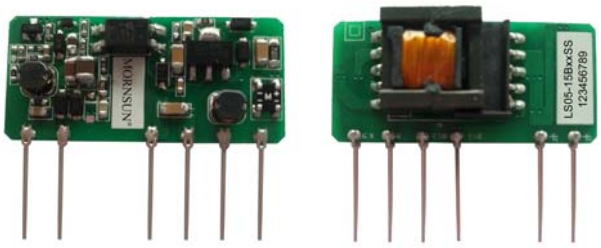
# AC/DC Converter

## LS05-15BXXSS Series

MORNSUN®

5W, AC/DC converter



## FEATURES

- Wide input voltage range: 85~264VAC/100~400VDC
- Over current protection and short circuit protection
- High efficiency, high safety isolation 3000VAC
- Urtal-slim SIP package
- Industrial grade
- Meet IEC60950, UL60950 and EN60950 standards
- UL60950, EN60950 approval
- 3 years of quality assurance

*LS05-15BXXSS series is a high efficiency green power modules provided by Mornsun. The features of this series are: Accept either AC or DC input, wide input voltage, high efficiency, low loss, safety isolation etc. All models are particularly suitable for the applications such as industrial, electric power, instrumentation, smart home which do not have high requirement on EMC.EMC application circuit must be added if the products need to be applied to EMC harsh environment .*

## Selection Guide

| Certification | Model | Output Power | Nominal Output Voltage and Current(Vo/Io) | Efficiency (230VAC,%/Typ.) | Max. Capacitive Load (uF) |
|---|---|---|---|---|---|
| UL/CE | LS05-15B03SS | 3.3W | 3.3V/1A | 67 | 2200 |
| | LS05-15B05SS | 5W | 5V/1A | 74 | 1500 |
| | LS05-15B09SS | | 9V/0.56A | 75 | 680 |
| | LS05-15B12SS | | 12V/0.42A | 76 | 470 |
| | LS05-15B15SS | | 15V/0.34A | 77 | 330 |
| | LS05-15B24SS | | 24V/0.21A | 79 | 100 |

## Input Specifications

| Item | Operating Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Input Voltage Range | Conventional | 100 | -- | 240 | VAC |
| | AC input | 85 | -- | 264 | |
| | DC input | 100 | -- | 400 | VDC |
| Input frequency | | 47 | -- | 63 | Hz |
| Input current | 115VAC | -- | -- | 0.2 | A |
| | 230VAC | -- | -- | 0.1 | |
| Inrush current | 115VAC | -- | 5 | -- | |
| | 230VAC | -- | 10 | -- | |
| leakage Current | CY0 is 1nF/400VAC | -- | -- | 0.25 | mA |

## Output Specifications

| Item | Operating Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Output Voltage Accuracy | LS05-15B03SS | -- | ±2 | ±3 | % |
| | LS05-15B05/09/12/15/24SS | -- | ±1 | ±2 | |
| Line Regulation | Full load | -- | ±0.1 | ±0.5 | |
| Load Regulation | 10%-100% load | -- | ±1 | ±1.5 | |
| Output Ripple & Noise* | 20MHz bandwidth (peak-peak value) | -- | 50 | 150 | mV |
| Temperature Drift Coefficient | | -- | ±0.02 | -- | %/°C |
| Stand-by Power Consumption | | -- | -- | 0.5 | W |
| Short Circuit Protection | | Continuous, self-recovery | | | |
| Over-current Protection | | ≥110%Io self-recovery | | | |
| Over-voltage Protection | | Zener clamp diode | | | |
| Min. Load | | 0 | -- | -- | % |

| | | | | | |
|---|---|---|---|---|---|
| Hold-up Time | 115VAC input | -- | 20 | -- | ms |
| | 230VAC input | -- | 80 | -- | |

Note: *Ripple and Noise measuring refer to "ripple and noise measure figure", 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(leakage current setting value:5 mA) | 3000 | -- | -- | VAC |
| Operating Temperature | | | -25 | -- | +85 | ℃ |
| Storage Temperature | | | -40 | -- | +105 | |
| Storage Humidity | | | -- | -- | 85 | %RH |
| Welding Temperature | | Wave-soldering | 260±5℃; time:5~10s | | | |
| | | Manual-welding | 360±10℃; time:3~5s | | | |
| Switching Frequency | | | -- | 100 | -- | kHz |
| Power Derating | | -25℃~0℃ | 0.8 | -- | -- | %/℃ |
| | | +55℃~+85℃ | 1.33 | -- | -- | |
| Safety Standard | | IEC60950/EN60950/UL60950 | | | | |
| Safety-regulated Certification | | EN60950/UL60950 | | | | |
| Safety Class | | CLASS II | | | | |
| Hot Plug | | Unavailable | | | | |
| MTBF | | MIL-HDBK-217F@25°C > 300,000 h | | | | |

