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Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China

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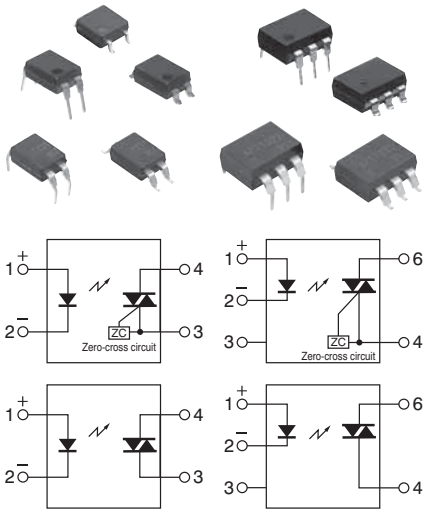
**Phototriac Coupler with various options for external Triac control**

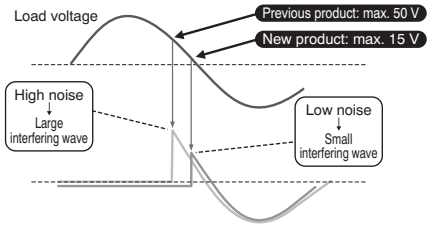
# Phototriac Coupler (APT1)




## FEATURES

**1. Low zero-cross voltage (max. 15 V) type added to lineup. Approximately 1/3 of previous product**

Helps reduce device noises even further.




**2. Two types available: Random type and zero-cross type**

**3. Many package sizes available. (Wide terminal type with 10.16 mm pitch between I/O terminals available.)**

**4. High dielectric strength. (Between input and output: SOP 3, 750 V; DIP 5,000 V)**

**5. Handles both 100 and 200 V AC 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.

**6. Terminal 5 of the DIP 6-pin type is completely molded.**

## TYPICAL APPLICATIONS

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

**2. Triac driver for SSRs**

## 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 |
| AC type | 600 V | 50 mA | Zero-cross (max. 50 V) | SOP4pin | APT1211S | APT1211SX (Picked from the 1/2-pin side) | APT1211SZ (Picked from the 3/4-pin side) | 1 tube contains: 100 pcs. 1 batch contains: 2, 000 pcs. | 1, 000 pcs. |
| | | | Zero-cross (max. 15 V) | | APT1231S | APT1231SX (Picked from the 1/2-pin side) | APT1231SZ (Picked from the 3/4-pin side) | | |
| | | | Random | | APT1221S | APT1221SX (Picked from the 1/2-pin side) | APT1221SZ (Picked from the 3/4-pin side) | | |

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 packing style | | Tape and reel packing style | | Tube | Tape and reel |
| AC type | 600 V | 100 mA | Zero-cross (max. 50 V) | DIP4pin | APT1211 | APT1211A | APT1211AX (Picked from the 1/2-pin side) | APT1211AZ (Picked from the 3/4-pin side) | [DIP4pin] 1 tube contains: 100 pcs. 1 batch contains: 1,000 pcs. [DIP6pin] 1 tube contains: 50 pcs. 1 batch contains: 500 pcs. | [DIP4pin] [DIP6pin] 1,000 pcs. |
| | | | Zero-cross (max. 15 V) | | APT1231 | APT1231A | APT1231AX (Picked from the 1/2-pin side) | APT1231AZ (Picked from the 3/4-pin side) | | |
| | | | Random | | APT1221 | APT1221A | APT1221AX (Picked from the 1/2-pin side) | APT1221AZ (Picked from the 3/4-pin side) | | |
| | | | Zero-cross (max. 50 V) | DIP6pin | APT1212 | APT1212A | APT1212AX (Picked from the 1/2/3-pin side) | APT1212AZ (Picked from the 4/6-pin side) | | |
| | | | Zero-cross (max. 15 V) | | APT1232 | APT1232A | APT1232AX (Picked from the 1/2/3-pin side) | APT1232AZ (Picked from the 4/6-pin side) | | |
| | | | Random | | APT1222 | APT1222A | APT1222AX (Picked from the 1/2/3-pin side) | APT1222AZ (Picked from the 4/6-pin side) | | |

