

20W, 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 87% efficiency
- Output short circuit, over-current, over-voltage protection
- 5000m altitude application
- Plastic case meets UL94V-0 flammability
- Meets Emissions CLASS B and surge LEVEL 4 without additional circuits
- OVC III (meet IEC62477-1, 2000m altitude)

LH20-23BxxR2 series AC-DC converters are highly efficient, environmental-friendly 20W power modules. It features universal 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 UL/EN/IEC62368, IEC62477 standards. The converters are widely used in industrial, power and office 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.
EN	LH20-23B03R2	11.55	3.3V/3500mA	80	36000
	LH20-23B05R2	15.5	5V/3100mA	82	12240
	LH20-23B09R2	18.9	9V/2100mA	85	5600
	LH20-23B12R2	19.2	12V/1600mA	86	5000
	LH20-23B15R2	19.5	15V/1300mA	87	3000
	LH20-23B24R2	20.4	24V/850mA	85	1200
	LH20-23B48R2	19.68	48V/410mA	87	500

Note: \* Use suffix "A2" for chassis mounting and suffix "A4" 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	--	--	0.6	A
	230VAC	--	--	0.34	
Inrush Current	115VAC	--	35	--	A
	230VAC	--	70	--	
Leakage Current	277VAC/50Hz	0.25mA RMS Max.			
Recommended External Input Fuse		3.15A/300V, slow-blow, required			
Hot Plug		Unavailable			

## Output Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit	
Output Voltage Accuracy	All load range	3.3V output	--	±3	--	%
		others	--	±2	--	
Linear Regulation	Full load	--	±0.5	--		

Load Regulation	0% - 100% load		--	±1	--	
Ripple & Noise*	20MHz bandwidth (peak-to-peak value)		--	--	100	mV
Temperature Coefficient			--	±0.02	--	%/°C
Stand-by Power Consumption	230VAC	3.3V/5V/9V/12V/15V/24V	--	0.15	0.3	W
		48V	--	0.3	0.5	
Short Circuit Protection			Hiccup, continuous, self-recovery			
Over-current Protection			≥130% Io, self-recovery			
Over-voltage Protection	3.3/5V		≤7.5VDC (Output voltage Hiccup)			
	9V		≤15VDC (Output voltage Hiccup)			
	12/15V		≤20VDC (Output voltage Hiccup)			
	24V		≤30VDC (Output voltage Hiccup)			
	48V		≤60VDC (Output voltage Hiccup)			
Minimum Load			0	--	--	%
Hold-up Time	115VAC		--	15	--	ms
	230VAC		--	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	4200	--	--	VAC
	Input - ⊕		2500	--	--	
	Output - ⊕		1250	--	--	
Impulse Withstand Voltage	Input - output	1.2/50us impulse waveform, three positive/ negative pulses, interval ≥5s. There is no breakdown discharge during the test.	6000	--	--	VDC
	Input - ⊕		6000	--	--	
	Output - ⊕		6000	--	--	
Insulation Resistance	Input - output	At 500VDC	100	--	--	MΩ
	Input - ⊕		100	--	--	
	Output - ⊕		100	--	--	
Operating Temperature			-40	--	+85	°C
Storage Temperature			-40	--	+105	°C
Storage Humidity			--	--	95	%RH
Soldering Temperature	Wave-soldering		260 ± 5°C; time: 5-10s			
	Manual-welding		360 ± 10°C; time: 3-5s			
Switching Frequency			--	65	--	KHz
Power Derating	-40°C to -25°C		4.00	--	--	% / °C
	+50°C to +70°C (3.3V/5V)		2.50	--	--	
	+55°C to +70°C (9V/12V/15V/24V/48V)		3.33	--	--	
	+70°C to +85°C		0.67	--	--	
	85VAC - 100VAC		1.67	--	--	% / VAC
	277VAC - 305VAC		0.72	--	--	
2000m - 5000m		6.67	--	--	% / Km	
Safety Standard			BS EN62368-1 & EN62368-1(report) safety approval; Design refer to UL/IEC62368-1, IEC62477-1			
Safety Class			CLASS I			
MTBF			MIL-HDBK-217F@25°C ≥300,000 h			

