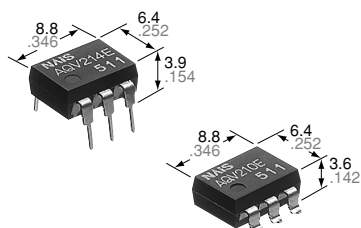


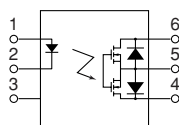
### FEATURES

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

- Stable on resistance**
- Low-level off state leakage current**
- Eliminates the need for a power supply to drive the power MOSFET**  
A power supply used to drive the power MOSFET is unnecessary because of the built-in optoelectronic device. This results in easy circuit design and small PC board area.
- Low thermal electromotive force (Approx. 1  $\mu$ V)**



mm inch



### TYPICAL APPLICATIONS

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

### TYPES

Type	I/O isolation	Output rating*		Part No.				Packing quantity	
				Through hole terminal	Surface-mount terminal				
		Load voltage	Load current	Tube packing style		Tape and reel packing style		Tube	Tape and reel
		Picked from the 1/2/3-pin side	Picked from the 4/5/6-pin side						
AC/DC	Standard 1,500 V AC	350 V	130 mA	AQV210E	AQV210EA	AQV210EAX	AQV210EAX	1 tube contains 50 pcs. 1 batch contains 500 pcs.	1,000 pcs.
		400 V	120 mA	AQV214E	AQV214EA	AQV214EAX	AQV214EAX		
	Reinforced 5,000 V	350 V	130 mA	AQV210EH	AQV210EHA	AQV210EHAX	AQV210EHAX		
		400 V	120 mA	AQV214EH	AQV214EHA	AQV214EHAX	AQV214EHAZ		

\*Indicate the peak AC and DC values.

Note: For space reasons, the SMD terminal shape indicator "A" and the package type indicator "X" and "Z" are omitted from the seal.

### RATING

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

Item		Sym- bol	Type of connec- tion	AQV210E(A)	AQV214E(A)	AQV210EH(A)	AQV214EH(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					
Output	Load voltage (peak AC)	V <sub>L</sub>		350 V	400 V	350 V	400 V		
	Continuous load current	I <sub>L</sub>		A	0.13 A	0.12 A	0.13 A	0.12 A	A connection: Peak AC, DC; B, C connection: DC
				B	0.15 A	0.13 A	0.15 A	0.13 A	
				C	0.17 A	0.15 A	0.17 A	0.15 A	
	Peak load current	I <sub>peak</sub>			0.4 A	0.3 A	0.4 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					

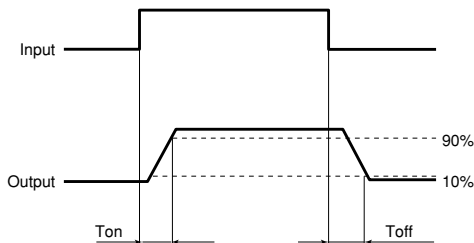
# GU-E PhotoMOS (AQV210E, AQV210EH)

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

Item				Symbol	Type of connection	AQV210E(A)	AQV214E(A)	AQV210EH(A)	AQV214EH(A)	Condition	
Input	LED operate current	Typical	I <sub>Fon</sub>	—	1.1 mA			1.6 mA		I <sub>L</sub> = Max.	
		Maximum			3 mA						
	LED turn off current	Minimum	I <sub>Foff</sub>	—	0.3 mA			0.4 mA		I <sub>L</sub> = Max.	
		Typical			1.0 mA			1.5 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	23 Ω	30 Ω	23 Ω	30 Ω	I <sub>F</sub> = 5 mA I <sub>L</sub> = Max. Within 1 s on time		
		Maximum			35 Ω	50 Ω	35 Ω	50 Ω			
		Typical	R <sub>on</sub>	B	11.5 Ω	22.5 Ω	11.5 Ω	22.5 Ω	I <sub>F</sub> = 5 mA I <sub>L</sub> = Max. Within 1 s on time		
		Maximum			17.5 Ω	25 Ω	17.5 Ω	25 Ω			
		Typical	R <sub>on</sub>	C	6.0 Ω	11.3 Ω	6.0 Ω	11.3 Ω	I <sub>F</sub> = 5 mA I <sub>L</sub> = Max. Within 1 s on time		
		Maximum			8.8 Ω	12.5 Ω	8.8 Ω	12.5 Ω			
	Output capacitance	Typical	C <sub>out</sub>	A	45 pF					I <sub>F</sub> = 0 mA V <sub>B</sub> = 0 V f = 1 MHz	
	Off state leakage current	Maximum	—	—	1 μA					I <sub>F</sub> = 0 mA V <sub>L</sub> = Max.	
	Transfer characteristics	Switching speed	Turn on time*	T <sub>on</sub>	—	0.5 ms			0.7 ms		I <sub>F</sub> = 0 mA → 5 mA** I <sub>L</sub> = Max.
			Maximum			2.0 ms					
Turn off time*			T <sub>off</sub>	—	0.05 ms					I <sub>F</sub> = 0 mA → 5 mA I <sub>L</sub> = Max.	
Maximum					1.0 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

