

### Product Typical Features

- ◆ Wide input voltage range ( 4:1), Output Power 12W
- ◆ Transfer Efficiency up to 87%
- ◆ Stand-by Power Consumption as low as 0.02W
- ◆ Output super-fast start up
- ◆ Continuous Short Circuit protection, Self-recovery
- ◆ Input under voltage, output over voltage, short circuit, over current protection
- ◆ Switching Frequency 250KHz
- ◆ Isolation Voltage 2150VAC
- ◆ Operating Temperature:-40°C~+85°C
- ◆ Good EMI performance
- ◆ International standard pin-out



**Test Condition:** Unless otherwise specified, data in the datasheet should be tested under the conditions of inputting nominal voltage, pure resistance rated load and Ta=25°C.

### Application Field

**FD12-XXSXXA3(C)4** is a newly designed DIP 1X1 packed, 12W output power, ultra wide input range 4:1, low stand-by power consumption, isolated regulated output DC-DC converter, could be widely used for industrial control, instrument, communication, power electricity, internet of things field.

### Typical Product List

| Part No           | Input Voltage Range (VDC) |       | Output Voltage/Current (Vo/Io) |                        | Input Current (mA) Nominal Voltage |              | Max. Capacitive Load | Ripple & Noise |      | Efficiency (%)@output full load, input nominal voltage |     |
|-------------------|---------------------------|-------|--------------------------------|------------------------|------------------------------------|--------------|----------------------|----------------|------|--------------------------------------------------------|-----|
|                   | Nominal                   | Range | Voltage (VDC)                  | Current (mA) MAX./Min. | Full load typ.                     | No Load typ. | uF                   | mVp-p          |      | Min                                                    | Typ |
|                   |                           |       |                                |                        |                                    |              |                      | Typ.           | Max. |                                                        |     |
| FD12-18S3V3A3(C)4 | 24                        | 9-36  | 3.3                            | 2400/0                 | 423                                | 1            | 5000                 | 50             | 100  | 75                                                     | 78  |
| FD12-18S05A3(C)4  | 24                        | 9-36  | 5                              | 2000/0                 | 514                                | 1            | 2000                 | 50             | 100  | 78                                                     | 81  |
| FD12-18S09A3(C)4  | 24                        | 9-36  | 9                              | 1333/0                 | 595                                | 1            | 1000                 | 50             | 100  | 81                                                     | 84  |
| FD12-18S12A3(C)4  | 24                        | 9-36  | 12                             | 1000/0                 | 595                                | 1            | 1000                 | 50             | 100  | 84                                                     | 86  |
| FD12-18S15A3(C)4  | 24                        | 9-36  | 15                             | 800/0                  | 588                                | 1            | 800                  | 50             | 100  | 82                                                     | 85  |
| FD12-18S24A3(C)4  | 24                        | 9-36  | 24                             | 500/0                  | 581                                | 1            | 600                  | 50             | 100  | 85                                                     | 87  |
| FD12-36S3V3A3(C)4 | 48                        | 18-75 | 3.3                            | 2400/0                 | 211                                | 1            | 5000                 | 50             | 100  | 75                                                     | 78  |

|                  |    |       |    |        |     |   |      |    |     |    |    |
|------------------|----|-------|----|--------|-----|---|------|----|-----|----|----|
| FD12-36S05A3(C)4 | 48 | 18-75 | 5  | 2000/0 | 257 | 1 | 2000 | 50 | 100 | 78 | 81 |
| FD12-36S09A3(C)4 | 48 | 18-75 | 9  | 1333/0 | 297 | 1 | 1000 | 50 | 100 | 81 | 84 |
| FD12-36S12A3(C)4 | 48 | 18-75 | 12 | 1000/0 | 297 | 1 | 1000 | 50 | 100 | 84 | 86 |
| FD12-36S15A3(C)4 | 48 | 18-75 | 15 | 800/0  | 294 | 1 | 800  | 50 | 100 | 84 | 86 |
| FD12-36S24A3(C)4 | 48 | 18-75 | 24 | 500/0  | 290 | 1 | 600  | 50 | 100 | 85 | 87 |

- Suffix "-T" is for chassis mounting, "-TS" suffix is for DIN-Rail mounting, DIN-Rail width is: 35mm;
- Max capacitive load is, when the power supply is fully loaded, the max capacity could be connected to output, if exceed, the power supply cannot start-up;
- To reduce no load power consumption and improve efficiency of light-load, IC will be flitter frequency under no-load and light-load operating, output cannot be no load, at least with 10% load or above 470uF high frequency low resistance electrolytic capacitor, otherwise the output ripple will rise;
- Suffix "C" is with Ctrl function, Suffix "N" is without Ctrl function.

