

## High Accuracy Three Axis Accelerometer

### ■ GENERAL DESCRIPTION

The M-A352 is a three axis digital output accelerometer featuring ultra-low noise, high stability, and low power consumption using fine processing technology of Quarts. Incorporating both high accuracy and durability, the versatile M-A352 is well suited to a wide-range of challenging applications such as SHM, seismic observation, condition monitoring for industrial equipment, and pose detection for industrial machinery (i.e. construction machinery/attachments, agricultural machinery/ implements, robots).

### ■ FEATURES

- **Ultra-low noise: 0.2 $\mu$ G/ $\sqrt{\text{Hz}}$  typ.**
- **Improved shock resistance: 1,000G**
- **Selectable output format: Acceleration / Tilt Angle**
- **Selectable interface: SPI / UART**
- **Programmable low-pass digital filters**
- **Low jitter external trigger function for synchronous sampling**
- **Solid Metallic Case (Size : 48mm x 24mm x 16mm, Weight: 25g)**



### ■ SPECIFICATION

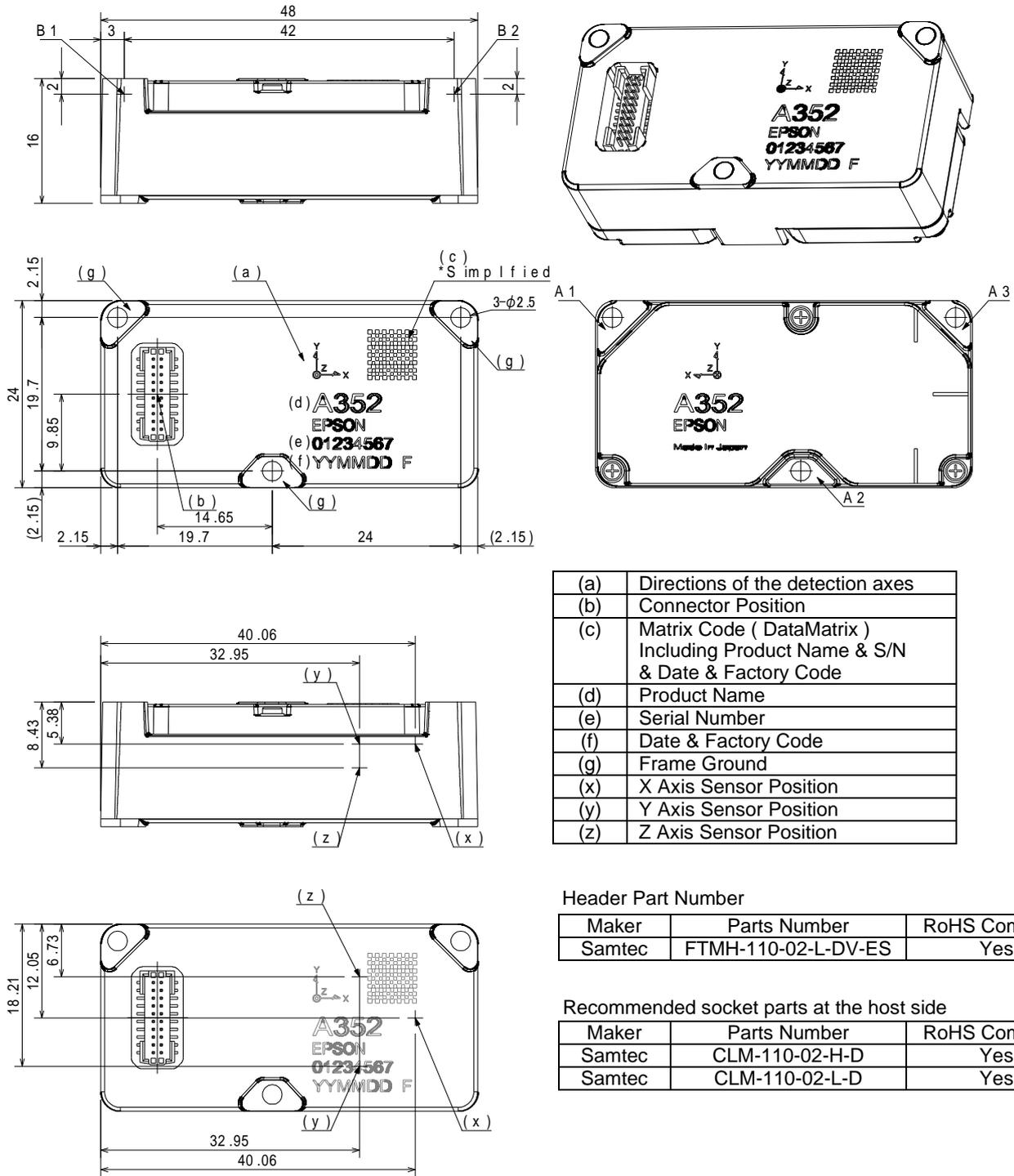
T<sub>A</sub>=-30°C to +85°C, VCC=3.15V~3.45V,  $\leq \pm 1\text{G}$ , unless otherwise noted.

