

3W, AC/DC converter



UL E235235 **CE CB RoHS**

Model marking with number, such as "0312" means "LS03-15B12SR2S"

FEATURES

- Wind input voltage: 85~264VAC/70~400VDC
- Over current protection and short circuit protection
- High efficiency, high power density
- Low power consumption, green power
- Industrial grade
- Open frame, ortal-slim SIP package
- Flexible design of peripheral circuit reduces layout problems
- Meets IEC60950/EN60950/UL60950

LS03-15BXXSR2S 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	LS03-15B03SR2S(-F)*	1.65W	3.3V/500mA	63	470
	LS03-15B05SR2S(-F)	2.5W	5V/500mA	68	470
	LS03-15B09SR2S(-F)	3W	9V/333mA	75	150
	LS03-15B12SR2S(-F)		12V/250mA	77	100
	LS03-15B15SR2S(-F)		15V/200mA	78	100
	LS03-15B24SR2S(-F)		24V/125mA	80	100

Note: *The model of 90 degrees of corner is with -F. For example the LS03-15B12SR2S of 90 degrees of corner product is LS03-15B12SR2S-F.

Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Input Voltage Range	AC input	85	--	264	VAC
	DC input	70	--	400	VDC
Input frequency		47	--	440	Hz
Input current	115VAC	--	--	0.12	A
	230VAC	--	--	0.06	
Inrush current	115VAC	--	13	--	
	230VAC	--	23	--	

Output Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit	
Output Voltage Accuracy	LS03-15B03SR2S(-F) ^①	--	--	±8	%	
	LS03-15B05SR2S(-F) ^②	--	--	±5		
	LS03-15B09SR2S(-F)	--	--			
	LS03-15B12SR2S(-F)	--	--			
	LS03-15B15SR2S(-F)	--	--			
	LS03-15B24SR2S(-F)	--	--			
Line Regulation	Full load	--	±1.5	--		
Load Regulation	5%-100% load	--	±2.5	--		
Output Ripple & Noise ^③	20MHz bandwidth (peak-peak value)	LS03-15B03SR2S(-F)/ LS03-15B05SR2S(-F)	--	70	150	mV
		LS03-15B09SR2S(-F)/LS03-15B12SR2S(-F)/ LS03-15B15SR2S(-F)/ LS03-15B24SR2S(-F)	--	50		

Temperature Drift		--	±0.15	--	%/°C
Stand-by Power		--	--	0.5	W
Short Circuit Protection		Continuous, self-recovery			
Over-current Protection		≥110%Io self-recovery			
Min. Load		10	--	--	%
Hold-up Time	115VAC input	20	--	--	ms
	230VAC input	80	--	--	
Note: ①②. When LS03-15B03SR2S and LS03-15B05SR2S working in -20°C~-40°C and 55°C~85°C temperature range output filter capacitor C2 need 270μF/16V solid-state capacitor. ③. Ripple and Noise measuring refer to "ripple and noise measure figure", please see <i>AC-DC Converter Application Notes</i> for specific operation methods.					

General Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Isolation Voltage	Input-output Test time: 1min	3000	--	--	VAC
Operating Temperature		-40	--	+85	°C
Storage Temperature		-40	--	+105	
Max. Product Surface Temperature		--	--	+90	
Storage Humidity		--	--	85	%RH
Switching Frequency		--	--	60	kHz
Power Derating	-40°C~-20°C	2	--	--	% / °C
	+55°C~+85°C	1.33	--	--	
Safety Standard	IEC60950/EN60950/UL60950				
Safety-regulated Certification	IEC60950/EN60950/UL60950				
Safety Class	CLASS II				
Hot Plug	Unavailable				
MTBF	MIL-HDBK-217F@25°C > 300,000 h				

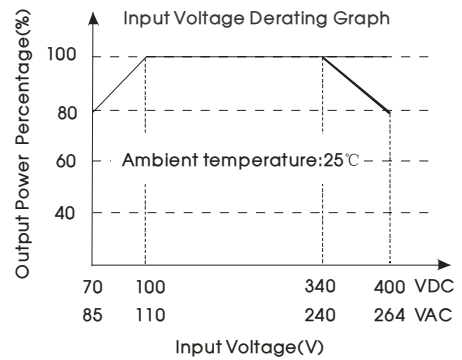
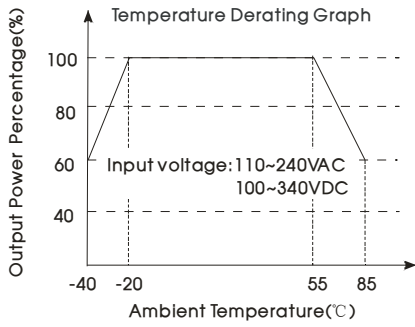
Physical Specifications

