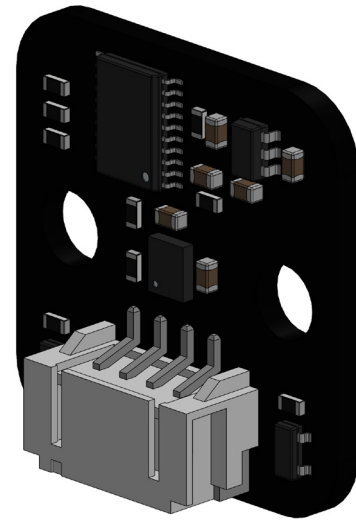


1. Feature

- Support Euler angle data.
- Support Gyro data, accel data.
- Sample rate 100Hz.

2. Application

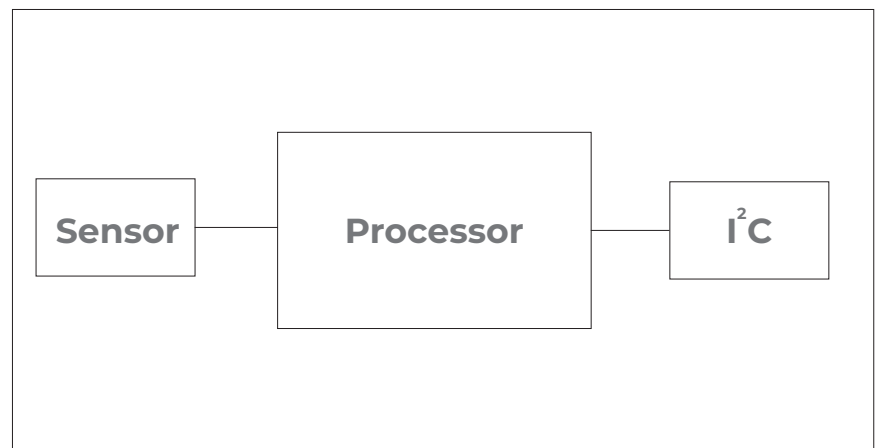
- Balance control
- Attitude recognize
- Navigation



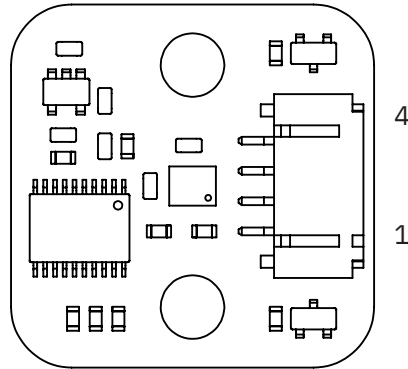
3. Introduction

MATRIX Motion sensor is an Inertial Measurement Unit 6-Degree Of Freedom sensor, communicate by I2C interface. Support Euler angle and accel/gyro raw data.

4. Block Diagram



5. Pinout



Pinout			
NO.	Name	I/O	Description
1	SDA	I/O	Serial data line.
2	SCL	I	Serial clock line.
3	VCC	I	Supply voltage.
4	GND	-	Supply ground.

6. Electrical Characteristics

Parameter	Min	Typ	Max	Units
Supply Voltage (VCC)	3	3.3	5	V
Sample rate	-	100	-	Hz
Acceleration measurement range	-4	-	4	g
Angular rate measurement range	-2000	-	2000	dps
I2C operating speed	100	-	400	KHz
I2C Low-Level Input Voltage	-0.5V	-	0.33*VCC	-
I2C High-Level Input Voltage	0.7*VCC	-	VCC	-

7. Usage

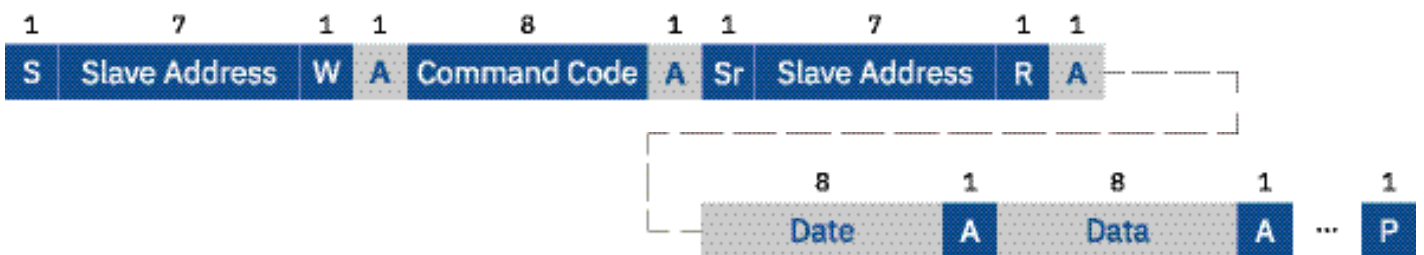
The MATRIX motion sensor follows the 7-bit I2C bus protocol by Philips. To access the sensor's functions, there are two ways that the master device should follow depends on Read or Write situation.



