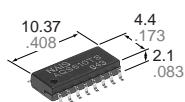


# NAIS

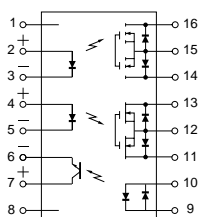
## GU (General Use) Type SOP Series Multi-function (1a1b MOSFET & optocoupler) 16 Pin Type

# 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	1μA	$I_F = 0\text{ mA (N.O.)}, I_F = 5\text{ mA (N.C.)}$ $V_L = \text{Max.}$	
Transfer characteristics	Operate time*	Typical	0.23 ms (N.O.), 0.52 ms (N.C.)		$I_F = 0\text{ mA} \rightarrow 5\text{ mA}$ $I_L = \text{Max.}$
		Maximum	1.0 ms		
	Reverse time*	Typical	0.04 ms (N.O.), 0.23 ms (N.C.)		$I_F = 5\text{ mA} \rightarrow 0\text{ mA}$ $I_L = \text{Max.}$
		Maximum	1.0 ms		

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

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

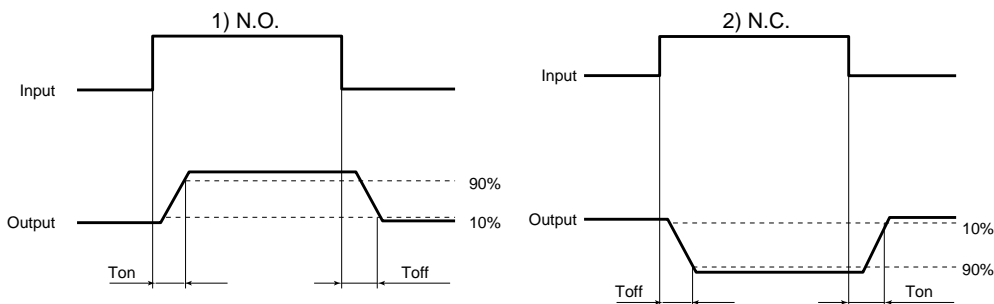
Item		Symbol	AQS610TS	Condition
Input	LED operate current	Typical	2 mA	$I_C = 2\text{ mA}$ $V_{CE} = 0.5\text{ V}$
		Maximum	6 mA	
	LED turn off current	Minimum	5μA	$I_C = 1\mu\text{A}$ $V_{CE} = 5\text{ V}$
		Typical	35μA	
LED dropout voltage	Typical	1.14 (1.25 V at $I_F = 50\text{ mA}$ )		$I_F = 5\text{ mA}$
	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	1,000MΩ	500V DC

\*Operate/Reverse time

For type of connection, see page 34.



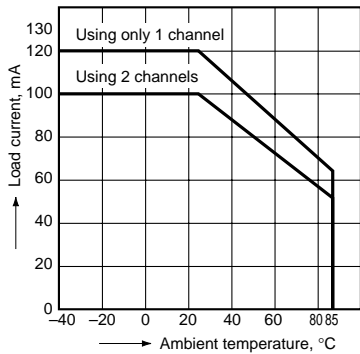
- For Dimensions, see Page 28.
- For Schematic and Wiring Diagrams, see Page 34.
- For Cautions for Use, see Page 36.

## REFERENCE DATA

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

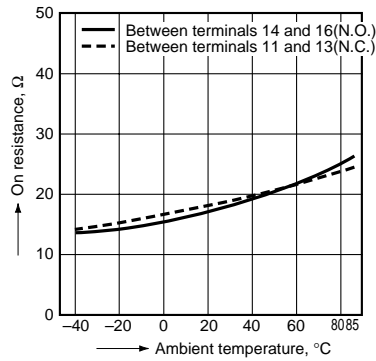
1. Load current vs. ambient temperature characteristics

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



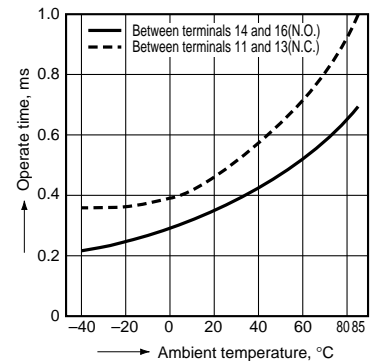
2. On resistance vs. ambient temperature characteristics

