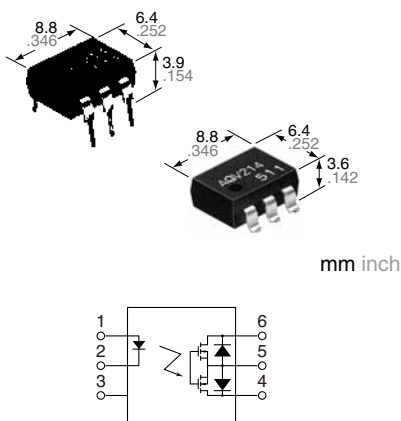


 (Standard type)
 
 (Reinforced type)

**6-pin type for switching low-level analog signal**

**PhotoMOS<sup>®</sup>**  
**GU 1 Form A**  
 (AQV210, AQV214H)



**RoHS compliant**

### FEATURES

- 1. Controls low-level analog signals**  
PhotoMOS feature extremely low closed-circuit offset voltage to enable control of low-level analog signals without distortion.
- 2. Controls various types of loads such as relays, motors, lamps and solenoids**
- 3. Optical coupling for extremely high isolation**  
Unlike mechanical relays, the PhotoMOS combines LED and optoelectronic device to transfer signals using light for extremely high isolation.
- 4. Eliminates the need for a counter electromotive force protection diode in the drive circuits on the input side**
- 5. Stable on-resistance**

- 6. Low-level off state leakage current of max. 1  $\mu$ A**
- 7. Reinforced insulation type of I/O voltage 5,000V also available**

### TYPICAL APPLICATIONS

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

### TYPES

	I/O isolation	Output rating*		Package	Part No.				Packing quantity	
					Through hole terminal	Surface-mount terminal				
						Tube packing style	Tape and reel packing style		Tube	Tape and reel
Load voltage	Load current		Picked from the 1/2/3-pin side	Picked from the 4/5/6-pin side						
AC/DC dual use	Standard 1,500 V AC	60V	550 mA	DIP6-pin	AQV212	AQV212A	AQV212AX	AQV212AZ	1 tube contains 50 pcs. 1 batch contains 500 pcs.	1,000 pcs.
		100 V	320 mA		AQV215	AQV215A	AQV215AX	AQV215AZ		
		200 V	180 mA		AQV217	AQV217A	AQV217AX	AQV217AZ		
		350 V	130 mA		AQV210	AQV210A	AQV210AX	AQV210AZ		
		400 V	120 mA		AQV214	AQV214A	AQV214AX	AQV214AZ		
		600 V	50 mA		AQV216	AQV216A	AQV216AX	AQV216AZ		
	Reinforced 5,000 V	400 V	120 mA		AQV214H	AQV214HA	AQV214HAX	AQV214HAZ		

\*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.

# GU 1 Form A (AQV210, AQV214H)

## RATING

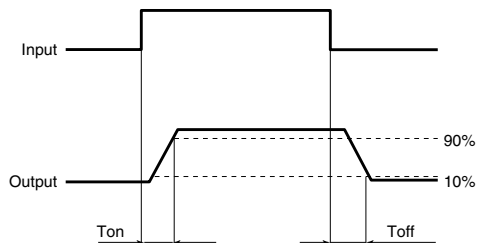
### 1. Absolute maximum ratings (Ambient temperature: 25°C 77°F)

Item		Symbol	Type of connection	AQV212(A)	AQV215(A)	AQV217(A)	AQV210(A)	AQV214(A)	AQV216(A)	AQV214H(A)	Remarks
Input	LED forward current	$I_F$		50 mA							
	LED reverse voltage	$V_R$		5 V							
	Peak forward current	$I_{FP}$		1 A							$f = 100 \text{ Hz}$ , Duty factor = 0.1%
	Power dissipation	$P_{in}$		75 mW							
Load voltage (peak AC)		$V_L$		60 V	100 V	200 V	350 V	400 V	600 V	400 V	
Output	Continuous load current	$I_L$	A	0.55 A	0.32 A	0.18 A	0.13 A	0.12 A	0.05 A	0.12 A	A connection: Peak AC, DC B, C connection: DC
			B	0.65 A	0.42 A	0.22 A	0.15 A	0.13 A	0.06 A	0.13 A	
			C	0.80 A	0.60 A	0.30 A	0.17 A	0.15 A	0.08 A	0.15 A	
Peak load current		$I_{peak}$		1.5 A	0.96 A	0.54 A	0.4 A	0.3 A	0.15 A	0.3 A	A connection: 100 ms (1 shot), $V_L = \text{DC}$
Power dissipation		$P_{out}$		500 mW							
Total power dissipation		$P_T$		550 mW							
I/O isolation voltage		$V_{iso}$		1,500 V AC						5,000 V AC	
Temperature limits	Operating	$T_{opr}$		-40°C to +85°C -40°F to +185°F							Non-condensing at low temp.
	Storage	$T_{stg}$		-40°C to +100°C -40°F to +212°F							

