



Grove - Optical Rotary Encoder(TCUT1600X01)

The Grove - Optical Rotary Encoder(TCUT1600X01) is a transmissive sensor that includes an infrared emitter and two phototransistor detectors. Usually, the infrared emitter emits infrared rays, the phototransistor detectors receives the infrared rays, then the phototransistor is turned on, both of the output is High, the on-board LED indicators light up. When there is an obstacle blocking, the phototransistor can not receive the infrared rays, so the phototransistor will be turned off and both of the output will be Low, the on-board LED indicators fade away.

You can use this sensor as a rotary encoder to detect the speed or rotation, and thanks to the two phototransistor detectors, you even can detect the rotation direction.

Features

- Double phototransistor detectors, can determine the direction of rotation
- On-board LED indicators
- Grove Interface

Specification

Item	Value
Operating voltage	3.3V / 5V
Operating temperature	-40°C to +105°C
Storage temperature Range	-40°C to +125°C
Emitter wavelength	950 nm
Gap	3 mm
Interface	Digital

Applications

- Automotive optical sensors
- Accurate position sensor for encoder
- Sensor for motion, speed, and direction
- Sensor for "turn and push" encoding

Hardware Overview

Pin Map



SIG1: default High, output of channel 1, which connect to phototransistor detector 1

Schemaitc

Power



The typical voltage of TCUT1600X01 is 5V, so we use the MP3120 current mode stepup converter to provide a stable 5V. The input of MP3120 ranges from 0.8V to 5V, so you can use this module with your Arduino both in 3.3V and 5V.



When the phototransistor detectors receive the infrared signal, the output should be High, and when the obstacle blocks the infrared, the OUT1 and OUIT2 should be Low. However due to the leakage current, it won't be 0V. The leakage voltage varies with the input voltage.

Mechanical Drawing





Directional Detection



Тір

Thanks to the two phototransistor detectors, we can detect the moving direction. If the obstacle moves from the left to right, The output states change should be $11 \rightarrow 01 \rightarrow 00 \rightarrow 10$; in the same way, if the obstacle moves from the right to left, it should be $11 \rightarrow 10 \rightarrow 00 \rightarrow 01$.

Platforms Supported

Arduino	Raspberry Pi	BeagleBone	Wio	LinkIt ONE
$\bigcirc \bigcirc$	B			

Caution

The platforms mentioned above as supported is/are an indication of the module's hardware or theoritical compatibility. We only provide software library or code examples for Arduino platform in most cases. It is not possible to provide software library / demo code for all possible MCU platforms. Hence, users have to write their own software library.

Getting Started

Play With Arduino

Hardware

Materials required

Seeeduino V4.2	Base Shield	Grove - Optical Rotary Encoder
	- HILL	A DE

Note

1 Please plug the USB cable gently, otherwise you may damage the port. Please use the USB cable with 4 wires inside, the 2 wires cable can't transfer data. If you are not sure about the wire you have, you can click here to buy

2 Each Grove module comes with a Grove cable when you buy. In case you lose the Grove cable, you can click here to buy.

- Step 1. Connect the Grove Optical Rotary Encoder to the D5 port of the Base Shield.
- Step 2. Plug Grove Base Shield into Seeeduino.
- Step 3. Connect Seeeduino to PC via a USB cable.



Note

If we don't have Grove Base Shield, We also can directly connect this module to Seeeduino as below.

Seeeduino	Grove - Optical Rotary Encoder
5V	Red
GND	Black
D6	White
D5	Yellow

Software

Note

If this is the first time you work with Arduino, we strongly recommend you to see Getting Started with Arduinobefore the start.

• Step 1. Install the Encoder Library in the Arduino IDE. You can find this library by the following path: Sketch→Include Library→Manage Libraries

e Edit S	ketch Tools Help	veora se		
	Verify/Compile	Ctrl+R		
	Upload	Ctrl+U		
sketch	Upload Using Programmer	Ctrl+Shift+U		
id set	Export compiled Binary	Ctrl+Alt+S		
// put	Show Sketch Folder	Ctrl+K		
	Include Library	3	Δ	
	Add File		Manage Libraries	
// put y) { our main code here, to run r	epeatedly:	Add .ZIP Library	
		10411 - 145	Arduino libraries	

Then search for the **encoder** in the pop-up window. Find the **Encoder by Paul Stoffregen**, choose the **Version1.4.1**, then click **Install**.

