



radino WiFi

The In-Circuit radino WiFi combines an Arduino Micro with **WiFi** in a small form-factor **EMC-compliant** enclosure.

It's part of the radino-series, which provides full-Arduino-compatible wireless communication devices in a small form factor, all **pin-compatible** to each other.



Features

- Arduino-compatible (Arduino Micro / Leonardo)
- Wifi ESP8266EX Chip, connected via SPI-UART-Bridge with 115 200 Baud. http://espressif.com/en/products/esp8266/
- ESP8266EX Firmware Upgrade through USB
- 802.11 b/g/n
- Wi-Fi Direct (P2P), soft-AP
- Standby power consumption of <1mW (DTIM3),
- Power down Leakage current<10μA
- 15 GPIOS (5 PWM, 5 Analog IN)
- I²C, SPI, UART
- USB (HUID Keyboard & Mouse, virtual UART)
- High-Performance, Low-Power Microcontroller
- Arduino Demo Applications available in our Library!

Applications

- Internet of Things (IoT)
- Mobile communications
- Digital home network
- Mobile accessories
- Data logging
- Any Arduino project

For more information visit: http://www.in-circuit.de/ http://www.radino.cc/



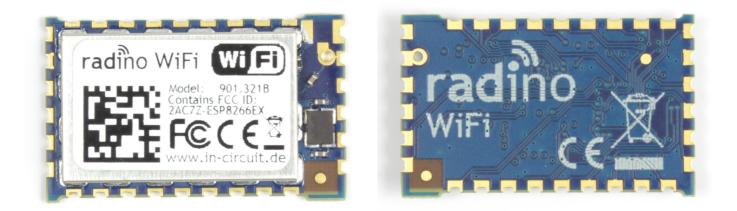


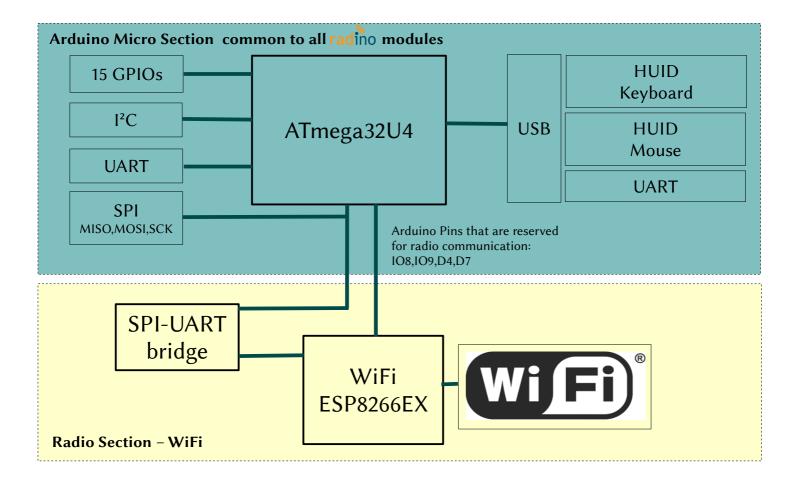


Overview

The In-Circuit radino WiFi combines an Arduino Micro with WiFi. Despite its small form factor, the radino WiFi offers great connectivity. It's a perfect core for any WiFi project, almost all GPIOs, interfaces and connections of the ATmega32U4 can be connected to external circuitry.

A modified Arduino Micro Bootloader is pre-installed on the radino WiFi. This enables easy programming by using the Arduino IDE (http://www,arduino.cc/). Refer to section "First steps with radino" for more information.

