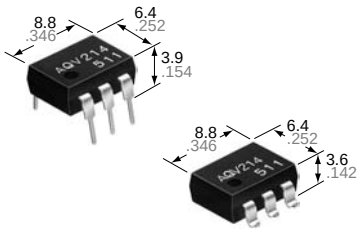
c UL us (Standard type) c UL us BSI (Reinforced type)

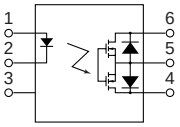
Panasonic
ideas for life

6-pin type for switching low-level analog signal

PhotoMOS Relays
GU 1 Form A
(AQV21❍, AQV214H)



mm inch



Compliance with RoHS Directive

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. Controls various types of loads such as relays, motors, lamps and solenoids
3. 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.
4. Eliminates the need for a counter electromotive force protection diode in the drive circuits on the input side
5. Stable on-resistance
6. Low-level off state leakage current of max. 1 μA
7. Reinforced insulation type of I/O voltage 5,000V also available

TYPICAL APPLICATIONS

- High-speed inspection machines
- Telephone equipment
- Data communication equipment
- Computers

TYPES

	I/O isolation	Output rating*		Package	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 1/2/3-pin side	Picked from the 4/5/6-pin side		
AC/DC dual use	Standard 1,500 V AC	60V	550 mA	DIP6-pin	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: The surface mount terminal shape indicator “A” and the packing style indicator “X” or “Z” are not marked on the relay.

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		5 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	0.55 A	0.32 A	0.18 A	0.13 A	0.12 A	0.05 A	0.12 A	A connection: Peak AC, DC B, C connection: DC
				B	0.65 A	0.42 A	0.22 A	0.15 A	0.13 A	0.06 A	0.13 A	
				C	0.80 A	0.60 A	0.30 A	0.17 A	0.15 A	0.08 A	0.15 A	
	Peak load current		I_{peak}		1.2 A	0.96 A	0.54 A	0.4 A	0.3 A	0.15 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							

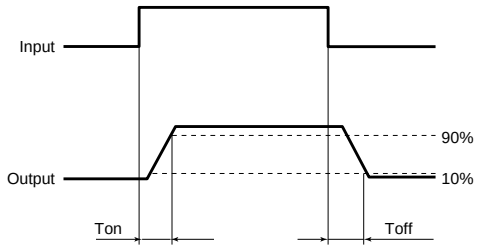
All Rights Reserved © COPYRIGHT Panasonic Electric Works Co., Ltd.

GU 1 Form A (AQV21❍, AQV214H)

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	1.2 mA	I_L = Max.
		Typical			0.79 mA	0.79 mA	0.79 mA	0.79 mA	0.79 mA	0.79 mA	0.79 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	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			0.63 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 mA V_B = 0 V f = 1 MHz
	Off state leakage current	Maximum	I_{Leak}	—	1 μA							I_F = 0 mA V_L = Max.
Transfer characteristics	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 V
		Maximum			1.5 pF							
	Initial I/O isolation resistance	Minimum	R_{iso}	—	1,000 MΩ							500 V DC

*Turn on/Turn off time



RECOMMENDED OPERATING CONDITIONS

Please obey the following conditions to ensure proper relay operation and resetting.

Item	Symbol	Recommended value	Unit
Input LED current	I_F	Standard type: 5 Reinforced type: 5 to 10	mA

■ For Dimensions

■ For Schematic and Wiring Diagrams

■ For Cautions for Use

■ These products are not designed for automotive use.
If you are considering to use these products for automotive applications, please contact your local Panasonic Electric Works technical representative.
For more information

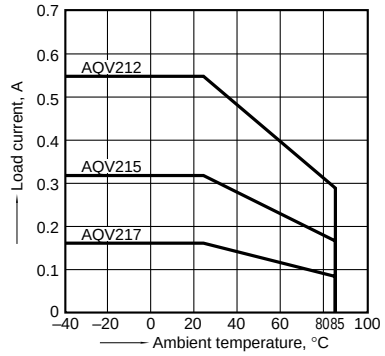
All Rights Reserved © COPYRIGHT Panasonic Electric Works Co., Ltd.

