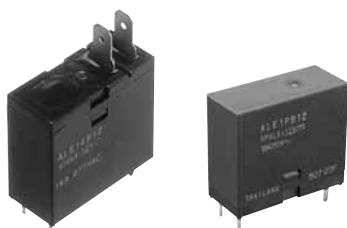




### 1 Form A 16A power relay for micro wave oven

## 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)

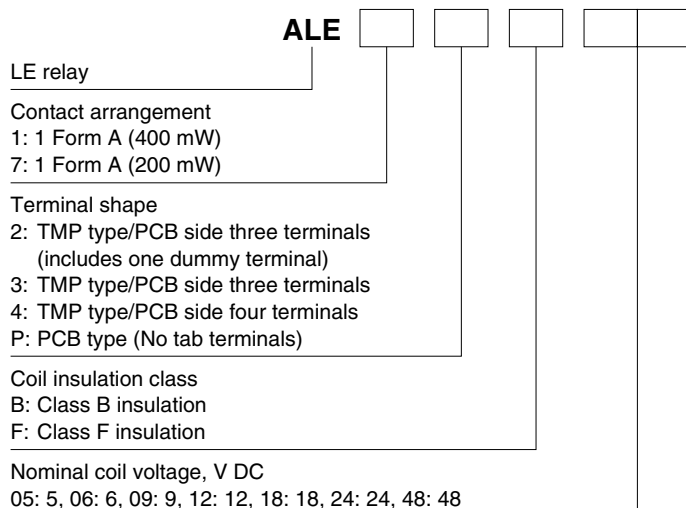
### TYPICAL APPLICATIONS

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                                                                                                                                               |
|                            | Insulation resistance (Initial)                                |                          | Min. 1,000MΩ (at 500V DC) Measurement at same location as “Breakdown voltage” section.                                                                     |
| Electrical characteristics | 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  $\pm 1.2 \times 50\mu s$  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.

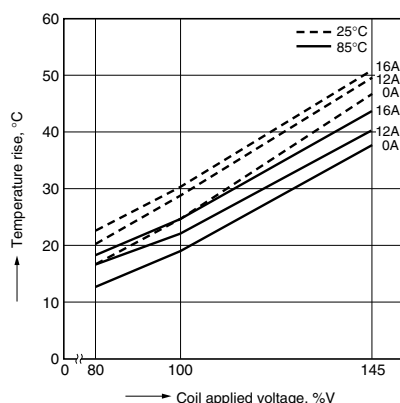
## REFERENCE DATA

### 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

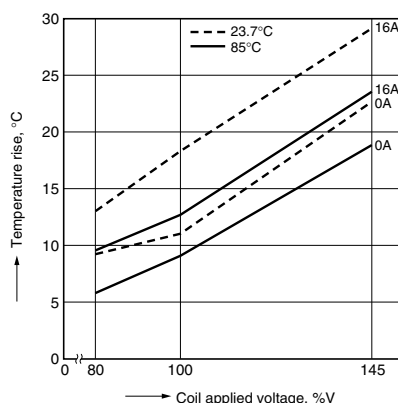


### 1.-(2) Coil temperature rise (200mW type)

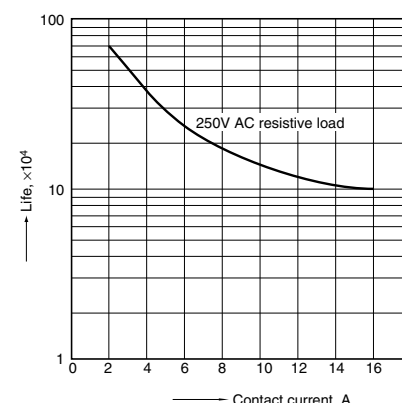
Sample: ALE74B12, 6 pcs.

Point measured: coil inside

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



### 2. Life curve



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

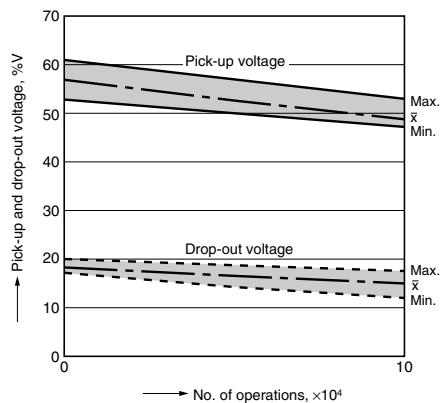
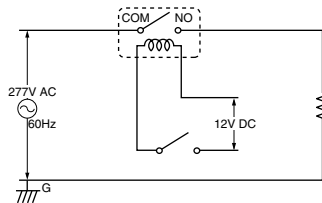
Sample: ALE14B12, 6 pcs.

