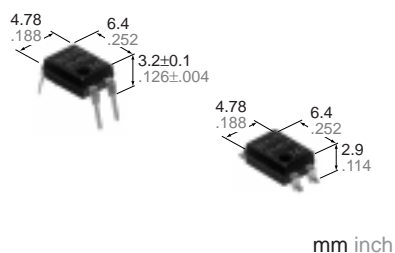


NAiS

GU (General Use) -E Type
1-Channel (Form A)
4-pin Type

PhotoMOS RELAYS

UL File No.: E43149
CSA File No.: LR26550



FEATURES

1. Reinforced insulation 5,000 V type

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

2. Compact 4-pin DIP size

The device comes in a compact (W)6.4 × (L)4.78 × (H) 3.2mm (W).252 × (L).188 × (H).126inch, 4-pin DIP size

3. Controls low-level analog signals

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

4. High sensitivity, low ON resistance

Can control a maximum 0.13 A load current with a 5 mA input current. Low

ON resistance of 25Ω (AQY210EH). Stable operation because there are no metallic contact parts.

5. Low-level off state leakage current

The SSR has an off state leakage current of several milliamperes, whereas the PhotoMOS relay has only 100 pA even with the rated load voltage of 350 V (AQY210EH).

TYPICAL APPLICATIONS

- Modem
- Telephone equipment
- Security equipment
- Sensors

TYPES

Type	I/O isolation voltage	Output rating*		Part No.				Packing quantity	
				Through hole terminal	Surface-mount terminal				
					Tube packing style	Tape and reel packing style		Tube	Tape and reel
Load voltage	Load current	Picked from the 1/2-pin side	Picked from the 3/4-pin side						
AC/DC type	Reinforced 5,000 V	350 V	130 mA	AQY210EH	AQY210EHA	AQY210EHAX	AQY210EHAZ	1 tube contains 100 pcs.	1,000 pcs.
		400 V	120 mA	AQY214EH	AQY214EHA	AQY214EHAX	AQY214EHAZ	1 batch contains 1,000 pcs.	

*Indicate the peak AC and DC values.

Note: For space reasons, the initial letters of the product number "AQY", 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	AQY210EH(A)	AQY214EH(A)	Remarks
Input	LED forward current	I_F	50 mA		
	LED reverse voltage	V_R	3 V		
	Peak forward current	I_{FP}	1 A		$f = 100 \text{ Hz}$, Duty factor = 0.1%
	Power dissipation	P_{in}	75 mW		
Output	Load voltage (peak AC)	V_L	350 V	400 V	
	Continuous load current	I_L	0.13 A	0.12 A	
	Peak load current	I_{peak}	0.4 A	0.3 A	100 ms, (1 shot), $V_L = \text{DC}$
	Power dissipation	P_{out}	500 mW		
Total power dissipation		P_T	550 mW		
I/O isolation voltage		V_{iso}	5,000 V AC		
Temperature limits	Operating	T_{opr}	-20 to +85°C -4 to +185°F		Non-condensing at low temperatures
	Storage	T_{stg}	-40 to +100°C -40 to +212°F		

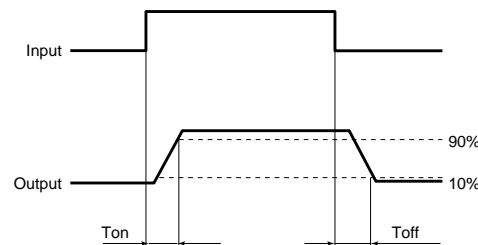
2. Electrical characteristics (Ambient temperature: 25°C 77°F)

