

TQ-SMD

625-735 to 784

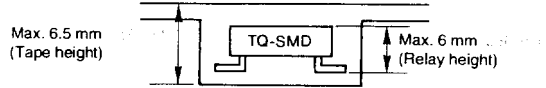
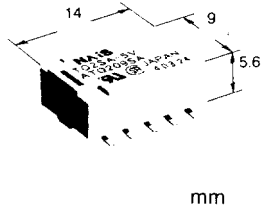
**NAIS**

**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))



- 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. (By voltage drop 6 V DC 1 A)	75 mΩ		
Contact material	Gold-clad silver alloy		
Rating	Nominal switching capacity (resistive load)	2 A 30 V DC 0.5 A 125 V AC	
	Max. switching power (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 0.3 A 110 V DC 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	10 <sup>5</sup>
		1 A 30 V DC resistive 0.5 A 125 V AC resistive	2×10 <sup>5</sup> 10 <sup>5</sup>

**Characteristics (at 20°C 68°F)**

Max. operating speed (at rated load)	20 cpm	
Operate time (at nominal voltage)*1	Max. 4 msec. (Approx. 2 msec.)	
Release time (at nominal voltage)*1	Max. 4 msec. (Approx. 1 msec.)	
Set time (for latching type) (at nominal voltage)*1	Max. 4 msec. (Approx. 2 msec.)	
Reset time (for latching type) (at nominal voltage)*1	Max. 4 msec. (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 (10×160 μsec.)	1,500 V (FCC Part 68)
	Between contacts and coil (2×10 μsec.)	2,500 V (Bellcore)
Initial insulation resistance	Min. 1,000 MΩ (at 500 V DC)	
Temperature rise*2	Max. 50°C	
Ambient temperature	-40°C to +85°C*3 (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	

\*1 Excluding contact bouncing time

\*2 Measured under the flow of nominal operating current at nominal voltage

\*3 +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 L: 1 coil latching L2: 2 coil latching	1.5, 3, 4.5, 5, 6, 9, 12, 24, 48* V	Nil: Tube packing Z: Tape and reel packing (picked from the 6/7/8/9/10-side)

\*48 V coil type: Single side stable only

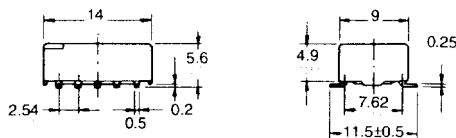
Notes: 1. Tape and reel (picked from 1/2/3/4/5-pin side) is also available by request. Part No. suffix "-X" is needed when ordering. (ex.) TQ2SA-3V-X  
2. Tape and reel packing symbol "-Z" or "-X" are not marked on the relay.

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 (±10%)	Coil resistance, Ω (±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 (±10%)	Coil resistance, Ω (±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.

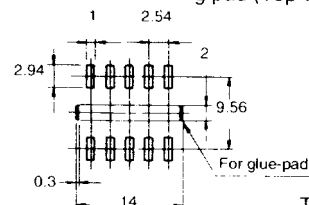
DIMENSIONS



General tolerance: ±0.3

Recommendable mounting pad (Top view)

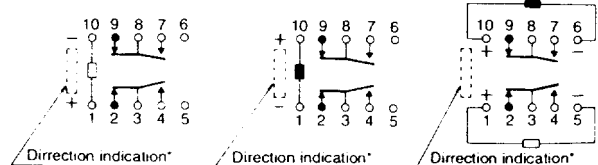
mm



Tolerance: ±0.1

Schematic (Top view)

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

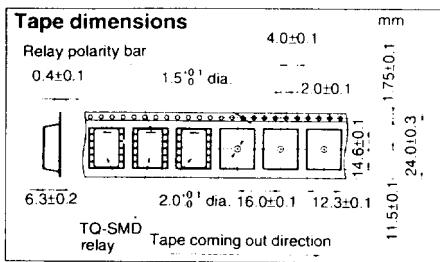


\*Orientation stripe located on top of relay.

