



### Phototriac coupler ideal for triac driver with wide variation

### APT Phototriac Coupler



RoHS compliant

### FEATURES

- Low zero-cross voltage (max. 15 V) type added to lineup. Approximately 1/3 of previous product**  
Helps reduce device noises even further.
- Two types available: Random type and zero-cross type**
- Many package sizes available.** (Wide terminal type with 10.16 mm pitch between I/O terminals available.)
- High dielectric strength.** (Between input and output: SOP 3, 750 V; DIP 5,000 V)
- Handles both 100 and 200 Vrms loads**  
This relay handles both voltages in a single product it is not necessary for users that use both types to manage separate part numbers.



- Terminal 5 of the DIP 6-pin type is completely molded.**
- Complies with safety standards**  
SOP4pin:  
C-UL (UL1577) Certified  
VDE (EN60747-5-5) Certified  
DIP4/6pin:  
C-UL (UL1577) Certified  
VDE (EN60747-5-5) Certified  
VDE (EN62368-1) Reinforced insulation certified

### TYPICAL APPLICATIONS

- For triac driver in heater controls of products such as office equipment, home appliances, and industrial machines. (For 100 V/200 V, 50/60 Hz lines)
- Triac driver for SSRs

### ORDERING INFORMATION

APT	1	2				
ON-state RMS current 1: 0.05 A/0.1 A						
Repetitive peak OFF-state voltage 2: 600 V						
Zero-cross function 1: With zero-cross function 2: Random 3: Low zero-cross (max. 15 V)						
Number of pin 1: 4 pins 2: 6 pins						
Package Nil: DIP S: SOP A: SMD						
Packing Nil: Tube X: Tape and reel packing X Z: Tape and reel packing Z						

# TYPES

## 1. SOP4 Type

Type	Output rating		Type	Package size	Part No.			Packing quantity	
	Repetitive peak OFF-state voltage	ON-state RMS current			Tube packing style	Tape and reel packing style		Tube	Tape and reel
						Picked from the 1/2-pin side	Picked from the 3/4-pin side		
AC type	600 V	50 mA	Zero-cross (max. 50 V)	SOP4pin	APT1211S	APT1211SX	APT1211SZ	1 tube contains: 100 pcs. 1 batch contains: 2,000 pcs.	1,000 pcs.
			Zero-cross (max. 15 V)		APT1231S	APT1231SX	APT1231SZ		
			Random		APT1221S	APT1221SX	APT1221SZ		

Note: For space reasons, the initial letters of the product number "APT" and "S" are omitted on the product seal.  
The package type indicator "X" and "Z" are omitted from the seal. (Ex. the label for product number APT1221SZ is 1221).

## 2. DIP4/6 Type

Type	Output rating		Type	Package size	Part No.				Packing quantity	
	Repetitive peak OFF-state voltage	ON-state RMS current			Through hole terminal	Surface-mount terminal		Tube	Tape and reel	
						Tape and reel packing style				
				Tube packing style	Picked from the 1/2-pin side 1/2/3-pin side	Picked from the 3/4-pin side 4/6-pin side				
AC type	600 V	100 mA	Zero-cross (max. 50 V)	DIP4pin	APT1211	APT1211A	APT1211AX	APT1211AZ	[DIP4pin] 1 tube contains: 100 pcs. 1 batch contains: 1,000 pcs.	[DIP4pin] [DIP6pin] 1,000 pcs.
			Zero-cross (max. 15 V)		APT1231	APT1231A	APT1231AX	APT1231AZ		
			Random		APT1221	APT1221A	APT1221AX	APT1221AZ		
			Zero-cross (max. 50 V)	DIP6pin	APT1212	APT1212A	APT1212AX	APT1212AZ	[DIP6pin] 1 tube contains: 50 pcs. 1 batch contains: 500 pcs.	
			Zero-cross (max. 15 V)		APT1232	APT1232A	APT1232AX	APT1232AZ		
			Random		APT1222	APT1222A	APT1222AX	APT1222AZ		

Note: For space reasons the initial letters "APT" of the product number for the DIP 4-pin type, the letter "A", which indicates the SMD terminal shape for the DIP 4-pin and 6-pin types, and the package type indications "X" and "Z" have been omitted from the product label. (Example: The label for product number APT1221AZ is 1221.)

