VRB-ZP-6W and VRA-ZP-6W series

6W, 1500VDC isolated voltage regulator single/positive/negative output DC-DC module power supply

- Ultra-wide input voltage range：4:1
- Low standby power consumption：0.15W(typ)
- Low ripple noise：75mV(typ)
- Input undervoltage protection
- Output short-circuit protection (self-recovery)
- Operating temperature：-40℃ ~+85℃

This series of module power supply is suitable for the power supply circuit where the input voltage changes greatly and the input and output must be isolated. Its ultra-wide input voltage range (4:1), high stability of the output voltage, low ripple noise, efficient and reliable characteristics, especially suitable for industrial control system power supply, communication system power supply, power monitoring system power supply, instrumentation power supply and other power systems.

Selection list

Model number	Nominal value of input voltage	Input voltage range	Output nominal voltage	Output rated current	Full-load efficiency (%_typ)	Maximum capacitive load (μF)
VRB2403ZP-6W	24V	9.0-36V	3.3V	1500mA	78	3300
VRB2405ZP-6W			5.0V	1200mA	82	2200
VRB2409ZP-6W			9.0V	666mA	85	1000
VRB2412ZP-6W			12V	500mA	86	680
VRB2415ZP-6W			15V	400mA	87	470
VRB2424ZP-6W			24V	250mA	88	330
VRA2405ZP-6W			±5.0V	±600mA	81	±680
VRA2412ZP-6W			±12V	±250mA	85	±330
VRA2415ZP-6W			±15V	±200mA	86	±220
VRA2424ZP-6W			±24V	±125mA	87	±150
VRB4803ZP-6W	48V	18-75V	3.3V	1500mA	78	3300
VRB4805ZP-6W			5.0V	1200mA	82	2200
VRB4809ZP-6W			9.0V	666mA	85	1000
VRB4812ZP-6W			12V	500mA	86	680
VRB4815ZP-6W			15V	400mA	87	470

VRB4824ZP-6W			24V	250mA	88	330
VRA4805ZP-6W			±5.0V	±600mA	81	±680
VRA4812ZP-6W			±12V	±250mA	85	±330
VRA4815ZP-6W			±15V	±200mA	86	±220
VRA4824ZP-6W			±24V	±125mA	87	±150

Product characteristics

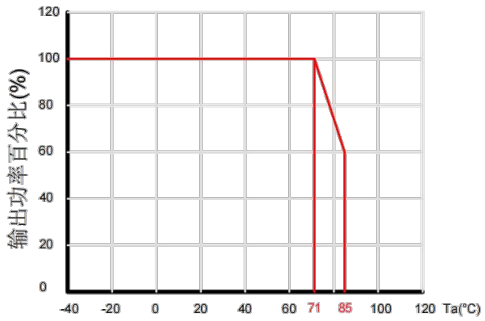
item	Working condition	Min	Typ	Max	unit
Input current (full/no load)	24V nominal input series	--	310/5	--	mA
	48V nominal input series	--	155/3	--	
Starting voltage	24V nominal input series	--	--	9	V
	48V nominal input series	--	--	18	
Start-up time	Nominal input voltage @ Full load (resistive load)	--	10	--	ms
Undervoltage shut off	24V nominal input series	--	7.0	--	V
	48V nominal input series	--	15	--	
Output voltage accuracy	Positive output @0-100% load	-2	±1	+2	%
	Negative output @0-100% load, balancing load	-3	±1.5	+3	
Linear adjustment rate	Positive output @ full load, Vin_min to Vin_max	-0.5	±0.3	+0.5	
	Negative output @ Full load, Vin_min to Vin_max, balancing load	-0.75	±0.5	+0.75	
Load adjustment rate	Positive output @ nominal input, 10%-100% load	-1.0	±0.5	+1.0	
	Negative output @ nominal input, 10%-100% load, balanced load	-1.5	±0.75	+1.5	
Dynamic response deviation	Nominal input @ load 50%-75%-50% variation	--	±5	±8	
Dynamic recovery time	Nominal input @ load 50%-75%-50% variation	--	300	500	μs
Ripple & Noise	20MHz bandwidth @Vin_nom,100% load	--	75	150	mVp-p
Short circuit protection		Sustainable, self-healing			
Overcurrent protection	Vin@Vin_min	110	--	150	%
Coefficient of temperature drift	Nominal input @100% load	--	±0.03		%/℃
Insulation voltage	Input-output, 60 seconds @ leakage current ≤1mA	1500	--	1700	VDC
Insulation resistance	Input-output, test voltage 500VDC	1000	--	--	MΩ
Isolation capacitance	Input-output, 100KHz/0.1V	--	2200	--	pF
Switching frequency	100% load @Vin_nom	--	300	--	KHz

