Lesson 2 Introduction of the Robotic Arm Driver Board

Table

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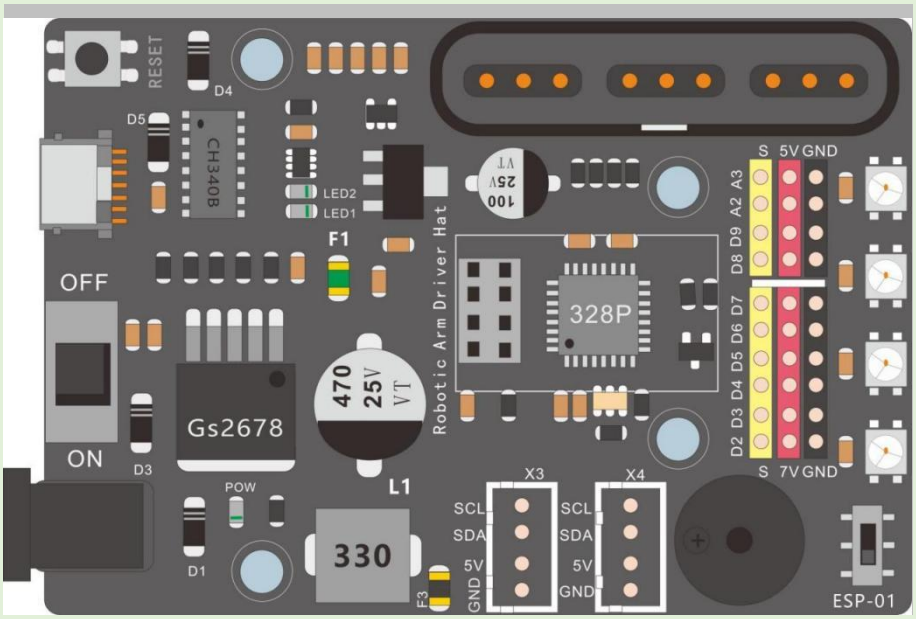
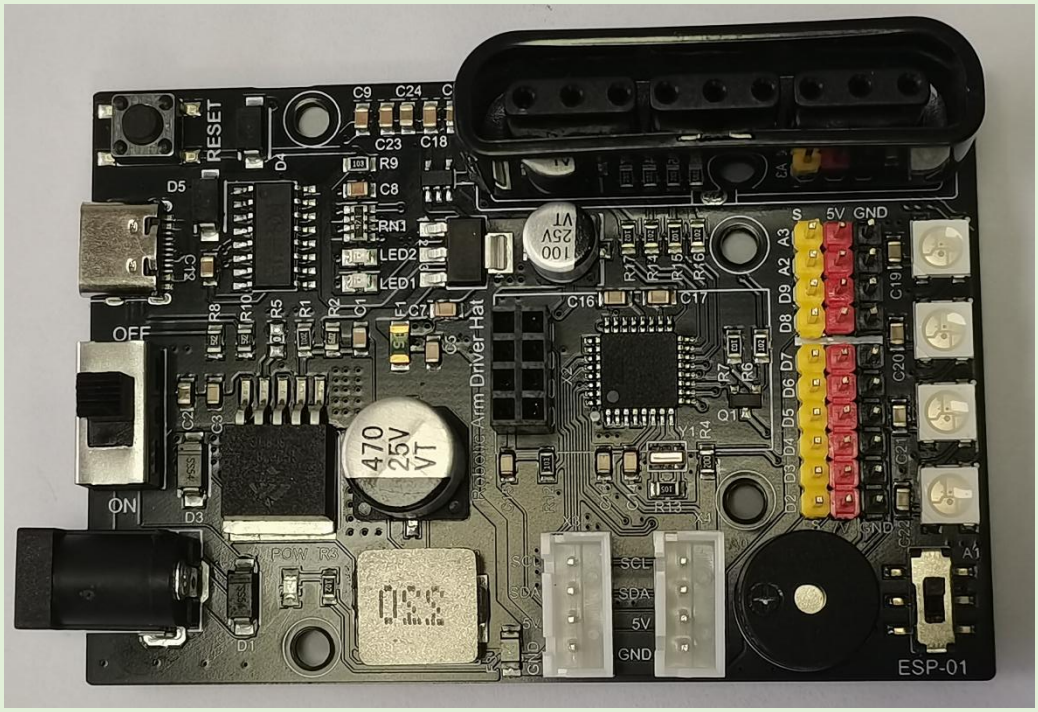
1. Appearance of Robotic Arm Driver Board

