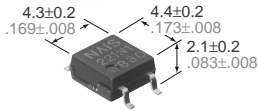


# NAIS

**RF (Radio Frequency)  
C × R 20 Type  
(by)**

# PhotoMOS RELAYS



mm inch

## FEATURES

**1. Low output capacitance between output terminals and low ON-resistance**

Output capacitance(C): 2.0pF (typ.)  
ON resistance(R): 9.8Ω (typ.)

**2. High speed switching**

Turn on time: 40ms  
Turn off time: 60ms

**3. SO package 4-pin type in super mini-ature design**

Size: (W)4.3 × (L)4.4 × (H)2.1 mm  
(W).169 × (L).173 × (H).083 inch

**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 10pA (typical) even with the rated load voltage

**5. Controls low-level analog signals**

**6. Low thermal electromotive force (Approx. 1 mV)**

## TYPICAL APPLICATIONS

**Measuring and testing equipment**

1. Testing equipment for semiconductor performance  
IC tester, Liquid crystal driver tester, semiconductor performance tester

2. Board tester

Bear board tester, In-circuit tester, function tester

3. Medical equipment

Ultrasonic wave diagnostic machine

4. Multi-point recorder (warping, thermo couple)

## TYPES

Type	Output rating*		Tape and reel packing style		Packing quantity	
	Load voltage	Load current	Picked from the 1/2-pin side	Picked from the 3/4-pin side	Tube	Tape and reel
AC/DC type	40V	120mA	AQY221N1SX	AQY221N1SZ	1,000 pcs	1,000 pcs

\* Indicate the peak AC and DC values.

Notes: (1) Tape package is the standard packing style. Also available in tube.

(Part No. suffix "X" or "Z" is not needed when ordering; Tube: 100 pcs.; Case: 2,000 pcs.)

(2) For space reasons, the initial letters of the product number "AQY and S", the package type indicator "X" and "Z" are omitted from the seal.

## RATING

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

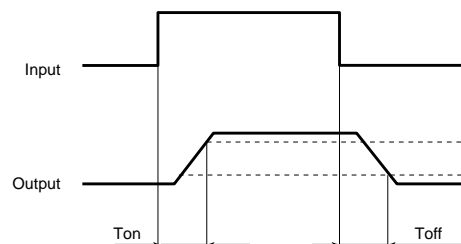
Item	Symbol	AQY221N1S	Remarks	
Input	LED forward current	I <sub>F</sub>	50mA	
	LED reverse voltage	V <sub>R</sub>	3V	
	Peak forward current	I <sub>FP</sub>	1A	f=100 Hz, Duty factor=0.1%
	Power dissipation	P <sub>in</sub>	75mW	
Output	Load voltage (peak AC)	V <sub>L</sub>	40V	
	Continuous load current	I <sub>L</sub>	0.12A	Peak AC,DC
	Peak load current	I <sub>peak</sub>	0.30A	100 ms (1 shot), V <sub>L</sub> = DC
	Power dissipation	P <sub>out</sub>	300mW	
Total power dissipation	P <sub>T</sub>	350mW		
I/O isolation voltage	V <sub>iso</sub>	1,500V 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	AQY221N1S	Condition	
Input	LED operate current	Typical	$I_{Fon}$	0.9mA	$I_L=100\text{ mA}$	
		Maximum		3.0mA		
	LED turn off current	Minimum	$I_{Foff}$	0.4mA	$I_L=100\text{ mA}$	
		Typical		0.85mA		
LED dropout voltage	Typical	$V_F$	1.14 (1.25 V at $I_F=50\text{mA}$ )	$I_F=5\text{mA}$		
	Maximum		1.5V			
Output	On resistance #	Typical	$R_{on}$	9.8Ω	$I_F=5\text{mA}$ $I_L=100\text{ mA}$ Within 1 s on time	
		Maximum		12.5Ω		
	Output capacitance #	Typical	$C_{out}$	2.0pF	$I_F=0$ $V_B=0\text{ V}$ $f=1\text{ MHz}$	
		Maximum		2.5pF		
	Off state leakage current	Typical	$I_{Leak}$	0.01nA	$I_F=0$ $V_L=Max.$	
		Maximum		10nA		
Transfer characteristics	Switching speed	Turn on time*	$T_{on}$	0.04ms	$I_F=5\text{mA}$ $V_L=10\text{V}$ $R_L=100\Omega$	
				Maximum		0.5ms
		Turn off time*	$T_{off}$	0.06ms		$I_F=5\text{mA}$ $V_L=10\text{V}$ $R_L=100\Omega$
				Maximum		
	I/O capacitance	Typical	$C_{iso}$	0.8pF	$f=1\text{MHz}$ $V_B=0$	
		Maximum		1.5pF		
	Initial I/O isolation resistance	Minimum	$R_{iso}$	1,000MΩ	500V DC	

