

Operation Manual Evaluation Board for Shock Sensor

PKGX-16-4021

Photo



Features

You can start to evaluate Shock Sensor easily with this evaluation board. Its features are;

- Wide bandwidth 100Hz~16.7kHz
- $\pm 10g$ measurement range at 5.0V supply voltage
- 2.7~5.0V supply voltage
- Analog out
- Size 17.0×12.5×4.0 mm (w×l×h)

Applications

PKGX-16-4021 is targeted to detect vibration for applications with high frequency range requirements.

- Vibration monitoring for preventive maintenance
 - Abnormal bearing vibration detection
 - Abnormal motor vibration detection

Overview

This document describes the operation manual for the evaluation board (PKGX-16-4021) for Shock Sensor produced by Murata Manufacturing Co., Ltd. Shock Sensor is one of the acceleration sensors based on piezo ceramic.

PKGX-16-4021 has wide bandwidth due to high resonance frequency of Shock Sensor based on Murata ceramic and process technology.

This board helps you to evaluate Shock Sensor.

Attention:

This datasheet is downloaded from the website of Murata Manufacturing Co., Ltd. Therefore, it's specifications are subject to change or our products in it may be discontinued without advance notice. Please check with our sales representatives or product engineers before ordering.

TABLE OF CONTENT

| | |
|--|-----------|
| 1. Introduction | 3 |
| 1.1 Functional Brock Diagram | |
| 1.2 Functional Brock Layout Diagram | |
| 2. Evaluation Procedures | 4 |
| 3. Electrical Specification and Board Information | 5 |
| 3.1 Input and Output Terminal | |
| 3.2 Electrical Specification | |
| 3.3 Circuit Diagram | |
| 3.4 Bill of Materials | |
| 3.5 External Dimension | |
| 3.6 Board Layout | |
| 4. Precautions | 13 |
| 4.1 Precautions when in use | |
| 4.2 Other precautions | |

Attention:

This datasheet is downloaded from the website of Murata Manufacturing Co., Ltd.
Therefore, it's specifications are subject to change or our products in it may be discontinued without advance notice.
Please check with our sales representatives or product engineers before ordering.

1. Introduction

This document describes the evaluation board for Shock Sensor.

1.1 Functional Block Diagram

Fig.1 shows the functional block diagram of evaluation board

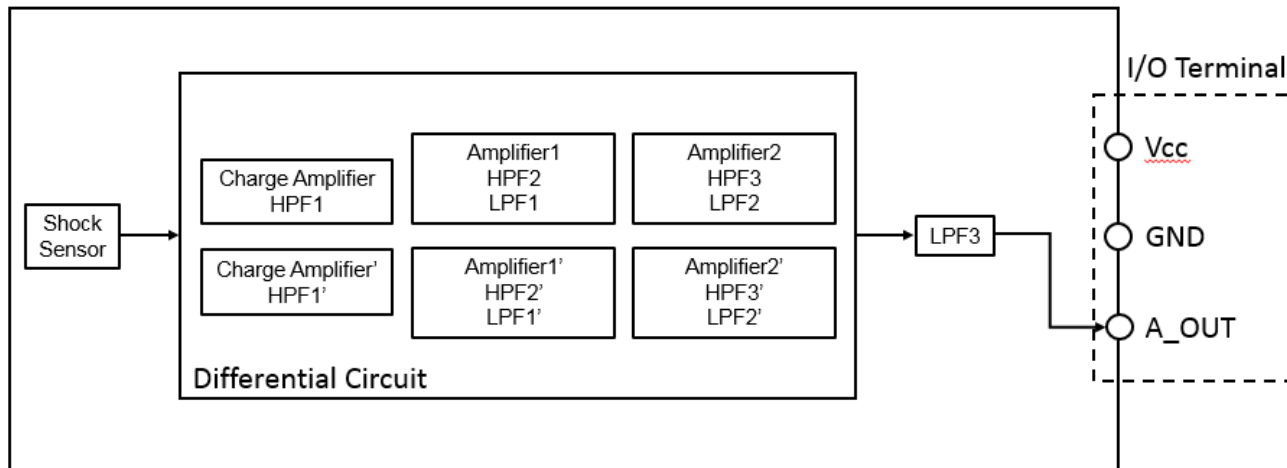


Fig.1 Functional Block Diagram

1.2 Functional Block Layout Diagram

Fig.2 shows the functional block layout of the evaluation board.

