

20W, AC-DC converter



RoHS



FEATURES

- Universal 85 - 264VAC and wide 100 - 370VDC Input
- Operating ambient temperature range -40°C to +70°C
- High I/O isolation test voltage up to 4000VAC
- Regulated output, low ripple & noise
- Output short circuit, over-current, over-voltage protection
- High efficiency, high reliability
- Plastic case meets flammability per UL94V-0
- EMC compliant to CISPR32/EN55032 CLASS B

LHE20-20A/C/Dxx series is one of Mornsun's compact size multiple output power converters. It features universal AC input and at the same time accepts DC input voltage, low power consumption, high efficiency, high reliability and reinforced isolation. It offers good EMC performance and is widely used in industrial and office 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 | | Efficiency at 230VAC (%) Typ. | Capacitive Load (uF) Max. | |
|---------------|------------------|--------------|------------------------------------|------------|-------------------------------|---------------------------|------|
| | | | (Vo1/Io1) | (Vo2/Io2) | | Vo1 | Vo2 |
| EN | LHE20-20A12** | 20W | +12V/830mA | -12V/830mA | 82 | 1200 | 1200 |
| | LHE20-20A15** | | +15/650mA | -15/650mA | 83 | 1000 | 1000 |
| -- | LHE20-20C0512-04 | | 5V/2000mA | ±12V/400mA | 78 | 16000 | 1000 |
| | LHE20-20C0515-03 | | 5V/2000mA | ±15V/300mA | 79 | 16000 | 680 |
| | LHE20-20D0512-06 | | 5V/2500mA | 12V/600mA | 78 | 20000 | 2000 |
| | LHE20-20D0515-05 | | 5V/2500mA | 15V/500mA | 78 | 20000 | 1200 |
| | LHE20-20D0524-03 | 5V/2500mA | 24V/300mA | 78 | 20000 | 500 | |

Note:
 ① * Use suffix "A2" for chassis mounting and suffix "A4" for DIN-Rail mounting.
 ② ** LHE20-20Axx parts use both outputs (positive and negative) as sampling feedback and others models use output Vo1 as sampling feedback, also defined as the primary output;
 ③ The 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 | -- | 264 | VAC |
| | DC input | 100 | -- | 370 | VDC |
| Input Frequency | | 47 | -- | 63 | Hz |
| Input Current | 115VAC | -- | -- | 0.60 | A |
| | 230VAC | -- | -- | 0.34 | |
| Inrush Current | 115VAC | -- | 25 | -- | |
| | 230VAC | -- | 45 | -- | |
| Recommended External Input Fuse | | 3.15A/250V, slow-blow, required | | | |
| Hot Plug | | Unavailable | | | |

Output Specifications

| Item | Operating Conditions | Min. | Typ. | Max. | Unit |
|-------------------------|-------------------------------|------|------|------|------|
| Output Voltage Accuracy | LHE20-20Axx (balanced load) | Vo1 | ±3 | -- | % |
| | | Vo2 | ±3 | -- | |
| | LHE20-20C/Dxx (balanced load) | Vo1 | ±2 | -- | |
| | | Vo2 | ±10 | -- | |
| Line Regulation | Full load | Vo1 | ±0.5 | -- | |
| | | Vo2 | ±1.5 | -- | |

| | | | | | | |
|--------------------------|---|---------------|---------------------------|-------|-----|------|
| Load Regulation | 10%-100% load (balanced load) | LHE20-20Axx | -- | ±2 | -- | % |
| | | LHE20-20C/Dxx | Vo1 | -- | ±2 | |
| Ripple & Noise* | 20MHz bandwidth (peak-to-peak value) | Vo1 | -- | -- | 100 | mV |
| | | Vo2 | -- | -- | 200 | |
| Temperature Coefficient | Vo1 | | -- | ±0.02 | -- | %/°C |
| Short Circuit Protection | | | Continuous, self-recover | | | |
| Over-current Protection | | | 150%-300% Io self-recover | | | |
| Over-voltage Protection | Vo1 | 5VDC Output | ≤7.5VDC | | | |
| | | 12VDC Output | ≤20VDC | | | |
| | | 15VDC Output | ≤20VDC | | | |
| Min. Load | | | 10 | -- | -- | % |
| Hold-up Time | 115VAC input | | -- | 10 | -- | ms |
| | 230VAC input | | -- | 60 | -- | |

