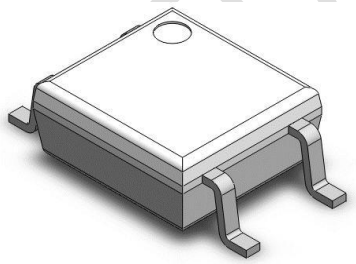
AMERICAN BRIGHT OPTOELECTRONICS CORP.

## Specification for APC-301X, APC-302X, and APC-305X

# APC-301X, APC-302X, APC-305X

*SOP4, DC Input, Random-Phase Photo TRIAC Photo Coupler*

**The APC-301X, APC-302X and APC-305X series combine an AlGaAs infrared emitting diode as the emitter which is optically coupled to a monolithic silicon random-phase photo TRIAC in a plastic SOP4 package.**
**With the robust coplanar double mold structure, APC-301X, APC-302X and APC-305X series provide the most stable isolation feature.**





## Features:

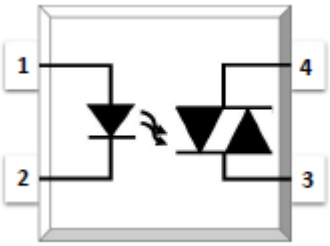
- High isolation $V_{rms}$: 3750V
- DC input with random-phase photo TRAIC output
- Operating temperature: - 40 °C to 100 °C
- RoHS & REACH Compliance
- MSL Class 1
- Halogen free (Optional)
- UL - UL1577
- VDE - EN60747-5-5(VDE0884-5)
- CQC - GB4943.1, GB8898
- cUL- CSA Component Acceptance Service Notice No. 5A

## Applications:

- Solenoid/valve controls
- Lighting controls
- Motor controls
- Temperature controls
- Static AC power switches
- Solid state relays



Rev. 1.0 (09/16/2021)

| Schematic Diagram | PIN Definition |
|---|---|
|   | 1. Anode<br>2. Cathode<br>3. Terminal<br>4. Terminal |

| Absolute Maximum Ratings | | | | |
|---|---|---|---|---|
| **Parameter** | **Symbol** | **Value** | **Unit** | **Note** |
| Input | | | | |
| Forward Current | $I_F$ | 60 | mA | |
| Reverse Voltage | $V_R$ | 6 | V | |
| Junction Temperature | $V_R$ | 125 | ˚C | |
| Input Power Dissipation | $P_I$ | 100 | mW | |
| Output | | | | |
| Off-state Output Terminal Voltage | APC-301X | 250 | V | |
| | APC-302X | 400 | | |
| | APC-305X | 600 | | |
| Common | | | | |
| Total Power Dissipation | $P_{tot}$ | 330 | mW | |
| Isolation Voltage | $V_{iso}$ | 3750 | Vrms | 1 |
| Operating Temperature | $T_{opr}$ | -40~100 | ˚C | |
| Storage Temperature | $T_{stg}$ | -55~125 | ˚C | |
| Soldering Temperature | $T_{sol}$ | 260 | ˚C | 2 |

Note 1. AC For 1 Minute, R.H. = 40 ~ 60%

Note 2. For 10 seconds

| Electrical Optical Characteristics at $T_a$=25°C | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Parameter | | Symbol | min | Typ. | Max. | unit | Test Condition | Note |
| Input | | | | | | | | |
| Forward Voltage | | $V_F$ | - | 1.24 | 1.4 | V | $I_F$=10mA | |
| Reverse Current | | $I_R$ | - | - | 10 | μA | $V_R$=6V | |
| Input Capacitance | | $C_{in}$ | - | 8.5 | 250 | pF | V=0, f=1kHz | |
| Output | | | | | | | | |
| Peak off-state Current, Either direction | | $I_{DRM}$ | - | - | 100 | nA | $V_{DRM}$=Rated $V_{DRM}$ $I_F$=0 | 3 |
| Peak on-state Current, Either direction | | $V_{TM}$ | - | 1.58 | 2.5 | V | $I_{TM}$= 100 mA | |
| Critical Rate of Rise of Off-state Voltage | | Dv/dt | 1000 | - | - | V/μs | $V_{PEAK}$ = Rated $V_{DRM}$ | 4 |
| Transfer Characteristics | | | | | | | | |
| LED Trigger Current | **APC-3010, APC-3021 APC-3051** | $I_{FT}$ | - | - | 15 | mA | Terminal Voltage = 3V $I_{TM}$ = 100 mA | |
| | **APC-3011, APC-3022 APC-3052** | | - | - | 10 | | | |
| | **APC-3012 APC-3023 APC-3053** | | - | - | 5 | | | |
| Holding Current | | $I_H$ | - | 257 | - | μA | | |
| Isolation Resistance | | $R_{ISO}$ | 10^12 | 10^14 | - | Ω | DC500V, 40~60% R.H. | |
| Floating Capacitance | | $C_{IO}$ | - | 0.4 | 1 | pF | V=0, f=1MHz | |

