



(Standard type)



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# NAIS

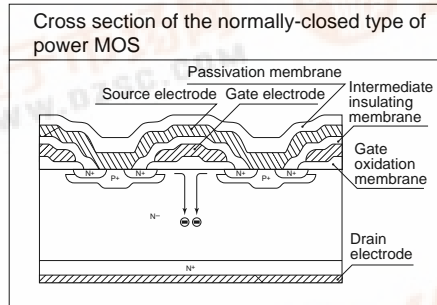
## HE (High-function Economy) Type 1- Channel (Form B) Type

# PhotoMOS RELAYS

## FEATURES

### 1. Form B (Normally-closed) type

Has been realized thanks to the built-in MOSFET processed by our proprietary method, DSD (Double-diffused and Selective Doping) method.



### 2. Controls low-level analog signals

PhotoMOS relays feature extremely low closed-circuit offset voltage to enable control of low-level analog signals without distortion.

### 3. High sensitivity, low ON resistance

Can control a maximum 0.15 A load current with a 5 mA input current. Low ON resistance of 16  $\Omega$  (AQV454). Stable operation because there are no metallic contact parts.

### 4. Controls various types of load such as relays, motors, lamps and solenoids.

### 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.

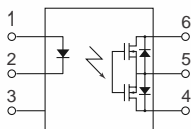
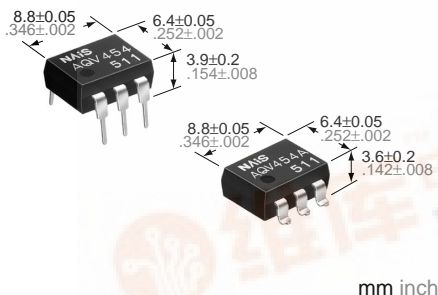
### 6. Low thermal electromotive force (Approx. 1 $\mu$ V) (Basic insulation)

### 7. Reinforced insulation 5,000 V type also available.

More than 0.4 mm .016 inch internal insulation distance between inputs and outputs. Conforms to IEC950 (reinforced insulation).

## TYPICAL APPLICATIONS

- Security equipment
- High-speed inspection machines
- Measuring instruments
- Telephone equipment
- Sensors



## TYPES

Type	I/O isolation	Output rating*		Part No.				Packing quantity	
		Load voltage	Load current	Through hole terminal	Surface-mount terminal				
					Tube packing style	Tape and reel packing style		Tube	Tape and reel
				Picked from the 1/2/3-pin side		Picked from the 4/5/6-pin side			
AC/DC	1,500 V AC	250 V	200 mA	AQV453	AQV453A	AQV453AX	AQV453AZ	1 tube contains 50 pcs. 1 batch contains 500 pcs.	1,000 pcs.
	Reinforced 5,000 V AC	400 V	150 mA	AQV454	AQV454A	AQV454AX	AQV454AZ		
				AQV454H	AQV454HA	AQV454HAX	AQV454HAZ		

\* Indicate the peak AC and DC values.

Note: For space reasons, the package type indicator "X" and "Z" are omitted from the seal.

