Radiocontrolli®
WIRELESS MODULES

Ultra Low Power sub 1GHz Multichannels Radio Transceiver

The **RC-S2LP-434** module is based on STMicroelectronics S2-LP transceiver. This device is a high performance ultra low power RF transceiver designed for RF wireless application in the sub 1GHz band.
Operative Frequency Band : 433MHz
The module is designed for maximum performance in a minimal space, with 4 programmable I/O pins.
Programmable from external microcontroller via SPI interface.
Ready for use SMD mounting (15x 22mm) - Metal shield.

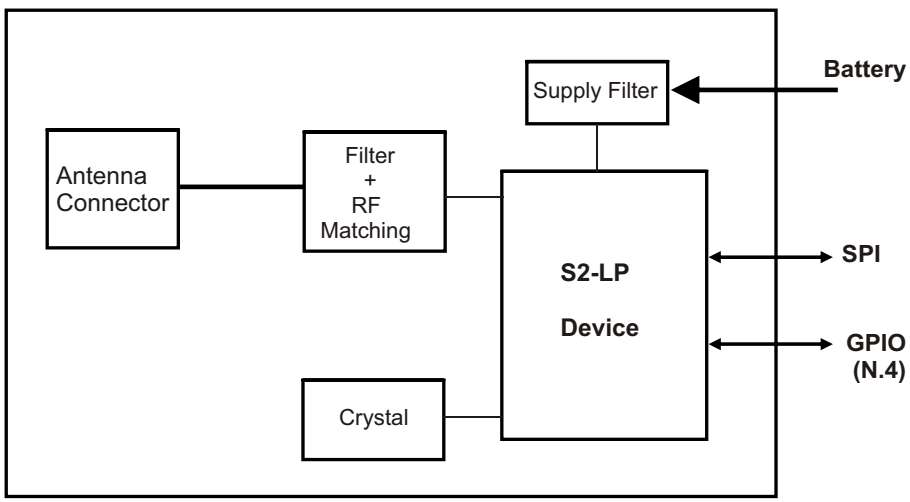
For more information and details, please refer to the S2-LP datasheet (www.st.com).

Sub-1GHz technology is becoming one of the chief driving forces behind the **Internet of Things (Iot)**, in particular this type of module is ideal for this applications basically for the following reasons :

Ultra low power consumption, the consumption of this device is 7mA when receiving and 20mA when transmitting at +14dBm (11mA at +10dBm) in sleep mode the consumption is 0.7µA.

Long range operations, the sensitivity parameter is -109dBm at data rates of 38.4 kbps and down to -128dBm when the data rate is 0.3kbps.
Interference from other wireless communications can be overcome with 90dB of blocking.
The RF output power levels can reach up to +16dBm.
All this ensure a robust signaling for long range communications.

Block Diagram



Applications :

- Low-Power Wireless Systems
- Home and Building Automation
- Smart Grid and Automatic Meter Reading
- Wireless Sensor Network
- 6LoWPAN systems