Note 3. Test voltage must be applied within dV/dt rating
Note 4. Refer to Fig. 15 & Fig 16

**Naming System:**

**APC-30KX**

K: Indicated to the LED output voltage value listed on Page 2

X: Indicated to the LED trigger current value listed on Page 3

## Characteristic Curves

**Fig 1. Forward Current vs. Ambient Temperature**

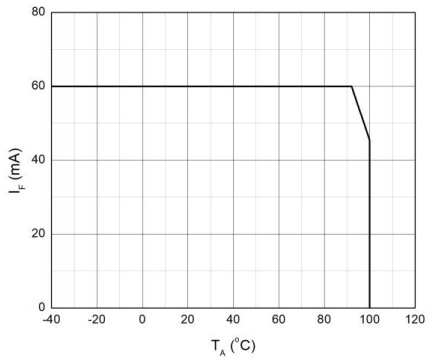



**Fig 2. On-state Terminal Current vs. Ambient Temperature**

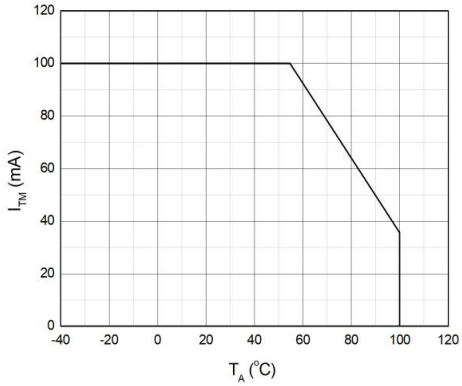



**Fig 3. Forward Current vs. Forward Voltage**

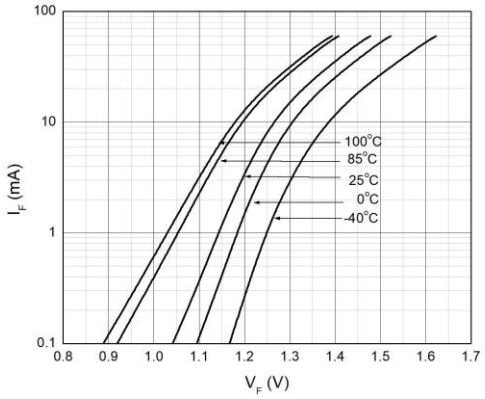



