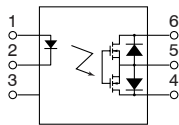
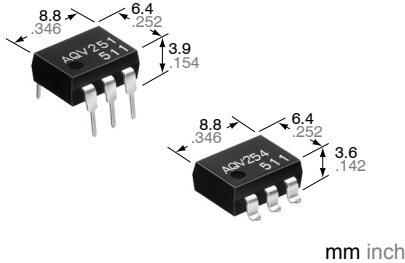


**High sensitivity and low on-resistance.  
DIP (1 Form A) 6-pin type.**

# HE PhotoMOS (AQV25○)



## FEATURES

- 1. Highly sensitive and low on-resistance**
- 2. Controls various types of loads such as relays, motors, lamps and solenoids.**
- 3. Optical coupling for extremely high isolation**  
5,000 Vrms I/O isolation available.
- 4. Low-level off state leakage current**
- 5. 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.
- 6. Low thermal electromotive force (Approx. 1 μV)**

## TYPICAL APPLICATIONS

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

## TYPES

### 1. I/O isolation voltage: 1,500 V AC

Output rating*		Part No.				Packing quantity	
		Through hole terminal	Surface-mount terminal		Tape and reel packing style		
Load voltage	Load current	Tube packing style		Picked from the 1/2/3-pin side	Picked from the 4/5/6-pin side	Tube	Tape and reel
40 V	500 mA	AQV251	AQV251A	AQV251AX	AQV251AZ	1 tube contains 50 pcs. 1 batch contains 500 pcs.	1,000 pcs.
60 V	400 mA	AQV252	AQV252A	AQV252AX	AQV252AZ		
100 V	350 mA	AQV255	AQV255A	AQV255AX	AQV255AZ		
200 V	250 mA	AQV257	AQV257A	AQV257AX	AQV257AZ		
250 V	200 mA	AQV253	AQV253A	AQV253AX	AQV253AZ		
400 V	150 mA	AQV254	AQV254A	AQV254AX	AQV254AZ		
1,000 V	30 mA	AQV259	AQV259A	AQV259AX	AQV259AZ		
1,500 V	20 mA	AQV258	AQV258A	AQV258AX	AQV258AZ		

### 2. I/O isolation voltage: Reinforced 5,000 V

Output rating*		Part No.				Packing quantity	
		Through hole terminal	Surface-mount terminal		Tape and reel packing style		
Load voltage	Load current	Tube packing style		Picked from the 1/2/3-pin side	Picked from the 4/5/6-pin side	Tube	Tape and reel
250 V	200 mA	AQV253H	AQV253HA	AQV253HAX	AQV253HAZ	1 tube contains 50 pcs. 1 batch contains 500 pcs.	1,000 pcs.
400 V	150 mA	AQV254H	AQV254HA	AQV254HAX	AQV254HAZ		

\*Indicate the peak AC and DC values.

Note: For space reasons, the SMD terminal shape indicator "A" and the package style indicator "X" or "Z" are not marked on the relay.

# HE PhotoMOS (AQV25○)

## RATING

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

Item		Sym- bol	Type of connec- tion	AQV251(A)	AQV252(A)	AQV255(A)	AQV257(A)	AQV253(A)	AQV254(A)	AQV259(A)	AQV258(A)	AQV253H(A)	AQV254H(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)	$V_L$		40 V	60 V	100 V	200 V	250 V	400 V	1,000 V	1,500 V	250 V	400 V			
	Continuous load current	$I_L$	A	0.5 A	0.4 A	0.35 A	0.25 A	0.2 A	0.15 A	0.03 A	0.02 A	0.2 A	0.15 A	A connection: Peak AC, DC B, C connection: DC		
			B	0.7 A	0.6 A	0.45 A	0.35 A	0.3 A	0.18 A	0.04 A	0.025 A	0.3 A	0.18 A			
			C	1.0 A	0.8 A	0.70 A	0.5 A	0.4 A	0.25 A	0.05 A	0.04 A	0.4 A	0.25 A			
	Peak load current	$I_{peak}$		1.8 A	1.5 A	1.0 A	0.75 A	0.6 A	0.5 A	0.09 A	0.06 A	0.6 A	0.5 A	A connection: 100 ms (1 shot) $V_L = DC$		
Power dissipation	$P_{out}$		360 mW													
Total power dissipation		$P_T$		410 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 temperatures		
	Storage	$T_{stg}$		-40°C to +100°C -40°F to +212°F												

