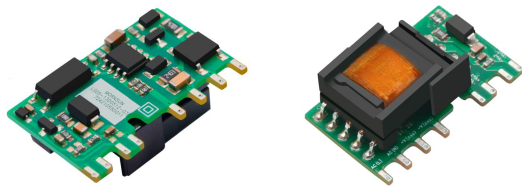


5W, AC-DC converter



RoHS



EN62368-1

LS05-13Dxx series is one of Mornsun's highly efficient green power with multiple outputs AC-DC converter series. They feature wide input range accepting either AC or DC voltage, high reliability, 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.

## 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
- Multi application, flexible layout
- Compact size, high power density, green power
- Output short circuit, over-current, over-voltage protection

## Selection Guide

Certification	Part No.	Output Power	Nominal Output Voltage and Current		Efficiency at 230VAC (%) Typ.	Capacitive Load (uF) Max.	
			(Vo1/Io1)	(Vo2/Io2)		Vo1	Vo2
EN	LS05-13D0512-03	5W	5V/200mA	12V/330mA	78	680	470
	LS05-13D0524-01		5V/200mA	24V/167mA	78	680	120

## 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
	230VAC	--	--	0.1	
Inrush Current	115VAC	--	20	--	
	230VAC	--	40	--	
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	Vo1	--	±2	--	%
	Vo2	--	±5	--	
Line Regulation	Full load	Vo1	±0.5	--	
		Vo2	±1.5	--	
Load Regulation	10%-100% load (balanced load)	Vo1	±1	--	
		Vo2	±5	--	
Cross Regulation	10%-100% load	--	--	20	
Ripple & Noise*	20MHz bandwidth (peak-to-peak value)	Vo1	50	100	mV
		Vo2	80	120	
Temperature Coefficient	Vo1	--	±0.15	--	%/°C
Short Circuit Protection		Continuous, self-recovery			
Over-current Protection	Normal temperature, high temperature	≥ 120%Io, self-recovery			

	Low temperature	≥105%Io, self-recovery			
Over-voltage Protection	Vo1	5V output	≤7.5VDC		
	Vo2	12V output	≤20VDC		
		24V output	≤35VDC		
Minimum Load		10	--	--	%
Hold-up Time	115VAC input	--	8	--	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 Vo1-Vo2	Electric Strength Test for 1min., leakage current <5mA		3600	--	VAC
		5000	--	--	VDC	
		500	--	--	VDC	
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	+60°C to +85°C	2.0	--	--	%/°C	
	85VAC - 100VAC	1.33	--	--	%VAC	
	277VAC - 305VAC	0.71	--	--		
Safety Standard		Design refer to IEC/UL62368-1, IEC/EN60335-1, IEC/EN61558-1 & EN62368-1 (Report)				
Safety Class		CLASS II				
MTBF		MIL-HDBK-217F@25°C > 1,000,000 h				

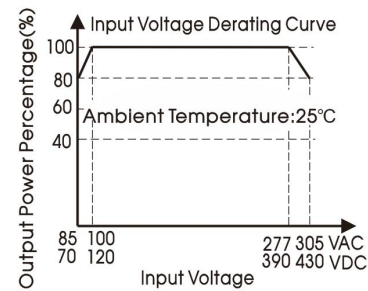
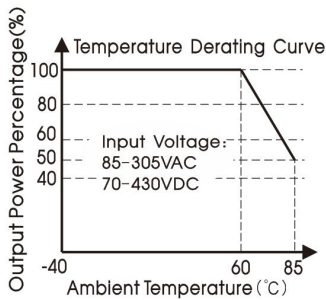
### Mechanical Specifications

Dimension	29.54 x 15.70 x 12.00 mm
Weight	5.6g(Typ.)
Cooling method	Free air convection

