Panasonic
ideas for life

1.5 GHz
MICROWAVE RELAYS

RK RELAYS

Compliance with RoHS Directive

FEATURES

1. Excellent high frequency characteristics

Impedance 50Ω (Initial)	V.S.W.R. (Max.)	1.5 (at 900 MHz)
	Insertion loss (dB. Max.)	0.3 (at 900 MHz)
	Isolation (dB. Min.)	60 (at 1.5 GHz)
Impedance 75Ω (Initial)	V.S.W.R. (Max.)	1.2 (at 900 MHz)
	Insertion loss (dB. Max.)	0.2 (at 900 MHz)
	Isolation (dB. Min.)	60 (at 1.5 GHz)

2. 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, 1 coil latching)

3. Sealed construction for automatic cleaning

4. Reversed contact types and latching types (1 coil latching/2 coil latching) are also available

TYPICAL APPLICATIONS

- **Audio visual equipment**
  Broadcast satellite tuners VCRs, CATVs, TVs
- **Communication equipment**
  Automobile telephones, maritime telephones, emergency and disaster prevention communications, PCM switches
- **Instrumentation**
  Testing equipment, measuring equipment

If you wish to use in applications with low level loads or with high frequency switching, please consult us.

ORDERING INFORMATION

RK □ – □ – □

Contact arrangement
1: Standard contact type
1R: Reversed contact type

Operating function
Nil: Single side stable
L: 1 coil latching
L2: 2 coil latching

Coil voltage, DC
3, 4.5, 5, 6, 9, 12, 24 V

Notes: 1. For transistor drive with 5 V circuits, we recommend the 4.5 V type in order to take into account voltage drops.
2. No part number distinguishment on impedance in RK relays.

TYPES

1. Standard type

Contact arrangement	Nominal coil voltage	Single side stable type	1 coil latching type	2 coil latching type
		Part No.	Part No.	Part No.
1 Form C	3 V DC	RK1-3V	RK1-L-3V	RK1-L2-3V
	4.5V DC	RK1-4.5V	RK1-L-4.5V	RK1-L2-4.5V
	5 V DC	RK1-5V	RK1-L-5V	RK1-L2-5V
	6 V DC	RK1-6V	RK1-L-6V	RK1-L2-6V
	9 V DC	RK1-9V	RK1-L-9V	RK1-L2-9V
	12 V DC	RK1-12V	RK1-L-12V	RK1-L2-12V
	24 V DC	RK1-24V	RK1-L-24V	RK1-L2-24V

Standard packing: 50 pcs. in an inner package; 500 pcs. in an outer package

2. Reversed type

Contact arrangement	Nominal coil voltage	Single side stable type	1 coil latching type	2 coil latching type
		Part No.	Part No.	Part No.
1 Form C reversed type	3 V DC	RK1R-3V	RK1R-L-3V	RK1R-L2-3V
	4.5V DC	RK1R-4.5V	RK1R-L-4.5V	RK1R-L2-4.5V
	5 V DC	RK1R-5V	RK1R-L-5V	RK1R-L2-5V
	6 V DC	RK1R-6V	RK1R-L-6V	RK1R-L2-6V
	9 V DC	RK1R-9V	RK1R-L-9V	RK1R-L2-9V
	12 V DC	RK1R-12V	RK1R-L-12V	RK1R-L2-12V
	24 V DC	RK1R-24V	RK1R-L-24V	RK1R-L2-24V

Standard packing: 50 pcs. in an inner package; 500 pcs. in an outer package

RATING

1. Coil data

1) Single side stable type

Nominal coil voltage	Pick-up voltage (at 20°C 68°F)	Drop-out voltage (at 20°C 68°F)	Nominal operating current [±10%] (at 20°C 68°F)	Coil resistance [±10%] (at 20°C 68°F)	Nominal operating power	Max. applied voltage (at 60°C 140°F)
3 V DC	75%V or less of nominal voltage (Initial)	10%V or more of nominal voltage (Initial)	66.7mA	45Ω	200mW	110%V of nominal voltage
4.5V DC			44.4mA	101Ω		
5 V DC			40.0mA	125Ω		
6 V DC			33.3mA	180Ω		
9 V DC			22.2mA	405Ω		
12 V DC			16.7mA	720Ω		
24 V DC			8.3mA	2,880Ω		

