STM WiFi + STM32F0-Discovery = Web Server

SILICA STM WiFi EvaBoard
STM WiFi (SPWF01Sx) Key Messages

- **Serial To WiFi 802.11b/g/n OEM Module**
- **Plug&Play Solution**
- **Very Small Form Size Factor**
- **FCC/IC/CE certified**
- **Multiple Antenna Options**
- **Low Power Use Modes Available**
- **Industrial Temperature Range**
- **Infrastructure Mode**
- **AhHoc/WiFi Direct Mode**
- **“Full TCP/IP Stack” SW Library with**
  - Built-in Wi-Fi security
  - Built-in TCP/IP stack
  - Built-in DHCP, DNS
  - Built-in HTTP server/client
- **Rich AT-like commands for host usage**
- **SDK for custom Application development (Q4/13)**
**STM WiFi (SPWF01Sx) Features**

- **Radio**: 2.4 GHz IEEE 802.11b/g/n
- **Micro**: STM32 ARM Cortex-M3
- **Memory**: 64KB RAM, 1.5 MB Flash
- **Size (mm)**: 26.92 x 15.24 x 2.35
- **Interfaces**:
  - Serial (UART, I2C, SPI)
  - GPIOs
  - JTAG
- **XTAL**: Integrated 32kHz XTAL to support low power modes
- **Side pads**: SMD
- **Temperature**: Industrial temperature range
- **Antenna Options**: Integrated Antenna/U.fl. Connector
- **Certifications**:
  - FCC, IC and CE certified
  - ROHS Compliant
- **Software. Multiple Stacks Available**
  - Full Stack
    - AT
    - SDK (Q4/13)

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Antenna Option</th>
<th>SW Library</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPWF01SA.11</td>
<td>Chip Antenna</td>
<td>Full Stack</td>
</tr>
<tr>
<td>SPWF01SC.11</td>
<td>U.FL</td>
<td>Full Stack</td>
</tr>
</tbody>
</table>

**Serial To WiFi Module**

802.11 b/g/n

UART/SPI /I2C/GPIO
## STM WiFi (SPWF01Sx) Characterization Figures

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Voltage, Vin</td>
<td>---</td>
<td>+3.1</td>
<td>+3.3</td>
<td>+3.6</td>
<td>V</td>
</tr>
<tr>
<td>Operating Temperature Range</td>
<td>---</td>
<td>-40</td>
<td>---</td>
<td>+85</td>
<td>°C</td>
</tr>
<tr>
<td>Radio Rec. Sensitivity Level</td>
<td>11g/9Mbs</td>
<td>---</td>
<td>-96</td>
<td>---</td>
<td>dBm</td>
</tr>
<tr>
<td>Radio Transmitter Output Power</td>
<td>50 load, 11g/9Mbps</td>
<td>--</td>
<td>+18.3</td>
<td>--</td>
<td>dBm</td>
</tr>
</tbody>
</table>
STM WiFi (SPWF01Sx) Architecture and Footprint

STM32F103CW1100b/g/n

Supply

UART/SPI

GPIO

JTAG

Flash 1MB

PA

Filter

3.3V

32kH

38MHz

Dimensions: L: 26.92mm W: 16.24mm H: 2.35mm

UFL connector version
STM WiFi (SPWF01Sx) Target Applications

- Smart Appliances
- Industrial Control and Data Acquisition
- Home Automation & Home Energy
- Home Security Systems
- Wireless Sensors
- Cable Replacement
- Medical Equipments
STM WiFi (SPWF01Sx) Supported System Configurations

**Infrastructure Mode**

- **Access Devices:** PC/Laptop/Tablet/Smart Phones
- **STAtion**
- **End Product**

**Ad-Hoc/Wi-Fi Direct Mode**

- **Access Devices:** PC/Laptop/Tablet/Smart Phones
- **IBSS**

**Supported System Configurations**

**Access Devices:**
- PC/Laptop/Tablet/Smart Phones
- Ad-Hoc/Wi-Fi Direct Mode
- Infrastructure Mode

**System Configurations:**
- PC/Laptop/Tablet/Smart Phones
- Internet
- Cloud Server
- AP/Router
- BSS

**End Products:**
- STAtion
- End Product
Enable the use of the module as a Network Coprocessor

- SetUp/Custom App
- AT Command Layer
  - WEB Server/HTTP Client
  - TCP/IP
  - MAC+PHY
- Application Layer
  - Customer code
  - ST Supplied

Host (STM32/STM8)

Can be very small!!