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/>

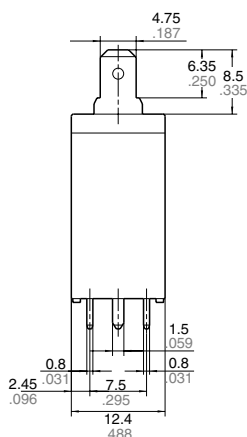
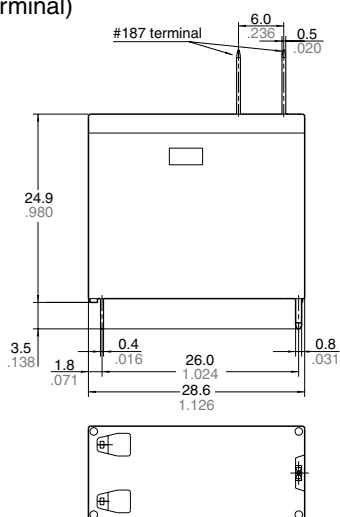
### 1. TMP type

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

**CAD Data**

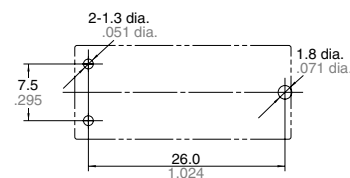


#### External dimensions



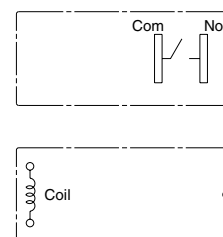
| Dimension:               | Tolerance          |
|--------------------------|--------------------|
| Less than 1mm .039inch:  | $\pm 0.1 \pm .004$ |
| Min. 1mm .039inch        |                    |
| less than 3mm .118 inch: | $\pm 0.2 \pm .008$ |
| Min. 3mm .118 inch:      | $\pm 0.3 \pm .012$ |

#### PC board pattern (Bottom view)



Tolerance:  $\pm 0.1 \pm .004$

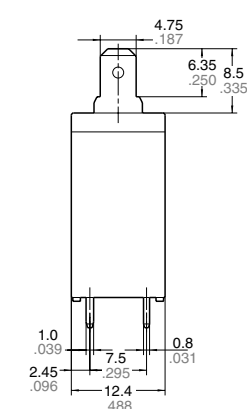
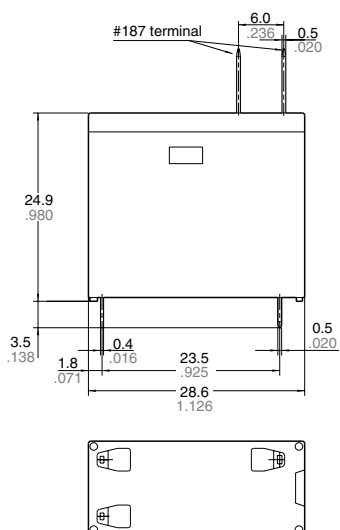
#### Schematic (Bottom view)



### 2) PCB side three terminals

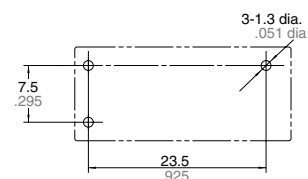
**CAD Data**

#### External dimensions



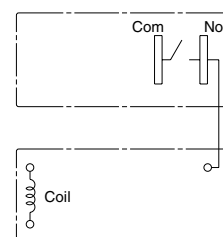
| Dimension:               | Tolerance          |
|--------------------------|--------------------|
| Less than 1mm .039inch:  | $\pm 0.1 \pm .004$ |
| Min. 1mm .039inch        |                    |
| less than 3mm .118 inch: | $\pm 0.2 \pm .008$ |
| Min. 3mm .118 inch:      | $\pm 0.3 \pm .012$ |

#### PC board pattern (Bottom view)



Tolerance:  $\pm 0.1 \pm .004$

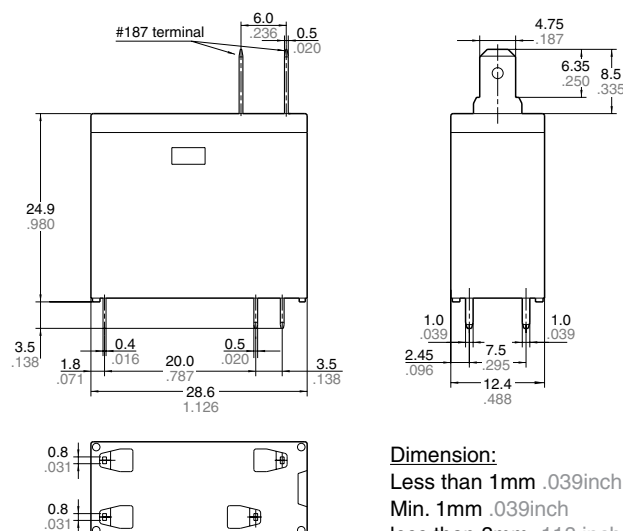
#### Schematic (Bottom view)