2) 1 coil latching type

Nominal coil voltage	Set voltage (at 20°C 68°F)	Reset voltage (at 20°C 68°F)	Nominal operating current [±10%] (at 20°C 68°F)	Coil resistance [±10%] (at 20°C 68°F)	Nominal operating power	Max. applied voltage (at 60°C 140°F)
3 V DC	75%V or less of nominal voltage (Initial)	75%V or less of nominal voltage (Initial)	66.7mA	45Ω	200mW	110%V of nominal voltage
4.5V DC			44.4mA	101Ω		
5 V DC			40.0mA	125Ω		
6 V DC			33.3mA	180Ω		
9 V DC			22.2mA	405Ω		
12 V DC			16.7mA	720Ω		
24 V DC			8.3mA	2,880Ω		

3) 2 coil latching type

Nominal coil voltage	Set voltage (at 20°C 68°F)	Reset voltage (at 20°C 68°F)	Nominal operating current [±10%] (at 20°C 68°F)		Coil resistance [±10%] (at 20°C 68°F)		Nominal operating power		Max. applied voltage (at 60°C 140°F)
			Set coil	Reset coil	Set coil	Reset coil	Set coil	Reset coil	
3 V DC	75%V or less of nominal voltage (Initial)	75%V or less of nominal voltage (Initial)	133.3mA	133.3mA	22.5Ω	22.5Ω	400mW	400mW	110%V of nominal voltage
4.5V DC			88.9mA	88.9mA	50.6Ω	50.6Ω			
5 V DC			80.0mA	80.0mA	62.5Ω	62.5Ω			
6 V DC			66.7mA	66.7mA	90.0Ω	90.0Ω			
9 V DC			44.4mA	44.4mA	202.5Ω	202.5Ω			
12 V DC			33.3mA	33.3mA	360.0Ω	360.0Ω			
24 V DC			16.7mA	16.7mA	1,440.0Ω	1,440.0Ω			

2. Specifications

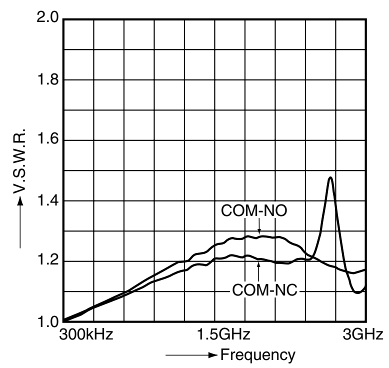
Characteristics	Item		Specifications
Contact	Arrangement		1 Form C
	Contact material		Stationary: Gold plating, Movable: Gold clad
	Initial contact resistance, max.		Max. 100mΩ (By voltage drop 10V AC 10mA)
Rating	Nominal switching capacity		0.01A 24V DC (resistive load), 10 W (at 1.2GHz, Impedance 50Ω)
	Contact carrying power		10W (at 1.2GHz, Impedance 50Ω)
	Max. switching voltage		30V DC
	Max. switching current		0.5A
	Nominal operating power	Single side stable	200mW
		1 coil latching	200mW
		2 coil latching	400mW
High frequency characteristics (Initial) (Impedance 50Ω)	V.S.W.R.		Max. 1.5 (at 900MHz)
	Insertion loss		Max. 0.3dB (at 900MHz)
	Isolation		Min. 60dB (at 1.5GHz)
High frequency characteristics (Initial) (Impedance 75Ω)	V.S.W.R.		Max. 1.2 (at 900MHz)
	Insertion loss		Max. 0.2dB (at 900MHz)
	Isolation		Min. 60dB (at 1.5GHz)
Electrical characteristics	Insulation resistance (Initial)		Min. 100MΩ (at 500V DC) Measurement at same location as "Initial breakdown voltage" section.
	Breakdown voltage (Initial)	Between open contacts	500 Vrms for 1min. (Detection current: 10mA)
		Between contact and coil	1,000 Vrms for 1min. (Detection current: 10mA)
		Between contact and earth terminal	500 Vrms for 1min. (Detection current: 10mA)
	Temperature rise (at 20°C)		Max. 60°C (By resistive method, nominal voltage applied to the coil and at nominal switching capacity)
	Operate time [Set time] (at 20°C)		Max. 10ms (Approx. 6ms) [Max. 10ms [Approx. 5ms] (Nominal operating voltage applied to the coil, excluding contact bounce time.)
	Release time [Reset time] (at 20°C)		Max. 6ms (Approx. 3ms) [Max. 10ms [Approx. 5ms] (Nominal operating voltage applied to the coil, excluding contact bounce time.) (without diode)
Mechanical characteristics	Shock resistance	Functional	Min. 196 m/s² {20 G} (Half-wave pulse of sine wave: 11ms; detection time: 10µs.)
		Destructive	Min. 980 m/s² {100 G} (Half-wave pulse of sine wave: 6ms.)
	Vibration resistance	Functional	10 to 55 Hz at double amplitude of 3mm (Detection time: 10µs.)
		Destructive	10 to 55 Hz at double amplitude of 5mm
Expected life	Mechanical		Min. 5×10^6 (at 180 cpm)
	Electrical (rated load)		Min. 3×10^5 (10mA 24V DC (resistive load)), Min. 10^5 (10W, 1.2GHz, Impedance 50Ω)
Conditions	Conditions for operation, transport and storage*		Ambient temperature: –40°C to +70°C –40°F to +158°F Humidity: 5 to 85% R.H. (Not freezing and condensing at low temperature)
Unit weight			Approx. 4.4 g .155 oz

