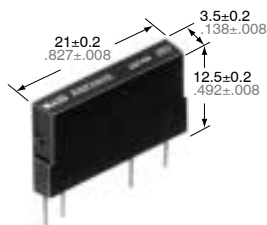


# NAIS

## POWER PhotoMOS RELAYS with Internal Varistor

# PhotoMOS RELAYS

### FEATURES



mm inch

#### 1. Power PhotoMOS relay with internal varistor

An internal varistor on the output side protects the output MOSFET from the reverse voltage from an external voltage surge or inductive load.

#### 2. High capacity PhotoMOS relay

Supports control of minute loads to a maximum 3.0 A. Suitable for output control.

#### 3. Supports both AC and DC

Bi-directional control so there is no need to differentiate according to the load as in conventional SSR's.

#### 4. Can be placed on-board the 4-unit relay (power photoMOS relay type)

#### 5. Ideal for inductive loads

Ideal for inductive loads such as motors, solenoids, and electro-magnetic contactors.

#### 6. High sensitivity, low ON resistance

Can control a maximum 3.0 A load with a 5 mA input current. Low On resistance of 0.18 Ω (AQZ202V).

#### 7. Compact slim-type 4-pin SIL

(W) 3.5x(L) 21.0x(H) 12.5 mm (W) .138x(L) .827x(H) .492 inch. The compact 73.5mm<sup>2</sup> size of the 4-pin SIL package allows high density mounting.

#### 8. Sockets also available

#### 9. Promoting the CE making

(Please inquire for further details.)

## TYPES

### AC/DC type

| Output rating                 |              |              | Part No. | Packing quantity |  |
|-------------------------------|--------------|--------------|----------|------------------|--|
| Load voltage (Effective Vrms) | Load current | Inner carton |          | Outer carton     |  |
| 17 V AC                       | 22 V DC      | 3.0 A        | 25 pcs.  | 500 pcs.         |  |
| 30 V AC                       | 38 V DC      | 2.0 A        |          |                  |  |
| 60 V AC                       | 85 V DC      | 1.0 A        |          |                  |  |
| 140 V AC                      | 180 V DC     | 0.5 A        |          |                  |  |

Note: Refer to the recommended load voltage.

## RATING

### AC/DC type

1) Absolute maximum ratings (Ambient temperature: 25°C 77°F)

| Item                    |                                   | Symbol            | AQZ202V                         | AQZ205V | AQZ207V | AQZ204V | Remarks                              |
|-------------------------|-----------------------------------|-------------------|---------------------------------|---------|---------|---------|--------------------------------------|
| Input                   | LED forward current               | I <sub>F</sub>    | 50 mA                           |         |         |         |                                      |
|                         | LED reverse voltage               | V <sub>R</sub>    | 3 V                             |         |         |         |                                      |
|                         | Peak forward current              | I <sub>FP</sub>   | 1 A                             |         |         |         | f = 100 Hz, Duty factor = 0.1%       |
|                         | Power dissipation                 | P <sub>in</sub>   | 75 mW                           |         |         |         |                                      |
| Output                  | Load voltage                      | V <sub>L</sub>    | 17 V                            | 30 V    | 60 V    | 140 V   | Effective Vrms                       |
|                         |                                   |                   | 22 V                            | 38 V    | 85 V    | 180 V   |                                      |
|                         | Continuous load current (Peak AC) | I <sub>L</sub>    | 3.0 A                           | 2.0 A   | 1.0 A   | 0.5 A   |                                      |
|                         | Peak load current                 | I <sub>peak</sub> | 9.0 A                           | 6.0 A   | 3.0 A   | 1.5 A   | 100 ms (1 shot), V <sub>L</sub> = DC |
| Power dissipation       | P <sub>out</sub>                  | 1.6 W             |                                 |         |         |         |                                      |
| Total power dissipation | P <sub>T</sub>                    | 1.6 W             |                                 |         |         |         |                                      |
| I/O isolation voltage   | V <sub>iso</sub>                  | 2,500 V AC        |                                 |         |         |         |                                      |
| Temperature limits      | Operating                         | T <sub>opr</sub>  | -40°C to +85°C -40°F to +185°F  |         |         |         | Non-condensing at low temperatures   |
|                         | Storage                           | T <sub>stg</sub>  | -40°C to +100°C -40°F to +212°F |         |         |         |                                      |

