

NAIS

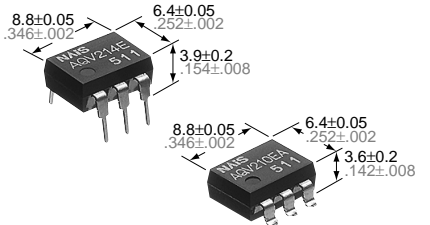
GU (General Use)-E Type [1-Channel (Form A) Type]

PhotoMOS RELAYS

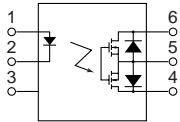
FEATURES

- 1. Controls low-level analog signals**
PhotoMOS relays feature extremely low closed-circuit offset voltage to enable control of low-level analog signals without distortion.
- 2. Control with low-level input signals**
- 3. Controls various types of loads such as relays, motors, lamps and solenoids.**
- 4. 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.
- 5. Eliminates the need for a counter electromotive force protection diode in the drive circuits on the input side**

- 6. Stable on resistance**
- 7. Low-level off state leakage current**
- 8. 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.
- 9. Low thermal electromotive force (Approx. 1 μ 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
AC/DC	Standard 1,500 V AC	350 V	130 mA	AQV210E	AQV210EA	AQV210EAX	AQV210EAX		
		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	AQV214EHAX		

*Indicate the peak AC and DC values.

Note: For space reasons, 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_F		50 mA					
	LED reverse voltage	V_R		3 V					
	Peak forward 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		350 V	400 V	350 V	400 V		
	Continuous load current	I_L		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_{peak}			0.4 A	0.3 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 temp.	
	Storage	T_{stg}		-40°C to +100°C -40°F to +212°F					

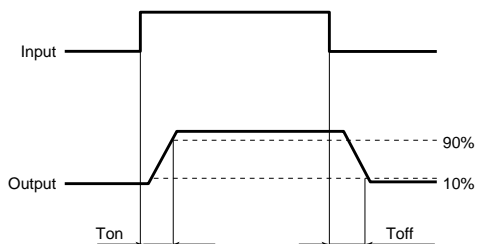
2. Electrical characteristics (Ambient temperature: 25°C 77°F)

Item		Symbol	Type of connection	AQV210E(A)	AQV214E(A)	AQV210EH(A)	AQV214EH(A)	Condition	
Input	LED operate current	Typical	I _{Fon}	—	1.1 mA	1.1 mA	1.6 mA	1.6 mA	
		Maximum			3 mA				I _L = Max.
	LED turn off current	Minimum	I _{Foff}	—	0.3 mA	0.3 mA	0.4 mA	0.4 mA	I _L = Max.
	Typical	1.0 mA			1.0 mA	1.5 mA	1.5 mA		
	LED dropout voltage	Typical	V _F	—	1.14 V (1.25 V at I _F = 50 mA)				I _F = 5 mA
		Maximum			1.5 V				
Output	On resistance	Typical	R _{on}	A	23 Ω	30 Ω	23 Ω	30 Ω	I _F = 5 mA I _L = Max. Within 1 s on time
		Maximum			35 Ω	50 Ω	35 Ω	50 Ω	
		Typical	R _{on}	B	11.5 Ω	22.5 Ω	11.5 Ω	22.5 Ω	I _F = 5 mA I _L = Max. Within 1 s on time
		Maximum			17.5 Ω	25 Ω	17.5 Ω	25 Ω	
		Typical	R _{on}	C	6.0 Ω	11.3 Ω	6.0 Ω	11.3 Ω	I _F = 5 mA I _L = Max. Within 1 s on time
		Maximum			8.8 Ω	12.5 Ω	8.8 Ω	12.5 Ω	
	Output capacitance	Typical	C _{out}	A	45 pF				I _F = 0 V _B = 0 f = 1 MHz
	Off state leakage current	Maximum	—	—	1 μA				I _F = 0 V _L = Max.
Transfer characteristics	Switching speed	Turn on time*	T _{on}	—	0.5 ms	0.5 ms	0.7 ms	0.7 ms	I _F = 5 mA** I _L = Max.
		Maximum			2.0 ms	2.0 ms	2.0 ms	2.0 ms	
	Turn off time*	Typical	T _{off}	—	0.05 ms				I _F = 5 mA I _L = Max.
		Maximum			1.0 ms				
	I/O capacitance	Typical	C _{iso}	—	0.8 pF				f = 1 MHz V _B = 0
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: 5 mA
Reinforced type: 5 to 10 mA

For type of connection, see page 31.