### Electromagnetic Compatibility (EMC)

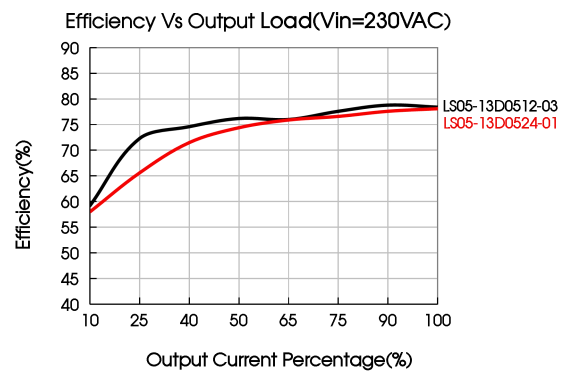
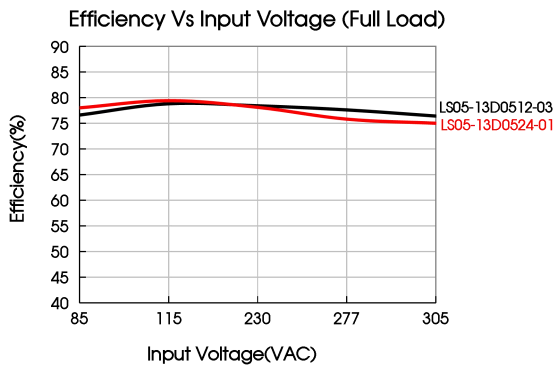
Emissions	CE	CISPR32/EN55032	CLASS A (Application circuit 1, 4)	
		CISPR32/EN55032	CLASS B (Application circuit 2, 3)	
	RE	CISPR32/EN55032	CLASS A (Application circuit 1, 4)	
		CISPR32/EN55032	CLASS B (Application circuit 2, 3)	
Immunity	ESD	IEC/EN61000-4-2	Contact ±6KV /Air ±8KV	Perf. Criteria B
	RS	IEC/EN61000-4-3	10V/m	perf. Criteria A
	EFT	IEC/EN61000-4-4	±4KV (Application circuit 1, 2, 3, 4)	perf. Criteria B
	Surge	IEC/EN61000-4-5	line to line ±1KV (Application circuit 1, 2)	perf. Criteria B
		IEC/EN61000-4-5	line to line ±2KV (Application 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

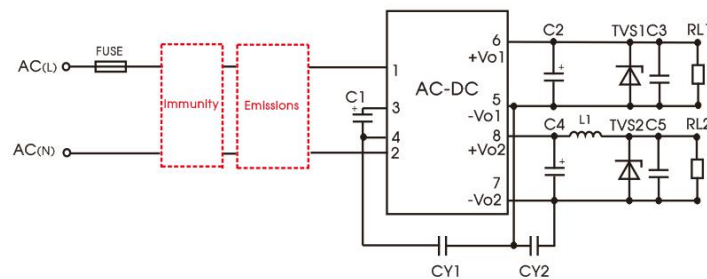


Note:

- ① With an AC input between 85 -100VAC/277- 305VAC and a DC input between 70 - 120VDC/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



Additional circuits design reference

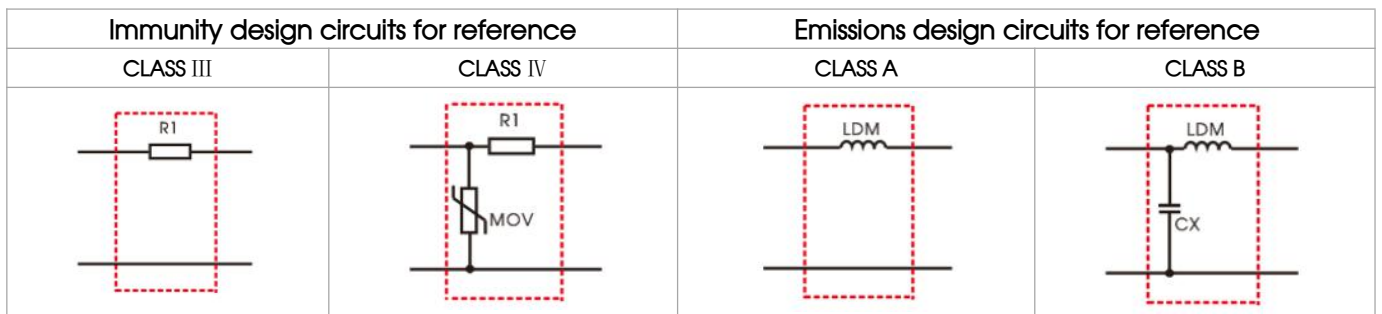
Additional components selection guide (No EMC devices)

Part No.	FUSE (required)	C1 (required)	C2 (required)	C5 (required)	L1 (required)	C3/C5	CY1	CY2	TVS1	TVS2
LS05-13D0512-03	1A/ 300V	10uF/450V (-25°C to +85°C, 85-305VAC input; -40°C to +85°C, 165-305VAC input)	100uF/16V (solid-state capacitor)	270uF/16V (solid-state capacitor)	4.7uH	0.1uF/ 50V	1nF/ 400VAC	1nF/ 250VAC	SMBJ7.0A	SMBJ20A
LS05-13D0524-01				220uF/35V						SMBJ30A

- Note:
1. C1: AC input, DC input, must be connected, and it is recommended to use the capacitor with ripple current >200mA@100KHz.
  2. We recommend using an electrolytic capacitor with high frequency and low ESR (ESR of C2 at low temperature of -40°C ≤ 1.1Ω) rating for C2, C4 (refer to manufacture's datasheet), electrolytic capacitor can be used for C2 when applied in normal and high temperature environments. Combined with C4, L1, they form a pi-type filter circuit. Choose a capacitor voltage rating with at least 20% margin, in other words not exceeding 80%. C3, C5 is a ceramic capacitor, used for filtering high frequency noise.
  3. 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.
  4. LDM (1.2mH, P/N: 12050373; 4.7mH, P/N: 12050305); L1 (4.7uH, P/N: 12050181) Mornsun quotation is available.