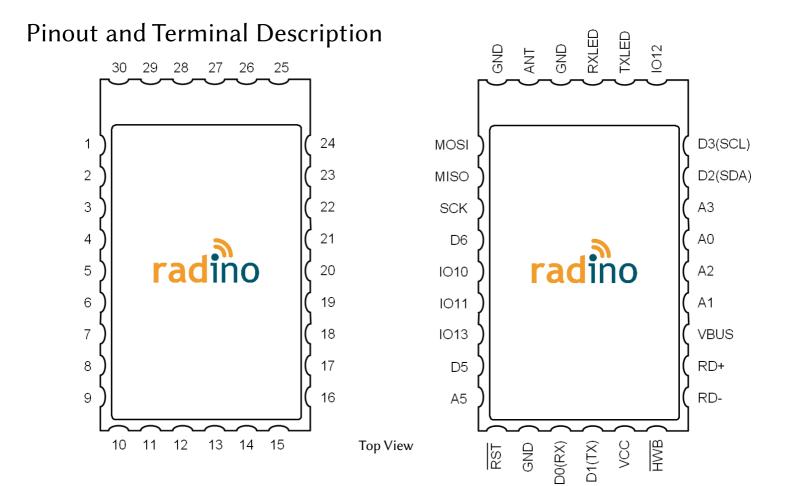




In-Circuit GmbH Boltenhagener Str. 124 D-01109 Dresden







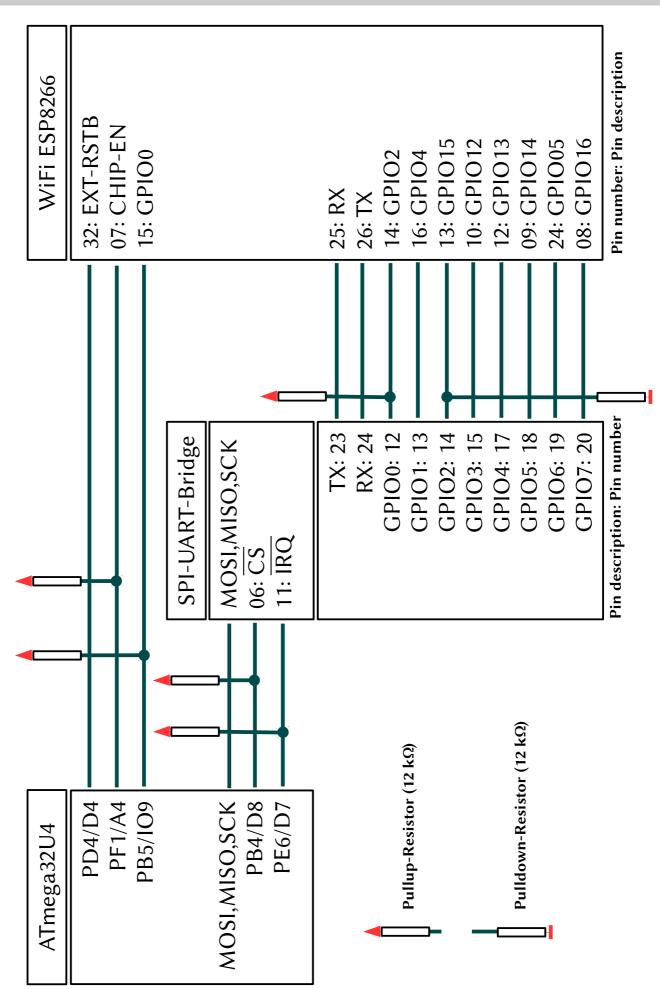
radino Pin No.	Name	Arduino Pin No.	Atmega32U4 Port	Description / Function (bold = main function)
1	MOSI	16	PB2	SPI-MOSI (also connected to internal radio section) GPIO; PCINT2
2	MISO	14	PB3	SPI-MISO (also connected to internal radio section) GPIO; PCINT3
3	SCK	15	PB1	SPI-SCK (also connected to internal radio section) GPIO; PCINT1
4	D6	6 A7	PD7	GPIO; PWM ADC10
5	IO10	10 A10	PB6	GPIO; PWM; PCINT6; ADC13
6	IO11	11	PB7	GPIO; PWM; PCINT7; UART-RTS
7	IO13	13	PC7	GPIO; PWM
8	D5	5	PC6	GPIO; PWM
9	A5	A5 23	PF0	ADC0 GPIO
10	Reset	-	Reset	Reset of Atmega32U4
11	GND	-	GND	Ground





