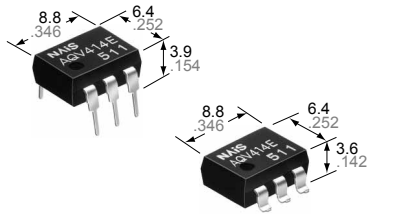
c UL us (AQV412EH) VDE (Standard type) c UL us (AQV410EH, 414EH) BSI (AQV410EH, 414EH) VDE (AQV410EH, 414EH) (Reinforced type)

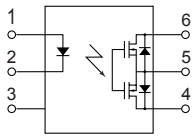
Panasonic
ideas for life

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

GU-E PhotoMOS (AQV414E, AQV41○EH)



mm inch



FEATURES

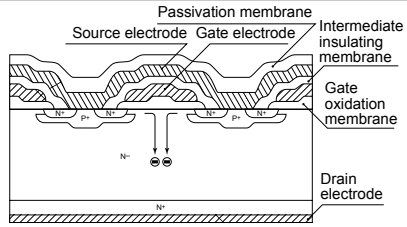
1. 60V type couples high capacity (0.55A) with low on-resistance (1Ω).

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

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 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 AQ○4 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 (Double-diffused and Selective Doping) method.

Cross section of the normally-closed type of power MOS



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 Ω (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

Type	I/O isolation voltage	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 type	1,500 V AC (Standard)	400 V	120 mA	AQV414E	AQV414EA	AQV414EAX	AQV414EAZ	1 tube contains 50 pcs. 1 batch contains 500 pcs.	1,000 pcs.
	5,000 V AC (Reinforced)	60 V	550 mA	AQV412EH	AQV412EHA	AQV412EHAX	AQV412EHAZ		
		350 V	130 mA	AQV410EH	AQV410EHA	AQV410EHAX	AQV410EHAZ		
		400 V	120 mA	AQV414EH	AQV414EHA	AQV414EHAX	AQV414EHAZ		

*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		Symbol	Type of connection	AQV414E(A)	AQV412EH(A)	AQV410EH(A)	AQV414EH(A)	Remarks
Input	LED forward current	I_F		50 mA				
	LED reverse voltage	V_R		5 V				
	Peak forwrd current	I_{FP}		1 A				f = 100 Hz, Duty factor = 0.1%
	Power dissipation	P_{in}		75 mW				
Output	Load voltage (peak AC)	V_L		400 V	60 V	350 V	400 V	
	Continuous load current	I_L	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_{peak}		0.3 A	1.5 A	0.4 A	0.3 A	A connection: 100 ms (1 shot), V_L = 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 temperatures
	Storage	T_{stg}		–40°C to +100°C –40°F to +212°F				

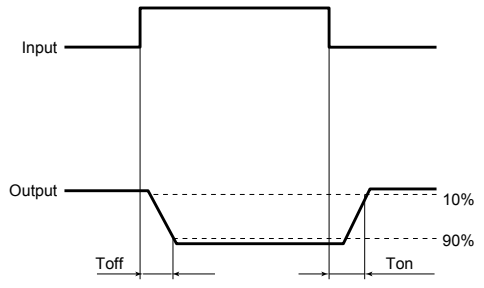
2. Electrical characteristics (Ambient temperature: 25°C 77°F)

