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REED SWITCH

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INTRODUCTION  GENERAL DESCRIPTION, RELIABILITY, PRECAUTIONS, DESCRIPTION OF SYMBOLS AND TERMS
## REED SWITCH TYPICAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>Part No.</th>
<th>ORD213 %</th>
<th>ORD211 %</th>
<th>ORD219 %</th>
<th>ORD312 %</th>
<th>ORD221 %</th>
<th>ORD228VL %</th>
<th>ORD224 %</th>
<th>ORD241 %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drop-out</td>
<td>5 mm</td>
<td>5 mm</td>
<td>5 mm</td>
<td>5 mm</td>
<td>5 mm</td>
<td>5 mm</td>
<td>5 mm</td>
<td>5 mm</td>
</tr>
<tr>
<td>Contact resistance [BR] [mil]</td>
<td>100 max</td>
<td>100 max</td>
<td>100 max</td>
<td>100 max</td>
<td>100 max</td>
<td>100 max</td>
<td>100 max</td>
<td></td>
</tr>
<tr>
<td>Breakdown voltage [DCV]</td>
<td>250 min</td>
<td>250 min</td>
<td>250 min</td>
<td>250 min</td>
<td>200 min</td>
<td>200 min</td>
<td>200 min</td>
<td></td>
</tr>
<tr>
<td>Insulation resistance [Ω]</td>
<td>10 min</td>
<td>10 min</td>
<td>10 min</td>
<td>10 min</td>
<td>10 min</td>
<td>10 min</td>
<td>10 min</td>
<td></td>
</tr>
<tr>
<td>Electronic capacitance [μF]</td>
<td>0.4 max</td>
<td>0.4 max</td>
<td>0.4 max</td>
<td>0.4 max</td>
<td>0.4 max</td>
<td>0.4 max</td>
<td>0.4 max</td>
<td></td>
</tr>
<tr>
<td>Contact rating [V, A, W]</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Maximum switching voltage [V]</td>
<td>DC24/AC24</td>
<td>DC24/AC24</td>
<td>DC24/AC24</td>
<td>DC24/AC24</td>
<td>DC24/AC24</td>
<td>DC24/AC24</td>
<td>DC24/AC24</td>
<td></td>
</tr>
<tr>
<td>Maximum switching current [A]</td>
<td>DC0.1</td>
<td>DC0.1</td>
<td>DC0.1</td>
<td>DC0.1</td>
<td>DC0.1</td>
<td>DC0.1</td>
<td>DC0.1</td>
<td></td>
</tr>
<tr>
<td>Maximum carry current [A]</td>
<td>DC0.3</td>
<td>DC0.3</td>
<td>DC0.3</td>
<td>DC0.3</td>
<td>DC0.3</td>
<td>DC0.3</td>
<td>DC0.3</td>
<td></td>
</tr>
<tr>
<td>Operating time [ms]</td>
<td>0.3 max</td>
<td>0.3 max</td>
<td>0.3 max</td>
<td>0.3 max</td>
<td>0.3 max</td>
<td>0.3 max</td>
<td>0.3 max</td>
<td></td>
</tr>
<tr>
<td>Release time [ms]</td>
<td>0.05 max</td>
<td>0.05 max</td>
<td>0.05 max</td>
<td>0.05 max</td>
<td>0.05 max</td>
<td>0.05 max</td>
<td>0.05 max</td>
<td></td>
</tr>
<tr>
<td>Resonant frequency [Hz]</td>
<td>11000</td>
<td>11000</td>
<td>11000</td>
<td>11000</td>
<td>11000</td>
<td>11000</td>
<td>11000</td>
<td></td>
</tr>
<tr>
<td>Maximum operating frequency [Hz]</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>Number of turns [T]</td>
<td>3.3</td>
<td>3.3</td>
<td>3.3</td>
<td>3.3</td>
<td>3.3</td>
<td>3.3</td>
<td>3.3</td>
<td></td>
</tr>
<tr>
<td>Coil resistance [Ω]</td>
<td>450</td>
<td>450</td>
<td>450</td>
<td>450</td>
<td>450</td>
<td>450</td>
<td>450</td>
<td></td>
</tr>
<tr>
<td>Operating Temperature Range</td>
<td>-40°C to +125°C</td>
<td>-40°C to +125°C</td>
<td>-40°C to +125°C</td>
<td>-40°C to +125°C</td>
<td>-40°C to +125°C</td>
<td>-40°C to +125°C</td>
<td>-40°C to +125°C</td>
<td></td>
</tr>
</tbody>
</table>

### Features [Contact material]
- Super ultra-miniature (Rh)
- Miniature high-performance (Rh)
- High-power long-life (Ir)
- Miniature offset-type (Rh)
- General purpose miniature-type (Rh)
- General purpose miniaturized, long seal (Rh)

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**UL File #: E70063**
### Electrical Characteristics

<table>
<thead>
<tr>
<th>Part No.</th>
<th>ORD2210V</th>
<th>ORD2211H</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOM.</td>
<td>1A</td>
<td>1A</td>
</tr>
<tr>
<td>Pull-in [mA]</td>
<td>10 - 40</td>
<td>10 - 40</td>
</tr>
<tr>
<td>Drop-out [mA]</td>
<td>4mA</td>
<td>4mA</td>
</tr>
<tr>
<td>Contact resistance [mΩ]</td>
<td>100 kΩ</td>
<td>100 kΩ</td>
</tr>
<tr>
<td>Breakdown voltage [V]</td>
<td>250 V</td>
<td>250 V</td>
</tr>
<tr>
<td>Insulation resistance [Ω]</td>
<td>10 MΩ</td>
<td>10 MΩ</td>
</tr>
<tr>
<td>Effective capacitance [pF]</td>
<td>0.5 pF</td>
<td>0.5 pF</td>
</tr>
<tr>
<td>Contact rating [mA]</td>
<td>1000</td>
<td>1000</td>
</tr>
<tr>
<td>Maximum switching voltage [V]</td>
<td>DC 300</td>
<td>DC 300</td>
</tr>
<tr>
<td>Maximum switching current [A]</td>
<td>0.15</td>
<td>0.15</td>
</tr>
<tr>
<td>Maximum carry current [A]</td>
<td>2.5</td>
<td>2.5</td>
</tr>
<tr>
<td>Operating time [ms]</td>
<td>0.4 ms</td>
<td>0.4 ms</td>
</tr>
<tr>
<td>Release time [ms]</td>
<td>0.05 ms</td>
<td>0.05 ms</td>
</tr>
<tr>
<td>Resonant frequency [Hz]</td>
<td>7.5 kHz</td>
<td>7.5 kHz</td>
</tr>
<tr>
<td>Minimum arc voltage [V]</td>
<td>500</td>
<td>500</td>
</tr>
<tr>
<td>Standard Coil</td>
<td>450</td>
<td>450</td>
</tr>
<tr>
<td>Number of turns [T]</td>
<td>5000</td>
<td>5000</td>
</tr>
<tr>
<td>Dimension [mm]</td>
<td>7.3 × 7.3</td>
<td>7.3 × 7.3</td>
</tr>
<tr>
<td>Operating Temperature Range</td>
<td>−40°C to +125°C</td>
<td>−40°C to +125°C</td>
</tr>
<tr>
<td>Features [Contact material]</td>
<td>General purpose miniature-type (Rh)</td>
<td>High breakdown Voltage (Rh)</td>
</tr>
</tbody>
</table>

### Operating Temperature Range

<table>
<thead>
<tr>
<th>Part No.</th>
<th>RA-901</th>
<th>RA-903</th>
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</thead>
<tbody>
<tr>
<td>NOM.</td>
<td>1A</td>
<td>1A</td>
</tr>
<tr>
<td>Page</td>
<td>119</td>
<td>127</td>
</tr>
</tbody>
</table>

