

**Panasonic**  
ideas for life

**High sensitivity and low on-resistance.  
DIP (1 Form B) 6-pin type.**

**HE PhotoMOS  
(AQV45○,  
AQV454H)**

## FEATURES

### 1. Form B (Normally-closed) type

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

**4. Controls various types of load such as relays, motors, lamps and solenoids.**

### 5. 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.

### 6. Low thermal electromotive force (Approx. 1 μV) (Basic insulation)

### 7. Reinforced insulation 5,000 V type also available.

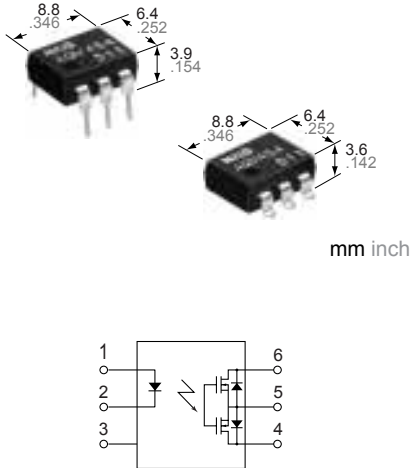
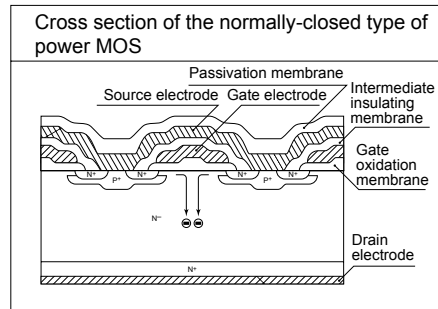
More than 0.4 mm .016 inch internal insulation distance between inputs and outputs. Conforms to IEC950 (reinforced insulation).

### 2. Controls low-level analog signals

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

### 3. High sensitivity, low ON resistance

Can control a maximum 0.15 A load current with a 5 mA input current. Low ON resistance of 16 Ω (AQV454). Stable operation because there are no metallic contact parts.



## TYPICAL APPLICATIONS

- Security equipment
- High-speed inspection machines
- Measuring instruments
- Telephone equipment
- Sensors

## TYPES

| Type  | I/O isolation         | Output rating* |              | Part No.                       |                        |                                |           | Packing quantity                                     |               |
|-------|-----------------------|----------------|--------------|--------------------------------|------------------------|--------------------------------|-----------|------------------------------------------------------|---------------|
|       |                       | Load voltage   | Load current | Through hole terminal          | Surface-mount terminal |                                |           |                                                      |               |
|       |                       |                |              |                                | Tube packing style     | Tape and reel packing style    |           | Tube                                                 | Tape and reel |
|       |                       |                |              | Picked from the 1/2/3-pin side |                        | Picked from the 4/5/6-pin side |           |                                                      |               |
| AC/DC | 1,500 V AC            | 250 V          | 200 mA       | AQV453                         | AQV453A                | AQV453AX                       | AQV453AZ  | 1 tube contains 50 pcs.<br>1 batch contains 500 pcs. | 1,000 pcs.    |
|       | Reinforced 5,000 V AC | 400 V          | 150 mA       | AQV454                         | AQV454A                | AQV454AX                       | AQV454AZ  |                                                      |               |
|       |                       |                |              | AQV454H                        | AQV454HA               | AQV454HAX                      | AQV454HAZ |                                                      |               |

\* 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.

