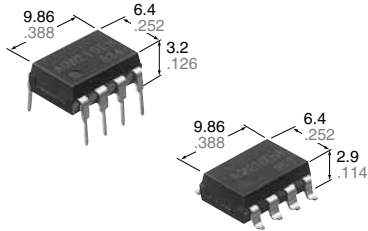
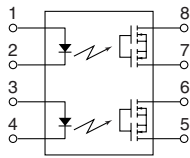


High cost-performance  
DIP8-pin type with  
reinforced insulation

PhotoMOS<sup>®</sup>  
GU-E 2 Form A  
(AQW210EH)



mm inch



RoHS compliant

## FEATURES

- Reinforced insulation of 5,000 V**  
More than 0.4 mm internal insulation distance between inputs and outputs. Con-forms to EN41003, EN60950 (reinforced insulation).
- Applicable for 2 Form A use as well as two independent 1 Form A use**
- Controls low-level analog signals**  
PhotoMOS feature extremely low closed-circuit offset voltage to enable control of low-level analog signals without distortion.
- High sensitivity and high speed response**  
Can control max. 0.14 A load current with 5 mA input current. Fast operation speed of typ. 0.5 ms (AQW210EH).
- Low-level off state leakage current of max. 1  $\mu$ A**

## TYPICAL APPLICATIONS

- Modem
- Telephone equipment
- Security equipment
- Sensing equipment

## TYPES

|                | I/O isolation voltage | Output rating* |              | Package  | Part No.              |                                  |            |                                  | Packing quantity |  |            |
|----------------|-----------------------|----------------|--------------|----------|-----------------------|----------------------------------|------------|----------------------------------|------------------|--|------------|
|                |                       | Load voltage   | Load current |          | Through hole terminal | Surface-mount terminal           |            | Tube                             | Tape and reel    |  |            |
|                |                       |                |              |          |                       | Tape and reel packing style      |            |                                  |                  |  |            |
| AC/DC dual use | Reinforced 5,000 V    | 60 V           | 500 mA       | DIP8-pin | Tube packing style    | Picked from the 1/2/3/4-pin side |            | Picked from the 5/6/7/8-pin side |                  | 1 tube contains: 50 pcs.<br>1 batch contains: 500 pcs. | 1,000 pcs. |
|                |                       | 350 V          | 120 mA       |          |                       | AQW212EH                         | AQW212EHA  | AQW212EHAX                       | AQW212EHAZ       |  |            |
|                |                       | 400 V          | 100 mA       |          |                       | AQW210EH                         | AQW210EHA  | AQW210EHAX                       | AQW210EHAZ       |  |            |
|                |                       | 600 V          | 40 mA        |          |                       | AQW214EH                         | AQW214EHA  | AQW214EHAX                       | AQW214EHAZ       |  |            |
|                |                       |                |              |          | AQW216EH              | AQW216EHA                        | AQW216EHAX | AQW216EHAZ                       |                  |  |            |

\*Indicate the peak AC and DC values.

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

## RATING

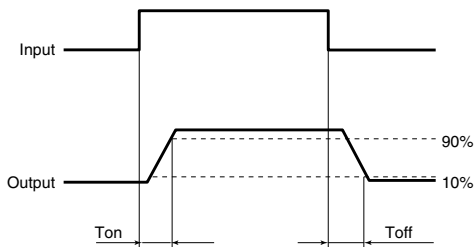
### 1. Absolute maximum ratings (Ambient temperature: 25°C 77°F)

