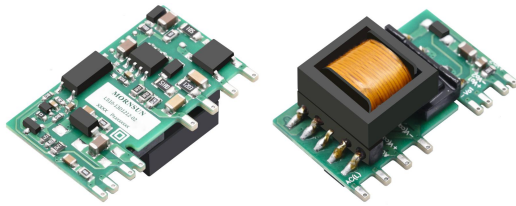


AC/DC Converter

LS10-13Dxx Series

MORNSUN®

10W, AC-DC converter



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
- High isolation dual output
- Multi application, compact size, flexible layout
- Output short circuit, over-current, over-voltage protection

LS10-13Dxx 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 efficiency, high reliability, low power consumption and reinforced isolation. It meets IEC/EN61558, IEC/EN60335, IEC/EN/UL62368 standards. 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 (Pending)	LS10-13D0505-06	10W	5V/1400mA	5V/600mA	77	470	330
	LS10-13DY505-06		5.7V/1230mA	5V/600mA	77	470	330
	LS10-13DY512-04		5.7V/910mA	12V/400mA	80	470	200
	LS10-13DY524-02		5.7V/910mA	24V/200mA	80	330	100
	LS10-13D1212-02		12V/630mA	12V/200mA	82	200	100

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	--	--	0.3	A
	230VAC	--	--	0.2	
Inrush Current	115VAC	--	20	--	
	230VAC	--	40	--	
leakage Current	277VAC/50Hz	0.25mA RMS Max			
Recommended External Input Fuse		2A/300V, slow-blow, required			
Hot Plug		Unavailable			

Output Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Output Voltage Accuracy	Vo1	--	±2	--	%
	Vo2	--	±8	--	
Line Regulation	Full load	Vo1	±1	--	
		Vo2	±1.5	--	
Load Regulation	10%-100% load (balanced load)	Vo1	±1	--	
		Vo2	±5	--	
Cross Regulation	10%-100% load	LS10-13D0505-06	--	±30	mV
		LS10-13DY505-06	--	±30	
		Others	--	±20	
Ripple & Noise*	20MHz bandwidth (peak-to-peak value)	--	80	150	mV

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AC/DC Converter

LS10-13Dxx Series

MORNSUN®

Standby Power Consumption	230VAC	--	--	0.3	W
Temperature Coefficient	Vo1	--	±0.15	--	%/°C
Short Circuit Protection	Hiccup, continuous, self-recovery				
Over-current Protection	≥110%Io, self-recovery				
Over-voltage Protection	Vo1	5V/5.7V output	≤9VDC (Output Voltage hiccup or clamp)		
		12V output	≤16VDC (Output Voltage hiccup or clamp)		
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
	Vo1-Vo2		5000	--	--	VDC
			500	--	--	
Insulation	Input-output	At 500VDC	100	--	--	M Ω
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	0.714	--	--	
Safety Standard			Design refer to IEC/EN61558-1, IEC/EN60335-1, IEC/EN/UL62368-1			
Safety Class			CLASS II			
MTBF			MIL-HDBK-217F@25°C > 1,000,000 h			

Mechanical Specifications

Dimension	34.50 x 18.00 x 14.75 mm
Weight	10g(Typ.)
Cooling method	Free air convection

Electromagnetic Compatibility (EMC)

EMI	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)	
EMS	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	±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)	
	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