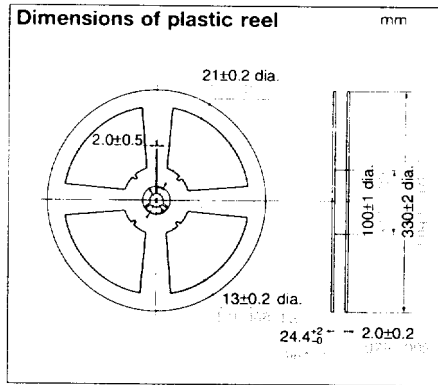
# TQ-SMD

## PACKING INFORMATION

### (1) Tape and reel packing

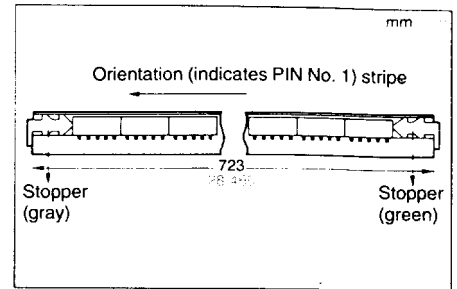


- When picked from 1/2/3/4/5-pin side, please add suffix-X like TQ2SA-3V-X.
- When picked from 6/7/8/9/10-side, please add suffix-Z like TQ2SA-3V-Z.



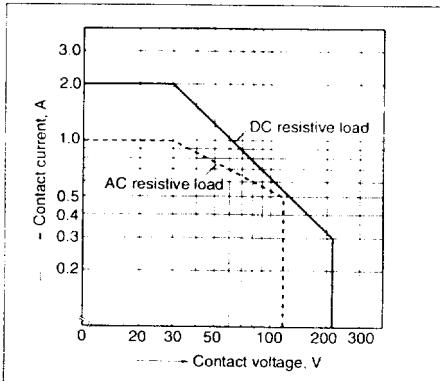
### (2) Tube packing

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

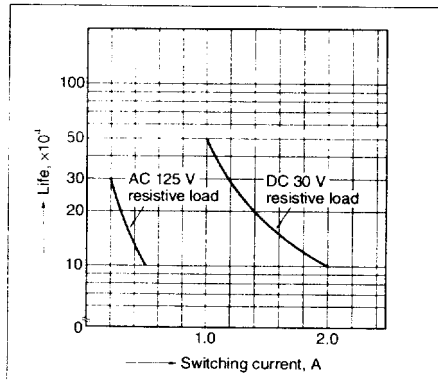


## DATA

### 1. Maximum switching power

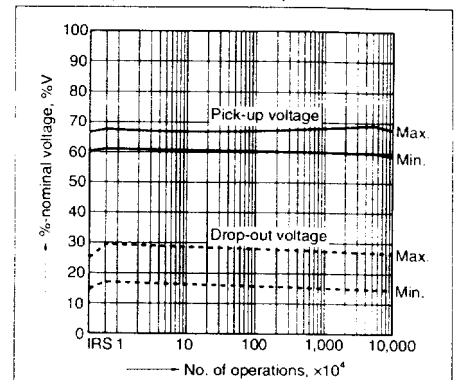


### 2. Life curve



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

Tested sample: TQ2SA-12V, 10 pcs.



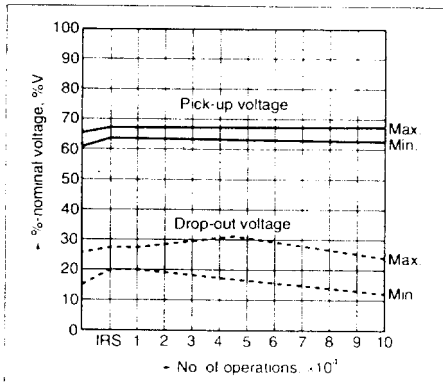
### 4.-(1) Electrical life

(2 A 30 V DC resistive load)

