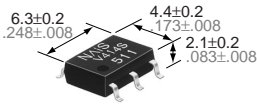


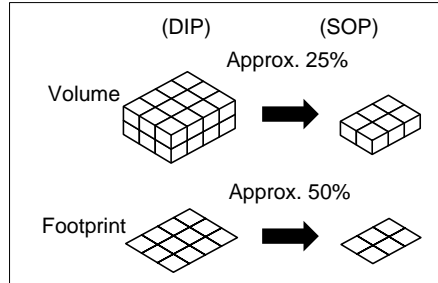
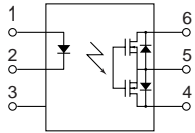
# NAIS

## GU (General Use) Type SOP Series [1-Channel (Form B) Type]

# PhotoMOS RELAYS

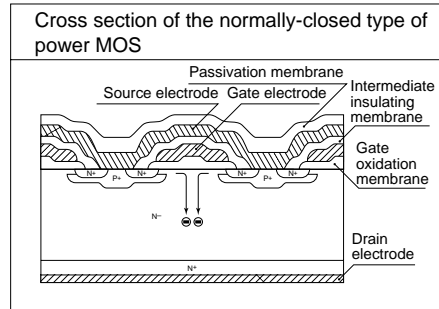


mm inch



### 2. Low on resistance (Max. 50 Ω) at 400 V for normally-closed type

has been achieved thanks to the built-in MOSFET processed by our proprietary method, DSD (Double-Diffused and Selective Doping) method.



### 3. Tape and reel

The device comes standard in a tape and reel (1,000 pcs./reel) to facilitate automatic insertion machines.

### 4. Controls low-level analog signals

PhotoMOS relays feature extremely low closed-circuit offset voltage to enable control of low-level analog signals without distortion.

### 5. Low-level off state leakage current

In contrast to the SSR with an off state leakage current of several milliamps, the PhotoMOS relay features a very small off state leakage current of only 100 pA even at the rated load voltage of 400 V.

### 6. Low thermal electromotive force (Approx. 1 μV)

## FEATURES

### 1. 1 channel (Form B) in super miniature design

The device comes in a super-miniature SO package measuring (W) 4.4 × (L) 6.3 × (H) 2.1 mm (W) .173 × (L) .248 × (H) .083 inch —approx. 25% of the volume and 50% of the footprint size of DIP type PhotoMOS Relays.

## TYPICAL APPLICATIONS

- Telephones
- Measuring instruments
- Computer
- Industrial robots
- High-speed inspection machines

## TYPES

| Type  | Output ratings* |              | Part No.                       |                                | Packing quantity in tape and reel |
|-------|-----------------|--------------|--------------------------------|--------------------------------|-----------------------------------|
|       | Load voltage    | Load current | Picked from the 1/2/3-pin side | Picked from the 4/5/6-pin side |                                   |
| AC/DC | 400 V           | 100 mA       | AQV414SX                       | AQV414SZ                       | 1,000 pcs.                        |

\*Indicate the peak AC and DC values.

Notes: (1) Tape package is the standard packing style. Also available in tube. (Part No. suffix "X" or "Z" is not needed when ordering; Tube: 75 pcs.; Case: 1,500 pcs.)

(2) For space reasons, the top two letters of the product number "AQ" are omitted on the product seal. The package type indicator "X" and "Z" are also omitted from the seal. (Ex. the label for product number AQV414S is V414S).

