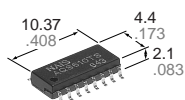


NAIS

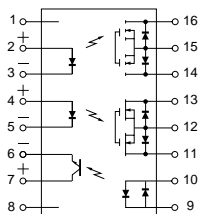
GU (General Use) Type SOP Series Multi-function (1a1b MOSFET & optocoupler) 16 Pin Type

PhotoMOS RELAYS

1a1b MOSFET Relay and
1 optocoupler type



mm inch



Relay portion
(2,3,14,15,16 pins)
(4,5,11,12,13 pins)
Detector portion
(6,7,9,10 pins)

FEATURES

1. SO package 16-Pin type in super miniature design

The device comes in a super-miniature SO package 16-Pin type measuring (W)4.4 × (L)10.37 × (H) 2.1mm (W).173 × (L).408 × (H).083inch

2. Ideal for PC card and Fax/Modem applications

The small size provides additional space for increased functionality. The new device has been specifically designed for the PCMCIA embedded and handheld device markets.

3. Tape and reel

The device comes standard in a tape and reel (1,000 pcs./reel) to facilitate automatic insertion machines.

TYPICAL APPLICATIONS

- PCMCIA Modem card (Data/fax modem)
- Laptop and notebook computers
- PDA's
- Mobile computing equipment
- Medical equipment
- Security systems
- Meters (Water, Gas, Vending machine)

TYPES

| 1 optocoupler type | Output rating* | | Part No. | | Packing quantity in tape and reel |
|--------------------|----------------|--------------|--|---|-----------------------------------|
| | Load voltage | Load current | Picked from the 1/2/3/4/5/6/7/8-pin side | Picked from the 9/10/11/12/13/14/15/16-pin side | |
| AC/DC type | 350 V | 100 mA | AQS610TSX | AQS610TSZ | 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: 50 pcs.; Case: 1,000 pcs.)

(2) 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)

1) Relay portion (2, 3, 14, 15, 16 and 4, 5, 11, 12, 13 pins)

| Item | | Symbol | AQS610TS | 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 | V_L | 350 V | |
| | Continuous load current | I_L | 0.1 A (0.12 A) | () : in case of using only 1 channel |
| | Peak load current | I_{peak} | 0.36 A | 100 ms (1 shot), $V_L = DC$ |
| | Power dissipation | P_{out} | 600 mW | |

2) Detector portion (6, 7, 9, 10 pins)

| Item | | Symbol | AQS610TS | Remarks |
|--------|----------------------|------------|----------|--------------------------------|
| Input | LED forward current | I_F | 50 mA | |
| | Peak forward current | I_{FP} | 1 A | f = 100 Hz, Duty factor = 0.1% |
| | Power dissipation | P_{in} | 75 mW | |
| Output | Output voltage | BV_{CEC} | 30 V | |
| | Power dissipation | P_{out} | 150 mW | |

3) Others

| Item | | Symbol | AQS610TS | Remarks |
|-------------------------|-----------|-----------|---------------------------------|------------------------------------|
| Total power dissipation | | P_T | 650 mW | |
| I/O isolation voltage | | V_{iso} | 1500 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 | |

AQS610TS

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

1) Relay portion (2, 3, 14, 15, 16 and 4, 5, 11, 12, 13 pins)

| Item | | Symbol | AQS610TS | Condition |
|--------------------------|---------------------------|---------------------------------------|--------------------------------|---|
| Input | LED operate current | Typical | 0.9 mA | $I_L = \text{Max.}$ |
| | | Maximum | 3 mA | |
| | LED reverse current | Minimum | 0.4 mA | $I_L = \text{Max.}$ |
| | | Typical | 0.8 mA | |
| LED dropout voltage | Typical | 1.14 (1.25 V at $I_F = 50\text{mA}$) | | $I_F = 5\text{mA}$ |
| | Maximum | 1.5 V | | |
| Output | On resistance | Typical | 18Ω | $I_F = 5\text{ mA (N.O.)}, I_F = 0\text{ mA (N.C.)}$ $I_L = \text{Max.}$ Within 1 s on time |
| | | Maximum | 25Ω | |
| | Off state leakage current | Maximum | I_{Leak} | |
| Transfer characteristics | Operate time* | Typical | 0.23 ms (N.O.), 0.52 ms (N.C.) | |
| | | Maximum | 1.0 ms | |
| | Reverse time* | Typical | 0.04 ms (N.O.), 0.23 ms (N.C.) | |
| | | Maximum | 1.0 ms | |