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**Note:** The table above provides a detailed breakdown of the electrical characteristics of the reed switch, including pull-in and drop-out currents, contact resistance, breakdown voltage, insulation resistance, effective capacitance, and more. The table also includes details on maximum switching voltage, current, operating time, release time, and resonant frequency, among other specifications. For more specific details, please refer to the table.
Environmental Characteristics

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

<table>
<thead>
<tr>
<th>Characteristics (common to all types)</th>
<th>Test Conditions</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shock</td>
<td>Will operate normally with shock of up to 294m/s$^2$ (11 msec)</td>
<td>MIL-STD-202G METHOD 213B-J</td>
</tr>
<tr>
<td>Vibration</td>
<td>Will operate normally with vibration of up to 196m/s$^2$ (10-2000Hz)</td>
<td>MIL-STD-202G METHOD 204D-D</td>
</tr>
<tr>
<td>Temperature range</td>
<td>Will operate normally between temperatures of -40°C ~ +125°C</td>
<td>–</td>
</tr>
<tr>
<td>Lead tensile strength</td>
<td>Will withstand 22.2N static load</td>
<td>MIL-STD-202G METHOD 211A</td>
</tr>
</tbody>
</table>

Remark
1. If shock in excess of 294m/s$^2$ is applied to a reed switch the pull-in value is subject to change from standard specifications.
2. Due to resonant frequency a reed switch may not operate properly if vibration is applied in excess of 2KHz (even minute acceleration).
3. Although a reed switch can operate beyond its specified range, mounting conditions need to be verified. Demagnetization may also occur due to temperature characteristics of permanent magnets (even at lower temperature ranges).
4. ORD213 and ORD311 will withstand a tensile static load of 14.7 N.

The UL recognition number for our reed switches is E70063.
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, reed switch improvements were made in parallel with the development of the telecommunications technology. At the same time, the advantages of reed switches such as 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.

Boasting extreme superior quality, our reed switches are manufactured by adopting our very own surface deactivation technology, high performance automatic sealing machines, and contact resistance technology employing our reputed magnetic flux scanning method. In particular, our pivotal surface deactivation technology suppresses the problematic issue of increased contact resistance caused by organic contamination common in conventional rhodium plated reed switches. Owing to this breakthrough, it is now possible to produce a reed switch with stabilized contact resistance. In fact, we received the prestigious Schneider Award at the 21st Annual National Relay Conference for this technology in 1973. Thereafter, we were awarded the Schneider Award at the 36th and 38th conference for our research into reed switch contact phenomena.

1. Reed Switch Characteristics
Reed switches display the following characteristics.
1) Hermetically sealed within a glass tube with inert gas, reeds contacts are not influenced by the external atmospheric environment.
2) Quick response because of small mass of moving parts.
3) Comprising of operating parts and electrical parts arranged coaxially, reed switches are suited to high-frequency applications.
4) 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

<table>
<thead>
<tr>
<th>Rotation detector</th>
<th>Tape deck automatic stop circuit</th>
<th>Automobile electronic circuit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proximity switch</td>
<td>Temperature detector</td>
<td>Gasoline tank volume monitor</td>
</tr>
<tr>
<td></td>
<td>Cargo handling equipment</td>
<td>Float switch</td>
</tr>
<tr>
<td></td>
<td>Toys</td>
<td>Facsimile</td>
</tr>
<tr>
<td></td>
<td>Leisure products</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Key switch</td>
<td>Data terminal equipment</td>
<td>Automatic balance</td>
</tr>
<tr>
<td></td>
<td>Computer I/O circuits</td>
<td>Security equipment</td>
</tr>
<tr>
<td></td>
<td>Machine tools</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switching system</td>
<td>Answer phone</td>
<td>Electronic switching system</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Automation</td>
<td>Ordinary control system</td>
<td>Automatic measuring equipment</td>
</tr>
<tr>
<td></td>
<td>Automatic system control</td>
<td>Plant system control</td>
</tr>
<tr>
<td></td>
<td>Traffic control system</td>
<td>Transmission equipment</td>
</tr>
<tr>
<td></td>
<td>Process control</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspection equipment</td>
<td>Various types of digital equipment</td>
<td>Subassembly for synchronous and other types of equipment</td>
</tr>
<tr>
<td></td>
<td>Digital circuit</td>
<td>Radio frequency relay</td>
</tr>
<tr>
<td></td>
<td>Data logger</td>
<td>Various special purpose relays</td>
</tr>
<tr>
<td></td>
<td>Analog circuit</td>
<td>Vending machines</td>
</tr>
<tr>
<td></td>
<td>D/A converter</td>
<td>Transmission equipment</td>
</tr>
<tr>
<td></td>
<td>Radio equipment</td>
<td>Broadcasting equipment</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3. Structure and Operating Principles

As shown in Figure 3.1, reed switches comprise of 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, reed switches are 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

Reed Switch Operating Principles

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 permanent magnet is to be used for driving a reed switch, the following steps are generally taken to select the type of magnet to be used and determining the relative distance of it to the reed switch.

1. Determining the Detection Mechanism
   Simple go and return, Rotate, Bias system, Shield system, etc.

2. Confirming the Mounting Space
   Confirming if space is sufficient

3. Selecting the Reed Switch
   Dimensions and features

4. Determining Magnet Type & PI Value
   Shape, Material, Pole composition, on-off stroke check, etc.

4-1 Permanent Magnet Drive Method

The following examples show the four basic patterns to drive a reed switch with a permanent magnet.

1) Go and Return Method

   ![Figure 4.1](image1)

2) Rotating Method

   ![Figure 4.2](image2)

3) Bias Method

   ![Figure 4.3](image3)

4) Shielding Method

   ![Figure 4.3](image4)
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 drop out 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)

Figure 4.4

(2) X-Z Characteristic H (Horizontal)

Figure 4.5

(3) X-Y Characteristic V (Vertical)

Figure 4.6
4-3 ORD228VL Magnet Drive Characteristics Example

Magnet: 5×5×6mm
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

(3) X-Y Characteristics V

Figure 4.7

Figure 4.8

Figure 4.9
4-3 ORD228VL Magnet Drive Characteristics Example

Magnet: 5×5×6mm
Anisotropic barium ferrite
Surface magnetic flux 120 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

(4) X-Y Characteristics V

Figure 4.10
Figure 4.11
Figure 4.12
REED SWITCH RELIABILITY

Introduction
In recent years, both the demand and application of the humble reed switch have continued to rapidly expand along with rapid developments in electronics and mechatronics. Some of the more prominent applications include automobile, communications, office automation, control, and customer electronics. In this fast-paced, all-crucial environment, a failure, for example, could have immeasurable consequences. With this in mind, we believe it is the obligation of the manufacture to ensure a steady supply of reliable, high quality products.

Based on this recognition, we have adopted the following comprehensive quality assurance system based on ISO9001 with integrated product policy in development, manufacturing, marketing and sales, which allows us to supply products with consistent and reliable quality.

We are committed to further expand our efforts to meet the ever-increasing demands for improvements in the performance and reliability of our products.

Below is an outline of our quality assurance system and its underlying concepts. Here, we will briefly explain our reliability testing methods and unique technologies which enable us to maintain high reliability in our reed switches.

1. Quality Assurance System and Underlying Concepts
The quality policy pursued by our company is as follows:

- Based on the trust and sympathy from our clients across the world, we will continuously improve our management system to ensure:
  - Stable supply of products
  - Reliable and high quality products
  - Products that offer value to our customers

Our product quality assurance process can be broadly divided into four stages consisting of the product planning stage, development and prototype production stage, trial mass production stage, and mass production stage. The entire process is illustrated in the flow chart shown in Figure 1.1, and we will explain each stage in sequential order.

