

5-25W, AC/DC converter



UL US CE CB RoHS

FEATURES

- Wide input voltage range: 85 - 305VAC/ 100 - 430VDC
- Operating temperature range: -40 to +70°C
- Conversion efficiency up to 87%
- Isolation voltage: 3K VAC
- IEC60950, EN60950, UL60950 approval
- Output short circuit, over-current, over-voltage protection
- Mounting: PCB mounting, Chassis mounting, DIN-Rail mounting available

LH(05-25)-13Bxx series —a compact size power converter offered by Mornsun. It features universal input voltage, taking both DC and AC input voltage, low power consumption, high efficiency, high reliability, safer isolation. It offers good EMC performance, which meet IEC/EN61000-4, CISPR22/EN55022, UL60950 and EN60950 standards, and it's widely used in industrial, office and civil applications. 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(Vo/Io)	Efficiency (230VAC, %/Typ.)	Max. Capacitive Load(μF)
UL/CE/CB	LH05-13B03	4W	3.3V/1250mA	72	4000
	LH05-13B05		5V/1000mA	77	4000
	LH05-13B09	5W	9V/550mA	79	1800
	LH05-13B12		12V/420mA	81	1800
	LH05-13B15		15V/330mA	82	1500
	LH05-13B24	5.5W	24V/230mA	84	330
	LH10-13B03	6.6W	3.3V/2000mA	70	26000
	LH10-13B05		5V/2000mA	76	9400
	LH10-13B09	10W	9V/1100mA	78	3600
	LH10-13B12		12V/900mA	80	2400
	LH10-13B15		15V/700mA	81	1200
	LH10-13B24		24V/450mA	82	370
	LH15-13B03	9.9W	3.3V/3000mA	74	36000
	LH15-13B05	14W	5V/2800mA	78	20000
	LH15-13B09		9V/1600mA	79	6000
	LH15-13B12	15W	12V/1250mA	82	3000
	LH15-13B15		15V/1000mA	82	3000
	LH15-13B24		24V/625mA	84	900
	LH15-13B48		48V/320mA	85	370
	LH20-13B03	11.55W	3.3V/3500mA	75	48000
	LH20-13B05	17.5W	5V/3500mA	78	12240
	LH20-13B09		9V/2100mA	79	5600
	LH20-13B12	20W	12V/1600mA	83	5400
	LH20-13B15		15V/1300mA	84	2400
LH20-13B24	24V/850mA		85	1840	
LH25-13B03	13.5W	3.3V/4100mA	75	48000	
LH25-13B05	20.5W	5V/4100mA	78	12240	
LH25-13B09	22.5W	9V/2500mA	79	5600	
LH25-13B12	25W	12V/2100mA	83	5400	

UL/CE/CB	LH25-13B15	24W	15V/1600mA	84	2400
	LH25-13B24	26.4W	24V/1100mA	85	1440
	LH25-13B48	24W	48V/500mA	87	800

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	LH05 models	--	--	0.125	A
		LH10 models	--	--	0.26	
		LH15 models	--	--	0.37	
		LH20/LH25 models	--	--	0.6	
	230VAC	LH05 models	--	--	0.08	
		LH10 models	--	--	0.16	
		LH15 models	--	--	0.22	
		LH20/LH25 models	--	--	0.34	
Inrush current	115VAC	LH05/LH10/LH15 models	--	10	--	
		LH20/LH25 models	--	15	--	
	230VAC	LH05/LH10 models	--	15	--	
		LH15 models	--	20	--	
LH20/ LH25 models	--	30	--			
Leakage current			0.3mA RMS typ./230VAC/50Hz			
Recommended External Input Fuse(Special package series include fuse)	LH05 models		1A/300V, slow fusing			
	LH10/LH15 models		2A/300V, slow fusing			
	LH20/ LH25 models		3.15A/300V, slow fusing			
Hot Plug			Unavailable			

Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Output Voltage Accuracy			--	±2	--	%
Line Regulation	Full load		--	±0.5	--	
Load Regulation	0%-100% load		--	±1	--	
Ripple & Noise*	20MHz bandwidth (peak-peak value)		--	50	100	mV
Temperature Coefficient			--	±0.02	--	%/°C
Short Circuit Protection			Hiccup, Continuous, self-recovery			
Over-current Protection			≥110%Io self-recovery			
Over-voltage Protection	LH05 models		Over-voltage shutdown			
	LH10/ LH15/ LH20/ LH25 models	3.3 / 5VDC Output	≤7.5VDC			
		9VDC Output	≤12VDC			
		12 / 15VDC Output	≤20VDC			
		24VDC Output	≤30VDC			
48VDC Output		≤60VDC				
Min. Load			0	--	--	%
Trim	LH20/ LH25 models		--	--	±10	
Hold-up Time	115VAC input		--	15	--	ms
	230VAC input		--	80	--	

Note: * Ripple and noise tested with "parallel cable" method, please see *AC-DC Converter Application Notes* for specific operation methods.

General Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Isolation Voltage*	Input-output	Test time: 1min	3000	--	--	VAC
	Input- 		2000	--	--	
Operating Temperature			-40	--	+70	°C
Storage Temperature	LH05/10/15		-40	--	+105	
	LH20/25		-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	LH05 models		--	65	132	kHz
	LH10 models		--	100	--	
	LH15/LH20/LH25 models		--	65	--	
Power Derating	-40°C to -10°C		2	--	--	% / °C
	50°C to +70°C (LH25-13Bxx)		3	--	--	
	55°C To +70°C (Others)		4	--	--	
Safety Standard			IEC60950/EN60950/UL60950			
Safety Certification			IEC60950/EN60950/UL60950			
Safety Class	LH15-13Bxx		CLASS II			
	Others		CLASS I			
MTBF			MIL-HDBK-217F@25°C > 300,000 h			

Note:* There is no pin  on LH15-13Bxx .

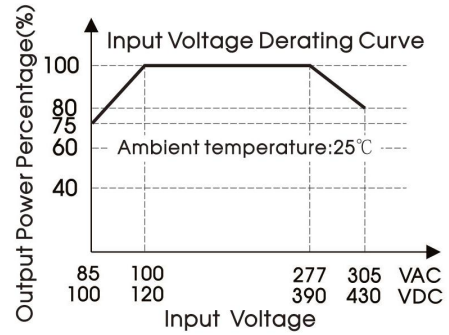
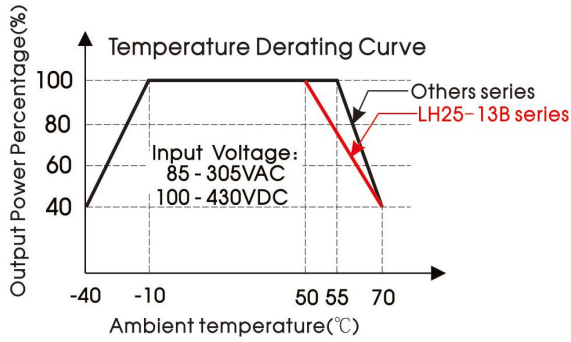
Physical Specifications

Casing Material	Black flame-retardant and heat-resistant plastic (UL94-V0)
Package Dimensions	Refer to the Dimensions
Weight	Refer to the Dimensions
Cooling method	Free convection

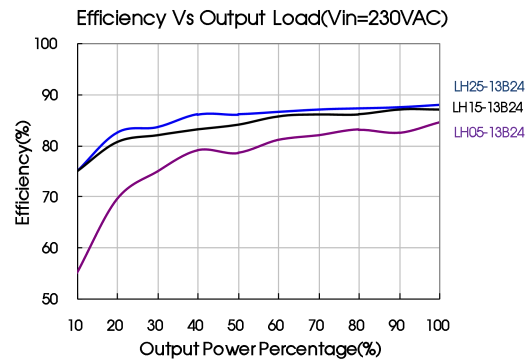
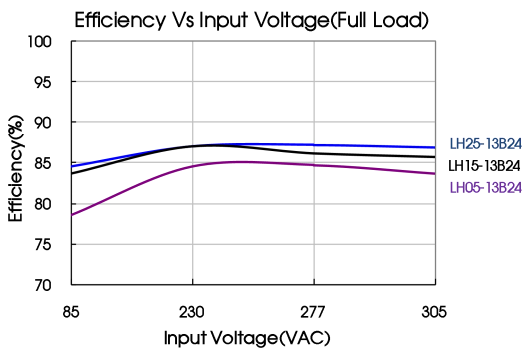
EMC Specifications

