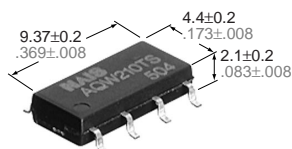


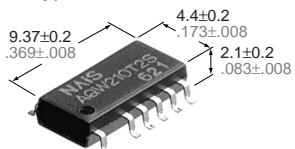
# NAIS

## GU (General Use) Type SOP Series Multi-function (MOSFET & optocoupler) Type

# PhotoMOS RELAYS

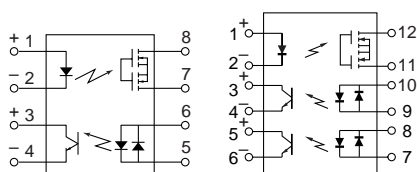


1 optocoupler type



2 optocouplers type

mm inch



Relay portion  
(1,2,7,8 pins)  
Detector portion  
(3,4,5,6 pins)

Relay portion  
(1,2,11,12 pins)  
Detector portion  
(3,4,9,10 pins)  
(5,6,7,8 pins)

## FEATURES

### 1. Multi-function type with MOSFET and optocoupler

Instead of the conventional arrangement of a separate PhotoMOS relay and optocoupler, PhotoMOS relay and 2 optocoupler this new multi-function type encapsulates the PhotoMOS relay and optocoupler into one SOP package.

### 2. Ultra-small package size

Integration of the two devices makes a significant size reduction possible. The SOP package measures (W) 4.4 × (D) 9.37 × (H) 2.1 mm ((W) .173× (D) .369× (H) .083 inch).

### 3. Ideal for PC card and Fax/Modem applications

The small size provides additional space for increased functionality, without sacrificing any of the performance of conventional MOSFET relay and optocoupler, PhotoMOS relay and 2 optocoupler com-

binations. The new device has been specifically designed for the PCMCIA market.

### 4. Also available in 8-pin SOP package

2 Form A MOSFET relays are also available in a single 8-pin SOP package.

## TYPICAL APPLICATIONS

- PCMCIA/JEIDA standard FAX/Modem card

## 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-pin side	Picked from the 5/6/7/8-pin side	
AC/DC type	350 V	120 mA	AQW210TSX	AQW210TSZ	1,000 pcs.
2 optocouplers type	Output rating*		Part No.		Packing quantity in tape and reel
	Load voltage	Load current	Picked from the 1/2/3/4/5/6-pin side	Picked from the 7/8/9/10/11/12-pin side	
AC/DC type	350 V	120 mA	AQW210T2SX	AQW210T2SZ	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)

Relay portion (1, 2, 7, 8 pins) [AQW210TS], (1,2,11,12 pins) [AQW210T2S]

	Item	Symbol	AQW210TS	AQW210T2S	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>	0.12 A		Peak AC, DC
	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>	400 mW		

Detector portion (3, 4, 5, 6 pins) [AQW210TS], (3,4,9,10 and 5,6,7,8 pins) [AQW210T2S]

	Item	Symbol	AQW210TS	AQW210T2S	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	100 mW	

# AQW210TS, 210T2S

## Others

Item	Symbol	AQW210TS	AQW210T2S	Remarks
Total power dissipation	$T_P$	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	

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

### Relay portion (1,2,7,8 pins) [AQW210TS] (1,2,11,12 pins) [AQW210T2S]

Item	Symbol	AQW210TS	AQW210T2S	Condition
Input	LED operate current	Typical	0.9 mA	$I_L = \text{Max.}$
		Maximum	3 mA	
	LED turn off current	Minimum	0.4 mA	$I_L = \text{Max.}$
		Typical	0.8 mA	
LED dropout voltage	Typical	1.14 V (1.25 V at $I_F = 50 \text{ mA}$ )		$I_F = 5 \text{ mA}$
	Maximum	1.5 V		
Output	On resistance	Typical	16 $\Omega$	$I_F = 5 \text{ mA}$ $I_L = \text{Max.}$ Within 1 s on time
		Maximum	35 $\Omega$	
	Off state leakage current	Maximum	$I_{leak}$	1 $\mu\text{A}$
Transfer characteristics	Turn on time*	Typical	0.23 ms	$I_F = 5 \text{ mA}$ $I_L = \text{Max.}$
		Maximum	0.5 ms	
	Turn off time*	Typical	0.04 ms	$I_F = 5 \text{ mA}$ $I_L = \text{Max.}$
		Maximum	0.2 ms	