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

General Specifications

| Item | Operating Conditions | | Min. | Typ. | Max. | Unit |
|-----------------------|----------------------|-----------------|--|------|------|---------|
| Isolation | Input-output | LHE20-20A/C/Dxx | 4000 | -- | -- | VAC |
| | Input \ominus | LHE20-20A/Dxx | 2500 | -- | -- | |
| | | LHE20-20Cxx | 2000 | -- | -- | |
| | Vo1-Vo2 | LHE20-20C/Dxx | 500 | -- | -- | VDC |
| Operating Temperature | | | -40 | -- | +70 | °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 | | | |
| Switching Frequency | | | -- | 65 | -- | kHz |
| Power Derating | -40°C to -25°C | | 2.67 | -- | -- | % / °C |
| | +50°C to +70°C | | 2.5 | -- | -- | |
| | 85VAC - 100VAC | | 1.0 | -- | -- | % / VAC |
| | 240VAC - 264VAC | | 0.83 | -- | -- | |
| Safety Standard | LHE20-20Axx | | BS EN62368-1/EN62368-1(report) safety approved; Design refer to UL/IEC62368-1 | | | |
| | LHE20-20C/Dxx | | Design refer to UL/IEC/EN62368-1 | | | |
| Safety Class | | | CLASS I | | | |
| MTBF | MIL-HDBK-217F@25°C | | ≥300,000 h | | | |

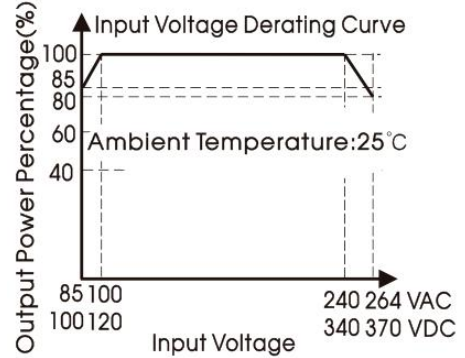
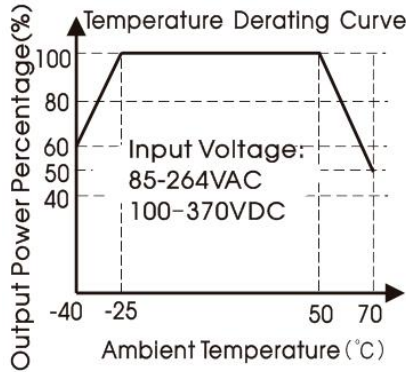
Mechanical Specifications

| | | |
|----------------|----------------------|---|
| Case Material | | Black plastic, flame-retardant and heat-resistant (UL94V-0) |
| Dimension | Horizontal package | 70.0 x 48.0 x 23.5 mm |
| | A2 chassis mounting | 96.1 x 54.0 x 32.0 mm |
| | A4 Din-Rail mounting | 96.1 x 54.0 x 36.6 mm |
| Weight | Horizontal package | 120g (Typ.) |
| | A2 chassis mounting | 170g (Typ.) |
| | A4 Din-Rail mounting | 210g (Typ.) |
| Cooling method | | Free air convection |

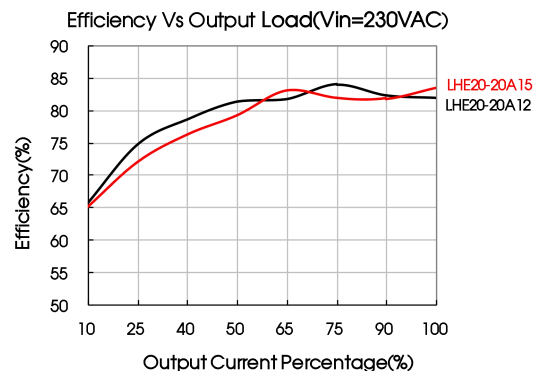
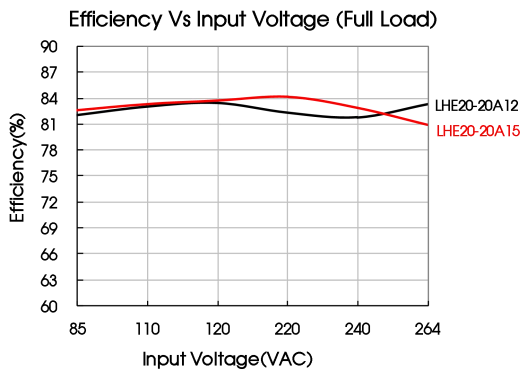
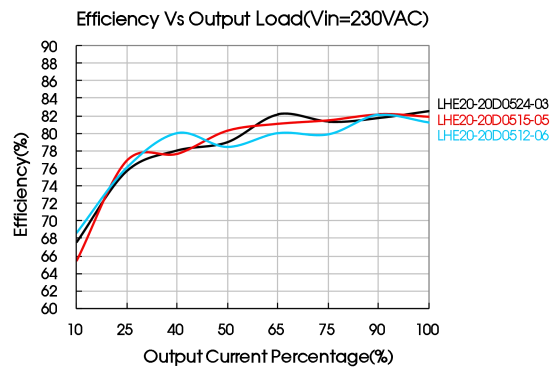
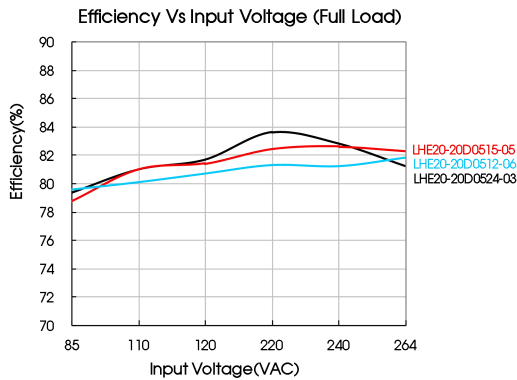
Electromagnetic Compatibility (EMC)

