



### 1 Form A 16A power relay for micro wave oven

## LE RELAYS (ALE)



TMP type

PCB type

**RoHS compliant**

Protective construction: Flux-resistant type

### FEATURES

**1. Supports magnetron and heater loads**

Capable for switching magnetron and heater loads found in microwave ovens.

**2. Excellent heat resistance**

Ambient temperature: up to 85°C 185°F  
 Certified UL coil insulation class B and class F

**3. High insulation resistance**

- Creepage distance and clearances between contact and coil:  
 Clearance Min. 8 mm .315 inch  
 Creepage Min. 9.5 mm .374 inch
- Surge withstand voltage: 10,000V

**4. Low operating power**

Nominal operating power: 400mW/200mW (High sensitive type)

**5. A wide variety of types**

Product line consists of 4 types with different shapes and pins

**6. Conforms to the various safety standards:**

UL, CSA, TÜV and VDE approved  
 UL, CSA and VDE approved (PCB type)

### TYPICAL APPLICATIONS

1. Microwave ovens
2. Refrigerators
3. OA equipment

### ORDERING INFORMATION



Notes: • Certified by UL, CSA, TÜV and VDE (TMP type).  
 • Certified by UL, CSA and VDE (PCB type).

## TYPES

## 1. Standard type

| Contact arrangement | Nominal coil voltage | TMP type  |                          |                         | PCB type<br>(No tab terminals) |
|---------------------|----------------------|---|--------------------------|-------------------------|--------------------------------|
|                     |                      | PCB side three terminals<br>(includes one dummy terminal) | PCB side three terminals | PCB side four terminals |                                |
|                     |                      | Part No.  | Part No.                 | Part No.                |                                |
| 1 Form A            | 5V DC                | ALE12○05  | ALE13○05                 | ALE14○05                | ALE1P○05                       |
|                     | 6V DC                | ALE12○06  | ALE13○06                 | ALE14○06                | ALE1P○06                       |
|                     | 9V DC                | ALE12○09  | ALE13○09                 | ALE14○09                | ALE1P○09                       |
|                     | 12V DC               | ALE12○12  | ALE13○12                 | ALE14○12                | ALE1P○12                       |
|                     | 18V DC               | ALE12○18  | ALE13○18                 | ALE14○18                | ALE1P○18                       |
|                     | 24V DC               | ALE12○24  | ALE13○24                 | ALE14○24                | ALE1P○24                       |
|                     | 48V DC               | ALE12○48  | ALE13○48                 | ALE14○48                | ALE1P○48                       |

Standard packing; Carton: 100 pcs. Case 500 pcs.

○: Input the following letter. Class B: B, Class F: F

## 2. High sensitive type

| Contact arrangement                      | Nominal coil voltage | TMP type  |                          |                         | PCB type<br>(No tab terminals) |
|--|----------------------|---|--------------------------|-------------------------|--------------------------------|
|  |                      | PCB side three terminals<br>(includes one dummy terminal) | PCB side three terminals | PCB side four terminals |                                |
|  |                      | Part No.  | Part No.                 | Part No.                |                                |
| 1 Form A<br>(High sensitivity:<br>200mW) | 5V DC                | ALE72○05  | ALE73○05                 | ALE74○05                | ALE7P○05                       |
|  | 6V DC                | ALE72○06  | ALE73○06                 | ALE74○06                | ALE7P○06                       |
|  | 9V DC                | ALE72○09  | ALE73○09                 | ALE74○09                | ALE7P○09                       |
|  | 12V DC               | ALE72○12  | ALE73○12                 | ALE74○12                | ALE7P○12                       |
|  | 18V DC               | ALE72○18  | ALE73○18                 | ALE74○18                | ALE7P○18                       |
|  | 24V DC               | ALE72○24  | ALE73○24                 | ALE74○24                | ALE7P○24                       |
|  | 48V DC               | ALE72○48  | ALE73○48                 | ALE74○48                | ALE7P○48                       |

Standard packing; Carton: 100 pcs. Case 500 pcs.

