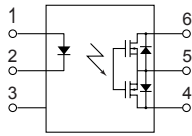
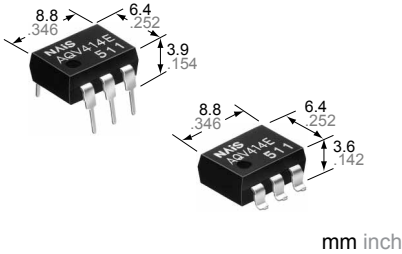




General use and economy type.
DIP (1 Form B) 6-pin type.
Reinforced insulation 5,000V type.

GU-E PhotoMOS

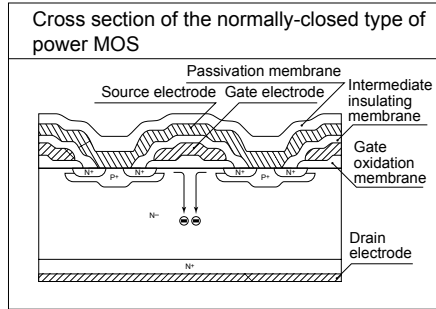
(AQV414E, AQV410EH)



2. This is the low-cost version PhotoMOS 1 Form B output type relay. Compared to the previous GU PhotoMOS 1 Form B type relay, the attainment of an economical price that is approximately 22% lower will further broaden its market.

3. Normally closed type (2 Form B) is low on-resistance. (All AQ○4 PhotoMOS are Form B types. And also the Form A types have a low on-resistance.)

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



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. High sensitivity, low ON resistance
Can control a maximum 0.13 A load current with a 5 mA input current. Low ON resistance of 18 Ω (AQV410EH). Stable operation because there are no metallic contact parts.

6. Low-level off-state leakage current
The SSR has an off-state leakage current of several milliamperes, whereas the PhotoMOS relay has typ. 100 pA even with the rated load voltage of 400 V (AQV414E).

7. Reinforced insulation 5,000 V type also available.
More than 0.4 mm internal insulation distance between inputs and outputs. Conforms to EN41003, EN60950 (reinforced insulation).

FEATURES

1. 60V type couples high capacity (0.55A) with low on-resistance (1Ω).

| Item | GU-E (1 Form B type) type | |
|-------------------------|---------------------------|--|
| | AQV410EH | AQV412EH NEW |
| Part No. | AQV410EH | AQV412EH |
| Load voltage | 350V | 60V |
| Continuous load current | 0.13A | 0.55A |
| ON resistance (typ.) | 18Ω | 1Ω |

TYPICAL APPLICATIONS

- Power supply
- Measuring equipment
- Security equipment
- Telephone equipment
- Sensors

TYPES

| Type | I/O isolation voltage | Output rating* | | Part No. | | | | Packing quantity | |
|------------|-------------------------|----------------|--------------|-----------------------|------------------------|------------|-----------------------------|--|---------------|
| | | | | Through hole terminal | Surface-mount terminal | | | Tube | Tape and reel |
| | | Load voltage | Load current | | Tube packing style | | Tape and reel packing style | | |
| AC/DC type | 1,500 V AC (Standard) | 400 V | 120 mA | AQV414E | AQV414EA | AQV414EAX | AQV414EAZ | 1 tube contains 50 pcs. 1 batch contains 500 pcs. | 1,000 pcs. |
| | | | | AQV412EH | AQV412EHA | AQV412EHAX | AQV412EHAZ | | |
| | 5,000 V AC (Reinforced) | 60 V | 550 mA | AQV410EH | AQV410EHA | AQV410EHAX | AQV410EHAZ | | |
| | | 350 V | 130 mA | AQV414EH | AQV414EHA | AQV414EHAX | AQV414EHAZ | | |

*Indicate the peak AC and DC values.

