

40W, AC/DC converter



## FEATURES

- Wide 85-305V Universal AC or 100-430VDC Input voltage
- Operating ambient temperature range: -40°C ~ +70°C
- High I/O isolation test voltage up to 4000VAC
- Regulated output, low ripple & noise
- Output short circuit, over-current, over-voltage protection
- High efficiency, high reliability
- Plastic case meets UL94V-0 flammability
- Meet EMI CISPR32/EN55032 CLASS B
- EN62368 safety approved

LHE40-23Bxx series are 40W efficient environmental-protection AC-DC module power supply. 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, CISPR32/EN55032, and is safety certified to IEC/EN/UL62368 standards. The converters are widely used in areas of industrial, electricity, office and applications with unstable supply voltage. 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 277VAC (%)Typ.	Capacitive Load (μF)Max.
CE	LHE40-23B03	40W	3.3VDC/8000mA	77	60000
	LHE40-23B05		5VDC/8000mA	80	40000
	LHE40-23B12		12VDC/3330mA	84	9000
	LHE40-23B15		15VDC/2660mA	84	7000
	LHE40-23B24		24VDC/1670mA	84	2000
	LHE40-23B48		48VDC/830mA	84	1000

Note: \* Use suffix "A5" for chassis mounting and suffix "A6" 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	--	--	1.0	A
	277VAC	--	--	0.6	
Inrush Current	115VAC	--	60	--	A
	230VAC	--	80	--	
Hot Plug		Unavailable			

## Output Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit	
Output Voltage Accuracy	All load range	3.3V/5V Output	--	±2	±3	
		12V/15V /24V/48V Output	--	±2	--	
Line Regulation	Rated load	--	±0.5	--	%	
Load Regulation	0% - 100% load(3.3V/5V Output)	--	±1	±3		
	0% - 100% load(12V/15V /24V/48V Output)	--	±1	--		
Ripple & Noise*	20MHz bandwidth (peak-to-peak value)	--	80	150	mV	
Temperature Coefficient		--	±0.02	--	%/°C	
Stand-by Power Consumption		--	--	0.5	W	
Short Circuit Protection		Hiccup, continuous, self-recovery				
Over-current Protection		≥110%Io, self-recovery				

Over-voltage Protection	3.3V Output	≤5.5V (Output voltage clamp or shut off)			
	5V Output	≤ 9 V (Output voltage clamp or shut off)			
	12V Output	≤ 16V (Output voltage clamp or shut off)			
	15V Output	≤24V (Output voltage clamp or shut off)			
	24V Output	≤35V (Output voltage clamp or shut off)			
	48V Output	≤56V (Output voltage clamp or shut off)			
Minimum Load		0	--	--	%
Hold-up Time	115VAC input	--	10	--	ms
	277VAC input	--	50	--	

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 Test	Input - Output	4000	--	--	VAC
Operating Temperature		-40	--	+70	°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			
Switching Frequency		--	65	--	kHz
Power Derating	-40°C to -30°C (LHE40-23B03/05)	4.0	--	--	% / °C
	-40°C to -30°C (LHE40-23B12/15)	3.0	--	--	
	-40°C to -30°C (LHE40-23B24/48)	2.0	--	--	
	+45°C to +70°C (LHE40-23B03/05)	3.0	--	--	
	+55°C to +70°C (LHE40-23B12/15)	3.7	--	--	
	+55°C to +70°C (LHE40-23B24/48)	2.7	--	--	
	85VAC-100VAC	1.33	--	--	% / VAC
	277VAC-305VAC	0.72	--	--	
Safety Standard		IEC62368/EN62368/UL62368			
Safety Certification		EN62368			
Safety Class		CLASS II			
MTBF		MIL-HDBK-217F@25°C > 300,000 h			

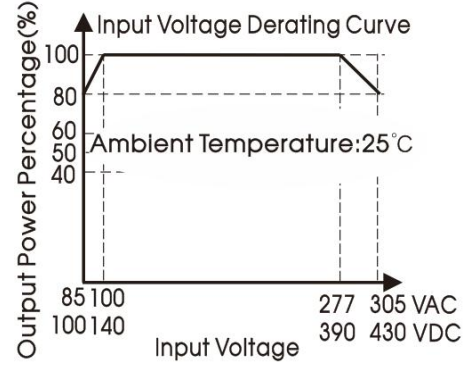
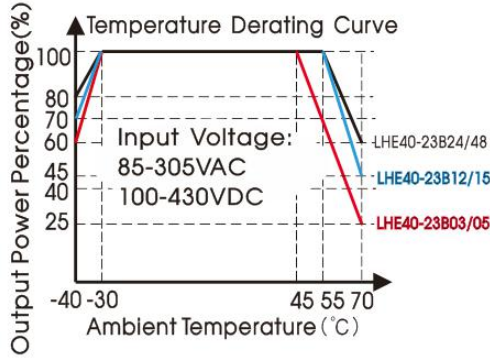
### Mechanical Specifications

