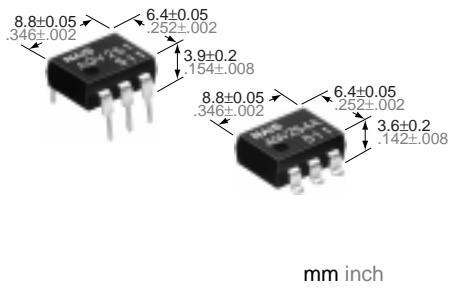


NAiS

**HE (High-function Economy)
Type
1-Channel (Form A) Type**

PhotoMOS RELAYS

**UL File No.: E43149
CSA File No.: LR26550**



FEATURES

1. High sensitivity and low on-resistance
 2. Controls various types of loads such as relays, motors, lamps and solenoids.
 3. Optical coupling for extremely high isolation
 4. Low-level off state leakage current
- 5,000 Vrms I/O isolation available.

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

I/O isolation voltage	Output rating*		Part No.			Packing quantity	
			Through hole terminal	Surface-mount terminal			
	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	
1,500 V AC	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	
Reinforced 5,000 V	250 V	200 mA	AQV253H	AQV253HA	AQV253HAX	AQV253HAZ	1,000 pcs.
	400 V	150 mA	AQV254H	AQV254HA	AQV254HAX	AQV254HAZ	

* 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	AQV251(A)	AQV252(A)	AQV255(A)	AQV257(A)	AQV253(A) AQV253H(A)	AQV254(A) AQV254H(A)	AQV259(A)	AQV258(A)	Remarks	
Input	LED forward current	I _F		50 mA								
	LED reverse voltage	V _R		3 V								
	Peak forward current	I _{FP}		1 A								
	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	f = 100 Hz, Duty factor + 0.1%	
	Continuous load current	I _L	A B C	0.5 A 0.7 A 1.0 A	0.4 A 0.6 A 0.8 A	0.35 A 0.45 A 0.70 A	0.25 A 0.35 A 0.5 A	0.2 A 0.3 A 0.4 A	0.15 A 0.18 A 0.25 A	0.03 A 0.04 A 0.05 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	A connection: Peak AC, DC B, C connection: DC 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}	-20°C to +80°C -4°F to +176°F								Non-condensing at low temperatures	
	Storage	T _{stg}	-40°C to +100°C -40°F to +212°F									

(): Value for reinforced 5,000 V type

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

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

Note: Recommendable LED forward current

Standard type: 5 mA

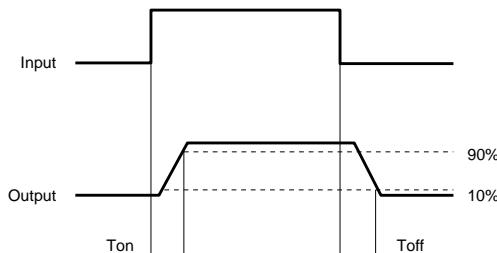
Reinforced type: 5 to 10 mA

*Turn on/Turn off time

For type of connection, see Page 26.

⟨ ⟩: Value for reinforced 5,000 V type

**1.25 V at $I_F = 50 \text{ mA}$



■ For Dimensions

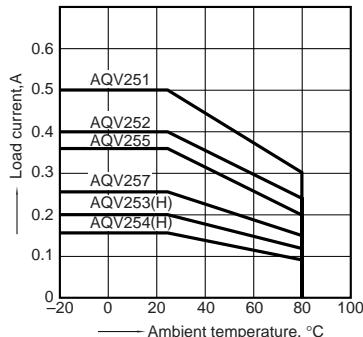
■ For Schematic and Wiring Diagrams

■ For Cautions for Use

REFERENCE DATA

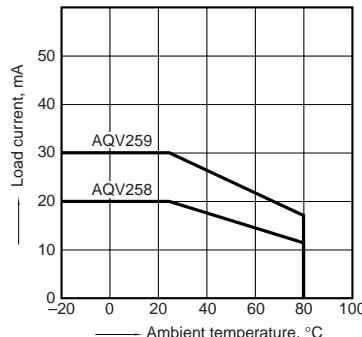
1.-1) Load current vs. ambient temperature characteristics

Allowable ambient temperature: -20°C to +80°C
-4°F to +176°F; Type of connection: A



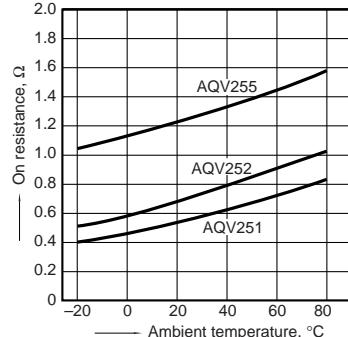
1.-2) Load current vs. ambient temperature characteristics

