

mm inch

- 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

## SPECIFICATIONS

### Contact

|                                                                    |                            |                                                                                                                                   |
|--------------------------------------------------------------------|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| Arrangement                                                        |                            | 1 Form C                                                                                                                          |
| Contact material                                                   | Movable                    | Silver alloy                                                                                                                      |
|                                                                    | Stationary                 | Gold-clad silver                                                                                                                  |
| Initial contact resistance, max.<br>(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<br>(Max. 1.8 GHz); Contact carrying power: 3 W (Max. 1.2 GHz)<br>1 W (Max. 1.8 GHz) |
|                                                                    |                            |                                                                                                                                   |
| High frequency characteristics<br>(Impedance 50Ω)                  | Isolation                  | Min. 15 dB (at 1 GHz)<br>Min. 10 dB (at 1.8 GHz)                                                                                  |
|                                                                    | Insertion loss             | Max. 0.5 dB (at 1 GHz)<br>Max. 1 dB (at 1.8 GHz)                                                                                  |
|                                                                    | V.S.W.R.                   | Max. 1.2 (at 1 GHz)<br>Max. 1.3 (at 1.8 GHz)                                                                                      |
| Expected life<br>(min. operations)                                 | Mechanical<br>(at 180 cpm) | 5×10 <sup>6</sup>                                                                                                                 |
|                                                                    | Electrical<br>(at 20 cpm)  | 10 <sup>5</sup> (0.1 A 30 V DC)<br>10 <sup>5</sup> (1 W at 1.8 GHz;<br>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* <sup>1</sup>                                                         |                           | Min. 1,000 MΩ at 500 V DC                                                         |
| Initial breakdown voltage* <sup>2</sup>                                                             | Between open contacts     | 750 Vrms for 1 min.                                                               |
|                                                                                                     | Between contacts and coil | 1,500 Vrms for 1 min.                                                             |
| Operate time* <sup>3</sup> (at nominal voltage)                                                     |                           | Max. 3 ms<br>(Approx. 1.5 ms)                                                     |
| Release time(without diode)* <sup>3</sup><br>(at nominal voltage)                                   |                           | Max. 2 ms<br>(Approx. 1 ms)                                                       |
| Temperature rise                                                                                    |                           | Max. 50°C with nominal coil voltage across coil and at nominal switching capacity |
| Shock resistance                                                                                    | Functional* <sup>4</sup>  | Min. 500 m/s <sup>2</sup> {50 G}                                                  |
|                                                                                                     | Destructive* <sup>5</sup> | Min. 1,000 m/s <sup>2</sup> {100 G}                                               |
| Vibration resistance                                                                                | Functional* <sup>6</sup>  | 10 to 55 Hz<br>at double amplitude of 3 mm                                        |
|                                                                                                     | Destructive               | 10 to 55 Hz<br>at double amplitude of 5 mm                                        |
| Conditions for operation, transport and storage<br>(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.  
<sup>\*1</sup> Measurement at same location as "Initial breakdown voltage" section  
<sup>\*2</sup> Detection current: 10mA  
<sup>\*3</sup> Excluding contact bounce time  
<sup>\*4</sup> Half-wave pulse of sine wave: 11ms, detection time: 10μs  
<sup>\*5</sup> Half-wave pulse of sine wave: 6ms  
<sup>\*6</sup> Detection time: 10μs

## TYPICAL APPLICATIONS

- Antenna switching of mobile phone
- Switching signal of measuring equipment

## ORDERING INFORMATION

Ex. RP 1 — H — 3V

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

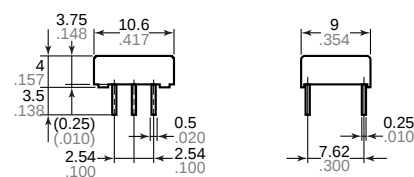
Note: Standard packing; Carton: 50 pcs. Case 1,000 pcs.

