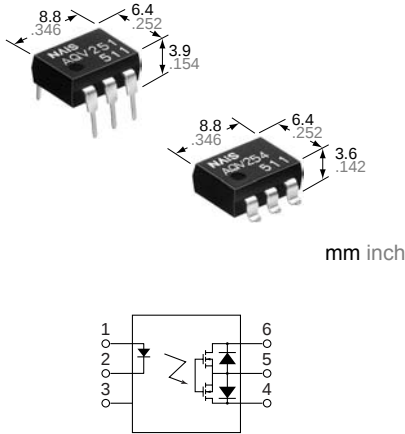


**Panasonic**  
ideas for life

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

**HE PhotoMOS  
(AQV25○)**



## FEATURES

- Highly sensitive and low on-resistance**
- Controls various types of loads such as relays, motors, lamps and solenoids.**
- Optical coupling for extremely high isolation**  
5,000 Vrms I/O isolation available.
- Low-level off state leakage current**
- 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.
- Low thermal electromotive force (Approx. 1  $\mu$ V)**

## TYPICAL APPLICATIONS

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

## TYPES

### 1. I/O isolation voltage: 1,500 V AC

| 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 |
|                |              |                       |                        | Picked from the 1/2/3-pin side | Picked from the 4/5/6-pin side |                                                      |               |
| 40 V           | 500 mA       | AQV251                | AQV251A                | AQV251AX                       | AQV251AZ                       | 1 tube contains 50 pcs.<br>1 batch contains 500 pcs. | 1,000 pcs.    |
| 60 V           | 400 mA       | AQV252                | AQV252A                | AQV252AX                       | AQV252AZ                       |                                                      |               |
| 100 V          | 350 mA       | AQV255                | AQV255A                | AQV255AX                       | AQV255AZ                       |                                                      |               |
| 200 V          | 250 mA       | AQV257                | AQV257A                | AQV257AX                       | AQV257AZ                       |                                                      |               |
| 250 V          | 200 mA       | AQV253                | AQV253A                | AQV253AX                       | AQV253AZ                       |                                                      |               |
| 400 V          | 150 mA       | AQV254                | AQV254A                | AQV254AX                       | AQV254AZ                       |                                                      |               |
| 1,000 V        | 30 mA        | AQV259                | AQV259A                | AQV259AX                       | AQV259AZ                       |                                                      |               |
| 1,500 V        | 20 mA        | AQV258                | AQV258A                | AQV258AX                       | AQV258AZ                       |                                                      |               |

### 2. I/O isolation voltage: Reinforced 5,000 V

| 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 |
|                |              |                       |                        | Picked from the 1/2/3-pin side | Picked from the 4/5/6-pin side |                                                      |               |
| 250 V          | 200 mA       | AQV253H               | AQV253HA               | AQV253HAX                      | AQV253HAZ                      | 1 tube contains 50 pcs.<br>1 batch contains 500 pcs. | 1,000 pcs.    |
| 400 V          | 150 mA       | AQV254H               | AQV254HA               | AQV254HAX                      | AQV254HAZ                      |                                                      |               |

\*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 (AQV25○)