End Product

STM WiFi (SPWF01Sx) AT Full Stack

SPWF01Sx.11 Beta Version AVAILABLE @ Q2 2013
Enable the module to host the whole target application

SetUp/Custom App/Web Pages  WEB Server/HTTP Client

TCP/IP

MAC+PHY

Customer code
ST Supplied

SPWF01Sx.2x
Beta Version
AVAILABLE @ Q4 2013

End Product
STM WiFi (SPWF01Sx) AT Full Stack Features

In the Available Beta Version

- Rich AT command set for RS-232
- Standards-compliant 802.11b/g/n operation
- IBSS and BSS Station operation modes
- Advanced Power Saving Modes
- Wireless security (WEP, WPA/WPA2-PSK)
- Full IPv4 stack + TCP + UDP (including DHCP client and DNS Client)
- Field update via WiFi and RS-232
- Rich AT command set for RS-232 control
- Built-in application utilities:
  - web server
  - http client (http get) (pull data mode)
  - “http post via get” (push data mode)

In the Final Release Version

- WiFi Direct + WPS
- Mini AP WLAN Functions (2 Clients)
- WPA/WPA2 Enterprise
- SSL/TLSS
- http post
- TCP/UDP Sockets API
- Telnet Server

AT Commands

- Device Control and Config
- Debug
- Power Mgt
- Timers
- Profile
- Watchdog
- Nvdata

WiFi Stack
- Connection
- Security
- Upper MAC
- Device Drivers

Packet if
- Control if
- Dns+dhc
- p+tcp/ip

RTOS

Peripheral Drivers

Sagrad WiFi Platform
### STM WiFi (SPWF01Sx) “Full Stack” Application Interface

<table>
<thead>
<tr>
<th>Utilities</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT-style commands</td>
<td>Multiple Categories: i.e. Utilities, Configuration, Network, GPIO, Files Management</td>
</tr>
<tr>
<td>Configuration Variables</td>
<td>Multiple SetUp categories: i.e security, network, applications.</td>
</tr>
<tr>
<td>Status Variables</td>
<td>Radio, channels …</td>
</tr>
<tr>
<td>Asynchronous Indications</td>
<td>Radio/Protocol/Status Indication Run-Time Messages that are echoed on the serial port</td>
</tr>
</tbody>
</table>

![Diagram showing SPI/UART communication with Host (STM32/STM8) and device, illustrating AT commands, Conf. Variables, Status Variables, and Asynchronous Indications.]
SILICA STM WiFi EvaBoard
STM WiFi (SPWF01Sx) availability

- Samples: early June 2013 (mat.21).
- Immediate availability of samples with selected customers (according with STM).
STM32F0-Discovery + STM WiFi = Web Server
To see on the Internet the WebServer, it is necessary to configure on the ADSL_Modem/Router the Port Forwarding and a DynDNS.
• We used the **STM32F0-Discovery** for control the SILICA STM WiFi EvaBoard.

• The SW was developed using KEIL C Compiler (32K free version).

• It is very easy transport this SW to the other STM32 family.

• Optionally: if you connect a led from **PC6** and **GND**, you have the possibility to monitor the waiting from the answer from STM WiFi module.
Connect STM WiFi module to STM32F0-Discovery

ATTENTION: Only the jumpers: PWR and TXD must be present on SILICA STM WiFi EvaBoard.
Connect STM WiFi module to STM32F0-Discovery

<table>
<thead>
<tr>
<th>TX</th>
<th>UART Transmit line</th>
<th>PA2</th>
<th>USART2_TX</th>
</tr>
</thead>
<tbody>
<tr>
<td>RX</td>
<td>UART Receive line</td>
<td>PA3</td>
<td>USART2_RX</td>
</tr>
</tbody>
</table>

5V tolerant

<table>
<thead>
<tr>
<th>RXD1</th>
<th>UART1 Receive data input</th>
<th>5V tolerant</th>
</tr>
</thead>
<tbody>
<tr>
<td>TXD1</td>
<td>UART1 Transmit data output</td>
<td>5V Tolerant</td>
</tr>
</tbody>
</table>

SILICA I The Engineers of Distribution
STM32F0-Discovery to control the STM WiFi module

STM32F0 + STM_WIFI = Web Server

On STM32F0-Discovery you must upload the file of the WebServer that is here.
I suggest to use ST-LINK Utility.

