

60W, AC-DC converter



FEATURES

- Universal 85-305VAC or 100-430VDC input voltage
- Operating ambient temperature range: -40°C to +85°C
- High I/O isolation test voltage up to 4200VAC
- Up to 91% efficiency
- Compact size, high power density
- Output short circuit, over-current, over-voltage protection
- 5000m altitude application
- OVC III (meet EN62477, 5000m altitude)
- Meets Emissions CLASS B and surge ± 2 KV without additional circuits



LD60-23BxxR2 series AC-DC converters is one of Mornsun's new generation compact size power converters. It features ultra-wide AC input and at the same time accepts DC input voltage, low power consumption, low ripple & noise, high efficiency, high reliability, reinforced isolation. It offers good EMC performance compliant to IEC/EN61000-4 and CISPR32/EN55032 and meets IEC/UL/EN62368, IEC/EN60335/62477, 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 (W)	Nominal Output Voltage and Current (Vo/Io)	Efficiency at 230VAC (%) Typ.	Capacitive Load (uF) Max.
IEC/UL/EN	LD60-23B05R2	60	5V/10A	89	20000
	LD60-23B12R2		12V/5A	91	5000
	LD60-23B15R2		15V/4A	90	3000
	LD60-23B24R2		24V/2.5A	90	1800
	LD60-23B48R2		48V/1.25A	91	470

Note: * Use suffix "A2S" for chassis mounting 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	--	--	1.8	A
	230VAC	--	--	1.0	
Inrush Current	115VAC	--	30	--	
	230VAC	--	60	--	
Leakage Current	277VAC/50Hz	0.25mA RMS Max.			
Fuse		3.15A/300V, slow-blow, required			
Hot Plug		Unavailable			

Output Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Output Voltage Accuracy		--	± 2	--	%
Line Regulation	Full load	--	± 1	--	
Load Regulation	0%-100% load	--	± 1.5	--	
Ripple & Noise*	20MHz bandwidth (peak-to-peak value)	--	80	150	mV
Stand-by Power Consumption	230VAC	--	0.3	0.45	W
Temperature Coefficient		--	± 0.02	--	%/°C

Short Circuit Protection		Hiccup, continuous, self-recovery			
Over-current Protection		≥140% I _o , self-recovery			
Over-voltage Protection	5VDC output	≤9VDC (Hiccup or clamp)			
	12VDC output	≤16VDC (Hiccup or clamp)			
	15VDC output	≤25VDC (Hiccup or clamp)			
	24VDC output	≤35VDC (Hiccup or clamp)			
	48VDC output	≤60VDC (Hiccup or clamp)			
Minimum Load		0	--	--	%
Hold-up Time	115VAC input	--	8	--	ms
	230VAC input	--	65	--	

Note: *The "Tip and barrel method" is used for ripple and noise test, output parallel 47uF 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	4200	--	--	VAC
Insulation Resistance	Input - output	Test voltage at 500VDC	100	--	--	MΩ
Operating Temperature			-40	--	+85	°C
Storage Temperature			-40	--	+85	
Storage Humidity			--	--	95	%RH
Soldering Temperature		Wave-soldering	260 ± 5°C; time: 5 - 10s			
		Manual-welding	360 ± 10°C; time: 3 - 5s			
Power Derating		-40°C to -25°C (85-200VAC input)	3.33	--	--	% / °C
		-40°C to -25°C (200-305VAC input)	1.33	--	--	
		+40°C to +70°C (5VDC output)	1.5	--	--	
		+45°C to +70°C (85-165VAC input, 12/15/24/48VDC output)	1.8	--	--	
		+50°C to +70°C (≥165VAC input, 12/15/24/48VDC output)	2.25	--	--	
		+70°C to +85°C	2	--	--	
		Operating Altitude Derating		85VAC - 100VAC	1.33	--
277VAC - 305VAC	0.72			--	--	
Operating Altitude Derating		2000m - 5000m	6.67	--	--	% / Km
Safety Standard		IEC/UL62368-1 safety approved & EN62368-1, BS EN 62368-1(Report); Design refer to IEC/EN60335-1/62477-1, EN61558-1				
Safety Class		CLASS II				
MTBF		MIL-HDBK-217F@25°C ≥500,000 h				