2D drawing



3D Physical picture



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2. Overview

This is a driver board specifically designed to drive Cokoino metal robotic arms, paired with Atemega328p main control chip, suitable for Arduino development environment. The main functional features are as follows:

1）Use the most popular type C USB interface, it is easier to plug and unplug.

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

3）Use DC to DC 7V and 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) Two I2C interfaces are reserved for external display screens or expansion of other I2C modules.

5) Use the PS2 interface to communicate with Atmega328p, making it convenient for the PS2 handle controller to control the operation of the robotic arm.

6) Designed 6 high-power servo signals, capable of withstanding a maximum output power of 7V/3A.

7) Mounted an active buzzer.

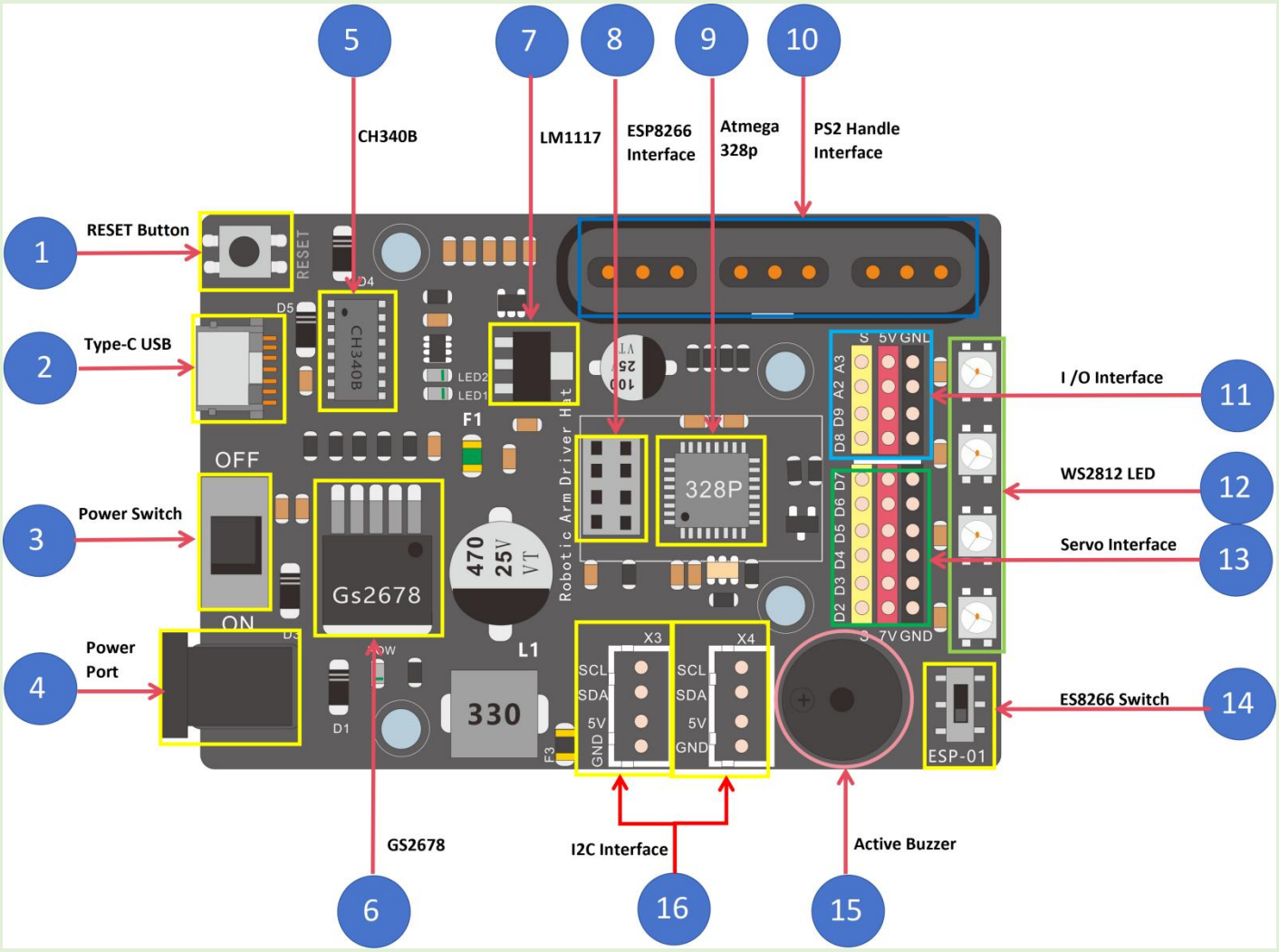
8) Mounted 4 WS2812 LEDs.

