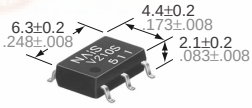
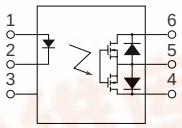
NAiS

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

# PhotoMOS RELAYS



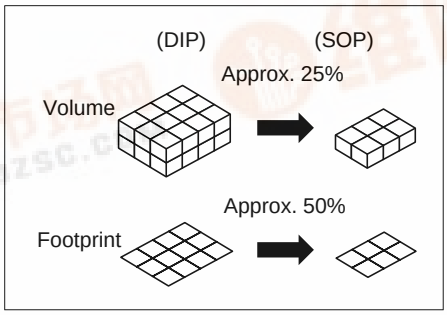

mm inch




## FEATURES

**1. 1 channel (Form A) 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.




**2. Tape and reel**

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

**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**

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 (AQV214S).

## TYPICAL APPLICATIONS

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

## TYPES

| Type | Output ratings* | | Part No. | | Packing quantity in tape and reel |
|---|---|---|---|---|---|
| | | | Picked from the 1/2/3-pin side | Picked from the 4/5/6-pin side | |
| | Load voltage | Load current | 1 Form A | 1 Form A | |
| AC/DC | 60 V | 350 mA | AQV212SX | AQV212SZ | 1,000 pcs. |
| | 100 V | 300 mA | AQV215SX | AQV215SZ | |
| | 200 V | 160 mA | AQV217SX | AQV217SZ | |
| | 350 V | 120 mA | AQV210SX | AQV210SZ | |
| | 400 V | 100 mA | AQV214SX | AQV214SZ | |
| | 600 V | 40 mA | AQV216SX | AQV216SZ | |

*Indicate the peak AC and DC values.

Notes: (1) Tape package is the standard packing style. Also available in tube. (Part No. suffix "X" ro "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 ommitted on the product seal. The package type indicator "X" and "Z" are also omitted from the seal. (Ex. the label for product number AQV214S is V214S).

## RATING

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

| Item | | Symbol | Type of connection | AQV212S | AQV215S | AQV217S | AQV210S | AQV214S | AQV216S | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|
| Input | LED forward current | $I_F$ | | 50 mA | | | | | | |
| | LED reverse voltage | $V_R$ | | 3 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 | 100 V | 200 V | 350 V | 400 V | 600 V | |
| | Continuous load current | $I_L$ | A | 0.35 A | 0.30 A | 0.16 A | 0.12 A | 0.10 A | 0.04 A | A connection: Peak AC, DC B,C connection: DC |
| | | | B | 0.50 A | 0.40 A | 0.20 A | 0.13 A | 0.11 A | 0.05 A | |
| | | | C | 0.70 A | 0.56 A | 0.28 A | 0.15 A | 0.12 A | 0.06 A | |
| | Peak load current | $I_{peak}$ | | 1.0A | 0.90A | 0.48A | 0.3 A | 0.3 A | 0.12 A | A connection: 100 ms (1 shot) $V_L$= DC |
| | Power dissipation | $P_{out}$ | | 450 mW | | | | | | |
| Total power dissipation | | $P_T$ | | 500 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 | | | | | | |

# AQV21❍S

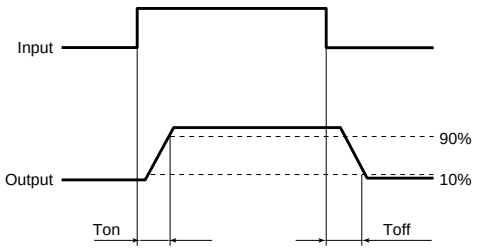
2. Electrical characteristics (Ambient temperature: 25°C 77°F)

