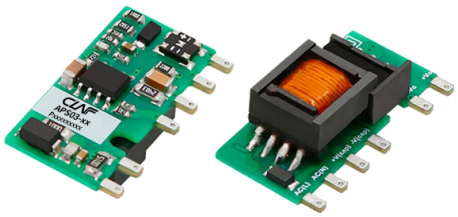
## DESCRIPTIONS

3W, AC/DC Converter



RoHS

UL62368-1 EN62368-1 BS EN62368-1

## FEATURES

- Ultra-wide 85 - 305VAC and 70 - 430VDC input voltage range
- Accepts AC or DC input (dual-use of same terminal)
- Operating ambient temperature range -40℃ to +85℃
- Multi application, flexible layout
- Compact size, high power density, green power
- Controllable life and adjustable cost
- No-load power consumption 0.1W
- Output short circuit, over-current protection
- Designed to meet IEC/EN60335, IEC/EN61558 standards

## APPLICATIONS

- Industrial control
- Electric power
- Instrumentation
- Smart home

## Selection Guide

| Certification | Part No | Output Power (W) | Nominal Output Voltage and Current (Vo/Io) | Efficiency at 230VAC (%) Typ. | Capacitive Load (uF) Max. |
|---|---|---|---|---|---|
| EN/BS EN | APS03-03 | 1.98W | 3.3V/600mA | 67 | 820 |
| UL/EN/BS EN | APS03-05 | 3W | 5V/600mA | 72 | 680 |
| EN/BS EN | APS03-09 | | 9V/333mA | 76 | 470 |
| | APS03-12 | | 12V/250mA | 77 | 470 |
| | APS03-15 | | 15V/200mA | 78 | 330 |
| | APS03-24 | | 24V/125mA | 80 | 200 |

Note: 1. The nominal output voltage refers to the voltage applied to the load terminal after adding external circuits.
2. If the product is used in a severe vibration application, it needs to be glued and fixed.
3. The product picture is for reference only. For details, please refer to the actual product.

## Specifications

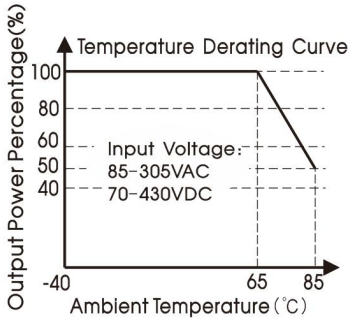
| Product Specifications | Item | Operating Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Input Specifications | Input Voltage Range | AC input | 85 | -- | 305 | VAC |
| | | DC input | 70 | -- | 430 | VDC |
| | Input Frequency | | 47 | -- | 63 | Hz |
| | Input Current | 115VAC | -- | -- | 0.12 | A |
| | | 230VAC | -- | -- | 0.06 | |
| | Inrush Current | 115VAC | -- | 13 | -- | |
| | | 230VAC | -- | 23 | -- | |
| | Recommended External Input Fuse | | 1A, slow-blow, required (The actual use needs to be selected according to the application environment) | | | |
| | Hot Plug | | Unavailable | | | |
| Output Specifications | Output Voltage Accuracy | 10% - 100% load | -- | ±5 | -- | % |
| | Line Regulation | Rated load | -- | ±1.5 | -- | |
| | Load Regulation | 10% - 100% load | -- | ±3 | -- | |
| | Ripple & Noise* | 20MHz bandwidth (peak-to-peak value), 10% - 100% load | -- | 80 | 150 | mV |
| | Temperature Coefficient | | -- | ±0.15 | -- | %/℃ |
| | Stand-by Power Consumption | 230VAC | -- | 0.10 | 0.15 | W |
| | Short Circuit Protection | | Hiccup, continuous, self-recover | | | |
| | Over-current Protection | | ≥110%Io, self-recover | | | |
| | Minimum Load | | 10 | -- | -- | % |
| General Specifications | Isolation Input-output | Electric Strength Test for 1min., leakage current < 5mA | 3000 | -- | -- | VAC |
| | Operating Temperature | | -40 | -- | +85 | ℃ |
| | Storage Temperature | | -40 | -- | +105 | |
| | Storage Humidity | | -- | -- | 95 | %RH |
| | Soldering Temperature | Wave-soldering | 260 ± 5℃; time: 5 - 10s | | | |
| | | Manual-welding | 360 ± 10℃; time: 3 - 5s | | | |
| | Power Derating | +65℃ to +85℃ | 2.5 | -- | -- | %/℃ |
| | | 85VAC - 100VAC | 1.33 | -- | -- | %/VAC |
| | | 277VAC - 305VAC | 1 | -- | -- | |
| | Safety Class | | CLASS II | | | |
| | MTBF | MIL-HDBK-217F@25℃ | > 1000,000 h | | | |
| Mechanical Specifications | Dimension | 26.40 x 12.58 x 11.00 mm | | | | |
| | Weight | 3.5g (Typ.) | | | | |
| | Cooling method | Free air convection | | | | |

