WF121 Wi-Fi® Module

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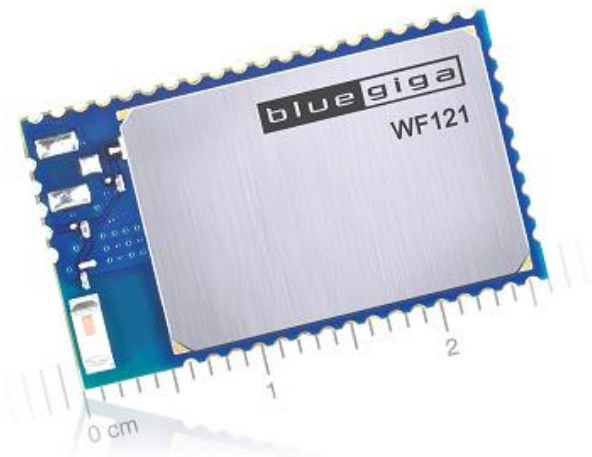
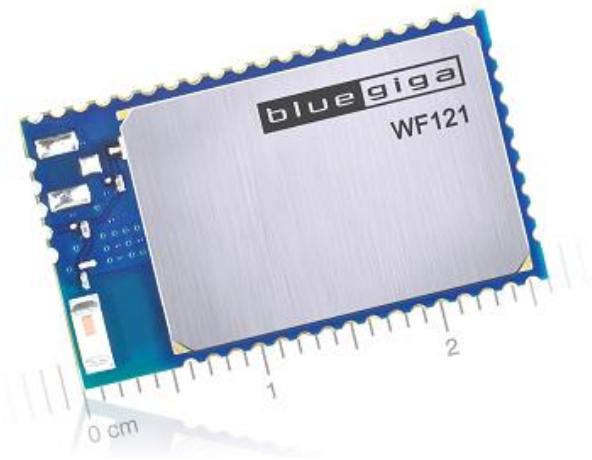


Key Features



IEEE 802.11 b/g/n radio
- Single 2.4 GHz band
- Symbol rate up to 72.2Mbps
- Integrated antenna or U.FL connector
- Client and Access Point modes supported

Excellent radio performance:
- TX power: +17 dBm
- RX sensitivity: -97 dBm

Host interfaces:
- UART, USB or SPI

Peripheral interfaces:
- GPIO, AIO and timers
- I2C, SPI and UART

Embedded TCP/IP stack on 802.11 MAC:
- IP, TCP and UDP
- DHCP, ICMP and DNS client protocols
- HTTP server
- mDNS

32-bit embedded microcontroller:
- 80Mhz, 128kB RAM and 512kB Flash
- MIPS architecture

