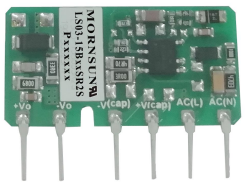
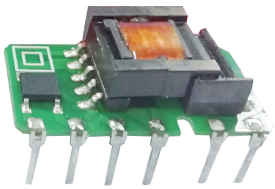
3W, AC/DC converter





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
- IEC/UL60950, EN62368 safety approval

LS03-15BxxSR2S(-F) 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 efficiency, low power consumption and CLASS II reinforced insulation. All models are particularly suitable for industrial control, electric power, instrumentation and smart home applications which don't have high requirement for dimension. A variety of EMC external circuits meet the needs of multiple industries.

Selection Guide

Certification	Part No.	Output Power	Nominal Output Voltage and Current (Vo/Io)	Efficiency at 230VAC (%) Typ.	Capacitive Load (uF) 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: 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	--	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)		--	--	±6	%
	LS03-15B05SR2S(-F)		--	--	±5	
	LS03-15B09SR2S(-F)		--	--		
	LS03-15B12SR2S(-F)		--	--		
	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	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: 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	Input-output	Electric Strength Test for 1min.	3000	--	--	VAC
Operating Temperature			-40	--	+85	℃
Storage Temperature			-40	--	+105	
Storage Humidity			--	--	85	%RH
Switching Frequency			--	--	65	kHz
Power Derating		-40℃ to -20℃(85 - 110VAC)	2.0	--	--	%/℃
		+70℃ to +85℃	2.67	--	--	
		85VAC -110VAC	0.8	--	--	%/VAC
		277VAC - 305VAC	1.1	--	--	
Safety Standard			IEC60950/EN62368/UL60950			
Safety Certification			IEC60950/EN62368/UL60950			
Safety Class			CLASS II			
MTBF			MIL-HDBK-217F@25°C>1000,000 h			

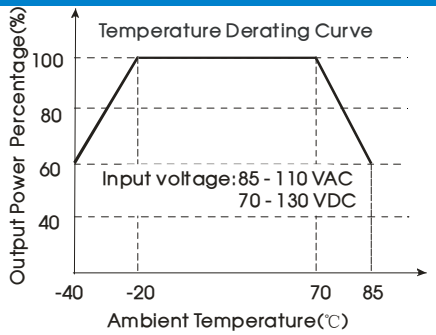
Mechanical Specifications

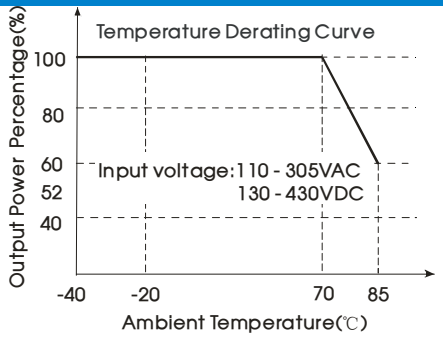
Dimensions	35.00 x 18.00 x 11.00 mm
Weight	6g (Typ.)
Cooling method	Free air convection

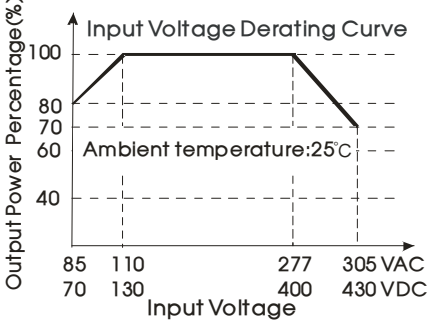
Electromagnetic Compatibility (EMC)

Emissions	CE	CISPR32/EN55032	CLASS A (Recommended circuit 1, 2, 6)	
		CISPR32/EN55032	CLASS B (Recommended circuit 3, 4, 5)	
	RE	CISPR32/EN55032	CLASS A (Recommended circuit 1, 2, 6)	
		CISPR32/EN55032	CLASS B (Recommended circuit 3, 4, 5)	
Immunity	ESD	IEC/EN61000-4-2	Contact ±4KV	Perf. Criteria B
	RS	IEC/EN61000-4-3	10V/m	perf. Criteria A
	EFT	IEC/EN61000-4-4	±2KV (Recommended circuit 1, 2, 3)	perf. Criteria B
		IEC/EN61000-4-4	±4KV (Recommended circuit 4, 5, 6)	perf. Criteria B
	Surge	IEC/EN61000-4-5	line to line ±1KV (Recommended circuit 1, 2)	perf. Criteria B
		IEC/EN61000-4-5	line to line ±2KV (Recommended circuit 6)	
		IEC/EN61000-4-5	line to line±1KV/line to ground ±2KV (Recommended circuit 3)	perf. Criteria B
		IEC/EN61000-4-5	line to line±2KV/line to ground ±4KV (Recommended circuit 4, 5)	
	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