*Turn on/Turn off time



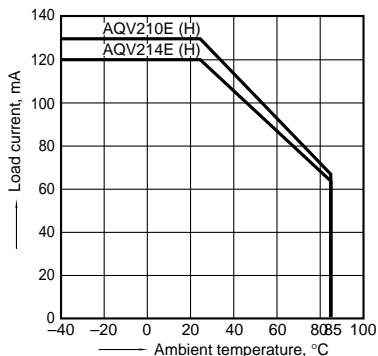
- For Dimensions, see Page 27.
- For Schematic and Wiring Diagrams, see Page 31.
- For Cautions for Use, see Page 36.

REFERENCE DATA

1. Load current vs. ambient temperature characteristics

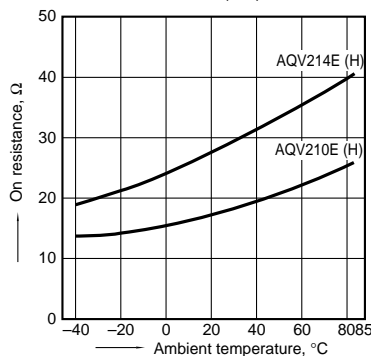
Allowable ambient temperature: -40°C to +85°C
-40°F to +185°F

Type of connection:A



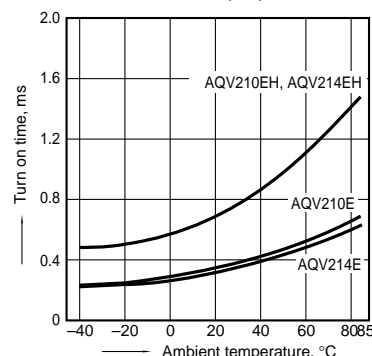
2. On resistance vs. ambient temperature characteristics

Measured portion: between terminals 4 and 6;
LED current: 5 mA; Load voltage: Max. (DC);
Continuous load current: Max. (DC)



3. Turn on time vs. ambient temperature characteristics

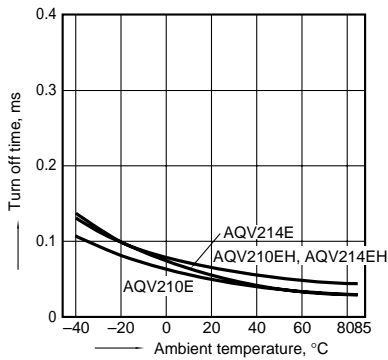
LED current: 5 mA;
Load voltage: Max. (DC);
Continuous load current: Max. (DC)



AQV210E

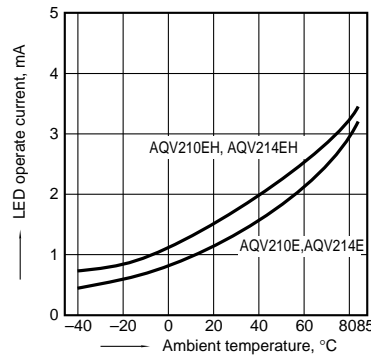
4. Turn off time vs. ambient temperature characteristics

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



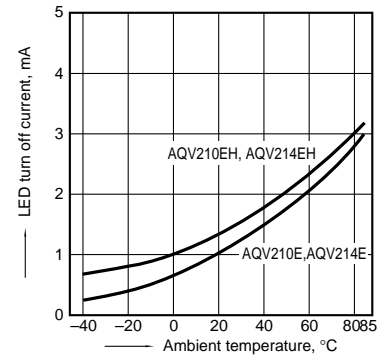
5. LED operate current vs. ambient temperature characteristics

