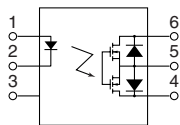
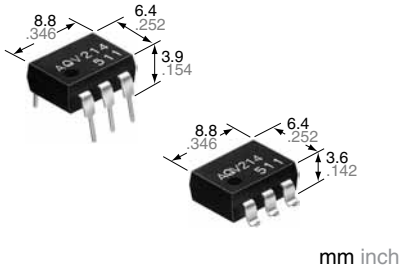


## 6-pin type for switching low-level analog signal

## PhotoMOS® 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	Tape and reel		
						Tube packing style		Tape and reel packing style				
		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	60 V	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				
		400 V	120 mA		AQV214H	AQV214HA	AQV214HAX	AQV214HAZ				
	Reinforced 5,000 V											

\*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)

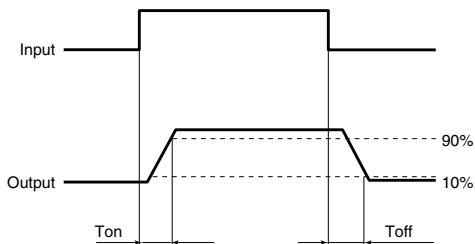
Item		Sym- bol	Type of connec- tion	AQV212(A)	AQV215(A)	AQV217(A)	AQV210(A)	AQV214(A)	AQV216(A)	AQV214H(A)	Remarks
Input	LED forward current	I <sub>F</sub>		50 mA							
	LED reverse voltage	V <sub>R</sub>		5 V							
	Peak forward current	I <sub>FP</sub>		1 A							f = 100 Hz, Duty factor = 0.1%
	Power dissipation	P <sub>in</sub>		75 mW							
Load voltage (peak AC)		V <sub>L</sub>		60 V	100 V	200 V	350 V	400 V	600 V	400 V	
Output	Continuous load current	I <sub>L</sub>	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 <sub>peak</sub>		1.2 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 <sub>L</sub> =DC
Power dissipation		P <sub>out</sub>		500 mW							
Total power dissipation		P <sub>T</sub>		550 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 temp.
	Storage	T <sub>stg</sub>		-40°C to +100°C -40°F to +212°F							

# GU 1 Form A (AQV21○, AQV214H)

## 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	—	1 mA	1 mA	1 mA	1 mA	1 mA	1 mA	1.3 mA	I <sub>L</sub> = Max.	
		Maximum		3 mA	3 mA	3 mA	3 mA	3 mA	3 mA	3 mA		
	LED turn off current	Minimum	—	0.4 mA	0.4 mA	0.4 mA	0.4 mA	0.4 mA	0.4 mA	0.4 mA	1.2 mA	I <sub>L</sub> = Max.
Typical		0.79 mA		0.79 mA	0.79 mA	0.79 mA	0.79 mA	0.79 mA	0.79 mA			
LED dropout 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	0.83 Ω	2.3 Ω	11.0 Ω	23 Ω	30 Ω	70 Ω	30 Ω	I <sub>F</sub> = 5 mA I <sub>L</sub> = Max. Within 1 s on time
		Maximum			2.5 Ω	4.0 Ω	15.0 Ω	35 Ω	50 Ω	120 Ω	50 Ω	
	On resistance	Typical	R <sub>on</sub>	B	0.44 Ω	1.15 Ω	5.5 Ω	11.5 Ω	22.5 Ω	55 Ω	22.5 Ω	I <sub>F</sub> = 5 mA I <sub>L</sub> = Max. Within 1 s on time
		Maximum			1.25 Ω	2.0 Ω	7.5 Ω	17.5 Ω	25 Ω	100 Ω	25 Ω	
	On resistance	Typical	R <sub>on</sub>	C	0.25 Ω	0.6 Ω	2.8 Ω	6.0 Ω	11.3 Ω	28 Ω	11.3 Ω	I <sub>F</sub> = 5 mA I <sub>L</sub> = Max. Within 1 s on time
		Maximum			0.63 Ω	1.0 Ω	3.8 Ω	8.8 Ω	12.5 Ω	50 Ω	12.5 Ω	
Output capacitance	Typical	C <sub>out</sub>	A	150 pF	110 pF	70 pF	45 pF	45 pF	45 pF	45 pF	I <sub>F</sub> = 0 mA V <sub>B</sub> = 0 V f = 1 MHz	
Off state leakage current	Maximum	I <sub>Leak</sub>	—	1 μA							I <sub>F</sub> = 0 mA V <sub>L</sub> = Max.	
Turn on time*	Typical	T <sub>on</sub>	—	0.65 ms	0.6 ms	0.25 ms	0.25 ms	0.21 ms	0.28 ms	0.6 ms	I <sub>F</sub> = 5 mA** I <sub>L</sub> = 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 <sub>off</sub>	—	0.08 ms	0.06 ms	0.05 ms	0.05 ms	0.05 ms	0.04 ms	0.05 ms	I <sub>F</sub> = 5 mA I <sub>L</sub> = Max.	
	Maximum			0.2 ms	0.2 ms	0.2 ms	0.2 ms	0.2 ms	0.2 ms	0.2 ms		
I/O capacitance	Typical	C <sub>iso</sub>	—	0.8 pF							f = 1 MHz V <sub>B</sub> = 0 V	
	Maximum			1.5 pF								
Initial I/O isolation resistance	Minimum	R <sub>iso</sub>	—	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 <sub>F</sub>	Standard type: 5 Reinforced type: 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.

