

**DIP6-pin type
with wide variation
Low on-resistance**

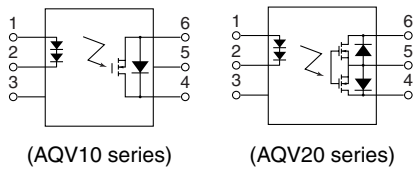
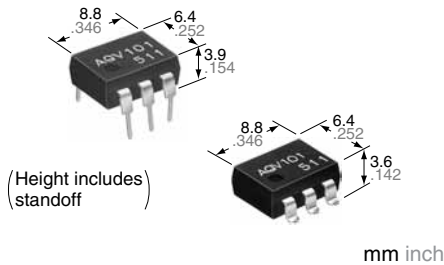
**PhotoMOS[®]
HF 1 Form A
(AQV100, 200)**

FEATURES

- Controls low-level analog signals**
PhotoMOS feature extremely low closed-circuit offset voltage to enable control of low-level analog signals without distortion.
- Controlled with low-level input signals**
- AC/DC dual use type and DC only type available.**

TYPICAL APPLICATIONS

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



RoHS compliant

TYPES

1. DC type (AQV10 series)

| | Output rating* | | Package | 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 | | | |
| | | | | | Picked from the 1/2/3-pin side | Picked from the 4/5/6-pin side | | | |
| DC only | 40 V | 700 mA | DIP6-pin | AQV101 | AQV101A | AQV101AX | AQV101AZ | 1 tube contains: 50 pcs. 1 batch contains: 500 pcs. | 1,000 pcs |
| | 60 V | 600 mA | | AQV102 | AQV102A | AQV102AX | AQV102AZ | | |
| | 250 V | 300 mA | | AQV103 | AQV103A | AQV103AX | AQV103AZ | | |
| | 400 V | 180 mA | | AQV104 | AQV104A | AQV104AX | AQV104AZ | | |

*Indicate the peak AC and DC values.

Note: The surface mount terminal indicator "A" and the packing style indicator "X" or "Z" are not marked on the device.

2. AC/DC type (AQV20 series)

| | Output rating* | | Package | 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 | | | |
| | | | | | Picked from the 1/2/3-pin side | Picked from the 4/5/6-pin side | | | |
| AC/DC dual use | 40 V | 500 mA | DIP6-pin | AQV201 | AQV201A | AQV201AX | AQV201AZ | 1 tube contains: 50 pcs. 1 batch contains: 500 pcs. | 1,000 pcs |
| | 60 V | 400 mA | | AQV202 | AQV202A | AQV202AX | AQV202AZ | | |
| | 250 V | 200 mA | | AQV203 | AQV203A | AQV203AX | AQV203AZ | | |
| | 400 V | 150 mA | | AQV204 | AQV204A | AQV204AX | AQV204AZ | | |

*Indicate the peak AC and DC values.

Note: The surface mount terminal indicator "A" and the packing style indicator "X" or "Z" are not marked on the device.

RATING

1. DC type

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

| Item | | Symbol | AQV101(A) | AQV102(A) | AQV103(A) | AQV104(A) | Remarks |
|-------------------------|------------------------------|------------|---------------------------------|-----------|-----------|-----------|------------------------------------|
| Input | LED forward current | I_F | 50 mA | | | | |
| | LED reverse voltage | V_R | 10 V | | | | |
| | Peak forward current | I_{FP} | 1 A | | | | f = 100 Hz, Duty factor = 0.1% |
| | Power dissipation | P_{in} | 150 mW | | | | |
| Output | Load voltage (DC) | V_L | 40 V | 60 V | 250 V | 400 V | |
| | Continuous load current (DC) | I_L | 0.7 A | 0.6 A | 0.3 A | 0.18 A | |
| | Peak load current | I_{peak} | 1.8 A | 1.5 A | 0.6 A | 0.5 A | 100 ms (1 shot) |
| | Power dissipation | P_{out} | 360 mW | | | | |
| Total power dissipation | | P_T | 410 mW | | | | |
| I/O isolation voltage | | V_{iso} | 1,500 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 | AQV101(A) | AQV102(A) | AQV103(A) | AQV104(A) | Condition |
|----------------------------------|---------------------------|-----------|------------------|-----------------|---------------|--------------|-----------------------|--|
| Input | LED operate current | Typical | I_{Fon} | 2.3 mA | | | | $I_L = \text{Max.}$ |
| | | Maximum | | 5 mA | | | | |
| | LED turn off current | Minimum | I_{Foff} | 0.8 mA | | | | $I_L = \text{Max.}$ |
| | | Typical | | 2.2 mA | | | | |
| LED dropout voltage | Typical | V_F | 2.3 V | | | | $I_F = 10 \text{ mA}$ | |
| | Maximum | | 3 V | | | | | |
| Output | On resistance | Typical | R_{on} | 0.3 Ω | 0.37 Ω | 2.7 Ω | 6.3 Ω | $I_F = 10 \text{ mA}$ $I_L = \text{Max.}$ Within 1 s on time |
| | | Maximum | | 0.5 Ω | 0.7 Ω | 4 Ω | 8 Ω | |
| | Off state leakage current | Maximum | I_{Leak} | 1 μA | | | | $I_F = 0 \text{ mA}$, $V_L = \text{Max.}$ |
| Transfer characteristics | Turn on time* | Typical | T_{on} | 0.23 ms | 0.22 ms | 0.13 ms | 0.09 ms | $I_F = 10 \text{ mA}$ $I_L = \text{Max.}$ |
| | | Maximum | | 1 ms | | | | |
| | Turn off time* | Typical | T_{off} | 0.07 ms | | | | $I_F = 10 \text{ mA}$ $I_L = \text{Max.}$ |
| | | Maximum | | 1 ms | | | | |
| | I/O capacitance | Typical | C_{iso} | 1.3 pF | | | | f = 1 MHz $V_B = 0 \text{ V}$ |
| | | Maximum | | 3 pF | | | | |
| Initial I/O isolation resistance | Minimum | R_{iso} | 1,000 M Ω | | | | 500 V DC | |