Package Dimensions	35.00*18.00*11.00mm
Weight	7 g(Typ)
Cooling method	Free air convection

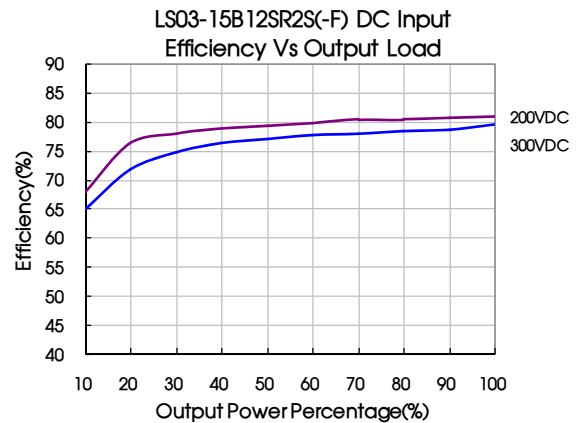
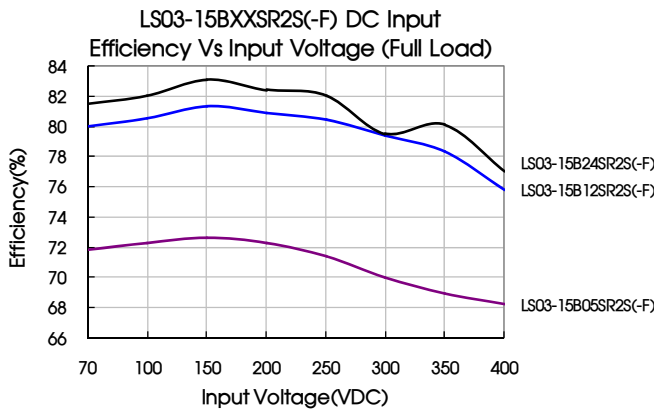
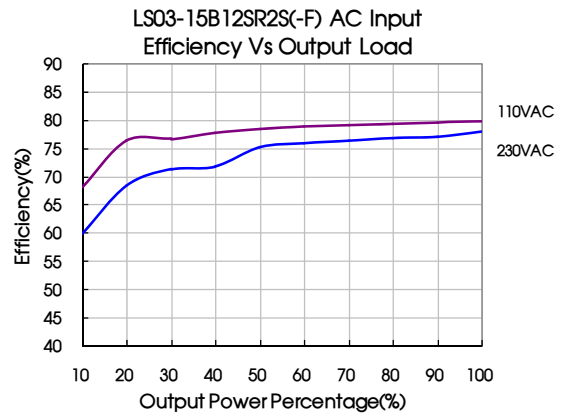
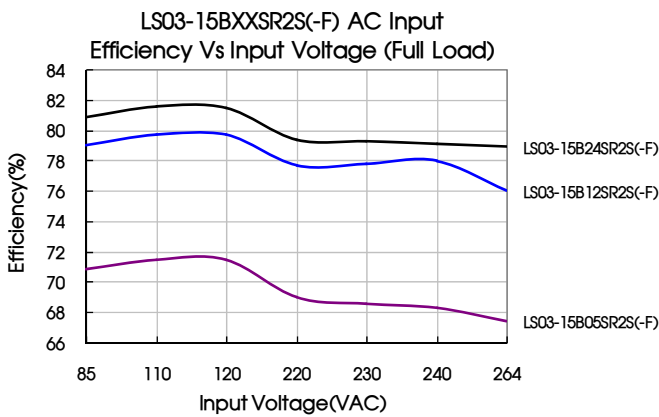
EMC Specifications

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 A (See Fig. 1 for recommended circuit)			
		CISPR22/EN55022, CLASS B (See Fig. 2 for recommended circuit)			
EMS	Electrostatic Discharge	IEC/EN61000-4-2	±4KV	Perf. Criteria B	
	Radiation Immunity	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 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. 1 or Fig. 2 for recommended circuit)	perf. Criteria B	
	Conducted Disturbance immunity	IEC/EN61000-4-6	10 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 / 70~100VDC / 340~400VDC.



