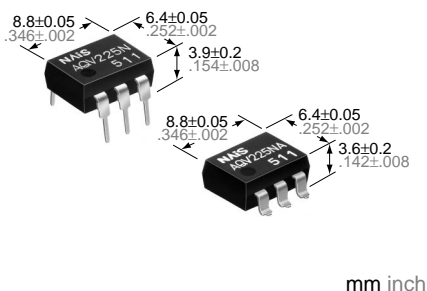


# NAIS

## RF (Radio Frequency) Type [1-Channel (Form A) Type] —Low On resistance—

# PhotoMOS RELAYS



## FEATURES

**1. PhotoMOS relay with high response speed, low leakage current and low On resistance**

**2. Low capacitance between output terminals ensures high response speed:**

The capacitance between output terminals is small, typically 10 pF. This enables for a fast operation speed of 200  $\mu$ s.

**3. High sensitivity and low On resistance**

Maximum 0.3 A of load current can be controlled with input current of 5 mA. The 10  $\Omega$  (AQV225N) On resistance is less than our conventional models. With no metallic contacts, the PhotoMOS relay has stable switching characteristics.

**4. Low-level off state leakage current**

The SSR has an off state leakage current of several milliamperes, whereas the PhotoMOS relay has only 30 pA even with the rated load voltage of 80 V (AQV225N).

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

PhotoMOS relay features extremely low closed-circuit offset voltages to enable control of small analog signals without distortion.

**6. Low terminals electromotive force (approx. 1  $\mu$ V)**

## TYPICAL APPLICATIONS

- Measuring devices
- Scanner, IC checker, Board tester

## 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	80 V	150 mA	AQV225N	AQV225NA	AQV225NAX	AQV225NAZ		
	200 V	70 mA	AQV227N	AQV227NA	AQV227NAX	AQV227NAZ		
	400 V	50 mA	AQV224N	AQV224NA	AQV224NAX	AQV224NAZ		

\*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)

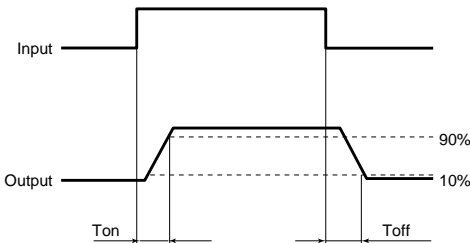
Item		Symbol	Type of connection	AQV225N(A)	AQV227N(A)	AQV224N(A)	Remarks	
Input	LED forward current	$I_F$		50 mA				
	LED reverse voltage	$V_R$		3 V				
	Peak forward current	$I_{FP}$		1 A				
	Power dissipation	$P_{in}$		75 mW				
Output	Load voltage (peak AC)	$V_L$		80 V	200 V	400 V		
	Continuous load current	$I_L$		A	0.15 A	0.07 A		0.05 A
				B	0.20 A	0.08 A		0.06 A
				C	0.30 A	0.10 A		0.08 A
	Peak load current	$I_{peak}$			0.45 A	0.21 A		0.15 A
Power dissipation	$P_{out}$		360 mW					
Total power dissipation		$P_T$		410 mW				
I/O isolation voltage		$V_{iso}$		1,500 V AC				
Temperature limits	Operating	$T_{opr}$		-40°C to +85°C -40°F to +185°F			Non-condensing at low temperatures	
	Storage	$T_{stg}$		-40°C to +100°C -40°F to +212°F				

# AQV220N

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

Item		Symbol	Type of connection	AQV225N(A)	AQV227N(A)	AQV224N(A)	Remarks	
Input	LED operate current	Typical	I <sub>Fon</sub>	0.90 mA			I <sub>L</sub> = Max.	
		Maximum		3.0 mA				
	LED turn off current	Minimum	I <sub>Foff</sub>	0.4 mA			I <sub>L</sub> = Max.	
		Typical		0.85 mA				
	LED dropout voltage	Typical	V <sub>F</sub>	1.14 V (1.25 V 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	7.0 Ω	30 Ω	70 Ω	I <sub>F</sub> = 5 mA I <sub>L</sub> = Max. Within 1 s on time
		Maximum		10 Ω	50 Ω	100 Ω		
		Typical	R <sub>on</sub>	B	3.5 Ω	16 Ω	55 Ω	
		Maximum		5 Ω	25 Ω	70 Ω		
	On resistance	Typical	R <sub>on</sub>	C	1.8 Ω	8 Ω	28 Ω	I <sub>F</sub> = 5 mA I <sub>L</sub> = Max. Within 1 s on time
		Maximum		2.5 Ω	12.5 Ω	35 Ω		
	Output capacitance	Typical	C <sub>out</sub>	—	10 pF			I <sub>F</sub> = 0 V <sub>B</sub> = 0 f = 1 MHz
		Maximum			15 pF			
	Off state leakage current	Typical	I <sub>Leak</sub>	—	30 pA	30 pA	90 pA	I <sub>F</sub> = 0 V <sub>L</sub> = Max.
		Maximum			10 nA			
Transfer characteristics	Switching speed	Turn on time*	T <sub>on</sub>	—	0.20 ms			I <sub>F</sub> = 5 mA I <sub>L</sub> = Max.
					Maximum	0.5 ms		
		Turn off time*	T <sub>off</sub>	—	0.08 ms			I <sub>F</sub> = 5 mA I <sub>L</sub> = Max.
					Maximum	0.2 ms		
	I/O capacitance	Typical	C <sub>iso</sub>	—	0.8 pF			f = 1 MHz V <sub>B</sub> = 0
		Maximum			1.5 pF			
Initial I/O isolation resistance	Minimum	R <sub>iso</sub>	—	1,000 MΩ			500 V DC	

