20W, AC-DC converter

CE Report EN62368-1 EN61558-1 EN60335-1 | CB IEC62368-1 | UK CA BS EN 62368-1 | RoHS

## FEATURES

- Ultra-wide 85 - 305VAC and 100 - 430VDC input voltage range
- Operating ambient temperature range: -40℃ to +85℃
- Up to 87% efficiency
- No-load power consumption 0.1W
- 5000m altitude application
- OVC Ⅲ (meet EN61558-1)
- Plastic case meets UL94V-0 flammability
- EMI performance meets CISPR32/EN55032 CLASS B, EN55014

*LD20-23BxxR2 series AC-DC converters is one of Mornsun's new generation compact size power converters. The feature 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/EN/UL62368/EN60335/EN61558/IEC/EN60601-1/ANSI/AAMI ES60601-1 standards. The converters are widely used in industrial, power, medical treatment, 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 No.* | Output Power | Nominal Output Voltage and Current (Vo/Io) | Efficiency at 230VAC (%) Typ. | Capacitive Load (uF) Max. |
|---|---|---|---|---|---|
| EN/IEC | LD20-23B03R2 | 14.85W | 3.3V/4500mA | 81 | 8000 |
| | LD20-23B05R2 | 20W | 5V/4000mA | 85 | 8000 |
| | LD20-23B09R2 | | 9V/2200mA | 84 | 5400 |
| | LD20-23B12R2 | | 12V/1670mA | 86 | 4000 |
| | LD20-23B15R2 | | 15V/1330mA | 87 | 3000 |
| | LD20-23B24R2 | | 24V/830mA | 87 | 1000 |

Note: *①Use suffix "A2S" for chassis and suffix "A4S" for DIN-Rail mounting;
②The product picture is for reference only. For details, please refer to the actual product.

## Input Specifications

| Item | Operating Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Input Voltage Range | AC input | 85 | -- | 305 | VAC |
| | DC input | 100 | -- | 430 | VDC |
| Input Frequency | | 47 | -- | 440 | Hz |
| Input Current | 115VAC | -- | -- | 0.5 | A |
| | 230VAC | -- | -- | 0.3 | |
| Inrush Current | 115VAC | -- | 20 | -- | |
| | 230VAC | -- | 45 | -- | |
| Leakage Current | 277VAC/50Hz | 0.1mA RMS Max. | | | |
| Built In Fuse | | 3.15A/300V, slow-blow | | | |
| Hot Plug | | Unavailable | | | |

## Output Specifications

| Item | Operating Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Output Voltage Accuracy | | -- | ±1.5 | -- | % |
| Line Regulation | Full load | -- | ±0.5 | -- | |
| Load Regulation | 0%-100% load | -- | ±1 | -- | |
| Ripple & Noise* | 20MHz bandwidth (peak-to-peak value) | -- | 100 | 150 | mV |


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| | | | | | | |
|---|---|---|---|---|---|---|
| Stand-by Power Consumption | 230VAC | 3.3/5/9/12/15V | -- | 0.10 | -- | W |
| | | 24V | -- | 0.12 | -- | |
| Temperature Coefficient | | | -- | ±0.02 | -- | %/℃ |
| Short Circuit Protection | | | Hiccup, continuous, self-recovery | | | |
| Over-current Protection | | | ≥110%Io, self-recovery | | | |
| Over-voltage Protection | 3.3/5V output | | ≤7.5VDC (Output voltage clamp or hiccup ) | | | |
| | 9V output | | ≤16VDC (Output voltage clamp or hiccup ) | | | |
| | 12/15V output | | ≤20VDC (Output voltage clamp or hiccup ) | | | |
| | 24V output | | ≤30VDC (Output voltage clamp or hiccup ) | | | |
| Minimum Load | | | 0 | -- | -- | % |
| Hold-up Time | 115VAC input | | -- | 8 | -- | ms |
| | 230VAC input | | -- | 50 | -- | |

