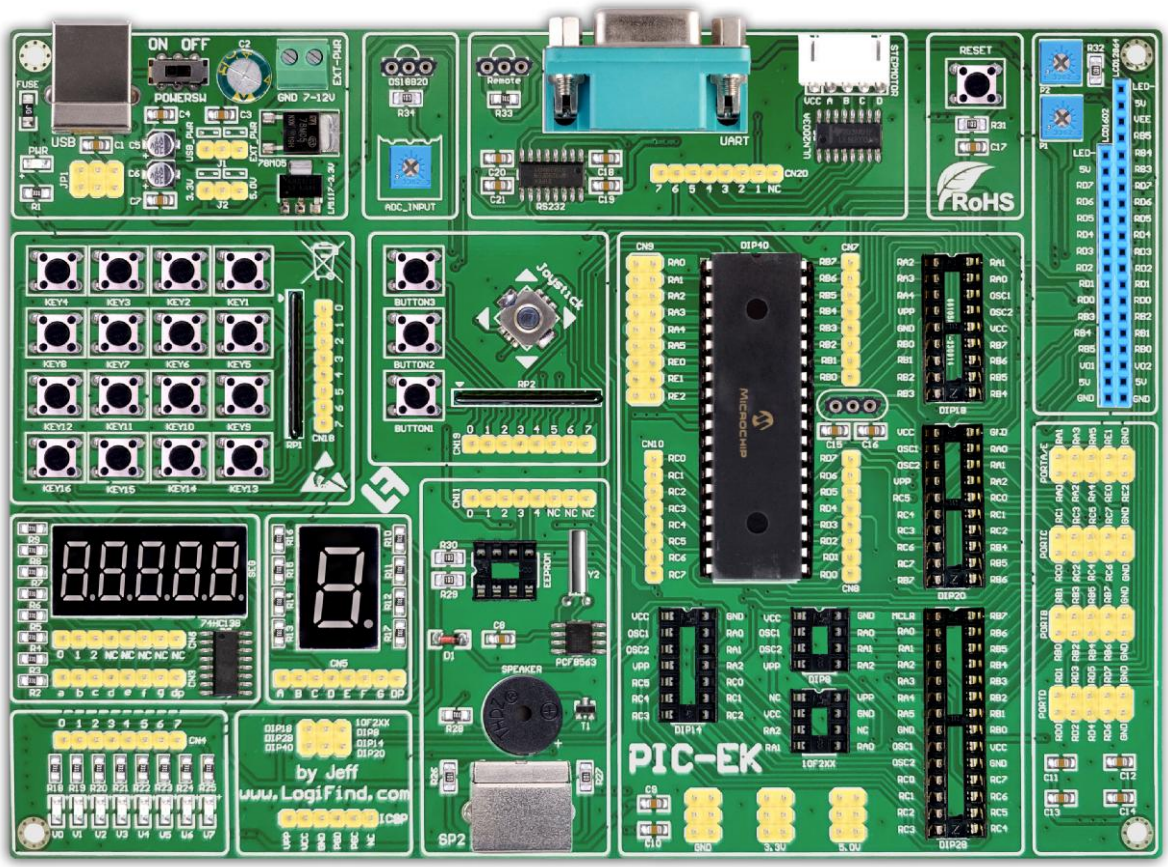


To our valued customers

I want to express my thanks to you for being interested in our products and for having confidence in **www.MicroHello.com** . The primary aim of our company is to design and produce high quality electronic products and to constantly improve the performance thereof in order to better suit your needs.

Please share your thoughts and feelings regarding our operation so that we can serve you better in the future. I thank you for your continued support and patronage.Your Dream is our Destination!

Sincerely,

Owner and General Manager
of www.MicroHello.com

CONTENTS

Chapter 1: Introduction

1)What is PIC-EK?

PIC-EK is an old friend. It has been with us for 4 generations. Many of us made our first steps in embedded world with **PIC-EK**. Today it has thousands of users: students, hobbyists, enthusiasts and professionals. It is used in many schools and other educational institutions across the globe. We have sold them over **5000pcs** in the world in the past 3 years. It provides a **low-cost** and **easy-to-use** platform with common modules to bring you into the colorful embedded world.

PIC-EK has many common modules which allow you connect them to the microcontroller via wires by yourself. We believe that you will enjoy this free connection mode, because it will bring you the fun of creation.We now present you with the new version **PIC-EK** that brings so much more, and we hope that you will be thrilled with your new board, just as we are. **PIC-EK** is a powerful PIC Development Board for 370+ Microchip PIC MCUs in DIP packaging. It features over 18 essential modules necessary in development. Board comes with **PIC16F877A** by default and we provide over 500 samples in C language based on PICC compiler for microcontrollers: **PIC16F877A**, **PIC16F887**, **PIC16F74**, **PIC16F77**, **PIC16F914**, **PIC16F917**, **PIC18F452**, **PIC18F4520**, **PIC18F4550**, **PIC18F4620**, **PIC18F458**, **PIC18F4580**, **PIC18F4585**, **PIC18F4680** and **PIC18F4685** .In the future, we will write more samples for other PIC MCUs

Of course, we are not perfect and we asking ourselves what we can do to make such a board even better, and at the same time, we are looking forward to receiving your valuable suggestions.

2)What's on Board?

Num	Description	Num	Description
1	**Dual Power Supply/USB Port** Board is equipped with power supply unit capable of supporting both 3.3V and 5V microcontrollers. Board can be powered over USB cable, or external adapter connectors. An USB Port is supported(for 18F2550,18F4550 etc.)	17	**SP2 Port** Board is equipped with SP2 Connecter.you can use it to build a KEY board of PC input.
2	**4*4 Key Board** 4*4 Key Board can be connected to each Input/Output group enable you to have digital inputs on each port pin. Buttons are of high quality and have an exceptional and stable response.	18	**Power Output Connecter for DIY** Board is equipped with Power Output Connecter for GND,3.3V and 5V output.
3	**4-digit Segled Display** Driving 7-segment displays is fun! PIC-EK™ provides 4-digit display for your applications.	19	**10f2xx Socket** 10f2xx Socket is for 10f2xx series PIC microcontrollers like 10f200,10f202 etc.
4	**User LEDs** Board contains total of 8 LEDs for PORT pins.	20	**DIP28 Socket** DIP28 Socket is for 28PIN PIC microcontrollers.
5	**ICSP connector** You need to use an external programmer with PIC-EK, we have provided the standard ICSP compatible connector.	21	**DIP14 Socket** DIP14 Socket is for 14PIN PIC microcontrollers.
6	**1-digit Segled display**	22	**DIP8 Socket**

	PIC-EK™ provides 4-digit common cathode display for your applications.		DIP8 Socket is for 8PIN PIC microcontrollers.
7	**Push buttons** 3 Push buttons is used for testing the digital inputs on each port pin. Buttons are of high quality and have an exceptional and stable response.	23	**DIP20 Socket** DIP20 Socket is for 20PIN PIC microcontrollers.
8	**Joystick** Joystick can be used for handling the on-screen menus or as a generic input device.	24	**Crystal oscillator Socket** Crystal oscillator Socket that provides external clock is connected to microcontroller osc pins and easy way to change different Crystal oscillator the user need.
9	**RS232 Circuit** RS232 communication circuit.	25	**DIP40 Socket** DIP40 Socket is for 40PIN PIC microcontrollers.
10	**ADC potentiometers** You can simulate analog inputs using this provided analog potentiometer which can be connected to each of the 8 supported microcontroller analog input pins.	26	**DIP18 Socket** DIP18 Socket is for 18PIN PIC microcontrollers.
11	**DS1820 Temp Sensor** Board supports Dallas DS18B20 One-Wire digital temperature sensor.	27	**ULN2003A driving** ULN2003A provided on board is for driving stepmotor.
12	**Infrared Remote Receiver** 1838B infrared receiver device provided on the board for your remote control.	28	**System Reset Button** High quality reset button with surrounding reset circuitry ensures stable reset operation.
13	**DB9(F) RS-232 Connector** You can implement UART communication through RS-232 connector provided on the board.	29	**LCD Contrast Potentiometers** The 2 potentiometers allows you to adjust the contrast level of the pixels on your LCD1602 character display and LCD12864 display.
14	**I2C EEPROM Socket** You can store xxxx bytes of configuration data or other data into on-board 24CXX Serial EEPROM with I2C interface.	30	**LCD1602 and LCD12864 Socket** Board are equipped with LCD1602 and LCD12864 connector which allow you to connect LCD1602 and LCD12864 display easily
15	**RTC Module** It features the PCF8563 real-time clock (RTC).	31	**IOs Headers** They are available in each Input/Output group, which is convenient for easier access to any PORT pin.
16	**Buzzer/Speaker** With piezo buzzer you can debug your applications, or have audio signalization feature.		

