AC/DC Converter
SLS15-23BxxDR3 Series

15W, DIY AC/DC converter

RoHS

FEATURES

- Ultra-wide 85 - 305VAC and 100 - 430VDC input voltage range
- Accepts AC or DC input (dual-use of same terminal)
- Operating ambient temperature range: -40℃ to +85℃
- High I/O isolation test voltage up to 4000VAC
- Multi application, compact size, flexible layout
- Output short circuit, over-current protection
- Plastic case meets UL94V-0 flammability
- Pollution degree 3 (meet IEC62368-1)

SLS15-23BxxDR3 series is one of SCHMID-M's miniaturized potting highly efficient green power AC-DC Converters. They feature wide input range accepting either AC or DC voltage, high reliability, low power consumption, reinforced isolation and strong applicability. 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 (Vo/Io)	Efficiency at 230VAC (%) Typ.	Capacitive Load (uF) Max.
EN (Pending)	SLS15-23B03DR3	9.9W	3.3V/3000mA	78	15000
	SLS15-23B05DR3	15W	5V/3000mA	81	15000
	SLS15-23B09DR3		9V/1670mA	84	5000
	SLS15-23B12DR3		12V/1250mA	84	4000
	SLS15-23B15DR3		15V/1000mA	84	1500
	SLS15-23B24DR3		24V/625mA	84	680

Note: The nominal output voltage refers to the voltage applied to the load terminal after adding external circuits.

Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Input Voltage Range	AC input	85	--	305	VAC
	DC input	100	--	430	VDC
Input Frequency		47	--	63	Hz
Input Current	115VAC	--	--	0.4	A
	230VAC	--	--	0.25	
Inrush Current	115VAC	--	20	--	
	230VAC	--	35	--	
Recommended External Input Fuse		1A, slow-blow, required (The actual use needs to be selected according to the application enviroment)			
Hot Plug		Unavailable			

Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Output Voltage Accuracy	10% - 100% load		--	±5	--	%
Line Regulation	Rated load	3.3V	--	±2.5	--	
		5V/9V/12V/15V/24V	--	±1.5	--	
Load Regulation	10% - 100% load		--	±3	--	
Ripple & Noise*	20MHz bandwidth (peak-to-peak value), 10% - 100% load		--	80	150	mV
Temperature Coefficient			--	±0.15	--	%/°C
Stand-by Power Consumption	230VAC		--	0.10	0.25	W

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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	--	40	--	

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		100	--	--	MΩ
Operating Temperature				-40	--	+85	℃
Storage Temperature				-40	--	+105	
Storage Humidity				--	--	95	%RH
Power Derating		+55℃ to +85℃	3.3V/5V/9V/24V	1.67	--	--	%/℃
		+55℃ to +85℃	12V	2.0	--	--	
		+50℃ to +85℃	15V	1.72	--	--	
		85VAC - 100VAC		1.33	--	--	%/VAC
		277VAC - 305VAC		0.72	--	--	
Safety Standard				Design refer to IEC/EN/UL62368-1, IEC/EN60335-1, IEC/EN61558-1			
Safety Class				CLASS II			
MTBF				MIL-HDBK-217F@25℃＞1,000,000 h			

Mechanical Specifications

Case Material	Black plastic, flame-retardant and heat-resistant (UL94V-0)
Dimension	33.34 x 21.50 x 9.72mm
Weight	14g (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, 5)	
	RE	CISPR32/EN55032	CLASS A (Application circuit 1, 4)	
		CISPR32/EN55032	CLASS B (Application circuit 2, 3, 5)	
Immunity	ESD	IEC/EN61000-4-2	Contact ±6KV /Air ±8KV	Perf. Criteria A
	RS	IEC/EN61000-4-3	10V/m	perf. Criteria A
	EFT	IEC/EN61000-4-4	±2KV (Application circuit 1, 2)	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 A
		IEC/EN61000-4-5	line to line ±2KV (Application circuit 3, 4)	perf. Criteria A
		IEC/EN61000-4-5	line to line ±2KV/line to ground ±4KV (Application circuit 5)	perf. Criteria A
	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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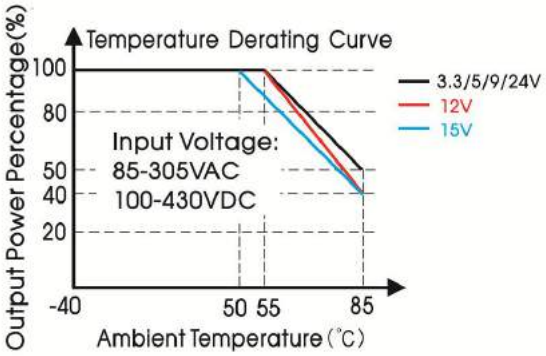
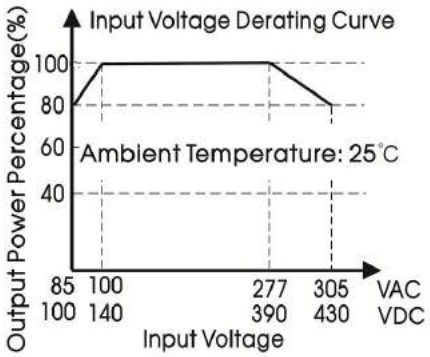
SLS15-23BxxDR3 Series