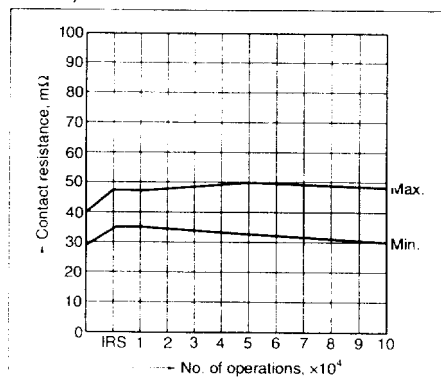
Tested sample: TQ2SA-12V, 6 pcs.

Operating frequency: 20 cpm

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



Change of contact resistance (mounting by IRS method)



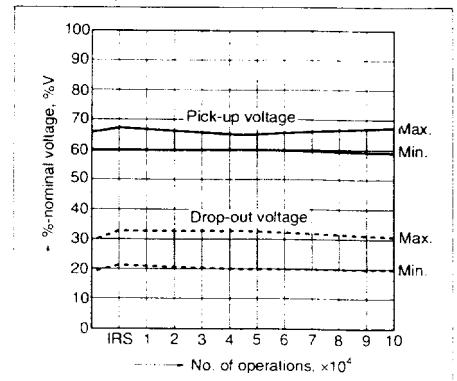
### 4.-(2) Electrical life

(0.5 A 125 V AC resistive load)

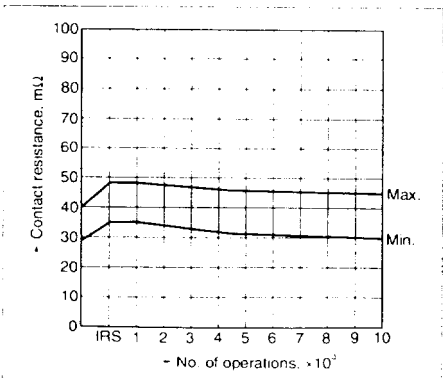
Tested sample: TQ2SA-12V, 6 pcs.

Operating frequency: 20 cpm

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



Change of contact resistance (mounting by IRS method)

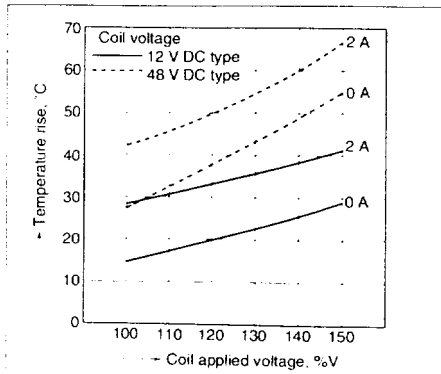


### 5. Coil temperature rise

Tested sample: TQ2SA-12V, 6 pcs.

