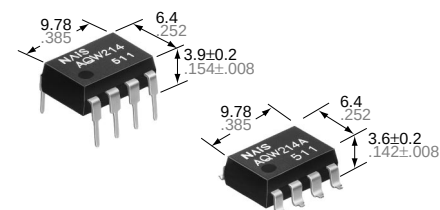


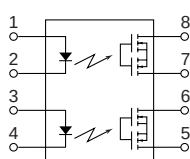
# NAIS

## GU (General Use) Type [2-Channel (Form A) Type]

# PhotoMOS RELAYS



mm inch



## FEATURES

### 1. Compact 8-pin DIP size

The device comes in a compact (W) 6.4 × (L) 9.78 × (H) 3.9 mm (W) .252 × (L) .385 × (H) .154 inch, 8-pin DIP size (through hole terminal type).

### 2. Applicable for 2 Form A use as well as two independent 1 Form A use

### 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. High sensitivity, high speed response

Can control a maximum 0.13 A load current with a 5 mA input current. Fast operation speed of 310 μs (typical). (AQW214)

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

The SSR has an off state leakage current of several milliamperes whereas the PhotoMOS relays has only 100 pA even with the rated load voltage of 400 V (AQW214).

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

### 7. Eliminates the need for a counter electromotive force protection diode in the drive circuits on the input side

### 8. Stable ON resistance.

### 9. Eliminates the need for a power supply to drive the power MOSFET

## TYPICAL APPLICATIONS

- High-speed inspection machines
- Telephones equipment
- Computer

## TYPES

### 1. AC/DC type

| Output rating* |              | Part No.              |                        |                             |          | Packing quantity                                     |               |
|----------------|--------------|-----------------------|------------------------|-----------------------------|----------|------------------------------------------------------|---------------|
|                |              | Through hole terminal | Surface-mount terminal |                             |          |                                                      |               |
| Load voltage   | Load current | Tube packing style    |                        | Tape and reel packing style |          | Tube                                                 | Tape and reel |
| 60V            | 350 mA       | AQW212                | AQW212A                | AQW212AX                    | AQW212AZ | 1 tube contains 40 pcs.<br>1 batch contains 400 pcs. | 1,000 pcs.    |
| 100 V          | 300 mA       | AQW215                | AQW215A                | AQW215AX                    | AQW215AZ |                                                      |               |
| 200 V          | 160 mA       | AQW217                | AQW217A                | AQW217AX                    | AQW217AZ |                                                      |               |
| 350 V          | 120 mA       | AQW210                | AQW210A                | AQW210AX                    | AQW210AZ |                                                      |               |
| 400 V          | 100 mA       | AQW214                | AQW214A                | AQW214AX                    | AQW214AZ |                                                      |               |
| 600 V          | 40 mA        | AQW216                | AQW216A                | AQW216AX                    | AQW216AZ |                                                      |               |

\*Indicate the peak AC and DC values.

Note: For space reasons, the package type indicator "X" and "Z" are omitted from the seal.

## RATING

### 1. AC/DC type

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

| Item                    |                         | Symbol            | AQW212(A)                       | AQW215(A)          | AQW217(A)         | AQW210(A)          | AQW214(A)          | AQW216(A)          | 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,<br>Duty factor = 0.1%                                  |
|                         | Power dissipation       | P <sub>in</sub>   | 75 mW                           |                    |                   |                    |                    |                    |                                                                    |
| Output                  | Load voltage (peak AC)  | V <sub>L</sub>    | 60 V                            | 100 V              | 200 V             | 350 V              | 400 V              | 600 V              |                                                                    |
|                         | Continuous load current | I <sub>L</sub>    | 0.35 A<br>(0.40 A)              | 0.30 A<br>(0.35 A) | 0.16 A<br>(0.2 A) | 0.12 A<br>(0.14 A) | 0.10 A<br>(0.13 A) | 0.04 A<br>(0.05 A) | ( ) : in case of using only 1 channel<br>A connection: Peak AC, DC |
|                         | Peak load current       | I <sub>peak</sub> | 1.0 A                           | 0.9 A              | 0.48 A            | 0.36 A             | 0.3 A              | 0.12 A             | A connection: 100 ms (1 shot),<br>V <sub>L</sub> = DC              |
|                         | Power dissipation       | P <sub>out</sub>  | 800 mW                          |                    |                   |                    |                    |                    |                                                                    |
| Total power dissipation |                         | P <sub>T</sub>    | 850 mW                          |                    |                   |                    |                    |                    |                                                                    |
| I/O isolation voltage   |                         | V <sub>iso</sub>  | 1,500 V AC                      |                    |                   |                    |                    |                    | Between input and output/<br>between contact sets                  |
| 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 |                    |                   |                    |                    |                    |                                                                    |

