15W, AC-DC converter

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℃ to +85℃
- High I/O isolation test voltage up to 3600VAC
- Small size, high efficiency
- Low power consumption, green power
- Output short circuit, over-current, over-voltage protection
- Technical design of industrial products

LS15-13BxxR3 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. The converters meet UL/IEC/EN62368, EN60335, EN61558 standards. The converter is widely used in industrial control, electricity power and telecommunications applications. 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.
--	LS15-13B03R3	9.9W	3.3V/3000mA	77	20000
	LS15-13B05R3	14W	5V/2800mA	78	15000
	LS15-13B09R3	15W	9V/1670mA	82	5000
	LS15-13B12R3		12V/1250mA	82	4000
	LS15-13B15R3		15V/1000mA	84	2000
	LS15-13B24R3		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	--	
Minimum Load			0	--	--	
Ripple & Noise*	20MHz bandwidth (peak-to-peak value)		--	80	150	mV
Stand-by Power Consumption	230VAC input		--	0.1	0.25	W

Temperature Coefficient		--	±0.02	--	%/°C
Short Circuit Protection	Recovery time <3s after the short circuit disappear.	Hiccup, continuous, self-recover			
Over-current Protection		≥110%Io, self-recover			
Over-voltage Protection	3.3VDC output	≤6.3VDC(Output voltage hiccup or clamp)			
	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)			
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	Electric Strength Test for 1min., leakage current<5mA	3600	--	--	VAC
Insulation Resistance	Input-output	At 500VDC	50	--	--	MΩ
Operating Temperature			-40	--	+85	°C
Storage Temperature			-40	--	+105	
Storage Humidity		Non-condensing	--	--	95	%RH
Soldering Temperature		Wave-soldering	260 ± 5℃; time：5 - 10s			
		Manual-welding	360 ± 10℃; 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	1.33	--	--	
		85VAC - 100VAC	1.67	--	--	%/VAC
		277VAC - 305VAC	0.72	--	--	
Safety Standard			Design refer to IEC/EN/UL62368-1, IEC/EN60335-1, EN61558-1			
Safety Class			CLASS II			
MTBF		MIL-HDBK-217F@25°C	≥300,000 h			

Mechanical Specifications

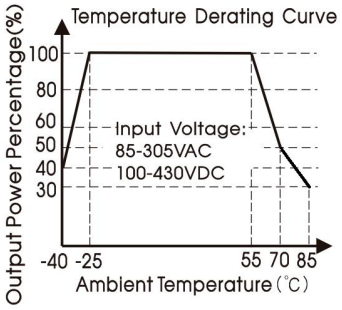
Dimension	40.50 x 26.00 x 15.00 mm
Weight	12g (Typ.)
Cooling method	Free air convection

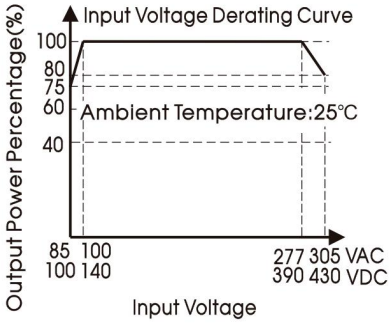
Electromagnetic Compatibility (EMC)

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)	
	Harmonic current	IEC/EN6100-3-2 CLASS A	
Immunity	ESD	IEC/EN 61000-4-2 Contact ±6KV/Air ±8KV	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 variations *	IEC61000-6-2/IEC61000-4-11	70% Un, 25/30 cycle(50/60Hz) 40% Un, 10/12 cycle(50/60Hz) 0% Un, 1 cycle	perf. Criteria B
	Voltage interruptions *	IEC61000-6-2/IEC61000-4-11	0% Un, 250/300 cycle(50/60Hz)	perf. Criteria C
Note: *Un is the maximum input nominal voltage.				