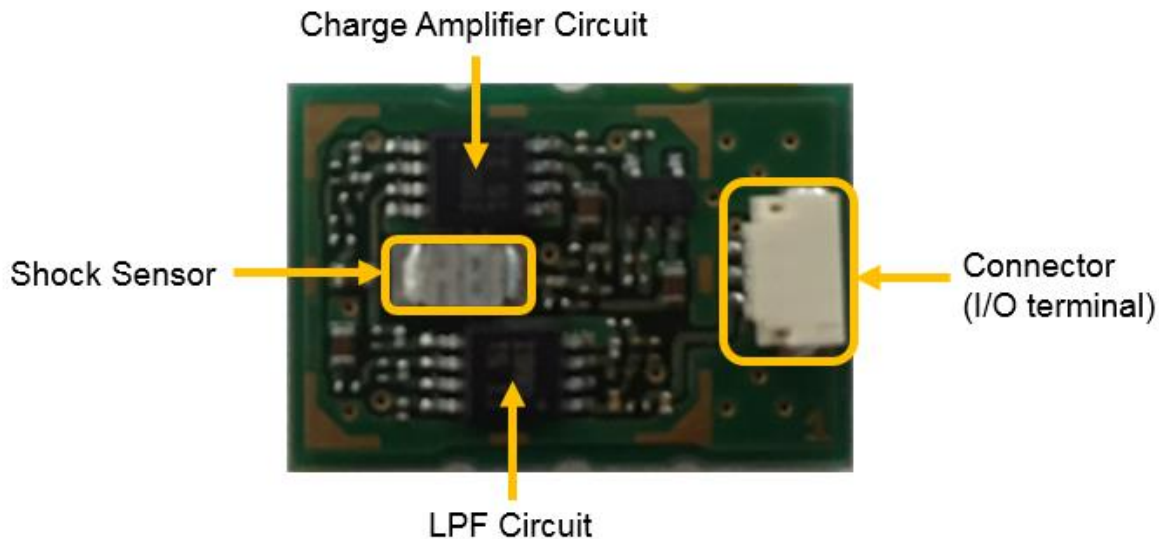


Fig.2 Functional Block Layout Diagram

Attention:

This datasheet is downloaded from the website of Murata Manufacturing Co., Ltd. Therefore, it's specifications are subject to change or our products in it may be discontinued without advance notice. Please check with our sales representatives or product engineers before ordering.

2. Evaluation Procedure

The following shows an example of the evaluation procedure to use this evaluation board.

- ① Attach this board to the target of measurement with superglue.

Note1: Put superglue on whole surface of back side evaluation board and put uniformly-flat, in order that the acceleration which you want to get can transact to the evaluation board.

Note2; If you want to remove this evaluation board from a target to use repeatedly, it is convenient to use a polyimide tape. Apply polyimide tape to a target and this evaluation board, and then apply superglue to the polyimide tape.

Note3: Do NOT use a double-sided tape because it can be a buffer.

- ② Supply predefined voltage (2.7~5.0V) to the board through Vcc and GND at I/O terminal.
- ③ Connect oscilloscope to AOUT.

Attention:

This datasheet is downloaded from the website of Murata Manufacturing Co., Ltd.
Therefore, it's specifications are subject to change or our products in it may be discontinued without advance notice.
Please check with our sales representatives or product engineers before ordering.

3 Specifications and Board Information

The following shows the electrical specification and the board information of the evaluation board when shipped.

3.1 Input and Output Terminals

Fig. 7 shows detailed information of input-output terminals (I/O Terminal) on the evaluation board.

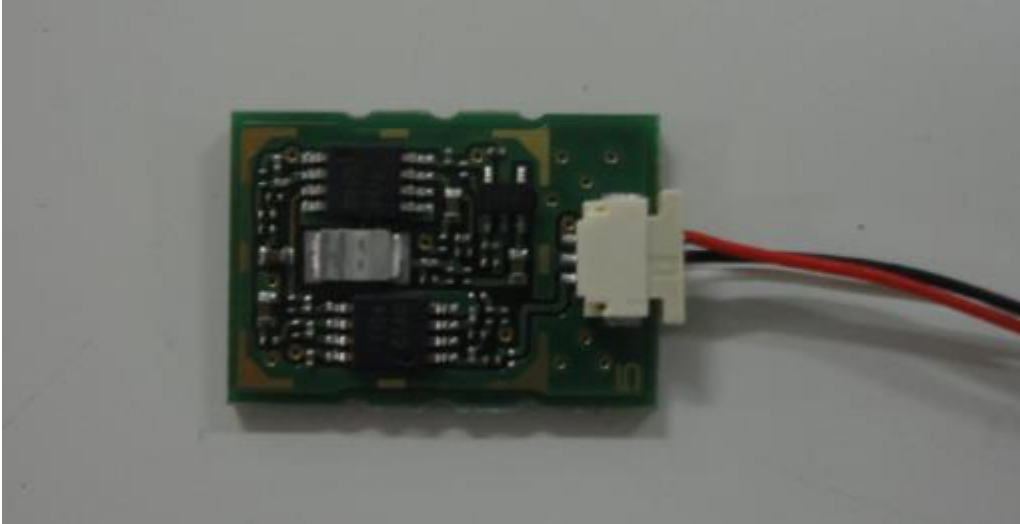


Fig.7 Appearance of Input-Output Terminals

Table 1. I/O Terminal List

| Symbol | Wire Color | Description |
|--------|------------|--|
| V | Red | The power supplying terminal of evaluation board |
| G | Black | The ground terminal of evaluation board |
| A | White | The analog output terminal of evaluation board |