\*Turn on/Turn off time



# Other types of products than the  $C_{out}$  (typ. 2.0pF) and  $R_{on}$  (A connection typ. 9.8 ohm) 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 441.

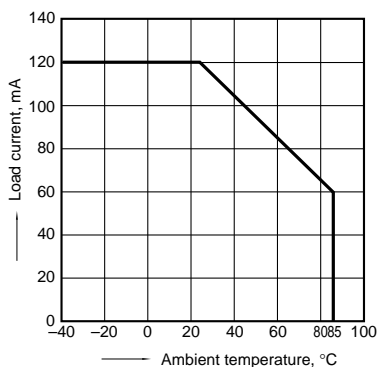
■ For Schematic and Wiring Diagrams, see Page 444.

■ For Cautions for Use, see Page 449.

## REFERENCE DATA

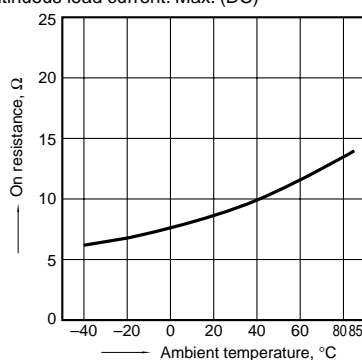
1. Load current vs. ambient temperature characteristics

Allowable ambient temperature: -40°C to +85°C  
-40°F to +185°F



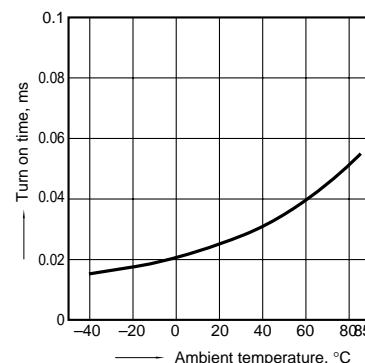
2. On resistance vs. ambient temperature characteristics

Measured portion: between terminals 3 and 4  
LED current: 5 mA; Load voltage: Max. (DC);  
Continuous load current: Max. (DC)



3. Turn on time vs. ambient temperature characteristics

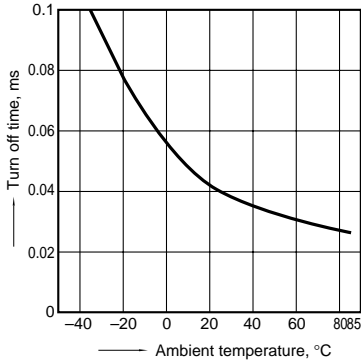
LED current: 5 mA; Load voltage: Max. (DC);  
Continuous load current: Max. (DC)



# AQY221N1S

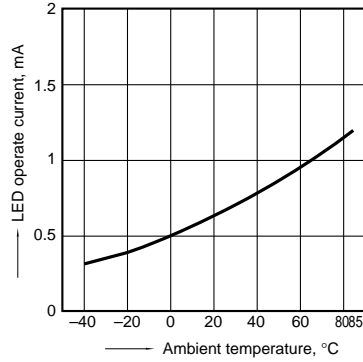
4. Turn off time vs. ambient temperature characteristics