Note: * The upper operation ambient temperature limit is the maximum temperature that can satisfy the coil temperature rise value. Refer to [6] AMBIENT ENVIRONMENT in GENERAL APPLICATION GUIDELINES.

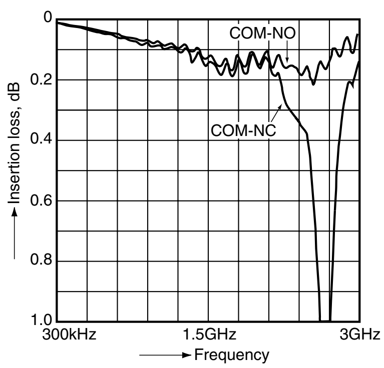
REFERENCE DATA

1.-(1) High frequency characteristics (Impedance 75Ω)
Sample: RK1-12V
Measuring method: Measured with HP network analyzer (HP8753C)

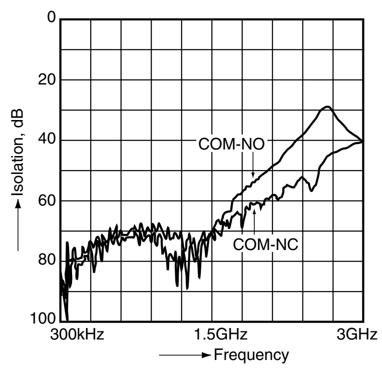
• V.S.W.R. characteristics



• Insertion loss characteristics



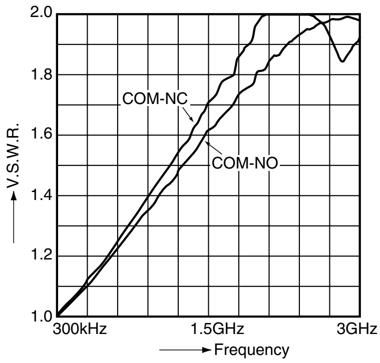
• Isolation characteristics



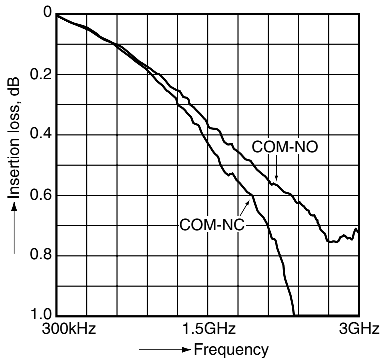
1.-(2) High frequency characteristics (Impedance 50Ω)

Sample: RK1-5V
Measuring method: Measured with HP network analyzer (HP8753C)

