



(Standard type)

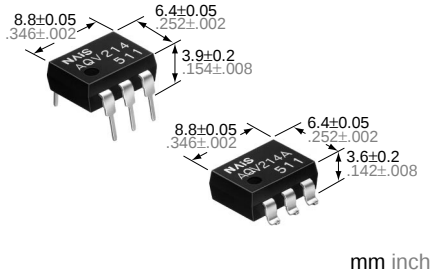


(Reinforced type)

NAIS**GU (General Use) 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
		Picked from the 1/2/3-pin side	Picked from the 4/5/6-pin side						
AC/DC	Standard 1,500 V AC	60V	400 mA	AQV212	AQV212A	AQV212AX	AQV212AZ	1 tube contains 50 pcs. 1 batch contains 500 pcs.	1,000 pcs.
		100 V	320 mA	AQV215	AQV215A	AQV215AX	AQV215AZ		
		200 V	180 mA	AQV217	AQV217A	AQV217AX	AQV217AZ		
		350 V	130 mA	AQV210	AQV210A	AQV210AX	AQV210AZ		
		400 V	120 mA	AQV214	AQV214A	AQV214AX	AQV214AZ		
		600 V	50 mA	AQV216	AQV216A	AQV216AX	AQV216AZ		
	Reinforced 5,000 V	400 V	120 mA	AQV214H	AQV214HA	AQV214HAX	AQV214HAZ		

*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	AQV212(A)	AQV215(A)	AQV217(A)	AQV210(A)	AQV214(A)	AQV216(A)	AQV214H(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		60 V	100 V	200 V	350 V	400 V	600 V	400 V	
	Continuous load current	I _L		A	0.40 A	0.32 A	0.18 A	0.13 A	0.12 A	0.05 A	A connection: Peak AC, DC; B, C connection: DC
				B	0.60 A	0.42 A	0.22 A	0.15 A	0.13 A	0.06 A	
				C	0.80 A	0.60 A	0.30 A	0.17 A	0.15 A	0.08 A	
	Peak load current	I _{peak}			1.2 A	0.96 A	0.54 A	0.4 A	0.3 A	0.15 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							
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				Sym- bol	Type of connec- tion**	AQV212(A)	AQV215(A)	AQV217(A)	AQV210(A)	AQV214(A)	AQV216(A)	AQV214H(A)	Condition
Input	LED operate current		Typical	I _{Fon}	—	1 mA	1 mA	1 mA	1 mA	1 mA	1 mA	1.3 mA	I _L = Max.
			Maximum			3 mA	3 mA	3 mA	3 mA	3 mA	3 mA	3 mA	
	LED turn off current		Minimum	I _{Foff}	—	0.4 mA	0.4 mA	0.4 mA	0.4 mA	0.4 mA	0.4 mA	I _L = Max.	
			Typical			0.79 mA	0.79 mA	0.79 mA	0.79 mA	0.79 mA	0.79 mA		1.2 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	0.83 Ω	2.3 Ω	11.0 Ω	23 Ω	30 Ω	70 Ω	30 Ω	I _F = 5 mA I _L = Max. Within 1 s on time
			Maximum			2.5 Ω	4.0 Ω	15.0 Ω	35 Ω	50 Ω	120 Ω	50 Ω	
			Typical	R _{On}	B	0.44 Ω	1.15 Ω	5.5 Ω	11.5 Ω	22.5 Ω	55 Ω	22.5 Ω	I _F = 5 mA I _L = Max. Within 1 s on time
			Maximum			1.25 Ω	2.0 Ω	7.5 Ω	17.5 Ω	25 Ω	100 Ω	25 Ω	
			Typical	R _{On}	C	0.25 Ω	0.6 Ω	2.8 Ω	6.0 Ω	11.3 Ω	28 Ω	11.3 Ω	I _F = 5 mA I _L = Max. Within 1 s on time
			Maximum			1.63 Ω	1.0 Ω	3.8 Ω	8.8 Ω	12.5 Ω	50 Ω	12.5 Ω	
	Output capacitance		Typical	C _{Out}	A	150 pF	110 pF	70 pF	45 pF	45 pF	45 pF	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*	Typical	T _{On}	—	0.65 ms	0.6 ms	0.25 ms	0.25 ms	0.21 ms	0.28 ms	0.6 ms	I _F = 5 mA** I _L =Max.
			Maximum			2 ms	2 ms	1.0 ms	0.5 ms	0.5 ms	0.5 ms	0.8 ms	
		Turn off time*	Typical	T _{Off}	—	0.08 ms	0.06 ms	0.05 ms	0.05 ms	0.05 ms	0.04 ms	0.05 ms	I _F = 5 mA I _L = Max.
			Maximum			0.2 ms	0.2 ms	0.2 ms	0.2 ms	0.2 ms	0.2 ms	0.2 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

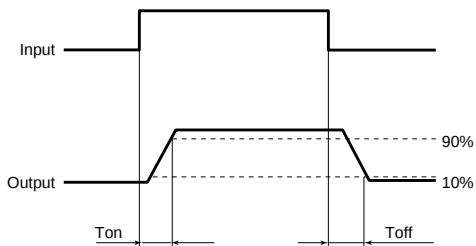
Standard type: 5 mA

Reinforced type: 5 to 10 mA

*Turn on/Turn off time

< >: Value for high I/O isolation voltage type

**Type of connection, see Page 444.



■ For Dimensions, see Page 440.