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

Item		Symbol	Type of connection**	AQV212(A)	AQV215(A)	AQV217(A)	AQV210(A)	AQV214(A)	AQV216(A)	AQV214H(A)	Condition	
Input	LED operate current	Typical	$I_{fon}$	1 mA						1.3 mA	$I_L = \text{Max.}$	
		Maximum		3 mA								
	LED turn off current	Minimum	$I_{foff}$	0.4 mA							$I_L = \text{Max.}$	
		Typical		0.79 mA						1.2 mA		
LED dropout voltage	Typical	$V_F$	—	1.25 V (1.14 V at $I_F = 5 \text{ mA}$ )							$I_F = 50 \text{ mA}$	
	Maximum			1.5 V								
Output	On resistance	Typical	$R_{on}$	A	0.83 $\Omega$	2.3 $\Omega$	11.0 $\Omega$	23 $\Omega$	30 $\Omega$	70 $\Omega$	30 $\Omega$	$I_F = 5 \text{ mA}$ $I_L = \text{Max.}$ Within 1 s on time
		Maximum			2.5 $\Omega$	4.0 $\Omega$	15.0 $\Omega$	35 $\Omega$	50 $\Omega$	120 $\Omega$	50 $\Omega$	
		Typical	$R_{on}$	B	0.44 $\Omega$	1.15 $\Omega$	5.5 $\Omega$	11.5 $\Omega$	22.5 $\Omega$	55 $\Omega$	22.5 $\Omega$	$I_F = 5 \text{ mA}$ $I_L = \text{Max.}$ Within 1 s on time
		Maximum			1.25 $\Omega$	2.0 $\Omega$	7.5 $\Omega$	17.5 $\Omega$	25 $\Omega$	100 $\Omega$	25 $\Omega$	
		Typical	$R_{on}$	C	0.25 $\Omega$	0.6 $\Omega$	2.8 $\Omega$	6.0 $\Omega$	11.3 $\Omega$	28 $\Omega$	11.3 $\Omega$	$I_F = 5 \text{ mA}$ $I_L = \text{Max.}$ Within 1 s on time
		Maximum			0.63 $\Omega$	1.0 $\Omega$	3.8 $\Omega$	8.8 $\Omega$	12.5 $\Omega$	50 $\Omega$	12.5 $\Omega$	
Output capacitance	Typical	$C_{out}$	A	150 pF	110 pF	70 pF	45 pF				$I_F = 0 \text{ mA}$ $V_B = 0 \text{ V}$ $f = 1 \text{ MHz}$	
Off state leakage current	Maximum	$I_{Leak}$	—	1 $\mu\text{A}$							$I_F = 0 \text{ mA}$ $V_L = \text{Max.}$	
Turn on time*	Typical	$T_{on}$	—	0.65 ms	0.6 ms	0.25 ms	0.25 ms	0.21 ms	0.28 ms	0.6 ms	$I_F = 5 \text{ mA}^{**}$ $I_L = \text{Max.}$	
	Maximum			2 ms	2 ms	1.0 ms	0.5 ms	0.5 ms	0.5 ms	0.8 ms		
Turn off time*	Typical	$T_{off}$	—	0.08 ms	0.06 ms	0.05 ms	0.05 ms	0.05 ms	0.04 ms	0.05 ms	$I_F = 5 \text{ mA}$ $I_L = \text{Max.}$	
	Maximum			0.2 ms								
I/O capacitance	Typical	$C_{iso}$	—	0.8 pF						$f = 1 \text{ MHz}$ $V_B = 0 \text{ V}$		
	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	$I_F$	Standard type: 5 Reinforced type: 5 to 10	mA

■ These products are not designed for automotive use.

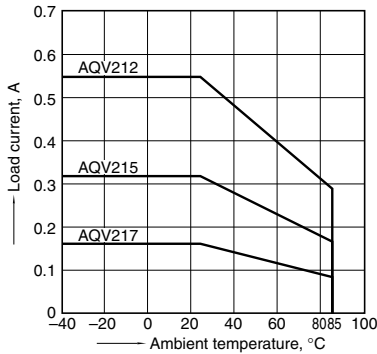
If you are considering to use these products for automotive applications, please contact your local Panasonic Corporation technical representative.