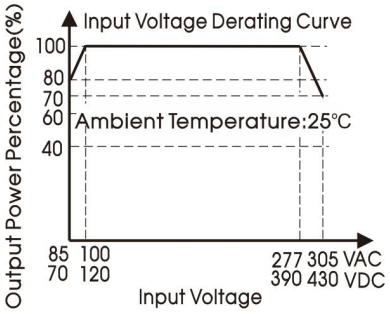
Note: 1. * The "parallel cable" method is used for ripple and noise test.
2. The product is able to work with 0% - 10% load and with stable output.

## Electromagnetic Compatibility (EMC)

| | | | | |
|---|---|---|---|---|
| Electromagnetic Compatibility (EMC) | Emissions | CE | CISP2/EN55032 CLASS A (Application circuit 1, 4) | |
| | | | CISP2/EN55032 CLASS B (Application circuit 2, 3) | |
| | | RE | CISP2/EN55032 CLASS A (Application circuit 1, 4) | |
| | | | CISP2/EN55032 CLASS B (Application circuit 2, 3) | |
| | Immunity | ESD | IEC/EN61000-4-2 Contact ±6KV | perf. Criteria B |
| | | RS | IEC/EN61000-4-3 10V/m | perf. Criteria A |
| | | EFT | IEC/EN61000-4-4 ±2KV (Application circuit 1, 2) | perf. Criteria B |
| | | | IEC/EN61000-4-4 ±4KV (Application circuit 3, 4) | perf. Criteria B |
| | | Surge | IEC/EN61000-4-5 line to line ±1KV (Application circuit 1, 2) | perf. Criteria B |
| | | | IEC/EN61000-4-5 line to line ±2KV (Application circuit 3, 4) | perf. Criteria B |
| | | CS | IEC/EN61000-4-6 10Vr.m.s | perf. Criteria A |
| | | Voltage dip, short interruption and voltage variation | IEC/EN61000-4-11 0%, 70% | perf. Criteria B |

## Characteristic Curve

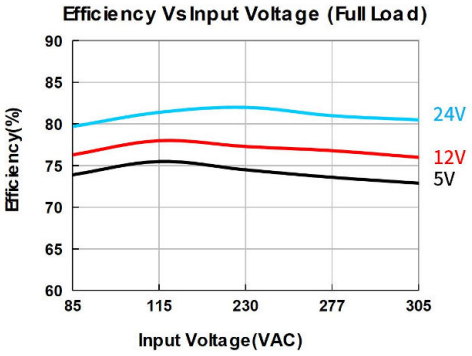


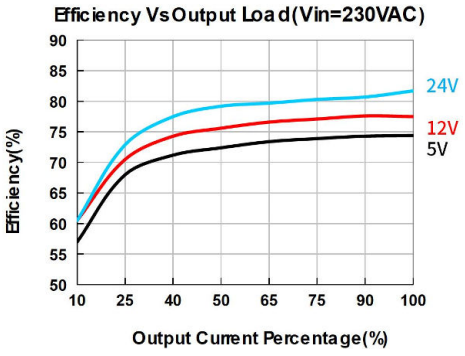




Note:

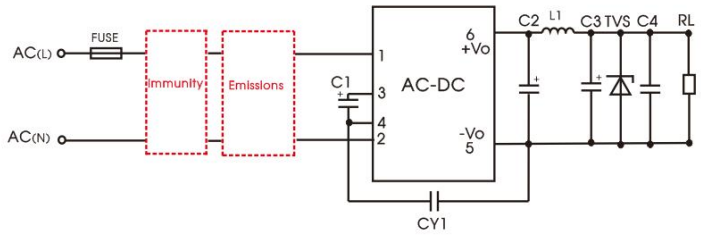
① With an AC input between 85 -100VAC/277- 305VAC and a DC input between 70 - 120VDC/390 - 430VDC, the output power must be derated as per temperature derating curves;

② This product is suitable for applications using natural air cooling.



