

NAIS

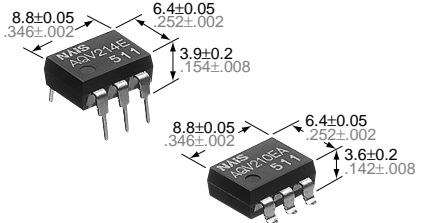
GU (General Use)-E Type [1-Channel (Form A) Type]

PhotoMOS RELAYS

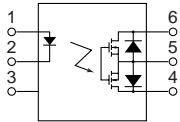
FEATURES

- 1. Controls low-level analog signals**
PhotoMOS relays feature extremely low closed-circuit offset voltage to enable control of low-level analog signals without distortion.
- 2. Control with low-level input signals**
- 3. Controls various types of loads such as relays, motors, lamps and solenoids.**
- 4. Optical coupling for extremely high isolation**
Unlike mechanical relays, the PhotoMOS relay combines LED and optoelectronic device to transfer signals using light for extremely high isolation.
- 5. Eliminates the need for a counter electromotive force protection diode in the drive circuits on the input side**

- 6. Stable on resistance**
- 7. Low-level off state leakage current**
- 8. Eliminates the need for a power supply to drive the power MOSFET**
A power supply used to drive the power MOSFET is unnecessary because of the built-in optoelectronic device. This results in easy circuit design and small PC board area.
- 9. Low thermal electromotive force (Approx. 1 μ V)**



mm inch



TYPICAL APPLICATIONS

- High-speed inspection machines
- Telephone equipment
- Data communication equipment
- Computer

TYPES

| Type | I/O isolation | 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 |
| AC/DC | Standard 1,500 V AC | 350 V | 130 mA | AQV210E | AQV210EA | AQV210EAX | AQV210EAX | | |
| | | 400 V | 120 mA | AQV214E | AQV214EA | AQV214EAX | AQV214EAX | | |
| | Reinforced 5,000 V | 350 V | 130 mA | AQV210EH | AQV210EHA | AQV210EHAX | AQV210EHAX | | |
| | | 400 V | 120 mA | AQV214EH | AQV214EHA | AQV214EHAX | AQV214EHAX | | |

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

| Item | | Sym- bol | Type of connec- tion | AQV210E(A) | AQV214E(A) | AQV210EH(A) | AQV214EH(A) | Remarks | |
|-------------------------|-------------------------|-------------|---------------------------------|------------|------------|-------------|-----------------------------|---|--|
| Input | LED forward current | I_F | | 50 mA | | | | f = 100 Hz, Duty factor = 0.1% | |
| | LED reverse voltage | V_R | | 3 V | | | | | |
| | Peak forward current | I_{FP} | | 1 A | | | | | |
| | Power dissipation | P_{in} | | 75 mW | | | | | |
| Output | Load voltage (peak AC) | V_L | | 350 V | 400 V | 350 V | 400 V | A connection: Peak AC, DC; B, C connection: DC | |
| | Continuous load current | I_L | | A | 0.13 A | 0.12 A | 0.13 A | | 0.12 A |
| | | | | B | 0.15 A | 0.13 A | 0.15 A | | 0.13 A |
| | | | | C | 0.17 A | 0.15 A | 0.17 A | | 0.15 A |
| | Peak load current | I_{peak} | | 0.4 A | 0.3 A | 0.4 A | 0.3 A | | A connection: 100 ms (1 shot), $V_L=DC$ |
| Power dissipation | P_{out} | 500 mW | | | | | | | |
| Total power dissipation | | P_T | 550 mW | | | | | | |
| I/O isolation voltage | | V_{iso} | 1,500 V AC | | 5,000 V AC | | | | |
| Temperature limits | Operating | T_{opr} | -40°C to +85°C -40°F to +185°F | | | | Non-condensing at low temp. | | |
| | Storage | T_{stg} | -40°C to +100°C -40°F to +212°F | | | | | | |

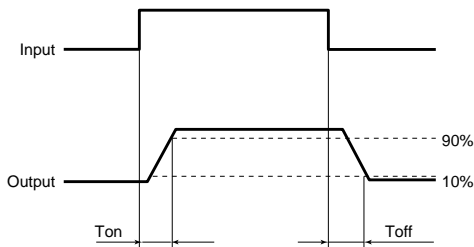
2. Electrical characteristics (Ambient temperature: 25°C 77°F)