Operating ambient temperature	The temperature derating requirement is met	-40	--	+85	℃
Product working temperature rise	100% load @Vin_nom,Ta=25 ℃	--	35	--	
Storage temperature		-55	--	+125	
Storage humidity	non-condensing	--	--	95	%RH
MTBF	MIL-HDBK-217F@25 ℃	1000	--	--	KHours
Welding temperature	Hand welding	370±10℃@3～5Sec			
	Wave soldering welding	260±10℃@5～10Sec			
Hot swap		nonsupport			
Cooling mode		Natural air cooling			
Housing material		Ferrous metal case			

Product EMC characteristics

EMI	Conduction disturbance	CISPR32/EN55032 CLASS B	
	Radiation disturbance	CISPR32/EN55032 CLASS B	
EMS	Electrostatic discharge	IEC/EN61000-4-2 Contact±4KV	Perf.Criteria B
	Radiation immunity	IEC/EN61000-4-3 10V/m	Perf.Criteria A
	Pulse group immunity	IEC/EN61000-4-4 ±2KV	Perf.Criteria B
	Surge immunity	IEC/EN61000-4-5 line to line ±2KV	Perf.Criteria B
	Conducted disturbance immunity	IEC/EN61000-4-6 3Vrms	Perf.Criteria A
	Voltage dips, drops and short interruption immunity	IEC/EN61000-4-29 0, 70%	Perf.Criteria B
Note: Refer to EMC recommended circuit test			

Product Characteristic Curve 1 (Temperature derating and conversion efficiency)



Temperature derating curve

Precautions for use

1. Consideration of additional input capacitance:

There are a variety of interference noises in the input line of the power supply. The frequency is high, the duration is short, but the peak value is very high. In order to make the power supply work stably and reliably, it is usually necessary to add a suitable absorption capacitance at the input end. In some cases, the lead between the power supply and the power supply on the PCBA board is very long, then it is necessary to connect the filter capacitor near the input pin of the power supply to achieve the effect of impedance matching. The greater the interference noise, the longer the line, the greater the required external capacitance value. We recommend the use of high frequency and low resistance electrolytic capacitors, general application, can be selected according to the recommended value of the "Design reference chapter".

2, the consideration of the output filter capacitance:

In the actual application circuit, the load size of the power supply varies, usually accompanied by large or small changes. In order to adapt it to different use occasions and load requirements, and work more stably and reliably, it is necessary to add a suitable capacitor to the output end of the power supply. On the one hand, to further reduce the output ripple and noise; On the other hand, the output voltage amplitude fluctuation caused by load jump is reduced by applying output capacitance to make the output voltage more stable. However, the output end can not add too large capacity capacitance, the larger the output capacitance, the power supply needs to start the instantaneous current provided by the power supply end will increase, and may even cause its output voltage can not be established; In addition, the capacitance value at the output end is too large, and the power supply is prone to output overshoot when starting. Therefore, in order to make the power supply work more stably and reliably, the output capacitance should be reduced as much as possible when the output voltage fluctuation amplitude caused by the load jump meets the requirements. The maximum capacitive load in the selection list only means that the power supply can start normally when the total capacitance of its output is within this value, and we do not recommend it. We recommend the use of high frequency and low resistance electrolytic capacitors, recommended values please see the "Design reference chapter".

3. Prevent hot swap test or use of the power module:

When the power supply is not disconnected, inserting the power supply into or removing it from the circuit is a hot swap operation. The power supply does not support hot swap during use or testing. Because in the hot swap process, due to the current mutation will produce high voltage spike, it may cause damage; In another case, a mechanical switch is connected in series between the power supply and the input end of the power supply product, and the power supply is controlled on and off by the mechanical switch. The mechanical switch will also produce high voltage spikes during on-off operation, which may also cause damage to the power supply. Power supply products in the test or use process, any operation that will produce high voltage spikes should not be ignored, need to take measures to prevent high voltage spikes directly added to its input, refer to the "Design reference chapter".

4, input high transient voltage peak protection:

If the product is used in an environment with harsh electromagnetic interference, for example, the input end of the product shares the power supply with the inductive load, or the power supply end

When the current loop is on/off, if not handled properly, there will be a high transient voltage spike in the power supply circuit, this interference is not dealt with, and too high peak voltage enters the product input, which is likely to cause product damage. The suppression of high voltage spikes is very important to ensure the stable and reliable use of the product. Commonly used transient voltage suppression devices are varistor (MOV), transient voltage suppression diode (TVS) and so on. Different devices have advantages and disadvantages, please choose according to the use of the occasion and requirements, refer to the "Design reference chapter".