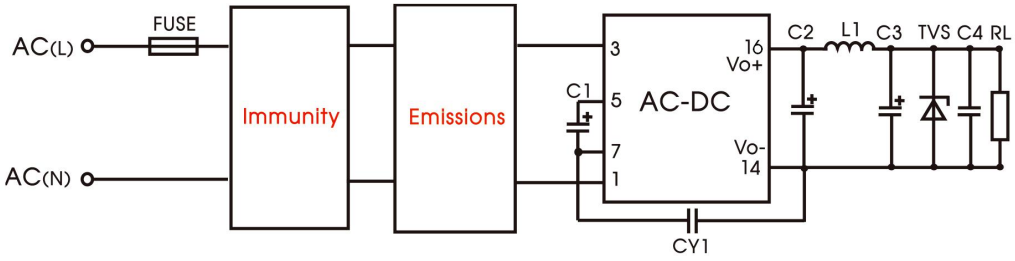
Product Characteristic Curve





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 Mornsun FAE.

Additional Circuits Design Reference



LS series additional circuits design reference

Part No.	FUSE (required)	C1 (required)	C2 (required)	L1 (required)	C3 (required)	C4	CY1 (required)	TVS
LS15-13B03R3	1A/300V	47UF/450V	1500uF/6.3V (solid-state capacitor)	2.2uH (Max: 8mΩ)	470uF/16V	0.1μF/50V	2.2nF/400VAC	SMBJ7.0A
LS15-13B05R3			1000uF/16V (solid-state capacitor)		330uF/16V			SMBJ7.0A
LS15-13B09R3			680uF/16V (solid-state capacitor)		220uF/35V			SMBJ12A
LS15-13B12R3								SMBJ20A
LS15-13B15R3			1000uF/25V					SMBJ20A
LS15-13B24R3			470uF/35V					SMBJ30A

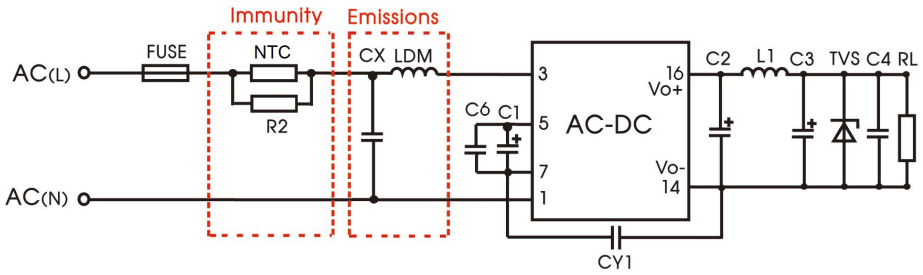
Note:
1. C1: input capacitors, C2: output storage capacitors, they must be connected externally.
2. We recommend using an electrolytic capacitor with high frequency and low ESR rating for C3 (refer to manufacture's datasheet). Combined with C2, L1, they form a pi-type filter circuit. Choose a capacitor 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 recommended to protect the application in case of converter failure and specification should be 1.2 times of the output voltage.
3. 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 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℃ to +85℃	CLASS A	LEVEL 3
2	Indoor civil environment	Smart home/Home appliances (2Y)		-25℃ to +55℃	CLASS B	LEVEL 3
	Indoor general environment	Intelligent building/Intelligent agriculture				
3	Indoor industrial environment	Manufacturing workshop		-25℃ to +55℃	CLASS B	LEVEL 4
4	Outdoor general environment	ITS/Video monitoring/Charging point/Communication/Security and protection		-40℃ to +85℃	CLASS A	LEVEL 4

