

# G9KB

PCB Power Relays

## 600 VDC, 50 A High Capacity Power Relay with Bidirectional Switching



- A high capacity of 600 VDC, 50 A and bidirectional opening and closing is achieved
- Ambient temperature 85°C
- Contact gap: 3.6 mm or more
- Low initial contact resistance  $\leq 5 \text{ m}\Omega$
- UL 60947-4-1 and EN 61810-10-certified (required for ESS switching devices)



Refer to the *Precautions* on page 4.

### Model Number Legend

G9KB-□□  
1 2

1. Number of Poles      2. Contact Form  
1: 1-pole                      A: SPST-NO (1a)

### Application Examples

- Energy Storage System
- V2X (V2H, V2B, etc.)
- DC household appliances

G  
9  
K  
B

### Ordering Information

| Terminal shape | Contact form | Enclosure rating | Model   | Rated coil voltage (V) | Minimum packing unit |
|----------------|--------------|------------------|---------|------------------------|----------------------|
| Standard       | SPST-NO (1a) | Flux protection  | G9KB-1A | 12 VDC<br>24 VDC       | 36 pcs/box           |

Note. When ordering, add the rated coil voltage to the model number.

Example: G9KB-1A DC12

Rated coil voltage

Both the coil voltage on the product and the packing will be marked as □□VDC.

### Ratings

#### ● Coil

| Rated voltage | Rated current (mA) | Coil resistance ( $\Omega$ ) | Must operate voltage (V) | Must release voltage (V) | Max. voltage (V)  | Power consumption (mW)         |
|---------------|--------------------|------------------------------|--------------------------|--------------------------|-------------------|--------------------------------|
|               |                    |                              | % of rated voltage       |                          |                   |                                |
| 12 VDC        | Approx. 235.3      | 51                           | 75% max. **              | 10 to 32%                | 110%<br>(at 23°C) | Approx. 2,800<br>Approx. 575 * |
| 24 VDC        | Approx. 116.5      | 206                          |                          |                          |                   |                                |

Note 1. The rated current and resistance are measured at a coil temperature of 23°C with a tolerance of  $\pm 10\%$ .

Note 2. The operating characteristics are measured at a coil temperature of 23°C.

Note 3. The maximum permissible voltage is the maximum value of the fluctuation range for the relay coil operating power supply and was measured at an ambient temperature of 23°C.

Note 4. Use this relay with coil voltage reduction.

\* Power consumption with Holding Voltage is approx. 575 mW (when applying Holding Voltage at 45%). Please confirm the details on page 4, under ●Coil Voltage Reduction (Holding Voltage) after Relay Operation.

\*\* Some mounting directions are not guaranteed. Please confirm the details on page 4 ●Mounting Direction.

#### ● Contacts

| Item                   | Resistive load             |
|------------------------|----------------------------|
| Contact type           | Double make                |
| Contact material       | Ag Alloy (Cd free)         |
| Rated load             | 600 VDC, 50 A/600 VDC, 1 A |
| Rated carry current    | 50 A                       |
| Max. switching voltage | 600 VDC                    |
| Max. switching current | 50 A                       |