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. DIP4/6 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 packing style | | Tape and reel packing style | | Tube | Tape and reel |
| AC type | 600 V | 100 mA | Zero-cross (max. 50 V) | DIP4pin | APT1211W | APT1211WA | APT1211WAY (Picked from the 1/4-pin side) | APT1211WAW (Picked from the 2/3-pin side) | [DIP4pin] 1 tube contains: 100 pcs. 1 batch contains: 1,000 pcs. [DIP6pin] 1 tube contains: 50 pcs. 1 batch contains: 500 pcs. | [DIP4pin] [DIP6pin] 1,000 pcs. |
| | | | Zero-cross (max. 15 V) | | APT1231W | APT1231WA | APT1231WAY (Picked from the 1/4-pin side) | APT1231WAW (Picked from the 2/3-pin side) | | |
| | | | Random | | APT1221W | APT1221WA | APT1221WAY (Picked from the 1/4-pin side) | APT1221WAW (Picked from the 2/3-pin side) | | |
| | | | Zero-cross (max. 50 V) | DIP6pin | APT1212W | APT1212WA | APT1212WAY (Picked from the 1/6-pin side) | APT1212WAW (Picked from the 3/4-pin side) | | |
| | | | Zero-cross (max. 15 V) | | APT1232W | APT1232WA | APT1232WAY (Picked from the 1/6-pin side) | APT1232WAW (Picked from the 3/4-pin side) | | |
| | | | Random | | APT1222W | APT1222WA | APT1222WAY (Picked from the 1/6-pin side) | APT1222WAW (Picked from the 3/4-pin side) | | |

Note: For space reasons the initial letters “APT” of the product number for the DIP 4-pin type, the letter “WA”, which indicates the SMD terminal shape for the DIP 4-pin and 6-pin types, and the package type indications “Y” and “W” have been omitted from the product label. (Example: The label for product number APT1221WAY is 1221.)

# 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 60Hz |
| Total power dissipation | | $P_T$ | 350 mW | |
| I/O isolation voltage | | $V_{iso}$ | 3,750 V AC | |
| Temperature limits | Operating | $T_{opr}$ | –40°C to +100°C –40°F to +212°F | Non-condensing at low temperatures |
| | Storage | $T_{stg}$ | –40°C to +125°C –40°F to +257°F | |

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

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

| Item | | | Symbol | APT1211(W) | APT1221(W) | APT1231(W) | 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 60Hz |
| Total power dissipation | | | $P_T$ | 500 mW | | | | | | |
| I/O isolation voltage | | | $V_{iso}$ | 5,000 V AC | | | | | | |
| Temperature limits | | Operating | $T_{opr}$ | –40°C to +100°C –40°F to +212°F | | | | | | Non-condensing at low temperatures |
| | | Storage | $T_{stg}$ | –40°C to +125°C –40°F 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) and DIP4pin wide terminal type (APT1211W, APT1221W, APT1231W): more than 100 V AC;
DIP6pin (APT1212, APT1222, APT1232) and DIP6pin wide terminal type (APT1212W, APT1222W, APT1232W): more than 120 V AC.

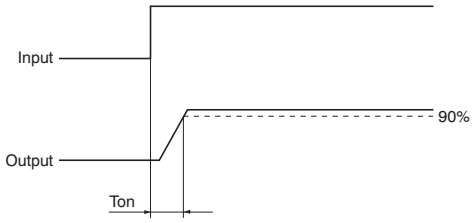
## 2. Electrical characteristics (Ambient temperature: 25°C 77°F)

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

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

Notes: 1. For type of connection, see page 8.
2. Terminals are either solder plated or solder dipped.