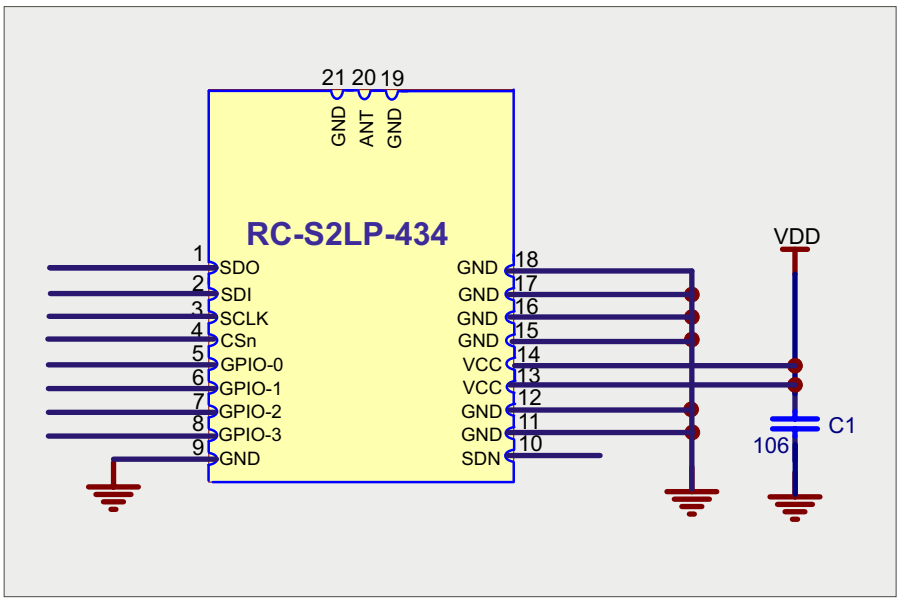
Technical Characteristics					
Parameter	Symbol	Min.	Typ.	Max.	Units
Supply Voltage	V_{CC}	1.8	3.00	3.6	VDC
Supply Current RX Mode	I_{CRX}		7.20		mA
Supply Current TX Mode +10dBm	I_{CTX1}		11.00		mA
Supply Current TX Mode +16dBm	I_{CTX2}		20.00		mA
Supply Current Standby Mode	I_{CTXAV}		0.50		µA
Supply Current Shut Down Mode	I_{CTXAV1}		2.50		nA
Operative Frequency Band	F_{of}		433.00		MHz
RF Power Output 50ohm	P_{oo}	-30.0		+15.5	dBm
RF Sensibility 38.4 kbps 2GFSK	S_d		-109		dBm
RF Sensibility 0.3 kbps 2GFSK	S_{CC}		-128		dBm
Operative Temperature	T_1	-30.0		+75.0	°C

(*) It's possible to reach the max value if the device (S2LP) is programmed in Boost Mode (see the STMicroelectronics S2LP datasheet).

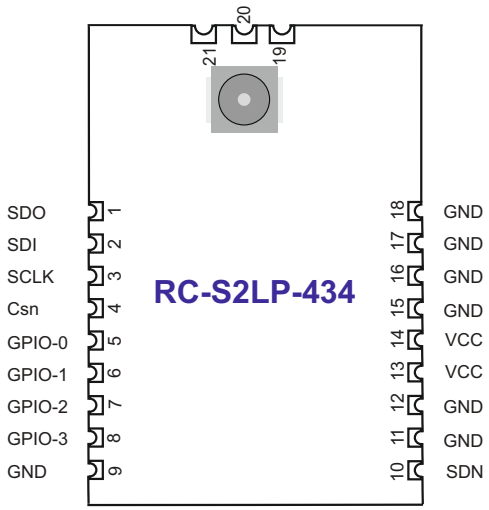
Electrical Parameters about the crystal XTAL used

No.	Item	Symb.	Electrical Specification				Remark
			Min.	Typ.	Max.	Units	
1	Nominal Frequency	F0	50.000000			MHz	
2	Mode of Vibration		Fundamental				
3	Frequency Tolerance	△F/F0	-10	-	10	ppm	At 25℃±3℃
4	Operating Temperature Range	T_{OPR}	-40	-	85	℃	
5	Frequency Stability (over operating temperature)	TC	-25	-	25	ppm	Ref. to 25℃
6	Storage Temperature	T_{STG}	-55	-	125	℃	
7	Load capacitance	CL	-	9	-	pF	
8	Equivalent Series Resistance	ESR	-	-	60	Ω	
9	Drive Level	DL	-	50	200	µW	
10	Insulation Resistance	IR	500	-	-	MΩ	At 100V_{DC}
11	Shunt Capacitance	C0	-	-	3	pF	
12	Aging Per Year	Fa	-2	-	2	ppm	First Year
13	Package type	E1SB					