radino Pin No.	Name	Arduino Pin No.	Atmega32U4 Port	Description / Function (bold = main function)
12	D0(RX)	0	PD2	UART-RX GPIO; INT2
13	D1(TX)	1	PD3	UART-TX GPIO; INT3
14	V _{cc}	-	VCC	Power supply
15	HWB	-	PE2	Hardware-Bootloader-Enable; Low-Active
16	RD-	-	RD-	USB-D-
17	RD+	-	RD+	USB-D+
18	V_{BUS}	-	VBUS	USB voltage IN (VBUS will NOT supply the module. Connect VCC on Pin 14 to supply the module.)
19	A1	A1 19	PF6	ADC6 GPIO
20	A2	A2 20	PF5	ADC5 GPIO
21	A0	A0 18	PF7	ADC7 GPIO
22	A3	A3 21	PF4	ADC4 GPIO
23	D2(SDA)	2	PD1	SDA GPIO; INT1
24	D3(SCL)	3	PD0	SCL GPIO; PWM; INT0
25	IO12	12 A11	PD6	GPIO; PWM ADC9
26	TXLED	-	PD5	TXLED GPIO; UART-CTS
27	RXLED/SS	17	PB0	RXLED GPIO; SS; PCINT0
28	GND	-	GND	Ground
29	ANTENNA	-	-	Antenna pin
30	GND	-	GND	Ground
-	RADIO_RST	4	PD4	connected to internal radio section Signal: Reset
-	IRQ of SPI- UART	7	PE6	connected to internal radio section Signal: INT6
-	SS-Pin for SPI- UART	8	PB4	connected to internal radio section Signal: SS
-	RADIO_GPIO0	9	PB5	connected to internal radio section Signal: GPIO0
-	RADIO_CHIP- EN	A4	PF1	connected to internal radio section Signal: CHIP-EN





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Detailed Interconnection diagram

PAS





Electrical Characteristics

Absolut Maximum Ratings

Note: These are absolute maximum ratings beyond which the module can be permanently damaged. These are not maximum operating conditions.

Rating	Min	Max	Unit
Storage Temperature	-65	125	°C
V _{cc}	-0.3	3.6	V
V _{BUS}	-0.5	6	V
Reset	-0.5	13	V
Other Terminal Voltages	-0.3	V _{CC} +0.3	V

Recommended Operating Conditions

Environmental conditions

Rating	Min	Тур.	Max	Unit
Operating Temperature	-40		85	°C
V _{cc}	2.7	3.3	3.6	V

DC Characteristics

 $T_A = -40^{\circ}C$ to 85°C, $V_{CC} = 2.7V$ to 3.6V (unless otherwise noted)

Symbol	Rating	Min	Тур.	Max	Unit
V _{IL}	Input Low Voltage, except Reset pin	-0.3		0.2V _{CC} -0.1V	V
V _{IL2}	Input Low Voltage, Reset pin	-0.5		0.1V _{cc}	V
V _{IH}	Input High Voltage, except Reset pin	0.2V _{CC} +0.9V		V _{CC} + 0.5	V
V _{IH1}	Input High Voltage, Reset pin	0.9V _{CC}		V _{CC} + 0.5	V
V _{OL}	Output Low Voltage			0.5	V
V _{OH}	Output High Voltage	2.3			V





Current consumption parameters

Operation conditions: V_{CC} =3.3V, T_{A} =40°C to +85°C.

