

# 가속도 모듈

Datasheet & User guide

## Information Security

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## Revision History

| VERSION       | DATE       | SUMMARY OF CHANGES | AUTHOR |
|---------------|------------|--------------------|--------|
| Version 0.1.0 | 2017.11.30 | 초안 작성              | 양학재    |
| Version 0.1.1 | 2017.12.01 | 내용 수정              | 양학재    |

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# 1. Description

ANALOG DEVICES社의 ADXL362 센서를 이용하여 제작한 가속도 센서 모듈입니다. ADXL362는 샤오X社의 스마트 밴드에 탑재된 가속도 센서입니다. Ultra low power로 구동되며 스마트 기기에 다양하게 사용되고 있습니다.

## 2. Feature

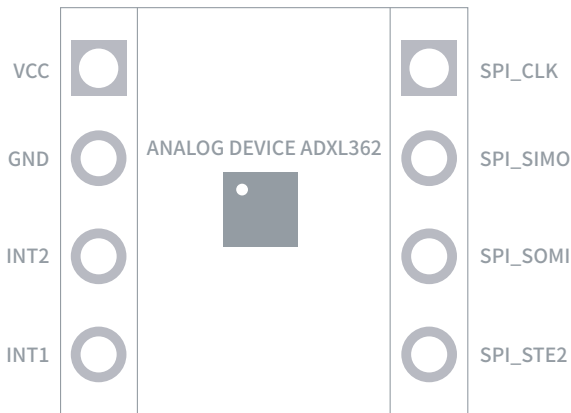
- Ultra low power
- Power can be derived from coin cell battery
  - 1.8  $\mu\text{A}$  @ 100 Hz ODR, 2.0 V supply
  - 3.0  $\mu\text{A}$  @ 400 Hz ODR, 2.0 V supply
  - 270 nA motion activated wake-up mode
  - 10 nA standby current
- High resolution: 1 mg/LSB
- Low noise down to 175  $\mu\text{g}/\sqrt{\text{Hz}}$
- Wide supply and I/O voltage ranges: 1.6 V to 3.5 V
  - Operates off 1.8 V to 3.3 V rails
- Acceleration sample synchronization via external trigger
- On-chip temperature sensor
- SPI digital interface
- Measurement ranges selectable via SPI command

## 3. Specification

| PARAMETER                               | TEST CINDITIONS/COMMENTS                | MIN | TYP    | MAX | UNIT          |
|-----------------------------------------|-----------------------------------------|-----|--------|-----|---------------|
| <b>POWER SUPPLY</b>                     |                                         |     |        |     |               |
| Operating Voltge Range(Vs)              |                                         | 1.6 | 2.0    | 3.5 | V             |
| I/O Voltage Range(V <sub>DD I/O</sub> ) |                                         | 1.6 | 2.0    | Vs  | V             |
| <b>SUPPLY CURRENT</b>                   |                                         |     |        |     |               |
| Mesurement Mode                         | 100Hz ODR (50Hz bandwidth) <sup>6</sup> |     |        |     |               |
| Normal Operation                        |                                         |     | 1.8    |     | $\mu\text{A}$ |
| Low Noise Mode                          |                                         |     | 3.3    |     | $\mu\text{A}$ |
| Ultralow Noise Mode                     |                                         |     | 13     |     | $\mu\text{A}$ |
| Wake-up Mode                            |                                         |     | 0.27   |     | $\mu\text{A}$ |
| Standby                                 |                                         |     | 0.01   |     | $\mu\text{A}$ |
| <b>TEMPERATURE SENSOR</b>               |                                         |     |        |     |               |
| Bias Average                            | @25°C                                   |     | 350    |     | LSB           |
| Standard Deviation                      |                                         |     | 290    |     | LSB           |
| Sensitivity Average                     |                                         |     | 0.065  |     | °C/LSB        |
| Standard Deviation                      |                                         |     | 0.0025 |     | °C/LSB        |

