

## ● Release History

- 2014-7-23 : **V1.0** , UM-MASSDUINO-V01-EN  
First released
- 2015-11-20 : **V2.5** , UM-MASSDUINO-V2.5-EN  
1, Add MD-328D Support  
2, Update MassDuino HSP
- 2016-04-11: **V3.0**, UM-MASSDUINO-V3.0-EN  
Update new version Arduino IDE Support

## ● Background

Arduino is an open-source electronics prototyping platform based on flexible, easy-to-use hardware and software. It is a very useful and applied tools. We can find many code and sharing information from internet. Arduino development board has good scalability/ compatibility, and a wide range for application. So we can extend from the Arduino board of the modules all type what we need. It's intended for artists, designers, hobbyists and anyone interested in creating interactive objects or environments.

Arduino can be very easy to implement prototypes for the original design verification, but if you want a large-scale commercial applications, the price of Arduino is still too high, so there very little Arduino-based commercial products on the market.

So we released **MassDuino**, a new solution that is easy to use Arduino platform advantages, combined with low manufacturing costs , making the products which is developed on Arduino platform can be mass-produced immediately, quickly turn ideas into products.

## ● What's MassDuino

Massduino is a new product line, which combines the Arduino platform peripheral -rich, convenient and quick development, low-cost and easy to manufacture large-scale production advantages. Almost all of the Arduino code can be applied to MassDuino without modification (or very small modification), users do not need to learn any new knowledge, you can immediately begin using MassDuino to commercial product development.

MassDuino use a special custom MCU MD-8088 and MD-328D, those chips has a very unique and new design, ensuring high operating efficiency while providing a low cost of applications.

INHAOS upcoming a series of application modules which is based MassDuino. The application modules can be developed in the Arduino environment, and then direct used to commercial products, creative implementation and production time reduced to a minimum.

*Make mass production with Arduino platform and chip cost <0.6USD*



## ● MassDuino Development Process

This chapter describe how to development a product with MassDuino, We assume that you have some basic knowledge of electronic technology, and familiar with the Arduino development environment.

**S1,** Understand what is MassDuino, the MassDuino series products are highly compatible with standard Arduino UNO R3, So you can use MassDuino like the Arduino UNO R3.

**S2,** Download MassDuino HSP (Ardunio 3rd-party Hardware Support Package for MassDuino) from [www.inhaos.com](http://www.inhaos.com) , At present the latest version of the HSP is V3.0, this version support chips is as follows:

**MD-8088:** 8KB Flash , 1KB SRAM, 10bit ADC

**MD-328D:** 32KB Flash , 2KB SRAM, 10/12/16 bit ADC

**MD-328D** is highest compatible with the ATmgea328P, we recommended to use MD-328D, in most case the Arduino UNO sketch can be used for MD-328P without any modification.

**S3,** Get one UNO development board , write sketch , run and debug .  
Currently we have below products:

**MD-8088:** MassDuino UNO R4

**MD-328D:** MassDuino UNO LC , MassDuino UNO LC Lite

**S4,** After prototype verified, do the mass production design, we provided below services:

- 1, We can help you do the whole product design and fabrication
- 2, Or you can do the design , we will help you make the prototype / pilot run / and mass production
- 3, Or you can buy chip from us , we can pre-programmed the chip or leave blank chip to you , with very good price

Need above service , please contact: [support@inhaos.com](mailto:support@inhaos.com)

## ● MD-8088 and MD-328D specification

### MD-8088

- Hi performance,Low power consumption 8bit RISC MCU
- 8K bytes of in-system programmable FLASH
- 1K bytes SRAM on-chip
- 504 bytes of data FLASH, support byte read (simulate E2PROM)
- Can be edited in the Arduino environment, concise and easy to use
- Programmable synchronous / asynchronous USART
- Can work in master / slave mode SPI Serial Interface
- Up to 30 programmable I / O
- High-performance, low -power and low-cost
- I2C -compatible two-wire serial communication interface protocols , supporting master and slave device mode

### MD-328D

- Hi performance,Low power consumption 8bit RISC MCU
- **32K** bytes of in-system programmable FLASH
- **2K** bytes SRAM on-chip
- **1K** bytes of data FLASH, support byte read (simulate E2PROM)
- Can be edited in the Arduino environment, concise and easy to use
- Programmable synchronous / asynchronous USART
- Can work in master / slave mode SPI Serial Interface
- Up to 30 programmable I / O
- High-performance, low -power and low-cost
- I2C -compatible two-wire serial communication interface protocols , supporting master and slave device mode
- 8-CH **10bit** 250Ksps ADC
- 1.8 to **5.5V**