■ For Schematic and Wiring Diagrams, see Page 444.

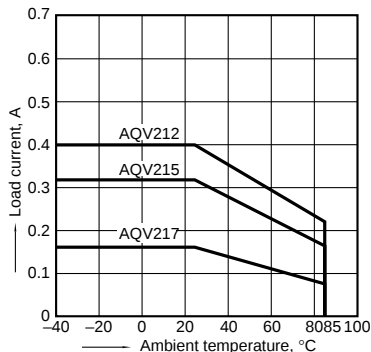
■ For Cautions for Use, see Page 449.

REFERENCE DATA

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

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

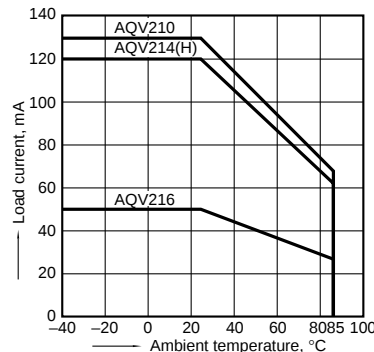
Type of connection: A



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

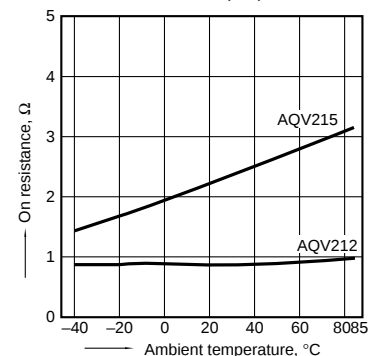
Allowable ambient temperature: -40°C to +85°C
-40°F to +185°F

Type of connection: A



2-(1). On resistance vs. ambient temperature characteristics

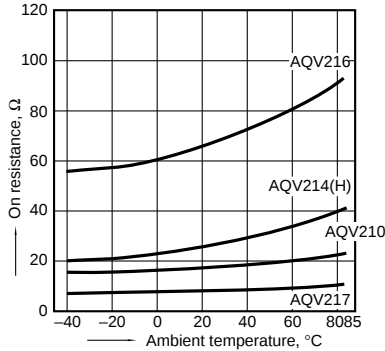
Measured portion: between terminals 4 and 6;
LED current: 5 mA; Load voltage: Max. (DC)
Continuous load current: Max. (DC)



AQV21○

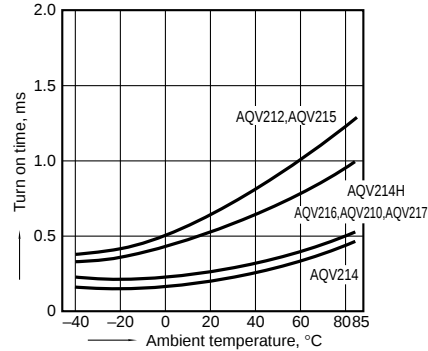
2-(2). On resistance vs. ambient temperature characteristics

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



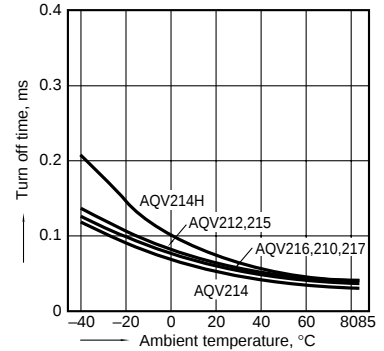
3. Turn on time vs. ambient temperature characteristics

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



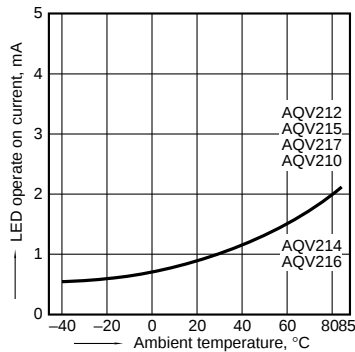
4. Turn off time vs. ambient temperature characteristics

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



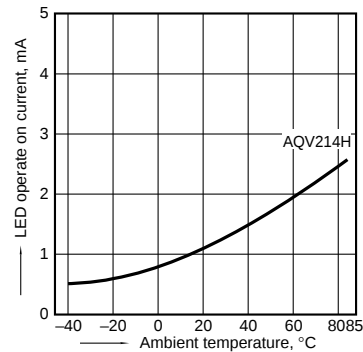
5-(1). LED operate current vs. ambient temperature characteristics

