

15W, 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 85% efficiency
- Output short circuit, over-current, over-voltage protection
- 5000m altitude application
- Plastic case meets UL94V-0 flammability
- Meets Emissions CLASS B and surge  $\pm 2\text{KV}$  without additional circuits
- OVC III (meet IEC62477-1, 2000m altitude)

LHE15-23BxxR2 series AC-DC converters are highly efficient, environmental-friendly 15W 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 IEC/EN/UL62368 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	Nominal Output Voltage and Current(Vo/Io)	Efficiency at 230VAC (%) Typ.	Capacitive Load (uF) Max.
EN/IEC	LHE15-23B03R2	9.9W	3.3V/3000mA	77	30000
	LHE15-23B05R2	14W	5V/2800mA	79	16000
EN	LHE15-23B09R2	15W	9V/1670mA	78	5500
EN/IEC	LHE15-23B12R2		12V/1250mA	82	4500
	LHE15-23B15R2		15V/1000mA	82	4000
	LHE15-23B24R2		24V/625mA	83	800
	LHE15-23B48R2		48V/320mA	85	400

Note: 1. \* Use suffix "A2" for chassis mounting and suffix "A4" for Din-Rail mounting.  
2. The product picture is for reference only. For details, please refer to the actual product.

## 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	--	--	0.37	A
	230VAC	--	--	0.22	
Inrush Current	115VAC	--	16	--	
	230VAC	--	30	--	
Leakage Current	277VAC/50Hz	0.25mA RMS Max.			
Recommended External Input Fuse		2A/300V, slow-blow, required			
Hot Plug		Unavailable			

## Output Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Output Voltage Accuracy	3.3V output	--	$\pm 3$	--	%
	others	--	$\pm 2$	--	
Line Regulation	Full load	--	$\pm 0.5$	--	
Load Regulation	0%-100% load	--	$\pm 1$	--	mV
Ripple & Noise*	20MHz bandwidth (peak-to-peak value)	--	50	100	
Temperature Coefficient		--	$\pm 0.02$	--	%/°C

Stand-by Power Consumption	230VAC	3.3V/5V/9V/12V/15V/24V	--	--	0.3	W
		48V	--	--	0.5	
Short Circuit Protection			Hiccup, continuous, self-recover			
Over-current Protection			≥ 150%Io, self-recover			
Over-voltage Protection	3.3/5V output		≤ 7.5VDC (Hiccup)			
	9V output		≤ 15VDC (Hiccup)			
	12/15V output		≤ 20VDC (Hiccup)			
	24V output		≤ 30VDC (Hiccup)			
	48V output		≤ 60VDC (Hiccup)			
Minimum Load			0	--	--	%
Hold-up Time	115VAC input		--	5	--	ms
	230VAC input		--	40	--	
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.,	4200	--	--	VAC
Impulse Withstand Voltage	Input - output	1.2/50 μs impulse waveform, three positive/negative pulses, interval ≥ 5s. There is no breakdown discharge during the test.	6000	--	--	VDC
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			
Switching Frequency			--	65	--	KHz
Power Derating	-40°C to -25°C		4.00	--	--	% / °C
	+55°C to +70°C		2.67	--	--	
	+70°C to +85°C		1.33	--	--	
	85VAC-100VAC		1.67	--	--	% / VAC
	277VAC-305VAC		0.72	--	--	
	2000m-5000m		6.67	--	--	% / Km
Safety Standard	9V output		EN62368-1 safety approved; Design refer to IEC/UL62368-1, IEC62477-1			
	Others		IEC/EN62368-1 safety approval; Design refer to UL62368-1, IEC62477-1			
Safety Class			CLASS II			
MTBF			MIL-HDBK-217F@25°C > 500,000 h			