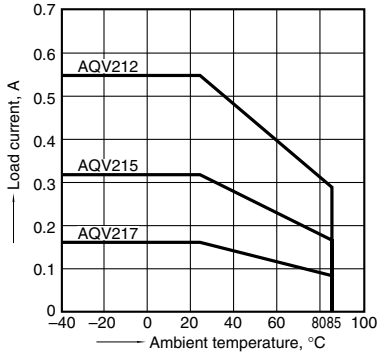
For more information.

**REFERENCE DATA**

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

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

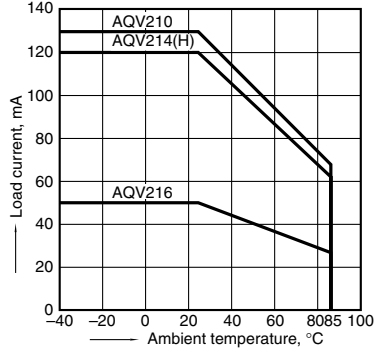
Type of connection: A



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

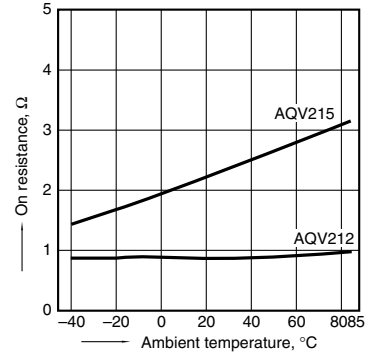
Allowable ambient temperature: -40°C to +85°C  
-40°F to +185°F

Type of connection: A



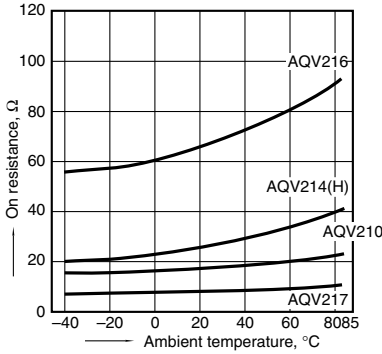
2-(1). On resistance vs. ambient temperature characteristics