***Turn on time**

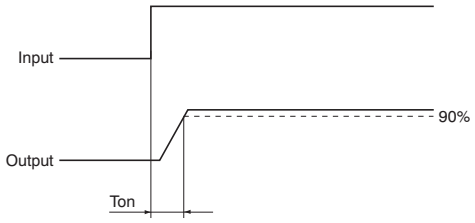


2) Zero-cross voltage type (max. 15V)

| Item | | | Symbol | APT1231S, APT1231(W), APT1232(W) | Condition |
|---|---|---|---|---|---|
| Input | LED dropout voltage | Typical | $V_F$ | 1.21 V | $I_F$ = 20 mA |
| | | Maximum | | 1.3 V | |
| | LED reverse current | Typical | $I_R$ | — | $V_R$ = 6 V |
| | | Maximum | | 10 μA | |
| Output | Repetitive peak OFF-state current | Typical | $I_{DRM}$ | — | $I_F$ = 0 mA, $V_{DRM}$ = 600 V |
| | | Maximum | | 1 μA | |
| | Repetitive peak On-state voltage | Typical | $V_{TM}$ | 1.2 V | $I_F$ = 10 mA, $I_{TM}$ = 0.03 A |
| | | Maximum | | 2 V | |
| | Holding current | Typical | $I_H$ | 0.3 mA | |
| | | Maximum | | 3.5 mA | |
| | Critical rate of rise of OFF-state voltage | Minimum | dv/dt | 500 V/μs | $V_{DRM}$ = 600 V ×1/√2 |
| Transfer characteristics | Trigger LED current | Maximum | $I_{FT}$ | 10 mA | $I_{DRM}$ = 30 mA |
| | Zero-cross voltage | Maximum | $V_{ZC}$ | 15 V | $I_F$ = 10 mA |
| | Turn on time* | Maximum | $T_{on}$ | 100 μs | $I_F$ = 20 mA, $I_{DRM}$ = 30 mA |
| | I/O capacitance | Maximum | $C_{iso}$ | 1.5 pF | f = 1 MHz, $V_B$ = 0 V |
| | I/O resistance | Minimum | $R_{iso}$ | 50 GΩ | 500 V DC |

Notes: 1. For type of connection, see page 8.
2. Terminals are either solder plated or solder dipped.

***Turn on time**




**RECOMMENDED OPERATING CONDITIONS**

Please follow the conditions below in order to ensure accurate operation and release of the phototriac coupler.

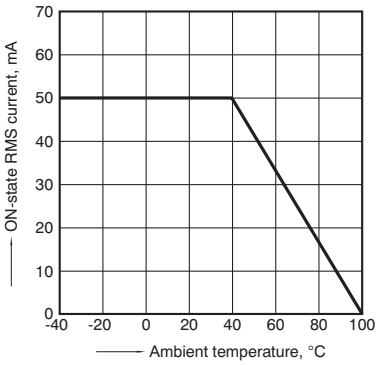
| Item | Symbol | Value | Unit |
|---|---|---|---|
| Input LED current | $I_F$ | 20 | mA |

# REFERENCE DATA

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

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

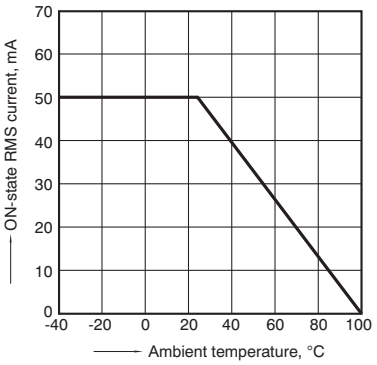
Tested sample: APT1211S, APT1221S




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

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

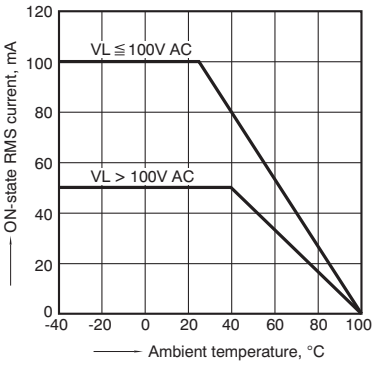
Tested sample: APT1231S




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

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

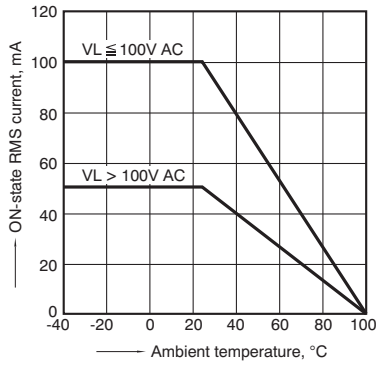
Tested sample: APT1211(A), APT1221(A), APT1211W(A), APT1221W(A)



