VK7022 USB data acquisition card

VK7022 USB 16-bit data acquisition card
——Precision Accurate Speed Reliable

Description

VK7022 is a USB high speed data acquisition card, featuring USB port photoelectric isolation, 8-channel true differential input, 16-bit resolution, maximum sampling rate of each channel 5KSPS, 8-channel 40Ksps, and precision pre-gain amplification.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.

VK7022 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 50uV
- High rate synchronous acquisition: Single channel maximum 5KSPS(5K points per second), 40Ksps at 8 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
- Metal shield housing: Strong anti-interference ability

Application

- USB data acquisition

- High resolution signal measurement

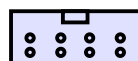- High resolution signal measurement

Acquisition card port diagram:

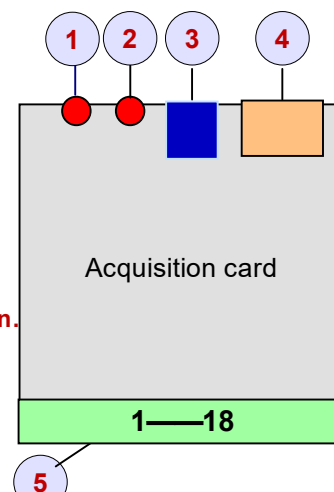| 1 | Status indicator light |
2	USB connection indicator light
3	USB port/power port
4	Digital IO port

See the next page for the following definition.

P0.4/CNT	P0.3/PWM	P0.2/PWM	P0.1/Aout
NC	3.3V	GND	VCC

| 5 | Analog input interface, function table as shown in the figure |

Acquisition card

1——18

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
- Ain8 +		- Ain7 +		AGND	- Ain6 +		- Ain5 +		- Ain4 +		- Ain3+		AGND	- Ain2 +		- Ain1 +	

The system block diagram

| Channel differential input | 8 channel preamplifier unit | Interference filtering suppression unit | 16bit High speed ADC | High precision datum | Real-time clock unit | Digital temperature sensor | Low noise power supply processing unit | DSP High speed processor | PWM count I/O The buffer The output | High speed USB transfer processing unit |

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Port functions

port number	name	function	note
	VCC	Digital power supply 5V, for digital power supply, can provide load current up to 50mA.	
	3.3V	Digital power supply 3.3V, for digital power supply, can provide load current up to 50mA.	
	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
	P0.2/ PWM1	● P0.2——Configured as a digital input/output port ● PWM1——Configured as A PWM output port	Function 2 choose 1
	P0.3/ PWM2	● P0.3——Configured as a digital input/output port ● PWM2——Configured as A PWM output port	Function 2 choose 1
	P0.4/ CNT	● P0.4——Configured as a digital input/output port ● CNT——Configured as a counter/frequency meter input port ● Ext Trig——Configure external trigger acquisition	Function 3 choose 1
	DGND	Digital earth	
1,3,6,8, 10,12, 15,17	**AinX+**	Analog input negative input terminal	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.
2,4,7,9, 11,13, 16,18	**AinX-**	Simulate the positive input terminal	
5,14	**AGND**	Analog ground	

The digital IO port leads to the definition behind the wire.

DR	P0.4	3.3V	P0.3	GND	P0.2	VCC	P0.1
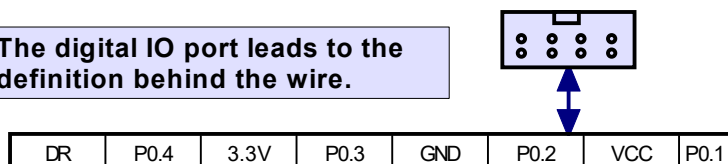
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Integrated electrical parameters

Item	Unit	Typical	Range
USB supply voltage:	V	5	4.5~5.5
USB power current:	mA	75	65~85
ADC analog port input voltage	V		+-10
ADC input resistance	KΩ	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	
ADC maximum sampling rate	ksps		50
Minimum resolution voltage (input range selected -1mV~+1mV)	uV		10
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		$2 \wedge 64$ 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

