Reed Switch Databook

Version 1.00, December 2004

Before accessing product data, please be so kind as to read our NOTICE.
Preface

We would like to thank you for patronizing Oki’s reed switch products.

In the rapidly expanding electronics industry, reed switch products cover a wide range of applications and are growing. Requirements for switches with better performance and more functions are increasing. The requirements for compactness and higher reliability are also increasing.

We are working very hard to fulfill these requirements by developing high performance, high reliability reed switch products.

This book contains data on our latest reed switch products. We sincerely hope that you find it useful.

We will continue to develop our reed switch products to help in the development of the electronics industry and appreciate your continued help and cooperation.

December 2004

Oki Sensor Device Corporation
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INTRODUCTION

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<table>
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<td>1C</td>
<td>1A</td>
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<td>10 ~ 50</td>
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<td>5min</td>
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<td>Contact rating [VA]</td>
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<td>16</td>
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<td>DCO.5</td>
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<td>Resonant frequency [Hz]</td>
<td>2200 ± 300</td>
<td>4400 ± 400</td>
<td>2750 ± 250</td>
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<td>Φ3.5 x 15</td>
<td>Φ3.7 x 15</td>
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<td>Operating Temperature Range</td>
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<td>-40°C ~ +125°C</td>
<td>-40°C ~ +125°C</td>
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<td>-40°C ~ +125°C</td>
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<td>Features [Contact material]</td>
<td>Long life (Rh)</td>
<td>Ultra miniature trans (Rh)</td>
<td>Miniature wide differential (Rh)</td>
<td>Miniature offset type long lead (Rh)</td>
<td>General purpose miniature type (Rh)</td>
<td>General purpose miniaturization (Rh)</td>
<td>Super ultra miniaturization (Irridium)</td>
<td>High-power long-life (Ir)</td>
<td>Miniature SMD (Rh)</td>
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<td>Page</td>
<td>117</td>
<td>125</td>
<td>133</td>
<td>141</td>
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<td>157</td>
<td>165</td>
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UL File #: E70063
Environmental Characteristics

Environmental conditions are the same for all models of reed switches.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Test methods</th>
<th>Remarks</th>
</tr>
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<tbody>
<tr>
<td>Shock Resistance</td>
<td>No malfunction or change in characteristics when subjected to shock of 30 G (11 m sec).</td>
<td>MIL-STD-202G METHOD213B condition J</td>
</tr>
<tr>
<td>Vibration Resistance</td>
<td>No malfunction or change in characteristics when subjected to vibration of less than 20 G (10 to 1000 Hz).</td>
<td>MIL-STD-202G METHOD204D condition D</td>
</tr>
<tr>
<td>Operating Temperature Range</td>
<td>Operating Temperature -40 to 125°C.</td>
<td>–</td>
</tr>
<tr>
<td>Lead tensile strength</td>
<td>Withstand static load of 2.27 kgf in tension.</td>
<td>MIL-STD-202G METHOD 211A</td>
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</table>

Remark 1. When subjected to shock above 30 G, reed switch pull-in value may change.

2. Because of reed resonance, frequencies over 1 kHz should be avoided. (Frequency range must be 10 to 1000 Hz.)

3. Actually, read switches can be operated beyond this temperature range if certain evaluation is done. It is noted that some magnet decreases magnetization at low temperatures.

The UL recognition number for our reed switches is E70063.
The CSA recognition number for our reed switches is 86615X0000.
GENERAL DESCRIPTION

The reed switch was invented by Dr. W. B. Ellwood at Bell Telephone Laboratories in 1936. The first application was made during 1938 when the reed switch was used as a selector switch in coaxial carrier equipment. Later, improvements of the reed switches were made in parallel with the development of the telecommunications technology. At the same time, the advantages of reed switches such as the speedy response time, hermetically sealed contacts, compact size and long mechanical life have contributed greatly to the development of telecommunications technology.

From 1956, when research and development on reed switches began in Japan, innovations have been made in improving contact performance, reducing overall size, improving manufacturing methods and reducing manufacturing cost. In addition to applications in switching systems, broad applications have been developed as sensors and controllers in automobile electrical devices, reed relays, and other instruments of various types.

Our reed switches of extremely superior quality are manufactured based on our own original technology for deactivating contact surfaces, high performance automatic sealing equipment and contact resistance measurement technology which uses magnetic flux scanning tests (FS method). In particular, our process for deactivating contact surfaces takes the fatal problem of the conventional rhodium contact reed switch and suppresses increases in contact resistance due to organic contamination. Thus, it became possible to manufacture reed switches with stabilized contact resistance. This original technology was awarded the highest award (Schneider Award) at the 21st Annual National Relay Conference.

Furthermore, we received the Schneider Awards at the 36th and 38th Annual National Relay Conferences for research into reed switch contact phenomena. Our engineering and technology capabilities are evaluated highly.

1. Reed Switch Characteristics

Reed switch characteristics are discussed below.

1. Reed switches are hermetically sealed within a glass tube with inert gas and do not receive any influence from the external atmospheric environment.
2. Quick response because of small mass of moving parts
3. The structure comprises the operating parts and electrical circuits arranged coaxially. Reed switches are suited to applications in radio frequency operation.
4. Reed switches are compact and light weight.
5. Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
6. With a permanent magnet installed, reed switches economically and easily become proximity switches.

2. Applications
3. Structure and Operating Principles

As shown in Figure 3.1, the reed switches comprise two ferromagnetic reeds placed with a gap in between and hermetically sealed in a glass tube. The glass tube is filled with inert gas to prevent the activation of the contacts. The surfaces of the reed contacts are plated with rhodium.

As shown in Figure 3.2, the reed switch is operated by the magnetic field of an energized coil or a permanent magnet which induces north (N) and south (S) poles on the reeds. The reed contacts are closed by this magnetic attractive force. When the magnetic field is removed, the reed elasticity causes the contacts to open the circuit.

**Basic reed switch structure**

![Figure 3.1](https://example.com/fig1.png)

**Make type**

**Changeover type**

**Reed switch operating principles**

![Figure 3.2](https://example.com/fig2.png)

The changeover type reed switch is normally ON, due to mechanical bias of the common (COM) lead, which is between the normally closed (N.C) reed contact and the normally open (N.O) reed contact.

When an external magnetic field is induced, the N.C blade is not affected because it is non-magnetic but the COM lead is attracted by the N.O lead and moves. When the magnetic field is removed, COM lead again moves to the N.C lead by mechanical bias.
4. Permanent Magnet Drive

When a reed switch is driven by a permanent magnet, the selection of the permanent magnet and the determination of its distance relative to the reed switch are done according to the following steps.

1. Study of detecting mechanism
   - Reciprocating movement, Rotational movement, Bias method or Shielding method

2. Study of mounting space
   - Does the space have restriction or limits?

3. Selection of reed switch
   - Dimensions and performance

4. Study of magnet type and decision of pull-in value of reed switch
   - Shape, Material, Magnet pole layout and ON-OFF stroke

4-1 Permanent magnet drive method

The following four patterns 1) through 4) illustrate typical methods to drive the reed switch by a permanent magnet.

1) Reciprocating method

   - Figure 4.1

2) Rotational method

   - Bar magnet
   - Two pole ring magnet
   - Four pole ring magnet

   - Figure 4.2

3) Bias method

   - Bias magnet

   - Figure 4.3

4) Shielding method

   - Shield plate (magnetic material)
4-2 Permanent magnet drive characteristics

When a reed switch is operated by a permanent magnet, its ON-OFF domains will differ according to the type of the reed switch, its pull-in and dropout values, read forming conditions as well as the permanent magnet material, its shape, and magnetizing conditions.

Typical drive characteristics are shown below.

(1) X-Y characteristic H (horizontal)

(2) X-Z characteristic H (horizontal)

(3) X-Y characteristic V (vertical)
4-3 ORD228VL magnet drive characteristics example

Magnet: $5 \times 5 \times 6\text{mm}$
Anisotropic barium ferrite
Surface magnetic flux: 120mT
Reed switch: ORD228VL: Pull-in Value 10.0 (AT)
Drop-out Value 7.3 (AT)

(1) X-Y characteristics H

(2) X-Z characteristics H

(4) X-Y characteristics V

Figure 4.7

Figure 4.8

Figure 4.9
4-3 ORD228VL magnet drive characteristics example (continuation)

Magnet: 5×5×6mm
Anisotropic barium ferrite
Surface magnetic flux 1.20 mT
Reed switch: ORD228VL: Pull-in Value 20.0(AT)
Drop-out Value 15.7(AT)

(1) X-Y characteristics H

(2) X-Z characteristics H

(3) X-Y characteristics V

Figure 4.10

Figure 4.11

Figure 4.12
REED SWITCH RELIABILITY

Reed switches play important roles in the recent marked progress in the development of electronics and mechatronics equipment. Important applications of reed switches cover a wide variety of fields such as those in communications equipment, office automation equipment, control equipment, and consumer electronics equipment and the demands for these devices are steadily increasing.

Under these conditions, for example, a failure in communications equipment can have incalculable influence. Now, it is the obligation of manufacturers to supply reliable and high quality products. We are fully aware of our obligations in this regard.

Accordingly, we have adopted a comprehensive quality assurance system based on ISO9001 with integrated product policy in development, manufacturing, marketing and sales. Moreover, we will expand our efforts to meet the demands for improvements in performance and reliability of the products.

We outline below our quality assurance system and the underlying concepts that enable us to supply reliable quality products. Furthermore, we explain the reliability testing methods and our original technology which we use to maintain the high reliability in our reed switch products.

1. Quality Assurance System and Underlying Concepts

The goals of the quality assurance system employed by we are as follows:
- Supply of high quality product
- On-time delivery
- Rational product cost
- Customer oriented product marketing.

The flow of product quality assurance consists of the following four stages, consisting of Product planning stage, Development and prototype production stage, Trial mass production stage, and Mass production stage.

This system is illustrated in the block diagram shown in Figure 1.1.

1-1 Product planning stage

To manufacture products that meet market demands and satisfy customer needs, we carefully study functional and failure rate requirements, product applications, environments and other conditions. After these studies, we specify the material, structure and the sizes of the products planned. We then proceed to the design plan, manufacturing engineering plan, and process capacity requirement plan. At this point, we prepare the development plans and time schedules.

1-2 Development and prototype production stage

At this stage, we concretely establish the required structure, dimensions, processes and assembly techniques. Furthermore, actual prototype testing is carried out to ensure reliability. Since most product quality is determined at the design stage, we build quality into the product design and pay careful attention to quality assurance during this stage.

Specifically,
1) After completing the basic design, the design engineering, production engineering and product reliability departments perform design reviews.
2) Prototypes are subjected to repeated functional and reliability testing. At this point, characteristics and reliability are confirmed while the stability and capacity of manufacturing processes are also confirmed.

1-3 Trial mass production stage

During this stage, various tests are performed to check the features and reliability mentioned above. These activities are aimed at the mass production level. After confirming product quality, we prepare the various mass production standards and start mass production.

1-4 Mass production stage

During the mass production stage, careful management of purchased materials and parts, facilities used during the manufacturing process, measuring equipment, manufacturing conditions and environment is necessary to ensure product quality stipulated during the designing stages. In-process quality and lot assurance inspections are shown in Figure 1.2.

Following lot assurance inspections, the products are placed in storage awaiting shipment to customers. Standards are also set up for handling, storage and transportation during this period, to ensure that no product quality problems develop before the product reaches the customers.
REED SWITCH RELIABILITY

Market and customers

Management

Business promotion department

Administrative department

Marketing and sales department

Development design department

Production engineering department

Quality assurance department

Production control department

Affiliated company (Sub company)

Business planning

Customer requirement

Corporate policy setting

Medium range business plan

Annual business plan

Requirement for commercialization

Approval

Specifications study for product planning

Approval for commercialization

Target specifications development plan

DR grade decision

New product development plan meeting (Development schedule/coordination of departments in charge and target specifications)

Actual design

Pilot production specifications

Creating CP-1

Design review-1

Pilot production plan • drawing

Conditions for pilot production

Design evaluation

Characteristics evaluation

Mass production specifications

Reliability evaluation

Environment specification

Environment control procedure

Facility procurement specifications

Validating specifications

Design review-2

Design output issuance

Delivery specifications brochures
Figure 1.1 Quality assurance system
All products are subjected to thorough quality checks as described above and shipped to the customers. If, by any chance, a failure does occur after delivery to the customers, defective products are processed and the problem is rectified immediately to minimize the inconvenience to the customers in accordance with the flow chart shown in Figure 1.3.

Quality improvement activities are employed to assure high quality product performance and reliability following the quality assurance and quality control flow shown in Figure 1.4.
Figure 1.4 Quality assurance and quality control flow

Figure 1.3 Failure report process flow chart
2. Our Original Technology Supports High Reliability

2-1 Deactivated rhodium contacts

Our reed switches are extremely reliable because of the use of rhodium as the contact material. Rhodium has two superior properties for use as contact material.

The first is its extreme hardness which is effective in preventing sticking. The second is the high melting point which remarkably reduces contact surface wear caused by joule heat and arc discharge. However, since rhodium belongs to the platinum group, it is absorptive and catalytic.

Therefore, rhodium-plated contacts adsorb organic impurities and form polymers during operations as shown in Figure 2.1. This greatly increases the contact resistance. In the low-level load operation, this phenomenon is particularly noticeable.

In order to deactivate the rhodium-plated contact, we have developed a unique high temperature oxygen treatment. This technique makes the organic impurities built on the surface burned with oxygen and forms oxygen molecule layer on the contact which in turn provide stable contact resistance. This unique method won the highest prize (Schneider Award) at the 21st National Relay Conference in Oklahoma, USA, in 1973.

Our technology is valued highly, and at the 36th and 38th Annual National Relay Conferences we also received the Schneider Awards for research on reed switch contact surface phenomena.

Our patents have been registered in Japan (Pat. No. 916386), USA (Pat. No. 3857175) and Germany (Pat. No. 2303587)

2-2 High performance, automatic sealing equipment

Sealing is the process of forming the reed switch from the assembly of pressed and plated reed and glass tube. This is one of the most important processes which demands severe quality control and management. At the time of sealing, working temperature reaches 1000 °C which makes the glass tube impurities evaporate and causes the reed switch contact surface to be contaminated. To prevent the effects of these phenomena, we have developed severe standards for selection of glass material. In addition we also use unique technology for automatic sealing. Improvements in manufacturing method such as these enable us to produce extremely high quality reed switches.

2-3 Magnetic flux scanning test (FS test) for measuring contact resistance

Sealing processes are performed under severe quality control and management. However, there is still a slight possibility for magnetic foreign particles to enter into the glass tube. We have conducted extensive research into the detection of microparticles and we developed the “Magnetic Flux Scanning Test” as an extremely high reliability technique for measuring contact resistance.

A general description is shown in Figure 2.2 where the magnetic attractive force from multiple layers of coils causes the magnetic foreign particles to move to the contact part of the reed switch. During check of the contact resistance, foreign particles are detected.

