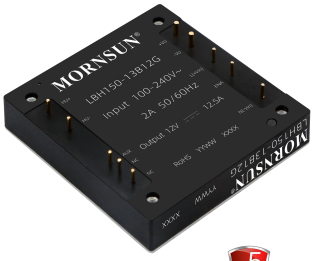
AC/DC 150W Brick Converter

LBH150-13BxxG Series

MORNSUN®



RoHS

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 under-voltage protection, output over-voltage/over-current/ short circuit protection
- Designed to meet UL/IEC62368 standards

LBH150-13BxxG 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/IEC/EN62368 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

Part No.	Output Power (W)	Nominal Output Voltage and Current(Vo/Io)	Efficiency at 230VAC (%) Typ.	Capacitive Load (uF) Max.
LBH150-13B12G	150	12V/12.5A	91	4000
LBH150-13B24G		24V/6.25A	92	1500
LBH150-13B28G		28V/5.36A	92	1500

Note: 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=150W	0.96	0.99	--	--
Input Current	115VAC	--	--	2	A
	230VAC	--	--	1	
Inrush Current	230VAC, Ta=25℃	--	--	30	
THD*	Ta=25℃, Vin=115/230V, Pout=150W	--	8	--	%
Input Under-voltage Protection	Under-voltage protection start (Input voltage drops from high to low)	60	--	75	VAC
	Under-voltage protection release (Input voltage rises from low to high)	70	--	85	
Recommended External Input Fuse		3.15A/300V, slow-blow, required			
Hot Plug		Unavailable			
Grounded Mode	PE is required for aluminum substrate application				

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

Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Output Voltage Accuracy	Full load range		--	±2	--	%
Line Regulation	Rated load		--	±0.5	--	
Load Regulation	0% - 100% load		--	±0.1	--	
Minimum Load			0	--	--	
Ripple & Noise*	20MHz bandwidth (peak-to-peak value) Load at room temperature >20%	12V	--	100	150	mV
		24V	--	200	250	
		28V	--	200	300	

Temperature Coefficient		--	±0.02	--	%/℃
Stand-by Power Consumption		--	2	4	W
Hold-up Time	115VAC/230VAC	--	8	--	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)			
	24VDC output	≤32VDC (Hiccup)			
	28VDC output	≤35VDC (Hiccup)			
No-load Output Of Auxiliary Source	Maximum pulling current about 10mA, take HU- as for reference ground (Internal resistor in series 1 kΩ)	8	12	15	V
Over Temperature Protection	Over-temperature protection start (Aluminum substrate temperature) until power off	105	--	115	℃
	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 "parallel cable" 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 <10mA	3000	--	--	VAC
	Input - PE		1500	--	--	
	Output - PE		1500	--	--	
Insulation Resistance	Input - Output	Test Voltage: 500VDC, Ta=25℃	100	--	--	MΩ
	Input - PE		100	--	--	
	Output - PE		100	--	--	
Operating Temperature		Al-Substrate temperature	-40	--	+100	℃
Storage Temperature			-40	--	+100	
Storage Humidity		Non-condensing	--	--	95	%RH
Soldering Temperature		Wave-soldering	260 ± 5℃; time: 5 - 10s			
		Manual-welding	360 ± 10℃; time: 3 - 5s			
Power Derating		+90℃ to +100℃ (Al-Substrate temperature)	1.67	--	--	%/℃
		85VAC - 100VAC	1.33	--	--	%/VAC
Safety Standard			Design refer to UL/IEC/EN62368-1			
Safety Class			CLASS I			
MTBF		MIL-HDBK-217F@25℃	≥1000,000 h			

Mechanical Specifications

Case Material	Black plastic, flame-retardant and heat-resistant (UL94V-0)	
Dimension	Horizontal package	63.14 x 60.60 x 12.70mm
Weight	Horizontal package	140g (Typ.)
Cooling Method	Conduction heat dissipation (Using from the Al-Substrate to additional heat radiation of the radiator cooling)	

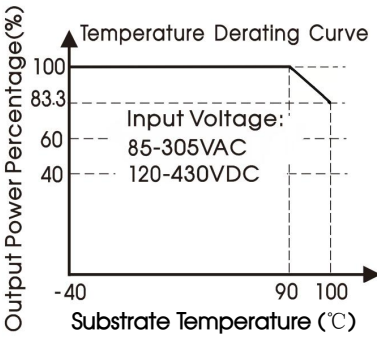
Electromagnetic Compatibility (EMC) (Based on recommended circuit)

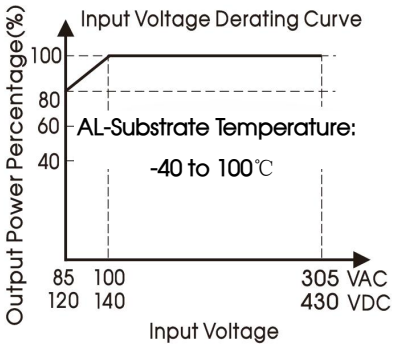
Emissions	CE	CISPR32/EN55032 CLASS A	
		CE102 GJB151B (See Fig. 2 for recommended circuit)	
	RE	CISPR32/EN55032 CLASS A	
	Harmonic current	IEC/EN61000-3-2 CLASS A	
Immunity	ESD	IEC/EN61000-4-2 Contact ±6KV/Air ±8KV	perf. Criteria A
	RS	IEC/EN61000-4-3 10V/m	perf. Criteria A
	EFT	IEC/EN61000-4-4 ±2KV	perf. Criteria A

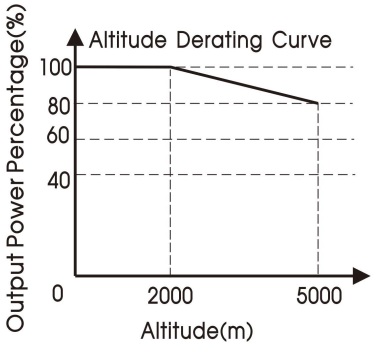
	Surge	IEC/EN61000-4-5	line to line ±2KV/line to PE ±4KV	perf. Criteria A
	CS	IEC/EN61000-4-6	10Vr.m.s	perf. Criteria A
	Voltage variation*	IEC61000-6-2/IEC 61000-4-11	70% Un, 25/30 cycle(50/60Hz) 40% Un, 10/12 cycle(50/60Hz) 0% Un, 1 cycle	perf. Criteria B
	Voltage interruption*	IEC61000-6-2/IEC61000-4-11	0% Un, 250/300 cycle(50/60Hz)	perf. Criteria C

Note: 1. Except for CE102 of the CE, other EMC test results are based on recommended circuit 1.
2. *Un is the maximum input nominal voltage.

Product Characteristic Curve







Note:
① With an AC input voltage between 85 - 100VAC/120 - 140VDC the output power must be derated as per the temperature derating curves;
② This product is suitable for applications using natural air cooling; for applications in closed environment please consult Mornsun FAE.

Additional Circuits Design Reference

1. Typical application

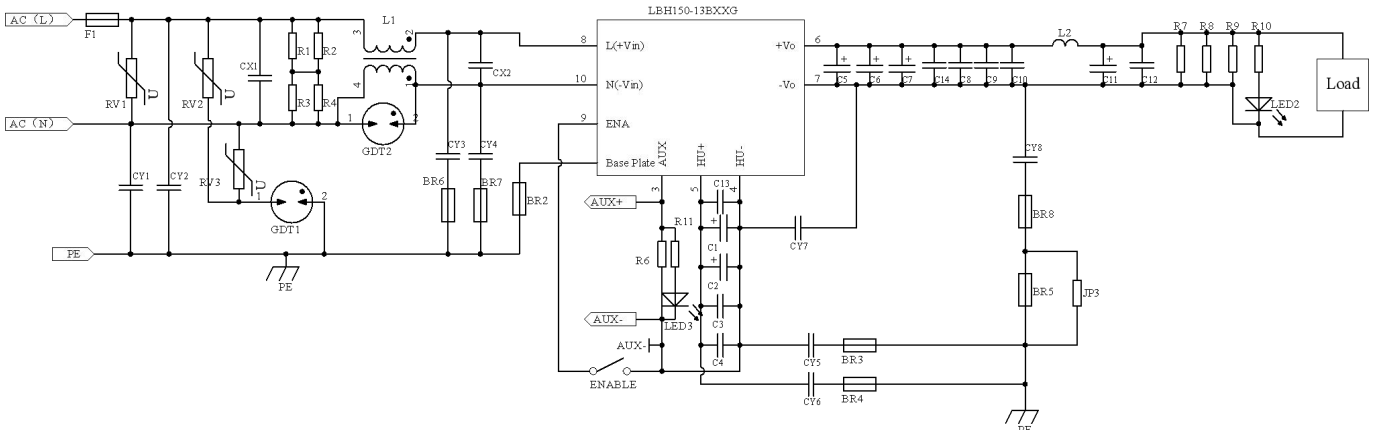


Fig. 1: Recommended circuit 1

Required Component		
Component		Recommended value
F1		3.15A/300VAC, slow-blow
L1		10mH/145mΩ, Max/3A (recommend MORNSUN P/N: FL2D-30-103)
C1/C2		82uF/450V (C1+C2≤200uF)*
CX1/CX2		684K/310VAC
R6		10KΩ/1206
LED2/LED3		GreenYellow/5V/30mA/Φ3.1mm (Optional)
R10	12V	5.6KΩ/1206 (Optional)
	24V/28V	10KΩ/1206 (Optional)
R11		5.6KΩ/1206 (Optional)
C5/C6/C7/C11	12V	1000uF/16V (Solid-state capacitor)
	24V/28V	470uF/35V