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



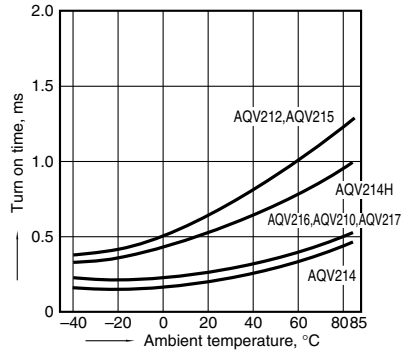
2-(2). On resistance vs. ambient temperature characteristics

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



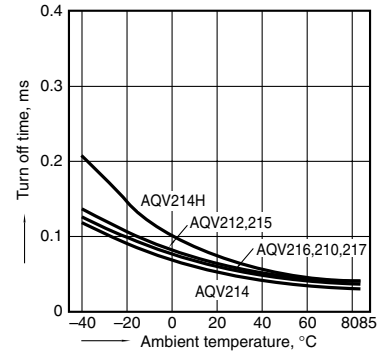
3. Turn on time vs. ambient temperature characteristics

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



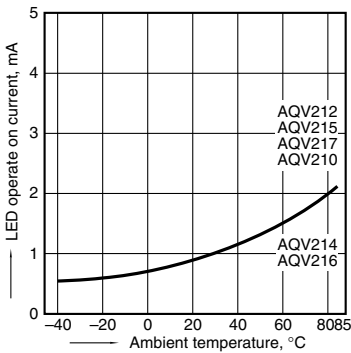
4. Turn off time vs. ambient temperature characteristics

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



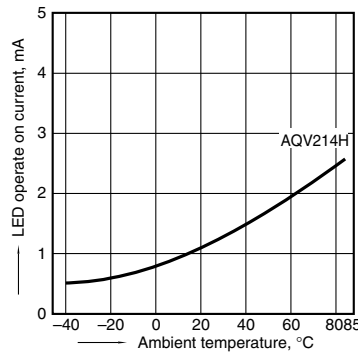
5-(1). LED operate current vs. ambient temperature characteristics

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



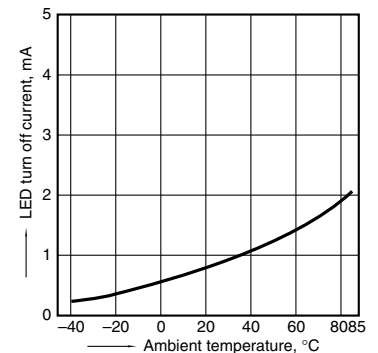
5-(2). LED operate current vs. ambient temperature characteristics

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



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

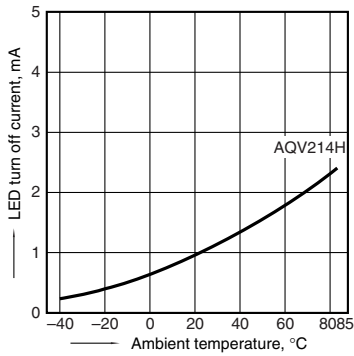
Load voltage: Max. (DC);  
Continuous load current: Max. (DC)



# GU 1 Form A (AQV210, AQV214H)

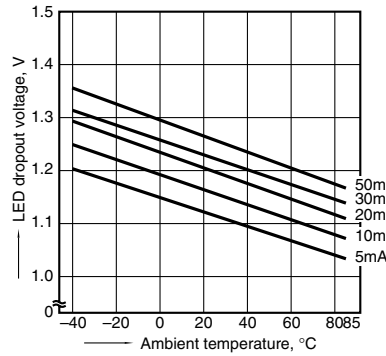
6-(2). LED turn off current vs. ambient temperature characteristics

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



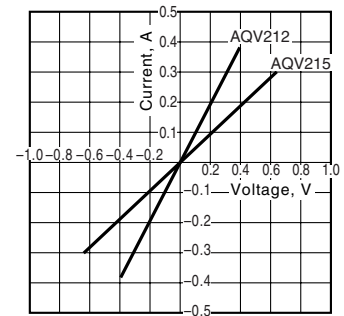
7. LED dropout voltage vs. ambient temperature characteristics

