

60W AC to DC Converter PCB Mount

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**RoHS
Compliant**



Features

- Universal 85V AC to 305V AC or 100V DC to 430V DC input voltage
- Operating ambient temperature range: -40°C to +85°C
- High I/O isolation test voltage up to 4200V AC
- Up to 90% efficiency
- Compact size, high power density
- Output short circuit, over-current, over-voltage protection
- 5000m altitude application
- OVC III (meet EN62477, 5000m altitude)
- Meets Emissions CLASS B and surge ± 2 KV without additional circuits

These series AC-DC converters is one of new generation compact size power converters. It features ultra-wide AC input and at the same time accepts DC input voltage, low power consumption, low ripple & noise, high efficiency, high reliability, reinforced isolation. It offers good EMC performance compliant to IEC/EN61000-4 and CISPR32/EN55032 and meets IEC/UL/EN62368, IEC/EN60335/62477, 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

| Certification | Part Number | Output Power (W) | Nominal Output Voltage and Current (Vo/Io) | Efficiency at 230V AC (%) Typ. | Capacitive Load (μ F) Max. |
|---------------|-----------------|------------------|--|--------------------------------|---------------------------------|
| IEC/UL/EN | MP-LD60-23B05R2 | 50 | 5V/10A | 89 | 20000 |
| | MP-LD60-23B12R2 | 60 | 12V/5A | 91 | 5000 |
| | MP-LD60-23B15R2 | | 15V/4A | 90 | 3000 |
| | MP-LD60-23B24R2 | | 24V/2.5A | 90 | 1800 |
| | MP-LD60-23B48R2 | | 48V/1.25A | 91 | 470 |

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| 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 | -- | -- | 1.8 | A |
| | 230V AC | -- | -- | 1 | |
| Inrush Current | 115V AC | -- | 30 | -- | |
| | 230V AC | -- | 60 | -- | |
| Leakage Current | 277V AC / 50Hz | 0.25mA RMS Max. | | | |
| Fuse | | 3.15A/300V, slow-blow, required | | | |
| Hot Plug | | Unavailable | | | |

Output Specifications

| Item | Operating Conditions | Min. | Typ. | Max. | Unit |
|--|--------------------------------------|--------------------------------------|-------|------|------|
| Output Voltage Accuracy | | -- | ±2 | -- | % |
| Line Regulation | Full load | -- | ±1 | -- | |
| Load Regulation | 0% - 100% load | -- | ±1.5 | -- | |
| Ripple & Noise* | 20MHz bandwidth (peak-to-peak value) | -- | 80 | 150 | mV |
| Stand-by Power Consumption | 230V AC | -- | 0.3 | 0.45 | W |
| Temperature Coefficient | | -- | ±0.02 | -- | %/°C |
| Short Circuit Protection | | Hiccup, continuous, self-recovery | | | |
| Over-current Protection | | ≥140% I _o , self-recovery | | | |
| Over-voltage Protection | 5V DC output | ≤9V DC (Hiccup or clamp) | | | |
| | 12V DC output | ≤16V DC (Hiccup or clamp) | | | |
| | 15V DC output | ≤24V DC (Hiccup or clamp) | | | |
| | 24V DC output | ≤35V DC (Hiccup or clamp) | | | |
| | 48V DC output | ≤60V DC (Hiccup or clamp) | | | |
| Minimum Load | | 0 | -- | -- | % |
| Hold-up Time | 115V AC input | -- | 8 | -- | ms |
| | 230V AC input | -- | 65 | | |
| Note: *The "Tip and barrel method" is used for ripple and noise test, output parallel 47uF electrolytic capacitor and 1uF ceramic capacitor, please refer to AC-DC Converter Application Notes for specific information. | | | | | |