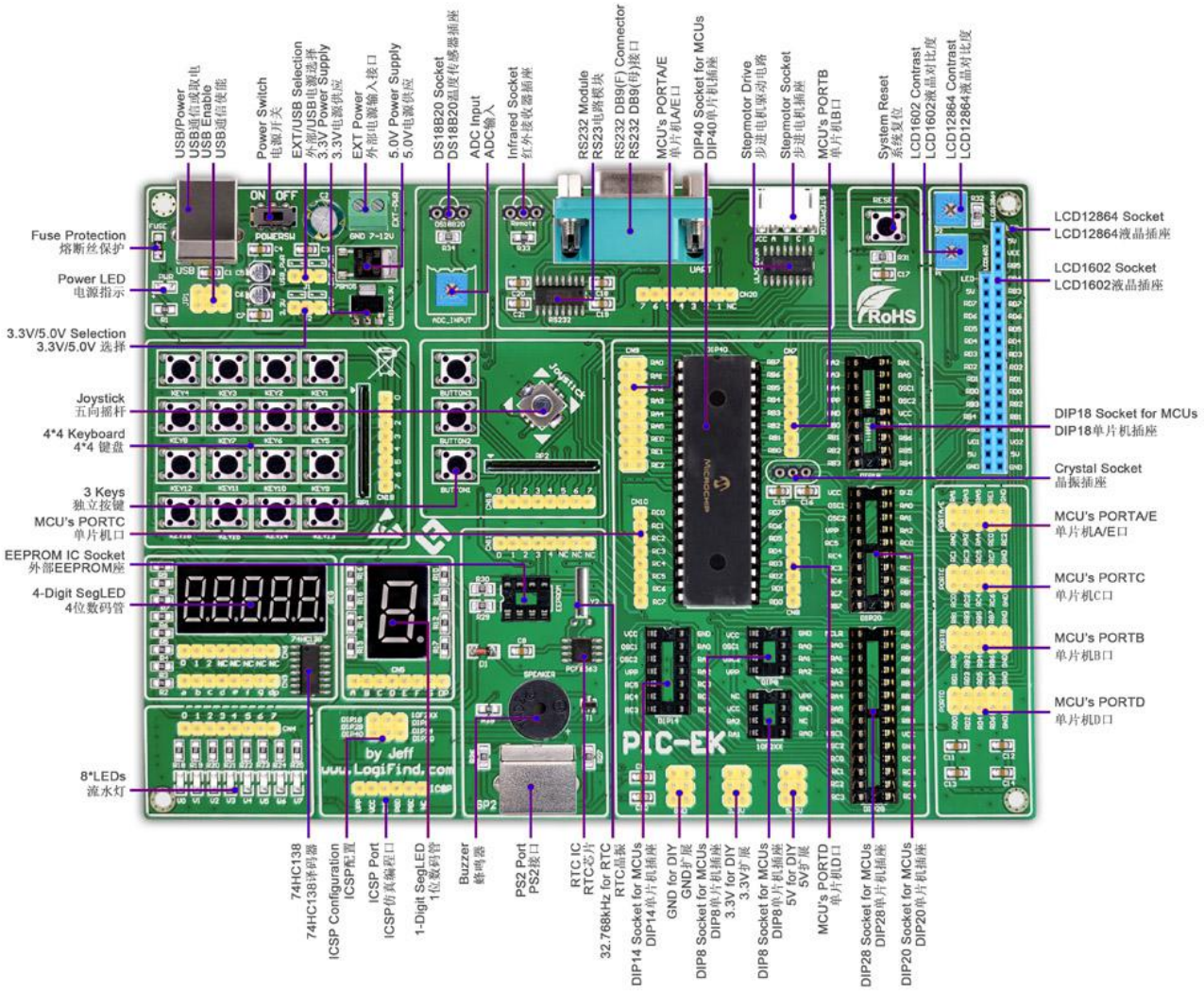


Figure 1-1.What's on board

3)Supported Devices

PIC-EK currently supports over 370+ Microchip PIC microcontrollers in DIP packaging, and the following shows the frequently-used:

PIC10FXX：						
PIC10F200	PIC10F202	PIC10F204	PIC10F206	PIC10F220	PIC10F222	
PIC12XX：						
PIC12C508	PIC12C508A	PIC12C509	PIC12C509A	PIC12C671	PIC12C672	PIC12CE518
PIC12CE519	PIC12CE673	PIC12CE674	PIC12F508	PIC12F509	PIC12F629	PIC12F635
PIC12F675	PIC12F683	PIC12F615	PIC12HV615			
PIC16XX：						
PIC16C505	PIC16C554	PIC16C558	PIC16C61	PIC16C62	PIC16C62A	PIC16C62B
PIC16C62A	PIC16C62B	PIC16C63	PIC16C63A	PIC16C64	PIC16C64A	PIC16C65
PIC16C65A	PIC16C65B	PIC16C66	PIC16C66A	PIC16C67	PIC16C620	PIC16C620A
PIC16C621	PIC16C621A	PIC16C622	PIC16C622A	PIC16C71	PIC16C72	PIC16C72A

PIC16C73	PIC16C73A	PIC16C73B	PIC16C74	PIC16C74A	PIC16C74B	PIC16C76
PIC16C77	PIC16C710	PIC16C711	PIC16C712	PIC16C716	PIC16C745	PIC16C765
PIC16C773	PIC16C774	PIC16C83	PIC16C84	PIC16F505	PIC16F506	PIC16F54
PIC16F627	PIC16F616	PIC16HV616	PIC16LF627A	PIC16F627A	PIC16F628	PIC16F887
PIC16F628A	PIC16LF628A	PIC16F630	PIC16F636	PIC16F639	PIC16F648A	PIC16F676
PIC16F683	PIC16F684	PIC16F685	PIC16F687	PIC16F688	PIC16F689	PIC16F690
PIC16F716	PIC16F72	PIC16F73	PIC16F74	PIC16F76	PIC16F77	PIC16F737
PIC16F747	PIC16F767	PIC16F777	PIC16F785	PIC16F83	PIC16F84	PIC16F84A
PIC16F87	PIC16F88	PIC16F818	PIC16F819	PIC16F870	PIC16F871	PIC16F872
PIC16F873	PIC16F873A	PIC16F874	PIC16F874A	PIC16F876	PIC16F876A	PIC16F877
PIC16F877A	PIC16F913	PIC16F914	PIC16F916	PIC16F917	PIC16F882	PIC16F883
PIC16F884	PIC16F886					
PIC18FXX：						
PIC18F242	PIC18F248	PIC18F252	PIC18F258	PIC18F442	PIC18F448	PIC18F452
PIC18F458	PIC18F1220	PIC18F1320	PIC18F2220	PIC18F2221	PIC18F2320	PIC18F2321
PIC18F2331	PIC18F2410	PIC18F2420	PIC18F2431	PIC18F2450	PIC18F2455	PIC18F2480
PIC18F2510	PIC18F2515	PIC18F2520	PIC18F2525	PIC18F2550	PIC18F2580	PIC18F2585
PIC18F2610	PIC18F2620	PIC18F2680	PIC18F4220	PIC18F4221	PIC18F4320	PIC18F4321
PIC18F4331	PIC18F4410	PIC18F4420	PIC18F4431	PIC18F4450	PIC18F4455	PIC18F4480
PIC18F4510	PIC18F4515	PIC18F4520	PIC18F4525	PIC18F4550	PIC18F4580	PIC18F4585
PIC18F4610	PIC18F4620	PIC18F4680	PIC18F4685			

4)Power Supply Requirement

PIC-EK development board supports both 3.3V and 5V power supply on a single board.This feature enables you to use wide range of peripheral boards. Power supply: via 2P Screw Terminal (**EX-PWR**) (+7-12V DC) or via **USB** cable (5V DC) Power capacity: up to 500mA with USB, and up to 600 mA with external power supply.

5)Programmer/Debugger Requirement

PIC-EK does not contain any programmer/debugger. An external PIC programmer/debugger is required to download code to the PIC MCUs. It supports many programmer/debugger like **PICKIT2**，**PICKIT3** or **ICD2** etc. Some third-party PIC programmer/debugger are also supported well, like **MCD2,mikroICD**,**QL2006,K128 and K149** etc.

6)System Specifications

Chapter 2: Hardware Details

1)Power Supply and USB

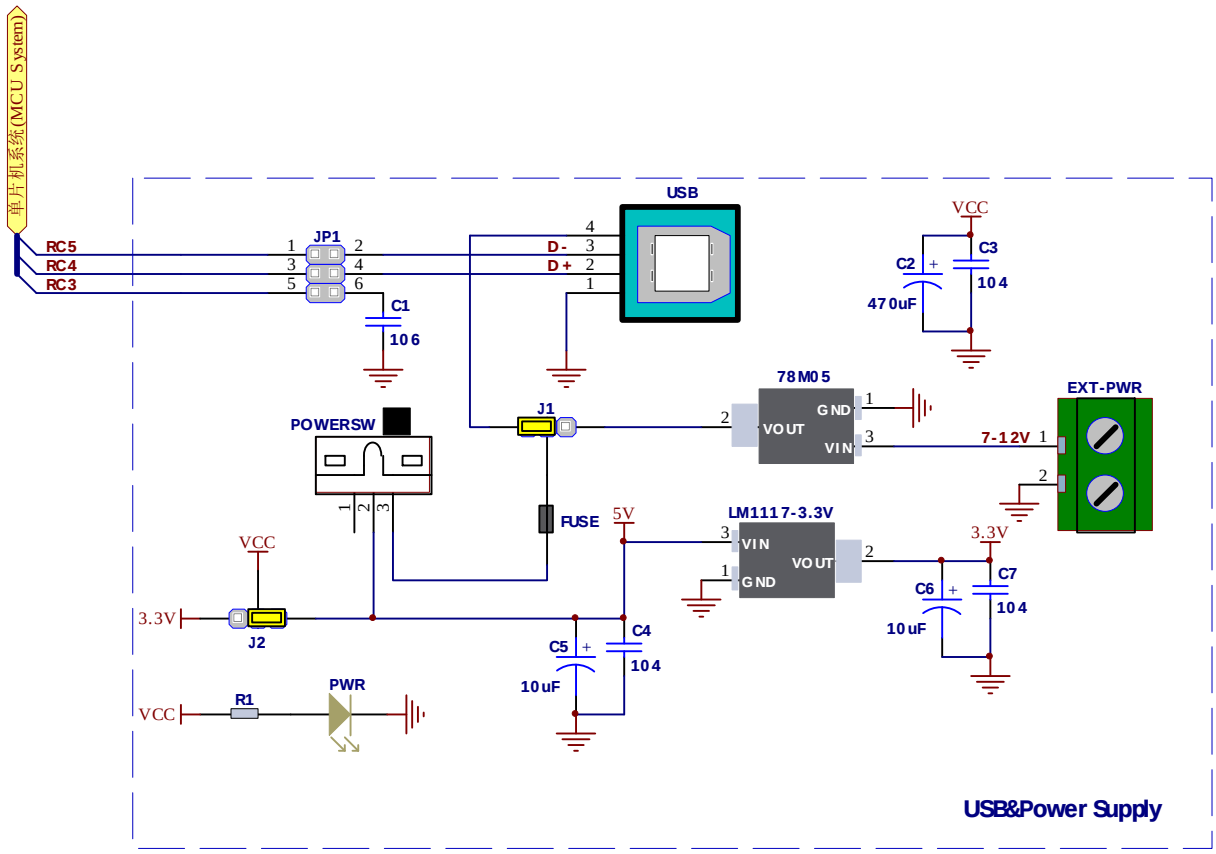


Figure 2-1: Two power supply unit and USB schematic

a).Power Supply

PIC-EK Board contains power supply that creates stable voltage **5V** and **3.3V** and current levels necessary for powering each part of the board. Power supply section contains two power regulators: **78M05**, which generates **5V**, and **LM1117-3.3** which creates **3.3V** power supply. The board can be powered in two different ways: with USB power supply (**USB**), or using external DC 7-12V via 2P Screw Terminal (**EXT-PWR**). External voltage levels must be in range of DC 7-12V. Use **J2** to specify whether you are using 5V or 3.3V power supply for the system. Use **J1** to specify whether you are using USB or External power supply. Upon providing the power using either external or USB power source you can turn on power supply by using switch(**POWERSW**). LED (**PWRLED**) will indicate the presence of power supply.

