

**Panasonic**  
ideas for life

Relay for control panel of  
1c 15A, and 2c 10A

**HK RELAYS (AHK)**



RoHS compliant

## FEATURES

### 1. Economical prices achieved

To assist rationalization, prices reduced to about half the price of previous products.

### 2. Compact with high-capacity

Enables high-capacity control:  
15 A for 1 Form C, 10 A for 2 Form C

### 3. Types for wide range of applications

Range includes relays with operation indicators, built-in diodes to absorb relay coil surge, and built-in CR circuits.

### 4. Sockets and terminal sockets are available.

## TYPICAL APPLICATIONS

Control panels

Power supply units

Molding machines

Machine tools

Welding equipment

Agricultural equipment

Office equipment

Vending machines

Communications equipment

Amusement machines, etc.

## ORDERING INFORMATION

	<b>AHK</b>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
HK relays						
Contact arrangement						
1: 1 Form C						
2: 2 Form C						
Terminal arrangement						
1: AC plug-in type						
2: DC plug-in type						
Type classification						
0: Standard						
1: With LED indication						
2: With diode						
3: With LED indication and diode						
4: With CR circuit						
5: With LED indication and CR circuit						
Nominal coil voltage						
06: 6, 12: 12, 24: 24, 48: 48 V						
X0: 100/110 V AC, 100/110 V DC						
X1: 110/120 V AC						
Y0: 200/220 V AC						
Y2: 220/240 V AC						

Note: Certified by UL/C-UL and TÜV

## TYPES

### 1. Plug-in type

Nominal coil voltage	1 Form C	2 Form C
	Part No.	Part No.
6V DC	AHK12006	AHK22006
12V DC	AHK12012	AHK22012
24V DC	AHK12024	AHK22024
48V DC	AHK12048	AHK22048
100/110V DC	AHK120X0	AHK220X0
12V AC	AHK11012	AHK21012
24V AC	AHK11024	AHK21024
48V AC	AHK11048	AHK21048
100/110V AC	AHK110X0	AHK210X0
110/120V AC	AHK110X1	AHK210X1
200/220V AC	AHK110Y0	AHK210Y0
220/240V AC	AHK110Y2	AHK210Y2

Standard packing: Carton: 20 pcs.; Case: 200 pcs.

### 2. Plug-in type (with LED indication)

Nominal coil voltage	1 Form C	2 Form C
	Part No.	Part No.
6V DC	AHK12106	AHK22106
12V DC	AHK12112	AHK22112
24V DC	AHK12124	AHK22124
48V DC	AHK12148	AHK22148
100/110V DC	AHK121X0	AHK221X0
12V AC	AHK11112	AHK21112
24V AC	AHK11124	AHK21124
48V AC	AHK11148	AHK21148
100/110V AC	AHK111X0	AHK211X0
110/120V AC	AHK111X1	AHK211X1
200/220V AC	AHK111Y0	AHK211Y0
220/240V AC	AHK111Y2	AHK211Y2

Standard packing: Carton: 20 pcs.; Case: 200 pcs.

### 3. Plug-in type (with diode)

Nominal coil voltage	1 Form C	2 Form C
	Part No.	Part No.
6V DC	AHK12206	AHK22206
12V DC	AHK12212	AHK22212
24V DC	AHK12224	AHK22224
48V DC	AHK12248	AHK22248
100/110V DC	AHK122X0	AHK222X0

Standard packing: Carton: 20 pcs.; Case: 200 pcs.

### 4. Plug-in type (with diode and LED indication)

Nominal coil voltage	1 Form C	2 Form C
	Part No.	Part No.
6V DC	AHK12306	AHK22306
12V DC	AHK12312	AHK22312
24V DC	AHK12324	AHK22324
48V DC	AHK12348	AHK22348
100/110V DC	AHK123X0	AHK223X0

Standard packing: Carton: 20 pcs.; Case: 200 pcs.

### 5. Plug-in type (with CR circuit)

Nominal coil voltage	1 Form C	2 Form C
	Part No.	Part No.
100/110V AC	AHK114X0	AHK214X0
110/120V AC	AHK114X1	AHK214X1
200/220V AC	AHK114Y0	AHK214Y0
220/240V AC	AHK114Y2	AHK214Y2

Standard packing: Carton: 20 pcs.; Case: 200 pcs.

