

Both low on-resistance and good cost-performance achieved.

PhotoMOS<sup>®</sup>  
HE 1 Form A  
(AQV25○)

## FEATURES

1. Wide variation of 40V, 60V, 100V, 200V, 250V, 400V, 600V, 1,000V and 1,500V load voltage
2. Low on-resistance of typ. 0.6Ω (AQV251)
3. Reinforced insulation type of 5,000V I/O isolation available

## TYPICAL APPLICATIONS

- Measuring instruments
- Data communication equipment
- Telephone equipment
- Automatic meter reading device



RoHS compliant

## TYPES

	I/O isolation	Output rating*		Package	Part No.				Packing quantity	
					Through hole terminal	Surface-mount terminal			Tube	Tape and reel
						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	1,500V	40 V	500 mA	DIP6-pin	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		
	Reinforced 5,000V	250 V	200 mA		AQV253H	AQV253HA	AQV253HAX	AQV253HAZ		
		400 V	150 mA		AQV254H	AQV254HA	AQV254HAX	AQV254HAZ		
		600 V	130 mA		AQV256H	AQV256HA	AQV256HAX	AQV256HAZ		

\*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. Absolute maximum ratings (Ambient temperature: 25°C 77°F)

Item	Symbol	Type of connection	AQV251(A)	AQV252(A)	AQV255(A)	AQV257(A)	AQV253(A)	AQV254(A)	AQV259(A)	AQV258(A)	AQV253H(A)	AQV254H(A)	AQV256H(A)	Remarks	
			Input	LED forward current	I <sub>F</sub>	50 mA									
	LED reverse voltage	V <sub>R</sub>	5 V												
	Peak forward current	I <sub>FP</sub>	1 A											f = 100 Hz, Duty factor +0.1%	
	Power dissipation	P <sub>in</sub>	75 mW												
Output	Load voltage (peak AC)	V <sub>L</sub>	40V	60V	100V	200V	250V	400V	1,000V	1,500V	250V	400V	600V		
	Continuous load current	I <sub>L</sub>	A	0.5A	0.4A	0.35A	0.25A	0.2A	0.15A	0.03A	0.02A	0.2A	0.15A	0.13A	A connection: Peak AC, DC
			B	0.7A	0.6A	0.45A	0.35A	0.3A	0.18A	0.04A	0.025A	0.3A	0.18A	0.14A	B, C connection: DC
			C	1.0A	0.8A	0.70A	0.5A	0.4A	0.25A	0.05A	0.04A	0.4A	0.25A	0.16A	
	Peak load current	I <sub>peak</sub>	1.8A	1.5A	1.0A	0.75A	0.6A	0.5A	0.09A	0.06A	0.6A	0.5A	0.4A	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						5,000 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		Sym- bol	Type of con- nection	AQV251(A)	AQV252(A)	AQV255(A)	AQV257(A)	AQV253(A)	AQV254(A)	AQV259(A)	AQV258(A)	AQV253H(A)	AQV254H(A)	AQV256H(A)	Condition		
Input	LED operate current	Typical	I <sub>Fon</sub>	0.9 mA								1.4 mA			I <sub>L</sub> = Max.		
		Maximum		3 mA													
	LED turn off current	Minimum	I <sub>Foff</sub>	0.4 mA													I <sub>L</sub> = Max.
		Typical		0.8 mA								1.3 mA					
LED dropout voltage	Typical	V <sub>F</sub>	—	1.25 V (1.14 V at I <sub>F</sub> = 5 mA)													I <sub>F</sub> = 50 mA
	Maximum			1.5 V													
Output	On resistance	Typical	R <sub>on</sub>	A	0.6 Ω	0.74 Ω	1.8 Ω	2.6 Ω	5.5 Ω	12.4 Ω	85 Ω	345 Ω	5.5 Ω	12.4 Ω	20 Ω	I <sub>F</sub> = 5 mA I <sub>L</sub> = Max. Within 1 s on time	
		Maximum			1 Ω	1.4 Ω	2.5 Ω	4 Ω	8 Ω	16 Ω	200 Ω	500 Ω	8 Ω	16 Ω	30 Ω		
	On resistance	Typical	R <sub>on</sub>	B	0.35 Ω	0.37 Ω	0.9 Ω	1.4 Ω	2.7 Ω	6.2 Ω	60 Ω	345 Ω	2.7 Ω	6.2 Ω	15 Ω	I <sub>F</sub> = 5 mA I <sub>L</sub> = Max. Within 1 s on time	
		Maximum			0.5 Ω	0.7 Ω	1.25 Ω	2 Ω	4 Ω	8 Ω	100 Ω	500 Ω	4 Ω	8 Ω	20 Ω		
	On resistance	Typical	R <sub>on</sub>	C	0.15 Ω	0.18 Ω	0.45 Ω	0.7 Ω	1.4 Ω	3.1 Ω	30 Ω	160 Ω	1.4 Ω	3.1 Ω	7.5 Ω	I <sub>F</sub> = 5 mA I <sub>L</sub> = Max. Within 1 s on time	
		Maximum			0.25 Ω	0.35 Ω	0.63 Ω	1 Ω	2 Ω	4 Ω	50 Ω	250 Ω	2 Ω	4 Ω	10 Ω		
Off state leakage current	Maximum	I <sub>Leak</sub>	—	1 μA						10 μA		1 μA			I <sub>F</sub> = 0 mA V <sub>L</sub> = Max.		
Transfer characteristics	Turn on time*	Typical	T <sub>on</sub>	1.7 ms	1.4 ms	0.9 ms	1.5 ms	0.8 ms	0.6 ms	0.35 ms	2.4 ms	1.8 ms	1.2 ms	I <sub>F</sub> = 5 mA I <sub>L</sub> = Max.			
		Maximum		3 ms		2 ms	3 ms	2 ms	1 ms		4 ms	3ms					
	Turn off time*	Typical	T <sub>off</sub>	—	0.07 ms	0.09 ms	0.1 ms	0.06 ms	0.05 ms	0.04 ms		0.06 ms	0.05 ms	0.06 ms	I <sub>F</sub> = 5 mA I <sub>L</sub> = Max.		
		Maximum		0.2 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>	Standard type: 5 Reinforced insulation 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 Corporation technical representative.  
For more information.