## TYPES ANE COIL DATA (at 20°C 68°F)

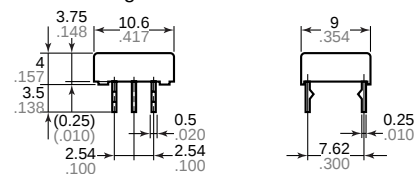
| Part No.                   |                         | Nominal voltage, V DC | Pick-up voltage, max. V DC | Drop-out voltage, min. V DC | Coil resistance, $\Omega$ ( $\pm 10\%$ ) | Nominal operating current, mA ( $\pm 10\%$ ) | Nominal operating power, mW | Maximum allowable voltage, V DC |
|----------------------------|-------------------------|-----------------------|----------------------------|-----------------------------|------------------------------------------|----------------------------------------------|-----------------------------|---------------------------------|
| 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

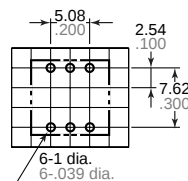
Standard PC board terminal



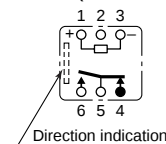
Self-clinching terminal

General tolerance:  $\pm 0.3 \pm .012$ 

PC board pattern (Copper-side view)

Tolerance:  $\pm 0.1 \pm .004$ 

Schematic (Bottom view)



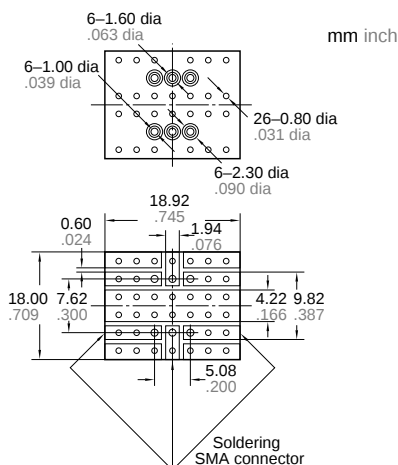
Deenergized condition

## REFERENCE DATA

Sample: RP1-6V

Measuring method: Impedance 50 $\Omega$ 

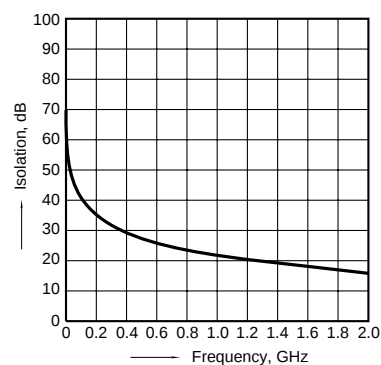
Measuring tool:



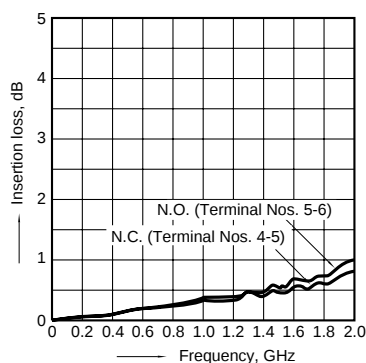
- PC board
- Double-sided through hole
  - Material: Glass-epoxy resin
  - $t = 1.0\text{mm}$  .039 inch
  - Copper plated thickness: 35  $\mu\text{m}$

