SV01A103AEA01R00

Rotary Position Sensor
High Rotational Life Type

Features
- **High Durability: 1M cycles**
- **Pb Free Soldering: 260°C**
- **Operating Temperature: -40°C to +85°C**
- **Terminal Shape: SMD Type and Lead Type**
- **Rotational Rotor: Through Hole Type**
- **Thin Type: 2.1mm**
- **RoHS Compliant**

Applications
- **Switch for white goods**
- **Digital still camera**
- **Switch for automotive**
- **Car audio**
- **Multi-function printer**
- **Robo**
- **Motor drive unitt**

Overview
Value analysis type for Consumer and Automotive market.

Small 12mm-size position sensors can be operated at temperatures from -40 to +85 degC, and has endurance of up to 1M cycles

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2. Specification

2.1 Operating Conditions

Table 1. Operating Conditions

Parameter	Spec	Test Method
Rated voltage	DC5±0.5V	
Operating Temperature Range	-40 ~ +85 degC	

2.2 Performance of Electrical Specifications

Table 2. Performance of Electrical Specifications

Parameter	Spec	Test Method
Standard total resistance range	10K ohm	
Standard total resistance range	±30% of standard total resistance value	
Linearity	±2%	4.1
Dielectric strength	250Vac, 1 minute, Leakage current less than 50μA	
Insulation resistance	100Mohm min. (250Vdc)	
Temperature coefficient of resistance (TCR)	±500ppm/°C	4.2
Electrical rotational angle	(Ref. : 333.3°)	
Electrical open area	15°max.	
Rotational torque	2mN·m (Ref.; 21gf·cm) max.	

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2.3 Environmental Specifications

Table 3. Environmental Specifications

ITEM	SPECIFICATION		TEST METHOD
	Total Resistance Change	Linearity	
High temperature exposure	+5/-30%	±3%	4.3
Low temperature exposure	±20%	±3%	4.4
Humidity	±20%	±3%	4.5
Humidity load life	±20%	±3%	4.6
Temperature cycle	±20%	±3%	4.7
Rotational life（reciprocal motion）	±20%	±3%	4.8
Vibration	±10%	±3%	4.9
Shock	±10%	±3%	4.10
Resistance to soldering heat	±20%	±3%	4.11
Vertical strength of the rotor	No mechanical deformation and damage		4.12
Edgewise strength of the rotor	No mechanical deformation and damage		4.13

2.4 Other characteristics

Table 4. Solderability

ITEM	SPECIFICATION	TEST METHOD
Solderability	More than 90 percent covered with solder coating	4.14

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3. Outline Dimensions and Land pattern

