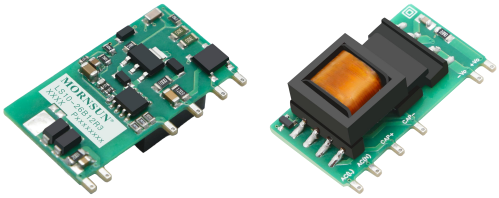
10W, DIY AC/DC converter



CE Report EN62368-1 | UKCA BS EN 62368-1 | RoHS | 3 years Warranty

## FEATURES

- Ultra-wide 85 - 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℃ to +85℃
- High I/O isolation test voltage up to 4000VAC
- Multi application, flexible layout
- Output short circuit, over-current protection

*LS10-26BxxR3 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 | LS10-26B03R3 | 6.6W | 3.3V/2000mA | 70 | 1500 |
| | LS10-26B05R3 | 10W | 5V/2000mA | 77 | 1500 |
| | LS10-26B09R3 | | 9V/1100mA | 80 | 1000 |
| | LS10-26B12R3 | | 12V/830mA | 82 | 680 |
| | LS10-26B15R3 | | 15V/670mA | 82 | 470 |
| | LS10-26B24R3 | | 24V/420mA | 83 | 330 |

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 | 85 | -- | 528 | VAC |
| | DC input | 100 | -- | 745 | VDC |
| Input Certified Voltage Range | AC input | 100 | -- | 480 | VAC |
| Input Frequency | | 47 | -- | 63 | Hz |
| Input Current | 115VAC | -- | -- | 0.30 | A |
| | 230VAC | -- | -- | 0.15 | |
| | 380VAC | -- | -- | 0.10 | |
| Inrush Current | 115VAC | -- | 15 | -- | |
| | 230VAC | -- | 30 | -- | |
| | 380VAC | -- | 50 | -- | |
| Leakage Current | 480VAC/50Hz | 0.5mA RMS Max. | | | |
| Recommended External Input Fuse | | 2A, 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 | | -- | ±6 | -- | % |
| | 5V | 0% - 10% load | -- | ±5 | -- | |
| | | 10% - 100% load | -- | ±4 | -- | |
| | 9V/12V/15V/24V | | -- | ±5 | -- | |
| Line Regulation | Rated load | 3.3V | -- | ±2 | -- | |
| | | 5V/9V/12V/15V/24V | -- | ±1.5 | -- | |
| Load Regulation | 10% - 100% load | | -- | ±3 | -- | |

| | | | | | |
|---|---|---|---|---|---|
| Ripple & Noise* | 20MHz bandwidth (peak-to-peak value), | -- | 100 | 180 | mV |
| Temperature Coefficient | | -- | ±0.2 | -- | %/℃ |
| Stand-by Power Consumption | 230VAC input | -- | -- | 0.30 | W |
| | 380VAC input | -- | -- | 0.50 | |
| Short Circuit Protection | | Hiccup, continuous, self-recovery | | | |
| Over-current Protection | | ⩾110% Io, self-recovery | | | |
| Minimum Load* | | 10 | -- | -- | % |
| Hold-up Time | 115VAC input | -- | 8 | -- | ms |
| | 230VAC input | -- | 35 | -- | |
| | 380VAC input | -- | 80 | -- | |

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 |
| Insulation Resistance | Input - output | At 500VDC | 50 | -- | -- | MΩ |
| Operating Temperature | | | -40 | -- | +85 | ℃ |
| Storage Temperature | | | -40 | -- | +105 | |
| Storage Humidity | | | -- | -- | 95 | %RH |
| Soldering Temperature | | Wave-soldering | 260 ± 5℃; time: 5 - 10s | | | |
| | | Manual-welding | 360 ± 10℃; time: 3 - 5s | | | |
| Power Derating | | +50℃ to +85℃ | 1.72 | -- | -- | %/℃ |
| | | -40℃ to -25℃ | 1.33 | -- | -- | |
| | | 85VAC - 100VAC | 1.33 | -- | -- | %/VAC |
| | | 480AVC - 528VAC | 0.42 | -- | -- | |
| Safety Standard | | | BS EN/EN62368-1 (Report) Safety Approval; Design refer to IEC/UL62368-1, IEC/EN62477-1, EN61010-1 | | | |
| Safety Class | | | CLASS II | | | |
| MTBF | | | MIL-HDBK-217F@25℃ >500,000 h | | | |

