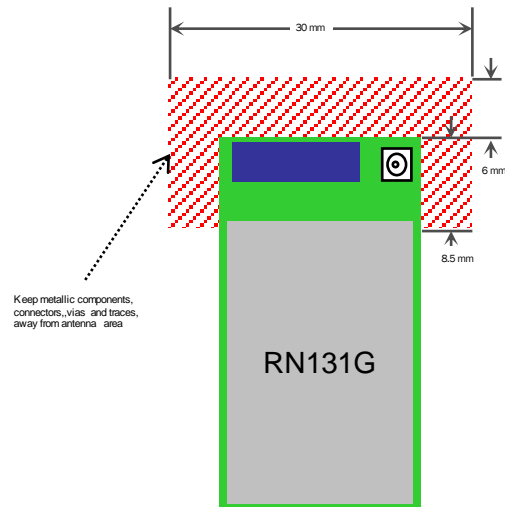
#Note 2 – Keep this area free from routes and exposed copper. Ok to place ground fill with solder mask.

Design Concerns

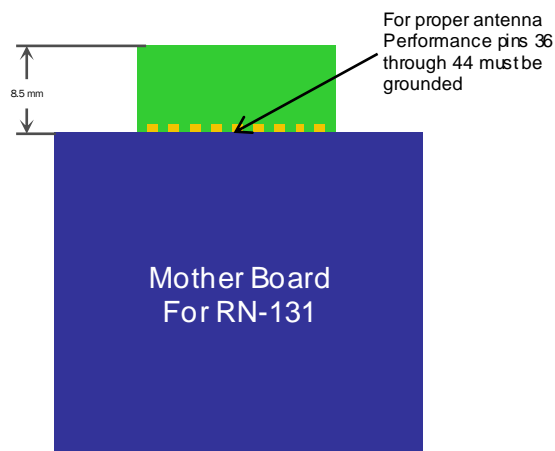
1. **Minimizing radio interference.** When integrating the WiFly module with on board chip antenna make sure the area around the chip antenna end the module protrudes at least 6mm from the mother board PCB and any metal enclosure. If this is not possible use the on board U.FL connector to route to an external Antenna.

The 8.5 mm area under the antenna end of the module should be keep clear of metallic components, connectors, vias, traces and other materials that can interfere with the radio signal.

2. **Proper grounding.** For the module antenna to function pins 36- to 44 must be connected to GND. We suggest you place module such that 0.5mm of these pads is exposed. This provides access for soldering pins 36 through 44 from below and provides ample clearance of the antenna from the PCB.



