

# Panasonic

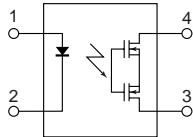
ideas for life

**Normally closed  
SOP4-pin type  
of 60V/350V/400V  
load voltage**

**PhotoMOS Relays**  
**GU SOP 1 Form B**  
**(AQY410S)**



mm inch



**Compliance with RoHS Directive**

## FEATURES

### 1. Small SOP4-pin package

The device comes in a super-miniature SO package 4-pin type measuring (W) 4.3×(L) 4.4×(H) 2.1 mm (.169×(L) .173×(H) .083 inch

### 2. Low on-resistance

The AQO4 series (normally closed type) has a low on-resistance.

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

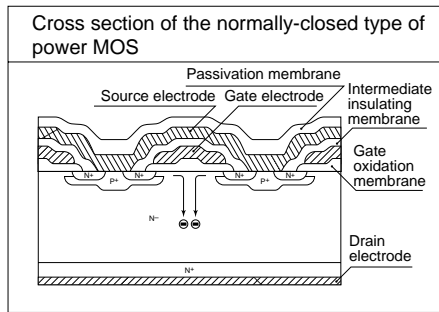
### 3. Controls low-level analog signals

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

### 4. Low-level off-state leakage current of max. 1 μA

## TYPICAL APPLICATIONS

- Power supply
- Measuring instruments
- Security equipment
- Telephone equipment
- Sensing equipment



## TYPES

|                | Output rating* |              | Package  | Part No.           |                              |                              | Packing quantity  |               |
|----------------|----------------|--------------|----------|--------------------|------------------------------|------------------------------|---|---------------|
|                | Load voltage   | Load current |          | Tube packing style | Tape and reel packing style  |                              | Tube  | Tape and reel |
|                |                |              |          |                    | Picked from the 1/2-pin side | Picked from the 3/4-pin side |   |               |
| AC/DC dual use | 60V            | 500mA        | SOP4-pin | AQY412S            | AQY412SX                     | AQY412SZ                     | 1 tube contains: 100 pcs.<br>1 batch contains: 2,000 pcs. | 1,000 pcs.    |
|                | 350V           | 120mA        |          | AQY410S            | AQY410SX                     | AQY410SZ                     |   |               |
|                | 400V           | 100mA        |          | AQY414S            | AQY414SX                     | AQY414SZ                     |   |               |

\* Indicate the peak AC and DC values.

Note: For space reasons, the three initial letters of the part number "AQY", the surface mount terminal shape indicator "S" and the packing style indicator "X" or "Z" are not marked on the relay. (Ex. the label for product number AQY412SX is 412)

## RATING

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

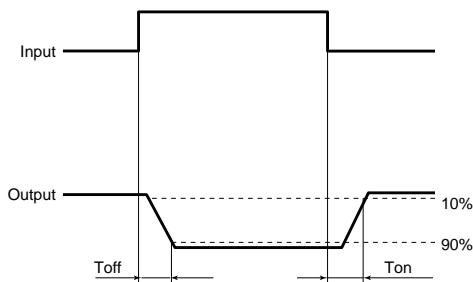
| Item                    |                         | Symbol     | AQY412S                         | AQY410S | AQY414S | Remarks                            |
|-------------------------|-------------------------|------------|---------------------------------|---------|---------|------------------------------------|
| Input                   | LED forward current     | $I_F$      | 50 mA                           |         |         |                                    |
|                         | LED reverse voltage     | $V_R$      | 5 V                             |         |         |                                    |
|                         | Peak forward current    | $I_{FP}$   | 1 A                             |         |         | f = 100 Hz, Duty factor = 0.1%     |
|                         | Power dissipation       | $P_{in}$   | 75 mW                           |         |         |                                    |
| Output                  | Load voltage (peak AC)  | $V_L$      | 60 V                            | 350 V   | 400 V   |                                    |
|                         | Continuous load current | $I_L$      | 0.5 A                           | 0.12 A  | 0.1 A   | Peak AC, DC                        |
|                         | Peak load current       | $I_{peak}$ | 1.5 A                           | 0.3 A   | 0.24 A  | 100ms (1 shot), $V_L = DC$         |
|                         | Power dissipation       | $P_{out}$  | 300 mW                          |         |         |                                    |
| Total power dissipation |                         | $P_T$      | 350 mW                          |         |         |                                    |
| I/O isolation voltage   |                         | $V_{iso}$  | 1,500 V AC                      |         |         |                                    |
| Temperature limits      | Operating               | $T_{opr}$  | -40°C to +85°C -40°F to +185°F  |         |         | Non-condensing at low temperatures |
|                         | Storage                 | $T_{stg}$  | -40°C to +100°C -40°F to +212°F |         |         |                                    |