## RATING

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

| Item                    |                         | Sym-<br>bol       | Type of<br>connec-<br>tion | AQV251(A)                       | AQV252(A) | AQV255(A) | AQV257(A) | AQV253(A) | AQV254(A) | AQV259(A) | AQV258(A) | AQV253H(A) | AQV254H(A) | Remarks                                          |
|-------------------------|-------------------------|-------------------|----------------------------|---------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|------------|------------|--------------------------------------------------|
| Input                   | LED forward current     | I <sub>F</sub>    |                            | 50 mA                           |           |           |           |           |           |           |           |            |            | f = 100 Hz,<br>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>    |                            | 40 V                            | 60 V      | 100 V     | 200 V     | 250 V     | 400 V     | 1,000 V   | 1,500 V   | 250 V      | 400 V      | A connection: Peak AC, DC<br>B, C connection: DC |
|                         | Continuous load current | I <sub>L</sub>    | A                          | 0.5 A                           | 0.4 A     | 0.35 A    | 0.25 A    | 0.2 A     | 0.15 A    | 0.03 A    | 0.02 A    | 0.2 A      | 0.15 A     |                                                  |
|                         |                         |                   | B                          | 0.7 A                           | 0.6 A     | 0.45 A    | 0.35 A    | 0.3 A     | 0.18 A    | 0.04 A    | 0.025 A   | 0.3 A      | 0.18 A     |                                                  |
|                         |                         |                   | C                          | 1.0 A                           | 0.8 A     | 0.70 A    | 0.5 A     | 0.4 A     | 0.25 A    | 0.05 A    | 0.04 A    | 0.4 A      | 0.25 A     |                                                  |
|                         | Peak load current       | I <sub>peak</sub> |                            | 1.8 A                           | 1.5 A     | 1.0 A     | 0.75 A    | 0.6 A     | 0.5 A     | 0.09 A    | 0.06 A    | 0.6 A      | 0.5 A      |                                                  |
|                         | 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                     |                                       |                      |                   | Sym-<br>bol                              | Type of<br>con-<br>nection | AQV251(A) | AQV252(A) | AQV255(A) | AQV257(A) | AQV253(A) | AQV254(A) | AQV259(A) | AQV258(A) | AQV253H(A)             | AQV254H(A)                                     | Condition             |
|--------------------------|---------------------------------------|----------------------|-------------------|------------------------------------------|----------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|------------------------|------------------------------------------------|-----------------------|
| Input                    | LED operate<br>current                | Typical              | I <sub>Fon</sub>  | —                                        | 0.9 mA                     |           |           |           |           |           |           |           | 1.4 mA    |                        | I <sub>L</sub> = Max.                          |                       |
|                          |                                       | Maximum              |                   |                                          | 3 mA                       |           |           |           |           |           |           |           |           |                        |                                                |                       |
|                          | LED turn off<br>current               | Minimum              | I <sub>Foff</sub> | —                                        | 0.4 mA                     |           |           |           |           |           |           |           |           |                        | I <sub>L</sub> = Max.                          |                       |
|                          |                                       | Typical              |                   |                                          | 0.8 mA                     |           |           |           |           |           |           |           | 1.3 mA    |                        |                                                |                       |
| LED dropout<br>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                                        | 0.6 Ω                      | 0.74 Ω    | 1.8 Ω     | 2.6 Ω     | 5.5 Ω     | 12.4 Ω    | 85 Ω      | 345 Ω     | 5.5 Ω     | 12.4 Ω                 | I <sub>F</sub> = 5 mA                          |                       |
|                          |                                       | Maximum              |                   |                                          | 1 Ω                        | 1.4 Ω     | 2.5 Ω     | 4 Ω       | 8 Ω       | 16 Ω      | 200 Ω     | 500 Ω     | 8 Ω       | 16 Ω                   | I <sub>L</sub> = Max.<br>Within 1 s on time    |                       |
|                          |                                       | Typical              | R <sub>on</sub>   | B                                        | 0.3Ω                       | 0.37 Ω    | 0.9 Ω     | 1.4 Ω     | 2.7 Ω     | 6.2 Ω     | 60 Ω      | 345 Ω     | 2.7 Ω     | 6.2 Ω                  | I <sub>F</sub> = 5 mA                          |                       |
|                          |                                       | Maximum              |                   |                                          | 0.5 Ω                      | 0.7 Ω     | 1.25 Ω    | 2 Ω       | 4 Ω       | 8 Ω       | 100 Ω     | 500 Ω     | 4 Ω       | 8 Ω                    | I <sub>L</sub> = Max.<br>Within 1 s on time    |                       |
|                          |                                       | Typical              | R <sub>on</sub>   | C                                        | 0.15 Ω                     | 0.18 Ω    | 0.45 Ω    | 0.7 Ω     | 1.4 Ω     | 3.1 Ω     | 30 Ω      | 160 Ω     | 1.4 Ω     | 3.1 Ω                  | I <sub>F</sub> = 5 mA                          |                       |
|                          |                                       | Maximum              |                   |                                          | 0.25 Ω                     | 0.35 Ω    | 0.63 Ω    | 1 Ω       | 2 Ω       | 4 Ω       | 50 Ω      | 250 Ω     | 2 Ω       | 4 Ω                    | I <sub>L</sub> = Max.<br>Within 1 s on time    |                       |
|                          | Off state leak-<br>age current        | Maximum              | —                 | —                                        | 1 μA                       |           |           |           |           |           | 10 μA     |           | 1 μA      |                        | I <sub>F</sub> = 0 mA<br>V <sub>L</sub> = Max. |                       |
| Transfer characteristics | Switch-<br>ing<br>speed               | Turn<br>on<br>time*  | T <sub>on</sub>   | —                                        | 1.7 ms                     | 1.4 ms    | 0.9 ms    | 1.5 ms    | 0.8ms     | 0.8ms     | 0.6ms     | 0.35 ms   | 2.4ms     | 1.8ms                  | I <sub>F</sub> = 5 mA                          |                       |
|                          |                                       |                      |                   |                                          | Maximum                    | 3 ms      |           | 2 ms      | 3 ms      | 2 ms      |           | 1 ms      |           | 4 ms                   | 3 ms                                           | I <sub>L</sub> = Max. |
|                          |                                       | Turn<br>off<br>time* | T <sub>off</sub>  | —                                        | 0.07 ms                    |           | 0.09 ms   | 0.1 ms    | 0.06 ms   | 0.05 ms   | 0.04 ms   |           | 0.06 ms   | 0.05 ms                | I <sub>F</sub> = 5 mA                          |                       |
|                          |                                       |                      |                   |                                          | 0.2 ms                     |           |           |           |           |           |           |           |           |                        | I <sub>L</sub> = Max.                          |                       |
|                          | I/O<br>capacitance                    | Typical              | C <sub>iso</sub>  | —                                        | 1.3 pF                     |           |           |           |           |           |           |           |           |                        | f = 1 MHz                                      |                       |
|                          |                                       | Maximum              |                   |                                          | 3 pF                       |           |           |           |           |           |           |           |           |                        | V <sub>B</sub> = 0 V                           |                       |
|                          | Initial I/O isola-<br>tion resistance |                      | Minimum           | R <sub>iso</sub>                         | —                          | 1,000 MΩ  |           |           |           |           |           |           |           |                        |                                                | 500 V DC              |