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

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

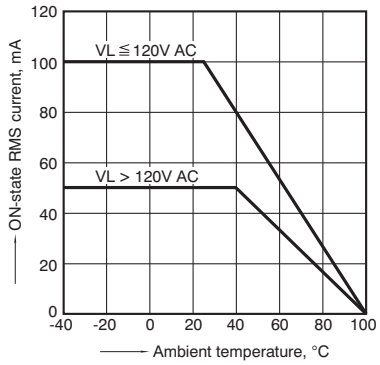
Tested sample: APT1231(A), APT1231W(A)




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

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

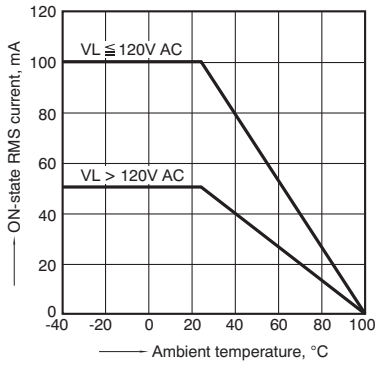
Tested sample: APT1212(A), APT1222(A), APT1212W(A), APT1222W(A)



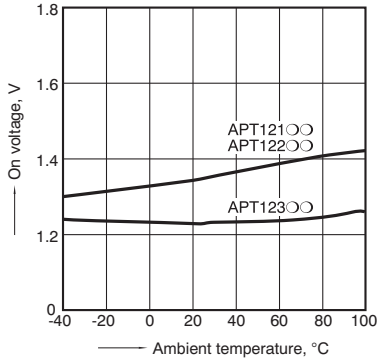

1-(6). ON-state RMS current vs. ambient temperature characteristics

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

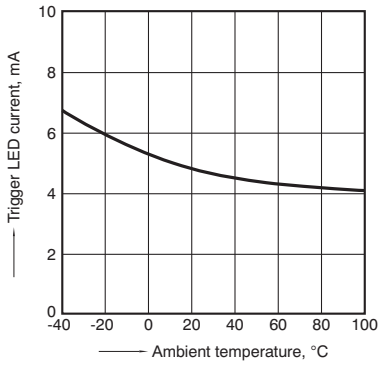
Tested sample: APT1232(A), APT1232W(A)



