3-15W, AC-DC converter

FEATURES

- Universal Input :85 ~ 264VAC,50/60Hz
- Regulated output, low ripple and noise
- Efficiency up to 81%
- Urtal-slim SIP package, green environmental protection
- Over-current, short circuit and over- voltage protection
- Plastic case, meets UL94V-0
- Meets: UL60950, EN60950
- Three years warranty (3 years of quality assurance)
- Mounting: PCB mounting, Chassis mounting with Screw Terminals, DIN-Rail mounting

c UL us CE E235235 RoHS

LB 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	Model	Output Power	Nominal Output Voltage and Current (Vo/Io)		Efficiency (230VAC, %/Typ.)	Max. Capacitive Load(μF)
			(vo1/Io1)	(vo2/Io2)		
UL/CE	LB03-10B03	3W	3.3V/1000mA	--	68	32000
	LB03-10B05		5v/600mA	--	71	30000
	LB03-10B09		9V/330mA	--	75	3800
	LB03-10B12		12V/250mA	--	74	2500
	LB03-10B15		15V/200mA	--	75	4300
	LB03-10B24		24V/125mA	--	77	800
	LB05-10B03	5W	3.3V/1500mA	--	70	27000
	LB05-10B05		5v/1000mA	--	73	9600
	LB05-10B09		9V/600mA	--	75	3800
	LB05-10B12		12V/450mA	--	76	2500
	LB05-10B15		15V/350mA	--	78	1200
	LB05-10B24		24V/230mA	--	79	400
	LB05-10A05		+5V/500mA	-5V/500mA	70	9000/9000
	LB05-10A12		+12V/210mA	-12V/210mA	74	2000/2000
	LB05-10A15		+15V/170mA	-15V/170mA	75	2000/2000
	LB05-10A24		+24V/100mA	-24V/100mA	77	700/700
	LB05-10D0505-01		+5V/900mA	+5V/100mA	70	8500/550
	LB05-10D0512-01		+5V/750mA	+12V/100mA	74	4500/270
	LB05-10D0515-01		+5V/700mA	+15V/100mA	74	4500/180
	LB05-10D0524-01		+5V/600mA	+24V/100mA	75	4200/180
--	LB10-10B03	10W	3.3V/3000mA	--	70	75000
--	LB10-10B05		5V/2000mA	--	73	46000
--	LB10-10B09		9V/1100mA	--	77	15000
--	LB10-10B12		12V/900mA	--	78	5500
--	LB10-10B15		15V/700mA	--	78	5300

Selection Guide

Certification	Model	Output Power	Nominal Output Voltage and Current (Vo/Io)		Efficiency (230VAC, %/Typ.)	Max. Capacitive Load(μF)
			(vo1/Io1)	(vo2/Io2)		
--	LB10-10B24	10W	24V/450mA	--	80	950
--	LB10-10A05		+5V/1000mA	-5V/1000mA	73	13000/13000
--	LB10-10A12		+12V/450mA	-12V/450mA	78	2500/2500
--	LB10-10A15		+15V/350mA	-15V/350mA	79	3300/3300
UL/CE	LB15-10B03	15w	3.3V/3500mA	--	71	50000
	LB15-10B05		5v/3000mA	--	74	13000
	LB15-10B09		9V/1600mA	--	77	6000
	LB15-10B12		12V/1250mA	--	79	5500
	LB15-10B15		15V/1000mA	--	80	2500
	LB15-10B24		24V/625mA	--	81	1500

Note: LB05/10/15-10AXX, use both Positive and Negative output as sampling feedback； and all others use Vo1 as sampling feedback.

