

40W, AC/DC converter



UL **CE** **RoHS**

FEATURES

- Wide input voltage range: 85 - 264VAC/100 - 370VDC
- Low standby power consumption: 0.5W, conversion efficiency up to 84%
- Output short circuit, over-current, over-voltage protection
- UL60950, EN60950 approval
- Mounting: PCB mounting, Chassis mounting, DIN-Rail mounting available

LH40 series is a 40W efficient environmental-protection AC-DC module power supply, which has advantages such as universal input voltage, accept either AC or DC input, high efficiency, high reliability, low power consumption and high safety isolation. The series products are widely used in industries such as industrial control, electricity, office.

Note: Please refer to Design Reference when module being used in a bad EMC environment.

Selection Guide

Certification	Part No.*	Output Power	Nominal Output Voltage and Current		Efficiency (230VAC, %/Typ.)	Max. Capacitive Load(μF)
			(Vo1/Io1)	(Vo2/Io2)		
UL/CE	LH40-10B03	40W	3.3VDC/8000mA	--	78	60000
	LH40-10B05		5VDC/8000mA	--	82	40000
	LH40-10B09		9VDC/4444mA	--	84	12000
	LH40-10B12		12VDC/3333mA	--	84	9000
	LH40-10B15		15VDC/2666mA	--	84	7000
	LH40-10B24		24VDC/1667mA	--	84	2000
	LH40-10D0512-13		5VDC/5000mA	12VDC/1250mA	82	10000/470
	LH40-10D0524-06		5VDC/5000mA	24VDC/625mA	82	10000/400
	LH40-10A05		+5VDC/4000mA	-5VDC/4000mA	82	12000/12000
	LH40-10A12		+12VDC/1666mA	-12VDC/1666mA	84	4400/4400
	LH40-10A15		+15VDC/1333mA	-15VDC/1333mA	84	1000/1000

Note:*Product model with a suffix of "A5" means chassis mounting and that with a suffix of "A6" indicates DIN-Rail mounting (e.g. LH40-10B05A5 means chassis mounting; LH40-10B05A6 means DIN-Rail mounting).

Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Input Voltage Range	AC input	85	--	264	VAC
	DC input	100	--	370	VDC
Input frequency		47	--	440	Hz
Input current	115VAC	--	--	1.0	A
	230VAC	--	--	0.6	
Inrush current	115VAC	--	30	--	A
	230VAC	--	50	--	
Hot Plug		Unavailable			

Output Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit	
Output Voltage Accuracy	LH40-10Bxx	Primary output	--	±2	--	%
	LH40-10Axx	Primary output / Secondary output	--	±2	--	
	LH40-10Dxx	Primary output	--	±2	--	
		Secondary output	--	±5	--	

Line Regulation	LH40-10Bxx	--	±0.5	--	%	
	LH40-10Axx	--	±0.5	--		
	LH40-10Dxx (Primary output)	--	±0.5	--		
	LH40-10Dxx (Secondary output)	--	±1.5	--		
Load Regulation	LH40-10Bxx	--	±1	--	%	
	LH40-10Axx (Balance load)	--	±2	--		
	LH40-10Dxx (Balance load)	Primary output	--	±2		--
		Secondary output	--	±5		--
Ripple & Noise*	20MHz bandwidth (peak-peak value)	--	50	100	mV	
Temperature Coefficient	Primary output	--	±0.02	--	%/°C	
Stand-by Power Consumption		--	--	0.5	W	
Short Circuit Protection		Continuous, self-recovery				
Over-current Protection		≥110%Io self-recovery				
Over-voltage Protection	3.3V Output	--	--	5.5	V	
	5V Output	--	--	9		
	9V Output	--	--	14		
	12V Output	--	--	16		
	15V Output	--	--	24		
	24V Output	--	--	35		
Min. Load	LH40-10Bxx	0	--	--	%	
	LH40-10Axx (Balance load)	10	--	--		
	LH40-10Dxx (Balance load)	25	--	--		
Cross Regulation	LH40-10A05	--	±8	--	%	
	LH40-10A12/ LH40-10A15	--	±5	--		
	LH40-10Dxx	Primary output	--	±1		--
		Secondary output	--	±7		--
Trim	LH40-10Bxx	--	--	±10		
Hold-up Time	115VAC input	--	15	--	ms	
	230VAC input	--	80	--		

Note: * Ripple and noise are measured by "parallel cable" method, please see AC-DC Converter Application Notes for specific operation.

General Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Isolation Voltage	Input-output	Test time: LH40-10Axx/ LH40-10Bxx/ LH40-10Dxx	3000	--	--	VAC
	Output-output	1min LH40-10Dxx	500	--	--	
Operating Temperature			-40	--	+70	°C
Storage Temperature			-40	--	+85	
Storage Humidity			--	--	95	%RH
Welding 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 (LH40-10B03/05)		4.0	--	--	%/°C
	-40°C to -30°C (LH40-10B09/12/15)		3.0	--	--	
	-40°C to -30°C (LH40-10Dxx/LH40-10Axx)		5.0	--	--	
	+45°C to +70°C (LH40-10B03/05)		3.0	--	--	
	+55°C to +70°C (LH40-10B09/12/15)		3.7	--	--	
	+55°C to +70°C (LH40-10B24)		2.7	--	--	
	+50°C to +70°C (LH40-10Dxx/LH40-10Axx)		3.0	--	--	
Safety Standard			IEC60950/EN60950/UL60950			
Safety Certification			EN60950/UL60950			
Safety Class			CLASS II			
MTBF	MIL-HDBK-217F@25°C		> 300,000 h			

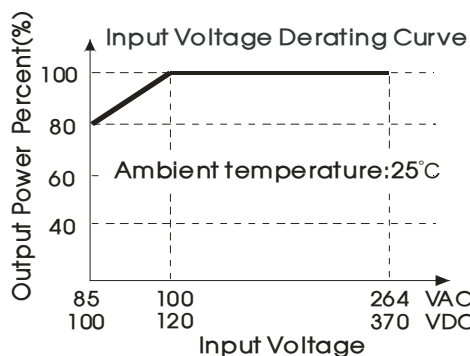
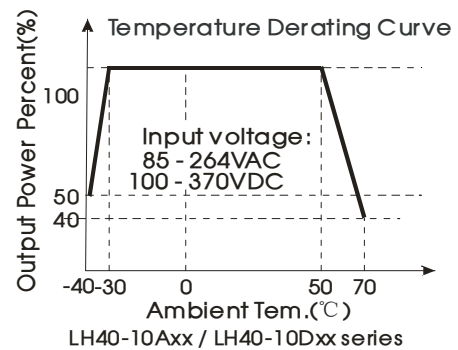
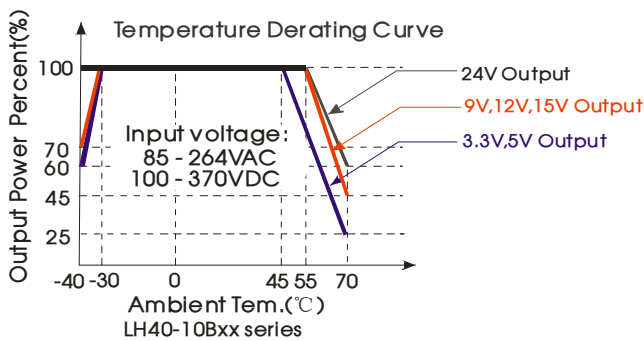
Physical Specifications

Casing Material	Black flame-retardant and heat-resistant plastic (UL94V-0)	
Dimensions	Horizontal package	89.00*63.50*25.00 mm
	A5 chassis package	135.00*70.00*33.50 mm
	A6 DIN-rail package	137.00*70.00*39.00 mm
Weight	Horizontal package/A5 chassis package/A6 DIN-rail package	225g/310g/370g(Typ.)
Cooling Method	Free air convection	

