

5-25W, AC/DC converter



UL US CE CB RoHS

FEATURES

- Wide input voltage range: 85 - 305VAC/ 100 - 430VDC
- Operating temperature range: -40 to +70°C
- Conversion efficiency up to 87%
- Isolation voltage: 3K VAC
- IEC60950, EN60950, UL60950 approval
- Output short circuit, over-current, over-voltage protection
- Mounting: PCB mounting, Chassis mounting, DIN-Rail mounting available

LH(05-25)-13Bxx series —a compact size power converter offered by Mornsun. It features universal input voltage, taking both DC and AC input voltage, low power consumption, high efficiency, high reliability, safer isolation. It offers good EMC performance, which meet IEC/EN61000-4, CISPR22/EN55022, UL60950 and EN60950 standards, and it's widely used in industrial, office and civil applications. Note: Please refer to Design Reference when module being used in a bad EMC environment.

Selection Guide

| Certification | Part No. | Output Power | Nominal Output Voltage and Current(Vo/Io) | Efficiency (230VAC, %/Typ.) | Max. Capacitive Load(μF) | |
|---------------|------------|--------------|---|-----------------------------|--------------------------|-------|
| UL/CE/CB | LH05-13B03 | 4W | 3.3V/1250mA | 72 | 4000 | |
| | LH05-13B05 | | 5V/1000mA | 77 | 4000 | |
| | LH05-13B09 | | 9V/550mA | 79 | 1800 | |
| | LH05-13B12 | | 12V/420mA | 81 | 1800 | |
| | LH05-13B15 | | 15V/330mA | 82 | 1500 | |
| | LH05-13B24 | 5.5W | 24V/230mA | 84 | 330 | |
| | LH10-13B03 | 6.6W | 3.3V/2000mA | 70 | 26000 | |
| | LH10-13B05 | | 5V/2000mA | 76 | 9400 | |
| | LH10-13B09 | | 9V/1100mA | 78 | 3600 | |
| | LH10-13B12 | | 12V/900mA | 80 | 2400 | |
| | LH10-13B15 | | 15V/700mA | 81 | 1200 | |
| | LH10-13B24 | | 24V/450mA | 82 | 370 | |
| | LH15-13B03 | 9.9W | 3.3V/3000mA | 74 | 36000 | |
| | LH15-13B05 | | 5V/2800mA | 78 | 20000 | |
| | LH15-13B09 | | 9V/1600mA | 79 | 6000 | |
| | LH15-13B12 | | 15W | 12V/1250mA | 82 | 3000 |
| | LH15-13B15 | | | 15V/1000mA | 82 | 3000 |
| | LH15-13B24 | | | 24V/625mA | 84 | 900 |
| | LH15-13B48 | | | 48V/320mA | 85 | 370 |
| | LH20-13B03 | 11.55W | | 3.3V/3500mA | 75 | 48000 |
| | LH20-13B05 | 17.5W | 5V/3500mA | 78 | 12240 | |
| | LH20-13B09 | | 9V/2100mA | 79 | 5600 | |
| | LH20-13B12 | | 20W | 12V/1600mA | 83 | 5400 |
| | LH20-13B15 | | | 15V/1300mA | 84 | 2400 |
| LH20-13B24 | 24V/850mA | | | 85 | 1840 | |
| LH25-13B03 | 13.5W | | | 3.3V/4100mA | 75 | 48000 |
| LH25-13B05 | 20.5W | 5V/4100mA | 78 | 12240 | | |
| LH25-13B09 | | 9V/2500mA | 79 | 5600 | | |
| LH25-13B12 | | 25W | 12V/2100mA | 83 | 5400 | |

| | | | | | |
|----------|------------|-------|------------|----|------|
| UL/CE/CB | LH25-13B15 | 24W | 15V/1600mA | 84 | 2400 |
| | LH25-13B24 | 26.4W | 24V/1100mA | 85 | 1440 |
| | LH25-13B48 | 24W | 48V/500mA | 87 | 800 |