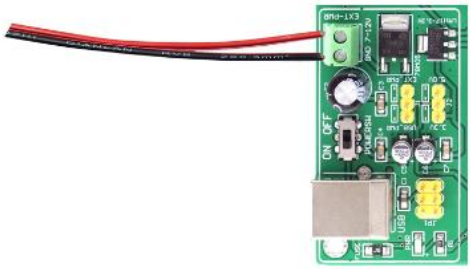
b).USB Module

The **D-** and **D+** lines on USB power supply connector (**USB**) are connected to the Microcontroller socket, which are for creating a USB HID application if you are using a microcontroller with USB module inside like **PIC18F4550**. The USB enable jumper(**JP1**) is used to enable the USB function.

2)How to power the board?

1.With USB cable

To power the board with USB cable, place jumper J1 in USB position(**USB_PWR**). You can then plug in the USB cable as shown on the right image, and turn the power switch(POWERSW) ON.



2.With laboratory power supply

To power the board using screw terminals, place jumper J1 in **EXT_PWR** position. You can then screw-on the cables in the screw terminals as shown on the right image, and turn the power switch(POWERSW) ON. External voltage levels must be in range of DC 7-12V and pay more attention to the "+" and "-" in case the board is damaged.

3)MCU System

PIC-EK board contains seven DIP sockets: DIP40, DIP28, DIP20, DIP18, DIP14,DIP8 and 10F2XX. And it supports over 100 8-bit PIC microcontrollers from PIC10F,PIC12F, PIC16F, PIC16LF, PIC18F, PIC18LF to PIC18FJ families.
There are two DIP8 sockets for PIC microcontrollers provided on the board - **DIP8** and **10F2XX**. Which of these sockets you will use depends solely on the pinout of the microcontroller in use. **PIC-EK** development system comes with the default **PIC16F877A** microcontroller in a DIP40 package.

The MCU system also contains **ICSP Interface**, **Crystal Socket** and **System Reset.**

a).ICSP Interface

In-Circuit Serial Programming (**ICSP**) is an enhanced ISP technique implemented in Microchip's PICmicro One-Time-Programmable (**OTP**) and FLASH RISC microcontrollers (MCU). Use of only two I/O pins to serially input and output data makes **ICSP** easy to use and less intrusive on the normal operation of the MCUs. We use standard 6p ICSP on the board and a jumper for setting proper **PGC** and **PGD** for different MCUs. The standard ICSP interface (**ICSP**) allows you to connect **PICKIT2**, **PICKIT3**, **ICD2** or other third-party Programmer/debugger directly.

b).System Reset

Reset circuit is made with 10K pull-up resistor, **RESET** button connected to GND and a 0.1uF capacitor for filtering.

c). System Clock Socket

System Clock Socket is connect to the MCU sockets directly, and allows you to change different crystals for your system.

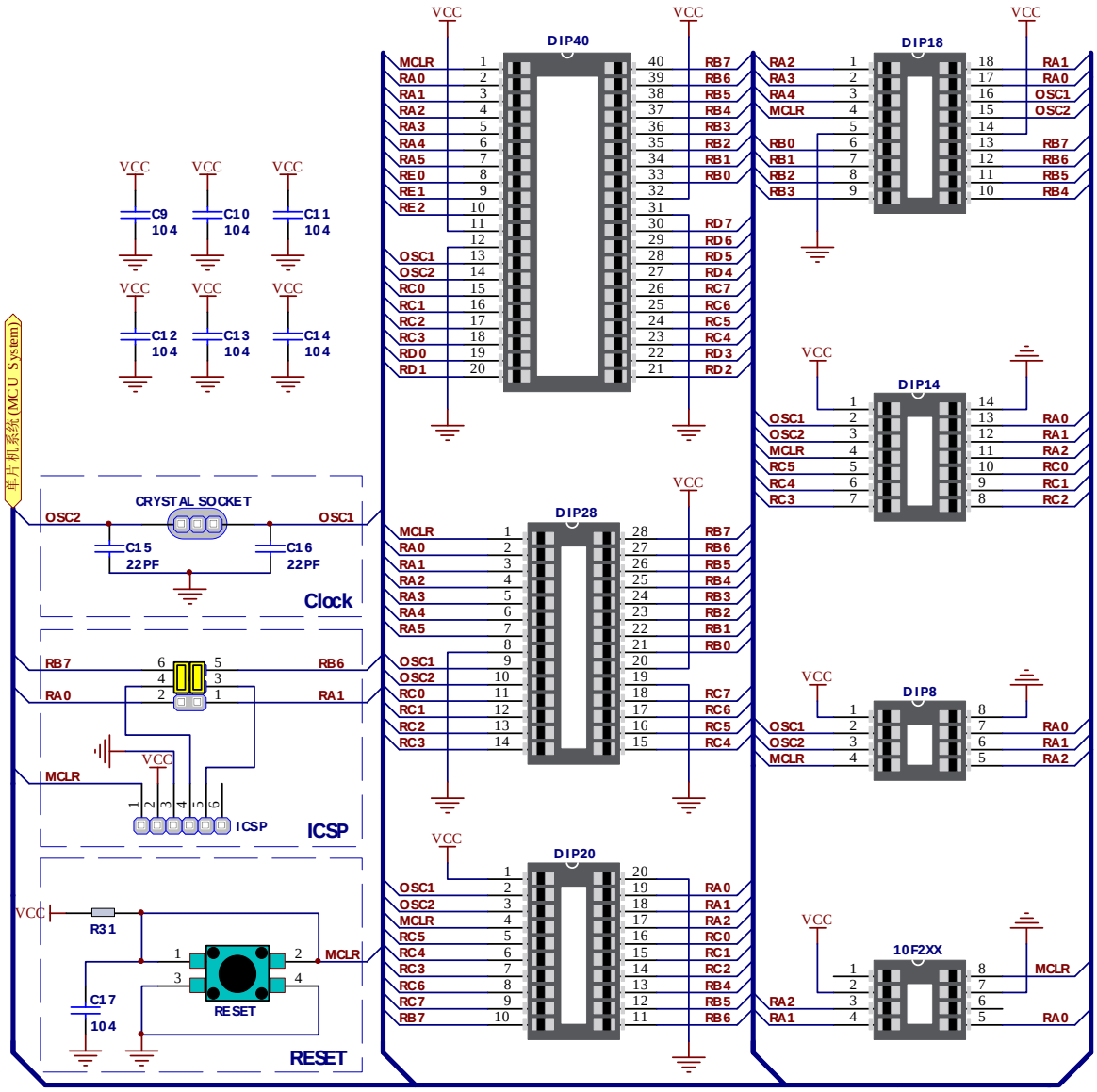


Figure 2-2: MCU System

4)4-Digit SEGLED Display

PIC-EK equips a common-cathode type 4-Digit Segled Display modules. One seven segment digit consist of 7+1 LEDs which are arranged in a specific formation which can be used to represent digits from 0 to 9 and even some letters. One additional LED is used for marking the decimal dot, in case you want to write a decimal point in the desired segment. **PIC-EK** contains four of these digits put together to form 4-digit segled display. Driving such a display is done using multiplexing techniques. Data lines are shared between segments, and therefore the same segment LEDs in each digit are connected in parallel. Each digit has it's unique digit select line, which is used to enable the digit to which the data is currently being sent. By multiplexing data through all four segments fast enough, you create an illusion that all four segments are in operation simultaneously. This is possible because human eye has a slower reaction time than the

mention changes. This way you can represent numbers in decimal or hexadecimal form.

On **PIC-EK** development board, eight data lines(a,b,c,d,e,f,g and dp) that are common for all the digits are connected to connector (**CN3**), and digit select lines are connected to connector (**CN6**) via a **74HC138** 3-to-8 line decoder.The two connectors does not be connected to any IOs yet. In order to enable module, it is necessary to connected them to the appropriate IOs Port via connector (**CN3**) and (**CN6**) using dupont wires,which makes your experiments more flexible. See the **PIC-EK Lab Operation Guide Manual** or the comments in the source code provided in CD Rom for how to connect the hardware.