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	LB03	115VAC	--	--	0.125	A
	LB05		--	--	0.26	
	LB10		--	--	0.37	
	LB15		--	--	0.6	
	LB03	230VAC	--	--	0.08	
	LB05		--	--	0.16	
	LB10		--	--	0.22	
	LB15		--	--	0.34	
Inrush current	LB03/ LB05	115VAC	--	10	--	
	LB10/ LB15		--	10	--	
	LB03/ LB05	230VAC	--	20	--	
	LB10/ LB15		--	30	--	
Leakage current			0.3mA RMS typ. 230VAC/50Hz			
Recommended External Input Fuse (Special package series include fuse)		LB03/ LB05	1A/250V, slow fusing			
		LB10/ LB15	2A/250V, slow fusing			

Output Specifications

Item		Operating Conditions		Min.	Typ.	Max.	Unit
Output Voltage Accuracy		Main circuit		--	±2	--	%
Line Regulation		Main circuit		--	±0.5	--	
		Auxiliary circuit		--	±1.5	--	
Load Regulation	10%-100% load	Single output		--	±1	--	
	balanced load	Dual output		--	±2	--	
		Isolation & twin output	main circuit	--	±3	--	
			auxiliary circuit	--	±5	--	
Output Ripple & Noise*		20MHz bandwidth (peak-peak value)		--	50	100	mV
Temperature Drift Coefficient		Main circuit		--	±0.02	--	%/°C
		Auxiliary circuit		--	±0.15	--	
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	Single output	0	--	--	%	
	Dual output (main circuit)	10	--	--		
	Isolation & twin output (main circuit)	10	--	--		
Hold-up Time	230VAC input	--	80	--	ms	
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			-25	--	+70	℃
Storage Temperature			-25	--	+105	
Storage Humidity			--	--	85	%RH
Welding Temperature		Wave-soldering	260±5℃; time:5~10s			
		Manual-welding	360±10℃; time:3~5s			
Switching Frequency			--	60	--	kHz
Power Derating		-25℃~-10℃	2.0	--	--	%/℃
		55℃~+70℃	3.75	--	--	
Safety Standard		IEC60950/EN60950/UL60950				
Safety-regulated Certification		EN60950/UL60950				
Safety Class	LB10-10BXX	CLASS II				
	Others	CLASS I				
Hot Plug		Unavailable				
MTBF		MIL-HDBK-217F@25°C > 300,000 h				

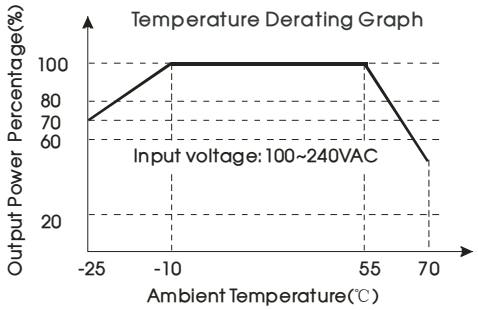
Physical Specifications

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

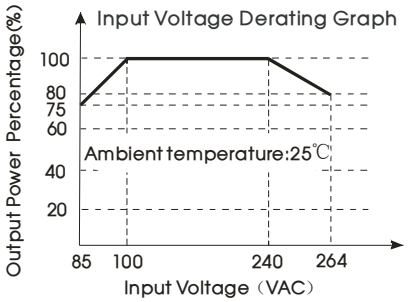
EMC Specifications

EMI	Conducted Disturbance	CISPR22/EN55022, CLASS B (Without External Circuit)	
	Radiated Emission	CISPR22/EN55022, CLASS B (Without External Circuit)	
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 (Without External Circuit)	perf. Criteria B
		IEC/EN61000-4-4 ±4KV (See Fig. 4 for recommended circuit)	perf. Criteria B
	Surge Immunity	IEC/EN61000-4-5 ±1KV/±2KV (Without External Circuit)	perf. Criteria B
		IEC/EN61000-4-5 ±2KV/±4KV (See Fig. 4 for recommended circuit)	perf. Criteria B
	Conducted Disturbance immunity	IEC/EN61000-4-6 10 Vr.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