EMI	CE	CISPR32/EN55032	CLASS B	
	RE	CISPR32/EN55032	CLASS B	
EMS	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/line to ground ±2KV	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
	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/277-305VAC/100-120VDC/390-430VDC;
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

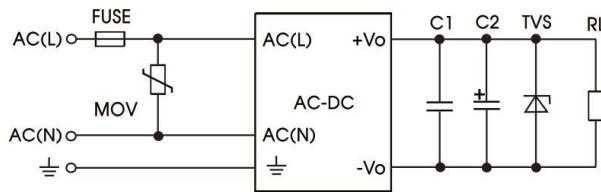


Fig. 1

Model	C1 (uF)	C2 (uF)	FUSE	MOV	TVS	Model	C1 (uF)	C2 (uF)	FUSE	MOV	TVS
LH05-13B03	1	330	1A/300V slow fusing, necessary	S14K350	SMBJ7.0A	LH15-13B15	1	220	2A/300V slow fusing, necessary	S14K350	SMBJ20A
LH05-13B05	1	330			SMBJ7.0A	LH15-13B24	1	68			SMBJ30A
LH05-13B09	1	120			SMBJ12A	LH15-13B48	1	33			SMBJ64A
LH05-13B12	1	120			SMBJ20A	LH20-13B03	1	330			SMBJ7.0A
LH05-13B15	1	68			SMBJ20A	LH20-13B05	1	330			SMBJ7.0A
LH05-13B24	1	68			SMBJ30A	LH20-13B09	1	220			SMBJ12A
LH10-13B03	1	470	2A/300V slow fusing, necessary	S14K350	SMBJ7.0A	LH20-13B12	1	220	SMBJ20A		
LH10-13B05	1	330			SMBJ7.0A	LH20-13B15	1	220	SMBJ20A		
LH10-13B09	1	120			SMBJ12A	LH20-13B24	1	220	SMBJ30A		
LH10-13B12	1	120			SMBJ20A	LH25-13B03	1	330	SMBJ7.0A		
LH10-13B15	1	120			SMBJ20A	LH25-13B05	1	330	SMBJ7.0A		
LH10-13B24	1	68			SMBJ30A	LH25-13B09	1	330	SMBJ12A		
LH15-13B03	1	680	2A/300V slow fusing, necessary	S14K350	SMBJ7.0A	LH25-13B12	1	330	SMBJ20A		
LH15-13B05	1	680			SMBJ7.0A	LH25-13B15	1	330	SMBJ20A		
LH15-13B09	1	470			SMBJ12A	LH25-13B24	1	120	SMBJ30A		
LH15-13B12	1	220			SMBJ20A	LH25-13B48	1	68	SMBJ64A		

Note:
Output filtering capacitor C2 is electrolytic capacitor, 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. Capacitor voltage reduced to at least 80%. C1 is ceramic capacitor, which is used to filter high-frequency noise. TVS is a recommended component to protect post-circuits if converter fails.

2. EMC solution-recommended circuit

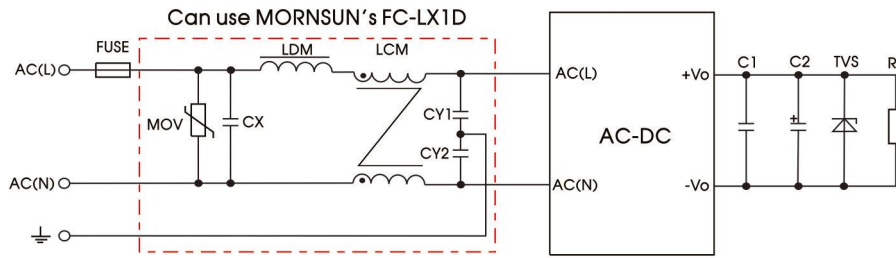
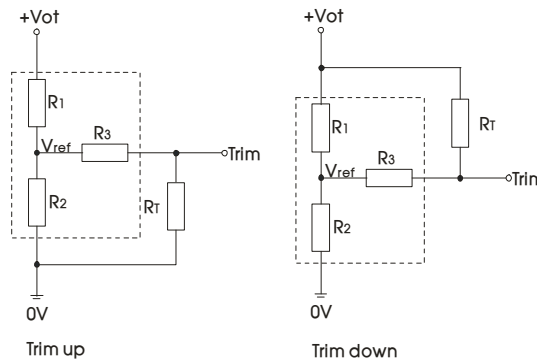