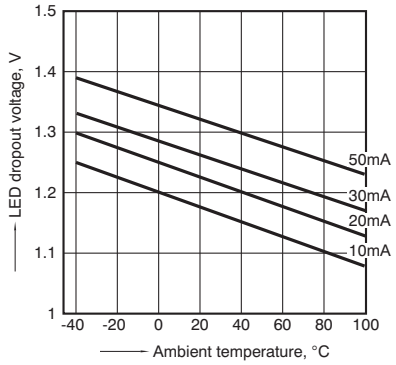

2. On voltage vs. ambient temperature characteristics



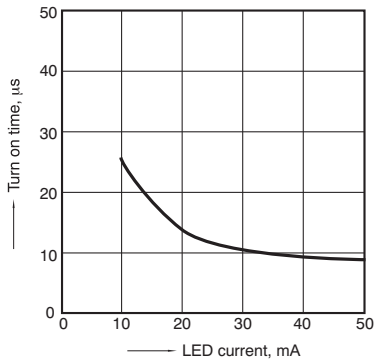

3. Trigger LED current vs. ambient temperature characteristics



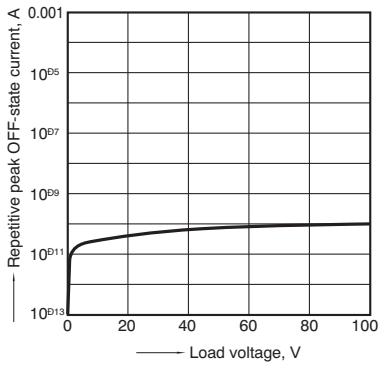

4. LED dropout voltage vs. ambient temperature characteristics



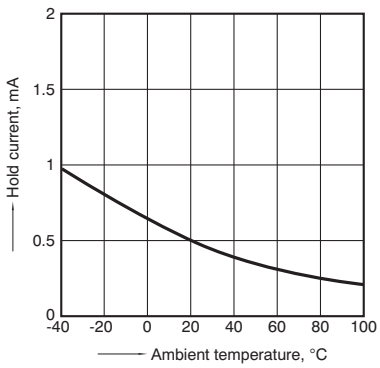

5. Turn on time vs. LED current



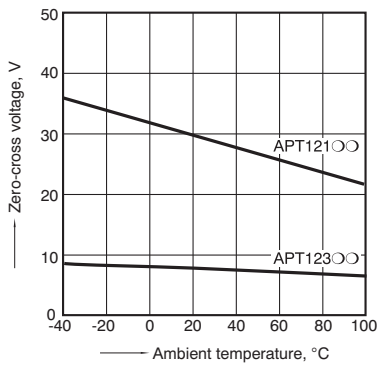

6. Repetitive peak OFF-state current vs. Load voltage characteristics




7. Hold current vs. ambient temperature characteristics




8. Zero-cross voltage vs. ambient temperature characteristics



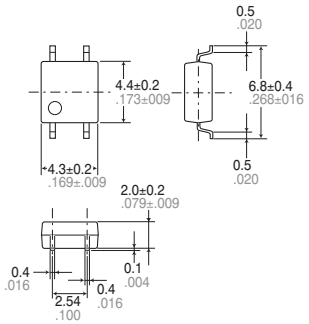
## DIMENSIONS (mm inch)

Download CAD Data from our Web site.

### 1. SOP Type

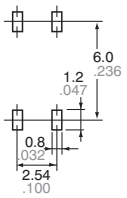
APT1211S, APT1221S, APT1231S

CAD Data




Terminal thickness = 0.15 .006
General tolerance: ±0.1 ±.004

Recommended mounting pad (TOP VIEW)

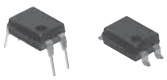



Tolerance: ±0.1 ±.004

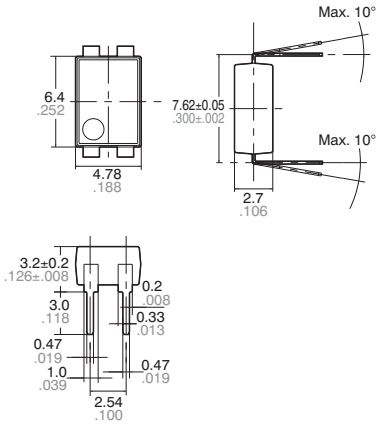
### 2. DIP4 Type

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

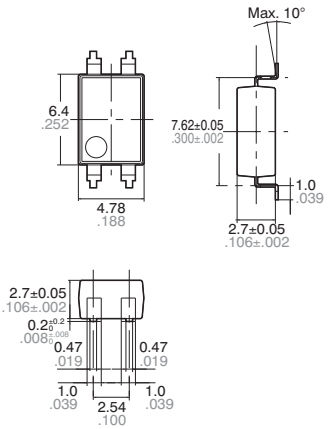
CAD Data



Through hole terminal type

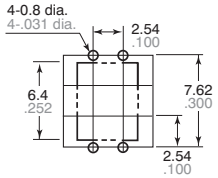



Surface mount terminal type



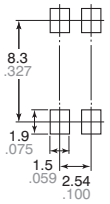

Terminal thickness = 0.2 .008
General tolerance: ±0.1 ±.004

PC board pattern (BOTTOM VIEW)




Tolerance: ±0.1 ±.004

Recommended mounting pad (TOP VIEW)