C8/C9/C10/C12	12V	106K/1206/25V
	24V/28V	105K/1206/50V
C14	12V	106K/1206/25V (Optional)
	24V/28V	105K/1206/50V (Optional)
L2	12V	0.39uH/1.15mΩ/24A (Recommended RKR0415A-R39M of CODACA)
	24V/28V	0.8uH/4mΩMax/15A (Recommended HCRC0415T-R80M of HUASUNTECH))
R7/R8/R9	12V	1KΩ/1206
	24V/28V	5.6KΩ/1206
Note: ① *C1+C2 total value exceeds specifications, these is a risk of damage to the product; ② R7/R8/R9 can be replaced by a single 2W plug-in wind-wound resistor with the same resistance as R7/R8/R9 after parallel equivalence.		

EMC Component	
Component	Recommended value
RV1/RV2/RV3	S14K350/6KA
GDT1	600V/5KA
GDT2	300V/1KA
R1/R2/R3/R4	2MΩ/1206
CY3/CY4/CY5/CY6/CY7	Y1/102M/400VAC
CY8	Y1/472M/400VAC
BR2/BR3/BR4	4*3.1*2.6/47Ω/100MHz/DCR 0.004Ω Max (Multilayer chip bead, recommended HCB403026-470Y of HUASUNTECH)
BR6/BR7/BR8	3.5*1.5*3.05/300Ω/10MHz (Plug-in magnetic bead, recommended B40-T3.5*1.52*3.05HP of ACME Electronics Corporation)
C3/C4	683K/1210
C13	683K/1210 (Optional)
BR5	NC
JP3	Jumper Φ0.6*7.5mm
CY1/CY2	NC

2. Conducted emission (CE102) recommended circuit

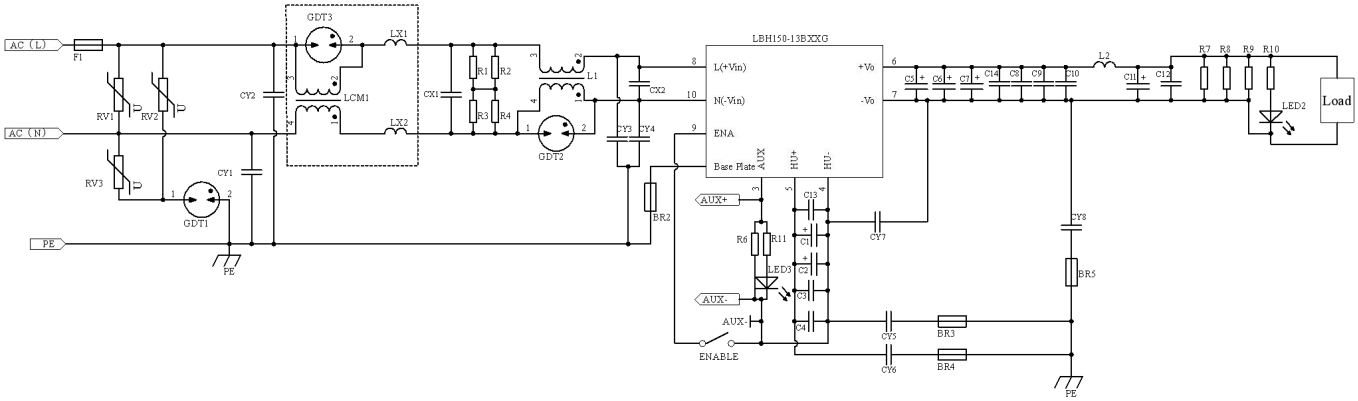
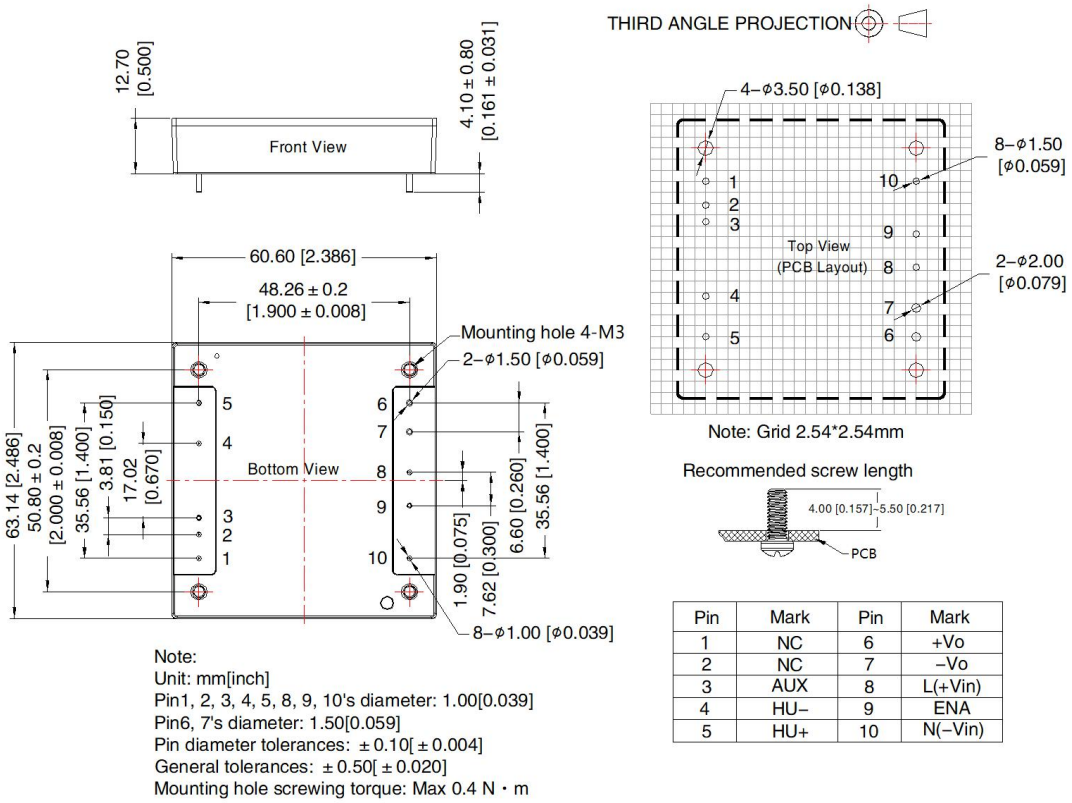


Fig. 2: Recommended circuit 2

Component	Recommended value
GDT3	300V/1KA
LX1/LX2	2mH/Min: 2A (recommend MORNSUN P/N: FD2D-20-202)
LCM1	5.6mH/Min: 2A (recommend MORNSUN P/N: FL2D-20-562)

CY1/CY2	Y1/102M/400VAC
Note: The external circuit component parameters are the same as those of the above recommended circuit 1.	

Dimensions and Recommended Layout



Note:
Unit: mm[inch]
Pin1, 2, 3, 4, 5, 8, 9, 10's diameter: 1.00[0.039]
Pin6, 7's diameter: 1.50[0.059]
Pin diameter tolerances: ±0.10[±0.004]
General tolerances: ±0.50[±0.020]
Mounting hole screwing torque: Max 0.4 N・m

Pin	Mark	Pin	Mark
1	NC	6	+Vo
2	NC	7	–Vo
3	AUX	8	L(+Vin)
4	HU–	9	ENA
5	HU+	10	N(–Vin)

Pin description					
1	NC	Open	6	+Vo	Positive DC output
2	NC	Open	7	-Vo	Negative DC output
3	AUX	Output of auxiliary source, reference HU-	8	L(+Vin)	AC input Line/Positive DC input
4	HU-	Keep the capacitor voltage negative	9	ENA	Switch enable pin
5	HU+	Keep the capacitor voltage positive	10	N(-Vin)	AC input Neutral/Negative DC input

Note:

1. For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging bag number: 58200069;
2. 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;
3. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25℃, humidity<75% with nominal input voltage and rated output load;
4. All index testing methods in this datasheet are based on our company corporate standards;
5. We can provide product customization service, please contact our technicians directly for specific information;
6. Products are related to laws and regulations: see "Features" and "EMC";
7. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.
8. All EMC tests require the test module to be mounted on a metal plate with a thickness of 3mm x 450mm x 450mm.