Symbol	Rating	Min	Тур.	Max	Unit
I _{on}	Full on		40	300	mA
I _s	Standby power consuption		0.5		mA
	TBD				





First steps with radino

The core of **radino** is an Arduino Micro, so the programming is as easy as programming an Arduino Micro. Visit http://www.arduino.cc/ for more information about the Arduino project.

1. Download & Install Arduino IDE

Arduino IDE is the development environment for Arduino. It's recommended to use this IDE when developing software for an Arduino-based module like radino. Nevertheless you can also use tools like Atmel Studio or any similar tool for Atmel microcontrollers to program these devices. (If they are based on an Atmel microcontroller like ATmega32U4 on radino).

→ Visit http://www.arduino.cc/en/Main/Software and download the latest version of Arduino IDE (We can't guarantee full functionality with BETA builds of Arduino IDE)

 \rightarrow Install Arduino IDE on your computer

Arduino IDE requires a main Sketch-folder where new sketches/projects will be saved to by default. Also all additional libraries and hardware-files have to be put into this folder to be recognized by the Arduino IDE.

Default paths for this Sketch-folder are:

My Documents\Arduino C:\Documents and Settings\yourUserName\My Documents\Arduino C:\Users\yourUserName\Documents\Arduino

German computers: Eigene Dateien\Arduino C:\Dokumente und Einstellungen\ihrBenutzerName\Eigene Dateien\Arduino C:\Benutzer\ihrBenutzerName\Eigene Dateien\Arduino

You can also define a specific path when installing Arduino IDE.

 \rightarrow Now start Arduino IDE. If installed properly, a window like this should open:

💿 sketch_oc	t13a Ardu	uino 1.0.5-r2	- D ×
File Edit Sk	etch Tools	Help	
) 🛨 🛨		<mark>.</mark> Q.
sketch_oc	t13a		
			×
•			F
1		In-Circuit radino nRF8001 on (COM29





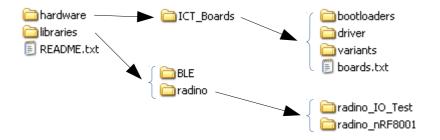
2. Download & Install radino support files

We provide a general Arduino support package for all our Arduino based products, which also includes support for the radino series. This includes required libraries, hardware files and example sketches for an easy start with radino

→ Visit http://www.in-circuit.de/ or http://www.radino.cc/ to download the latest In-Circuit Arduino SW Support Package

\rightarrow Unzip the downloaded file

You now have 2 folders ('hardware' and 'libraries') and a file called 'README.txt'. The content of these folders could look like the following structure:



Folder 'hardware' contains all hardware information required by the Arduino IDE to recognize and program the radino The subfolder 'driver' contains all required USB-drivers for radino

Folder 'libraries' contains all example sketches provided for radino.

'README.txt' provides general information about installing these 2 folders properly.

 \rightarrow Now copy both folders into your main Arduino-Sketch folder. As mentioned in '1. Download & Install Arduino IDE', this folder was specially defined or has one of the following default paths:

My Documents\Arduino C:\Documents and Settings\yourUserName\My Documents\Arduino C:\Users\yourUserName\Documents\Arduino

German computers: Eigene Dateien\Arduino C:\Dokumente und Einstellungen\ihrBenutzerName\Eigene Dateien\Arduino C:\Benutzer\ihrBenutzerName\Eigene Dateien\Arduino





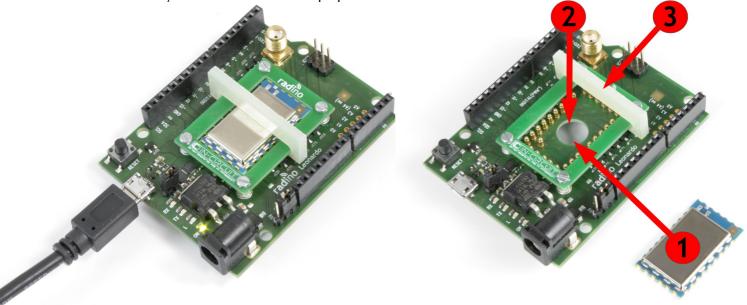
3. Connect your radino

We recommend to use the radino Leonardo for easy programming and development.