Reference Schematics

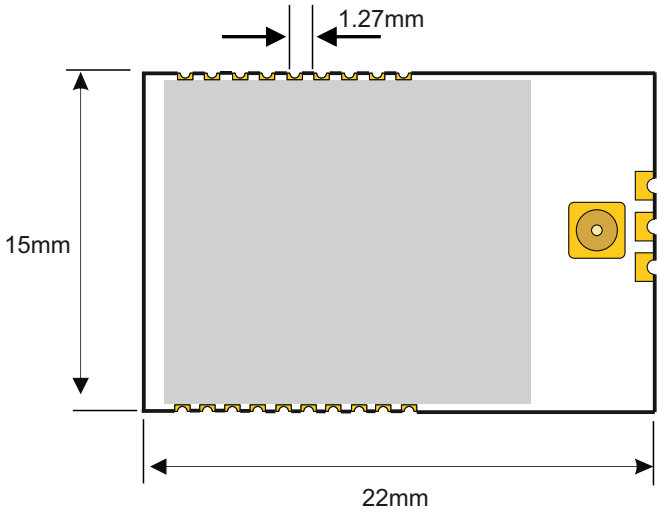


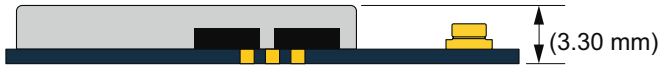
Pin out device



Pin Descriptions			
Pin Number	Name	I/O	Description
13,14	VCC	—	Supply Voltage
9,11,12,15,16 17,18,19,21	GND	—	Ground
01	SDO	O	SPI slave data output
02	SDI	I	SPI slave data input
03	SCLK	I	SPI slave clock input
04	CSn	I	SPI chip select
05	GPIO-0	I/O	General purpose I/O may be configured throught the SPI registers to perform various functions.
06	GPIO-1	I/O	General purpose I/O may be configured throught the SPI registers to perform various functions.
07	GPIO-2	I/O	General purpose I/O may be configured throught the SPI registers to perform various functions.
08	GPIO-3	I/O	General purpose I/O may be configured throught the SPI registers to perform various functions.
10	SDN	I	Shutdown input pin. SDN should be = 0 in all modes, except in shtdown mode.
20	ANT		Connect to an external Antenna

Mechanical dimensions

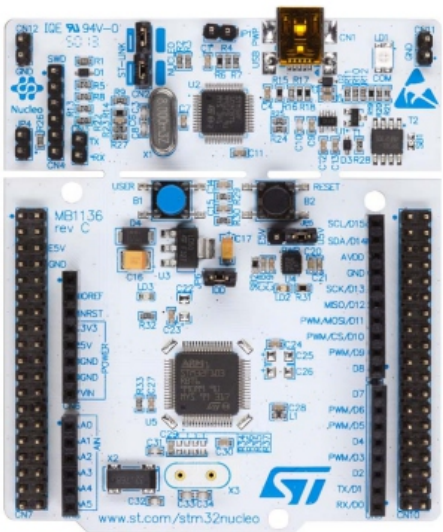




Sub-1 GHz transceiver development kit based on RC-S2LP-434

To make immediate usable this module with STMicroelectronics development system, has been realized the following board adapter (see picture below).
The main board to use is the NUCLEO-L152RE development board, equipped with a low power microcontroller STM32L to control the S2-LP and the ST-LINK/V2-1 debugger and programmer for firmware updating.
The RC-S2LP-434-EK is equipped with Antenna (with SMA connector) and UFL-SMA cable.