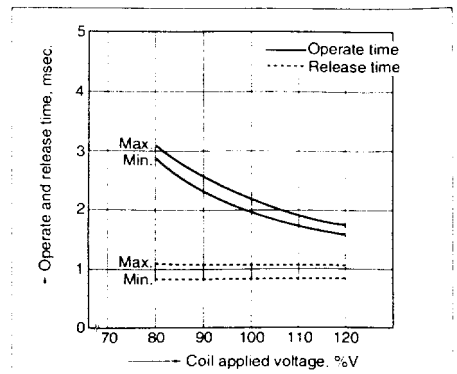
Point measured: Inside the coil

Ambient temperature: 25°C

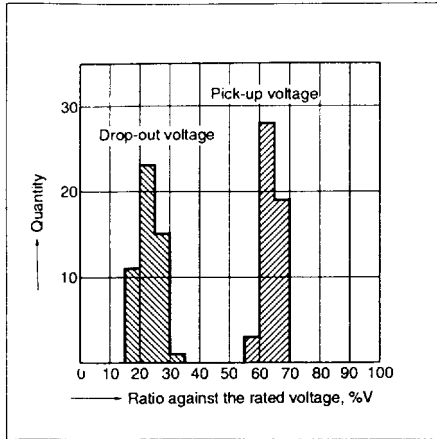


### 6. Operate and release time

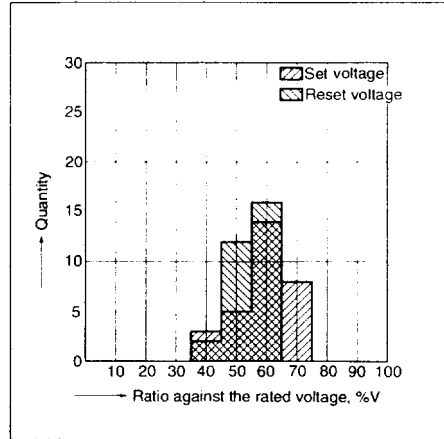
Tested sample: TQ2SA-12V, 6 pcs.



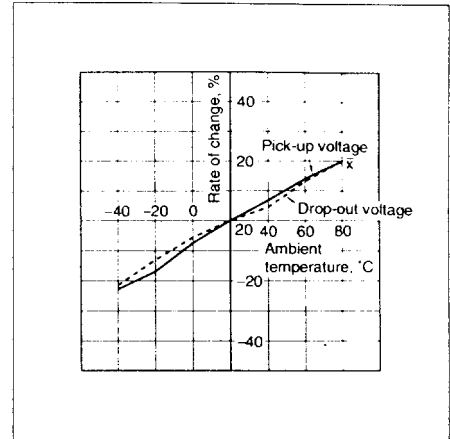
7. Distribution of pick-up and drop-out voltage  
Tested sample: TQ2SA-12V, 50 pcs.



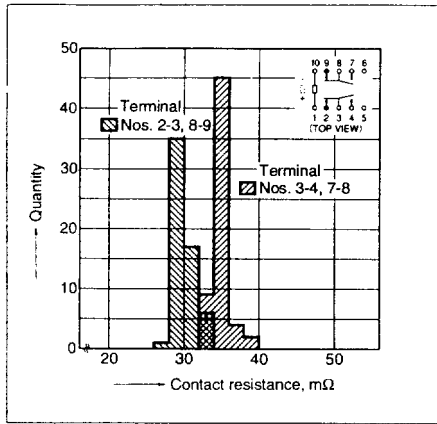
8. Distribution of set and reset voltage  
Tested sample: TQ2SA-L2-12V, 30 pcs.



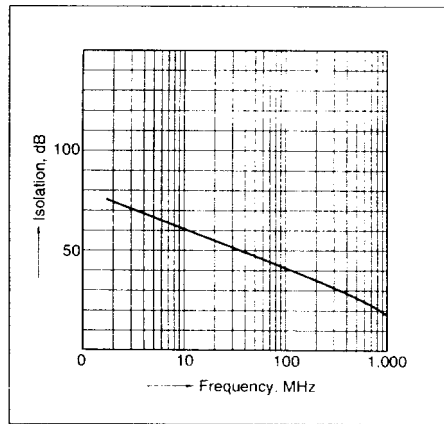
9. Ambient temperature characteristics  
Tested sample: TQ2SA-12V, 5 pcs



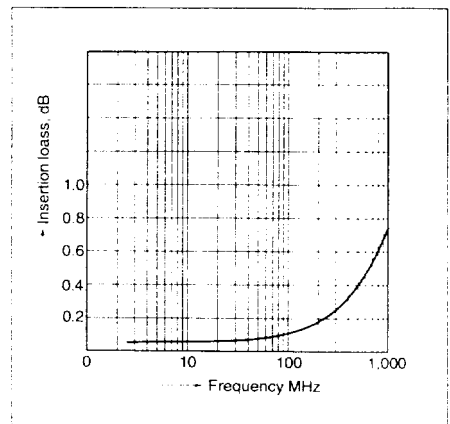
10. Distribution of contact resistance  
Tested sample: TQ2SA-5V, 30 pcs. (30x4 contacts)



