MORNSUN®

LH SERIES

5-25W, AC-DC CONVERTER

LH series ----is 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, meets IEC/EN61000-4, CISPR22/EN55022, UL60950 and EN60950 standards, and widely used in industrial, office and civil applications. For harsh EMC environment, this series of products must use the refered application circuit.

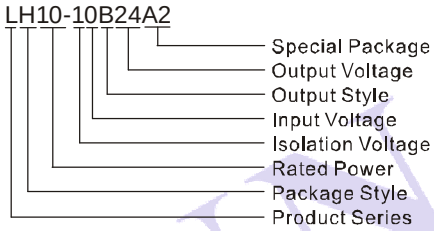


RoHS c UL us E235235 CE

PRODUCT FEATURES

1.Universal Input :85 ~ 264VAC,50/60Hz
2.Regulated output, low ripple and noise
3.Efficiency up to 85%
4.Over-current, short circuit and over-temperature protection
5.Plastic case, meets UL94V-0
6.Meets：UL60950 and EN60950
7.Three years warranty
8.Mounting:PCB mounting, Chassis mounting with Screw Terminals, DIN-Rail mounting

PART NUMBER SYSTEM



SELECTION GUIDE

Approval	Model	Package	Power	Output (Vo1/Io1)	Output (Vo2/Io2)	Ripple and Noise(Typ)	Efficiency (%)(Typ.)
UL/CE	LH05-10B03	48.5X36X20.5mm	4W	3.3V/1250mA		50mV	70
UL/CE	LH05-10B05		5W	5V/1000mA			75
UL/CE	LH05-10B09			9V/550mA			77
UL/CE	LH05-10B12			12V/420mA			79
UL/CE	LH05-10B15			15V/330mA			80
UL/CE	LH05-10B24			24V/230mA			82
	LH05-10A05			+5V/500mA	-5V/500mA		75
	LH05-10A12			+12V/210mA	-12V/210mA		79
	LH05-10A15			+15V/160mA	-15V/160mA		79
	LH05-10A24			+24V/100mA	-24V/100mA		80
	LH05-10C0505-01			5V/800mA	±5V/100mA		70
	LH05-10C0512-01			5V/600mA	±12V/100mA		73
	LH05-10C0515-01			5V/600mA	±15V/80mA		74
	LH05-10C0524-01			5V/600mA	±24V/50mA		75
	LH05-10D0505-01			5V/900mA	5V/100mA		71
	LH05-10D0512-01			5V/750mA	12V/100mA		73
	LH05-10D0515-01			5V/700mA	15V/100mA		73
	LH05-10D0524-01			5V/600mA	24V/100mA		75
UL/CE	LH10-10B03	55X45X21.0mm	6.6 W	3.3V/2000mA		50mV	70
UL/CE	LH10-10B05		10W	5V/2000mA			76
UL/CE	LH10-10B09			9V/1100mA			78
UL/CE	LH10-10B12			12V/900mA			80
UL/CE	LH10-10B15			15V/700mA			81
UL/CE	LH10-10B24			24V/450mA			82
UL/CE	LH10-10A05			+5V/1000mA	-5V/1000mA		76
UL/CE	LH10-10A12			+12V/450mA	-12V/450mA		80
UL/CE	LH10-10A15			+15V/350mA	-15V/350mA		81
UL/CE	LH10-10A24			+24V/200mA	-24V/200mA		84
	LH10-10C0512-02			5V/1000mA	±12V/200mA		75
	LH10-10C0515-02			5V/900mA	±15V/200mA		75
UL/CE	LH10-10D0505-02			5V/1800mA	5V/200mA		75
UL/CE	LH10-10D0512-02			5V/1500mA	12V/200mA		79
UL/CE	LH10-10D0515-02			5V/1400mA	15V/200mA		79
UL/CE	LH10-10D0524-02			5V/1000mA	24V/200mA		81
UL/CE	LH15-10B03	62X45X22.5mm	9.9W	3.3V/3000mA		50mV	73