Sample: All types  
LED current: 5 to 50 mA



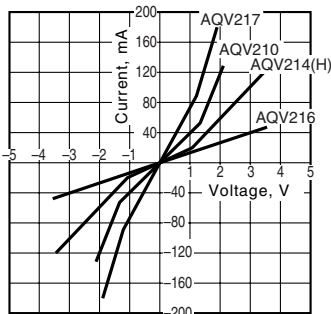
8-(1). Current vs. voltage characteristics of output at MOS portion

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



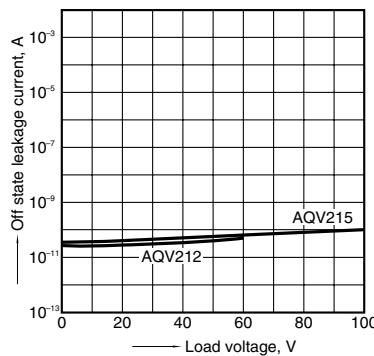
8-(2). Current vs. voltage characteristics of output at MOS portion

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



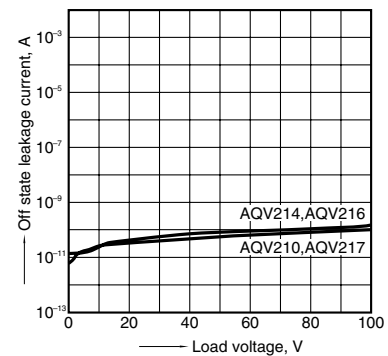
9-(1). Off state leakage current vs. load voltage characteristics

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



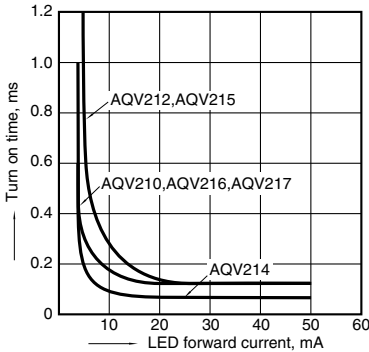
9-(2). Off state leakage current vs. load voltage characteristics

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



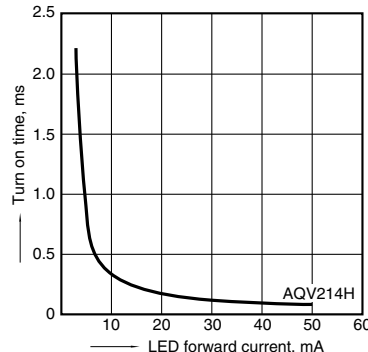
10-(1). Turn on time vs. LED forward current characteristics

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



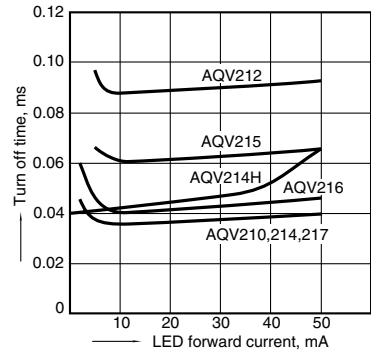
10-(2). Turn on time vs. LED forward current characteristics

Measured portion: between terminals 4 and 6;  
Load voltage: 400 V (DC); Continuous load current: 120 mA (DC); Ambient temperature: 25°C 77°F



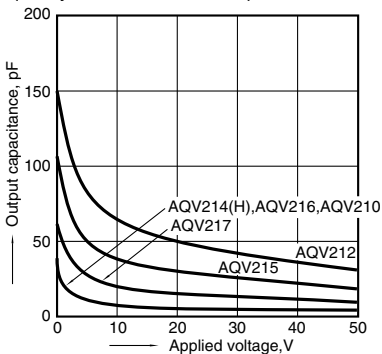
11. Turn off time vs. LED forward current characteristics

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



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