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

GU-E PhotoMOS (AQV414E, AQV410EH)

RATING

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

| Item | Symbol | Type of connection | AQV414E(A) | AQV412EH(A) | AQV410EH(A) | AQV414EH(A) | 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 | | | | | |
| Load voltage (peak AC) | V_L | | 400 V | 60 V | 350 V | 400 V | | |
| Output | Continuous load current | I_L | A | 0.12 A | 0.55 A | 0.13 A | 0.12 A | A connection: Peak AC, DC B,C connection: DC |
| | | | B | 0.13 A | 0.65 A | 0.15 A | 0.13 A | |
| | | | C | 0.15 A | 0.8 A | 0.17 A | 0.15 A | |
| Peak load current | I_{peak} | | 0.3 A | 1.5 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 temperatures | |
| | Storage | T_{stg} | -40°C to +100°C -40°F to +212°F | | | | | |

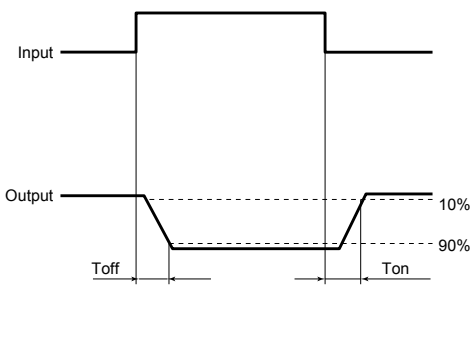
2. Electrical characteristics (Ambient temperature: 25°C 77°F)

| Item | Symbol | Type of connection | AQV414E(A) | AQV412EH(A) | AQV410EH(A) | AQV414EH(A) | Condition | | | |
|----------------------------------|---------------------------|---------------------|------------|----------------------------------|-------------|-------------|--------------|------------------------------|--|---|
| Input | LED operate (OFF) current | Typical | 1.45 mA | 1.9 mA | 1.9 mA | 1.9 mA | $I_L = Max.$ | | | |
| | | Maximum | 3.0 mA | | | | | | | |
| | LED reverse (ON) current | Minimum | I_{Fon} | 0.3 mA | 0.4 mA | 0.4 mA | 0.4 mA | $I_L = Max.$ | | |
| Typical | | | 1.40 mA | 1.8 mA | 1.8 mA | 1.8 mA | | | | |
| LED dropout voltage | Typical | V_F | — | 1.25 V (1.14 V at $I_F = 5 mA$) | | | | $I_F = 50 mA$ | | |
| | Maximum | | | 1.5 V | | | | | | |
| Output | On resistance | Typical | R_{on} | A | 26 Ω | 1 Ω | 18 Ω | 25.2 Ω | $I_F = 0 mA$ $I_L = Max.$ Within 1 s on time | |
| | | Maximum | | | 50 Ω | 2.5 Ω | 35 Ω | 50 Ω | | |
| | On resistance | Typical | R_{on} | B | 20 Ω | 0.55 Ω | 13 Ω | 19 Ω | $I_F = 0 mA$ $I_L = Max.$ Within 1 s on time | |
| | | Maximum | | | 25 Ω | 1.3 Ω | 17.5 Ω | 25 Ω | | |
| | On resistance | Typical | R_{on} | C | 10 Ω | 0.3 Ω | 6.5 Ω | 10 Ω | $I_F = 0 mA$ $I_L = Max.$ Within 1 s on time | |
| | | Maximum | | | 12.5 Ω | 0.7 Ω | 8.8 Ω | 12.5 Ω | | |
| Off state leakage current | Maximum | I_{Leak} | — | 1 μA | 10 μA | 10 μA | 10 μA | $I_F = 5 mA$ $V_L = Max.$ | | |
| Transfer characteristics | Switching speed | Operate (OFF) time* | Typical | T_{off} | — | 0.7 ms | 3 ms | 1.5 ms | 1.3 ms | $I_F = 0 mA \rightarrow 5 mA$ $I_L = Max.$ |
| | | | Maximum | | | 2.0 ms | 10 ms | 3.0 ms | 3.0 ms | |
| | Switching speed | Reverse (ON) time* | Typical | T_{on} | — | 0.1 ms | 0.3 ms | 0.3 ms | 0.3 ms | $I_F = 5 mA \rightarrow 0 mA$ $I_L = Max.$ |
| | | | Maximum | | | 1.0 ms | 1.5 ms | 1.5 ms | 1.5 ms | |
| | I/O capacitance | Typical | C_{iso} | — | 0.8 pF | | | | f = 1 MHz $V_B = 0 V$ | |
| 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 $I_F = 5 mA$
Reinforced type $I_F = 5$ to $10 mA$