Fig 2

Element model	Recommended value	Element model	Recommended value	
MOV	S14K350	FC-LX1D	EMC filter	
CY1 , CY2	1000pF/400VAC	FUUSE	LH05	2A/300V slow fusing, necessary
CX	0.1μF/310VAC		LH10/15	2A/300V slow fusing, necessary
LCM	10mH, recommended to use MORNSUN's FL2D-Z5-103		LH20/25	3.15A/300V slow fusing, necessary
LDM	4.7μH/2A	--	--	

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:

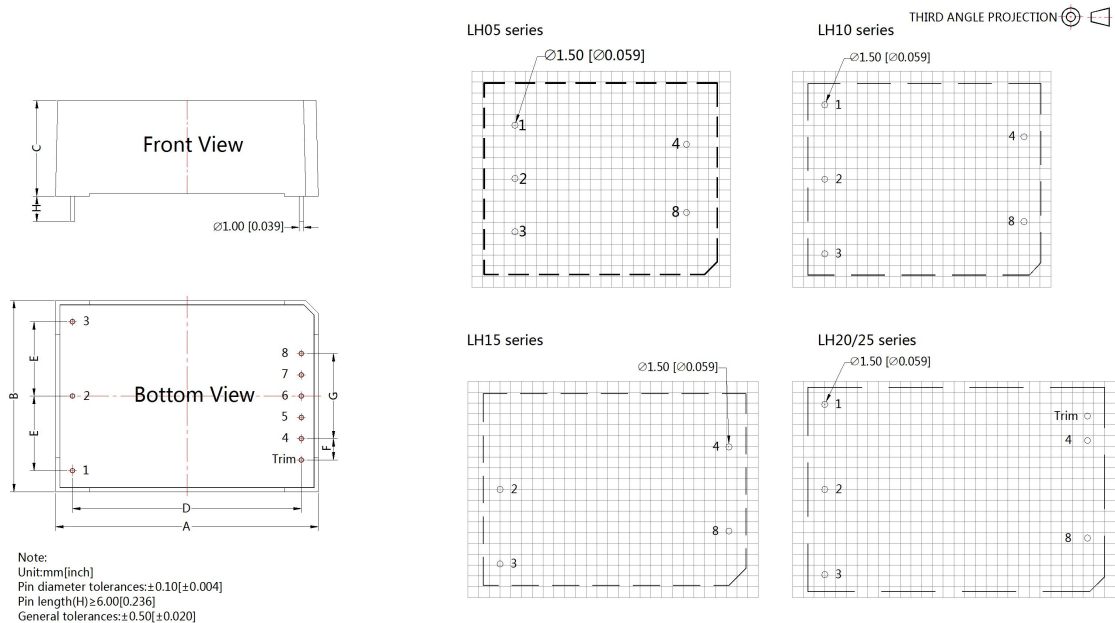
$$\begin{aligned} \text{up: } R_T &= \frac{\alpha R_2}{R_2 - \alpha} - R_3 & \alpha &= \frac{V_{ref}}{V_{ot} - V_{ref}} \cdot R_1 \\ \text{down: } R_T &= \frac{\alpha R_1}{R_1 - \alpha} - R_3 & \alpha &= \frac{V_{ot} - V_{ref}}{V_{ref}} \cdot R_2 \end{aligned}$$

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	3.3	1.98	1	1.24	Output voltage after regulation, variation ≤ ±10%
5V	3.3	3.3	1	2.5	
9V	7.5	2.87	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	68	3.73	1	2.5	

4. For more information about Mornsun EMC Filter products, please visit www.mornsun-power.com to download the Selection Guide of EMC Filter

Dimensions and Recommended Layout



Dimensions (Unit: mm)					
NO.	LH05	LH10	LH15	LH20	LH25
A	55.00	55.00	62.00	70.00	70.00
B	45.00	45.00	45.00	48.00	48.00
C	21.00	21.00	22.50	23.50	23.50
D	40.50	47.00	54.00	62.00	62.00
E	12.50	17.50	17.50	20.00	20.00
F	--	--	--	5.75	5.75
G	16.00	20.00	20.00	23.00	23.00
H	6(Min)				

