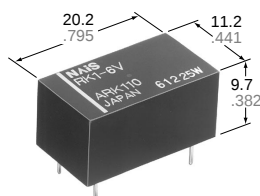


# NAIS

## 1.5 GHz MICROWAVE RELAY

# RK-RELAYS



mm inch

- Excellent high frequency characteristics  
Isolation: Min. 60dB (at 1.5 GHz)  
Insertion loss: Max. 0.3dB (at 900 MHz)
- V.S.W.R.: Max. 1.5 (at 900MHz)
- High sensitivity in small size  
Size: 20.2 × 11.2 × 9.7 mm .795 × .441 × .382 inch  
Nominal power consumption: 200 mW (single side stable type)
- Sealed construction for automatic cleaning
- Latching types are also available

## SPECIFICATIONS

### Contact

|                                                   |                            |                                                 |                   |
|---------------------------------------------------|----------------------------|-------------------------------------------------|-------------------|
| Arrangement                                       | 1 Form C                   |                                                 |                   |
| Contact material                                  | Gold-clad                  |                                                 |                   |
| Initial contact resistance, max.<br>(By HP4328A)  | 100 mΩ                     |                                                 |                   |
| Rating                                            | Max. switching power       | 10 W                                            |                   |
|                                                   | Max. switching voltage     | 30 V DC                                         |                   |
|                                                   | Max. switching current     | 0.5 A                                           |                   |
|                                                   | Nominal switching capacity | 0.01 A 24 V DC 10 W (at 1.2 GHz, Impedance 50Ω) |                   |
| High frequency characteristics<br>(Impedance 50Ω) | Isolation                  | Min. 60 dB (at 1.5 GHz)                         |                   |
|                                                   | Insertion loss             | Max. 0.3 dB (at 900 MHz)                        |                   |
|                                                   | V.S.W.R.                   | Max. 1.5 (at 900 MHz)                           |                   |
| Expected life (min. operations)                   | Mechanical                 | 5×10 <sup>6</sup>                               |                   |
|                                                   |                            |                                                 |                   |
|                                                   | Electrical                 | 0.01 A 24 V DC                                  | 3×10 <sup>5</sup> |
|                                                   |                            | 10 W 1.2 GHz                                    | 10 <sup>5</sup>   |

### Coil (at 25°C, 68°F)

|                    |                         |
|--------------------|-------------------------|
|                    | Nominal operating power |
| Single side stable | 200 mW                  |
| 1 coil latching    | 200 mW                  |
| 2 coil latching    | 400 mW                  |

### Characteristics

|                                                                                                     |                                    |                                                                                   |
|-----------------------------------------------------------------------------------------------------|------------------------------------|-----------------------------------------------------------------------------------|
| Initial insulation resistance* <sup>1</sup>                                                         |                                    | Min. 100 MΩ at 500 V DC                                                           |
| Initial breakdown voltage* <sup>2</sup>                                                             | Between open contacts              | 500 Vrms                                                                          |
|                                                                                                     | Between contact and coil           | 1,000 Vrms                                                                        |
|                                                                                                     | Between contact and earth terminal | 500 Vrms                                                                          |
| Operate time [Set time]* <sup>3</sup> (at nominal voltage)                                          |                                    | Approx. 6 ms [Approx. 5ms]                                                        |
| Release time (without diode) [Reset time]* <sup>3</sup> (at nominal voltage)                        |                                    | Approx. 3 ms [Approx. 5ms]                                                        |
| Temperature rise                                                                                    |                                    | Max. 60°C with nominal coil voltage across coil and at nominal switching capacity |
| Shock resistance                                                                                    | Functional* <sup>4</sup>           | Min. 196 m/s <sup>2</sup> {20 G}                                                  |
|                                                                                                     | Destructive* <sup>5</sup>          | Min. 980 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 60°C<br>−40°F to 140°F                                                   |
|                                                                                                     | Humidity                           | 5 to 85% R.H.                                                                     |
| Unit weight                                                                                         |                                    | Approx. 4.4 g .155 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