## RATING

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

Item		Symbol	Type of connection	AQV453(A)	AQV454(A)	AQV454H(A)	Remarks	
Input	LED forward current	I <sub>F</sub>		50 mA				
	LED reverse voltage	V <sub>R</sub>		3 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>		250 V	400 V			
	Continuous load current	I <sub>L</sub>		A	0.2 A		A connection: Peak AC, DC B,C connection: DC	
				B	0.3 A			
				C	0.4 A			
	Peak load current	I <sub>PEAK</sub>			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		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				Symbol	Type of connection	AQV453(A)	AQV454(A)	AQV454H(A)	Remarks
Input	LED operate (OFF) current		Typical	I <sub>Foff</sub>	—	1 mA	0.9 mA	1.4 mA	I <sub>L</sub> = Max.
			Maximum			3 mA			
	LED reverse (ON) current		Minimum	I <sub>Fon</sub>	—	0.4 mA			I <sub>L</sub> = Max.
			Typical			0.9 mA	0.8 mA	1.3 mA	
	LED dropout voltage		Typical	V <sub>F</sub>	—	1.14 V (1.25V at I <sub>F</sub> =50 mA)			I <sub>F</sub> = 5 mA
			Maximum			1.5 V			
Output	On resistance		Typical	R <sub>on</sub>	A	5.5 Ω	10.5 Ω	10.5 Ω	I <sub>F</sub> = 0 mA I <sub>L</sub> = Max. Within 1 s on time
			Maximum			8 Ω	16 Ω	16 Ω	
			Typical	R <sub>on</sub>	B	2.7 Ω	6.3 Ω	6.3 Ω	I <sub>F</sub> = 0 mA I <sub>L</sub> = Max. Within 1 s on time
			Maximum			4 Ω	8 Ω	8 Ω	
			Typical	R <sub>on</sub>	C	1.4 Ω	3.1 Ω	3.1 Ω	I <sub>F</sub> = 0 mA I <sub>L</sub> = Max. Within 1 s on time
			Maximum			2 Ω	4 Ω	4 Ω	
	Off state leakage current		Maximum	I <sub>LLeak</sub>	—	1 μA	10 μA	10 μA	I <sub>F</sub> = 5 mA V <sub>L</sub> = Max.
	Transfer characteristics	Switching speed	Operate (OFF) time*	Typical	T <sub>off</sub>	—	1.52 ms	1.2 ms	1.8 ms
Maximum				3 ms			2.0 ms	3.0 ms	
Reverse (ON) time*			Typical	T <sub>on</sub>	—	0.4 ms	0.36 ms	0.4 ms	I <sub>F</sub> = 5 mA → 0 mA I <sub>L</sub> = Max.
			Maximum			1 ms	1.0 ms	1.0 ms	
I/O capacitance		Typical	C <sub>iso</sub>	—	1.3 pF			f = 1 MHz V <sub>B</sub> = 0	
		Maximum			3 pF				
Initial I/O isolation resistance			Minimum	R <sub>iso</sub>	—	1,000 MΩ			500 V DC

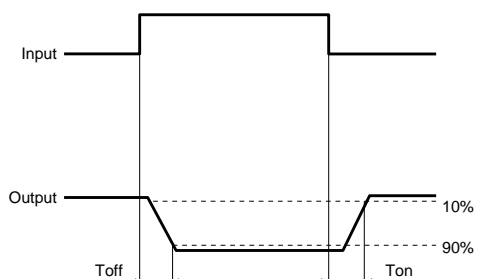
Note: Recommendable LED forward current.

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

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

\*Operate/Reverse time

For type of connection, see Page 32.



■ For Dimensions, see Page 27.

■ For Schematic and Wiring Diagrams, see Page 32.

■ For Cautions for Use, see Page 36.

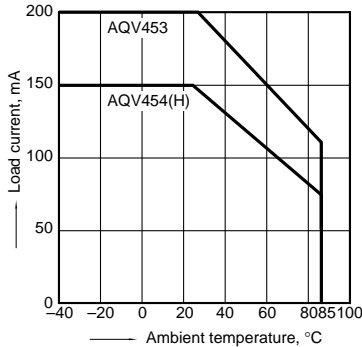
# AQV45○

## REFERENCE DATA

### 1. Load current vs. ambient temperature characteristics

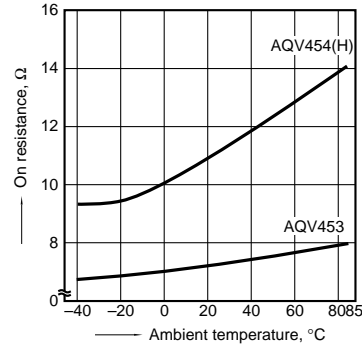
Allowable ambient temperature:  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$   
 $-40^{\circ}\text{F}$  to  $+185^{\circ}\text{F}$

Type of connection: A



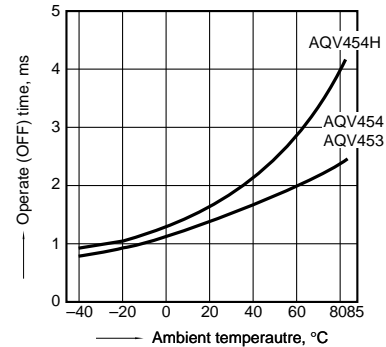
### 2. On resistance vs. ambient temperature characteristics

Measured portion: between terminals 4 and 6;  
 LED current: 0 mA; Load voltage: Max. (DC);  
 Continuous load current: Max. (DC)



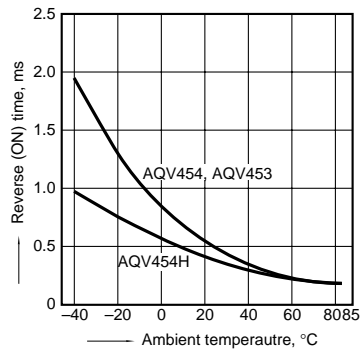
### 3. Operate (OFF) time vs. ambient temperature characteristics

