WiFly GSX 802.11 b/g Wireless LAN Module

Features

- FCC / CE/ IC certified 2.4GHz IEEE 802.11b/g transceiver
- Small form factor: 1050 x 700 x 130 mil
- Controllable output power: 0dBm to 12 dBm
- RF pad connector for antennas
- Certified antennas: Chip antenna, 4" Dipole, PCB trace and wire antenna
- Ultra-low power - 4uA sleep, 38mA Rx, 120 mA Tx at 0dBm
- High throughput - 921Kbps TX, 500Kbps RX data rate with TCP/IP and WPA2 over UART, 2 to 3 Mbps over SPI
- 8 Mbit flash memory and 128 KB RAM
- 10 general purpose digital I/O
- 8 analog sensor interfaces
- Real-time clock for wakeup and time stamping
- Accepts 3.3V regulated power supply or 3V battery
- Supports Adhoc and infrastructure networks
- On board complete TCP/IP networking stack
- Environmentally friendly- RoHS compliant.

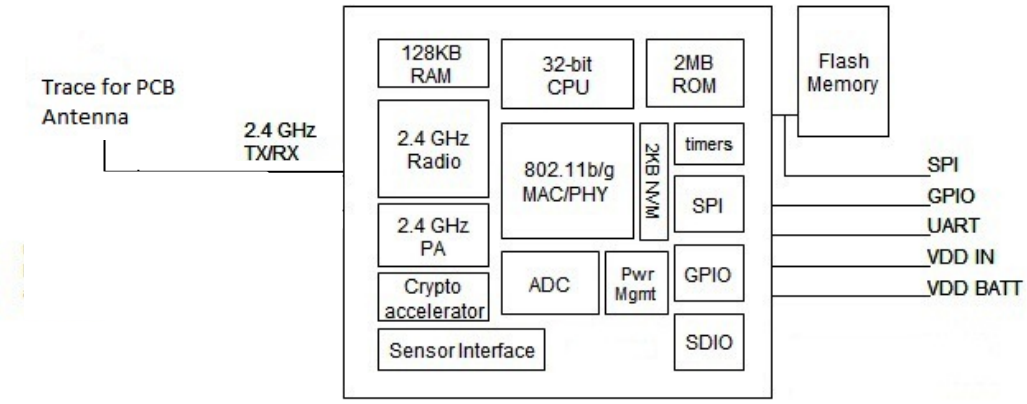
Applications

- Remote Monitoring
- Industrial sensors and controls
- Telemetry
- Home Automation

Description

The RN-171 module is a standalone complete TCP/IP wireless networking module. Due to its small form factor and extremely low power consumption, the RN-171 is perfect for mobile wireless applications such as asset monitoring, sensors and portable battery operated devices. It incorporates a 2.4GHz radio, 32-bit SPARC processor, TCP/IP stack, real-time clock, crypto accelerator, power management and analog sensor interfaces. This module is preloaded with firmware to simplify integration and minimizes development of your application. In the simplest configuration the hardware only requires four connections (PWR, TX, RX and GND) to create a wireless data connection. Additionally, the analog sensor inputs can be used to interface a variety of sensors such as temperature, audio, motion and acceleration. The ability to go into deep sleep mode and automatically scan and associate to an AP when awake makes the RN-171 suitable for roaming applications. The RN-171 also includes a built in HTML client to automatically post serial uart data or sensor data to a web server.

Block Diagram



Overview

- Host Data Rate up to 921 Kbps TX, 500 Kbps RX for UART, 2 to 3 Mbps over SPI slave
- Intelligent, built-in power management with programmable wakeup
- Real time clock for time stamping, auto-sleep and auto-wakeup
- Configuration using simple ASCII commands
- Software controlled transmit power (0dBm to 12dBm) for ultra low power applications
- 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, HTML client
- 802.11 power save and roaming functions
- Castellated pads for reliable soldering

Environmental Conditions

Parameter	RN-171
Temperature Range (Operating)	-40 °C ~ +85 °C
Temperature Range (Storage)	-40°C ~ +85 °C
Relative Humidity (Operating)	≤90%
Relative Humidity (Storage)	≤90%