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



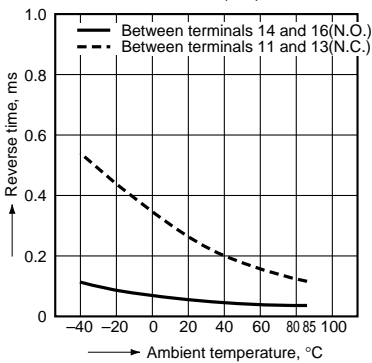
3. Operate time vs. ambient temperature characteristics

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



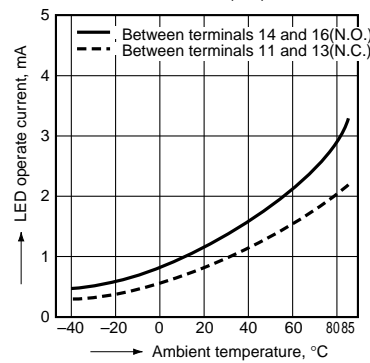
4. Reverse time vs. ambient temperature characteristics

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



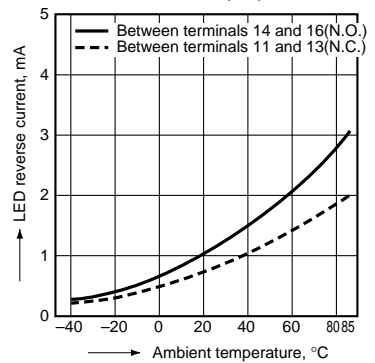
5. LED operate current vs. ambient temperature characteristics

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



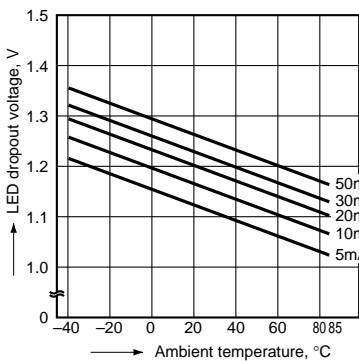
6. LED reverse current vs. ambient temperature characteristics

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



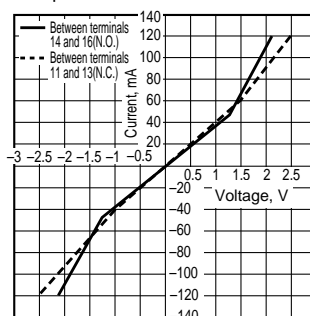
7. LED dropout voltage vs. ambient temperature characteristics

LED current: 5 to 50 mA



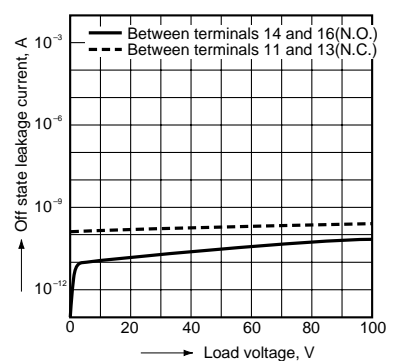
8. Voltage vs. current characteristics of output at MOS portion

Ambient temperature:  $25^{\circ}\text{C}$   $77^{\circ}\text{F}$



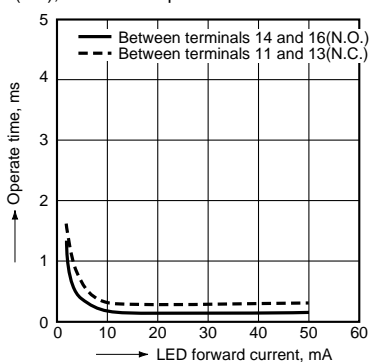
9. Off state leakage current

Ambient temperature:  $25^{\circ}\text{C}$   $77^{\circ}\text{F}$



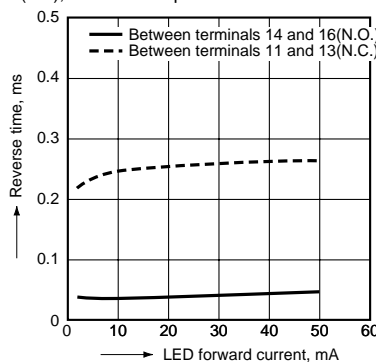
10. LED forward current vs. operate time characteristics