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 | -- | 63 | Hz |
| Input current | 115VAC | LH05 models | -- | -- | 0.125 | A |
| | | LH10 models | -- | -- | 0.26 | |
| | | LH15 models | -- | -- | 0.37 | |
| | | LH20/LH25 models | -- | -- | 0.6 | |
| | 230VAC | LH05 models | -- | -- | 0.08 | |
| | | LH10 models | -- | -- | 0.16 | |
| | | LH15 models | -- | -- | 0.22 | |
| | | LH20/LH25 models | -- | -- | 0.34 | |
| Inrush current | 115VAC | LH05/LH10/LH15 models | -- | 10 | -- | |
| | | LH20/LH25 models | -- | 15 | -- | |
| | 230VAC | LH05/LH10 models | -- | 15 | -- | |
| | | LH15 models | -- | 20 | -- | |
| LH20/ LH25 models | -- | 30 | -- | | | |
| Leakage current | | | 0.3mA RMS typ./230VAC/50Hz | | | |
| Recommended External Input Fuse(Special package series include fuse) | LH05 models | | 1A/300V, slow fusing | | | |
| | LH10/LH15 models | | 2A/300V, slow fusing | | | |
| | LH20/ LH25 models | | 3.15A/300V, slow fusing | | | |
| Hot Plug | | | Unavailable | | | |

Output Specifications

| Item | Operating Conditions | | Min. | Typ. | Max. | Unit |
|--------------------------|-----------------------------------|-------------------|-----------------------------------|-------|------|------|
| Output Voltage Accuracy | | | -- | ±2 | -- | % |
| Line Regulation | Full load | | -- | ±0.5 | -- | |
| Load Regulation | 0%-100% load | | -- | ±1 | -- | |
| Ripple & Noise* | 20MHz bandwidth (peak-peak value) | | -- | 50 | 100 | mV |
| Temperature Coefficient | | | -- | ±0.02 | -- | %/°C |
| Short Circuit Protection | | | Hiccup, Continuous, self-recovery | | | |
| Over-current Protection | | | ≥110%Io self-recovery | | | |
| Over-voltage Protection | LH05 models | | Over-voltage shutdown | | | |
| | LH10/ LH15/ LH20/ LH25 models | 3.3 / 5VDC Output | ≤7.5VDC | | | |
| | | 9VDC Output | ≤12VDC | | | |
| | | 12 / 15VDC Output | ≤20VDC | | | |
| | | 24VDC Output | ≤30VDC | | | |
| | | 48VDC Output | ≤60VDC | | | |
| Min. Load | | | 0 | -- | -- | % |
| Trim | LH20/ LH25 models | | -- | -- | ±10 | |
| Hold-up Time | 115VAC input | | -- | 15 | -- | ms |
| | 230VAC input | | -- | 80 | -- | |

Note: * Ripple and noise tested with "parallel cable" method, please see *AC-DC Converter Application Notes* for specific operation methods.

General Specifications

| Item | Operating Conditions | | Min. | Typ. | Max. | Unit |
|-----------------------|--|-----------------|--------------------------------|------|------|--------|
| Isolation Voltage* | Input-output | Test time: 1min | 3000 | -- | -- | VAC |
| | Input-  | | 2000 | -- | -- | |
| Operating Temperature | | | -40 | -- | +70 | °C |
| Storage Temperature | LH05/10/15 | | -40 | -- | +105 | |
| | LH20/25 | | -40 | -- | +85 | |
| Storage Humidity | | | -- | -- | 95 | %RH |
| Welding Temperature | Wave-soldering | | 260±5°C; time:5~10s | | | |
| | Manual-welding | | 360±10°C; time:3~5s | | | |
| Switching Frequency | LH05 models | | -- | 65 | 132 | kHz |
| | LH10 models | | -- | 100 | -- | |
| | LH15/LH20/LH25 models | | -- | 65 | -- | |
| Power Derating | -40°C to -10°C | | 2 | -- | -- | % / °C |
| | 50°C to +70°C (LH25-13Bxx) | | 3 | -- | -- | |
| | 55°C To +70°C (Others) | | 4 | -- | -- | |
| Safety Standard | | | IEC60950/EN60950/UL60950 | | | |
| Safety Certification | | | IEC60950/EN60950/UL60950 | | | |
| Safety Class | LH15-13Bxx | | CLASS II | | | |
| | Others | | CLASS I | | | |
| MTBF | | | MIL-HDBK-217F@25°C > 300,000 h | | | |

Note:* There is no pin  on LH15-13Bxx .

