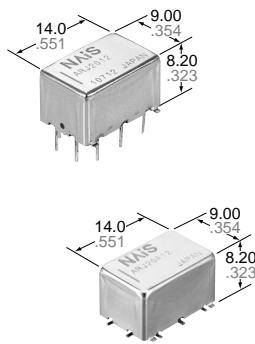


NAiS

SMD RELAYS  
WITH 8GHz CAPABILITIES

RJ-RELAYS



## 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) x 9.00 (W) x 8.20 (H) mm

.551 (L) x .354 (W) x .323 (H) inch

TYPICAL  
APPLICATIONS

## Measurement equipment market

Attenuator circuits, spectrum analyzer, oscilloscope, mobile equipment, tester

## Mobile telecommunication market

IMT2000, microwave communication

## Medical instruments market

## SPECIFICATIONS

## Contact

Arrangement		2 Form C
Contact material		Gold alloy
Initial contact resistance		Max. 150mΩ
Rating	Contact rating	1W (at 5 GHz, Impedance 50 Ω, V.S.W.R. ≤ 1.25) 10mA 10V DC (resistive load)
	Contact carrying power	1W (at 5 GHz, Impedance 50 Ω, V.S.W.R. ≤ 1.25)
	Max. switching voltage	30 V DC
	Max. switching current	0.3 A 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
	Input power	Between contact sets
		Min. 30dB
	Input power	
Expected life (min. operations)	Mechanical (at 180 cpm)	10 <sup>7</sup>
	Electrical (at 20cpm)	1W, at 5GHz, V.S.W.R. ≤ 1.25
		10 <sup>5</sup>
	10mA 10V DC (resistive load)	
	10 <sup>6</sup>	

## Coil (at 20°C, 68°F)

	Nominal operating power	
Single side stable	200 mW	
2 coil latching	150 mW	

## Characteristics

Initial insulation resistance* <sup>1</sup>	Min. 500 MΩ (at 500 V DC)
Initial breakdown voltage* <sup>2</sup>	Between open contacts
	Between contact sets
	Between contact and coil
Operate time [Set time]* <sup>3</sup> (at 20°C)	Max. 5ms
Release time (without diode)[Reset time]* <sup>3</sup> (at 20°C)	Max. 5ms
Temperature rise (at 20°C)* <sup>4</sup>	Max. 50°C
Shock resistance	Functional* <sup>5</sup>
	Destructive* <sup>6</sup>
Vibration resistance	Functional* <sup>7</sup>
	Destructive
Conditions for operation, transport and storage* <sup>8</sup> (Not freezing and condensing at low temperature)	Ambient temp. -30°C to 70°C -22°F to 158°F
Humidity	
Unit weight	Approx. 3 g .11 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> Nominal operating voltage applied to the coil, excluding contact bounce time.\*<sup>4</sup> By resistive method, nominal voltage applied to the coil, 5GHz, V.S.W.R. ≤ 1.25\*<sup>5</sup> Half-wave pulse of sine wave: 6ms, detection time: 10μs.\*<sup>6</sup> Pulse of sine wave: 11ms.\*<sup>7</sup> Detection time: 10μs\*<sup>8</sup> Refer to 6. Conditions for operation, transport and storage mentioned in NOTES

## ORDERING INFORMATION

Ex. ARJ 2

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

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".

## TYPES AND COIL DATA (at 20°C 68°F)

### 1. Standard PC board terminal

- Packing of standard PC board terminal: 50 pcs. in an inner package (carton); 500 pcs. in an outer package

Operating function	Coil Rating, V DC	Part No.	Pick-up voltage, V DC (max.) (initial)	Drop-out voltage, V DC (min.) (initial)	Nominal operating current, mA (±10%)	Coil resistance, Ω (±10%)	Nominal operating power, mW	Max. allowable voltage, V DC
		Standard PC board terminal						
Single side stable	3	ARJ2003	2.25	0.3	66.6	45	200	3.3
	4.5	ARJ204H	3.375	0.45	44.4	101.2	200	4.95
	12	ARJ2012	9	1.2	16.6	720	200	13.2
	24	ARJ2024	18	2.4	8.3	2,880	200	26.4

Operating function	Coil Rating, V DC	Part No.	Set voltage, V DC (max.) (initial)	Reset voltage, V DC (min.) (initial)	Nominal operating current, mA (±10%)	Coil resistance, Ω (±10%)	Nominal operating power, mW	Max. allowable voltage, V DC
		Standard PC board terminal						
2 coil latching	3	ARJ2203	2.25	2.25	50	60	150	3.3
	4.5	ARJ224H	3.375	3.375	33.3	135	150	4.95
	12	ARJ2212	9	9	12.5	960	150	13.2
	24	ARJ2224	18	18	6.3	3,840	150	26.4

