AC/DC Converter

LD05-23BxxR2 Series

MORNSUN®

5W, AC-DC converter

FEATURES

- Ultra-wide 85 - 305VAC and 100 - 430VDC input voltage range
- 1 x 1 inch compact size
- Operating ambient temperature range: -40℃ to +85℃
- Up to 81.5% efficiency
- No-load power consumption 0.1W
- 5000m altitude application
- Plastic case meets UL94V-0 flammability
- EMI performance meets CISPR32/EN55032 CLASS B, EN55014

CB Report RoHS

UL62368-1 EN62368-1
EN61558-1
EN60335-1

LD05-23BxxR2 series AC-DC converters is one of Mornsun's compact size power converter. It features ultra-wide AC input and at the same time accepts DC input voltage, low power consumption, high efficiency, high reliability, reinforced isolation. It offers good EMC performance compliant to IEC/EN61000-4 and CISPR32/EN55032 and meets IEC/EN/UL62368/EN60335/EN61558 standards. The converters are widely used in industrial, power, home appliances, instrumentation, communication and civil applications. 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.
UL/EN/IEC	LD05-23B03R2	5W	3.3V/1515mA	71.5	4000
	LD05-23B05R2		5V/1000mA	77.5	3000
	LD05-23B09R2		9V/555mA	80.5	1200
	LD05-23B12R2		12V/416mA	80.5	1200
	LD05-23B15R2		15V/333mA	81.5	680
	LD05-23B24R2		24V/208mA	81.5	220

Note: * Use suffix "A2S" for chassis and suffix "A4S" for DIN-Rail mounting.

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	--	--	0.13	A
	230VAC	--	--	0.07	
Inrush Current	115VAC	--	15	--	
	230VAC	--	25	--	
Leakage Current	277VAC/50Hz	0.25mA RMS Max.			
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	3.3V output	--	±3	--	%
	others	--	±2	--	
Line Regulation	Full load	--	±0.5	--	
Load Regulation	0%-100% load	--	±1	--	

Ripple & Noise*	20MHz bandwidth (peak-to-peak value)	--	50	100	mV
Stand-by Power Consumption	230VAC	--	0.10	--	W
Temperature Coefficient		--	±0.02	--	%/°C
Short Circuit Protection		Hiccup, continuous, self-recovery			
Over-current Protection		⩾130%Io, self-recovery			
Over-voltage Protection	3.3/5VDC output	⩽7.5VDC			
	9VDC output	⩽15VDC			
	12VDC output	⩽16VDC			
	15VDC output	⩽20VDC			
	24VDC output	⩽30VDC			
Minimum Load		0	--	--	%
Hold-up Time	115VAC input	--	5	--	ms
	230VAC input	--	50	--	

Note: *The "Tip and barrel method" is used for ripple and noise test, output parallel 10uF electrolytic capacitor and 1uF ceramic capacitor, 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		4000	--	--	VAC
Operating Temperature				-40	--	+85	°C
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		-40℃ to -25℃		3.0	--	--	%/°C
		+50℃ to +70℃	3.3V	1.75	--	--	
		+55℃ to +70℃	5V/9V/12V	2.33	--	--	
		+60℃ to +70℃	15V/24V	3.5	--	--	
		+70℃ to +85℃	3.3V	1.67	--	--	
			Others	1.0	--	--	
		85VAC - 100VAC		1.0	--	--	%/VAC
		277VAC - 305VAC		0.54	--	--	
		2000m - 5000m		6.7	--	--	%/Km
Safety Standard				IEC/UL62368-1, EN61558-1, EN60335-1 Safety Approval & EN62368-1 (Report)			
Safety Class				CLASS Ⅱ			
MTBF				MIL-HDBK-217F@25°C > 2,602,000 h			
Designed Life		230VAC	Ta：25℃ 100% load	>130x10^3 h			
			Ta：55℃ 100% load	>41x10^3 h			

Mechanical Specifications

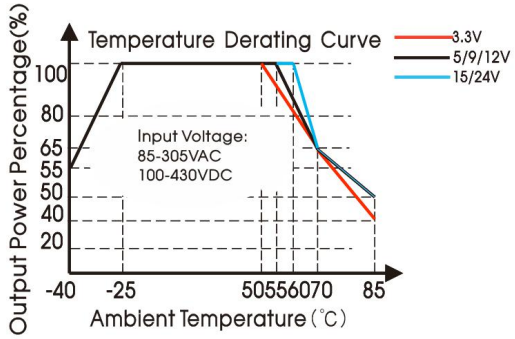
Case Material		Black plastic, flame-retardant and heat-resistant (UL94V-0)
Dimension	Horizontal package	25.40 x 25.40 x 17.60 mm
	A2S mounting	76.00 x 31.50 x 26.40 mm
	A4S mounting	76.00 x 31.50 x 31.00 mm
Weight	Horizontal package	18.0g (Typ.)
	A2S mounting	38.0g (Typ.)
	A4S mounting	58.0g (Typ.)
Cooling method		Free air convection

