



RoHS compliant

## FEATURES

**1. Even with small form factor, sensitive enough for direct IC-driving**  
 The dimensions of this high-density 4-gap balanced armature are 31 mm × 14 mm × 11 mm 1.220 inch × .551 inch × .433 inch. Despite this small size, high sensitivity is achieved by a mechanism that incorporates high-efficiency polarized magnetic circuits along with our exclusive spring alignment method. With an minimum operating power of about 150 mW, nominal operating power of 240 mW, this relay can be directly driven by transistor or chip controllers.

**2. High switching capability**  
 High contact pressure, low contact bounce, and forced separation structure that radically improves resistance to contact welding (1 Form A 1 Form B type equivalent to TV-3). Strong against lamp inductive loads, maximum switching capacity has reached 3,040 VA (8A 380V AC).

**3. High breakdown voltage – Optimal for control in 250 V power circuits**  
 High breakdown voltage has been achieved. Between contacts and coil of 3,750 Vrms; Surge breakdown voltage between coil and contact of 6,000 V, and between open contacts of 1,200 Vrms mean that these relays are suitable even for 250 V power circuit control.

**4. Improved stability**  
**Conforms to all types of safety standards.**  
 Insulating distance of more than 3 mm secured. Complies with Japan Electrical Appliance and Material Safety Law requirements for operating 200 V power supply circuits, and conforms with UL, CSA and VDE standards.

**5. Latching types available**  
 In addition to single side stable types, convenient 2 coil latching types with memory functions are also available. Moreover, we offer 2 Form A specifications which, with double pole switching for applications such as 250 V power circuit switching, can enable safer designs.

**6. Automatic cleaning possible**  
 The sealed design means that these relays can undergo immersion in automatic washing systems and are suitable for automatic soldering. Even in difficult environments, the contacts remain reliable.

**7. Easy to design PC board patterns**  
 Features 4/10 dual-in-line terminals. Because the lead spacing has a pitch greater than 7.54 mm .297 inch, designers can make easy adjustments with the width of the land size. This, along with the large insulation distance, simplifies the drawing of PC board patterns.

**8. To improve soldering efficiency, preapplication of solder to the terminals is recommended.**

**9. Sockets are available.**

## ORDERING INFORMATION



Contact arrangement  
 1: 1 Form A 1 Form B  
 2: 2 Form A

Operating function  
 Nil: Single side stable  
 L2: 2 coil latching

Nominal coil voltage  
 DC 3, 5, 6, 9, 12, 24, 48 V

Contact material  
 F: AgSnO<sub>2</sub> type contact

Note: Certified by UL, CSA, VDE and SEV

# ST

## TYPES

| Contact arrangement | Nominal coil voltage | Single side stable | 2 coil latching |
|---------------------|----------------------|--------------------|-----------------|
|                     |                      | Part No.           | Part No.        |
| 1 Form A 1 Form B   | 3V DC                | ST1-DC3V-F         | ST1-L2-DC3V-F   |
|                     | 5V DC                | ST1-DC5V-F         | ST1-L2-DC5V-F   |
|                     | 6V DC                | ST1-DC6V-F         | ST1-L2-DC6V-F   |
|                     | 9V DC                | ST1-DC9V-F         | ST1-L2-DC9V-F   |
|                     | 12V DC               | ST1-DC12V-F        | ST1-L2-DC12V-F  |
|                     | 24V DC               | ST1-DC24V-F        | ST1-L2-DC24V-F  |
| 2 Form A            | 48V DC               | ST1-DC48V-F        | ST1-L2-DC48V-F  |
|                     | 3V DC                | ST2-DC3V-F         | ST2-L2-DC3V-F   |
|                     | 5V DC                | ST2-DC5V-F         | ST2-L2-DC5V-F   |
|                     | 6V DC                | ST2-DC6V-F         | ST2-L2-DC6V-F   |
|                     | 9V DC                | ST2-DC9V-F         | ST2-L2-DC9V-F   |
|                     | 12V DC               | ST2-DC12V-F        | ST2-L2-DC12V-F  |
| 2 Form A            | 24V DC               | ST2-DC24V-F        | ST2-L2-DC24V-F  |
|                     | 48V DC               | ST2-DC48V-F        | ST2-L2-DC48V-F  |

Standard packing: Carton: 50 pcs.; Case: 500 pcs.