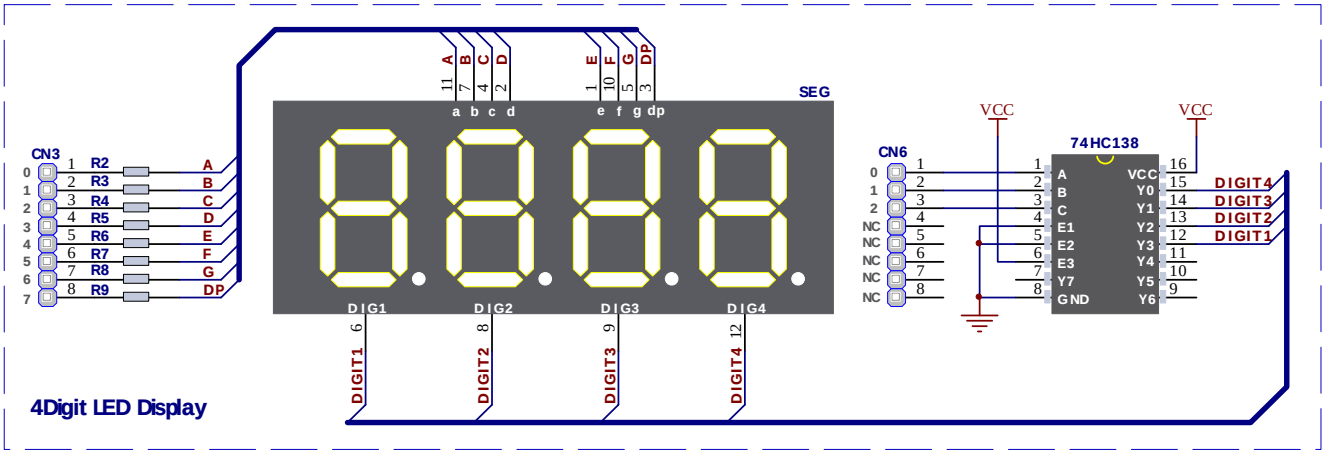


Figure 2-3: 4-Digit Segled Display Module

5)1-Digit SEGLED Display

PIC-EK equips a common-cathode type 1-Digit Segled Display modules. Driving such a display is done using simplest mode: the common pin is connect to **GND** and all PINs of segments(a,b,c,d,e,f,g and dp) are connect to IOs directly or indirectly.

On **PIC-EK** development board, eight data lines(a,b,c,d,e,f,g and dp) are connected to connector(**CN5**),and this connector(**CN5**) does not be connected to any IOs yet.In order to enable module, it is necessary to connected it to the appropriate IOs Port via connector (**CN5**) using dupont wires,which makes your experiments more flexible. See the **PIC-EK Lab Operation Guide Manual** or the comments in the source code provided in CD Rom for how to connect the hardware.

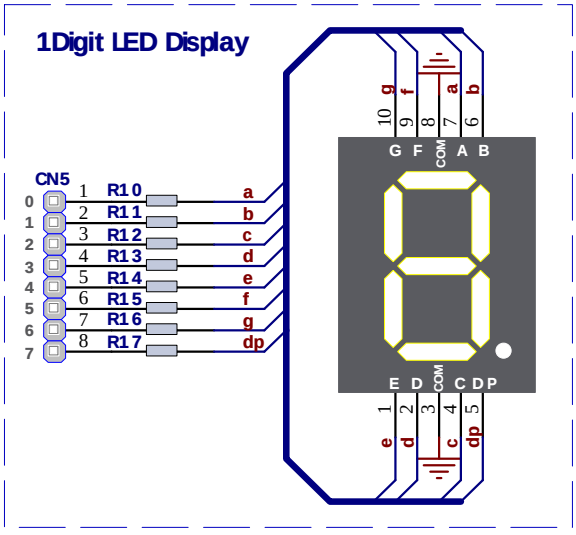


Figure 2-4: 1-Digit Segled Display Module

6)Eight LEDs

LED (Light-Emitting Diode) is a highly efficient electronic light source. When connecting LEDs, it is necessary to place a current limiting resistor in series so that LEDs are provided with the current value specified by the manufacturer. The current varies from 0.2mA to 20mA, depending on the type of the LED and the manufacturer. **PIC-EK** board uses low-current LEDs with typical current consumption of 0.2mA or 0.3mA, depending of VCC voltage selection. Board contains 8 LEDs which can be used for visual indication of the logic state on PORT pins. An active LED indicates that a logic high (1) is present on the pin.

On **PIC-EK** development board, eight LEDs are connected to connector(**CN4**),and this connector(**CN4**) does not be connected to any IOs yet. In order to enable LEDs, it is necessary to connected them to the appropriate IOs Port via connector (**CN4**) using dupont wires,which makes your experiments more flexible. See the **PIC-EK Lab Operation Guide Manual** or the comments in the source code provided in CD Rom for how to connect the hardware.

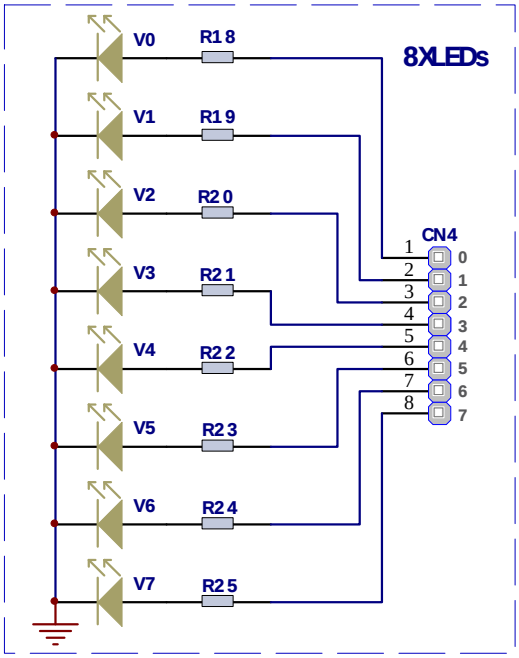


Figure 2-5: 8 LEDs

7)Buttons and Joystick

The logic state of all microcontroller digital inputs may be changed using push buttons. **PIC-EK** equips 3 user buttons **Button1**, **Button2** and **Button3**. **PIC-EK** also equips a **Joystick** which is a smart navigation key concept based on contactless, magnetic movement detection. You can think it simply as 5 Tact Switchs installed on one device, and they are the **Left**, **Right**, **Up**, **Down** and **Center**.

On **PIC-EK** development board, 3 user buttons and **Joystick** are connected to connector(**CN19**),and this connector(**CN19**) does not be connected to any IOs yet. In order to enable 3 user buttons and **Joystick**, it is necessary to connected them to the appropriate IOs Port via connector (**CN19**) using dupont wires,which makes your experiments more flexible. See the **PIC-EK Lab Operation Guide Manual** or the comments in the source code provided in CD Rom for how to connect the hardware.

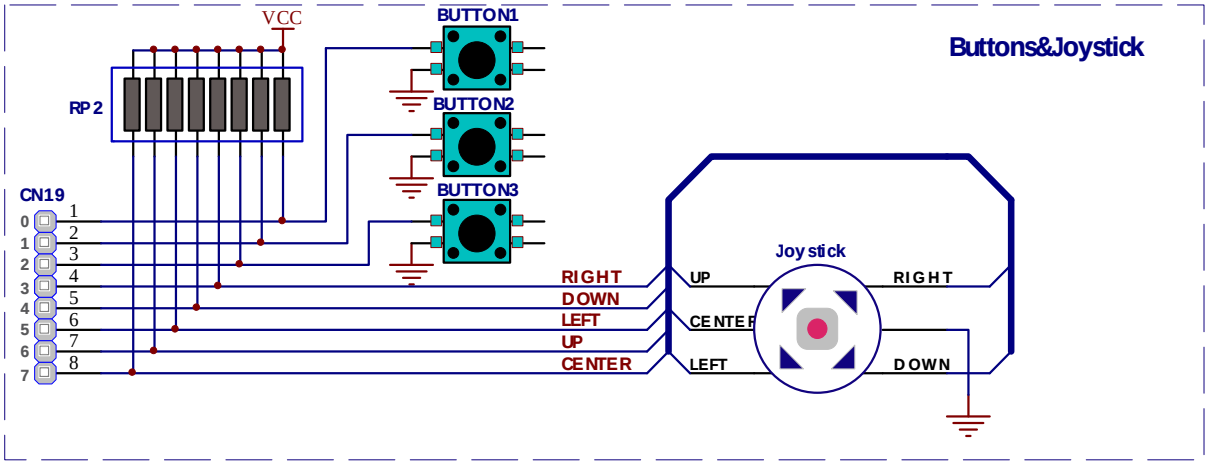


Figure 2-6: Buttons and Joystick

8)4X4 Matrix Keypad

4X4 Matrix Keypad is used for loading numerics into the microcontroller. It consists of 16 buttons arranged in a form of an array containig four Rows and four columns.

On **PIC-EK** development board, **4X4 Matrix Keypad** is connected to connector(**CN18**),and this connector(**CN18**) does not be connected to any IOs yet. In order to enable **4X4 Matrix Keypad**, it is necessary to connected it to the appropriate IOs Port via connector (**CN18**) using dupont wires,which makes your experiments more flexible. See the **PIC-EK Lab Operation Guide Manual** or the comments in the source code provided in CD Rom for how to connect the hardware.