Electrical Characteristics (Provisional)

Supply Voltage		Min	Typ.	Max.	Unit
Supply Voltage (VBATT option)		3.0	3.3	3.7	VDC
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)*	0dBm		120		mA
	12dBm		190		mA

*The transmit power can be controlled via firmware

Analog Sensor Inputs

Parameter	Value
Sense 0,1,2,3 wakeup detect threshold	500mV
AD sense 0-7 measurement range	0-400mV **(Do not exceed 1.2V DC)**
Resolution	14 bits = 12uV
Accuracy	5% un-calibrated, .01% calibrated
Minimum conversion time	35us (5kHz over Wi-Fi)
Sensor Power (pin 33) output resistance 3.3V	10 ohms, max current = 50mA

Radio Characteristics

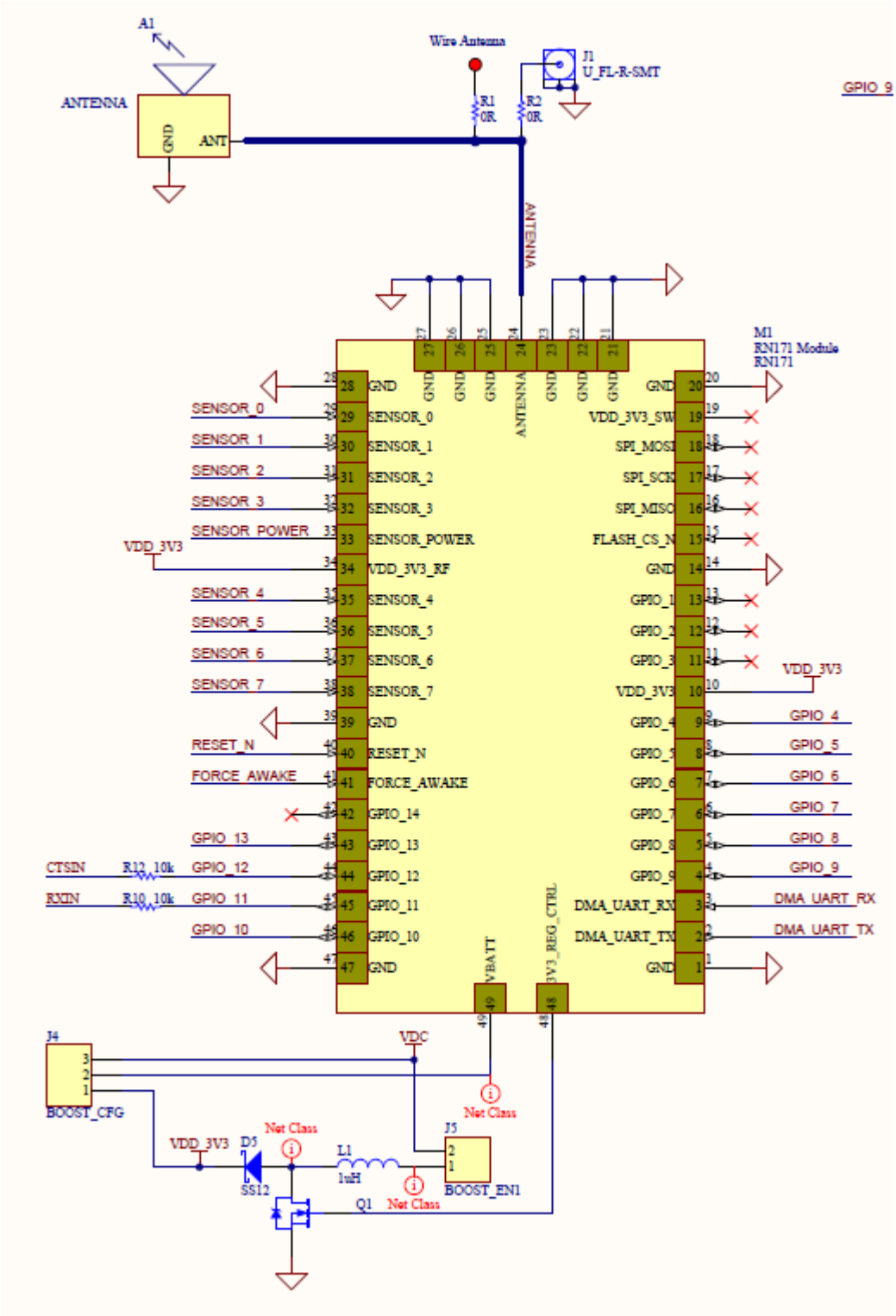
Parameter	Specifications
Frequency	2402 ~ 2480MHz
Modulation	802.11b compatibility : DSSS(CCK-11, CCK-5.5, DQPSK-2, DBPSK-1) 802.11g : OFDM (default)
Channel intervals	5MHz
Channels	1 - 14
Transmission rate (over the air)	1 – 11Mbps for 802.11b / 6 – 54Mbps for 802.11g
Receive sensitivity	-83dBm typ.
Output level (Class1)	-2dBm to +12dBm (configurable via software)