	ary Manager						
ype Al	۰ ×	Topic All	~ encod	r			
			1				
base6 Base6 base6 More in	4 by Densauger 4 encoder/deco 4 characters are nfo	o oder for arduino e interpreted as p	repo Uses commo adding,	n web conventions - '+' for	62, '/' for 63, '='	for padding. Not	e that invalid
DeadR	Reckoning-libra wheel encoder d	ry by Jae An lata on a differer	itial drive robot t	estimate position. This lib	rary implements	dead reckoning (on a
differe More in	ential drive robol	t using encoder t	ick count to estim	ate the position of the robo	t real time.		
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When the library is installed you will see **INSTALLED**, click **Close** then.

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Type	All	V Topic	All	~	encoder			
bas Mor	e64 characte <u>e info</u>	rs are inte	rpreted as	padding.				^
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Gro	veEncoder b	Install y David A ibrary Thi	ntler s library en	ables the Gr	ve Rotary Encoder v1.2 to be con	trolled by a basic Arduino		-10
Mor	<u>e info</u>						2	~
							Close	100

Thanks for Paul for his splendid library.

- **Step 2.** Restart the Arduino IDE. Open the example, you can open it in the following three ways :
 - a. Open it directly in the Arduino IDE via the path: File \rightarrow Examples \rightarrow Encoder \rightarrow Basic.

New Open	Ctrl+N Ctrl+O			
Open Recent Sketchbook	>			
Examples	3	*		
Close	Ctrl+W	Firmata	>	
Save	Ctrl+S	GSM	>	
Save As	Ctrl+Shift+S	LiquidCrystal	>	
		PN532	>	
Page Setup	Ctrl+Shift+P	Radio	>	
Print	Ctrl+P	Robot Control	>	
Preferences	Ctrl+Comma	Robot Motor	>	
-		SD	>	
Quit	Ctrl+Q	Servo	>	
			*	

Encoder	2	Basic
Grove - LED Matrix Driver(HT16K3	3 wi€	NoInterrupts
Grove Multiple Switch library	2	SpeedTest
Grove Temper Humidity TH02	2	TwoKnobs

b. Open it in your computer by click the Basic.pde which you can find in the xxxx\Arduino\libraries\Encoder\examples\Basic, XXXX is the location you installed the Arduino IDE.

Name	Date modified	Туре	Size
💿 Basic.pde		PDE File	1 KB

c. Or, you can just click the icon <a>[in upper right corner of the code block to copy the following code into a new sketch in the Arduino IDE.

1	/* Encoder Library - Basic Example
2	* http://www.pirc.com/teensy/td_libs_Encoder.html
3	*
1	* This example code is in the public domain
5	
6	
7	#include <encoder.h></encoder.h>
8	
9	// Change these two numbers to the pins connected to your
10	encoder
11	// Bost Porformanco: both pins have interrupt capability
10	/ Cood Derformence, only the first air here interrupt capability
12	Good Performance, only the first pin has interrupt capability
13	Low Performance: neither pin has interrupt capability
14	Encoder myEnc(5, 6);
15	// avoid using pins with LEDs attached
16	
17	void setup() {
18	Serial begin(9600):
10	Sorial println("Basic Encodor Tost:"):
00	
20	}
21	
22	long oldPosition = -999;
23	
24	void loop() {
25	long newPosition = mvEnc.read():
26	if (newPosition I- oldPosition) {
27	oldPosition - nowPosition:
21	Coricl println(powDecition)
20	
29	}
	}

Тір

You can change two numbers to the pins connected to your encoder, for the Best Performance: both pins have interrupt capability, so you can change the code line 13 into Encoder myEnc(2, 3);, meanwhile, you should connect this sensor to the **D2** of the baseshield.

- **Step 4.** Upload the demo. If you do not know how to upload the code, please check How to upload code.
- Step 5. Open the Serial Monitor of Arduino IDE by click Tool-> Serial Monitor. Or tap the Ctrl + Shift + M key at the same time. Set the baud rate to 9600.

Success

If every thing goes well, you will get the result. When you move the obstacle from left to right, the count value will increase by 1; when you move the obstacle from right to left, the count value will be decremented by 1.

1	Basic Encoder Test:
2	0
3	1
4	2
5	3
6	4
7	3
. 8	2
ğ	1
10	0
11	1
10	
12	-2
13	-3
14	-4