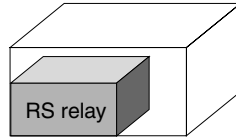


mm inch

## FEATURES

### 1. Super miniature design

14 × 8.6 × 7 mm .551 × .339 × .276 inch

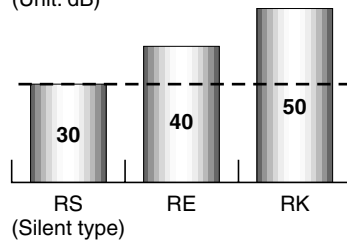


60% OFF in volume  
(Compared to RK/RE)

### 2. Lineup includes silent type.

Operation noise

(Unit: dB)



### 3. Excellent high frequency

**characteristics (to 3 GHz, Impedance: 75Ω)**

Frequency	to 900 MHz	to 3 GHz
V. S. W. R. (Max.)	1.15	1.4
Insertion loss (dB, Max.)	0.1	0.3
Isolation (dB, Min.)	60	30

### 4. Lineup includes reversed contact type

Great design freedom is possible using reversed contact type in which the positions of the N.O. and N.C. contacts are switched.

**RoHS Directive compatibility information**  
<http://www.mew.co.jp/ac/e/environment/>

## SPECIFICATIONS

Contact		Characteristics		
Arrangement	1 Form C	Initial insulation resistance*1	Min. 100 MΩ at 500 V DC	
Contact material	Gold	Initial breakdown voltage*2	Between open contacts: 500 Vrms	
Initial contact resistance, max. (By voltage drop 10V DC 10mA)	100 mΩ		Between contact and earth terminal: 500 Vrms	
Rating	Contact rating		Between contact and coil: 1,000 Vrms	
	Contact carrying power	Operate time (at 20°C 68°F)*3 (at nominal voltage)	Max. 10 ms	
	Max. switching voltage	Release time (without diode) (at 20°C 68°F)*3 (at nominal voltage)	Max. 6 ms	
	Max. switching current	Set and reset time (at 20°C 68°F)*3	Max. 10 ms	
	High frequency characteristics (Impedance 75Ω, to 3 GHz) (Initial)	V.S.W.R.	Temperature rise (at 20°C 68°F)*4	Max. 60°C 140°C
Expected life (min. operations)	Mechanical (at 180 cpm)	Shock resistance	Functional*5: Min. 196 m/s <sup>2</sup> {20 G}	
		Vibration resistance	Destructive*6: Min. 980 m/s <sup>2</sup> {100 G}	
			Conditions for operation, transport and storage (Not freezing and condensing at low temperature)	Functional*7: 10 to 55 Hz at double amplitude of 3 mm
	Electric (at 20cpm)	Destructive: 10 to 55 Hz at double amplitude of 5 mm		
		Single side stable standard type	Ambient temp.	For single side stable standard and Latching type: -40°C to 70°C -40°F to 158°F
				For single side stable silent type: -40°C to 60°C -40°F to 140°F
Single side stable silent type	Humidity	5 to 85% R.H.		
Single side stable	5 × 10 <sup>6</sup>	Unit weight	Approx. 2 g .071 oz	
Single side stable silent type	10 <sup>6</sup>	<b>Remarks</b>		
Latching type	10 <sup>6</sup>	* Specifications will vary with foreign standards certification ratings.		
10 m A 24 VDC (resistive load)	3 × 10 <sup>5</sup>	*1 Measurement at same location as "Initial breakdown voltage" section		
1 W, at 3GHz, Impedance: 75Ω, V.S.W.R: Max. 1.4	3 × 10 <sup>5</sup>	*2 Detection current: 10mA		
		*3 Excluding contact bounce time		
		*4 By resistive method, nominal voltage applied to the coil, contact current 10 mA		
		*5 Half-wave pulse of sine wave: 11ms, detection time: 10μs		
		*6 Half-wave pulse of sine wave: 6ms		
		*7 Detection time: 10μs		

### Coil (at 25°C, 68°F)

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

## TYPICAL APPLICATIONS

## 1. Broadcasting and video equipment markets

- Digital broadcasting market
- STB/tuner market, etc.