### 2. Surface-mount terminal

- Packing of surface-mount terminal: 50 pcs. in an inner package (carton); 500 pcs. in an outer package
- Packing of surface-mount terminal: 500 pcs. in an inner package (tape and reel); 500 pcs. in an outer package

Operating function	Coil Rating, V DC	Part No.		Pick-up voltage, V DC (max.) (initial)	Drop-out voltage, V DC (min.) (initial)	Nominal operating current, mA (±10%)	Coil resistance, Ω (±10%)	Nominal operating power, mW	Max. allowable voltage, V DC
		Carton packing	Tape and reel packing						
Single side stable	3	ARJ20A03	ARJ20A03Z	2.25	0.3	66.6	45	200	3.3
	4.5	ARJ20A4H	ARJ20A4HZ	3.375	0.45	44.4	101.2	200	4.95
	12	ARJ20A12	ARJ20A12Z	9	1.2	16.6	720	200	13.2
	24	ARJ20A24	ARJ20A24Z	18	2.4	8.3	2,880	200	26.4

Operating function	Coil Rating, V DC	Part No.		Set voltage, V DC (max.) (initial)	Reset voltage, V DC (min.) (initial)	Nominal operating current, mA (±10%)	Coil resistance, Ω (±10%)	Nominal operating power, mW	Max. allowable voltage, V DC
		Carton packing	Tape and reel packing						
2 coil latching	3	ARJ22A03	ARJ22A03Z	2.25	2.25	50	60	150	3.3
	4.5	ARJ22A4H	ARJ22A4HZ	3.375	3.375	33.3	135	150	4.95
	12	ARJ22A12	ARJ22A12Z	9	9	12.5	960	150	13.2
	24	ARJ22A24	ARJ22A24Z	18	18	6.3	3,840	150	26.4

## REFERENCE DATA

### 1. High frequency characteristics

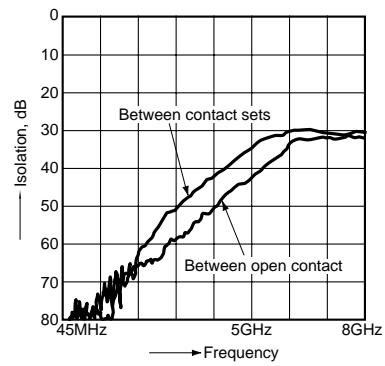
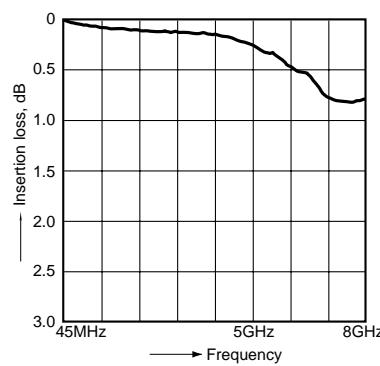
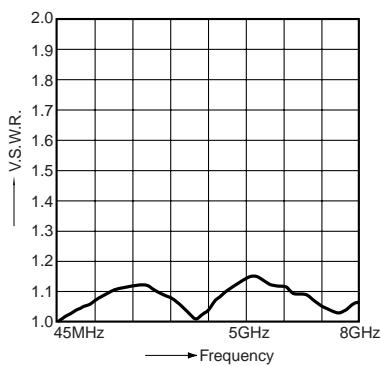
Sample: ARJ20A12

Measuring method: Measured with MEW PC board by HP network analyzer (HP8510C).

• V.S.W.R. characteristics

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

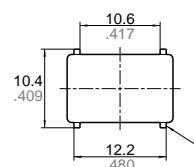
• Isolation characteristics



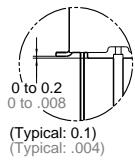
## DIMENSIONS

mm inch

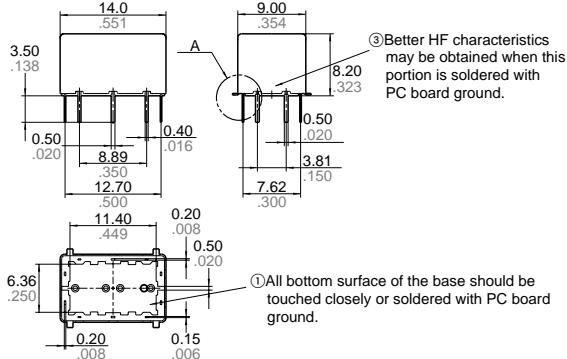
### 1. Standard PC board terminal



Expansion of A



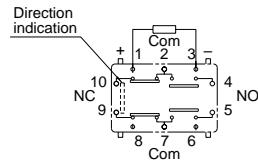
② 4 ribs should be soldered with PC board ground.  
0 to 0.2  
0 to .008  
(Typical: 0.1)  
(Typical: .004)