### Input Specification

|                                |                                 |                                              |
|--------------------------------|---------------------------------|----------------------------------------------|
| Stand-by Consumption           | 0.05 W(TYP)                     |                                              |
| Input Filter                   | $\pi$ filter                    |                                              |
| Input Under-Voltage Protection | 5~9VDC@FD12-18SXXA3 Input       |                                              |
|                                | 11~18VDC@FD12-36SXXA3 Input     |                                              |
| CTRL*                          | Module turn-on                  | CTRL suspended or TTL high level (2.5-12VDC) |
|                                | Module turn-off                 | CTRL connect to GND or low level (0-1.2VDC)  |
|                                | Input current when switched off | 5mA (TYP)                                    |

Note: \*The voltage of CTRL pin is relative to GND pin.

### Output Specification

|                                 |                                                                      |            |                       |
|---------------------------------|----------------------------------------------------------------------|------------|-----------------------|
| Output Voltage Accuracy         | Full voltage full load                                               | Vo         | ±2.0%                 |
| Voltage Regulation              | Nominal load, full voltage rang                                      | Vo         | ±0.5%                 |
| Load Regulation                 | 10% ~ 100% nominal load                                              | Vo         | ±1.0%                 |
| Ripple & Noise                  | Nominal load, nominal voltage Twisted Pair Method, 20M Hz bandwidth; | ≤15% load, | 5%Vo mVp-p typ        |
|                                 |                                                                      | ≥15% load, | 50mVp-p typ, 100mVp-p |
| Output Over-voltage Protection  | 120%~200%Vo                                                          |            |                       |
| Output Over-load Protection     | 110%~220%Io                                                          |            |                       |
| Output Short circuit Protection | Continuous, Self-recovery                                            |            |                       |

|                                  |                              |                         |                       |
|----------------------------------|------------------------------|-------------------------|-----------------------|
| Dynamic Response                 | 25% nominal load step change | $\Delta V_o / \Delta t$ | $\leq 6\% / 500\mu s$ |
| Output Voltage Regulation        | Not Available                |                         |                       |
| Turn-on delay time               | Typical                      | 250ms                   |                       |
| Output Turn-on Overshoot Voltage |                              | $\leq 10\% V_o$         |                       |