Design Reference

1. Typical application circuit

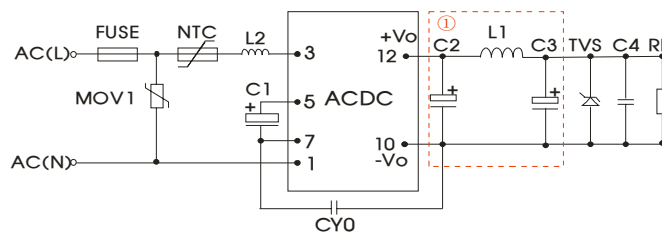


Fig. 1: Typical application circuit
Note: ① is PI filter circuit.

Model	FUSE (Required)	NTC	MOV1	C1 (Required)	L2	C2 (Required)	L1 (Required)	C3 (Required)	C4	CY0	TVS
LS03-15B03SR2S(-F)	1A/ 250V	13D- 5	S14K3 20	10μF/ 400V	5mH	330μF/ 35V	2.2 μH	120μF/25V	0.1 μF/ 50 V	1nF/ 400 VAC	SMBJ 7.0A
LS03-15B05SR2S(-F)								SMBJ 12A			
LS03-15B09SR2S(-F)								SMBJ 20A			
LS03-15B12SR2S(-F)						SMBJ 20A					
LS03-15B15SR2S(-F)						SMBJ 20A					
LS03-15B24SR2S(-F)						SMBJ 30A					

Note:
1. C1,C2and C3 are electrolytic capacitors. They are required both AC input and DC input.
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).C2 and C3 are output filter capacitors, they are recommended to be high frequency and low impedance electrolytic capacitors. Capacitance and rated ripple current of capacitors refer to the datasheets provided by the manufactures. Voltage derating of capacitors should be 80% or above. C4 is a ceramic capacitor, which is used to filter high frequency noise. C2,C3 and L1 form a pi-type filter circuit. Current of L1 and L2 refer to the datasheets provided by the manufactures, current derating should be 80% or above. TVS is a recommended component to protect post-circuits (if converter fails).

