VK7012 USB high-speed 16-bit data acquisition card

VK7012 USB high-speed 16-bit data acquisition card

——Precision Accurate Speed Reliable

Description

VK7012 is a USB high speed data acquisition card, with 4-channel true differential input, 16-bit resolution, maximum sampling rate of 40KSPS, precision pre-gain amplification,USB photoelectric isolation features.The product adopts a number of high-precision 16-bit ADC units and the pre-differential amplifier module developed by the company over the years, so that the product has the advantages of high speed, high resolution, high precision, ultra-low noise, high suppression ratio, wide measuring range and low temperature bleaching. It is suitable for various occasions of precise and high-speed acquisition.

VK7012 acquisition card adopts all-metal shield, which can be used in industrial occasions with strong interference, and has the advantages of moisture-proof, shockproof and anti-interference.

characteristic

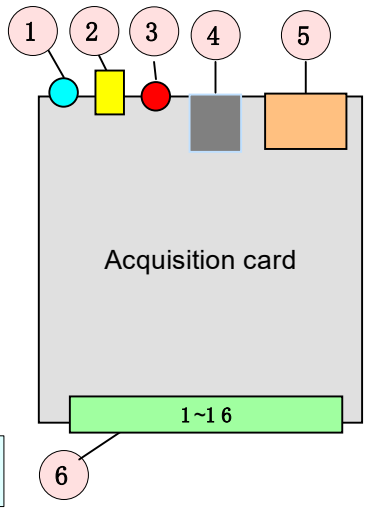
- High precision,high resolution: 16-bit resolution
- Ultra-low noise pre-differential amplification:Minimum measurement 0.1uV
- High rate synchronous acquisition: Single channel maximum 10kSPS(10k points per second), 40KSPS at 4 channels
- input range: 0 ~ ± 10V
- Counting/frequency measurement : Counting or frequency measurement
- Integrate 2-channel PWM output:16 bit adjustable PWM
- Integrate 1 channel DAC output :0 ~ 3.3 V analog
- USB photoelectric isolation: Electrical isolation
- Metal shield housing: Strong anti-interference ability

Application

- Weak signal measurement and collection
- High impedance differential signal measurement
- High resolution signal measurement
- Multi-card networking data acquisition

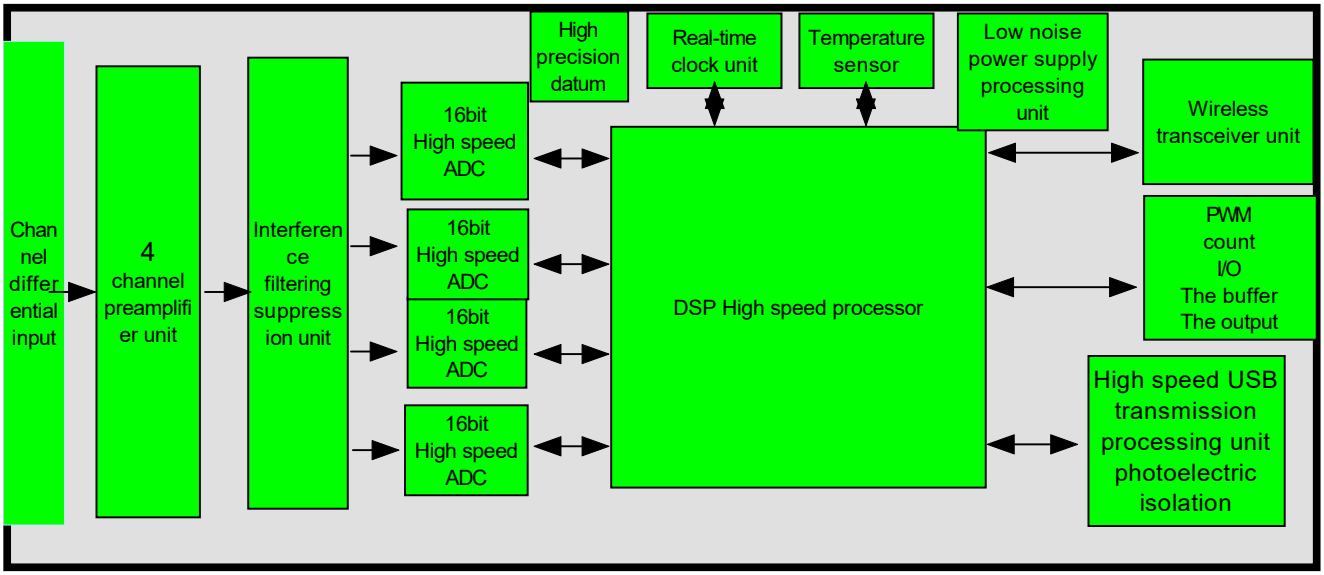
Acquisition card port diagram:

1. Acquisition status indicator light
2. Wireless Acquisition transmitting antenna (wireless version reserved)
3. USB connection indicator light
4. USB port
5. Extend the application selection terminal
6. Input and output interface, function table as shown in the figure.