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Approval	Model	Package	Power	Output (Vo1/Io1)	Output (Vo2/Io2)	Ripple and Noise(Typ)	Efficiency (%)(Typ.)
UL/CE	LH15-10B05	62X45X22.5mm	15W	5V/2800mA			76
UL/CE	LH15-10B09			9V/1600mA			78
UL/CE	LH15-10B12			12V/1250mA			80
UL/CE	LH15-10B15			15V/1000mA			80
UL/CE	LH15-10B24			24V/625mA			84
UL/CE	LH15-10B48			48V/320mA			85
	LH15-10A05			+5V/1500mA	-5V/1500mA		76
	LH15-10A12			+12V/650mA	-12V/650mA		81
	LH15-10A15			+15V/500mA	-15V/500mA		83
	LH15-10C0505-05			5V/2000mA	±5V/500mA		75
	LH15-10C0512-02			5V/2000mA	±12V/200mA		77
	LH15-10C0515-02			5V/1800mA	±15V/200mA		78
	LH15-10C0524-01			5V/2000mA	±24V/100mA		78
	LH15-10D0505-08			5V/2200mA	5V/800mA		76
	LH15-10D0512-04			5V/2000mA	12V/400mA		80
	LH15-10D0515-03			5V/2000mA	15V/300mA		80
	LH15-10D0524-02			5V/2000mA	24V/200mA		81
UL/CE	LH20-10B03	70X48X23.5mm	20W	3.3V/4100mA		50mV	73
UL/CE	LH20-10B05			5V/3500mA			75
UL/CE	LH20-10B09			9V/2100mA			77
UL/CE	LH20-10B12			12V/1600mA			81
UL/CE	LH20-10B15			15V/1300mA			83
UL/CE	LH20-10B24			24V/850mA			85
	LH20-10A05			+5V/2000mA	-5V/2000mA		75
	LH20-10A12			+12V/830mA	-12V/830mA		82
	LH20-10A15			+15V/650mA	-15V/650mA		83
	LH20-10C0512-04			5V/2000mA	±12V/400mA		75
	LH20-10C0515-03			5V/2000mA	±15V/300mA		76
	LH20-10C0524-02			5V/2000mA	±24V/200mA		77
	LH20-10D0512-06			5V/2500mA	12V/600mA		75
	LH20-10D0524-03			5V/2500mA	24V/300mA		77
UL/CE	LH25-10B03	70X48X23.5mm	25W	3.3V/4100mA		50mV	73
UL/CE	LH25-10B05			5V/4100mA			74
UL/CE	LH25-10B09			9V/2500mA			78
UL/CE	LH25-10B12			12V/2100mA			82
UL/CE	LH25-10B15			15V/1600mA			83
UL/CE	LH25-10B24			24V/1100mA			85
UL/CE	LH25-10B48			48V/500mA			87

Note: LH05-10AXX sample Vo2 for feedback；LH10/15/20-10AXX sample positive and negative output for feedback；others sample Vo1 for feedback。

INPUT SPECIFICATIONS

Input voltage range		85～264VAC, 120～370VDC	
Input frequency		47～63Hz	
Input current		110VAC	230VAC
	LH05 models	120mA, typ	70mA, typ
	LH10 models	230mA, typ	120mA, typ
	LH15 models	250mA, typ	140mA, typ
	LH20 models	330mA, typ	180mA, typ
	LH25 models	420mA, typ	230mA, typ
Inrush current		110VAC	230VAC
	LH05 models	10A, typ	20A, typ
	LH10 models	10A, typ	20A, typ
	LH15 models	10A, typ	20A, typ
	LH20/LH25 models	16A, typ	30A, typ
Leakage current		0.3mA RMS typ./230VAC/50Hz	

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Recommended External Input Fuse (Special package series include fuse)	LH05 models LH10/LH15 models LH20/LH25 models	1A/250V 2A/250V 3.15A/250V	Slow-Blow Slow-Blow Slow-Blow

OUTPUT SPECIFICATIONS

Voltage set accuracy		±2%
Input variation		±0.5% (main output) ±1.5% (supplement output)
Load variation (10-100%)	Single output models	±1%
	Dual output models (balanced load)	±2%
	Isolated triple output (balanced load)	Vo1: ±3% (main output) ±Vo2: ±5% (supplement output)
	Isolated and separated twin output (balanced load)	Vo1: ±3% (main output) Vo2: ±5% (supplement output)
Minimum load	single output models Dual output models (balanced load) Isolated and separated twin output (balanced load) Isolated triple output (balanced load)	0% 10% 10% 10%
Ripple & noise(p-p)	(20MHz Bandwidth)	50mV (Typ) 100mV (Max)
Short circuit protection		Continuous, and auto resume
Over current protection		≥110% Io
Output over-voltage protection	3.3 / 5VDC models 9VDC models 12 / 15VDC models 24VDC models 48VDC models	≤7.5VDC ≤12VDC ≤20VDC ≤30VDC ≤60VDC