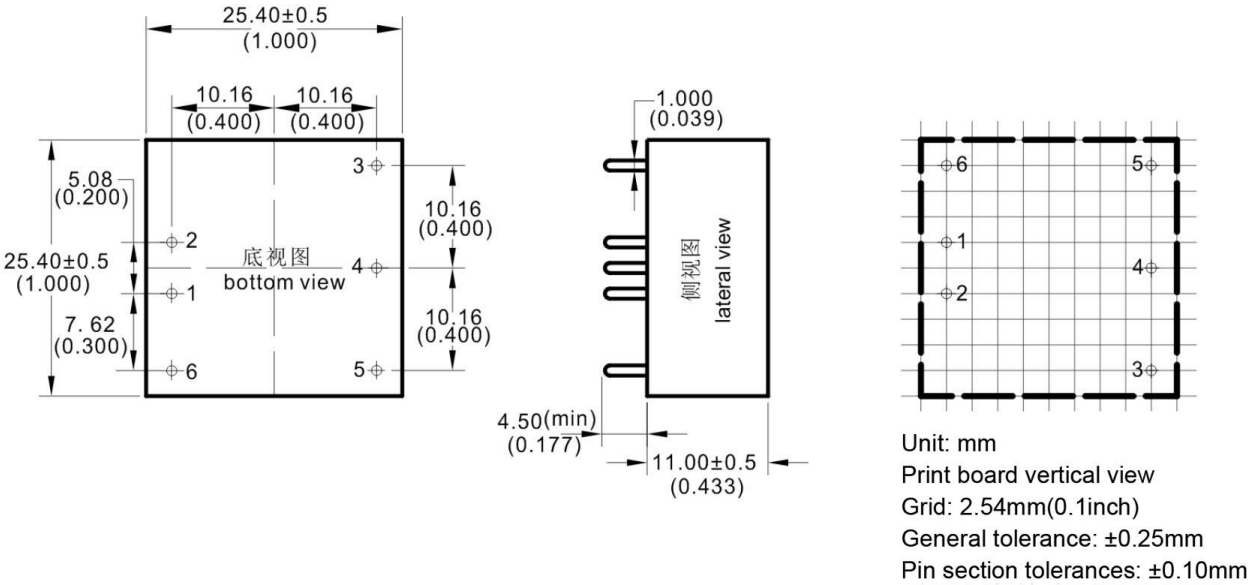
## General Specification

|                          |                                     |                                                 |
|--------------------------|-------------------------------------|-------------------------------------------------|
| Switching Frequency      | Typical                             | 250KHz                                          |
| Operating Temperature    | Refer to Temperature Derating Curve | $-40^{\circ}\text{C} \sim +85^{\circ}\text{C}$  |
| Storage Temperature      |                                     | $-55^{\circ}\text{C} \sim +125^{\circ}\text{C}$ |
| Max Case Temperature     | Within Operating Curve              | $+105^{\circ}\text{C}$                          |
| Relative Humidity        | No condensing                       | 5%~95%                                          |
| Case Material            |                                     | Aluminum Metal Case                             |
| Cooling Method           |                                     | Free air convection                             |
| Isolation Voltage        | Input to Output                     | $2150\text{Vac} \leq 5\text{mA} / 1\text{min}$  |
| Meantime Between Failure | MIL-HDBK-217F@25°C                  | $2 \times 10^5 \text{Hrs}$                      |
| Product Weight           | Average                             | 18g                                             |

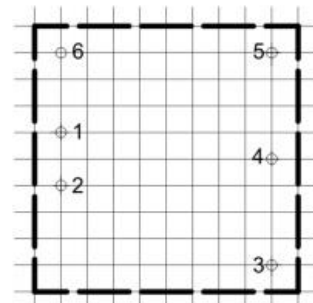
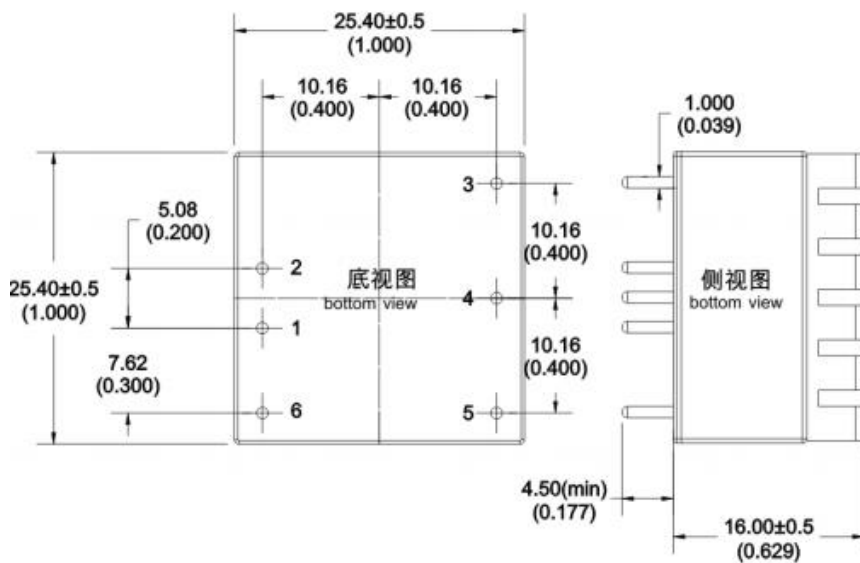
## EMC Characteristics