Since we use this unique technology, we have succeeded in making rapid progress toward improving reed switch reliability.
3. Reliability Testing Methods

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specifications</th>
<th>Unit</th>
<th>Test method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature and humidity cycle</td>
<td>−10~+65 (80~98)</td>
<td>°C</td>
<td>MIL-STD-202G 106E (Refer to Figure 2.3)</td>
</tr>
<tr>
<td>Temperature cycle</td>
<td>−55~+125 (%)</td>
<td>°C</td>
<td>Chart is shown in Figure 2.4.</td>
</tr>
<tr>
<td>High temperature storage test</td>
<td>125 °C</td>
<td></td>
<td>500H</td>
</tr>
<tr>
<td>Low temperature storage test</td>
<td>−40 °C</td>
<td></td>
<td>500H</td>
</tr>
<tr>
<td>Shock Resistance</td>
<td>30min</td>
<td>G</td>
<td>MIL-STD-202G 213B Condition J</td>
</tr>
<tr>
<td>Vibration Resistance</td>
<td>20min</td>
<td>G</td>
<td>MIL-STD-202G 204D Condition D</td>
</tr>
</tbody>
</table>

Figure 2.3 Temperature and humidity cycle chart

Figure 2.4 Temperature cycle chart
PRECAUTIONS AND APPLICATIONS

1. Contact Protection Circuit

When a reed switch is to be connected to the inductive load or the load where surge current or rush current flows (such as capacitance load, lamp, long cable, etc.), the following contact protection circuits are also required for the reed switch.

1-1 Inductive loads

In case an electromagnetic relay, electromagnetic solenoid, or electromagnetic counter which has inductance component is provided as a load in a circuit, the energy stored in the inductance will cause an inverse voltage when the reed contacts break. The voltage, although dependent on the inductance value, sometimes reaches as high as several hundred volts and becomes a major factor to deteriorate the contacts. In order to prevent this, many protection circuits are provided, typical examples of which are shown in Figure 1.1.

a) Contact protection by capacitor and resistance (Also possible at the load terminal.)

\[
C = \frac{I^2}{10} [\mu F]
\]

\[
R = \frac{E}{10I} \left(1+\frac{E}{50}\right) [\Omega]
\]

b) Contact protection by varistor

When the contact open time is long, varistor should be put into the load terminal.

d) Resistance (R) is installed in the circuit to protect contact. R should be between 50 and 500 Ω

1-2 Capacitive loads

In case a capacitor is provided in series or in parallel with the reed switch contacts in a closed circuit, the rush current which flows at the time of charge and discharge of the capacitance will cause much deterioration of the reed contacts.

Fig. 1.2 shows typical examples of the protection circuits to prevent the rush current.

1-3 Lamp load

The circuit with a lamp load is, therefore, considered similar to a circuit with a capacitor where large current flows to charge the capacitor, thus requiring the contact protection circuit.

Fig. 1.3 shows examples of protection circuits.
2. Reed Switch Lead Forming

When reed switches are used, usually the leads are cut or bent. However, precautions should be taken when performing these processes.

1. Cutting and bending positions must be determined with reference to the center of the contact or to the end of the lead. If the position is measured from the end of the glass tube, the contact center position may be moved.

2. When in cutting on bending the leads, be sure to protect the sealing portions. As shown in Figure 2.1, the lead should be placed firmly by a jig.

3. After the process, confirm that there is no crack or chipping in the glass tube.

---

2-1 Cutting the leads

Since the leads of a reed switch comprise part of the magnetic circuit, shortening the leads by cutting will cause the required ampere turns for pull-in and drop-out to increase as shown in Fig. 2.2.

Here in this figure, a standard coil was used in making measurements and there may be differences when the reed switch is driven by a permanent magnet depending on the difference of the shape of magnet and orientation of magnetization. Therefore, it is necessary to actually examine the change of the pull-in and drop-out values by the magnet and drive method to be used. In some cases, a reed switch becomes more sensitive to a magnet than original.
2-2 Bending the leads
As in the case of cutting the leads, influence on the pull-in and drop-out characteristics must be checked by actually using the magnet and the driving method planned.

2-3 Measuring the electrical characteristics of reed switches after cutting or bending
When the leads of a reed switch are cut, it is not possible to measure electrical characteristics by using a standard test jig. However, it is possible to measure these characteristics after processing if a special jig is made. It is also possible to measure electrical characteristics of the reed switch with a bent lead by using the jig similar to the one used for a reed switch with a cut lead. However, when both leads are bent, the reed switch cannot be inserted into a coil and therefore cannot be measured.

3. Reed Switch Mounting
Generally, a reed switch is mounted by soldering or welding. When the mounting space (including its vicinity) is non-magnetic, there is no influence on operation but when the material is magnetic, operation characteristics do change. Therefore, it is necessary to check these in consideration of the assembling conditions.

3-1 Soldering
Leads are tin plated and are soldered ordinarily (250 to 360 °C). When soldering, keep the soldering point at least 1 mm away from the glass end. In addition, there is also a danger of causing the glass tube to be damaged by heat if the soldering is done for a long time. Keep the process to less than five seconds.

3-2 Welding
When welding, also keep the welding point at least 1 mm away from the glass end. When using a large power supply for welding, heat generated in lead may cause damage to the glass tube. Precautions to prevent this are necessary.
Welding current may also induce magnetic field and cause the reed switch to operate. Therefore, it may introduce welding current to the contact and contact may be melted. Precautions are also necessary.

3-3 Ultrasonic welding
Be very careful when using ultrasonic welding methods to weld reed switches or using ultrasonic welder in the vicinity of a reed switch. The ultrasonic can change the contact gap and the characteristics of the reed switch.

3-4 Mounting on a printed circuit board
When mounting on a printed circuit board, the reed switch should float on the board as shown in Figure 3.1 or hole should be opened in the printed circuit board to prevent the glass from touching the board surface. Otherwise, it is possible to cause damage to the glass tube because of physical shocks or other adverse elements applied externally to it.

4. Reed Switch Resin Mold
When reed switches are molded with resin, it is possible for the resin stress to break or damage the glass tube. Therefore, the resin should be selected carefully. Moreover, it is necessary to perform temperature cycle testing to ensure selection of safe resin material.
On the other hand, there is no problem if silicone or other soft resin is used.
5. Dropping Reed Switches

Avoid dropping reed switches. If a reed switch is dropped onto a hard surface from a height more than 30 cm, it is possible to cause the characteristics to change. If a reed switch has been dropped, carefully inspect its characteristics and exterior appearance before use. If a reed switch has been subjected to shock more than 30 G, the pull-in value may change.

6. Relation to Characteristic Values Given by Other Makers

Measurement methods are manufacture dependent. Therefore, the pull-in value may be different depending on the measurement conditions (standard coils and overall length of the reed switch are different). Accordingly, it is necessary to correlate the characteristics.

7. Certified Pull-in Value for Reed Switches

The pull-in value (four digits) shown on the reed switch package is selected range values. The certified pull-in value for this selected range has a tolerance of ±2AT.

Example: Certified pull-in value for ORD211 (2025) is 18 to 27 AT.

8. Specifications

Specifications given here are subject to change for improvement without notice to the users. Please make sure that you have the latest values and specifications before actual use.
## DESCRIPTION OF SYMBOLS AND TERMS

Following is generally used terms regarding the basic operating characteristics of the reed switches.

<table>
<thead>
<tr>
<th>Term</th>
<th>Symbol</th>
<th>Unit</th>
<th>Description and Test Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pull-in Value</td>
<td>PI</td>
<td>AT</td>
<td>• This is the most important operating characteristic of a reed switch. It is given as the product of the energizing current for the coil necessary to operate the switch and the number of turns of the coil winding. This is the sensitivity of reed switch. High sensitivity means low pull-in value.</td>
</tr>
<tr>
<td>Drop-out Value</td>
<td>DO</td>
<td>AT</td>
<td>• Drop-out value is obtained by taking the product of the value of the current flowing in the coil at the time when the contacts are released and the number of turns of the coil windings. Drop-out value is correlative to pull-in value and is a secondary value.</td>
</tr>
</tbody>
</table>

### Test method (1) Measurement circuits of pull-in and drop-out values

**Make type**

- Coil saturation current: 20mA (SOAK) 100AT
- Voltage between contacts: 2 to 10 V: DC
- Current between contacts: less than 10 mA

**Transfer type**

- Coil saturation current: 20mA (SOAK) 100AT
- Voltage between contacts: 2 to 10 V: DC
- Current between contacts: less than 10 mA

Current at time of operation x number of turns in standard coil (5000T): Indicated in AT
Note: Measure after making sure that the center of the coil and the center of the reed switch contacts are aligned. Initially, apply soak current (100 AT) then return to zero (AT). Next, apply the current in the same direction and measure it. The polarity of the current applied to the coil should make the direction of the energized magnetic field to be the same as the direction of terrestrial magnetism. (The leading end of the coil-wire at the top should have positive polarity.)

Contact resistance

- Contact resistance is the resistance between contacts when the contacts are closed and includes conductor resistance.

- Test method (2) Measurement circuit of contact resistance

  **Make type**

  ![Make type diagram]

  - Oki Standard Coil
  - Microohmmeter (YHP-4328A or equivalent)
  - Applied voltage for measurement (less than 10V DC)
  - Current for measurement (less than 10 mA)
  - Coil current 20 mA (100AT)

  **Transfer type**

  ![Transfer type diagram]

  - Oki Standard Coil
  - Microohmmeter (YHP-4328A or equivalent)
  - Applied voltage for measurement (less than 10V DC)
  - Current for measurement (less than 10 mA)
  - Coil current 20 mA (100AT) N.O
  - 0 mA (0AT) N.C

Breakdown voltage

- Specifies a maximum value of transient voltage over the contacts caused by surge current or other external factors. Below this rated value, the reed switch operates without destruction of its contact insulation resistance.
## DESCRIPTION OF SYMBOLS AND TERMS

<table>
<thead>
<tr>
<th>Term</th>
<th>Symbol</th>
<th>Unit</th>
<th>Description and Test Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insulation Resistance</td>
<td>V</td>
<td></td>
<td>• Insulation resistance is the resistance between lead ends and the resistance against leak current across the reed switch glass tube or its surface.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Test method: MIL-STD-202G METHOD302 (Measurement is made by using a DC 100 V super megger.)</td>
</tr>
<tr>
<td>Electrostatic Capacitance</td>
<td>pF</td>
<td></td>
<td>• Electrostatic capacitance is the value of capacitance between open contacts. The overlap of reed switch contacts is uniform. Therefore, when the contact gap becomes large, accompanying an increase in pull-in value, the electrostatic capacitance becomes small. Electrostatic capacitance is measured at 1MHz-0.1V.</td>
</tr>
<tr>
<td>Contact rating</td>
<td>W/VA</td>
<td></td>
<td>• Contact rating is the maximum product of the voltage and current at which contacts operate and contact switching performance is stable. This is a very important value. In order to anticipate constant life expectancy and assure reliability when switching is performed, the contact rating must not be exceeded and it is less than the product of (maximum switching voltage) X (maximum switching current). Contact rating is also called contact capacitance or contact power allowance.</td>
</tr>
<tr>
<td>Maximum switching voltage</td>
<td>V</td>
<td></td>
<td>• Maximum switching voltage is the maximum voltage at which contacts can be switched. It is used as a reference value of voltage for contact switching performance. In order to anticipate constant life expectancy and assure reliability when switching is performed, the maximum switching voltage must not be exceeded. Maximum switching voltage is also called rated contact voltage, maximum Working voltage, or allowable contact voltage.</td>
</tr>
<tr>
<td>Maximum switching current</td>
<td>A</td>
<td></td>
<td>• Maximum switching current is the maximum current at which contacts can be switched. It is a reference value of current for contact switching performance. In order to anticipate constant life expectancy and assure reliability when switching is performed, the maximum switching current must not be exceeded. Maximum switching current is also called rated contact current, maximum on-off contact current, or rated on-off current.</td>
</tr>
<tr>
<td>Maximum carry current</td>
<td>A</td>
<td></td>
<td>• Maximum carry current is the maximum current which can flow continuously over the closed contact. In order to anticipate constant life expectancy and assure reliability, the maximum switching carry current must not be exceeded. Maximum carry current is also called rated contact carry current or allowable contact carry current.</td>
</tr>
<tr>
<td>Term</td>
<td>Symbol</td>
<td>Unit</td>
<td>Description and Test Methods</td>
</tr>
<tr>
<td>-------------------</td>
<td>--------</td>
<td>------</td>
<td>-----------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Operate time</td>
<td>Top</td>
<td>ms</td>
<td>• Operate time means the time required for the contacts to close after applying voltage to the energizing coil. Unless otherwise specified, operate time does not include bounce time.</td>
</tr>
<tr>
<td>Bounce time</td>
<td>Tb</td>
<td>ms</td>
<td>• Bounce time means the time between the time when the contacts closed initially and the time when they come to close stably.</td>
</tr>
<tr>
<td>Release time</td>
<td>Trls</td>
<td>ms (μs)</td>
<td>• Release time is the elapsed time before the contacts are opened after the coil energizing voltage is removed.</td>
</tr>
</tbody>
</table>

- Test method (3) Time characteristics measurement circuit

**Make type**

![Make type diagram]

**Transfer type**

![Transfer type diagram]
### Term and Symbol

<table>
<thead>
<tr>
<th>Term</th>
<th>Symbol</th>
<th>Unit</th>
<th>Description and Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resonant Frequency</td>
<td>Hz</td>
<td></td>
<td>Resonant frequency is the vibration frequency inherent to the reed switch. If the reed switch is subjected to vibrations which have the similar frequency to the resonant frequency, it may cause misoperation.</td>
</tr>
<tr>
<td>Maximum Operating Frequency</td>
<td>Hz</td>
<td></td>
<td>Maximum operating frequency is the maximum drive frequency. The reed switch can be operated with a frequency higher than the maximum operating frequency. However, operation with such a frequency may cause an endless bouncing.</td>
</tr>
<tr>
<td>Standard Coil</td>
<td>Number</td>
<td></td>
<td>The standard coil is the coil provided for measuring reed switch characteristics. The standard coil varies depending on the type of the reed switch.</td>
</tr>
</tbody>
</table>

#### Standard Coil Specifications

<table>
<thead>
<tr>
<th>Number</th>
<th>No.3</th>
<th>No.6</th>
<th>No.8</th>
<th>No.10</th>
<th>901</th>
<th>903</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>21</td>
<td>15</td>
<td>10</td>
<td>10</td>
<td>12</td>
<td>5</td>
</tr>
<tr>
<td>B</td>
<td>25</td>
<td>19</td>
<td>12</td>
<td>10</td>
<td>12</td>
<td>5.5</td>
</tr>
<tr>
<td>C</td>
<td>4.6</td>
<td>3.7</td>
<td>3.3</td>
<td>4.6</td>
<td>5.0</td>
<td>4.4</td>
</tr>
<tr>
<td>D</td>
<td>3.5</td>
<td>2.9</td>
<td>2.3</td>
<td>3.5</td>
<td>3.6</td>
<td>3.6</td>
</tr>
<tr>
<td>E</td>
<td>11.0</td>
<td>11.0</td>
<td>11.0</td>
<td>13.0</td>
<td>16.0</td>
<td>20.0</td>
</tr>
</tbody>
</table>

- **Coil resistance**
  - 500 Ω (5000T)
  - 450 Ω (5000T)
  - 550 Ω (5000T)
  - 550 Ω (5000T)
  - 950 Ω (5000T)