Note: *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 <5 mA | | 4200 | -- | -- | VAC |
| Insulation Resistance | Input - output | At 500VDC | | 100 | -- | -- | MΩ |
| Operating Temperature | | | | -40 | -- | +85 | ℃ |
| Storage Temperature | | | | -40 | -- | +85 | |
| Storage Humidity | | | | -- | -- | 95 | %RH |
| Soldering Temperature | | Wave-soldering | | 260 ± 5℃; time: 5 - 10s | | | |
| | | Manual-welding | | 360 ± 10℃; time: 3 - 5s | | | |
| Switching Frequency | | | | -- | 65 | -- | kHz |
| Power Derating | | -40℃ to -25℃ | 85VAC-165VAC | 2.0 | -- | -- | %/℃ |
| | | +50℃to +70℃ | 3.3/5/9V | 2.5 | -- | -- | |
| | | +55℃ to +70℃ | 12/15/24V | 3.33 | -- | -- | |
| | | +70℃ to +85℃ | | 1.33 | -- | -- | |
| | | 85VAC - 100VAC | | 2.0 | -- | -- | %/VAC |
| | | 277VAC - 305VAC | | 0.71 | -- | -- | |
| | | 2000m - 5000m | | 6.7 | -- | -- | %/Km |
| Safety Standard | | | | IEC/EN/BS EN62368-1, EN61558-1, EN60335-1 safety approval; Design refer to UL62368-1, IEC/EN60601-1, ANSI/AAMI ES60601-1 | | | |
| Safety Class | | | | CLASS II | | | |
| MTBF | | MIL-HDBK-217F@25℃ | | ≥1,500,000 h | | | |
| Designed life | | 230VAC | Ta: 25℃ 100% load | >130x10³ h | | | |
| | | | Ta: 55℃ 100% load | >16x10³ h | | | |
| | | | Ta: 55℃ 80% load | >27x10³ h | | | |

## Mechanical Specifications

| | | |
|---|---|---|
| Case Material | | Black plastic, flame-retardant and heat-resistant (UL94V-0) |
| Dimension | DIP package | 52.40 x 27.20 x 24.00 mm |
| | A2S chassis mounting | 76.00 x 31.50 x 32.80 mm |
| | A4S Din-Rail mounting | 76.00 x 31.50 x 37.40 mm |
| Weight | DIP package | 55g (Typ.) |
| | A2S chassis mounting | 75g (Typ.) |
| | A4S Din-Rail mounting | 95g (Typ.) |
| Cooling method | | Free air convection |


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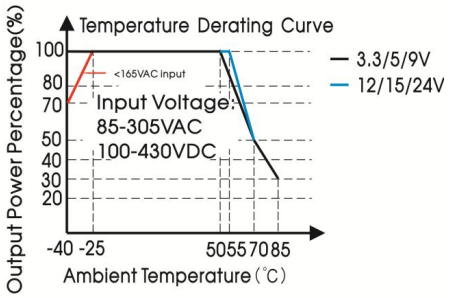
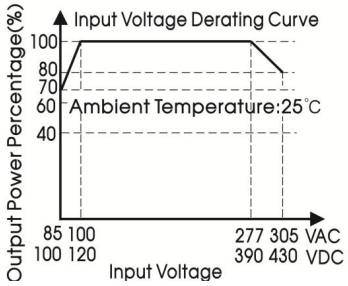
## Electromagnetic Compatibility (EMC)