## Mechanical Specifications

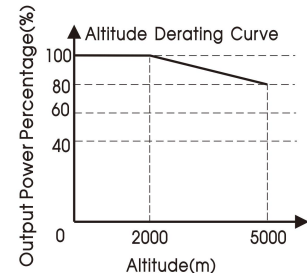
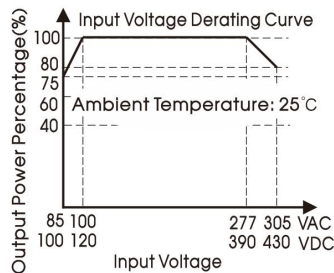
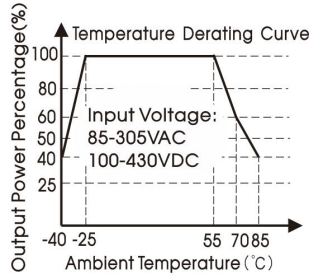
Case Material		Black plastic, flame-retardant and heat-resistant (UL94V-0)
Dimension	Horizontal package	62.00 x 45.00 x 22.50 mm
	A2 chassis mounting	96.10 x 54.00 x 31.00mm
	A4 Din-Rail mounting	96.10 x 54.00 x 35.60mm
Weight	Horizontal package/A2 chassis mounting/A4 Din-Rail mounting	
		80g (Typ.)/125g (Typ.)/165g (Typ.)
Cooling Method		Free air convection

## Electromagnetic Compatibility (EMC)

Emissions	CE	CISPR32/EN55032 CLASS B
	RE	CISPR32/EN55032 CLASS B

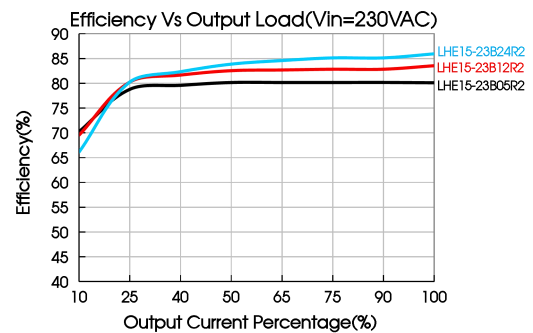
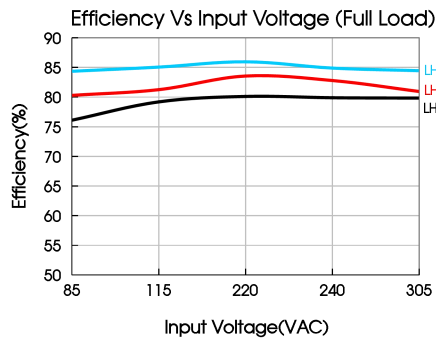
Immunity	ESD	IEC/EN61000-4-2	Contact $\pm 8\text{KV}$ /Air $\pm 15\text{KV}$	perf. Criteria A
	RS	IEC/EN61000-4-3	10V/m	perf. Criteria A
	EFT	IEC/EN61000-4-4	$\pm 4\text{KV}$	perf. Criteria A
	Surge	IEC/EN61000-4-5	line to line $\pm 2\text{KV}$	perf. Criteria A
		IEC/EN61000-4-5	line to line $\pm 4\text{KV}$ / 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	10A/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 factory or one of our FAE.



## Design Reference

### 1. Typical application

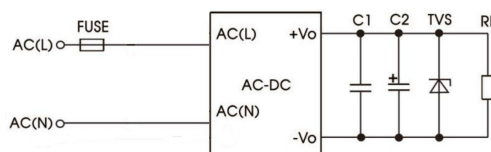


Fig. 1: Typical circuit diagram

Part No.	C1	C2	FUSE	TVS
LHE15-23B03R2	1uF/50V	680uF/25V	2A/300V, slow-blow, required	SMBJ7.0A
LHE15-23B05R2		680uF/25V		SMBJ7.0A
LHE15-23B09R2		470uF/25V		SMBJ12A
LHE15-23B12R2		220uF/25V		SMBJ20A
LHE15-23B15R2		220uF/25V		SMBJ20A
LHE15-23B24R2		68uF/35V		SMBJ30A
LHE15-23B48R2		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