EMC Specifications

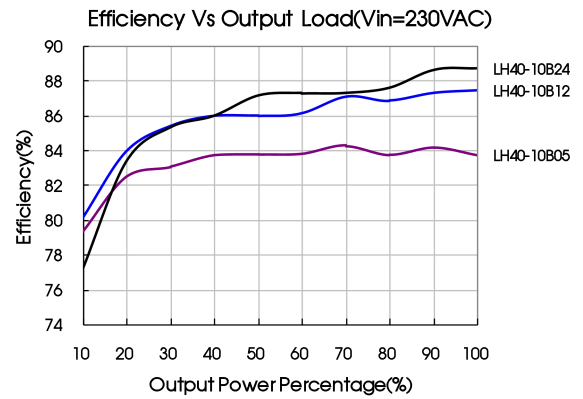
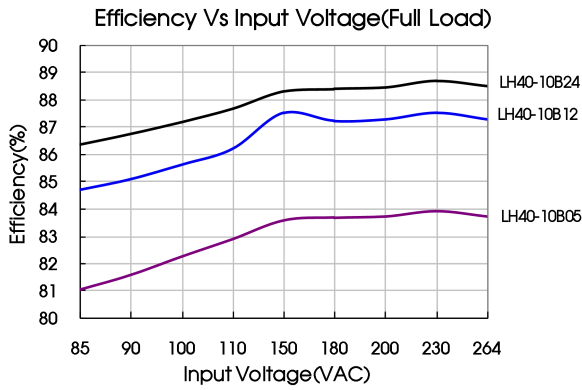
EMI	CE	CISPR22/EN55022	CLASS B	
	RE	CISPR22/EN55022	CLASS B	
EMS	ESD	IEC/EN61000-4-2	Contact ± 6 KV/Air ± 8 KV	Perf. Criteria B
	RS	IEC/EN61000-4-3	10V/m	perf. Criteria A
	EFT	IEC/EN61000-4-4	± 2 KV	perf. Criteria B
		IEC/EN61000-4-4	± 4 KV (See Fig. 4 for recommended circuit)	perf. Criteria B
	Surge	IEC/EN61000-4-5	line to line ± 1 KV/line to ground ± 2 KV	perf. Criteria B
		IEC/EN61000-4-5	line to line ± 2 KV/ line to ground ± 4 KV (See Fig. 4 for recommended circuit)	perf. Criteria B
	CS	IEC/EN61000-4-6	10Vr.m.s	perf. Criteria A
	PFM	IEC/EN61000-4-8	10A/m	perf. Criteria A
Voltage dips, short interruptions and voltage variations immunity	IEC/EN61000-4-11	0%, 70%	perf. Criteria B	

Product Characteristic Curve



Note:

- ① Input voltage should be derated based on temperature derating when it is 85-100VAC/100-120VDC;
- ② This product is suitable for use in natural air cooling environments, if in a closed environment, please contact our company's FAE.



Design Reference

1. Typical application circuit

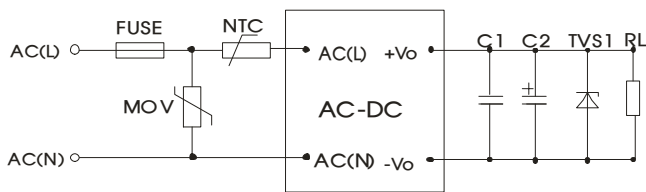


Fig. 1: LH40-10Bxx typical application circuit

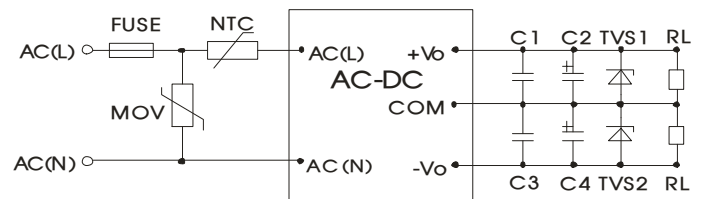


Fig. 2: LH40-10Axx typical application circuit

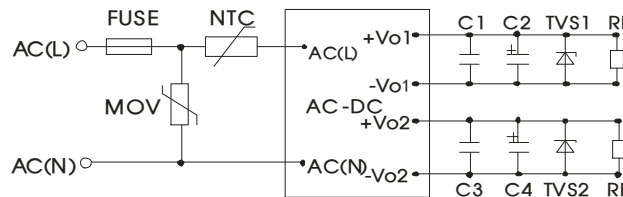


Fig. 3: LH40-10Dxx typical application circuit

Model	C2(uF)	C4(uF)	C1, C3(uF)	TVS1	TVS2
LH40-10B03	680	--	1	SMBJ7.0A	--
LH40-10B05	680	--	1	SMBJ7.0A	--
LH40-10B09	330	--	1	SMBJ12A	--
LH40-10B12	220	--	1	SMBJ20A	--
LH40-10B15	220	--	1	SMBJ20A	--
LH40-10B24	120	--	1	SMBJ30A	--
LH40-10D0512-13	680	220	1	SMBJ7.0A	SMBJ20A
LH40-10D0524-06	680	120	1	SMBJ7.0A	SMBJ30A
LH40-10A05	680	680	1	SMBJ7.0A	SMBJ7.0A
LH40-10A12	220	220	1	SMBJ20A	SMBJ20A
LH40-10A15	220	220	1	SMBJ20A	SMBJ20A

Note: Output filtering capacitor C2, C4 are electrolytic capacitors, it is recommended to apply electrolytic capacitor with high frequency and low resistance. For capacitance and current of capacitor please refer to manufacture's datasheet. Capacitance withstand voltage derating should be 80% or above. C1, C3 are ceramic capacitors, which is used to filter high-frequency noise. TVS is a recommended component to protect post-circuits if converter fails. External input FUSE model is recommended to use 3.15A/250VAC, slow fusing. External input NTC model is recommended to use 5D-9. External input MOV model is recommended to use S10K300.

