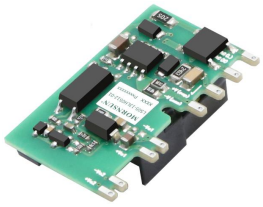
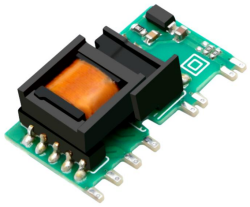
AC/DC Converter
LS05-13Hxx Series

MORNSUN®

5W, AC-DC converter





CE Report EN62368-1 RoHS 3 years Warranty

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℃ to +85℃
- Dual output, high I/O isolation test voltage up to 3000VAC (Vo1-Vo2)
- Multi application, compact size, flexible layout
- High power density, green power
- Output short circuit, over-current, over-voltage protection

LS05-13Hxx series is one of Mornsun's small volume and highly isolated power with multiple outputs AC-DC converter series. They feature wide input range accepting either AC or DC voltage, high reliability 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 (uF) Max.	
			(Vo1/Io1)	(Vo2/Io2)		Vo1	Vo2
EN	LS05-13H0505-02	5W	5V/800mA	5V/200mA	76	1000	470
	LS05-13H0512-01		5V/760mA	12V/100mA	77	1000	470

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		--	±8	--	
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		--	12	20	
Ripple & Noise*	20MHz bandwidth (peak-to-peak value)	Vo1	--	50	120	mV
		Vo2	--	80	150	
Temperature Coefficient	Vo1		--	±0.15	--	%/℃
Short Circuit Protection			Continuous, self-recovery			
Over-current Protection	Io is the load point for voltage derating		⩾110% Io, self-recovery			

Over-voltage Protection	Vo1/Vo2	5V output	≤7.5VDC			
		12V output	≤20VDC			
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	Electric Strength Test for 1min., leakage current <5mA	3600	--	--	VAC
			5000	--	--	VDC
	Vo1-Vo2		3000	--	--	VAC
Insulation Resistance	Input-output	At 500VDC	50	--	--	MΩ
Operating Temperature			-40	--	+85	℃
Storage Temperature			-40	--	+105	
Storage Humidity			--	--	95	%RH
Soldering Temperature		Wave-soldering	260 ± 5℃; time：5 - 10s			
		Manual-welding	360 ± 10℃; time：3 - 5s			
Switching Frequency			--	65	--	kHz
Power Derating		+60℃ to +85℃	2.0	--	--	%/℃
		85VAC - 110VAC	0.8	--	--	%/VAC
		277VAC - 305VAC	0.71	--	--	
Safety Standard			EN62368-1 Safety Approval; Design refer to IEC/UL62368-1, IEC/EN60335-1, IEC/EN61558-1 standards			
Safety Class			CLASS II			
MTBF			MIL-HDBK-217F@25℃ >1,000,000 h			

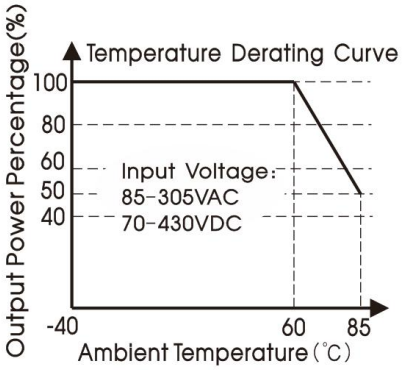
Mechanical Specifications

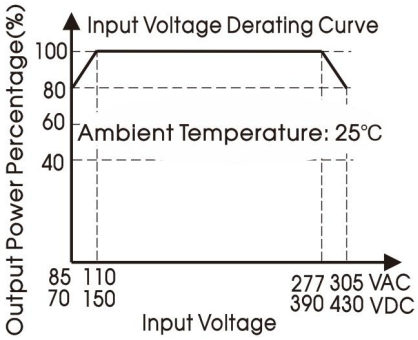
Dimension	32.84 x 16.79 x 12.00 mm
Weight	6.0g (Typ.)
Cooling method	Free air convection