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

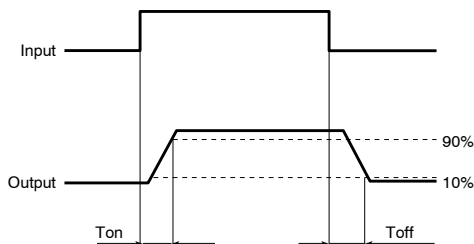
Item		Sym- bol	Type of connec- tion	AQV251(A)	AQV252(A)	AQV255(A)	AQV257(A)	AQV253(A)	AQV254(A)	AQV259(A)	AQV258(A)	AQV253H(A)	AQV254H(A)	Condition		
Input	LED operate current	Typical	—	0.9 mA								1.4 mA				$I_L = \text{Max.}$
		Maximum		3 mA												
	LED turn off current	Minimum	—	0.4 mA										$I_L = \text{Max.}$		
		Typical		0.8 mA								1.3 mA				
LED dropout voltage	Typical	$V_F$	—	1.25 V (1.14 V at $I_F = 5 \text{ mA}$ )										$I_F = 50 \text{ mA}$		
	Maximum			1.5 V												
Output	On resistance	Typical	A	0.6 $\Omega$	0.74 $\Omega$	1.8 $\Omega$	2.6 $\Omega$	5.5 $\Omega$	12.4 $\Omega$	85 $\Omega$	345 $\Omega$	5.5 $\Omega$	12.4 $\Omega$	$I_F = 5 \text{ mA}$ $I_L = \text{Max.}$ Within 1 s on time		
		Maximum		1 $\Omega$	1.4 $\Omega$	2.5 $\Omega$	4 $\Omega$	8 $\Omega$	16 $\Omega$	200 $\Omega$	500 $\Omega$	8 $\Omega$	16 $\Omega$			
		Typical	B	0.3 $\Omega$	0.37 $\Omega$	0.9 $\Omega$	1.4 $\Omega$	2.7 $\Omega$	6.2 $\Omega$	60 $\Omega$	345 $\Omega$	2.7 $\Omega$	6.2 $\Omega$	$I_F = 5 \text{ mA}$ $I_L = \text{Max.}$ Within 1 s on time		
		Maximum		0.5 $\Omega$	0.7 $\Omega$	1.25 $\Omega$	2 $\Omega$	4 $\Omega$	8 $\Omega$	100 $\Omega$	500 $\Omega$	4 $\Omega$	8 $\Omega$			
	Typical	C	0.15 $\Omega$	0.18 $\Omega$	0.45 $\Omega$	0.7 $\Omega$	1.4 $\Omega$	3.1 $\Omega$	30 $\Omega$	160 $\Omega$	1.4 $\Omega$	3.1 $\Omega$	$I_F = 5 \text{ mA}$ $I_L = \text{Max.}$ Within 1 s on time			
	Maximum		0.25 $\Omega$	0.35 $\Omega$	0.63 $\Omega$	1 $\Omega$	2 $\Omega$	4 $\Omega$	50 $\Omega$	250 $\Omega$	2 $\Omega$	4 $\Omega$				
Off state leakage current	Maximum	—	—	1 $\mu\text{A}$						10 $\mu\text{A}$		1 $\mu\text{A}$		$I_F = 0 \text{ mA}$ $V_L = \text{Max.}$		
Transfer characteristics	Switching speed	Turn on time*	$T_{on}$	—	1.7 ms	1.4 ms	0.9 ms	1.5 ms	0.8ms	0.8ms	0.6ms	0.35 ms	2.4ms	1.8ms	$I_F = 5 \text{ mA}$ $I_L = \text{Max.}$	
		Maximum			3 ms		2 ms	3 ms	2 ms		1 ms		4 ms	3 ms		
	Turn off time*	Typical	$T_{off}$	—	0.07 ms		0.09 ms	0.1 ms	0.06 ms	0.05 ms	0.04 ms		0.06 ms	0.05 ms	$I_F = 5 \text{ mA}$ $I_L = \text{Max.}$	
		Maximum			0.2 ms											
	I/O capacitance	Typical	$C_{iso}$	—	1.3 pF										f = 1 MHz $V_B = 0 \text{ V}$	
Maximum	3 pF															
Initial I/O isolation resistance	Minimum	$R_{iso}$	—	1,000 M $\Omega$										500 V DC		

