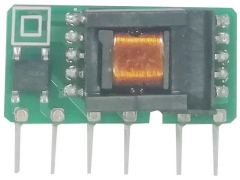
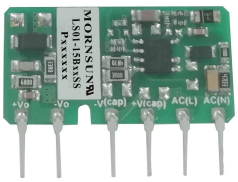
1W, AC/DC converter





FEATURES

- Ultra-wide 85 - 305VAC and 70 - 430VDC input voltage Range
- AC and DC dual-use (input from the same terminal)
- Compact size, high power density
- Output short circuit, over-current protection
- IEC/EN/UL62368 safety approval

LS01-15BxxSS series 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 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 (230VAC, %/Typ.)	Max. Capacitive Load (uF)
UL/CE/CB	LS01-15B05SS	1W	5V/200mA	66	220
	LS01-15B09SS		9V/111mA	67	100
	LS01-15B12SS		12V/83mA	70	100
	LS01-15B15SS		15V/67mA	69	100
	LS01-15B24SS		24V/42mA	68	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	--	9	--	
	277VAC	--	15	--	
Recommended External Input Fuse		1A, slow-blow, required			
Hot Plug		Unavailable			

Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Output Voltage Accuracy	LS01-15B05SS		--	--	±8	%
	LS01-15B09SS		--	--	±5	
	LS01-15B12SS		--	--		
	LS01-15B15SS		--	--		
	LS01-15B24SS		--	--		
Line Regulation	Full load		--	±1.5	--	
Load Regulation	5% - 100% load	5V/9V/12V/15V	--	±3.0	--	
		24V	--	±6.0	--	
Ripple & Noise*	20MHz bandwidth (peak-to-peak value)		--	50	120	mV
Temperature Coefficient			--	±0.15	--	%/°C
Stand-by Power Consumption	5V/9V/12V/15V		--	0.15	0.25	W
	24V		--	0.2	0.3	

Short Circuit Protection		Continuous, self-recovery			
Over-current Protection		110 - 500%Io, self-recovery			
Min. Load		5	--	--	%
Hold-up Time	230VAC input	150	180	--	ms
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 Voltage	Input-output	Test time: 1min	3000	--	--	VAC
Operating Temperature			-40	--	+85	℃
Storage Temperature			-40	--	+105	
Storage Humidity			--	--	85	%RH
Switching Frequency			--	--	100	kHz
Safety Standard			IEC62368/EN62368/UL62368			
Safety Certification			IEC62368/EN62368/UL62368			
Safety Class			CLASS II			
MTBF			MIL-HDBK-217F@25°C>200,000 h			

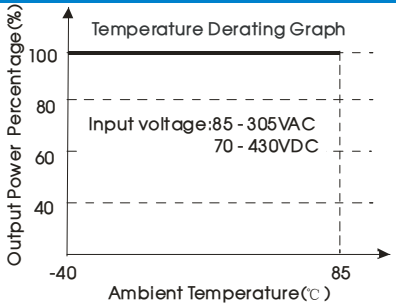
Mechanical Specifications

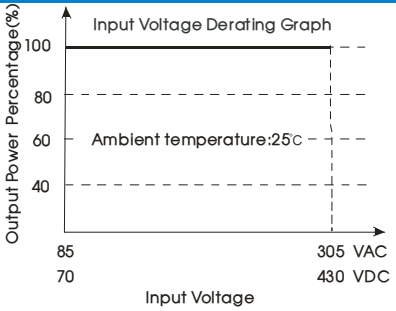
Dimensions	35.00 x 18.00 x 11.00 mm
Weight	6 g (Typ.)
Cooling method	Free air convection

Electromagnetic Compatibility (EMC)

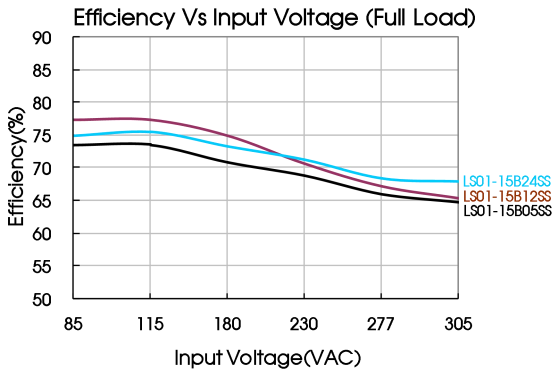
Emissions	CE	CISPR32/EN55032	CLASS A (Recommended circuit 1, 2, 6)	
		CISPR32/EN55032	CLASS B (Recommended circuit 3, 4, 5)	
	RE	CISPR32/EN55032	CLASS A (Recommended circuit 1, 2, 6)	
		CISPR32/EN55032	CLASS B (Recommended circuit 3, 4, 5)	
Immunity	ESD	IEC/EN61000-4-2	Contact ±4KV	Perf. Criteria B
	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