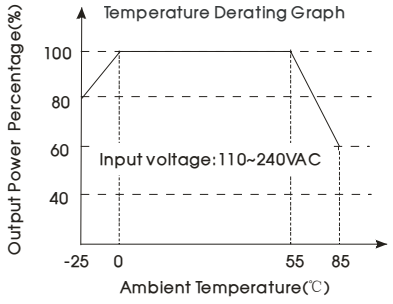
## Physical Specifications

| | |
|---|---|
| Package Dimensions | 42.00*13.65*20.00mm |
| Weight | 7 g(Typ.) |
| Cooling method | Free air convection |

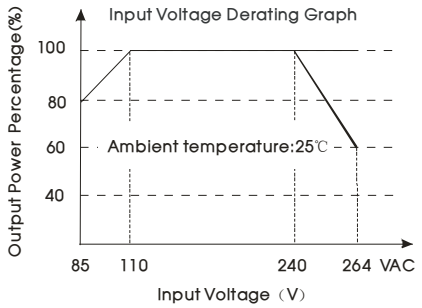
## EMC Specifications

| | | | |
|---|---|---|---|
| EMI | Conducted Disturbance | CISPR22/EN55022, CLASS A (See Fig. 1 for recommended circuit) | |
| | | CISPR22/EN55022, CLASS B (See Fig. 2 for recommended circuit) | |
| | Radiated Emission | CISPR22/EN55022, CLASS B (See Fig. 1or Fig. 2 for recommended circuit) | |
| EMS | Electrostatic Discharge | IEC/EN61000-4-2 contact ±4KV | Perf. Criteria B |
| | Radiation Immunity | IEC/EN61000-4-3 10V/m | perf. Criteria A |
| | EFT | IEC/EN61000-4-4 ±2KV (See Fig. 1 for recommended circuit) | perf. Criteria B |
| | | IEC/EN61000-4-4 ±4KV (See Fig. 2 for recommended circuit) | perf. Criteria B |
| | Surge Immunity | IEC/EN61000-4-5 ±1KV/2KV (See Fig. 1or Fig. 2 for recommended circuit) | perf. Criteria B |
| | Conducted Disturbance | IEC/EN61000-4-6 3 Vr.m.s(See Fig. 2 for recommended circuit) | perf. Criteria A |
| | Immunity for Power | IEC/EN61000-4-8 10A/m | perf. Criteria A |
| | Immunities of voltage dip, drop and short interruption | IEC/EN61000-4-11 0%-70% | perf. Criteria B |

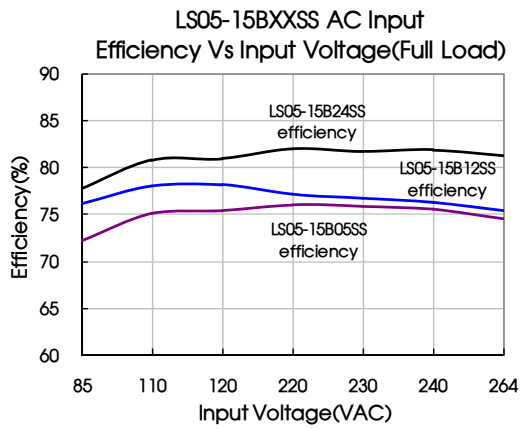
## Product Characteristic Curve

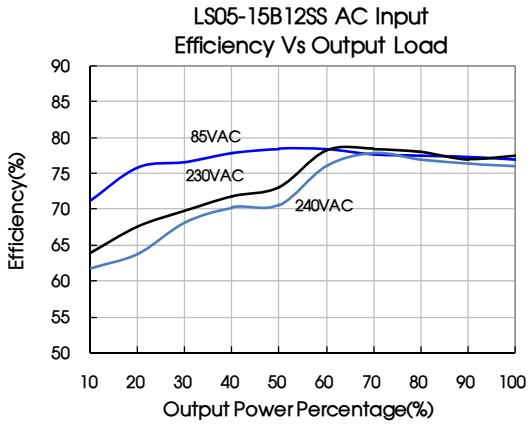


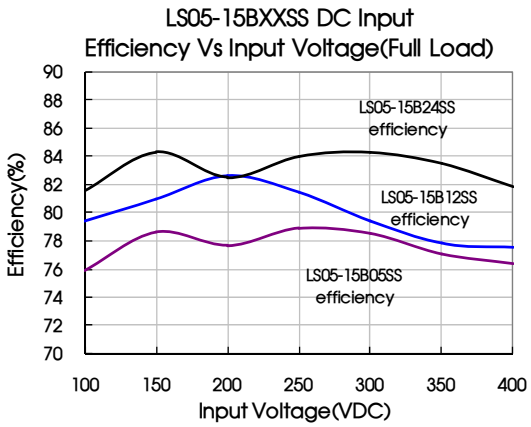

Note: Input voltage should be derated based on temperature derating when it is 85~110VAC /240~264VAC.