Allowable ambient temperature: -20°C to +80°C
-4°F to +176°F; Type of connection: A



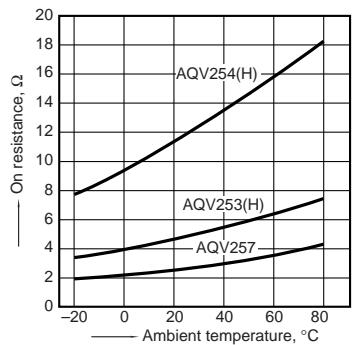
2.-1) On resistance vs. ambient temperature characteristics

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



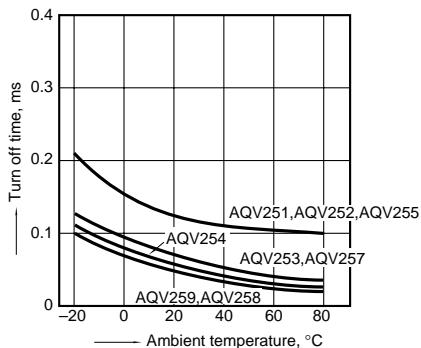
2.-{(2)} On resistance vs. ambient temperature characteristics

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



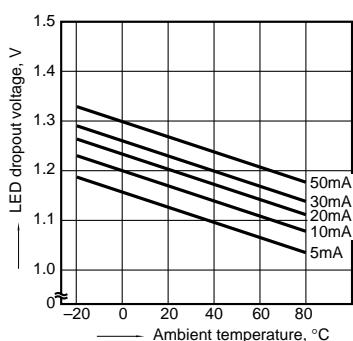
4. Turn off time vs. ambient temperature characteristics

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



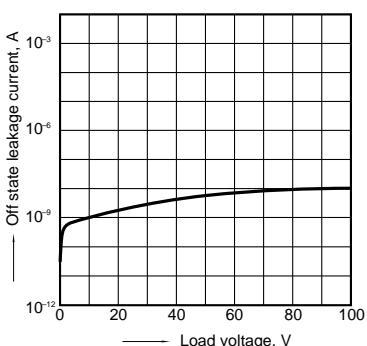
7. LED dropout voltage vs. ambient temperature characteristics

LED current: 5 to 50 mA



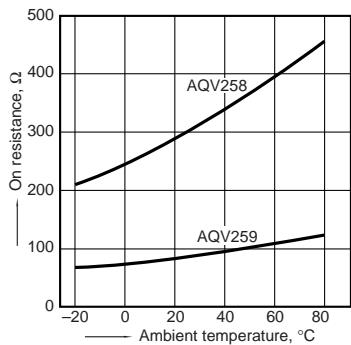
9.-{(1)} Off state leakage current

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



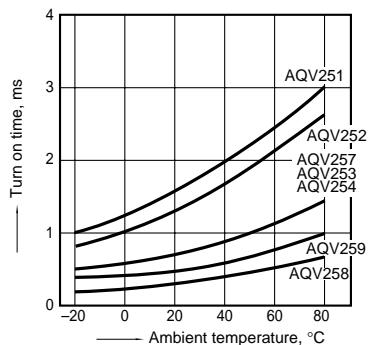
2.-{(3)} On resistance vs. ambient temperature characteristics

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



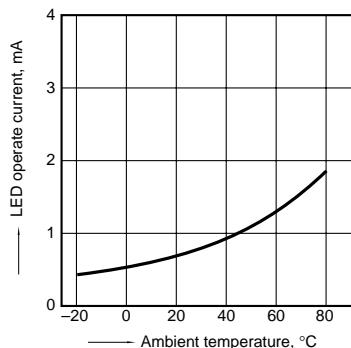
3. Turn on time vs. ambient temperature characteristics

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



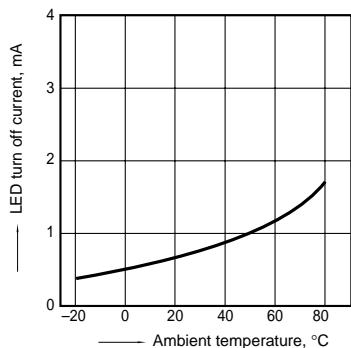
5. LED operate current vs. ambient temperature characteristics