AQW21○

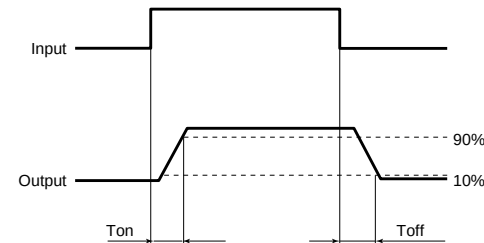
2. Electrical characteristics (Ambient temperature: 25°C 77°F)

| Item                             |                           |               | Symbol            | AQW212(A)                                 | AQW215(A) | AQW217(A) | AQW210(A) | AQW214(A) | AQW216(A) | Condition                                   |
|----------------------------------|---------------------------|---------------|-------------------|-------------------------------------------|-----------|-----------|-----------|-----------|-----------|---------------------------------------------|
| Input                            | LED operate current       | Typical       | I <sub>Fon</sub>  | 0.9 mA                                    |           |           |           |           |           | I <sub>L</sub> = Max.                       |
|                                  |                           | Maximum       |                   | 3 mA                                      |           |           |           |           |           |                                             |
|                                  | LED turn off current      | Minimum       | I <sub>Foff</sub> | 0.4 mA                                    |           |           |           |           |           | I <sub>L</sub> = Max.                       |
|                                  |                           | Typical       |                   | 0.8 mA                                    |           |           |           |           |           |                                             |
|                                  | LED dropout voltage       | Typical       | V <sub>F</sub>    | 1.14 V (1.25 V at I <sub>F</sub> = 50 mA) |           |           |           |           |           | I <sub>F</sub> = 5 mA                       |
|                                  |                           | Maximum       |                   | 1.5 V                                     |           |           |           |           |           |                                             |
| Output                           | On resistance             | Typical       | R <sub>on</sub>   | 0.83 Ω                                    | 2.3 Ω     | 11 Ω      | 23 Ω      | 30 Ω      | 70 Ω      | I <sub>F</sub> = 5 mA                       |
|                                  |                           | Maximum       |                   | 2.5 Ω                                     | 4.0 Ω     | 15 Ω      | 35 Ω      | 50 Ω      | 120 Ω     | I <sub>L</sub> = Max.<br>Within 1 son time  |
|                                  | Off state leakage current | Maximum       | I <sub>Leak</sub> | 1 μA                                      |           |           |           |           |           | I <sub>F</sub> = 0<br>V <sub>L</sub> = Max. |
|                                  | Transfer characteristics  | Turn on time* | Typical           | T <sub>on</sub>                           | 0.65 ms   | 0.60 ms   | 0.25 ms   | 0.25 ms   | 0.31 ms   | 0.28 ms                                     |
| Maximum                          |                           |               | 2 ms              |                                           | 2 ms      | 1.0 ms    | 0.5 ms    | 0.5 ms    | 0.5 ms    | I <sub>L</sub> = Max.                       |
| Turn off time*                   |                           | Typical       | T <sub>off</sub>  | 0.08 ms                                   | 0.06 ms   | 0.05 ms   | 0.05 ms   | 0.05 ms   | 0.04 ms   | I <sub>F</sub> = 5 mA                       |
|                                  |                           | Maximum       |                   | 0.2 ms                                    |           |           |           |           |           | I <sub>L</sub> = Max.                       |
| I/O capacitance                  |                           | Typical       | C <sub>iso</sub>  | 0.8 pF                                    |           |           |           |           |           | f = 1 MHz                                   |
|                                  |                           | Maximum       |                   | 1.5 pF                                    |           |           |           |           |           | V <sub>B</sub> = 0                          |
| Initial I/C isolation resistance |                           | Minimum       | R <sub>iso</sub>  | 1,000 MΩ                                  |           |           |           |           |           | 500 V DC                                    |

Note: Recommendable LED forward current I<sub>F</sub> = 5mA.