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LBH150-13BxxG Series Power Supply Application Manual

Content

1. Appearance Pin Definition

1.1. Appearance pin definition

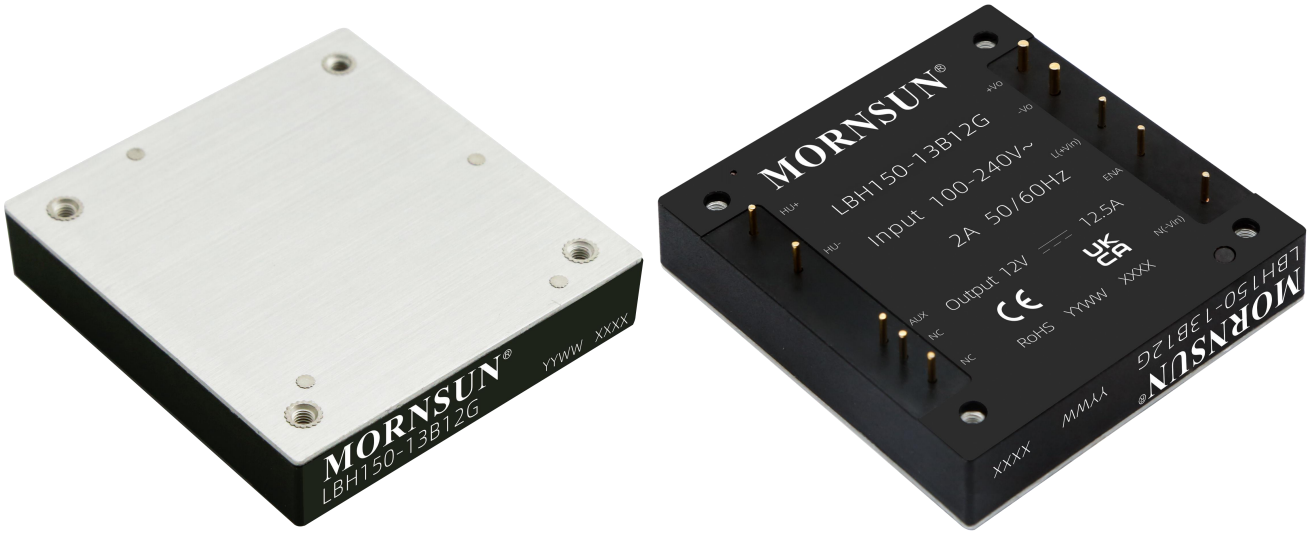


Figure 1: Appearance pins

1	NC	Open	6	+Vo	Positive DC output
2	NC	Open	7	-Vo	Negative DC output
3	AUX	Output of auxiliary source, reference HU-	8	L(+Vin)	AC input Line/Positive DC input
4	HU-	Keep the capacitor voltage negative	9	ENA	Switch enable pin
5	HU+	Keep the capacitor voltage positive	10	N(-Vin)	AC input Neutral/Negative DC input

2. Instructions For Use

2.1. Input requirements

The AC input voltage and DC input voltage must be within the defined voltage range (refer to datasheet), otherwise the power supply may not work properly or even malfunction. The power module does not have a built-in fuse. For better protection, it is recommended that customers use a circuit breaker not greater than 3.15A.

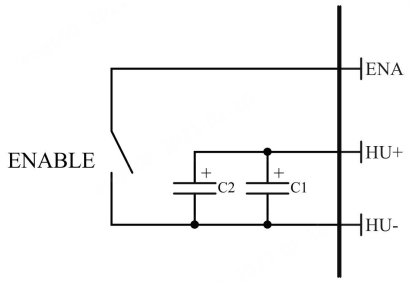
To ensure the reliability of the product, hot plugging is prohibited.

2.2. Output requirements

At any output voltage value, if the long-term normal operation, the maximum output current and power must not exceed the rated value, and ensure that the aluminum substrate temperature does not exceed the temperature derating curve requirements.

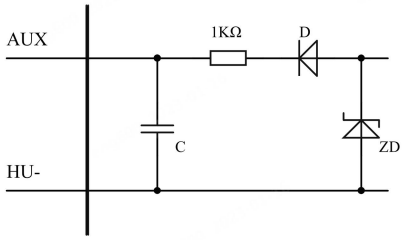
2. 3. ENA Remote control switch

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. 4. Auxiliary power supply for external signals (AUX terminal)

The module additionally provides 12V auxiliary source output, the reference ground is HU- and provides an auxiliary control power supply for the primary side control circuit. No load voltage 8-15V (Internal resistor in series 1 kΩ , maximum pulling current about 10mA).



2. 5. Input under-voltage protection (UVP)

When the input voltage is lower than the under-voltage protection set value, the module output is closed; When the input voltage is higher than the under-voltage protection power-on setting value, the module output is normal. The under-voltage protection has a return difference, that is, the shutdown setting value is lower than the start-up setting value, so as to prevent the module from being affected by external interference or the transient drop of input voltage when it is started.

2. 6. Output over-voltage protection (OVP)

This module has output hiccup type output over-voltage protection function. When the output end of the module is over-voltage, the output voltage hiccup. After the fault is rectified, the module output automatically recovers to normal.

2. 7. Over-current/short circuit protection

This module is designed with over-current/short circuit protection circuit, which can withstand over-current or short circuit at the output end. In short circuit state, the module is in hiccup state (working 150ms, rest 2s), as shown in Figure 2; After the over-current and short circuit faults are eliminated, the module output automatically recovers to normal.

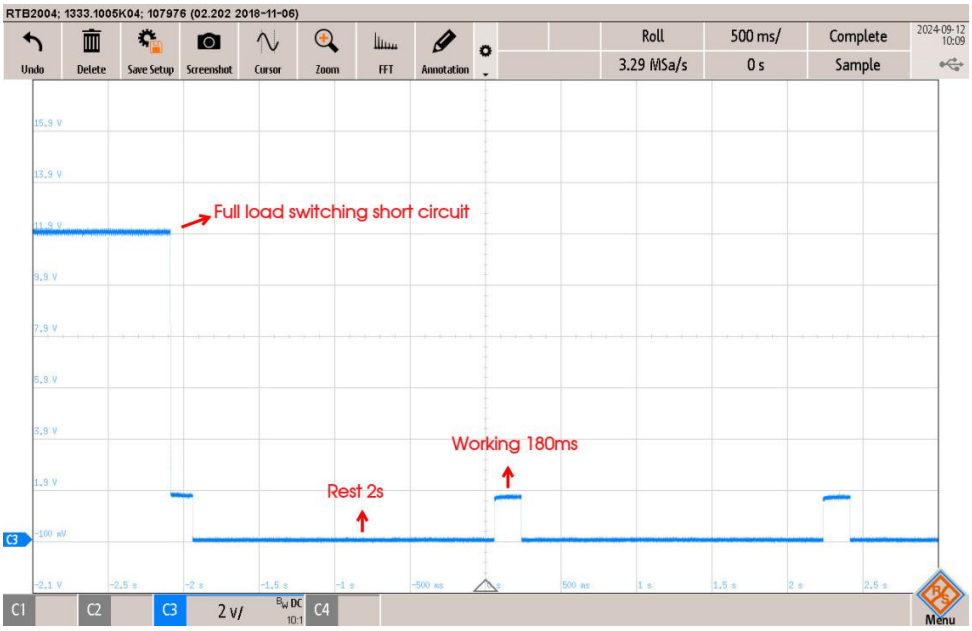


Figure 2: Output voltage waveform of full-load switching short-circuit

2. 8. Over-temperature protection

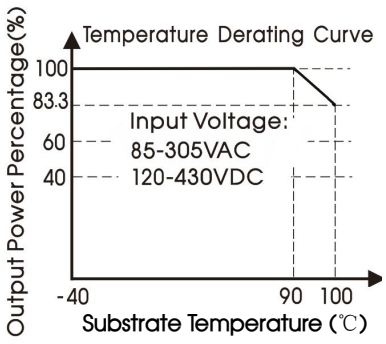
The module has built-in over-temperature protection circuit to prevent the module from being damaged due to excessive temperature rise such as overload and short circuit. When the temperature of the aluminum substrate exceeds the over-temperature protection setting value, the output of the module automatically shuts down. It needs to be powered off and reset to restore normal. Over-temperature protection circuit adopts thermistor sampling, instant overheating may not protect in time, resulting in product damage. Ensure good heat dissipation when using the product.