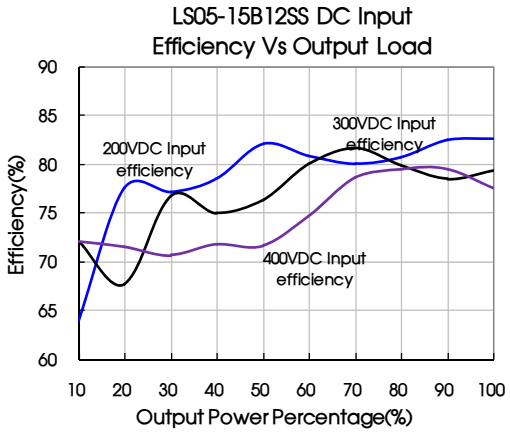



Note: When input DC, VDC=1.414VAC-20.




## Design Reference

### 1. Typical application circuit

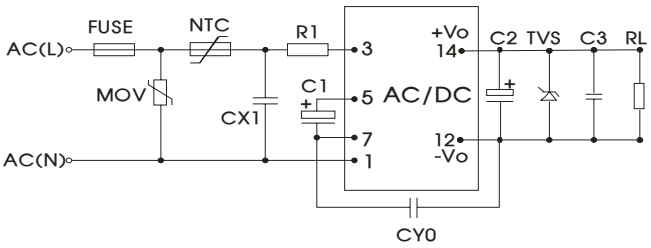



Fig. 1: Typical application circuit

| Model | C1 (Required) | C2 (Required) | R1 | C3 | CX1 | CY0 | NTC | MOV | FUSE (Required) | TVS |
|---|---|---|---|---|---|---|---|---|---|---|
| LS05-15B03SS | 10μF/400V | 220μF/35V | 12Ω/2W | 100nF/50V | 0.1μF/275VAC | 1nF/400VAC | 13D-5 | 14D561K | 1A/250V | SMBJ7.0A |
| LS05-15B05SS | | | | | | | | | | |
| LS05-15B09SS | | | | | | | | | | SMBJ12A |
| LS05-15B12SS | | 150μF/35V | | | | | | | | SMBJ20A |
| LS05-15B15SS | | | | | | | | | | |
| LS05-15B24SS | | | | | | | | | | SMBJ30A |

Note:

1. C1: When AC input, C1 is used as filter capacitor, the value of C1 is recommended to be 10μF /400V.
   When DC input, C1 is used as EMC filter capacitor, the value of C1 is recommended to be 10μF/400V(when the input voltage is above 370VDC, the recommended value of C1 is 10μF/450V).
2. Output filtering capacitor C2 is electrolytic capacitor, C2 is recommended to apply electrolytic capacitor with high frequency and low resistance. For capacitance and current of capacitor please refer to manufacture's datasheet. Capacitance withstand voltage derating should be 80% or above. C3 is ceramic capacitor, which is used to filter high-frequency noise.