○: Input the following letter. Class B: B, Class F: F

## RATING

## 1. Coil data

## 1) Standard type

| Nominal coil voltage | Pick-up voltage<br>(at 20°C 68°F)            | Drop-out voltage<br>(at 20°C 68°F)          | Nominal operating current<br>[±10%] (at 20°C 68°F) | Coil resistance<br>[±10%] (at 20°C 68°F) | Nominal operating power<br>(at 20°C 68°F) | Max. applied voltage<br>(at 20°C 68°F) |
|----------------------|--|---|--|--|---|--|
| 5V DC                | 75%V or less of nominal voltage<br>(Initial) | 5%V or more of nominal voltage<br>(Initial) | 80 mA  | 63Ω                                      | 400mW                                     | 7.25V DC                               |
| 6V DC                |  |   | 66.7mA   | 90Ω                                      |   | 8.7 V DC                               |
| 9V DC                |  |   | 44.4mA   | 203Ω                                     |   | 13.05V DC                              |
| 12V DC               |  |   | 33.3mA   | 360Ω                                     |   | 17.4 V DC                              |
| 18V DC               |  |   | 22.2mA   | 810Ω                                     |   | 26.1 V DC                              |
| 24V DC               |  |   | 16.7mA   | 1,440Ω                                   |   | 34.8 V DC                              |
| 48V DC               |  |   | 8.3mA  | 5,760Ω                                   |   | 69.6 V DC                              |

## 2) High sensitive type

| Nominal coil voltage | Pick-up voltage<br>(at 20°C 68°F)            | Drop-out voltage<br>(at 20°C 68°F)          | Nominal operating current<br>[±10%] (at 20°C 68°F) | Coil resistance<br>[±10%] (at 20°C 68°F) | Nominal operating power<br>(at 20°C 68°F) | Max. applied voltage<br>(at 20°C 68°F) |
|----------------------|--|---|--|--|---|--|
| 5V DC                | 75%V or less of nominal voltage<br>(Initial) | 5%V or more of nominal voltage<br>(Initial) | 40 mA  | 125Ω                                     | 200mW                                     | 7.25V DC                               |
| 6V DC                |  |   | 33.3mA   | 180Ω                                     |   | 8.7 V DC                               |
| 9V DC                |  |   | 22.2mA   | 405Ω                                     |   | 13.05V DC                              |
| 12V DC               |  |   | 16.7mA   | 720Ω                                     |   | 17.4 V DC                              |
| 18V DC               |  |   | 11.1mA   | 1,620Ω                                   |   | 26.1 V DC                              |
| 24V DC               |  |   | 8.3mA  | 2,880Ω                                   |   | 34.8 V DC                              |
| 48V DC               |  |   | 4.2mA  | 11,520Ω                                  |   | 69.6 V DC                              |