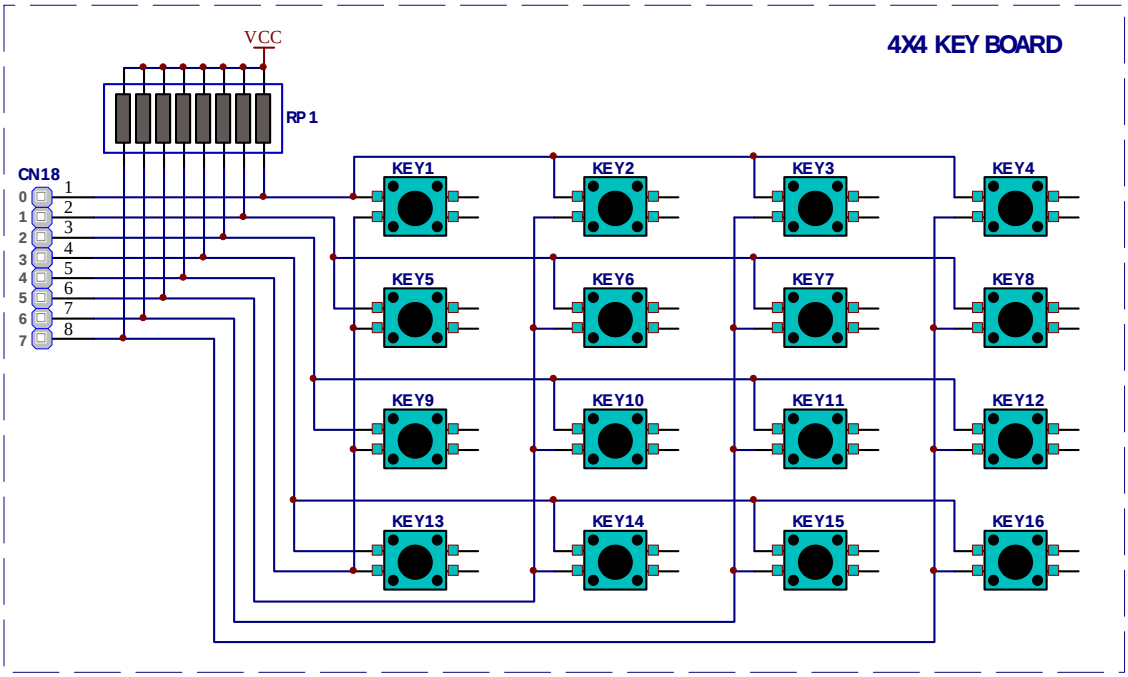


Figure 2-7: 4X4 Matrix Keypad

9)1-wire DS18B20 and ADC input

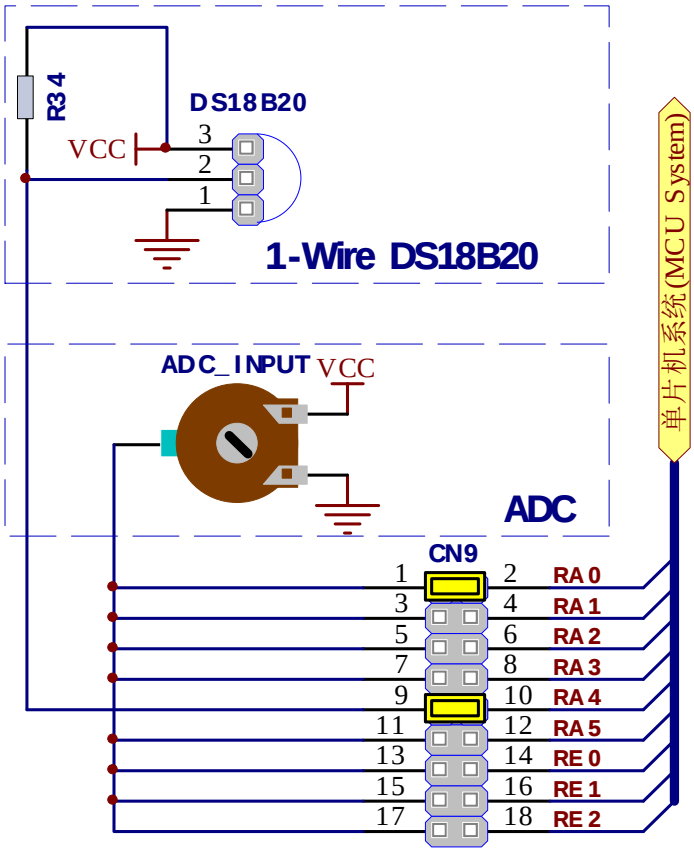


Figure 2-8: 1-wire and ADC input

a).1-Wire DS18B20 Temperature Sensor Module

DS18B20 is a digital temperature sensor that uses 1-wire® interface for it's operation. It is capable of measuring temperatures within the range of -55 to 128°C, and provides ±0.5°C accuracy for temperatures within the range of -10 to 85°C. It requires 3V to 5.5V power supply for stable operation. It takes maximum of 750ms for the **DS18B20** to calculate temperature with 9-bit resolution. 1-wire® serial communication enables data to be transferred over a single communication line, while the process itself is under the control of the master microcontroller. The advantage of such communication is that only one microcontroller pin is used. Multiple sensors can be connected on the same line. All slave devices by default have a unique ID code, which enables the master device to easily identify all devices sharing the same interface.

PIC-EK provides a socket for the **DS18B20**. Communication line with the microcontroller is connected via connector(**CN9**) to MCU's IO **RA4**.See the **Figure 2-8.**

b).ADC input

Digital signals have two discrete states, which are decoded as high and low, and interpreted as logic 1 and logic 0. Analog signals, on the other hand, are continuous, and can have any value within defined range. A/D converters are specialized circuits which can convert analog signals (voltages) into a digital representation, usually in form of an integer number. The value of this number is linearly dependent on the input voltage value. Most microcontrollers nowadays internally have A/D

converters connected to one or more input pins. Some of the most important parameters of A/D converters are conversion time and resolution. Conversion time determines how fast can an analog voltage be represented in form of a digital number. This is an important parameter if you need fast data acquisition. The other parameter is resolution. Resolution represents the number of discrete steps that supported voltage range can be divided into. It determines the sensitivity of the A/D converter. Resolution is represented in maximum number of bits that resulting number occupies. Most microcontrollers have 10-bit resolution, meaning that maximum value of conversion can be represented with 10 bits,which converted to integer is 210=1024. This means that supported voltage range, for example from 0-3.3V, can be divided into 1024 discrete steps of about 3.222mV.

PIC-EK provides an interface in form of potentiometer for simulating analog input voltages that can be routed to any of the **8 channels** supported analog input pins(**AN0** to **AN8**) via Jumper **CN9**. See the **PIC-EK Lab Operation Guide Manual** or the comments in the source code provided in CD Rom for how to connect the hardware.

10)PS/2, Buzzer,EEPROM and RTC

a).PS/2 Communication Port

The PS/2 port is a 6-pin mini-DIN connector used for connecting some keyboards and mice to a PC compatible computer system. **PIC-EK** provides a standard PS/2 port to connect a common PC keyboard to your **PIC-EK**.

On **PIC-EK** development board, **PS/2 Module** is connected to connector(**CN11.0~1**),and this connector(**CN11.0~1**) does not be connected to any IOs yet. In order to enable **PS/2 Module**, it is necessary to connected it to the appropriate IOs Port via connector (**CN11.0~1**) using dupont wires,which makes your experiments more flexible. See the **PIC-EK Lab Operation Guide Manual** or the comments in the source code provided in CD Rom for how to connect the hardware.

b).Piezo Buzzer

Piezoelectricity is the charge which accumulates in certain solid materials in response to mechanical pressure,but also providing the charge to the **piezo** electric material causes it to physically deform. One of the most widely used applications of piezoelectricity is the production of sound generators, called piezo buzzers. **Piezo buzzer** is an electric component that comes in different shapes and sizes, which can be used to create sound waves when provided with analog electrical signal.

PIC-EK comes with **piezo buzzer** which can be connected to any IO of microcontroller via connector (**CN11.2**). **Buzzer** is driven by transistor **T1**. Microcontrollers can create sound by generating a **PWM**(Pulse Width Modulated) signal–a square wave signal, which is nothing more than a sequence of logic zeros and ones. Frequency of the square signal determines the pitch of the generated sound, and duty cycle of the signal can be used to increase or decrease the volume in the range from 0% to 100% of the duty cycle. You can generate **PWM** signal using hardware capture-compare module, which is usually available in most microcontrollers, or by writing a custom software which emulates the desired signal waveform.

On **PIC-EK** development board, **buzzer module** is connected to connector(**CN11.2**),and this connector(**CN11.2**) does not be connected to any IOs yet. In order to enable **buzzer module**, it is necessary to connected it to the appropriate IOs Port via connector (**CN11.2**) using dupont wires,which makes your experiments more flexible. See the **PIC-EK Lab Operation Guide Manual** or the comments in the source code provided in CD Rom for how to connect the hardware.

c).I²C EEPROM

I²C is a multi-master serial single-ended bus that is used to attach low-speed peripherals to computer or embedded systems. **I²C** uses only two open-drain lines, Serial Data Line (**SDA**) and Serial Clock (**SCL**), pulled up with resistors. **SCL** line is driven by a master, while **SDA** is used as bidirectional line either by master or slave device.
Up to 112 slave devices can be connected to the same bus. Each slave must have a unique address.
PIC-EK equips an socket for external **EEPROM** IC with different capacity,which is connected to connector(**CN11.3~4**),and this connector(**CN11.3~4**) does not be connected to any IOs yet. In order to enable **EEPROM module**, it is necessary to connected it to the appropriate IOs Port via connector (**CN11.3~4**) using dupont wires, which makes your experiments more flexible. See the **PIC-EK Lab Operation Guide Manual** or the comments in the source code provided in CD Rom for how to connect the hardware.

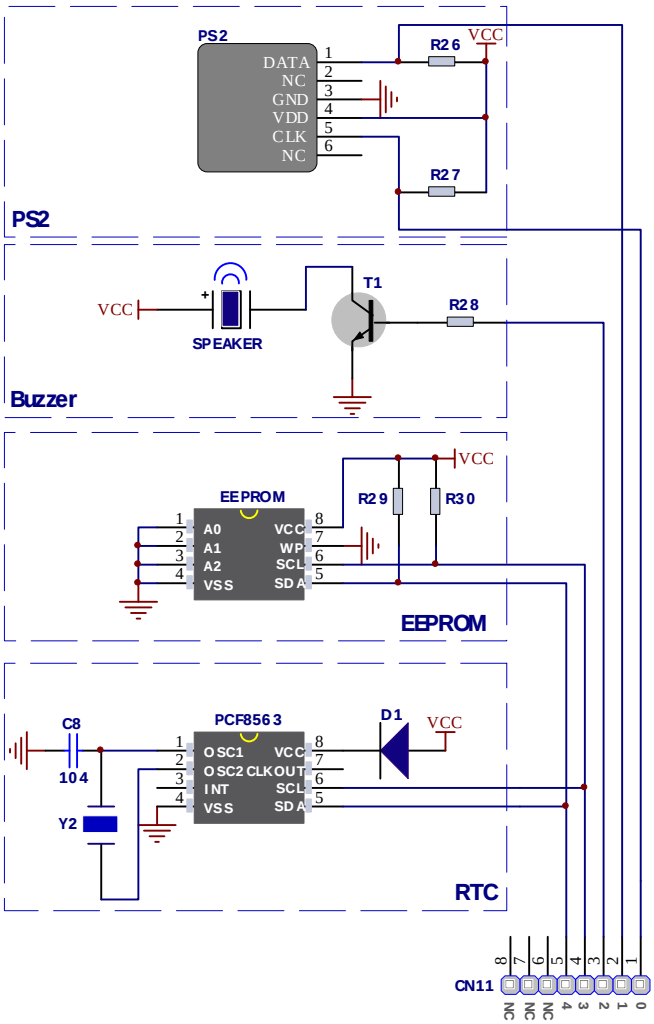


Figure 2-9: PS/2, Buzzer,EEPROM and RTC

d).Real Time Clock PCF8563

The **PCF8563** is a CMOS real-time clock/calendar optimized for low power consumption. A programmable clock output, interrupt output and voltage-low detector are also provided. All address and data are transferred serially via a two-line bidirectional I2C-bus. Maximum bus speed is 400 kbits/s. The built-in word address register is incremented automatically after each written or read data byte.