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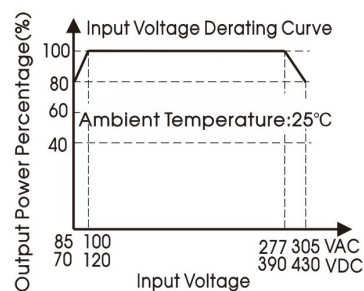
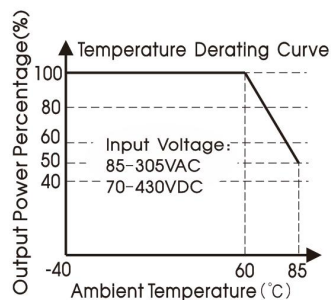
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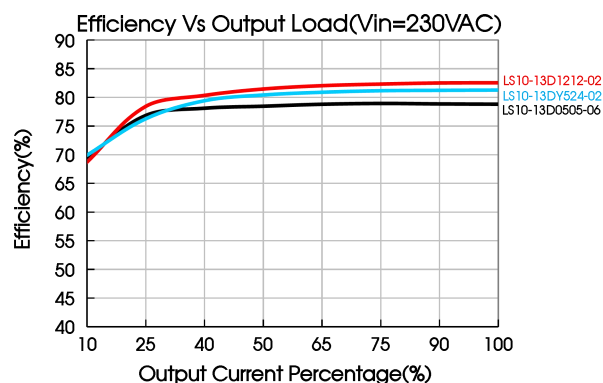
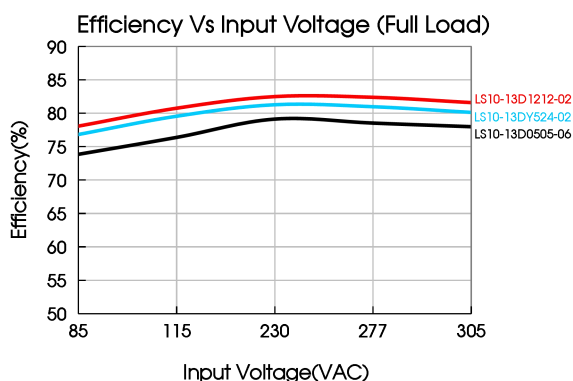
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Product Characteristic Curve

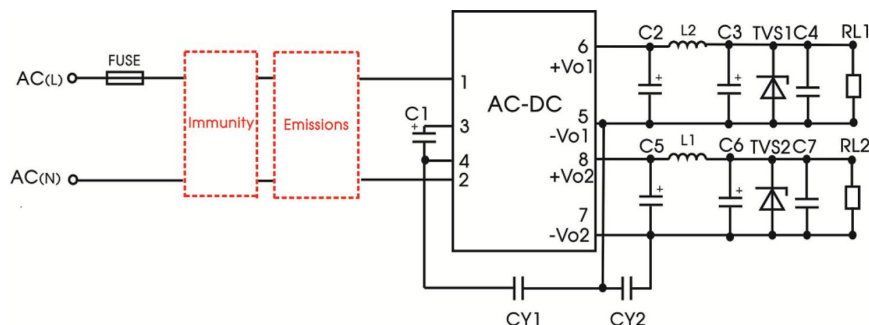


Note:

- 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 components selection guide (No EMC devices)

Additional components selection guide (No EMC devices)												
Part No.	FUSE (required)	C1 (required)	C2 (required)	C5 (required)	L1/L2 (required)	C3	C6	C4/C7	CY1	CY2	TVS1	TVS2
LS10-13D0505-06	2A/300V	22uF/ 450V	470uF/ 16V (solid-state capacitor)	220uF/16V	2.2uH	220uF/ 16V	220uF/ 16V	0.1uF/ 50V	1nF/ 400VAC	1nF/ 250VAC	SMBJ7.0A	SMBJ7.0A
LS10-13DY505-06											SMBJ12A	SMBJ7.0A
LS10-13DY512-04											SMBJ12A	SMBJ20A
LS10-13DY524-02											SMBJ12A	SMBJ30A
LS10-13D1212-02											SMBJ20A	SMBJ20A

Note:

1. C1: input capacitors; C2, C5: 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, L2, they form a pi-type filter circuit. Choose a capacitor voltage rating with at least 20% margin, in other words not exceeding 80%. C4, C7 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. The distance of the original secondary side isolation belt is greater than 6mm to meet the safety requirements; In the peripheral layout, it is also necessary to pay attention to the creepage distance greater than 6mm and the electrical clearance greater than 5.5mm, which can meet the certification as a whole together with the periphery.
5. LDM (2.2mH, P/N: 12050564); L1/L2 (2.2uH, P/N: 12050329) Mornsun quotation is available.

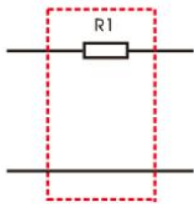
Environmental Application EMC Solution

Environmental application EMC solution selection table

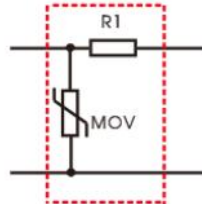
Recommended circuit	Application environmental	Typical industry	Input voltage range	Environment temperature	Emissions	Immunity
1	Basic application	None	85~305VAC	-40℃ to +85℃	CLASS A	CLASS III
2	Indoor civil environment	Smart home/Home appliances (2Y)		-25℃ to +55℃	CLASS B	CLASS III
	Indoor general environment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

