# SmartElex

## ATmega2560 Development Board

# INDEX

## 1. Description :-

**SmartElex ATmega2560 Development Board** is a powerful development platform based on ATMEGA2560 microcontroller which is one of the most feature rich AVR microcontroller from Atmel, featuring 256K Flash, 8K RAM, 86 I/O lines arranged in nine 8 bit ports, 16 ADCs, 4 UARTs, 6 timers, 8 interrupts and much more.

This board is ideal for developing embedded applications involving high speed wireless communication, USB based data logging, real time data monitoring and control etc. Board has lots of peripherals such as LCD, SD card, XBee wireless adaptor board, CH340 USB to Serial converter, 2 servo motors connector, DS1307 based Real-Time Clock, UL2003 7 channel driver, L293D dual DC motor driver, 1 Potentiometers, 8 switches, 8 LEDs, Buzzer, Relay and JTAG interface etc. The I/O pins on the microcontroller can be accessed from Male Burg pin connectors. It supports the operating supply voltage between 7V to 14V and has built-in reverse polarity protection.

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## 2. Features:

1. Microcontroller: ATmega2560 with 16 MHz crystal with On-Board USBASP Programmer.
2. Recommended Input Voltage: 12V
3. Min-Max Input Voltage: 9-15V
4. 5 mm standard DC plug-in jack for Input supply
5. On-board TPS5430 SMPS.
6. 2.4GHz ZigBee (XBee) wireless module adaptor
7. 2x16 Character Alphanumeric LCD.
8. SD card Holder.
9. CH340G USB to Serial converter.
10. ESP8255 Adaptor interface with USB to Serial Converter.
11. Connector for 2 servo motors.
12. DS1307 based Real-Time Clock with Battery Backup.
13. ULN2003 7 channel 500mA driver.
14. L293D 600mA Dual DC motor Driver.
15. 1 Analog Potentiometers, 8 Switches, 8 LEDs, Buzzer.
16. Switches: Reset, Power (ON-OFF SWITCH).
17. Male Burg Pin Connectors for all ports.

## 3. Package Include:-

1. ATmega2560 Development Board.

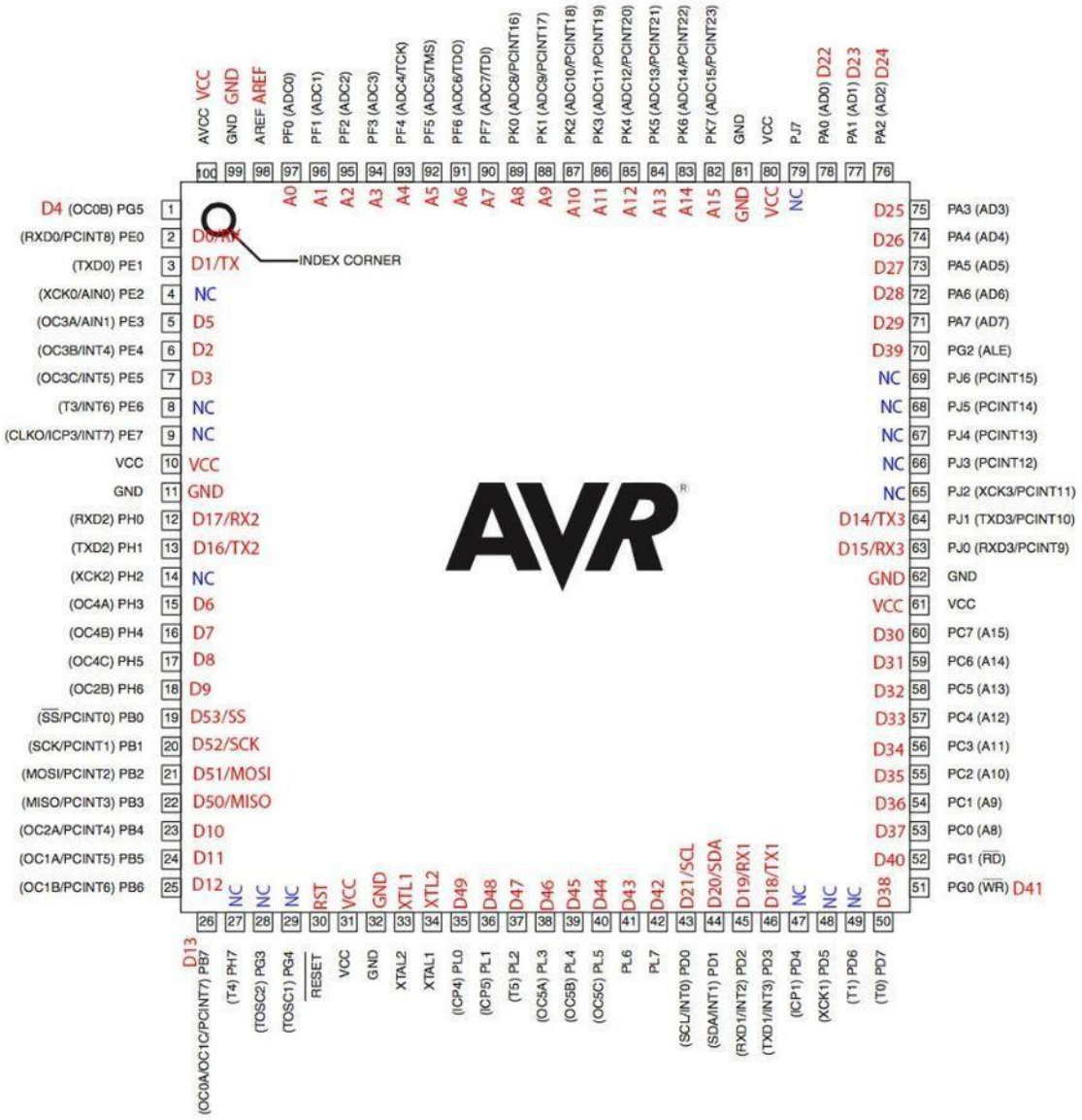
2. LCD1602 (For SKU 631968 only)