Transmit Power

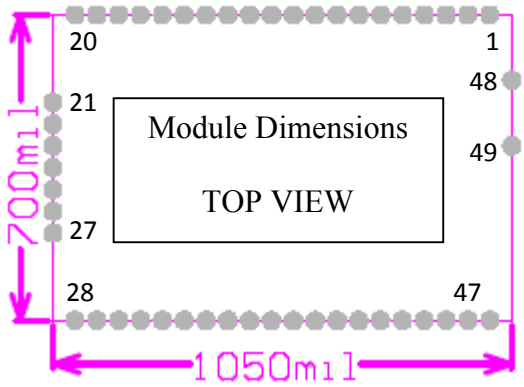
Output Power	802.11 b (2Mbps) Current in mA*	802.11 g (24Mbps) Current in mA*
0	120	135
2	130	150
4	170	190
6	175	200
8	180	210
10	185	225
12	190	240

*** Measured at 3.3VDC VCC. The power consumption is the average power, active during actual power consumption**

Typical Application Circuit



Pin Description



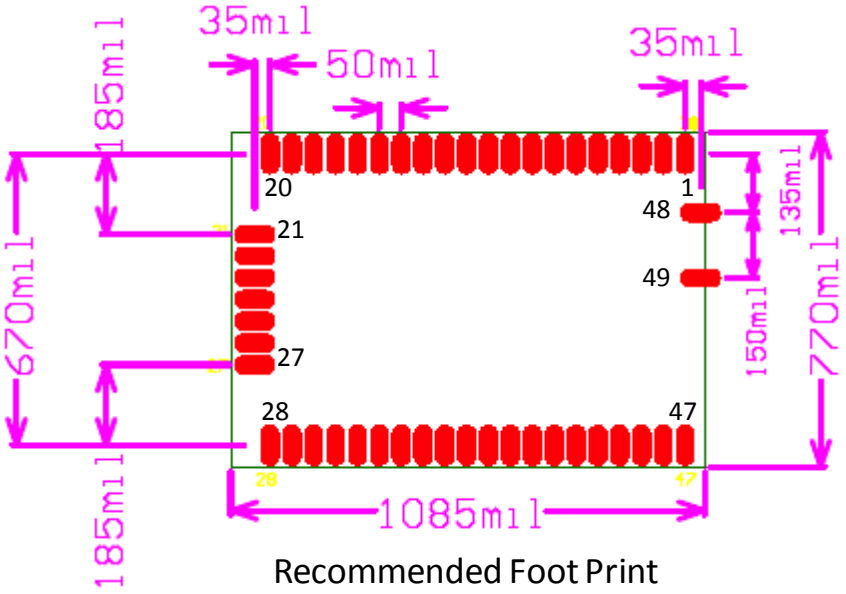
Pad Number	Signal Name	Description	Optional Function	Direction
1	GND	Ground		POWER
2	DMA_UART_TX	DMA UART Transmit (active low)		OUTPUT
3	DMA_UART_RX	DMA UART Receive (active low)		INPUT
4	GPIO 9	Enable Adhoc mode, Restore factory defaults, 8mA drive, 3.3V tolerant		IN / OUT
5	GPIO 8	GPIO, 24mA drive, 3.3V tolerant		IN / OUT
6	GPIO 7	GPIO, 24mA drive, 3.3V tolerant		IN / OUT
7	GPIO 6	GPIO, 24mA drive, 3.3V tolerant, Connection STATUS on Roving Firmware		IN / OUT
8	GPIO 5	GPIO, 24mA drive, 3.3V tolerant,		IN / OUT
9	GPIO 4	GPIO, 24mA drive, 3.3V tolerant	Association STATUS	IN / OUT
10	VDD_3.3V	3.3V Power Supply		POWER
11	GPIO 3	GPIO, 8mA drive, 3.3V tolerant		IN / OUT
12	GPIO 2	GPIO, 8mA drive, 3.3V tolerant		IN / OUT
13	GPIO 1	GPIO, 8mA drive, 3.3V tolerant		IN / OUT
14	GND	Ground		GND
15	Not Used	Do not connect		No Connect
16	Not Used	Do not connect		No Connect
17	Not Used	Do not connect		No Connect
18	Not Used	Do not connect		No Connect
19	Not Used	Do not connect		No Connect
20	GND	Ground		GND
21, 22, 23	GND	Ground		GND
24	ANTENNA	802.11b/g antenna		RF
25, 26, 27	GND	Ground		GND
28	GND	Ground		GND
29	SENSOR 0	Sensor Interface, Analog input to module, **1.2V tolerant**		INPUT
30	SENSOR 1	Sensor Interface, Analog input to module, **1.2V tolerant**		INPUT
31	SENSOR 2	Sensor Interface, Analog input to module, **1.2V tolerant**		INPUT
32	SENSOR 3	Sensor Interface, Analog input to module, **1.2V tolerant**		INPUT
33	SENSOR POWER	Output voltage from module, 3.3V Max		POWER
34	VDD_3.3V_RF	3.3V RF Power Supply (connect to 3.3V rail)		POWER

