

15W, AC-DC converter



UL US CE CB RoHS



FEATURES

- Universal 85-305VAC or 100-430VDC input voltage
- Accepts AC or DC input(dual-use of same terminal)
- Operating ambient temperature range: -40°C to +85°C
- Small size, high power density
- Low power consumption, green power
- Output short circuit, over-current, over-voltage protection
- Regulated output, low ripple & noise
- Design to meet IEC/EN60335 standards
- IEC/EN/UL62368 safety approval

LS15-13BxxSS(-F) series is one of Mornsun's highly efficient green power AC-DC Converter series. They feature ultra-wide input range accepting either AC or DC voltage, high efficiency, low power consumption and reinforced isolation. All models are particularly suitable for industrial control, electric power, instrumentation and smart home applications which have high requirement for dimension and don't have high requirement on EMC. For extremely harsh EMC environment, we recommend using the application circuit show in Design Reference of this datasheet.

Selection Guide

Certification	Part No.*	Output Power	Nominal Output Voltage and Current	Efficiency at 230VAC (%) Typ.	Capacitive Load (μF) Max.
CE/UL/CB	LS15-13B03SS(-F)	9.9W	3.3V/3000mA	75	20000
	LS15-13B05SS(-F)	14W	5V/2800mA	77	15000
	LS15-13B09SS(-F)	15W	9V/1670mA	82	5000
	LS15-13B12SS(-F)		12V/1250mA	82	4000
	LS15-13B15SS(-F)		15V/1000mA	84	2000
	LS15-13B24SS(-F)		24V/625mA	85	1000

Note: ① *Due to different rectification methods, the layout of 3.3V/5V/9V and 12V/15V/24V output terminals is different.

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	100	--	430	VDC
Input Frequency		47	--	63	Hz
Input Current	115VAC	--	--	0.4	A
	230VAC	--	--	0.25	
Inrush Current	115VAC	--	18	--	
	230VAC	--	35	--	
Leakage Current	277VAC/50Hz	0.25mA RMS Max.			
Recommended External Input Fuse		1A/300V, slow-blow, required			
Hot Plug		Unavailable			

Output Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Output Voltage Accuracy	3.3VDC output	--	±3	--	
	Other output	--	±2	--	
Line Regulation	Full load	--	±0.5	--	%
Load Regulation	0%-100% load	3.3VDC output	--	±2	
		5VDC output	--	±1.5	
		Other output	--	±1	
Ripple & Noise*	20MHz bandwidth (peak-to-peak value)	--	80	150	mV
Stand-by Power Consumption	230VAC input	--	0.10	0.25	W
Temperature Coefficient		--	±0.02	--	%/°C

Short Circuit Protection		Hiccup, continuous, self-recovery			
Over-current Protection		≥110%Io, self-recovery			
Over-voltage Protection	3.3/5VDC output	≤9VDC (Output voltage hiccup or clamp)			
	9VDC output	≤12VDC (Output voltage hiccup or clamp)			
	12VDC output	≤16VDC (Output voltage hiccup or clamp)			
	15VDC output	≤20VDC (Output voltage hiccup or clamp)			
	24VDC output	≤30VDC (Output voltage hiccup or clamp)			
Minimum Load		0	--	--	%
Hold-up Time	115VAC input	--	10	--	ms
	230VAC input	--	40	--	

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	3000	--	--	VAC
Electric Strength Test for 1min., leakage current <5mA					
Operating Temperature		-40	--	+85	°C
Storage Temperature		-40	--	+105	
Storage Humidity		--	--	95	%RH
Soldering Temperature	Wave-soldering	260 ± 5°C; time: 5 - 10s			
	Manual-welding	360 ± 10°C; time: 3 - 5s			
Switching Frequency		--	65	--	kHz
Power Derating	-40°C to -25°C	4	--	--	% / °C
	+55°C to +70°C	3.34	--	--	
	+70°C to +85°C	2.67	--	--	
	85VAC - 100VAC	1.67	--	--	% / VAC
	277VAC - 305VAC	0.72	--	--	
Safety Standard		IEC/EN/UL62368, IEC/EN60335			
Safety Certification		IEC/EN/UL62368			
Safety Class		CLASS II			
MTBF		MIL-HDBK-217F@25°C > 1000,000 h			

