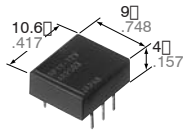
Panasonic
ideas for life

**LOW PROFILE HIGH FREQUENCY RELAY**

# RP RELAYS




mm inch

## FEATURES

- **High frequency relay with the low profile of 4 mm .157 inch**
- **Excellent high frequency characteristics**
  **Isolation: Min. 10dB (at 1.8 GHz)**
  **Insertion loss: Max. 1.0dB (at 1.8 GHz)**
  **V.S.W.R.: Max. 1.3 (at 1.8 GHz)**
- **High sensitivity in small size**
  **Size: 10.6 × 9 × 4 mm .417 × .354 × .157 inch**
  **Nominal operating power: 140 mW**
- **Utilizes tube package for automatic mounting.**
- **Self-clinching terminal also available**

## SPECIFICATIONS

### Contact

| | | |
|---|---|---|
| Arrangement | | 1 Form C |
| Contact material | Movable | Silver alloy |
| | Stationary | Gold-clad silver |
| Initial contact resistance, max. (By voltage drop 6 V DC 0.1 A) | | 50 mΩ |
| Rating | Nominal switching capacity | 0.1 A 30 V DC<br>Contact switching power: 1 W (Max. 1.8 GHz); Contact carrying power: 3 W (Max. 1.2 GHz)<br>1 W (Max. 1.8 GHz) |
| High frequency characteristics (Impedance 50Ω) (Initial) | V.S.W.R. | Max. 1.2 (at 1 GHz)<br>Max. 1.3 (at 1.8 GHz) |
| | Insertion loss | Max. 0.5 dB (at 1 GHz)<br>Max. 1 dB (at 1.8 GHz) |
| | Isolation | Min. 15 dB (at 1 GHz)<br>Min. 10 dB (at 1.8 GHz) |
| Expected life (min. operations) | Mechanical (at 180 cpm) | $5\times10^6$ |
| | Electrical (at 20 cpm) | $10^5$ (0.1 A 30 V DC resistive load) |
| | | $10^5$ (1 W at 1.8 GHz; V.S.W.R.: max. 1.3) |

### Coil (at 25°C, 68°F)

| Voltage type | Nominal operating power |
|---|---|
| 1.5 to 12 V DC | 140 mW |
| 24 V DC | 270 mW |

### Characteristics

| | | |
|---|---|---|
| Max. operating speed (at rated load) | | 20 cpm |
| 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 contacts and coil | 1,500 Vrms for 1 min. |
| Operate time*3 (at nominal voltage) | | Max. 3 ms (Approx. 1.5 ms) |
| Release time(without diode)*3 (at nominal voltage) | | Max. 2 ms (Approx. 1 ms) |
| Temperature rise | | Max. 50°C with nominal coil voltage across coil and at nominal switching capacity |
| Shock resistance | Functional*4 | Min. 500 m/s² {50 G} |
| | Destructive*5 | Min. 1,000 m/s² {100 G} |
| Vibration resistance | Functional*6 | 10 to 55 Hz at double amplitude of 3 mm |
| | Destructive | 10 to 55 Hz at double amplitude of 5 mm |
| Conditions for operation, transport and storage*7 (Not freezing and condensing at low temperature) | Ambient temp. | -40°C to 70°C<br>-40°F to 158°F |
| | Humidity | 5 to 85% R.H. |
| Unit weight | | Approx. 1 g .04 oz |

**Remarks**

* Specifications will vary with foreign standards certification ratings.
*1 Measurement at same location as "Initial breakdown voltage" section
*2 Detection current: 10mA
*3 Excluding contact bounce time
*4 Half-wave pulse of sine wave: 11ms, detection time: 10μs
*5 Half-wave pulse of sine wave: 6ms
*6 Detection time: 10μs
*7 Refer to 7. Conditions for operation, transport and storage conditions in NOTES at the back of this data sheet.