2. Specifications

| Characteristics  | Item  | Specifications   |  |
|--|---|--|--|
| Contact  | Arrangement                                       | 1 Form A   |  |
|  | Contact resistance (Initial)                      | Max. 100 mΩ (By voltage drop 6 V DC 1A)  |  |
|  | Contact material                                  | AgSnO <sub>2</sub> type  |  |
| Rating   | Nominal switching capacity (resistive load)       | 16A 277V AC  |  |
|  | Max. switching power (resistive load)             | 4,432VA  |  |
|  | Max. switching voltage                            | 277V AC  |  |
|  | Max. switching current                            | 16A  |  |
|  | Nominal operating power                           | 400mW (Standard type), 200mW (High sensitive type)   |  |
|  | Min. switching capacity (reference value)*1       | 100mA, 5V DC   |  |
|  | Electrical characteristics                        | Insulation resistance (Initial)  | Min. 1,000MΩ (at 500V DC) Measurement at same location as "Breakdown voltage" section. |
| Breakdown voltage (Initial)                                    |   | Between open contacts  | 1,000 Vrms for 1 min. (Detection current: 10 mA)                                       |
|  |   | Between contact and coil   | 4,000 Vrms for 1 min. (Detection current: 10 mA)                                       |
| Temperature rise (coil)  |   | Max. 55°C 131°F, Max. 45°C 113°F (200mW type) (By resistive method, nominal coil voltage applied to the coil; contact carrying current: 16A, at 20°C 68°F) |  |
| Surge breakdown voltage*2 (Between contact and coil) (Initial) |   | 10,000 V   |  |
| Operate time (at nominal voltage) (at 20°C 68°F)               |   | Max. 20 ms (excluding contact bounce time.)  |  |
| Release time (at nominal voltage) (at 20°C 68°F)               |   | Max. 20 ms, Max. 25 ms (200mW type) (excluding contact bounce time) (With diode)   |  |
| Mechanical characteristics                                     | Shock resistance                                  | Functional   | 200 m/s <sup>2</sup> (Half-wave pulse of sine wave: 11 ms; detection time: 10μs.)      |
|  |   | Destructive  | 1,000 m/s <sup>2</sup> (Half-wave pulse of sine wave: 6 ms.)                           |
|  | Vibration resistance                              | Functional   | 10 to 55 Hz at double amplitude of 1.5 mm (Detection time: 10μs.)                      |
|  |   | Destructive  | 10 to 55 Hz at double amplitude of 1.5 mm  |
| Expected life  | Mechanical (at 180 times/min.)                    | Min. 2×10 <sup>6</sup>   |  |
|  | Electrical (at 20 times/min.)                     | Min. 10 <sup>5</sup> (at resistive load)   |  |
| Conditions   | Conditions for operation, transport and storage*3 | Ambient temperature: -40°C to +85°C -40°F to +185°F; Humidity: 5 to 85% R.H. (Not freezing and condensing at low temperature)                              |  |
|  | Max. operating speed                              | 20 times/min. (at nominal switching capacity)  |  |
| Unit weight  |   | Approx. 17 g .60 oz, Approx. 15 g .53 oz (PCB type)  |  |

\* Specifications will vary with foreign standards certification ratings.

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 ±1.2×50μs 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.-(1) Coil temperature rise (400mW type)

Sample: ALE14B12, 6 pcs.  
Point measured: coil inside  
Ambient temperature: 25°C 77°F, 85°C 185°F



1.-(2) Coil temperature rise (200mW type)

Sample: ALE74B12, 6 pcs.  
Point measured: coil inside  
Ambient temperature: 23.7°C 74.66°F, 85°C 185°F



2. Life curve



# LE (ALE)

## 3. Electrical life test (16 A 277 V AC, resistive load)

Sample: ALE14B12, 6 pcs.

Operation frequency: 20 times/min.

(ON/OFF = 1.5s: 1.5s)

Ambient temperature: Room temperature

Circuit:



## DIMENSIONS (mm inch)

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

### 1) TMP type

1) PCB side three terminals  
(includes one dummy terminal)

**CAD Data**



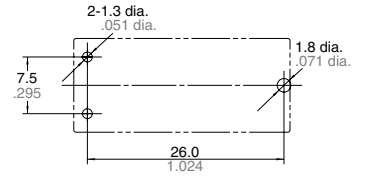
#### External dimensions



**Dimension:**  
 Less than 1mm .039inch:  $\pm 0.1 \pm 0.004$   
 Min. 1mm .039inch  
 less than 3mm .118 inch:  $\pm 0.2 \pm 0.008$   
 Min. 3mm .118 inch:  $\pm 0.3 \pm 0.012$

**Tolerance**  
 Less than 1mm .039inch:  $\pm 0.1 \pm 0.004$   
 Min. 1mm .039inch  
 less than 3mm .118 inch:  $\pm 0.2 \pm 0.008$   
 Min. 3mm .118 inch:  $\pm 0.3 \pm 0.012$

#### PC board pattern (Bottom view)



Tolerance:  $\pm 0.1 \pm 0.004$

#### Schematic (Bottom view)



### 2) PCB side three terminals

**CAD Data**

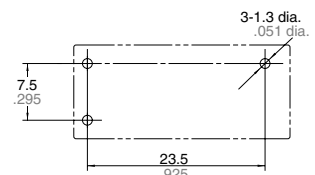
#### External dimensions



**Dimension:**  
 Less than 1mm .039inch:  $\pm 0.1 \pm 0.004$   
 Min. 1mm .039inch  
 less than 3mm .118 inch:  $\pm 0.2 \pm 0.008$   
 Min. 3mm .118 inch:  $\pm 0.3 \pm 0.012$

