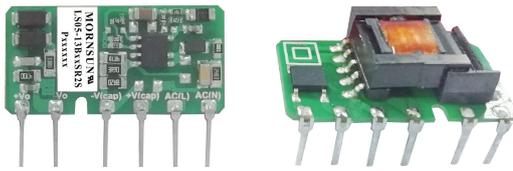


5W, AC/DC converter



FEATURES

- Ultra-wide 85 - 305VAC and 70 - 430VDC input voltage range
- Accepts AC or DC input (dual-use of same terminal)
- Operating ambient temperature range -40°C to +85°C
- Compact size, high power density
- Low power consumption, green power
- Output short circuit, over-current protection
- Over-voltage class II
- IEC/EN/UL62368, EN60335 safety approval

LS05-13BxxSR2S(-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 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 (uF) Max.
CE/UL/CB	LS05-13B03SR2S(-F)*	3.3W	3.3V/1000mA	67	2200
	LS05-13B05SR2S(-F)	5W	5V/1000mA	74	1500
	LS05-13B09SR2S(-F)		9V/560mA	75	680
	LS05-13B12SR2S(-F)		12V/420mA	77	470
	LS05-13B15SR2S(-F)		15V/340mA	77	330
	LS05-13B24SR2S(-F)		24V/210mA	79	100

Note: ① *An "-F" suffix designates horizontal package vs. standard vertical mounting.
 ② 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	--	--	0.2	A
	277VAC	--	--	0.1	
Inrush Current	115VAC	--	20	--	A
	277VAC	--	40	--	
Recommended External Input Fuse		1A, slow-blow, required			
Hot Plug		Unavailable			

Output Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Output Voltage Accuracy	10% - 100% load	--	±5	--	%
Line Regulation	Rated load	--	±1.5	--	
Load Regulation	10% - 100% load	--	±3	--	
Ripple & Noise*	20MHz bandwidth (peak-to-peak value)	--	80	150	mV
Temperature Coefficient		--	±0.15	--	%/°C
Stand-by Power Consumption	230VAC	--	0.25	0.5	W
Short Circuit Protection		Hiccup, continuous, self-recovery			
Over-current Protection		≥110%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., leakage current < 5mA	3000	--	--	VAC
Operating Temperature			-40	--	+85	°C
Storage Temperature			-40	--	+105	
Storage Humidity			--	--	95	%RH
Power Derating	-40°C to -20°C	85VAC - 110VAC	2.50	--	--	% / °C
	+55°C to +85°C		1.67	--	--	
	85VAC - 110VAC		1.60	--	--	% / VAC
	277VAC - 305VAC		1.43	--	--	
Safety Standard			IEC/EN/UL62368, EN60335			
Safety Certification			IEC/EN/UL62368, EN60335			
Safety Class			CLASS II			
MTBF			MIL-HDBK-217F@25°C>300,000 h			

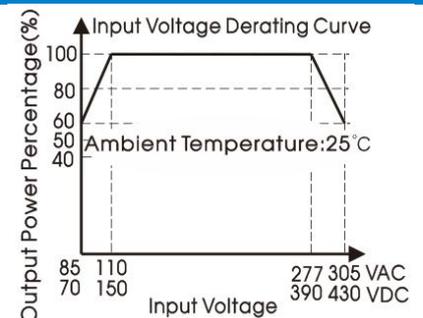
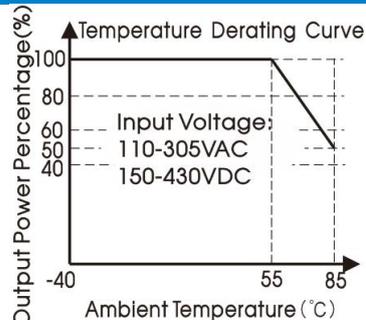
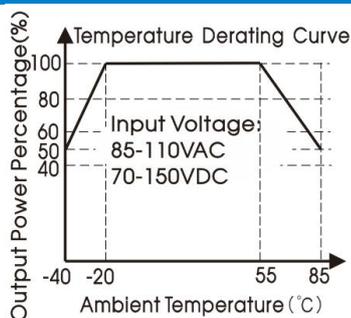
Mechanical Specifications

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

Electromagnetic Compatibility (EMC)

