

10W, DIY AC/DC converter



FEATURES

- Ultra-wide 85 - 528VAC and 100 - 745VDC input voltage range
- Accepts AC or DC input (dual-use of same terminal)
- Working available with any two phases
- Operating ambient temperature range: -40°C to +85°C
- High I/O isolation test voltage up to 4000VAC
- Multi application, flexible layout
- Output short circuit, over-current protection

LS10-26BxxR3 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 reliability, low power consumption and reinforced isolation. All models are particularly suitable for industrial control, electric power, instrumentation applications which have high requirement for dimension. 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.
EN (Pending)	LS10-26B03R3	10W	3.3V/2000mA	70	1500
	LS10-26B05R3		5V/2000mA	77	1500
	LS10-26B09R3		9V/1100mA	80	1000
	LS10-26B12R3		12V/830mA	82	680
	LS10-26B15R3		15V/670mA	82	470
	LS10-26B24R3		24V/420mA	83	330

Note: 1. The nominal output voltage refers to the voltage applied to the load terminal after adding external circuits.
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	--	528	VAC
	DC input	100	--	745	VDC
Input Certified Voltage Range	AC input	100	--	480	VAC
Input Frequency		47	--	63	Hz
Input Current	115VAC	--	--	0.30	A
	230VAC	--	--	0.15	
	380VAC	--	--	0.10	
Inrush Current	115VAC	--	15	--	
	230VAC	--	30	--	
	380VAC	--	50	--	
Leakage Current	480VAC/50Hz	0.5mA RMS Max.			
Recommended External Input Fuse		2A, 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	3.3V	--	±6	--	%	
	5V	0% - 10% load	--	±5		--
		10% - 100% load	--	±4		--
	9V/12V/15V/24V	--	±5	--		
Line Regulation	Rated load	3.3V	--	±2	--	
		5V/9V/12V/15V/24V	--	±1.5	--	
Load Regulation	10% - 100% load	--	±3	--		

Ripple & Noise*	20MHz bandwidth (peak-to-peak value),	--	100	180	mV
Temperature Coefficient		--	±0.2	--	%/°C
Stand-by Power Consumption	230VAC input	--	--	0.30	W
	380VAC input	--	--	0.50	
Short Circuit Protection		Hiccup, continuous, self-recovery			
Over-current Protection		≥110%Io, self-recovery			
Minimum Load*		10	--	--	%
Hold-up Time	115VAC input	--	8	--	ms
	230VAC input	--	35	--	
	380VAC input	--	80	--	
Note: 1. *The "parallel cable" method is used for ripple and noise test, please refer to AC-DC Converter Application Notes for specific information; 2. The product is able to work with 0%-10% load and with stable output.					

General Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit	
Isolation	Input-output	Electric Strength Test for 1min., leakage current <5mA		4000	--	VAC
Insulation Resistance	Input - output	At 500VDC		50	--	MΩ
Operating Temperature		-40	--	+85	°C	
Storage Temperature		-40	--	+105		
Storage Humidity		--	--	95	%RH	
Power Derating	+50°C to +85°C	1.72	--	--	% / °C	
	-40°C to -25°C	1.33	--	--		
	85VAC - 100VAC	1.33	--	--	% / VAC	
	480AVC - 528VAC	0.42	--	--		
Safety Standard		Design refer to IEC/EN/UL62368-1/ BS EN 62368-1/ IEC/EN62477-1/EN61010-1				
Safety Class		CLASS II				
MTBF		MIL-HDBK-217F@25°C > 500,000 h				

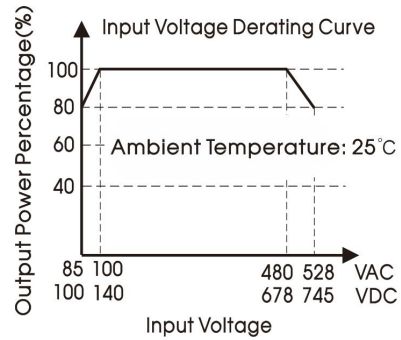
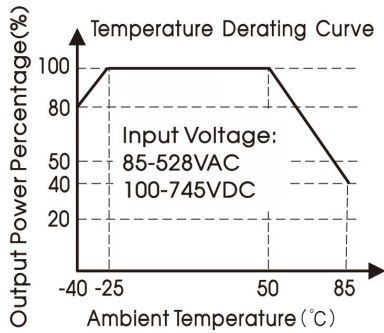
Mechanical Specifications