RC-S2LP - 434 - EK



NUCLEO_L152RE

Recommended Hardware design

1) Hardware

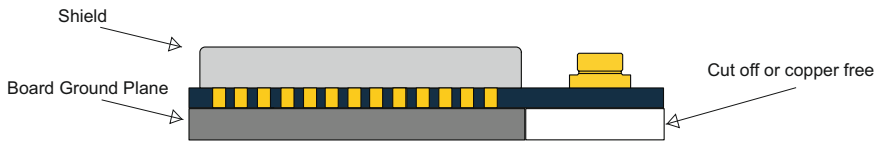
All unused pins should be left floating; do not ground.
All GND pins must be well grounded.
Traces should not be routed underneath the module.

2) Power Supply

The transceiver module must be powered from a regulated voltage.
It is recommended to keep the power supply line for VCC as short and low impedence as possible. Near the power pins it is recommended to insert a ceramic the decoupling capacitor (100nF).

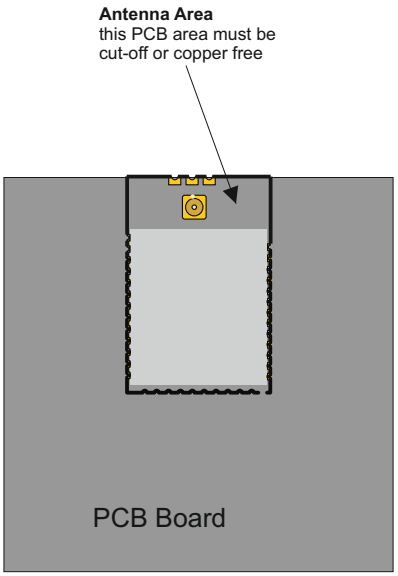
3) Ground Plane

It is recommended to have a copper ground plane under the shielded zone of the module. The ground plane should be unbroken.

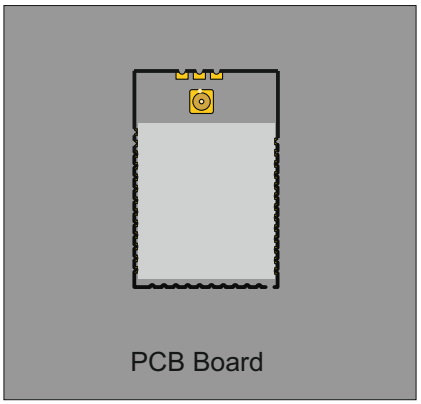


4) Module Placement

The antenna on the PCB has an omnidirectional radiation pattern. To maximize antenna efficiency, an adequate grounding plane must be provided under the module. Instead the areas underneath and surrounding the antenna area must be free of copper.