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
+5V	P0.1 Aout	P0.2 PWM	P0.3 PWM	P0.4 CNT	DGND	+ Ain4 -		AGND	+ Ain3 -		AGND	+ Ain2 -		+ Ain1 -	

The system block diagram



Port functions

port number	name	function	note
1	**+5V**	• Digital power supply 5V, for digital power supply, can provide load current up to 50mA.	
2	**P0.1/ Aout**	• P0.1—— Configured as a digital input/output port • AOUT——Configured as an analog output port, it can output 0~3.3V	Function 2 choose 1
3	**P0.2/ PWM1**	• P0.2——Configured as a digital input/output port • PWM1——Configured as A PWM output port	Function 2 choose 1
4	**P0.3/ PWM2**	• P0.3——Configured as a digital input/output port • PWM2——Configured as A PWM output port	Function 2 choose 1
5	**P0.4/ CNT**	• P0.4——Configured as a digital input/output port • CNT——Configured as a counter/frequency meter input port • ExTriAcq——Configured to trigger acquisition IO externally (falling edge valid)	Function 3 choose 1
6	**DGND**	Digital earth	
7	**Ain4+**	Analog input positive input terminal - channel 4	If the ground wire is connected to the digital terminal during the analog terminal acquisition, digital interference may be introduced to reduce the acquisition accuracy.
8	**Ain4-**	Analog input negative input terminal - channel 4	
9	**AGND**	Analog ground	
10	**Ain3+**	Analog input positive input terminal - channel 3	
11	**Ain3-**	Analog input negative input terminal - channel 3	
12	**AGND**	Analog ground	
13	**Ain2+**	Analog input positive input terminal - channel 2	
14	**Ain2-**	Analog input negative input terminal - channel 2	
15	**Ain1+**	Analog input positive input terminal - channel 1	
16	**Ain1-**	Analog input negative input terminal - channel 1	

VK7012 USB high-speed 16-bit data acquisition card

VK7012 USB high-speed precision data acquisition card

Integrated electrical parameters

Project	Unit	Typical	Range
USB supply voltage:	V	5	4.5~5.5
USB power current:	mA	50	30~100
ADC analog port input voltage	V		+-10
Digital port input VL low level	V	0	-0.3~1
Digital port input VH high level	V	3.3	2~5.5
Digital port output voltage	V	3.3	3.2~3.4
Digital port output drive current (high current output)	mA	10	
Digital port input absorption current (5V input voltage)	uA	170	
Digital port (P0.4) triggers acquisition		Drop edge trigger	
ADC maximum sampling rate	kps		100
Minimum resolution voltage (input range selected -1mV~+1mV)	uV		0.1
Aout output voltage	V		0~3.3
PWM output frequency (P0.2/PWM1, P0.3/PWM2 ports)	Hz		0~100k
PWM duty ratio (P0.2/PWM1, P0.3/PWM2 ports)	%		0~100
Counter input maximum frequency (P0.4/CNT port)	Hz		100K
The counter enters the maximum value		2 ^ 64 joules	
Working temperature:	c		-20~ 85
Storage temperature	c		-40~ 105
Physical size (length, width and height)	mm	110*82*24	Connector length is not included.

Use absolute maximum values safely

Project	Unit		
USB supply voltage:	V	-1~+6	***Exceeding the absolute maximum may damage the device and cause irreparable damage.**
ADC analog port	V	+-200（There are protective circuits inside.)	
Digital ports	V	+-200（There are protective circuits inside.)	
DAC output port	V	-1~+6	
All Port Electrostatic Input (ESD)	V	2000	

ADC analog conversion unit

VK7012 USB high-speed 16-bit data acquisition card

ADC detailed electrical parameters

Item	Unit	Typical	Note
Differential input common mode rejection ratio(CMRR)	dB	130	
Input bias current	nA	1	
Input bias voltage	uv	10	
Input equivalent voltage noise	nVp-p	200	When the input range is + - 10V, the maximum value is 400
Input equivalent current noise	pAp-p	1	The maximum value is 2
Equivalent input capacitance	pF	400	
Input resistance	GΩ	1	
Maximum temperature drift of amplification unit	ppm/°C	6	

Input range vs noise

Program set	Corresponding measurement range	Background noise	NOTE
0	-10V~+10V	0.3mV	ADC background noise is white noise, which will be superimposed on the measurement results (*note 2)
1	-5V~+5V	0.1mV	
2	-2.5V~+2.5V	60uV	
3	-1V~+1V	25uV	
4	-500mV~+500mV	15uV	
5	-100mV~+100mV	6.5uV	
6	-20mV~+20mV	6uV	
7	-1mV~+1mV	5uV	