| Total Items |     | Sub Items                                                         | Test Standard    | Class                                                              |
|-------------|-----|-------------------------------------------------------------------|------------------|--------------------------------------------------------------------|
| EMC         | EMI | CE                                                                | CISPR22/EN55032  | CLASS B (see recommended circuit photo ②)                          |
|             |     | RE                                                                | CISPR22/EN55032  | CLASS B (see recommended circuit photo ②)                          |
|             | EMS | RS                                                                | IEC/EN61000-4-3  | 10V/m Perf.Criteria B (see recommended circuit photo 2)            |
|             |     | CS                                                                | IEC/EN61000-4-6  | 3Vr.m.s Perf.Criteria B (see recommended circuit photo 2)          |
|             |     | ESD                                                               | IEC/EN61000-4-2  | Contact $\pm 4\text{KV}$ Perf.Criteria B                           |
|             |     | Surge                                                             | IEC/EN61000-4-5  | $\pm 2\text{KV}$ Perf.Criteria B (see recommended circuit photo 1) |
|             |     | EFT                                                               | IEC/EN61000-4-4  | $\pm 2\text{KV}$ Perf.Criteria B (see recommended circuit photo 1) |
|             |     | Voltage dips, short interruptions and voltage variations immunity | IEC/EN61000-4-11 | 0%~70% Perf.Criteria B                                             |

A3 Packing Dimension

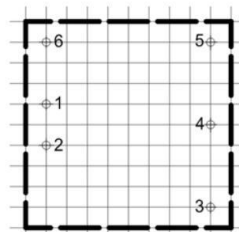
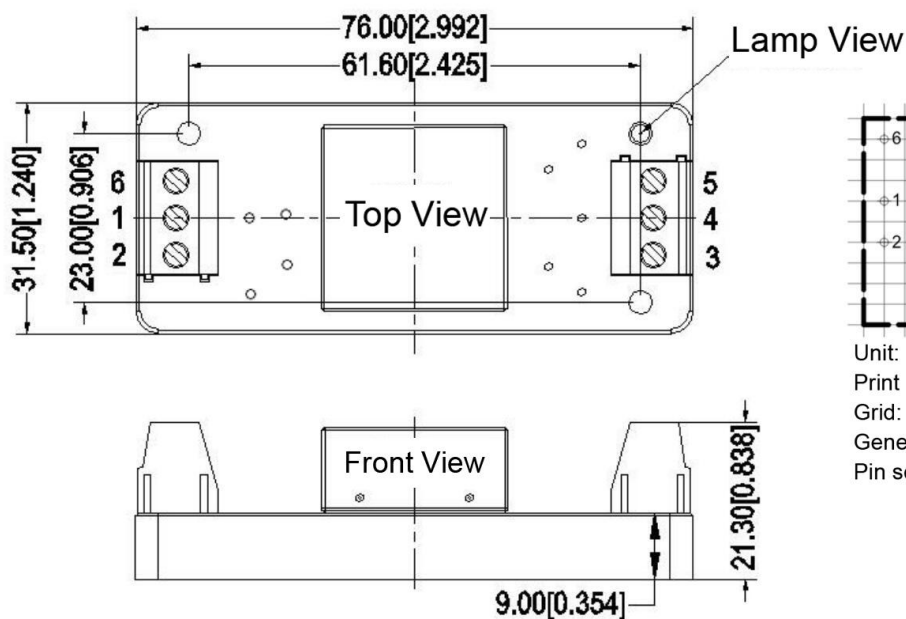