**Note: You need to buy SD card, USB Cable, XBee wireless modules and ESP8255 Module separately.**

## 4. ATmega2560A Pin Diagram & Features:-

### 1. Pin Configurations

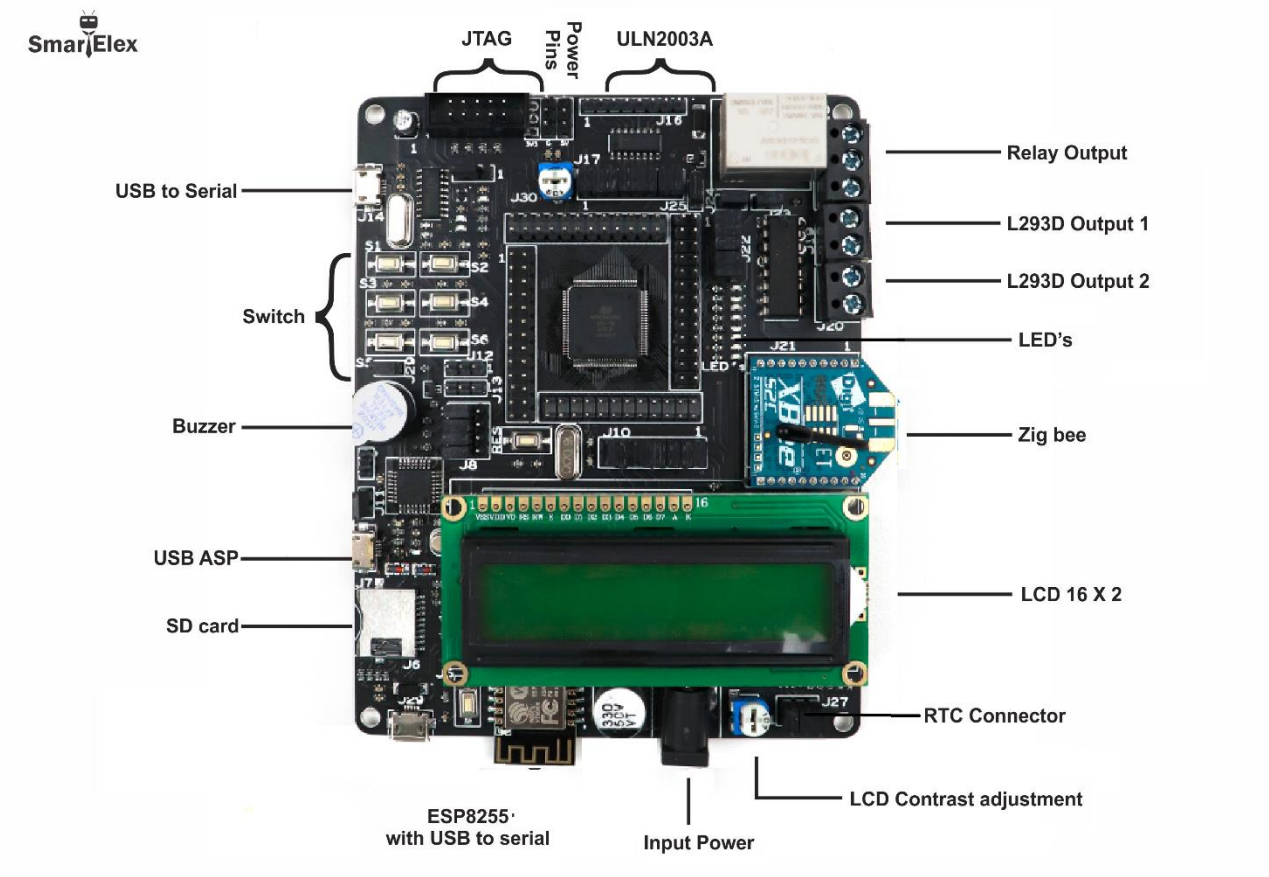
**Figure 1-1.** TQFP-pinout ATmega640/1280/2560



