

## Order Placement Recommendations and Considerations

The Products and Specifications listed in this document are subject to change without notice (including specifications, manufacturing facility and discontinuing the end of Products) as occasioned by the improvements of Products. Consequently, when you review the mass-production design for the Products listed or when you place orders for these Products, Panasonic Industry Co., Ltd. asks you to contact one of our customer service representatives and check that the details listed in the document are commensurate with the most up-to-date information.

### [Safety precautions]

Panasonic Industry Co., Ltd. is consistently striving to improve quality and reliability. However, the fact remains that electrical components and devices generally cause failures at a given statistical probability. Furthermore, their durability varies with use environments or use conditions. In this respect, please check for actual electrical components and devices under actual conditions before use without fail. Continued usage in a state of degraded condition may cause the deteriorated insulation, thus result in abnormal heat, smoke or firing. Please carry out safety design and periodic maintenance including redundancy design, design for fire spread prevention, and design for malfunction prevention so that no accidents resulting in injury or death, fire accidents, or social damage will be caused as a result of failure of the Products or ending life of the Products.

As scope of warranty changes in accordance with your application, quality standards of Products fall into the following three categories depending on the applications of the products: Reference Standards, Special Standards, and Specified Standards that meet the quality assurance program designated by the customer. These quality standards have been established so that our products will be used for the applications listed below.

Reference Standards: Computers, office automation equipment, communications equipment, audio-video products, home electrical appliances, machine tools, personal devices, industrial robots

Special Standards: Transportation equipment (automobiles, trains, ships, etc.), traffic signal equipment, crime and disaster prevention devices, electric power equipment, various safety devices, and medical equipment not directly targeted for life support

Specified Standards: Aircraft equipment, aeronautical and space equipment, seabed relay equipment, nuclear power control systems, and medical equipment, devices and systems for life support

In the case that your usage is under the following conditions without exchanging the new specifications, Panasonic Industry Co., Ltd. shall not warrant the quality of the Products. Panasonic Industry Co., Ltd. asks you to contact one of our customer service representatives before exchange written in specifications.

- (1) When our products are to be used in any of the applications listed for the Special Standards or Specified Standards
- (2) When, even for any of the applications listed for the Reference Standards, our products may possibly be used beyond the range of the specifications, environment or conditions listed in the document or when you are considering the use of our products in any conditions or an environment that is not listed in the document
- (3) When you change to other equipment that have different usage condition after exchange the specifications in the usage above condition (1).

[Acceptance inspection]

In connection with the products you have purchased from us or with the products delivered to your premises, please perform an acceptance inspection with all due speed and, in connection with the handling of our products both before and during the acceptance inspection, please give full consideration to the control and preservation of our products.

[Warranty period]

Unless otherwise stipulated by both parties, the warranty period of our products is one year after their purchase by you or after their delivery to the location specified by you.

[Scope of warranty]

In the event that Panasonic Industry Co., Ltd. confirms any failures or defects of the Products by reasons solely attributable to Panasonic Industry Co., Ltd. during the warranty period, Panasonic Industry Co., Ltd. shall supply the replacements of the Products, parts or replace and/or repair the defective portion by free of charge at the location where the Products were purchased or delivered to your premises as soon as possible.

However, please note that the following failures and defects are not covered by the warranty, Panasonic Industry Co., Ltd. does not take any responsibility:

- (1) When the failure or defect was caused by a specification, standard, handling method, etc. which was specified by you
- (2) When the failure or defect was caused after purchase or delivery to your premises by an alteration in construction, performance, specification, etc. which did not involve us
- (3) When the failure or defect was caused by a phenomenon that could not be predicted by the technology at purchasing or contracted time
- (4) When the use of our Products deviated from the scope of the conditions and environment set forth in the specifications
- (5) When, after our Products were incorporated into your Products or equipment for use, damage resulted which could have been avoided if your Products or equipment had been equipped with the functions, construction, etc. the provision of which is accepted practice in the industry
- (6) When the failure or defect was caused by a natural disaster or other force majeure
- (7) When the Products is resold.

