

5-25W, AC/DC converter



UL **CE** E235235 **RoHS**

FEATURES

- Wide input voltage range : 85~264VAC/120~370VDC
- Low temperature operating range of military grade: -40~70℃
- Conversion efficiency up to 87%
- Short circuit , over-current, over- voltage protection
- Meets IEC60950, EN60950, UL60950 standards
- Three years warranty

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. For harsh EMC environment, this series of product must use the refered application circuit.

Selection Guide

Certification	Part No.	Output Power	Nominal Output Voltage and Current (Vo/Io)	Efficiency (230VAC, %/Typ.)	Max. Capacitive Load(μF)
UL/CE (pending)	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

Selection Guide

Certification	Part No.	Output Power	Nominal Output Voltage and Current (Vo/Io)	Efficiency (230VAC, %/Typ.)	Max. Capacitive Load(μF)
UL/CE (pending)	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		120	--	370	VDC
Input frequency			47	--	63	Hz
Input current	LB05 models	115VAC	--	--	0.125	A
	LB10 models		--	--	0.26	
	LB15 models		--	--	0.37	
	LB20/LB25 models		--	--	0.6	
	LB05 models	230VAC	--	--	0.08	
	LB10 models		--	--	0.16	
	LB15 models		--	--	0.22	
	LB20/LB25 models		--	--	0.34	
Inrush current	LB05/LB10/LB15 models	115VAC	--	10	--	
	LB20/ LB25 models		--	16	--	
	LB05/LB10/LB15 models	230VAC	--	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			

Output Specifications

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

Note: *Parallel line test method is adopted to test the ripple and noise, 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
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	--	66	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-regulated Certification		EN60950/UL60950(pending)				
Safety Class		LB15-10BxxLT	CLASS II			
		Others	CLASS I			
Hot Plug		Unavailable				
MTBF		MIL-HDBK-217F@25℃ > 300,000 h				

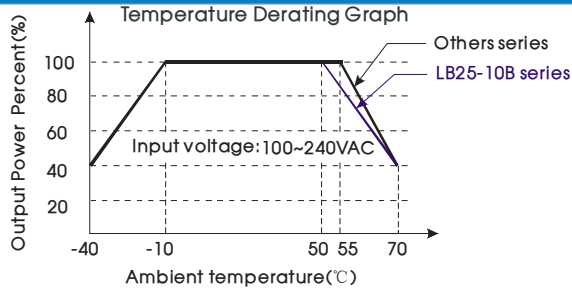
Physical Specifications

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 air convection

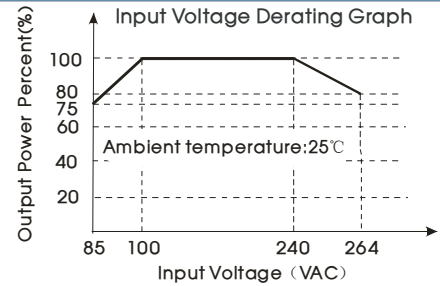
EMC Specifications

EMI	Conducted Disturbance	CISPR22/EN55022, CLASS B			
	Radiated Emission	CISPR22/EN55022, CLASS B			
EMS	Electrostatic Discharge	IEC/EN61000-4-2	±6KV/±8KV	Perf. Criteria B	
	Radiation Immunity	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 Immunity	IEC/EN61000-4-5	±1KV/±2KV	perf. Criteria B	
		IEC/EN61000-4-5	±2KV/±4KV (See Fig. 2 for recommended circuit)	perf. Criteria B	
	Conducted Disturbance immunity	IEC/EN61000-4-6	10 V _{r.m.s}	perf. Criteria A	
	Immunity for Power frequency magnetic field	IEC/EN61000-4-8	10A/m	perf. Criteria A	
	Immunities of voltage dip, drop and short interruption	IEC/EN61000-4-11	0%-70%	perf. Criteria B	

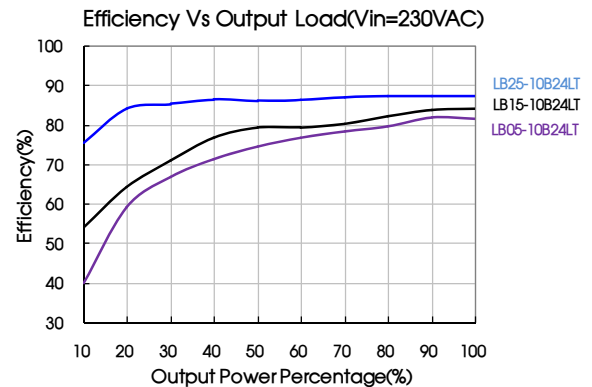
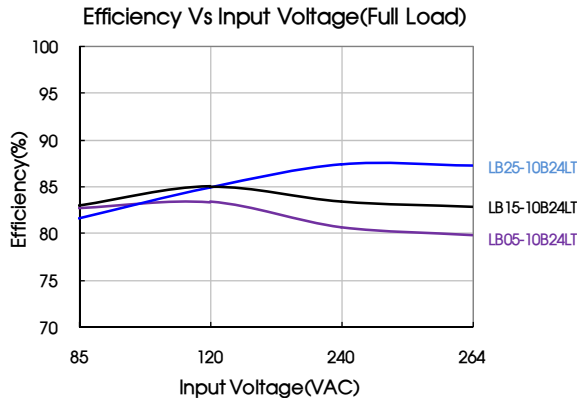
Product Characteristic Curve



Note: When input 85~100VAC/240~264VAC, it need to be voltage derated on basis of temperature derating.



Note: When input DC, VDC=1.414VAC-20.



Design Reference

1. Typical application circuit

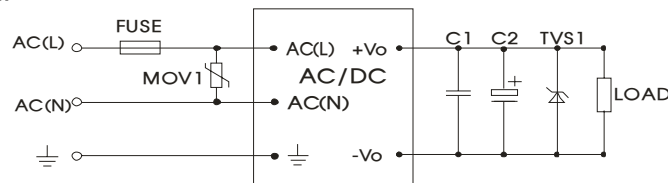


Fig. 1: Typical application circuit

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
LB15-10B15LT	1	220	SMBJ20A
LB15-10B24LT	1	120	SMBJ30A
LB15-10B48LT	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

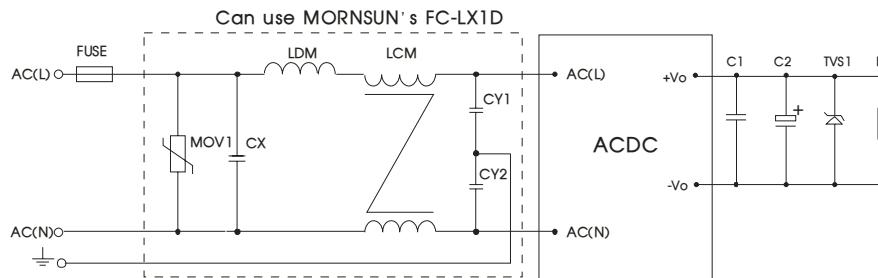


Fig. 2: EMC Recommended circuit with higher requirements

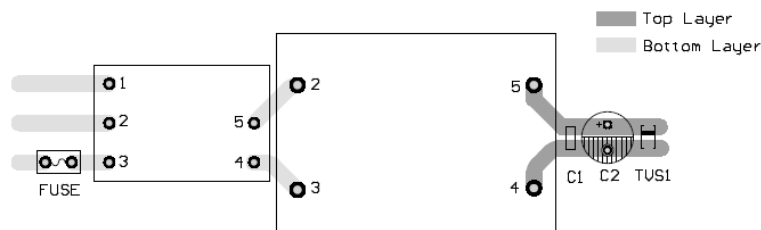
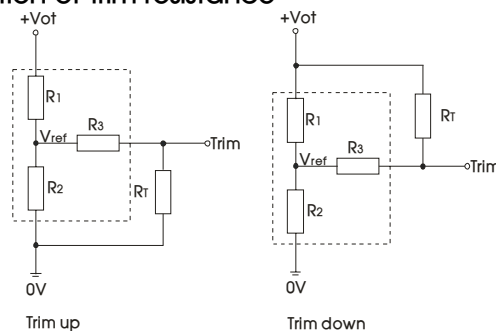


Fig.3: Recommended EMC circuit-PCB layout

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	2KV/4KV 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	5 μH	--	--	--

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:

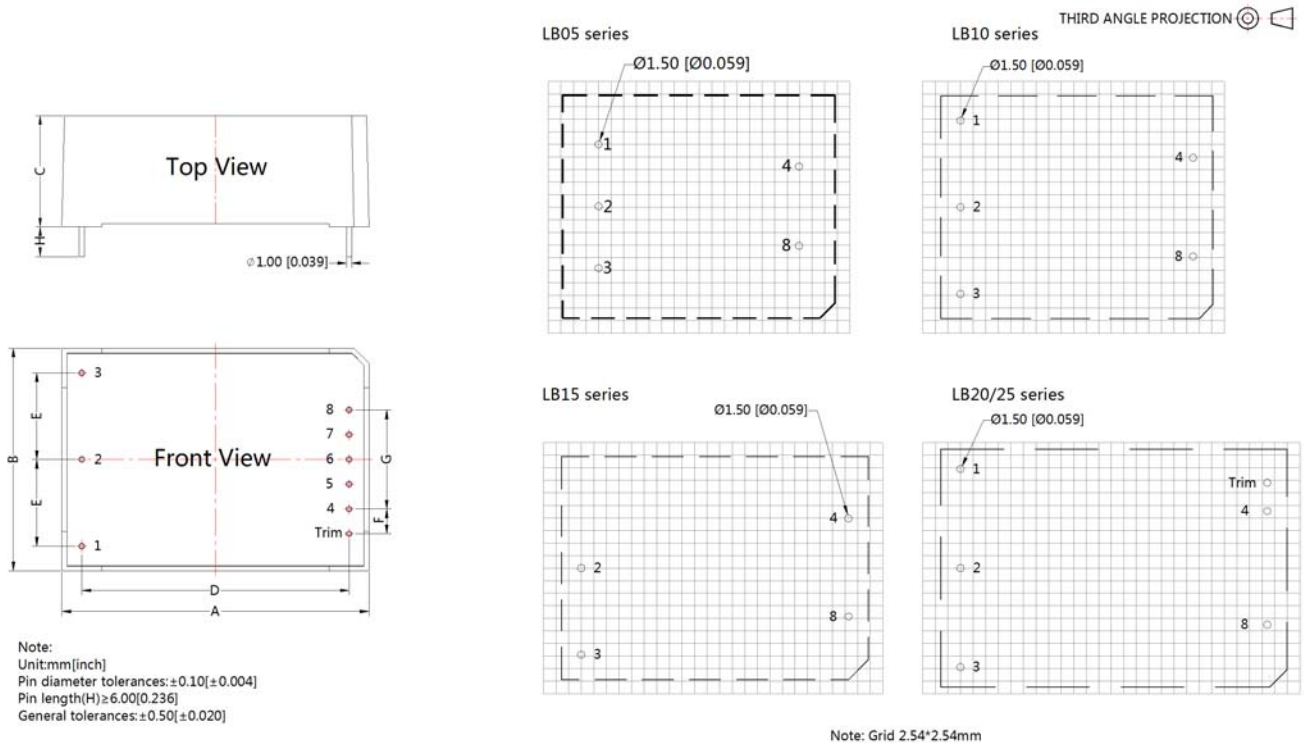
$$\begin{aligned} \text{up: } R_T &= \frac{\alpha R_2}{R_2 - \alpha} - R_3 & \alpha &= \frac{V_{\text{ref}}}{V_{\text{ot}} - V_{\text{ref}}} \cdot R_1 \\ \text{down: } R_T &= \frac{\alpha R_1}{R_1 - \alpha} - R_3 & \alpha &= \frac{V_{\text{ot}} - V_{\text{ref}}}{V_{\text{ref}}} \cdot R_2 \end{aligned}$$

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 please find the application notes on www.mornsun-power.com

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.)	70g	80g	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.

Note:

1. Packing Information please refer to 'Product Packing Information'. The Packing bag number of Horizontal package : 58220006;
2. Unless otherwise specified, data in this datasheet should be tested under the conditions of $T_a=25^{\circ}\text{C}$, humidity<75% when inputting nominal voltage and outputting rated load;
3. All index testing methods in this datasheet are based on our Company's corporate standards;
4. The performance indexes of the product models listed in this manual are as above, but some indexes of non-standard model products will exceed the above-mentioned requirements, and please directly contact our technician for specific information;
5. We can provide product customization service;
6. Specifications of this product are subject to changes without prior notice.

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