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



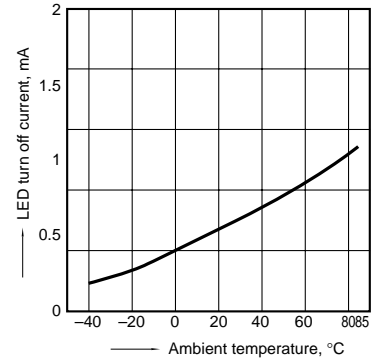
5. LED operate current vs. ambient temperature characteristics

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



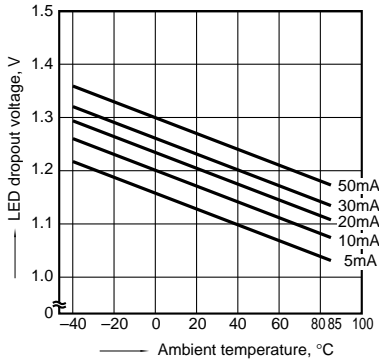
6. LED turn off current vs. ambient temperature characteristics

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



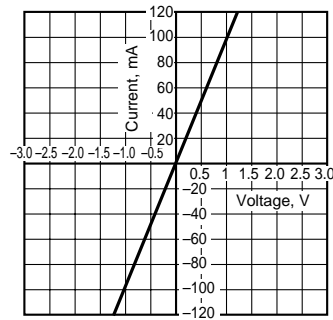
7. LED dropout voltage vs. ambient temperature characteristics

LED current: 5 to 50 mA



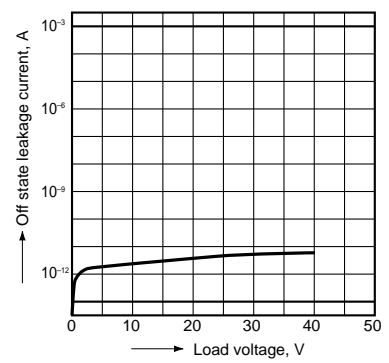
8. Voltage vs. current characteristics of output at MOS portion

Measured portion: between terminals 3 and 4  
Ambient temperature: 25°C 77°F



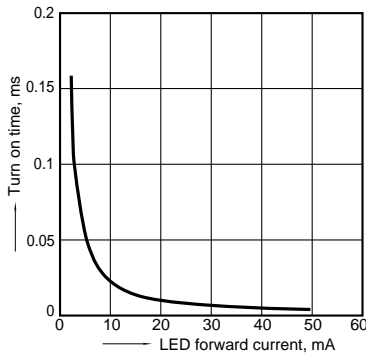
9. Off state leakage current

Measured portion: between terminals 3 and 4  
Ambient temperature: 25°C 77°F



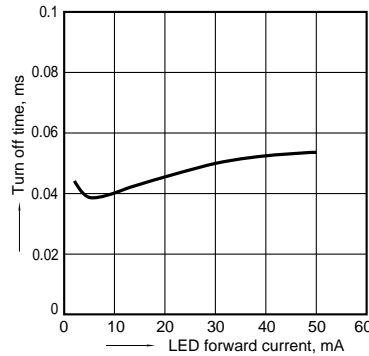
10. LED forward current vs. turn on time characteristics

Measured portion: between terminals 3 and 4  
Load voltage: Max. (DC); Continuous load current: Max. (DC); Ambient temperature: 25°C 77°F



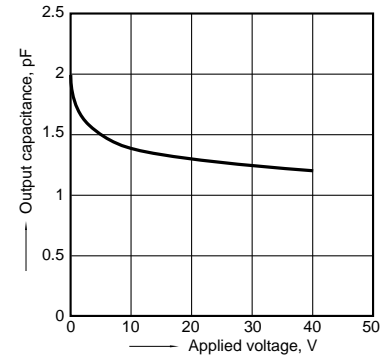
11. LED forward current vs. turn off time characteristics

