FUJITSU THE POSSIBILITIES ARE INFINITE

# MINIATURE RELAY

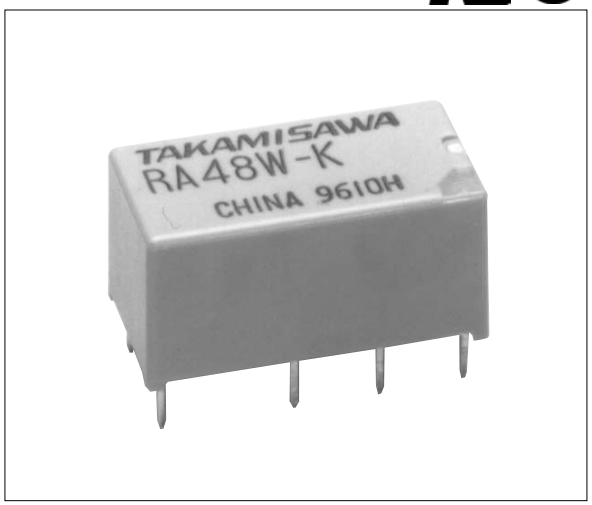
# 2 POLES—1 to 2 A (FOR SIGNAL SWITCHING)

# RA SERIES

**RoHS compliant**

## ■ FEATURES

- Ultra high sensitivity (75 to 150 mW)
- High reliability-bifurcated contacts
- Conforms to FCC rules and regulations Part 68
  —Dielectric strength 1,500 VAC between coil and contacts
  —Surge strength 1,500 V
- UL, CSA recognized
- Wide operating range
- DIL pitch terminals
- Plastic sealed type
- Latching type available
- Dial-pulse relay available
- RoHS compliant since date code: 0418H
  Please see page 7 for more information




## ■ ORDERING INFORMATION

[Example] RA (a) L (b) – (*) D (c) 12 (d) W (e) – K (f)

| | | |
|---|---|---|
| (a) | Series Name | RA : RA Series |
| (b) | Operation Function | Nil : Standard type<br>L : Latching type |
| (c) | Number of Coil | Nil : Single winding type<br>D : Double winding type |
| (d) | Nominal Voltage | Refer to the COIL DATA CHART |
| (e) | Contact | W : Bifurcated type |
| (f) | Enclosure | K : Plastic sealed type |

Note: Actual marking omits the hyphen (-) of (*)
For movable and stationary contact with gold overlay type, add suffix ""-OH"".

## ■ COIL DATA CHART

| | MODEL | Nominal voltage | Coil resistance (±10%) | Must operate voltage*1 | Must release voltage*1 | Nominal power |
|---|---|---|---|---|---|---|
| Standard Type | RA-1.5 W-K | 1.5 VDC | 15Ω | +1.0 VDC | +0.15 VDC | 150 mW |
| | RA- 3 W-K | 3 VDC | 60Ω | +2.0 VDC | +0.3 VDC | 150 mW |
| | RA-4.5 W-K | 4.5 VDC | 135Ω | +3.1 VDC | +0.45 VDC | 150 mW |
| | RA- 5 W-K | 5 VDC | 167Ω | +3.4 VDC | +0.5 VDC | 150 mW |
| | RA- 6 W-K | 6 VDC | 240Ω | +4.0 VDC | +0.6 VDC | 150 mW |
| | RA- 9 W-K | 9 VDC | 540Ω | +6.1 VDC | +0.9 VDC | 150 mW |
| | RA- 12 W-K | 12 VDC | 960Ω | +8.1 VDC | +1.2 VDC | 150 mW |
| | RA- 18 W-K | 18 VDC | 2,160Ω | +12.3 VDC | +1.8 VDC | 150 mW |
| | RA- 24 W-K | 24 VDC | 2,880Ω | +16.1 VDC | +2.4 VDC | 200 mW |
| | RA- 48 W-K | 48 VDC | 11,520Ω | +32.2 VDC | +4.8 VDC | 200 mW |