Dimension	38.00 x 20.00 x 15.25 mm
Weight	10.0g (Typ.)
Cooling method	Free air convection

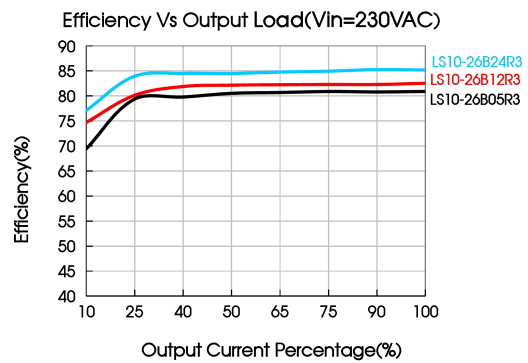
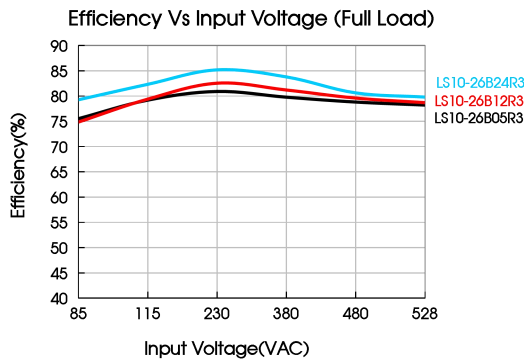
Electromagnetic Compatibility (EMC)

Emissions	CE	CISPR32/EN55032	CLASS A (Application circuit 1, 4, 5, 6)	
		CISPR32/EN55032	CLASS B (Application circuit 2, 3)	
	RE	CISPR32/EN55032	CLASS A (Application circuit 1, 4, 5, 6)	
		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	±2KV (Application circuit 1, 4, 6)	perf. Criteria B
		IEC/EN61000-4-4	±4KV (Application circuit 2, 3, 5)	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
		IEC/EN61000-4-5	line to line ±2KV/line to ground ±4KV (Application circuit 5)	perf. Criteria B
		IEC/EN 61000-4-5	line to line ±4KV (Application circuit 6)	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	

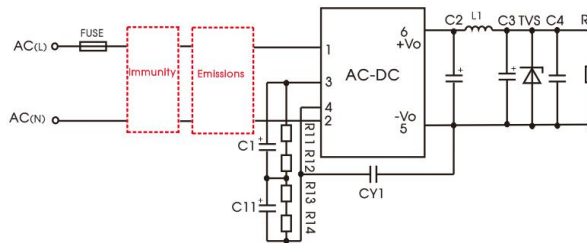
Product Characteristic Curve



Note: ① With an AC input between 85 - 100V/480-528VAC and a DC input between 100 - 140V/678-745VDC, 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



LS series additional circuits design reference

LS10 series additional components selection guide (No EMC devices)

Part No.	C1/C11 (required)	R11/R12/R13/R14 (chip resistor, required)	C2 (required)	L1(required)	C3 (required)	C4	CY1 (required)	TVS
LS10-26B03R3	47uF/400V	1MΩ /1206/(1/4W)	1500uF/6.3V (solid-state capacitor)	2.2uH/15mΩ Max/6.5A	680uF/25V	0.1uF/50V	1nF/400VA C	SMBJ7.0A
LS10-26B05R3			820uF/16V (solid-state capacitor)		330uF/25V			
LS10-26B09R3			470uF/16V (solid-state capacitor)		1000uF/16V			
LS10-26B12R3			330uF/25V		100uF/35V			
LS10-26B15R3			470uF/25V (solid-state capacitor)					
LS10-26B24R3			470uF/35V					