**ATmega2560 Features:-**

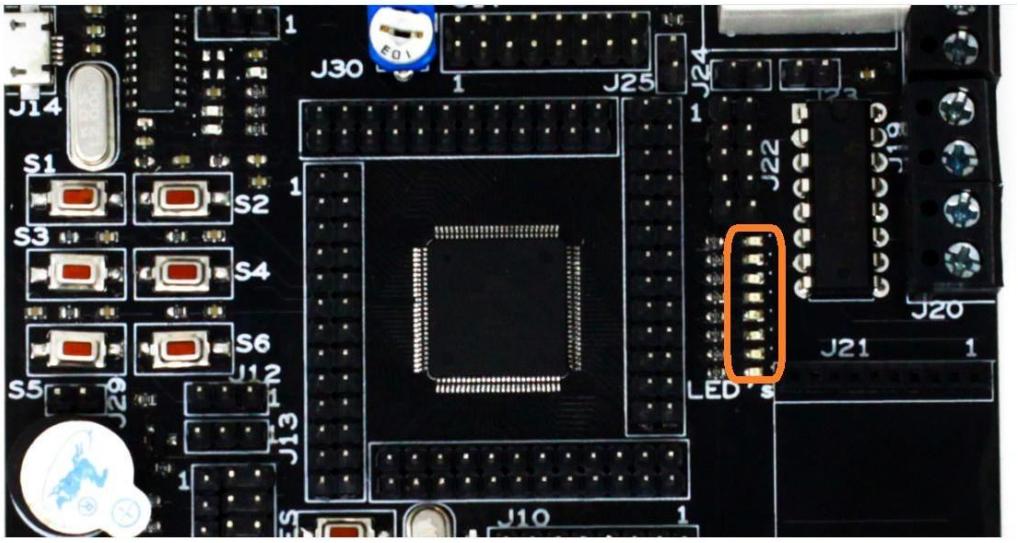
- Advanced RISC Architecture
- Up to 16 MIPS Throughput at 14.7456 MHz
- 256K Bytes of In-System Self-Programmable Flash
- 8K Bytes RAM
- 4K Byte Internal EEPROM
- 86 Programmable I/O Lines arranged in nine 8 bit ports
- In-System Programming by On-chip Boot Program
- JTAG
- 16-channel, 10-bit ADC
- Two 8-bit Timer/Counters with Separate Prescaler and Compare Modes
- Four 16-bit Timer/Counter with Separate Prescaler, Compare Mode, and Capture
- Real Time Counter with Separate Oscillator
- Twelve 16 bit and Four 8 bit PWM Channels,
- Four Programmable Serial USART
- Eight external interrupts
- Master/Slave SPI Serial Interface
- Byte-oriented Two-wire Serial Interface
- Programmable Watchdog Timer with Separate On-chip Oscillator
- 100 pin TQFP package

