



### 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;<br>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  $\pm 1.2 \times 50\mu\text{s}$  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.

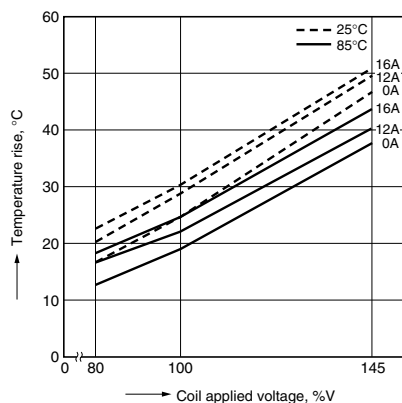
## REFERENCE DATA

### 1.-(1) Coil temperature rise (400mW type)

Sample: ALE14B12, 6 pcs.

Point measured: coil inside

Ambient temperature: 25°C 77°F, 85°C 185°F

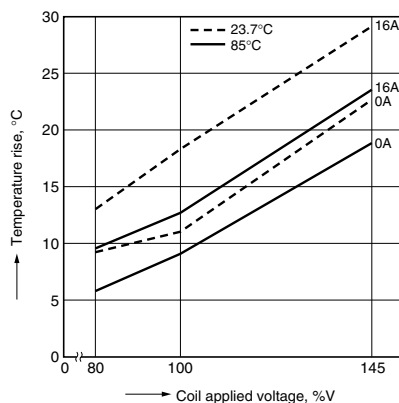


### 1.-(2) Coil temperature rise (200mW type)

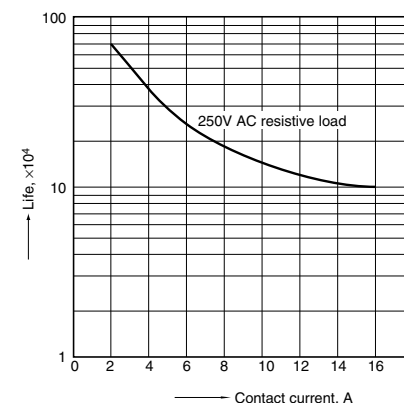
Sample: ALE74B12, 6 pcs.

Point measured: coil inside

Ambient temperature: 23.7°C 74.66°F, 85°C 185°F



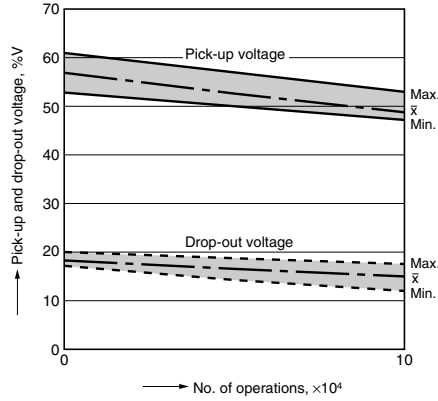
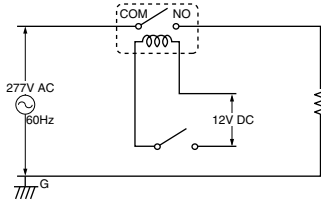
### 2. Life curve



# 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/>

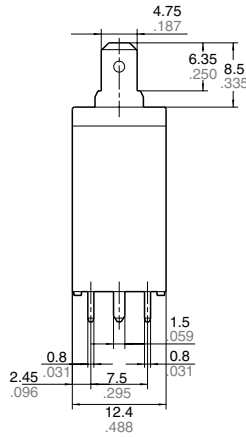
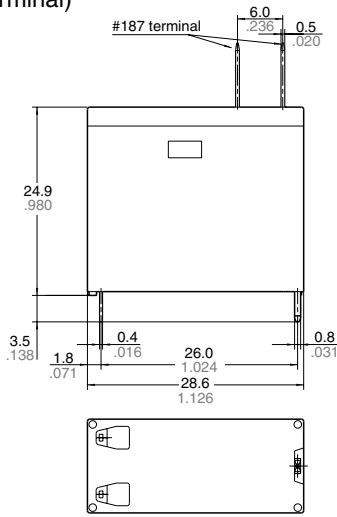
### 1. TMP type