Note: *1 Specified values are subject to pulse wave voltage.
All values in the table are measured at 20°C.

| | MODEL | Nominal voltage | Coil resistance (±10%) | Set voltage*1 | Reset voltage*1 | Nominal power |
|---|---|---|---|---|---|---|
| Single Winding Latching Type | RAL-1.5 W-K | 1.5 VDC | 30Ω | +1.0 VDC | –1.0 VDC | 75 mW |
| | RAL- 3 W-K | 3 VDC | 120Ω | +2.1 VDC | –2.1 VDC | 75 mW |
| | RAL-4.5 W-K | 4.5 VDC | 270Ω | +3.1 VDC | –3.1 VDC | 75 mW |
| | RAL- 5 W-K | 5 VDC | 335Ω | +3.4 VDC | –3.4 VDC | 75 mW |
| | RAL- 6 W-K | 6 VDC | 480Ω | +4.1 VDC | –4.1 VDC | 75 mW |
| | RAL- 9 W-K | 9 VDC | 1,080Ω | +6.3 VDC | –6.3 VDC | 75 mW |
| | RAL- 12 W-K | 12 VDC | 1,920Ω | +8.3 VDC | –8.3 VDC | 75 mW |
| | RAL- 18 W-K | 18 VDC | 4,320Ω | +12.5 VDC | –12.5 VDC | 75 mW |
| | RAL- 24 W-K | 24 VDC | 5,760Ω | +16.6 VDC | –16.6 VDC | 100 mW |
| | RAL -48 W-K | 48 VDC | 11,520Ω | +21.0 VDC | –21.0 VDC | 200 mW |
| Double Winding Latching Type | RAL-D1.5 W-K | 1.5 VDC | P 15Ω | +1.0 VDC | | 150 mW |
| | | | S 15Ω | | +1.0 VDC | |
| | RAL-D 3 W-K | 3 VDC | P 60Ω | +2.0 VDC | | 150 mW |
| | | | S 60Ω | | +2.0 VDC | |
| | RAL-D4.5 W-K | 4.5 VDC | P 135Ω | +3.1 VDC | | 150 mW |
| | | | S 135Ω | | +3.1 VDC | |
| | RAL-D 5 W-K | 5 VDC | P 167Ω | +3.4 VDC | | 150 mW |
| | | | S 167Ω | | +3.4 VDC | |
| | RAL-D 6 W-K | 6 VDC | P 240Ω | +4.0 VDC | | 150 mW |
| | | | S 240Ω | | +4.0 VDC | |
| | RAL-D 9 W-K | 9 VDC | P 540Ω | +6.1 VDC | | 150 mW |
| | | | S 540Ω | | +6.1 VDC | |
| | RAL-D 12 W-K | 12 VDC | P 960Ω | +8.1 VDC | | 150 mW |
| | | | S 960Ω | | +8.1 VDC | |
| | RAL-D 18 W-K | 18 VDC | P 2,160Ω | +12.3 VDC | | 150 mW |
| | | | S 2,160Ω | | +12.3 VDC | |
| | RAL-D 24 W-K | 24 VDC | P 2,880Ω | +16.1 VDC | | 200 mW |
| | | | S 2,880Ω | | +16.1 VDC | |
| | RAL-D 48 W-K | 48 VDC | P 11,520Ω | +32.2 VDC | | 200 mW |
| | | | S 11,520Ω | | +32.2 VDC | |

Note: *1 Specified values are subject to pulse wave voltage.
All values in the table are measured at 20°C.

