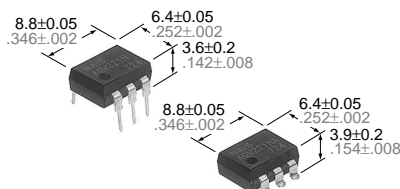


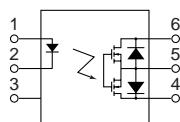
# NAIS

## RF (Radio Frequency) Type Low C and R

# PhotoMOS RELAYS



mm inch



### FEATURES

- 1. Low output capacitance between output terminals and low ON-resistance**
- 2. High speed switching (Turn on time: typ. 200µs)**
- 3. High sensitivity**  
Control loads up to 250mA with input current 5mA
- 4. Low-level off state leakage current**  
The SSR has an off state leakage current of several milliamperes, where as this PhotoMOS relay has only 20pA (typical) even with the rated load voltage
- 5. Controls low-level analog signals**  
PhotoMOS relays features extremely low-closed-circuit offset voltage to enable control of low-level analog signals without distortion
- 6. Low thermal electromotive force (Approx. 1 µV)**

### TYPICAL APPLICATIONS

- Measuring and testing equipment**
- Testing equipment for semiconductor performance  
IC tester, Liquid crystal driver tester, semiconductor performance tester
  - Board tester  
Bear board tester, In-circuit tester, function tester
  - Medical equipment  
Ultrasonic wave diagnostic machine
  - Multi-point recorder  
(warping, thermo couple)

### TYPES

Type	Output rating*		Part No.				Packing quantity	
			Through hole terminal	Surface-mount terminal				
	Load voltage	Load current	Tube packing style		Tape and reel packing style		Tube	Tape and reel
AC/DC type	40 V	150 mA	AQV221N	AQV221NA	Picked from the 1/2/3-pin side AQV221NAX	Picked from the 4/5/6-pin side AQV221NAZ	1 tube contains 50 pcs. 1 batch contains 500 pcs.	1,000 pcs.

\*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	AQV221N(A)	Remarks	
Input	LED forward current	I <sub>F</sub>	50 mA	f = 100 Hz, Duty factor = 0.1%	
	LED reverse voltage	V <sub>R</sub>	3 V		
	Peak forward current	I <sub>FP</sub>	1 A		
	Power dissipation	P <sub>in</sub>	75 mW		
Output	Load voltage (peak AC)	V <sub>L</sub>	40 V	A connection: Peak AC, DC B, C connection: DC	
	Continuous load current	I <sub>L</sub>	A		0.15 A
			B		0.18 A
			C		0.25 A
	Peak load current	I <sub>peak</sub>	0.45 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 temperatures	
	Storage	T <sub>stg</sub>	-40°C to +100°C -40°F to +212°F		

# AQV221N

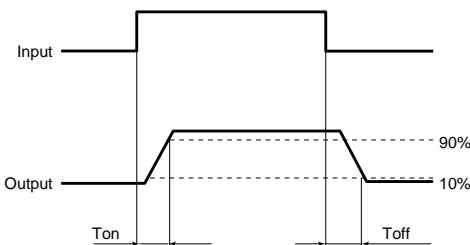
## 2. Electrical characteristics (Ambient temperature: 25°C 77°F)