For type of connection, see page 34.



\*\* Recommendable LED forward current  
Standard type: 5 mA  
Reinforced type: 5 to 10 mA

■ For Dimensions, see Page 29.

■ For Schematic and Wiring Diagrams, see Page 34.

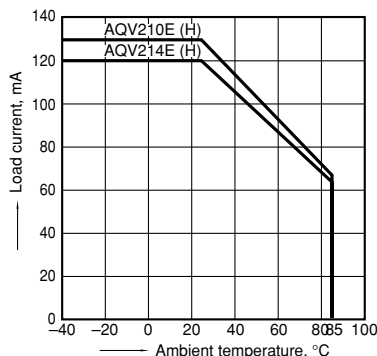
■ For Cautions for Use, see Page 38.

## REFERENCE DATA

### 1. Load current vs. ambient temperature characteristics

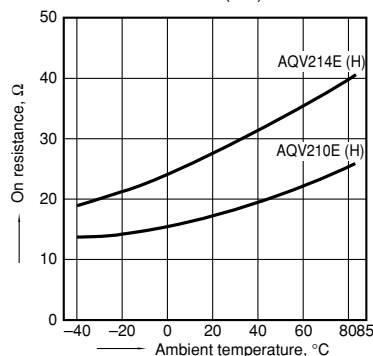
Allowable ambient temperature:  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$   
 $-40^{\circ}\text{F}$  to  $+185^{\circ}\text{F}$

Type of connection: A



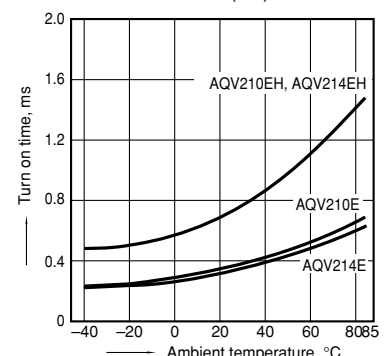
### 2. On resistance vs. ambient temperature characteristics

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

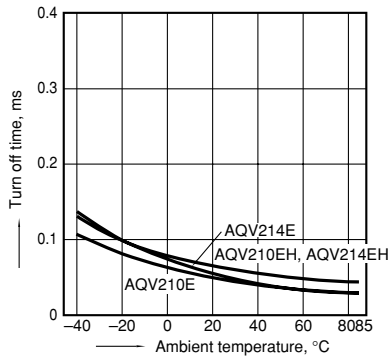
LED current: 5 mA;  
Load voltage: Max. (DC);  
Continuous load current: Max. (DC)



# GU-E PhotoMOS (AQV210E, AQV210EH)

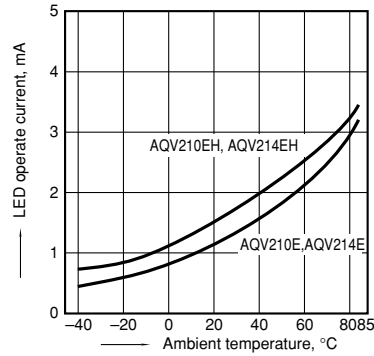
## 4. Turn off time vs. ambient temperature characteristics