P: Primary coil S: Secondary coil

## ■ SPECIFICATIONS

| Item | | | Standard Type | Single Winding Latching Type | Double Winding Latching Type |
|---|---|---|---|---|---|
| | | | RA-( ) W-K | RAL-( ) W-K | RAL-D ( ) W-K |
| Contact | Arrangement | | 2 form C (DPDT) | | |
| | Material | | Gold overlay palladium | | |
| | Style | | Bifurcated (cross bar) | | |
| | Resistance (initial) | | Maximum 100 mΩ (at 1 A 6 VDC) | | |
| | Rating (resistive) | | 0.5 A 120 VAC or 1 A 24 VDC | | |
| | Maximum Carrying Current | | 2 A | | |
| | Maximum Switching Power | | 60 VA, 24 W | | |
| | Maximum Switching Voltage | | 250 VAC, 220 VDC | | |
| | Maximum Switching Current | | 2 A | | |
| | Minimum Switching Load*1 | | 0.01 mA 10 mVDC | | |
| | Capacitance (10 MHz) | | Approximately 1.5 pF (between open contacts), 1.0 pF (adjacent contacts)<br>Approximately 1.7 pF (between coil and contacts) | | |
| Coil | Nominal Power (at 20°C) | | 150 to 200 mW | 75 to 200 mW | 150 to 200 mW |
| | Operate Power (at 20°C) | | 70 to 90 mW | 40 to 50 mW | 70 to 90 mW |
| | Operating Temperature | | –40°C to +80°C (no frost) (refer to the CHARACTERISTIC DATA) | | |
| Time Value | Operate (at nominal voltage) | | Maximum 6 ms | Maximum 6 ms (set) | |
| | Release (at nominal voltage) | | Maximum 4 ms | Maximum 6 ms (reset) | |
| Life | Mechanical | | $2 \times 10^7$ operations minimum | | |
| | Electrical | | $2 \times 10^5$ ops. min. (0.5 A 120 VAC), $5 \times 10^5$ ops. min. (1 A 24 VDC) | | |
| Other | Vibration Resistance | Misoperation | 10 to 55 Hz (double amplitude of 5.0 mm) | | |
| | | Endurance | 10 to 55 Hz (double amplitude of 5.0 mm) | | |
| | Shock Resistance | Misoperation | 500 m/s$^2$ (11 ±1 ms) | | |
| | | Endurance | 1,000 m/s$^2$ ( 6 ±1 ms) | | |
| | Weight | | Approximately 3.7 g | | |

*1 Minimum switching loads mentioned above are reference values. Please perform the confirmation test with the actual load before production since reference values may vary according to switching frequencies, environmental conditions and expected reliability levels.

## ■ INSULATION

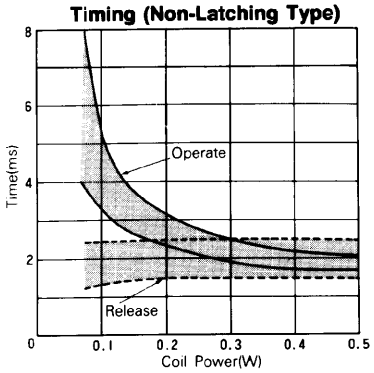
| Item | | Standard | Single latch | Double latch |
|---|---|---|---|---|
| Isolation (initial) | | Minimum 1,000 MΩ (at 500VDC) | | |
| Dielectric Strength | open contacts | 1,000VAC 1 min., | | |
| | coil and contacts/ adjacent contact | 1,500VAC 1 min., | | |
| Surge Voltage | | 1500V (coil-contact) (10/160 μs standard wave) | | |

## ■ SAFETY STANDARDS

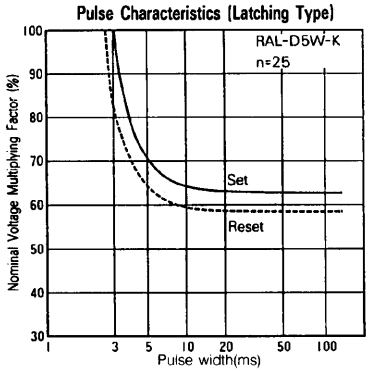
| Type | Compliance | Contact rating |
|---|---|---|
| UL | UL 478, UL 508<br>E 45026 | Flammability: UL 94-V0 (plastics)<br>0.5A, 120VAC (resistive)<br>2A, 30VDC (resistive)<br>0.5A, 60VDC (resistive) |
| CSA | C22.2 No. 14<br>LR 35579 | |

