Lesson 2 Introduction of the Robot Control Board

Table

1. Appearance of Robot Control Board
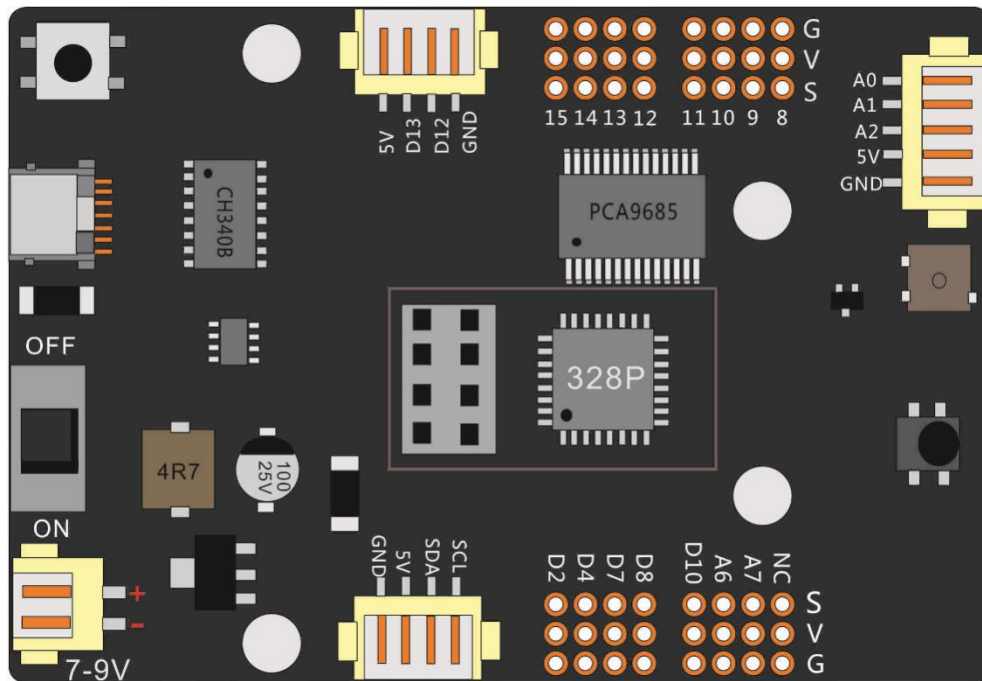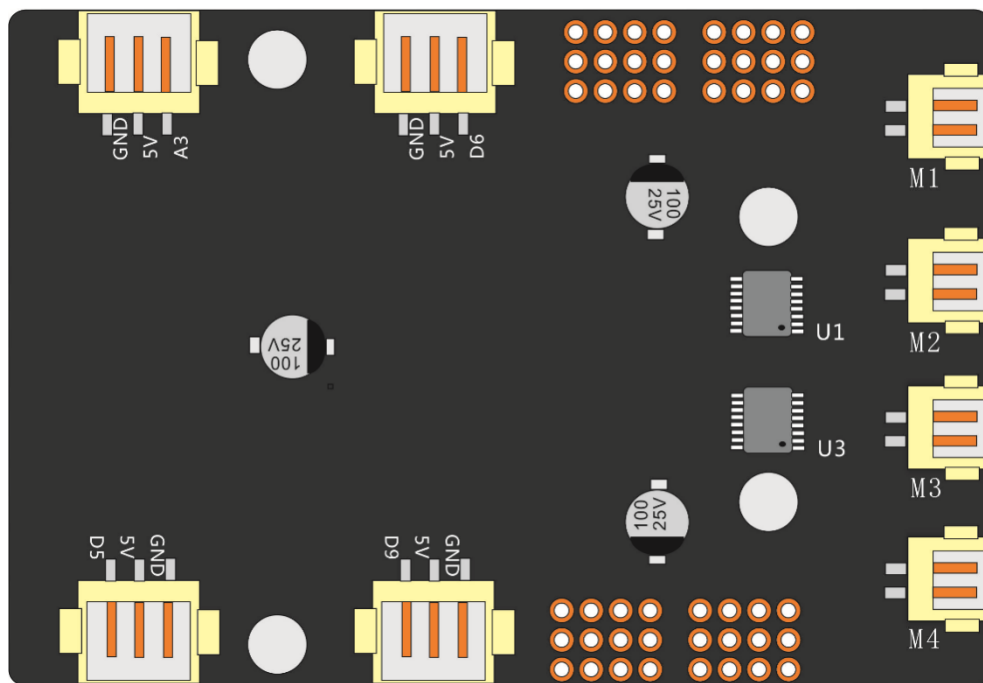
2. Overview

It is a powerful control board, which is compatible with arduino UNO R3 and more powerful than it, its features are as follows:

1）Use the most popular type C USB interface, it is easier to plug and unplug, and can be connected to DC7~9V power supply.