Electromagnetic Compatibility (EMC)

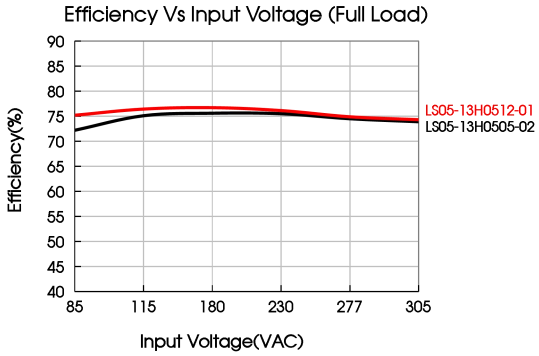
Emissions	CE	CISPR32/EN55032	CLASS A (Application circuit 1, 4)	
		CISPR32/EN55032	CLASS B (Application circuit 2, 3)	
	RE	CISPR32/EN55032	CLASS B (Application circuit 1, 2, 3, 4)	
Immunity	ESD	IEC/EN61000-4-2	Contact ±8KV /Air ±15KV	perf. Criteria B
	RS	IEC/EN61000-4-3	10V/m	perf. Criteria A
	EFT	IEC/EN61000-4-4	±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

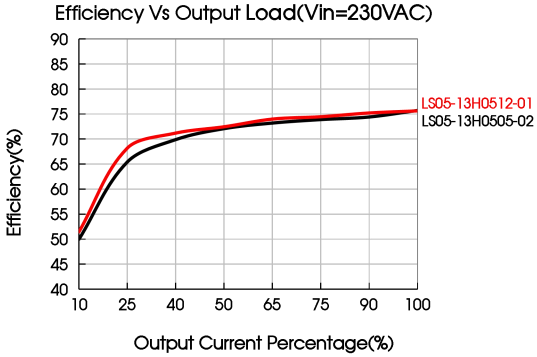
Product Characteristic Curve



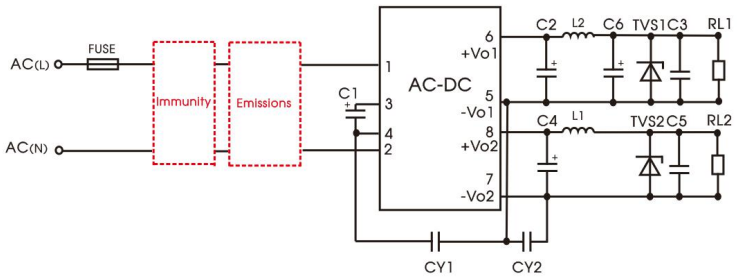


Note: ① With an AC input between 85 -110VAC/277- 305VAC and a DC input between 70 - 150VDC/390 - 430VDC, the output power must be derated as per temperature derating curves;
② This product is suitable for applications using natural air cooling; for applications in closed environment please consult Mornsun FAE.





Additional Circuits Design Reference



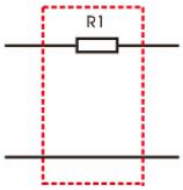
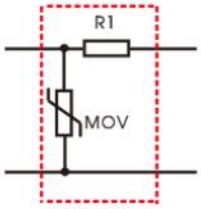
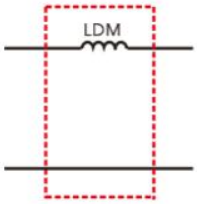
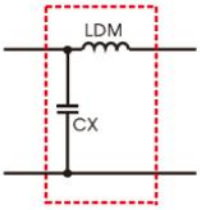
Additional circuits design reference

Additional components selection guide (No EMC devices)											
Part No.	FUSE (required)	C1 (required)	C2 (required)	C6	C4 (required)	L1/L2 (required)	C3/C5	CY1	CY2	TVS1	TVS2
LS05-13H0505-02	1A/300V	10uF/450V (-25℃ to +85℃, 85-305VAC input; -40℃ to +85℃, 165-305VAC input) 22uF/450V (-40℃ to +85℃, 85-305VAC input)	270uF/16V (solid-state capacitor)	47uF/25V	100uF/16V (solid-state capacitor)	4.7uH	0.1uF/ 50V	1nF/ 400VAC	1nF/ 250VAC	SMBJ7.0A	SMBJ7.0A
LS05-13H0512-01					100uF/25V (solid-state capacitor)						SMBJ20A