2. AC/DC type

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

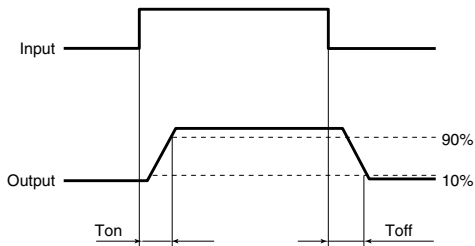
| Item | | Symbol | Type of connection | AQV201(A) | AQV202(A) | AQV203(A) | AQV204(A) | Remarks | |
|-------------------------|-------------------------|------------|--------------------|---------------------------------|-----------|-----------|-----------|-----------------------------------|---|
| Input | LED forward current | I_F | / | 50 mA | | | | | |
| | LED reverse voltage | V_R | | 10 V | | | | | |
| | Peak forward current | I_{FP} | | 1 A | | | | f = 100 Hz, Duty factor = 0.1% | |
| | Power dissipation | P_{in} | | 150 mW | | | | | |
| Output | Load voltage (peak AC) | V_L | / | 40 V | 60 V | 250 V | 400 V | | |
| | Continuous load current | I_L | | A | 0.5 A | 0.4 A | 0.2 A | 0.15 A | A connection: Peak AC, DC B, C connection: DC |
| | | | | B | 0.7 A | 0.6 A | 0.3 A | 0.18 A | |
| | | | | C | 1.0 A | 0.8 A | 0.4 A | 0.25 A | |
| | Peak load current | I_{peak} | | | 1.8 A | 1.5 A | 0.6 A | 0.5 A | A connection 100 ms (1 shot) $V_L = \text{DC}$ |
| | Power dissipation | P_{out} | | | 360 mW | | | | |
| Total power dissipation | | P_T | | 410 mW | | | | | |
| I/O isolation voltage | | V_{iso} | | 1,500 V AC | | | | | |
| Temperature limits | Operating | T_{opr} | | -40°C to +85°C -40°F to +185°F | | | | Non-condensing at low temperature | |
| | Storage | T_{stg} | | -40°C to +100°C -40°F to +212°F | | | | | |

HF 1 Form A (AQV100, 200)

