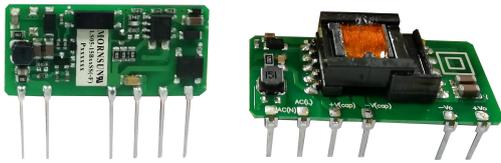


5W, AC/DC converter



FEATURES

- 85 - 305VAC and 100 - 430VDC input voltage range
- High I/O isolation test voltage up to 4000VAC
- Multi application, flexible layout
- Output short circuit, over-current, over-voltage protection
- Compact size
- Industrial-grade design
- IEC/EN/UL62368 safety approval
- IEC/EN/UL62368, IEC 61558-1/61558-2-16 safety approval (12V)

LS05-15BxxSS(-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, reinforced isolation. All models are particularly suitable for industrial control, electric power and instrumentation applications which don't have high requirement for dimension and lower demand for EMC compliance levels. A variety of EMC external circuits meet the needs of multiple industries. 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 (Vo/Io)	Efficiency at 230VAC (%) Typ.	Capacitive Load (uF) Max.
CB/CE/UL	LS05-15B03SS(-F)	3.3W	3.3V/1A	67	2200
	LS05-15B05SS(-F)		5V/1A	74	1500
	LS05-15B09SS(-F)		9V/0.56A	75	680
	LS05-15B12SS(-F)		12V/0.42A	76	470
	LS05-15B15SS(-F)		15V/0.34A	77	330
	LS05-15B24SS(-F)		24V/0.21A	79	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	100	--	430	VDC
Input Frequency		47	--	63	Hz
Input Current	115VAC	--	--	0.2	A
	230VAC	--	--	0.1	
Inrush Current	115VAC	--	5	--	
	230VAC	--	10	--	
Recommended External Input Fuse		1A, slow-blow, required (The actual use needs to be selected according to the application environment)			
Hot Plug		Unavailable			

Output Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Output Voltage Accuracy	LS05-15B03SS(-F)	--	±2	±3	%
	LS05-15B05/09/12/15/24SS(-F)	--	±1	±2	
Line Regulation	Full load	--	±0.5	--	
Load Regulation	10% - 100% load	--	±1	±1.5	
Output Ripple & Noise*	20MHz bandwidth (peak-to-peak value)	--	50	150	mV
Temperature Coefficient		--	±0.02	--	%/°C
Stand-by Power Consumption		--	--	0.5	W
Short Circuit Protection		Hiccup, continuous, self-recovery			
Over-current Protection		≥ 150%Io, self-recovery			
Over-voltage Protection	3.3/5V output	≤ 7.5 V (Output voltage clamp)			
	9V output	≤ 15 V (Output voltage clamp)			

	12/15V output	≤ 20 V (Output voltage clamp)			
	24V output	≤ 30 V (Output voltage clamp)			
Minimum Load		0	--	--	%
Hold-up Time	115VAC input	10	15	--	ms
	230VAC input	65	75	--	

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	4000	--	--	VAC
Operating Temperature		-40	--	+85	°C	
Storage Temperature		-40	--	+105		
Storage Humidity		--	--	85	%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	2	--	--	% / °C	
	-25°C to +0°C	0.8	--	--		
	+55°C to +85°C	2	--	--		
	85VAC - 110VAC	0.8	--	--	% / VAC	
	240VAC - 305VAC	0.31	--	--		
Safety Standard	3.3V/5V/9V/15V/24V	IEC/EN/UL62368				
	12V	IEC/EN/UL62368、IEC61558-1/61558-2-16				
Safety Certification	3.3V/5V/9V/15V/24V	IEC/EN/UL62368				
	12V	IEC/EN/UL62368、IEC61558-1/61558-2-16				
Safety Class		CLASS II				
MTBF		MIL-HDBK-217F@25°C > 1,000,000 h				

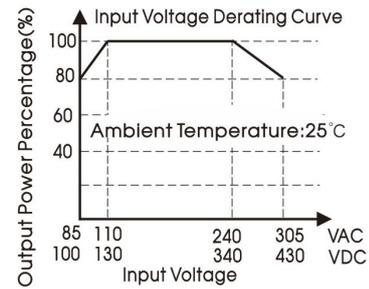
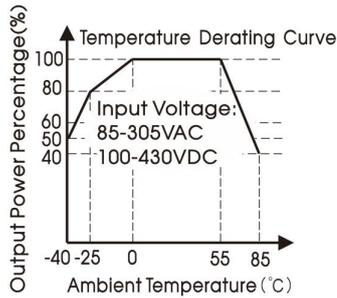
Mechanical Specifications

Dimension	Refer to the dimensions
Weight	7g (Typ.)
Cooling method	Free air convection

Electromagnetic Compatibility (EMC)