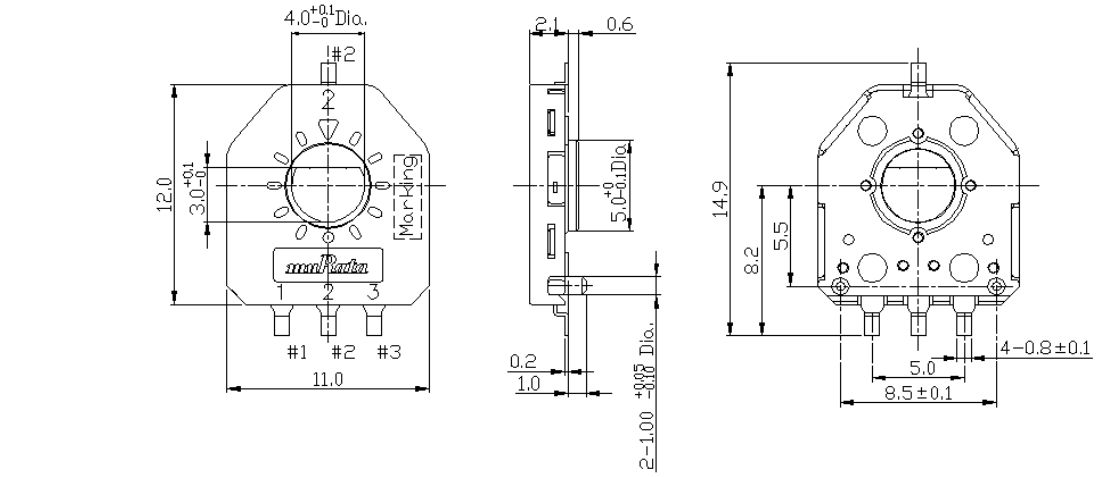

Fig.1 Dimentions

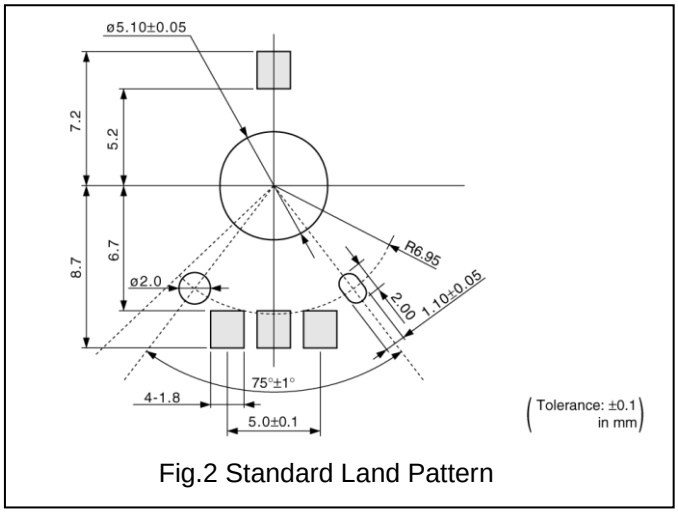

Fig.2 Standard Land Pattern

(Unit : mm)

(Tolerance : ±0.3)

The hole size of the three above-mentioned places is a value on condition of manual soldering.
When using a mounting machine,please expand the size of each hole to the value which applied the mounting accuracy of the mounting machine.

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4. Test Method

The tests and measurements shall be conducted under the condition of 15~35°C of temperature 25~75% of relative humidity and 86~106 k pa of atmospheric pressure unless otherwise specified. In case when entertained a doubt in judgment obtained from results measured in accordance with the above mentioned conditions, the tests and measurements shall be conducted under the condition of 25±2°C of temperature and, 50±2% of relative humidity and 86~106 k pa of atmospheric pressure. When the potentiometer is tested after soldering on PCB .,it shall be tested after being kept in a room (15~35°C, 25~75%RH) over 24 hours except ”Resistance to soldering heat “

4.1 Linearity

Linearity should be specified a deviation with be below ideal straight line, between ± 160 degrees from the index point which is 50% of output voltage.

The ideal straight line has 100% /333.3 degree as taper and pass the above index point.

Measurement is performed using the following measurement circuit, and the rotor should be rotated to clockwise direction.

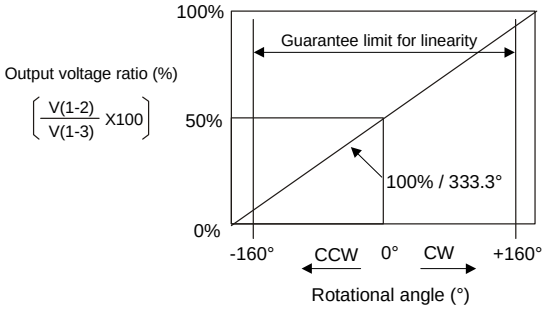

Fig.3 Linearity

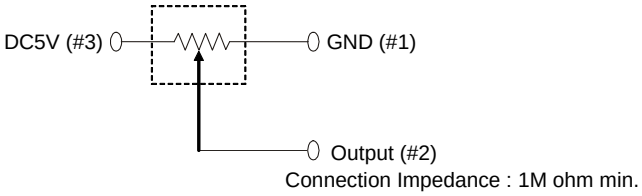

Fig.4 Circuit Diagram

4.2 Temperature coefficient of resistance (TCR)

The rotary position sensor should be subjected to each of the following temperatures for 30~45 minutes.

Table 5. Temperature coefficient of resistance

Sequence	*1	2	*3	4
Temp. (°C)	+25	-40	+25	+125

Note* : Reference temperature

Temperature coefficient of resistance should be applied to the following formula

$$TCR = \frac{R_2 - R_1}{R_1 (T_2 - T_1)} \times 10^6 \text{ (ppm / °C)}$$

T_1 : Reference temperature in degrees celsius
T_2 : Test temperature in degrees celsius
R_1 : Resistance at reference temperature in ohm
R_2 : Resistance at test temperature in ohm

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4.3 High temperature exposure

The rotary position sensor should be stored in a chamber at a temperature of 85±2°C without loading for 250 ±8 hours. After removing from the chamber, the rotary position sensor should be kept in the dry box for 1-2 hours.