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

**CAD Data**



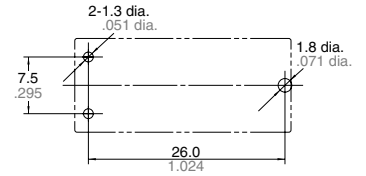
#### External dimensions



**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:  $\pm 0.3 \pm 0.012$

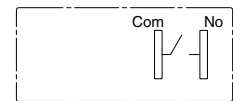
**Tolerance**  
 Less than 1mm .039inch:  $\pm 0.1 \pm 0.004$   
 Min. 1mm .039inch  
 less than 3mm .118 inch:  $\pm 0.2 \pm 0.008$   
 Min. 3mm .118 inch:  $\pm 0.3 \pm 0.012$

#### PC board pattern (Bottom view)



Tolerance:  $\pm 0.1 \pm 0.004$

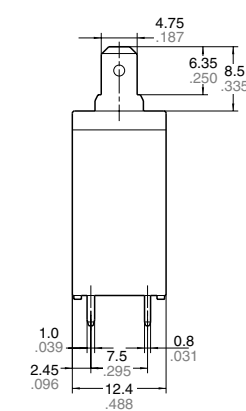
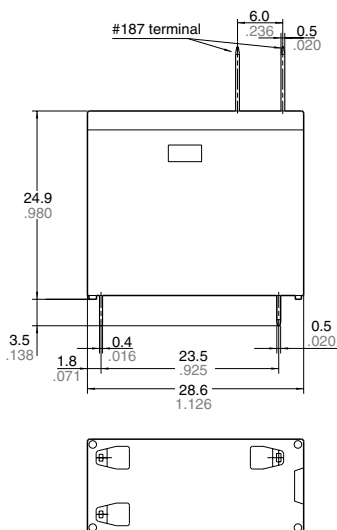
#### Schematic (Bottom view)



### 2) PCB side three terminals

**CAD Data**

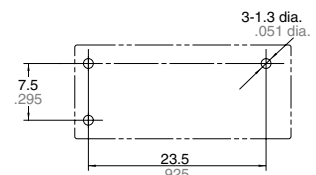
#### External dimensions



**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:  $\pm 0.3 \pm 0.012$

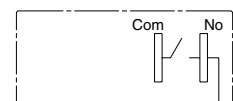
**Tolerance**  
 Less than 1mm .039inch:  $\pm 0.1 \pm 0.004$   
 Min. 1mm .039inch  
 less than 3mm .118 inch:  $\pm 0.2 \pm 0.008$   
 Min. 3mm .118 inch:  $\pm 0.3 \pm 0.012$

#### 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)



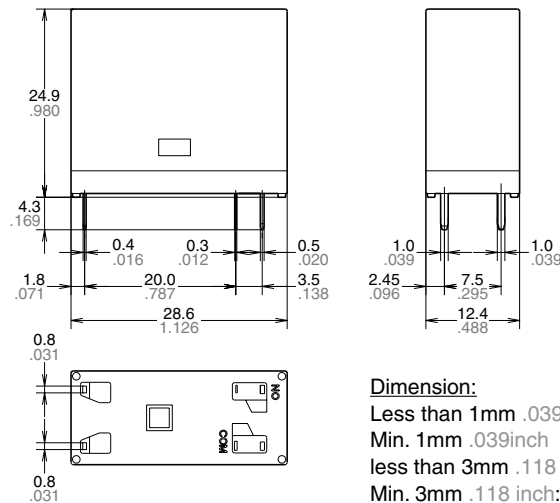
**Dimension:**  
 Less than 1mm .039inch:  $\pm 0.1 \pm 0.004$   
 Min. 1mm .039inch  
 less than 3mm .118 inch:  $\pm 0.2 \pm 0.008$   
 Min. 3mm .118 inch:  $\pm 0.3 \pm 0.012$

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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- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

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#### Как с нами связаться

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