I²C Write Protocol



I²C Read Protocol



To get the i2c library for Matrix color sensor, please visit sites as below:

Arduino Library : <https://github.com/Matrix-Robotics/MatrixMotionSensor>

Microbit Library : <https://github.com/Matrix-Robotics/pxt-MatrixMotion>

8. I2C Register Tabel

8.1. Register definitions

Register Tabel (Summary)				
Register(hex)	Name	R/W	Reset Value	BITS Description
01h	Device ID	R	0x44	Device ID [7:0]
02h	Device Control	R/W	0x00	Device Control [4:0]
03h	ROLL_L	R	0x00	Roll degree [15:0]
04h	ROLL_H	R	0x00	
05h	PITCH_L	R	0x00	YAW degree [15:0]
06h	PITCH_H	R	0x00	
07h	YAW_L	R	0x00	Pitch degree [15:0]
08h	YAW_H	R	0x00	
09h	GYRO_X_L	R	0x00	gyroscope x-Axis [15:0]
0Ah	GYRO_X_H	R	0x00	
0Bh	GYRO_Y_L	R	0x00	gyroscope y-Axis [15:0]
0Ch	GYRO_Y_H	R	0x00	
0Dh	GYRO_Z_L	R	0x00	gyroscope z-Axis [15:0]
0Eh	GYRO_Z_H	R	0x00	
0Fh	ACCEL_X_L	R	0x00	accelerometer x-Axis [15:0]
10h	ACCEL_X_H	R	0x00	
11h	ACCEL_Y_L	R	0x00	accelerometer y-Axis [15:0]
12h	ACCEL_Y_H	R	0x00	
13h	ACCEL_Z_L	R	0x00	accelerometer z-Axis [15:0]
14h	ACCEL_Z_H	R	0x00	

8.2. Device ID

The Device ID register is one-byte / read-only data. This register will always return 0x44 even when the device power is disabled.

Device ID (01h)				
Bit	Name	R/W	Reset Value	Description
7 to 0	Device ID [7:0]	R	0x44	Device ID [7:0]

8.3. Device Control

The Device Control register is used primarily to power the device on and off.

Device Control (02h)				
Bit	Name	R/W	Default	Description
7	-	R	0	Reserved
6	-	R	0	Reserved
5	-	R	0	Reserved
4	-	R	0	Reserved
3	-	R	0	Reserved
2	-	R	0	Reserved
1	RST	W	0	Set bit to 1 to reset sensor to default status.
0	PWR	R/W	0	Enable/disable device power.

8.4. Euler Angle

Eular angle from -180 to 180, format by 16-bits signed numbers

Eular Angle(03h~08h)				
Register(hex)	Name	R/W	Reset Value	BITS Description
03h	Roll degree L [15:8]	R	0x0000	Data of the target axis [15:0]
04h	Roll degree H [7:0]			
05h	YAW degree L [15:8]			
06h	YAW degree H [7:0]			
07h	Pitch degree L [15:8]			
08h	Pitch degree H [7:0]			

8.5. Gryo Data

Gryo data from -2000 to 2000, format by 16-bits signed numbers, unit = dps.