Item				Symbol	Type of connec-tion	AQV414E(A)	AQV412EH(A)	AQV410EH(A)	AQV414EH(A)	Condition
Input	LED operate (OFF) current		Typical	I_{Foff}	—	1.45 mA	1.9 mA	1.9 mA	1.9 mA	I_L= Max.
			Maximum			3.0 mA				
	LED reverse (ON) current		Minimum	I_{Fon}	—	0.3 mA	0.4 mA	0.4 mA	0.4 mA	I_L= Max.
			Typical			1.40 mA	1.8 mA	1.8 mA	1.8 mA	
	LED dropout voltage		Typical	V_F	—	1.25 V (1.14 V at I_F= 5 mA)				I_F= 50 mA
			Maximum			1.5 V				
Output	On resistance		Typical	R_{on}	A	26 Ω	1 Ω	18 Ω	25.2 Ω	I_F = 0 mA I_L= Max. Within 1 s on time
			Maximum			50 Ω	2.5 Ω	35 Ω	50 Ω	
			Typical	R_{on}	B	20 Ω	0.55 Ω	13 Ω	19 Ω	I_F= 0 mA I_L= Max. Within 1 s on time
			Maximum			25 Ω	1.3 Ω	17.5 Ω	25 Ω	
			Typical	R_{on}	C	10 Ω	0.3 Ω	6.5 Ω	10 Ω	I_F= 0 mA I_L= 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_{Leak}	—	1 μA	10 μA	10 μA	10 μA	I_F= 5 mA V_L = Max.
Transfer characteristics	Switching speed	Operate (OFF) time*	Typical	T_{off}	—	0.7 ms	3 ms	1.5 ms	1.3 ms	I_F = 0 mA → 5 mA I_L = Max.
			Maximum			2.0 ms	10 ms	3.0 ms	3.0 ms	
		Reverse (ON) time*	Typical	T_{on}	—	0.1 ms	0.3 ms	0.3 ms	0.3 ms	I_F= 5 mA → 0 mA I_L = Max.
			Maximum			1.0 ms	1.5 ms	1.5 ms	1.5 ms	
	I/O capacitance		Typical	C_{iso}	—	0.8 pF				f = 1 MHz V_B = 0 V
			Maximum			1.5 pF				
	Initial I/O isolation resistance		Minimum	R_{iso}	—	1,000 MΩ				500 V DC

Note: Recommendable LED forward current

Standard type I_F = 5 mA
Reinforced type I_F = 5 to 10 mA

*Operate/Reverse time

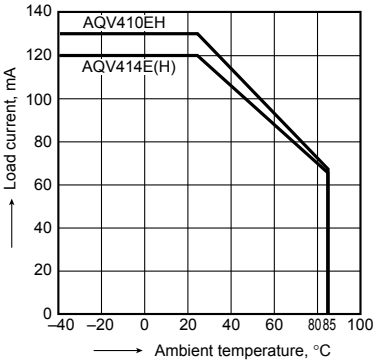


REFERENCE DATA

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

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

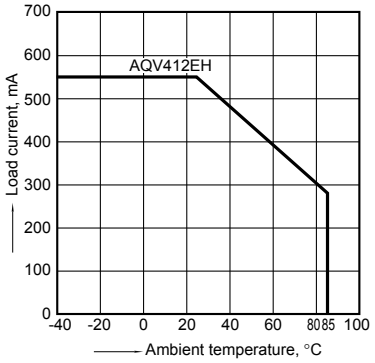
Type of connection: A



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

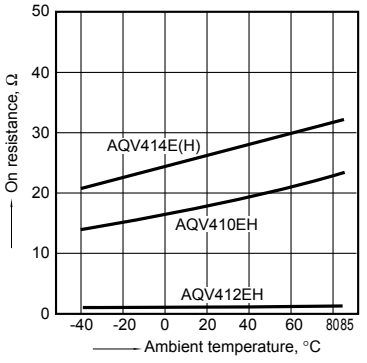
Allowable ambient temperature: –40°C to +85°C
–40°F to +185°F

Type of connection: A



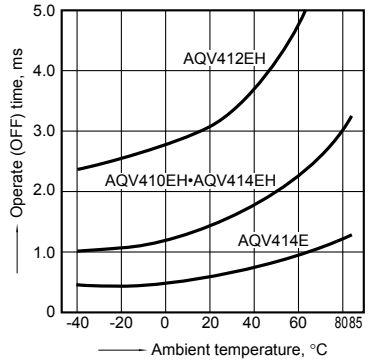
2. On resistance vs. ambient temperature characteristics

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



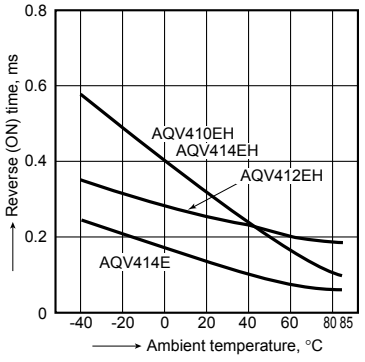
3. Operate (OFF) time vs. ambient temperature characteristics

