

Features/产品特点

- 1. Wide voltage range input (2:1)
- 2. Standby power consumption: 0.3W
- 3. Working temperature range: -40 °C to+105 °C
- 4. Up to 91% efficiency
- 5. Output short circuit, overcurrent, overload protection
- 6. International standard pins, PCB board direct installation

- 1. 宽电压范围输入 (2:1)
- 2. 待机功耗：0.3W
- 3. 工作温度范围：-40℃至+105℃
- 4. 效率高达91%
- 5. 输出短路，过流，过载保护
- 6. 国际标准引脚，PCB 板直插安装

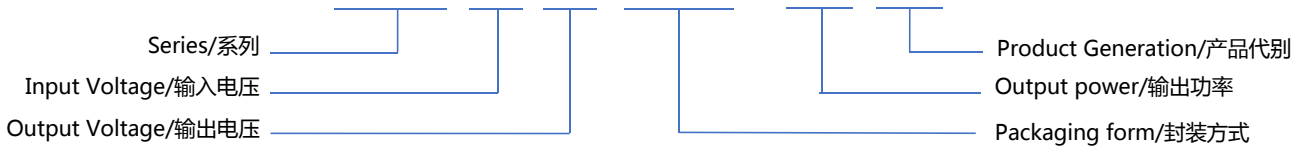
Description/概述

DC-DC module power supply, Wide voltage input, Power 20W, Isolated, Regulated, Single output, DIP packaging

DC-DC 模块电源，宽电压输入，功率20W，隔离，稳压，单路输出，DIP 封装

Model Numbering/命名规则

VRBxxxxYMD-20WR3



Selection Guide/选型表

产品型号 Product model	输入电压 Input Voltage Standard value(range)	输出电压 Output Voltage	输出电流 Output Current (mA) (Max./Min.)	效率 Efficiency % (Min./Typ.)	最大容性负载 Maximum capacitive load (μF)
VRB1203YMD-20WR3	12VDC (9-18)	3.3VDC	5000/0	86/88	10000
VRB1205YMD-20WR3	12VDC (9-18)	5VDC	4000/0	88/90	10000
VRB1209YMD-20WR3	12VDC (9-18)	9VDC	2222/0	87/89	10000
VRB1212YMD-20WR3	12VDC (9-18)	12VDC	1667/0	88/90	1600
VRB1215YMD-20WR3	12VDC (9-18)	15VDC	1333/0	87/89	1000
VRB1224YMD-20WR3	12VDC (9-18)	24VDC	833/0	89/91	500

Power Solutions

DC-DC Converters/转换器

VRB_YMD-20WR3

Series/系列

3rd generation chip solution

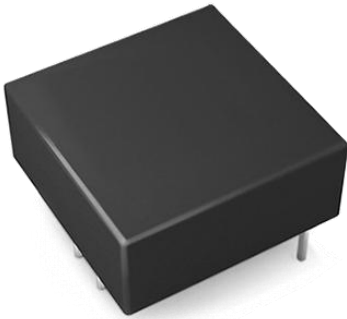
第3代芯片方案

3-year quality assurance

3年超长质保

3rd generation manufacturing process

第3代制造工艺



DC-DC Converters/转换器

产品型号 Product model	输入电压 Input Voltage Standard value(range)	输出电压 Output Voltage	输出电流 Output Current (mA) (Max./Min.)	效率 Efficiency % (Min./Typ.)	最大容性负载 Maximum capacitive load (μ F)
VRB2403YMD-20WR3	24VDC (18-36)	3.3VDC	5000/0	86/88	10000
VRB2405YMD-20WR3	24VDC (18-36)	5VDC	4000/0	88/90	10000
VRB2409YMD-20WR3	24VDC (18-36)	9VDC	2222/0	87/89	10000
VRB2412YMD-20WR3	24VDC (18-36)	12VDC	1667/0	88/90	1600
VRB2415YMD-20WR3	24VDC (18-36)	15VDC	1333/0	87/89	1000
VRB2424YMD-20WR3	24VDC (18-36)	24VDC	833/0	89/91	500