2）Use CH340B USB to serial chip so that it can be compatible with various PC systems.

3）Use DC to DC 5V power supply regulator system, make it not easy to heat up and save more power, and it can reach a maximum output 5A current.

4) Use more powerful DC3.3V voltage regulator chip, its maximum load up to 3.3V\500mA

(5) Add A6, A7 two analog input port, it can be connected to more output analog signal module

(6) Add two DRV8833 motor driver chips, it can drive four motors

(7) Add a PCA9685 chip, of which 8 PWM pins used to drive the DRV8833, 8 PWM pins to connect more external modules

(8) Add a buzzer

(9) Add a infrared receiver, you can use the infrared remote control function

(10) Add an ESP8266 expansion interface, it can be connected to the ESP8266 module, to use WIFI control functions

3. Introduction

For the main components and functions of the Robot Control Board, please refer to the following table.
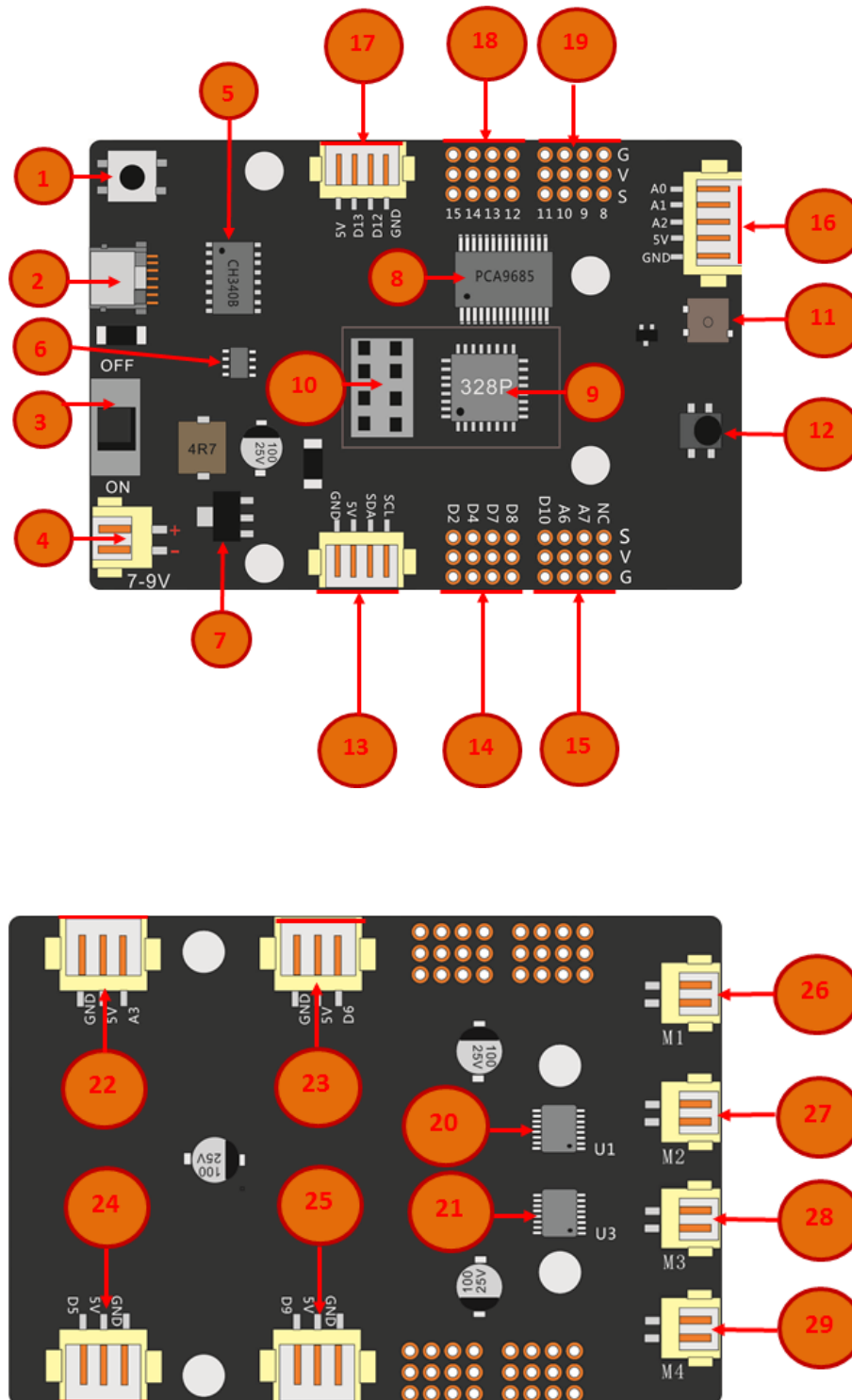
1	Reset button	The reset button of the system, press it to trigger the reset of the control board (reset the main control IC).
2	Type C USB Port	Burn the code on the IDE to the control board
3	Power Switch	Dial to ON to power on, dial to OFF to power off
4	Power Port	2.54*2pin Port, pay attention to the positive and negative when connecting the external power supply, power supply range: 7-9V DC
5	USB to serial port system	The chip is CH340B, which enables the control board to communicate with the PC
6	5V Voltage Regulator System	DC to DC 5V voltage regulator system to convert external power supply to DC5V
7	5V to 3.3V chip	DC to DC 3.3V regulator system, convert 5V to DC3.3V
8	PCA9685chip	The PCA9685 is an 12C-bus controlled 16-channel LED controller optimized for Red/Green/ Blue/Amber(RGBA)color backlighting applications.
9	Control IC	ATMega328P chip, it is the core processor, just like the human brain, which handles receiving, sending, judging, interrupting, timing, driving and other events.
10	ESP8266 shield	Plug ESP8266 Module and reach ESP8266 function
11	Buzzer	Occupy D11 IO Port of 328p chip