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| General Specifications | | | | | | |
|-----------------------------|--|--|--|------|------|----------|
| Item | | Operating Conditions | Min. | Typ. | Max. | Unit |
| Isolation | Input - output | Electric strength test for 1min., Leakage current<5mA | 4200 | -- | -- | V AC |
| Insulation Resistance | Input - output | Test Voltage at 500V DC | 100 | | -- | MΩ |
| Operating Temperature | | | -40 | | +85 | °C |
| Storage Temperature | | | -40 | | +85 | |
| Storage Humidity | | | -- | | 95 | %RH |
| Soldering Temperature | | Wave-soldering | 260 ± 5°C; time: 5 - 10s | | | |
| | | Manual-welding | 360 ± 10°C; time: 3 - 5s | | | |
| Power Derating | -40°C to -25°C (85-200V AC Input) | | 3.33 | -- | -- | % / °C |
| | -40°C to -25°C (200-305V AC input) | | 1.33 | | | |
| | +40°C to +70°C (5V DC output) | | 1.5 | | | |
| | +45°C to +70°C (85-165V AC input, 12/15/24/48V DC output) | | 1.8 | | | % / V AC |
| | +50°C to +70°C (≥165V AC input, 12/15/24/48V DC output) | | 2.25 | | | |
| | +70°C to +85°C | | 2 | | | |
| | 85V AC - 100V AC | | 1.33 | | | |
| | 277V AC - 305V AC | | 0.72 | | | |
| Operating Altitude Derating | 2000m - 5000m | | 6.67 | | | %/Km |
| Safety Standard | | | IEC/UL62368-1 safety approved & EN62368-1, BS EN 62368-1(Report); Design refer to IEC/EN60335-1/62477-1,EN61558-1 | | | |
| Safety Class | | | CLASS II | | | |
| MTBF | | | MIL-HDBK-217F@25°C ≥500,000 h | | | |

| Mechanical Specifications | | |
|---------------------------|---|------------------------|
| Case Material | Black plastic, flame-retardant and heat-resistant (UL94V-0) | |
| Dimensions | Horizontal package | 70mm × 48mm × 27mm |
| | A2 chassis mounting | 96.1mm × 54mm × 35.5mm |
| | A4 Din-Rail mounting | 96.1mm × 54mm × 40.1mm |
| Weight | Horizontal package | 130g (Typ.) |
| | A2S chassis mounting | 177g (Typ.) |
| | A4S Din-Rail mounting | 220g (Typ.) |
| Cooling Method* | Free air convection | |

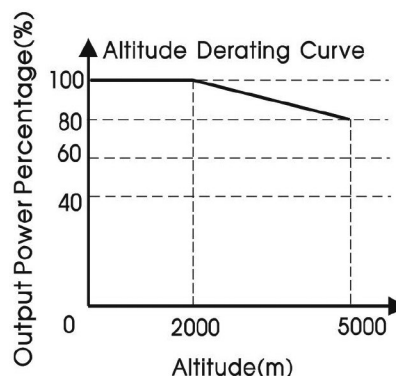
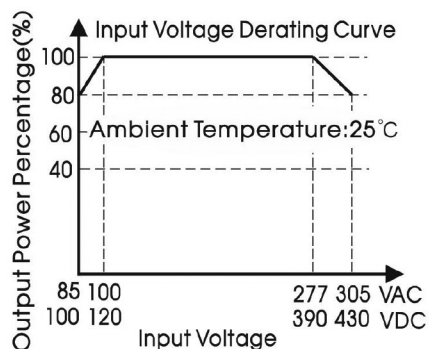
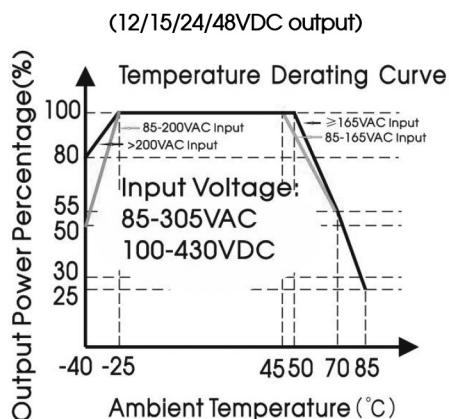
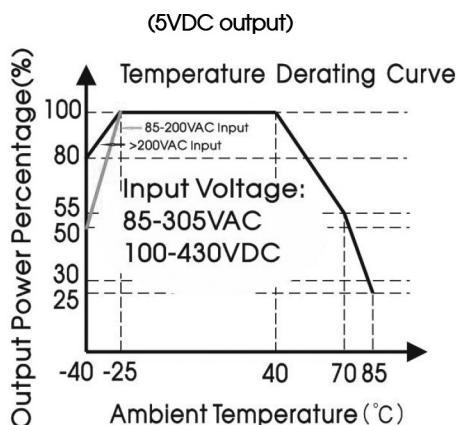
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Electromagnetic Compatibility (EMC)