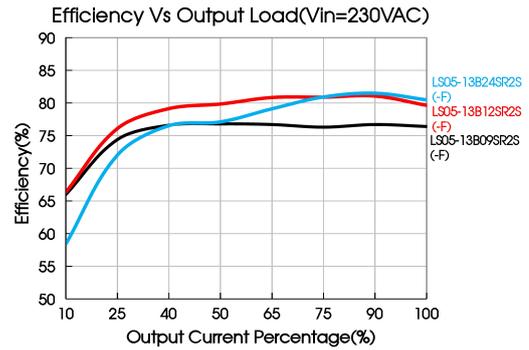
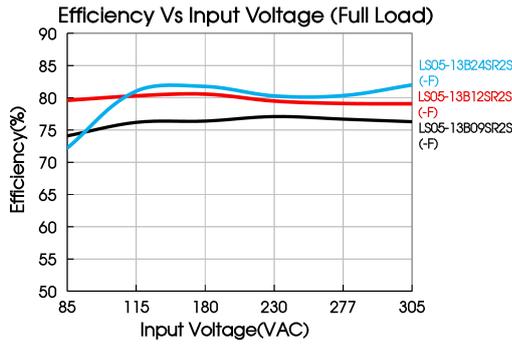
Emissions	CE	CISPR32/EN55032	CLASS A (Recommended circuit 1, 2, 6)	
		CISPR32/EN55032	CLASS B (Recommended circuit 3, 4, 5)	
	RE	CISPR32/EN55032	CLASS A (Recommended circuit 1, 2, 6)	
		CISPR32/EN55032	CLASS B (Recommended circuit 3, 4, 5)	
Immunity	ESD	IEC/EN61000-4-2	Contact ±4KV	Perf. Criteria B
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

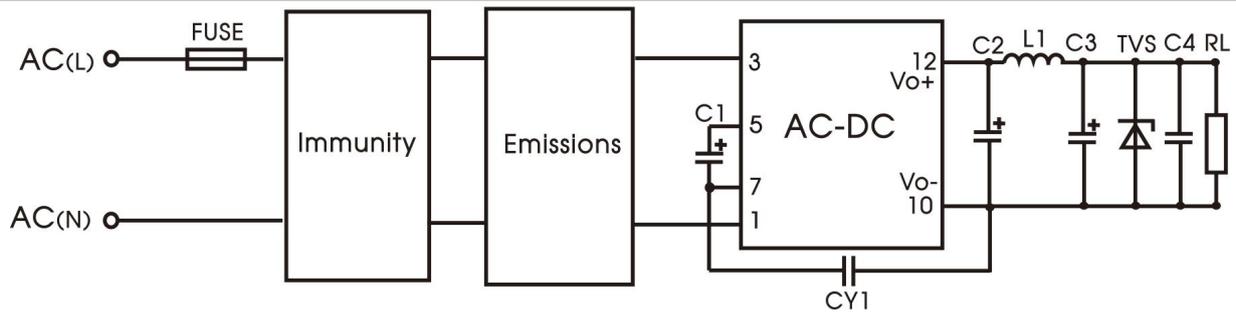


Note:

- With an AC input between 85 - 110VAC / 277 - 305VAC and a DC input between 70 - 150VDC / 390 - 430VDC, the output power must be derated as per temperature derating curves;
- 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(-F) series additional circuits design reference

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

LS05(-F) series additional components selection guide							
Part No.	FUSE (required)	C1(required)	C2 (required)	L1 (required)	C3 (required)	C4	CY1 (required)
LS05-13B03SR2S(-F)	1A/300V	10uF/450V (-20°C to +85°C) 22uF/450V (-40°C to +85°C)	470uF/16V (solid-state capacitor)	4.7uH (Max 60mΩ)	150uF/35V	0.1uF/50V	1.0nF/400VAC
LS05-13B05SR2S(-F)			270uF/16V (solid-state capacitor)		100uF/35V		
LS05-13B09SR2S(-F)					47uF/35V		
LS05-13B12SR2S(-F)							
LS05-13B15SR2S(-F)					220uF/35V		
LS05-13B24SR2S(-F)							

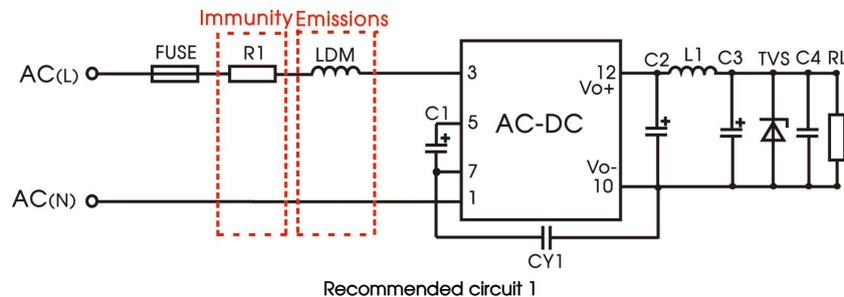
- Note:
- C1: input capacitors, C2: output storage capacitors, they must be connected externally.
 - We recommend using an electrolytic capacitor with high frequency and low ESR rating for C3 (refer to manufacture's datasheet). Combined with C2, L1, they form a pi-type filter circuit. Choose a capacitor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