35	SENSOR 4	Sensor Interface, Analog input to module, **1.2V tolerant**		INPUT
36	SENSOR 5	Sensor Interface, Analog input to module, **1.2V tolerant**		INPUT
37	SENSOR 6	Sensor Interface, Analog input to module, **1.2V tolerant**		INPUT
38	SENSOR 7	Sensor Interface, Analog input to module, **1.2V tolerant**		INPUT
39	GND	Ground		GND
40	RESET	**Optional** Module Reset Signal (active low), 100k Pull up, apply pulse of at least 160us, 3.3V Tolerant		INPUT
41	FORCE_AWAKE	**Optional** Module Awake Signal (active high), 100k pull down, apply pulse of at least 260us, 3.3V Tolerant		INPUT
42	GPIO 14	GPIO, 8mA drive, 3.3V tolerant		IN / OUT
43	GPIO 13	UART RTS flow control, 8mA drive, 3.3V tolerant		OUT
44	GPIO 12	UART CTS flow control, 3.3V tolerant		IN
45	GPIO 11	UART RX, 3.3V tolerant		IN
46	GPIO 10	UART TX, 8mA drive, 3.3V tolerant		OUT
47	GND	Ground		GND
48	SREG_3V3_CTRL	Boost Regulator Control		OUT
49	VDD-BATT	Battery input, 2.0-3.3V with boost regulator in use, connect to VDD if not using boost regulator		POWER

NOTE #1: Any of the sensors 0-3 can be used to wake the module. The sensor pins are 1.2V tolerant. DO NOT apply 3.3V on these pins. DO NOT apply 3.3V on any of sensor pins.