| | | | | |
|---|-------|-------------------------|--|------------------|
| Emissions | CE | CISPR32/EN55032 CLASS B | | |
| | RE | CISPR32/EN55032 CLASS B | | |
| Immunity | ESD | IEC/EN61000-4-2 | Contact $\pm 6\text{KV}$ /Air $\pm 8\text{KV}$ | Perf. Criteria A |
| | RS | IEC/EN61000-4-3 | 10V/m | Perf. Criteria A |
| | EFT | IEC/EN 61000-4-4 | $\pm 2\text{KV}$ | Perf. Criteria A |
| | | IEC/EN61000-4-4 | $\pm 4\text{KV}$ (See Fig. 2 for recommended circuit) | Perf. Criteria A |
| | Surge | IEC/EN61000-4-5 | line to line $\pm 2\text{KV}$ | Perf. Criteria A |
| | | IEC/EN61000-4-5 | line to line $\pm 2\text{KV}$ /line to PE $\pm 4\text{KV}$ (See Fig. 2 for recommended circuit) | Perf. Criteria A |
| | CS | IEC/EN61000-4-6 | 10 Vr.m.s | Perf. Criteria A |
| Voltage dips, short interruptions and voltage variation | | IEC/EN61000-4-11 | 0%, 70% | perf. Criteria B |

Product Characteristic Curve



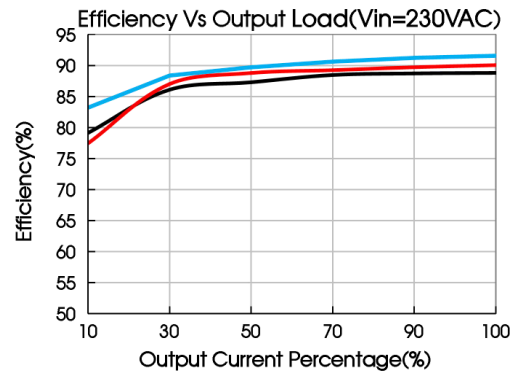
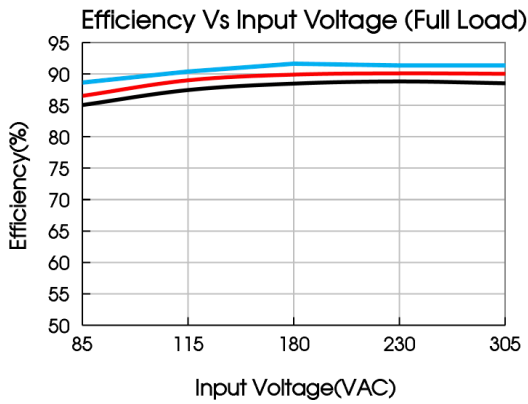
- Note: 1 With an AC input between 85-100V AC/277-305V AC and a DC input between 100-120VDC/390-430V DC, the output power must be derated as per temperature derating curves;
2 This product is suitable for applications using natural air cooling; for applications in closed environment please consult FAE.

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Design Reference

Typical application

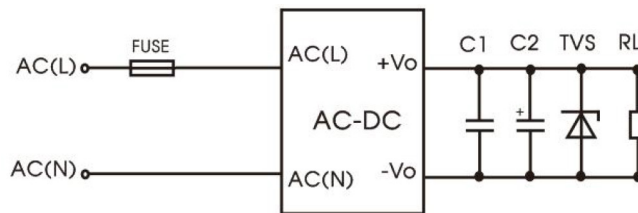


Fig. 1: Typical circuit diagram

| Part Number. | Fuse | C1 | C2 | TVS |
|-----------------|---------------------------------------|-----------|-----------|---------|
| MP-LD60-23B05R2 | 3.15A/300V, slow-blow, required | 1uF/50V | 470uF/16V | SMBJ10A |
| MP-LD60-23B12R2 | | | 330uF/25V | SMBJ20A |
| MP-LD60-23B15R2 | | | 330uF/25V | SMBJ30A |
| MP-LD60-23B24R2 | | | 220uF/35V | SMBJ40A |
| MP-LD60-23B48R2 | | -1uF/100V | 100uF/63V | SMBJ60A |

Output Filter Components:

We recommend using an electrolytic capacitor with high frequency, and low ESR rating for C2. 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.