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

2) Detector portion (6, 7, 9, 10 pins)

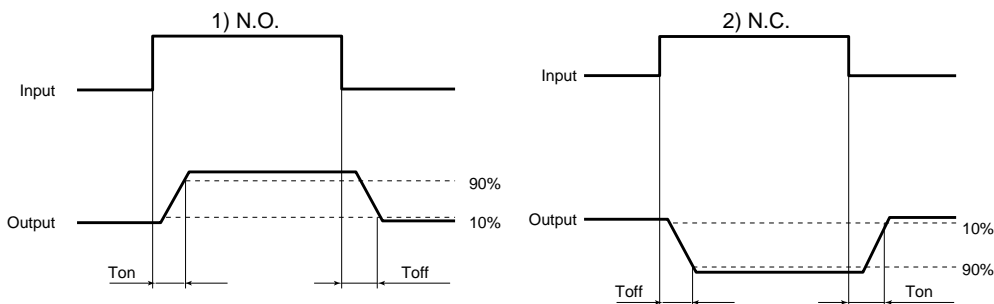
| Item | | Symbol | AQS610TS | Condition |
|--------------------------|---------------------------|--|-----------|---|
| Input | LED operate current | Typical | 2 mA | $I_C = 2\text{ mA}$ $V_{CE} = 0.5\text{ V}$ |
| | | Maximum | 6 mA | |
| | LED turn off current | Minimum | 5μA | $I_C = 1\mu\text{A}$ $V_{CE} = 5\text{ V}$ |
| | | Typical | 35μA | |
| LED dropout voltage | Typical | 1.14 (1.25 V at $I_F = 50\text{ mA}$) | | $I_F = 5\text{ mA}$ |
| | Maximum | 1.5 V | | |
| Output | Saturation voltage | Typical | 0.08 V | $I_F = 15\text{ mA}$ $I_C = 2\text{ mA}$ |
| | | Maximum | 0.5 V | |
| | Off state leakage current | Typical | 0.01 nA | $I_F = 0$ $V_{CE} = 5\text{ V}$ |
| | | Maximum | 500 nA | |
| | Current transfer ratio | Minimum | 33% | $I_F = 5\text{ mA}$ $V_{CE} = 0.5\text{ V}$ |
| Typical | | 100% | | |
| Transfer characteristics | Turn on time* | Typical | T_{on} | $I_F = 5\text{ mA}$ $V_{CE} = 5\text{ V}$ $I_C = 2\text{ mA}$ |
| | Turn off time* | Typical | T_{off} | $I_F = 5\text{ mA}$ $V_{CE} = 5\text{ V}$ $I_C = 2\text{ mA}$ |

3) Others

| Item | | Symbol | AQS610TS | Condition |
|--------------------------|----------------------------------|---------|-----------|---------------------------------|
| Transfer characteristics | I/O capacitance | Typical | 0.8pF | $f = 1\text{ MHz}$ $V_B = 0$ |
| | | Maximum | 1.5pF | |
| | Initial I/O isolation resistance | Minimum | R_{iso} | 1,000MΩ |

*Operate/Reverse time

For type of connection, see page 34.

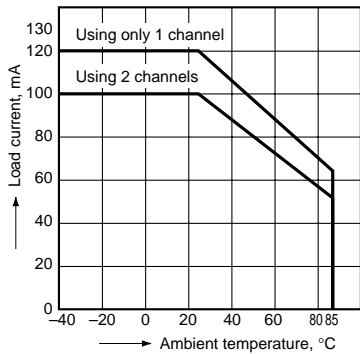


REFERENCE DATA

[1] Relay portion (2, 3, 14, 15, 16 and 4, 5, 11, 12, 13 pins)

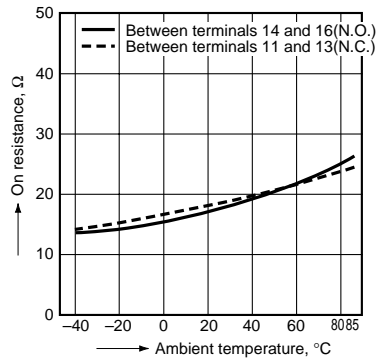
1. Load current vs. ambient temperature characteristics

