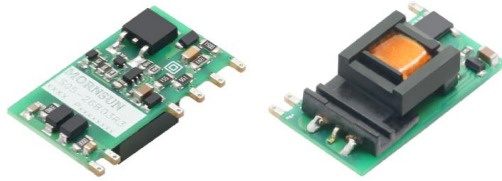


5W, DIY AC/DC converter



RoHS



EN62368-1

FEATURES

- Ultra-wide 90 - 528VAC and 100 - 745VDC input voltage range
- Accepts AC or DC input (dual-use of same terminal)
- Working available with any two phases
- Operating ambient temperature range: -40°C to +85°C
- High I/O isolation test voltage up to 4000VAC
- Multi application, flexible layout
- Output short circuit, over-current protection

LS05-26BxxR3 series is one of Mornsun's highly efficient green power AC-DC Converter series. They feature wide input range accepting either AC or DC voltage, high reliability, low power consumption and reinforced isolation. All models are particularly suitable for industrial control, electric power, instrumentation applications which have high requirement for dimension. 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 | LS05-26B03R3 | 5W | 3.3V/1000mA | 70 | 2200 |
| | LS05-26B05R3 | | 5V/1000mA | 72 | 1500 |
| | LS05-26B09R3 | | 9V/560mA | 72 | 680 |
| | LS05-26B12R3 | | 12V/420mA | 78 | 470 |
| | LS05-26B15R3 | | 15V/340mA | 78 | 330 |
| | LS05-26B24R3 | | 24V/210mA | 78 | 100 |

Note: 1. The nominal output voltage refers to the voltage applied to the load terminal after adding external circuits.
2. If the product is used in a severe vibration application, it needs to be glued and fixed.

Input Specifications

| Item | Operating Conditions | Min. | Typ. | Max. | Unit |
|---------------------------------|----------------------|---|------|------|------|
| Input Voltage Range | AC input | 90 | -- | 528 | VAC |
| | DC input | 100 | -- | 745 | VDC |
| Input Frequency | | 47 | -- | 63 | Hz |
| Input Current | 115VAC | -- | -- | 0.20 | A |
| | 230VAC | -- | -- | 0.10 | |
| | 480VAC | -- | -- | 0.07 | |
| Inrush Current | 115VAC | -- | 10 | -- | |
| | 230VAC | -- | 17 | -- | |
| | 480VAC | -- | 28 | -- | |
| Leakage Current | 480VAC/50Hz | 0.6mA 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 | -- | ±3 | ±6 | % |
| | 5V/9V/12V/15V/24V | -- | ±2.5 | ±5 | |
| Line Regulation | Rated load | -- | ±1.5 | -- | |
| Load Regulation | 10% - 100% load | -- | ±3 | -- | |
| Ripple & Noise* | 20MHz bandwidth (peak-to-peak value), 10% - 100% load | -- | 100 | 180 | mV |

| | | | | | |
|---|--------------|-----------------------------------|------|------|------|
| Temperature Coefficient | | -- | ±0.2 | -- | %/°C |
| Stand-by Power Consumption | 230VAC input | -- | -- | 0.30 | W |
| | 380VAC input | -- | -- | 0.50 | |
| Short Circuit Protection | | Hiccup, continuous, self-recovery | | | |
| Over-current Protection | | ≥120%Io, self-recovery | | | |
| Minimum Load* | | 10 | -- | -- | % |
| Hold-up Time | 115VAC input | -- | 8 | -- | ms |
| | 230VAC input | -- | 35 | -- | |
| | 380VAC input | -- | 100 | -- | |
| Note: 1. *The "parallel cable" method is used for ripple and noise test, please refer to AC-DC Converter Application Notes for specific information; 2. The product is able to work with 0%-10% load and with stable output. | | | | | |

General Specifications

| Item | Operating Conditions | Min. | Typ. | Max. | Unit |
|-----------------------|---|--|------|------|--------|
| Isolation | Input-output Electric Strength Test for 1min., leakage current <5mA | 4000 | -- | -- | VAC |
| Operating Temperature | | -40 | -- | +85 | °C |
| Storage Temperature | | -40 | -- | +105 | |
| Storage Humidity | | -- | -- | 95 | %RH |
| Power Derating | +55°C to +85°C | 2.0 | -- | -- | % / °C |
| | 90VAC - 110VAC | 2.0 | -- | -- | |
| | 480VAC - 528VAC | 0.42 | -- | -- | %/VAC |
| Safety Standard | | EN62368-1 (Report); Design refer to IEC/UL62368-1, IEC/EN60335-1, IEC/EN61558-1 | | | |
| Safety Class | | CLASS II | | | |
| MTBF | | MIL-HDBK-217F@25°C > 500,000 h | | | |

