## ■ Relay Classification

| Model | Mounting | Enclosure Ratings | Features |
|---|---|---|---|
| G4W  | Discrete | Unsealed | Designed for manual soldering |
| G2R  | | Flux protection | Design inhibits flux intrusion into the casing fro the terminals during soldering. |
| G6A  | | Fully sealed | Sealed resin casings and covers, limiting damage from corrosive atmospheres. |
| G6S  | Surface mounting | | Surface mounting relays permit automatic reflow soldering. |

## ■ Construction

**SEALING**

**Unsealed Relays**

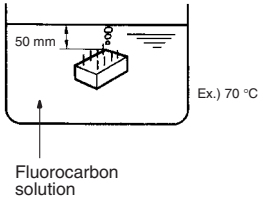
Relays of this type are intended for manual soldering. No measures are taken against penetration of flux and cleaning solvent into the relay. This type of relay cannot be immersion-cleaned.

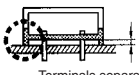
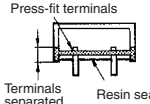
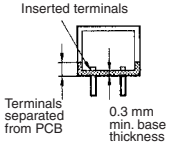
**Flux-protection Relays**

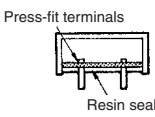
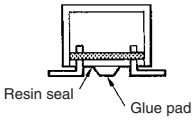
Special design construction prevents flux from penetrating into the relay housing, for example, due to capillary action up the terminals when the relay is soldered onto a PCB. This type of relay also cannot be immersion-cleaned.

**Fully Sealed Relays**

Fully sealing prevents not only flux, but also cleaning solvent from penetrating into the relay housing. Therefore, this type of relay can be immersion-cleaned. Relays are each tested before being shipped. The relay is immersed in fluorocarbon solution for 1 minute, at a temperature of 70˚C +5˚C/-0˚C, to see if gases escape from the relay. The following figure illustrates the test conditions.




| Classification | Unsealed | | Flux protection | |
|---|---|---|---|---|
| **Construction** |   |   |   |   |
| **Features** | Terminals are separated from PCB surface when relay is mounted. | Contacts are positioned away from base. | Terminals are pressed into base. | Terminals are inserted into base 0.3 mm min. thick. |
| **Automatic flux application** | Poor | Poor | Good | Good |
| **Automatic soldering** | Poor | Poor | Good | Good |
| **Automatic cleaning** | Poor | Poor | Poor | Poor |
| **Manual soldering** | Good | Good | Good | Good |
| **Penetration of dust** | Fair | | Fair | |
| **Penetration of corrosive gas** | Poor | | Poor | |

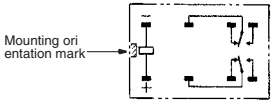
| Classification | Fully Sealed | Surface Mounting |
|---|---|---|
| **Construction** |  |  |
| **Features** | Terminals are separated from PCB surface when relay is mounted. | Terminal and base, as well as the base and casing, are sealed with adhesive; the L-shaped terminals and adhesive pads allow temporary fixing to the board. |
| **Automatic flux application** | Good | Good |
| **Automatic soldering** | Good | Good |
| **Automatic cleaning** | Good | Good |
| **Manual soldering** | Good | Good |
| **Penetration of dust** | Good | Good |
| **Penetration of corrosive gas** | Good | Good |

## ■ Operation

### SINGLE-SIDE STABLE RELAYS (STANDARD)

The contacts of this simple type of relay momentarily turn ON and OFF, depending on the excitement state of the coil.

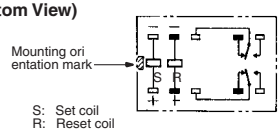
**Terminal Arrangement/ Internal Connections (Bottom View)**




### DOUBLE-WINDING, LATCHING RELAYS

This latching relay has two coils: set and reset. It can retain the ON or OFF states even when a pulsating voltage is supplied, or when the voltage is removed.

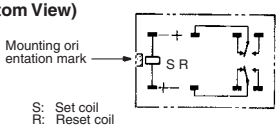
**Terminal Arrangement/ Internal Connections (Bottom View)**




### SINGLE-WINDING, LATCHING RELAYS

Unlike the double-winding latching relay, the single-winding latching relay has only one coil. This coil, however, serves as both the set and reset coils, depending on the polarity (direction) of current flow. When current flows through the coil in the forward direction, it functions as a set coil; when current flows through the coil in the reverse direction, it functions as a reset coil.

**Terminal Arrangement/ Internal Connections (Bottom View)**




### BUILT-IN DIODE

A diode is built into some relays, wired in parallel with the coil to absorb the counterelectromotive force (counter emf) generated by the coil.

### BUILT-IN OPERATION INDICATOR

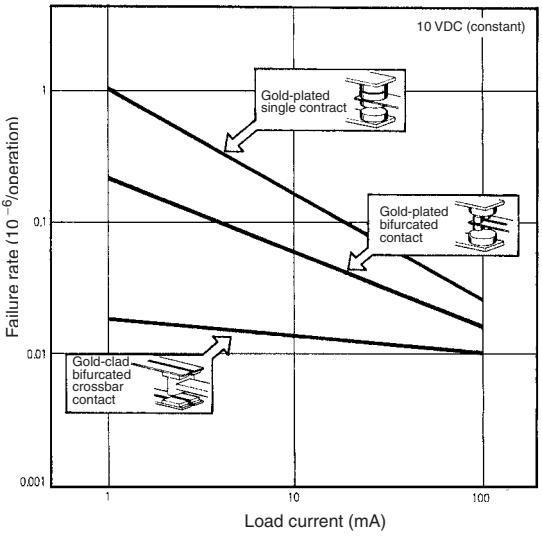
Some relays are provided with a light-emitting diode (LED), wired in parallel with the coil. This permits a fast–check of the relay's operating status.

## ■ Contacts

Contact ratings are generally indicated according to resistive loads and inductive loads (cosφ = 0.4 or L/R = 7 ms). Contact shape and material are also shown to guide the customer in selection of a model suitable for the intended load and required service life.

When used at extremely low loads, the failure rate differs according to the contact material and contact method, as shown in the figure. For example, in comparing a single contact point with a bifurcated contact point, the bifurcated contact model has higher parallel redundancy and will therefore exhibit a lower failure rate.

**Failure Rate vs. Load Current**



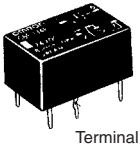

## ■ Terminals

**STRAIGHT PCB TERMINALS**

PCB terminals are normally straight.

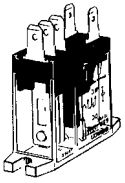
**Self-clinching (S-shaped) PCB Terminals**

Some relays have terminals that are bent into an “S” shape. This secures the PCB relay to the PCB prior to soldering, helping the terminals stay in their holes and keeping the relay level.



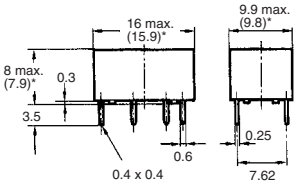
Terminal

**Quick-connect Terminals**



## ■ Dimensions

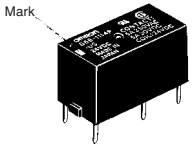
For miniature relays, the maximum dimensions and the average values ( ) marked with an asterisk are provided to aid the customer in designing.



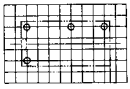

*Average value

### MOUNTING ORIENTATION MARK

On the top of all OMRON relays is a mark indicating where the relay coil is located. Knowing the coil location aids in designing PCBs when spacing components. Also, pin orientation is easy to discern when automatic or hand-mounting relays.



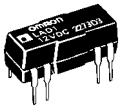

On dimensional drawings in all OMRON literature this mark is left-oriented. Mounting holes, terminal arrangements, and internal connections follow this alignment. The following two symbols are used to represent the orientation mark.

| Drawing view | Bottom | Top |
|---|---|---|
| **Detail** | Mounting holes | Terminal arrangement/ internal connections |
| **Symbol** |  |  |
| **Example** |   (Bottom view) |   (Bottom view) |

### TERMINAL ARRANGEMENT/INTERNAL CONNECTIONS

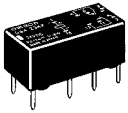
**Top View**

If the terminal arrangement of a relay can be seen from above the PCB, the top view of the relay is provided in the Dimensions section of the catalog or data sheet.



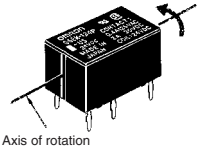
**Bottom View**

If the relay's terminals cannot be seen from above the PC board, as in this example, a bottom view is shown.



**Rotation Direction to Bottom View**

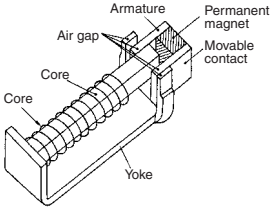
The bottom view shown in the catalog or data sheet is rotated in the direction indicated by the arrow, with the coil always on the left.




## ■ Moving Loop System

In the U.S.A., the National Association of Relay Manufactures (NARM) in April 1984, awarded OMRON for monumental advances in relay technology, as embodied in the Moving Loop System.

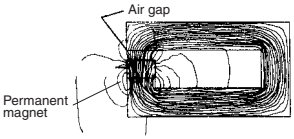
This unique relay construction maximizes electrical and permanent magnet energy. A high-efficiency magnet adds to the magnetic flux of the relay coil, which also allows for tighter packing of relay parts. Relays having such a coil are known as "polarized relays." Details of construction are shown below.




The moving loop design has similarities with polarized relays; however, the following two features make for a large performance distinction.

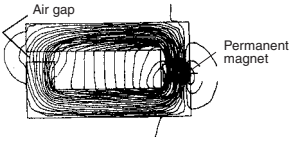
A permanent magnet is placed in the vicinity of the "working gaps." The flux energy of this permanent magnet complements that of the electrical coil. This increased efficiency enables the mechanism holding the contacts closed to ultimately switch larger loads, and at the same time reduces the power consumed by the coil.

The following diagram shows concentric lines of magnetic flux when the permanent magnet is placed near the working gap.



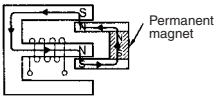
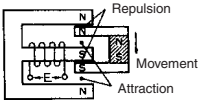
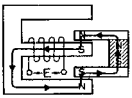

### CONVENTIONAL RELAY COIL

The following diagram shows the lines of magnetic flux when the permanent magnet is placed away from the working gap. These lines of flux detract from the total strength of the coil.



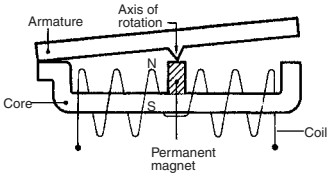

When the switching voltage is removed from the coil, the collapse of the magnetic flux created by the permanent magnet and the electrical coil provides the force to return the relay contacts to the reset position. Note the flux path and magnet polarity in the illustration overleaf.

**Operating Principle**

| | |
|---|---|
| **Release** |   |
| **Transition from release to operation (operating voltage supplied)** |   |
| **Operation** |  |

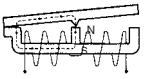
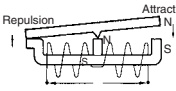
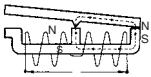
**Super Moving Loop System**

A very small high-sensitivity magnetic circuit is incorporated to further minimize the conventional moving loop system.




This magnetic circuit has the following features:

1. High-efficiency polarized magnetic circuit utilizes power of both attraction and repulsion.
2. Balanced armature system improves resistance to both vibration and impacts.
3. Ideal mechanism for a low-profile relay.

| | |
|---|---|
| **Release** |  Released status is maintained by per manent magnet. |
| **Transition from release to operation (operating voltage supplied)** |   The armature see saws due to the at traction and repul sion torque exerted on the armature by the coil voltage and the permanent magnet. |
| **Operation** |  Energized status is maintained by the coil voltage and permanent magnet. |

**Note:** The above applies to a latching relay.

## ■ Glossary

**TERMS RELATED TO CONTACTS**

**Carry Current**

The value of the current which can be continuously applied to the relay contacts without opening or closing them, and which allows the relay to stay within the permissible temperature rise.

**Maximum Switching Current**

A current which serves as a reference in determining the performance of the relay contacts. This value will never exceed the current flow. When using a relay, do not exceed this value.

**Contact Form**

OMRON uses the following relay terminology for the various polarity and switch configurations.

SPST-NO (Single-pole, single-throw, normally open)

SPST-NC (Single-pole, single-throw, normally close)

SPDT (or changeover contact) (single-pole, double-throw)

DPDT (Double-pole, double–throw)

**Contact Symbols**

| NO | NC | DT (NO/NC) | MBB |
|---|---|---|---|
|  |  |  |  |

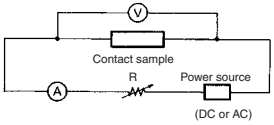
**Make-before-break (MBB) Contact**

A contact arrangement in which part of the switching section is shared between both an NO and NC contact. When the relay operates or releases, the contact that closes the circuit operates before the contact that opens the circuit releases. Thus both contacts are closed momentarily at the same time.

**Contact Resistance**

The total resistance of the conductor, as well as specific resistivities such as of the armature and terminal, and the resistance of the contacts. This value is determined by measuring the voltage drop across the contacts by applying test currents as shown in the table below.

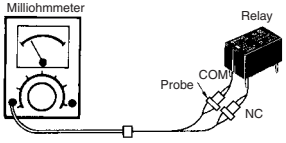
A: Ammeter
V: Voltmeter
R: Variable resistor




**Test Current**

| Rated current or switching current | Test current (mA) |
|---|---|
| Less than 0.01 | 1 |
| 0.01 or higher but less than 0.1 | 10 |
| 0.1 or higher but less than 1 | 100 |
| 1 or higher | 1,000 |

To measure the contact resistance, a milliohmmeter can also be used, although the accuracy drops slightly.



**Maximum Switching Power**

The maximum value of the load capacity which can be switched without problem. When using a relay, do not exceed this value.

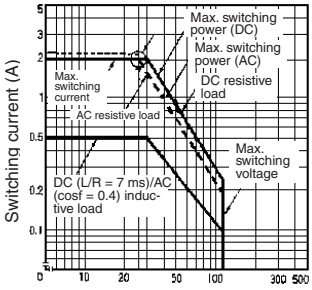
For example, when maximum switching voltage $V_1$ is known, maximum switching current $I_1$ can be obtained at the point of intersection on the characteristic curve "Maximum Switching Power" shown below. Conversely, maximum switching voltage $V_1$ can be obtained if $I_1$ is known.

$$\text{Maximum switching current } (I_1) = \frac{\text{Max. switching power [W(VA)]}}{\text{Max. switching voltage (V1)}}$$

$$\text{Maximum switching voltage } (V_1) = \frac{\text{Max. switching power [W(VA)]}}{\text{Max. switching current (I1)}}$$

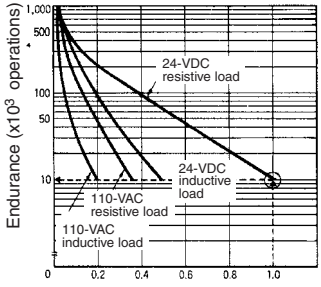
For instance, if the maximum switching voltage = 40 V
Maximum switching current = 2 A (see circled point on graph below.)

**Maximum Switching Power**




The life expectancy of the relay can be determined from the "Endurance" curve shown below, based on the rated switching current ($I_1$) obtained above. For instance, the electrical endurance at the obtained maximum switching current of 2 A is slightly over 300,000 operations (see circled point on graph below).

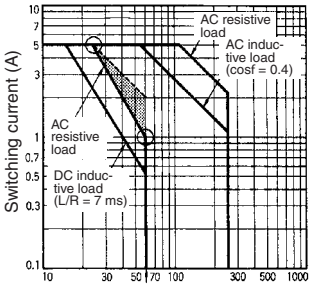
**Endurance**




However, with a DC load, it may become difficult to break the circuit of 48 V or more due to arcing. Determine the suitability of the relay in actual usage testing.

The correlation between the contact ratings is shown in the following figure:

**Maximum Switching Power**




**Failure Rate**

The failure rate indicates the lower limit of switching capability of a relay as the reference value. Such minute load levels are found in microelectronic circuits. This value may vary, depending on operating frequency, operating conditions, expected reliability level of the relay, etc. It is always recommended to double-check relay suitability under actual load conditions.

In this catalog, the failure rate of each relay is indicated as a reference value. It indicates failure level at a reliability level of 60% ($\lambda_{60}$).$\lambda_{60}$=0.1x $10^{-6}$/operation means that one failure is presumed to occur per 10,000,000 (ten million) operations at a reliability level of 60%.

**Number of Poles**

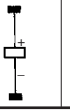
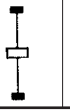
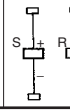
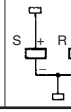
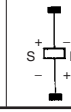
The number of contact circuits. See Contact Form for reference.

**TERMS RELATED TO COILS**

**Rated Coil Voltage**

A reference voltage applied to the coil when the relay is used under normal operating conditions.

**Coil Symbols**

| Single-sided stable | | Double-winding Latching | | Single-winding latching |
|---|---|---|---|---|
| Polarised | Non-polarised | w/4 terminals | w/3 terminals | |
|  |  |  |  |  |



**Coil Resistance (Applicable to DC-switching Relays only)**

The resistance of the coil is measured at a temperature of 23°C with a tolerance of ±10% unless otherwise specified. (The coil resistance of an AC-switching type relay may be given for reference when the coil inductance is specified.)

**Hot Start**

The ratings set forth in the catalog or data sheet are measured at a coil temperature of 23°C.

**Maximum Voltage**

The maximum value of the pulsating voltage fluctuations in the operating power supply to the relay coil.

**Minimum Pulse Width**

The minimum value of the pulsating voltage required to set and reset a latching relay at a temperature of 23°C.

**Must Operate (Must Set) Voltage**

The threshold value of a voltage at which a relay operates when the input voltage applied to the relay coil in the reset state is increased gradually.

**Must Release (Must Reset) Voltage**

The threshold value of a voltage at which a relay releases when the rated input voltage applied to the relay coil in the operating state is decreased gradually.

**Power Consumption**

The power (= rated voltage x rated current) consumed by the coil when the rated voltage is applied to it. A frequency of 60 Hz is assumed if the relay is intended for AC operation. The current flows through the coil when the rated voltage is applied to the coil at a temperature of 23°C. The tolerance is $^{+15\%}/_{-20\%}$ unless otherwise specified.

**TERMS RELATED TO ELECTRICAL CHARACTERISTICS**

**Dielectric Strength**

The critical value which a dielectric can withstand without rupturing when a high-tension voltage is applied for 1 minute between the following points:

Between coil and contact

Between contacts of different polarity

Between contacts of same polarity

Between set coil and reset coil

Between current-carrying metal parts and ground terminal

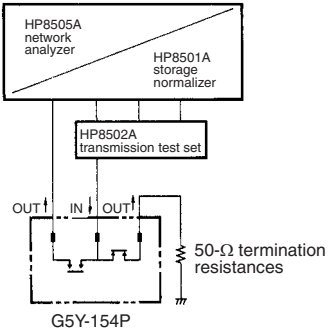
Note that normally a leakage current of 3 mA is detected; however, a leakage current of 1 mA to 10 mA may be detected on occasion.

**Electrical Endurance**

The life of a relay when it is switched at the rated operating frequency with the rated load applied to its contacts.

**High-frequency Isolation (Applicable to High-frequency Relay only)**

The degree of isolation of a high-frequency signal, which is equivalent to the insulation resistance of ordinary relays.




G5Y-154P

The following characteristics are measured with contacts unrelated to the measurement terminated at 50Ω, when a signal is applied from input terminal 11 to output terminal 8 or from input terminal 11 to output terminal 14 of the sample.

1. Isolation characteristics
2. Insertion loss characteristics
3. Return loss

The following conversion formula converts from return loss to VSWR.

$$VSWR = \frac{1 + 10^{-\frac{x}{20}}}{1 - 10^{-\frac{x}{20}}}$$

where,
*x = return loss*

**High-frequency Switching Power (Applicable to High-frequency Relays Only)**

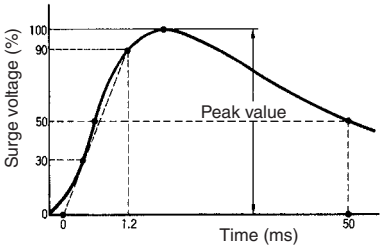
The power of a high-frequency signal that can be switched.

**High–frequency Transmitted Power (Applicable to High-frequency Relays Only)**

The transmission capacity of a high-frequency signal.

**Impulse Withstand Voltage**

The critical value which the relay can withstand when the voltage surges momentarily due to lightning, switching an inductive load, etc. The surge waveform which has a pulse width of ±1.2 x 50 μs is shown below:




**Insertion Loss (Applicable to High-frequency Relays Only)**

The attenuation of a high-frequency signal in a transmission line and is equivalent to the contact resistance of ordinary relays.

**Insulation Resistance**

The resistance between an electric circuit such as the contacts and coil, and grounded, non-conductive metal parts such as the core, or the resistance between the contacts. The measured values are as follows:

| Rated insulation voltage | Measured value |
|---|---|
| 60 V max. | 250 V |
| 61 V min. | 500 V |

**Maximum Operating Frequency**

The frequency or intervals at which the relay continuously operates and releases, satisfying the rated mechanical and electrical endurance.

**Mechanical Endurance**

The life of a relay when it is switched at the rated operating frequency without the rated load.

**Operate Bounce Time**

The bounce time of the normally open (NO) contact of a relay when the rated coil voltage is applied to the relay coil at an ambient temperature of 23°C.

**Operate Time**

The time that elapses after power is applied to a relay coil until the NO contacts have closed, at an ambient temperature of 23°C. Bounce time is not included. For the relays having an operate time of less than 10 ms, the mean (reference) value of its operate time is specified as follows:

| | |
|---|---|
| **Operate time** | 5 ms max. (mean value: approx. 2.3 ms) |

**Release Bounce Time**

The bounce time of the normally closed (NC) contact of a relay when the coil is de-energized at an ambient temperature of 23°C.

**Release Time**

The time that elapses between the moment a relay coil is de-energized until the NC contacts have closed, at an ambient temperature of 23°C. (With a relay having SPST-NO or DPST-NO contacts, this is the time that elapses until the NO contacts have operated under the same condition.) Bounce time is not included. For the relays having an operate time of less than 10 ms, the mean (reference) value of its operate time is specified as follows:

| | |
|---|---|
| **Release time** | 5 ms max. (mean value: approx. 2.3 ms) |

**Reset Time (Applicable to Latching Relays Only)**

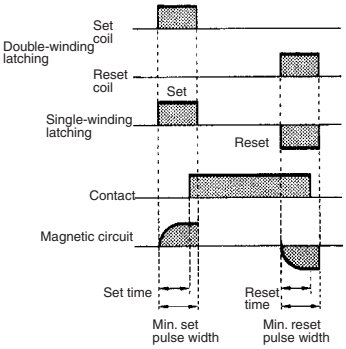
The time that elapses from the moment a relay coil is de-energized until the NC contacts have closed, at an ambient temperature of 23°C. (With a relay having SPST-NO contacts, this is the time that elapses until the NO contacts have operated under the same condition.) Bounce time is not included. For the relays having a reset time of less than 10 ms, the mean (reference) value of its reset time is specified as follows:

| | |
|---|---|
| **Reset time** | 5 ms max. (mean value: approx. 2.3 ms) |

**Set Time**

The time that elapses after power is applied to a relay coil until the NO contacts have closed, at an ambient temperature of 23°C. Bounce time is not included. For the relays having a set time of less than 10 ms, the mean (reference) value of its set time is specified as follows:

| | |
|---|---|
| **Reset time** | 5 ms max. (mean value: approx. 2.3 ms) |




**Shock Resistance**

The shock resistance of a relay is divided into two categories: "Destruction" which quantifies the characteristic change of, or damage to, the relay due to considerably large shocks which may develop during the transportation or mounting of the relay, and "Malfunction" which quantifies the malfunction of the relay while it is in operation.

**Stray Capacitance**

The capacitance measured between terminals at an ambient temperature of 23°C and a frequency of 1 kHz.

**VSWR (Applicable to High-frequency Relays Only)**

Stands for voltage standing-wave ratio. The degree of reflected wave that is generated in the transmission line.

**Vibration Resistance**

The vibration resistance of a relay is divided into two categories: "Destruction" which quantifies the characteristic changes of, or damage to, the relay due to considerably large vibrations which may develop during the transportation or mounting of the relay, and "Malfunction" which quantifies the malfunction of the relay due to vibrations while it is in operation.

$a = 0.002f^2A$

where,

a: Acceleration of vibration

f: Frequency

A: Double amplitude

# Precautions

## ■ Basic Information

Before actually committing any component to a mass-production situation, OMRON strongly recommends situational testing, in as close to actual production situations as possible. One reason is to confirm that the product will still perform as expected after surviving the many handling and mounting processes in involved in mass production. Also, even though OMRON relays are individually tested a number of times, and each meets strict requirements, a certain testing tolerance is permissible. When a high-precision product uses many components, each depends upon the rated performance thresholds of the other components. Thus, the overall performance tolerance may accumulate into undesirable levels. To avoid problems, always conduct tests under the actual application conditions.

**GENERAL**

To maintain the initial characteristics of a relay, exercise care that it is not dropped or mishandled. For the same reason, do not remove the case of the relay; otherwise, the characteristics may degrade. Avoid using the relay in an atmosphere containing sulphuric acid (SO2), hydrogen sulphide (H2S), or other corrosive gases. Do not continuously apply a voltage higher than the rated maximum voltage to the relay. Never try to operate the relay at a voltage and a current other than those rated.

If the relay is intended for DC operation, the coil has polarity. Connect the power source to the coil in the correct direction. Do not use the relay at temperatures higher than that specified in the catalog or data sheet.

The storage for the relay should be in room temperature and humidity.

**COIL**

**1) AC-switching Relays**

Generally, the coil temperature of the AC-switching relay rises higher than that of the DC-switching relay. This is because of resistance losses in the shading coil, eddy current losses in the magnetic circuit, and hysteresis losses. Moreover, a phenomenon known as "beat" may take place when the AC-switching relay operates on a voltage lower than that rated. For example, beat may occur if the relay's supply voltage drops. This often happens when a motor (which is to be controlled by the relay) is activated. This results in damage to the relay contacts by burning, contact weld, or disconnection of the self–holding circuit. Therefore, countermeasures must be taken to prevent fluctuation in the supply voltage.

One other point that requires attention is the "inrush current." When the relay operates, and the armature of the relay is released from the magnet, the impedance drops. As a result, a current much higher than that rated flows through the coil. This current is known as the inrush current. (When the armature is attracted to the magnet, however, the impedance rises, decreasing the inrush current to the rated level.) Adequate consideration must be given to the inrush current, along with the power consumption, especially when connecting several relays in parallel.

**2) DC-switching Relays**

This type of relay is often used as a so-called "marginal" relay that turns ON or OFF when the voltage or current reaches a critical value, as a substitute for a meter. However, if the relay is used in this way, its control output may fail to satisfy the ratings because the current applied to the coil gradually increases or decreases, slowing down the speed at which the contacts move. The coil resistance of the DC-switching relay changes by about 0.4% per degree C change in the ambient temperature. It also changes when the relay generates heat. This means that the must operate and must release voltages may increase as the temperature rises.

**Coil switching voltage Source**

If the supply voltage fluctuates, the relay will be caused to malfunction regardless of whether the fluctuation lasts for a long time or only for a moment.

For example, assume that a large-capacity solenoid, relay, motor, or heater is connected to the same power source as the relay, or that many relays are used at the same time. If the capacity of the power source is insufficient to operate these devices at the same time, the relay may not operate, because the supply voltage has dropped. Conversely, if a high voltage is applied to the relay (even after taking voltage drop into account), chances are that the full voltage will be applied. As a consequence, the relay's coil will generate heat. Therefore, be sure 1) to use a power source with sufficient capacity and 2) that the supply voltage to the relay is within the rated must operate voltage range of the relay.

**Minimum Must Operate Voltage**

When the relay is used at a high temperature, or when the relay coil is continuously energized, the coil temperature rises and coil resistance increases. Consequently, the must operate voltage increases. This increase in the must operate voltage requires attention when determining the minimum must operate voltage are given below for reference when designing a power source appropriate for the relay.

Assuming a coil temperature rise of 10˚C, the coil resistance will increase about 4%. The must operate voltage increases as follows:

Rated values of Model LZN2 taken from catalog or data sheet

Rated voltage: 12 VDC

Coil resistance: 500Ω

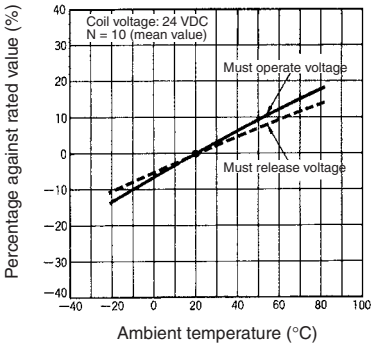
Must operate voltage: 80% max. of rated voltage at 23˚C coil temperature

The rated current that flows through this relay can be obtained by dividing the rated voltage by the coil resistance. Hence,

12 VDC ÷ 500Ω = 24 mA

However, the relay operates at 80% maximum of this rated current, i.e., 19.2 mA (= 24 mA x 0.8). Assuming that the coil temperature rises by 10˚C, the coil resistance increases 4% to 520Ω (= 500Ω x 1.04). The voltage that must be applied to the relay to flow a switching current of 19.2 mA x 520Ω = 9.98 V. This voltage, which is at a coil temperature of 33˚C (= 23˚C + 10˚C), is 83.2% of the rated voltage (= 9.98 V ÷ 12 V). As is evident from this, the must operate voltage increases when the coil temperature rises, in this example, 10˚C from 23˚C.

**Coil Temperature vs. Must Operate/release Voltage (LZN)**




The minimum must operate voltage can be determined by this expression.

$$E_T > E \times \frac{Epv + 5}{100} \times \left( \frac{T - Ta}{234.5 + Ta} + 1 \right) [V]$$

where,

E (V): Rated coil voltage

Epv (%): Must operate voltage

Ta: Coil temperature for determining Epv (20˚C, unless otherwise specified)

T (˚C): Ambient operating temperature

$E_T$ (V): Minimum must operate voltage

**Note:** In the above expression, T is taken to be the result of energization of the coil, when the coil temperature is the same as the ambient temperature.

## ■ Coil Input

To guarantee accurate and stable relay operation, the first and foremost condition to be satisfied is the application of the rated voltage to the relay. Additionally, the rated voltage in light of the type of the power source, voltage fluctuation, and changes in coil resistance due to temperature rise. If a voltage higher than the rated maximum voltage is applied to the coil for a long time, layer short-circuiting and damage to the coil by burning may take place.

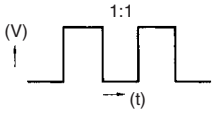
**Coil Temperature Rise**

When a current flows through the coil, the coil's temperature rises to a measurable level, because of copper loss. If an alternating current flows, the temperature rises even more, due not only to the copper loss, but additionally to the iron loss of the magnetic materials, such as the core. Moreover, when a current is applied to the contact, heat is generated on the contacts, raising the coil temperature even higher (however, with relays whose switching current is rated at 2 A or lower, this rise is insignificant).

**Temperature Rise by Pulsating Voltage**

When a pulsating voltage having an ON time of less than 2 minutes is applied to the relay, the coil temperature rise varies, and is independent of the duration of the ON time, depending only on the ratio of the ON time to the OFF time. The coil temperature in this case does not rise as high as when a voltage is continuously applied to the relay.

| Energization time | Release temperature rise |
|---|---|
| Continuous energization | 100% |
| ON:OFF = 3:1 approx. | 80% |
| ON:OFF = 1:1 approx. | 50% |
| ON:OFF = 1:3 approx. | 35% |



**Changes in Must Operate Voltage by Coil Temperature Rise**

The coil resistance of a DC-switching relay increases (as the coil temperature rises) when the coil has been continuously energized, de-energized once, and then immediately energized again. This increase in the coil resistance raises the voltage value at which the relay operates. Additionally, the coil resistance rises when the relay is used at a high ambient temperature.

**Maximum Must Operate Voltage**

The maximum voltage applicable to a relay is determined in accordance with the coil temperature rise and the coil insulation materials' heat resistivity, electrical as well as mechanical life, general characteristics, and other factors.

If a voltage exceeding the maximum voltage is applied to the relay, it may cause the insulation materials to degrade, the coil to be burnt, and the relay to not operate at normal levels. Actually, however, there are occasions when the maximum voltage is exceeded to compensate for fluctuation in the supply voltage. In this event, pay attention to the following points.

The coil temperature must not exceed the temperature that the spool and wound wire constituting the coil can withstand. The following table shows the wires often used for a coil. In this table, the coil temperature is measured through calculation of the coil resistance.

| Wire material | Maximum coil temperature |
|---|---|
| Polyurethane (UEW) | 120°C |
| Polyester (PEW) | 130°C |

**How to Calculate Coil Temperature**

$$t = \frac{R2 - R1}{R1} (234.5+T1) + T1\ [C°]$$

where,

R1 (Ω): coil resistance before energization

R2 (Ω): coil resistance after energization

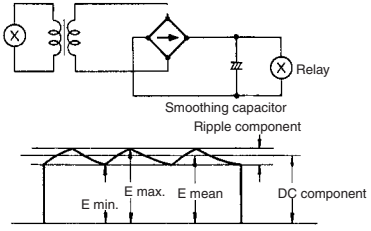
T1 (°C): coil temperature (ambient) before energization

t (°C): coil temperature after energization

Before using the relay confirm that there are no problems.

**DC Input Power Source**

Pay attention to the coil polarity of the DC-switching relay. Power sources for DC-operated relays are usually a battery or a DC power supply, either with a maximum ripple of 5%. If power is supplied to the relay via a rectifier, the must operate and must release voltages vary with the ripple percentage. Therefore, check the voltages before actually using the relay. If the ripple component is extremely large, beat may occur. If this happens, it is recommended that a smoothing capacitor be inserted as shown in the following diagram.



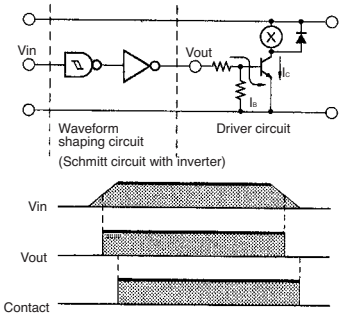

$$\text{Ripple percentage} = \frac{Emax. - Emin.}{Emean} 100$$

where,
E max.: maximum value of ripple component
E min.: minimum value of ripple component
E mean: mean value of DC component

If the voltage applied to the DC-operated coil increases or decreases slowly, each contact of a multi-pole contact relay may not operate at the same time. It is also possible for this situation to result in the must operate voltage varying each time the relay operates. Either way, circuit sequencing will not be correct. In critical applications, the use of a Schmitt circuit is recommended to reshape the DC waveform to trigger all contacts of the relay at the same time.

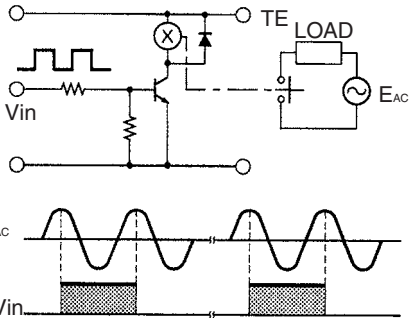
**Relay Driving Signal Waveform**

A long rise time and/or fall time of the signal driving the relay may prolong the operate time and/or release time of the relay. This situation may shorten the life of the contacts. If this situation cannot be avoided, providing a Schmitt trigger circuit at the circuit stage preceding the relay circuit will shape a waveform with sharp transitions, as shown in the following diagram:



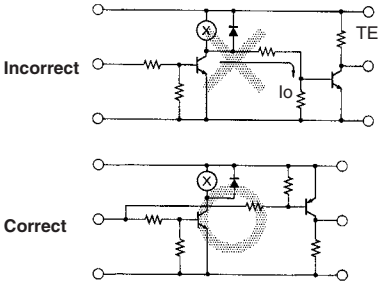

If the Schmitt trigger circuit is configured of transistors, a residual voltage may exist in the output of the circuit. Therefore, confirm that the rated voltage is present across the relay coil, or that the residual voltage drops to zero when the relay releases. When an IC (e.g., TC74HC132P) is used, this value is close to zero.

**Cyclic Switching of AC Load**




If the relay operates in synchronization with the supply voltage, the life of the relay may be shortened. When designing the control system in which the relay is used, estimate the life of the relay and thus the reliability of the overall system under actual operating conditions. Moreover, construct the circuit so that the relay operates in a random phase or in the vicinity of the zero point.

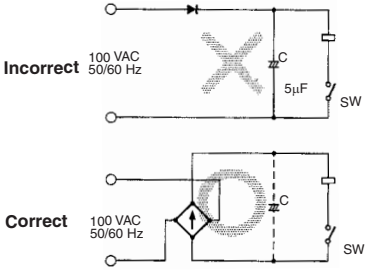
**Dark Current in OFF Time**




A circuit that produces a control output as soon as the relay operates must be carefully designed. In the example on the left, electrode dark current flows as shown when the relay operates. When dark current flows into the relay coil, the relay's resistivity to shock and vibration may degrade.

**Overcoming Beat in DC Relays**

When using AC power to generate power for operating a DC relay, the use of half-wave rectification causes the formation of a pulsating current. Therefore, when the capacitance of the smoothing capacitor C is low, the relay generates a beat. However, when a bridge rectification circuit is used, the frequency of the pulsating current doubles, generating no beat even when a smoothing capacitor C is not provided. The bridge rectification circuit can provide a higher rectification efficiency to increase the contact attraction, which is desirable in terms of prolonging the service life of the contact.

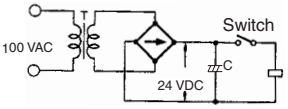



**Voltage Considerations for AC Relays**

For stable relay operation, a voltage +10% to -20% of the rated voltage should be applied to the relay. The voltage applied to the relay must be a sine wave. When a commercial power source is used, there should be no problem. However, if an AC stabilized power source is used, either beat or abnormal heating may occur, depending on the wave distortion of the power source. A shading coil is used to suppress beat in an AC current coil, but wave distortion defeats this function.

When a motor, solenoid, transformer, or other device is connected to the same power line source as the relay controller, and any of these devices causes a drop in the line voltage, the relay may vibrate, damaging the contact. This commonly occurs when a small transformer is added to the line, when the transformer is too small, when long wiring is used, or when thin wiring is used in the customer's premises. Be aware of this phenomenon, as well as normal voltage fluctuations. Should this problem occur, check the change in voltage with a synchroscope or the like, and take appropriate countermeasures. Effective countermeasures include replacing the relay with a special relay suited to the circumstances, or use of a DC circuit and inclusion of a capacitor to compensate for the voltage change, as shown in the following circuit diagram.

**Voltage change compensation circuit incorporating a capacitor**



## ■ Contacts

The contacts are the most important constituent of a relay. Their characteristics are significantly affected by factors such as the material of the contacts, voltage and current values applied to them (especially, the voltage and current waveforms when energizing and de-energizing the contacts), the type of load, operating frequency, atmosphere, contact arrangement, and bounce. If any of these factors fail to satisfy predetermined values, problems such as metal deposition between contacts, contact welding, wear, or rapid increase in the contact resistance may occur.

**Switching voltage (AC, DC)**

When a relay breaks an inductive load, a fairly high counterelectromotive force (counter emf) is generated in the relay's contact circuit. The higher the counter emf, the greater the damage to the contacts. This may result in a significant decrease in the switching power of DC-switching relays. This is because, unlike the AC-switching relay, the DC-switching relay does not have a zero-cross point. Once arc has been generated, it does not easily diminish, prolonging the arc time. Moreover, the unidirectional flow of the current in a DC circuit may cause metal deposition to occur between contacts and the contacts to wear rapidly (this is discussed later).

Despite the information a catalog or data sheet sets forth as the approximate switching power of the relay, always confirm the actual switching power by performing a test with the actual load.

**Switching Current**

The quantity of electrical current which flows through the contact directly influences the contact' characteristics. For example, when the relay is used to control an inductive load such as a motor or a lamp, the contacts will wear more quickly, and metal deposition between the mating contacts will occur more often as the inrush current to the contacts increases. Consequently, at some point the contacts may not be able to open.

**Contact Materials**

Selection of an appropriate contact material according to the load to be opened or closed is important. Several contact materials and their properties are listed below.

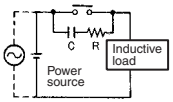
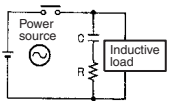
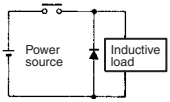
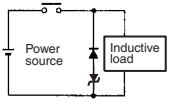
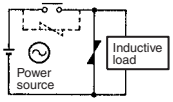
**Contact Materials and Feature**

| | |
|---|---|
| **P. G. S. Alloy** | This material has excellent corrosion resistance and is suitable for very small current circuits. (Au : Ag : Pt = 69 : 25 : 6) |
| **AgPd** | This material exhibits good corrosion and sulphur resistance. In a dry circuit, it attracts organic gas to generate a polymer, therefore it is usually plated with gold or other material. |
| **Ag** | This material has the highest electric and heat conductivities among all metals. It exhibits low contact resistance, but easily forms sulphide film in a sulphide gas environment. This may result in defective contact performance at a low-voltage small-current operation. |
| **AgNi** | This material exhibits the same high electric conductivity as silver and excellent arc resistance. |
| **$AgSnO_2$** | This material exhibits excellent deposition resistance. It easily forms sulphide film in a sulphide gas environment, the same as Ag contact material. |
| **AgSnIn** | This material exhibits excellent deposition resistance and exhaustion resistance. |
| **AgW** | This material exhibits a high hardness and melting point. It also exhibits excellent arc resistance and superior resistance to deposition and transfer. However, it shows high contact resistance and inferior environmental resistance. |

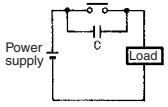
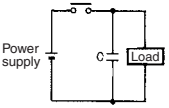
**Contact Protection Circuit**

A contact protection circuit, designed to prolong the life of the relay, is recommended. This protection will have the additional advantages of suppressing noise, as well as preventing the generation of carbide and nitric acid, which otherwise would be generated at the contact surface when the relay contact is opened. However, unless designed correctly, the protection circuit may produce adverse effects, such as prolonging the release time of the relay.

The following table lists examples of contact protection circuits.

| Circuit example | | Applicability | | Features and remarks | Element selection |
|---|---|---|---|---|---|
| | | AC | DC | | |
| CR |  | Fair | Good | Load impedance must be much smaller than the RC circuit when the relay operates on an AC voltage. | Optimum C and R values are: C: 1 to 0.5 μF for 1–A switching current R: 0.5 to 1Ω for 1–V switching voltage |
| |  | Good | Good | The release time of the contacts will be delayed when a relay solenoid is used as a load. This circuit is effective if connected across the load when the supply voltage is 24 to 48 V. When the supply voltage is 100 to 240 V, connect the circuit across the contacts. | These values do not always agree with the optimum values due to the nature of the load and the dispersion in the relay characteristics. Confirm optimum values experimentally. Capacitor C suppresses discharge when the contacts are opened, while resistor R limits the current applied when the contacts are closed the next time. Generally, employ a capacitor C whose dielectric strength is 200 to 300 V. If the circuit is powered by an AC power source, employ an AC capacitor (non–polarized). |
| Diode |  | Poor | Good | The energy stored in a coil (inductive load) reaches the coil as current via the diode connected in parallel with the coil, and is dissipated as Joule (measurable) heat by the resistance of the inductive load. This type of circuit delays the release time more than the RC type. | Employ a diode having a reverse breakdown voltage of more than 10 times the circuit voltage and a forward current rating greater than the load current. A diode having a reverse breakdown voltage two to three times that of the supply voltage can be used in an electronic circuit where the circuit voltage is not particularly high. |
| Diode + Zener Diode |  | Poor | Good | This circuit effectively shortens release time in applications where the release time of a diode protection circuit proves to be too slow. | The zener diode breakdown voltage should be about the same as the supply voltage. |
| Varistor |  | Good | Good | By utilizing the constant-voltage characteristic of a varistor, this circuit prevents high voltages from being applied across the contacts. This circuit also somewhat delays the release time. This circuit, if connected across the load, is effective when the supply voltage is 24 to 48 V. If the supply voltage is 100 to 240 V, connect the circuit across the contacts. | – |

Avoid use of a surge suppressor in the manner shown below.

| | |
|---|---|
|  |  |
| This circuit arrangement is very effective for diminishing sparking (arcing) at the contacts, when breaking the circuit. However, since electrical energy is stored in C (capacitor) when the contacts are open, the current from C flows into the contacts when they close. Therefore, metal deposition is likely to occur between mating contacts. | This circuit arrangement is very useful for diminishing sparking (arcing) at the contacts when breaking the circuit. However, since the charging current to C flows into the contacts when they are closed, metal deposition is likely to occur between the mating contacts. |

Although it is considered that switching a DC inductive load is more difficult than a resistive load, an appropriate contact protection circuit can achieve almost the same characteristics.

## ■ Latching Relays

Avoid use in locations subject to excessive magnetic particles or dust.

Avoid use in magnetic fields (over 8,000 A.m).

Take measures to preventing problems caused by vibration or shock. Problems may originate from other relay(s) operating or releasing on the same panel.

Avoid simultaneous energization of the set and reset coils, even though both coils can be continuously energized.

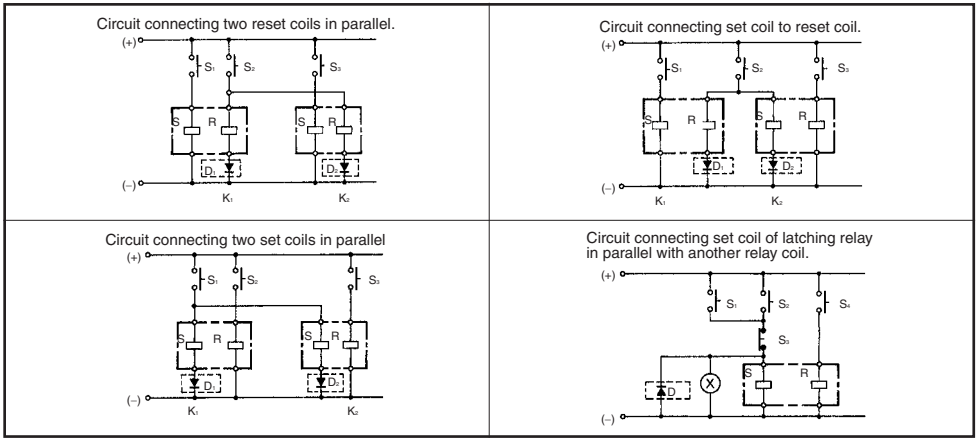
Avoid use under conditions where excessive surge-generating sources exist in the coil power source.

When planning to mount multiple relays together, observe the minimum mounting interval of each type of relay.

**Drive Circuit (Double-winding Relays G5AK, G6AK, G6BK, etc.)**

When a DC-switching latching relay is used in one of the circuits shown in the following diagram, the relay contacts may be released from the locked state unless a diode (enclosed in the dotted box in the circuit diagram) is connected to the circuit.

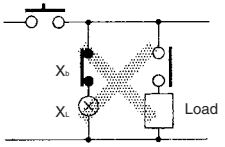
**Circuits**




When connecting a diode to the relay circuit, be sure to use a diode with a repetitive peak–inverse voltage, and a DC reverse voltage sufficient to withstand external noise or surge. Also be sure that the diode has an average rectified current greater than the coil current.

If the contact of the relay is used to de-energize the relay, the relay may not operate normally. Avoid using the relay in a circuit like the one shown below:

**Incorrect Use:**




XL: Latching relay
Xb: NC contact of relay

## ■ PCB Design

**Soldering**

As demands for more compact electronic devices have grown, so have demands declined for the plug-in relays that requires a bulky socket for connection. This trend has lead to the development of relays that can be soldered directly onto the PCB. Smaller relays have made possible great density increases on the PCB, which in turn reduces the size of the product or device. However, unless the relay is fully sealed, when soldered onto a PCB, flux may penetrate into the housing, adversely affecting the internal circuitry.

The following points will help when designing a product which uses relays. This section points out details to be noted when soldering a relay to a PCB.

**PCB Selection**

In general, relays are directly mounted and soldered onto a PCB. Although seemingly an uninvolved process, soldering and its related processes of flux application, relay mounting, heat application, and washing can be detrimental to a relay's performance. For example, if the PCB were to warp, the internal mechanism of the relay could become distorted, degrading the performance characteristics. Thus it could be said that the relay's characteristics are also affected by the size, thickness, and material of the PCB. Therefore, carefully select a PCB that will not jeopardise the performance of the relay.