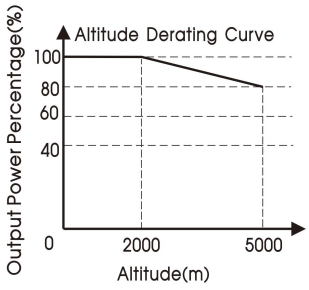
| | | | | |
|---|---|---|---|---|
| Emissions | CE | CISPR32/EN55032 | CLASS B | |
| | | CISPR11/EN55011 | CLASS B | |
| | | EN55014-1 | | |
| | RE | CISPR32/EN55032 | CLASS B | |
| | | CISPR11/EN55011 | CLASS B | |
| | | EN55014-1 | | |
| | Flicker | IEC/EN6100-3-3 | | |
| | | EN55014-1 | | |
| Immunity | ESD | IEC/EN61000-4-2 | Contact ±6KV/Air ±8KV | perf. Criteria A |
| | | IEC/EN55014-2 | | perf. Criteria A |
| | RS | IEC/EN61000-4-3 | 10V/m | perf. Criteria A |
| | | IEC/EN55014-2 | | perf. Criteria A |
| | EFT | IEC/EN61000-4-4 | ±2KV | perf. Criteria A |
| | | IEC/EN61000-4-4 | ±4KV (See Fig. 2, Fig. 3 for recommended circuit) | perf. Criteria A |
| | | IEC/EN55014-2 | | perf. Criteria A |
| | Surge | IEC/EN61000-4-5 | line to line ±1KV | perf. Criteria A |
| | | IEC/EN61000-4-5 | line to line ±2KV (See Fig. 2 for recommended circuit) | perf. Criteria A |
| | | IEC/EN61000-4-5 | line to line ±2KV/line to PE ±4KV (See Fig. 3 for recommended circuit) | perf. Criteria A |
| | | IEC/EN55014-2 | | perf. Criteria A |
| | CS | IEC/EN61000-4-6 | 10Vr.m.s | perf. Criteria A |
| | | IEC/EN55014-2 | | perf. Criteria A |
| | PFMF | IEC/EN6100-4-8 | 10A/m | perf. Criteria A |
| | | IEC/EN55014-2 | | perf. Criteria A |
| | Voltage dip, short interruption and voltage variation | IEC/EN61000-4-11 | 0%, 70% | perf. Criteria B |
| | | IEC/EN55014-2 | | perf. Criteria B |

Note: ①When the output terminal of the product needs to be connected to PE through a Y capacitor, or close to the metal frame, please refer to the Fig. 3 for recommended circuit.
②Unless otherwise specified, EMC performance indicators are tested according to typical application circuits (Fig. 1).

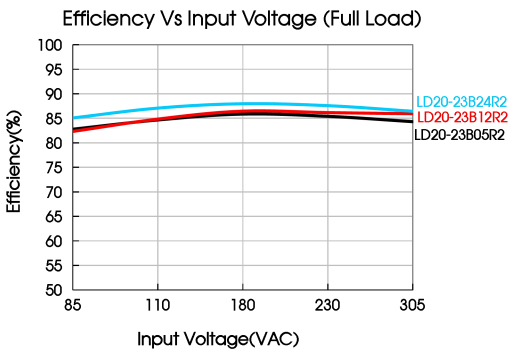
## Product Characteristic Curve

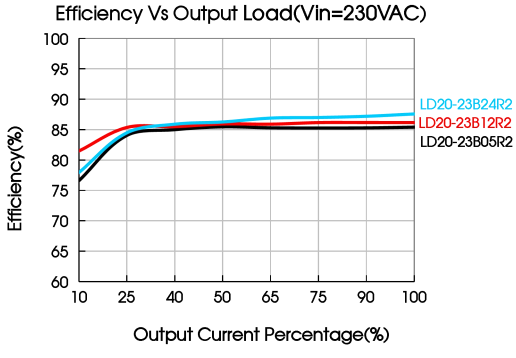



Note: ① With an AC input between 85-100V/277-305VAC and a DC input between 100-120V/390-430VDC, the output power must be derated as per temperature derating curves;
② This product is suitable for applications using natural air cooling; for applications in closed environment please consult Mornsun FAE.





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## Design Reference

### 1. Typical application

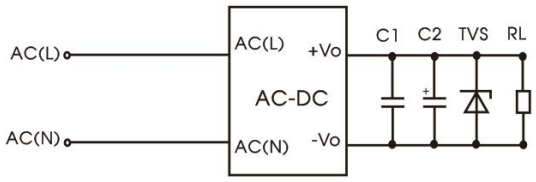


Fig. 1: Typical circuit diagram

| Part No. | C1 | C2 | TVS |
|---|---|---|---|
| LD20-23B03R2 | 1uF/50V | 10uF/16V | SMBJ7.0A |
| LD20-23B05R2 | | 10uF/16V | SMBJ7.0A |
| LD20-23B09R2 | | 10uF/25V | SMBJ12A |
| LD20-23B12R2 | | 10uF/25V | SMBJ20A |
| LD20-23B15R2 | | 10uF/25V | SMBJ20A |
| LD20-23B24R2 | | 10uF/35V | SMBJ30A |