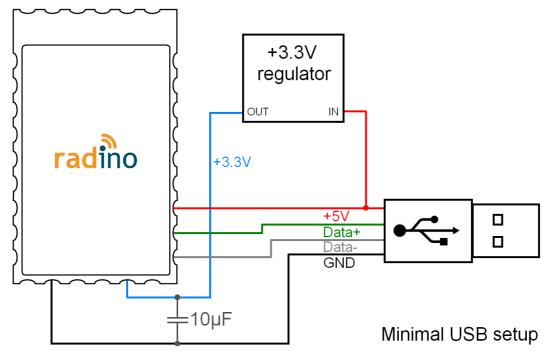
Just plug the radino into the socket on the radino Leonardo board as depicted in the right picture: 1.) put the radino into the socket on radino Leonardo ...

- 2.) press it down
- 3.) move the fastener to the middle of the radino and stop pressing on module
- The radino is connected reliable now.

Note: you can use the radino Leonardo to pre-program your radino modules before soldering them. The socket is very durable and able to keep up more than 1 million insertions!



The minimal USB setup is shown in the picture below. This also represents the minimal setup for an USB-to-radio-UART-stick with radino.







4. Install driver & determine serial port

After connecting radino, your computer will recognize it. When first using radino, a driver installation is required. If asked for the driver, just point the driver installer tool to the radino 'driver' folder mentioned in '2. Download & Install radino support files'.:

	, Ordner suchen	? ×
Assistent für das Suchen neuer Hardware	Wählen Sie den Ordner, der die Treiber für die	
Wählen Sie die Such- und Installationsoptionen.	Hardwarekomponente enthält.	
	🗉 🖃 🥯 Lokaler Datenträger (C:)	
Diese Quellen nach dem zutreffendsten Treiber durchsuchen	⊞ ☐ 74cefbe8ac98a26558b6f5d923	
Verwenden Sie die Kontrollkästchen, um die Standardsuche zu erweitern oder	Config.Msi	
einzuschränken. Lokale Pfade und Wechselmedien sind in der Standardsuche mit	🗆 🗀 Documents and Settings	
einbegriffen. Der zutreffendste Treiber wird installiert.	🖃 🧰 yourUserName	
	🗆 🗀 My Documents	
🔲 Wechselmedien durchsuchen (Diskette, CD,)	🗆 🖂 🗁 Arduino	
Folgende Quelle ebenfalls durchsuchen:	🗆 🗀 hardware	
C:\Documents and Settings\vourUserName\Mv Doc Durchsuchen	🗆 🗀 ICT_Boards	
C:\Documents and Settings\yourUserName\My Doc 🔽 Durchsuchen	🗄 🖃 bootloaders	
	🗀 driver	
O Nicht suchen, sondern den zu installierenden Treiber selbst wählen	🗄 🖃 🖂 🕀 🕀	
Verwenden Sie diese Option, um einen Gerätetreiber aus einer Liste zu wählen. Es wird	🗉 🖃 🛅 libraries	-1
nicht garantiert, dass der von Ihnen gewählte Treiber der Hardware am besten entspricht.		÷ i i i i i i i i i i i i i i i i i i i
	Klicken Sie auf ein Pluszeichen, um Unterordner anzuzeigen.	
<zurück weiter="" │=""> │ Abbrechen │</zurück>		
< Zuruck Weiter Abbrechen	OK Abbrech	ien

Your computer now assigns a serial port / COM-port. It's important to know the COM-port number of your radino. Therefore open the 'device manager' of Windows. (e.g. by clicking Start \rightarrow Run \rightarrow type 'devmgmt.msc' \rightarrow Enter) The radino in this example got the COM-port COM30:

🚇 Geräte-Manager	
Datei Aktion Ansicht ?	
$\leftarrow \rightarrow 1 1 \textcircled{3} \textcircled{3} 1 \textcircled{3} \textcircled{3}$	
Anschlüsse (COM und LPT) ECP-Druckeranschluss (LPT1) In-Circuit radino nRF8001 (COM30) Kommunikationsanschluss (COM1) STMicroelectronics Virtual COM Port (COM3) Addio-, Video- und Gamecontroller Computer DVD/CD-ROM-Laufwerke Eingabegeräte (Human Interface Devices) Grafikkarte DE ATA/ATAPI-Controller JUE ATA/ATAPI-Controller JUE ATA/ATAPI-Controller Jungo Connectivity Laufwerke Maiuse und andere Zeigegeräte Monitore Monitore Prozessoren Speichervolumes Systemgeräte Tastaturen	
	•





5. Upload your first sketch

If Arduino IDE and the support files were installed properly, it's now time to upload the first sketch to your radino

 \rightarrow Open Arduino IDE and select one of the variuos available example sketches for your radius

😳 sketch_oct13a Ardui	no 1.0.5-r2				
File Edit Sketch Tools	Help				
New	Ctrl+N				
Open	Ctrl+O				
Sketchbook	•				
Examples	۱.	01.Basics	۱.		
Close	Ctrl+W	02.Digital			
Save	Ctrl+S	03.Analog			
Save As	Ctrl+Shift+S	04.Communication			
Upload	Ctrl+U	05.Control			
Upload Using Programmer	Ctrl+Shift+U	06.Sensors			
Page Setup	Ctrl+Shift+P	07.Display			
Print	Ctrl+P	08.Strings			
		09.USB			
Preferences	Ctrl+Comma	10.StarterKit			
Quit	Ctrl+Q	ArduinoISP			
		BLE	•		
		ICT			
		radino		radino_IO_Test	
		Time		radino_nRF8001 🕨	Nordic_BLE-SDK-Examples
		TinyGPS	1		radino_nRF8001_leonardo_IO_HF_Test

\rightarrow Now choose your corresponding radino to which you want to upload the sketch:

🤓 radino_nRF8001	_leonardo_IO_HF_Tes	st Arduino 1.	0.5-r2
File Edit Sketch	Tools Help		
	Auto Format Archive Sketch	Ctrl+T	
radino_nRF800	Fix Encoding & Reload Serial Monitor	Ctrl+Shift+M	h services_lock.h uart_over_ble.h
/* Copyright (*			ASA
* Permission	Board	•	 In-Circuit radino nRF8001
* of this sof.	Serial Port	•	Arduino Uno
* in the Soft	Programmer	•	Arduino Duemilanove w/ ATmega328
* to use, cop	Burn Bootloader		Arduino Diecimila or Duemilanove w/ ATmega168
* copies of th	le portomare, and t i	, berwic bei	Arduino Nano w/ ATmega328
* furnished to	do so, subject to) the follow	Arduino Nano w/ ATmega168
*			Arduino Mega 2560 or Mega ADK
+	and the second sec	n 2012 - 11 - 1	





Now select the corresponding serial port / COM-port of radino that was determined in step '4. Install driver & determine serial port':

	_leonardo_IO_HF_Tes 'ools Help	t Arduino 1.().5-r2		
	Auto Format Archive Sketch	Ctrl+T			
radino_nRF800	Fix Encoding & Reload		n services_lock.h	uart_over_ble.h	
/* Copyright (Serial Monitor	Ctrl+Shift+M	ASA		
*	Board	•			
* Permission * of this sof	Serial Port	•	(the "So	obtaining a copy ftware"), to dea	
* in the Soft	Programmer	+		ation the rights	
* to use, cop	- Burn Bootloader		✓ COM30 _ublicense	, and/or sell	
* copies of the	: portware, and to	permic per	sons to whom the So	ftware is	
* furnished to	do so, subject to	the follow	ing conditions:		

To upload your sketch simply click on the 'Upload'-Button on the top left corner.