## 3. DIP6 Wide Terminal Type

Type	Output rating*		Type	Package size	Part No.				Packing quantity	
	Repetitive peak OFF-state voltage	ON-state RMS current			Through hole terminal	Surface-mount terminal		Tube	Tape and reel	
						Tape and reel packing style				
				Tube packing style	Picked from the 1/6-pin side	Picked from the 3/4-pin side				
AC type	600 V	100 mA	Zero-cross (max. 50 V)	DIP6pin	APT1212W	APT1212WA	APT1212WAY	APT1212WAW	1 tube contains: 50 pcs. 1 batch contains: 500 pcs.	1,000 pcs.
			Zero-cross (max. 15 V)		APT1232W	APT1232WA	APT1232WAY	APT1232WAW		
			Random		APT1222W	APT1222WA	APT1222WAY	APT1222WAW		

Note: For space reasons the initial letters the letter "WA", which indicates the SMD terminal shape for the DIP 6-pin types, and the package type indications "Y" and "W" have been omitted from the product label. (Example: The label for product number APT1212WAY is 1212.)

## RATING

### 1. Absolute maximum ratings (Ambient temperature: 25°C 77°F)

#### 1) SOP4 types

Item		Symbol	APT1211S, APT1221S, APT1231S	Remarks
Input	LED forward current	$I_F$	50 mA	
	LED reverse voltage	$V_R$	6 V	
	Peak forward current	$I_{FP}$	1 A	f = 100 Hz, Duty Ratio = 0.1%
Output	Repetitive peak OFF-state voltage	$V_{DRM}$	600 V	
	ON-state RMS current*	$I_{T(RMS)}$	0.05 A	AC
	Non-repetitive surge current	$I_{TSM}$	0.6 A	In one cycle at 60 Hz
Total power dissipation		$P_T$	350 mW	
I/O isolation voltage		$V_{iso}$	3,750 Vrms	
Temperature limits	Operating	$T_{opr}$	-40 to +100°C -40 to +212°F	Non-condensing at low temperatures
	Storage	$T_{stg}$	-40 to +125°C -40 to +257°F	

Note: "X" and "Z" at the end of the part numbers have been omitted.

#### 2) DIP4/6 type and DIP6 Wide terminal type

Item		Symbol	APT1211, APT1221, APT1231, APT1212(W), APT1222(W), APT1232(W)	Remarks
Input	LED forward current	$I_F$	50 mA	
	LED reverse voltage	$V_R$	6 V	
	Peak forward current	$I_{FP}$	1 A	f = 100 Hz, Duty Ratio = 0.1%
Output	Repetitive peak OFF-state voltage	$V_{DRM}$	600 V	
	ON-state RMS current*	$I_{T(RMS)}$	0.1 A	AC
	Non-repetitive surge current	$I_{TSM}$	1.2 A	In one cycle at 60 Hz
Total power dissipation		$P_T$	500 mW	
I/O isolation voltage		$V_{iso}$	5,000 Vrms	
Temperature limits	Operating	$T_{opr}$	-40 to +100°C -40 to +212°F	Non-condensing at low temperatures
	Storage	$T_{stg}$	-40 to +125°C -40 to +257°F	

Note: "A", "AX", "AZ" "AY" and "AW" at the end of the part numbers have been omitted.

\* Do not exceed 0.05 A of ON state RMS current in case of following load voltage condition.

DIP4pin (APT1211, APT1221, APT1231): more than 100 Vrms;

DIP6pin (APT1212, APT1222, APT1232) and DIP6pin wide terminal type (APT1212W, APT1222W, APT1232W): more than 120 Vrms.