# HE PhotoMOS (AQV45○, AQV454H)

## RATING

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

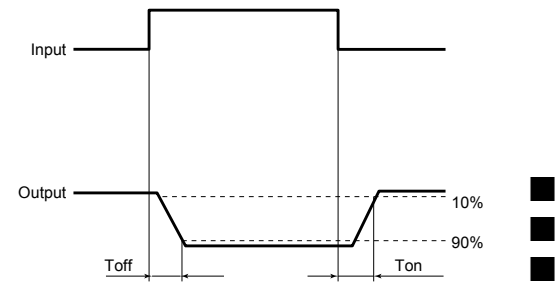
| Item                    |                         | Symbol            | Type of connection | AQV453(A)                       | AQV454(A) | AQV454H(A) | Remarks                                               |
|-------------------------|-------------------------|-------------------|--------------------|---------------------------------|-----------|------------|-------------------------------------------------------|
| Input                   | LED forward current     | I <sub>F</sub>    |                    | 50 mA                           |           |            | f = 100 Hz, Duty factor = 0.1%                        |
|                         | LED reverse voltage     | V <sub>R</sub>    |                    | 5 V                             |           |            |                                                       |
|                         | Peak forward current    | I <sub>FP</sub>   |                    | 1 A                             |           |            |                                                       |
|                         | Power dissipation       | P <sub>in</sub>   |                    | 75 mW                           |           |            |                                                       |
| Output                  | Load voltage (peak AC)  | V <sub>L</sub>    |                    | 250 V                           | 400 V     |            | A connection: Peak AC, DC<br>B,C connection: DC       |
|                         | Continuous load current | I <sub>L</sub>    | A                  | 0.2 A                           | 0.15 A    |            |                                                       |
|                         |                         |                   | B                  | 0.3 A                           | 0.18 A    |            |                                                       |
|                         |                         |                   | C                  | 0.4 A                           | 0.25 A    |            |                                                       |
|                         | Peak load current       | I <sub>PEAK</sub> |                    | 0.6 A                           | 0.5 A     |            | A connection: 100 ms (1 shot),<br>V <sub>L</sub> = DC |
|                         | Power dissipation       | P <sub>OUT</sub>  |                    | 360 mW                          |           |            |                                                       |
| Total power dissipation |                         | P <sub>T</sub>    |                    | 410 mW                          |           |            |                                                       |
| I/O isolation voltage   |                         | V <sub>iso</sub>  |                    | 1,500 V AC                      |           | 5,000 V AC |                                                       |
| 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 |           |            |                                                       |

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

| Item                             |                           |                 | Symbol              | Type of connection | AQV453(A)                               | AQV454(A) | AQV454H(A) | Remarks                                                              |
|----------------------------------|---------------------------|-----------------|---------------------|--------------------|-----------------------------------------|-----------|------------|----------------------------------------------------------------------|
| Input                            | LED operate (OFF) current | Typical         | I <sub>Foff</sub>   | —                  | 1 mA                                    | 0.9 mA    | 1.4 mA     | I <sub>L</sub> = Max.                                                |
|                                  |                           | Maximum         |                     |                    | 3 mA                                    |           |            |                                                                      |
|                                  | LED reverse (ON) current  | Minimum         | I <sub>Fon</sub>    | —                  | 0.4 mA                                  |           |            | I <sub>L</sub> = Max.                                                |
|                                  |                           | Typical         |                     |                    | 0.9 mA                                  | 0.8 mA    | 1.3 mA     |                                                                      |
|                                  | LED dropout voltage       | Typical         | V <sub>F</sub>      | —                  | 1.25 V (1.14 V at I <sub>F</sub> =5 mA) |           |            | I <sub>F</sub> = 50 mA                                               |
|                                  |                           | Maximum         |                     |                    | 1.5 V                                   |           |            |                                                                      |
| Output                           | On resistance             | Typical         | R <sub>on</sub>     | A                  | 5.5 Ω                                   | 12.4 Ω    |            | I <sub>F</sub> = 0 mA<br>I <sub>L</sub> = Max.<br>Within 1 s on time |
|                                  |                           | Maximum         |                     |                    | 8 Ω                                     | 16 Ω      |            |                                                                      |
|                                  |                           | Typical         | R <sub>on</sub>     | B                  | 2.7 Ω                                   | 6.2 Ω     |            | I <sub>F</sub> = 0 mA<br>I <sub>L</sub> = Max.<br>Within 1 s on time |
|                                  |                           | Maximum         |                     |                    | 4 Ω                                     | 8 Ω       |            |                                                                      |
|                                  |                           | Typical         | R <sub>on</sub>     | C                  | 1.4 Ω                                   | 3.1 Ω     |            | I <sub>F</sub> = 0 mA<br>I <sub>L</sub> = Max.<br>Within 1 s on time |
|                                  |                           | Maximum         |                     |                    | 2 Ω                                     | 4 Ω       |            |                                                                      |
|                                  | Off state leakage current | Maximum         | I <sub>LLeak</sub>  | —                  | 1 μA                                    | 1 μA      | 10 μA      | I <sub>F</sub> = 5 mA<br>V <sub>L</sub> = Max.                       |
|                                  | Transfer characteristics  | Switching speed | Operate (OFF) time* | T <sub>off</sub>   | —                                       | 1.52 ms   | 1.2 ms     | 1.8 ms                                                               |
| Maximum                          |                           |                 |                     |                    |                                         | 3 ms      | 2.0 ms     | 3.0 ms                                                               |
| Reverse (ON) time*               |                           |                 | T <sub>on</sub>     | —                  | 0.4 ms                                  | 0.36 ms   | 0.4 ms     | I <sub>F</sub> = 5 mA → 0 mA<br>I <sub>L</sub> = Max.                |
|                                  |                           |                 |                     |                    | 1 ms                                    |           |            |                                                                      |
| I/O capacitance                  |                           | Typical         | C <sub>iso</sub>    | —                  | 1.3 pF                                  |           |            | f = 1 MHz<br>V <sub>B</sub> = 0 V                                    |
|                                  |                           | Maximum         |                     |                    | 3 pF                                    |           |            |                                                                      |
| Initial I/O isolation resistance |                           | Minimum         |                     | R <sub>iso</sub>   | —                                       | 1,000 MΩ  |            |                                                                      |