## 2. Communications market

- Antennae switching
- All types of wireless devices

## ORDERING INFORMATION

Ex. ARS    

Contact arrangement	Operating function	Coil voltage, DC
1: Standard contact type (1 Form C) 3: Reversed contact type (1 Form C)	0: Single side stable standard type (Impedance: 75Ω) 1: 1 coil latching (Impedance: 75Ω) 2: 2 coil latching (Impedance: 75Ω) 3: Single side stable silent type (Impedance: 75Ω)	03: 3 V 4H: 4.5 V 09: 9 V 12: 12 V 24: 24 V

## TYPES AND 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)
Standard type		Silent type								
Standard contact type	Reversed contact type	Standard contact type	Reversed contact type							
ARS1003	ARS3003	ARS1303	ARS3303	3	2.25	0.3	45	66.7	200	3.3
ARS104H	ARS304H	ARS134H	ARS334H	4.5	3.38	0.45	101.3	44.4	200	4.95
ARS1009	ARS3009	ARS1309	ARS3309	9	6.75	0.9	405	22.2	200	9.9
ARS1012	ARS3012	ARS1312	ARS3312	12	9	1.2	720	16.7	200	13.2
ARS1024	ARS3024	ARS1324	ARS3324	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)
Standard contact type	Reversed contact type							
ARS1103	ARS3103	3	2.25	2.25	45	66.7	200	3.3
ARS114H	ARS314H	4.5	3.38	3.38	101.3	44.4	200	4.95
ARS1109	ARS3109	9	6.75	6.75	405	22.2	200	9.9
ARS1112	ARS3112	12	9	9	720	16.7	200	13.2
ARS1124	ARS3124	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)
Standard contact type	Reversed contact type							
ARS1203	ARS3203	3	2.25	2.25	22.5	133.3	400	3.3
ARS124H	ARS324H	4.5	3.38	3.38	50.6	88.9	400	4.95
ARS1209	ARS3209	9	6.75	6.75	202.5	44.4	400	9.9
ARS1212	ARS3212	12	9	9	360	33.3	400	13.2
ARS1224	ARS3224	24	18	18	1,440	16.7	400	26.4

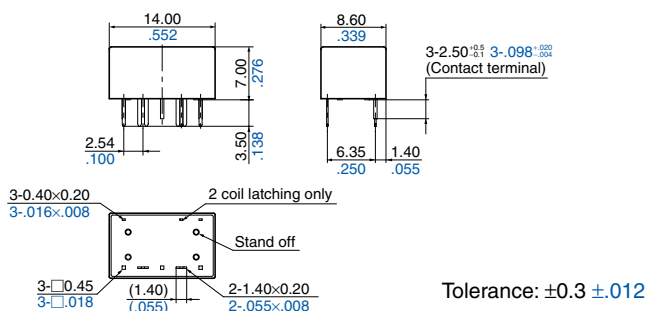
Notes: Packing of standard contact (1 Form C) type: 50 pcs. in an inner package (carton), 500 pcs. in outer package (case)

Packing of reversed contact type: 50 pcs. in an inner package (carton), 500 pcs. in outer package (case)

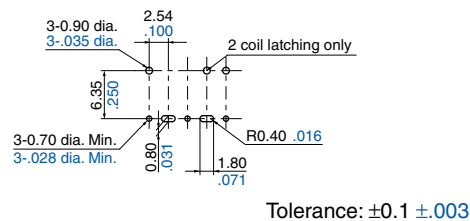
# RS (ARS)

## DIMENSIONS

mm inch



### PC board pattern (Bottom view)



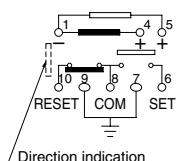
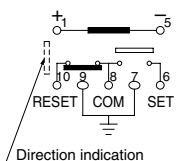
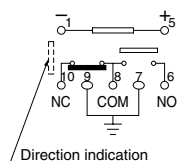
### Schematic (Bottom view)

#### 1. Standard contact type

Single side stable type  
(Deenergized condition)

1 coil latching type  
(Reset condition)

2 coil latching type  
(Reset condition)

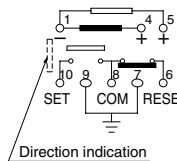
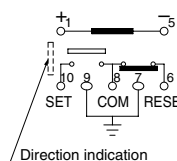
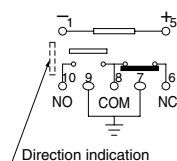


#### 2. Reversed contact type

Single side stable type  
(Deenergized condition)

1 coil latching type  
(Reset condition)

2 coil latching type  
(Reset condition)