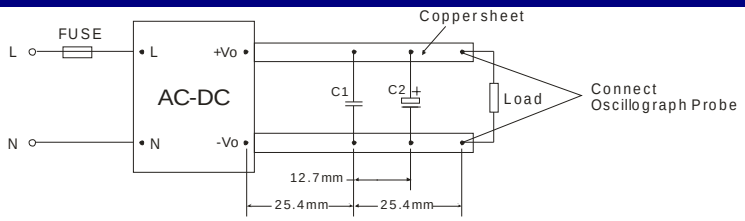
COMMON SPECIFICATIONS

Temperature ranges		Operating temperature : Power derating (55℃～70℃) (-40℃～-10℃) Storage temperature: Case temperature:	-40℃～+70℃ 3.75% / ℃ 2% / ℃ -40℃～+105℃ +90℃ max	
Hold-up time		(Vin=230VAC)	80ms(typ)	
Humidity (non condensing)			95%(max)	
Temperature coefficient			0.02%/℃ (main output) 0.15%/℃ (supplement output)	
Switching frequency			65kHz(typ.)	
I/O-isolation voltage			3000VAC/1Min	
EMC	EMI	CE	CISPR22/EN55022, CLASS B(without external circuit)	
		RE	CISPR22/EN55022, CLASS B(without external circuit)	
	EMS	ESD	IEC/EN 61000-4-2 Contact ±6KV / Air ±8KV	perf. Criteria B
		RS	IEC/EN 61000-4-3 10V/m	perf. Criteria A
		EFT	IEC/EN 61000-4-4 ±2KV(without external circuit)	perf. Criteria B
			IEC/EN 61000-4-4 ±4KV (with typical applications Figure 6)	perf. Criteria B
		Surge	IEC/EN 61000-4-5 ±1KV/±2KV(without external circuit)	perf. Criteria B
			IEC/EN 61000-4-5 ±2KV/±4KV (with typical applications Figure 6)	perf. Criteria B
Safety standards			IEC60950,EN60950,UL60950	
Safety approvals			EN60950,UL60950	
Safety Class		LH15-10BXX	CLASS Ⅱ	
		Others	CLASS Ⅰ	
Case material			UL94V-0	
Install			PCB mounting, Chassis mounting with Screw Terminals, DIN-Rail mounting	
MTBF			>300,000H @25℃	

Note:
1. Ripple and Noise are measured by the method of parallel lines;
2. All specifications measured at Ta=25°C, humidity<75%, nominal input voltage and rated output load unless otherwise specified;
3. All characteristics are for listed model only, non-standard models may perform differently, please contact our technical person for more detail.

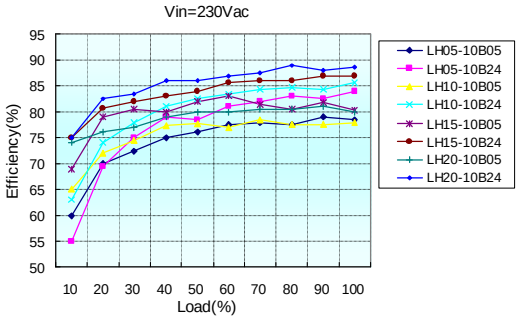
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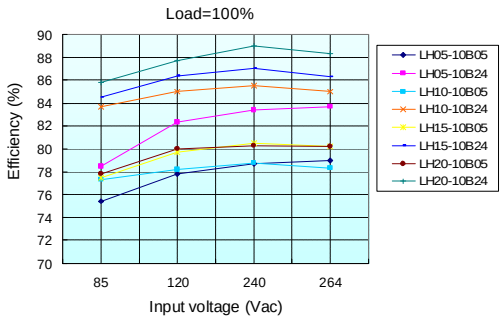
PARALLEL LINES MEASURE