- Audio visual equipment  
broadcast satellite tuners  
VCRs, CATVs, TVs
- Communication equipment  
automobile telephones  
maritime telephones
- Instrumentation  
test equipment  
measuring equipment

## ORDERING INFORMATION

Ex. RK

1

L2

24V

| Contact arrangement                                             | Operating function                                                   | Coil voltage, DC             |
|-----------------------------------------------------------------|----------------------------------------------------------------------|------------------------------|
| 1: Standard type<br>1R: R type<br>(See Schematic on next page.) | Nil: Single side stable<br>L: 1 coil latching<br>L2: 2 coil latching | 3, 4.5, 5, 6, 9, 12,<br>24 V |

Note: Standard packing; Carton: 50 pcs. Case 500 pcs.

TYPES ANE COIL DATA (at 20°C 68°F)

• Single side stable type

| 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 | Nominal operating power, mW | Maximum allowable voltage, V DC (at 60°C 140°F) |
|----------|-----------|-----------------------|----------------------------|-----------------------------|---------------------------|-------------------------------|-----------------------------|-------------------------------------------------|
| RK1-3V   | RK1R-3V   | 3                     | 2.25                       | 0.3                         | 45                        | 66.7                          | 200                         | 3.3                                             |
| RK1-4.5V | RK1R-4.5V | 4.5                   | 3.38                       | 0.45                        | 101                       | 44.4                          | 200                         | 4.95                                            |
| RK1-5V   | RK1R-5V   | 5                     | 3.75                       | 0.5                         | 125                       | 40                            | 200                         | 5.5                                             |
| RK1-6V   | RK1R-6V   | 6                     | 4.5                        | 0.6                         | 180                       | 33.3                          | 200                         | 6.6                                             |
| RK1-9V   | RK1R-9V   | 9                     | 6.75                       | 0.9                         | 405                       | 22.2                          | 200                         | 9.9                                             |
| RK1-12V  | RK1R-12V  | 12                    | 9                          | 1.2                         | 720                       | 16.7                          | 200                         | 13.2                                            |
| RK1-24V  | RK1R-24V  | 24                    | 18                         | 2.4                         | 2,880                     | 8.3                           | 200                         | 26.4                                            |

• 1 coil latching type

| Part No.   |             | Nominal voltage, V DC | Set voltage, max. V DC | Reset voltage, max. V DC | Coil resistance, Ω (±10%) | Nominal operating current, mA | Nominal operating power, mW | Maximum allowable voltage, V DC (at 60°C 140°F) |
|------------|-------------|-----------------------|------------------------|--------------------------|---------------------------|-------------------------------|-----------------------------|-------------------------------------------------|
| RK1-L-3V   | RK1R-L-3V   | 3                     | 2.25                   | 2.25                     | 45                        | 66.7                          | 200                         | 3.3                                             |
| RK1-L-4.5V | RK1R-L-4.5V | 4.5                   | 3.38                   | 3.38                     | 101                       | 44.4                          | 200                         | 4.95                                            |
| RK1-L-5V   | RK1R-L-5V   | 5                     | 3.75                   | 3.75                     | 125                       | 40                            | 200                         | 5.5                                             |
| RK1-L-6V   | RK1R-L-6V   | 6                     | 4.5                    | 4.5                      | 180                       | 33.3                          | 200                         | 6.6                                             |
| RK1-L-9V   | RK1R-L-9V   | 9                     | 6.75                   | 6.75                     | 405                       | 22.2                          | 200                         | 9.9                                             |
| RK1-L-12V  | RK1R-L-12V  | 12                    | 9                      | 9                        | 720                       | 16.7                          | 200                         | 13.2                                            |
| RK1-L-24V  | RK1R-L-24V  | 24                    | 18                     | 18                       | 2,880                     | 8.3                           | 200                         | 26.4                                            |