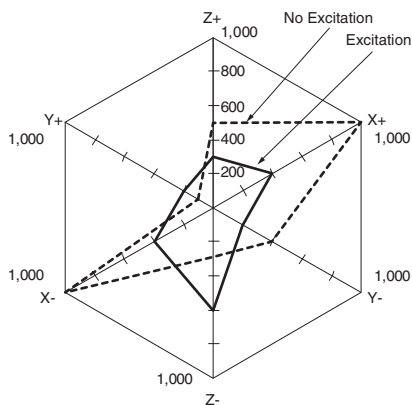
## Characteristics

| Item  | Model                                 | G9KB-1A   |
|---|---------------------------------------|---|
| Contact resistance *1                       |                                       | 5 mΩ max.   |
| Operate time *2                             |                                       | 30 ms max.  |
| Release time *2                             |                                       | 10 ms max.  |
| Insulation resistance *3                    |                                       | 1,000 MΩ min.   |
| Dielectric strength                         | Between coil and contacts             | 5,000 VAC, 50/60 Hz for 1 min   |
|   | Between contacts of the same polarity | 2,500 VAC, 50/60 Hz for 1 min   |
| Impulse withstand voltage                   |                                       | Between coil and contacts 10 kV (1.2 × 50 μs)   |
| Vibration resistance                        | Destruction                           | 10 to 55 to 10 Hz, 0.75 mm single amplitude (1.5 mm double amplitude)   |
|   | Malfunction                           | Excitation: 10 to 55 to 10 Hz, 0.75 mm single amplitude (1.5 mm double amplitude)<br>No excitation: 10 to 55 to 10 Hz, 1.5 mm single amplitude (0.3 mm double amplitude)  |
| Shock resistance                            | Destruction                           | 1,000 m/s <sup>2</sup>  |
|   | Malfunction                           | Excitation: 100 m/s <sup>2</sup><br>No excitation: 50 m/s <sup>2</sup>  |
| Durability                                  | Mechanical                            | 1,000,000 operations min. (at 10,800 operations/h)  |
|   | Electrical (Resistive) *4             | (1) 600 VDC 50 A 2,000 operations min. (Switching frequency: 1 second ON - 9 seconds OFF at 85°C and 25% to 75% RH) *5<br>(2) 600 VDC 1 A 100,000 operations min. (Switching frequency: 1 second ON - 9 seconds OFF at 85°C and 25% to 75% RH) *5 |
| Failure rate (P level) (Reference value) *6 |                                       | 1 A at 5 VDC  |
| Use conditions                              | Coil holding voltage *7               | 45% to 60% of rated coil voltage  |
|   | Ambient operating temperature         | -40°C to 85°C (with no icing or condensation)   |
|   | Ambient operating humidity            | 5% to 85%   |
| Weight                                      |                                       | Approx. 110 g   |

Note. The values given above are initial values at 23°C. (except electrical durability)

- \*1. Measurement conditions: 6 VDC, 20 A (after 30 seconds) voltage drop method.
- \*2. Measurement conditions: Applied rated coil voltage, no contact bouncing.
- \*3. Measurement conditions: Measured with a 1,000 VDC megohmmeter at the same point as the dielectric strength was measured.
- \*4. This specification is when diode and zener diode are used. For relay coil, please connect diode and zener diode.  
For more detail, please refer to ●Diode Connection for Operating Coil on page 4.
- \*5. The humidity range of 25% to 75% conforms to the environmental conditions of JIS C 5442.  
Also, refer to ●Relay Service Life on page 5.
- \*6. The value was measured at a switching frequency of 180 operations/ minute.
- \*7. For the detail regarding holding voltage usage, please refer to ●Coil Voltage Reduction (Holding Voltage) after Relay Operation on page 4.

## Malfunction shock resistance



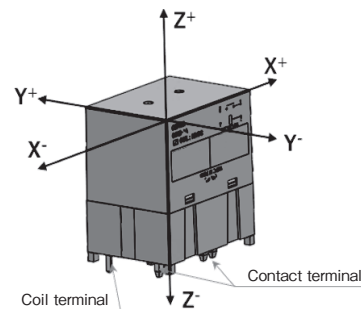
### Measurement:

Measure the value of contact malfunction happening by applying 3 axes with 6 direction 3 times each. The energized voltage is within the range of the rated holding voltage.