*Operate/Reverse time

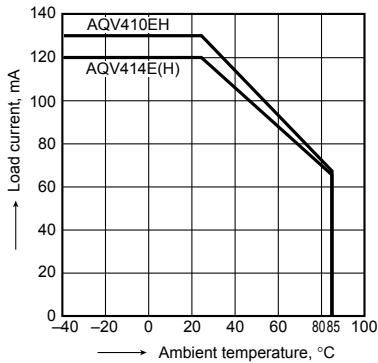


REFERENCE DATA

1-(1). Load current vs. ambient temperature characteristics

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

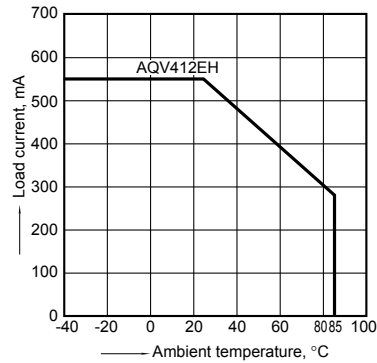
Type of connection: A



1-(2). Load current vs. ambient temperature characteristics

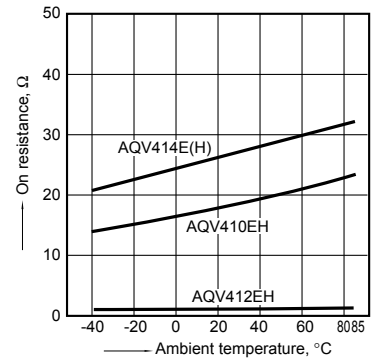
Allowable ambient temperature: -40°C to $+85^{\circ}\text{C}$
 -40°F to $+185^{\circ}\text{F}$

Type of connection: A



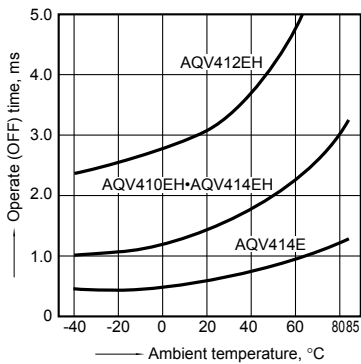
2. On resistance vs. ambient temperature characteristics

Measured portion: between terminals 4 and 6;
 LED current: 0 mA; Load voltage: Max. (DC);
 Continuous load current: Max. (DC)



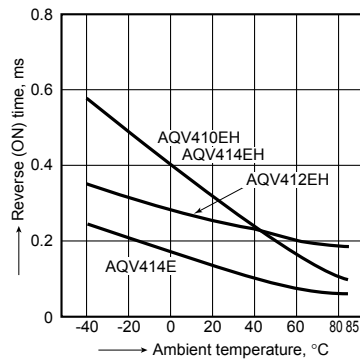
3. Operate (OFF) time vs. ambient temperature characteristics

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



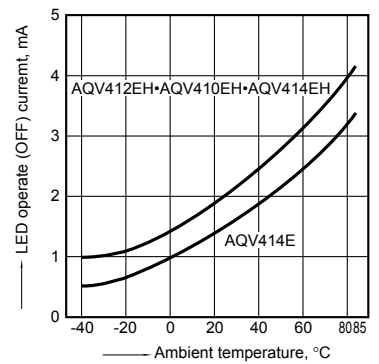
4. Reverse (ON) time vs. ambient temperature characteristics