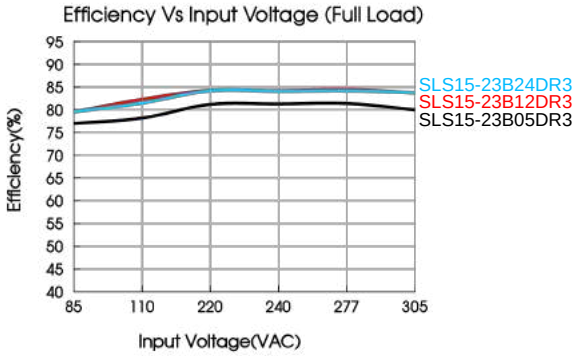
Product Characteristic Curve

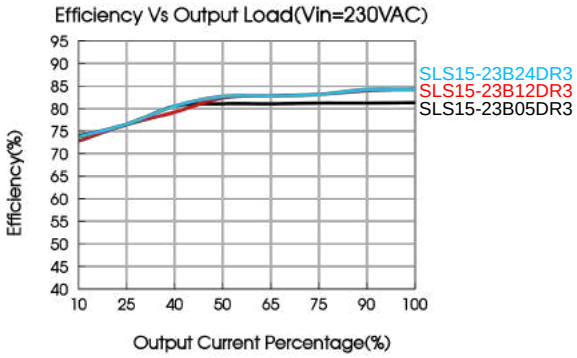




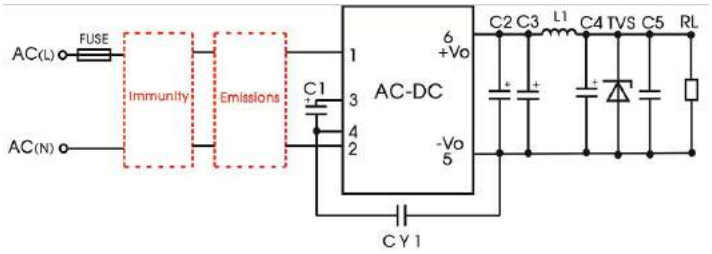
Note: ① With an AC input between 85-100VAC/277-305VAC and a DC input between 100-140VDC/390-430VDC, the output power must be derated as per temperature derating curves;

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



SLS series additional circuits design reference

SLS15 series additional components selection guide (No EMC devices)								
Part No.	C1 (required)	C2 (required)	C3 (required)	L1 (required)	C4 (required)	C5	CY1 (required)	TVS
SLS15-23B03DR3	33uF/450V (-25℃ to +85℃, 85-305VAC input; -40℃ to +85℃, 165-305VAC input) 47uF/450V (-40℃ to +85℃, 85-305VAC input)	1500uF/6.3V (solid-state capacitor)	/	2.0uH/15mΩ Max/6.5A	470uF/16V	0.1uF/ 50V	1nF/ 400VAC (the 9V and 5V applications had 2.2nF 3/5 of the time)	SMBJ7.0A
SLS15-23B05DR3		1000uF/16V (solid-state capacitor)	/					
SLS15-23B09DR3		470uF/16V (solid-state capacitor)	/		220uF/16V			SMBJ12A
SLS15-23B12DR3					220uF/16V			SMBJ20A
SLS15-23B15DR3		470uF/25V	470uF/25V		220uF/25V			
SLS15-23B24DR3		470uF/35V	/		100uF/35V			SMBJ30A

Note:

1. C1 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 >400mA@100KHz.
2. We recommend using an electrolytic capacitor with high frequency and low ESR rating for C4 (refer to manufacture's datasheet), electrolytic capacitor can be used for C2, C3 when applied in normal and high temperature environments. Combined with C2, C3, L1, they form a pi-type filter circuit. Choose a capacitor voltage rating with at least 20% margin, in other words not exceeding 80%. 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: 12050314); L1 (2.0uH, P/N: 12050419) SCHMID-M quotation is available.