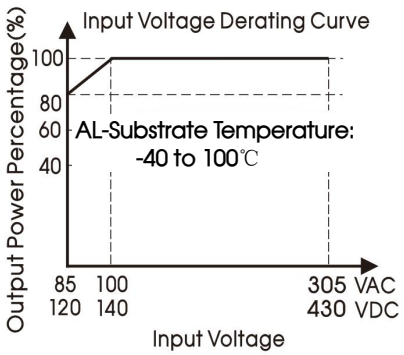
2. 9. Output power derating

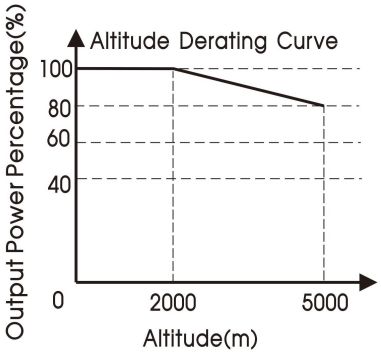
When the input voltage is greater than 100VAC(140VDC), only need to derate according to the temperature derating curve.

When the input voltage is lower than 100VAC(140VDC), the output power will be derated according to the following input voltage derating curve after temperature derating;

The temperature derating curve is a typical test value, the working condition is heat sink with air cooling. For applications in closed environment please consult Mornsun FAE.







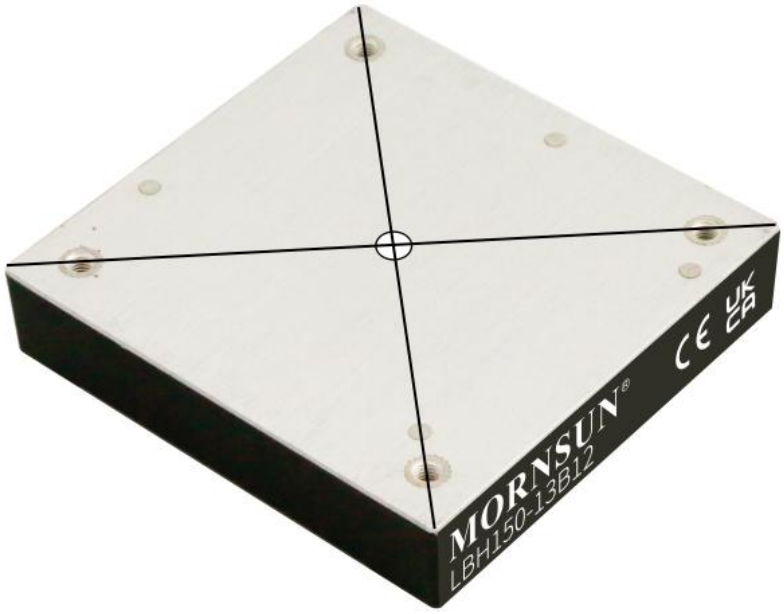


Figure 3: AL-Substrate temperature test point

Note: The test point of Al-Substrate temperature is the temperature of the center point of the substrate.

2. 10. Peripheral layout recommendation

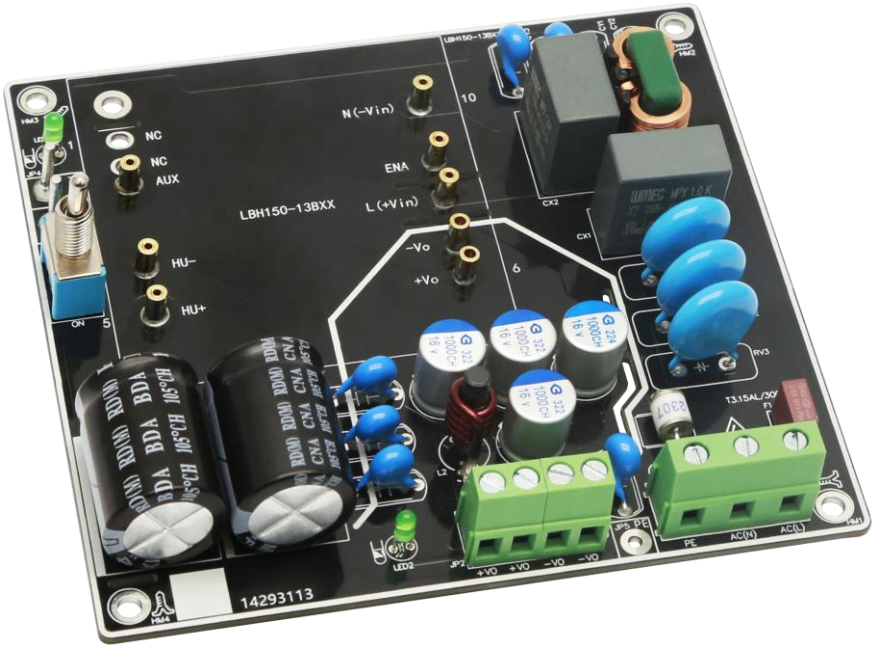
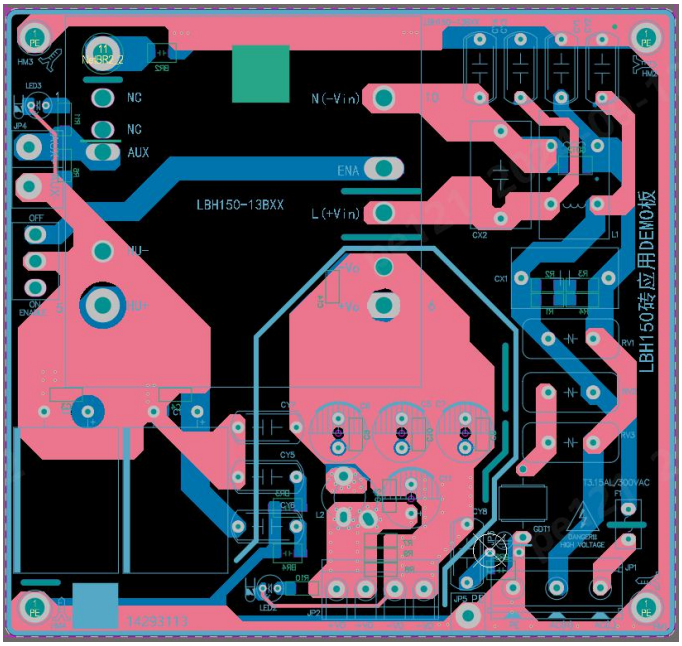


Figure 4: DEMO board physical drawing of recommended circuit 1



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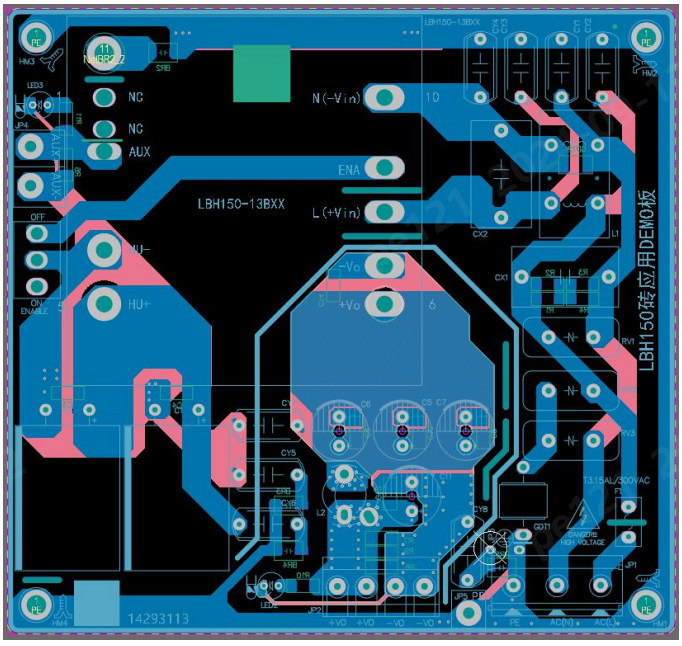

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Figure 5: PCB routing diagram of recommended circuit 1

