Embedded Processor & Board

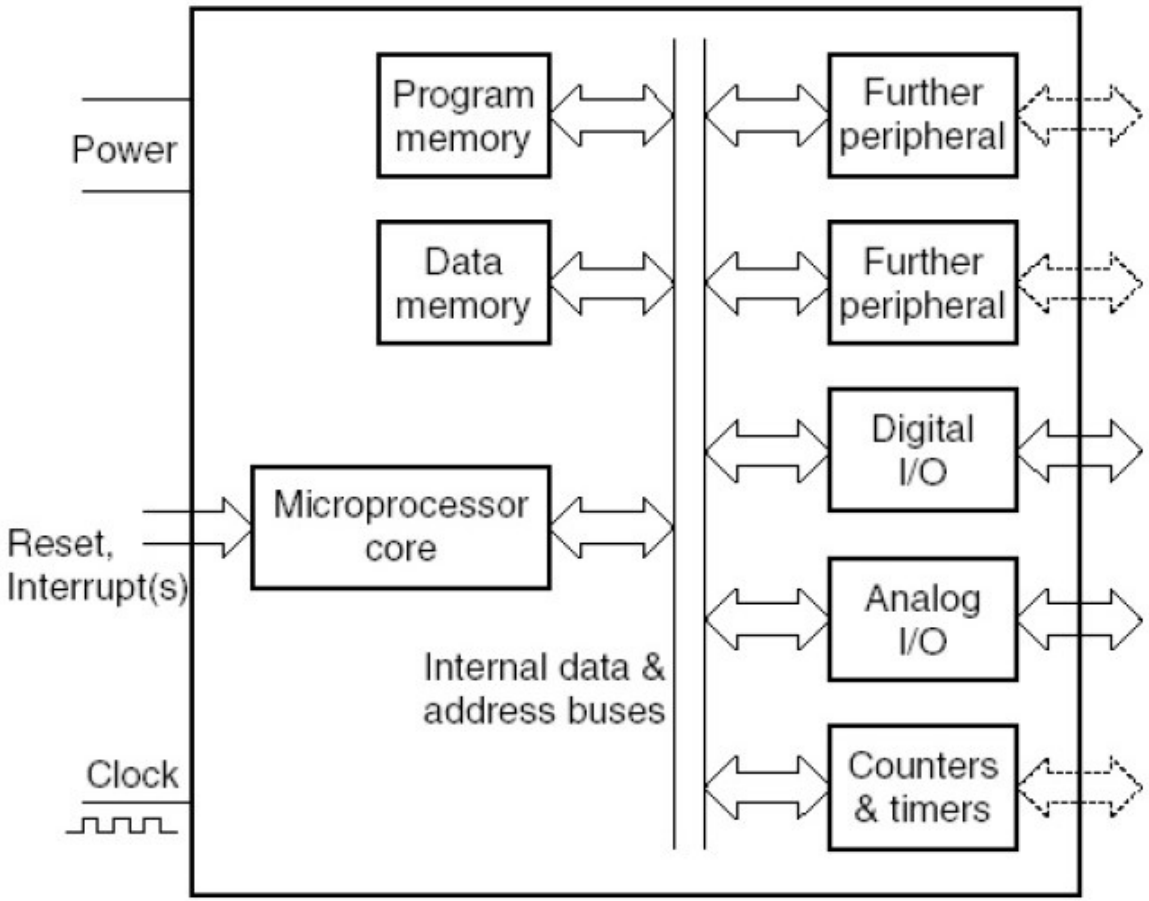
- MCU
  - ESP-WROOM-32
- Microprocessor
  - Xtensa LX7 Processor
- Embedded Board
  - thingcontrol board V 1.0

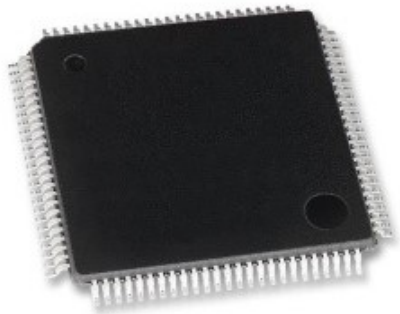
Embedded Processor

- Microcontroller being made up of three parts:
  - Core Microprocessor
  - Memory
  - Peripherals (include Input/Output)