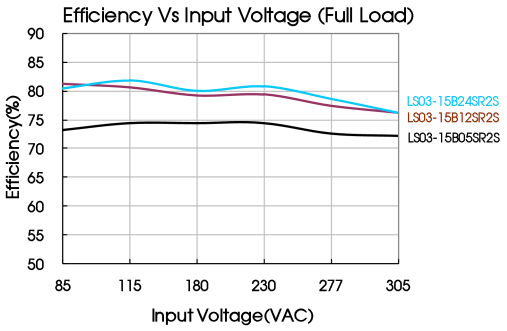
Product Characteristic Curve

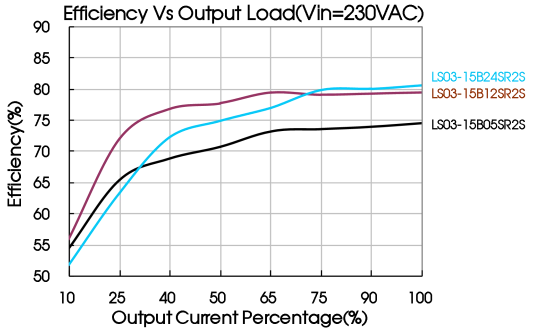




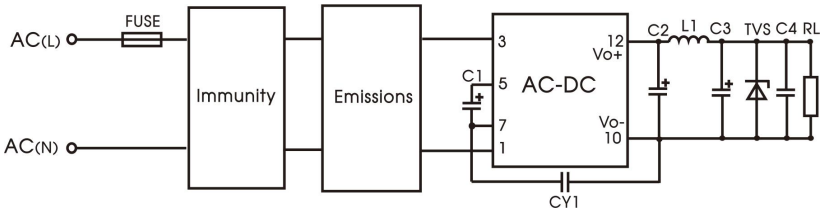


Note:
①With an AC input between 85 - 110VAC/277- 305VAC and a DC input between 70 - 130VDC/400 - 430VDC, the output power must be derated as per temperature derating curves;
② This product is suitable for applications using natural air cooling; for applications in closed environment please consult factory or one of our FAE.

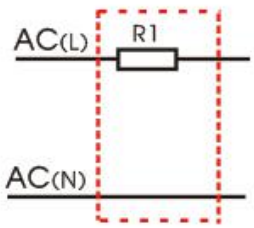
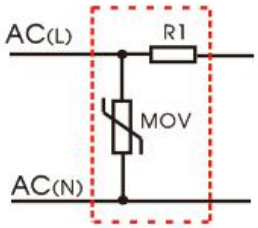
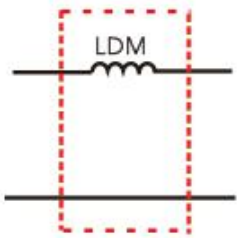
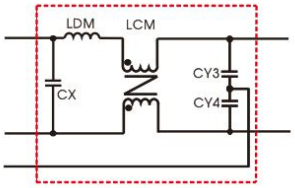




Additional Circuits Design Reference



LS series additional circuits design reference

Immunity design circuits for reference		Emissions design circuits for reference	
CLASS III	CLASS IV	CLASS A	CLASS B
			

LS03 series additional components selection guide							
Part No.	FUSE (required)	C1 (required)	C2 (required)	L1 (required)	C3 (required)	C4	CY1 (required)
LS03-15B03SR2S(-F)	1A/300V	10uF/450V (-20℃ to +85℃) 22uF/450V (-40℃ to +85℃)	270uF/ 16V (solid-state capacitor)	4.7uH (Max 60mΩ)	120uF/ 25V	0.1uF/ 50V	1.0nF/ 400VAC
LS03-15B05SR2S(-F)					68uF/ 35V		
LS03-15B09SR2S(-F)							
LS03-15B12SR2S(-F)							
LS03-15B15SR2S(-F)			470uF/ 35V		47uF/35V		
LS03-15B24SR2S(-F)			220uF/ 35V				