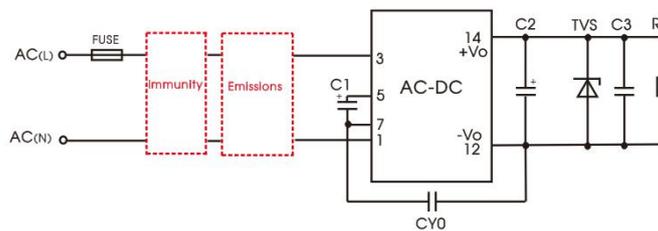
Emissions	CE	CISPR32/EN55032	CLASS A (Application circuit 1, 4)	
		CISPR32/EN55032	CLASS B (Application circuit 2, 3)	
	RE	CISPR32/EN55032	CLASS B (Application circuit 1, 2, 3, 4)	
Immunity	ESD	IEC/EN61000-4-2	Contact ±6KV Perf. Criteria B	
	RS	IEC/EN61000-4-3	10V/m perf. Criteria A	
	EFT	IEC/EN61000-4-4	±2KV (Application circuit 1, 2)	perf. Criteria B
		IEC/EN61000-4-4	±4KV (Application circuit 3, 4,)	perf. Criteria B
	Surge	IEC/EN61000-4-5	line to line ±1KV (Application circuit 1)	perf. Criteria B
		IEC/EN61000-4-5	line to line ±2KV (Application circuit 4)	
		IEC/EN61000-4-5	line to line ±1KV/line to ground ±2KV (Application circuit 2)	perf. Criteria B
		IEC/EN61000-4-5	line to line ±2KV/line to ground ±4KV (Application circuit 3)	
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/240 - 305VAC and a DC input between 100 - 130VDC/340 - 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 series additional circuits design reference (No EMC devices)

LS05(-F) series additional components selection guide (No EMC devices)

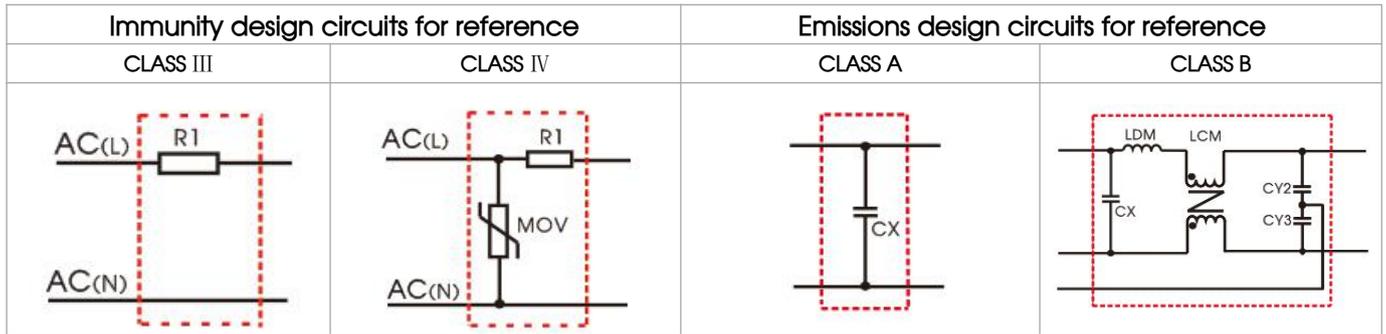
Part No.	C1(required)	C2(required)	C3 (required)	CY0	TVS
LS05-15B03SS(-F)	10uF/450V (-25°C to +85°C) 22uF/450V (-40°C to +85°C)	220uF/16V (-25°C to +85°C)	0.1uF/50V	1nF/400VAC	SMBJ7.0A
LS05-15B05SS(-F)		470uF/16V (-40°C to +85°C)			SMBJ7.0A
LS05-15B09SS(-F)		220uF/25V (-25°C to +85°C)			SMBJ12A
LS05-15B12SS(-F)		470uF/25V (-40°C to +85°C)			SMBJ20A
LS05-15B15SS(-F)		150uF/35V (-25°C to +85°C)			SMBJ20A
LS05-15B24SS(-F)		470uF/35V (-40°C to +85°C)			SMBJ30A

- Note:
- C1 is used as filter capacitor with AC input (must be connected externally) and as EMC filter capacitor with DC input(must be connected). The recommended value of C1 is 10uF/400V(85Vac-264Vac), 10uF/450V(85Vac-305Vac);10uF /400V(100Vdc-370Vdc), 10uF/450V(100Vdc-430Vdc).
 - We recommend using an electrolytic capacitor with high frequency and low ESR rating for C2 (refer to manufacture's datasheet). Choose a capacitor voltage rating with at least 20% margin, in other words not exceeding 80%. C3 is a ceramic capacitor used for filtering high-frequency noise. A suppressor diode (TVS) is 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