Sample rate vs effective resolution

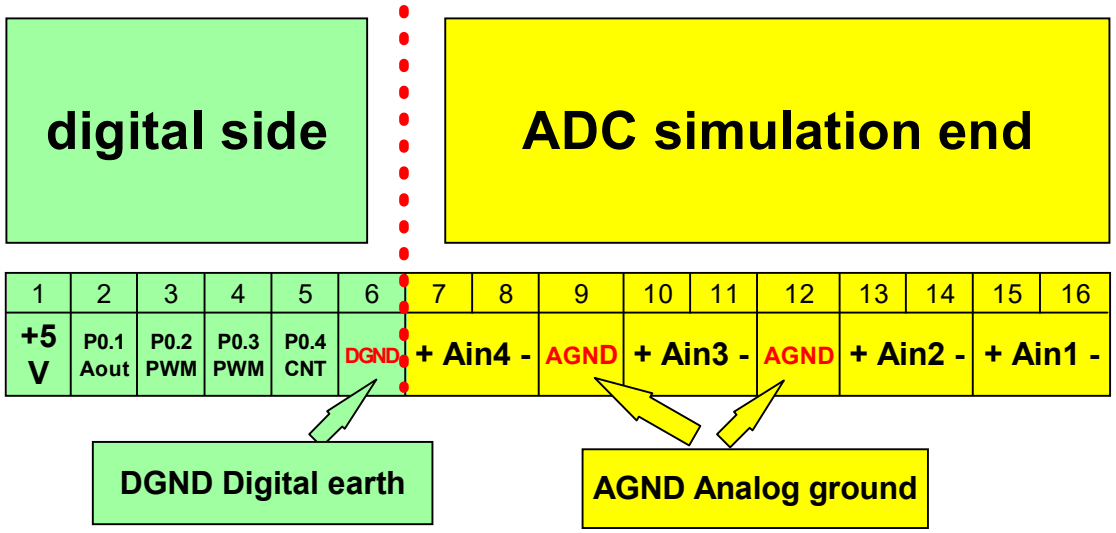
sampling rate	Effective resolution (*note 1)	Note
1 ~ 4Ksps	21bit	
4K~10Ksps	20bit	When the sampling rate is high, the greater the noise of ADC and surrounding internal devices, so as to reduce the effective resolution(*note2)

note 1: The effective resolution is all ADC characteristics
note 2: For signal acquisition, the background noise of ADC and the effective resolution corresponding to the sampling rate shall be considered at the same time

Precautions for Use

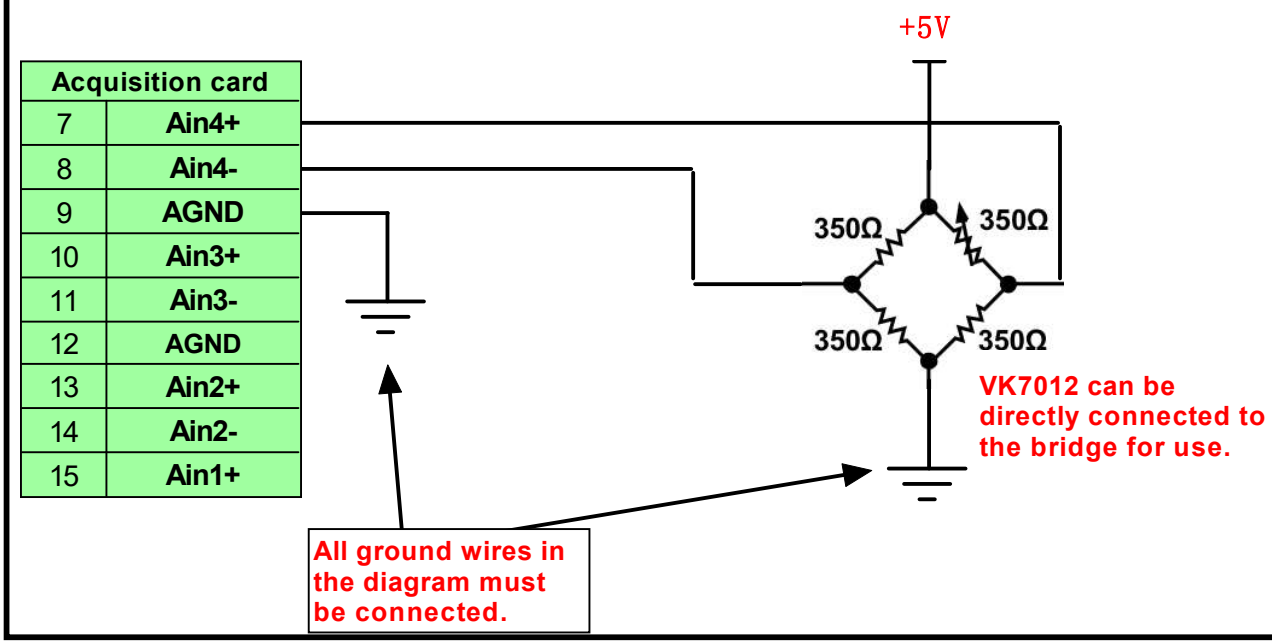
The ground wire is divided into digital ground and analog ground.