## 1. High frequency characteristics

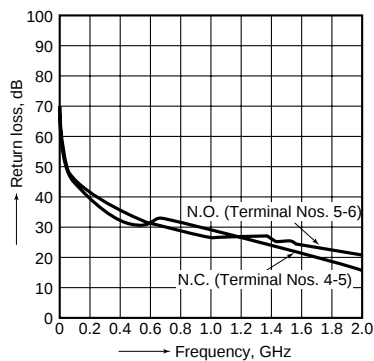
## • Isolation



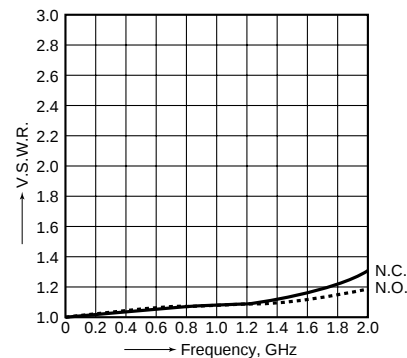
## • Insertion loss



## • Return loss

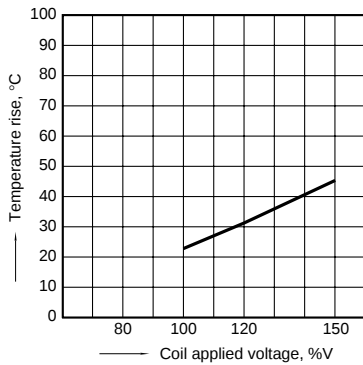


## • V.S.W.R.



## 2. Coil temperature rise

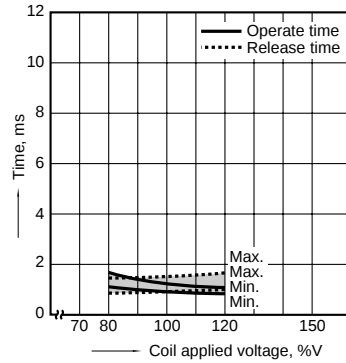
Sample: RP1-6V; No. of samples: n = 5  
 Carrying current: 0.1 A  
 Ambient temperature: 25°C 77°F



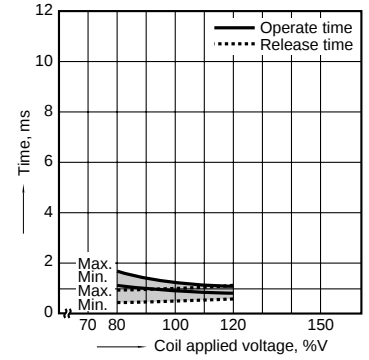
## 3. Operate/release time

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

• With diode



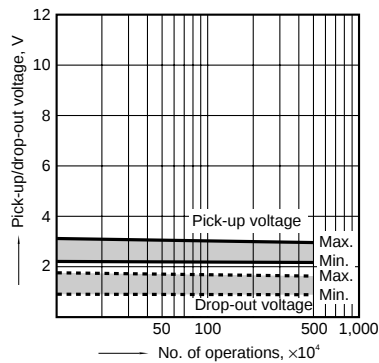
• Without diode



## 4. Mechanical life

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

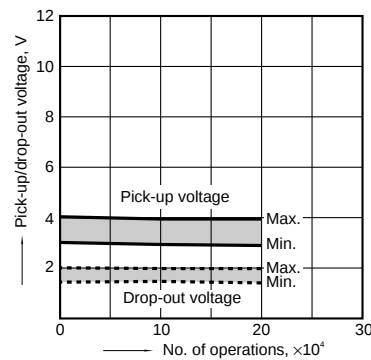
• Change of pick-up, drop-out voltage



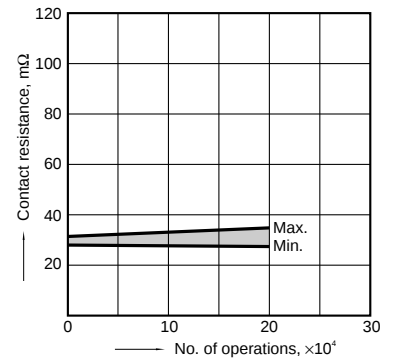
## 5. Electrical life (0.1 A 30 V DC)

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

• Change of pick-up/drop-out voltage

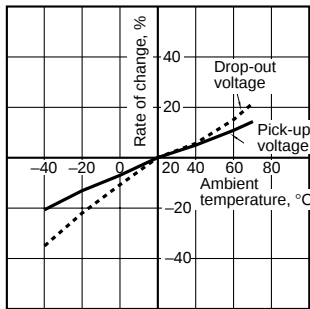


• Change of contact resistance



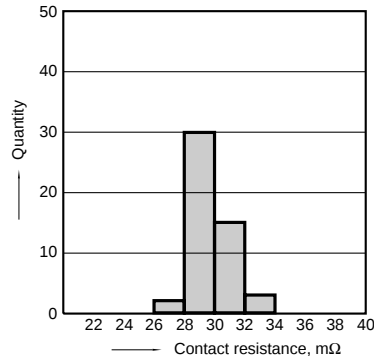
## 6. Ambient temperature characteristics