# AQZ200V

## 2) Electrical characteristics (Ambient temperature: 25°C 77°F)

| Item                     |                                  | Symbol        | AQZ202V                                   | AQZ205V          | AQZ207V      | AQZ204V      | Remarks  |  |   |
|--------------------------|----------------------------------|---------------|---|------------------|--------------|--------------|--|--|---|
| Input                    | LED operate current              | Typical       | 1.0 mA                                    |                  |              |              | $I_L = 100 \text{ mA}$<br>$V_L = 10 \text{ V}$                     |  |   |
|                          |                                  | Maximum       | 3.0 mA                                    |                  |              |              |  |  |   |
|                          | LED turn off current             | Minimum       | 0.4 mA                                    |                  |              |              | $I_L = 100 \text{ mA}$<br>$V_L = 10 \text{ V}$                     |  |   |
|                          |                                  | Typical       | 0.9 mA                                    |                  |              |              |  |  |   |
| LED dropout voltage      | Typical                          | $V_F$         | 1.25 V (1.16 V at $I_F = 10 \text{ mA}$ ) |                  |              |              | $I_F = 50 \text{ mA}$  |  |   |
|                          | Maximum                          |               | 1.5 V                                     |                  |              |              |  |  |   |
| Output                   | On resistance                    | Typical       | 0.11 $\Omega$                             | 0.23 $\Omega$    | 0.7 $\Omega$ | 2.1 $\Omega$ | $I_F = 10 \text{ mA}$<br>$I_L = \text{Max.}$<br>Within 1 s on time |  |   |
|                          |                                  | Maximum       | 0.18 $\Omega$                             | 0.34 $\Omega$    | 1.1 $\Omega$ | 3.2 $\Omega$ |  |  |   |
|                          | Off state leakage current        | Maximum       | $I_{Leak}$                                | 1 mA             |              |              |  | $I_F = 0$<br>$V_L = \text{Max. DC}$  |   |
| Transfer characteristics | Switching speed                  | Turn on time* | $T_{on}$                                  | Typical          | 2.46 ms      | 2.40 ms      | 1.12 ms  | 1.65 ms  | $I_F = 10 \text{ mA}$<br>$I_L = 100 \text{ mA}$<br>$V_L = 10 \text{ V}$ |
|                          |                                  |               |   | Maximum          | 5.0 ms       |              |  |  |   |
|                          |                                  |               |   | Typical          | 5.64 ms      | 5.65 ms      | 2.57 ms  | 3.88 ms  | $I_F = 5 \text{ mA}$<br>$I_L = 100 \text{ mA}$<br>$V_L = 10 \text{ V}$  |
|                          |                                  |               |   | Maximum          | 10.0 ms      |              |  |  |   |
|                          | Turn off time*                   | $T_{off}$     | Typical                                   | 0.22 ms          | 0.21 ms      | 0.10 ms      | 0.08 ms  | $I_F = 5 \text{ mA or } 10 \text{ mA}$<br>$I_L = 100 \text{ mA}$<br>$V_L = 10 \text{ V}$ |   |
|                          |                                  |               | Maximum                                   | 3.0 ms           |              |              |  |  |   |
|                          | I/O capacitance                  | $C_{iso}$     | Typical                                   | 0.8 pF           |              |              |  | $f = 1 \text{ MHz}$<br>$V_B = 0$   |   |
|                          |                                  |               | Maximum                                   | 1.5 pF           |              |              |  |  |   |
|                          | Initial I/O isolation resistance | Minimum       | $R_{iso}$                                 | 1,000 M $\Omega$ |              |              |  | 500 V DC   |   |
|                          | Maximum operating frequency      | Maximum       | —   | 1.0 cps          |              |              |  | $I_F = 10 \text{ mA}$<br>Duty factor = 50%<br>$I_L = \text{Max.}, V_L = \text{Max.}$     |   |
| Vibration resistance     | Minimum                          | —             | 10 to 55 Hz at double amplitude of 3 mm   |                  |              |              | 2 hours for 3 axes   |  |   |
| Shock resistance         | Minimum                          | —             | 4,900 m/s <sup>2</sup> {500 G} 1 ms       |                  |              |              | 3 times for 3 axes   |  |   |