• 2 coil latching type

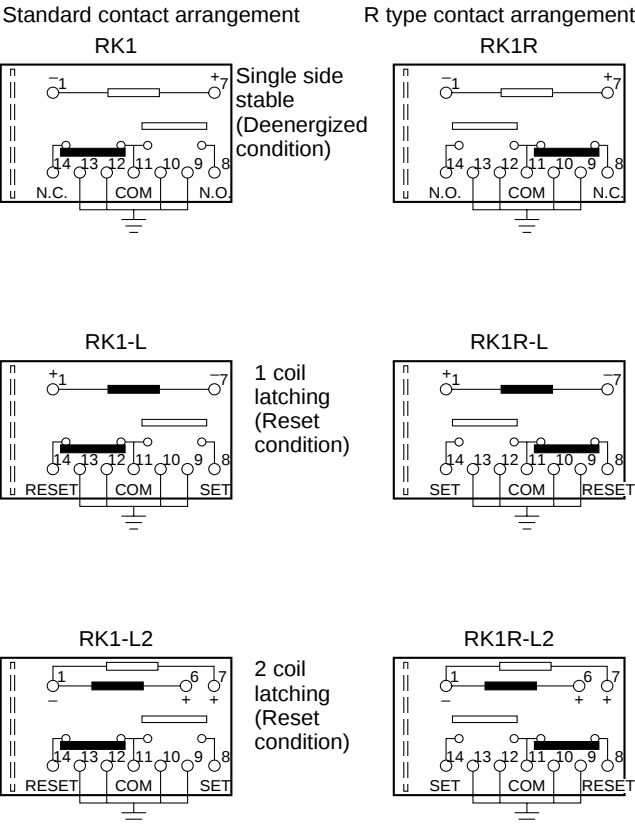
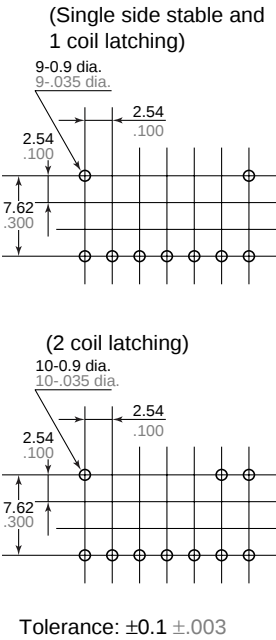
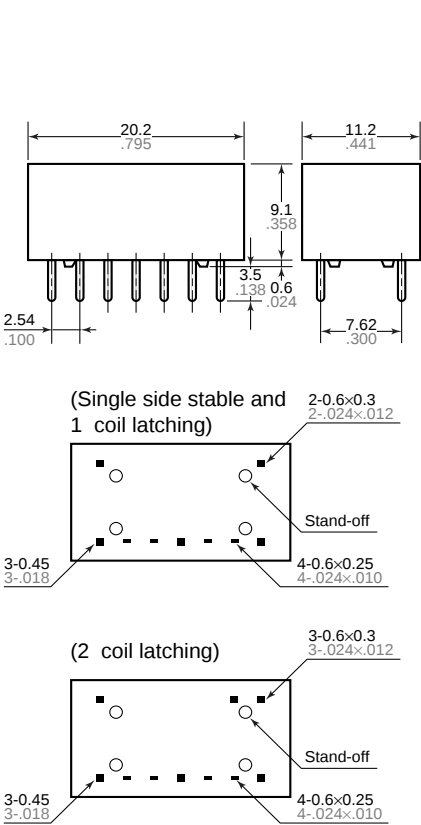
| Part No.    |              | Nominal voltage, V DC | Set voltage, max. V DC | Reset voltage, max. V DC | Coil resistance, Ω (±10%) | Nominal operating current, mA | Nominal operating power, mW | Maximum allowable voltage, V DC (at 60°C 140°F) |
|-------------|--------------|-----------------------|------------------------|--------------------------|---------------------------|-------------------------------|-----------------------------|-------------------------------------------------|
| RK1-L2-3V   | RK1R-L2-3V   | 3                     | 2.25                   | 2.25                     | 22.5                      | 133.3                         | 400                         | 3.3                                             |
| RK1-L2-4.5V | RK1R-L2-4.5V | 4.5                   | 3.38                   | 3.38                     | 50.6                      | 88.9                          | 400                         | 4.95                                            |
| RK1-L2-5V   | RK1R-L2-5V   | 5                     | 3.75                   | 3.75                     | 62.5                      | 80                            | 400                         | 5.5                                             |
| RK1-L2-6V   | RK1R-L2-6V   | 6                     | 4.5                    | 4.5                      | 90                        | 66.7                          | 400                         | 6.6                                             |
| RK1-L2-9V   | RK1R-L2-9V   | 9                     | 6.75                   | 6.75                     | 202.5                     | 44.4                          | 400                         | 9.9                                             |
| RK1-L2-12V  | RK1R-L2-12V  | 12                    | 9                      | 9                        | 360                       | 33.3                          | 400                         | 13.2                                            |
| RK1-L2-24V  | RK1R-L2-24V  | 24                    | 18                     | 18                       | 1,440                     | 16.7                          | 400                         | 26.4                                            |