Item			Symbol	Type of connection**	AQV221N(A)	Remarks	
Input	LED operate current	Typical	$I_{Fon}$	—	0.90 mA	$I_L = \text{Max.}$	
		Maximum			3.0 mA		
	LED turn off current	Minimum	$I_{Foff}$	—	0.4 mA	$I_L = \text{Max.}$	
		Typical			0.85 mA		
	LED dropout voltage	Typical	$V_F$	—	1.14 V (1.25 V at $I_F = 50 \text{ mA}$ )	$I_F = 5 \text{ mA}$	
		Maximum			1.5 V		
Output	On resistance #	Typical	$R_{on}$	A	9.8 $\Omega$	$I_F = 0 \text{ mA}$ $I_L = \text{Max.}$ Within 1 s on time	
		Maximum			15 $\Omega$		
		Typical	$R_{on}$	B	5 $\Omega$	$I_F = 5 \text{ mA}$ $I_L = \text{Max.}$ Within 1 s on time	
		Maximum			7.5 $\Omega$		
		Typical	$R_{on}$	C	2.5 $\Omega$	$I_F = 5 \text{ mA}$ $I_L = \text{Max.}$ Within 1 s on time	
		Maximum			3.8 $\Omega$		
	Output capacitance #	Typical	$C_{out}$	A	3.9 pF	$I_F = 0$ $V_B = 0V$ $f = 1 \text{ MHz}$	
		Maximum			5 pF		
	Off state leakage current	Typical	$I_{Leak}$	—	20 pA	$I_F = 0$ $V_L = \text{Max.}$	
		Maximum			10 nA		
Transfer characteristics	Switching speed	Turn on time*	Typical	$T_{on}$	—	0.2 ms	$I_F = 5 \text{ mA}$ $I_L = \text{Max.}$
			Maximum			0.5 ms	
		Turn off time*	Typical	$T_{off}$	—	0.08 ms	$I_F = 5 \text{ mA}$ $I_L = \text{Max.}$
			Maximum			0.2 ms	
	I/O capacitance	Typical	$C_{iso}$	—	0.8 pF	$f = 1 \text{ MHz}$ $V_B = 0$	
		Maximum			1.5 pF		
Initial I/O isolation resistance	Minimum	$R_{iso}$	—	1,000 M $\Omega$	500 V DC		

Note: Recommendable LED forward current  $I_F = 5 \text{ mA}$

\*\*For type of connection, see Page 31.

\*Turn on/Turn off time



# Other types of products than the  $C_{out}$  (typ. 3.9pF) and  $R_{on}$  (A connection typ. 9.8 $\Omega$ ) combinations carried in this catalog are also available.

(There is a trade-off between  $R_{on}$  and  $C_{out}$  both cannot be reduced at the same time.)

For more information, please contact our sales office in your area.

■ For Dimensions, see Page 27.

■ For Schematic and Wiring Diagrams, see Page 31.

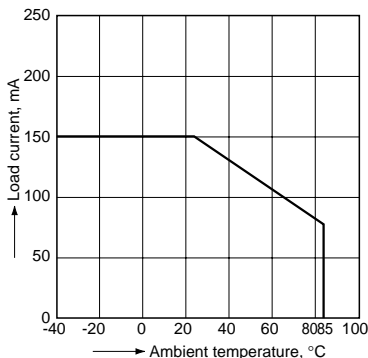
■ For Cautions for Use, see Page 36.

## REFERENCE DATA

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

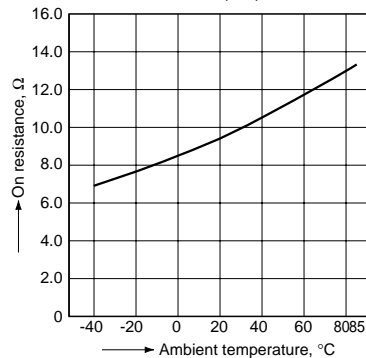
Allowable ambient temperature:  $-40^\circ\text{C}$  to  $+85^\circ\text{C}$   
 $-40^\circ\text{F}$  to  $+185^\circ\text{F}$

Type of connection: A



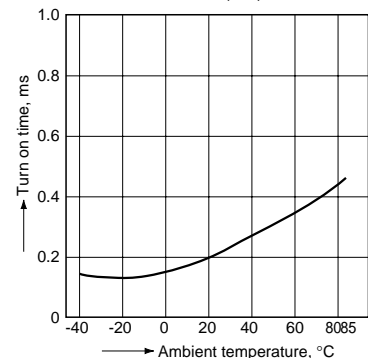
### 2. On resistance vs. ambient temperature characteristics