PIC-EK equips an **Real Time Clock PCF8563 module**, which is connected to connector(**CN11.3~4**),and this connector(**CN11.3~4**) does not be connected to any IOs yet. In order to enable **PCF8563 module**, it is necessary to connected it to the appropriate IOs Port via connector (**CN11.3~4**) using dupont wires,which makes your experiments more flexible. See the **PIC-EK Lab Operation Guide Manual** or the comments in the source code provided in CD Rom for how to connect the hardware.

11)Step Motor, Infrared Receiver and RS232

a).Step Motor with Driver

The **ULN2003A** is high-voltage high-current Darlington transistor arrays. Each consists of seven npn Darlington pairs that feature high-voltage outputs with common-cathode clamp diodes for switching inductive loads. The collector-current rating of a single Darlington pair is 500 mA. The Darlington pairs can be paralleled for higher current capability. Applications include relay drivers, hammer drivers, lamp drivers, display drivers (LED and gas discharge), line drivers, and logic buffers.

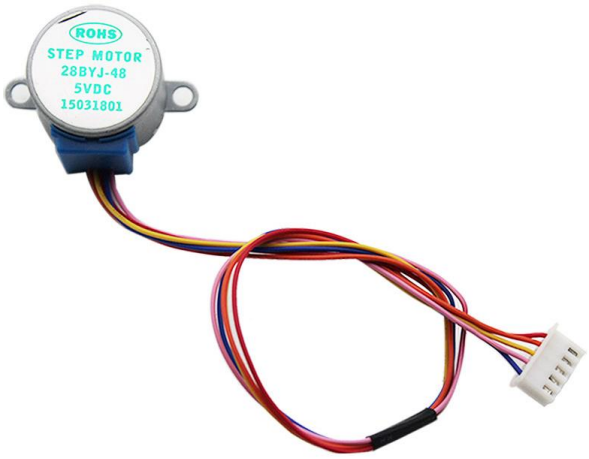


Figure 2-10: BYJ-48-5V Step Motor

PIC-EK equips an **ULN2003A** drive module with stepmotor connector, which is connected to connector(**CN20.2~5**),and this connector(**CN20.2~5**) does not be connected to any IOs yet. In order to enable **ULN2003A** module to drive a BYJ-48-5V stepmotor**(Figure 2-10)**, it is necessary to connected it to the appropriate IOs Port via connector (**CN20.2~5**) using dupont wires,which makes your experiments more flexible. See the **PIC-EK Lab Operation Guide Manual** or the comments in the source code provided in CD Rom for how to connect the hardware.

b).Infrared Receiver

1838V is miniaturized infrared receivers for remote control and other applications requiring improved ambient light rejection.The separate PIN diode and preamplifier IC are assembled on a single leadframe. The epoxy package contains a special IR filter.This module has excellent performance even in disturbed ambient light applications and provides protection against uncontrolled output pulses.

PIC-EK equips a socket(**Remote**) for installing **1838V** infrared receiver, which is connected to connector(**CN20.1**),and this connector(**CN20.1**) does not be connected to any IOs yet. In order to enable **1838V** infrared receiver module, it is necessary to connected it to the appropriate IOs Port via connector (**CN20.1**) using dupont wires,which makes your

experiments more flexible. See the **PIC-EK Lab Operation Guide Manual** or the comments in the source code provided in CD Rom for how to connect the hardware.

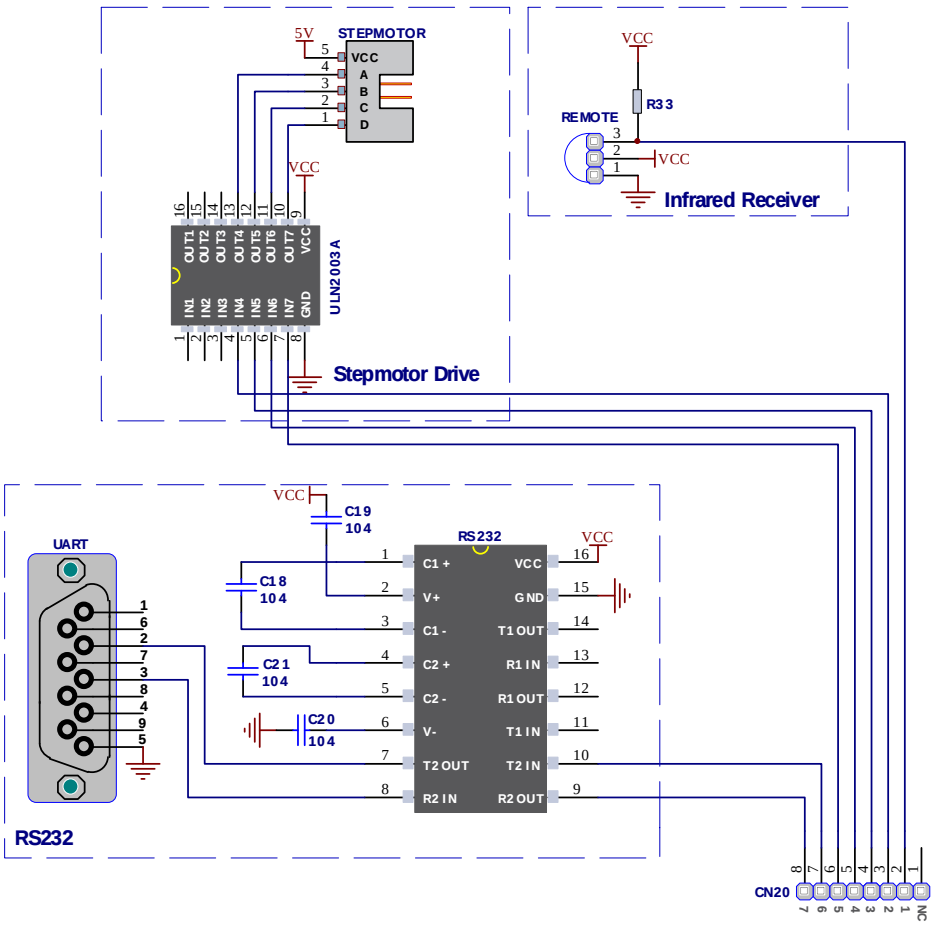


Figure 2-11: Step Motor, Infrared Receiver and RS232

c).UART via RS-232

The **UART** (universal asynchronous receiver/transmitter) is one of the most common ways of exchanging data between the MCU and peripheral components. It is a serial protocol with separate transmit and receive lines, and can be used for full-duplex communication. Both sides must be initialized with the same baud rate, otherwise the data will not be received correctly. **RS-232** serial communication is performed through a 9-pin SUB-D connector and the microcontroller **UART** module. In order to enable this communication, it is necessary to establish a connection between RX and TX lines on SUB-D connector and the same pins on the target microcontroller. Since RS-232 communication voltage levels are different than microcontroller logic levels, it is necessary to use a RS-232 Transceiver circuit.

PIC-EK equips an **RS-232** module with a sp3232/max3232 IC, which is connected to connector(**CN20.6~7**),and this connector(**CN20.6~7**) does not be connected to any IOs yet. In order to enable **RS-232** infrared receiver module, it is necessary to connected it to the appropriate IOs Port via connector (**CN20.6~7**) using dupont wires,which makes your experiments more flexible. See the **PIC-EK Lab Operation Guide Manual** or the comments in the source code provided in CD Rom for how to connect the hardware.

12)LCD 2x16 characters (Socket)

Liquid Crystal Displays or LCDs are cheap and popular way of representing information to the end user of some electronic device. Character LCDs can be used to represent standard and custom characters in the predefined number of fields. The **PIC-EK** provides the connector and the necessary interface for supporting 2x16 character LCDs. This type of display has two rows consisted of 16 character fields. Each field is a 7x5 pixel matrix. Board equips an universal socket allowing you to install 16x2 LCD very easily,and no need any dupont wire.

Connector pinout explained

1-GND

2-5V

3-Vo,LCD contrast level from potentiometer **P1**

4-RS,Register Select Signal

5-E,Display Enable

6-R/W,Determines whether display is in Read or Write mode. It's always connected to GND, leaving the display in Write mode all the time.

7~14-Data Port,Display is supported in 8-bit data mode.