Microcontrollers

- Microcontrollers



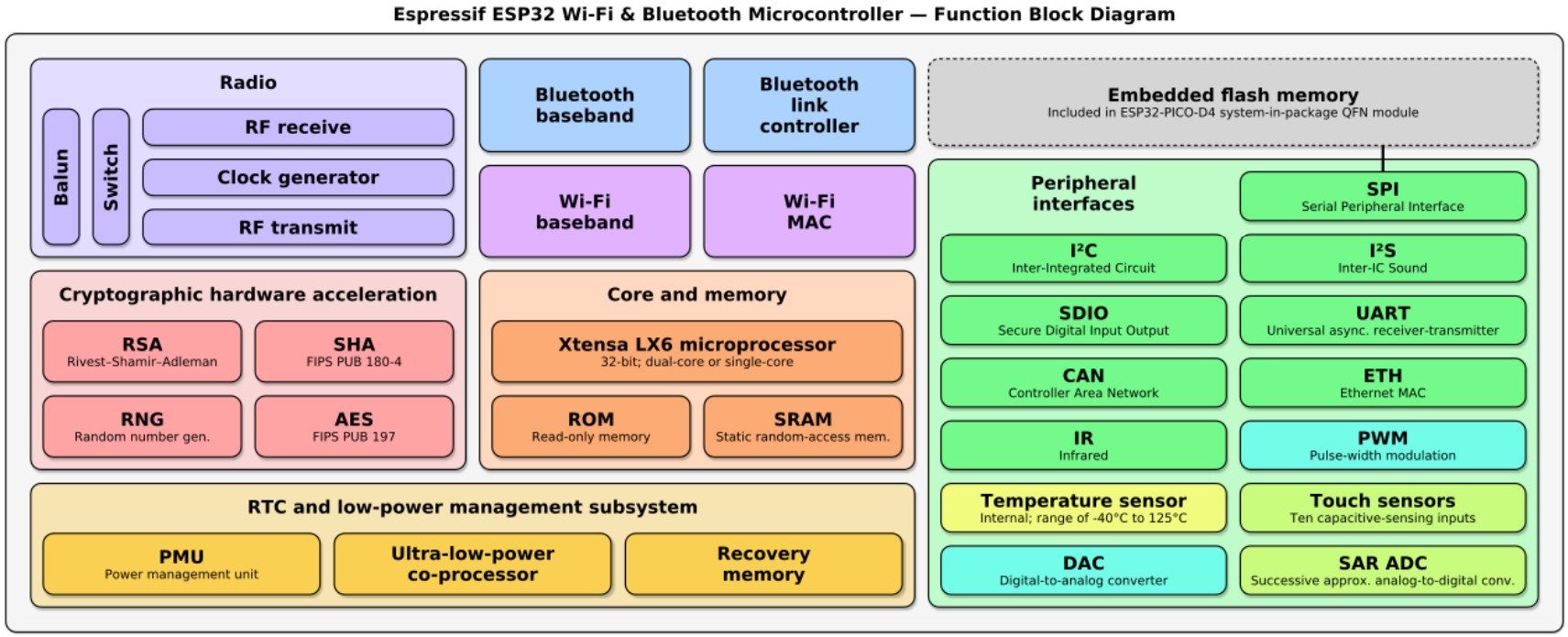


ESP-WROOM-32


ESP-WROOM-32


JUB7.820.1719-2
94V-0
S Y16M09D30
GND
IO23
IO22
TXD0
RXD0
IO21
NC
IO19
IO18
IO5
IO17
IO16
IO4
IO0
IO2
IO15
SD1
SD0
CLK
CMD
SD2
SD3
IO13
GND
IO12
GND
3V3
EN
SENSOR_VP
SENSOR_VN
IO34
IO35
IO32
IO33
IO25
IO26
IO27
IO14