Immunity design circuits for reference

CLASS III

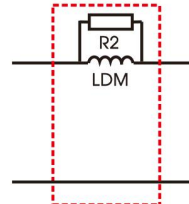


CLASS IV

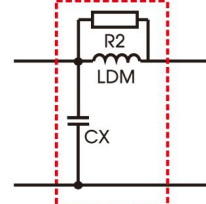


Emissions design circuits for reference

CLASS A

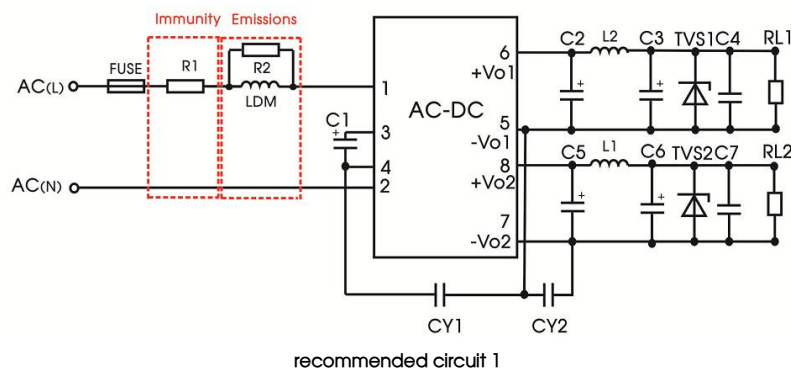


CLASS B



Electromagnetic Compatibility Solution--Recommended Circuit

1. Application circuit 1—Basic application

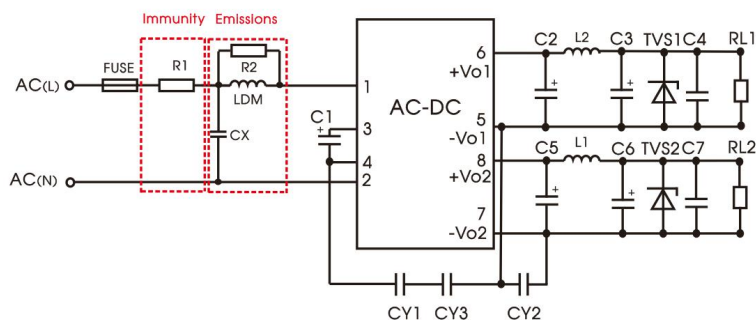


Application environmental	Ambient temperature range	Immunity CLASS	Emissions CLASS
Basic application	-40℃ to +85℃	CLASS III	CLASS A

Component	Recommended value
FUSE	2A/300V, slow-blow, required
R1	6.8Ω /3W (wire-wound resistor, required)
R2	10K/1206/(1/4W) (chip resistor)
LDM	2.2mH

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 $\geq 0.31A$ 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°C to +55°C	CLASS III	CLASS B

Component	Recommended value
FUSE	2A/300V, slow-blow, required
R1	6.8 Ω /3W (wire-wound resistor, required)
R2	10K/1206/(1/4W) (chip resistor)
CX	0.1uF/305VAC
LDM	2.2mH

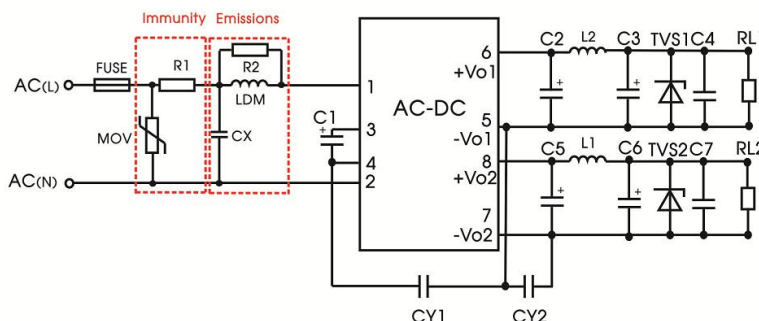
Note 1: In the home appliance application environment, the two Y capacitors of the primary and secondary need to be externally connected (CY1/CY3, value at 2.2nF/250VAC), which can meet the EN60335 certification.

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 chip resistor or carbon film resistor.