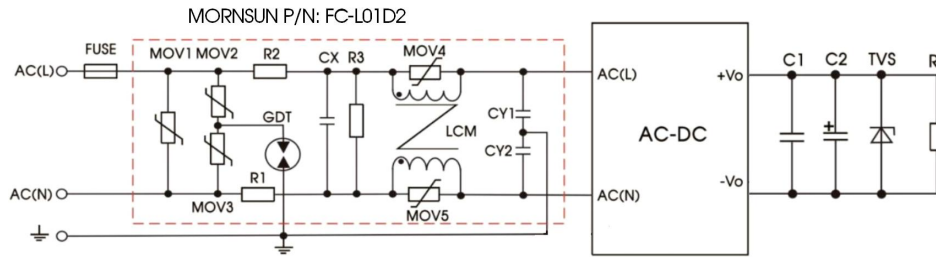


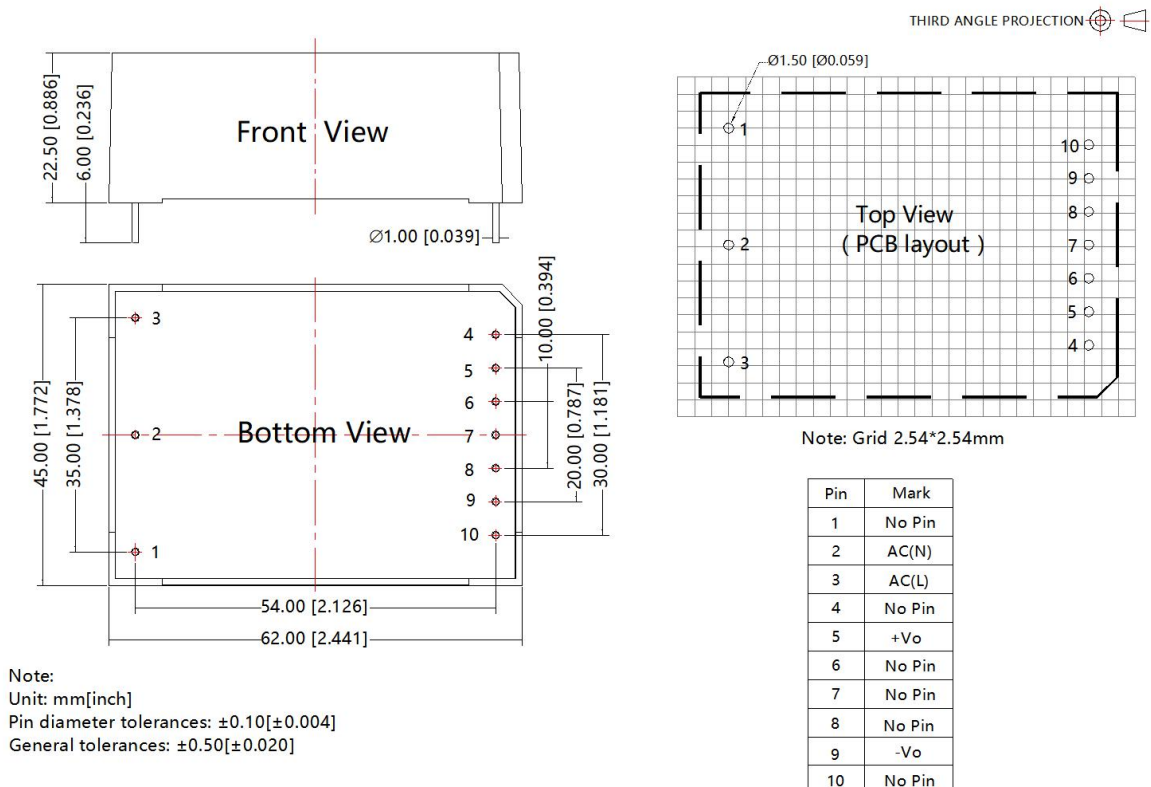
Fig 2: EMC application circuit with higher requirements

Component	Recommended value	Component	Recommended value
MOV1	S20K350	CY1/CY2	2200PF/400VAC
MOV2/MOV3	S14K350	GDT	B 5G3600
MOV4/MOV5	S07K350	R3	1M $\Omega$ /2W (wire-wound resistor, required)
CX	0.15uF/310VAC	FUSE	2A/300V, slow-blow, required
R1/R2	2 $\Omega$ /3W (wire-wound resistor, required)		
LCM	10mH, we recommended using part No. FL2D-Z5-153 (MORNSUN)		

Note: R3 (required) can also be replaced by 4 pieces of 1.5M $\Omega$ /1206 patch resistors in series and parallel.

