

300W, AC-DC Brick Converter



FEATURES

- Ultra-wide 85 - 305VAC and 120 - 430VDC input voltage range
- Typical efficiency up to 92%, power factor up to 0.99
- International standard half brick package
- Compact size, high power density
- Over temperature protection, input reverse polarity protection, over-voltage/over-current/output short circuit protection
- Designed to meet UL/IEC62368 standards

LBH300-13Bxx series is a new generation product of Mornsun's ultra compact size and highly efficient green power converter. It is a standard half brick package size with ultra-wide input voltage, high efficiency, high reliability and reinforced isolation. The products are safe and reliable with good EMC performance, the safety specifications meet the international UL/EN/IEC62368 standards. They are widely used in switching equipment, access equipment, mobile communications, microwave communications, optical transmission, routers and other areas of the communication, as well as electronics and mechanical equipment etc. For harsh EMC environment, the application circuit in the datasheet is strongly recommended.

Selection Guide

Certification	Part No.	Output Power (W)	Nominal Output Voltage and Current(Vo/Io)	Efficiency at 230VAC (%) Typ.	Capacitive Load (uF) Max.
EN	LBH300-13B12	300	12V/25A	92	4000
	LBH300-13B24		24V/12.5A	92	2000
	LBH300-13B28		28V/10.72A	92	2000
--	LBH300-13B48*		48V/6.25A	92	1000
	LBH300-13B54*		54V/5.6A	92	1000

Note: 1. *48V/54V under development; for more details, please consult the MORNSUN FAE.
2. The product picture is for reference only. For details, please refer to the actual product.

Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Input Voltage Range	AC input	85	--	305	VAC
	DC input	120	--	430	VDC
Input Frequency		47	--	63	Hz
Power Factor*	50/60Hz, 115VAC/230VAC, Pout=300W	--	0.99	--	--
Input Current	115VAC	--	--	4	A
	230VAC	--	--	2	
Inrush Current	230VAC, Ta=25°C	--	--	40	
THD*	Ta=25°C, Vin=115V, Pout=300W	--	8	--	%
	Ta=25°C, Vin=230V, Pout=300W	--	5	--	%
Input Under-voltage Protection	Under-voltage protection start (Input voltage drops from high to low)	60	--	75	VAC
	Under-voltage protection start (Input voltage rises from low to high)	75	--	85	
Hot Plug		Unavailable			
Grounded Mode	PE is required for AI-Substrate application				

Note: *The power factor and THD test result are based on recommended circuit 1.

Output Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Output Voltage Accuracy		--	±2	--	%
Line Regulation	Full load	--	±0.5	--	
Load Regulation		--	±1	--	

Ripple & Noise*	20MHz bandwidth (peak-to-peak value) Load at room temperature 30% - 100%	12V	--	150	--	mV
		24V	--	240	--	
		28V	--	240	--	
		48V	--	400	--	
		54V	--	400	--	
Load Dynamic Response	Overshoot amplitude	25% - 50% - 25% load, 50% - 75% - 50% load, slopes of 0.1A/us	--	--	5	%
	Recovery time		--	--	200	us
Stand-by Power Consumption			--	1.5	3	W
Minimum Load			0	--	--	%
Hold-up Time			--	10	--	ms
Short Circuit Protection			Hiccup, continuous, self-recover			
Over-current Protection			120% Io, self-recover after fault disappear			
Over-voltage Protection	12VDC output		≤16VDC (Hiccup or clamp)			
	24VDC output		≤35VDC (Hiccup or clamp)			
	28VDC output		≤35VDC (Hiccup or clamp)			
	48VDC output		≤60VDC (Hiccup or clamp)			
	54VDC output		≤63VDC (Hiccup or clamp)			
No-load Output Of Auxilliary Source	Maximum pulling current about 10mA, take HU- as for reference ground	10	12	15		V
Over Temperature Protection	Over-temperature protection start (Al-Substrate temperature) until power off	105	--	115		°C
	Over-temperature protection recovery	Reset input				
ENA Remote Control ON/OFF	Enable control pin	ENA connect to HU- , output is normal				
		ENA disconnect to HU- , output turn off				

Note: *The "Tip and barrel" method is used for ripple and noise test, please refer to AC-DC Converter Application Notes for specific information.

General Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Isolation	Input - Output	Electric Strength Test for 1min., leakage current <5mA	3000	--	--	VAC
	Input - PE		1500	--	--	
	Output - PE		1500	--	--	
Insulation Resistance	Input - Output	Test Voltage: 500VDC, Ta=25°C	100	--	--	MΩ
	Input - PE		100	--	--	
	Output - PE		100	--	--	
Operating Temperature	Al-Substrate temperature		-40	--	+100	°C
Storage Temperature			-40	--	+100	
Storage Humidity			--	--	95	%RH
Soldering Temperature	Wave-soldering		260 ± 5°C; time: 5 - 10s			
	Manual-welding		360 ± 10°C; time: 3 - 5s			
Power Derating	Al-Substrate temperature	-40°C to +100°C	--	--	--	%/°C
	Input voltage	85VAC - 110VAC	0.32	--	--	%/VAC
	Altitude	2000m - 5000m	6.67	--	--	%/Km
Safety Standard	12V/24V/28V		BS EN/EN62368-1(report) safety approved; Design refer to UL/IEC62368-1			
	48V/54V		Design refer to UL/EN/IEC62368-1			
Safety Class			CLASS I			
MTBF	MIL-HDBK-217F@25°C		≥500,000 h			

Mechanical Specifications

Case Material	Black plastic, flame-retardant and heat-resistant (UL94V-0)
Dimension	63.14 x 60.60 x 12.70mm
Weight	155g (Typ.)
Cooling method	Conduction heat dissipation, it is necessary to ensure that the product aluminum substrate surface temperature lower than 100℃.

Electromagnetic Compatibility (EMC) (Based on recommended circuit)*

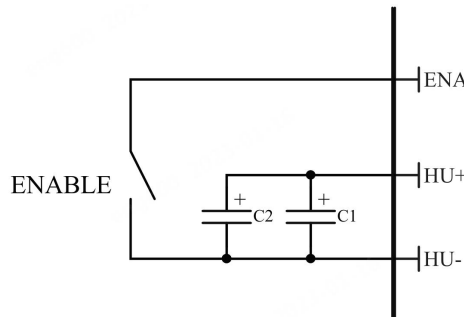
Emissions	CE	CISPR32/EN55032 CLASS A	
		CE102 GJB151B (Recommended circuit 2)	
	RE	CISPR32/EN55032 CLASS A	
	Harmonics	IEC/EN6100-3-2	perf. Criteria A
EMS	ESD	IEC/EN61000-4-2 Contact ±6KV/Air ±8KV	perf. Criteria A
	RS	IEC/EN61000-4-3 10V/m	perf. Criteria A
	EFT	IEC/EN61000-4-4 ±4KV	perf. Criteria A
	Surge	IEC/EN61000-4-5 Line to line ±2KV/line to PE ±4KV	perf. Criteria A
	CS	IEC/EN61000-4-6 10Vr.m.s	perf. Criteria A
	Voltage dip, short interruption and voltage variation	IEC/EN61000-4-11 0%, 70%	perf. Criteria B

Note: *Except for CE102 of the CE, other EMC test results are based on recommended circuit 1.

Instructions

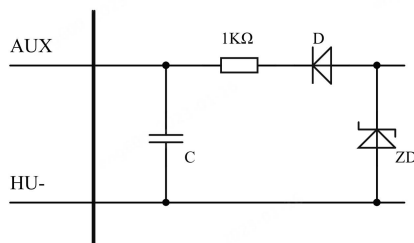
1. ENA Remote Control Switch

The module has built-in ENA remote control switch function. This function can control ON/OFF of the output voltage when the input voltage is turned on. Short circuit ENA and HU-, and the output voltage is normal; ENA disconnect to HU-, and the output voltage turn off. The wiring diagram circuit is as follows:

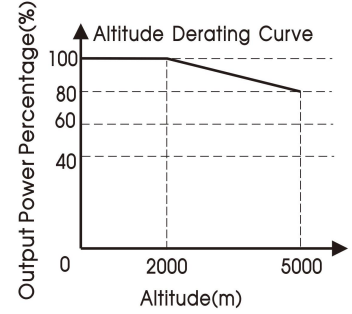
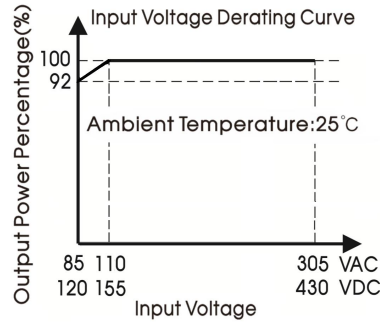
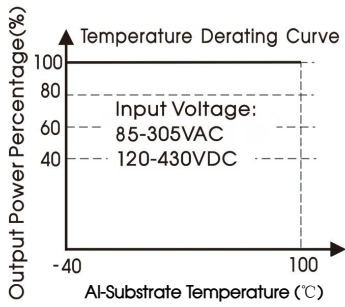


2. Auxilliary Power Supply For External Signals (AUX Terminal)

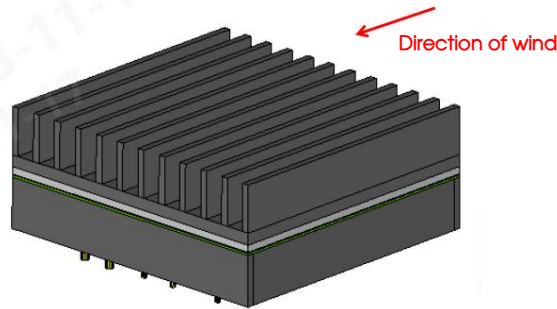
The module additionally provides 12V auxilliary source output, the reference ground is HU- and provides an auxilliary control power supply for the primary side control circuit. No load voltage 10-15V (Internal resistor in series 1 kΩ , maximum pull-up current about 10mA).



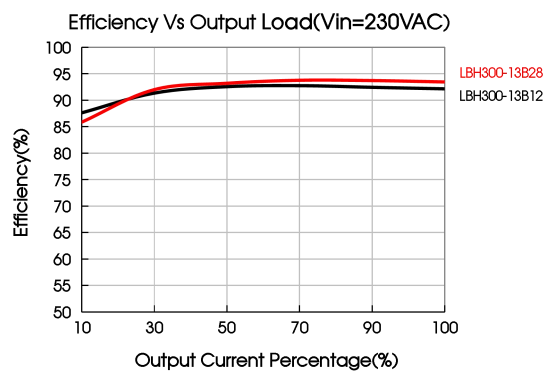
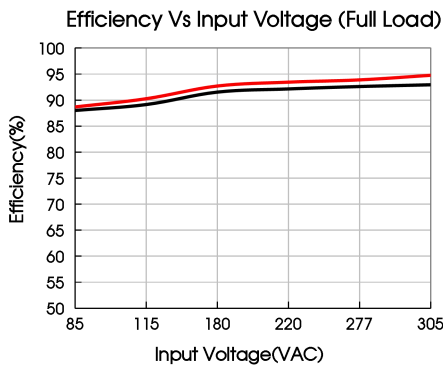
Product Characteristic Curve



Note:
 ① With an AC input voltage between 85 - 110VAC/120 - 155VDC the output power must be derated as per the voltage derating curves;
 ② The temperature derating curve is a typical test value, the working condition is heat sink with air cooling, and the temperature test point of Al-Substrate is at the center of it.



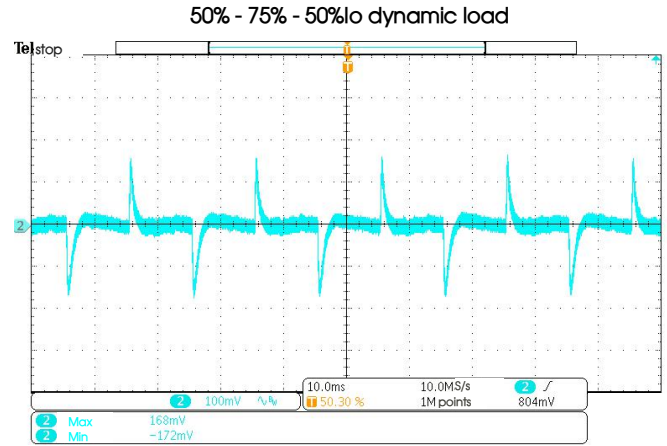
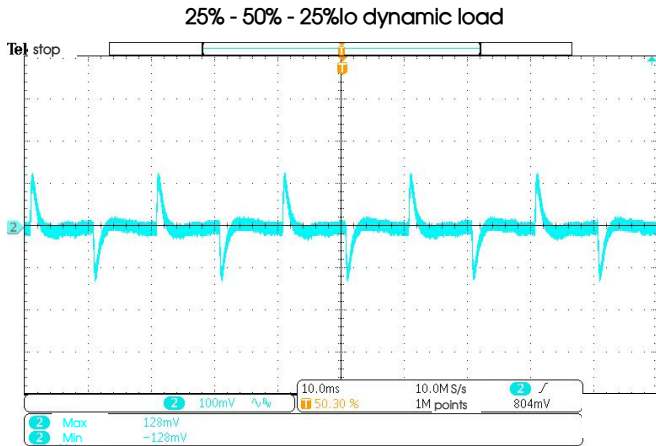
Note:
 ① Under ambient temperature of 25°C, input voltage of 115V, add heat sink and 1.2m/s wind blowing, when the surface temperature of the Al-Substrate is 100°C, the device temperature rise meets the requirement of temperature derating.
 ② Under ambient temperature of 25°C, input voltage of 230V, add heat sink and 0.6m/s wind blowing, when the surface temperature of the Al-Substrate is 100°C, the device temperature rise meets the requirement of temperature derating.



