

3W, AC/DC converter



## FEATURES

- Ultra-wide 85 - 305VAC and 70 - 430VDC input voltage range
- Output short circuit, overcurrent protection
- High efficiency, high power density
- Low power consumption, green power
- Industrial-grade design
- Compact size open frame
- Flexible design of peripheral circuit reduces layout problems
- IEC60950, UL60950, EN60950 safety approved

LS03-15BxxSR2S (-F) is one of Mornsun's highly efficient green power AC-DC Converter series. They feature ultra-wide wide input range accepting either AC or DC voltage, high efficiency, low power consumption and Class II reinforced insulation. All models are particularly suitable for industrial control, electric power, instrumentation and smart home type applications which do not have high levels of EMC requirement. We recommend using external components as shown in design reference for enhanced EMC performance in harsh environmental conditions.

## Selection Guide

Certification	Part No. *	Output Power	Nominal Output Voltage and Current (Vo/Io)	Efficiency at 230VAC (%) Typ.	Capacitive Load (μF) Max.
UL/CE/CB	LS03-15B03SR2S(-F)*	1.98W	3.3V/600mA	65	820
	LS03-15B05SR2S(-F)	3W	5V/600mA	70	680
	LS03-15B09SR2S(-F)		9V/333mA	73	470
	LS03-15B12SR2S(-F)		12V/250mA	74	470
	LS03-15B15SR2S(-F)		15V/200mA	75	330
	LS03-15B24SR2S(-F)		24V/125mA	77	100

Note:\*An "-F" suffix designates horizontal package.

## Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Input Voltage Range	AC input	85	--	305	VAC
	DC input	70	--	430	VDC
Input Frequency		47	--	63	Hz
Input Current	115VAC	--	--	0.12	A
	277VAC	--	--	0.06	
Inrush Current	115VAC	--	13	--	
	277VAC	--	23	--	
Required External Input Fuse		1A, slow-blow, required			
Hot Plug		Unavailable			

## Output Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Output Voltage Accuracy	LS03-15B03SR2S(-F) <sup>①</sup>	--	--	±6	%
	LS03-15B05SR2S(-F) <sup>②</sup>	--	--	±5	
	LS03-15B09SR2S(-F) <sup>③</sup>	--	--		
	LS03-15B12SR2S(-F) <sup>④</sup>	--	--		
	LS03-15B15SR2S(-F)	--	--		
	LS03-15B24SR2S(-F)	--	--		
Line Regulation	Full load	3.3V	--	±2.5	--
		5V/9V/12V/15V/24V	--	±1.5	--
Load Regulation	10% - 100% load	3.3V/5V/9V/12V/15V	--	±3.0	--
		24V	--	±6.0	--

Ripple & Noise <sup>⑤</sup>	20MHz bandwidth (peak-to-peak value)	--	80	150	mV
Temperature Coefficient		--	±0.15	--	%/°C
Stand-by Power Consumption	230VAC input	--	0.15	0.25	W
Short Circuit Protection		Continuous, self-recovery			
Overcurrent Protection		110 - 500% Io, self-recovery			
Minimum Load		10	--	--	%
Note: ①②③④ Use solid-state 270 $\mu$ F/16V for output filter capacitor C2 when operating 3.3V/5V/9V/12V models, especially at temperatures in the -20°C to -40°C range. ⑤ The "parallel cable" method is used for Ripple and noise test, please refer to AC-DC Converter Application Notes for specific information.					

## General Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit	
Isolation Test	Input-output	Electric Strength Test for 1min.	3000	--	--	VAC
Operating Temperature		-40	--	+85	°C	
Storage Temperature		-40	--	+105		
Storage Humidity		--	--	85	%RH	
Switching Frequency		--	--	65	kHz	
Power Derating	-40°C to -20°C (85 - 110VAC)	2.0	--	--	% / °C	
	+70°C to +85°C	2.67	--	--		
Safety Standard		IEC60950/EN60950/UL60950				
Safety Certification		IEC60950/EN60950/UL60950				
Safety Class		CLASS II				
MTBF	MIL-HDBK-217F@25°C	>300,000 h				