## Mechanical Specifications

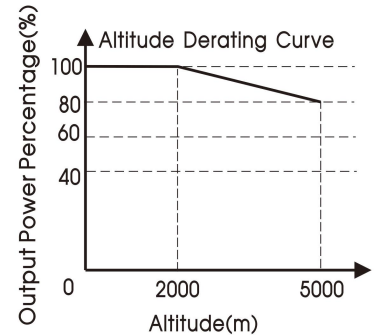
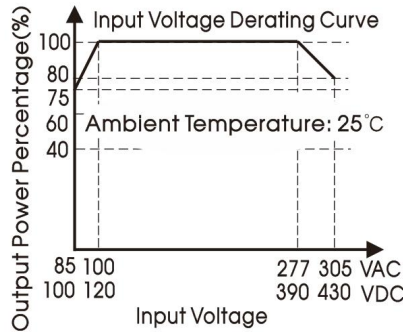
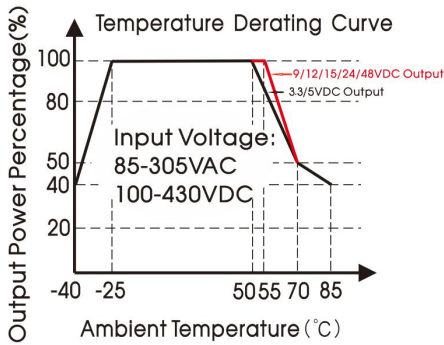
Case Material	Black plastic, flame-retardant and heat-resistant (UL94V-0)	
Dimension	Horizontal package	62.00 x 45.00 x 22.50 mm
	A2 chassis mounting	96.10 x 54.00 x 31.00mm
	A4 Din-Rail mounting	96.10 x 54.00 x 35.60mm

Weight	Horizontal package/A2 chassis mounting/A4 Din-Rail mounting	85g (Typ.)/130g (Typ.)/170g (Typ.)
Cooling Method	Free air convection	

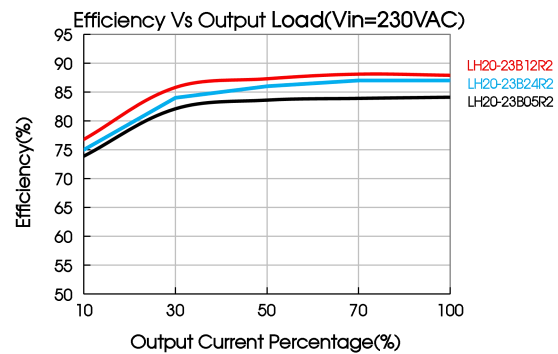
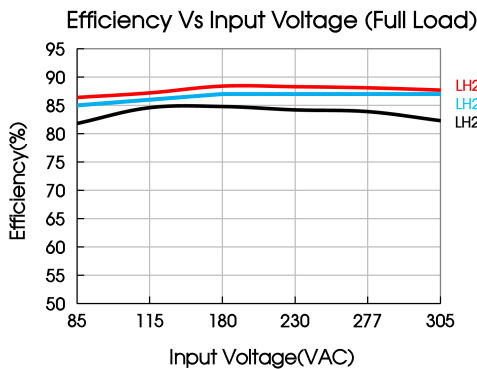
### Electromagnetic Compatibility (EMC)

Emissions	CE	CISPR32/EN55032	CLASS B	
	RE	CISPR32/EN55032	CLASS B	
Immunity	ESD	IEC/EN61000-4-2	Contact $\pm 8\text{KV}$ /Air $\pm 15\text{KV}$	perf. Criteria A
	RS	IEC/EN61000-4-3	10V/m	perf. Criteria A
	EFT	IEC/EN61000-4-4	$\pm 4\text{KV}$	perf. Criteria A
	Surge	IEC/EN61000-4-5	line to line $\pm 2\text{KV}$ /line to PE $\pm 4\text{KV}$	perf. Criteria A
			line to line $\pm 4\text{KV}$ / line to PE $\pm 6\text{KV}$ (See Fig. 2 for recommended circuit)	perf. Criteria A
	CS	IEC/EN61000-4-6	10Vr.m.s	perf. Criteria A
	PFM	IEC/EN61000-4-8	30A/m	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

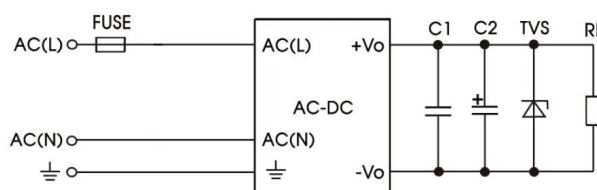


Fig. 1: Typical circuit diagram

Part No.	FUSE	C1	C2	TVS
LH20-23B03R2	3.15A/300V, slow-blow, required	1uF	680uF/25V	SMBJ7.0A
LH20-23B05R2			680uF/25V	SMBJ7.0A
LH20-23B09R2			470uF/25V	SMBJ12A
LH20-23B12R2			220uF/25V	SMBJ20A
LH20-23B15R2			220uF/25V	SMBJ20A
LH20-23B24R2			68uF/35V	SMBJ30A
LH20-23B48R2			33uF/63V	SMBJ64A