Product Characteristic Curve

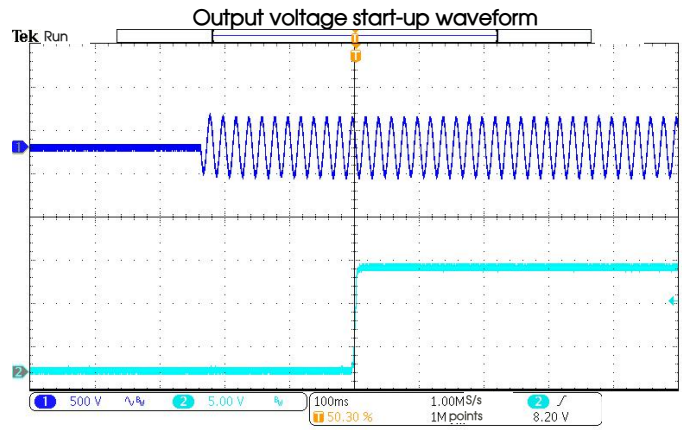
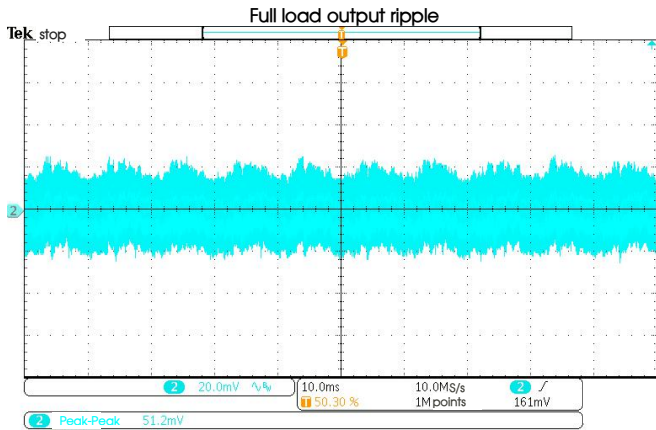
1. Dynamic Response

Test conditions: Tc=25°C, Vin= 230VAC, Vout=12V, tip with 20MHz bandwidth. Products are tested based on recommended circuit 1 and the "Tip and barrel method" is used for test, output parallel 10uF electrolytic capacitor and 1uF ceramic capacitor.



2. Output Ripple And Start-up Waveform

Test conditions: $T_c=25^\circ\text{C}$, $V_{in}=230\text{VAC}$, $V_{out}=12\text{V}$, tip with 20MHz bandwidth. Products are tested based on recommended circuit 1 and the "Tip and barrel method" is used for test, output parallel 10uF electrolytic capacitor and 1uF ceramic capacitor.