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EMC compliance recommended circuit

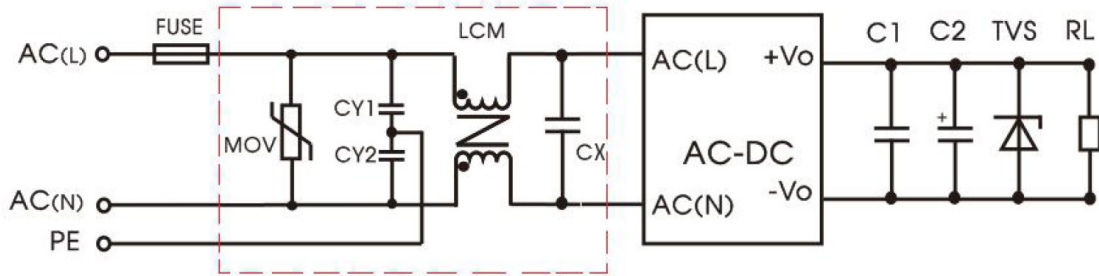
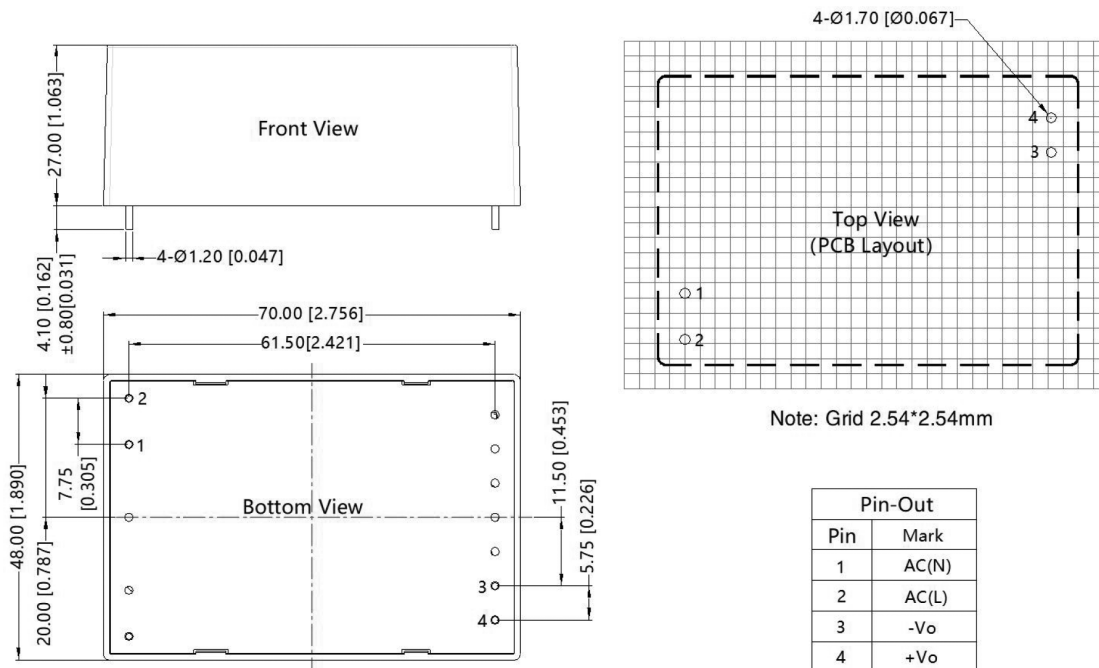


Fig. 2: EMC application circuit with higher requirements

| Component | Recommended value |
|-----------|---------------------------------------|
| FUSE | 3.15A/300V, slow-blow, required |
| MOV | S14K350 |
| CY1/CY2 | 1nF/400V AC |
| CX | 684K/310V |
| LCM | 20mH, P/N: FL2D-10-203 is recommended |