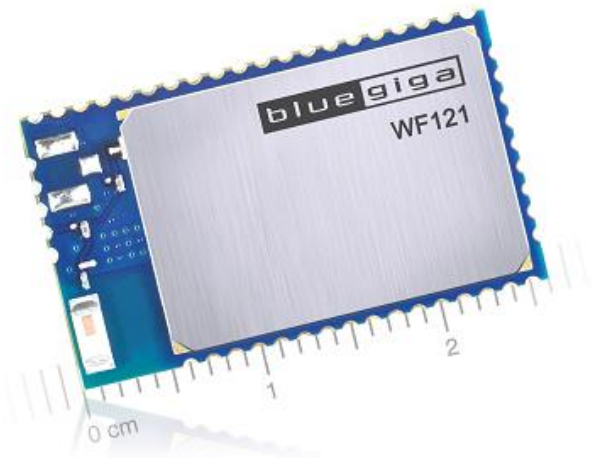
Small size: 15.4 x 26.2 x 2.1 mm

Bluegiga BGScript™ scripting language for stand-alone applications

Temperature range: -40°C - +85°C

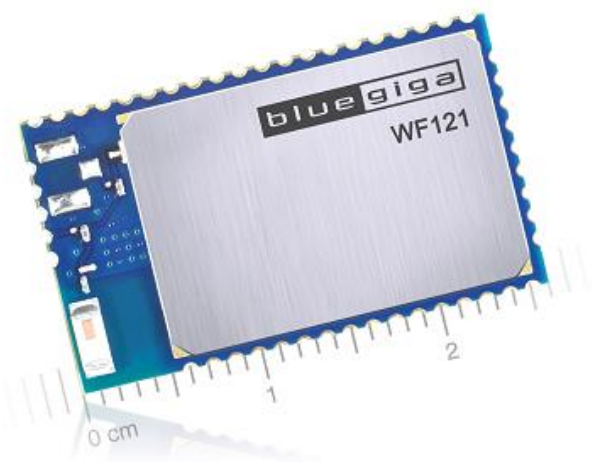
Fully CE, FCC and IC qualified

Benefits



- Small, stand-alone 802.11 b/g/n module with radio, antenna and 32-bit MCU
- Long range provided by excellent radio performance
- Embedded TCP/IP and 802.11 MAC stacks
- On-board end user applications enabled by Bluegiga BGScript™
- Industrial specifications, long life time and future proof solution
- Regulatory qualifications reducing R&D risk, costs and time-to-market

WF121 Overview



Single stream 802.11 b/g/n radio

- Frequency: 2402 – 2480 MHz
- TX power: +17 dBm
- RX sensitivity: -97 dBm

Supported 802.11 standards

- 802.11n
- 802.11g
- 802.11b

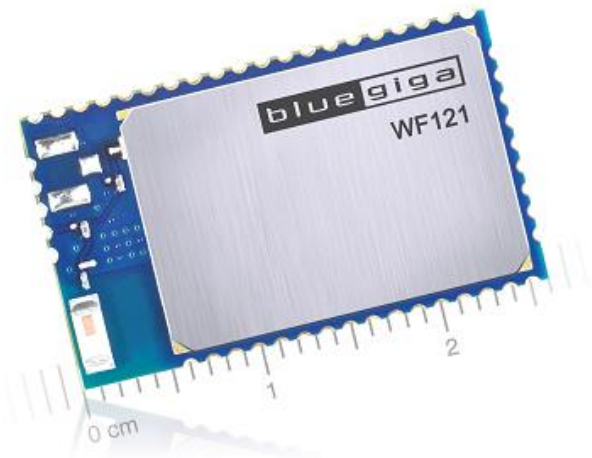
Channels

- North America 11 channels
- Rest of the world: 13 channels

Line-of-sight range

- Up to 500 meters

WF121 Overview



Host interfaces

- UART
- SPI
- USB (USB/CDC)

Peripheral intererfaces

- 38 general purpose IO pins
- 2 x I2C
- 2 x SPI
- 4 x UART
- 10/100 Mbps RMII (Ethernet)
- Timer
- 10 x AIO (10-bit ADC)

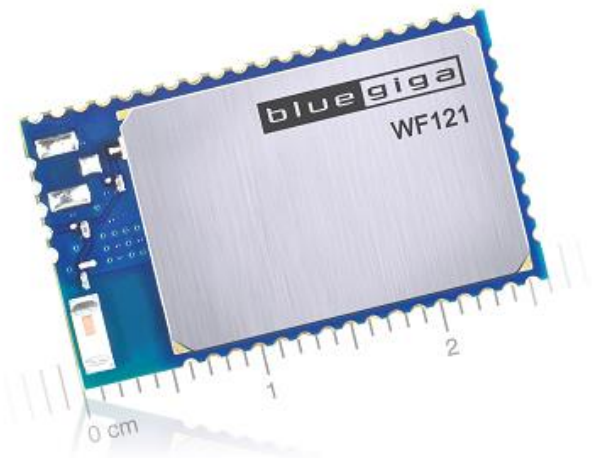
Radio co-existence interfaces

- 3-wire Unity 3
- 3-wire Unity 3e+ (recommended)
- 4-wire Unity 4

Programming & Debug

- 802.11 debug SPI
- MCU programming interface

WF121 Overview



Microcontroller

- MIPS architecture
- 80MHz
- 1.56 DMIPS/MHz

SRAM

- 128kB
- ~20kB free

Flash

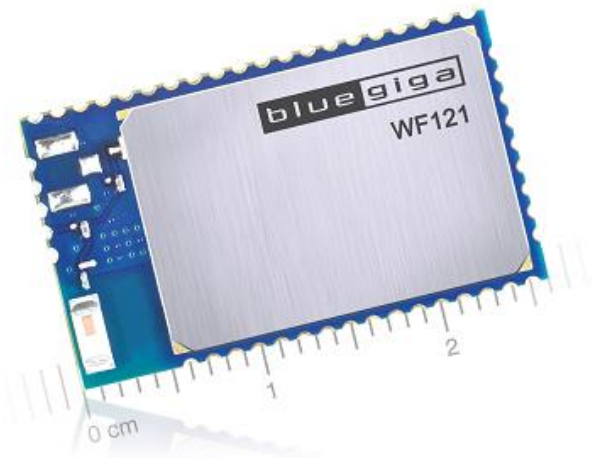
- 512kB
- ~ 10-20% free depending on software configuration