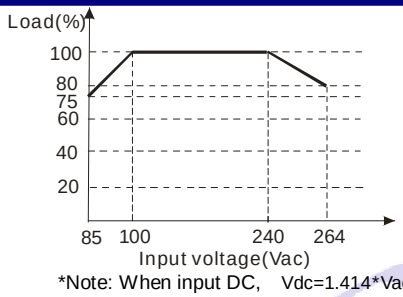
C1: 1μF (ceramic capacitor) C2: 10μF (electrolytic capacitor)

TYPICAL EFFICIENCY CURVE



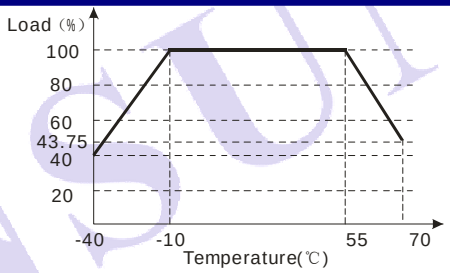


INPUT VOLTAGE VS LOAD



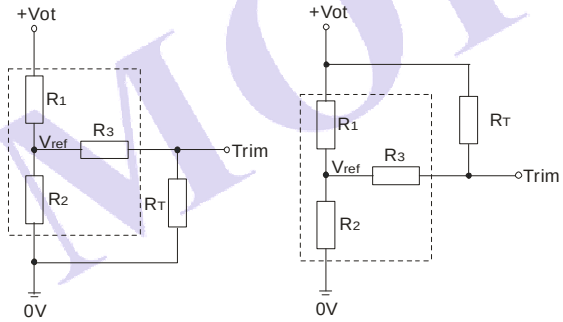
*Note: When input DC, Vdc=1.414*Vac-20.

TEMPERATURE VS LOAD



TRIM APPLICATION & TRIM CALCULATION

Application circuit for TRIM
(Part in broken line is the interior of models)



Formula for resistance of Trim

up: $R_T = \frac{aR_2}{R_2 - a} - R_3$ $\quad a = \frac{Vref}{Vot - Vref} \cdot R_1$

down: $R_T = \frac{aR_1}{R_1 - a} - R_3$ $\quad a = \frac{Vot - Vref}{Vref} \cdot R_2$

Note: Value for R1, R2, R3, and Vref refer to the following table.
R_T: Resistance of Trim
a: User-defined parameter, no actual meanings.

Vo(V) / Resistance	3.3	5	9	12	15	24	48
R1(KΩ)	2	3.3	7.5	3.8	7.5	8.6	1.2
R2(KΩ)	1.2	3.3	2.8	1	1.5	1	22
R3(KΩ)	1	1	1	1	1	1	1.2
Vref(V)	1.2	2.5	2.5	2.5	2.5	2.5	2.5
Vot(V)	Output voltage of Trim, variation ≤ ±10%						

TYPICAL APPLICATIONS

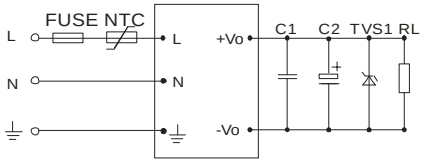


Figure 1: LH**-10B**(Single Output)

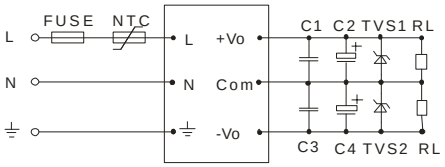


Figure 2:LH**-10A**(Dual Output)

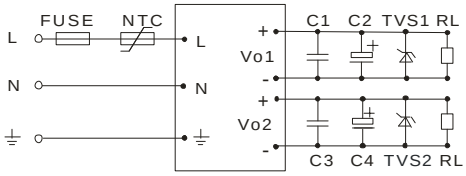


Figure 3:LH**-10D**(Isolate Twin Output)

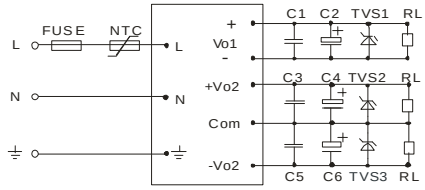


Figure 4:LH**-10C**(Triple Output)

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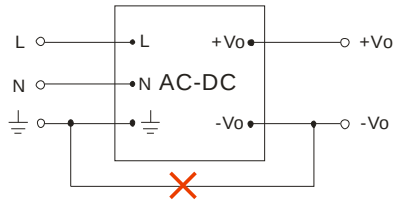


Figure 5:Note: This application is not supported for this series.

