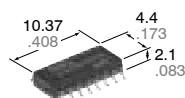


# NAIS

**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

## 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 x (L)10.37 x (H) 2.1mm (W).173 x (L).408 x (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 <sub>F</sub>	50 mA	
	LED reverse voltage	V <sub>R</sub>	3 V	
	Peak forward current	I <sub>FP</sub>	1 A	f = 100 Hz, Duty factor = 0.1%
	Power dissipation	P <sub>in</sub>	75 mW	
Output	Load voltage	V <sub>L</sub>	350 V	
	Continuous load current	I <sub>L</sub>	0.1 A (0.12 A)	( ) : in case of using only 1 channel
	Peak load current	I <sub>peak</sub>	0.36 A	100 ms (1 shot), V <sub>L</sub> = DC
	Power dissipation	P <sub>out</sub>	600 mW	

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

Item		Symbol	AQS610TS	Remarks
Input	LED forward current	I <sub>F</sub>	50 mA	
	Peak forward current	I <sub>FP</sub>	1 A	f = 100 Hz, Duty factor = 0.1%
	Power dissipation	P <sub>in</sub>	75 mW	
Output	Output voltage	BV <sub>CEC</sub>	30 V	
	Power dissipation	P <sub>out</sub>	150 mW	

3) Others

Item		Symbol	AQS610TS	Remarks
Total power dissipation		P <sub>T</sub>	650 mW	
I/O isolation voltage		V <sub>iso</sub>	1500 V 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	

# 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	$V_F$	1.14 (1.25 V at $I_F = 50 \text{ mA}$ )	$I_F = 5 \text{ mA}$	
	Maximum		1.5 V		
Output	On resistance	Typical	$R_{on}$	$I_F = 5 \text{ mA (N.O.)}, I_F = 0 \text{ mA (N.C.)}$ $I_L = \text{Max.}$ Within 1 s on time	
		Maximum			25Ω
	Off state leakage current	Maximum	$I_{Leak}$	1μA	$I_F = 0 \text{ mA (N.O.)}, I_F = 5 \text{ mA (N.C.)}$ $V_L = \text{Max.}$
Transfer characteristics	Operate time*	Typical	$T_{on}$	$I_F = 0 \text{ mA} \nabla 5 \text{ mA}$ $I_L = \text{Max.}$	
		Maximum			1.0 ms
	Reverse time*	Typical	$T_{off}$	0.04 ms (N.O.), 0.23 ms (N.C.)	$I_F = 5 \text{ mA} \nabla 0 \text{ mA}$ $I_L = \text{Max.}$
		Maximum		1.0 ms	

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

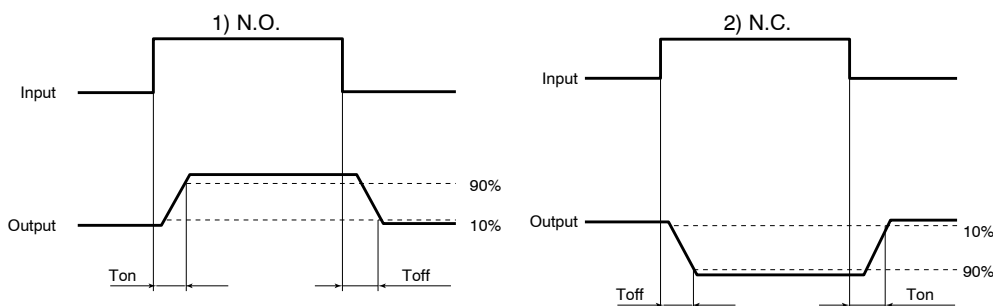
### 2) Detector portion (6, 7, 9, 10 pins)

Item		Symbol	AQS610TS	Condition	
Input	LED operate current	Typical	$I_{Fon}$	$I_C = 2 \text{ mA}$ $V_{CE} = 0.5 \text{ V}$	
		Maximum			6 mA
	LED turn off current	Minimum	$I_{Foff}$	5μA	$I_C = 1 \text{ mA}$ $V_{CE} = 5 \text{ V}$
		Typical		35μA	
LED dropout voltage	Typical	$V_F$	1.14 (1.25 V at $I_F = 50 \text{ mA}$ )	$I_F = 5 \text{ mA}$	
	Maximum		1.5 V		
Output	Saturation voltage	Typical	$V_{on}$	$I_F = 15 \text{ mA}$ $I_C = 2 \text{ mA}$	
		Maximum			0.5 V
	Off state leakage current	Typical	$I_{CEO}$	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	$C_{iso}$	$f = 1 \text{ MHz}$ $V_B = 0$
		Maximum		
	Initial I/O isolation resistance	Minimum	$R_{iso}$	1,000MΩ

\*Operate/Reverse time



■ For Dimensions, see Page 441.