| Parameter                              | Test Conditions / Comments                                       | Min  | Typ             | Max        | Unit                                 |
|--|--|------|-----------------|------------|--------------------------------------|
| <b>SPECIFICATIONS</b>                  |  |      |                 |            |                                      |
| Output Range                           | f = DC ~ 460Hz   |      |                 | $\pm 15$   | G                                    |
| Scale Factor                           | 2 <sup>-24</sup> G/LSB   |      | 0.06            |            | $\mu\text{G}/\text{LSB}$             |
| Sensitivity Error                      | 25°C, $\leq 1\text{G}$   |      | $\pm 500$       |            | $\times 10^{-6}$ (ppm)               |
| Nonlinearity                           | $\leq 1\text{G}$ , Best fit straight line, RT                    |      |                 | $\pm 0.03$ | % of FS                              |
| Misalignment                           | 25°C   |      |                 | $\pm 0.1$  | Deg                                  |
| Initial Error                          | 25°C   |      |                 | $\pm 2$    | mG                                   |
| Bias Repeatability                     | T <sub>A</sub> =25°C and VCC=3.3V<br>for one year after shipment |      | 3               |            | mG                                   |
| Bias Temperature Error                 | 25°C   |      |                 | $\pm 2$    | mG                                   |
| Noise Density                          | 25°C, Avg, f = 0.5Hz ~ 6Hz                                       |      | 0.2             | 0.7        | $\mu\text{G}/\sqrt{\text{Hz}}$ , rms |
| Cantilever Resonance frequency         | 25°C, VCC3.3V  |      | 850             |            | Hz                                   |
| VRC                                    | at 50Hz, 25°C, VCC3.3V   |      |                 | $\pm 50$   | $\mu\text{G}/\text{G}^2$             |
| Power Supply Current                   | Standard noise floor condition,<br>200Sps, Average               |      | 13.2            | 18.0       | mA                                   |
|  | Reduced noise floor condition,<br>200Sps, Average                |      | 16.2            | 20.0       | mA                                   |
|  | Sleep mode   |      | 1.3             | 2.0        | mA                                   |
| <b>FUNCTION</b>                        |  |      |                 |            |                                      |
| Built-in LPF Cut off                   | -6dB at 25°C, selectable   | 9    |                 | 460        | Hz                                   |
| User LPF                               |  |      | 4, 64, 128, 512 |            | Tap                                  |
| Output Data Rate                       |  | 50   |                 | 1,000      | Sps                                  |
| Ext.Trigger Input Cycle                |  | 1    |                 | 20         | ms                                   |
| Ext.Trigger Jitter                     | ADC's completion to Ext.Trigger input                            | 0    |                 | 5          | $\mu\text{s}$                        |
| <b>RECOMMENDED OPERATING CONDITION</b> |  |      |                 |            |                                      |
| VCC to GND                             |  | 3.15 | 3.3             | 3.45       | V                                    |
| Operating temperature range            | No condensation  | -30  |                 | 85         | °C                                   |
| <b>ABSOLUTE MAXIMUM RATINGS</b>        |  |      |                 |            |                                      |
| Acceleration/Shock                     | Half-sine 0.2msec  |      | 1,000           |            | G                                    |
| MTBF                                   | JIS-C5003, 60% reliability leve                                  |      | 87,600          |            | Hour                                 |
| Storage Temperature Range              | No condensation  | -40  |                 | 85         | °C                                   |