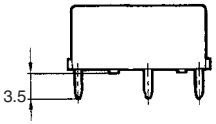
**PCB MATERIALS**

Generally, the substrate of a PCB is made of glass epoxy (GE), paper epoxy (PE), or paper phenol (PP). Of these, the glass-epoxy or paper-epoxy PCB is recommended for mounting relays. See the following table

| Item | Epoxy Based | | Phenol-based |
|---|---|---|---|
| | Glass Epoxy (GE) | Paper Epoxy (PE) | Paper Phenol (PP) |
| Electrical characteristics | High insulation resistance. Insulation resistance hardly affected by humidity. | Fair | Insulation resistance degraded by humidity. |
| Mechanical characteristics | Little expansions/shrinkage caused by change in temperature or humidity. Suitable for through-hole PCBs and multi-layered PCBs. | Fair | Much expansion/shrinkage caused by changes in temperature or humidity. Not suitable for through-hole PCB. |
| Cost Effectiveness | Expensive | Fair | Fair |

**PCB Thickness**

PCBs having a thickness of 0.8, 1.2, 1.6, or 2.0 mm are generally used. A PCB that is 1.6 mm thick is best for mounting a PCB relay, considering the weight of the relay and the length of the terminals. (The terminal length of OMRON relays is 3, 3.5, or 4.0 to 5.0 mm.)




**Terminal Hole Diameter and Land Diameter**

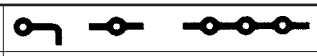
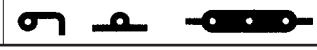
Select the appropriate terminal hole and land diameters from the following table, based on the PCB mounting hole drawing. Land diameters may be reduced to less than those listed below if the through-hole connection process is to be employed.

**Terminal Hole and Land Diameters**

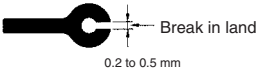
| Terminal Hole Diameter | | Minimum Land Diameter |
|---|---|---|
| Normal | Tolerance | |
| 0.6 mm | ±0.1 mm | 1.5 mm |
| 0.8 mm | | 1.8mm |
| 1.0 mm | | 2.0mm |
| 1.2 mm | | 2.5mm |
| 1.3 mm | | 2.5mm |
| 1.5 mm | | 3.0mm |
| 1.6 mm | | 3.0mm |
| 2.0 mm | | 3.0mm |

**Shape of Lands**

The land section should be on the center line of the copper-foil pattern, so that the soldered fillets become uniform.

| | |
|---|---|
| **Correct** |  |
| **Incorrect** |  |

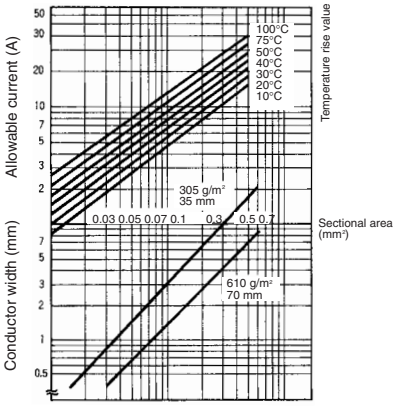
A break in the circular land area will prevent molten solder from filling holes reserved for components which must be soldered manually after the automatic soldering of the PCB is complete.




**Conductor Width and Thickness**

The following thickness of copper foil are standard: 35 µm and 70 µm. The conductor width is determined by the current flow and allowable temperature rise. Refer to the chart below.

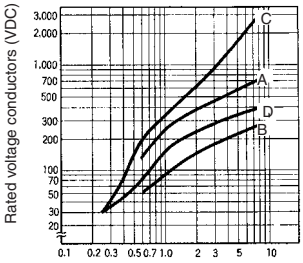
**Conductor Width and Carry Current**
(according to IEC Pub326-3)




**Conductor Pitch**

The conductor pitch on a PCB is determined according to the insulation resistance between conductors and the environmental conditions under which the PCB is to be placed. The following graph shows the general relationship between the voltage between conductors and the conductor pitch on a PCB. However, if the PCB must conform to safety organization standards (such as UL, CSA, VDE, etc.), priority must be given to fulfilling their requirements.

**Voltage between Conductors vs. Conductor Pitch**




Conductor pitch (mm)

A = w/o coating at altitude of 3,000 m max.
B = w/o coating at altitude of 3,000 m or higher but lower than 15,000 m
C = w/coating at altitude of 3,000 m max.
D = w/coating at altitude of 3,000 m or higher

**Temperature and Humidity**

PCBs expand or contract with changes in temperature. Should expansion occur with a relay mounted on the PCB, the internal components of the relay may be shifted out of operational tolerance. As a result, the relay may not be able to operate with its normal characteristics.

PCB materials have "directionality," which means that a PCB generally has expansion and contraction coefficients 1/10 to 1/2 higher in the vertical direction than in the horizontal direction. Conversely, its warp in the vertical direction is 1/10 to 1/2 less than in the horizontal direction. Therefore, take adequate counter-measures against humidity by coating the PCB. Should heat or humidity be entirely too high, the relay's physical characteristics will likewise be affected. For example, as the heat rises the PCB's insulation resistance degrades. Mechanically, PCB parts will continue to expand as heat is applied, eventually passing the elastic limit, which will permanently warp components.

Moreover, if the relay is used in an extremely humid environment, silver migration may take place.

**Gas**

Exposure to gases containing substances such as sulphuric acid, nitric acid, or ammonia can cause malfunctions such as faulty contacting in relays. They can also cause the copper film of a PCB to corrode, or prevent positive contacts between the PCB's connectors. Of the gases mentioned, nitric acid is particularly damaging as it tends to accelerate the silver migration. As a counter-measure against gas exposure damage, the following processes on the relay and PCB have proved useful.

| Item | Process |
|---|---|
| **Outer Casing, housing** | Sealed construction by using packing, etc |
| **Relay** | Use of simplified hermetically sealed type relay, DIP relay, reed relay |
| **PCB, Copper Firm** | Coating |
| **Connector** | Gold-plating, rhodium-plating process |

**Vibration and Shock**

Although the PCB itself is not usually a source of vibration or shock, it may simplify or prolong the vibration by resonate with external vibrations or shocks. Securely fix the PCB, paying attention to the following points.

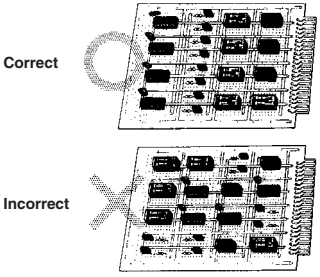
| Mounting Method | Process |
|---|---|
| **Rack Mounting** | No gap between rack's guide & PCB |
| **Screw Mounting** | Securely tighten screw.<br>Place heavy components such as relays on part of PCB near where screws are to be used.<br>Attach rubber washers to screws when mounting components that are affected by shock (such as audio devices.) |

**Mounting Position**

Depending on where the relay is mounted, the function of the relay (and the performance of the circuit which includes the relay) may be adversely affected.

The relay may malfunction if it is mounted near a transformer or other device that generates a large magnetic field, or much heat. Provide an adequate distance between the relay and such devices.

Also, keep the relay away from semiconductor devices, if they are to be mounted on the same PCB.




**Mounting Direction**

To allow a relay to operate to its full capability, adequate consideration must be given to the mounting direction of the relay. Relay characteristics that are considerably influenced by mounting direction are shock resistance, life, and contact reliability.

**Shock Resistance**

Ideally, the relay must be mounted so that any shock or vibration is applied to the relay at right angles to the operating direction of the armature of the relay. Especially when a relay's coil is not energized, the shock resistance and noise immunity are significantly affected by the mounting direction of the relay.

**Life**

When switching a heavy load that generates arc (generally, having a greater impedance than that of the relay coil), substances spattered from the contact may accumulate in the vicinity, resulting in degradation of the insulation resistance of the circuit. Mounting the relay in the correct direction is also important in preventing this kind of degradation of the insulation resistance.

**Contact Reliability**

Switching both a heavy and a minute load with a single relay contact is not recommended. The reason for this is that the substances scattered from the contact when the heavy load is switched degrade the contact when switching the minute load. For example, when using a multi-pole contact relay, avoid the mounting direction or terminal connections in which the minute load switching contact is located below the heavy load switching contact.

**Mounting Interval**

When mounting multiple relays side by side on a PCB, pay attention to the following points:

When many relays are mounted together, they may generate an abnormally high heat due to the thermal interference between the relays. Therefore, provide an adequate distance between the relays to dissipate the heat. When using a relay, be sure to check the minimum mounting interval.

Also, if multiple PCBs with relays are mounted to a rack, the temperature may rise. In this case, preventive measures must be taken so that the ambient temperature falls within the rated value.

**PATTERN LAYOUT**

**Countermeasures Against Noise**

The relay can be a noise source when viewed from a semiconductor circuit. This must be taken into consideration when designing the layout positioning of the relay and other semiconductor components on the PCB.

Keep the relay away from semiconductor components as far away as possible.

Locate the surge suppressor for the relay coil as close to the relay as possible.

Do not route wiring for signals such as audio signals that are likely to be affected by noise below the relay.

Design the shortest possible pattern.

One method for separating the power source and relay from other electronic components is to use shielded patterns.

**Coating**

As is also the case in humid environments, coating the PCB is recommended to prevent the insulation of its pattern form being degraded by gases containing harmful substances. When coating the PCB, however, care must be exercised not to allow the coating agent to penetrate into the relays mounted on the PCB; otherwise, faulty contact of the relay may occur due to sticking or coating. Moreover, some coating agents may degrade or adversely affect the relay. Select the coating agent carefully.

**Type of Coating**

| Item | Applicability to PCB with relays mounted | Feature |
|---|---|---|
| **Epoxy** | Good | Good insulation. Performing this coating is a little difficult, but has no effect on relay contact. |
| **Urethane** | Good | Good insulation and easy to coat. Be careful not to allow the coating on the relay itself, as thinner-based solvents are often used with this coating. |
| **Silicon** | Good | Good insulation and easy to coat. However, silicon gas may cause faulty contact of relay. |

## ■ Automatic Mounting of Relay on PCB

**THOUGH-HOLE MOUNTING**

The following tables list the processes required for mounting a relay onto a PCB and the points to be noted in each process.

**Process 1: Placement**

Do not bend any terminal of the relay to use it as a self–clinching relay or the relay may malfunction.

It is recommended to use magazine-packaged self–clinching relays for placement onto the PCB.

**Possibility of Automatic Placement**

| Construction | Unsealed | Flux protection | Fully sealed |
|---|---|---|---|
| **Magazine-packaged relay** | NO | YES | YES |
| **Self-clinching relays** | | | |

**Process 2: Flux Application**

To apply flux to a flux protection or fully sealed relay, a sponge soaked with flux can be used. Place the relay in the holes drilled in the PCB and press the PCB (with the relay still mounted) firmly against the sponge. The flux will be pushed up the relay's contact legs, and through the PCB holes. This method must never be applied with an unsealed relay because the flux will penetrate into the relay.

The flux used with the sponge must be a non-corrosive resin-type flux.

For the flux solvent, use an alcohol–based solvent, which tends to be less chemically reactive.

Apply the flux sparingly and evenly to prevent penetration into the relay. When dipping the relay terminals into liquid flux, be sure to adjust the flux level, so that the upper surface of the PCB is not flooded with flux.

**Possibility of Dipping Method**

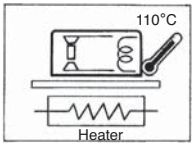
| Unsealed | Flux protection | Fully sealed |
|---|---|---|
| NO | YES | YES |

**Process 3: Transportation**

When the PCB is transported, the relay mounted on the PCB may be lifted from the board surface due to vibration. This can be prevented if the relay mounted on the PCB has self-clinching terminals.

**Process 4: Preheating**

Preheat the PCB at a temperature of 110°C maximum within a period of approximately 40 seconds for smooth soldering. The characteristics of the relay may change if it is heated at a high temperature for a long time.




**Possibility of Preheating**

| Unsealed | Flux protection | Fully sealed |
|---|---|---|
| NO | YES | YES |

**Process 5: Soldering**

Flow soldering is recommended to assure a uniform solder joint.

- Solder temperature and soldering time: 260°C, 5 s max.
- Adjust the level of the molten solder so that the PCB is not flooded with solder.

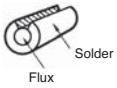
**Possibility of Automatic Soldering**

| Unsealed | Flux protection | Fully sealed |
|---|---|---|
| NO | YES | YES |

**Manual Soldering**

Complete the soldering operation quickly. Use the correct wattage of soldering iron. Do not overheat while smoothing the applied solder with the tip of the iron.

- Solder: JIS Z3282, H60, or H63 (containing resin-type flux)
- Soldering iron: rated at 30 to 60 W
- Tip temperature: 280∞C to 300∞C
- Soldering time: 3 s max.
- The following table contains recommended solders:




| Type | Sparkle solder |
|---|---|
| Applicable solder diameter | 0.8 to 1.6 mm |
| Spread rate | 90% |
| Storage | 3 months max. |

**Possibility of Manual Soldering**

| Unsealed | Flux protection | Fully sealed |
|---|---|---|
| YES | YES | YES |

The solder in the illustration shown above is provided with a cut section to prevent the flux from splattering.

**Process 6: Cooling**

Upon completion of automatic soldering, use a fan or other device to forcibly cool the PCB. This helps prevent the relay and other components from deteriorating from the residual heat of soldering.

Fully sealed relays are washable. Do not, however, put fully sealed relays in a cold cleaning solvent immediately after soldering or the seals may be damaged.

| Flux protection | Fully sealed |
|---|---|
| Necessary | Necessary |

**Process 7: Cleaning**

Avoid cleaning the soldered terminals whenever possible. When a resin-type flux is used, no cleaning is necessary. If cleaning cannot be avoided, exercise care in selecting an appropriate cleaning solvent.

**Clensing Method**

| Unsealed | Flux protection | Fully sealed |
|---|---|---|
| Boiling cleaning and immersion cleaning are not possible. Clean only the back of the PCB with a brush. | | Boiling cleaning and immersion cleaning are possible. Ultrasonic cleaning will have an adverse effect on the performance of relays not specifically manufactured for ultrasonic cleaning. The washng temperature is 40°C max.. |

**List of Cleaning Solvents**

| Solvent | | Fully Seated |
|---|---|---|
| **Chlorine-based** | Perochlene<br>Chlorosolder<br>Trichloroethylene | Yes |
| **Water-based** | Indusco<br>Holys | Yes |
| **Alcohol-based** | IPA<br>Ethanol | Yes |
| **Others** | Thinner<br>Gasoline | No |
| **Cleaning method** | | Automatic cleaning<br>Ultrasonic cleaning (see note 4) |

**Note: 1.** Consult your OMRON representative before using any other cleaning solvent. Do not use Freon-TMC-based, thinner-based, or gasoline-based cleaning solvents.

**2.** Worldwide efforts are being made at discontinuing the use of CFC-113-based (fluorochlorocarbon-based) and trichloroethylene-based cleaning solvents. The user is requested to refrain from using these cleaning solvents

**3.** It may be difficult to clean the space between the relay and PCB using hydrogen-based or alcohol-based cleaning solvent. It is recommended the stand-off-type be used G6A-□-ST when using hydrogen-based or alcohol-based cleaning solvents.

**4.** Ultrasonic cleaning may have an adverse effect on the performance of relays not specifically manufactured for ultrasonic cleaning. Please refer to the model number to determine if your relay is intended to be cleaned ultrasonically.

**Process 8: Coating**

Do not apply a coating agent to any flux-resistant relay or relay with a case because the coating agent will penetrate into the relay and the contacts may be damaged.

Some coating agents may damage the case of the relay. Be sure to use a proper coating agent.

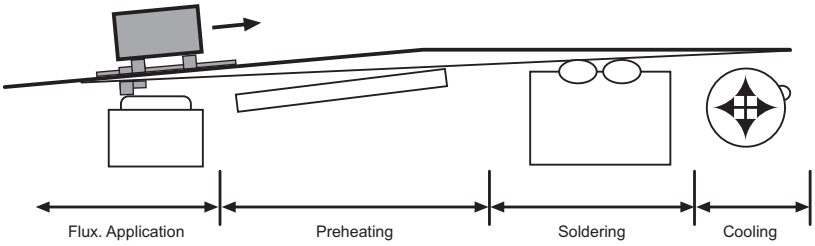
Do not fix the position of relay with resin or the characteristics of the relay will change.

| Resin | Fully Sealed |
|---|---|
| Epoxy | YES |
| Urethane | YES |
| Silicone | NO |
| Fluorine | YES |

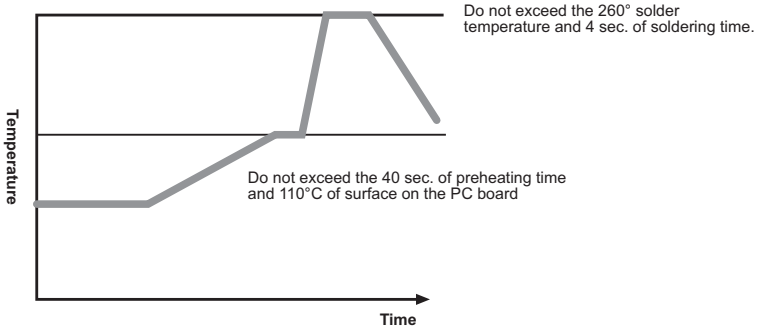
**Soldering Profile**

**PCB RELAY THT TYPE – PROFILE OF SOLDER TEMPERATURE FOR LEAD FREE**

**Process flow chart**




**Solder Profile**




**Soldering Heat Resistance – PCB (THT)**

| Item | Present (SnPB) | Lead Free Type |
|---|---|---|
| **Preheating temperature** | 100°C | 110°C |
| **Preheating time** | 60 sec. max. | 40 sec. |
| **Solder temperature** | Approx. 250°C | 260°C |
| **Soldering time** | 5 sec. max. | 4 sec. max. |

We recommend to confirm under the actual soldering condition at the customer before use.

**SURFACE MOUNTING**

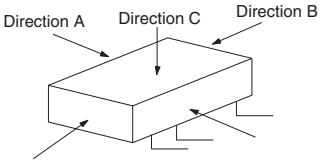
The following tables list the processes required for mounting a relay onto a PCB and the points to be noted in each process.

**Process 1: Cream Solder Printing**

Do not use a cream solder that contains a flux with a large amount of chlorine or the terminals of the relay may be corroded.

**Process 2: Relay Mounting**

The holding force of the relay holder must be the same as or more than the minimum holding force value required by the relay.




| Direction | G6H | G6S |
|---|---|---|
| A | 200 g max. | 200 g max. |
| B | 500 g max. | 500 g max. |
| C | 200 g max. | 200 g max. |

**Process 3: Transportation**

The relay may be dismounted by vibration during transportation. To prevent this, it is recommended an adhesive agent be applied to the relay's gluing part (protruding part) to tack the relay.

**Adhesive Agent Application Methods**

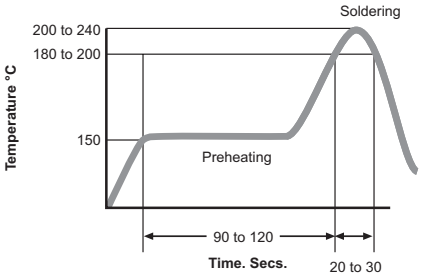
| Dispenser Method | Screen-printing Method |
|---|---|
| YES | YES |

**Process 4: Soldering Reflow**

**IRS Recommended Soldering Temperature**

**Mounting temperature for Lead solder mounting**

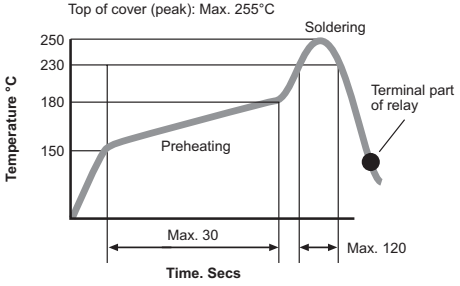
The recommended soldering conditions show the temperature changes of the PCB surface. The conditions however, differ with the relay model. Check the relay specifications before soldering (for details refer to precautions for each model). Do not put the relay in a cleaning solvent or other cold liquid immediately after soldering or the seal of the relay may be damaged.




Recommended IRS Conditions (G6H-2F)

**Mounting temperature for Lead-Free solder mounting**

The recommended soldering conditions show the temperature change of the relay terminal section. The conditions however differ with the relay model. Check the relay specifications before soldering (for details refer to precautions for each model). Do not put the relay in a cleaning solvent or other cold liquid immediately after soldering or the seal of the relay may be damaged.




Recommended IRS Conditions (G6H-2F)

**Note:** Do not submerge the relay in a solder bath. Doing so will deform the resin causing faulty operation.

**Cleaning**

Boiling cleaning and immersion cleaning are recommended.

Ultrasonic cleaning will have an adverse effect on the performance of relays not specifically manufactured for ultrasonic cleaning.

**List of Cleaning Solvent**

| Solvent | | Fully Seated |
|---|---|---|
| **Chlorine-based** | Perochlene<br>Chlorosolder<br>Trichloroethylene | Yes |
| **Water-based** | Indusco<br>Holys | Yes |
| **Alcohol-based** | IPA<br>Ethanol | Yes |
| **Others** | Thinner<br>Gasoline | No |
| **Cleaning method** | | Automatic cleaning<br>Ultrasonic cleaning (see note 4) |

**Note: 1.** Consult your OMRON representative before using any other cleaning solvent. Do not use Freon-TMC-based, thinner-based, or gasoline-based cleaning solvents.

**2.** Worldwide efforts are being made at discontinuing the use of CFC-113-based (fluorochlorocarbon-based) and trichloroethylene-based cleaning solvents. The user is requested to refrain from using these cleaning solvents

**3.** It may be difficult to clean the space between the relay and PCB using hydrogen-based or alcohol–based cleaning solvent. It is recommended the stand-off-type be used G6A-□-ST when using hydrogen-based or alcohol-based cleaning solvents.

**4.** Ultrasonic cleaning may have an adverse effect on the performance of relays not specifically manufactured for ultrasonic cleaning. Please refer to the model number to determine if your relay is intended to be cleaned ultrasonically.

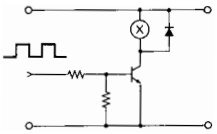
## ■ Correct Use

**RELAYS IN ELECTRONIC CIRCUITRY**

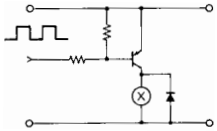
**Driving by Transistor**

When a transistor is used to drive the relay, be sure to ground the emitter of the transistor.

**NPN transistor**



**PNP transistor**



When the transistor is used in a emitter-follower configuration (i.e., the collector is grounded), give adequate consideration to the voltage across the collector and emitter. The required voltage must be applied to the relay.

**Selecting a Transistor for Driving the Relay**

After determining which relay to use, and after becoming familiar with its ratings, select a transistor to drive the relay.

1. From the relay's catalog or data sheet, ascertain the following characteristics:
   Rated voltage: _ VDC
   Rated current: _ mA
   coil resistance: _ Ω
2. Determine the minimum and maximum values of the must operate voltage form the rated voltage.
   Minimum must operate voltage: _ V
   Maximum must operate voltage: _ V
   (If ripple is contained in the rated voltage, obtain the maximum value including the ripple.)
3. By determining the component for suppressing surge, obtain the dielectric strength of the transistor for driving the relay.

< In the case of diode>
(Maximum of must operate voltage + 0.6) x 2* ≅ VcEO ≅ VcBO = __V

< In the case of diode and zener diode>
(Maximum of must operate voltage + 0.6 + breakdown voltage**) x 2* ≅ VCEO ≅ VcBO = __V

< In the case of varistor>
(Maximum of must operate voltage + varistor voltage***) x 2* ≅ VcEO ≅ VcBO = __V

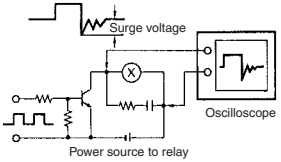
< In the case of RC>
(Maximum of must operate voltage + surge voltage****) x 2* ≅ VcEO ≅ VcBO = __V

* This safety factor must be determined by the user.

** The breakdown voltage differs, depending upon the component. Therefore, if multiple zener diodes are to be used, use their maximum breakdown voltage.

*** The varistor voltage differs depending upon the component. In addition, the varistor voltage of a single varistor may vary depending upon the current. Consult the manufacturer of the varistor to be used to determine the varistor voltage.

**** The surge voltage differs depending upon the type and rating of the relay, and the constants of C and R of the circuit in which the relay is used. Positively determine the surge voltage by experiment.




where,
R ≅ Coil resistance of relay
(measured changing the value of C)
C = 0.01 to 0.2 μF

4. Determine collector current $I_C$.
   $I_C$ = Maximum must operate voltage/coil resistance x 2*

5 *This safety factor must be determined by the user. Select the transistor that satisfies the conditions determined in steps 3 and 4 above.

**Absolute Maximum Ratings (NPN Transistor Ratings)**

| Item | Symbol | Rating |
|---|---|---|
| **Collector–base voltage** | $V_{CBO}$ | 60 V |
| **Collector–emitter voltage** | $V_{CBO}$ | 50 V |
| **Emitter–base voltage** | $V_{CBO}$ | 5.0 V |
| **Collector current (DC)** | $I_C$ (DC) | 100 mA |
| **Collector current (pulse)** | $I_C$ (pulse)* | 200 mA |
| **Base current (DC)** | $I_B$ (DC) | 20 mA |
| **Base current (pulse)** | $I_B$ (pulse)* | 40 mA |
| **Total power dissipation** | $P_T$ | 250 mW |
| **Junction temperature** | $T_J$ | 125°C |
| **Storage temperature** | $T_{stg}$ | -55°C to 125°C |

IPW ≤ 10 ms, duty cycle ≥ 50%

| Model | | G5NB-E | G5SB |
|---|---|---|---|
| Features | | Compact single pole 5A high isolation relay<br>CTI: 250 | Environmentally friendly compact relay |
| | | ROHS compliant | ROHS compliant |
| Appearance<br><br>Dimensions (LxWxH) | |  <br>20.5 x 7.2 x 15.3 |  <br>20.3 x 10.3 x 15.8 |
| Contact Ratings | Contact Form | SPST-NO | SPST |
| | Contact Material | AgNi | AgNi + AgSnIn |
| | Resistive Load | 5 A at 250 VAC<br>3 A at 30 VDC | 5 A at 250 VAC<br>5 A at 30 VDC |
| | Max. Switching Current | 5 A | 5 A |
| | Min. Permissible load | 10 mA at 5 VDC | 10 mA at 5 VDC |
| Coil ratings | Rated Voltage | 5 to 24 VDC | 5 to 24 VDC |
| | Power Consumption (Approx.) | 200 mW | 400 mW |
| Endurance | Electrical (operations) | 100,000 (5A / 250 VAC)<br>50,000 (5A / 30 VDC) | 50,000 min |
| | Mechanical (operations) | 5,000,000 | 5,000,000 min |
| Dialectric strength | Between coil & contacts | 4,000 VAC | 4,000 VAC |
| | Between contacts of different polarity | – | – |
| | Between contacts of same polarity | 750 VAC | 1,000 VAC |
| Ambient temperature (operating) | | -40°C to 85°C | -40°C to 70°C |
| ProtectiveConstruction | | Flux Protection (RTII) | Flux Protection (RTII) |
| Insulation distance | Creepage (Typical) | 7.2 mm | 6.7 mm |
| | Clearance (Typical) | 7.1 mm | 5.8 mm |
| Tracking Resistance (CTI) | | 250 V | 250 V |
| Variations | Single Side Stable | • | • |
| | Single Winding Latching | | |
| | Double Winding Latching | | |
| | PCB Terminal | • | • |
| | Plug-in Terminal | | |
| | Quick Connect Terminal | | |
| | Panel Mount | | |
| | Fully sealed | | |
| | Flux Protection | • | |
| Approved Standards | | UL, CSA, EN (VDE) | UL, CSA, EN (VDE) |
| Packag -ing | Min. Pack Quantity | 100 (Tray), 50 (Tube) | 100 (Tray), 50 (Tube) |
| | Min. Order Quantity | 500 | 500 |
| Page | | 45 | 49 |

| Model | | G6M | G6D | G6DS |
|---|---|---|---|---|
| Features | | Slim single in-line miniature relay | Slim miniature relay capable of relaying controller output | Slim miniature relay with 1 pole 5A switching capability |
| | | ROHS compliant | ROHS compliant | ROHS compliant |
| Appearance<br><br>Dimensions (LxWxH) | |  <br>20.3 x 5.1 x 17.7 |  <br>17.5 x 6.5 x 12.5 |  <br>20.3 x 5.08 x 12.5 |
| Contact Ratings | Contact Form | SPST-NO | SPST-NO | SPST-NO |
| | Contact Material | AgNi | AgSnIn | AgNi |
| | Resistive Load | 5 A at 250 VAC<br>5 A at 30 VDC | 5 A at 250 VAC<br>5 A at 30 VDC | 5 A at 250 VAC<br>5 A at 30 VDC |
| | Max. Switching Current | 5 A | 5 A | 5 A |
| | Min. Permissible load | 10 mA at 5 VDC | 10 mA at 5 VDC | 5 mA at 24 VDC |
| Coil ratings | Rated Voltage | 5 to 24 VDC | 5 to 24 VDC | 5 to 24 VDC |
| | Power Consumption (Approx.) | 120 mW | 200 mW | 180 mW, 120 mW (high sensitivity.) |
| Endurance | Electrical (operations) | 100,000 min | 70,000 min | 100,000 min |
| | Mechanical (operations) | 20,000,000 min | 20,000,000 min | 20,000,000 min |
| Dialectric strength | Between coil & contacts | 3,000 VAC | 3,000 VAC | 3,000 VAC |
| | Between contacts of different polarity | – | – | – |
| | Between contacts of same polarity | 750 VAC | 750 VAC | 750 VAC |
| Ambient temperature (operating) | | -40°C to 85°C | -25°C to 70°C | -40°C to 85°C |
| ProtectiveConstruction | | Fully Sealed (RTIII) | Fully Sealed (RTIII) | Fully Sealed (RTIII) |
| Insulation Distance | Creepage (Typical) | 3.5 mm | 4.5 mm | 6.4 mm |
| | Clearance (Typical) | 3.5 mm | 4.5 mm | 5.2 mm |
| Tracking Resistance (CTI) | | 250 V | 100 V | 175 V |
| Variations | Single Side Stable | • | • | • |
| | Single Winding Latching | | | |
| | Double Winding Latching | | | |
| | PCB Terminal | • | • | • |
| | Plug-in Terminal | | | |
| | Quick Connect Terminal | | | |
| | Panel Mount | | | |
| | Fully sealed | • | • | • |
| | Flux Protection | | | |
| Approved Standards | | UL, CSA, EN (VDE) | UL, CSA, IEC (TÜV), EN (VDE) | UL, EN (VDE) |
| Packag -ing | Min. Pack Quantity | 25 (Tube) | 25 (Tube) | 25 (Tube) |
| | Min. Order Quantity | 500 | 500 | 500 |
| Page | | 52 | 55 | 59 |

| Model | | G6B | | G2RG |
|---|---|---|---|---|
| Features | | Sub-miniature relay | | Power Relay with 2 x 1.5 mm contact gap. Meets requirements of european UPS standards. |
| | | ROHS compliant | | ROHS compliant |
| Appearance | |  | |  |
| Dimensions (LxWxH) | | 20 x 10 x 10 | 20 x 11 x 11 | 29 x 13.5 x 25.5 |
| Contact Ratings | Contact Form | SPST-NO | SPST-NO/NC, DPST-NO, DPST-NC | DPST-NO |
| | Contact Material | AgNi (FD version = AgSnIn) | | AgSnIn |
| | Resistive Load | 5 A at 250 VAC<br>5 A at 30 VDC | | 8 A at 250 VAC |
| | Max. Switching Current | 5 A | | 8 A |
| | Min. Permissible load | 10 mA at 5 VDC | | 10 mA at 5 VDC |
| Coil ratings | Rated Voltage | 5 to 24 VDC | | 12 & 24 VDC |
| | Power Consumption (Approx.) | 120 mW | 300 mW | 800 mW |
| Endura-nce | Electrical (operations) | 100,000 min | | 10,000 min |
| | Mechanical (operations) | 50,000,000 min | | 1,000,000 min |
| Dialectric strength | Between coil & contacts | 3,000 VAC | | 5,000 VAC |
| | Between contacts of different polarity | – | 2,000 VAC | 3,000 VAC |
| | Between contacts of same polarity | 1,000 VAC | | 1,000 VAC |
| Ambient temperature (operating) | | -25°C to 70°C | | -40°C to 70°C |
| ProtectiveConstruction | | Flux Protection (RTII)<br>Fully Sealed (RTIII) | | Fully Sealed (RTIII) |
| Insulation Distance | Creepage (Typical) | 5.0 mm | 3.2 mm | 10.0 mm |
| | Clearance (Typical) | 4.1 mm | 2.7 mm | 9.3 mm |
| Tracking Resistance (CTI) | | 100 V | | 250 V |
| Variations | Single Side Stable | • | | • |
| | Single Winding Latching | • | | |
| | Double Winding Latching | • | | |
| | PCB Terminal | • | | • |
| | Plug-in Terminal | | | |
| | Quick Connect Terminal | | | |
| | Panel Mount | • | | |
| | Fully sealed | | | • |
| | Flux Protection | | | • |
| Approved Standards | | UL, CSA, SEV, IEC, (TÜV), EN (VDE) | | UL, CSA, EN (VDE) |
| Packag -ing | Min. Pack Quantity | 100 (Tray), 20 (Tube) | | 100 (Tray) |
| | Min. Order Quantity | 100 (Tray), 400 (Tube) | | 100 (Tray) |
| Page | | 63 | | 71 |

| Model | | G5Q-EU | | G6RN | |
|---|---|---|---|---|---|
| Features | | Compact low cost high isolation relay<br>CTI: 250 | | Slim, low profile heavy duty relay | |
| | | ROHS compliant | | ROHS compliant | |
| Appearance<br><br>Dimensions (LxWxH) | |  <br>20.3 x 10.3 x 15.8 | |  <br>28.5 x 10 x 15 | |
| Contact Ratings | Contact Form | SPST-NO | SPDT | SPST-NO | SPDT |
| | Contact Material | AgNi | | AgNi (Au clad) | |
| | Resistive Load | 10 A at 250 VAC<br>5 A at 30 VDC (NO) | | 8 A at 250 VAC<br>5 A at 30 VDC | |
| | Max. Switching Current | 10 A (NO), 3 A (NC) | | 8 A | |
| | Min. Permissible load | 10 mA at 5 VDC | | 10 mA at 5 VDC | |
| Coil ratings | Rated Voltage | 5 to 24 VDC | | 5 to 48 VDC | |
| | Power Consumption (Approx.) | 200 mW | 400 mW | 220-250 mW | |
| Endurance | Electrical (operations) | 25,000 min (10 A / 250 VAC – NO)<br>100,000 min (3 A / 250 VAC – NC) | | 100,000 min | |
| | Mechanical (operations) | 10,000,000 min | | 10,000,000 min | |
| Dialectric strength | Between coil & contacts | 4,000 VAC | | 4,000 VAC | |
| | Between contacts of different polarity | – | | – | |
| | Between contacts of same polarity | 1,000 VAC | | 1,000 VAC | |
| Ambient temperature (operating) | | -40°C to 85°C | | -40°C to 85°C | |
| ProtectiveConstruction | | Fully Sealed (RTIII) | | Fully Sealed (RTIII) | |
| Insulation distance | Creepage (Typical) | 6.7 mm | | 9.8 mm | |
| | Clearance (Typical) | 5.8 mm | | 8.1 mm | |
| Tracking Resistance (CTI) | | 250 V | | 250 V | |
| Variations | Single Side Stable | • | | • | |
| | Single Winding Latching | | | | |
| | Double Winding Latching | | | | |
| | PCB Terminal | • | | • | |
| | Plug-in Terminal | | | | |
| | Quick Connect Terminal | | | | |
| | Panel Mount | | | | |
| | Fully sealed | • | | • | |
| | Flux Protection | • | | | |
| Approved Standards | | UL, CSA, EN (VDE) | | UL, CSA, SEV, IEC, EN (VDE) | |
| Packag -ing | Min. Pack Quantity | 40 (Tube) | | 20 (Tube) | |
| | Min. Order Quantity | 400 | | 400 | |
| Page | | 75 | | 79 | |

| Model | | G5LE | | G5LB | |
|---|---|---|---|---|---|
| Features | | Sub-miniature 'sugar cube' relay. | | Low profile 10A sugar cube relay. | |
| | | ROHS compliant | | ROHS compliant | |
| Appearance<br><br>Dimensions (LxWxH) | |  <br>22.5 x 16.5 x 19 | |  <br>19.6 x 15.6 x 15.2 | |
| Contact Ratings | Contact Form | SPST-NO | SPST | SPST-NO | SPDT |
| | Contact Material | $AgSnO_2$, (AgSnIn optional) | | $AgSnO_2$ | |
| | Resistive Load | 10 A at 120 VAC<br>8 A at 30 VDC | | 10 A at 120 VAC<br>8 A at 30 VDC | |
| | Max. Switching Current | 10 A | | 10 A | |
| | Min. Permissible load | 100 mA at 5 VDC | | 100 mA at 5VDC | |
| Coil ratings | Rated Voltage | 5 to 48 VDC | | 3 to 48 VDC | |
| | Power Consumption (Approx.) | 360-400 mW | | 360 mW | |
| Endurance | Electrical (operations) | 100,000 min | | 100,000 min | |
| | Mechanical (operations) | 10,000,000 min | | 10,000,000 min | |
| Dialectric strength | Between coil & contacts | 2,000 VAC | | 2,000 VAC | |
| | Between contacts of different polarity | – | | – | |
| | Between contacts of same polarity | 750 VAC | | 750 VAC | |
| Ambient temperature (operating) | | -40°C to 85°C | | -40°C to 85°C | |
| ProtectiveConstruction | | Flux Protection (RTII)<br>Fully Sealed (RTIII) | | Flux Protection (RTII)<br>Fully Sealed (RTIII) | |
| Insulation distance | Creepage (Typical) | 3.3 mm | | 3.3 mm | |
| | Clearance (Typical) | 2.7 mm | | 2.7 mm | |
| Tracking Resistance (CTI) | | 250 V | | 250 V | |
| Variations | Single Side Stable | • | | • | |
| | Single Winding Latching | | | | |
| | Double Winding Latching | | | | |
| | PCB Terminal | • | | • | |
| | Plug-in Terminal | | | | |
| | Quick Connect Terminal | | | | |
| | Panel Mount | | | | |
| | Fully sealed | • | | • | |
| | Flux Protection | • | | • | |
| Approved Standards | | UL, CSA, SEV, IEC, EN (VDE) | | UL, CSA, EN (VDE) | |
| Packag -ing | Min. Pack Quantity | 100 (Tray), 25 (Tube) | | 100 (Tray), 25 (Tube) | |
| | Min. Order Quantity | 500 (Tray), 250 (Tube) | | 500 (Tray), 1,000 (Tube) | |
| Page | | 83 | | 88 | |

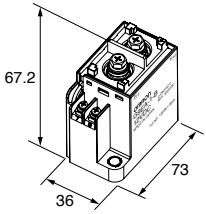
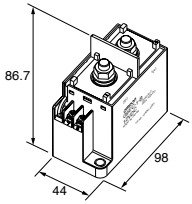
| Model | | G5CA | | G6C | |
|---|---|---|---|---|---|
| Features | | Flat power relay.<br>ROHS compliant. | | General purpose power relays | |
| | | ROHS compliant | | ROHS compliant | |
| Appearance<br><br>Dimensions (LxWxH) | |  <br>22 x 16 x 11 | |  <br>20 x 15 x 10 | |
| Contact Ratings | Contact Form | SPST-NO | | SPST-NO | SPST-NO/NC |
| | Contact Material | AgSnIn | | AgNi (FD version AgSnIn) | |
| | Resistive Load | 10 A at 250 VAC<br>10 A at 30 VDC | 10 A at 110 VAC | 10 A at 250 VAC<br>10 A at 30 VDC | 8 A at 250 VAC<br>8 A at 30 VAC |
| | Max. Switching Current | 10 A | 15 A | 10 A | 8 A |
| | Min. Permissible load | 10 mA at 5 VDC | | 10 mA at 5 VDC | |
| Coil ratings | Rated Voltage | 5 to 48 VDC | | 3 to 24 VDC | |
| | Power Consumption (Approx.) | 200 mW<br>(150 mW high sensitivity version) | | 200 mW | |
| Endurance | Electrical (operations) | 300,000 min | 100,000 min | 100,000 min | |
| | Mechanical (operations) | 20,000,000 min | | 50,000,000 min | |
| Dialectric strength | Between coil & contacts | 2,500 VAC | | 2,000 VAC | |
| | Between contacts of different polarity | – | | – | 2,000 VAC |
| | Between contacts of same polarity | 1,000 VAC | | 1,000 VAC | |
| Ambient temperature (operating) | | -25°C to 70°C | | -25°C to 70°C | |
| ProtectiveConstruction | | Flux Protection (RTII)<br>Fully Sealed (RTIII) | | Flux Protection (RTII)<br>Fully Sealed (RTIII) | |
| Insulation distance | Creepage (Typical) | 3.5 mm | | 5.5 mm | |
| | Clearance (Typical) | 2.8 mm | | 5.5 mm | |
| Tracking Resistance (CTI) | | 250 V | | 175 V | |
| Variations | Single Side Stable | • | | • | |
| | Single Winding Latching | | | • | |
| | Double Winding Latching | | | • | |
| | PCB Terminal | • | | • | |
| | Plug-in Terminal | | | | |
| | Quick Connect Terminal | • | | | |
| | Panel Mount | | | | |
| | Fully sealed | • | | • | |
| | Flux Protection | • | | • | |
| Approved Standards | | UL, CSA, SEV, SEMKO, IEC (TÜV), EN (VDE) | | UL, CSA, SEV, IEC (TÜV), EN (VDE) | |
| Packaging | Min. Pack Quantity | 20 (Tube) | | 100 (Tray), 20 (Tube) | |
| | Min. Order Quantity | 200 | | 100 (Tray), 200 (Tube) | |
| Page | | 92 | | 96 | |

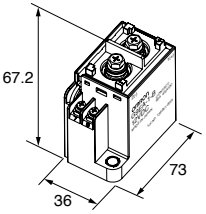
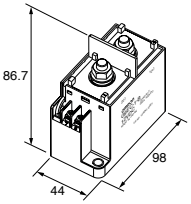
| Model | | G2R | | |
|---|---|---|---|---|
| Features | | General pupose power relays | | |
| | | ROHS compliant | | |
| Appearance<br><br>Dimensions (LxWxH) | |  <br>29 x 13 x 25.5 | | |
| Contact Ratings | Contact Form | SPST-NO, SPDT | SPST-NO, SPDT | DPST-NO, DPDT |
| | Contact Material | AgSnIn | | |
| | Resistive Load | 10 A at 250 VAC<br>10 A at 30 VDC | 16 A at 250 VAC<br>16 A at 30 VDC | 5 A at 250 VAC<br>5 A at 30 VDC |
| | Max. Switching Current | 10 A | 16 A | 5 A |
| | Min. Permissible load | 100 mA at 5 VDC | 100 mA at 5 VDC | 10 mA at 5 VDC |
| Coil ratings | Rated Voltage | 5 to 100 VDC, 12 to 240 VAC | | |
| | Power Consumption (Approx.) | DC: 530mW; 360mW high sensitivity version<br>AC: 900Mva | | |
| Endura-nce | Electrical (operations) | 100,000 min | | |
| | Mechanical (operations) | DC: 20,000,000 min<br>AC: 10,000,000 min | | |
| Dialec-tric strength | Between coil & contacts | 5,000 VAC | | |
| | Between contacts of different polarity | – | – | 3,000 VAC |
| | Between contacts of same polarity | 1,000 VAC | | |
| Ambient temperature (operating) | | -40°C to 70°C | | |
| ProtectiveConstruction | | Flux Protection (RTII)<br>Fully Sealed (RTIII) | | |
| Insulation distance | Creepage (Typical) | 10.0 mm | | |
| | Clearance (Typical) | 9.3 mm | | |
| Tracking Resistance (CTI) | | 175 V | | |
| Variations | Single Side Stable | • | | |
| | Single Winding Latching | | | |
| | Double Winding Latching | • | | |
| | PCB Terminal | • | | |
| | Plug-in Terminal | • | | |
| | Quick Connect Terminal | • | | |
| | Panel Mount | • | | |
| | Fully sealed | • | | |
| | Flux Protection | • | | |
| Approved Standards | | UL, CSA, SEV, SEMKO, IEC (TÜV), IEC (EN), EN (VDE) | | |
| Packag -ing | Min. Pack Quantity | 100 (Tray), 15 (Tube) | | |
| | Min. Order Quantity | 150 (Tube) | | |
| Page | | 105 | | |

| Model | | G2RL | | | |
|---|---|---|---|---|---|
| Features | | Low profile relays with Class F insulation available.<br>ROHS compliant.<br>High Capacity and high sensitivity models available. | | | |
| | | ROHS compliant | | | |
| Appearance<br><br>Dimensions (LxWxH) | |  <br>29 x 12.7 x 15.7 | | | |
| Contact Ratings | Contact Form | SPST-NO, SPDT | SPST-NO, SPDT | SPST-NO, SPDT | DPST-NO, DPDT |
| | Contact Material | $AgSnO_2$ | | | |
| | Resistive Load | 10 A at 250 VAC<br>10 A at 24 VDC | 12 A at 250 VAC<br>12 A at 24 VDC | 16 A at 250 VAC<br>16 A at 24 VDC | 8 A at 250 VAC<br>8 A at 24 VDC |
| | Max. Switching Current | 10 A | 12 A | 16 A | 8 A |
| | Min. Permissible load | 10 mA at 5 VDC | | | |
| Coil ratings | Rated Voltage | 5 to 48 VDC | | | |
| | Power Consumption (Approx.) | 400 mW (250mW high sensitivity) | | | |
| Endurance | Electrical (operations) | 50,000 min | | | |
| | Mechanical (operations) | 20,000,000 min | | | |
| Dielectric strength | Between coil & contacts | 5,000 VAC | | | |
| | Between contacts of different polarity | – | – | – | 2,500 VAC |
| | Between contacts of same polarity | 1,000 VAC | | | |
| Ambient temperature (operating) | | -40°C to 85°C | | | |
| ProtectiveConstruction | | Flux Protection (RTII) | Flux Protection (RTII)<br>Fully Sealed (RTIII) | | |
| Dielectric strength | Creepage (Typical) | 11.0 mm | | | |
| | Clearance (Typical) | 10.0 mm | | | |
| Tracking Resistance (CTI) | | 250 V | | | |
| Variations | Single Side Stable | • | | | |
| | Single Winding Latching | | | | |
| | Double Winding Latching | | | | |
| | PCB Terminal | • | | | |
| | Plug-in Terminal | | | | |
| | Quick Connect Terminal | | | | |
| | Panel Mount | | | | |
| | Fully sealed | • | | | |
| | Flux Protection | • | | | |
| Approved Standards | | UL, CSA, EN (VDE) | | | |
| Packag -ing | Min. Pack Quantity | 25 (Tube) | | | |
| | Min. Order Quantity | 100 | | | |
| Page | | 121 | | | |

| Model | | G5RL | | G4W | |
|---|---|---|---|---|---|
| Features | | Single-pole 16A power relay with DC or AC coil types | | Relay with 10kV impulse and 4kV withstand voltages for power supply switching applications | |
| | | ROHS compliant | | ROHS compliant | |
| Appearance<br><br>Dimensions (LxWxH) | |  <br>29.0 x 12.7 x 15.7 | |  <br>30.5 x 19.5 x 30.5 | |
| Contact Ratings | Contact Form | SPST-NO | SPDT | SPST-NO | DPST-NO |
| | Contact Material | AgSnIn | | AgSnIn | |
| | Resistive Load | 16A at 250VAC (NO),<br>16A at 24VDC (NO),<br>5A at 250VAC (NC),<br>5A at 24VDC (NC) | | 15 A at 250 VAC<br>15 A at 24 VDC | 10 A at 250 VAC<br>10 A at 24 VDC |
| | Max. Switching Current | 16 A (NO), 5A (NC) | | 15 A | 10 A |
| | Min. Permissible load | 40 mA at 24 VDC | | 100 mA at 5 VDC | |
| Coil ratings | Rated Voltage | 5 to 48VDC, 24-230/240 VAC | | 12 to 100 VDC | |
| | Power Consumption (Approx.) | 0.75VA (AC coil),<br>400mW (DC coil) | | 800 mW | |
| Endurance | Electrical (operations) | 50,000 min | | 100,000 min | |
| | Mechanical (operations) | 10,000,000 min | | 5,000,000 min | |
| Dielectric strength | Between coil & contacts | 6,000 VAC | | 4,000 VAC | |
| | Between contacts of different polarity | - | | – | 2,000 VAC |
| | Between contacts of same polarity | 1,000 VAC | | 1,500 VAC | |
| Ambient temperature (operating) | | -40°C to 85°C (-40°C to 70°C-AC coil) | | -25°C to 55°C | |
| Protective Construction | | Flux Protection (RT11) | | Unsealed (RTI) | |
| Dielectric strength | Creepage (Typical) | | 8.0 mm (min.) | 8.0 mm (min.) | |
| | Clearance (Typical) | | 8.0 mm (min.) | 8.0 mm (min.) | |
| Tracking Resistance (CTI) | | 250V | | 175 V | |
| Variations | Single Side Stable | | | • | |
| | Single Winding Latching | | | | |
| | Double Winding Latching | | | | |
| | PCB Terminal | • | | • | |
| | Plug-in Terminal | | | | |
| | Quick Connect Terminal | | | • | |
| | Panel Mount | | | | |
| | Fully sealed | | | | |
| | Flux Protection | • | | | |
| Approved Standards | | UL, CSA, EN (VDE) | | UL, CSA, EN (VDE), SEV, SEMKO, DEMKO | |
| Packag -ing | Min. Pack Quantity | 100 (Tray) | | 50 (Tray) | |
| | Min. Order Quantity | 100 | | 50 | |
| Page | | 126 | | 130 | |