- **Measured read switch**
  - ORD229
  - ORD2210
  - ORD234
  - ORD2210V
  - ORD219
  - ORD221
  - ORD228VL
  - ORD2211
  - ORD2212
  - ORD2220
  - ORD2221
  - ORD211
  - ORD213
  - ORD311
  - ORT551
  - RA-901
  - RA-903
APPLICATION NOTES

The potential applications for reed switches are very broad. The main applications for reed switches are in automotive electronic devices, various types of instruments and testers, household appliances and so forth. Here, some actual examples of reed switch applications are provided.
Reciprocating operation

OFF  N  S  OFF  OK

Key Switch
Reed switch
Magnet

Application examples:
Various types of button switches
Keyboard

Position sensor
Reed switch
Magnet

Application examples:
Various types of door sensors
Security system

Position sensor
Reed switch
Magnet

Application examples:
Various types of position sensors
Conveyor control

Position sensor
Reed switch
Magnet

Application examples: Automatic balance
Application examples:
- Liquid level sensor
- Various float switches

Application examples:
- Various types of rotation sensor

Application examples:
- Pressure sensor
- Wind pressure sensor

Application examples:
- Various types of fluid level sensor
- Flow measurement instruments for water, gas, and wind
Shielding operation

Magnetic substance (shielded plate)

Reed switch application examples-III

Miscellaneous reed switch application examples

☆ Temperature sensor
(Combination of thermal ferrite)

Application examples: Electronic cooker, Heat detector

☆ Tilt detection

Application examples: Security system, seismic sensor

☆ Security system

Application examples: Detecting the passing of various types of magnetic substances

Application examples: Pulse generator
Reed switch Application example: Car

- Reed switch
- Ring magnet
- Speed sensor [ORD234] [ORD2212] (Low operation noise)
  - Engine control
  - Automatic door lock
  - Automatic speed control
  - Power steering

- Burnout light bulb sensor [ORD2212]
  - Monitor
- Engine oil float [ORD221]
  - Monitor
- Engine temperature sensor [ORD221]
  - Fan
  - Monitor
- Air bag sensor [ORD221] [ORD2210]
- Power sheet sensor [ORD228VL]
- Thermo ferrite
- Reed switch
- Float magnet
- Brake oil float [ORD2211] (Lamp of load)
  - Monitor
- Monitor
- Sensor probe
**REED SWITCH**

**ORD211**

Ultra-miniature

---

**GENERAL DESCRIPTION**

The ORD211 is a small single-contact reed switch designed for general control of low-level loads less than 24 V. The contacts are sealed within the glass tube with inert gas to maintain contact reliability.

---

**FEATURES**

1. Reed contacts are hermetically sealed within a glass tube with inert gas and do not receive any influence from the external atmospheric environment.
2. Quick response
3. The structure comprises the operating parts and electrical circuits arranged coaxially. Reed switches are suited to applications in radio frequency operation.
4. Reed switches are compact and light weight.
5. Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
6. With a permanent magnet installed, reed switches economically and easily become proximity switches.

---

**EXTERNAL DIMENSIONS (Unit: mm)**

---

**APPLICATIONS**

- Automotive electronic devices
- Control equipment
- Communication equipment
- Measurement equipment
- Household appliances
### ELECTRICAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Rated value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pull-in Value (PI)</td>
<td>10～40</td>
<td>AT</td>
</tr>
<tr>
<td>Drop-out Value (DO)</td>
<td>5min</td>
<td>AT</td>
</tr>
<tr>
<td>Contact resistance (CR)</td>
<td>100max</td>
<td>mΩ</td>
</tr>
<tr>
<td>Breakdown voltage</td>
<td>150min</td>
<td>VDC</td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>10^9min</td>
<td>Ω</td>
</tr>
<tr>
<td>Electrostatic capacitance</td>
<td>0.2max</td>
<td>pF</td>
</tr>
<tr>
<td>Contact rating</td>
<td>1.0</td>
<td>VA</td>
</tr>
<tr>
<td>Maximum switching voltage</td>
<td>24 (\text{DC})</td>
<td>V</td>
</tr>
<tr>
<td>Maximum switching current</td>
<td>0.1</td>
<td>A</td>
</tr>
<tr>
<td>Maximum carry current</td>
<td>0.3</td>
<td>A</td>
</tr>
</tbody>
</table>

(1) Drop-out Value vs. Pull-in Value

(2) Contact resistance

(Measurement length: 22mm)
(3) Breakdown voltage

![Breakdown voltage graph](image)

(4) Insulation resistance

![Insulation resistance graph](image)

(5) Electrostatic capacitance

![Electrostatic capacitance graph](image)
## OPERATING CHARACTERISTICS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Rated value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operate time</td>
<td>0.3max</td>
<td>ms</td>
</tr>
<tr>
<td>Bounce time</td>
<td>0.3max</td>
<td>ms</td>
</tr>
<tr>
<td>Release time</td>
<td>0.05max</td>
<td>ms</td>
</tr>
<tr>
<td>Resonant frequency</td>
<td>7500±500</td>
<td>Hz</td>
</tr>
<tr>
<td>Maximum operating frequency</td>
<td>500</td>
<td>Hz</td>
</tr>
</tbody>
</table>

(1) Operate time

![Graph](image1)

(2) Bounce time

![Graph](image2)

(3) Release time

![Graph](image3)

(4) Resonant frequency

![Graph](image4)
MECHANICAL CHARACTERISTICS
(1) Lead tensile test (static load)

![Graph showing pull-in and drop-out values with contact resistance before and after test]

(2) Lead tensile strength

![Graph showing cumulative frequency percent against breaking load]

ENVIRONMENTAL CHARACTERISTICS
(1) Temperature characteristics

![Graph showing rate of change percent against temperature]
(2) Temperature cycle

(3) Temperature and humidity cycle

(4) High temperature storage test

(5) Low temperature storage test
(6) Shock test

1) Electrical characteristics

![Graph showing electrical characteristics before and after shock test with pull-in value, drop-out value, and contact resistance.]

2) Misoperation area

![Graph showing acceleration and pull-in value for misoperation area with open-close data.]

(7) Vibration test

![Graph showing vibration test results with pull-in value, drop-out value, and contact resistance before and after test.]

(30G: 11ms)

(20G: 10〜1000Hz)
LIFE EXPECTANCY DATA: ORD211

Load conditions
Voltage: 5VDC
Current: 100 µA, 1 mA, 5 mA
Load: Resistive load

Load conditions
Voltage: 12VDC
Current: 5 mA, 10 mA, 100 mA
Load: Resistive load

Load conditions
Voltage: 24VDC
Current: 1 mA, 10 mA, 50 mA
Load: Resistive load
The ORD213 is a small single-contact reed switch designed for general control of low-level loads less than 24 V. The reed contacts are sealed within the glass tube within inert gas to maintain contact reliability.

**FEATURES**

1. Reed contacts are hermetically sealed within a glass tube with inert gas and do not receive any influence from the external atmospheric environment.
2. Quick response
3. The structure comprises the operating parts and electrical circuits arranged coaxially. Reed switches are suited to applications in radio frequency operation.
4. Reed switches are compact and light weight.
5. Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
6. With a permanent magnet installed, reed switches economically and easily become proximity switches.

**EXTERNAL DIMENSIONS (Unit: mm)**

![External Dimensions Diagram]

**APPLICATIONS**

- Automotive electronic devices
- Control equipment
- Communication equipment
- Measurement equipment
- Household appliances
## ELECTRICAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>Parameter</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Pull-in Value (PI)</td>
<td>10~40</td>
<td>AT</td>
</tr>
<tr>
<td>Drop-out Value (DO)</td>
<td>5min</td>
<td>AT</td>
</tr>
<tr>
<td>Contact resistance (CR)</td>
<td>200max</td>
<td>mΩ</td>
</tr>
<tr>
<td>Breakdown voltage</td>
<td>150min</td>
<td>VDC</td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>$10^9$min</td>
<td>Ω</td>
</tr>
<tr>
<td>Electrostatic capacitance</td>
<td>0.4max</td>
<td>pF</td>
</tr>
<tr>
<td>Contact rating</td>
<td>1.0</td>
<td>VA</td>
</tr>
<tr>
<td>Maximum switching voltage</td>
<td>24 (DC, AC)</td>
<td>V</td>
</tr>
<tr>
<td>Maximum switching current</td>
<td>0.1</td>
<td>A</td>
</tr>
<tr>
<td>Maximum carry current</td>
<td>0.3</td>
<td>A</td>
</tr>
</tbody>
</table>

(1) Drop-out Value vs. Pull-in Value

(2) Contact resistance

(Measurement length: 22mm)
(3) Breakdown voltage

(4) Insulation resistance

(5) Electrostatic capacitance
### OPERATING CHARACTERISTICS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Rated value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operate time</td>
<td>0.3max</td>
<td>ms</td>
</tr>
<tr>
<td>Bounce time</td>
<td>0.3max</td>
<td>ms</td>
</tr>
<tr>
<td>Release time</td>
<td>0.05max</td>
<td>ms</td>
</tr>
<tr>
<td>Resonant frequency</td>
<td>11000±2000</td>
<td>Hz</td>
</tr>
<tr>
<td>Maximum operating frequency</td>
<td>500</td>
<td>Hz</td>
</tr>
</tbody>
</table>

(1) Operate time

(2) Bounce time

(3) Release time

(4) Resonant frequency
■ MECHANICAL CHARACTERISTICS

(1) Lead tensile test (static load)

(2) Lead tensile strength

■ ENVIRONMENTAL CHARACTERISTICS

(1) Temperature characteristics
(2) Temperature cycle

$(-55°C$ to $125°C)$

(3) Temperature and humidity cycle

$(-10°C$ to $65°C
80%$ to $98%)$

(4) High temperature storage test

$(+125°C$-$500H)$

(5) Low temperature storage test

$(-40°C$-$500H)$
(6) Shock test

1) Electrical characteristics

2) Misoperation area

(7) Vibration test
LIFE EXPECTANCY DATA: ORD213

Load conditions
Voltage: 5VDC
Current: 100µA, 1mA, 5mA
Load: Resistive load

Cumulative failure rate

![Graph](image1)

Load conditions
Voltage: 12VDC
Current: 5mA, 10mA, 100mA
Load: Resistive load

Cumulative failure rate

![Graph](image2)

Load conditions
Voltage: 24VDC
Current: 1mA, 10mA, 50mA
Load: Resistive load

Cumulative failure rate

![Graph](image3)
REED SWITCH
ORD219
Miniature High-performance

■ GENERAL DESCRIPTION
The ORD219 is a small single-contact reed switch designed for general control of medium-level loads less than 100 V. The contacts are sealed within the glass tube with inert gas to maintain contact reliability.

■ FEATURES
(1) Reed contacts are hermetically sealed within a glass tube with inert gas and do not receive any influence from the external atmospheric environment.
(2) Quick response
(3) The structure comprises the operating parts and electrical circuits arranged coaxially. Reed switches are suited to applications in radio frequency operation.
(4) Reed switches are compact and light weight.
(5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
(6) With a permanent magnet installed, reed switches economically and easily become proximity switches.

■ EXTERNAL DIMENSIONS (Unit: mm)

![External Dimensions Diagram]

■ APPLICATIONS
- Automotive electronic devices
- Control equipment
- Communication equipment
- Measurement equipment
- Household Appliances
## ELECTRICAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Rated value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pull-in Value (PI)</td>
<td>10～30</td>
<td>AT</td>
</tr>
<tr>
<td>Drop-out Value (DO)</td>
<td>5min</td>
<td>AT</td>
</tr>
<tr>
<td>Contact resistance (CR)</td>
<td>100max</td>
<td>mΩ</td>
</tr>
<tr>
<td>Breakdown voltage</td>
<td>200min</td>
<td>VDC</td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>10^9min</td>
<td>Ω</td>
</tr>
<tr>
<td>Electrostatic capacitance</td>
<td>0.3max</td>
<td>pF</td>
</tr>
<tr>
<td>Contact rating</td>
<td>10</td>
<td>VA</td>
</tr>
<tr>
<td>Maximum switching voltage</td>
<td>100 (DC)</td>
<td>V</td>
</tr>
<tr>
<td>Maximum switching current</td>
<td>0.5</td>
<td>A</td>
</tr>
<tr>
<td>Maximum carry current</td>
<td>1.0</td>
<td>A</td>
</tr>
</tbody>
</table>

(1) Drop-out Value vs. Pull-in Value

(2) Contact resistance

(Measurement length: 32mm)
(3) Breakdown voltage

![Breakdown voltage graph]

(4) Insulation resistance

![Insulation resistance graph]

(5) Electrostatic capacitance

![Electrostatic capacitance graph]
## OPERATING CHARACTERISTICS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Rated value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operate time</td>
<td>0.4max</td>
<td>ms</td>
</tr>
<tr>
<td>Bounce time</td>
<td>0.3max</td>
<td>ms</td>
</tr>
<tr>
<td>Release time</td>
<td>0.05max</td>
<td>ms</td>
</tr>
<tr>
<td>Resonant frequency</td>
<td>5900±400</td>
<td>Hz</td>
</tr>
<tr>
<td>Maximum operating frequency</td>
<td>500</td>
<td>Hz</td>
</tr>
</tbody>
</table>

1. **Operate time**
   
   ![Operate time graph](image1)

2. **Bounce time**
   
   ![Bounce time graph](image2)

3. **Release time**
   
   ![Release time graph](image3)

4. **Resonant frequency**
   
   ![Resonant frequency graph](image4)
**MECHANICAL CHARACTERISTICS**

1. Lead tensile test (static load)

   ![Graph showing contact resistance before and after test](image)

   - Pull-in Value
   - Drop-out Value
   - Contact resistance

2. Lead tensile strength

   ![Graph showing cumulative frequency percent vs. breaking load](image)

   - Before test
   - After test

**ENVIRONMENTAL CHARACTERISTICS**

1. Temperature characteristics

   ![Graph showing rate of change percent vs. temperature](image)

   - Rate of change percent
   - Contact resistance
   - Pull-in Value
   - Drop-out Value
(2) Temperature cycle

(-55°C to 125°C)

Pull-in Value  Drop-out Value

Contact resistance

Before test  After test

(3) Temperature and humidity cycle

(-10°C to 65°C  80% to 98%)

Pull-in Value  Drop-out Value

Contact resistance

Before test  After test

(4) High temperature storage test

(+125°C-500H)

Pull-in Value  Drop-out Value

Contact resistance

Before test  After test

(5) Low temperature storage test

(-40°C-500H)

Pull-in Value  Drop-out Value

Contact resistance

Before test  After test
(6) Shock test

1) Electrical characteristics

![Graph showing electrical characteristics before and after shock test.]

(30G: 11ms)

2) Misoperation area

![Graph showing misoperation area after shock test.]

(20G: 10~1000Hz)

(7) Vibration test

![Graph showing electrical characteristics before and after vibration test.]

(20G: 10~1000Hz)
LIFE EXPECTANCY DATA: ORD219

Load conditions
Voltage: 5VDC
Current: 100µA, 1mA, 5mA
Load: Resistive load

Cumulative failure rate
Number of operations
* Arrow indicates number of operations where test was completed.

Load conditions
Voltage: 12VDC
Current: 5mA, 10mA, 100mA
Load: Resistive load

Cumulative failure rate
Number of operations
* Arrow indicates number of operations where test was completed.