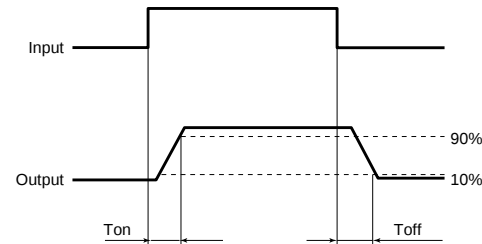
Note: Recommendable LED forward current

For type of connection, see catalog.

Standard type: 5 mA

Reinforced type: 5 to 10 mA

\*Turn on/Turn off time



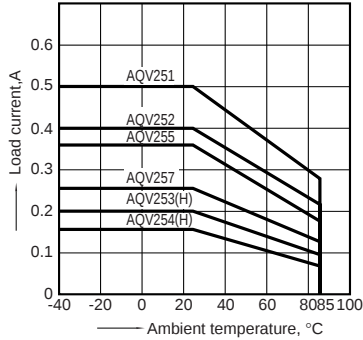
- For Dimensions, see catalog.
- For Schematic and Wiring Diagrams, see catalog.
- For Cautions for Use, see page 13catalog.

## REFERENCE DATA

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

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

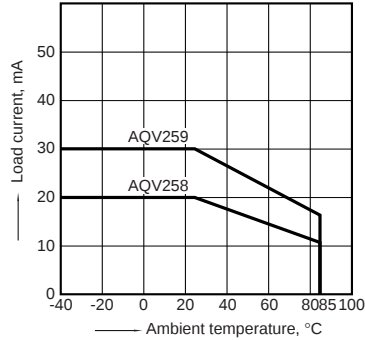
Type of connection: A



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

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

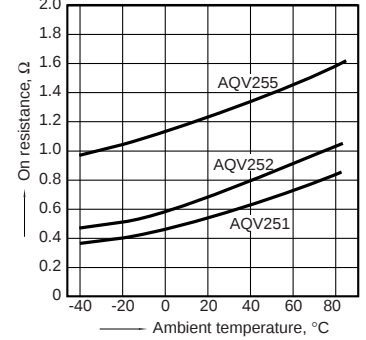
Type of connection: A



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

Measured portion: between terminals 4 and 6;  
LED current: 5 mA;