### 6. Plug-in type (with CR circuit and LED indication)

Nominal coil voltage	1 Form C	2 Form C
	Part No.	Part No.
100/110V AC	AHK115X0	AHK215X0
110/120V AC	AHK115X1	AHK215X1
200/220V AC	AHK115Y0	AHK215Y0
220/240V AC	AHK115Y2	AHK215Y2

Standard packing: Carton: 20 pcs.; Case: 200 pcs.

\* For sockets and terminal sockets, see page 100.

## RATING

### 1. Coil data

#### 1) AC coils

Nominal coil voltage	Nominal coil current, mA		Nominal operating power, V A		Pick-up voltage (at 20°C 68°F)	Drop-out voltage (at 20°C 68°F)	Inductance, H		Max. applied voltage
	50Hz	60Hz	50Hz	60Hz			When drop-out	When operating	
12V AC	111	100	1.3	1.2	80%V or less of nominal voltage (Initial)	30%V or more of nominal voltage (Initial)	0.312	0.295	110%V of nominal voltage
24V AC	56	50					1.243	1.181	
48V AC	28	25					4.974	4.145	
100/110V AC	13.4/14.7	12/13.2					23.75	20.63	
110/120V AC	12.2/13.5	10.9/11.9					27.19	25.57	
200/220V AC	6.7/7.4	6/6.6					85.98	81.76	

Notes: 1. The relay operates in a range of 80% to 110 % V of the nominal coil voltage, but ideally, in consideration of temporary voltage fluctuations, it should be operated at the nominal coil voltage. In particular, for AC operation, if the impressed voltage drops to 80% V or more below the nominal coil voltage, humming will occur and a large current will flow leading possibly to coil burnout.  
2. The maximum applied voltage is the maximum voltage fluctuation value for the coil power supply. This value is not a permissible value for continuous operation. (This value differs depending on the ambient temperature. Please contact us for details.)

## 2) DC coils (at 20°C 68°F)

Nominal coil voltage	Nominal coil current, mA	Nominal operating power, W	Coil resistance, $\Omega$	Pick-up voltage (at 20°C 68°F)	Drop-out voltage (at 20°C 68°F)	Max. applied voltage (at 70°C 158°F)
6V DC	150	0.9	40	80%V or less of nominal voltage (Initial)	10%V or more of nominal voltage (Initial)	110%V of nominal voltage
12V DC	75		160			
24V DC	37		650			
48V DC	18.5		2,600			
100/110V DC	10	1.0	10,000			

Notes: 1. The rated excitation current is  $\pm 10\%$  (20°C 68°F).  
2. The coil resistance for DC operation is the value measured when the coil temperature is 20°C 68°F. Compensate  $\pm 0.4\%$  for every  $\pm 1^\circ\text{C}$  change in temperature.  
3. The relay operates in a range of 80% to 110 % V of the nominal coil voltage, but ideally, in consideration of temporary voltage fluctuations, it should be operated at the nominal coil voltage.  
4. For use with 200 V DC, connect a 10 K $\Omega$  (5W) resistor, in series, to the 100 V DC relay.  
5. The maximum applied voltage is the maximum voltage fluctuation value for the coil power supply. This value is not a permissible value for continuous operation. (This value differs depending on the ambient temperature. Please contact us for details.)

