# 10ACFEW_3 series

10Watt - AC-DC converter

## AC-DC Converter 10 Watt

- **Ultra-wide 85-305VAC & 100-430 VDC input range**
- **Accepts AC or DC input (dual-use of same terminal)**
- **Operating ambient temp. range -40°C to +85°C**
- **Multi application, flexible layout**
- **Compact size, high power density, green power**
- **No-load power consumption as low as 0.1W**
- **Output short circuit, over-current, over-voltage protection**
- **Design meets IEC/EN61558, IEC/EN60335 standards**
- **IEC/EN/UL62368 safety approved**

10ACFEW_3 series is one of GAPTEC's highly efficient green power AC-DC Converter series. They feature wide input range accepting either AC or DC voltage, high efficiency, low power consumption and Class II reinforced insulation. All models are particularly suitable for industrial control, electric power, instrumentation and smart home applications which have high requirement for dimension and don't have high requirement on EMC. For extremely harsh EMC environment, we recommend using the application circuit show in Design Reference of this datasheet.

UL-62368-1 (E347551)

### Common specifications

| | |
|---|---|
| Short circuit protection: | Hiccup, continuous, self-recovery |
| Cooling: | Free air convection |
| Operation temperature range: | -40°C to +85°C |
| Storage temperature range: | -40°C to +105°C |
| Storage humidity range: | < 95% |
| Power derating: | +55°C to +85°C: 2.5%/°C MIN<br>85VAC - 100VAC: 1.0%/VAC MIN<br>277VAC - 305VAC: 0.54%/VAC MIN |
| Safety standard: | IEC/EN/UL62368, IEC/EN60335, IEC/EN61558 |
| Safety-regulated certification: | IEC/EN/UL62368 |
| Safety class: | Class II |
| Hot plug: | Unavailable |
| Case material: | Plastic [UL94-V0] |
| Dimension: | 32.00 x 17.20 x 15.05 mm |
| MTBF (MIL-HDBK-217F@25°C): | >1000,000 hours |
| Weight: | 8.2g (Typ.) |

### Input specifications

| Item | Operating Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|
| Input voltage range | • AC Input<br>• DC Input | 85<br>100 | | 305<br>430 | VAC<br>VDC |
| Input frequency | | 47 | | 63 | Hz |
| Input current | • 115VAC<br>• 230VAC | | | 0.30<br>0.18 | A<br>A |
| Inrush current | • 115VAC<br>• 277VAC | | 15<br>30 | | A<br>A |
| Recommended External Input Fuse | 1A, slow-blow, required (The actual use needs to be selected according to the application enviroment) | | | | |

### Isolation specifications

| Item | Operating Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|
| Isolation voltage (input-output) | Electric Strength Test for 1min., leakage current < 5mA | 3600<br>5000 | | | VAC<br>VDC |

### Output specifications

| Item | Operating Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|
| Output voltage accuracy* | 3.3V<br>5V/9V/12V/15V/24V | | ±3<br>±2 | | % |
| Line regulation | Rated load | | ±1 | | % |
| Load regulation | 0% - 100% load | | ±1.5 | | % |
| Ripple & Noise* | 20MHz Bandwidth (peak-peak value) | | 80 | 150 | mV |
| Temperature Coefficient | | | ±0.02 | | %/°C |
| Stand-by Power Consumption | 230VAC : 3.3V/5V<br>230VAC : 9V/12V/15V<br>230VAC : 24V | | 0.05<br>0.09<br>0.13 | 0.10<br>0.12<br>0.15 | W |
| Over-current Protection | | ≥110% Io self-recovery | | | |
| Min. load | | 0 | | | % |

Note: * The "parallel cable" method is used for ripple and noise test, please refer to AC-DC Converter Application Notes for specific information.

**Example:**
**10ACFW_03S3**
**10 = 10Watt; AC = AC-DC; F = Open Frame; W = wide input**
**03 = 3.3Vout; S = single output; 3 = 3,6kVAC isolation (5kVDC)**

**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°C, 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.



GAPTEC-Electronic GmbH & Co. KG
sales@gaptec-electronic.com – www.gaptec-electronic.com