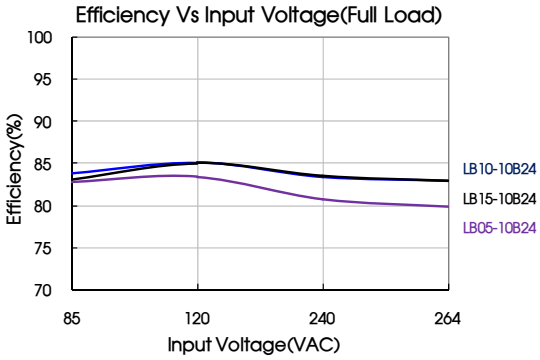
Product Characteristic Curve

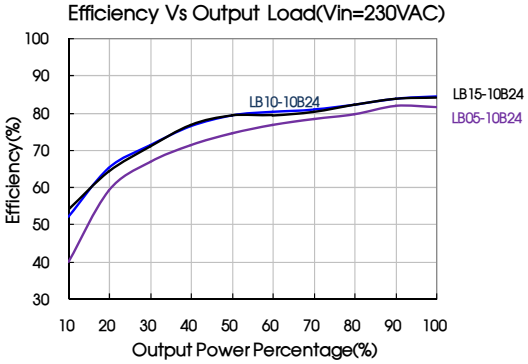


Note: Input voltage should be derated based on temperature derating when it is 85~100VAC/240~264VAC.



Note：When input DC，VDC=1.414*VAC-20.





Design Reference

1. Typical application circuit

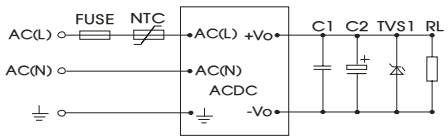


Fig. 1: LBXX-10B**(Single)

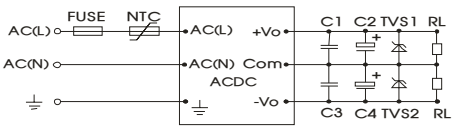


Fig. 2: LBXX-10A**(Dual)

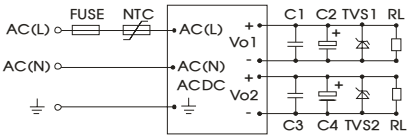


Fig. 3: LBXX-10D**(Isolation & twin)

Model	C2	C4	TVS1	TVS2	Model	C2	C4	TVS1	TVS2
LB03-10B03	220		SMBJ7.0		LB05-10D0515-01	220	47	SMBJ7.0	SMBJ20A
LB03-10B05	220		SMBJ7.0		LB05-10D0524-01	220	47	SMBJ7.0	SMBJ30A
LB03-10B09	120		SMBJ12A		LB10-10B03	470		SMBJ7.0	
LB03-10B12	120		SMBJ20A		LB10-10B05	330		SMBJ7.0	
LB03-10B15	68		SMBJ20A		LB10-10B09	120		SMBJ12	
LB03-10B24	10		SMBJ30A		LB10-10B12	120		SMBJ20	
LB05-10B03	330		SMBJ7.0A		LB10-10B15	120		SMBJ20	
LB05-10B05	330		SMBJ7.0A		LB10-10B24	68		SMBJ30	
LB05-10B09	120		SMBJ12A		LB10-10A05	220	220	SMBJ7.0	SMBJ7.0A
LB05-10B12	120		SMBJ20A		LB10-10A12	120	120	SMBJ20	SMBJ20A
LB05-10B15	68		SMBJ20A		LB10-10A15	47	47	SMBJ20	SMBJ20A
LB05-10B24	68		SMBJ30A		LB15-10B03	330		SMBJ7.0	
LB05-10A05	120	120	SMBJ7.0	SMBJ7.0A	LB15-10B05	680		SMBJ7.0	
LB05-10A12	68	68	SMBJ20A	SMBJ20A	LB15-10B12	220		SMBJ20	
LB05-10A15	47	47	SMBJ20A	SMBJ20A	LB15-10B09	120		SMBJ20	
LB05-10A24	10	10	SMBJ30A	SMBJ30A	LB15-10B15	220		SMBJ20	
LB05-10D0505-01	220	68	SMBJ7.0	SMBJ7.0A	LB15-10B24	68		SMBJ30A	
LB05-10D0512-01	220	68	SMBJ7.0	SMBJ20A					

Note:
Output filtering capacitor C2 and C4 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. C1and C3 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