9) Reserved 4 I/O signals, which can be expanded to other functional modules.

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 Robotic Arm Driver 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	DC Power Port,power supply range: 7-12V DC.

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5	USB to serial port system	The chip is CH340B, which enables the control board to communicate with the PC
6	7V Voltage Regulator System	DC to DC 7V voltage regulator system to convert external power supply to DC7V
7	5V Voltage Regulator System	DC to DC 5V voltage regulator system to convert external power supply to DC5V
8	ESP8266 Interface	Plug ESP8266 Module and reach ESP8266 function
9	Control IC	AteMega328P model, it is the core processor, just like the human brain, which handles receiving, sending, judging, interrupting, timing, driving and other events.
10	PS2 Handle Interface	Plug PS2 Handle,use PS2 Handle to control the Arm action
11	I/O Port	D8,The digital IO port of the Atemega328p
		D9:The digital IO port of theAtemega328p, it is also used for the PWM output port (using timer1)
		A2:Analog input port, it is also used for digital IO port
		A3:Analog input port, it is also used for digital IO port
12	WS2812LED	Four WS2812 LEDs connected in series, occupying A1 (I/O PIN) of Atmega328p
13	Servo interface	Occupying the D2, D3, D4, D5, D6, D7 signal pins of Atmega328p, used to drive metal servos with a maximum output power of 7V/3A
14	ESP8266 Switch	Turn the switch to the "ESP-01" silk screen end, open the communication connection between AteMega328p and ESP8266. Turn the switch to the end away from the "ESP-01" silk screen, close the communication connection between AteMega328p and ESP8266.
15	Buzzer	Occupy A0 IO Port of 328p chip
16	IIC port	SDA：IIC data port (multifunction IO port, common pin with A4) SCL：IIC clock port (multifunction IO port, common pin with A5) Used to expand I2C functionality