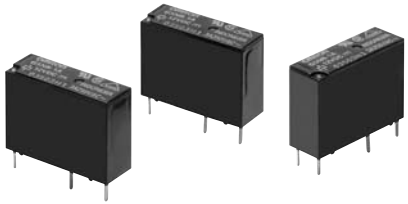
| Model | | G8P | | G4A | |
|---|---|---|---|---|---|
| Features | | Small, low cost power relays | | Relay with 10kV impulse and 4kV withstand voltages for power supply switching applications | |
| | | ROHS compliant | | ROHS compliant | |
| Appearance<br><br>Dimensions (LxWxH) | |  <br>32.1 x 28.2 x 20.1 | |  <br>30.5 x 16 x 23.5 |  <br>30.5 x 16 x 26.8 |
| Contact Ratings | Contact Form | SPST-NO | SPDT | SPST-NO | |
| | Contact Material | AgSnIn | | $AgSnO_2$ | |
| | Resistive Load | 30 A at 250 VAC<br>20 A at 28 VDC | 20/10 A at 250 VAC<br>20/10 A at 30 VAC | 20 A at 250 VAC | |
| | Max. Switching Current | 30 A | 20/10 A | 20 A | |
| | Min. Permissible load | 500 mA at 5 VDC | | 100 mA at 5 VDC | |
| Coil ratings | Rated Voltage | 5 to 110 VDC | | 5 to 24 VDC | |
| | Power Consumption (Approx.) | 900 mW | | 900 mW | |
| Endurance | Electrical (operations) | 100,000 min | | 100,000 min | |
| | Mechanical (operations) | 10,000,000 min | | 2,000,000 min | |
| Dialectric strength | Between coil & contacts | 2,500 VAC | | 4,500 VAC | |
| | Between contacts of different polarity | – | | – | |
| | Between contacts of same polarity | 1,500 VAC | | 1,000 VAC | |
| Ambient temperature (operating) | | -55°C to 105°C | | -20°C to 60°C | |
| ProtectiveConstruction | | Unsealed (RTI), Flux Protection (RTII)<br>Fully Sealed (RTIII) | | Flux Protection (RTII) | |
| Dialectric strength | Creepage (Typical) | 4.08 mm (min.) | | 6.4 mm | |
| | Clearance (Typical) | 1.6 mm (min.) | | 3.2 mm | |
| Tracking Resistance (CTI) | | 175 V | | 250 V | |
| Variations | Single Side Stable | • | | • | |
| | Single Winding Latching | | | | |
| | Double Winding Latching | | | | |
| | PCB Terminal | • | | • | |
| | Plug-in Terminal | | | • | |
| | Quick Connect Terminal | • | | | |
| | Panel Mount | • | | | |
| | Fully sealed | • | | | |
| | Flux Protection | | | • | |
| Approved Standards | | UL, CSA, EN (VDE) | | UL, CSA, IEC, EN (VDE) | |
| Packag -ing | Min. Pack Quantity | 50 (Tray) | | 50 (Tray) | |
| | Min. Order Quantity | 250 | | 50 | |
| Page | | 136 | | 142 | |

| Model | | G9EA | | G9EC |
|---|---|---|---|---|
| | | G9EA-1(-B) | G9EA-1(-B)-CA | G9EC-1(-B) |
| Classification | | Switching/current conduction | High-current conduction | Switching/current conduction |
| Appearance | |  | |  |
| Features | | **Standard model**<br>Compact, carries/switches 400 V, 60 A loads | **Carries 100 A**<br>Low contact resistance when carrying current | **Largest capacity in series**<br>Carries/switches 400 V, 200 A loads |
| Contact | Contact Form | SPST-NO | | SPST-NO |
| | Contact structure | Double-break, single | | Double-break, single |
| | Contact resistance | 30 mΩ max.<br>(0.6 mΩ typical) | 10 mΩ max.<br>(0.3 mΩ typical) | 30 mΩ max.<br>(0.2 mΩ typical) |
| | Switching voltage drop | 0.1 V max.<br>(for a carry current of 60 A) | 0.1 V max.<br>(for a carry current of 100 A) | 0.1 V max.<br>(for a carry current of 200 A) |
| | Electrical endurance | 120 VDC, 100 A,<br>3,000 operations min. | 400 VDC, 30 A,<br>1,000 operations min. | 400 VDC, 200 A,<br>3,000 operations min. |
| | | 400 VDC, 60 A,<br>3,000 operations min. | 120 VDC, 30 A,<br>2,500 operations min. | – |
| | | 400 VDC, 30 A,<br>30,000 operations min. | – | – |
| | Maximum switching current | 100 A | 30 A | 200 A |
| | Rated carry current | 60 A | 100 A | 200 A |
| | Short-time carry current | 100 A (10 min) | 150 A (10 min) | 300 A (15 min) |
| | Maximum interruption current | 600 A at 300 VDC (5 times) | – | 1,000 A at 400 VDC<br>(10 times) |
| | Overload interruption | 180 A at 400 VDC<br>(100 times min.) | 100 A at 120 VDC<br>(150 times min.) | 700 A at 400 VDC<br>(40 times min.) |
| | Reverse polarity interruption | -60 A at 200 VDC<br>(1,000 times min.) | – | -200 A at 200 VDC<br>(1,000 times min.) |
| Coil | Rated voltage | 12, 24, 48, 60 & 100 VDC | | 12, 24, 48, 60 & 100 VDC |
| | Power consumption | Approx. 5 to 5.4 W | | Approx. 11 W |
| Mechanical endurance | | 200,000 operations min. | | 200,000 operations min. |
| Page | | 146 | | 153 |

| Model | | G9EA | | G9EC |
|---|---|---|---|---|
| | | G9EA-1(-B) | G9EA-1(-B)-CA | G9EC-1(-B) |
| Classification | | Switching/current conduction | High-current conduction | Switching/current conduction |
| Appearance | |  | |  |
| Features | | **Standard model** Compact, carries/switches 400 V, 60 A loads | **Carries 100 A** Low contact resistance when carrying current | **Largest capacity in series** Carries/switches 400 V, 200 A loads |
| Insulation resistance (see note 1) | Between Coil and Contacts | 1,000 MΩ min | | 1,000 MΩ min |
| | Between contacts of the same polarity | 1,000 MΩ min | | 1,000 MΩ min |
| Dielectric strength | Between Coil and Contacts | 2,500 VAC, 1 min | | 2,500 VAC, 1 min |
| | Between contacts of the same polarity | 2,500 VAC, 1 min | | 2,500 VAC, 1 min |
| Impulse withstand voltage (see note 2) | | 4,500 V | | 4,500 V |
| Ambient operating temperature | | -40 to 70°C (with no icing or condensation) | | -40 to 50°C (with no icing or condensation) |
| Ambient operating humidity | | 5% to 85% | | 5% to 85% |
| Terminals | Screw terminals | Yes | | Yes |
| | Lead wire output | Yes | | Yes |
| Page | | 146 | | 153 |

**Note: 1.** The insulation resistance was measured with a 500 VDC megohmmeter.
**2.** The impulse withstand voltage was measured with a JEC-212 (1981) standard impulse voltage waveform (1.2 x 50 μs).

## A Miniature Relay with 1-pole 5 A Switching Capability and 10 kV Impulse Withstand Voltage



- ROHS compliant.
- Highly efficient magnetic circuit for high sensitivity (200 mW).
- Compact, slim, yet provides 10 kV impulse withstand voltage (between coil and contacts).
- Standard model conforms to UL, CSA and EN standards.
- Tracking resistance: CTI>250

## Ordering Information

| Classification | Contact form | Enclosure ratings | Model |
|---|---|---|---|
| Standard | SPST-NO | Flux protection | G5NB-1A |

**Note:** When ordering, add the rated coil voltage to the model number.
Example: G5NB-1A-E 12 VDC
└── Rated coil voltage

**Model Number Legend**

**G5NB-□□-E□VDC**
1 2 3

**1. Number of Poles**

1: 1 pole

**2. Contact Form**

A: SPST-NO

**3. Rated Coil Voltage**

5, 12, 18, 24 VDC

## Application Examples

Water heaters, refrigerators, air conditioners, and small electric appliances

# Specifications

## ■ Coil Ratings

| | | | | |
|---|---|---|---|---|
| **Rated voltage** | 5 VDC | 12 VDC | 18 VDC | 24 VDC |
| **Rated current** | 40.0 mA | 16.7 mA | 11.1 mA | 8.3 mA |
| **Coil resistance** | 125 Ω | 720 Ω | 1,620 Ω | 2,880 Ω |
| **Must operate voltage** | 75% max. of rated voltage | | | |
| **Must release voltage** | 10% min. of rated voltage | | | |
| **Max. voltage** | 170% of rated voltage (at 23°C) | | | |
| **Power consumption** | Approx. 200 mW | | | |

**Note:** The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.
The operating characteristics are measured at a coil temperature of 23°C.
The "Max. voltage" is the maximum voltage that can be applied to the relay coil.

## ■ Contact Ratings

| | |
|---|---|
| **Load** | Resistive load ($\cos\varphi = 1$) |
| **Rated load** | 5 A at 250 VAC, 3 A at 30 VDC |
| **Contact material** | AgNi |
| **Max. switching voltage** | 250 VAC, 30 VDC |
| **Max. switching current** | 5 A |
| **Max. switching power** | 1250 VA, 90 W |
| **Failure rate (reference value)** | 10 mA at 5 VDC |

**Note:** P level: $\lambda_{60} = 0.1 \times 10^{-6}$/operation (with an operating frequency of 120 operations/min)

## ■ Characteristics

| | | |
|---|---|---|
| **Contact resistance (See note 2.)** | | 100 mΩ max. |
| **Operate time** | | 10 ms max. |
| **Release time** | | 10 ms max. |
| **Insulation resistance (See note 3.)** | | 1,000 MΩ min. (at 500 VDC) |
| **Dielectric strength** | | 4,000 VAC, 50/60 Hz for 1 min between coil and contacts<br>750 VAC, 50/60 Hz for 1 min between contacts of same polarity |
| **Impulse withstand voltage** | | 10,000 V (1.2 x 50 ms) between coil and contacts |
| **Insulation Distance** | **Creepage (Typ)** | 7.2 mm |
| | **Clearance (Typ)** | 7.1 mm |
| **Tracking Resistance CTI)** | | 250 V |
| **Vibration resistance** | | Destruction: 10 to 55 to 10 Hz, 0.75-mm single amplitude (1.5-mm double amplitude)<br>Malfunction: 10 to 55 to 10 Hz, 0.75-mm single amplitude (1.5-mm double amplitude) |
| **Shock resistance** | | Destruction: 1,000 m/s$^2$<br>Malfunction: 100 m/s$^2$ |
| **Endurance** | | Mechanical: 5,000,000 operations min.<br>Electrical: 100,000 operations min (5 A at 250 VAC), 200,000 operations min. (3 A at 30 VDC) |
| **Failure rate P level (reference value) (See note 4.)** | | 5 VDC, 10 mA |
| **Ambient temperature** | | Operating: -40°C to 85°C (with no icing or condensation) |
| **Ambient humidity** | | Operating: 5% to 85% |
| **Weight** | | Approx. 4 g |

**Note: 1.** The data shown above are initial value.
**2.** Measurement conditions: 5 VDC, 1 A, voltage drop method.
**3.** Measurement conditions: Measured at the same points as the dielectric strength using a 500-VDC ohmmeter.
**4.** This value is for a switching frequency of 120 operations/minute.

## ■ Approved Standards

### UL508 (File No. 41515)

| Coil ratings | Contact ratings |
|---|---|
| 5 to 24 VDC | 5 A, 30 VDC (resistive)<br>5 A, 125 VAC (resistive)<br>5 A, 250 VAC (general use) |

### CSA C22.2 (No. 0, No. 1, No. 14) (File No. LR31928)

| Coil ratings | Contact ratings |
|---|---|
| 5 to 24 VDC | 5 A, 30 VDC (resistive)<br>5 A, 125 VAC (resistive)<br>5 A, 250 VAC (general use) |

### EN 61810-1 (VDE Reg No 137575)

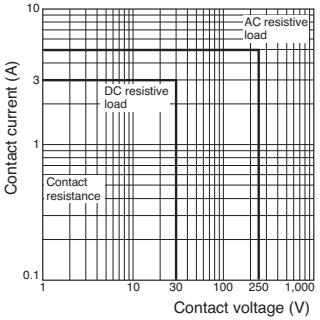
| Coil ratings | Contact ratings |
|---|---|
| 5 to 24VDC | 5 A, 30 VDC (resistive)<br>5 A, 250 VAC (general use) |

## ■ Actual Load Life (Reference Values)

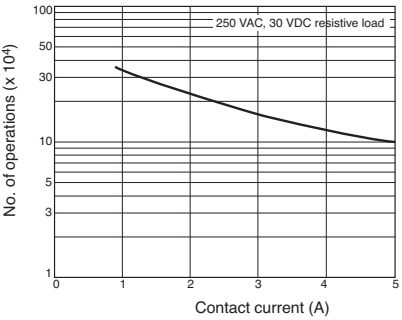
1. 120-VAC motor and lamp load (2.5-A surge and 0.5-A normal): 250,000 operations min.(at 23°C)
2. 160-VDC valve load (with varistor) (0.24-A): 250,000 operations min.(at 23°C)

# Engineering Data

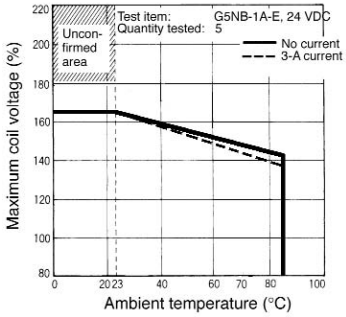
### Maximum Switching Capacity




### Endurance

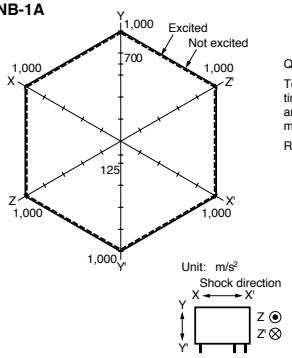



### Ambient Temperature vs. Maximum Coil Voltage




### Malfunctioning Shock

**G5NB-1A**




Quantity Tested: 5 units

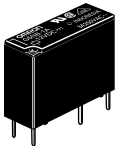
Test Method: Shock was applied 3 times in 6 directions along 3 axes and the level at which shock caused malfunction was measured.

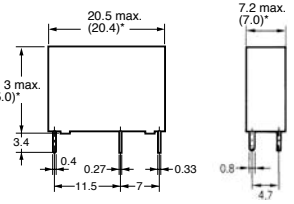
Rating: 100 m/s²

# Dimensions

**Note:** All units are in millimetres unless otherwise indicated.

**G5NB-1A-E**

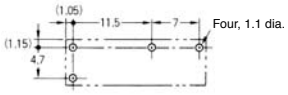




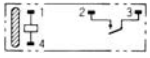

*Average value

**PCB Mounting Holes (Bottom View)**

Tolerance: ±0.1 mm




**Terminal Arrangement/ Internal Connections (Bottom View)**




(No coil polarity)

# Precautions

## ■ Correct Use

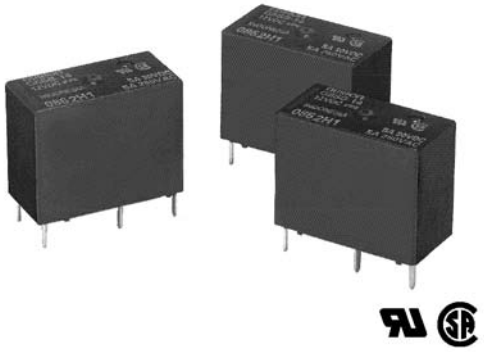
### HANDLING

The enclosure rating of the G5NB is for flux protection. Do not use immersion-cleaning.

**ALL DIMENSIONS SHOWN ARE IN MILLIMETRES.**
To convert millimetres into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

## Compact Single-pole Relay for Switching 5 A (Normally Open Contact), Fan Control of Air Conditioners, and Heating Control of Small Appliances.

- ROHS compliant.
- Compact SPDT Relay with high insulation.
- Incorporates a normally open contact that switches 5 A max.
- Ensures a withstand impulse voltage of 8,000 V between the coil and contacts.
- Conforms to UL, CSA and EN.



## Application Examples

- Fan Motor
- Refrigerator
- Air Conditioner
- Oven
- Washing Machine
- Others

## Ordering Information

| Classification | Contact form | Enclosure ratings | Model |
|---|---|---|---|
| Standard | SPDT | Fully sealed | G5SB-14 |

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

Example: G5SB-14 12 VDC
Rated coil voltage

**Model Number Legend**

**G5SB-□□□ VDC**
1 2 3

**1. Number of Poles**

1: 1 pole (SPDT)

**2. Protective Structure**

4: Fully sealed

**3. Rated Coil Voltage**

5, 9, 12, 24 VDC

## Specifications

### ■ Coil Ratings

| Rated voltage | 5 VDC | 9 VDC | 12 VDC | 24 VDC |
|---|---|---|---|---|
| Rated current | 80 mA | 44.4 mA | 33.3 mA | 16.7 mA |
| Coil resistance | 63 Ω | 202 Ω | 360 Ω | 1,440 Ω |
| Must operate voltage | 75% max. of rated voltage | | | |
| Must release voltage | 5% min. of rated voltage | | | |
| Max. voltage | 110% of rated voltage | | | |
| Power consumption | Approx. 400 mW | | | |

## ■ Contact Ratings

| | |
|---|---|
| **Load** | Resistive Load |
| **Rated load** | 3 A (NO)/3 A (NC) at 125 VAC<br>5 A (NO)/3 A (NC) at 125 VAC<br>5 A (NO) at 250 VAC<br>3 A (NC) at 250 VAC<br>5 A (NO)/3 A (NC) at 30 VDC |
| **Contact material** | Ag Alloy |
| **Rated carry current** | 5 A (NO)/3 A (NC) |
| **Max. switching voltage** | 250 VAC, 30 VDC |
| **Max. switching current** | 5 A (NO)/3 A (NC) |
| **Max. switching capacity** | 1,250 VA, 150 W (NO)<br>750 VA, 30 W (NC) |
| **Min. permissible load** | 10 mA at 5 VDC |

**Note:** P level: $\lambda_{60} = 0.1 \times 10^{-6}$/operation (with an operating frequency of 120 operations/min)

## ■ Characteristics

| | | |
|---|---|---|
| **Contact resistance (see note 2)** | | 100 mΩ max. |
| **Operate time (see note 3)** | | 10 ms max. |
| **Release time (see note 3)** | | 5 ms max. |
| **Insulation resistance (see note 4)** | | 1,000 MΩ min. |
| **Dielectric strength** | | 4,000 VAC, 50/60 Hz for 1 min between coil and contacts<br>1,000 VAC, 50/60 Hz for 1 min between contacts of same polarity |
| **Impulse withstand voltage** | | 8 kV (1.2 x 50 μs) |
| **Insulation Distance** | **Creepage (Typ)** | 6.7 mm |
| | **Clearance (Typ)** | 5.8 mm |
| **Tracking Resistance CTI)** | | 250 V |
| **Vibration resistance** | | Destruction: 10 to 55 Hz, 0.75-mm single amplitude (1.5-mm double amplitude)<br>Malfunction: 10 to 55 Hz, 0.75-mm single amplitude (1.5-mm double amplitude) |
| **Shock resistance** | | Destruction: 1,000 $m/s^2$ (approx. 100 G)<br>Malfunction: Energized: 100 $m/s^2$ (approx. 10 G)<br>Non-energized: 100 $m/s^2$ (approx. 10 G) |
| **Endurance (see note 5)** | | Mechanical: 5,000,000 operations (18,000 operations per hour)<br>Electrical: 200,000 operations: 3 A (NO)/3 A (NC) at 125 VAC resistive load<br>50,000 operations: 5 A (NO)/3 A (NC) at 125 VAC resistive load<br>50,000 operations: 5 A (NO) at 250 VAC resistive load<br>10,000 operations: 3 A (NC) at 250 VAC resistive load<br>10,000 operations: 5 A (NO)/3 A (NC) at 30 VDC resistive load<br>Switching frequency: 1,800 operations per hour |
| **Ambient temperature** | | Operating: -40°C to 70°C with no icing or condensation |
| **Ambient humidity** | | Operating: 5% to 95% |
| **Weight** | | Approx. 6.5 g |

**Note: 1.** The data shown above are initial values.
**2.** The contact resistance is possible with 1 A applied at 5 VDC using a fall-of-potential method.
**3.** The operating time is possible with the operating voltage imposed with no contact bounce at an ambient temperature of 23°C.
**4.** The insulation resistance is possible between coil and contacts and between contacts of the same polarity at 500 VDC.
**5.** The electrical durability data items shown are possible at 23°C.

## ■ Approved Standards

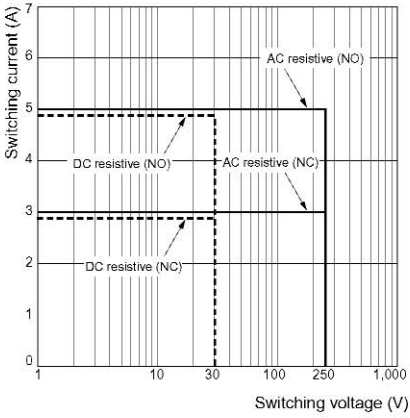
**UL508 (File No. E41515)/CSA C22.2 (No.14) (File No. LR31928)**
**EN 61810-1 (VDE Reg. no 40000957)**

| Model | Coil ratings | Contact ratings |
|---|---|---|
| G5SB | 5 to 24 VDC | 3 A, 125 VAC (resistive) NC only<br>2 A, 125 VAC (resistive) NC only<br>5 A, 250 VAC (resistive) NO only<br>3 A, 250 VAC (resistive) NO only<br>5 A, 30 VDC (resistive) NO only |

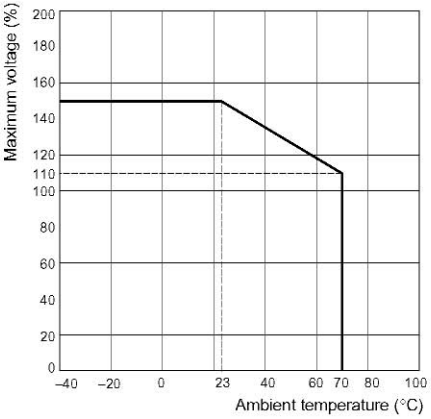
Electrical endurance tests are performed at 70°C.

# Engineering Data

**Max. Switching Capacity**

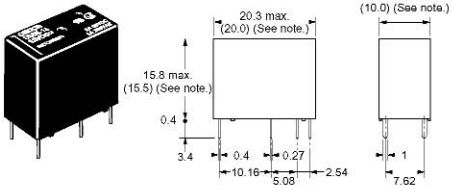



**Ambient Temperature vs. Maximum Voltage**

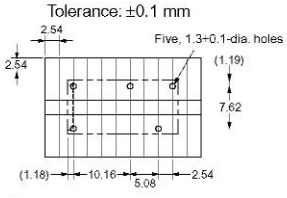



# Dimensions

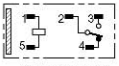
**Note:** All units are in millimetres unless otherwise indicated.




**PCB Mounting Holes (Bottom View)**



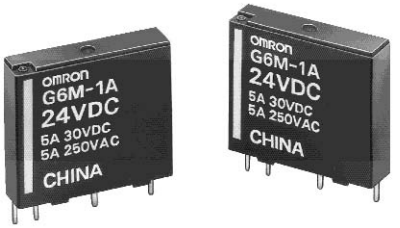

**Terminal Arrangement/ Internal Connections (Bottom View)**




**Note:** Values in parentheses are average values.

**ALL DIMENSIONS SHOWN ARE IN MILLIMETRES.**
To convert millimetres into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

## Slim, Miniature Relay, Capable of Relaying Programmable Controller and Temperature Controller Outputs




- ROHS compliant.
- Slim 5-mm width, and miniature size.
- Reduced mounting area ideal for high-density mounting.
- Highly efficient magnetic circuit for high sensitivity (40% higher than the G6D, with power consumption of 120 mW).
- Satisfies IEC61131-2 and IEC61010 requirements.
- SIL (single-in-line) terminal pitch.
- UL, CSA and EN approved.

# Ordering Information

| Classification | Contact form | Enclosure ratings | Model |
|---|---|---|---|
| Standard | SPST-NO | Fully sealed | G6M-1A |

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

Example: G6M-1A 12 VDC
Rated coil voltage

**Model Number Legend**

**G6M -□ □ □ VDC**
**1 2 3**

**1. Number of Poles**

1: 1 pole

**2. Contact Form**

A: SPST-NO

**3. Rated Coil Voltage**

5, 12, 24 VDC

# Specifications

## ■ Coil Ratings

| | | | |
|---|---|---|---|
| **Rated voltage** | 5 VDC | 12 VDC | 24 VDC |
| **Rated current** | 24 mA | 10 mA | 5 mA |
| **Coil resistance** | 208 Ω | 1,200 Ω | 4,800 Ω |
| **Must operate voltage** | 75% max. of rated voltage | | |
| **Must release voltage** | 5% min. of rated voltage | | |
| **Max. voltage** | 160% of rated voltage (at 23°C) | | |
| **Power consumption** | Approx. 120 mW | | |

**Note: 1.** The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.
**2.** Operating characteristics are measured at a coil temperature of 23°C.
**3.** The maximum allowable voltage is the maximum possible value of the voltage that can be applied to the relay coil. It is not the maximum voltage that can be applied continuously.
**4.** The must operate voltage is 72% or less of the rated voltage if the relay is mounted vertically and the terminals are pointed downwards.

## ■ Contact Ratings

| | |
|---|---|
| **Rated load** | 3 A at 250 VAC, 3 A at 30 VDC |
| **Contact material** | AgNi |
| **Rated carry current** | 5 A |
| **Max. switching voltage** | 270 VAC, 125 VDC |
| **Max. switching current** | 5 A |
| **Max. switching power** | 750 VAC, 90 W |
| **Min. permissable load** | 10 mA at 5 VDC (at 120 operations/min) |

**Note:** P level: $\lambda_{60} = 0.1 \times 10^{-6}$/operation

## ■ Characteristics

| | | |
|---|---|---|
| **Contact resistance** | | 100 mΩ max. |
| **Operate time** | | 10 ms max. |
| **Release time** | | 5 ms max. |
| **Insulation resistance** | | 1,000 MΩ min. (at 500 VDC) |
| **Dielectric strength** | | 3,000 VAC, 50/60 Hz for 1 min between coil and contacts<br>750 VAC, 50/60 Hz for 1 min between contacts of same polarity |
| **Impulse withstand voltage** | | 5,080 V (1.2 x 50 μs) between coil and contacts |
| **Insulation Distance** | **Creepage (Typ)** | 3.5 mm |
| | **Clearance (Typ)** | 3.5 mm |
| **Tracking Resistance CTI)** | | 250 V |
| **Vibration resistance** | | Destruction: 10 to 55 Hz, 2.5-mm single amplitude (5.0-mm double amplitude)<br>Malfunction: 10 to 55 Hz, 0.75-mm single amplitude (1.5-mm double amplitude) |
| **Shock resistance** | | Destruction: 1,000 $m/s^2$<br>Malfunction: 100 $m/s^2$ |
| **Endurance** | | Mechanical: 20,000,000 operations min. (at 18,000 operations/hr)<br>Electrical: 100,000 operations min. (3 A at 250 VAC/30 VDC, resistive load) |
| **Ambient temperature** | | Operating: -40°C to 85°C (with no icing) |
| **Ambient humidity** | | Operating: 5% to 85% |
| **Weight Approx.** | | 4 g |

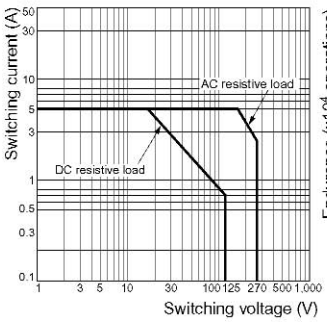
## ■ Approved Standards

### UL508 (File No. E41515)/CSA C22.2 (No.14) (File No. LR31928)
### EN 61810-1 (VDE Reg. no 400003429)

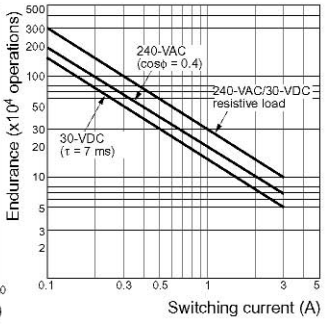
| Model | Coil ratings | Contact ratings |
|---|---|---|
| G6M-1A | 4.5 to 24 VDC | 5 A, 250 VAC (resistive load, 6,000 operations)<br>5 A, 24 VDC (resistive load, 6,000 operations)<br>3 A, 250 VAC (general use, 100,000 operations)<br>3A, 24 VDC (general use, 100,000 operations) |

# Engineering Data

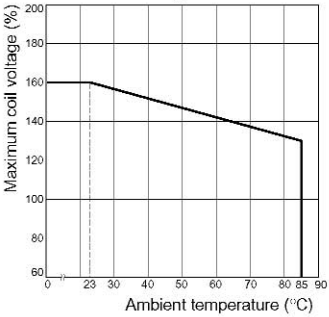
**Maximum Switching Power**




**Endurance**



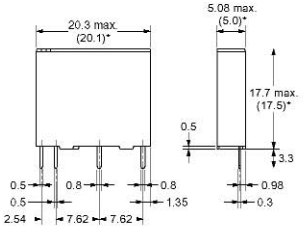

**Ambient Temperature vs. Maximum Coil Voltage**



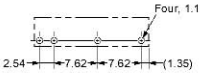

Note: The maximum coil voltage refers to the maximum value in a varying range of operating power voltage, not a continuous voltage.

# Dimensions

**G6M-1A**

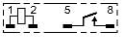




**Terminal Arrangement/ Internal Connections (Bottom View)**




**Mounting Holes (Bottom View)**

Tolerance: ±0.1




# Precautions

**BASIC INFORMATION**

Before actually committing any component to a mass-productionsituation, OMRON strongly recommends situational testing, in as close to actual production situations as possible. One reason is to confirm that the product will still perform as expected after surviving the many handling and mounting processes involved in mass production. Also, even though OMRON relays are individually tested a number of times, and each meets strict requirements, a certain testing tolerance is permissible. When a high-precision product uses many components, each depends upon the rated performance thresholds of the other components. Thus, the overall performance tolerance may accumulate into undesirable levels.

To avoid problems, always conduct tests under the actual application conditions.

**General**

To maintain the initial characteristics of a relay, exercise care that it is not dropped or mishandled. For the same reason, do not remove the case of the relay; otherwise, the characteristics may degrade. Avoid using the relay in an atmosphere containing sulfuric acid ($SO_2$), hydrogen sulfide ($H_2S$), or other corrosive gases.

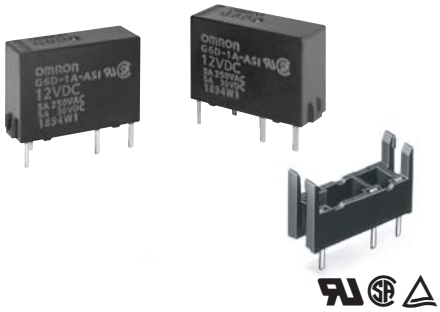
Do not continuously apply a voltage higher than the rated maximum voltage to the relay. Never try to operate the relay at a voltage and a current other than those rated.

Do not use the relay at temperatures higher than that specified in the catalog or data sheet.

**ALL DIMENSIONS SHOWN ARE IN MILLIMETRES.**
To convert millimetres into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

CAT. No. K121-E2-03-X

## Slim, Miniature Relay, Capable of Relaying Programmable Controller and Temperature Controller Outputs



- ROHS compliant.
- Slim and miniature: 17.5 x 6.5 x 12.5 mm (L x W x H).
- Ideal for high-density mounting
- Switches 5 A at 250 VAC/30 VDC.
- Allows 300,000 operations with a 2-A load at 250 VAC or 30 VDC.
- Actual load switching capability equals the G6B's capability.
- Washable construction.

## Ordering Information

| Classification | Contact form | Enclosure ratings | Model |
|---|---|---|---|
| Standard | SPST-NO | Fully sealed | G6D-1A-ASI |

**Note:** When ordering, add the rated coil voltage to the model number.
Example: G6D-1A-ASI 12 VDC
Rated coil voltage

**Model Number Legend**

**G6D -** □ □ **-** □ □ **VDC**
**1 2 3 4**

1. **Number of Poles**
   1: 1 pole
2. **Contact Form**
   A: SPST-NO
3. **Contact Material**
   ASI: Silver alloy (cadmium-free)
4. **Rated Coil Voltage**
   5, 12, 24 VDC

## ■ Accessories (Order Separately)

| | |
|---|---|
| **Connecting Socket** | P6D-04P |

# Specifications

## ■ Coil Ratings

| | | | |
|---|---|---|---|
| **Rated voltage** | 5 VDC | 12 VDC | 24 VDC |
| **Rated current** | 40 mA | 16.7 mA | 8.3 mA |
| **Coil resistance** | 125 Ω | 720 Ω | 2,880 Ω |
| **Must operate voltage** | 70% max. of rated voltage | | |
| **Must release voltage** | 10% min. of rated voltage | | |
| **Max. voltage** | 160% of rated voltage (at 23°C) | | |
| **Power consumption** | Approx. 200 mW | | |

**Note:** The must operate voltage is 75% or less of the rated voltage if the relay is mounted upside down.

## ■ Contact Ratings

| | |
|---|---|
| **Rated load** | 5 A at 250 VAC, 5 A at 30 VDC, resistive load |
| **Contact material** | AgSnIn |
| **Rated carry current** | 5 A |
| **Max. switching voltage** | 250 VAC, 30 VDC |
| **Max. switching current** | 5 A |
| **Max. switching power** | 1,250 VA, 150 W |
| **Failure rate (reference value)** | 10 mA at 5 VDC |

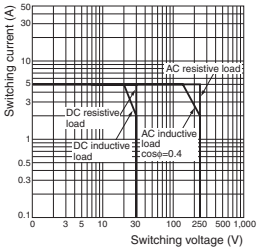
**Note:** P level: $\lambda_{60} = 0.1 \times 10^{-6}$/operation.

## ■ Characteristics

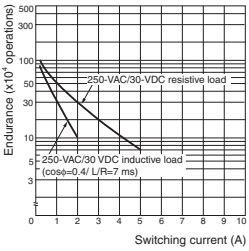
| | | |
|---|---|---|
| **Contact resistance** | | 100 mΩ max. |
| **Operate time** | | 10 ms max. |
| **Release time** | | 5 ms max. |
| **Insulation resistance** | | 1,000 MΩ min. (at 500 VDC) |
| **Dielectric strength** | | 3,000 VAC, 50/60 Hz for 1 min between coil and contacts<br>750 VAC, 50/60 Hz for 1 min between contacts of same polarity |
| **Impulse withstand voltage** | | G6B 6KV 1.2*50μsec |
| **Insulation Distance** | **Creepage (Typ)** | 4.5 mm |
| | **Clearance (Typ)** | 4.5 mm |
| **Tracking Resistance CTI)** | | 100 V |
| **Vibration resistance** | | Destruction: 10 to 55 to 10 Hz, 0.75-mm single amplitude (1.5-mm double amplitude)<br>Malfunction: 10 to 55 to 10 Hz, 0.75-mm single amplitude (1.5-mm double amplitude) |
| **Shock resistance** | | Destruction: 1,000 $m/s^2$<br>Malfunction: Energized: 100 $m/s^2$ |
| **Endurance** | | Mechanical: 20,000,000 operations min. (at 18,000 operations/hr)<br>Electrical: 70,000 operations min. (5 A at 250 VAC/30 VDC, resistive load)<br>300,000 operations min. (2 A at 250 VAC/30 VDC, resistive load) |
| **Ambient temperature** | | Operating: -25°C to 70°C (with no icing) |
| **Ambient humidity** | | Operating: 5% to 85% |
| **Weight** | | Approx. 3 g |

# Engineering Data

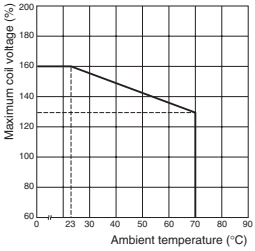
### Maximum Switching Power




### Endurance

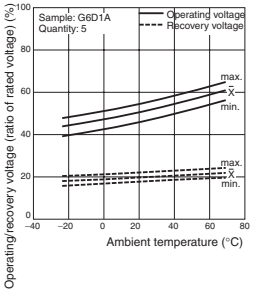



### Ambient Temperature vs. Maximum Coil Voltage

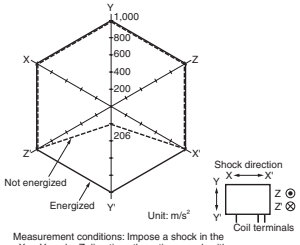



**Note:** The maximum coil voltage is the maximum voltage that can be applied to the relay coil

### Ambient Temperature vs. Operating/Recovery Voltage G6D-1A-ASI




### Malfunctioning Shock G6D-1A-ASI




Measurement conditions: Impose a shock in the ±X, ±Y, and ±Z directions three times each with the Relay energized to check the shock values that cause the Relay to malfunction.

## ■ Approved Standards

The rated values approved by each of the safety standards may be different from the performance characteristics individually defined in this catalogue.

### UL Approval (File No. E41515) UL508

| Model | Number of poles | Coil ratings | Contact Ratings | Number of test operations |
|---|---|---|---|---|
| G6D-1A-ASI | 1 | 5 to 24 VDC | 5 A, 250 VAC (General Use) | 6,000 |
| | | | 5 A, 30 VDC | |

### CSA Approval (File No. LR31928) C22.2 No. 14

| Model | Number of poles | Coil ratings | Contact Ratings | Number of test operations |
|---|---|---|---|---|
| G6D-1A-ASI | 1 | 5 to 24 VDC | 5 A, 250 VAC (General Use) | 6,000 |
| | | | 5 A, 30 VDC (Resistive) | |

### EN/TÜV Approval (Registration No. R50029064/EN61810-1)

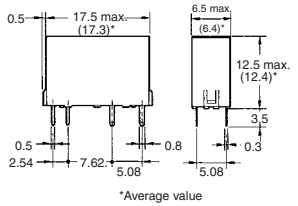
| Model | Number of poles | Coil ratings | Contact Ratings | Number of test operations |
|---|---|---|---|---|
| G6D-1A-ASI | 1 | 5, 12, 24 VDC | 5 A, 250 VAC (cosφ = 1.0) | 70,000 |
| | | | 5 A, 30 VDC (0 ms) | |

# Dimensions

**Note: 1.** All units are in millimetres unless otherwise indicated.

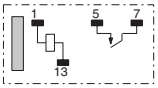
**2.** Orientation marks are indicated as follows:

**G6D-1A-ASI**



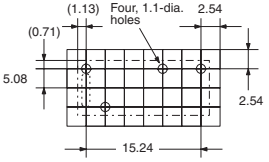

*Average value

**Terminal Arrangement/ Internal Connections (Bottom View)**

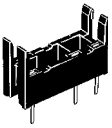


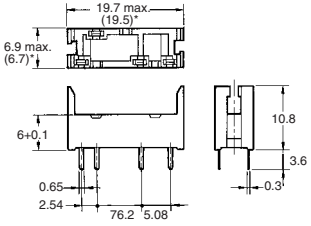

**Mounting Holes (Bottom View)**

Tolerance: ±0.1




**P6D-04P Socket**

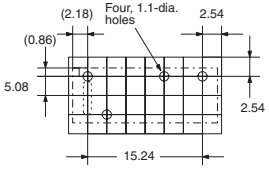





*Average value

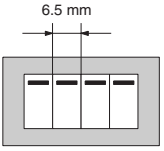
**Mounting Holes (Bottom View)**

Tolerance: ±0.1

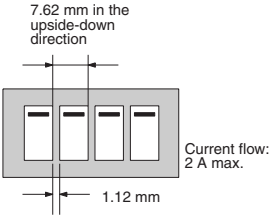



# Precautions

More than two relays can be closely mounted right side up as shown in the following illustration.

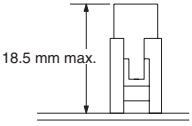



More than two relays can be closely mounted upside down as shown in the following illustration.




**Note:** The space between each relay required for heat radiation may vary with operating conditions. Contact your OMRON representative for details

**SOCKET MOUNTING HEIGHT**




When mounting the relay, insert it into the socket as vertically as possible so that the relay terminals contact securely with the contact pins on the socket.

The P6D is flux-resistive. Do not wash the P6D with water.

Dismount the relay from the socket before soldering the socket to a PCB.

**ALL DIMENSIONS SHOWN ARE IN MILLIMETRES.**
To convert millimetres into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

CAT. No. K127-E2-02-X

## Slim, Miniature Relay with 1-pole 5-A Switching Capability

- Slim 5-mm width and miniature size. (20.3 x 5.08 x 12.5 mm max.)
- Ideal for high-density mounting.
- Delivers high switching performance (5 A at 250 VAC/30 VDC) and enables various loads all in a slim, miniature size.
- Highly sensitive coil type (120 mW) also available.
- Satisfies EN 61131-2 (PLC) and EN 61010 (measuring instrument/control equipment) reinforced insulation requirement.
- Special socket also added to the series.

RoHS Compliant


**Applications:**
PLCs, I/O modules, I/O ports, Timers, Temperature Controllers, and Control Boards.

## Ordering Information

| Classification | Contact form | Enclosure ratings | Model |
|---|---|---|---|
| Standard | SPST-NO | Fully sealed | G6DS-1A |
| High-sensitivity | | | G6DS-1A-H |

**Note:** When ordering, add the rated coil voltage to the model number.
Example: G6DS-1A 12 VDC
Rated coil voltage

**G6DS - □ □ - □ □ VDC**
**1 2 3 4**

1. **Number of Poles**
   1: 1 pole
2. **Contact Form**
   A: SPST-NO
3. **Classification**
   None: Standard
   H: High-sensitivity
4. **Rated Coil Voltage**
   5, 12, 24 VDC

## ■ Accessories (Order Separately)

| | |
|---|---|
| Connecting Socket | P6DS-04P |
| Relay Pullout Tool | R99-01 for G6DS |

## ■ Coil Ratings

| Item | Standard | | | High-sensitivity | | |
|---|---|---|---|---|---|---|
| Rated voltage | 5 VDC | 12 VDC | 24 VDC | 5 VDC | 12 VDC | 24 VDC |
| Rated current | 36 mA | 15 mA | 7.5 mA | 24 mA | 10 mA | 5 mA |
| Coil resistance | 139Ω | 800Ω | 3,200Ω | 208Ω | 1,200Ω | 4,800Ω |
| Must operate voltage | 70% max. of rated voltage | | | | | |
| Must release voltage | 5% min. of rated voltage | | | | | |
| Max. voltage | 160% of rated voltage (at 23°C) | | | | | |
| Power consumption | Approx. 180 mW | | | Approx. 120 mW | | |

**Note: 1.** The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.

**2.** Operating characteristics are measured at a coil temperature of 23°C.

**3.** "Max. voltage" refers to the maximum voltage that can be applied to the relay coil. It is not the maximum voltage that can be applied continuously.

## ■ Contact Ratings

| Item | Resistive load (cosφ=1) | Inductive load (cosφ=0.4, L/R=7 ms) |
|---|---|---|
| Rated load | 5 A at 250 VAC, 5 A at 30 VDC | 2 A at 250 VAC, 2 A at 30 VDC |
| Contact Material | AgNi | |
| Rated carry current | 5 A | |
| Max. switching voltage | 250 VAC, 30 VDC | |
| Max. switching current | 5 A | |
| Max. switching power | 1,250 VA, 150 W | |
| Failure rate (reference value) (See note.) | 5 mA at 24 VDC | |

**Note:** P level: λ60 = 0.1 x $10^{-6}$ operation

## ■ Characteristics

| | |
|---|---|
| Contact resistance (See note 1.) | 100 mΩ max. |
| Operate time | 10 ms max. |
| Release time | 5 ms max. |
| Insulation resistance (See note 2.) | 1,000 MΩ min. (at 500 VDC) |
| Dielectric strength | 3,000 VAC, 50/60 Hz for 1 min between coil and contacts<br>750 VAC, 50/60 Hz for 1 min between contacts of same polarity |
| Impulse withstand voltage | 6,000 V (1.2 x 50 μs) between coil and contacts |
| Insulation Distance | Creepage (Typ) 6.4mm |
| | Clearance (Typ) 5.2mm |
| Tracking Resistance (CTI) | 175V |
| Vibration resistance | Destruction: 10 to 55 to 10 Hz, 0.75-mm single amplitude (1.5-mm double amplitude)<br>Malfunction: 10 to 55 to 10 Hz, 0.75-mm single amplitude (1.5-mm double amplitude) |
| Shock resistance | Destruction: 1,000 m/s²<br>Malfunction: 150 m/s² (standard type). 130 m/s² (high-sensitivity type) |
| Endurance | Mechanical: 20,000,000 operations min. (at 18,000 operations/hr)<br>Electrical: 100,000 operations min. (at 1,800 operations/hr) for standard type.<br>80,000 operations min. (at 1,800 operations/hr) for high-sensitivity type. (at 23ΩC) |
| Ambient temperature | Operating: -40°C to 85°C (with no icing) |
| Ambient humidity | Operating: 5% to 85% |
| Weight | Approx. 2.3 g |

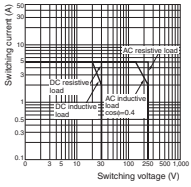
**Note:** The data shown above are initial values.

**1.** The contact resistance is possible with 1 A applied at 5 VDC using a fall-of-potential method.

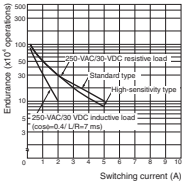
**2.** The insulation resistance is possible between coil and contacts and between contacts of the same polarity at 500 VDC.

## ■ Engineering Data

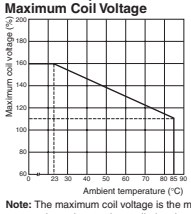
**Maximum Switching Power**




**Endurance**

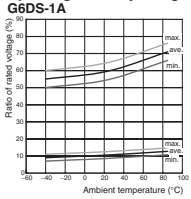



**Ambient Temperature vs. Maximum Coil Voltage**

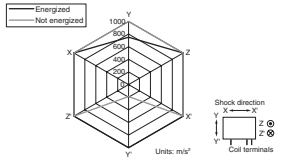



**Note:** The maximum coil voltage is the maximum voltage that can be applied to the relay coil.

**Ambient Temperature vs. Operating/Recovery Voltage G6DS-1A**




**Malfunctioning Shock G6DS-1A**




Measurement conditions: Impose a shock in the ±X, ±Y, and ±Z directions three times each with the Relay energized to check the shock values that cause the Relay to malfunction.

## ■ Approved Standards

• The rated values approved by each of the safety standards may be different from the performance characteristics individually defined in this catalog.

### UL 508 (File No. E41515)/CSA C22.2 No.14 (File No. LR31928)

| Model | Contact form | Coil ratings | Contact ratings |
|---|---|---|---|
| G6DS-1A | SPST-NO | 5 to 24 VDC | 5 A, 250 VAC (Resistive & General Use) |
| | | | 5 A, 30 VDC (Resistive & General Use) |
| G6DS-1A-H | | | 5 A, 250 VAC (Resistive & General Use) |
| | | | 5 A, 30 VDC (Resistive & General Use) |

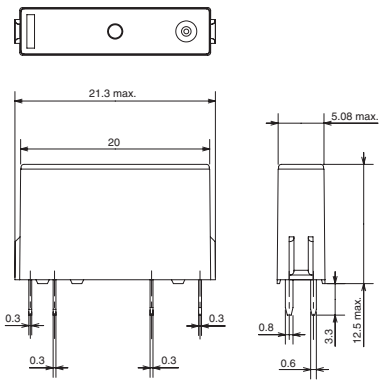
### VDE (EN61810-1) (License No. B161)

| Model | Contact form | Coil ratings | Contact ratings |
|---|---|---|---|
| G6DS-1A | SPST-NO | 5, 12, 24 VDC | 5 A, 250 VAC (cosφ=1.0) |
| | | | 5 A, 30 VDC (0 ms) |
| G6DS-1A-H | | | 5 A, 250 VAC (cosφ=1.0) |
| | | | 5 A, 30 VDC (0 ms) |

# Dimensions

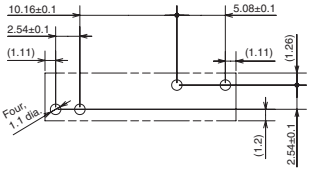
**Note:** All units are in millimetres unless otherwise indicated.