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	KΩ	10	
Maximum temperature drift of amplification unit	ppm/°C	6	

Input range vs noise

Program set	Corresponding measurement range	Background noise	NOTE
0	-10V~+10V	0.12mV(*Note 3)	ADC background noise is white noise, which will be superimposed on the measurement results (*note 2)
1	-5V~+5V	0.12mV(*Note 3)	
2	-2.5V~+2.5V	0.12mV(*Note 3)	
3	-1V~+1V	0.12mV(*Note 3)	
4	-500mV~+500mV	0.12mV(*Note 3)	

Sample rate vs effective resolution

sampling rate	Effective resolution (*note 1)	Note
1 ~ 5Ksps	16bit	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

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Precautions for Use

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

The port on the USB power side is the digital terminal (including Aout output).On the other side is the analog input port.

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.

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DGND Digital earth

VCC	DGND	3.3V	DR
P0.1/Aout	P0.2/PWM	P0.3/PWM	P0.4/CNT

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
- Ain8 +		- Ain7 +		AGND	- Ain6 +		- Ain5 +		- Ain4 +		- Ain3+		AGND	- Ain2 +		- Ain1 +	

AGND Analog ground

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.

+5V

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

350Ω 350Ω

350Ω 350Ω

VK7022 can be directly connected to the bridge for use.

All ground wires in the diagram must be connected.

There is no precision amplification unit inside the 702 type. If precision measurement bridge is required, 701 or 702H is recommended
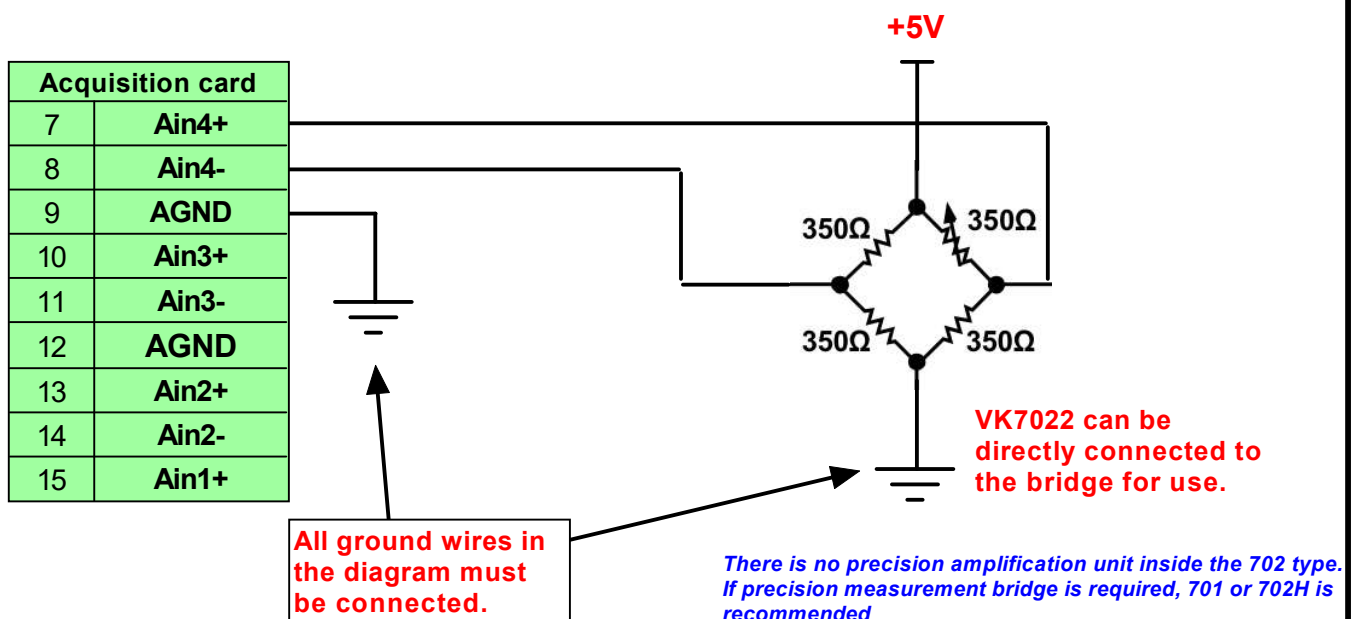
Differential mode of ADC input