Case Material	Black flame-retardant and heat-resistant plastic (UL94V-0)	
Dimensions	Horizontal package	89.00 x 63.50 x 25.00 mm
	A5 chassis package	135.00 x 70.00 x 33.50 mm
	A6 DIN-rail package	137.00 x 70.00 x 39.00 mm
Weight	Horizontal package/A5 chassis package/A6 DIN-rail package	215g/300g/360g(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 B
	RS	IEC/EN61000-4-3	10V/m	perf. Criteria A
	EFT	IEC/EN61000-4-4	±2KV	perf. Criteria B
		IEC/EN61000-4-4	±4KV (See Fig. 2 for recommended circuit)	perf. Criteria B
	Surge	IEC/EN61000-4-5	line to line ±1KV	perf. Criteria B
		IEC/EN61000-4-5	line to line±2KV/ line to ground ±4KV (See Fig. 2 for recommended circuit)	perf. Criteria B
	CS	IEC/EN61000-4-6	10Vr.m.s	perf. Criteria A

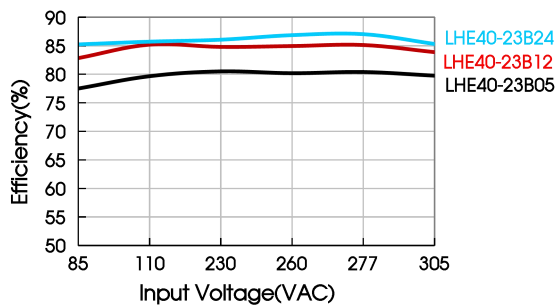
Product Characteristic Curve



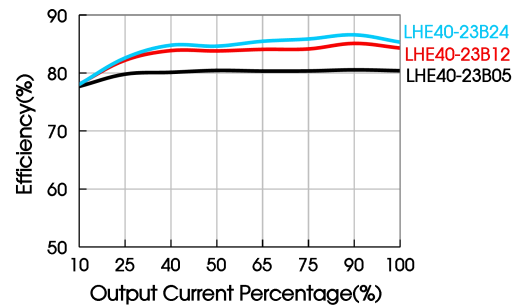
Note: ① With an AC input between 85 - 100VAC/277 - 305VAC and a DC input between 100 - 140VDC/390 - 430VDC, the output power must be derated as per temperature derating curves;

② This product is suitable for applications using natural air cooling; for applications in closed environment please consult factory or one of our FAE.

Efficiency Vs Input Voltage (Full Load)



Efficiency Vs Output Load (Vin=277VAC)



Design Reference

1. Typical application circuit

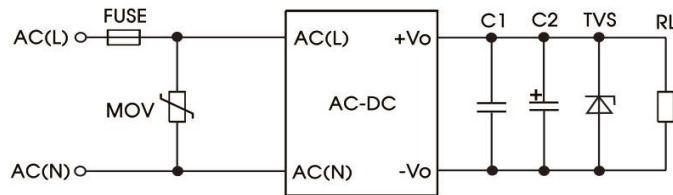


Fig. 1: Typical application circuit

Part No.	C2(uF)	C1 (uF)	TVS	MOV	Fuse
LHE40-23B03	680	1	SMBJ7.0A	S14K350	3.15A/300V, slow-blow, required
LHE40-23B05	680	1	SMBJ7.0A		
LHE40-23B12	220	1	SMBJ20A		
LHE40-23B15	220	1	SMBJ20A		
LHE40-23B24	120	1	SMBJ30A		
LHE40-23B48	100	1	SMBJ64A		

Note:

