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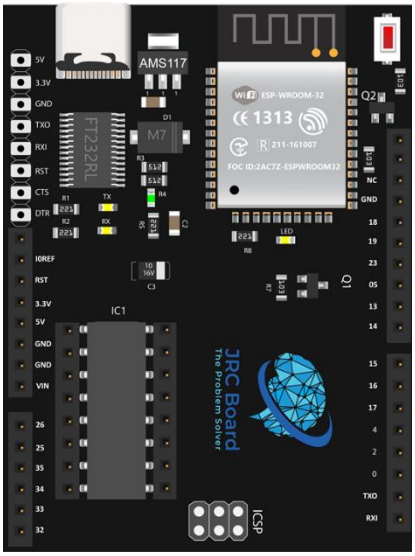
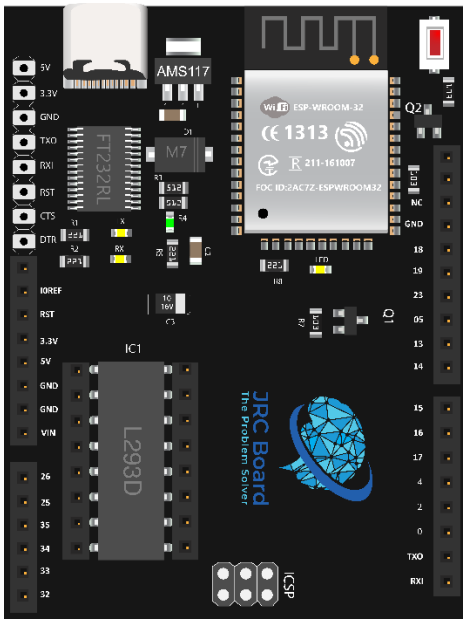
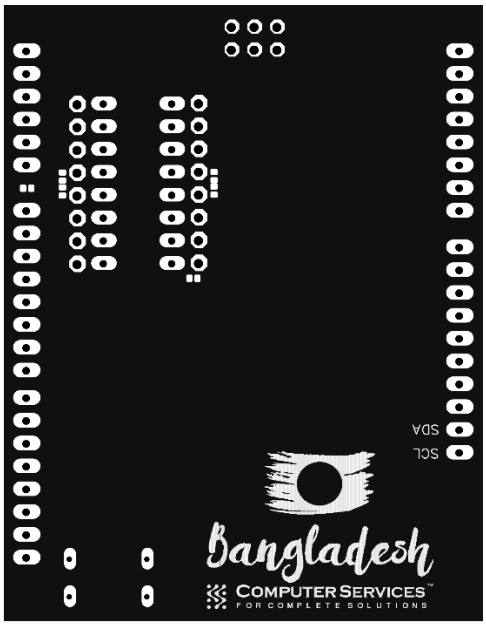
Introduction:



JRC board is a microcontroller board based on the ESP-WROOM-32. It has 20 digital input/output pins of which pin 25 and 26 can be used as analog outputs, 12 analog inputs, an USB type C connection, an ICSP header and a reset button. It contains everything needed to support the microcontroller. Simply connect it to a computer with a USB cable or battery to get started. Keep Up with the World a Low-Cost Board for Schools in Bangladesh and Beyond. Powerful System on Chip. An In-House Development Board for our future products to blend in the Existing Ecosystem.