Note: Recommendable LED forward current

Standard type:  $I_F = 5 \text{ mA}$

Reinforced type:  $I_F = 5 \text{ to } 10 \text{ mA}$

\*Turn on/Turn off time



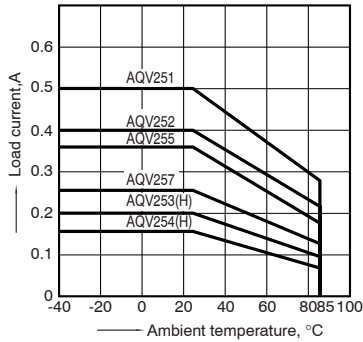
- Dimensions
- Schematic and Wiring Diagrams
- Cautions for Use

## REFERENCE DATA

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

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

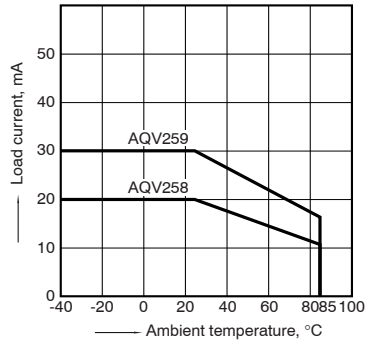
Type of connection: A



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

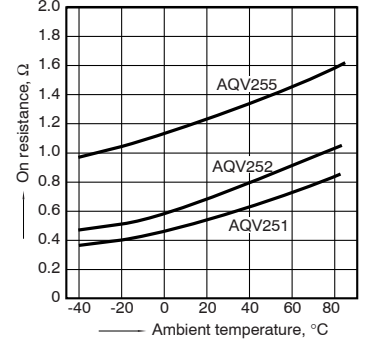
Allowable ambient temperature:  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$   
 $-40^{\circ}\text{F}$  to  $+185^{\circ}\text{F}$  ;

Type of connection: A



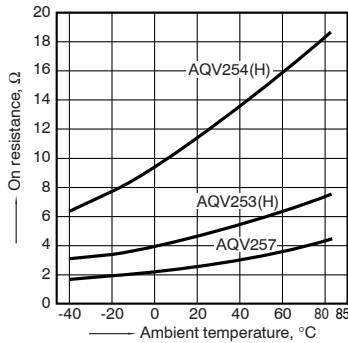
2.-(1) On resistance vs. ambient temperature characteristics

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



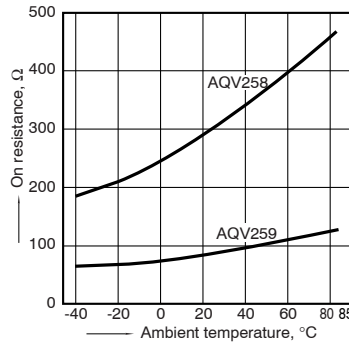
2.-(2) On resistance vs. ambient temperature characteristics

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



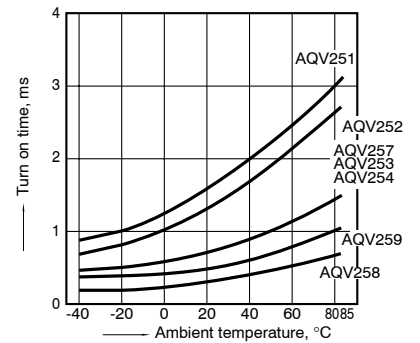
2.-(3) On resistance vs. ambient temperature characteristics

Measured portion: between terminals 4 and 6;  
 LED current: 5 mA;  
 Continuous load current: 30 mA (DC)



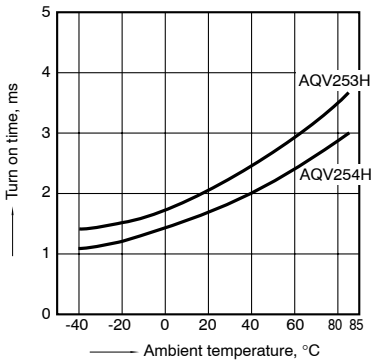
3.-(1) Turn on time vs. ambient temperature characteristics

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



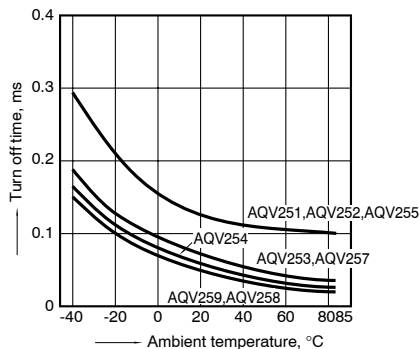
3.-(2) Turn on time vs. ambient temperature characteristics