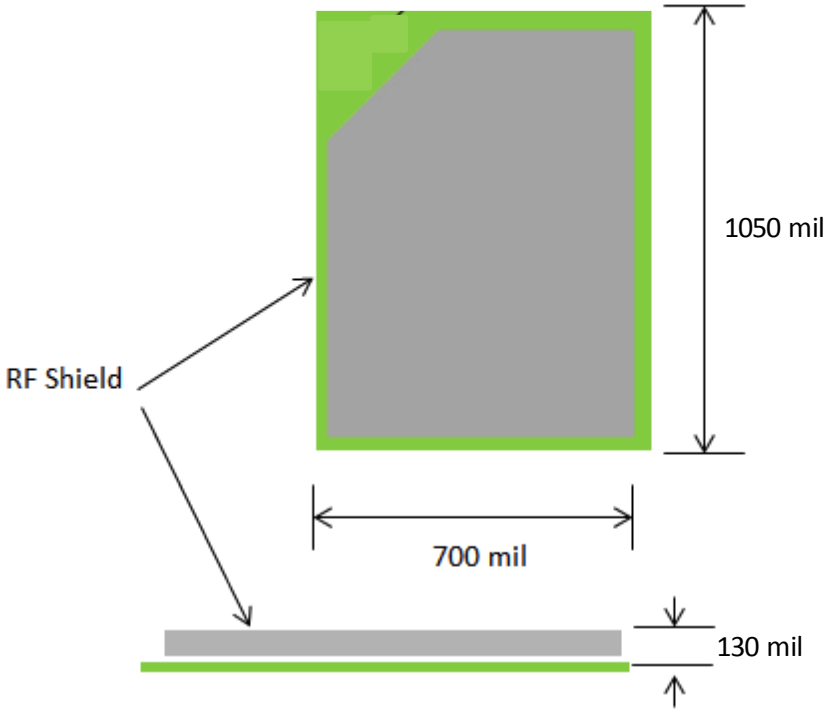
NOTE #2: When sensor pins are used as sensor inputs, they saturate at 400mV. Sensor pins will accept input voltages up to 1.2V but will saturate at 400mV. DO NOT apply 3.3V on any of sensor pins.

Physical Dimensions



Recommended Foot Print

Recommend footprint pad size: 40 mil x 90 mil



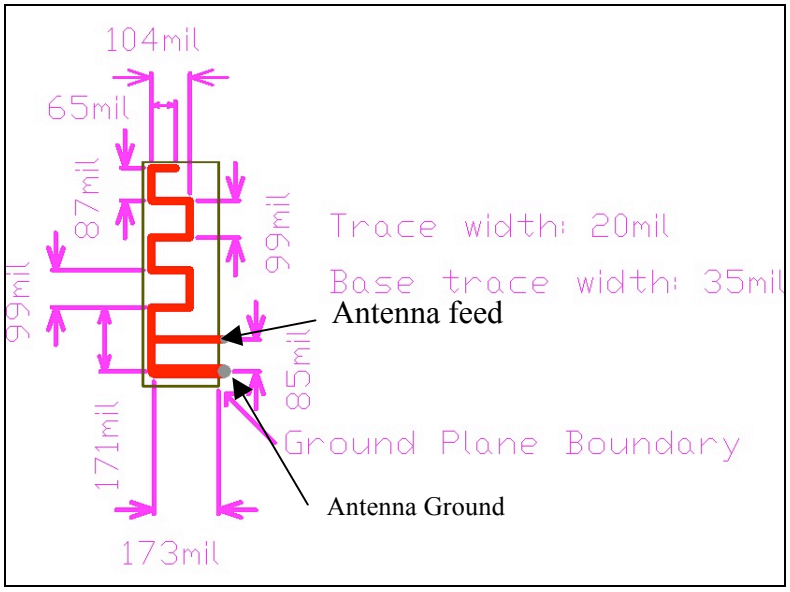
Design Concerns

Antenna Design. A recommended PCB trace Antenna pattern is shown below. The antenna ground should be connected with at least 2 vias to the ground plane and / or ground polygon on both top and bottom layers. The ground plane should come close to the antenna, exactly where shown in the diagram. The distance is critical. There should be no ground place / trace under the antenna, under any circumstance.

The antenna feed will go through the polygon on a 50 ohm impedance trace to the source of the signal. Unless the antenna trace is exactly 50 ohm and the source has a 50 ohm output impedance a matching PI filter should be used (2 capacitors and an inductor).

