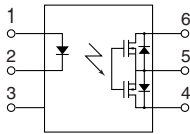
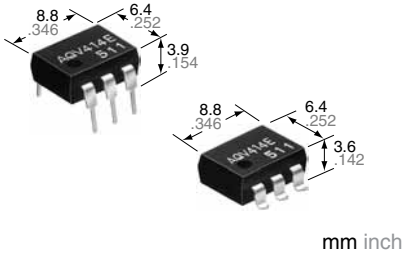


**Normally closed DIP6-pin economic type with reinforced insulation**

**PhotoMOS<sup>®</sup>**  
**GU-E 1 Form B**  
 (AQV414E, AQV410EH)

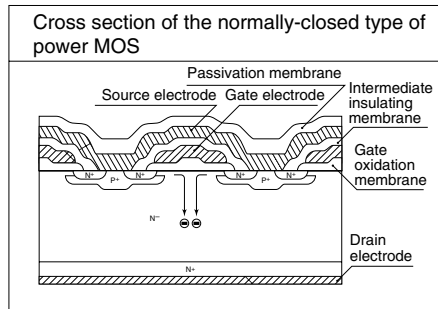


**RoHS compliant**

## FEATURES

- High cost-performance type of PhotoMOS 1 Form B output**
- 60V type couples high capacity (0.55A) with low on-resistance (typ. 1Ω).**
- Low on-resistance**

This has been realized thanks to the built-in MOSFET processed by our proprietary method, DSD (Double-diffused and Selective Doping) method.



- 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 low on-resistance**

Can control max. 0.55 A load current with 5 mA input current.

Low on-resistance of typ. 1Ω (AQV412EH).

- Low-level off-state leakage current of max. 1 μA (AQV414E)**

- Reinforced insulation 5,000 V type also available**

More than 0.4 mm internal insulation distance between inputs and outputs. Conforms to EN41003, EN60950 (reinforced insulation).

## TYPICAL APPLICATIONS

- Power supply
- Measuring equipment
- Security equipment
- Telephone 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				
					Tube packing style	Picked from the 1/2/3-pin side	Picked from the 4/5/6-pin side			
AC/DC dual use	1,500 V AC (Standard)	400 V	120 mA	DIP6-pin	AQV414E	AQV414EA	AQV414EAX	AQV414EAZ	1 tube contains: 50 pcs. 1 batch contains: 500 pcs.	1,000 pcs.
		60 V	550 mA		AQV412EH	AQV412EHA	AQV412EHAX	AQV412EHAZ		
	5,000 V AC (Reinforced)	350 V	130 mA		AQV410EH	AQV410EHA	AQV410EHAX	AQV410EHAZ		
		400 V	120 mA		AQV414EH	AQV414EHA	AQV414EHAX	AQV414EHAZ		

\*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)

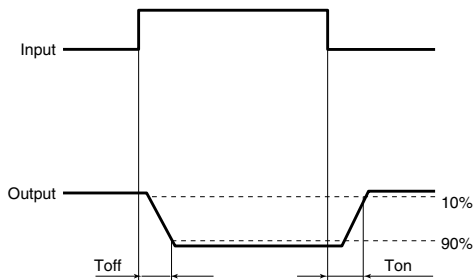
Item	Symbol	Type of connection	AQV414E(A)	AQV412EH(A)	AQV410EH(A)	AQV414EH(A)	Remarks		
Input	LED forward current	I <sub>F</sub>	50 mA						
	LED reverse voltage	V <sub>R</sub>	5 V						
	Peak forward current	I <sub>FP</sub>	1 A				f = 100 Hz, Duty factor = 0.1%		
	Power dissipation	P <sub>in</sub>	75 mW						
Output	Load voltage (peak AC)	V <sub>L</sub>	400 V	60 V	350 V	400 V			
	Continuous load current	I <sub>L</sub>	A	0.12 A	0.55 A	0.13 A	0.12 A	A connection: Peak AC, DC B,C connection: DC	
			B	0.13 A	0.65 A	0.15 A	0.13 A		
			C	0.15 A	0.8 A	0.17 A	0.15 A		
	Peak load current	I <sub>peak</sub>	0.3 A				1.5 A	0.4 A	0.3 A
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 temperatures		
	Storage	T <sub>stg</sub>	-40°C to +100°C -40°F to +212°F						