**Fig 4. Off-state Terminal Current vs. Ambient Temperature**

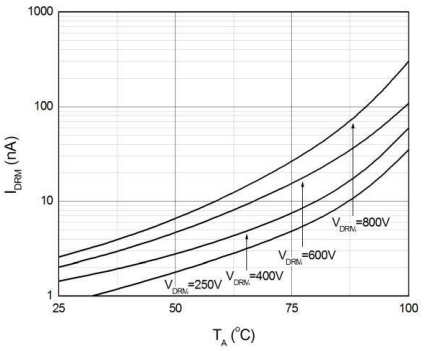



**Fig 5. Normalized Off-state Terminal Voltage vs. Ambient Temperature**

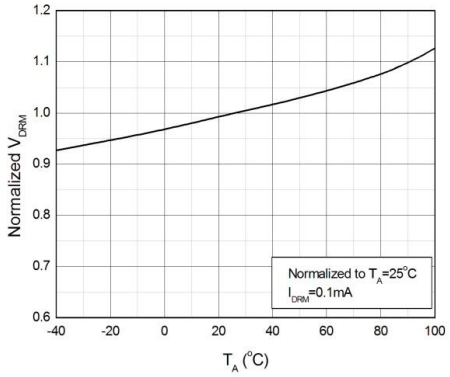



**Fig 6. Normalized Trigger Current vs. LED Trigger Pulse Width**

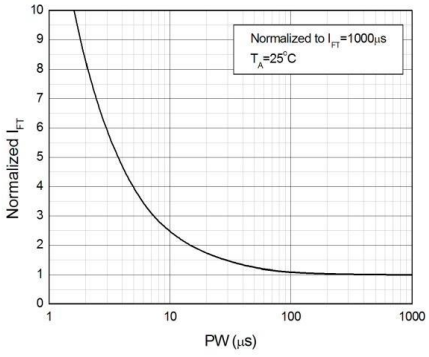


**Fig 7. Normalized Trigger Current vs. Ambient Temperature**

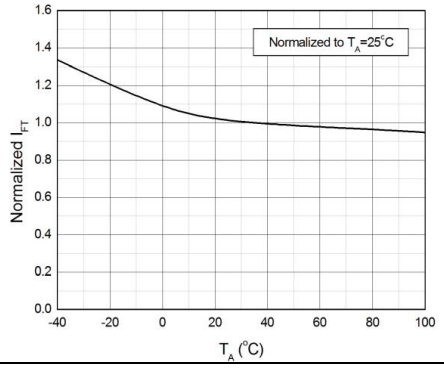



**Fig 8. On-state Terminal Voltage vs. Ambient Temperature**

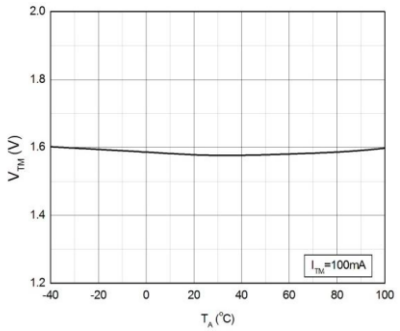



**Fig 9. On-state Terminal Voltage vs. On-state Terminal Current**

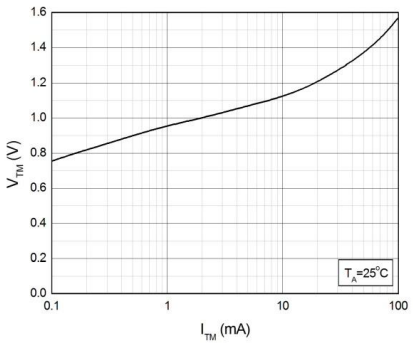



