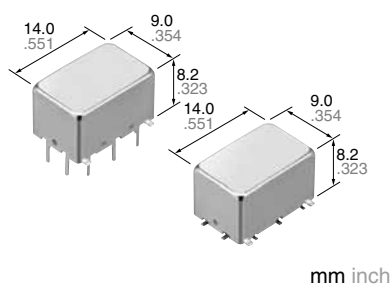


**8 GHz max. capable,
1 W carrying power
(at 5 GHz), 50Ω impedance
and 2 Form C relays**

RJ RELAYS (ARJ)



RoHS compliant

Protective construction: Sealed type

FEATURES

- **Excellent high frequency characteristics (50Ω, at 5GHz)**
V.S.W.R.: Max. 1.25
Insertion loss: Max. 0.5dB
Isolation: Min. 35dB
(Between open contacts)
Min. 30dB
(Between contact sets)
- **Surface mount terminal**
Surface mount terminals are now standard so there is much less work in designing PC boards.
- **Small size**
Size: 14.00 (L)×9.00 (W)×8.20 (H) mm
.551 (L)×.354 (W)×.323 (H) inch

TYPICAL APPLICATIONS

- **Measuring equipment market**
Attenuator circuits, spectrum analyzer, oscilloscope, Telecommunication equipment and tester inspection.
- **Network communications market**
Microwave communication
- **Medical instrument market**

If you consider using applications with low level loads or with high frequency switching, please consult us.

ORDERING INFORMATION

	ARJ	2					
RJ relays							
Contact arrangement							
2: 2 Form C							
Operating function							
0: Single side stable							
2: 2 coil latching							
Terminal shape							
Nil: Standard PC board terminal							
A: Surface-mount terminal							
Coil voltage (DC)							
03: 3V, 4H: 4.5V, 12: 12V, 24: 24V (H=0.5)							
Packing style							
Nil: Carton packing							
X: Tape and reel packing (picked from 1/2/3-pin side)							
Z: Tape and reel packing (picked from 6/7/8-pin side)							

TYPES

1. Standard PC board terminal

Contact arrangement	Rated voltage	Part No.		Standard packing	
		Single side stable	2 coil latching	Carton	Case
2 Form C	3 V DC	ARJ2003	ARJ2203	50 pcs.	500 pcs.
	4.5 V DC	ARJ204H	ARJ224H		
	12 V DC	ARJ2012	ARJ2212		
	24 V DC	ARJ2024	ARJ2224		

2. Surface-mount terminal

1) Carton packing

Contact arrangement	Rated voltage	Part No.		Standard packing	
		Single side stable	2 coil latching	Carton	Case
2 Form C	3 V DC	ARJ20A03	ARJ22A03	50 pcs.	500 pcs.
	4.5 V DC	ARJ20A4H	ARJ22A4H		
	12 V DC	ARJ20A12	ARJ22A12		
	24 V DC	ARJ20A24	ARJ22A24		

2) Tape and reel packing

Contact arrangement	Rated voltage	Part No.		Standard packing	
		Single side stable	2 coil latching	Tape and reel	Case
2 Form C	3 V DC	ARJ20A03Z	ARJ22A03Z	500 pcs.	1,000 pcs.
	4.5 V DC	ARJ20A4HZ	ARJ22A4HZ		
	12 V DC	ARJ20A12Z	ARJ22A12Z		
	24 V DC	ARJ20A24Z	ARJ22A24Z		

Note: Tape and reel packing symbol “-Z” is not marked on the relay. “X” type tape and reel packing (picked from 1/2/3-pin side) is also available. Suffix “X” instead of “Z”.

RATING

1. Coil data

1) Single side stable

Rated voltage	Pick-up voltage* (at 20°C 68°F)	Drop-out voltage* (at 20°C 68°F)	Rated operating current [±10%] (at 20°C 68°F)	Coil resistance [±10%] (at 20°C 68°F)	Rated operating power	Max. allowable voltage (at 70°C 158°F)
3 V DC	75%V or less of rated voltage (Initial)	10%V or more of rated voltage (Initial)	66.6 mA	45 Ω	200 mW	110%V of rated voltage
4.5 V DC			44.4 mA	101.2 Ω		
12 V DC			16.6 mA	720 Ω		
24 V DC			8.3 mA	2,880 Ω		

* Square, pulse drive (JIS C5442)

