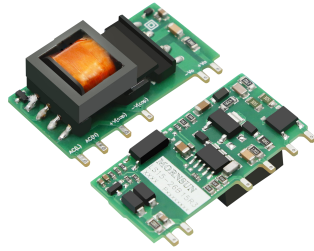


15W, DIY AC/DC converter



FEATURES

- Ultra-wide 176 - 528VAC and 248 - 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 3600VAC
- Multi application, flexible layout
- Output short circuit, over-current protection

LS15-26BxxR3 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)	LS15-26B03R3	9.9W	3.3V/3000mA	70	1500
	LS15-26B05R3	14W	5V/2800mA	75	1500
	LS15-26B09R3	15W	9V/1670mA	79	1000
	LS15-26B12R3		12V/1250mA	80	820
	LS15-26B15R3		15V/1000mA	81	680
	LS15-26B24R3		24V/625mA	82	390

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	176	--	528	VAC
	DC input	248	--	745	VDC
Input Certified Voltage Range	AC input	200	--	400	VAC
Input Frequency		47	--	63	Hz
Input Current	230VAC	--	--	0.25	A
	380VAC	--	--	0.20	
Inrush Current	230VAC	--	30	--	
	480VAC	--	58	--	
Leakage Current	400VAC/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/5V	--	±3	--	%
	9V/12V/15V/24V	--	±2	--	
Line Regulation	Rated load	3.3V/5V	--	±1	
		9V/12V/15V/24V	--	±0.5	
Load Regulation	3.3V/5V	--	±2	--	
	9V/12V/15V/24V	--	±1	--	
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	$\geq 110\% I_o$, self-recovery				
Minimum Load*		0	--	--	%
Hold-up Time	230VAC input	--	35	--	ms
	380VAC input	--	80	--	
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
Insulation Resistance	Input - output	At 500VDC	100	--	--	MΩ
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				
Power Derating	+50°C to +85°C	2.0	--	--	% / °C	
	-40°C to -25°C	2.67	--	--		
	480AVC - 528VAC	0.42	--	--	% / VAC	
Safety Standard		Design refer to BS EN62368-1, IEC/EN/UL62368-1, IEC/EN62477-1, EN61010-1, EN61558-1				
Safety Class		CLASS II				
MTBF		MIL-HDBK-217F@25°C $\geq 1,000,000$ h				

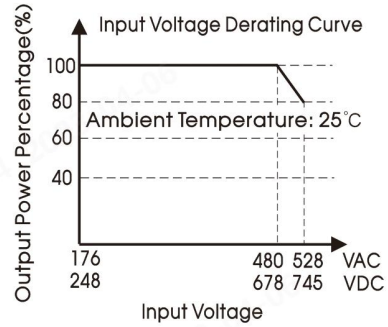
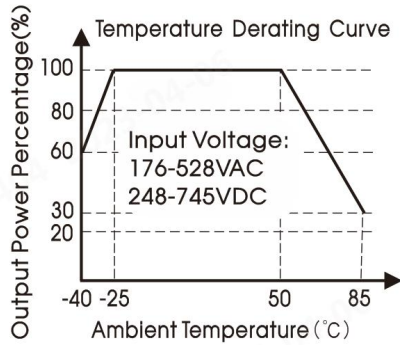
Mechanical Specifications

Dimension	40.04 x 20.00x 15.25 mm
Weight	10.0g (Typ.)
Cooling method	Free air convection

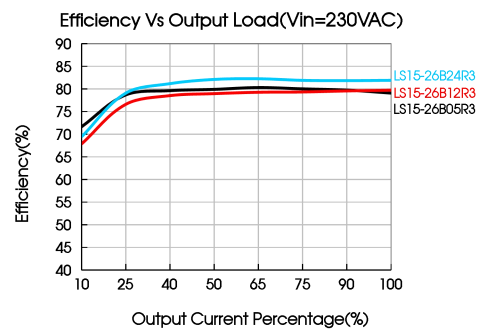
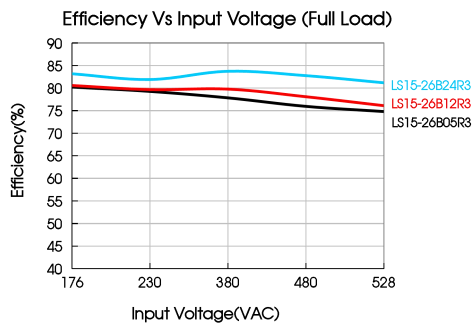
Electromagnetic Compatibility (EMC)

