

**DIP6-pin type  
with wide variation  
Low on-resistance**

**PhotoMOS<sup>®</sup>  
HF 1 Form A  
(AQV100, 200)**

## FEATURES

- Controls low-level analog signals**  
PhotoMOS feature extremely low closed-circuit offset voltage to enable control of low-level analog signals without distortion.
- Controlled with low-level input signals**
- AC/DC dual use type and DC only type available.**

## TYPICAL APPLICATIONS

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



**RoHS compliant**

## TYPES

### 1. DC type (AQV10 series)

	Output rating*		Package	Part No.				Packing quantity	
				Through hole terminal	Surface-mount terminal		Tube	Tape and reel	
	Load voltage	Load current			Tube packing style	Tape and reel packing style			
					Picked from the 1/2/3-pin side	Picked from the 4/5/6-pin side			
DC only	40 V	700 mA	DIP6-pin	AQV101	AQV101A	AQV101AX	AQV101AZ	1 tube contains: 50 pcs. 1 batch contains: 500 pcs.	1,000 pcs
	60 V	600 mA		AQV102	AQV102A	AQV102AX	AQV102AZ		
	250 V	300 mA		AQV103	AQV103A	AQV103AX	AQV103AZ		
	400 V	180 mA		AQV104	AQV104A	AQV104AX	AQV104AZ		

\*Indicate the peak AC and DC values.

Note: The surface mount terminal indicator "A" and the packing style indicator "X" or "Z" are not marked on the device.

### 2. AC/DC type (AQV20 series)

	Output rating*		Package	Part No.				Packing quantity	
				Through hole terminal	Surface-mount terminal		Tube	Tape and reel	
	Load voltage	Load current			Tube packing style	Tape and reel packing style			
					Picked from the 1/2/3-pin side	Picked from the 4/5/6-pin side			
AC/DC dual use	40 V	500 mA	DIP6-pin	AQV201	AQV201A	AQV201AX	AQV201AZ	1 tube contains: 50 pcs. 1 batch contains: 500 pcs.	1,000 pcs
	60 V	400 mA		AQV202	AQV202A	AQV202AX	AQV202AZ		
	250 V	200 mA		AQV203	AQV203A	AQV203AX	AQV203AZ		
	400 V	150 mA		AQV204	AQV204A	AQV204AX	AQV204AZ		

\*Indicate the peak AC and DC values.

Note: The surface mount terminal indicator "A" and the packing style indicator "X" or "Z" are not marked on the device.

## RATING

### 1. DC type

#### 1) Absolute maximum ratings (Ambient temperature: 25°C 77°F)

Item		Symbol	AQV101(A)	AQV102(A)	AQV103(A)	AQV104(A)	Remarks
Input	LED forward current	I <sub>F</sub>	50 mA				
	LED reverse voltage	V <sub>R</sub>	10 V				
	Peak forward current	I <sub>FP</sub>	1 A				f = 100 Hz, Duty factor = 0.1%
	Power dissipation	P <sub>in</sub>	150 mW				
Output	Load voltage (DC)	V <sub>L</sub>	40 V	60 V	250 V	400 V	
	Continuous load current (DC)	I <sub>L</sub>	0.7 A	0.6 A	0.3 A	0.18 A	
	Peak load current	I <sub>peak</sub>	1.8 A	1.5 A	0.6 A	0.5 A	100 ms (1 shot)
	Power dissipation	P <sub>out</sub>	360 mW				
Total power dissipation		P <sub>T</sub>	410 mW				
I/O isolation voltage		V <sub>iso</sub>	1,500 V (AC)				
Temperature limits	Operating	T <sub>opr</sub>	-40°C to +85°C -40°F to +185°F				Non-condensing at low temperatures
	Storage	T <sub>stg</sub>	-40°C to +100°C -40°F to +212°F				

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

Item			Symbol	AQV101(A)	AQV102(A)	AQV103(A)	AQV104(A)	Condition
Input	LED operate current	Typical	I <sub>Fon</sub>	2.3 mA				I <sub>L</sub> = Max.
		Maximum		5 mA				
	LED turn off current	Minimum	I <sub>Foff</sub>	0.8 mA				I <sub>L</sub> = Max.
		Typical		2.2 mA				
LED dropout voltage	Typical	V <sub>F</sub>	2.3 V				I <sub>F</sub> = 10 mA	
	Maximum		3 V					
Output	On resistance	Typical	R <sub>on</sub>	0.3 Ω	0.37 Ω	2.7 Ω	6.3 Ω	I <sub>F</sub> = 10 mA I <sub>L</sub> = Max. Within 1 s on time
		Maximum		0.5 Ω	0.7 Ω	4 Ω	8 Ω	
	Off state leakage current	Maximum	I <sub>Leak</sub>	1 μA				I <sub>F</sub> = 0 mA, V <sub>L</sub> = Max.
Transfer characteristics	Turn on time*	Typical	T <sub>on</sub>	0.23 ms	0.22 ms	0.13 ms	0.09 ms	I <sub>F</sub> = 10 mA I <sub>L</sub> = Max.
		Maximum		1 ms				
	Turn off time*	Typical	T <sub>off</sub>	0.07 ms				I <sub>F</sub> = 10 mA I <sub>L</sub> = Max.
		Maximum		1 ms				
	I/O capacitance	Typical	C <sub>iso</sub>	1.3 pF				f = 1 MHz V <sub>B</sub> = 0 V
		Maximum		3 pF				
Initial I/O isolation resistance	Minimum	R <sub>iso</sub>	1,000 MΩ				500 V DC	