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		-25℃ to +55℃	CLASS B	CLASS IV
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

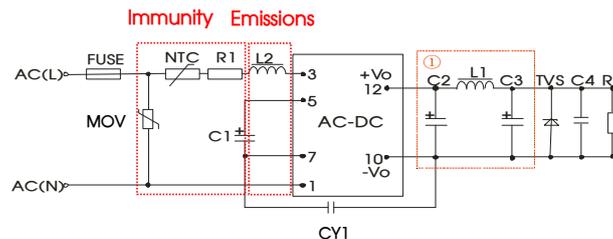


Recommended circuit 1

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

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.



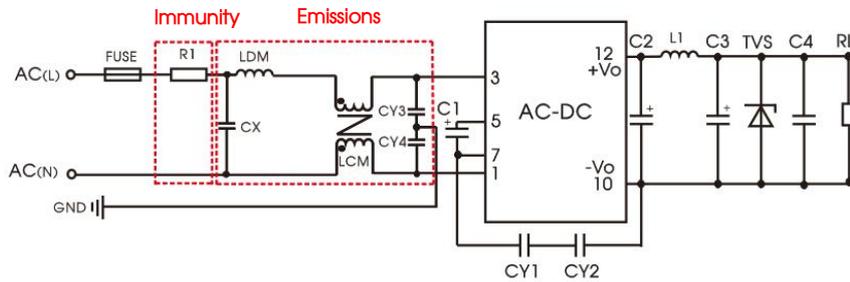
Recommended circuit 2

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	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

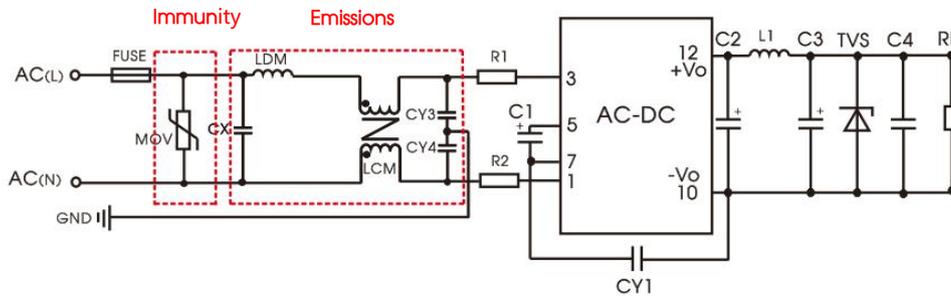
Application environmental	Ambient temperature range	Immunity CLASS	Emissions CLASS
Indoor civil /general	-25°C to +55°C	CLASS III	CLASS B

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

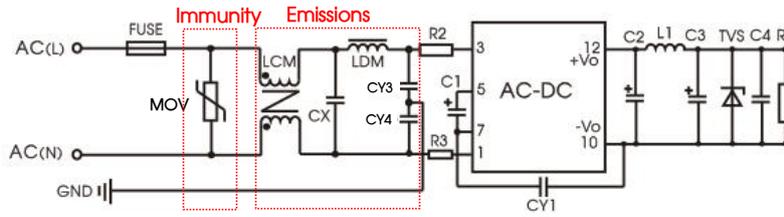


Recommended circuit 4

Application environmental	Ambient temperature range	Immunity CLASS	Emissions CLASS
Indoor industrial	-25°C to +55°C	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.



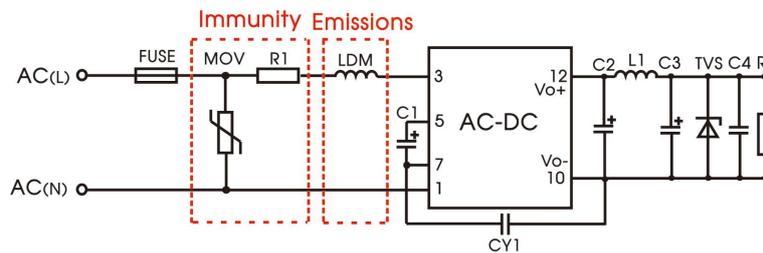
Recommended circuit 5

Application environmental	Ambient temperature range	Immunity CLASS	Emissions CLASS
Indoor industrial	-25°C to +55°C	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