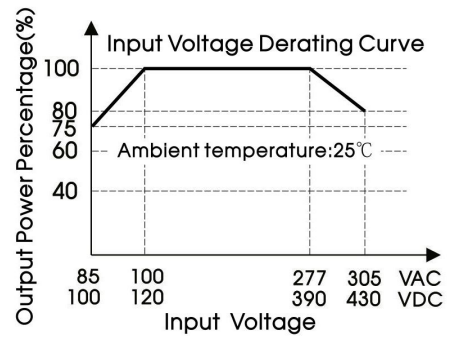
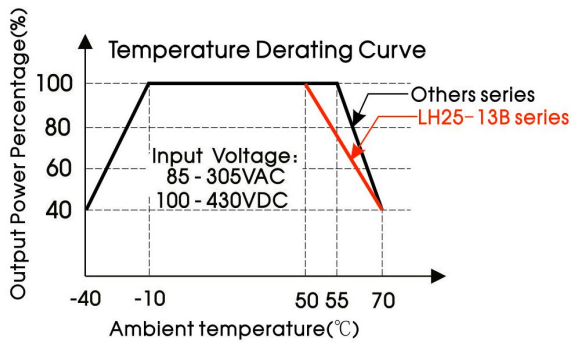
Physical Specifications

| | |
|--------------------|--|
| Casing Material | Black flame-retardant and heat-resistant plastic (UL94-V0) |
| Package Dimensions | Refer to the Dimensions |
| Weight | Refer to the Dimensions |
| Cooling method | Free convection |

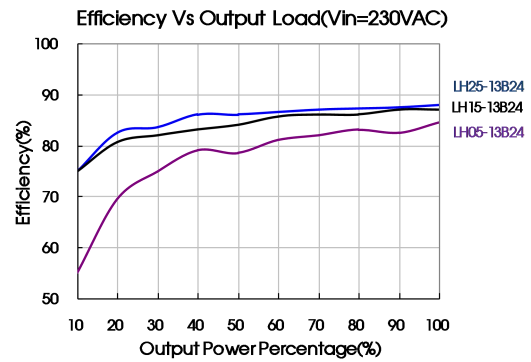
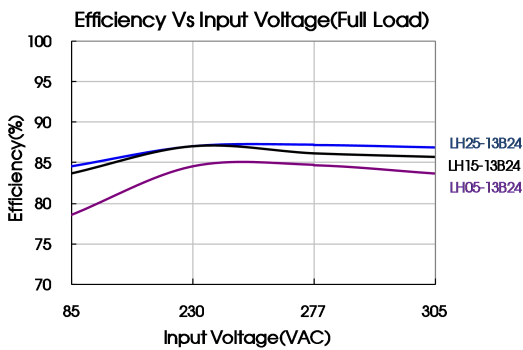
EMC Specifications

| | | | | |
|-----|---|------------------|---|------------------|
| EMI | CE | CISPR32/EN55032 | CLASS B | |
| | RE | CISPR32/EN55032 | CLASS B | |
| EMS | ESD | IEC/EN61000-4-2 | 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. 2 for recommended circuit) | perf. Criteria B |
| | Surge | IEC/EN61000-4-5 | line to line ±1KV/line to ground ±2KV | perf. Criteria B |
| | | IEC/EN61000-4-5 | line to line ±2KV/ line to ground ±4KV (See Fig. 2 for recommended circuit) | perf. Criteria B |
| | CS | IEC/EN61000-4-6 | 10Vr.m.s | perf. Criteria A |
| | PFM | IEC/EN61000-4-8 | 10A/m | perf. Criteria A |
| | Voltage dips, short interruptions and voltage variations immunity | IEC/EN61000-4-11 | 0%,70% | perf. Criteria B |

Product Characteristic Curve



Note: ① Input voltage should be derated based on temperature derating when it is 85-100VAC/277~305VAC/100-120VDC/390~430VDC;
② This product is suitable for use in natural air cooling environments, if in a closed environment, please contact our company's FAE.



