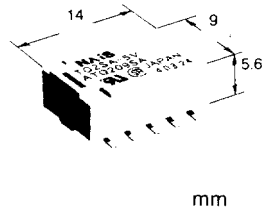
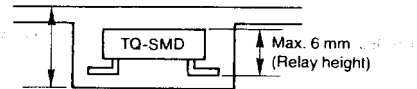


TQ-SMD

625-735 to 784

**NAIS****ULTRA LOW-PROFILE  
SURFACE-MOUNT RELAY****TQ-SMD  
RELAYS**UL File No.: E43149  
CSA File No.: LR26550

- Ultra low-profile: 6 mm (.236 inch) in height conforming to EIA standards (Tape height: max. 6.5 mm (.256 inch))

Max. 6.5 mm  
(Tape height)

- Tape and reel package is available as standard packing style
- Surge withstand between contacts and coil: 2,500 V
- Breakdown voltage between contacts and coil: 1,500 V
- 2 Amp. high capacity
- High sensitivity:  
2 Form C; 140 mW power consumption (single side stable type)
- Surge voltage withstand: 1,500 V FCC Part 68

**SPECIFICATIONS****Contact**

|                                                                  |                                                |                                                 |
|------------------------------------------------------------------|------------------------------------------------|-------------------------------------------------|
| Arrangement                                                      |                                                | 2 Form C                                        |
| Initial contact resistance, max.<br>(By voltage drop 6 V DC 1 A) |                                                | 75 mΩ                                           |
| Contact material                                                 |                                                | Gold-clad silver alloy                          |
| Rating                                                           | Nominal switching capacity<br>(resistive load) | 2 A 30 V DC<br>0.5 A 125 V AC                   |
|                                                                  | Max. switching power<br>(resistive load)       | 60 W, 62.5 VA                                   |
|                                                                  | Max. switching voltage                         | 220 V DC, 125 V AC                              |
|                                                                  | Max. switching current                         | 2 A                                             |
|                                                                  | Min. switching capability                      | 10 μA 10 mV DC                                  |
| UL/CSA rating                                                    |                                                | 2 A 30 V DC<br>0.3 A 110 V DC<br>0.5 A 125 V AC |
| Expected life (min. operations)                                  | Mechanical (at 180 cpm)                        | 10 <sup>8</sup>                                 |
|                                                                  | Electrical (at 20 cpm)                         | 2 A 30 V DC resistive<br>10 <sup>5</sup>        |
|                                                                  |                                                | 1 A 30 V DC resistive<br>2×10 <sup>5</sup>      |
|                                                                  |                                                | 0.5 A 125 V AC resistive<br>10 <sup>5</sup>     |

**Characteristics (at 20°C 68°F)**

|                                                                      |                                           |                                                                                  |
|----------------------------------------------------------------------|-------------------------------------------|----------------------------------------------------------------------------------|
| Max. operating speed (at rated load)                                 |                                           | 20 cpm                                                                           |
| Operate time (at nominal voltage)* <sup>1</sup>                      |                                           | Max. 4 msec.<br>(Approx. 2 msec.)                                                |
| Release time (at nominal voltage)* <sup>1</sup>                      |                                           | Max. 4 msec.<br>(Approx. 1 msec.)                                                |
| Set time (for latching type)<br>(at nominal voltage)* <sup>1</sup>   |                                           | Max. 4 msec.<br>(Approx. 2 msec.)                                                |
| Reset time (for latching type)<br>(at nominal voltage)* <sup>1</sup> |                                           | Max. 4 msec.<br>(Approx. 2 msec.)                                                |
| Initial break-down voltage                                           | Between open contacts                     | 1,000 Vrms for 1 min.                                                            |
|                                                                      | Between contact sets                      | 1,500 Vrms for 1 min.                                                            |
|                                                                      | Between contact and coil                  | 1,500 Vrms for 1 min.                                                            |
| Surge voltage                                                        | Between open contacts<br>(10×160 μsec.)   | 1,500 V (FCC Part 68)                                                            |
|                                                                      | Between contacts and coil<br>(2×10 μsec.) | 2,500 V (Bellcore)                                                               |
| Initial insulation resistance                                        |                                           | Min. 1,000 MΩ (at 500 V DC)                                                      |
| Temperature rise* <sup>2</sup>                                       |                                           | Max. 50°C                                                                        |
| Ambient temperature                                                  |                                           | -40°C to +85°C* <sup>3</sup><br>(Not freezing and condensing at low temperature) |
| Shock resistance                                                     | Functional                                | Min. 750 m/s <sup>2</sup> (75 G)                                                 |
|                                                                      | Destructive                               | Min. 1,000 m/s <sup>2</sup> (100 G)                                              |
| Vibration resistance                                                 | Functional                                | 200 m/s <sup>2</sup> (20 G), 10 to 55 Hz at double amplitude of 3.3 mm           |
|                                                                      | Destructive                               | 294 m/s <sup>2</sup> (30 G), 10 to 55 Hz at double amplitude of 5 mm             |
| Unit weight                                                          |                                           | 2 Form C: Approx. 2 g                                                            |