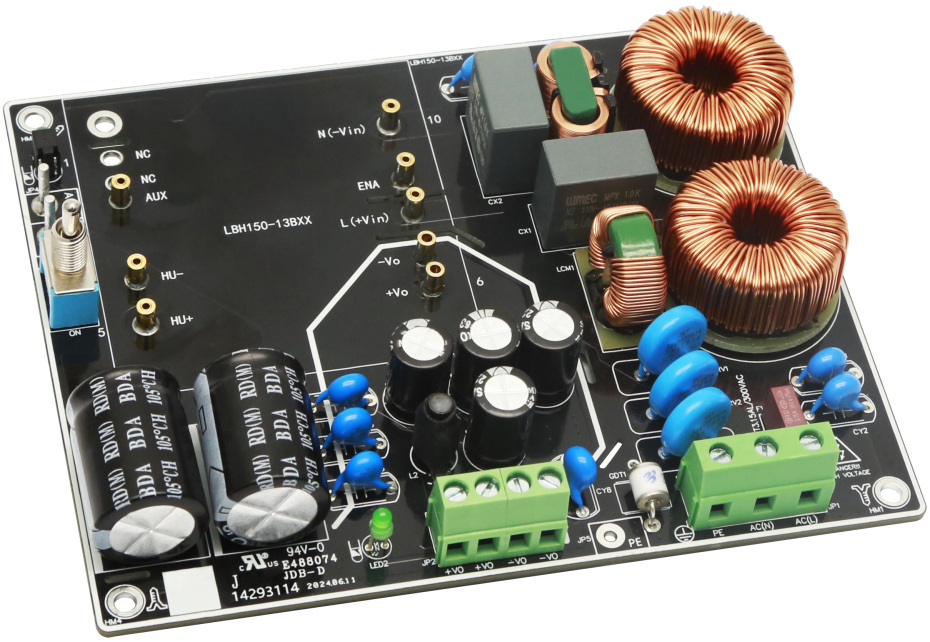
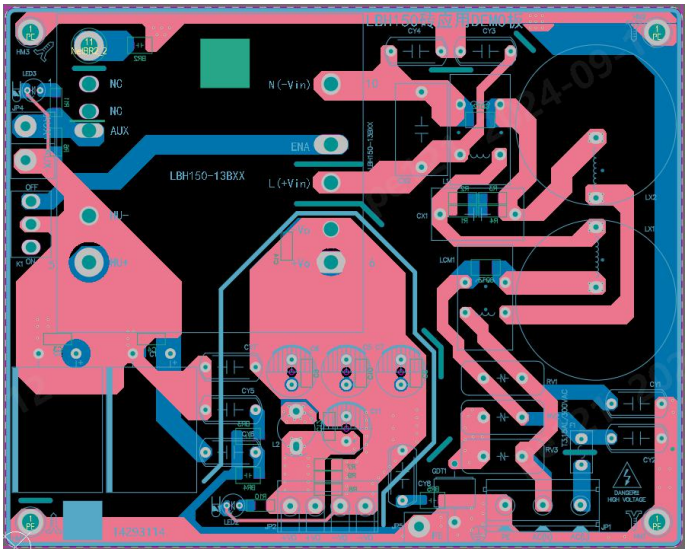


Figure 6: DEMO board physical drawing of recommended circuit 2



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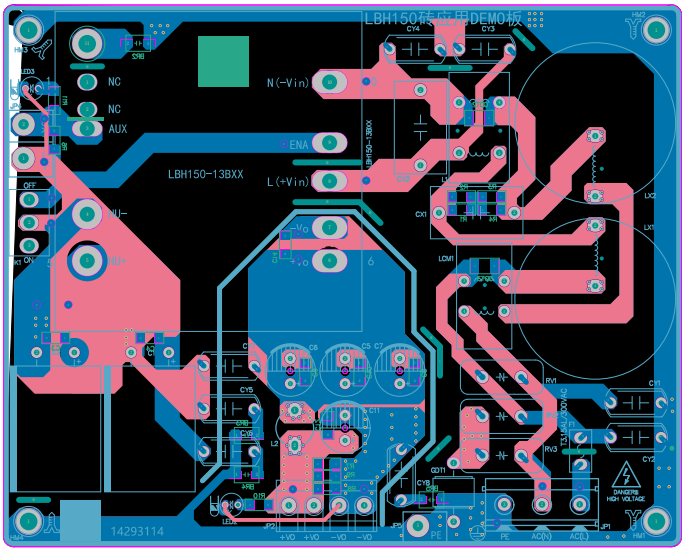

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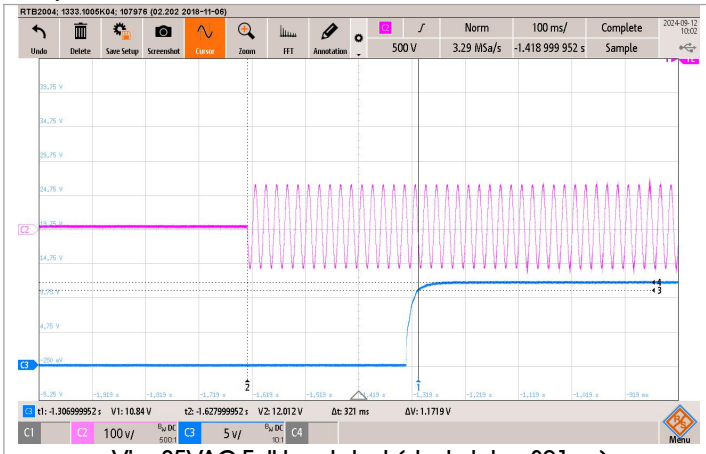
Figure 7: PCB routing diagram of recommended circuit 2

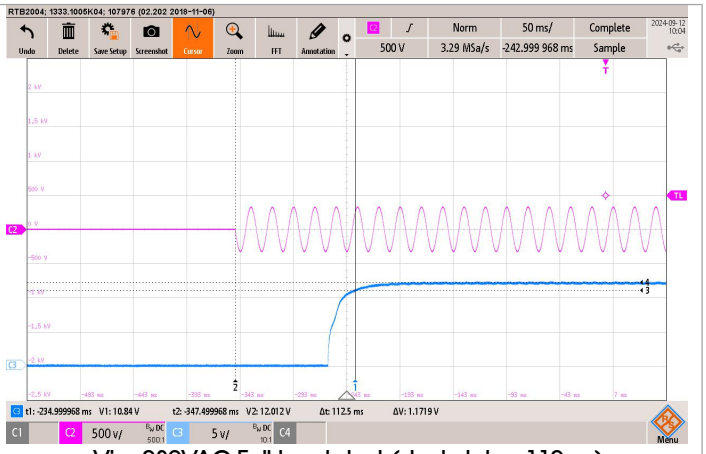
3. Test Waveform

3. 1. Switch ON/OFF

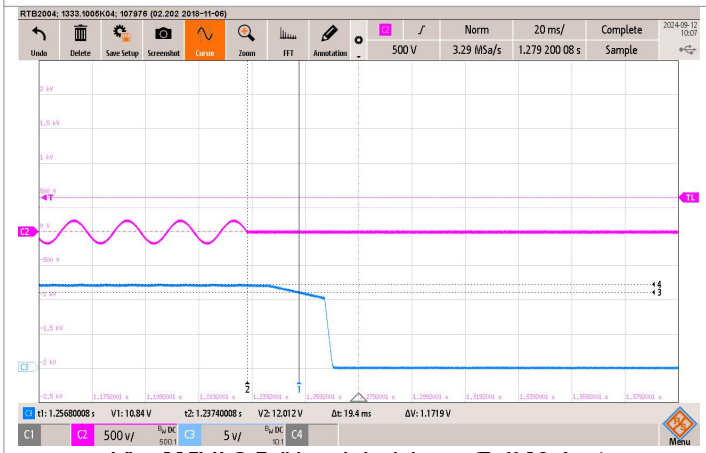
Test conditions: Tc=25℃, LBH150-13B12G product is tested based on recommended circuit 1, C1/C2=82uF.



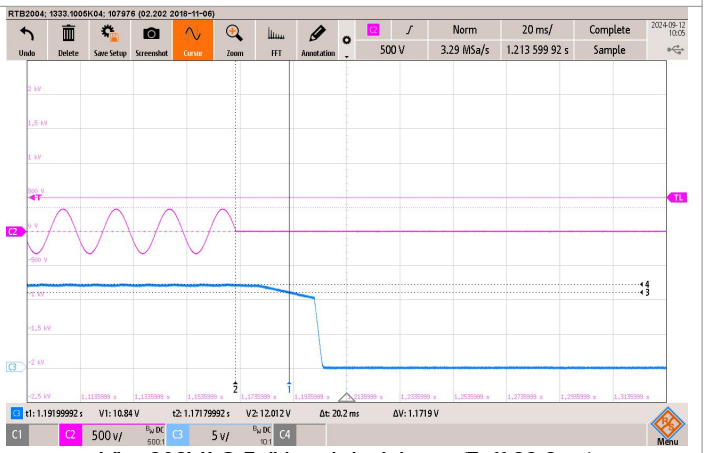
Vin=85VAC Full load start (start delay 321ms)



Vin=230VAC Full load start (start delay 112ms)



Vin=115VAC Full load shutdown (Toff 19.4ms)



Vin=230VAC Full load shutdown (Toff 20.2ms)