Load conditions
Voltage: 24VDC
Current: 100mA, 200mA, 400mA
Load: Resistive load

Cumulative failure rate
Number of operations
REED SWITCH
ORD221
Miniature Offset-type

■ GENERAL DESCRIPTION

The ORD221 is a small single-contact reed switch designed for general control of medium-level loads less than 100 V. The contacts are sealed within the glass tube with inert gas to maintain contact reliability.

■ FEATURES

(1) Reed contacts are hermetically sealed within a glass tube with inert gas and do not receive any influence from the external atmospheric environment.
(2) Quick response
(3) The structure comprises the operating parts and electrical circuits arranged coaxially. Reed switches are suited to applications in radio frequency operation.
(4) Reed switches are compact and light weight.
(5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
(6) With a permanent magnet installed, reed switches economically and easily become proximity switches.

■ EXTERNAL DIMENSIONS (Unit: mm)

![Diagram of external dimensions]

■ APPLICATIONS

- Automotive electronic devices
- Control equipment
- Communication equipment
- Measurement equipment
- Household appliances
## ELECTRICAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Rated value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pull-in Value (PI)</td>
<td>10～30</td>
<td>AT</td>
</tr>
<tr>
<td>Drop-out Value (DO)</td>
<td>5min</td>
<td>AT</td>
</tr>
<tr>
<td>Contact resistance (CR)</td>
<td>100max</td>
<td>mΩ</td>
</tr>
<tr>
<td>Breakdown voltage</td>
<td>200 min (PI≥20)</td>
<td>VDC</td>
</tr>
<tr>
<td></td>
<td>150min (PI&lt;20)</td>
<td>VDC</td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>10^9min</td>
<td>Ω</td>
</tr>
<tr>
<td>Electrostatic capacitance</td>
<td>0.3max</td>
<td>pF</td>
</tr>
<tr>
<td>Contact rating</td>
<td>10</td>
<td>VA</td>
</tr>
<tr>
<td>Maximum switching voltage</td>
<td>100 (V&lt;sub&gt;DC&lt;/sub&gt;)</td>
<td>V</td>
</tr>
<tr>
<td>Maximum switching current</td>
<td>0.3</td>
<td>A</td>
</tr>
<tr>
<td>Maximum carry current</td>
<td>1.0</td>
<td>A</td>
</tr>
</tbody>
</table>

(1) Drop-out Value vs. Pull-in Value

(2) Contact resistance

(Measurement length: 32mm)
(3) Breakdown voltage

![Graph showing breakdown voltage vs. pull-in value](image)

(4) Insulation resistance

![Graph showing cumulative frequency percent vs. insulation resistance](image)

(5) Electrostatic capacitance

![Graph showing electrostatic capacitance vs. pull-in value](image)
OPERATING CHARACTERISTICS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Rated value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operate time</td>
<td>0.4max</td>
<td>ms</td>
</tr>
<tr>
<td>Bounce time</td>
<td>0.5max</td>
<td>ms</td>
</tr>
<tr>
<td>Release time</td>
<td>0.05max</td>
<td>ms</td>
</tr>
<tr>
<td>Resonant frequency</td>
<td>2750±250</td>
<td>Hz</td>
</tr>
<tr>
<td>Maximum operating frequency</td>
<td>500</td>
<td>Hz</td>
</tr>
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</table>

1. Operate time

2. Bounce time

3. Release time

4. Resonant frequency
MECHANICAL CHARACTERISTICS
(1) Lead tensile test (static load)

(2) Lead tensile strength

ENVIRONMENTAL CHARACTERISTICS
(1) Temperature characteristics
(2) Temperature cycle

(3) Temperature and humidity cycle

(4) High temperature storage test

(5) Low temperature storage test
(6) Shock test

1) Electrical characteristics

(30G: 11ms)

(7) Vibration test
LIFE EXPECTANCY DATA: ORD221

Load conditions
Voltage: 5VDC
Current: 100μA, 1mA, 5mA
Load: Resistive load

Load conditions
Voltage: 12VDC
Current: 5mA, 10mA, 100mA
Load: Resistive load

Load conditions
Voltage: 24VDC
Current: 10mA, 100mA, 200mA
Load: Resistive load
REED SWITCH
ORD228VL
Miniature High-performance

- **GENERAL DESCRIPTION**
  The ORD228VL is a small single-contact reed switch designed for general control of medium level loads less than 100 V. The contacts are sealed within the glass tube with inert gas to maintain contact reliability.

- **FEATURES**
  1. Reed contacts are hermetically sealed within a glass tube with inert gas and do not receive any influence from the external atmospheric environment.
  2. Quick response
  3. The structure comprises the operating parts and electrical circuits arranged coaxially. Reed switches are suited to applications in radio frequency operation.
  4. Reed switches are compact and light weight.
  5. Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
  6. With a permanent magnet installed, reed switches economically and easily become proximity switches.

- **EXTERNAL DIMENSIONS (Unit: mm)**

![External Dimensions Diagram]

- **APPLICATIONS**
  - Automotive electronic devices
  - Control equipment
  - Communication equipment
  - Measurement equipment
  - Household appliances
## ELECTRICAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Rated value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pull-in Value (PI)</td>
<td>10~50</td>
<td>AT</td>
</tr>
<tr>
<td>Drop-out Value (DO)</td>
<td>5min</td>
<td>AT</td>
</tr>
<tr>
<td>Contact resistance (CR)</td>
<td>100max</td>
<td>mΩ</td>
</tr>
<tr>
<td>Breakdown voltage</td>
<td>200 min (PI≥20)</td>
<td>VDC</td>
</tr>
<tr>
<td></td>
<td>150 min (PI&lt;20)</td>
<td>VDC</td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>10^9min</td>
<td>Ω</td>
</tr>
<tr>
<td>Electrostatic capacitance</td>
<td>0.3max</td>
<td>pF</td>
</tr>
<tr>
<td>Contact rating</td>
<td>10</td>
<td>VA</td>
</tr>
<tr>
<td>Maximum switching voltage</td>
<td>100 (DC/AC)</td>
<td>V</td>
</tr>
<tr>
<td>Maximum switching current</td>
<td>0.5</td>
<td>A</td>
</tr>
<tr>
<td>Maximum carry current</td>
<td>1.0</td>
<td>A</td>
</tr>
</tbody>
</table>

(1) Drop-out Value vs. Pull-in Value

(2) Contact resistance

(Measurement length: 32mm)
(3) Breakdown voltage

![Graph showing Breakdown voltage vs. Pull-in Value]

(4) Insulation resistance

![Graph showing Cumulative frequency percent (%) vs. Insulation resistance]

(5) Electrostatic capacitance

![Graph showing Electrostatic capacitance vs. Pull-in Value]
OPERATING CHARACTERISTICS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Rated value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operate time</td>
<td>0.4max</td>
<td>ms</td>
</tr>
<tr>
<td>Bounce time</td>
<td>0.3max</td>
<td>ms</td>
</tr>
<tr>
<td>Release time</td>
<td>0.05max</td>
<td>ms</td>
</tr>
<tr>
<td>Resonant frequency</td>
<td>5000±400</td>
<td>Hz</td>
</tr>
<tr>
<td>Maximum operating frequency</td>
<td>500</td>
<td>Hz</td>
</tr>
</tbody>
</table>

(1) Operate time

(2) Bounce time

(3) Release time

(4) Resonant frequency
MECHANICAL CHARACTERISTICS

1. Lead tensile test (static load)

![Graph showing pull-in value and drop-out value with breaking load and cumulative frequency percent.]

(2.27 kg - 10 sec)

ENVIRONMENTAL CHARACTERISTICS

1. Temperature characteristics

![Graph showing rate of change percent with temperature.]

CR DO PI
(2) Temperature cycle

(-55°C to 125°C)

(3) Temperature and humidity cycle

(-10°C to 65°C
80% to 98%)

(4) High temperature storage test

(+125°C-500H)

(5) Low temperature storage test

(-40°C-500H)
(6) Shock test

1) Electrical characteristics

2) Misoperation area

(7) Vibration test

---

Before test | After test
---|---
Pull-in Value | Pull-in Value
Drop-out Value | Drop-out Value
Contact resistance | Contact resistance

---

Before test | After test
---|---
Pull-in Value | Pull-in Value
Drop-out Value | Drop-out Value
Contact resistance | Contact resistance

---

Before test | After test
---|---
Pull-in Value | Pull-in Value
Drop-out Value | Drop-out Value
Contact resistance | Contact resistance

---

Before test | After test
---|---
Pull-in Value | Pull-in Value
Drop-out Value | Drop-out Value
Contact resistance | Contact resistance

---

Before test | After test
---|---
Pull-in Value | Pull-in Value
Drop-out Value | Drop-out Value
Contact resistance | Contact resistance

---

Before test | After test
---|---
Pull-in Value | Pull-in Value
Drop-out Value | Drop-out Value
Contact resistance | Contact resistance

---

Before test | After test
---|---
Pull-in Value | Pull-in Value
Drop-out Value | Drop-out Value
Contact resistance | Contact resistance

---

Before test | After test
---|---
Pull-in Value | Pull-in Value
Drop-out Value | Drop-out Value
Contact resistance | Contact resistance

---

Before test | After test
---|---
Pull-in Value | Pull-in Value
Drop-out Value | Drop-out Value
Contact resistance | Contact resistance

---

Before test | After test
---|---
Pull-in Value | Pull-in Value
Drop-out Value | Drop-out Value
Contact resistance | Contact resistance

---

Before test | After test
---|---
Pull-in Value | Pull-in Value
Drop-out Value | Drop-out Value
Contact resistance | Contact resistance

---

Before test | After test
---|---
Pull-in Value | Pull-in Value
Drop-out Value | Drop-out Value
Contact resistance | Contact resistance

---

Before test | After test
---|---
Pull-in Value | Pull-in Value
Drop-out Value | Drop-out Value
Contact resistance | Contact resistance

---

Before test | After test
---|---
Pull-in Value | Pull-in Value
Drop-out Value | Drop-out Value
Contact resistance | Contact resistance

---
**LIFE EXPECTANCY DATA: ORD228VL**

Load conditions
Voltage: 5VDC
Current: 100µA , 1mA , 5mA
Load: Resistive load

Load conditions
Voltage: 12VDC
Current: 5mA , 10mA , 100mA
Load: Resistive load

Load conditions
Voltage: 24VDC
Current: 100mA , 200mA , 400mA
Load: Resistive load
REED SWITCH
ORD2211
Lamp Load

■ GENERAL DESCRIPTION
The ORD2211 is a single-contact reed switch designed for direct opening or closing lamps of 12 V - 3.4 W. The contacts are sealed within the glass tube with inert gas to maintain contact reliability.

■ FEATURES
(1) Reed contacts are hermetically sealed within a glass tube with inert gas and do not receive any influence from the external atmospheric environment.
(2) Quick response
(3) The structure comprises the operating parts and electrical circuits arranged coaxially. Reed switches are suited to applications in radio frequency operation.
(4) Reed switches are compact and light weight.
(5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
(6) With a permanent magnet installed, reed switches economically and easily become proximity switches.

■ EXTERNAL DIMENSIONS (Unit: mm)

![Diagram of external dimensions]

■ APPLICATIONS
- Automotive electronic devices
- Control equipment
- Communication equipment
- Measurement equipment
- Household appliances
ELECTRICAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Rated value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pull-in Value (PI)</td>
<td>20~60</td>
<td>AT</td>
</tr>
<tr>
<td>Drop-out Value (DO)</td>
<td>8min</td>
<td>AT</td>
</tr>
<tr>
<td>Contact resistance (CR)</td>
<td>100max</td>
<td>mΩ</td>
</tr>
<tr>
<td>Breakdown voltage</td>
<td>200min (PI≥20)</td>
<td>VDC</td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>10⁹min</td>
<td>Ω</td>
</tr>
<tr>
<td>Electrostatic capacitance</td>
<td>0.3max</td>
<td>pF</td>
</tr>
<tr>
<td>Contact rating</td>
<td>50 (12V-3.4W lamp)</td>
<td>VA</td>
</tr>
<tr>
<td>Maximum switching voltage</td>
<td>100 (DC)</td>
<td>V</td>
</tr>
<tr>
<td>Maximum switching current</td>
<td>0.5 (Inrush 3A)</td>
<td>A</td>
</tr>
<tr>
<td>Maximum carry current</td>
<td>2.5</td>
<td>A</td>
</tr>
</tbody>
</table>

(1) Drop-out Value vs. Pull-in Value
(2) Contact resistance
(3) Breakdown voltage

![Breakdown voltage graph]

(4) Insulation resistance

![Insulation resistance graph]

(5) Electrostatic capacitance

![Electrostatic capacitance graph]
### OPERATING CHARACTERISTICS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Rated value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operate time</td>
<td>0.6max</td>
<td>ms</td>
</tr>
<tr>
<td>Bounce time</td>
<td>0.4max</td>
<td>ms</td>
</tr>
<tr>
<td>Release time</td>
<td>0.05max</td>
<td>ms</td>
</tr>
<tr>
<td>Resonant frequency</td>
<td>4600±500</td>
<td>Hz</td>
</tr>
<tr>
<td>Maximum operating frequency</td>
<td>500</td>
<td>Hz</td>
</tr>
</tbody>
</table>

1. **Operate time**

![Operate time graph](image)

2. **Bounce time**

![Bounce time graph](image)

3. **Release time**

![Release time graph](image)

4. **Resonant frequency**

![Resonant frequency graph](image)
**MECHANICAL CHARACTERISTICS**

1. Lead tensile test (static load)

   ![Graph showing lead tensile test results with Pull-in Value and Drop-out Value.]

   - AT
   - PI
   - DO

   Before test
   After test

2. Lead tensile strength

   ![Graph showing cumulative frequency percent (%) vs. breaking load.]

**ENVIRONMENTAL CHARACTERISTICS**

1. Temperature characteristics

   ![Graph showing rate of change percent (%) vs. temperature.]

   - CR
   - DO
   - PI

   Before test
   After test
(2) Temperature cycle

(-55°C to 125°C)

(3) Temperature and humidity cycle

(-10°C to 65°C
80% to 98%)

(4) High temperature storage test

(+125°C-500H)

(5) Low temperature storage test

(-40°C-500H)
(6) Shock test

1) Electrical characteristics

2) Misoperation area

(7) Vibration test
LIFE EXPECTANCY DATA: ORD2211

Load conditions
Voltage: 13, 14, 16 : VDC
Current: 12V-3.4W Lamp

Load conditions
Voltage: 50VDC
Current: 1A
Load: Resistive load

Load conditions
Voltage: 6VDC
Current: 10mA, 50mA
Load: Resistive load
REED SWITCH
ORD2212
Closed Differential, Low Operating Noise

- GENERAL DESCRIPTION
  The ORD2212 is a single-contact reed switch designed for the purpose of low operating noise and closed differential motion. The contacts are sealed within the glass tube with inert gas to maintain contact reliability.

- FEATURES
  (1) Reed contacts are hermetically sealed within a glass tube with inert gas and do not receive any influence from the external atmospheric environment.
  (2) Quick response
  (3) The structure comprises the operating parts and electrical circuits arranged coaxially. Reed switches are suited to applications in radio frequency operation.
  (4) Reed switches are compact and light weight.
  (5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
  (6) With a permanent magnet installed, reed switches economically and easily become proximity switches.