1-1 Product planning stage
To manufacture products that meet market demand and satisfy customer needs, we carefully study functional and failure rate requirements, product applications, environment 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, process capacity requirement plan, and level adjustment 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. We also manufacture actual prototypes, on which testing is carried out to ensure reliability. Since most product quality is determined at the design stage, we, from the perspective of building quality into product design, pay particular attention to quality confirmation at this stage.

Specifically,

1) After completing basic design, our design engineering, production engineering and product reliability departments perform design reviews.

2) Prototypes are subjected to repeated characteristics and reliability evaluation. At this point, characteristics and reliability are confirmed while the stability and capacity of manufacturing processes are also evaluated.

1-3 Trial mass production stage
Here, similar to that above, various tests are performed on mass production prototypes to check the characteristics and reliability of products at factory level. After confirming that the product quality is satisfactory, we start mass production after conducting mass production preparation reviews.

1-4 Mass production stage
At this stage, careful management of purchased materials and parts, management of product quality during the manufacturing process, management of our facilities and measuring equipment as well as careful management of manufacturing conditions and the environment is implemented to ensure that product quality stipulated during the designing stage is achieved and maintained. The general description of our in-process quality control and assurance is shown in Figure 1.2.
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 1.3 Failure Report Process Flow Chart

Figure 1.4 Quality Assurance and Quality Control Flow

System Management

Sales & Marketing

Customer

Failure report

Failure analysis report

Usage Quality

• Transportation control
• Stock control
• Packaging

• Reliability test
• Product test
• Screening
• Process control
• In-process inspection
• Incoming inspection

Target Quality

• Service
• Failure analysis
• Customer information analysis

Quality assurance and quality control

Quality Management

• Quality and reliability information
• Quality evaluation
• Failure analysis
• Reliability engineering
• Quality control and education

Engineering

• Marketing
• Product planning
• Quality objectives

Design Quality

• Operation standards
• Technical standards
• Quality standards
• Design review
• Prototype review

Production Management

Request for technical improvement based on detailed analysis

Report on results of investigation and improvement

Technical improvement direction

Request for technical improvement

Report on result of investigation and study

Request for manufacturing improvement

Report of investigation and analysis

Failure report and failed sample analysis request
2. Our Original Technology Supports High Reliability

2-1 High-reliability contact materials

Our reed switches traditionally use rhodium as their contact material, and are highly rated by our customers for their extremely high reliability.

Rhodium is a metal that belongs to the platinum group and has superior properties such as its extreme hardness, which is effective in preventing sticking, and its high melting point which gives it the ability to significantly reduce contact surface wear caused by joule heart and arc discharge. We have been employing rhodium as the contact material after overcoming its unfavorable property of absorbing organic impurities, by developing and applying our own original technology.*1

*1 Contact surface deactivation treatment (awarded Schneider Award)

Nevertheless, with the recent changes in the environment, there have been calls for even higher functionality and reliability in reed switches. We have been collaborating with material manufacturers in response to these demands, and have developed reed switches with iridium contacts, for which mass production technologies had previously been difficult to establish. We have manufactured several variations of reed switch products with iridium contacts, with more to be released at future dates.

While iridium is part of the platinum family as is rhodium, iridium has higher hardness and higher melting point than rhodium. These properties make it possible for reed switches with iridium contacts to achieve higher functionality, higher reliability and longer operating life than reed switches with rhodium contacts, even when both types of reed switches have the same shape.

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 that demands stringent quality control and management. At the time of sealing, working temperature reaches about 1000 degrees C, which induces any impurities on the glass tube to evaporate but causes contamination on the reed switch contacts. To prevent the effects of these phenomena, we have developed strict standards for the selection of glass material and use our own unique and superior technology for automatic sealing. Such improvements in the manufacturing processes 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 stringent 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 have 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 a multilayered coil causes the magnetic foreign particles to move to the contact part of the reed switch. Foreign particles are detected by measuring changes in the contact resistance.

This new technology has allowed us to further improve 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) °C</td>
<td>(80～98) (%)</td>
<td>MIL-STD-202G 106E (Refer to Figure 2.3)</td>
</tr>
<tr>
<td>Temperature cycle</td>
<td>−55～+125 °C</td>
<td>(%)</td>
<td>Chart is shown in Figure 2.4.</td>
</tr>
<tr>
<td>High temperature storage test</td>
<td>125 °C</td>
<td>°C</td>
<td>500H</td>
</tr>
<tr>
<td>Low temperature storage test</td>
<td>−40 °C</td>
<td>°C</td>
<td>500H</td>
</tr>
</tbody>
</table>

Figure 2.1 Oxygen Treatment vs Untreated

Figure 2.2 Magnetic Flux Scanning Test (FS Test)

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 in deteriorating the contacts. In order to prevent this, many protection circuits are provided, typical examples of which are shown in Figure 1.1.

\[
C = \frac{I^2}{10} \text{[\mu F]} \\
R = \frac{E}{10I (1+50/E)} \text{[\Omega]}
\]

1-2 Capacitive loads
Significant deterioration of reed contacts is incurred when a capacitor is provided in series or in parallel with the reed switch contacts in a closed circuit due to rush current flowing at charge and discharge of capacitance.

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

![Figure 1.2](image)

1-3 Lamp load
In general, tungsten lamps are used and these lamps display low resistance right before lighting up and high resistance as they begin to light up. They exhibit a steady current and when operating a reed switch under these conditions the contacts are prone to sticking because rush current (approximately 5-10 times larger) will run directly after the lamp initiates. As such, it is crucial to incorporate a contact protection circuit in circuits with lamp loads as the amount of current that runs through the circuit is reflective of that flowing to charge a capacitor.

Fig. 1.3 shows examples of protection circuits.

![Figure 1.3](image)
PRECAUTIONS AND APPLICATIONS

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 move.

2. When cutting or bending the leads, be sure to protect the sealing portions. As shown in Figure 2.1, the lead should be firmly secured 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 shape of the 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 may become more sensitive to a magnet than it was initially.
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 a jig similar to the one used for a reed switch with cut leads. 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 edge of the glass. 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 edge of the glass. When using a large power supply for welding, heat generated in the leads 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. This may induce welding current to the reed switch and effectively melt the contacts together. Precautions are necessary.

3-3 Ultrasonic welding
It is important to take extra care when using ultrasonic welding on a reed switch or using an ultrasonic welder in the vicinity of a reed switch as it can alter the contact gap and characteristics of a reed switch.

3-4 Mounting on a printed circuit board
When installing on a printed circuit board, either elevate the reed switch above the board or drill holes in the board to ensure that the glass tube does not come into contact with the board (Fig. 3.1). Other methods can cause damage to the glass tube by way of mechanical influence or other adverse elements applied externally.

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 $294 m/s^2$, the pull-in value may change.

![Figure 3.2](image)

6. Relation to Characteristic Values Given by Other Makers
Measurement methods are manufacturer 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 values (four digit numbers) indicated on packaging refers to the range values determined at the time of product sorting. The guaranteed pull-in values have a tolerance of $\pm 2AT$ on these range values. For example, the guaranteed pull-in value of ORD211 2025AT is 18 to 27AT.

8. Reed Switch Life Characteristics
The life test data provided by our company is an example of test results when a reed switch is actuated by a coil (100 AT square wave excitation). When a reed switch is actuated by a permanent magnet, the life characteristics of the reed switch may vary depending on the transfer rate and distance of the permanent magnet.

The information contained in these specifications can change without prior notice or warning owing to product and/or technical improvement. Before using any of our products, please make sure that the information being referred to is up-to-date.
**DESCRIPTION OF SYMBOLS AND TERMS**

Following are some commonly used terms for the fundamental operating characteristics of a reed switch.