WF121 Overview

Power supply:

- **Main power supply**
  - 2.3V - 3.6V
- **VDD_PA : Front-end power supply**
  - 2.7 - 4.8V
- **IO voltage levels**
  - 2.3V to 3.6V

WF121 Overview



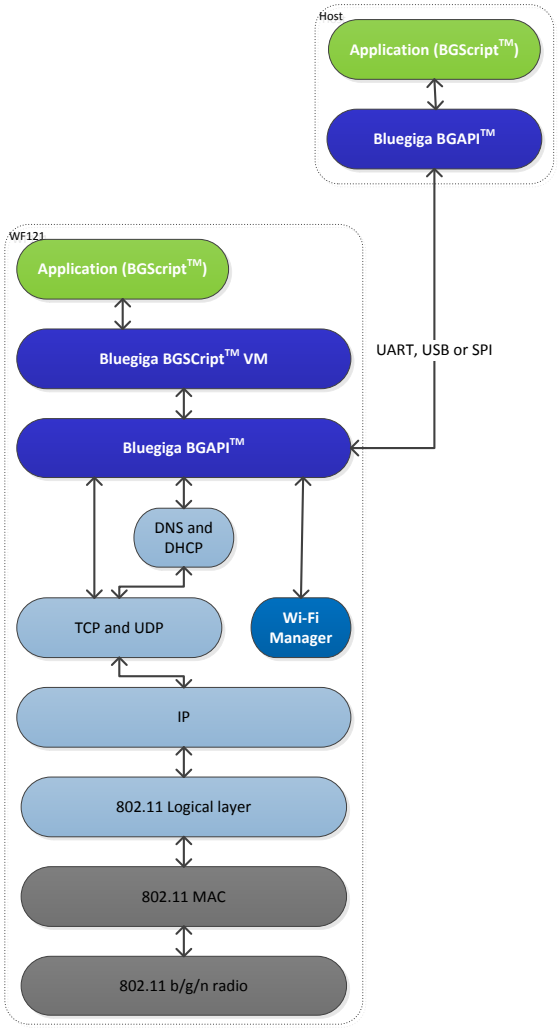
Current consumption at 3.3V

- **Avg. TX/RX with full throughput**
  - 170 mA
- **Idle, associated to an Access Point**
  - 2.5 mA
- **Idle, un-associated**
  - 170 uA
- **Deep sleep**
  - 62 uA