**G6DS-1A/1A-H**

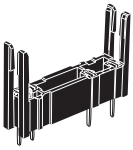



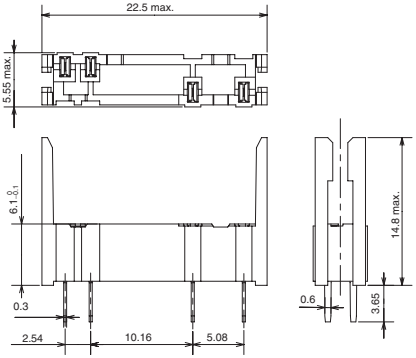

**Terminal Arrangement/ Internal Connections (Bottom View)**

**Mounting Holes (Bottom View)**

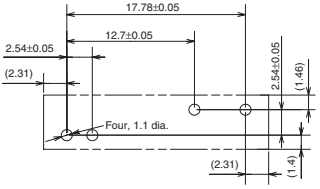



**Connecting Socket**
**P6DS-04P**






**Mounting Holes (Bottom View)**




## Relay Pullout Tool

**R99-01 for G6DS**

A convenient removal pullout tool (R99-01 for G6DS) is available to pull Relays out of special sockets mounted closely side by side.

# Packing

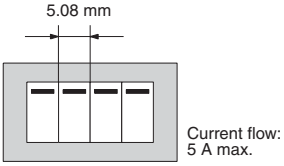
**Note:** All units are in millimetres unless otherwise indicated.

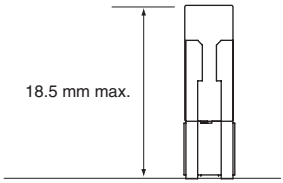
## ■ Stick packing

1 stick = 25 Relays
1 packing case = 20 sticks (500 Relays)
1 carton box = 6 packing cases (3,000 Relays)

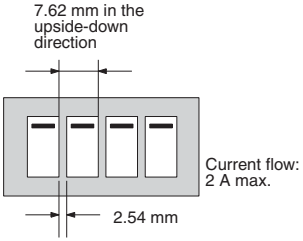
# Precautions

More than two Relays can be closely mounted right side up as shown in the following illustration. (This applies to the P6DS as well.)




More than two Relays can be closely mounted upside down as shown in the following illustration.




**Note:** The space between Relays required for heat radiation may vary with operating conditions. Contact your OMRON representative for details.

When mounting the Relay, insert it into the Socket as vertically as possible so that the Relay terminals contact securely with the contact pins on the Socket.

The P6DS is flux-resistive. Do not wash the P6DS with water. Dismount the Relay from the Socket before soldering the Socket to a PCB.

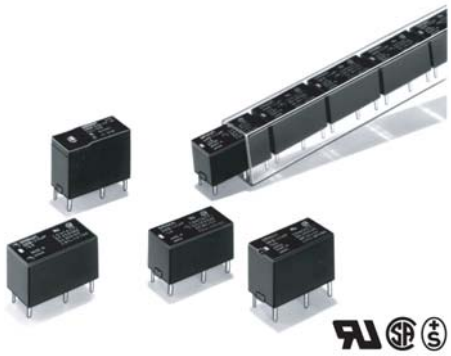
**Disclaimer:**
All technical performance data applies to the product as such; specific conditions of individual applications are not considered. Always check the suitability of the product for your intended purpose. OMRON does not assume any responsibility or liability for noncompliance herein, and we recommend prior technical clarification for applications where requirements, loading, or ambient conditions differ from those applying to general electric applications. Any responsibility for the application of the product remains with the customer alone. THIS COMPONENT CAN NOT BE USED FOR AUTOMOTIVE APPLICATIONS.

**ALL DIMENSIONS SHOWN ARE IN MILLIMETRES.**
To convert millimetres into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

CAT. No. K130-E2-02-X

## Sub-miniature Relay that Switches up to 5 A

- ROHS compliant.
- Sub-miniature: 20 x 10 x 10 mm (L x W x H).
- Low power consumption: 200 mW.
- Unique moving loop armature reduces relay size, magnetic interference, and contact bounce time.
- Single- and double-winding latching types also available.



# Ordering Information

| Classification | Contact form | Straight PCB | Self-clinching PCB |
|---|---|---|---|
| Single-side stable | SPST-NO | G6B-1114P-US | G6B-1114C-US |
| | SPST-NO+SPST-NC | G6B-2114P-US | G6B-2114C-US |
| | DPST-NO | G6B-2214P-US | G6B-2214C-US |
| | DPST-NC | G6B-2014P-US | G6B-2014C-US |
| Single-winding latching | SPST-NO | G6BU-1114P-US | G6BU-1114C-US |
| Double-winding latching | SPST-NO | G6BK-1114P-US | G6BK-1114C-US |
| High-capacity single-side stable | SPST-NO | G6B-1174P-US | G6B-1174C-US |

**Note:** When ordering, add the rated coil voltage to the model number.
Example: G6B-1114P-US 12 VDC
Rated coil voltage

**Model Number Legend**

**G6B □-□ □ □ □ □ - □ □ VDC**
**1 2 3 4 5 6 7**

**1. Relay Function**
None: Single-side stable
U: Single-winding latching
K: Double-winding latching

**2. Contact Form**
21: SPST-NO + SPST-NC
22: DPST-NO
20: DPST-NC
11: SPST-NO

**3. Contact Type**
1: Standard
7: High-capacity

**4. Enclosure Ratings**
4: Fully sealed

**5. Terminals**
P: Straight PCB
C: Self-clinching PCB

**6. Approved Standards**
US: UL/CSA certified

**7. Rated Coil Voltage**
5, 6, 12, 24 VDC

## ■ Accessories (Order Separately)

**Back Connecting Sockets**

| Applicable relay | Back connecting socket* |
|---|---|
| G6B(U)-1114P-US | P6B-04P |
| G6BK-1114P-US | P6B-06P |
| G6B-2114P-US | P6B-26P |
| G6B-1174P-US | P6B-04P |

*Not applicable to the self-clinching type.

| | |
|---|---|
| **Removal Tool** | P6B-Y1 |
| **Hold-down Clips** | P6B-C2 |

# Specifications

## ■ Coil Ratings

**Single-side Stable Type**

| Item | | SPST-NO | | | | | SPST-NO + SPST-NC, DPST-NO, DPST-NC | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Rated voltage | | 3 VDC | 5 VDC | 6 VDC | 12 VDC | 24 VDC | 3 VDC | 5 VDC | 6 VDC | 12 VDC | 24 VDC |
| Rated current | | 67 mA | 40 mA | 33.3 mA | 16.7 mA | 8.3 mA | 100 mA | 60 mA | 50 mA | 25 v | 12.5 mA |
| Coil resistance | | 45 Ω | 125 Ω | 180 Ω | 720 Ω | 2,880 Ω | 30 Ω | 83.3 Ω | 120 Ω | 480 Ω | 1,920 Ω |
| Coil inductance (H) (ref. value) | Armature OFF | 0.20 | 0.28 | 0.31 | 1.2 | 4.9 | – | – | – | – | – |
| | Armature ON | 0.18 | 0.26 | 0.28 | 1.1 | 4.1 | – | – | – | – | – |
| Must operate voltage | | 70% max. of rated voltage | | | | | 80% max. of rated voltage | | | | |
| Must release voltage | | 10% min. of rated voltage | | | | | | | | | |
| Max. voltage | | 160% of rated voltage (at 23°C) | | | | | 140% of rated voltage (at 23°C) | | | | |
| Power consumption | | Approx. 200 mW | | | | | Approx. 300 mW | | | | |

**Single-winding Latching Type**

| | | | | | | |
|---|---|---|---|---|---|---|
| Rated voltage | | 3 VDC | 5 VDC | 6 VDC | 12 VDC | 24 VDC |
| Rated current | | 67 mA | 40 mA | 33.3 mA | 16.7 mA | 8.3 mA |
| Coil resistance | | 45 Ω | 125 Ω | 180 Ω | 720 Ω | 2,880 Ω |
| Coil inductance (H) (ref. value) | Armature OFF | 0.20 | 0.28 | 0.31 | 1.2 | 4.9 |
| | Armature ON | 0.18 | 0.26 | 0.28 | 1.1 | 4.1 |
| Must operate voltage | | 70% max. of rated voltage | | | | |
| Must release voltage | | 70% min. of rated voltage | | | | |
| Max. voltage | | 160% of rated voltage (at 23°C) | | | | |
| Power consumption | | Approx. 200 mW | | | | |

**Double-winding Latching Type**

| Rated voltage | | | 3 VDC | 5 VDC | 6 VDC | 12 VDC | 24 VDC |
|---|---|---|---|---|---|---|---|
| Set coil | Rated current | | 93.2 mA | 56 mA | 46.8 mA | 23.3 mA | 11.7 mA |
| | Coil resistance | | 32.2 Ω | 89.2 Ω | 128.5 Ω | 515 Ω | 2,060 Ω |
| | Coil inductance (H) (ref. value) | Armature OFF | 0.11 | 0.15 | 0.18 | 0.52 | 1.2 |
| | | Armature ON | 0.11 | 0.15 | 0.18 | 0.52 | 1.2 |
| Reset coil | Rated current | | 93.2 mA | 56 mA | 46.8 mA | 23.3 mA | 11.7 mA |
| | Coil resistance | | 32.2 Ω | 89.2 Ω | 128.5 Ω | 515 Ω | 2,060 Ω |
| | Coil inductance (H) (ref. value) | Armature OFF | 0.11 | 0.15 | 0.18 | 0.52 | 1.2 |
| | | Armature ON | 0.11 | 0.15 | 0.18 | 0.52 | 1.2 |
| Must set voltage | | | 70% max. of rated voltage | | | | |
| Must reset voltage | | | 70% min. of rated voltage | | | | |
| Max. voltage | | | 130% of rated voltage (at 23°C) | | | | |
| Power consumption | | | Set coil: Approx. 280 mW<br>Reset coil: Approx. 280 mW | | | | |

**Note: 1.** The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.

**2.** Operating characteristics are measured at a coil temperature of 23°C.

## ■ Contact Ratings

| Item | SPST-NO | | SPST-NO + SPST-NC, DPST-NO, DPST-NC | |
|---|---|---|---|---|
| **Load** | Resistive load ($\cos\varphi$ = 1) | Inductive load ($\cos\varphi$ = 0.4; L/R = 7 ms) | Resistive load ($\cos\varphi$ = 1) | Inductive load ($\cos\varphi$ = 0.4; L/R = 7 ms) |
| **Rated load** | 5 A at 250 VAC; 5 A at 30 VDC | 2 A at 250 VAC; 2 A at 30 VDC | 5 A at 250 VAC; 5 A at 30 VDC | 1.5 A at 250 VAC; 1.5 A at 30 VDC |
| **Contact material** | AgNi (FD version = AgSnIn) | | | |
| **Rated carry current** | 5 A | | | |
| **Max. switching voltage** | 380 VAC, 125 VDC | | | |
| **Max. switching current** | 5 A | | | |
| **Max. switching power** | 1,250 VA, 150 W | 500 VA, 60 W | 1,250 VA, 150 W | 375 VA, 80 W |
| **Failure rate (reference value)** | 10 mA at 5 VDC | | | |

| Item | SPST-NO (High-capacity) | |
|---|---|---|
| **Load** | Resistive load ($\cos\varphi$ = 1) | Inductive load ($\cos\varphi$ = 0.4; L/R = 7 ms) |
| **Rated load** | 8 A at 250 VAC; 5 A at 30 VDC | 2 A at 250 VAC; 2 A at 30 VDC |
| **Contact material** | AgNi (FD version = AgSnIn) | |
| **Rated carry current** | 8 A | |
| **Max. switching voltage** | 380 VAC, 125 VDC | |
| **Max. switching current** | 8 A | |
| **Max. switching power** | 2,000 VA, 150 W | |
| **Failure rate (reference value)** | 10 mA at 5 VDC | |

**Note:** P level: $\lambda_{60} = 0.1 \times 10^{-6}$/operation

## ■ Characteristics

| Item | | SPST-NO | SPST-NO + SPST-NC, DPST-NO, DPST-NC |
|---|---|---|---|
| **Contact resistance** | | 30 mΩ max. | |
| **Operate (set) time** | | 10 ms max. (mean value: 1-pole approx. 3 ms, 2-pole approx. 4 ms) | |
| **Release (reset) time** | | Single-side stable types: 10 ms max. (mean value: 1-pole approx. 1 ms, 2-pole approx. 2 ms)<br>Latching types: 10 ms max. (mean value: approx. 3 ms) | |
| **Min. set/reset signal width** | | Latching type: 15 ms min. (at 23˚C) | |
| **Max. operating frequency** | | Mechanical: 18,000 operations/hr<br>Electrical: 1,800 operations/hr (under rated load) | |
| **Insulation resistance** | | 1,000 MΩ min. (at 500 VDC, at 250 VDC between set coil and reset coil) | |
| **Dielectric strength** | | 3,000 VAC (Latching types: 2,000 VAC), 50/60 Hz for 1 min between coil and contacts<br>1,000 VAC, 50/60 Hz for 1 min between contacts of same polarity<br>250 VAC, 50/60 Hz for 1 min between set and reset coils<br>2,000 VAC, 50/60 Hz for 1 min between contacts of different polarity | |
| **Impulse withstand voltage** | | 6,000V (1.2 x 50 μs) between coil and contacts | |
| **Insulation Distance** | **Creepage (Typ)** | 5.0 mm | 3.2 mm |
| | **Clearance (Typ)** | 4.1 mm | 2.7 mm |
| **Tracking Resistance CTI)** | | 100 V | |
| **Vibration resistance** | | Destruction: 10 to 55 to 10 Hz, 0.75mm single amplitude (1.5mm double amplitude)<br>Malfunction: 10 to 55 to 10 Hz, 0.75mm single amplitude (1.5mm double amplitude) | |
| **Shock resistance** | | Destruction: 1,000 $m/s^2$<br>Malfunction: Single-side stable: 100 $m/s^2$; Latching: 300 $m/s^2$ | |
| **Endurance** | | Mechanical: 50,000,000 operations min. (at 18,000 operations/hr)<br>Electrical: 100,000 operation min. (at 1,800 operations/hr) | |
| **Ambient temperature** | | Operating: -25°C to 70°C (with no icing) | |
| **Ambient humidity** | | Operating: 5% to 85% | |
| **Weight** | | Double-winding latching: Approx. 3.7 g<br>High-capacity: Approx. 4.6 g<br>Double pole: Approx. 4.5 g<br>Other: Approx. 3.5 g | |

**Note:** The data shown above are initial values.

## ■ Approved Standards

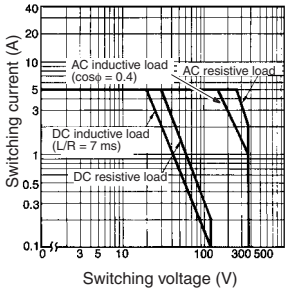
**UL508 (File No. E41643)/CSA C22.2 No.14 (File No. LR31928)**
**EN 61810-1 (VDE Reg No. 5361)/Connector EN 61984 (VDE Reg No. 125603)**

| Model | Contact form | Coil ratings | Contact ratings |
|---|---|---|---|
| G6B-1114P-US<br>G6B-1114C-US<br>G6BU-1114P-US<br>G6BU-1114C-US<br>G6BK-1114P-US<br>G6BK-1114C-US | SPST-NO | 3 to 24 VDC | 5 A, 250 VAC (general use)<br>5 A, 30 VDC (resistive load) |
| G6B-1174P-US<br>G6B-1174C-US | | | 8 A, 250 VAC (general use)<br>8 A, 30 VDC (resistive load) |
| G6B-2114P-US<br>G6B-2114C-US<br>G6B-2214P-US<br>G6B-2214C-US<br>G6B-2014P-US<br>G6B-2014C-US | SPST-NO + SPST-NC<br>DPST-NO<br>DPST-NC | | 5 A, 250 VAC (general use)<br>5 A, 30 VDC (resistive load) |

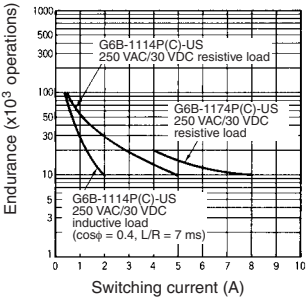
# Engineering Data

**G6B-1114P-US**

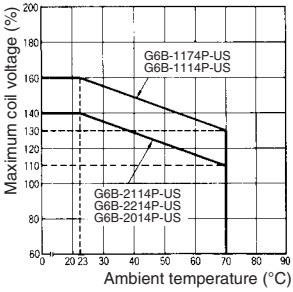
**Maximum Switching Power**




**Endurance**



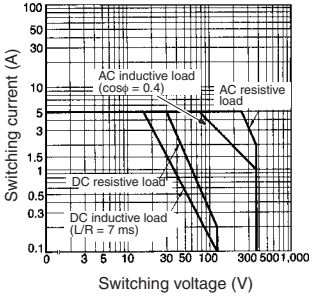

**Ambient Temperature vs. Maximum Coil Voltage**



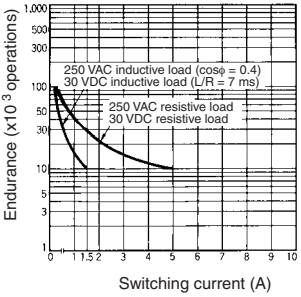

**Note:** The maximum coil voltage refers to the maximum value in a varying range of operating power voltage, not a continuous voltage.

**G6B-2114P-US, G6B-2214P-US**
**G6B-2014P-US**

**Maximum Switching Power**



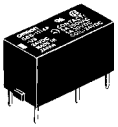

**Endurance**

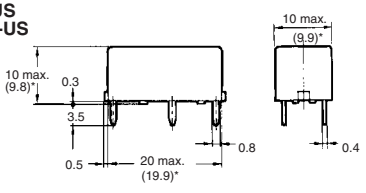


# Dimensions

**Note: 1.** All units are in millimetres unless otherwise indicated.
**2.** Orientation marks are indicated as follows:

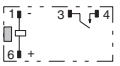
### G6B-1114P-US
### G6BU-1114P-US



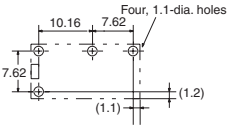



*Average value

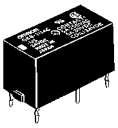
**Terminal Arrangement/Internal Connections (Bottom View)**
**G6B-1114P, -1114C**

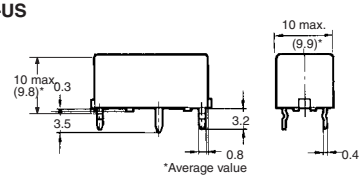



**Mounting Holes (Bottom View)**
**G6B-1114P, -1114C**
**G6BU-1114P, -1114C**



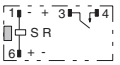

### G6B-1114C-US
### G6BU-1114C-US



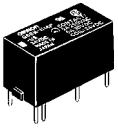


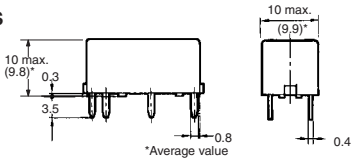

*Average value

**Terminal Arrangement/Internal Connections (Bottom View)**
**G6BU-1114P, -1114C**



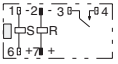

### G6BK-1114P-US



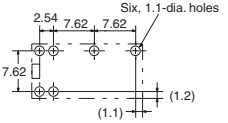



*Average value

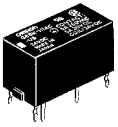
**Terminal Arrangement/Internal Connections (Bottom View)**
**G6BK-1114P, -1114C**

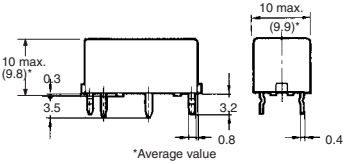



**Mounting Holes (Bottom View)**
**G6BK-1114P, -1114C**



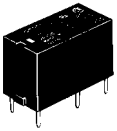

### G6BK-1114C-US

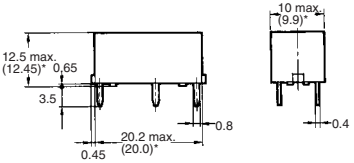





*Average value

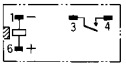
### G6B-1174P-US



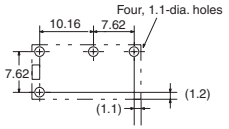



*Average value

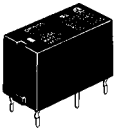
**Terminal Arrangement/Internal Connections (Bottom View)**
**G6B-1174P, -1174C**

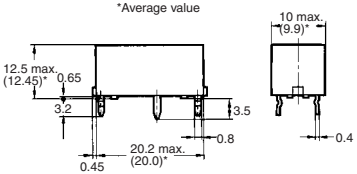



**Mounting Holes (Bottom View)**



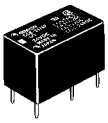

### G6B-1174C-US

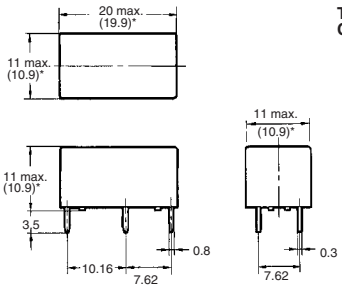





*Average value

**G6B-2114P-US**
**G6B-2214P-US**
**G6B-2014P-US**

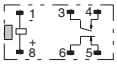




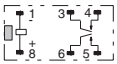

*Average value

**Terminal Arrangement/Internal Connections (Bottom View)**

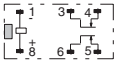
**G6B-2114P-US**



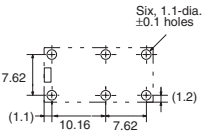

**G6B-2214P-US**



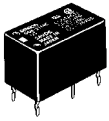

**G6B-2014P-US**

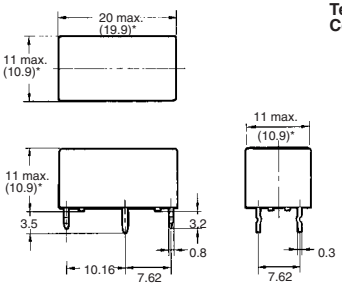



**Mounting Holes (Bottom View)**
Tolerance: ±0.1




**G6B-2114C-US**
**G6B-2214C-US**
**G6B-2014C-US**

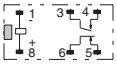




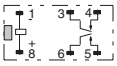

*Average value

**Terminal Arrangement/Internal Connections (Bottom View)**

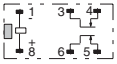
**G6B-2114C-US**



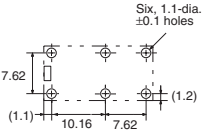

**G6B-2214C-US**



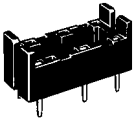

**G6B-2014C-US**

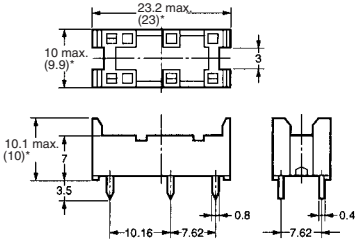



**Mounting Holes (Bottom View)**
Tolerance: ±0.1



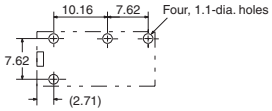

**Back Connecting Socket**
**P6B-04P**



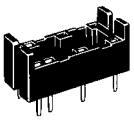


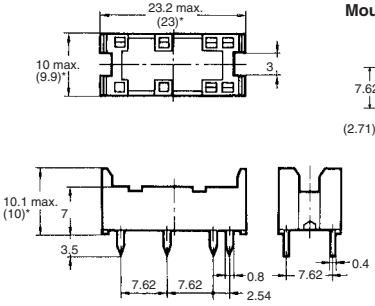

*Average value

**Mounting Holes (Bottom View)**

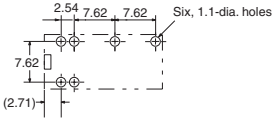


**P6B-06P**



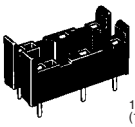


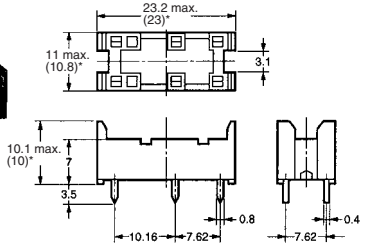

**Mounting Holes (Bottom View)**



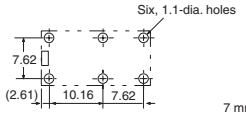

*Average value

**P6B-26P**



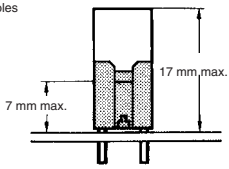



**Mounting Holes (Bottom View)**




**Note:** Rated current of socket is 5 A max.

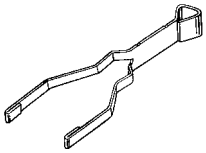
**Mounting Height of Relay with Connecting Socket**



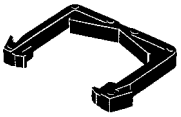

**Note:** Height of G6B-1174P-US is 19.5 mm max.

*Average value

**Removal Tool**
**P6B-Y1**



**Hold-down Clips**
**P6B-C2**

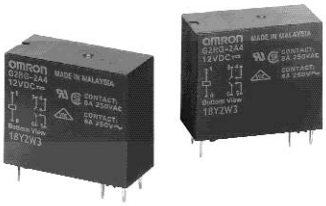


**Note:** P6B-C2 Hold-down Clips cannot be used for G6B-1174P-US.

**ALL DIMENSIONS SHOWN ARE IN MILLIMETRES.**
To convert millimetres into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

## Power Relay with 1.5mm Contact Gap

- ROHS compliant.
- Clearance between contact terminals of the same polarity: 1.5 mm min.
- Meets the requirements of European UPS standards. Note:UPS: Uninterruptible power systems.
- Conforms to EN 61810-1, UL508, CSA22.2.
- Meets VDE0700 requirements for household products according to VDE0110.
- Tracking resistance: CTI > 250 V.



# Ordering Information

| Contact form | Rated coil voltage | Model number |
|---|---|---|
| DPST-NO | 12 VDC<br>24 VDC | G2RG-2A4 |

**Model Number Legend**

**G2RG-□□□**
**1 2 3**

**1. Number of Poles**

2: 2 poles

**2. Contact Form**

A: N.O. contact

**3. Protective Structure**

4: Plastic sealing

# Specifications

## ■ Coil Ratings

| Rated voltage | Rated current | Coil resistance | Must-operate voltage | Must-release Voltage | Maximum allowable voltage | Power consumption |
|---|---|---|---|---|---|---|
| 12 VDC | 66.6 mA | 180 Ω | 80% max. | 10% min. | 140% (at 23°C) | Approx. 800 mW |
| 24 VDC | 33.3 mA | 720 Ω | | | | |

**Note:** **1.** The rated current and coil resistance are for a coil temperature of 23°C and have a tolerance of ±10%.
**2.** The operating characteristics given in the above table are for a coil temperature of 23°C.
**3.** The maximum allowable voltage is the maximum possible value of the voltage that can be applied to the relay coil.

## ■ Contact Ratings

| | |
|---|---|
| **Load** | Resistive load |
| **Contact mechanism** | Single |
| **Contact material** | Ag Alloy |
| **Rated load** | 8 A at 250 VAC, 8 A at 24 VDC |
| **Rated carry current** | 8 A |
| **Maximum switching voltage** | 380 VAC, 125 VDC |
| **Maximum switching current** | 8 A |
| **Failure rate (P level, reference value) (See note.)** | 5 VDC, 10 mA |

**Note:** This value is for a switching frequency of 120 operations/min

## ■ Characteristics

| | | |
|---|---|---|
| **Contact resistance (See note 1.)** | | 100 mΩ max. |
| **Operate time** | | 15ms max. |
| **Release time** | | 5 ms max. |
| **Insulation resistance** | | 1,000 MΩ min (at 500VDC) |
| **Max. switching frequency** | **Mechanical** | 18,000 operations/hr |
| | **Electical** | 18,000 operations/hr (under rated load) |
| **Insulation Resistance (See note 2)** | | 1,000 MΩ min (at 500VDC |
| **Impulse withstand voltage** | | 10KV 1*40µsec |
| **Insulation Distance** | **Creepage (Typ)** | 10.0 mm |
| | **Clearance (Typ)** | 9.3 mm |
| **Tracking Resistance CTI)** | | 250 V |
| **Dielectric Strength** | | 5,000 VAC, 50/60Hz for 1.min between coil and contacts<br>3,000 VAC, 50/60Hz for 1 min between contacts of different polarity<br>1,000 VAC, 50/50 Hz for 1 min between contacts of the same polarity |
| **Impulse withstand voltage** | | 10 kV (1.2 x 50µs) |
| **Vibration resistance** | **Destruction** | 10 to 55 to 10Hz, 0.75 mm single amplitude (1.5 mm double amplitude) |
| | **Malfunction** | 10 to 55 to 10Hz, 0.75 mm single amplitude (1.5 mm double amplitude) |
| **Shock resistance** | **Destruction** | 1,000 $m/s^2$ |
| | **Malfunction** | 200 $m/s^2$ when energised |
| **Endurance** | **Mechanical** | 1,000,000 operations min. (at 18,000 Operations/hr) |
| | **Electrical** | 10,000 operations min. (at 1,800 operations/hr under rated load) |
| **Ambient operating temperature** | | 40 to 70°C (with no icing or condensation) |
| **Ambient operating humidity** | | 5% to 85% |
| **Weight** | | Approx 17.2 g |

**Note 1.** The above values are initial values (at an ambient temperature of 23°C).
**2.** Measurement conditions: 5 VDC, 1 A voltage-drop method.
**3.** Measurement conditions: Measure with a 500 VDC megohmmeter at the same places as the dielectric strength.

## ■ Approved Standards

The approvedrated values for international standards are different to the individually specified characteristic values. Be sure to confirm that required standardsare satified before actual use.

### UK508 (File No. E41643)

| Model | Contact form | Coil rating | Contact rating |
|---|---|---|---|
| G2RG-2A4 | DPSP-NO | 12 to 24 VDC | 8 A, 250 VAC (general use) |

### CSA C22.2 No. 14 (File No. LR31928)

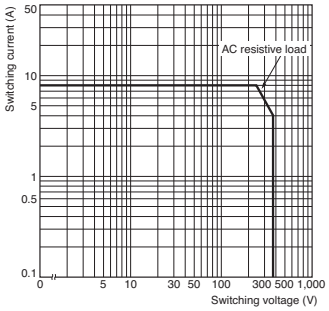
| Model | Contact form | Coil rating | Contact rating |
|---|---|---|---|
| G2RG-2A4 | DPSP-NO | 12 to 24 VDC | 8 A, 250 VAC (general use) |

### EN 61810-1 (VDE Reg No. 6166)

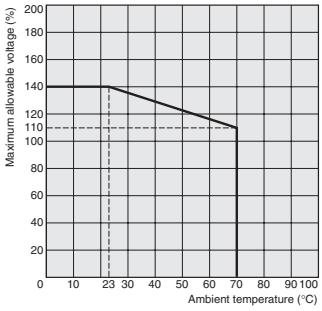
| Model | Contact form | Coil rating | Contact rating |
|---|---|---|---|
| G2RG-2A4 | DPSP-NO | 12, 24 VDC | 8 A, 250 VAC<br>cosφ 1 (general use) |

# Engineering Data

### Maximum Switching Capacity



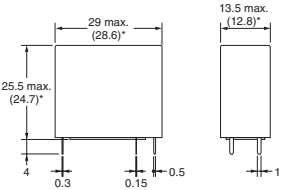

### Ambient Temperature vs Maximum Allowable Voltage




**Note:** The maximum allowable voltage is the maximum possible value of the voltage that can be applied to the relay coil.

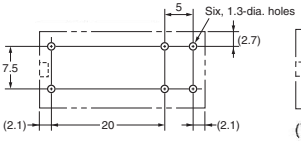
# Dimensions

**G2RG-2A4**




*Figures in parentheses indicate average values.

**PCB Mounting Holes (Bottom View)**




**Terminal Arrangement/ Internal Connections (Bottom View)**


(The coil has no polarity.)

# Precautions

## ■ Correct Use

**Differences with the G2R**

The G2RG-2A4 has the same terminal arrangement as the G2R-2A4 but the switch capacity and electrical endurance are different. Confirm that correct operation is possible in the actual operating conditions before using in applications.

**ALL DIMENSIONS SHOWN ARE IN MILLIMETRES.**
To convert millimetres into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

CAT. No. K142-E2-02-X

## Compact, High Isolation Relay

- ROHS compliant.
- Compact single pole relay with high isolation between coil and contacts.
- Up to 10 A 250 VAC switching on the NO contacts.
- Ensures a withstand impulse voltage of 8,000 V between the coil and contacts.
- Low coil power consumption (SPST-NO: 200 mW, SPDT: 400 mW.
- UL class F coil insulation.
- UL, CSA and EN approvals.
- Ideal for appliance and HVAC controls.
- Tracking resistance: CTI > 250.

# Ordering Information

**To Order:** Select the part number and add the desired coil voltage rating (e.g. G5Q-14-EU-DC12)

| Classification | | Enclosure rating | Part number |
|---|---|---|---|
| Single contact, Class F coil | SPST-NO | Vented | G5Q-1A-EU |
| | | Sealed | G5Q-1A4-EU |
| | SPDT | Vented | G5Q-1-EU |
| | | Sealed | G5Q-14-EU |

# Specifications

## ■ Coil Ratings

| Rated voltage (V) | | Rated current | Coil resistance (Ω) | Pick-up voltage | Drop-out Voltage | Maximum voltage | Power consumption (mW) |
|---|---|---|---|---|---|---|---|
| SPDT | DC5 | 80 | 63 | 75% of max. | 5% of max. | 190% at 23°C | 400 |
| | DC12 | 33.3 | 360 | | | | |
| | DC24 | 16.7 | 1440 | | | | |
| SPST-NO | DC5 | 40 | 125 | | | | 200 |
| | DC12 | 16.7 | 720 | | | | |
| | DC24 | 8.3 | 2880 | | | | |

**Note:** Rated current and coil resistance are measured at 23°C with a tolerance of 10%.

## ■ Contact Ratings

| Load | SPDT | SPDT-NO |
|---|---|---|
| **Rated load (resistive)** | 10A at 250 VAC (NO)<br>3A at 250 VAC (NO)<br>3A at 125 VAC (NO)<br>5A at 30 VDC (NO)<br>3A at 250 VDC (NC)<br>3A at 125 VDC (NC)<br>3A at 30 VDC (NC) | 10A at 250 VAC<br>3A at 250 VAC<br>3A at 125 VAC<br>5A at 30 VDC |
| **Contact material** | AgNi | |
| **Rated carry current** | AC 10 A – DC 5A (NO)/ AC 3A – DC 3A (NC) | |
| **Max. switching voltage** | 277 VAC, 30 VDC | |
| **Max. switching current** | AC: 10 A (NO)/3 A (NC)<br>DC: 5 A (NO)/3 A (NC) | |
| **Max. switching capacity** | 2500 VA, 150 W (NO)<br>750 VA, 90 W (NC) | |
| **Min. permissible load** | 10 mA at 5 VDC (P level: $\lambda 60 = 0.1 \times 10^{-6}$ operation) | |

## ■ Characteristics

| | | |
|---|---|---|
| **Contact resistance (see note 2)** | | 100 mΩ max. |
| **Operate time** | | 10 ms max. |
| **Release time** | | 5 ms max. |
| **Insulation resistance (see note 3)** | | 1,000 MΩ min. |
| **Dielectric strength** | | 4,000 VAC, 50/60 Hz for 1 min between coil and contacts<br>1000 VAC, 50/60 Hz for 1 min between contacts of same polarity |
| **Impulse withstand voltage** | | 8 kV (1.2 x 50 ms) between coil and contacts |
| **Insulation Distance** | **Creepage (Typ)** | 6.7 mm |
| | **Clearance (Typ)** | 5.8 mm |
| **Tracking Resistance (CTI)** | | 250 V |
| **Vibration resistance** | | Destruction: 10 to 55 Hz, 1.5-mm double amplitude for 2 hours<br>Malfunction: 10 to 55 Hz, 1.5-mm double amplitude for 5 minutes |
| **Shock resistance** | | Destruction: 1,000 $m/s^2$ (approx. 100G)<br>Malfunction: 100 $m/s^2$ (approximately 10G) |
| **Life expectancy (see note 4)** | | Mechanical 10,000,000 operations (18,000 operations per hour) |
| | | Electrical 200,000 operations: 3 A (NO)/3 A (NC) at 125 VAC resistive load<br>100,000 operations: 3 A (NO)/3 A (NC) at 250 VAC<br>5 A (NO)/3 A (NC) at 30 VDC resistive load<br>25,000 operations: 10A (NO) at 250 VAC (900 operations per hour:<br>1 sec ON/3 sec OFF) |
| | | Switching frequency: 1,800 operations per hour: 1 sec ON/1 SEC OFF |
| **Ambient temperature** | | Operating & storage: -40°C to 85°C (with no icing) |
| **Ambient humidity** | | Operating & storage: 5% to 85% |

**Note: 1.** The data shown above are initial value.
**2.** The contact resistance is possible with 1 A applied at 5 VDC using a fall-of-potential method.
**3.** The insulation resistance is possible between coil and contacts and between contacts of the same polarity at 500 VDC.
**4.** The electrical life data items shown are possible at 23°C.

## ■ UL508 (File No. E41515)
## CSA C22.2 No. 14 (File No. LR31928)

| Model | Coil ratings | Contact ratings | |
|---|---|---|---|
| | | NO contacts | NO contacts |
| G5Q-EU | 5-48 VDC | 10 A, 250 VAC resistive<br>10 A, 30 VDC resistive<br>4 A, 120 VAC resistive, 100,000 ops.<br>4 FLA, 4 LRA 120 VAC, definite purpose, 100,000 operations. | 3 A, 250 VAC resistive<br>3 A, 30 VDC resistive<br>4 LRA, 2 FLA, 120 VAC definite purpose, 100,000 operations. |

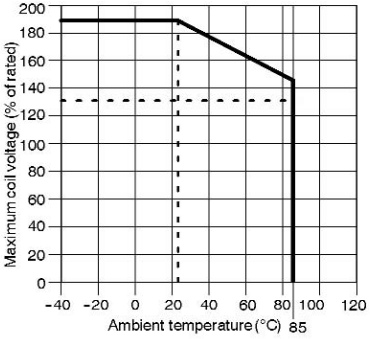
**Note:** Ratings for both NO contacts and NC contacts are given at 105°C (221°F).

## EN 61810-1 (VDE Reg. no 125314)

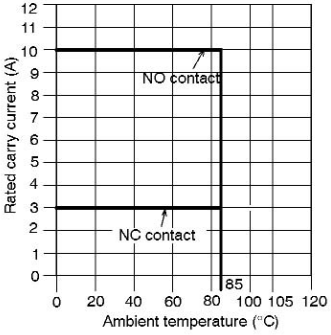
| Model | Coil ratings | Contact ratings |
|---|---|---|
| G5Q-EU | 5,12, 24 VDC | 10 A, 250 VAC<br>5 A, 30 VDC (NO)<br>3 A, 250 VDC (NC) |

# Engineering Data

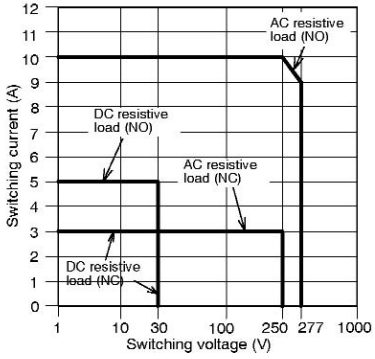
### ■ AMBIENT TEMPERATURE VS. MAXIMUM VOLTAGE




### ■ AMBIENT TEMPERATURE VS. RATED CARRY CURRENT



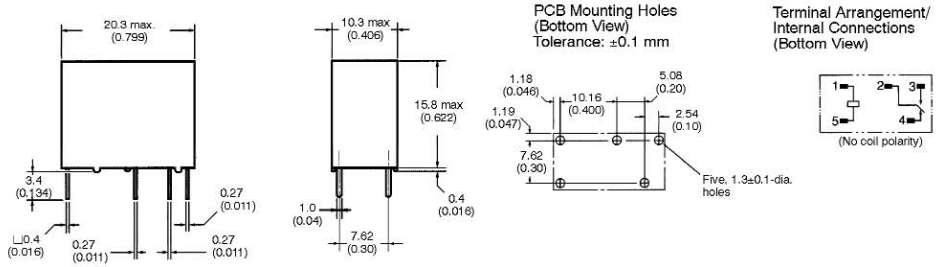

### ■ MAX. SWITCHING CAPACITY



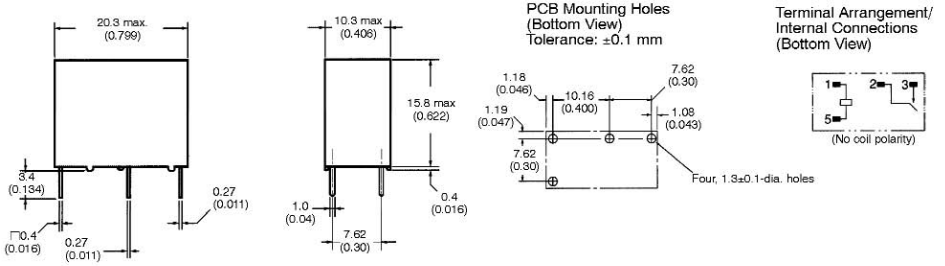
# Dimensions

**Note:** All units are in millimetres unless otherwise indicated.

## ■ G5Q-EU SPDT




## ■ SPST-NO




# Precautions

**CAUTION**

Do not touch the terminals of the relay or the charted part of the socket when power is supplied to the Relay. Otherwise, an electric shock may occur,

**ALL DIMENSIONS SHOWN ARE IN MILLIMETRES.**
To convert millimetres into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

CAT. No. J155-E2-01-X

## Heavy-duty Miniature Relay

- ROHS compliant.
- Incorporates environment-friendly, cadmium-free contacts.
- Variety of contact forms: SPDT or SPST-NO (continuous current rating: 8 A)
- Dielectric strength of 4 kV at a distance of 8 mm.
- Tracking resistance: CTI>250
- Conforms to EN 61810-1.

# Ordering Information

| Classification | Enclosure ratings | Contact material | Contact form | |
|---|---|---|---|---|
| | | | SPST-NO | SPDT |
| Standard | Fully sealed | AgNi (Au clad) | G6RN-1A | G6RN-1 |
| | | AgNi (Au clad) | G6RN-1A-AP4 | G6RN-1-AP4 |

**Note:** When ordering, add the rated coil voltage to the model number.
Example: G6RN-1A 24 VDC
Rated coil voltage

**Model Number Legend**

**G6RN-@@-@ @ VDC**
1 2 3 4

**1. Number of Poles**

1: 1 pole

**2. Contact Form**

None: SPDT
A: SPST-NO

**3. Contact Material**

None: AgNi + gold plating (0.35 μ)
AP4: AgNi + gold plating (4 μ)

**4. Rated Coil Voltage**

5, 12, 24, 48 VDC

# Specifications

## ■ Coil Ratings

| | | | | |
|---|---|---|---|---|
| **Rated voltage** | 5 VDC | 12 VDC | 24 VDC | 48 VDC |
| **Rated current** | 44 mA | 18.3 mA | 9.2 mA | 5.2 mA |
| **Coil resistance** | 114 Ω | 655 Ω | 2,620 Ω | 9,210 Ω |
| **Must operate voltage** | 70% max. of rated voltage | | | |
| **Must release voltage** | 10% min. of rated voltage | | | |
| **Max. voltage** | 110% of rated voltage at max. temperature (at 85˚C) | | | |
| **Power consumption** | Approx. 220 mW | | Approx. 250 mW | |

**Note: 1.** The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.
**2.** Operating characteristics are measured at a coil temperature of 23°C..

## ■ Contact Ratings

| | |
|---|---|
| **Load** | Resistance load (cosφ = 1) |
| **Rated load** | 8 A at 250 VAC: 5 A at 30 VDC |
| **Contact Material** | AgNi (Au clad) |
| **Rated carry current** | 8 A |
| **Max. switching voltage** | 250 VAC; 30 VDC, (400 VAC) (see note) |
| **Max. switching current** | AC 8 A; DC 5 A |
| **Max. switching power** | 2,000 VA; 150 W |
| **Failure rate (reference value)** | 5 VDC 10 mA (for gold plating 0.35 μ min.) |

**Note:** Electrical life expectancy is reduced.

## ■ Characteristics

| | | |
|---|---|---|
| **Operate time** | | Max. 15 ms (Typ. 6 ms) |
| **Release time** | | Max. 5 ms (Typ. 3 ms) |
| **Max. operating frequency** | | Mechanical: 36,000 operations/hr<br>Electrical: 360 operations/hr (under rated load) |
| **Insulation resistance** | | 1,000 MΩ min. (at 500 VDC) |
| **Impulse withstand voltage** | | 10KV 1.2*50μsec |
| **Insulation Distance** | **Creepage (Typ)** | 9.8 mm |
| | **Clearance (Typ)** | 8.1 mm |
| **Tracking Resistance CTI)** | | 250 V |
| **Dielectric strength** | | 4,000 VAC between coil and contacts<br>1,000 VAC between contacts |
| **Creepage/clearance** | | 8 mm min. between coil and contacts |
| **Vibration resistance** | | Malfunction: NO: 10 to 55 to 10 Hz, 0.75mm single amplitude (1.5mm double amplitude)<br>NC: 10 to 55 to 10 Hz, 0.4mm single amplitude (0.8mm double amplitude) |
| **Shock resistance** | | Destruction: 1,000 $m/s^2$<br>Malfuction: NO 100 $m/s^2$<br>NC 50 $m/s^2$ |
| **Endurance** | | Mechanical: 10,000,000 operations min.<br>Electrical: Approx. 50,000 operations |
| **Ambient temperature** | | Operating: -40°C to 85°C (with no icing) |
| **Ambient humidity** | | Operating: 5% to 85% |
| **Weight** | | Approx. 9 g |
| **Protection class** | | II according to VDE0106 Part 1 |
| **Insulation class** | | C/250, B/380 according to VDE0110 |

## ■ Approved Standards

## ■ EN 61810-1 (VDE Reg. no 0435 part no 201 & 102/Reg. no 6135)

| Contact form | Coil ratings | Contact rating |
|---|---|---|
| SPDT<br>SPST-NO | 5, 6, 12, 18, 24<br>36, 48 VDC | 8 A at 250 VAC (cosφ = 1) |

## ■ UL508 (File No. E41515)

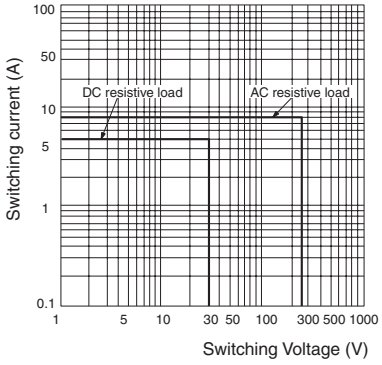
| Coil ratings | Contact ratings |
|---|---|
| 5 to 48 VDC | 10 A at 250 VAC (resistive)<br>5 A at 30 VDC (resistive)<br>8 A at 250 VAC (resistive) (ambient temperature: 85°C) |

## ■ CSA C22.2 (File No. LR31928-543)

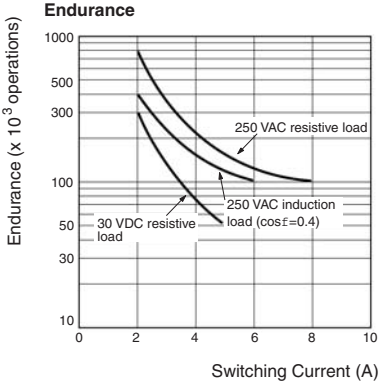
| Coil ratings | Contact ratings |
|---|---|
| 5 to 48 VDC | 10 A at 250 VAC (resistive)<br>5 A at 30 VDC (resistive)<br>8 A at 250 VAC (resistive) (ambient temperature: 85°C) |

# Engineering Data

**Maximum Switching Power**

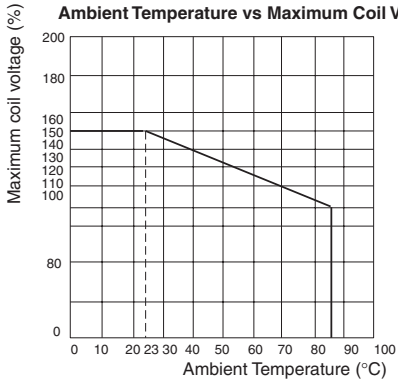



**Endurance**



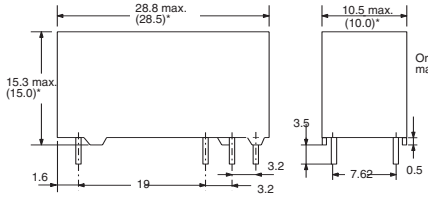
# Engineering Data

**Ambient Temperature vs Maximum Coil Voltage**



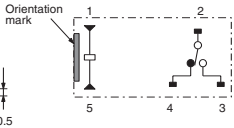

**Note:** The maximum coil voltage refers to the maximum value in a varying range of operating power voltage, not a continuous voltage.