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



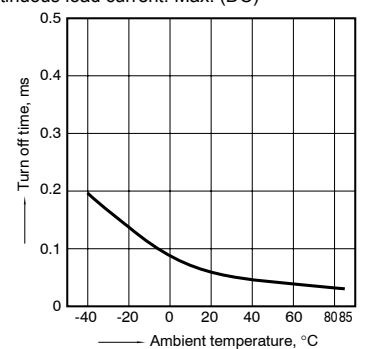
4.-(1) Turn off time vs. ambient temperature characteristics

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



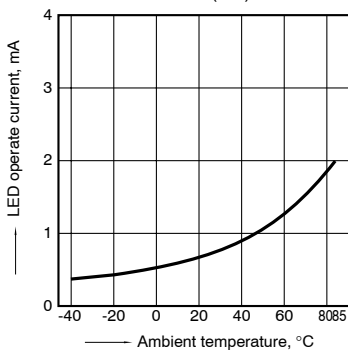
4.-(2) Turn off time vs. ambient temperature characteristics

Sample: AQV253H, AQV254H  
 LED current: 5 mA; Load voltage: Max. (DC);  
 Continuous load current: Max. (DC)



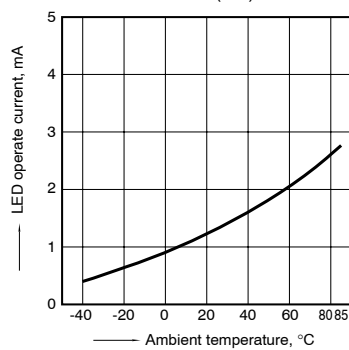
5.-(1) LED operate current vs. ambient temperature characteristics

Sample: AQV251, AQV252, AQV253, AQV254, AQV259;  
 Load voltage: Max. (DC);  
 Continuous load current: Max. (DC)



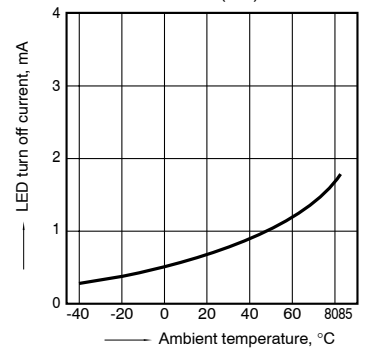
5.-(2) LED operate current vs. ambient temperature characteristics

Sample: AQV253H, AQV254H;  
 Load voltage: Max. (DC);  
 Continuous load current: Max. (DC)



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

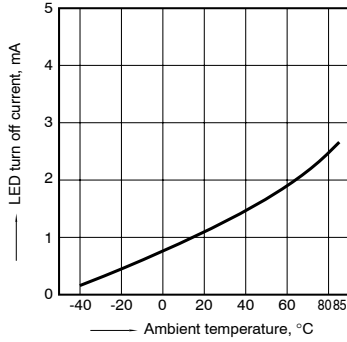
Sample: AQV251, AQV252, AQV253, AQV254, AQV259;  
 Load voltage: Max. (DC);  
 Continuous load current: Max. (DC)



# HE PhotoMOS (AQV25○)

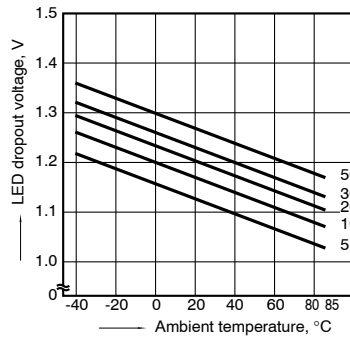
## 6.-(2) LED turn off current vs. ambient temperature characteristics

Sample: AQV251, AQV252, AQV253, AQV254, AQV259; Load voltage: Max. (DC); Continuous load current: Max. (DC)



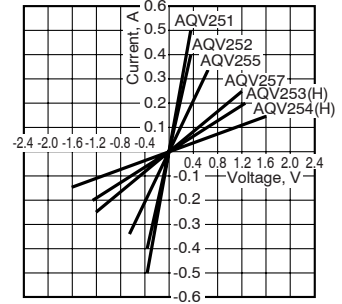
## 7. LED dropout voltage vs. ambient temperature characteristics

LED current: 5 to 50 mA



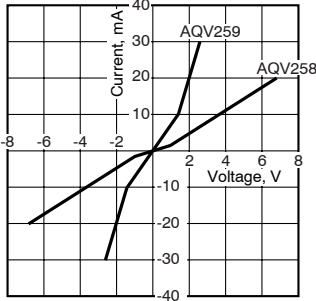
## 8.-(1) Current vs. voltage characteristics of output at MOS portion