DIMENSIONS

mm inch

PC board pattern (Copper-side view)

Schematic (Bottom view)



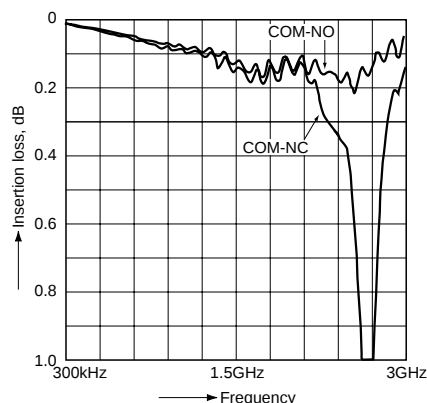
## REFERENCE DATA

### 1.-(1) High frequency characteristics (Impedance 75Ω)

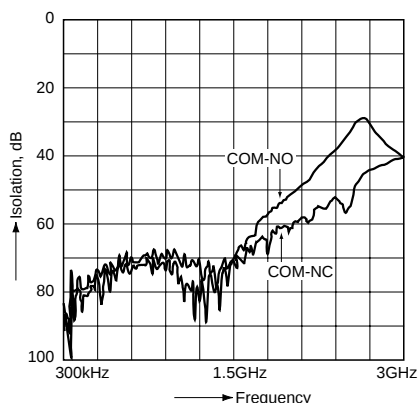
Sample: RK1-12V

Measuring method: Measured with HP network analyzer (HP8753C)

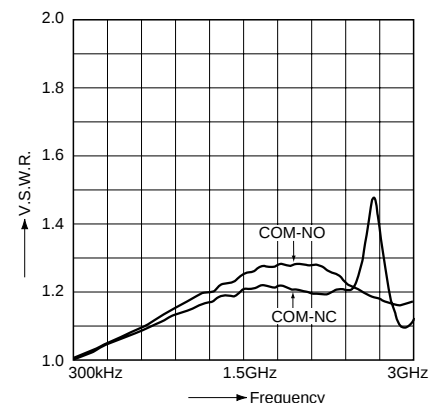
#### • Insertion loss characteristics



#### • Isolation characteristics



#### • V.S.W.R. characteristics

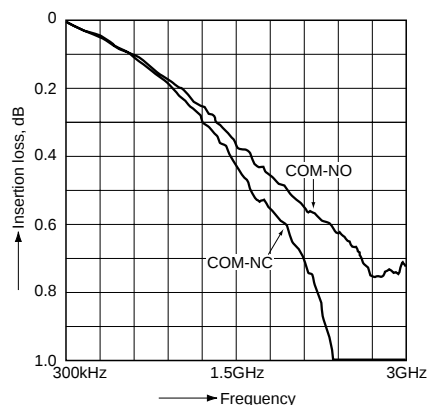


### 1.-(2) High frequency characteristics (Impedance 50Ω)

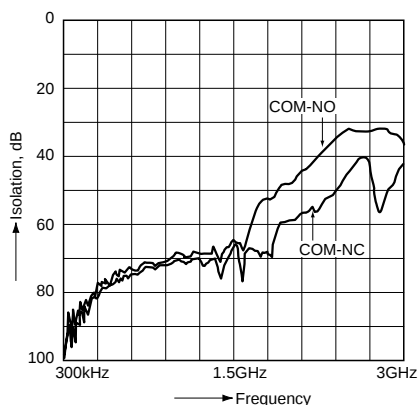
Sample: RK1-5V

Measuring method: Measured with HP network analyzer (HP8753C)