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, 2, 6)	perf. Criteria B
		IEC/EN61000-4-4	±4KV (Application circuit 3, 4, 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 PE ±4KV (Application circuit 5)	perf. Criteria B
		IEC/EN61000-4-5	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	

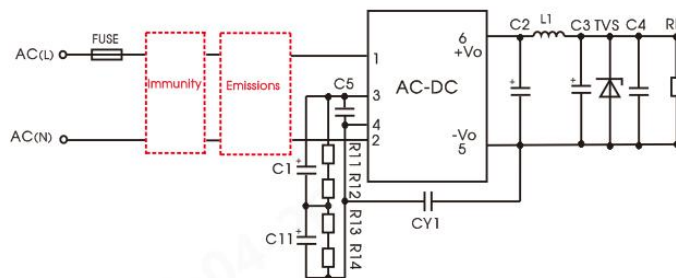
Product Characteristic Curve



Note: ① With an AC input between 480-528VAC and a DC input between 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 Mornsun FAE.



Additional Circuits Design Reference



LS series additional circuits design reference

LS15 series additional components selection guide (No EMC devices)

Part No.	C1/C11 (required)	R11/R12/R13/R14 (SMD resistor, required)	C5	C2 (required)	L1 (required)	C3 (required)	C4	CY1 (required)	TVS
LS15-26B03R3	47uF/400V	1MΩ/1206/ (1/4W)	4.7nF/ 1000V	1500uF/6.3V (solid-state capacitor)	2.2uH/15mΩ Max/6.5A	680uF/25V	0.1uF/ 50V	2.2nF/ 400VAC	SMBJ7.0A
LS15-26B05R3				1000uF/16V (solid-state capacitor)		330uF/25V			
LS15-26B09R3				470uF/16V (solid-state capacitor)		390uF/16V			
LS15-26B12R3				470uF/25V (solid-state capacitor)		330uF/25V			
LS15-26B15R3				470uF/35V		100uF/35V			
LS15-26B24R3									

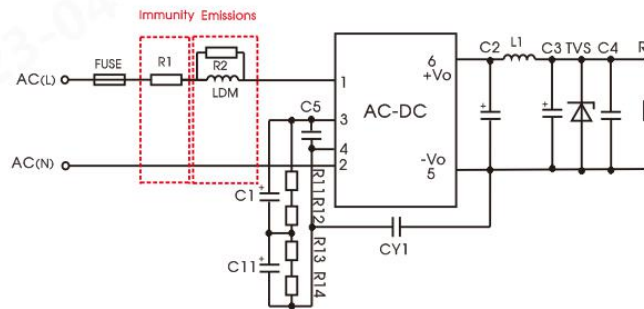
- Note:
- C1/C11 is used as filter capacitor with AC input (must be connected externally) and as EMC filter capacitor with DC input (must be connected), and it is recommended to use the capacitor with ripple current >200mA@100KHz. It is recommended to use electrolytic capacitor C1/C11 with ESR ≤ 100Ω 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 ≤ 1.1Ω) 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, C5 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	176 - 528VAC	-40°C to +85°C	Class A	Level 3
2	Indoor general environment	Intelligent building/Intelligent agriculture		-25°C to +50°C	Class B	Level 3
3	Indoor industrial environment	Manufacturing workshop		-25°C to +50°C	Class B	Level 4
4	Outdoor general environment	ITS/Video monitoring/Charging point/Communication/Security and protection		-40°C to +85°C	Class A	Level 4
5	Outdoor industrial environment	Electricity/Grid		-40°C to +85°C	Class A	Level 4
6	Strong lightning surge	Electricity dedicated		-40°C to +85°C	Class A	Level 4