\*<sup>1</sup> Excluding contact bouncing time\*<sup>2</sup> Measured under the flow of nominal operating current at nominal voltage\*<sup>3</sup> +70°C in case of 2 A current switching

## ORDERING INFORMATION

Ex. TQ    2    SA    —    L    —    3V    —    Z

| Contact arrangement | Surface-mount availability      | Operating function                                                   | Coil voltage (DC)                   | Packing style                                                                   |
|---------------------|---------------------------------|----------------------------------------------------------------------|-------------------------------------|---------------------------------------------------------------------------------|
| 2: 2 Form C         | SA: Surface-mount terminal type | Nil: Single side stable<br>L: 1 coil latching<br>L2: 2 coil latching | 1.5, 3, 4.5, 5, 6, 9, 12, 24, 48* V | Nil: Tube packing<br>Z: Tape and reel packing (picked from the 6/7/8/9/10-side) |

\*48 V coil type: Single side stable only

Notes: 1. Tape and reel (picked from 1/2/3/4/5-pin side) is also available by request. Part No. suffix "-X" is needed when ordering. (ex.) TQ2SA-3V-X  
2. Tape and reel packing symbol "-Z" or "-X" are not marked on the relay.

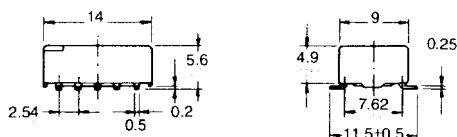
## TYPES

| Operating function | Part No.   | Nominal voltage, V DC | Pick-up voltage, V DC (max.) | Drop-out voltage, V DC (min.) | Nominal operating current, mA ( $\pm 10\%$ ) | Coil resistance, $\Omega$ ( $\pm 10\%$ ) | Nominal operating power, mW | Max. allowable voltage, V DC |
|--------------------|------------|-----------------------|------------------------------|-------------------------------|----------------------------------------------|------------------------------------------|-----------------------------|------------------------------|
| Single side stable | TQ2SA-1.5V | 1.5                   | 1.13                         | 0.15                          | 93.8                                         | 16                                       | 140                         | 2.2                          |
|                    | TQ2SA-3V   | 3                     | 2.25                         | 0.3                           | 46.7                                         | 64.3                                     | 140                         | 4.5                          |
|                    | TQ2SA-4.5V | 4.5                   | 3.38                         | 0.45                          | 31                                           | 145                                      | 140                         | 6.7                          |
|                    | TQ2SA-5V   | 5                     | 3.75                         | 0.5                           | 28.1                                         | 178                                      | 140                         | 7.5                          |
|                    | TQ2SA-6V   | 6                     | 4.5                          | 0.6                           | 23.3                                         | 257                                      | 140                         | 9                            |
|                    | TQ2SA-9V   | 9                     | 6.75                         | 0.9                           | 15.5                                         | 579                                      | 140                         | 13.5                         |
|                    | TQ2SA-12V  | 12                    | 9                            | 1.2                           | 11.7                                         | 1,028                                    | 140                         | 18                           |
|                    | TQ2SA-24V  | 24                    | 18                           | 2.4                           | 8.3                                          | 2,880                                    | 200                         | 36                           |
|                    | TQ2SA-48V  | 48                    | 36                           | 4.8                           | 6.3                                          | 7,680                                    | 300                         | 57.6                         |