### Standard value:

Excitation 100 m/s<sup>2</sup>  
No excitation 50 m/s<sup>2</sup>

### Shock direction

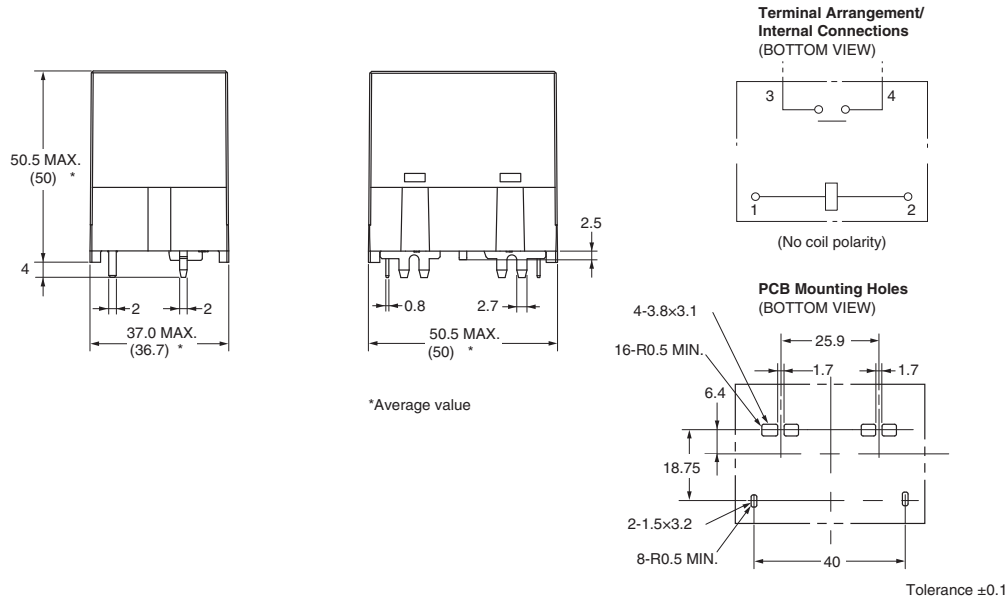


## Dimensions

**CAD Data** Please visit our website, which is noted on the last page.

**(Unit:mm)**

### Standard type G9KB-1A



## Approval Standard

UL/C-UL Certified: (File No. E41515)

| Model   | Contact form | Coil ratings | Contact ratings               | Number of test operations |
|---------|--------------|--------------|-------------------------------|---------------------------|
| G9KB-1A | SPST-NO(1a)  | 12, 24 VDC * | 600 VDC 40 A (Resistive) 85°C | 6,000                     |
|         |              |              | 600 VDC 50 A (Resistive) 85°C | 2,000                     |

\* Holding voltage of 45% (after applying rated voltage to coil for 0.1 seconds)

EN/IEC, TÜV Certified: (Certificate No. R 50528195)

| Model   | Contact form | Coil ratings | Contact ratings               | Number of test operations |
|---------|--------------|--------------|-------------------------------|---------------------------|
| G9KB-1A | SPST-NO(1a)  | 12, 24 VDC * | 600 VDC 1 A (Resistive) 85°C  | 100,000                   |
|         |              |              | 600 VDC 50 A (Resistive) 85°C | 2,000                     |

\* Holding voltage of 45% (after applying rated voltage to coil for 0.1 seconds)

CQC Certified: (Certificate No. CQC21002322255)

| Model   | Contact form | Coil ratings | Contact ratings               | Number of test operations |
|---------|--------------|--------------|-------------------------------|---------------------------|
| G9KB-1A | SPST-NO(1a)  | 12, 24 VDC * | 600 VDC 1 A (Resistive) 85°C  | 100,000                   |
|         |              |              | 600 VDC 50 A (Resistive) 85°C | 2,000                     |

\* Holding voltage of 45% (after applying rated voltage to coil for 0.1 seconds)

|                                     |                      |   |
|-------------------------------------|----------------------|---|
| Creepage distance (required value)  |                      | 12.6 mm min. (IEC) / 12.7 mm min. (UL)  |
| Clearance (required value)          |                      | 8.0 mm min. (IEC) / 9.5 mm min. (UL)  |
| Insulation material group           |                      | III   |
| Type of insulation                  | coil-contact circuit | Basic (600 V, OV-cat.III, Pollution degree 3, up to 2,000 m above sea level)<br>Reinforced (600 V, OV-cat.III, Pollution degree 2, up to 2,000 m above sea level) |
|                                     | open contact circuit | Micro disconnection   |
| Rated insulation voltage            |                      | 600 V   |
| Rated voltage system                |                      | 600 V   |
| Category of protection (IEC61810-1) |                      | RTII  |
| Flammability class (UL94)           |                      | V-0   |
| Coil insulation system (UL)         |                      | Class F   |

## Precautions

- Please refer to “Safety Precautions for All Relays” for correct use.
- Electrical Appliances and Materials Safety Act

The G9KB-1A series does not comply with the Electrical Appliances and Materials Safety Act. Please select our relays carefully in accordance with the application you wish to use the product for.

### Warning

As this relay is a high-voltage and high-current type, there is a risk of abnormal heat generation, smoke generation or fire if you use the relay with a contact voltage, current, or for a number of times beyond the specified range. Use only within the specified ranges.



If the power is switched on when the connections are insufficient, there is a risk of abnormal heat generation. Do not connect and use probes and sockets on individual relays.



If the power is switched on when the connections are insufficient, there is a risk of abnormal heat generation. Please install and use relays under recommended conditions.