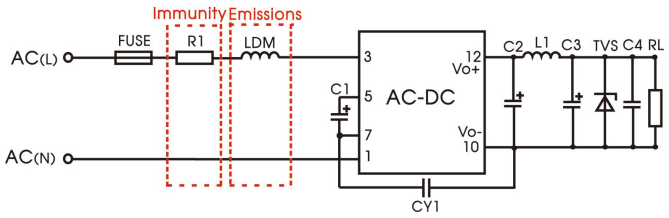
Note:
1. C1: input capacitors, C2: output storage capacitors, they must be connected externally.
2. We recommend using an electrolytic capacitor with high frequency and low ESR rating for C3 (refer to manufacture's datasheet). Combined with C2, L1, they form a pi-type filter circuit. Choose a capacitor voltage rating with at least 20% margin, in other words not exceeding 80%. C4 is a ceramic capacitor, used for filtering high frequency noise. A suppressor diode (TVS) is a recommended to protect the application in case of a converter failure and specification should be 1.2 times of the output voltage.

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
1/2	Basic application	None	85～305VAC	-40℃ to +85℃	CLASS A	CLASS Ⅲ
3	Indoor civil environment	Smart home/Home appliances (2Y)		-25℃ to +55℃	CLASS B	CLASS Ⅲ
	Indoor general environment	Intelligent building/Intelligent agriculture				
4/5	Indoor industrial environment	Manufacturing workshop		-25℃ to +55℃	CLASS B	CLASS Ⅳ
6	Outdoor general environment	ITS/Video monitoring/Charging point/Communication/Security and protection		-40℃ to +85℃	CLASS A	CLASS Ⅳ

Electromagnetic Compatibility Solution--Recommended Circuit

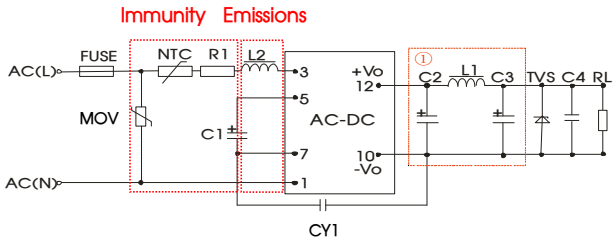
1. Recommended circuit 1/2——Basic application



Recommended circuit 1

Application environmental	Ambient temperature range	Immunity CLASS	Emissions CLASS
Basic application	-40℃ to +85℃	CLASS Ⅲ	CLASS A

Component	Recommended value
R1 (wire-wound resistor, required)	12Ω/3W
LDM	4.7mH
FUSE (required)	1A/300V, slow-blow
Note: R1 is the input plug-in resistor, this resistor needs to be a wire-wound resistor (required), please do not select chip resistor or carbon film resistor.	

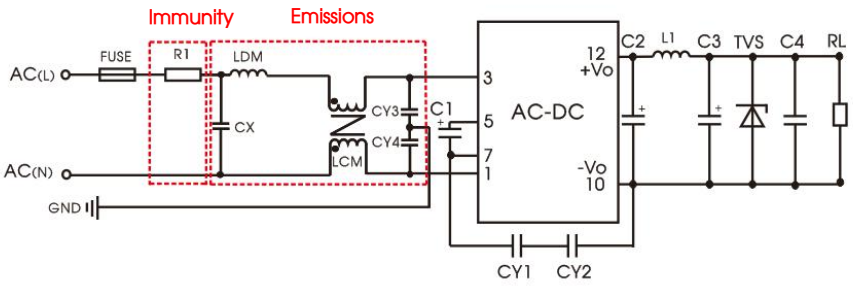


Recommended circuit 2

Application environmental	Ambient temperature range	Immunity CLASS	Emissions CLASS
Basic application	-40℃ to +85℃	CLASS Ⅲ	CLASS A

Component	Recommended value
R1 (wire-wound resistor, required)	12Ω/2W
L2	4.7mH
NTC	13D-5
MOV	S14K350
FUSE (required)	1A/300V, slow-blow
Note: R1 is the input plug-in resistor, this resistor needs to be a wire-wound resistor (required), please do not select chip resistor or carbon film resistor.	