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



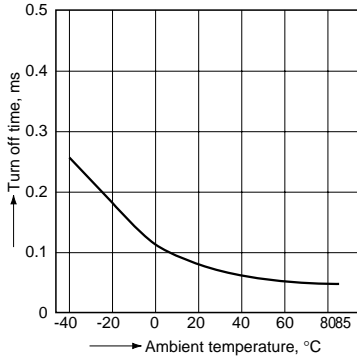
### 3. Turn on time vs. ambient temperature characteristics

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



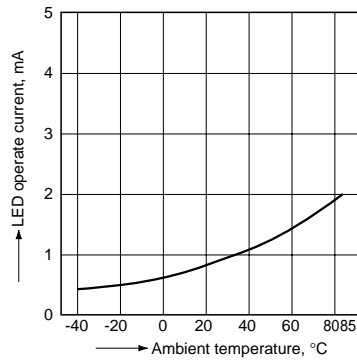
4. Turn off time vs. ambient temperature characteristics

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



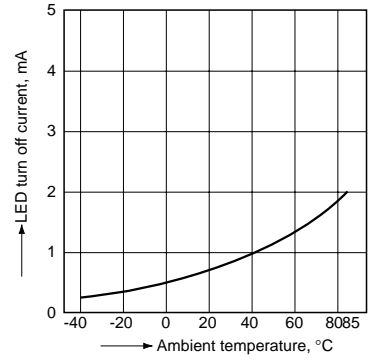
5. LED operate current vs. ambient temperature characteristics

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



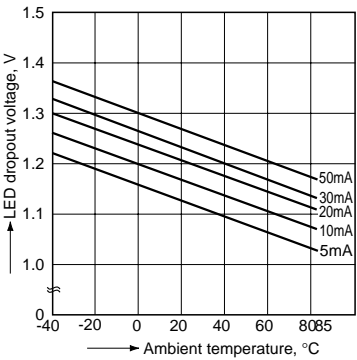
6. LED turn off current vs. ambient temperature characteristics

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



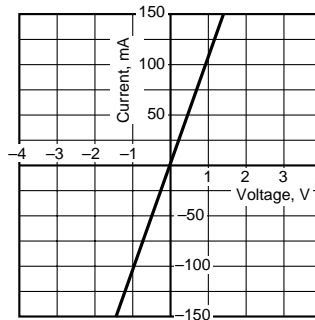
7. LED dropout voltage vs. ambient temperature characteristics

LED current: 5 to 50 mA



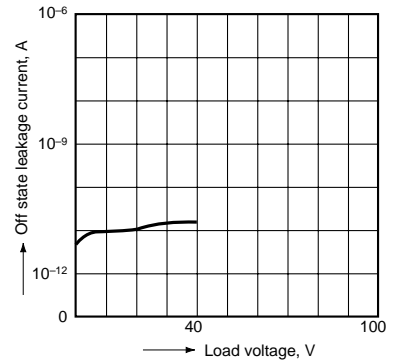
8. Voltage vs. current characteristics of output at MOS portion

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



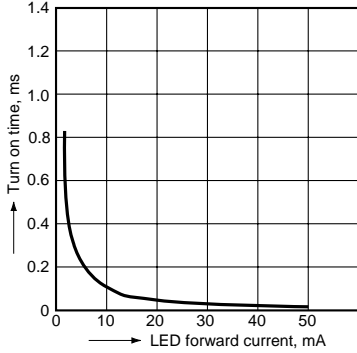
9. Off state leakage current

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



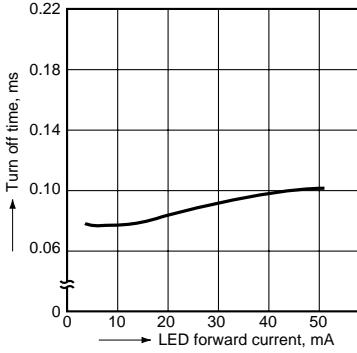
10. LED forward current vs. turn on time characteristics