# GU-E 1 Form B (AQV414E, AQV410EH)

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

Item		Symbol	Type of connection	AQV414E(A)	AQV412EH(A)	AQV410EH(A)	AQV414EH(A)	Condition	
Input	LED operate (OFF) current	Typical	—	1.45 mA	1.9 mA			I <sub>L</sub> = Max.	
		Maximum		3.0 mA					
	LED reverse (ON) current	Minimum	—	0.3 mA	0.4 mA			I <sub>L</sub> = Max.	
		Typical		1.40 mA	1.8 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	26 Ω	1 Ω	18 Ω	25.2 Ω	I <sub>F</sub> = 0 mA I <sub>L</sub> = Max. Within 1 s on time
		Maximum			50 Ω	2.5 Ω	35 Ω	50 Ω	
		Typical	R <sub>on</sub>	B	20 Ω	0.55 Ω	13 Ω	19 Ω	I <sub>F</sub> = 0 mA I <sub>L</sub> = Max. Within 1 s on time
		Maximum			25 Ω	1.3 Ω	17.5 Ω	25 Ω	
	Typical	R <sub>on</sub>	C	10 Ω	0.3 Ω	6.5 Ω	10 Ω	I <sub>F</sub> = 0 mA I <sub>L</sub> = Max. Within 1 s on time	
	Maximum			12.5 Ω	0.7 Ω	8.8 Ω	12.5 Ω		
Off state leakage current	Maximum	I <sub>Leak</sub>	—	1 μA	10 μA			I <sub>F</sub> = 5 mA V <sub>L</sub> = Max.	
Transfer characteristics	Operate (OFF) time*	Typical	T <sub>off</sub>	—	0.7 ms	3 ms	1.5 ms	1.3 ms	I <sub>F</sub> = 0 mA → 5 mA I <sub>L</sub> = Max.
		Maximum			2.0 ms	8 ms	3.0 ms		
	Reverse (ON) time*	Typical	T <sub>on</sub>	—	0.1 ms	0.3 ms			I <sub>F</sub> = 5 mA → 0 mA I <sub>L</sub> = Max.
		Maximum			1.0 ms	1.5 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	

\*Operate/Reverse 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.

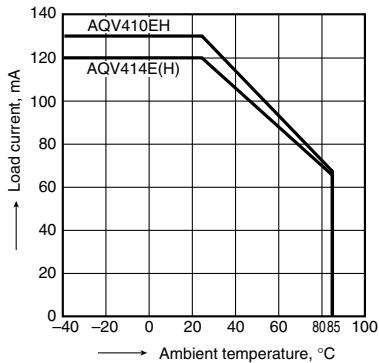
For more information.

## REFERENCE DATA

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

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

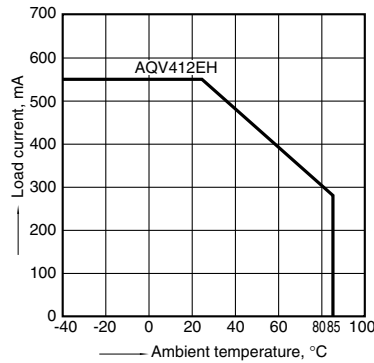
Type of connection: A



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

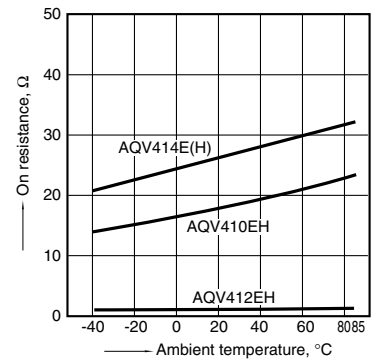
Allowable ambient temperature:  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$   
 $-40^{\circ}\text{F}$  to  $+185^{\circ}\text{F}$

Type of connection: A



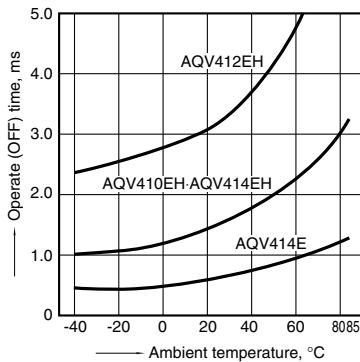
2. On resistance vs. ambient temperature characteristics

Measured portion: between terminals 4 and 6;  
 LED current: 0 mA; Load voltage: Max. (DC);  
 Continuous load current: Max. (DC)



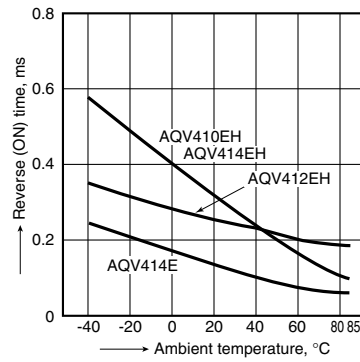
3. Operate (OFF) time vs. ambient temperature characteristics