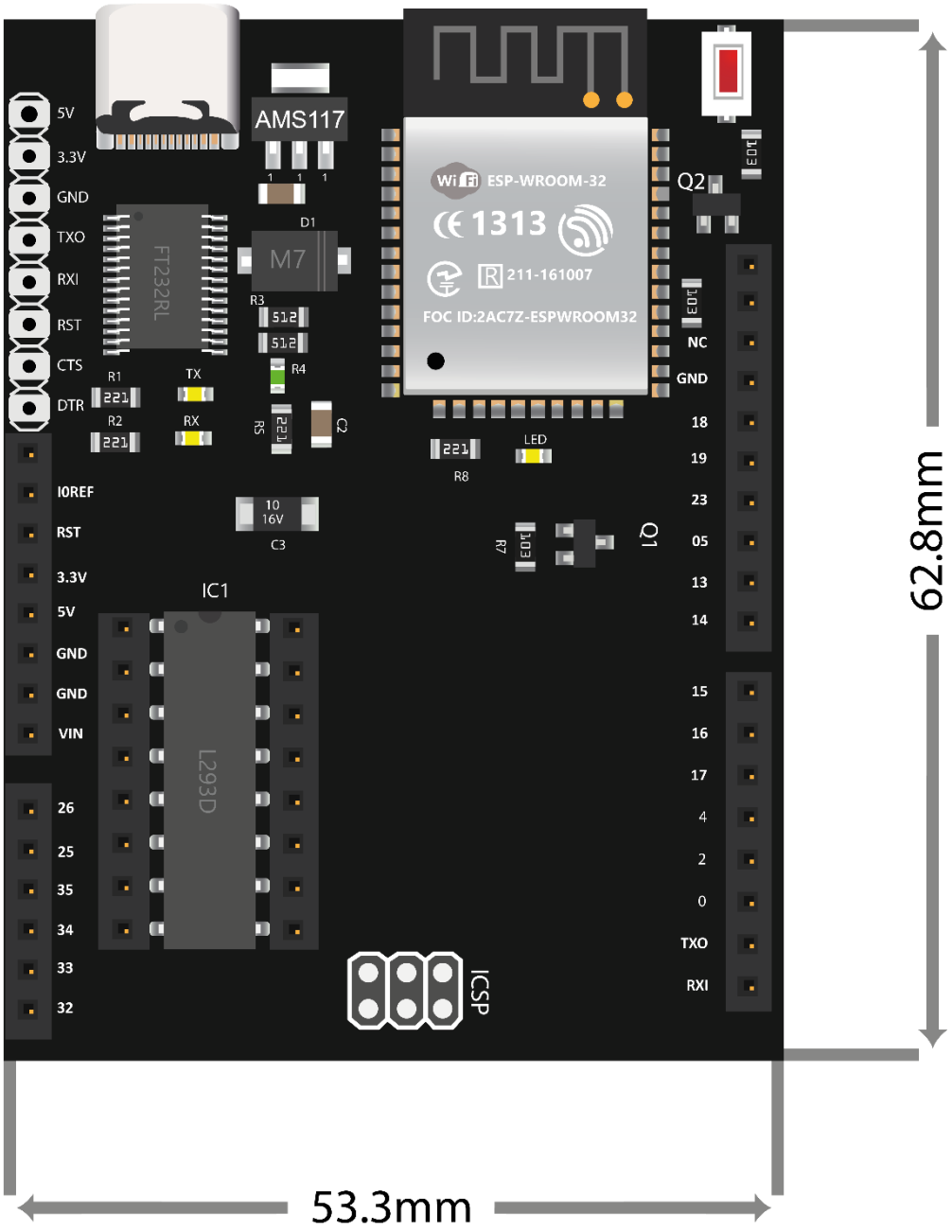
Overall View:



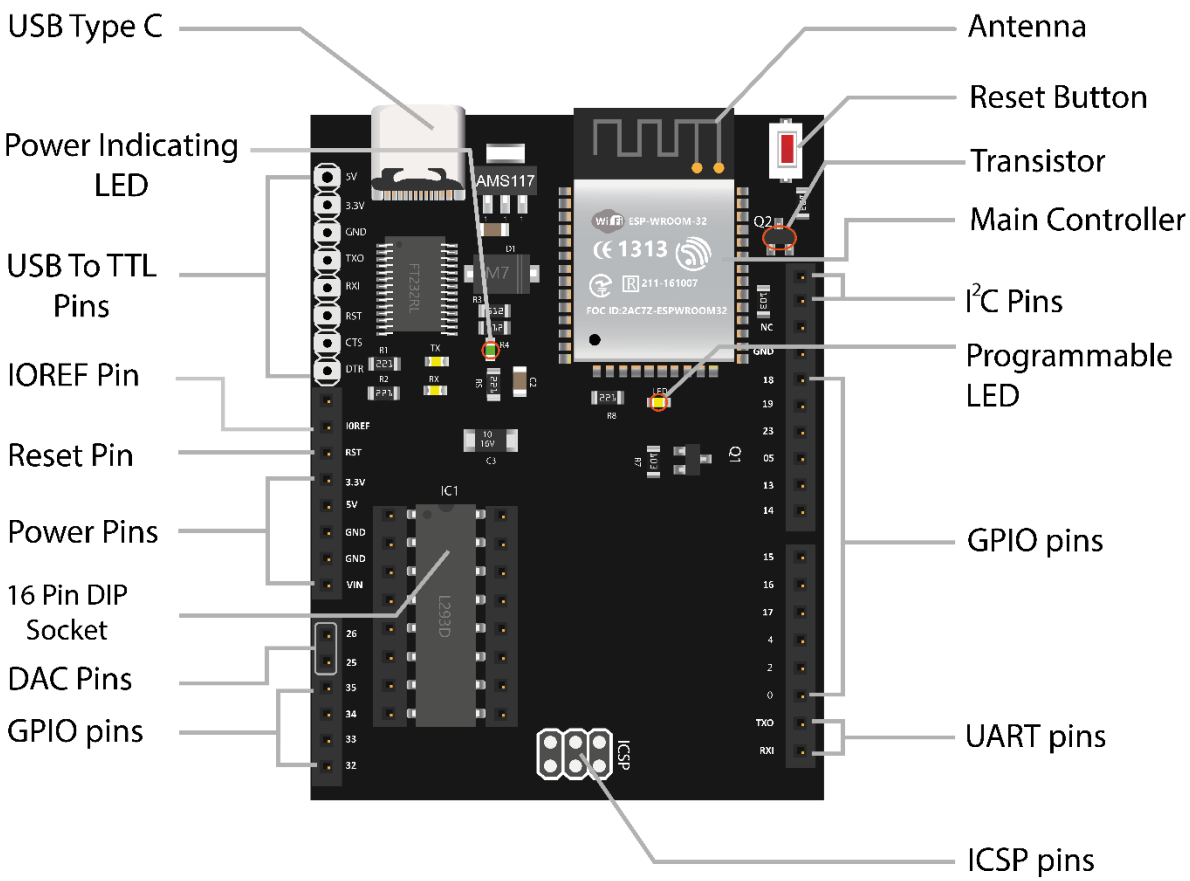


Structural Information:

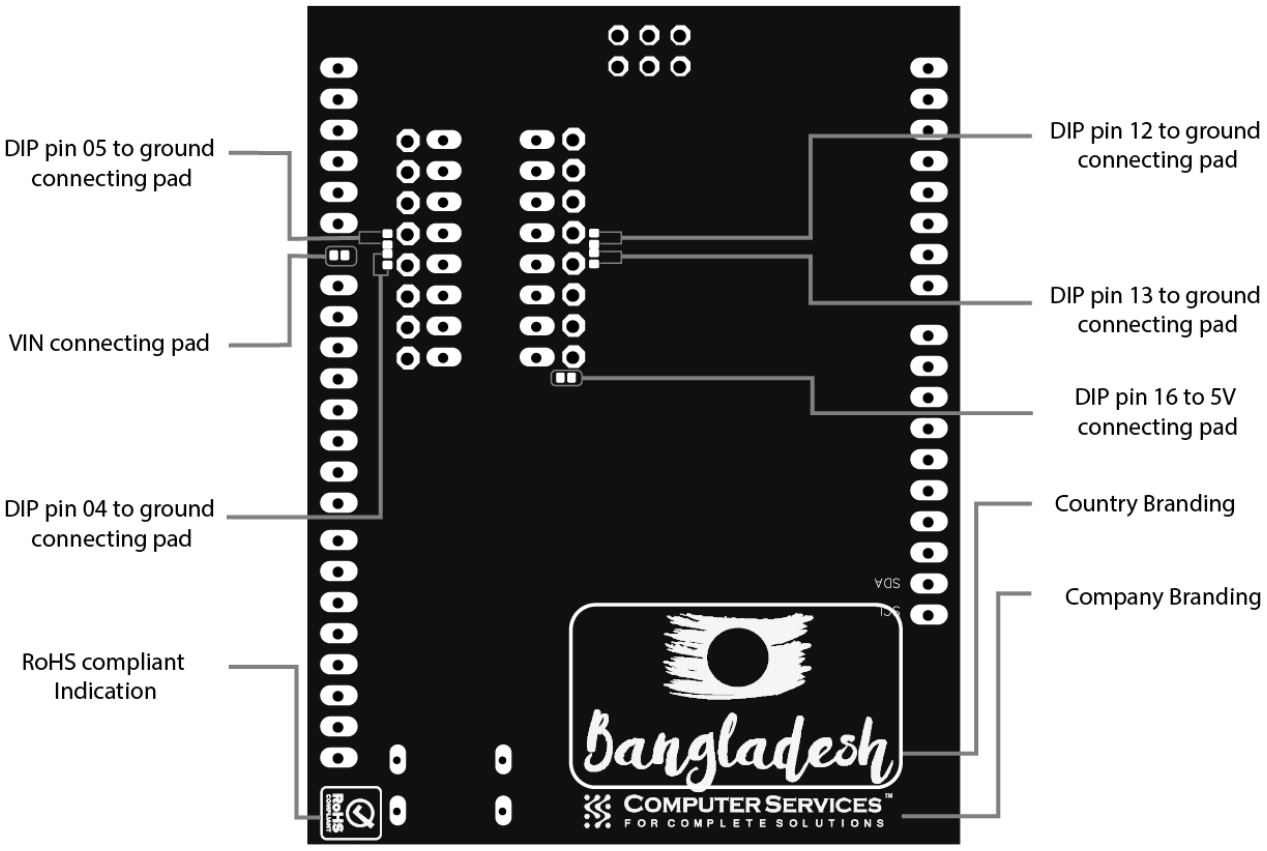
Dimension:



Top part:


USB Type C
Power Indicating LED
USB To TTL Pins
IOREF Pin
Reset Pin
Power Pins
16 Pin DIP Socket
DAC Pins
GPIO pins
Antenna
Reset Button
Transistor
Main Controller
I2C Pins
Programmable LED
GPIO pins
UART pins
ICSP pins
AMS117
ESP-WROOM-32
FCC ID:2AC7Z-ESPWROOM32
IC1
L293D
ICSP

Bottom part:


DIP pin 05 to ground connecting pad
VIN connecting pad
DIP pin 04 to ground connecting pad
RoHS compliant Indication
DIP pin 12 to ground connecting pad
DIP pin 13 to ground connecting pad
DIP pin 16 to 5V connecting pad
Country Branding
Company Branding
Bangladesh
COMPUTER SERVICES
FOR COMPLETE SOLUTIONS

Spec list:

Processor:

- **CPU**: Xtensa Dual-Core 32-bit LX6 Microprocessor, operating at 240 MHz and performing at up to 600 DMIPS.
- Ultra-Low Power (ULP) Co-Processor.