2. EMC solution-recommended circuit

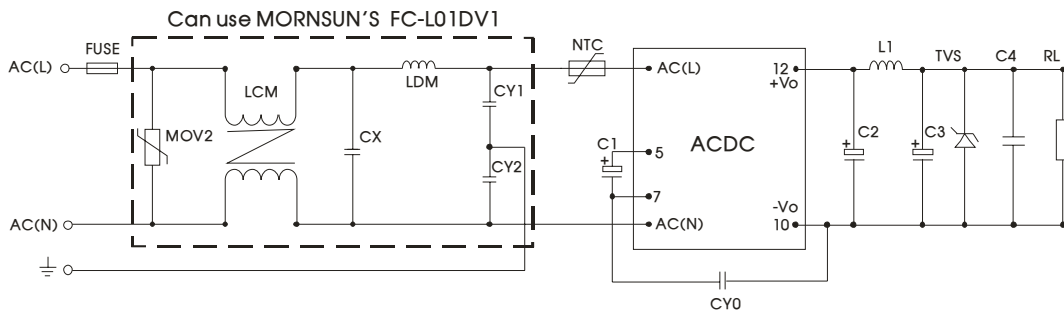


Fig 2: EMC application circuit with higher requirements

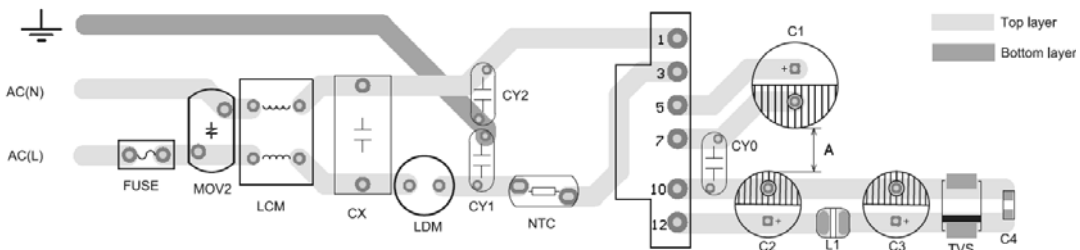


Fig 3: Recommended EMC circuit-PCB layout

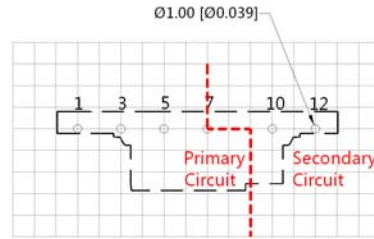
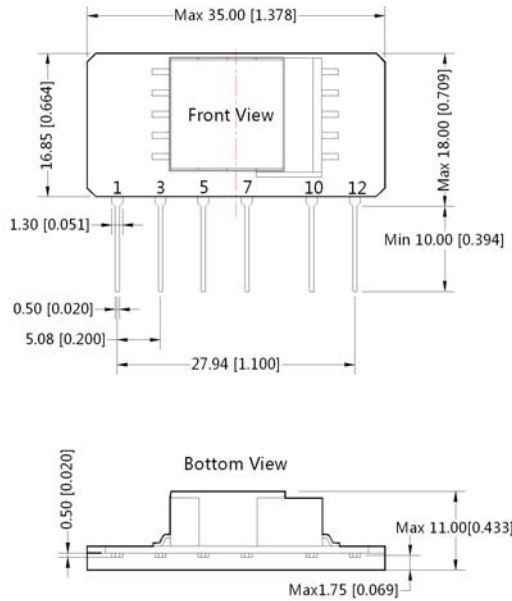
Suggestions for safety regulation and wiring width: wire width ≥3mm, distance between wires ≥6mm, and distance between wire and ground ≥6mm, A ≥6.4mm

Components	Recommend Parameter
MOV2	S14K320
CY1	1nF/400VAC
CY2	1nF/400VAC
CX	0.1μF/275VAC
LCM	3.5mH
LDM	0.3mH
FC-L01DV1	MORNSUN's 1KV/2KV Surge protector
FUSE(Required)	1A/250V, slow fusing

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

LS03-R2S Dimensions and Recommended Layout

THIRD ANGLE PROJECTION



Note: Grid 2.54*2.54mm

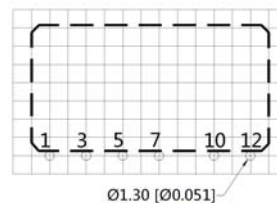
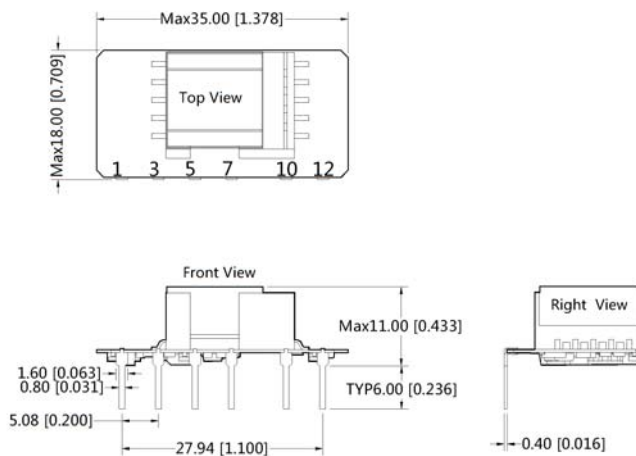
Pin-Out	
Pin	Function
1	AC (N)
3	AC (L)
5	+V(cap)
7	-V(cap)
10	-Vo
12	+Vo

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

- 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-R2S-F Dimensions and Recommended Layout

THIRD ANGLE PROJECTION



Note: Grid 2.54*2.54mm

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]

- 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.

Note:

1. Packing Information please refer to 'Product Packing Information'. Packing bag number: 58220018(LS03-15BXXSR2S)/58220025 (LS03-15BXXSR2S-F);
2. External electrolytic capacitors are required to modules, more details refer to typical applications;
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 $T_a=25^{\circ}\text{C}$, humidity<75%, nominal input voltage (115VAC or 230VAC)and rated output load unless otherwise specified;
5. In order to increase the conversion efficiency of the product with light load in the design, the product will have slight audio noise when operating with load less than 30% of rated load, but it will not affect the product's reliability and performance;
6. Module required dispensing fixed after assembled;
7. Recommends placing the insulation sheet between the bottom of the curved legs Module (LS03-R2S-F) and the PCB board, recommended materials for the FR700, thickness is more than 0.4mm.
8. All index testing methods in this datasheet are based on our Company's corporate standards;
9. We can provide product customization service;
10. Specifications of this product are subject to changes without prior notice.

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