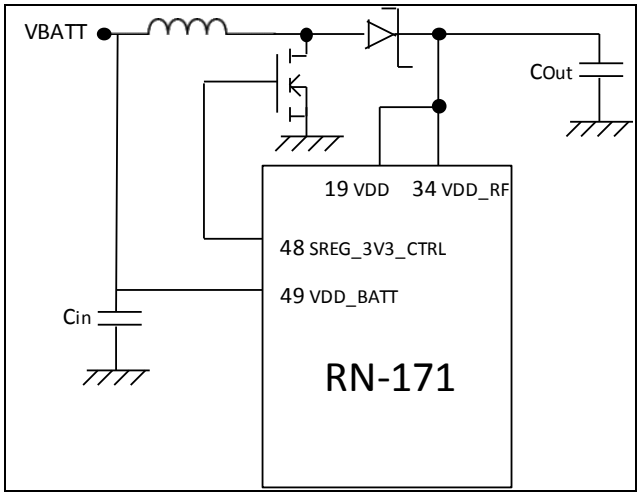
The left side of the antenna should be placed on the PCB edge. If not possible please leave at least 1 inch of clearance from any trace or ground plane. The top and bottom of the antenna (the shorter side) should either be placed on the PCB edge or have at least 1 inch clearance from any trace or ground plane.

To control the impedance of the antenna feed the board should be a 4 layer board with a dedicated ground plane and a thickness of around 8-14 mil between the ground plane and the top layer (where the antenna feed is routed). A two layer board would not be thin enough to obtain the desired impedance using a decent width for the trace.



Using Batteries The RN-171 module does not have a Boost Regulator circuit. This makes the choice of batteries absolutely critical because if the battery voltage drops below 3V, the module performance will start to degrade.. One possible battery of choice is the ER14505 3.6V battery. This battery is known to have a long battery life. If this battery is used to power the module, it is recommended that you use a 1000uF to 3000uF bypass capacitor as the ER14505 battery has high output impedance.

Boost Regulator: The RN-171 does not have a boost regulator on board. A recommended circuit for the boost regulator is shown below.



Designs that include the boost regulator will provide good supply to the flash even when the battery voltage drops close to 1.8V.

If a board containing RN-171 does not include the boost regulator, it **SHOULD** include a 2.7V undervoltage reset circuit to prevent the module from accessing flash when supply voltage falls below 2.7V.
All supported flash chips are rated for minimum VDD of 2.7V.

Powering from a 3.3V Regulated Source: Apply 3.3V regulated power to pins 10, 34 and 49. Leave pin 48 (SREG_3V3_CTRL) unconnected. **Do not connect pin 48 to ground. leave it as unconnected.**

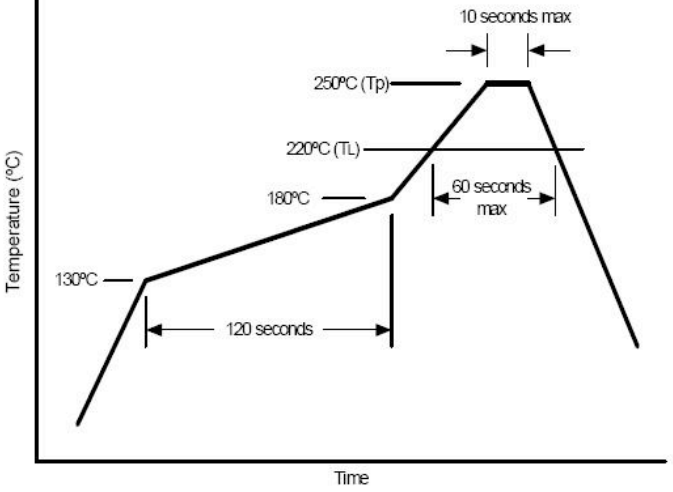
Solder Reflow. Reflow temperature must not exceed 220C.

To reflow solder the RN-171 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!***

Note also, that the temperature profile is based on the IC level and other components level only (without the shield can). So if we go on module perspective, above 245C profile should be acceptable.

In fact the module temperature profile specifications tells, that you should be able to go beyond 240C (from 220C[60secs] to 250C[10secs]). The module temperature profile diagram is shown below.



Note : Tp is restricted by the maximum temperature rating of the external antenna connector

Ordering Information

Part Number	Description
RN-171	Industrial Temperature (- 40 to + 85 C) with RF pad for external antenna
RN-174	SuRFboard carrier PCB for RN-171, 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.	

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