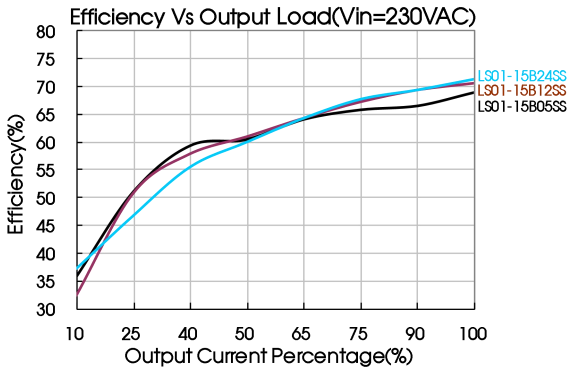
Product Characteristic Curve



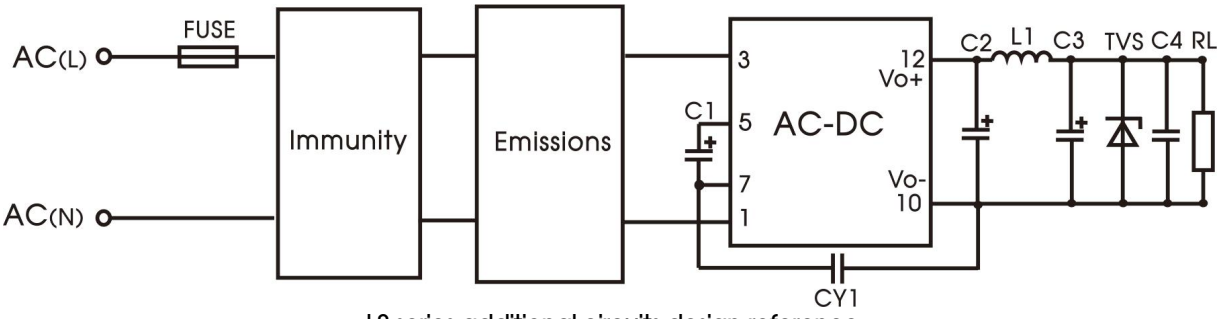


Note: This product is suitable for applications using natural air cooling; for applications in closed environment please consult factory or one of our FAE.



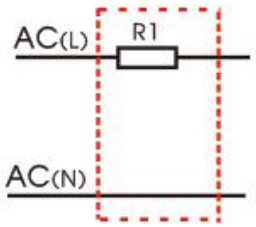


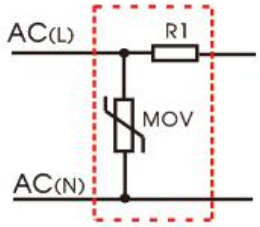
Additional Circuits Design Reference

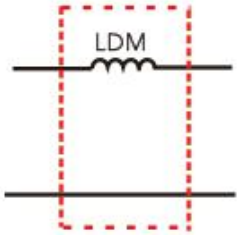


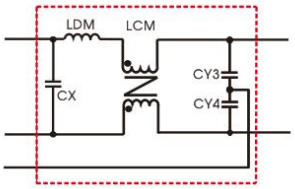
LS series additional circuits design reference

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









LS series additional components selection guide								
Part No.	FUSE (required)	C1required)	C2 (required)	L1 (required)	C3 （required）	C4	CY1 （required）	TVS
LS01-15B05SS	1A/300V	4.7μF/450V (-20℃ to +85℃) 10μF/450V (-40℃ to +85℃)	270μF/16V (solid-state capacitor)	2.2μH (Max 60mΩ)	68μF/ 35V	0.1μF/ 50V	1.0nF/ 400VAC	SMBJ7.0A
LS01-15B09SS			100μF/16V (solid-state capacitor)					SMBJ12A
LS01-15B12SS								SMBJ20A
LS01-15B15SS			100uF/35V					SMBJ20A
LS01-15B24SS								SMBJ30A