4.4 Low temperature exposure

The rotary position sensor should be stored in a chamber at a temperature of -40±3°C without loading for 168 ±4 hours. After removing from the chamber, the rotary position sensor should be kept in the dry box for 1-2 hours

4.5 Humidity

The rotary position sensor should be stored in a chamber at temperature of 60±2°C and relative humidity of 90 ~ 95% for 250±8 hrs. After removing from the chamber, the rotary position sensor should be kept in the dry box for 5±1/6 hours.

4.6 Humidity load life

Full rated continuous working voltage not exceeding 5Vdc should be applied intermittently between terminal #1 and terminal #3 of the rotary position sensor, 1.5 hours on and 0.5 hours off, for 96±4 hours in total in a chamber at a temperature of 40±2°C and the relative humidity of 90~95%.After removing from the chamber, the rotary position sensor should be kept in the dry box for 5±1/6 hours.

4.7 Temperature cycle

The rotary position sensor should be subjected to Table 6 temperature for 5 cycles. Then, the rotary position sensor should be kept in the dry box for 1~2 hours.

Table 6. Temperature Cycle

Sequence	1	2	3	4
Temp.(°C)	-40±3	+25±2	+85±3	+25±2
Time (min.)	30	5 max.	30	5 max.

4.8 Rotational life (reciprocal motion)

The adjustment rotor should be continuously rotated within ±160° of effective electrical rotational angle,at the rate of 3 cycle for 1 second for 1M cycles under the condition of 25±2°C of temperature without loading. Then, the rotary position sensor should be kept in the dry box for 10±5 minutes.

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4.9 Vibration

The rotary position sensor should be log-swept by the sine oscillatory wave of the maximum amplitude 1.5mm, under the condition of the vibrational frequency between 10Hz and 55kHz.

1 cycle which is vibrated for each 2 hours in the 3 direction of x, y, and z., should be applied during 6 hours in total.

Then, the rotary position sensor should be kept in the dry box for 1~2 hours.

4.10 Shock

The rotary position sensor should be applied the following shock test : Half sine wave with the peak acceleration 20G can be applied in each 5 times (total 15 times) in the 3 direction of x, y, and z with bidirectional.

Then, the rotary position sensor should be kept in the dry box for 1~2 hours

4.11 Resistance to soldering heat.

The rotary position sensor should be soldered by reflow soldering method according to the standard soldering Condition (refer to the below table). Then, the rotary position sensor should be kept in the dry box for 24 +8/-0 hours.

Table 7. Soldering heat

Pre-heating		Heating		Peak	Cycle of reflow
Temp.(°C)	Time(sec.)	Temp.(°C)	Time(sec.)	Temp.(°C)	
150~180	60~120	Over 230	30~50	260 +5/-0	2

4.12 Vertical strength of the rotor

The rotary position sensor should be holding. The force of 10N(Ref.; 1.0kgf) should be applied to the rotor in vertical direction of the axes of rotor for 10 seconds.

4.13 Edgewise strength of the rotor

The rotary position sensor should be holding. The vertical shaft should be inserted to the rotor.

The force of 3N(Ref.; 306gf) should be applied to vertical shaft in vertical direction of the axes of vertical shaft.

4.14 Solderability

All terminals where is 1.3mm from the point of the terminal of the rotary position sensor should be dipped into the flux for 3 sec. and dipped into the solder bath at a temperature of 245±3°C for 3.0±0.5 seconds.

