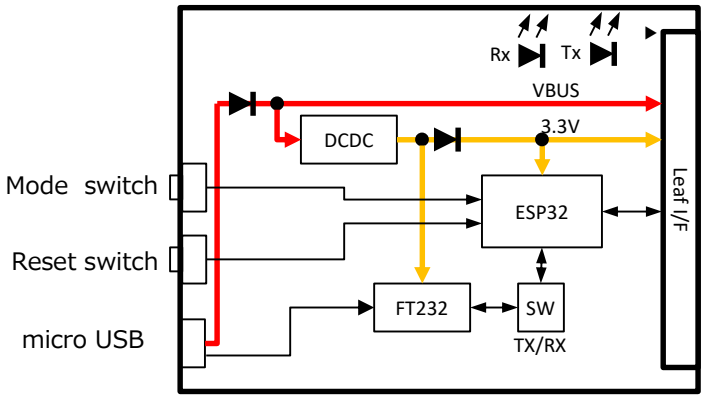
AP02 ESP32 MCU

1. Description

The ESP32 MCU Leaf is equipped with an Xtensa Dual-Core 32-bit LX6 Microprocessor from Espressif Systems. Additionally, an ESP32-WROOM-32 chip is integrated on the leaf, supporting Wi-Fi and BLE communication. With hardware, the ESP32 MCU Leaf acquired the Radio Equipment Conformity Certification.

2. Leaf specification

2-1. Block diagram



2-2. Power supply specification

Symbol	Parameter	Condition	Min.	Typ.	Max.
Vdd	Power Supply Voltage	–	3.0V	3.3V	3.6V
Idd	Operating current	Active(Average)	-	80mA	-
		Sleep	-	5uA	-

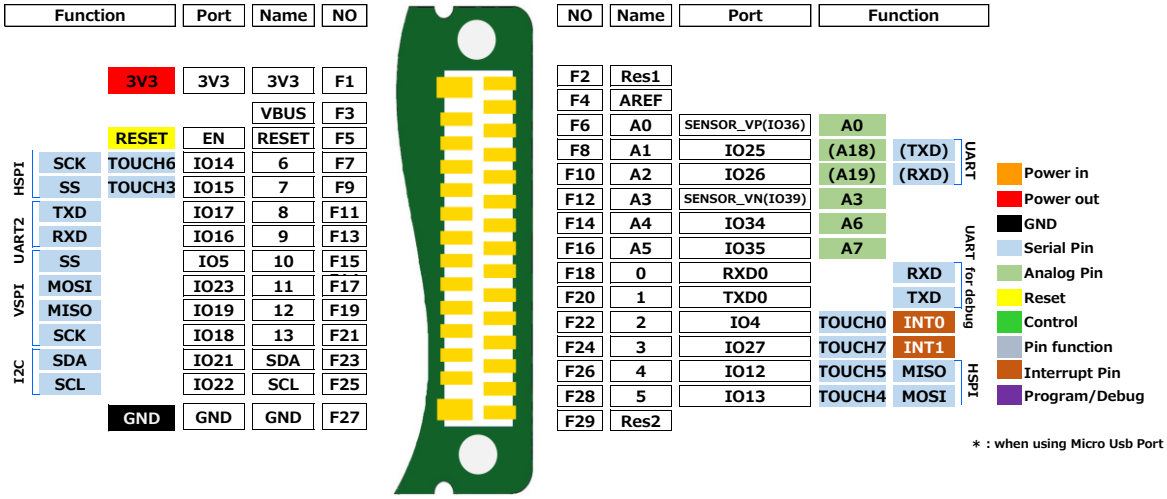
2-3. Main parts

Reference No.	Part name	Part number	Vendor name	note
IC700	MCU	ESP32-WROOM-32	Espressif Systems	–
IC701	USB to Serial Converter	FT232RQ	FTDI	32pin QFN
IC703	Synchronous step-down micro DC/DC convert	XCL222B331ER	TOREX	VBUS→3.3V
IC702	Analog Switch	TS3A4751RUCR	Texas Instruments	–

2-4. Appearance

Top Side	Back Side
	

2-5. Pinout



2-6. Notes of Pin use

Name	Port	Notes
D4	IO12	No pull-up
D7	IO15	No pull-down
D10	IO5	No pull-down
A0	SENSOR_VP(IO36)	Input only
A1	IO25	Connected with Wi-Fi chip. Not suitable as analog pin
A2	IO26	Connected with Wi-Fi chip. Not suitable as analog pin
A3	SENSOR_VN(IO39)	Input only
A4	IO34	Input only
A5	IO35	Input only

2-7. LED/Switch

Item	Part number	Notes
LED	DS700	FT232RQ controlled LED Flashes on UART TX data transmission.
	DS701	FT232RQ controlled LED Flashes on UART RX data transmission.
Reset Switch	S700	Resets the ESP32 and other devices.
Boot mode Switch	S701	Switch to change to boot mode