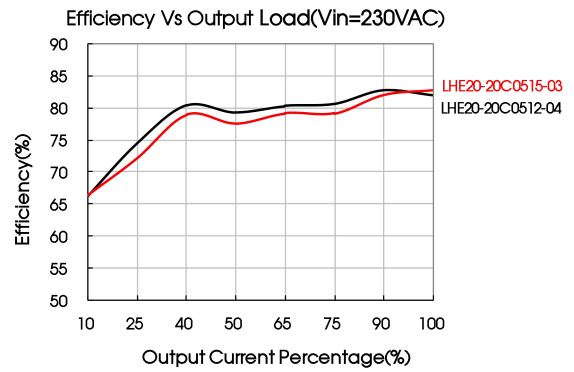
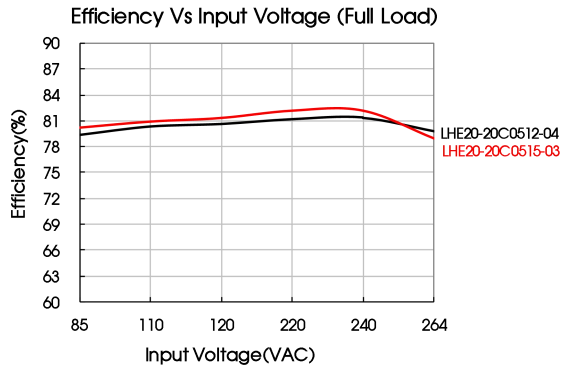
| | | | | |
|---|------------------|------------------|---|------------------|
| Emissions | CE | CISPR32/EN55032 | CLASS B | |
| | RE | CISPR32/EN55032 | CLASS B | |
| Immunity | ESD | IEC/EN 61000-4-2 | Contact ±6KV/Air ±8KV | perf. Criteria B |
| | RS | IEC/EN61000-4-3 | 10V/m | perf. Criteria A |
| | EFT | IEC/EN61000-4-4 | ±2KV | perf. Criteria B |
| | | IEC/EN61000-4-4 | ±4KV (See Fig. 4 for recommended circuit) | perf. Criteria B |
| | Surge | IEC/EN61000-4-5 | line to line ±1KV/line to PE ±2KV | perf. Criteria B |
| | | IEC/EN61000-4-5 | line to line ±2KV/line to PE ±4KV (See Fig. 4 for recommended circuit) | 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 | |

Product Characteristic Curve



Note: ① With an AC input between 85-100V/240-264VAC and a DC input between 100-120V/340-370VDC, 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.