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

### 1) Zero-cross type (max. 50 V) and random type

Item		Symbol	APT1211S, APT1211, APT1212(W)	APT1221S, APT1221, APT1222(W)	Condition
Input	LED dropout voltage	Typical	1.21 V		$I_F = 20 \text{ mA}$
		Maximum	1.3 V		
	LED reverse current	Typical	—		$V_R = 6 \text{ V}$
		Maximum	10 $\mu\text{A}$		
Output	Repetitive peak OFF-state current	Typical	—		$I_F = 0 \text{ mA}$ $V_{DRM} = 600 \text{ V}$
		Maximum	1 $\mu\text{A}$		
	Repetitive peak On-state voltage	Typical	1.3 V		$I_F = 10 \text{ mA}$ $I_{TM} = 0.05 \text{ A}$
		Maximum	2.5 V		
Holding current	Typical	0.3 mA			
	Maximum	3.5 mA			
Critical rate of rise of OFF-state voltage	Minimum	dv/dt	500 V/ $\mu\text{s}$		$V_{DRM} = 600 \text{ V} \times 1/\sqrt{2}$
Transfer characteristics	Trigger LED current	Maximum	$I_{FT}$	10 mA	$V_D = 6 \text{ V}$ $R_L = 100 \Omega$
	Zero-cross voltage	Maximum	$V_{ZC}$	50 V	$I_F = 10 \text{ mA}$
	Turn on time*	Maximum	$T_{on}$	100 $\mu\text{s}$	$I_F = 20 \text{ mA}$ $V_D = 6 \text{ V}$ $R_L = 100 \Omega$
	I/O capacitance	Maximum	$C_{iso}$	1.5 pF	$f = 1 \text{ MHz}$ $V_B = 0 \text{ V}$
	I/O isolation resistance	Minimum	$R_{iso}$	50 G $\Omega$	500 V DC

Note: 1. For type of connection, see "SCHEMATIC AND WIRING DIAGRAMS".

#### \*Turn on time



### 2) Zero-cross type (max. 15 V)

Item		Symbol	APT1231S, APT1231, APT1232(W)	Condition	
Input	LED dropout voltage	Typical	1.21 V		$I_F = 20 \text{ mA}$
		Maximum	1.3 V		
	LED reverse current	Typical	—		$V_R = 6 \text{ V}$
		Maximum	10 $\mu\text{A}$		
Output	Repetitive peak OFF-state current	Typical	—		$I_F = 0 \text{ mA}$ $V_{DRM} = 600 \text{ V}$
		Maximum	1 $\mu\text{A}$		
	Repetitive peak On-state voltage	Typical	1.2 V		$I_F = 10 \text{ mA}$ $I_{TM} = 0.03 \text{ A}$
		Maximum	2 V		
Holding current	Typical	0.3 mA			
	Maximum	3.5 mA			
Critical rate of rise of OFF-state voltage	Minimum	dv/dt	500 V/ $\mu\text{s}$		$V_{DRM} = 600 \text{ V} \times 1/\sqrt{2}$
Transfer characteristics	Trigger LED current	Maximum	$I_{FT}$	10 mA	$I_{TM} = 0.03 \text{ A}$
	Zero-cross voltage	Maximum	$V_{ZC}$	15 V	$I_F = 10 \text{ mA}$
	Turn on time*	Maximum	$T_{on}$	100 $\mu\text{s}$	$I_F = 20 \text{ mA}$ $I_{TM} = 0.03 \text{ A}$
	I/O capacitance	Maximum	$C_{iso}$	1.5 pF	$f = 1 \text{ MHz}$ $V_B = 0 \text{ V}$
	I/O isolation resistance	Minimum	$R_{iso}$	50 G $\Omega$	500 V DC

Note: 1. For type of connection, see "SCHEMATIC AND WIRING DIAGRAMS".

#### \*Turn on time



## RECOMMENDED OPERATING CONDITIONS

Please use under recommended operating conditions to obtain expected characteristics.