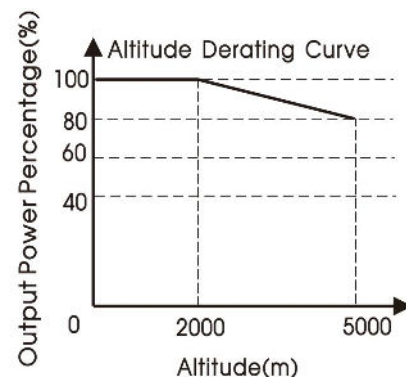
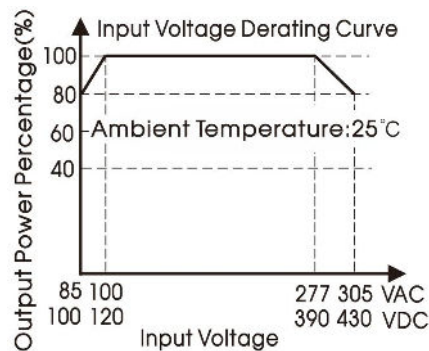
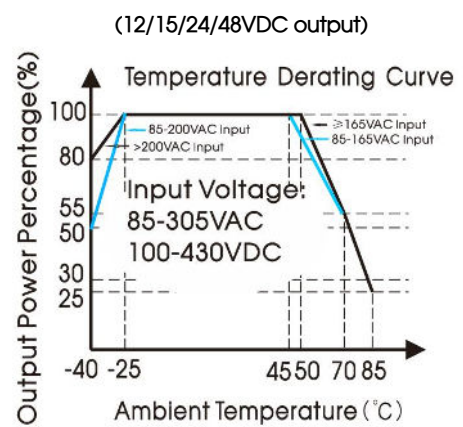
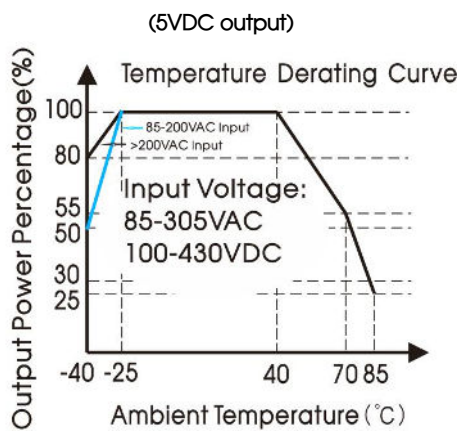
Mechanical Specifications

Case Material		Black plastic, flame-retardant and heat-resistant (UL94V-0)
Dimension	Horizontal package	70.00 x 48.00 x 27.00 mm
	A2 chassis mounting	96.10 x 54.00 x 35.50 mm
	A4 Din-Rail mounting	96.10 x 54.00 x 40.10 mm
Weight	Horizontal package	130g (Typ.)
	A2S chassis mounting	177g (Typ.)
	A4S Din-Rail mounting	220g (Typ.)
Cooling Method		Free air convection

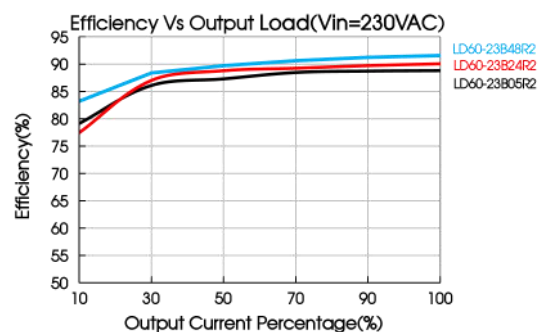
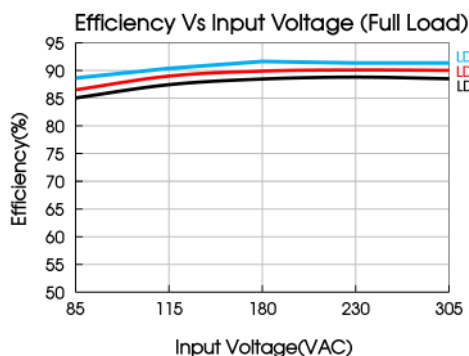
Electromagnetic Compatibility (EMC)

Emissions	CE	CISPR32/EN55032	CLASS B	
	RE	CISPR32/EN55032	CLASS B	
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	perf. Criteria A
		IEC/EN61000-4-4	±4KV (See Fig. 2 for recommended circuit)	perf. Criteria A
	Surge	IEC/EN61000-4-5	line to line ±2KV	perf. Criteria A
		IEC/EN61000-4-5	line to line ±2KV/line to PE ±4KV (See Fig. 2 for recommended circuit)	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

Product Characteristic Curve



Note: ① With an AC input between 85-100VAC/277-305VAC and a DC input between 100-120VDC/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 Mornsun FAE.