ESP-WROOM-32


Espressif ESP32 Wi-Fi & Bluetooth Microcontroller — Function Block Diagram
Radio
Balun
Switch
RF receive
Clock generator
RF transmit
Bluetooth baseband
Bluetooth link controller
Wi-Fi baseband
Wi-Fi MAC
Embedded flash memory
Included in ESP32-PICO-D4 system-in-package QFN module
Peripheral interfaces
SPI
Serial Peripheral Interface
I²C
Inter-Integrated Circuit
I²S
Inter-IC Sound
SDIO
Secure Digital Input Output
UART
Universal async. receiver-transmitter
CAN
Controller Area Network
ETH
Ethernet MAC
IR
Infrared
PWM
Pulse-width modulation
Temperature sensor
Internal; range of -40°C to 125°C
Touch sensors
Ten capacitive-sensing inputs
DAC
Digital-to-analog converter
SAR ADC
Successive approx. analog-to-digital conv.
Cryptographic hardware acceleration
RSA
Rivest–Shamir–Adleman
SHA
FIPS PUB 180-4
RNG
Random number gen.
AES
FIPS PUB 197
Core and memory
Xtensa LX6 microprocessor
32-bit; dual-core or single-core
ROM
Read-only memory
SRAM
Static random-access mem.
RTC and low-power management subsystem
PMU
Power management unit
Ultra-low-power co-processor
Recovery memory

ESP-WROOM-32

- Vendor : Espressif
- Processors:
  - CPU: Xtensa dual-core (or single-core) 32-bit LX6 microprocessor, operating at 160 or 240 MHz and performing at up to 600 DMIPS
  - Ultra low power (ULP) co-processor
- Memory: 520 KB SRAM, 448 KB ROM, 4MB Flash
- Wireless connectivity:
  - Wi-Fi: 802.11 b/g/n
  - Bluetooth: v4.2 BR/EDR and BLE (shares the radio with Wi-Fi)

ESP-WROOM-32

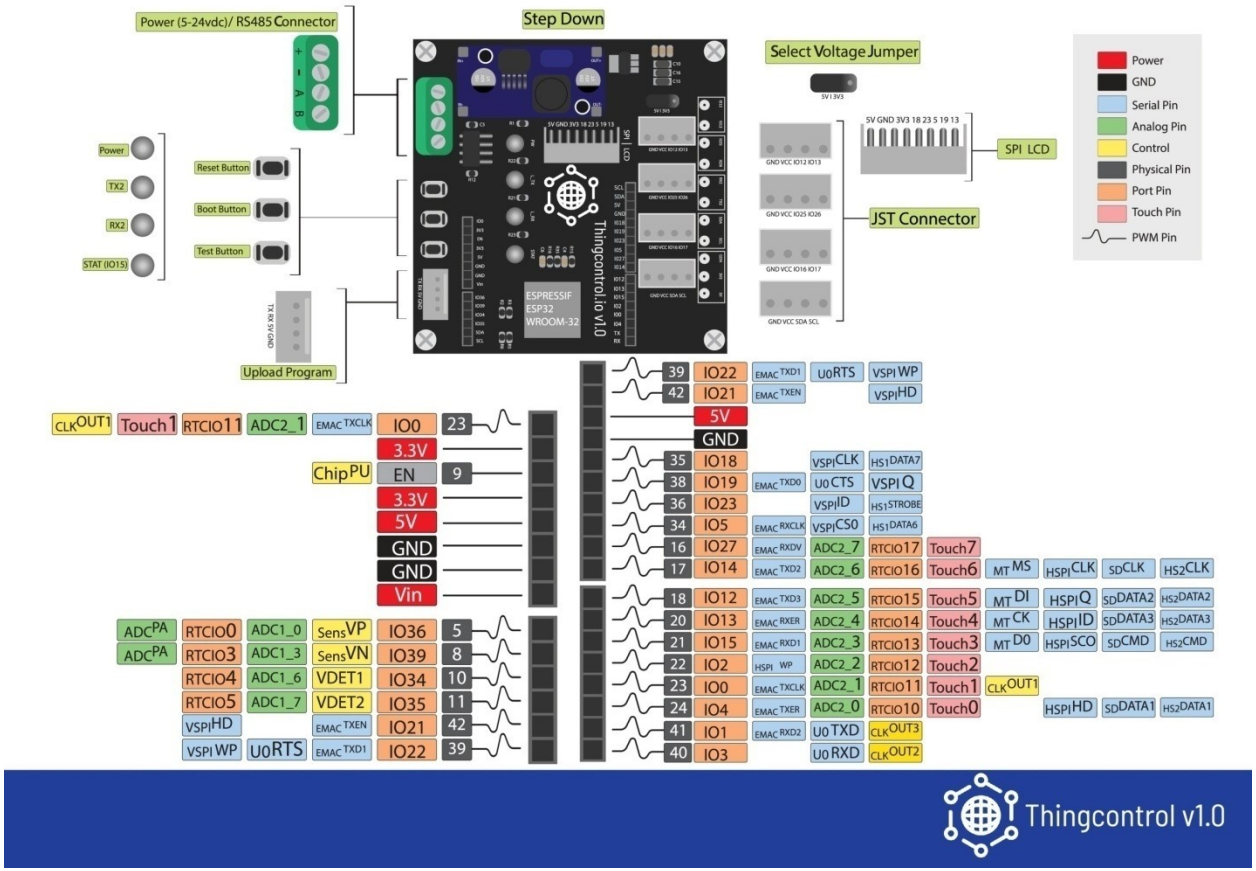
- Peripheral interfaces:
  - 34 × programmable GPIOs
  - 12-bit SAR ADC up to 18 channels
  - 2 × 8-bit DACs
  - 10 × touch sensors (capacitive sensing GPIOs)
  - 4 × SPI
  - 2 × I^2S interfaces
  - 2 × I^2C interfaces
  - 3 × UART