AC/DC Converter

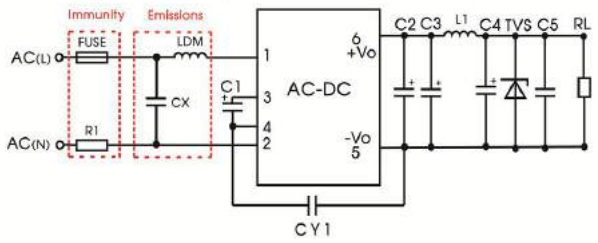
SLS15-23BxxDR3 Series

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	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				
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 B	CLASS Ⅳ

Electromagnetic Compatibility Solution--Recommended Circuit

1. Application circuit 1——Basic application

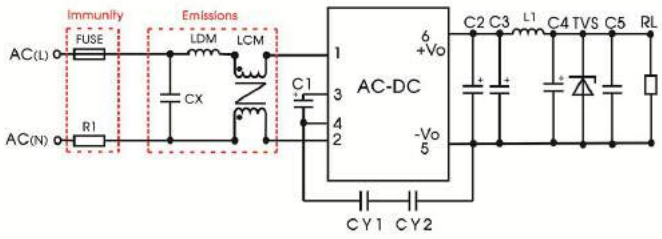


Application circuit 1

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

Component	Recommended value
FUSE	1A/300V, slow-blow, required
R1	6.8Ω/3W (wire-wound resistor, required)
CX	0.1uF/310VAC
LDM	1.2mH/Max: 2.5Ω/Min: 0.4A
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: 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.	

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

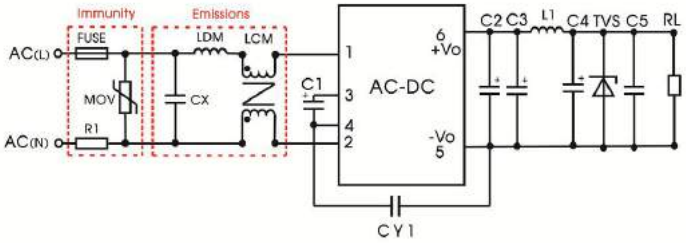


Application circuit 2

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

Component	Recommended value
FUSE	1A/300V, slow-blow, required
R1	6.8Ω/3W (wire-wound resistor, required)
CX	0.2uF/310VAC
LDM	1.2mH/Max: 2.5Ω/Min: 0.4A
LCM	12.6mH/Min: 0.4A
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 X capacitor needs to be connected in parallel with the bleeder resistance, the recommended resistance value is less than 2.5MΩ, 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

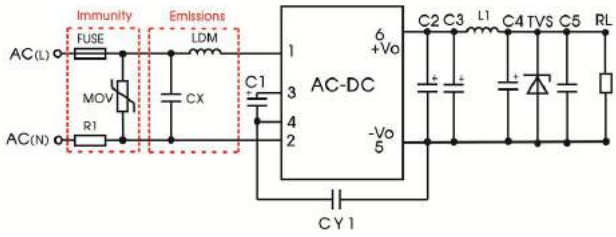


Application circuit 3

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

Component	Recommended value
FUSE	2A/300V, slow-blow, required
R1	6.8Ω/3W (wire-wound resistor, required)
MOV	S14K350
CX	0.2uF/310VAC
LDM	1.2mH/Max: 2.5Ω/Min: 0.4A
LCM	12.6mH/Min: 0.4A
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: 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 2.5MΩ, and the actual need to be selected according to the certification standard.	

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

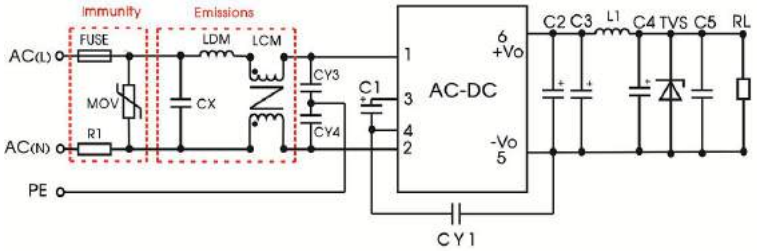


Application circuit 4

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
R1	6.8Ω/3W (wire-wound resistor, required)
MOV	S14K350
CX	0.1uF/310VAC
LDM	1.2mH/Max: 2.5Ω/Min: 0.4A
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: 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.	