Attention:

This datasheet is downloaded from the website of Murata Manufacturing Co., Ltd. Therefore, it's specifications are subject to change or our products in it may be discontinued without advance notice. Please check with our sales representatives or product engineers before ordering.

3.2 Electrical Specifications & Mechanical Specifications

The following shows the electrical and mechanical specifications of this evaluation board.

Table 2. Electrical Specifications

※Unless otherwise specified, temperature of measurement is 25°C and supply voltage 3.3V.

| Parameters | | Value | | | Unit |
|-------------------------------------|-------------|-------|--------------------|-----------------|------|
| | | Min. | Typ. | Max. | |
| Operating Temperature Range | | -40 | - | 85 | °C |
| V _{CC} Input Voltage Range | | 2.5 | - | 5 | V |
| A_OUT Output Voltage Range | | 0 | - | V _{CC} | V |
| Reference Voltage | | T.B.D | V _{CC} /2 | T.B.D | V |
| Gain | Charge AMP | | 14.8 | | dB |
| | Charge AMP' | | 14.8 | | |
| | AMP 2 | | 16.7 | | dB |
| | AMP 2' | | 16.7 | | |
| | AMP 3 | | 20.8 | | |
| | AMP 3' | | 20.8 | | dB |
| Cutoff frequency(-3dB) | HPF 1 | | 80 | | Hz |
| | HPF 1' | | 80 | | Hz |
| | HPF 2 | | 33 | | Hz |
| | HPF 2' | | 33 | | Hz |
| | HPF 3 | | 33 | | Hz |
| | HPF 3' | | 33 | | Hz |
| | LPF 1 | | 15603 | | Hz |
| | LPF 1' | | 15603 | | Hz |
| | LPF 2 | | 14109 | | Hz |
| | LPF 2' | | 14109 | | Hz |
| LPF 3 | | 15251 | | Hz | |
| Current Consumption (Note 3) | | | 3.2 | | mA |

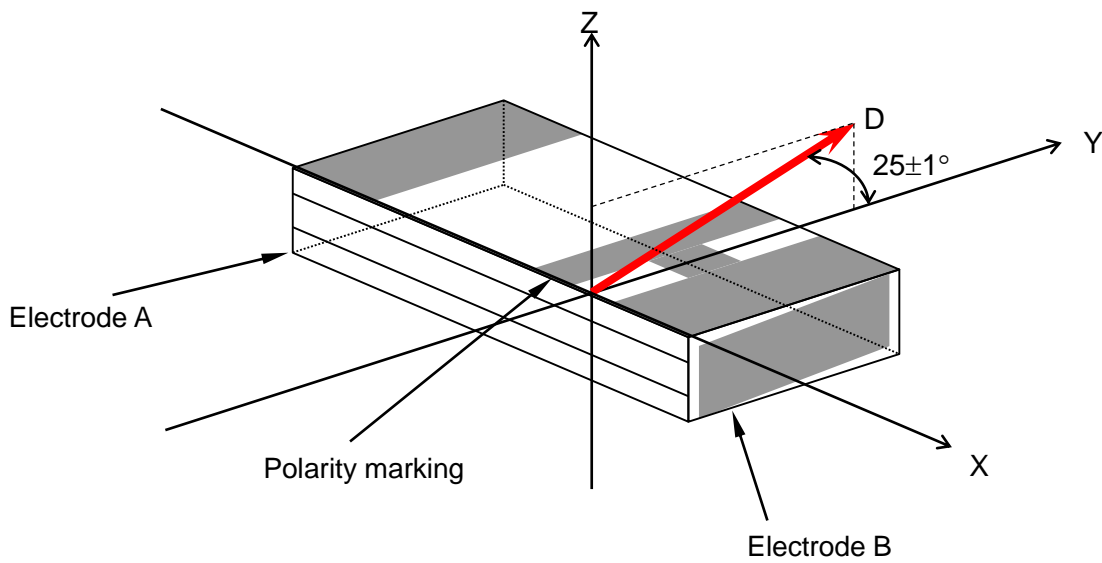
Note 3: Current Consumption is depending on Current Consumption of OP-AMP and Current Consumption generated of Reference Voltage portion.