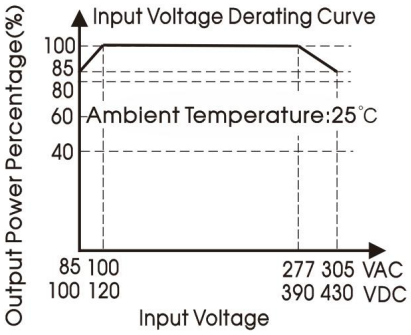
Electromagnetic Compatibility (EMC)

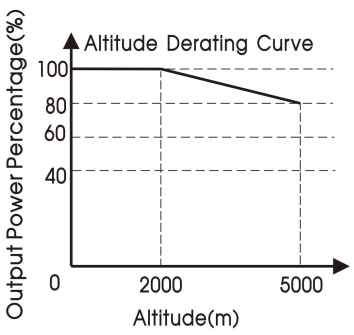
Emissions	CE	CISPR32/EN55032 CLASS B	
		CISPR32/EN55032 CLASS B (See Fig.3 for recommended circuit)	
		EN55014-1	
	RE	CISPR32/EN55032 CLASS B	
		CISPR32/EN55032 CLASS B (See Fig.3 for recommended circuit)	
		EN55014-1	
Immunity	ESD	IEC/EN 61000-4-2 Contact ±6KV/Air ±8KV	Perf. Criteria B
		EN55014-2	Perf. Criteria B
	RS	IEC/EN61000-4-3 10V/m	perf. Criteria A
		EN55014-2	perf. Criteria A
	EFT	IEC/EN61000-4-4 ±2KV (See Fig.1 for typical application circuit)	perf. Criteria B
		IEC/EN61000-4-4 ±4KV (See Fig.2 for recommended circuit)	perf. Criteria B
		IEC/EN61000-4-4 ±4KV (See Fig.3 for recommended circuit)	perf. Criteria A
		EN55014-2	perf. Criteria B
	Surge	IEC/EN61000-4-5 line to line ±1KV (See Fig.1 for typical application circuit)	perf. Criteria B
		IEC/EN61000-4-5 line to line ±2KV (See Fig.2 for recommended circuit)	perf. Criteria B
		IEC/EN61000-4-5 line to line ±2KV/line to ground ±4KV (See Fig.3 for recommended circuit)	perf. Criteria A
		EN55014-2	perf. Criteria B
	CS	IEC/EN61000-4-6 10Vr.m.s	perf. Criteria A
		EN55014-2	perf. Criteria A
	Voltage dip, short interruption and voltage variation	IEC/EN61000-4-11 0%, 70%	perf. Criteria B
		EN55014-2	perf. Criteria B

Note: When the output terminal of the product needs to be connected to PE through a Y capacitor, or close to the metal frame, please refer to the Fig.3 for recommended circuit.

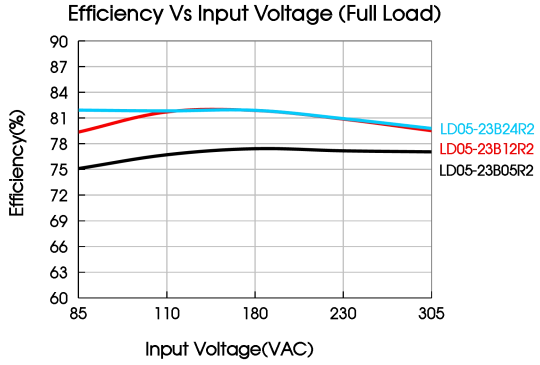
Product Characteristic Curve

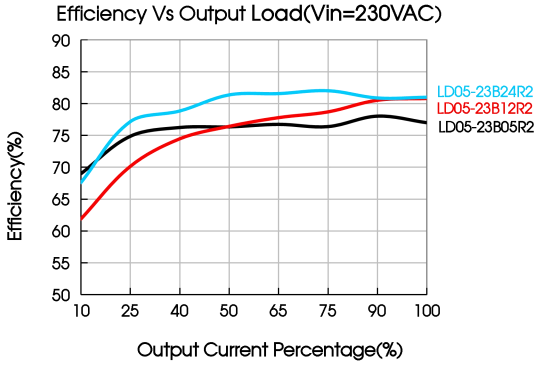






Note: ① With an AC input between 85-100V/277-305VAC and a DC input between 100-120V/390-430VDC, the output power must be derated as per temperature derating curves;
② This product is suitable for applications using natural air cooling; for applications in closed environment please consult factory or one of our FAE.