Note:
1. C1: AC input, DC input, must be connected, and it is recommended to use the capacitor with ripple current >200mA@100KHz. The capacitor of 10uF/450V can work normally after startup (-40℃ to +85℃, 85-305VAC input);
2. C2, C4, C6 is the output filter capacitor (required), we recommend using an electrolytic capacitor with high frequency and low ESR (ESR at low temperature of -40℃≤1.1Ω) rating for C2, C4 (refer to manufacture's datasheet), electrolytic capacitor can be used for C2/C4 when applied in normal and high temperature environments. 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.

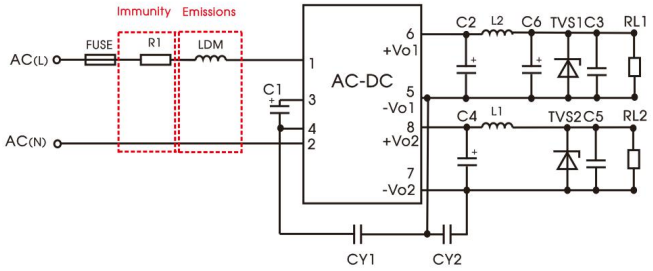
Environmental Application EMC Solution

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

Immunity design circuits for reference		Emissions design circuits for reference	
Level 3	Level 4	Class A	Class B
			

Electromagnetic Compatibility Solution--Recommended Circuit

1. Application circuit 1——Basic application

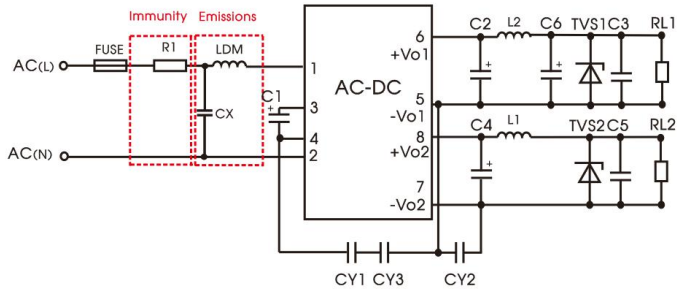


recommended circuit 1

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

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 SMD 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

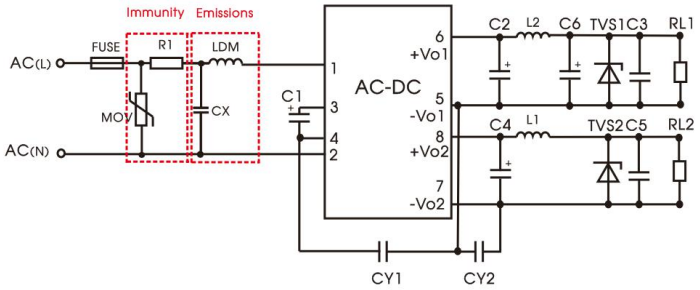


Recommended circuit 2

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

Component	Recommended value
R1	12Ω/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 3.8MΩ, 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 SMD resistor or carbon film resistor. Note 4: LDM is the inductor of the input plug-in, the inductance with saturation current≥0.2A should be selected.			

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

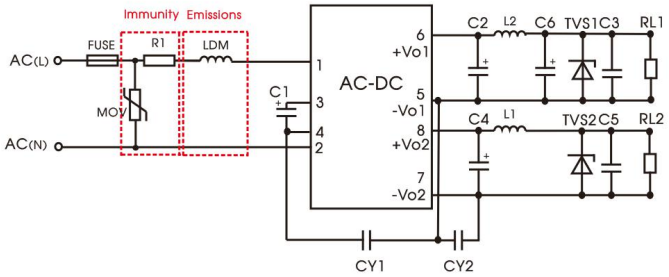


Recommended circuit 3

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

Component	Recommended value
MOV	S14K350
CX	0.1uF/310VAC
LDM	1.2mH
R1	24Ω/5W (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 3.8MΩ, 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 SMD resistor or carbon film resistor. Note 3: LDM is the inductor of the input plug-in, the inductance with saturation current≥0.2A should be selected.	