| Operating function | Part No.      | Nominal voltage, V DC | Set voltage, V DC (max.) | Reset voltage, V DC (min.) | Nominal operating current, mA ( $\pm 10\%$ ) | Coil resistance, $\Omega$ ( $\pm 10\%$ ) | Nominal operating power, mW | Max. allowable voltage, V DC |
|--------------------|---------------|-----------------------|--------------------------|----------------------------|----------------------------------------------|------------------------------------------|-----------------------------|------------------------------|
| 1 coil latching    | TQ2SA-L-1.5V  | 1.5                   | 1.13                     | 1.13                       | 46.9                                         | 32                                       | 70                          | 2.2                          |
|                    | TQ2SA-L-3V    | 3                     | 2.25                     | 2.25                       | 23.3                                         | 128.6                                    | 70                          | 4.5                          |
|                    | TQ2SA-L-4.5V  | 4.5                   | 3.38                     | 3.38                       | 15.6                                         | 289.3                                    | 70                          | 6.7                          |
|                    | TQ2SA-L-5V    | 5                     | 3.75                     | 3.75                       | 14                                           | 357                                      | 70                          | 7.5                          |
|                    | TQ2SA-L-6V    | 6                     | 4.5                      | 4.5                        | 11.7                                         | 514                                      | 70                          | 9                            |
|                    | TQ2SA-L-9V    | 9                     | 6.75                     | 6.75                       | 7.8                                          | 1,157                                    | 70                          | 13.5                         |
|                    | TQ2SA-L-12V   | 12                    | 9                        | 9                          | 5.8                                          | 2,057                                    | 70                          | 18                           |
|                    | TQ2SA-L-24V   | 24                    | 18                       | 18                         | 4.2                                          | 5,760                                    | 100                         | 36                           |
| 2 coil latching    | TQ2SA-L2-1.5V | 1.5                   | 1.13                     | 1.13                       | 93.8                                         | 16                                       | 140                         | 2.2                          |
|                    | TQ2SA-L2-3V   | 3                     | 2.25                     | 2.25                       | 46.7                                         | 64.3                                     | 140                         | 4.5                          |
|                    | TQ2SA-L2-4.5V | 4.5                   | 3.38                     | 3.38                       | 31                                           | 145                                      | 140                         | 6.7                          |
|                    | TQ2SA-L2-5V   | 5                     | 3.75                     | 3.75                       | 28.1                                         | 178                                      | 140                         | 7.5                          |
|                    | TQ2SA-L2-6V   | 6                     | 4.5                      | 4.5                        | 23.3                                         | 257                                      | 140                         | 9                            |
|                    | TQ2SA-L2-9V   | 9                     | 6.75                     | 6.75                       | 15.5                                         | 579                                      | 140                         | 13.5                         |
|                    | TQ2SA-L2-12V  | 12                    | 9                        | 9                          | 11.7                                         | 1,028                                    | 140                         | 18                           |
|                    | TQ2SA-L2-24V  | 24                    | 18                       | 18                         | 8.3                                          | 2,880                                    | 200                         | 36                           |

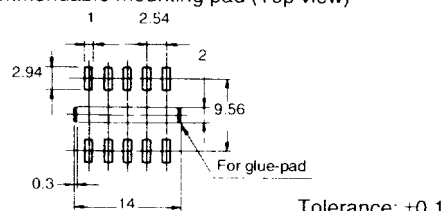
Notes: 1. Specified value of pick-up, drop-out, set and reset voltage is with the condition of square wave coil pulse.  
2. Standard packing: Tube: 50 pcs.; Case: 1,000 pcs.; Tape and reel: 500 pcs./reel  
3. In case of 5 V drive circuit, it is recommended to use 4.5 V type relay.

## DIMENSIONS



General tolerance:  $\pm 0.3$

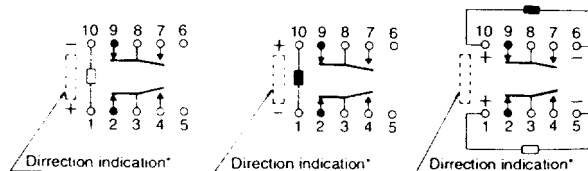
Recommendable mounting pad (Top view) mm



Tolerance:  $\pm 0.1$

Schematic (Top view)

- Single side stable (Deenergized condition)
- 1 coil latching (Reset condition)
- 2 coil latching (Reset condition)

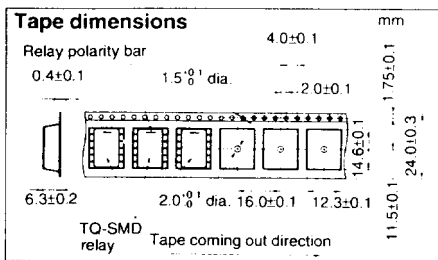


\*Orientation stripe located on top of relay.