For type of connection, see page 32.

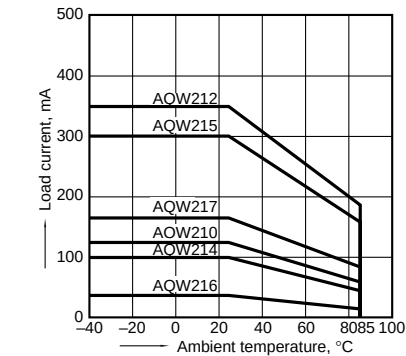
\*Turn on/Turn off time



REFERENCE DATA

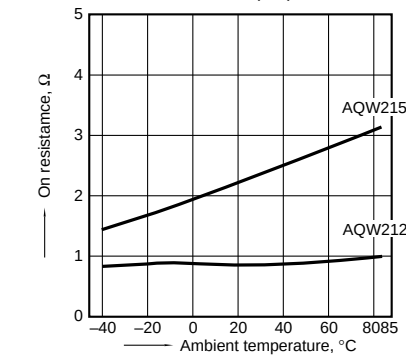
1. Load current vs. ambient temperature characteristics

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



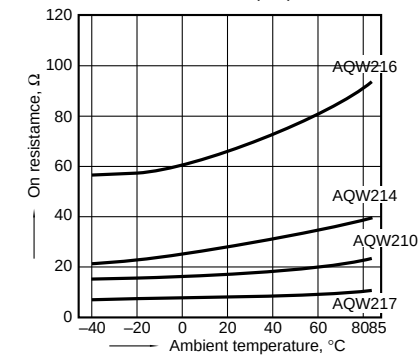
2.-(1) On resistance vs. ambient temperature characteristics

Measured portion: between terminals 5 and 6, 7 and 8;  
LED current: 5 mA; Load voltage: Max. (DC);  
Continuous load current: Max. (DC)



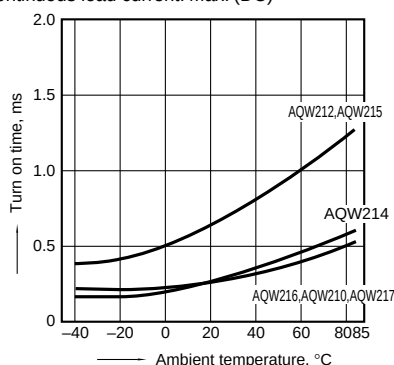
2.-(2) On resistance vs. ambient temperature characteristics

Measured portion: between terminals 5 and 6, 7 and 8;  
LED current: 5 mA; Load voltage: Max. (DC);  
Continuous load current: Max. (DC)



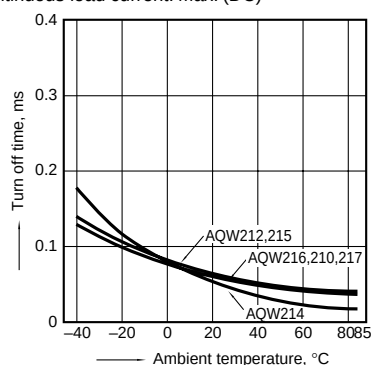
### 3. Turn on time vs. ambient temperature characteristics

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



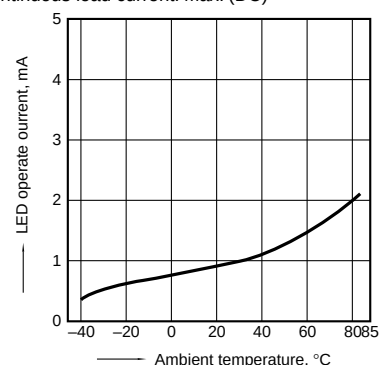
### 4. Turn off time vs. ambient temperature characteristics