Top view



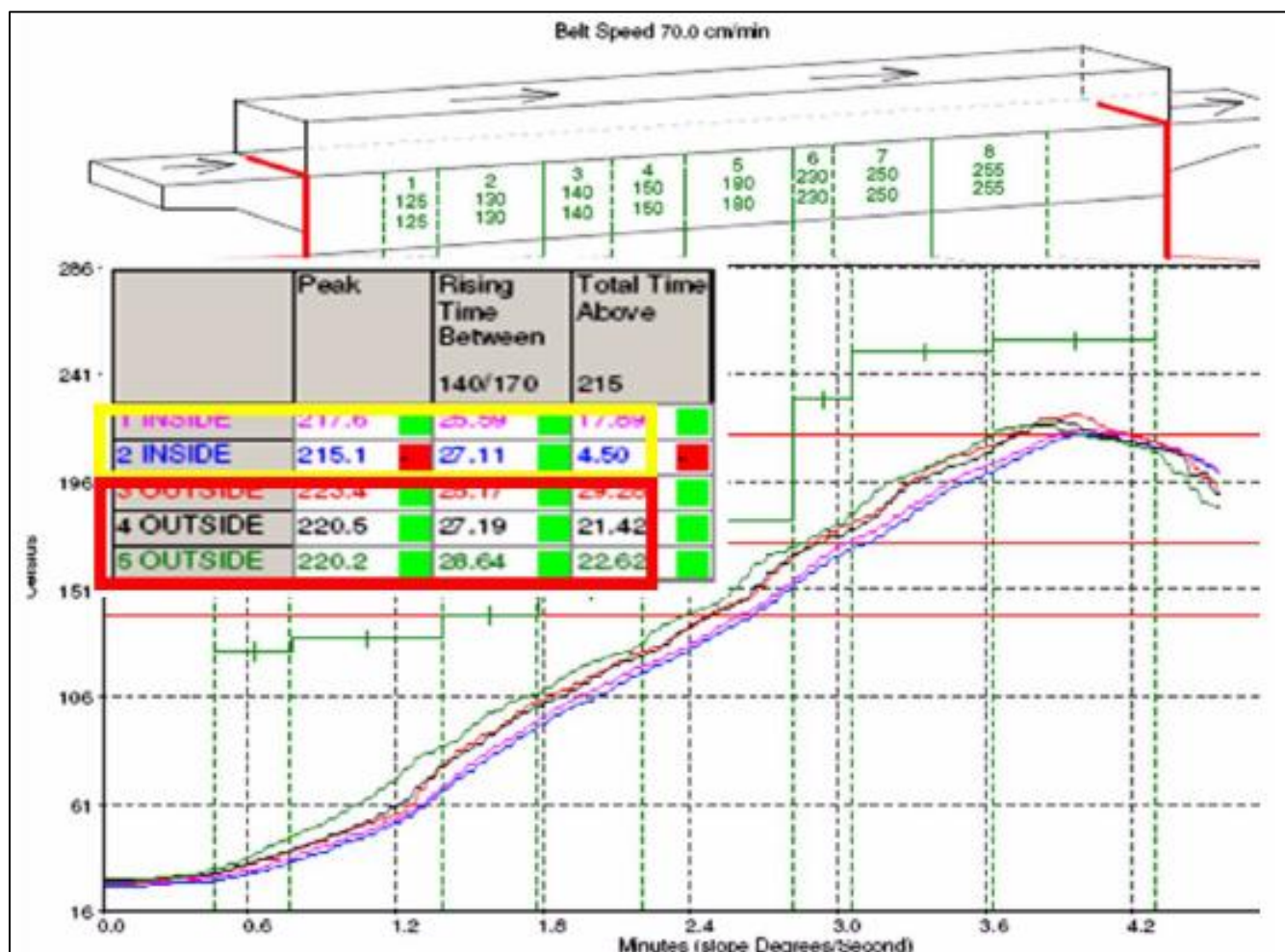
Bottom view

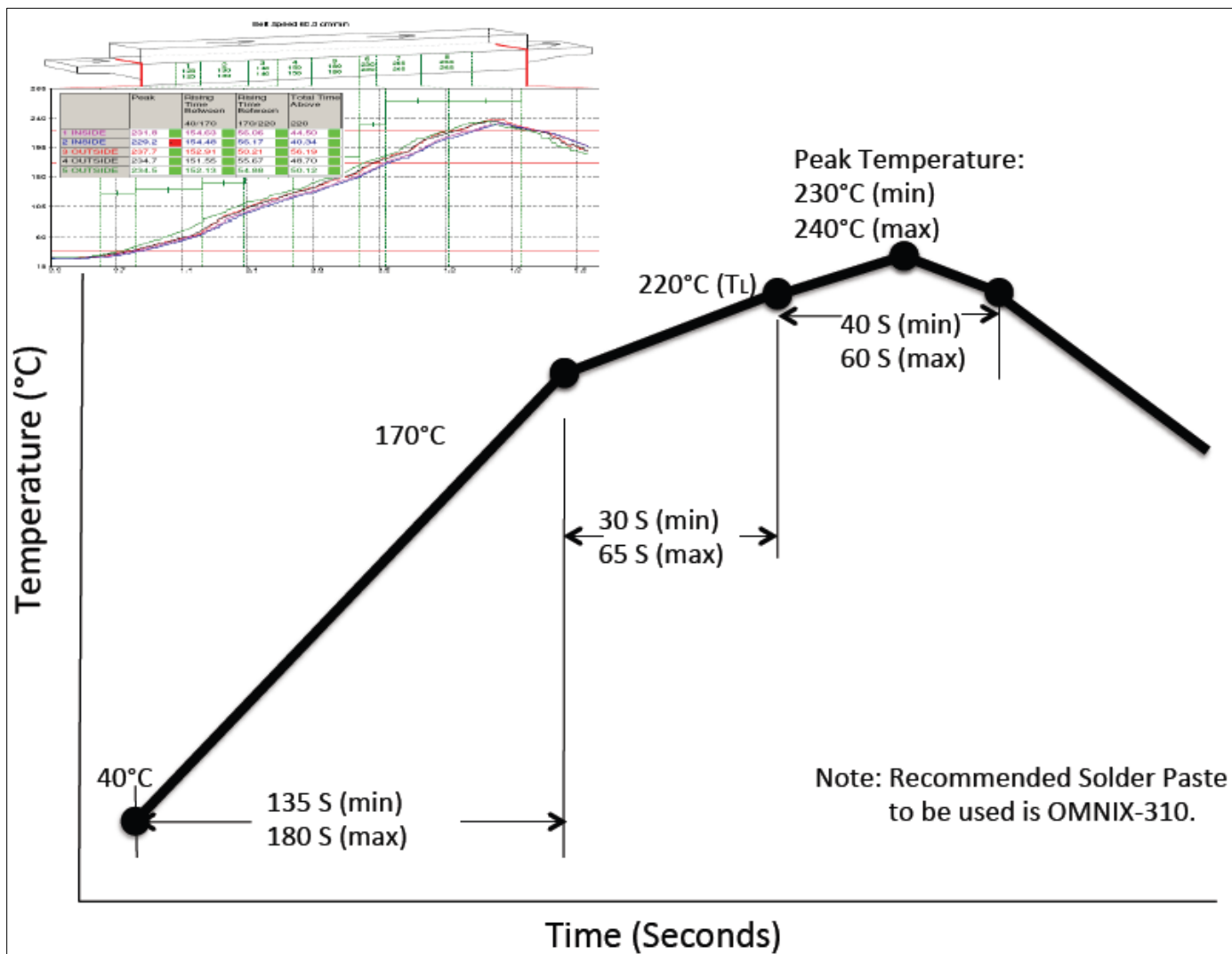
3. **Solder Reflow.** Reflow temperature must not exceed 220C.

To reflow solder the RN-131G and RN-131C module onto a PCB Roving recommends a RoHS compliant solder paste equivalent to the NIHON ALMIT paste or OMNIX OM-310 solder paste from Alpha metals.

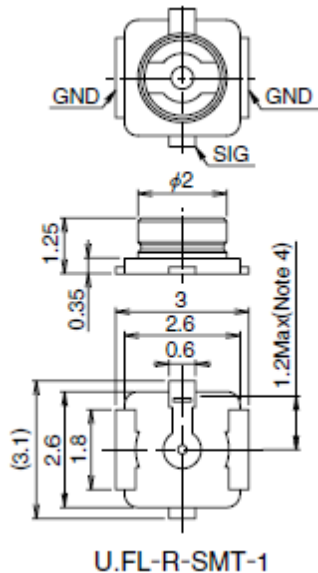
NOTE: Use no clean Flux, Do NOT water wash!