Item		Symbol	AQY210EH(A)	AQY214 EH(A)	Condition			
Input	LED operate current	Minimum Typical Maximum	I _{Fon}	1.2 mA 3.0 mA	I _L = Max.			
	LED turn off current	Minimum Typical Maximum				I _{Foff}	0.4 mA 1.1 mA	I _L = Max.
	LED dropout voltage	Minimum Typical Maximum						
Output	On resistance	Minimum Typical Maximum	R _{on}	18 Ω 25 Ω	26 Ω 35 Ω	I _F = 5 mA I _L = Max. Within 1 s on time		
	Off state leakage current	Minimum Typical Maximum					I _{Leak}	1 μA
Transfer characteristics	Turn on time*	Minimum Typical Maximum	T _{on}	0.5 ms 2.0 ms	I _F = 5 mA I _L = Max.			
	Turn off time*	Minimum Typical Maximum				T _{off}	0.08 ms 1.0 ms	I _F = 5 mA I _L = Max.
	I/O capacitance	Minimum Typical Maximum						
	Initial I/O isolation resistance	Minimum Typical Maximum				R _{iso}	1,000 MΩ	500 V DC

Note: Recommendable LED forward current I_F = 5 to 10 mA.

For type of connection, see Page 19

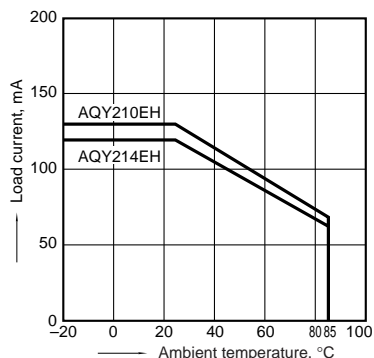
*Turn on/Turn off time



REFERENCE DATA

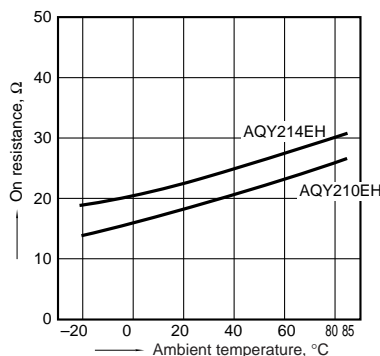
1. Load current vs. ambient temperature characteristics

Allowable ambient temperature: -20°C to +85°C
-4°F to +185°F



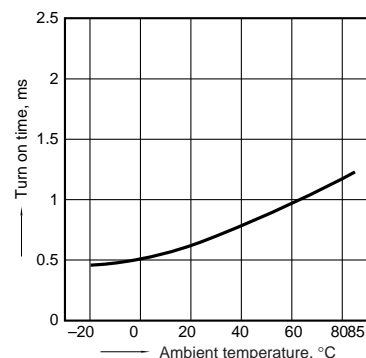
2. On resistance vs. ambient temperature characteristics

Measured portion: between terminals 3 and 4;
LED current: 5 mA; Load voltage: Max. (DC);
Continuous load current: Max. (DC)



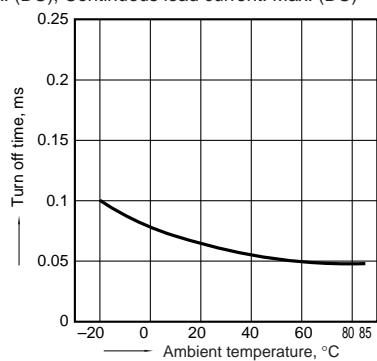
3. Turn on time vs. ambient temperature characteristics

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



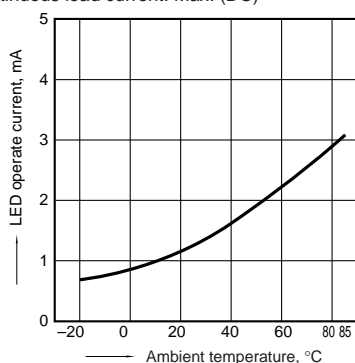
4. Turn off time vs. ambient temperature characteristics

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



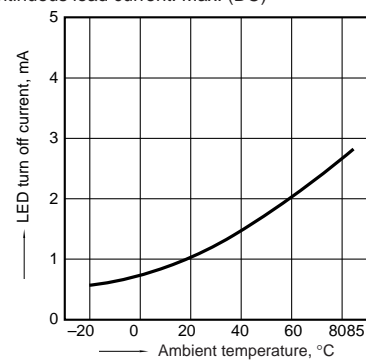
5. LED operate current vs. ambient temperature characteristics