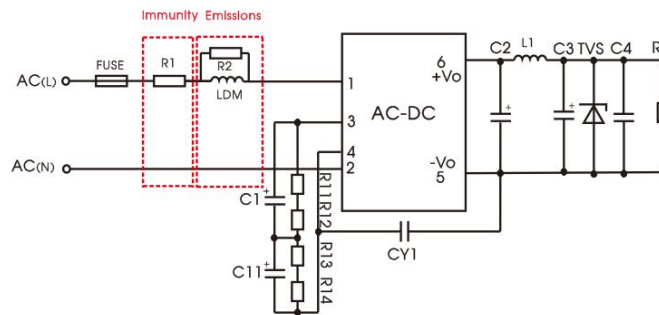
- Note:
- C1/C11 is used as filter capacitor with AC input (must be connected externally) and as EMC filter capacitor with DC input (must be connected), and it is recommended to use the capacitor with ripple current > 200mA@100KHz. It is recommended to use electrolytic capacitor C1/C11 with ESR ≤ 100 Ω at low temperature.
 - R11, R12, R13, R14 are the voltage equalizing resistors of C1, C11 electrolytic capacitors (must be connected), and SMD anodes can be used;
 - We recommend using an electrolytic capacitor with high frequency and low ESR (ESR of C3 at low temperature of -40°C ≤ 1.1 Ω) rating for C3 (refer to manufacture's datasheet), electrolytic capacitor can be used for C2 when applied in normal and high temperature environments. 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.
 - LDM (2.2mH, P/N: 12050564), L1 (2.2uH, P/N: 12050504) 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	85-528VAC	-40℃ to +85℃	CLASS A	CLASS III
2	Indoor general environment	Intelligent building/Intelligent agriculture		-25℃ to +55℃	CLASS B	CLASS III
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
5	Outdoor industrial environment	Electricity/Grid		-40℃ to +85℃	Class A	CLASS IV
6	Strong lightning surge	Electricity dedicated		-40℃ to +85℃	Class A	CLASS IV

Electromagnetic Compatibility Solution--Recommended Circuit

1. Application circuit 1—Basic application



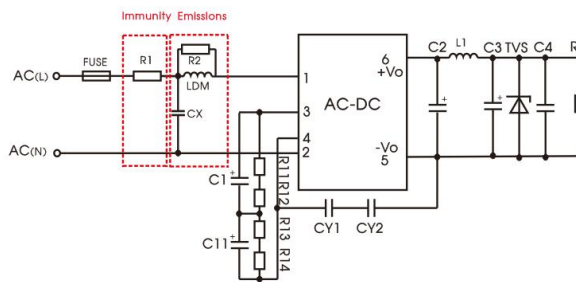
Recommended circuit 1

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

Component	Recommended value	
FUSE	2A/500V, slow-blow, required	
R1	6.8Ω/3W (wire-wound resistor, required)	
R2	LS10-26B03/05/12R3	10K/1206/(1/4W) (chip resistor)
	LS10-26B09/15/24R3	4.7K/1206/(1/4W) (chip resistor)
LDM	2.2mH/Max: 4.81Ω/Min: 0.31A	

Note: 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—Universal system recommended circuits for indoor general environment



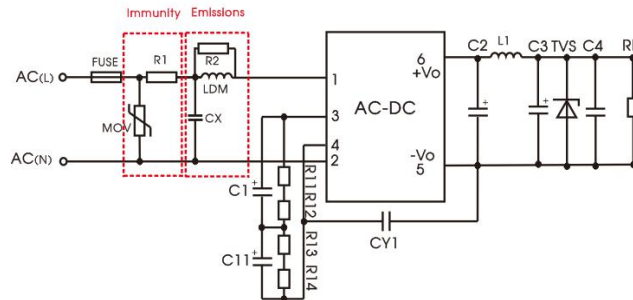
Recommended circuit 2

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

Component	Recommended value
R1	6.8Ω /3W (wire-wound resistor, required)
R2	LS10-26B03/05/12R3
	LS10-26B09/15/24R3
LDM	10K/1206/(1/4W) (chip resistor)
CX	4.7K/1206/(1/4W) (chip resistor)
FUSE	2.2mH/Max: 4.81Ω /Min: 0.31A
	0.1uF/480VAC
	2A/500V, 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/CY2, value at 2.2nF/250VAC), which can meet the EN60335 certification;
 Note 2: According to the certification requirements, the CX 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



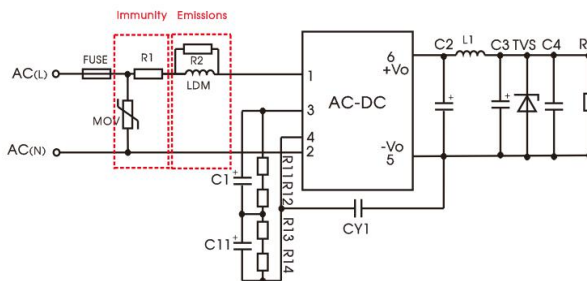
Recommended circuit 3

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

Component	Recommended value
MOV	S14K550
CX	0.1uF/480VAC
R2	LS10-26B03/05/12R3
	LS10-26B09/15/24R3
LDM	10K/1206/(1/4W) (chip resistor)
R1	4.7K/1206/(1/4W) (chip resistor)
FUSE	2.2mH/Max: 4.81Ω /Min: 0.31A
	6.8Ω /3W (wire-wound resistor, required)
	2A/500V, slow-blow, required