# GU SOP 1 Form B (AQY41OS)

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

| Item                             |                           |                  | Symbol                                   | AQY412S         | AQY410S             | AQY414S               | Remarks  |
|----------------------------------|---------------------------|------------------|--|-----------------|---------------------|-----------------------|--|
| Input                            | LED operate (OFF) current | Typical          | $I_{\text{off}}$                         | 0.9 mA          |                     |                       | $I_L = \text{Max.}$  |
|                                  |                           | Maximum          |  | 3 mA            |                     |                       |  |
|                                  | LED reverse (ON) current  | Minimum          | $I_{\text{on}}$                          | 0.4 mA          |                     |                       | $I_L = \text{Max.}$  |
|                                  |                           | Typical          |  | 0.85 mA         |                     |                       |  |
| LED dropout voltage              | Typical                   | $V_F$            | 1.25 V (1.14 V at $I_F = 5 \text{ mA}$ ) |                 |                     | $I_F = 50 \text{ mA}$ |  |
|                                  | Maximum                   |                  | 1.5 V                                    |                 |                     |                       |  |
| Output                           | On resistance             | Typical          | $R_{\text{on}}$                          | 1 $\Omega$      | 18 $\Omega$         | 26 $\Omega$           | $I_F = 0 \text{ mA}$<br>$I_L = \text{Max.}$<br>Within 1 s on time    |
|                                  |                           | Maximum          |  | 2.5 $\Omega$    | 25 $\Omega$         | 35 $\Omega$           |  |
|                                  | Off state leakage current | Maximum          | $I_{\text{Leak}}$                        | 1 $\mu\text{A}$ |                     |                       | $I_F = 5 \text{ mA}$<br>$V_L = \text{Max.}$                          |
| Transfer characteristics         | Operate (OFF) time*       | Typical          | $T_{\text{off}}$                         | 0.9 ms          | 0.52 ms             | 0.47 ms               | $I_F = 0 \text{ mA} \rightarrow 5 \text{ mA}$<br>$I_L = \text{Max.}$ |
|                                  |                           | Maximum          |  | 3 ms            | 1 ms                |                       |  |
|                                  | Reverse (ON) time*        | Typical          | $T_{\text{on}}$                          | 0.21 ms         | 0.23 ms             | 0.28 ms               | $I_F = 5 \text{ mA} \rightarrow 0 \text{ mA}$<br>$I_L = \text{Max.}$ |
|                                  |                           | Maximum          |  | 1 ms            | 1 ms                |                       |  |
|                                  | I/O capacitance           | Typical          | $C_{\text{iso}}$                         | 0.8 pF          |                     |                       | $f = 1 \text{ MHz}$  |
|                                  | Maximum                   | 1.5 pF           |  |                 | $V_B = 0 \text{ V}$ |                       |  |
| Initial I/O isolation resistance | Minimum                   | $R_{\text{iso}}$ | 1,000 M $\Omega$                         |                 |                     | 500 V DC              |  |

\*Operate/Reverse time



## RECOMMENDED OPERATING CONDITIONS

Please obey the following conditions to ensure proper relay operation and resetting.

| Item              | Symbol | Recommended value | Unit |
|-------------------|--------|-------------------|------|
| Input LED current | $I_F$  | 5                 | mA   |

- For Dimensions
- For Schematic and Wiring Diagrams
- For Cautions for Use

■ These products are not designed for automotive use.

If you are considering to use these products for automotive applications, please contact your local Panasonic Electric Works technical representative.