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



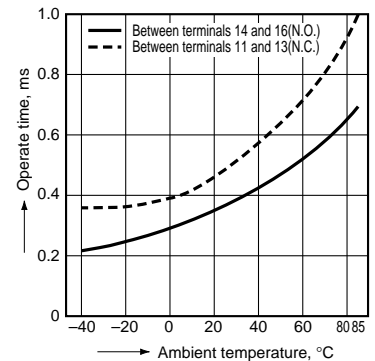
2. On resistance vs. ambient temperature characteristics

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



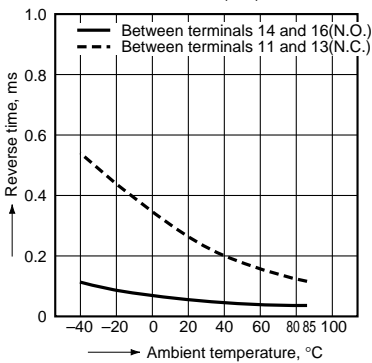
3. Operate time vs. ambient temperature characteristics

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



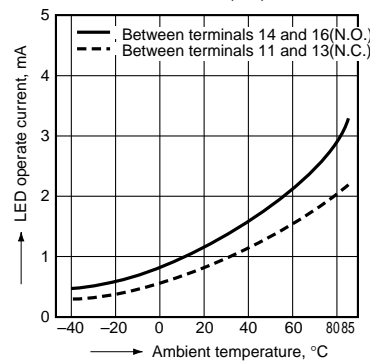
4. Reverse time vs. ambient temperature characteristics

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



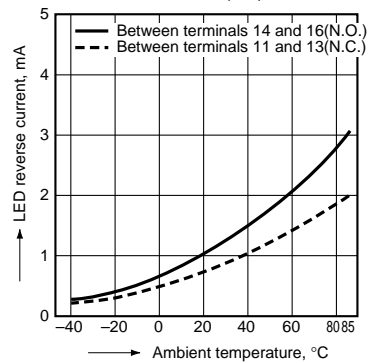
5. LED operate current vs. ambient temperature characteristics

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



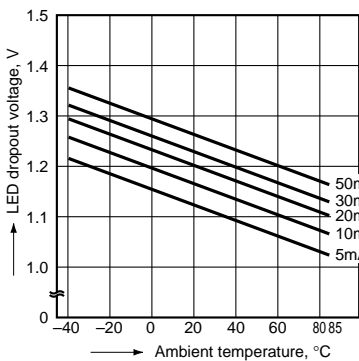
6. LED reverse current vs. ambient temperature characteristics

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



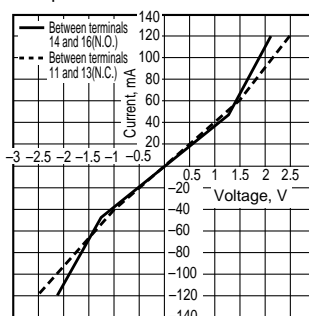
7. LED dropout voltage vs. ambient temperature characteristics

LED current: 5 to 50 mA



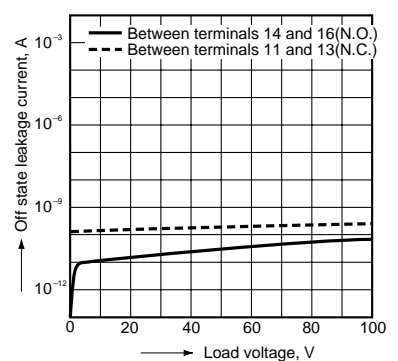
8. Voltage vs. current characteristics of output at MOS portion

Ambient temperature: 25°C 77°F



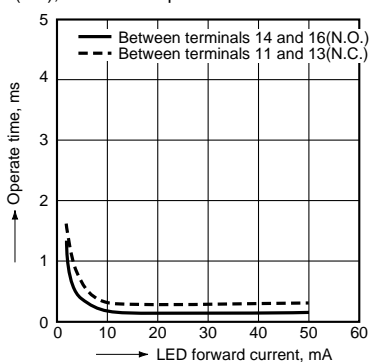
9. Off state leakage current

Ambient temperature: 25°C 77°F



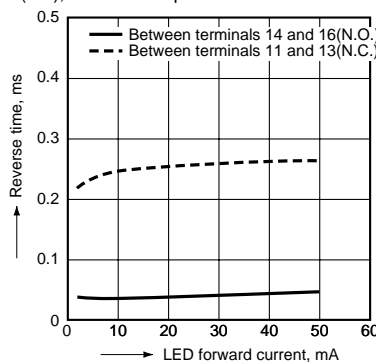
10. LED forward current vs. operate time characteristics

