

Cautions For Use of Phototriac Coupler/AQ-H

SAFETY WARNINGS

- Do not use the product under conditions that exceed the range of its specifications. It may cause overheating, smoke, or fire.
- Do not touch the recharging unit while the power is on. There is a danger of

electrical shock. Be sure to turn off the power when performing mounting, maintenance, or repair operations on the relay (including connecting parts such as the terminal board and socket).

- Check the connection diagrams in the

catalog and be sure to connect the terminals correctly. Erroneous connections could lead to unexpected operating errors, overheating, or fire.

Cautions for Use

1. Applying stress that exceeds the absolute maximum rating

If the voltage and current value for any of the terminals exceeds the absolute maximum rating, internal elements will deteriorate because of the excessive voltage and current. In extreme cases, wiring may melt, or silicon P/N junctions may be destroyed.

As a result, the design should ensure that the absolute maximum ratings will never be exceeded, even momentarily.

2. Derating

De-rating is absolutely imperative for reliable design and is an essential factor in determining product life. Therefore, be sure to amply de-rate the maximum rated values when designing a system. Since it is important to de-rate in accordance with the type of relay, conditions for use, and environment, please be sure to conduct tests using actual equipment. Also, if there is a possibility that, due to a quality problem, this product might have a great effect on human life or property, do take product liability into consideration by being sure to take even extra leeway against the maximum rated value and implement safety measures such as the construction of redundant circuits.

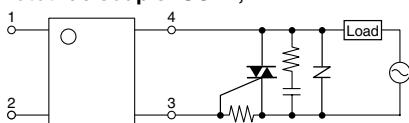
3. The phototriac coupler is designed solely to drive a triac. As a condition, the triac must be powered beforehand.

4. The internal IC could be damaged if a short forms between the I/O terminals while the phototriac coupler and AQ-H SSR are powered.

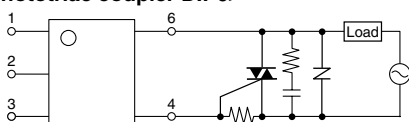
5. Output spike voltages

1) The figure below shows an ordinary triac drive circuit. Please add a snubber circuit or varistor, as noise/surge on the load side could damage the unit or cause malfunctions.

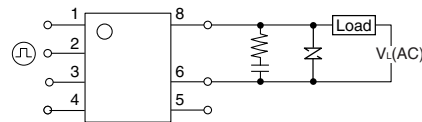
<Phototriac coupler SOP4, DIP4>



<Phototriac coupler DIP6>



<AQ-H>



Note: Connection of an external resistor, etc., to terminal No. 5 (gate) is not necessary.

2) Clamp diode can limit spike voltages at the load side. However, long wires may cause spike voltages due to inductance. It is recommended to keep wires as short as possible to minimize inductance.

3) Output terminals may become conductive when a sudden voltage rise is applied, although the input power is not applied. This may occur even if voltage rise between terminals is less than the repetitive peak OFF-state voltage.

Therefore, please perform sufficient tests with actual conditions.

4) When controlling loads using zero-cross voltage types in which the voltage and current phases differ, since the triac sometimes does not turn on regardless of the input state, please conduct sufficient tests using actual equipment.

6. Recommended input current value

$I_F = 20 \text{ mA}$

7. Important Notes for Mounting

1) Temperature rise in the lead portion is highly dependent on package size. If multiple different packages are mounted on the same board, please check your board beforehand in an actual product, ensuring that the temperature conditions of the phototriac coupler fall within the parameters listed.

2) If the mounting conditions exceed the conditions recommended above, strength of the resin used will decrease and inconsistencies of the thermal expansion coefficients in the component materials will increase greatly. This can cause package cracking and breakage of the bonding wires. Please contact us for consultation.

8. Cleaning

The phototriac coupler and AQ-H SSR are formed an optical path by coupling a light-emitting diode (LED) and photodiode via transparent silicon resin. For this reason, unlike other directory element molded resin products (e.g.,

MOS transistors and bipolar transistors), avoid ultrasonic cleaning if at all possible. We recommend cleaning with an organic solvent. If you cannot avoid using ultrasonic cleaning, please ensure that the following conditions are met, and check beforehand for defects.

- Frequency: 27 to 29 kHz
- Ultrasonic output:
 - No greater than 0.25 W/cm^2
- Cleaning time:
 - No longer than 30 s
- Cleanser used: Asahiklin AK-225
- Other: Submerge in solvent in order to prevent the PCB and elements from being contacted directly by the ultrasonic vibrations.

