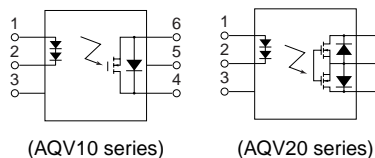
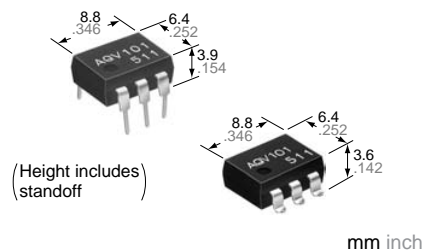


**DIP6-pin type  
with wide variation  
Low on-resistance**

**PhotoMOS Relays  
HF 1 Form A  
(AQV100, 200)**



## 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. Controlled with low-level input signals**
- 3. AC/DC dual use type and DC only type available.**

## TYPICAL APPLICATIONS

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

**Compliance with RoHS Directive**

## 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		
DC only			40 V	700 mA	DIP6-pin	AQV101	AQV101A	AQV101AX	AQV101AZ
	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 relay.

### 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		
AC/DC dual use			40 V	500 mA	DIP6-pin	AQV201	AQV201A	AQV201AX	AQV201AZ
	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 relay.

## 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			0.08 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)

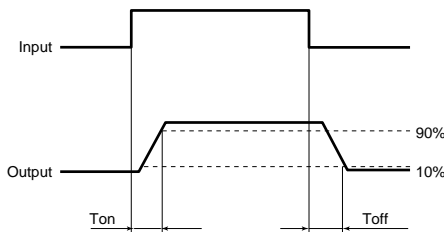
Item		Symbol	Type of connection	AQV201(A)	AQV202(A)	AQV203(A)	AQV204(A)	Remarks	
Input	LED forward current	I <sub>F</sub>		50 mA					
	LED reverse voltage	V <sub>R</sub>		10 V					
	Peak forward current	I <sub>FP</sub>		1 A				f = 100 Hz, Duty factor = 0.1%	
	Power dissipation	P <sub>in</sub>		150 mW					
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					

# HF 1 Form A (AQV100, 200)

## 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	$I_{Fon}$	2.4 mA				$I_L = \text{Max.}$	
		Maximum		5 mA					
	LED turn off current	Minimum	$I_{Foff}$	0.8 mA				$I_L = \text{Max.}$	
		Typical		2.2 mA					
	LED dropout voltage	Typical	$V_F$	2.3 V				$I_F = 10 \text{ mA}$	
Maximum		3 V							
Output	On resistance	Typical	$R_{on}$	A	0.6 $\Omega$	0.74 $\Omega$	5.5 $\Omega$	12.4 $\Omega$	$I_F = 10 \text{ mA}$ $I_L = \text{Max.}$ Within 1 s on time
		Maximum		1 $\Omega$	1.4 $\Omega$	8 $\Omega$	16 $\Omega$		
		Typical	$R_{on}$	B	0.3 $\Omega$	0.37 $\Omega$	2.7 $\Omega$	6.2 $\Omega$	$I_F = 10 \text{ mA}$ $I_L = \text{Max.}$ Within 1 s on time
		Maximum		0.5 $\Omega$	0.7 $\Omega$	4 $\Omega$	8 $\Omega$		
	Typical	$R_{on}$	C	0.15 $\Omega$	0.18 $\Omega$	1.4 $\Omega$	3.1 $\Omega$	$I_F = 10 \text{ mA}$ $I_L = \text{Max.}$ Within 1 s on time	
	Maximum		0.25 $\Omega$	0.35 $\Omega$	2 $\Omega$	4 $\Omega$			
	Off state leakage current	Maximum	$I_{Leak}$	—	1 $\mu\text{A}$				$I_F = 0 \text{ mA}$ , $V_L = \text{Max.}$
	Transfer characteristics	Turn on time*	Typical	$T_{on}$	—	0.38 ms	0.41 ms	0.21 ms	0.18 ms
Maximum			1 ms				$I_L = \text{Max.}$		
Turn off time*		Typical	$T_{off}$	—	0.08 ms		0.07 ms		$I_F = 10 \text{ mA}$
		Maximum		1 ms				$I_L = \text{Max.}$	
I/O capacitance		Typical	$C_{iso}$	—	1.3 pF				$f = 1 \text{ MHz}$
Maximum	3 pF				$V_B = 0 \text{ V}$				
Initial I/O isolation resistance	Minimum	$R_{iso}$	—	1,000 M $\Omega$				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	$I_F$	10	mA

- For Dimensions
- For Schematic and Wiring Diagrams
- For Cautions for Use

■ These products are not designed for automotive use.

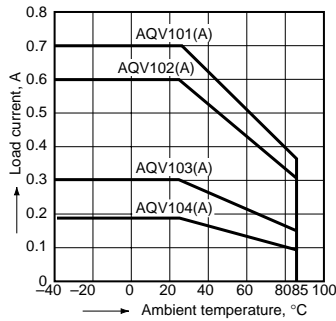
If you are considering to use these products for automotive applications, please contact your local Panasonic Electric Works technical representative.