Design Reference

1. Typical application

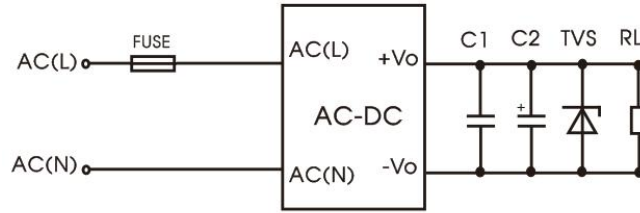


Fig. 1: Typical circuit diagram

Part No.	C1	C2	FUSE	TVS
LD60-23B05R2	1uF/50V	470uF/16V	3.15A/300V slow-blow, required	SMBJ10A
LD60-23B12R2		330uF/25V		SMBJ20A
LD60-23B15R2		330uF/25V		SMBJ30A
LD60-23B24R2		220uF/35V		SMBJ40A
LD60-23B48R2	1uF/100V	100uF/63V		SMBJ60A

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

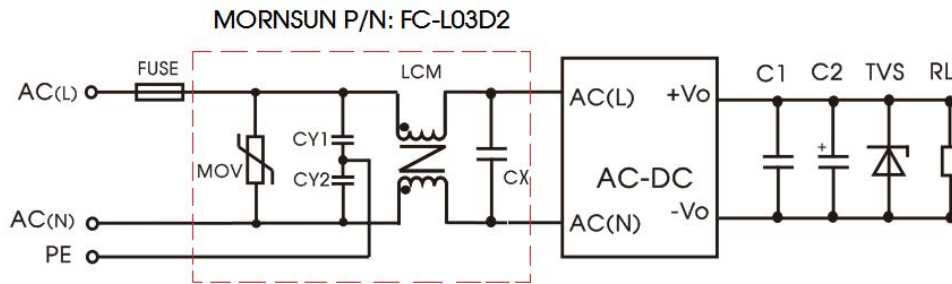


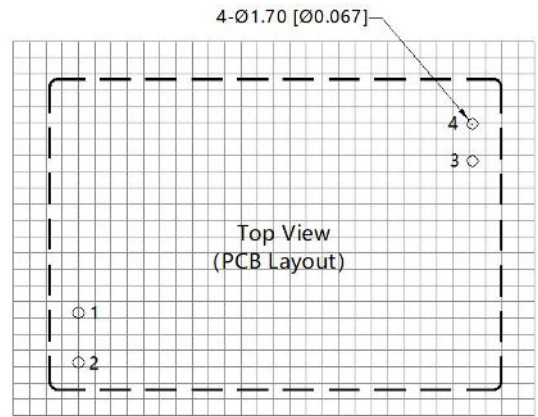
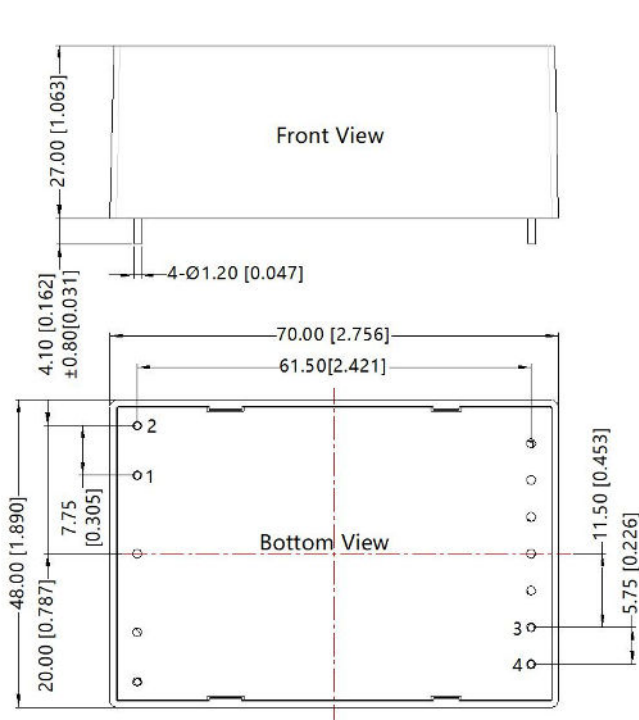
Fig. 2: EMC application circuit with higher requirements

Component	Recommended value
FUSE	3.15A/300V, slow-blow, required
MOV	S14K350
CY1/CY2	1nF/400VAC
CX	684K/310V
LCM	20mH, P/N: FL2D-10-203 (MORNSUN) is recommended

