User Manual - Datasheet

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Website: fluotechnology.co.uk

SUMMARY

The FLUO WI-FI is the best development board for creating your own connected objects and IoT solutions. This board is based on the ATmega644p by ATMEL (MICROCHIP), compatible with the Arduino Ecosystem; as well as on the ESP32 module by ESPRESSIF, providing it with Wi-Fi and Bluetooth Low Energy (BLE) connectivity.

The ESP32 microcontroller supports the FreeRTOS operating system and it's programmable with Arduino code. The board has built-in 2.4GHz Wi-Fi and Bluetooth Low Energy (BLE), micro-SD card slot, 20 digital input/output pins (6 of them can be used as PWM outputs and 6 as analog inputs), 16 MHz crystal oscillator (used by AVR microcontrollers), a micro USB connection, a power jack with a supply range of 5 to 20 V, an ICSP header, and 2 reset buttons. It also has an Arduino R3 compatible pin header form factor, making it compatible with all Arduino R3 compatible shields.

FLUO WI-FI provides a powerful Cloud back end out of the box thanks to its support to IPv4 and IPv6, Secure HTTP, Coap, REST and MQTT protocols. It is easy to program thanks to FLUO exclusive software that will allow you to upload your sketches wirelessly and connect it to its surroundings through numerous sensors, actuators and Arduino compatible shields.

TECH SPECS

BOARD SPECS

Input Voltage	5V (USB) – 5V to 20V (Power Jack)
Wire interface	USB micro-B (loading sketches, serial debugging)
R3 Headers Supply Voltage	5V
Power Consumption	250 mA (under normal use conditions)
Board Size	53 X 68mm (2.1″ X 2.7″)
Weight	60g

AVR MICROCONTROLLER

Microcontroller	ATmega 644p
Architecture	8-bit Atmel AVR
Operating Voltage	5V
Digital I/O Pins	20
PWM Output	6
Analog I/O Pins	6
DC Current per I/O Pin	40mA on I/O Pins; 50mA on 3.3V
Flash Memory	64KB
SRAM	4KB
Interface	SPI – I2C – UART
Clock Speed	16MHz

ESP MICROCONTROLLER

Microcontroller	ESP32
Architecture	XTENSA LX6
Operating Voltage	3.3V
Flash Memory	16MB
SRAM	520KB
Connectivity	WiFi 802.11 class BGN & Bluetooth 4.2 (BLE)
Clock Speed	160MHz + 160MHz
Radio performance	150mbps data rate with ht 40 (49MHz channel width, 400ns guard interval, 1 spatial stream, 64-QASM, 5/6 coding rate)
Security	Hardware accelerated dedicated encryption (AES/SHA2/ Elliptical Curve Cryptography/RSA-4096)