**SPDT Type**



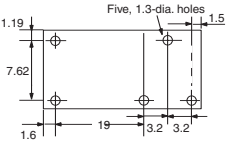

*Average value.

**Terminal Arrangement/ Internal Connections (Bottom View)**

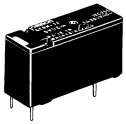


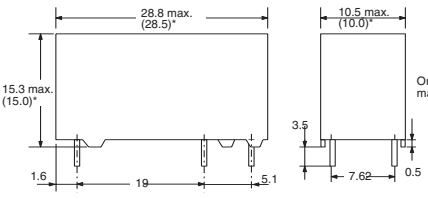

**Mounting Holes (Bottom View)**

Tolerance: ±0.1



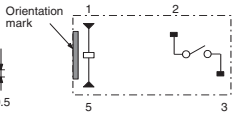

**SPST-NO Type**





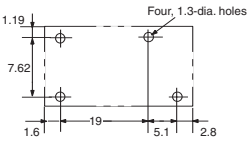

*Average value.

**Terminal Arrangement/ Internal Connections (Bottom View)**




**Mounting Holes (Bottom View)**

Tolerance: ±0.1




**ALL DIMENSIONS SHOWN ARE IN MILLIMETRES.**
To convert millimetres into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

## A Cubic, Single-pole 10-A Power Relay

- ROHS compliant.
- Sub-miniature 'sugar cube' relay with universal terminal footprint.
- Conforms to EN 61810-1, UL508, CSA22.2.
- Tracking resistance: CTI>250 (-VD type).
- UL class-F coil insulation model available (UL class-B coil insulation for standard model).
- High switching power: 10 A.
- Two types of seal available; flux protection and fully sealed.
- Withstands impulse of up to 4,500 V.
- 400-mW and 360-mW coil power consumption types available.
- Pre-soldered terminals.

## Ordering Information

| Enclosure Rating | Contact Form | Contact Material | |
|---|---|---|---|
| | | $AgSnO_2$ | AgSnIn |
| Flux protection | SPDT | G5LE-1<br>G5LE-1-VD<br>G5LE-1-CF | G5LE-1-ASI<br>G5LE-1-ASI-VD<br>G5LE-1-ASI-CF |
| | SPST-NO | G5LE-1A<br>G5LE-1A-VD<br>G5LE-1A-CF | G5LE-1A-ASI<br>G5LE-1A-ASI-VD<br>G5LE-1A-ASI-CF |
| Fully sealed | SPDT | G5LE-14<br>G5LE-14-VD<br>G5LE-14-CF | G5LE-14-ASI<br>G5LE-14-ASI-VD<br>G5LE-14-ASI-CF |
| | SPST-NO | G5LE-1A4<br>G5LE-1A4-VD<br>G5LE-1A4-CF | G5LE-1A4-ASI<br>G5LE-1A4-ASI-VD<br>G5LE-1A4-ASI-CF |

**Note:** When ordering, add the rated coil voltage to the model number.
Example: G5LE-1 12 VDC
Rated coil voltage

**Model Number Legend**

**G5LE -** □ □ □ - □ - □ - □ - □ □ **VDC**
1 2 3 4 5 6 7 8

**1. Number of Poles**

1: 1 pole

**2. Contact Form**

None: SPDT
A: SPST-NO

**3. Enclosure ratings**

None: Flux protection
4: Fully sealed

**4. Contact Material**

None: $AgSnO_2$
ASI: AgSnIn

**5. Insulation System**

None: Class B
CF: Class F (UL and CSA only)

**6. Coil Power Consumption/Coil Characteristic**

None: Approx. 400 mW
36: Approx. 360 mW

**7. Approved Standards**

None: UL, CSA, TÜV
VD: UL, CSA, TÜV and VDE
(Not applicable with "-CF.")

**8. Rated Coil Voltage**

5, 9, 12, 24, 48 VDC

# Specifications

## ■ Coil Ratings

**400-mW Type**

| | | | | | |
|---|---|---|---|---|---|
| **Rated voltage** | 5 VDC | 9 VDC | 12 VDC | 24 VDC | 48 VDC |
| **Rated current** | 79.4 mA | 45 mA | 33.3 mA | 16.7 mA | 8.33 mA |
| **Coil resistance** | 63 Ω | 200 Ω | 360 Ω | 1,440 Ω | 5,760 Ω |
| **Must operate voltage** | 75% max. of rated voltage | | | | |
| **Must release voltage** | 10% min. of rated voltage | | | | |
| **Max. voltage** | 130% of rated voltage at 85°C, 170% of rated voltage at 23°C | | | | |
| **Power consumption** | Approx. 400 mW | | | | |

**Note:** The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.

**360-mW Type**

| | | | | | |
|---|---|---|---|---|---|
| **Rated voltage** | 5 VDC | 9 VDC | 12 VDC | 24 VDC | 48 VDC |
| **Rated current** | 72 mA | 40 mA | 30 mA | 15 mA | 7.5 mA |
| **Coil resistance** | 70 Ω | 225 Ω | 400 Ω | 1,600 Ω | 6,400 Ω |
| **Must operate voltage** | 75% max. of rated voltage | | | | |
| **Must release voltage** | 10% min. of rated voltage | | | | |
| **Max. voltage** | 130% of rated voltage (at 85°C), 170% of rated voltage (at 23°C) | | | | |
| **Power consumption** | Approx. 360 mW | | | | |

**Note:** The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.

## ■ Contact Ratings

| | |
|---|---|
| **Load** | Resistive load ($\cos\varphi = 1$) |
| **Rated Load** | 10 A at 120 VAC; 8 A at 30 VDC; 10 A at 250 VAC (12 + 24 VDC) |
| **Contact material** | $AgSnO_2$ (AgSnIn optional) |
| **Rated Carry Current** | 10 A |
| **Max. switching voltage** | 250 VAC, 125 VDC (30 VDC when UL/CSA standard is applied) |
| **Max. switching current** | AC: 10 A; DC: 8 A |
| **Max. switching power** | 1,200 VA, 240 W |
| **Failure rate (reference value)** | 100 mA at 5 VDC |

## ■ Characteristics

| | | |
|---|---|---|
| **Contact resistance** | | 100 mΩ max. |
| **Operate time** | | 10 ms max. |
| **Release time** | | 5 ms max. |
| **Bounce Time** | | Operate: Approx. 0.6 ms<br>Release: Approx. 7.2 ms |
| **Max. switching frequency** | | Mechanical: 18,000 operations/hr<br>Electrical: 1,800 operations/hr at rated load |
| **Insulation resistance** | | 100 MΩ min. (at 500 VDC) |
| **Dielectric strength** | | 2,000 VAC, 50/60 Hz for 1 min between coil and contacts<br>750 VAC, 50/60 Hz for 1 min between contacts of same polarity |
| **Impulse withstand voltage** | | 4,500 V (1.2 50 μs) between coil and contacts |
| **Insulation Distance** | **Creepage (Typ)** | 3.3 mm |
| | **Clearance (Typ)** | 2.7 mm |
| **Tracking Resistance (CTI)** | | 250 V |
| **Vibration resistance** | | Destruction: 10 to 55 to 10 Hz, 0.75-mm single amplitude (1.5-mm double amplitude)<br>Malfunction: 10 to 55 to 10 Hz, 0.75-mm single amplitude (1.5-mm double amplitude) |
| **Shock resistance** | | Destruction: 1,000 $m/s^2$<br>Malfunction: 100 $m/s^2$ |
| **Endurance** | | Mechanical: 10,000,000 operations min. (at 18,000 operations/hr)<br>Electrical: 100,000 operations min. (at 1,800 operations/hr)<br>36,000 operations min. (10 A at 250 VAC) |
| **Ambient temperature** | | Operating: -40°C to 85°C (with no icing) |
| **Ambient humidity** | | Operating: 5% to 85% |
| **Weight** | | Approx. 12 g |

## ■ Approved Standards

**UL508, UL114, UL478, UL325, UL873, UL1409, UL1950 (File No. E41643)/CSA C22.2 No. 14, No. 1 (File No. LR34815)**

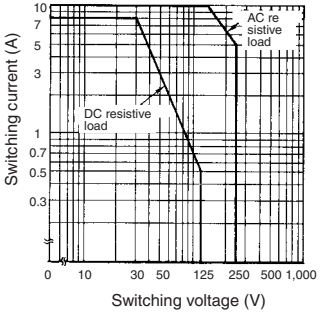
| Model | Coil ratings | Contact ratings |
|---|---|---|
| G5LE | 3 to 48 VDC | 12 A, 120 VAC (resistive load 30,000 cycles)<br>10 A, 250 VAC (general use)<br>10 A, 125 VAC (general use 100,000 cycles)<br>8 A, 30 VDC (resistive load)<br>6 A, 277 VAC (general use)<br>NO:<br>1/6 hp, 120 VAC (50,000 cycles)<br>1/3 hp, 125 VAC, 70°C 30K with Class 130B system<br>65°C 30K with Class 105 Coil insulation system<br>TV-3, 120 VAC<br>TV-5, 120 VAC (For ASI only)<br>NC:<br>1/8 hp, 120 VAC (50,000 cycles)<br>1/10 hp, 120 VAC (50,000 cycles)) |

## EN 61810-1, EN 60255, IEC (VDE TUV Reg No. R9151267, VDE Reg No. 6850UG)

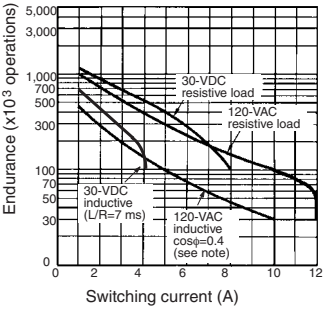
| Model | Coil ratings | Contact ratings |
|---|---|---|
| G5LE | Approx. 400 mW<br>3, 5, 6, 9, 12, 24, 48 VDC<br>Approx. 360 mW<br>5, 6, 12, 24, 48 VDC | 10A, 250 VAC (resistive load 50,000 cycles at 85°C)<br>5A, 30VDC<br>2.5A, 250VAC (cosφ = 0.4) |

# Engineering Data

**Maximum Switching Power**
**G5LE**

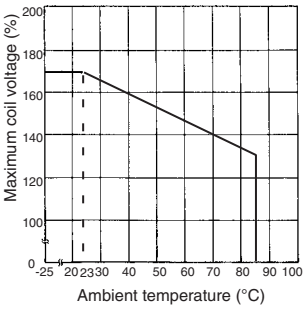



**Endurance**
**G5LE**




**Note:** Same curve as for 250-VAC resistive load

**Ambient Temperature vs. Maximum Coil Voltage**



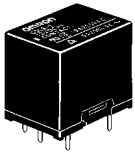

**Note:** The maximum coil voltage refers to the maximum value in a varying range of operating power voltage, not a continuous voltage.

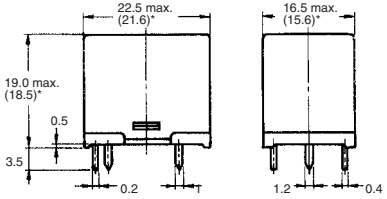
# Dimensions

**Note: 1.** All units are in millimetres unless otherwise indicated.

**2.** Orientation marks are indicated as follows:

**G5LE-1**
**G5LE-1A**

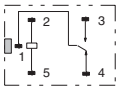





*Average value

**Terminal Arrangement/Internal Connections (Bottom View)**

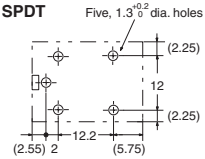
**SPDT**



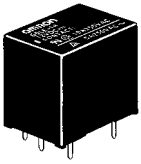

**Mounting Holes (Bottom View)**

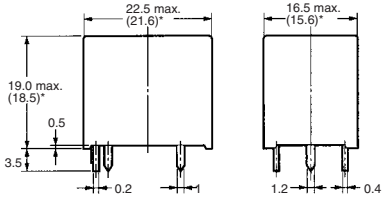
Tolerance: ±0.1 mm unless specified

**SPDT**




**G5LE-14**
**G5LE-1A4**

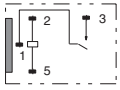





*Average value

**Terminal Arrangement/Internal Connections (Bottom View)**

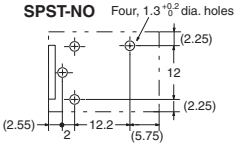
**SPST-NO**




**Mounting Holes (Bottom View)**

Tolerance: ±0.1 mm unless specified

**SPST-NO**

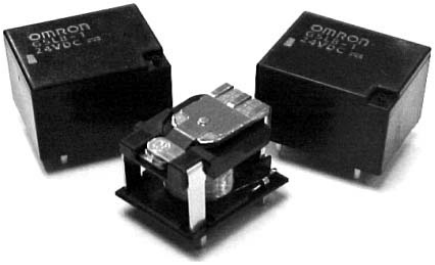



**ALL DIMENSIONS SHOWN ARE IN MILLIMETRES.**
To convert millimetres into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

CAT. No. K100-E2-03-X

## A Cubic, Single-pole 10-A Power Relay

- ROHS compliant.
- L 19.6 x W 15.6 x H 15.2 (mm)
- Subminiature 'Sugar Cube' relays.
- Standard 360mW – Lower Coil power consumption.
- Standard Class B insulation, (Class F available).
- Standard CTI 175, (CTI 250 available).
- Withstands impulse of up to 4,500V.
- Approved to EN 61810-1



## Ordering Information

| Sealing | Contact Form | Contact Material |
|---|---|---|
| | | $AgSnO_2$ |
| Unsealed (vent hole) | SPDT | G5LB-1 |
| | SPST-NO | G5LB-1A |
| Plastic-sealed | SPDT | G5LB-14 |
| | SPST-NO | G5LB-1A4 |

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

Examples : G5LB-1 12 VDC

Rated Coil Voltage

**Model Number Legend**

**G5LB** □ □ □ □ □ □ □ □ **VDC**

**1 2 3 4 5 6 7 8**

**1. Number of Poles**
1: 1 pole

**2. Contact Form/Contact Construction**
None: SPDT
A: SPST-NO

**3. Sealing/Protective Construction**
None: Unsealed (vent hole)
4: Sealed

**4. Contact Type**
None: Standard (Silver Tin Oxide)

**5. Coil Power Consumption**
None: 360mW
40: 400mW
60: 600mW (UL and CSA only)

**6. 6. Tracking Index and Insulation**
None: CTI >175 – Class B Insulation
25: CTI >250 – Class F Insulation

**7. Optional Suffix(es)**
None: Standards
May include additional numbers(s) and / or letter(s) for sales purposes

**8. Rated Coil Value**

## ■ Coil Ratings

| Rated voltage | 3 VDC | 5 VDC | 6 VDC | 9 VDC | 12 VDC | 24 VDC | 36 VDC | 48 VDC |
|---|---|---|---|---|---|---|---|---|
| Rated current | 123.3 mA | 72.0 mA | 60.8 mA | 40.8 mA | 30.7 mA | 15.2 mA | 10.2 mA | 7.6 mA |
| Coil resistance | 24.3 Ω | 69.4 Ω | 98.7 Ω | 220.4 Ω | 390.6 Ω | 1575.4 Ω | 3533.7 Ω | 6287.4 Ω |
| Must operate voltage | 75% of rated voltage (max.) | | | | | | | |
| Must release voltage | 10% of rated voltage (min.) | | | | | | | |
| Max. voltage | 130% of rated voltage at 85°C, 170% of rated voltage at 23°C | | | | | | | |
| Power consumption | Approx. 360 mW | | | | | | | |

**Note:** The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.

| Rated voltage | 3 VDC | 5 VDC | 6 VDC | 9 VDC | 12 VDC | 24 VDC | 36 VDC | 48 VDC |
|---|---|---|---|---|---|---|---|---|
| Rated current | 136.4 mA | 80.0 mA | 67.8 mA | 45.7 mA | 32.8 mA | 17.0 mA | 11.3 mA | 8.5 mA |
| Coil resistance | 22.0 Ω | 62.5 Ω | 88.5 Ω | 196.9 Ω | 366.0 Ω | 1,407.7 Ω | 3,196.8 Ω | 5,638.0 Ω |
| Must operate voltage | 75% of rated voltage (max.) | | | | | | | |
| Must release voltage | 10% of rated voltage (min.) | | | | | | | |
| Max. voltage | 130% of rated voltage at 85°C, 170% of rated voltage at 23°C | | | | | | | |
| Power consumption | Approx. 400 mW | | | | | | | |

**Note:** The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.

| Rated voltage | 3 VDC | 5 VDC | 6 VDC | 9 VDC | 12 VDC | 24 VDC | 36 VDC | 48 VDC |
|---|---|---|---|---|---|---|---|---|
| Rated current | 200.2 mA | 120.0 mA | 100.7 mA | 66.8 mA | 50.4 mA | 25.3 mA | 16.6 mA | 12.6 mA |
| Coil resistance | 15.0Ω | 41.7 Ω | 59.6 Ω | 134.8 Ω | 237.9 Ω | 947.6 Ω | 2164.8 Ω | 3800.0 Ω |
| Must operate voltage | 75% of rated voltage (max.) | | | | | | | |
| Must release voltage | 10% of rated voltage (min.) | | | | | | | |
| Max. voltage | 130% of rated voltage at 85°C, 170% of rated voltage at 23°C | | | | | | | |
| Power consumption | Approx. 600 mW | | | | | | | |

**Note:** The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.

## ■ Contact Ratings

| | |
|---|---|
| Load | Resistive load ($\cos\varphi = 1$) |
| Rated load | 10A at 120 VAC, 8A at 30 VDC & 10A at 250 VAC |
| Contact material | $AgSnO_2$ |
| Rated carry current | 10A |
| Max. switching voltage | 250 VAC, 125 VDC (30 VDC when UL/CSA standard is applied) |
| Max. switching current | AC: 10A; DC: 8A |
| Max. switching capacity | 1,200 VA, 240 W & 2,500 VA |
| Min. permissible load | 100 mA at 5 VDC |

## ■ Approved Standards

**UL 325, UL 873 (File No. E41643)/CSA 22.2 No. 14 (File No. LR3928)**
**EN 61810-1 (VDE Reg. no A662)**

| Model | Coil Ratings | Contact Ratings |
|---|---|---|
| G5LB | 3 - 48 VDC | 10A 250 VAC<br>10A 30 VDC |

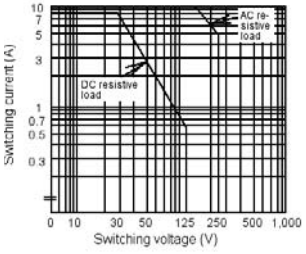
## ■ Characteristics

| | | |
|---|---|---|
| **Contact resistance** | | 100 mΩ max. |
| **Operate time** | | 10 ms max. |
| **Release time** | | 5 ms max. |
| **Max. switching frequency** | | Mechanical: 18,000 operations/hr<br>Electrical: 1,800 operations/hr (under rated load) |
| **Insulation resistance** | | 1,000MΩ |
| **Insulation Distance** | **Creepage (Typ)** | 3.3 mm |
| | **Clearance (Typ)** | 2.7 mm |
| **Tracking Resistance (CTI)** | | 250 V |
| **Dielectric strength** | | 750 VAC, 50/60 Hz for 1 min. between contacts of same polarity<br>2,000 VAC, 50/60 Hz for 1 min. between coil and contacts |
| **Impulse withstand voltage** | | 4,500V between coil and contacts, 1.2 x 5 μsec |
| **Vibration resistance** | | Destruction: 10 to 55Hz, 1.5mm double amplitude<br>Malfunction: 10 to 55Hz, 1.5mm double amplitude |
| **Shock resistance** | | Destruction: 1,000 m/s² (approx. 100G)<br>Malfunction: 100 m/s² (approx. 10G) |
| **Life expectancy** | | Mechanical: 10,000,000 operations min. (at 18,000 operations/hr)<br>Electrical: *100,000 operations min. (at 1,800 operations/hr, 10A 120VAC) |
| **Ambient temperature** | | Operating: -40°C to 85°C |
| **Ambient humidity** | | Operating: 35% to 85°C |
| **Weight** | | Approx. 10g* |

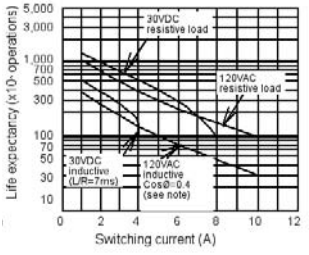
*G5LB-1

# Engineering Data

**Max. Switching Capacity G5LB-1**

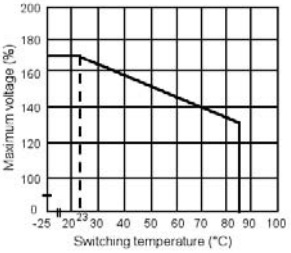



**Life Expectancy G5LB-1**




**Note:** Curve 120VAC inductive Cosφ = 0.4 is same for 250VAC resistive load.

**Ambient Temp. Vs Max. Voltage**



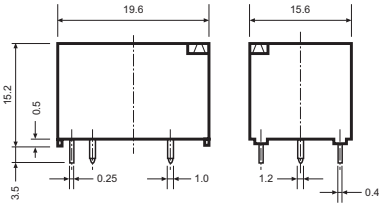

**Note:** The maximum coil voltage refers to the maximum value in a varying range of operating power voltage, not a continuous voltage.

# Dimensions

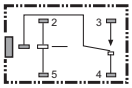
**Note:** 1. All units are milimeters unless otherwise indiated
2. Orientation marks are indicated as follow:

## ■ SPDT Types

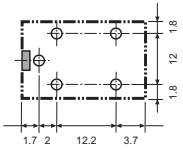
### G5LB-1



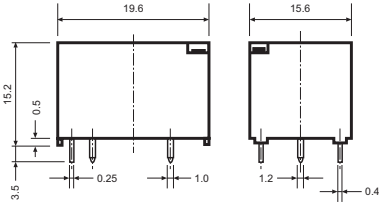

**Terminal Arrangemment/ Internal Connections (Bottom View)**




**Mounting Holes (Bottom View) Tolerance: ±0.1mm**

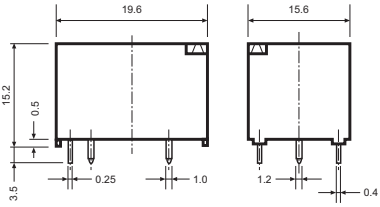



### G5LB-14

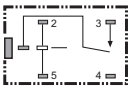



## ■ SPST Types

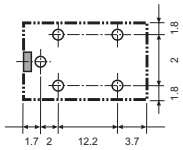
### G5LB-1



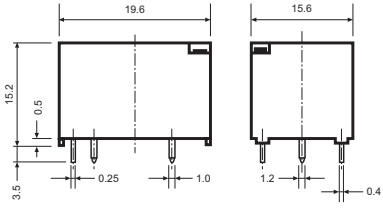

**Terminal Arrangemment/ Internal Connections (Bottom View)**




**Mounting Holes (Bottom View) Tolerance: ±0.1mm**




### G5LB-1A4




**ALL DIMENSIONS SHOWN ARE IN MILLIMETRES.**
To convert millimetres into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

## Flat Relays that Switch 10-A/15-A Loads with New Quick-connect Terminals

- ROHS compliant.
- Ideal for switching power in household appliances or for outputs from industrial devices.
- Sub-miniature dimensions: 22 x 16 x 11 mm (L x W x H).
- High-sensitivity models available with low power consumption (150 mW).
- UL and CSA approved.
- Fully sealed models and quick-connect terminal models available (#187 load contact terminals).

## Ordering Information

| Contact form | Enclosure ratings | General purpose | High-sensitivity | High-capacity | Quick-connect terminals |
|---|---|---|---|---|---|
| SPST-NO | Flux protection | G5CA-1A | G5CA-1AH | G5CA-1A-E | G5CA-1AE-TP-E |
| – | Fully sealed | G5CA-1A4 | G5CA-1A4H | – | – |

**Note:** 1. When ordering, add the rated coil voltage to the model number.
Example: G5C-1 12 VDC
Rated coil voltage
2. High-capacity models with a Fully sealed structure are not available.
3. Standard or high-sensitivity models with quick-connect terminals are not available.

**Model Number Legend**

**G5CA-1A** – □ – □ – □ – □ – □ **VDC**
1 2 3 4 5 6

**1. Number of Poles**
1A: 1 pole (SPST-NO)

**2. 2. Enclosure Ratings**
None: Flux protection
4: Fully sealed

**3. 3. Terminal Form**
None: PCB Terminal
TP: Quick-connect terminal (#187)

**4. Special functions**
None: Standard
E: High capacity

**5. Coil Consumption**
None: Standard
H: High sensitivity

**6. 6. Rated coil voltage**
5, 12, 24 VDC

**Standard Specifications**
Contact configuration: SPST-NO
Enclosure ratings: Flux protection
Terminal form: PCB terminal

## ■ Coil Ratings

| Item | Standard, high-capacity, or quick-connect terminals | | | High-sensitivity | | |
|---|---|---|---|---|---|---|
| | 5 VDC | 12 VDC | 24 VDC | 5 VDC | 12 VDC | 24 VDC |
| **Rated current** | 40 mA | 16.7 mA | 8.3 mA | 30 mA | 12.5 mA | 6.25 mA |
| **Coil resistance** | 125 Ω | 720 Ω | 2,880 Ω | 167 Ω | 960 Ω | 3,840 Ω |
| **Must operate voltage** | 75% max. of rated voltage | | | 80% max. of rated voltage | | |
| **Must release voltage** | 10% min. of rated voltage | | | | | |
| **Max. voltage** | 150% (standard)/130% (high-capacity, quick-connect terminals) of rated voltage (at 23°C) | | | 150% (at 23°C) | | |
| **Power consumption** | Approx. 200 mW | | | Approx. 150 mW | | |

## ■ Contact Ratings

| Item | Standard | | High-sensitivity | | High-capacity, or quick-connect terminals | |
|---|---|---|---|---|---|---|
| | Resistive load (cosφ = 1) | Inductive load (cosφ = 0.4, L/R = 7 ms) | Resistive load (cosφ = 1) | Inductive load (cosφ = 0.4, L/R = 7 ms) | Resistive load (cosφ = 1) | Inductive load (cosφ = 0.4, L/R = 7 ms) |
| **Contact Material** | AgSnIn | | AgSnIn | | AgSnIn | |
| **Rated load** | 10 A at 250 VAC; 10 A at 30 VDC | 3 A at 250 VAC; 3 A at 30 VDC | 10 A at 250 VAC; 10 A at 30 VDC | 3 A at 250 VAC; 3 A at 30 VDC | 15 A at 110 VAC; 10 A at 30 VDC | 5 A at 110 VAC; 3 A at 30 VDC |
| **Rated carry current** | 10 A | | 10 A | | 15 A | |
| **Max. switching voltage** | 250 VAC, 125 VDC | | 250 VAC, 125 VDC | | 250 VAC, 125 VDC | |
| **Max. switching current** | 10 A | | 10 A | | 15 A | |
| **Max. switching** | 2,500 VA, 300 W | 750 VA, 90 W | 2,500 VA, 300 W | 750 VA, 90 W | 2,500 VA, 300 W | 750 VA, 90 W |

## ■ Characteristics

| | | |
|---|---|---|
| **Contact resistance** | | 30 mΩ max. (Quick-connect terminals type: 100 mΩ max.) |
| **Operate time** | | 10 ms max. (High-sensitivity type: 15 ms max.) |
| **Release time** | | 10 ms max. |
| **Insulation resistance** | | 1,000 MΩ min. |
| **Dielectric strength** | | 2,500 VAC, 50/60 Hz for 1 min between coil and contacts<br>1,000 VAC, 50/60 Hz for 1 min between contacts of same polarity |
| **Insulation Distance** | **Creepage (Typ)** | 3.5 mm |
| | **Clearance (Typ)** | 2.8 mm |
| **Tracking Resistance (CTI)** | | 250 V |
| **Impulse withstand voltage** | | 4,500 V (1.2 x 50 μs) between coil and contacts |
| **Vibration resistance** | | Destruction: 10 to 55 to 10 Hz, 0.75-mm single amplitude (1.5-mm double amplitude)<br>Malfunction: 10 to 55 to 10 Hz, 0.75-mm single amplitude (1.5-mm double amplitude) |
| **Shock resistance** | | Destruction: 1,000 m/s$^2$<br>Malfunction: 200 m/s$^2$ |
| **Endurance** | | Mechanical: 20,000,000 operations min. at 18,000 operations/hr<br>Electrical: 300,000 operations min. (100,000 operations min. for Fully sealed Type) at 1,200 operations/hr under rated load of 10 A at 250 VAC;<br>100,000 operations min. under load of 15 A at 110 VAC for high-capacity models<br>100,000 operations min. at 1,200 operations/hr under rated load of 10 A at 30 VDC |
| **Ambient temperature** | | Operating: -25°C to 70°C (with no icing) |
| **Ambient humidity** | | Operating: 5% to 85% |
| **Weight** | | Approx. 8 g (for TP model: Approx. 9.6 g) |

**Note: 1.** The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.
**2.** Operating characteristics are measured at a coil temperature of 23°C.

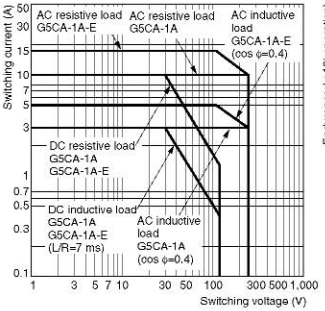
## ■ Approved Standards

**UL508 (File No. E41515)/CSA C22.2 No.14 (File No. LR31928)**
**IEC/VDE standard/TUV Certified: IEC255/VDE0435 (Certification No.R9351138)**

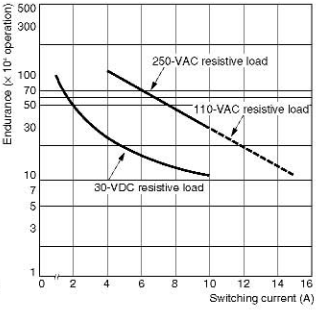
| Model | Coil ratings |
|---|---|
| 3 to 100 VDC | 15 A, 125 VAC<br>10 A, 250 VAC<br>10 A, 30 VDC (resistive load only) |

## ■ Engineering Data

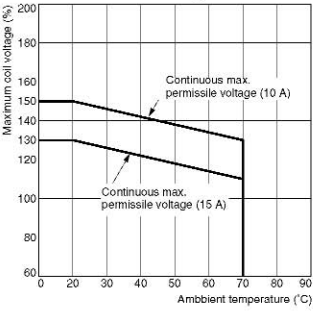
### Maximum Switching Power



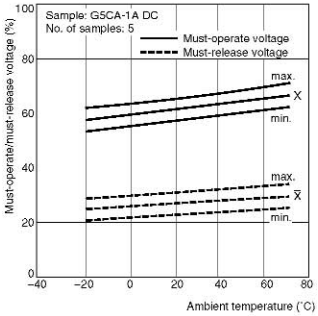

### Endurance




### Ambient Temperature vs. Maximum Coil Voltage

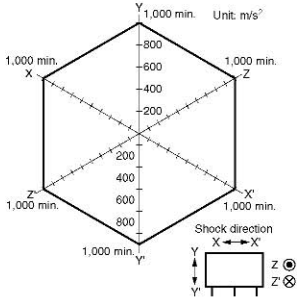



### Operating Temperature vs. Must-operate/Must-release Voltage




**Note**: The "maximum voltage" is the maximum voltage that can be applied to the relay coil.

### Malfunction Shock

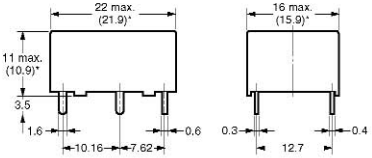



No. of samples: 10
Measured value: The value at which malfunction occurs in the contact when the contact is subjected to shock three times each in six directions for three axes.
Standard: 200 m/s²

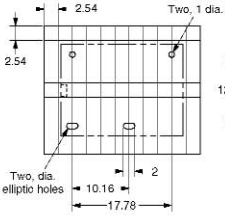
## Dimensions

**Note: 1.** All units are in millimetres unless otherwise indicated.
**2.** Orientation marks are indicated as follows:

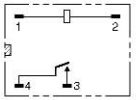
**G5CA-1A(-E)**
**G5CA-1A4(-H)**




**Mounting Holes (PCB)**
(BOTTOM VIEW)
Tolerance: ±0.1 mm




**Terminal Arrangement/ Internal Connections**
(BOTTOM VIEW)

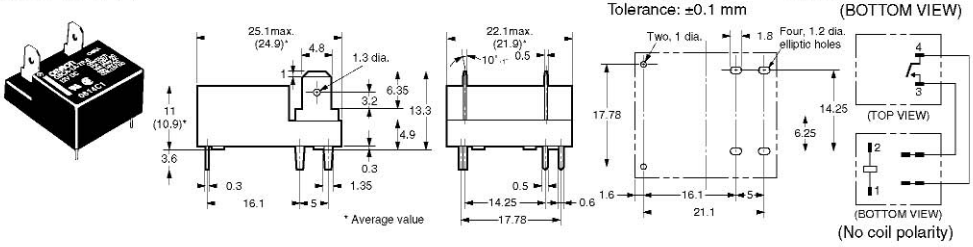



(No coil polarity)

**Note**: Orientation marks are indicated as follows:

# Dimensions (cont)

**G5CA-1A-TP-E**

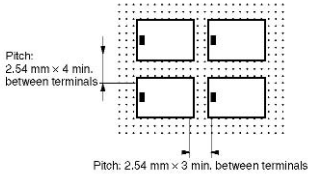



# Precautions

## ■ Precautions for Correct Use

**Installation**

Make sure that sufficient space is provided between relays when installing two or more relays side by side to facilitate heat dissipation. Insufficient heat dissipation may result in the relay malfunctioning.




**Quick-connect Terminal Connections**

- Do not pass current through the PCB of the load contactterminals (quick-connect terminals).
- The terminals are compatible with Faston receptacle #187 and are suitable for positive-lock mounting.

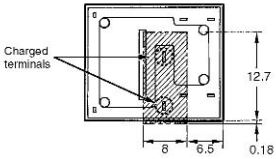
  Use only Faston terminals with the specified numbers. Select leads for connecting Faston receptacles with wire diameters that are within the allowable range for the load current. Do not apply excessive force to the terminals when mounting or dismounting the Faston receptacle.

  Insert and remove terminals carefully one at a time. Do not insert terminals on an angle, or insert/remove multiple terminals at the same time.

  The following positive-lock connectors made by AMP are recommended. Contact the manufacturer directly for details on connectors including availability.

**Charged Terminals**

The section marked with dotted circles (indicated by arrows) in the following diagram includes the charged terminals of the relay. When the relay is mounted on a PCB, make sure that there are no metal patterns on the section of the PCB facing the portion of the relay shaded in the following diagram.




**Other Precautions**

- The G5CA is a power relay designed for applications switching power loads such as heaters in electric household appliances. Do not use the G5CA to switch micro loads less than 100 mA, such as in signal applications.
- Use fully sealed models if the relays will require washing. Fluxprotection models may malfunction or the relay's performance may be otherwise adversely affected if cleaning fluid enters the relay.

| Type | Type Receptacle terminals (See note.) | Positive housing |
|---|---|---|
| #187 terminals (width: 4.75 mm) | AMP 170330-1 (170324-1) | AMP 172074-1 (natural color) |
| | AMP 170331-1 (170325-1) | AMP 172074-4 (yellow) |
| | AMP 170332-1 (170326-1) | AMP 172074-5 (green)<br>AMP 172074-6 (blue) |

**Note:** The numbers shown in parentheses are for air-feeding

**ALL DIMENSIONS SHOWN ARE IN MILLIMETRES.**
To convert millimetres into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

CAT. No. J151-E2-02-X

## SPST-NO Type Breaks 10-A Loads; SPST-NO + SPST-NC Type Breaks 8-A Load

- Compact: 20 x 15 x 10 mm (L x W x H).
- Low power consumption: 200 mW.
- Flux protection or fully sealed construction available.
- Unique moving loop armature reduces relay size, magnetic interference, and contact bounce.
- Single- and double-winding latching types also available

## Ordering Information

| Classification | Contact form | Straight PCB | | Self-clinching PCB | |
|---|---|---|---|---|---|
| | | Flux protection | Fully sealed | Flux protection | Fully sealed |
| Single-side stable | SPST-NO | G6C-1117P-US | G6C-1114P-US | G6C-1117C-US | G6C-1114C-US |
| | SPST-NO + SPST-NC | G6C-2117P-US | G6C-2114P-US | G6C-2117C-US | G6C-2114C-US |
| Single-winding latching | SPST-NO | G6CU-1117P-US | G6CU-1114P-US | G6CU-1117C-US | G6CU-1114C-US |
| | SPST-NO + SPST-NC | G6CU-2117P-US | G6CU-2114P-US | G6CU-2117C-US | G6CU-2114C-US |
| Double-winding latching | SPST-NO | G6CK-1117P-US | G6CK-1114P-US | G6CK-1117C-US | G6CK-1114C-US |
| | SPST-NO + SPST-NC | G6CK-2117P-US | G6CK-2114P-US | G6CK-2117C-US | G6CK-2114C-US |

**Note:** When ordering, add the rated coil voltage to the model number.
Example: G6C-1117P-US 12 VDC
Rated coil voltage

**Model Number Legend**

**G6C □ - □ □ □ □ - □ □ VDC**
**1 2 3 4 5 6 7**

1. **Relay Function**
   None: Single-side stable
   U: Single-winding latching
   K: Double-winding latching
2. **Contact Form**
   11: SPST-NO
   21: SPST-NO + SPST-NC
3. **Contact Type**
   1: Standard
4. **Enclosure Ratings**
   7: Flux protection
   4: Fully sealed
5. **Terminals**
   P: Straight PCB
   C: Self-clinching PCB
6. **Approved Standards**
   US: UL/CSA certified
7. **Rated Coil Voltage**
   3, 5, 6, 12, 24 VDC

## ■ Accessories (Order Separately)

**Back Connecting Sockets**

| Applicable relay | Back connecting socket* |
|---|---|
| G6C(U)-1114P-US<br>G6C(U)-1117P-US<br>G6C(U)-2114P-US<br>G6C(U)-2117P-US | P6C-06P |
| G6CK-1114P-US<br>G6CK-1117P-US<br>G6CK-2114P-US<br>G6CK-2117P-US | P6C-08P |

*Not applicable to the self-clinching type.
The operating current for the socket is 5 A max

| Removal Tool | P6B-Y1 |
|---|---|
| **Hold-down Clips** | P6B-C2 |

# Specifications

## ■ Coil Rating

**Single-side Stable Type**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Rated voltage** | | 3 VDC | 5 VDC | 6 VDC | 12 VDC | 24 VDC |
| **Rated current** | | 67 mA | 40 mA | 33.3 mA | 16.7 mA | 8.3 mA |
| **Coil resistance** | | 45 Ω | 125 Ω | 180 Ω | 720 Ω | 2,880 Ω |
| **Coil inductance** | **Armature OFF** | 0.078 | 0.22 | 0.36 | 1.32 | 4.96 |
| **(H) (ref. value)** | **Armature OFF** | 0.067 | 0.18 | 0.29 | 1.13 | 4.19 |
| **Must operate voltage** | | 70% max. of rated voltage | | | | |
| **Must release voltage** | | 70% min. of rated voltage | | | | |
| **Max. voltage** | | 160% of rated voltage (at 23°C) | | | | |
| **Power consumption** | | Approx. 200 mW | | | | |

**Single-side Latching Type**

| | | | | | | |
|---|---|---|---|---|---|---|
| **Rated voltage** | | 3 VDC | 5 VDC | 6 VDC | 12 VDC | 24 VDC |
| **Rated current** | | 67 mA | 40 mA | 33.3 mA | 16.7 mA | 8.3 mA |
| **Coil resistance** | | 45 Ω | 125 Ω | 180 Ω | 720 Ω | 2,880 Ω |
| **Coil inductance** | **Armature OFF** | 0.09 | 0.25 | 0.36 | 1.75 | 5.83 |
| **(H) (ref. value)** | **Armature OFF** | 0.06 | 0.20 | 0.24 | 1.17 | 3.84 |
| **Must operate voltage** | | 70% max. of rated voltage | | | | |
| **Must release voltage** | | 70% min. of rated voltage | | | | |
| **Max. voltage** | | 160% of rated voltage (at 23°C) | | | | |
| **Power consumption** | | Approx. 200 mW | | | | |

**Double-winding Latching Type**

| Rated voltage | | | 3 VDC | 5 VDC | 6 VDC | 12 VDC | 24 VDC |
|---|---|---|---|---|---|---|---|
| Set coil | Rated current | | 93.5 mA | 56.0 mA | 46.7 mA | 23.3 mA | 11.7 mA |
| | Coil resistance | | 32.1 Ω | 89.3 Ω | 129 Ω | 514 Ω | 2,056 Ω |
| | Coil inductance | Armature OFF | 0.03 | 0.07 | 0.10 | 0.37 | 1.56 |
| | (H) (ref. value) | Armature OFF | 0.02 | 0.06 | 0.08 | 0.32 | 1.18 |
| Reset coil | Rated current | | 93.5 mA | 56.0 mA | 46.7 mA | 23.3 mA | 11.7 mA |
| | Coil resistance | | 32.1 Ω | 89.3 Ω | 129 Ω | 514 Ω | 2,056 Ω |
| | Coil inductance | Armature OFF | 0.03 | 0.08 | 0.12 | 0.47 | 1.46 |
| | (H) (ref. value) | Armature OFF | 0.02 | 0.07 | 0.10 | 0.38 | 1.13 |
| Must set voltage | | | 70% max. of rated voltage | | | | |
| Must reset voltage | | | 70% min. of rated voltage | | | | |
| Max. voltage | | | 130% of rated voltage (at 23°C) | | | | |
| Power consumption | | | Set coil: Approx. 280 mW<br>Reset coil: Approx. 280 mW | | | | |

**Note: 1.** The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.

**2.** Operating characteristics are measured at a coil temperature of 23°C.

**3.** The minimum pulse width of the set and reset voltage is 20 ms.

## ■ Contact Ratings

| Item | SPST-NO | | SPST-NO+SPST-NC | |
|---|---|---|---|---|
| Load | Resistive load (cosφ = 1) | Inductive load (cosφ = 0.4; L/R = 7 ms) | Resistive load (cosφ = 1) | Inductive load cosφ = 0.4; L/R = 7 ms) |
| Rated load | 10 A at 250 VAC;<br>10A at 30 VDC | 5 A at 30 VAC;<br>5 A at 30 VDC | 8A at 30 VAC;<br>8A at 30 VDC; | 3.5 A at 250 VAC;<br>3.5 A at 30 VDC |
| Contact material | AgNi (FD version = AgSnIn) | | | |
| Rated carry current | 10 A | | 8 A | |
| Max. switching voltage | 380 VAC, 125 VDC (the case of latching 250 VAC, 125 VDC) | | | |
| Max. switching current | 10 A | | 8 A | |
| Max. switching power | 2,500 VA, 300 W | 1,250 VA, 220 W | 2,000 VA, 240 W | 875 VA, 170 W |
| Failure rate (reference value) | 10 mA at 5 VDC | | | |

## ■ Characteristics

| | | |
|---|---|---|
| **Contact resistance** | | 30 mΩ max. |
| **Operate (set) time** | | 10 ms max. (mean value: approx. 5 ms) |
| **Release (reset) time** | | 10 ms max. (mean value: approx. 2 ms; latching types: mean value: approx. 5 ms) |
| **Bounce Time** | | Operate: 5 ms max.<br>Release: 5 ms max. |
| **Min. set/reset signal width** | | Latching type: 20 ms (at 23°C) |
| **Max. switching frequency** | | Mechanical: 18,000 operations/hr<br>Electrical: 1,800 operations/hr (under rated load) |
| **Insulation resistance** | | 1,000 MΩ min. (at 500 VDC, at 250 VDC between set coil and reset coil) |
| **Dielectric strength** | | 2,000 VAC, 50/60 Hz for 1 min between coil and contacts<br>2,000 VAC, 50/60 Hz for 1 min between contacts of different polarity<br>1,000 VAC, 50/60 Hz for 1 min between contacts of same polarity<br>250 VAC, 50/60 Hz for 1 min between set and reset coils |
| **Insulation Distance** | **Creepage (Typ)** | 5.5 mm |
| | **Clearance (Typ)** | 5.5 mm |
| **Tracking Resistance (CTI)** | | 175 V |
| **Impulse withstand voltage** | | 6.000 V (1.2 x 50 μs) between coil and contacts (latching types: 4,500 V, 1.2 50 μs) |
| **Vibration resistance** | | Destruction: 10 to 55 to 10 Hz, 0.75-mm single amplitude (1.5-mm double amplitude)<br>Malfunction: 10 to 55 to 10 Hz, 0.75-mm single amplitude (1.5-mm double amplitude) |
| **Shock resistance** | | Destruction: 1,000 m/s$^2$<br>Malfunction: 100 m/s$^2$ |
| **Ambient temperature** | | Operating: -25°C to 70°C (with no icing) |
| **Ambient humidity** | | Operating: 5% to 85% |
| **Endurance** | | Mechanical: 50,000,000 operations min. (at 18,000 operations/hr)<br>Electrical: 100,000 operations min. (at 1,800 operations/hr) |
| **Weight** | | Approx. 5.6 g |

## ■ Approved Standards

### UL508 (File No. E41643)

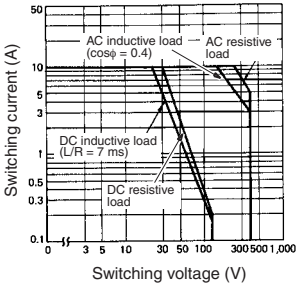
| Model | Contact form | Coil rating | Contact rating |
|---|---|---|---|
| G6C-1114P-US<br>G6C-1114C-US<br>G6C-1117P-US<br>G6C-1117C-US | SPST-NO | 3 to 60 VDC | 10 A, 250 VAC (general use)<br>10 A, 30 VDC (resistive load)<br>1/6 hp, 125 VAC<br>1/4 hp, 125 VAC<br>1/4 hp, 250 VAC<br>1/3 hp, 250 VAC<br>TV-5<br>600 W, 120 VAC (tungsten)<br>530 VA, 20 to 265 VAC, 2 A max. (pilot duty)<br>43.2 VA, 30 VDC (pilot duty)<br>12LRA, 2.2FLA, 30 VDC (30,000 cycle) |
| G6C-2114P-US<br>G6C-2114C–US<br>G6C-2117P-US<br>G6C-2117C-US | SPST-NO + SPST-NC | | 8 A, 250 VAC (general use)<br>8 A, 30 VDC (resistive load)<br>1/6 hp, 125 VAC<br>1/4 hp, 125 VAC<br>1/4 hp, 250 VAC<br>TV-5<br>600 W, 120 VAC (tungsten) |

## ■ Approved Standards (continued)
## CSA C22.2 No.14 (File No. LR31928)
## EN 61810-1 (VDE Reg. no 2413)

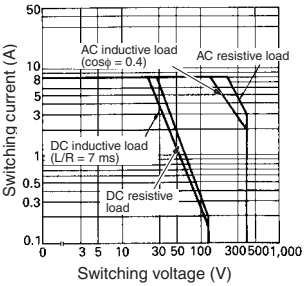
| Model | Contact form | Coil rating | Contact rating |
|---|---|---|---|
| G6C-1114P-US<br>G6C-1114C-US<br>G6C-1117P-US<br>G6C-1117C-US | SPST-NO | 3 to 60 VDC | 10 A, 250 VAC (general use)<br>10 A, 30 VDC (resistive load)<br>1/6 hp, 125 VAC<br>1/4 hp, 125 VAC<br>1/4 hp, 250 VAC<br>1/3 hp, 250 VAC<br>TV-5<br>600 W, 120 VAC (tungsten) |
| G6C-2114P-US<br>G6C-2114C-US<br>G6C-2117P-US<br>G6C-2117C-US | SPST-NO + SPST-NC | 3 to 60 VDC | 8 A, 250 VAC (general use)<br>8 A, 30 VDC (resistive load)<br>1/6 hp, 125 VAC<br>1/4 hp, 125 VAC<br>1/4 hp, 250 VAC<br>TV-5<br>600 W, 120 VAC (tungsten) |

## ■ Engineering Data

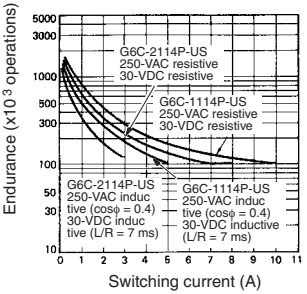
**Maximum Switching Power**
**SPST-NO**



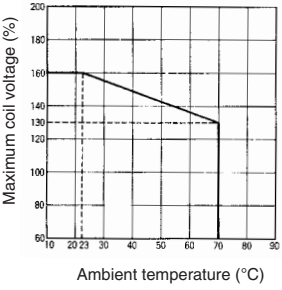

**SPST-NO + SPST-NC**




**Endurance**




**Ambient Temperature vs. Maximum Coil Voltage**

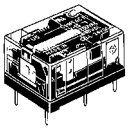


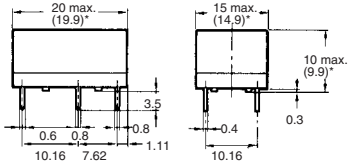

**Note:** The maximum coil voltage refers to the maximum value in a varying range of operating power voltage, not a continuous voltage.