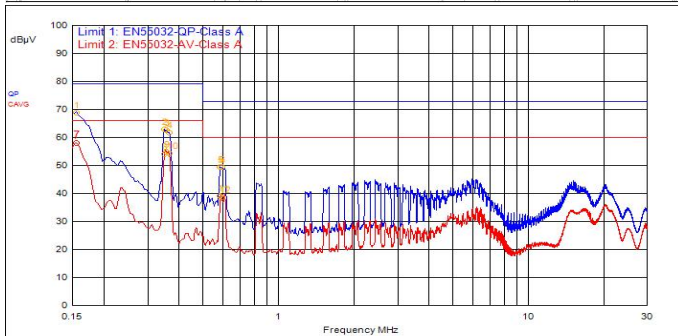


3. Conductive Waveform

(1) Safety specifications: CISPR32/EN55032 CLASS A

Test conditions: $T_c=25^\circ\text{C}$, $V_{in}=230\text{VAC}$, $V_{out}=12\text{V}$, products are tested based on recommended circuit 1.

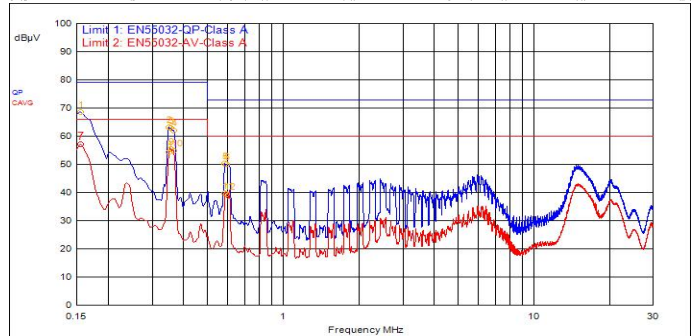
Settings SubRange Summary			
Range Number: 1			
Start Freq.:	0.150MHz	Stop Freq.:	30.000MHz
Freq. Step:			
Trace 1:	QPeak	Trace 2:	C_AVG
Trace 3:	-		
Bandwidth:		Measurement Time:	10 ms
Attenuator:	0 dB		
Antenna/Probe:	LISN-8122	Cable:	CE CABLE
Amplifier/Atten.:	ATT-10dB		



ID	Frequency	Probe	Cable	Atten.	Detector	Meter Read	Meas Level	Limit	Limit Dist.
7	156.000kHz	0.1	0.2	10.0	C_AVG	47.7	58.1	66.0	-7.9
1	156.000kHz	0.1	0.2	10.0	QPeak	58.7	69.0	79.0	-10.0
9	357.000kHz	0.2	0.2	10.0	C_AVG	44.5	54.9	66.0	-11.1
10	366.000kHz	0.2	0.2	10.0	C_AVG	44.0	54.4	66.0	-11.6

L line peak value and average value

Settings SubRange Summary			
Range Number: 1			
Start Freq.:	0.150MHz	Stop Freq.:	30.000MHz
Freq. Step:			
Trace 1:	QPeak	Trace 2:	C_AVG
Trace 3:	-		
Bandwidth:		Measurement Time:	10 ms
Attenuator:	0 dB		
Antenna/Probe:	LISN-8122	Cable:	CE CABLE
Amplifier/Atten.:	ATT-10dB		

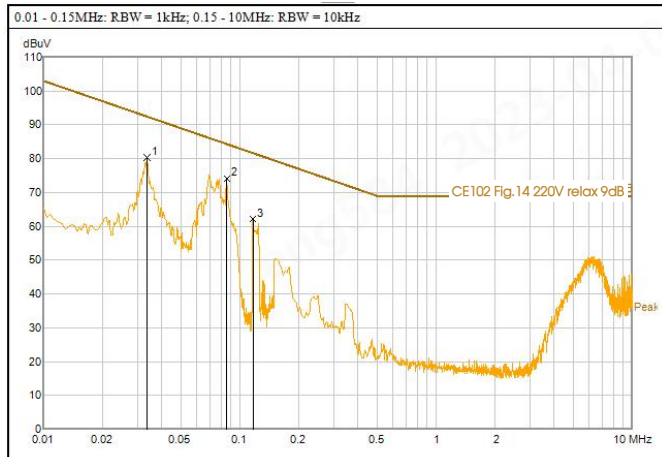


ID	Frequency	Probe	Cable	Atten.	Detector	Meter Read	Meas Level	Limit	Limit Dist.
7	156.000kHz	0.1	0.2	10.0	C_AVG	46.8	57.1	66.0	-8.9
1	156.000kHz	0.1	0.2	10.0	QPeak	58.3	68.6	79.0	-10.4
9	357.000kHz	0.2	0.2	10.0	C_AVG	44.9	55.3	66.0	-10.7
10	366.000kHz	0.2	0.2	10.0	C_AVG	44.4	54.8	66.0	-11.2