| Item                    |                         | Symbol     | AQW212EH(A)                     | AQW210EH(A)        | AQW214EH(A)       | AQW216EH(A)        | Remarks  |
|-------------------------|-------------------------|------------|---------------------------------|--------------------|-------------------|--------------------|--|
| Input                   | LED forward current     | $I_F$      | 50mA                            |                    |                   |                    |  |
|                         | LED reverse voltage     | $V_R$      | 5V                              |                    |                   |                    |  |
|                         | Peak forward current    | $I_{FP}$   | 1A                              |                    |                   |                    | $f = 100$ Hz,<br>Duty factor = 0.1%                    |
|                         | Power dissipation       | $P_{in}$   | 75mW                            |                    |                   |                    |  |
| Output                  | Load voltage (peak AC)  | $V_L$      | 60 V                            | 350 V              | 400 V             | 600 V              |  |
|                         | Continuous load current | $I_L$      | 0.5 A<br>(0.6 A)                | 0.12 A<br>(0.14 A) | 0.1 A<br>(0.13 A) | 0.04 A<br>(0.05 A) | Peak AC, DC<br>( ): in case of using<br>only 1 channel |
|                         | Peak load current       | $I_{peak}$ | 1.5 A                           | 0.36 A             | 0.3 A             | 0.15 A             | 100 ms (1 shot),<br>$V_L = DC$                         |
|                         | Power dissipation       | $P_{out}$  | 800mW                           |                    |                   |                    |  |
| Total power dissipation |                         | $P_T$      | 850mW                           |                    |                   |                    |  |
| I/O isolation voltage   |                         | $V_{iso}$  | 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                                 | AQW212EH(A) | AQW210EH(A) | AQW214EH(A) | AQW216EH(A)          | Condition   |
|----------------------------------|---------------------------|--|-------------|-------------|-------------|----------------------|---|
| Input                            | LED operate current       | Typical                                | 1.2mA       |             |             |                      | I <sub>L</sub> =Max.  |
|                                  |                           | Maximum                                | 3.0mA       |             |             |                      |   |
|                                  | LED turn off current      | Minimum                                | 0.4mA       |             |             |                      | I <sub>L</sub> =Max.  |
|                                  |                           | Typical                                | 1.1mA       |             |             |                      |   |
| LED dropout voltage              | Typical                   | 1.25 V (1.14 V at I <sub>F</sub> =5mA) |             |             |             | I <sub>F</sub> =50mA |   |
|                                  | Maximum                   | 1.5V                                   |             |             |             |                      |   |
| Output                           | On resistance             | Typical                                | 0.83Ω       | 18Ω         | 26Ω         | 52Ω                  | I <sub>F</sub> =5mA<br>I <sub>L</sub> =Max.<br>Within 1 s on time |
|                                  |                           | Maximum                                | 2.5Ω        | 25Ω         | 35Ω         | 120Ω                 |   |
|                                  | Off state leakage current | Maximum                                | 1μA         |             |             |                      | I <sub>F</sub> =0mA<br>V <sub>L</sub> =Max.                       |
| Transfer characteristics         | Turn on time*             | Typical                                | 1ms         | 0.5ms       |             |                      | I <sub>F</sub> =5mA<br>I <sub>L</sub> =Max.                       |
|                                  |                           | Maximum                                | 4ms         | 2.0ms       |             |                      |   |
|                                  | Turn off time*            | Typical                                | 0.08ms      |             |             | 0.04ms               | I <sub>F</sub> =5mA<br>I <sub>L</sub> =Max.                       |
|                                  |                           | Maximum                                | 1.0ms       |             |             |                      |   |
|                                  | I/O capacitance           | Typical                                | 0.8pF       |             |             |                      | f = 1MHz<br>V <sub>B</sub> = 0V                                   |
|                                  |                           | Maximum                                | 1.5pF       |             |             |                      |   |
| Initial I/O isolation resistance | Minimum                   | R <sub>iso</sub>                       | 1,000MΩ     |             |             | 500V 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 <sub>F</sub> | 5 to 10           | mA   |

- For Dimensions.
- For Schematic and Wiring Diagrams.
- For Cautions for Use.

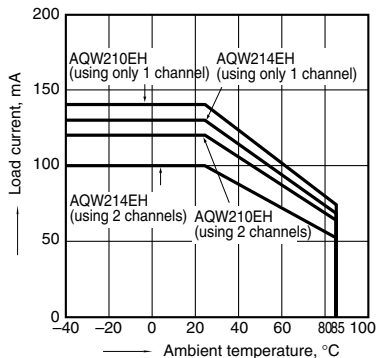
■ These products are not designed for automotive use.