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+

1kΩ

thermocouple

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

1kΩ

Transformer coupling input

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

Ac coupling input

1kΩ   1kΩ
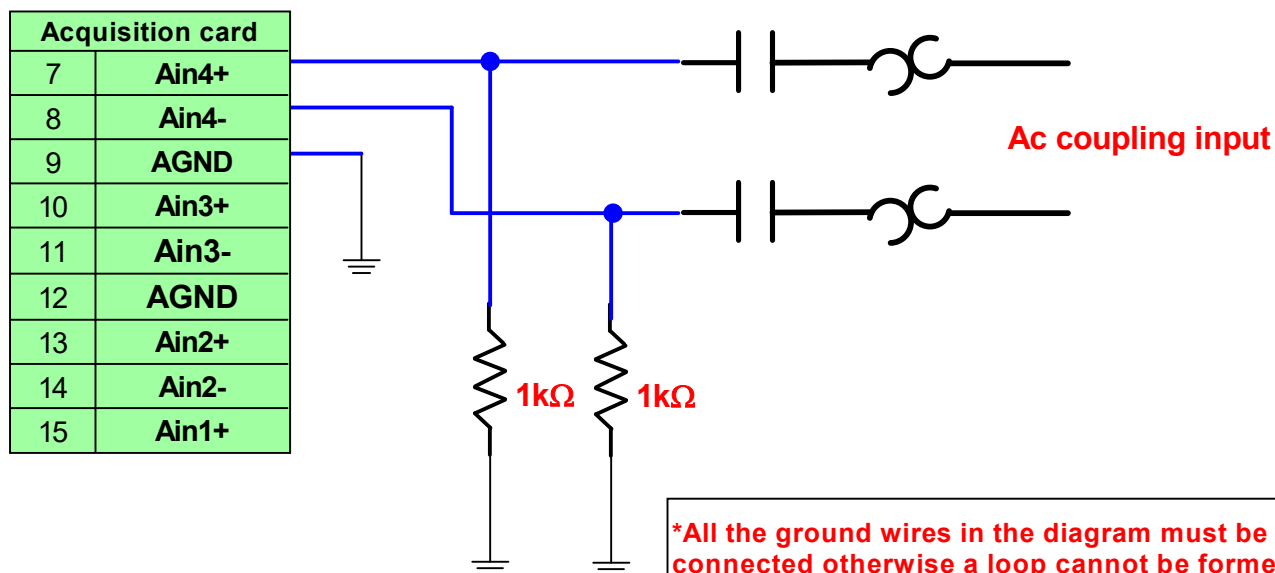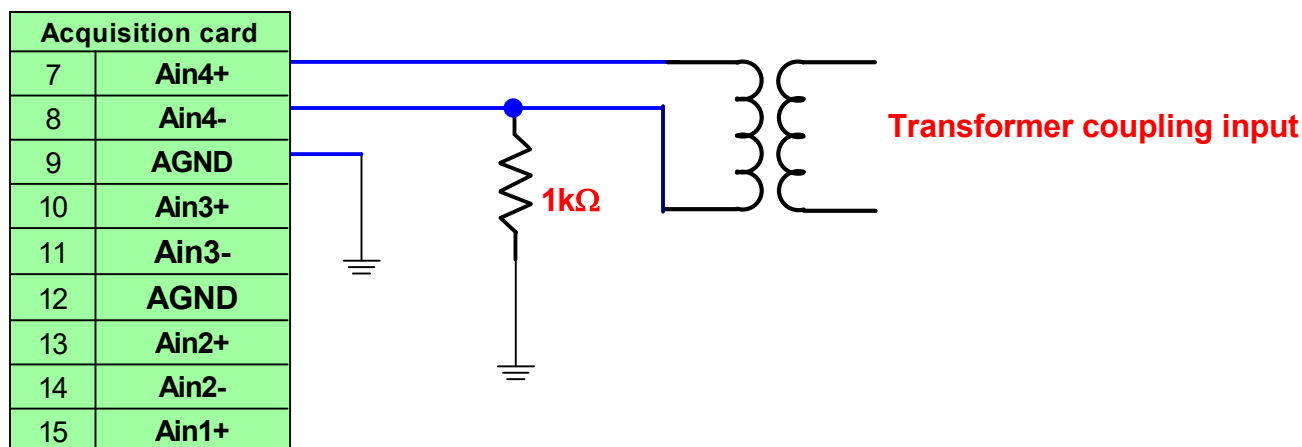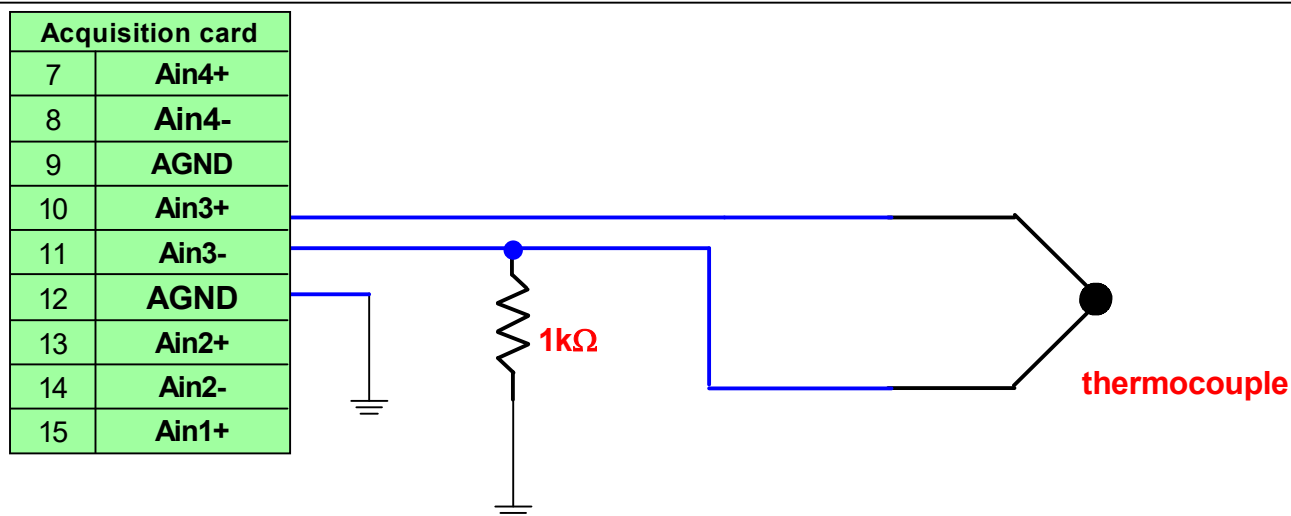
*All the ground wires in the diagram must be connected otherwise a loop cannot be formed.