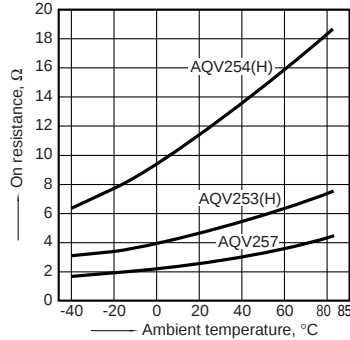
Continuous load current: Max. (DC)



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

Measured portion: between terminals 4 and 6;  
LED current: 5 mA;

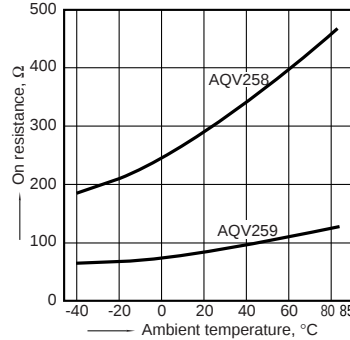
Continuous load current: Max. (DC)



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

Measured portion: between terminals 4 and 6;  
LED current: 5 mA;

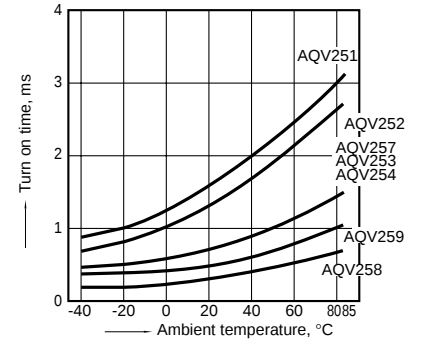
Continuous load current: 30 mA (DC)



### 3.-(1) Turn on time vs. ambient temperature characteristics

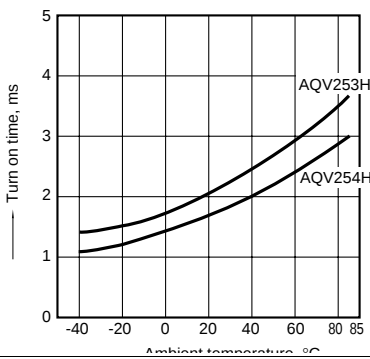
LED current: 5 mA;  
Load voltage: Max. (DC);

Continuous load current: Max. (DC)



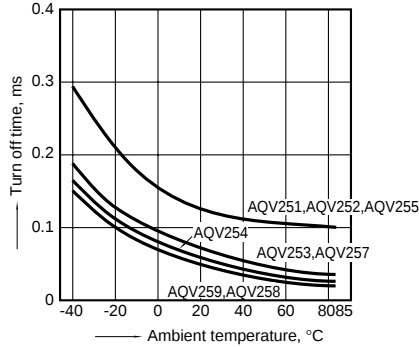
### 3.-(2) Turn on time vs. ambient temperature characteristics

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



### 4.-(1) Turn off time vs. ambient temperature characteristics

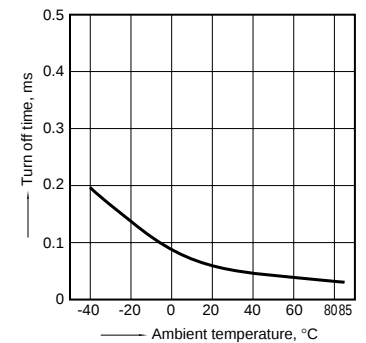
LED current: 5 mA; Load voltage: Max. (DC);  
Continuous load current: Max. (DC)



### 4.-(2) Turn off time vs. ambient temperature characteristics

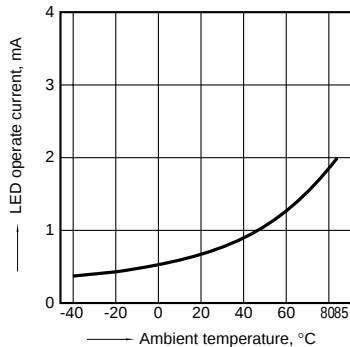
Sample: AQV253H, AQV254H

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



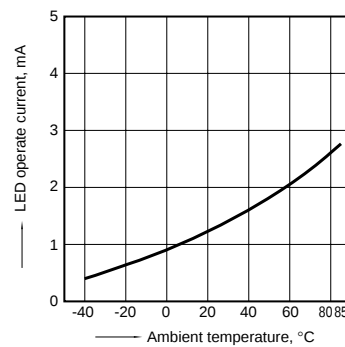
### 5.-(1) LED operate current vs. ambient temperature characteristics