Note 4: LDM is the inductor of the input plug-in, the inductance with saturation current $\geq 0.31\text{A}$ 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°C to +55°C	CLASS IV	CLASS B

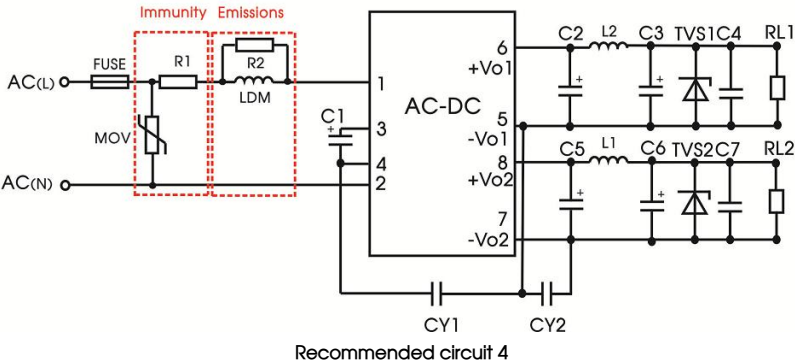
Component	Recommended value
FUSE	2A/300V, slow-blow, required
MOV	S10K350
R1	6.8 Ω /3W (wire-wound resistor, required)
R2	10K/1206/(1/4W) (chip resistor)
CX	0.1uF/305VAC
LDM	2.2mH

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 $3.8\text{M}\Omega$, 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 $\geq 0.31\text{A}$ should be selected.

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



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

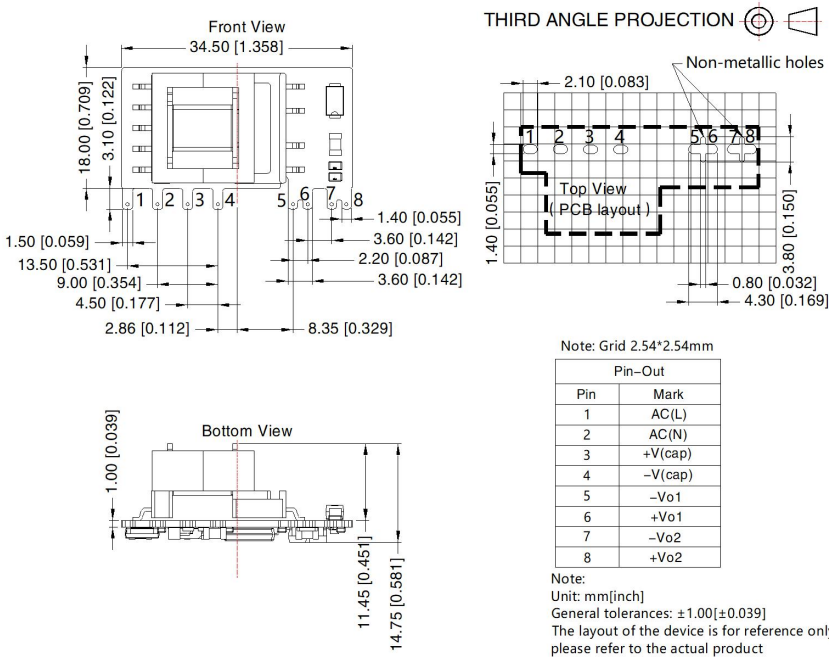
Component	Recommended value
FUSE	2A/300V, slow-blow, required
MOV	S10K350
R1	6.8Ω /3W (wire-wound resistor, required)
R2	10K/1206/(1/4W) (chip resistor)
LDM	2.2mH

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 ≥0.31A should be selected.

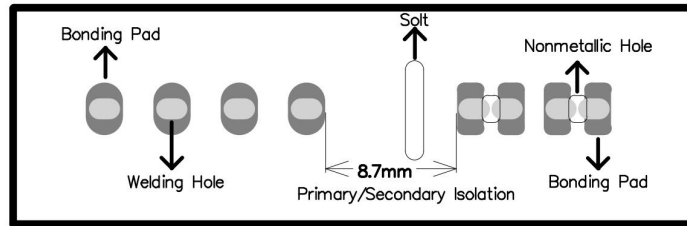
5. For additional information please refer to application notes on www.mornsun-power.com.

Dimensions and Recommended Layout

LS10-13Dxx series dimensions



LS10-13Dxx series recommended pad



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. Packaging bag number: 58220134;
2. External electrolytic capacitors are required to modules, more details refer to typical applications;
3. This part is open frame, at least 6mm 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.

Mornsun Guangzhou Science & Technology Co., Ltd.

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