Electromagnetic Compatibility Solution—Recommended Circuit

1. Application circuit 1—Basic application



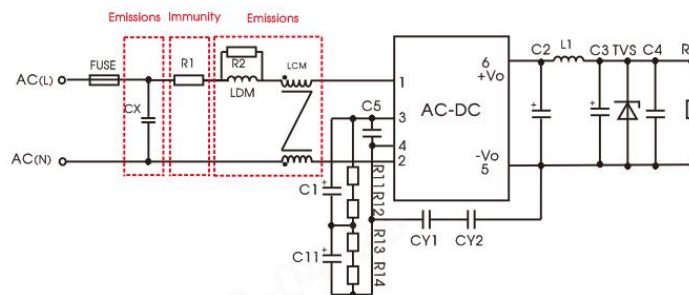
Recommended circuit 1

Application environmental	Ambient temperature range	Immunity level	Emissions class
Basic application	-40°C to +85°C	Level 3	Class A

Component	Recommended value
FUSE	2A/500V, slow-blow, required
R1	6.8Ω /3W (wire-wound resistor, required)
R2	4.7K/1206/(1/4W) (SMD 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 SMD resistor or carbon film resistor.

2. Application circuit 2—Universal system recommended circuits for indoor general environment



Recommended circuit 2

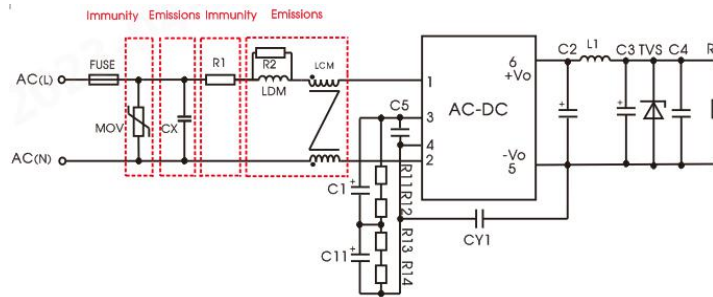
Application environmental	Ambient temperature range	Immunity level	Emissions class
Indoor civil /general	-25℃ to +50℃	Level 3	Class B

Component	Recommended value
R1	6.8Ω /3W (wire-wound resistor, required)
R2	4.7K/1206/(1/4W) (SMD resistor)
LDM	2.2mH/Max: 4.81 Ω /Min: 0.31A
LCM	10mH/1A
CX	0.1uF/480VAC
FUSE	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 SMD resistor or carbon film resistor.

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



Recommended circuit 3

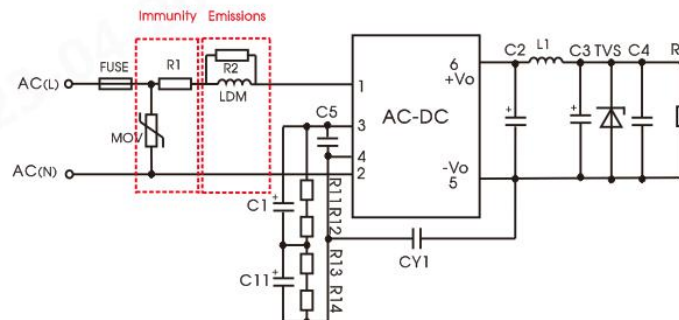
Application environmental	Ambient temperature range	Immunity level	Emissions class
Indoor industrial	-25℃ to +50℃	Level 4	Class B

Component	Recommended value
MOV	S14K550
CX	0.1uF/480VAC
R2	4.7K/1206/(1/4W) (SMD resistor)
LDM	2.2mH/Max: 4.81 Ω /Min: 0.31A
LCM	10mH/1A
R1	6.8Ω /3W (wire-wound resistor, required)
FUSE	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 SMD resistor or carbon film resistor.