DOCUMENTATION
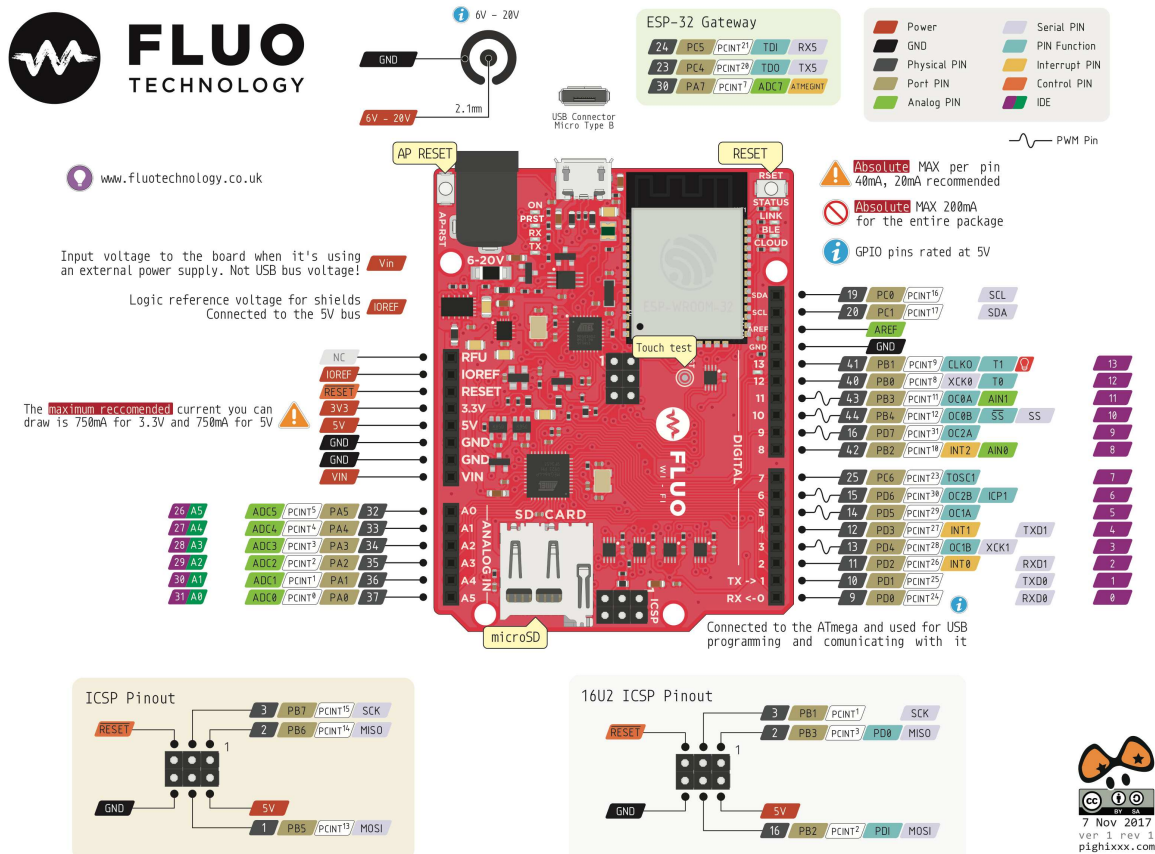
Pinout

The pinout diagram serves as a quick reference guide for your FLUO WI-FI where you can find detailed information about the board. Each of the 20 digital pins on the FLUO WI-FI can be used as inputs or outputs by using the pinMode(), digitalWrite() and digitalRead() functions. The I/O pins are rated at 5V, they can provide or receive 25 mA of current as recommended operating condition and they have an internal pull-up resistor of 20 to 50kOhm (disconnected by default). The value of current for each I/O pin must not exceed a maximum of 40mA to avoid permanent damage to the microcontroller.

PIN DESCRIPTION

VIN: The input voltage to the FLUO WI-FI when it's using an external power supply (as opposed to 5V from the USB connection or any other regulated power supply). You can supply voltage through this pin, or, if supplying voltage via the power jack, access it through this pin.

5V: This pin outputs a regulated 5V from the on-board regulator. The board can be supplied with power either from the DC power jack (7 to 12V), the USB connector (5V), or the VIN pin of the board (7 to 12V). It's not advised to supply voltage via the 5V or 3.3V pins as it would bypass the regulator and your FLUO WI-FI might be damaged when doing so.

3V3: A 3.3V supply generated by the on-board regulator. Maximum current draw 50 mA.

GND: Ground pins.

IOREF: This pin on the FLUO WI-FI provides the voltage reference with which the microcontroller operates. A properly configured shield can read the IOREF pin voltage and select the appropriate power supply or enable voltage translators on the outputs to work with the 5V or 3.3V.

PINS WITH SPECIALIZED FUNCTIONS

Serial: (Pins 0 (RX) and 1 (TX)) They're used to receive (RX) and transmit (TX) TTL serial data. These pins are connected to the corresponding pins of the ATmega16U2 USB-to-TTL Serial chip and to the ESP32

External Interrupts: (Pins 2, 4 and 8) These pins can be configured to trigger an interrupt on a low value, a rising or falling edge, or a change in value.

PWM: (Pins 3, 5, 6, 9, 10 and 11) They each provide an 8-bit PWM output.

SPI: (ICSP header) These pins support SPI communication.

LED: (Pin 13) There is a built-in orange LED driven by this pin.

I2C/TWI: (SDA pin and SCL pin) They support I2C/TWI communication.

Analog Input: (Pins A0 to A5) They each provide 10 bits of resolution. By default they measure from GND to 5V, though is it possible to change the upper end of their range using software library or the AREF pin, a reference voltage for the Analog Inputs.
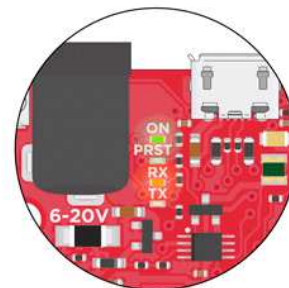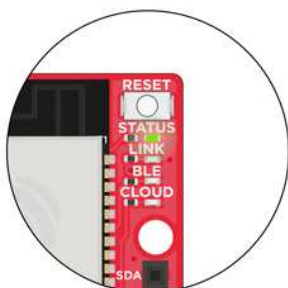
LEDS

ON LED turns on when the FLUO WI-FI is powered up

PRST LED turns on when both the ATmega644p and the ESP-32 have successfully rebooted.

RX/TX *LEDs flash when there is serial (USB Serial) data being transmitted to or from your FLUO WI-FI via the USB connection.*
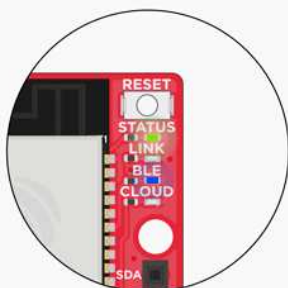
STATUS LED turns on when the firmware is running

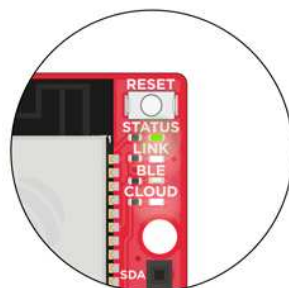**LINK** LED blinks when your FLUO WI-FI is in AP Mode.