产品型号 Product model	输入电压 Input Voltage Standard value(range)	输出电压 Output Voltage	输出电流 Output Current (mA) (Max./Min.)	效率 Efficiency % (Min./Typ.)	最大容性负载 Maximum capacitive load (μ F)
VRB4803YMD-20WR3	48VDC (36-72)	3.3VDC	5000/0	86/88	10000
VRB4805YMD-20WR3	48VDC (36-72)	5VDC	4000/0	88/90	10000
VRB4809YMD-20WR3	48VDC (36-72)	9VDC	2222/0	87/89	10000
VRB4812YMD-20WR3	48VDC (36-72)	12VDC	1667/0	88/90	1600
VRB4815YMD-20WR3	48VDC (36-72)	15VDC	1333/0	87/89	1000
VRB4824YMD-20WR3	48VDC (36-72)	24VDC	833/0	89/91	500

Input Characteristics/输入特性

Parameter/参数	Conditions/测试条件	Min.	Typ.	Max.	Units
Input current (Rated Load) 输入电流 (额定负载)	12VDC Nominal voltage input 12VDC标称电压输入	--	1550	1900	mA
	24VDC Nominal voltage input 24VDC标称电压输入	--	780	960	mA
	48VDC Nominal voltage input 48VDC标称电压输入	--	390	470	mA
Input current (No-load) 输入电流 (空载)	12VDC Nominal voltage input 12VDC标称电压输入	--	25	30	mA
	24VDC Nominal voltage input 24VDC标称电压输入	--	10	15	mA
	48VDC Nominal voltage input 48VDC标称电压输入	--	6	9	mA
Reflected ripple current 反射纹波电流		30	40	50	mA

DC-DC Converters/转换器

Parameter/参数	Conditions/测试条件		Min.	Typ.	Max.	Units
Input impulse voltage 输入冲击电压	12VDC Nominal voltage input 12VDC标称电压输入		-0.7	--	25	VDC
	24VDC Nominal voltage input 24VDC标称电压输入		-0.7	--	50	VDC
	48VDC Nominal voltage input 48VDC标称电压输入		-0.7	--	100	VDC
Starting voltage 启动电压	12VDC Nominal voltage input 12VDC标称电压输入		--	--	9	VDC
	24VDC Nominal voltage input 24VDC标称电压输入		--	--	9	VDC
	48VDC Nominal voltage input 48VDC标称电压输入		--	--	18	VDC
Under voltage protect 输入欠压保护	12VDC Nominal voltage input 12VDC标称电压输入		5.5	6.5	--	VDC
	24VDC Nominal voltage input 24VDC标称电压输入		5.5	6.5	--	VDC
	48VDC Nominal voltage input 48VDC标称电压输入		12	15.5	--	VDC
Start Time 启动时间			--	10	--	ms
Remote control foot 遥控脚（ Ctrl ） （ Some models are applicable ） （ 部分型号适用 ）	Module On 模块开启	Ctrl hovering or connected to TTL high level (3.5-12VDC) Ctrl 悬空或接TTL 高电平(3.5-12VDC)				
	Module shutdown 模块关断	Ctrl connected to GND or low level (0-1.2VDC) Ctrl 接 GND 或低电平(0-1.2VDC)				
	Input current during shutdown 关断时输入电流		--	6	10	mA
Input filter 输入滤波类型	PI type PI 型					
Remarks/备注: This product does not support hot plug /此产品不支持热插拔						

Output Characteristic/输出特性

Parameter/参数	Conditions/测试条件	Min.	Typ.	Max.	Units
Output voltage accuracy 输出电压精度	0% -100% Load 0% -100%负载	--	±1	±3	%
Linear regulation rate 线性调节率	Input voltage variation± 1% 输入电压变化±1%	--	±0.2	±0.5	%
Load regulation rate 负载调节率	10% to 100% load 10%-100% 负载	--	±0.5	±1	%
Ripple & Noise 波纹和噪声	Pure resistive load, 20MHz bandwidth 纯电阻负载, 20MHz 带宽	--	50	100	mVp-p
Dynamic response step deviation 动态响应阶跃偏差		--	±3	±8	%
Dynamic response recovery time 动态响应恢复时间			300	500	μs
Temperature drift coefficient 温度漂移系数	100% load 满载	--	±0.03	--	%/°C

DC-DC Converters/转换器

Parameter/参数	Conditions/测试条件	Min.	Typ.	Max.	Units
Output overvoltage protection 输出过压保护	Full voltage range input 全电压范围输入	110	--	160	%Vo
Output overcurrent protection 输出过流保护	Full voltage range input 全电压范围输入	110	150	190	%Io
Short Circuit Protection 输出短路保护	Full voltage range input 全电压范围输入	Sustainable, Self-healing 可持续、自恢复			