#### ■ Continual DC bias (for AQV258\*\*, AQV259\*\*)

In cases in which a continual DC bias is applied between the input and output, the output-side MOS-FET may deteriorate due to the voltage. Therefore, please verify operation of the actual design before using. An example of a circuit that might undergo MOS-FET deterioration due to voltage is given below.

# HE 1 Form A (AQV25○)

## 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;

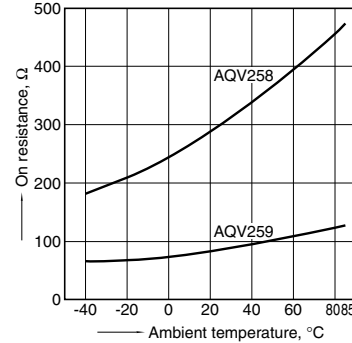
Continuous load current: Max. (DC)



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, AQV256H  
 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, AQV255, AQV258, AQV259; Load voltage: Max. (DC);  
 Continuous load current: Max. (DC)



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

Sample: AQV253H, AQV254H, AQV256H; Load voltage: Max. (DC);  
 Continuous load current: Max. (DC)



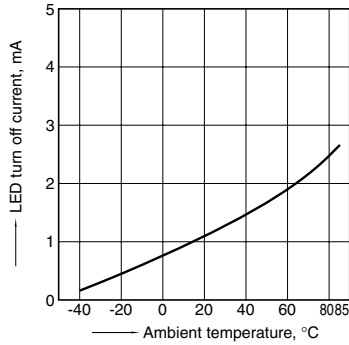
6.-(1) LED turn off current vs. ambient temperature characteristics

Sample: AQV251, AQV252, AQV253, AQV254, AQV255, AQV258, AQV259; Load voltage: Max. (DC);  
 Continuous load current: Max. (DC)



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

Sample: AQV253H, AQV254H, AQV256H;  
Load voltage: Max. (DC);  
Continuous load current: Max. (DC)



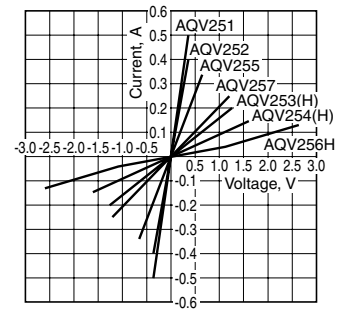
## 7. LED dropout voltage vs. ambient temperature characteristics

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



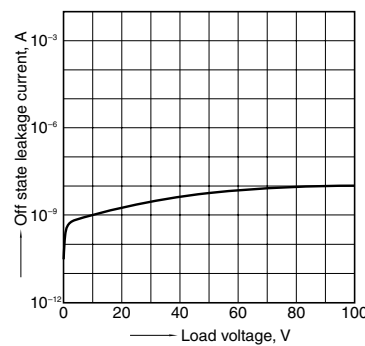
## 8.-(2) Current vs. voltage characteristics of output at MOS portion

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



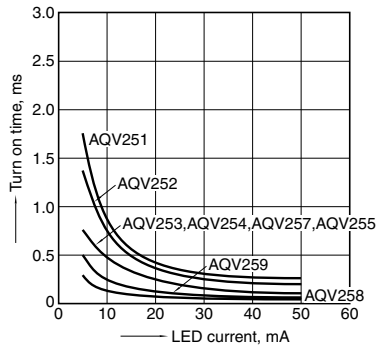
## 9.-(2) Off state leakage current vs. load voltage characteristics

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



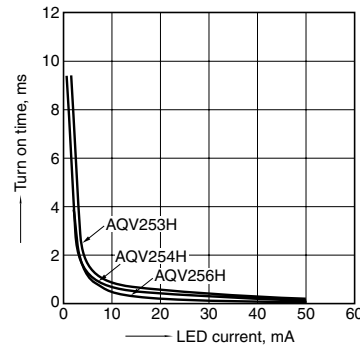
## 10.-(1) Turn on time vs. LED forward current characteristics

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



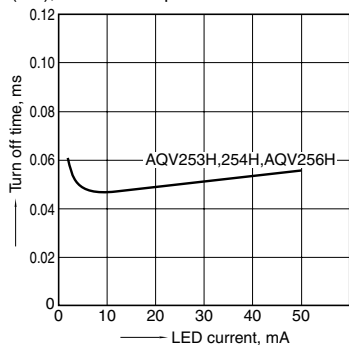
## 11.-(1) Turn off time vs. LED forward current characteristics

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



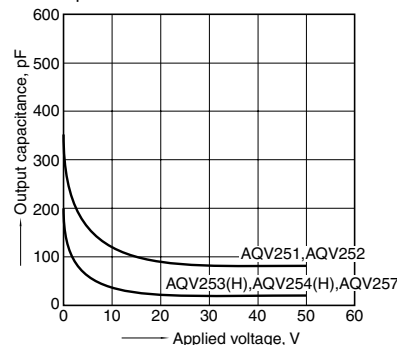
## 11.-(2) Turn off time vs. LED forward current characteristics

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



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Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: [ocean@oceanchips.ru](mailto:ocean@oceanchips.ru)

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А