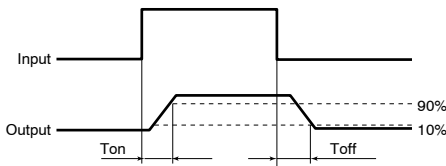
## 3) Internal varistor characteristics

| Item             | AQZ202V | AQZ205V | AQZ207V | AQZ204V |
|------------------|---------|---------|---------|---------|
| Varistor voltage | 27 V    | 47 V    | 100 V   | 220 V   |
| Maximum energy   | 0.5 J   | 1.0 J   | 2.0 J   | 4.5 J   |

Note: When using the relay to absorb the reverse voltage during inductive load switching, make sure the load is within the inductance range given in the internal varistor characteristics data below, rather than the energy resistance range for the internal varistor. Note, the inductance range will differ if the switching frequency is higher than the rate given for the characteristics data conditions.

Note: Recommendable LED forward current  $I_F = 5$  to 10 mA.

\*Turn on/off time

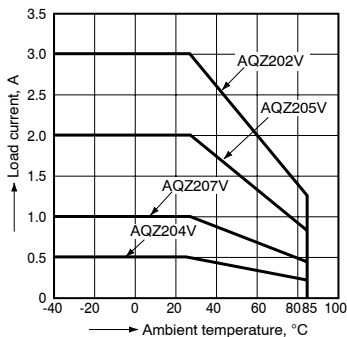


- For Dimensions, see Page 442.
- For Schematic and Wiring Diagrams, see Page 448.
- For Cautions for Use, see Page 453.

## REFERENCE DATA

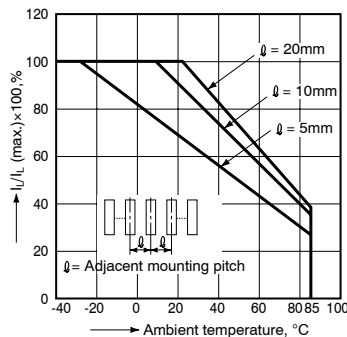
### 1. Load current vs. ambient temperature characteristics

Allowable ambient temperature: -40°C to +85°C  
-40°F to +185°F



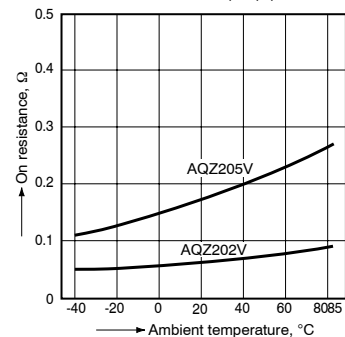
### 2. Load current vs. ambient temperature characteristics in adjacent mounting

$I_L$ : Load current;  
 $I_L(\text{max.})$ : Maximum continuous load current



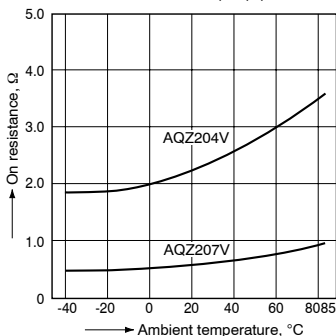
### 3.-(1) On resistance vs. ambient temperature characteristics

LED current: 10 mA;  
Continuous load current: 3.0 A (DC) (AQZ202V),  
2.0 A (DC) (AQZ205V),



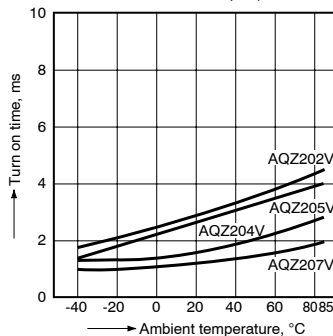
### 3.-(2) On resistance vs. ambient temperature characteristics