## REFERENCE DATA

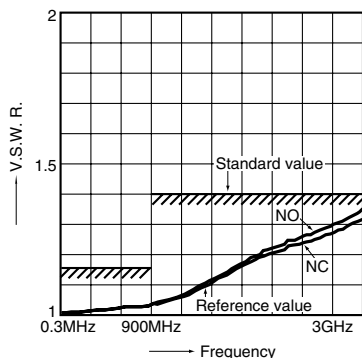
### 1. High frequency characteristics

Sample: ARS104H

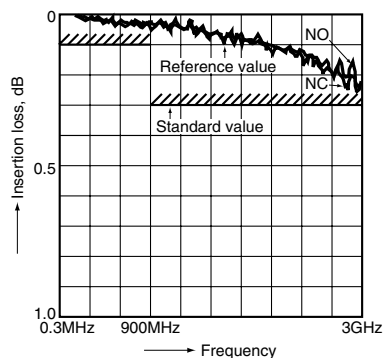
Measuring method: Measured with MEW PC board by Agilent Technologies network analyzer (E8363B).

\*For details see No. 7 under "NOTES".

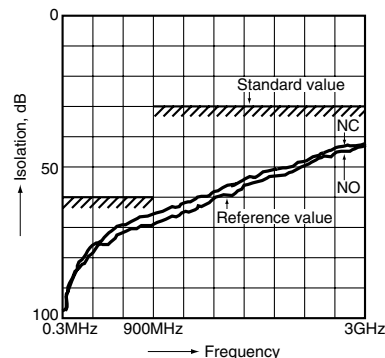
#### • V.S.W.R. characteristics



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

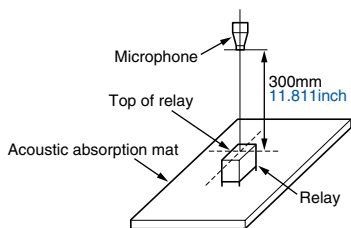


#### • Isolation characteristics

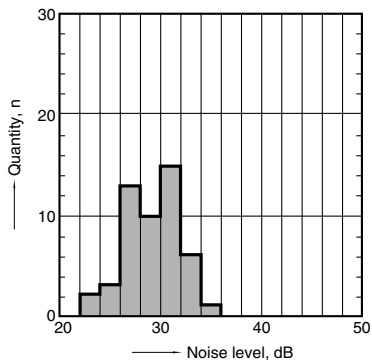


## 2.-(1) Operation noise distribution

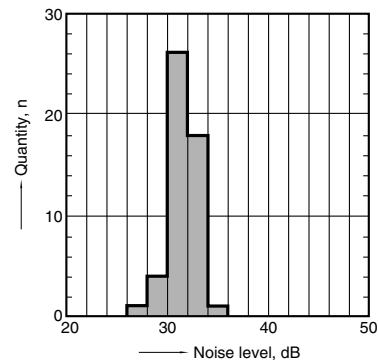
Sample: ARS134H (single side stable silent type), 50 pcs.  
 Coil voltage: rated voltage applied (with diode)  
 Equipment setting: A weighted sound pressure level, FAST.  
 Background noise: approx. 20 dB  
 Method of measurement: See figure below.



When operated

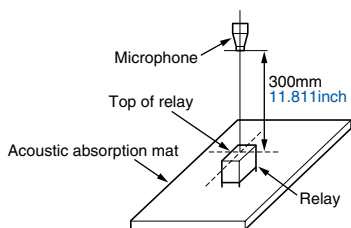


When released

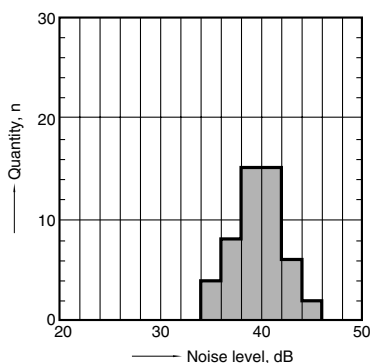


## 2.-(2) Operation noise distribution

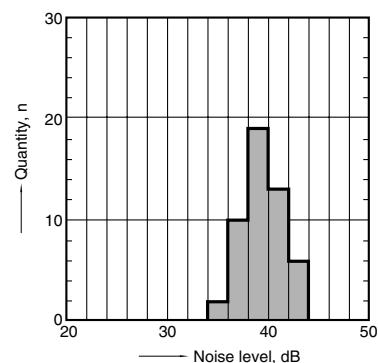
Sample: ARS104H (single side stable standard type), 50 pcs.  
 Coil voltage: rated voltage applied (with diode)  
 Equipment setting: A weighted sound pressure level, FAST.  
 Background noise: approx. 20 dB  
 Method of measurement: See figure below.