A3-H Packing Dimension



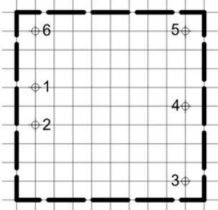
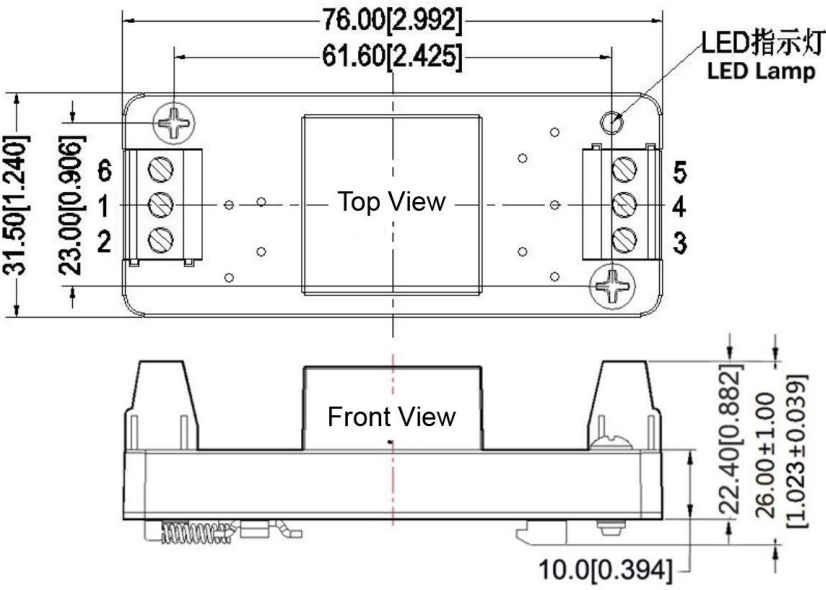
Unit: mm  
 Print board vertical view  
 Grid: 2.54mm(0.1inch)  
 General tolerance:  $\pm 0.25$ mm  
 Pin section tolerances:  $\pm 0.10$ mm

### A3-T Packing Dimension



Unit: mm  
 Print board vertical view  
 Grid: 2.54mm(0.1inch)  
 General tolerance:  $\pm 0.25$ mm  
 Pin section tolerances:  $\pm 0.10$ mm

A3-TS Packing Dimension



Unit: mm  
Print board vertical view  
Grid: 2.54mm(0.1inch)  
General tolerance: ±0.25mm  
Pin section tolerances: ±0.10mm

| Packing Code | L x W x H        |                     |
|--------------|------------------|---------------------|
| A3           | 25.4X 25.4X11 mm | 1X1 X0.433inch      |
| A3-T         | 76X31.5X21.3mm   | 2.99X1.24X0.838inch |
| A3-H         | 25.4X25.4X16mm   | 1X1 X0.629inch      |

Pin-out

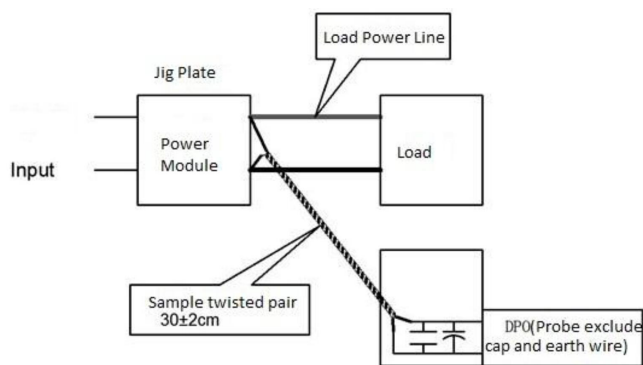
| Single (S)                     | 1    | 2    | 3     | 4   | 5     | 6    |
|--------------------------------|------|------|-------|-----|-------|------|
|                                | -Vin | +Vin | +Vout | NP  | GND   | CTRL |
| Positive and negative dual (D) | 1    | 2    | 3     | 4   | 5     | 6    |
|                                | -Vin | +Vin | +Vout | COM | -Vout | CTRL |

Ripple& Noise Test: (Twisted Pair Method 20MHZ bandwidth)

## Test Method:

a. 12# twisted pair to connect, Oscilloscope bandwidth set as 20MHz, 100M bandwidth probe, terminated with 0.1uF polypropylene capacitor and 10uF high frequency low resistance electrolytic capacitor in parallel, oscilloscope set as Sample pattern.

b. Input terminal connect to power supply, output terminal connect to electronic load through jig plate, Use  $30\text{cm} \pm 2\text{cm}$  sampling line, Power line selected from corresponding diameter wire with insulation according to the flow of output current.