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5. Packing information

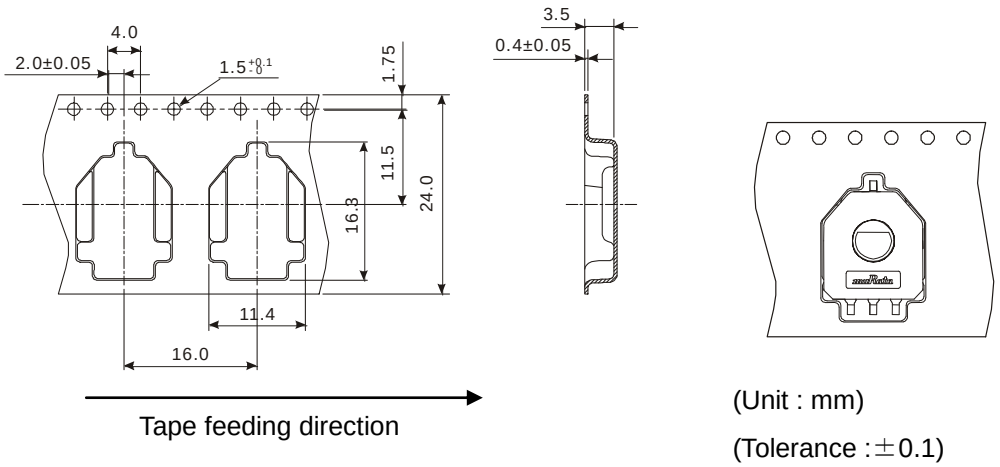
5.1 Part Number and packing

SV01A103AEA01B00 Bulk : 50pcs./pack

SV01A103AEA01R00 Taping : 1000pcs./reel

5.2 Taping Specification

5.2.1 Plastic Tape Dimensions

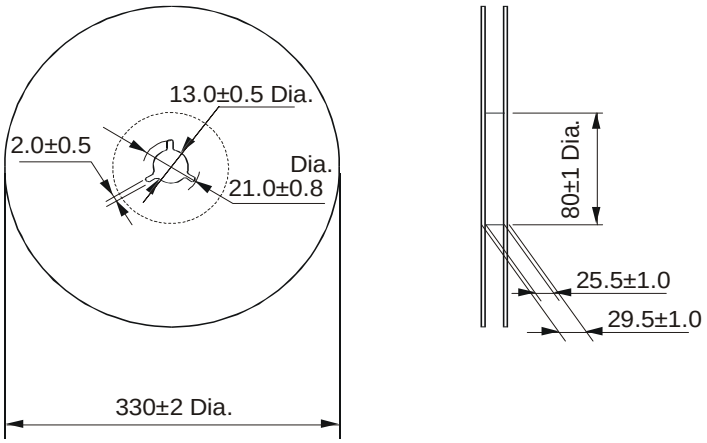


(Unit : mm)

(Tolerance : ±0.1)

Fig.5 Taping Dimension

5.2.2 Reel dimensions



➢ Marking on the reel

1) Customer part number
2) Murata part number
3) Inspection number
4) Quantity

Fig.6 Reel Dimension

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6. ⚠Caution

6.1 Limitation of Applications

Please do not use in the applications listed below which require a high reliability to prevent the defects which might cause a damage to the Peoples' life and/or property.

1) Aircraft equipment
2) Aerospace equipment
3) Undersea equipment
4) Power plant control equipment
5) Medical equipment
6) Transportation equipment (trains, ships, etc.)
7) Traffic signal equipment
8) Disaster prevention / crime prevention equipment
9) Data-processing equipment
10) Military equipment (regardless of directly/indirectly)
11) Security device/system
12) Outside-usage, in which the sensor is exposed to splashes or dusts

Application of similar complexity and/or reliability requirement to the applications listed in the above

6.2 Fail-Safe

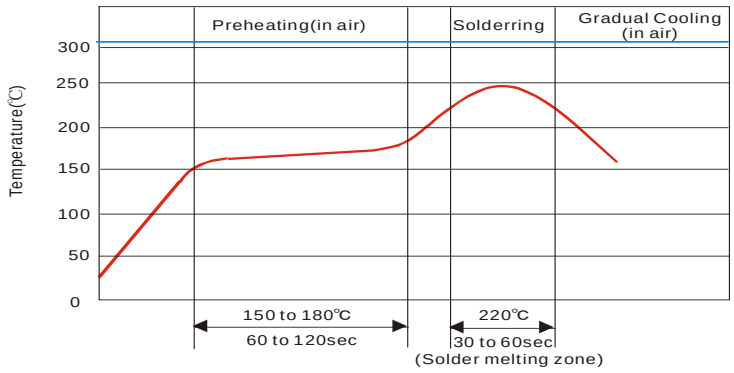
Please make sure to provide an appropriate fail-safe function on your product to prevent a second damage that may be caused by the abnormal function or the failure of our product.

6.3 Notice in design and usage

6.3.1 Soldering

1) Standard soldering condition (Lead-free solder : Sn-3Ag-0.5Cu)

Reflow soldering



*Peak temperature : 245±3°C *Cycle of reflow : 2 time

Fig.7 Reflow Chart

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Soldering Iron

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Temperature of tip	:	350±10°C max.
Soldering time		3 sec. max. / 1 terminal
Diameter of tip	:	3mm Dia.max.
Wattage of iron	:	30W max.