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



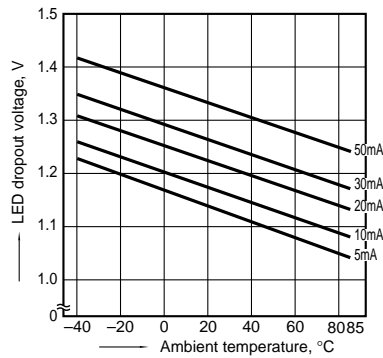
6. LED turn off current vs. ambient temperature characteristics

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



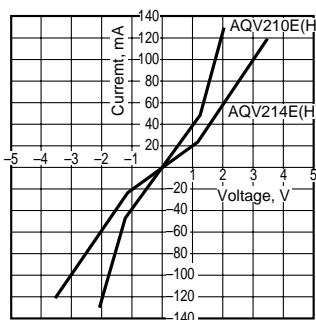
7. LED dropout voltage vs. ambient temperature characteristics

Sample: All types
LED current: 5 to 50 mA



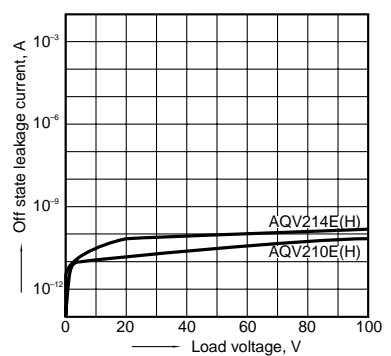
8. Voltage vs. current characteristics of output at MOS portion

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



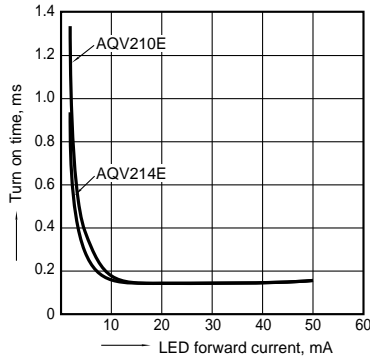
9. Off state leakage current

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



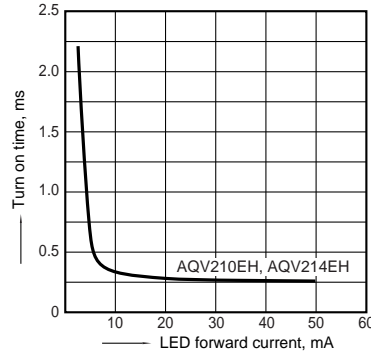
10-(1). LED forward current vs. turn on time characteristics

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



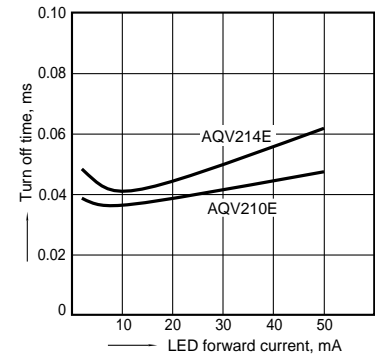
10-(2). LED forward current vs. turn on time characteristics

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



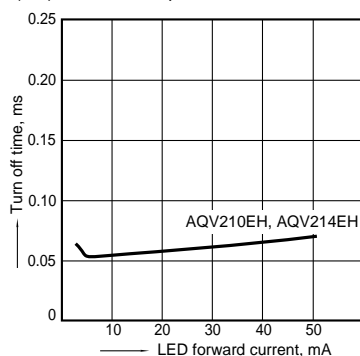
11-(1). LED forward current vs. turn off time characteristics

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



11-(2). LED forward current vs. turn off time characteristics

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



12. Applied voltage vs. output capacitance characteristics

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