## 10ACFEW_3 series

10Watt - AC-DC converter

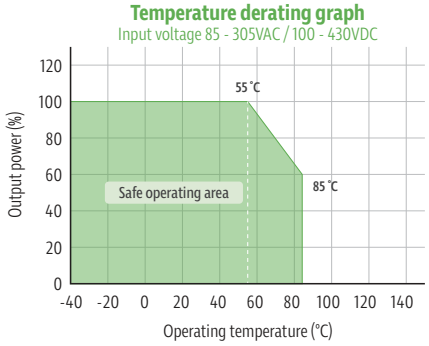
# Product Selection Guide

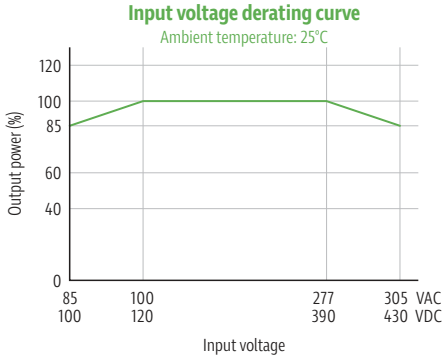
| Approval | Model | Power [W] | Output [Vo] | Output [Io] | Efficiency [%, typ] | Capacitive load [µF, max] |
|---|---|---|---|---|---|---|
| UL | 10ACFEW_03S3 | 6.6 | 3.3V | 2000mA | 73 | 1500 |
| UL | 10ACFEW_05S3 | 10 | 5V | 2000mA | 77 | 1500 |
| UL | 10ACFEW_09S3 | 10 | 9V | 1100mA | 80 | 1000 |
| UL | 10ACFEW_12S3 | 10 | 12V | 830mA | 82 | 680 |
| UL | 10ACFEW_15S3 | 10 | 15V | 670mA | 82 | 470 |
| UL | 10ACFEW_24S3 | 10 | 24V | 420mA | 83 | 330 |

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.

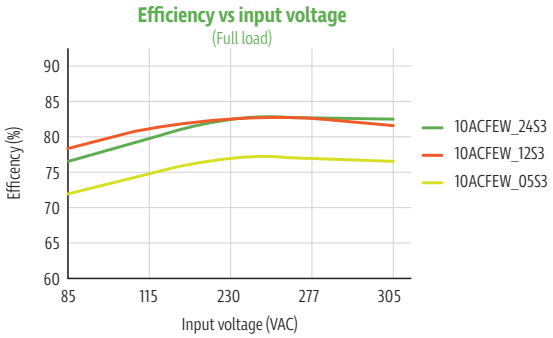
| Electromagnetic Compatibility (EMC) | | | | |
|---|---|---|---|---|
| Emissions | CE | CISPR32/EN55032 CLASS A (Application circuit 1, 4)<br>CISPR32/EN55032 CLASS B (Application circuit 2, 3) | | |
| Emissions | RE | CISPR32/EN55032 CLASS A (Application circuit 1, 4)<br>CISPR32/EN55032 CLASS B (Application circuit 2, 3) | | |
| Immunity | ESD | IEC/EN 61000-4-2 | Contact ±6KV | perf. Criteria B |
| Immunity | RS | IEC/EN 61000-4-3 | 10V/m | perf. Criteria A |
| Immunity | EFT | IEC/EN 61000-4-4<br>IEC/EN 61000-4-4 | ± 2kV (see application circuit 1, 2)<br>± 4kV (see application circuit 3, 4) | perf. Criteria B<br>perf. Criteria B |
| Immunity | Surge | IEC/EN 61000-4-5<br>IEC/EN 61000-4-5 | line to line ±1KV (Application circuit 1, 2)<br>line to line±2KV (Application circuit 3, 4) | perf. Criteria B<br>perf. Criteria B |
| Immunity | CS | IEC/EN 61000-4-6 | 10 Vr.m.s | perf. Criteria A |
| Immunity | Voltage dip, short interruption and voltage variation | IEC/EN 61000-4-11 | 0%-70% | perf. Criteria B |

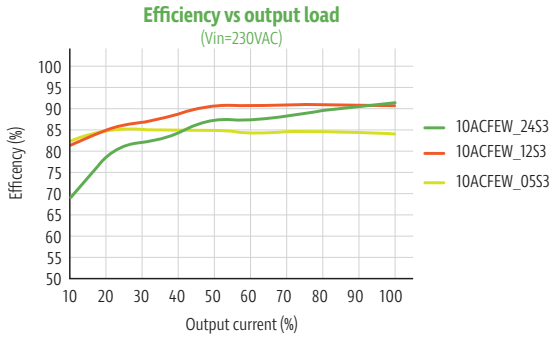
# Product typical curve & Efficiency




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; for applications in closed environment please consult factory or one of our FAE.

