DESCRIPTIONS

1000W, AC-DC Brick Switching Power Supply



RoHS

FEATURES

- Universal 85 - 305VAC or 120 - 430VDC Input voltage
- Output voltage adjustable
- Wide operating temperature range: -40℃ to +100℃（Baseplate）
- Input under-voltage protection, output over-voltage/ short circuit/over-current protection, over-temperature protection
- Active PFC, PF value up to 0.98
- Integrated parallel current sharing, status indication, remote control, auxiliary power supply, remote compensation function
- High I/O isolation test voltage up to 3000VAC
- Operating up to 5000m altitude
- Safety according to IEC/UL 62368, GB4943

APPLICATIONS

- Industrial
- LED
- Street light control
- Security
- Telecommunications
- Smart home

Selection Guide

Certification	Part No.	Rated Output Power (W)*	Nominal Output Voltage and Current (Vo/Io)	Output Voltage Adjustable Range (V)	Efficiency at 230VAC (%) Typ.*	Room Temperature Max. Capacitive Load (μF)	Low Temperature Max. Capacitive Load (μF)
--	APBF1000-28-NS	1008	28V/36A	14.0 - 33.6	91.5	5000	5000
	APBF1000-48-NS	1008	48V/21A	24.0 - 55.1	92.5	5000	5000

Note: 1.*Under any conditions, the total power of the product should not exceed the rated output power, and the output current should not exceed the rated output current;

2.*Due to different working modes, the efficiency difference between 0.5% and 0.7% is normal.

3.The product picture is for reference only. For details, please refer to the actual product.

Specifications

Product Specifications	Item	Operating Conditions			Min.	Typ.	Max.	Unit
Input Specifications	Input Voltage Range	AC input			85	--	305	VAC
		DC input			120	--	430	VDC
	Input Voltage Frequency				47	--	63	Hz
	Input Current	115VAC			--	--	10.8	A
		230VAC			--	--	5.3	
	Inrush Current	Built-in inrush current suppression circuit, external 10Ω resistor	115VAC	Cold start	--	20	23	
			230VAC		--	40	46	
	Input Under-voltage Protection	Protection start			50	--	75	VAC
		Protection release			75	--	85	
	Leakage Current	277VAC			<0.75 mA			
	Power Factor	115VAC	Normal temperature, full load		PF ≥ 0.98			
		230VAC			PF ≥0.96			
	Total Harmonic Ratio Of Input Current (THD)	Normal temperature, full load			≤10%			
	Hot Plug				Unavailable			
Output Specifications	Output Voltage Accuracy*	Full load range			--	--	±2	%
	Line Regulation	Rated load			--	--	±1	
	Load Regulation	0% - 100% load			--	--	±2	
	Ripple & Noise*	25℃, 20MHz bandwidth (peak-to-peak value)	APBF1000-28-NS		--	--	150	mV
			APBF1000-48-NS		--	--	350	
	Hold-up Time	115/230VAC (main bus with external electrolytic capacitor, >1500uF)			20	30	--	ms
	Output Over Voltage Protection	APBF1000-28-NS			Vo≤40.6VDC (hiccup, clamp or shutdown)			
		APBF1000-48-NS			Vo≤60VDC (hiccup, clamp or shutdown)			
	Short Circuit Protection	Recover time <5s after the short circuit disappear			Hiccup, continuous, self-recover			
	Over-current Protection	APBF1000-28-NS	Output voltage 14VDC-19VDC, output hiccup and constant current protection		42	--	47	A
			Output voltage 19VDC-25VDC, output constant current protection		42	--	47	
			Output voltage		31	--	47	

			25VDC-33.6VDC, output constant current protection				
		APBF1000-48-NS	Output voltage 24VDC-33VDC, output hiccup and constant current protection	24	--	28	A
			Output voltage 33VDC-43VDC, output constant current protection	24	--	28	
			Output voltage 43VDC-55.1VDC, output constant current protection	18	--	28	
Output Specifications	Over-temperature Protection	Input voltage 85VAC-170VAC Rated load (base plate temperature)	Protect start	95	--	125	℃
			Protect release	85	--	115	
		Input voltage 170VAC-305VAC Rated load (base plate temperature)	Protect start	110	--	140	
			Protect release	100	--	130	
General Specifications	Isolation Test	Input - ⏚	Electric test for 1min, leakage current <10mA (recommended external circuit 3)	2500	--	--	VAC
		Input - output		3000	--	--	
		Output - ⏚		1500	--	--	
	Insulation Resistance	Input - ⏚	Environment temperature: 25±5℃ Relative humidity: <95%RH, non-condensing Testing voltage: 500VDC	100	--	--	MΩ
		Input - output		100	--	--	
		Output - ⏚		100	--	--	
	Operating Temperature*	The max temperature refer to the Aluminun base of PCB		-40	--	100	℃
	Storage Temperature*			-40	--	85	
	Operating Humidity	Non-condensing		20	--	90	%RH
	Storage Humidity			10	--	95	
	Power Derating	Operating temperature derating		--	--	--	%/℃
		Input voltage derating*	85VAC<Vin≤170VAC	--	--	85	℃
			170VAC<Vin≤	--	--	100	

			305VAC				
		Altitude derating	2000m-5000m	6.67	--	--	℃/Km
		Output voltage derating	APBF1000-28-NS	14VDC-28VDC	Maximum output power Po=Vo*36		
				28VDC-33.6VDC	Maximum output power 1008W		
			APBF1000-48-NS	24VDC-48VDC	Maximum output power Po=Vo*21		
				48VDC-55.1VDC	Maximum output power 1008W		
	Parallel Operation*	PC (2-6 PCS of the same product in parallel) maximum current ≥50%Io		5	--	10	%
	Remote Switch*	-ON/OFF, +ON/OFF, end use recommendation	Power on	2	--	10	mA
			Power off	--	--	0.15	mA
	TRIM Output Voltage Adjustable Range*	APBF1000-28-NS	230VAC input, full load range	14	--	33.6	V
		APBF1000-48-NS		24	--	55.1	V
	Remote Compensation	-S, +S		Compensation voltage should within the range of the voltage adjustable range.			
	Status Indication	IOG/ENA (maximum sink current 5mA, maximum source voltage 35V)	Normal state	L			
			Fault state	H			
	Safety Class			CLASS I			
	MTBF	MIL-HDBK-217F@25℃		≥500,000 h			
	Pollution Degree	1					
	Warranty	Aluminum substrate temperature: <100℃		5 years			
Mechanical Specifications	Case Material	Aluminum substrate+black Plastic(SABIC PC945)					
	Dimensions	160.00mm × 100.00mm × 13.40mm					
	Weight	545g (Typ.)					
	Cooling Method*	Conduction heat dissipation, it is necessary to ensure that the product aluminum substrate surface temperature lower than 100℃.					

Note:1.*For all the above test items, please refer to our company standard "AC-DC Black Box Test Specification" for specific test specifications and methods;
2.*Output Voltage Accuracy: including setting error, line regulation, load regulation;
3.The "Tip and barrel method" is used for ripple and noise test, output parallel 47uF electrolytic capacitor and 0.1uF ceramic capacitor, please refer to Enclosed Switching Power Supply Application Notes for specific information. When the LBF1000-13B28-NS is deployed as a military communication vehicle's onboard power supply system, it must comply . Within the input range of 154VAC-264VAC, at nominal output voltage and under load variations from light to full load, the output ripple voltage RMS value ≤10mV, with a peak-to-peak value ≤100mV. If operating at -40℃ to 55℃, increase each electrolytic capacitor CEH1-CEH8 in Recommended Circuit 1 to at least 470uF. For ambient temperatures reaching -40℃, an external 3740uF/450V large electrolytic capacitor is required to maintain RMS ripple voltage ≤10mV.
4.*In order to optimize the heat dissipation performance, should add a heat sink for heat dissipation, The surface of the heat sink must be coated with thermal grease;
5.*The max temperature is the base plate temperature;
6.* Parallel current sharing needs to adjust the output voltage of the product within ±2% accuracy through the trim pin. When 2-3pcs of the same product are paralleled, they can output at most 90% of the rated output current, current sharing accuracy can reach within 5%; 4-6pcs (same product) can output up to 85% of

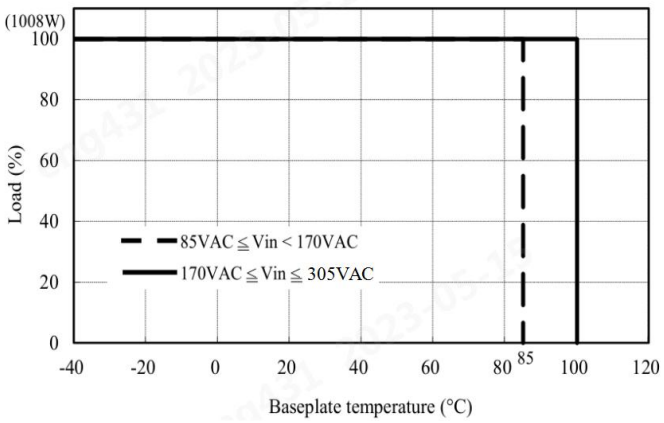
the rated output current when they are paralleled, and the current sharing accuracy can reach within 10%;
7.*Pay attention when the remote control is used with an external power supply. This module has a built-in MAX0.25W4.7K resistor. For details, see the schematic diagram in the application manual.
8.*The TRIM pin is pulled up to 3.3V by a built-in 1K resistor. When the external adjustment method is used, the input voltage between TRIM and COM should be greater than 0V and less than 3.3V.
9. *Cooling method refer to the Product Characteristic Curve.

Electromagnetic Compatibility (EMC)

Electromagnetic Compatibility (EMC)	Emissions (EMID)	CE	CISPR32/EN55032 CLASS A (Recommended external circuit 1)	
			CE102 (Recommended external circuit 2)	
		RE	CISPR32/EN55032 CLASS A (Recommended external circuit 1)	
		Harmonic current	IEC/EN61000-3-2 CLASS A (Recommended external circuit 1)	
	Immunity (EMS)	ESD	IEC/EN61000-4-2 Contact ±6KV /Air ±8KV (Recommended external circuit 1)	perf. Criteria B
		RS	IEC/EN61000-4-3 10V/m (Recommended external circuit 1)	perf. Criteria A
		EFT (Input port)	IEC/EN61000-4-4 ±2KV (Recommended external circuit 1)	perf. Criteria B
		Surge (Input port)	IEC/EN61000-4-5 line to line ±2KV/line to ground ±4KV (Recommended external circuit 1)	perf. Criteria B
		CS	IEC/EN61000-4-6 10Vr.m.s (Recommended external circuit 1)	perf. Criteria A
		Voltage dips, short interruptions and voltage variations immunity	IEC/EN61000-4-11 70% Un,25/30 cycle(50/60Hz) 0% Un, 0.5/1 cycle (Recommended external circuit 1)	perf. Criteria B
		Intercom interference test	MS-SOP-DQC-007 (Recommended external circuit 1)	perf. Criteria B

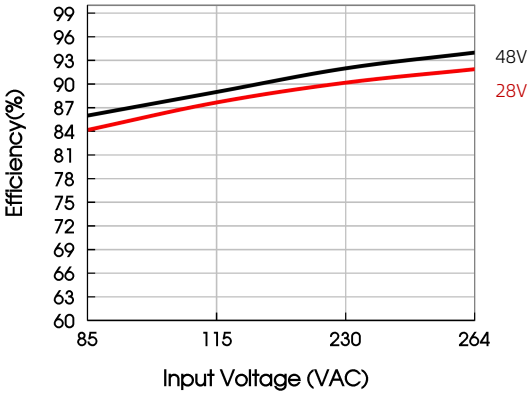
Note: *Un is the maximum input nominal voltage.

Characteristic Curve

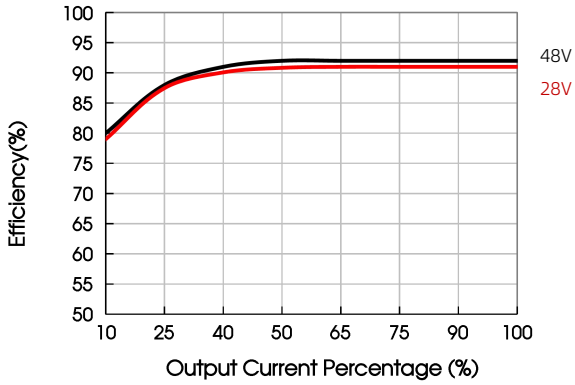


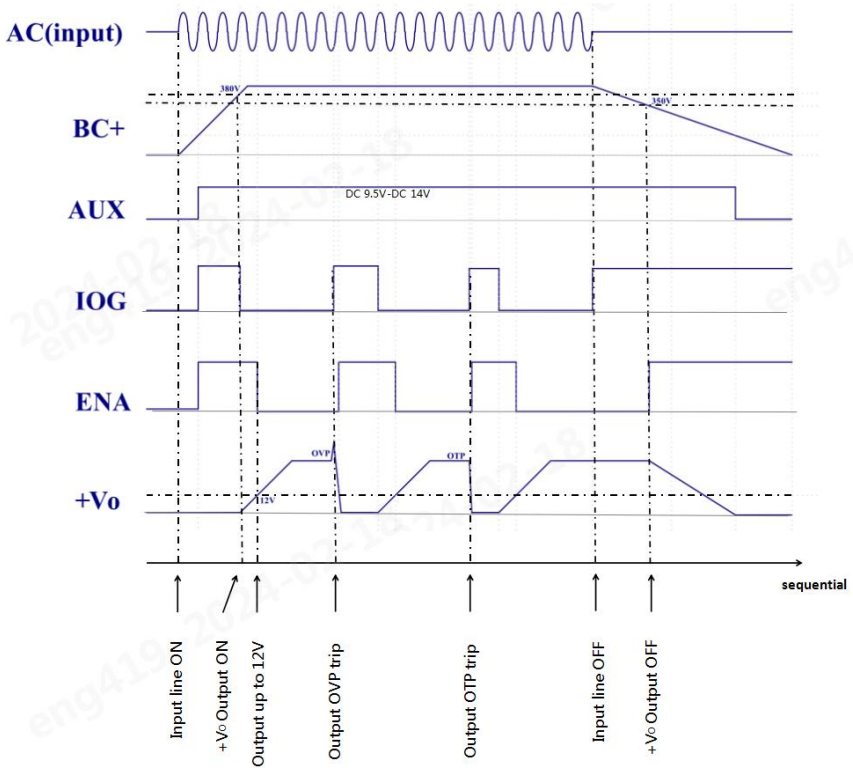
Note: This product is suitable for applications using in good conduction heat dissipation conditon.