### 2. AC/DC type

#### 1) Absolute maximum ratings (Ambient temperature: 25°C 77°F)

Item		Symbol	Type of connection	AQV201(A)	AQV202(A)	AQV203(A)	AQV204(A)	Remarks	
Input	LED forward current	I <sub>F</sub>	/	50 mA					
	LED reverse voltage	V <sub>R</sub>		10 V					
	Peak forward current	I <sub>FP</sub>		1 A				f = 100 Hz, Duty factor = 0.1%	
	Power dissipation	P <sub>in</sub>		150 mW					
Output	Load voltage (peak AC)	V <sub>L</sub>	/	40 V	60 V	250 V	400 V		
	Continuous load current	I <sub>L</sub>		A	0.5 A	0.4 A	0.2 A	0.15 A	A connection: Peak AC, DC B, C connection: DC
				B	0.7 A	0.6 A	0.3 A	0.18 A	
				C	1.0 A	0.8 A	0.4 A	0.25 A	
	Peak load current	I <sub>peak</sub>		1.8 A	1.5 A	0.6 A	0.5 A	A connection 100 ms (1 shot) V <sub>L</sub> = DC	
	Power dissipation	P <sub>out</sub>		360 mW					
Total power dissipation		P <sub>T</sub>	410 mW						
I/O isolation voltage		V <sub>iso</sub>	1,500 V AC						
Temperature limits	Operating	T <sub>opr</sub>	-40°C to +85°C -40°F to +185°F				Non-condensing at low temperature		
	Storage	T <sub>stg</sub>	-40°C to +100°C -40°F to +212°F						

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

Item		Symbol	Type of connection	AQV201(A)	AQV202(A)	AQV203(A)	AQV204(A)	Remarks	
Input	LED operate current	Typical	I <sub>Fon</sub>	2.4 mA				I <sub>L</sub> = Max.	
		Maximum		5 mA					
	LED turn off current	Minimum	I <sub>Foff</sub>	0.8 mA				I <sub>L</sub> = Max.	
		Typical		2.2 mA					
LED dropout voltage	Typical	V <sub>F</sub>	2.3 V				I <sub>F</sub> = 10 mA		
	Maximum		3 V						
Output	On resistance	Typical	R <sub>on</sub>	A	0.6 Ω	0.74 Ω	5.5 Ω	12.4 Ω	I <sub>F</sub> = 10 mA I <sub>L</sub> = Max. Within 1 s on time
		Maximum			1 Ω	1.4 Ω	8 Ω	16 Ω	
		Typical	R <sub>on</sub>	B	0.3 Ω	0.37 Ω	2.7 Ω	6.2 Ω	
		Maximum			0.5 Ω	0.7 Ω	4 Ω	8 Ω	
		Typical	R <sub>on</sub>	C	0.15 Ω	0.18 Ω	1.4 Ω	3.1 Ω	I <sub>F</sub> = 10 mA I <sub>L</sub> = Max. Within 1 s on time
		Maximum			0.25 Ω	0.35 Ω	2 Ω	4 Ω	
	Off state leakage current	Maximum	I <sub>Leak</sub>	—	1 μA				I <sub>F</sub> = 0 mA, V <sub>L</sub> = Max.
	Transfer characteristics	Turn on time*	Typical	T <sub>on</sub>	—	0.38 ms	0.41 ms	0.21 ms	0.18 ms
Maximum			1 ms						
Turn off time*		Typical	T <sub>off</sub>	—	0.08 ms		0.07 ms		I <sub>F</sub> = 10 mA I <sub>L</sub> = Max.
		Maximum		1 ms					
I/O capacitance		Typical	C <sub>iso</sub>	—	1.3 pF				f = 1 MHz V <sub>B</sub> = 0 V
	Maximum	3 pF							
Initial I/O isolation resistance	Minimum	R <sub>iso</sub>	—	1,000 MΩ				500 V DC	

\*Turn on/Turn off time



## RECOMMENDED OPERATING CONDITIONS

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

Item	Symbol	Recommended value	Unit
Input LED current	I <sub>F</sub>	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 Corporation technical representative.