| Item | | | Symbol | Type of connection | AQV212S | AQV215S | AQV217S | AQV210S | AQV214S | AQV216S | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Input | LED operate current | Typical | $I_{Fon}$ | — | 0.7 mA | | | | | | $I_L$= Max. |
| | | Maximum | | | 3 mA | | | | | | |
| | LED turn off current | Minimum | $I_{Foff}$ | — | 0.4 mA | | | | | | $I_L$= Max. |
| | | Typical | | | 0.65 mA | | | | | | |
| | LED dropout voltage | Typical | $V_F$ | — | 1.14 V (1.25 V at $I_F$ = 50 mA) | | | | | | $I_F$= 5 mA |
| | | Maximum | | | 1.5 V | | | | | | |
| Output | On resistance | Typical | $R_{on}$ | A | 0.83 Ω | 2.3 Ω | 11 Ω | 23 Ω | 30 Ω | 70 Ω | $I_F$= 5 mA<br>$I_L$= Max.<br>Within 1 s on time |
| | | Maximum | | | 2.5 Ω | 4.0 Ω | 15 Ω | 35 Ω | 50 Ω | 120 Ω | |
| | | Typical | $R_{on}$ | B | 0.44 Ω | 1.15 Ω | 5.5 Ω | 11.5 Ω | 22.5 Ω | 55 Ω | $I_F$ = 5 mA<br>$I_L$ = Max.<br>Within 1 s on time |
| | | Maximum | | | 1.25 Ω | 2.0 Ω | 7.5 Ω | 17.5 Ω | 25 Ω | 100 Ω | |
| | | Typical | $R_{on}$ | C | 0.25 Ω | 0.6 Ω | 2.8 Ω | 6.0 Ω | 11.3 Ω | 28 Ω | $I_F$ = 5 mA<br>$I_L$ = Max.<br>Within 1 s on time |
| | | Maximum | | | 0.63 Ω | 1.0 Ω | 3.8 Ω | 8.8 Ω | 12.5 Ω | 50 Ω | |
| | Off state leakage current | Maximum | $I_{Leak}$ | — | 1 μA | | | | | | $I_F$ = 0<br>$V_L$ = Max. |
| Transfer characteristics | Turn on time* | Typical | $T_{on}$ | — | 0.65 ms | 0.60 ms | 0.25 ms | 0.25 ms | 0.25 ms | 0.28 ms | $I_F$= 5 mA<br>$V_L$ = Max. |
| | | Maximum | | | 2.0 ms | 2.0 ms | 1.0 ms | 0.5 ms | 0.5 ms | 0.5 ms | |
| | Turn off time | Typical | $T_{off}$ | — | 0.08 ms | 0.06 ms | 0.05 ms | 0.05 ms | 0.05 ms | 0.04 ms | $I_F$= 5 mA<br>$V_L$ = Max. |
| | | Maximum | | | 0.2 ms | | | | | | |
| | I/O capacitance | Typical | $C_{iso}$ | — | 0.8 pF | | | | | | f = 1 MHz<br>$V_B$ = 0 |
| | | Maximum | | | 1.5 pF | | | | | | |
| | Initial I/C isolation resistance | Minimum | $R_{iso}$ | — | 1,000 MΩ | | | | | | 500 V DC |

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

For type of connection, see page 31.

*Turn on/Turn off time



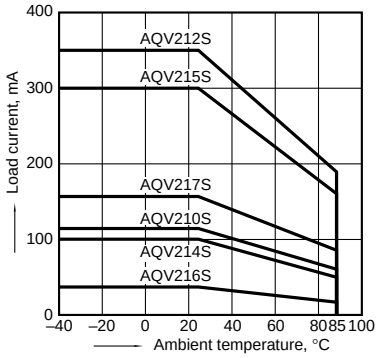

■ **For Dimensions, see Page 28.**
■ **For Schematic and Wiring Diagrams, see Page 31.**
■ **For Cautions for Use, see Page 36.**

## REFERENCE DATA

1. Load current vs. ambient temperature characteristics

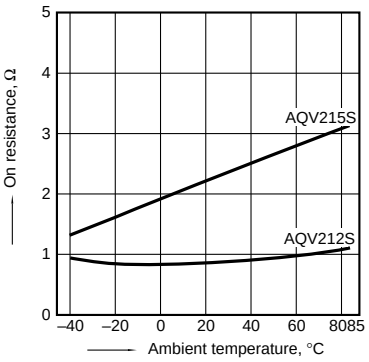
Allowable ambient temperature: –40°C to +85°C
–40°F to +185°F

Type of connection: A



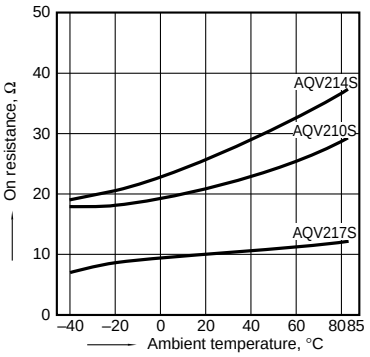

2.-(1) On resistance vs. ambient temperature characteristics

Measured portion: between terminals 4 and 6;
LED current: 5 mA; Load voltage: Max. (DC);
Continuous load current: Max. (DC)



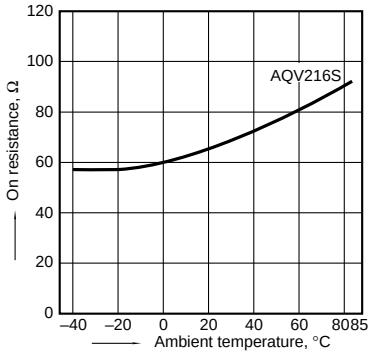

2.-(2) On resistance vs. ambient temperature characteristics

Measured portion: between terminals 4 and 6;
LED current: 5 mA; Load voltage: Max. (DC);
Continuous load current: Max. (DC)



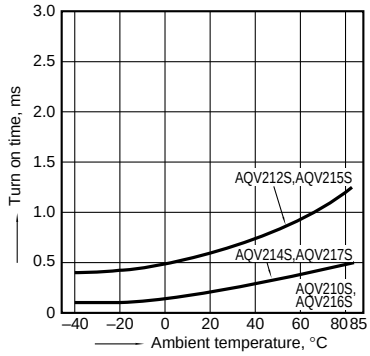
2.-(3) On resistance vs. ambient temperature characteristics