| Item | | | Sym- bol | Type of connec- tion | AQV210E(A) | AQV214E(A) | AQV210EH(A) | AQV214EH(A) | Condition | |
|----------------------------------|---------------------------|------------------|-------------------|----------------------------|---|------------|-------------|-------------|--|--|
| Input | LED operate current | Typical | I _{Fon} | — | 1.1 mA | 1.1 mA | 1.6 mA | 1.6 mA | I _L = Max. | |
| | | Maximum | | | 3 mA | | | | | |
| | LED turn off current | Minimum | I _{Foff} | — | 0.3 mA | 0.3 mA | 0.4 mA | 0.4 mA | I _L = Max. | |
| | Typical | 1.0 mA | | | 1.0 mA | 1.5 mA | 1.5 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 | 23 Ω | 30 Ω | 23 Ω | 30 Ω | I _F = 5 mA I _L = Max. Within 1 s on time | |
| | | Maximum | | | 35 Ω | 50 Ω | 35 Ω | 50 Ω | | |
| | | Typical | R _{on} | B | 11.5 Ω | 22.5 Ω | 11.5 Ω | 22.5 Ω | I _F = 5 mA I _L = Max. Within 1 s on time | |
| | | Maximum | | | 17.5 Ω | 25 Ω | 17.5 Ω | 25 Ω | | |
| | | Typical | R _{on} | C | 6.0 Ω | 11.3 Ω | 6.0 Ω | 11.3 Ω | I _F = 5 mA I _L = Max. Within 1 s on time | |
| | | Maximum | | | 8.8 Ω | 12.5 Ω | 8.8 Ω | 12.5 Ω | | |
| | Output capacitance | Typical | C _{out} | A | 45 pF | | | | I _F = 0 V _B = 0 f = 1 MHz | |
| | Off state leakage current | Maximum | — | — | 1 μA | | | | I _F = 0 V _L = Max. | |
| Transfer characteristics | Switching speed | Turn on time* | Typical | T _{on} | — | 0.5 ms | 0.5 ms | 0.7 ms | 0.7 ms | I _F = 5 mA** I _L = Max. |
| | | | Maximum | | | 2.0 ms | 2.0 ms | 2.0 ms | 2.0 ms | |
| | | Turn off time* | Typical | T _{off} | — | 0.05 ms | | | | I _F = 5 mA I _L = Max. |
| | | | Maximum | | | 1.0 ms | | | | |
| | I/O capacitance | Typical | C _{iso} | — | 0.8 pF | | | | f = 1 MHz V _B = 0 | |
| Maximum | | 1.5 pF | | | | | | | | |
| Initial I/O isolation resistance | Minimum | R _{iso} | — | 1,000 MΩ | | | | 500 V DC | | |

Note: Recommendable LED forward current
Standard type: 5 mA
Reinforced type: 5 to 10 mA

For type of connection, see page 31.

*Turn on/Turn off time

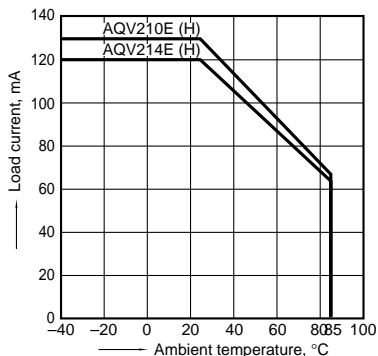


REFERENCE DATA

1. Load current vs. ambient temperature characteristics

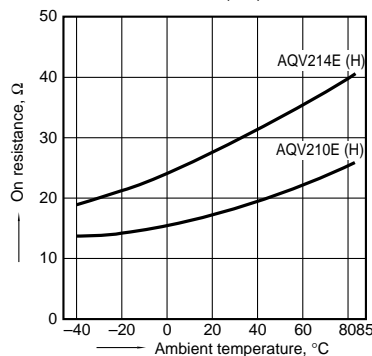
Allowable ambient temperature: -40°C to +85°C
-40°F to +185°F

Type of connection: A



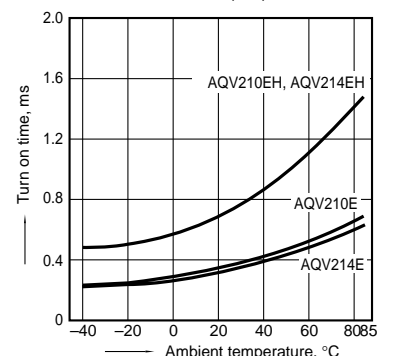
2. On resistance vs. ambient temperature characteristics

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



3. Turn on time vs. ambient temperature characteristics

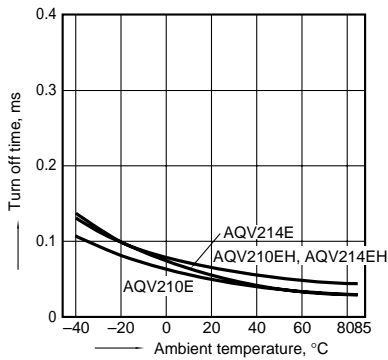
LED current: 5 mA;
Load voltage: Max. (DC);
Continuous load current: Max. (DC)