<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 reeds switch. Pull-in is the product of the current value necessary to operate the coil multiplied by the number of coil windings. This is the sensitivity of a 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**

- Beginning of Winding (top)
- Detector
- End of Winding (Bottom)
- Coil Saturation Current 20mA
- (SOAK) 100AT
- Oki Standard Coil
- Voltage Between Contacts 2 to 10 V: DC
- Current Between Contacts (less than 10 mA)

- Pull-in Value
- Drop-out Value

Current at time of operation x number of turns in standard coil (5000T): Indicated in AT

**Change Over Type**

- Beginning of Winding (top)
- Detector
- End of Winding (Bottom)
- Coil Saturation Current 20mA
- (SOAK) 100AT
- Oki Standard Coil
- Voltage Between Contacts 2 to 10 V: DC
- Current Between Contacts (less than 10 mA)

- Pull-in Value
- Drop-out Value

Current at time of operation x number of turns in standard coil (5000T): Indicated in AT
## DESCRIPTION OF SYMBOLS AND TERMS

<table>
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<tr>
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<th>Symbol</th>
<th>Unit</th>
<th>Description and Test Methods</th>
</tr>
</thead>
</table>
| Contact Resistance          | CR     | mΩ   | 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 be adjusted so that the magnetic field runs in the same direction as terrestrial magnetism. (The leading end of the coil-wire at the top should have positive polarity.)  
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)

| Breakdown voltage           | V      |      | • This value indicates the resistance voltage of the contacts. Breakdown voltage specifies the level of temporary overvoltage that a switch can withstand during a power surge or other similar phenomena generated externally or in the circuit.  
  **Change Over Type**  
  ![Change Over 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
### 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>
</table>
| Insulation Resistance         | V      |      | • Test method: MIL-STD-202G METHOD301  
Breakdown voltage varies depending on pull-in value. Breakdown voltage shown here is the value measured for the switch whose pull-in value is 20AT or more. The criterion of leak current is less than 0.1mA for one minute.  
• Test method: MIL-STD-202G METHOD302  
(Measurement is made by using a insulation resistance tester at 100V DC.)  
Insulation resistance is the resistance between lead ends and the resistance against leak current across the reed switch glass tube or its surface. |
| Electrostatic Capacitance     | pF     |      | • Electrostatic capacitance is the value of capacitance between open contacts. The overlap of a reed switch is fixed to determine electrical performance. The wider the contact gap the lower the electrostatic capacitance. Electrostatic capacitance is measured at 1MHz-0.1V. |
| Contact Rating                | WVA    |      | • Contact rating is the maximum product of voltage and current and is a very important value when determining contact switching performance. In order to anticipate constant life expectancy and assure reliability when switching is performed, the contact rating must not be exceeded and must be less than the product of (maximum switching voltage) X (maximum switching current).  
Contact rating is also called contact capacitance or contact power allowance. |
| Maximum Switching Voltage     | V      |      | • Maximum switching voltage is the maximum voltage at which contacts can be switched and is a reference voltage for determining 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. |
| Maximum Switching Current     | A      |      | • Maximum switching current is the maximum current at which contacts can be switched and is a reference voltage for determining 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. |
| Maximum Carry Current         | A      |      | • 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. |
### 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>Operate Time</td>
<td>Top</td>
<td>ms</td>
<td>• Operate time refers to the time required for the contacts to close after applying voltage to the 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 refers to the time between the contacts closing initially and the time they completely close.</td>
</tr>
<tr>
<td>Release Time</td>
<td>Trls</td>
<td>ms (μs)</td>
<td>• Release time refers to the time taken for the contacts to return to their normal position after the voltage applied to the coil is removed.</td>
</tr>
</tbody>
</table>

• Test method (3) Time characteristics measurement circuit

#### Make Type

![Make Type Diagram](image)

#### Change Over Type

![Change Over Type Diagram](image)
Resonant Frequency  Hz  • Resonant frequency is the vibration frequency inherent to the Reed switch. Misoperation may occur if the Reed switch is subjected to vibrations which have a similar frequency to the resonant frequency.

Maximum Operating Frequency  Hz  • Maximum operating frequency is the maximum drive frequency. This value indicates the maximum operating frequency for opening and closing the Reed switch. If this value is exceeded, abnormal switching may occur due to the relationship with operate time and bounce time.

Standard Coil  Number  • The standard coil is the coil provided for measuring Reed switch characteristics. The standard coil varies depending on the type of the Reed switch.

<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>
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<tbody>
<tr>
<td>A</td>
<td>21</td>
<td>18</td>
<td>12</td>
<td>10</td>
<td>10</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>7.5</td>
</tr>
<tr>
<td>C</td>
<td>φ 4.6</td>
<td>φ 3.7</td>
<td>φ 3.3</td>
<td>φ 4.6</td>
<td>φ 5.0</td>
<td>φ 4.4</td>
</tr>
<tr>
<td>D</td>
<td>φ 3.5</td>
<td>φ 2.9</td>
<td>φ 3.3</td>
<td>φ 3.5</td>
<td>φ 3.6</td>
<td>φ 3.2</td>
</tr>
<tr>
<td>E</td>
<td>φ 11.0</td>
<td>φ 11.0</td>
<td>φ 11.0</td>
<td>φ 13.0</td>
<td>φ 16.0</td>
<td>φ 20.0</td>
</tr>
<tr>
<td>Coil Resistance (Number of Turns)</td>
<td>500 Ω (5000Ω)</td>
<td>450 Ω (5000Ω)</td>
<td>600 Ω (5000Ω)</td>
<td>550 Ω (5000Ω)</td>
<td>550 Ω (5000Ω)</td>
<td>930 Ω (5000Ω)</td>
</tr>
<tr>
<td>Measured Reed Switch</td>
<td>ORD229</td>
<td>ORD2210</td>
<td>ORD219</td>
<td>ORD221</td>
<td>ORD222</td>
<td>ORD2211</td>
</tr>
</tbody>
</table>
Application Notes
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.
Reed Switch Application Examples - I

Reciprocating Operation

OFF \rightarrow \text{N} \text{S} \rightarrow \text{OFF}

ON

Key Switch

Reed Switch

Magnet

Application Examples:
Various types of button switches
(keyboards, etc.)

Position Sensor

Reed Switch

Magnet

Application Examples:
Various types of door sensors
(security systems, etc.)

Application Examples:
Various types of position sensors
(conveyor control, etc.)

Application Examples: Automatic balance
Reed Switch Application Examples-II

Position Sensor

OFF—ON—OFF

Rotating Operation

OFF

ON

ON

OFF

Application Examples: Liquid level sensor, various float switches

Application Examples: Various types of rotation sensors

Application Examples: Pressure sensors and wind pressure sensors

Application Examples: Various types of fluid level sensors (flow measurement instruments for water, gas and wind)
Reed Switch Application Examples-III

Shielding Operation

Magnetic Material (Shielding Plate)

OFF

ON

S

N

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
Reed Switch Application Example: Car

- Engine Control
- Automatic Door Lock
- Automatic Speed Control
- Power Steering

- Brake Switch
- Brake Oil Float
- Air Bag Sensor

- Speed Sensor
- Engine Oil Float
- Engine Temperature Sensor

- Burnout Light Bulb Sensor
- Monitor

- Ring Magnet
- Float Magnet
- Sensor Probe
- Thermo Ferrite

APPLICATION NOTES
Data Sheets
REED SWITCH
ORD213
Super ultra-miniature

■ GENERAL DESCRIPTION
The ORD213 is a small single-contact reed switch designed for general control of low-level loads less than 24V. The reed contacts are sealed within the glass tube with inert gas to maintain contact reliability.