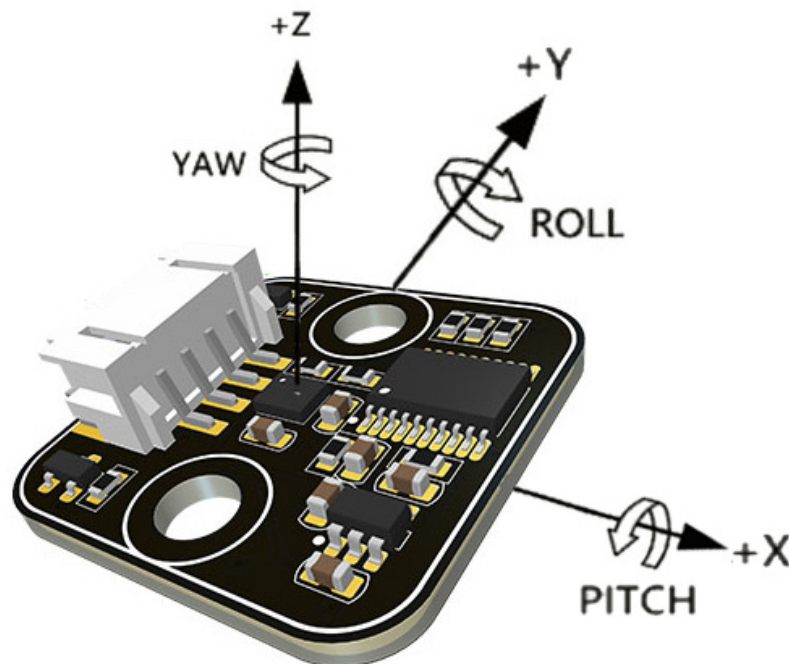
Gyro Data(09h~0Eh)				
Register(hex)	Name	R/W	Reset Value	BITS Description
09h	GYRO_X_L [15:8]	R	0x0000	Data of the target axis [15:0]
0Ah	GYRO_X_H [7:0]			
0Bh	GYRO_Y_L [15:8]			
0Ch	GYRO_Y_H [7:0]			
0Dh	GYRO_Z_L [15:8]			
0Eh	GYRO_Z_H [7:0]			

8.6. Accel Data

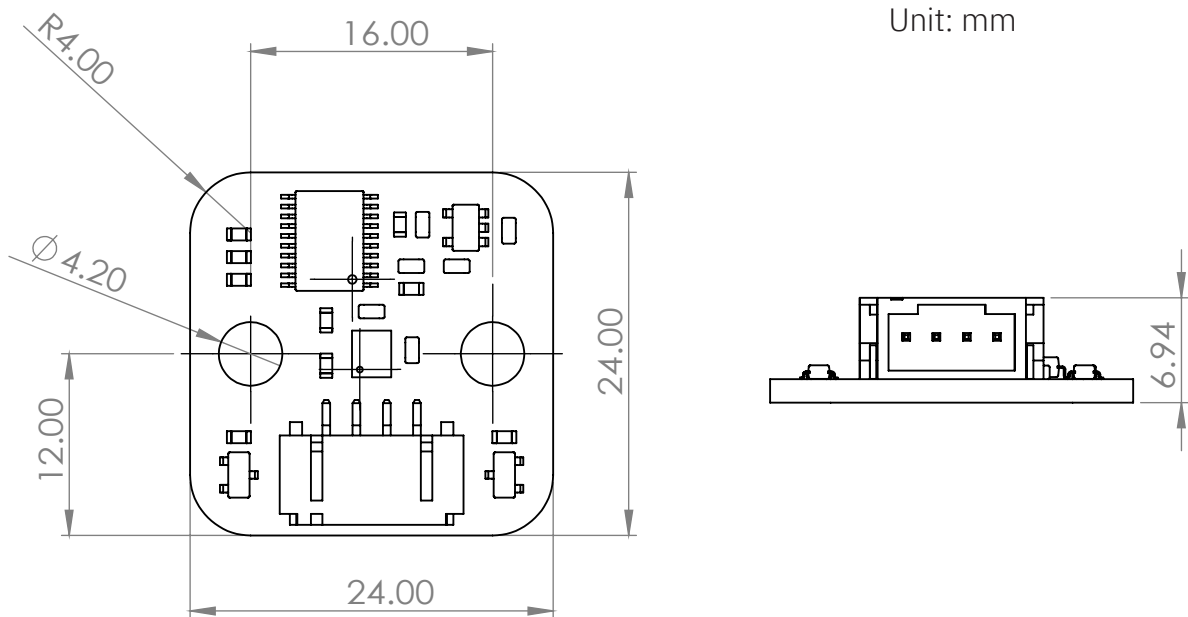
Accel data from -32768 to 32768, format by 16-bits signed numbers, unit = mm/s².

Gyro Data(09h~0Eh)				
Register(hex)	Name	R/W	Reset Value	BITS Description
0Fh	ACCEL_X_L [15:8]	R	0x0000	Data of the target axis [15:0]
10h	ACCEL_X_H [7:0]			
11h	ACCEL_Y_L [15:8]			
12h	ACCEL_Y_H [7:0]			
13h	ACCEL_Z_L [15:8]			
14h	ACCEL_Z_H [7:0]			

8.7. Direction of Axis



9. Dimensions



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