5, positive and negative output load balance requirements:

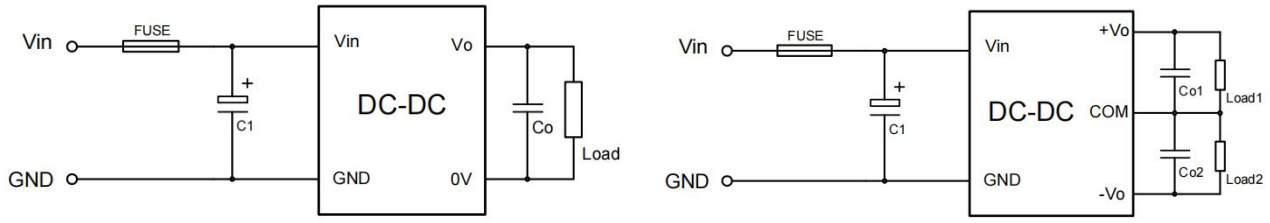
The actual load of the positive and negative output products usually has an imbalance between the two loads. In this case, the voltage of the negative output will change with the change of the load of the two channels. When the main load is constant, the negative output voltage will increase with the decrease of the load and decrease with the increase of the load. When the negative output load is constant, the negative output voltage decreases with the decrease of the positive output load and increases with the increase of the positive output load. If the positive output load is much smaller than the negative output load, it will even cause the product to not work properly. In practical applications, it is necessary to fully consider whether the extreme situation of the two-way load meets the requirements, and improve the balance of the two-way load as much as possible to make the product work more stable and reliable.

6, input polarity and output power expansion:

The inputend ofthe productshas no anti-reverse protection,please note:the inputpolarity willcause damage to the product when in use. To achieve anti-reverse or non-polar use without damaging the product, a diode or rectifier bridge can be connected in series at the input end, refer to the "Design Reference section"; In addition, the product does not support output parallel to achieve output power expansion, please choose our higher power level products.

Design reference

1、 Application circuit：



Vin	C1	Vo	Co	Vo	Co/Co1/Co2
24V	470uF/50V	3.3V	470uF/10V	24V	100uF/35V
48V	220uF/100V	5V	470uF/16V	±5V	±220uF/16V
		9V	330uF/25V	±12V	±100uF/25V
		12V	220uF/25V	±15V	±100uF/35V
		15V	220uF/25V	±24V	±47uF/50V

External capacitance values (Table 1)

Note: The input and output capacitors are recommended to use high-frequency and low-resistance electrolytic capacitors, whose capacity values can be referred to (Table 1), and the output capacitors can also use MLCC capacitors. The external capacitance should be as close as possible to the input and output pins of the product; In addition to the use of high-frequency electrolytic capacitors, a 0.1uF chip capacitor is added.

The input anti-reverse connection function can be realized by using the circuit in Figure (1). The non-polar input can be used by using the circuit in Figure (2). Among them, diode D1 is recommended to use a

Schottky diode with a small on-voltage drop, and rectifier bridge BD1 is recommended to use a low-voltage drop rectifier bridge. If the conduction pressure drop is large, the loss is large and the heat is serious during use. The rated voltage and current of diode D1 and rectifier bridge BD1 should have sufficient margin, and the current must meet the temperature derating requirements.

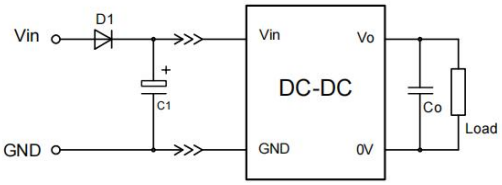


Figure (1)

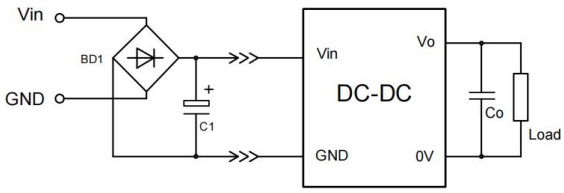
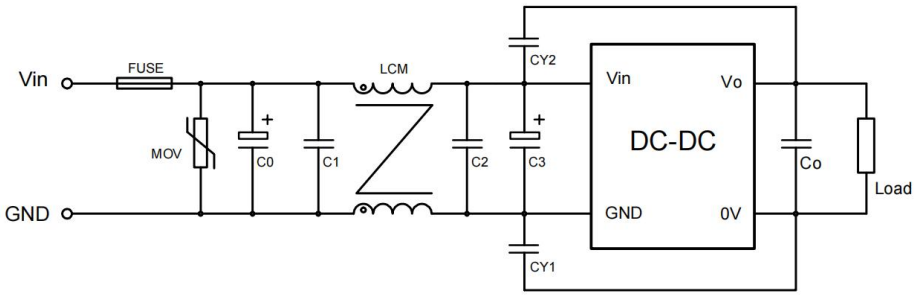
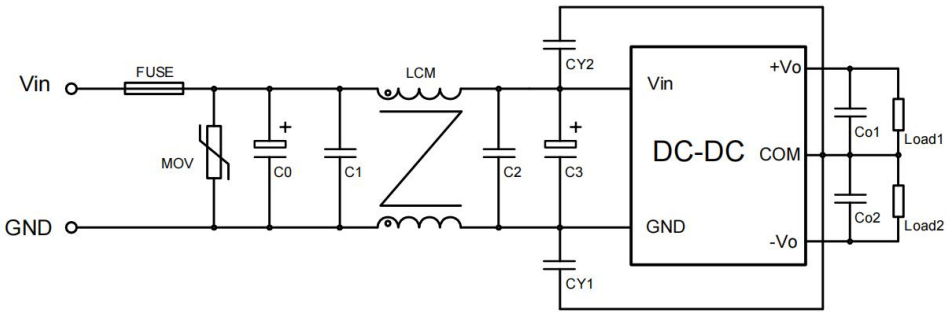