## ● MassDuino UNO family selection guide

No.	Items	BUONO UNO LC	MassDuino UNO R4	MassDuino UNO LC	MassDuino UNO LC Lite
1	Microcontroller	ATmega328P	MD-8088	MD328D	MD328D
2	Operation Voltage	3.3V or 5V	3.3V or 5V	3.3V or 5V	3.3V or 5V
3	Input Voltage (recommended)	7-24V	7-24V	7-24V	7-24V
4	Digital I/O Pins	14 (of which 6 provide PWM output)	14 (of which 6 provide PWM output)	14 (of which 6 provide PWM output)	14 (of which 6 provide PWM output)
5	Analog Input Pins	8 (A6/A7 in Extend)	8 (A6/A7 in Extend)	8 (A6/A7 in Extend)	8 (A6/A7 in Extend)
6	ADC Resolutions	10 bit	10 bit	10/12/16 bit	10/12/16 bit
7	Flash Memory	32 KB of which 0.5 KB used by bootloader	8 KB of which 1 KB used by bootloader	32 KB of which 1 KB used by bootloader	32 KB of which 1 KB used by bootloader
8	SRAM	2KB	1KB	2KB	2KB
9	EEPROM	1KB	504B	1KB Share with Flash Memory	1KB Share with Flash Memory
10	Clock Speed	16MHz	16MHz	16MHz	16MHz
11	Interface	Micro USB (CH341)	6Pin UART Serial Light	Micro USB (CH341)	6Pin UART Serial Light
12	Picture				
13	Main Advantage	USB UART interface ATmega328P Chipset Good cost performance Line Regulator, low noise	6Pin USB2Serial Light MD-8088 Chipset Very Good cost performance Line Regulator, low noise <b>WILL BE PHASE OUT SOON, NOT RECOMMEND!</b>	USB UART interface MD328D Chipset 10/12/16 bit ADC Very Good cost performance USB UART interface Ready for mass production	6Pin USB2Serial Light MD328D Chipset 10/12/16 bit ADC Very Good cost performance USB UART interface Ready for mass production

## ● How to use

We released an Arduino 3rd-party hardware package for MassDuino , so you can download it from website ([www.inhaos.com](http://www.inhaos.com)) before using it , and put it in the appropriate location , then you can use it like to use any other Arduino board. The installation process is as follows.

- step1:** Download the Arduino software from the official website and then install it on the computer.  
( Surport Arduino 1.5.X and Arduino 1.6.x )



**step2:** Download the MassDuino support package



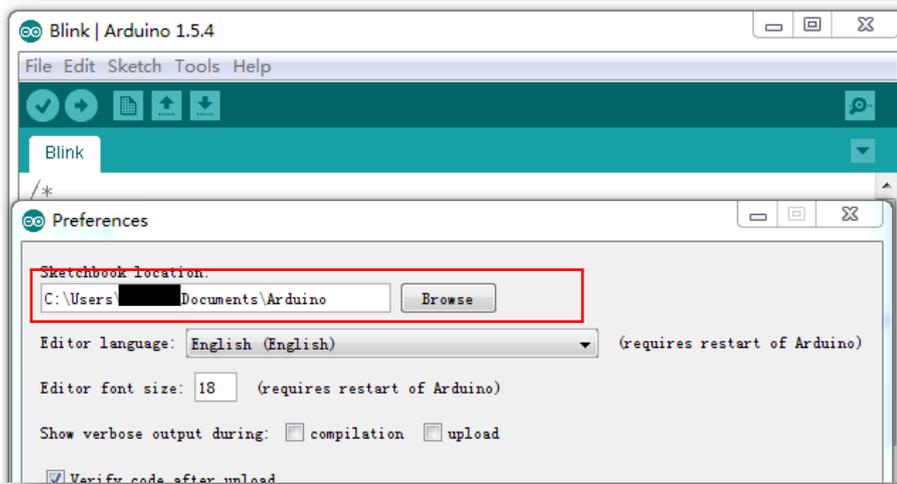
**step3:** Install MassDuino support package to Arduino IDE

PS: Before do this, please make sure your Arduino IDE is closed.