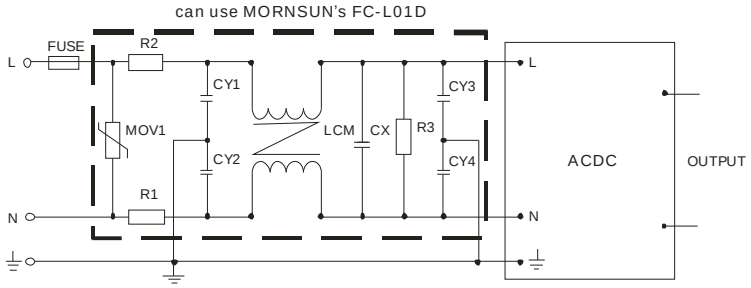


Figure 6:LH05-25 series Recommended circuit for application require higher EMC standard (external circuit output same as above)

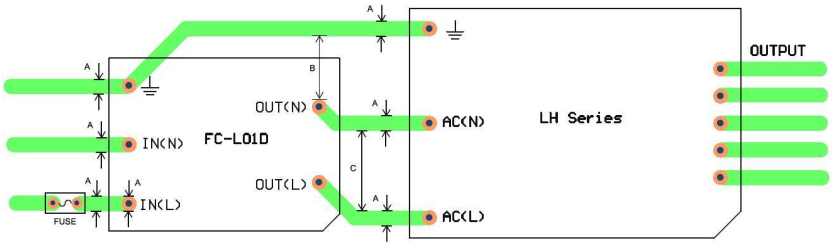


Figure 7: EMC application circuit PCB layout
Safety and recommend wiring: linewidth A≥3mm,B≥6mm,C≥9mm

EXTERNAL CAPACITORS TYPICAL VALUE(Unit: μF)

MODEL	C2	C4	C6	TVS1	TVS2	TVS3
LH05-10B03	330			SMBJ7.0A		
LH05-10B05	330			SMBJ7.0A		
LH05-10B09	120			SMBJ12A		
LH05-10B12	120			SMBJ20A		
LH05-10B15	68			SMBJ20A		
LH05-10B24	68			SMBJ30A		
LH05-10A05	120	120		SMBJ7.0A	SMBJ7.0A	
LH05-10A12	68	68		SMBJ20A	SMBJ20A	
LH05-10A15	47	47		SMBJ20A	SMBJ20A	
LH05-10A24	10	10		SMBJ30A	SMBJ30A	
LH05-10C0505-01	220	22	22	SMBJ7.0A	SMBJ7.0A	SMBJ7.0A
LH05-10C0512-01	120	22	22	SMBJ7.0A	SMBJ20A	SMBJ20A
LH05-10C0515-01	120	22	22	SMBJ7.0A	SMBJ20A	SMBJ20A
LH05-10C0524-01	120	22	22	SMBJ7.0A	SMBJ30A	SMBJ30A
LH05-10D0505-01	220	22		SMBJ7.0A	SMBJ7.0A	
LH05-10D0512-01	220	22		SMBJ7.0A	SMBJ20A	
LH05-10D0515-01	120	22		SMBJ7.0A	SMBJ20A	
LH05-10D0524-01	120	22		SMBJ7.0A	SMBJ30A	
LH10-10B03	470			SMBJ7.0A		
LH10-10B05	330			SMBJ7.0A		
LH10-10B09	120			SMBJ12A		
LH10-10B12	120			SMBJ20A		
LH10-10B15	120			SMBJ20A		
LH10-10B24	68			SMBJ30A		
LH10-10A05	220	220		SMBJ7.0A	SMBJ7.0A	
LH10-10A12	120	120		SMBJ20A	SMBJ20A	
LH10-10A15	47	47		SMBJ20A	SMBJ20A	
LH10-10A24	33	33		SMBJ30A	SMBJ30A	
LH10-10C0512-02	220	68	68	SMBJ7.0A	SMBJ20A	SMBJ20A
LH10-10C0515-02	220	47	47	SMBJ7.0A	SMBJ20A	SMBJ20A
LH10-10D0505-02	220	68		SMBJ7.0A	SMBJ7.0A	
LH10-10D0512-02	220	68		SMBJ7.0A	SMBJ20A	
LH10-10D0515-02	220	47		SMBJ7.0A	SMBJ20A	
LH10-10D0524-02	220	47		SMBJ7.0A	SMBJ30A	
LH15-10B03	680			SMBJ7.0A		
LH15-10B05	680			SMBJ7.0A		
LH15-10B09	470			SMBJ12A		
LH15-10B12	220			SMBJ20A		
LH15-10B15	220			SMBJ20A		
LH15-10B24	68			SMBJ30A		