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



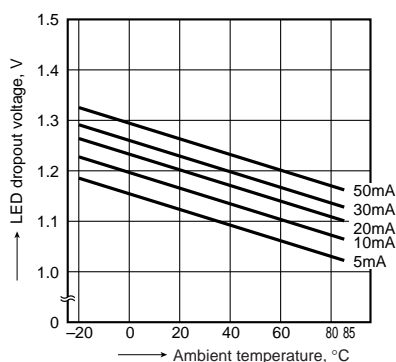
6. LED turn off current vs. ambient temperature characteristics

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



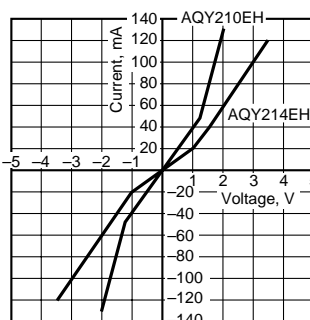
7. LED dropout voltage vs. ambient temperature characteristics

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



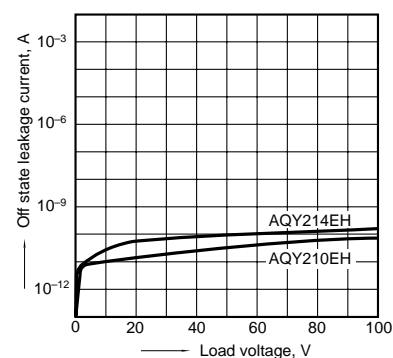
8. Voltage vs. current characteristics of output at MOS portion

Measured portion: between terminals 3 and 4; Ambient temperature: 25°C 77°F



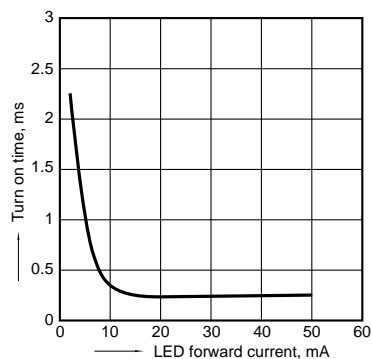
9. Off state leakage current

Measured portion: between terminals 3 and 4; Ambient temperature: 25°C 77°F



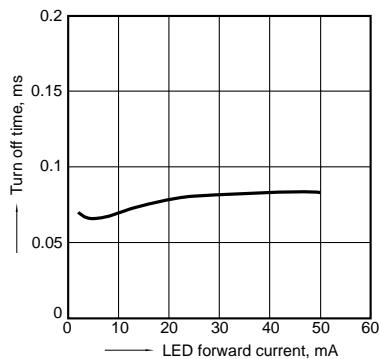
10. LED forward current vs. turn on time characteristics

Sample: All types
Measured portion: between terminals 3 and 4;
Load voltage: Max. (DC); Continuous load current: Max. (DC); Ambient temperature: 25°C 77°F



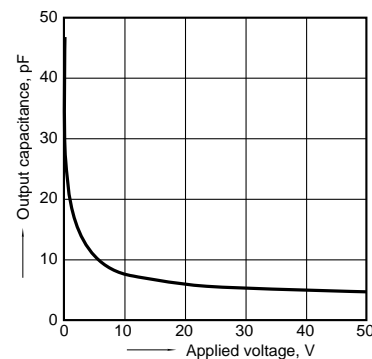
11. LED forward current vs. turn off time characteristics

Sample: All types
Measured portion: between terminals 3 and 4;
Load voltage: Max. (DC); Continuous load current: Max. (DC); Ambient temperature: 25°C 77°F