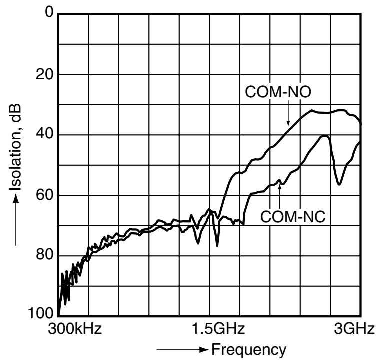
• V.S.W.R. characteristics



• Insertion loss characteristics

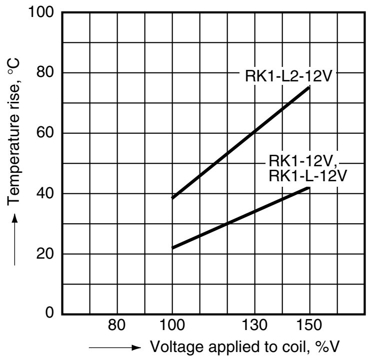


• Isolation characteristics



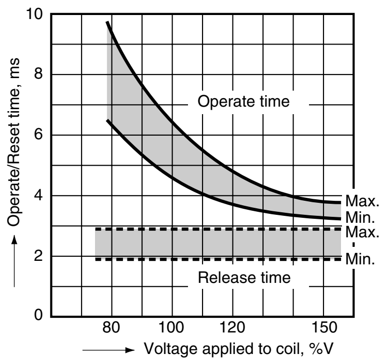
2. Coil temperature rise

Sample: RK1-12V, RK1-L-12V, RK1-L2-12V
No. of samples: n = 6
Carrying current: 10 mA
Ambient temperature: 25°C 77°F



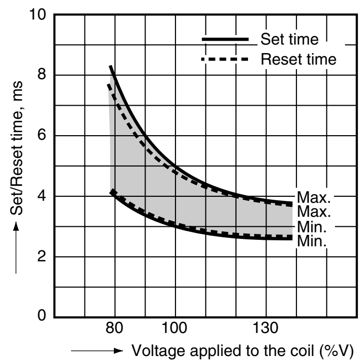
3.-(1) Operate/Release time (Single side stable)

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



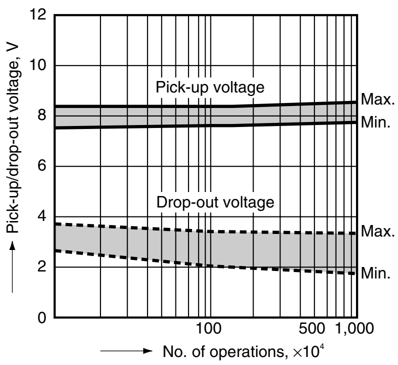
3.-(2) Set/Reset time (Latching)

Sample: RK1-L-12V, RK1-L2-12V
No. of samples: n = 12



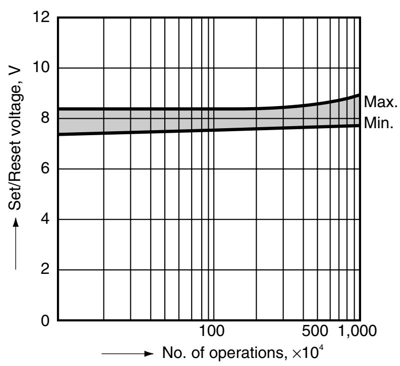
4.-(1) Mechanical life test (Single side stable)

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



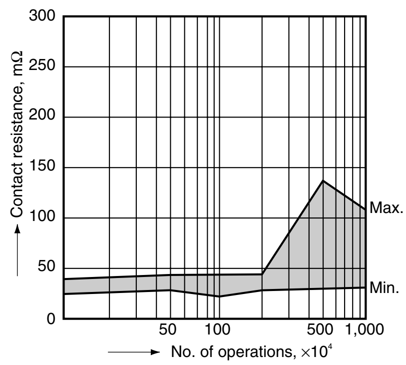
4.-(2) Mechanical life test (Latching)

Sample: RK1-L2-12V
No. of samples: n = 12



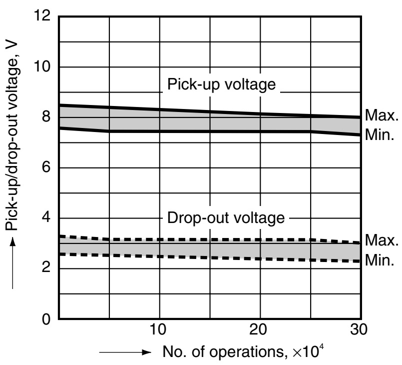
4.-(3) Mechanical life test

Sample: RK1-12V
No. of samples: n = 20 (20 × 2 contacts)



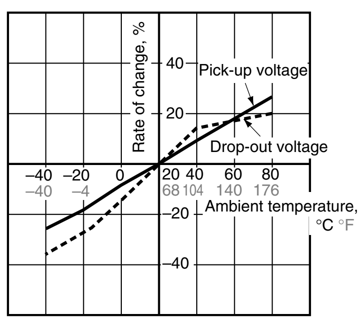
5. Electrical life test (0.01 A 24 V DC)