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

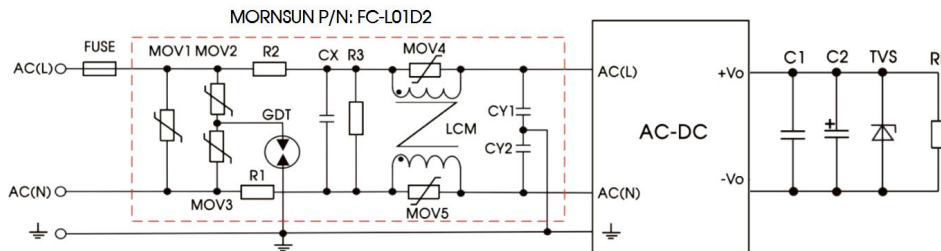


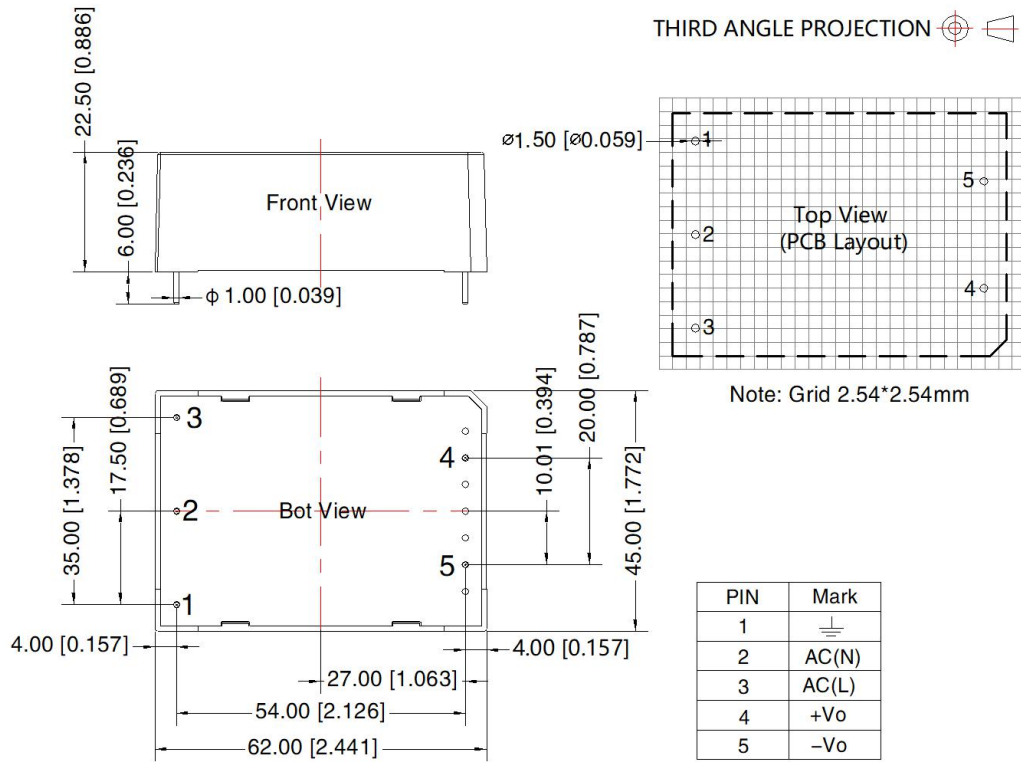
Fig. 2: EMC application circuit with higher requirements  
(Output external circuit refer to the typical application)

Component	Recommended value	Component	Recommended value
MOV1	S20K350	CY1/CY2	2200PF/400VAC
MOV2/MOV3	S14K350	GDT	B 5G3600
MOV4/MOV5	S07K350	R3	1MΩ /2W (wire-wound resistor)
CX	0.15UF/310VAC	FUSE	3.15A/300V, slow-blow, required
R1/R2	2Ω /3W (wire-wound resistor)		
LCM	4.7mH, P/N: FL2D-10-472 (MORNSUN) is recommended		

Note: R3 can also be replaced by 4 pieces of 1.5MΩ /1206 SMD resistors in series and parallel.