For more information

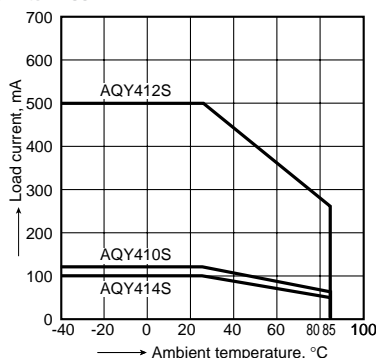
## REFERENCE DATA

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

Allowable ambient temperature:

-40°C to +85°C

-40°F to +185°F

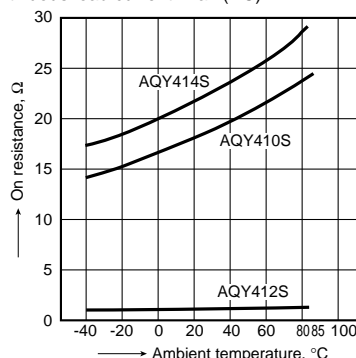


### 2. On resistance vs. ambient temperature characteristics

Measured portion: between terminals 3 and 4;

LED current: 0 mA;

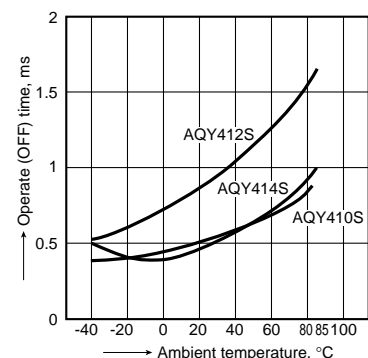
Continuous load current: Max.(DC)



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

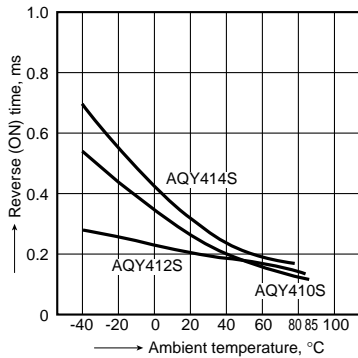
LED current: 5 mA; Load voltage: Max.(DC);

Continuous load current: Max.(DC)



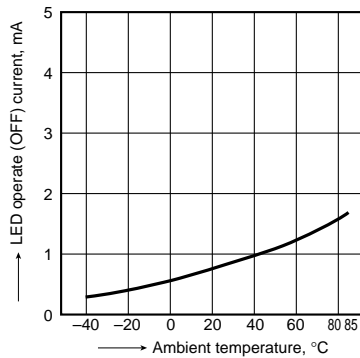
## 4. Reverse (ON) time vs. ambient temperature characteristics

LED current: 5 mA; Load voltage: Max.(DC);  
Continuous load current: Max.(DC)



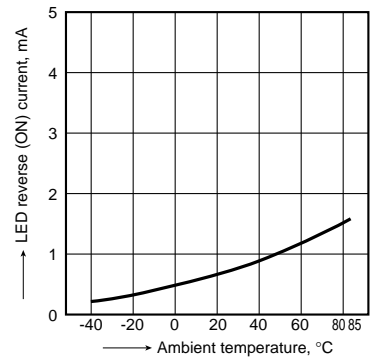
## 5. LED operate (OFF) current vs. ambient temperature characteristics

Sample: All types;  
Load voltage: Max.(DC);  
Continuous load current: Max.(DC)



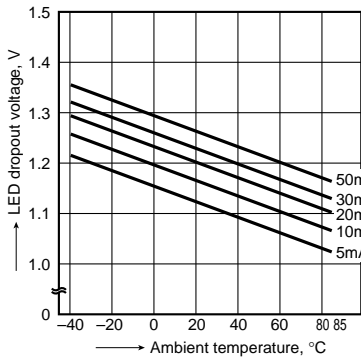
## 6. LED reverse (ON) current vs. ambient temperature characteristics

Sample: All types;  
Load voltage: Max.(DC);  
Continuous load current: Max.(DC)



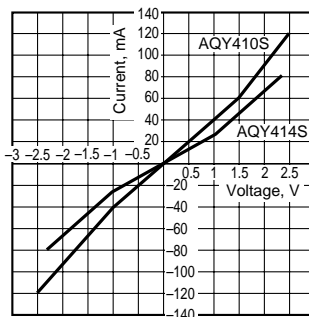
## 7. LED dropout voltage vs. ambient temperature characteristics