■ FEATURES
(1) Hermetically sealed within a glass tube with inert gas, reed contacts are not influenced by the external atmospheric environment.
(2) Quick response
(3) Comprising of operating parts and electrical parts arranged coaxially, reed switches are suited to high-frequency applications.
(4) Compact and light weight.
(5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
(6) Economically and easily becomes a proximity switch when paired with a magnet.

■ 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>200max</td>
<td>mΩ</td>
</tr>
<tr>
<td>Breakdown Voltage</td>
<td>150min</td>
<td>VDC</td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>10^9min</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)</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) Pull-in Value vs. Drop-out 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 85°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

(294 m/s² : 11ms)

Pull-in Value • Drop-out Value

Contact Resistance

Before Test  After Test

(7) Vibration Test

(196 m/s² : 10~2000Hz)

Pull-in Value • Drop-out Value

Contact Resistance

Before Test  After Test
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 100V. The contacts are sealed within the glass tube with inert gas to maintain contact reliability.

■ FEATURES
(1) Hermetically sealed within a glass tube with inert gas, reed contacts are not influenced by the external atmospheric environment.
(2) Quick response
(3) Comprising of operating parts and electrical parts arranged coaxially, reed switches are suited to high-frequency applications.
(4) Compact and light weight.
(5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
(6) Economically and easily becomes a proximity switch when paired with a magnet.

■ EXTERNAL DIMENSIONS (Unit: mm)

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

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</tr>
<tr>
<td>Drop-out Value (DO)</td>
<td>5min</td>
<td>AT</td>
</tr>
<tr>
<td>Contact Resistance (CR)</td>
<td>200 max</td>
<td>mΩ</td>
</tr>
<tr>
<td>Breakdown Voltage</td>
<td>250 min</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>0.4 max</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) Pull-in Value vs. Drop-out Value

(2) Contact Resistance

(Measurement length: 22mm)
(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>0.3max</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

(2) Bounce Time

(3) Release Time

(4) Resonant Frequency
**MECHANICAL CHARACTERISTICS**

1. Lead Tensile Test (Static Load)

   ![Graph](image1)

2. Lead Tensile Strength

   ![Graph](image2)

**ENVIRONMENTAL CHARACTERISTICS**

1. Temperature Characteristics

   ![Graph](image3)
(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)

Pull-in Value • Drop-out Value
Contact Resistance
Before Test After Test

Contact Resistance
Before Test After Test
(6) Shock Test
1) Electrical Characteristics

![Graph showing electrical characteristics with pull-in value and drop-out value.]

(294m/s² : 11ms)

(7) Vibration Test

![Graph showing vibration test with pull-in value and drop-out value.]

(196m/s² : 10~2000Hz)
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 24V. The contacts are sealed within the glass tube with inert gas to maintain contact reliability.

■ FEATURES
(1) Hermetically sealed within a glass tube with inert gas, reed contacts are not influenced by the external atmospheric environment.
(2) Quick response
(3) Comprising of operating parts and electrical parts arranged coaxially, reed switches are suited to high-frequency applications.
(4) Compact and light weight.
(5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
(6) Economically and easily becomes a proximity switch when paired with a magnet.

■ 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>10~40</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>10⁹min</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 (VDC)</td>
<td></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>

### Graphs

1. **Pull-in Value vs. Drop-out Value**
   - The graph shows the relationship between pull-in value and drop-out value, indicating how these two parameters vary with each other. The measurement length is 22mm.

2. **Contact Resistance**
   - The graph illustrates the cumulative frequency percent of contact resistance. The measurement length is also 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

(25 Hz: 100AT energized)

(3) Release Time

(25Hz: 100AT energized)

(4) Resonant Frequency

(25Hz: 100AT energized)
## MECHANICAL CHARACTERISTICS

1. Lead Tensile Test (Static Load)

   - (22.2N-10sec)

<table>
<thead>
<tr>
<th>Temperature Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pull-in Value</strong></td>
</tr>
<tr>
<td>Before Test</td>
</tr>
<tr>
<td>CR</td>
</tr>
</tbody>
</table>

2. Lead Tensile Strength

   - Cumulative Frequency Percent (%)

   - Contact Resistance

   - Rate of Change

   - Breaking Load

## ENVIRONMENTAL CHARACTERISTICS

1. Temperature Characteristics

   - Rate of Change

   - 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

(204m/s² : 11ms)

2) Misoperation Area

(196m/s² : 10~2000Hz)

(7) Vibration Test

Before Test After Test

Before Test After Test

Before Test After Test

Pull-in Value • Drop-out Value

Contact Resistance

Pull-in Value • Drop-out Value

Contact Resistance
**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 100V. The contacts are sealed within the glass tube with inert gas to maintain contact reliability.

- **FEATURES**
  
  (1) Hermetically sealed within a glass tube with inert gas, reed contacts are not influenced by the external atmospheric environment.
  
  (2) Quick response
  
  (3) Comprising of operating parts and electrical parts arranged coaxially, reed switches are suited to high-frequency applications.
  
  (4) Compact and light weight.
  
  (5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
  
  (6) Economically and easily becomes a proximity switch when paired with a magnet.

- **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>10～40</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>200min (PI≥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)</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) Pull-in Value vs. Drop-out Value

(2) Contact Resistance
(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>0.4max</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

(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

(294 m/s² : 11ms)

2) Misoperation Area

(196 m/s² : 10 ~ 2000 Hz)

(7) Vibration Test
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 200V. The contacts are sealed within the glass tube with inert gas to maintain contact reliability.

■ FEATURES
   (1) Hermetically sealed within a glass tube with inert gas, reed contacts are not influenced by the external atmospheric environment.
   (2) Quick response
   (3) Comprising of operating parts and electrical parts arranged coaxially, reed switches are suited to high-frequency applications.
   (4) Compact and light weight.
   (5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
   (6) Economically and easily becomes a proximity switch when paired with a magnet.

■ 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>250min</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>30</td>
<td>VA</td>
</tr>
<tr>
<td>Maximum Switching Voltage</td>
<td>200DC</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) Pull-in Value vs. Drop-out Value

(2) Contact Resistance

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

![Breakdown Voltage Graph](image1)

(4) Insulation Resistance

![Insulation Resistance Graph](image2)

(5) Electrostatic Capacitance

![Electrostatic Capacitance Graph](image3)
## 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)

(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

(294m/s² : 11ms)

(7) Vibration Test

(196m/s² : 10~2000Hz)
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 100V. The contacts are sealed within the glass tube with inert gas to maintain contact reliability.

■ FEATURES
(1) Hermetically sealed within a glass tube with inert gas, reed contacts are not influenced by the external atmospheric environment.
(2) Quick response
(3) Comprising of operating parts and electrical parts arranged coaxially, reed switches are suited to high-frequency applications.
(4) Compact and light weight.
(5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
(6) Economically and easily becomes a proximity switch when paired with a magnet.

■ 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 (10≤PI&lt;20)</td>
<td>VDC</td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>10⁴min</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) Pull-in Value vs. Drop-out Value

(2) Contact Resistance

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

- Breakdown Voltage vs. Pull-in Value

(4) Insulation Resistance

- Cumulative Frequency Percent (%) vs. Insulation Resistance

(5) Electrostatic Capacitance

- 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>0.5max</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>
</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

(-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

(294m/s² : 11ms)

2) Misoperation Area

(196m/s² : 10〜2000Hz)

(7) Vibration Test
REED SWITCH
ORD2221
Miniature offset, long lead-type

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

■ FEATURES
(1) Hermetically sealed within a glass tube with inert gas, reed contacts are not influenced by the external atmospheric environment.
(2) Quick response
(3) Comprising of operating parts and electrical parts arranged coaxially, reed switches are suited to high-frequency applications.
(4) Compact and light weight.
(5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
(6) Economically and easily becomes a proximity switch when paired with a magnet.