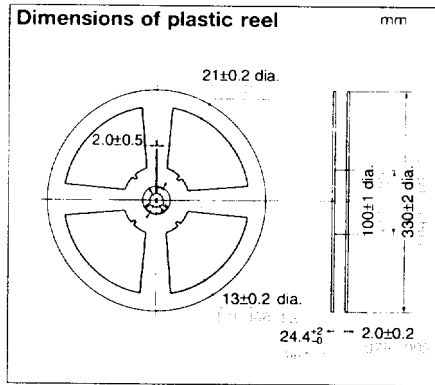
# TQ-SMD

## PACKING INFORMATION

### (1) Tape and reel packing

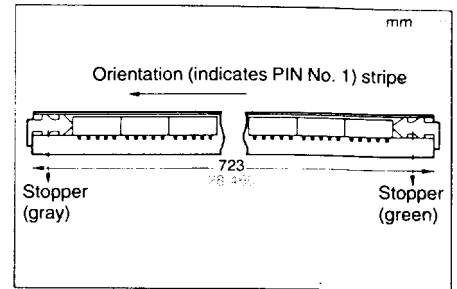


- When picked from 1/2/3/4/5-pin side, please add suffix-X like TQ2SA-3V-X.
- When picked from 6/7/8/9/10-side, please add suffix-Z like TQ2SA-3V-Z.



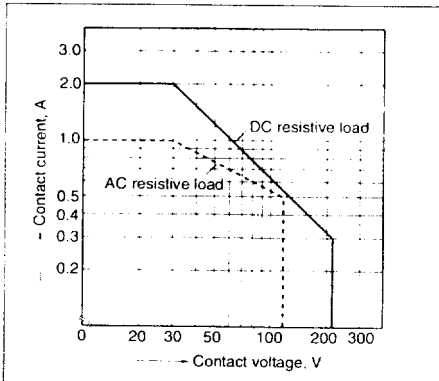
### (2) Tube packing

Relays are packed in a tube with the orientation stripe (PIN No. 1) toward the gray stopper.

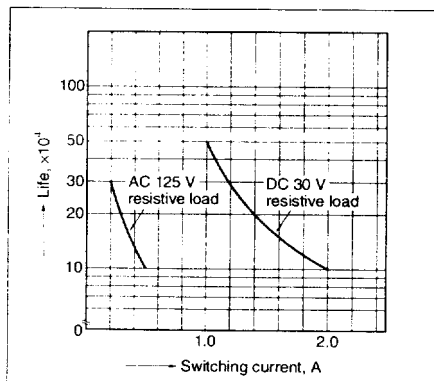


## DATA

### 1. Maximum switching power

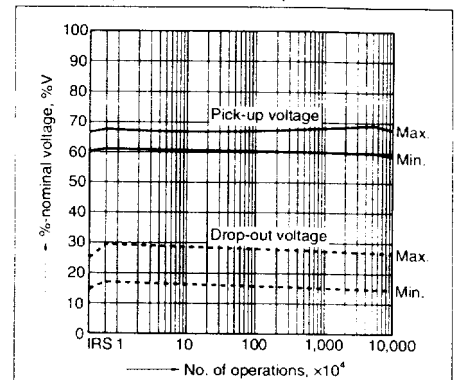


### 2. Life curve



### 3. Mechanical life (mounting by IRS method)

Tested sample: TQ2SA-12V, 10 pcs.



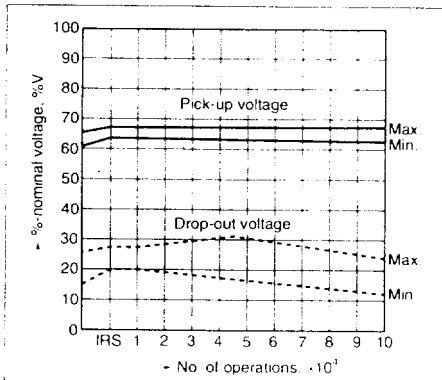
### 4.-(1) Electrical life

(2 A 30 V DC resistive load)

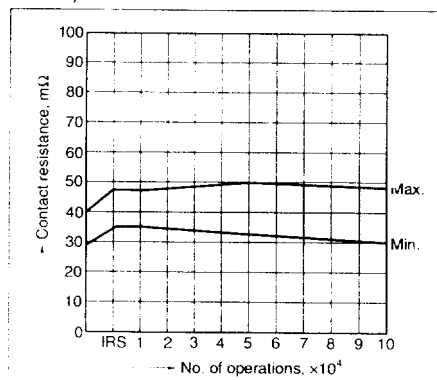
Tested sample: TQ2SA-12V, 6 pcs.