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



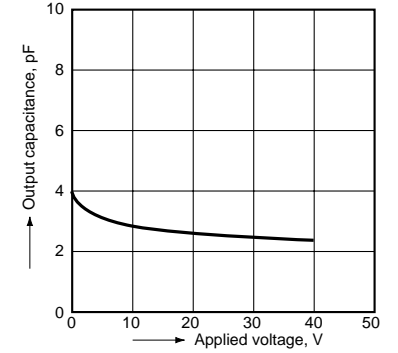
11. LED forward current vs. turn off time characteristics

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



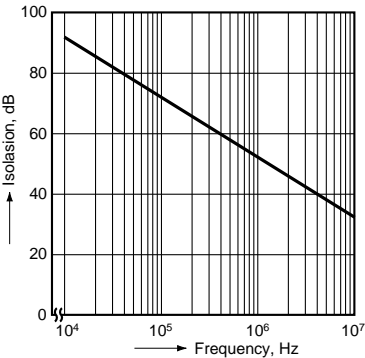
12. Applied voltage vs. output capacitance characteristics

Measured portion: between terminals 4 and 6; Frequency: 1 MHz, 30 mVrms; Ambient temperature: 25°C 77°F



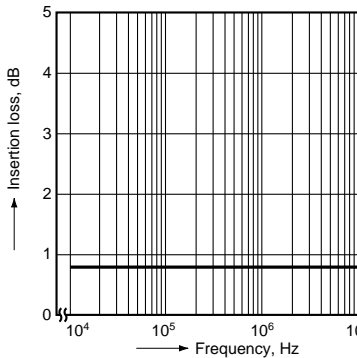
13. Isolation characteristics (50 Ω impedance)

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



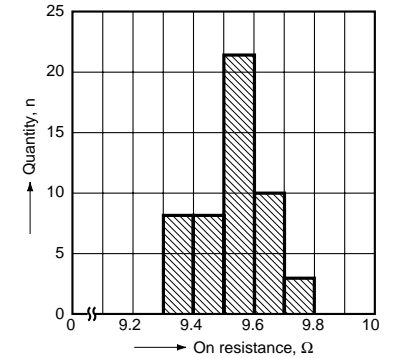
14. Insertion loss characteristics (50 Ω impedance)

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



15. On resistance distribution

Measured portion: between terminals 4 and 6; Continuous load current: 150mA(DC); Quantity, n=50; Ambient temperature: 25°C 77°F



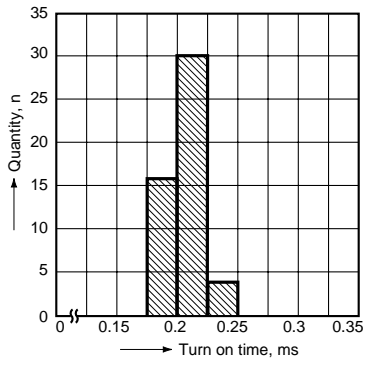
# AQV221N

## 16. Turn on time distribution

Load voltage: 40V(DC)

Continuous load current: 150mA(DC)

Quantity, n=50; Ambient temperature: 25°C 77°F

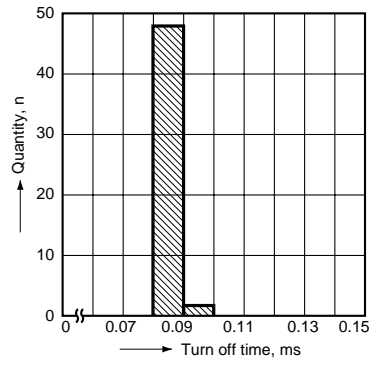


## 17. Turn off time distribution

Load voltage: 40V(DC)

Continuous load current: 150mA(DC)

Quantity, n=50; Ambient temperature: 25°C 77°F



## 18. LED operate current distribution

Load voltage: 40V(DC)

Continuous load current: 150mA(DC)

Quantity, n=50; Ambient temperature: 25°C 77°F