## Additional Circuits Design Reference




APS series additional circuits design reference

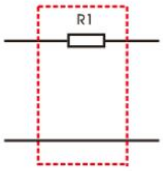
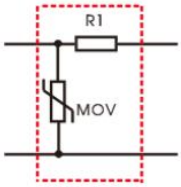
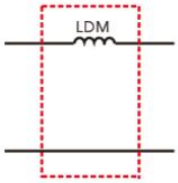
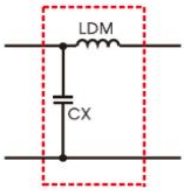
| APS series additional components selection guide (No EMC devices) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Part No. | C1(required) | C2 (required) | L1 (required) | C3 (required) | C4 | CY1 (required) | TVS |
| APS03-03 | 10uF/450V (-25℃ to +85℃, 85-305VAC input; -40℃ to +85℃, 165-305VAC input) 22uF/450V (-40℃ to +85℃, 85-305VAC input) | 470uF/6.3V (solid-state capacitor) | 4.7uH/60mΩ /2.2A | 150uF/35V | 0.1uF/ 50V | 1.0nF/ 400VAC | SMBJ7.0A |
| APS03-05 | | 270uF/16V (solid-state capacitor) | | | | | SMBJ12A |
| APS03-09 | | | | 47uF/35V | | | |
| APS03-12 | | | | | | | SMBJ20A |
| APS03-15 | | 220uF/35V | | | | | |
| APS03-24 | | | | | | | SMBJ30A |

Note:

1. C1 is used as filter capacitor with AC input (must be connected externally) and as EMC filter capacitor with DC input (must be connected), and it is recommended to use the capacitor with ripple current ＞200mA@100KHz.
2. We recommend using an electrolytic capacitor with high frequency and low ESR (ESR of C3 at low temperature of -40℃≤1.1Ω) rating for C3 (refer to manufacture's datasheet), electrolytic capacitor can be used for C2 when applied in normal and high temperature environments. Combined with C2, L1, they form a pi-type filter circuit. Choose a capacitor voltage rating with at least 20% margin, in other words not exceeding 80%. C4 is a ceramic capacitor, used for filtering high frequency noise.
3. A suppressor diode (TVS) is recommended to protect the application in case of converter failure and specification should be 1.2 times of the output voltage.

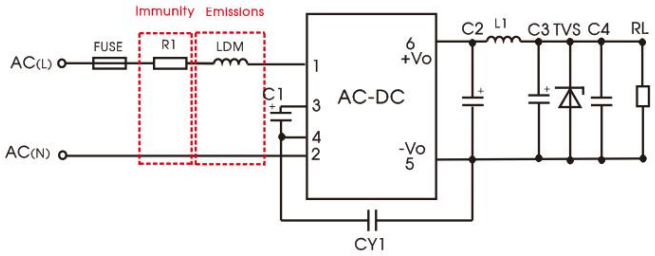
## Environmental Application EMC Solution

| APS series environmental application EMC solution selection table | | | | | | |
|---|---|---|---|---|---|---|
| Recommended circuit | Application environmental | Typical industry | Input voltage range | Environment temperature | Emissions | Immunity |
| 1 | Basic application | None | 85 - 305VAC | -40℃ to +85℃ | Class A | Level 3 |
| 2 | Indoor civil environment | Smart home/Home appliances (2Y) | | -25℃ to +55℃ | Class B | Level 3 |
| | Indoor general environment | Intelligent building/Intelligent agriculture | | | | |
| 3 | Indoor industrial environment | Manufacturing workshop | | -25℃ to +55℃ | Class B | Level 4 |
| 4 | Outdoor general environment | ITS/Video monitoring/Charging point/Communication/Security and protection | | -40℃ to +85℃ | Class A | Level 4 |

| Immunity design circuits for reference | | Emissions design circuits for reference | |
|---|---|---|---|
| Level 3 | Level 4 | Class A | Class B |
|  |  |  |  |

## Electromagnetic Compatibility Solution--Recommended Circuit

1. Application circuit 1——Basic application

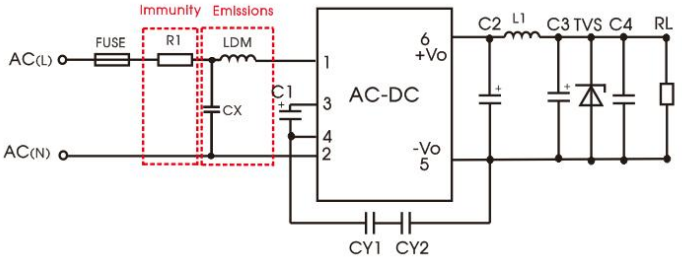



recommended circuit 1

| Application environmental | Ambient temperature range | Immunity Level | Emissions Class |
|---|---|---|---|
| Basic application | -40℃ to +85℃ | Level 3 | Class A |

| | |
|---|---|
| FUSE (required) | 1A/300V, slow-blow |
| R1 (wire-wound resistor, required) | 12Ω/3W |
| LDM | 1.2mH/Max: 4Ω/Min: 0.2A |
| Note: R1 is the input plug-in resistor, this resistor needs to be a wire-wound resistor (required), please do not select SMD resistor or carbon film resistor. | |