The terms and conditions of the warranty set forth in this Order Placement Recommendations and Consideration shall apply to the Products purchased or delivered to your premises. And the above terms and conditions shall not cover any induced damages by the failure or defects of the Products. In any case, Panasonic Industry Co., Ltd. will compensate up to the maximum amount you paid for the number of defective Products.

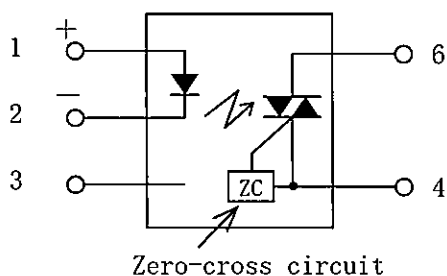
Panasonic Industry Co., Ltd.  
Electromechanical Controls Business Division

1. TYPE ; APT1232WA DIP6 Wide Terminal SMD type  
 Optical isolated triac driver Zero-cross type (100/200V lines, 50/60Hz)

2. DRAWING NO. ; APT1232WA

3. CHARACTERISTICS

3- 1 Equivalent circuit



3- 2 Absolute maximum ratings (Ta=25°C)

Item		Symbol	Value	Unit
Input	LED forward current	$I_F$	50	mA
	LED reverse voltage	$V_R$	6	V
	Peak forward current *1	$I_{FP}$	1	A
Output	Repetitive peak OFF-state voltage	$V_{DRM}$	600	V
	ON-state RMS current	$I_{T(RMS)}$	0.1	A
	Non-repetitive surge current *2	$I_{TSM}$	1.2	A
Total power dissipation		$P_T$	500	mW
I/O isolation voltage		$V_{iso}$	5000 (AC)	V
Temperature limits	Operating *3	$T_{opr}$	-40 to 100	°C
	Storage	$T_{stg}$	-40 to 125	°C

\*1 f=100Hz, Duty Ratio=0.1%

\*2 Do not exceed 50mA of ON state RMS current in case of following load voltage condition : more than 120V AC

\*3 60Hz, 1 cycle

\*4 Non-condensing at low temperatures

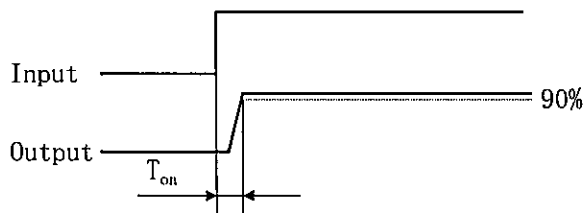
Panasonic Industry Co., Ltd.	DESIGNED	<i>K. Minami</i>	DATE : Nov. 2. '05
	CHECKED	<i>M. Fujiwara</i>	
	ENACTED	<i>[Signature]</i>	

3- 3 Electrical characteristics (Ta=25°C)

Item		Symbol	Test conditions	Min.	Typ.	Max.	Unit
Input	LED dropout voltage	$V_F$	$I_F=20\text{mA}$	—	1.21	1.3	V
	LED reverse current	$I_R$	$V_R=6\text{V}$	—	—	10	$\mu\text{A}$
Output	Peak OFF-state current	$I_{DRM}$	$I_F=0, V_{DRM}=600\text{V}$	—	—	1	$\mu\text{A}$
	Peak ON-state voltage	$V_{TM}$	$I_F=10\text{mA}, I_{TM}=0.03\text{A}$	—	1.2	2	V
	Holding current	$I_{IH}$	—	—	0.3	3.5	mA
	Critical rate of rise of OFF-state voltage	$d_v/d_t$	$V_{DRM}=600\text{V} \times 1/\sqrt{2}$	500	—	—	$\text{V}/\mu\text{s}$
Transfer characteristics	Trigger LED current *1	$I_{FT}$	$I_{TM}=0.03\text{A}$	—	—	10	mA
	Zero-cross voltage	$V_{ZC}$	$I_F=10\text{mA}$	—	—	15	V
	Turn on time *2	$T_{on}$	$I_F=20\text{mA}, I_{TM}=0.03\text{A}$	—	—	100	$\mu\text{s}$
	I/O capacitance	$C_{iso}$	$f=1\text{MHz}, V_B=0$	—	—	1.5	pF
	I/O resistance	$R_{iso}$	DC500V	50	—	—	$\text{G}\Omega$