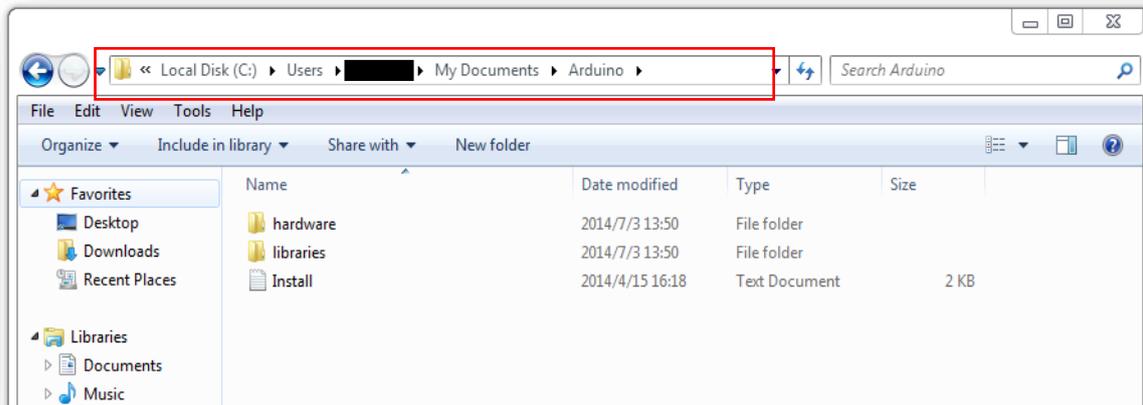
Unzip the support package file, and move the two Folders (libraries and hardware) to:

C:\Users\<>USERNAME>\Documents\Arduino

You can check Arduino->File->Preferences to find your support file installation directory.

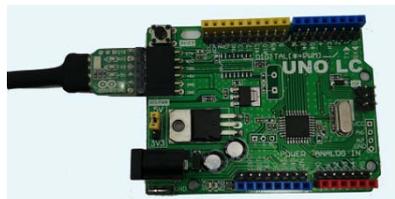


In my computer, the support package Installed here.



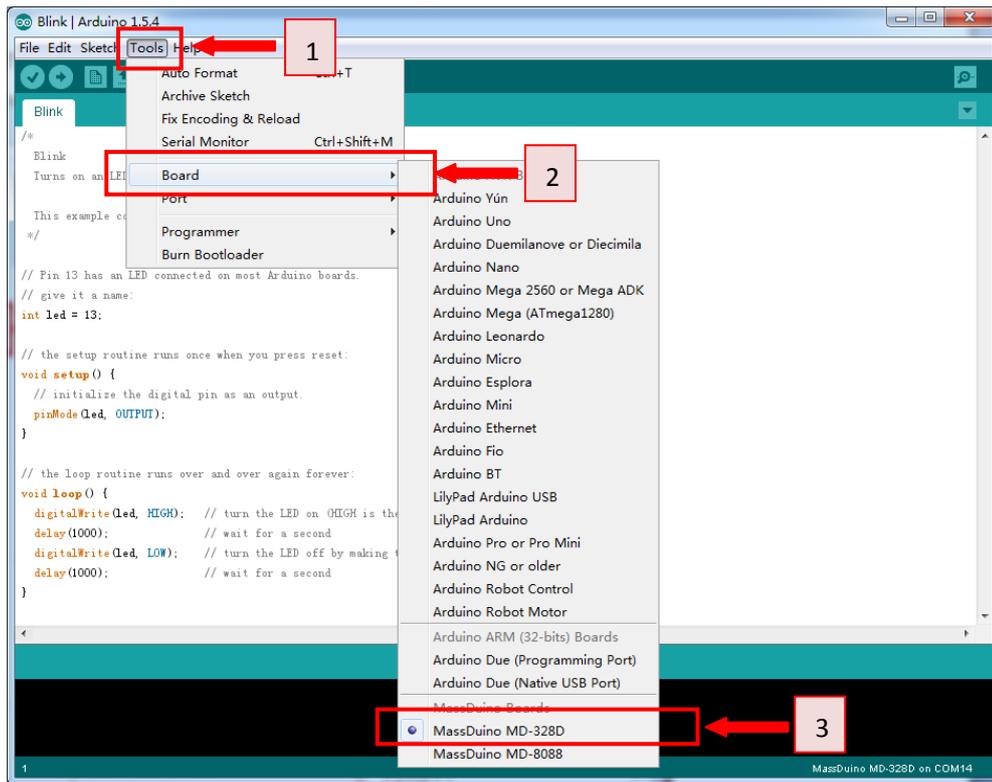
**step4:** Connect MassDuino board to your computer with a USB-Serial adapter and USB cable.