When operated

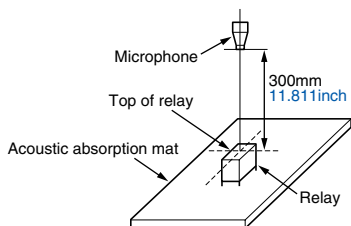


When released

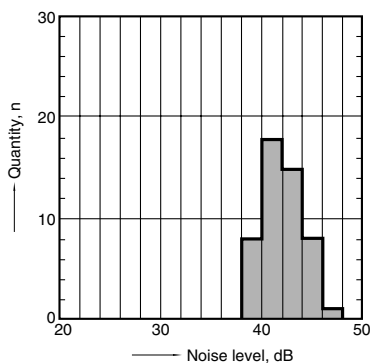


## 2.-(3) Operation noise distribution

Sample: ARS114H (latching type), 50 pcs.  
 Coil voltage: rated voltage applied (with diode)  
 Equipment setting: A weighted sound pressure level, FAST.  
 Background noise: approx. 20 dB  
 Method of measurement: See figure below.



When set and reset



## 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 30 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 RS 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. Conditions for operation, transport and storage conditions

#### 1) Temperature

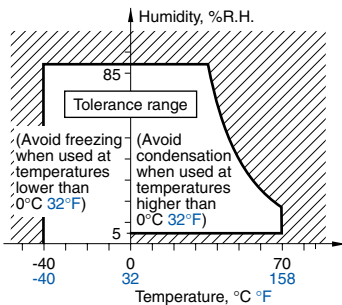
- Single side stable standard and latching type:  $-40$  to  $70^{\circ}\text{C}$   $-40$  to  $158^{\circ}\text{F}$
- Single side stable silent type:  $-40$  to  $60^{\circ}\text{C}$   $-40$  to  $140^{\circ}\text{F}$

#### 2) Humidity: 5 to 85% RH

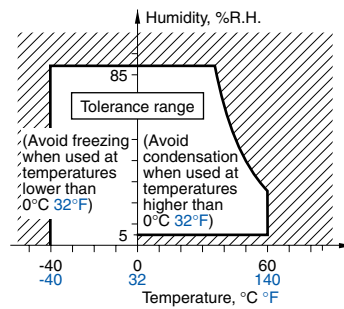
(Avoid freezing and condensation.) The humidity range varies with the temperature. Use within the range indicated in the graph below.

3) Atmospheric pressure: 86 to 106 kPa  
Temperature and humidity range for usage, transport, and storage:

Single side stable standard and latching type



### Single side stable silent type



### 4) 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.

### 5) Freezing

Condensation or other moisture may freeze on the relay when the temperature is lower than  $0^{\circ}\text{C}$   $32^{\circ}\text{F}$ . This causes problems such as sticking of movable parts or operational time lags.

### 6) 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. Soldering

1) 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.  $260\pm 5^{\circ}\text{C}$   $500\pm 41^{\circ}\text{F}$  for max. 6 seconds

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

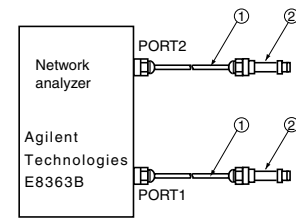
2) Please meet the following conditions if this relay is to be soldered by hand.

(1)  $260^{\circ}\text{C}$  for max. 10 seconds

(2)  $350^{\circ}\text{C}$  for max. 3 seconds

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

### 7. Measuring method (Impedance $75\Omega$ )



#### Connector

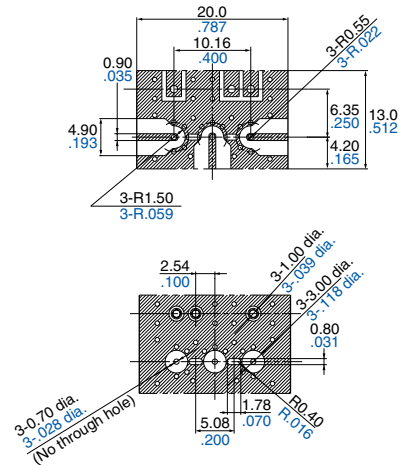
Connect connectors 1 and 2 respectively to PORT 1 and PORT 2, and then perform calibration using the  $75\Omega$  F type.