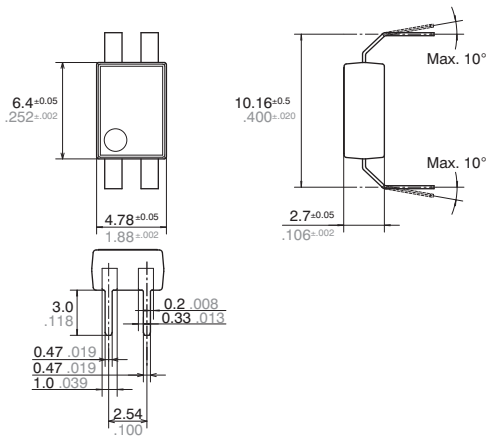

Tolerance: ±0.1 ±.004

### 3. DIP4 Wide Terminal Type

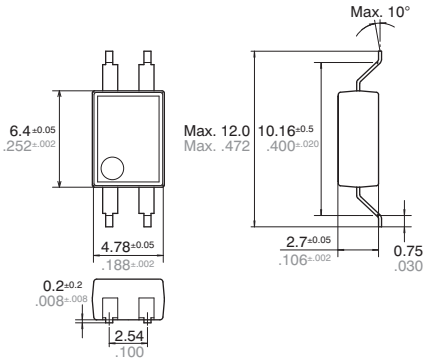
APT1211W(A), APT1221W(A), APT1231W(A)

CAD Data

Through hole terminal type

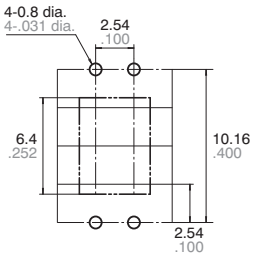



Surface mount terminal type



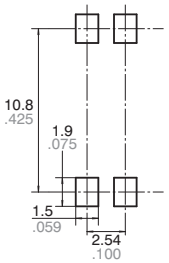

Terminal thickness = 0.20 .008
General tolerance: ±0.1 ±.004

PC board pattern (BOTTOM VIEW)




Tolerance: ±0.1 ±.004

Recommended mounting pad (TOP VIEW)



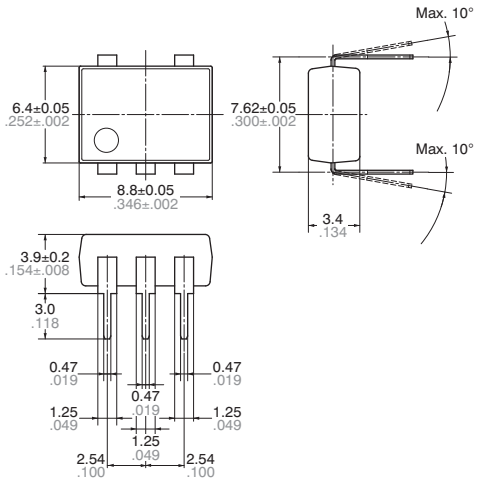

Tolerance: ±0.1 ±.004

### 4. DIP6 Type

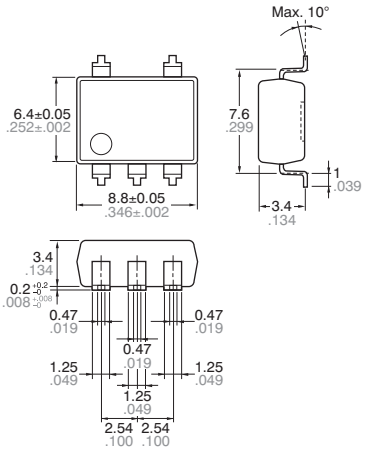
APT1212(A), APT1222(A), APT1232(A)

CAD Data

Through hole terminal type

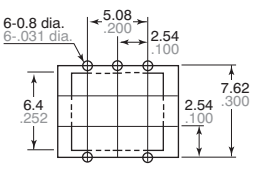



Surface mount terminal type



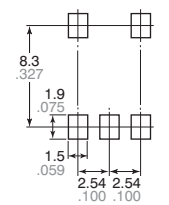

Terminal thickness = 0.25 .010
General tolerance: ±0.1 ±.004

PC board pattern (BOTTOM VIEW)




Tolerance: ±0.1 ±.004

Recommended mounting pad (TOP VIEW)