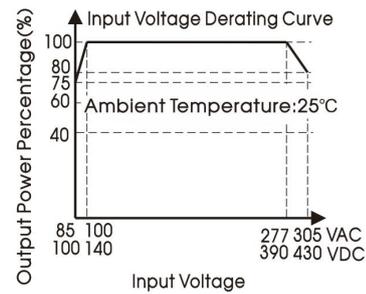
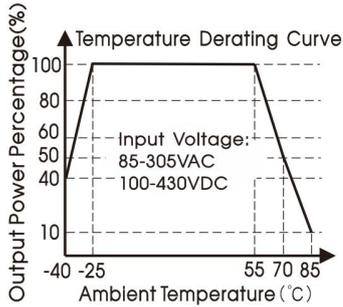
Mechanical Specifications

Dimension	44.50 x 24.00 x 15.00 mm
Weight	11g (Typ.)
Cooling method	Free air convection

Electromagnetic Compatibility (EMC)

Emissions	CE	CISPR32/EN55032	CLASS A (Recommended circuit 1, 4)	
		CISPR32/EN55032	CLASS B (Recommended circuit 2, 3)	
	RE	CISPR32/EN55032	CLASS A (Recommended circuit 1, 4)	
		CISPR32/EN55032	CLASS B (Recommended circuit 2, 3)	
Immunity	ESD	IEC/EN 61000-4-2	Contact ±6KV	Perf. Criteria B
	RS	IEC/EN61000-4-3	10V/m	perf. Criteria A
	EFT	IEC/EN61000-4-4	±2KV (Recommended circuit 1, 2)	perf. Criteria B
		IEC/EN61000-4-4	±4KV (Recommended circuit 3, 4)	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 3, 4)	perf. Criteria B
	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	

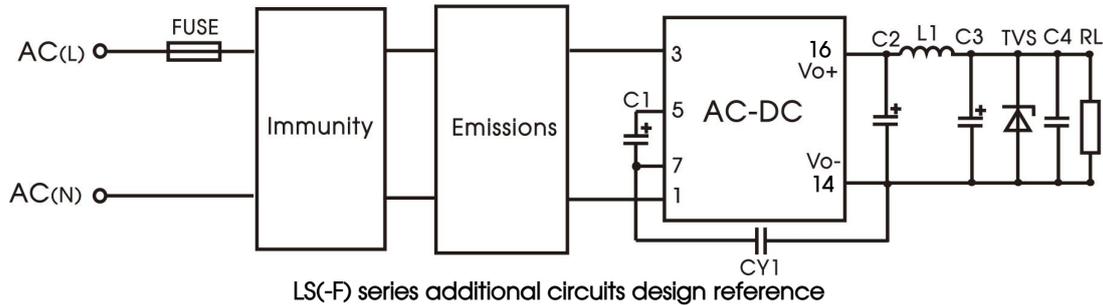
Product Characteristic Curve



Note: ① With an AC input between 85-100V/277-305VAC and a DC input between 100-140V/390-430VDC, 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



LS15(-F) series additional components selection guide

Part No.	FUSE(required)	C1 (required)	C2 (required)	L1 (required)	C3 (required)	C4	CY1 (required)	TVS
LS15-13B03SS(-F)	1A/300V	33μF/450V	470μF/ 16V (solid-state capacitor)	2.2μH (Max 22mΩ)	220μF/16V	0.1μF/ 50V	2.2nF/ 400VAC	SMBJ7.0A
LS15-13B05SS(-F)								SMBJ7.0A
LS15-13B09SS(-F)								SMBJ12A
LS15-13B12SS(-F)			SMBJ20A					
LS15-13B15SS(-F)			SMBJ20A					
LS15-13B24SS(-F)			SMBJ30A					

- 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 recommended to protect the application in case of converter failure and specification should be 1.2 times of the output voltage.
 - The distance of the original secondary side isolation belt is greater than 6.4mm to meet the safety requirements. In the layout of the periphery, it is also necessary to pay attention to the creepage distance greater than 6.4mm, and the electrical clearance greater than 4.0mm can meet the certification together with the periphery.