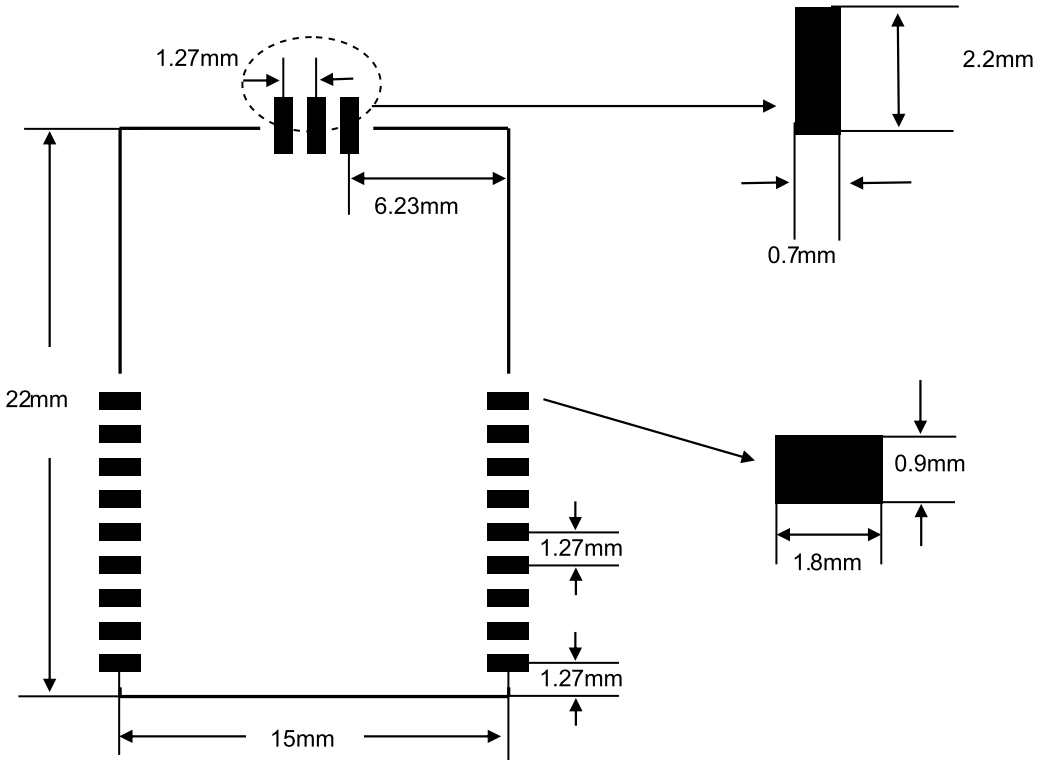


Recommended location XY plane



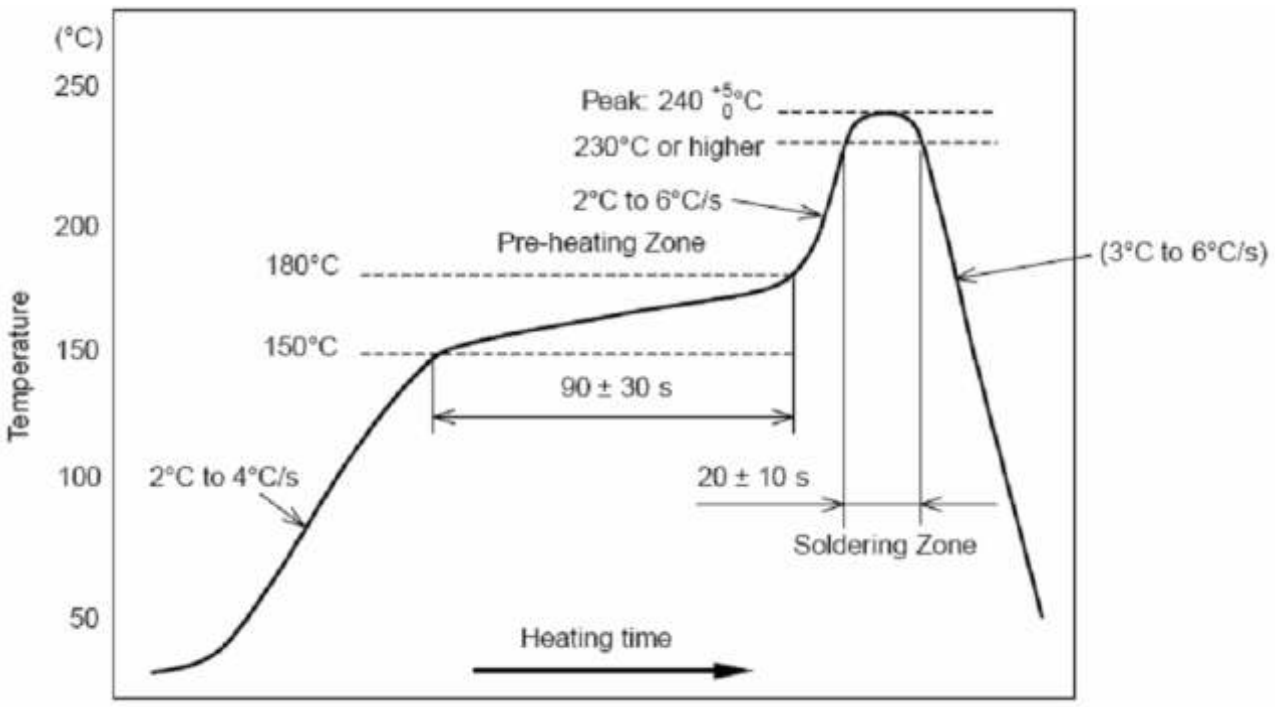
Not Recommended location XY plane

Recommended PCB Layout

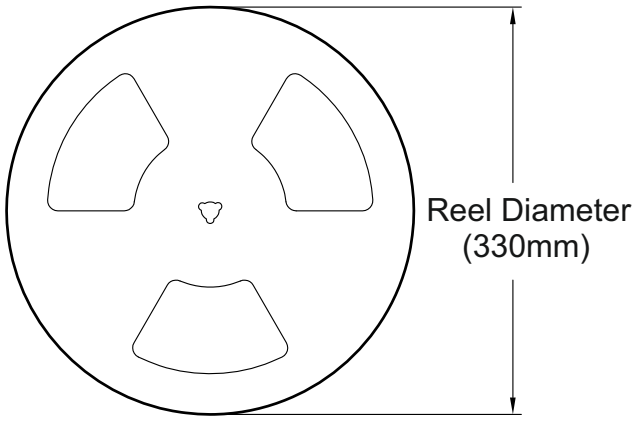


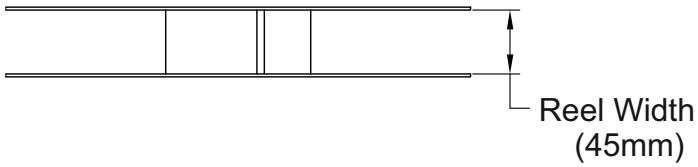
RC-S2LP-434

Recommended Reflow Profile for Lead Free Solder

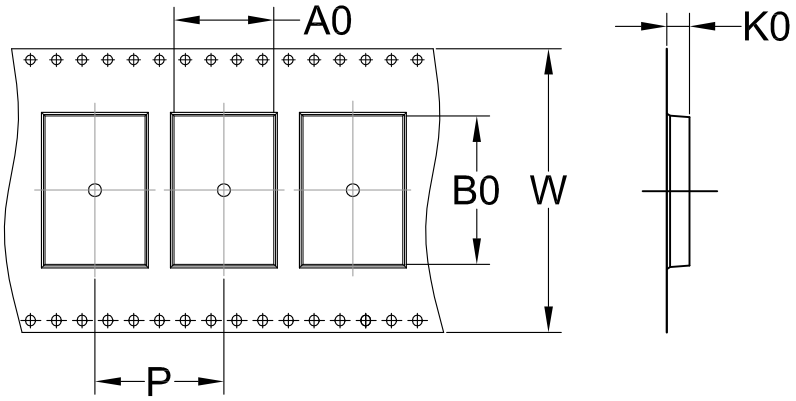


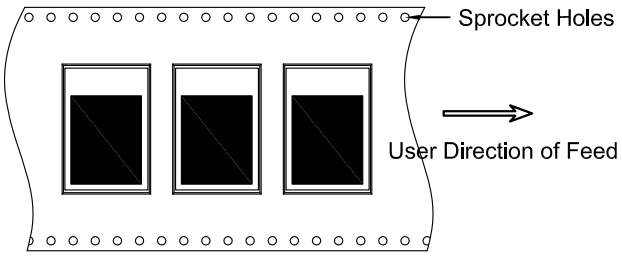
REEL DIMENSIONS





TAPE DIMENSIONS





A0	Dimension designed to accommodate the component width	15.5mm	± 0.10mm
B0	Dimension designed to accommodate the component length	23.0mm	± 0.10mm
K0	Dimension designed to accommodate the component thickness	3.5mm	± 0.10mm
W	Overall width of the carrier tape	44.0mm	± 0.30mm
P	Pitch between successive cavity centers	20.0mm	± 0.10mm