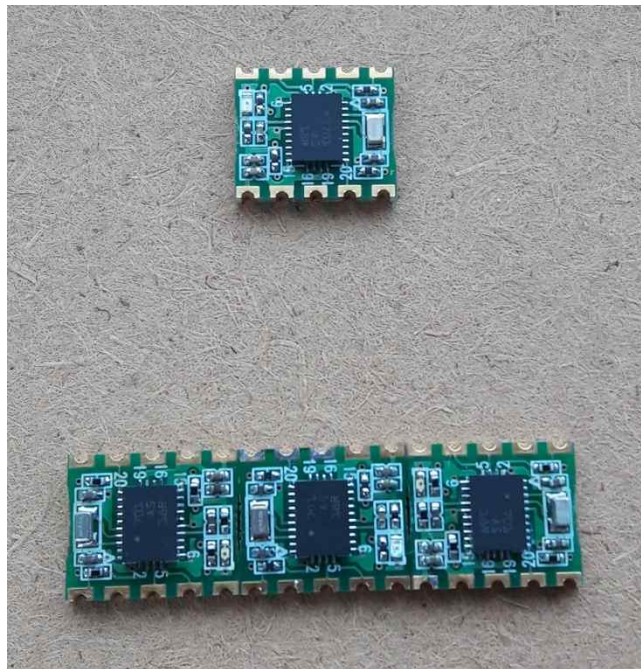


OSTSen-B055 User Guide



Ver 1.0

Hara Systems Inc.

1. OSTSen-B055 Overview

OSTSen-B055 is a 9-axis absolute orientation sensing module, which is based on BOSCH Sensortec BNO055. The BNO055 is a System in Package(SiP), integrating a triaxial 14-bit accelerometer, a triaxial 16-bit gyroscope with a range of ± 2000 degrees per second, triaxial geomagnetic sensor and a 32 bit cortex M0+ microcontroller running Bosch Sensortec sensor fusion software, in a single package.

The corresponding chip-sets are integrated into one single 28-pin LGA 3.8mm x 5.2mm x 1.1mm housing. For optimum system integration the BNO055 is equipped to run with HID-I2C protocol running the BNO055 into a plug-and-play sensor hub solution for devices running the Windows 8.0 or 8.1 operation system.

2. Application

- Navigation
- Robotics
- Fitness and well-being
- Augmented reality
- Context awareness
- Tablets and ultra-books

3. Features

3.1 Key Features

- Output fused sensor data
 - Quaternion, Euler angles, Rotation vector, Linear acceleration, Gravity, Heading
- 3 sensor in one device
 - An advanced triaxial 16 bit gyroscope, a versatile, leading edge triaxial 14 bit accelerometer and a full performance geomagnetic sensor
- Small package
 - GA package 28 pins, Footprint 3.8 x 5.2mm² height 1.13mm
- Power Management
 - Intelligent Power Management: normal, low power and suspend mode available
- Common voltage supplies
 - V_{DD} voltage range: 2.4V to 3.6V

- Digital interface
 - HID-I2C(Windows 8 compatible), I2C, UART
 - V_{DDIO} voltage range: 1.7V to 3.6V
- Consumer electronics suite
 - MSL1, RoHS compliant, halogen-free
 - Operating temperature: -40 °C to +85 °C

3.2 Accelerometer Features

- Programmable functionality
 - Acceleration ranges $\pm 2g/\pm 4g/\pm 8g/\pm 16g$
 - Low-pass filter bandwidths 1kHz ~ < 8Hz
 - Operation modes : normal, suspend, Low power, standby, deep suspend
- On-chip interrupt controller
 - Motion-triggered interrupt-signal generation for
 - . Any-motion(slope) detection
 - . Slow or motion recognition
 - . High-g detection

3.3 Gyroscope Features

- Programmable functionality
 - Ranges switchable from $\pm 125^\circ/s$ to $\pm 2000^\circ/s$
 - Low-pass filter bandwidths 523Hz - 12Hz
 - Operation modes : normal, fast power up, deep suspend, suspend, advanced power save
 - Low power, standby, deep suspend
- On-chip interrupt controller
 - Motion-triggered interrupt-signal generation for
 - . Any-motion(slope) detection
 - . High rate