Efficiency Vs Input Voltage (Full Load)



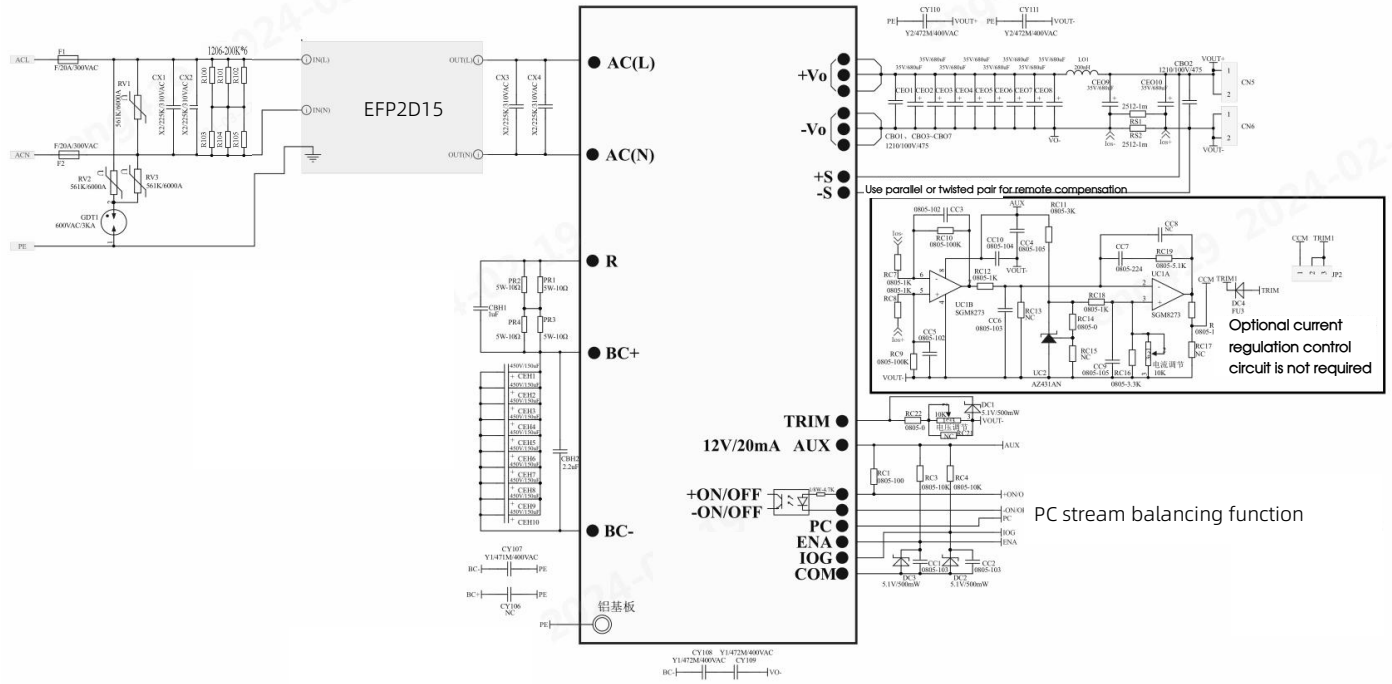
Efficiency Vs Output Load (Vin=230VAC)



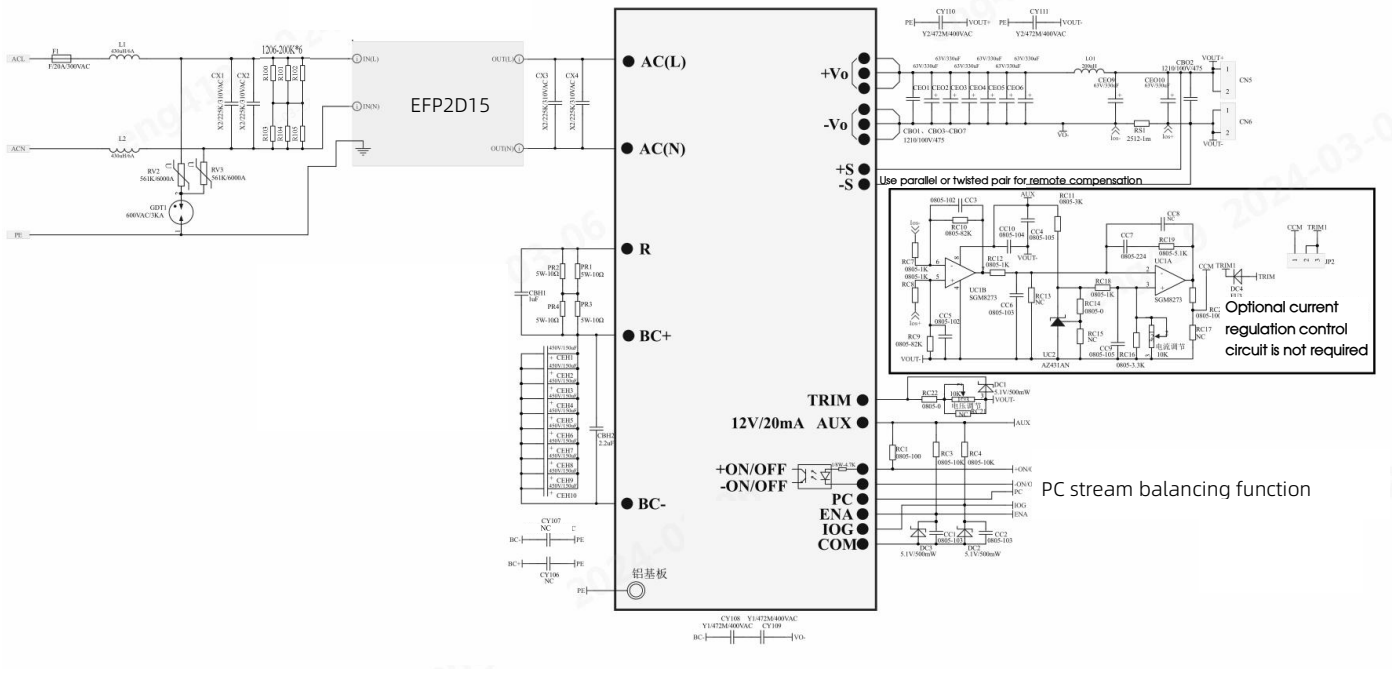


Circuit Timing

Recommended External Circuit



APBF1000-28-NS

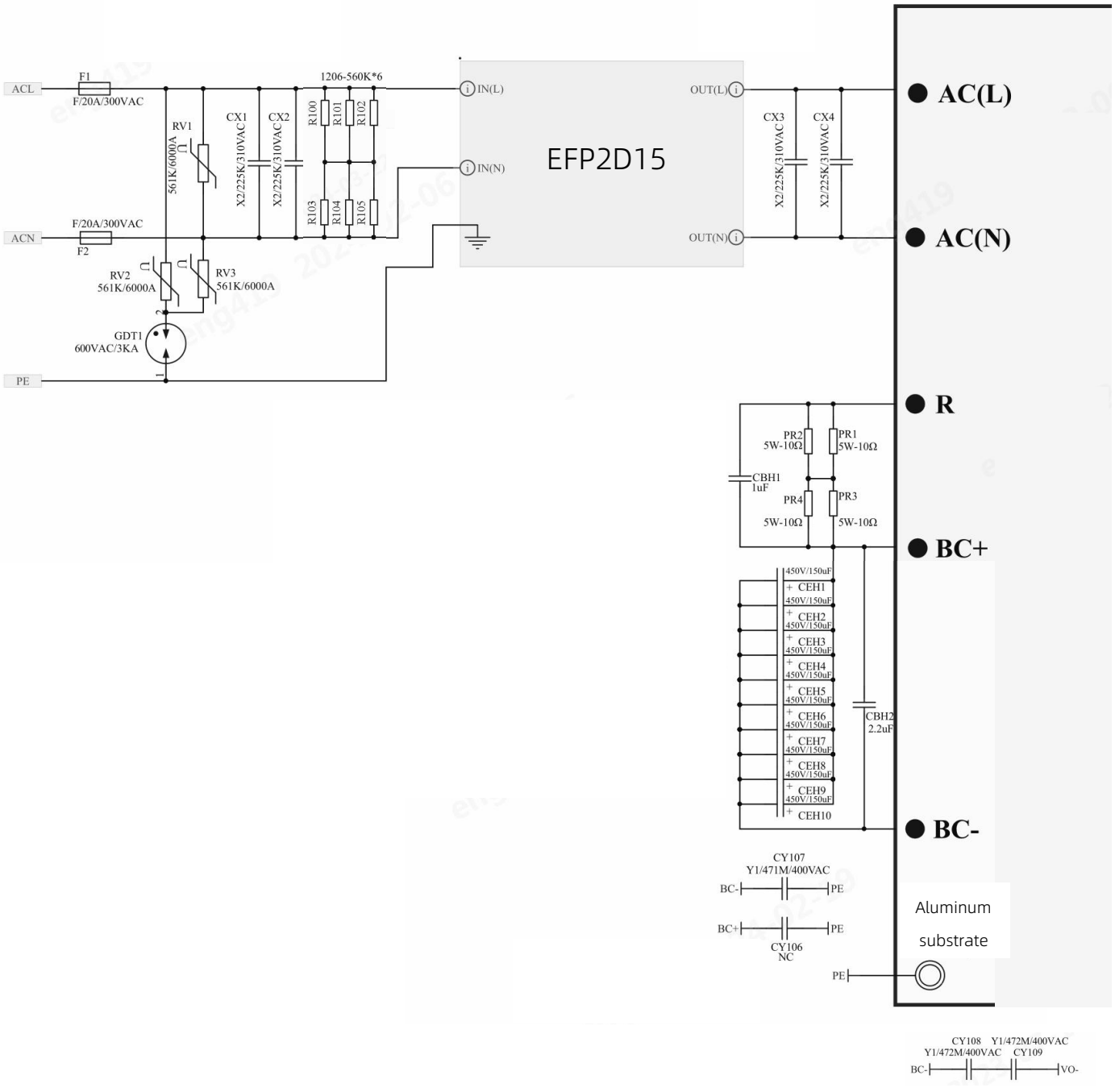


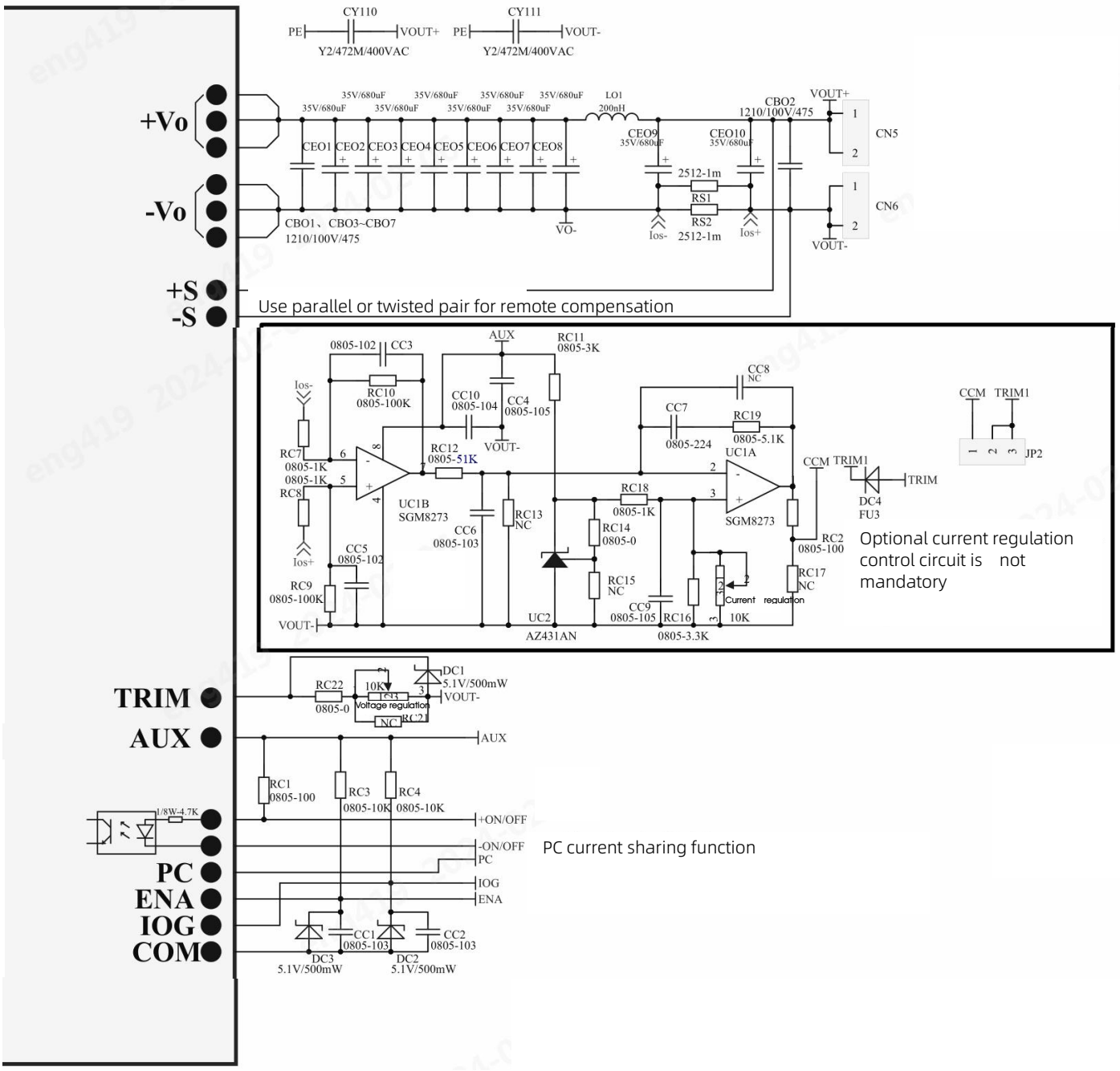
APBF1000-48-NS

Recommended External Circuit 1

Note: The breakdown chart is as follows.

2.The breakdown chart of Recommended External Clrcult





APBF1000-28-NS the recommended device selection list is as follows::

Component type	Recommended value
F1	300VAC/25A slow-blow
PR1/PR2/PR3/RP4	10Ω/5W/wire-round resistor

RV2/RV3	14D561K/6000A
CX1/CX2/CX3/CX4	X2/225K/310VAC
R100/R101/R102/R103/R104/R105	200K/1206
EFP2D15	EFP2D15
GDT1	600V/5KA
GDT5/GDT8	300V/1KA
CBH1	105K/630VDC(Film Capacitor)
CBH2	225K/630VDC((Film Capacitor)
CEH1/CEH2/CEH3/CEH4/CEH5/CEH6 CEH7/CEH8/CEH9/CEH10	150uF/450V (electrolytic capacitor)
CEO1/CEO2/CEO3/CE04/CEO5/CEO6 CEO7/CEO8/CEO9/CEO10	680uF/35V(electrolytic capacitor)
CY107	Y2/471K/250VAC
CY108/CY109/CY110/CY111	Y2/472M/250VAC
RS1/RS2	1mΩ/2W/2512
LO1	0.4uH/1.2mΩ/80A
CBO1/CBO2/CBO3/CBO4/CBO5/CBO6/CBO7	475K/100V/1210

APBF1000-48-NS the recommended device selection list is as follows::

Component type	Recommended value
F1	300VAC/25A slow-blow
PR1/PR2/PR3/RP4	10Ω/5W/wire-round

	resistor
RV2/RV3	14D561K/6000A
CX1/CX2/CX3/CX4	X2/225K/310VAC
R100/R101/R102/R103/R104/R105	200K/1206
EFP2D15	EFP2D15
GDT1	600V/5KA
GDT5/GDT8	300V/1KA
CBH1	105K/630VDC(Film Capacitor)
CBH2	225K/630VDC((Film Capacitor)
CEH1/CEH2/CEH3/CEH4/CEH5/CEH6 CEH7/CEH8/CEH9/CEH10	150uF/450V (electrolytic capacitor)
CEO1/CEO2/CEO3/CE04/CEO5/CEO6 CEO9/CEO10	330uF/63V(electrolytic capacitor)
CY108/CY109/CY110/CY111	Y2/472M/250VAC
RS1	1mΩ/2W/2512
LO1	0.4uH/1.2mΩ/80A
CBO1/CBO2/CBO3/CBO4/CBO5/CBO6/CBO7	475K/100V/1210