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



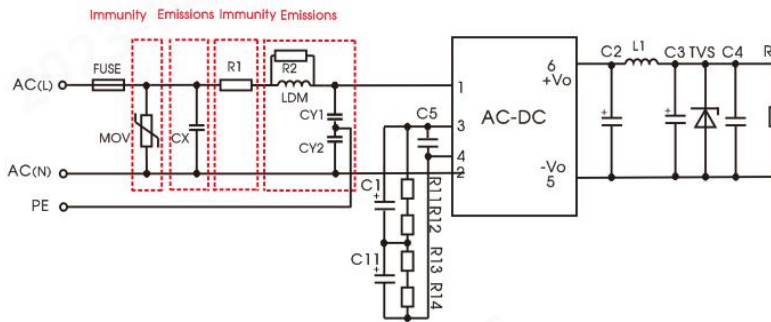
Recommended circuit 4

Application environmental	Ambient temperature range	Immunity level	Emissions class
Outdoor general environment	-40°C to +85°C	Level 4	Class A

Component	Recommended value
MOV	S14K550
R2	4.7K/1206/(1/4W) (SMD 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 SMD 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 level	Emissions class
Outdoor industrial environment	-40°C to +85°C	Level 4	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 SMD resistor or carbon film resistor.

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

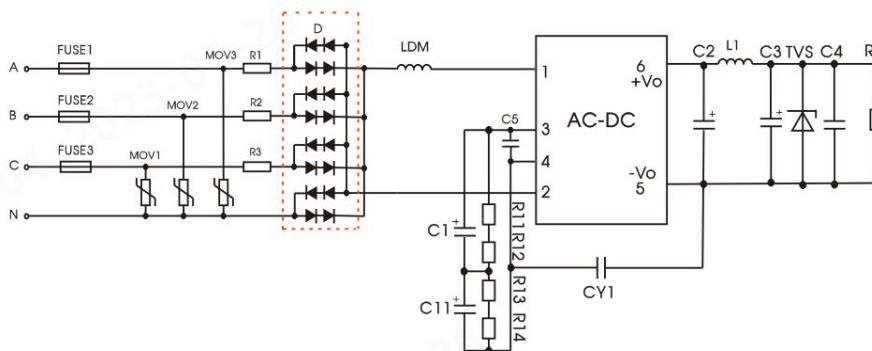


Fig. (1): Recommended circuit for applications which require 4KV differential-mode surge standard (full-wave rectification)

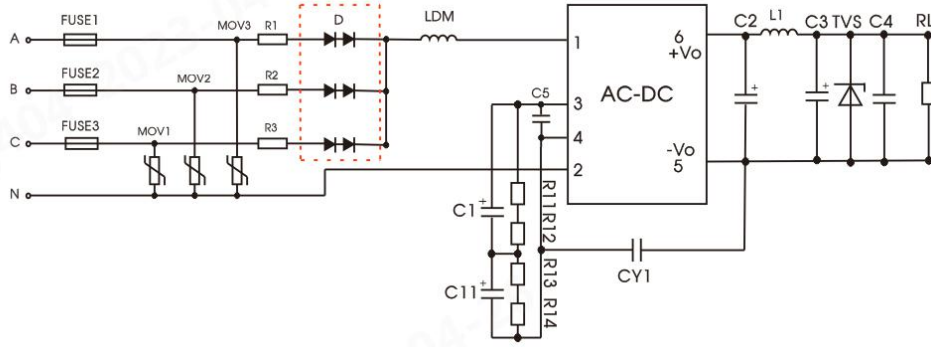


Fig. (2): Recommended circuit for applications which require 4KV differential-mode surge standard (half-wave rectification)

Application environmental	Ambient temperature range	Immunity level	Emissions class
Strong lightning surge environment	-40°C to +85°C	Level 4	Class A