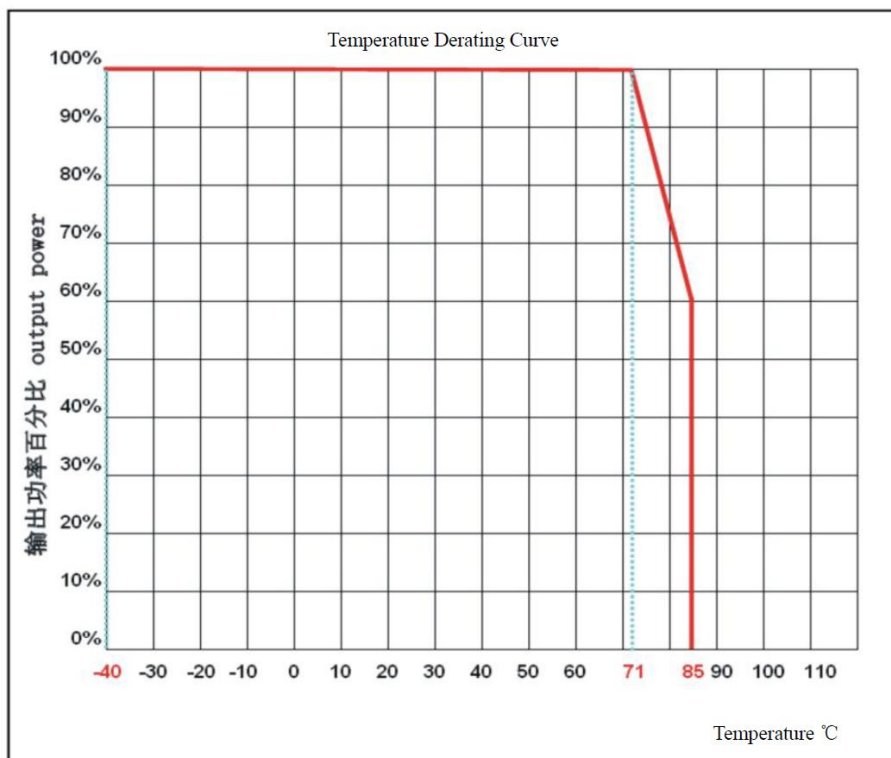


## Application Reference:

- 1.The recommended minimum load is 10% or above 470uF high frequency low resistance electrolytic capacitor, or output ripple will rise;
- 2.Recommend the unbalance loads of dual output to be  $\leq \pm 5\%$ ;
- 3.The maximum capacitive load is tested under pure resistance and full load condition;
- 4.Our company could provide whole power supply solution, or customized made items; Due to space limitation, please contact our team for more information.

