ULTRA-SMALL PACKAGE
FLAT POLARIZED RELAY

GQ-RELAYS

**SPECIFICATIONS**

**Contact**

<table>
<thead>
<tr>
<th>Arrangement</th>
<th>2 Form C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial contact resistance, max. (By voltage drop 6 V DC 1A)</td>
<td>100 mΩ</td>
</tr>
<tr>
<td>Contact material</td>
<td>Stationary: AgPd+Au clad. Movable: AgPd</td>
</tr>
</tbody>
</table>

**Rating**

| Nominal switching capacity (resistive load) | 1 A 30 VDC 0.3 A 125 VAC |
| Max. switching power (resistive load)      | 30 W, 37.5 VA |
| Max. switching voltage                     | 110 VDC, 125 VAC |
| Max. switching current                     | 1 A |
| Min. switching capacity *1                  | 10 μA 10 mVDC |

**Nominal operating power**

| Single side stable          | 140 mW (1.5 to 12 VDC) 230 mW (24 VDC) |
| 1 coil latching             | 100 mW (1.5 to 12 VDC) 120 mW (24 VDC) |

**Expected life (min. operations)**

| Mechanical (at 180 cpm)     | 5 × 10³ |
| Electrical (at 20 cpm)      | 1 A 30 V DC resistive 10⁵ |
|                            | 0.3 A 125 V AC resistive 10⁵ |

**Characteristics**

| Initial insulation resistance*1 | Min. 1,000 MΩ (at 500 V DC) |
| Initial breakdown voltage*2     | Between open contacts 750 Vrms for 1 min. |
|                                | Between contact sets 1,000 Vrms for 1 min. |
|                                | Between contact and coil 1,500 Vrms for 1 min. |
| Initial surge voltage           | Between open contacts (10×160 μs) 1,500 V (FCC Part 68) |
|                                | Between contacts and coil (2×10 μs) 2,500 V (Bellcore) |
| Operate time [Set time]*3       | Max. 4 ms (Approx. 2 ms) [Max. 4 ms (Approx. 2 ms)] |
| Release time (without diode)    | Max. 4 ms (Approx. 1 ms) [Max. 4 ms (Approx. 2 ms)] |
| Temperature rise*5              | Max. 50°C |
| Shock resistance                | Functional*6 |
|                                | Destructive*6 |
|                                | Min. 750 m/s² (75G) |
|                                | Min. 1,000 m/s² (100G) |
| Vibration resistance            | Functional*7 |
|                                | Destructive |
|                                | 10 to 55 Hz at double amplitude of 3.3 mm |
|                                | 10 to 55 Hz at double amplitude of 5 mm |
| Conditions for operation, transport and storage*8 (Not freezing and condensing at low temperature) | Ambient | Temperature ≤2 |
|                                | -40°F to 85°C | -40°F to 185°F |
|                                | Humidity     | 5 to 85% R.H. |
| Unit weight                     | Approx. 1 g .035 oz |

**Notes:**

*1 This value can change due to the switching frequency, environmental conditions, and desired reliability level, therefore it is recommended to check this with the actual load.

*2 The upper limit for the ambient temperature is the maximum temperature that can satisfy the coil temperature rise. Under the packing condition, allowable temperature range is from -40 to +70°C to -40 to +158°F.

**TYPICAL APPLICATIONS**

- Telephone exchange, transmission equipment
- Communications devices
- Measurement devices
- Home appliances, and audio/visual equipment
- Handheld and portable products

**Remarks:**

* Measurement at same location as “Initial breakdown voltage” section.
* Nominal voltage applied to the coil, excluding contact bounce time.
* By resistive method, nominal voltage applied to the coil; contact carrying current: 1 A.
* Half-wave pulse of sine wave: 6 ms; detection time: 10 μs.
* Half-wave pulse of sine wave: 6 ms.
* Detection time: 10 μs.
* Refer to 8. Conditions for operation, transport and storage mentioned in Cautions for use.
### ORDERING INFORMATION