## RATING

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

| Item                    | Symbol                  | Type of connection | AQV414S                         | Remarks   |        |
|-------------------------|-------------------------|--------------------|---------------------------------|---|--------|
| Input                   | LED forward current     | I <sub>F</sub>     | 50 mA                           | f = 100 Hz, Duty factor = 0.1%                  |        |
|                         | LED reverse voltage     | V <sub>R</sub>     | 3 V                             |   |        |
|                         | Peak forward current    | I <sub>FP</sub>    | 1 A                             |   |        |
|                         | Power dissipation       | P <sub>in</sub>    | 75 mW                           |   |        |
| Output                  | Load voltage (peak AC)  | V <sub>L</sub>     | 400 V                           | A connection: Peak AC, DC<br>B,C connection: DC |        |
|                         | Continuous load current | I <sub>L</sub>     | A                               |   | 0.10 A |
|                         |                         |                    | B                               |   | 0.11 A |
|                         |                         |                    | C                               |   | 0.12 A |
|                         | Peak load current       | I <sub>peak</sub>  |                                 |   | 0.3 A  |
| Power dissipation       | P <sub>out</sub>        |                    | 450 mW                          |   |        |
| Total power dissipation | P <sub>T</sub>          |                    | 500 mW                          |   |        |
| I/O isolation voltage   | V <sub>iso</sub>        |                    | 1,500 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 |   |        |

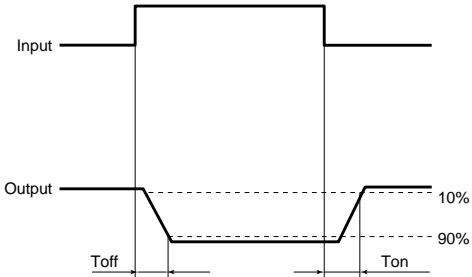
2. Electrical characteristics (Ambient temperature: 25°C 77°F)

| Item                             |                           |                                  | Symbol     | Type of connection | AQV414S                                   | Remarks   |                                  |
|----------------------------------|---------------------------|----------------------------------|------------|--------------------|---|---|----------------------------------|
| Input                            | LED operate current       | Typical                          | $I_{Fon}$  | —                  | 0.6 mA                                    | $I_L = \text{Max.}$   |                                  |
|                                  |                           | Maximum                          |            |                    | 3 mA                                      |   |                                  |
|                                  | LED turn off current      | Minimum                          | $I_{Foff}$ | —                  | 0.4 mA                                    | $I_L = \text{Max.}$   |                                  |
|                                  |                           | Typical                          |            |                    | 0.55 mA                                   |   |                                  |
|                                  | LED dropout voltage       | Typical                          | $V_F$      | —                  | 1.14 V (1.25 V at $I_F = 50 \text{ mA}$ ) |   | $I_F = 5 \text{ mA}$             |
| Maximum                          |                           | 1.5 V                            |            |                    |   |   |                                  |
| Output                           | On resistance             | Typical                          | $R_{on}$   | A                  | 26 $\Omega$                               | $I_F = 5 \text{ mA}$<br>$I_L = \text{Max.}$<br>Within 1 s on time |                                  |
|                                  |                           | Maximum                          |            |                    | 50 $\Omega$                               |   |                                  |
|                                  |                           | Typical                          | $R_{on}$   | B                  | 20 $\Omega$                               |   |                                  |
|                                  |                           | Maximum                          |            |                    | 25 $\Omega$                               |   |                                  |
|                                  | Off state leakage current | Maximum                          | $I_{Leak}$ | —                  | 1 $\mu\text{A}$                           |   | $I_F = 0$<br>$V_L = \text{Max.}$ |
|                                  |                           | Initial I/C isolation resistance |            |                    | Minimum                                   | $R_{iso}$   |                                  |
| Transfer characteristics         | Turn on time*             | Typical                          | $T_{on}$   | —                  | 0.47 ms                                   | $I_F = 5 \text{ mA}$<br>$V_L = \text{Max.}$                       |                                  |
|                                  |                           | Maximum                          |            |                    | 1.0 ms                                    |   |                                  |
|                                  | Turn off time             | Typical                          | $T_{off}$  | —                  | 0.28 ms                                   | $I_F = 5 \text{ mA}$<br>$V_L = \text{Max.}$                       |                                  |
|                                  |                           | Maximum                          |            |                    | 1.0 ms                                    |   |                                  |
|                                  | I/O capacitance           | Typical                          | $C_{iso}$  | —                  | 0.8 pF                                    | $f = 1 \text{ MHz}$<br>$V_B = 0$                                  |                                  |
|                                  |                           | Maximum                          |            |                    | 1.5 pF                                    |   |                                  |
| Initial I/C isolation resistance |                           | Minimum                          | $R_{iso}$  | —                  | 1,000 M $\Omega$                          | 500 V DC  |                                  |

Note: Recommendable LED forward current  $I_F = 5 \text{ mA}$ .