LED current: 10 mA;  
 Continuous load current: 3.0 A (DC) (AQZ202V),  
 2.0 A (DC) (AQZ205V),



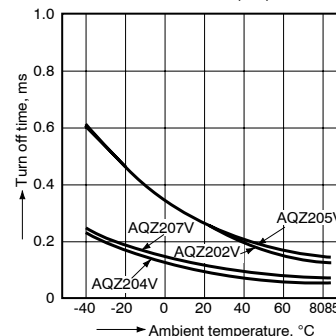
### 4. Turn on time vs. ambient temperature characteristics

LED current: 10 mA;  
 Load voltage: 10 V (DC)  
 Continuous load current: 100 mA (DC)



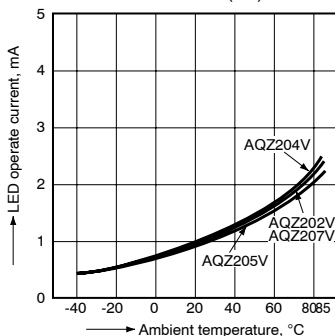
### 5. Turn off time vs. ambient temperature characteristics

LED current: 10 mA;  
 Load voltage: 10 V (DC)  
 Continuous load current: 100 mA (DC)



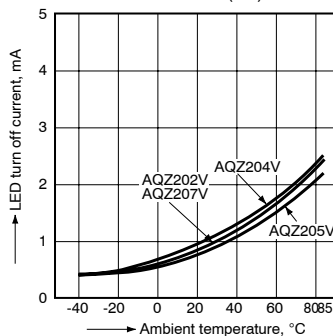
### 6. LED operate vs. ambient temperature characteristics

Load voltage: 10 V (DC);  
 Continuous load current: 100 mA (DC)



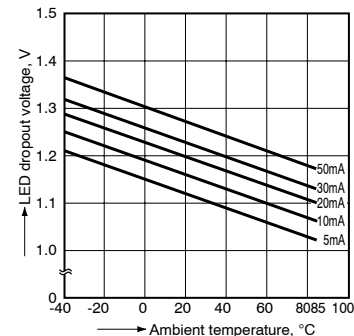
### 7. LED turn off current vs. ambient temperature characteristics

Load voltage: 10 V (DC)  
 Continuous load current: 100 mA (DC)



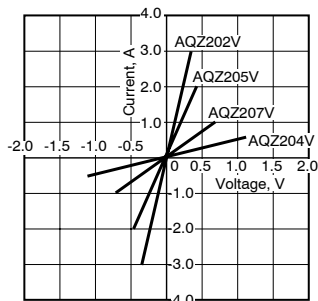
### 8. LED dropout voltage vs. ambient temperature characteristics

Sample: all types; LED current: 5 to 50 mA



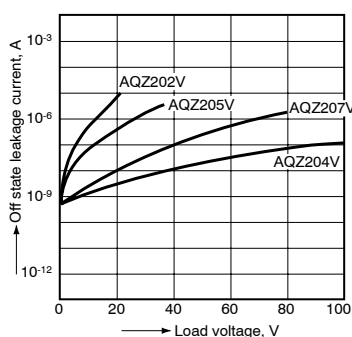
### 9. Voltage vs. current characteristics of output at MOS portion

Ambient temperature: 25°C 77°F



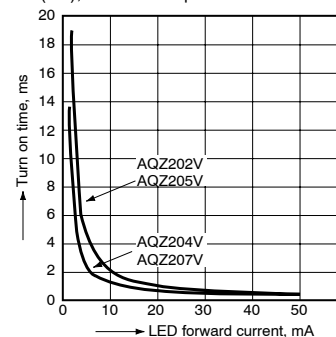
### 10. Off state leakage current

Ambient temperature: 25°C 77°F



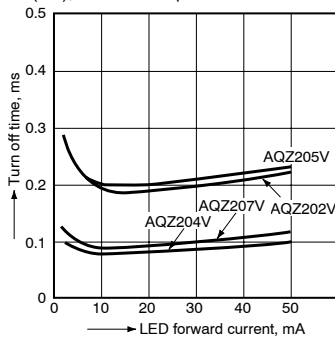
### 11. LED forward current vs. turn on time characteristics