2) 2 coil latching

Rated voltage	Set voltage* (at 20°C 68°F)	Reset voltage* (at 20°C 68°F)	Rated operating current [±10%] (at 20°C 68°F)	Coil resistance [±10%] (at 20°C 68°F)	Rated operating power	Max. allowable voltage (at 70°C 158°F)
3 V DC	75%V or less of rated voltage (Initial)	75%V or less of rated voltage (Initial)	50 mA	60 Ω	150 mW	110%V of rated voltage
4.5 V DC			33.3 mA	135 Ω		
12 V DC			12.5 mA	960 Ω		
24 V DC			6.3 mA	3,840 Ω		

* Square, pulse drive (JIS C5442)

2. Specifications

Characteristics		Item	Specifications
Contact data	Arrangement		2 Form C
	Contact resistance (initial)		Max. 150mΩ (By voltage drop 10V DC 10mA)
	Contact material		Gold plating
	Contact rating (resistive)		1W (at 5GHz, Impedance 50Ω, V.S.W.R. ≦ 1.25) 10mA 10V DC
	Contact input power		1W (at 5GHz, Impedance 50Ω, V.S.W.R. ≦ 1.25)
	Max. switching voltage		30V DC
	Max. switching current		0.3A DC
High frequency characteristics (Initial) (~5GHz, Impedance 50Ω)	V.S.W.R.		Max. 1.25
	Insertion loss (without D.U.T. board's loss)		Max. 0.5dB
	Isolation	Between open contacts	Min. 35dB
		Between contact sets	Min. 30dB
	Input power		1W (at 5GHz, impedance 50Ω, V.S.W.R. ≦ 1.25, at 20°C)
Insulation resistance (Initial)			Min. 500MΩ (at 500V DC, Measured portion is the same as the case of dielectric voltage.)
Breakdown voltage (Initial)	Between open contacts		500 Vrms for 1min. (detection current: 10mA)
	Between contact sets		500 Vrms for 1min. (detection current: 10mA)
	Between contact and coil		500 Vrms for 1min. (detection current: 10mA)
	Between coil and earth terminal		500 Vrms for 1min. (detection current: 10mA)
	Between contact and earth terminal		500 Vrms for 1min. (detection current: 10mA)
Time characteristics	Operate [Set] time (initial)		Max. 5ms (at 20°C 68°F, at rated voltage, without bounce)
	Release [Reset] time (initial)		Max. 5ms (at 20°C 68°F, at rated voltage, without bounce, without diode)
Mechanical characteristics	Shock resistance	Functional	Min. 500 m/s ² (half-sine shock pulse: 6ms; detection time: 10μs)
		Destructive	Min. 1,000 m/s ² (half-sine shock pulse: 11ms)
	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. 10 ⁷ (at 180 times/min.)
	Electrical		Min. 10 ⁶ (at 20 times/min.) (1W, at 5GHz, V.S.W.R. ≦ 1.25) Min. 10 ⁶ (at 20 times/min.) (10mA 10V DC resistive)
Conditions	Conditions for operation, transport and storage*		Ambient temperature: -30 to +70°C -22 to +158°F Humidity: 5 to 85% R.H. (Not freezing and condensing at low temperature)
Unit weight			Approx. 3 g .11 oz

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

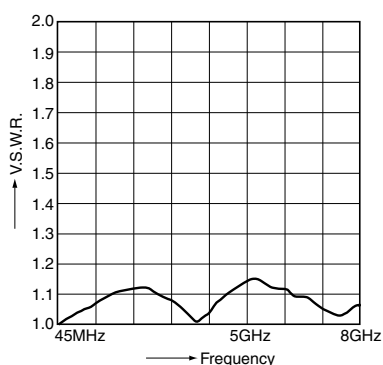
REFERENCE DATA

1. High frequency characteristics

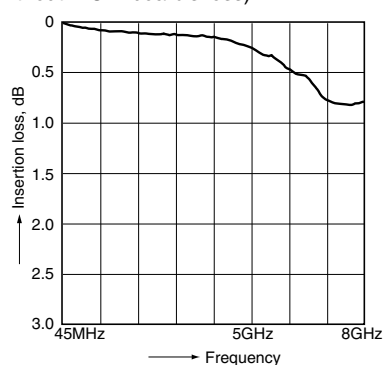
Sample: ARJ20A12

Measuring method: Measured by using our PC board for measurement and HP network analyzer (HP8510C).