Operating frequency: 20 cpm

Change of pick-up and drop-out voltage (mounting by IRS method)



Change of contact resistance (mounting by IRS method)



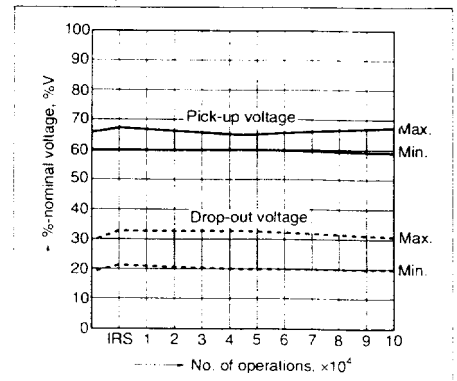
### 4.-(2) Electrical life

(0.5 A 125 V AC resistive load)

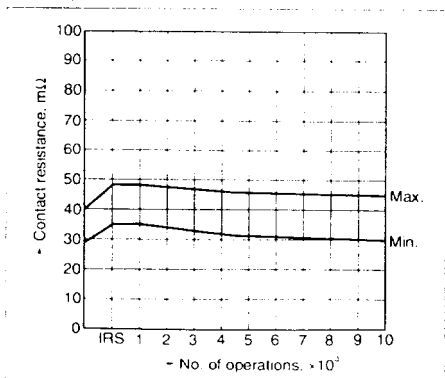
Tested sample: TQ2SA-12V, 6 pcs.

Operating frequency: 20 cpm

Change of pick-up and drop-out voltage (mounting by IRS method)



Change of contact resistance (mounting by IRS method)

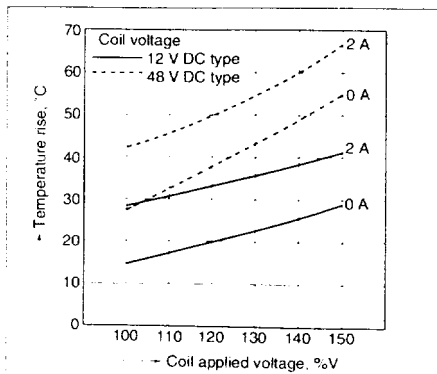


### 5. Coil temperature rise

Tested sample: TQ2SA-12V, 6 pcs.

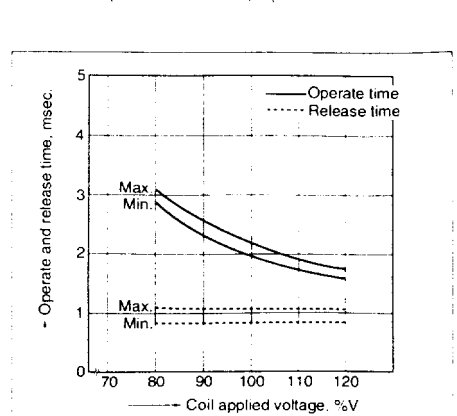
Point measured: Inside the coil

Ambient temperature: 25°C

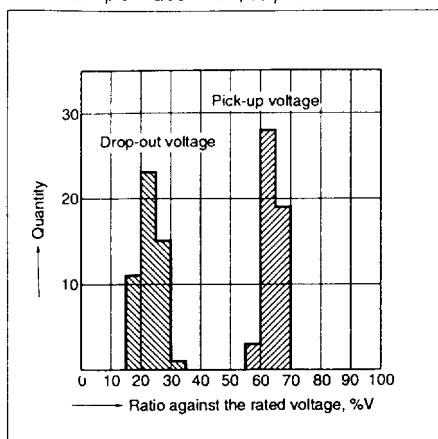


### 6. Operate and release time

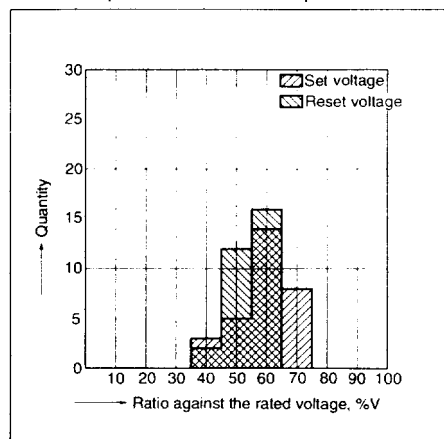
Tested sample: TQ2SA-12V, 6 pcs.