**Tolerance**  
 Less than 1mm .039inch:  $\pm 0.1 \pm 0.004$   
 Min. 1mm .039inch  
 less than 3mm .118 inch:  $\pm 0.2 \pm 0.008$   
 Min. 3mm .118 inch:  $\pm 0.3 \pm 0.012$

#### PC board pattern (Bottom view)



Tolerance:  $\pm 0.1 \pm 0.004$

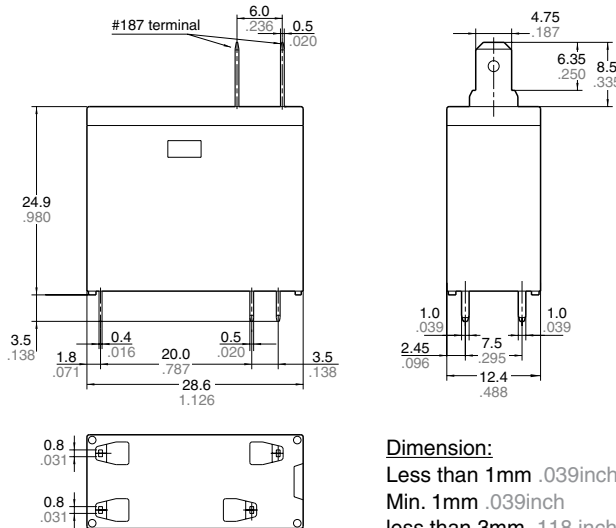
#### Schematic (Bottom view)



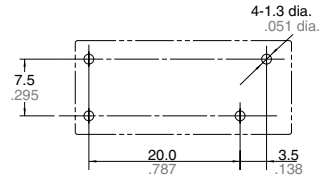
3) PCB side four terminals

**CAD Data**

External dimensions

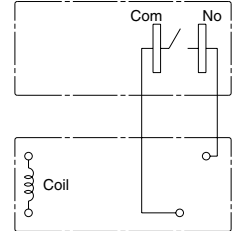


PC board pattern (Bottom view)



Tolerance:  $\pm 0.1 \pm 0.004$

Schematic (Bottom view)



**Dimension:**  
 Less than 1mm .039inch:  $\pm 0.1 \pm 0.004$   
 Min. 1mm .039inch  
 less than 3mm .118 inch:  $\pm 0.2 \pm 0.008$   
 Min. 3mm .118 inch:  $\pm 0.3 \pm 0.012$

2. PCB type  
(No tab terminals)

**CAD Data**



External dimensions



PC board pattern (Bottom view)



Tolerance:  $\pm 0.1 \pm 0.004$

Schematic (Bottom view)



**Dimension:**  
 Less than 1mm .039inch:  $\pm 0.1 \pm 0.004$   
 Min. 1mm .039inch  
 less than 3mm .118 inch:  $\pm 0.2 \pm 0.008$   
 Min. 3mm .118 inch:  $\pm 0.3 \pm 0.012$

**SAFETY STANDARDS**

| UL/C-UL (Recognized) |  | CSA (Certified) |  | VDE (Certified) |  | TV rating (UL/CSA)             |        | TÜV (Certified)      |  |
|----------------------|--|-----------------|--|-----------------|--|--------------------------------|--------|----------------------|--|
| File No.             | Contact rating                           | File No.        | Contact rating                           | File No.        | Contact rating                             | File No.                       | Rating | File No.             | Rating                                     |
| E43149               | 16A 277V AC<br>16A 30V DC<br>18A 125V AC | LR26550         | 16A 277V AC<br>16A 30V DC<br>18A 125V AC | 40009159        | 16A 250V AC (cosφ=1.0)<br>16A 30V DC (0ms) | UL<br>E43149<br>CSA<br>LR26550 | TV-5   | B 12 06<br>13461 325 | 16A 250V AC (cosφ=1.0)<br>16A 30V DC (0ms) |

**NOTES**

1. For cautions for use, please read "GENERAL APPLICATION GUIDELINES" on page B-1.

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