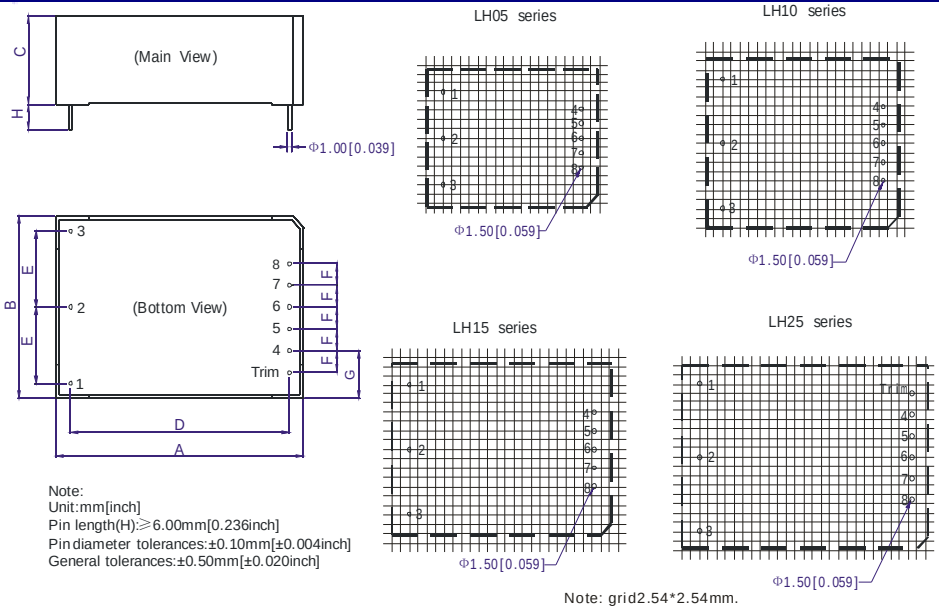
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LH15-10B48	33			SMBJ64A		
LH15-10A05	470	470		SMBJ7.0A	SMBJ7.0A	
LH15-10A12	220	220		SMBJ20A	SMBJ20A	
LH15-10A15	120	120		SMBJ20A	SMBJ20A	
LH15-10C0505-05	470	220	220	SMBJ7.0A	SMBJ7.0A	SMBJ7.0A
LH15-10C0512-02	470	120	120	SMBJ7.0A	SMBJ20A	SMBJ20A
LH15-10C0515-02	470	120	120	SMBJ7.0A	SMBJ20A	SMBJ20A
LH15-10C0524-01	470	120	120	SMBJ7.0A	SMBJ30A	SMBJ30A
LH15-10D0505-08	470	470		SMBJ7.0A	SMBJ7.0A	
LH15-10D0512-04	470	220		SMBJ7.0A	SMBJ20A	
LH15-10D0515-03	470	120		SMBJ7.0A	SMBJ20A	
LH15-10D0524-02	470	47		SMBJ7.0A	SMBJ30A	
LH20-10B03	330			SMBJ7.0A		
LH20-10B05	330			SMBJ7.0A		
LH20-10B09	220			SMBJ12A		
LH20-10B12	220			SMBJ20A		
LH20-10B15	220			SMBJ20A		
LH20-10B24	220			SMBJ30A		
LH20-10A05	470	470		SMBJ7.0A	SMBJ7.0A	
LH20-10A12	120	120		SMBJ20A	SMBJ20A	
LH20-10A15	68	68		SMBJ20A	SMBJ20A	
LH20-10C0512-04	330	120	120	SMBJ7.0A	SMBJ20A	SMBJ20A
LH20-10C0515-03	330	120	120	SMBJ7.0A	SMBJ20A	SMBJ20A
LH20-10C0524-02	330	47	47	SMBJ7.0A	SMBJ30A	SMBJ30A
LH20-10D0512-06	330	220		SMBJ7.0A	SMBJ20A	
LH20-10D0524-03	330	120		SMBJ7.0A	SMBJ30A	
LH25-10B03	330			SMBJ7.0A		
LH25-10B05	330			SMBJ7.0A		
LH25-10B09	330			SMBJ12A		
LH25-10B12	330			SMBJ20A		
LH25-10B15	330			SMBJ20A		
LH25-10B24	120			SMBJ30A		
LH25-10B48	68			SMBJ64A		