Design Reference

1. Typical application circuit

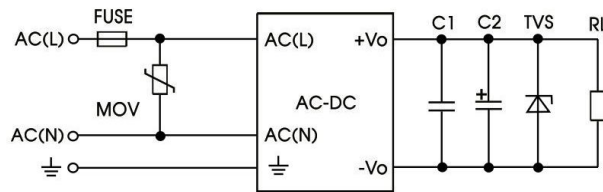


Fig. 1

| Model | C1 (uF) | C2 (uF) | FUSE | MOV | TVS | Model | C1 (uF) | C2 (uF) | FUSE | MOV | TVS |
|------------|---------|---------|--------------------------------------|---------|----------|------------|---------|---------|---|---------|----------|
| LH05-13B03 | 1 | 330 | 1A/300V slow fusing, necessary | S14K350 | SMBJ7.0A | LH15-13B15 | 1 | 220 | 2A/300V slow fusing, necessary | S14K350 | SMBJ20A |
| LH05-13B05 | 1 | 330 | | | SMBJ7.0A | LH15-13B24 | 1 | 68 | | | SMBJ30A |
| LH05-13B09 | 1 | 120 | | | SMBJ12A | LH15-13B48 | 1 | 33 | | | SMBJ64A |
| LH05-13B12 | 1 | 120 | | | SMBJ20A | LH20-13B03 | 1 | 330 | | | SMBJ7.0A |
| LH05-13B15 | 1 | 68 | | | SMBJ20A | LH20-13B05 | 1 | 330 | | | SMBJ7.0A |
| LH05-13B24 | 1 | 68 | 2A/300V slow fusing, necessary | S14K350 | SMBJ30A | LH20-13B09 | 1 | 220 | 3.15A/300V slow fusing, necessary | S14K350 | SMBJ12A |
| LH10-13B03 | 1 | 470 | | | SMBJ7.0A | LH20-13B12 | 1 | 220 | | | SMBJ20A |
| LH10-13B05 | 1 | 330 | | | SMBJ7.0A | LH20-13B15 | 1 | 220 | | | SMBJ20A |
| LH10-13B09 | 1 | 120 | | | SMBJ12A | LH20-13B24 | 1 | 220 | | | SMBJ30A |
| LH10-13B12 | 1 | 120 | | | SMBJ20A | LH25-13B03 | 1 | 330 | | | SMBJ7.0A |
| LH10-13B15 | 1 | 120 | | | SMBJ20A | LH25-13B05 | 1 | 330 | | | SMBJ7.0A |
| LH10-13B24 | 1 | 68 | | | SMBJ30A | LH25-13B09 | 1 | 330 | | | SMBJ12A |
| LH15-13B03 | 1 | 680 | | | SMBJ7.0A | LH25-13B12 | 1 | 330 | | | SMBJ20A |
| LH15-13B05 | 1 | 680 | | | SMBJ7.0A | LH25-13B15 | 1 | 330 | | | SMBJ20A |
| LH15-13B09 | 1 | 470 | | | SMBJ12A | LH25-13B24 | 1 | 120 | | | SMBJ30A |
| LH15-13B12 | 1 | 220 | | | SMBJ20A | LH25-13B48 | 1 | 68 | | | SMBJ64A |

Note:
Output filtering capacitor C2 is electrolytic capacitor, it is recommended to apply electrolytic capacitor with high frequency and low resistance. For capacitance and current of capacitor please refer to manufacture's datasheet. Capacitor voltage reduced to at least 80%. C1 is ceramic capacitor, which is used to filter high-frequency noise. TVS is a recommended component to protect post-circuits if converter fails.