For type of connection, see page 32.

\*Turn on/Turn off time



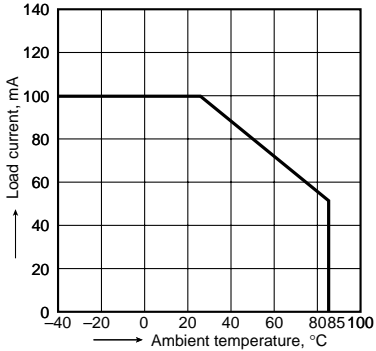
- For Dimensions, see Page 28.
- For Schematic and Wiring Diagrams, see Page 32.
- For Cautions for Use, see Page 36.

REFERENCE DATA

1. Load current vs. ambient temperature characteristics

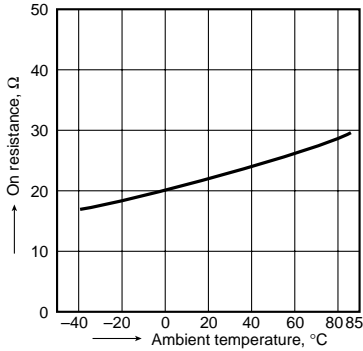
Allowable ambient temperature:  $-40^\circ\text{C}$  to  $+85^\circ\text{C}$   
 $-40^\circ\text{F}$  to  $+185^\circ\text{F}$

Type of connection: A



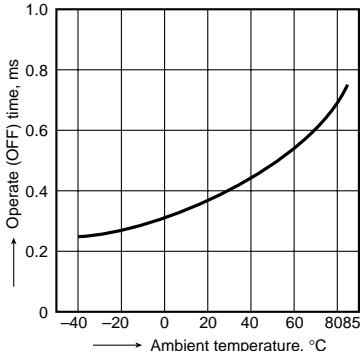
2. On resistance vs. ambient temperature characteristics

Measured portion: between terminals 4 and 6;  
LED current: 0 mA;  
Continuous load current: 100 mA (DC)



3. Operate (OFF) time vs. ambient temperature characteristics

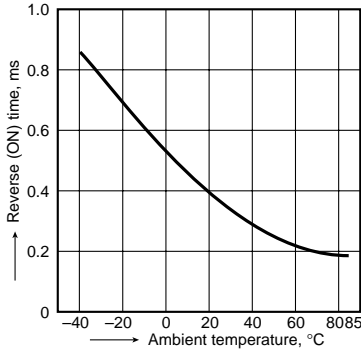
LED current: 5 mA;  
Load voltage: 400 V (DC);  
Continuous load current: 100 mA (DC)



# AQV414S

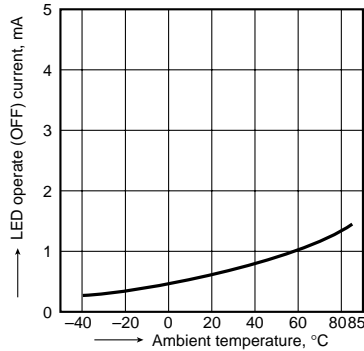
## 4. Reverse (ON) time vs. ambient temperature characteristics

LED current: 50 mA;  
Load voltage: 400 V (DC);  
Continuous load current: 100 mA (DC)