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

## REFERENCE DATA

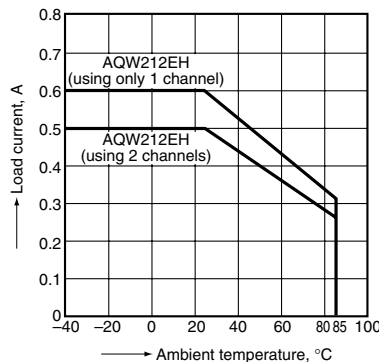
1-(1). Load current vs. ambient temperature characteristics

Allowable ambient temperature: -20°C to +85°C  
-4°F to +185°F



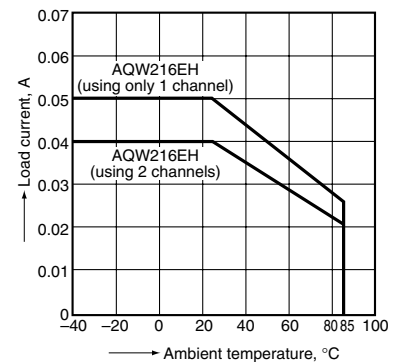
1-(2). Load current vs. ambient temperature characteristics

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



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

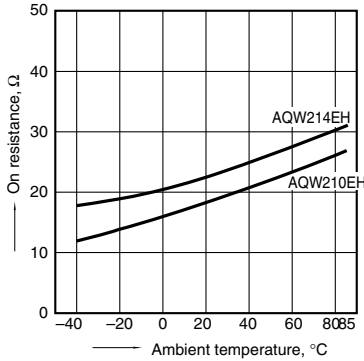
Allowable ambient temperature: -40°C to +85°C  
-40°F to +185°F



# GU-E 2 Form A (AQW21○EH)

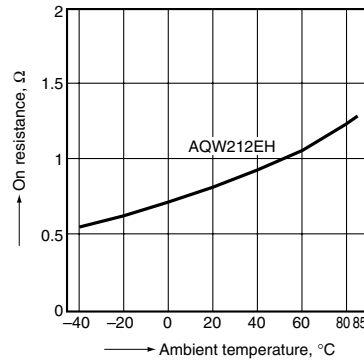
## 2-(1). On resistance vs. ambient temperature characteristics

Measured portion: between terminals 5 and 6, 7 and 8;  
LED current: 5 mA; Load voltage: Max. (DC);  
Continuous load current: Max. (DC)



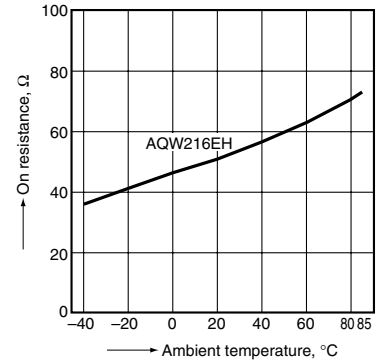
## 2-(2). On resistance vs. ambient temperature characteristics

Measured portion: between terminals 5 and 6, 7 and 8;  
LED current: 5 mA; Load voltage: Max. (DC);  
Continuous load current: Max. (DC)



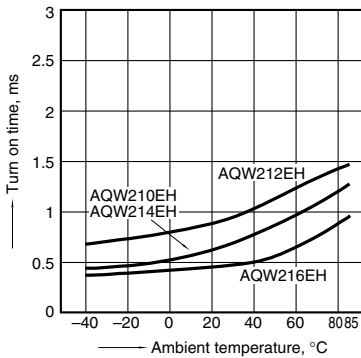
## 2-(3). On resistance vs. ambient temperature characteristics

Measured portion: between terminals 5 and 6, 7 and 8;  
LED current: 5 mA; Load voltage: Max. (DC);  
Continuous load current: Max. (DC)