Note 1: According to the certification requirements, the CX 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 environment



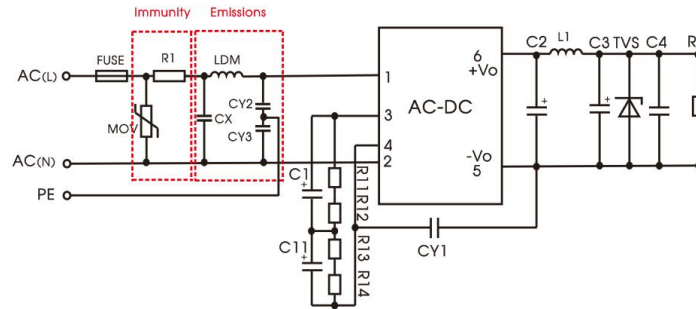
Recommended circuit 4

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

Component		Recommended value
MOV		S14K550
R2	LS10-26B03/05/12R3	10K/1206/(1/4W) (chip resistor)
	LS10-26B09/15/24R3	4.7K/1206/(1/4W) (chip resistor)
LDM		2.2mH/Max: 4.81 Ω /Min: 0.31A
R1		6.8 Ω /3W (wire-wound resistor, required)
FUSE		2A/500V, slow-blow, required

Note: 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. Application circuit 5—Universal system recommended circuits for outdoor industrial environment



Recommended circuit 5

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

Component	Recommended value
MOV	S14K550
LDM	2.2mH/Max: 4.81 Ω /Min: 0.31A
R1	6.8 Ω /3W (wire-wound resistor, required)
CX	0.1uF/480VAC
FUSE	2A/500V, slow-blow, required
CY2/CY3	1nF/400VAC

Note 1: According to the certification requirements, the CX 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.

6. Application circuit 6—Universal system recommended circuits for strong lightning surge environment

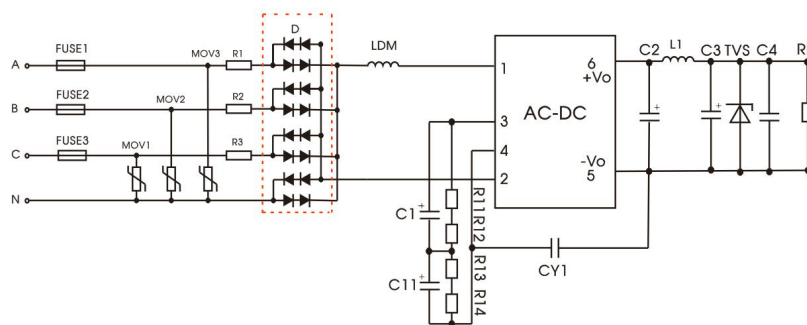


Fig. (1): Recommended circuit for applications which require 4KV differential-mode surge standard (full-wave rectification)

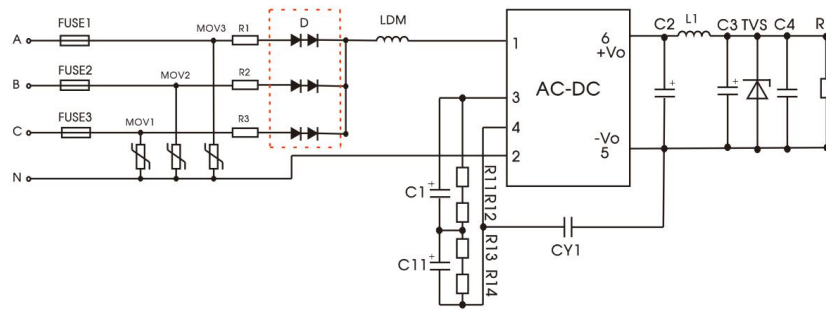


Fig. (2): Recommended circuit for applications which require 4KV differential-mode surge standard (half-wave rectification)

Application environmental	Ambient temperature range	Immunity CLASS	Emissions CLASS
Strong lightning surge environment	-40°C to +85°C	CLASS IV	CLASS A