Note: Applies to unit area ultrasonic output for ultrasonic baths.

9. Transportation and storage

1) Extreme vibration during transport will warp the lead or damage the relay. Handle the outer and inner boxes with care.

2) Storage under extreme conditions will cause soldering degradation, external appearance defects, and deterioration of the performance. The following storage conditions are recommended:

- Temperature: $0 \text{ to } 45^\circ\text{C}$ $32 \text{ to } 113^\circ\text{F}$
- Humidity: Less than 70% R.H.
- Atmosphere: No harmful gasses such as sulfuric acid gas, minimal dust.

3) Storage of SOP type

Phototriac couplers implemented in SO packages (SOP 4-pin type) are sensitive to moisture and come in sealed moisture-proof packages. Observe the following cautions on storage.

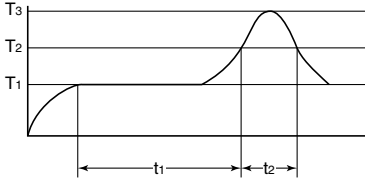
- After the moisture-proof package is unsealed, use the devices as soon as possible (within 1 month $\leq 45^\circ\text{C}$ 113°F / 70% R.H.).
- If the devices are to be left in storage after the moisture-proof package has been unsealed, keep them in another moisture-proof bag containing silica gel and use within 3 months.

10. Soldering

1) When soldering PC board terminals, keep soldering time to within 10 s at 260°C 500°F.

2) When soldering surface-mount terminals or SO package, the following conditions are recommended.

(1) IR (Infrared reflow) soldering method



T₁ = 150 to 180°C 302 to 356°F
 T₂ = 230°C 446°F
 T₃ = 250°C 482°F or less
 t₁ = 60 to 120 s or less
 t₂ = 30 s or less

(2) Soldering iron method

Tip temperature: 350 to 400°C 662 to 752°F

Wattage: 30 to 60 W

Soldering time: within 3 s

(3) Others

Check mounting conditions before using other soldering methods (DWS, VPS, hot-air, hot plate, laser, pulse heater, etc.)

• The temperature profile indicates the temperature of the soldered terminal on the surface of the PC board. The ambient temperature may increase excessively. Check the temperature under mounting conditions.

• When using lead-free solder we recommend one with an alloy composition of Sn3.0Ag0.5Cu. Please consult us regarding details such as soldering conditions.

11. The following shows the packaging format

1) Tape and reel (Phototriac coupler)

mm inch

Type	Tape dimensions	Dimensions of paper tape reel
SO package 4-pin type	<p>(1) When picked from 1/2-pin side: Part No. APT○○○○SX (Shown above) (2) When picked from 3/4-pin side: Part No. APT○○○○SZ</p>	
DIP 4-pin type	<p>(1) When picked from 1/2-pin side: Part No. APT○○○○AX (2) When picked from 3/4-pin side: Part No. APT○○○○AZ</p>	
DIP 6-pin type	<p>(1) When picked from 1/2/3-pin side: Part No. APT○○○○AX (2) When picked from 4/5/6-pin side: Part No. APT○○○○AZ</p>	