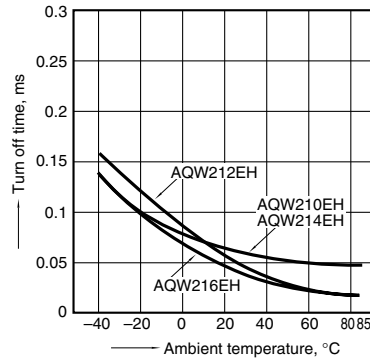
## 3. Turn on time vs. ambient temperature characteristics

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



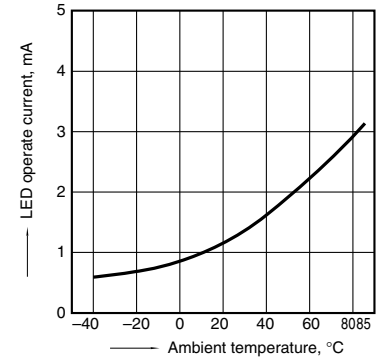
## 4. Turn off time vs. ambient temperature characteristics

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



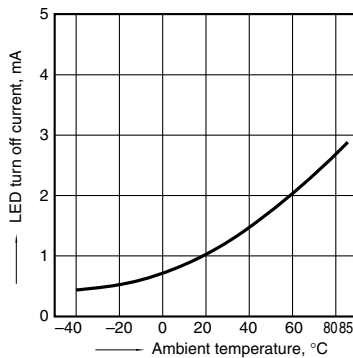
## 5. LED operate current vs. ambient temperature characteristics

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



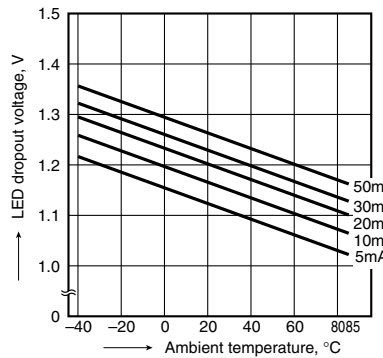
## 6. LED turn off current vs. ambient temperature characteristics

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



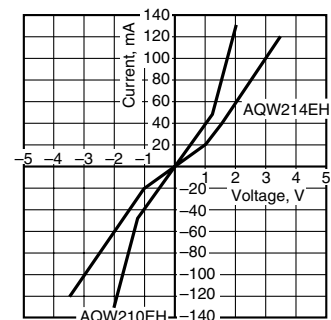
## 7. LED dropout voltage vs. ambient temperature characteristics

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



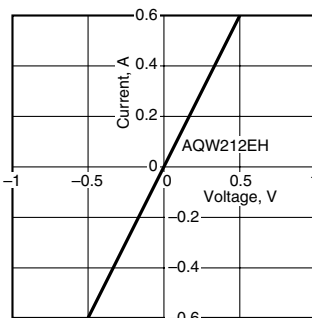
## 8-(1). Current vs. voltage characteristics of output at MOS portion

Measured portion: between terminals 5 and 6, 7 and 8;  
Ambient temperature: 25°C 77°F



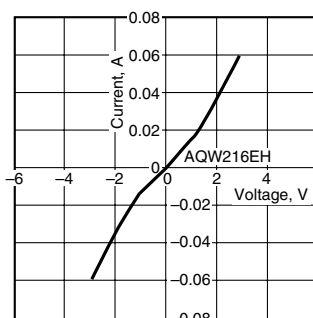
## 8-(2). Current vs. voltage characteristics of output at MOS portion

Measured portion: between terminals 3 and 4;  
Ambient temperature: 25°C 77°F



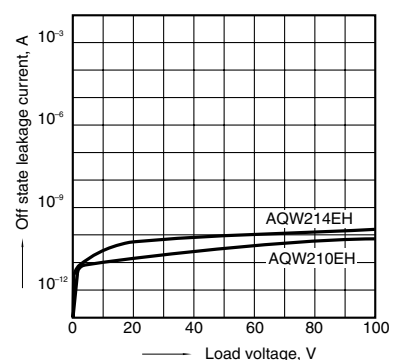
## 8-(3). Current vs. voltage characteristics of output at MOS portion