Note: 1) For product models with output voltages of $\pm 5\text{VDC}$ and $\pm 9\text{VDC}$, the maximum output voltage accuracy is $\pm 5\%$ under 0% -5% load conditions;
2) When tested under 0% -100% load working conditions, the indicator of load adjustment rate is $\pm 5\%$;
3) 0% -5% load ripple&noise less than or equal to 5% Vo. The twisted pair test method for ripple and noise can add capacitive load at the output end to reduce light load ripple.

注：1) 输出电压为 $\pm 5\text{VDC}$ 、 $\pm 9\text{VDC}$ 的产品型号，在 0%-5%负载条件下，输出电压精度最大值为 $\pm 5\%$ ；
2) 按 0%-100%负载工作条件测试时，负载调整率的指标为 $\pm 5\%$ ；
3) 0%-5%的负载纹波&噪声小于等于 5%Vo.纹波和噪声的测试方法双绞线测试法，可以在输出端加容性负载降低轻载纹波。

General Characteristics/通用特性

Parameter/参数	Conditions/测试条件	Min.	Typ.	Max.	Units
Isolation voltage 隔离电压	Input-output, Test time 1 minute, Leakage current less than 1 mA 输入-输出，测试时间1分钟，漏电流小于1 mA	1500	--	--	VDC
Insulation resistance 绝缘电阻	Input-output, Insulation voltage 500VDC 输入-输出，绝缘电压500VDC	1000	--	--	MΩ
Isolation capacitance 隔离电容	Input-output, 100KHz/0.1V 输入-输出，100KHz/0.1V	--	2000	--	pF
Working temperature 工作温度	Temperature $\geq 71\text{ }^{\circ}\text{C}$ for derating (See Figure 4) 温度 $\geq 71^{\circ}\text{C}$ 时，降额使用（见图4）	-40	--	+105	$^{\circ}\text{C}$
Storage temperature 储存温度		-55	--	+125	$^{\circ}\text{C}$
Storage humidity 储存湿度	Non condensing 无凝结	--	--	95	%RH
Maximum temperature of the casing during operation 工作最大壳温	Ta=25 $^{\circ}\text{C}$, Nominal input, Full output Ta=25 $^{\circ}\text{C}$ ，标称电压输入，满载	--	--	100	$^{\circ}\text{C}$
Soldering temperature resistance of pins 引脚耐焊接温度	The distance from the welding spot to the shell is 1.5mm, 10 seconds 焊点到壳体的距离为1.5mm，10秒	--	300	--	$^{\circ}\text{C}$
Switching frequency 开关频率	Full load, Nominal input voltage 满载，标称输入电压	--	270	--	kHz
Vibrate 振动		10- 55Hz,10G,30Min.alongX,YandZ			
Mean time between failures 【MTBF】 平均无故障时间	MIL-HDBK-217F@25 $^{\circ}\text{C}$	1000	--	--	kHours

Physical Characteristics/物理特性

Parameter/参数	Content/内容
Housing material 外壳材料	Aluminum alloy 铝合金
Overall dimensions 外形尺寸	25.40 × 25.40 × 11.70 mm
Weight 重量	15g(Typ.)
Cooling mode 冷却方式	Natural air cooling 自然空冷

EMC Characteristics/EMC特性

Parameter	Category	Content	
EMI	Conductive distVRBance 传导骚扰	CISPR32/EN55032 CLASS A (裸机/Bare machine) CLASS B (推荐电路/Recommended circuit)	
	Radiation distVRBance 辐射骚扰	CISPR32/EN55032 CLASS A (裸机/Bare machine) CLASS B (推荐电路/Recommended circuit)	
EMS	Electrostatic Discharge 静电放电	IEC/EN61000-4-2 Contact ±4kV	perf. CriteriaB
	Radiated Immunity 辐射抗扰度	IEC/EN61000-4-3 10V/m	perf. CriteriaA
	Pulse group Immunity 脉冲群抗扰度	IEC/EN61000-4-4 ±2kV	perf. CriteriaB
	Surge Immunity 浪涌抗扰度	IEC/EN61000-4-5 line to line ±2kV	perf. CriteriaB
	Conducted distVRBance immunity 传导骚扰抗扰度	IEC/EN61000-4-6 3 Vr.m.s	perf. CriteriaA
	Voltage dips, and short-term interruptions immunity 电压骤降和短期中断抗扰度	IEC/EN61000-4-29 0%, 70%	perf. CriteriaB