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

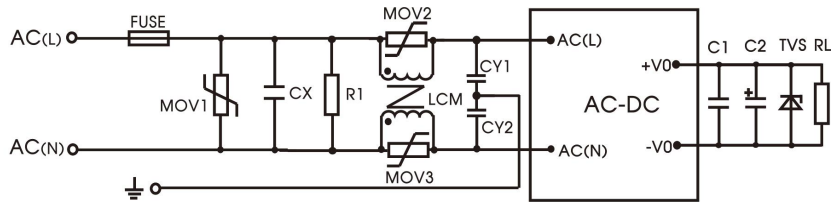
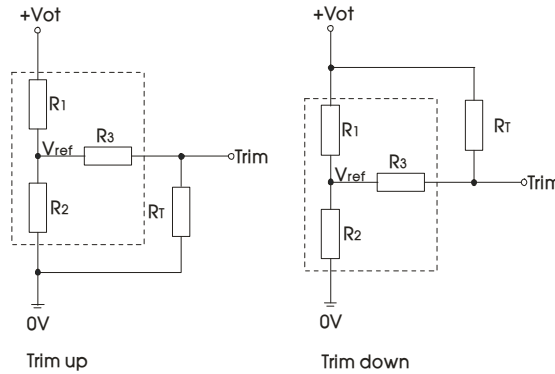


Fig.2 (Output external circuit refer to the typical application circuit)

Element model	Recommended value
MOV1	S14K350
MOV2, MOV3	S07K350
CX	0.15μF/300VAC
CY1	2.2nF/400VAC
CY2	2.2nF /400VAC
R1	1MΩ /2W
LCM	2.2 mH, recommended to use MORNSUN's FL2D-10-222
FUSE	3.15A/300V, slow-blow, required

3. Trim Function for Output Voltage Adjustment (open if unused)



Trim resistor connection (dashed line shows internal resistor network)

Calculating Trim resistor values:

$$\text{up: } R_T = \frac{\alpha R_2}{R_2 - \alpha} - R_3$$

$$\alpha = \frac{V_{ref}}{V_{ot} - V_{ref}} \cdot R_1$$

$R_T$  = Trim Resistor value;  
 $\alpha$  = Self-defined parameter;


$$\text{down: } R_T = \frac{\alpha R_1}{R_1 - \alpha} - R_3$$

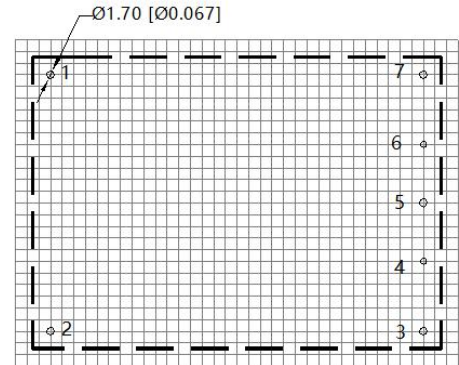
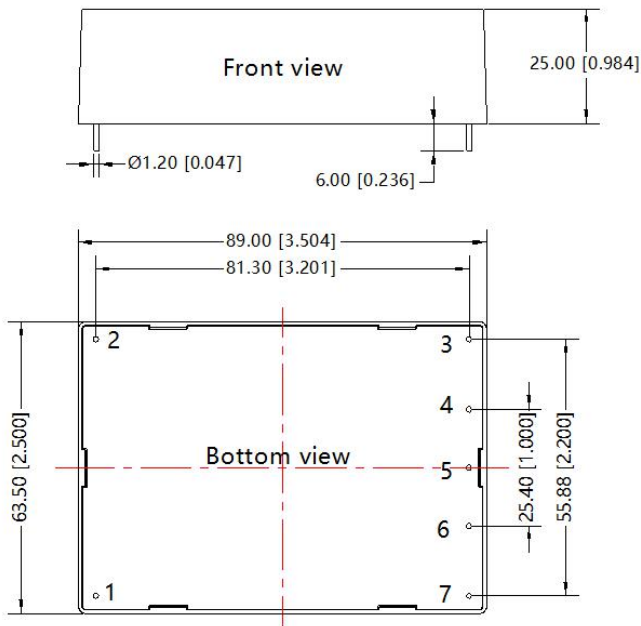
$$\alpha = \frac{V_{ot} - V_{ref}}{V_{ref}} \cdot R_2$$