# Dimensions

**Note: 1.** All units are in millimetres unless otherwise indicated.
**2.** Orientation marks are indicated as follows:

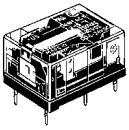
### G6C-@117P-US

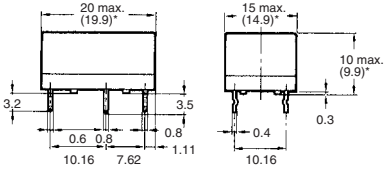





*Average value

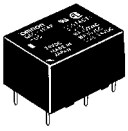
### G6C-@117C-US

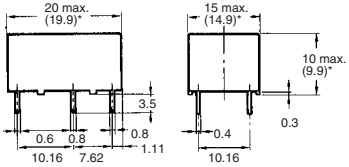





*Average value

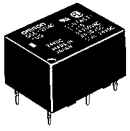
### G6C-@114P-US

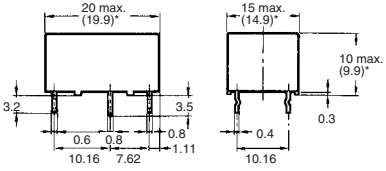





*Average value

### G6C-@114C-US

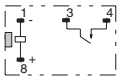





*Average value

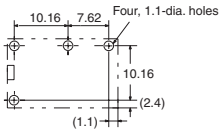
### G6C-1117P-US, G6C-1117C-US
### G6C-1114P-US, G6C-1114C-US

**Terminal Arrangement/Internal Connections (Bottom View)**



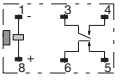

**Mounting Holes (Bottom View)**

Tolerance: ±0.1



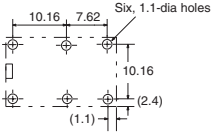

### G6C-2117P-US, G6C-2117C-US
### G6C-2114P-US, G6C-2114C-US

**Terminal Arrangement/Internal Connections (Bottom View)**

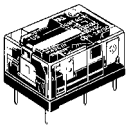


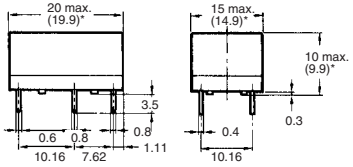

**Mounting Holes (Bottom View)**

Tolerance: ±0.1



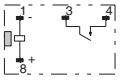
### G6CU-@117P-US



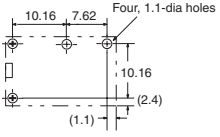



*Average value

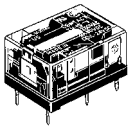
**G6CU-1117P-US, G6CU-1117C-US**
**G6CU-1114P-US, G6CU-1114C-US**
**Terminal Arrangement/Internal Connections (Bottom View)**

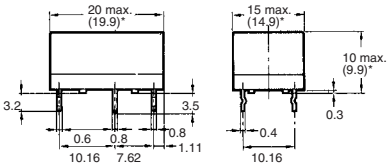



**Mounting Holes (Bottom View)**



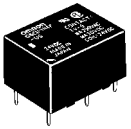

### G6CU-@117C-US

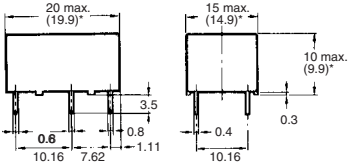





*Average value

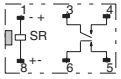
### G6CU-@114P-US



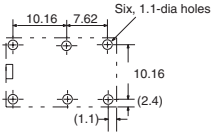



*Average value

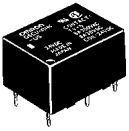
**G6CU-2117P-US, G6CU-2117C-US**
**G6CU-2114P-US, G6CU-2114C-US**
**Terminal Arrangement/Internal Connections (Bottom View)**

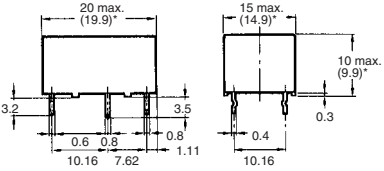



**Mounting Holes (Bottom View)**



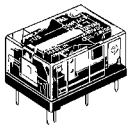

### G6CU-@114C-US

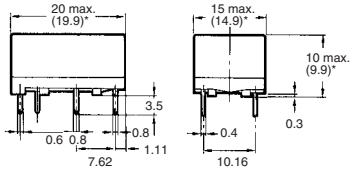





*Average value

### G6CK-@117P-US

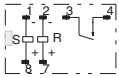




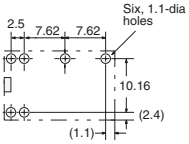

*Average value

**G6CK-1117P-US, G6CK-1117C-US**
**G6CK-1114P-US, G6CK-1114C-US**

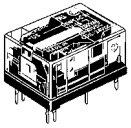
**Terminal Arrangement/Internal Connections (Bottom View)**

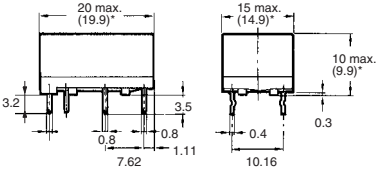



**Mounting Holes (Bottom View)**



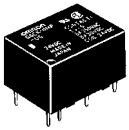

### G6CK-@117C-US

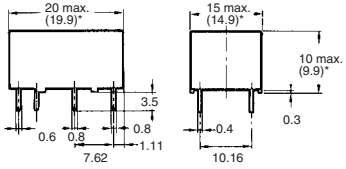





*Average value

### G6CK-@114P-US

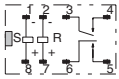




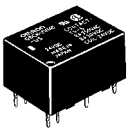

*Average value

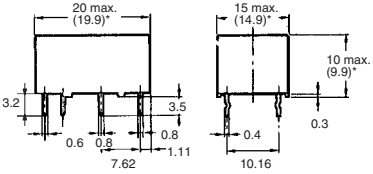
**G6CK-2117P-US, G6CK-2117C-US**
**G6CK-2114P-US, G6CK-2114C-US**

**Terminal Arrangement/Internal Connections (Bottom View)**



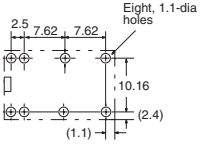

### G6CK-@114C-US





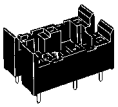

*Average value

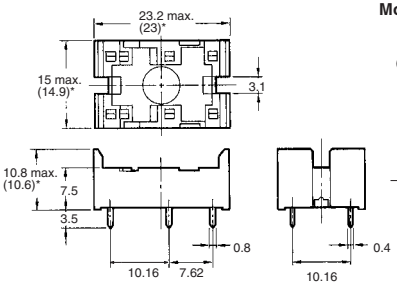
**Mounting Holes (Bottom View)**



## Back Connecting Sockets

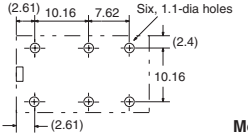
**P6C-06P**



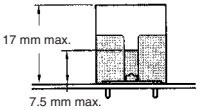



*Average value

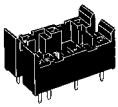
**Mounting Holes (Bottom View)**

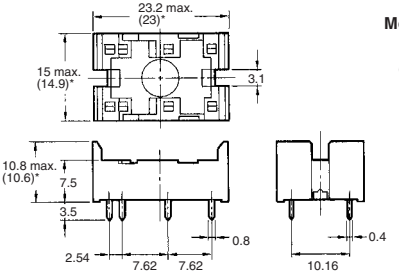



**Mounting Height of Relay with Connecting Socket**



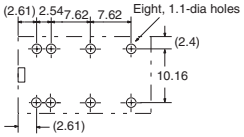

**P6C-08P**






*Average value

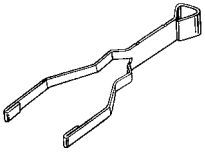
**Mounting Holes (Bottom View)**




**Note:** Rated current of socket max. 5 A

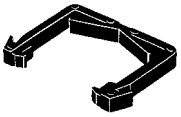
## Removal Tool

**P6B-Y1**



## Hold-down Clips

**P6B-C2**



## A Power Relay for a Variety of Purposes with Various Models

- ROHS compliant
- Conforms to EN 61810-1, UL508, CSA22.2, SEV, SEMKO.
- Meets EN60335-1 requirements for household products according to VDE0110.
- Clearance and creepage distance: 8 mm/8 m.
- Models with CTI250 material available.
- High-sensitivity (360 mW) and high-capacity (16 A) types available.
- Double-winding latching type available.

## Ordering Information

| Classification | | Enclosure Ratings | Coil Ratings | Contact Form | | | |
|---|---|---|---|---|---|---|---|
| | | | | SPST-NO | SPDT | DPST-NO | DPDT |
| **PCB terminal** | General-purpose | Flux protection | AC/DC | G2R-1A | G2R-1 | G2R-2A | G2R-2 |
| | | Fully sealed | | G2R-1A4 | G2R-14 | G2R-2A4 | G2R-24 |
| | Bifurcated contact | Flux protection | DC | G2R-1AZ | G2R-1Z | – | – |
| | | Fully sealed | | G2R-1AZ4 | G2R-1Z4 | – | – |
| | High-capacity | Flux protection | AC/DC | G2R-1A-E | G2R-1-E | – | – |
| | High-sensitivity | Flux protection | DC | G2R-1A-H | G2R-1-H | G2R-2A-H | G2R-2-H |
| | Double-winding latching | Flux protection | | G2RK-1A | G2RK-1 | G2RK-2A | G2RK-2 |
| **Quick connect (upper bracket mounting)** | General-purpose | Unsealed | AC | G2R-1A3-S | G2R-13-S | – | – |
| | | | DC | – | – | – | – |

**Note:** 1. When ordering, add the rated coil voltage to the model number.
Example: G2R-1A 12 VDC
Rated coil voltage

2. Models with CTI250 material are also available.
Contact your OMRON representative for more details.

**Model Number Legend**

**G2R □-□ □ □ □-□ □-□ □VDC**
**1 2 3 4 5 6 7 8 9**

**1. Relay Function**
None: Single-side stable
K: Double-winding latching

**2. Number of Poles**
1: 1 pole
2: 2 poles

**3. Contact Form**
None: □PDT
A: □PST-NO

**4. Contact Type**
None: Single
Z: Bifurcated

**5. Enclosure Ratings**
None: Flux protection
4: Fully sealed

**6. Terminals**
None: Straight PCB
T: Quick-connect (upper bracket mounting)

**7. Classification**
None: General-purpose
E: High-capacity
H: High-sensitivity

**8. Safety Standards**
None: UL/CSA/EN/SEV/TÜV
SKVD: UL/CSA/EN/SEV/TÜV/SEMKO

**9. Rated Coil Voltage**
Refer to Coil Ratings

# Specifications

## ■ Coil Ratings

| Rated voltage | | 12 VAC | 24 VAC | 100/(110) VAC | 120 VAC | 200/(220)VAC | 220 VAC | 230 VAC | 240 VAC |
|---|---|---|---|---|---|---|---|---|---|
| Rated Current | 50Hz | 93 mA | 46.5 mA | 11 mA | 9.3 mA | 5.5 (4.0) mA | 5.1 mA | 4.7 mA | 4.7 mA |
| | 60Hz | 75 mA | 37.5 mA | 9/(10.6) mA | 7.5 mA | 4.5 (5.3) mA | 4.1 mA | 3.8 mA | 3.8 mA |
| Coil resistance | | 65 Ω | 260 Ω | 4,600 Ω | 6,500 Ω | 20,200 Ω | 25,000 Ω | 26,850 | 30,000 Ω |
| Coil inductance | Armature OFF | 0.19 | 0.81 | 13.34 | 21 | 51.3 | 57.5 | 62 | 65.5 |
| (H) (ref. value) | Armature ON | 0.39 | 1.55 | 26.84 | 42 | 102 | 117 | 124 | 131 |
| Must operate voltage | | 80% max. of rated voltage | | | | | | | |
| Must release voltage | | 30% min. of rated voltage | | | | | | | |
| Max. voltage | | 140% of rated voltage (at 23°C) | | | | | | | |
| Power consumption | | Approx. 0.9 VA at 60 Hz (approx. 0.7 VA at 60 Hz) | | | | | | | |

| Rated voltage | | 5 VDC | 6 VDC | 12 VDC | 24 VDC | 48 VDC | 100 VDC |
|---|---|---|---|---|---|---|---|
| Rated current (50/60Hz) | | 106 mA | 88.2 mA | 43.6 mA | 21.8 mA | 11.5 mA | 5.3 mA |
| Coil resistance | | 47 Ω | 68 Ω | 275 Ω | 1,100 Ω | 4,170 Ω | 18,860 Ω |
| Coil inductance | Armature OFF | 0.20 | 0.28 | 1.15 | 4.27 | 13.86 | 67.2 |
| (H) (ref. value) | Armature ON | 0.39 | 0.55 | 2.29 | 8.55 | 27.71 | 93.2 |
| Must operate voltage | | 70% max. of rated voltage | | | | | |
| Must release voltage | | 15% min. of rated voltage | | | | | |
| Max. voltage | | 170% of rated voltage (at 23°C) | | | | | |
| Power consumption | | Approx. 0.53 W | | | | | |

**High-sensitivity Relays**

| Rated voltage | | 5 VDC | 6 VDC | 12 VDC | 24 VDC | 48 VDC |
|---|---|---|---|---|---|---|
| Rated current (50/60Hz) (see Note. 1) | | 71.4 mA | 60 mA | 30 mA | 15 mA | 7.5 mA |
| Coil resistance (see Note. 1) | | 70 Ω | 100 Ω | 400 Ω | 1,600 Ω | 6,400 Ω |
| Coil inductance (H) (ref. value) | Armature OFF | 0.37 | 0.53 | 2.14 | 7.80 | 31.20 |
| | Armature ON | 0.75 | 1.07 | 4.27 | 15.60 | 62.40 |
| Must operate voltage | | 70% max. of rated voltage | | | | |
| Must release voltage | | 15% min. of rated voltage | | | | |
| Max. voltage | | 170% of rated voltage (at 23°C) | | | | |
| Power consumption | | Approx. 0.36 W | | | | |

**Note: 1.** The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of $^{+15\%}/_{-20\%}$ (AC rated current) or ±10% (DC coil resistance)

**2.** Operating characteristics are measured at a coil temperature of 23°C

**3.** Depending on the type of relay, some relays do not have coil specifications. Contact your Omron representative for more details.

**Double-winding Latching Relays**

| Rated voltage | | | 5 VDC | 6 VDC | 12 VDC | 24 VDC |
|---|---|---|---|---|---|---|
| Set Coil | Rated current (see note 1.) | | 167 mA | 138 mA | 70.6 mA | 34.6 mA |
| | Coil resistance (see note 1.) | | 30 Ω | 43.5 Ω | 170 Ω | 694 Ω |
| | Coil inductance (H) (ref. value) | Armature OFF | 0.073 | 0.104 | 0.42 | 1.74 |
| | | Armature ON | 0.146 | 0.208 | 0.83 | 3.43 |
| Reset Coil | Rated current | | 119 mA | 100 mA | 50 mA | 25 mA |
| | Coil resistance | | 42 Ω | 60 Ω | 240 Ω | 960 Ω |
| | Coil inductance (H) (ref. value) | Armature OFF | 0.003 | 0.005 | 0.018 | 0.079 |
| | | Armature ON | 0.006 | 0.009 | 0.036 | 0.148 |
| Must set voltage | | | 70% max. of rated voltage | | | |
| Must reset voltage | | | 70% max. of rated voltage | | | |
| Max. voltage | | | 140% of rated voltage (at 23°C) | | | |
| Power consumption | | | Set coil: Approx. 850 mW; Reset coil: Approx. 600 mW | | | |

**Note: 1.** The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.

**2.** Operating characteristics are measured at a coil temperature of 23°C.

## ■ Contact Ratings

**PCB/Flux Protection, Plug-in, Quick-connect Terminal Relays**

| Item | General-purpose, quick-connect terminal | | | | High-capacity | |
|---|---|---|---|---|---|---|
| **Number of poles** | 1 pole | | 2 poles | | 1 pole | |
| **Load** | Resistive load (cosφ = 1) | Inductive load (cosφ = 0.4; L/R = 7 ms) | Resistive load (cosφ = 1) | Inductive load (cosφ = 0.4; L/R = 7 ms) | Resistive load (cosφ = 1) | Inductive load (cosφ = 0.4; L/R = 7 ms) |
| **Rated Load** | 10 A at 250 VAC; 10 A at 30 VDC | 7.5 A at 250 VAC; 5 A at 30 VDC | 5 A at 250 VAC; 5 A at 30 VDC | 2 A at 250 VAC; 3 A at 30 VDC | 16 A at 250 VAC; 16 A at 30 VDC | 8 A at 250 VAC; 8 A at 30 VDC |
| **Contact material** | AgSnIn | | | | | |
| **Rated carry current** | 10 A | | 5 A | | 16 A | |
| **Max. switching voltage** | 380 VAC, 125 VDC | | 380 VAC, 125 VDC | | 380 VAC, 125 VDC | |
| **Max. switching current** | 10 A | | 5 A | | 16 A | |
| **Max. switching power** | 2,500 VA, 300 W | 1,875 VA, 150 W | 1,250 VA, 150 W | 500 VA, 90 W | 4,000 VA, 480 W | 2,000 VA, 240 W |
| **Failure rate (reference value)** | 100 mA at 5 VDC | | 10 mA at 5 VDC | | 100 mA at 5 VDC | |

**Note: 1.** P level: $\lambda_{60}$ = 0.1 x $10^{-6}$/operation.

**PCB/Flux Protection Relays**

| Item | Bifurcated contacts | | High-sensitivity | | | |
|---|---|---|---|---|---|---|
| **Number of poles** | 1 pole | | 1 pole | | 2 poles | |
| **Load** | Resistive load (cosφ = 1) | Inductive load (cosφ = 0.4; L/R = 7 ms) | Resistive load (cosφ = 1) | Inductive load (cosφ = 0.4; L/R = 7 ms) | Resistive load (cosφ = 1) | Inductive load (cosφ = 0.4; L/R = 7 ms) |
| **Rated Load** | 5 A at 250 VAC; 5 A at 30 VDC | 2 A at 250 VAC; 3 A at 30 VDC | 5 A at 250 VAC; 5 A at 30 VDC | 2 A at 250 VAC; 3 A at 30 VDC | 3 A at 250 VAC; 3 A at 30 VDC | 1 A at 250 VAC; 1.5 A at 30 VDC |
| **Rated carry current** | 5 A | | 5 A | | 3 A | |
| **Max. switching voltage** | 380 VAC, 125 VDC | | 380 VAC, 125 VDC | | 380 VAC, 125 VDC | |
| **Max. switching current** | 5 A | | 5 A | | 3 A | |
| **Max. switching power** | 1,250 VA, 150 W | 500 VA, 90 W | 1,250 VA, 150 W | 500 VA, 90 W | 750 VA, 90 W | 250 VA, 45 W |
| **Failure rate (reference value)** | 1 mA at 5 VDC | | 100 mA at 5 VDC | | 10 mA at 5 VDC | |

**Note:** P level: $\lambda_{60}$ = 0.1 x $10^{-6}$/operation.

**PCB/Fully Sealed Relays**

| Item | General-purpose (single contact) | | | | Bifurcated contact | |
|---|---|---|---|---|---|---|
| **Number of poles** | 1 pole | | 2 poles | | 1 pole | |
| **Load** | Resistive load (cosφ = 1) | Inductive load (cosφ = 0.4; L/R = 7 ms) | Resistive load (cosφ = 1) | Inductive load (cosφ = 0.4; L/R = 7 ms) | Resistive load (cosφ = 1) | Inductive load (cosφ = 0.4; L/R = 7 ms) |
| **Rated Load** | 8 A at 250 VAC; 8 A at 30 VDC | 6 A at 250 VAC; 4 A at 30 VDC | 4 A at 250 VAC; 4 A at 30 VDC | 1.5 A at 250 VAC; 2.5 A at 30 VDC | 5 A at 250 VAC; 5 A at 30 VDC | 2 A at 250 VAC; 3 A at 30 VDC |
| **Rated carry current** | 8 A | | 4 A | | 5 A | |
| **Max. switching voltage** | 380 VAC, 125 VDC | | 380 VAC, 125 VDC | | 380 VAC, 125 VDC | |
| **Max. switching current** | 8 A | | 4 A | | 5 A | |
| **Max. switching power** | 2,000 VA, 240 W | 1,500 VA, 120 W | 1,000 VA, 120 W | 375 VA, 75 W | 1,250 VA, 150 W | 500 VA, 90 W |
| **Failure rate (reference value)** | 100 mA at 5 VDC | | 10 mA at 5 VDC | | 1 mA at 5 VDC | |

**Note:** P level: $\lambda_{60} = 0.1 \times 10^{-6}$/operation.

**Latching Relays**

| Number of poles | 1 pole | | 2 poles | |
|---|---|---|---|---|
| **Load** | Resistive load (cosφ = 1) | Inductive load (cosφ = 0.4; L/R = 7 ms) | Resistive load (cosφ = 1) | Inductive load (cosφ = 0.4; L/R = 7 ms) |
| **Rated Load** | 5 A at 250 VAC; 5 A at 30 VDC | 3.5 A at 250 VAC; 2.5 A at 30 VDC | 3 A at 250 VAC; 3 A at 30 VDC | 1.5 A at 250 VAC; 2 A at 30 VDC |
| **Rated carry current** | 5 A | | 3 A | |
| **Max. switching voltage** | 380 VAC, 125 VDC | | 380 VAC, 125 VDC | |
| **Max. switching current** | 5 A | | 3 A | |
| **Max. switching power** | 1,250 VA, 150 W | 875 VA, 75 W | 750 VA, 90 W | 375 VA, 60 W |
| **Failure rate (reference value)** | 100 mA at 5 VDC | | 10 mA at 5 VDC | |

**Note:** P level: $\lambda_{60} = 0.1 \times 10^{-6}$/operation.

## ■ Characteristics

**Standard Relays**

| Item | | 1 Pole | 2 Poles |
|---|---|---|---|
| **Contact resistance** | | 30 mΩ max. (high-capacity type: 100 mΩ max.) | 50 mΩ max. |
| **Operate (set) time** | | 15 ms max | |
| **Release (reset) time** | | AC: 10 ms max.; DC: 5 ms max. (w/built-in diode: 20 ms max.) | |
| **Max. operating frequency** | | Mechanical: 18,000 operations/hr<br>Electrical: 1,800 operations/hr (under rated load) | |
| **Insulation resistance** | | 1,000 MΩ min. (at 500 VDC) | |
| **Impulse withstand voltage** | | 10KV 1*40μsec | |
| **Insulation Distance** | **Creepage (Typ)** | 10.0 mm | |
| | **Clearance (Typ)** | 9.3 mm | |
| **Tracking Resistance (CTI)** | | 175 V | |
| **Dielectric strength** | | 5,000 VAC, 50/60 Hz for 1 min between coil and contacts*;<br>1,000 VAC, 50/60 Hz for 1 min between contacts of same polarity | 5,000 VAC, 50/60 Hz for 1 min between coil and contacts*;<br>3,000 VAC, 50/60 Hz for 1 min between contacts of different polarity<br>1,000 VAC, 50/60 Hz for 1 min between contacts of same polarity |
| **Vibration resistance** | | Destruction: 10 to 55 to 10 Hz, 0.75mm single amplitude (1.5mm double amplitude)<br>Malfunction: 10 to 55 to 10 Hz, 0.75mm single amplitude (1.5mm double amplitude) | |
| **Shock resistance** | | Destruction: 1,000 $m/s^2$<br>Malfunction: 200 $m/s^2$ when energized; 100 $m/s^2$ when not energized | |
| **Endurance** | | Mechanical: AC coil: 10,000,000 operations min.;<br>DC coil: 20,000,000 operations min. (at 18,000 operations/hr)<br>Electrical:100,000 operations min. (at 1,800 operations/hr under rated load) | |
| **Ambient temperature** | | Operating: -40°C to 70°C (with no icing) | |
| **Ambient humidity** | | Operating: 5% to 85% | |
| **Weight** | | Approx. 17 g | |

**Double-winding Latching Relays**

| Item | 1 Pole | 2 Poles |
|---|---|---|
| **Contact resistance** | 30 mΩ max. | 50 mΩ max. |
| **Set time** | 20 ms max | |
| **Reset time** | 20 ms max. | |
| **Min. set/reset signal width** | 30 ms max. | |
| **Max. operating frequency** | Mechanical: 18,000 operations/hr<br>Electrical: 1,800 operations/hr (under rated load) | |
| **Insulation resistance** | 1,000 MΩ min. (at 500 VDC) | |
| **Dielectric strength** | 5,000 VAC, 50/60 Hz for 1 min between coil and contacts*;<br>1,000 VAC, 50/60 Hz for 1 min between contacts of same pole;<br>1,000 VAC, 50/60 Hz for 1 min between set and reset coil | 5,000 VAC, 50/60 Hz for 1 min between coil and contacts*;<br>3,000 VAC, 50/60 Hz for 1 min between contacts of different poles<br>1,000 VAC, 50/60 Hz for 1 min between contacts of same pole<br>1,000 VAC, 50/60 Hz for 1 min between set and reset coil |
| **Vibration resistance** | Destruction: 10 to 55 to 10 Hz, 0.75mm single amplitude (1.5mm double amplitude)<br>Malfunction: 10 to 55 to 10 Hz, 0.75mm single amplitude (1.5mm double amplitude) | |
| **Shock resistance** | Destruction: 1,000 $m/s^2$ (approx. 100G)<br>Malfunction: Set: 500 $m/s^2$ (approx. 50G); 200 $m/s^2$ (approx. 20G)<br>Reset: 100 $m/s^2$ (approx. 10G) | |
| **Endurance** | Mechanical: 10,000,000 operations min (at 18,000 operations/hr)<br>Electrical: 100,000 operations min. (at 1,800 operations/hr under rated load) | |
| **Ambient temperature** | Operating: -40°C to 70°C (with no icing) | |
| **Ambient humidity** | Operating: 5% to 85% | |
| **Weight** | Approx. 17 g (Quick-connect type: approx. 20g) | |

**Note:** Values in the above table are the initial values.
*2,000 VAC, 50/60 Hz for 1 minute when the P2R-05A or P2R-08A socket is mounted.

## ■ Approved Standards

### UL 508 (File No. E41643), CSA 22.2 No.14 (File No. LR31928)

| Model | Contact form | Coil ratings | Contact ratings |
|---|---|---|---|
| G2R-1<br>G2R-14<br>G2R-1-H<br>G2R-1-S<br>G2R-1-T | SPDT | 3 to 110 VDC<br>3 to 240 VAC | 10 A, 30 VDC (resistive)<br>10 A, 250 VAC (general use)<br>TV-3 (NO contact only) |
| G2R-1A<br>G2R-1A4<br>G2R-1A-H<br>G2R-1A-S<br>G2R-1A-T | SPST-NO | | |
| G2R-1-E | SPDT | | 16 A, 30 VDC (resistive, NO contact only)<br>16 A, 250 VAC (general use, NO contact only)<br>TV-3 (NO contact only); (1/3 hp, 120 VAC For UL) |
| G2R-1A-E | SPST-NO | | |
| G2R-2<br>G2R-24<br>G2R-2-H<br>G2R-2-S | DPDT | | 5 A, 30 VDC (resistive)<br>5 A, 250 VAC (general use)<br>TV-3 (NO contact only) |
| G2R-2A<br>G2R-2A4<br>G2R-2A-H<br>G2R-2A-S | DPST-NO | | |
| G2R-1A-ASI | SPST-NO | | 10 A, 30 VDC (resistive)<br>10 A, 250 VAC (general use)<br>TV-5/TV-8 (NO contact only), (For UL)<br>TV-8 (NO contact only); 1/4 hp, 125 VAC (For CSA) |

## SEV

| Contact form | Coil ratings | Contact ratings |
|---|---|---|
| 1 pole | 3 to 110 VDC<br>3 to 240 VAC | 16 A, 250 VAC1 (AgSnIn contact)<br>16 A, 30 VDC1 (AgSnIn contact)<br>10 A, 250 VAC1<br>5 A, 250 VAC3<br>10 A, 30 VDC1 |
| 2 poles | | 5 A, 250 VAC1<br>2 A, 380 VAC1<br>5 A, 30 VDC1 |

## SEMKO

| Contact form | Coil ratings | Contact ratings |
|---|---|---|
| 1 pole | 3 to 110 VDC<br>3 to 240 VAC | 10/80 A, 250 VAC<br>3/100 A, 250 VAC<br>16/128 A, 250 VAC (AgSnIn contact) |
| 2 poles | | 5/40 A, 250 VAC |

## TÜV (EN61810-1)

| Contact form | Coil ratings | Contact ratings |
|---|---|---|
| 1 pole | 3 to 110 VDC, 6 VAC to 240 VAC<br>(for Standard coil)<br>3 to 48 VDC (for K, U coil)<br>3 to 70 VDC (for H coil) | 10 A, 250 VAC ($\cos\varphi$ = 1.0)<br>10 A, 30 VDC (0 ms)<br>16 A, 250 VAC ($\cos\varphi$ = 1.0)<br>(AgSnIn contact) |
| 2 poles | | 8 A, 250 VAC ($\cos\varphi$ = 0.4)<br>5 A, 250 VAC ($\cos\varphi$ =1.0)<br>5 A, 30 VDC (0 ms)<br>2.5 A, 250 VAC ($\cos\varphi$ = 0.4) |

## EN 61810-1 (VDE)

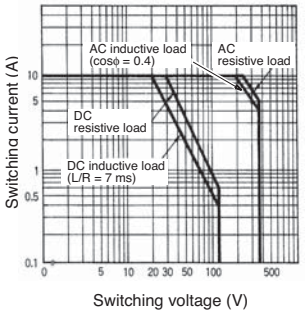
| Contact form | Coil ratings | Contact ratings |
|---|---|---|
| 1 pole | 5, 6, 9, 12, 18, 24, 48, 60, 100, 110 VDC<br>12, 18, 24, 48, 50, 100/(110), 110, 120,<br>200/(220), 220, 230, 240 VAC | 10 A, 250 VAC ($\cos\varphi$ = 1.0)<br>10 A, 30 VDC (0 ms)<br>16 A, 250 VAC ($\cos\varphi$ = 1.0) |
| 2 poles | 5, 6, 9, 12, 18, 24, 48, 60, 100, 110 VDC<br>12, 18, 24, 48, 50, 100/(110), 110, 120,<br>200/(220), 220, 230, 240 VAC | 5 A, 250 VAC ($\cos\varphi$ =1.0)<br>5 A, 30 VDC (0 ms) |

# Engineering Data

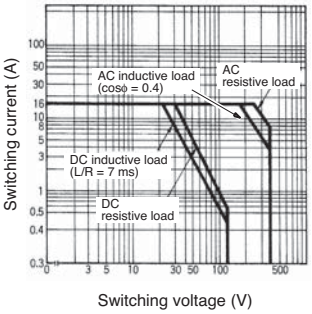
## Maximum Switching Power

### Flux Protection/Plug-in Relays

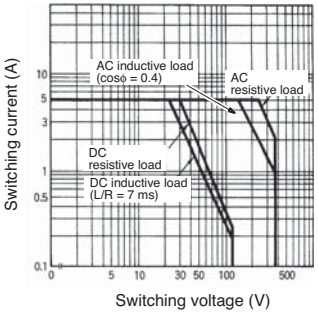
**G2R-1, G2R-1A, G2R-1-T, G2R-1A-T**



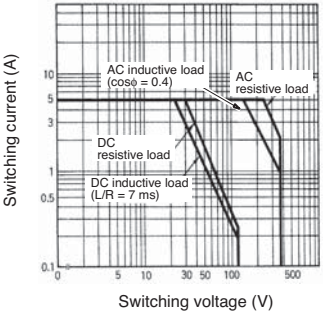

**G2R-1-E, G2R-1A-E**



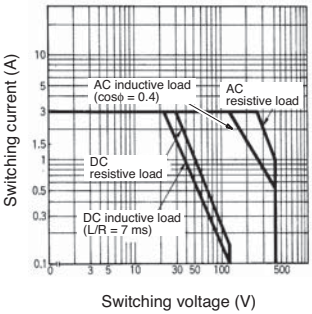

**G2R-1Z, G2R-1AZ**



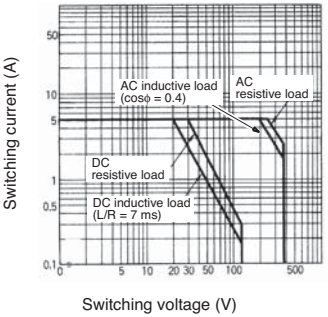

**G2R-1-H, G2R-1A-H, G2R-2, G2R-2A**



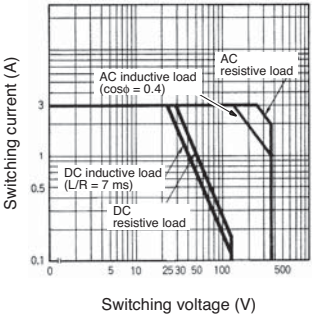

**G2R-2-H, G2R-2A-H**




**G2RK-1A, G2RK-1**

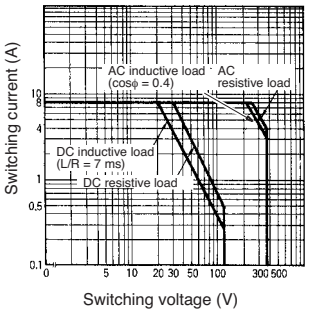



**G2RK-2A, G2RK-2**

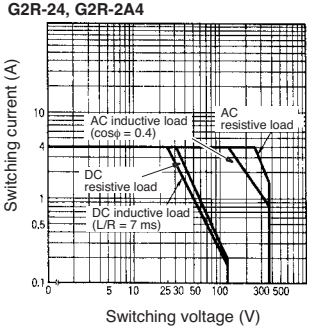


### Fully Sealed Relays

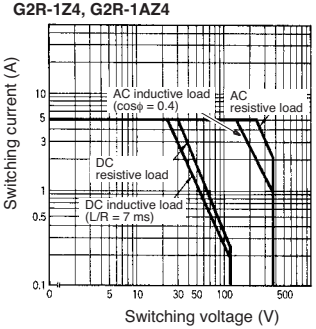
**G2R-14, G2R-1A4**




**G2R-24, G2R-2A4**



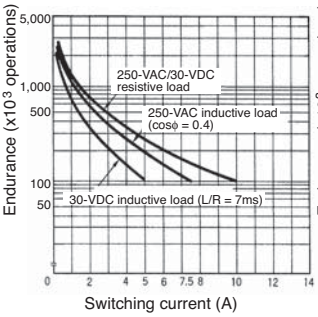

**G2R-1Z4, G2R-1AZ4**



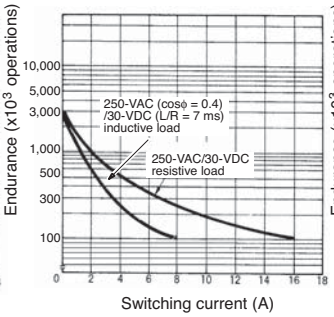

## Endurance

### Flux Protection/Plug-in Relays

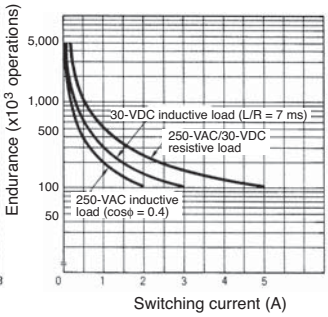
**G2R-1, G2R-1A, G2R-1-T, G2R-1A-T**



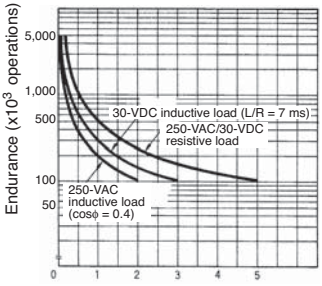

**G2R-1-E, G2R-1A-E**



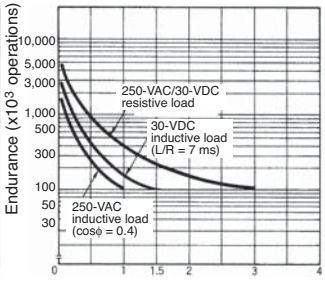

**G2R-1Z, G2R-1AZ**




**G2R-1-H, G2R-1A-H, G2R-2**
**G2R-2A**

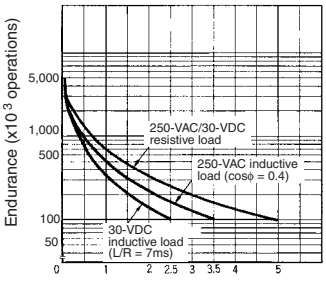



**G2R-2-H, G2R-2A-H**

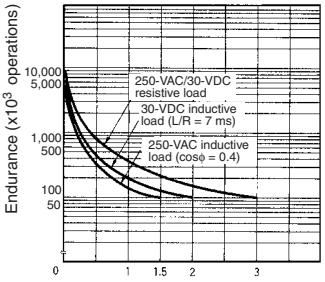


# Engineering Data (cont.)

**G2RK-1A, G2RK-1**

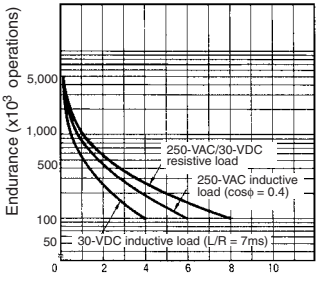



**G2RK-2A, G2RK-2**

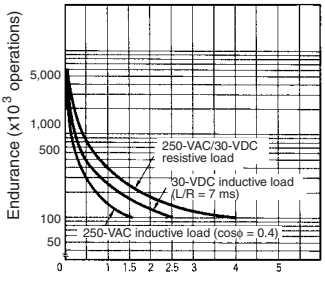



**Fully sealed Relays**

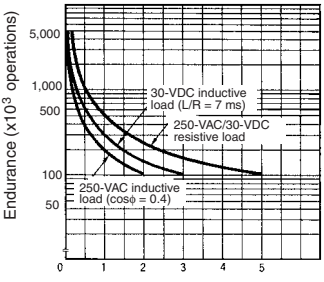
**G2R-14, G2R-1A4**



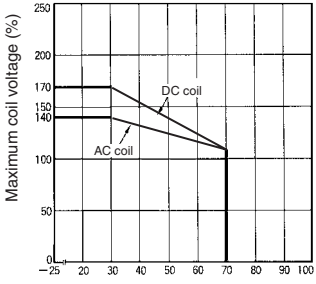

**G2R-24, G2R-2A4**




**G2R-1Z4, G2R-1AZ4**




**Ambient Temperature vs Maximum Coil Voltage**




**Note:** The maximum coil voltage refers to the maximum value in a varying range of operating power voltage, not a continuous voltage.

# Dimensions

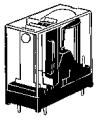
**Note: 1.** All units are in millimetres unless otherwise indicated.

**2.** Orientation marks are indicated as follows:

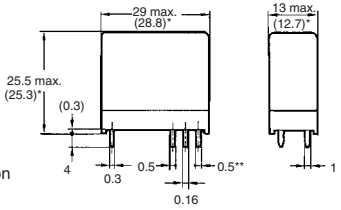
## Relays with PCB Terminals

### SPDT Relays

**G2R-1, G2R-1Z, G2R-1-H**

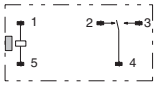


The illustration shows the G2R-1.



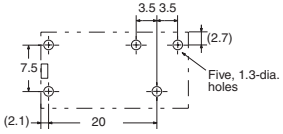

*Average value
**0.3 (-H Type)

**Terminal Arrangement/ Internal Connections (Bottom View)**




**Mounting Holes (Bottom View)**

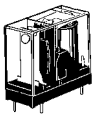
Tolerance: ±0.1



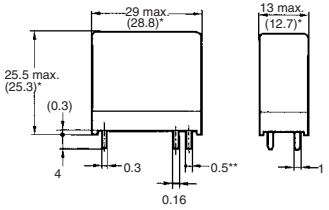

(No coil polarity)

### SPST-NO Relays

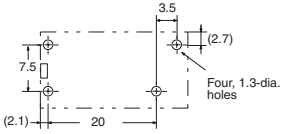
**G2R-1A, G2R-1AZ, G2R-1A-H**



The illustration shows the G2R-1A.



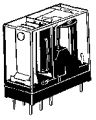

*Average value
**0.3 (-H Type)

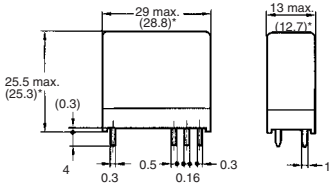




(No coil polarity)

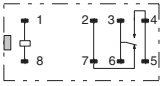
### SPDT/High-capacity Relays

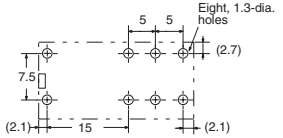
**G2R-1-E**






*Average value

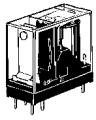


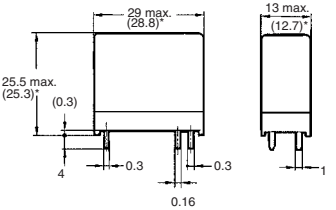




(No coil polarity)

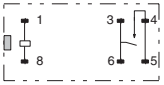
### SPST-NO/High-capacity Relays

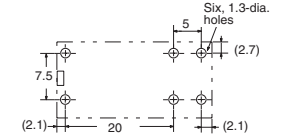
**G2R-1A-E**






*Average value

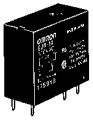


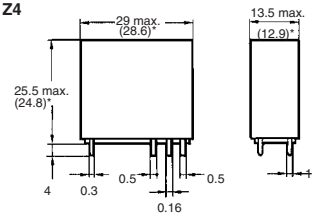




(No coil polarity)

## Relays with PCB Terminals

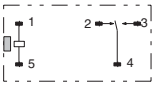
### SPDT Relays
**G2R-14, G2R-1Z4**





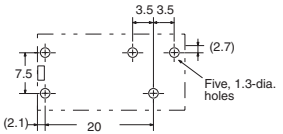

*Average value

**Terminal Arrangement/ Internal Connections (Bottom View)**



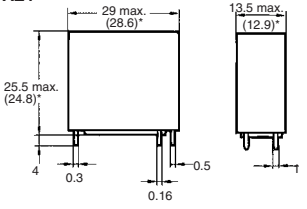

**Mounting Holes (Bottom View)**

Tolerance: ±0.1

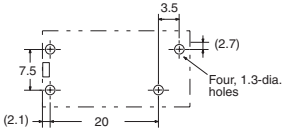



(No coil polarity)

### SPST-NO Relays
**G2R-1A4, G2R-1AZ4**



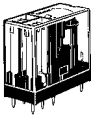

*Average value

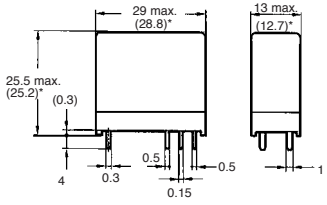




(No coil polarity)

## Relays with PCB Terminals

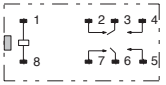
### DPDT Relays
**G2R-2, G2R-2-H**





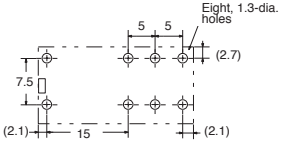

*Average value

**Terminal Arrangement/ Internal Connections (Bottom View)**



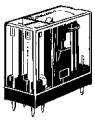

**Mounting Holes (Bottom View)**

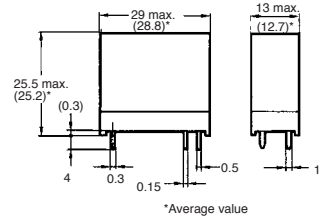
Tolerance: ±0.1



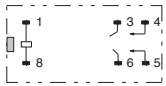

(No coil polarity)

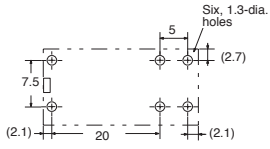
### DPST-NO Relays
**G2R-2A, G2R-2A-H**





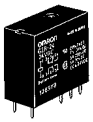

*Average value

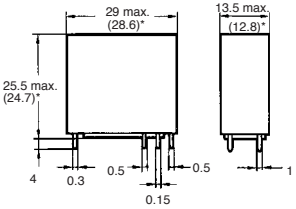


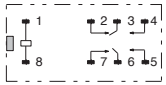

(No coil polarity)

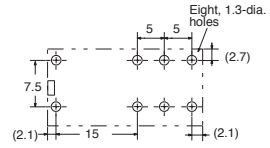
### DPDT Relays
**G2R-24**





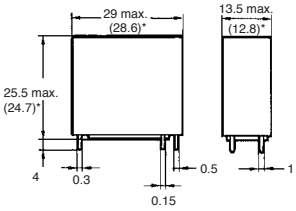

*Average value



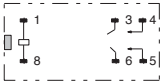



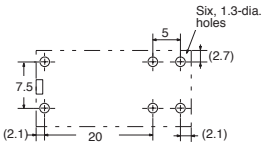

(No coil polarity)

### DPST-NO Relays
**G2R-2A4**




*Average value

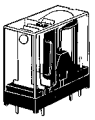


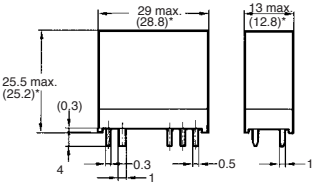




(No coil polarity)

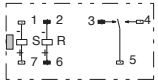
## Double-winding Latching Relays with PCB Terminals

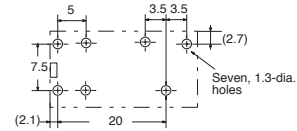
### SPDT Relays
**G2RK-1**






*Average value

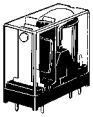


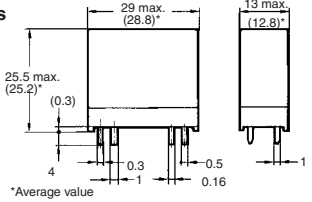




(After confirming coil polarity, wire correctly.)

## Double-winding Latching Relays with PCB Terminals

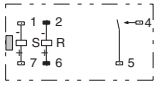
### SPST-NO Relays
**G2RK-1A**





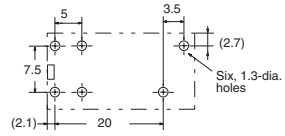

*Average value

**Terminal Arrangement/ Internal Connections (Bottom View)**



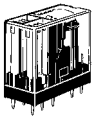

**Mounting Holes (Bottom View)**

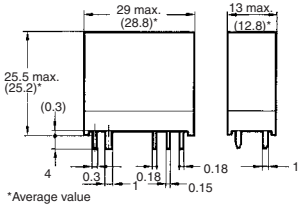
Tolerance: ±0.1



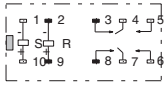

(After confirming coil polarity, wire correctly.)

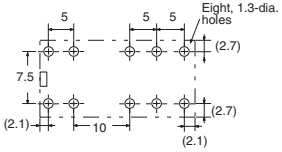
### DPDT Relays
**G2RK-2**





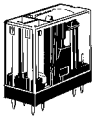

*Average value

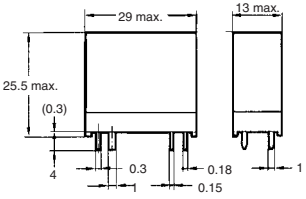


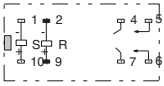



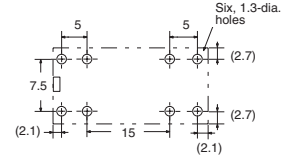

(After confirming coil polarity, wire correctly.)