Load voltage: 10 V (DC); Continuous load current: 100 mA (DC); Ambient temperature: 25°C 77°F



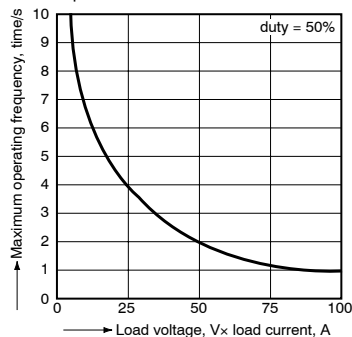
### 12. LED forward current vs. turn off time characteristics

Load voltage: 10 V (DC); Continuous load current: 100 mA (DC); Ambient temperature: 25°C 77°F



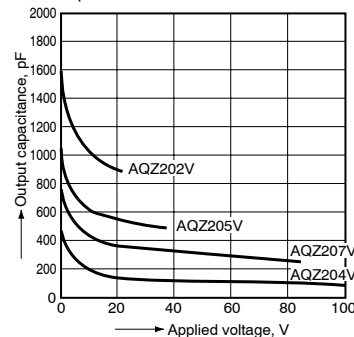
### 13. Maximum operating frequency vs. load voltage/current characteristics

LED current: 10 mA  
 Ambient temperature: 25°C 77°F



### 14. Applied voltage vs. output capacitance characteristics

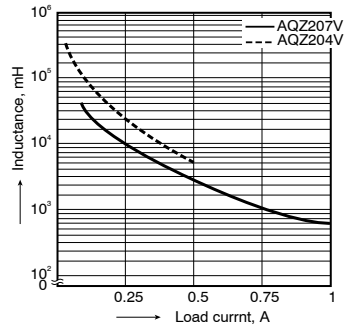
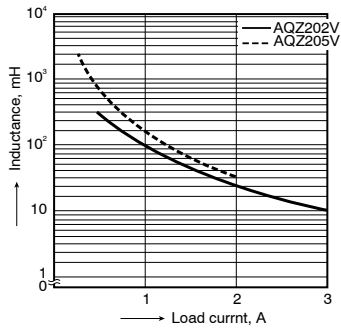
Frequency: 1 MHz;  
 Ambient temperature: 25°C 77°F



# AQZ200V

## 15. Data for internal varistor characteristic

Operating frequency: 1 Hz  
 No. of operations: 10<sup>6</sup> max.



## ACCESSORY

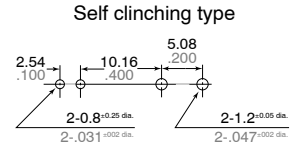
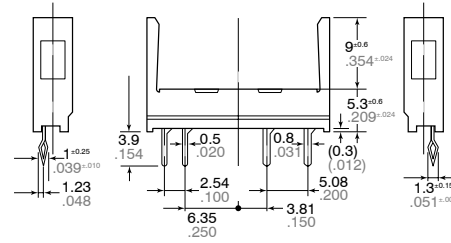
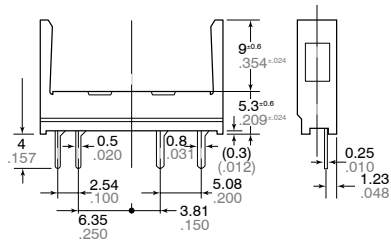
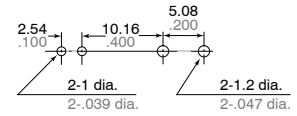
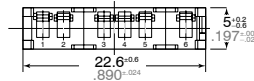
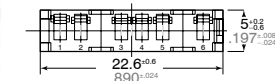
mm inch

For more details, please consult our nearest office.

Socket Standard type

Self clinching type

PC board pattern  
(BOTTOM VIEW)  
Standard type



PA1a-PS

PA1a-PS-H

Tolerance: ±0.1 ±0.04