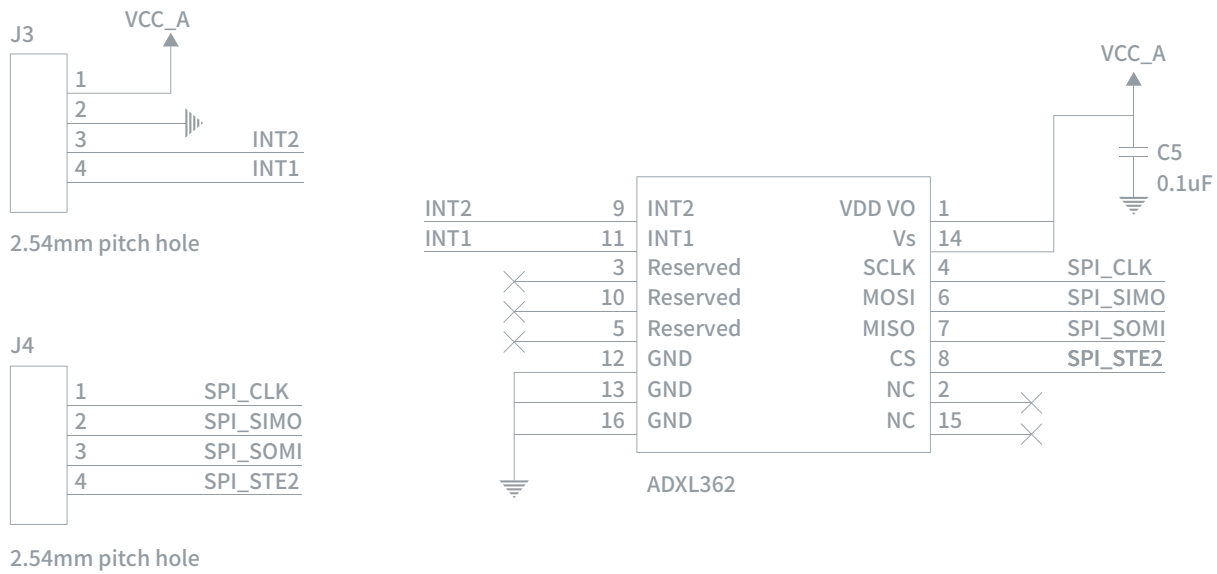
|                                                                       |                                                            |               |        |
|-----------------------------------------------------------------------|------------------------------------------------------------|---------------|--------|
| Sensitivity Repeatability                                             |                                                            | ±0.5          | °C     |
| Resolution                                                            |                                                            | 12            | Bits   |
| <b>ENVIRONMENTAL</b> Each axis                                        |                                                            |               |        |
| Operating Temperature Range                                           |                                                            | -40 ±85       | °C     |
| <b>SENSOR INPUT</b> Each axis                                         |                                                            |               |        |
| Measurement Range                                                     | User selectable                                            | ±2, ±4, ±8    | g      |
| Nonlinearity                                                          | Percentage of full scale                                   | ±0.5          | %      |
| Sensor Resonant Frequency                                             |                                                            | 3000          | Hz     |
| Cross Axis Sensitivity <sup>3</sup>                                   |                                                            | ±1.5          | %      |
| <b>OUTPUT RESOLUTION</b> Each axis                                    |                                                            |               |        |
| All g Range                                                           |                                                            | 12            | Bits   |
| <b>SENSITIVITY</b> Each axis                                          |                                                            |               |        |
| Sensitivity Calibration Error                                         |                                                            | ±10           | %      |
| Sensitivity at X <sub>OUT</sub> , Y <sub>OUT</sub> , Z <sub>OUT</sub> | 2g range                                                   | 1             | mg/LSB |
|                                                                       | 4g range                                                   | 2             | mg/LSB |
|                                                                       | 8g range                                                   | 4             | mg/LSB |
| Sensitivity at X <sub>OUT</sub> , Y <sub>OUT</sub> , Z <sub>OUT</sub> | 2g range                                                   | 1000          | LSB/g  |