2. EMC solution-recommended circuit

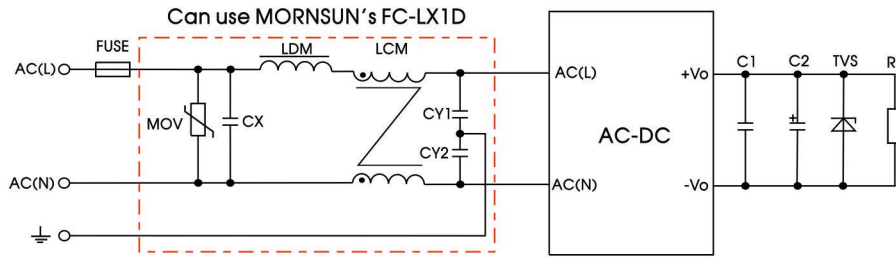
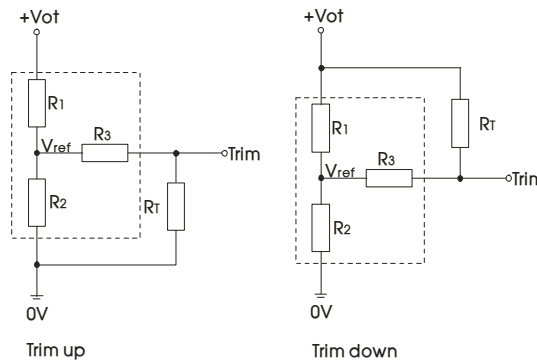


Fig 2

| Element model | Recommended value | Element model | Recommended value | |
|---------------|--|---------------|-------------------|-----------------------------------|
| MOV | S14K350 | FC-LX1D | EMC filter | |
| CY1 , CY2 | 1000pF/400VAC | FUUSE | LH05 | 2A/300V slow fusing, necessary |
| CX | 0.1μF/310VAC | | LH10/15 | 2A/300V slow fusing, necessary |
| LCM | 10mH, recommended to use MORNSUN's FL2D-Z5-103 | | LH20/25 | 3.15A/300V slow fusing, necessary |
| LDM | 4.7μH/2A | -- | -- | |

3. Application of Trim and calculation of Trim resistance



Applied circuits of Trim (Part in broken line is the interior of models)

Calculation formula of Trim resistance:

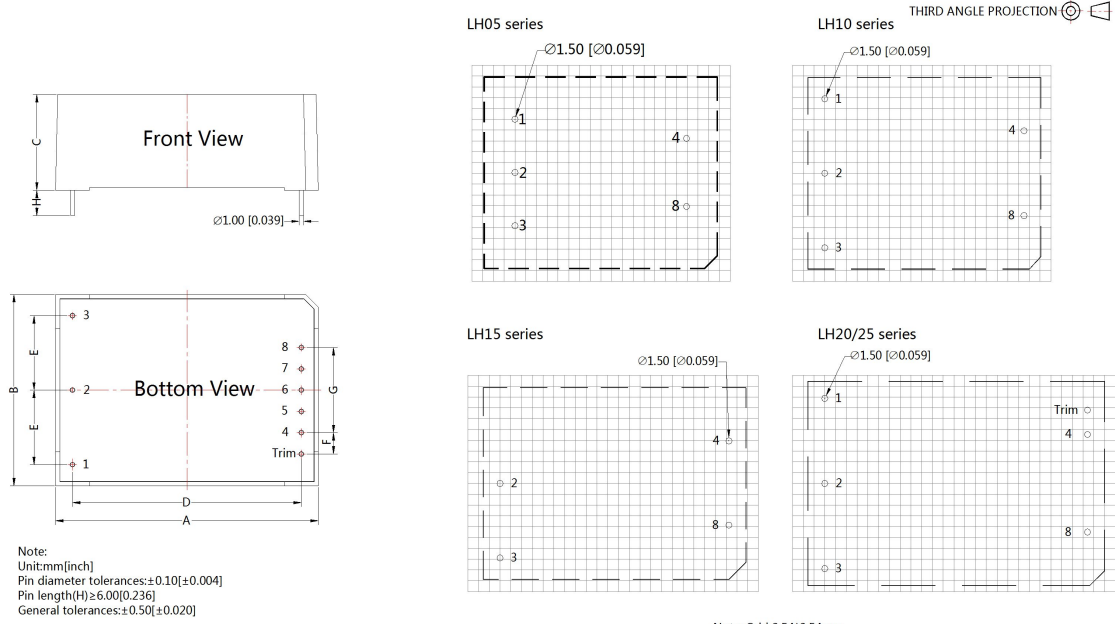
$$\begin{aligned} \text{up: } R_T &= \frac{\alpha R_2}{R_2 - \alpha} - R_3 & \alpha &= \frac{V_{ref}}{V_{ot} - V_{ref}} \cdot R_1 \\ \text{down: } R_T &= \frac{\alpha R_1}{R_1 - \alpha} - R_3 & \alpha &= \frac{V_{ot} - V_{ref}}{V_{ref}} \cdot R_2 \end{aligned}$$