Design Reference

1. Typical application

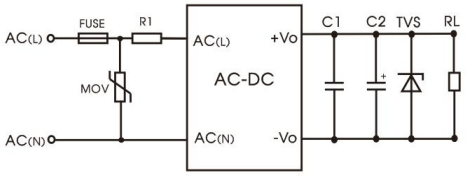


Fig. 1: Typical circuit diagram

Part No.	C1(uF)	C2(uF)	FUSE	R1	TVS	MOV
LD05-23B03R2	1	150	1A/300V, slow-blow, required	12Ω/3W (wire-wound resistor)	SMBJ7.0A	S10K350
LD05-23B05R2		150			SMBJ7.0A	
LD05-23B09R2		120			SMBJ12A	
LD05-23B12R2		120			SMBJ20A	
LD05-23B15R2		120			SMBJ20A	
LD05-23B24R2		68			SMBJ30A	

Output Filter Components:
We recommend using an electrolytic capacitor with high frequency, and low ESR rating for C2 (refer to manufacture's datasheet). Choose a Capacitor voltage rating with at least 20% margin, in other words not exceeding 80%. C1 is a ceramic capacitor used for filtering high-frequency noise and TVS is a recommended suppressor diode to protect the application in case of a converter failure.

2. EMC compliance recommended circuit

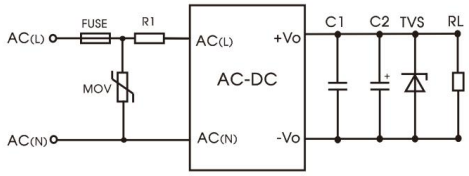


Fig 2: EMC application circuit with higher requirements

Component	Recommended value
MOV	S14K350
R1	33Ω/3W (wire-wound resistor)
FUSE	2A/300V, slow-blow, required

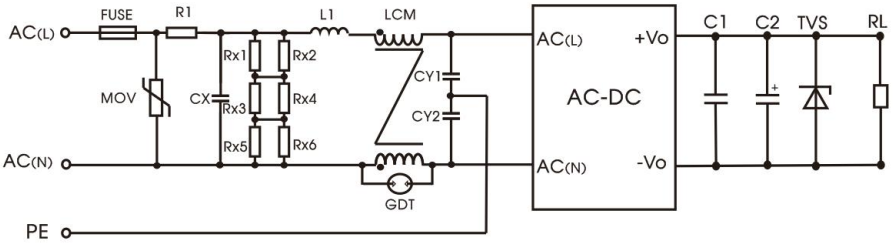
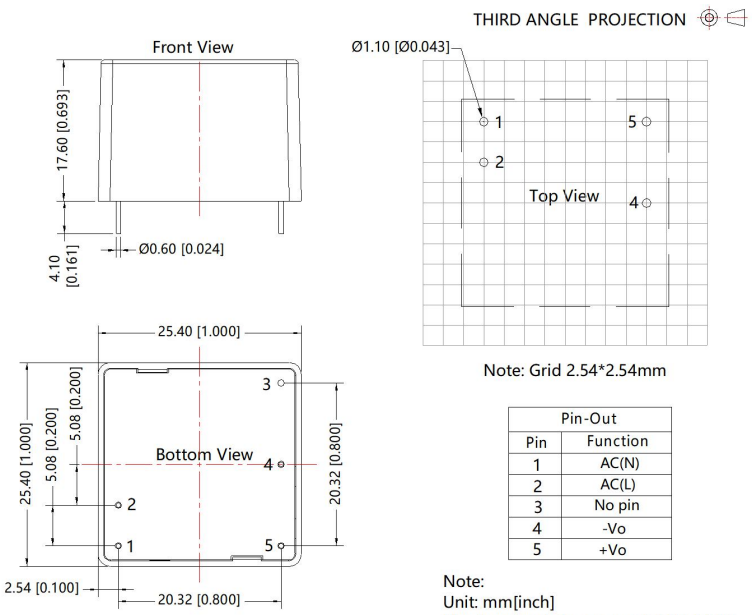