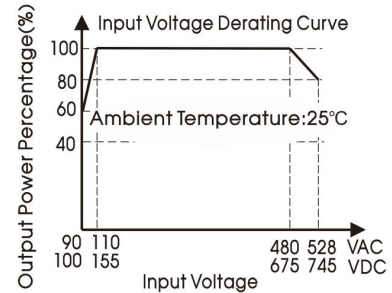
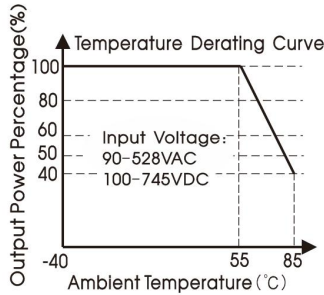
Mechanical Specifications

| | |
|----------------|--------------------------|
| Dimension | 33.50 x 17.20 x 13.00 mm |
| Weight | 6.2g (Typ.) |
| Cooling method | Free air convection |

Electromagnetic Compatibility (EMC)

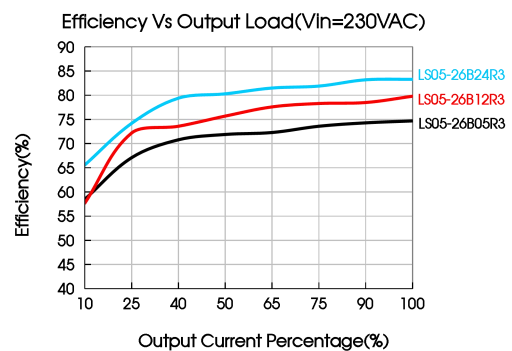
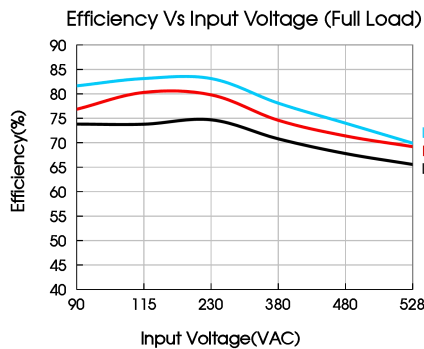
| | | | | |
|---|------------------|------------------|---|------------------|
| Emissions | CE | CISPR32/EN55032 | CLASS A (Application circuit 1, 4, 5, 6) | |
| | | CISPR32/EN55032 | CLASS B (Application circuit 2, 3) | |
| | RE | CISPR32/EN55032 | CLASS A (Application circuit 1, 4, 5, 6) | |
| | | CISPR32/EN55032 | CLASS B (Application circuit 2, 3) | |
| Immunity | ESD | IEC/EN61000-4-2 | Contact ±6KV | Perf. Criteria B |
| | RS | IEC/EN61000-4-3 | 10V/m | perf. Criteria A |
| | EFT | IEC/EN61000-4-4 | ±2KV (Application circuit 1, 2) | perf. Criteria B |
| | | IEC/EN61000-4-4 | ±4KV (Application circuit 3, 4, 5, 6) | perf. Criteria B |
| | Surge | IEC/EN61000-4-5 | line to line ±1KV (Application circuit 1, 2) | perf. Criteria B |
| | | IEC/EN61000-4-5 | line to line ±2KV (Application circuit 3, 4) | perf. Criteria B |
| | | IEC/EN61000-4-5 | line to line ±2KV/line to ground ±4KV (Application circuit 5) | perf. Criteria B |
| | | IEC/EN 61000-4-5 | line to line ±4KV (Application circuit 6) | 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

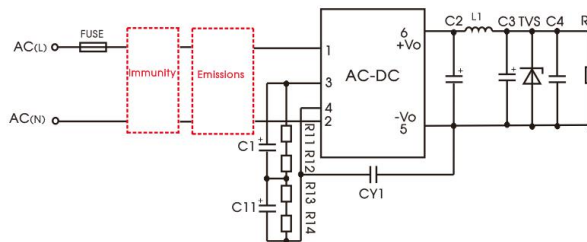


Note: ① With an AC input between 90-110V/480-528VAC and a DC input between 100-155V/675-745VDC, the output power must be derated as per temperature derating curves;

② This product is suitable for applications using natural air cooling; for applications in closed environment please consult factory or one of our FAE.