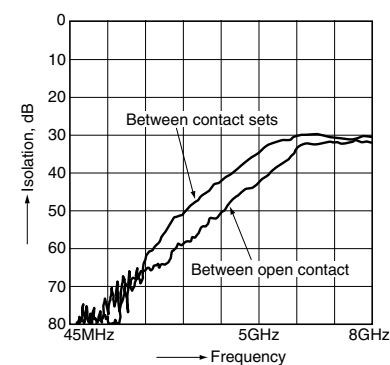
• V.S.W.R. characteristics



• Insertion loss characteristics (without D.U.T. board's loss)



• Isolation characteristics

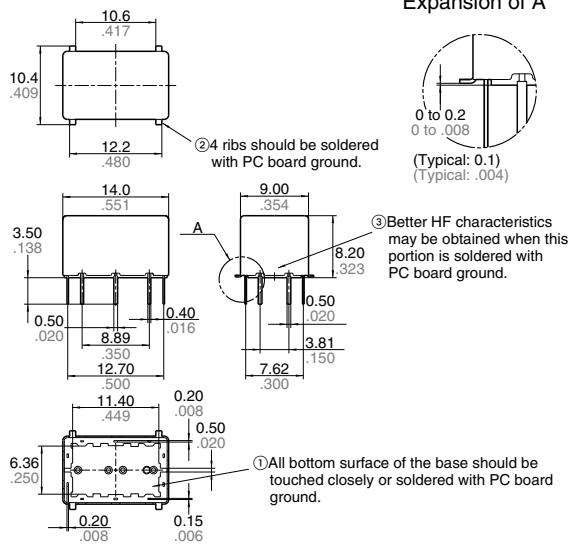


DIMENSIONS (mm inch)

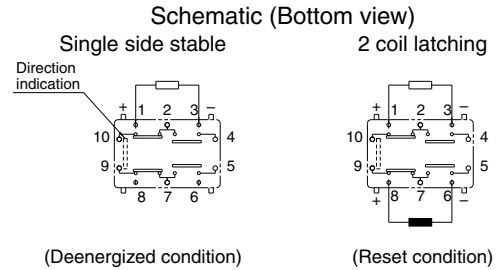
The CAD data of the products with a **CAD** mark can be downloaded from: <http://industrial.panasonic.com/ac/e/>

1. Standard PC board terminal

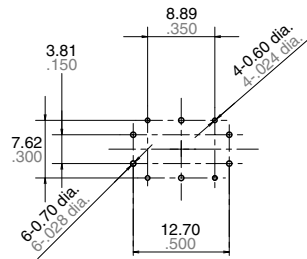
CAD



Tolerance: $\pm 0.3 \pm .012$



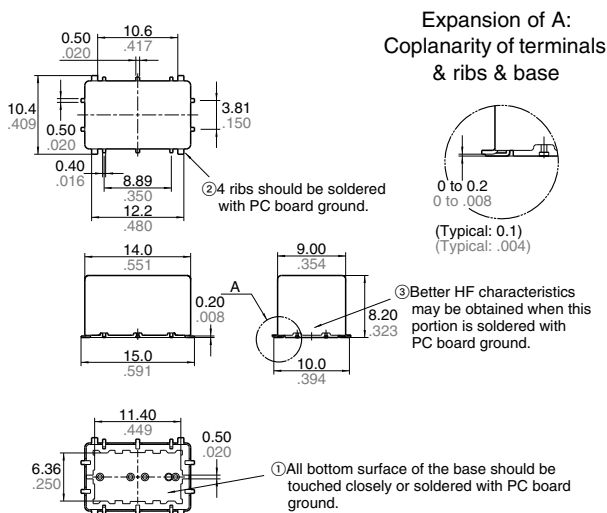
PC board pattern



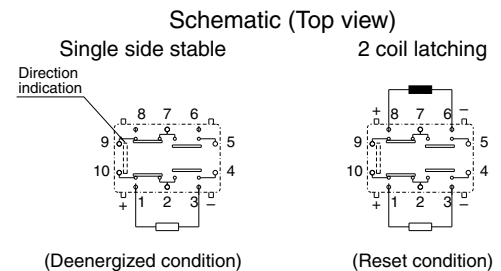
Tolerance: $\pm 0.1 \pm .004$

2. Surface mount terminal

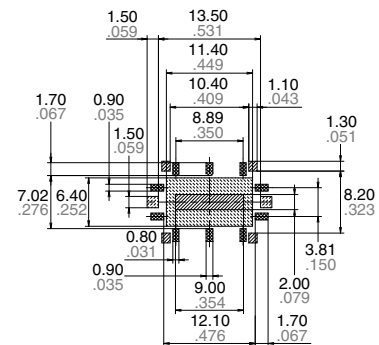
CAD



Tolerance: $\pm 0.3 \pm .012$



PC board pattern



Tolerance: $\pm 0.1 \pm .004$

Note: Please consult us regarding recommended PC board patterns.