REFERENCE DATA

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

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

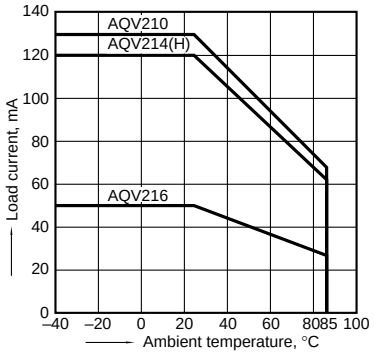
Type of connection: A



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

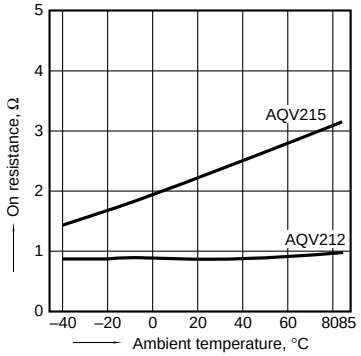
Allowable ambient temperature: –40°C to +85°C
–40°F to +185°F

Type of connection: A



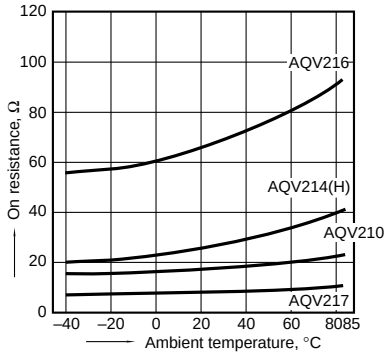
2-(1). On resistance vs. ambient temperature characteristics

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



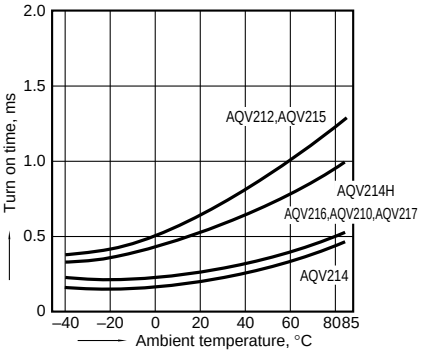
2-(2). On resistance vs. ambient temperature characteristics

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



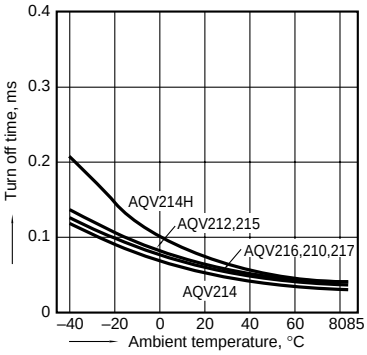
3. Turn on time vs. ambient temperature characteristics

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



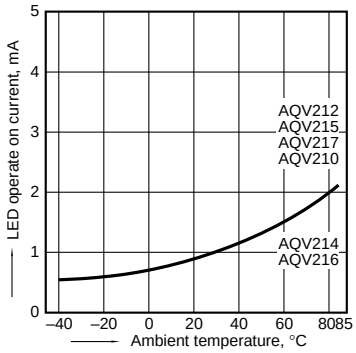
4. Turn off time vs. ambient temperature characteristics

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



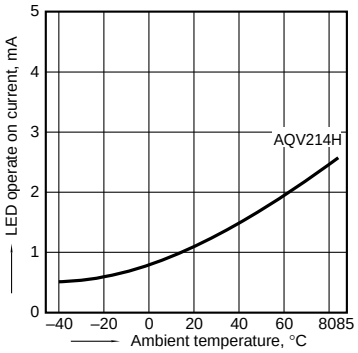
5-(1). LED operate current vs.ambient temperature characteristics

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



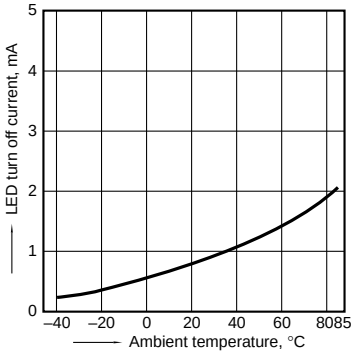
5-(2). LED operate current vs.ambient temperature characteristics

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)

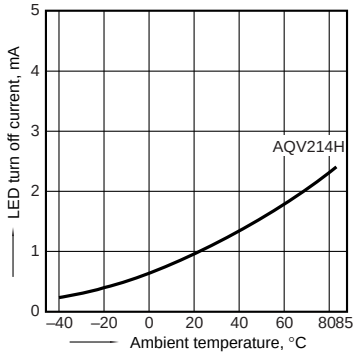


All Rights Reserved © COPYRIGHT Panasonic Electric Works Co., Ltd.