**Fig 10. Holding Current vs. Ambient Temperature**

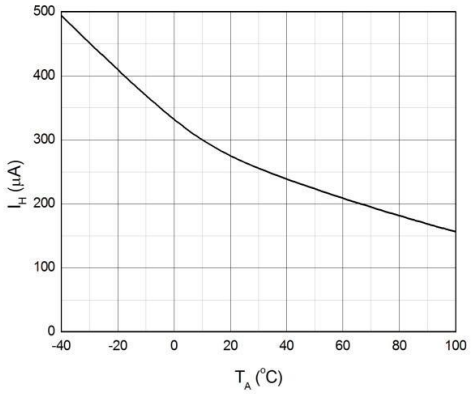



**Fig 11. Turn On Time vs. Forward Current**

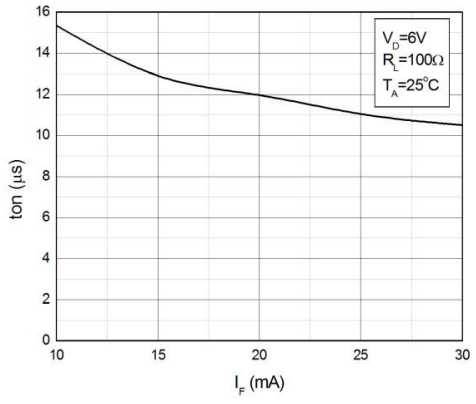



**Fig 12. Turn On Time vs. Ambient Temperature**

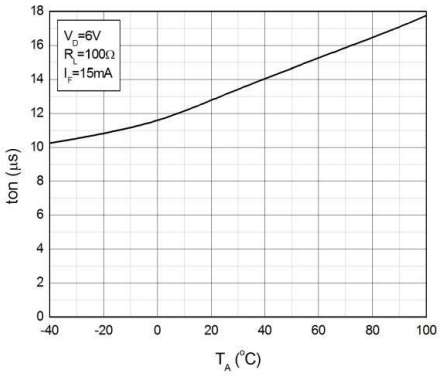


**Fig 13. Test Circuits of Turn On Time**

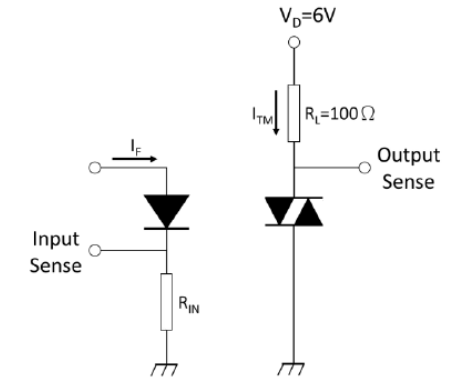



**Fig 14. Waveforms of Turn On time**

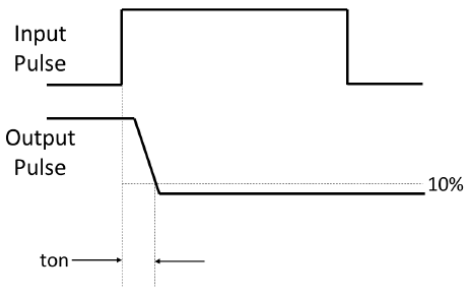



**Fig 15. Test Ciruicts of dV/dt**

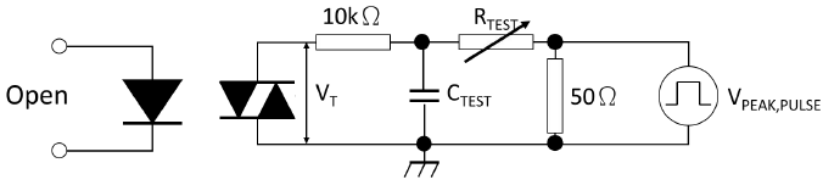
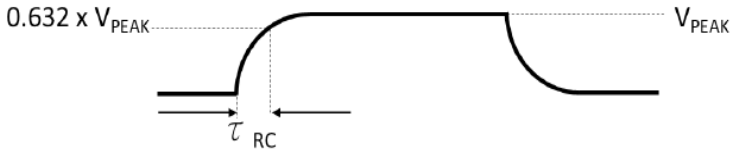
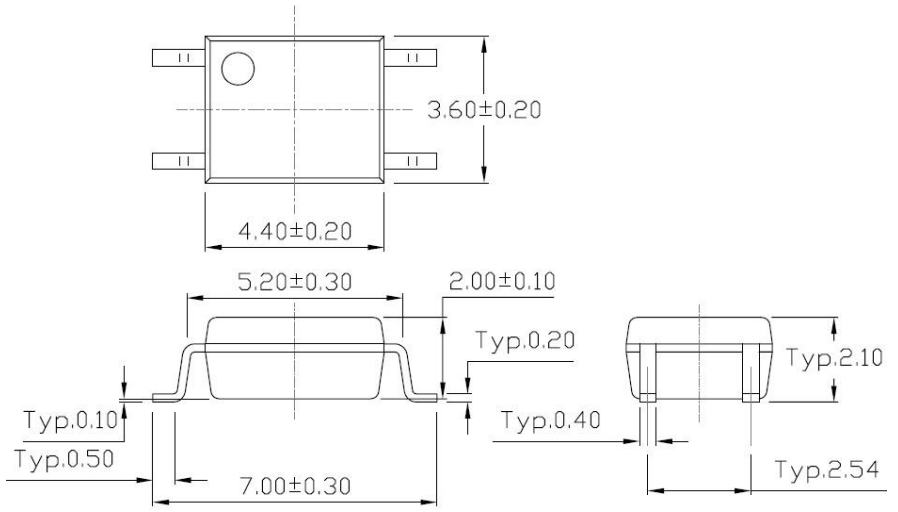