- EXTERNAL DIMENSIONS (Unit: mm)

- APPLICATIONS
  - Automotive electronic devices
  - Control equipment
  - Communication equipment
  - Measurement equipment
  - Household appliances
# ELECTRICAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Rated value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pull-in Value (PI)</td>
<td>15～45</td>
<td>AT</td>
</tr>
<tr>
<td>Drop-out Value (DO)</td>
<td>DO/PI ≥ 0.8 (PI ≥ 20)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DO/PI ≥ 0.7 (PI &lt; 20)</td>
<td></td>
</tr>
<tr>
<td>Contact resistance (CR)</td>
<td>100max</td>
<td>mΩ</td>
</tr>
<tr>
<td>Breakdown voltage</td>
<td>150min</td>
<td>VDC</td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>10⁹min</td>
<td>Ω</td>
</tr>
<tr>
<td>Electrostatic capacitance</td>
<td>0.5max</td>
<td>pF</td>
</tr>
<tr>
<td>Contact rating</td>
<td>10</td>
<td>VA</td>
</tr>
<tr>
<td>Maximum switching voltage</td>
<td>100 (DC)</td>
<td>V</td>
</tr>
<tr>
<td>Maximum switching current</td>
<td>0.2</td>
<td>A</td>
</tr>
<tr>
<td>Maximum carry current</td>
<td>0.5</td>
<td>A</td>
</tr>
</tbody>
</table>

(1) Drop-out Value vs. Pull-in Value

(2) Contact resistance

(Measurement length: 32mm)
(3) Breakdown voltage

![Breakdown voltage graph]

(4) Insulation resistance

![Insulation resistance graph]

(5) Electrostatic capacitance

![Electrostatic capacitance graph]
### OPERATING CHARACTERISTICS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Rated value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operate time</td>
<td>0.4max</td>
<td>ms</td>
</tr>
<tr>
<td>Bounce time</td>
<td>1.0max</td>
<td>ms</td>
</tr>
<tr>
<td>Release time</td>
<td>0.05max</td>
<td>ms</td>
</tr>
<tr>
<td>Resonant frequency</td>
<td>3900±500</td>
<td>Hz</td>
</tr>
<tr>
<td>Maximum operating frequency</td>
<td>500</td>
<td>Hz</td>
</tr>
</tbody>
</table>

1. **Operate time**

   ![Operate time graph](image1)

   *(25Hz: 100AT energized)*

2. **Bounce time**

   ![Bounce time graph](image2)

   *(25Hz: 100AT energized)*

3. **Release time**

   ![Release time graph](image3)

   *(25Hz: 100AT energized)*

4. **Resonant frequency**

   ![Resonant frequency graph](image4)

   *(25Hz: 100AT energized)*
■ MECHANICAL CHARACTERISTICS

(1) Lead tensile test (static load)

(2) Lead tensile strength

■ ENVIRONMENTAL CHARACTERISTICS

(1) Temperature characteristics
(2) Temperature cycle

(3) Temperature and humidity cycle

(4) High temperature storage test

(5) Low temperature storage test
(6) Shock test
1) Electrical characteristics

(30G: 11ms)

(7) Vibration test

(20G: 10~1000Hz)
LIFE EXPECTANCY DATA: ORD2212

Load conditions
Voltage: 5VDC
Current: 100μA, 1mA, 5mA
Load: Resistive load

Load conditions
Voltage: 6VDC
Current: 10mA, 20mA
Load: Resistive load

Load conditions
Voltage: 15VDC
Current: 5mA, 10mA
Load: Resistive load
REED SWITCH
ORD229
High Breakdown Voltage

■ GENERAL DESCRIPTION

The ORD229 is a single-contact reed switch designed for high breakdown voltage of 600 VDC and high power of AC 70 VA and DC 50 W. The contacts are sealed within the glass tube with inert gas to maintain contact reliability.

■ FEATURES

(1) Reed contacts are hermetically sealed within a glass tube with inert gas and do not receive any influence from the external atmospheric environment.
(2) Quick response
(3) The structure comprises an operating system and electrical circuits coaxially. Reed switches are suited to applications in radio frequency.
(4) Reed switches are compact and light weight.
(5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
(6) With a permanent magnet installed, reed switches economically and easily become proximity switches.

■ EXTERNAL DIMENSIONS (Unit: mm)

![Diagram of external dimensions]

■ APPLICATIONS

- Automotive electronic devices
- Control equipment
- Communication equipment
- Measurement equipment
- Household appliances
### ELECTRICAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Rated value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pull-in Value (PI)</td>
<td>20〜60</td>
<td>AT</td>
</tr>
<tr>
<td>Drop-out Value (DO)</td>
<td>6min</td>
<td>AT</td>
</tr>
<tr>
<td>Contact resistance (CR)</td>
<td>100</td>
<td>mΩ</td>
</tr>
<tr>
<td>Breakdown voltage</td>
<td>600 min (PI ≥ 35)</td>
<td>VDC</td>
</tr>
<tr>
<td></td>
<td>500 min (PI 20 to 35)</td>
<td>VDC</td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>$10^{10}$ min</td>
<td>Ω</td>
</tr>
<tr>
<td>Electrostatic capacitance</td>
<td>0.5max</td>
<td>pF</td>
</tr>
<tr>
<td>Contact rating</td>
<td>50</td>
<td>W</td>
</tr>
<tr>
<td></td>
<td>70</td>
<td>VA</td>
</tr>
<tr>
<td>Maximum switching voltage</td>
<td>300AC</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>350DC</td>
<td>V</td>
</tr>
<tr>
<td>Maximum switching current</td>
<td>DC0.7/AC0.5</td>
<td>A</td>
</tr>
<tr>
<td>Maximum carry current</td>
<td>2.5</td>
<td>A</td>
</tr>
</tbody>
</table>

1. Drop-out Value vs. Pull-in Value
2. Contact resistance

(Measurement length: 32mm)
(3) Breakdown voltage

![Breakdown voltage graph](image)

(4) Insulation resistance

![Insulation resistance graph](image)

(5) Electrostatic capacitance

![Electrostatic capacitance graph](image)
### OPERATING CHARACTERISTICS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Rated value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operate time</td>
<td>0.6max</td>
<td>ms</td>
</tr>
<tr>
<td>Bounce time</td>
<td>0.5max</td>
<td>ms</td>
</tr>
<tr>
<td>Release time</td>
<td>0.05max</td>
<td>ms</td>
</tr>
<tr>
<td>Resonant frequency</td>
<td>2500±250</td>
<td>Hz</td>
</tr>
<tr>
<td>Maximum operating frequency</td>
<td>500</td>
<td>Hz</td>
</tr>
</tbody>
</table>

1. **Operate time**

   ![Operate time graph](image)

2. **Bounce time**

   ![Bounce time graph](image)

3. **Release time**

   ![Release time graph](image)

4. **Resonant frequency**

   ![Resonant frequency graph](image)
■ MECHANICAL CHARACTERISTICS

(1) Lead tensile test (static load)

(2) Lead tensile strength

■ ENVIRONMENTAL CHARACTERISTICS

(1) Temperature characteristics
(2) Temperature cycle

(-55°C to 125°C)

Pull-in Value • Drop-out Value
Contact resistance

Before test After test

(3) Temperature and humidity cycle

(-10°C to 65°C
80% to 98%)

Pull-in Value • Drop-out Value
Contact resistance

Before test After test

(4) High temperature storage test

(+125°C-500H)

Pull-in Value • Drop-out Value
Contact resistance

Before test After test

(5) Low temperature storage test

(-40°C-500H)

Pull-in Value • Drop-out Value
Contact resistance

Before test After test
(6) Shock test

1) Electrical characteristics

![Graph showing electrical characteristics before and after test](image)

(30G: 11ms)

(7) Vibration test

![Graph showing vibration characteristics before and after test](image)

(20G: 10〜1000Hz)

2) Misoperation area

![Graph showing misoperation area](image)

(Open→Close)
**LIFE EXPECTANCY DATA: ORD229**

Load conditions
Voltage: 200VAC
Current: 200mA, 250mA
Load: Resistive load

Load conditions
Voltage: 350VDC, 270VDC
Current: 1mA, 270µA
Load: Resistive load

Load conditions
Voltage: 100VDC, 50VDC
Current: 0.5A, 1.0A, 0.5A
Load: Resistive load
**REED SWITCH**

**ORD2210**

**High Power**

- **GENERAL DESCRIPTION**

  The ORD2210 is a single-contact reed switch designed for high current of 1.0 A DC and 0.7 A AC and high power of AC 70 VA and DC 50 W. The contacts are sealed within the glass tube with inert gas to maintain contact reliability.

- **FEATURES**

  1. Reed contacts are hermetically sealed within a glass tube with inert gas and do not receive any influence from the external atmospheric environment.
  2. Quick response
  3. The structure comprises the operating parts and electrical circuits arranged coaxially. Reed switches are suited to applications in radio frequency operation.
  4. Reed switches are compact and light weight.
  5. Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
  6. With a permanent magnet installed, reed switches economically and easily become proximity switches.

- **EXTERNAL DIMENSIONS (Unit: mm)**

![Diagram of external dimensions](image)

- **APPLICATIONS**

  - Automotive electronic devices
  - Control equipment
  - Communication equipment
  - Measurement equipment
  - Household appliances
### ELECTRICAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Rated value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pull-in Value (PI)</td>
<td>15~60</td>
<td>AT</td>
</tr>
<tr>
<td>Drop-out Value (DO)</td>
<td>7min</td>
<td>AT</td>
</tr>
<tr>
<td>Contact resistance (CR)</td>
<td>100</td>
<td>mΩ</td>
</tr>
<tr>
<td>Breakdown voltage</td>
<td>250min (PI≥20)</td>
<td>VDC</td>
</tr>
<tr>
<td></td>
<td>200min (PI&lt;20)</td>
<td>VDC</td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>10^{10}min</td>
<td>Ω</td>
</tr>
<tr>
<td>Electrostatic capacitance</td>
<td>0.5max</td>
<td>pF</td>
</tr>
<tr>
<td>Contact rating</td>
<td>50</td>
<td>W</td>
</tr>
<tr>
<td></td>
<td>70</td>
<td>VA</td>
</tr>
<tr>
<td>Maximum switching voltage</td>
<td>200DC</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>150AC</td>
<td>V</td>
</tr>
<tr>
<td>Maximum switching current</td>
<td>1.0DC</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>0.7AC</td>
<td>A</td>
</tr>
<tr>
<td>Maximum carry current</td>
<td>2.5</td>
<td>A</td>
</tr>
</tbody>
</table>

(1) Drop-out Value vs. Pull-in Value

(2) Contact resistance

(Measurement length: 32mm)
(3) Breakdown voltage

![Graph showing Breakdown voltage distribution](image)

(4) Insulation resistance

![Graph showing Insulation resistance distribution](image)

(5) Electrostatic capacitance

![Graph showing Electrostatic capacitance distribution](image)
### OPERATING CHARACTERISTICS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Rated value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operate time</td>
<td>0.6max</td>
<td>ms</td>
</tr>
<tr>
<td>Bounce time</td>
<td>0.5max</td>
<td>ms</td>
</tr>
<tr>
<td>Release time</td>
<td>0.05max</td>
<td>ms</td>
</tr>
<tr>
<td>Resonant frequency</td>
<td>2500±250</td>
<td>Hz</td>
</tr>
<tr>
<td>Maximum operating frequency</td>
<td>500</td>
<td>Hz</td>
</tr>
</tbody>
</table>

1. Operate time

   ![Operate time graph](image1)

2. Bounce time

   ![Bounce time graph](image2)

3. Release time

   ![Release time graph](image3)

4. Resonant frequency

   ![Resonant frequency graph](image4)
MECHANICAL CHARACTERISTICS

(1) Lead tensile test (static load)

(2) Lead tensile strength

ENVIRONMENTAL CHARACTERISTICS

(1) Temperature characteristics
(2) Temperature cycle

(3) Temperature and humidity cycle

(4) High temperature storage test

(5) Low temperature storage test
(6) Shock test

1) Electrical characteristics

![Diagram showing electrical characteristics before and after shock test]

(30G: 11ms)

2) Misoperation area

![Diagram showing misoperation area after shock test]

(7) Vibration test

![Diagram showing vibration test before and after test]

(20G: 10~1000Hz)
## LIFE EXPECTANCY DATA: ORD2210

### 1. Load conditions
- **Voltage:** 100VAC
- **Current:** 0.7A, 0.5A
- **Load:** Resistive load

### 2. Load conditions
- **Voltage:** 100VDC, 50VDC
- **Current:** 0.5A, 1.0A, 0.5A
- **Load:** Resistive load

### 3. Load conditions
- **Voltage:** 15VDC
- **Current:** 3mA
- **Load:** Resistive load
REED SWITCH
ORD2210V
Vacuum High Power

- GENERAL DESCRIPTION
  The ORD2210V is a small single-contact reed switch of a vacuum type designed for ultra high breakdown voltages 1000 V DC between the reed contacts.

- FEATURES
  (1) Reed contacts are hermetically sealed within a glass tube with inert gas and do not receive any influence from the external atmospheric environment.
  (2) Quick response
  (3) The structure comprises the operating parts and electrical circuits arranged coaxially. Reed switches are suited to applications in radio frequency operation.
  (4) Reed switches are compact and light weight.
  (5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
  (6) With a permanent magnet installed, reed switches economically and easily become proximity switches.

- EXTERNAL DIMENSIONS (Unit: mm)

- APPLICATIONS
  - Automotive electronic devices
  - Control equipment
  - Communication equipment
  - Measurement equipment
  - Household appliances
### ELECTRICAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Rated value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pull-in Value (PI)</td>
<td>20~60</td>
<td>AT</td>
</tr>
<tr>
<td>Drop-out Value (DO)</td>
<td>7min</td>
<td>AT</td>
</tr>
<tr>
<td>Contact resistance (CR)</td>
<td>100</td>
<td>mΩ</td>
</tr>
<tr>
<td>Breakdown voltage</td>
<td>1000</td>
<td>VDC</td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>10&lt;sup&gt;10&lt;/sup&gt;min</td>
<td>Ω</td>
</tr>
<tr>
<td>Electrostatic capacitance</td>
<td>0.5max</td>
<td>pF</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>VA</td>
</tr>
<tr>
<td>Maximum switching voltage</td>
<td>350DC</td>
<td>V</td>
</tr>
<tr>
<td>Maximum switching current</td>
<td>1.0</td>
<td>A</td>
</tr>
<tr>
<td>Maximum carry current</td>
<td>2.5</td>
<td>A</td>
</tr>
</tbody>
</table>

(1) Drop-out Value vs. Pull-in Value

(2) Contact resistance

(Measurement length: 32mm)
(3) Breakdown voltage

(4) Insulation resistance

(5) Electrostatic capacitance
### OPERATING CHARACTERISTICS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Rated value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operate time</td>
<td>0.6max</td>
<td>ms</td>
</tr>
<tr>
<td>Bounce time</td>
<td>0.5max</td>
<td>ms</td>
</tr>
<tr>
<td>Release time</td>
<td>0.05max</td>
<td>ms</td>
</tr>
<tr>
<td>Resonant frequency</td>
<td>2500±250</td>
<td>Hz</td>
</tr>
<tr>
<td>Maximum operating frequency</td>
<td>500</td>
<td>Hz</td>
</tr>
</tbody>
</table>

1. **Operate time**
   
   ![Operate time graph](image)

2. **Bounce time**
   
   ![Bounce time graph](image)

3. **Release time**
   
   ![Release time graph](image)

4. **Resonant frequency**
   
   ![Resonant frequency graph](image)
■ MECHANICAL CHARACTERISTICS

(1) Lead tensile test (static load)

(2) Lead tensile strength

■ ENVIRONMENTAL CHARACTERISTICS

(1) Temperature characteristics
(2) Temperature cycle

(-55°C to 125°C)

(3) Temperature and humidity cycle

(-10°C to 65°C 80% to 98%)

(4) High temperature storage test

(+125°C-500H)

(5) Low temperature storage test

(-40°C-500H)
(6) Shock test
1) Electrical characteristics

![Graph showing electrical characteristics before and after test.]