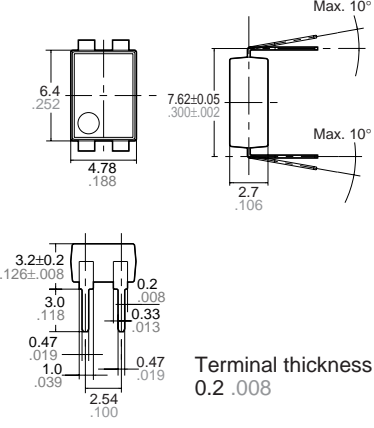
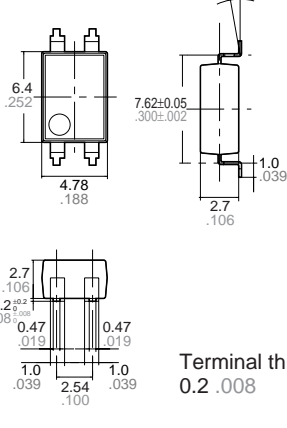
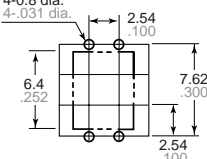
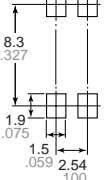
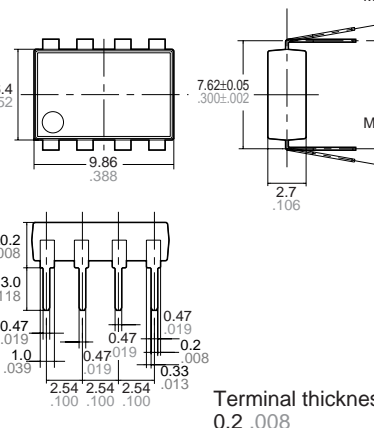
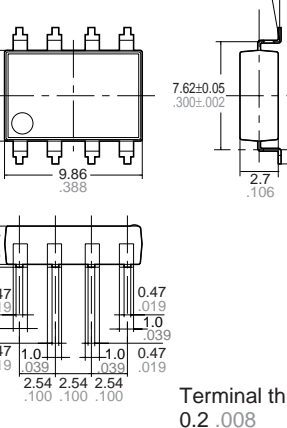
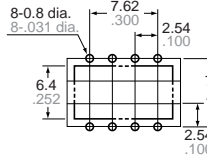
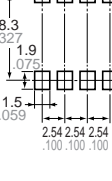
12. Applied voltage vs. output capacitance characteristics

Sample: All types
Measured portion: between terminals 3 and 4;
Frequency: 1 MHz; Ambient temperature: 25°C 77°F



Dimensions

mm inch

Type	Dimensions		
<p>AQY210EH AQY410EH Series</p>	<p>Through hole terminal type</p>  <p>Terminal thickness = 0.2 .008</p> <p>General tolerance: $\pm 0.1 \pm .004$</p>	<p>Surface mount terminal type</p>  <p>Terminal thickness = 0.2 .008</p> <p>General tolerance: $\pm 0.1 \pm .004$</p>	<p>PC board pattern (Bottom view)</p>  <p>Tolerance: $\pm 0.1 \pm .004$</p> <p>Mounting pad (Top view)</p>  <p>Tolerance: $\pm 0.1 \pm .004$</p>
<p>AQW210EH AQW410EH AQW610EH Series</p>	<p>Through hole terminal type</p>  <p>Terminal thickness = 0.2 .008</p> <p>General tolerance: $\pm 0.1 \pm .004$</p>	<p>Surface mount terminal type</p>  <p>Terminal thickness = 0.2 .008</p> <p>General tolerance: $\pm 0.1 \pm .004$</p>	<p>PC board pattern (Bottom view)</p>  <p>Tolerance: $\pm 0.1 \pm .004$</p> <p>Mounting pad (Top view)</p>  <p>Tolerance: $\pm 0.1 \pm .004$</p>

Schematic and Wiring Diagrams

Type	Schematic	Output configuration	Load	Con-nection	Wiring diagram
AQY210EH Series		1a	AC/DC	—	
AQW210EH Series		2a	AC/DC	—	<p>(1) Two independent 1 Form A use</p> <p>(2) 2 Form A use</p>
AQY410EH Series		1b	AC/DC	—	
AQW610EH Series		1a1b	AC/DC	—	<p>(1) Two independent 1 Form A & 1 Form B use</p> <p>(2) 1 Form A 1 Form B use</p>
AQW410EH Series		2b	AC/DC	—	<p>(1) Two independent 1 Form B use</p> <p>(2) 2 Form B use</p>

Note: E_1 : Power source at input side; I_F : LED forward current; V_L : Load voltage; I_L : Load current.