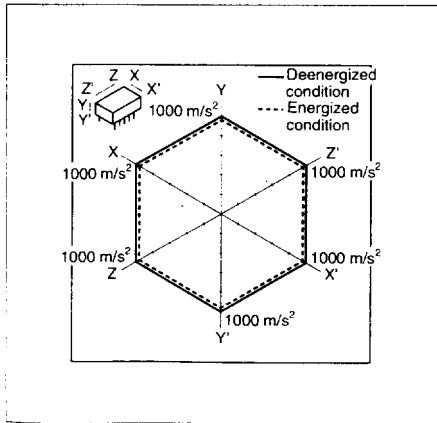
11.-(1) High frequency characteristics  
Isolation characteristics



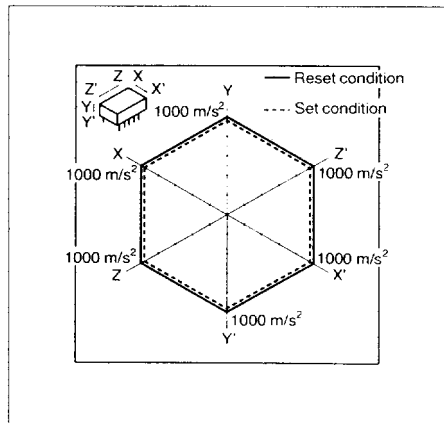
11.-(2) High frequency characteristics  
Insertion loss characteristics



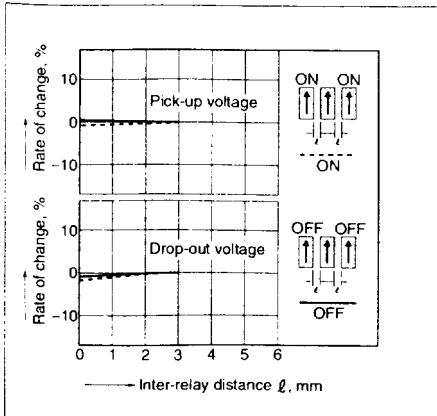
12.-(1) Malfunctional shock (single side stable)  
Tested sample TQ2SA-12V, 6 pcs.



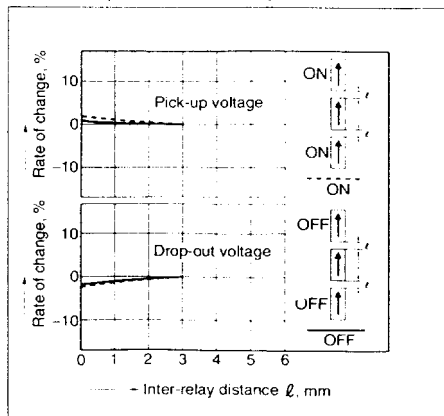
12.-(2) Malfunctional shock (latching)  
Tested sample: TQ2SA-L2-12V, 6 pcs.



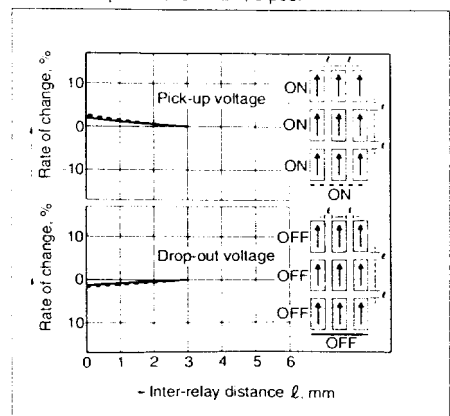
13.-(1) Influence of adjacent mounting  
Tested sample: TQ2SA-12V, 5 pcs.