Output Filter Components:
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

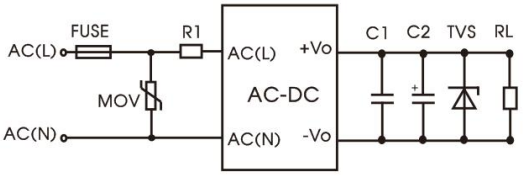


Fig. 2: EMC application circuit with higher requirements

| Component | Recommended value |
|---|---|
| FUSE | 3.15A/300V, slow-blow, required |
| MOV | S14K350 |
| R1 | 3Ω/3W (wire-wound resistor) |

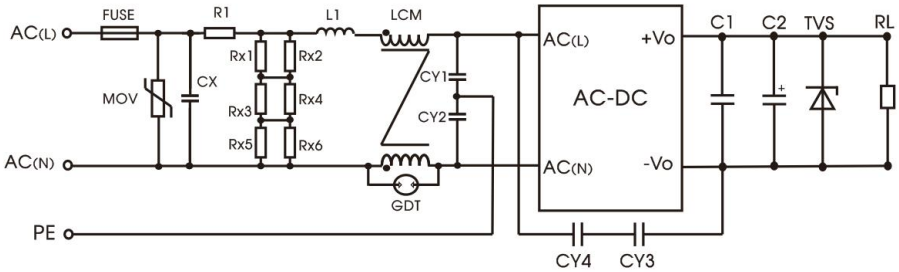


Fig. 3: Recommended circuit for class Ⅰ equipment
(Recommended when the output terminal of the product needs to be connected to PE or connected to PE through a Y capacitor)

| Component | Recommended value |
|---|---|
| FUSE | 3.15A/300V, slow-blow, required |
| MOV | S14K350 |
| CX | 334K/305VAC |
| R1 | 6.8Ω/5W (wire-wound resistor) |
| L1 | 1.2mH/0.5A |
| CY1/CY2 | 2.2nF/400VAC |
| CY3/CY4 | 1nF/400VAC |
| GDT | 300V/1KA |
| LCM | 20 mH, P/N: FL2D-10-203 (MORNSUN) is recommended |
| Note: Rx1/Rx2/Rx3/Rx4/Rx5/Rx6 is the bleeder resistance of CX, and the recommended resistance value is 1.5MΩ/150VDC. | |


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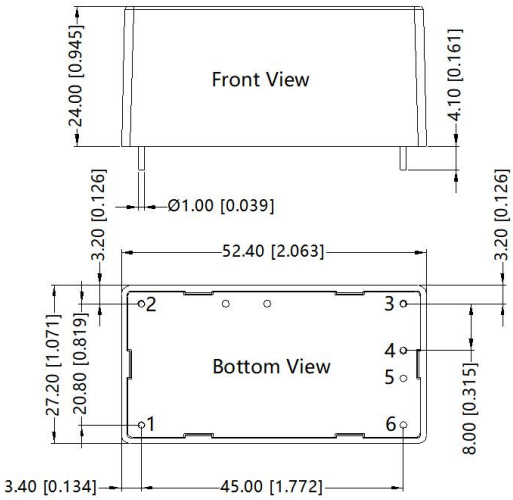
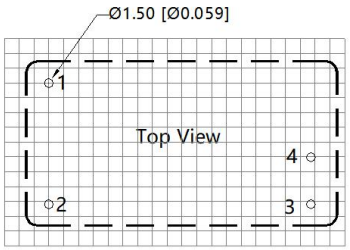
3. For additional information please refer to application notes on www.mornsun-power.com.

