URB-LD-20W Series

20W,1500VDC isolated voltage regulator single-output DC-DC module power supply

- 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)
- Output ON/OFF remote control
- The output voltage can be fine-tuned
- 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)
URB2403LD-20W	24V	9-36V	3.3V	5000mA	85	6000
URB2405LD-20W			5.0V	4000mA	87	4000
URB2409LD-20W			9.0V	2222mA	87	2000
URB2412LD-20W			12V	1666mA	89	1000
URB2415LD-20W			15V	1333mA	89	820
URB2424LD-20W			24V	833mA	91	680
URB4803LD-20W	48V	18-75V	3.3V	5000mA	85	6000
URB4805LD-20W			5.0V	4000mA	87	4000
URB4809LD-20W			9.0V	2222mA	87	2000
URB4812LD-20W			12V	1666mA	89	1000
URB4815LD-20W			15V	1333mA	89	820
URB4824LD-20W			24V	833mA	91	680
URB11005LD-20W	110V	40-160V	5V	4000mA	86	4000

URB11012LD-20W			12V	1666mA	88	1000
URB11015LD-20W			15V	1333mA	88	820
URB11024LD-20W			24V	833mA	89	680

Product characteristics

item	Working condition	Min	Typ	Max	unit
Input current (full/no load)	24V nominal input series	--	946/5	--	mA
	48V nominal input series	--	473/3	--	
	110V nominal input series	--	209/2	--	
Starting voltage	24V nominal input series	--	--	9	V
	48V nominal input series	--	--	18	
	110V nominal input series	--	--	40	
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	--	16	--	
	110V nominal input series	--	36	--	
Remote control output ON/OFF	Module output ON (ON)	Ctrl pin suspended or connected to high level (2.5V-Vin)			
	Module output OFF (OFF)	Ctrl pin GND or low (0-0.5V)			
	Input current when turned off	--	2	--	mA
Output voltage accuracy	0-100% load	-2	±1	+2	%
Output voltage adjustable (TRIM)	Percentage of the nominal output voltage value	90	--	110	
Linear adjustment rate	Full load, Vin_min to Vin_max	-0.5	±0.3	+0.5	
Load adjustment rate	Nominal input, 10%-100% load	-1.0	±0.5	+1.0	
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

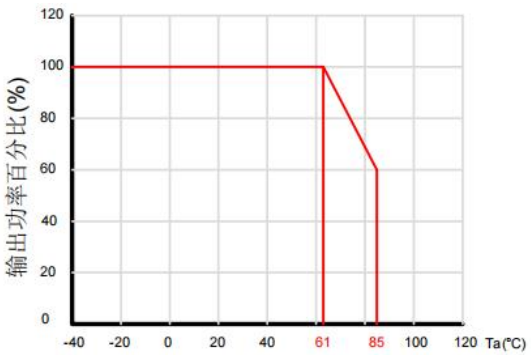
Switching frequency	100% load @Vin_nom	--	300	--	KHz
Operating ambient temperature	The temperature derating requirement is met	-40	--	+85	℃
Product working temperature rise	100% load @Vin_nom,Ta=25℃	--	40	--	
Storage temperature		-55	--	+125	
Storage humidity	non-condensing	--	--	95	%RH
MTBF	MIL-HDBK-217F@25℃	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			
Pin material		Brass, finish: mist tin			

Product EMC characteristics

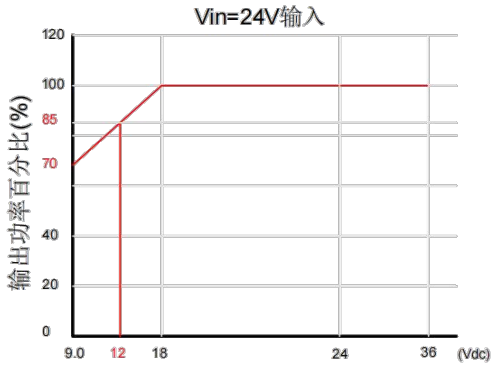
EMI	Conduction disturbance	CISPR32/EN55032 CLASS B		
	Radiation disturbance	CISPR32/EN55032 CLASS A		
EMS	Electrostatic discharge	IEC/EN61000-4-2	Contact±4KV	Perf.Criteria B
	Radiation immunity	IEC/EN61000-4-3	10V/m	Perf.Criteria A
	Pulse group immunity	IEC/EN61000-4-4	±2KV	Perf.Criteria B
	Surge immunity	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