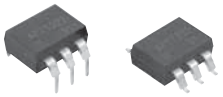



Tolerance: ±0.1 ±.004

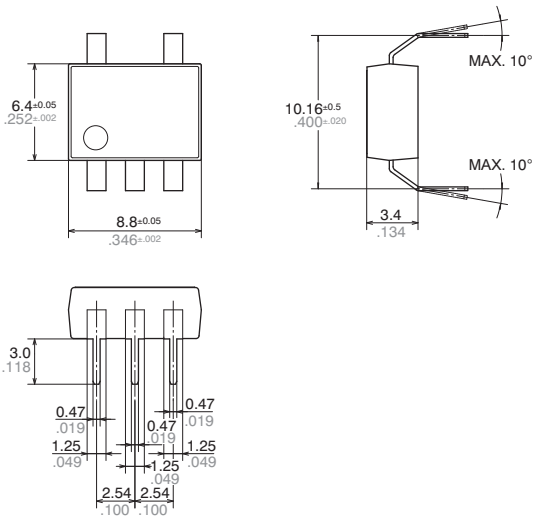
**5. DIP6 Wide Terminal Type**

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

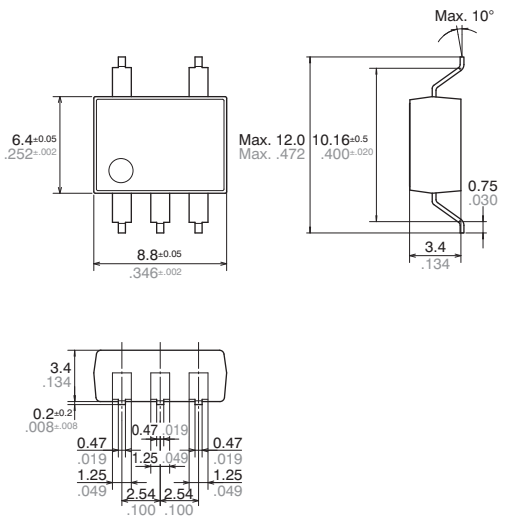
CAD Data



Through hole terminal type

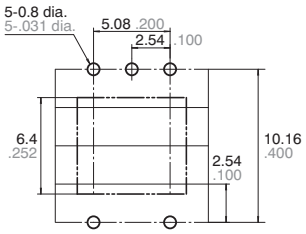



Surface mount terminal type



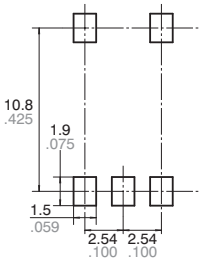

Terminal thickness = 0.25 .010
General tolerance: ±0.1 ±.004

PC board pattern (BOTTOM VIEW)




Tolerance: ±0.1 ±.004

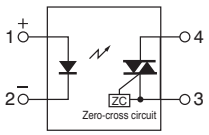
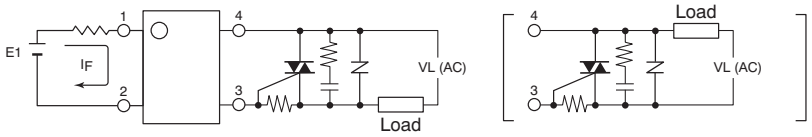
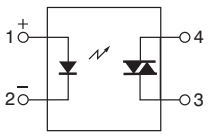
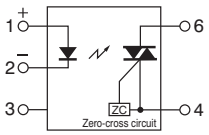
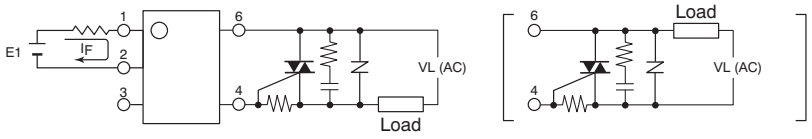
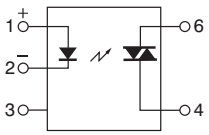
Recommended mounting pad (TOP VIEW)




Tolerance: ±0.1 ±.004

## SCHEMATIC AND WIRING DIAGRAMS

Notes: $E_1$: Power source at input side; $I_F$: LED forward current; $V_L$: Load voltage; $I_L$: Load current;

| Schematic | Output configuration | Load | Wiring diagram |
|---|---|---|---|
|   | 1 Form A | AC |   |
|   | | | |
|   | | |   |
|   | | | |

## See special section on Phototriac Couplers in Cautions for Use