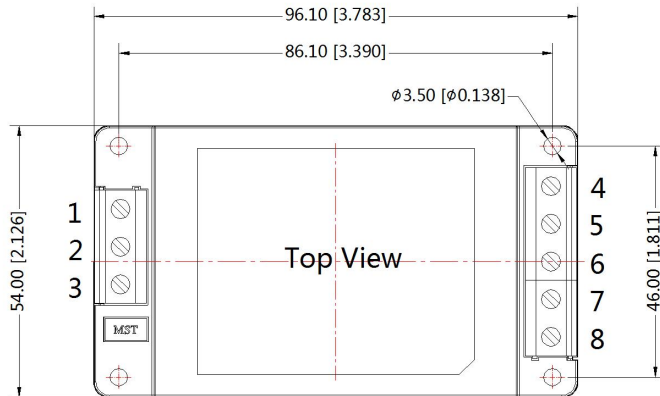
Models Weight					
Weight	LH05	LH10	LH15	LH20	LH25
(Typ.)	75g	75g	85g	120g	120g

Pin Connection	
Pin	LHxx-13Bxx
1	
2	AC(N)
3	AC(L)
4	-Vo
5	No Pin
6	No Pin
7	No Pin
8	+Vo
Trim	Trim**

There is no pin "1" on LH15-13Bxx
 Trim**: only for LH20/25-13Bxx Series.

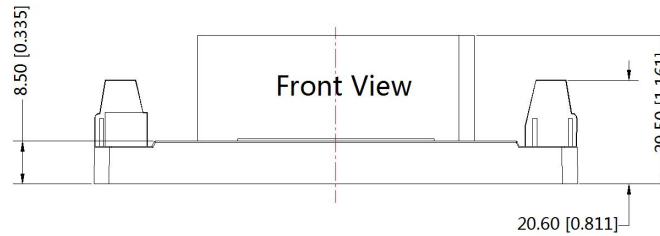
LHXXA2 Dimensions

THIRD ANGLE PROJECTION 



Pin-Out	
Pin	LHxx-13BxxA2
1	⏏
2	AC(N)
3	AC(L)
4	-Vo
5	NC
6	NC/Trim**
7	NC
8	+Vo

There is no pin "1" on the LH15-13BxxA2 series.
NC/Trim** : The pin is Trim on the LH20/25-13BxxA2 series and is not connected on other single output products.




*The figure left is related to the LH15-13BxxA2 series. the height of other series is different.

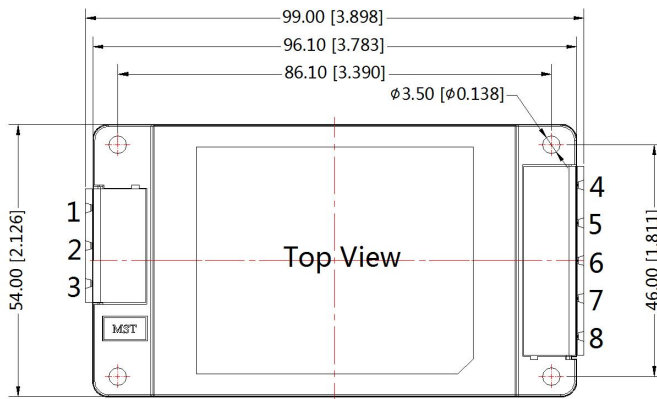
Note:
Unit:mm[inch]
Wire range : 24-12 AWG
Tightening torque: Max 0.4 N·m
General tolerances:±1.00[±0.039]

Dimensions (Unit: mm)	
Model	Dimensions
LH05XXA2	96.1*54.0*29.5mm
LH10XXA2	96.1*54.0*29.5mm
LH15XXA2	96.1*54.0*31.0mm
LH20XXA2	96.1*54.0*32.0mm
LH25XXA2	96.1*54.0*32.0mm

Models weight					
Weight	LH05	LH10	LH15	LH20	LH25
Typ.	125g	125g	135g	170g	170g

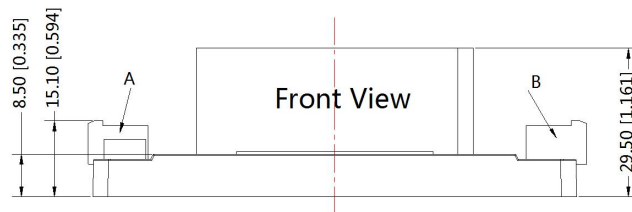
LHXXA3 Dimensions

THIRD ANGLE PROJECTION 



Pin-Out	
Pin	LHxx-13BxxA3
1	\perp
2	AC(N)
3	AC(L)
4	-Vo
5	NC
6	NC/Trim**
7	NC
8	+Vo

There is no pin "1" on the LH15-13BxxA3 series.
NC/Trim** : The pin is Trim on the LH20/25-13BxxA3 series and is not connected on other single output products.