Load voltage: Max. (DC); Continuous load current: Max. (DC); Ambient temperature: 25°C 77°F



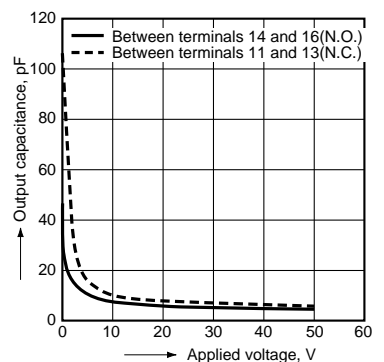
11. LED forward current vs. reverse time characteristics

Load voltage: Max. (DC); Continuous load current: Max. (DC); Ambient temperature: 25°C 77°F



12. Applied voltage vs. output capacitance characteristics

Frequency: 1 MHz; Ambient temperature: 25°C 77°F

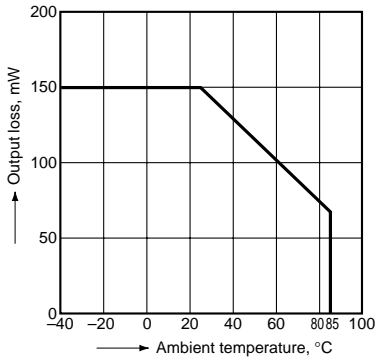


AQS610TS

[2] Detector portion (6, 7, 9, 10 pins)

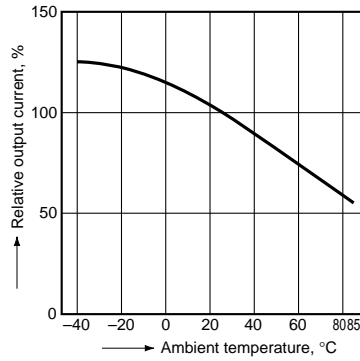
1. Output loss vs. ambient temperature characteristics

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



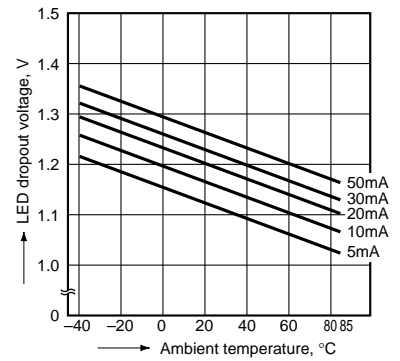
2. Relative output current vs. ambient temperature characteristics

Measured portion: between terminals 6 and 7
 $I_F = 5\text{ mA}$, $V_{CE} = 0.5\text{ V DC}$



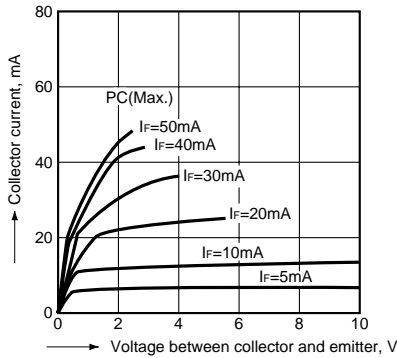
3. LED dropout voltage vs. ambient temperature characteristics

LED current: 5 to 50 mA



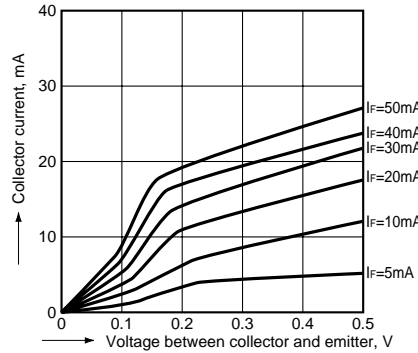
4-1. Collector current vs. voltage between collector and emitter characteristics (I_C - V_{CE})

Measured portion: between terminals 6 and 7
 Ambient temperature: 25°C 77°F



4-2. Collector current vs. voltage between collector and emitter characteristics (I_C - V_{CE})

Measured portion: between terminals 6 and 7
 Ambient temperature: 25°C 77°F



5. Off state leakage current

Measured portion: between terminals 6 and 7
 $I_F = 0\text{ mA}$
 $T_a = 25^{\circ}\text{C}$ 77°F