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



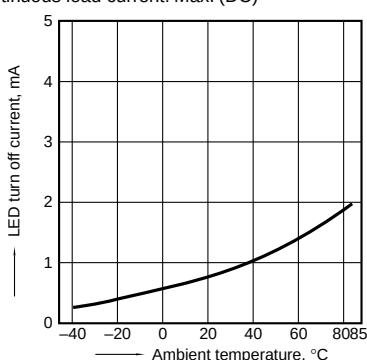
### 5. LED operate current vs. ambient temperature characteristics

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



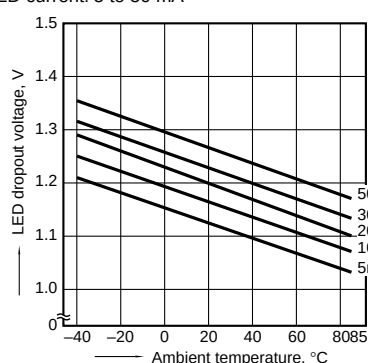
### 6. LED turn off current vs. ambient temperature characteristics

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



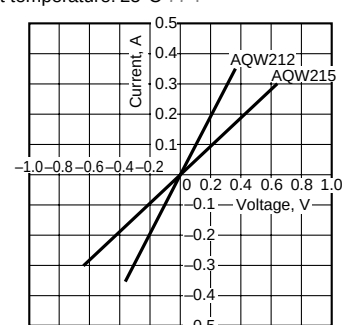
### 7. LED dropout voltage vs. ambient temperature characteristics

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



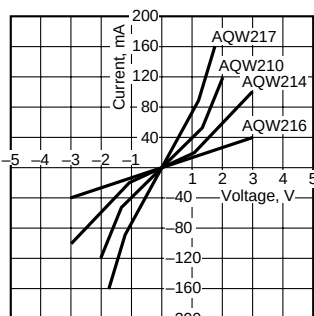
### 8.-(1) Voltage vs. current characteristics of output at MOS portion

Measured portion: between terminals 5 and 6, 7 and 8;  
Ambient temperature: 25°C 77°F



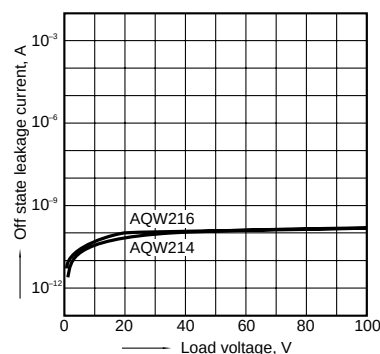
### 8.-(2) Voltage vs. current characteristics of output at MOS portion

Measured portion: between terminals 5 and 6, 7 and 8;  
Ambient temperature: 25°C 77°F



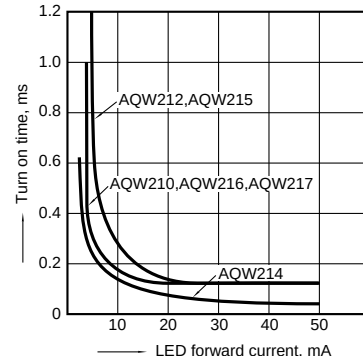
### 9. Off state leakage current

Measured portion: between terminals 5 and 6, 7 and 8;  
Ambient temperature: 25°C 77°F



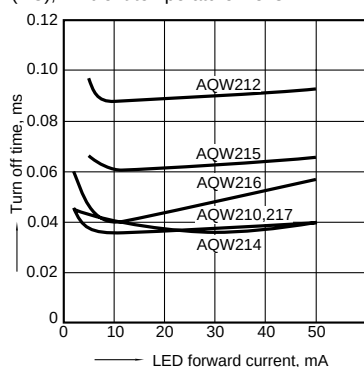
### 10. LED forward current vs. turn on time characteristics

Measured portion: between terminals 5 and 6, 7 and 8;  
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 5 and 6, 7 and 8;  
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 5 and 6, 7 and 8;  
Frequency: 1 MHz;  
Ambient temperature: 25°C 77°F