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



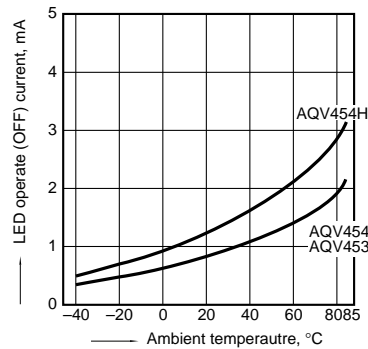
### 4. Reverse (ON) time vs. ambient temperature characteristics

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



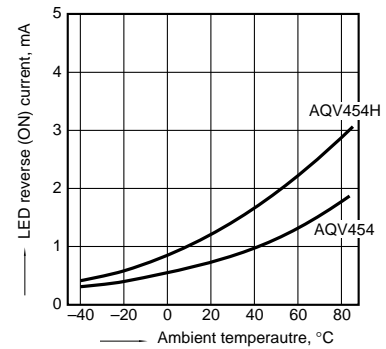
### 5. LED operate (OFF) current vs. ambient temperature characteristics

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



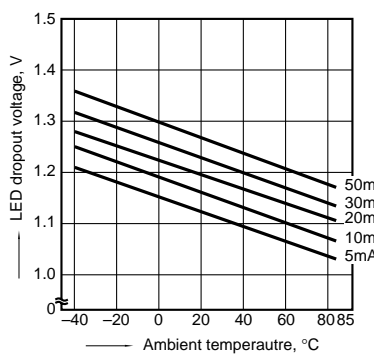
### 6. LED reverse (ON) current vs. ambient temperature characteristics

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



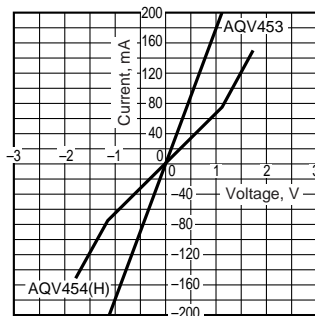
### 7. LED dropout voltage vs. ambient temperature characteristics

LED current: 5 to 50 mA



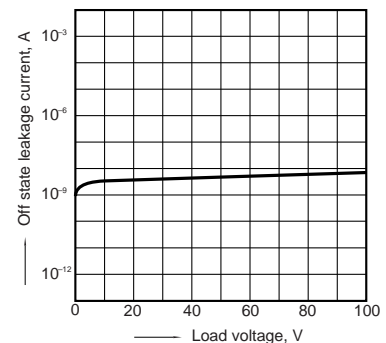
### 8. Voltage vs. current characteristics of output at MOS portion

Measured portion: between terminals 4 and 6;  
 Ambient temperature:  $25^{\circ}\text{C}$   $77^{\circ}\text{F}$



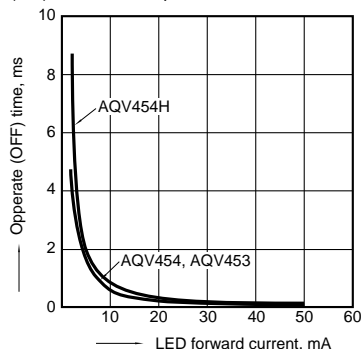
### 9. Off state leakage current

Sample: AQV454;  
 Measured portion: between terminals 4 and 6;  
 Ambient temperature:  $25^{\circ}\text{C}$   $77^{\circ}\text{F}$



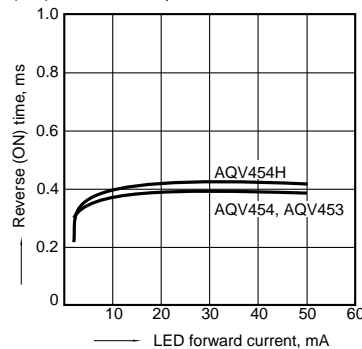
### 10. LED forward current vs. operate (OFF) time characteristics

Measured portion: between terminals 4 and 6;  
 Load voltage: Max. (DC); Continuous load current: Max. (DC); Ambient temperature:  $25^{\circ}\text{C}$   $77^{\circ}\text{F}$



### 11. LED forward current vs. reverse (ON) time characteristics

Measured portion: between terminals 4 and 6;  
 Load voltage: Max. (DC); Continuous load current: Max. (DC); Ambient temperature:  $25^{\circ}\text{C}$   $77^{\circ}\text{F}$



### 12. Applied voltage vs. output capacitance characteristics

Measured portion: between terminals 4 and 6;  
 Frequency: 1 MHz; Ambient temperature:  $25^{\circ}\text{C}$   $77^{\circ}\text{F}$