N line peak value and average value

(2) Safety specifications: CE102 GJB151B

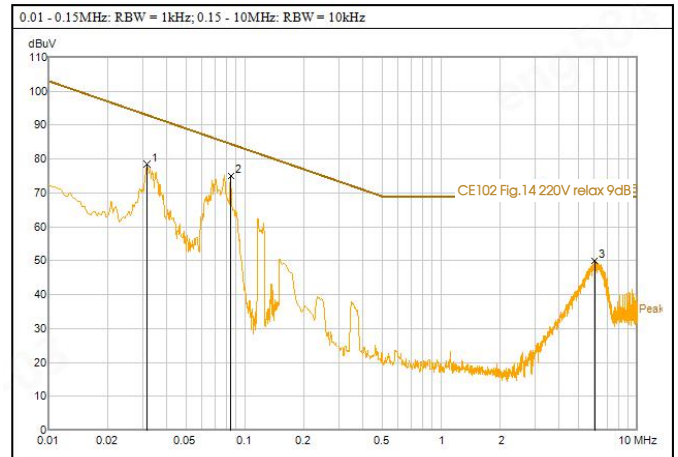
Test conditions: $T_c=25^{\circ}\text{C}$, $V_{in}=230\text{VAC}$, $V_{out}=12\text{V}$, products are tested based on recommended circuit 2.



SN	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Level (dBuV)	Margin (dB)	Note
1	0.0336	59.82	20.67	86.49	92.47	11.98	Peak value
2	0.0856	54.06	20.06	74.12	84.34	10.22	Peak value
3	0.1164	42.17	19.99	62.16	81.67	19.51	Peak value

Note: Result = Reading + Factor, Margin = Level - Result

L line peak value



SN	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Level (dBuV)	Margin (dB)	Note
1	0.0316	55.93	22.53	78.46	93	14.54	Peak value
2	0.0844	54.6	20.43	75.03	84.46	9.43	Peak value
3	6.05	30.07	20.01	50.08	69	18.92	Peak value

Note: Result = Reading + Factor, Margin = Level - Result

N line peak value

Additional Circuits Design Reference

1. Typical application

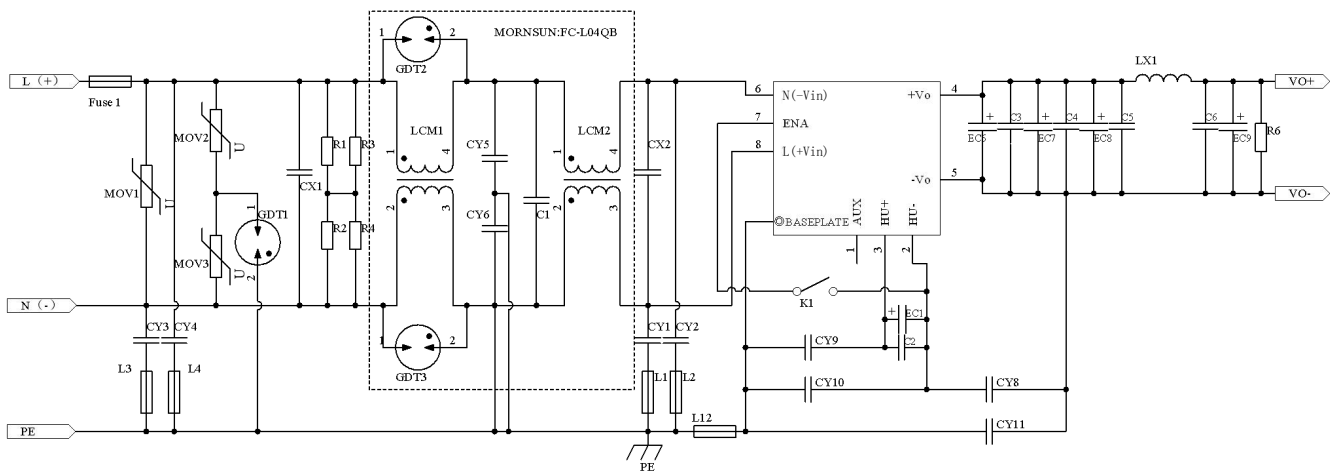


Fig. 1: Recommended circuit 1

Component	Recommended value	
Fuse1	300VAC/6.3A, show-blow	
MOV1/MOV2/MOV3	S10K350/3500A	
R1/R2/R3/R4	510K Ω /1206	
CX1	155K/310VAC	
CX2	225K/310VAC	
MORNSUN P/N: FC-L04QB*	C1	Y2/103M/300VAC
	CY5/CY6	Y1/222M/400VAC
	LCM1	5mH
	LCM2	100uH