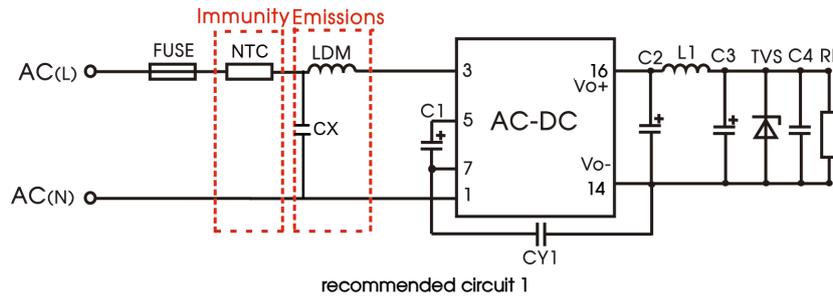
Environmental Application EMC Solution

LS(-F) series environmental application EMC solution selection table

Recommended circuit	Application environmental	Typical industry	Input voltage range	Environment temperature	Emissions	Immunity
1	Basic application	None	85~305VAC	-40°C to +85°C	CLASS A	CLASS III
2	Indoor civil environment	Smart home/Home appliances (2Y)		-25°C to +55°C	CLASS B	CLASS III
	Indoor general environment	Intelligent building/Intelligent agriculture		-25°C to +55°C	CLASS B	CLASS IV
3	Indoor industrial environment	Manufacturing workshop		-25°C to +55°C	CLASS B	CLASS IV
4	Outdoor general environment	ITS/Video monitoring/Charging point/Communication/Security and protection	-40°C to +85°C	CLASS A	CLASS A	CLASS IV

Electromagnetic Compatibility Solution—Recommended Circuit

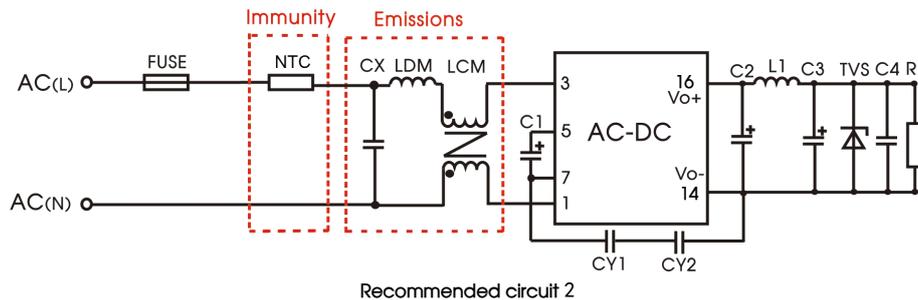
1. Recommended circuit 1—Basic application



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

Component	Recommended value
NTC	10D-10
LDM	1.2mH (MIN: 0.4A, MAX: 4Ω)
CX	0.1μF/310VAC
FUSE(required)	1A/300V, slow-blow

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

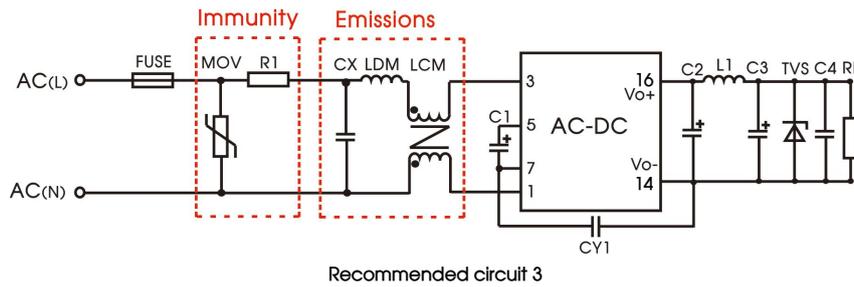


Application environmental	Ambient temperature range	Immunity CLASS	Emissions CLASS
Indoor civil /general	-25°C to +55°C	CLASS III	CLASS B

Component	Recommended value
NTC	10D-10
CY1(CY2)	2.2nF/400VAC
LCM	10mH (MIN: 0.4A, MAX: 600mΩ)
LDM	0.33mH (MIN: 0.4A, MAX: 1Ω)
CX	0.22μF/310VAC
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.

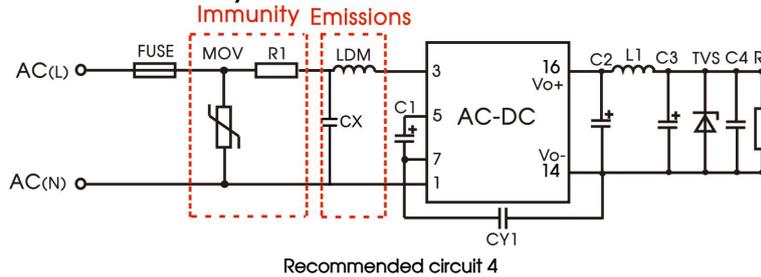
3. Recommended circuit 3—Universal system recommended circuits for indoor industrial environment