### DPST-NO Relays
**G2RK-2A**





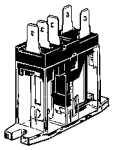



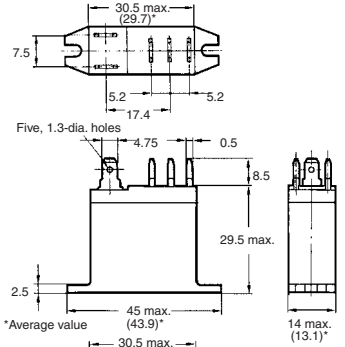




(After confirming coil polarity, wire correctly.)

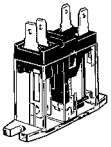
### Relays with Quick-connect Terminals

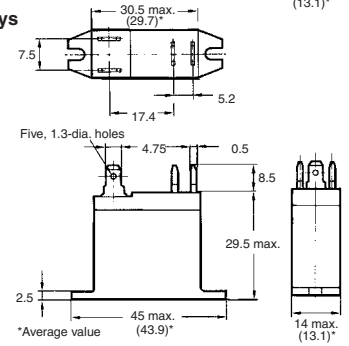
**SPDT Relays**
**G2R-1-T**



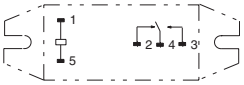



**SPST-NO Relays**
**G2R-1A-T**



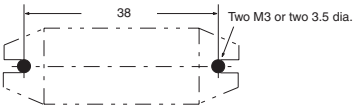



**Terminal Arrangement/Internal Connections (Bottom View)**

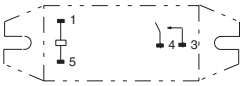



(No coil polarity)

**Mounting Holes (Bottom View)**
Tolerance: ±0.1

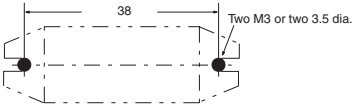



**Terminal Arrangement/Internal Connections (Bottom View)**




(No coil polarity)

**Mounting Holes (Bottom View)**

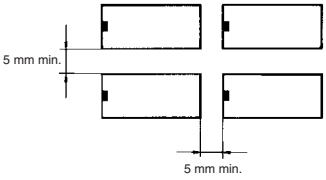



**Note:** Model number of quick-connect terminal is 187.

# Precautions

## ■ Mounting

When mounting a number of relays on a PCB, be sure to provide a minimum mounting space of 5 mm between the two juxtaposed relays as shown below.




The above minimum mounting space is necessary due to mutual thermal interference generated by the relays. This restriction may be ignored, however, depending on the operating conditions of the relays. Consult OMRON for details.

There is no restriction on the mounting direction of each relay on the PCB.

When using this circuit, confirm the set and reset states and then take into account the circuit constant.

## Next-generation PCB Relay Available in Various Models

- ROHS compliant.
- High sensitivity: (250mW) and high capacity (16A) models available
- Low profile: 15.7 mm max. in height.
- Conforms to EN 61810-1, UL508 and CSA22.2.
- Meets VDE0700 requirements for household products according to VDE0110.
- Clearance and creepage distance: 8mm/8mm.
- Tracking distance: CTI>250 (Both standard and class F type).
- UL 1446 Class F Coil Insulation system available.
- High sensitivity: 400 mW

- 5mm and 7mm terminal pitch models available (contact Omron)

## Ordering Information

| Classification | Enclosure ratings | Contact form | | | |
|---|---|---|---|---|---|
| | | SPST-NO | SPDT | DPST-NO | DPDT |
| General-purpose | Flux protection | G2RL-1A | G2RL-1 | G2RL-2A | G2RL-2 |
| | Fully sealed | G2RL-1A4 | G2RL-14 | G2RL-2A4 | G2RL-24 |
| High-capacity | Flux protection | G2RL-1A-E | G2RL-1-E | --- | --- |
| | Fully sealed | G2RL-1A4-E | G2RL-14-E | --- | --- |
| High-sensitivity | Flux protection | G2RL-1A-H | G2RL-1-H | --- | --- |

**Note:** When ordering, add the rated coil voltage to the model number.
Example: G2RL-1A 12 VDC
Rated coil voltage

**Model Number Legend**

**G2RL-□□□-□-□**
1 2 3 4 5

1. **Number of Poles**
   1: 1 pole
   2: 2 poles
2. **Contact Form**
   None: □PDT
   A: □PST-NO
3. **Enclosure Ratings**
   None: Flux protection
   4: Fully sealed
4. **Classification**
   None: General purpose
   E: High capacity (1 pole)
5. **Approved Standards**
   None: UL, CSA, VDE, UL Class B Insulation
   CF: UL, CSA, VDE, UL Class F Insulation

## Specifications

### ■ Coil Ratings (for General Purpose and high capacity models)

| Rated voltage | 5 VDC | 12 VDC | 24 VDC | 48 VDC |
|---|---|---|---|---|
| Rated current | 80.0 mA | 33.3 mA | 16.7 mA | 8.96 mA |
| Coil resistance | 62.5 Ω | 360 Ω | 1,440 Ω | 5,358 Ω |
| Must operate voltage | 70% max. of the rated voltage | | | |
| Must release voltage | 10% min. of the rated voltage | | | |
| Max. voltage | 180% at 85°C of the rated voltage (at 23°C | | | |
| Power consumption | Approx. 400 mW | | | Approx. 430 mW |

**Note:** The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.

## Next-generation PCB Relay Available in Various Models

- ROHS compliant.
- High sensitivity: (250mW) and high capacity (16A) models available
- Low profile: 15.7 mm max. in height.
- Conforms to EN 61810-1, UL508 and CSA22.2.
- Meets VDE0700 requirements for household products according to VDE0110.
- Clearance and creepage distance: 8mm/8mm.
- Tracking distance: CTI>250 (Both standard and class F type).
- UL 1446 Class F Coil Insulation system available.
- High sensitivity: 400 mW

- 5mm and 7mm terminal pitch models available (contact Omron)

## Ordering Information

| Classification | Enclosure ratings | Contact form | | | |
|---|---|---|---|---|---|
| | | SPST-NO | SPDT | DPST-NO | DPDT |
| General-purpose | Flux protection | G2RL-1A | G2RL-1 | G2RL-2A | G2RL-2 |
| | Fully sealed | G2RL-1A4 | G2RL-14 | G2RL-2A4 | G2RL-24 |
| High-capacity | Flux protection | G2RL-1A-E | G2RL-1-E | --- | --- |
| | Fully sealed | G2RL-1A4-E | G2RL-14-E | --- | --- |
| High-sensitivity | Flux protection | G2RL-1A-H | G2RL-1-H | --- | --- |

**Note:** When ordering, add the rated coil voltage to the model number.
Example: G2RL-1A 12 VDC
Rated coil voltage

**Model Number Legend**

**G2RL-□□□-□-□**
1 2 3 4 5

1. **Number of Poles**
   1: 1 pole
   2: 2 poles
2. **Contact Form**
   None: □PDT
   A: □PST-NO
3. **Enclosure Ratings**
   None: Flux protection
   4: Fully sealed
4. **Classification**
   None: General purpose
   E: High capacity (1 pole)
5. **Approved Standards**
   None: UL, CSA, VDE, UL Class B Insulation
   CF: UL, CSA, VDE, UL Class F Insulation

## Specifications

### ■ Coil Ratings (for General Purpose and high capacity models)

| Rated voltage | 5 VDC | 12 VDC | 24 VDC | 48 VDC |
|---|---|---|---|---|
| Rated current | 80.0 mA | 33.3 mA | 16.7 mA | 8.96 mA |
| Coil resistance | 62.5 Ω | 360 Ω | 1,440 Ω | 5,358 Ω |
| Must operate voltage | 70% max. of the rated voltage | | | |
| Must release voltage | 10% min. of the rated voltage | | | |
| Max. voltage | 180% at 85°C of the rated voltage (at 23°C | | | |
| Power consumption | Approx. 400 mW | | | Approx. 430 mW |

**Note:** The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.

## ■ Coils Ratings for High-sensitivity Models

| | | | |
|---|---|---|---|
| **Rated voltage** | 5 VDC | 12 VDC | 24 VDC |
| **Rated current** | 50.0 mA | 20.8 mA | 10.42 mA |
| **Coil resistance** | 100 Ω | 576 Ω | 2,304Ω |
| **Must operate voltage** | 70% max. of the rated voltage | | |
| **Must release voltage** | 10% min. of the rated voltage | | |
| **Max. voltage** | 180% of rated voltage (at 23°C) | | |
| **Power consumption** | Approx. 250 mW | | |

**Note:** The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.

## ■ Contact Ratings

| Item | General-purpose Models | | High-capacity Models | High-sensitivity Models |
|---|---|---|---|---|
| **Number of poles** | 1 pole | 2 poles | 1 pole | 1 pole |
| **Contact material** | Ag Alloy (Cd free) | | | |
| **Load** | Resistive load (cosϕ=1) | | | |
| **Rated load** | 12 A at 250 VAC<br>12 A at 24 VDC<br>(See note.) | 8 A at 250 VAC<br>8 A at 30 VDC<br>(See note.) | 16 A at 250 VAC<br>16 A at 30 VDC<br>(See note.) | 10 A at 250 VAC<br>10 A at 24 VDC<br>(See note.) |
| **Rated carry current** | 12 A (See note.) | 8 A (70°C)/5 A (85°C)<br>(See note.) | 16 A (See note.) | 10 A (See note.) |
| **Max. switching voltage** | 440 VAC, 300 VDC | | | |
| **Max. switching current** | 12 A | 8 A | 16 A | 10 A |
| **Max. switching power** | 3,000 VA (4,000 VA) | 2,000 VA | 4,000 VA | 2,500 VA |

**Note:** Contact your OMRON representative for the ratings on fully sealed models.

## ■ Characteristics

| Item | General-purpose (High-capacity) Models | General-purpose Models | High-sensitivity Models |
|---|---|---|---|
| **Number of poles** | 1 pole | 2 pole | 1 pole |
| **Contact resistance** | 100 mΩ max. | | |
| **Operate (set) time** | 15 ms max. | | |
| **Release (reset) time** | 5 ms max. | | |
| **Max. operating frequency** | Mechanical:18,000 operation/hr<br>Electrical:1,800 operation/hr at rated load | | |
| **Insulation resistance** | 1,000 MΩ min. (at 500 VDC) | | |
| **Dielectric strength** | 5,000 VAC, 1 min between coil and contacts<br>1,000 VAC, 1 min between contacts of same polarity | 5,000 VAC, 1 min between coil and contacts<br>2,500 VAC, 1 min between contacts of different polarity<br>1,000 VAC, 1 min between contacts of same polarity | 5,000 VAC, 1 min between coil and contacts<br>1,000 VAC, 1 min between contacts of same polarity |
| **Impulse withstand voltage** | 10 kV (1.2x50 μs) between coil and contact | | |
| **Vibration resistance** | Destruction:10 to 55 to 10 Hz, 0.75 mm single amplitude (1.5 mm double amplitude)<br>Malfunction:10 to 55 to 10 Hz, 0.75 mm single amplitude (1.5 mm double amplitude) | | |
| **Shock resistance** | Destruction: 1,000 m/s² (approx. 100 G)<br>Malfunction: 100 m/s² (approx. 10 G) | | |
| **Endurance (Mechanical)** | 20,000,000 operations (at 18,000 operations/hr) | | |
| **Ambient temperature** | Operating: –40°C to 85°C (with no icing)<br>Storage: –40°C to 85°C (with no icing) | | |
| **Ambient humidity** | 5% to 85% | | |
| **Weight** | Approx. 12 g | | |

**Note:** Values in the above table are the initial values.

## ■ Approved Standards

### UL508 (File No. E41643)/CSA C22.2 (No. 14) (File No. LR31928)

| Model | Contact form | Coil ratings | Contact ratings |
|---|---|---|---|
| G2RL-1A | SPST-NO | 3 to 48 VDC | 12 A at 250 VAC (General use) |
| G2RL-1 | SPDT | | 12 A at 24 VDC (Resistive) |
| G2RL-1A-E | SPST-NO | | 16 A at 250 VAC (General use) |
| G2RL-1-E | SPDT | | 16 A at 24 VDC (Resistive) |
| G2RL-1A-H | SPST-NO | 5 to 24 VDC | 10 A at 250 VAC (General use) |
| G2RL-1-H | SPDT | | 10 A at 24 VDC (Resistive) |
| G2RL-2A | DPST-NO | 3 to 48 VDC | 8 A at 277 VAC (General use) |
| G2RL-2 | DPDT | | 8 A at 30 VDC (Resistive) |

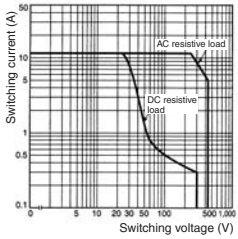
### VDE (EN61810-1) (License No. 119650)

| Model | Contact form | Coil ratings | Contact ratings |
|---|---|---|---|
| G2RL-1(A) | 1 pole | 5, 12, 18, 22, 24, 48 VDC | 12 A at 250 VAC (cosϕ=1)<br>12 A at 24 VDC (L/R=0 ms)<br>AC15: 3 A at 240 VAC<br>DC13: 2.5 A at 24 VDC, 50 ms |
| G2RL-1(A)-E | 1 pole (high capacity | 5, 12, 18, 22, 24, 48 VDC | 16 A at 250 VAC (cosϕ=1)<br>16 A at 24 VDC (L/R=0 ms)<br>AC15: 3 A at 240 VAC (NO)<br>1.5 A at 240 VAC (NC)<br>DC13: 2.5 A at 24 VDC (NO), 50 ms |
| G2RL-1(A)-H | 1 pole (high sensitivity) | 5, 9, 12, 24 VDC | 10 A at 250 VAC (cosϕ=1)<br>10 A at 24 VDC (L/R=0 ms) |
| G2RL-2(A) | 2 poles | 5, 12, 18, 22, 24, 48 VDC | 8 A at 250 VAC (cosϕ=1)<br>8 A at 24 VDC (L/R=0 ms)<br>AC15: 1.5 A at 240 VAC<br>DC13: 2 A at 30 VDC, 50 ms |

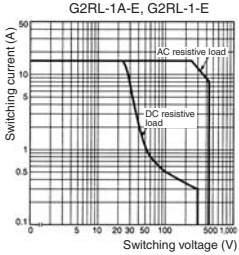
# Engineering Data

### Maximum Switching Capacity

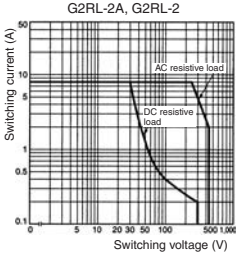
G2RL-1A, G2RL-1



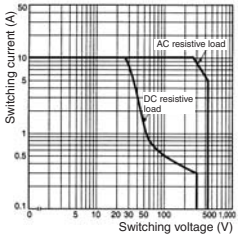

G2RL-1A-E, G2RL-1-E



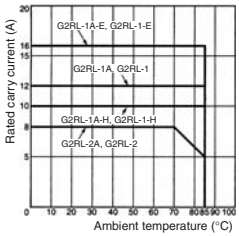

G2RL-2A, G2RL-2



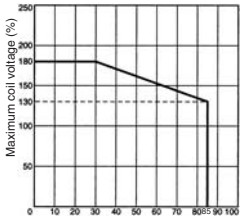

G2RL-1A-H, G2RL-1-H




### Ambient Temperature vs Rated Carry Current




### Ambient Temperature vs Maximum Coil Voltage




**Note:** The maximum coil voltage refers to the maximum value in a varying range of operating power voltage, not a continuous voltage.

**Note:** Contact your OMRON representative for the data on fully sealed models.

## Electrical Endurance Data

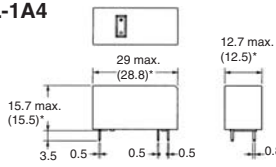
| | | |
|---|---|---|
| **G2RL-1-E** | 16 A at 250 VAC (cosϕ=1)<br>16 A at 24 VDC<br>8 A at 250 VAC (cosϕ=0.4)<br>8 A at 30 VDC (L/R=7 ms) | 30,000 operations min.<br>30,000 operations min.<br>200,000 operation min. (normally open side operation)<br>10,000 operation min. (normally open side operation) |
| **G2RL-1** | 12 A at 250 VAC (cosϕ=1)<br>12 A at 24 VDC<br>5 A at 250 VAC (cosϕ=0.4)<br>5 A at 30 VDC (L/R=7 ms) | 50,000 operations min.<br>30,000 operations min.<br>150,000 operation min. (normally open side operation)<br>20,000 operation min. (normally open side operation) |
| **G2RL-1-H** | 10 A at 250 VAC (cosϕ=1)<br>10 A at 24 VDC | 100,000 operations min.<br>50,000 operations min. |
| **G2RL-2** | 8 A at 250 VAC (cosϕ=1)<br>8 A at 30 VDC | 30,000 operations min.<br>30,000 operations min. |
| **G2RL-1A-E** | Pilot duty (A300), 250 VAC<br>Pilot duty (A300), 125 VAC | 250,000 operations min.<br>150,000 operations min. |

**Note:** The results shown reflect values measured using very severe test conditions i.e., Duty: 1 s ON/1 s OFF. Electrical endurance will vary depending on the test conditions. Contact your OMRON representative if you require more detailed information for the electrical endurance under your test conditions.

## Dimensions

**Note:** All units are in millimetres unless otherwise indicated.

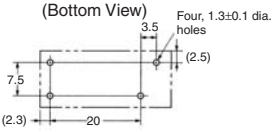
### G2RL-1A(-H), G2RL-1A4



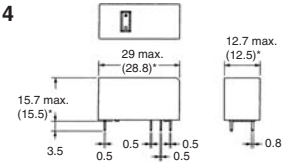

Terminal Arrangement/ Internal Connection (Bottom View)


* Indicates average dimensions.

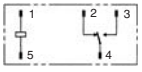
Mounting Holes (Bottom View)




### G2RL-1(-H), G2RL-14

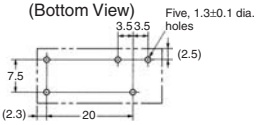



Terminal Arrangement/ Internal Connection (Bottom View)

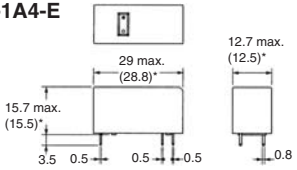



* Indicates average dimensions.

Mounting Holes (Bottom View)



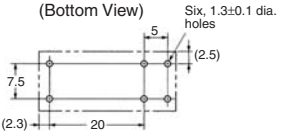

### G2RL-1A-E, G2RL-1A4-E



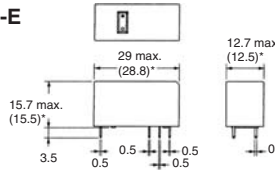

Terminal Arrangement/ Internal Connection (Bottom View)


* Indicates average dimensions.

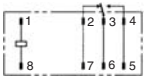
Mounting Holes (Bottom View)




### G2RL-1-E, G2RL-14-E

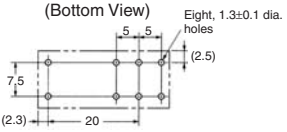



Terminal Arrangement/ Internal Connection (Bottom View)

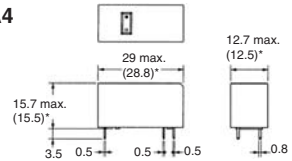



* Indicates average dimensions.

Mounting Holes (Bottom View)



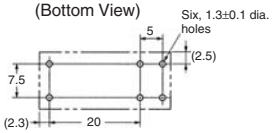
### G2RL-2A, G2RL-2A4



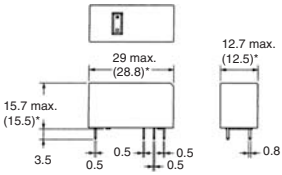

Terminal Arrangement/
Internal Connection
(Bottom View)


* Indicates average dimensions.

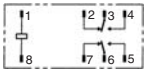
Mounting Holes
(Bottom View)




### G2RL-2, G2RL-24

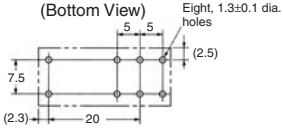



Terminal Arrangement/
Internal Connection
(Bottom View)




* Indicates average dimensions.

Mounting Holes
(Bottom View)




# Precautions

## Basic Information

Before actually committing any component to a mass-production situation, OMRON strongly recommends situational testing, in as close to actual production situations as possible. One reason is to confirm that the product will still perform as expected after surviving the many handling and mounting processes involved in mass production. Also, even though OMRON relays are individually tested a number of times, and each meets strict requirements, a certain testing tolerance is permissible. When a high-precision product uses many components, each depends upon the rated performance thresholds of the other components. Thus, the overall performance tolerance may accumulate into undesirable levels. To avoid problems, always conduct tests under the actual application conditions.

### General

To maintain the initial characteristics of a relay, exercise care that it is not dropped or mishandled. For the same reason, do not remove the case of the relay; otherwise, the characteristics may degrade. Avoid using the relay in an atmosphere containing sulfuric acid ($SO_2$), hydrogen sulfide ($H_2S$), or other corrosive gases. Do not continuously apply a voltage higher than the rated maximum voltage to the relay. Never try to operate the relay at a voltage and a current other than those rated.
Do not use the relay at temperatures higher than that specified in the catalog or data sheet.



CAT. No. J117-E2-04-X

## A Single-pole 16A Power Relay AC-coil Type

- ROHS compliant
- L 29.0 x W 12.7 x H 15.7 (mm) Low profile: 15.7mm in height.
- Standards class F insulation available.
- Clearance and creepage distance between coil and contact: 8mm / 8mm, between the same pole 3mm / 4mm.
- Inrush peak currents up to 100A (DC models only)



RCX

## Ordering Information

| Classification | | Enclosure Ratings | Special Function | Coil Ratings | Contact form | |
|---|---|---|---|---|---|---|
| | | | | | SPST-NO | SPDT |
| Class F | High capacity | Flux protection | - | AC Coil | - | G5RL-1-E |
| | | | High inrush | DC Coil | G5RL-1A-E-HR | G5RL-1-E-HR |

**Note:** When ordering, add the rated coil voltage to the number.
Example: G5RL-1-E-HR 12 VDC
G5RL-1-E 100 VAC
Rated coil voltage

**Model Number Legend**

**G5RL – □ □ □ – □ □ VAC**
**1 2 3 4 5**

1. **Number of Poles**
   1: 1 pole
2. **Contact Form / Contact Construction**
   None: SPDT
   A: SPST-NO
3. **Classification**
   E: High-capacity
4. **Special Function**
   HR: High inrush (DC models only)
5. **Rated Coil Voltage**
   Refer to 'coil ratings'

## Specifications

### ■ Coil Ratings

| Rated voltage | 24 VAC | 100 VAC | 115 VAC / 120 VAC | | 200 VAC | 230 VAC / 240 VAC | |
|---|---|---|---|---|---|---|---|
| Rated current 50Hz (mA) | 31.30 | 7.50 | 5.85 | 6.25 | 3.75 | 3.00 | 3.13 |
| Rated current 60Hz (mA) | 28.30 | 6.88 | 5.35 | 5.70 | 3.45 | 2.76 | 2.88 |
| Coil resistance Ω | 443 | 8220 | 11600 | | 33000 | 47600 | |
| Must operate voltage | 75% max. of rated voltage | | | | | | |
| Must release voltage | 15% min. of rated voltage | | | | | | |
| Max. voltage | 90% ~ 110% of rated voltage | | | | | | |
| Power consumption | Approx. 0.75 VA | | | | | | |

**Note: 1.** The above items are measured at a coil temperature of 23.
**2.** The tolerance of rated current is +15% / -20%.
**3.** Power consumption drop was measured at 50Hz.
**4.** Coil resistance is provided as reference values.

| Rated voltage (DC coil) | 5 VDC | 12 VDC | 24 VDC | 48 VDC |
|---|---|---|---|---|
| Rated current (mA) | 80.0 | 33.3 | 16.7 | 8.96 |
| Coil resistance (Ω) | 62.5 | 360 | 1,440 | 5,358 |
| Must operate voltage | 70% of rated voltage (max.) | | | |
| Must release voltage | 10% of rated voltage (min.) | | | |
| Max. voltage | 130% of rated voltage | | | |
| Power consumption | Approx. 400 mW | | | Approx. 430 mW |

**Note:** The above items are measured at a coil temperature of 23°C.
The tolerance of the rated current is ±10%.

## ■ Contact Ratings

| | |
|---|---|
| **Load** | Resistive load (cosϕ = 1) |
| **Rated load** | 16A at 250 VAC (NO), 16A at 24VDC (NO), 5A at 250 VAC (NC), 5A at 24VDC (NC) |
| **Contact material** | Ag Alloy (cd free) |
| **Rated carry current** | 16A (N.O.), 5A (N.C.) |
| **Max. switching voltage** | 250VAC, 24 VDC |
| **Max. switching current** | 16A (N.O.), 5A (N.C.) |
| **Max. switching capacity** | AC 4000 VA (N.O.), AC 1250 VA (N.C.), DC384 W(N.O.), DC120 W (N.C.) |
| **Min. permisable load** | 40mA at 24 VDC |

**Note:** P level: $\lambda 60 = 0.1 \times 10^{-6}$ operations

## ■ Approved Standards

### UL 508 (File No. E41643 Vol.4 Sec.38) / CSA C22.2 No.1,C22.2 No.14 (Certificate No:1419093)

| Model | Coil ratings | Contact ratings |
|---|---|---|
| G5RL-1(A)-E-HR | 5 to 48 VDC | 16 A, 250 VAC General, 50,000 c - NO<br>TV-5, 25,000 c - NO<br>A 300 Pilot Duty, 720 VA, 240 VAC, 30,000 c- NO<br>½Hp, 120 VAC, 6,000 c - NO<br>60 LRA/ 10 FLA, 250 VAC, 6,000 c - NO<br>5 A, 250 VAC General, 50,000 c - NC<br>5 A, 24 VDC Resistive, 50,000 c - NC |
| G5RL-1-E | 24 to 240 VAC | |

### VDE DIN EN 61810-1 Edition 2 and EN60255-25 (Reg. No. A282)

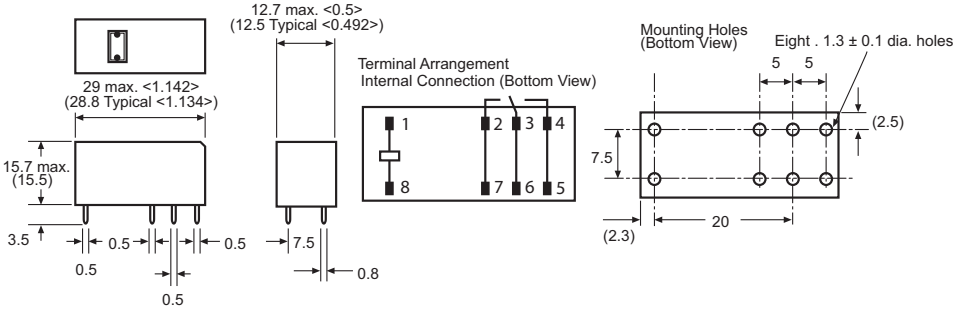
| Model | Coil ratings | Contact ratings |
|---|---|---|
| G5RL-1(A)-E-HR | 5, 12, 24, 48V | 16 A at 250 VAC cosϕ=1 15,000 operations - NO<br>240 VAC 100 A (0-P) Steady 10 A (rms) 50,000 operations - NO<br>240 VAC 50 A (0-P) Steady 5 A (rms) 10,000 operations - NO |
| G5RL-1-E | 24,100,115/120, 200, 230/240 VAC (50 Hz) | 16 A, 250 VAC 15,000 operations - NO |

## ■ Characteristics

| Item | | DC Coil | AC Coil |
|---|---|---|---|
| Contact resistance | | 100 m Ω max. | |
| Operate time | | 15 ms max. | 20 ms max. |
| Release time | | 5 ms max. | 20 ms max. |
| Max. switching frequency | | Mechanical: 18,000 operations/hr<br>Electrical: 1,800 operations/hr (under rated load) | |
| Insulation resistance | | 1,000MΩ min. (at 500VDC) | |
| Dielectric strength | | 1,000 VAC, 50/60 Hz for 1 min. between contacts of same polarity<br>6,000 VAC, 50/60 Hz for 1 min. between coil and contacts | |
| Insulation Distance | Creepage (Typ) | 8.0 mm | |
| | Clearance (Typ) | 8.0 mm | |
| Tracking Resistance (CTI) | | 250 V | |
| Impulse withstand voltage | | 10,000V between coil and contacts, 1.2 X 50 μsec | |
| Vibration resistance | | Destruction: 10 to 55 to 10Hz, 1.5 mm double amplitude<br>Malfunction: 10 to 55 to 10Hz, 1.5 mm double amplitude | |
| Shock resistance | | Destruction: 1,000 m/s$^2$ (approx. 100G)<br>Malfunction: 100 m/s$^2$ (approx. 10G) | |
| Life expectancy | | Mechanical: 10,000,000 operations min. (at 18,000 operations/hr)<br>Electrical: 50,000 operations min.<br>Resistive load 16A 250VAC N.O. at 1 sec on / 4 sec off)<br>Resistive load 16A 24VDC N.O. at 1 sec on / 4 sec off)<br>Resistive load 5A 250VAC N.C. at 1 sec on / 4 sec off)<br>Resistive load 5A 24VDC N.C. at 1 sec on / 4 sec off)<br>100,000 operations min.<br>Resistive load 12A 24VDC N.O. at 1 sec on / 4 sec off) | |
| Ambient temperature | | Operating: -40°C to 85°C (with no icing) | Operating: -40°C to 70°C (with no icing) |
| Ambient humidity | | Operating: 5% to 85% | |
| Weight Approx. | | 10 g | |

# Dimensions

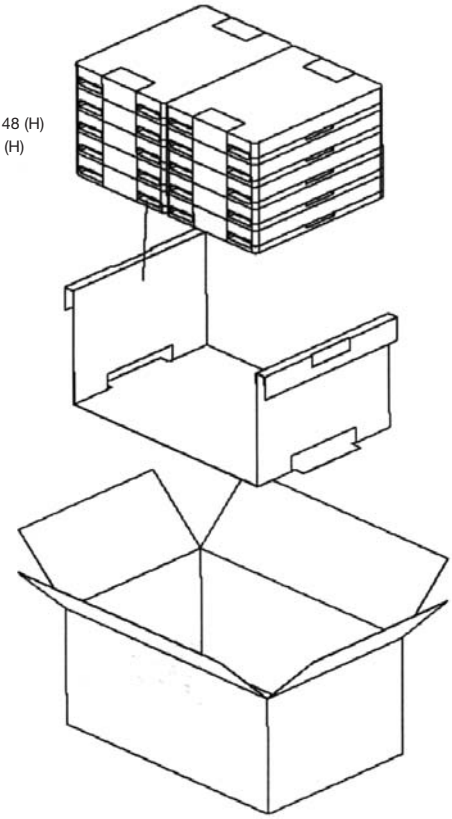
**Note:** All units are in millimetres unless otherwise indicated.



# Packaging

**Note:** All units are in millimetres unless otherwise indicated.

**Polystyrene Trays Packing**
1 Polystyrene: 100 pcs relay
1 Sleeve Packing: 5 polystyrene tray
1 Carton: 2 sleeve packing –1000 pcs relay
Weight: Approx. 12 Kg per carton
Size of polystyrene tray is approximately:340 (L) x 120 (W) x 48 (H)
Size of Carton box is approximately: 535 (L) x 355 (W) x 250 (H)



**ALL DIMENSIONS SHOWN ARE IN MILLIMETRES.**
To convert millimetres into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

## Impulse Withstand Voltage as High as 10 kV with 4kV Dielectric Strength: Ideal for Power Supply Switching

- ROHS compliant.
- Creepage distance of 8 mm min.
- Dielectric strength of 4,000 VAC min.
- SPST-NO types conform to TV-8 rating.
- DPST-NO types conform to TV-5 rating.
- International 2.54mm terminal pitch.

# Ordering Information

| Contacts | | SPST-NO | DPST-NO |
|---|---|---|---|
| **Mounting style** | **Terminals** | | |
| General purpose | PCB (straight) | G4W-1112P-US-TV8 | G4W-2212P-US-TV5 |

**Note:** When ordering, add the rated coil voltage to the model number.
Example: G4W-11123A-US-TV8 12 VDC
Rated coil voltage

**Model Number Legend**

**G4W -** □ □ □ □ - □ - □ - □ - □ **VDC**
**1 2 3 4 5 6 7 8**

1. **Contact Form**
   11: SPST-NO
   22: DPST-NO
2. **Contact Type**
   1: Single Button
3. **Enclosure Ratings**
   2: Unsealed
4. **Terminals**
   P: Straight PCB
5. **Approved Standards**
   US: UL, CSA certified
6. **TV Ratings**
   TV5: TV-5
   TV8: TV-8
7. **Special Function**
   None: General purpose
   Z: Full-wave rectifier
8. **Rated Coil Voltage**
   12, 24, 100 VDC

# Specifications

## ■ Coil Ratings

**Single-side Stable Type**

| | | | | |
|---|---|---|---|---|
| **Rated voltage** | | 12 VDC | 24 VDC | 100 VDC |
| **Rated current** | | 66.7 mA | 33.3 mA | 8 mA |
| **Coil resistance** | | 180 Ω | 720 Ω | 12,500 Ω |
| **Coil inductance (H) (ref. value)** | **Armature OFF** | 0.93 | 3.7 | 61.8 |
| | **Armature ON** | 1.65 | 6.4 | 106 |
| **Must operate voltage** | | 80% max. of rated voltage | | |
| **Must release voltage** | | 10% min. of rated voltage | | |
| **Max. voltage** | | 130% of rated voltage (at 23°C) | | |
| **Power consumption** | | Approx. 800 mW | | |

**Note: 1.** The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±15%.

**2.** Operating characteristics are measured at a coil temperature of 23°C.

## ■ Contact Ratings

| Item | SPST-NO | | DPST-NO | |
|---|---|---|---|---|
| **Load** | Resistive load ($\cos\varphi$ = 1) | Inductive load ($\cos\varphi$ = 0.4; L/R = 7 ms) | Resistive load ($\cos\varphi$ = 1) | Inductive load ($\cos\varphi$ = 0.4; L/R = 7 ms) |
| **Rated load** | 15A at 250 VAC; 15A at 24 VDC | 10A at 250 VAC; 7.5A at 24 VDC | 10A at 250 VAC; 10A at 24 VDC; | 7.5A at 250 VAC; 5A at 24 VDC |
| **Contact material** | AgSnIn | | | |
| **Rated carry current** | 15A | | 10A | |
| **Max. switching voltage** | 250 VAC, 125 VDC | | | |
| **Max. switching current** | 15A | | 10A | |
| **Max. switching power** | 3,750 VA, 375 W | 2,500 VA, 255 W | 2,500 VA, 240 W | 1,850 VA, 120 W |
| **Failure rate (reference value)** | 100 mA at 5 VDC | | | |

## ■ Characteristics

| | | |
|---|---|---|
| **Contact resistance** | | 30 mΩ max. |
| **Operate time** | | 20 ms max. (mean value: approx. 13 ms) |
| **Release time** | | 5 ms max. (mean value: approx. 2.5 ms) |
| **Bounce time** | | Operate: approx. 3 ms |
| **Max. Operating Frequency** | | Mechanical: 18,000 operations/hr<br>Electrical: 1,800 operations/hr (under rated load) |
| **Insulation resistance** | | 100 MΩ max. (at 500 VDC) |
| **Dielectric strength** | | 4,000 VAC, 50/60 Hz for 1 min between coil and contacts<br>2,000 VAC, 50/60 Hz for 1 min between contacts of different polarities (DPST-NO)<br>1,500 VAC, 50/60 Hz for 1 min between contacts of same polarity |
| **Insulation Distance** | **Creepage (Typ)** | 8.0 mm |
| | **Clearance (Typ)** | 8.0 mm |
| **Tracking Resistance (CTI)** | | 175 V |
| **Impulse withstand voltage** | | 10,000 V (1.2 x 50 μs) between coil and contacts |
| **Vibration resistance** | | Destruction: 10 to 55 to 10 Hz, 0.75mm single amplitude (1.5mm double amplitude)<br>Malfunction: 10 to 55 to 10 Hz, 0.75mm single amplitude (1.5mm double amplitude) |
| **Shock resistance** | | Destruction: 1,000 $m/s^2$<br>Malfunction: 150 $m/s^2$ |
| **Endurance** | | Mechanical: 5,000,000 operations min. (at 18,000 operations/hr)<br>Electrical: 100,000 operations min. (at 1,800 operations/hr) |
| **Ambient temperature** | | Operating: -25°C to 55°C (with no icing) |
| **Ambient humidity** | | Operating: 5% to 85% RH |
| **Weight** | | Approx. 29 g |

## ■ Approved Standards

### UL508 (File No. E41643)/CSA C22.2 No.14 (File No.LR31928)

| Model | Contact Form | Coil ratings | Contact ratings |
|---|---|---|---|
| G4W-1112P-US-TV8 | SPST-NO | 6 to 120 VDC | 15 A, 250 VAC (general use)<br>15 A, 24 VDC<br>TV-8<br>1/2 hp, 125 VAC<br>1 hp, 250 VAC<br>3/4 hp, 240 VAC |
| G4W-2212P-US-TV5 | DPST-NO | | 15 A, 250 VAC (general use)<br>10 A, 250 VAC (general use)<br>15 A, 24 VDC<br>TV-5<br>1/2 hp, 250 VAC<br>1/3 hp, 125/250 VAC |

### SEMKO (File No. 204772)

| Contact form | Coil ratings | Contact ratings |
|---|---|---|
| SPST-NO | 6-100 VDC | 15/120 A, 250 VAC |
| DPST | 6-120 VDC | 10/80 A, 250 VAC |

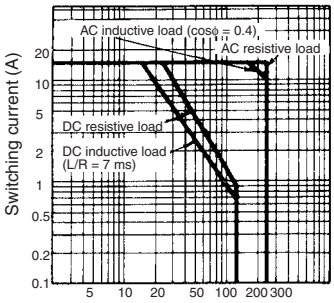
### EN 61810-1 (VDE0435 (File No. 1907)

| Contact form | Coil ratings | Contact ratings |
|---|---|---|
| SPST-NO | 6, 12, 24, 48, 100 VDC | 15 A, 250 VAC ($\cos\varphi$ = 1.0)<br>10 A, 250 VAC ($\cos\varphi$ = 0.4)<br>15 A, 24 VDC (0 ms)<br>7.5 A, 24 VDC (40 ms) |
| DPST-NO | | 10 A, 250 VAC ($\cos\varphi$ = 1.0)<br>7.5 A, 250 VAC ($\cos\varphi$ = 0.4)<br>10 A, 24 VDC (0 ms)<br>5 A, 24 VDC (40 ms) |

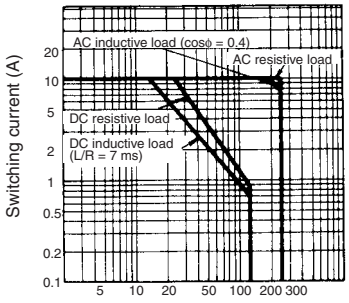
# Engineering Data

**Maximum Switching Power**

**G4W-1112P-US-TV8/-11123A-US-TV8/-11123T-US-TV8**

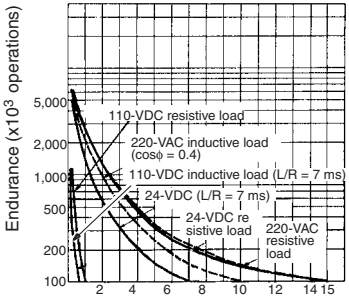



**G4W-2212P-US-TV5/-22123A-US-TV5/-22123T-US-TV5**

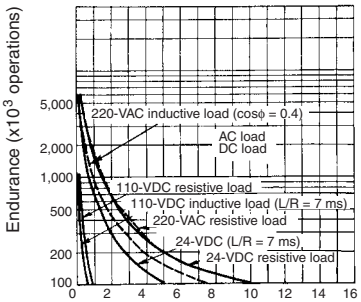



**Endurance**

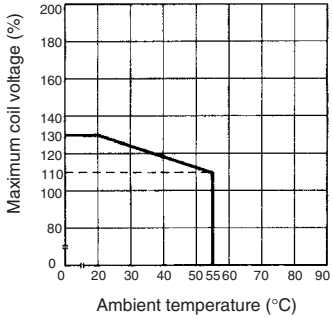
**G4W-1112P-US-TV8/-11123A-US-TV8/-1123T-US-TV8**




**G4W-2212P-US-TV5/-22123A-US-TV5/-22123T-US-TV5**



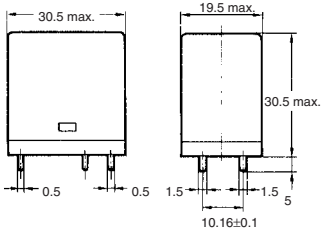

**Ambient Temperature vs. Maximum Coil Voltage**



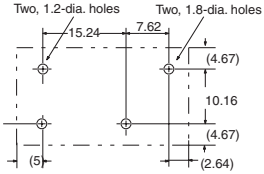

**Note:** The maximum coil voltage refers to the maximum value in a varying range of operating power voltage, not a continuous voltage.

# Dimensions

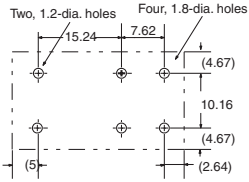
**G4W-@12P-US-TV**



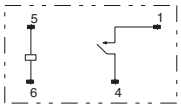

**Mounting Holes (Bottom View)**
**G4W-1112P-US-TV-8**

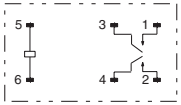



**G4W-2212P-US-TV-5**




**Terminal Arrangement/Internal Connections (Bottom View)**



## Compact, Low-cost 30-A Power Relay for PC Board or Panel-mounted Applications

- ROHS compliant.
- Compact, yet capable of switching up to 30-A loads.
- Complies with UL873 and UL508 column A spacings (⅛" through air, ¼" over surface).
- UL Class F insulation standard.
- Withstands of up to 6,000 V under 1.250 μs impulse wave or ring wave.
- A selection of contact forms: SPDT and SPST-NO.
- Quick-connect terminals versions ideal for PC board and panel mounting.
- Flanged mounting available.
- Ideal for home and industrial appliances, HVAC (heating, ventilating, and air conditioning), and many other applications.

## Ordering Information

| Classification | | Contact Form | Enclosure Rating | | |
|---|---|---|---|---|---|
| Mounting style | Terminals | | Opem | Unsealed | Fully Sealed |
| PCB mounting | PCB | SPST-NO | G8P-1AP | G8P-1A2P | G8P-1A4P |
| | | SPDT | G8P-1CP | G8P-1C2P | G8P-1C4P |
| | | SPST-NO | G8P-1ATP | G8P-1A2TP | G8P-1A4TP |
| | | SPDT | G8P-1CTP | G8P-1C2TP | G8P-1C4TP |
| Flanged mounting | Quick-connect | SPST-NO | – | G8P-1A2T-F | – |
| | | SPDT | – | G8P-1C2T-F | – |

**Note: 1.** The contacts described above are AgCdO.

**2.** When ordering, add the rated coil voltage to the model number
Example: G8P-1AP 12 VDC

Rated coil voltage

**Model Number Legend**

**G8P -** □ □ □ □ **-** □ □ **VDC**

1 2 3 4 5 6

**1. Number of Poles**
1: 1 pole

**2. Contact Form**
A: SPST-NO
C: SPDT

**3. Enclosure Ratings**
None: Open
2: Unsealed
4: Fully-Sealed

**4. Terminals**
P: Straight PCB for contacts and coil
T: Quick-connect (#250 terminals for contacts and #187 terminals for coil)
TP: Quick-connect (#250 terminals) and straight PCB for contacts, and straight PCB for coil

**5. Mounting**
None: PCB mounting
F: Flanged mounting

**6. Rated Coil Voltage**
5, 9, 12, 24, 48, 110
Other rated coil voltages available.

# Specifications

## ■ Coil Ratings

| Rated voltage | 5 VDC | 9 VDC | 12 VDC | 24 VDC | 48 VDC | 110 VDC |
|---|---|---|---|---|---|---|
| Rated current | 185 mA | 93 mA | 77 mA | 36 mA | 19 mA | 9 mA |
| Coil resistance | 27 Ω | 97 Ω | 155 Ω | 660 Ω | 2,480 Ω | 12,400 Ω |
| Must operate voltage | 75% max. of rated voltage | | | | | |
| Must release voltage | 10% min. of rated voltage | | | | | |
| Max. voltage | 120% of rated voltage | | | | | |
| Power consumption | Approx. 900 mW | | | | | |

**Note:** The rated current and coil resistance are measured at a coil temperature of 23°C with tolerances of ±10%.

## ■ Contact Ratings

| Item | SPST-NO | SPDT |
|---|---|---|
| Load | Resistive load (cosφ = 1) | |
| Rated load | 30 A at 250 VAC;<br>20 A at 28 VDC | 20 A/10 A* at 250 VAC;<br>20 A/10 A* at 28 VDC |
| Contact material | AgSnIn | |
| Rated carry current | 30 A | 20 A/10 A* |
| Max. switching voltage | 250 VAC, 28 VDC | |
| Max. switching current | AC: 30 A, DC: 20 A | AC: 20 A/10 A, DC: 20 A/10 A* |
| Max. switching capacity | 7,500 VA, 560 W | 5,000/2,500 VA, 560/280 W* |

**Note:** *NO contact/NC contact.

## ■ Characteristics

| | | |
|---|---|---|
| Contact resistance | | 100 mΩ max. |
| Operate time | | 15 ms max. |
| Release time | | 10 ms max. |
| Max. Operating Frequency | | Mechanical: 18,000 operations/hr<br>Electrical: 360 operations/hr (under rated load) |
| Insulation resistance | | 100 MΩ min. (at 500 VDC) |
| Dielectric strength | | 2,500 VAC, 50/60 Hz for 1 min between coil and contacts<br>1,500 VAC, 50/60 Hz for 1 min between contacts of same polarity |
| Insulation Distance | Creepage (Typ) | 4.08 mm (min.) |
| | Clearance (Typ) | 1.6 mm (min.) |
| Tracking Resistance (CTI) | | 175 V |
| Impulse withstand voltage | | 6,000 V (1.2/50 μs) between coil and contacts |
| Vibration resistance<br>nours<br><br>minutes | | Destruction: 10 to 55 to 10 Hz, 0.825-mm single amplitude (1.65-mm double amplitude) for 2<br><br>Malfunction: 10 to 55 to 10 Hz, 0.825-mm single amplitude (1.65-mm double amplitude) for 5 |
| Shock resistance | | Destruction: 1,000 m/s² (approx. 100G)<br>Malfunction: 100 m/s² (approx. 10G) |
| Endurance | | Mechanical: 10,000,000 operation min. (at 18,000 operations/hr)<br>Electrical: 100,000 operations min. (at rated load) |
| Ambient temperature | | Operating: -55°C to 105°C (with no icing) |
| Ambient humidity | | Operating: 5% to 85% |
| Weight | | G8P-1CP: Approx. 21 g, G8P-1CTP: Approx. 24 g<br>G8P-1C4P: Approx. 28 g, G8P-1C4TP: Approx. 31 g |

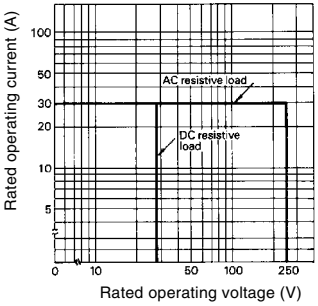
## ■ Approved Standards
## UL (File No. E41643)/CSA (File No. LR34815-101)
## EN 61810-1 (VDE Reg No. 40004714)

| Type | Contact form | Coil ratings | Contact ratings |
|---|---|---|---|
| G8P-1A | SPST-NO | 5 to 110 VDC | 30 A, 277 VAC (G.P./Res.)<br>30 A, 250 VAC, 100 k ops. (Res.)<br>20 A, 120-240 VAC, 70°C, 100 k ops. (G.P./Res.)<br>20 A, 28 VDC (Res.)<br>20 A, 240 VAC, 105°C, 100 k ops. (Res.)<br>1 hp, 125-250 VAC<br>2 hp, 250 VAC<br>A300 Pilot Duty<br>12FLA/72LRA, 250 VAC, 100 k ops.<br>20 FLA/96 LRA, 125 VAC, 100 k ops.<br>5 A, 250 VAC (Tungsten)<br>20 A, 120-277 VAC (Ballast)<br>25A, 250VAC |
| G8P-1C | SPDT | 5 to 110 VDC | 30 A/30 A, 250 VAC (Res.)<br>30 A/30 A, 277 VAC, 40°C, 100 k opns (NO) and<br>50 k opns (NC)<br>20 A/15 A, 120-240 VAC, 105°C, 100 k ops. (Res.)<br>20 A/10 A, 120-240 VAC, 70°C, 100 k ops. (G.P./Res.)<br>20 A/10 A, 28 VDC (Res.)<br>1/2 hp/ 1/2 hp, 125 VAC, 100 k ops.<br>2 hp/ 1/2 hp, 250 VAC<br>1 hp/ 1/4 hp, 125 VAC<br>B150 Pilot Duty<br>5 A/3 A, 250 VAC (Tungsten)<br>6 A/3 A, 277 VAC (Ballast) |

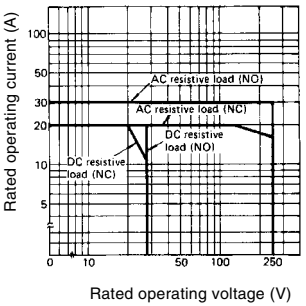
# Engineering Data

**Maximum Switching capacity**

**SPST-NO**

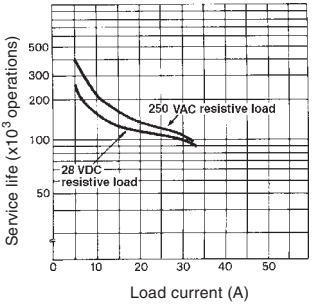



**SPDT**

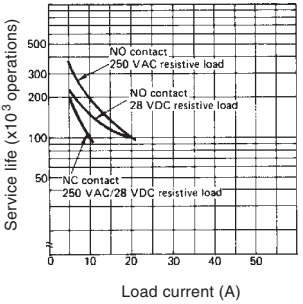



**Endurance**

**SPST-NO**




**SPDT**

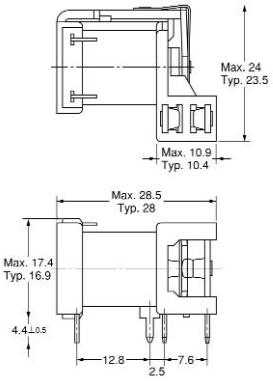


# Dimensions

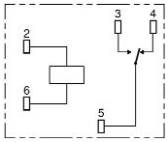
**Note:** All units are in millimetres unless otherwise indicated.