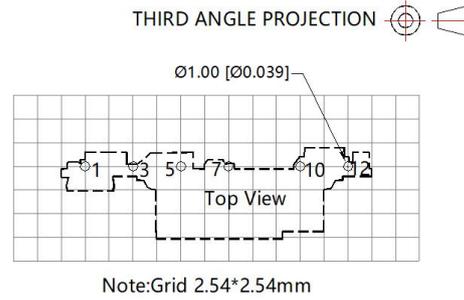
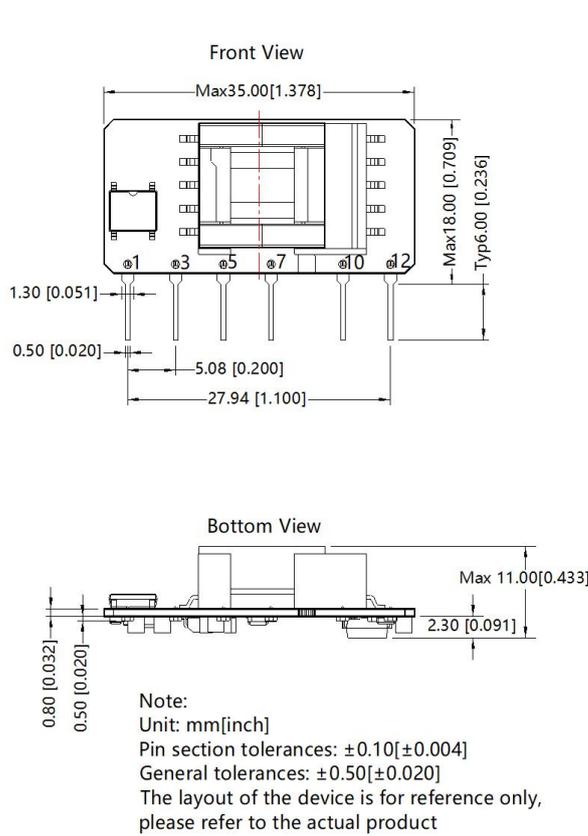
Application environmental	Ambient temperature range	Immunity CLASS	Emissions CLASS
Outdoor general environment	-40°C to +85°C	CLASS IV	CLASS A

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.

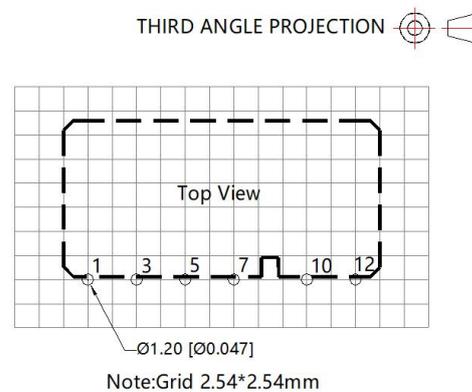
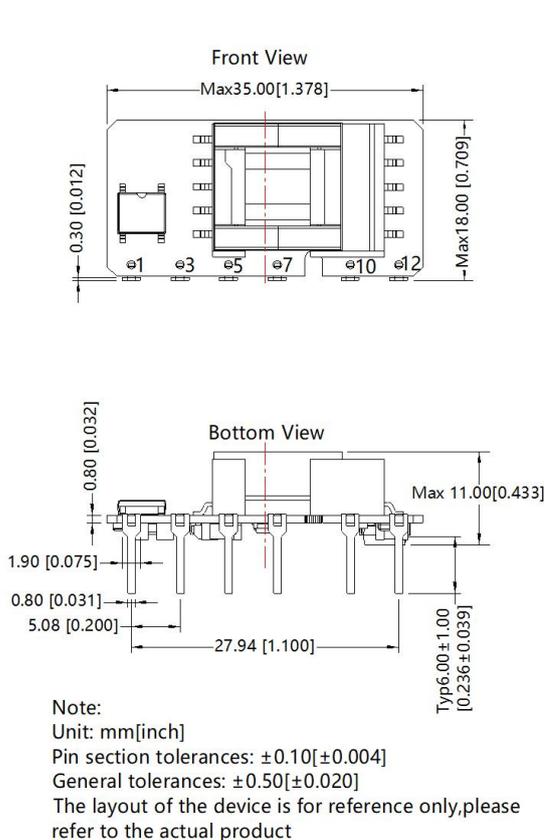
LS05-13BxxSR2S Dimensions and Recommended Layout



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 $\geq 6.4\text{mm}$ for safety between external componets in primary circuit and secondary circuit.

LS05-13BxxSR2S-F Dimensions and Recommended Layout



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 $\geq 6.4\text{mm}$ 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(LS05-13BxxSR2S); 58220025(LS05-13BxxSR2S-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 $T_a=25^{\circ}\text{C}$, 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.

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