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

### Detector portion (3,4,5,6 pins) [AQW210TS] (3,4,9,10 and 5,6,7,8 pins) [AQW210T2S]

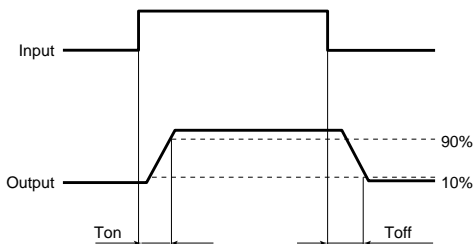
Item	Symbol	AQW210TS	AQW210T2S	Condition
Input	LED operate current	Typical	2 mA	$I_C = 2 \text{ mA}$ $V_{CE} = 0.5 \text{ V}$
		Maximum	6 mA	
	LED turn off current	Minimum	5 $\mu\text{A}$	$I_C = 1 \mu\text{A}$ $V_{CE} = 5 \text{ V}$
		Typical	35 $\mu\text{A}$	
LED dropout voltage	Typical	1.14 V (1.25 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	$T_{on}$	0.01 ms $I_F = 5 \text{ mA}$ $V_{CE} = 5 \text{ V}$ $I_C = 2 \text{ mA}$
	Turn off time*	Typical	$T_{off}$	0.03 ms $I_F = 5 \text{ mA}$ $V_{CE} = 5 \text{ V}$ $I_C = 2 \text{ mA}$

### Detector portion

Item	Symbol	AQW210TS	AQW210T2S	Remarks
Input	I/O capacitance	Typical	0.8 pF	$f = 1 \text{ MHz}$ $V_B = 0$
		Maximum	1.5 pF	
Initial I/O isolation resistance	Minimum	$R_{iso}$	1,000 M $\Omega$	DC 500 V

\*Turn on/Turn off time

For type of connection, see page 33.



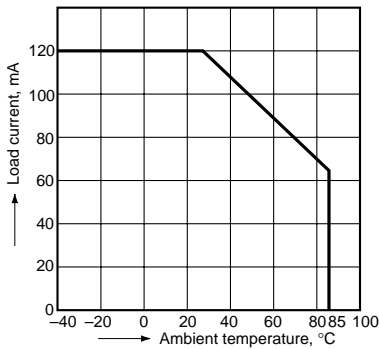
- For Dimensions, see Page 28.
- For Schematic and Wiring Diagrams, see Page 33.
- For Cautions for Use, see Page 36.

REFERENCE DATA

[1] Relay portion (1, 2, 7, 8 pins) [AQW 210TS] (1, 2, 11, 12 pins) [AQW210T2S]

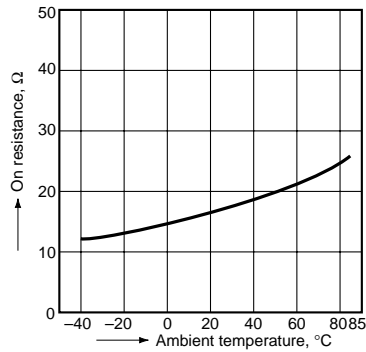
1. Load current vs. ambient temperature characteristics

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



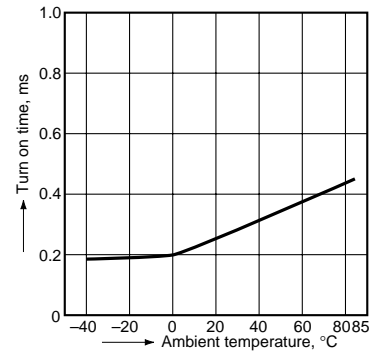
2. On resistance vs. ambient temperature characteristics

Measured portion: between terminals 7 and 8 (AQW210TS), 11 and 12 (AQW210T2S); LED current: 5 mA; Load voltage: Max. (DC); Continuous load current: Max. (DC)



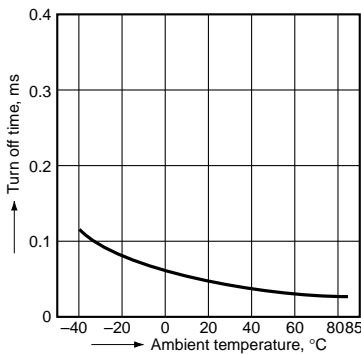
3. Turn on time vs. ambient temperature characteristics