Input ports 1~6 are digital terminals (including Aout output), and 7~16 are analog ports.
When in use, digital input and AOUT output should be used in conjunction with digital ground (DGND), while ADC acquisition terminal should be used in conjunction with analog ground (AGND), so as to avoid digital interference of digital input to analog input.



Differential mode of ADC input

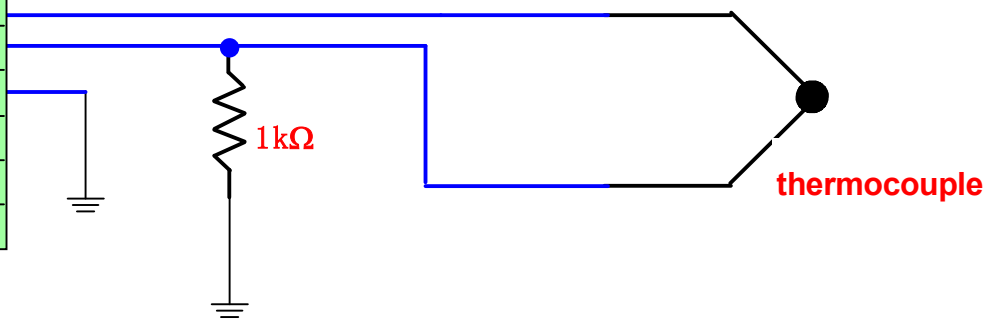
Differential mode is the least noise input mode, which can effectively suppress all kinds of common mode interference.But care must be taken to provide the correct input loop to the input end.The correct common ground is the first step in ensuring the input loop.



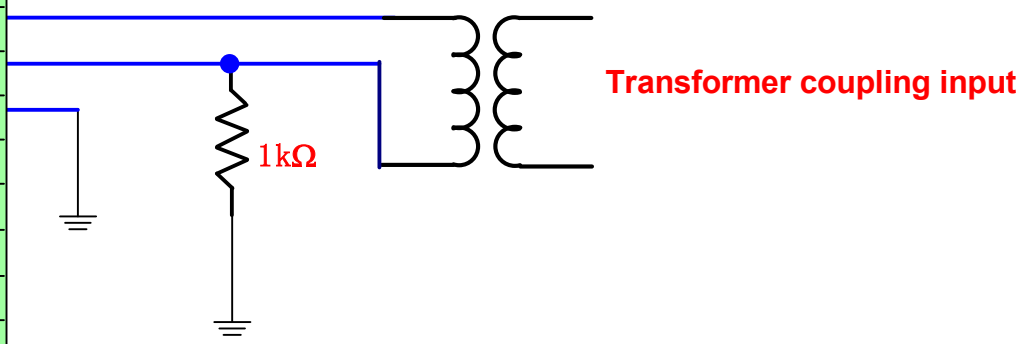
Differential mode of ADC input

If there is no common ground on the input side, you can create the input return path as follows.

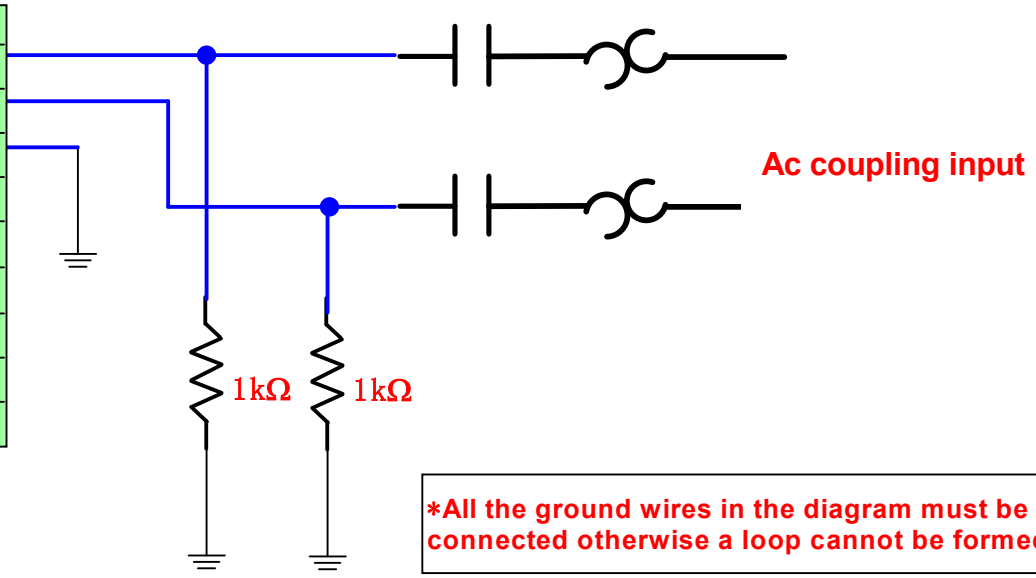
Acquisition card	
7	Ain4+
8	Ain4-
9	AGND
10	Ain3+
11	Ain3-
12	AGND
13	Ain2+
14	Ain2-
15	Ain1+