## ■ CHARACTERISTIC DATA

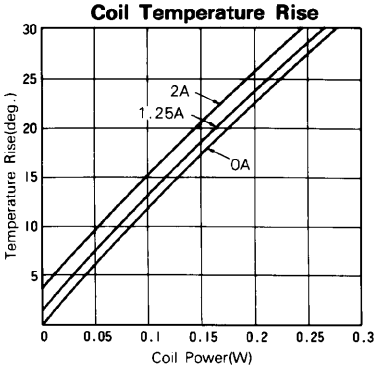
**Timing (Non-Latching Type)**



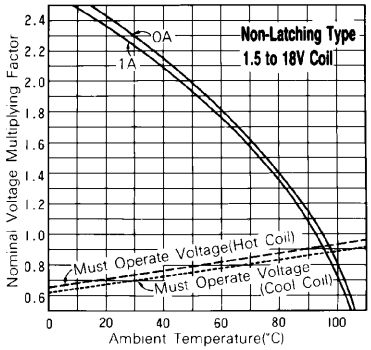

**Pulse Characteristics (Latching Type)**



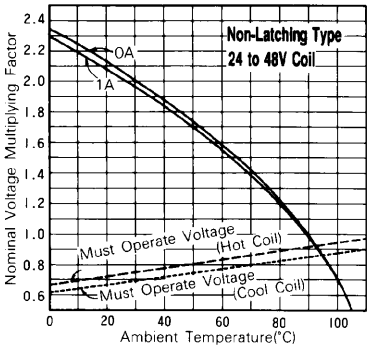

**Coil Temperature Rise**



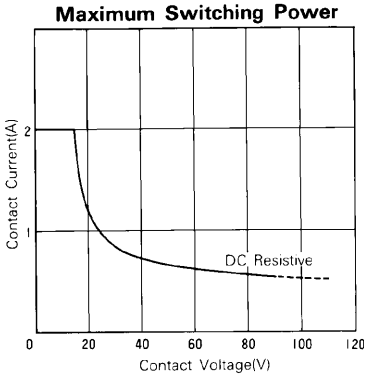

**Operating Range**



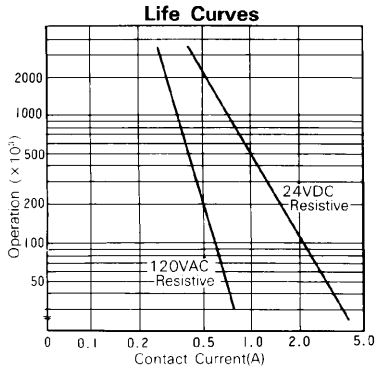

**Operating Range**




**Maximum Switching Power**

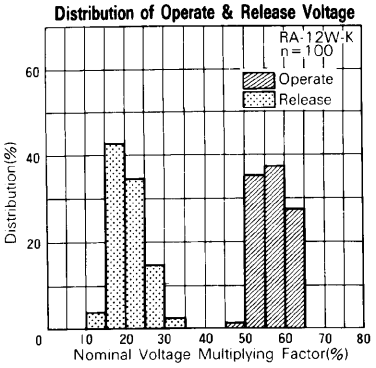



**Life Curves**

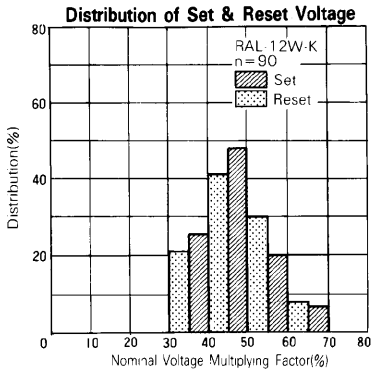


## ■ REFERENCE DATA

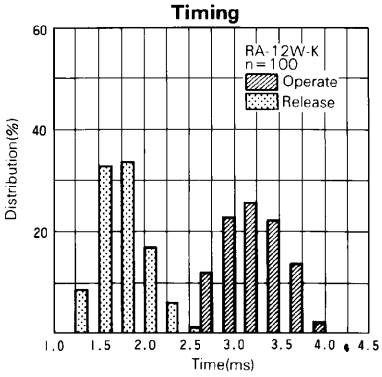
Distribution of Operate & Release Voltage