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



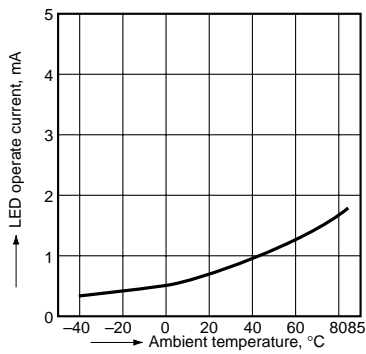
4. Turn off time vs. ambient temperature characteristics

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



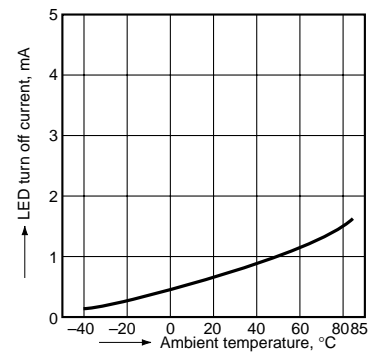
5. LED operate current vs. ambient temperature characteristics

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



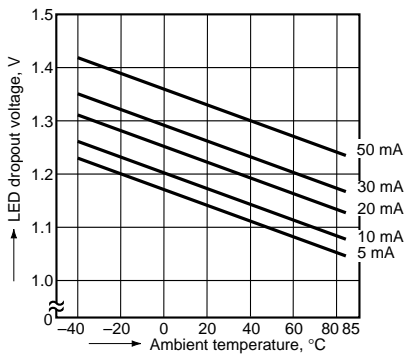
6. LED turn off current vs. ambient temperature characteristics

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



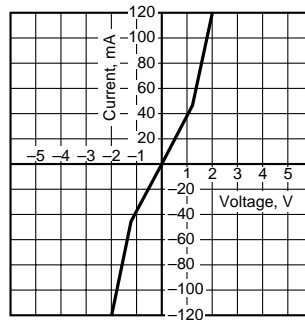
7. LED dropout voltage vs. ambient temperature characteristics

LED current: 5 to 50 mA



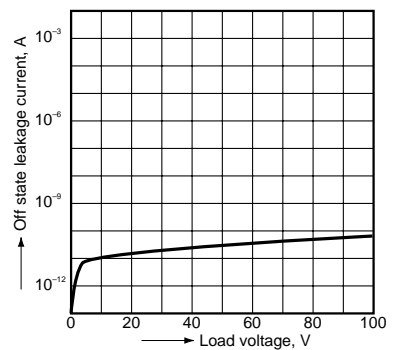
8. Voltage vs. current characteristics of output at MOS portion

Measured portion: between terminals 7 and 8 (AQW210TS), 11 and 12 (AQW210T2S); Ambient temperature: 25°C 77°F



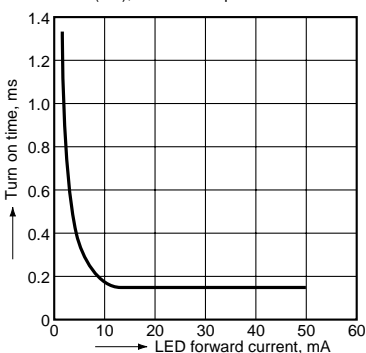
9. Off state leakage current

Measured portion: between terminals 7 and 8 (AQW210TS), 11 and 12 (AQW210T2S); Ambient temperature: 25°C 77°F



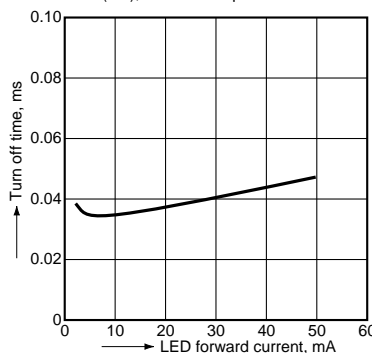
10. LED forward current vs. turn on time characteristics

Measured portion: between terminals 7 and 8 (AQW210TS), 11 and 12 (AQW210T2S); Load voltage: Max. (DC); Continuous load current: Max. (DC); Ambient temperature: 25°C 77°F