*The figure left is related to the LH10-13BxxA3 series. the height of other series is different.

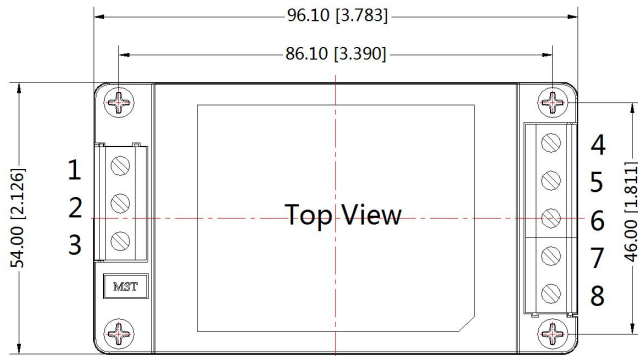
Note:
Unit:mm[inch]
General tolerances:±1.00[±0.039]
A:DEGSON P/N:
2EDGRC-7.5-03P-14-100A (H)
B:DEGSON P/N:
2EDGRC-7.5-05P-14-100A (H)

Dimensions (Unit: mm)	
Model	Dimensions
LH05XXA3	99.0*54.0*29.5mm
LH10XXA3	99.0*54.0*29.5mm
LH15XXA3	99.0*54.0*31.0mm
LH20XXA3	99.0*54.0*32.0mm
LH25XXA3	99.0*54.0*32.0mm

Models weight					
Weight	LH05	LH10	LH15	LH20	LH25
Typ.	125g	125g	135g	170g	170g

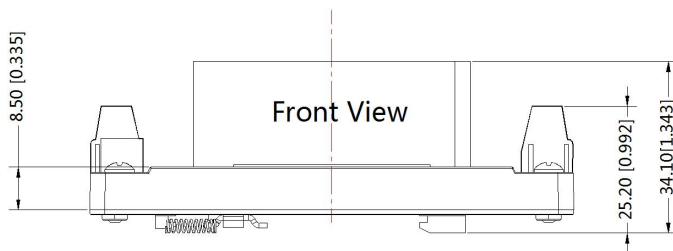
LHXXA4 Dimensions

THIRD ANGLE PROJECTION 



Pin-Out	
Pin	LHxx-13BxxA4
1	±
2	AC(N)
3	AC(L)
4	-Vo
5	NC
6	NC/Trim**
7	NC
8	+Vo

There is no pin "1" on the LH15-13BxxA4 series.
NC/Trim** : The pin is Trim on the LH20/25-13BxxA4 series and is not connected on other single output products.



*The figure left is related to the LH10-13BxxA4 series. the height of other series is different.

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]

Dimensions (Unit: mm)	
Model	Dimensions
LH05XXA4	96.1*54.0*34.1mm
LH10XXA4	96.1*54.0*34.1mm
LH15XXA4	96.1*54.0*35.6mm
LH20XXA4	96.1*54.0*36.6mm
LH25XXA4	96.1*54.0*36.6mm

Models weight					
Weight	LH05	LH10	LH15	LH20	LH25
Typ.	165g	165g	175g	210g	210g

Note:

1. Packing information please refer to Product Packing Information which can be downloaded from www.mornsun-power.com. Packing bag number: 58220006;the Packing bag number of A2/A3/A4 package:58220010;
2. 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;
3. The maximum capacitive load offered were tested at input voltage range and full load;
4. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25℃, humidity<75% with nominal input voltage and rated output load;
5. All index testing methods in this datasheet are based on our Company's corporate standards;
6. We can provide product customization service, please contact our technicians directly for specific information;
7. Products are related to laws and regulations: see "Features" and "EMC";
8. 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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