Attention:

This datasheet is downloaded from the website of Murata Manufacturing Co., Ltd. Therefore, it's specifications are subject to change or our products in it may be discontinued without advance notice. Please check with our sales representatives or product engineers before ordering.

Table 3. Mechanical Specifications

| Parameters | Value | | | Unit |
|-----------------------------------|-------|------|-------|------|
| | Min. | Typ. | Max. | |
| Circuit Sensitivity | T.B.D | 0.25 | T.B.D | V/G |
| Sensor Resonance Frequency | 34 | 42 | | kHz |
| Number of Axis | | 1 | | |
| Inclination Angle of Sensor Shaft | 24 | 25 | 26 | ° |



Axis D : This axis (Inclination) is an acceleration applied direction, when electric charge sensitivity is checked. Its tolerance is within $\pm 1^\circ$.

Fig.8 Inclination of Shock Sensor Shaft (PKGS-25WXP1-R)

Attention:

This datasheet is downloaded from the website of Murata Manufacturing Co., Ltd. Therefore, its specifications are subject to change or our products in it may be discontinued without advance notice. Please check with our sales representatives or product engineers before ordering.

3.3 Circuit Diagram

Following shows the circuit diagram of this evaluation board.

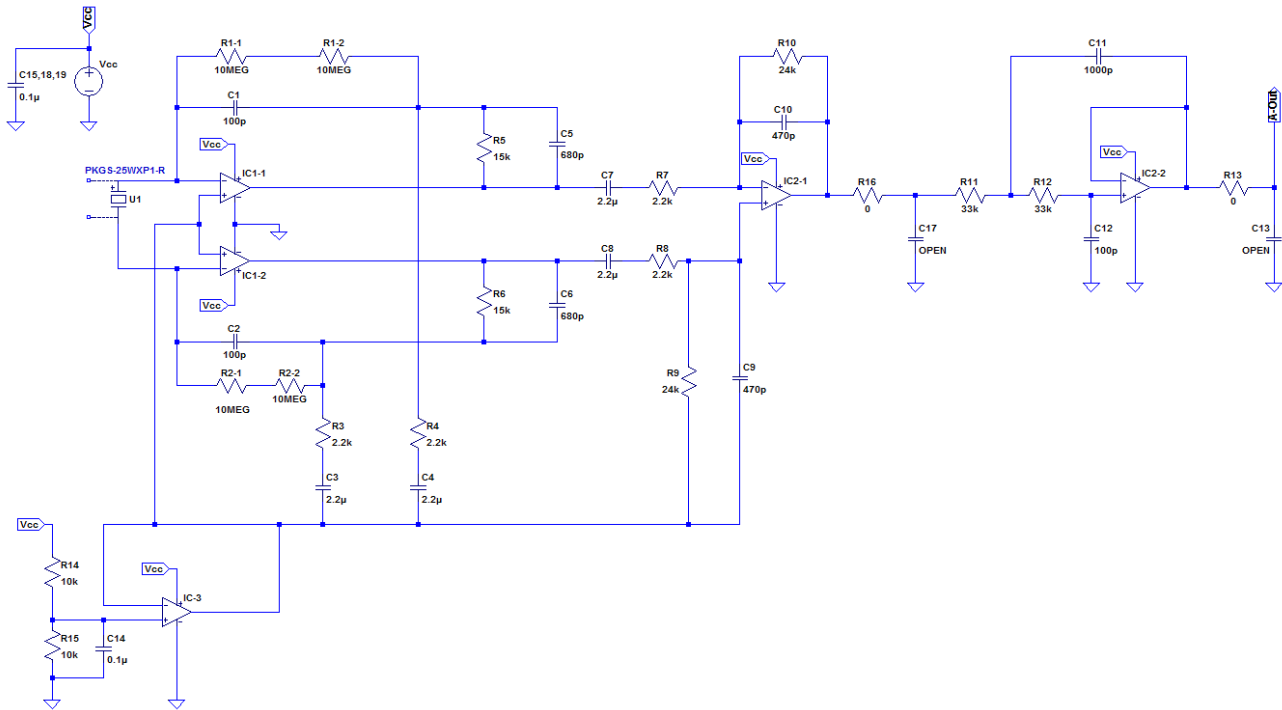


Fig 9. Circuit Diagram

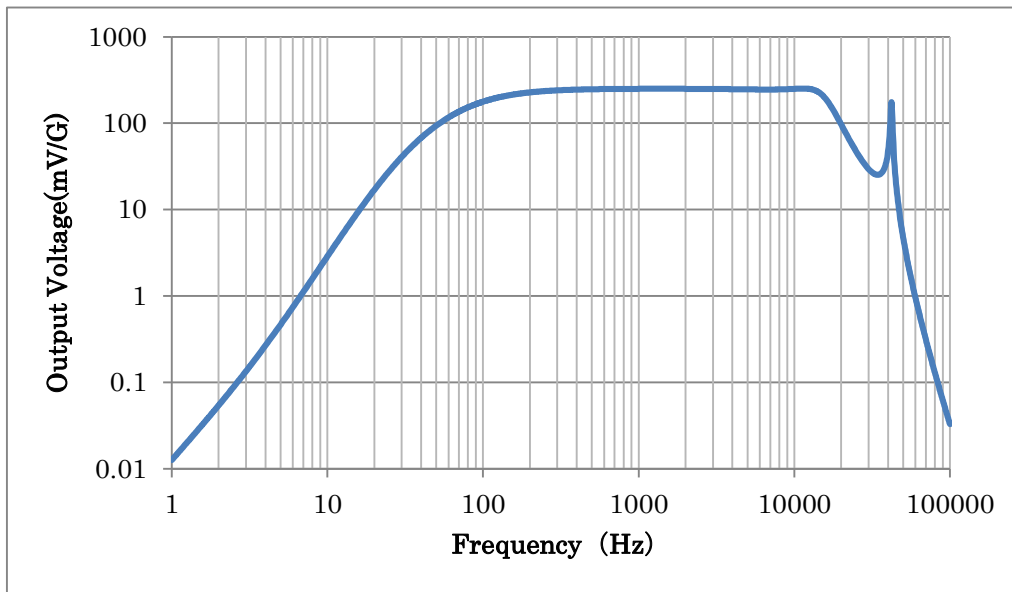
(Formulas Descriptions)

| | | | |
|------------|---|------|--------------------------------------|
| Charge AMP | = $20\log_{10} (Cf/C1)$ | [dB] | (In case of PKGS-25WXP1-R, Cf=550pF) |
| Charge AMP | = $20\log_{10} (Cf/C1)$ | [dB] | (In case of PKGS-25WXP1-R, Cf=550pF) |
| AMP2 | = $20\log_{10} (R3/R2)$ | [dB] | |
| AMP2 | = $20\log_{10} (R3/R2)$ | [dB] | |
| AMP3 | = $20\log_{10} (R5/R4)$ | [dB] | |