## Mechanical Specifications

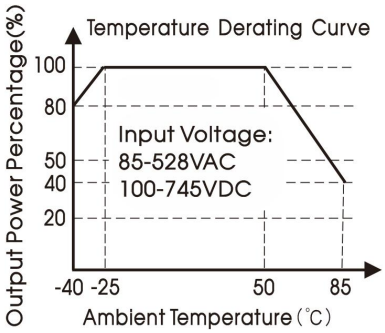
| | |
|---|---|
| Dimension | 38.00 x 20.00 x 15.25 mm |
| Weight | 10.0g (Typ.) |
| Cooling method | Free air convection |

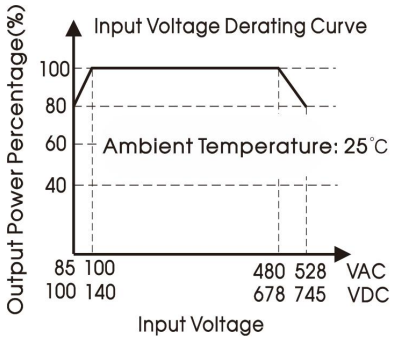
## Electromagnetic Compatibility (EMC)

| | | | | |
|---|---|---|---|---|
| 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/Air ±8KV | perf. Criteria B |
| | RS | IEC/EN61000-4-3 | 10V/m | perf. Criteria A |
| | EFT | IEC/EN61000-4-4 | ±2KV (Application circuit 1, 4, 6) | perf. Criteria B |
| | | IEC/EN61000-4-4 | ±4KV (Application circuit 2, 3, 5) | 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 PE ±4KV (Application circuit 5) | perf. Criteria B |
| | | IEC/EN61000-4-5 | line to line ±4KV (Application circuit 6) | perf. Criteria B |
| | CS | IEC/EN61000-4-6 | 10Vr.m.s | perf. Criteria A |

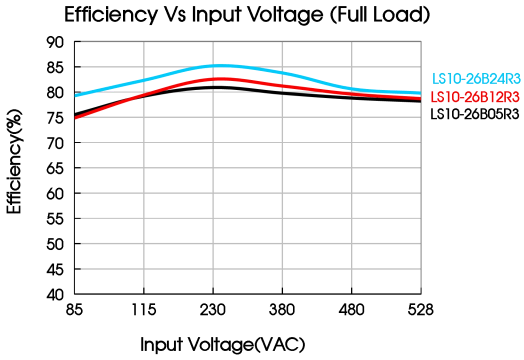
| | | | |
|---|---|---|---|
| | Voltage dip, short interruption and voltage variation | IEC/EN61000-4-11 0%, 70% | perf. Criteria B |

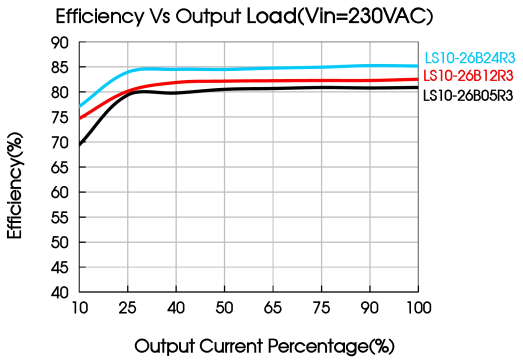
## Product Characteristic Curve



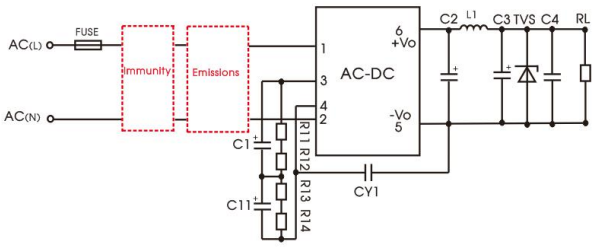




Note: ① With an AC input between 85 -100V/480-528VAC and a DC input between 100 - 140V/678-745VDC, the output power must be derated as per temperature derating curves;
② This product is suitable for applications using natural air cooling; for applications in closed environment please consult Mornsun FAE.