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



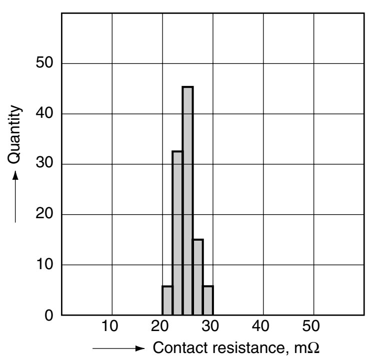
6. Ambient temperature characteristics

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

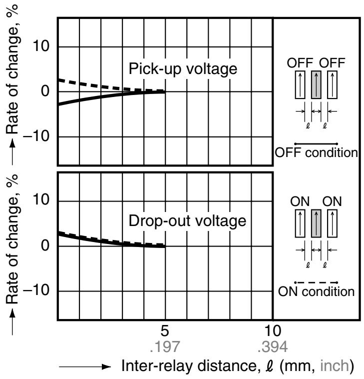


7. Contact resistance distribution (initial)

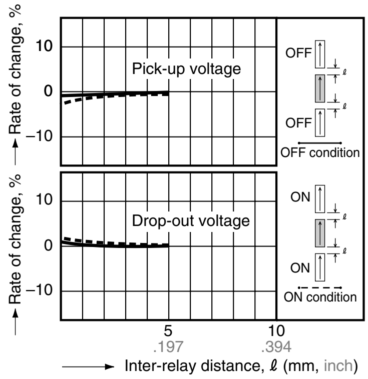
Sample: RK1-12V
No. of samples: n = 50 (50 × 2 contacts)



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



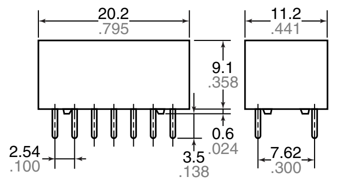
8.-(2) Influence of adjacent mounting
Sample: RK1-12V; No. of samples: n = 10



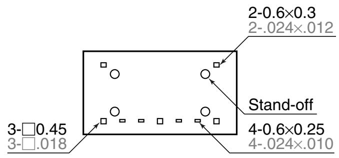
DIMENSIONS (mm inch)

The CAD data of the products with a CAD Data mark can be downloaded from: http://panasonic-electric-works.net/ac

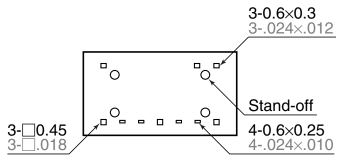
CAD Data



Single side stable and
1 coil latching



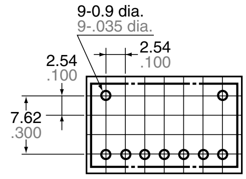
2 coil latching



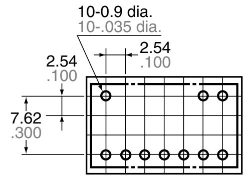
General tolerance: ±0.3 ±.012

PC board pattern (Bottom view)

Single side stable and
1 coil latching



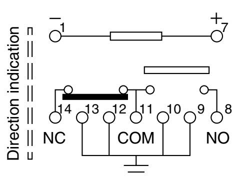
2 coil latching



Tolerance: ±0.1 ±.003

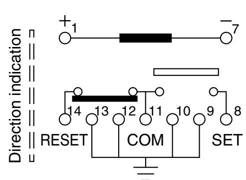
Schematic (Bottom view)

Single side stable



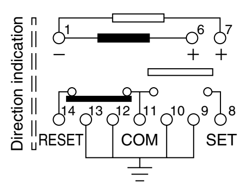
(Deenergized condition)

1 coil latching



(Reset condition)

2 coil latching



(Reset condition)

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

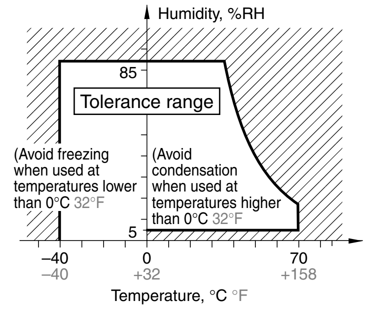
4. Soldering and cleaning
1) Perform manual soldering under the conditions below.
- Within 10 s at 260°C 500°F
- Within 3 s at 350°C 662°F

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±9°F within 6 s.
2) For automatic cleaning, the boiling method is recommended. Avoid ultrasonic cleaning which subjects the relays to high frequency vibrations, which may cause the contacts to stick. It is recommended that alcoholic solvents be used.

5. 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.

6. 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 general cautions for use, please refer to the “General Application Guidelines”.