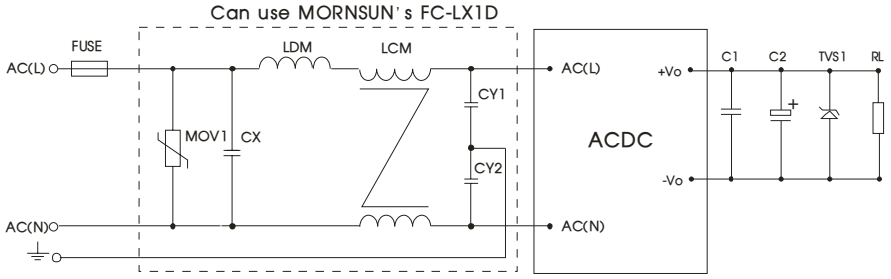


Fig. 4: EMC Recommended circuit with higher requirements

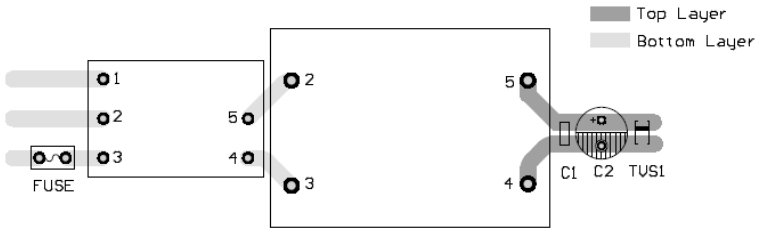


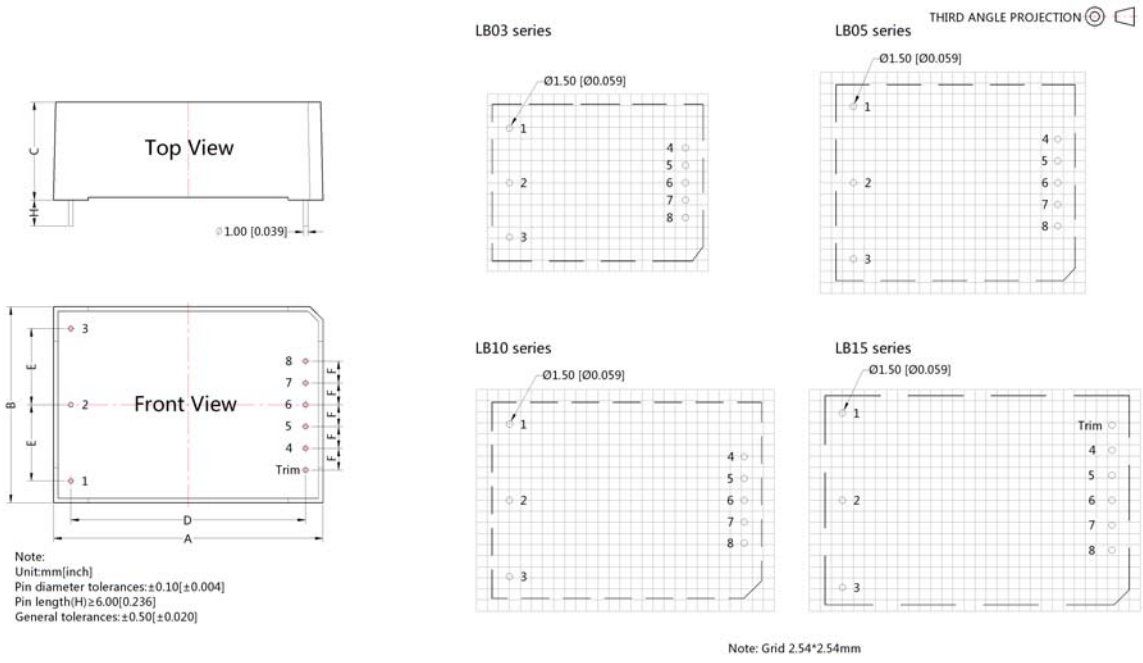
Fig. 5: Recommended EMC circuit-PCB layout