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



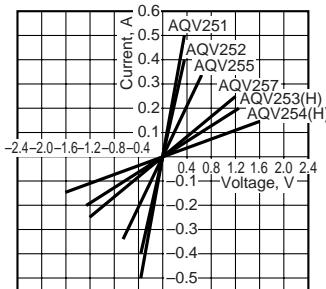
6. LED turn off current vs. ambient temperature characteristics

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



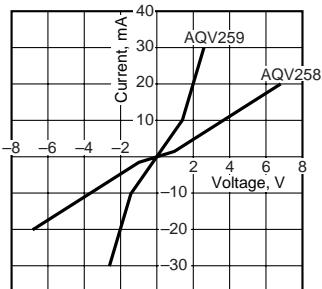
8.-{(1)} Voltage vs. current characteristics of output at MOS portion

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



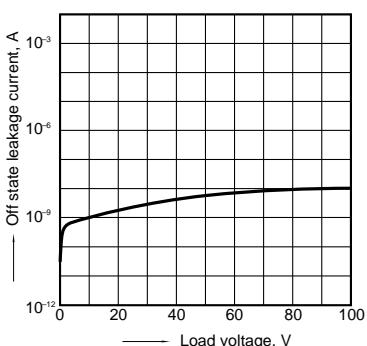
8.-{(2)} Voltage vs. current characteristics of output at MOS portion

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



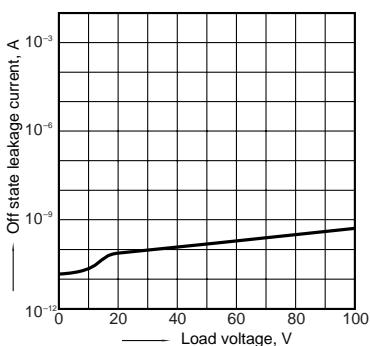
9.-{(1)} Off state leakage current

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



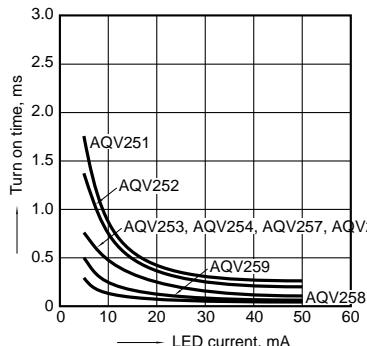
9.-{(2)} Off state leakage current

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



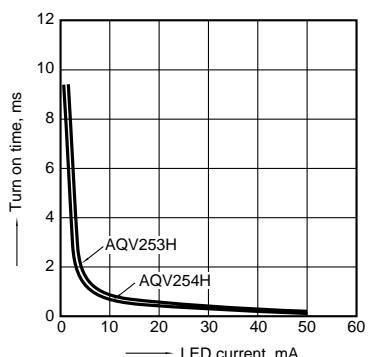
10.-{(1)} LED forward current vs. turn on time characteristics

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



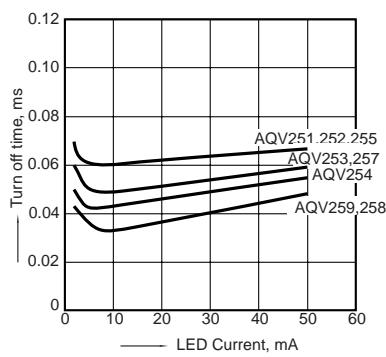
10.-{(2)} LED forward current vs. turn on time characteristics

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



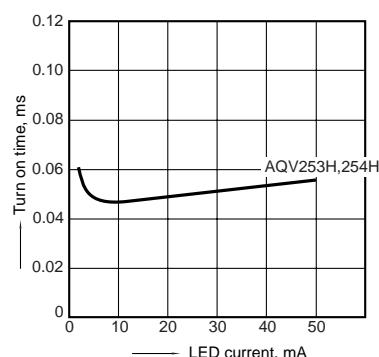
11.-{(1)} LED forward current vs. turn off time characteristics

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



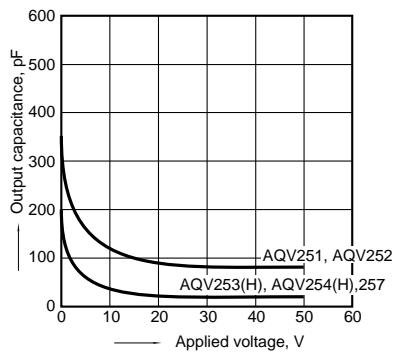
11.-{(2)} LED forward current vs. turn off time characteristics

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



12.-{(1)} Applied voltage vs. output capacitance characteristics

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



12.-{(2)} Applied voltage vs. output capacitance characteristics

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