Memory:

- 520KB of RAM (expendable up to 8MB externally)
- 1024 locations for EEPROM
- 4MB of flash memory (expandable up to 16 MB externally)

Wireless connectivity:

- Wi-Fi: 802.11 b/g/n
- v4.2 BR/EDR and BLE

Peripheral Interfaces:

- 12-bit SAR ADC up to 12 channels
- 2 × 8-bit DACs (GPIO 25 and 26)
- 18 × PWM pins (Controlled by up to 16 channels)
- 6 × Touch Sensors (Capacitive Sensing GPIOs)
- 2 × SPI
- 1 × I2S Interfaces
- 2 × I2C Interfaces (can modify into nearly any pins)
- 2 × UART
- All digital pins compatible with external interrupt

Technical Information:

Microcontroller	**ESP32**
Operating Voltage	**3.3V**
Input Voltage (recommended)	**4.2-5V**
Input Voltage (limit)	**6-15V**
Digital I/O Pins	**20**
PWM Digital I/O Pins	**18 (up to 16 channels, max frequency 78.125kHz)**
Analog Input Pins	**12**
DC Current per I/O Pin	**40 mA**
DC Current for 3.3V Pin	**600 mA**
Flash Memory	**4 MB**
RAM	**500KB**
EEPROM	**512B**
Clock Speed	**240 MHz**
LED_BUILTIN	**13**
Length	**68.8 millimeter**
Width	**53.5 millimeter**

Power Consumption:

For ESP32 microcontroller:

Power mode	Description			Power consumption
Modem-sleep	The CPU is powered on.	* 240 MHz	Dual-core chip(s)	30 mA ~ 68 mA
			Single-core chip(s)	N/A
		* 160 MHz	Dual-core chip(s)	27 mA ~ 44 mA
			Single-core chip(s)	27 mA ~ 34 mA
		Normal speed: 80 MHz	Dual-core chip(s)	20 mA ~ 31 mA
			Single-core chip(s)	20 mA ~ 25 mA
Light sleep	-			0.8 mA
Deep sleep	The ULP coprocessor is powered on.			150 μA
	ULP sensor-monitored pattern			100 μA @1% duty
	RTC timer + RTC memory			10 μA
Hibernation	RTC timer only			5 μA
Power off	CHIP_PU is set to low level; the chip is powered off.			1 μA

RF Power Consumption:

Mode	Min	Typ	Max	Unit
Transmit 802.11b, DSSS 1 Mbps, POUT = +19.5 dBm	-	240	-	mA
Transmit 802.11g, OFDM 54 Mbps, POUT = +16 dBm	-	190	-	mA
Transmit 802.11n, OFDM MCS7, POUT = +14 dBm	-	180	-	mA
Receive 802.11b/g/n	-	95 ~ 100	-	mA
Transmit BT/BLE, POUT = 0 dBm	-	130	-	mA
Receive BT/BLE	-	95 ~ 100	-	mA

FTDI Uploader Chip:

- While Code Upload: 100mA max.
- While USB Suspend: 100µA max

For Power Indicating LED: 25mA

General Overview (considering built-in LED lights up):

Normal State (No wireless connection)	**60 mA**
Idle State (can wake up by interrupts)	**30 mA**
Deep Sleep State (only reads time and sensor)	**25mA**
Bluetooth On and Searching / transmitting	**150 mA**
Bluetooth On and Idle (connected / receiving)	**130 mA**
Wi-Fi On and Searching / transmitting / receiving	**280 mA**
Wi-Fi On and Idle (connected)	**150 mA**
Wi-Fi and Bluetooth Both Turned on and Idle	**250 mA**
ESP Now Protocol	**25mA**

Please Note that:

- the overall power consumption can be lowered drastically by removing power indicating led which consumes 25mA of constant current.

- The Deep Sleep Technology can associate ULP sensor reading system which can be triggered by a drastic change.

- ESP Now is a peer-to-peer communication system which can draw very low power and transmit small packet of data in a low bandwidth and very long range. It can send data when triggered by interrupts and go into ULP state drawing much less power.

Key Features:

Dual Core Processor:

JRC Board has embedded ESP32 chip which got dual core processor. Each core can be operated individually. One of them is ultra-low power processor which can operate at very low power.

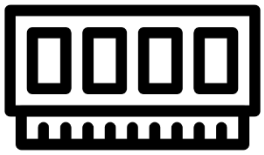
Faster and better:

The core clock frequency of the JRC Board is 240Mhz which is faster than most of the common MCU in the market. It also operates as 32-bit core compared to other 8-bit and 16-bit core processor existing in the community. That means it can handle more heavy calculating tasks more efficiently!