Used standard Arduino USB2Serial Light cable to upload sketch and communication.

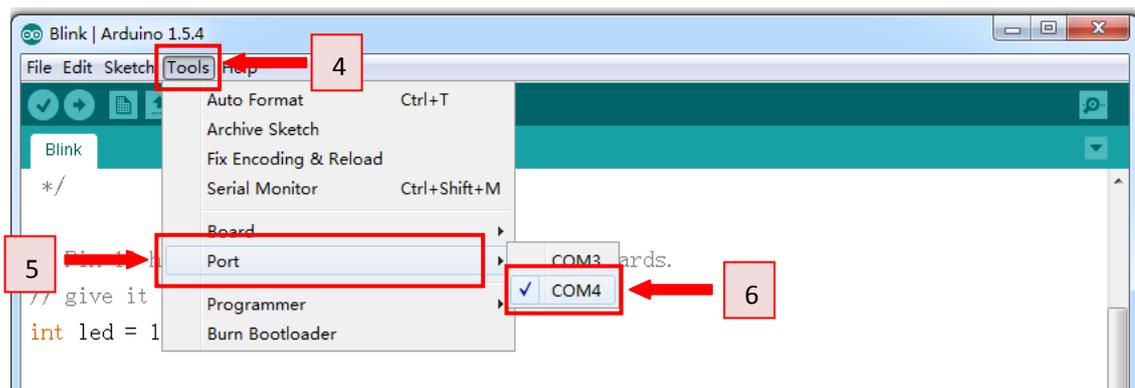


## ● My first MassDuino sketch

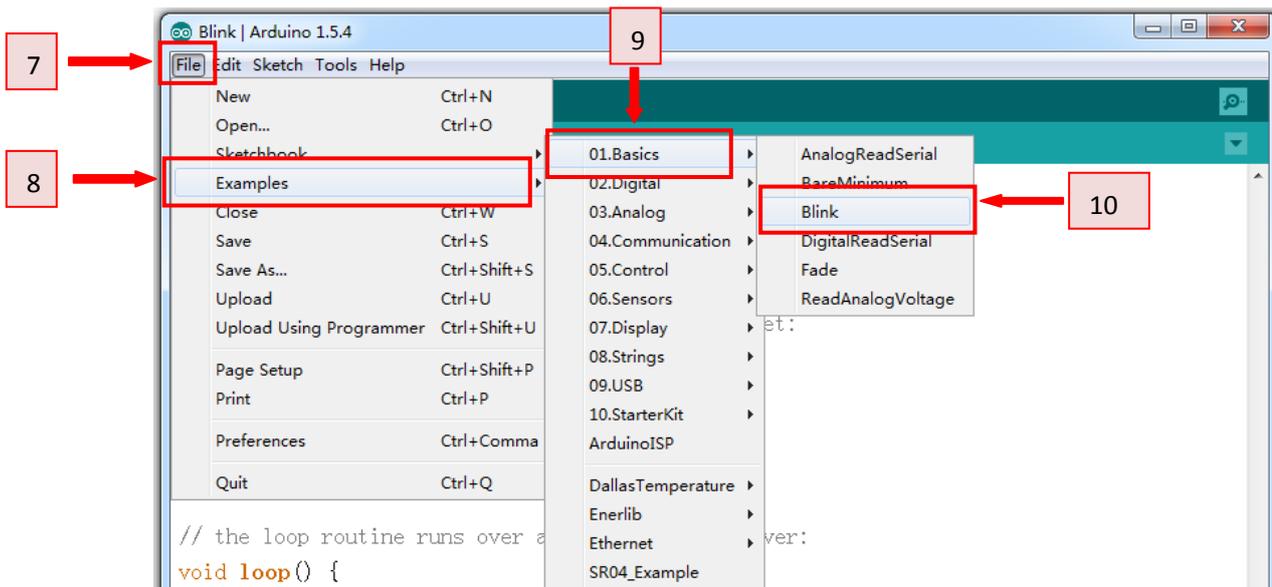
- 1) Open the Arduino IDE. Select the board: Click Tools -> Board -> MassDuino UNO R4.0