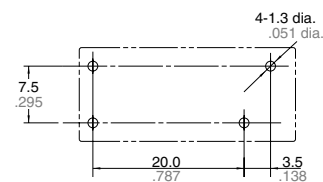
## 3) PCB side four terminals

## CAD Data

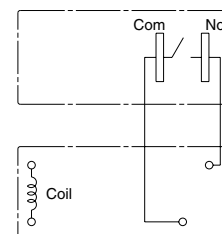
## External dimensions



## PC board pattern (Bottom view)



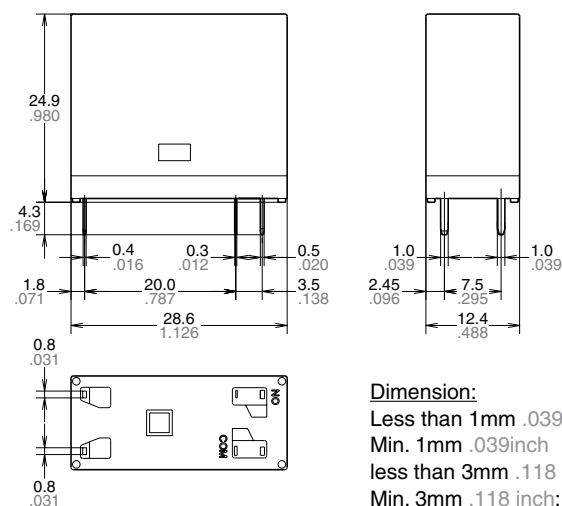
## Schematic (Bottom view)

2. PCB type  
(No tab terminals)

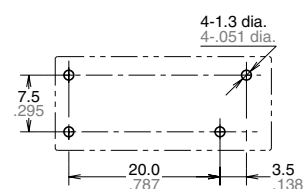
## CAD Data



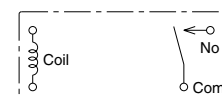
## External dimensions



## PC board pattern (Bottom view)



## Schematic (Bottom view)



## 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.

# Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

## Panasonic:

[ALE1PB24](#) [ALE75B05](#) [ALE75B06](#) [ALE75B09](#) [ALE75B12](#) [ALE75B18](#) [ALE75B24](#) [ALE75B48](#) [ALE75F05](#)  
[ALE75F06](#) [ALE75F09](#) [ALE75F12](#) [ALE75F18](#) [ALE75F24](#) [ALE75F48](#) [ALE14B05](#) [ALE14B06](#) [ALE14B09](#) [ALE14B12](#)  
[ALE14B24](#) [ALE14B48](#) [ALE15B12](#) [ALE15B24](#) [ALE1PB12](#) [ALE12B05](#) [ALE12B06](#) [ALE12B09](#) [ALE12B12](#)  
[ALE12B18](#) [ALE12B24](#) [ALE12B48](#) [ALE12F05](#) [ALE12F06](#) [ALE12F09](#) [ALE12F12](#) [ALE12F18](#) [ALE12F24](#) [ALE12F48](#)  
[ALE13B05](#) [ALE13B06](#) [ALE13B09](#) [ALE13B12](#) [ALE13B18](#) [ALE13B24](#) [ALE13B48](#) [ALE13F05](#) [ALE13F06](#)  
[ALE13F09](#) [ALE13F12](#) [ALE13F18](#) [ALE13F24](#) [ALE13F48](#) [ALE14B18](#) [ALE14F05](#) [ALE14F06](#) [ALE14F09](#) [ALE14F12](#)  
[ALE14F18](#) [ALE14F24](#) [ALE14F48](#) [ALE1PB05](#) [ALE1PB06](#) [ALE1PB09](#) [ALE1PB18](#) [ALE1PB48](#) [ALE1PF05](#)  
[ALE1PF06](#) [ALE1PF09](#) [ALE1PF12](#) [ALE1PF18](#) [ALE1PF24](#) [ALE1PF48](#) [ALE72B05](#) [ALE72B06](#) [ALE72B09](#)  
[ALE72B12](#) [ALE72B18](#) [ALE72B24](#) [ALE72B48](#) [ALE72F05](#) [ALE72F06](#) [ALE72F09](#) [ALE72F12](#) [ALE72F18](#) [ALE72F24](#)  
[ALE72F48](#) [ALE73B05](#) [ALE73B06](#) [ALE73B09](#) [ALE73B12](#) [ALE73B18](#) [ALE73B24](#) [ALE73B48](#) [ALE73F05](#)  
[ALE73F06](#) [ALE73F09](#) [ALE73F12](#) [ALE73F18](#) [ALE73F24](#) [ALE73F48](#)