Manufacturer	Alpha Metals http://www.alphametals.com	NIHON ALMIT Co. LTD http://almit.co.jp
Part Number	OMNIX OM-310	LFM-70W INP
Metal Composition	SAC305 (96.5% Sn, 3% Ag, 0.5% Cu)	88% Sn, 3.5% Ag, 0.5% Bi, 8% In
Temp. Liquidus	~220°C	~215°C





4. **U.FL connector.** Use Hirose U.FL connector **U.FL-R-SMT** to for connecting external antennas. See Roving Networks U.FL to SMA cable. Part number: RN-UFL-SMA6



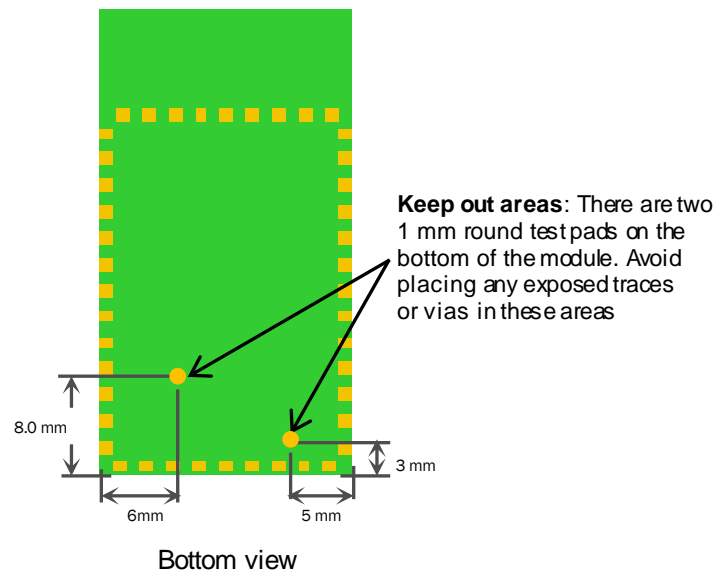
5. **Connection Status.** GPIO-4, GPIO-5, GPIO-6 are available to drive a status LEDs. GPIO-6 indicates TCP/IP connection status. This signal is ON high for an active connection, toggles fast to indicate no IP address and toggles slow indicates IP address OK but not connection. GPIO-4 indicates association status. High means not associated with a network, Off indicates associated and Internet access is OK. GPIO-5 toggles when data is transferred.
6. **Keep out areas.** When designing your PCB avoid exposed trace and via beneath the module.
7. **Powering the module.** The WiFly module can be powered from either 3.0VDC batteries or 3.3VDC regulated power.

3.0VDC battery power

- Apply power to pin 20 (VDD-BATT)
- Short pin 17 (3.3V-REG-OUT) to pin 18 (3.3V-REG-IN) (battery boost mode)
- 150mA of current at 3.3V available for external devices on pin 21 when in battery boost mode.

3.3 VDC power

- Apply power to pin 20(VDD-BATT) and pin 21 (VDD-IN)
- Connect pin 18 (3.3V-REG-IN) to ground and leave pin 17 (3.3V-REG-OUT) unconnected.



8. **Reset (Pin 5).** The RESET signal is used to reset the module and is ACTIVE low. This pin has a built in 100k pull up. It is not required to connect this pin and it can be left unconnected. To reset the module a pulse of 160us minimum duration at 3.3V must be applied.
9. **Force Awake (Pin 9).** This signal forces the module to wake up from sleep state. FORCE_AWAKE is active high signal. To wake the module, a pulse of minimum 250 us at 3.3V must be applied.
10. **Achieving lowest power in sleep mode**

To achieve the lowest power consumption (4uA) in sleep mode connect a weak pull down (100K resistor to GND) on the following pin.

Pin 22 - DMA-TX

If GPIO-8 through GPIO-4 are being used to drive an output, connect a 100k pull down resistor. Any GPIOs not used (No connect) can be left floating.

Pin 25 - GPIO-8

Pin 26 - GPIO-7

Pin 27 - GPIO-6

Pin 28 - GPIO-5

Pin 29 - GPIO-4

Other GPIO lines: No pulldown needed, internal pulldown (80K) already on chip.