For more information

## REFERENCE DATA

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

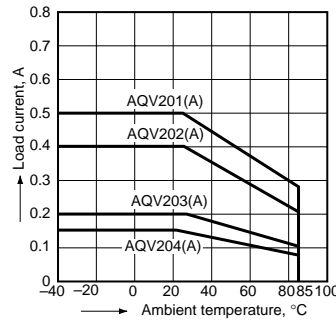
Allowable ambient temperature:  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$   
 $-40^{\circ}\text{F}$  to  $+185^{\circ}\text{F}$



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

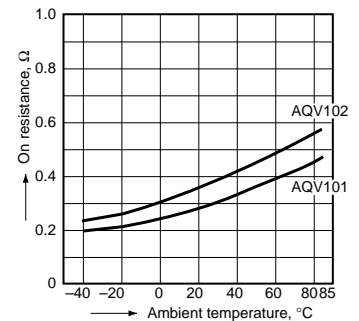
Allowable ambient temperature:  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$   
 $-40^{\circ}\text{F}$  to  $+185^{\circ}\text{F}$

Type of connection: A



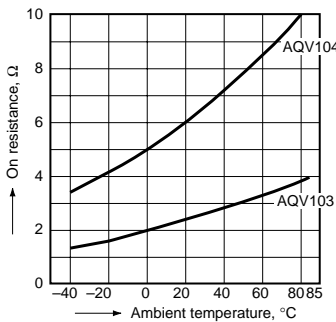
2.-(1) On resistance vs. ambient temperature characteristics (DC type: AQV101, AQV102)

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



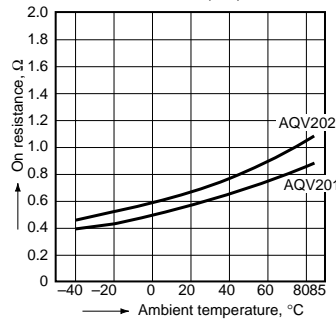
2.-(2) On resistance vs. ambient temperature characteristics (DC type: AQV103, AQV104)

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



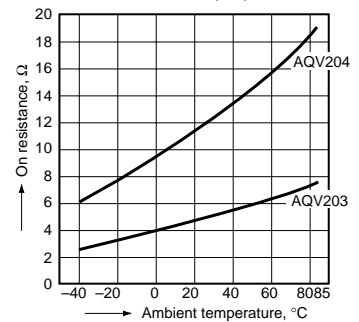
2.-(3) On resistance vs. ambient temperature characteristics (AC/DC type: AQV201, AQV202)

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



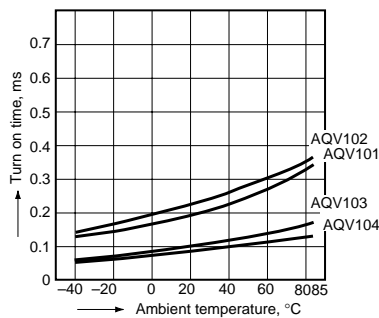
2.-(4) On resistance vs. ambient temperature characteristics (AC/DC type: AQV203, AQV204)

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



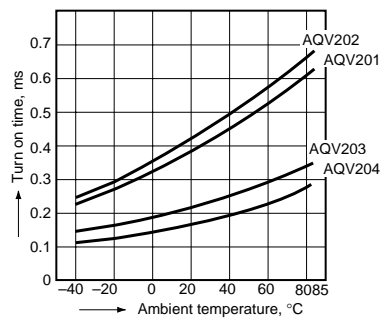
3.-(1) Turn on time vs. ambient temperature characteristics (DC type)

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



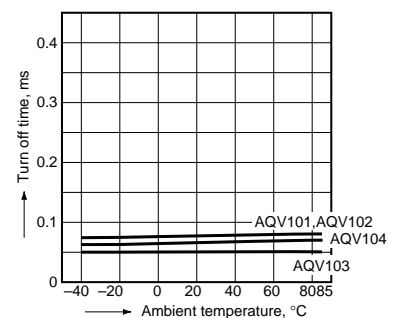
3.-(2) Turn on time vs. ambient temperature characteristics (AC/DC type)

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



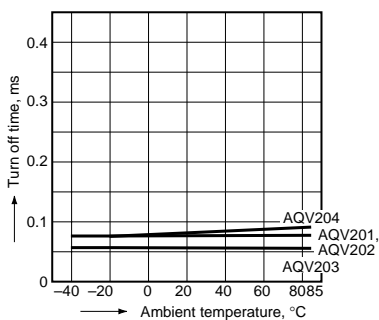
4.-(1) Turn off time vs. ambient temperature characteristics (DC type)