## TYPICAL APPLICATIONS

- Antenna switching of mobile phone
- Switching signal of measuring equipment
- All types of compact wireless devices

## ORDERING INFORMATION

Ex. RP 1 ☐ ☐ ☐

| Contact arrangement | Operating function | Terminal shape | Coil voltage (DC) |
|---|---|---|---|
| 1: 1 Form C | Nil: Single side stable | Nil: Standard PC board terminal<br>H: Self-clinching terminal | 1.5, 3, 4.5, 5, 6, 9, 12, 24 V |

Note: Standard packing; Carton: 50 pcs. Case 1,000 pcs.

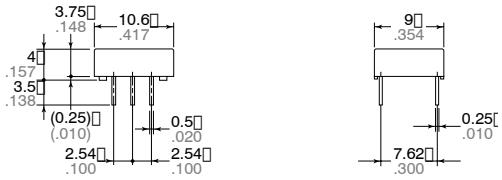
## TYPES ANE COIL DATA (at 20°C 68°F)

| Part No. | | Nominal voltage, V DC | Pick-up voltage, max. V DC | Drop-out voltage, min. V DC | Coil resistance, Ω (±10%) | Nominal operating current, mA (±10%) | Nominal operating power, mW | Maximum. allowable voltage, V DC |
|---|---|---|---|---|---|---|---|---|
| Standard PC board terminal | Self-clinching terminal | | | | | | | |
| RP1-1.5V | RP1-H-1.5V | 1.5 | 1.125 | 0.15 | 16 | 93.8 | 140 | 2.25 |
| RP1-3V | RP1-H-3V | 3 | 2.25 | 0.3 | 64.3 | 46.7 | 140 | 4.5 |
| RP1-4.5V | RP1-H-4.5V | 4.5 | 3.375 | 0.45 | 145 | 31.1 | 140 | 6.75 |
| RP1-5V | RP1-H-5V | 5 | 3.75 | 0.5 | 178 | 28 | 140 | 7.5 |
| RP1-6V | RP1-H-6V | 6 | 4.5 | 0.6 | 257 | 23.3 | 140 | 9 |
| RP1-9V | RP1-H-9V | 9 | 6.75 | 0.9 | 579 | 15.6 | 140 | 13.5 |
| RP1-12V | RP1-H-12V | 12 | 9 | 1.2 | 1,028 | 11.7 | 140 | 18 |
| RP1-24V | RP1-H-24V | 24 | 18 | 2.4 | 2,133 | 11.3 | 270 | 28.8 |

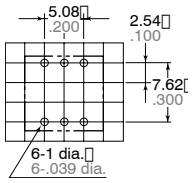
## DIMENSIONS

mm inch

Standard PC board terminal

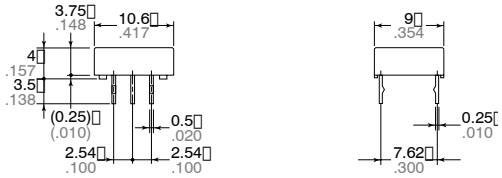



PC board pattern (Bottom view)

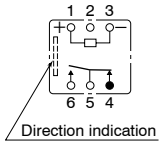



Tolerance: ±0.1 ±.004

Self-clinching terminal




Schematic (Bottom view)




General tolerance: ±0.3 ±.012

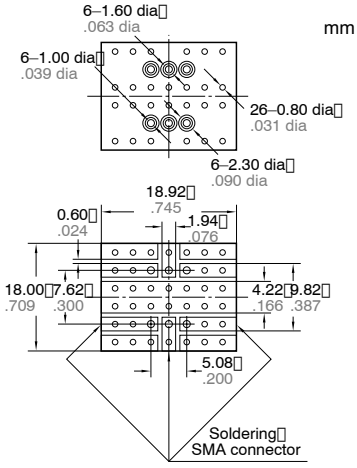
Deenergized condition

## REFERENCE DATA

1. High frequency characteristics

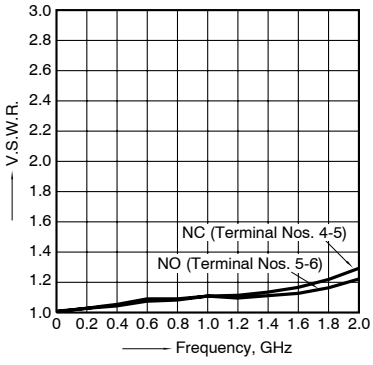
Sample: RP1-6V
Measuring method: Impedance 50Ω
Measuring tool:

mm inch

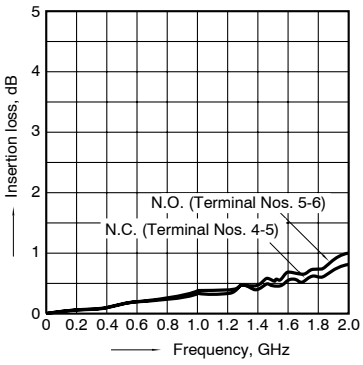



PC board
- Double-sided through hole
- Material: Glass-epoxy resin
- t = 1.0mm .039 inch
- Copper plated thickness: 35 μm

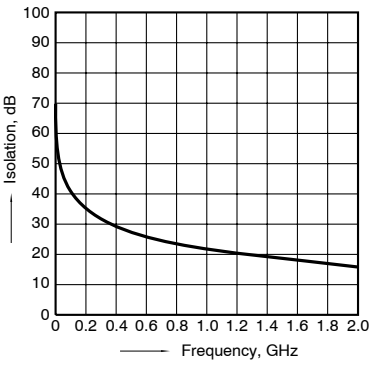
• V.S.W.R




• Insertion loss

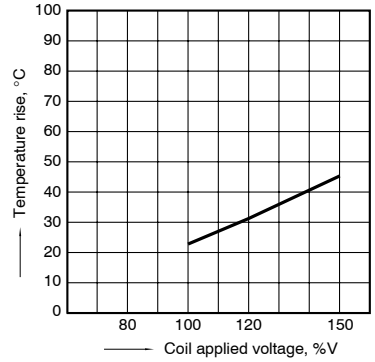



• Isolation



2. Coil temperature rise

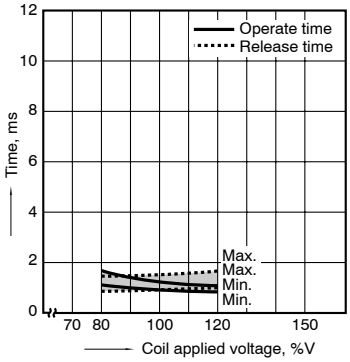
Sample: RP1-6V; No. of samples: n = 5
Carrying current: 0.1 A
Ambient temperature: 25°C 77°F