Additional Circuits Design Reference



LS series additional circuits design reference

LS05 series additional components selection guide (No EMC devices)

| Part No. | C2(required) | L1(required) | C3(required) | C4 | CY1(required) | TVS |
|--------------|----------------------------------|---------------------|--------------|-----------|---------------|----------|
| LS05-26B03R3 | 470uF/16V(solid-state capacitor) | 2.2uH/15mΩ Max/6.5A | 150uF/35V | 0.1uF/50V | 1.0nF/400VAC | SMBJ7.0A |
| LS05-26B05R3 | | | | | | |
| LS05-26B09R3 | 270uF/16V(solid-state capacitor) | | 100uF/35V | | | |
| LS05-26B12R3 | | | | | | |
| LS05-26B15R3 | 220uF/35V | | | | | SMBJ20A |
| LS05-26B24R3 | 150uF/35V | | 47uF/35V | | | SMBJ30A |

| | C1/C11(required) | | R11/R12/R13/R14 |
|-----------------|----------------------------|----------------------------|----------------------------|
| | -25°C to +85°C | -40°C to +85°C | 1MΩ /1206/(1/4W)(required) |
| 90VAC - 528VAC | 33uF/400V | 47uF/400V | |
| 165VAC - 528VAC | 22uF/400V | 33uF/400V | |
| 90VAC - 305VAC | C1: 10uF/450V C11: wire | C1: 22uF/450V C11: wire | / |

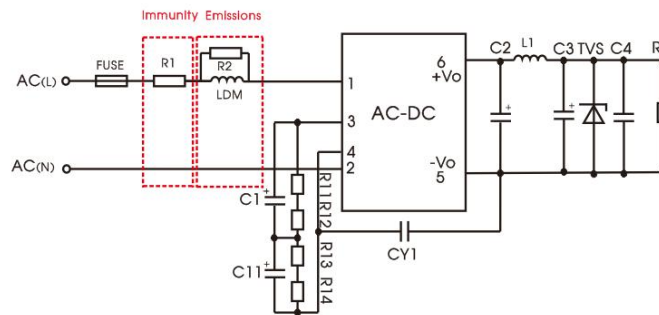
- Note:
- C1/C11 is used as filter capacitor with AC input (must be connected externally) and as EMC filter capacitor with DC input (must be connected), and it is recommended to use the capacitor with ripple current >200mA@100KHz. It is recommended to use electrolytic capacitor C1/C11 with ESR ≤ 20Ω at low temperature.
 - R11, R12, R13, R14 are the voltage equalizing resistors of C1, C11 electrolytic capacitors (must be connected), and SMD anodes can be used;
 - We recommend using an electrolytic capacitor with high frequency and low ESR (ESR of C3 at low temperature of -40°C ≤ 1.1Ω) rating for C3 (refer to manufacture's datasheet), electrolytic capacitor can be used for C2 when applied in normal and high temperature environments. Combined with C2, L1, they form a pi-type filter circuit. Choose a capacitor voltage rating with at least 20% margin, in other words not exceeding 80%. C4 is a ceramic capacitor, used for filtering high frequency noise.
 - A suppressor diode (TVS) is recommended to protect the application in case of converter failure and specification should be 1.2 times of the output voltage.
 - LDM (1.2mH, P/N: 12050314; 2.2mH, P/N: 12050552; 4.7mH, P/N: 12050305). L1 (2.2uH, P/N: 12050504) Mornsun quotation is available.