Electromagnetic Compatibility Solution--Recommended Circuit

1. Recommended circuit 1——Basic application

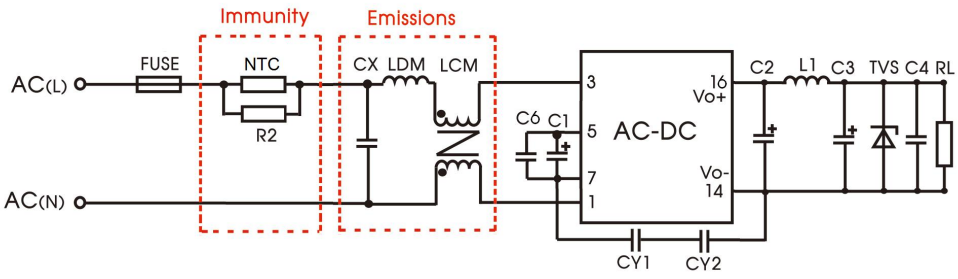


recommended circuit 1

Application environmental	Ambient temperature range	Immunity LEVEL	Emissions CLASS
Basic application	-40℃ to +85℃	LEVEL 3	CLASS A

Component	Recommended value
NTC	8D-15
R2	24Ω/3W (wire-wound resistor)
C6	103K/1206/630V
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

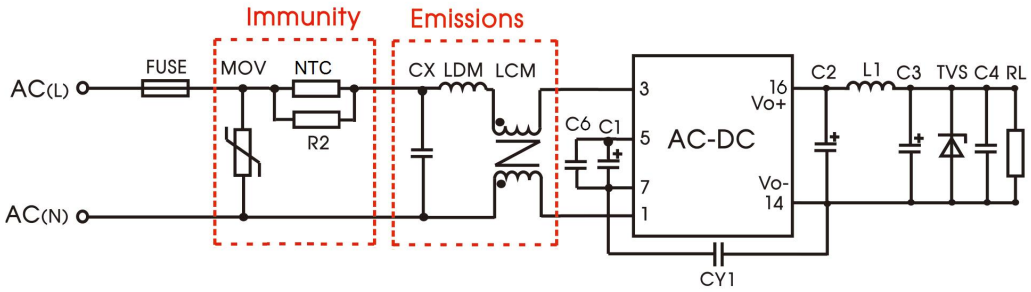


Recommended circuit 2

Application environmental	Ambient temperature range	Immunity LEVEL	Emissions CLASS
Indoor civil /general	-25℃ to +55℃	LEVEL 3	CLASS B

Component	Recommended value
NTC	8D-15
R2	24Ω/3W (wire-wound resistor)
C6	103K/1206/630V
CY1/CY2	2.2nF/400VAC
LCM	20mH, P/N: FL2D-10-203 (Mornsun) is recommended
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

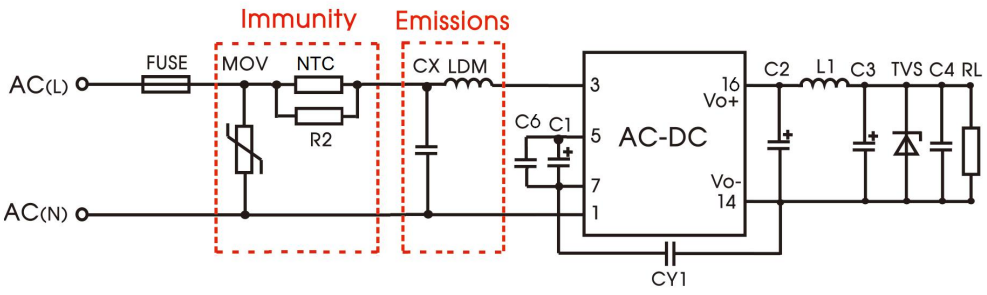


Recommended circuit 3

Application environmental	Ambient temperature range	Immunity LEVEL	Emissions CLASS
Indoor industrial	-25℃ to +55℃	LEVEL 4	CLASS B

Component	Recommended value
MOV	S14K350
CY1	2.2nF/400VAC
CX	0.22μF/310VAC
LCM	20mH, P/N: FL2D-10-203 (Mornsun) is recommended
LDM	0.33mH (MIN: 0.4A, MAX: 1Ω)
NTC	8D-15
R2	24Ω/3W (wire-wound resistor)
C6	103K/1206/630V
FUSE(required)	2A/300V, slow-blow