■ For Schematic and Wiring Diagrams, see Page 447.

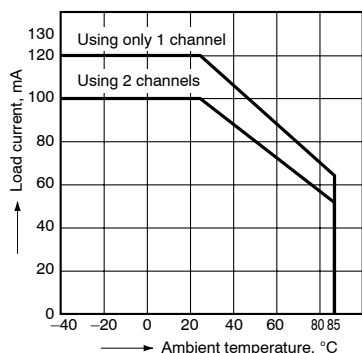
■ For Cautions for Use, see Page 449.

## REFERENCE DATA

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

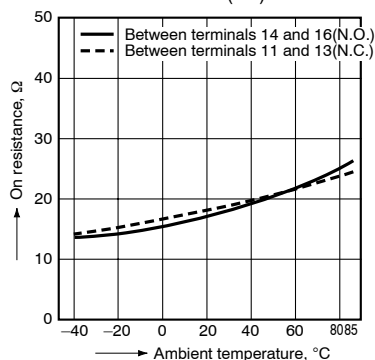
1. Load current vs. ambient temperature characteristics

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



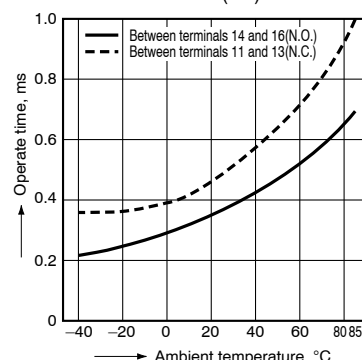
2. On resistance vs. ambient temperature characteristics

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



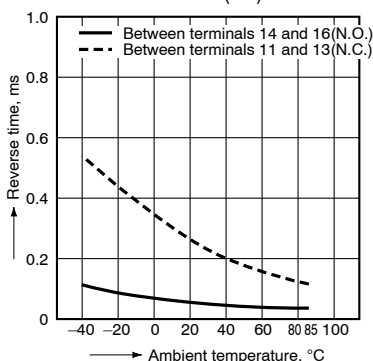
3. Operate time vs. ambient temperature characteristics

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



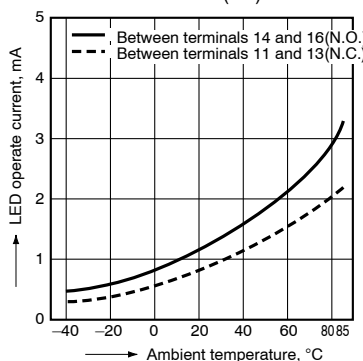
4. Reverse time vs. ambient temperature characteristics

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



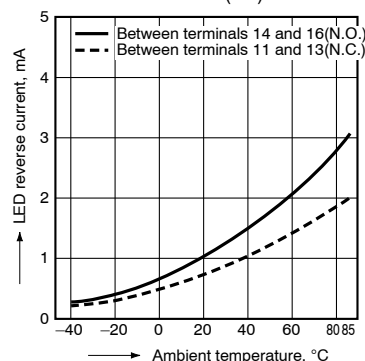
5. LED operate current vs. ambient temperature characteristics

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



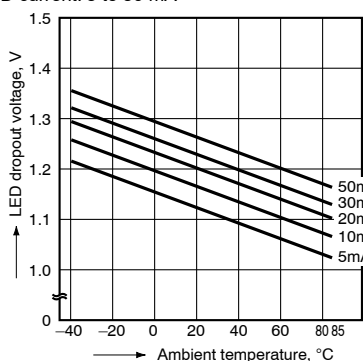
6. LED reverse current vs. ambient temperature characteristics

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



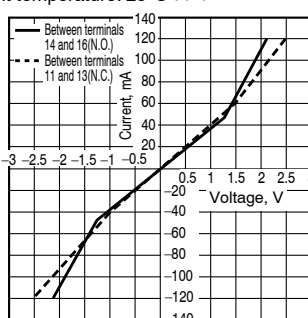
7. LED dropout voltage vs. ambient temperature characteristics

LED current: 5 to 50 mA



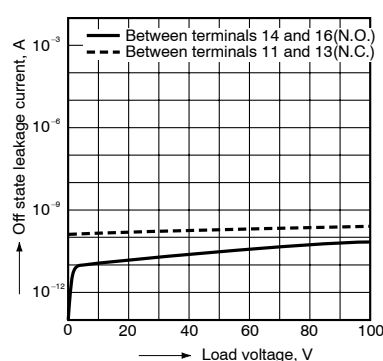
8. Voltage vs. current characteristics of output at MOS portion