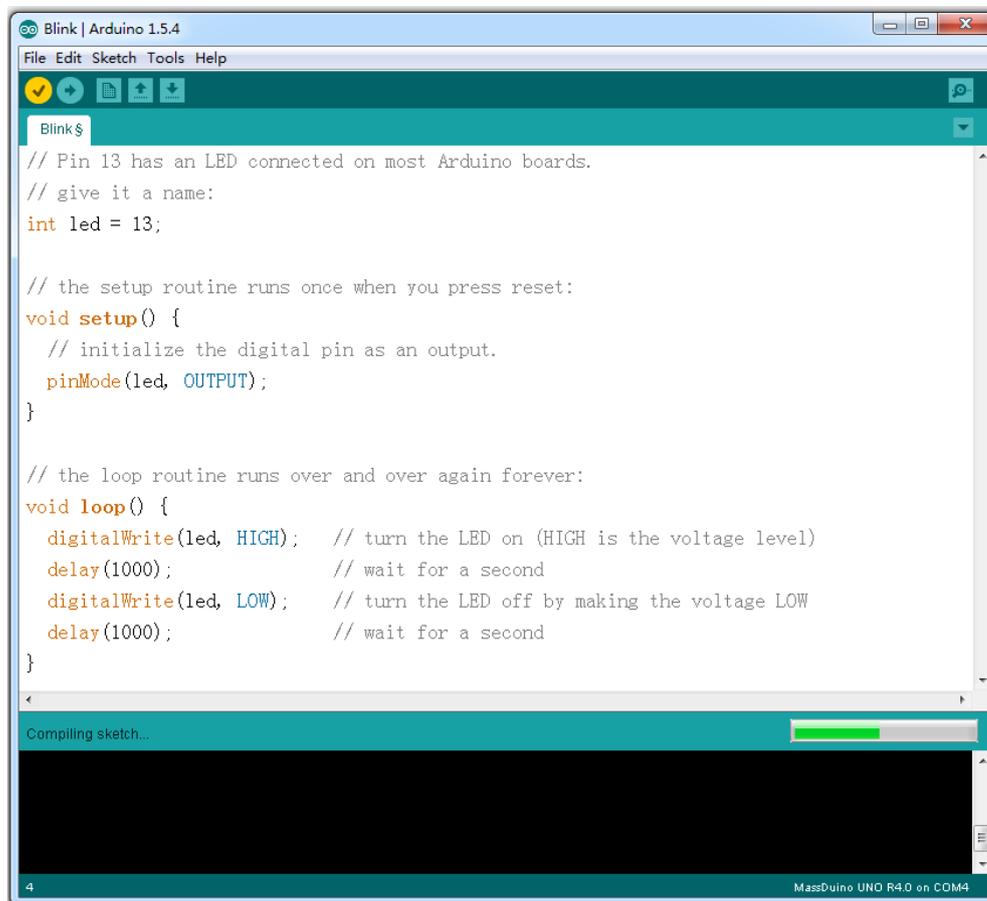
- 2) Select the COM: Click Tools -> Serial Port -> COM4(which connected with MassDuino.)



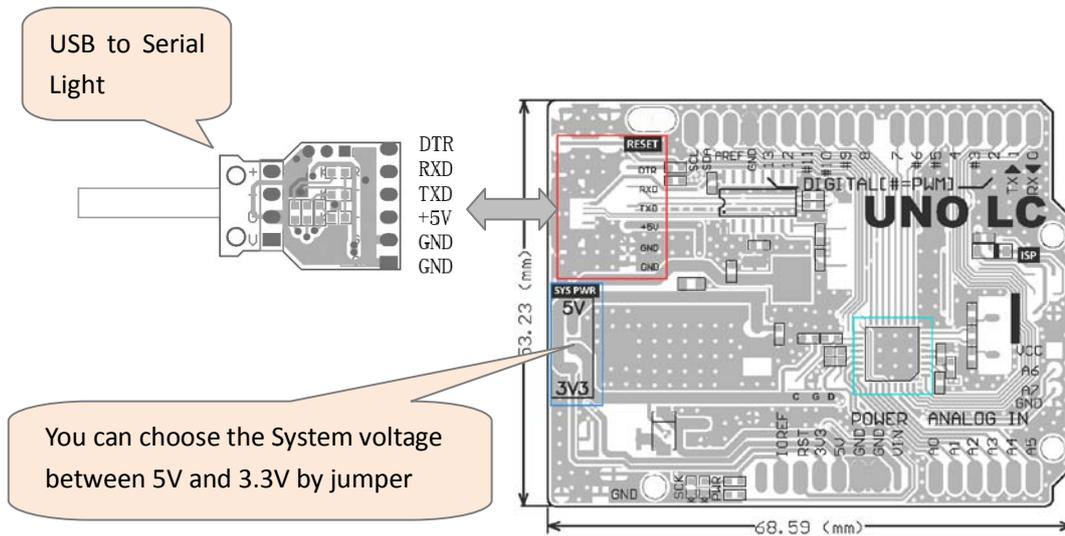
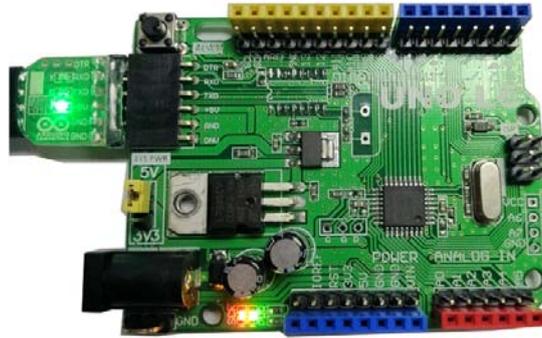
3) step6: An example of program: Click File -> Examples -> which you want.