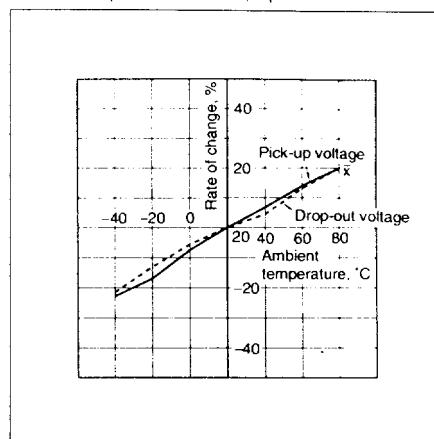
7. Distribution of pick-up and drop-out voltage  
Tested sample: TQ2SA-12V, 50 pcs.



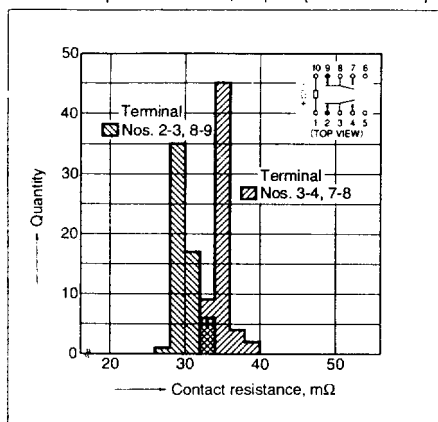
8. Distribution of set and reset voltage  
Tested sample: TQ2SA-L2-12V, 30 pcs.



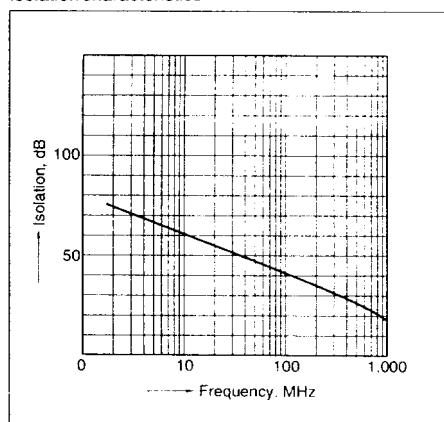
9. Ambient temperature characteristics  
Tested sample: TQ2SA-12V, 5 pcs



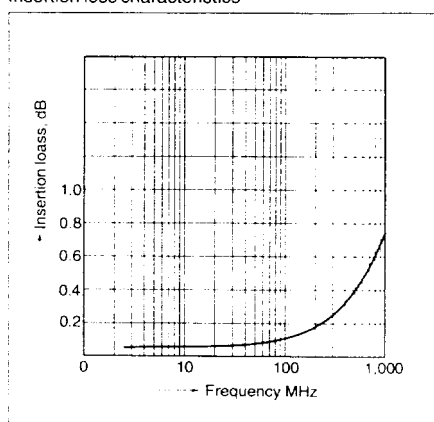
10. Distribution of contact resistance  
Tested sample: TQ2SA-5V, 30 pcs. (30x4 contacts)



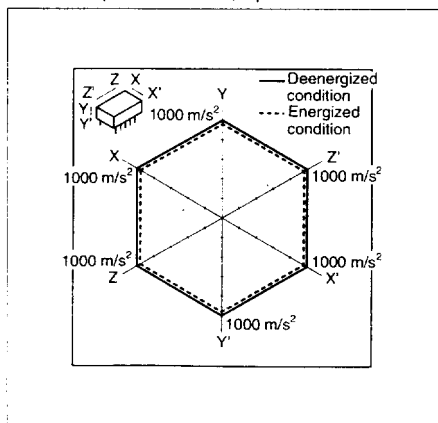
11.-(1) High frequency characteristics  
Isolation characteristics



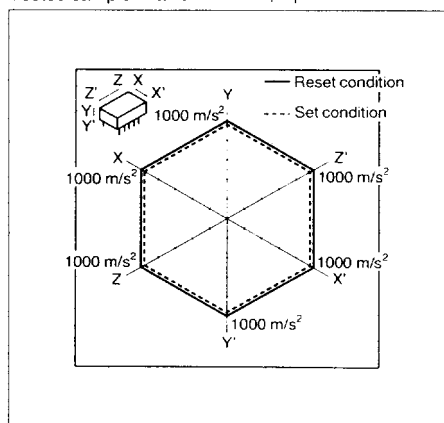
11.-(2) High frequency characteristics  
Insertion loss characteristics