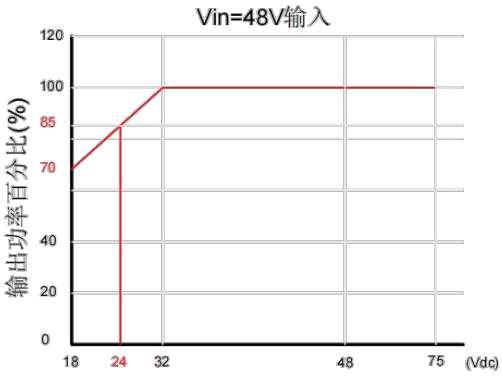
Product derating curve



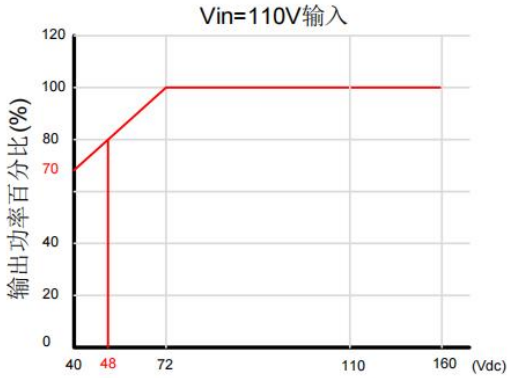
Temperature derating curve



Temperature derating curve



Input voltage derating curve



Input voltage 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".

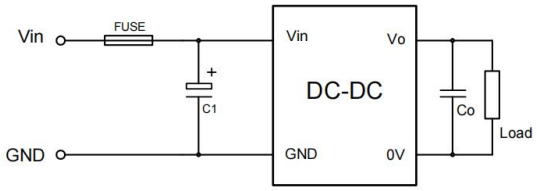
5, input polarity and output power expansion:

The input end of the product has no anti-reverse protection, please note: the input polarity will cause 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
24V	470uF/50V	3.3V，5V	470uF/16V
48V	100uF/100V	9V	330uF/16V
110V	47uF/200V	12V，15V	220uF/25V
		24V	100uF/35V

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.

2、Input anti-reverse application circuit:

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.

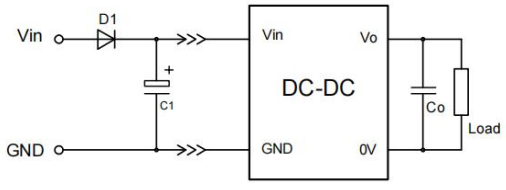


Figure (1)

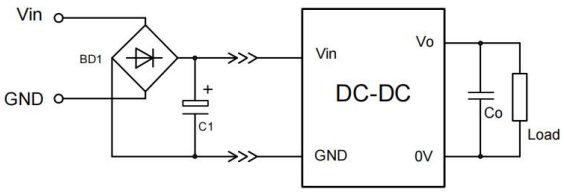


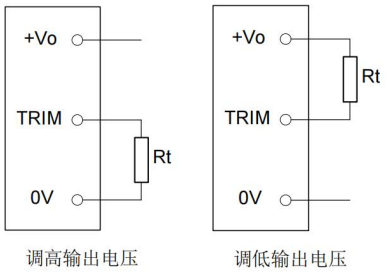
Figure (2)

2、 Ctrl pin function:

The product has an output ON/OFF control function, which is achieved by controlling the level of the "Ctrl" pin (with -Vin as the reference zero potential). When the "Ctrl" pin is suspended or connected to high power level, the product output is normal; When the "Ctrl" pin is connected to "-Vin" or low power level, the product output is turned off. This pin can be directly connected to the TTL control circuit.