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
CY1	2.2nF/400VAC
CX	0.22μF/310VAC
LCM	10mH (MIN: 0.4A, MAX: 600mΩ)
LDM	0.33mH (MIN: 0.4A, MAX: 1Ω)
R1	12Ω/3W
FUSE(required)	2A/300V, slow-blow

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

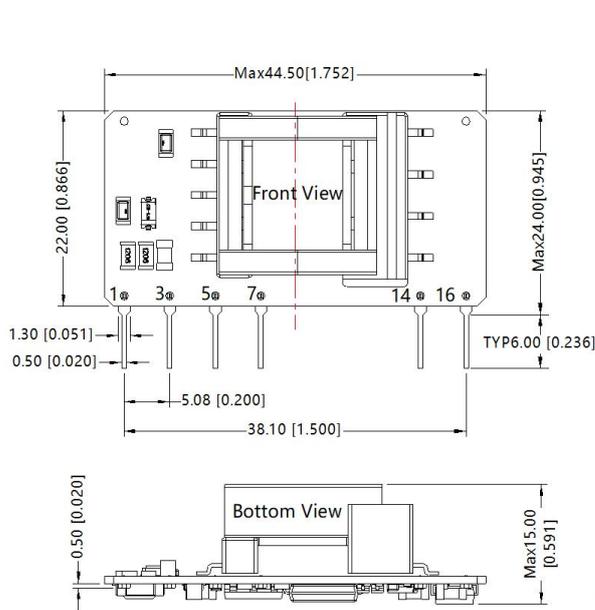


Application environmental	Ambient temperature range	Immunity CLASS	Emissions CLASS
Outdoor general environment	-40°C to +85°C	CLASS IV	CLASS A

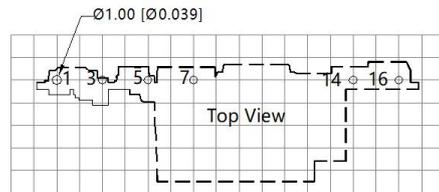
Component	Recommended value
MOV	S14K350
LDM	1.2mH (MIN: 0.4A, MAX: 4Ω)
CX	0.1μF/310VAC
R1	12Ω/3W
FUSE(required)	2A/300V, slow-blow

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

LS15-13BxxSS Dimensions and Recommended Layout



THIRD ANGLE PROJECTION



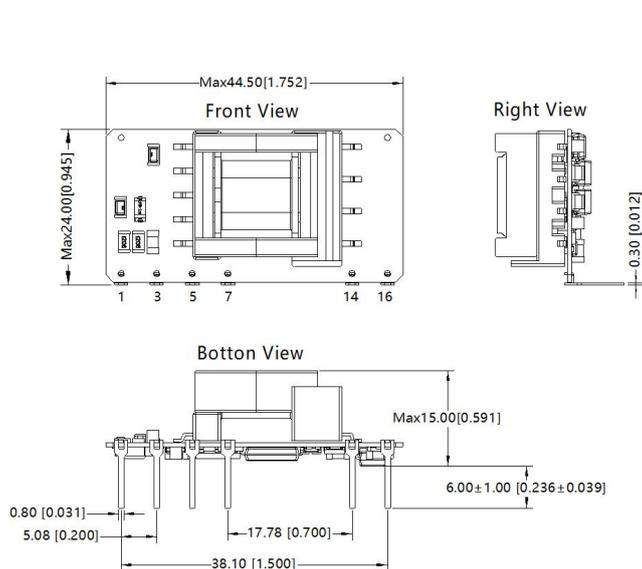
Note: Grid 2.54*2.54mm

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

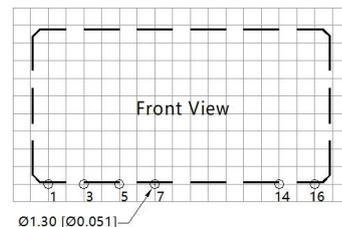
- 1.It is necessary to add C1 between pin5 and pin7.
- 2.It is necessary to add Pi circuits to the output, such as the recommended circuit 1.
- 3.The distance of the primary and secondary isolation area >6.4mm to meet the safety requirements. The whole layout including additional circuits meet safety requirements with conditions of the creepage distance >6.4mm and the electrical clearance >4mm.

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

LS15-13BxxSS-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)
14	-Vo
16	+Vo

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

Note:

1. For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging bag number: 58220085(LS15-13BxxSS); 58220025(LS15-13BxxSS-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 improve the efficiency at light load, there will be audible noise generated, but it does not affect product performance and reliability;
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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