Sample: AQV251, AQV252, AQV253, AQV254, AQV259; Load voltage: Max. (DC);  
Continuous load current: Max. (DC)



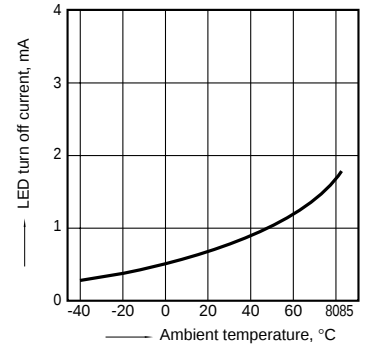
### 5.-(2) LED operate current vs. ambient temperature characteristics

Sample: AQV253H, AQV254H; Load voltage: Max. (DC);  
Continuous load current: Max. (DC)



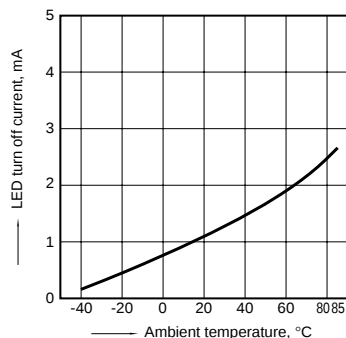
### 6. -(1) LED turn off current vs. ambient temperature characteristics

Sample: AQV251, AQV252, AQV253, AQV254, AQV259; Load voltage: Max. (DC);  
Continuous load current: Max. (DC)

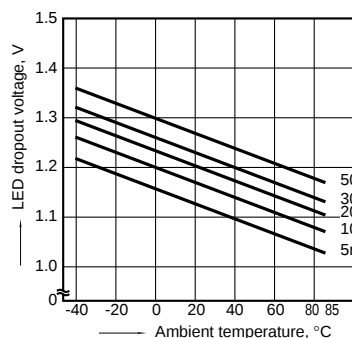


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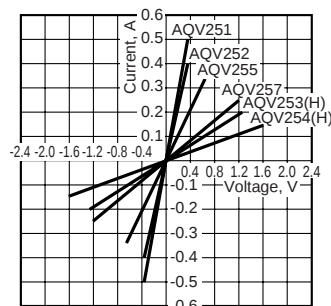
6.-(2) LED turn off current vs. ambient temperature characteristics  
Sample: AQV251, AQV252, AQV253, AQV254, AQV259; Load voltage: Max. (DC); Continuous load current: Max. (DC)



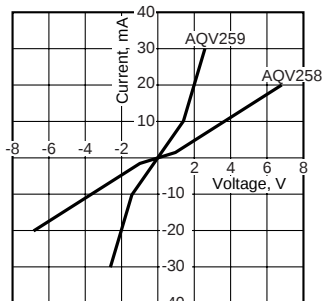
7. LED dropout voltage vs. ambient temperature characteristics  
LED current: 5 to 50 mA



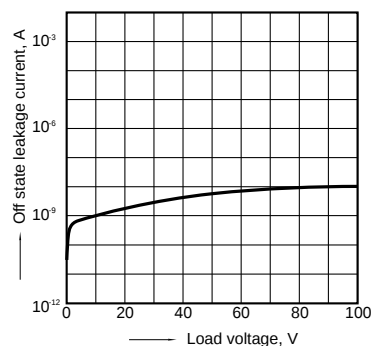
8.-(1) Current vs. voltage characteristics of output at MOS portion  
Measured portion: between terminals 4 and 6;  
Ambient temperature: 25°C 77°F