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



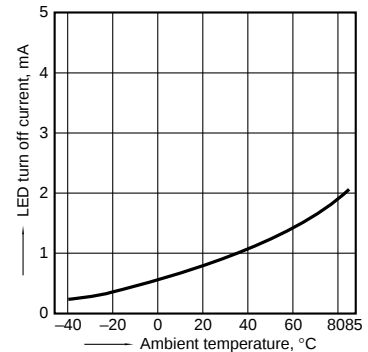
5-(2). LED operate current vs. ambient temperature characteristics

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



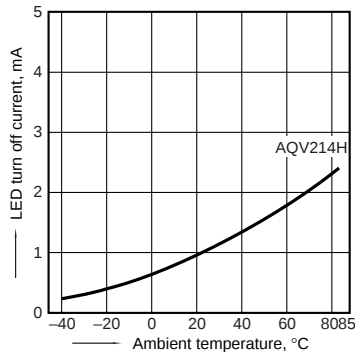
6-(1). LED turn off current vs. ambient temperature characteristics

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



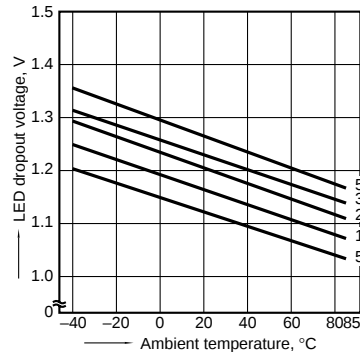
6-(2). LED turn off current vs. ambient temperature characteristics

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



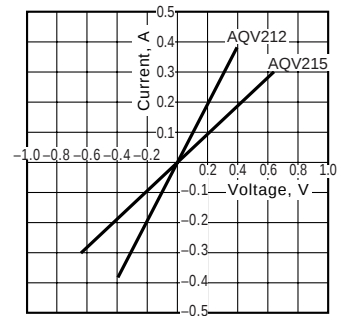
7. LED dropout voltage vs. ambient temperature characteristics

Sample: All types
LED current: 5 to 50 mA



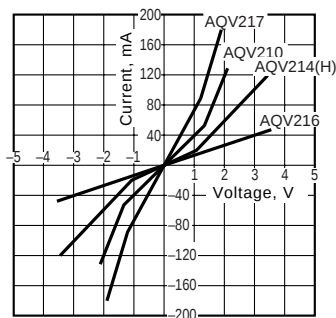
8-(1). Voltage vs. current characteristics of output at MOS portion

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



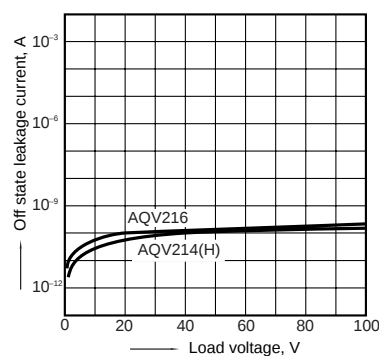
8-(2). Voltage vs. current characteristics of output at MOS portion

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



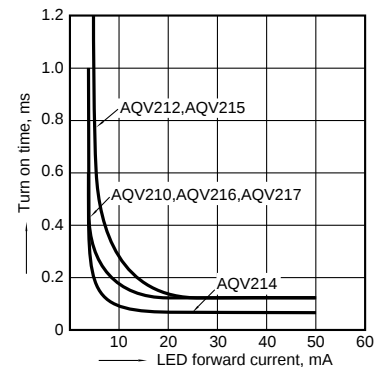
9. Off state leakage current

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



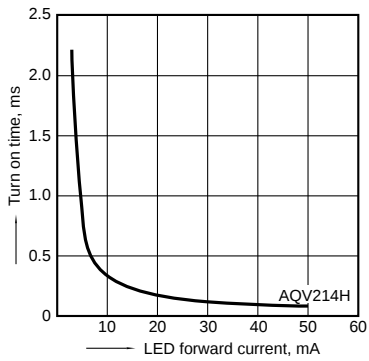
10-(1). LED forward current vs. turn on time characteristics

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



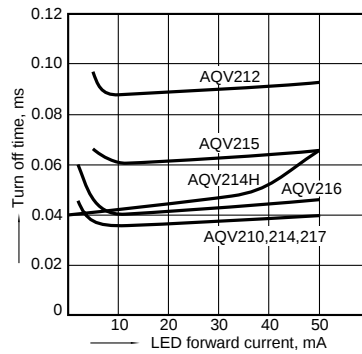
10-(2). LED forward current vs. turn on time characteristics

Measured portion: between terminals 4 and 6;
Load voltage: 400 V (DC); Continuous load current:
120 mA (DC); Ambient temperature: 25°C 77°F



11. 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



12. Applied voltage vs. output capacitance characteristics

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