Note:

1. Output filtering capacitors C2, C4 and C6 are electrolytic capacitors, It is recommended to use high frequency and low impedance electrolytic capacitors. For capacitance and current of capacitor please refer to manufacture's datasheet. Voltage derating of capacitor should be 80% or above. C1,C3,C5 are use to filter high frequency noise，suggest choose 1μF. TVS is recommended component to protect post-circuits (if converter fails). External input NTC is recommended to use 5D-9.
2. For standard EMC requirement, please refer to figure 1, figure 2, figure 3 or figure 4, if higher EMC requirement ,please refer to figure 6.
   MOV: Varistor, model: 561KD14, it is used to protect the device under surge;
   R1 、R2：2Ω/3W Winding resistor；
   R3：1MΩ/2W；
   CY1、CY2、CY3、CY4：102M/400VAC；
   CX：224K/275VAC；
   LCM：10mH-30mH；
   FC-L01D：MORNSUN's 2KV/4KV Surge protector.
3. FUSE：LH05 recommended to use 1A/250V，LH10/LH15 recommended to use 2A/250V, LH20/LH25 recommended to use 3.15A/250V.

PCB MOUNTING WITH SOLDER PINS



Note:
Unit:mm[inch]
Pin length(H):≥6.00mm[0.236inch]
Pin diameter tolerances:±0.10mm[±0.004inch]
General tolerances:±0.50mm[±0.020inch]

Note: grid2.54*2.54mm.

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OUTLINE AND DIMENSIONS (Unit: mm)					
NO.	LH05	LH10	LH15	LH20	LH25
A	48.50	55.00	62.00	70.00	70.00
B	36.00	45.00	45.00	48.00	48.00
C	20.50	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	4.00	5.00	5.00	5.75	5.75
G	10.00	12.50	12.50	12.50	12.50

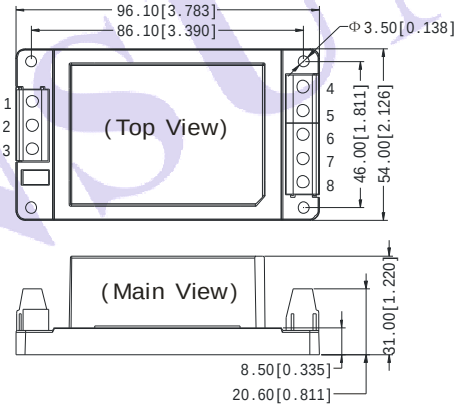
MODELS WEIGHT					
WEIGHT	LH05	LH10	LH15	LH20	LH25
(Typ.)	50g	70g	80g	120g	120g

FOOTPRINT DETAILS				
Pin	LHXX-10B	LHXX-10A	LHXX-10C	LHXX-10D
1	⏚	⏚	⏚	⏚
2	AC(N)	AC(N)	AC(N)	AC(N)
3	AC(L)	AC(L)	AC(L)	AC(L)
4	-Vo	-Vo	-Vo1	-Vo1
5	No Pin	No Pin	+Vo1	+Vo1
6	No Pin	COM	-Vo2	No Pin
7	No Pin	No Pin	COM	-Vo2
8	+Vo	+Vo	+Vo2	+Vo2
Trim	Trim**	No Pin	No Pin	No Pin

There is no pin "1" ⏚ on LH15-10BXX
Trim**: only for LH20/25-10BXX Series.

LHXXA2 CHASSIS MOUNTING WITH SCREW TERMINALS





Note:
Unit: mm[inch]
General tolerances: ±0.50mm[±0.020inch]
*The figure above is related to LH15 series, the height of other series is different.