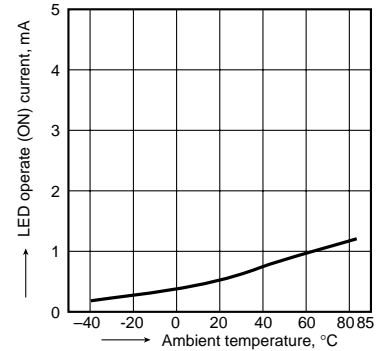
## 5. LED operate (OFF) current vs. ambient temperature characteristics

Load voltage: 400 V (DC);  
Continuous load current: 100 mA (DC)



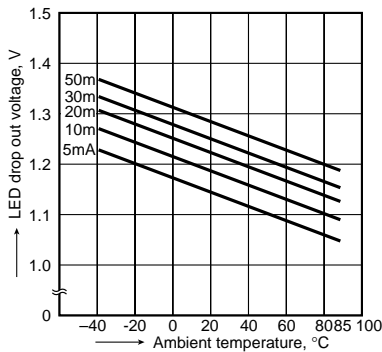
## 6. LED reverse (ON) current vs. ambient temperature characteristics

Load voltage: 400 V (DC);  
Continuous load current: 100 mA (DC)



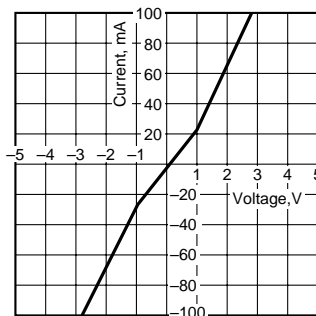
## 7. LED dropout voltage vs. ambient temperature characteristics

LED current: 5 to 50 mA



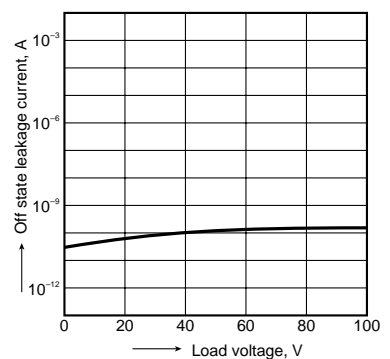
## 8. Voltage vs. current characteristics of output at MOS portion

Measured portion: between terminals 4 and 6;  
Ambient temperature: 25°C 77°F



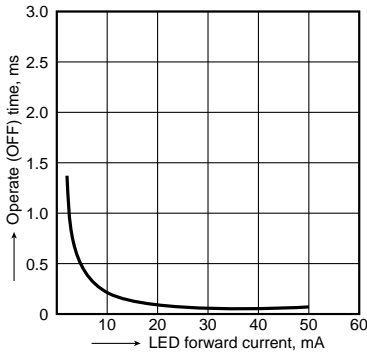
## 9. Off state leakage current

Measured portion: between terminals 4 and 6;  
LED current: 5 mA;  
Ambient temperature: 25°C 77°F



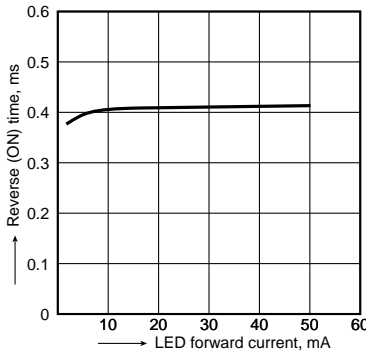
## 10. LED forward current vs. operate (OFF) time characteristics

Measured portion: between terminals 4 and 6;  
Load voltage: 400 V (DC); Continuous load current: 100 mA (DC); Ambient temperature: 25°C 77°F



## 11. LED forward current vs. reverse (ON) time characteristics

Measured portion: between terminals 4 and 6;  
Load voltage: 400 V (DC); Continuous load current: 100 mA (DC); Ambient temperature: 25°C 77°F



## 12. Applied voltage vs. output capacitance characteristics

Measured portion: between terminals 4 and 6;  
Frequency: 1 MHz;  
Ambient temperature: 25°C 77°F