15-LED+,Connection with 5V

16-LED-,Connection with GND

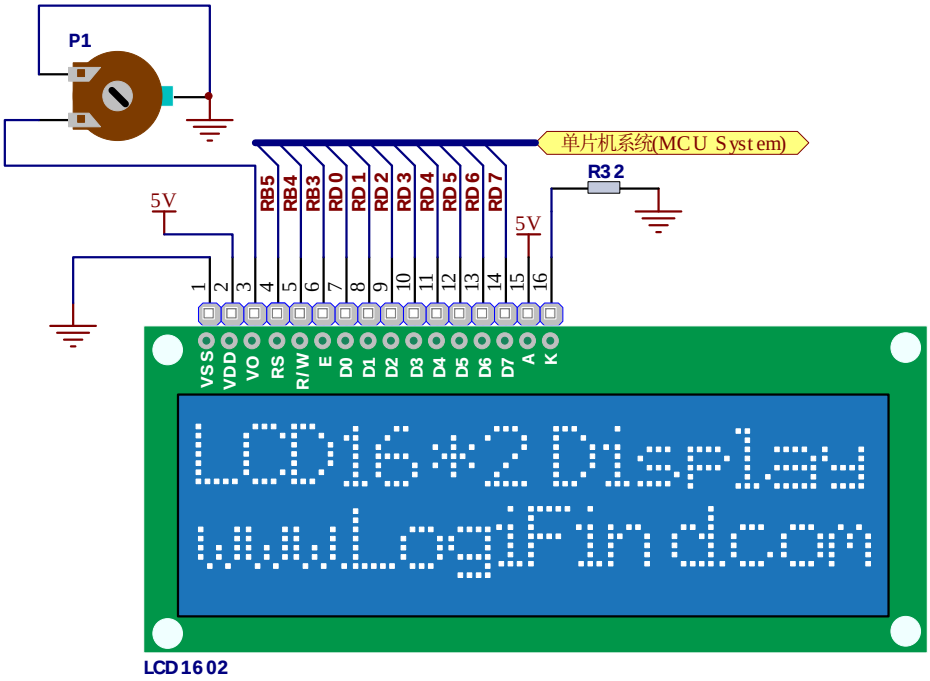


Figure 2-12: LCD 2x16 characters Socket

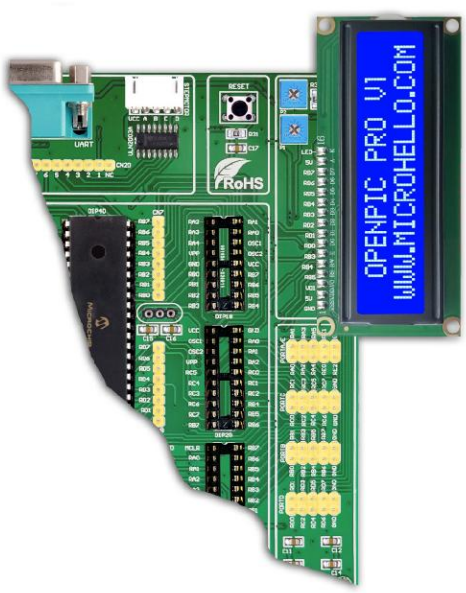


Figure 2-13: LCD 2x16 characters installing direction

IMPORTANT:
Make sure to Place the LCD1602 in the right direction.
Make sure to turn off the power supply before placing LCD onto the board. Otherwise your display can be permanently damaged.

13)GLCD 128x64(Socket)

Graphical Liquid Crystal Displays, or GLCDs are used to display monochromatic graphical content, such as text, images, humanmachine interfaces and other content. **PIC-EK** provides the connector and necessary interface for supporting GLCD with resolution of 128x64 pixels and proper PINOUTs.It is compatible with the most popular LCD12864 in the market with KS108 or ST7920 display controller.The example we provide is only for LCD12864 with ST7920 display controller.The **PIC-EK** equips an universal socket allowing you to install 128*64 Graphical LCD very easily,and no need any dupont wire..

Connector pinout explained:

1-GND
2-VCC
3-Vo,GLCD contrast level from potentiometer **P2**
4-RS,Data (High), Instruction (Low) selection
5-R/W,Determines whether display is in Read or Write mode.
6-E,Display Enable line
7~14,D0–D7,Data lines
15-PSB,Parallel/Serial Mode Selection
16-RB4
17-RST
18-VEE
19-LEDA - 5V
20-LEDK – GND

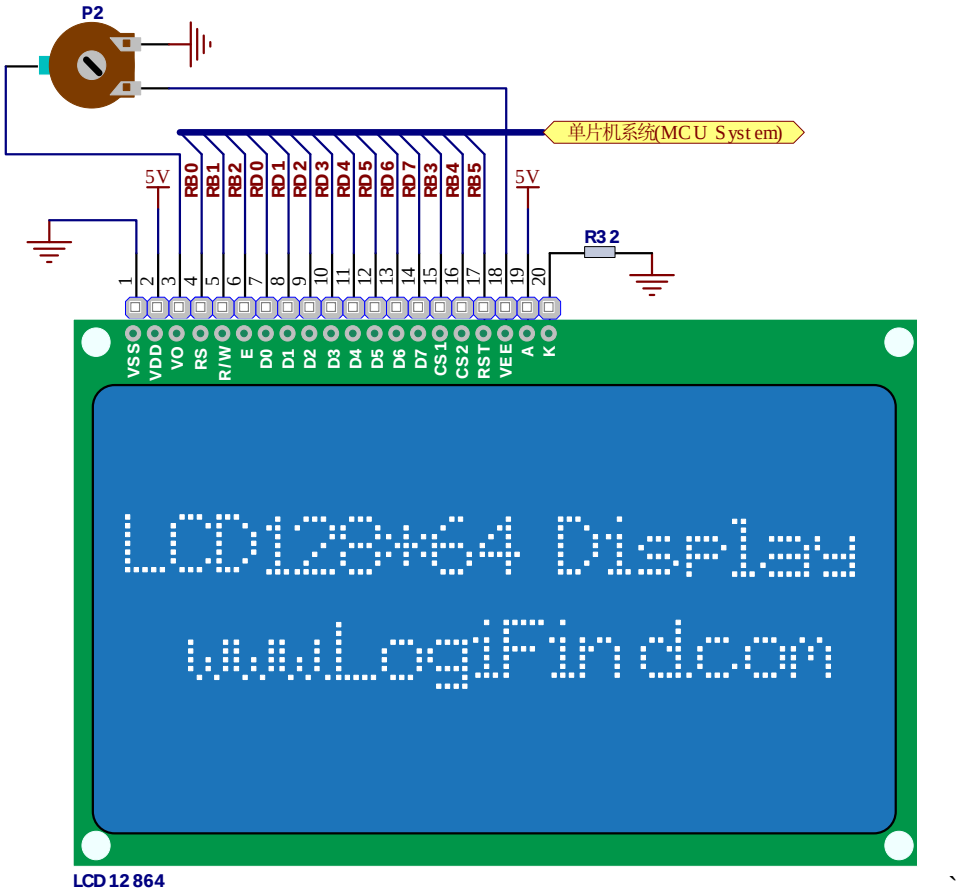


Figure 2-14: GLCD 128x64 Socket

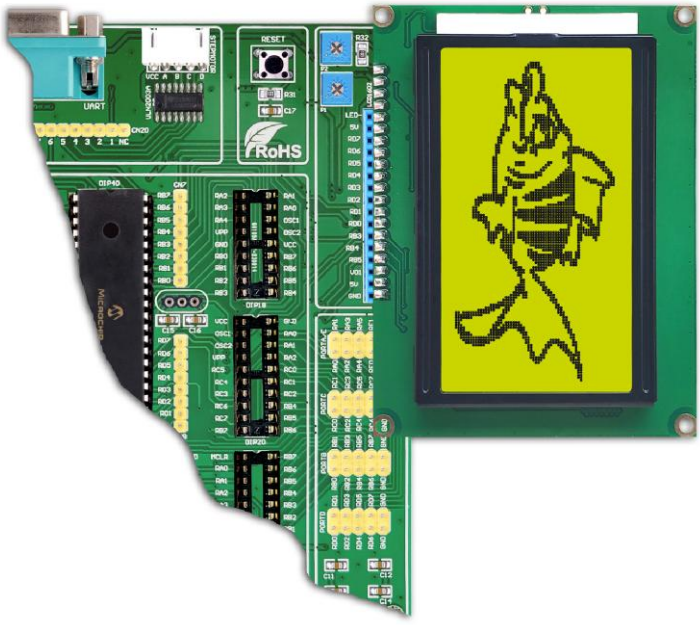


Figure 2-15: GLCD 128x64 installing direction

IMPORTANT:

Make sure to Place the LCD12864 in the right direction.

Make sure to turn off the power supply before placing LCD onto the board. Otherwise your display can be permanently damaged.

14)Input/Output Group

One of the most distinctive features of **PIC-EK** are its Input/Output PORT groups. It makes development easier, and the entire **PIC-EK** cleaner and well organized. We have also provided an additional Input/Output PORT headers on the right side of the board, so you can access any pin you want from both sides of the board.

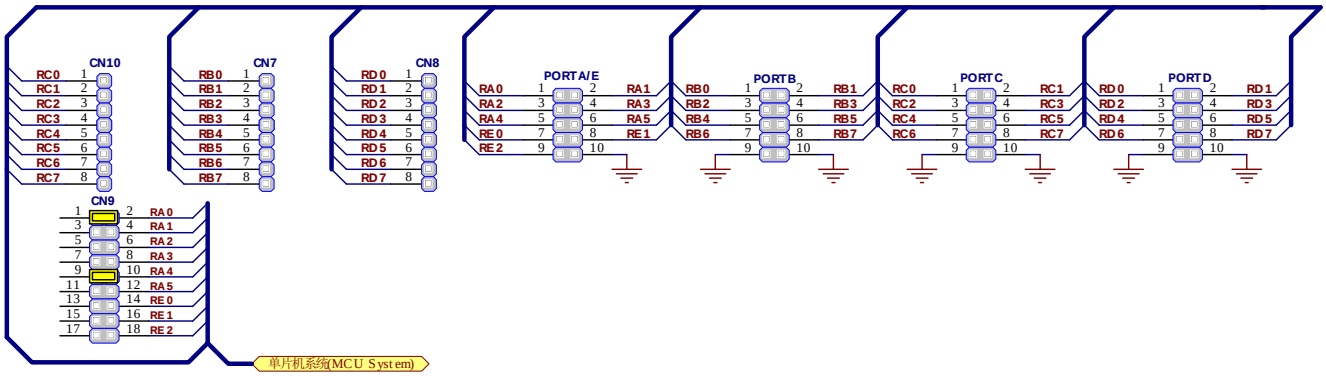


Figure 2-16: Input/Output Group

15)Power Supply Header for DIY

PIC-EK provides three headers (**GND**,**3.3V** and **5.0V**) for your prototype DIY.