∞ radino_nRF8001_leonardo_IO_HF_Test Arduino 1.0.5-r2					
File Edit Sketch Tools Help					
🔊 🔸 🗈 🖬 🖬				P	
radino_nRF8001_leonardo_IO_HF_Test	services.h	services_lock.h	uart_over_ble.h		
/* Copyright (c) 2014, Nordic Semiconductor ASA *					
* copies of the Software, and to permit persons to whom the Software is					
4					
Uploading					
Binary sketch size: 14,766 bytes (of a 28,672 byte maximum)					
1			In-Circuit rad	ino nRF8001 on COM30	

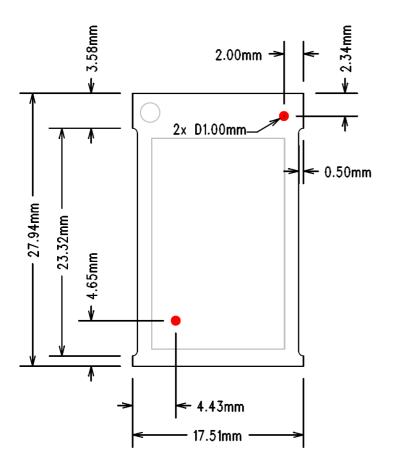
Now you can open the serial monitor to communicate with your radino:

ooradino_nRF8001_l File Edit Sketch To	eonardo_IO_HF_Test Arduino 1.0.5-r2 ols Help		
		Seri	al Monitor 🔎
radino_nRF8001_	🚣 COM30		
/* Copyright (c)		Send	
*	Arduino setup	_	
	Set line ending to newline to send data from the serial m Evt Device Started: Setup	nonitor	_
	Evt Device Started: Secup Evt Device Started: Standby		▼
Done uploading.	Advertising started		
Binary sketch siz	Autoscroll Newline 9600) baud 🔽	
1	In-Cir	cuit radino nRF	8001 on COM30