## Additional Circuits Design Reference




LS series additional circuits design reference

| LS10 series additional components selection guide (No EMC devices) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Part No. | C1/C11 (required) | R11/R12/R13/R14 (SMD resistor, required) | C2 (required) | L1(required) | C3 (required) | C4 | CY1 (required) | TVS |
| LS10-26B03R3 | 47uF/400V | 1MΩ/1206/(1/4W) | 1500uF/6.3V (solid-state capacitor) | 2.2uH/15mΩ Max/6.5A | 680uF/25V | 0.1uF/50V | 1nF/400VAC | SMBJ7.0A |
| LS10-26B05R3 | | | 820uF/16V (solid-state capacitor) | | 330uF/25V | | | |
| LS10-26B09R3 | | | 470uF/16V (solid-state capacitor) | | 1000uF/16V | | | SMBJ12A |
| LS10-26B12R3 | | | | | 330uF/25V | | | SMBJ20A |
| LS10-26B15R3 | | | 470uF/25V (solid-state capacitor) | | 100uF/35V | | | |
| LS10-26B24R3 | | | 470uF/35V | | | | | SMBJ30A |

Note:
1. 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≤ 100Ω at low temperature.

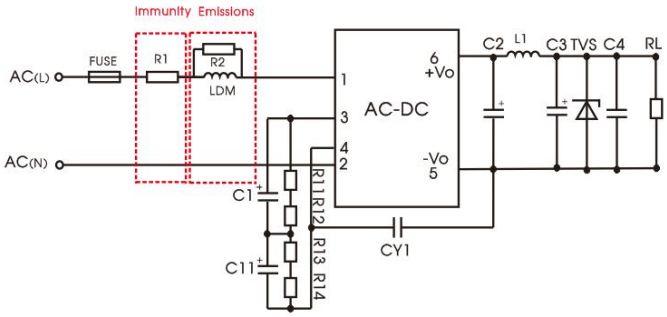
2. R11, R12, R13, R14 are the voltage equalizing resistors of C1, C11 electrolytic capacitors (must be connected), and SMD anodes can be used;
3. We recommend using an electrolytic capacitor with high frequency and low ESR (ESR of C3 at low temperature of -40℃≤1.1Ω) rating for C3 (refer to manufacture's 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.
4. 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.
5. LDM (2.2mH, P/N: 12050564), L1 ( 2.2uH, P/N: 12050504) Mornsun quotation is available.

## Environmental Application EMC Solution

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

## Electromagnetic Compatibility Solution--Recommended Circuit

### 1. Application circuit 1——Basic application

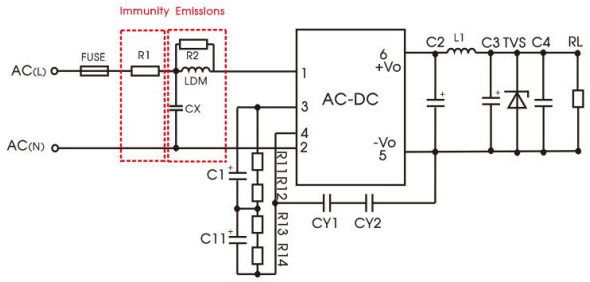



Recommended circuit 1

| Application environmental | Ambient temperature range | Immunity level | Emissions class |
|---|---|---|---|
| Basic application | -40℃ to +85℃ | Level 3 | Class A |

| Component | | Recommended value |
|---|---|---|
| FUSE | | 2A/500V, slow-blow, required |
| R1 | | 6.8Ω/3W (wire-wound resistor, required) |
| R2 | LS10-26B03/05/12R3 | 10K/1206/(1/4W) (SMD resistor) |
| | LS10-26B09/15/24R3 | 4.7K/1206/(1/4W) (SMD resistor) |
| LDM | | 2.2mH/Max: 4.81Ω/Min: 0.31A |
| Note: R1 is the input plug-in resistor, this resistor needs to be a wire-wound resistor (required), please do not select SMD resistor or carbon film resistor. | | |