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



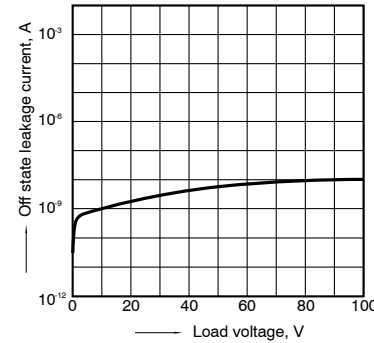
## 8.-(2) Current vs. voltage characteristics of output at MOS portion

Sample: AQV259; Measured portion: between terminals 4 and 6; Ambient temperature: 25°C 77°F



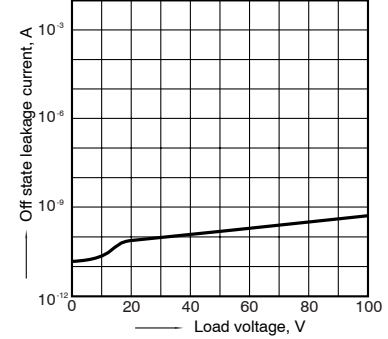
## 9.-(1) Off state leakage current vs. load voltage characteristics

Sample: AQV259; Measured portion: between terminals 4 and 6; Ambient temperature: 25°C 77°F



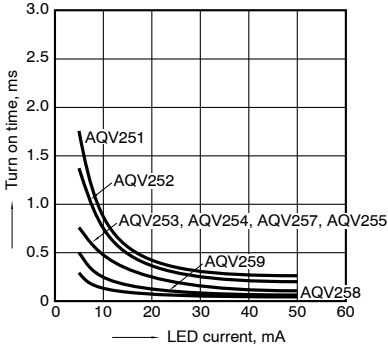
## 9.-(2) Off state leakage current vs. load voltage characteristics

Sample: AQV254H; Measured portion: between terminals 4 and 6; Ambient temperature: 25°C 77°F



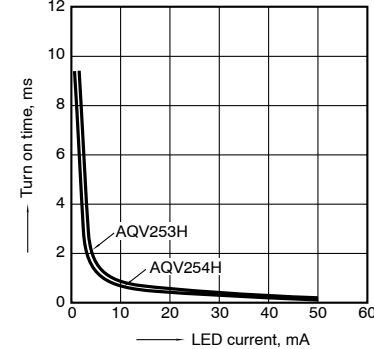
## 10.-(1) Turn on time vs. LED forward current characteristics

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



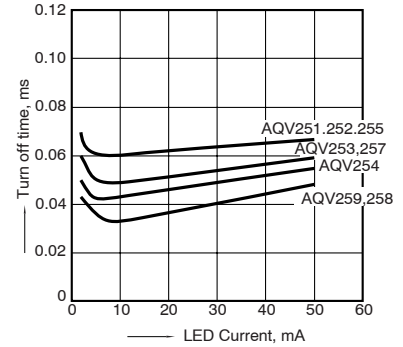
## 10.-(2) Turn on time vs. LED forward current characteristics

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



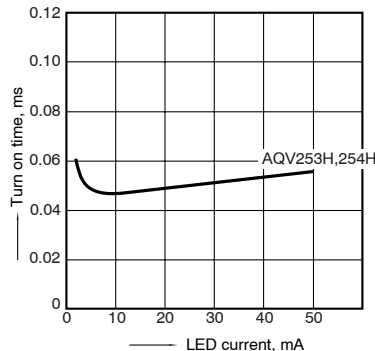
## 11.-(1) Turn off time vs. LED forward current characteristics

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



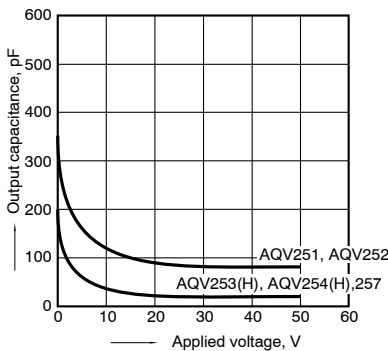
## 11.-(2) Turn off time vs. LED forward current characteristics

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



## 12.-(1) Output capacitance vs. applied voltage characteristics

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



## 12.-(2) Output capacitance vs. applied voltage characteristics

Sample: AQV259; Measured portion: between terminals 4 and 6; Frequency: 1 MHz; Ambient temperature: 25°C 77°F