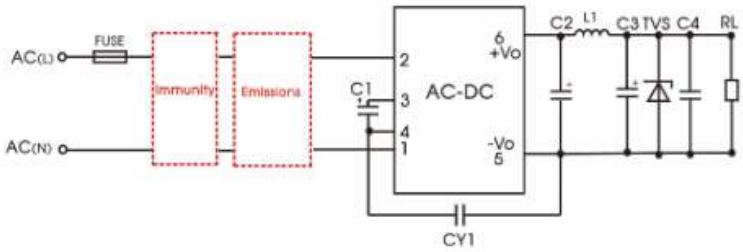




GAPTEC-Electronic GmbH & Co. KG
sales@gaptec-electronic.com – www.gaptec-electronic.com

# Typical application circuit




Additional circuits design reference

Additional components selection guide (No EMC devices)

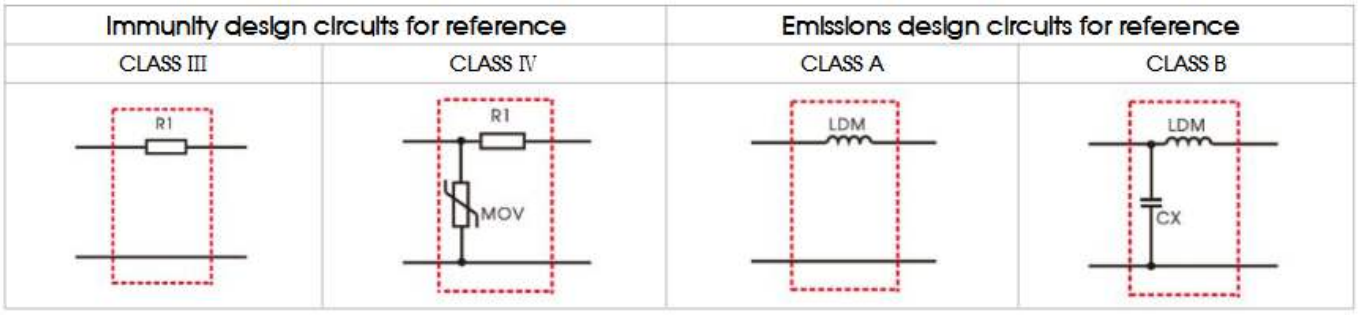
| Model | C1 (required) | C2 (required) | L1 (required) | C3 (required) | C4 | CY1 (required) | TVS |
|---|---|---|---|---|---|---|---|
| 10ACFEW_03S3 | 22μF/450V | 820μF/16V (solid-state capacitor) | 2μH/15mΩ Max/6.5A | 150μF/35V | 0.1μF/ 50V | 1.0nF/ 400VAC | SMBJ7.0A |
| 10ACFEW_05S3 | | 270μF/16V (solid-state capacitor) | | | | | |
| 10ACFEW_09S3 | | | | 150μF/35V | | | SMBJ12A |
| 10ACFEW_12S3 | | | | | | | SMBJ20A |
| 10ACFEW_15S3 | | 470uF/35V | | 220uF/35V | | | |
| 10ACFEW_24S3 | | | | | | | 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 300mA@100KHz.
2. We recommend using an electrolytic capacitor with high frequency and low ESR 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

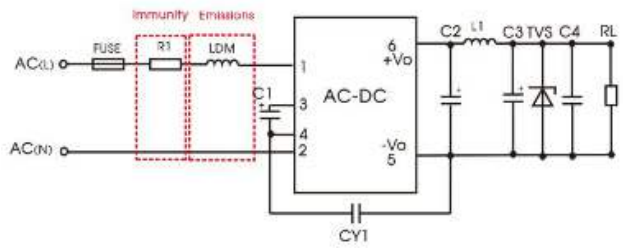
Environmental application EMC solution selection table

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



# Electromagnetic Compatibility Solution-Recommended Circuit

## 1. Application circuit 1—Basic application

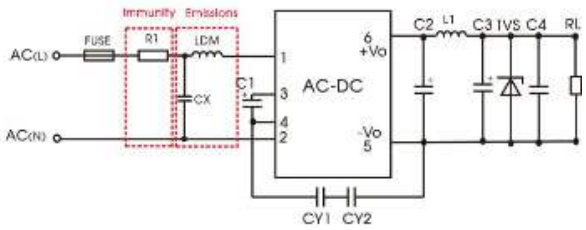



Recommended circuit 1

| Application environmental | Ambient temperature range | Immunity CLASS | Emissions CLASS |
|---|---|---|---|
| Basic application | -40°C to +85°C | CLASS III | CLASS A |

| Component | Recommended value |
|---|---|
| FUSE (required) | 1A/300V, slow-blow |
| R1 (required) | 12Ω/3W |
| LDM | 4.7mH/Max: 15Ω/Min: 0.2A |

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



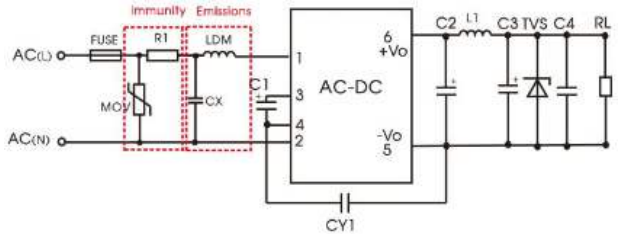

recommended circuit 2

| Application environmental | Ambient temperature range | Immunity CLASS | Emissions CLASS |
|---|---|---|---|
| Indoor civil /general | -25°C to +55°C | CLASS III | CLASS B |

| Component | Recommended value |
|---|---|
| R1 (required) | 6.8Ω/3W |
| LDM | 2.2mH/Max: 4Ω/Min: 0.24A |
| CY1(CY2) | 1.0nF/400VAC |
| CX | 0.1μF/310VAC |
| FUSE (required) | 1A/300V, slow-blow |

Note 1: To meet the IEC/EN60335 certification, the two Y capacitors of the primary and secondary need to be externally connected (CY1/CY2, value at 2.2nF/250VAC);
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.