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



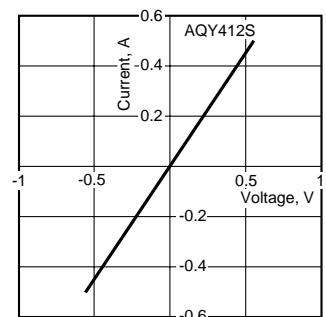
## 8-(1). Current vs. voltage characteristics of output at MOS portion

Measured portion: between terminals 3 and 4;  
Ambient temperature: 25°C 77°F



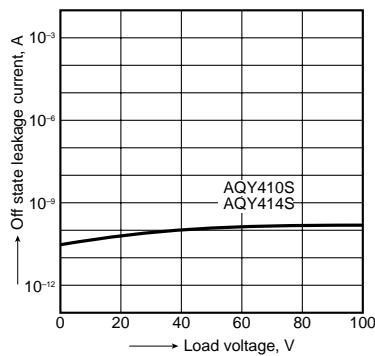
## 8-(2). Current vs. voltage characteristics of output at MOS portion

Measured portion: between terminals 3 and 4;  
Ambient temperature: 25°C 77°F



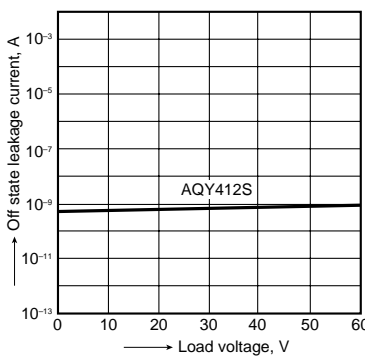
## 9-(1). Off state leakage current vs. load voltage characteristics

Measured portion: between terminals 3 and 4;  
LED current: 5 mA; Ambient temperature: 25°C 77°F



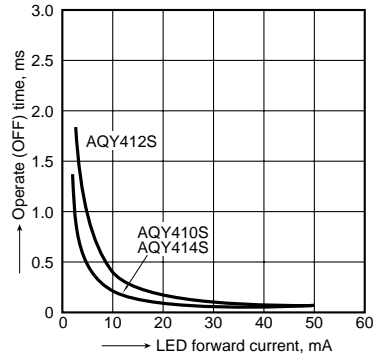
## 9-(2). Off state leakage current vs. load voltage characteristics

Measured portion: between terminals 3 and 4;  
LED current: 5 mA; Ambient temperature: 25°C 77°F



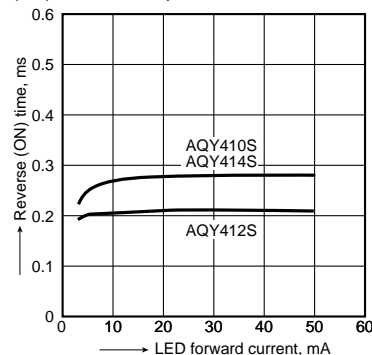
## 10. Operate (OFF) time vs. LED forward current characteristics

Measured portion: between terminals 3 and 4;  
Load voltage: Max.(DC); Continuous load current: Max.(DC); Ambient temperature: 25°C 77°F



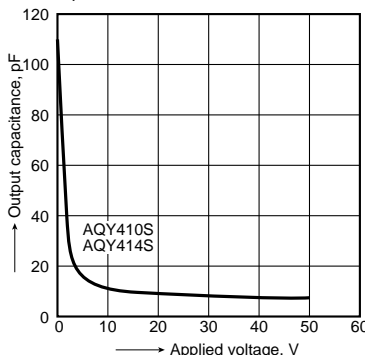
## 11. Reverse (ON) time vs. LED forward current characteristics

Measured portion: between terminals 3 and 4;  
Load voltage: Max.(DC); Continuous load current: Max.(DC); Ambient temperature: 25°C 77°F



## 12-(1). Output capacitance vs. applied voltage characteristics

Measured portion: between terminals 3 and 4;  
Frequency: 1 MHz;  
Ambient temperature: 25°C 77°F



## 12-(2). Output capacitance vs. applied voltage characteristics

Measured portion: between terminals 3 and 4;  
Frequency: 1 MHz;  
Ambient temperature: 25°C 77°F