|                                                                       | 4g range                                                   | 500           | LSB/g  |
|                                                                       | 8g range                                                   | 250           | LSB/g  |
| Sensitivity Change to Temperature <sup>3</sup>                        | -40°C to +85°C                                             | 0.05          | %/°C   |
| <b>0g OFFSET</b> Each axis                                            |                                                            |               |        |
| 0g Output <sup>4</sup>                                                | X <sub>OUT</sub> , Y <sub>OUT</sub>                        | -150 ±35 ±150 | mg     |
|                                                                       | Z <sub>OUT</sub>                                           | -250 ±50 ±250 | mg     |
| 0g Offset vs. Temperature <sup>3</sup>                                |                                                            |               |        |
| Normal Operation                                                      | X <sub>OUT</sub> , Y <sub>OUT</sub>                        | ±0.5          | mg/°C  |
|                                                                       | Z <sub>OUT</sub>                                           | ±0.6          | mg/°C  |
| Low Noise Mode and Ultralow Noise Mode                                | X <sub>OUT</sub> , Y <sub>OUT</sub> , Z <sub>OUT</sub>     | ±0.35         | mg/°C  |
| <b>NOISE PERFORMANCE</b>                                              |                                                            |               |        |
| Noise Density                                                         |                                                            |               |        |
| Normal Operation                                                      | X <sub>OUT</sub> , Y <sub>OUT</sub>                        | 550           | µg/√Hz |
|                                                                       | Z <sub>OUT</sub>                                           | 920           | µg/√Hz |
| Low Noise Mode                                                        | X <sub>OUT</sub> , Y <sub>OUT</sub>                        | 400           | µg/√Hz |
|                                                                       | Z <sub>OUT</sub>                                           | 550           | µg/√Hz |
| Ultralow Noise Mode                                                   | X <sub>OUT</sub> , Y <sub>OUT</sub>                        | 250           | µg/√Hz |
|                                                                       | Z <sub>OUT</sub>                                           | 350           | µg/√Hz |
|                                                                       | V <sub>S</sub> = 3.5V; X <sub>OUT</sub> , Y <sub>OUT</sub> | 175           | µg/√Hz |
|                                                                       | V <sub>S</sub> = 3.5V; Z <sub>OUT</sub>                    | 250           | µg/√Hz |