**Contact arrangement**
- 2: 2 Form C
- 1: 1 coil latching

**Operating function**
- 0: Single side stable

**Type of operation**
- Nil: Standard PC board terminal
- A: Surface-mount terminal A type
- S: Surface-mount terminal S type

**Terminal shape**
- nil: Standard PC board terminal

**Coil voltage (DC)**
- 1H: 1.5V
- 3: 3V
- 4H: 4.5V
- 6: 6V

**Packing style**
- nil: Tube packing
- Z: Tape and reel packing (picked from 5/6/7/8 pin side)

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**TYPES AND COIL DATA** *(at 20°C 68°F)*

### (1) Standard PC board terminal

<table>
<thead>
<tr>
<th>Operating Function</th>
<th>Coil Rating, V DC</th>
<th>Part No.</th>
<th>Pick-up voltage, V DC (max.) (initial)</th>
<th>Drop-out voltage, V DC (min.) (initial)</th>
<th>Nominal operating current, mA</th>
<th>Coil resistance, Ω (±10%)</th>
<th>Nominal operating power, mW</th>
<th>Max. allowable voltage, V DC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single side stable</td>
<td>1.5</td>
<td>AGQ2001H</td>
<td>1.2</td>
<td>0.15</td>
<td>93.8</td>
<td>16</td>
<td>140</td>
<td>2.25</td>
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<tr>
<td></td>
<td>3</td>
<td>AGQ20003</td>
<td>2.25</td>
<td>0.3</td>
<td>46.7</td>
<td>64.2</td>
<td>140</td>
<td>4.5</td>
</tr>
<tr>
<td></td>
<td>4.5</td>
<td>AGQ2004H</td>
<td>3.38</td>
<td>0.45</td>
<td>31</td>
<td>145</td>
<td>140</td>
<td>6.75</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>AGQ2006</td>
<td>4.5</td>
<td>0.6</td>
<td>23.3</td>
<td>257</td>
<td>140</td>
<td>9</td>
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<tr>
<td></td>
<td>9</td>
<td>AGQ2009</td>
<td>6.75</td>
<td>0.9</td>
<td>15.5</td>
<td>579</td>
<td>140</td>
<td>13.5</td>
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<tr>
<td></td>
<td>12</td>
<td>AGQ2012</td>
<td>9</td>
<td>1.2</td>
<td>11.7</td>
<td>1,028</td>
<td>140</td>
<td>18</td>
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<td></td>
<td>24</td>
<td>AGQ2024</td>
<td>18</td>
<td>2.4</td>
<td>9.6</td>
<td>2,504</td>
<td>230</td>
<td>28.8</td>
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</tbody>
</table>

### (2) Surface-mount terminal

<table>
<thead>
<tr>
<th>Operating Function</th>
<th>Coil Rating, V DC</th>
<th>Part No.</th>
<th>Set voltage, V DC (max.) (initial)</th>
<th>Reset voltage, V DC (max.) (initial)</th>
<th>Nominal operating current, mA</th>
<th>Coil resistance, Ω (±10%)</th>
<th>Nominal operating power, mW</th>
<th>Max. allowable voltage, V DC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single side stable</td>
<td>1.5</td>
<td>AGQ2101H</td>
<td>1.13</td>
<td>1.13</td>
<td>66.7</td>
<td>22.5</td>
<td>100</td>
<td>2.25</td>
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<tr>
<td></td>
<td>3</td>
<td>AGQ2103</td>
<td>2.25</td>
<td>2.25</td>
<td>33.3</td>
<td>90</td>
<td>100</td>
<td>4.5</td>
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<tr>
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<td>4.5</td>
<td>AGQ2104H</td>
<td>3.38</td>
<td>3.38</td>
<td>22.2</td>
<td>202.5</td>
<td>100</td>
<td>6.75</td>
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<tr>
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<td>AGQ2106</td>
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<td>16.7</td>
<td>360</td>
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<td>AGQ2109</td>
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<td>11.1</td>
<td>810</td>
<td>100</td>
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<td>AGQ2112</td>
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<td>9</td>
<td>8.3</td>
<td>1,440</td>
<td>100</td>
<td>18</td>
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<td>24</td>
<td>AGQ2124</td>
<td>18</td>
<td>18</td>
<td>5.0</td>
<td>4,800</td>
<td>120</td>
<td>36</td>
</tr>
</tbody>
</table>