Built in Wi-Fi and Bluetooth:

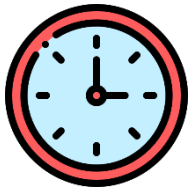
It got a unique feature which make it compatible with most of IoT systems out there. It got built-in Wi-Fi and Bluetooth system which can be activated by program. It makes more convenient making any communication project as there needs not a single extra component.

More Flash Memory and RAM:



Most of the MCUs in the market does not come with much RAM and ROM. Although they cope up with small projects, they can not go along with heavy projects. JRC Board got 4MB of flash memory and 512 KB of static RAM to handle all the simple to medium IoT projects. It can even launch a simple web server.

Built-in RTC Module:



It got built-in RTC module which can measure time very accurately. We don't need to install or add anything extra. Moreover, it can go on at ultra-low power mode!

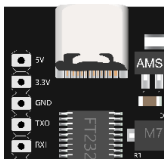
Internal Temperature Sensor:

JRC Board got internal temperature sensor which can monitor the activities of the JRC Board and can warn the user if it heats due to overloading.

Internal Hall Sensor:

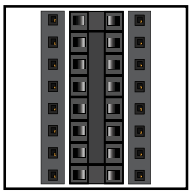
JRC Board has an internal hall sensor which can measure polarity of a magnet, intensity of the magnetic field, change of magnetic field. Can be used in many different purposes like security device, motion encoding, power measurement etc.

USB Type C port:



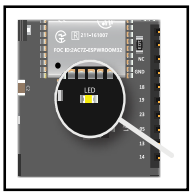
For uploading code or powering up the device, JRC Board got built in USB Type-C port which is more convenient for plugging in and can also handle more power!

DIP-16 Socket:



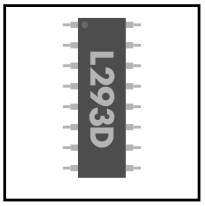
JRC Board has DIP-16 Socket where you can put any types of DIP logic chip and test them on your board. No hassle for breadboard! It got a L293D chip by default which can act as a motor driver.

Debugging LED:



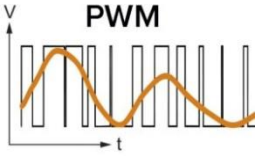
It got a tiny SMD led which is wired with pin-13 of the JRC Board. It can be programmed to light up for any debugging and testing purpose.

Motor Driver chip:



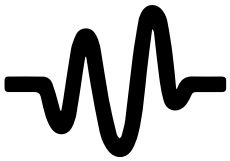
The GPIO pins of JRC Board can not handle large powering device, it can only deliver signal for necessary jobs. This problem can be bypassed by a built-in motor driver chip (L293D) in the board which is detachable and can handle generous power. It can play a great role for learning actuator and other power projects.

PWM pins:



JRC Board got 16 PWM Channel which can be modified to any frequency and can even be attached with any GPIO pins on the Board (except 25 and 26). It can get very high resolution (up to 16 bit) and its resolution can even be adjusted in the program.

DAC pins:



JRC Board got two special pins which can perform DAC or Digital to Analog signal. These two pins can make pure sine wave which can be implemented in different power-electronics related projects!