Acquisition card	
7	Ain4+
8	Ain4-
9	AGND
10	Ain3+
11	Ain3-
12	AGND
13	Ain2+
14	Ain2-
15	Ain1+



Acquisition card	
7	Ain4+
8	Ain4-
9	AGND
10	Ain3+
11	Ain3-
12	AGND
13	Ain2+
14	Ain2-
15	Ain1+

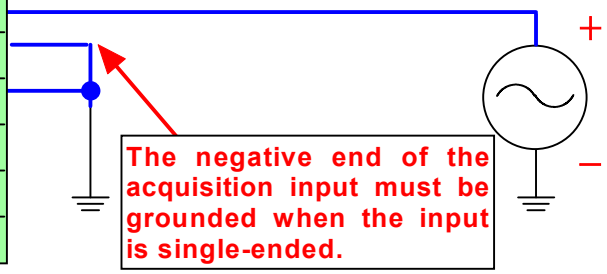


*All the ground wires in the diagram must be connected otherwise a loop cannot be formed.

Application of single-ended input to ADC input

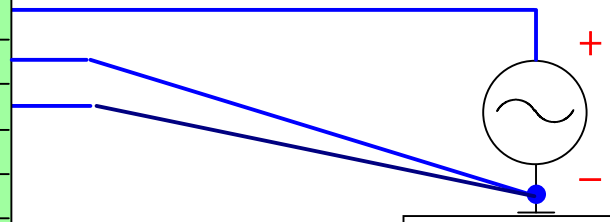
When the input is single, the negative end of the differential input must be grounded.
When the acquisition card is used to collect non-differential signals, it can also give full play to the performance of high suppression ratio and eliminate the noise caused by ground wire.

Acquisition card	
7	Ain4+
8	Ain4-
9	AGND
10	Ain3+
11	Ain3-
12	AGND
13	Ain2+
14	Ain2-
15	Ain1+



Better connection

Acquisition card	
7	Ain4+
8	Ain4-
9	AGND
10	Ain3+
11	Ain3-
12	AGND
13	Ain2+
14	Ain2-
15	Ain1+

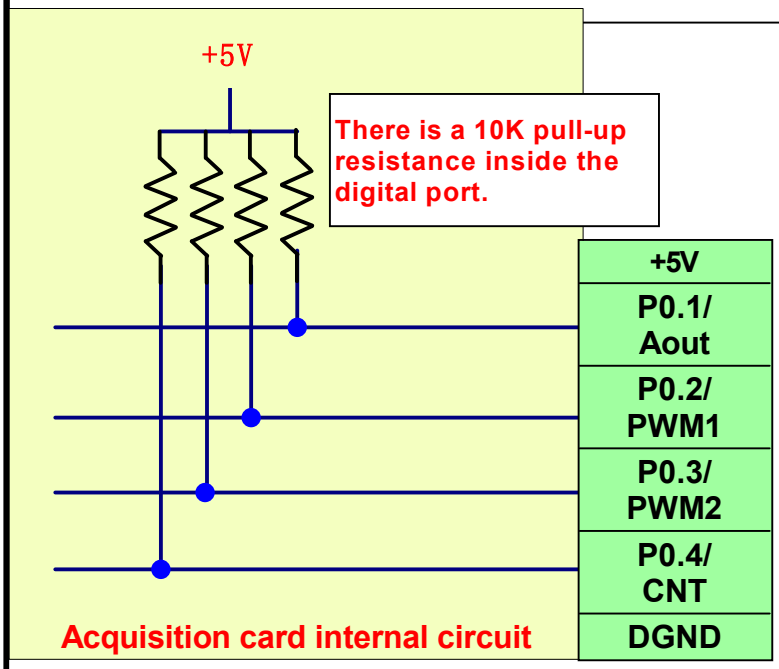


The negative end is connected to the remote input ground end, which can suppress the noise introduced by the ground circuit.