## 5. Product Layout :-



## 6. Example

### A) LED BLINKING (You will find 8 LED's on Board)




**CODE :-**

```
#ifndef F_CPU
#define F_CPU 16000000UL                    // set the CPU clock
#endif


#include <avr/io.h>
#include <util/delay.h>
#include <stdlib.h>
int main(void)
```

```
{
        DDRA=0Xff;
  while(1)
   {
         PORTC = 0xff;
          _delay_ms(500);
          PORTC = 0x00;
           _delay_ms(500);
   }
```

## 7. Hardware Configurations :

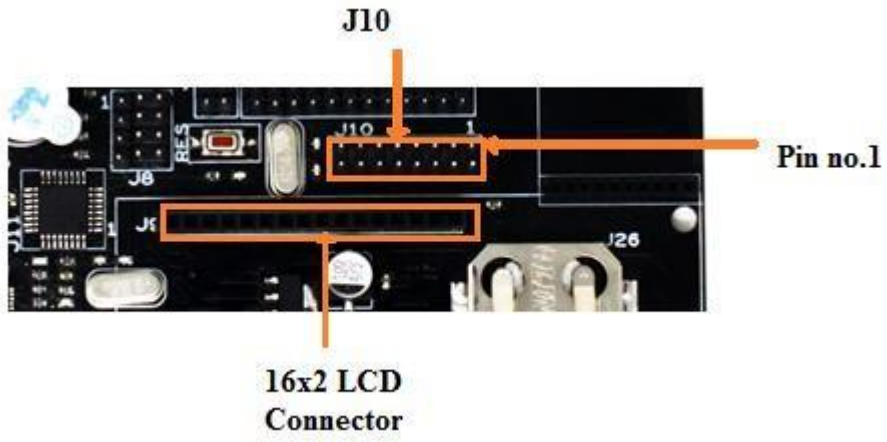
### Modules and Jumpers Relationship

| Jumper | Related Module | Usage |
|---|---|---|
| J8 | USBASP/SD CARD Selection | This jumper for selection between USBASP and SD Card. See photos |
| J10 | LCD 16X2 | Connecting all pins enabled LCD interface. |
| J17 | ULN2003 | Connecting all pins enabled ULN2003 interface. |
| J22 | L293D INPUT | Connection all pin connect Input Pins of L293D AND VCC. |
| J23 | L293D EN2 Pin | By Shorten this Jumper EN1 Pin of L293D Connect to 5V |
| J24 | L293D EN1 Pin | By Shorten this Jumper EN1 Pin of L293D Connect to 5V |
| J25 | Relay | Input voltage given to the relay coil |
| J26 | RTC Battery | Insert CR2032 Cell to Power RTC. |
| J27 | RTC | Connect I2C connection through jumper wire. |
| J29 | Buzzer | Buzzer connect to the microcontroller pin PH2 |

| Jumper | Related Module | Usage |
|---|---|---|
| J1 | DC Jack | Connect the INPUT Power (12V) |
| J2 | SMD Switch | Power ON-OFF switch |
| J3 | ESP8255 CH_EN PIN | CH Pin of ESP Connect either VCC or GND. |
| J5 | ESP8255 | Connect the ESP8255 As shown in photos. |
| J6 | SD Card Slot | Insert SD Card |
| J7 | USBASP | Programming USB Port using USBASP. |
| J9 | LCD16X2 | Connect the LCD Here |
| J14 | USB To Serial | Connect the USB To Serial (UART2). |
| J16 | Output ULN2003 | Output PIN of ULN2003 output 1 to output7. |
| J18 | Relay | Relay connector (NO-COM-NC) |
| J19/J20 | L293D | L293D OUTPUT M1 & M2 |
| J21 | XBEE | Connect XBEE To communicate with UART0 |
| J29 | USB To Serial | Connect the 3.3V USB To Serial (UART2). |

**A)** LCD Interfacing:-

**Test setup:** To enable the LCD connect jumpers to all pins of J10. The contrast of LCD can be varied using the POT




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 8 | 7 | 6 | 5 | 4 | 3 | 2 | **1** |
| 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 |