2. Application circuit 2——Indoor civil /Universal system recommended circuits for general environment

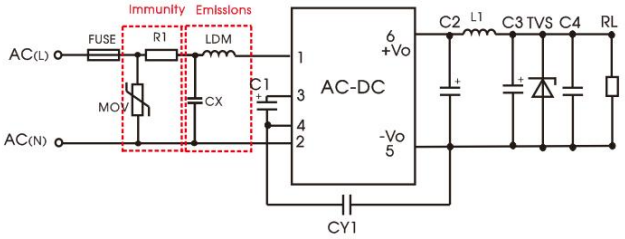



Recommended circuit 2

| Application environmental | Ambient temperature range | Immunity Level | Emissions Class |
|---|---|---|---|
| Indoor civil/general | -25℃ to +55℃ | Level 3 | Class B |

| Component | Recommended value |
|---|---|
| R1 (wire-wound resistor, required) | 12Ω/3W |
| LDM | 1.2mH/Max: 4.0Ω/Min: 0.2A |
| CX | 0.1uF/310VAC |
| FUSE (required) | 1A/300V, slow-blow |
| Note 1: In the home appliance application environment, the two Y capacitors of the primary and secondary need to be externally connected (CY1/CY2, value at 2.2nF/250VAC), which can meet the EN60335 certification.<br>Note 2: According to the certification requirements, the X capacitor needs to be connected in parallel with the bleeder resistance, the recommended resistance value is less than 3.8MΩ, and the actual need to be selected according to the certification standard.<br>Note 3: R1 is the input plug-in resistor, this resistor needs to be a wire-wound resistor (required), please do not select SMD resistor or carbon film resistor. | |

## 3. Application circuit 3——Universal system recommended circuits for indoor industrial environment

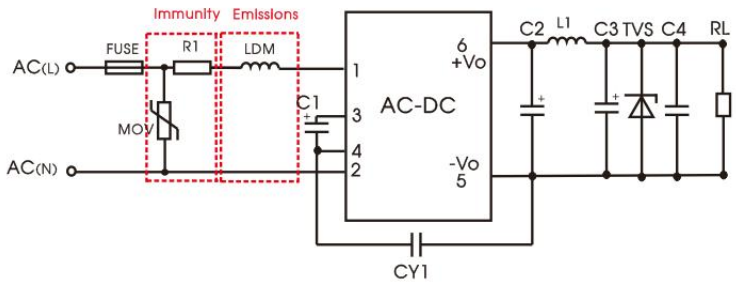



Recommended circuit 3

| Application environmental | Ambient temperature range | Immunity Level | Emissions Class |
|---|---|---|---|
| Indoor industrial | -25℃ to +55℃ | Level 4 | Class B |

| Component | Recommended value |
|---|---|
| MOV | S14K350 |
| CX | 0.1uF/310VAC |
| LDM | 1.2mH/Max: 4.0Ω/Min: 0.2A |
| R1 (wire-wound resistor, required) | 12Ω/2W |
| FUSE (required) | 2A/300V, slow-blow |
| Note 1: According to the certification requirements, the X capacitor needs to be connected in parallel with the bleeder resistance, the recommended resistance value is less than 3.8MΩ, and the actual need to be selected according to the certification standard.<br>Note 2: R1 is the input plug-in resistor, this resistor needs to be a wire-wound resistor (required), please do not select SMD resistor or carbon film resistor. | |