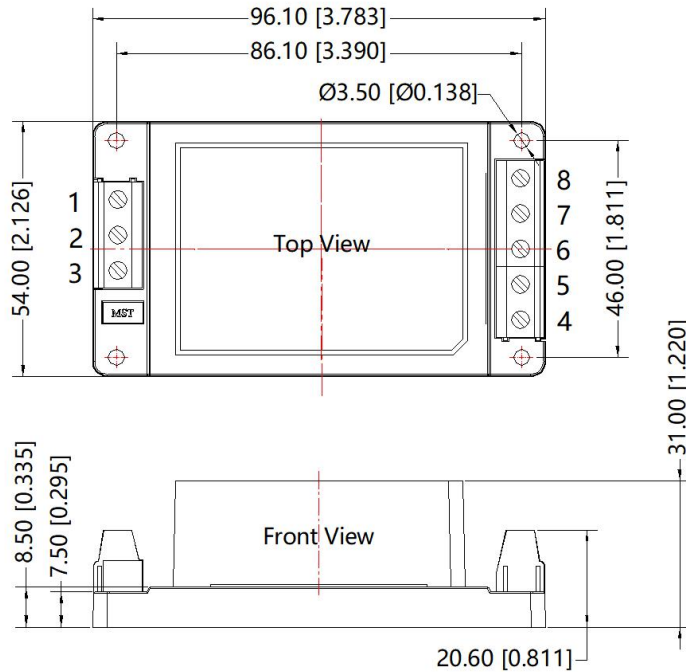
3. For additional information please refer to application notes on [www.mornsun-power.com](http://www.mornsun-power.com).

## Dimensions and Recommended Layout



## A2 Dimensions

THIRD ANGLE PROJECTION

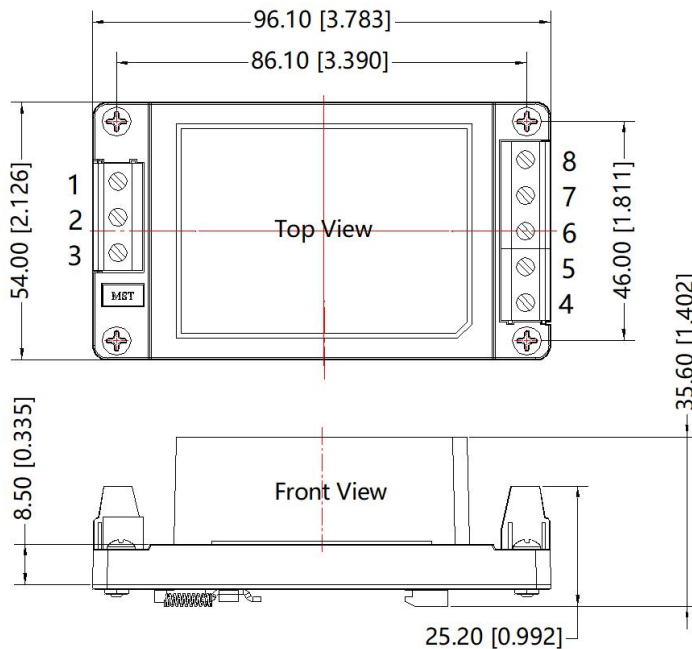


Pin	Mark
1	NC
2	AC(N)
3	AC(L)
4	+Vo
5	NC
6	NC
7	NC
8	-Vo

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

## A4 Dimensions

THIRD ANGLE PROJECTION



Pin	Mark
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: 24-12 AWG  
Tightening torque: Max 0.4 N·m  
General tolerances: ±1.00[±0.039]



Note:

1. For additional information on Product Packaging please refer to [www.mornsun-power.com](http://www.mornsun-power.com). Packaging bag number : 58220006 (Horizontal package); 58220010 (A2/A4 package);
2. 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;
3. All index testing methods in this datasheet are based on our company corporate standards;
4. We can provide product customization service, please contact our technicians directly for specific information;
5. Products are related to laws and regulations: see "Features" and "EMC";
6. 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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