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- **Standard packing**: 50 pcs. (tube); 1,000 pcs. (tape and reel) in an inner package.
- **Tape and reel packing symbol - Z**: is not marked on the relay. "X" type tape and reel packing (picked from 1/2/3/4-pin side) is also available. Suffix "X" instead of "Z".

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- For each surface-mounted terminal variation, input the following letter.
  - A type: A, S type: S

**Note**
- Standard packing: 50 pcs. (tube), 900 pcs. (tape and reel) in an inner package; 1,000 pcs. (tube), 1,800 pcs. (tape and reel) in an outer package.
- Specified value of pick-up, drop-out, set and reset voltage is with the condition of square wave coil pulse.
### DIMENSIONS

1. **PC board terminal**
   - [Image]

2. **Surface-mount terminal**
   - **A type**
     - [Image]
   - **S type**
     - [Image]

### REFERENCES DATA

1. **Max. switching capacity**
   - [Graph]

2. **Life curve**
   - [Graph]

### CAUTIONS FOR USE

1. **Coil operating power**
   1. As a general rule, only a pure DC power supply should be used for the coil drive.
   2. To ensure proper operation, the voltage applied to both terminals of the coil should be ±5% (at 20°C 68°F) the rated operating voltage of the coil. Also, be aware that the pick-up and drop-out voltages will fluctuate depending on the ambient temperature and operating conditions.
   3. The ripple factor for the voltage applied to the coil should be less than 5%.
   4. For set and reset latching relays, the

### Reference Data

<table>
<thead>
<tr>
<th>Component</th>
<th>DC Resistive Load</th>
<th>AC Resistive Load</th>
<th>DC 30V Resistive Load</th>
<th>AC 125V Resistive Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact Voltage</td>
<td>30</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Switching Current</td>
<td>0.3</td>
<td>1.0</td>
<td>0.3</td>
<td>1.0</td>
</tr>
<tr>
<td>No. of Operations</td>
<td>0</td>
<td>10</td>
<td>0</td>
<td>10</td>
</tr>
</tbody>
</table>

### Packing Style

1. **1)** The relay is packed in a tube with the relay orientation mark on the left side, as shown in the figure below.

2. **Tape and reel packing**
   1. **(A type)**
     - [Graph]
   2. **(S type)**
     - [Graph]
For Cautions for Use, see Relay Technical Information.

6. Automatic insertion
To maintain the internal function of the relay, the chucking pressure should not exceed the values below.
Chucking pressure in the direction A: 9.8 N (1 kgf) or less
Chucking pressure in the direction B: 9.8 N (1 kgf) or less
Chucking pressure in the direction C: 9.8 N (1 kgf) or less

Please chuck the portion.

Avoid chucking the center of the relay. In addition, excessive chucking pressure to the pinpoint of the relay should also be avoided.

7. Soldering
1) When soldering standard PC board terminals, the following conditions are recommended.
   (1) Preheating
      Temperature 100°C 212°F
      Time Within approx. 1 minute
   (2) Soldering
      Temperature 250°C 482°F
      Time Within approx. 5s
2) When soldering surface-mount terminals, the following conditions are recommended.
   (1) IR (Infrared reflow) soldering method

(2) Soldering iron method
   Tip temperature: 280°C to 300°C
   Wattage: 30 to 60 W
   Soldering time: within 5 s
3) Other soldering methods
   Check mounting conditions before using other soldering methods (hot-air, hot plate, pulse heater, etc.).