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



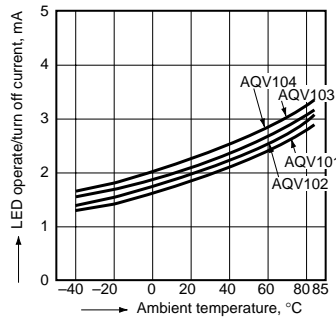
4.-(2) Turn off time vs. ambient temperature characteristics (AC/DC type)

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



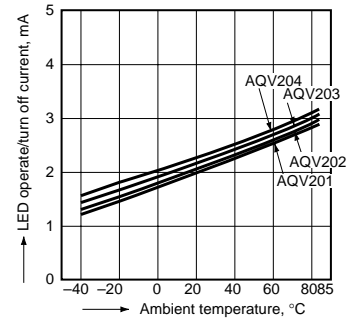
5.-(1) LED operate/turn off current vs. ambient temperature characteristics (DC type)

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



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

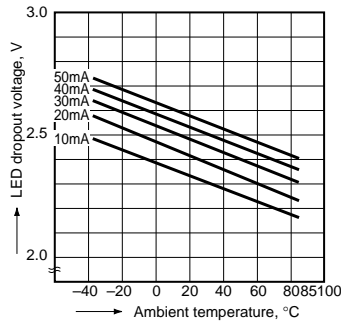
Load voltage: Max. (DC);  
 Continuous load current: Max. (DC)



# HF 1 Form A (AQV100, 200)

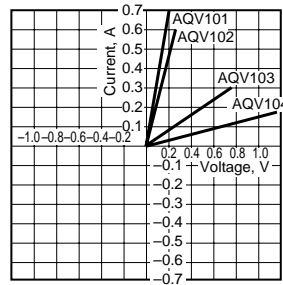
## 6. LED dropout voltage vs. ambient temperature characteristics

Sample: AQV202  
LED current: 10 to 50 mA



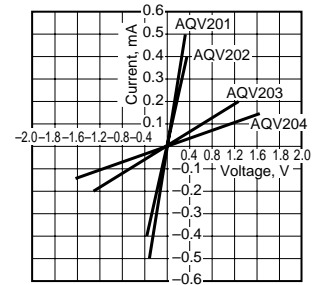
## 7.-(1) Current vs. voltage characteristics of output at MOS portion (DC type)

Ambient temperature: 25°C 77°F



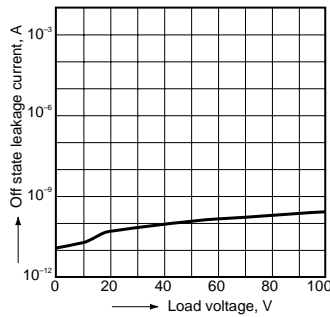
## 7.-(2) Current vs. voltage characteristics of output at MOS portion (AC/DC type)

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



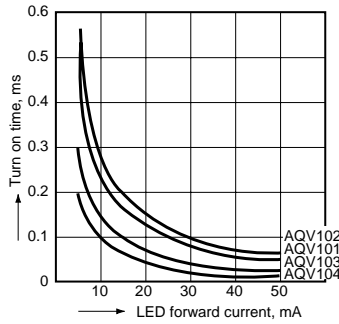
## 8. Off state leakage current vs. load voltage characteristics

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



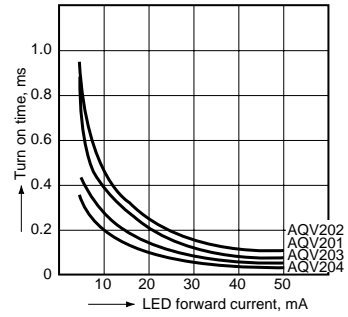
## 9.-(1) Turn on time vs. LED forward current characteristics (DC type)

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



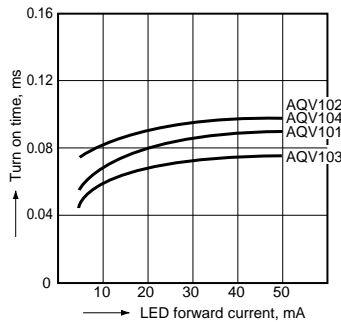
## 9.-(2) Turn on time vs. LED forward current characteristics (AC/DC type)

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



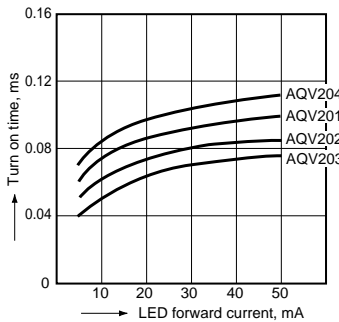
## 10.-(1) Turn off time vs. LED forward current characteristics (DC type)

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



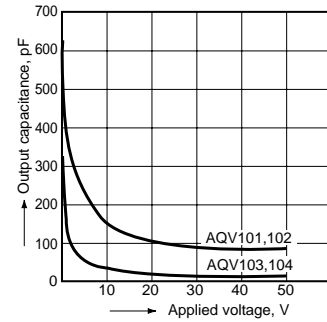
## 10.-(2) Turn off time vs. LED forward current characteristics (AC/DC type)

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