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



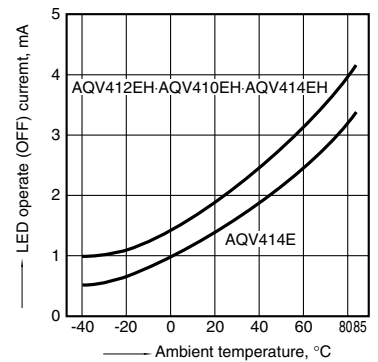
4. Reverse (ON) time vs. ambient temperature characteristics

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



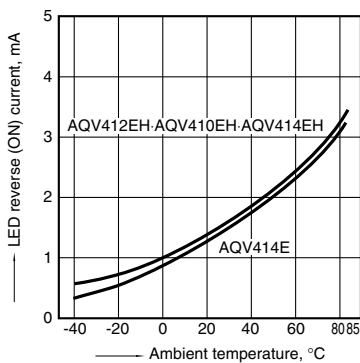
5. LED operate (OFF) current vs. ambient temperature characteristics

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



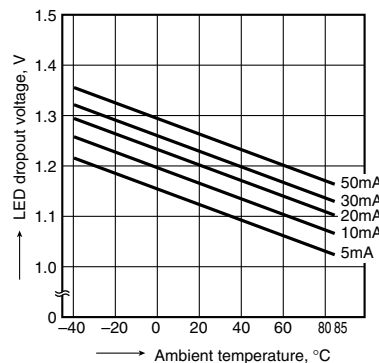
6. LED reverse (ON) current vs. ambient temperature characteristics

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



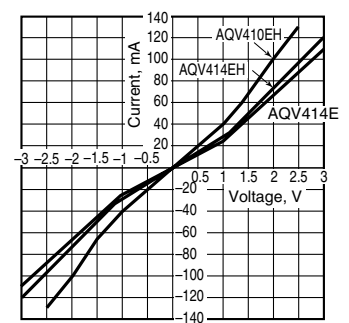
7. LED dropout voltage vs. ambient temperature characteristics

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



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

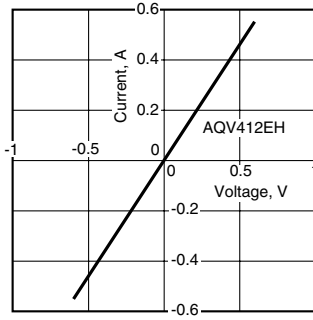
Measured portion: between terminals 4 and 6;  
 Ambient temperature:  $25^{\circ}\text{C}$   $77^{\circ}\text{F}$



# GU-E 1 Form B (AQV414E, AQV41EH)

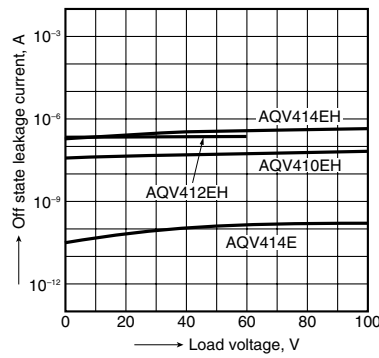
## 8-(2). Current vs. voltage characteristics of output at MOS portion

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



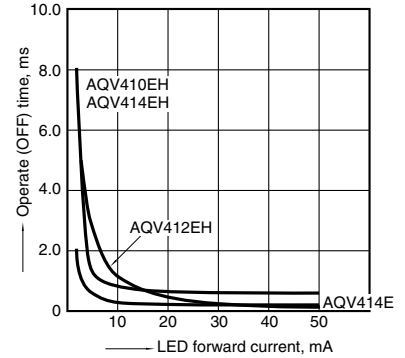
## 9. Off state leakage current vs. load voltage characteristics

Sample: All types;  
Measured portion: between terminals 4 and 6;  
LED current: 5 mA; Ambient temperature: 25°C 77°F



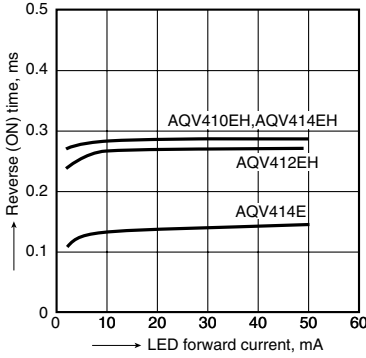
## 10. Operate (OFF) time vs. LED forward current characteristics

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



## 11. Reverse (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



## 12. Output capacitance vs. applied voltage characteristics

Measured portion: between terminals 4 and 6;  
Frequency: 1 MHz;  
Ambient temperature: 25°C 77°F