Bluegiga Wi-Fi Software

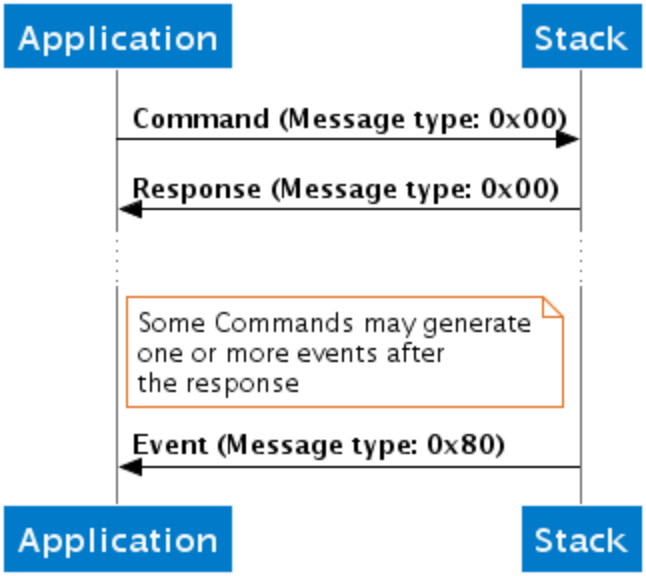
Bluegiga Wi-Fi Software

- **Bluegiga Wi-Fi software mplements the following layers**
  - 802.2 MAC stack
  - IPv4 compatible TCP/IP stack
  - IP, TCP and UDP
  - DHCP and DNS
  - ICMP
- **802.11 features**
  - 802.11 client (STA) mode
  - 802.11 Access Point mode upto five clients
  - WPA2, WPA, WEP and WPS security
- **Implements the following clients and servers**
  - TCP client/server
  - UDP client/server
  - DHCP client
  - DNS client
  - HTTP server
  - mDNS client
- **Simple API for external host processors**
  - BGAPI™ : A simple protocol over UART, USB or SPI interfaces
  - BGLib™ : A C library for host processors implementing BGAPI
- **Supports standalone applications as well**
  - BGScript™ : A simple scripting language for writing applications
  - **No separate host needed**



Bluegiga Wi-Fi Software

- **BGAPI™ serial protocol** : A simple binary command, response and event protocol between the host and the stack
  - Used when a separate host (MCU) is used to control WF121 over UART, USB or SPI
  - Very small memory requirements size requirement and low implementation overhead



Bluegiga Wi-Fi Software

- **BGLib™ library** : A portable ANSI C library, which implements the BGAPI protocol
  - Easy to port to various architectures such as : ARM Cortex, PIC16/32 etc.
  - Uses fuction–call back architecture

C Functions

```
/* Function */
void wifi_cmd_sme_wifi_on(
    void
);

/* Callback */
struct wifi_msg_sme_wifi_on_rsp_t{
    uint16 result
}
void wifi_rsp_sme_wifi_on(
    const struct wifi_msg_sme_wifi_on_rsp_t * msg
)
```

Bluegiga Wi-Fi Software

- **BGScript™ scripting language** : A very simple BASIC-like application scripting language
  - Used when applications are implemented on the WF121's PIC32 controller
  - Enables very fast application development and allows programs to be executed directly on the WF121 without the need of an external MCU
  - Free of charge SDK and development tools

System start-up

```
# Boot event listener
event system_boot(major,minor,patch,build,ll_version,protocol,hw)

   # System started - start Wi-Fi radio
   call sme_wifi_on()

end
```

Hint: double-click to select code

Bluegiga Wi-Fi Software

- **Why to use BGScript™?**

- **Very simple to use**
  - Fast development of simple Wi-Fi applications
  - Examples: Access Point scan and connection, simple user interfaces, simple sensors

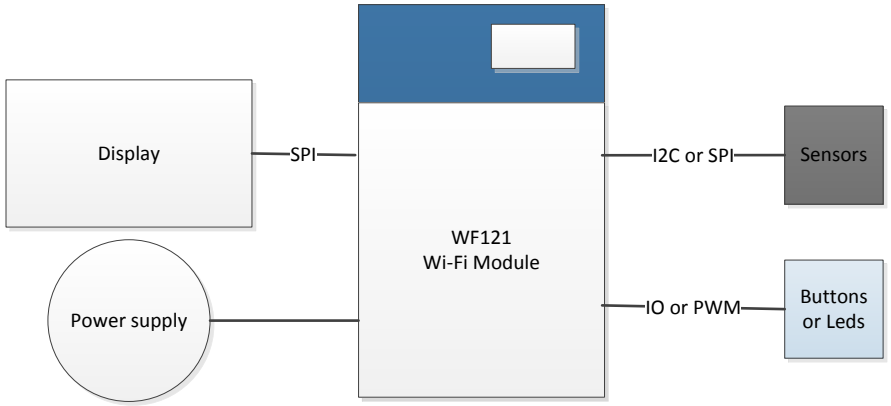
- **Free software development tools**
  - Code developed with any text or source code editor
  - Code compiled with Bluegiga's free compiler

- **Example scripts available**
  - Access Point scan
  - Embedded Wi-Fi Access Point and HTTP server
  - TCP server
  - TCP client
  - Serial cable replacement

- **Cuts out the need for external MCU**
  - Reduced product eBoM
  - Smaller footprint
  - Faster time-to-market