## 4. Pin Out Description

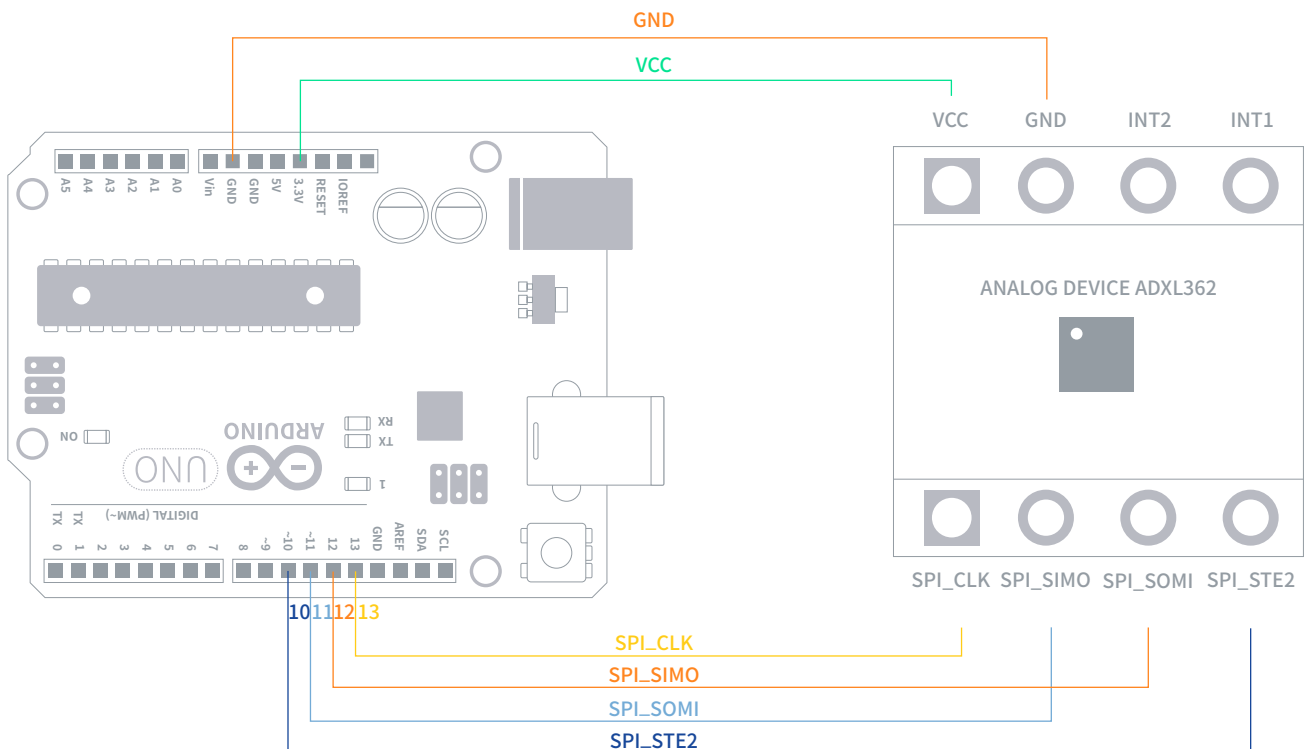


| PIN      | DESCRIPTION                                                                 |
|----------|-----------------------------------------------------------------------------|
| VCC      | Supply Voltage for Digital I/O.                                             |
| GND      | Ground. This pin must be grounded.                                          |
| INT2     | Interrupt 2 Output. INT2 also serves as an input for synchronized sampling. |
| INT1     | Interrupt 1 Output. INT1 also serves as an input for external clocking.     |
| SPI_CLK  | SPI Communications Clock                                                    |
| SPI_SIMO | Master Output, Slave Input. SPI serial data input.                          |
| SPI_SOMI | Master Input, Slave Output. SPI serial data output.                         |
| SPI_STE2 | SPI Chip Select, Active Low. Must be low during SPI communications.         |