No.	Product name	Contents
1	85134-60003	Test port cable
2	11852B	Conversion adapter; $50\Omega$ N type (female) to $75\Omega$ N type (male)
	85039-60011	Conversion adapter; $75\Omega$ N type (female) to $75\Omega$ F type (male)

After calibration, connect the D.U.T. board and measure.

#### PC board

Dimensions (mm inch)



Material: Glass PTFE double-sided through hole PC board R-4737

(Matsushita Electric Works)

Board thickness:  $t = 0.8$  mm

Copper plating:  $18\mu\text{m}$

Connector (F type receptacle)

Product name: C05-0236 (Komine Musen Electric Corporation)

**8. 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.

### High Frequency Relays – Television Broadcasting

Televisions and broadcasting equipment use relays to switch between signal sources. A set top box enables a TV to receive and decode digital television. These receivers are necessary for viewers using analog television sets to receive digital broadcasts. A set top box also allows a television to become a user interface to the internet. A digital video recorder (DVR) is essentially a set top box with recording capability.

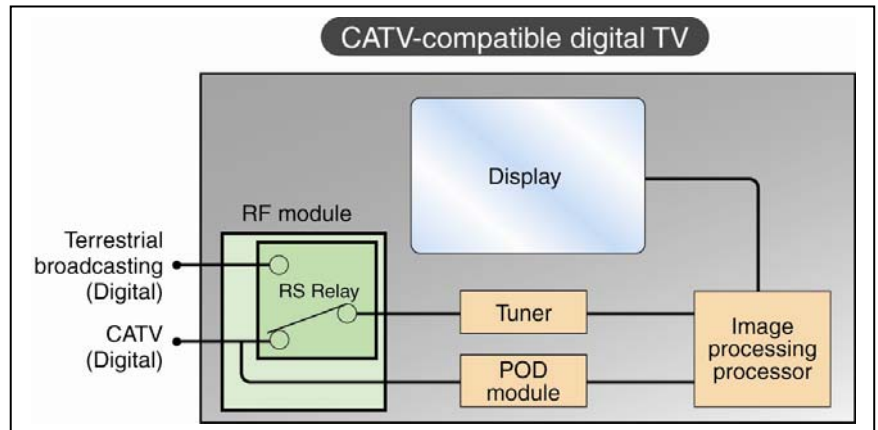
Possibilities for a signal source:

- Satellite dish, cable television and VHF/UHF antenna
- Ethernet cable, telephone line (including DSL)



Televisions can use a relay or RF module with a metal housing and external connectors. In addition to the relay an RF module also contains electronic components such as capacitors and resistors. The configuration is designed to customer requirements with additional options based on the application.

A set top box that contains a cable TV tuner uses a relay to switch between the cable and antenna input.



**Isolation** characteristics of the relay are a key component to prevent signal leakage between contacts. A higher isolation value provides better protection against crosstalk between channels. Other considerations include relay dimensions and operating noise levels.



#### ARS

**Dimensions:** 14.0(L) x 8.6(W) x 7.0(H) mm  
**Isolation:** 60dB typ @ 900MHz  
 30dB typ @ 3GHz  
**Operating Noise:** 30dB / 40dB  
**Options:** Low operating noise versions, reversed contacts

ARS is offered in 75Ω configuration for television broadcasting applications. **ARS is the smallest 3GHz high frequency relay available.** Also offered in a low operating noise version.

PhotoMOS relays can also be used in set top box applications, such as the AQY series for billing function.



## Essential characteristics in selecting a high frequency device

1. **Contact configuration:** e.g. 1 Form C
2. **Frequency:** MHz / GHz
3. **Impedance:** 50Ω or 75Ω
4. **Insertion loss:** less than \_\_\_ dB
5. **Isolation:** more than \_\_\_ dB
6. **Return Loss:** more than \_\_\_ dB or **VSWR** less than \_\_\_
7. **Switching Power:** \_\_\_ W (Specify whether ON/OFF switching is performed while high frequency signals are passing through the device)
8. **Expected switching life:** more than \_\_\_ operations