*All the ground wires in the diagram must be connected otherwise a loop cannot be formed.

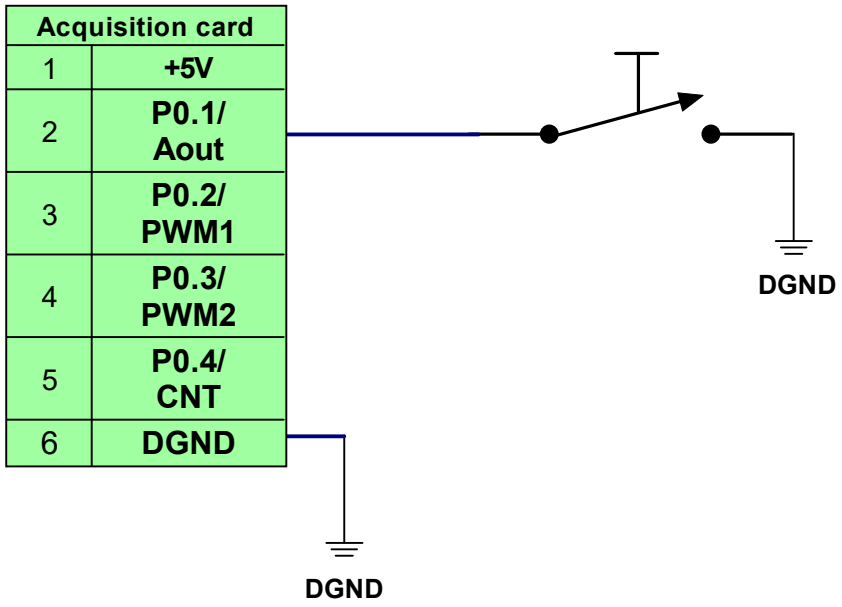
Digital port as input application

When the acquisition card is used as input, its internal pull-up resistance can be more convenient to use.



Key in to make

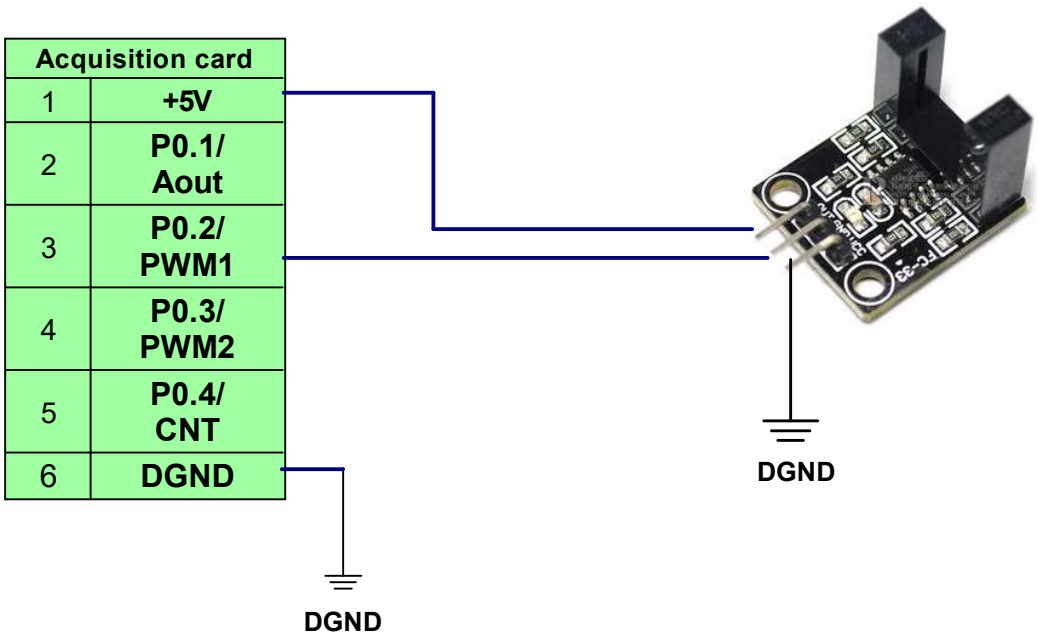
When the acquisition card is used as input, its internal pull-up resistance can be more convenient to use.



*All the ground wires in the diagram must be connected otherwise a loop cannot be formed.