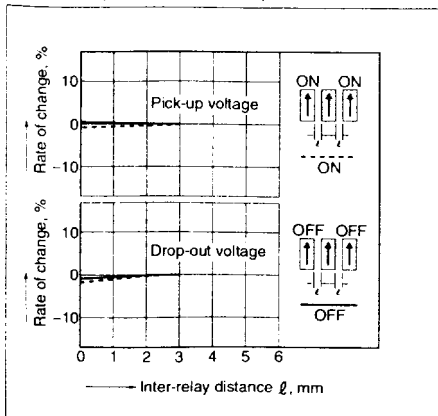
12.-(1) Malfunctional shock (single side stable)  
Tested sample TQ2SA-12V, 6 pcs.



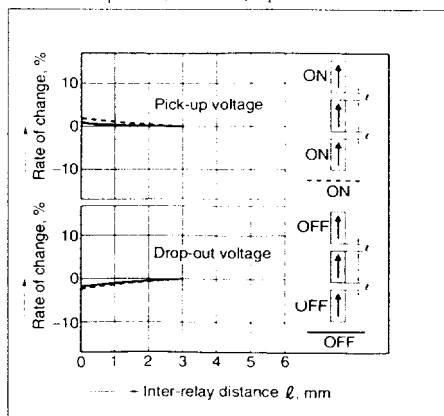
12.-(2) Malfunctional shock (latching)  
Tested sample: TQ2SA-L2-12V, 6 pcs.



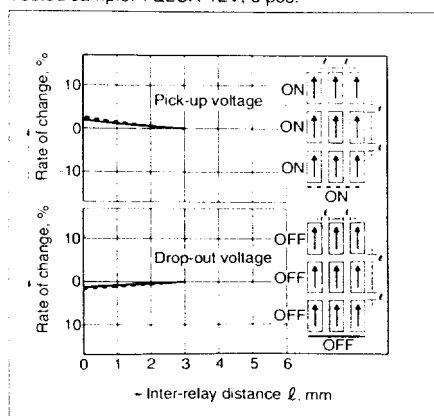
13.-(1) Influence of adjacent mounting  
Tested sample: TQ2SA-12V, 5 pcs.



13.-(2) Influence of adjacent mounting  
Tested sample: TQ2SA-12V, 6 pcs.



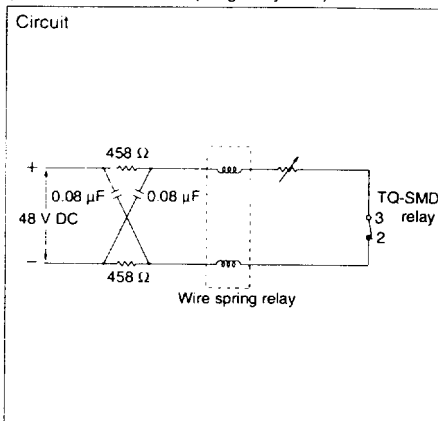
13.-(3) Influence of adjacent mounting  
Tested sample: TQ2SA-12V, 6 pcs.



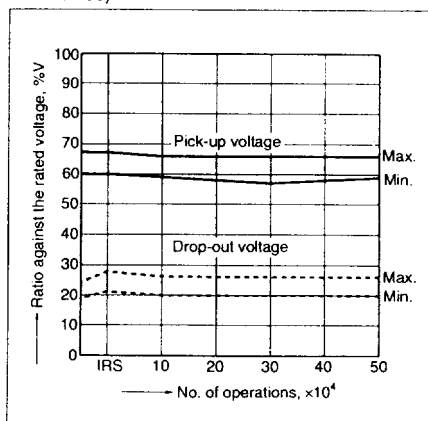
# TQ-SMD

## 14. Pulse dialing test

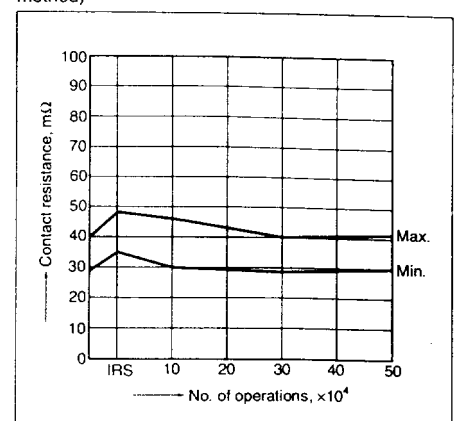
Tested sample: TQ2SA-12V, 6 pcs.  
(35 mA 48 V DC wire spring relay load)