| AMP3 | = $20\log_{10} (R3/R2)$ | [dB] | |
| HPF1 | = $1/(2 \times \pi \times C1 \times R1)$ | [Hz] | |
| HPF1 | = $1/(2 \times \pi \times C4 \times R4)$ | [Hz] | |
| HPF2 | = $1/(2 \times \pi \times C1 \times R1)$ | [Hz] | |
| HPF2' | = $1/(2 \times \pi \times C4 \times R4)$ | [Hz] | |
| HPF3 | = $1/(2 \times \pi \times C1 \times R1)$ | [Hz] | |
| HPF3' | = $1/(2 \times \pi \times C4 \times R4)$ | [Hz] | |
| LPF1 | = $1/(2 \times \pi \times C3 \times R3)$ | [Hz] | |
| LPF1' | = $1/(2 \times \pi \times C5 \times R5)$ | [Hz] | |
| LPF2 | = $1/(2 \times \pi \times C2 \times R6)$ | [Hz] | |
| LPF2' | = $1/(2 \times \pi \times C1 \times R1)$ | [Hz] | |
| LPF3 | = $1/(2 \times \pi \times \sqrt{C4 \times R4})$ | [Hz] | |

Attention:

This datasheet is downloaded from the website of Murata Manufacturing Co., Ltd. Therefore, its specifications are subject to change or our products in it may be discontinued without advance notice. Please check with our sales representatives or product engineers before ordering.

Below is the simulated frequency response curve of above circuitry (Fig.9).



Note 4: This Frequency Response Curve serves as referencing purpose only. In this simulation, the frequency response ranges from 99 Hz to 16,700 Hz (-3dB points). Actual frequency response curve varies according to the actual characteristics of circuitry and components.

Fig 10. Frequency Response Curve of PKGX-16-4021

Attention:

This datasheet is downloaded from the website of Murata Manufacturing Co., Ltd. Therefore, it's specifications are subject to change or our products in it may be discontinued without advance notice. Please check with our sales representatives or product engineers before ordering.