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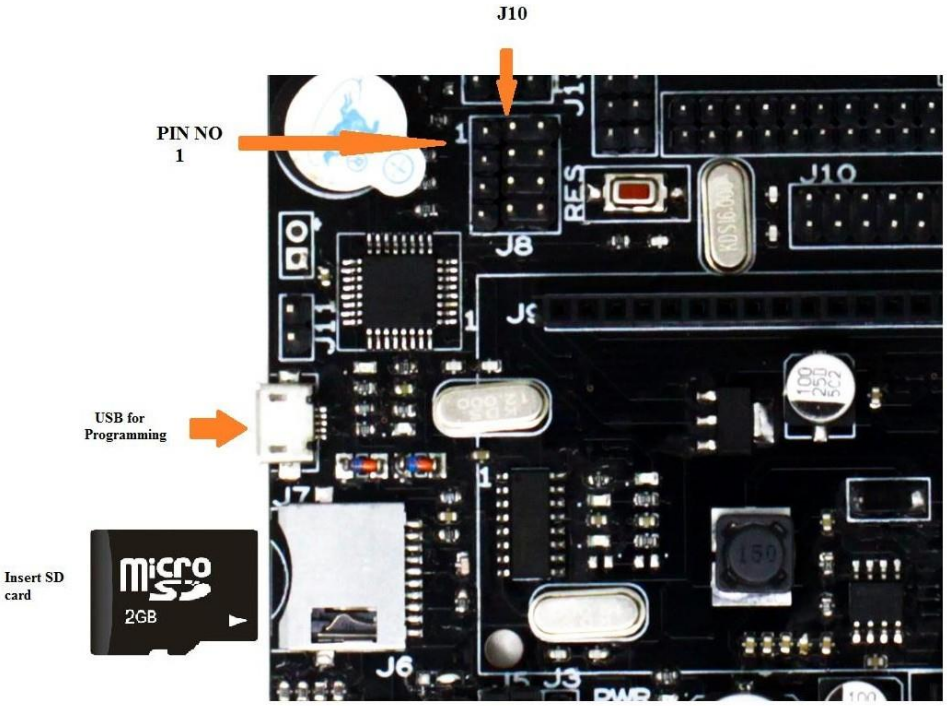
| **PIN No.** | **Micro-controller Pin** | **PIN No.** | **LCD 16x02** |
|---|---|---|---|
| 1 | 5V | 9 | LCD VCC |
| 2 | PL6 | 10 | EN |
| 3 | PL5 | 11 | R/~W |
| 4 | PL4 | 12 | RS |
| 5 | PL3 | 13 | D7 |
| 6 | PL2 | 14 | D6 |
| 7 | PL1 | 15 | D5 |
| 8 | PL0 | 16 | D4 |

**B) SD/MMC connector OR USBASP**

**Test setup:** Insert a SD card in the SD card holder (J6). To interface SD with microcontroller or USBASP work as a programmer we need connect jumper as shown in below table.



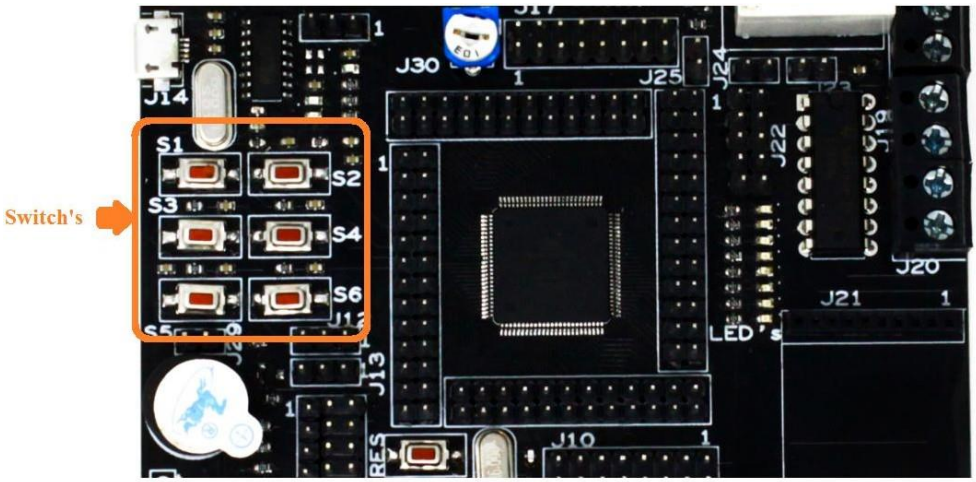

| PIN No. | USBASP Connection | PIN No. | Micro-Controller connection | PIN No. | SD Card Connection |
|---|---|---|---|---|---|
| **1** | MISO USBASP | 5 | MISO | 9 | MISO SD |
| 2 | MOSI USBASP | 6 | MOSI | 10 | MOSI SD |
| 3 | SCK USBASP | 7 | SCK | 11 | SCK SD |
| 4 | | 8 | SS | 12 | SS SD |

## C) Buzzer

**Test setup:** Connect jumper to J29 to connect with microcontroller Pin PH2. Applying HIGH signal on this pin buzzer will ON.