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



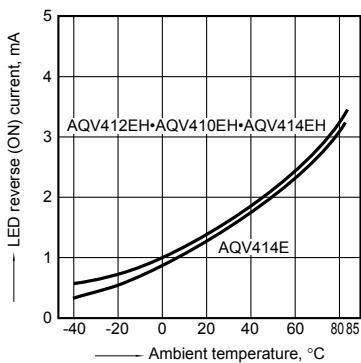
5. LED operate (OFF) current vs. ambient temperature characteristics

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



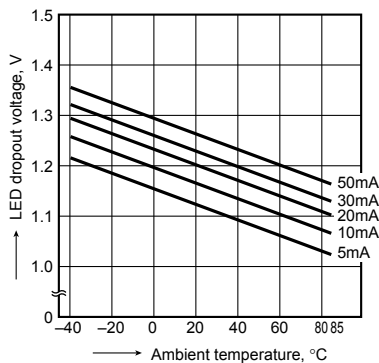
6. LED reverse (ON) current vs. ambient temperature characteristics

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



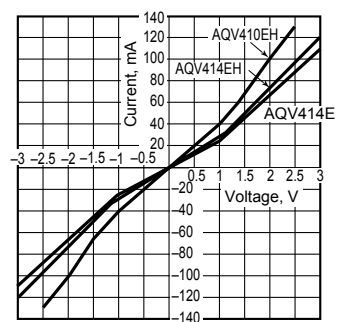
7. LED dropout voltage vs. ambient temperature characteristics

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



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

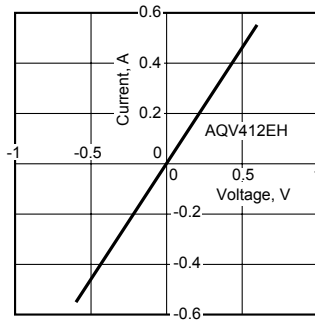
Measured portion: between terminals 4 and 6;
 Ambient temperature: 25°C 77°F



GU-E PhotoMOS (AQV414E, AQV410EH)

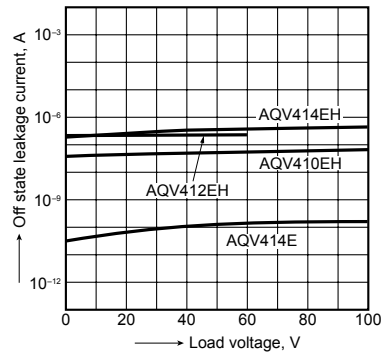
8-(2). Current vs. voltage characteristics of output at MOS portion

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



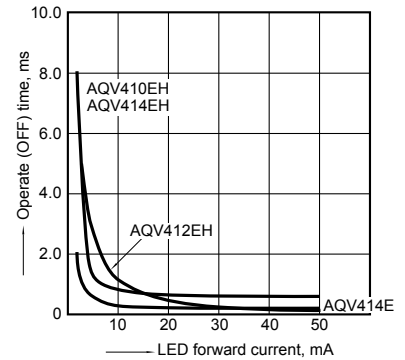
9. Off state leakage current vs. load voltage characteristics

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



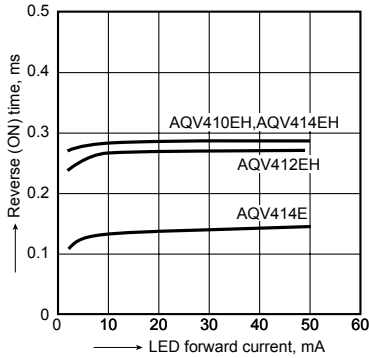
10. Operate (OFF) time vs. LED forward current characteristics

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



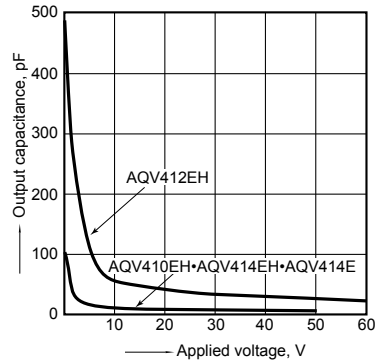
11. Reverse (ON) time vs. LED forward current characteristics

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



12. Output capacitance vs. applied voltage characteristics

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



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