## 4. Application circuit 4——Universal system recommended circuits for outdoor general environment

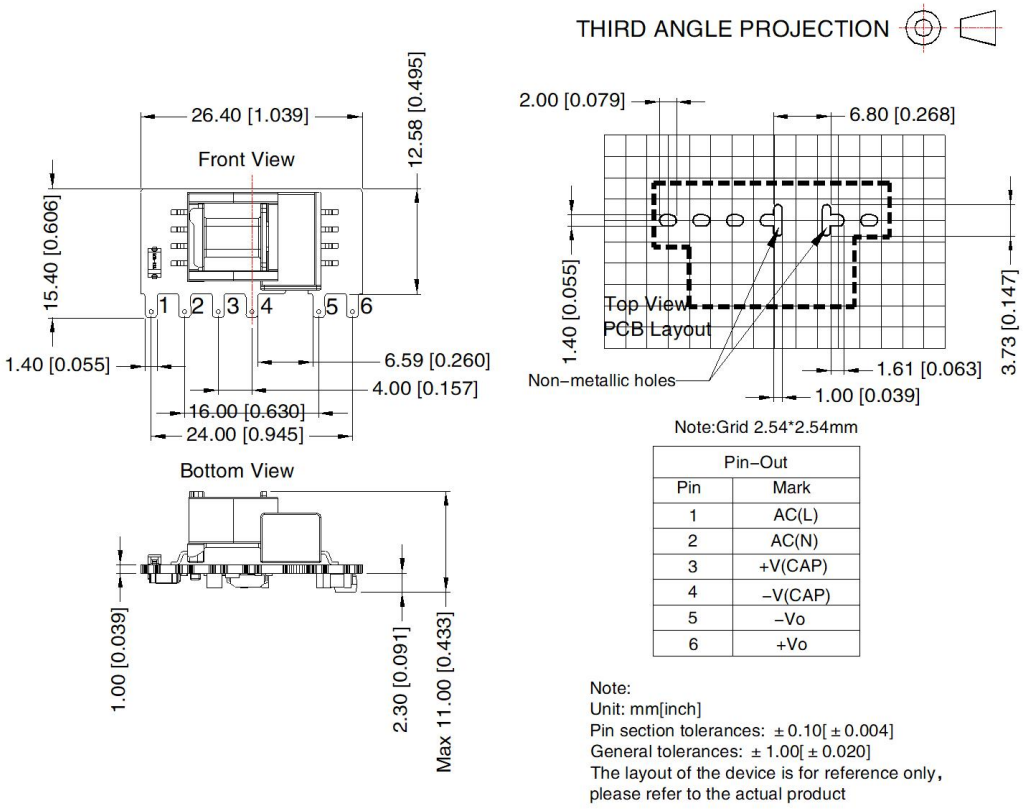



Recommended circuit 4

| Application environmental | Ambient temperature range | Immunity Level | Emissions Class |
|---|---|---|---|
| Outdoor general environment | -40℃ to +85℃ | Level 4 | Class A |

| Component | Recommended value |
|---|---|
| MOV | S14K350 |
| LDM | 1.2mH/Max: 4Ω/Min: 0.2A |
| R1 (wire-wound resistor, required) | 12Ω/2W |
| FUSE (required) | 2A/300V, slow-blow |
| Note: R1 is the input plug-in resistor, this resistor needs to be a wire-wound resistor (required), please do not select SMD resistor or carbon film resistor. | |

## Dimensions and Recommended Layout

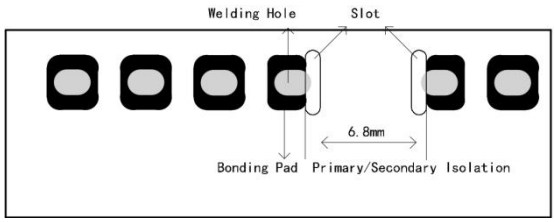



Note:Grid 2.54*2.54mm

| Pin-Out | |
|---|---|
| Pin | Mark |
| 1 | AC(L) |
| 2 | AC(N) |
| 3 | +V(CAP) |
| 4 | -V(CAP) |
| 5 | -Vo |
| 6 | +Vo |

Note:
Unit: mm[inch]
Pin section tolerances: ±0.10[±0.004]
General tolerances: ±1.00[±0.020]
The layout of the device is for reference only, please refer to the actual product

## Recommended pad




Note: There is a slot(non-metallic hole) between pin 4/5, which the side pad were being cut off. For details, please refer to the recommended dimensions or pad.

Note:

1. External electrolytic capacitors are required to modules, more details refer to typical applications;
2. This part is open frame, at least 6.4mm creepage distance between the primary and secondary external components of the module is needed to meet the safety requirement, refer to the recommended welding hole design in the external dimension drawing;
3. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25℃, humidity<75%, nominal input voltage (115V and 230V) and rated output load;
4. All index testing methods in this datasheet are based on our company corporate standards;
5. We can provide product customization service, please contact our technicians directly for specific information;
6. Products are related to laws and regulations: see "Features" and "EMC";
7. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.