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

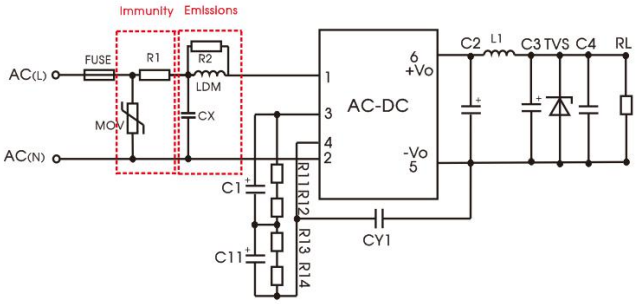



Recommended circuit 2

| Application environmental | Ambient temperature range | Immunity level | Emissions class |
|---|---|---|---|
| Indoor civil /general | -25℃ to +55℃ | Level 3 | Class B |

| Component | | Recommended value |
|---|---|---|
| R1 | | 6.8Ω/3W (wire-wound resistor, required) |
| R2 | LS10-26B03/05/12R3 | 10K/1206/(1/4W) (SMD resistor) |
| | LS10-26B09/15/24R3 | 4.7K/1206/(1/4W) (SMD resistor) |
| LDM | | 2.2mH/Max: 4.81Ω/Min: 0.31A |
| CX | | 0.1uF/480VAC |
| FUSE | | 2A/500V, slow-blow, required |
| 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;<br>Note 2: According to the certification requirements, the CX 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;<br>Note 3: R1 is the input plug-in resistor, this resistor needs to be a wire-wound resistor (required), please do not select SMD resistor or carbon film resistor. | | |

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

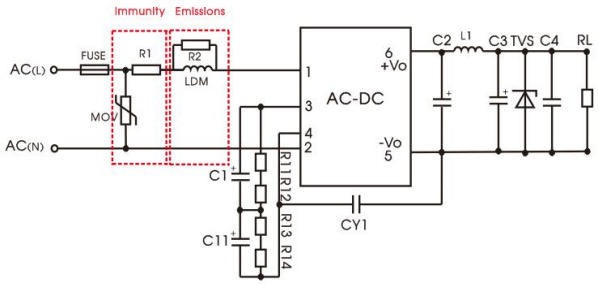



Recommended circuit 3

| Application environmental | Ambient temperature range | Immunity level | Emissions class |
|---|---|---|---|
| Indoor industrial | -25℃ to +55℃ | Level 4 | Class B |

| Component | | Recommended value |
|---|---|---|
| MOV | | S14K550 |
| CX | | 0.1uF/480VAC |
| R2 | LS10-26B03/05/12R3 | 10K/1206/(1/4W) (SMD resistor) |
| | LS10-26B09/15/24R3 | 4.7K/1206/(1/4W) (SMD resistor) |
| LDM | | 2.2mH/Max: 4.81Ω/Min: 0.31A |
| R1 | | 6.8Ω/3W (wire-wound resistor, required) |
| FUSE | | 2A/500V, slow-blow, required |
| Note 1: According to the certification requirements, the CX 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;<br>Note 2: R1 is the input plug-in resistor, this resistor needs to be a wire-wound resistor (required), please do not select SMD resistor or carbon film resistor. | | |

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

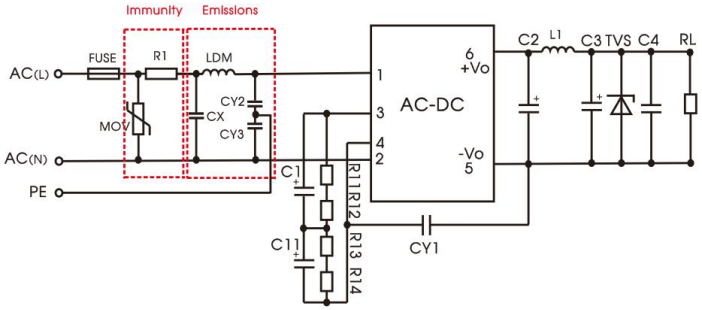



Recommended circuit 4

| Application environmental | Ambient temperature range | Immunity level | Emissions class |
|---|---|---|---|
| Outdoor general environment | -40℃ to +85℃ | Level 4 | Class A |

