# 5W AC to DC Converter PCB Mount

5W, AC-DC converter

RoHS Compliant

## Features

- Ultra-wide 85 - 305VAC and 100 - 430VDC input voltage range
- 1” × 1” compact size
- Operating ambient temperature range: -40°C to +85°C
- Up to 81.5% efficiency
- No-load power consumption 0.1W
- Plastic case meets UL94V-0 flammability
- EMI performance meets CISPR32 / EN55032 CLASS B
- IEC/EN/UL62368/EN60335/EN61558 safety approval

## Description

MP-LD05-23BxxR2 series AC-DC converters is one of compact size power converter. It features ultra-wide AC input and at the same time accepts DC input voltage, low power consumption, high efficiency, high reliability, reinforced isolation. It offers good EMC performance compliant to IEC/EN61000-4 and CISPR32/EN55032 and meets IEC/EN/UL62368/EN60335/EN61558 standards. The converters are widely used in industrial, power, home appliances, instrumentation, communication and civil applications. For extremely harsh EMC environment, we recommend using the application circuit show in Design Reference of this datasheet.

## Selection Guide

| Part Number | Output Power | Nominal Output Voltage and Current | Efficiency at 230VAC (%) Typ. | Capacitive Load (μF) Max. |
|---|---|---|---|---|
| MP-LD05-23B03R2 | 5W | 3.3V/1515mA | 71.5 | 4000 |
| MP-LD05-23B05R2 | | 5V/1000mA | 77.5 | 3000 |
| MP-LD05-23B09R2 | | 9V/555mA | 80.5 | 1200 |
| MP-LD05-23B12R2 | | 12V/416mA | | |
| MP-LD05-23B24R2 | | 24V/208mA | 81.5 | 220 |

## Input Specifications

| Item | Operating Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Input Voltage Range | AC input | 85 | - | 305 | V AC |
| | DC input | 100 | | 430 | V DC |
| Input Frequency | | 47 | | 63 | Hz |
| Input Current | 115V AC | - | | 0.13 | A |
| | 230V AC | | | 0.07 | |
| Inrush Current | 115V AC | | 15 | | |
| | 230V AC | | 25 | | |
| Leakage Current | 277VAC/50Hz | 0.25mA RMS Max. | | | |
| 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

| Item | Operating Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Output Voltage Accuracy | 3.3V output | -- | ±3 | - | % |
| | others | -- | ±2 | - | |
| Linear Regulation | Full load | -- | ±0.5 | - | |
| Load Regulation | 0%-100% load | -- | ±1 | - | |
| Ripple & Noise* | 20MHz bandwidth (peak-to-peak value) | -- | 50 | 100 | mV |
| Stand-by Power Consumption | 230V AC | -- | 0.1 | - | W |
| Temperature Coefficient | | -- | ±0.02 | - | %/°C |
| Short-circuit Protection | | Hiccup, continuous, self-recovery | | | |
| Over-current Protection | | ≥130%Io, self-recovery | | | |
| Over-voltage Protection | 3.3/5V DC output | ≤7.5V DC | | | |
| | 9V DC output | ≤15V DC | | | |
| | 12V DC output | ≤16V DC | | | |
| | 24V DC output | ≤30V DC | | | |
| Minimum Load | | 0 | - | - | % |
| Hold-up Time | 115V AC input | - | 5 | - | ms |
| | 230V AC input | - | 50 | - | |

**Notes:** *The “Tip and barrel method” is used for ripple and noise test, output parallel 10uF electrolytic capacitor and 1uF ceramic capacitor, please refer to AC-DC Converter Application Notes for specific information.