Suggestions for safety regulation and wiring width: wire width ≥3mm, distance between wires ≥6mm, and distance between wire and ground ≥6mm

Element model	Recommended value	Element model	Recommended value	
MOV1	S14K350	LDM	5uH	
CY1 , CY2	1000pF/400VAC	FC-LX1D	2KV/4KV EMC filter	
CX	0.1μF/275VAC	FUSE	LB03/05	1A/250V slow fusing, necessary
LCM	10mH, recommended to use MORNSUN's FL2D-Z5-103		LB10/15	2A/250V slow fusing, necessary

3. For more information please find the application notes on www.mornsun-power.com

Dimensions and Recommended Layout



Outline and dimensions (Unit: mm)				
No.	LB03	LB05	LB10	LB15
A	48.50	55.00	62.00	70.00
B	36.00	45.00	45.00	48.00
C	20.50	21.00	22.50	23.50
D	40.50	47.00	54.00	62.00
E	12.50	17.50	17.50	20.00
F	4.00	5.00	5.00	5.75
G	10.00	12.50	12.50	12.50

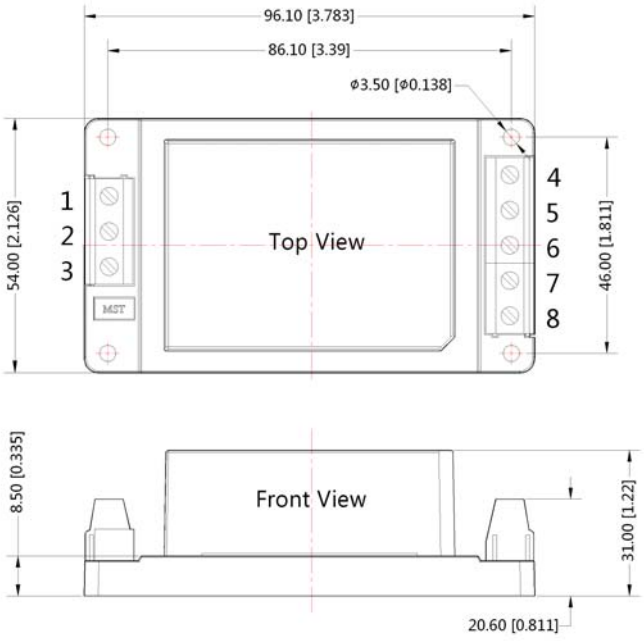
Modles weight				
Weight	LB03	LB05	LB10	LB15
(Typ.)	50g	70g	80g	120g

Footprint details				
Pin	LBXX-10B	LBXX-10A	LBXX-10C	LBXX-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 LB10-10BXX
Trim**: only for LB15-10BXX Series.

LBXXA2 Dimensions

THIRD ANGLE PROJECTION



Note:
Unit:mm[inch]
Wire range : 24~12 AWG
General tolerances:±0.50[±0.020]

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

There is no pin "1" , ⏚ on LB10-10BXXA2.
NC/Trim** : The pin is Trim on LB15-10BXXA2 ,
The pin is not connected on other single output products.

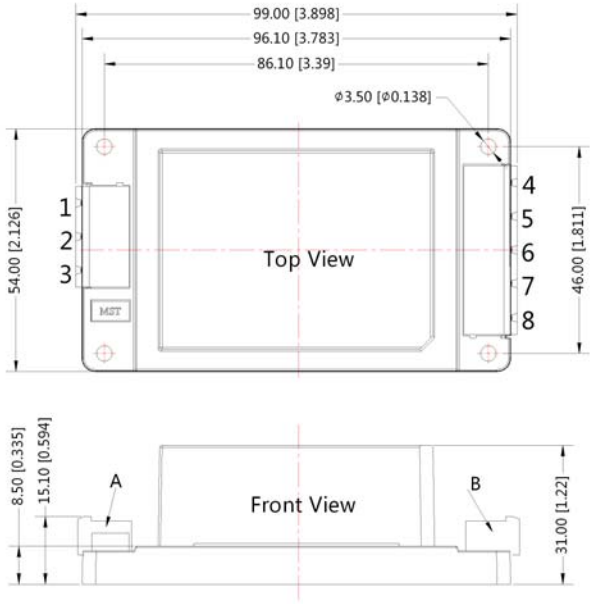
*The figure above is related to LB10XXA2 series, the height of other series is different.