LINK LED remains turned on when your FLUO WI-FI is connected to your wireless network

BLE LED blinks when the Bluetooth connection on your FLUO WI-FI is in discoverable mode

BLE LED remains turned on when your FLUO WI-FI is paired with another Bluetooth device

CLOUD LED turns on when your FLUO WI-FI is connnected to the Internet

BUTTONS

RESET Button: Press and release to reboot the ATmega644p. You can reboot both the ATmega644p and the ESP-32 by pressing this button for 3 seconds.

AP-RST Button: By pressing this button for more than 5 seconds, the FLUO WI-FI will reset back to AP Mode, allowing you to configure your wireless connection to the FLUO-WIFI. After those 5 seconds, the STATUS LED will blink rapidly and the LINK LED will begin blinking.

POWER

The FLUO WI-FI can be powered via the USB connection or with an external power supply. The power supply is selected automatically. External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or a battery. The adapter can be connected by plugging a 2.1mm center-positive plug into the board's power jack. Leads from a battery can be connected to the *GND* and *VIN* pins of the POWER connector. It can operate on an external power supply of 5 to 20 V, with a recommended range is 7 to 12 V.

PROTECTION

FLUO WI-FI has a resettable polyfuse that protects your computer's USB ports from short circuits and overcurrents. Although most computers provide their own internal protection, the fuse provides an extra layer of protection. If more than 500mA is applied to the USB port, the fuse will automatically break the connection until the short circuit or overload is removed.

COMMUNICATION PROTOCOLS

The FLUO WI-FI offers many possibilities in terms of communication with the Cloud, computers or other microcontrollers.

Serial: The ATmega16U2 provides a dedicated UART TTL (5V) serial communication. It also allows for serial (CDC) communication over USB and appears as a virtual COM port on your computer. This Serial CDC is connected to the ATmega644P and ESP-32 for debugging or for communicating with others devices. The chip also acts as a full speed USB 2.0 device, using standard USB COM drivers. The Arduino IDE FLUO Edition includes a serial monitor which allows simple text data to be sent to and from your FLUO WI-FI. The RX and TX LEDs on the board will flash when data is being transmitted via the USB connection to and from your computer. Internal Virtual Serial is used for serial communication between the ATmega644P and the ESP-32. The SoftwareSerial library allows for serial communication on any of the digital pins. Pins 0 and 1 should be avoided as they are used by the Arduino Bridge library.

I2C (TWI) and SPI: The ATmega644P also supports I2C (TWI) and SPI communication. Arduino standard libraries are available to simplify the use of I2C and SPI buses.

Bluetooth Low Energy (BLE): This popular communications protocol allows you to connect your Smartphone to your FLUO WI-FI wirelessly and directly without the need of an Internet connection.

Wi-Fi: FLUO's namesake technology. This communication protocol will allow you connect your FLUO to the cloud, unleashing all its power.

PROGRAMMING

The FLUO WI-FI can be programmed with the Arduino IDE FLUO Edition.
HERE You will find all the information you need to configure your FLUO WI-FI and use the Arduino IDE FLUO Edition to begin creating your first project.
The ATmega 644p on the FLUO WI-FI comes preprogrammed with a bootloader that allows you to upload new code to it without the use of an external hardware programmer using the original STK500 protocol. It can be programmed through USB or wirelessly (OTA).
You could also bypass the bootloader and program the microcontroller through the ICSP (In-Circuit Serial Programming) header using Arduino ISP or similar methods. Click HERE for more details.
The ATmega16U2 firmware source code is available on our GitHub repository.
You could then use Atmel's FLIP software (Windows) or the DFU programmer (macOS and Linux) to load a new firmware. Or you can use the ISP header with an external programmer (overwriting the DFU bootloader).

MEMORY

The ATmega644p has 64KB of Flash program memory, 4KB of SRAM and a 2KB EEPROM.
The ESP32 has 16MB of Flash program memory (8MB + 8MB for OTA partition) and 520KB of SRAM.
The FLUO WI-FI has a microSD card slot that will come in handy if you need more memory for your projects. If you want to use your microSD card, it's important that you format it in *FAT32* or *exFAT*
before connecting it to your FLUO WI-FI.

OPEN SOURCE HARDWARE

FLUO WI-FI is Open Source Hardware! You can study and use the schematics and EAGLE files found on our GitHub repository.

REVISIONS

V00 – Internal use, prototype
V01 – First commercialy-available Actual HW and SW version available

SAFETY COMPLIANCE CERTIFICATIONS

This product is compliant with the following directives:
CE (EU), FCC (US), RoHS (Restriction of Hazardous Substances).
WiFi Alliance Certification
TÜV Certification
USB Vendor ID: 11983

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