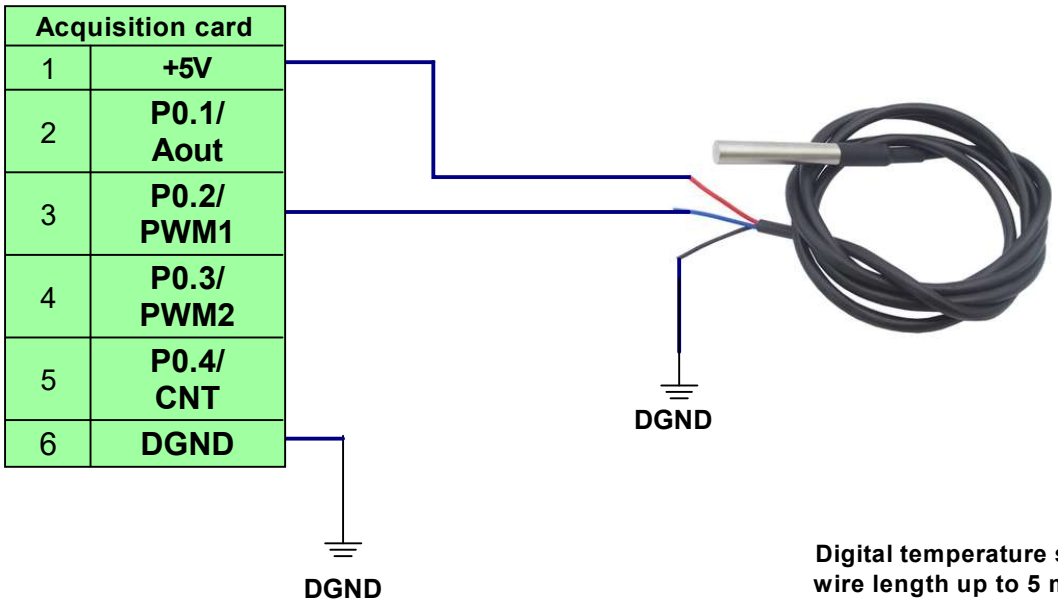
Use an internal 5V power supply to supply the sensor input

When the acquisition card is used as input, its internal pull-up resistance can be more convenient to use.



Any digital port can be connected to digital temperature sensor

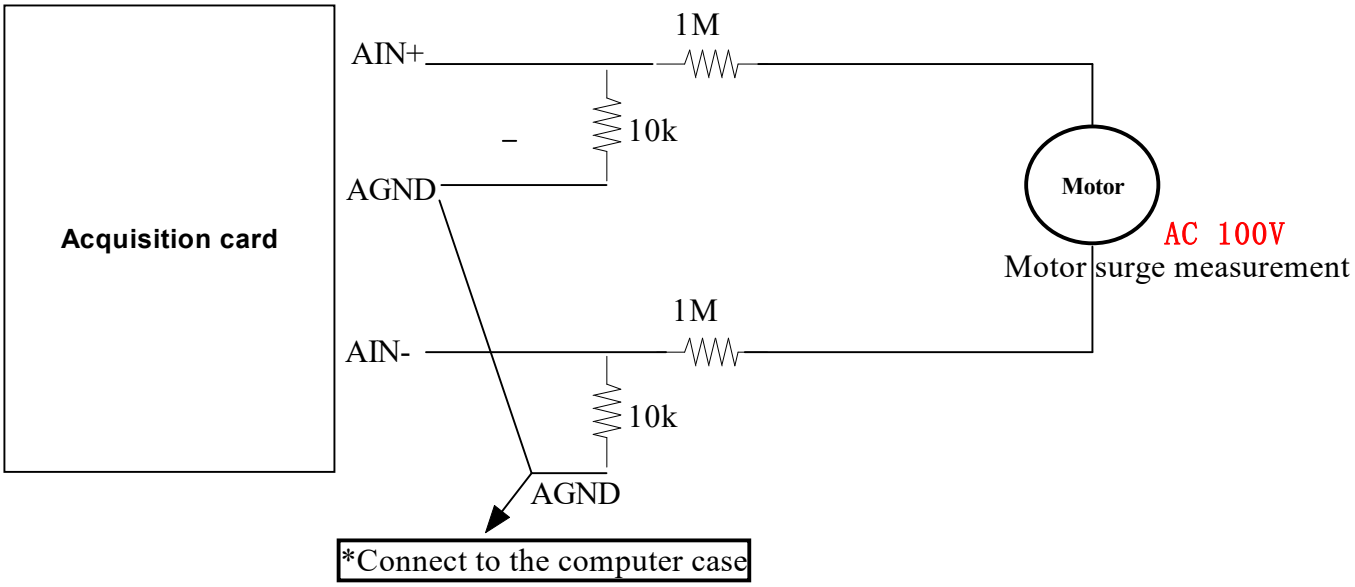
Any digital port of the acquisition card can be connected with 18B20 digital temperature sensor to directly read the temperature value.



Digital temperature sensor wire length up to 5 meters.