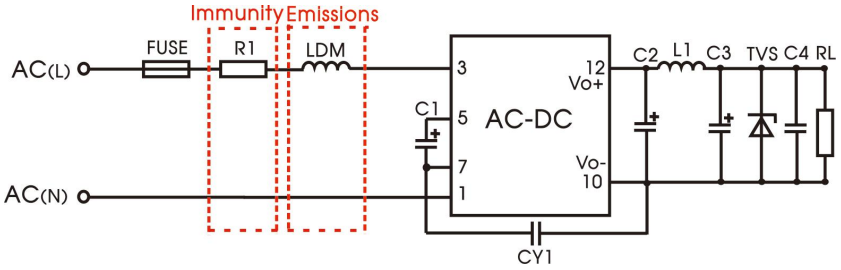
Note:
1. C1: input capacitors, C2: output storage capacitors, they must be connected externally.
2. We recommend using an electrolytic capacitor with high frequency and low ESR rating for C3 (refer to manufacture's datasheet). Combined with C2, L1, they form a pi-type filter circuit. Choose a capacitor 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

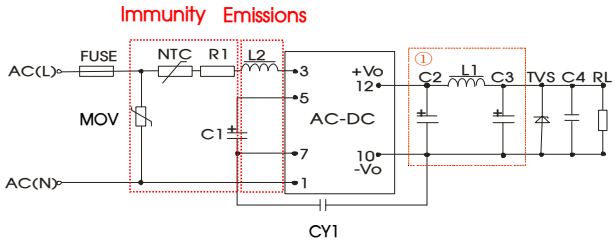
1. Recommended circuit 1/2——Basic application



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	12Ω/3W
LDM	4.7mH
FUSE (required)	1A/300V, slow-blow

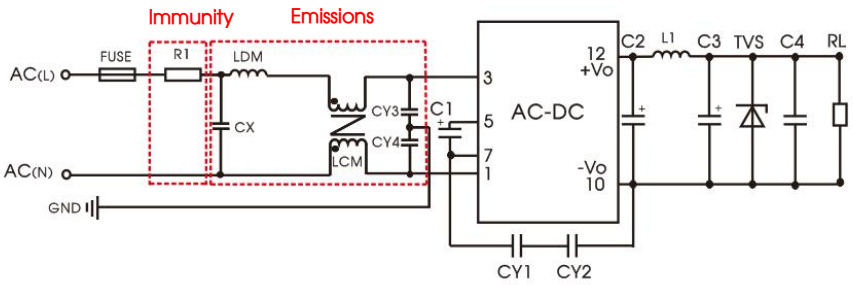


Recommended circuit 2

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

Component	Recommended value
R1	12Ω/2W
L2	4.7mH
NTC	13D-5
MOV	S14K350
FUSE (required)	1A/300V, slow-blow

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

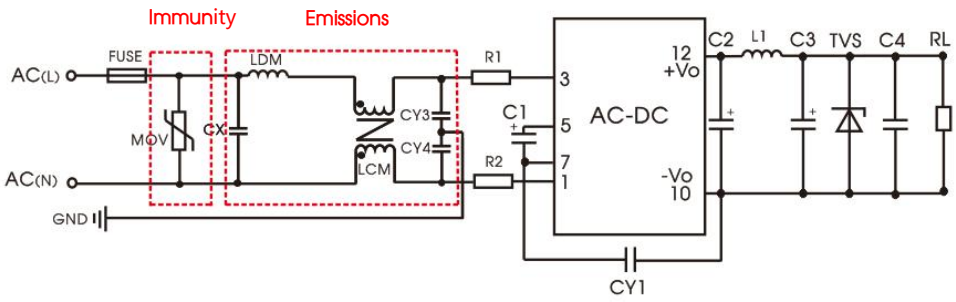


Recommended circuit 3

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

Component	Recommended value
R1	12Ω/3W
CY1(CY2)	1.0nF/400VAC
LCM	3.5mH
LDM	0.33mH
CX	0.1μF/310VAC
CY3、CY4	0.56nF/400VAC
FUSE (required)	1A/300V, slow-blow
Note: 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.	