CH2: Input voltage, CH3: Output voltage

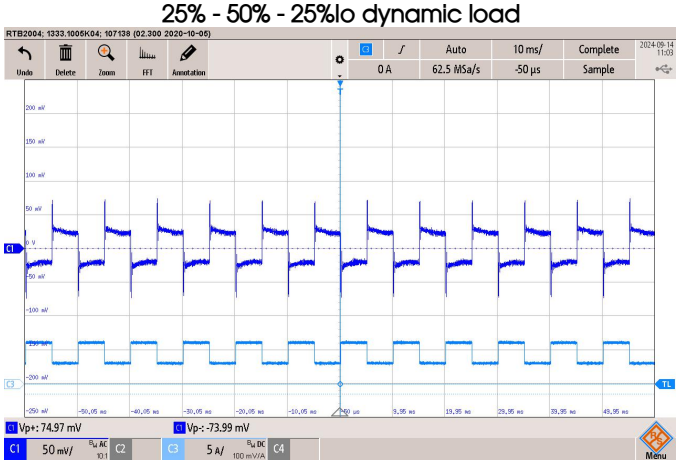
Note: The power OFF hold-up time is related to the C1, C2 capacitance, and can be adjusted with reference to the following formula:

$$t = \frac{0.5 \cdot C_{C1+C2} \cdot (U1^2 - U2^2)}{P_O}$$

3. 2. Dynamic response

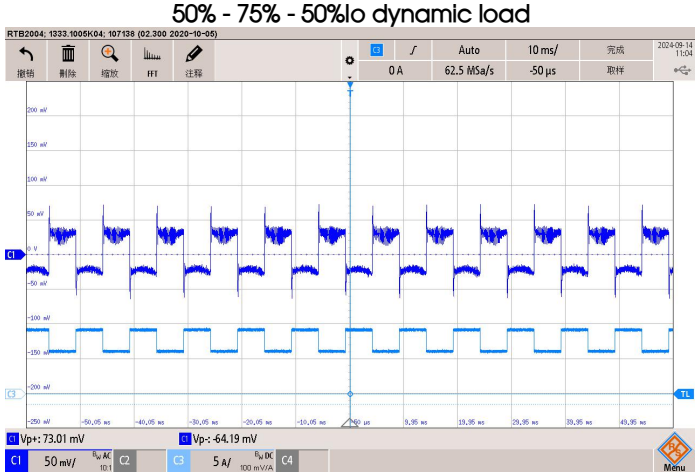
Test conditions: Tc=25℃, Vin= 230VAC, Vout=12V, 20MHz bandwidth. Products are tested based on recommended circuit 1 and the "parallel cable" method is used for test, output parallel 10uF electrolytic capacitor and 1uF ceramic capacitor.

25% - 50% - 25%Io dynamic load



CH1: Output voltage, CH3: Output current

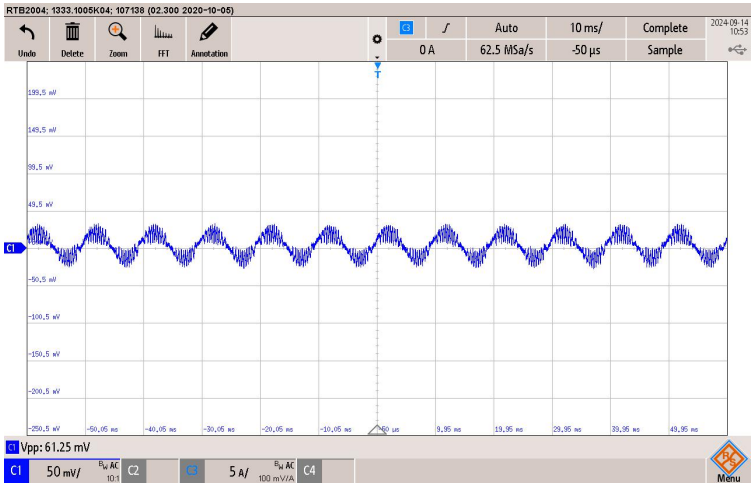
50% - 75% - 50%Io dynamic load



CH1: Output voltage, CH3: Output current

3. 3. Output ripple & noise

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

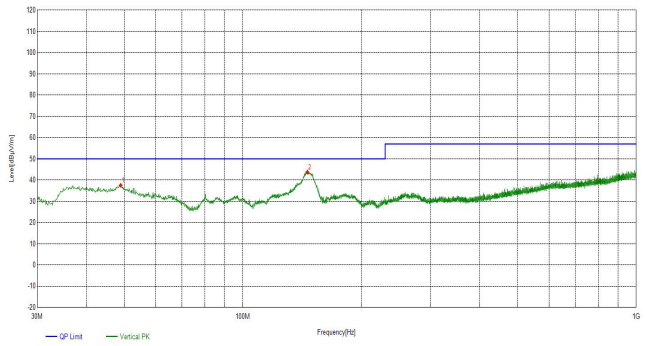


Waveform of full load output ripple
CH1: Output voltage

3. 4. Conducted & radiated emission (EMI)

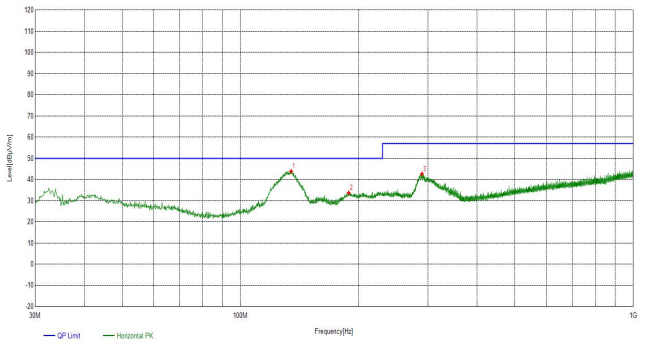
(1) Radiated emission (RE)：
Safety specifications: CISPR32/EN55032 CLASS A

RE Tc=25℃, Vin=115VAC, Pout= 150W, LBH150-13B12G is tested based on recommended circuit 1



Suspected List										
Frequency [MHz]	Polarity	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Height [cm]	Angle deg	Pass/Fail
48.9169	Vertical	20.47	17.10	37.57	50.00	12.43	PK	100	79	PASS
145.8296	Vertical	20.54	23.24	43.78	50.00	6.22	PK	100	217	PASS

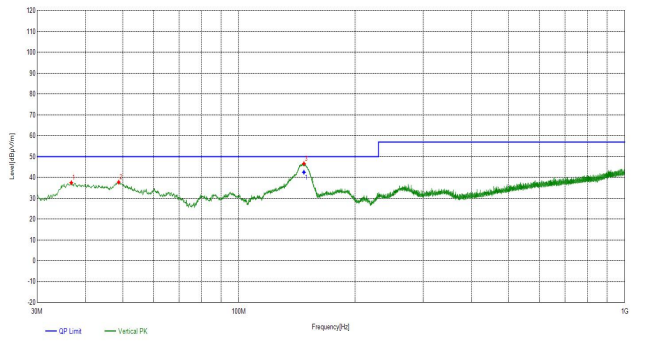
Vertical waveform



Suspected List										
Frequency [MHz]	Polarity	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Height [cm]	Angle deg	Pass/Fail
134.5765	Horizontal	19.62	24.28	43.90	50.00	6.10	PK	100	294	PASS
188.6109	Horizontal	18.31	15.42	33.73	50.00	16.27	PK	100	13	PASS
289.792	Horizontal	20.89	21.78	42.67	57.00	14.33	PK	100	332	PASS

Horizontal waveform

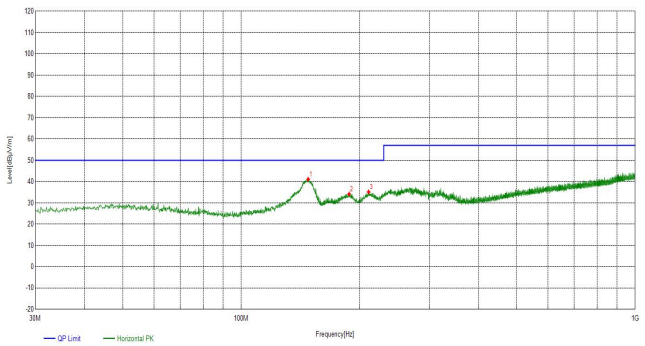
RE Tc=25℃, Vin=230VAC, Pout= 150W, LBH150-13B12G is tested based on recommended circuit 1



Suspected List										
Frequency [MHz]	Polarity	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Height [cm]	Angle deg	Pass/Fail
36.7907	Vertical	19.64	17.84	37.48	50.00	12.52	PK	100	4	PASS
48.8199	Vertical	20.47	17.29	37.76	50.00	12.24	PK	100	19	PASS
147.3817	Vertical	20.63	26.01	46.64	50.00	3.36	PK	100	223	PASS

Final Data List								
Frequency [MHz]	Polarity	Factor [dB]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]	Height [cm]	Angle [°]	Pass/Fail
147.3817	Vertical	20.63	42.51	50.00	7.49	110	223	PASS

Vertical waveform



Suspected List										
Frequency [MHz]	Polarity	Factor [dB]	Reading [dBμV/m]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Detector	Height [cm]	Angle deg	Pass/Fail
147.8668	Horizontal	20.65	20.47	41.12	50.00	8.88	PK	100	294	PASS
187.8348	Horizontal	18.40	15.75	34.15	50.00	15.85	PK	100	68	PASS
210.5351	Horizontal	17.68	17.45	35.13	50.00	14.87	PK	100	209	PASS