Relay terminals.
Ground. Note that soldering is required.
Ground. Note that you must determine the necessity of solder based on effect of heat when soldering.
Ground. Note that some extra work is required due to the effect of lifting when soldering.

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

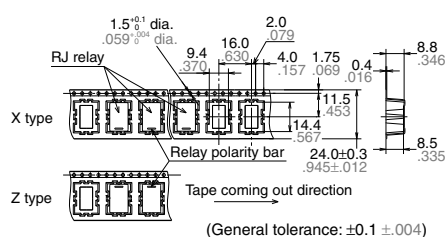
Since RJ relays are highly sensitive polarized relays, their characteristics will be affected by a strong external magnetic field. Avoid using the relay under that condition.

4. Cleaning

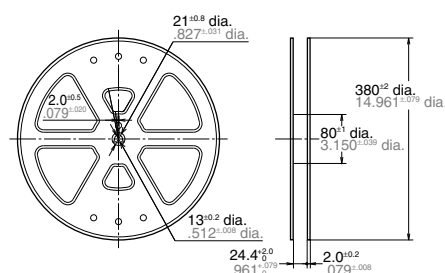
For automatic cleaning, the boiling method is recommended. Avoid ultrasonic cleaning which subjects the relays to high frequency vibrations, which may cause the contacts to stick. It is recommended that alcoholic solvents be used.

5. Tape and reel packing

1) Tape dimensions



2) Dimensions of plastic reel



6. Conditions for operation, transport and storage conditions

1) Ambient temperature, humidity, and atmospheric pressure during usage, transport, and storage of the relay:

(1) Temperature:

−30 to +70°C −22 to +158°F

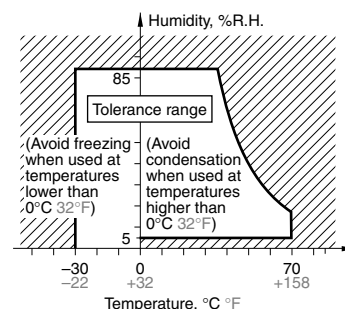
(However, tolerance range is −30 to +60°C −22 to +140°F if package is carried as is.)

(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.

5) 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 solder 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.

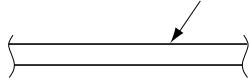
7. Soldering

1) Surface-mount terminal

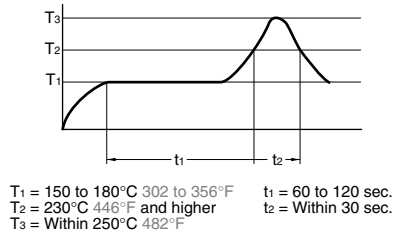
In case of automatic soldering, the following conditions should be observed

(1) Position of measuring temperature

Surface of PC board where relay is mounted.



(2) IR (infrared reflow) soldering method



Temperature rise of relay itself may vary according to the mounting level or the heating method of reflow equipment. Therefore, please set the temperature of soldering portion of relay terminal and the top surface of the relay case not to exceed the above mentioned soldering condition. It is recommended to check the temperature rise of each portion under actual mounting condition before use.

2) Standard PC board terminal

Please meet the following conditions if this relay is to be automatically soldered.

(1) Preheating: Max. $120^\circ\text{C } 248^\circ\text{F}$ (terminal solder surface) for max. 120 seconds

(2) Soldering: Max. $260 \pm 5^\circ\text{C } 500 \pm 9^\circ\text{F}$ for max. 6 seconds
The effect on the relay depends on the actual substrate used. Please verify the substrate to be used.

Moisture-proof packaging enables RJ relay's standard PCB type capable for reflow soldering.

Please contact us in the case of reflow soldering considerations.

3) Hand soldering

Please meet the following conditions if this relay is to be soldered by hand.

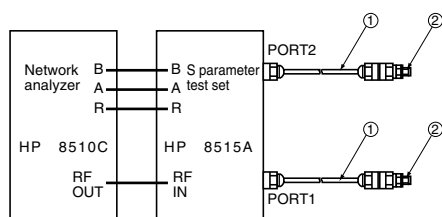
(1) Wattage: 30 to 60 W

(2) Tip temperature/time: $280 \text{ to } 300^\circ\text{C } 536 \text{ to } 572^\circ\text{F}$ for max. 5 seconds

The effect on the relay depends on the actual substrate used. Please verify the substrate to be used.