3.4 Bill of Material

The following show the bill of materials of the evaluation module when shipped.

| Ref. | Part No. | Description | Mfg. |
|-------|--------------------|-----------------|---------|
| C1 | GRM0332C1H101GA01# | 100 p F/50V/CH | Murata |
| C2 | GRM0332C1H101GA01# | 100 p F/50V/CH | Murata |
| C3 | GRM155B30J225KE95# | 2.2μF/6.3V/B | Murata |
| C4 | GRM155B30J225KE95# | 2.2μF/6.3V/B | Murata |
| C5 | GRM0332C1E681GA01# | 680 p F/25V/CH | Murata |
| C6 | GRM0332C1E681GA01# | 680 p F/25V/CH | Murata |
| C7 | GRM155B30J225KE95# | 2.2μF/6.3V/B | Murata |
| C8 | GRM155B30J225KE95# | 2.2μF/6.3V/B | Murata |
| C9 | GRM0332C1E471GA01# | 470 p F/25V/CH | Murata |
| C10 | GRM0332C1E471GA01# | 470 p F/25V/CH | Murata |
| C11 | GRM0332C1E102GA01# | 1000 p F/25V/CH | Murata |
| C12 | GRM0332C1H101GA01# | 100 p F/50V/CH | Murata |
| C13 | OPEN | | - |
| C14 | GRM033B31A104KE84# | 0.1uF/10V/B | Murata |
| C15 | GRM033B31A104KE84# | 0.1uF/10V/B | Murata |
| C17 | OPEN | - | - |
| C18 | GRM033B31A104KE84# | 0.1uF/10V/B | Murata |
| C19 | GRM033B31A104KE84# | 0.1uF/10V/B | Murata |
| CN1 | SM03B-SURS-TF | Connector | JST |
| IC1 | OPA2377AIDGKT | Op-Amplifier | TI |
| IC2 | OPA2377AIDGKT | Op-Amplifier | TI |
| IC3 | TLV6001IDCKT | Op-Amplifier | TI |
| R1-1 | MCR006YLPF106 | 10Mohm±1.0% | R O H M |
| R1-2 | MCR006YLPF106 | 10Mohm±1.0% | R O H M |
| R2-1 | MCR006YLPF106 | 10Mohm±1.0% | R O H M |
| R2-2 | MCR006YLPF106 | 10Mohm±1.0% | R O H M |
| R3 | MCR006YLPD222 | 2.2kohm±0.5% | R O H M |
| R4 | MCR006YLPD222 | 2.2kohm±0.5% | R O H M |
| R5 | MCR006YLPD153 | 15kohm±0.5% | R O H M |
| R6 | MCR006YLPD153 | 15kohm±0.5% | R O H M |
| R7 | MCR006YLPD222 | 2.2kohm±0.5% | R O H M |
| R8 | MCR006YLPD222 | 2.2kohm±0.5% | R O H M |
| R9 | MCR006YLPD243 | 24kohm±0.5% | R O H M |
| R10 | MCR006YLPD243 | 24kohm±0.5% | R O H M |
| R11 | MCR006YLPD333 | 33kohm±0.5% | R O H M |
| R12 | MCR006YLPD333 | 33kohm±0.5% | R O H M |
| R13 | SHORT | 0 | - |
| R14 | MCR006YLPD103 | 10kohm±0.5% | R O H M |
| R15 | MCR006YLPD103 | 10kohm±0.5% | R O H M |
| R16 : | SHORT | 0 | - |
| U1 | PKGS-25WXP1-R | Shock Sensor | Murata |

Attention:

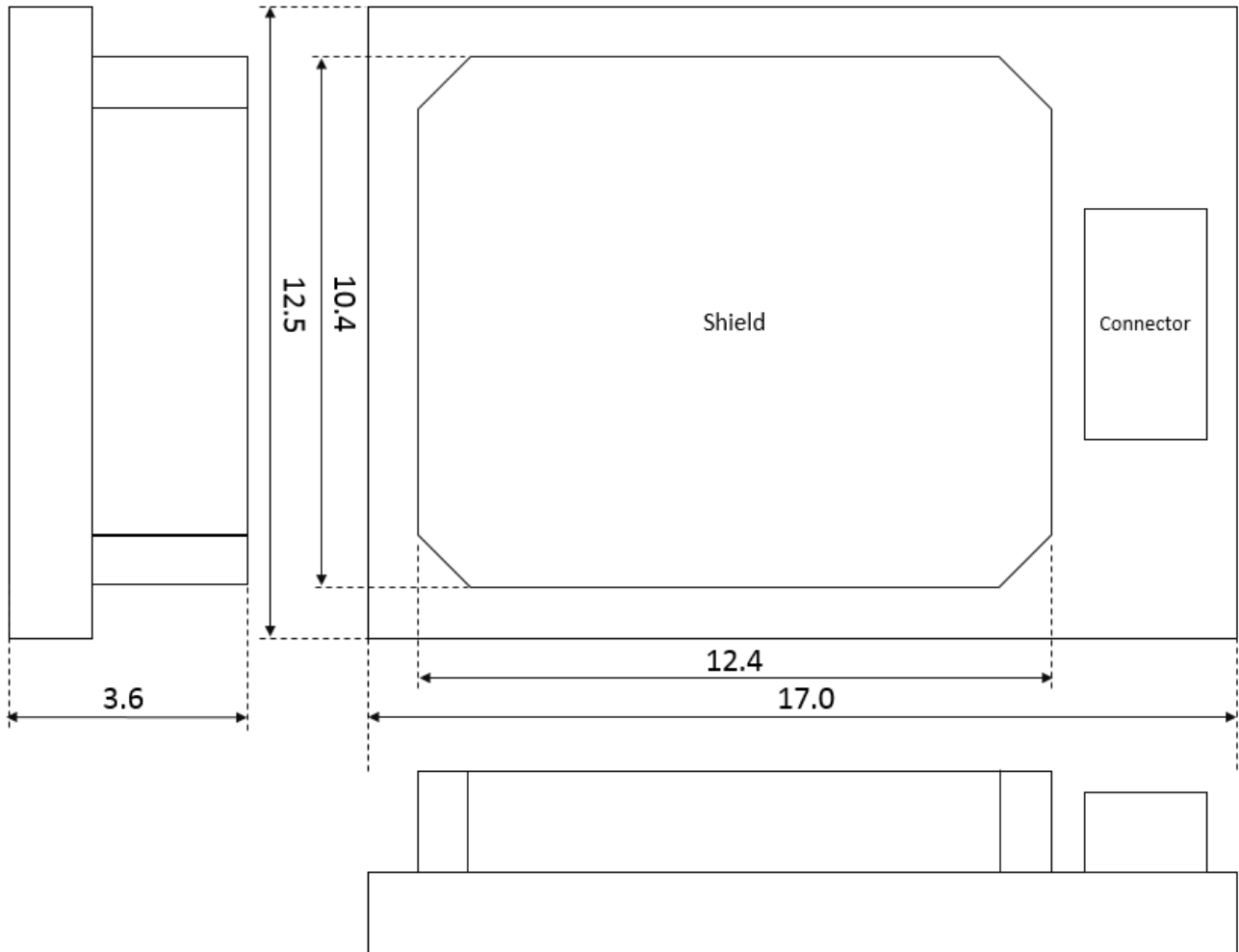
This datasheet is downloaded from the website of Murata Manufacturing Co., Ltd. Therefore, it's specifications are subject to change or our products in it may be discontinued without advance notice. Please check with our sales representatives or product engineers before ordering.

3.5 External Dimensions

The outline dimensions of the evaluation module are shown in the drawing below.

Table 5. External Dimensions (Typical)

| External Dimensions (Length × Width × Height) [mm] |
|--|
| 17.0×12.5×3.6 |



Note 4. The height of Connector's portion is 3.55mm.

Fig11. External Dimension Drawing

Attention:

This datasheet is downloaded from the website of Murata Manufacturing Co., Ltd. Therefore, its specifications are subject to change or our products in it may be discontinued without advance notice. Please check with our sales representatives or product engineers before ordering.

3.6 Board Layout

The following shows the board layout of this evaluation module.