■ EXTERNAL DIMENSIONS (Unit: mm)

![Diagram of external dimensions]

MAX  13.0
0.35×0.6
MAX  ø2.3
MAX  56.7±0.3

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

<table>
<thead>
<tr>
<th>Parameter</th>
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<th>Unit</th>
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<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 (PI≥20)</td>
<td>VDC</td>
</tr>
<tr>
<td></td>
<td>150min (10≤PI&lt;20)</td>
<td>VDC</td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>10³min</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) Pull-in Value vs. Drop-out Value

(2) Contact Resistance
(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</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**
   - (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)

![Graph showing pull-in and dropout values before and after the test with contact resistance and rate of change.]

(2) Lead Tensile Strength

![Graph showing cumulative frequency percent against breaking load.]

■ ENVIRONMENTAL CHARACTERISTICS
(1) Temperature Characteristics

![Graph showing rate of change against temperature.]

 ORD2221 ●

3
(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

(294m/s² : 11ms)

2) Misoperation Area

(294m/s² : 11ms)

(7) Vibration Test

(196m/s² : 10~2000Hz)
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 100V. The contacts are sealed within the glass tube with inert gas to maintain contact reliability.

■ FEATURES
(1) Hermetically sealed within a glass tube with inert gas, reed contacts are not influenced by the external atmospheric environment.
(2) Quick response
(3) Comprising of operating parts and electrical parts arranged coaxially, reed switches are suited to high-frequency applications.
(4) Compact and light weight.
(5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
(6) Economically and easily becomes a proximity switch when paired with a magnet.

■ 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>10~40</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>200 min (PI≥20)</td>
<td>VDC</td>
</tr>
<tr>
<td></td>
<td>150 min (10≤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/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) Pull-in Value vs. Drop-out 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>

(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

![Pull-in Value & Drop-out Value Graph]

(294m/s² : 11ms)

2) Misoperation Area

![Acceleration vs Pull-in Value Graph]

(289m/s² : 11 ms)

(7) Vibration Test

![Pull-in Value & Drop-out Value Graph]

(196m/s² : 10~2000Hz)
REED SWITCH
ORD324
General purpose miniature-type

■ GENERAL DESCRIPTION
The ORD324 is a small single-contact reed switch designed for general control of medium level loads less than 200V. The contacts are sealed within the glass tube with inert gas to maintain contact reliability.

■ FEATURES
(1) Hermetically sealed within a glass tube with inert gas, reed contacts are not influenced by the external atmospheric environment.
(2) Quick response
(3) Comprising of operating parts and electrical parts arranged coaxially, reed switches are suited to high-frequency applications.
(4) Compact and light weight.
(5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
(6) Economically and easily becomes a proximity switch when paired with a magnet.

■ 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>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>250 min</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>0.3max</td>
<td>pF</td>
</tr>
<tr>
<td>Contact Rating</td>
<td>10</td>
<td>VA</td>
</tr>
<tr>
<td>Maximum Switching Voltage</td>
<td>200DC</td>
<td>V</td>
</tr>
<tr>
<td>Maximum Switching Current</td>
<td>150AC</td>
<td>V</td>
</tr>
<tr>
<td>Maximum Carry Current</td>
<td>0.5</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>1.0</td>
<td>A</td>
</tr>
</tbody>
</table>

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

(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

(294 m/s² : 11 ms)

2) Misoperation Area

(196 m/s² : 10 ~ 2000 Hz)

(7) Vibration Test
REED SWITCH
ORD324H
General purpose miniature-type, long lead

■ GENERAL DESCRIPTION
The ORD324H is a small single-contact reed switch designed for general control of low-level loads less than 200V. The contacts are sealed within the glass tube with inert gas to maintain contact reliability.

■ FEATURES
(1) Hermetically sealed within a glass tube with inert gas, reed contacts are not influenced by the external atmospheric environment.
(2) Quick response
(3) Comprising of operating parts and electrical parts arranged coaxially, reed switches are suited to high-frequency applications.
(4) Compact and light weight.
(5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
(6) Economically and easily becomes a proximity switch when paired with a magnet.

■ 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>10～40</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>250min</td>
<td>VDC</td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>$10^{10}\text{min}$</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>200DC</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>

![Diagram 1: Pull-in Value vs. Drop-out Value](image1)

![Diagram 2: Contact Resistance](image2)

(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>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)

(22.2N-10sec)

Before Test After Test

Contact Resistance

ENVIRONMENTAL CHARACTERISTICS
(1) Temperature Characteristics
(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

![Electrical Characteristics Graph]

(294 m/s² : 11 ms)

(7) Vibration Test

![Vibration Test Graph]

(196 m/s² : 10 ~ 2000 Hz)
REED SWITCH
ORD325
General purpose miniature-type

■ GENERAL DESCRIPTION

The ORD325 is a small single-contact reed switch designed for general control of medium-level loads less than 200V. The contacts are sealed within the glass tube with inert gas to maintain contact reliability.

■ FEATURES

(1) Hermetically sealed within a glass tube with inert gas, reed contacts are not influenced by the external atmospheric environment.
(2) Quick response
(3) Comprising of operating parts and electrical parts arranged coaxially, reed switches are suited to high-frequency applications.
(4) Compact and light weight.
(5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
(6) Economically and easily becomes a proximity switch when paired with a magnet.

■ 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>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>300min (PI ≥ 15)</td>
<td>VDC</td>
</tr>
<tr>
<td></td>
<td>250min (PI &lt; 15)</td>
<td>VDC</td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>10⁹ min</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>200DC</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) Pull-in Value vs. Drop-out 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>0.4max</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±300</td>
<td>Hz</td>
</tr>
<tr>
<td>Maximum Operating Frequency</td>
<td>500</td>
<td>Hz</td>
</tr>
</tbody>
</table>

#### Diagrams:

1. **Operate Time**
   - (25Hz: 100AT energized)
   - Graph showing Operate Time vs. Pull-in Value.

2. **Bounce Time**
   - (25Hz: 100AT energized)
   - Graph showing Cumulative Frequency Percent vs. Bounce Time.

3. **Release Time**
   - (25Hz: 100AT energized)
   - Graph showing Release Time vs. Drop-out Value.

4. **Resonant Frequency**
   - Graph showing Cumulative Frequency Percent vs. 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

(294m/s² : 11ms)

2) Misoperation Area

(196m/s² : 10~2000Hz)

(7) Vibration Test

Before Test  After Test
REED SWITCH
ORD229

High breakdown voltage

■ GENERAL DESCRIPTION
The ORD229 is a single-contact, high power reed switch (70VA AC or 50W DC) designed for high breakdown voltages up to 600V DC.

■ FEATURES
(1) Hermetically sealed within a glass tube with inert gas, reed contacts are not influenced by the external atmospheric environment.
(2) Quick response
(3) Comprising of operating parts and electrical parts arranged coaxially, reed switches are suited to high-frequency applications.
(4) Compact and light weight.
(5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
(6) Economically and easily becomes a proximity switch when paired with a magnet.

■ 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>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>600 min (PI≥35)</td>
<td>VDC</td>
</tr>
<tr>
<td></td>
<td>500 min (20≤PI&lt;35)</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>Contact Rating</td>
<td>50DC</td>
<td>W</td>
</tr>
<tr>
<td></td>
<td>70AC</td>
<td>VA</td>
</tr>
<tr>
<td>Maximum Switching Voltage</td>
<td>350DC</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>300AC</td>
<td>V</td>
</tr>
<tr>
<td>Maximum Switching Current</td>
<td>DC0.7</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td>AC0.5</td>
<td>A</td>
</tr>
<tr>
<td>Maximum Carry Current</td>
<td>2.5</td>
<td>A</td>
</tr>
</tbody>
</table>

1. **Pull-in Value vs. Drop-out 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>0.6max</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**

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

(294m/s² : 11ms)

2) Misoperation Area

(196m/s² : 10~2000Hz)

(7) Vibration Test
REED SWITCH
ORD2210
High power

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

■ FEATURES
(1) Hermetically sealed within a glass tube with inert gas, reed contacts are not influenced by the external atmospheric environment.
(2) Quick response
(3) Comprising of operating parts and electrical parts arranged coaxially, reed switches are suited to high-frequency applications.
(4) Compact and light weight.
(5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
(6) Economically and easily becomes a proximity switch when paired with a magnet.