Figure (2)

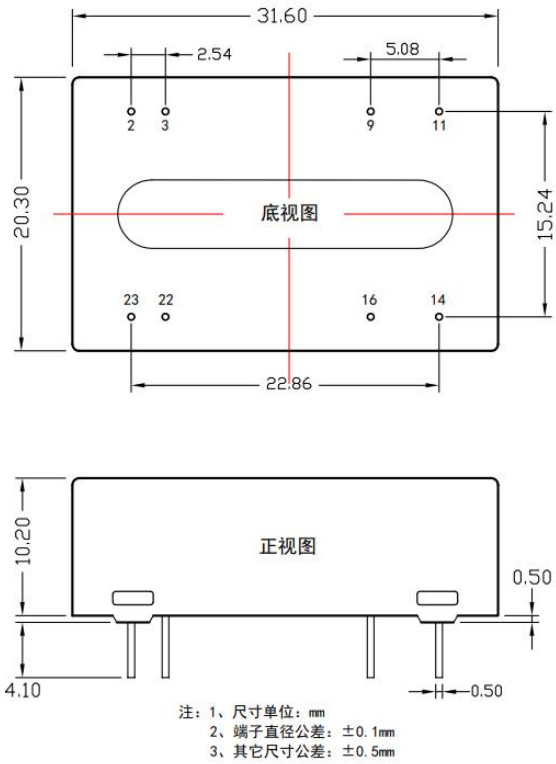
3、EMC Recommended circuit:



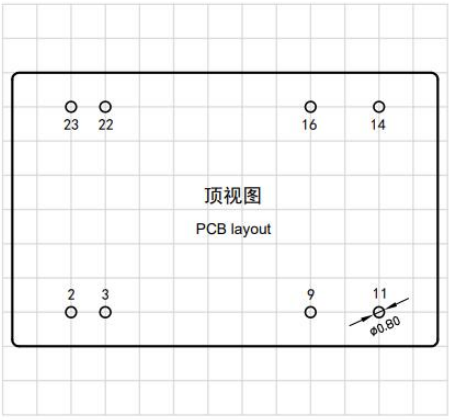


Component parameter description：		
Component code	PA(B)24xxMP-6WN	PA(B)48xxMP-6WN
FUSE	Select according to the actual current size	
MOV	20D470K	14D101K
C0 C3	470uF/50V	220uF/100V
C1 C2	4.7uF/50V	4.7uF/100V
LCM	10mH	10mH
CY1 CY2	2.2nF/2KV	2.2nF/2KV
Co Co1 Co2	Select according to (Table 1)	

Appearance size and pin function



引脚	单路	正负
2，3	-Vin	-Vin
9	No Pin	0V
11	NC	-Vo
14	+Vo	+Vo
16	0V	0V
22，23	+Vin	+Vin



栅格的距离为2.54*2.54mm

Note:

1. For specific packaging information, please refer to the "Product Shipping Packaging Instructions";
2. If the working load of the product is lower than the minimum load requirements, we cannot guarantee that the product performance can meet all performance indicators;
3. The maximum capacitive load is tested in the input voltage range and under full load conditions;

4. Unless otherwise specified, all indicators in this manual are measured at Ta=25℃, humidity <75%RH, nominal input voltage and rated output load;
5. All index test methods in this manual are based on the company's enterprise standards;
6. Our company can provide product customization, specific circumstances can directly contact our technical personnel;
7. Products related to laws and regulations: see "Product Characteristics", "EMC characteristics";
8. Our products shall be classified and stored in accordance with ISO14001 and relevant environmental laws and regulations after scrapping, and handed over to qualified units.