V <sub>out</sub>	R1(KΩ)	R2(KΩ)	R3(KΩ)	V <sub>ref</sub> (V)	V <sub>ot</sub> (V)
3.3V	2	1.2	1	1.24	Output voltage after regulation, variation ≤ ±10%
5V	3.3	3.3	1	2.5	
12V	3.83	1	1	2.5	
15V	7.5	1.5	1	2.5	
24V	8.66	1	1	2.5	
48V	22	1.2	1	2.5	

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

Dimensions and Recommended Layout

THIRD ANGLE PROJECTION 



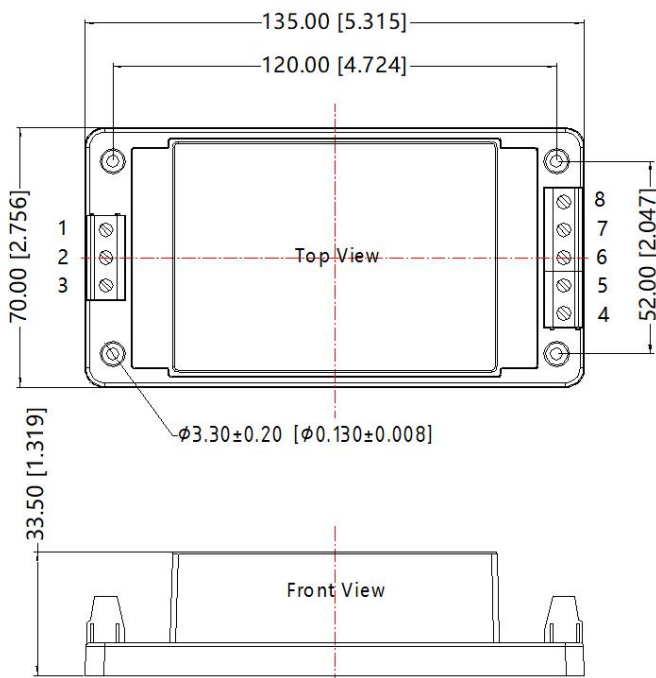
Note : Grid 2.54\*2.54mm

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

Pin-Out	
Pin	LHE40-23B
1	AC(L)
2	AC(N)
3	Trim
4	No Pin
5	-Vo
6	No Pin
7	+Vo

A5 Chassis Package Dimensions

THIRD ANGLE PROJECTION 

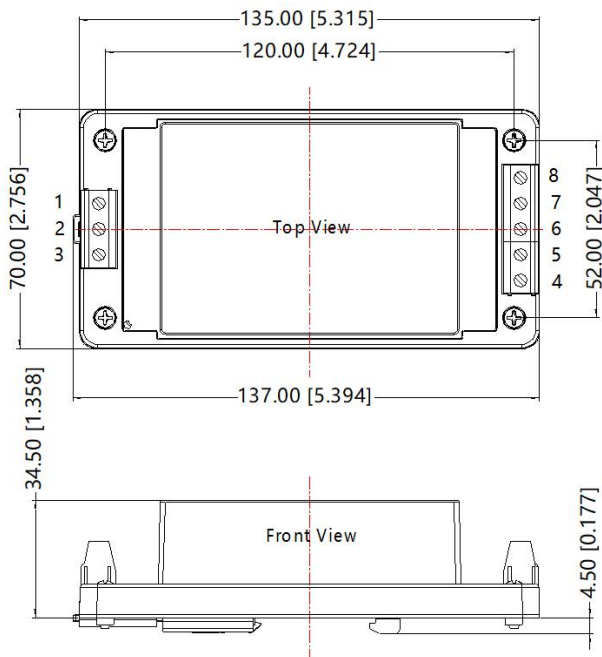


Pin-Out	
Pin	LHE40-23B
1	AC(L)
2	AC(N)
3	NC
4	Trim
5	NC
6	-Vo
7	NC
8	+Vo

Note:  
Unit: mm[inch]  
Wire range: 24-12 AWG  
Tightening torque: Max 0.4 N·m  
General tolerances:  $\pm 1.00[\pm 0.040]$

A6 DIN-rail Package Dimensions

THIRD ANGLE PROJECTION 



Pin-Out	
Pin	LHE40-23B
1	AC(L)
2	AC(N)
3	NC
4	Trim
5	NC
6	-Vo
7	NC
8	+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[±0.040]

Notes:

- For additional information on Product Packaging please refer to [www.mornsun-power.com](http://www.mornsun-power.com). Packaging bag number of Horizontal package: 58220021, the packaging bag number of A5/A6 package: 58220031;
- 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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