## REFERENCE DATA

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

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

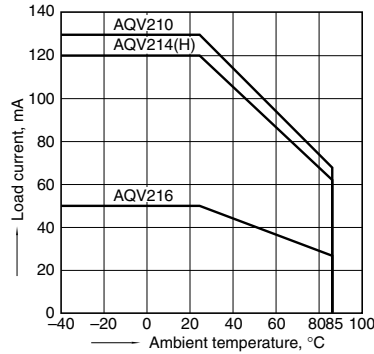
Type of connection: A



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

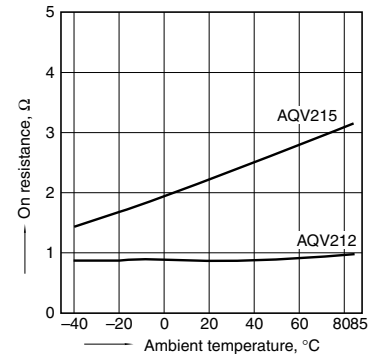
Allowable ambient temperature: -40°C to +85°C  
-40°F to +185°F

Type of connection: A



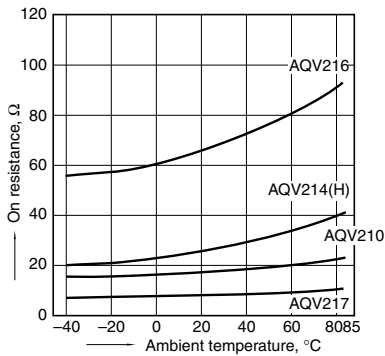
2-(1). On resistance vs. ambient temperature characteristics

Measured portion: between terminals 4 and 6;  
LED current: 5 mA; Load voltage: Max. (DC)  
Continuous load current: Max. (DC)



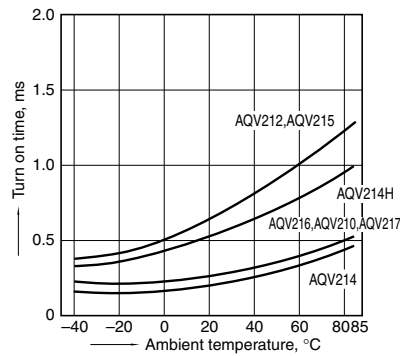
2-(2). On resistance vs. ambient temperature characteristics

Measured portion: between terminals 4 and 6;  
LED current: 5 mA; Load voltage: Max. (DC)  
Continuous load current: Max. (DC)



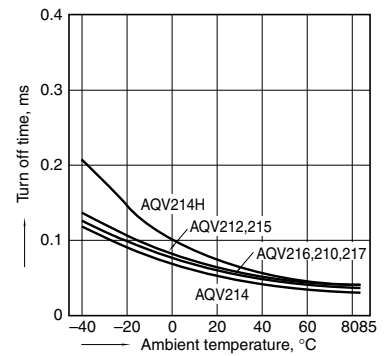
3. Turn on time vs. ambient temperature characteristics

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



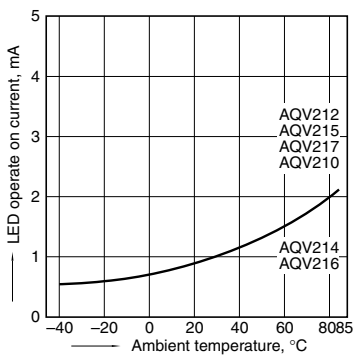
4. Turn off time vs. ambient temperature characteristics

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



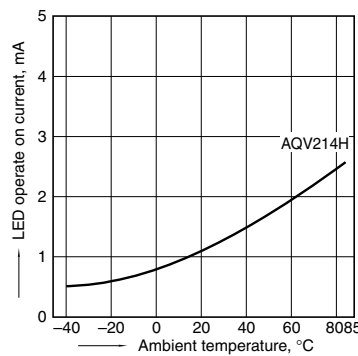
5-(1). LED operate current vs. ambient temperature characteristics

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



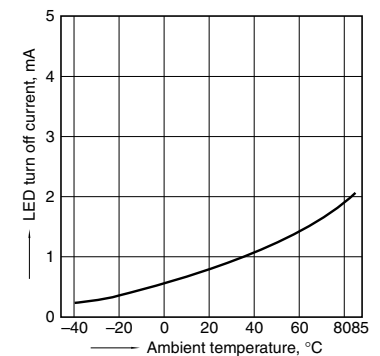
5-(2). LED operate current vs. ambient temperature characteristics

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



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

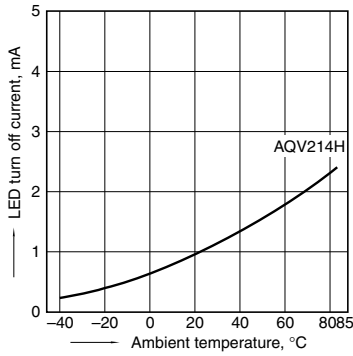
Load voltage: Max. (DC);  
Continuous load current: Max. (DC)