The power consumption in sleep mode without these signals connected to a pull down is 655uA

11. **Sensor Interfaces.** Inputs must not exceed 1.2V. Sensitivity saturates at 400 mV.
12. **Adhoc mode and Restoring Factory Settings.** Adhoc mode is controlled through GPIO-9. It is a good idea to connect pin 24, GPIO-9 to a switch or jumper connected to a pull up. When GPIO-9 is driven high at power up the module will be in Adhoc mode. If GPIO-9 is then toggled low 5 times, the initial factory default configuration will be RESTORED. This is useful for cases where the module is mis-configured and is no long responding.

13. Compliance Information

FCC Compliance

This equipment has been tested and found to comply with the limits for a Class 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 the radio communications. However, there are no guarantees that interference will not occur in a particular installation.

Troubleshooting

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 instructions

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

Conditions

Operation is subject to the following conditions

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

Markings

To satisfy the FCC exterior labeling requirements the following text must be placed on the exterior of the end product

Contains Module FCC ID: U30-G2M5477

This marking applies to the G2M5477 and RN-131 module, which are one in the same. Any similar working that expresses the same meaning may be used.

FCC Warning**Modifications**

Modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment under FCC rules.

Radio Frequency Exposure

Property (Units Measured)	Value
<i>Antenna Gain (dBi)</i>	<i>2.0</i>
<i>Numeric Gain (numeric)</i>	<i>1.58</i>
<i>Max Allowable Peak Power (dBm)</i>	<i>+23.76</i>
<i>Max Allowable Peak Power (mW)</i>	<i>237.7</i>
<i>Calculated Safe Distance at 1 mW/cm²</i>	<i>5.5 cm</i>
<i>Minimum Separation Distance</i>	<i>20³ cm</i>

This equipment has been evaluated in accordance with the FCC bulletin 56 "Hazards of radio frequency and electromagnetic fields" and Bulletin 65 "Human exposure to radio frequency and electromagnetic fields"

A distance greater or equal to 20cm from the device should be maintained for safe operation in an uncontrolled environment.

NCC (Taiwan statement)**Contains Transmitter Module NCC ID: CCAF11LP0240T6****802.11b/802.11g/BT 警語：**

第十二條→經型式認證合格之低功率射頻電機，非經許可，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。
第十四條→低功率射頻電機之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。
前項合法通信，指依電信法規定作業之無線電通信。低功率射頻電機須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。

*Unofficial Translation***Article 12**

Without permission granted by the NCC, any company, enterprise, or user is not allowed to change frequency, enhance transmitting power or alter original characteristic as well as performance to an approved low power radio-frequency devices.

Article 14

The low power radio-frequency devices shall not influence aircraft security and interfere legal communications; If found, the user shall cease operating immediately until no interference is achieved. The said legal communications means radio communications is operated in compliance with the Telecommunications Act.

The low power radio-frequency devices must be susceptible with the interference from legal communications or ISM radio wave radiated devices.

Compliance Information

FCC	ID U3O-G2M5477 Part 15.247
IC	(canada) RSS-210
CE	EU ID # 0681
REG	U9M20901-1000-C
RADIO	EN 300328 V1.7.1 (10/2006)
EMC	EN 301489-1 V1.8.1 (04/2008), EN 301489-17 V1.3.2 (04/2008)
SAFETY	EN 60950-1:2001+A11:2004
RoHs	Compliant

Ordering Information

Part Number	Description
RN-131G	Industrial Temperature (-30 to + 85 C) With chip antenna and U.FL connector
RN-131C	Commercial Temperature (0 to + 70 C) With chip antenna and U.FL connector
RN-131G-EVAL	Development Kit for the RN-131G (Includes the RN-131G module)
RN-134	SuRFboard carrier PCB for RN-131, RS-232, LEDs, power regulator. Sensor connections
RN-SMA4-RP	4" external antenna with reverse polarity SMA connector. Used with RN-UFL-SMA6
RN-UFL-SMA6	6 inch cable with U.FL connector on one end and SMA on the other
For other configurations, contact Roving Networks directly.	

Visit <http://www.rovingnetworks.com> for current pricing and a list of distributors carrying our products.

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