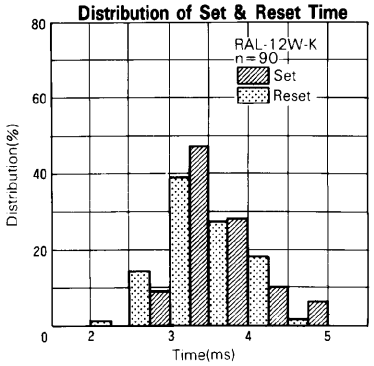

Distribution of Set & Reset Voltage



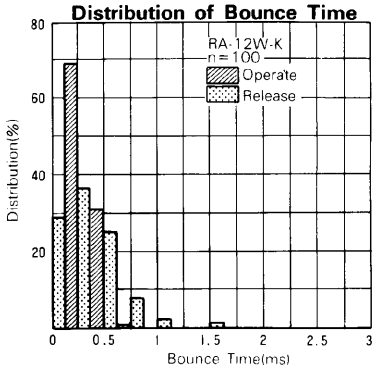

Timing



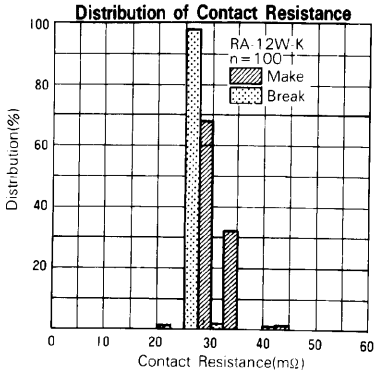

Distribution of Set & Reset Time



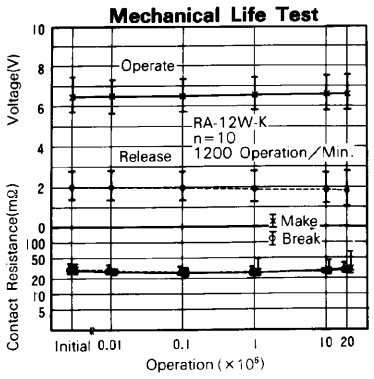

Distribution of Bounce Time



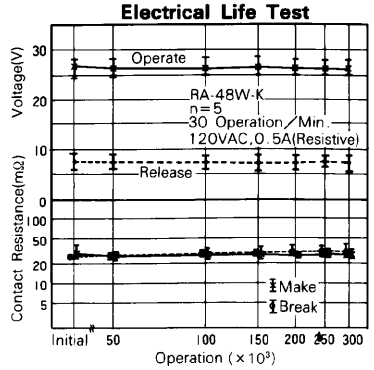

Distribution of Contact Resistance



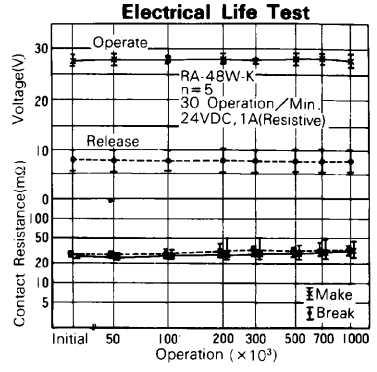

Mechanical Life Test



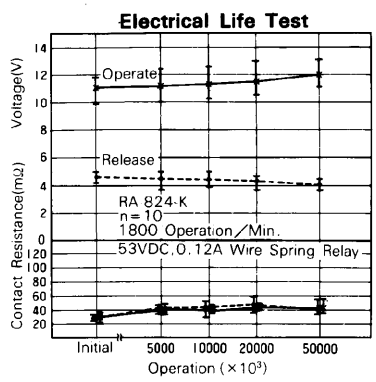

Electrical Life Test



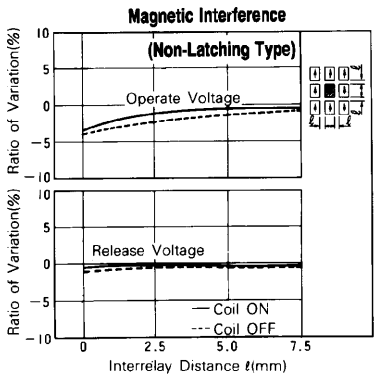

Electrical Life Test