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

Dimensions and Recommended Layout

THIRD ANGLE PROJECTION



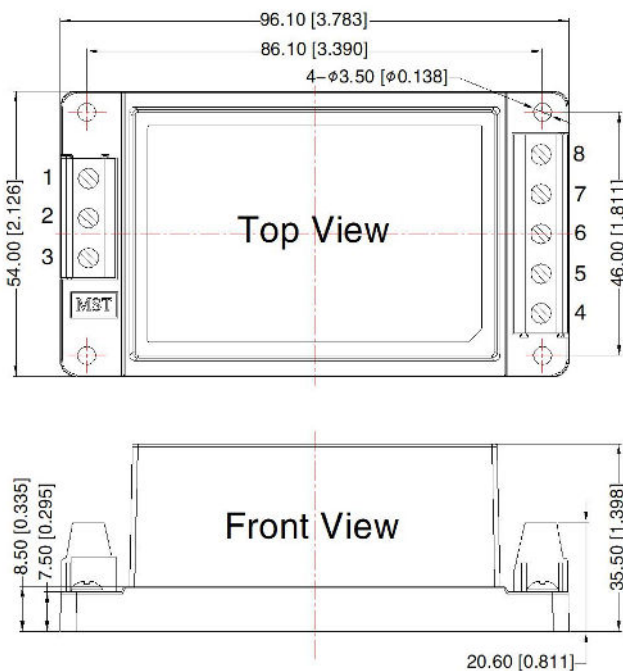
Note: Grid 2.54*2.54mm

Pin-Out	
Pin	Mark
1	AC(N)
2	AC(L)
3	-Vo
4	+Vo

Note:
Unit: mm[inch]
Pin diameter tolerances: $\pm 0.10 [\pm 0.004]$
General tolerances: $\pm 0.50 [\pm 0.020]$

A2S Dimensions

THIRD ANGLE PROJECTION

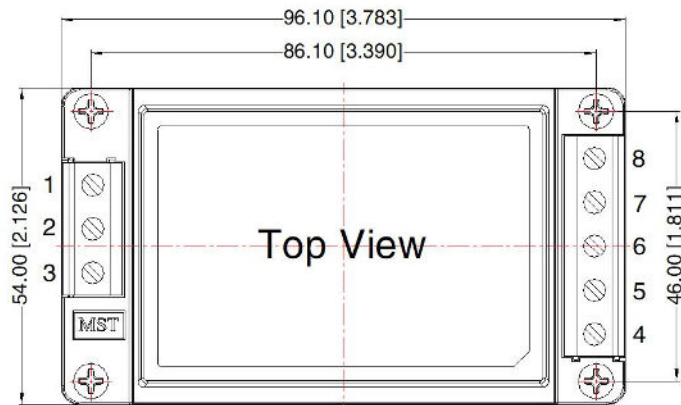


Pin-Out	
Pin	Function
1	NC
2	AC(N)
3	AC(L)
4	+Vo
5	NC
6	NC
7	NC
8	-Vo

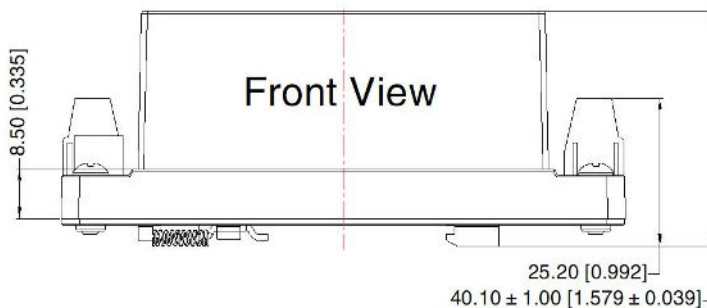
Note:
Unit: mm[inch]
Wire range: 24-12AWG
Tightening torque: Max 0.4N · M
General tolerances: $\pm 1.00 [\pm 0.039]$

A4S Dimensions

THIRD ANGLE PROJECTION 



Pin-Out	
Pin	Function
1	NC
2	AC(N)
3	AC(L)
4	+Vo
5	NC
6	NC
7	NC
8	-Vo



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

Note:

- For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging bag number: 58220017; (Horizontal package); 58220019 (A2S/A4S package);
- 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;
- Unless otherwise specified, parameters in this datasheet were measured under the conditions of $T_a=25^{\circ}\text{C}$, humidity<75% with nominal input voltage and rated output load;
- All index testing methods in this datasheet are based on our company corporate standards;
- We can provide product customization service, please contact our technicians directly for specific information;
- Products are related to laws and regulations: see "Features" and "EMC";
- 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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