## D) User Interface Switch

**Test setup : 6 Switch are connect to the microcontroller as follows. When you press the logic "LOW" appers on respective pin otherwise PIN will be "HIGH".**



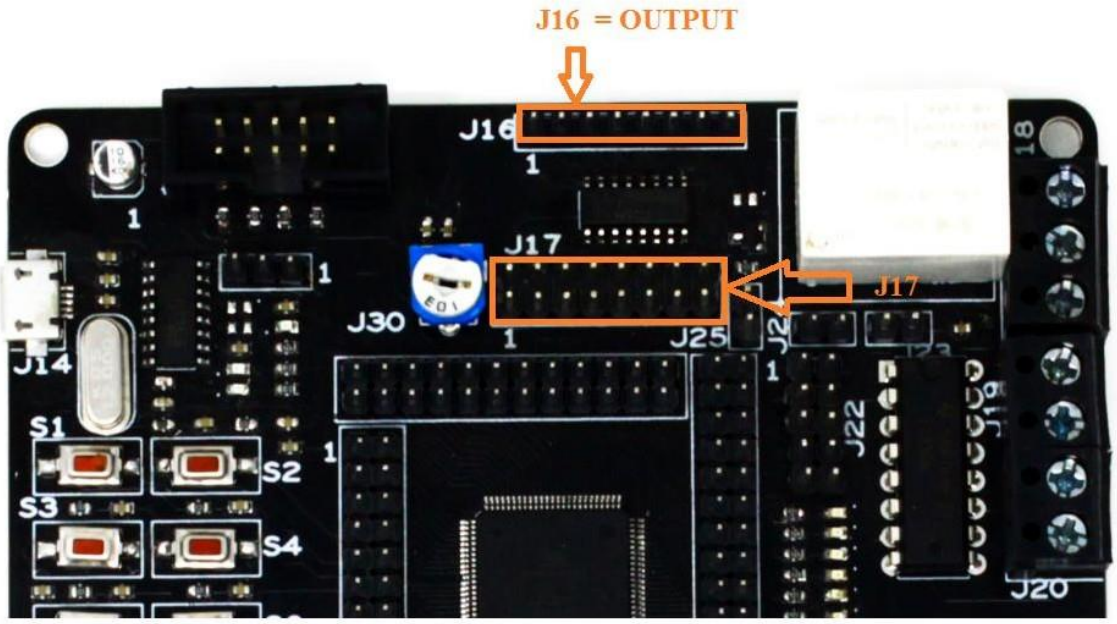

| Switch | Micro-Controller PIN no. |
|---|---|
| SW1 | PE4 |
| SW2 | PE5 |
| SW3 | PE6 |
| SW4 | PE7 |
| SW5 | PD2 |
| SW6 | PD3 |

## E) JTAG Connector

**Test setup : Connect JTAG 10PIN FRC Connector on board.**

**F) ULN2003**

**Test setup: -** To Enable the ULN2003 driver connects J10 the jumper as follows.




**INPUT Connector J10 Pin configuration:-**

| **ULN2003** | 9 = VCC | 10=IN1 | 11 =IN2 | 12 =IN3 | 13 =IN4 | 14 =IN4 | 15 =IN5 | 16 =IN6 |
|---|---|---|---|---|---|---|---|---|
| **Micro-controller** | **1 = 5V** | 2 =PK0 | 3= PK1 | 4 = PK2 | 5= PK3 | 6 =PK4 | 7 =PK5 | 8 =PK6 |