Change of pick-up and drop-out voltage (mounting by IRS method)



Change of contact resistance (mounting by IRS method)



## NOTES

### 1. Coil operating power

Pure DC current should be applied to the coil. And 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 are slightly different.

### 2. Coil connection

When connecting coils, refer to the wiring diagram to prevent mis-operation or malfunction.

### 3. External magnetic field

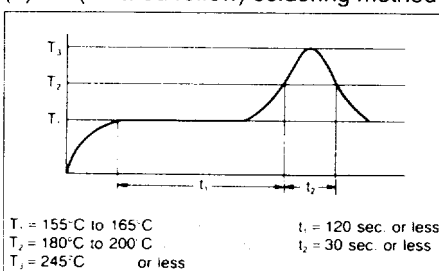
Since TQ-SMD-relay is highly sensitive polarized relay, its characteristics will be affected by a strong external magnetic field. So avoid using relays under that condition.

### 4. Cleaning

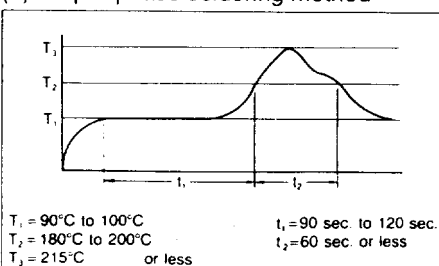
In automatic cleaning, cleaning with the boiling method is recommended. Avoid ultrasonic cleaning for relays. It is recommended that a fluorinated hydrocarbon or other alcoholic solvents be used. Trichloroethylene and chloroethene can be used for cleaning.

### 5. Soldering

(1) IR (Infrared reflow) soldering method



(2) Vapor phase soldering method



(3) Soldering iron method

Tip temperature:  $280^{\circ}\text{C to } 300^{\circ}\text{C}$

$536^{\circ}\text{F to } 572^{\circ}\text{F}$

Wattage: 30 to 60 W

Soldering time: within 5 sec.

(4) Other soldering methods

Check mounting conditions before using other soldering methods (hot-air, hot plate, pulse heater, etc.).

- The temperature profile indicates the temperature of the soldered terminal on the surface of the PC board. The ambient temperature may increase excessively. Check the temperature under mounting conditions.

- The conditions for the Infrared reflow soldering apply when preheating using the VPS method.

### 6. Automatic insertion

To maintain the internal function of the relay, the chucking pressure should not exceed the values below.

Chucking pressure in the direction A:

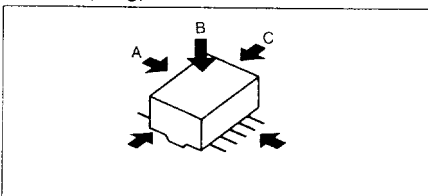
9.8N (1 kg) or less\*

Chucking pressure in the direction B:

9.8N (1 kg) or less

Mounting pressure in the direction C:

9.8N (1 kg) or less



\*Avoid chucking the center of the relay

### 7. Others

1) If in error the relay has been dropped, the appearance and characteristics should be checked before use without fail.

2) The cycle lifetime is defined under the standard test condition specified in the JIS\* C 5442-1986 standard (temperature  $15^{\circ}\text{C to } 35^{\circ}\text{C}$   $59^{\circ}\text{F to } 95^{\circ}\text{F}$ , humidity 25% to 85%). 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.

3) For secure operations, the voltage applied to coil should be nominal voltage. In addition, please note that pick-up and drop-out voltage will be changed according to the ambient temperature and operating condition.

4) Set and reset pulse widths used for self-holding relays should be no less than 10 ms at the rated coil voltage to ensure proper operation regardless of ambient temperature or operating condition.

5) Latching relays are shipped from the factory in the reset state. A shock to the relay during shipping or installation may cause it to change to the set state. Therefore, it is recommended that the relay be used in a circuit which initializes the relay to the required state (set or reset) whenever the power is turned on.

\*JIS: Japanese Industrial Standards