Measured portion: between terminals 3 and 4;  
Ambient temperature: 25°C 77°F



## 9-(1). Off state leakage current vs. load voltage characteristics

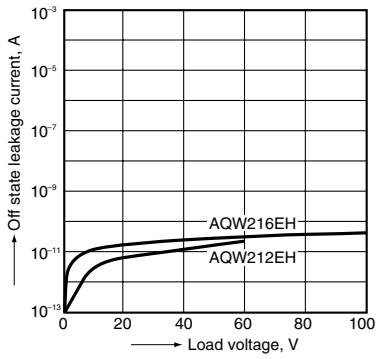
Measured portion: between terminals 5 and 6, 7 and 8;  
Ambient temperature: 25°C 77°F



# GU-E 2 Form A (AQW210EH)

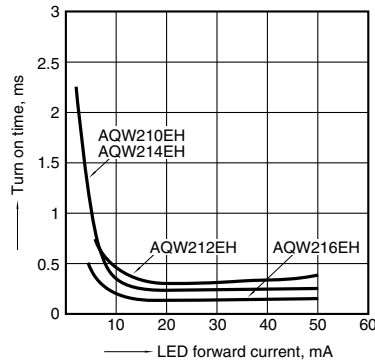
## 9-(2). Off state leakage current vs. load voltage characteristics

Measured portion: between terminals 5 and 6, 7 and 8;  
Ambient temperature: 25°C 77°F



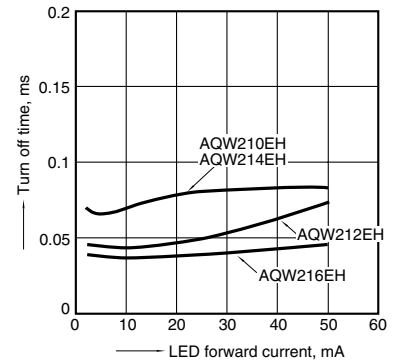
## 10. Turn on time vs. LED forward current characteristics

Sample: All types  
Measured portion: between terminals 5 and 6, 7 and 8;  
Load voltage: Max. (DC); Continuous load current:  
Max. (DC); Ambient temperature: 25°C 77°F



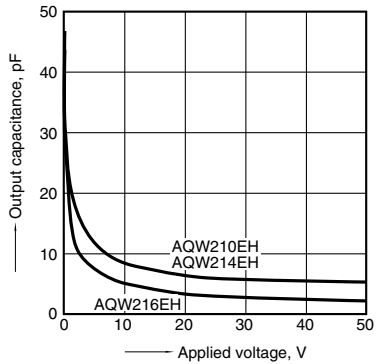
## 11. Turn off time vs. LED forward current characteristics

Sample: All types  
Measured portion: between terminals 5 and 6, 7 and 8;  
Load voltage: Max. (DC); Continuous load current:  
Max. (DC); Ambient temperature: 25°C 77°F



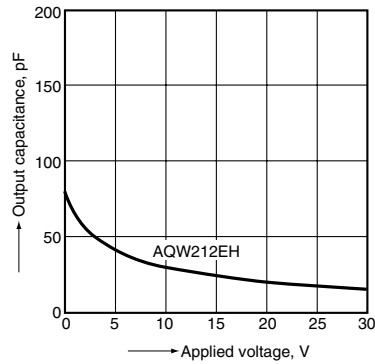
## 12-(1). Output capacitance vs. applied voltage characteristics

Measured portion: between terminals 5 and 6, 7 and 8;  
Frequency: 1 MHz; Ambient temperature: 25°C 77°F



## 12-(2). Output capacitance vs. applied voltage characteristics

Measured portion: between terminals 5 and 6, 7 and 8;  
Frequency: 1 MHz; Ambient temperature: 25°C 77°F



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