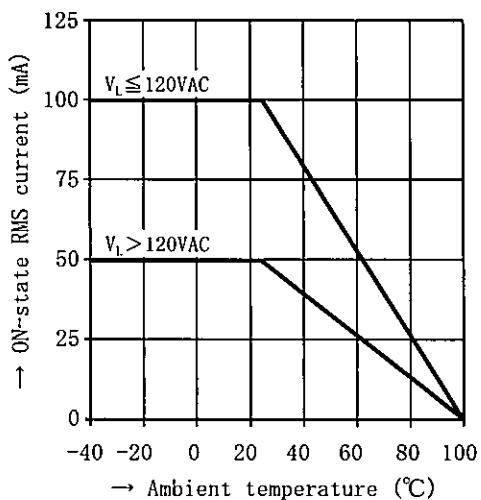
\*1 Recommended LED current  $I_F=20\text{mA}$

\*2 Turn on time



3- 4 The terminal leads receive solder plating or solder dip plating.

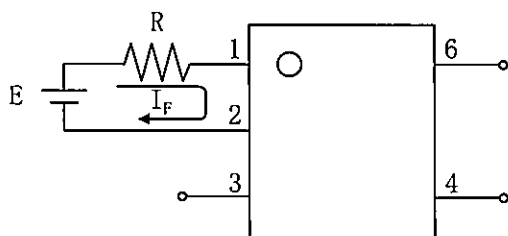
4. ON-STATE RMS CURRENT VS. AMBIENT TEMPERATURE CHARACTERISTICS



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5. USING METHODS

Examples of resistance value to control LED forward current  $I_F$ . ( $I_F=20\text{mA}$ )



E	R
5V	Approx. 190 $\Omega$
12V	Approx. 540 $\Omega$
24V	Approx. 1.1k $\Omega$

6. NOTE

6- 1 Regarding cautions for use and explanation of technical terms, please refer to our web site.

6- 2 About derating design

Derating is essential in any reliable design and is a significant factor for product life. Even if the conditions of use (temperature, current, voltage, etc.) of the product fall within the absolute maximum ratings, reliability can be reduced remarkably when used under high load (high temperature, high humidity, high current, high voltage, etc.). Therefore, please derate sufficiently below the absolute maximum rating and verify operation of the actual design before using.

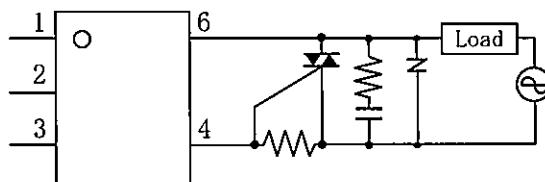
6- 3 This device is used only for triac driving.

6- 4 Short across terminals

The internal IC could be damaged if a short forms between the I/O terminals while the Phototriac Coupler is powered.

6- 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.



(2) Even if spike voltages generated at the load are limited with a clamp diode if the circuit wires are long, spike voltages will occur by inductance. Keep wires as short as possible to minimize inductance.

(3) If the steep rising voltage is applied between output terminals while the Phototriac Coupler is off, even though the voltage is under repetitive peak OFF-state voltage, this device may turn on with zero LED current.

Please check this with your equipment.

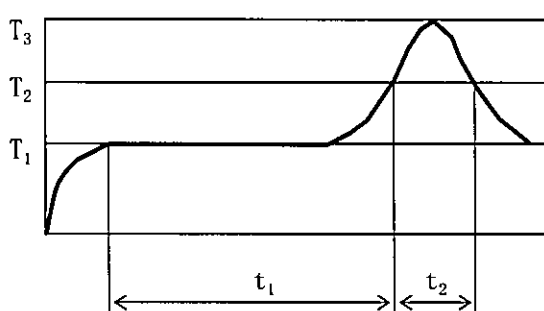
DATE : Nov. 2. '05

- (4) When you control the load, which has different phase between voltage and current, the Phototriac Coupler may not turn off, due to the steep rising voltage applied between output terminals when the Phototriac Coupler turn off.  
Please check this with your equipment.
- (5) When you control the load, which phase shift between voltage and current, Zero-cross type may not turn on with LED current.  
Please check this with your equipment.