Fig 3: Recommended circuit for class Ⅰ equipment

Component	Recommended value
FUSE	2A/300V, slow-blow, required
MOV	S14K350
CX	334K/305VAC
R1	33Ω/3W (wire-wound resistor)
L1	1.2mH/0.3A
CY1/CY2	1nF/400VAC
GDT	300V/1KA
LCM	20 mH, we recommended using part no. FL2D-10-203 (MORNSUN)
Note: Rx1/Rx2/Rx3/Rx4/Rx5/Rx6 is the bleeder resistance of CX, and the recommended resistance value is 1.5MΩ/150VDC.	

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

Dimensions and Recommended Layout

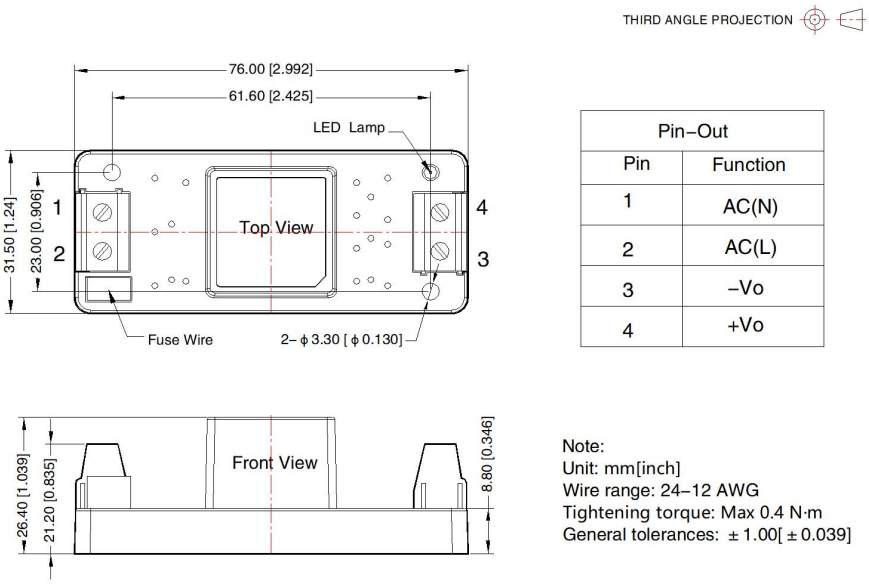


Note: Grid 2.54*2.54mm

Pin-Out	
Pin	Function
1	AC(N)
2	AC(L)
3	No pin
4	-Vo
5	+Vo

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

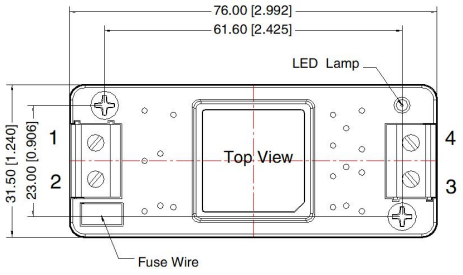
A2S Dimensions

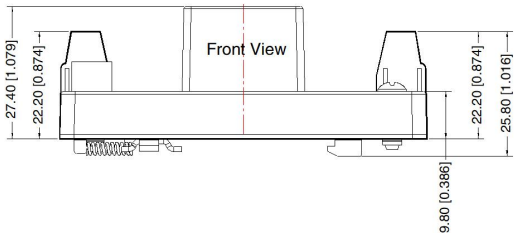


Pin–Out	
Pin	Function
1	AC(N)
2	AC(L)
3	–Vo
4	+Vo

Note:
Unit: mm[inch]
Wire range: 24–12 AWG
Tightening torque: Max 0.4 N·m
General tolerances: ± 1.00[± 0.039]

A4S Dimensions





THIRD ANGLE PROJECTION

Pin–Out	
Pin	Function
1	AC(N)
2	AC(L)
3	–Vo
4	+Vo

Note:
Unit: mm[inch]
Wire range: 24–12 AWG
Tightening torque: Max 0.4 N·m
Mounting rail: TS35, rail needs to connect safety ground
General tolerances: ±1.00[±0.039]

Note:

1. For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging bag number: 58220096 (Horizontal package); 58220022 (A2S/A4S package);
2. If the product is not operated within the required load range, the product performance cannot be guaranteed to comply with all parameters in the datasheet;
3. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25℃, humidity<75% with nominal input voltage 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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