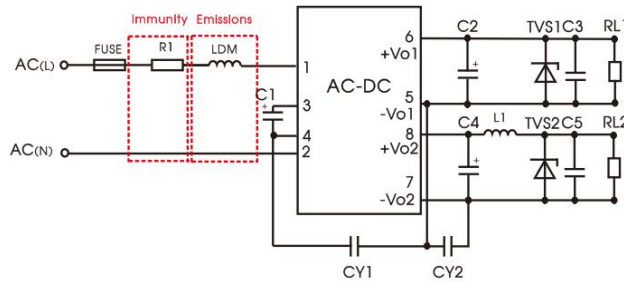
Environmental Application EMC Solution

Recommended circuit	Application environmental	Typical industry	Input voltage range	Environment temperature	Emissions	Immunity
1	Basic application	None	85~305VAC	-40℃ to +85℃	CLASS A	CLASS III
2	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
3	Indoor industrial environment	Manufacturing workshop		-40℃ to +85℃	CLASS A	CLASS IV
4	Outdoor general environment	ITS/Video monitoring/Charging point/Communication/Security and protection				



Electromagnetic Compatibility Solution--Recommended Circuit

1. Application circuit 1—Basic application



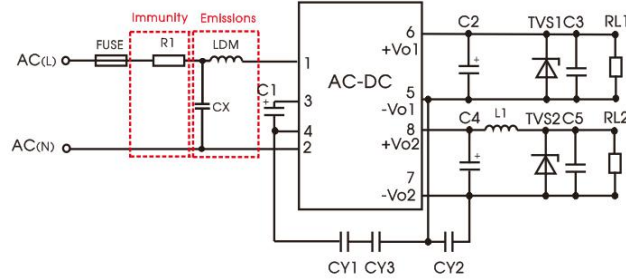
recommended circuit 1

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

FUSE	1A/300V, slow-blow, required
R1	12Ω /2W (wire-wound resistor, required)
LDM	1.2mH

Note 1: 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.  
Note 2: LDM is the inductor of the input plug-in, the inductance with saturation current ≥0.2A should be selected.

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℃ to +55℃	CLASS III	CLASS B

Component	Recommended value
R1	12 Ω /2W (wire-wound resistor, required)
LDM	1.2mH
CX	0.1uF/310VAC
FUSE	1A/300V, slow-blow, required

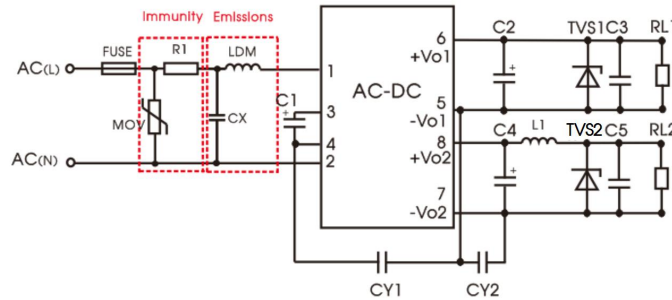
Note 1: In the home appliance application environment, the two Y capacitors of the primary and secondary need to be externally connected (CY1/CY3, value at 2.2nF/250VAC), which can meet the EN60335 certification.

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 3.8M Ω, 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.

Note 4: LDM is the inductor of the input plug-in, the inductance with saturation current  $\geq 0.2A$  should be selected.

### 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	-25℃ to +55℃	CLASS IV	CLASS B

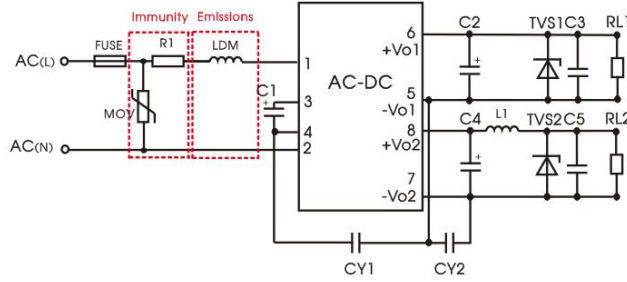
Component	Recommended value
MOV	S14K350
CX	0.1uF/310VAC
LDM	4.7mH
R1	12 Ω /3W (wire-wound resistor, required)
FUSE	2A/300V, slow-blow, required

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 3.8M Ω, 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.