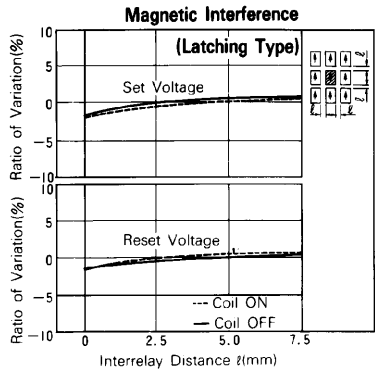

Electrical Life Test

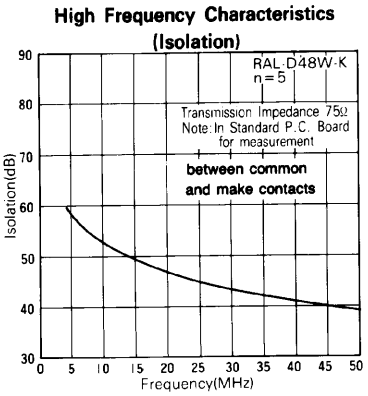


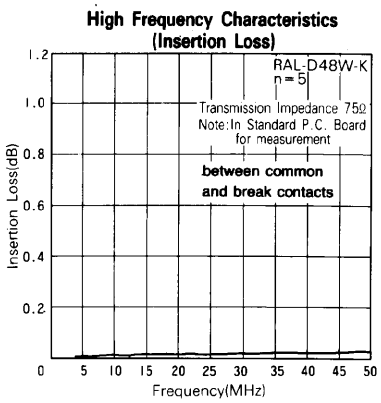

Magnetic Interference




Magnetic Interference



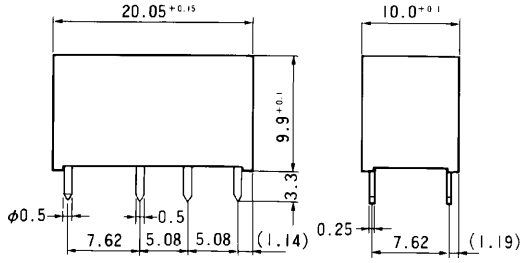


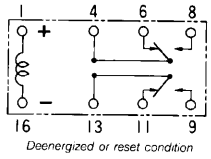



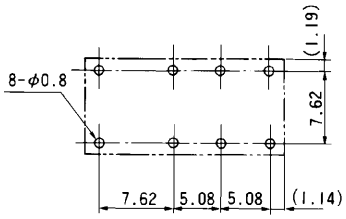

## ■ DIMENSIONS

- **Dimensions**
- **Schematics** (Bottom View)
- **PC board mounting hole layout** (Bottom View)

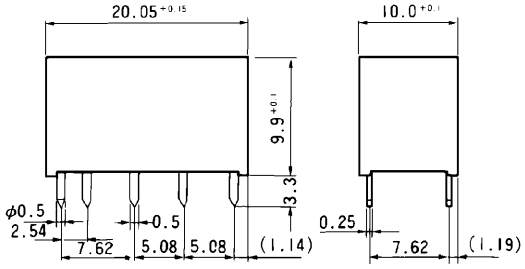
RA, RAL type (Non-latching type, single winding latching type)