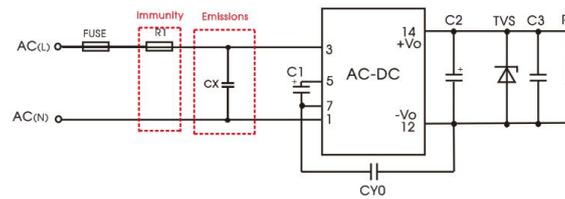
LS(-F) series environmental application EMC solution selection table

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
4	Outdoor general environment	ITS/Video monitoring/Charging point/Communication/Security and protection		-40°C to +85°C	CLASS A	CLASS IV



Electromagnetic Compatibility Solution—Recommended Circuit

1. Application circuit 1—Basic application



Recommended circuit 1

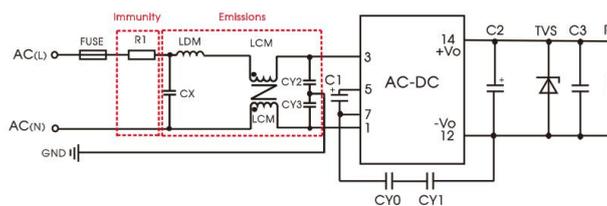
Application environmental	Ambient temperature range	Immunity CLASS	Emissions CLASS
Basic application	-40°C to +85°C	CLASS III	CLASS A

Component	Recommended value
R1 (wire-wound resistor, required)	12Ω /3W
CX	0.1uF/310VAC
FUSE	1A/300V, slow-blow

Note 1: According to the certification requirements, the X capacitor needs to be connected in parallel with the bleeder resistance, the recommended resistance value is less than 3.8MΩ, and the actual need to be selected according to the certification standard.

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.

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



Recommended circuit 2

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

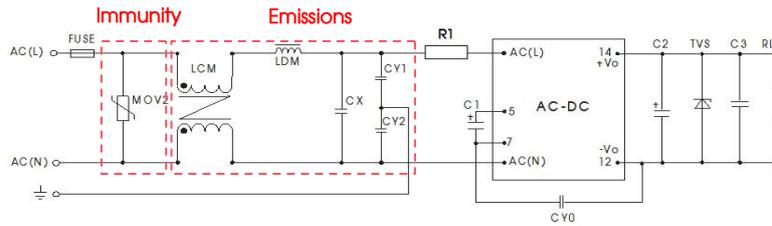
Component	Recommended value
R1 (wire-wound resistor, required)	12Ω /3W
CY0(CY1)	1nF/400VAC
LCM	3.5mH (MIN: 0.2A, MAX: 200mΩ)
LDM	0.33mH (MIN: 0.4A, MAX: 1Ω)
CX	0.1uF/310VAC
CY2/CY3	1nF/400VAC
FUSE (required)	1A/300V, slow-blow

Note 1: In the home appliance application environment, the two Y capacitors of the primary and secondary need to be externally connected (CY0/CY1, value at 2.2nF/250VAC), which can meet the EN60335 certification.

Note 2: According to the certification requirements, the X capacitor needs to be connected in parallel with the bleeder resistance, the recommended resistance value is less than 3.8MΩ, and the actual need to be selected according to the certification standard.

Note 3: 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. Application circuit 3—Universal system recommended circuits for indoor industrial environment



Recommended circuit 3

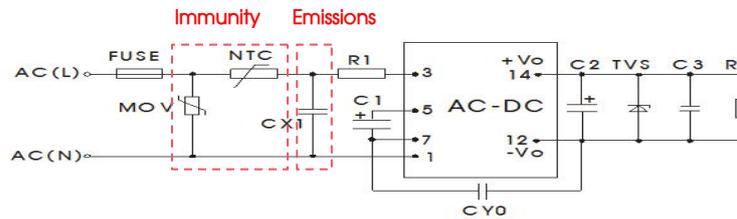
Application environmental	Ambient temperature range	Immunity CLASS	Emissions CLASS
Indoor industrial environment	-25°C to +55°C	CLASS IV	CLASS B

Component	Recommended value
R1 (wire-wound resistor, required)	12 Ω /3W
LCM	3.5mH (MIN: 0.2A, MAX: 200mΩ)
LDM	0.33mH (MIN: 0.4A, MAX: 1 Ω)
CX	0.1uF/310VAC
CY1, CY2	1nF/400VAC
FUSE (required)	2A/300V, slow-blow
MOV2	S14K350

Note 1: According to the certification requirements, the X capacitor needs to be connected in parallel with the bleeder resistance, the recommended resistance value is less than 3.8MΩ, and the actual need to be selected according to the certification standard.