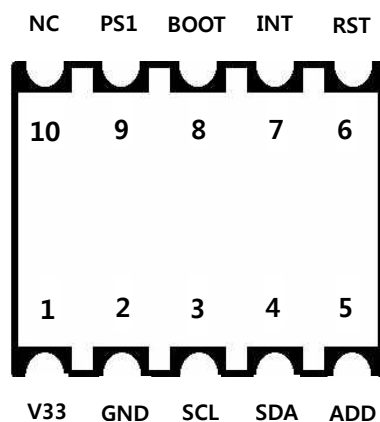
3.4 Magnetometer Features

- Flexible functionality
 - Magnetic field range typical $\pm 1300\mu T$ (x-, y-axis); $\pm 2000\mu T$ (z-axis)
 - Magnetic field resolution of $\sim 0.3\mu T$
 - Operation modes : low power, regular, enhanced regular, high accuracy
 - Power modes: normal, sleep, suspend, force

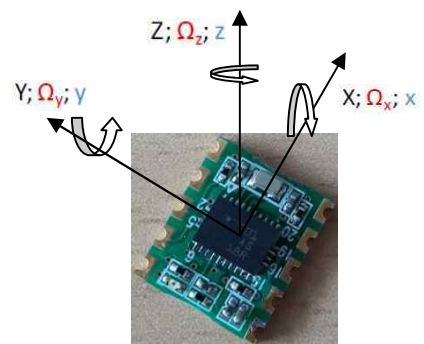
4. Application Information

4.1 Module Pin Out and Signal Description

Pin Number	Pin Name	Pin Description
1	V33	Power supply voltage (2.4V ~ 3.6V)
2	GND	Power supply ground
3	SCL	I2C: serial clock (SCL) [I2C] SCL, [UART] RX
4	SDA	I2C: serial data (SDA) [I2C] SDA, [UART] TX
5	ADD	I2C address select [I2C] I2C address, [UART] GND
6	RST	Reset pin (Active Low)
7	INT	Interrupt output
8	BOOT	Bootloader mode select pin (Active Low)
9	PS1	Protocol select pin [I2C]GND, [UART]V33
10	NC	Not Connect



< Top View >

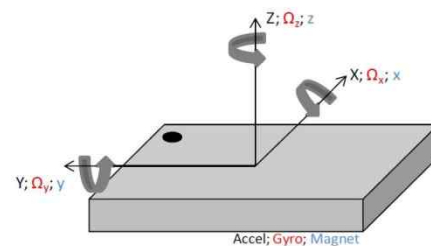
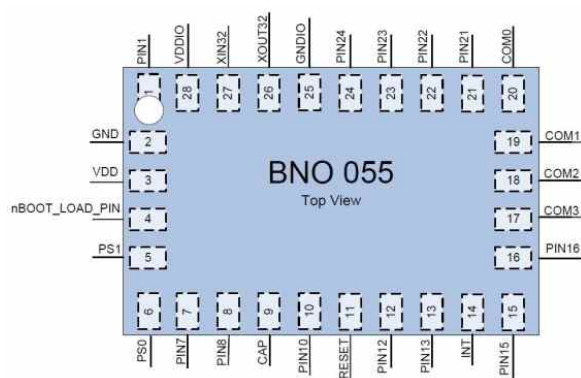
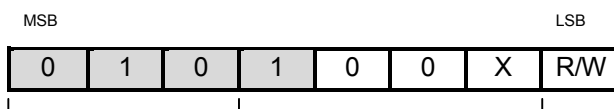


Accel; Gyro; Magnet

4.2 BNO055 Pin out and Signal Description

Pin Number	Pin Name	Pin Description
2,10,15,16,18,25	GND	Power supply ground
3	VDD	Power supply VDD
4	BOOT_LOAD	Bootloader mode select pin (Active Low)
5	PS1	Protocol select pin 1 [I2C] GND, [UART] VDD
6	PS0	Protocol select pin 2 [I2C] GND, [UART] GND
9	CAP	External capacitor
11	RESET	Reset pin (Active Low)
14	INT	Interrupt output
17	COM3	Digital interface pin 3 [I2C] I2C address, [UART] GND
19	COM1	Digital interface pin 1 [I2C] SCL, [UART] RX
20	COM0	Digital interface pin 0 [I2C] SDA, [UART] TX
26	XOUT32	Optional OSC port
27	XIN32	Optional OSC port
28	VDDIO	Power supply VDDIO
1,7,8,12,13,21,22,23,24	DNC	Do not connect