4、TRIM pin function:

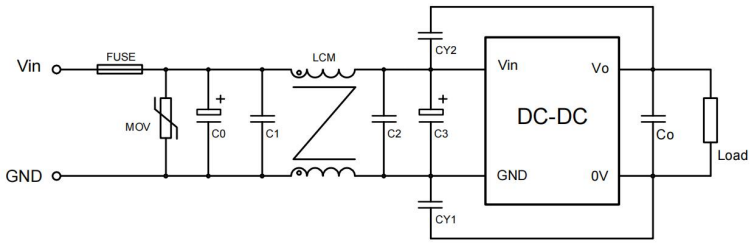
The product has the function of output voltage adjustment, which is realized by adjusting the series resistance value of the "TRIM" pin. Note that if you want to lower the output voltage value, it must be controlled at 90% or more of the nominal output voltage; The maximum output voltage adjustable is 110% of the nominal output voltage. The use of TRIM and the calculation of resistance are as follows:



Nominal output voltage	To adjust the output voltage (Vo) calculation formula:	
	Turn up	Turn down
3.3V	(29.83+3.3Rt)/(8.2+Rt)	(29.83+3.3Rt)/(10.2+Rt)
5.0V	(110.1+5.0Rt)/(20+Rt)	(110.1+5.0Rt)/(23.92+Rt)
9.0V	(268.74+9.0Rt)/(27+Rt)	(268.74+9.0Rt)/(37+Rt)
12V	(435.69+12Rt)/(33+Rt)	(435.69+12Rt)/(48+Rt)
15V	(546.12+15Rt)/(33+Rt)	(546.12+15Rt)/(52.6+Rt)
24V	(1885.5+24Rt)/(75+Rt)	(1885.5+24Rt)/(108+Rt)

5、EMC Recommended circuit:

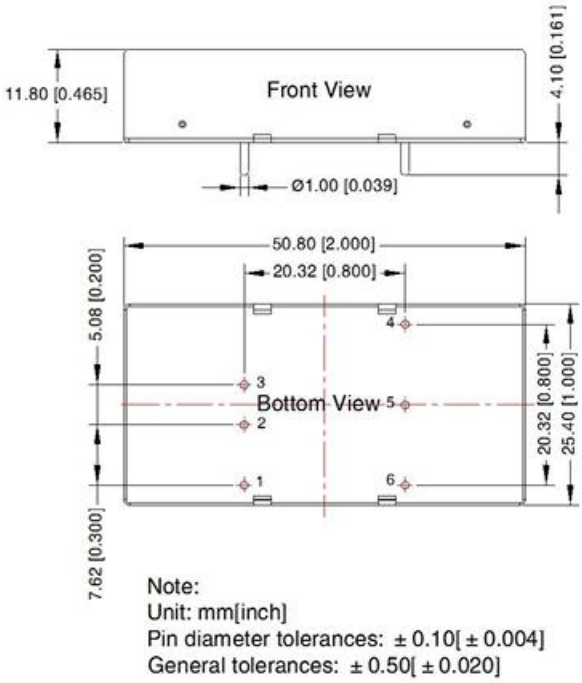
When the product is measured for EMC characteristics, it is measured according to the following circuit parameters, which can be changed according to the actual needs in the circuit application.

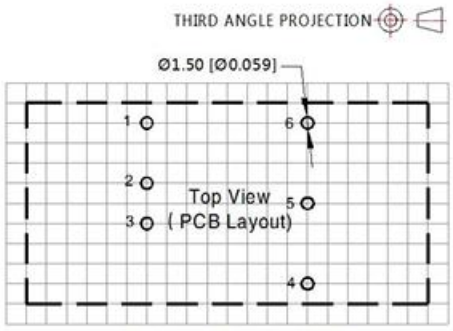


Component parameter description：			
Component code	URB24xxLD-20W	URB48xxLD-20W	URB110xxLD-20W
FUSE	Select according to the actual current size		
MOV	20D470K	14D101K	14D201K

C0 C3	470uF/50V	220uF/100V	47uF/200V
C1 C2	4.7uF/50V	4.7uF/100V	2.2uF/200V
LCM	2mH	4.7mH	10mH
CY1 CY2	2.2nF/2KV	2.2nF/2KV	2.2nF/2KV
Co Co1 Co2	Select according to (Table 1)		

Appearance size and pin function





Pin–Out		
Pin	Single	Dual
1	Ctrl	Ctrl
2	GND	GND
3	Vin	Vin
4	+Vo	+Vo
5	Trim	0V
6	0V	–Vo

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 under the condition of input voltage range, full load and electronic load CR mode;
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.