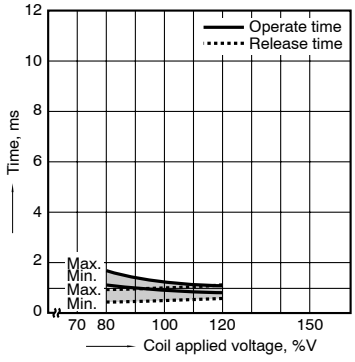

3. Operate/release time

Sample: RP1-9V; No. of samples: n = 50

• With diode



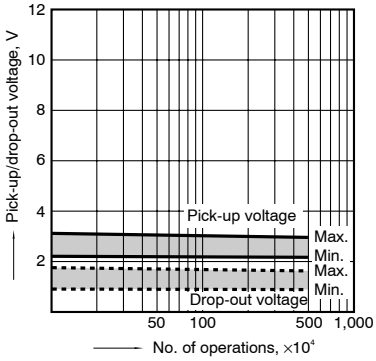

• Without diode




4. Mechanical life

Sample: RP1-5V; No. of samples: n = 8

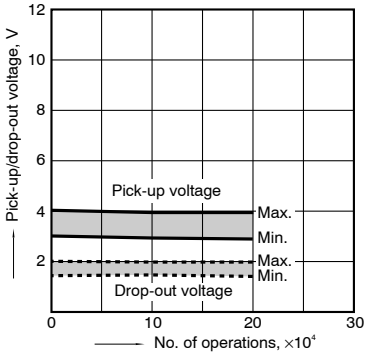
• Change of pick-up, drop-out voltage



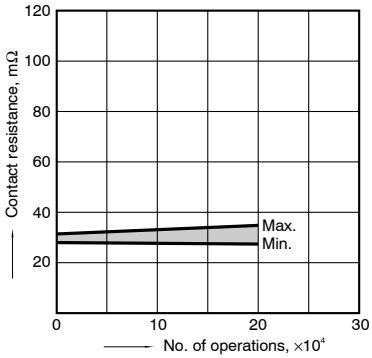

5. Electrical life (0.1 A 30 V DC)

Sample: RP1-6V; No. of samples: n = 6

• Change of pick-up/drop-out voltage

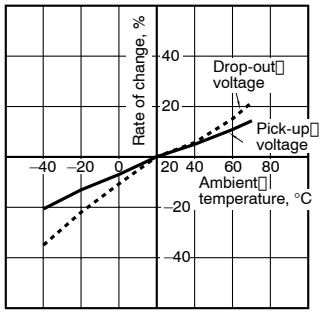



• Change of contact resistance



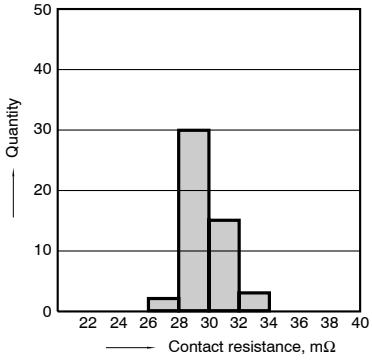

6. Ambient temperature characteristics

Sample: RP1-6V; No. of samples: n = 5



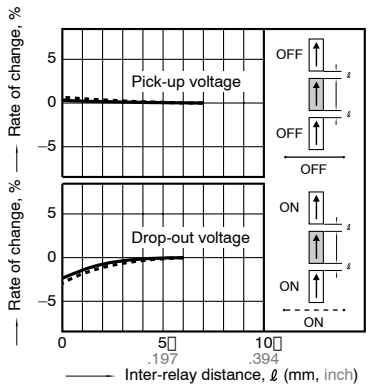

7. Contact resistance distribution (initial)

Sample: RP1-12V; No. of samples: n = 25



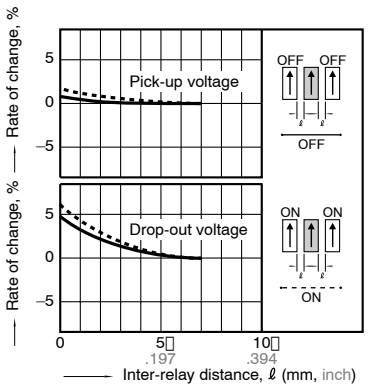

8.-(1) Influence of adjacent mounting

Sample: RP1-12V; No. of samples: n = 6



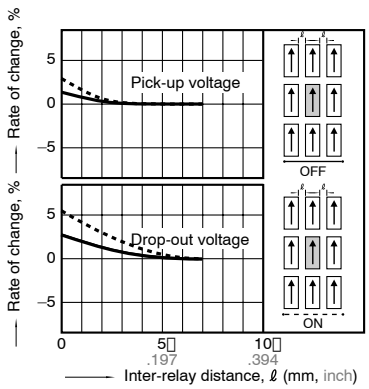

8.-(2) Influence of adjacent mounting

Sample: RP1-12V; No. of samples: n = 6

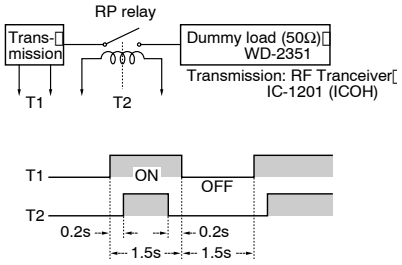



8.-(3) Influence of adjacent mounting

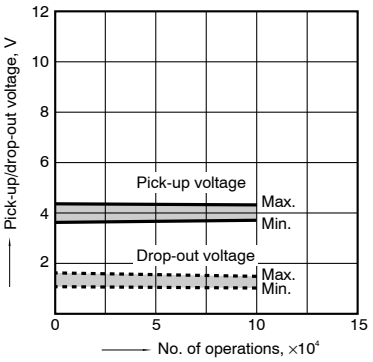
Sample: RP1-12V; No. of samples: n = 6



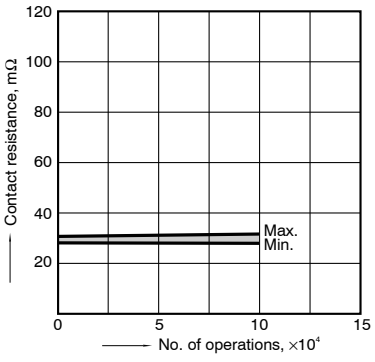
9. High frequency switching test (1.2 GHz, 1 W)
Sample: RP1-6V; No. of samples: n = 6
Ambient temperature: 20°C 68°F




• Change of pick-up/drop-out voltage




• Change of contact resistance



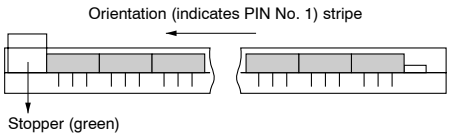

# NOTES

**1. Coil operating power**
Pure DC current should be applied to the coil. The wave form should be rectangular. If it includes ripple, the ripple factor should be less than 5%.