| Component | | Recommended value |
|---|---|---|
| MOV | | S14K550 |
| R2 | LS10-26B03/05/12R3 | 10K/1206/(1/4W) (SMD resistor) |
| | LS10-26B09/15/24R3 | 4.7K/1206/(1/4W) (SMD resistor) |
| LDM | | 2.2mH/Max: 4.81Ω/Min: 0.31A |
| R1 | | 6.8Ω/3W (wire-wound resistor, required) |
| FUSE | | 2A/500V, slow-blow, required |
| Note: R1 is the input plug-in resistor, this resistor needs to be a wire-wound resistor (required), please do not select SMD 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 level | Emissions class |
|---|---|---|---|
| Outdoor industrial environment | -40℃ to +85℃ | Level 4 | Class A |

| Component | Recommended value |
|---|---|
| MOV | S14K550 |
| LDM | 2.2mH/Max: 4.81Ω/Min: 0.31A |
| R1 | 6.8Ω/3W (wire-wound resistor, required) |
| CX | 0.1uF/480VAC |
| FUSE | 2A/500V, slow-blow, required |
| CY2/CY3 | 1nF/400VAC |
| Note 1: According to the certification requirements, the CX 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;<br>Note 2: R1 is the input plug-in resistor, this resistor needs to be a wire-wound resistor (required), please do not select SMD resistor or carbon film resistor. | |

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

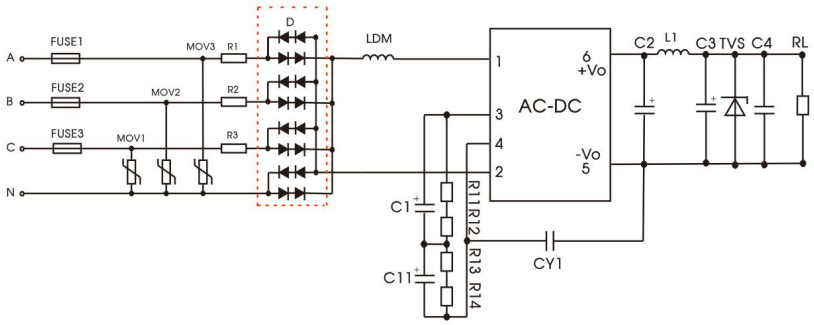



Fig. (1): Recommended circuit for applications which require 4KV differential-mode surge standard (full-wave rectification)

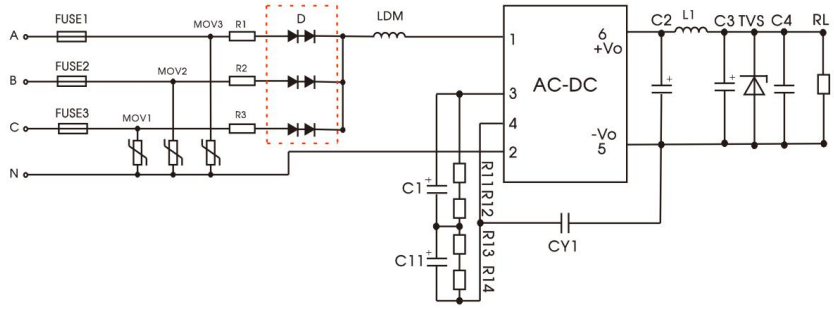



Fig. (2): Recommended circuit for applications which require 4KV differential-mode surge standard (half-wave rectification)