**Fig 16. Waveforms of dV/dt**

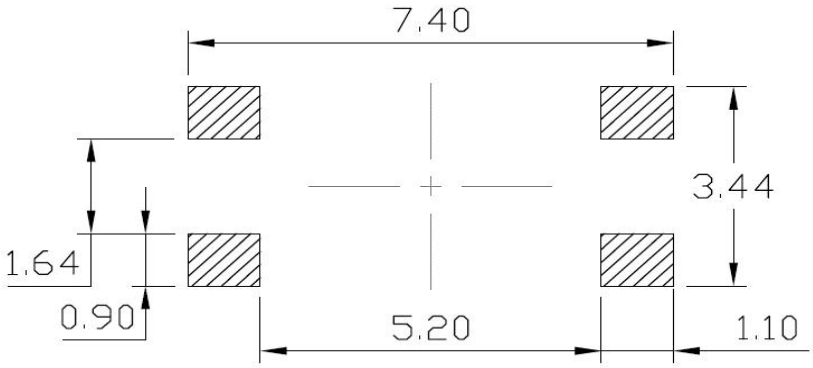



$$dv/dt = \frac{0.632 \times V_{PEAK}}{\tau_{RC}}$$

## Package Dimension (mm)

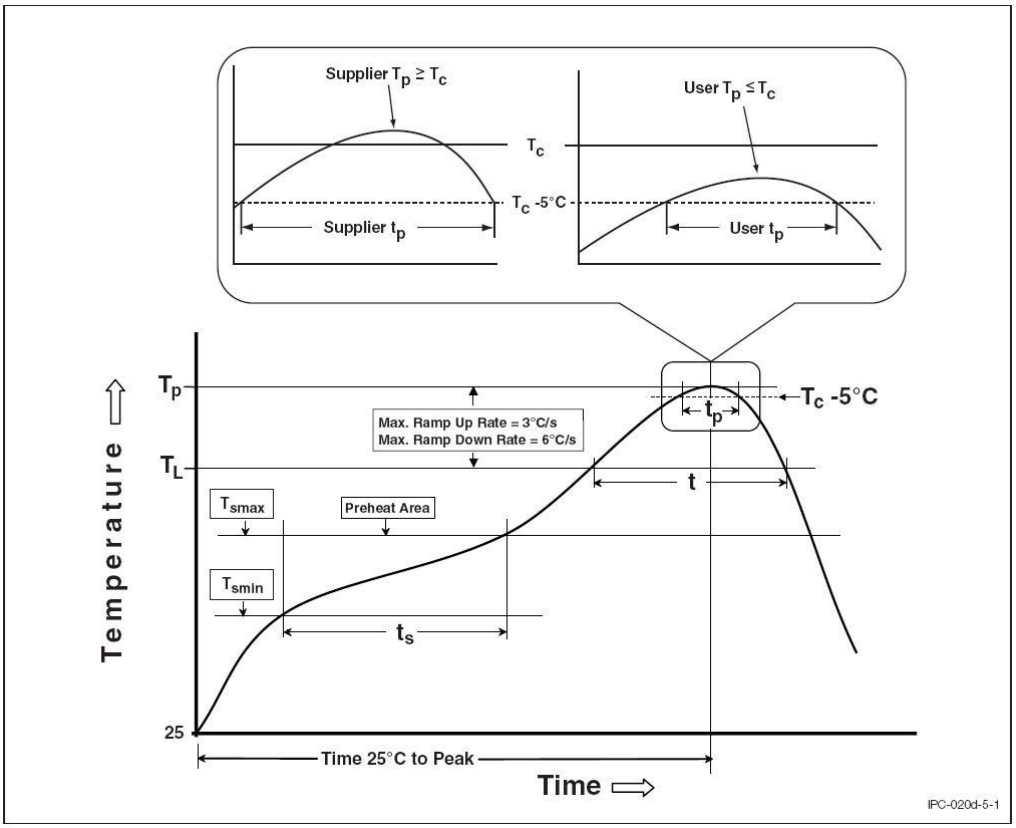



## Recommended Solder Mask (mm)



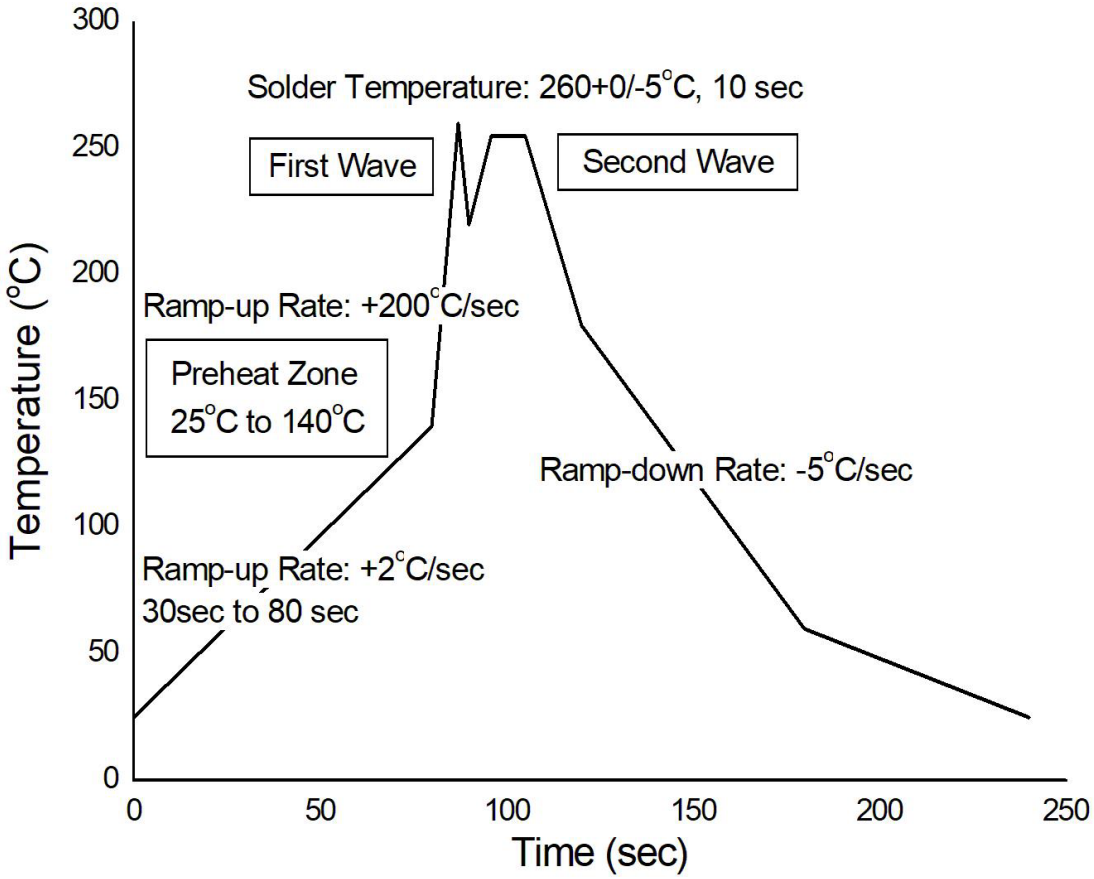
## Reflow Information

### Reflow Profile




| Profile Feature | Sn-Pb Assembly Profile | Pb-free Assembly Profile |
|---|---|---|
| Temperature min. ($T_{s, min}$) | 100˚C | 150˚C |
| Temperature Max. ($T_{s, Max}$) | 150˚C | 200˚C |
| Time (ts) from ($T_{s, min}$ to $T_{s, max}$) | 60-120 s | 60-120 s |
| Ramp-up Rate (tL to tP) | 3˚C/s max. | 3˚C/s max. |
| Liquidous Temperature (TL) | 183˚C | 217˚C |
| Time (tL) Maintained Above (TL) | 60-150 s | 60-150 s |
| Peak Body Package Temperature | 235˚C +0˚C/ -5˚C | 260˚C +0˚C/ -5˚C |
| Time (tP) within 5°C of 260°C | 20 s | 30 s |
| Ramp-down Rate (TP to TL) | 6˚C/s max. | 6˚C/s max. |
| Time 25°C to Peak Temperature | 6 minutes max. | 8 minutes max. |

| Temperature Profile of Soldering |
|---|
| Wave soldering (JESD22-A111 compliant) |




| Hand soldering by soldering iron | |
|---|---|
| Soldering temperature | 380 +0/-5˚C |
| Soldering time | 3 s max. |

- One time soldering is recommended for all soldering method
- Do not solder more than three times for IR reflow soldering

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