Measured portion: between terminals 3 and 4  
Load voltage: Max. (DC); Continuous load current: Max. (DC); Ambient temperature: 25°C 77°F



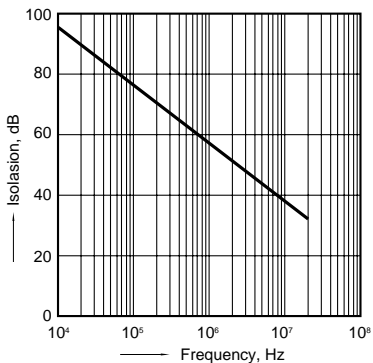
12. Applied voltage vs. output capacitance characteristics

Measured portion: between terminals 3 and 4  
Frequency: 1 MHz, 30m Vrms;  
Ambient temperature: 25°C 77°F



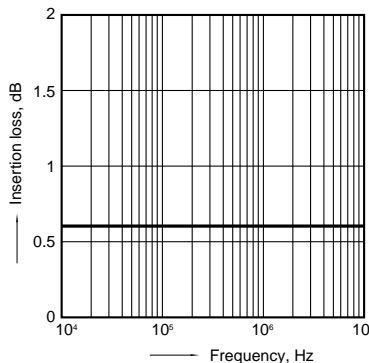
13. Isolation characteristics (50Ω impedance)

Measured portion: between terminals 3 and 4  
Ambient temperature: 25°C 77°F



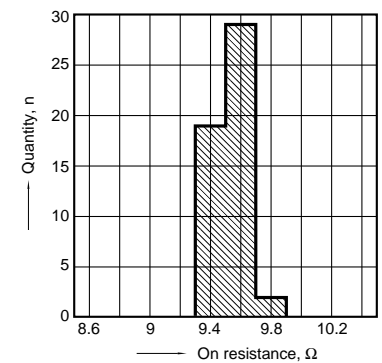
14. Insertion loss characteristics (50Ω impedance)

Measured portion: between terminals 3 and 4  
Ambient temperature: 25°C 77°F



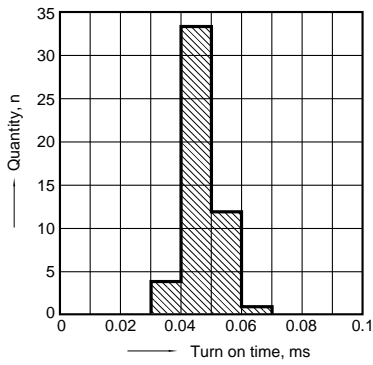
15. On resistance distribution

Measured portion: between terminals 3 and 4  
Continuous load current: 120mA(DC)  
Quantity, n=50; Ambient temperature: 25°C 77°F



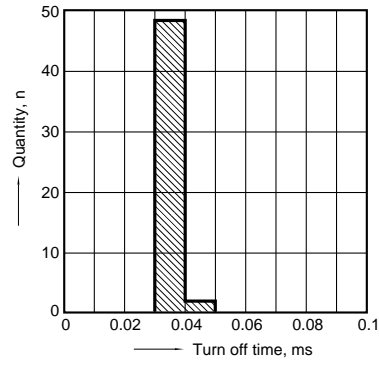
## 16. Turn on time distribution

Load voltage: 40V(DC)  
 Continuous load current: 120mA(DC)  
 Quantity, n=50; Ambient temperature: 25°C 77°F



## 17. Turn off time distribution

Load voltage: 40V(DC)  
 Continuous load current: 120mA(DC)  
 Quantity, n=50; Ambient temperature: 25°C 77°F



## 18. LED operate current distribution

Load voltage: 40V(DC)  
 Continuous load current: 120mA(DC)  
 Quantity, n=50; Ambient temperature: 25°C 77°F