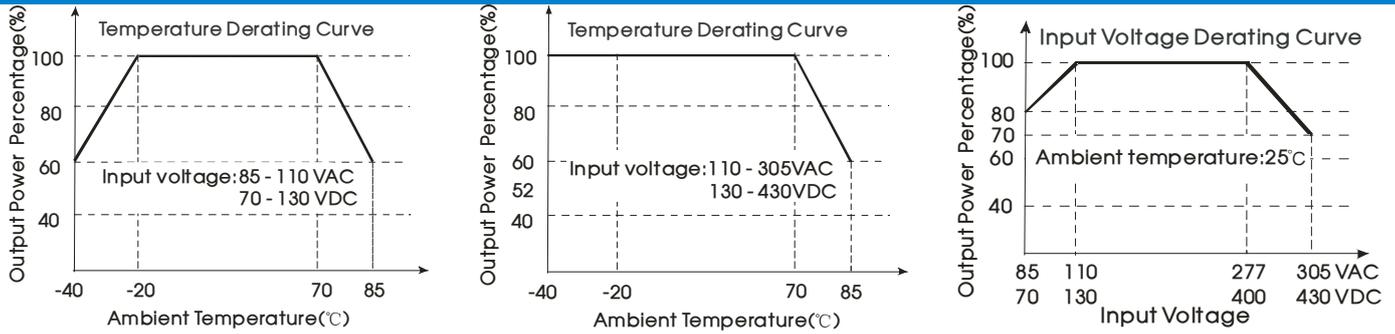
## Mechanical Specifications

Case Material	35.00 x 18.00 x 11.00 mm
Weight	6g (Typ.)
Cooling method	Free air convection

## Electromagnetic Compatibility (EMC)

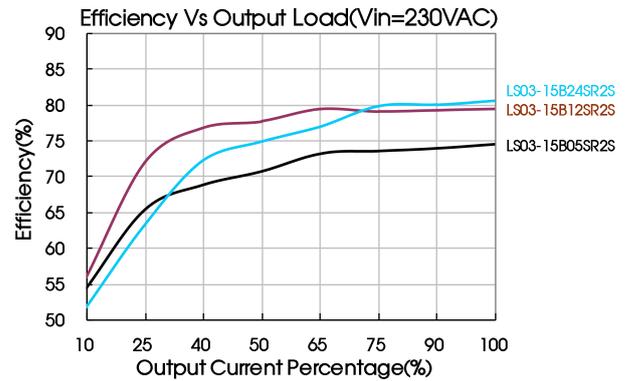
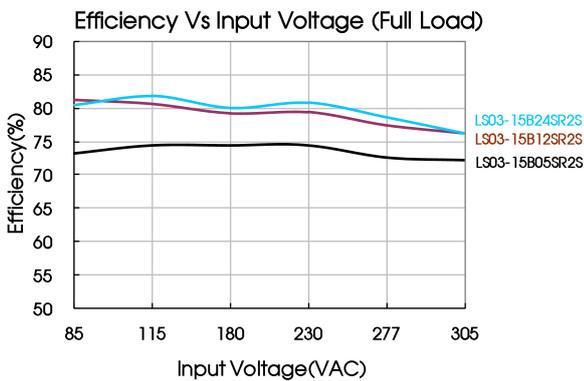
Emissions	CE	CISPR32/EN55032	CLASS A (See Fig. 1 for typical application)	
		CISPR32/EN55032	CLASS B (See Fig. 2 for recommended circuit)	
	RE	CISPR32/EN55032	CLASS A (See Fig. 1 for typical application)	
		CISPR32/EN55032	CLASS B (See Fig. 2 for recommended circuit)	
Immunity	ESD	IEC/EN61000-4-2	Contact ±4kV	Perf. Criteria B
	RS	IEC/EN61000-4-3	10V/m (See Fig. 2 for recommended circuit)	perf. Criteria A
	EFT	IEC/EN61000-4-4	±2kV (See Fig. 1 for typical application)	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 (See Fig. 1 for typical application)	perf. Criteria B
		IEC/EN61000-4-5	line to line±1kV/line to ground ±2kV (See Fig. 2 for recommended circuit)	perf. Criteria B
	CS	IEC/EN61000-4-6	10Vr.m.s (See Fig. 2 for recommended circuit)	perf. Criteria A
Voltage dips, short interruptions and voltage variations	IEC/EN61000-4-11	0%, 70% (See Fig. 2 for recommended circuit)	perf. Criteria B	

### Product Characteristic Curve



Note:

- ① With an AC input between 85 - 110VAC/277 - 305VAC and a DC input between 70 - 130VDC/400 - 430VDC, 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.