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

| Item | | Symbol | Type of connection | AQV201(A) | AQV202(A) | AQV203(A) | AQV204(A) | Remarks | |
|----------------------------------|----------------------|-------------------|--------------------|-----------|-----------|-----------|-----------|---|---|
| Input | LED operate current | Typical | — | 2.4 mA | | | | I _L = Max. | |
| | | Maximum | | 5 mA | | | | | |
| | LED turn off current | Minimum | — | 0.8 mA | | | | I _L = Max. | |
| | | Typical | | 2.2 mA | | | | | |
| LED dropout voltage | Typical | V _F | — | 2.3 V | | | | I _F = 10 mA | |
| | Maximum | | | 3 V | | | | | |
| Output | On resistance | Typical | R _{on} | A | 0.6 Ω | 0.74 Ω | 5.5 Ω | 12.4 Ω | I _F = 10 mA I _L = Max. Within 1 s on time |
| | | Maximum | | | 1 Ω | 1.4 Ω | 8 Ω | 16 Ω | |
| | | Typical | R _{on} | B | 0.3 Ω | 0.37 Ω | 2.7 Ω | 6.2 Ω | I _F = 10 mA I _L = Max. Within 1 s on time |
| | | Maximum | | | 0.5 Ω | 0.7 Ω | 4 Ω | 8 Ω | |
| | Typical | R _{on} | C | 0.15 Ω | 0.18 Ω | 1.4 Ω | 3.1 Ω | I _F = 10 mA I _L = Max. Within 1 s on time | |
| | Maximum | | | 0.25 Ω | 0.35 Ω | 2 Ω | 4 Ω | | |
| Off state leakage current | Maximum | I _{Leak} | — | 1 μA | | | | I _F = 0 mA, V _L = Max. | |
| Transfer characteristics | Turn on time* | Typical | T _{on} | — | 0.38 ms | 0.41 ms | 0.21 ms | 0.18 ms | I _F = 10 mA I _L = Max. |
| | | Maximum | | | 1 ms | | | | |
| | Turn off time* | Typical | T _{off} | — | 0.08 ms | | 0.07 ms | | I _F = 10 mA I _L = Max. |
| | | Maximum | | | 1 ms | | | | |
| | I/O capacitance | Typical | C _{iso} | — | 1.3 pF | | | | f = 1 MHz V _B = 0 V |
| Maximum | | 3 pF | | | | | | | |
| Initial I/O isolation resistance | Minimum | R _{iso} | — | 1,000 MΩ | | | | 500 V DC | |

*Turn on/Turn off time



RECOMMENDED OPERATING CONDITIONS

Please obey the following conditions to ensure proper device operation and resetting.

| Item | Symbol | Recommended value | Unit |
|-------------------|----------------|-------------------|------|
| Input LED current | I _F | 10 | mA |

■ For Dimensions.

■ For Schematic and Wiring Diagrams.

■ For Cautions for Use.

■ These products are not designed for automotive use.

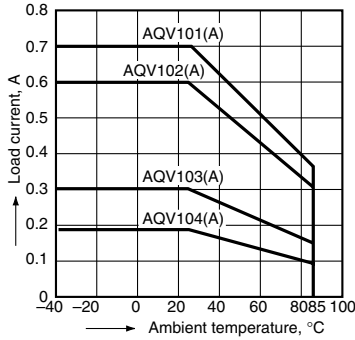
If you are considering to use these products for automotive applications, please contact your local Panasonic Corporation technical representative.

For more information.

REFERENCE DATA

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

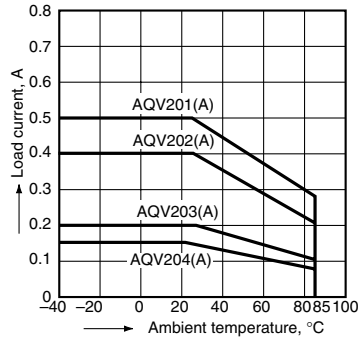
Allowable ambient temperature: -40°C to $+85^{\circ}\text{C}$
 -40°F to $+185^{\circ}\text{F}$



1.-(2) Load current vs. ambient temperature characteristics (AC/DC type)

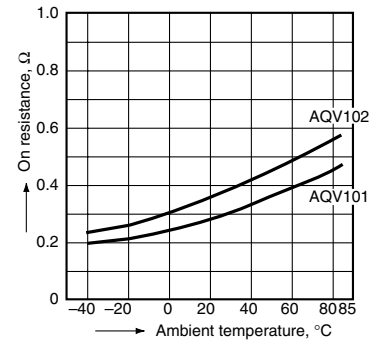
Allowable ambient temperature: -40°C to $+85^{\circ}\text{C}$
 -40°F to $+185^{\circ}\text{F}$

Type of connection: A



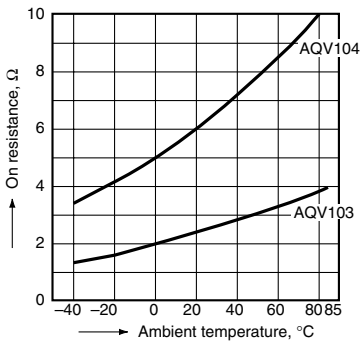
2.-(1) On resistance vs. ambient temperature characteristics (DC type: AQV101, AQV102)

LED current: 10 mA;
 Continuous load current: Max. (DC)