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.

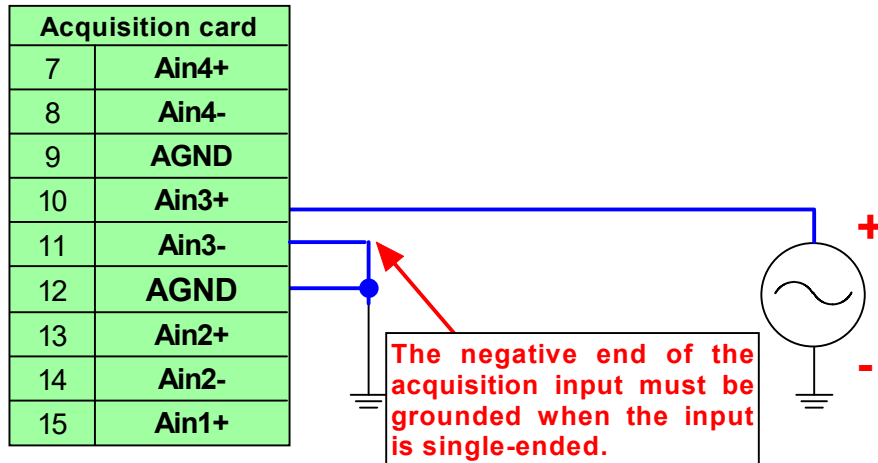| Acquisition card	
7	Ain4+
8	Ain4-
9	AGND
10	Ain3+
11	Ain3-
12	AGND
13	Ain2+
14	Ain2-
15	Ain1+