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

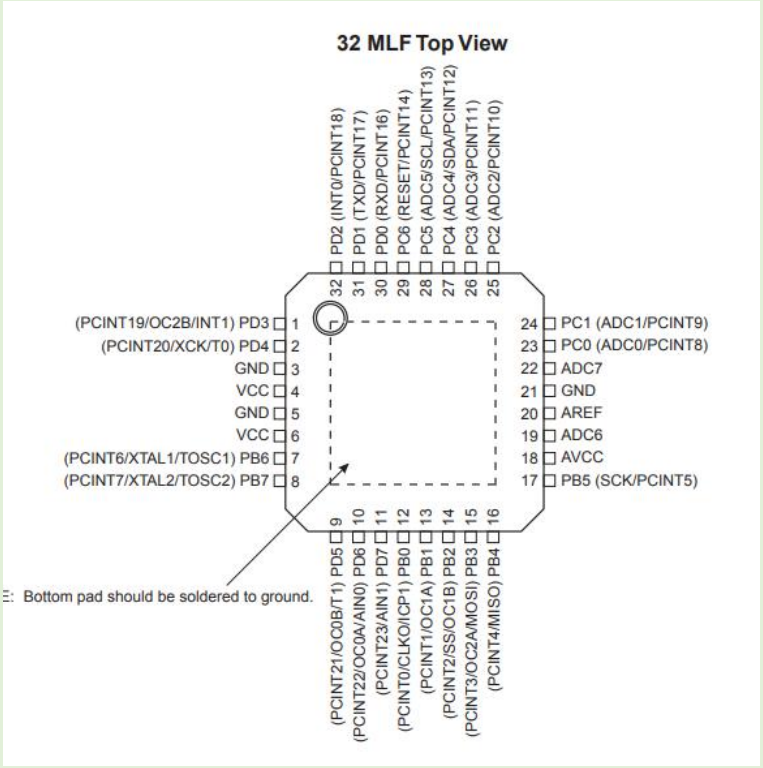
LED_BUILTIN：13（IO）

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.



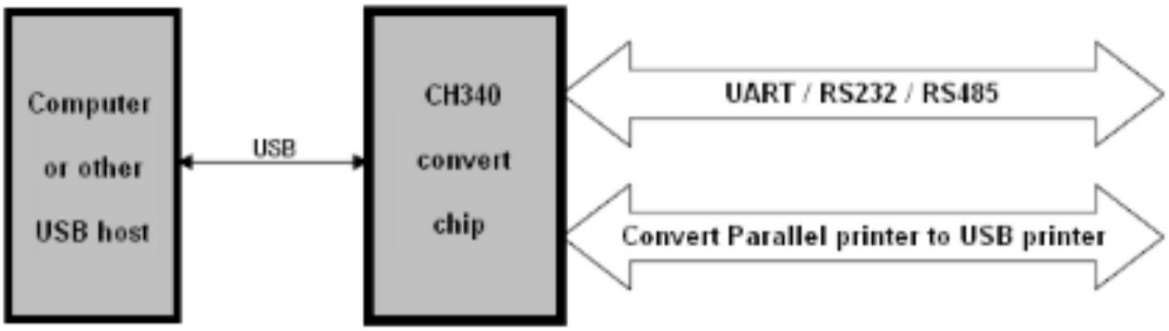
The idle digital pins on the control board can be used as an input or output, using pinMode(),digitalWrite(), and digitalRead() functions. They operate at 5 volts. Each pin can provide or receive 20 mA as recommended operating condition and has an internal pull-up resistor (disconnected by default) of 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 CH340B Specification

1. Introduction

CH340 is a USB bus converter chip, which converts USB to serial UART interface or to printer interface.

In serial UART mode, CH340 provides common MODEM signal, to expand UART interface of computer or upgrade common serial devices to USB bus directly. For more information about converting USB to printer interface, please refer to the manual CH340DS2.



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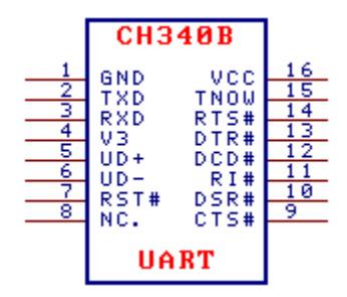
2. Features