Note) This accelerometer is referenced to the standard gravity acceleration value. (9.80665m/s<sup>2</sup>)

# M-A352AD10

## OUTLINE DIMENSIONS



|     |   |
|-----|---|
| (a) | Directions of the detection axes  |
| (b) | Connector Position  |
| (c) | Matrix Code ( DataMatrix )<br>Including Product Name & S/N<br>& Date & Factory Code |
| (d) | Product Name  |
| (e) | Serial Number   |
| (f) | Date & Factory Code   |
| (g) | Frame Ground  |
| (x) | X Axis Sensor Position  |
| (y) | Y Axis Sensor Position  |
| (z) | Z Axis Sensor Position  |

### Header Part Number

| Maker  | Parts Number        | RoHS Compliant |
|--------|---------------------|----------------|
| Samtec | FTMH-110-02-L-DV-ES | Yes            |

### Recommended socket parts at the host side

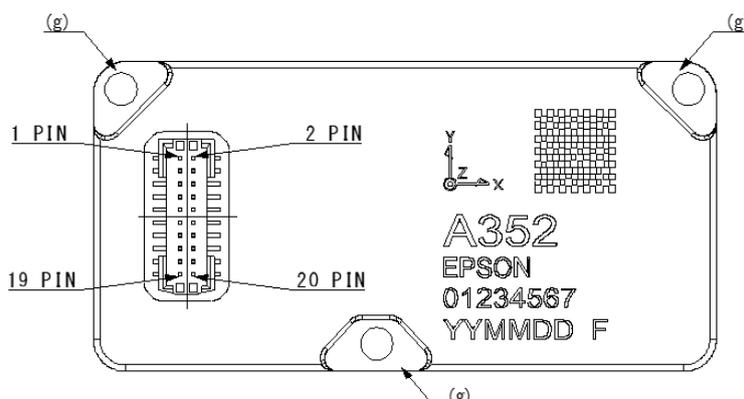
| Maker  | Parts Number   | RoHS Compliant |
|--------|----------------|----------------|
| Samtec | CLM-110-02-H-D | Yes            |
| Samtec | CLM-110-02-L-D | Yes            |

\*1) This product is calibrated based on the surfaces A1, A2, A3, and B1, B2.

\*2) In order to demonstrate the performance of the product properly, please fix surfaces A1, A2, A3 to rugged parts with M2 screw.

\*3) When high connection reliability is required, please tighten this product together with the board on which the connector is mounted.

## ■ PIN LAYOUT AND FUNCTION



| Pin No.     | Mnemonic | Type* <sup>1</sup> | Description                                    |
|-------------|----------|--------------------|--|
| 1           | SCLK     | I                  | SPI Serial Clock <sup>*2</sup>                 |
| 2           | SDO      | O                  | SPI Data Output <sup>*2</sup>                  |
| 5           | SDI      | I                  | SPI Data Input <sup>*2</sup>                   |
| 6           | /CS      | I                  | SPI Chip Select <sup>*2</sup>                  |
| 7           | SOUT     | O                  | UART Data Output <sup>*2</sup>                 |
| 9           | SIN      | I                  | UART Data Input <sup>*2</sup>                  |
| 13          | DRDY     | O                  | Data Ready                                     |
| 14          | EXT      | I                  | External Trigger Input<br>(Sleep Wakeup Input) |
| 16          | /RST     | I                  | Reset  |
| 10,11,12    | VCC      | S                  | Power Supply 3.3V                              |
| 3,4,8,15    | GND      | S                  | Ground <sup>*3</sup>                           |
| 17,18,19,20 | NC       | N/A                | Do Not Connect                                 |

\*1 Pin Type I: Input, O: Output, I/O: Input/Output, S: Supply, N/A: Not Applicable

\*2 Connect only one of the serial interfaces (SPI or UART) at a time. This product malfunctions when both SPI and UART are connected at the same time.