(7) Vibration test

![Graph showing vibration test results.]

2) Misoperation area

![Graph showing misoperation area.]

(20G: 10~1000Hz)

(30G: 11ms)
**LIFE EXPECTANCY DATA: ORD2210V**

Load conditions:
- Voltage: 200VDC
- Current: 1mA
- Load: Resistive load

![Graph showing cumulative failure rate with No failure indicated.]

Load conditions:
- Voltage: 500VDC
- Current: 1mA
- Load: Resistive load

![Graph showing cumulative failure rate.]

Load conditions:
- Voltage: 1kVDC
- Current: 1mA
- Load: Resistive load

![Graph showing cumulative failure rate.]

* Arrow indicates number of operations where test was completed.*
REED SWITCH
ORD234
Long Life

■ GENERAL DESCRIPTION
The ORD234 is a single-contact reed switch designed for long life for increased number of operations. The contacts are sealed within the glass tube with inert gas to maintain contact reliability.

■ FEATURES
(1) Reed contacts are hermetically sealed within a glass tube with inert gas and do not receive any influence from the external atmospheric environment.
(2) Quick response
(3) The structure comprises the operating parts and electrical circuits arranged coaxially. Reed switches are suited to applications in radio frequency operation.
(4) Reed switches are compact and light weight.
(5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
(6) With a permanent magnet installed, reed switches economically and easily become proximity switches.

■ EXTERNAL DIMENSIONS (Unit: mm)

![Diagram of external dimensions]

- 0.4×0.65
- MAX 63.5
- MAX 21.0
- 43.4±0.3

■ APPLICATIONS
- Automotive electronic devices
- Control equipment
- Communication equipment
- Measurement equipment
- Household appliances
### ELECTRICAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Rated value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pull-in Value (PI)</td>
<td>15～60</td>
<td>AT</td>
</tr>
<tr>
<td>Drop-out Value (DO)</td>
<td>6min</td>
<td>AT</td>
</tr>
<tr>
<td>Contact resistance (CR)</td>
<td>100max</td>
<td>mΩ</td>
</tr>
<tr>
<td>Breakdown voltage</td>
<td>250min (PI ≥ 20)</td>
<td>VDC</td>
</tr>
<tr>
<td></td>
<td>200min (PI ≤ 20)</td>
<td>VDC</td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>10^{10} min</td>
<td>Ω</td>
</tr>
<tr>
<td>Electrostatic capacitance</td>
<td>0.5max</td>
<td>pF</td>
</tr>
<tr>
<td>Contact rating</td>
<td>10</td>
<td>VA</td>
</tr>
<tr>
<td>Maximum switching voltage</td>
<td>200DC</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>100AC</td>
<td>V</td>
</tr>
<tr>
<td>Maximum switching current</td>
<td>0.5</td>
<td>A</td>
</tr>
<tr>
<td>Maximum carry current</td>
<td>2.0</td>
<td>A</td>
</tr>
</tbody>
</table>

(1) Drop-out Value vs. Pull-in Value

(2) Contact resistance

(Measurement length: 32mm)
(3) Breakdown voltage

![Breakdown voltage graph](image)

(4) Insulation resistance

![Insulation resistance graph](image)

(5) Electrostatic capacitance

![Electrostatic capacitance graph](image)
### OPERATING CHARACTERISTICS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Rated value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operate time</td>
<td>0.5max</td>
<td>ms</td>
</tr>
<tr>
<td>Bounce time</td>
<td>0.5max</td>
<td>ms</td>
</tr>
<tr>
<td>Release time</td>
<td>0.05max</td>
<td>ms</td>
</tr>
<tr>
<td>Resonant frequency</td>
<td>2200±300</td>
<td>Hz</td>
</tr>
<tr>
<td>Maximum operating frequency</td>
<td>500</td>
<td>Hz</td>
</tr>
</tbody>
</table>

1. Operate time

   ![Operate time graph](image1)

2. Bounce time

   ![Bounce time graph](image2)

3. Release time

   ![Release time graph](image3)

4. Resonant frequency

   ![Resonant frequency graph](image4)
■ MECHANICAL CHARACTERISTICS

(1) Lead tensile test (static load)

(2) Lead tensile strength

■ ENVIRONMENTAL CHARACTERISTICS

(1) Temperature characteristics
(2) Temperature cycle

(3) Temperature and humidity cycle

(4) High temperature storage test

(5) Low temperature storage test
(6) Shock test

1) Electrical characteristics

(30G: 11ms)

2) Misoperation area

(20G: 10~1000Hz)

(7) Vibration test
### LIFE EXPECTANCY DATA: ORD234

#### Load conditions
- **Voltage:** 5VDC
- **Current:** 100μA, 1mA, 5mA
- **Load:** Resistive load

![Graph](image1.png)

#### Load conditions
- **Voltage:** 6VDC, 7VDC
- **Current:** 10mA, 20mA, 2.2mA
- **Load:** Resistive load

![Graph](image2.png)

#### Load conditions
- **Voltage:** 12VDC, 24VDC, 48VDC
- **Current:** 10mA, 250mA, 400mA
- **Load:** Resistive load

![Graph](image3.png)
REED SWITCH

ORT551

Ultraminiature Transfer

■ GENERAL DESCRIPTION

The OR551 is a ultraminiature two-contacts reed switch designed for transfer type operation. The contacts are sealed within the glass tube with inert gas to maintain contact reliability.

■ FEATURES

(1) Reed contacts are hermetically sealed within a glass tube with inert gas and do not receive any influence from the external atmospheric environment.
(2) Quick response
(3) The structure comprises the operating parts and electrical circuits arranged coaxially. Reed switches are suited to applications in radio frequency operation.
(4) Reed switches are compact and light weight.
(5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
(6) With a permanent magnet installed, reed switches economically and easily become proximity switches.

■ EXTERNAL DIMENSIONS (Unit: mm)

![External Dimensions Diagram]

■ APPLICATIONS

- Automotive electronic devices
- Control equipment
- Communication equipment
- Measurement equipment
- Household appliances
### ELECTRICAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Rated value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pull-in Value (PI)</td>
<td>10～30</td>
<td>AT</td>
</tr>
<tr>
<td>Drop-out Value (DO)</td>
<td>4min</td>
<td>AT</td>
</tr>
<tr>
<td>Contact resistance (CR)</td>
<td>100max</td>
<td>mW</td>
</tr>
<tr>
<td>Breakdown voltage</td>
<td>200min (PI≥20)</td>
<td>VDC</td>
</tr>
<tr>
<td></td>
<td>150min (PI&lt;20)</td>
<td>VDC</td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>10⁹min</td>
<td>W</td>
</tr>
<tr>
<td>Electrostatic capacitance</td>
<td>1.5max</td>
<td>pF</td>
</tr>
<tr>
<td>Contact rating</td>
<td>3</td>
<td>VA</td>
</tr>
<tr>
<td>Maximum switching voltage</td>
<td>30 (\frac{DC}{AC})</td>
<td>V</td>
</tr>
<tr>
<td>Maximum switching current</td>
<td>0.2</td>
<td>A</td>
</tr>
<tr>
<td>Maximum carry current</td>
<td>0.5</td>
<td>A</td>
</tr>
</tbody>
</table>

1. **Drop-out Value vs. Pull-in Value**

2. **Contact resistance**

(Measurement length: 30mm)
(3) Breakdown voltage

![Breakdown voltage graph](image)

(4) Insulation resistance

![Insulation resistance graph](image)

(5) Electrostatic capacitance

![Electrostatic capacitance graph](image)
### OPERATING CHARACTERISTICS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Rated value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operate time</td>
<td>1.0max</td>
<td>ms</td>
</tr>
<tr>
<td>Bounce time NO</td>
<td>1.0max</td>
<td>ms</td>
</tr>
<tr>
<td>Bounce time NC</td>
<td>1.5max</td>
<td>ms</td>
</tr>
<tr>
<td>Release time</td>
<td>0.5max</td>
<td>ms</td>
</tr>
<tr>
<td>Resonant frequency</td>
<td>6000±4000</td>
<td>Hz</td>
</tr>
<tr>
<td>Maximum operating frequency</td>
<td>200</td>
<td>Hz</td>
</tr>
</tbody>
</table>

1. Operate time

2. Bounce time

3. Release time

4. Resonant frequency
# MECHANICAL CHARACTERISTICS

1. Lead tensile test (static load)

![Diagram showing lead tensile test](image)

2. Lead tensile strength

![Diagram showing lead tensile strength](image)

# ENVIRONMENTAL CHARACTERISTICS

1. Temperature characteristics

![Diagram showing temperature characteristics](image)
(2) Temperature cycle

(-55°C ~ +125°C)

Before test After test

Pull-in Value • Drop-out Value

Contact resistance

mΩ

(3) Temperature and humidity cycle

(-10°C ~ +65°C)

80% ~ 98%

Before test After test

Pull-in Value • Drop-out Value

Contact resistance

mΩ

(4) High temperature storage test

(+125°C -500H)

Before test After test

Pull-in Value • Drop-out Value

Contact resistance

mΩ

(5) Low temperature storage test

(-40°C -500H)

Before test After test

Pull-in Value • Drop-out Value

Contact resistance

mΩ
(6) Shock test

1) Electrical characteristics

![Graph showing electrical characteristics before and after shock test](image)

2) Misoperation area

![Graph showing misoperation area](image)

(30G: 11ms)

(7) Vibration test

![Graph showing vibration test results](image)

(20G: 10~1000Hz)
LIFE EXPECTANCY DATA: ORT551

Load conditions
Voltage: 5VDC
Current: 100μA, 1mA, 5mA
Load: Resistive load

Load conditions
Voltage: 12VDC
Current: 5mA, 10mA, 100mA
Load: Resistive load

Load conditions
Voltage: 24VDC
Current: 50mA, 100mA
Load: Resistive load

* Arrow indicates number of operations where test was completed.
REED SWITCH
ORD2220
Miniature Wide Differential

■ GENERAL DESCRIPTION

The ORD2220 is a small single-contact reed switch designed for general control of low-level loads less than 40 V. The contacts are sealed within the glass tube with inert gas to maintain contact reliability.

■ FEATURES

(1) Reed contacts are hermetically sealed within a glass tube with inert gas and do not receive any influence from the external atmospheric environment.
(2) Quick response
(3) The structure comprises the operating parts and electrical circuits arranged coaxially. Reed switches are suited to applications in radio frequency operation.
(4) Reed switches are compact and light weight.
(5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
(6) With a permanent magnet installed, reed switches economically and easily become proximity switches.

■ EXTERNAL DIMENSIONS (Unit: mm)

![External Dimensions Diagram]

■ APPLICATIONS

- Automotive electronic devices
- Control equipment
- Communication equipment
- Measurement equipment
- Household appliances
ELECTRICAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Rated value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pull-in Value (PI)</td>
<td>08～40</td>
<td>AT</td>
</tr>
<tr>
<td>Drop-out Value (DO)</td>
<td>3min</td>
<td>AT</td>
</tr>
<tr>
<td>Contact resistance (CR)</td>
<td>100max</td>
<td>mΩ</td>
</tr>
<tr>
<td>Breakdown voltage</td>
<td>200min</td>
<td>VDC</td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>10^9min</td>
<td>Ω</td>
</tr>
<tr>
<td>Electrostatic capacitance</td>
<td>0.3max</td>
<td>pF</td>
</tr>
<tr>
<td>Contact rating</td>
<td>16</td>
<td>VA</td>
</tr>
<tr>
<td>Maximum switching voltage</td>
<td>40 (\text{DC})</td>
<td>V</td>
</tr>
<tr>
<td>Maximum switching current</td>
<td>0.4</td>
<td>A</td>
</tr>
<tr>
<td>Maximum carry current</td>
<td>0.7</td>
<td>A</td>
</tr>
</tbody>
</table>

(1) Drop-out Value vs. Pull-in Value

(2) Contact resistance

(Measurement length: 32mm)
(3) Breakdown voltage

(4) Insulation resistance

(5) Electrostatic capacitance
### OPERATING CHARACTERISTICS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Rated value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operate time</td>
<td>0.4max</td>
<td>ms</td>
</tr>
<tr>
<td>Bounce time</td>
<td>0.3max</td>
<td>ms</td>
</tr>
<tr>
<td>Release time</td>
<td>0.05max</td>
<td>ms</td>
</tr>
<tr>
<td>Resonant frequency</td>
<td>4400±400</td>
<td>Hz</td>
</tr>
<tr>
<td>Maximum operating frequency</td>
<td>500</td>
<td>Hz</td>
</tr>
</tbody>
</table>

1. **Operate time**
   - (25Hz: 100AT energized)

2. **Bounce time**
   - (25Hz: 100AT energized)

3. **Release time**
   - (25Hz: 100AT energized)

4. **Resonant frequency**
   - (25Hz: 100AT energized)
**MECHANICAL CHARACTERISTICS**

1. Lead tensile test (static load)

   ![](image1)

2. Lead tensile strength

   ![](image2)

**ENVIRONMENTAL CHARACTERISTICS**

1. Temperature characteristics

   ![](image3)
(2) Temperature cycle

(-55°C ~ +125°C)

Before test

After test

Pull-in Value • Drop-out Value

Contact resistance

mΩ

AT

50

40

30

20

10

0

Contact resistance

mΩ

AT

50

40

30

20

10

0

(3) Temperature and humidity cycle

(-10°C ~ +65°C 80% ~ 98%)

Before test

After test

Pull-in Value • Drop-out Value

Contact resistance

mΩ

AT

50

40

30

20

10

0

(4) High temperature storage test

(+125°C - 500H)

Before test

After test

Pull-in Value • Drop-out Value

Contact resistance

mΩ

AT

50

40

30

20

10

0

(5) Low temperature storage test

(-40°C - 500H)

Before test

After test

Pull-in Value • Drop-out Value

Contact resistance

mΩ

AT

50

40

30

20

10

0
(6) Shock test

1) Electrical characteristics

![Graph showing electrical characteristics before and after shock test]

2) Misoperation area

![Graph showing misoperation area]

(7) Vibration test

![Graph showing vibration test results]

(20G: 10-1000Hz)
**LIFE EXPECTANCY DATA: ORD2220**

Load conditions
Voltage: 5VDC
Current: 100µA, 1mA, 5mA
Load: Resistive load

Load conditions
Voltage: 12VDC
Current: 5mA, 10mA, 100mA
Load: Resistive load

Load conditions
Voltage: 24VDC
Current: 100mA, 200mA, 400mA
Load: Resistive load
REED SWITCH
ORD2221
Miniature Offset type Long Lead

■ GENERAL DESCRIPTION

The ORD2221 is a single-contact reed switch designed for general control of medium-level loads less than 100 V. The contacts are sealed within the glass tube with inert gas to maintain contact reliability.