12	Infrared receiver	Occupy D3 IO port of 328P chip，used to receive signals from an external infrared remote control
13	IIC port	SDA：IIC data port (multifunction IO port, common pin with A4) SCL：IIC clock port (multifunction IO port, common pin with A5)
14	Digital IO port	Digital IO port 2、4、7、8 of the control board
15	Digital IO port	D10：The digital IO port of the control board, it is also used for the PWM output port (using timer1) and the SS of the SPI. A6：Analog input port, multi-function IO port A7：Analog input port, multi-function IO port
16	Digital IO port	A0、A1、A2：Analog input port, it is also used for digital IO port
17	Digital IO port	12：The digital IO port of the control board, which is also used for the MISO of the SPI 13：The digital IO port of the control board, which is also used for the SCK of the SPI
18	PCA9685 extended IO port	12,13,14,15 channel signal port, for PWM signal output port
19	PCA9685 extended IO port	8,9,10,11 channel signal port, for PWM signal output port

20	DRV8833	It is motor driver chip that can drive two DC Motors
21	DRV8833	It is motor driver chip that can drive two DC Motors
22	Digital IO port	A3：Analog input port, it is also used for digital IO port
23	Digital IO port	D6：The digital IO port of the control board, it is also used for the PWM output port (using timer0)
24	Digital IO port	D5：The digital IO port of the control board, it is also used for the PWM output port (using timer0)
25	Digital IO port	D9：The digital IO port of the control board, it is also used for the PWM output port (using timer1)
26	Port to connect motor	M1 Port to connect 5V DC Motor
27	Port to connect motor	M2 Port to connect 5V DC Motor
28	Port to connect motor	M3 Port to connect 5V DC Motor
29	Port to connect motor	M4 Port to connect 5V DC Motor

4. Specification parameters of the main chip

4.1 ATmega328P Specification

Microcontroller：ATmega328P

Operating Voltage：5V

Input Voltage (recommended)：6-12V

Input Voltage (limit)：6-18V（Is not recommended to use）

Digital I/O Pins：14 (of which 6 provide PWM output)