## 5. Schematic



## 6. Arduino Connection



## 7. Directions

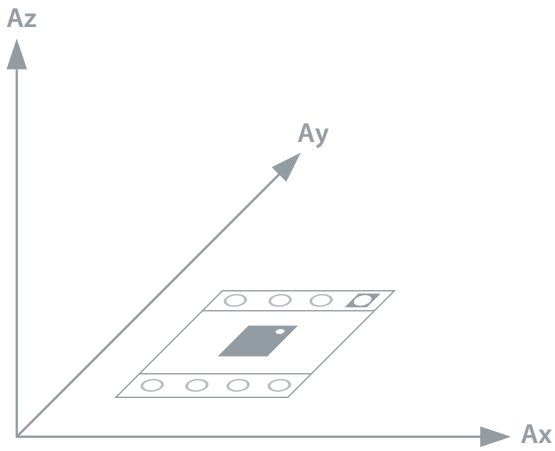
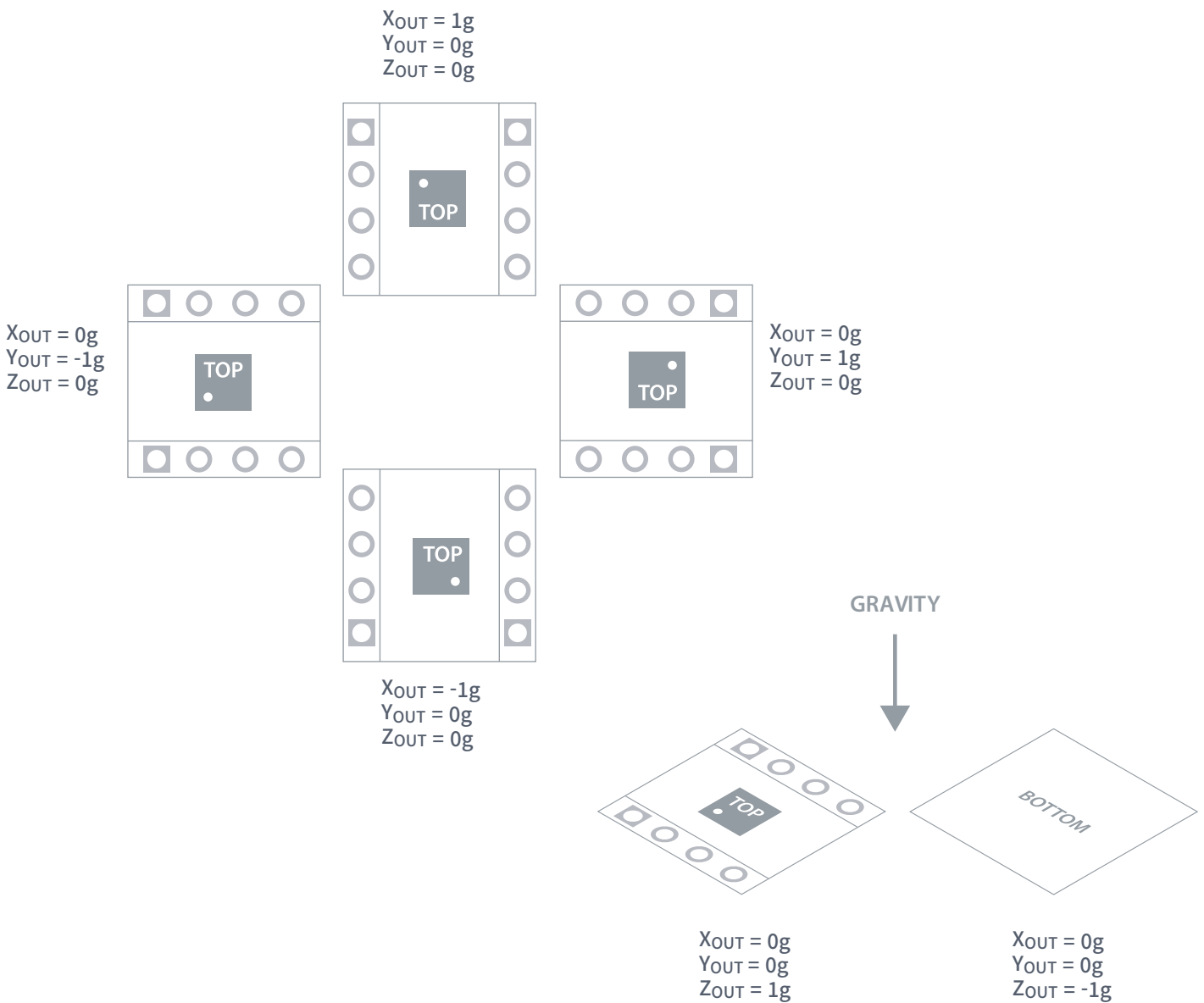
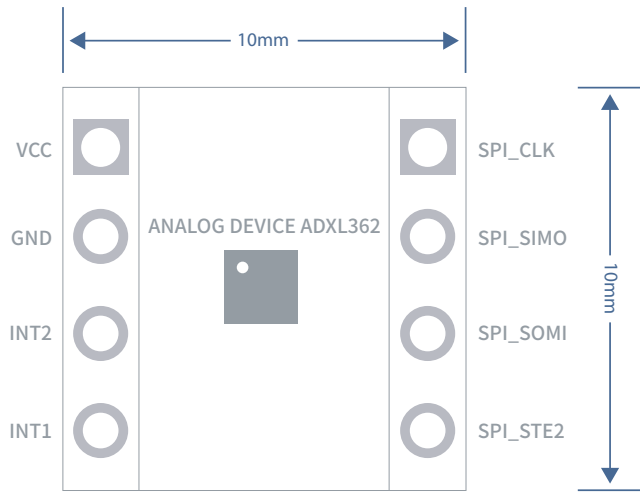


Figure 50. Axes of Acceleration Sensitivity  
(Corresponding Output Increases  
When Accelerated Along the Sensitive Axis)





## 8. Dimensions



## Contact

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