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



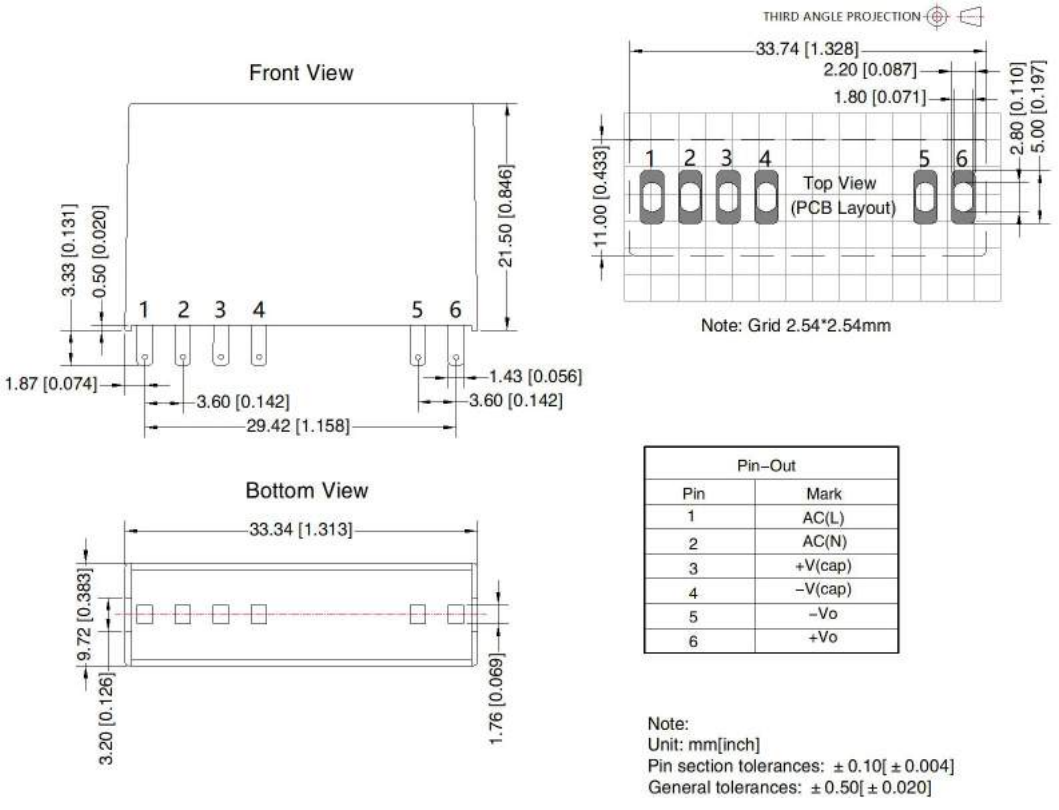
Application circuit 5

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

Component	Recommended value
FUSE	2A/300V, slow-blow, required
R1	6.8Ω/3W (wire-wound resistor, required)
MOV	S14K350
CX	0.2uF/310VAC
LDM	1.2mH/Max: 2.5Ω/Min: 0.4A
LCM	12.6mH/Min: 0.4A
CY3/CY4	1nF/400VAC
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: 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 2.5MΩ, and the actual need to be selected according to the certification standard.	

Dimensions and Recommended Layout

SLS15-23BxxDR3 series dimensions

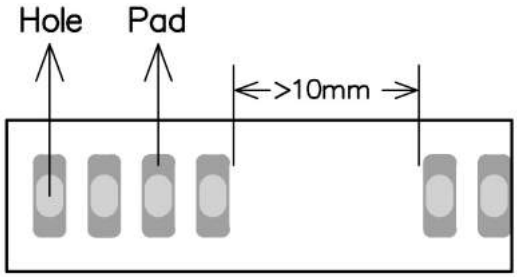


Note: Grid 2.54*2.54mm

Pin-Out	
Pin	Mark
1	AC(L)
2	AC(N)
3	+V(cap)
4	-V(cap)
5	-Vo
6	+Vo

Note:
Unit: mm[inch]
Pin section tolerances: ±0.10[±0.004]
General tolerances: ±0.50[±0.020]

SLS15-23BxxDR3 series recommended pad



Note: Please refer to the recommended dimensions or pad.

Note:

1. External electrolytic capacitors are required to modules, more details refer to typical applications;
2. This series is a potting product, 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;
3. 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;
4. All index testing methods in this datasheet are based on our company corporate standards;
5. We can provide product customization service, please contact our technicians directly for specific information;
6. Products are related to laws and regulations: see "Features" and "EMC";
7. 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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