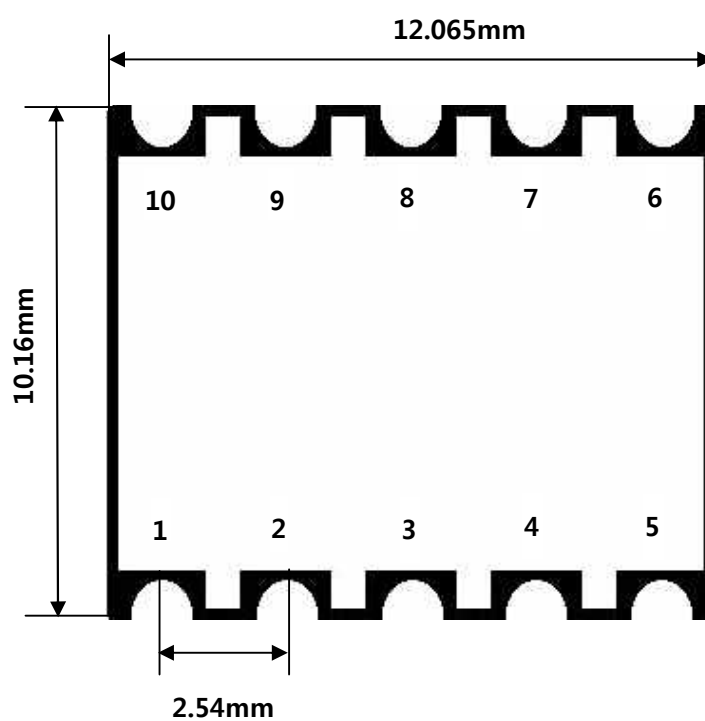
- **BNO055** I2C 7bit device address:0x29 (in module : ADD is HIGH and PS1 is GND)
0x28 (in module : ADD is LOW and PS1 is GND)



< BNO055 Pin out (Top View) >

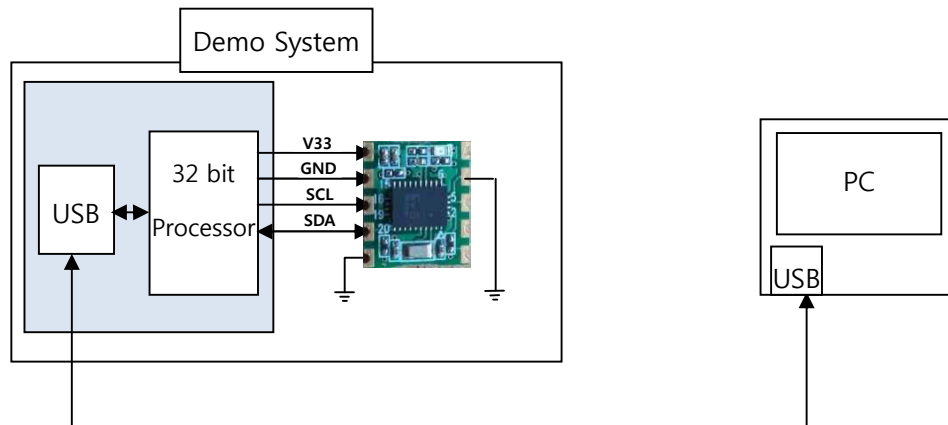
< Orientation of Axes >

5. Module Dimension

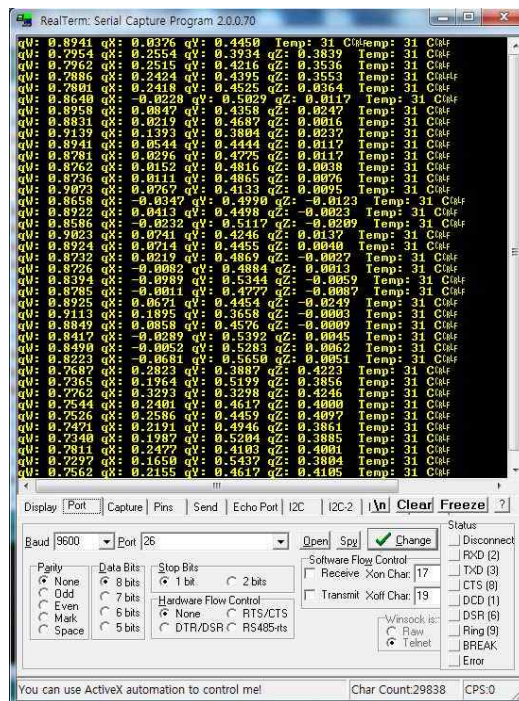


< OSTSen-B055 module >

6. Demo System



OSTSen-B055 Data Display on PC



7. Reference

- 1) https://www.bosch-sensortec.com/bst/products/all_products/bno055
 - 2) https://ae-bst.resource.bosch.com/media/tech/media/datasheets/BST_BNO055_DS000_14.pdf
 - 3) https://github.com/adafruit/Adafruit_BNO055
 - 4) <https://github.com/alvaroferran/BNO055>
- If you need more information or have some questions about OSTSen-B055, contact ostsen@hanmail.net.