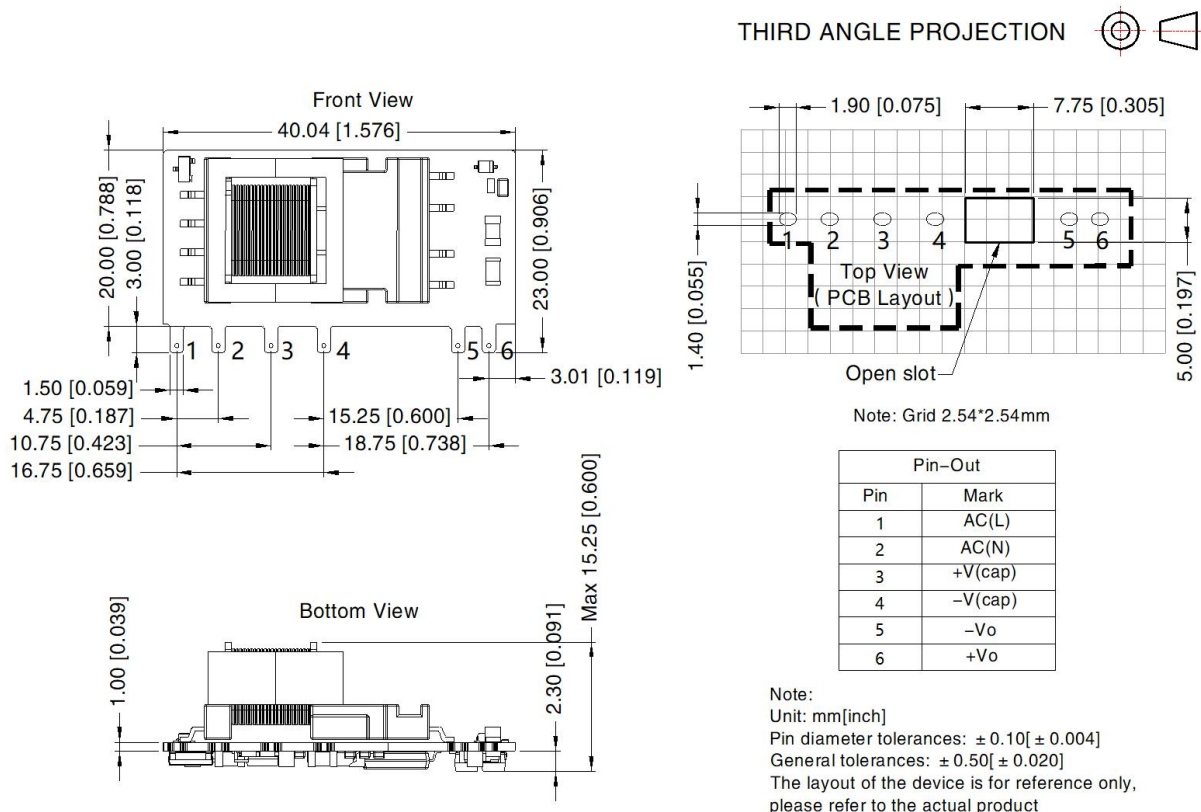
Component	Recommended value
FUSE1/FUSE2/FUSE3	6.3A/500V, slow-blow, required
MOV1/MOV2/MOV3	S14K550
R1/R2/R3	12 Ω /5W (wire-wound resistor, required)
D	2A/1000V
LDM	2.2mH/Max: 4.81 Ω /Min: 0.31A

Note: R1/R2/R3 is the input plug-in resistor, this resistor needs to be a wire-wound resistor (required), please do not select SMD resistor or carbon film resistor.

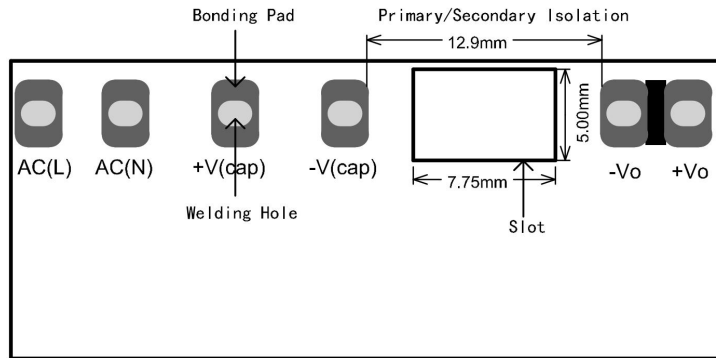
7. For additional information please refer to application notes on www.mornsun-power.com.

Dimensions and Recommended Layout

LS15-26BxxR3 series dimensions



LS15-26BxxR3 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 8.4 mm 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 (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. 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.

Mornsun Guangzhou Science & Technology Co., Ltd.

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