However, check it with the actual circuit since the characteristics may be slightly different. The nominal operating voltage should be applied to the coil for more than 20 ms to set/reset the latching type relay.

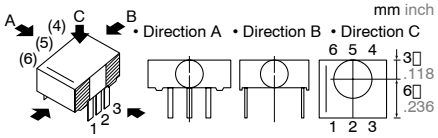
**2. Coil connection**
When connecting coils, refer to the wiring diagram to prevent mis-operation or malfunction.

**3. External magnetic field**
Since RP relays are highly sensitive polarized relays, their characteristics will be affected by a strong external magnetic field. Avoid using the relay under that condition.

**4. Packing direction**
Relays are packed in a tube with the orientation stripe (PIN NO. 1) toward the green stopper.




**5. Automatic mounting**
To maintain the internal function of the relay, the chucking pressure should not exceed the values below.
Chucking pressure* in the direction A:
4.9 N {500 gf} 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 be avoided.



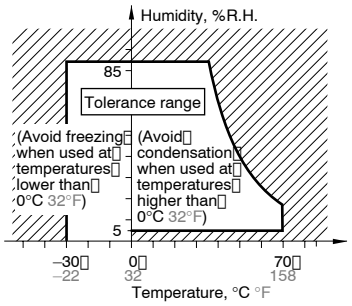

*Value of chucking pressure is shown by the value of weight pressed on the portion (4 mm .157 inch dia.).

**6. Soldering**
Preheat according to the following conditions.

| | |
|---|---|
| Temperature | 120°C 248°F or less |
| Time | Within 2 minute |

Soldering should be done at 260±5°C 500±5°F within 6 s.
1) Perform manual soldering under the conditions below.
• Within 10 s at 260°C 500°F
• Within 3 s at 350°C 662°F

**7. Conditions for operation, transport and storage conditions**
1) Ambient temperature, humidity, and atmospheric pressure during usage, transport, and storage of the relay:
(1) Temperature:
–40 to +70°C –40 to +158°F
(2) Humidity: 5 to 85% RH
(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 and 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.