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.

4. Application circuit 4—Universal system recommended circuits for outdoor general/harsh Environment



Recommended circuit4

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

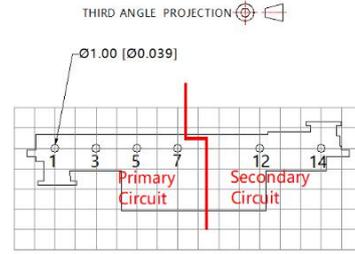
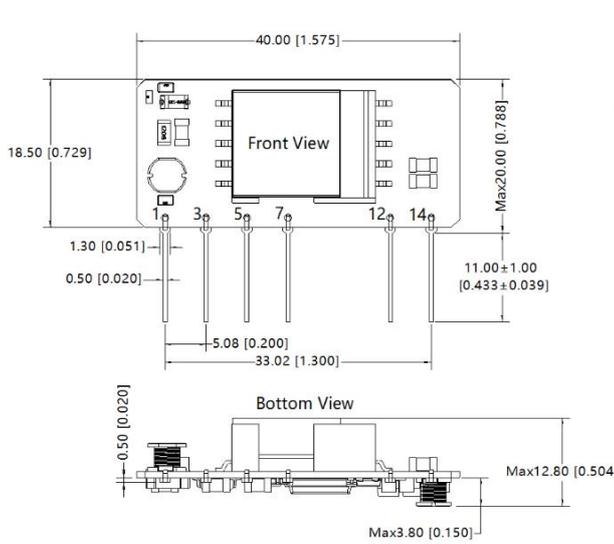
Component	Recommended value
R1 (wire-wound resistor, required)	12 Ω /3W
CX1	0.1uF/310VAC
NTC	13D-5
MOV	S14K350
FUSE	1A/300V, slow-blow

Note 1: According to the certification requirements, the X capacitor needs to be connected in parallel with the bleeder resistance, the recommended resistance value is less than 3.8MΩ, and the actual need to be selected according to the certification standard.

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.

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

LS05-15BxxSS Dimensions and Recommended Layout



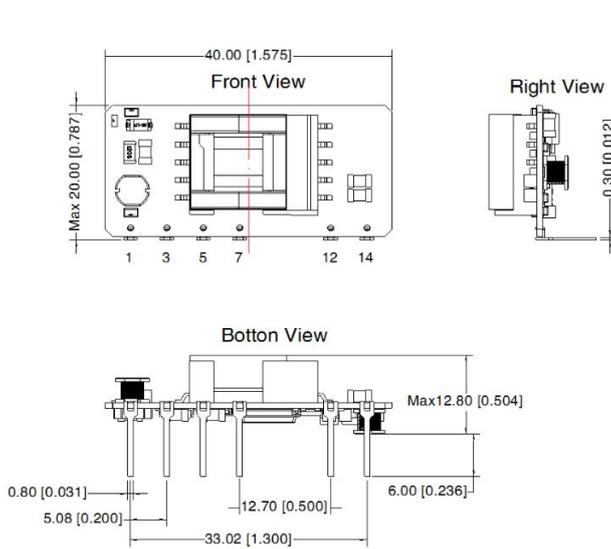
Note: Grid 2.54*2.54mm

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

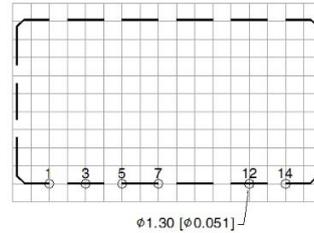
1. It is necessary to add C1 between pin5 and pin7.
2. It is necessary to add circuit to the output, such as the recommended circuit 1.
3. It is needed to have distance ≥ 6.4 mm for safety between external componets in primary circuit and secondary circuit.
4. After final installation, all requirement for class II of IEC61558-2-16 shall be fulfilled in end system. Installation should be operated by professionals.

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

LS05-15BxxSS-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)
12	-Vo
14	+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 recommended circuit 1;
3. It is needed to have distance ≥ 6.4 mm for safety between external componets in primary circuit and secondary circuit.
4. After final installation, all requirement for class II of IEC61558-2-16 shall be fulfilled in end system. Installation should be operated by professionals.

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: 58220086(LS05-15BxxSS); 58220026(LS05-15BxxSS-F);
2. This part is open frame, at least 6.4mm safety distance between the the primary and secondary external components of the module is needed to meet the safety requirement;
3. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25°C, humidity<75% with nominal input voltage and rated output load;
4. All index testing methods in this datasheet are based on our company corporate standards;
5. We can provide product customization service, please contact our technicians directly for specific information;
6. Products are related to laws and regulations: see "Features" and "EMC";
7. 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.

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