+

-

The negative end of the acquisition input must be grounded when the input is single-ended.

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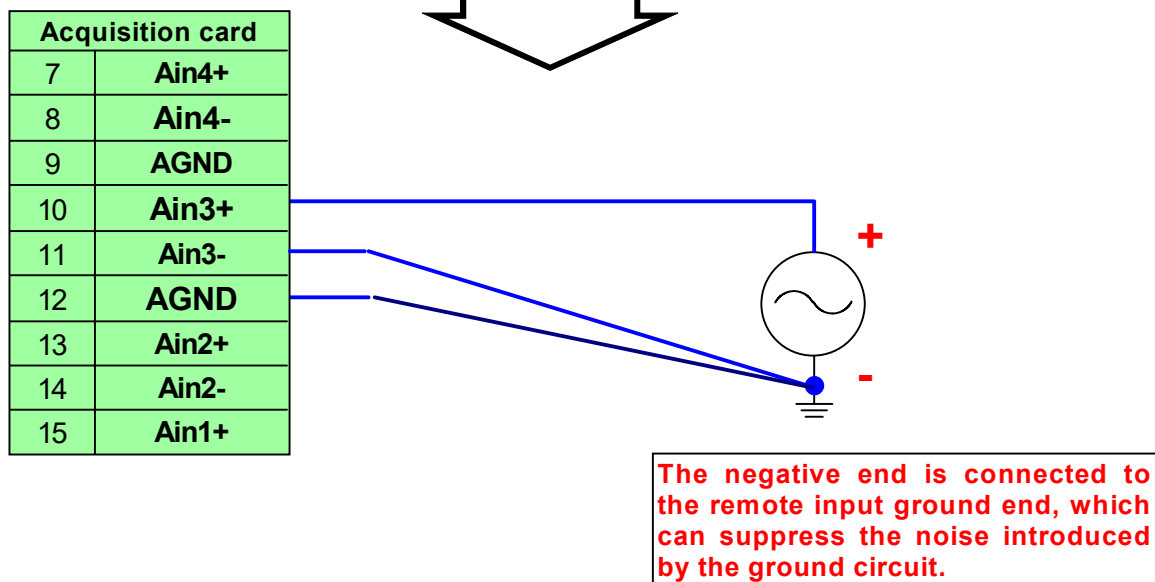
*All the ground wires in the diagram must be connected otherwise a loop cannot be formed.