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



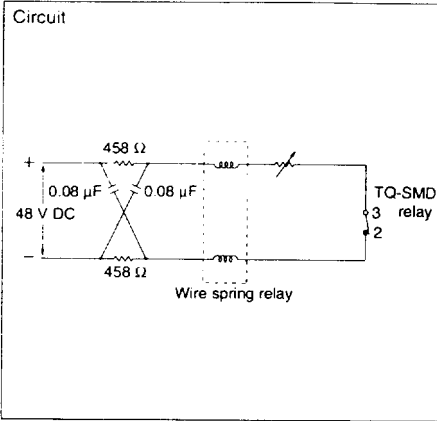
13.-(3) Influence of adjacent mounting  
Tested sample: TQ2SA-12V, 6 pcs.



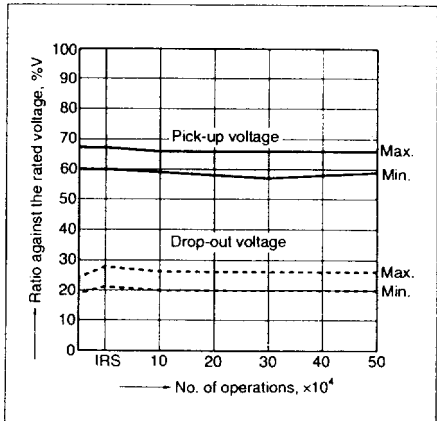
# TQ-SMD

## 14. Pulse dialing test

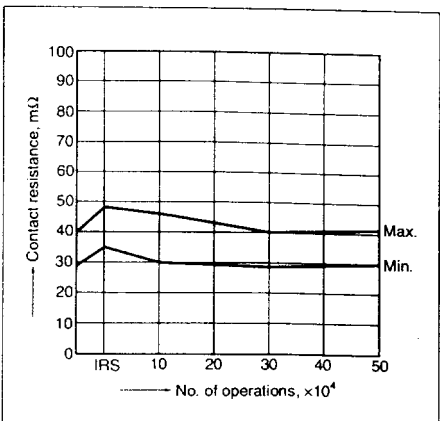
Tested sample: TQ2SA-12V, 6 pcs.  
(35 mA 48 V DC wire spring relay load)



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



Change of contact resistance (mounting by IRS method)

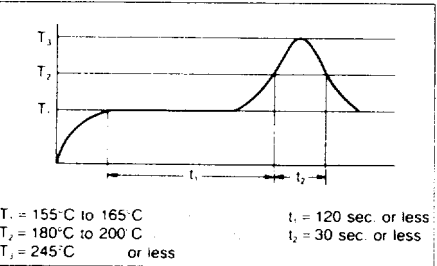


## NOTES

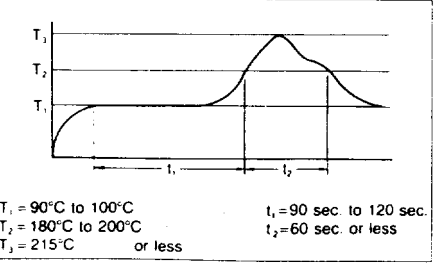
- Coil operating power**  
Pure DC current should be applied to the coil. And wave form should be rectangular. If it includes ripple, the ripple factor should be less than 5%. However, check it with the actual circuit since the characteristics are slightly different.
- Coil connection**  
When connecting coils, refer to the wiring diagram to prevent mis-operation or malfunction.
- 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.
- 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. Trichlorie and chloroethene can be used for cleaning.

### 5. Soldering

(1) IR (Infrared reflow) soldering method

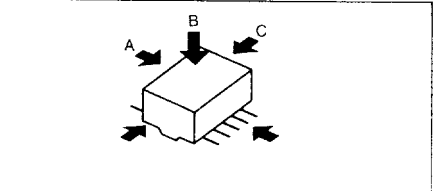


### (2) Vapor phase soldering method



- 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.
- 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.

- 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

- 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