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

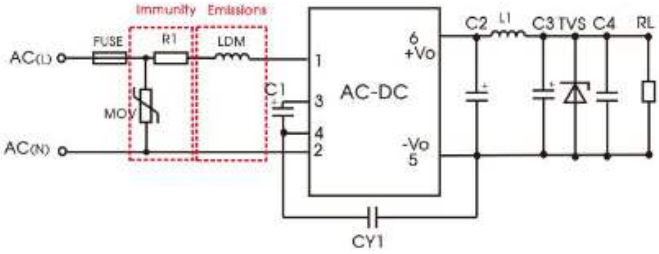



Recommended circuit 3

| Application environmental | Ambient temperature range | Immunity CLASS | Emissions CLASS |
|---|---|---|---|
| Indoor industrial | -25°C to +55°C | CLASS IV | CLASS B |

| Component | Recommended value |
|---|---|
| MOV | S14K350 |
| CX | 0.1μF/310VAC |
| CY1 | 1nF/400VAC |
| LDM | 2.2mH/Max: 4Ω/Min: 0.24A |
| R1 (required) | 6.8Ω/3W |
| FUSE (required) | 2A/300V, slow-blow |
| Note: 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. | |

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

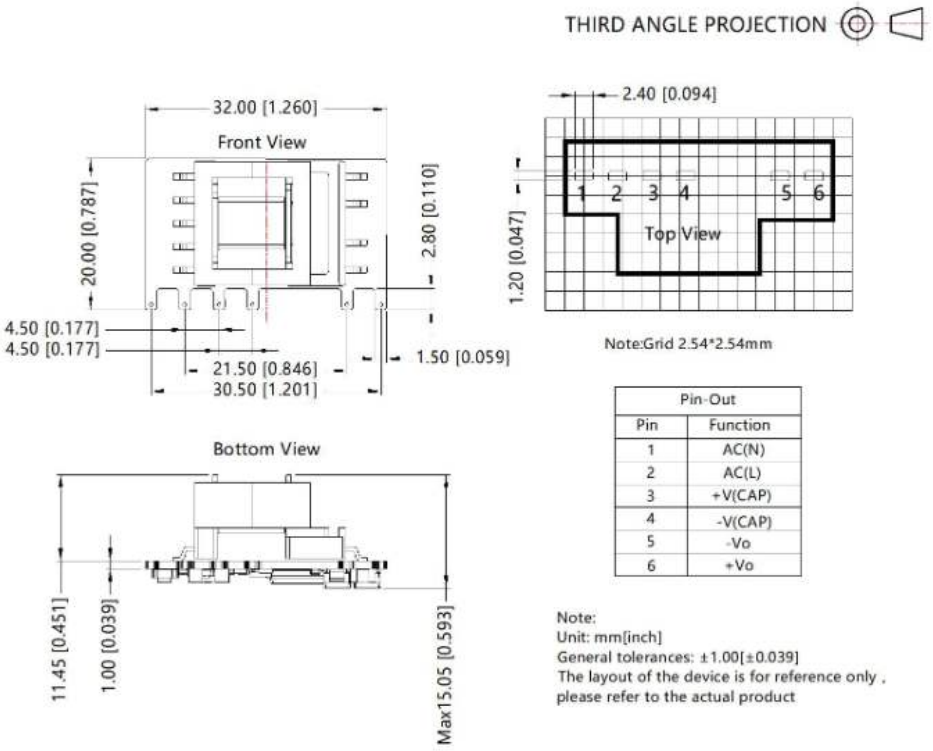



Recommended circuit 4

| Application environmental | Ambient temperature range | Immunity CLASS | Emissions CLASS |
|---|---|---|---|
| Outdoor general environment | 40°C to +85°C | CLASS IV | CLASS A |

| Component | Recommended value |
|---|---|
| MOV | S14K350 |
| LDM | 2.2mH/Max: 4Ω/Min: 0.24A |
| R1 (required) | 6.8Ω/3W |
| FUSE (required) | 2A/300V, slow-blow |

# Dimensions and Recommended Layout




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

Note:
Unit: mm[inch]
General tolerances: ±1.00[±0.039]
The layout of the device is for reference only , please refer to the actual product