6- 6 Recommended LED current  
 $I_F=20\text{mA}$

6- 7 Soldering condition

(1) IR (Infrared reflow) soldering method



$T_1=150$  to  $180^\circ\text{C}$   
 $T_2=230^\circ\text{C}$   
 $T_3=250^\circ\text{C}$  or less  
 $t_1=60$  to  $120\text{s}$  or less  
 $t_2=30\text{s}$  or less

(2) Soldering iron method

Tip temperature ;  $350$  to  $400^\circ\text{C}$   
Wattage ;  $30$  to  $60\text{W}$   
Soldering time ; Within  $3\text{s}$

(3) Others

- Check mounting conditions before using other soldering methods (DWS, VPS, hot-air, hot plate, 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.

6- 8 Notes for mounting

- (1) If many different packages are combined on a single substrate, then lead temperature rise is highly dependent on package size. For this reason, please make sure that the temperatures of the terminal solder area of the Phototriac Coupler falls within the temperature conditions of item 6-7 before mounting.
- (2) If the mounting conditions exceed the recommended solder conditions in item 6-7, resin strength will fall and the nonconformity of the heat expansion coefficient of each constituent material will increase markedly, possibly causing cracks in the package, severed bonding wires, and the like. For this reason, please inquire with us about whether this use is possible.

DATE : Nov. 2.'05

6- 9 Cleaning solvents compatibility

The Phototriac Coupler forms an optical path by coupling a light-emitting diode (LED) and photodiode via resin.

For this reason, unlike other directory element molded resin products (e.g., MOS transistors and bipolar transistors), avoid ultrasonic cleansing if at all possible. We recommend cleaning with an organic solvent. If you cannot avoid using ultrasonic cleansing, please ensure that the following conditions are met, and check beforehand for defects.

- Frequency : 27 to 29 kHz
- Ultra-sonic output : No greater than 0.25W/cm<sup>2</sup>
- Cleaning time : No longer than 30 s
- Cleanser used : Asahiklin AK-225
- Others : 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.

6- 10 Transportation and storage

(1) Extreme vibration during transport will warp the lead or damage the Phototriac Coupler.

Handle the outer and inner boxes with care.

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

- Temperature : 0 to 45°C
- Humidity : Less than 70% R. H.
- Atmosphere : No harmful gasses such as sulfurous acid gas, minimal dust.

7. UL, c-UL standards

This Phototriac Coupler has been approved by UL, c-UL standards. (File No. E191218)

UL, c-UL ratings

	Maximum Current (mA)		Maximum Power (mW)		Isolation Voltage (V)	Junction Temperature (°C)
	Input	Output	Input	Output		
APT1232WA	50	100	50	500	5000 (AC)	125

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Panasonic Industry Co., Ltd.

TITLE	SPECIFICATIONS FOR PHOTOTRIAC COUPLER	PAGE	6/6
NAME	Phototriac Coupler		APT1232WA

8. WARRANTY

Panasonic Industry Co., Ltd. will do our utmost to keep our product to be free from defects. However:

- (1) To avoid uses of the product not in accordance with its specifications, Panasonic Industry Co., Ltd. asks the purchaser to present the purchaser's specification, the final destination, application of the final product and the method of installation of the product.
- (2) If the purchaser believes that the possibility exists that the installation or anticipated use of the product may cause personal injury, death or property damage, Panasonic Industry Co., Ltd. advises the purchaser to be broad-minded about conditions and performance requirements listed on this specification and to take precautions such as applying a double-circuit.
- (3) The warranty period of this product is one year from the date of arrival of the product at the location of the purchaser, and is limited to the listed items on this specification. If upon arrival any defect due to Panasonic Industry Co., Ltd.'s failure to perform becomes apparent, Panasonic Industry Co., Ltd. will replace exchange or repair the defective product on the site where it was received.