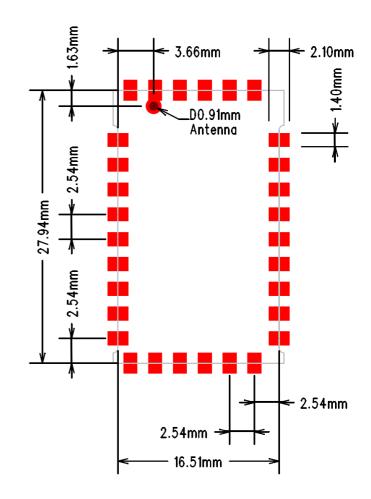


Package Dimensions and recommended PCB Footprint



seen from top side

recommended footprint





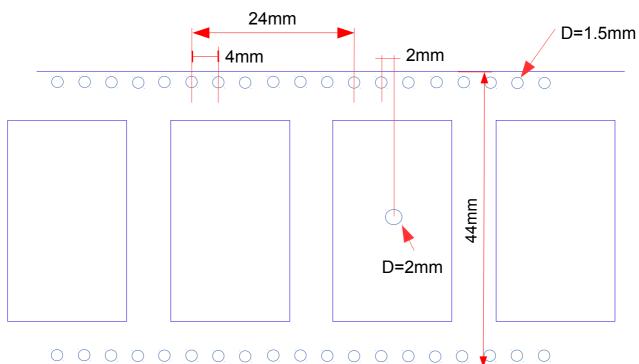


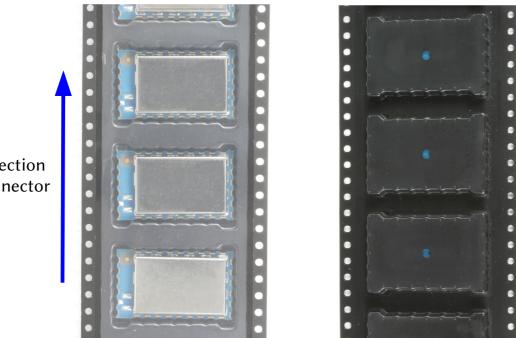
Packaging: tape & reel specification

All radino modules come in a tape & reel package suitable for pick and place machines. Small quantities are delivered as cut-tape. There are 2 kinds of reels available with 100pcs and 500pcs per reel (see section ordering information) Except the number of modules, all parameters are same to both reel sizes:

- 13" reel size

- 44mm tape width
- tape pocket dimensions 29mm x 19mm x 4mm
- module spacing 24mm
- 2mm hole in the middle of the module body
- 1.5mm tape holes for transport





Transport direction (Antenna connector to the left)



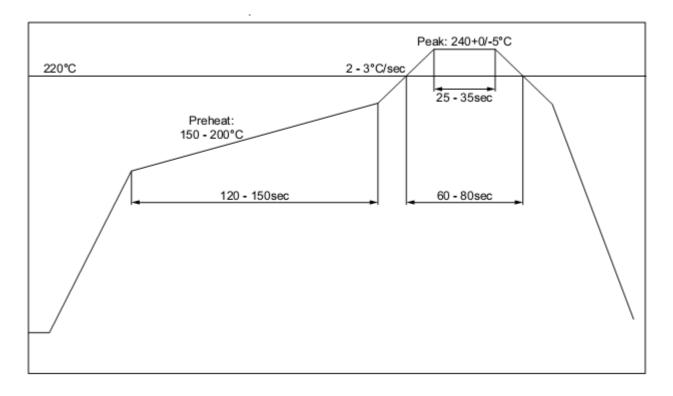


Reflow temperature profile

The single most critical stage in the automated assembly process is the reflow stage. The reflow profile shall not exceed the following maximum ratings:

- heating gradients <3°C/sec
- peak zone temperature of the module <245 $^\circ\!\mathrm{C}$
- time in peak zone <40 sec.
- time above 220°C <80 sec.

Excessive temperatures, transport times and shocks during the reflow process MUST not be applied to the module.



Washability

The radino modules are wash-resistant, but are not sealed. In-Circuit recommends manufacturing without washing. If washing is needed make sure that a drying time is provided to the modules before applying electrical power. The drying time should be sufficient to allow any moisture that may have migrated into the module to evaporate, thus eliminating the potential for shorting damage during power-up or testing.

If the wash contains contaminants, the performance may be adversely affected, even after drying.





Ordering Information

Part	Ordering Code	MOQ	Package
radino WiFi	901.321B	1	Cut Tape
radino WiFi	901.321B	100	Reel 100pcs
radino WiFi	901.321B	500	Reel 500pcs
Radino Leonardo Evaluation and Production Board	901.319	1	Single devices in Box





Certifications



European R&TTE Directive Statements

The radino WiFi module has been tested and found to comply with Annex IV of the R&TTE Directive 1999/5/EC

and is subject of a notified body opinion. The module has been approved for Antennas with gains of 2 dBi or less.

Federal Communication Commission Certification Statements

The radino WiFi complies with Part 15 of the FCC rules and regulations. In order to retain compliance with the

FCC certification requirements, the following conditions must be met:

- 1. Modules must be installed by original equipment manufacturers (OEM) only.
- 2. The module must only be operated with antennas at a gain of 2 dBi max.
- 3. The OEM must place a clearly visible text label on the outside of the end-product containing the text "Contains FCC ID: 2AC7Z-ESP8266EX"



Revision history:

Version	Date	Changes	Editor
A	2014/10/17	Initial Version	Träger
	2015/01/08	Minor update	Kormann
	2015/01/15	Minor update	Träger