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



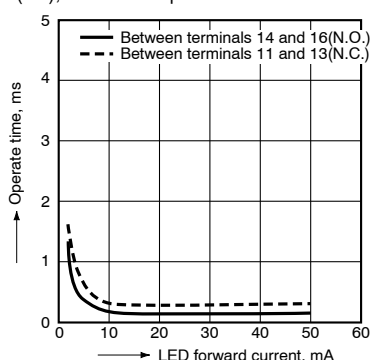
9. Off state leakage current

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



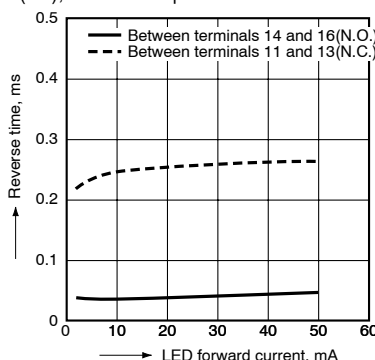
10. LED forward current vs. operate time characteristics

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



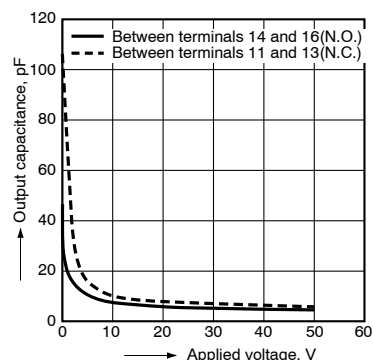
11. LED forward current vs. reverse time characteristics

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

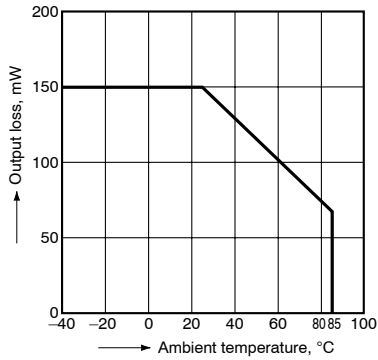


# AQS610TS

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

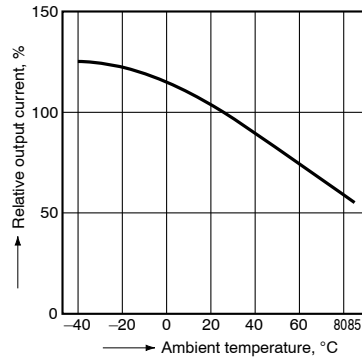
### 1. Output loss vs. ambient temperature characteristics

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



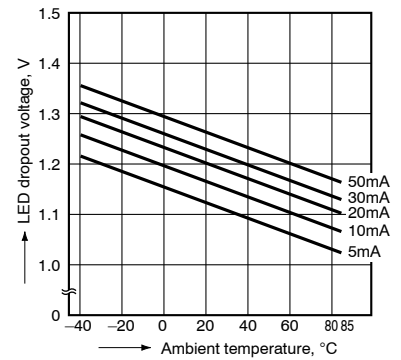
### 2. Relative output current vs. ambient temperature characteristics

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



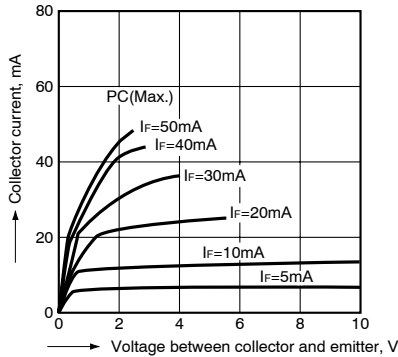
### 3. LED dropout voltage vs. ambient temperature characteristics

LED current: 5 to 50 mA



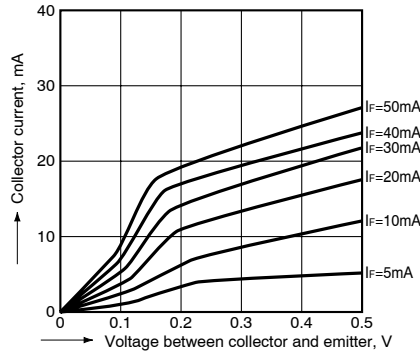
### 4-1. Collector current vs. voltage between collector and emitter characteristics ( $I_C$ - $V_{CE}$ )

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  
 $I_F = 0 \text{ mA}$   
 $T_a = 25^{\circ}\text{C}$   $77^{\circ}\text{F}$