Item	Symbol	Min.	Max.	Unit
Input LED current	$I_F$	15	25	mA

## REFERENCE DATA

1-(1). ON-state RMS current vs. ambient temperature characteristics

Allowable ambient temperature: -40 to +100°C  
-40 to +212°F

Tested sample: APT1211S, APT1221S



1-(2). ON-state RMS current vs. ambient temperature characteristics

Allowable ambient temperature: -40 to +100°C  
-40 to +212°F

Tested sample: APT1231S



1-(3). ON-state RMS current vs. ambient temperature characteristics

Allowable ambient temperature: -40 to +100°C  
-40 to +212°F

Tested sample: APT1211(A), APT1221(A)



1-(4). ON-state RMS current vs. ambient temperature characteristics

Allowable ambient temperature: -40 to +100°C  
-40 to +212°F

Tested sample: APT1231(A)



1-(5). ON-state RMS current vs. ambient temperature characteristics

Allowable ambient temperature: -40 to +100°C  
-40 to +212°F

Tested sample: APT1212(A), APT1222(A),  
APT1212W(A), APT1222W(A)



1-(6). ON-state RMS current vs. ambient temperature characteristics

Allowable ambient temperature: -40 to +100°C  
-40 to +212°F

Tested sample: APT1232(A), APT1232W(A)



2. On voltage vs. ambient temperature characteristics



3. Trigger LED current vs. ambient temperature characteristics



4. LED dropout voltage vs. ambient temperature characteristics



5. Turn on time vs. LED current characteristics



6. Repetitive peak OFF-state current vs. Load voltage characteristics



7. Hold current vs. ambient temperature characteristics



## 8. Zero-cross voltage vs. ambient temperature characteristics



## DIMENSIONS (mm inch)

The CAD data of the products with a **CAD** mark can be downloaded from: <https://industrial.panasonic.com/ac/e/>

### 1. SOP Type

APT1211S, APT1221S, APT1231S

**CAD**



#### External dimensions



#### Recommended mounting pad (TOP VIEW)



Tolerance:  $\pm 0.1 \pm .004$

Terminal thickness =  $0.15 \pm .006$

General tolerance:  $\pm 0.1 \pm .004$

### 2. DIP4 Type

APT1211(A), APT1221(A), APT1231(A)

**CAD**



#### External dimensions

##### Through hole terminal type



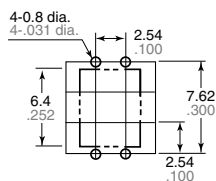
##### Surface mount terminal type



Terminal thickness =  $0.20 \pm .008$

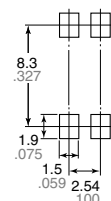
General tolerance:  $\pm 0.1 \pm .004$

#### PC board pattern (BOTTOM VIEW)



Tolerance:  $\pm 0.1 \pm .004$

#### Recommended mounting pad (TOP VIEW)



Tolerance:  $\pm 0.1 \pm .004$

3. DIP6 Type

APT1212(A), APT1222(A), APT1232(A)

CAD



External dimensions

Through hole terminal type



Surface mount terminal type



Terminal thickness = 0.25 ±0.010  
General tolerance: ±0.1 ±0.004

PC board pattern (BOTTOM VIEW)



Tolerance: ±0.1 ±0.004

Recommended mounting pad (TOP VIEW)



Tolerance: ±0.1 ±0.004

4. DIP6 Wide Terminal Type

APT1212W(A), APT1222W(A), APT1232W(A)

CAD



External dimensions

Through hole terminal type



Surface mount terminal type



Terminal thickness = 0.25 .010  
General tolerance: ±0.1 ±.004

PC board pattern (BOTTOM VIEW)



Tolerance: ±0.1 ±.004

Recommended mounting pad (TOP VIEW)



Tolerance: ±0.1 ±.004

SCHEMATIC AND WIRING DIAGRAMS

Schematic	Output configuration	Load	Wiring diagram
<p>Zero-cross circuit</p>	1 Form A	AC	<p>Power source at input side</p>
<p>Zero-cross circuit</p>			<p>Power source at input side</p>
<p>Zero-cross circuit</p>			<p>Power source at input side</p>
<p>Zero-cross circuit</p>			<p>Power source at input side</p>



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