Design Reference

1. Typical application

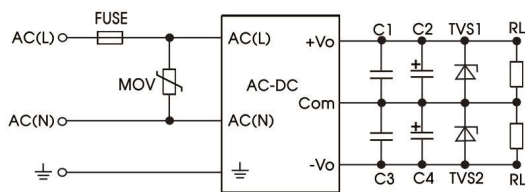


Fig. 1: LHE20-20Axx series, typical circuit diagram

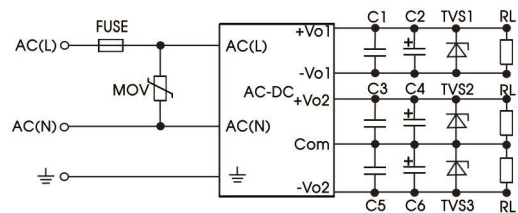


Fig. 2: LHE20-20Cxx series, typical circuit diagram

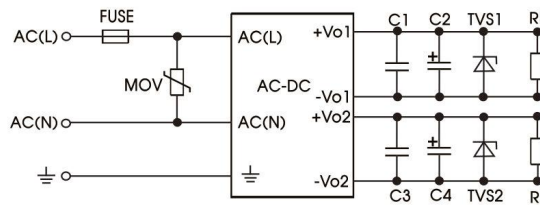


Fig. 3: LHE20-20Dxx series, typical circuit diagram

| Model | FUSE | MOV | C1/C3/C5 | C2(uF) | C4(uF) | C6(uF) | TVS1 | TVS2 | TVS3 |
|------------------|--------------------------------------|---------|-----------|--------|--------|--------|----------|---------|---------|
| LHE20-20A12 | 3.15A/250V slow-blow, required | S14K300 | 0.1uF/50V | 120 | 120 | -- | SMBJ20A | SMBJ20A | -- |
| LHE20-20A15 | | | | 68 | 68 | -- | SMBJ20A | SMBJ20A | -- |
| LHE20-20C0512-04 | | | | 330 | 120 | 120 | SMBJ7.0A | SMBJ20A | SMBJ20A |
| LHE20-20C0515-03 | | | | 330 | 120 | 120 | SMBJ7.0A | SMBJ20A | SMBJ20A |
| LHE20-20D0512-06 | | | | 470 | 470 | -- | SMBJ7.0A | SMBJ20A | -- |
| LHE20-20D0515-05 | | | | | 220 | -- | SMBJ7.0A | SMBJ20A | -- |
| LHE20-20D0524-03 | | | | | 47 | -- | SMBJ7.0A | SMBJ30A | -- |

Input and Output Components:

We recommend using electrolytic capacitors with high frequency and low ESR rating for C2, C4 and C6 (refer to manufacture's datasheet). Choose a capacitor voltage rating with at least 20% margin, in other words not exceeding 80%. C1, C3 and C5 are ceramic capacitors 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

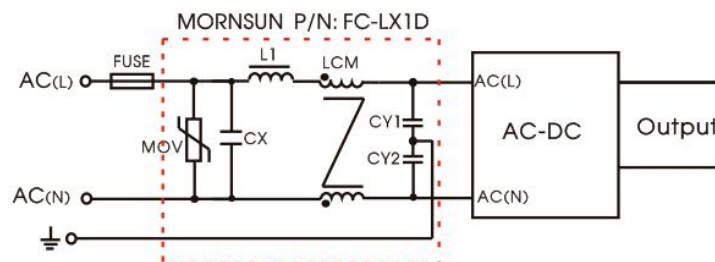
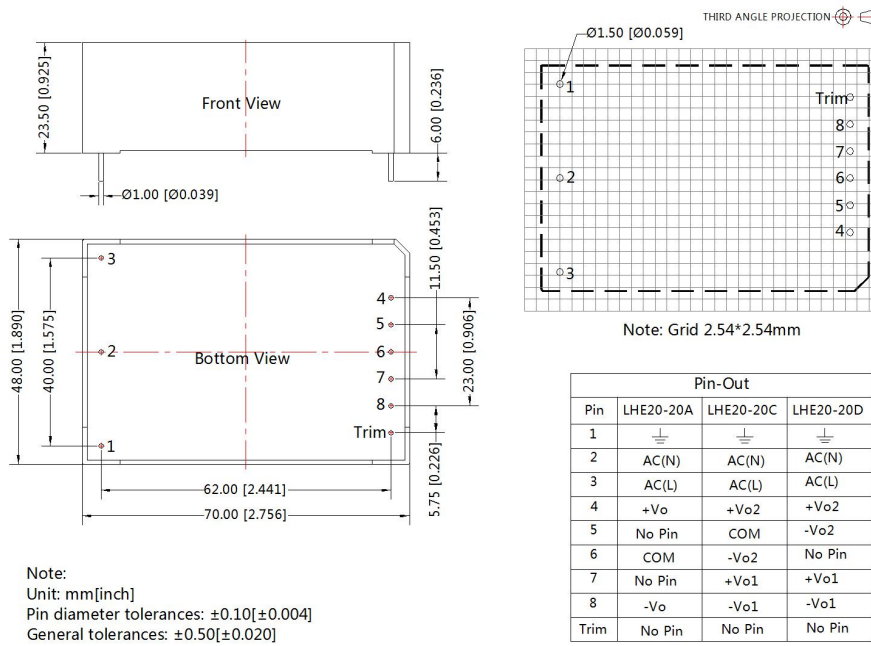