GDT1		3600V/3KA
GDT2/GDT3		90V/500A/3216
L1/L2/L3/L4/L12		4x3.1x2.6/47Ω /DCR 0.004Ω Max (Suppressing high frequency bead)
CY8/CY10/CY11		Y1/102M/400VAC
CY1/CY2/CY3/CY4/CY9		Y1/222M/400VAC
EC1		300-470uF/450V (Aluminum electrolytic capacitor)
C2		683K/630V
LX1		0615/0.8uH/1.8mΩ Max/60A
EC6/EC7/EC8/EC9	12V	1500uF/25V (Solid-state capacitor)
	24V/28V	680uF/35V (Solid-state capacitor)
	48V/54V	330uF/63V (Aluminum electrolytic capacitor)
C3/C4/C5/C6	12V/24V/28V	106K/50V/1206
	48V/54V	105K/100V/1206
R6**	12V	240Ω /2W
	24V	1kΩ /2W
	28V	1.5kΩ /2W
	48V	2kΩ /2W
	54V	3kΩ /2W

Note:
 ① All recommended circuit components must be connected.
 ② * P/N: FC-L04QB (MORNSUN) is preferred, the effect of the self-built circuit is greatly affected by magnetic material and layout.
 ③ **R6 can be replaced by four 1206 resistors in parallel, and the resistance value after parallel equivalence is the same as the recommended value of R6.