Cautions for Use

SAFETY WARNINGS

• Do not use the product under conditions that exceed the range of its specifications. It may cause overheating, smoke, or fire.

• Do not touch the recharging unit while the power is on. There is a danger of electrical shock. Be sure to turn off the power when performing mounting, maintenance, or repair operations on the relay (including connecting parts such as the terminal board and socket).

• Check the connection diagrams in the catalog and be sure to connect the terminals correctly. Erroneous connections could lead to unexpected operating errors, overheating, or fire.

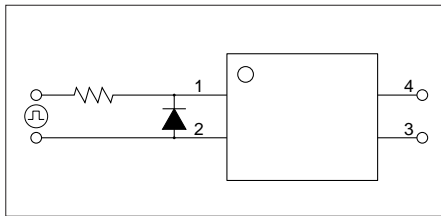
NOTES

1. Short across terminals

Do not short circuit between terminals when relay is energized, since there is the possibility of breaking the internal IC.

2. Surge voltages at the input

If reverse surge voltages are present at the input terminals, connect a diode in reverse parallel across the input terminals and keep the reverse voltages below the reverse breakdown voltage.



3. Recommended LED forward current (I_F)

It is recommended that the LED forward current (I_F) of each PhotoMOS Relay should be set according to the following table.

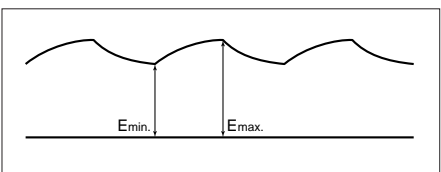
Type	Product name	Recommended LED forward current (I _F)
DIP SMD type	AQY210EH, 410EH Series AQW210EH, 410EH, 610EH Series	5 to 10 mA

4. Ripple in the input power supply

If ripple is present in the input power supply, observe the following:

1) For LED operate current at E_{min}, maintain the value mentioned in the table of "Note 3. Recommended LED forward current (I_F)."

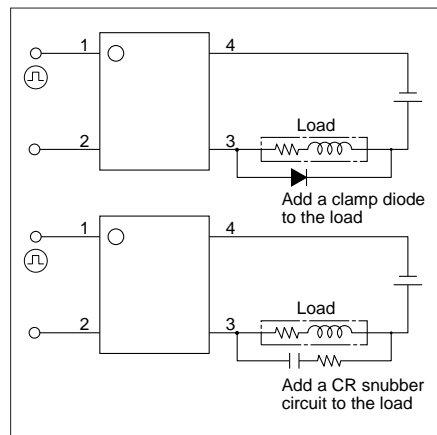
2) For LED operate current at 50 mA or less at E_{max}.



5. Output spike voltages

1) If an inductive load generates spike voltages which exceed the absolute maximum rating, the spike voltage must be limited.

Typical circuits are shown below.



2) Even if spike voltages generated at the load are limited with a clamp diode if the circuit wires are long, spike voltages will occur by inductance. Keep wires as short as possible to minimize inductance.

6. Cleaning solvents compatibility

Dip cleaning with an organic solvent is recommended for removal of solder flux, dust, etc. Select a cleaning solvent from the following table. If ultrasonic cleaning must be used, the severity of factors such as frequency, output power and cleaning solvent selected may cause loose wires and other defects. Make sure these conditions are correct before use. For details, please consult us.