Environmental Application EMC Solution

| Recommended circuit | Application environmental | Typical industry | Input voltage range | Environment temperature | Emissions | Immunity |
|---------------------|--------------------------------|---|---------------------|-------------------------|-----------|-----------|
| 1 | Basic application | None | 90-528VAC | -40℃ to +85℃ | CLASS A | CLASS III |
| 2 | Indoor general environment | Intelligent building/Intelligent agriculture | | -25℃ to +55℃ | CLASS B | CLASS III |
| 3 | Indoor industrial environment | Manufacturing workshop | | -25℃ to +55℃ | CLASS B | CLASS IV |
| 4 | Outdoor general environment | ITS/Video monitoring/Charging point/Communication/Security and protection | | -40℃ to +85℃ | CLASS A | CLASS IV |
| 5 | Outdoor industrial environment | Electricity/Grid | | -40℃ to +85℃ | Class A | CLASS IV |
| 6 | Strong lightning surge | Electricity dedicated | | -40℃ to +85℃ | Class A | CLASS IV |

Electromagnetic Compatibility Solution--Recommended Circuit

1. Application circuit 1—Basic application



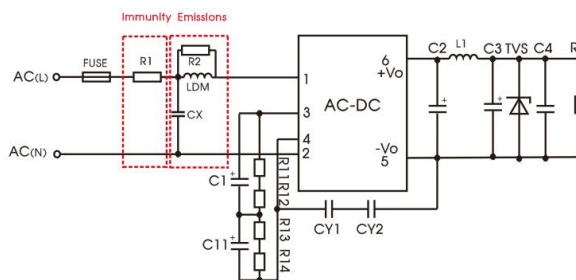
recommended circuit 1

| Application environmental | Ambient temperature range | Immunity CLASS | Emissions CLASS |
|---------------------------|---------------------------|----------------|-----------------|
| Basic application | -40℃ to +85℃ | CLASS III | CLASS A |

| | | |
|------------------------------------|-----------------------|----------------------------|
| FUSE (required) | | 1A/500V, slow-blow |
| R1 (wire-wound resistor, required) | | 12Ω /3W |
| R2 (Chip resistor) | LS05-26B05/09R3 | 20K/1206/(1/4W) |
| | LS05-26B03/12R3 | 2K/1206/(1/4W) |
| | LS05-26B15/24R3 | 15K/1206/(1/4W) |
| LDM | LS05-26B05R3 | 1.2mH/Max: 2.5Ω /Min: 0.2A |
| | LS05-26B09R3 | 2.2mH/Max: 15Ω /Min: 0.2A |
| | LS05-26B03/12/15/24R3 | 4.7mH/Max: 15Ω /Min: 0.2A |

Note: R1 is the input plug-in resistor, this resistor needs to be a wire-wound resistor (required), please do not select chip resistor or carbon film resistor.

2. Application circuit 2—Universal system recommended circuits for indoor general environment



Recommended circuit 2

| | | | |
|---------------------------|---------------------------|----------------|-----------------|
| Application environmental | Ambient temperature range | Immunity CLASS | Emissions CLASS |
| Indoor civil /general | -25℃ to +55℃ | CLASS III | CLASS B |

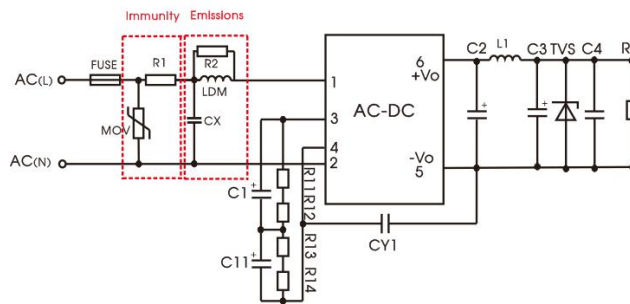
| Component | Recommended value | |
|------------------------------------|-----------------------|-----------------------------|
| R1 (wire-wound resistor, required) | 12 Ω /3W | |
| R2 (Chip resistor) | LS05-26B05/09R3 | 20K/1206/(1/4W) |
| | LS05-26B03/12R3 | 2K/1206/(1/4W) |
| | LS05-26B15/24R3 | 15K/1206/(1/4W) |
| LDM | LS05-26B05R3 | 1.2mH/Max: 2.5 Ω /Min: 0.2A |
| | LS05-26B09R3 | 2.2mH/Max: 15 Ω /Min: 0.2A |
| | LS05-26B03/12/15/24R3 | 4.7mH/Max: 15 Ω /Min: 0.2A |
| CX | 0.1uF/480VAC | |
| FUSE (required) | 1A/500V, slow-blow | |

Note 1: In the home appliance application environment, the two Y capacitors of the primary and secondary need to be externally connected (CY1/CY2, value at 2.2nF/250VAC), which can meet the EN60335 certification;

Note 2: According to the certification requirements, the X capacitor needs to be connected in parallel with the bleeder resistance, the recommended resistance value is less than 3.8MΩ, and the actual need to be selected according to the certification standard;

Note 3: R1 is the input plug-in resistor, this resistor needs to be a wire-wound resistor (required), please do not select chip resistor or carbon film resistor.