■ FEATURES

(1) Reed contacts are hermetically sealed within a glass tube with inert gas and do not receive any influence from the external atmospheric environment.
(2) Quick response
(3) The structure comprises the operating parts and electrical circuits arranged coaxially. Reed switches are suited to applications in radio frequency operation.
(4) Reed switches are compact and light weight.
(5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
(6) With a permanent magnet installed, reed switches economically and easily become proximity switches.

■ EXTERNAL DIMENSIONS (Unit: mm)

![Diagram of external dimensions]

MAX 13.0

MAX 42.3

56.7±0.3

■ APPLICATIONS

- Automotive electronic devices
- Control equipment
- Communication equipment
- Measurement equipment
- Household appliances
## ELECTRICAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Rated value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pull-in Value (PI)</td>
<td>10~70</td>
<td>AT</td>
</tr>
<tr>
<td>Drop-out Value (DO)</td>
<td>5min</td>
<td>AT</td>
</tr>
<tr>
<td>Contact resistance (CR)</td>
<td>100max</td>
<td>mΩ</td>
</tr>
<tr>
<td>Breakdown voltage</td>
<td>200min (PI≥20)</td>
<td>VDC</td>
</tr>
<tr>
<td></td>
<td>150min (PI&lt;20)</td>
<td>VDC</td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>10⁹min</td>
<td>Ω</td>
</tr>
<tr>
<td>Electrostatic capacitance</td>
<td>0.3max</td>
<td>pF</td>
</tr>
<tr>
<td>Contact rating</td>
<td>10</td>
<td>VA</td>
</tr>
<tr>
<td>Maximum switching voltage</td>
<td>100 (DC)</td>
<td>V</td>
</tr>
<tr>
<td>Maximum switching current</td>
<td>0.3</td>
<td>A</td>
</tr>
<tr>
<td>Maximum carry current</td>
<td>1.0</td>
<td>A</td>
</tr>
</tbody>
</table>

(1) Drop-out Value vs. Pull-in Value

(2) Contact resistance

(Measurement length: 32mm)
(3) Breakdown voltage

![Breakdown voltage graph]

(4) Insulation resistance

![Insulation resistance graph]

(5) Electrostatic capacitance

![Electrostatic capacitance graph]
# OPERATING CHARACTERISTICS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Rated value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operate time</td>
<td>1.0max</td>
<td>ms</td>
</tr>
<tr>
<td>Bounce time</td>
<td>1.0max</td>
<td>ms</td>
</tr>
<tr>
<td>Release time</td>
<td>0.05max</td>
<td>ms</td>
</tr>
<tr>
<td>Resonant frequency</td>
<td>2750±250</td>
<td>Hz</td>
</tr>
<tr>
<td>Maximum operating frequency</td>
<td>500</td>
<td>Hz</td>
</tr>
</tbody>
</table>

(1) Operate time

(2) Bounce time

(3) Release time

(4) Resonant frequency
■ MECHANICAL CHARACTERISTICS
(1) Lead tensile test (static load)

(2.27kg-10 sec)

AT

Pull-in Value • Drop-out Value

Contact resistance

Before test

After test

■ ENVIRONMENTAL CHARACTERISTICS
(1) Temperature characteristics
(2) Temperature cycle

(-55°C ~ +125°C)

(3) Temperature and humidity cycle

(-10°C ~ +85°C
80% ~ 98%)

(4) High temperature storage test

(+125°C - 500H)

(5) Low temperature storage test

(-40°C - 500H)
(6) Shock test
1) Electrical characteristics

(30G: 11ms)

(7) Vibration test

(20G: 10~1000Hz)
LIFE EXPECTANCY DATA: ORD2221

Load conditions
Voltage: 5VDC
Current: 100μA, 1mA, 5mA
Load: Resistive load

Load conditions
Voltage: 12VDC
Current: 5mA, 10mA, 100mA
Load: Resistive load

Load conditions
Voltage: 24VDC
Current: 10mA, 100mA, 200mA
Load: Resistive load

* Arrow indicates number of operations where test was completed.
REED SWITCH

ORD9215

General Purpose Miniature

■ GENERAL DESCRIPTION

The ORD9215 is a small single-contact reed switch designed for general control of medium-level loads less than 100 V. The contacts are sealed within the glass tube with inert gas to maintain contact reliability.

■ FEATURES

(1) Reed contacts are hermetically sealed within a glass tube with inert gas and do not receive any influence from the external atmospheric environment.
(2) Quick response
(3) The structure comprises the operating parts and electrical circuits arranged coaxially. Reed switches are suited to applications in radio frequency operation.
(4) Reed switches are compact and light weight.
(5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
(6) With a permanent magnet installed, reed switches economically and easily become proximity switches.

■ EXTERNAL DIMENSIONS (Unit: mm)

![External Dimensions Diagram]

■ APPLICATIONS

- Control equipment
- Communication equipment
- Measurement equipment
- Household appliances
### ELECTRICAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Rated value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pull-in Value (PI)</td>
<td>10~50</td>
<td>AT</td>
</tr>
<tr>
<td>Drop-out Value (DO)</td>
<td>4min</td>
<td>AT</td>
</tr>
<tr>
<td>Contact resistance (CR)</td>
<td>100max</td>
<td>mΩ</td>
</tr>
<tr>
<td>Breakdown voltage</td>
<td>150min</td>
<td>VDC</td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>10⁹min</td>
<td>Ω</td>
</tr>
<tr>
<td>Electrostatic capacitance</td>
<td>0.3max</td>
<td>pF</td>
</tr>
<tr>
<td>Contact rating</td>
<td>10</td>
<td>VA</td>
</tr>
<tr>
<td>Maximum switching voltage</td>
<td>100 (DC)</td>
<td>V</td>
</tr>
<tr>
<td>Maximum switching current</td>
<td>0.5</td>
<td>A</td>
</tr>
<tr>
<td>Maximum carry current</td>
<td>1.0</td>
<td>A</td>
</tr>
</tbody>
</table>

(1) Drop-out Value vs. Pull-in Value

(2) Contact resistance

(Measurement length: 32mm)
(3) Breakdown voltage

(4) Insulation resistance

(5) Electrostatic capacitance
## OPERATING CHARACTERISTICS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Rated value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operate time</td>
<td>0.4max</td>
<td>ms</td>
</tr>
<tr>
<td>Bounce time</td>
<td>0.4max</td>
<td>ms</td>
</tr>
<tr>
<td>Release time</td>
<td>0.05max</td>
<td>ms</td>
</tr>
<tr>
<td>Resonant frequency</td>
<td>3700±400</td>
<td>Hz</td>
</tr>
<tr>
<td>Maximum operating frequency</td>
<td>500</td>
<td>Hz</td>
</tr>
</tbody>
</table>

1. Operate time

2. Bounce time

3. Release time

4. Resonant frequency
■ MECHANICAL CHARACTERISTICS

(1) Lead tensile test (static load)

(2) Lead tensile strength

■ ENVIRONMENTAL CHARACTERISTICS

(1) Temperature characteristics
(2) Temperature cycle

Temperature cycle: (-55°C to +125°C)

Contact resistance measurements before and after test:
- Pull-in Value
- Drop-out Value
- Contact resistance

(3) Temperature and humidity cycle

Temperature and humidity cycle: (-10°C to +65°C, 80% to 98%)

Contact resistance measurements before and after test:
- Pull-in Value
- Drop-out Value
- Contact resistance

(4) High temperature storage test

High temperature storage test: (+125°C -500H)

Contact resistance measurements before and after test:
- Pull-in Value
- Drop-out Value
- Contact resistance

(5) Low temperature storage test

Low temperature storage test: (-40°C -500H)

Contact resistance measurements before and after test:
- Pull-in Value
- Drop-out Value
- Contact resistance
(6) Shock test

1) Electrical characteristics

(30G: 11ms)

G
1500
1000
500

G
0
10
20
30
40
50
60
AT
AT

Pull-in Value
Drop-out Value

Contact resistance

Before test
After test

(20G: 10-1000Hz)

(7) Vibration test

misoperation area
LIFE EXPECTANCY DATA: ORD9215

Load conditions
Voltage: 5VDC
Current: 100μA, 1mA, 5mA
Load: Resistive load

Load conditions
Voltage: 12 VDC
Current: 5mA, 10mA, 100mA
Load: Resistive load

Load conditions
Voltage: 24 VDC
Current: 100mA, 200mA, 400mA
Load: Resistive load
The ORD9216 is a small single-contact reed switch designed for general control of medium-level loads less than 100 V. The contacts are sealed within the glass tube with inert gas to maintain contact reliability.

(1) Reed contacts are hermetically sealed within a glass tube with inert gas and do not receive any influence from the external atmospheric environment.

(2) Quick response

(3) The structure comprises the operating parts and electrical circuits arranged coaxially. Reed switches are suited to applications in radio frequency operation.

(4) Reed switches are compact and light weight.

(5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.

(6) With a permanent magnet installed, reed switches economically and easily become proximity switches.

**EXTERNAL DIMENSIONS (Unit: mm)**

**APPLICATIONS**

- Control equipment
- Communication equipment
- Measurement equipment
- Household appliances
### ELECTRICAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Rated value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pull-in Value (PI)</td>
<td>10～50</td>
<td>AT</td>
</tr>
<tr>
<td>Drop-out Value (DO)</td>
<td>5min</td>
<td>AT</td>
</tr>
<tr>
<td>Contact resistance (CR)</td>
<td>100max</td>
<td>mΩ</td>
</tr>
<tr>
<td>Breakdown voltage</td>
<td>150min</td>
<td>VDC</td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>10⁵min</td>
<td>Ω</td>
</tr>
<tr>
<td>Electrostatic capacitance</td>
<td>0.3max</td>
<td>pF</td>
</tr>
<tr>
<td>Contact rating</td>
<td>10</td>
<td>VA</td>
</tr>
<tr>
<td>Maximum switching voltage</td>
<td>100 (DC)</td>
<td>V</td>
</tr>
<tr>
<td>Maximum switching current</td>
<td>0.5</td>
<td>A</td>
</tr>
<tr>
<td>Maximum carry current</td>
<td>1.0</td>
<td>A</td>
</tr>
</tbody>
</table>

1. **Drop-out Value vs. Pull-in Value**

2. **Contact resistance**

(Measurement length: 32mm)
(3) Breakdown voltage

(4) Insulation resistance

(5) Electrostatic capacitance
### OPERATING CHARACTERISTICS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Rated value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operate time</td>
<td>0.4max</td>
<td>ms</td>
</tr>
<tr>
<td>Bounce time</td>
<td>0.3max</td>
<td>ms</td>
</tr>
<tr>
<td>Release time</td>
<td>0.05max</td>
<td>ms</td>
</tr>
<tr>
<td>Resonant frequency</td>
<td>5000±400</td>
<td>Hz</td>
</tr>
<tr>
<td>Maximum operating frequency</td>
<td>500</td>
<td>Hz</td>
</tr>
</tbody>
</table>

**Graphs**

1. **Operate time**
   
   ![Graph 1](image1.png)

2. **Bounce time**
   
   ![Graph 2](image2.png)

3. **Release time**
   
   ![Graph 3](image3.png)

4. **Resonant frequency**
   
   ![Graph 4](image4.png)
### MECHANICAL CHARACTERISTICS

1. Lead tensile test (static load)

   - Pull-in Value • Drop-out Value
   - Contact resistance

   Before test  | After test
   ---|---
   AT  |  AT
   PI  |  PI
   DO  |  DO

2. Lead tensile strength

### ENVIRONMENTAL CHARACTERISTICS

1. Temperature characteristics

   - Rate of change percent
   - Cumulative frequency percent (%)

   Before test  | After test
   ---|---
   AT  |  AT
   PI  |  PI
   DO  |  DO

   - Contact resistance

   Temperature

   - Breaking load

   Cumulative frequency percent (%) vs. Breaking load

   Cumulative frequency percent (%) vs. Temperature
(2) Temperature cycle
(-55°C～+125°C)

(3) Temperature and humidity cycle
(-10°C～+65°C
80%～98%)

(4) High temperature storage test
(+125°C-500H)

(5) Low temperature storage test
(-40°C-500H)
(6) Shock test
1) Electrical characteristics

(30G: 11ms)

Pull-in Value • Drop-out Value

AT

Contact resistance

Before test
After test

(7) Vibration test

(20G: 10〜1000Hz)

Pull-in Value • Drop-out Value

AT

Contact resistance

Before test
After test
LIFE EXPECTANCY DATA: ORD9216

Load conditions
Voltage: 5VDC
Current: 100μA, 1mA, 5mA
Load: Resistive load

Load conditions
Voltage: 12 VDC
Current: 5mA, 10mA, 100mA
Load: Resistive load

Load conditions
Voltage: 24 VDC
Current: 100mA, 200mA, 400mA
Load: Resistive load

* Arrow indicates number of operations where test was completed.
REED SWITCH
ORD311
Super Ultra Miniature Long Life

- GENERAL DESCRIPTION

The ORD311 is a small single-contact reed switch designed for general control of medium level loads less than 100 V. The contacts are sealed within the glass tube with inert gas to maintain contact reliability.

- FEATURES

  1. Reed switches are hermetically sealed within a glass tube with inert gas and do not receive any influence from the external atmospheric environment.
  2. Quick response
  3. The structure comprises the operating parts and electrical circuits arranged coaxially. Reed switches are suited to applications in radio frequency operation.
  4. Reed switches are compact and light weight.
  5. Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
  6. With a permanent magnet installed, reed switches economically and easily become proximity switches.

- EXTERNAL DIMENSIONS (Unit: mm)

![Diagram]

- APPLICATIONS

  - Automotive electronic devices
  - Control equipment
  - Communication equipment
  - Measurement equipment
  - Household appliances
### ELECTRICAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Rated value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pull-in Value (PI)</td>
<td>10〜30</td>
<td>AT</td>
</tr>
<tr>
<td>Drop-out Value (DO)</td>
<td>5min</td>
<td>AT</td>
</tr>
<tr>
<td>Contact resistance (CR)</td>
<td>200max</td>
<td>mΩ</td>
</tr>
<tr>
<td>Breakdown voltage</td>
<td>250min</td>
<td>VDC</td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>$10^9$min</td>
<td>Ω</td>
</tr>
<tr>
<td>Electrostatic capacitance</td>
<td>0.4max</td>
<td>pF</td>
</tr>
<tr>
<td>Contact rating</td>
<td>10</td>
<td>VA</td>
</tr>
<tr>
<td>Maximum switching voltage</td>
<td>$100 \left(\frac{DC}{AC}\right)$</td>
<td>V</td>
</tr>
<tr>
<td>Maximum switching current</td>
<td>1.0</td>
<td>A</td>
</tr>
<tr>
<td>Maximum carry current</td>
<td>0.5</td>
<td>A</td>
</tr>
</tbody>
</table>

1. Drop-out Value vs. Pull-in Value
2. Contact resistance
(3) Breakdown voltage

![Graph showing breakdown voltage versus pull-in value.]

(4) Insulation resistance

![Graph showing cumulative frequency percent versus insulation resistance.]

(5) Electrostatic capacitance

![Graph showing electrostatic capacitance versus pull-in value.]

