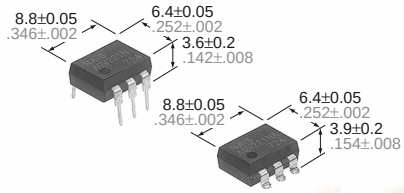
BSI pending

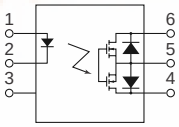
NAiS

# 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**

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* | | 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 |
| | | | | | Picked from the 1/2/3-pin side | Picked from the 4/5/6-pin side | | |
| AC/DC type | 40 V | 150 mA | AQV221N | AQV221NA | AQV221NAX | 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 | $I_F$ | | 50 mA | |
| | LED reverse voltage | $V_R$ | | 3 V | |
| | Peak forward current | $I_{FP}$ | | 1 A | f = 100 Hz, Duty factor = 0.1% |
| | Power dissipation | $P_{in}$ | | 75 mW | |
| Output | Load voltage (peak AC) | $V_L$ | | 40 V | |
| | Continuous load current | $I_L$ | A | 0.15 A | A connection: Peak AC, DC<br>B, C connection: DC |
| | | | B | 0.18 A | |
| | | | C | 0.25 A | |
| | Peak load current | $I_{peak}$ | | 0.45 A | 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 | |
| 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 | |

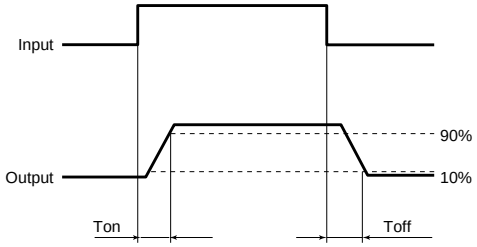
# AQV221N

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

Note: Recommendable LED forward current $I_F$ = 5mA
*Turn on/Turn off time

**For type of connection, see Page 31.




# Other types of products than the $C_{out}$ (typ. 3.9pF) and $R_{on}$ (A connection typ. 9.8Ω) 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.

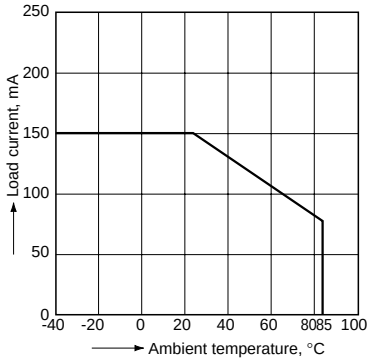

**■ For Dimensions, see Page 27.**
**■ For Schematic and Wiring Diagrams, see Page 31.**
**■ For Cautions for Use, see Page 36.**


## REFERENCE DATA

1. Load current vs. ambient temperature characteristics

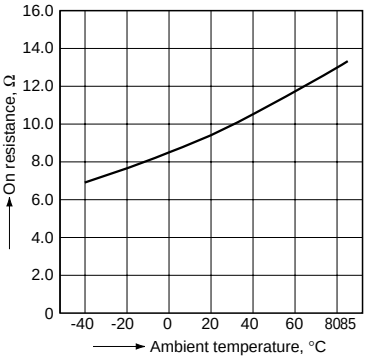
Allowable ambient temperature: –40°C to +85°C
–40°F to +185°F

Type of connection: A



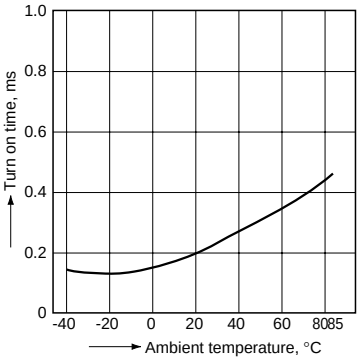

2. On resistance vs. ambient temperature characteristics

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



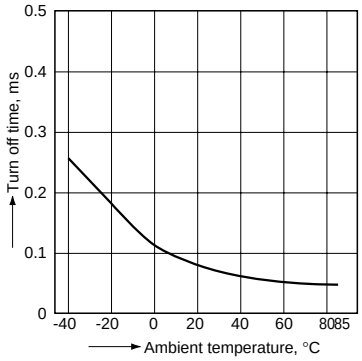

3. Turn on time vs. ambient temperature characteristics

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



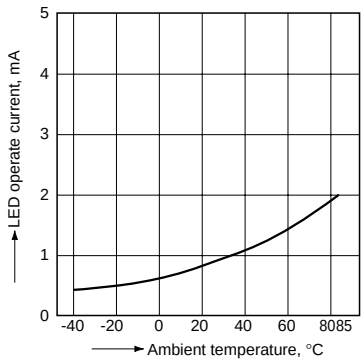
4. Turn off time vs. ambient temperature characteristics