Fig. 4: recommended circuit 4

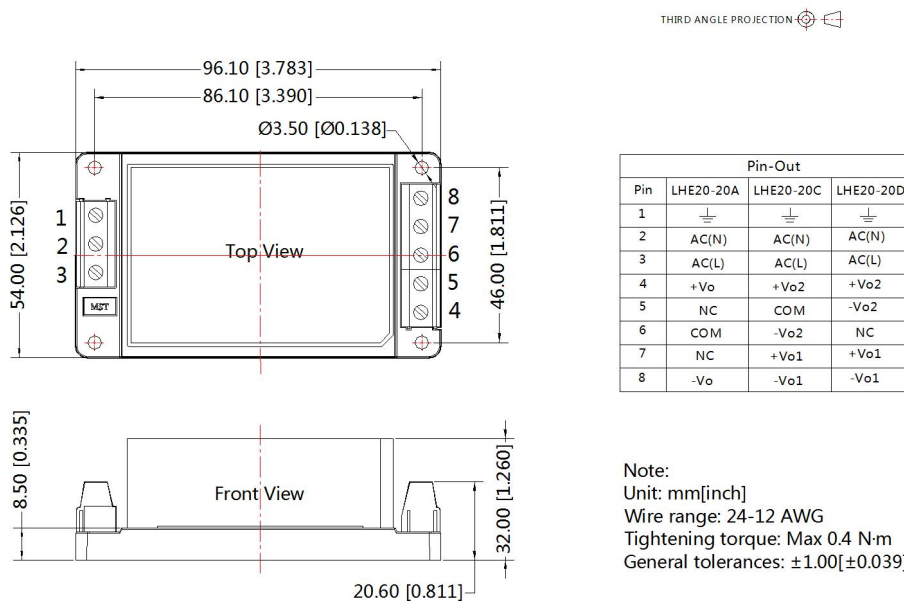
| Element model | Recommended value |
|---------------|---|
| MOV | S14K300 |
| CY1/CY2 | 1000pF/400VAC |
| CX | 0.1uF/275VAC |
| LCM | 10mH, P/N: FL2D-Z5-103 (MORNSUN) is recommended |
| L1 | 4.7uH/2A |
| FC-LX1D | 2KV/4KV EMC filter |
| FUSE | 3.15A/250V, slow-blow, required |

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

Dimensions and Recommended Layout

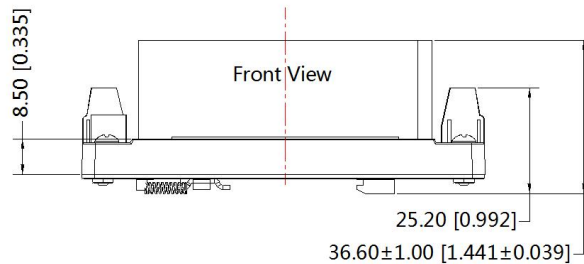
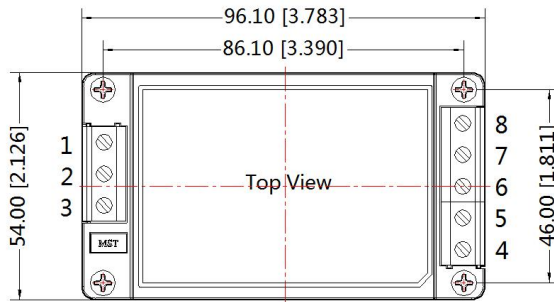


A2 Dimensions



A4 Dimensions

THIRD ANGLE PROJECTION



| Pin | Pin-Out | | |
|-----|-----------|-----------|-----------|
| | LHE20-20A | LHE20-20C | LHE20-20D |
| 1 | ⏏ | ⏏ | ⏏ |
| 2 | AC(N) | AC(N) | AC(N) |
| 3 | AC(L) | AC(L) | AC(L) |
| 4 | +Vo | +Vo2 | +Vo2 |
| 5 | NC | COM | -Vo2 |
| 6 | COM | -Vo2 | NC |
| 7 | NC | +Vo1 | +Vo1 |
| 8 | -Vo | -Vo1 | -Vo1 |

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

- Note:
- For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging bag number: 58220006 (Horizontal package); 58220010 (A2/A4 package);
 - 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;
 - 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;
 - All index testing methods in this datasheet are based on our company corporate standards;
 - We can provide product customization service, please contact our technicians directly for specific information;
 - Products are related to laws and regulations: see "Features" and "EMC";
 - If product involves multi-brand materials and there are differences in color etc, please refer to the standards of each manufacturer;
 - 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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