APBF1000-28-NS Optional current regulation control circuit is not required, the recommended device selection list is as follows:

Component type	Recommended value

RC7, RC8,RC18	1KΩ/0805
RC9, RC10	100KΩ/0805
CC10	104K/50V/0805/X7R
CC1, CC2, CC6	103K/100V/0805/X7R
CC3, CC5	102K/250V/0805/X7R
CC4, CC9	105K/50V/0805/X7R
CC7	224K/50V/0805/X7R
RC12	51K/0805
RC14	0Ω/0805
RC1	100Ω/0805
RC20	10Ω/0805
RC3, RC4	10KΩ/0805
RC11	3KΩ/0805
RC16	3.3KΩ/0805
RC19	5.1KΩ/0805
RS1, RS2	1mΩ/2512
Voltage regulation, current regulation	10KΩ/1/2W
DC2, DC3	5.1V/200mW/SOD-323
DC4	40V/2A/SOD-123FL
UC1	SGM8273-2XS8G/TR/SOP-8 (same

	specification dual channel low noise high-precision operational amplifier can also be used)
UC2	TPR432B-S3TR/SOT-23 (devices with the same specification of2.5V reference can also be used)

APBF1000-48-NS Optional current regulation control circuit is not required, the recommended device selection list is as follows:

Component type	Recommended value
RC7, RC8, RC12, RC18	1KΩ/0805
RC9, RC10	82KΩ/0805
CC10	104K/50V/0805/X7R
CC1, CC2, CC6	103K/100V/0805/X7R
CC3, CC5	102K/250V/0805/X7R
CC4, CC9	105K/50V/0805/X7R
CC7	224K/50V/0805/X7R
RC14	0Ω/0805
RC1	100Ω/0805
RC20	10Ω/0805
RC3, RC4	10KΩ/0805
RC11	3KΩ/0805
RC16	3.3KΩ/0805

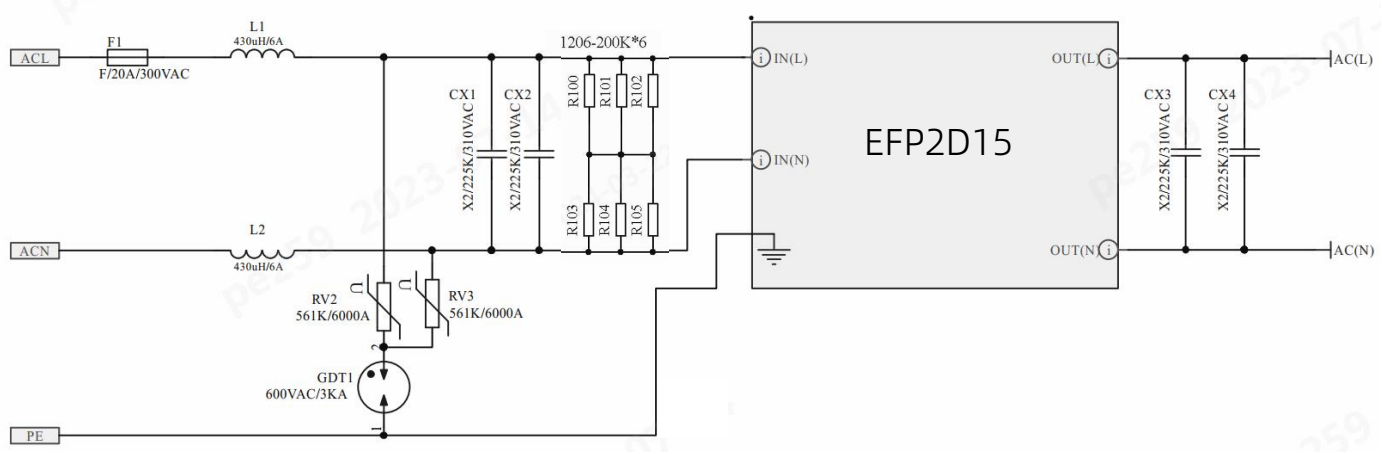
RC19	5.1KΩ/0805
RS1	1mΩ/2512
Voltage regulation, current regulation	10KΩ/1/2W
DC2, DC3	5.1V/200mW/SOD-323
DC4	40V/2A/SOD-123FL
UC1	SGM8273-2XS8G/TR/SOP-8 (same specification dual channel low noise high-precision operational amplifier can also be used)
UC2	TPR432B-S3TR/SOT-23 (devices with the same specification of 2.5V reference can also be used)

Note:JP2 in the schematic diagram is equivalent to using a jumper switch, when using a current regulation control circuit, it is necessary to short circuit CCM toTRIM1, if this function is not used, please disconnect CCM from TRIM1.

Note: 1. The no-load ripple voltage of the product will slightly exceed the specification (150mV) after switching from load to no-load, which can be improved by connecting a dummy load (resistance value ≤ 1.4KΩ) in parallel with the external circuit.

2.If there is a strict requirements on the output ripple voltage rms value, the single capacity of CEH1-CEH8 electrolytic capacitor should be increased to at least 470 uF (For routine use of CEH1-CEH10, use 150uF).

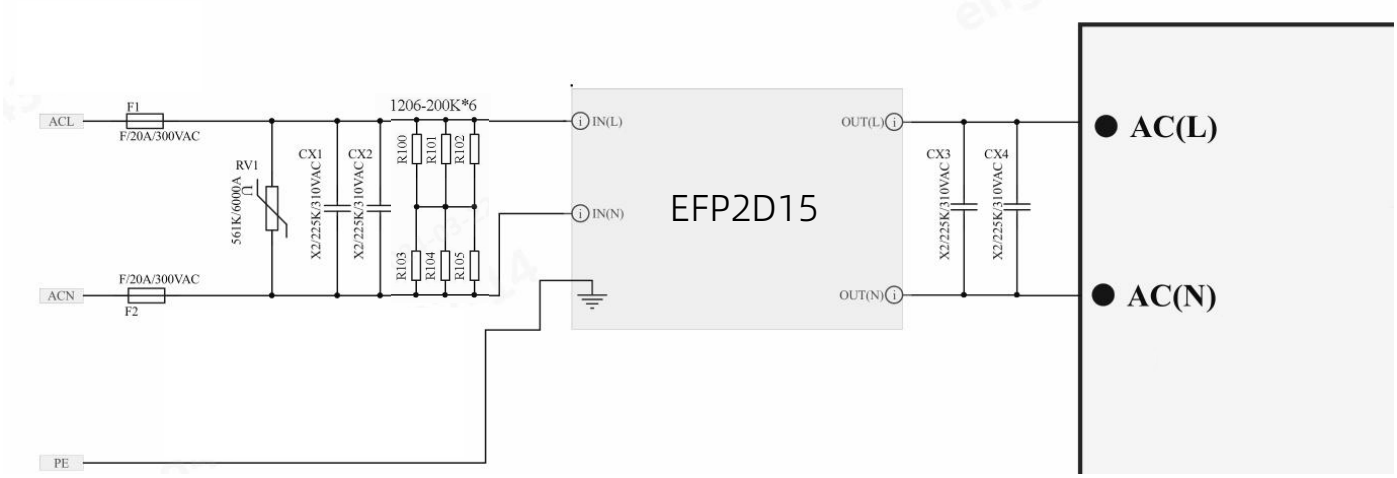
3.For the EMC sectlon,external clrcults are recommended



Recommended External Circuit 2

L1/L2	EFLD2D-6-431
Note: 1. The rest of devices are same as above recommended external circuit 1. L1 and L2 have been added to meet the conduction disturbance performance of low frequency conduction in the range of 9KHz -10MHz.	

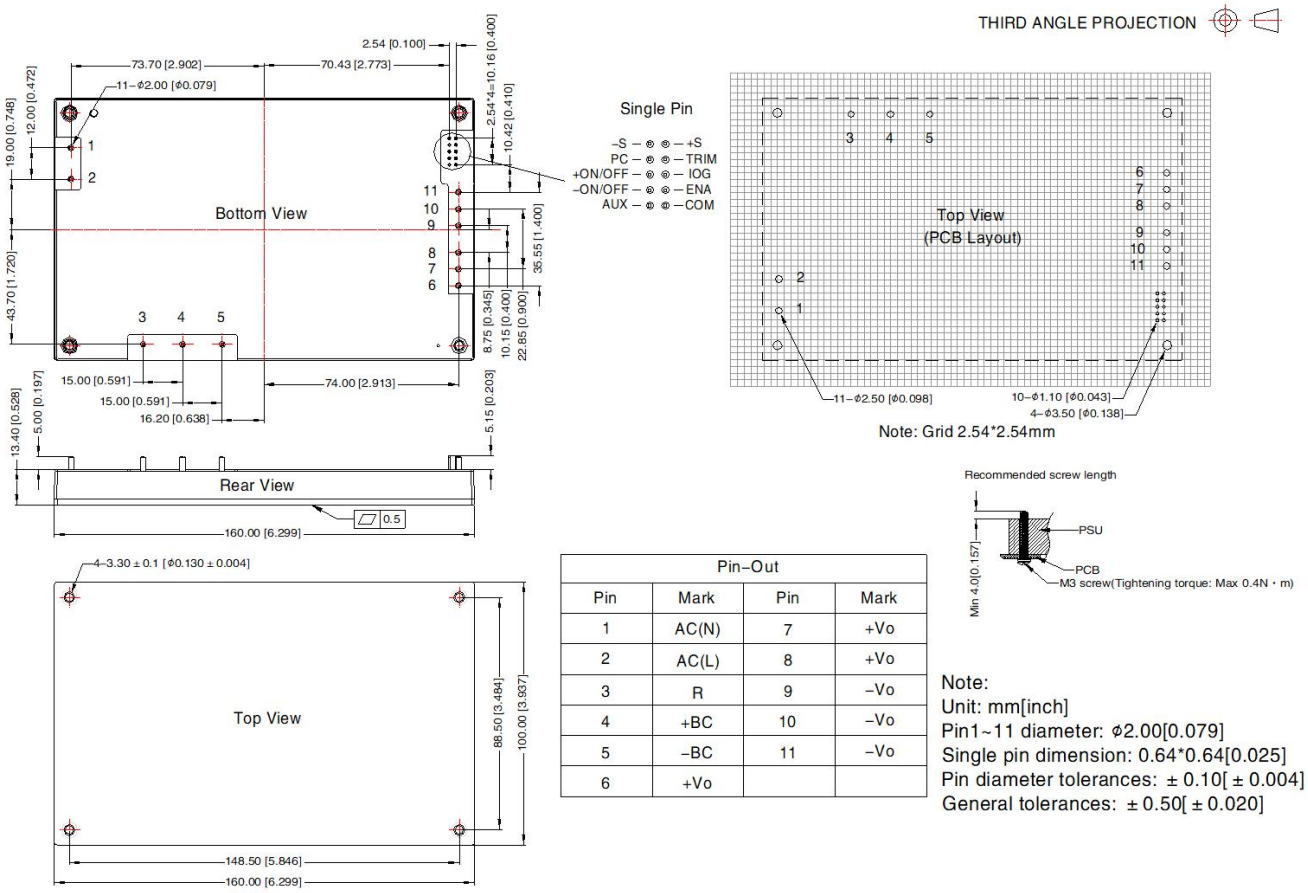
Note: Customer can choose filter module EFP2D15 and EFLD2D-6-431 to replace the part of EMC circuit in the Recommended External Circuit.



Recommended External Circuit 3（for EMC）

Note:
1.The rest of devices are same as above recommended external circuit 1.
2.Gas discharge tube GDT1 is removed from this circuit to satisfy the isolation withstand voltage specification.

Dimensions and Recommended



Pin–Out			
Pin	Mark	Pin	Mark
1	AC(N)	7	+Vo
2	AC(L)	8	+Vo
3	R	9	–Vo
4	+BC	10	–Vo
5	–BC	11	–Vo
6	+Vo		

Note:
Unit: mm[inch]
Pin1~11 diameter: ϕ2.00[0.079]
Single pin dimension: 0.64*0.64[0.025]
Pin diameter tolerances: ± 0.10[± 0.004]
General tolerances: ± 0.50[± 0.020]

Note:

1. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25℃, humidity<75%RH with nominal input voltage and rated output load;
2. All index testing methods in this datasheet are based on our company corporate standards;
3. In order to improve the efficiency, there will be audible noise generated when work at light load, but it does not affect product performance and reliability;
4. We can provide product customization service, please contact our technicians directly for specific information;
5. Products are related to laws and regulations: see "Features" and "EMC";
6. The out case needs to be connected to PE (⏚) of system when the terminal equipment in operating;
7. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units;
8. The power supply is considered a component which will be installed into a terminal equipment. All EMC tests should be confirmed with the final equipment.

APBF1000-xx-NS Series Power Supply Application Manual

Content

1. Performance characteristics and appearance pin definition 18
2. Instructions for use 18
2.1 Input requirements 18
2.2 Output requirements 18
2.3 Remote compensation (+S, -S terminals) 18
2.4 Output voltage adjustment (TRIM terminal) 20
2.5 Remote control switch (ON/OFF terminal) 23
2.6 Parallel operation (PC terminal) 26
2.7 Auxiliary power supply for external signals (AUX terminal) 26
2.8 Status indicator (IOG terminal) 26
2.9 Power ON signal (ENA terminal) 27
2.10 Input under-voltage protection (UVP) 27
2.11 Output over-voltage protection (OVP) 27
2.12 Over-current circuit protection (OCP) 27
2.13 Over-temperature protection (OTP) 29
2.14 External current regulating and controlling 23
3. Test waveform 31
3.1 Startup and shutdown 31
3.2 Dynamic response 33
3.3 Output ripple and noise 33
3.4 Conductive and radiation 34
4. Appearance specifications 40
4.1 Manufacturing data/dimensions 40
4.2 Installation and disassembly methods 41
4.3 Cooling method 41

1.Performance characteristics and appearance pin definition



Figure1: Appearance Pin

Appearance Pin (Port) Definition:

1	Input N line	-S	-Remote sensing terminal
2	Input L line	+S	+Remote sensing terminal
3	External inrush current limiting resister terminal (R)	PC	Output current balance terminal
4	+Boosted voltage terminal (+BC)	TRIM	Output voltage trimming terminal
5	-Boosted voltage terminal (-BC)	+ON/OFF	+ON/OFF control terminal
6, 7, 8	+Output voltage (+Vo)	-ON/OFF	-ON/OFF control terminal
9, 10, 11	-Output voltage (-Vo)	IOG	Output status indicating terminal
COM	Common ground terminal	ENA	Power on signal terminal
AUX	Auxiliary power supply terminal for external circuits		

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. There is no fuse inside the power module. For better protection, it is recommended that customers use a circuit breaker not greater than 20A.

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

2.2 Output requirements

At any voltage value, the maximum output current and power must not exceed the rated value.

2.3 Remote compensation (+S, -S terminals)

As shown in Figure 2, the +S and -S terminals are respectively connected to the load terminal (VOUT+ and VOUT-) through twisted-pair signal cables or differential signal cables (+S and -S) to compensate the line voltage drop between the module and the load. If the remote compensation connection is not required, the +S and -S terminals can be floating.