For more information.

## REFERENCE DATA

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

Allowable ambient temperature:  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$   
 $-40^{\circ}\text{F}$  to  $+185^{\circ}\text{F}$



1.-(2) Load current vs. ambient temperature characteristics (AC/DC type)

Allowable ambient temperature:  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$   
 $-40^{\circ}\text{F}$  to  $+185^{\circ}\text{F}$

Type of connection: A



2.-(1) On resistance vs. ambient temperature characteristics (DC type: AQV101, AQV102)

LED current: 10 mA;  
 Continuous load current: Max. (DC)



2.-(2) On resistance vs. ambient temperature characteristics (DC type: AQV103, AQV104)

LED current: 10 mA;  
 Continuous load current: Max. (DC)



2.-(3) On resistance vs. ambient temperature characteristics (AC/DC type: AQV201, AQV202)

Measured portion: between terminals 4 and 6;  
 LED current: 10 mA;  
 Continuous load current: Max. (DC)



2.-(4) On resistance vs. ambient temperature characteristics (AC/DC type: AQV203, AQV204)

Measured portion: between terminals 4 and 6;  
 LED current: 10 mA;  
 Continuous load current: Max. (DC)



3.-(1) Turn on time vs. ambient temperature characteristics (DC type)

LED current: 10 mA;  
 Load voltage: Max. (DC);  
 Continuous load current: Max. (DC)



3.-(2) Turn on time vs. ambient temperature characteristics (AC/DC type)

LED current: 10 mA;  
 Load voltage: Max. (DC);  
 Continuous load current: Max. (DC)



4.-(1) Turn off time vs. ambient temperature characteristics (DC type)

LED current: 10 mA;  
 Load voltage: Max. (DC);  
 Continuous load current: Max. (DC)



4.-(2) Turn off time vs. ambient temperature characteristics (AC/DC type)

LED current: 10 mA; Load voltage: Max. (DC);  
 Continuous load current: Max. (DC)



5.-(1) LED operate/turn off current vs. ambient temperature characteristics (DC type)

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



5.-(2) LED operate/turn off current vs. ambient temperature characteristics (AC/DC type)

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



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## 6. LED dropout voltage vs. ambient temperature characteristics

Sample: AQV202  
LED current: 10 to 50 mA



## 7.-(1) Current vs. voltage characteristics of output at MOS portion (DC type)

Ambient temperature: 25°C 77°F



## 7.-(2) Current vs. voltage characteristics of output at MOS portion (AC/DC type)

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



## 8. Off state leakage current vs. load voltage characteristics

Sample: AQV204;  
Measured portion: between terminals 4 and 6;  
Ambient temperature: 25°C 77°F



## 9.-(1) Turn on time vs. LED forward current characteristics (DC type)

Load voltage: Max. (DC);  
Continuous load current: Max. (DC);  
Ambient temperature: 25°C 77°F



## 9.-(2) Turn on time vs. LED forward current characteristics (AC/DC type)

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



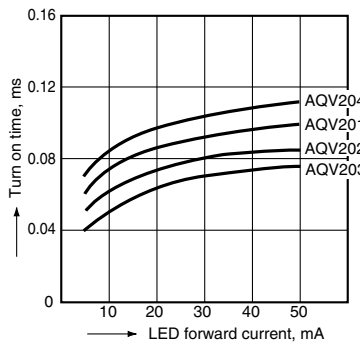
## 10.-(1) Turn off time vs. LED forward current characteristics (DC type)

Load voltage: Max. (DC);  
Continuous load current: Max. (DC);  
Ambient temperature: 25°C 77°F



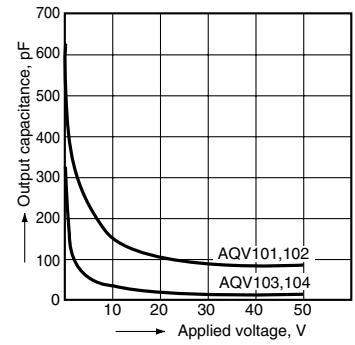
## 10.-(2) Turn off time vs. LED forward current characteristics (AC/DC type)

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



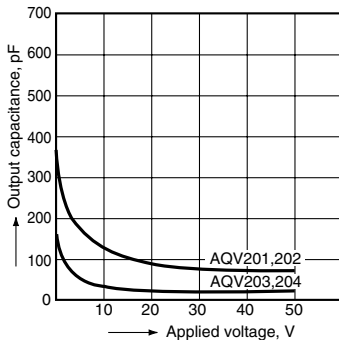
## 11.-(1) Output capacitance vs. applied voltage characteristics (DC type)

Frequency: 1 MHz;  
Ambient temperature: 25°C 77°F



## 11.-(2) Output capacitance vs. applied voltage characteristics (AC/DC type)

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



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