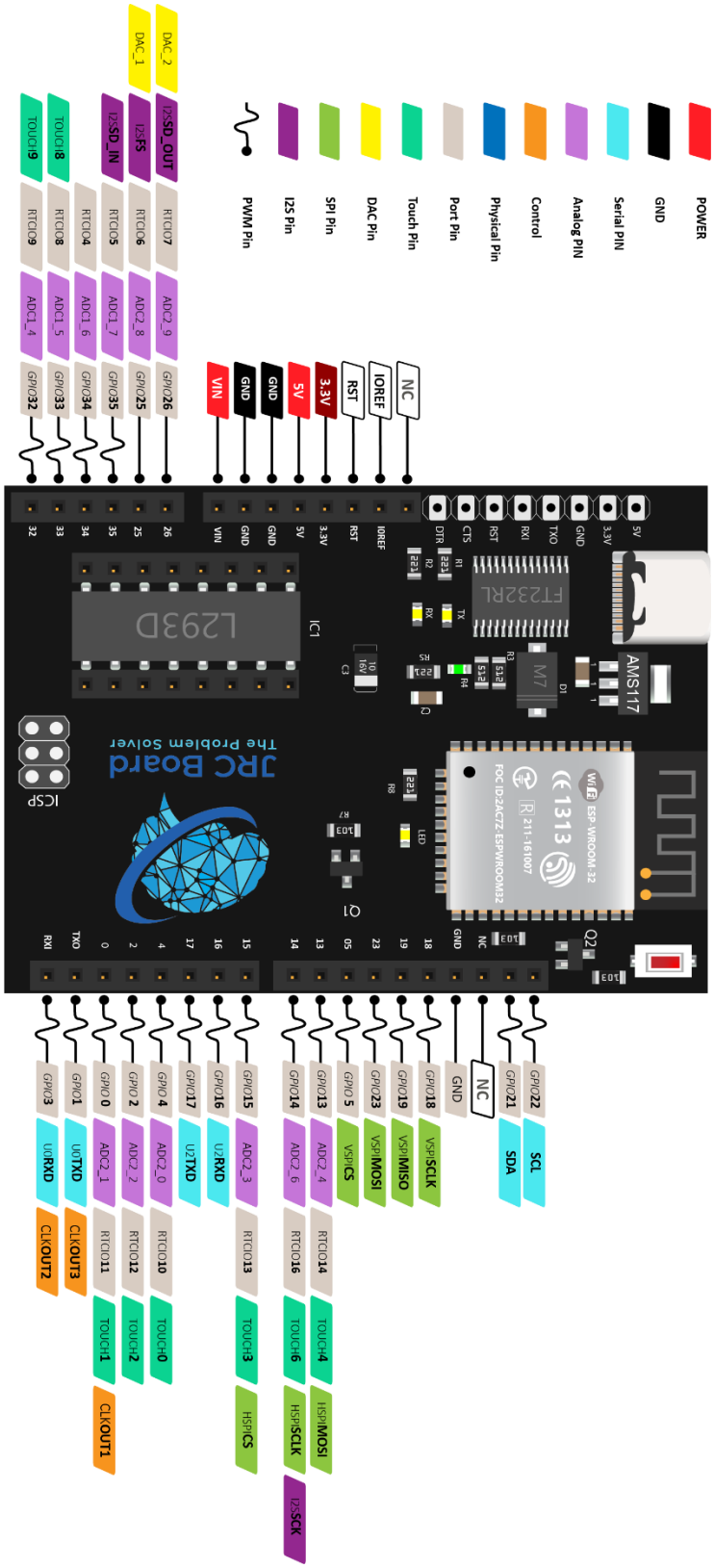
ADC pins:

JRC Board got 12 ADC pins or analog to digital pins which can take analog input and measure it up to 12-bit precision. This way the board can be very precise about measuring any voltages or analog sensor reading.

Touch pins:

JRC Board got 6 touch sensitive pins which can be programmed for any tasks. Making a project with touch navigation makes it more elegant and cooler looking! It got other uses also!

Peripheral Interface Visual:



Motivation:

There are many existing micro-controller boards in the community which are great for learning purpose. But they don't serve much significant value in real life implementation and industrialization. That was the inspiration for making this all-in-one JRC Board which can be used for simple to complex projects. Moreover, it can support most of the popular shields in the market which can make creating project easier and more fun. Students can not only learn basic electronics, programming and other stuffs from this board, but also, they can apply for more complex IoT project and industrial applications. Almost every student from developed to under-developed areas can be benefitted from this board.

It can create a bridge between learning and industrialization to lead the future generation for greater technological revolution.

A few projects done with JRC Board: