

5-25W, AC/DC converter



UL US CB CE

RoHS

FEATURES

- Wide input voltage range:
85~264VAC/100~370VDC
- Operating temperature range : -40~70℃
- Conversion efficiency up to 87%
- Output short circuit, over-current, over-voltage protections
- Meets IEC60950, EN60950, UL60950 standards

LB(05-25)-10BxxLT 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, EN60950 standards, and is 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	LB05-10B03LT	4W	3.3V/1250mA	70	4000
	LB05-10B05LT	5W	5V/1000mA	75	4000
	LB05-10B09LT		9V/550mA	77	1800
	LB05-10B12LT		12V/420mA	79	1800
	LB05-10B15LT		15V/330mA	80	1500
	LB05-10B24LT		24V/230mA	82	330
	LB10-10B03LT	6.6W	3.3V/2000mA	70	26000
	LB10-10B05LT	10W	5V/2000mA	76	9400
	LB10-10B09LT		9V/1100mA	78	3600
	LB10-10B12LT		12V/900mA	80	2400
	LB10-10B15LT		15V/700mA	81	1200
	LB10-10B24LT		24V/450mA	82	370
	LB15-10B03LT	9.9W	3.3V/3000mA	73	36000
	LB15-10B05LT	14W	5V/2800mA	76	20000
	LB15-10B09LT	15W	9V/1600mA	78	6000
	LB15-10B12LT		12V/1250mA	80	3000
	LB15-10B15LT		15V/1000mA	80	3000
	LB15-10B24LT		24V/625mA	84	900
	LB15-10B48LT		48V/320mA	85	370
	LB20-10B03LT	13.5W	3.3V/4100mA	74	48000
	LB20-10B05LT	17.5W	5V/3500mA	78	12000
	LB20-10B09LT	20W	9V/2100mA	80	7200
	LB20-10B12LT		12V/1600mA	82	5400
	LB20-10B15LT		15V/1300mA	83	2700
	LB20-10B24LT		24V/850mA	85	1800
	LB25-10B03LT	13.5W	3.3V/4100mA	74	48000
	LB25-10B05LT	20.5W	5V/4100mA	79	12000
	LB25-10B09LT	25W	9V/2500mA	81	5600
	LB25-10B12LT		12V/2100mA	83	5400
	LB25-10B15LT	25W	15V/1600mA	84	2400
	LB25-10B24LT		24V/1100mA	85	1400
	LB25-10B48LT		48V/500mA	87	800

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	--	63	Hz
Input Current	115VAC	LB05 models	--	--	0.125	A
		LB10 models	--	--	0.26	
		LB15 models	--	--	0.37	
		LB20/LB25 models	--	--	0.6	
	230VAC	LB05 models	--	--	0.08	
		LB10 models	--	--	0.16	
		LB15 models	--	--	0.22	
		LB20/LB25 models	--	--	0.34	
Inrush Current	115VAC	LB05/LB10/LB15 models	--	10	--	
		LB20/ LB25 models	--	16	--	
	230VAC	LB05/LB10/LB15 models	--	20	--	
		LB20/ LB25 models	--	30	--	
Leakage current			0.1mA RMS typ. 230VAC/50Hz			
Recommended External Input Fuse	LB05 models		1A/250V, slow fusing			
	LB10/ LB15 models		2A/250V, slow fusing			
	LB20/ LB25 models		3.15A/250V, 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	10%-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	LB05 models		Over-voltage shutdown			
	LB10/ LB15/ LB20/ LB25 models	3.3/5VDC	≤7.5VDC			
		9VDC	≤12VDC			
		12/15VDC	≤20VDC			
		24VDC	≤30VDC			
		48VDC	≤60VDC			
Min. Load			0	--	--	%
Trim	LB20/ LB25 models		--	--	±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: 1min	3000	--	--	VAC
	Input- 		2000	--	--	
Operating Temperature			-40	--	+70	℃
Storage Temperature			-40	--	+105	
Storage Humidity			--	--	95	%RH

Welding Temperature	Wave-soldering	260±5℃; time:5~10s			
	Manual-welding	360±10℃; time:3~5s			
Switching Frequency	LB05 models	--	65	132	KHz
	LB10 models	--	100	--	
	LB15/LB20/LB25 models	--	65	--	
Power Derating	-40℃ to -10℃	2	--	--	% /℃
	50℃ to +70℃ (LB25-10BxxLT series)	3	--	--	
	55℃ to +70℃ (Others)	4	--	--	
Safety Standard		IEC60950/EN60950/UL60950			
Safety Certification		EN60950/UL60950			
Safety Class	LB15-10BxxLT	CLASS II			
	Others	CLASS I			
MTBF		MIL-HDBK-217F@25℃ > 300,000 h			
Note:* There is no pin  on LB15-10BxxLT.					

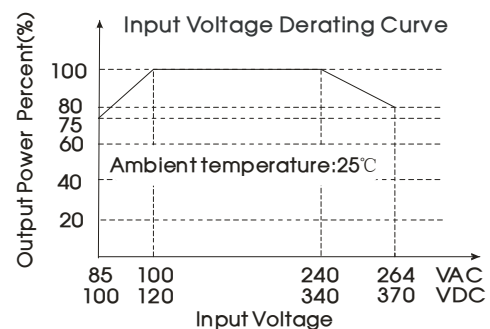
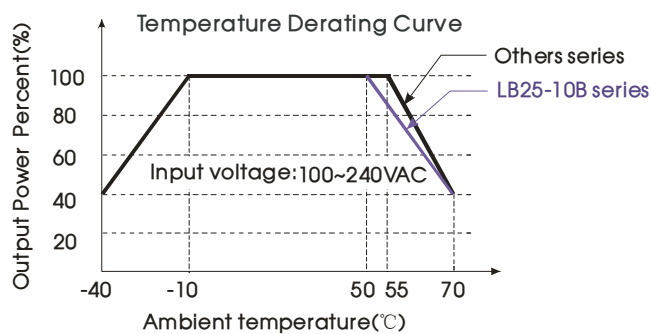
Physical Specifications

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

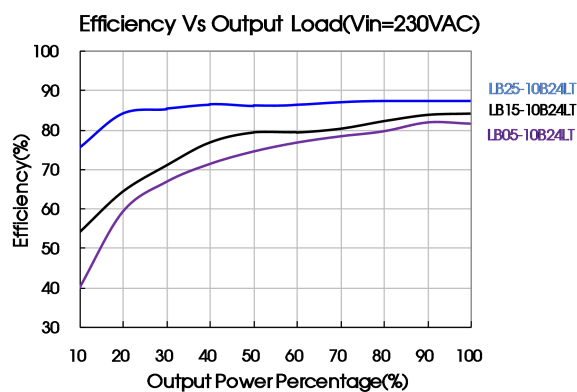
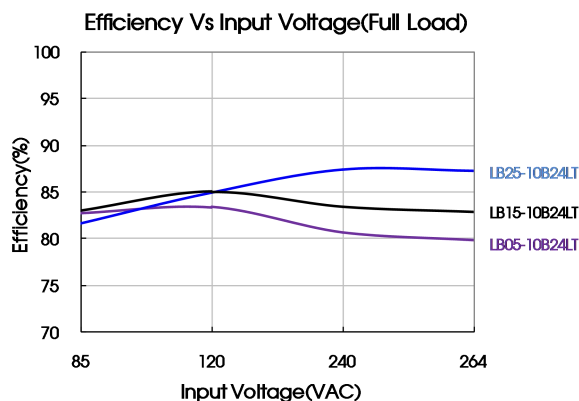
EMC Specifications

EMI	CE	CISPR22/EN55022, CLASS B		
	RE	CISPR22/EN55022, CLASS B		
EMS	ESD	IEC/EN61000-4-2	±6KV/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	±1KV/±2KV	perf. Criteria B
		IEC/EN61000-4-5	±2KV/±4KV (See Fig. 2 for recommended circuit)	perf. Criteria B
	CS	IEC/EN61000-4-6	10 Vr.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 When input 85~100VAC/240~264VAC/100~120VDC/340~370VDC, it need to be voltage derated on basis of temperature derating;
 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

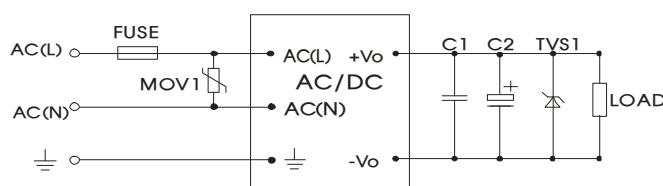


Fig. 1

Model	C1(uF)	C2(uF)	TVS1
LB05-10B03LT	1	330	SMBJ7.0A
LB05-10B05LT	1	330	SMBJ7.0A
LB05-10B09LT	1	120	SMBJ12A
LB05-10B12LT	1	120	SMBJ20A
LB05-10B15LT	1	68	SMBJ20A
LB05-10B24LT	1	68	SMBJ30A
LB10-10B03LT	1	470	SMBJ7.0A
LB10-10B05LT	1	330	SMBJ7.0A
LB10-10B09LT	1	120	SMBJ12A
LB10-10B12LT	1	120	SMBJ20A
LB10-10B15LT	1	120	SMBJ20A
LB10-10B24LT	1	68	SMBJ30A
LB15-10B03LT	1	680	SMBJ7.0A
LB15-10B05LT	1	680	SMBJ7.0A
LB15-10B09LT	1	470	SMBJ12A
LB15-10B12LT	1	220	SMBJ20A

Model	C1(uF)	C2(uF)	TVS1
LB15-10B15LT	1	220	SMBJ20A
LB15-10B24LT	1	68	SMBJ30A
LB15-10B48LT	1	33	SMBJ64A
LB20-10B03LT	1	330	SMBJ7.0A
LB20-10B05LT	1	330	SMBJ7.0A
LB20-10B09LT	1	220	SMBJ12A
LB20-10B12LT	1	220	SMBJ20A
LB20-10B15LT	1	220	SMBJ20A
LB20-10B24LT	1	220	SMBJ30A
LB25-10B03LT	1	330	SMBJ7.0A
LB25-10B05LT	1	330	SMBJ7.0A
LB25-10B09LT	1	330	SMBJ12A
LB25-10B12LT	1	330	SMBJ20A
LB25-10B15LT	1	330	SMBJ20A
LB25-10B24LT	1	120	SMBJ30A
LB25-10B48LT	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. Capacitance withstand voltage derating should be 80% or above. C1 is ceramic capacitor, advice use 1μF. 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

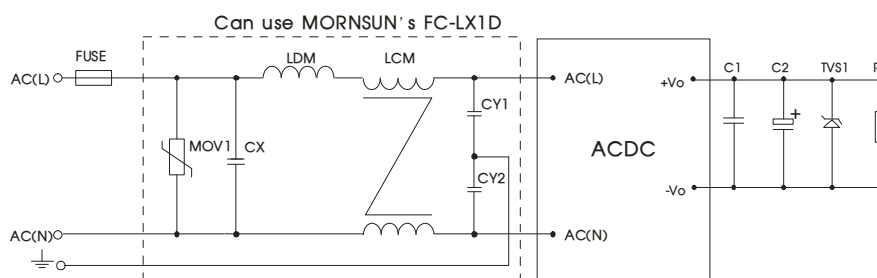


Fig 2

EMC solution-recommended circuit PCB layout

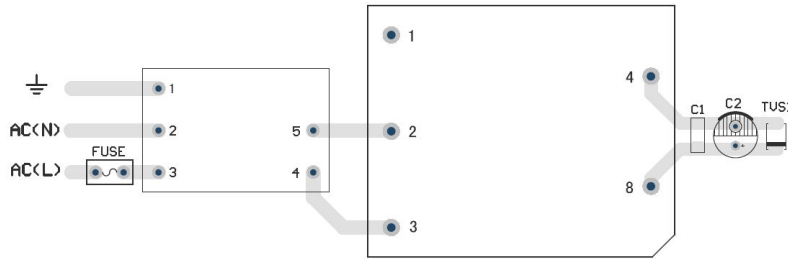
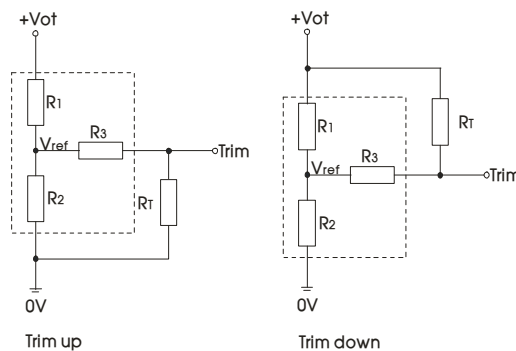


Fig 3

Note: Suggestions for safety regulation and wiring width: wire width $\geq 3\text{mm}$, distance between wires $\geq 6\text{mm}$, and distance between wire and ground $\geq 6\text{mm}$

Element model	Recommended value	Element model	Recommended value	
MOV1	S14K350	FC-LX1D	EMC filter	
CY1 , CY2	1000pF/400VAC	FUSE	LB05	1A/250V slow fusing, necessary
CX	0.1 μF /275VAC		LB10/15	2A/250V slow fusing, necessary
LCM	10mH, recommended to use MORNSUN's FL2D-Z5-103		LB20/25	3.15A/250V slow fusing, necessary
LDM	4.7 μH /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:

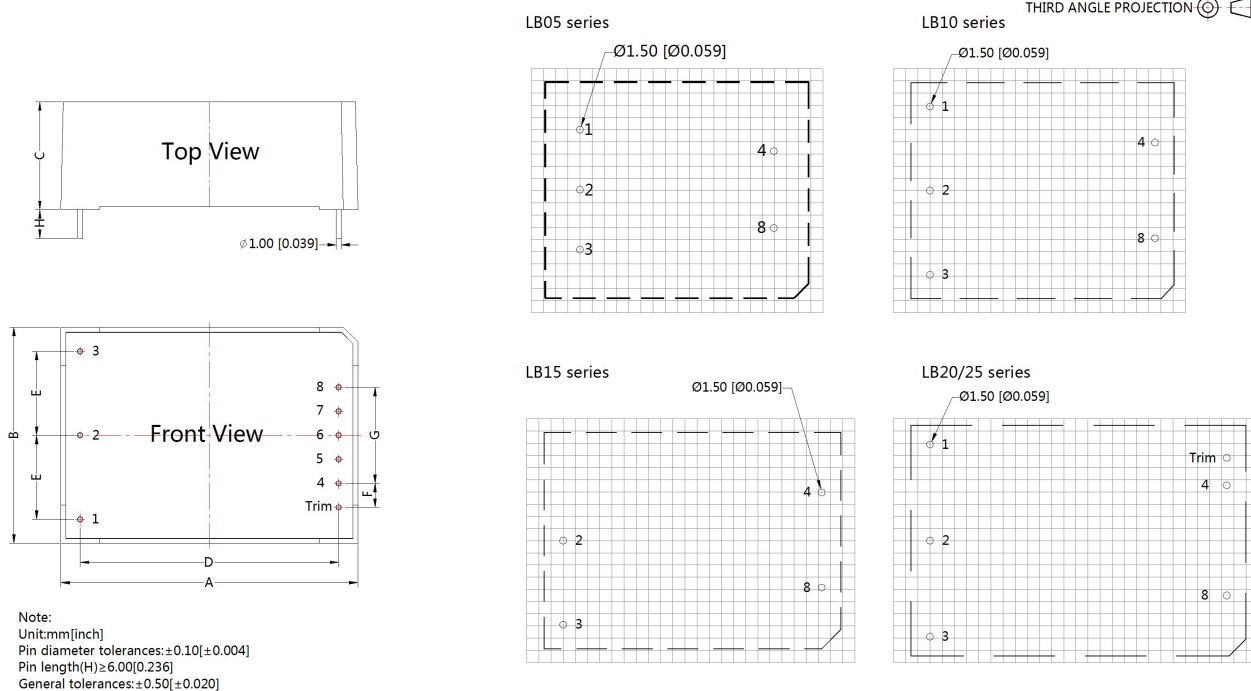
$$\begin{aligned} \text{up: } R_T &= \frac{\alpha R_2}{R_2 - \alpha} - R_3 & \alpha &= \frac{V_{\text{ref}}}{V_{\text{ot}} - V_{\text{ref}}} \cdot R_1 \\ \text{down: } R_T &= \frac{\alpha R_1}{R_1 - \alpha} - R_3 & \alpha &= \frac{V_{\text{ot}} - V_{\text{ref}}}{V_{\text{ref}}} \cdot R_2 \end{aligned}$$

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

Vout	R1(K Ω)	R2(K Ω)	R3(K Ω)	Vref(V)	Vot(V)
3.3V	3.3	1.98	1	1.24	Output voltage after regulation, variation $\leq \pm 10\%$
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.	LB05	LB10	LB15	LB20	LB25
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

Models Weight					
Weight	LB05	LB10	LB15	LB20	LB25
(Typ.)	75g	75g	85g	120g	120g

Pin Connection	
Pin	LBxx-10BxxLT
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 LB15-10BxxLT
Trim**: only for LB20/25-10BxxLT Series.

Notes:

- Packing information please refer to Product Packing Information which can be downloaded from www.mornsun-power.com. Packing bag number: 58220006;
- 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;
- Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25 °C, humidity<75% with nominal input voltage and rated output load;
- All index testing methods in this datasheet are based on our Company's corporate standards;
- The performance parameters of the product models listed in this manual are as above, but some parameters of non-standard model products may exceed the requirements mentioned above. Please contact our technicians directly for specific information;
- We can provide product customization service;
- Specifications are subject to change without prior notice.

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