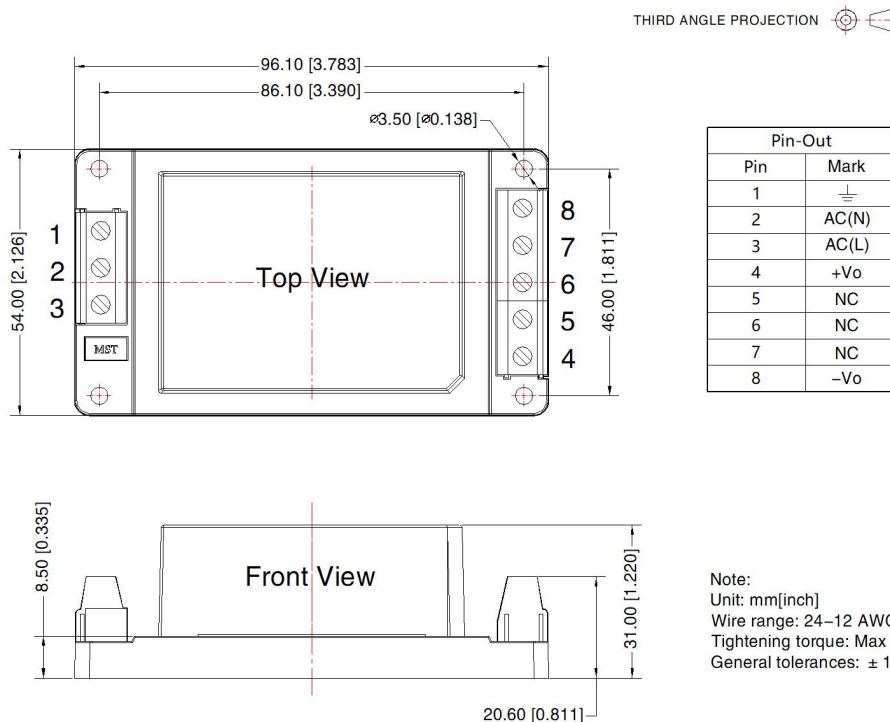
3. For additional information please refer to application notes on [www.mornsun-power.com](http://www.mornsun-power.com).

Dimensions and Recommended Layout



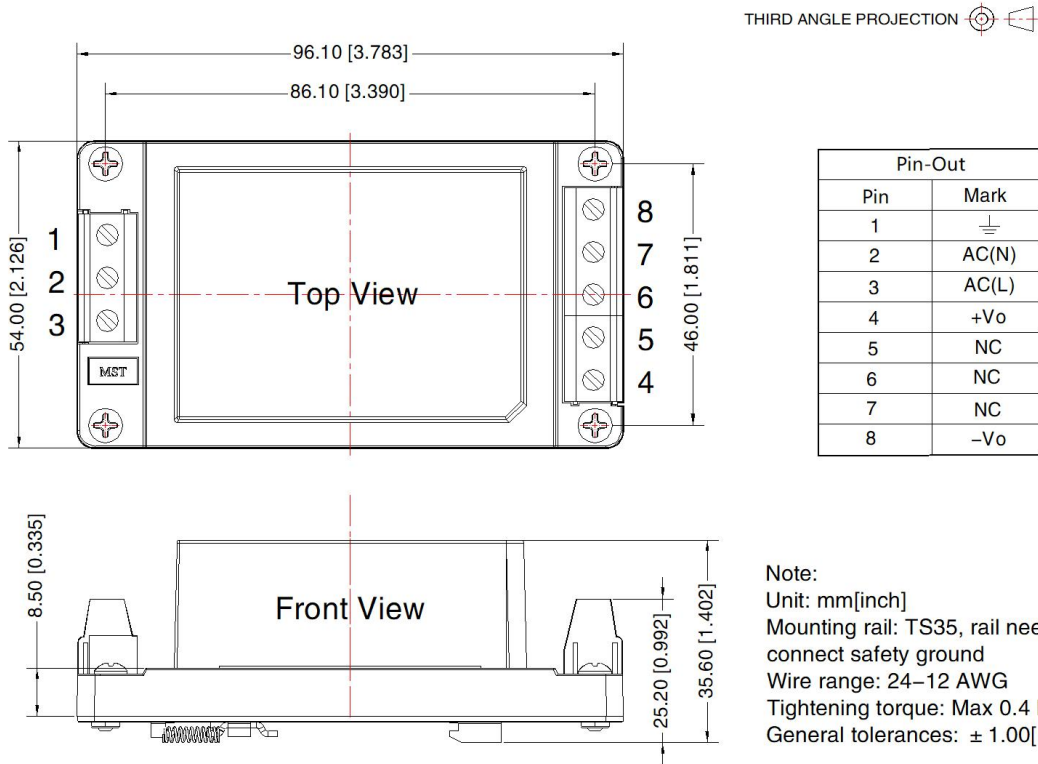
Note:  
Unit: mm[inch]  
General tolerances:  $\pm 0.5[\pm 0.020]$   
Terminal section:  $\pm 0.1[\pm 0.004]$   
The layout of the device is for reference only,  
please refer to the actual product

A2 Dimensions





A4 Dimensions



- Note:
- For additional information on Product Packaging please refer to [www.mornsun-power.com](http://www.mornsun-power.com). Packaging bag number: 58220006 (Horizontal package); 58220019 (A2/A4 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";
  - If product involves multi-brand materials and there are differences in color etc, please refer to the standards of each manufacturer;
  - 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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