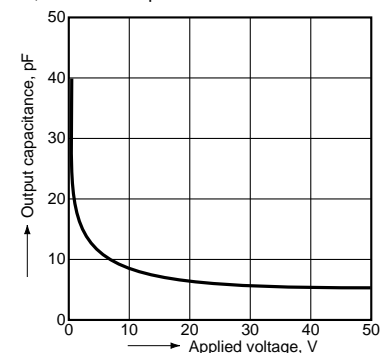
11. LED forward current vs. turn off time characteristics

Measured portion: between terminals 7 and 8 (AQW210TS), 11 and 12 (AQW210T2S); 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 7 and 8 (AQW210TS), 11 and 12 (AQW210T2S); Frequency: 1 MHz; Ambient temperature: 25°C 77°F

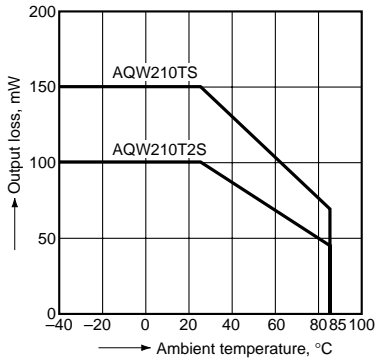


# AQW210TS, 210T2S

## [2] Detector portion (3, 4, 5, 6 pins) [AQW 210TS] (3/4/9/10 pins and 5/6/7/8 pins) [AQW210T2S]

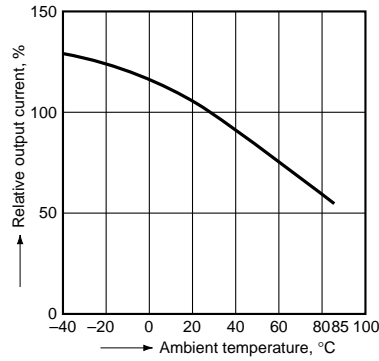
1. Output loss vs. ambient temperature characteristics

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



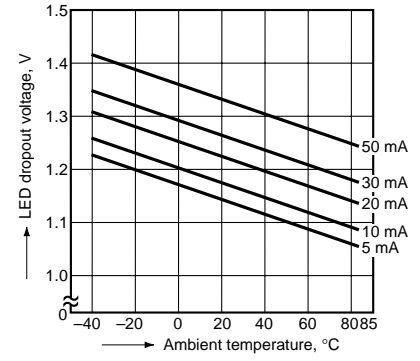
2. Relative output current vs. ambient temperature characteristics

Measured portion: between terminals 3 and 4 (AQW210TS), 3 and 4, 5 and 6 (AQW210T2S)  
 $I_F = 5\text{ mA}$ ,  $V_{CE} = 0.5\text{ V DC}$



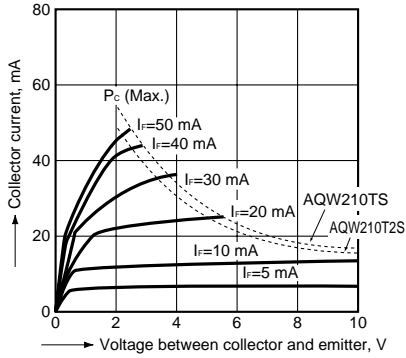
3. LED dropout voltage vs. ambient temperature characteristics

LED current: 5 to 50 mA



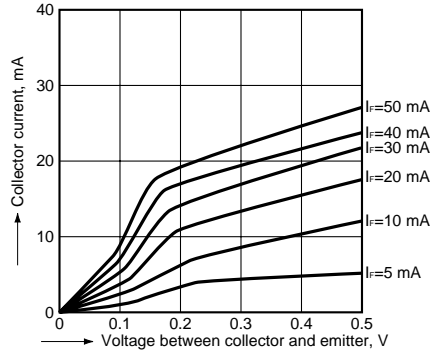
4-1. Collector current vs. voltage between collector and emitter characteristics ( $I_C$ - $V_{CE}$ )

Measured portion: between terminals 3 and 4 (AQW210TS), 3 and 4, 5 and 6 (AQW210T2S)  
 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 3 and 4 (AQW210TS), 3 and 4, 5 and 6 (AQW210T2S)  
 Ambient temperature:  $25^{\circ}\text{C}$   $77^{\circ}\text{F}$



5. Off state leakage current

Measured portion: between terminals 3 and 4 (AQW210TS), 3 and 4, 5 and 6 (AQW210T2S)  
 LED current: 0 mA  
 Ambient temperature:  $25^{\circ}\text{C}$   $77^{\circ}\text{F}$