- Full speed USB device interface, USB 2.0 compatible.
- Emulate standard UART interface, used to upgrade the original serial peripherals or expand additional serial UART via USB.
- Original serial applications are totally compatible without any modification.
- Hardware full duplex serial UART interface, integrated transmit-receive buffer, supports communication baud rate varies from 50bps to 2Mbps.
- Supports common MODEM interface signals RTS, DTR, DCD, RI, DSR and CTS.
- Provides further RS232, RS485, RS422 interface, etc. through external voltage conversion chip.
- CH340R supports IrDA criterion SIR infrared communication, supports baud rate varies from 2400bps to 115200bps.
- Software compatible with CH341, use driver of CH341 directly.
- Supports 5V and 3.3V power supply even 3V.
- CH340C/N/K/E and CH340B have integrated 12MHz clock, no external crystal required, CH340B also integrates EEPROM used to configure the serial number, etc.
- RoHS compliant SOP-16, SOP-8, SSOP-20 and ESSOP-10, MSOP-10 lead-free package.

3. Package



4.3 LM1117 Specification

5 V FIXED POSITIVE LDO REGULATOR, 1.3 V DROPOUT, PSFM

Parameter	Attribute value
Minimum input voltage	6.5 V

Maximum input voltage	15 V
Number of functions	1
Number of terminals	3
Processing and packaging description	TO-220, 3 PIN
each_compli	Yes
Status	Active
Adjustment type	FIXED POSITIVE SINGLE OUTPUT LDO
Adjustable	FIXED
dropout_voltage1_nom	1.2 V
Maximum voltage difference 1	1.3 V
input_voltage_absolute_max	20 V
jesd_30_code	R-PSFM-T3
jesd_609_code	e0
line_regulation_max	0.0100 V
load_regulation_max	0.0150 V
moisture_sensitivity_level	1
Output number	1
erating_temperature,_tj_mi	0.0 Cel

4.4 GS2678 Specification

5A 350KHz 25V Buck DC to DC Converter

Features

- Wide 3.6V to 25V Input Voltage Range
- Output Adjustable from 0.8V to 23V
- Maximum Duty Cycle 100%
- Minimum Drop Out 0.6V
- Fixed 350KHz Switching Frequency
- 5A Constant Output Current Capability
- Internal Optimize Power MOSFET
- High efficiency
- Excellent line and load regulation
- TTL shutdown capability
- EN pin with hysteresis function
- Built in thermal shutdown function
- Built in current limit function
- Built in output short protection function
- Available in TO-263 package

Applications

- LCD Monitor and LCD TV
- Digital Photo Frame
- Set-up Box
- ADSL Modem
- Telecom / Networking Equipment

General Description

The GS2678 is a 350 KHz fixed frequency PWM buck (step-down) DC/DC converter, capable of driving a 5A load with high efficiency, low ripple and excellent line and load regulation. Requiring a minimum number of external components, the regulator is simple to use and include internal frequency compensation and a fixed-frequency oscillator.

The PWM control circuit is able to adjust the duty ratio linearly from 0 to 100%. An enable function, an over current protection function is built inside. When short protection function happens, the operation frequency will be reduced from 350KHz to 80KHz. An internal compensation block is built in to minimize external component count.

5. Summaries

Robot Arm Driver Hat is a control board designed based on Arduino UNO, suitable for Arduino IDE programming.

Equipped with GS2678 high-power power supply chip, with a maximum input power of 9V/4A, it can support 7V/3A power output for servo motors, thereby driving metal robotic arms to work.

Equipped with a PS2 controller interface, using the PS2 controller to control the robotic arm provides a more user-friendly experience.

Equipped with ESP8266 interface, it can be plugged in and used to control the operation of the robotic arm through an APP.

Equipped with an active buzzer, the sound is very loud during operation and can be used as an alarm or prompt.

There are 4 WS2812 LED beads posted on the board, which can display some brilliant colors and can also be used as signal lights.

Four I/O ports, A3, A3, D8, and D9, are reserved for expanding modules with digital or analog signal values.

Reserved 2 I2C interfaces, which can be used to expand some I2C communication modules, such as 1602LCD.