Strong interference signal measurement

When the input signal is strong and with interference, interference will cause USB communication disconnect.Measurements can be made in the following manner.
Method one,increase the input buffer resistance.

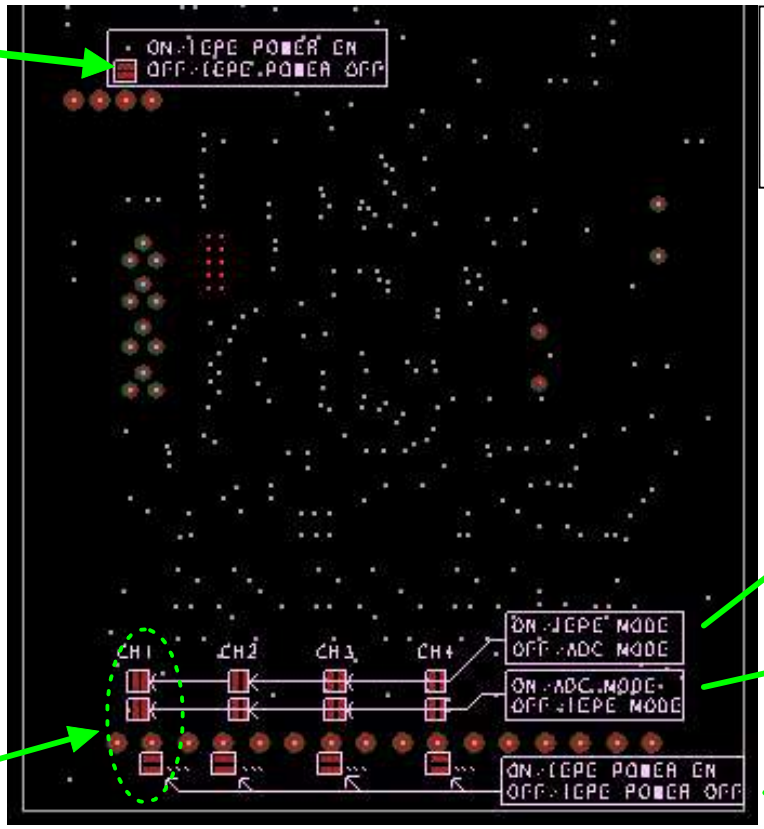


*The computer and the interference source share the ground, the interference signal does not pass through the USB cable, thus guarantees the communication stability.

Recommendations for industrial applications: USB acquisition card is not recommended for industrial applications, because USB bus is designed for easy portability, but is not suitable for strictly industrial applications, and is not suitable for long-term continuous acquisition applications.For industrial application, we suggest using LAN network mouth, which has the advantages of strong anti-interference ability and long-distance transmission control.

IEPE schema specification(Optional function)

This acquisition card is optional for IEPE function.The acquisition card with IEPE function will be integrated with 24V power supply unit, constant-current drive and The receiving unit, and the four channels can be separately set as ordinary ADC input or IEPE sensor access through the hardware jumper. Currently, the software selection mode is not supported.The hardware jumper setting function is as follows:



IEPE total power enable: power on for IEPE after short connection.

*To do this, disassemble the device housing and take out the PCB.Then modify the jumper with the tin spot.

After short connection, IEPE conduction.Open to ADC mode.

After short connection is ADC mode.Open for IEPE mode.

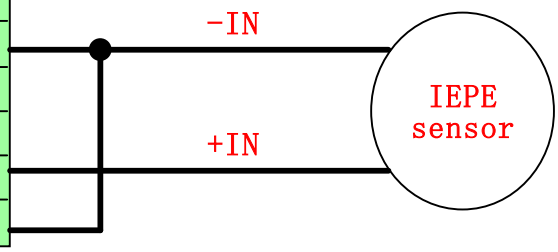
Corresponding to a channel

After short connection, IEPE conduction.Open to ADC mode.

The input port is connected to the IEPE sensor

When connected to IEPE sensor, AIN- and AGND are connected together as the negative end of input, and AIN+ as the positive end of input.

Acquisition card	
7	Ain4+
8	Ain4-
9	AGND
10	Ain3+
11	Ain3-
12	AGND
13	Ain2+
14	Ain2-
15	Ain1+
16	Ain1-



Power status indicator (beside USB interface)

Acquisition status indicator (red and blue two-in-one LED):
1. Red and blue LED lights are out: normal collection is under way.
2. Blue light flashing constantly: indicates the stopped state of sampling, waiting for new command to start sampling again, standby state.
3. The red light will flicker: if there is data overflow or data error during the collection process.
4. The red light is always on: it means the data cannot be sent out, or the USB fails.

VK7012 USB high-speed 16-bit data acquisition card

Physical dimension drawing