Note 3: LDM is the inductor of the input plug-in, the inductance with saturation current  $\geq 0.2A$  should be selected.

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



Recommended circuit 4

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

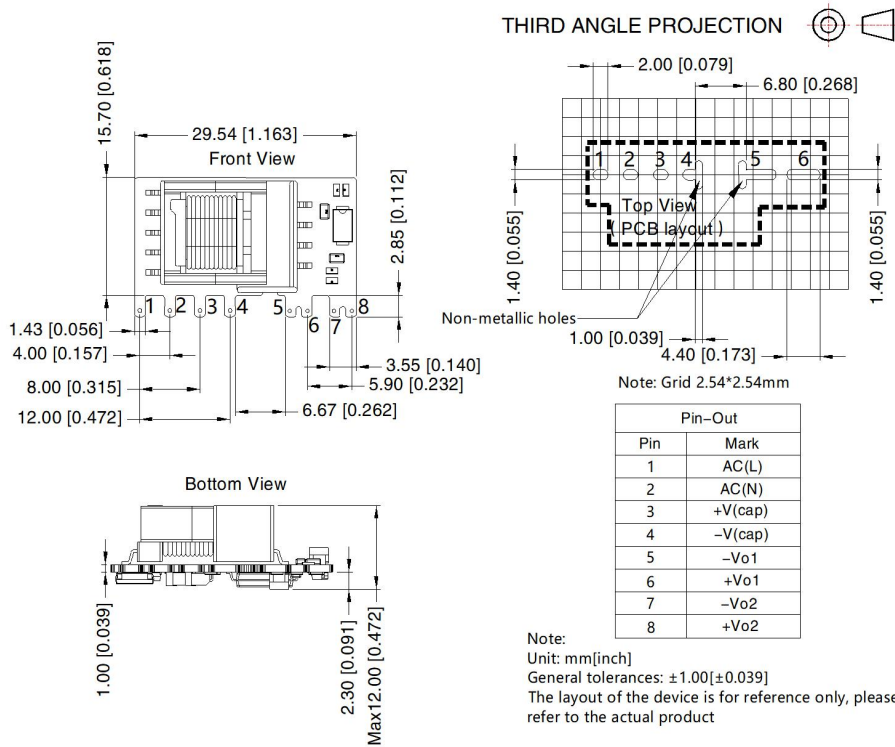
Component	Recommended value
MOV	S14K350
LDM	4.7mH
R1	12 Ω /3W (wire-wound resistor, required)
FUSE	2A/300V, slow-blow, required

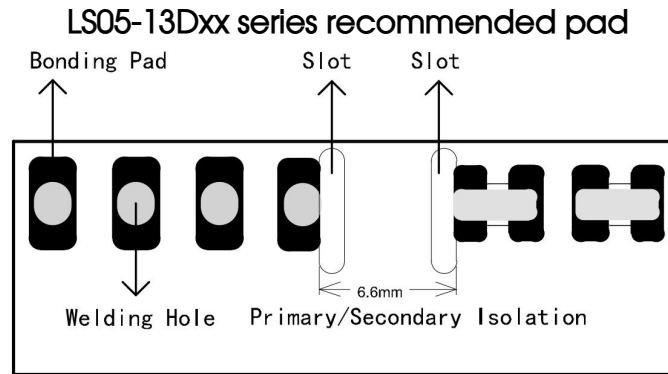
Note 1: R1 is the input plug-in resistor, this resistor needs to be a wire-wound resistor (required), please do not select chip resistor or carbon film resistor.  
Note 2: LDM is the inductor of the input plug-in, the inductance with saturation current  $\geq 0.2A$  should be selected.

5. For additional information please refer to application notes on [www.mornsun-power.com](http://www.mornsun-power.com).

Dimensions and Recommended Layout

LS05-13Dxx series dimensions





Note: There is a slot(non-metallic hole) between pin 4/5, which the side pad were being cut off. For details, please refer to the recommended dimensions or pad.

Note:

1. For additional information on Product Packaging please refer to [www.mornsun-power.com](http://www.mornsun-power.com). Packaging bag number: 58220085;
2. External electrolytic capacitors are required to modules, more details refer to typical applications;
3. This part is open frame, at least 6.4mm creepage distance between the primary and secondary external components of the module is needed to meet the safety requirement, refer to the recommended welding hole design in the external dimension drawing;
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. All index testing methods in this datasheet are based on our company corporate standards;
6. We can provide product customization service, please contact our technicians directly for specific information;
7. Products are related to laws and regulations: see "Features" and "EMC";
8. 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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