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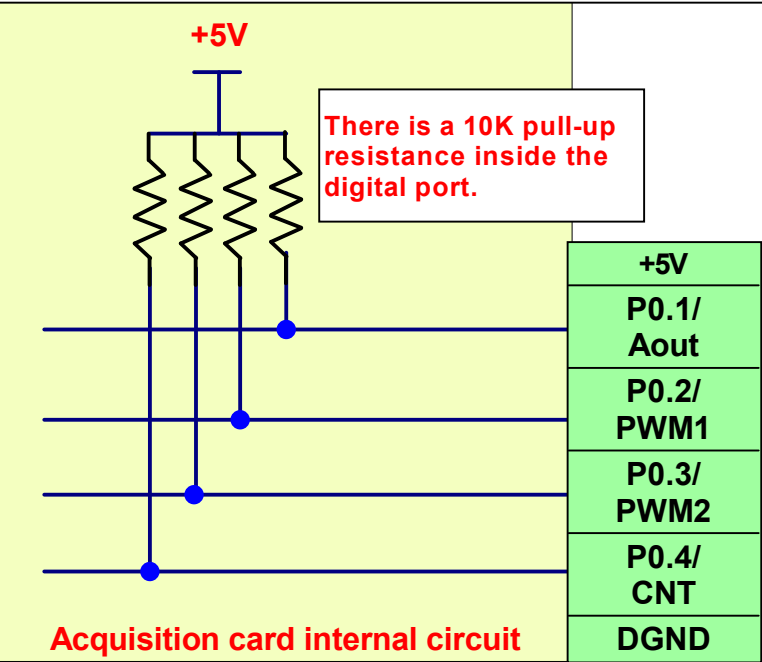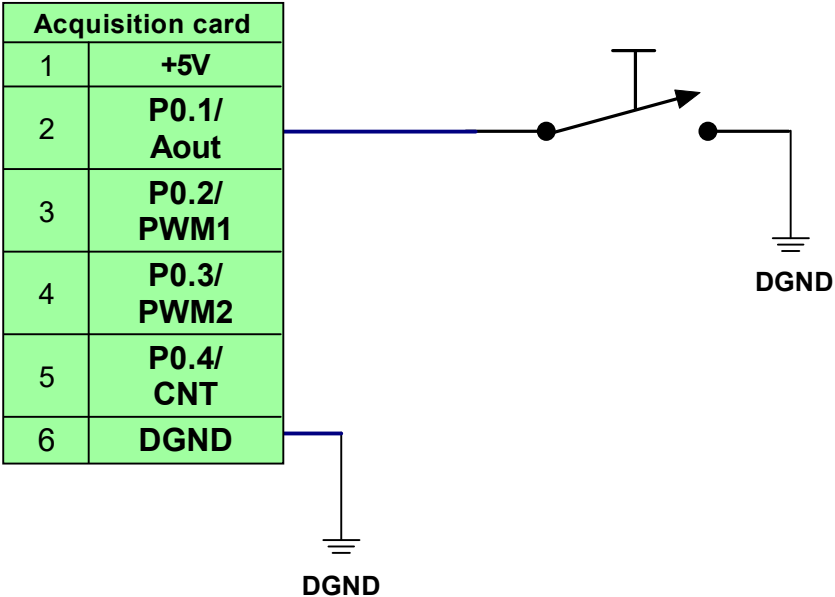
When the acquisition card is used as input, its internal pull-up resistance can be more convenient to use.

+5V

There is a 10K pull-up resistance inside the digital port.

+5V	
P0.1/ Aout	
P0.2/ PWM1	
P0.3/ PWM2	
P0.4/ CNT	
DGND	

Acquisition card internal circuit

Key in to make

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

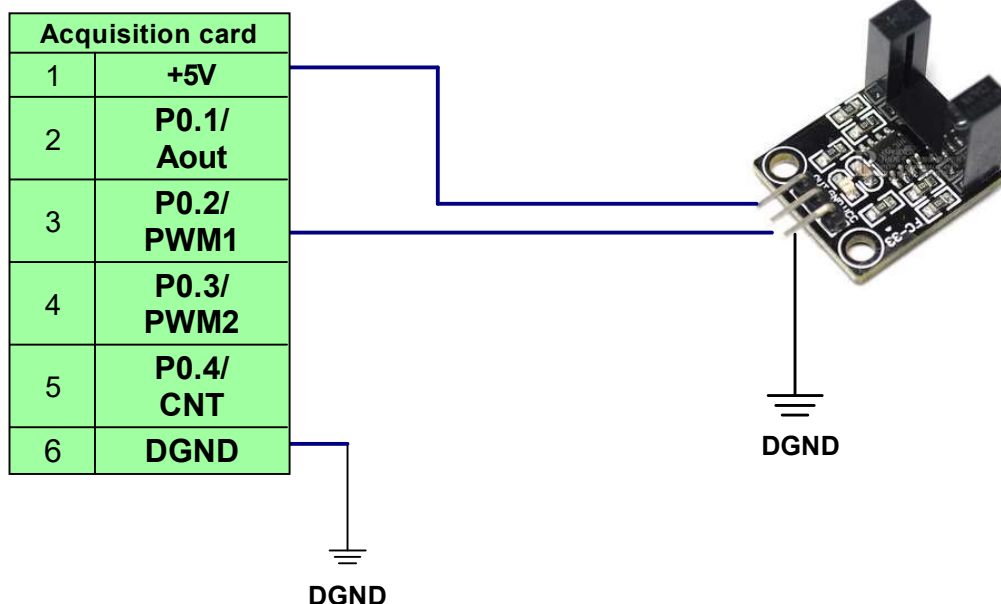| Acquisition card	
1	**+5V**
2	**P0.1/ Aout**
3	**P0.2/ PWM1**
4	**P0.3/ PWM2**
5	**P0.4/ CNT**
6	**DGND**