3. Application circuit 3—Universal system recommended circuits for indoor industrial environment



Recommended circuit 3

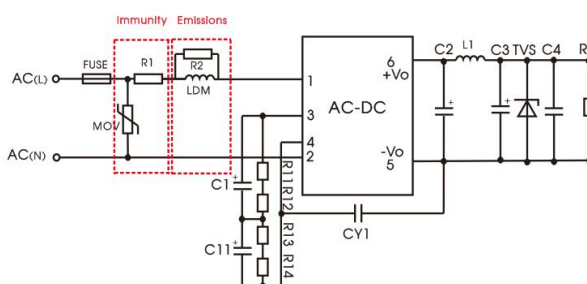
| | | | |
|---------------------------|---------------------------|----------------|-----------------|
| Application environmental | Ambient temperature range | Immunity CLASS | Emissions CLASS |
| Indoor industrial | -25℃ to +55℃ | CLASS IV | CLASS B |

| Component | Recommended value | |
|------------------------------------|-----------------------|-----------------------------|
| MOV | S14K550 | |
| CX | 0.1uF/480VAC | |
| R2 (Chip resistor) | LS05-26B05/09R3 | 20K/1206/(1/4W) |
| | LS05-26B03/12R3 | 2K/1206/(1/4W) |
| | LS05-26B15/24R3 | 15K/1206/(1/4W) |
| LDM | LS05-26B05R3 | 1.2mH/Max: 2.5 Ω /Min: 0.2A |
| | LS05-26B09R3 | 2.2mH/Max: 15 Ω /Min: 0.2A |
| | LS05-26B03/12/15/24R3 | 4.7mH/Max: 15 Ω /Min: 0.2A |
| R1 (wire-wound resistor, required) | 12 Ω /3W | |
| FUSE (required) | 2A/500V, slow-blow | |

Note 1: According to the certification requirements, the X capacitor needs to be connected in parallel with the bleeder resistance, the recommended resistance value is less than 3.8MΩ, and the actual need to be selected according to the certification standard;

Note 2: R1 is the input plug-in resistor, this resistor needs to be a wire-wound resistor (required), please do not select chip resistor or carbon film resistor.

4. Application circuit 4—Universal system recommended circuits for outdoor general environment



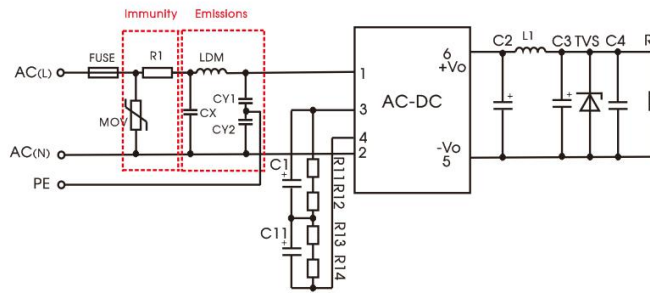
Recommended circuit 4

| Application environmental | Ambient temperature range | Immunity CLASS | Emissions CLASS |
|-----------------------------|---------------------------|----------------|-----------------|
| Outdoor general environment | -40°C to +85°C | CLASS IV | CLASS A |

| Component | Recommended value |
|------------------------------------|---|
| MOV | S14K550 |
| R2 (Chip resistor) | LS05-26B05/09R3 20K/1206/(1/4W) |
| | LS05-26B03/12R3 2K/1206/(1/4W) |
| | LS05-26B15/24R3 15K/1206/(1/4W) |
| LDM | LS05-26B05R3 1.2mH/Max: 2.5 Ω /Min: 0.2A |
| | LS05-26B09R3 2.2mH/Max: 15 Ω /Min: 0.2A |
| | LS05-26B03/12/15/24R3 4.7mH/Max: 15 Ω /Min: 0.2A |
| R1 (wire-wound resistor, required) | 12 Ω /3W |
| FUSE (required) | 2A/500V, slow-blow |

Note: R1 is the input plug-in resistor, this resistor needs to be a wire-wound resistor (required), please do not select chip resistor or carbon film resistor.