2. EMC solution-recommended circuit

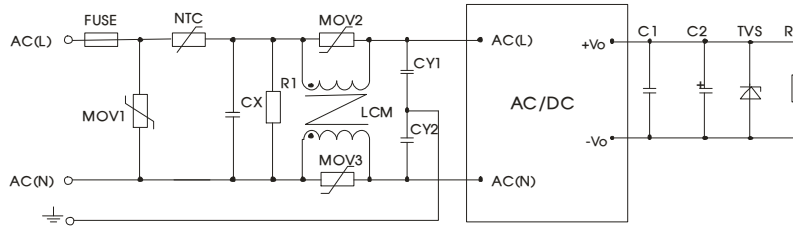
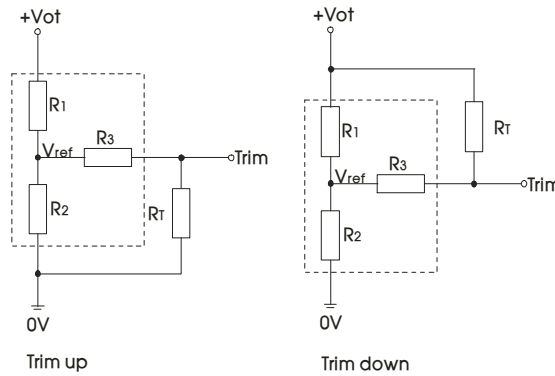


Fig.4 (Output external circuit refer to the typical application circuit)

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;
NTC	5D-14
FUSE	3.15A/250V, slow fusing, necessary

3. Application of Trim and calculation of Trim resistance



Applied circuits of Trim (Part in broken line is the interior of models)

Calculation formula of Trim resistance:

$$\text{up: } R_T = \frac{\alpha R_2}{R_2 - \alpha} - R_3 \quad \alpha = \frac{V_{ref}}{V_{ot} - V_{ref}} \cdot R_1$$

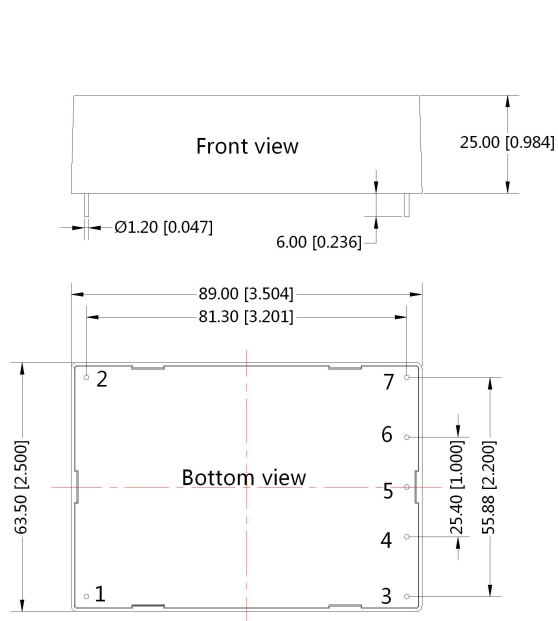
$$\text{down: } R_T = \frac{\alpha R_1}{R_1 - \alpha} - R_3 \quad \alpha = \frac{V_{ot} - V_{ref}}{V_{ref}} \cdot R_2$$

R_T is Trim resistance, α is a self-defined parameter, with no real meaning.