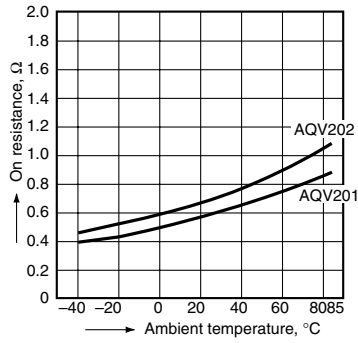
2.-(2) On resistance vs. ambient temperature characteristics (DC type: AQV103, AQV104)

LED current: 10 mA;
 Continuous load current: Max. (DC)



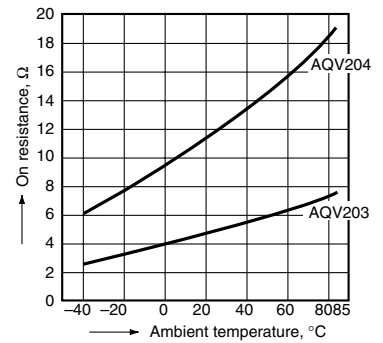
2.-(3) On resistance vs. ambient temperature characteristics (AC/DC type: AQV201, AQV202)

Measured portion: between terminals 4 and 6;
 LED current: 10 mA;
 Continuous load current: Max. (DC)



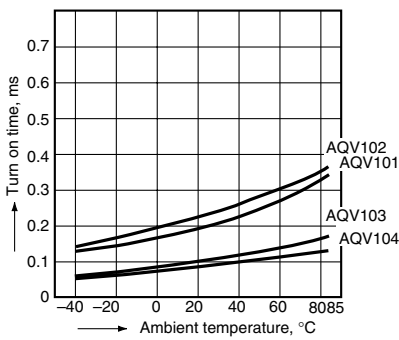
2.-(4) On resistance vs. ambient temperature characteristics (AC/DC type: AQV203, AQV204)

Measured portion: between terminals 4 and 6;
 LED current: 10 mA;
 Continuous load current: Max. (DC)



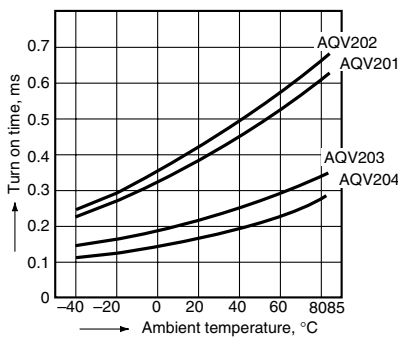
3.-(1) Turn on time vs. ambient temperature characteristics (DC type)

LED current: 10 mA;
 Load voltage: Max. (DC);
 Continuous load current: Max. (DC)



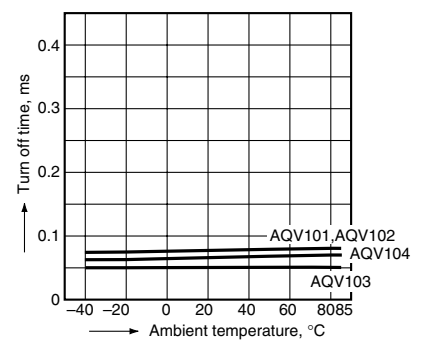
3.-(2) Turn on time vs. ambient temperature characteristics (AC/DC type)

LED current: 10 mA;
 Load voltage: Max. (DC);
 Continuous load current: Max. (DC)



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

LED current: 10 mA;
 Load voltage: Max. (DC);
 Continuous load current: Max. (DC)



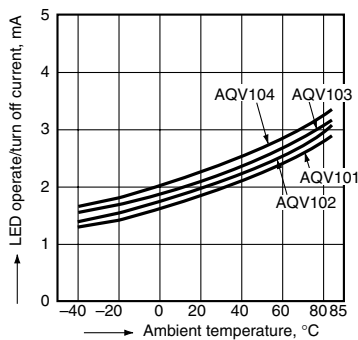
4.-(2) Turn off time vs. ambient temperature characteristics (AC/DC type)

LED current: 10 mA; Load voltage: Max. (DC);
 Continuous load current: Max. (DC)



5.-(1) LED operate/turn off current vs. ambient temperature characteristics (DC type)

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



5.-(2) LED operate/turn off current vs. ambient temperature characteristics (AC/DC type)

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



HF 1 Form A (AQV100, 200)

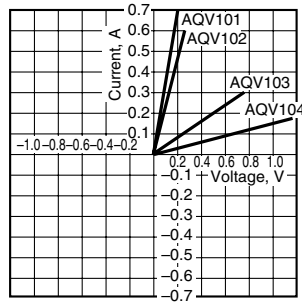
6. LED dropout voltage vs. ambient temperature characteristics