\*3 Please connect (g) Frame Ground to any GND pin (No.3, 4, 8, 15).

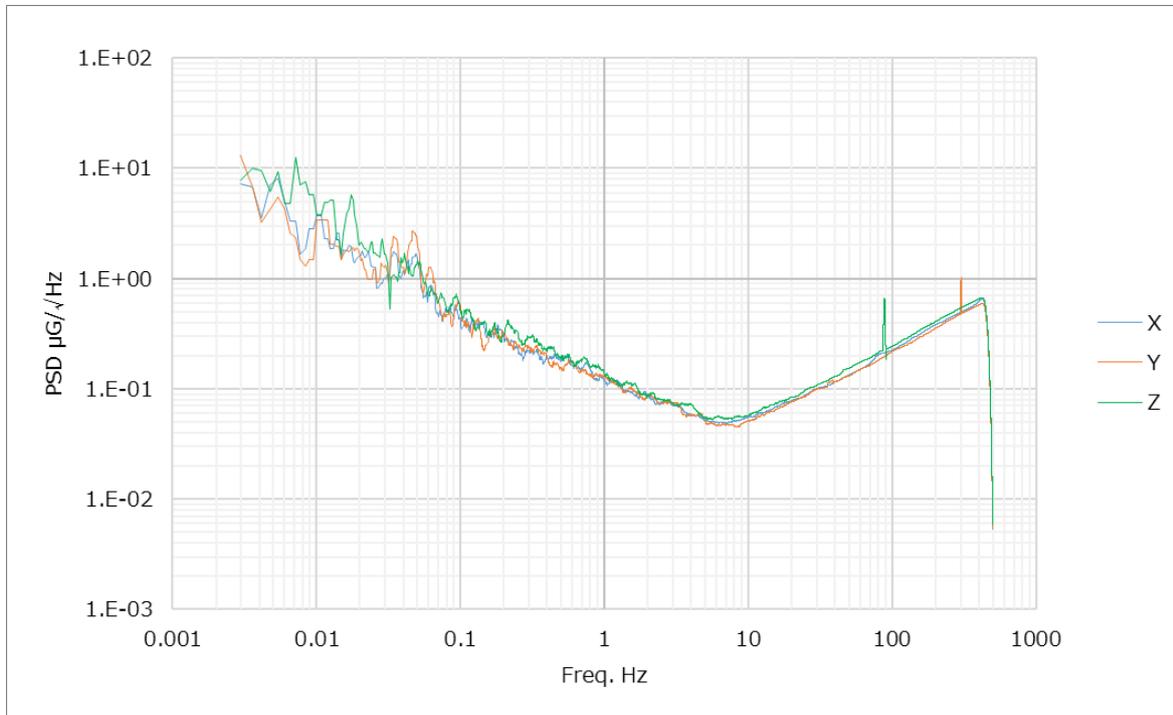
## ■ EVALUATION TOOLS

Evaluation tools can be provided for the M-A352. For details, contact our representatives.

| Product Model Number | Product Name | Comments  |
|----------------------|--------------|---|
| X2H000021000200      | M-G32EV041   | USB Evaluation Board for M-A352AD10<br>*Works with Logger Software.     |
| X2H000021000300      | M-G32EV051   | Relay board for M-A352AD10<br>*Combination with M-G32EV041 is possible. |

## ■ Noise Density Data

Power Spectrum Density (Reduced noise floor condition)



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