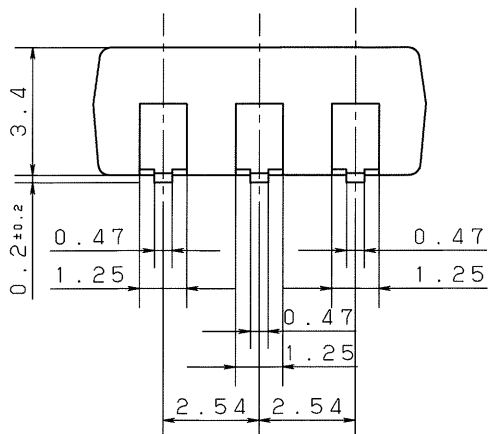
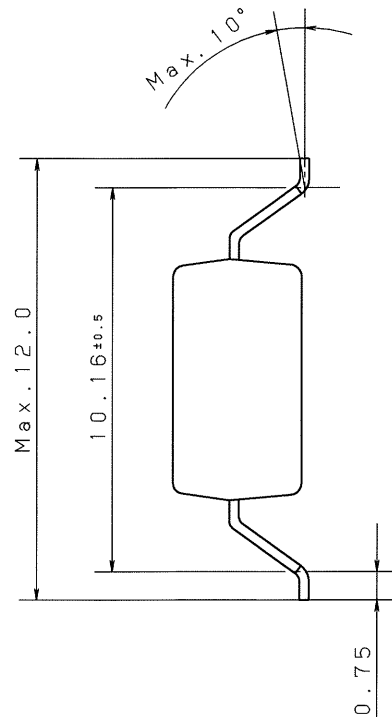
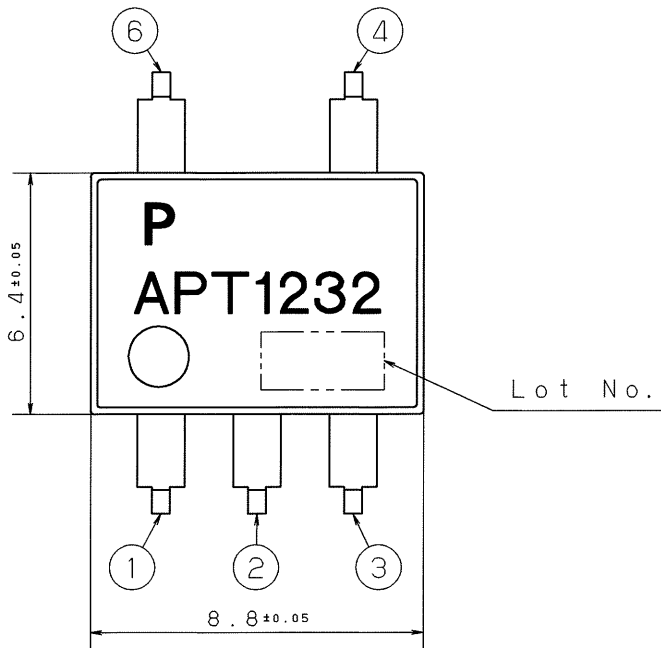
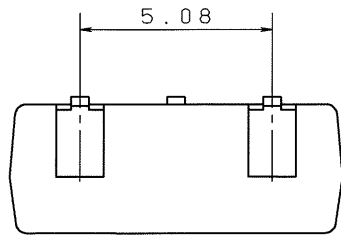
The following are excluded from the warranty conditions:

- ① Any consequential damages or loss of profits are resulting from malfunctions or defects of the product.
- ② The product is affected by the use, the storage and the transport after the delivery.
- ③ An unforeseen situation arises which was unable to be predicted by the technology level at the time of shipment.
- ④ A natural or man-made disaster which is outside of Panasonic Industry Co., Ltd.'s control occurs such as earthquake, flood, fire or social strife.

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Panasonic Industry Co., Ltd.





- ① INPUT: DC+
- ② INPUT: DC-
- ③ NO CONNECTION
- ④ OUTPUT: AC
- ⑥ OUTPUT: AC

t = 0.25

Instruction outside the tolerance: ±0.1

Catalog No. APT1232WA		Drawing Name DIMENSIONS	
Name Phototriac coupler		Drawing No. APT1232WA	
Remark		Scale 5:1	Unit: mm
Date Nov. 2, 2005			
Drawn <i>M. Nishimura</i>	Checked <i>S. [Signature]</i>	Panasonic Industry Co., Ltd.	
Designed <i>G. [Signature]</i>	Enacted <i>T. [Signature]</i>		

(3rd Angle System)