PWM Digital I/O Pins：6（D3, D5, D6, D9, D10, D11）

Analog Input Pins：6（A0~A7）

DC Current per I/O Pin：20 mA

DC Current for 3.3V Pin：500mA

Flash Memory：32 KB (ATmega328P) of which 0.5 KB used by bootloader

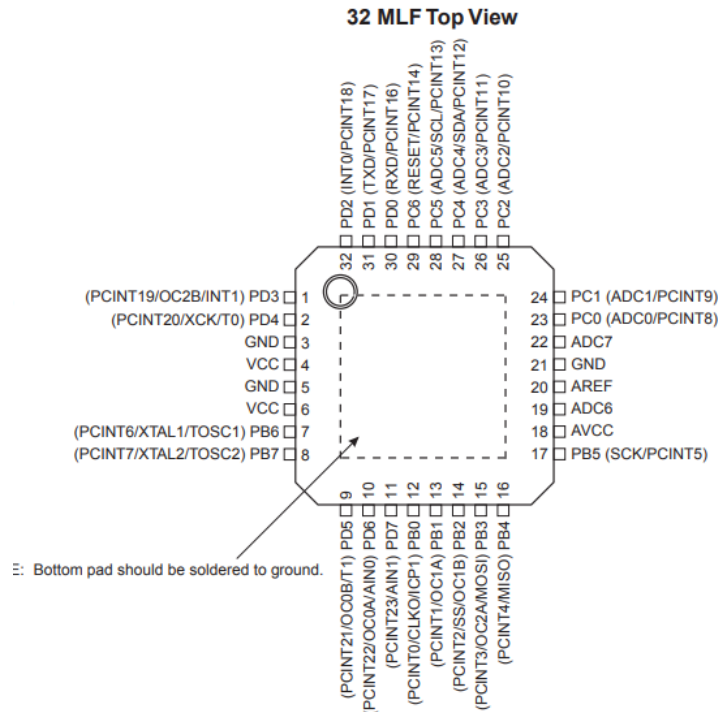SRAM：2 KB (ATmega328P)

EEPROM：1 KB (ATmega328P)

Clock Speed：16 MHz

LED_BUILTIN：13（IO）

size：69.5mm*55.0mm

Bootloader：UNO REV3

Input and Output

See the mapping between Arduino pins and ATmega328P ports. The mapping for the Atmega328 is identical.

32 MLF Top View

Ξ: Bottom pad should be soldered to ground.

The idle digital pins on the control board can be used as an input or output, using pinMode(),digitalWrite(),

and digitalRead() functions. They operate at 5 volts. Each pin can provide or receive 20 mA as recommended operating

condition and has an internal pull-up resistor (disconnected by default) of 20-50k ohm. A maximum of 40mA is the value

that must not be exceeded on any I/O pin to avoid permanent damage to the microcontroller.

4.2 DRV8833 Specification

1 Features

- Dual-H-Bridge Current-Control Motor Driver
  - Can Drive Two DC Motors or One Stepper Motor
  - Low MOSFET ON-Resistance: HS + LS 360 mΩ

Description

The DRV8833 device provides a dual bridge motor driver solution for toys, printers, and other mechatronic applications.

The device has two H-bridge drivers, and can drive two DC brush motors, a bipolar stepper motor, solenoids, or other inductive loads.

- Output Current (at V_M = 5 V, 25°C)

  - 1.5-A RMS, 2-A Peak per H-Bridge in PWP and RTY Package Options
  - 500-mA RMS, 2-A Peak per H-Bridge in PW Package Option

- Outputs can be in Parallel for
  - 3-A RMS, 4-A Peak (PWP and RTY)
  - 1-A RMS, 4-A Peak (PW)

- Wide Power Supply Voltage Range:

  2.7 to 10.8 V

- PWM Winding Current Regulation and Current

  Limiting
  Enhanced Surface-Mount Packages

The output driver block of each H-bridge consists of N-channel power MOSFETs configured as an H-bridge to drive the motor windings. Each H-bridge includes circuitry to regulate or limit the winding current.

Internal shutdown functions with a fault output pin are provided for overcurrent protection, short-circuit protection, undervoltage lockout, and overtemperature. A low-power sleep mode is also provided.