Remarks
- The temperature profile indicates the temperature of the soldered terminal on the surface of the PC board. The ambient temperature may increase excessively. Check the temperature under mounting conditions.

8. Conditions for operation, transport and storage
1) Ambient temperature, humidity, and atmospheric pressure during usage, transport, and storage of the relay:
   (1) Temperature:
      -40 to +85°C –40 to +185°F.
   (temperature range under our standard packing style)
      -40 to +70°C –40 to +158°F.
   (2) Humidity: 5 to 85% R.H.
   (Avoid freezing and condensation.)
   The humidity range varies with the temperature. Use within the range indicated in the graph below.
   (3) Atmospheric pressure: 86 to 106 kPa
   Temperature and humidity range for usage, transport, and storage:

2) Condensation
   Condensation forms when there is a sudden change in temperature under high temperature, high humidity conditions. Condensation will cause deterioration of the relay insulation.

3) Freezing
   Condensation or other moisture may freeze on the relay when the temperature is lower than 0°C 32°F.
   This causes problems such as sticking of movable parts or operational time lags.

4) Low temperature, low humidity environments
   The plastic becomes brittle if the relay is exposed to a low temperature, low humidity environment for long periods of time.
   Storage procedures for surface-mount terminal types
   Since the relay is very sensitive to humidity, it is packed in humidity-free, hermetically sealed packaging. When storing the relay, be careful of the following points:
   (1) Be sure to use the relay immediately after removing it from its sealed package.
   (2) When storing the relay for long periods of time after removing it from its sealed package, we recommend using a humidity-free bag with silica gel to prevent subjecting the relay to humidity.
   Furthermore, if the relay is sold mounted when it has been subjected to excessive humidity, cracks and leaks can occur. Be sure to mount the relay under the required mounting conditions.

9. Others
1) Heat, smoke, and even a fire may occur if the relay is used in conditions outside of the allowable ranges for the coil ratings, contact ratings, operating cycle lifetime, and other specifications. Therefore, do not use the relay if these ratings are exceeded. Also, make sure that the relay is wired correctly. Incorrect wiring may cause unexpected events or the generation of heat or flames.
2) If the relay has been dropped, the appearance and characteristics should always be checked before use.
3) The cycle lifetime is defined under the standard test condition specified in the JIS* C 5442-1996 standard
   (temperature 15 to 35°C 59 to 95°F, humidity 25 to 75%). Check this with the real device as it is affected by coil driving circuit, load type, activation frequency, activation phase, ambient conditions and other factors. Also, be especially careful of loads such as those listed below.
   (1) When used for AC load-operating and the operating phase is synchronous.
   Rocking and fusing can easily occur due to contact shifting.
   (2) High-frequency load-operating
   When high-frequency opening and closing of the relay is performed with a load that causes arcs at the contacts, nitrogen and oxygen in the air is fusée by the arc energy and HNO₃ is formed. This can corrode metal materials.
   Three countermeasures for these are listed here.
   - Incorporate an arc-extinguishing circuit.
   - Lower the operating frequency
   - Lower the ambient humidity

4) Latching relays are shipped from the factory in the reset state. A shock to the relay during shipping or installation may cause it to change to the set state.
   Therefore, it is recommended that the relay be used in a circuit which initializes the relay to the required state (set or reset) whenever the power is turned on.
5) Check the ambient conditions when storing or transporting the relays and devices containing the relays. Freezing or condensation may occur in the relay, causing functional damage. Avoid subjecting the relays to heavy loads, or strong vibration and shocks.
6) We recommend latching type when using in applications which involve lengthy duty cycles.
7) If silicone materials (e.g., silicone rubbers, silicone oils, silicone coating agents, silicone sealers) are used in the vicinity of the relay, the gas emitted from the silicone may adhere to the contacts of the relay during opening and closing and lead to improper contact. If this is the case, use a material other than silicone.

*Japanese Industrial Standards