Type	Tape dimensions	Dimensions of paper tape reel
DIP 4-pin wide terminal type	<p>Tractor feed holes: 1.5^{+0.1} dia., 0.59^{+0.004} dia.</p> <p>Direction of picking: 4.0^{+0.1}, 5.25^{+0.1}, 1.75^{+0.1}, .069^{+0.004}</p> <p>Dimensions: 0.35^{+0.05}, .014^{+0.002}, 3.7^{+0.3}, .146^{+0.012}, 12.0^{+0.1}, .472^{+0.004}, 2.0^{+0.1}, .079^{+0.004}, 1.6^{+0.1} dia., .063^{+0.004} dia., 11.5^{+0.1}, .453^{+0.004}, 24.0^{+0.3}, .945^{+0.012}, 12.1^{+0.1}, .476^{+0.004}</p> <p>(1) When picked from 1/4-pin side: Part No. APT○○○○WAY (2) When picked from 2/3-pin side: Part No. APT○○○○WAW</p>	<p>Dimensions: 2.0^{+0.5}, .079^{+0.020}, 21.0^{+0.8}, .827^{+0.031}, 100⁺¹ dia., 3.937^{+0.039} dia., 13^{+0.5} dia., .512^{+0.020} dia., 25.5^{+2.0}, 1.004^{+0.079}, 1.7^{+0.8}, .067^{+0.031}, 100⁺¹ dia., 3.937^{+0.039} dia., 330⁺², 12.992^{+0.079}</p>
DIP 6-pin wide terminal type	<p>Tractor feed holes: 1.5^{+0.1} dia., 0.59^{+0.004} dia.</p> <p>Direction of picking: 4.0^{+0.1}, 9.2^{+0.1}, 1.75^{+0.1}, .069^{+0.004}</p> <p>Dimensions: 0.35^{+0.05}, .014^{+0.002}, 4.3^{+0.3}, .169^{+0.012}, 12.0^{+0.1}, .472^{+0.004}, 2.0^{+0.1}, .079^{+0.004}, 1.6^{+0.1} dia., .063^{+0.004} dia., 11.5^{+0.1}, .453^{+0.004}, 24.0^{+0.3}, .945^{+0.012}, 12.1^{+0.1}, .476^{+0.004}</p> <p>(1) When picked from 1/6-pin side: Part No. APT○○○○WAY (2) When picked from 3/4-pin side: Part No. APT○○○○WAW</p>	<p>Dimensions: 2.0^{+0.5}, .079^{+0.020}, 21.0^{+0.8}, .827^{+0.031}, 100⁺¹ dia., 3.937^{+0.039} dia., 13^{+0.5} dia., .512^{+0.020} dia., 25.5^{+2.0}, 1.004^{+0.079}, 1.7^{+0.8}, .067^{+0.031}, 100⁺¹ dia., 3.937^{+0.039} dia., 330⁺², 12.992^{+0.079}</p>

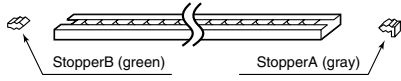
2) Tape and reel (AQ-H)

Type	Tape dimensions	Dimensions of paper tape reel
8-pin SMD type	<p>Tractor feed holes: 1.5^{+0.1} dia., 0.59^{+0.004} dia.</p> <p>Direction of picking: 4.0^{+0.1}, 10.1^{+0.1}, 1.75^{+0.1}, .069^{+0.004}</p> <p>Dimensions: 0.3^{+0.05}, .012^{+0.002}, 4.5^{+0.3}, .177^{+0.012}, 12.0^{+0.1}, .472^{+0.004}, 2.0^{+0.1}, .079^{+0.004}, 1.55^{+0.1} dia., .061^{+0.004} dia., 7.5^{+0.1}, .295^{+0.004}, 10.2^{+0.1}, .402^{+0.004}, 16^{+0.3}, .630^{+0.012}</p> <p>(1) When picked from 1/2/3/4-pin side: Part No. AQH○○○○AX (Shown above) (2) When picked from 5/6/8-pin side: Part No. AQH○○○○AZ</p>	<p>Dimensions: 2.0^{+0.5}, .079^{+0.020}, 21.0^{+0.8}, .827^{+0.031}, 80⁺¹ dia., 3.150^{+0.039} dia., 13^{+0.5} dia., .512^{+0.020} dia., 17.5^{+2.0}, 6.89^{+0.079}, 2.0^{+0.5}, .079^{+0.020}, 300⁺² dia., 11.811^{+0.079} dia., 80⁺¹ dia., 3.150^{+0.039} dia.</p>

3) Tube

(1) Devices are packaged in a tube as pin No. 1 is on the stopper B side. Observe correct orientation when mounting them on PC boards.

(SOP type)



(DIP type)





13. Applying stress that exceeds the absolute maximum rating

If the voltage and current value for any of the terminals exceeds the absolute maximum rating, internal elements will deteriorate because of the excessive voltage and current. In extreme cases, wiring may melt, or silicon P/N junctions may be destroyed.

As a result, the design should ensure that the absolute maximum ratings will never be exceeded, even momentarily.

14. Standard Chart

File No. (Standard No.)	 us		
	EU191218 (UL1577)	Nr.40011542 (EN60747-5-2)	Nr.40011542 (EN60950)
APT1211S	<input type="radio"/>	<input type="radio"/>	
APT1221S	<input type="radio"/>	<input type="radio"/>	
APT1231S	<input type="radio"/>	<input type="radio"/>	
APT1211(W)(A)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
APT1221(W)(A)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
APT1231(W)(A)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
APT1212(W)(A)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
APT1222(W)(A)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
APT1232(W)(A)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>