## 2. Specifications

Characteristics	Item		Specifications
Contact	Contact resistance (Initial)		Max. 50 mΩ (By voltage drop 6 V DC 1A)
	Contact material		AgSnO <sub>2</sub> type
Rating	Nominal switching capacity		1 Form C: 15A 125V AC (resistive load), 2 Form C: 10A 125V AC (resistive load)
	Max. switching voltage		250V AC, 125V DC
	Max. switching current		15A (1 Form C), 10A (2 Form C)
	Min. switching capacity (Reference value)* <sup>1</sup>		100mA 5V DC
Electrical characteristics	Insulation resistance (Initial)		Min. 100MΩ (at 500V DC) Measurement at same location as “Breakdown voltage” section.
	Breakdown voltage (Initial)	Between open contacts	1,000 Vrms for 1min. (Detection current: 10mA.)
		Between contact sets	2,000 Vrms for 1min. (Detection current: 10mA.)
		Between contact and coil	2,000 Vrms for 1min. (Detection current: 10mA.)
	Temperature rise (coil)		Max. 80°C 176°F (By resistive method, nominal voltage)
	Operate time (at 20°C 68°F)* <sup>2</sup>		Max. 25ms (Nominal coil voltage applied to the coil, excluding contact bounce time.)
Release time (at 20°C 68°F)* <sup>2</sup>		Max. 25ms (Nominal coil voltage applied to the coil, excluding contact bounce time.) (without diode)	
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 1 mm (Detection time: 10μs.)
		Destructive	10 to 55 Hz at double amplitude of 2 mm
Expected life	Mechanical		AC type: 5×10 <sup>7</sup> (at 180 times/min.), DC type: 10 <sup>8</sup> (at 180 times/min.)
	Electrical	AC load	1 Form C: 15A 125V AC (resistive load) (cosφ=1), Min. 2×10 <sup>5</sup> 2 Form C: 10A 125V AC (resistive load) (cosφ=1), Min. 5×10 <sup>5</sup>
Conditions	Conditions for operation, transport and storage* <sup>3</sup>		Ambient temperature: −50°C to +70°C −58°F to +158°F (Without LED indication); −50°C to +60°C −58°F to +140°F (With LED indication) Humidity: 5 to 85% R.H. (Not freezing and condensing at low temperature)
	Max. Operating speed		20 times/min. (at max. rating)
Unit weight			Approx. 35g 1.23 oz

Notes: If integrating into electrical appliances that will be subject to compliance to the Electrical Appliance and Material Safety Law, please use in an ambient temperature between -50°C to +40°C -58°F to +104°F (AC type).

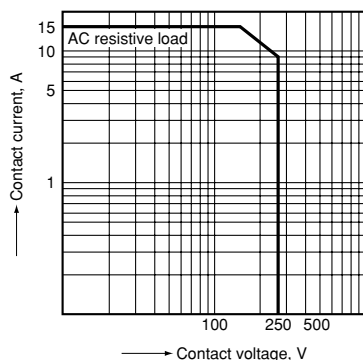
\*1. This value can change due to the switching frequency, environmental conditions and desired reliability level, therefore it is recommended to check this with the actual load.

\*2. For the AC coil types, the operate/release time will differ depending on the phase.

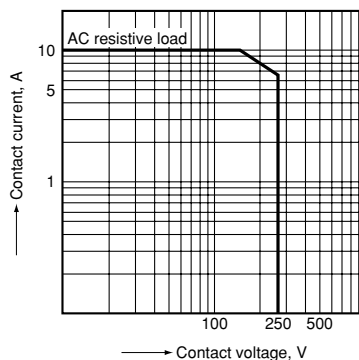
\*3. The upper limit of the ambient temperature is the maximum temperature that can satisfy the coil temperature rise value. Refer to Usage, transport and storage conditions in NOTES.

## REFERENCE DATA

1-(1). Max. switching capacity (1 Form C type)

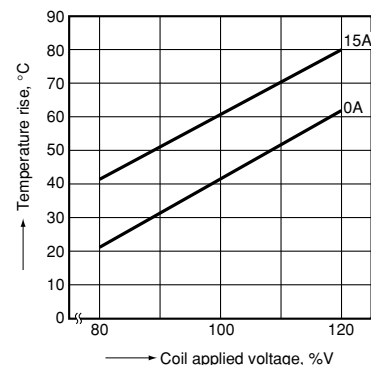


1-(2). Max. switching capacity (2 Form C type)



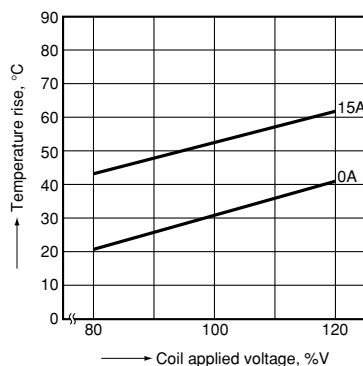
2-(1). Coil temperature rise (1 Form C/AC type)