### Design Reference

#### 1. Typical application circuit

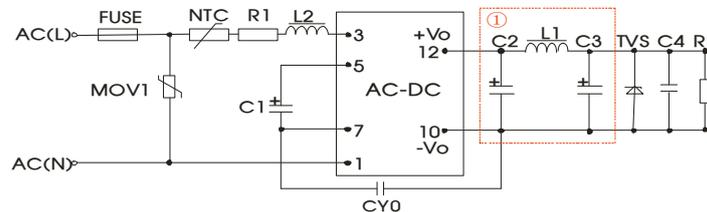


Fig. 1: Typical circuit diagram  
Note: ① is a PI filter circuit.

Model	FUSE (required)	C1 (required)	L2	NTC	C2 (required)	L1 (required)	C3 (required)	C4	CY0	TVS
LS03-15B03SR2S(-F)	1A/ 300V	10μF/450V (-20°C to +85°C) 22μF/450V (-40°C to +85°C)	4.7mH	13D-5	270μF/ 16V (Solid Capacitor)	4.7μH	120μF/25V	0.1μF/ 50V	1nF/400 VAC	SMBJ7.0A
LS03-15B05SR2S(-F)							68μF/35V			SMBJ12A
LS03-15B09SR2S(-F)							47μF/35V			SMBJ20A
LS03-15B12SR2S(-F)							220μF/ 35V			SMBJ30A
LS03-15B15SR2S(-F)										
LS03-15B24SR2S(-F)										

Note:  
 C1: C1 is used as filter capacitor with AC input and as EMC filter capacitor with DC input;  
 R1: R1 is a 12Ω/2W current limiting resistance;  
 An external input NTC (13D-5) is recommended for inrush current limitation and an external MOV (S14K350) for transient suppression.  
 Output filter: We recommend using an electrolytic capacitor with high frequency, high ripple current and low ESR rating for C2 and C3 refer to manufacture's datasheet). Combined with 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 a recommended to protect the application in case of a converter failure.

2. EMC compliance recommended circuit

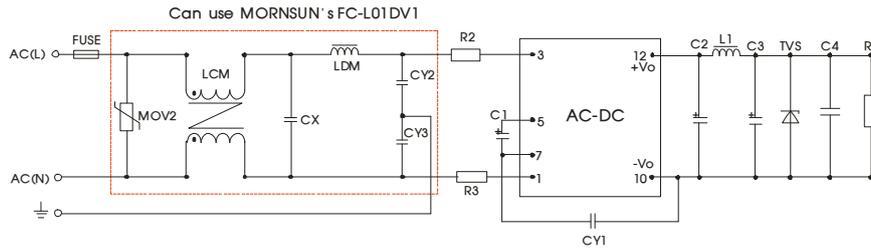


Fig 2

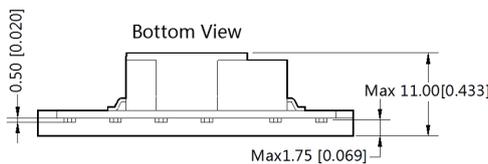
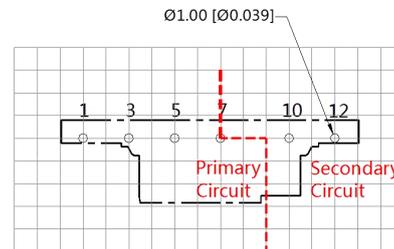
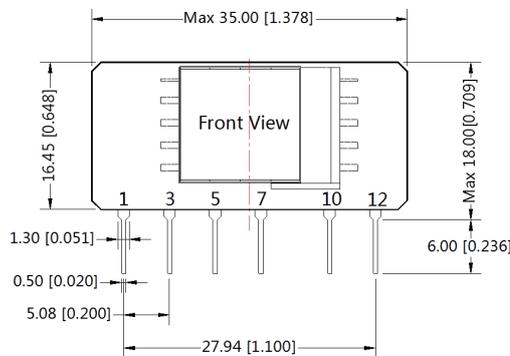
Components	Recommend Parameter
MOV2	S14K350
CY1	2.2nF/400VAC
CY2/CY3	1nF/400VAC
CX	0.1μF/310VAC
LCM	3.50mH
LDM	0.33mH
R2/R3	12Ω/2W
FUSE (required)	1A/300V, slow-blow

Can use MORNSUN's FC-L01DV1 EMC model

3. For additional information please refer to application notes on [www.mornsun-power.com](http://www.mornsun-power.com).