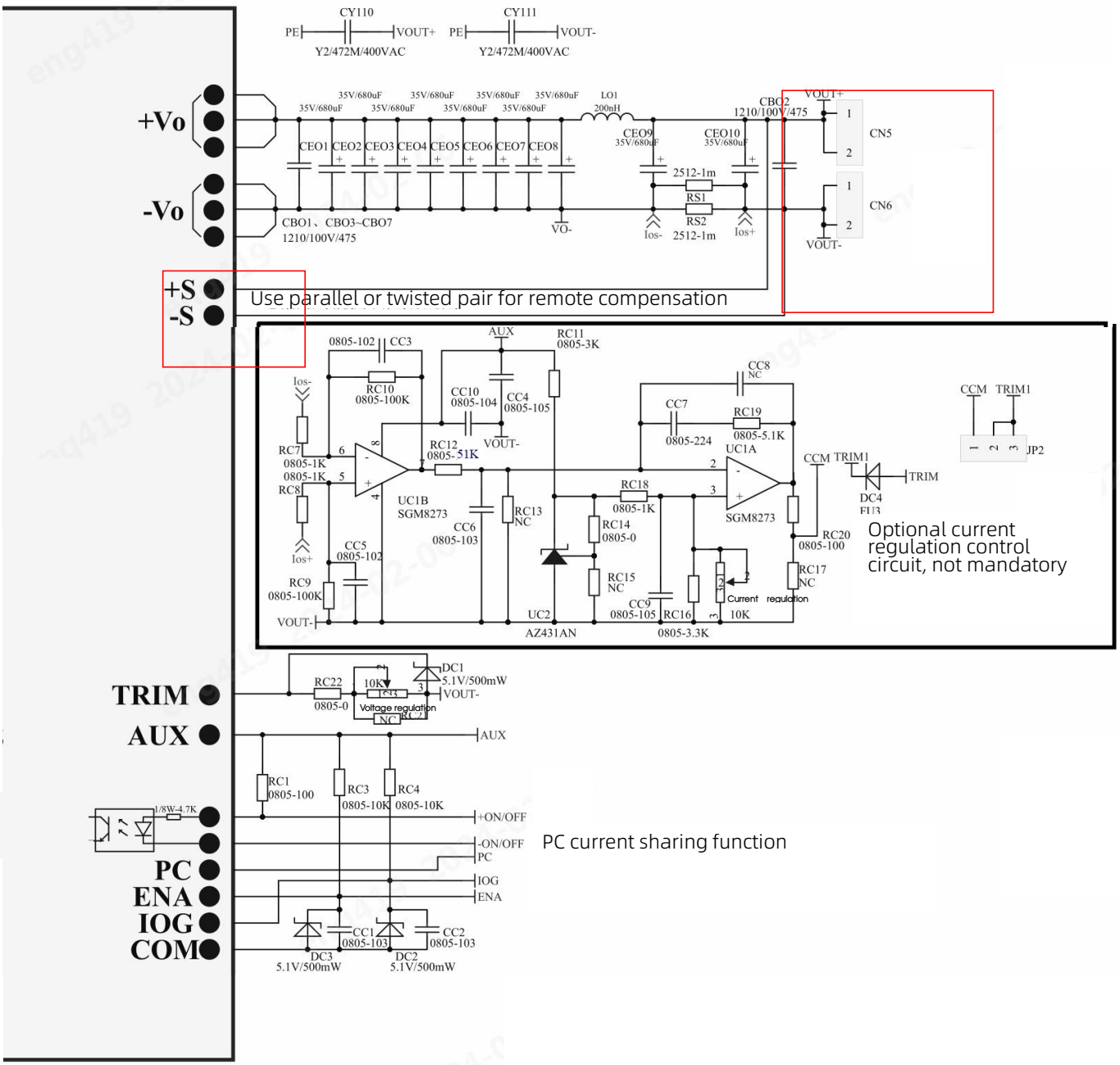


Figure 2: Schematic diagram of the remote compensation connection

Note: In the case of parallel machines or hot and cold backup, the remote compensation function cannot be used, otherwise the voltage anti backflow function will fail, and there may even be a risk of damage to the product.

2.4 Output voltage adjustment (TRIM terminal)

As shown in the wiring diagram in the red box in Figure 3, the output voltage of the APBF1000-28-NS module can be adjusted voltage from 14V to 33.6V by connecting the external 10K adjustable resistor with TRIM and VOUT terminals； the output voltage of the APBF1000-48-NS module can be adjusted voltage from 24V to 55.1V by connecting the external 10K adjustable resistor with TRIM and VOUT terminals. When the output voltage is higher than the adjustable range, it may cause output over-voltage protection. When the output voltage increases, reduce the output current to ensure that the maximum output power of the module stays within the specified range. When the output voltage is lowered, the maximum output current remains unchanged.

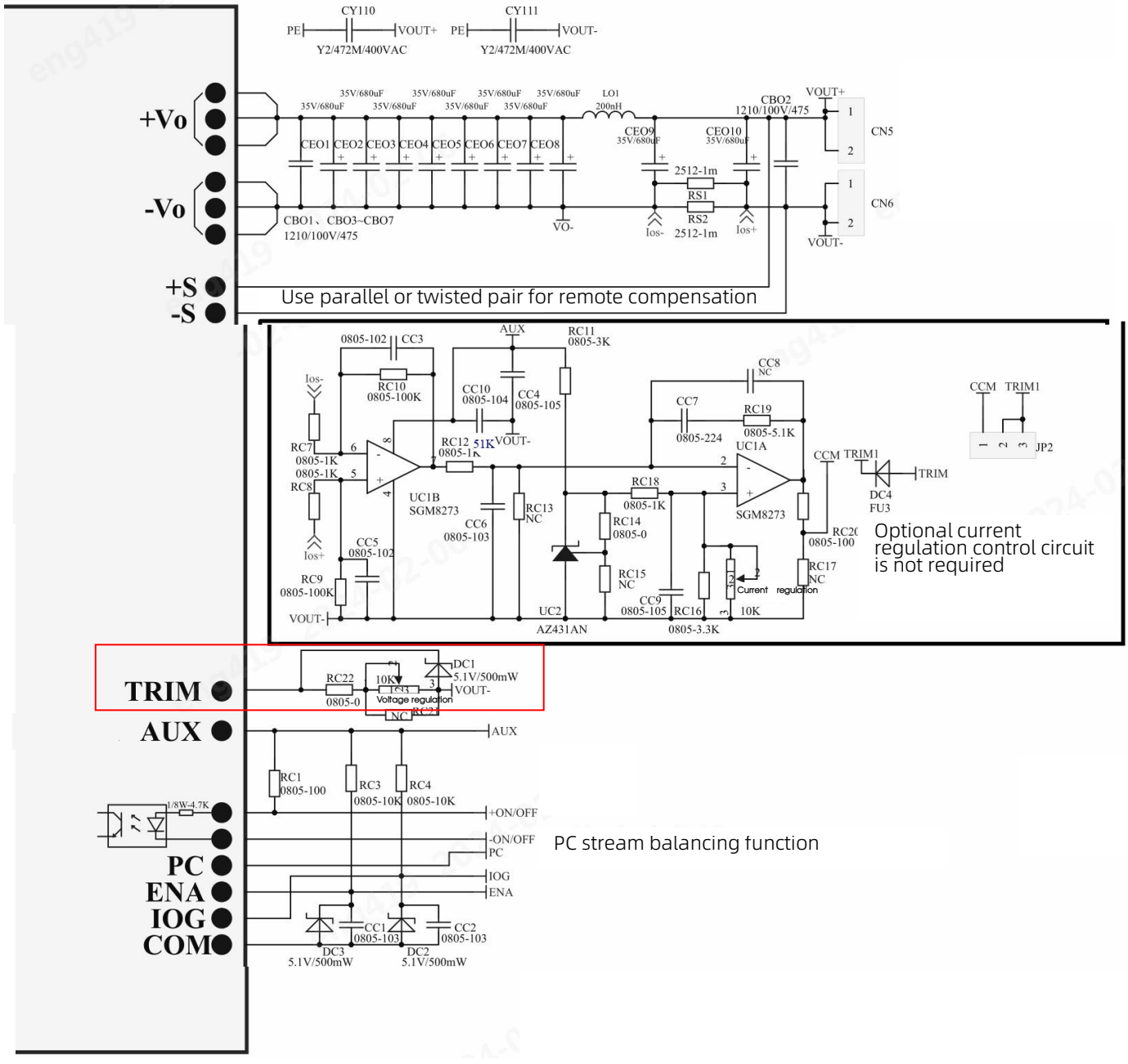


Figure 3: Schematic diagram of the output voltage regulation connection

when using adjustable resistors to adjust voltage, curve diagram of the corresponding relationship between power module TRIM pin terminal voltage and output voltage is shown in figure 4:

$$Vtrim = 3.3 \times \frac{RC22 + R_{Adjustable\ resistor}}{RC22 + R_{Adjustable\ resistor} + RU} = 3.3 \times \frac{RC22 + R_{Adjustable\ resistor}}{RC22 + R_{Adjustable\ resistor} + 1K\Omega}$$

$$Vout = (Vtrim - 0.3) \times \frac{Voutmax - Voutmin}{3 - 0.3} + Voutmin$$

Note: RU is internal resistance of the module, 3.3 is internal power supply

Recommended value of Trim resistor (adjustable slip Rvoltage regulation to achieve upper and lower output voltage regulation):

Vout	RC22	Rvoltage regulation
APBF1000-28-NS	0Ω/0805	Sliding rheostat with adjustable range of 0-10kΩ
APBF1000-48-NS	0Ω/0805	Sliding rheostat with adjustable range of 0-10kΩ
Note: When the sliding rheostat adjustment resistance exceeds the recommended adjustable range too much, the module will enter over-voltage protection.		

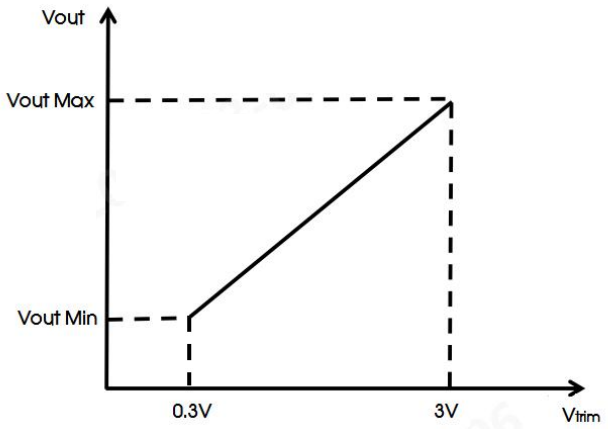


Figure 4: curve diagram of the corresponding relationship between Vtrim and Vout

Part No.	Vout max	Vout min
APBF1000-28-NS	34.1V	13.5V
APBF1000-48-NS	55.6V	23.5V

when the output is fixed, and no need for adjustment resistance, fixed resistor (RC22) can be directly connected, adapt the required output voltage by selecting the appropriate resistance value, power module TRIM pin terminal circuit connection diagram is shown in figure 5, TRIM pin terminal voltage relationship:

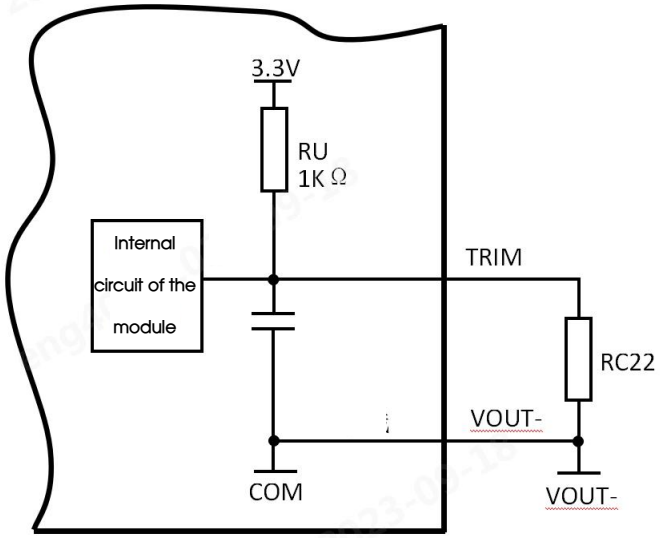


Figure 5: power module TRIM pin terminal circuit connection diagram

$$Vout = (Vtrim - 0.3) \times \frac{Voutmax - Voutmin}{3 - 0.3} + Voutmin$$

$$Vtrim = 3.3 \times \frac{RC22}{RC22 + RU} = 3.3 \times \frac{RC22}{RC22 + 1K\Omega}$$

APBF1000-28-NS: Typical output voltage 28Vcorresponds to a fixed resistance (RC22) value of around 2K, if the Trim PIN is suspended, the output voltage is around 34.5V.

APBF1000-48-NS: Typical output voltage 48Vcorresponds to a fixed resistance (RC22) value of around 2.52K, if the Trim PIN is suspended, the output voltage is around 55.6V.

APBF1000-28-NS: When the output voltage is between 25.5V and 27.5V, he working mode of the power module exists in PWM mode and PFM mode; When the output voltage is above 27.5V, the working mode of the power module is PFM mode; When the output voltage is below 25.5V, the working mode of the power module is PWM mode; APBF1000-48-NS: When the output voltage is between 45V and 47V, the working mode of the power module exists in PWM mode and PFM mode; When the

output voltage is above 47V, the working mode of the power module is PFM mode; When the output voltage is below45V, the working mode of the power module is PWM mode, the efficiency of power supply operating in PWM mode is slightly lower by 0.5%-0.7% compared to operating in PFM mode.

2.5 Remote control switch (ON/OFF terminal)

The product with built-in remote control switch function. This function enables switching of the output to be controlled while the input voltage on. As shown in Figure 6, the remote control function shielding connection diagram, the ON/OFF signal terminal of this product with built-in isolation optocoupler in the power supply. If this function is not used, the customer can supply power to the +ON/OFF terminal via the AUX terminal through the current limiting resistor RC1. - The ON/OFF terminal is connected to the COM pin; if you need to use the ON/OFF function to achieve electrical isolation control, you can refer to the schematic diagram of the remote switch connection in Figure 7, and use the ON/OFF control signal isolated from the power supply to provide power supply connections for the ON/OFF terminal (The control signal cannot be reversed).