(1MHz)
## OPERATING CHARACTERISTICS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Rated value</th>
<th>Unit</th>
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</thead>
<tbody>
<tr>
<td>Operate time</td>
<td>0.3max</td>
<td>ms</td>
</tr>
<tr>
<td>Bounce time</td>
<td>0.3max</td>
<td>ms</td>
</tr>
<tr>
<td>Release time</td>
<td>0.05max</td>
<td>ms</td>
</tr>
<tr>
<td>Resonant frequency</td>
<td>13000±2000</td>
<td>Hz</td>
</tr>
<tr>
<td>Maximum operating frequency</td>
<td>500</td>
<td>Hz</td>
</tr>
</tbody>
</table>

1. Operate time

![Operate time graph](image)

2. Bounce time

![Bounce time graph](image)

3. Release time

![Release time graph](image)

4. Resonant frequency

![Resonant frequency graph](image)
- **MECHANICAL CHARACTERISTICS**
  (1) Lead tensile test (static load)

![Graph showing pull-in value, drop-out value, and contact resistance before and after test]

(2) Lead tensile strength

![Graph showing cumulative frequency percent against breaking load]

- **ENVIRONMENTAL CHARACTERISTICS**
  (1) Temperature characteristics

![Graph showing rate of change percent against temperature]
(2) Temperature cycle

(-55°C～+125°C)

(3) Temperature and humidity cycle

(-10°C～+85°C 80%～98%)

(4) High temperature storage test

(+125°C-500H)

(5) Low temperature storage test

(-40°C-500H)
(6) Shock test

1) Electrical characteristics

![Graph showing electrical characteristics with axes labeled as AT, pull-in value, and contact resistance.]

(30G: 11ms)

![Graph showing misoperation area with axes labeled as AT and acceleration.]

2) Misoperation area

(20G: 10-1000Hz)

(7) Vibration test

![Graph showing vibration test with axes labeled as AT, pull-in value, and contact resistance.]

Before test After test

Before test After test

PI DO CR
LIFE EXPECTANCY DATA: ORD311

Load conditions
Voltage: 5VDC
Current: 100μA 10mA, 20mA
Load: Resistive load

Load conditions
Voltage: 12VDC
Current: 5mA, 10mA, 100mA
Load: Resistive load

Load conditions
Voltage: 24VDC
Current: 1mA, 10mA, 100mA
Load: Resistive load

* Arrow indicates number of operations where test was completed.
REED SWITCH
ORD312
High Power Long Life

■ GENERAL DESCRIPTION

The ORD312 is a small single-contact reed switch designed for general control of medium level loads less than 200 V. The contacts are sealed within the glass tube with inert gas to maintain contact reliability.

■ FEATURES

(1) Reed contacts are hermetically sealed within a glass tube with inert gas and do not receive any influence from the external atmospheric environment.
(2) Quick response
(3) The structure comprises the operating parts and electrical circuits arranged coaxially. Reed switches are suited to applications in radio frequency operation.
(4) Reed switches are compact and light weight.
(5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
(6) With a permanent magnet installed, reed switches economically and easily become proximity switches.

■ EXTERNAL DIMENSIONS (Unit: mm)

![External Dimensions Diagram]

■ APPLICATIONS

- Automotive electronic devices
- Control equipment
- Communication equipment
- Measurement equipment
- Household appliances
### ELECTRICAL CHARACTERISTICS

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<tr>
<th>Parameter</th>
<th>Rated value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pull-in Value (PI)</td>
<td>10～30</td>
<td>AT</td>
</tr>
<tr>
<td>Drop-out Value (DO)</td>
<td>5min</td>
<td>AT</td>
</tr>
<tr>
<td>Contact resistance (CR)</td>
<td>100max</td>
<td>mΩ</td>
</tr>
<tr>
<td>Breakdown voltage</td>
<td>250min</td>
<td>VDC</td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>10^9min</td>
<td>Ω</td>
</tr>
<tr>
<td>Electrostatic capacitance</td>
<td>0.3max</td>
<td>pF</td>
</tr>
<tr>
<td>Contact rating</td>
<td>30</td>
<td>VA</td>
</tr>
<tr>
<td>Maximum switching voltage</td>
<td>200DC, 100AC</td>
<td>V</td>
</tr>
<tr>
<td>Maximum switching current</td>
<td>0.5</td>
<td>A</td>
</tr>
<tr>
<td>Maximum carry current</td>
<td>1.0</td>
<td>A</td>
</tr>
</tbody>
</table>

(1) Drop-out Value vs. Pull-in Value

(2) Contact resistance

(Measurement length: 32mm)
(3) Breakdown voltage

![Breakdown voltage graph]

(4) Insulation resistance

![Insulation resistance graph]

(5) Electrostatic capacitance

![Electrostatic capacitance graph]
## OPERATING CHARACTERISTICS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Rated value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operate time</td>
<td>0.4max</td>
<td>ms</td>
</tr>
<tr>
<td>Bounce time</td>
<td>0.3max</td>
<td>ms</td>
</tr>
<tr>
<td>Release time</td>
<td>0.05max</td>
<td>ms</td>
</tr>
<tr>
<td>Resonant frequency</td>
<td>5900±400</td>
<td>Hz</td>
</tr>
<tr>
<td>Maximum operating frequency</td>
<td>500</td>
<td>Hz</td>
</tr>
</tbody>
</table>

1. Operate time

(25Hz: 100AT energized)

2. Bounce time

(25Hz: 100AT energized)

3. Release time

(25Hz: 100AT energized)

4. Resonant frequency

(25Hz: 100AT energized)
MECHANICAL CHARACTERISTICS
(1) Lead tensile test (static load)

(2) Lead tensile strength

ENVIRONMENTAL CHARACTERISTICS
(1) Temperature characteristics
(2) Temperature cycle

(-55°C ~ +125°C)

Pull-in Value • Drop-out Value
Before test After test

Contact resistance

(3) Temperature and humidity cycle

(-10°C ~ +85°C 80% ~ 98%)

Pull-in Value • Drop-out Value
Before test After test

Contact resistance

(4) High temperature storage test

(+125°C - 500H)

Pull-in Value • Drop-out Value
Before test After test

Contact resistance

(5) Low temperature storage test

(-40°C - 500H)

Pull-in Value • Drop-out Value
Before test After test

Contact resistance
(6) Shock test
   1) Electrical characteristics

   (30G: 11ms)

   Pull-in Value • Drop-out Value

   Contact resistance

   Before test     After test

   CR

   PI

   DO

   G

   Misoperation area

   Acceleration

   0     10     20     30     40     50     60

   AT

(7) Vibration test

   (20G: 10—1000Hz)

   Pull-in Value • Drop-out Value

   Contact resistance

   Before test     After test

   CR

   PI

   DO
LIFE EXPECTANCY DATA: ORD312

Load conditions
Voltage: 5VDC
Current: 100μA, 10mA, 20mA
Load: Resistive load

Load conditions
Voltage: 12VDC
Current: 5mA, 10mA, 100mA
Load: Resistive load

Load conditions
Voltage: 200VDC
Current: 10mA, 50mA, 150mA
Load: Resistive load

* Arrow indicates number of operations where test was completed.
MOLDED SWITCH
RA-901
Miniature SMD

■ GENERAL DESCRIPTION

The RA-901 is a molded switch made by molding the glass tube of ORD228VL with resin and processing the leads. It ensures ease of handling of the switch while maintaining the excellent characteristics of ORD228VL.

■ FEATURES

(1) It has a gull wing shape lead suitable for SMT.
(2) Automatic mounting of component by tape and reel feed is possible.
(3) It features enhanced shock resistance characteristics due to resin mold that protects the glass tube.
(4) General Purpose Miniature

■ EXTERNAL DIMENSIONS (Unit: mm)

![Diagram of external dimensions with dimensions labeled]

■ PAD LAYOUT SAMPLE

![Diagram of pad layout sample with dimensions labeled]

■ APPLICATIONS

- Automotive electronic devices
- Control equipment
- Communication equipment
- Measurement equipment
- Household appliances
### SPECIFICATION

<table>
<thead>
<tr>
<th>Contact form</th>
<th>1A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pull-in value (PI)</td>
<td>15〜49AT</td>
</tr>
<tr>
<td>Drop-out value (DO)</td>
<td>10AT (Min.)</td>
</tr>
<tr>
<td>Contact resistance (CR)</td>
<td>100mΩ (Max.)</td>
</tr>
<tr>
<td>Contact rating</td>
<td>10W (Max.)</td>
</tr>
<tr>
<td>Maximum switching voltage</td>
<td>100V</td>
</tr>
<tr>
<td>Maximum switching current</td>
<td>0.5A</td>
</tr>
<tr>
<td>Maximum carry current</td>
<td>1.0A</td>
</tr>
<tr>
<td>Breakdown voltage</td>
<td>200V (Min.)</td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>1×10⁹Ω (Min.)</td>
</tr>
<tr>
<td>Operate time</td>
<td>0.4ms (Max.)</td>
</tr>
<tr>
<td>Bounce time</td>
<td>0.3ms (Max.)</td>
</tr>
<tr>
<td>Release time</td>
<td>0.05ms (Max.)</td>
</tr>
<tr>
<td>Shock resistance</td>
<td>50G〜11ms</td>
</tr>
<tr>
<td>Vibration resistance</td>
<td>50G (10〜2000Hz)</td>
</tr>
<tr>
<td>Operating temperature range</td>
<td>−40〜125℃</td>
</tr>
<tr>
<td>Storage temperature range</td>
<td>−50〜125℃</td>
</tr>
</tbody>
</table>

### PULL-IN VALUE TABLE

<table>
<thead>
<tr>
<th>Model No.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pull-in value (AT)</td>
<td>15〜34</td>
<td>18〜36</td>
<td>19〜39</td>
<td>21〜42</td>
<td>24〜45</td>
<td>27〜49</td>
<td>30〜49</td>
<td>34〜49</td>
</tr>
</tbody>
</table>
ENVIRONMENTAL CHARACTERISTICS

(1) Temperature cycle

(-55°C ~ +125°C)

(2) Temperature and humidity cycle

(-10°C ~ +65°C  80% ~ 98%)

<table>
<thead>
<tr>
<th>Pull-in Value (AT)</th>
<th>Before test</th>
<th>After test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Drop-out Value (AT)</th>
<th>Before test</th>
<th>After test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Contact resistance (mΩ)</th>
<th>Before test</th>
<th>After test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
(3) High temperature storage test (125°C 500H)

(4) Low temperature storage test (-40°C 500H)
(5) Shock test

(50G 11msec)

Pull-in Value (AT)  | 50  | 40  | 30  | 20  | 10  | 0
Before test | After test

Drop-out Value (AT) | 70  | 60  | 50  | 40  | 30  | 20  | 10  | 0
Before test | After test

Contact resistance (mΩ) | 50  | 40  | 30  | 20  | 10  | 0
Before test | After test

(6) Vibration test

(50G 10～2000Hz)

Pull-in Value (AT)  | 50  | 40  | 30  | 20  | 10  | 0
Before test | After test

Drop-out Value (AT) | 70  | 60  | 50  | 40  | 30  | 20  | 10  | 0
Before test | After test

Contact resistance (mΩ) | 50  | 40  | 30  | 20  | 10  | 0
Before test | After test
### Shock Resistance Test

- **Pull-in Value (AT)**
  - Before test: 50
  - After test: 50

- **Drop-out Value (AT)**
  - Before test: 70
  - After test: 70

- **Contact resistance (mΩ)**
  - Before test: 20
  - After test: 20

*Note: 10mm steel ball free fall impact height 230 mm*
MOLDED SWITCH
RA-903
Ultra Miniature SMD

GENERAL DESCRIPTION
The RA-903 is a molded switch made by molding the glass tube of ORD213 with resin and processing the leads. It ensures ease of handling while maintaining the excellent features of ORD213 and its light weight.

FEATURES
(1) It has a gull wing shape lead suitable for SMT.
(2) Automatic mounting of this component by tape and reel feed is possible.
(3) It features enhanced shock resistance characteristics due to resin mold that protects the glass tube.
(4) Ultacompact and light weight

EXTERNAL DIMENSIONS (Unit: mm)

PAD LAYOUT SAMPLE

APPLICATIONS
- Automotive electronic devices
- Control equipment
- Communication equipment
- Measurement equipment
- Household appliances
## SPECIFICATION

<table>
<thead>
<tr>
<th>Contact form</th>
<th>1A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pull-in value (PI)</td>
<td>16~46AT</td>
</tr>
<tr>
<td>Drop-out value (DO)</td>
<td>10AT (Min.)</td>
</tr>
<tr>
<td>Contact resistance (CR)</td>
<td>200mΩ (Max.)</td>
</tr>
<tr>
<td>Contact rating</td>
<td>1W (Max.)</td>
</tr>
<tr>
<td>Maximum switching voltage</td>
<td>24V</td>
</tr>
<tr>
<td>Maximum switching current</td>
<td>0.1A</td>
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<tr>
<td>Maximum carry current</td>
<td>0.3A</td>
</tr>
<tr>
<td>Breakdown voltage</td>
<td>150V (Min.)</td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>$1 \times 10^9 \Omega$ (Min.)</td>
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<tr>
<td>Operate time</td>
<td>0.3ms (Max.)</td>
</tr>
<tr>
<td>Bounce time</td>
<td>0.3ms (Max.)</td>
</tr>
<tr>
<td>Release time</td>
<td>0.05ms (Max.)</td>
</tr>
<tr>
<td>Shock resistance</td>
<td>50G~11ms</td>
</tr>
<tr>
<td>Vibration resistance</td>
<td>50G (10~2000Hz)</td>
</tr>
<tr>
<td>Operating temperature range</td>
<td>−40~125°C</td>
</tr>
<tr>
<td>Storage temperature range</td>
<td>−50~125°C</td>
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## PULL-IN VALUE TABLE

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<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pull-in value (AT)</td>
<td>16~29</td>
<td>18~32</td>
<td>20~34</td>
<td>22~36</td>
<td>24~42</td>
<td>28~46</td>
</tr>
</tbody>
</table>
ENVIRONMENTAL CHARACTERISTICS

(1) Temperature cycle  
(-55°C ~ +125°C)

(2) Temperature and humidity cycle  
(-10°C ~ +65°C  80% ~ 98%)

<table>
<thead>
<tr>
<th></th>
<th>Before test</th>
<th>After test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pull-in Value (AT)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drop-out Value (AT)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contact resistance (mΩ)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
(3) High temperature storage test \( (125 \, ^\circ C \, 500H) \)

![Graphs showing Pull-in Value, Drop-out Value, and Contact resistance before and after the test for high temperature storage.]

(4) Low temperature storage test \( (-40 \, ^\circ C \, 500H) \)

![Graphs showing Pull-in Value, Drop-out Value, and Contact resistance before and after the test for low temperature storage.]

(5) Shock test

(5G 11msec)

Pull-in Value (AT)

Before test After test

Drop-out Value (AT)

Before test After test

Contact resistance (mΩ)

Before test After test

(6) Vibration test

(5G 10～2000Hz)

Pull-in Value (AT)

Before test After test

Drop-out Value (AT)

Before test After test

Contact resistance (mΩ)

Before test After test
(7) Shock Resistance test

(φ 10mm steel ball, free fall impact height 230mm)