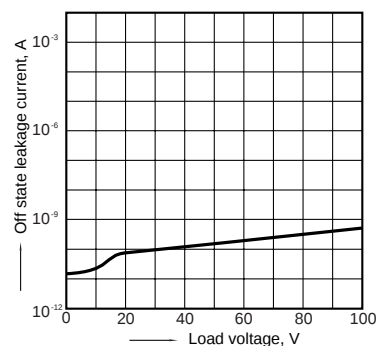
8.-(2) Current vs. voltage characteristics of output at MOS portion  
Sample: AQV259  
Measured portion: between terminals 4 and 6;  
Ambient temperature: 25°C 77°F



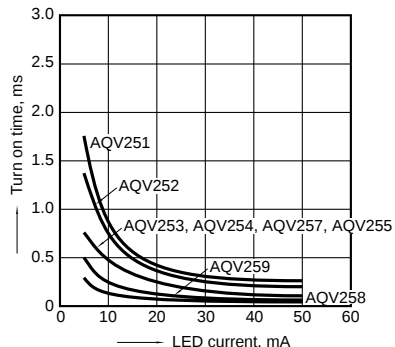
9-(1). Off state leakage current vs. load voltage characteristics  
Sample: AQV259;  
Measured portion: between terminals 4 and 6;  
Ambient temperature: 25°C 77°F



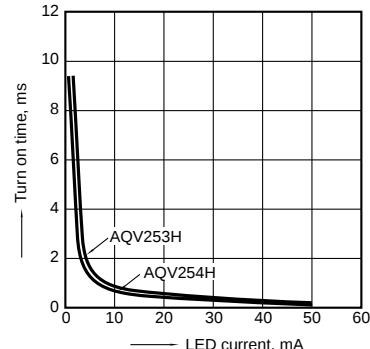
9-(2). Off state leakage current vs. load voltage characteristics  
Sample: AQV254H;  
Measured portion: between terminals 4 and 6;  
Ambient temperature: 25°C 77°F



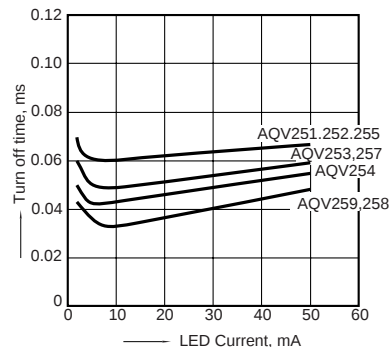
10-(1). Turn on time vs. LED forward current characteristics  
Measured portion: between terminals 4 and 6;  
Load voltage: Max. (DC); Continuous load current: Max. (DC); Ambient temperature: 25°C 77°F



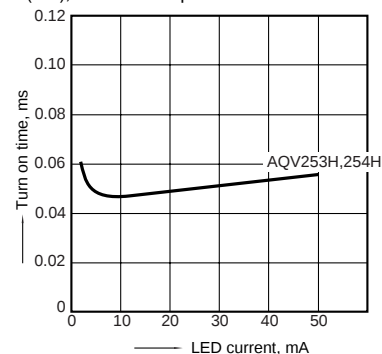
10-(2). Turn on time vs. LED forward current characteristics  
Measured portion: between terminals 4 and 6;  
Load voltage: Max. (DC); Continuous load current: Max. (DC); Ambient temperature: 25°C 77°F



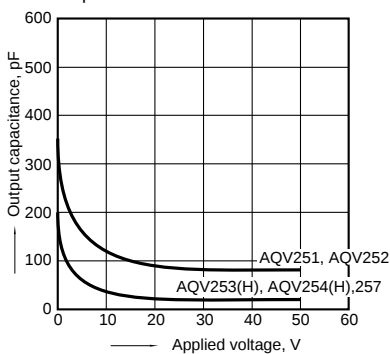
11-(1). Turn off time vs. LED forward current characteristics  
Measured portion: between terminals 4 and 6;  
Load voltage: Max. (DC); Continuous load current: Max. (DC); Ambient temperature: 25°C 77°F



11-(2). Turn 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



12.-(1) Output capacitance vs. applied voltage characteristics  
Measured portion: between terminals 4 and 6;  
Frequency: 1 MHz;  
Ambient temperature: 25°C 77°F



12.-(2) Output capacitance vs. applied voltage characteristics  
Sample: AQV259;  
Measured portion: between terminals 4 and 6;  
Frequency: 1 MHz; Ambient temperature: 25°C 77°F