Sample: AQV202
LED current: 10 to 50 mA



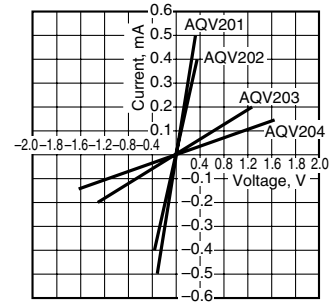
7.-(1) Current vs. voltage characteristics of output at MOS portion (DC type)

Ambient temperature: 25°C 77°F



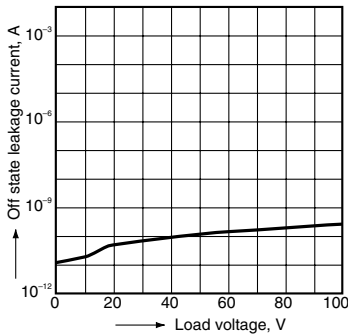
7.-(2) Current vs. voltage characteristics of output at MOS portion (AC/DC type)

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



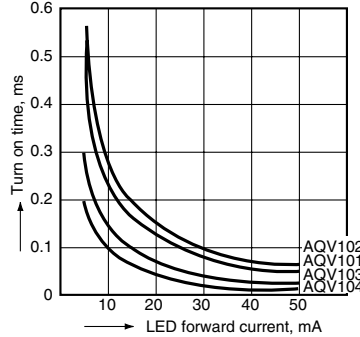
8. Off state leakage current vs. load voltage characteristics

Sample: AQV204;
Measured portion: between terminals 4 and 6;
Ambient temperature: 25°C 77°F



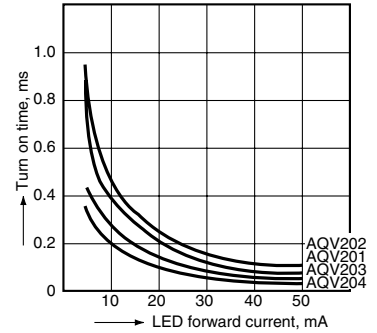
9.-(1) Turn on time vs. LED forward current characteristics (DC type)

Load voltage: Max. (DC);
Continuous load current: Max. (DC);
Ambient temperature: 25°C 77°F



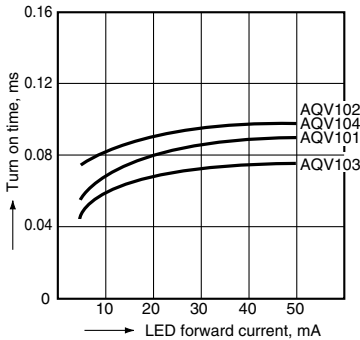
9.-(2) Turn on time vs. LED forward current characteristics (AC/DC type)

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



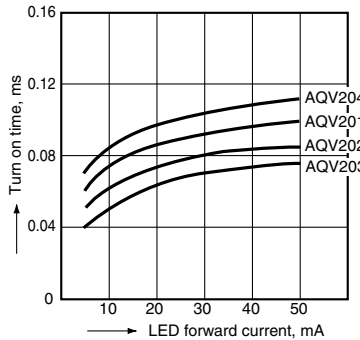
10.-(1) Turn off time vs. LED forward current characteristics (DC type)

Load voltage: Max. (DC);
Continuous load current: Max. (DC);
Ambient temperature: 25°C 77°F



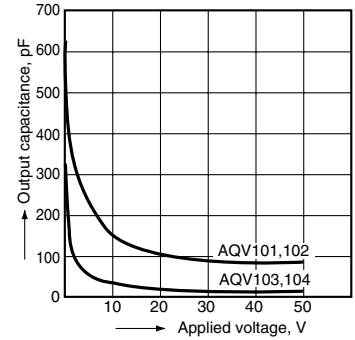
10.-(2) Turn off time vs. LED forward current characteristics (AC/DC type)

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



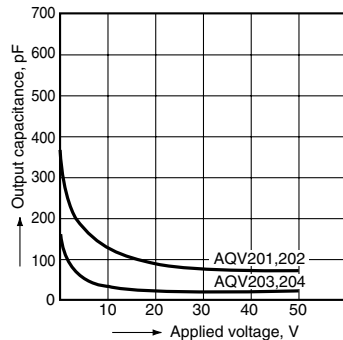
11.-(1) Output capacitance vs. applied voltage characteristics (DC type)

Frequency: 1 MHz;
Ambient temperature: 25°C 77°F



11.-(2) Output capacitance vs. applied voltage characteristics (AC/DC type)

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



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