**OUTPUT Connector J16 Pin configuration:-**

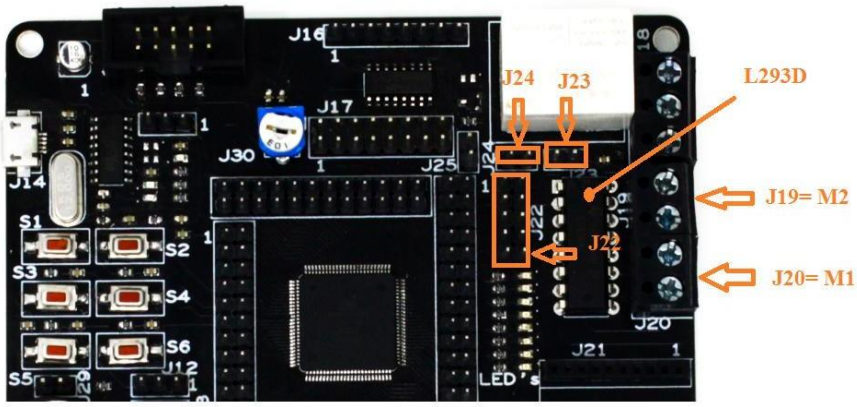
| **1 = OUT1** | 2 =OUT2 | 3 = OUT3 | 4= OUT4 | 5=OUT5 | 6 = OUT6 | 7 = OUT7 | 8= ULN2003 VCC |
|---|---|---|---|---|---|---|---|

## G) RELAY

**Test Setup: -** To enable the relay J25 should connect. After connecting jumper J25 Input voltage applied to the one terminal of relay coil. To On-Off relay switch you need apply signal on PJ2 Pin.

## H) L293D Motor Driver

**Test Setup: -** To Enable the L293D Connect J22, J23 and J24 as follows.

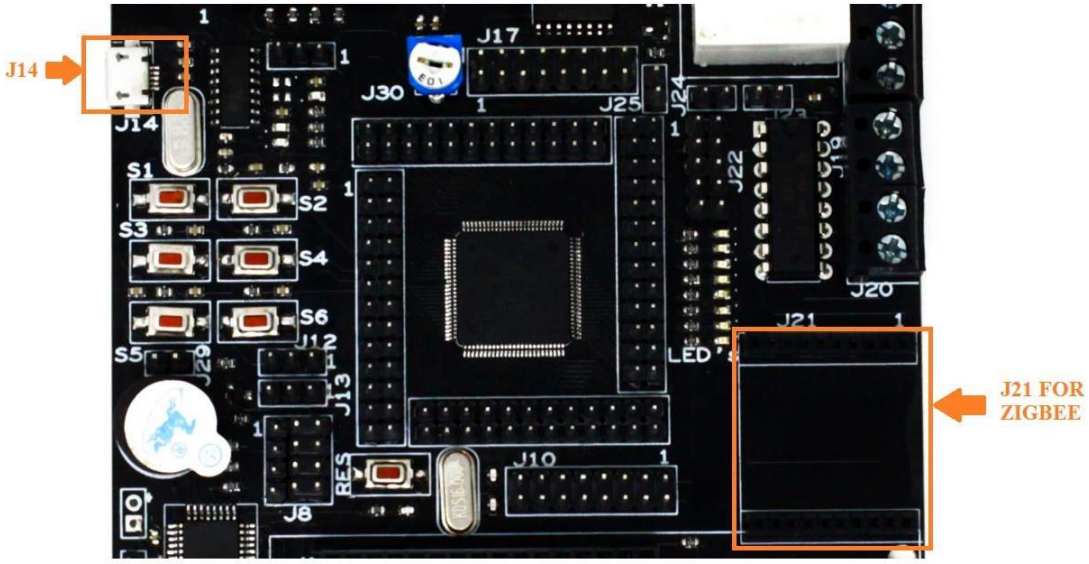



**PINOUT J22:-**

| Micro-Controller | L293D |
|---|---|
| **1=5V** | 6=L293D +5V VCC |
| 2=PJ4 | 7=IN1 |
| 3=PJ5 | 8=IN2 |
| 4=PJ6 | 9=IN3 |
| 5=PJ7 | 10=IN4 |

## I) ZIGBEE

**Test Setup: -** UART0 is connected to the XBEE. You just need to place ZigBee on J21. J14 USB is for USB to Serial converter connected to the UART0.



**J) RTC:-**

To power up RTC 3V CR2032 Coin cell should insert. Connect J27 through wire as follows.

| | | | |
|---|---|---|---|
| **RTC** | 1 = I2C SCL | 2= I2C =SDA | 3 = SQW (Optional) |
| **CONTROLLER** | 4= I2C SCL | 5=SDA | NC |

## 8. Warranty

1. Standard warranty of product is 6 months.
2. Warranty only applies to manufacturing defect.
3. No warranty will apply if the Product has been subject to misuse, static discharge, neglect, accident, modification, or has been soldered or altered in any way.