## General Specifications

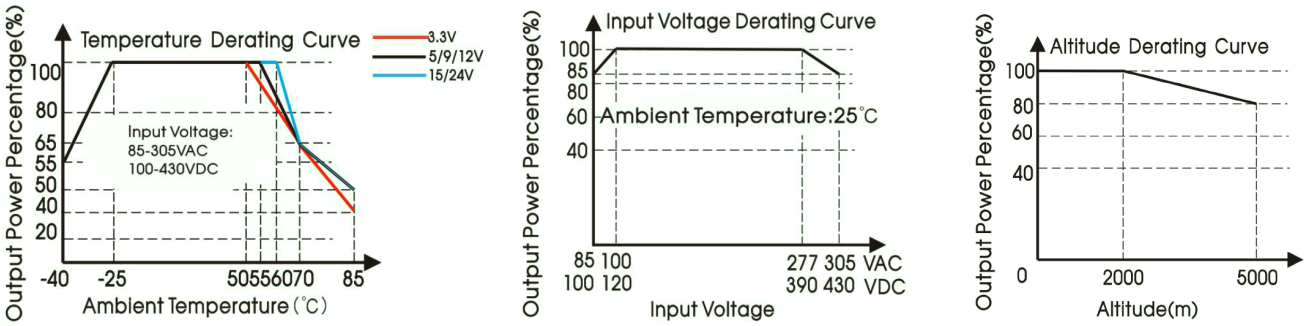
| Item | | Operating Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| Isolation | Input-Output | Electric Strength Test for 1min, leakage current <5mA | | 4000 | - | - | V AC |
| Operating Temperature | | | | -40 | - | +85 | °C |
| Storage Temperature | | | | | - | +105 | |
| Storage Humidity | | | | - | - | +95 | %RH |
| Soldering Temperature | | Wave-soldering | | 260 ± 5°C; time: 5 - 10s | | | |
| | | Manual-welding | | 360 ± 10°C; time: 3 - 5s | | | |
| Switching Frequency | | | | - | 65 | - | kHz |
| Power Derating | | -40°C to -25°C | | 3 | - | - | %/°C |
| | | +50°C to +70°C | 3.3V | 1.75 | - | - | |
| | | +55°C to +70°C | 5V/9V/12V | 2.33 | - | - | |
| | | +60°C to +70°C | 24V | 3.5 | - | - | |
| | | +70°C to +85°C | 3.3V | 1.67 | - | - | |
| | | | Others | 1 | - | - | |
| | | 85V AC - 100V AC | | 1 | - | - | %/VAC |
| | | 277V AC - 305V AC | | 0.54 | - | | |
| | | 2000m - 5000m | | 0.67 | - | -- | %/Km |

| Item | Operating Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Safety Standard | | | IEC/EN/UL62368/EN60335/EN61558 | | | |
| Safety Certification | | | IEC/EN/UL62368/EN60335/EN61558 | | | |
| Safety Class | | | CLASS II | | | |
| MTBF | | | MIL-HDBK-217F@25°C > 2602,000 h | | | |
| Designed Life | 230V AC | Ta:25°C 100% load | >130 × $10^3$ h | | | |
| | | Ta: 55°C 100% load | <41 × $10^3$ h | | | |

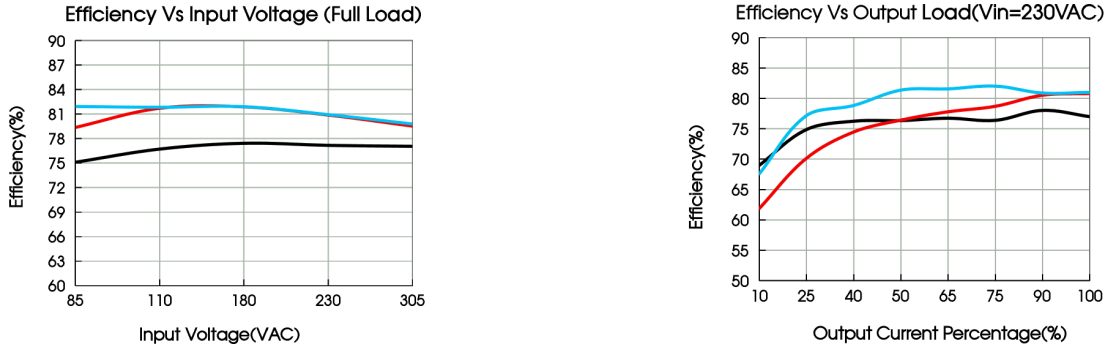
| Mechanical Specifications | | | |
|---|---|---|---|
| Case Material | | | Black plastic; flame-retardant and heat-resistant (UL94 V-0) |
| Dimensions | Horizontal package | | 25.4mm × 25.4mm × 17.6mm |
| Weight | Horizontal package | 3.3V/5V/9V/12V | 18g (Typ.) |
| | | 24V | 18.5g (Typ.) |
| Cooling Method | | | Free air convection |