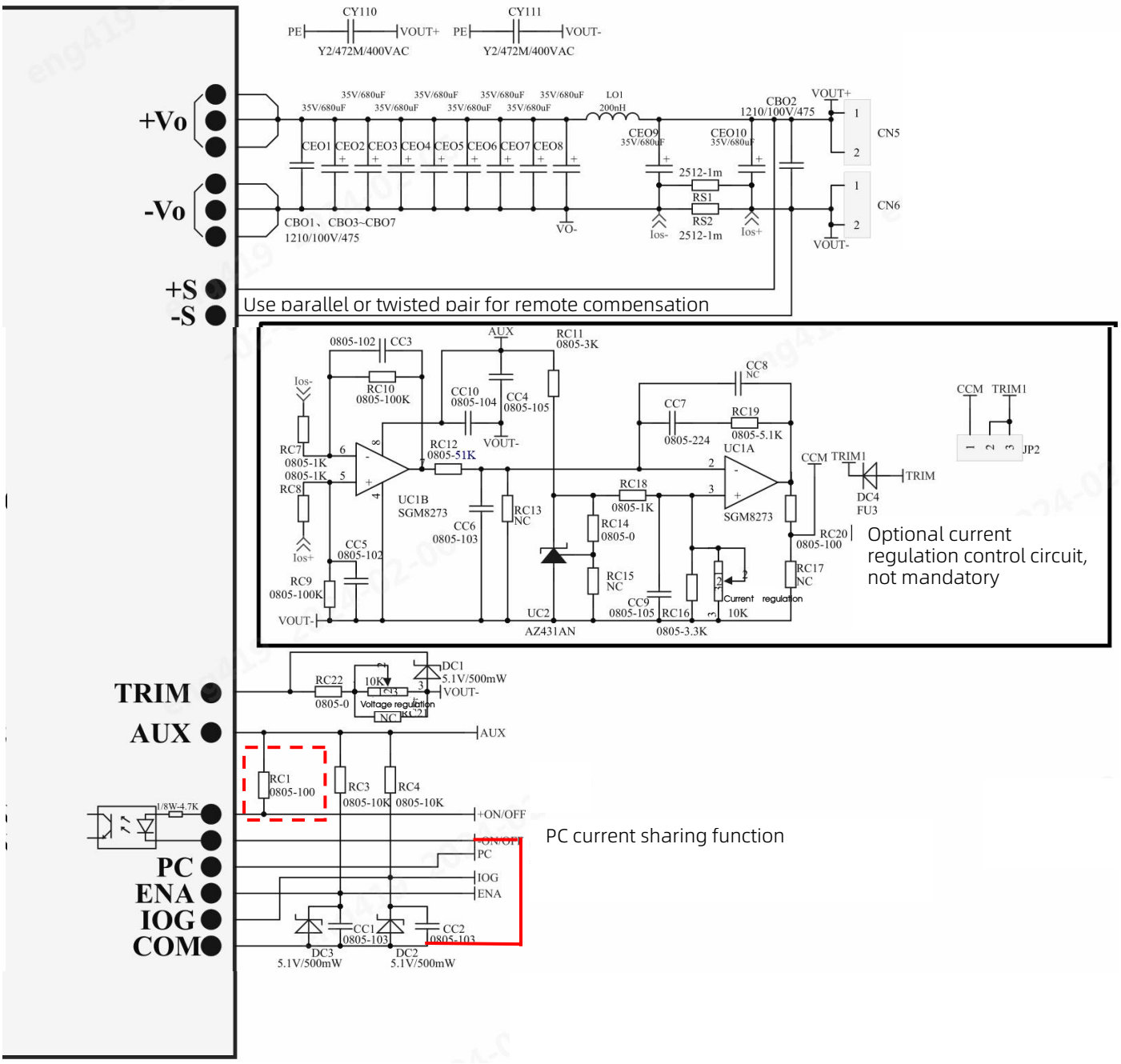


Figure 6: Remote function shielding connection diagram

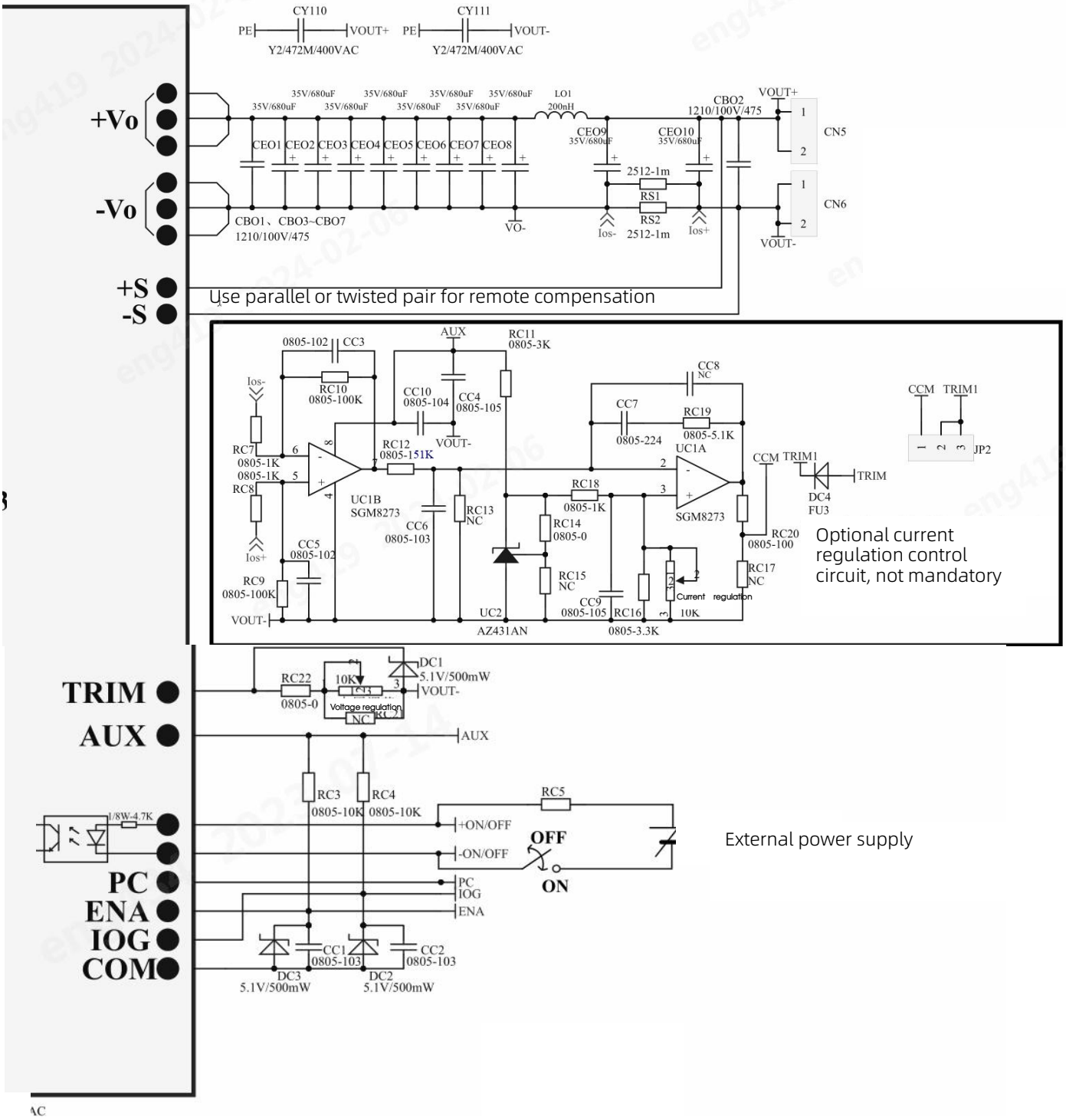


Figure 7: Schematic diagram of remote switch connection

Select the external voltage and external resistance, as the ON/OFF terminals current is shown below.

Table 1 Recommended ON/OFF terminal current

ON/OFF terminal current	Output Voltage
2-10mA	ON

<0.15mA	OFF

2.6 Parallel operation (PC terminal)

The PC terminal is a parallel current sharing bus. Parallel-connect the PC and COM terminals of each power module to equalize the output current between modules. At the output end of the power supply, the output cable width and length of each module should be as consistent as possible, and the line impedance should be as similar as possible. After the output filtering of a single module, a load bus is drawn from the load end. After the output filtering, each module accesses the load bus nearby through the load line of the same specification and length, and themobility is optimal.

Power modules support 2-6 parallel redundancy. Set the accuracy of the output voltage within ±2% precision when adjust the output voltage for parallel operation.

When the system is used in parallel, the maximum load current cannot exceed the maximum output current of a single power module; otherwise, the entire parallel power system cannot start properly.

Table 2 Condition for parallel operation

Parallel units	Maximum output current
2-3 units	90% of nominal output current
4-6 units	85% of nominal output current

2.7 Auxiliary power supply for external signals (AUX terminal)

The AUX terminal output voltage ranges from DC9.5V to DC14V, The AUX terminal keep current constant and reduce voltage when the output current is over 20mA. AUX terminal reference position COM terminal. Do not short-circuit the AUX terminal to a terminal other than the ON/OFF terminal. Otherwise, the power module may be damaged.

2.8 Status indicator (IOG terminal)

This signal is located at the secondary output side and is an open drain output. the reference ground is the COM terminal. By monitoring the signal from IOG terminal to COM terminal, you can check whether the power module is working properly. Low level when working normally, high level when working abnormally.

Note: Normal output is "low", when a fault occurs, the output is "high" (maximum pull-down current is 5mA, maximum applied voltage is 35V).

2.9 Power ON signal (ENA terminal)

This signal is located at the secondary output side and is an open drain output. the reference ground is the COM terminal. When output voltage goes over Typ. Output voltage threshold level 12V at start up, Power ON signal is “low level”. “high level” when working abnormally.

Note: Normal output is "low", when a fault occurs, the output is "high" (maximum pull-down current is 5mA, maximum applied voltage is 35V).

2.10 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 set 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 starting itself and working normally.

2.11 Output over-voltage protection (OVP)

When the output end of the module is over-voltage, the output voltage hiccup or clamped at a fixed value. After the fault is rectified, the module output automatically recovers to normal.

2.12 Over-current circuit protection (OCP)

This module is designed with over-current/short circuit protection circuit, which can withstand over-current or short circuit at the output end. After the over-current and short circuit faults are eliminated, the module output automatically recovers to normal.

APBF1000-28-NS: When the output voltage setting value less than 25V, Typ. constant current value is 45A; When the

output voltage setting value between 25V-34.1V, Typ. constant current value decreasing as the output voltage setting value increases, the relationship diagram is shown in Figure 8.

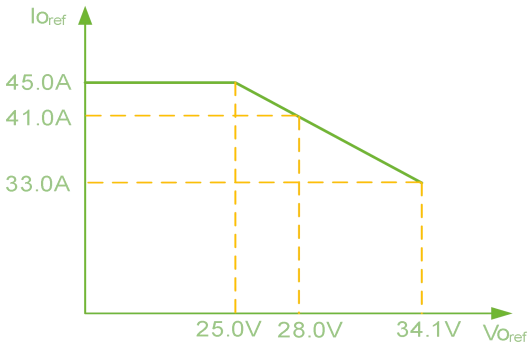


Figure 8: the relationship diagram between output voltage setting value and Typ. constant current value.

When the output voltage setting value less than 17V, OCP mode is hiccup mode Typ. 1s at work, 4s at rest; When the output voltage setting value more than 19V, OCP mode is Constant current mode; When the output voltage setting value between 17V and 19V, both states may exist.

APBF1000-48-NS: When the output voltage setting value less than 43V, Typ. constant current value is 26A; When the output voltage setting value between 43V-55.6V, Typ. constant current value decreasing as the output voltage setting value increases, the relationship diagram is shown in Figure 9.

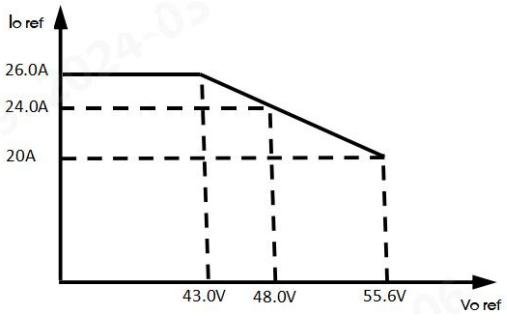


Figure 9: the relationship diagram between output voltage setting value and Typ. constant current value.

When the output voltage setting value less than 31V, OCP mode is hiccup mode Typ. 1s at work, 4s at rest; When the output voltage setting value more than 33V, OCP mode is Constant current mode; When the output voltage setting value

between 31V and 33V, both states may exist.

Note: that continuous short circuit or overload condition, might result in power module damage.

2.13 Over-temperature protection (OTP)

The built-in over-temperature protection circuit of the module prevents the module from being damaged due to excessive temperature rise such as overload and short circuit. When the temperature of the module shell exceeds the set value of over-temperature protection, the output of the module automatically closes. You need to power off and reset to restore the system.

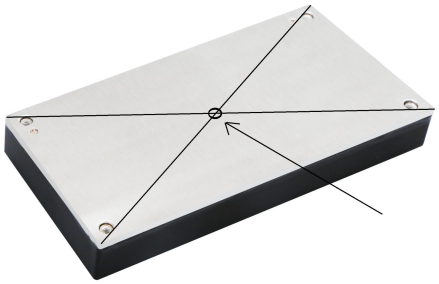


Figure 10: AL-Substrate temperature test point

2.14 External current regulating and controlling circuits

The internal constant current point of the module is fixed,if needed use an external current regulating control circuit to adjust the constant current point,then can refer to the following recommendations for debugging,output constant current control output current feedback error amplifier， As shown in recommended peripheral circuit diagram 1,since the output current sampling operation amplifier has a maximum output voltage signal is 1.8V,in order to ensure the value range of the normal operating reference voltage（ $Iadj$ ）is 0-2Vdc,RC18（recommende1KΩ) and CC9(recommend 1μF) is a filter circuit for reference voltage to ensure that the circuit to provide a stable reference voltage.CC7(recommend 10nF ~ 1μF) and RC19(recommend3KΩ ~ 10KΩ) and CC8(usually unnecessary) is to compensate the loop of current feedback error amplifier，RC20 and DC4 is coupled circuit(necessary)，It can prevents the damage of operational amplifier and power module,when the

output of the operational amplifier is higher than the Trim of power module,DC1 is the 5.1V voltage regulator,It also can can prevents the damage of operational amplifier and power module,when the output of the operational amplifier is higher than the Trim of power module,CC9(recommend 1nF ~ 4.7μF) is the capacitance of the current feedback error amplifier and also is the current feedback error amplifier's output compensates for one of the response frequency poles,it can effectively improved the stability of feedback loop in feedback loop debugging,the effect of RC22 is very important,it determines the upper limit of the output voltage.

External loop output constant current control circuit topology link,set the upper limit of the output voltage($Vout\ set$) of the power module:

$$Vout\ set = (Vtrim - 0.3) \times \frac{Voutmax - Voutmin}{3 - 0.3} + Voutmin$$

$$Vtrim = 3.3 \times \frac{RC22}{RC22 + RU} = 3.3 \times \frac{RC22}{RC22 + 1K\Omega}$$

Model	V out max	V out min
APBF1000-28-NS	34.1V	13.5V
APBF1000-48-NS	55.6V	23.5V

Special version:when the output voltage(or charging voltage) of the power module is lower than 19V,the power supply can be burped constant current mode output.

1)The external output constant current control circuit has constant current setting:

$$Io_{set} = \frac{V_{OPin}}{Rs}$$

Io_{set} :Module output current

V_{OPin} :The input voltage signal amplitude of the amplifier

Rs :Module power output current sampling resistance

2)Amplifier output voltage signal

$$V_{OPin} = \frac{V_{OPout}}{\beta}$$

V_{OPout} :The output signal amplitude of the amplifier

β :The multiple of output current sampling operational amplifier

V_{OPin} :The input signal amplitude of the amplifier.

3)The relationship between the current adjustable resistance and amplifier's output voltage signal

$$V_{OPout} = \frac{Vref}{RC18 + \frac{RC16 * R_{Adjustable\ current}}{RC16 + R_{Adjustable\ curren}}}$$

Note:1. IOS+ and IOS- need separate leads from the sampling resistor to the control circuit.

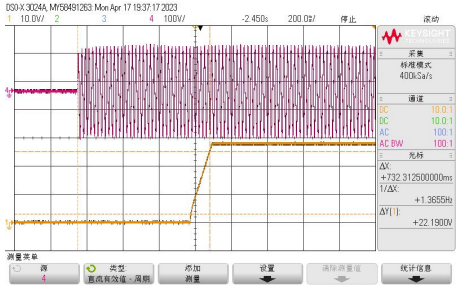
2. when use external current regulation control circuit,CCM and TRIM1 need connect in the picture.