Note: Recommendable LED forward current I<sub>F</sub> = 5mA  
\*Turn on/Turn off time



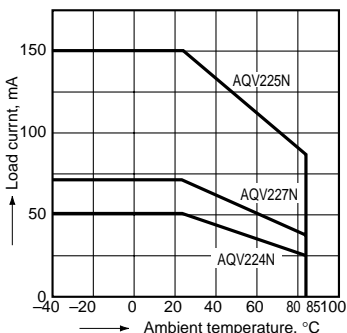
- For Dimensions, see Page 441.
- For Schematic and Wiring Diagrams, see Page 444.
- For Cautions for Use, see Page 449.

## REFERENCE DATA

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

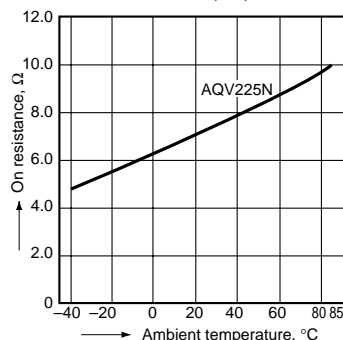
Allowable ambient temperature: -40°C to +85°C  
-40°F to +185°F

Type of connection: A



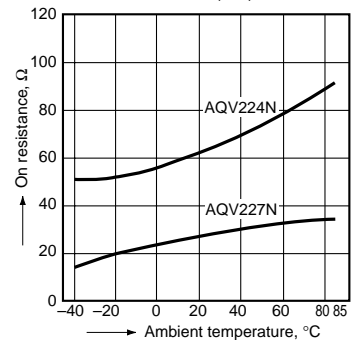
### 2.-(1) On resistance vs. ambient temperature characteristics

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



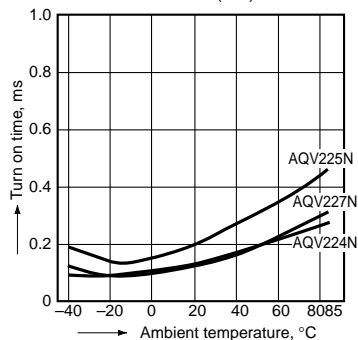
### 2.-(2) On resistance vs. ambient temperature characteristics

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



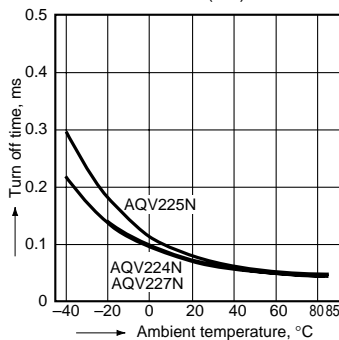
**3. Turn on time vs. ambient temperature characteristics**

Sample: AQV225N, AQV227N, AQV224N;  
LED current: 5 mA; Load voltage: Max. (DC);  
Continuous load current: Max. (DC)



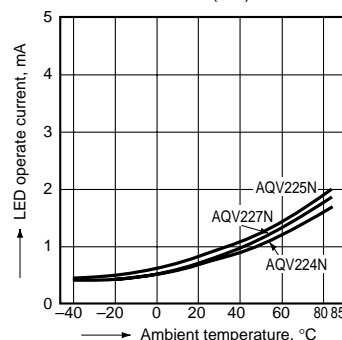
**4. Turn off time vs. ambient temperature characteristics**

Sample: AQV225N, AQV227N, AQV224N;  
LED current: 5 mA; Load voltage: Max. (DC);  
Continuous load current: Max. (DC)