Remember:
- Connect your PC WiFi to the classroom A.P./Router
- Connect Silica STM WiFi EvaBoard to your PC
- Connect the STM32F0-Discovery to your PC
• Close the ST-LINK Utility
• Disconnect the USB cable from STM32F0-Discovery
• Wait a second
• Reconnect the USB cable to STM32F0-Discovery.
• Now run Tera Term or Hyper Terminal and press and release the **black button** on the STM32F0-Discovery. This is for reset the STM32F0-Discovery.

• For doing the connection just press and release the **blue button** on the STM32F0-Discovery.

At this point you see the **Blue led that flashing** and the **Red led that changes from OFF to ON**.

After some seconds, **Blue and Green leds are flashing** and this means that the STM WiFi module is trying to connect to the WiFi Router.

After **20/60 sec**, **Blue and Green leds go OFF** and this means that the connection is done.

• Also, the **led LED2 must be ON. LED2 (LINK)** is on the SILICA STM WiFi **EvaBoard**, this means that the WiFi connection is active.

• At this point, it is also loaded on the STM WiFi module, the html page named: **led.html**

This page shows the status of the LEDs mounted on the STM32F0-Discovery.
WiFi Sniffing

In the terminal Tera Term or Hyper Terminal you will see something similar to the image showed here. In the yellow box there is the address that the access point and/or router have assigned to our WiFi card.
Now open the html page (use Windows Internet Explorer):

cgi_demo.html

this page is used to send commands to STM WiFi Module.

• Suppose that the STM WiFi IP is: 168.169.0.5
• Open your browser and type:

192.168.0.5/cgi_demo.html
STM32F0-Discovery to control the STM WiFi module

The custom commands (implemented on STM32F0-Discovery) to control the STM WiFi module are:
- **Igon** – TurnON the green LED
- **Igoff** – TurnOFF the green LED
- **Ibon** – TurnON the blue LED
- **Iboff** – TurnOFF the blue LED
- **X** – Clear RxBuffer
- **reset** – reset the STM WiFi module, it reloads the WiFi configuration received from STM32F0-Discovery.
  During the reset the Blue and Green Leds are flashing.

You have the possibility to see the LEDs status in the page: 192.168.0.5/led.html

**Remember:** you must reload the led.html page after every command sent by using the cgidemo.html page.
STM32F0-Discovery to control the STM WiFi module

Try the commands:
• `Igon` – Turn ON the green LED
• `Igoff` – Turn OFF the green LED
• `Ibon` – Turn ON the blue LED
• `Iboff` – Turn OFF the blue LED
and see the results, remember to reload the page after any command.
What we offer

- A complete source code for STM32F0xx family that is very easy to transfer on other STM32 families (Cortex Mx).
- A complete manual that covers the topics below.
  - Resource available via STM WiFi pins
  - Firmware update
  - HTML pages
  - How to use the SILICA STM WiFi EvaBoard
  - AT Commands
  - AT SetUp commands (to connect STM WiFi module to WiFi network)
  - AT GPIO commands
  - AT General Commands
  - Create a filename.html (a complete HTML example)
  - NotePad++
  - How to use Tera Term
  - How to connect STM WiFi module to STM32F0-Discovery (Web Server), C source code
  - How to scan your local network
  - How to use PYTHON on LINUX to drive STM WiFi module
  - How to use PYTHON on Windows 7 to drive STM WiFi module
What we offer

• Comprehensive manual that explain the SW implementation and that covering the topics below

  • How to connect STM WiFi module to STM32F0-Discovery
  • The Web pages
  • The definitions
  • The variables
  • The principal functions
The code size of the Web Server is:

- Flash < 8K
- Ram < 3K

It is possible reduce the code size using the C Compiler optimizations.
ATTENTION:

this SW is available only for: SILICA Customers

enrico.marinoni@silica.com  (FAE SILICA Italy)