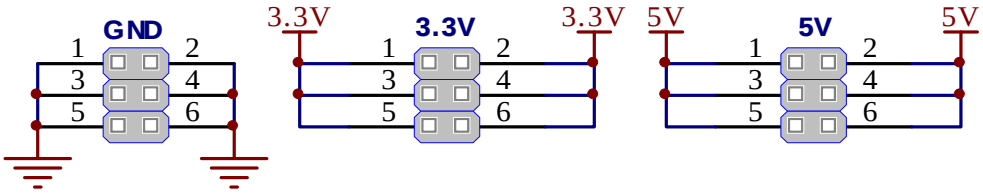


Figure 2-17: Power Supply Header for DIY

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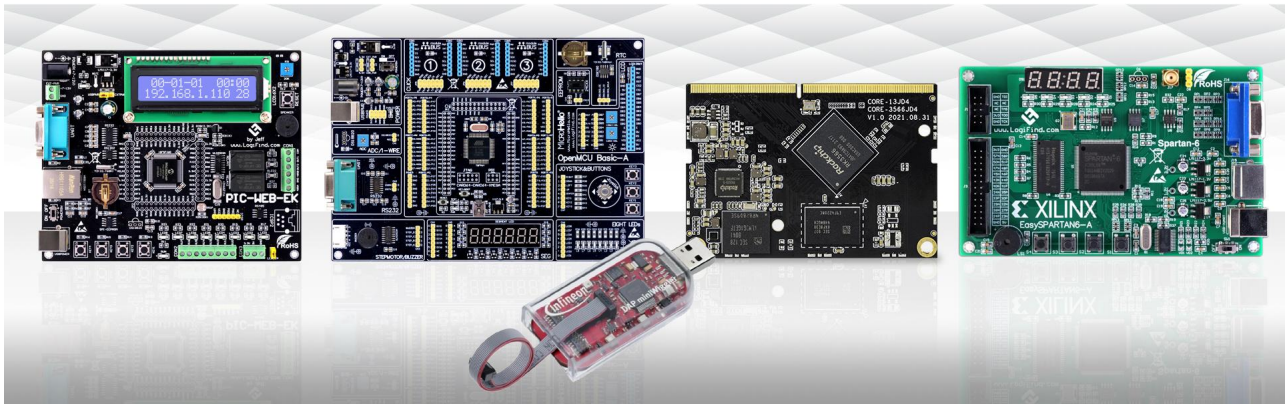
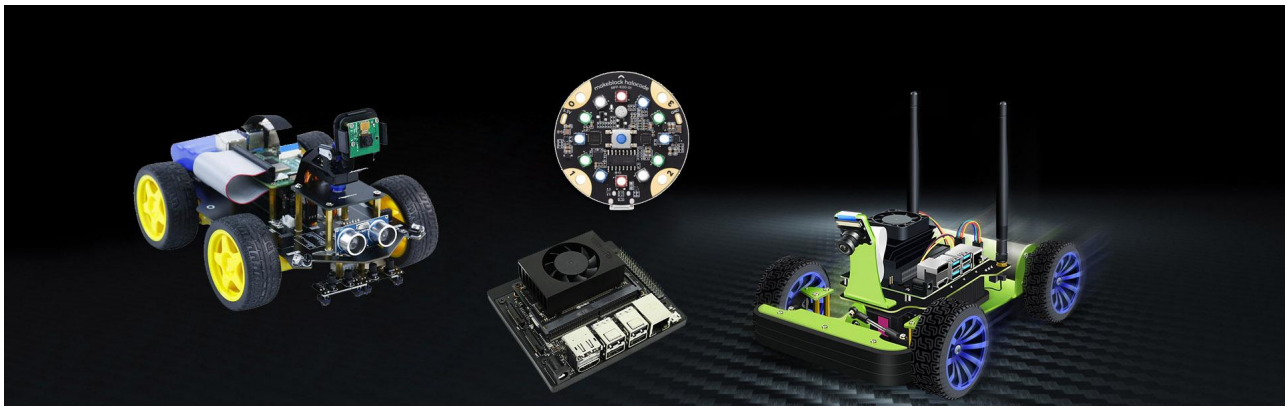
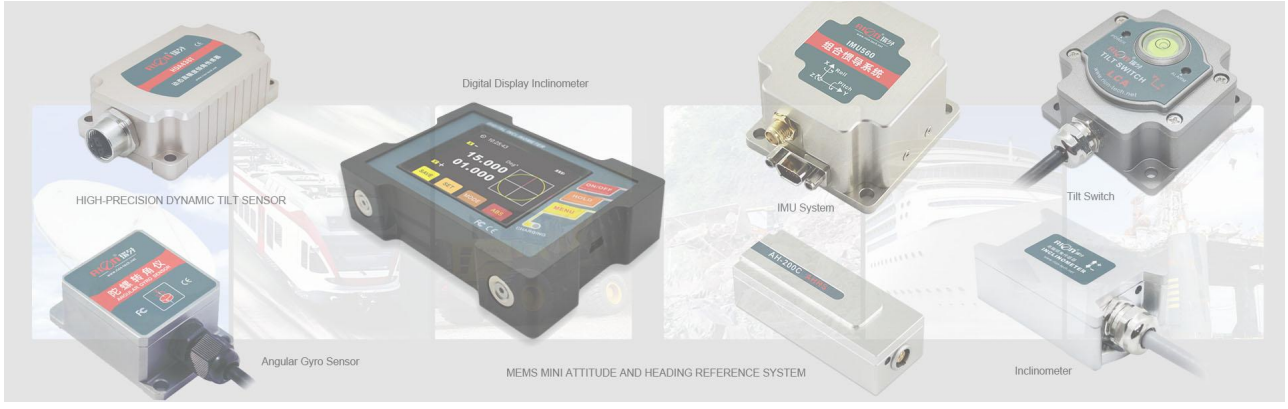
1. FPGA/CPLD/MCU Development Tools: Raspberry Pi; Arduino; MCU development boards and Programmers/debuggers of FPGA/CPLD, AVR, PIC, PIC32, PIC24, dsPIC, MSP430, NXP, C8051F, 51, STM32, STM8, LPC and ESP32.



2.AI and Robots: Jetson AI development board,AI camera,AI Robot,MCU Robot, Raspberry Robot, Arduino Robot, Robot/AI accessories.



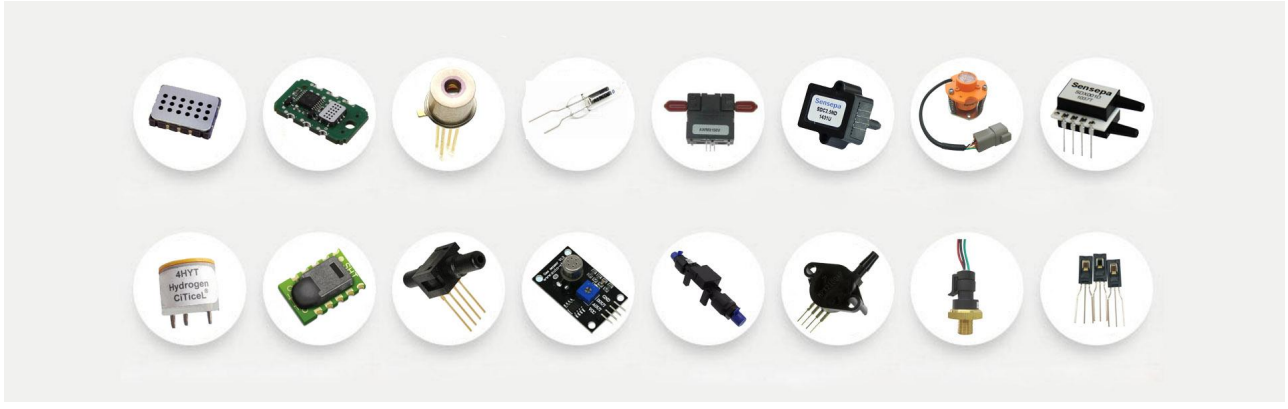
3. Attitude Solutions: Inclinometer，Dynamic Inclinometer，Tilt Switch，Dynamic Tilt Switch，Digital Compass，Accelerometer，Digital Display Inclinometer，GYRO，AHRS，North Finder，Inertial Navigation System，Photovoltaic Tilt Sensor.



4. CAN Bus Series: CAN Analyzer, USBCAN-OBD, Ethernet/Modbus TCP/Modbus RTU/WIFI to CAN, CANopen to UART, CANopen slave/master Converter, Programmable Smart Gateway Series, CANopen IO Coupler, Modbus IO Coupler.

5. Displays: Character LCD display, Graphic LCD display, Color LCD display(TFT), Segment LCD display, Segment LED display, Black & White ePaper, Multi-Color ePaper, Full Color ePaper.

6. Sensors and Sensor Modules: Pressure/Force Sensor,Distance Measuring Sensor, Acceleration Sensor, Micro Flow/Air Flow Sensor, Dust Sensor, Temperature and Humidity Sensor, Transmissive Sensor, Hall-effect Rotary Position Sensor, Air Quality Sensor,Gas sensor(for CO2，CH4，O2，NH3，H2S，NO2，O3，SO2，CL2，HCL，HF，PH3，ETO，H2，HCHO，C2H5OH，C3H8，NO，CLO2，HCN or CH3SH，etc.)



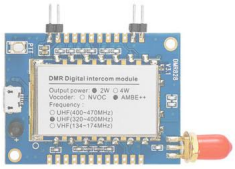
7. Wireless Modules: RF Module，LoRa Module，FSK Front-End RF Module，Sensor Acquisition

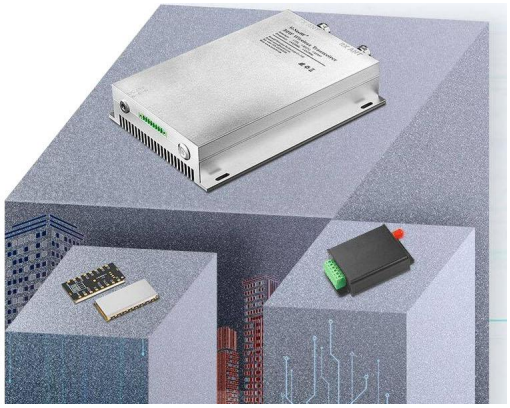
Gateway and Node，Data Transceiver Module，Walkie Talkie Module，Wireless Switch Module，Wireless Audio Module，GPS Module，SDR，LoRaWan Gateways and Nodes，ASK & Superheterodyne Module.


LoRa module


Wireless Data Transceiver Module


Wireless Switch Module


Digital Walkie Talkie Module



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