Note: Recommendable LED forward current.

Standard type: I<sub>F</sub> = 5 mA  
Reinforced type: I<sub>F</sub> = 5 to 10 mA  
\*Operate/Reverse time

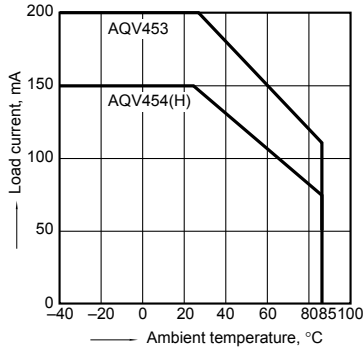


## REFERENCE DATA

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

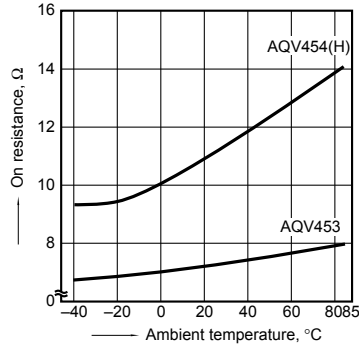
Allowable ambient temperature:  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$   
 $-40^{\circ}\text{F}$  to  $+185^{\circ}\text{F}$

Type of connection: A



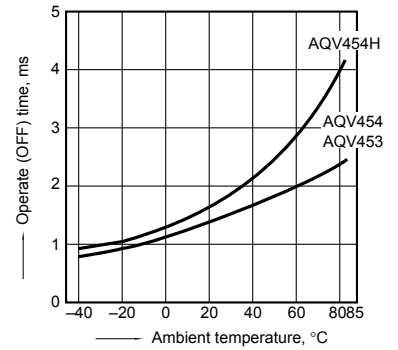
### 2. On resistance vs. ambient temperature characteristics

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



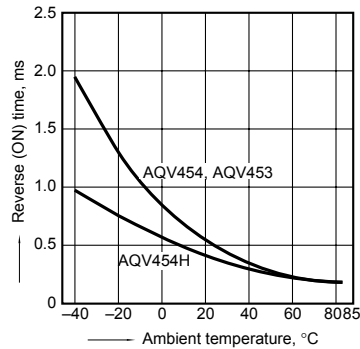
### 3. Operate (OFF) time vs. ambient temperature characteristics

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



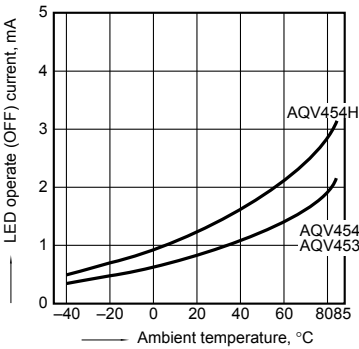
### 4. Reverse (ON) time vs. ambient temperature characteristics