4) Avoid high frequency cleaning since this may adversely affect relay characteristics. Use alcohol-based cleaning solutions when cleaning relays.

8. Measuring method (50Ω type)



Connect connectors 1 and 2 respectively to PORT 1 and PORT 2. Perform calibration using the 3.5 mm .138 inch calibration kit (HP85052B).

No.	Part number	Description
1	HP 85131	3.5 mm .138 inch Test port, Extension cable
2	HP 83059	3.5 mm .138 inch Coaxial Adapter

After calibration, connect the D.U.T board and measure. Non measure terminals: 50 Ω termination

*Isolation (Between contact sets): Measured between open contact (4-5 terminal, 9-10 terminal)

Notes:

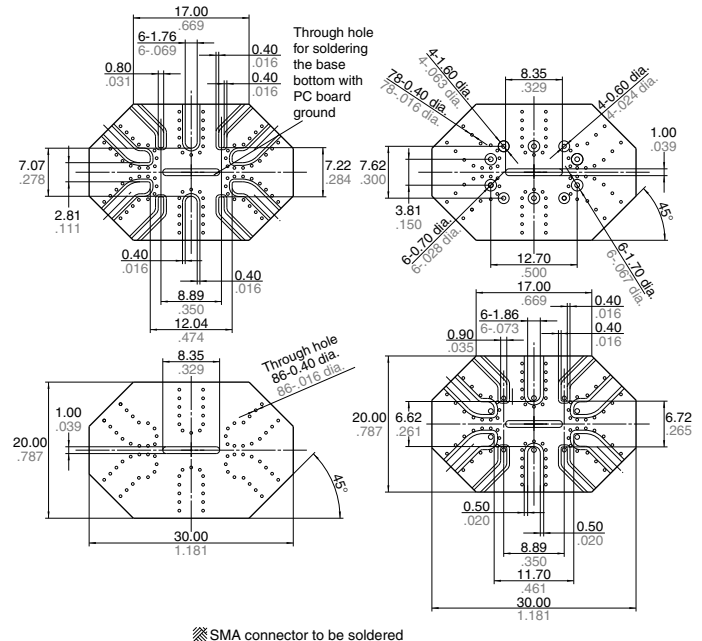
1. All bottom surface of the base should be touched closely or soldered with PC board ground.
2. 4 ribs should be soldered with PC board ground.

D.U.T board

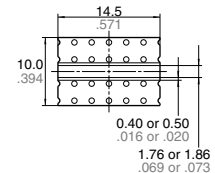
Dimensions (mm inch)

<Surface mount terminal>

<Standard PC board terminal>



<Calibration board>



Material: Glass PTFE double-sided through hole PC board R-4737 (manufactured by our company)

Board thickness: $t = 0.8 \text{ mm}$

Copper plating: 18μm

Connector (SMA type receptacle)

Product name: R125 510 (RADIALL)

Insertion loss compensation;

The insertion loss of relay itself is given by subtracting the insertion loss of short-circuit the Com and the NC (or NO). (signal path and two connectors)

9. Others

1) The switching 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.

- When used for AC load-operating and the operating phase is synchronous. Rocking and fusing can easily occur due to contact shifting.

- 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 fused by the arc energy and HNO_3 is formed. This can corrode metal materials.

Three countermeasures for these are listed here.

(1) Incorporate an arc-extinguishing circuit.

(2) Lower the operating frequency

(3) Lower the ambient humidity

2) Use the relay within specifications such as coil rating, contact rating and on/off service life. If used beyond limits, the relay may overheat, generate smoke or catch fire.

3) Be careful not to drop the relay. If accidentally dropped, carefully check its appearance and characteristics before use.

4) Be careful to wire the relay correctly. Otherwise, malfunction, overheat, fire or other trouble may occur.

5) If a relay stays on in a circuit for many months or years at a time without being activated, circuit design should be reviewed so that the relay can remain non-excited. A coil that receives current all the time heats, which degrades insulation earlier than expected. A latching type relay is recommended for such circuits.

6) The latching type relay is shipped in the reset position. But jolts during transport or impacts during installation can change the reset position. It is, therefore, advisable to build a circuit in which the relay can be initialized (set and reset) just after turning on the power.

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.

8) We recommend latching type when using in applications which involve lengthy duty cycles.

* Japanese Industrial Standards

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

Please contact

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Electromechanical Control Business Division

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industrial.panasonic.com/ac/e/

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