R_T is Trim resistance
 α is a self-defined parameter, with no real meaning.

| Vout | R1(KΩ) | R2(KΩ) | R3(KΩ) | Vref(V) | Vot(V) |
|------|--------|--------|--------|---------|---|
| 3.3V | 3.3 | 1.98 | 1 | 1.24 | Output voltage after regulation, variation ≤ ±10% |
| 5V | 3.3 | 3.3 | 1 | 2.5 | |
| 9V | 7.5 | 2.87 | 1 | 2.5 | |
| 12V | 3.83 | 1 | 1 | 2.5 | |
| 15V | 7.5 | 1.5 | 1 | 2.5 | |
| 24V | 8.66 | 1 | 1 | 2.5 | |
| 48V | 68 | 3.73 | 1 | 2.5 | |

4. For more information about Mornsun EMC Filter products, please visit www.mornsun-power.com to download the Selection Guide of EMC Filter

Dimensions and Recommended Layout



| Dimensions (Unit: mm) | | | | | |
|-----------------------|--------|-------|-------|-------|-------|
| NO. | LH05 | LH10 | LH15 | LH20 | LH25 |
| A | 55.00 | 55.00 | 62.00 | 70.00 | 70.00 |
| B | 45.00 | 45.00 | 45.00 | 48.00 | 48.00 |
| C | 21.00 | 21.00 | 22.50 | 23.50 | 23.50 |
| D | 40.50 | 47.00 | 54.00 | 62.00 | 62.00 |
| E | 12.50 | 17.50 | 17.50 | 20.00 | 20.00 |
| F | -- | -- | -- | 5.75 | 5.75 |
| G | 16.00 | 20.00 | 20.00 | 23.00 | 23.00 |
| H | 6(Min) | | | | |

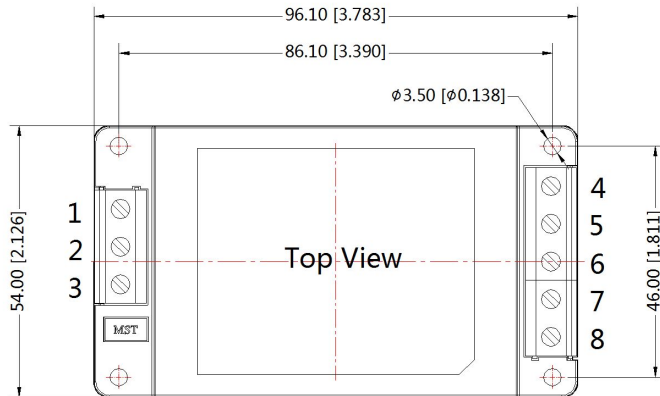
| Models Weight | | | | | |
|---------------|------|------|------|------|------|
| Weight | LH05 | LH10 | LH15 | LH20 | LH25 |
| (Typ.) | 75g | 75g | 85g | 120g | 120g |

| Pin Connection | |
|----------------|------------|
| Pin | LHxx-13Bxx |
| 1 | |
| 2 | AC(N) |
| 3 | AC(L) |
| 4 | -Vo |
| 5 | No Pin |
| 6 | No Pin |
| 7 | No Pin |
| 8 | +Vo |
| Trim | Trim** |

There is no pin "1" on LH15-13Bxx
Trim**: only for LH20/25-13Bxx Series.