\* For sockets, see page 113.

## RATING

### 1. Coil data

#### 1) Single side stable

| Nominal coil voltage | Pick-up voltage (at 20°C 68°F)            | Drop-out voltage (at 20°C 68°F)           | Nominal operating current [±10%] (at 20°C 68°F) | Coil resistance [±10%] (at 20°C 68°F) | Nominal operating power | Max. applied voltage (at 20°C 68°F) |
|----------------------|---|---|---|---------------------------------------|-------------------------|-------------------------------------|
| 3V DC                | 80%V or less of nominal voltage (Initial) | 10%V or more of nominal voltage (Initial) | 75mA  | 38Ω                                   | 240mW                   | 150%V of nominal voltage            |
| 5V DC                |   |   | 47mA  | 105Ω                                  |                         |                                     |
| 6V DC                |   |   | 40mA  | 150Ω                                  |                         |                                     |
| 9V DC                |   |   | 25mA  | 360Ω                                  |                         |                                     |
| 12V DC               |   |   | 20mA  | 600Ω                                  |                         |                                     |
| 24V DC               |   |   | 10mA  | 2,400Ω                                |                         |                                     |
| 48V DC               |   |   | 4.7mA   | 9,000Ω                                |                         |                                     |

#### 2) 2 coil latching

| Nominal coil voltage | Set voltage (at 20°C 68°F)                | Reset voltage (at 20°C 68°F)              | Nominal operating current [±10%] (at 20°C 68°F) |            | Coil resistance [±10%] (at 20°C 68°F) |            | Nominal operating power |            | Max. applied voltage (at 20°C 68°F) |
|----------------------|---|---|---|------------|---------------------------------------|------------|-------------------------|------------|-------------------------------------|
|                      |   |   | Set coil  | Reset coil | Set coil                              | Reset coil | Set coil                | Reset coil |                                     |
| 3V DC                | 80%V or less of nominal voltage (Initial) | 80%V or less of nominal voltage (Initial) | 75mA  | 75mA       | 40Ω                                   | 40Ω        | 240mW                   | 240mW      | 150%V of nominal voltage            |
| 5V DC                |   |   | 45mA  | 45mA       | 110Ω                                  | 110Ω       |                         |            |                                     |
| 6V DC                |   |   | 37.5mA  | 37.5mA     | 155Ω                                  | 155Ω       |                         |            |                                     |
| 9V DC                |   |   | 25mA  | 25mA       | 360Ω                                  | 360Ω       |                         |            |                                     |
| 12V DC               |   |   | 18.8mA  | 18.8mA     | 640Ω                                  | 640Ω       |                         |            |                                     |
| 24V DC               |   |   | 10mA  | 10mA       | 2,400Ω                                | 2,400Ω     |                         |            |                                     |
| 48V DC               |   |   | 4.7mA   | 4.7mA      | 10,200Ω                               | 10,200Ω    |                         |            |                                     |