■ 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>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>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 (15≤PI&lt;20)</td>
<td>VDC</td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>10¹⁰min</td>
<td>Ω</td>
</tr>
<tr>
<td>Electrostatic Capacitance</td>
<td>0.5max</td>
<td>pF</td>
</tr>
<tr>
<td>Contact Rating</td>
<td>50DC</td>
<td>W</td>
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<tr>
<td></td>
<td>70AC</td>
<td>VA</td>
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<tr>
<td>Maximum Switching Voltage</td>
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<td>V</td>
</tr>
<tr>
<td></td>
<td>150AC</td>
<td>V</td>
</tr>
<tr>
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<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. **Pull-in Value vs. Drop-out 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](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

(294m/s² : 11ms)

2) Misoperation Area

(294m/s² : 11ms)

(7) Vibration Test

(196m/s² : 10~2000Hz)
REED SWITCH
ORD2210V
Vacuum high power

■ GENERAL DESCRIPTION
The ORD2210V is a vacuum type, small single-contact reed switch designed for ultra high breakdown voltages up to 1000V DC.

■ FEATURES
(1) Hermetically sealed within a glass tube with inert gas, reed contacts are not influenced by the external atmospheric environment.
(2) Quick response
(3) Comprising of operating parts and electrical parts arranged coaxially, reed switches are suited to high-frequency applications.
(4) Compact and light weight.
(5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
(6) Economically and easily becomes a proximity switch when paired with a magnet.

■ 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>7min</td>
<td>AT</td>
</tr>
<tr>
<td>Contact Resistance (CR)</td>
<td>100max</td>
<td>mΩ</td>
</tr>
<tr>
<td>Breakdown Voltage</td>
<td>1000min</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>Maximum Switching Voltage</td>
<td>350DC</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>300AC</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. **Pull-in Value vs. Drop-out Value**

   - **Graph**: Shows the relationship between pull-in and drop-out values. The x-axis represents the pull-in value (AT), and the y-axis represents the drop-out value (AT). The graph indicates how the pull-in value affects the drop-out value.

2. **Contact Resistance**

   - **Graph**: Shows the cumulative frequency percent (%) of contact resistance values. The x-axis represents contact resistance (mΩ), ranging from 0.1 to 99.9, and the y-axis represents cumulative frequency percent (%) from 0 to 100. The graph displays the distribution of contact resistance values with measurement length of 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

(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

(294m/s² : 11ms)

(7) Vibration Test

(196m/s² : 10~2000Hz)
REED SWITCH
ORD2211
Lamp load

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

■ FEATURES
(1) Hermetically sealed within a glass tube with inert gas, reed contacts are not influenced by the external atmospheric environment.
(2) Quick response
(3) Comprising of operating parts and electrical parts arranged coaxially, reed switches are suited to high-frequency applications.
(4) Compact and light weight.
(5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
(6) Economically and easily becomes a proximity switch when paired with a magnet.

■ 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>20～40</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</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) Pull-in Value vs. Drop-out 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>0.4max</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±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

(-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 with metrics for pull-in value and drop-out value.]

(294 m/s² : 11 ms)

2) Misoperation Area

![Graph showing misoperation area with acceleration and pull-in value on axes.]

(open→close)

(7) Vibration Test

![Graph showing vibration test results with metrics for pull-in value and drop-out value.]

(196 m/s² : 10~2000 Hz)
REED SWITCH
ORD2211H
Lamp load, long lead-type

■ GENERAL DESCRIPTION
The ORD2211H is a long lead, single contact reed switch designed for direct opening or closing lamps of 12V - 3.4W. The contacts are sealed within the glass tube with inert gas to maintain contact reliability.

■ FEATURES
(1) Hermetically sealed within a glass tube with inert gas, reed contacts are not influenced by the external atmospheric environment.
(2) Quick response
(3) Comprising of operating parts and electrical parts arranged coaxially, reed switches are suited to high-frequency applications.
(4) Compact and light weight.
(5) Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
(6) Economically and easily becomes a proximity switch when paired with a magnet.

■ 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>20~40</td>
<td>AT</td>
</tr>
<tr>
<td>Drop-out Value (DO)</td>
<td>8 min</td>
<td>AT</td>
</tr>
<tr>
<td>Contact Resistance (CR)</td>
<td>100 max</td>
<td>mΩ</td>
</tr>
<tr>
<td>Breakdown Voltage</td>
<td>200 min</td>
<td>VDC</td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>10⁹ min</td>
<td>Ω</td>
</tr>
<tr>
<td>Electrostatic Capacitance</td>
<td>0.3 max</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) Pull-in Value vs. Drop-out 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>0.6max</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±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)

<table>
<thead>
<tr>
<th>Pull-in Value</th>
<th>Operate Time (ms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>0.1</td>
</tr>
<tr>
<td>20</td>
<td>0.2</td>
</tr>
<tr>
<td>30</td>
<td>0.3</td>
</tr>
<tr>
<td>40</td>
<td>0.4</td>
</tr>
<tr>
<td>50</td>
<td>0.5</td>
</tr>
</tbody>
</table>

(3) Release Time

(25Hz: 100AT energized)

<table>
<thead>
<tr>
<th>Drop-out Value</th>
<th>Release Time (μs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>30</td>
<td>5</td>
</tr>
<tr>
<td>40</td>
<td>0.5</td>
</tr>
<tr>
<td>50</td>
<td>0</td>
</tr>
</tbody>
</table>

(4) Resonant Frequency

(25Hz: 100AT energized)

<table>
<thead>
<tr>
<th>AT</th>
<th>Resonant Frequency (Hz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>4100</td>
</tr>
<tr>
<td>20</td>
<td>4600</td>
</tr>
<tr>
<td>30</td>
<td>5100</td>
</tr>
</tbody>
</table>

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

1. Lead Tensile Test (Static Load)

   - **Pull-in Value - Drop-out Value**
   - **AT**
   - **Pi**
   - **DO**

   **Contact Resistance**
   - Before Test
   - After Test

2. Lead Tensile Strength

   - **Cumulative Frequency Percent (%)**
   - **Breaking Load**

**ENVIRONMENTAL CHARACTERISTICS**

1. Temperature Characteristics

   - **Rate of Change**
   - **Temperature**
   - **%**
   - **CR**
   - **DO**
   - **Pi**
(2) Temperature Cycle

(3) Temperature and Humidity Cycle

(4) High Temperature Storage Test

(5) Low Temperature Storage Test
(6) Shock Test
1) Electrical Characteristics

(294m/s² : 11ms)

2) Misoperation Area

(196m/s² : 10～2000Hz)

(7) Vibration Test
REED SWITCH
ORT551
Ultra-miniature transfer

- GENERAL DESCRIPTION
  The ORT551 is a ultraminiature two-contact reed switch designed for changeover type operation. The contacts are sealed within the glass tube with inert gas to maintain contact reliability.

- FEATURES
  1. Hermetically sealed within a glass tube with inert gas, reed contacts are not influenced by the external atmospheric environment.
  2. Quick response
  3. Comprising of operating parts and electrical parts arranged coaxially, reed switches are suited to high-frequency applications.
  4. Compact and light weight.
  5. Superior corrosion resistance and wear resistance of the contacts assures stable switching operation and long life.
  6. Economically and easily becomes a proximity switch when paired with a magnet.