Outline and dimensions (Unit: mm)	
Model	Dimensions
LB03XXA2	96.10*54.00*29.00
LB05XXA2	96.10*54.00*29.50
LB10XXA2	96.10*54.00*31.00
LB15XXA2	96.10*54.00*32.00

Models weight				
Weight	LB03	LB05	LB10	LB15
Typ.	100g	120g	130g	170g

LBXXA3 Dimensions

THIRD ANGLE PROJECTION



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

There is no pin "1" , ⏚ on LB10-10BXXA3.
NC/Trim** : The pin is Trim on LB15-10BXXA3 ,
The pin is not connected on other single output products.

*The figure above is related to LB10XXA3 series, the height of other series is different.

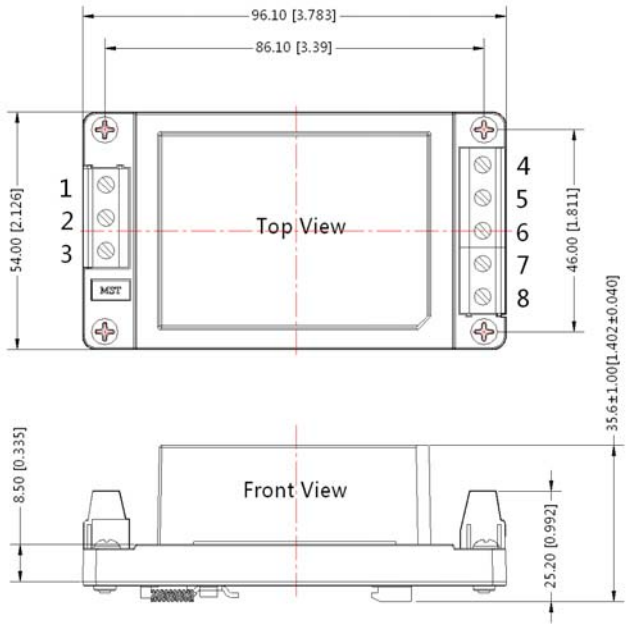
Note:
Unit:mm[inch]
Wire range : 24~12 AWG
General tolerances:±0.50[±0.020]
A:DEGSON P/N: 2EDGRC-7.5-03P-14-100A (H)
B: DEGSON P/N: 2EDGRC-7.5-05P-14-100A (H)

Outline and dimensions (Unit: mm)	
Model	Dimensions
LB03XXA3	99.00*54.00*29.00
LB05XXA3	99.00*54.00*29.50
LB10XXA3	99.00*54.00*31.00
LB15XXA3	99.00*54.00*32.00

Models weight				
Weight	LB03	LB05	LB10	LB15
Typ.	100g	120g	130g	170g

LBXXA4 Dimensions

THIRD ANGLE PROJECTION



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

There is no pin "1" , ⏚ on LB10-10BXXA4.
NC/Trim** : The pin is Trim on LB15-10BXXA4 ,
The pin is not connected on other single output products.

*The figure above is related to LB10XXA4 series, the height of other series is different.

Note:
Unit:mm[inch]
Wire range : 24~12 AWG
General tolerances:±0.50[±0.020]

Outline and dimensions (Unit: mm)	
Model	Dimensions
LB03XXA4	96.10*54.00*33.60
LB05XXA4	96.10*54.00*34.10
LB10XXA4	96.10*54.00*35.60
LB15XXA4	96.10*54.00*36.60

Models weight				
Weight	LB03	LB05	LB10	LB15
Typ.	140g	160g	170g	210g

Note:

1. Packing Information please refer to 'Product Packing Information'. The Packing bag number of Horizontal package : 58220007 (LB03), 58220006(others), the Packing bag number of A2/A3/A4 package:58220010;
2. Unless otherwise specified, data in this datasheet should be tested under the conditions of Ta=25°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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