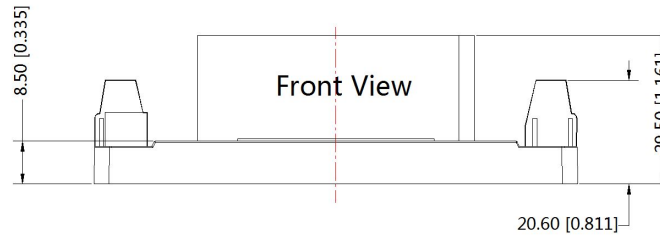
LHXXA2 Dimensions

THIRD ANGLE PROJECTION 



| Pin-Out | |
|---------|--------------|
| Pin | LHxx-13BxxA2 |
| 1 | ⏏ |
| 2 | AC(N) |
| 3 | AC(L) |
| 4 | -Vo |
| 5 | NC |
| 6 | NC/Trim** |
| 7 | NC |
| 8 | +Vo |

There is no pin "1" on the LH15-13BxxA2 series.
NC/Trim** : The pin is Trim on the LH20/25-13BxxA2 series and is not connected on other single output products.



*The figure left is related to the LH10-13BxxA2 series. the height of other series is different.

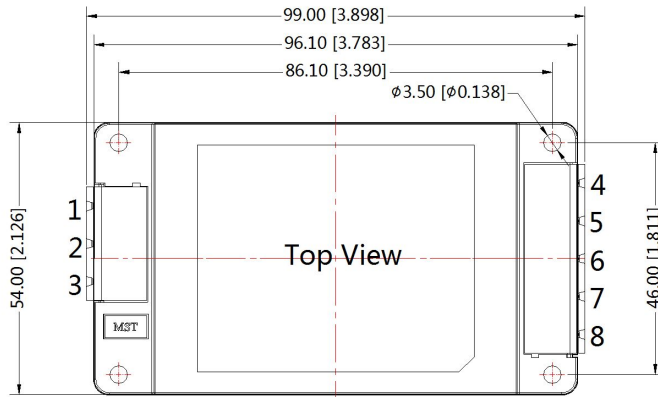
Note:
Unit:mm[inch]
Wire range : 24-12 AWG
Tightening torque: Max 0.4 N·m
General tolerances:±1.00[±0.039]

| Dimensions (Unit: mm) | |
|-----------------------|------------------|
| Model | Dimensions |
| LH05XXA2 | 96.1*54.0*29.5mm |
| LH10XXA2 | 96.1*54.0*29.5mm |
| LH15XXA2 | 96.1*54.0*31.0mm |
| LH20XXA2 | 96.1*54.0*32.0mm |
| LH25XXA2 | 96.1*54.0*32.0mm |

| Models weight | | | | | |
|---------------|------|------|------|------|------|
| Weight | LH05 | LH10 | LH15 | LH20 | LH25 |
| Typ. | 125g | 125g | 135g | 170g | 170g |

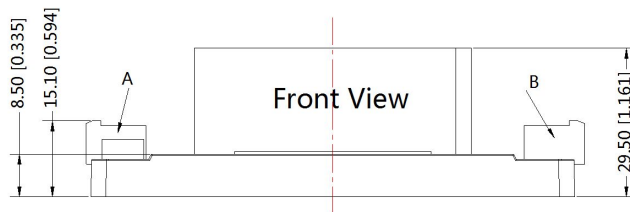
LHXXA3 Dimensions

THIRD ANGLE PROJECTION 



| Pin-Out | |
|---------|---------------|
| Pin | LHxx-13BxxA3 |
| 1 | \varnothing |
| 2 | AC(N) |
| 3 | AC(L) |
| 4 | -Vo |
| 5 | NC |
| 6 | NC/Trim** |
| 7 | NC |
| 8 | +Vo |

There is no pin "1" on the LH15-13BxxA3 series.
NC/Trim** : The pin is Trim on the LH20/25-13BxxA3 series and is not connected on other single output products.



*The figure left is related to the LH10-13BxxA3 series. the height of other series is different.