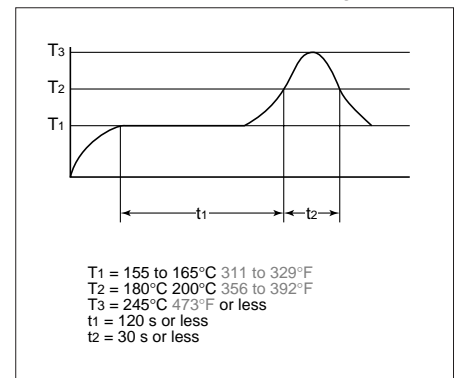
Cleaning solvent	Compatibility (○: Yes ×: No)
Chlorine-base • I.I.I. Trichloroethylene (Chloroethylene) • Trichloroethylene (Trichlene) • Perchloroethylene • Methylene chloride	○
Aqueous • Indusco 624, 1000 • Hollis 310 • Lonco Terg	○
Alcohol-base • IPA • Ethanol	○
Others • Thinner • Gasoline	×

7. Soldering

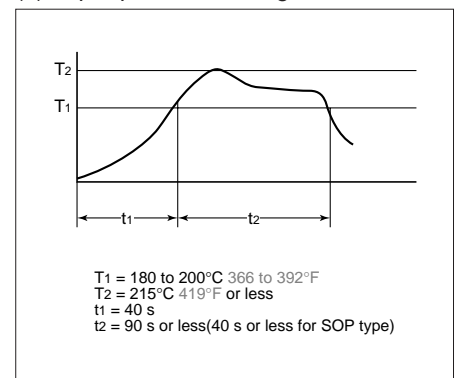
1) When soldering PC board terminals, keep soldering time to within 10 s at 260°C 500°F.

2) When soldering surface-mount terminals, the following conditions are recommended.

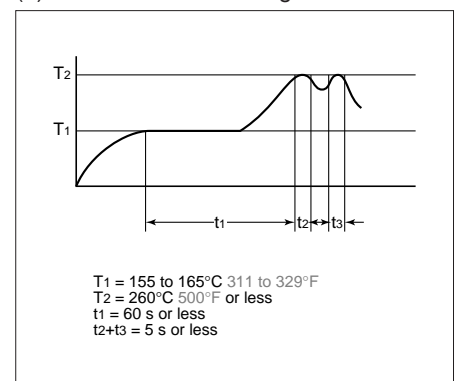
(1) IR (Infrared reflow) soldering method



(2) Vapor phase soldering method



(3) Double wave soldering method



(4) Soldering iron method
 Tip temperature: 280 to 300°C 536 to 572°F
 Wattage: 30 to 60 W
 Soldering time: within 5 s

(5) Others
 Check mounting conditions before using other soldering methods (hot-air, hot plate, pulse heater, etc.)
 • The temperature profile indicates the temperature of the soldered terminal on the surface of the PC board. The

ambient temperature may increase excessively. Check the temperature under mounting conditions.
 • The conditions for the infrared reflow soldering apply when preheating using the VPS method.

8. The following shows the packaging format

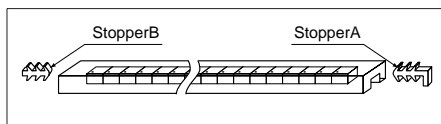
1) Tape and reel

mm inch

Type	Tape dimensions	Dimensions of paper tape reel
AQY○○○EHA 4-pin SMD type	<p>(1) When picked from 1/2-pin side: Part No. AQY○○○EHAX (Shown above) (2) When picked from 3/4-pin side: Part No. AQY○○○EHAZ</p>	
AQW○○○EHA 8-pin SMD type	<p>(1) When picked from 1/2/3/4-pin side: Part No. AQW○○○EHAX (Shown above) (2) When picked from 5/6/7/8-pin side: Part No. AQW○○○EHAZ</p>	

2) Tube

Devices are packaged in a tube so pin No. 1 is on the stopper B side. Observe correct orientation when mounting them on PC boards.



9. Transportation and storage

1) Extreme vibration during transport will warp the lead or damage the relay. Handle the outer and inner boxes with care.
 2) Storage under extreme conditions will cause soldering degradation, external

appearance defects, and deterioration of the characteristics. The following storage conditions are recommended:

- Temperature: 0 to 45°C 32 to 113°F
- Humidity: Less than 70% R.H.
- Atmosphere: No harmful gasses such as sulfurous acid gas, minimal dust.