- 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>10~30</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>mΩ</td>
</tr>
<tr>
<td>Breakdown Voltage</td>
<td>200min (PI≥20)</td>
<td>VDC</td>
</tr>
<tr>
<td></td>
<td>150min (10≤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>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 (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) Pull-in Value vs. Drop-out Value

(2) Contact Resistance

(Measurement length: 30mm)
(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>1.0max</td>
<td>ms</td>
</tr>
<tr>
<td>Bounce Time</td>
<td>NO 1.0max</td>
<td>ms</td>
</tr>
<tr>
<td></td>
<td>NC 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)

(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

2) Misoperation Area

(294m/s^2 : 11ms)

(294m/s^2 : 11ms)

(196m/s^2 : 10~2000Hz)

(196m/s^2 : 10~2000Hz)

(196m/s^2 : 10~2000Hz)

(196m/s^2 : 10~2000Hz)

(196m/s^2 : 10~2000Hz)

(196m/s^2 : 10~2000Hz)

(196m/s^2 : 10~2000Hz)

(196m/s^2 : 10~2000Hz)

(196m/s^2 : 10~2000Hz)
MOLDED SWITCH
RA-901
Miniature SMD

■ GENERAL DESCRIPTION
The RA-901 is a molded ORD228VL reed switch with processed leads. While boasting the excellent characteristics of the ORD228VL, the molded exterior ensures ease of handling.

■ FEATURES
(1) Gull wing shape leads for SMT applications
(2) Automatic mounting of component by tape and reel
(3) Enhanced shock resistance due to resin mold protecting the glass tube
(4) General purpose miniature

■ EXTERNAL DIMENSIONS (Unit: mm)

■ PAD LAYOUT SAMPLE

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

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
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<tbody>
<tr>
<td>Contact Form</td>
<td>1A</td>
</tr>
<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>10VA</td>
</tr>
<tr>
<td>Maximum Switching Voltage</td>
<td>100V DC/AC</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>$1 \times 10^3 \Omega$ (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>490m/s$^2$–11ms</td>
</tr>
<tr>
<td>Vibration Resistance</td>
<td>490m/s$^2$ (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>
</tr>
<tr>
<td>Electrostatic Capacitance</td>
<td>0.3pF (Max.)</td>
</tr>
<tr>
<td>Resonant Frequency</td>
<td>5400Hz (typ)</td>
</tr>
<tr>
<td>Maximum Operating Frequency</td>
<td>500Hz</td>
</tr>
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</table>

### PULL-IN VALUE TABLE (After forming)

<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>

### Reflow Conditions

![Reflow Conditions Diagram]

- Temperature (°C): 0 to 300
- Time: 0 to 300 seconds
- Reflow Conditions:
  - Initial Temperature: 2～6°C/s
  - 250～260°C: 30 s max.
  - 160～175°C: 60 s max.
  - 220°C: 60 s max.
Magnet Drive Characteristics Example (1)

Magnet: 5 x 5 x 6 mm
Anisotropic barium ferrite
Surface magnetic flux 120 mT

Molded Switch: RA-901-1
Pull-in value 15.0 (AT)
Drop-out value 13.5 (AT)

(1) X-Y Characteristic H

(2) X-Z Characteristic H

(3) X-Y Characteristic V
RA-901 Magnet Drive Characteristics Example (2)

Magnet: 5 x 5 x 6 mm  
Anisotropic barium ferrite  
Surface magnetic flux 120 mT  

Molded Switch: RA-901-1  
Pull-in value 34.0 (AT)  
Drop-out value 29.1 (AT)  

(1) X-Y Characteristic H  
(2) X-Z Characteristic H  
(3) X-Y Characteristic V
■ ENVIRONMENTAL CHARACTERISTICS
(1) Temperature Cycle
(-55°C ~ +125°C)

(2) Temperature and Humidity Cycle
(-10°C ~ +65°C  80% ~ 98%)

RA-901
(3) High Temperature Storage Test  
(125°C  500H)

Pull-in Value (AT)

Drop-out Value (AT)

Contact Resistance (mΩ)

Before Test  After Test

Before Test  After Test

Before Test  After Test

(4) Low Temperature Storage Test  
(-40°C  500H)

Pull-in Value (AT)

Drop-out Value (AT)

Contact Resistance (mΩ)

Before Test  After Test

Before Test  After Test

Before Test  After Test
(5) Shock Test

(490 m/s² 11msec)

(6) Vibration Test

(490 m/s² 10~2000Hz)

- Pull-in Value (AT)
- Drop-out Value (AT)
- Contact Resistance (mΩ)

Before Test | After Test
---|---
50 | 40
40 | 30
30 | 20
20 | 10
10 | 0
(7) Shock Resistance Test

(ϕ 10mm steel ball free fall impact height 230 mm)
MOLDED SWITCH
RA-903
Ultra-miniature SMD

- GENERAL DESCRIPTION
  The RA-903 is a molded ORD213 reed switch with processed leads. While boasting the excellent characteristics of the ORD213, the molded exterior ensures ease of handling.

- FEATURES
  1. Gull wing shape leads for SMT applications
  2. Automatic mounting of this component by tape and reel
  3. Enhanced shock resistance due to resin mold protecting the glass tube
  4. Ultra-compact 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>1VA</td>
</tr>
<tr>
<td>Maximum Switching Voltage</td>
<td>24V DC/AC</td>
</tr>
<tr>
<td>Maximum Switching Current</td>
<td>0.1A</td>
</tr>
<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>1×10^9Ω (Min.)</td>
</tr>
<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>490m/s²~11ms</td>
</tr>
<tr>
<td>Vibration Resistance</td>
<td>490m/s² (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>
</tr>
<tr>
<td>Electrostatic Capacitance</td>
<td>0.4pF (Max.)</td>
</tr>
<tr>
<td>Resonant Frequency</td>
<td>13000Hz (typ)</td>
</tr>
<tr>
<td>Maximum Operating Frequency</td>
<td>500Hz</td>
</tr>
</tbody>
</table>

**PULL-IN VALUE TABLE (After forming)**

<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>
</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>

**Reflow Conditions**

![Reflow Conditions Diagram]
Magnet Drive Characteristics Example (1)

Magnet: 5 x 5 x 6 mm
Anisotropic barium ferrite
Surface magnetic flux 120 mT

Molded Switch: RA-901-1
Pull-in value 16.8 (AT)
Drop-out value 15.9 (AT)

(1) X-Y Characteristic H

(2) X-Z Characteristic H

(3) X-Y Characteristic V
RA-903 Magnet Drive Characteristics Example (2)

Magnet: 5 x 5 x 6 mm
Anisotropic barium ferrite
Surface magnetic flux 120 mT

Molded Switch: RA-901-1
Pull-in value 27.9 (AT)
Drop-out value 25.6 (AT)

(1) X-Y Characteristic H

(2) X-Z Characteristic H

(3) X-Y Characteristic V
ENVIRONMENTAL CHARACTERISTICS

(1) Temperature Cycle

(-55℃ ~ +125℃)

(2) Temperature and Humidity Cycle

(-10℃ ~ +65℃  80% ~ 98%)

- Pull-in Value (AT)
- Drop-out Value (AT)
- Contact Resistance (mΩ)
(3) High Temperature Storage Test  (125°C  500H)

(4) Low Temperature Storage Test  (-40°C  500H)
(5) Shock Test

(490m/s² 11msec)

(6) Vibration Test

(490m/s² 10~2000Hz)
(7) Shock Resistance Test

- **Pull-in Value (AT)**
  - Before Test: 20
  - After Test: 20

- **Drop-out Value (AT)**
  - Before Test: 20
  - After Test: 20

- **Contact Resistance (mΩ)**
  - Before Test: 80
  - After Test: 80

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