Measured portion: Inside the coil  
Ambient temperature: 70°C 158°F



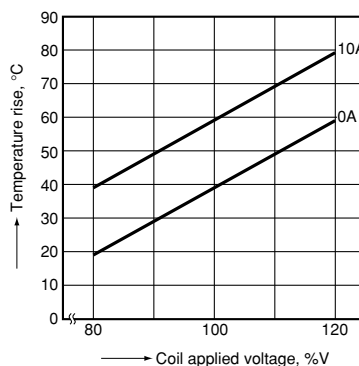
2-(2). Coil temperature rise (1 Form C/DC type)

Measured portion: Inside the coil  
Ambient temperature: 70°C 158°F



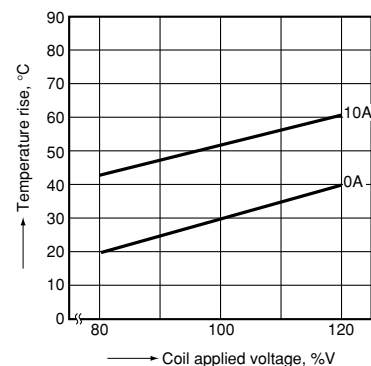
2-(3). Coil temperature rise (2 Form C/AC type)

Measured portion: Inside the coil  
Ambient temperature: 70°C 158°F

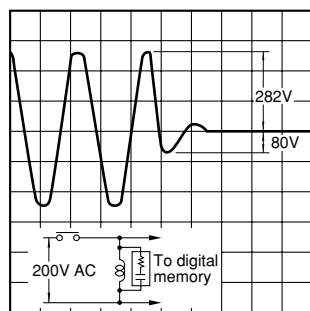


2-(4). Coil temperature rise (2 Form C/DC type)

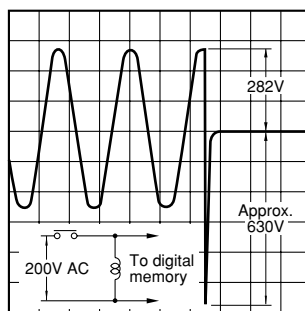
Measured portion: Inside the coil  
Ambient temperature: 70°C 158°F



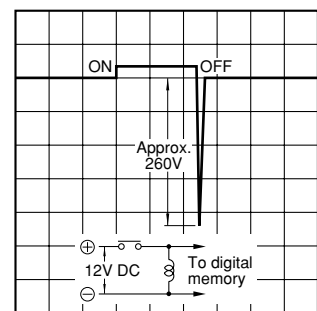
3-(1). AC coil surge voltage waveform  
(With CR circuit)



3-(2). AC coil surge voltage waveform  
(Without CR circuit)

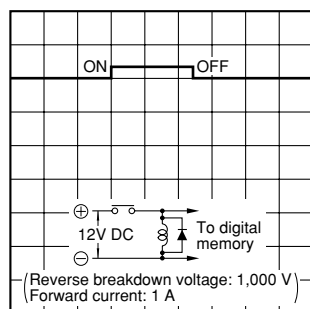


4-(1). DC coil surge voltage waveform  
(Without diode)



4-(2). DC coil surge voltage waveform  
(With diode)

Diode characteristics:  
Reverse breakdown voltage: 1,000 V  
Forward current: 1 A



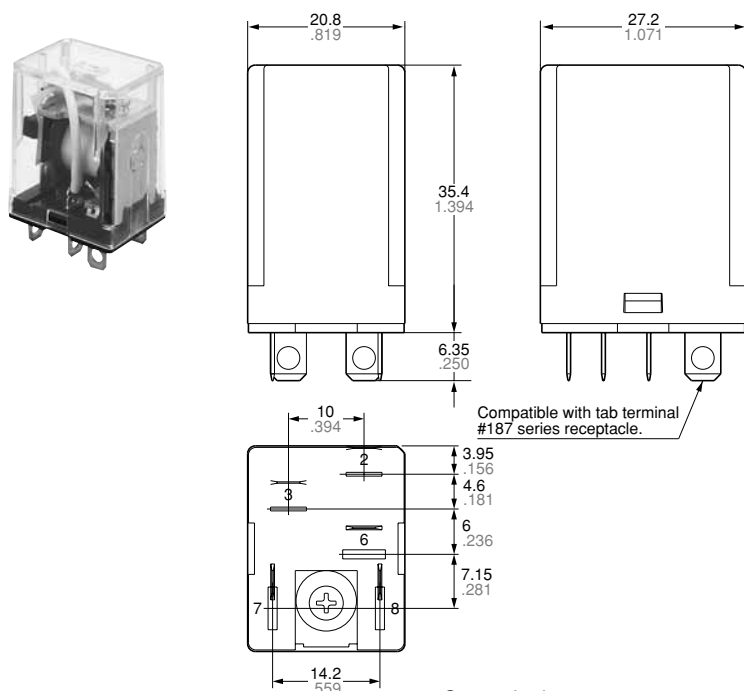
## DIMENSIONS (mm inch)