General tolerance:  $\pm 0.3 \pm 0.012$

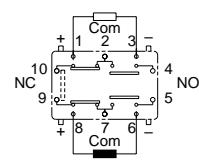
Schematic (Bottom view)

Single side stable



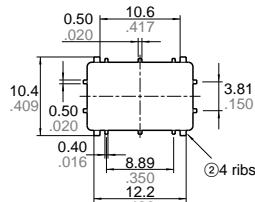
(Deenergized condition)

2 coil latching

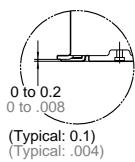


(Reset condition)

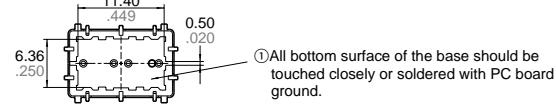
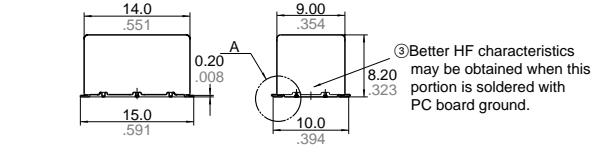
### 2. Surface mount terminal



Expansion of A

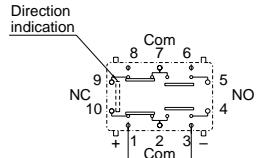


0 to 0.2  
0 to .008  
(Typical: 0.1)  
(Typical: .004)



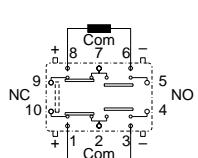
Schematic (Top view)

Single side stable



(Deenergized condition)

2 coil latching



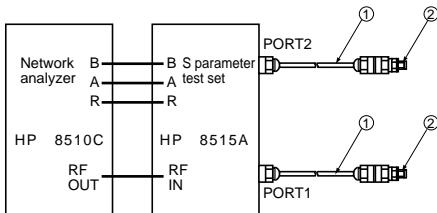
(Reset condition)

General tolerance:  $\pm 0.3 \pm 0.012$



# RJ(ARJ2)

## Measuring method (Impedance 50Ω)



## Connector

No.	Product name	Contents
1	HP 85131-60013	3.5 mm testport, Extension cable
2	HP 83059	3.5 mm coaxial adaptor

(Step 1) Calibrate the test system with HP calibration kit [HP85052B]

(Step 2) After calibration, connect the D.U.T. board and measure. Connect 50 Ω terminals on connectors other than those for measurement.

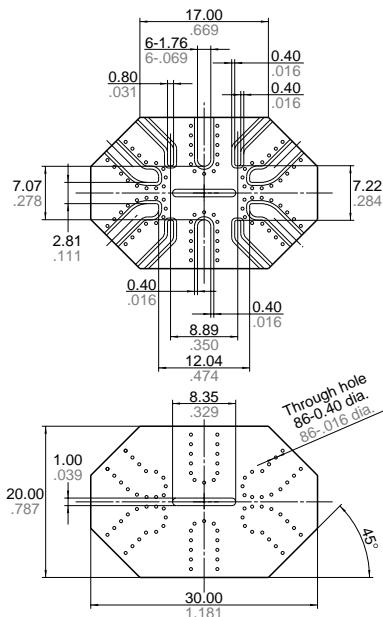
### Notes)

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.

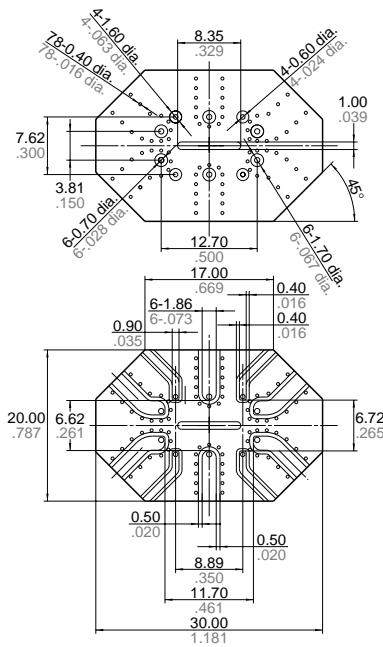
## Measuring board

### 1) Dimensions

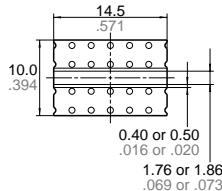
#### <Surface mount terminal>



#### <Standard PC board terminal>



#### <Calibration board>



2) Material: Glass PTFE double-sided through hole PC board R-4737 (Matsushita Electric Works)

3) Board thickness:  $t = 0.8$  mm

4) Copper plating: 18 $\mu$ m

• 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<sub>3</sub> 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