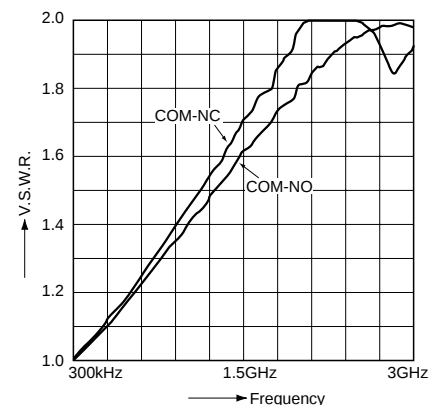
#### • Insertion loss characteristics



#### • Isolation characteristics



#### • V.S.W.R. characteristics



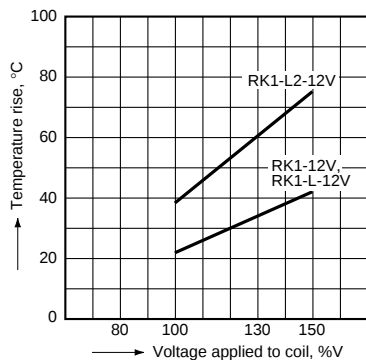
### 2. Coil temperature rise

Sample: RK1-12V, RK1-L-12V, RK1-L2-12V

No. of samples: n = 6

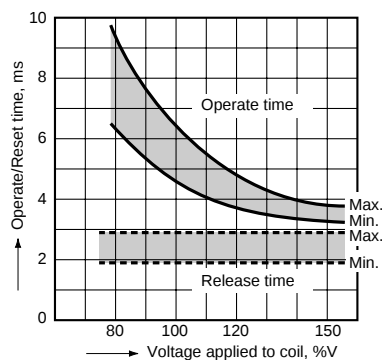
Carrying current: 10 mA

Ambient temperature: 25°C 77°F



### 3.-(1) Operate/Release time (Single side stable)

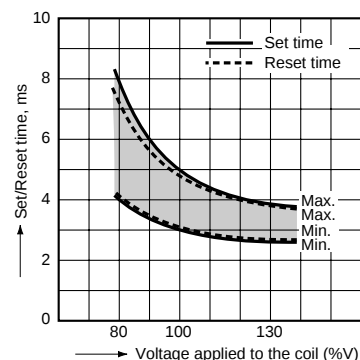
Sample: RK1-12V; No. of samples: n = 6



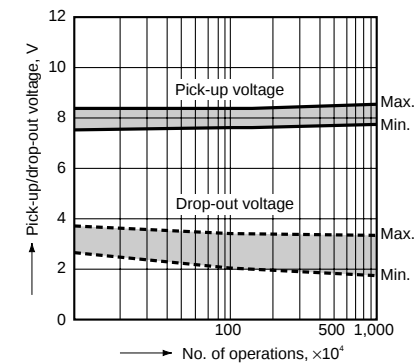
### 3.-(2) Set/Reset time (Latching)

Sample: RK1-L-12V, RK1-L2-12V

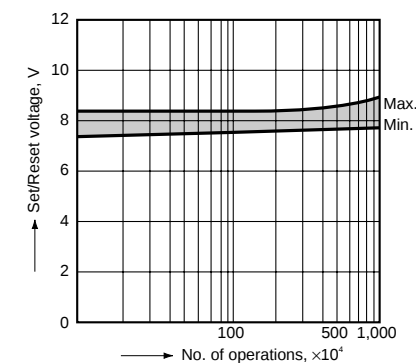
No. of samples: n = 12



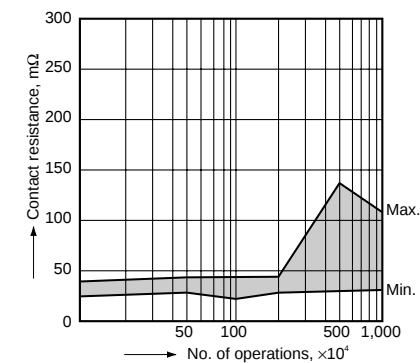
4.-(1) Mechanical life test (Single side stable)  
Sample: RK1-12V; No. of samples: n = 12