LS03-15BxxSR2S Dimensions and Recommended Layout

THIRD ANGLE PROJECTION



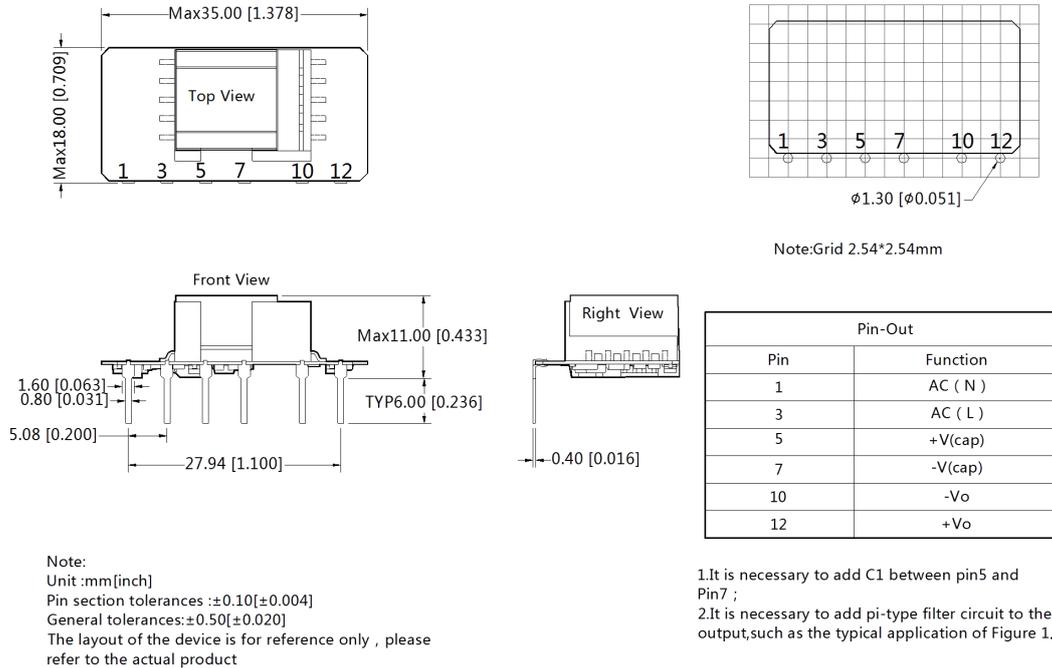
Pin-Out	
Pin	Function
1	AC ( N )
3	AC ( L )
5	+V(cap)
7	-V(cap)
10	-Vo
12	+Vo

Note:  
Unit: mm[inch]  
Pin section tolerances: ±0.10[±0.004]  
General tolerances: ±0.50[±0.020]  
The layout of the device is for reference only , please refer to the actual product

1.It is necessary to add C1 between pin5 and pin7 ;  
2.It is necessary to add pi-type filter 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.

LS03-15BxxSR2S -F Dimensions and Recommended Layout

THIRD ANGLE PROJECTION 



Note:

- For additional information on Product Packaging please refer to [www.mornsun-power.com](http://www.mornsun-power.com). Packaging bag number: 58220032(LS03-15BxxSR2S)/58220025 (LS03-15BxxSR2S-F);
- External electrolytic capacitors are required to modules, more details refer to typical applications;
- This part is open frame, at least 6.4mm safety distance between the primary and secondary external components of the module is needed to meet the safety requirement;
- 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 and 230V) and rated output load;
- In order to increase the conversion efficiency of the product with light load in the design, the product will have audio noise when it is operating, but don't affect the product's reliability and performance;
- Module required dispensing fixed after assembled;
- All index testing methods in this datasheet are based on our Company's corporate standards;
- We can provide product customization service, please contact our technicians directly for specific information;
- Products are related to laws and regulations: see "Features" and "EMC";
- Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units;
-  : It is only suitable for safe use in areas under 2000m above sea level.

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