## 2. Specifications

| Characteristics                         | Item   | Specifications   |  |
|---|--|--|--|
| Contact                                 | Arrangement  | 1 Form A 1 Form B, 2 Form A  |  |
|   | Contact material   | Au-flashed AgSnO <sub>2</sub> type   |  |
|   | Contact resistance (Initial)   | Max. 30 mΩ (By voltage drop 6 V DC 1A)   |  |
| Rating                                  | Max. switching power (resistive load)  | 3,040 VA, 150 W  |  |
|   | Max. switching voltage   | 380 V AC, 250 V DC   |  |
|   | Max. switching current   | 8 A  |  |
|   | Minimum operating power  | 150mW (Single side stable, 2 coil latching)  |  |
|   | Nominal operating power  | 240mW (Single side stable, 2 coil latching)  |  |
|   | Min. switching capacity (Reference value)*1  | 100 mA 5V DC   |  |
| Electrical characteristics              | Insulation resistance (Initial)<br>(at 25°C, 50% relative humidity)                                    | Min. 1,000MΩ (at 500V DC)<br>Measurement at same location as "Breakdown voltage" section.  |  |
|   | Breakdown voltage (Initial)  | Between open contacts  | 1,200 Vrms for 1 min. (Detection current: 10 mA)                                       |
|   |  | Between contact sets   | 2,000 Vrms for 1 min. (Detection current: 10 mA)                                       |
|   |  | Between contact and coil   | 3,750 Vrms for 1 min. (Detection current: 10 mA)                                       |
|   | Surge breakdown voltage (Initial)*2  | 6,000 V (Between contact and coil)   |  |
|   | Operate time [Set time] (at 20°C 68°F)   | Max. 15 ms [Max. 15 ms]<br>(Nominal coil voltage applied to the coil, excluding contact bounce time.)                            |  |
|   | Release time [Reset time] (at 20°C 68°F)   | Max. 10 ms [Max. 15 ms]<br>(Nominal coil voltage applied to the coil, excluding contact bounce time.) (without diode)            |  |
| Temperature rise (coil) (at 60°C 140°F) | Max. 55°C<br>(By resistive method, nominal voltage applied to the coil; contact carrying current: 8A.) |  |  |
| Mechanical characteristics              | Shock resistance   | Functional   | Min. 196 m/s <sup>2</sup> (Half-wave pulse of sine wave: 11 ms; detection time: 10μs.) |
|   |  | Destructive  | Min. 980 m/s <sup>2</sup> (Half-wave pulse of sine wave: 6 ms.)                        |
|   | Vibration resistance   | Functional   | 10 to 55 Hz at double amplitude of 2 mm (Detection time: 10μs.)                        |
|   |  | Destructive  | 10 to 55 Hz at double amplitude of 3 mm  |
| Expected life                           | Mechanical   | Min. 10 <sup>7</sup> (at 180 times/min.)   |  |
|   | Electrical   | Min. 10 <sup>6</sup> (8 A 250 V AC resistive) (ON : OFF = 1 s : 5 s)   |  |
| Conditions                              | Conditions for operation, transport and storage*3  | Ambient temperature: -40°C to +60°C -40°F to +140°F;<br>Humidity: 5 to 85% R.H. (Not freezing and condensing at low temperature) |  |
|   | Max. operating speed   | 30 cps   |  |
| Unit weight                             |  | Approx. 10g .353 oz  |  |

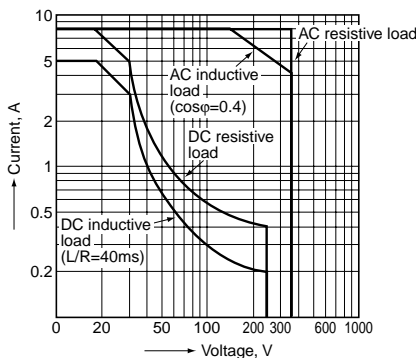
Notes: \*1. This value can change due to the switching frequency, environmental conditions, and desired reliability level, therefore it is recommended to check this with the actual load.

\*2. Wave is standard shock voltage of  $\pm 1.2 \times 50\mu\text{s}$  according to JEC-212-1981

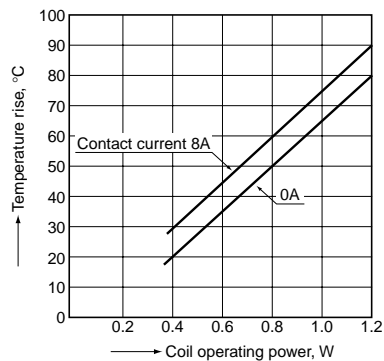
\*3. The upper limit of the ambient temperature is the maximum temperature that can satisfy the coil temperature rise value. Refer to Usage, transport and storage conditions in NOTES.