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



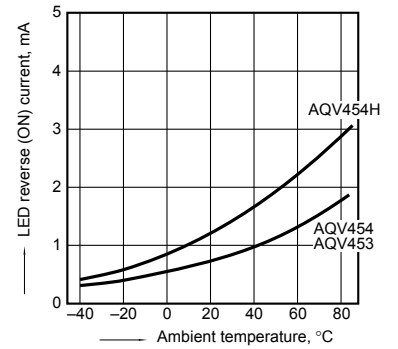
### 5. LED operate (OFF) current vs. ambient temperature characteristics

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



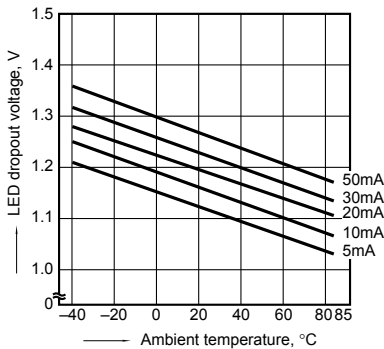
### 6. LED reverse (ON) current vs. ambient temperature characteristics

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



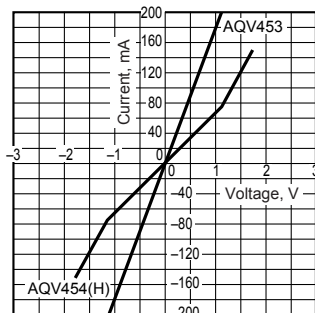
### 7. LED dropout voltage vs. ambient temperature characteristics

LED current: 5 to 50 mA



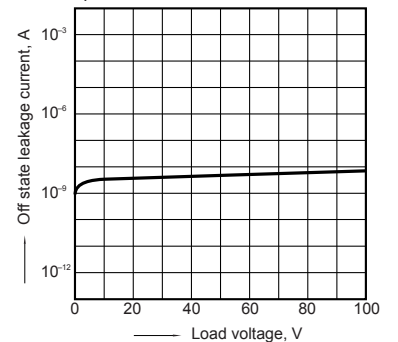
### 8. Current vs. voltage characteristics of output at MOS portion

Measured portion: between terminals 4 and 6;  
 Ambient temperature:  $25^{\circ}\text{C}$   $77^{\circ}\text{F}$



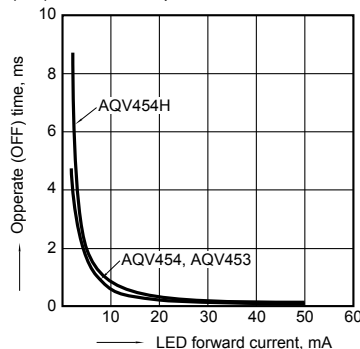
### 9. Off state leakage current vs. load voltage characteristics

Sample: AQV454;  
 Measured portion: between terminals 4 and 6;  
 Ambient temperature:  $25^{\circ}\text{C}$   $77^{\circ}\text{F}$



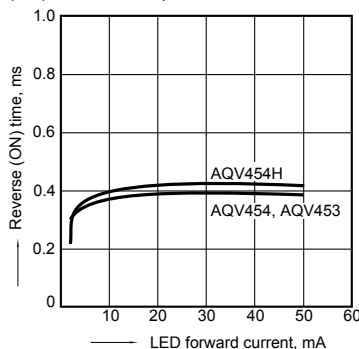
### 10. Operate (OFF) time vs. LED forward current characteristics

Measured portion: between terminals 4 and 6;  
 Load voltage: Max. (DC); Continuous load current: Max. (DC); Ambient temperature:  $25^{\circ}\text{C}$   $77^{\circ}\text{F}$



### 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:  $25^{\circ}\text{C}$   $77^{\circ}\text{F}$



### 12. Output capacitance vs. applied voltage characteristics

Measured portion: between terminals 4 and 6;  
 Frequency: 1 MHz; Ambient temperature:  $25^{\circ}\text{C}$   $77^{\circ}\text{F}$