## 2. EMC solution-recommended circuit

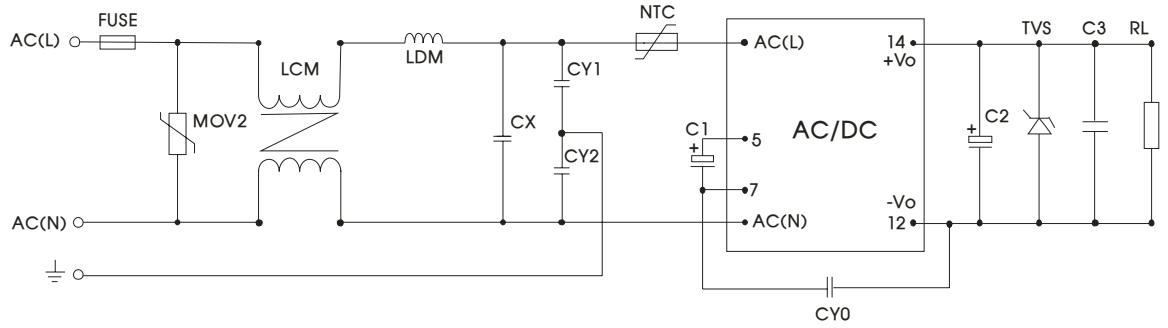



Fig 2: EMC application circuit with higher requirements

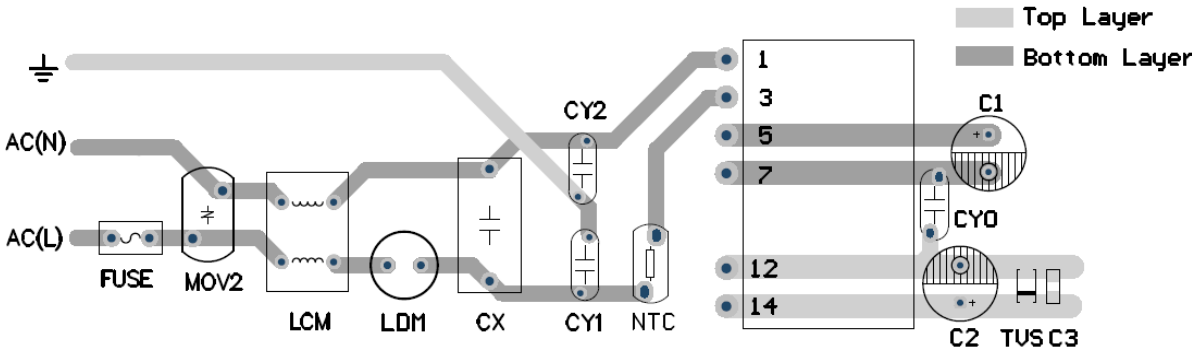


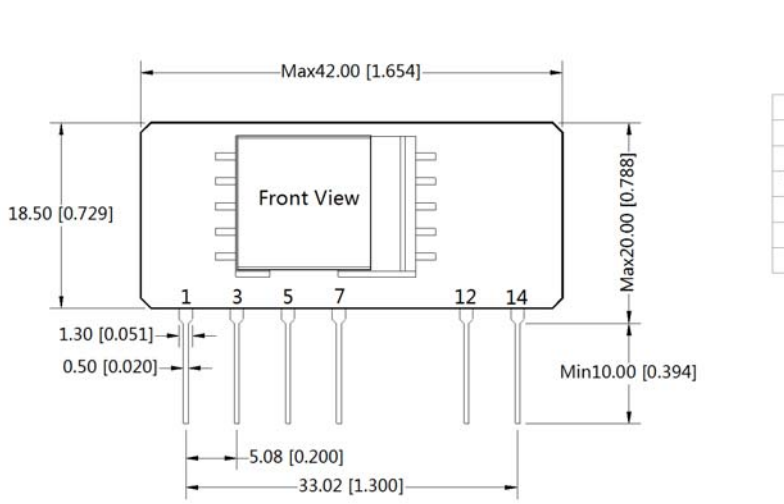

Fig 3: Recommended EMC circuit-PCB layout

Suggestions for safety regulation and wiring width: wire width ≥3mm, distance between wires ≥6mm, and distance between wire and ground ⩾6mm

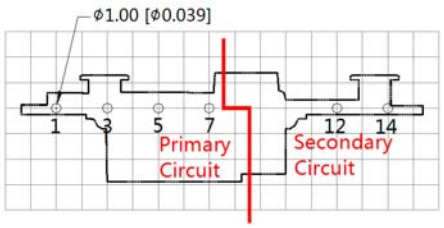
| Components | Recommend Parameter |
|---|---|
| MOV2 | S14K320 |
| CY1, CY2 | 1nF/400VAC |
| CX | 0.1μF/275VAC |
| LCM | 3.5mH |
| LDM | 330μH |
| NTC | 13D-5 |
| FUSE | 1A/250V, slow fusing, required |

## 3. For more information please find application notes on www.mornsun-power.com

## Dimensions and Recommended Layout




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




Note:Grid 2.54*2.54mm

| Pin-Out | |
|---|---|
| Pin | Function |
| 1 | AC(N) |
| 3 | AC(L) |
| 5 | +V(cap) |
| 7 | -V(cap) |
| 12 | -Vo |
| 14 | +Vo |

1.It is necessary to add C1 between pin5 and pin7.
2.It is necessary to add circuit to the output,such as the typical application of Figure 1.
3..It is needed to have distance ≥6.4mm for safety between external componets in primary circuit and secondary circuit.

Note:

1. Packing Information please refer to 'Product Packing Information'. Packing bag number: 58230001;
2. Module required dispensing fixed after assembled;
3. This part is open frame, at least 6.4mm safety distance between the the primary and secondary external components of the module is needed to meet the safety requirement;
4. All specifications were measured at Ta=25° C, humidity<75%, nominal input voltage and rated output load unless otherwise specified;
5. All index testing methods in this datasheet are based on our Company's corporate standards;
6. The performance indexes of the product models listed in this manual are as above, but some indexes of non-standard model products will exceed the above-mentioned requirements, and please directly contact our technician for specific information;
7. We can provide product customization service;
8. Specifications of this product are subject to changes without prior notice.

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