2. Conducted Emission (CE102) Recommended Circuit

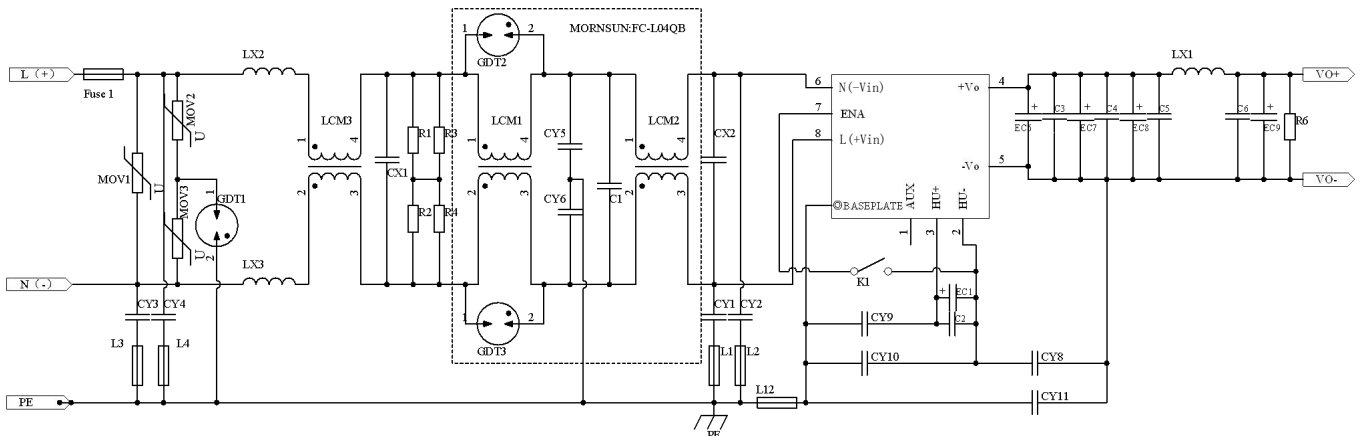


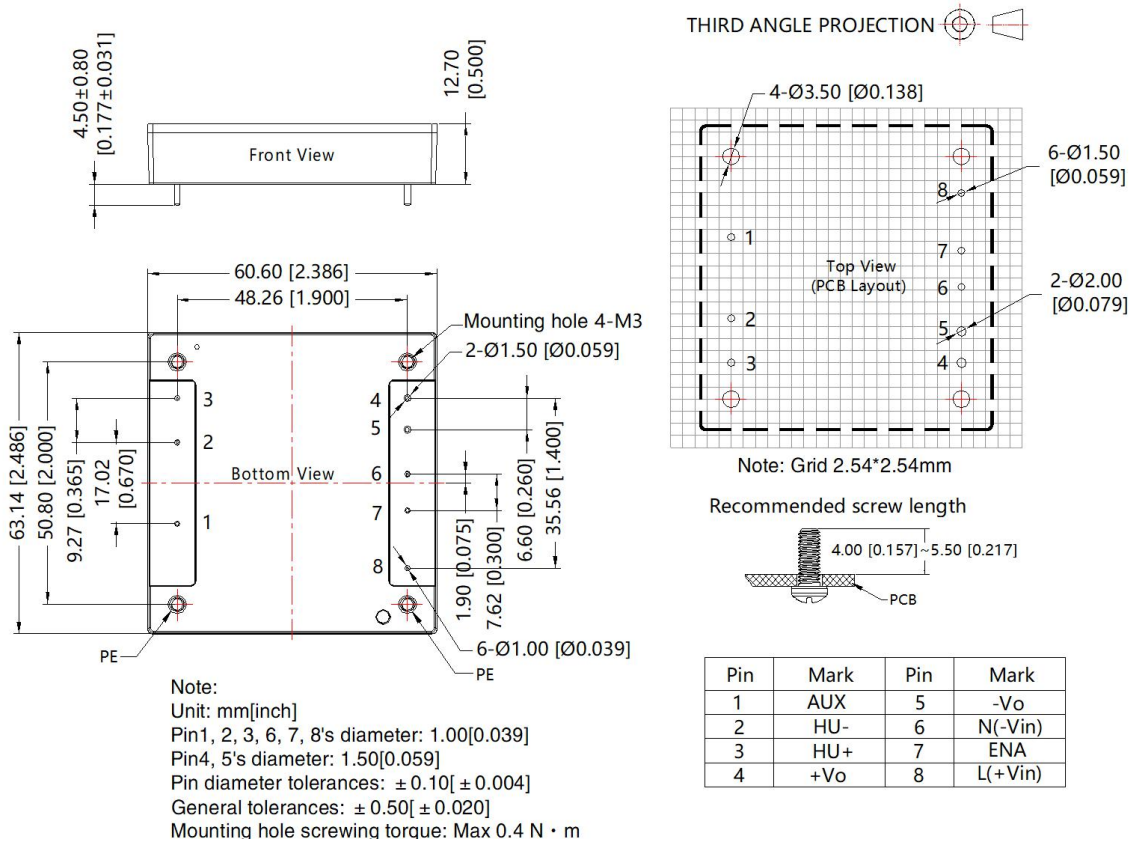
Fig. 2: Recommended circuit 2

Component	Recommended value
LX2/LX3	300uH/Min: 2A, recommend MORNSUN P/N: FD2D-20-301
LCM3	10mH/Min: 2A, recommend MORNSUN P/N: FD2D-20-103

Note: The external circuit component parameters are the same as those of the above recommended circuit 1.

3. For additional information please refer to application notes on www.mornsun-power.com

Dimensions and Recommended Layout



Pin	Mark	Pin	Mark
1	AUX	5	-Vo
2	HU-	6	N(-Vin)
3	HU+	7	ENA
4	+Vo	8	L(+Vin)

Pin description					
1	AUX	Output of auxiliary source, reference HU-	5	-Vo	Negative DC output
2	HU-	Keep the capacitor voltage negative	6	N(-Vin)	AC input Neutral/Negative DC input
3	HU+	Keep the capacitor voltage positive	7	ENA	Switch enable pin
4	+Vo	Positive DC output	8	L(+Vin)	AC input line/Positive DC input

- Note:
- For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging bag number: 58200069;
 - 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 $T_a=25^{\circ}\text{C}$, humidity<75% with nominal input voltage and rated output load;
 - All index testing methods in this datasheet are based on our company corporate standards;
 - We can provide product customization service, please contact our technicians directly for specific information;
 - Products are related to laws and regulations: see "Features" and "EMC";
 - If product involves multi-brand materials and there are differences in color etc, please refer to the standards of each manufacturer.
 - 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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