3. MCU(ESP32-WROOM-32) Specification

3-1. Description

Item	Description
SoC	ESP32-D0WDQ6 (CPU:Xtensa LX6 32-bit dual-core)
Clock frequency	80M～240MHz
Flash Memory	4MB
SRAM	520KB
Wi-Fi protocols	IEEE 802.11b/g/n
Bluetooth Protocols	Bluetooth v4.2 BR/EDR and BLE specification
RF certification	FCC/CE-RED/IC/TELEC/KCC/SRRC/NCC
Wi-Fi certifaction	Wi-Fi Alliance
Bluetooth certification	BQB
On-chip sensor	Hall sensor
Integrated crystal	40 MHz crystal
Compatibility	ESP32 Dev Module

3-2. Specifications

3-2-1. Absolute Maximum Ratings

Parameter	Value
Operating Temperature	-40℃ to +85℃
Maximum Operation Voltage	3.6V

3-2-2. Electrical characteristics

Symbol	Parameter	Condition	Min.	Typ.	Max.
Vdd	Power Supply Voltage	–	3.0V	3.3V	3.6V
Idd	Operating current	Average	-	80mA	-
		Minimum current delivered	500mA	-	-
		Transmit 802.11b, DSSS 1 Mbps, POUT = +19.5 dBm	-	240mA	-
		Transmit 802.11g, OFDM 54 Mbps, POUT = +16 dBm	-	190mA	-
		Transmit 802.11n, OFDM MCS7, POUT = +14 dBm	-	180mA	-
		Receive 802.11b/g/n	-	95～100mA	-
		Transmit BT/BLE, POUT = 0 dBm	-	130mA	-
		Receive BT/BLE	-	95～100mA	-
	Modem-sleep	–	-	20mA～68mA	-
	Light-sleep	–	-	0.8mA	-

	Deep-sleep	RTC timer + RTC memory	-	10uA	-
	Hibernation	RTC timer only	-	5uA	-
	Power Off	CHIP_PU is set to low level, the chip is powered off.	-	0.1uA	-

3-3. Link destination of datasheet

https://www.espressif.com/en/esp-wroom-32/resources

3-4. Main functions and libraries

include file : WiFi.h（Arduino core for the ESP32）

Refer to the following.
https://garretlab.web.fc2.com/arduino/esp32/

Arduino core for the ESP32
https://github.com/espressif/arduino-esp32

3-5. Power saving control

ESP32-WROOM-32 is set to deep sleep by the following function.

```
esp_deep_sleep_start();
```

Wakeup

Pin with External Interrupt
RTC Timer Interrupt
Touch Sensor Interrupt

4. USB-Serial conversion (FT232RQ) Specification

4-1. Description

Item	Description
USB	USB 2.0 Full Speed
Data transfer rates	300 baud to 3 Mbaud

4-2. Specification

4-2-1. Absolute Maximum Ratings

Parameter	Value
Operating Temperature	-45℃ to +85℃
Maximum Operation Voltage	VCC 6.0V

4-2-2. Electrical characteristics

Symbol	Parameter	Condition	Min.	Typ.	Max.
VCC1	VCC supply voltage	Internal Oscillator	4.0V		5.25V
VCC2	VCCIO supply voltage	–	1.8V		5.25V

ICC1	Operating supply current	Normal Operation		15mA	
ICC2	Operating supply current	USB Suspend	50uA	70uA	100uA

4-3. Link destination of data sheet

https://www.ftdichip.com/Products/ICs/FT232R.htm

5. Synchronous step-down micro DC/DC converts (XCL222B331ER) Specification

5-1. Description

Item	Description
Oscillation frequency	1.2MHz
Control methods	PWM/PFM automatic switching control
Protection circuit	Current Limit Circuit / Thermal Shutdown /Short-circuit protection

5-2. Electrical characteristics

5-2-1. Absolute Maximum Ratings

Parameter	Value
Operating Temperature	-40℃ to +105℃
Maximum Operation Voltage	Vin 6.2V
Power Dissipation	1000mW (40mm×40mm, t=1.6mm, FR-4 standard PCB)

5-2-2. Ratings

Symbol	Parameter	Condition	Min.	Typ.	Max.
Vin	Operating Voltage	–	2.5V		5.5V
Vout	Output Voltage	Iout =30mA	3.234V	3.3V	3.366V
Iout	Maximum Output Current	Vin =5.5V	500mA		
Iq	Quiescent Current	Vout =Vout(E) ×1.1V		15uA	25uA
Ttso	Thermal Shutdown	–		150℃	
Ilimh	Current Limit	Vout=0.6V	1.3A	1.5A	2.5A
Vshort	Short Protection Threshold Voltage	–	0.17V	0.27V	0.37V
Rdchg	CL Discharge	VCE=0V, VOUT=4.0V	50Ω	210Ω	300Ω

5-3. Link destination of data sheet

https://www.torex.co.jp/products/built-in-dcdc-converters/series/?name=xcl222

6. Analog Switch (TS3A4751RUCR) Specification

6-1. Description

6-1-1. Absolute Maximum Ratings

Parameter	Value
Operating Temperature	-40℃ to +85℃
Maximum Operation Voltage	4V

6-1-2. Ratings

Symbol	Parameter	Condition	Min.	Typ.	Max.
Vdd	Supply Voltage	Internal Oscillator	1.65V	-	3.6V
Ron	On resistance	2.7V	-	0.7Ω	1.1Ω
Idd	supply current	3.6V	-	-	0.75uA

6-2. Link destination of data sheet

http://www.tij.co.jp/product/jp/ts3a4751

7. Revision history

Rev A1.0: First edition, January 2020