5. Application circuit 5—Universal system recommended circuits for outdoor industrial environment



Recommended circuit 5

| Application environmental | Ambient temperature range | Immunity CLASS | Emissions CLASS |
|--------------------------------|---------------------------|----------------|-----------------|
| Outdoor industrial environment | -40°C to +85°C | CLASS IV | CLASS A |

| Component | Recommended value |
|------------------------------------|---|
| MOV | S14K550 |
| LDM | LS05-26B05R3 1.2mH/Max: 2.5 Ω /Min: 0.2A |
| | LS05-26B09R3 2.2mH/Max: 15 Ω /Min: 0.2A |
| | LS05-26B03/12/15/24R3 4.7mH/Max: 15 Ω /Min: 0.2A |
| R1 (wire-wound resistor, required) | 12 Ω /3W |
| CX | 0.1uF/480VAC |
| FUSE (required) | 2A/500V, slow-blow |
| CY1/CY2 | 1.0nF/400VAC |

Note: R1 is the input plug-in resistor, this resistor needs to be a wire-wound resistor (required), please do not select chip resistor or carbon film resistor.

6. Application circuit 6—Universal system recommended circuits for strong lightning surge environment

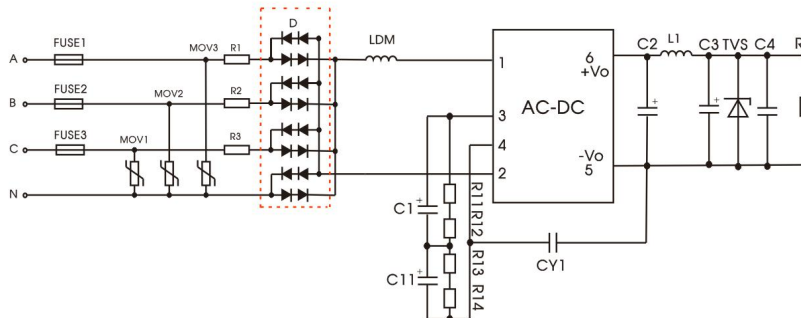


Fig. (1): Recommended circuit for applications which require 4KV differential-mode surge standard (full-wave rectification)

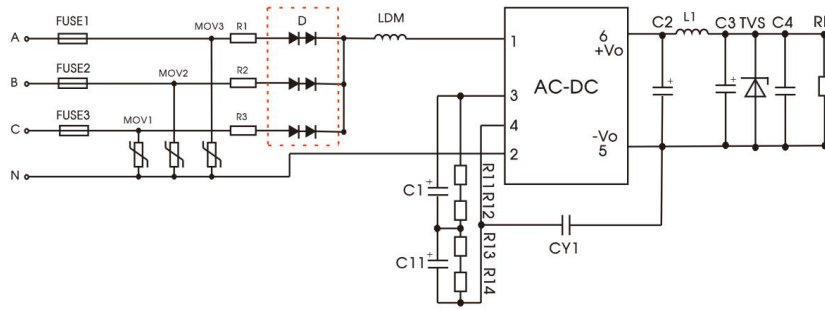


Fig. (2): Recommended circuit for applications which require 4KV differential-mode surge standard (half-wave rectification)

| | | | |
|---|---|----------------------------|----------------------------|
| Application environmental Strong lightning surge environment | Ambient temperature range -40°C to +85°C | Immunity CLASS CLASS IV | Emissions CLASS CLASS A |
|---|---|----------------------------|----------------------------|