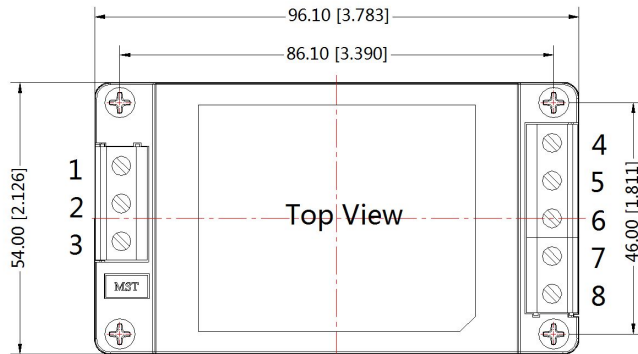
Note:
Unit:mm[inch]
General tolerances:±1.00[±0.039]
A:DEGSON P/N:
2EDGRC-7.5-03P-14-100A (H)
B:DEGSON P/N:
2EDGRC-7.5-05P-14-100A (H)

| Dimensions (Unit: mm) | |
|-----------------------|------------------|
| Model | Dimensions |
| LH05XXA3 | 99.0*54.0*29.5mm |
| LH10XXA3 | 99.0*54.0*29.5mm |
| LH15XXA3 | 99.0*54.0*31.0mm |
| LH20XXA3 | 99.0*54.0*32.0mm |
| LH25XXA3 | 99.0*54.0*32.0mm |

| Models weight | | | | | |
|---------------|------|------|------|------|------|
| Weight | LH05 | LH10 | LH15 | LH20 | LH25 |
| Typ. | 125g | 125g | 135g | 170g | 170g |

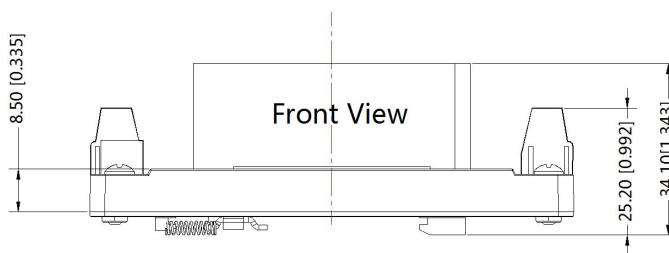
LHXXA4 Dimensions

THIRD ANGLE PROJECTION 



| Pin-Out | |
|---------|--------------|
| Pin | LHxx-13BxxA4 |
| 1 | ± |
| 2 | AC(N) |
| 3 | AC(L) |
| 4 | -Vo |
| 5 | NC |
| 6 | NC/Trim** |
| 7 | NC |
| 8 | +Vo |

There is no pin "1" on the LH15-13BxxA4 series.
NC/Trim** : The pin is Trim on the LH20/25-13BxxA4 series and is not connected on other single output products.



*The figure left is related to the LH10-13BxxA4 series. the height of other series is different.

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]

| Dimensions (Unit: mm) | |
|-----------------------|------------------|
| Model | Dimensions |
| LH05XXA4 | 96.1*54.0*34.1mm |
| LH10XXA4 | 96.1*54.0*34.1mm |
| LH15XXA4 | 96.1*54.0*35.6mm |
| LH20XXA4 | 96.1*54.0*36.6mm |
| LH25XXA4 | 96.1*54.0*36.6mm |

| Models weight | | | | | |
|---------------|------|------|------|------|------|
| Weight | LH05 | LH10 | LH15 | LH20 | LH25 |
| Typ. | 165g | 165g | 175g | 210g | 210g |

Note:

1. Packing information please refer to Product Packing Information which can be downloaded from www.mornsun-power.com. Packing bag number: 58220006;the Packing bag number of A2/A3/A4 package:58220010;
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. The maximum capacitive load offered were tested at input voltage range and full load;
4. 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;
5. All index testing methods in this datasheet are based on our Company's corporate standards;
6. We can provide product customization service, please contact our technicians directly for specific information;
7. Products are related to laws and regulations: see "Features" and "EMC";
8. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.

Mornsun Guangzhou Science & Technology Co., Ltd.

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