DGND

DGND

*All the ground wires in the diagram must be connected otherwise a loop cannot be formed.
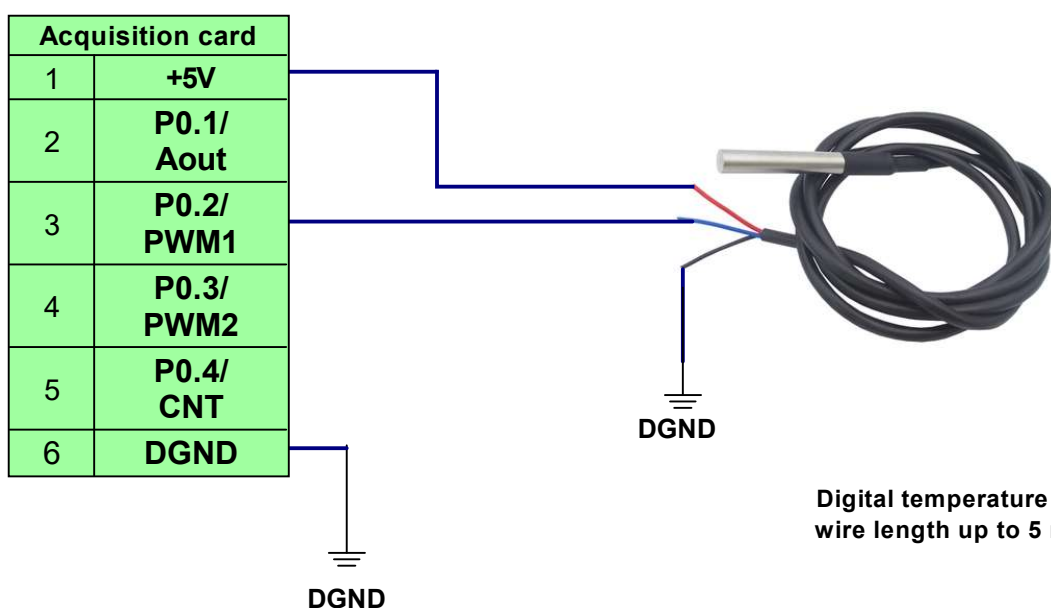
Use an internal 5V power supply to supply the sensor input

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

Acquisition card	
1	**+5V**
2	**P0.1/ Aout**
3	**P0.2/ PWM1**
4	**P0.3/ PWM2**
5	**P0.4/ CNT**
6	**DGND**

DGND

DGND

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.

Acquisition card	
1	**+5V**
2	**P0.1/ Aout**
3	**P0.2/ PWM1**
4	**P0.3/ PWM2**
5	**P0.4/ CNT**
6	**DGND**

DGND

DGND

Digital temperature sensor wire length up to 5 meters.

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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.

VK7022 USB data acquisition card

121mm

112mm

80,8mm

9mm

Front view

24,2mm

24,2mm

80,8mm

80,8mm

Left

Right

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