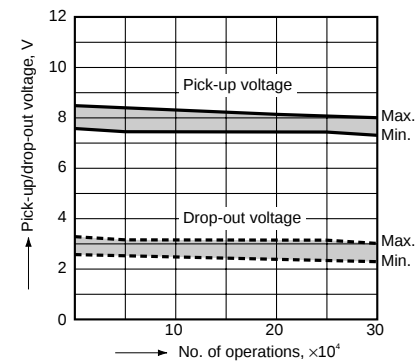
4.-(2) Mechanical life test (Latching)  
Sample: RK1-L2-12V  
No. of samples: n = 12



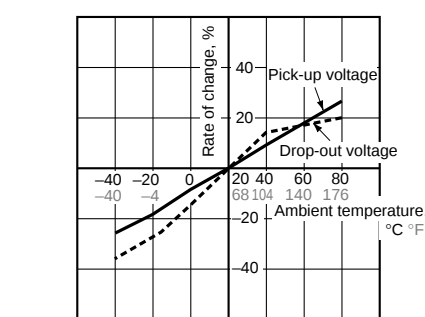
4.-(3) Mechanical life test  
Sample: RK1-12V  
No. of samples: n = 20 (20 x 2 contacts)



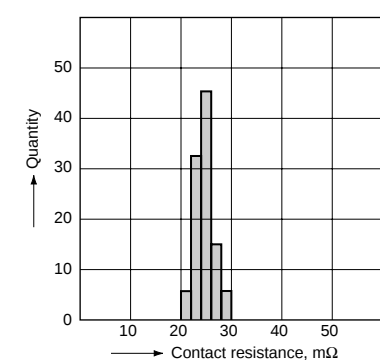
5. Electrical life test (0.01 A 24 V DC)  
Sample: RK1-12V; No. of samples: n = 6



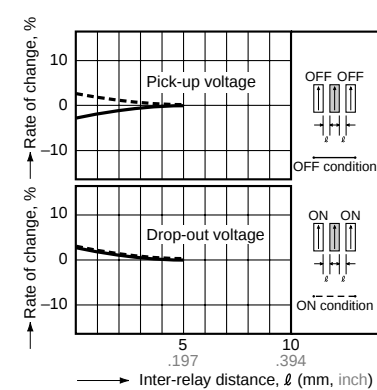
6. Ambient temperature characteristics  
Sample: RK1-12V; No. of samples: n = 6



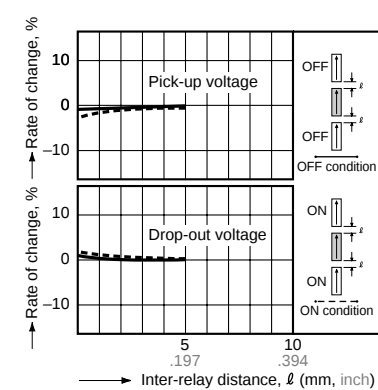
7. Contact resistance distribution (initial)  
Sample: RK1-12V  
No. of samples: n = 50 (50 x 2 contacts)



8.-(1) Influence of adjacent mounting  
Sample: RK1-12V; No. of sample: n = 10



8.-(2) Influence of adjacent mounting  
Sample: RK1-12V; No. of samples: n = 10



## NOTES

### 1. Soldering

Perform soldering under the conditions below.

- Within 10 s at 260°C 500°F
- Within 3 s at 350°C 662°F

### 2. Latching relay

In order to assure proper operating regardless of changes in the ambient usage temperature and usage conditions, nominal operating voltage should be applied to the coil for more than 30 ms to set/reset the latching type relay.

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