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



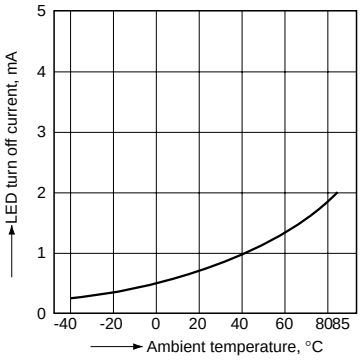

5. LED operate current vs. ambient temperature characteristics

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



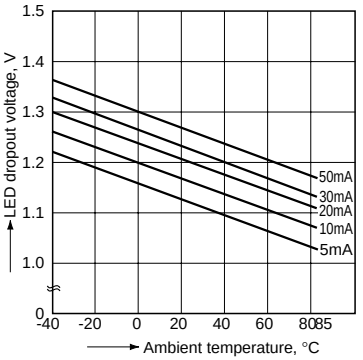

6. LED turn off current vs. ambient temperature characteristics

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



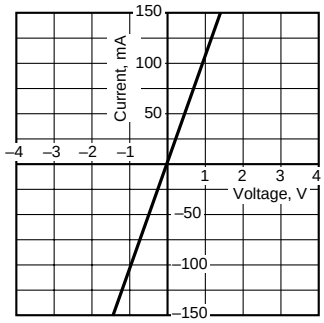

7. LED dropout voltage vs. ambient temperature characteristics

LED current: 5 to 50 mA



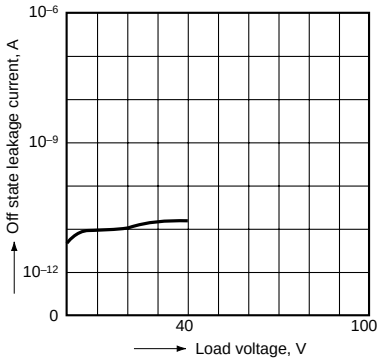

8. Voltage vs. current characteristics of output at MOS portion

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



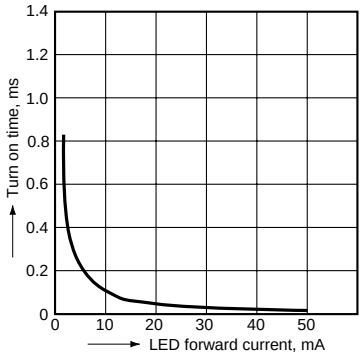

9. Off state leakage current

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



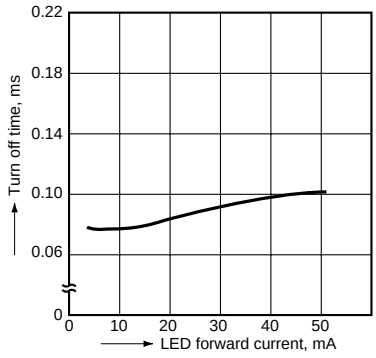

10. LED forward current vs. turn on time characteristics

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



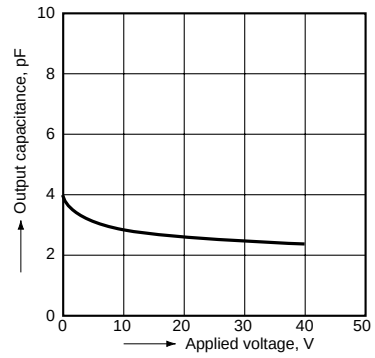

11. LED forward current vs. turn off time characteristics

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



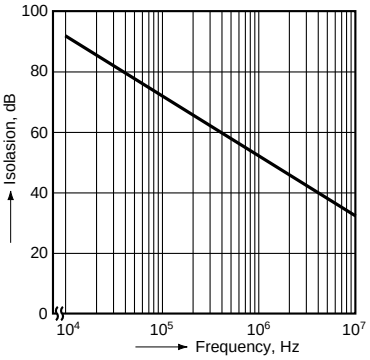

12. Applied voltage vs. output capacitance characteristics

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



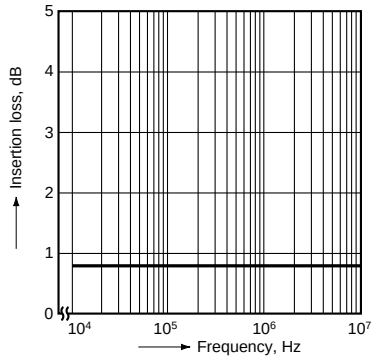

13. Isolation characteristics (50 Ω impedance)

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



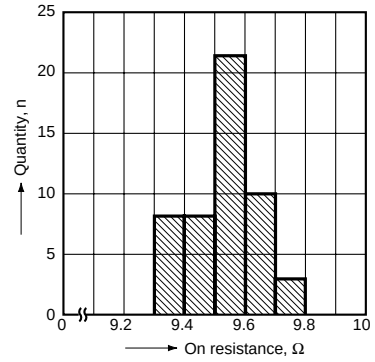

14. Insertion loss characteristics (50 Ω impedance)

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



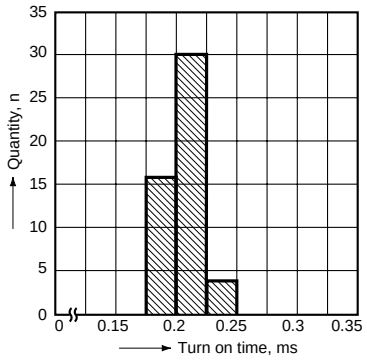

15. On resistance distribution

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



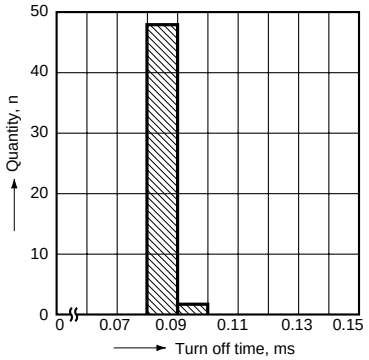
16. Turn on time distribution

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