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



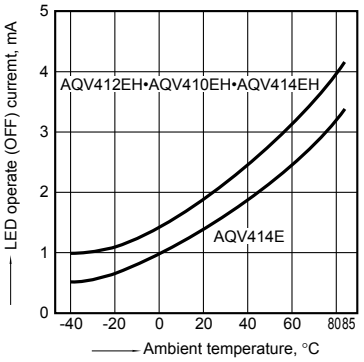
4. Reverse (ON) time vs. ambient temperature characteristics

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



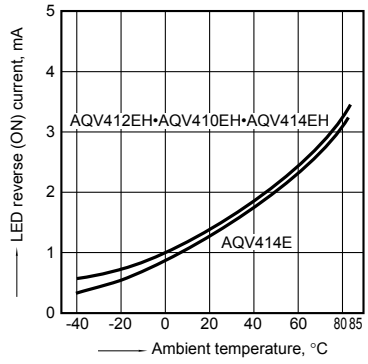
5. LED operate (OFF) current vs. ambient temperature characteristics

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



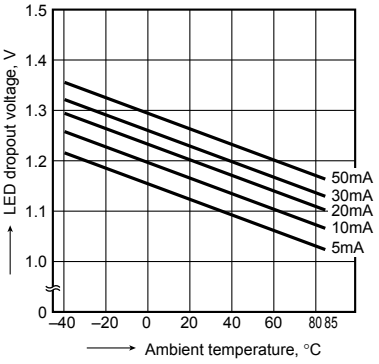
6. LED reverse (ON) current vs. ambient temperature characteristics

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



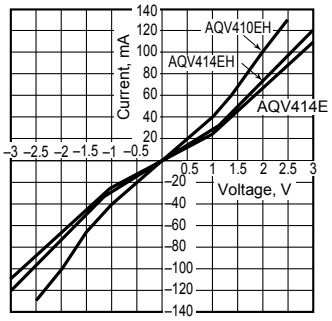
7. LED dropout voltage vs. ambient temperature characteristics

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



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

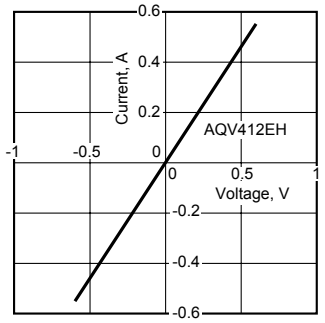
Measured portion: between terminals 4 and 6;
Ambient temperature: 25°C 77°F



GU-E PhotoMOS (AQV414E, AQV41❍EH)

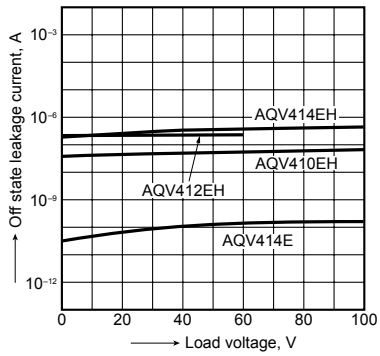
8-(2). Current vs. voltage characteristics of output at MOS portion

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



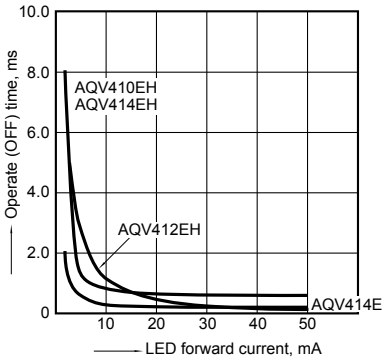
9. Off state leakage current vs. load voltage characteristics

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



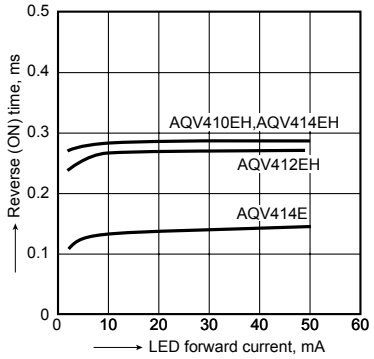
10. Operate (OFF) time vs. LED forward current characteristics

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