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



Recommended circuit 4

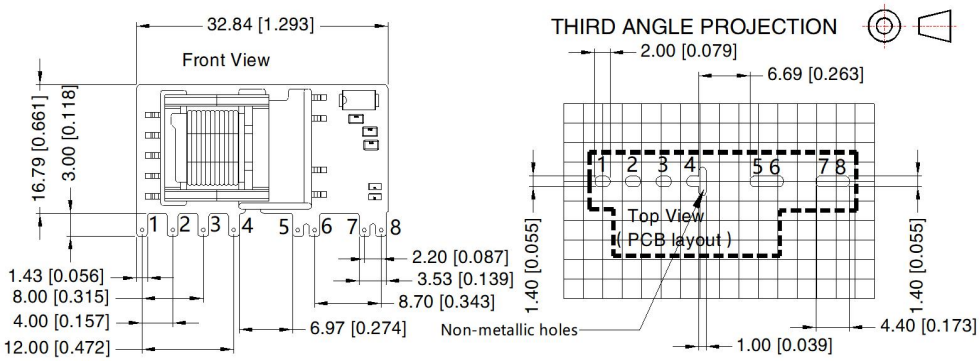
Application environmental	Ambient temperature range	Immunity Level	Emissions Class
Outdoor general environment	-40℃ to +85℃	Level 4	Class A

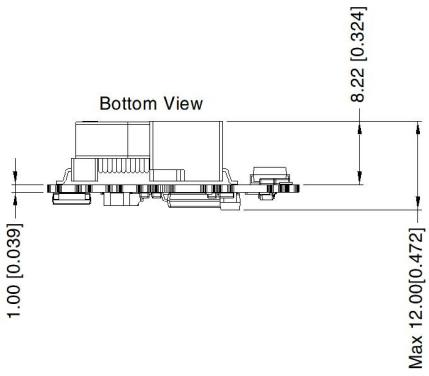
Component	Recommended value
MOV	S14K350
LDM	1.2mH
R1	24Ω/5W (wire-wound resistor, required)
FUSE	2A/300V, slow-blow, required
Note 1: R1 is the input plug-in resistor, this resistor needs to be a wire-wound resistor (required), please do not select SMD resistor or carbon film resistor. Note 2: LDM is the inductor of the input plug-in, the inductance with saturation current≥0.2A should be selected.	

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

Dimensions and Recommended Layout

LS05-13Hxx series dimensions



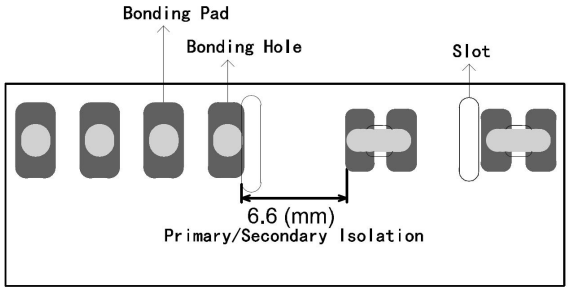


Note: Grid 2.54*2.54mm

Pin–Out	
Pin	Mark
1	AC(L)
2	AC(N)
3	+V(cap)
4	–V(cap)
5	–Vo1
6	+Vo1
7	–Vo2
8	+Vo2

Note:
Unit: mm[inch]
Pin section tolerances: ±0.10[±0.004]
General tolerances: ±1.00[±0.039]
The layout of the device is for reference only, please refer to the actual product

LS05-13Hxx series recommended pad



Note: There is a slot(non-metallic hole) between pin 4, 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. Packaging bag number: 58220084;
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 Ta=25℃, 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. If product involves multi-brand materials and there are differences in color etc, please refer to the standards of each manufacturer;
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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