Before using other soldering conditions than those listed above, please consult with Murata factory representative prior to using. If the soldering conditions are not suitable, e.g., excessive time and/or excessive temperature, the rotary position sensor may deviate from the specified characteristics.

2) The soldering iron should not come in contact with the case of the rotary position sensor. If such contact does occur, the rotary position sensor may be damaged.

3) Rotary position sensor is designed for the purpose of soldering. If you intend to connect with conductive adhesive or other method, please consult with Murata factory representative prior to using.

4) Rotary position sensor is not seated construction. So, when soldering, please pay your attention to prevent flux coming into the rotary position sensor.

5) It is available for electrical use either A terminal of B terminal as #2 terminal to provide flexible wiring design. In case when A terminal is used in electrical, please fix B terminal to PCB by solder to secure enough adhesives.

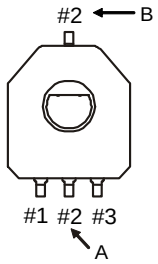

Fig.8 Terminal

6.3.2 Cleaning

Can not be cleaned by any solvents due to the open construction.

6.3.3 Operating environmental conditions

1) Uncontrolled mechanical force except usual rotation on the hollow rotor of product, may cause big change of electrical characteristic, big increase of rotational torque or mechanical damage of product.

Therefore, please pay your attention on the following points for your design.

1. The fixing method of product must be soldering by the terminals of product. And please do not fix by screw cramping of supporting board which might cause mechanical deformation of product.

2. Your connecting shaft must be sustained by your bearing and any uncontrolled force should not apply on the hollow rotor of product.

2) Do not use the rotary position sensor under the conditions listed below. f you use the rotary position sensor in the conditions listed below, please consult with Murata factory representative prior to using.

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1. Corrosive gasses atmosphere (Ex. Cl_2, H_2S, NH_3, SO_2, NOx, etc.)
2. In liquid (Ex. water, oil, medical liquid, organic solvent, etc.)
3. Dusty / dirty atmosphere
4. Direct sunlight
5. Static voltage nor electric / magnetic fields
6. Direct sea breeze
7. Other variations of the above

6.4 Notice in Storage

6.4.1 Storage conditions

1) To ensure the solderability of the terminal, store that the temperature is -10°C~+40°C and the relative humidity is 30~85%RH, and use within six months after delivery. If you are going to use a product which has been stored for more than six months, please check its solderability beforehand.

2) Do not store in or near corrosive gases.

3) Do not store under direct sunlight.

6.5 Notice in Circuit design and other

6.5.1 Connecting impedance

The rotary position sensor is designed the condition shown on Fig-1, that is connecting the output terminal and A/D port of the microprocessor directly. In other words, connecting impedance presuppose certain M ohm and the contact resistance are set high. Therefore, please make sure the connecting impedance is to be more than 1M ohm.

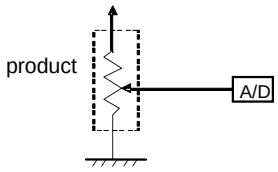

Fig.9 Circuit Diagram

6.5.2 Noise Suspension

To minimize the processing error which occur in rare cases, when data is installed through the product and noise influence from wiper contact and/or outside, please note the following points and program rotary position sensor, the rotary position sensor may deviate from the specified characteristics.

1) Data install should be done plural times and applied the mean value.
2) Data considered as error should be invalid.
3) Data should be re-installed if quaere occurs.

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6.5.3 Cautions to use grease or oil

In case of using grease or oil on connecting shaft or gear which are connected to the rotary position sensor, please prevent grease or oil coming into the rotary position sensor. If grease or oil puts into the rotary position sensor, the rotary position sensor may deviate from the specified characteristics.

6.6 Other

1) Please make sure that your product has been evaluated in view of your specifications with our product being mounted to your product.

2) You are requested not to use our product deviating from the agreed specifications.

3) Please return one copy of this product specification with your signature of receipt. If the copy is not returned within three months, this product specification will be deemed to have been received.

4) We consider it not appropriate to include any terms and conditions with regard to the business transaction in the product specifications, drawings or other technical documents. Therefore, if your technical documents as above include such terms and conditions such as warranty clause, product. liability clause, or intellectual property infringement liability clause, they will be deemed to be invalid.

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