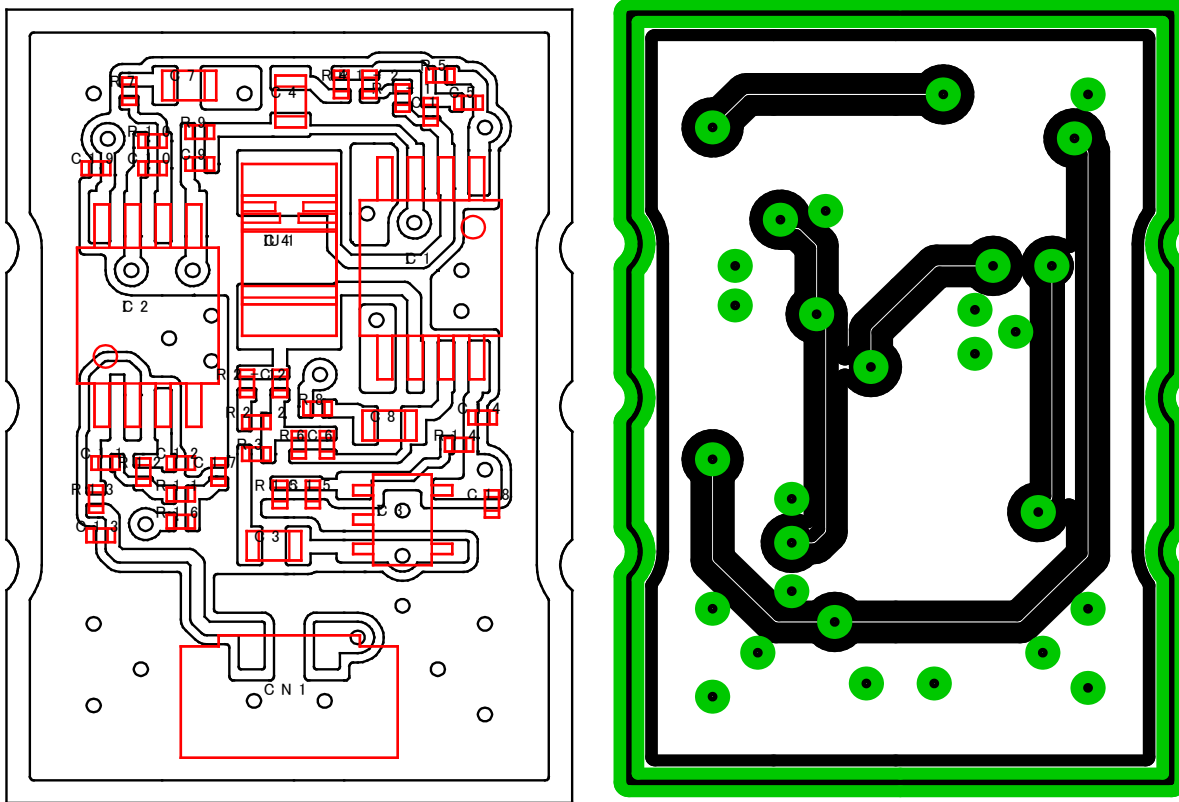


Fig 12. Board Layout

Attention:

This datasheet is downloaded from the website of Murata Manufacturing Co., Ltd. Therefore, it's specifications are subject to change or our products in it may be discontinued without advance notice. Please check with our sales representatives or product engineers before ordering.

4. Precautions

4.1 Precautions when in use

- This evaluation board cannot detect gravitational acceleration and free fall.
- Please take off direct sunlight and moisture during storage of this evaluation board. There is a possibility of corrosion on the connector.
- Due to change of atmospheric pressure, the characteristics of this evaluation board may change. Please do not use in conditions where atmospheric pressure is vastly different from ground level (e.g. vacuum and water etc).
- Please do not store the evaluation board in environments which is exposed to dust, oil, corrosive gases, acid and alkaline.
- When exposed to sudden changing temperature, this evaluation board may extemporarily generate output even when there is no applying acceleration. The output is affected by different conditions of stress and individual differences of sensor. Please evaluate deeply influence of temperature change which you expect by your set.
- Depending on the environment of usage, evaluation board may be susceptible to external electrical noise. In this case, please use the shield cover provided for noise reduction.
- Mounting of provided shield cover on this evaluation board will be performed by users as needed. Please be extreme caution not to cause short circuit during the installation of shielding.
- This evaluation module detects acceleration that is transmitted through your housing and your mounting board. Please use this module after considering characteristics of mechanical acceleration transmission in your set deeply.
- Depending on the mounting conditions of the evaluation module internal resonance of set and interferences from inherited frequencies of each component, there is a possibility that acceleration is not transmitted from this product as intended by user.

Attention:

This datasheet is downloaded from the website of Murata Manufacturing Co., Ltd. Therefore, it's specifications are subject to change or our products in it may be discontinued without advance notice. Please check with our sales representatives or product engineers before ordering.

4.2 Other Precautions

This document and evaluation board shall not;

- -be used for other purpose than the purpose for evaluation of Murata's sensor products,
 - -be disclosed, transferred and/or lent to third party,
 - -be copied, reproduced and published.
-
- WE HEREBY DISCLAIM FROM ANY AND ALL WARRANTIES FOR THIS DOCUMENT THIS EVALUATION BOARD, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT MITIGATION ANY WARRANTY OF DESIGN, MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR AGAINST INFRINGEMENT OF INTELLECTUAL PROPERTY RIGHTS
-
- We SHALL NOT BE LIABLE FOR ANY DAMAGES OR LOSSES, INCLUDING CLAIMS ON A THIRD PARTY, ARISING OUT OF OR RELATING TO THE USE OF THIS DOCUMENT AND EVALUATION BOARD
 - It is the user' s responsibility for any changes to circuit. Any change related activities to the circuit will result a void in warranty.

Attention:

This datasheet is downloaded from the website of Murata Manufacturing Co., Ltd. Therefore, it's specifications are subject to change or our products in it may be discontinued without advance notice. Please check with our sales representatives or product engineers before ordering.