ESP32-WROOM-32

- Peripheral interfaces:
  - SD/SDIO/CE-ATA/MMC/eMMC host controller
  - SDIO/SPI slave controller
  - Ethernet MAC interface with dedicated DMA and IEEE 1588 Precision Time Protocol support
  - CAN bus 2.0
  - Infrared remote controller (TX/RX, up to 8 channels)
  - Motor PWM
  - LED PWM (up to 16 channels)
  - Hall effect sensor
  - Ultra low power analog pre-amplifier

Thingcontrol Board V 1.0

Thingcontrol Board V 1.0



Thingcontrol Board V 1.0

Thingcontrol V 1.0 Specification	
MCU	ESP32 – WROOM
Number of Cores	2 (Dual-core)
WiFi	2.4 GHz up to 150 Mbit/s
Bluetooth	BLE (Bluetooth Low Energy) and Legacy Bluetooth
Architecture	32 bits
Clock Frequency	Up to 240 MHz
RAM	512 KB
Peripherals	RS485/UART/I2C/Digital Input-Output/ Analog Input-Output/SPI – TFT LCD
Power	5 - 24 VDC
Compatible	UNO Pin
Special Function	ON – OFF Pin sensor (Low Power Mode)

Thingcontrol Board V 1.0

- สามารถต่อ Arduino Shield รวมทั้ง communication Shield ทั้ง NB-IOT , LoRA , SigFox , 3/4/5G
- มี JST connector จำนวน 4 ชุดสำหรับงาน Analog/Digital/UART/I2C
- สามารถเลือกไฟเลี้ยง 3.3/5 V ได้จาก Jumper
- มีช่อง SPI สำหรับต่อจอภาพ TFT โดยเฉพาะทำให้การเดินสายเป็นระเบียบเรียบร้อย
- ON-OFF Sensor Pin (Low Power Mode)
- มาพร้อมกับ RS485
- มาพร้อมกับกล่องที่สามารถติดตั้งกับราง DIN RAIL และฝาผนัง

Software Development Kit

- Arduino IDE
  - C++
- Thonny
  - MicroPython

IDE = Integrated Development Environment