# GU 1 Form A (AQV210, AQV214H)

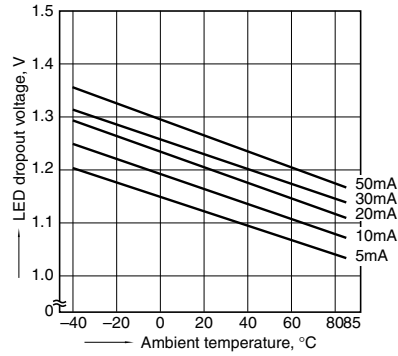
## 6-(2). LED turn off current vs. ambient temperature characteristics

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



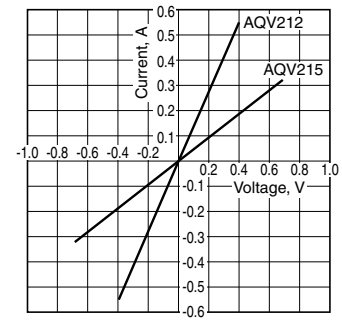
## 7. LED dropout voltage vs. ambient temperature characteristics

Sample: All types  
LED current: 5 to 50 mA



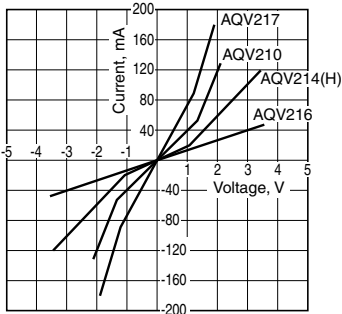
## 8-(1). Current vs. voltage characteristics of output at MOS portion

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



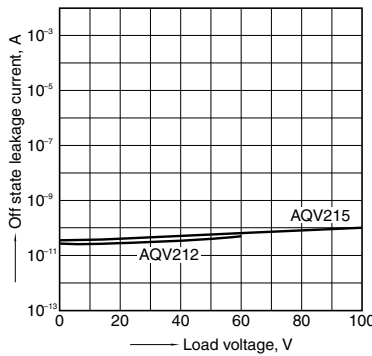
## 8-(2). Current vs. voltage characteristics of output at MOS portion

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



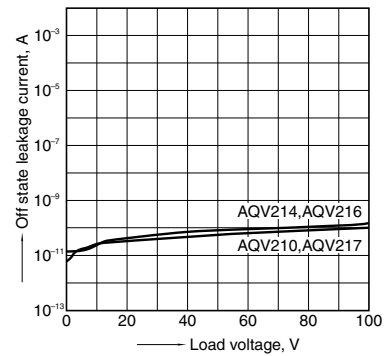
## 9-(1). Off state leakage current vs. load voltage characteristics

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



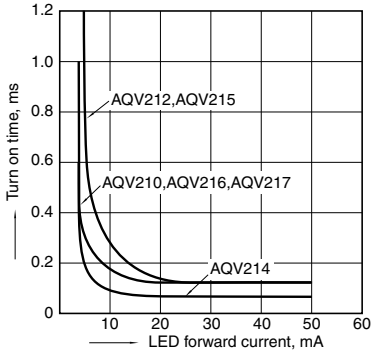
## 9-(2). Off state leakage current vs. load voltage characteristics

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



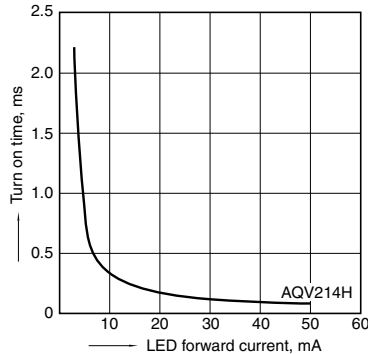
## 10-(1). Turn on time vs. LED forward current characteristics

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



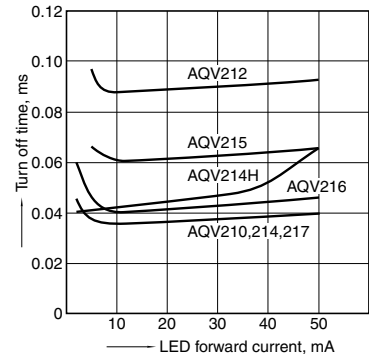
## 10-(2). Turn on time vs. LED forward current characteristics

Measured portion: between terminals 4 and 6;  
Load voltage: 400 V (DC); Continuous load current: 120 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: Max. (DC); Continuous load current: Max. (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