2. Recommended circuit 3——Indoor civil /Universal system recommended circuits for general environment

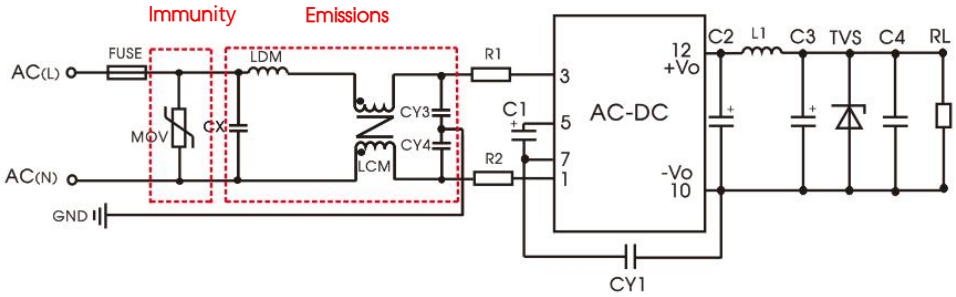


Recommended circuit 3

Application environmental	Ambient temperature range	Immunity CLASS	Emissions CLASS
Indoor civil /general	-25℃ to +55℃	CLASS Ⅲ	CLASS B

Component	Recommended value
R1 (wire-wound resistor, required)	12Ω/3W
CY1(CY2)	1.0nF/400VAC
LCM	3.5mH
LDM	0.33mH
CX	0.1uF/310VAC
CY3, CY4	0.56nF/400VAC
FUSE (required)	1A/300V, slow-blow
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/400VAC), which can meet the EN60335 certification. In other industries, only one Y capacitor is needed. Note 2: R1 is the input plug-in resistor, this resistor needs to be a wire-wound resistor (required), please do not select chip resistor or carbon film resistor.			

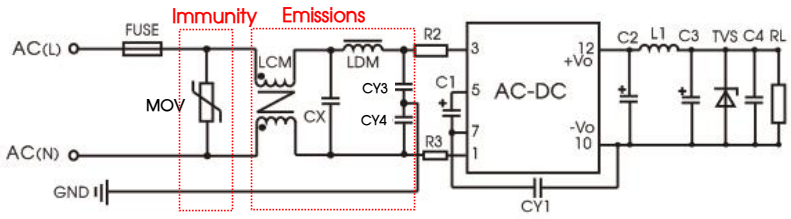
3. Recommended circuit 4/5——Universal system recommended circuits for indoor industrial environment



Recommended circuit 4

Application environmental	Ambient temperature range	Immunity CLASS	Emissions CLASS
Indoor industrial	-25℃ to +55℃	CLASS Ⅳ	CLASS B

Component	Recommended value
MOV	S14K350
C1	450V/22uF
CY1	2.2nF/400VAC
CX	0.1uF/310VAC
LCM	3.5mH
LDM	0.33mH
R1, R2 (wire-wound resistor, required)	12Ω/2W
CY3, CY4	0.56nF/400VAC
FUSE (required)	2A/300V, slow-blow
Note: R1, R2 is the input plug-in resistor, this resistor needs to be a wire-wound resistor (required), please do not select chip resistor or carbon film resistor.	

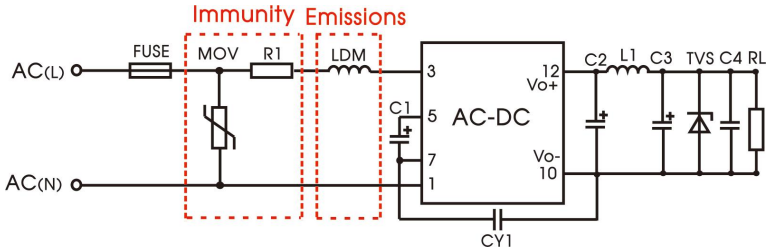


Recommended circuit 5

Application environmental	Ambient temperature range	Immunity CLASS	Emissions CLASS
Indoor industrial	-25℃ to +55℃	CLASS Ⅳ	CLASS B

Component	Recommended value
MOV	S14K350
C1	450V/22uF
CY1	2.2nF/400VAC
CY3, CY4	0.56nF/400VAC
CX	0.1uF/310VAC
LCM	3.5mH
LDM	0.33mH
R2, R3 (wire-wound resistor, required)	12Ω/2W
FUSE (required)	2A/300V, slow-blow
Note: R2, R3 is the input plug-in resistor, this resistor needs to be a wire-wound resistor (required), please do not select chip resistor or carbon film resistor.	