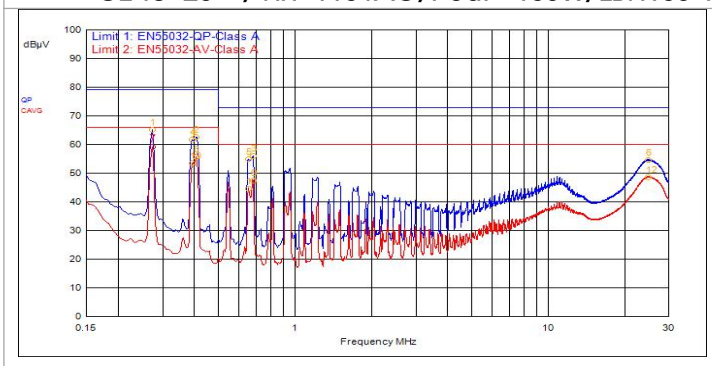
Horizontal waveform

The test results meet CLASS A standards

(2) Conducted emission (CE):

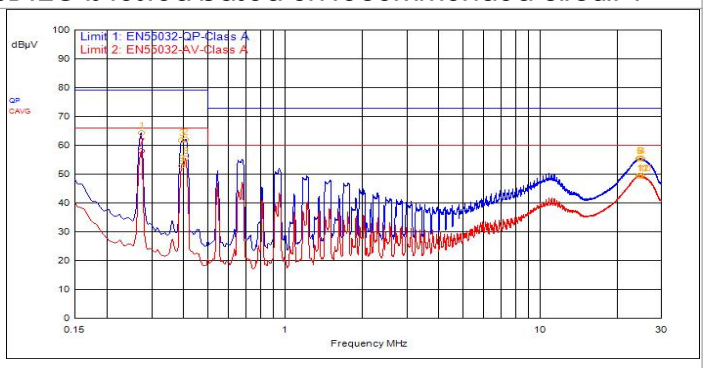
Safety specifications: CISPR32/EN55032 CLASS A

CE Tc=25℃, Vin=115VAC, Pout= 150W, LBH150-13B12G is tested based on recommended circuit 1



ID	Frequency	Probe	Cable	Atten.	Detector	Meter Read	Meas Level	Limit	Limit Dist.
7	273.000kHz	0.2	0.2	11.4	C_AVG	47.3	59.0	66.0	-7.0
8	408.000kHz	0.2	0.2	10.7	C_AVG	44.7	55.8	66.0	-10.2
12	24.936MHz	1.0	0.2	10.7	C_AVG	36.8	48.7	60.0	-11.3
10	393.000kHz	0.2	0.2	10.8	C_AVG	42.3	53.5	66.0	-12.5
9	684.000kHz	0.2	0.2	10.0	C_AVG	36.9	47.3	60.0	-12.7
1	273.000kHz	0.2	0.2	11.4	QPeak	53.3	65.1	79.0	-13.9

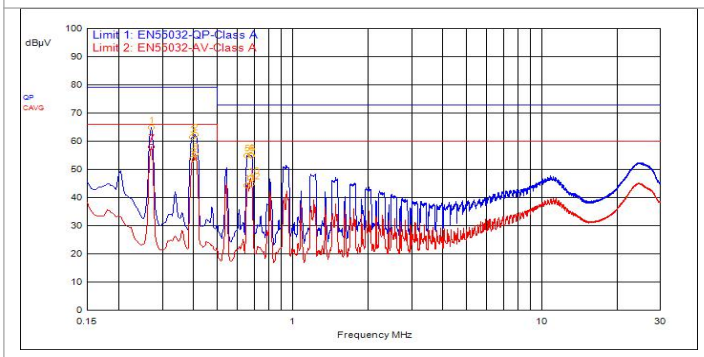
L line



ID	Frequency	Probe	Cable	Atten.	Detector	Meter Read	Meas Level	Limit	Limit Dist.
7	273.000kHz	0.2	0.2	11.4	C_AVG	46.3	58.1	66.0	-7.9
8	408.000kHz	0.2	0.2	10.7	C_AVG	44.4	55.5	66.0	-10.5
11	24.579MHz	1.0	0.2	10.7	C_AVG	37.5	49.4	60.0	-10.6
12	24.660MHz	1.0	0.2	10.7	C_AVG	37.5	49.4	60.0	-10.6
10	25.098MHz	1.1	0.2	10.7	C_AVG	37.4	49.3	60.0	-10.7
9	393.000kHz	0.2	0.2	10.8	C_AVG	41.8	53.0	66.0	-13.0

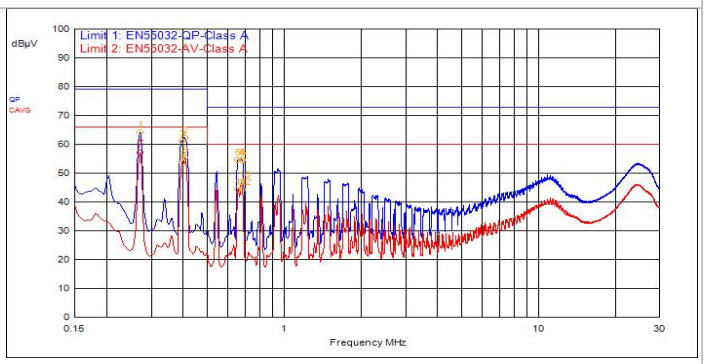
N line

CE Tc=25℃, Vin=230VAC, Pout= 150W, LBH150-13B12G is tested based on recommended circuit 1



ID	Frequency	Probe	Cable	Atten.	Detector	Meter Read	Meas Level	Limit	Limit Dist.
7	270.000kHz	0.2	0.2	11.4	C_AVG	46.2	57.9	66.0	-8.1
8	408.000kHz	0.2	0.2	10.7	C_AVG	44.3	55.4	66.0	-10.6
9	396.000kHz	0.2	0.2	10.8	C_AVG	42.5	53.7	66.0	-12.3
10	678.000kHz	0.2	0.2	10.0	C_AVG	36.5	46.9	60.0	-13.1
1	270.000kHz	0.2	0.2	11.4	QPeak	53.1	64.8	79.0	-14.2
12	687.000kHz	0.2	0.2	10.0	C_AVG	34.5	45.0	60.0	-15.0

L line



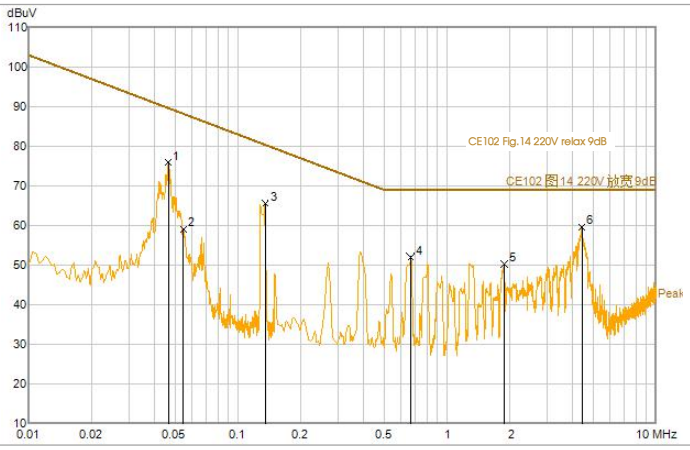
ID	Frequency	Probe	Cable	Atten.	Detector	Meter Read	Meas Level	Limit	Limit Dist.
7	270.000kHz	0.2	0.2	11.4	C_AVG	45.4	57.2	66.0	-8.8
8	408.000kHz	0.2	0.2	10.7	C_AVG	44.3	55.4	66.0	-10.6
9	396.000kHz	0.2	0.2	10.8	C_AVG	42.5	53.7	66.0	-12.3
10	678.000kHz	0.2	0.2	10.0	C_AVG	36.4	46.8	60.0	-13.2
1	270.000kHz	0.2	0.2	11.4	QPeak	52.5	64.2	79.0	-14.8
12	687.000kHz	0.2	0.2	10.0	C_AVG	34.0	44.4	60.0	-15.6

N line

At 115/230VAC input and full load, the test results meet the EN55032 CLASS A standards

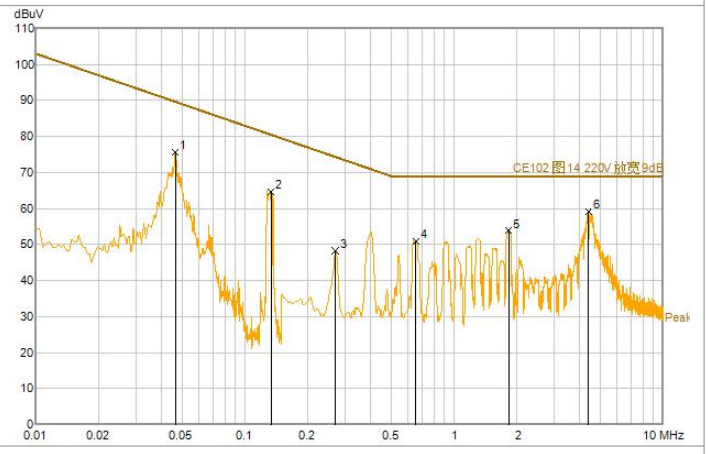
Safety specifications: CE102 GJB151B

CE Tc=25℃, Vin=230VAC, Pout= 150W, LBH150-13B12G is tested based on recommended circuit 2