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



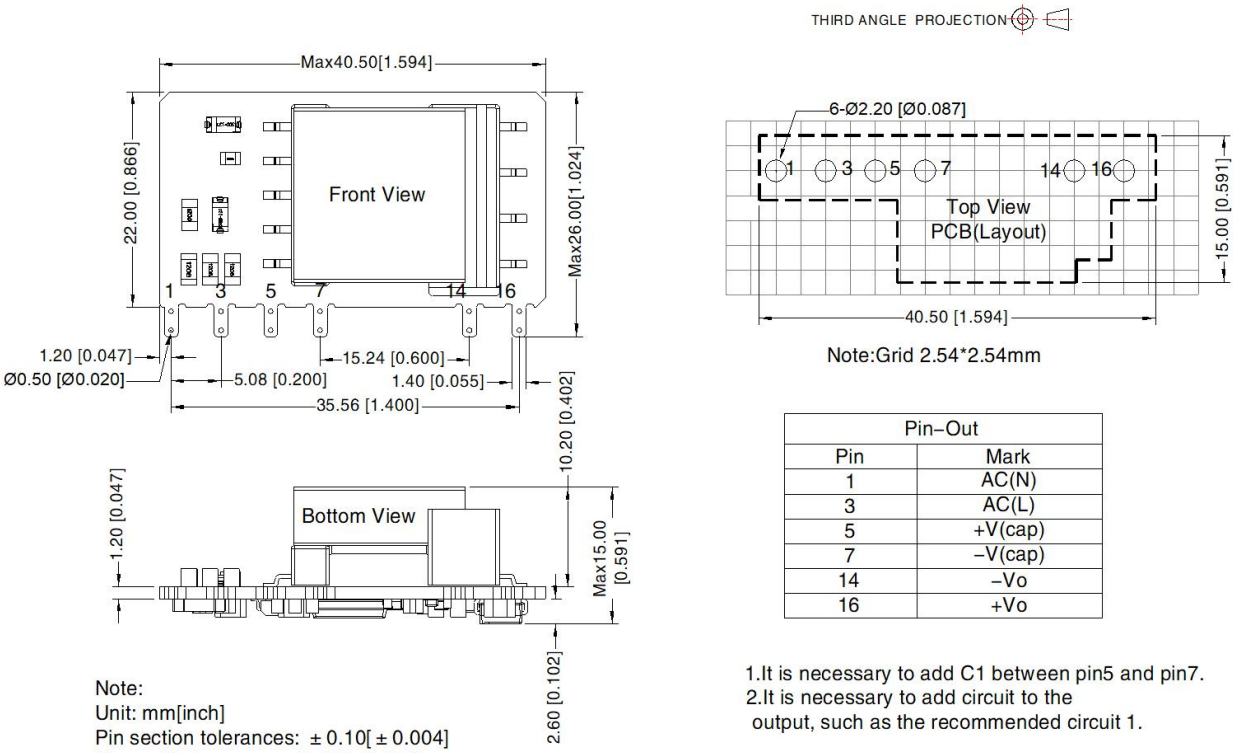
Recommended circuit 4

Application environmental	Ambient temperature range	Immunity LEVEL	Emissions CLASS
Outdoor general environment	-40℃ to +85℃	LEVEL 4	CLASS A

Component	Recommended value
MOV	S14K350
LDM	1.2mH (MIN: 0.4A, MAX: 4Ω)
CX	0.1μF/310VAC
NTC	8D-15
R2	24Ω/3W (wire-wound resistor)
C6	103K/1206/630V
FUSE(required)	2A/300V, slow-blow

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

Dimensions and Recommended Layout



Note:Grid 2.54*2.54mm

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

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

1.It is necessary to add C1 between pin5 and pin7.
2.It is necessary to add circuit to the output, such as the recommended circuit 1.

Note:

1. For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging bag number: 58220252;
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 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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