The DRV8833 is packaged in a 16-pin WQFN package with PowerPAD™ (Eco-friendly: RoHS & no $_{Sb/Br}$). Thermally

2 Applications
- Battery-Powered Toys
- POS Printers
- Video Security Cameras

- Office Automation Machines
- Gaming Machines
- Robotics

Device Information[1]

PART NUMBER	PACKAGE	BODY SIZE (NOM)
DRV8833	TSSOP (16)	5.00 mm × 4.40 mm
	HTSSOP (16)	5.00 mm × 4.40 mm
	WQFN (16)	4.00 mm × 4.00 mm

(1) For all available packages, see the orderable addendum at the end of the data sheet.

Simplified Schematic

2.7 to 10.8
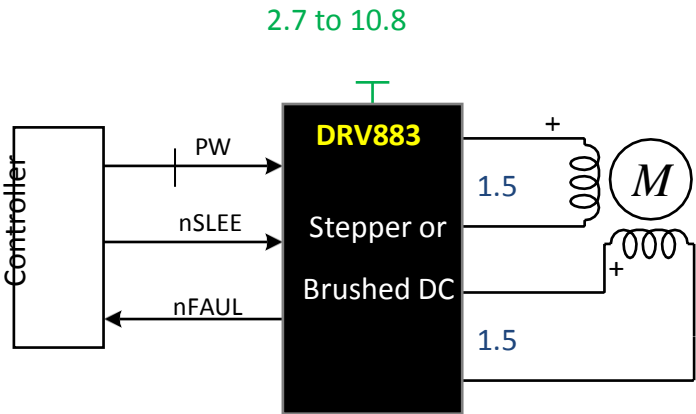
4.3 PCA9685 Specification

The PCA9685 is an 12C-bus controlled 16-channel LED controller optimized for Red/Green/ Blue/ Amber(RGBA)color backlighting applications.Each LED output has its own 12-bit resolution (4096 steps)fixed frequency individual PWM controller that operates at a programmable frequency from a typical of 24 Hz to 1526 Hz with a duty cycle that is adjustable from 0%to 100%to allow the LED to be set to a specific brightness value.All outputs are set to the same PWM frequency.

Each LED output can be off or on(no PWM control),or set at its individual PWM controller value.The LED output driver is programmed to be either open-drain with a 25 mA current sink capability at 5 V or totem pole with a 25 mA sink,10 mA source capability at 5 V.The PCA9685 operates with a supply voltage range of 2.3 V to 5.5 V and the inputs and outputs are 5.5 V tolerant.LEDs can be directly connected to the LED output (up to 25 mA,5.5 V)or controlled with external drivers and a minimum amount of discrete components for larger current or higher voltage LEDs.The PCA9685 is in the new Fast-mode Plus (Fm+) family. Fm+ devices offer higher frequency (up to 1 MHz) and more densely populated bus operation (up to 4000 pF).

PCA9685 pin

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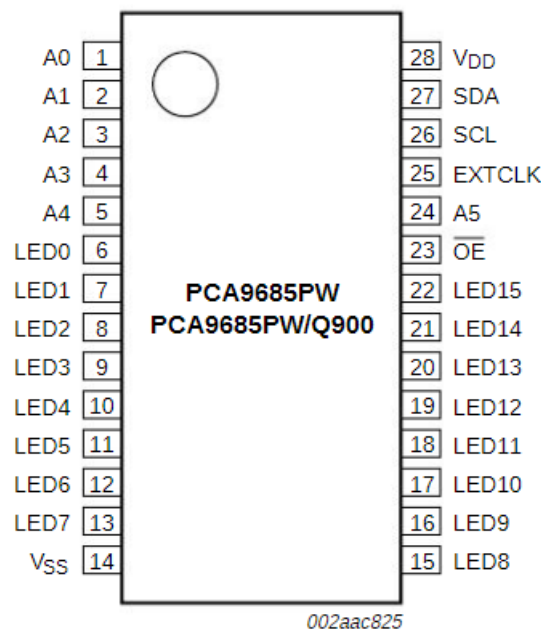
5. Summaries

The Robot Control Board is very powerful, it not only has the function of Arduino UNO R3, but also expands the interface for infrared receiver, ESP8266 module, DRV8833 motor driver, PCA9685, etc. It uses PCA9685 to expand 16 channels of signals, 8 channels are used for DRV8833 driving signals, and the other 8 channels of PWM signals are idle and can be connected to more modules.

You can use it to DIY more experiments, expand more functions, and help realize the ideas in your mind.