GU 1 Form A (AQV21❍, AQV214H)

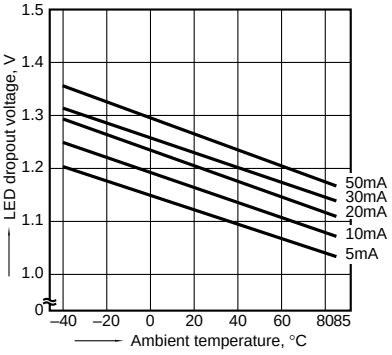
6-(2). LED turn off current vs. ambient temperature characteristics

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



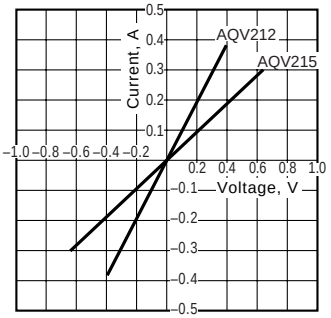
7. LED dropout voltage vs. ambient temperature characteristics

Sample: All types
LED current: 5 to 50 mA



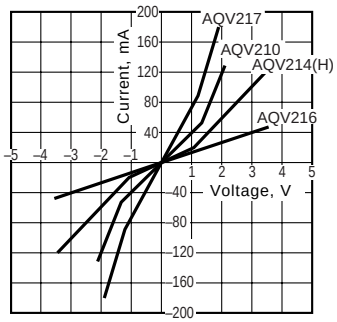
8-(1). Current vs. voltage characteristics of output at MOS portion

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



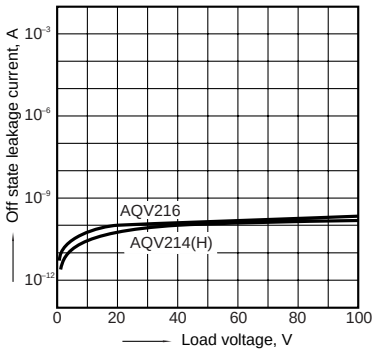
8-(2). Current vs. voltage characteristics of output at MOS portion

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



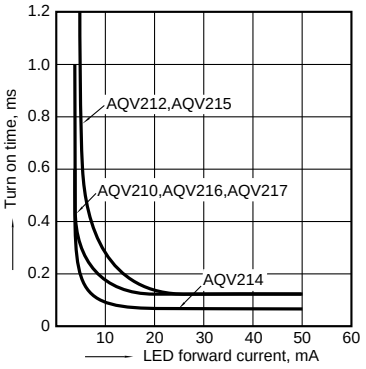
9. Off state leakage current vs. load voltage characteristics

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



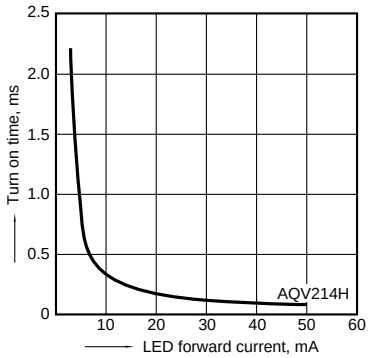
10-(1). Turn on time vs. LED forward current characteristics

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



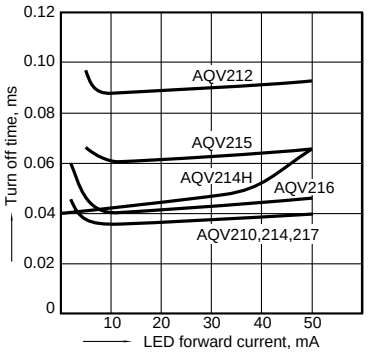
10-(2). Turn on time vs. LED forward current characteristics

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



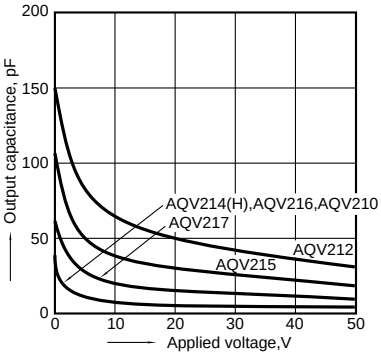
11. Turn off time vs. LED forward current characteristics

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



12. Output capacitance vs. applied voltage characteristics

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



All Rights Reserved © COPYRIGHT Panasonic Electric Works Co., Ltd.