SN	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Note
1	0.0464	55.67	20.3	75.97	89.66	13.69	Peak value
2	0.0548	38.95	20.18	59.13	88.22	29.09	Peak value
3	0.1352	45.81	19.88	65.69	80.37	14.68	Peak value
4	0.67	32.27	19.82	52.09	69	16.91	Peak value
5	1.878	30.41	19.81	50.22	69	18.78	Peak value
6	4.422	39.81	19.86	59.67	69	9.33	Peak value

L line



SN	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Note
1	0.0464	55.67	20.3	75.97	89.66	13.98	Peak value
2	0.0332	44.81	19.88	64.69	80.5	15.81	Peak value
3	0.27	28.57	19.85	48.42	74.36	25.94	Peak value
4	0.658	31.18	19.82	51	69	18	Peak value
5	1.826	34.08	19.81	53.89	69	15.11	Peak value
6	4.402	39.37	19.86	59.23	69	9.77	Peak value

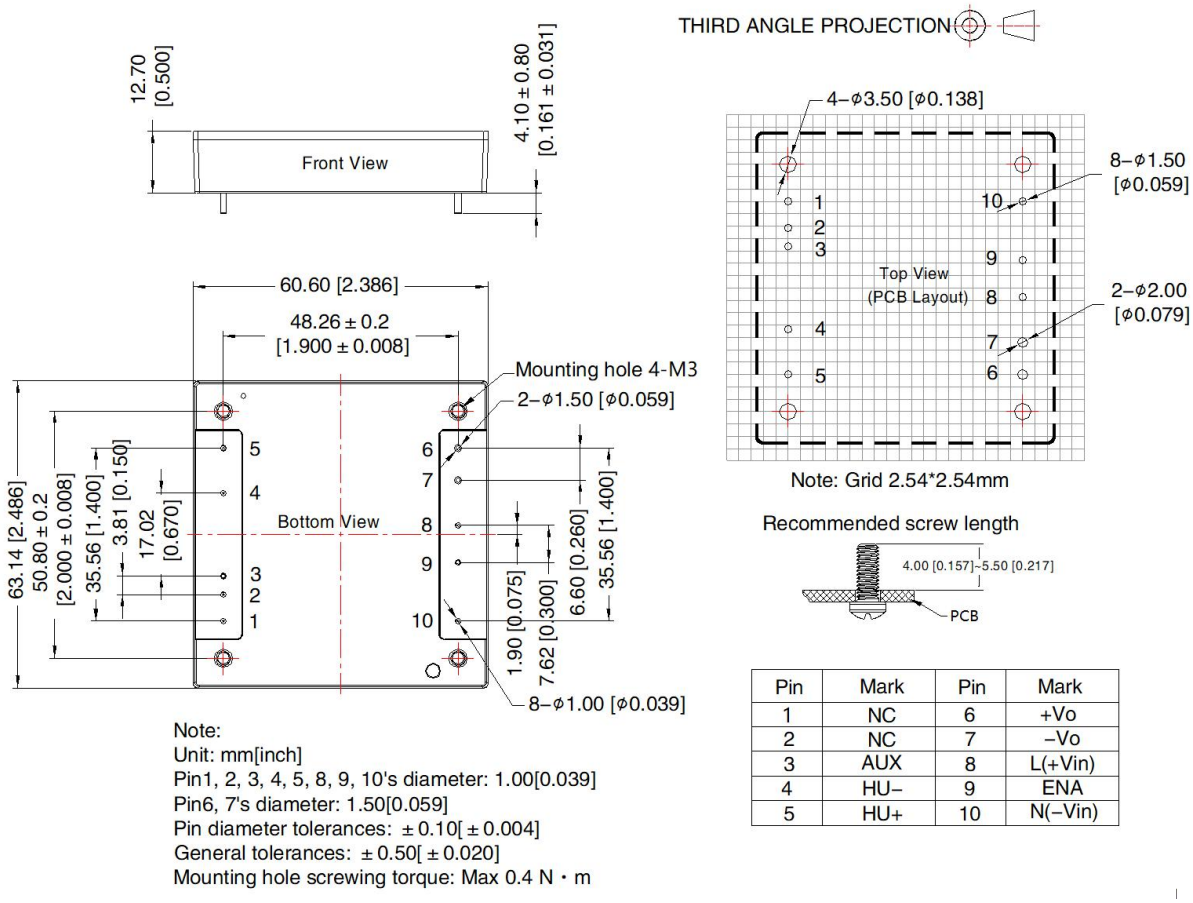
N line

The test results meet the CE102 GJB151B standard

4. Appearance Specifications

4. 1. Manufacturing data/dimensions

Length: 63.14mm ±2.486mm
Width: 60.60mm ±2.386mm
Height: 12.70mm ±0.50mm
Terminal length: 4.10mm ±0.80mm
Weight: 140g (Typ.)



Pin	Mark	Pin	Mark
1	NC	6	+Vo
2	NC	7	–Vo
3	AUX	8	L(+Vin)
4	HU–	9	ENA
5	HU+	10	N(–Vin)

Note:
Unit: mm[inch]
Pin1, 2, 3, 4, 5, 8, 9, 10's diameter: 1.00[0.039]
Pin6, 7's diameter: 1.50[0.059]
Pin diameter tolerances: ± 0.10[± 0.004]
General tolerances: ± 0.50[± 0.020]
Mounting hole screwing torque: Max 0.4 N・m

Figure 8: Manufacturing data/size diagram

4. 2. Installation and disassembly methods

Installation method: Place the heat sink on the aluminum base plate and fasten the heat sink to the product using four screws.

Removing method: Use a tool to separate the four screws from the heat sink.

Maximum mounting hole tightening torque: 0.4N.m.

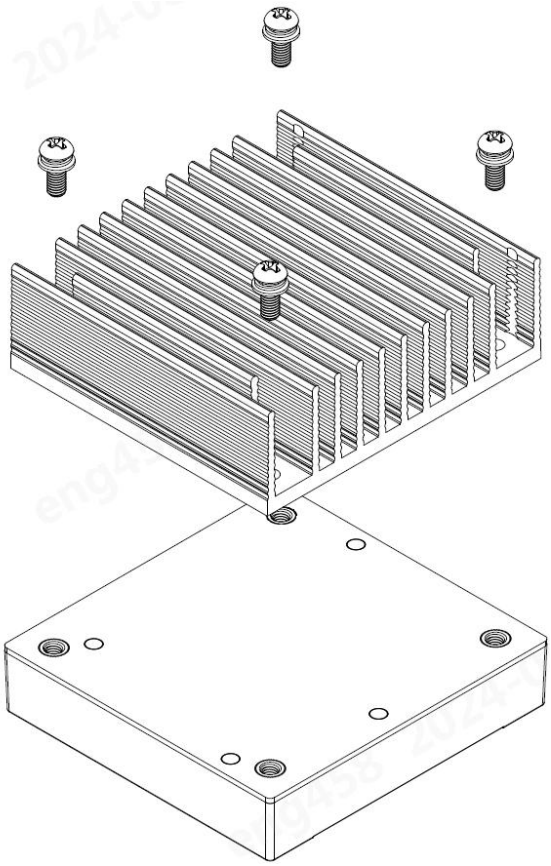


Figure 9: Product and heat sink installation and disassembly diagram

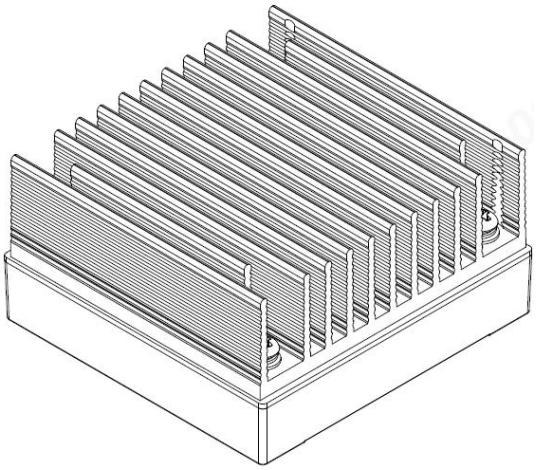


Figure 10: Schematic diagram of the finished product after installation

4. 3. Cooling method

Heat dissipation method	Surface heat sink	□
	Natural cooling	□
	Conduction heat dissipation	■
	In this document, "■" indicates selected, and "□" indicates not selected	

For more details, please consult the MORNSUN FAE.