Dimensions and Recommended Layout



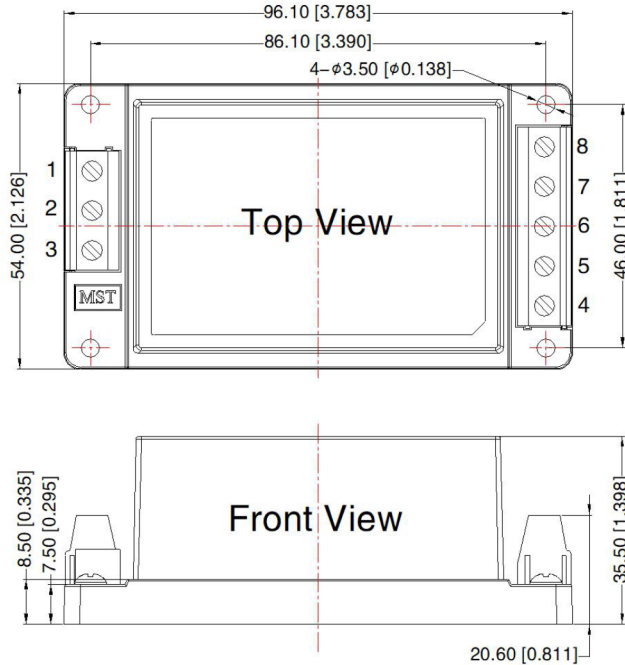
Note:
Unit: mm[inch]
Pin diameter tolerances: ± 0.10 [± 0.004]
General tolerances: ± 0.50 [± 0.020]

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

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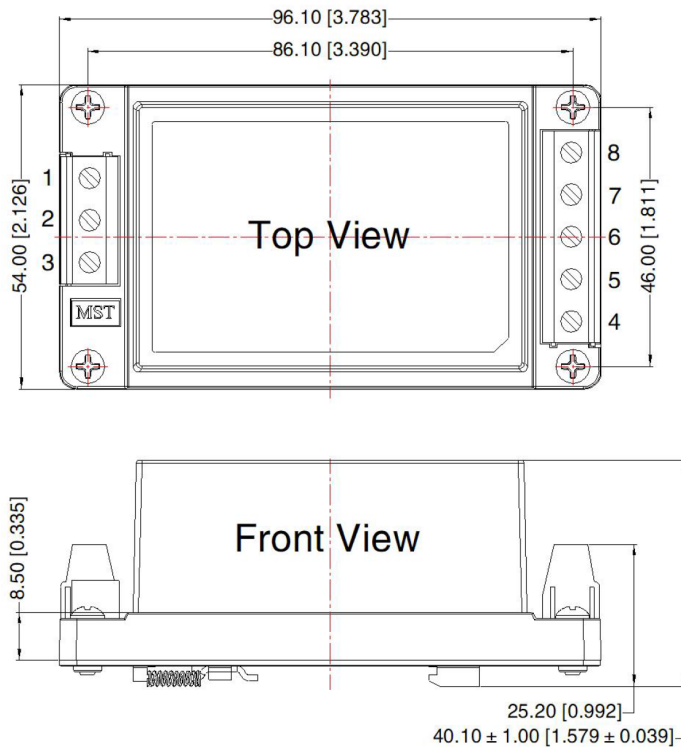
A2S Dimensions



| Pin-Out | |
|---------|----------|
| Pin | Function |
| 1 | NC |
| 2 | AC(N) |
| 3 | AC(L) |
| 4 | +Vo |
| 5 | NC |
| 6 | NC |
| 7 | NC |
| 8 | -Vo |

Note:
Unit: mm[inch]
Wire range: 24-12AWG
Tightening torque: Max 0.4N · M
General tolerances: $\pm 1.00[\pm 0.039]$

A4S Dimensions



| Pin-Out | |
|---------|----------|
| Pin | Function |
| 1 | NC |
| 2 | AC(N) |
| 3 | AC(L) |
| 4 | +Vo |
| 5 | NC |
| 6 | NC |
| 7 | NC |
| 8 | -Vo |

Note:
Unit: mm[inch]
Mounting rail: TS35,rail needs to connect safety ground
Wire range: 24-12AWG
Tightening torque: Max 0.4N · M
General tolerances: $\pm 1.00[\pm 0.039]$

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Notes:

1. If the product is not operated within the required load range, the product performance cannot be guaranteed to comply with all parameters in the datasheet;
2. Unless otherwise specified, parameters in this datasheet were measured under the conditions of $T_a=25^{\circ}\text{C}$, humidity<75% with nominal input voltage and rated output load;
3. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.

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