OUTLINE AND DIMENSIONS (Unit: mm)	
MODEL	DIMENSIONS
LH05XXA2	96.1x54x29
LH10XXA2	96.1x54x29.5
LH15XXA2	96.1x54x31
LH20XXA2	96.1x54x32
LH25XXA2	96.1x54x32

MODELS WEIGHT					
WEIGHT	LH05	LH10	LH15	LH20	LH25
Typ.	100g	120g	130g	170g	170g

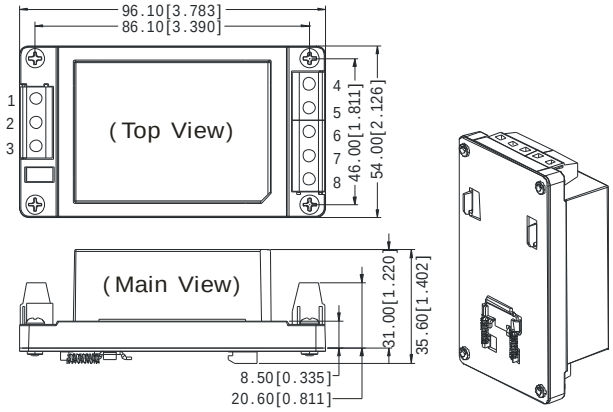
FOOTPRINT DETAILS				
Pin	LHXX-10B	LHXX-10A	LHXX-10C	LHXX-10D
1	⏚	⏚	⏚	⏚
2	AC(N)	AC(N)	AC(N)	AC(N)
3	AC(L)	AC(L)	AC(L)	AC(L)
4	-Vo	-Vo	-Vo1	-Vo1
5	NC	NC	+Vo1	+Vo1
6	NC/Trim**	COM	-Vo2	NC
7	NC	NC	COM	-Vo2
8	+Vo	+Vo	+Vo2	+Vo2

There is no pin "1" ⏚ on LH15-10BXXA2.
NC/Trim** : The pin is Trim on LH20/25-10BXXA2 ,
The pin is not connected on other single output products.

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LHXXA4 DIN-RAIL MOUNTING





Note:
Unit: mm[inch]
General tolerances: ±0.50mm[±0.020inch]

OUTLINE AND DIMENSIONS (Unit: mm)	
MODEL	DIMENSIONS
LH05XXA4	96.1x54x33.6
LH10XXA4	96.1x54x34.1
LH15XXA4	96.1x54x35.6
LH20XXA4	96.1x54x36.6
LH25XXA4	96.1x54x36.6

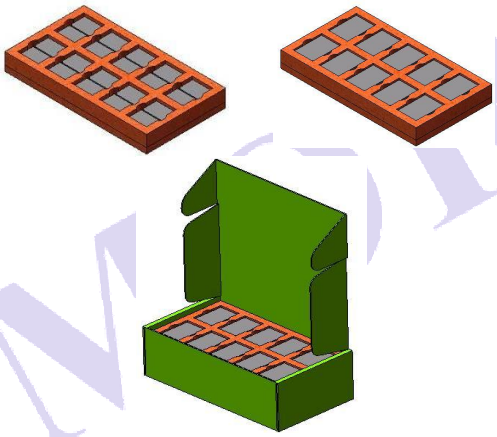
MODELS WEIGHT					
WEIGHT	LH05	LH10	LH15	LH20	LH25
Typ.	140g	160g	170g	210g	210g

* The figure above is related to LH15 series, the height of other series is different.
**Footprint Details are the same as Chassis mounting with Screw Terminals'.

PACKAGE DIAGRAM

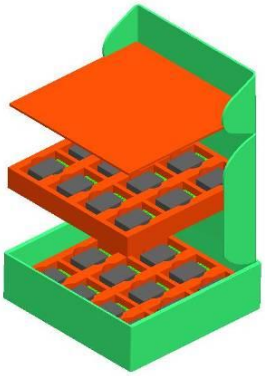
PCB mounting Series

(LH05 series) (Other series)



Inner packaging box dimensions: L*W*H=355*192*93mm
Packaging quantity: 20pcs (LH05 series: 40pcs)
Outer packaging box dimensions: L*W*H=405*380*305mm
Packaging quantity: 120pcs (LH05 series: 240pcs)

Special Package Series



Inner packaging box dimensions: L*W*H=365*350*105mm
Packaging quantity: 24pcs
Outer packaging box dimensions: L*W*H=390*360*245mm
Packaging quantity: 48pcs

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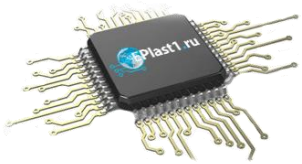
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- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
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- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



Как с нами связаться

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