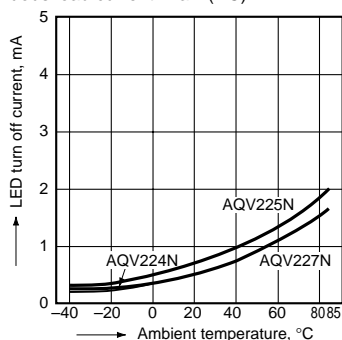
**5. LED operate current vs. ambient temperature characteristics**

Sample: AQV225N, AQV227N, AQV224N;  
Load voltage: Max. (DC);  
Continuous load current: Max. (DC)



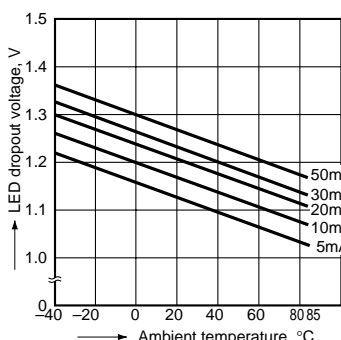
**6. LED turn off current vs. ambient temperature characteristics**

Sample: AQV225N, AQV227N, AQV224N;  
Load voltage: Max. (DC);  
Continuous load current: Max. (DC)



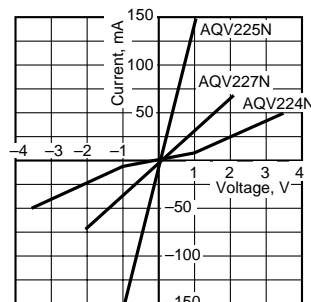
**7. LED dropout voltage vs. ambient temperature characteristics**

Sample: All types;  
LED current: 5 to 50 mA



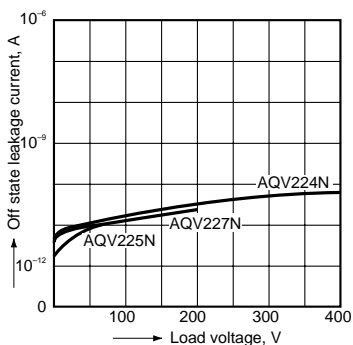
**8. Voltage vs. current characteristics of output at MOS portion**

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



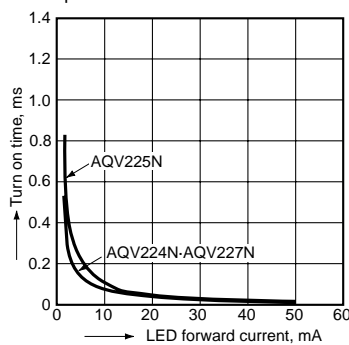
**9. Off state leakage current**

Sample: AQV225N, AQV227N, AQV224N;  
Measured portion: between terminals 4 and 6;  
Ambient temperature: 25°C 77°F



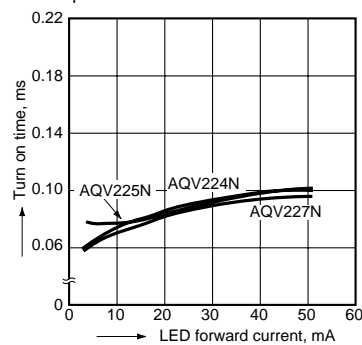
**10. LED forward current vs. turn on time characteristics**

Sample: AQV225N, AQV227N, AQV224N;  
Measured portion: between terminals 4 and 6;  
Load voltage: Max. (DC);  
Continuous load current: Max. (DC);  
Ambient temperature: 25°C 77°F



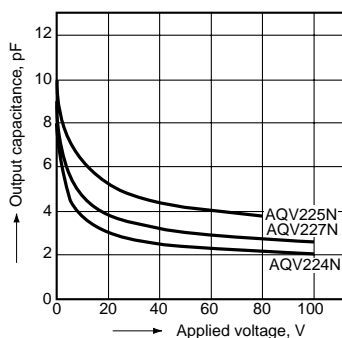
**11. LED forward current vs. turn off time characteristics**

Sample: AQV225N, AQV227N, AQV224N;  
Measured portion: between terminals 4 and 6;  
Load voltage: Max. (DC);  
Continuous load current: Max. (DC);  
Ambient temperature: 25°C 77°F



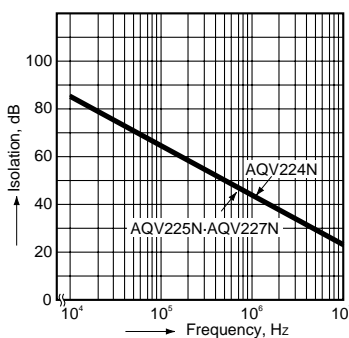
**12. Applied voltage vs. output capacitance characteristics**

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