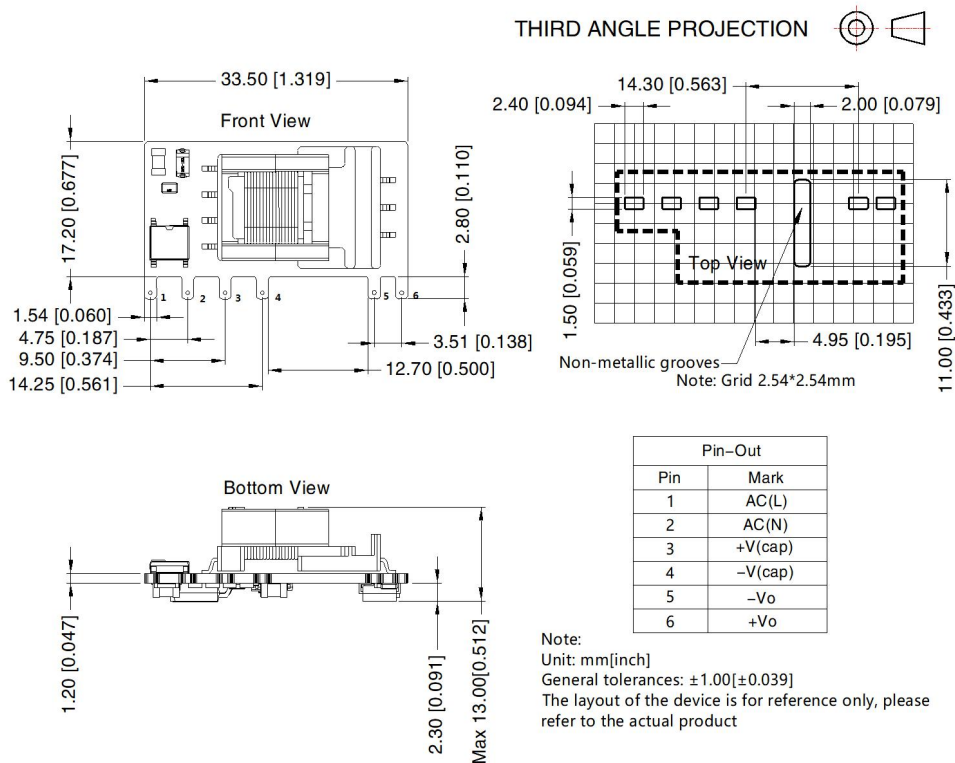
| Component | Recommended value | |
|--|-----------------------|-----------------------------|
| FUSE1/FUSE2/FUSE3 (required) | 3.15A/500V | |
| MOV1/MOV2/MOV3 | S14K550 | |
| R1/R2/R3 (wire-wound resistor, required) | 12 Ω /5W | |
| D | 2A/1000V | |
| LDM | LS05-26B05R3 | 1.2mH/Max: 2.5 Ω /Min: 0.2A |
| | LS05-26B09R3 | 2.2mH/Max: 15 Ω /Min: 0.2A |
| | LS05-26B03/12/15/24R3 | 4.7mH/Max: 15 Ω /Min: 0.2A |

Note: R1/R2/R3 is the input plug-in resistor, this resistor needs to be a wire-wound resistor (required), please do not select chip resistor or carbon film resistor.

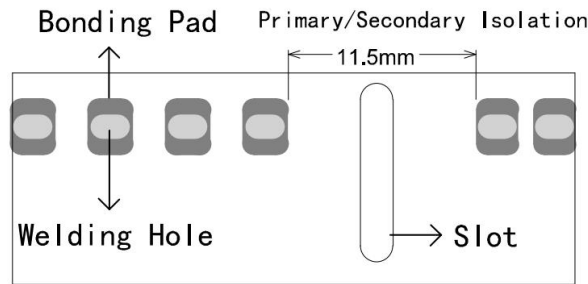
7. For additional information please refer to application notes on www.mornsun-power.com.

Dimensions and Recommended Layout

LS05-26BxxR3 series dimensions



LS05-26BxxR3 series recommended pad



Note: There is a slot(non-metallic hole) between pin 4/5; For details, please refer to the recommended dimensions or pad.

Note:

1. For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging bag number: 58220134;
2. External electrolytic capacitors are required to modules, more details refer to typical applications;
3. This part is open frame, at least 8.4mm creepage distance between the primary and secondary external components of the module is needed to meet the safety requirement, refer to the recommended welding hole design in the external dimension drawing;
4. Unless otherwise specified, parameters in this datasheet were measured under the conditions of $T_a=25^{\circ}\text{C}$, humidity<75%, nominal input voltage (115V, 230V and 380V) and rated output load;
5. All index testing methods in this datasheet are based on our company 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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