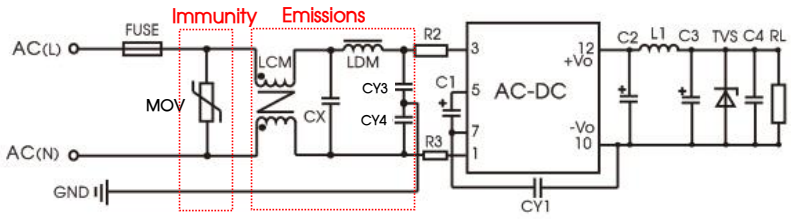
3. Recommended circuit 4/5——Universal system recommended circuits for indoor industrial environment



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/10uF
CY1	2.2nF/400VAC
CX	0.1μF/310VAC
LCM	3.5mH
LDM	0.33mH
R1、R2	12Ω/2W
CY3、CY4	0.56nF/400VAC
FUSE (required)	2A/300V, slow-blow

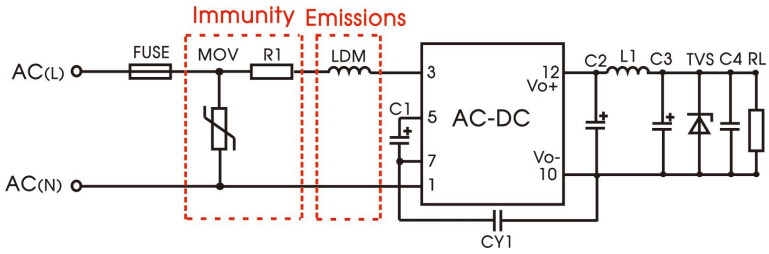


Recommended circuit 5

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/10uF
CY1	2.2nF/400VAC
CY3/CY4	0.56nF/400VAC
CX	0.1μF/310VAC
LCM	3.5mH
LDM	0.33mH
R2/R3	12Ω/2W
FUSE (required)	2A/300V, slow-blow

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



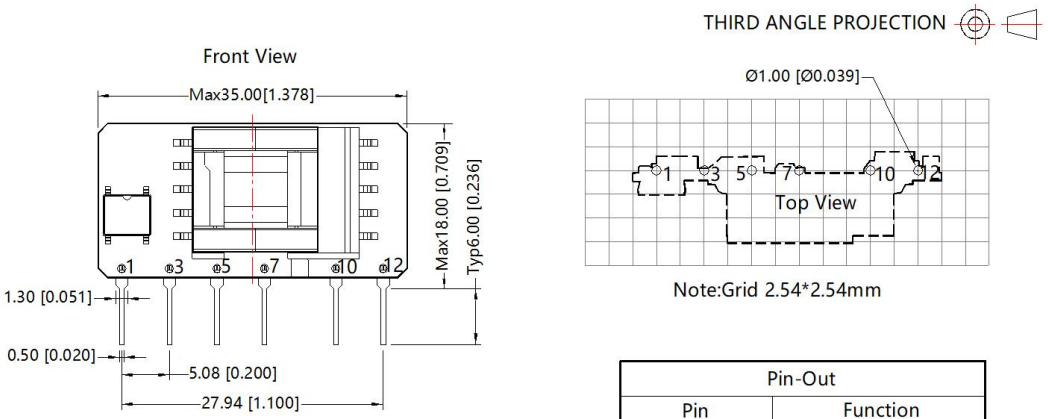
Recommended circuit 6

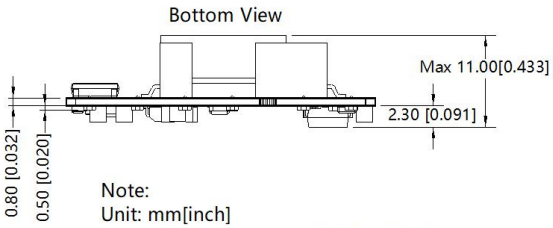
Application environmental	Ambient temperature range	Immunity CLASS	Emissions CLASS
Outdoor general environment	-40℃ to +85℃	CLASS Ⅳ	CLASS A

Component	Recommended value
MOV	S14K350
C1	450V/10uF
LDM	4.7mH
R1	12Ω/3W
FUSE (required)	2A/300V, slow-blow

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

LS01-15BxxSS Dimensions and Recommended Layout





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;
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.

Mornsun Guangzhou Science & Technology Co., Ltd.
Address: No. 5, Kehui St. 1, Kehui Development Center, Science Ave., Guangzhou Science City, Huangpu District, Guangzhou, P. R. China
el: 86-20-38601850 Fax: 86-20-38601272 E-mail: info@mornsun.cn www.mornsun-power.com