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

### 1. Plug-in type (1 Form C) including diode/CR

**CAD Data**

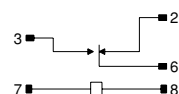
External dimensions



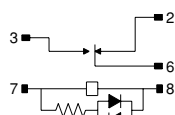
General tolerance:  $\pm 0.3 \pm .012$

Schematic (Bottom view)

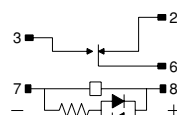
Standard type



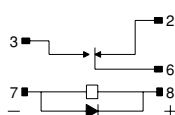
LED AC type



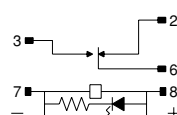
LED DC type



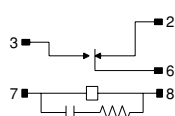
Diode DC type



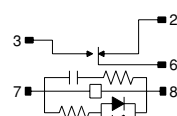
Diode/LED DC type



CR AC type



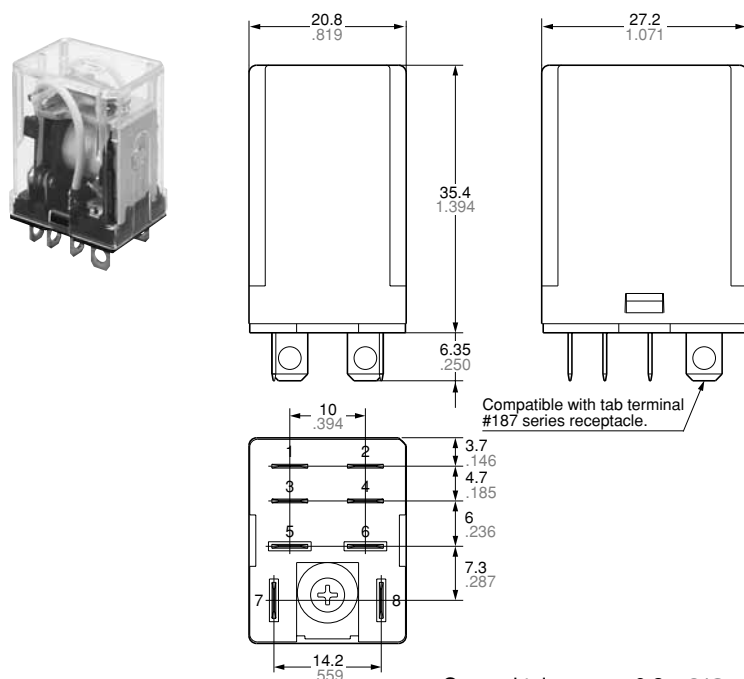
CR/LED AC type



### 2. Plug-in type (2 Form C) including diode/CR

**CAD Data**

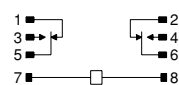
External dimensions



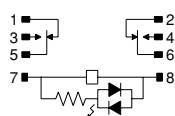
General tolerance:  $\pm 0.3 \pm .012$

Schematic (Bottom view)

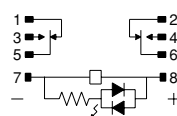
Standard type



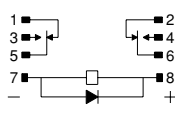
LED AC type



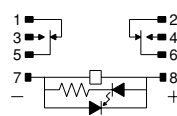
LED DC type



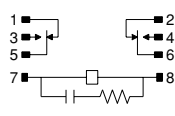
Diode DC type



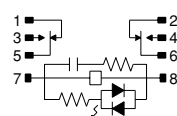
Diode/LED DC type



CR AC type



CR/LED AC type



## SAFETY STANDARDS

	File No.	Certification authority: UL/C-UL	File No.	Certification authority: TÜV
1 Form C	E43028*	10A 250V AC, 1/2HP 125V AC, 10A 30V DC	B 04 01 13461 027	15A 125V AC (cosφ=1.0), 15A 30V DC (0ms)
2 Form C	E43028*	10A 250V AC, 1/2HP 125V AC, 10A 30V DC	B 04 01 13461 027	10A 125V AC (cosφ=1.0), 10A 30V DC (0ms)