3. Test waveform

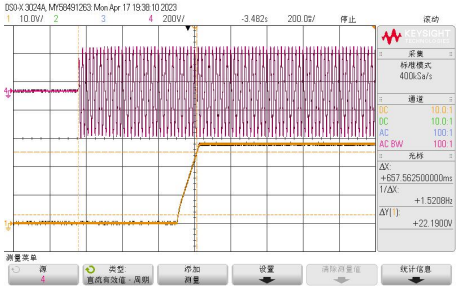
3.1 Startup and shutdown

Test conditions: Tc=25℃, APBF1000-28-NS products are tested based on recommended circuit 1,

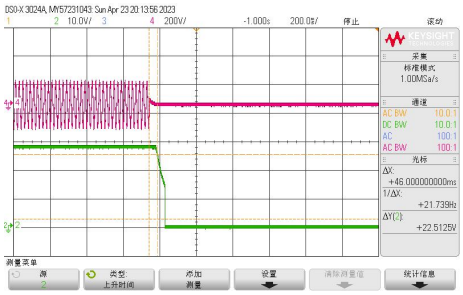
CEH1-CEH10=1500uF.



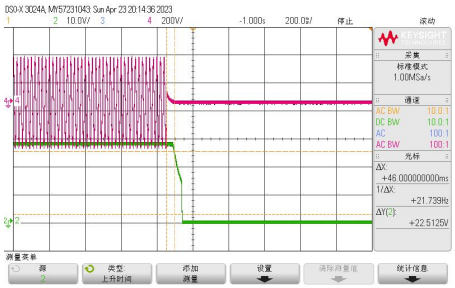
Vin=115VAC Full load start (start delay 732ms)



Vin=230VAC Full load start (start delay 657ms)



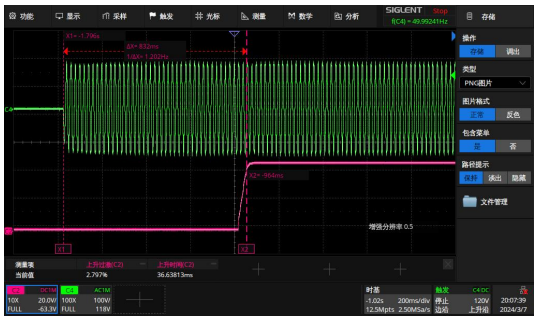
Vin=115VAC Full load shutdown (46ms)



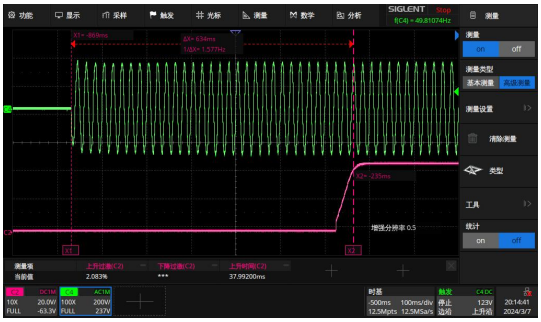
Vin=230VAC Full load shutdown (46ms)

Test conditions: Tc=25℃, APBF1000-48-NS products are tested based on recommended circuit 1,

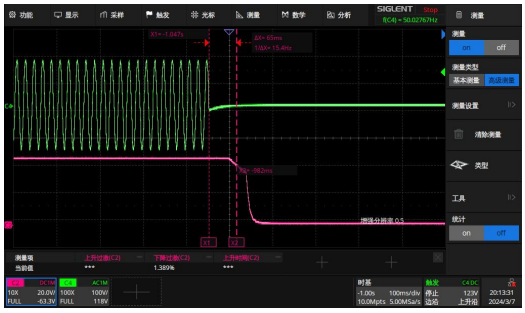
CEH1-CEH10=1500uF.



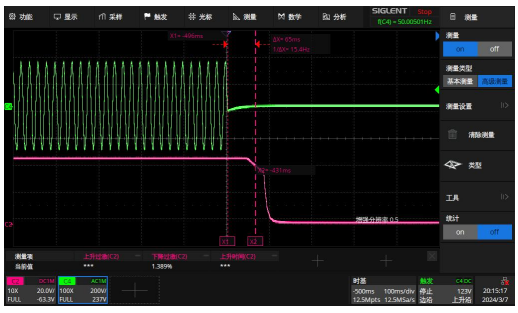
Vin=115VAC Full load start (start delay 832ms)



Vin=230VAC Full load start (start delay 634ms)



Vin=115VAC Full load shutdown (65ms)



Vin=230VAC Full load shutdown (65ms)

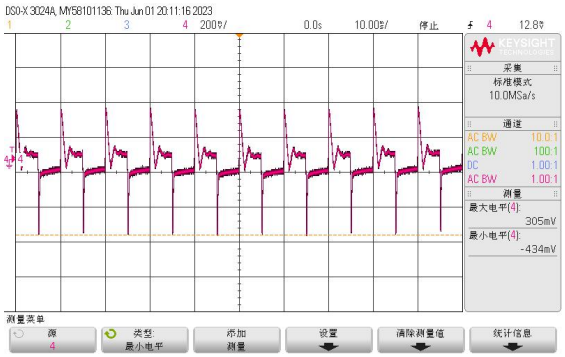
Note: The power OFF hold-up time is related to the CEH capacitance, and can be adjusted with reference to the following formula:

$$t = \frac{0.5 \cdot C_{EH} \cdot (U_1^{\,2} - U_2^{\,2})}{P_o}$$

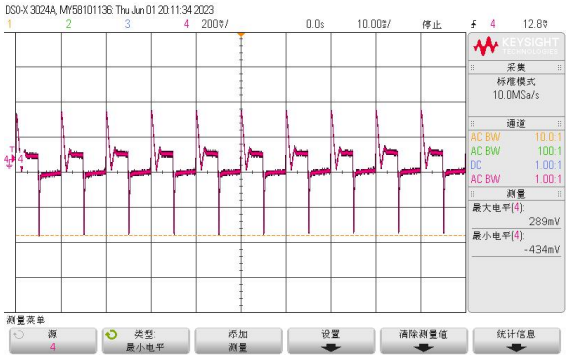
U1=410VDC, U2=325VDC, Po=1008W (based on actual power output).

3.2 Dynamic response

Test conditions: Tc=25℃, current rate slope 0.1A/us, APBF1000-28-NS products are tested based on recommended circuit 1.



Vin=115VAC 10%-100% dynamic



Vin=230VAC 10%-100% dynamic

Test conditions: Tc=25℃, current rate slope 0.1A/us, APBF1000-48-NS products are tested based on recommended circuit 1.



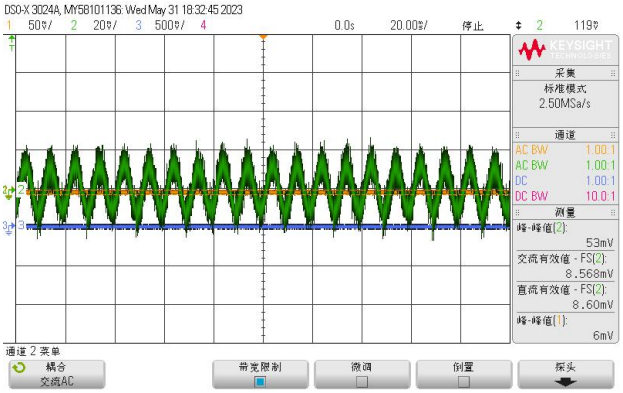
Vin=115VAC 10%-100% dynamic



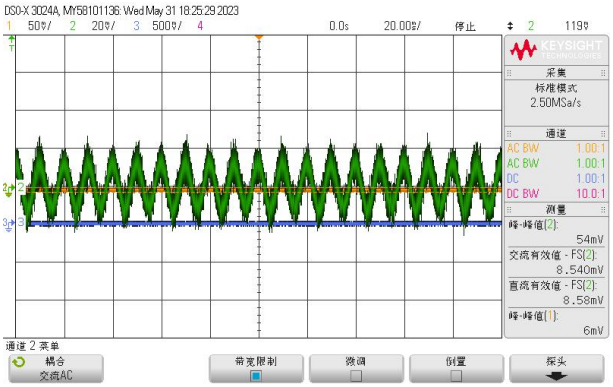
Vin=230VAC 10%-100% dynamic

3.3 Output ripple and noise

Test conditions: Tc=25℃, 20M bandwidth (peak to peak value) APBF1000-28-NS products are tested based on recommended circuit 1, increase the capacitance of each CEH1-CEH8 electrolytic capacitor to at least 470μF.

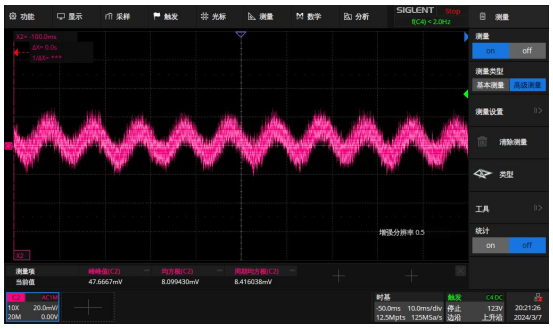


Vin=115VAC full load ripple noise (53mV)/ripple RMS value (8.5mV)

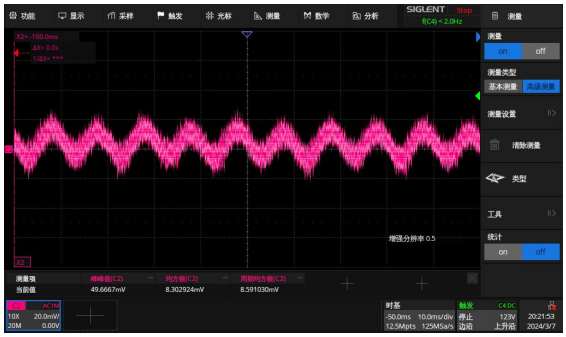


Vin=230VAC full load ripple noise (54mV)/ripple RMS value (8.5mV)

Test conditions: Tc=25℃, 20M bandwidth (peak to peak value) APBF1000-48-NS products are tested based on recommended circuit 1, increase the capacitance of each CEH1-CEH8 electrolytic capacitor to at least 470μF.



Vin=115VAC full load ripple noise (48mV)/ripple RMS value (8.1mV)



Vin=230VAC full load ripple noise (50mV)/ripple RMS value (8.6mV)

3.4 Conductive and radiation

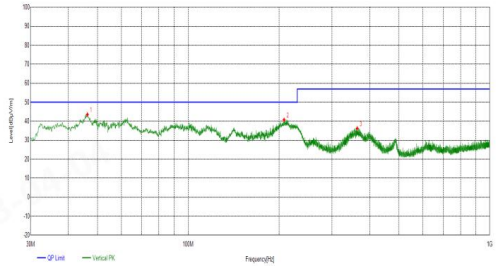
(1) Radiation (RE)

APBF1000-28-NS products Safety specifications: CISPR32/EN55032 CLASS A

RE Tc=25℃, Vin=115VAC, Pout=1008W, based on recommended circuit 1 test

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
46.2976	Vertical	14.24	29.29	43.53	50.00	6.47	PK	100	234	PASS
207.9158	Vertical	11.77	28.98	40.75	50.00	9.25	PK	100	82	PASS
363.4223	Vertical	16.84	19.39	36.23	57.00	20.77	PK	100	227	PASS

TRACE

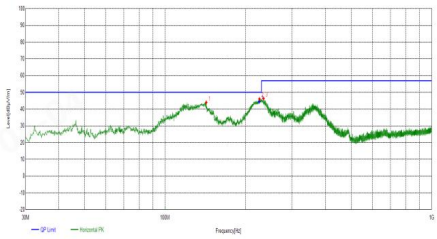


Vertical waveform and reading point

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
142.8223	Horizontal	13.98	30.05	44.03	50.00	5.97	PK	100	67	PASS
225.9596	Horizontal	12.41	33.67	46.08	50.00	3.92	PK	100	82	PASS
234.1084	Horizontal	12.70	33.69	46.39	57.00	10.61	PK	100	97	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
225.5476	Horizontal	12.40	44.43	50.00	5.57	110	82	PASS

TRACE

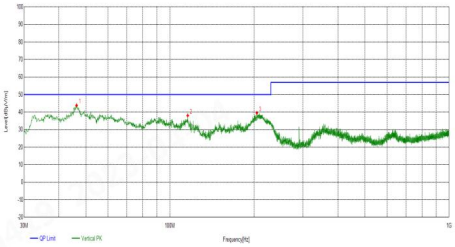


Horizontal waveform and reading point

RE Tc=25℃, Vin=230VAC, Pout=1008W, based on recommended circuit 1 test

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
46.2976	Vertical	14.24	29.59	43.83	50.00	6.17	PK	100	125	PASS
115.8536	Vertical	12.02	26.04	38.06	50.00	11.94	PK	100	208	PASS
204.9085	Vertical	11.66	27.83	39.49	50.00	10.51	PK	100	48	PASS

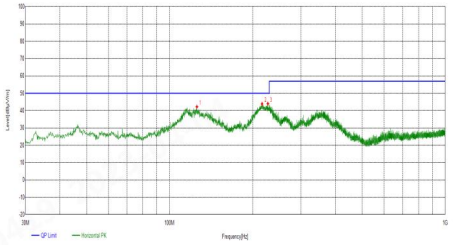
TRACE



Vertical waveform and reading point

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
125.6516	Horizontal	12.63	29.59	42.22	50.00	7.78	PK	100	189	PASS
216.5497	Horizontal	12.08	31.82	43.90	50.00	6.10	PK	100	21	PASS
227.3177	Horizontal	12.46	31.58	44.04	50.00	5.96	PK	100	74	PASS

TRACE



Horizontal waveform and reading point

The test results meet CLASS A standards

APBF1000-48-NS products Safety specifications: CISPR32/EN55032 CLASS A

RE Tc=25℃, Vin=115VAC, Pout=1008W, based on recommended circuit 1 test

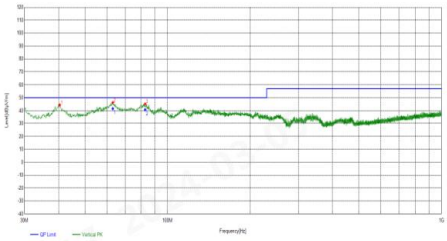
Suspected List

Frequency [MHz]	Polarity	Factor [dB]	Reading [dBµV/m]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Detector	Height [cm]	Angle deg	Pass/Fail
40.38	Vertical	19.92	24.46	44.38	50.00	5.62	PK	100	105	PASS
63.0803	Vertical	19.37	26.82	46.19	50.00	3.81	PK	100	14	PASS
82.7733	Vertical	15.75	29.40	45.15	50.00	4.85	PK	100	214	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
63.0807	Vertical	19.37	41.49	50.00	8.51	350	14	PASS
82.7724	Vertical	15.75	40.68	50.00	9.32	200	214	PASS

TRACE



Vertical waveform and reading point

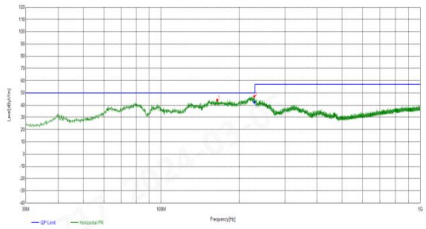
Suspected List

Frequency [MHz]	Polarity	Factor [dB]	Reading [dBµV/m]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Detector	Height [cm]	Angle deg	Pass/Fail
164.4554	Horizontal	20.70	23.55	44.25	50.00	5.75	PK	100	105	PASS
228.6759	Horizontal	18.51	28.68	47.19	50.00	2.81	PK	100	136	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
228.6871	Horizontal	18.51	42.28	50.00	7.72	120	136	PASS