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



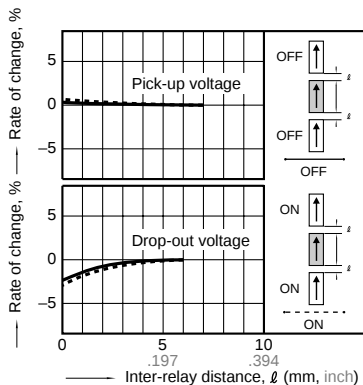
## 7. Contact resistance distribution (initial)

Sample: RP1-6V; No. of samples: n = 25



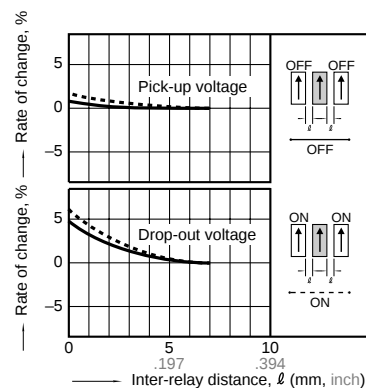
## 8.-(1) Influence of adjacent mounting

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



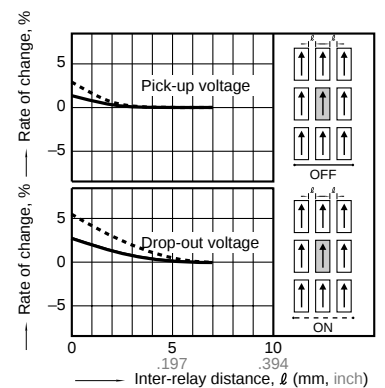
## 8.-(2) Influence of adjacent mounting

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



## 8.-(3) Influence of adjacent mounting

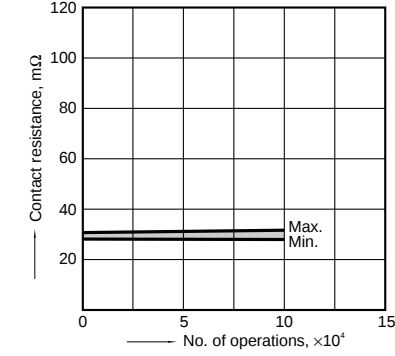
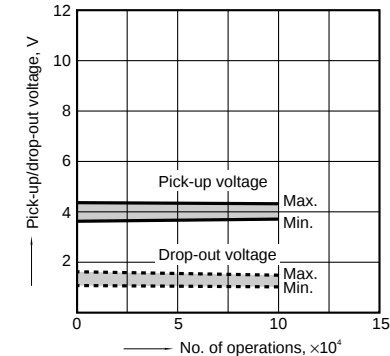
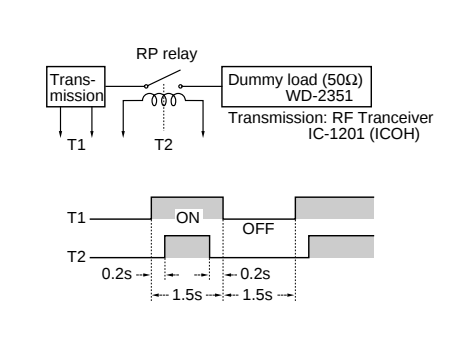
Sample: RP1-12V; No. of samples: n = 6



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

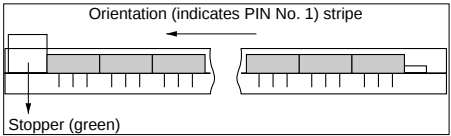
• Change of contact resistance



NOTES

1. Packing direction

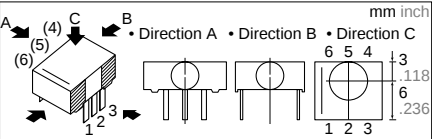
Relays are packed in a tube with the orientation stripe (PIN NO. 1) toward the green stopper.



2. 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.).

3. Soldering

Preheat according to the following conditions.

|             |                     |
|-------------|---------------------|
| Temperature | 100°C 212°F or less |
| Time        | Within 1 minute     |

Soldering should be done at 250°C 482°F within 5 s.

For Cautions for Use, see Relay Technical Information (Page 48 to 76).