Vout	R1(KΩ)	R2(KΩ)	R3(KΩ)	Vref(V)	Vot(V)
3.3V	2	1.2	1	1.24	Output voltage after regulation, variation ≤ ±10%
5V	3.3	3.3	1	2.5	
9V	4.7	1.8	1	2.5	
12V	3.83	1	1	2.5	
15V	4.99	1	1	2.5	
24V	8.66	1	1	2.5	

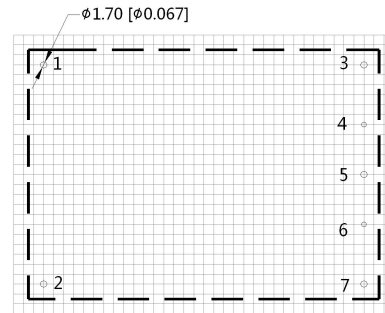
4. For more information, Please find the application note on www.mornsun-power.com

Dimensions and Recommended Layout



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

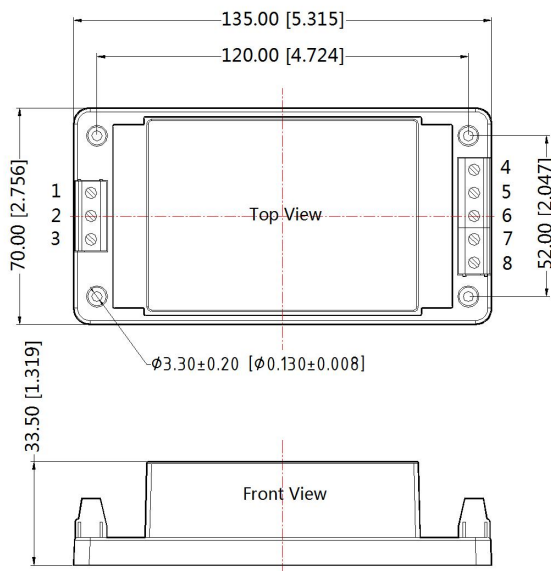
THIRD ANGLE PROJECTION



Note : Grid 2.54*2.54mm

Pin-Out			
Pin	LH40-10A	LH40-10B	LH40-10D
1	AC(L)	AC(L)	AC(L)
2	AC(N)	AC(N)	AC(N)
3	+Vo	+Vo	+Vo2
4	No Pin	No Pin	+Vo1
5	COM	-Vo	-Vo2
6	No Pin	No Pin	-Vo1
7	-Vo	Trim	No Pin

A5 Chassis Package Dimensions



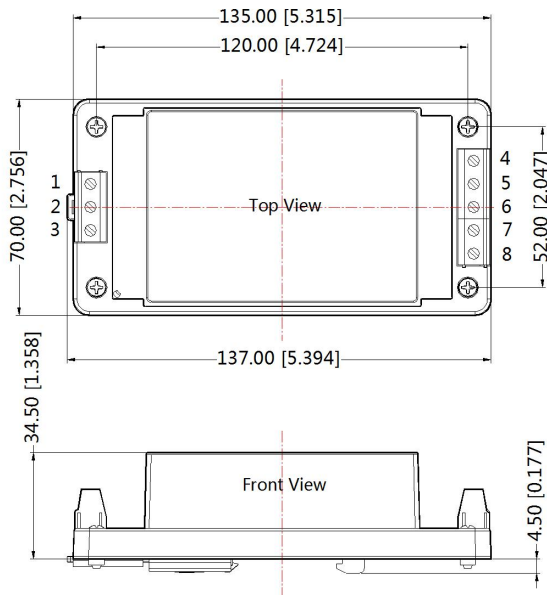
THIRD ANGLE PROJECTION

Pin-Out			
Pin	LH40-10A	LH40-10B	LH40-10D
1	AC(L)	AC(L)	AC(L)
2	AC(N)	AC(N)	AC(N)
3	NC	NC	NC
4	+Vo	+Vo	+Vo2
5	NC	NC	+Vo1
6	COM	-Vo	-Vo2
7	NC	NC	-Vo1
8	-Vo	Trim	NC

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

A6 DIN-rail Package Dimensions

THIRD ANGLE PROJECTION 



Pin-Out			
Pin	LH40-10A	LH40-10B	LH40-10D
1	AC(L)	AC(L)	AC(L)
2	AC(N)	AC(N)	AC(N)
3	NC	NC	NC
4	+Vo	+Vo	+Vo2
5	NC	NC	+Vo1
6	COM	-Vo	-Vo2
7	NC	NC	-Vo1
8	-Vo	Trim	NC

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:

1. Packing information please refer to Product Packing Information which can be downloaded from www.mornsun-power.com. Packing bag number of Horizontal package: 58220021, the Packing bag number of A5/A6 package: 58220031;
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's corporate standards;
4. We can provide product customization service, please contact our technicians directly for specific information;
5. Specifications are subject to change without prior notice.

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