## REFERENCE DATA

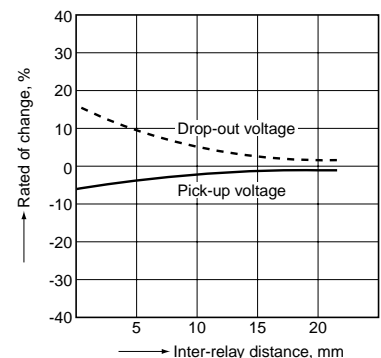
### 1. Max. switching power



### 2. Coil temperature rise



### 3. Influence of adjacent mounting



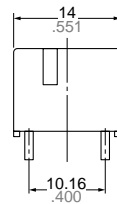
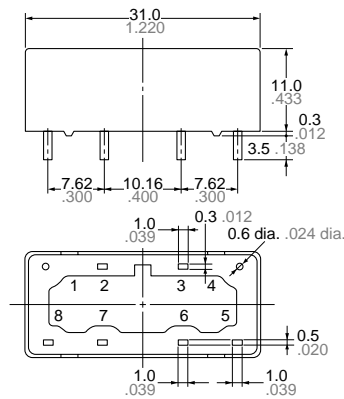
**DIMENSIONS** (mm inch)

The CAD data of the products with a **CAD Data** mark can be downloaded from: <http://industrial.panasonic.com/ac/e/>

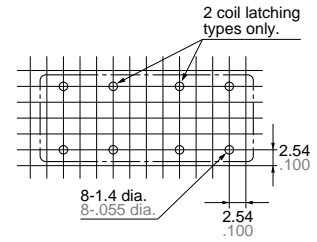
**CAD Data**



External dimensions



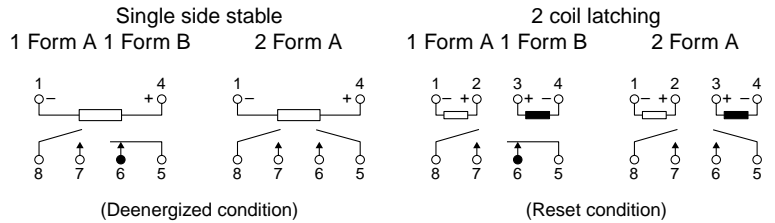
PC board pattern (Bottom view)



Tolerance:  $\pm 0.1 \pm 0.004$

General tolerance:  $\pm 0.5 \pm 0.020$

Schematic (Bottom view)



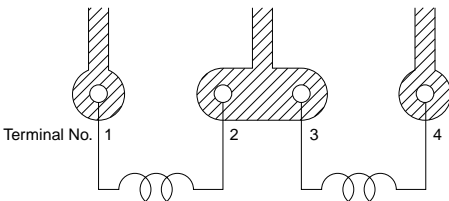
**SAFETY STANDARDS**

| UL/C-UL (Recognized) |   | CSA (Certified) |   | VDE (Certified) |   | TV rating (UL/CSA)         |        | SEV        |                |
|----------------------|---|-----------------|---|-----------------|---|----------------------------|--------|------------|----------------|
| File No.             | Contact rating                                | File No.        | Contact rating                                | File No.        | Contact rating  | File No.                   | Rating | File No.   | Contact rating |
| E43028               | 8A 250V AC<br>1/4HP 125, 250V AC<br>5A 30V DC | LR26550<br>etc. | 8A 250V AC<br>1/4HP 125, 250V AC<br>5A 30V DC | 1017            | 8A 250V AC ( $\cos\phi=1.0$ )<br>4A 250V AC ( $\cos\phi=0.4$ )<br>5A 30V DC | UL: E43028<br>CSA: LR26550 | —      | 98-1 10289 | 8A 380V AC     |

**NOTES**

**1. PC board patterns for 2 coil latching types**

When applying relays in power supply operation circuits for finished products regulated by the Electrical Appliance and Material Safety Law, use the pattern shown below.



**2. Soldering should be done under the following conditions:**

- 1) 250°C 482°F within 10s  
300°C 572°F within 5s  
350°C 662°F within 3s
- 2) 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 a fluorinated hydrocarbon or other alcoholic solvents be used.

**3. When using, please be aware that the a contact and b contact sides of 1 Form A and 1 Form B types may go on simultaneously at operate time and release time.**

**For Cautions for Use.**

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