Load voltage: Max. (DC); Continuous load current: Max. (DC); Ambient temperature:  $25^{\circ}\text{C}$   $77^{\circ}\text{F}$



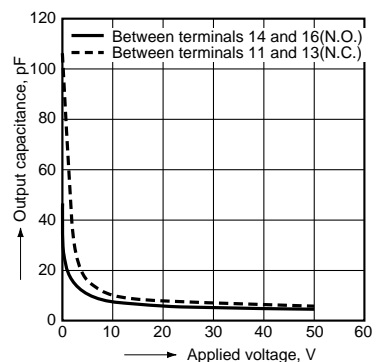
11. LED forward current vs. reverse time characteristics

Load voltage: Max. (DC); Continuous load current: Max. (DC); Ambient temperature:  $25^{\circ}\text{C}$   $77^{\circ}\text{F}$



12. Applied voltage vs. output capacitance characteristics

Frequency: 1 MHz; Ambient temperature:  $25^{\circ}\text{C}$   $77^{\circ}\text{F}$

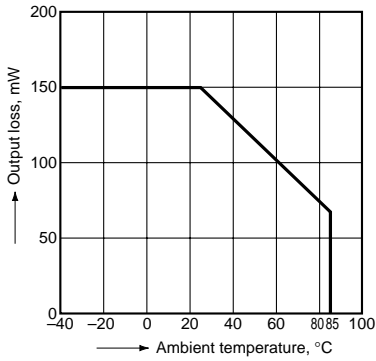


# AQS610TS

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

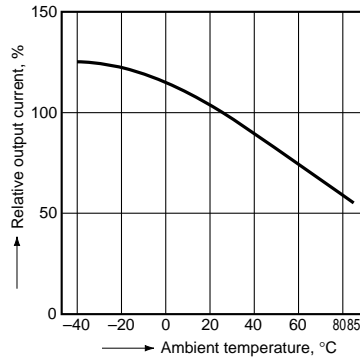
1. Output loss vs. ambient temperature characteristics

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



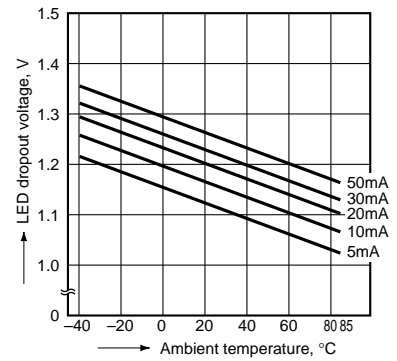
2. Relative output current vs. ambient temperature characteristics

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



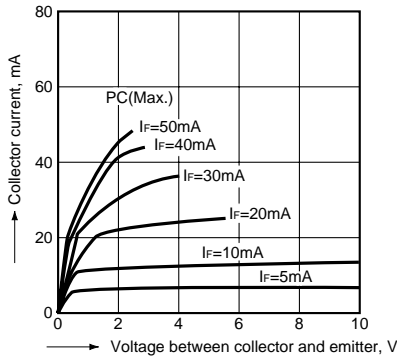
3. LED dropout voltage vs. ambient temperature characteristics

LED current: 5 to 50 mA



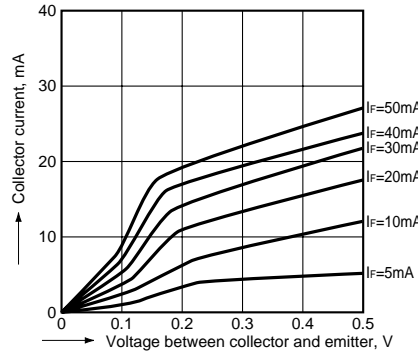
4-1. Collector current vs. voltage between collector and emitter characteristics ( $I_C$ - $V_{CE}$ )

Measured portion: between terminals 6 and 7  
 Ambient temperature:  $25^{\circ}\text{C}$   $77^{\circ}\text{F}$



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

Measured portion: between terminals 6 and 7  
 Ambient temperature:  $25^{\circ}\text{C}$   $77^{\circ}\text{F}$



5. Off state leakage current

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