## ■ Open Types

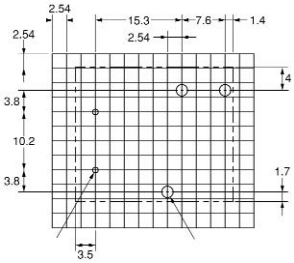
**G8P-1CP/1AP**




**Terminal Arrangement/Internal Connections (Bottom View)**

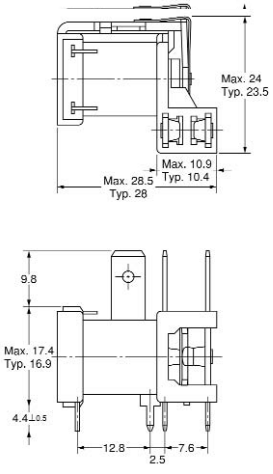



**Mounting Holes (Bottom View)**

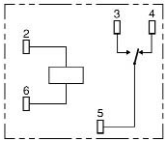



**Note:** Pin #4 is omitted on G8P-1AP.

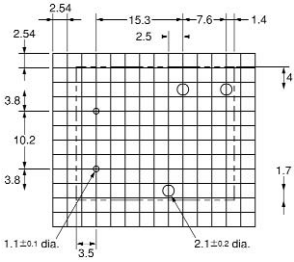
**G8P-1CTP/1ATP**




**Terminal Arrangement/Internal Connections (Bottom View)**



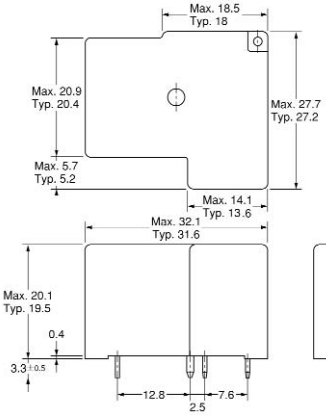

**Mounting Holes (Bottom View)**



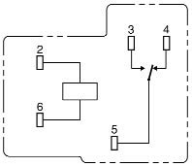

**Note:** Pin #4 is omitted on G8P-1ATP

## ■ Fully-Sealed Types/Unsealed Types

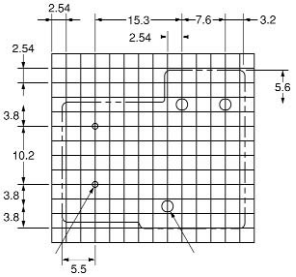
**G8P-1C4P/1A4P/1C2P/1A2P**




**Terminal Arrangement/Internal Connections (Bottom View)**

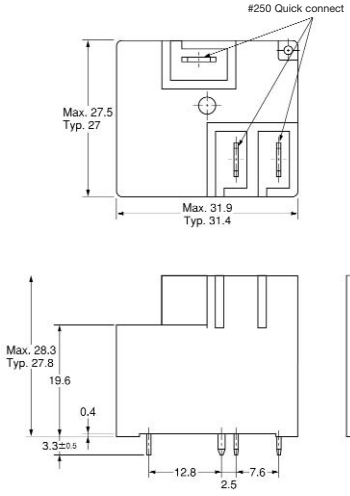



**Mounting Holes (Bottom View)**

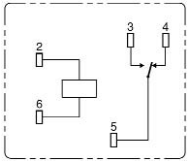



**Note:** Pin #4 is omitted on G8P-1A4P/1A2P

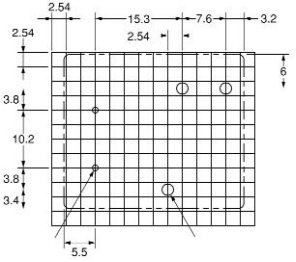
**G8P-1C4TP/1A4TP/1C2TP/1A2TP**




**Terminal Arrangement/Internal Connections (Bottom View)**



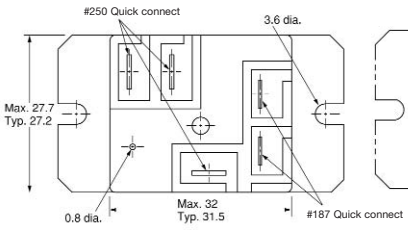

**Mounting Holes (Bottom View)**



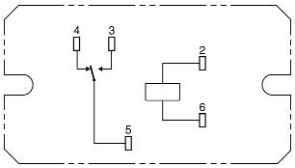

**Note:** Pin #4 is omitted on G8P-1A4TP/1A2TP

## ■ Flange Mounting Types

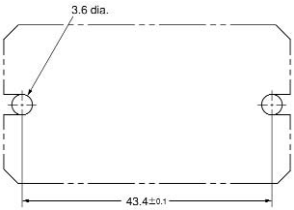
**G8P-1C2T-F/1A2T-F**



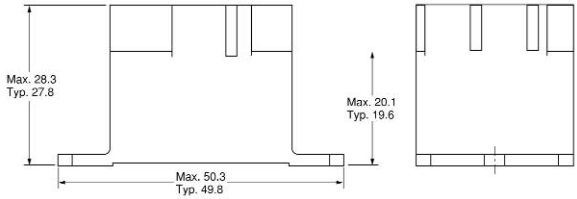

**Terminal Arrangement/Internal Connections (Bottom View)**




**Mounting Holes (Bottom View)**




**Note:** Pin #4 is omitted on G8P-1A2T-F




**Note:** Allow air circulation within the sealed type G8P by removing the knock off nib from the cover after soldering and cleaning is complete.

# Precautions

**Sealed Relays**

Remove the vent hole tape seal from the cover after all soldering and cleaning have been completed to allow air circulation within sealed G8P Relays.

## Miniature Single-pole Relay with 80-A Surge Current and 20-A Switching Current

- ROHS compliant.
- Ideal for motor switching.
- Miniature, relay with high switching power and long endurance.
- Creepage distance conforms to UL, CSA and EN standards.
- Highly noise-resistive insulation materials employed.
- Standard model available with flux protection construction.


## Ordering Information

| Classification | Contact Form | Model |
|---|---|---|
| #250 tab terminals/PCB coil terminals | SPST-NO | G4A-1A-E |
| PCB terminals/PCB coil terminals | | G4A-1A-PE |

**Note:** When ordering, add the rated coil voltage to the model number.
Example: G4A-1A-E 12 VDC
Rated coil voltage

**Model Number Legend**

**G4A-@@-@@ @ VDC**
1 2 3 4 5

1. **Number of Poles**
   1: 1 pole
2. **Contact Form**
   A: SPST-NO
3. **Terminals**
   None: #250 tab/PCB coil terminals
   P: Straight PCB/PCB terminals
4. **Special Function**
   E: For long endurance
5. **Rated Coil Voltage**
   5, 12, 24 VDC

# Specifications

## ■ Coil Rating

| | | | | |
|---|---|---|---|---|
| **Rated voltage** | | 5 VDC | 12 VDC | 24 VDC |
| **Rated current** | | 180 mA | 75 mA | 37.5 mA |
| **Coil resistance** | | 27.8Ω | 160Ω | 640Ω |
| **Coil inductance** | **Armature OFF** | – | 0.8 H | 3.5 H |
| **(ref. value)** | **Armature ON** | – | 1.1 H | 4.8 H |
| **Must operate voltage** | | 70% of rated voltage max. | | |
| **Must release voltage** | | 10% of rated voltage min. | | |
| **Max. permissible voltage** | | 160% of rated voltage at (23°) | | |
| **Power consumption** | | Approx. 0.9 W | | |

**Note: 1.** The rated current and coil resistance are measured at a coil temperature of 23°C with a tolerance of ±10%.

**2.** Operating characteristics are measured at a coil temperature of 23°C.

**3.** Max. permissible voltage refers to the maximum value in a varying range of operating power voltage, not a continuous voltage.

## ■ Contact Ratings

| | |
|---|---|
| **Rated load** | 20 A at 250 VAC |
| **Contact material** | $AgSnO_2$ |
| **Rated carry current** | 20 A |
| **Max. switching voltage** | 250 VAC |
| **Max. switching current** | 20 A |
| **Max. switching power** | 5,000 VA |
| **Failure rate (ref. value)** | 100 mA at 5 VDC |

**Note:** P level: $\lambda_{60} = 0.1 \times 10^{-6}$/operation (with an operating frequency of 120 operations/min).

## ■ Endurance

**with Motor Load**

| Load conditions | Switching frequency | Electrical endurance |
|---|---|---|
| 250 VAC:<br>Inrush current: 80 A, 0.3 s ($\cos\varphi = 0.7$)<br>Break current: 20 A ($\cos\varphi = 0.9$) | ON: 1.5 s<br>OFF: 1.5 s | 200,000 operations |

**With Overload**

| Load conditions | Switching frequency | Electrical endurance |
|---|---|---|
| 250 VAC:<br>Inrush current: 80 A ($\cos\varphi = 0.7$)<br>Break current: 80 A ($\cos\varphi = 0.7$) | ON: 1.5 s<br>OFF: 99 s | 1,500 operations |

**With Inverter Load**

| Load conditions | Switching frequency | Electrical endurance |
|---|---|---|
| 100 VAC:<br>Inrush current: 200 A (0-P)<br>Break current: 20 A | ON: 3 s<br>OFF: 5 s | 30,000 operations |

## ■ Characteristics

| | | |
|---|---|---|
| **Contact resistance** | | 100 mΩ max. |
| **Operate time** | | 20 ms max. |
| **Release time** | | 10 ms max. |
| **Max. Operating Frequency** | | Mechanical: 18,000 operations/hr |
| **Insulation resistance** | | 1000 MΩ max. (at 500 VDC) |
| **Insulation resistance** | | 100 MΩ max. (at 500 VDC) |
| **Dielectric strength** | | 4,500 VAC 50/60 Hz for 1 min between coil and contacts<br>1,000 VAC 50/60 Hz for 1 min between contacts of same polarity |
| **Impulse withstand voltage** | | TBA |
| **Insulation Distance** | **Creepage (Typ)** | 6.4 mm |
| | **Clearance (Typ)** | 3.2 mm |
| **Tracking Resistance (CTI)** | | 250 V |
| **Shock resistance** | | Destruction: 1,000 m/s$^2$<br>Malfunction: 200 m/s$^2$ |
| **Vibration resistance** | | Destruction: 10 to 55 to 10 Hz, 0.75-mm single amplitude (1.5-mm double amplitude)<br>Malfunction: 10 to 55 to 10 Hz, 0.75-mm single amplitude (1.5-mm double amplitude) |
| **Endurance** | | Mechanical: 2,000,000 operations min. (at 18,000 operations/hr)<br>Motor load: 100,000 operations min. (ON/OFF: 1.5 s)<br>Inverter load: 30,000 operations min. (ON: 3 s, OFF: 5 s) |
| **Ambient temperature** | | Operating: -20°C to 60°C (with no icing) |
| **Ambient humidity** | | Operating: 5% to 85% |
| **Weight** | | Approx. 25 g |

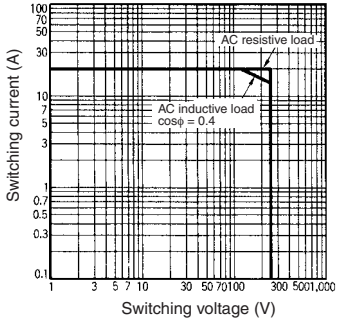
**Note:** The data shown above are initial values.

## DIN EN 61810-1/EN 60255-23 (VDE Reg. No. 6673)

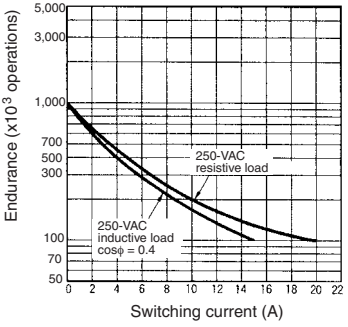
| Model | Coil ratings | Contact ratings |
|---|---|---|
| G4A-1A | 5 to 48 VDC | 20A, 250VAC |

# Engineering Data

**Maximum Switching Power**



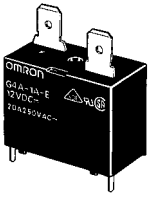

**Endurance**

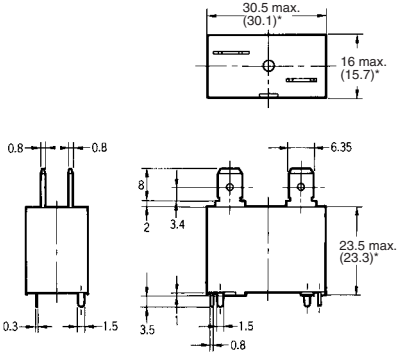


# Dimensions

**Note:** All units are in millimetres unless otherwise indicated; dimensions shown in parentheses are in inches.

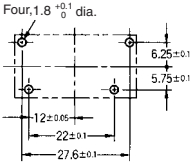
**G4A-1A-E**



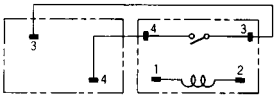

*Average value

**Mounting Holes (Bottom View)**



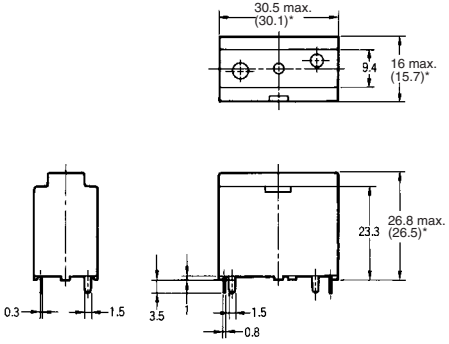

**Terminal Arrangement /Internal Connections**

(Top View) (Bottom View)



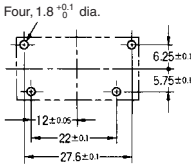

Tab Terminal PCB Terminal

**G4A-1A-PE**

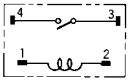




*Average value

**Mounting Holes (Bottom View)**




**Terminal Arrangement /Internal Connections (Bottom View)**




# Precautions

**Mounting**

When mounting two or more relays side by side, provide a minimum space of 3 mm between relays.

**Terminal Connection**

The terminals fit FASTON receptacle 250 and are suitable for positive-lock mounting.
Do not apply excessive force on the terminals when mounting or dismounting the relay.
The following positive-lock connectors made by AMP are recommended.

| Type | Receptacle terminals | Positive housing |
|---|---|---|
| #250 terminals (width: 6.35 mm) | AMP 170333-1 (170327-1)<br>AMP 170334-1 (170328-1)<br>AMP 170335-1 (170329-1) | AMP 172076-1 natural color<br>AMP 172076-4 yellow<br>AMP 172076-5 green<br>AMP 172076-6 blue |

**Note:** The numbers shown in parentheses are for air-feeding.

## DC Power Relays Capable of Interrupting High-voltage, High-current Loads


- A compact relay (73 x 36 x 67.2 mm (L x W x H)) capable of switching 400-V 60-A/100-A DC loads. (Capable of interrupting 600 A at 300 VDC max.)
- The switching section and driving section are gas-injected and hermetically sealed, allowing these compact relays to interrupt high-capacity loads. The sealed construction also requires no arc space, saves space, and helps ensure safe applications.
- Downsizing and optimum design allow no restrictions on the mounting direction.
- Terminal Cover and DIN Track Adapters are also available for industrial applications.
- UL/CSA approval pending.

# Model Number Structure

### ■ Model Number Legend

**G9EA-□-□-□-□**
**1 2 3 4**

**1. Number of Poles**
1: 1 pole

**2. Contact Form**
Blank: SPST-NO

**3. Coil Terminals**
B: M3.5 screw terminals
Blank: Lead Wire Output

**4. Special Functions**
CA: High-current conduction (100 A)

**Note:** Power-saving Models (with auxiliary contacts function) are scheduled to be added to the lineup as special function models.

# Specifications

### ■ List of Models

| Models | Terminals | | Contact form | Rated coil voltage | Model |
|---|---|---|---|---|---|
| | Coil terminals | Contact terminals | | | |
| Switching / current conduction models | Screw terminals | Screw terminals | SPST-NO | 12 VDC<br>24 VDC<br>48 VDC<br>60 VDC<br>100 VDC | G9EA-1-B |
| | Lead wires | | | | G9EA-1 |
| High-current conduction models | Screw terminals | | | | G9EA-1-B-CA |
| | Lead wires | | | | G9EA-1-CA |

**Note: 1.** Relays come with two M5 screws for the main terminals (contacts).
**2.** Relays with coil terminals and screw terminals come with two M3.5 screws.

## ■ Ratings

**Coil**

| Rated voltage | Rated current | Coil resistance | Must-operate voltage | Must-release voltage | Max. Voltage (see note 3) | Power consumption |
|---|---|---|---|---|---|---|
| 12 VDC | 417 mA | 28.8 Ω | 75% max. of rated voltage | 8% min. of rated voltage | 130% of rated voltage | Approx. 5 W |
| 24 VDC | 208 mA | 115.2 Ω | | | | |
| 48 VDC | 102 mA | 469.3 Ω | | | | |
| 60 VDC | 86.2 mA | 695.7 Ω | | | | Approx. 5.2 W |
| 100 VDC | 53.6 mA | 1,864 Ω | | | | Approx. 5.4 W |

**Note: 1.** The figures for the rated current and coil resistance are for a coil temperature of 23°C and have a tolerance of ±10%.
**2.** The figures for the operating characteristics are for a coil temperature of 23°C.
**3.** The figure for the maximum voltage is the maximum voltage that can be applied to the relay coil for period of 10 minutes at an ambient temperature of 23°C. It does not apply to continuous operation.

**Contacts**

| Item | Rated current | |
|---|---|---|
| | G9EA-1(-B) | G9EA-1(-B)-CA |
| **Rated load** | 60 A at 400 VDC, 100 A at 120 VDC | 30 A at 400 VDC |
| **Rated carry current** | 60 A | 100 A |
| **Maximum switching voltage** | 400 V | 400 V |
| **Maximum switching current** | 100 A | 30 A |

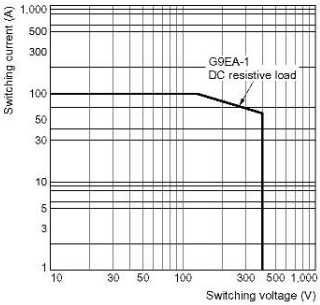
## ■ Characteristics

| Item | | G9EA-1(-B) | G9EA-1(-B)-CA |
|---|---|---|---|
| **Contact resistance (see note 2)** | | 30 mΩ max. (0.6 mΩ typical) | 10 mΩ max. (0.3 mΩ typical) |
| **Contact voltage drop** | | 0.1 V max.<br>(for a carry current of 60 A) | 0.1 V max.<br>(for a carry current of 100 A) |
| **Operate time** | | 50 ms max. | |
| **Release time** | | 30 ms max. | |
| **Insulation resistance (see note 3.)** | **Between coil & contacts** | 1,000 MΩ min. | |
| | **Between contacts of the same polarity** | 1,000 MΩ min. | |
| **Dielectric strength** | **Between coil & contacts** | 2,500 VAC, 1 min | |
| | **Between contacts of the same polarity** | 2,500 VAC, 1 min | |
| **Impulse withstand voltage (See note 4.)** | | 4,500 V | |
| **Vibration resistance** | **Destruction** | 10 to 55 to 10 Hz, 0.75-mm single amplitude<br>(Acceleration: 2.94 to 88.9 $m/s^2$) | |
| | **Malfunction** | 10 to 55 to 10 Hz, 0.75-mm single amplitude<br>(Acceleration: 2.94 to 88.9 $m/s^2$) | |
| **Shock resistance** | **Destruction** | 490 $m/s^2$ | |
| | **Malfunction** | 196 $m/s^2$ | |
| **Mechanical endurance (See note 5.)** | | 200,000 ops. min. | |
| **Electrical endurance (See note 6.)** | | 120 VDC, 100 A, 3,000 ops. min. | 400 VDC, 30 A, 1,000 ops. min. |
| | | 400 VDC, 60 A, 3,000 ops. min. | 120 VDC, 30 A, 2,500 ops. min. |
| | | 400 VDC, 30 A, 30,000 ops. min. | – |
| **Short-time carry current** | | 100 A (10 min) | 150 A (10 min) |
| **Maximum interruption current** | | 600 A at 300 VDC (5 times) | – |
| **Overload interruption** | | 180 A at 400 VDC<br>(100 times min.) | 100 A at 120 VDC<br>(150 times min.) |
| **Reverse polarity interruption** | | -60 A at 200 VDC<br>(1,000 times min.) | – |
| **Ambient operating temperature** | | -40 to 70°C (with no icing or condensation) | |
| **Ambient operating humidity** | | 5% to 85% | |
| **Weight Approx.** | | 310 g | |

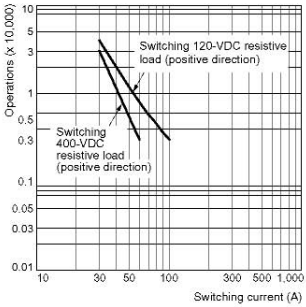
**Note: 1.** The above values are initial values at an ambient temperature of 23°C unless otherwise specified.
**2.** The contact resistance was measured with 1 A at 5 VDC using the voltage drop method.
**3.** The insulation resistance was measured with a 500-VDC megohmmeter.
**4.** The impulse withstand voltage was measured with a JEC-212 (1981) standard impulse voltage waveform (1.2 x 50 μs).
**5.** The mechanical endurance was measured at a switching frequency of 3,600 operations/hr.
**6.** The electrical endurance was measured at a switching frequency of 60 operations/hr.

## ■ G9EA-1(-B) Switching/Current Conduction Models

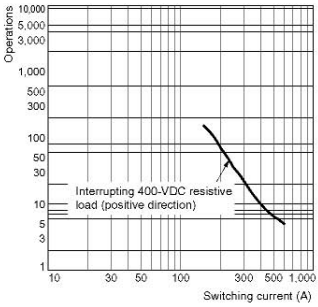
### Maximum Switching Capacity



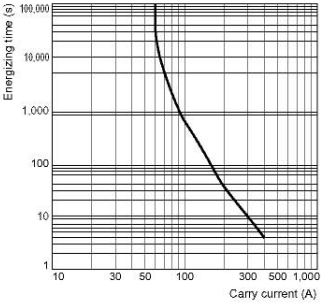

### Electrical Endurance (Switching Performance)




### Electrical Endurance (Interruption Performance)

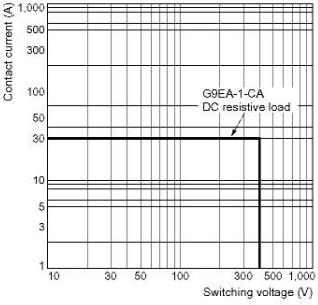



### Carry Current vs Energizing Time

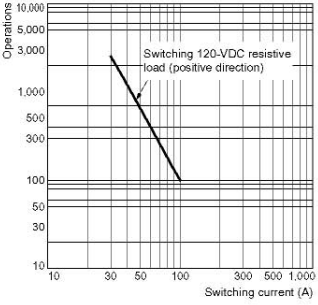



## ■ G9EA-1(-B)-CA High-current Conduction Models

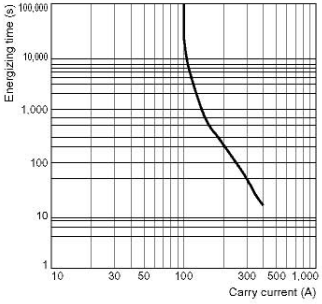
### Maximum Switching Capacity




### Electrical Endurance (Switching Performance)

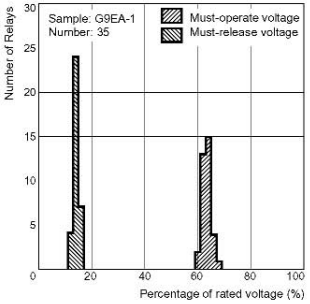



### Carry Current vs Energizing Time

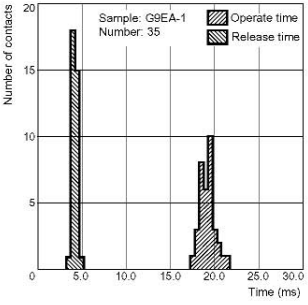


## ■ All G9EA-1 Models

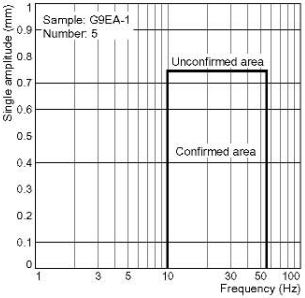
### Must-operate Voltage and Must-release Voltage Distributions



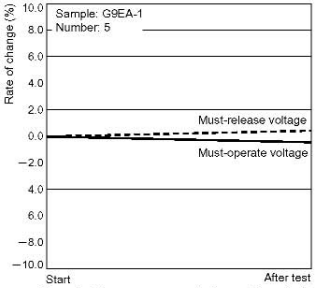

### Time Characteristic Distributions




### Vibration Malfunction

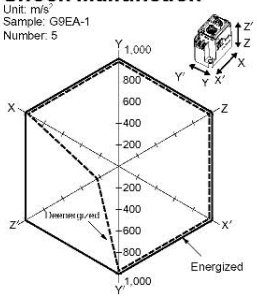



### Vibration Resistance



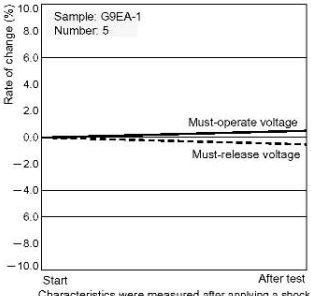

Characteristics were measured after applying vibration at a frequency of 10 to 55 Hz (single amplitude of 0.75 mm) to the test piece (not energized) for 2 hours each in 3 directions. The percentage rate of change is the average value for all of the samples

### Shock Malfunction




The value at which malfunction occurred was measured after applying shock to the test piece 3 times each in 6 directions along 3 axes.

### Shock Resistance



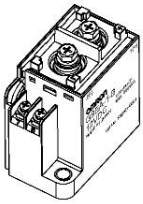

Characteristics were measured after applying a shock of 490 $m/s^2$ to the test piece 3 times each in 6 directions along 3 axes. The percentage rate of change is the average value for all of the samples.

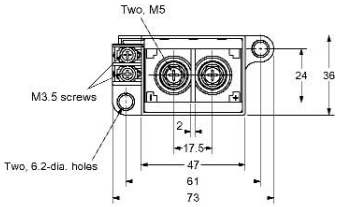
# Dimensions

**Note:** All units are in millimetres unless otherwise indicated.

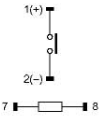
## ■ Models with Screw Terminals

**G9EA-1-B(-CA)**



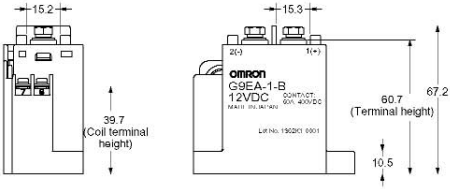



**Terminal Arrangement/ Internal Connections** (TOP VIEW)

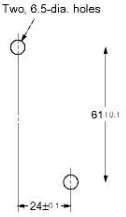



**Note:** Be sure to connect terminals with the correct polarity. Coils do not have polarity.

| Dimension (mm) | Tolerance (mm) |
|---|---|
| 10 or lower | +0.3 |
| 10 to 50 | +0.5 |
| 50 or higher | ⊥1 |

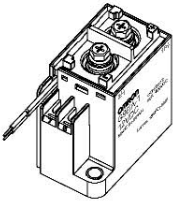


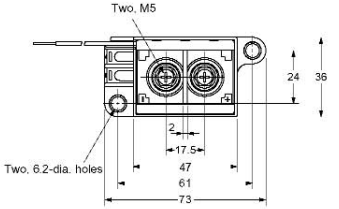

**Mounting Hole Dimensions** (TOP VIEW)



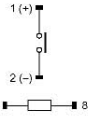

## ■ Models with Lead Wires

**G9EA-1(-CA)**



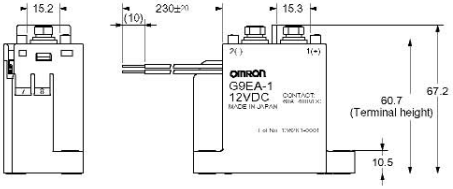



**Terminal Arrangement/ Internal Connections** (TOP VIEW)

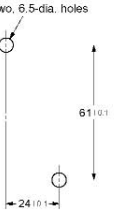



**Note:** Be sure to connect terminals with the correct polarity. Coils do not have polarity.

| Dimension (mm) | Tolerance (mm) |
|---|---|
| 10 or lower | +0.3 |
| 10 to 50 | +0.5 |
| 50 or higher | ⊥1 |



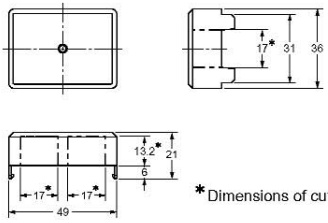

**Mounting Hole Dimensions** (TOP VIEW)



# Options

## ■ Terminal Cover

**P9EA-C**

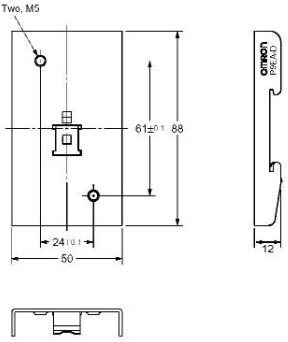



*Dimensions of cutouts for wiring.

| Dimension (mm) | Tolerance (mm) |
|---|---|
| 10 or lower | +0.3 |
| 10 to 50 | ⊥0.5 |
| 50 or higher | ⊥1 |

## ■ DIN Track Adaptor

**P9EA-D**




| Dimension (mm) | Tolerance (mm) |
|---|---|
| 10 or lower | ⊥0.3 |
| 10 to 50 | ⊥0.5 |
| 50 or higher | +1 |

## DC Power Relays Capable of Interrupting High-voltage, High-current Loads

- A compact relay (98 x 44 x 86.7 mm (L x W x H)) capable of switching 400V, 200 A DC loads. (Capable of interrupting 1,000 A at 400 VDC max.)
- The switching section and driving section are gas-injected and hermetically sealed, allowing these compact relays to interrupt high-capacity loads. The sealed construction also requires no arc space, saves space, and helps ensure safe applications.
- Downsizing and optimum design allow no restrictions on the mounting direction.
- Terminal Cover is also available for industrial applications.
- UL/CSA approval pending.


## Model Number Structure

**Model Number Legend**

**G9EC-□-□-□-□**
**1 2 3 4**

1. **Number of Poles**
   1: 1 pole
2. **Contact Form**
   Blank: SPST-NO
3. **Coil Terminals**
   B: M3.5 screw terminals (standard)
   Blank: Lead wire output
4. **Special Functions**

**Note:** Power-saving Models (with auxiliary contacts function) are scheduled to be added to the line-up as special function models.

## Specifications

### ■ List of Models

| Models | Terminals | | Contact form | Rated coil voltage | Model |
|---|---|---|---|---|---|
| | Coil terminals | Contact terminals | | | |
| Switching / current conduction models | Screw terminals | Screw terminals | SPST-NO | 12 VDC<br>24 VDC<br>48 VDC<br>60 VDC<br>100 VDC | G9EC-1-B |
| | Lead wires | | | | G9EC-1 |

**Note: 1.** Relays come with two M8 nuts for the main terminals (contacts).
**2.** Relays with coil terminals and screw terminals come with two M3.5 screws.

## ■ Ratings

**Coil**

| Rated voltage | Rated current | Coil resistance | Must-operate voltage | Must-release voltage | Max. Voltage (see note 3) | Power consumption |
|---|---|---|---|---|---|---|
| 12 VDC | 938 mA | 12.8 Ω | 75% max. of rated voltage | 8% min. of rated voltage | 110% of rated voltage | Approx. 11 W |
| 24 VDC | 469 mA | 51.2 Ω | | | | |
| 48 VDC | 234 mA | 204.8 Ω | | | | |
| 60 VDC | 188 mA | 320.0 Ω | | | | |
| 100 VDC | 113 mA | 888.9 Ω | | | | |

**Note: 1.** The figures for the rated current and coil resistance are for a coil temperature of 23°C and have a tolerance of ±10%.
**2.** The figures for the operating characteristics are for a coil temperature of 23°C.
**3.** The figure for the maximum voltage is the maximum voltage that can be applied to the relay coil for period of 10 minutes at an ambient temperature of 23°C. It does not apply to continuous operation.

**Contacts**

| Item | Rated current |
|---|---|
| | G9EC-1(-B) |
| **Rated load** | 200 A at 400 VDC |
| **Rated carry current** | 200 A |
| **Maximum switching voltage** | 400 V |
| **Maximum switching current** | 200 A |

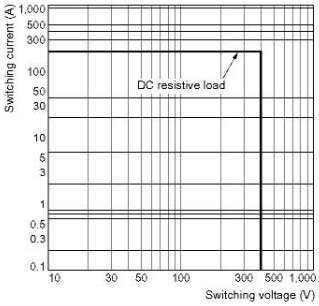
## ■ Characteristics

| Item | | G9EC-1(-B) |
|---|---|---|
| **Contact resistance (see note 2)** | | 30 mΩ max. (0.2 mΩ typical) |
| **Contact voltage drop** | | 0.1 V max. (for a carry current of 200 A) |
| **Operate time** | | 50 ms max. |
| **Release time** | | 30 ms max. |
| **Insulation resistance (see note 3.)** | **Between coil & contacts** | 1,000 MΩ min. |
| | **Between contacts of the same polarity** | 1,000 MΩ min. |
| **Dielectric strength** | **Between coil & contacts** | 2,500 VAC, 1 min |
| | **Between contacts of the same polarity** | 2,500 VAC, 1 min |
| **Impulse withstand voltage (See note 4.)** | | 4,500 V |
| **Vibration resistance** | **Destruction** | 10 to 55 to 10 Hz, 0.75-mm single amplitude (Acceleration: 2.94 to 88.9 $m/s^2$) |
| | **Malfunction** | 10 to 55 to 10 Hz, 0.75-mm single amplitude (Acceleration: 2.94 to 88.9 $m/s^2$) |
| **Shock resistance** | **Destruction** | 490 $m/s^2$ |
| | **Malfunction** | 196 $m/s^2$ |
| **Mechanical endurance (See note 5.)** | | 200,000 ops. min. |
| **Electrical endurance (resistive load) (See note 6.)** | | 400 VDC, 200 A, 3,000 ops. min. |
| **Short-time carry current** | | 300 A (15 min) |
| **Maximum interruption current** | | 1.000 A at 400 VDC (10 times) |
| **Overload interruption** | | 700 A at 400 VDC (40 times min.) |
| **Reverse polarity interruption** | | -200 A at 200 VDC (1,000 times min.) |
| **Ambient operating temperature** | | -40 to 50°C (with no icing or condensation) |
| **Ambient operating humidity** | | 5% to 85% |
| **Weight Approx.** | | 570 g |

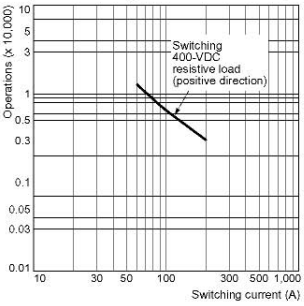
**Note: 1.** The above values are initial values at an ambient temperature of 23°C unless otherwise specified.
**2.** The contact resistance was measured with 1 A at 5 VDC using the voltage drop method.
**3.** The insulation resistance was measured with a 500 VDC megohmmeter.
**4.** The impulse withstand voltage was measured with a JEC-212 (1981) standard impulse voltage waveform (1.2 x 50 μs).
**5.** The mechanical endurance was measured at a switching frequency of 3,600 operations/hr.
**6.** The electrical endurance was measured at a switching frequency of 60 operations/hr.

## ■ G9EC-1 Switching / Current Conduction Models

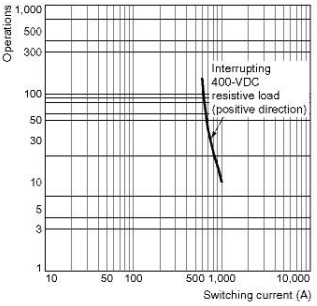
### Maximum Switching Capacity



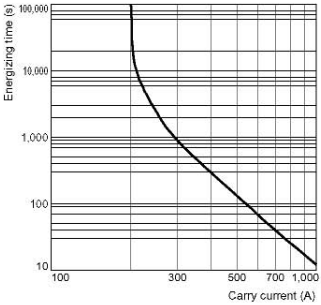

### Electrical Endurance (Switching Performance)



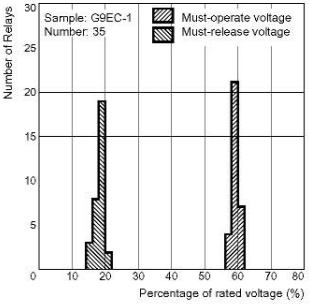

### Electrical Endurance (Interruption Performance)



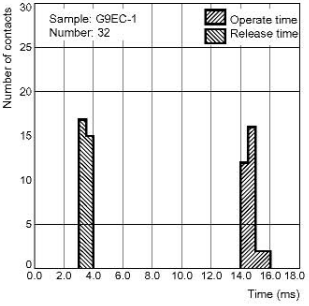

### Carry Current vs Energizing Time




### Must-operate Voltage and Must-release Voltage Distributions

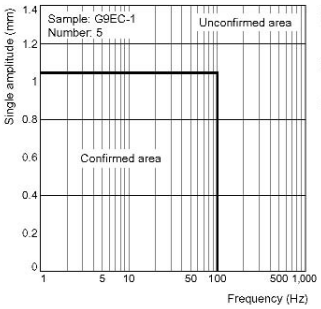



### Time Characteristic Distributions

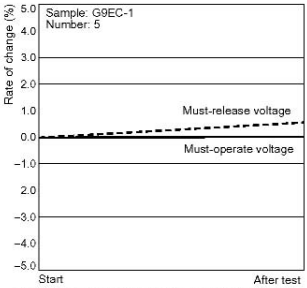


## ■ G9EC-1 Switching / Current Conduction Models

### Vibration Malfunction

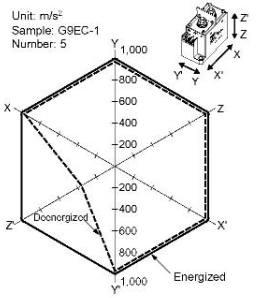



### Vibration Resistance



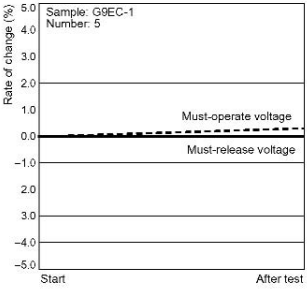

Characteristics were measured after applying vibration at a frequency of 10 to 55 Hz (single amplitude of 0.75 mm) to the test piece (not energized) for 2 hours each in 3 directions. The percentage rate of change is the average value for all of the samples

### Shock Malfunction




The value at which malfunction occurred was measured after applying shock to the test piece 3 times each in 6 directions along 3 axes.

### Shock Resistance



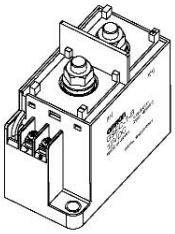

Characteristics were measured after applying a shock of 490 m/s² to the test piece 3 times each in 6 directions along 3 axes. The percentage rate of change is the average value for all of the samples.

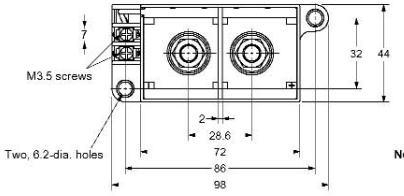
# Dimensions

**Note:** All units are in millimetres unless otherwise indicated.

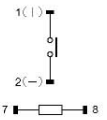
## ■ Models with Screw Threads

**G9EC-1-B**



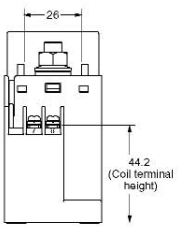


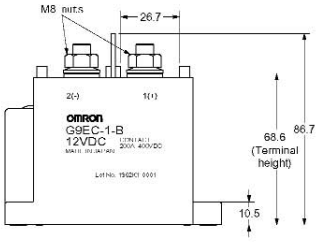

**Terminal Arrangement/ Internal Connections** (TOP VIEW)



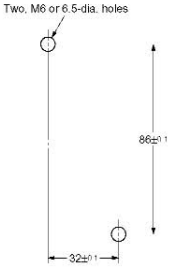

**Note:** Be sure to connect terminals with the correct polarity. Coils do not have polarity.

| Dimension (mm) | Tolerance (mm) |
|---|---|
| 10 or lower | ⊥0.3 |
| 10 to 50 | +0.5 |
| 50 or higher | +1 |



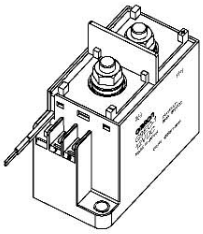



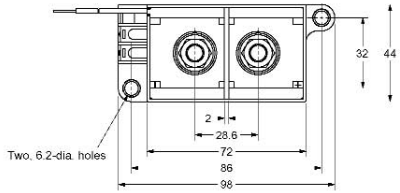

**Mounting Hole Dimensions** (TOP VIEW)



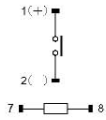

## ■ Models with Lead Wires

**G9EC-1**



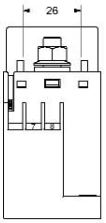


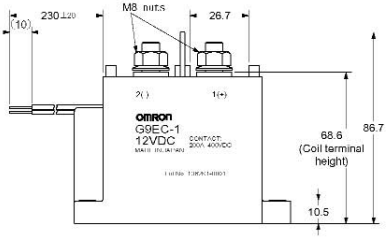

**Terminal Arrangement/ Internal Connections** (TOP VIEW)



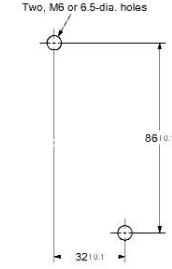

**Note:** Be sure to connect terminals with the correct polarity. Coils do not have polarity.

| Dimension (mm) | Tolerance (mm) |
|---|---|
| 10 or lower | ⊥0.3 |
| 10 to 50 | ⊥0.5 |
| 50 or higher | ⊥1 |



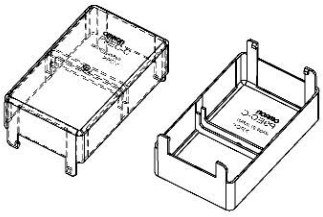

**Mounting Hole Dimensions** (TOP VIEW)

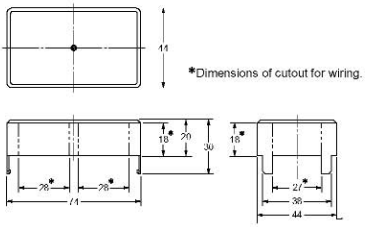


# Options

## ■ Terminal Cover

**P9EC-C**






| Dimension (mm) | Tolerance (mm) |
|---|---|
| 10 or lower | +0.3 |
| 10 to 50 | +0.5 |
| 50 or higher | ±1 |

# Precautions

**WARNING**

Take measures to prevent contact with charged parts when using the Relay for high voltages.

## ■ Correct Use

Refer to the relevant catalog for common precautions.

1. Be sure to tighten all screws to the appropriate torque given below. Loose screws may result in burning due to abnormal heat generation during energization.
   - M8 screws: 8.82 to 9.80 N·m
   - M6 screws: 3.92 to 4.90 N·m
   - M5 screws: 1.57 to 2.35 N·m
   - M4 screws: 0.98 to 1.37 N·m
   - M3.5 screws: 0.75 to 1.18 N·m
2. The G9EA and G9EC Relays' contacts have polarity. Be sure to perform connections with the correct polarity. If the contacts are connected with the reverse polarity, the switching characteristics specified in this document cannot be assured.
3. Do not drop or disassemble this Relay. Not only may the Relay fail to meet the performance specifications, it may also result in damage, electric shock, or burning.
4. Do not use these Relays in strong magnetic fields of 800 A/m or higher (e.g., near transformers or magnets). The arc discharge that occurs during switching may be bent by the magnetic field, resulting in flashover or insulation faults.
5. This Relay is a device for switching high DC voltages. If it is used for voltages exceeding the specified range, it may not be possible to interrupt the load and burning may result. In order to prevent fire spreading, use a configuration in which the current load can be interrupted in the event of emergencies.

   In order to ensure safety of the system, replace the Relay on a regular basis.
6. If the Relay is used for no-load switching, the contact resistance may increase and so confirm correct operation under the actual operating conditions.
7. These Relays contain pressurized gas. Even in applications with low switching frequencies, the ambient temperature and heat caused by arc discharge in the contacts may allow permeation of the sealed gas, resulting in arc interruption failure.

   In order to ensure safety of the system, replace Relays on a regular basis.
8. Do not use or store the Relay in a vacuum. Doing so will accelerate deterioration of the sealing.
9. With this Relay, if the rated voltage (or current) is continuously applied to the coil and contacts, and then turned OFF and immediately ON again, the coil temperature, and consequently the coil resistance, will be higher than usual. This means that the mustoperate voltage will also be higher than usual, exceeding the rated value ("hot start"). In this case, take the appropriate countermeasures, such as reducing the load current or restricting the energizing time or ambient operating temperature.
10. The ripple percentage for DC relays can cause fluctuations in the must-operate voltage or humming. For this reason, reduce the ripple percentage in full-wave rectified power supply circuits by adding a smoothing capacitor. Ensure that the ripple percentage is less than 5%.
11. Ensure that a voltage exceeding the specified maximum voltage is not continuously applied to the coil. Abnormal heating in the coil may shorten the lifetime of the insulation coating.
12. Do not use the Relay at a switching voltage or current greater than the specified maximum values. Doing so may result in arc discharge interruption failure or burning due to abnormal heating in the contacts.
13. The contact ratings are for resistive loads. The electrical endurance with inductive loads is inferior to that of resistive loads. Confirm correct operation under the actual operating conditions.
14. Do not use the Relay in locations where water, solvents, chemicals, or oil may come in contact with the case or terminals. Doing so may result in deterioration of the case resin or abnormal heating due to corrosion or contamination of the terminals. Also, if electrolyte adheres to the output terminals, electrolysis may occur between the output terminals, resulting in corrosion of the terminals or wiring disconnections.
15. Be sure to turn OFF the power and confirm that there is no residual voltage before replacing the Relay or performing wiring.
16. The distance between crimp terminals or other conductive parts will be reduced and insulation properties will be lowered if wires are laid in the same direction from the contact terminals. Use insulating coverings, do not wire in the same direction, and take other measures as required to maintain insulation properties.
17. Do not tighten the screws to a torque exceeding 11 N·m for the M8 screws and 5 N·m for the M5 screws.

    Overtightening the contact terminals will reduce the switching performance and damage the product.

The coil's power consumption can be reduced by using in combination with a semiconductor circuit. Consult your OMRON representative for details.

**Recommended Wire Size**

| Model | Size |
|---|---|
| **G9EA-1(-B)** | 14 to 22 $mm^2$ |
| **G9EA-1(-B)-CA** | 22 to 38 $mm^2$ |
| **G9EC-1(-B)** | 38 to 60 $mm^2$ |
| **G9EB-1-B** | Consult your OMRON representative |

**Note:** Use flexible leads.

**ALL DIMENSIONS SHOWN ARE IN MILLIMETRES.**
To convert millimetres into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

CAT. No. J144-E2-02