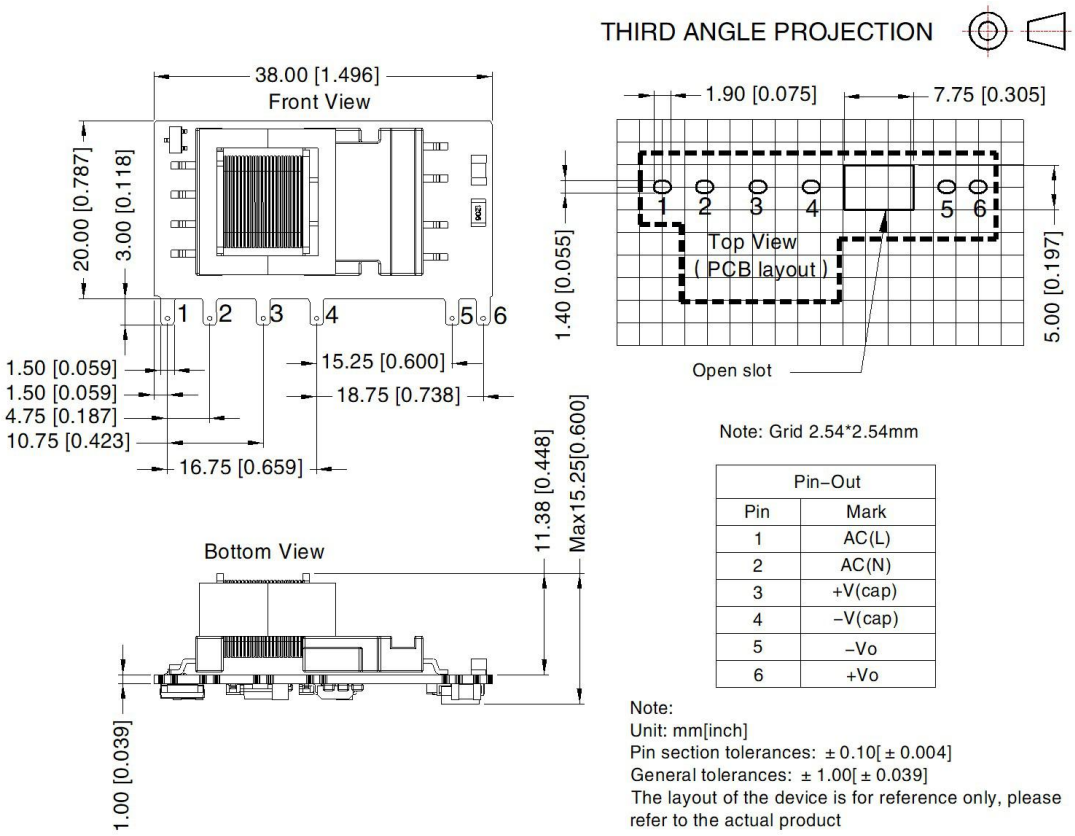
| Application environmental | Ambient temperature range | Immunity level | Emissions class |
|---|---|---|---|
| Strong lightning surge environment | -40℃ to +85℃ | Level 4 | Class A |

| Component | Recommended value |
|---|---|
| FUSE1/FUSE2/FUSE3 | 6.3A/500V, slow-blow, required |
| MOV1/MOV2/MOV3 | S14K550 |
| R1/R2/R3 | 12Ω/5W (wire-wound resistor, required) |
| D | 2A/1000V |
| LDM | 2.2mH/Max: 4.81Ω/Min: 0.31A |
| Note: R1/R2/R3 is the input plug-in resistor, this resistor needs to be a wire-wound resistor (required), please do not select SMD resistor or carbon film resistor. | |

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

## Dimensions and Recommended Layout

### LS10-26BxxR3 series dimensions

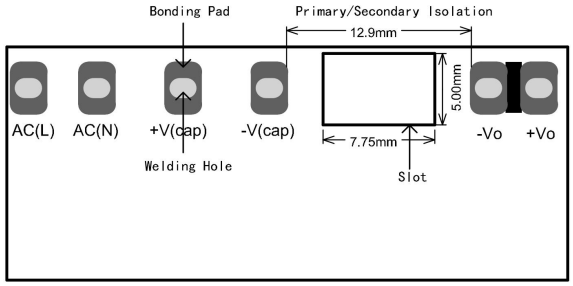



Note: Grid 2.54*2.54mm

| Pin–Out | |
|---|---|
| Pin | Mark |
| 1 | AC(L) |
| 2 | AC(N) |
| 3 | +V(cap) |
| 4 | –V(cap) |
| 5 | –Vo |
| 6 | +Vo |

Note:
Unit: mm[inch]
Pin section tolerances: ± 0.10[ ± 0.004]
General tolerances: ± 1.00[ ± 0.039]
The layout of the device is for reference only, please refer to the actual product

### LS10-26BxxR3 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: 58220252;
2. External electrolytic capacitors are required to modules, more details refer to typical applications;
3. This part is open frame, at least 8.4 mm 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 Ta=25℃, 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. If product involves multi-brand materials and there are differences in color etc, please refer to the standards of each manufacturer.
9. 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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