TRACE



Horizontal waveform and reading point

RE Tc=25℃, Vin=230VAC, Pout=1008W, based on recommended circuit 1 test

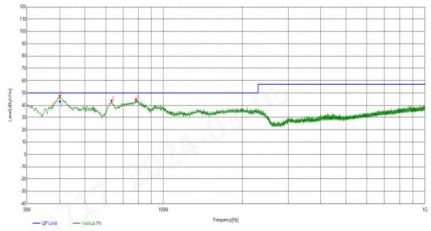
Suspected List

Frequency [MHz]	Polarity	Factor [dB]	Reading [dBµV/m]	Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]	Detector	Height [cm]	Angle deg	Pass/Fail
40.089	Vertical	19.90	27.69	47.59	50.00	2.41	PK	100	117	PASS
63.1773	Vertical	19.37	24.15	43.52	50.00	6.48	PK	100	2	PASS
78.4078	Vertical	16.48	28.08	44.56	50.00	5.44	PK	100	187	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
40.0878	Vertical	19.90	43.03	50.00	6.97	117	117	PASS

TRACE

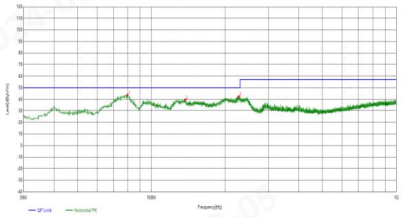


Vertical waveform and reading point

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
79.863	Horizontal	16.17	27.67	43.84	50.00	6.16	PK	100	224	PASS
137.3897	Horizontal	19.85	19.75	39.60	50.00	10.40	PK	100	262	PASS
227.4147	Horizontal	18.46	24.03	42.49	50.00	7.51	PK	100	132	PASS

TRACE



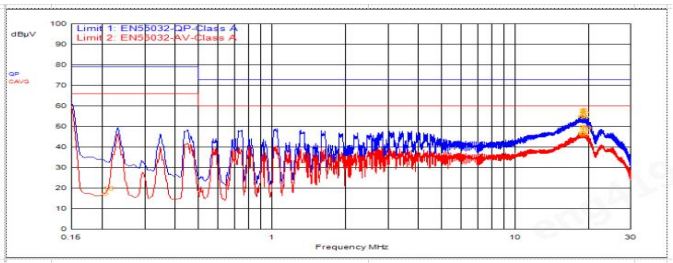
Horizontal waveform and reading point

The test results meet CLASS A standards

(2)Conductive (CE)

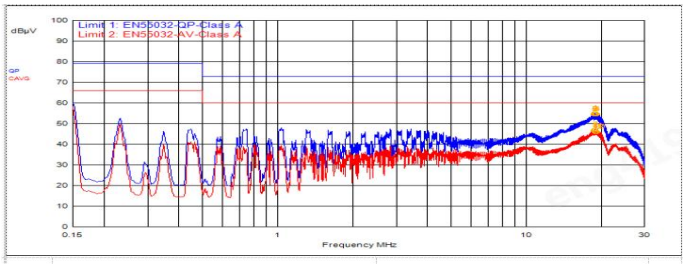
APBF1000-28-NS products　Safety specifications: CISPR32/EN55032　CLASS A

CE Tc=25℃, Vin=115VAC, Pout=1008W, based on recommended circuit 1 test



ID	Frequency	Probe	Cable	Atten.	Detector	Meter Read	Meas Level	Limit	Limit Dist.
14	150.000kHz	0.1	0.2	10.0	C_AVG	49.6	59.9	66.0	-6.1
7	19.074MHz	1.0	0.2	10.0	C_AVG	35.7	46.9	60.0	-13.1
9	18.780MHz	1.0	0.2	10.0	C_AVG	35.7	46.8	60.0	-13.2
8	19.365MHz	1.0	0.2	10.0	C_AVG	35.6	46.7	60.0	-13.3
10	18.945MHz	1.0	0.2	10.0	C_AVG	35.3	46.5	60.0	-13.5
12	19.002MHz	1.0	0.2	10.0	C_AVG	34.8	46.0	60.0	-14.0
11	19.656MHz	1.0	0.2	10.0	C_AVG	34.7	45.9	60.0	-14.1
1	19.074MHz	1.0	0.2	10.0	QPeak	44.0	55.1	73.0	-17.9
2	19.365MHz	1.0	0.2	10.0	QPeak	43.9	55.1	73.0	-17.9
3	18.780MHz	1.0	0.2	10.0	QPeak	43.8	54.9	73.0	-18.1
4	18.945MHz	1.0	0.2	10.0	QPeak	43.5	54.7	73.0	-18.3
5	19.656MHz	1.0	0.2	10.0	QPeak	43.5	54.7	73.0	-18.3
6	19.002MHz	1.0	0.2	10.0	QPeak	43.5	54.7	73.0	-18.3

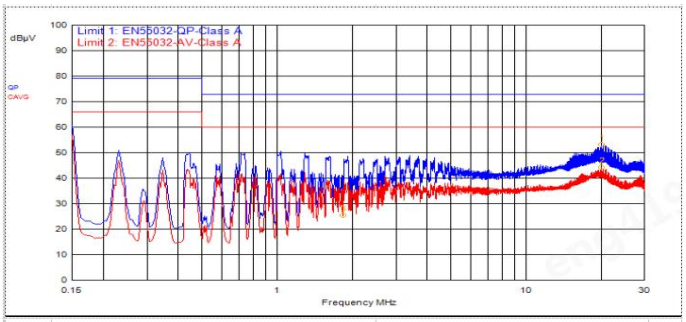
L line



ID	Frequency	Probe	Cable	Atten.	Detector	Meter Read	Meas Level	Limit	Limit Dist.
13	150.000kHz	0.1	0.2	10.0	C_AVG	48.0	58.3	66.0	-7.7
7	19.020MHz	1.0	0.2	10.0	C_AVG	35.9	47.1	60.0	-12.9
11	18.729MHz	1.0	0.2	10.0	C_AVG	35.4	46.5	60.0	-13.5
8	18.891MHz	1.0	0.2	10.0	C_AVG	35.3	46.5	60.0	-13.5
10	19.077MHz	1.0	0.2	10.0	C_AVG	34.9	46.1	60.0	-13.9
9	19.311MHz	1.0	0.2	10.0	C_AVG	34.9	46.0	60.0	-14.0
12	18.948MHz	1.0	0.2	10.0	C_AVG	34.7	45.9	60.0	-14.1
1	19.020MHz	1.0	0.2	10.0	QPeak	43.9	55.1	73.0	-17.9
2	18.891MHz	1.0	0.2	10.0	QPeak	43.5	54.7	73.0	-18.3
3	19.311MHz	1.0	0.2	10.0	QPeak	43.4	54.6	73.0	-18.4
4	19.077MHz	1.0	0.2	10.0	QPeak	43.4	54.6	73.0	-18.4
5	18.729MHz	1.0	0.2	10.0	QPeak	43.4	54.5	73.0	-18.5
6	18.948MHz	1.0	0.2	10.0	QPeak	43.3	54.5	73.0	-18.5

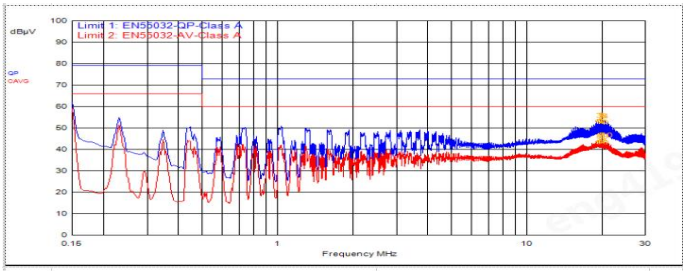
N line

CE Tc=25℃, Vin=230VAC, Pout=1008W, based on recommended circuit 1 test



ID	Frequency	Probe	Cable	Atten.	Detector	Meter Read	Meas Level	Limit	Limit Dist.
4	150.000kHz	0.1	0.2	10.0	C_AVG	46.8	57.1	66.0	-8.9
2	20.238MHz	1.0	0.2	10.0	C_AVG	33.1	44.3	60.0	-15.7
1	20.238MHz	1.0	0.2	10.0	QPeak	41.9	53.1	73.0	-19.9
3	1.836MHz	0.3	0.2	10.0	C_AVG	14.7	25.3	60.0	-34.7

L line



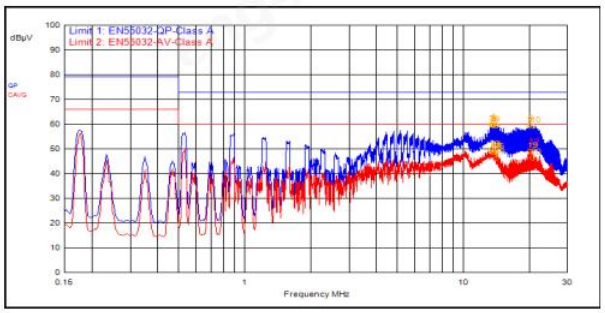
ID	Frequency	Probe	Cable	Atten.	Detector	Meter Read	Meas Level	Limit	Limit Dist.
11	150.000kHz	0.1	0.2	10.0	C_AVG	48.8	59.1	66.0	-6.9
7	20.064MHz	1.0	0.2	10.0	C_AVG	32.7	43.9	60.0	-16.1
10	20.355MHz	1.0	0.2	10.0	C_AVG	32.7	43.9	60.0	-16.1
6	19.776MHz	1.0	0.2	10.0	C_AVG	32.6	43.7	60.0	-16.3
8	19.488MHz	1.0	0.2	10.0	C_AVG	32.4	43.5	60.0	-16.5
9	20.643MHz	1.0	0.2	10.0	C_AVG	32.1	43.3	60.0	-16.7
1	19.776MHz	1.0	0.2	10.0	QPeak	42.3	53.5	73.0	-19.5
2	20.064MHz	1.0	0.2	10.0	QPeak	42.0	53.2	73.0	-19.8
3	19.488MHz	1.0	0.2	10.0	QPeak	41.9	53.1	73.0	-19.9
4	20.643MHz	1.0	0.2	10.0	QPeak	41.8	53.0	73.0	-20.0
5	20.355MHz	1.0	0.2	10.0	QPeak	41.8	53.0	73.0	-20.0

N line

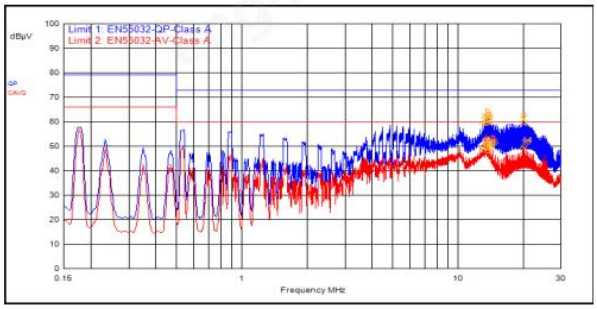
The test results meet the EN55032 CLASS A standard

APBF1000-48-NS products Safety specifications: CISPR32/EN55032 CLASS A

CE Tc=25℃, Vin=115VAC, Pout=1008W, based on recommended circuit 1 test



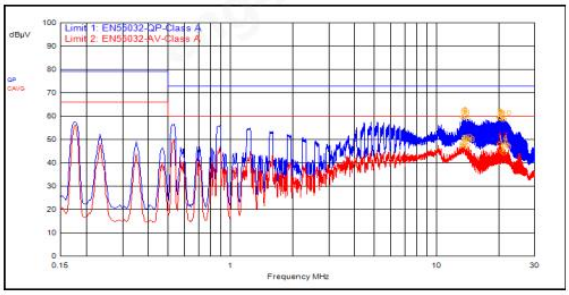
ID	Frequency	Probe	Cable	Atten.	Detector	Meter Read	Meas Level	Limit	Limit Dist.
12	20.256MHz	1.0	0.2	10.0	C_AVG	38.7	49.9	60.0	-10.1
13	13.398MHz	0.9	0.2	10.0	C_AVG	38.5	49.5	60.0	-10.5
11	13.755MHz	0.9	0.2	10.0	C_AVG	38.4	49.5	60.0	-10.5
19	20.187MHz	1.0	0.2	10.0	C_AVG	37.8	49.0	60.0	-11.0
14	13.707MHz	0.9	0.2	10.0	C_AVG	37.6	48.7	60.0	-11.3
15	14.112MHz	0.9	0.2	10.0	C_AVG	37.4	48.5	60.0	-11.5
17	13.659MHz	0.9	0.2	10.0	C_AVG	37.4	48.5	60.0	-11.5
16	13.803MHz	0.9	0.2	10.0	C_AVG	37.4	48.5	60.0	-11.5
1	13.755MHz	0.9	0.2	10.0	QPeak	49.4	60.5	73.0	-12.5
2	20.256MHz	1.0	0.2	10.0	QPeak	48.7	59.9	73.0	-13.1
3	13.398MHz	0.9	0.2	10.0	QPeak	48.6	59.7	73.0	-13.3
4	13.707MHz	0.9	0.2	10.0	QPeak	48.6	59.7	73.0	-13.3
5	14.112MHz	0.9	0.2	10.0	QPeak	48.5	59.5	73.0	-13.5
6	13.803MHz	0.9	0.2	10.0	QPeak	48.4	59.5	73.0	-13.5
20	20.961MHz	1.0	0.2	10.0	C_AVG	35.1	46.4	60.0	-13.6
7	13.659MHz	0.9	0.2	10.0	QPeak	48.2	59.3	73.0	-13.7
8	14.268MHz	0.9	0.2	10.0	QPeak	48.2	59.3	73.0	-13.7
9	20.187MHz	1.0	0.2	10.0	QPeak	48.0	59.2	73.0	-13.8
10	20.961MHz	1.0	0.2	10.0	QPeak	48.0	59.2	73.0	-13.8
18	14.268MHz	0.9	0.2	10.0	C_AVG	35.1	46.2	60.0	-13.8



ID	Frequency	Probe	Cable	Atten.	Detector	Meter Read	Meas Level	Limit	Limit Dist.
11	13.491MHz	0.9	0.2	10.0	C_AVG	39.6	50.7	60.0	-9.3
12	13.851MHz	0.9	0.2	10.0	C_AVG	39.3	50.4	60.0	-9.6
14	20.328MHz	1.0	0.2	10.0	C_AVG	38.9	50.1	60.0	-9.9
17	13.134MHz	0.9	0.2	10.0	C_AVG	38.6	49.7	60.0	-10.3
16	19.971MHz	1.0	0.2	10.0	C_AVG	38.0	49.2	60.0	-10.8
20	13.446MHz	0.9	0.2	10.0	C_AVG	38.1	49.1	60.0	-10.9
13	13.803MHz	0.9	0.2	10.0	C_AVG	38.0	49.1	60.0	-10.9
15	14.211MHz	0.9	0.2	10.0	C_AVG	38.0	49.1	60.0	-10.9
1	13.491MHz	0.9	0.2	10.0	QPeak	50.6	61.7	73.0	-11.3
2	13.851MHz	0.9	0.2	10.0	QPeak	50.3	61.4	73.0	-11.6
19	13.707MHz	0.9	0.2	10.0	C_AVG	36.9	48.0	60.0	-12.0
18	13.755MHz	0.9	0.2	10.0	C_AVG	36.9	47.9	60.0	-12.1
3	13.803MHz	0.9	0.2	10.0	QPeak	49.1	60.2	73.0	-12.8
4	20.328MHz	1.0	0.2	10.0	QPeak	48.9	60.1	73.0	-12.9
5	14.211MHz	0.9	0.2	10.0	QPeak	48.8	59.9	73.0	-13.1
6	19.971MHz	1.0	0.2	10.0	QPeak	48.4	59.6	73.0	-13.4
7	13.134MHz	0.9	0.2	10.0	QPeak	48.5	59.5	73.0	-13.5
8	13.755MHz	0.9	0.2	10.0	QPeak	48.5	59.5	73.0	-13.5
9	13.707MHz	0.9	0.2	10.0	QPeak	48.4	59.5	73.0	-13.5
10	13.446MHz	0.9	0.2	10.0	QPeak	48.3	59.4	73.0	-13.6