## Dimensions and Recommended Layout

THIRD ANGLE PROJECTION



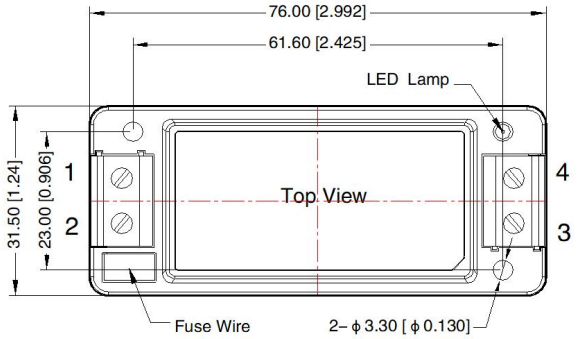

Note: Grid 2.54*2.54mm

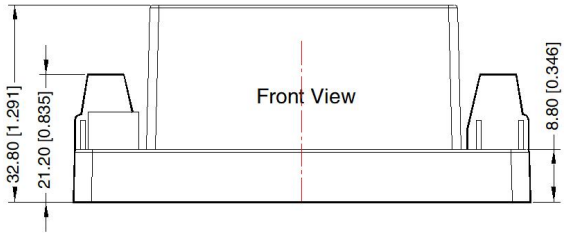
| Pin-Out | |
|---|---|
| Pin | Function |
| 1 | AC(L) |
| 2 | AC(N) |
| 3 | -Vo |
| 4 | +Vo |
| 5 | No Pin |
| 6 | No Pin |

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

## A2S Dimensions

THIRD ANGLE PROJECTION




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

Note:
Unit: mm[inch]
Wire range: 24–12 AWG
Tightening torque: Max 0.4 N·m
General tolerances: ± 1.00[ ± 0.039]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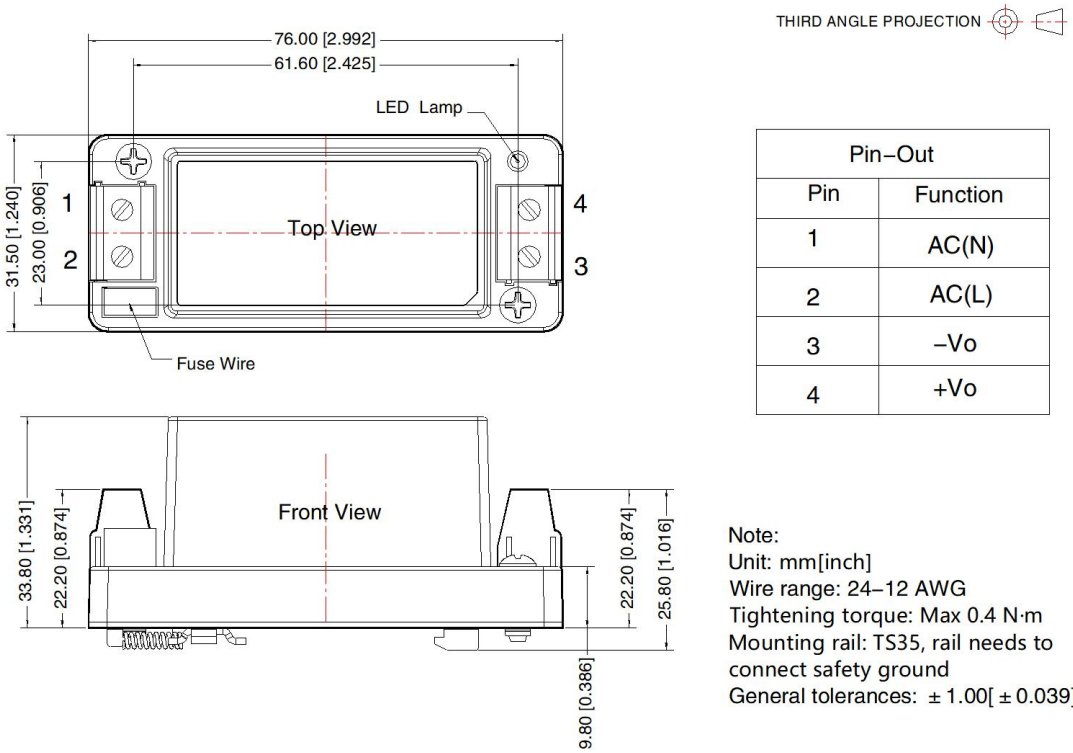
## A4S Dimensions




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

Note:
Unit: mm[inch]
Wire range: 24–12 AWG
Tightening torque: Max 0.4 N·m
Mounting rail: TS35, rail needs to connect safety ground
General tolerances: ±1.00[±0.039]

Note:

1. For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging bag number: 58220011 (DIP package); 58220022 (A2S/A4S package);
2. 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;
3. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25℃, humidity <75% with nominal input voltage 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.

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