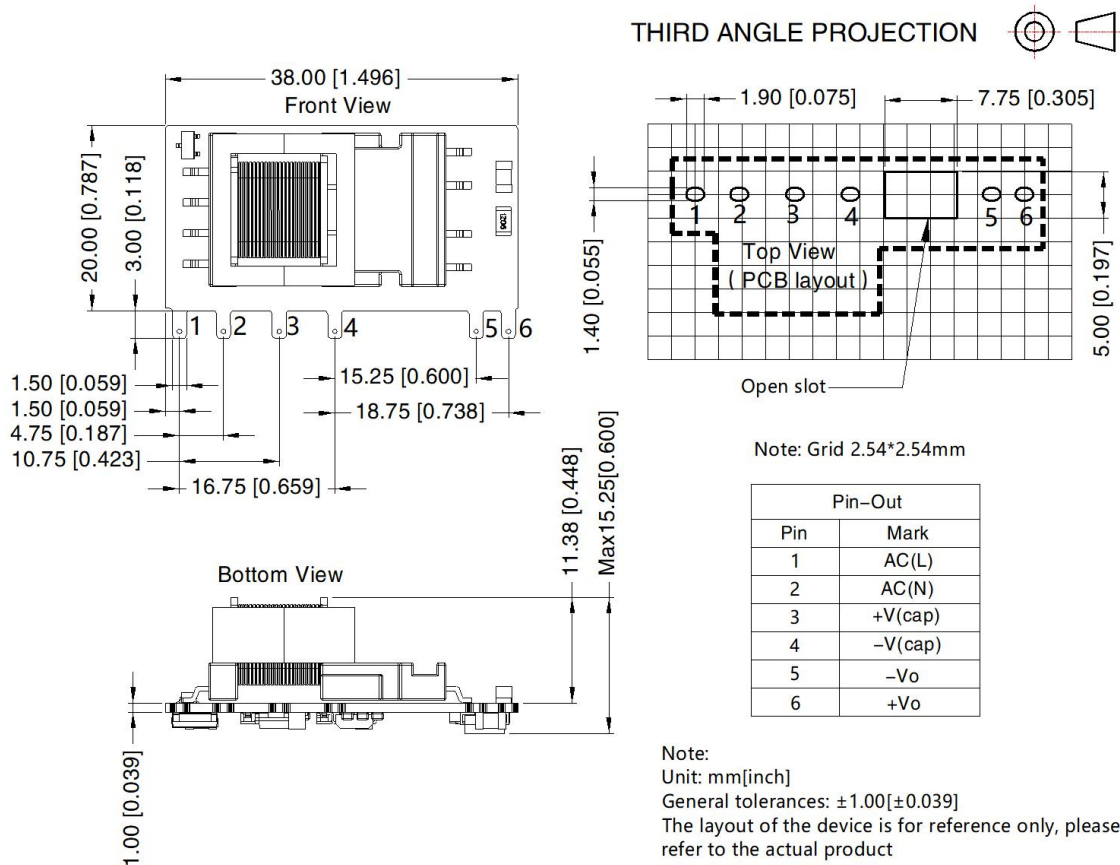
Component	Recommended value
FUSE1/FUSE2/FUSE3	6.3A/500V, slow-blow, required
MOV1/MOV2/MOV3	S14K550
R1/R2/R3	12Ω /5W (wire-wound resistor, required)
D	2A/1000V
LDM	2.2mH/Max: 4.81Ω /Min: 0.31A

Note: R1/R2/R3 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.

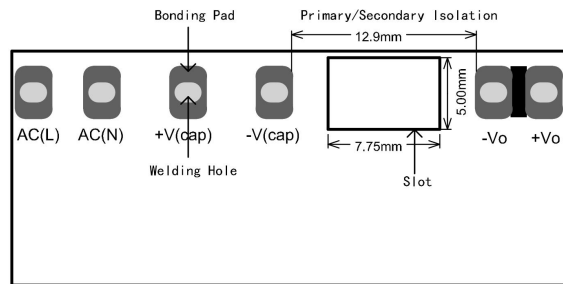
7. For additional information please refer to application notes on www.mornsun-power.com.

Dimensions and Recommended Layout

LS10-26BxxR3 series dimensions



LS10-26BxxR3 series recommended pad



Note: There is a slot(non-metallic hole) between pin 4/5; 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: 58220252;
2. External electrolytic capacitors are required to modules, more details refer to typical applications;
3. This part is open frame, at least 7.2mm 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, 230V and 380V) 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.

Address: No. 5, Kehui St. 1, Kehui Development Center, Science Ave., Guangzhou Science City, Huangpu District, Guangzhou, P. R. China
Tel: 86-20-38601850 Fax: 86-20-38601272 E-mail: info@mornsun.cn www.mornsun-power.com