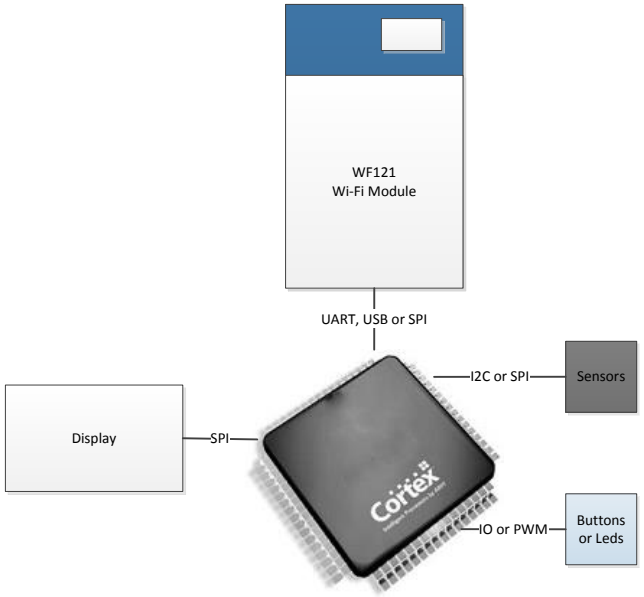
Use Cases

- **Standalone architecture**: No separate host processor
  - Sensors and peripherals are directly connected to the WF121 via the IO interfaces
  - Application executed on the on-board PIC32
  - Application developed with BGScript™

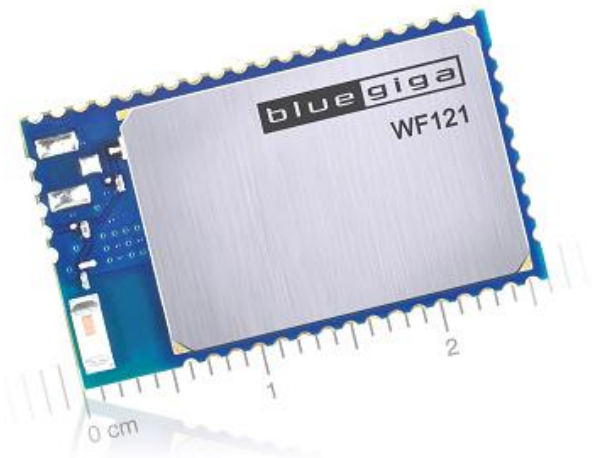


Use Cases

- **Hosted architecture**: A separate MCU is used
  - Sensors and peripherals are directly connected to the MCU via the IO interfaces
  - WF121 connected to the MCU via UART, USB or SPI
  - Application developerd to the MCU and interfacing to WF121 done using BGAPI™ protocol (BGLib™ can be used on the host)

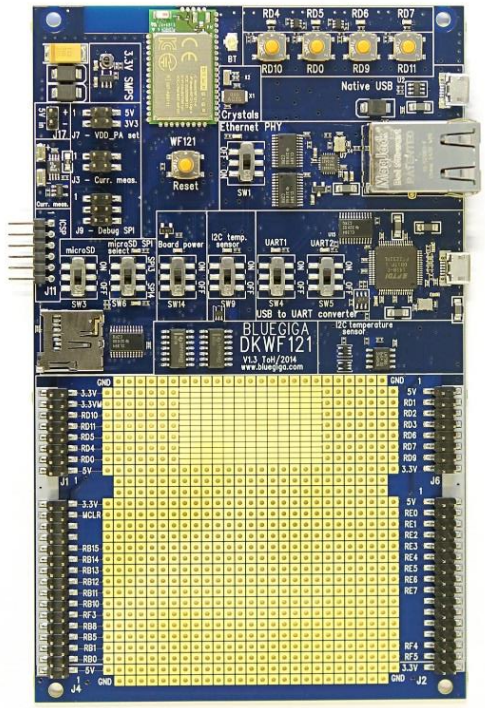


Certifications



- **CE**
  - EN300328
  - EN301489-1/17
  - EN60950-1
- **FCC**
  - Part 15C modular approval
- **Industry Canada**
  - IC modular certification
- **South Korea**
  - KCC certification
- **Japan**
  - ARIB-STD-66

Development Tools



- **WF121 Development Kit**
  - WF121-A
  - Dual port USB-to-UART converter
  - Micro USB
  - 4 buttons
  - 4 leds
  - MicroSD card
  - I2C temperature sensor
  - Current measurement point
  - Ethernet connector
  - Debug interfaces
  - IO headers

  + Documentation

  + 1 x WF121-A

  + Programming cables

  + Free of charge SDK and examples

Thank You