4. Recommended circuit 6——Universal system recommended circuits for outdoor general/harsh environment



Recommended circuit 6

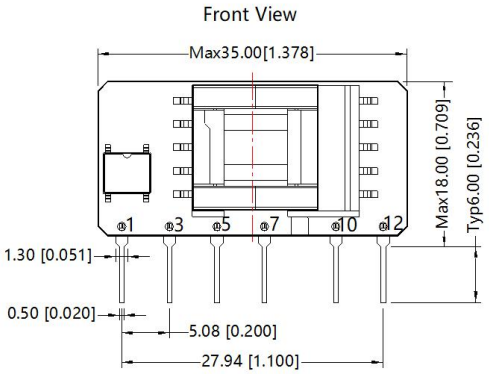
Application environmental	Ambient temperature range	Immunity CLASS	Emissions CLASS
Outdoor general environment	-40℃ to +85℃	CLASS Ⅳ	CLASS A

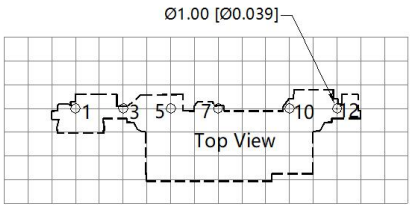
Component	Recommended value
MOV	S14K350
C1	450V/22uF
LDM	4.7mH
R1 (wire-wound resistor, required)	12Ω/3W
FUSE (required)	2A/300V, slow-blow
Note: R1 is the input plug-in resistor, this resistor needs to be a wire-wound resistor (required), please do not select chip resistor or carbon film resistor.	

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

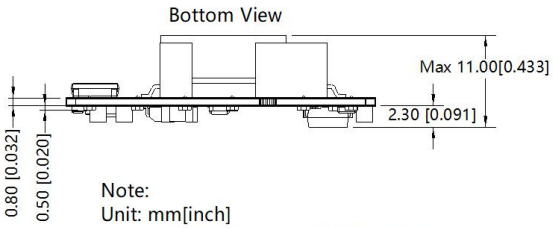
LS03-15BxxSR2S Dimensions and Recommended Layout

THIRD ANGLE PROJECTION





Note:Grid 2.54*2.54mm



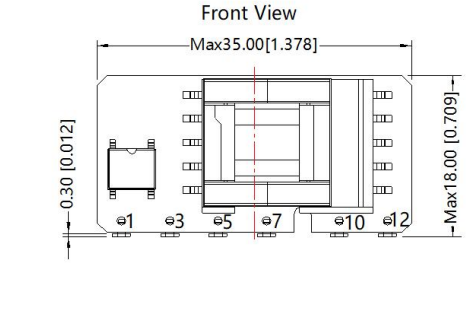
Note:
Unit: mm[inch]
Pin section tolerances: ±0.10[±0.004]
General tolerances: ±0.50[±0.020]
The layout of the device is for reference only, please refer to the actual product

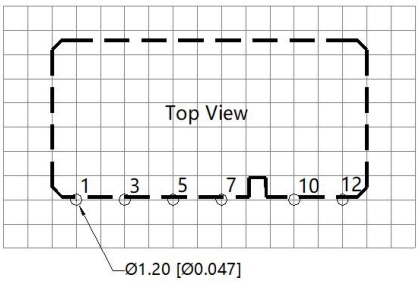
Pin-Out	
Pin	Function
1	AC (N)
3	AC (L)
5	+V(cap)
7	-V(cap)
10	-Vo
12	+Vo

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.

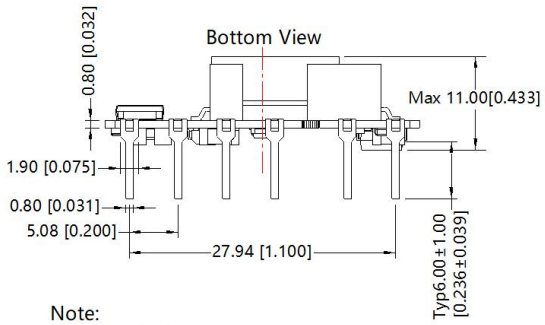
LS03-15BxxSR2S-F Dimensions and Recommended Layout

THIRD ANGLE PROJECTION





Note:Grid 2.54*2.54mm



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

Pin-Out	
Pin	Function
1	AC (N)
3	AC (L)
5	+V(cap)
7	-V(cap)
10	-Vo
12	+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. For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging bag number: 58220084(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 primary and secondary external components of the module is needed to meet the safety requirement;
4. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25℃, humidity<75%, nominal input voltage (115V and 230V) and rated output load;
5. 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;
6. All index testing methods in this datasheet are based on our company corporate standards;
7. We can provide product customization service, please contact our technicians directly for specific information;
8. Products are related to laws and regulations: see "Features" and "EMC";
9. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.
10. 

: It is only suitable for safe use in areas under 2000m above sea level.

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