AQV210E

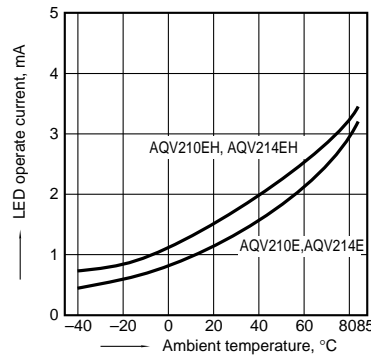
4. Turn off time vs. ambient temperature characteristics

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



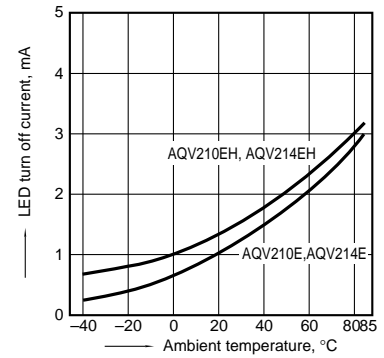
5. LED operate current vs. ambient temperature characteristics

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



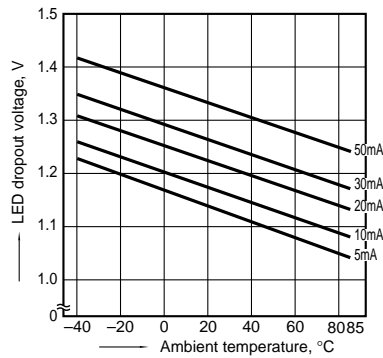
6. LED turn off current vs. ambient temperature characteristics

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



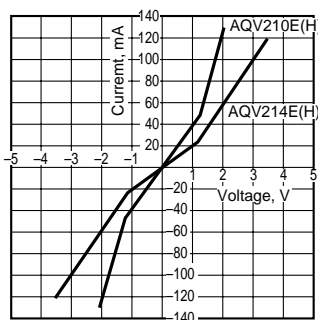
7. LED dropout voltage vs. ambient temperature characteristics

Sample: All types
LED current: 5 to 50 mA



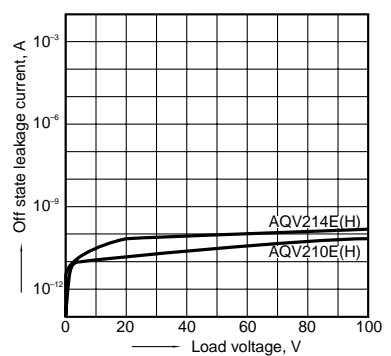
8. Voltage vs. current characteristics of output at MOS portion

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



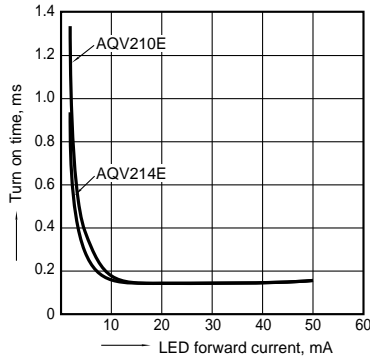
9. Off state leakage current

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



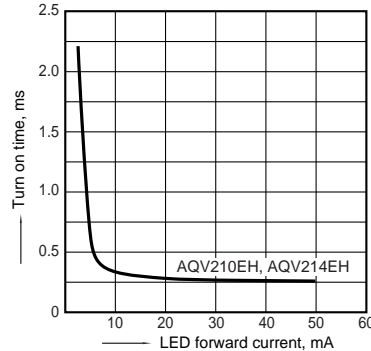
10-(1). LED forward current vs. turn on time characteristics

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



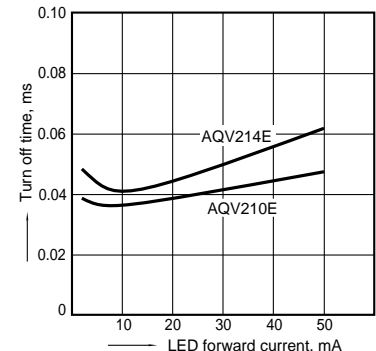
10-(2). LED forward current vs. turn on time characteristics

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



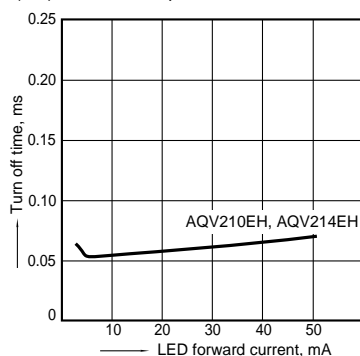
11-(1). LED forward current vs. turn off time characteristics

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



11-(2). LED forward current vs. turn off time characteristics

Measured portion: between terminals 4 and 6;
Load current: 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