### Precautions for Safe Use

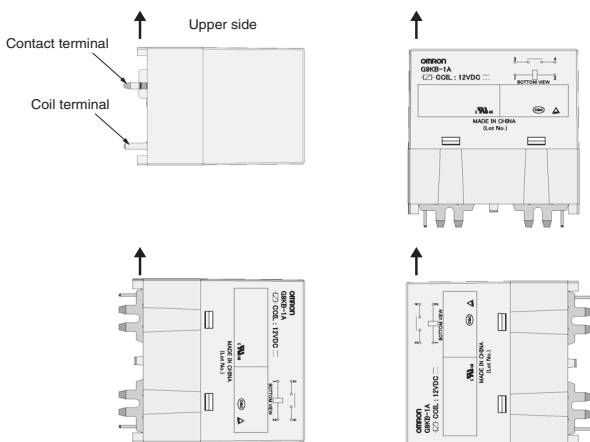
#### ● Drop

- Do not use relays that have been dropped as they may not function properly.

### Precautions for Correct Use

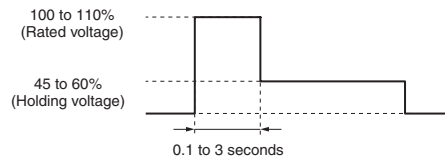
#### ● Mounting Direction

- The relay is limited for mounting direction due to the specification of operation voltage and electrical durability. Do not use in any other direction except as indicated in below chart. There is a risk of reduced operational lifetime for failure to observe this warning.



#### ● Coil Voltage Reduction (Holding Voltage) after Relay Operation

- Use this relay with coil voltage reduction.
- Apply the rated voltage for 0.1 to 3 seconds to the coil first.
- The range of coil rated voltage must be set as 100 to 110%, and holding voltage must be 45 to 60%. Do not exceed the ranges due to the change of coil voltage difference and so on.

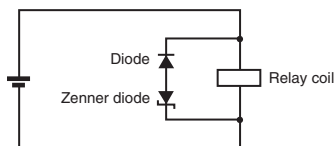


|                 | Applied coil voltage | Coil resistance * | Coil power consumption |
|-----------------|----------------------|-------------------|------------------------|
| Rated voltage   | 100 to 110%          | 51 Ω (12 VDC)     | Approx. 2.8 to 3.4 W   |
| Holding voltage | 45 to 60%            | 206 Ω (24 VDC)    | Approx. 0.57 to 1.1 W  |

\* The coil resistances were measured at a coil temperature of 23°C with tolerances of ± 10%.

#### ● Diode Connection for Operating Coil

- Connect diode and Zener diode (or Varistor) to the coil (refer to the picture below).  
Diode is for coil surge absorption. Ensure to include Zener diode as there is a possibility of any influence for switching capability when only using diodes.
- Coil has no polarity. Connect the diodes in the reverse polarity of the voltage applied to the coil.
- The recommended Zener diode voltage is 3 times that of the rated coil voltage.
- Use diodes with reverse dielectric strength 10 times or more that of coil rated voltage, and with forward current more than coil rated current.



#### ● PCB Terminal soldering

- Solder at 290°C for 20 seconds (max.) in soldering bath.
- It is not possible to wash relay as this is not fully sealed type.

#### ● Assembly

- Assemble relays in an environment with less amount of dust and harmful gases.
- Using the Relay under high temperature, high humidity, or harmful gas may deteriorate its performance characteristics due to condensation or corrosive materials, resulting in failure or burn damage to the relay.
- This product weight is about 110 g. Be careful of the strength of PCB. To reduce soldering crack due to heat stress, use both sides through hole PCB.

### ●Relay Service Life

- These relays must be used for high DC voltages. The final failure mode is failure to break the circuit. In a worst-case scenario, burning may extend to surrounding components. Do not use these relays outside of the specified ratings and service life, or for any application other than high DC voltages. Implement safety circuits and other safety measures to minimize the risk in case of the unlikely event of a failure.
- In a low-humidity or low-temperature (negative) environment, the life cycle may vary as a result of high voltage and large-current opening and closing. Therefore, be sure to check on the actual machine.
- The coil drive circuit, ambient environment, switching frequency, or load conditions (e.g., inductive load or capacitor load) may reduce the service life and possibly lead to failure to break. Always confirm the service life in the actual equipment.

### ●Micro load

- This is a power relay for high power switching. Do not use for micro loads such as signal switching.

### ●Installation Gap

- Secure an installation gap of 20 mm or more for the product.

Please check each region's Terms & Conditions by region website.

## OMRON Corporation

Device & Module Solutions Company

### Regional Contact

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