\* CSA standard: Certified by C-UL

## NOTES

### 1. Coil applied voltage

#### 1) DC coil

To ensure proper operation, the voltage applied to both terminals of the coil should be  $\pm 5\%$  (at 20°C 68°F) the nominal voltage of the coil. Also, be aware that the pick-up and dropout voltages will fluctuate depending on the ambient temperature and operating conditions.

#### 2) AC Coil

To enable stable operation of the relay, apply the nominal voltage. Ensure that the fluctuation range of the power source voltage remains, in principle, within +10% to -15% of the value of the nominal current. Moreover, the ideal waveform for the voltage applied to the coil is a sine curve. If commercially provided power source is used, the waveform should be checked. If a stabilized AC power source is used, the conditioning equipment may distort the waveform, and abnormal heating may result. With AC coils, hum can be normally stopped by the use of a shading coil. If the waveform is distorted, however, the shading coil may be ineffective.

### 2. LED indications

The light of the light emitting diode is what displays operation. If voltage remains after relay might illuminate briefly.

### 3. Switching lifetime

The switching lifetime is defined under the standard test condition specified in the JIS C 5442(\*2) standard (temperature 15 to 35°C 59 to 95°F, humidity 25 to 75% R.H.). 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. Also, be especially careful of loads such as those listed below.

1) When used for AC load-operating and the operating phase is synchronous. Rocking and fusing can easily occur due to contact shifting.

2) High-frequency load operating  
When high-frequency opening and closing of the relay is performed with a load that causes arcs at the contacts, nitrogen and oxygen in the air is fused by the arc energy and  $\text{HNO}_3$  is formed. This can corrode metal materials. Three countermeasures for these are listed here.

- (1) Incorporate an arc-extinguishing circuit.
- (2) Lower the operating frequency
- (3) Lower the ambient humidity

### 4. Conditions for operation, transport and storage

1) Ambient temperature, humidity, and atmospheric pressure during usage, transport, and storage of the relay:

(1) Temperature:

-50 to +70°C -58 to +158°F

(without LED)

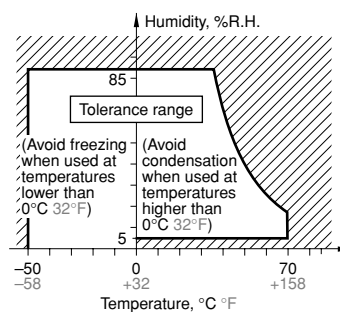
-50 to +60°C -58 to +140°F

(with LED)

(2) Humidity: 5 to 85% RH (Avoid freezing and condensation.)

The humidity range varies with the temperature. Use within the range indicated in the graph below.

Temperature and humidity range for usage, transport, and storage



(3) Atmospheric pressure: 86 to 106kPa

#### 2) Condensation

Condensation forms when there is a sudden change in temperature under high temperature and high humidity conditions. Condensation will cause deterioration of the relay insulation.

#### 3) Freezing

Condensation or other moisture may freeze on the relay when the temperatures is lower than 0°C 32°F. This causes problems such as sticking of movable parts or operational time lags.

#### 4) Low temperature, low humidity environments

The plastic becomes brittle if the relay is exposed to a low temperature, low humidity environment for long periods of time.

### 5. Diode characteristics

1) Reverse breakdown voltage: 1,000 V

2) Forward current: 1 A

### 6. Diode and CR built-in type

Since the diode and CR inside the relay coil are designed to absorb the counter emf, the element may be damaged if a large surge, etc., is applied to the diode and CR.

If there is the possibility of a large surge voltage from the outside, please implement measures to absorb it.

7. Please connect DC coil types with LED and built-in diode correctly by verifying the coil polarity (“+” and “-”). Connecting with reverse polarity will cause the LED not to light and damage the built-in diode due to its specification.

# Mouser Electronics

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