



mm inch



#### **FEATURES**

# 1. 60V type couples high capacity (0.55A) with low on-resistance (1 $\Omega$ ).

Item	GU-E (1 Form B type) type					
Part No.	AQV410EH	AQV412EH				
Load voltage	350V	60V				
Continuous load current	0.13A	0.55A				
ON resistance (typ.)	18Ω	1Ω				

### General use and economy type. DIP (1 Form B) 6-pin type. Reinforced insulation 5,000V type.

2. This is the low-cost version PhotoMOS 1 Form B output type relay. Compared to the previous GU PhotoMOS 1 Form B type relay the

PhotoMOS 1 Form B type relay, the attainment of an economical price that is approximately 22% lower will further broaden its market.

3. Normally closed type (2 Form B) is low on-resistance. (All AQO4 PhotoMOS are Form B

# types. And also the Form A types have a low on-resistance.)

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

Cross section of the normally-closed type of power MOS
Passivation membrane
Intermediate
insulating
membrane
Gate
Oxidation
membrane
Drain
electrode

**4. Controls low-level analog signals** PhotoMOS relays feature extremely low closed-circuit offset voltage to enable control of low-level analog signals without distortion.



#### 5. High sensitivity, low ON resistance

Can control a maximum 0.13 A load current with a 5 mA input current. Low ON resistance of 18  $\Omega$  (AQV410EH). Stable operation because there are no metallic contact parts.

6. Low-level off-state leakage current The SSR has an off-state leakage current of several milliamperes, whereas the PhotoMOS relay has typ. 100 pA even with the rated load voltage of 400 V (AQV414E).

# 7. 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
- Sensors

### TYPES

IVNE		Output rating*			Pa				
	I/O isolation			Through hole terminal	S	urface-mount term	Packing quantity		
	voltage	Land	Lood			Tape and ree	packing style		
		Load Load voltage		Tube pac	king style	Picked from the 1/2/3-pin side	Picked from the 4/5/6-pin side	Tube	Tape and reel
	1,500 V AC (Standard)	400 V	120 mA	AQV414E	AQV414EA	AQV414EAX	AQV414EAZ	1 tube contains	
	5,000 V AC (Reinforced)	60 V		AQV412EH	AQV412EHA	AQV412EHAX	AQV412EHAZ	50 pcs.	1,000 pcs.
		350 V	130 mA	mA AQV410EH AQV410EHA AQV410EHAX AQV410		AQV410EHAZ	1 batch contains 500 pcs.	-	
		400 V 120		AQV414EH	AQV414EHA	AQV414EHAX	AQV414EHAZ	000 poo.	

\*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.

## GU-E PhotoMOS (AQV414E, AQV41OEH)

#### 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
	LED forward current	IF			50			
1	LED reverse voltage	Vr		5 V				
Input	Peak forwrd current	<b>I</b> FP		1 A				f = 100 Hz, Duty factor = 0.1%
	Power dissipation	Pin			75 ו			
	Load voltage (peak AC)	VL		400 V	60 V	350 V	400 V	
	Continuous load current	١L	А	0.12 A	0.55 A	0.13 A	0.12 A	
Output			В	0.13 A	0.65 A	0.15 A	0.13 A	A connection: Peak AC, DC B,C connection: DC
			С	0.15 A	0.8 A	0.17 A	0.15 A	
	Peak load current	Іреак		0.3 A	1.5 A	0.4 A	0.3 A	A connection: 100 ms (1 shot), $V_L = DC$
	Power dissipation	Pout		500 mW				
Total power dissipation		Рт			550			
I/O isolation voltage		Viso		1,500 V AC 5,000 V AC				
Temperature limits	Operating	Topr		-4	0°C to +85°C	Non-condensing at low temperatures		
	Storage T <sub>stg</sub>			-40°C to +100°C -40°F to +212°F				

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

	Iten	n		Symbol	Type of connec- tion	AQV414E(A)	AQV412EH(A)	AQV410EH(A)	AQV414EH(A)	Condition
	LED operate (OFF) current		Typical	IFoff	_	1.45 mA	1.9 mA	1.9 mA	1.9 mA	l∟= Max.
Input			Maximum			3.0 mA				
	LED reverse (ON)		Minimum	- IFon	_	0.3 mA	0.4 mA	0.4 mA	0.4 mA	lı = Max.
input	current	current				1.40 mA	1.8 mA	1.8 mA	1.8 mA	
	LED dropout voltage		Typical	VF		1.25 V (1.14 V at I⊧= 5 mA)			l⊧= 50 mA	
			Maximum	VF			1.	5 V		1F- 50 MA
	On resistance Maxim Typica Maxim Typica		Typical	Ron	A	26 Ω	1Ω	18 Ω	25.2 Ω	I⊧ = 0 mA I∟= Max. Within 1 s on time
			Maximum			50 Ω	2.5 Ω	35 Ω	50 Ω	
			Typical	Ron	В	20 Ω	0.55 Ω	13 Ω	19 Ω	I⊧= 0 mA I∟= Max. Within 1 s on time
Output			Maximum			25 Ω	1.3 Ω	17.5 Ω	25 Ω	
			Typical	m Ron	С	10 Ω	0.3 Ω	6.5 Ω	10 Ω	I⊧= 0 mA I∟= Max. Within 1 s on time
			Maximum			12.5 Ω	0.7 Ω	8.8 Ω	12.5 Ω	
	Off state leakage current		Maximum	Leak	_	1 µA	10 µA	10 µA	10 µA	l⊧= 5 mA V∟ = Max.
	Switching speed	Operate (OFF) time*	Typical	Toff	_	0.7 ms	3 ms	1.5 ms	1.3 ms	I⊧ = 0 mA → 5 mA I∟ = Max.
			Maximum			2.0 ms	10 ms	3.0 ms	3.0 ms	
		Reverse	Typical	т	Ton —	0.1 ms	0.3 ms	0.3 ms	0.3 ms	I⊧= 5 mA → 0 mA
Transfer characteristics		(ON) time*	Maximum	Ion		1.0 ms	1.5 ms	1.5 ms	1.5 ms	I∟ = Max.
	U/O canacitance ⊢		Typical	Ciso		0.8 pF			f = 1 MHz V <sub>B</sub> = 0 V	
			Maximum			1.5 pF				
	Initial I/O isolation resistance		Minimum	Riso	_	1,000 ΜΩ			500 V DC	

Standard type I<sub>F</sub> = 5 mA Reinforced type I<sub>F</sub> = 5 to 10 mA \*Operate/Reverse time



Note: Recommendable LED forward current

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

Allowable ambient temperature:  $-40^{\circ}C$  to  $+85^{\circ}C$  $-40^{\circ}F$  to  $+185^{\circ}F$ Type of connection: A



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

LED current: 5mA; 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)



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

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



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

LED current: 5 mA; 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



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)



5. LED operate (OFF) current vs. ambient temperature characteristics Load voltage: Max. (DC); Continuous load current: Max. (DC)



8-(1). Current vs. voltage characteristics of output at MOS portion Measured portion: between terminals 4 and 6;



-80

-100 -120

-140

# GU-E PhotoMOS (AQV414E, AQV41OEH)

8-(2). Current vs. voltage characteristics of output at MOS portion Measured portion: between terminals 4 and 6; Ambient temperature: 25°C 77°F



 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:  $25^{\circ}C$  77°F



12. Output capacitance vs. applied voltage characteristics

Measured portion: between terminals 4 and 6; Frequency: 1 MHz; Ambient temperature: 25°C  $77^\circ\text{F}$ 

