



**RoHS compliant**

### FEATURES

#### 1. Protects Circuit from excess current

The short circuit protection function prevents the continued flow of short current. After short current is detected, load current is monitored, and if the load returns to normal, the device returns to normal operation.

#### 2. No need for fuses, polyswitches, or other protectors

The built-in short circuit protection function eliminates the need for overcurrent protectors, reducing mounting costs and space requirements.

#### 3. High capacity

Can control up to 0.5A (60V DC) load current.

### TYPICAL APPLICATIONS

- Industrial equipment
- Security equipment

### TYPES

|         | 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    |                                |  |               |
| DC only | 60 V           | 500 mA       | DIP6-pin | AQV112KL              | AQV112KLA              | Picked from the 1/2/3-pin side | Picked from the 4/5/6-pin side | 1 tube contains: 50 pcs.<br>1 batch contains: 500 pcs. | 1,000 pcs.    |

\*Indicate the 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)

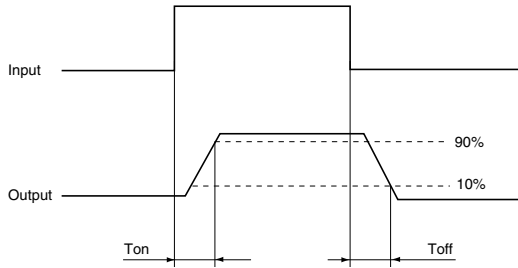
| Item                    |                         | Symbol    | AQV112KL(A)                     | Remarks                            |
|-------------------------|-------------------------|-----------|---------------------------------|------------------------------------|
| Input                   | 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                           |                                    |
| Output                  | Load voltage (peak AC)  | $V_L$     | 7 to 60V                        |                                    |
|                         | Continuous load current | $I_L$     | 0.5 A                           | Peak AC, DC                        |
|                         | Power dissipation       | $P_{out}$ | 500 mW                          |                                    |
| Total power dissipation |                         | $P_T$     | 550 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 |                                    |

# GU 1 Form A Short Circuit Protection (AQV112KL)

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

| Item                             |                                      | Symbol    | AQV112KL(A)                              | Condition  |  |
|----------------------------------|--------------------------------------|-----------|--|--|--|
| Input                            | LED operate current                  | Typical   | 0.8 mA                                   | $I_L = 100\text{mA}$   |  |
|                                  |                                      | Maximum   | 10 mA                                    |  |  |
|                                  | LED turn off current                 | Minimum   | 0.3 mA                                   | $I_L = 100\text{mA}$   |  |
|                                  |                                      | Typical   | 0.7 mA                                   |  |  |
| LED dropout voltage              | Typical                              | $V_F$     | 1.35 V (1.17 V at $I_F = 10\text{ mA}$ ) | $I_F = 50\text{ mA}$   |  |
|                                  | Maximum                              |           | 1.5 V                                    |  |  |
| Output                           | On resistance                        | Typical   | 0.55 $\Omega$                            | $I_F = 10\text{ mA}$<br>$I_L = \text{Max.}$                          |  |
|                                  |                                      | Maximum   | 2.0 $\Omega$                             |  |  |
|                                  | Load short circuit detection voltage | Typical   | $V_{LSHT}$                               | 5 V  | $I_F = 10\text{ mA}$   |
|                                  |                                      | Maximum   |  | 7 V  |  |
|                                  | Off state leakage current            | Maximum   | $I_{Leak}$                               | 1 $\mu\text{A}$  | $I_F = 0\text{ mA}$<br>$V_L = \text{Max.}$                           |
| Transfer characteristics         | Turn on time*                        | Typical   | 2.0 ms                                   | $I_F = 10\text{ mA}$<br>$I_L = 100\text{ mA}$<br>$V_L = 10\text{ V}$ |  |
|                                  |                                      | Maximum   | 5.0 ms                                   |  |  |
|                                  | Turn off time*                       | Typical   | $T_{off}$                                | 0.1 ms   | $I_F = 10\text{ mA}$<br>$I_L = 100\text{ mA}$<br>$V_L = 10\text{ V}$ |
|                                  |                                      | Maximum   |  | 1.0 ms   |  |
|                                  | I/O capacitance                      | Typical   | $C_{iso}$                                | 0.8 pF   | $f = 1\text{ MHz}$<br>$V_B = 0\text{ V}$                             |
|                                  |                                      | Maximum   |  | 1.5 pF   |  |
| Initial I/O isolation resistance | Minimum                              | $R_{iso}$ | 1,000 M $\Omega$                         | 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. Load current vs. ambient temperature characteristics

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



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

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



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

Measured portion: between terminals 4 and 6;  
LED current: 10 mA; Load voltage: 10V (DC);  
Load current: 100 mA



# GU 1 Form A Short Circuit Protection (AQV112KL)

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

Measured portion: between terminals 4 and 6;  
LED current: 10 mA; Load voltage: 10 V (DC);  
Load current: 100 mA (DC)



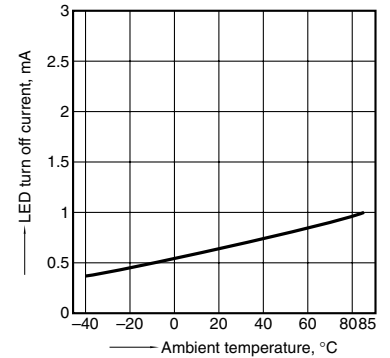
## 5. LED operate current vs. ambient temperature characteristics

Measured portion: between terminals 4 and 6;  
Load current: 100 mA



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

Measured portion: between terminals 4 and 6;  
Load current: 100 mA



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

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



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

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



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

Measured portion: between terminals 1 and 2;  
LED current: 10 to 50 mA



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

Measured portion: between terminals 4 and 6;  
Load voltage: 10 V (DC); Load current: 100 mA (DC);  
Ambient temperature: 25°C 77°F



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

Measured portion: between terminals 4 and 6;  
Load voltage: 10 V (DC); Load current: 100 mA (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



## 13. Short circuit peak current vs. time characteristics

Measured portion: between terminals 4 and 6;  
LED current: 10 mA; Load resistance: 0;  
Ambient temperature: 25°C 77°F



## 14. Short current monitoring interval vs. time characteristics

Measured portion: between terminals 4 and 6;  
LED current: 10 mA; Load resistance: 0;  
Ambient temperature: 25°C 77°F



# GU 1 Form A Short Circuit Protection (AQV112KL)

## What is short circuit protection Non-latch type?

If the load current reaches a predetermined overcurrent level, the output-side short circuit protection function cuts off the load current. It then monitors the load current, and if it returns to normal, automatically recovers to normal device operation.

In order to operate the short circuit protection function, ensure that the input current is at least  $I_F = 10 \text{ mA}$ .

Operation chart (Non-latch type)



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