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



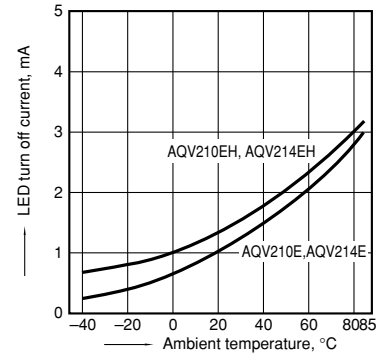
## 5. LED operate current vs. ambient temperature characteristics

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



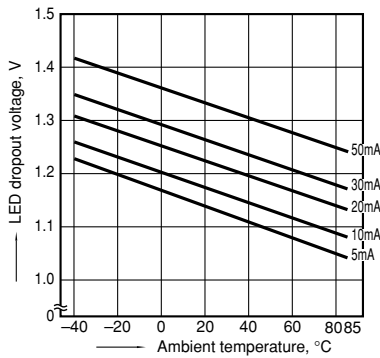
## 6. LED turn off current vs. ambient temperature characteristics

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



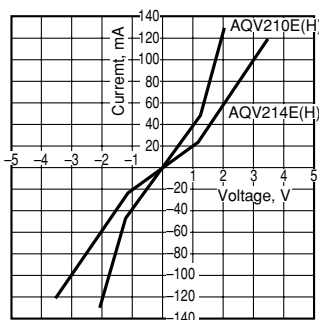
## 7. LED dropout voltage vs. ambient temperature characteristics

Sample: All types  
LED current: 5 to 50 mA



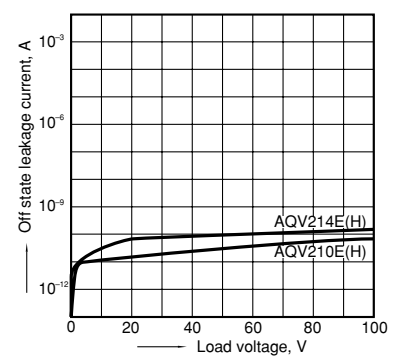
## 8. Current vs. voltage characteristics of output at MOS portion

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



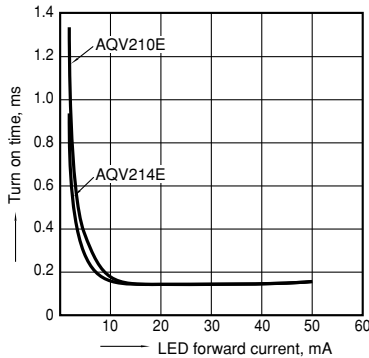
## 9. Off state leakage current vs. load voltage characteristics

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



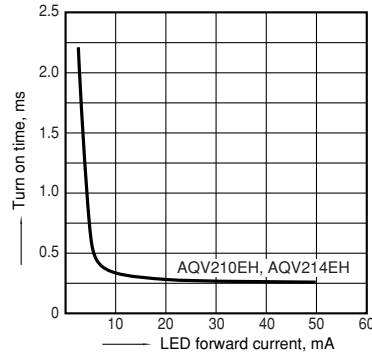
## 10-(1). Turn on time vs. LED forward current characteristics

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



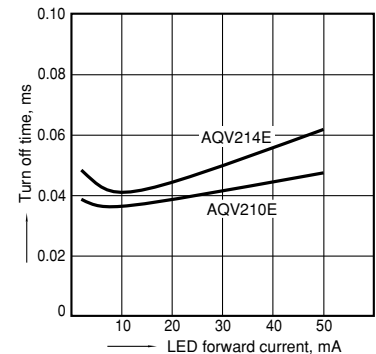
## 10-(2). Turn on time vs. LED forward current characteristics

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



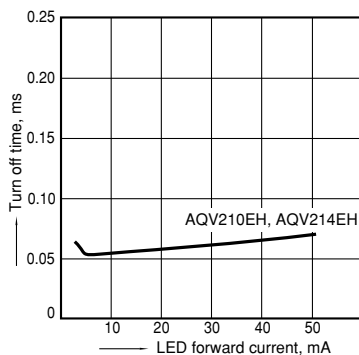
## 11-(1). Turn off time vs. LED forward current characteristics

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



## 11-(2). 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