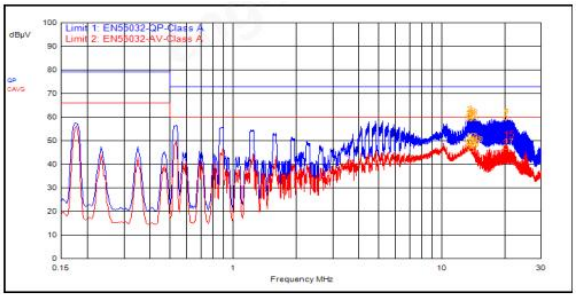
L line N line

CE Tc=25℃, Vin=230VAC, Pout=1008W, based on recommended circuit 1 test



ID	Frequency	Probe	Cable	Atten.	Detector	Meter Read	Meas Level	Limit	Limit Dist.
17	20.187MHz	1.0	0.2	10.0	C_AVG	37.5	48.7	60.0	-11.3
12	13.755MHz	0.9	0.2	10.0	C_AVG	37.2	48.3	60.0	-11.7
15	13.398MHz	0.9	0.2	10.0	C_AVG	37.2	48.2	60.0	-11.8
14	20.259MHz	1.0	0.2	10.0	C_AVG	36.9	48.1	60.0	-11.9
13	13.446MHz	0.9	0.2	10.0	C_AVG	36.4	47.5	60.0	-12.5
18	14.112MHz	0.9	0.2	10.0	C_AVG	36.3	47.3	60.0	-12.7
1	13.803MHz	0.9	0.2	10.0	QPeak	49.1	60.1	73.0	-12.9
11	13.803MHz	0.9	0.2	10.0	C_AVG	36.0	47.1	60.0	-12.9
2	13.755MHz	0.9	0.2	10.0	QPeak	48.8	59.9	73.0	-13.1
3	13.446MHz	0.9	0.2	10.0	QPeak	48.4	59.5	73.0	-13.5
16	20.610MHz	1.0	0.2	10.0	C_AVG	35.2	46.4	60.0	-13.6
4	20.259MHz	1.0	0.2	10.0	QPeak	48.1	59.3	73.0	-13.7
5	13.398MHz	0.9	0.2	10.0	QPeak	48.2	59.3	73.0	-13.7
6	20.610MHz	1.0	0.2	10.0	QPeak	47.9	59.1	73.0	-13.9
7	20.187MHz	1.0	0.2	10.0	QPeak	47.8	59.0	73.0	-14.0
8	14.112MHz	0.9	0.2	10.0	QPeak	47.8	58.9	73.0	-14.1
9	20.961MHz	1.0	0.2	10.0	QPeak	47.4	58.6	73.0	-14.4
10	21.315MHz	1.0	0.2	10.0	QPeak	47.4	58.6	73.0	-14.4
19	20.961MHz	1.0	0.2	10.0	C_AVG	33.6	44.8	60.0	-15.2
20	21.315MHz	1.0	0.2	10.0	C_AVG	33.1	44.3	60.0	-15.7

L line



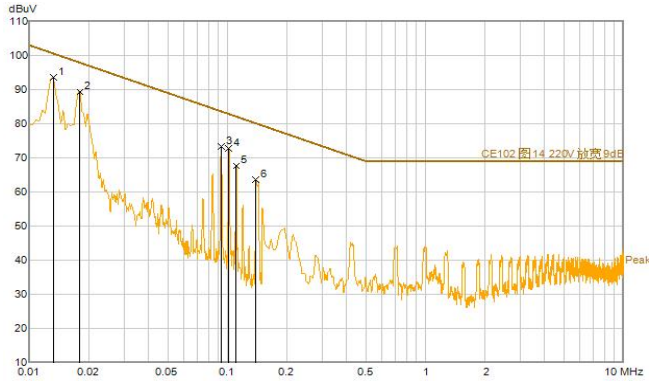
ID	Frequency	Probe	Cable	Atten.	Detector	Meter Read	Meas Level	Limit	Limit Dist.
15	20.256MHz	1.0	0.2	10.0	C_AVG	38.5	49.7	60.0	-10.3
12	13.443MHz	0.9	0.2	10.0	C_AVG	38.4	49.5	60.0	-10.5
11	13.803MHz	0.9	0.2	10.0	C_AVG	38.3	49.4	60.0	-10.6
13	14.160MHz	0.9	0.2	10.0	C_AVG	37.3	48.4	60.0	-11.6
14	13.755MHz	0.9	0.2	10.0	C_AVG	37.0	48.1	60.0	-11.9
1	13.803MHz	0.9	0.2	10.0	QPeak	50.0	61.1	73.0	-11.9
18	14.520MHz	0.9	0.2	10.0	C_AVG	36.8	47.9	60.0	-12.1
16	13.851MHz	0.9	0.2	10.0	C_AVG	36.7	47.8	60.0	-12.2
2	13.443MHz	0.9	0.2	10.0	QPeak	49.5	60.6	73.0	-12.4
17	20.328MHz	1.0	0.2	10.0	C_AVG	35.9	47.1	60.0	-12.9
20	13.491MHz	0.9	0.2	10.0	C_AVG	36.0	47.1	60.0	-12.9
3	14.160MHz	0.9	0.2	10.0	QPeak	49.0	60.1	73.0	-12.9
4	13.755MHz	0.9	0.2	10.0	QPeak	48.6	59.6	73.0	-13.4
5	20.256MHz	1.0	0.2	10.0	QPeak	48.4	59.6	73.0	-13.4
6	13.851MHz	0.9	0.2	10.0	QPeak	48.4	59.5	73.0	-13.5
7	20.328MHz	1.0	0.2	10.0	QPeak	48.1	59.3	73.0	-13.7
19	13.962MHz	0.9	0.2	10.0	C_AVG	35.2	46.3	60.0	-13.7
8	14.520MHz	0.9	0.2	10.0	QPeak	48.2	59.3	73.0	-13.7
9	13.962MHz	0.9	0.2	10.0	QPeak	48.1	59.2	73.0	-13.8
10	13.491MHz	0.9	0.2	10.0	QPeak	48.1	59.1	73.0	-13.9

N line

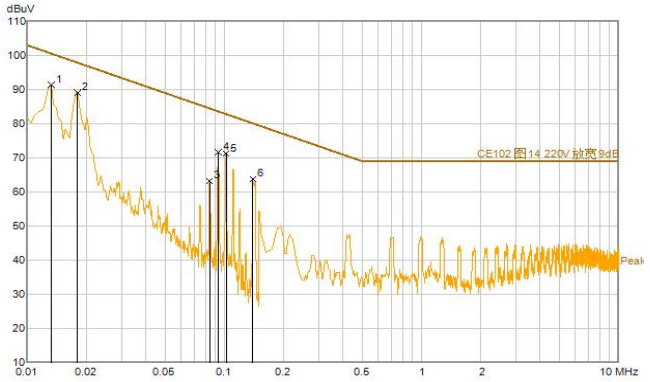
The test results meet the EN55032 CLASS A standard

APBF1000-28-NS products Safety specifications: CE102

CE Tc=25℃, Vin=220VAC, Pout=1008W, based on recommended circuit 2 test



Serial Number	Frequency (MHz)	Read value (dBuV)	Correction factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.0132	63.8	27.57	91.37	100.59	9.22	Peak
2	0.018	63.78	25.4	89.18	97.89	8.71	Peak
3	0.084	42.84	20.43	63.27	84.5	21.23	Peak
4	0.0928	51.25	20.34	71.59	83.64	12.05	Peak
5	0.102	50.98	20.26	71.24	82.82	11.58	Peak
6	0.1392	43.68	20.12	63.8	80.11	16.31	Peak



Serial Number	Frequency (MHz)	Read value (dBuV)	Correction factor (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Remark
1	0.0132	66.13	27.57	93.7	100.59	6.89	Peak
2	0.018	63.99	25.4	89.39	97.89	8.5	Peak
3	0.0928	53.05	20.34	73.39	83.64	10.25	Peak
4	0.1016	52.49	20.26	72.75	82.85	10.1	Peak
5	0.1108	47.51	20.22	67.73	82.1	14.37	Peak
6	0.1392	43.47	20.12	63.59	80.11	16.52	Peak

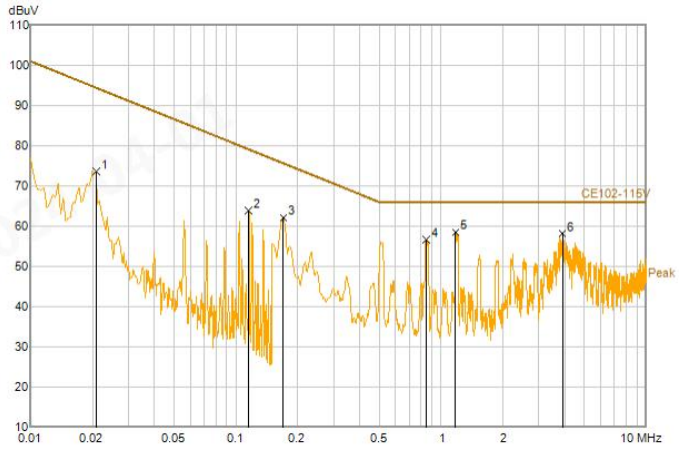
L line

N line

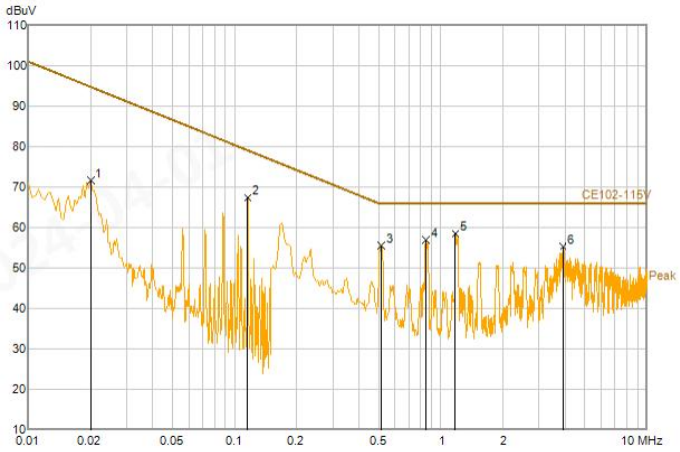
The test results meet the CE102 standard

APBF1000-48-NS products Safety specifications: CE102

CE Tc=25℃, Vin=220VAC, Pout=1008W, based on recommended circuit 2 test



Serial Number	Frequenc (MHz)	Real value (dBuV)	Correction factor (dB)	Result (dBuV)	Limit (dBuV)	Marain (dB)	Remark
1	0.0208	52.36	21.25	73.61	94.45	20.84	Peak
2	0.1156	43.28	20.63	63.91	79.1	15.19	Peak
3	0.17	41.53	20.57	62.1	75.65	13.55	Peak
4	0.846	36.24	20.42	56.66	66	9.34	Peak
5	1.178	38.15	20.4	58.55	66	7.45	Peak
6	3.91	37.78	20.37	58.15	66	7.85	Peak



Serial Number	Frequency (MHz)	Real value (dBuV)	Correction factor (dB)	Result (dBuV)	Limit (dBuV)	Marain (dB)	Remark
1	0.02	50.31	21.38	71.69	94.8	23.11	Peak
2	0.1156	46.83	20.61	67.44	79.1	11.66	Peak
3	0.514	34.96	20.49	55.45	66	10.55	Peak
4	0.846	36.4	20.45	56.85	66	9.15	Peak
5	1.178	38.08	20.44	58.52	66	7.48	Peak
6	3.91	34.92	20.42	55.34	66	10.66	Peak

L line

N line

The test results meet the CE102 standard

4. Appearance specifications

4.1 Manufacturing data/dimensions

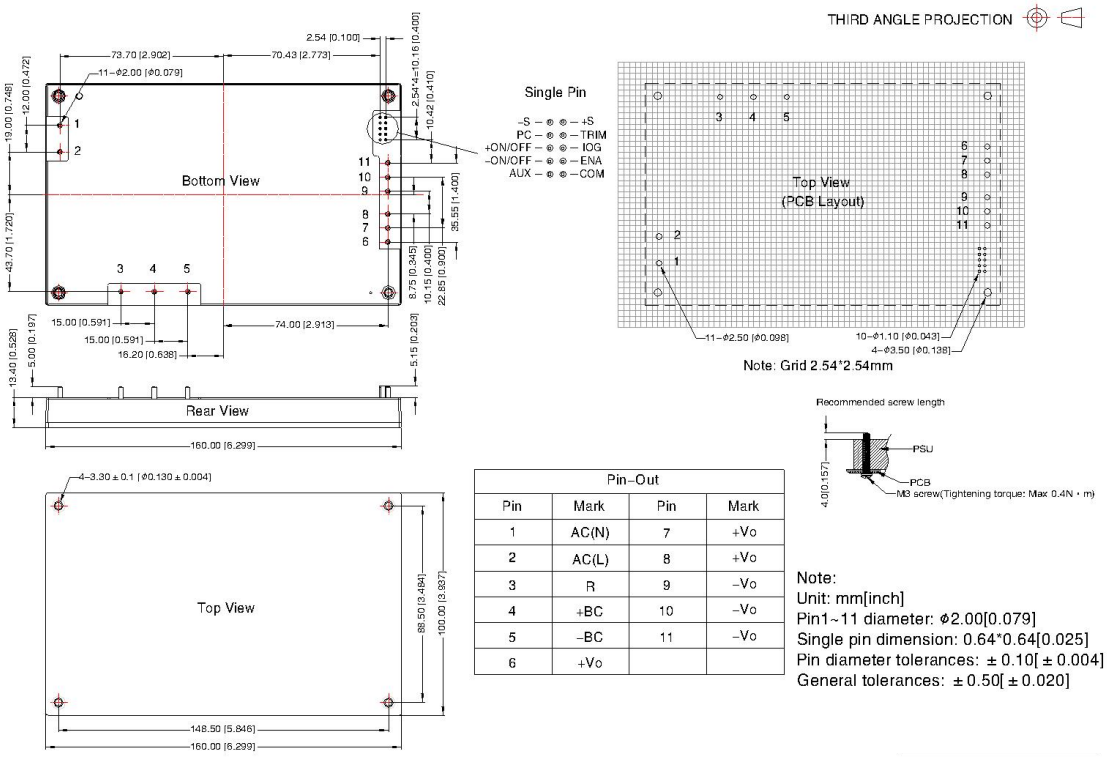
Length: 160.00mm±0.5mm

Width: 100.00mm±0.5mm

Height: 13.40mm±0.5mm

Terminal length: 5.0mm±0.5mm

Weight: 545g±30g



Pin-Out			
Pin	Mark	Pin	Mark
1	AC(N)	7	+Vo
2	AC(L)	8	+Vo
3	R	9	-Vo
4	+BC	10	-Vo
5	-BC	11	-Vo
6	+Vo		

Figure 11: 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.

4.3 Cooling method

Heat dissipation method	Surface heat sink	□

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