Measured portion: between terminals 4 and 6;
LED current: 5 mA; Load voltage: Max. (DC);
Continuous load current: Max. (DC)



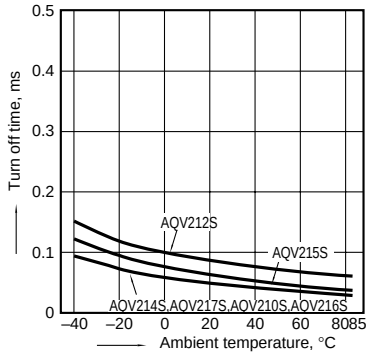

3. Turn on time vs. ambient temperature characteristics

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



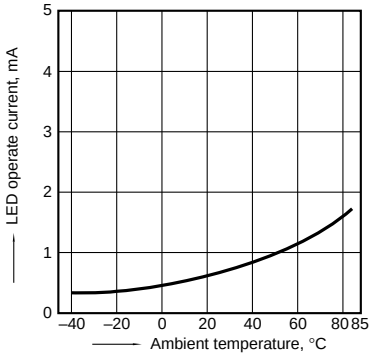

4. Turn off time vs. ambient temperature characteristics

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



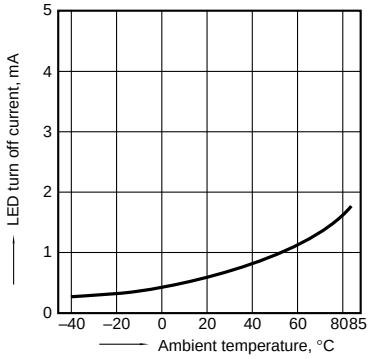

5. LED operate current vs. ambient temperature characteristics

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



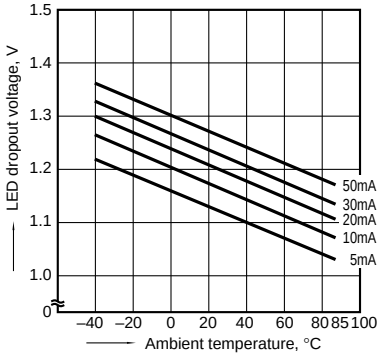

6. LED turn off current vs. ambient temperature characteristics

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



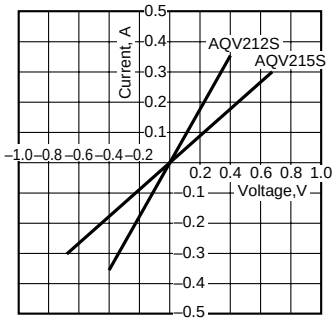

7. LED dropout voltage vs. ambient temperature characteristics

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



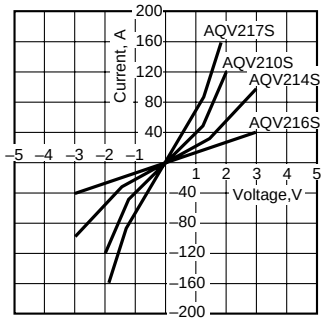

8.-(1). Voltage vs. current characteristics of output at MOS portion

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



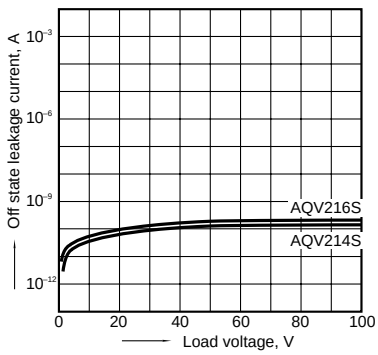

8.-(2). Voltage vs. current characteristics of output at MOS portion

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



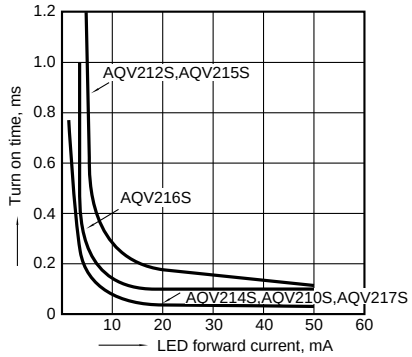

9. Off state leakage current

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



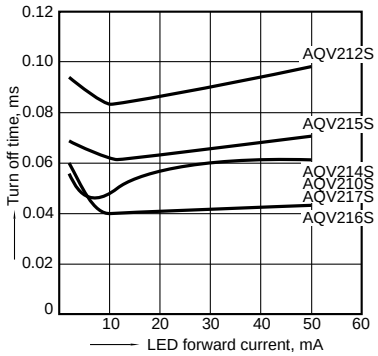

10. LED forward current vs. turn on time characteristics

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




11. LED forward current vs. turn off time characteristics

Measured portion: between terminals 4 and 6;
Load voltage: Max. (DC); Continuous load current:
Max. (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