| Electromagnetic Compatibility (EMC) | | | | |
|---|---|---|---|---|
| Emissions | CE | CISPR32/EN55032 | CLASS B | |
| | | EN55014-1 | | |
| | RE | CISPR32/EN55032 | CLASS B (see Fig. 5-2 for recommended circuit) | |
| | | EN55014-1 | | |
| Immunity | ESD | IEC/EN61000-4-2 | Contact ±6KV/Air ±8KV | perf. Criteria B |
| | | EN55014-2 | | perf. Criteria B |
| | RS | IEC/EN61000-4-3 | 10V/m | perf. Criteria A |
| | | EN55014-2 | | perf. Criteria A |
| | EFT | IEC/EN61000-4-4 | ±2KV (See Fig.1 for typical application circuit) | perf. Criteria B |
| | | IEC/EN61000-4-4 | ±4KV (See Fig.2 for recommended circuit) | perf. Criteria B |
| | | EN55014-2 | | perf. Criteria B |
| | Surge | IEC/EN61000-4-5 | line to line ±1KV | perf. Criteria B |
| | | | (See Fig.1 for typical application circuit) | |
| | | IEC/EN61000-4-5 | line to line ±2KV | perf. Criteria B |
| | | | (See Fig.2 for recommended circuit) | |
| | | EN55014-2 | | perf. Criteria B |
| | CS | IEC/EN61000-4-6 | 10Vr.m.s | perf. Criteria A |
| | | EN55014-2 | | perf. Criteria A |
| | Voltage dip, short interruption and voltage variation | IEC/EN61000-4-11 | 0%, 70% | perf. Criteria B |
| | | EN55014-2 | | perf. Criteria B |

## Typical Characteristic Curves




Note: ① With an AC input between 85-100V/277-305VAC and a DC input between 100-120V/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.




## Design Reference

1. Typical application

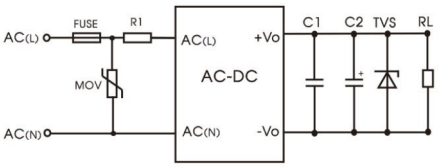



Fig. 1: Typical circuit diagram

| Part Number | C1(μF) | C2(μF) | FUSE | R1 | TVS | MOV |
|---|---|---|---|---|---|---|
| MP-LD05-23B03R2 | 1 | 150 | 1A/300V, slow-blow, required | 12Ω/3W | SMBJ7A | S10K350 |
| MP-LD05-23B05R2 | | | | | | |
| MP-LD05-23B09R2 | | 120 | | | SMBJ12A | |
| MP-LD05-23B12R2 | | | | | SMBJ20A | |
| MP-LD05-23B24R2 | | 68 | | | SMBJ30A | |

Output Filter Components:
We recommend using an electrolytic capacitor with high frequency, and low ESR rating for C2 (refer to manufacture's datasheet). Choose a Capacitor voltage rating with at least 20% margin, in other words not exceeding 80%. C1 is a ceramic capacitor used for filtering high-frequency noise and TVS is a recommended suppressor diode to protect the application in case of a converter failure.

## 2. EMC compliance recommended circuit

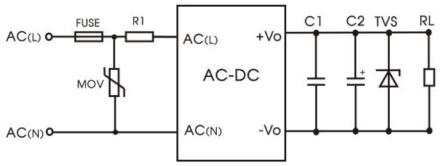
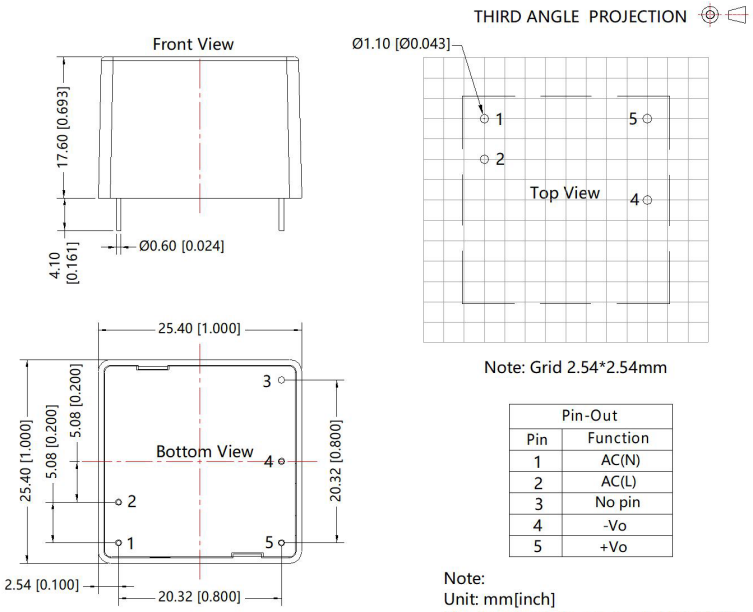



Fig 2: EMC application circuit with higher requirements

| Component | Recommended value |
|---|---|
| MOV | S14K350 |
| R1 | 33Ω/3W |
| FUSE | 2A/300V, slow-blow, required |

## Dimensions and Recommended Layout




Note: Grid 2.54*2.54mm

| Pin-Out | |
|---|---|
| Pin | Function |
| 1 | AC(N) |
| 2 | AC(L) |
| 3 | No pin |
| 4 | -Vo |
| 5 | +Vo |

Note:
Unit: mm[inch]
Pin diameter tolerances: ±0.10[±0.004]
General tolerances: ±0.50[±0.020]