## Product Characteristic Curve



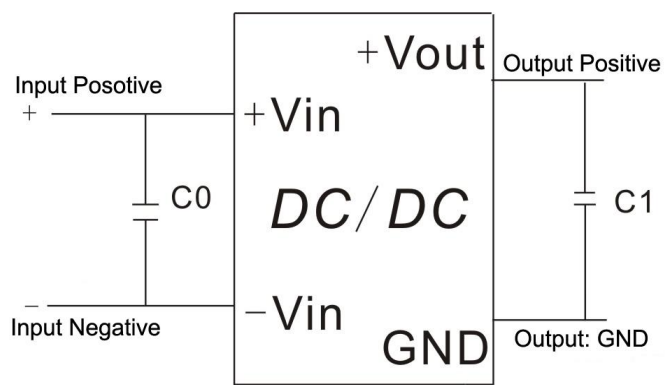


## Design Application

### Recommended circuit

#### 1. DC/DC test circuit:

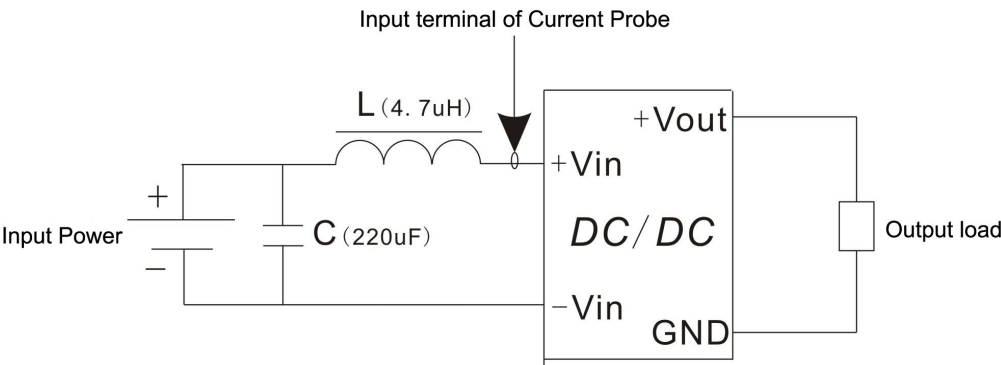
Normal recommended capacitors: C0: 47-100uF; C1: 470uF.



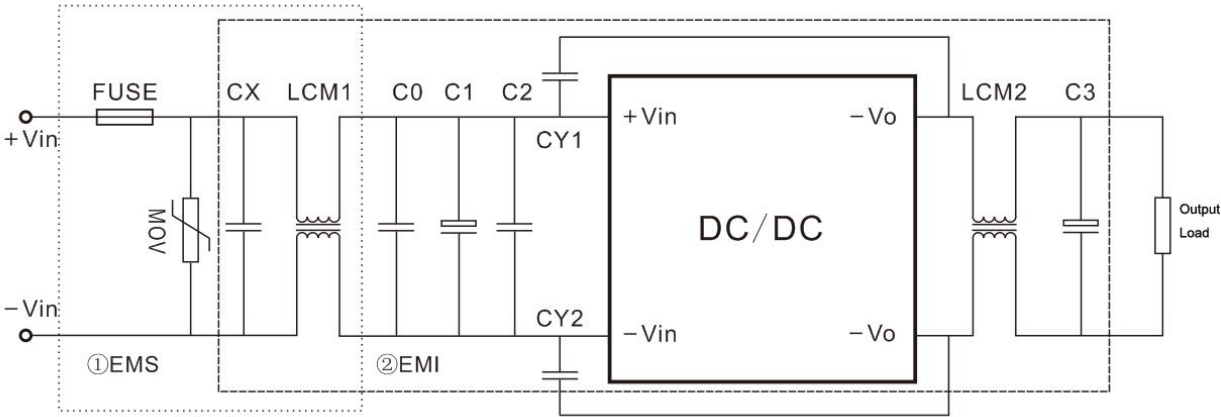


2. Input reflecting ripple current test circuit:

Capacitor C choose low ESR ones, withstand voltage value should be bigger than max input voltage;



3. EMC external recommended circuit:



Recommended Spec:

| Component | FD12-18SXXA3 Input              | FD12-36SXXA3 Input |
|-----------|---------------------------------|--------------------|
| FUSE      | According to customer's request |                    |
| MOV       | 14D560K                         | 14D101K            |
| CX        | 0.47uF                          | 0.47uF             |
| LCM1      | 5mH                             | 5mH                |
| C0        | 1uF/100V                        | 1uF/100V           |
| C1        | 220uF/100V                      | 220uF/100V         |
| C2        | 1uF/100V                        | 1uF/100V           |
| LCM2      | 30uH                            | 30uH               |
| C3        | 47uF/50V                        | 47uF/50V           |
| CY1,CY2   | 1nF/2000V                       |                    |

**Note:**

1. The product should be used under the specification range, otherwise it will cause permanent damage to it.
2. If the product worked beyond the load range or below the minimum load, we cannot ensure that the performance of product is in accordance with all the indexes in this manual;
3. Unless otherwise specified, data in this datasheet should be tested under conditions of  $T_a=25^{\circ}\text{C}$ , humidity<75% when inputting nominal voltage and outputting rated load(pure resistance load);
4. All index testing methods in this datasheet are based on our Company's corporate standards
5. 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;
6. We can provide customized product service;
7. The product specification may be changed at any time without prior notice.

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