4) step7: Upload the blink example to MassDuino.



5) Now you can see the LED is blinking according to the arduino code.



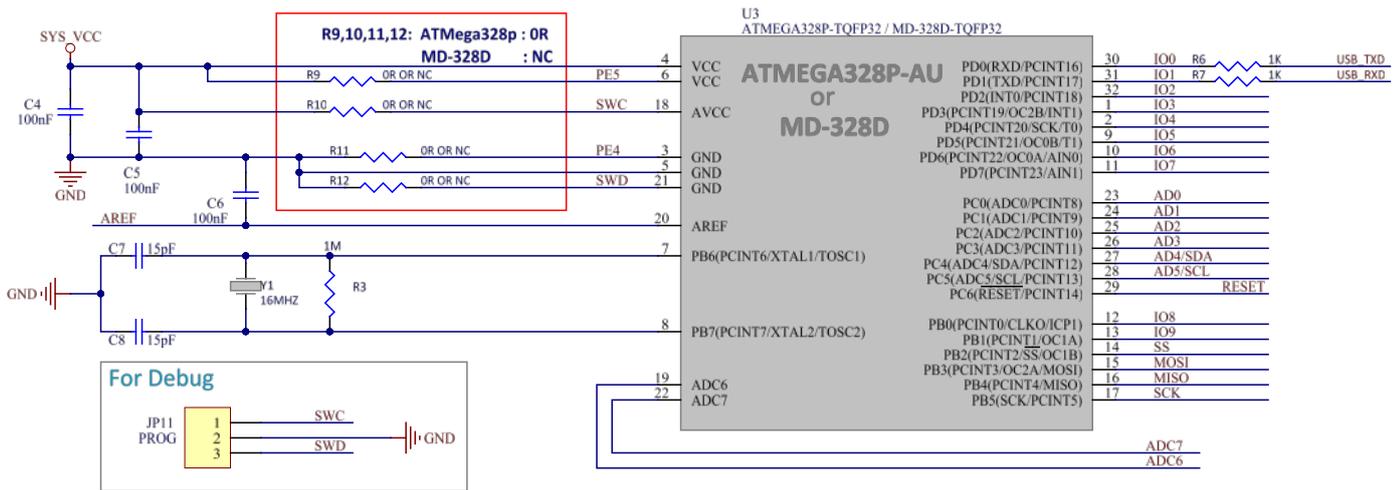
### ● About the analogRead speed for MassDuino MD-328D

The MassDuino MD-328D support 3 kinds of analogRead mode:

Mode	Resolution	Function	Time takes
1	10	analogRead()	300us
2	12	analogRead_12bits()	768us
3	16	analogRead_16bits()	8ms

So the higher resolution it outputs the longer time it takes, please select the appropriate output resolution according to your specific application.

● How to use MD-328D to replaced ATmega328P in Arduino system



The schematic showed the hardware difference between MD-328D and ATmega328P, here only 4pins need to difference connection:

No.	Pin Number	ATmega328P pin Function	MD-328D pin Function	Remark
1	3	GND	PE4	R11
2	6	VCC	PE5	R9
3	18	AVCC	SWC	R10
4	21	GND	SWD	R12

INHAOS Arduino UNO LC design support both ATMEGA328P and MD-328D , the difference of them is the resistor , R9,R10,R11,R12, if user want use MD-328D to design his own project , just reference the schematic show above.

INHAOS also sell MD-328D with very good price, please contact : [support@inhaos.com](mailto:support@inhaos.com)

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