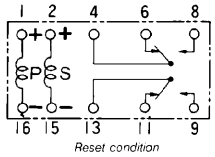


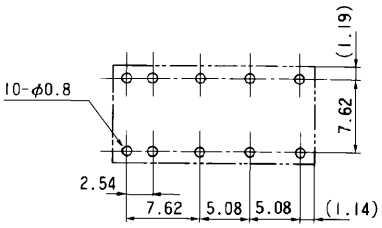




RAL-D type (Double winding latching type)




Unit: mm

# RoHS Compliance and Lead Free Relay Information

## 1. General Information

- Relays produced after the specific date code that is indicated on each data sheet are lead-free now. Most of our signal and power relays are lead-free. Please refer to Lead-Free Status Info. (http://www.fujitsu.com/us/downloads/MICRO/fcai/relays/lead-free-letter.pdf)
- Lead free solder paste currently used in relays is Sn-3.0Ag-0.5Cu.
- All signal and most power relays also comply with RoHS. Please refer to individual data sheets. Relays that are RoHS compliant do not contain the 5 hazardous materials that are restricted by RoHS directive (lead, mercury, chromium IV, PBB, PBDE).
- It has been verified that using lead-free relays in leaded assembly process will not cause any problems (compatible).
- “LF” is marked on each outer and inner carton. (No marking on individual relays).
- To avoid leaded relays (for lead-free sample, etc.) please consult with area sales office.
- We will ship leaded relays as long as the leaded relay inventory exists.

Note: Cadmium was exempted from RoHSon October 21, 2005. (Amendment to Directive 2002/95/EC)

## 2. Recommended Lead Free Solder Profile

- Recommended solder paste Sn-3.0Ag-0.5Cu.

### Reflow Solder condition

**Flow Solder condition:**

| | |
|---|---|
| Pre-heating: | maximum 120˚C |
| Soldering: | dip within 5 sec. at 260˚C soler bath |

**Solder by Soldering Iron:**

| | |
|---|---|
| Soldering Iron | |
| Temperature: | maximum 360˚C |
| Duration: | maximum 3 sec. |

**We highly recommend that you confirm your actual solder conditions**

## 3. Moisture Sensitivity

- Moisture Sensitivity Level standard is not applicable to electromechanical realys.

## 4. Tin Whisker

- Dipped SnAgCu solder is known as low risk tin whisker. No considerable length whisker was found by our in house test.

## Fujitsu Components International Headquarter Offices

**Japan**
Fujitsu Component Limited
Gotanda-Chuo Building
3-5, Higashigotanda 2-chome, Shinagawa-ku
Tokyo 141, Japan
Tel: (81-3) 5449-7010
Fax: (81-3) 5449-2626
Email: promothq@ft.ed.fujitsu.com
Web: www.fcl.fujitsu.com

**Europe**
Fujitsu Components Europe B.V.
Diamantlaan 25
2132 WV Hoofddorp
Netherlands
Tel: (31-23) 5560910
Fax: (31-23) 5560950
Email: info@fceu.fujitsu.com
Web: emea.fujitsu.com/components/

**North and South America**
Fujitsu Components America, Inc.
250 E. Caribbean Drive
Sunnyvale, CA 94089 U.S.A.
Tel: (1-408) 745-4900
Fax: (1-408) 745-4970
Email: components@us.fujitsu.com
Web: http://www.fujitsu.com/us/services/edevices/components/

**Asia Pacific**
Fujitsu Components Asia Ltd.
102E Pasir Panjang Road
#01-01 Citilink Warehouse Complex
Singapore 118529
Tel: (65) 6375-8560
Fax: (65) 6273-3021
Email: fcal@fcal.fujitsu.com
Web: http://www.fujitsu.com/sg/services/micro/components/