Circuit Design and Application/电路设计与应用

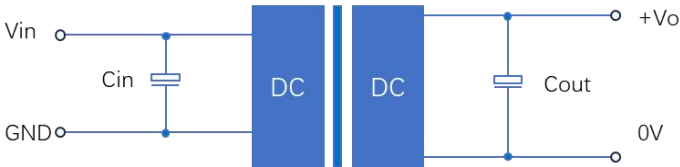


Figure 1: Application circuit
图1：应用电路

Table 1:
Recommended Capacitive Load Values
推荐电容负载值

Vin(VDC)	Cin(μF)	Vo(VDC)	Cout(μF)
Nominal voltage 标称电压	100	Nominal voltage 标称电压	10

DC-DC Converters/转换器

Figure 2: EMC Typical Recommended Circuits
图2:EMC典型推荐电路

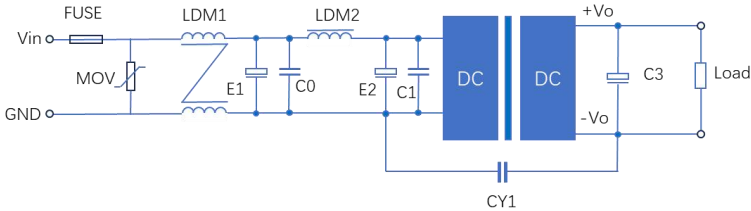
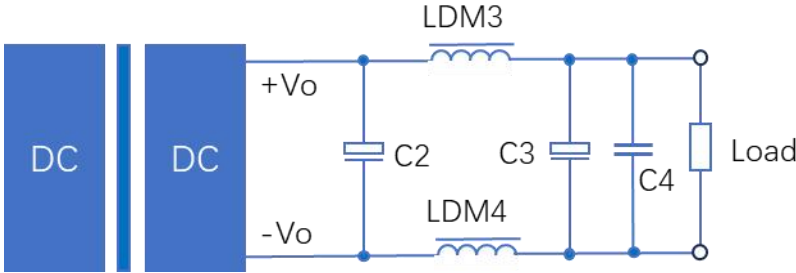


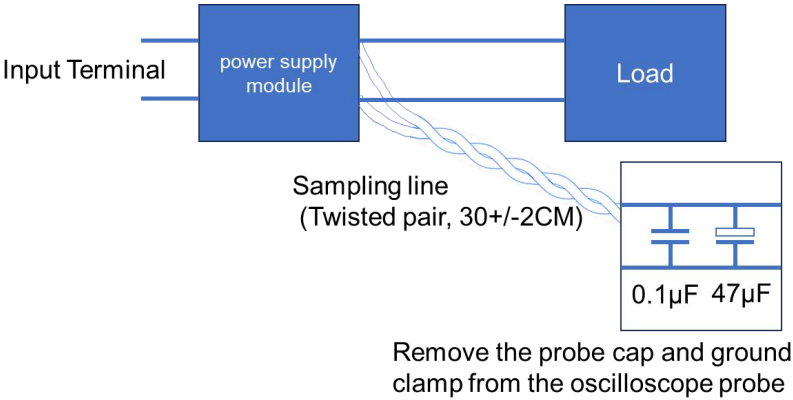
Table 2:
Recommended Circuit Parameter Values
推荐电路参数

Category	Component	Value
EMI	MOV	14D560K
	E1/E2	100μF
	C0/C1	1μF
	CY1	1nF/2KV
	LDM1	10mH
	LDM2	10μH

Figure 3: Ripple application and testing
图3:纹波应用及测试



When using in situations with strict requirements for ripple and noise, it is recommended to use the circuit shown in the figure above.
在对纹波和噪声有严格要求的情况下使用时，建议使用上图所示的电路。



The testing method for ripple and noise is to use a 12 # twisted pair connection, with an oscilloscope bandwidth of 20MHZ and a 100M bandwidth oscilloscope probe. The capacitor shown in the above figure is connected in parallel to the oscilloscope probe, and the sampling mode of the oscilloscope is SAMPLE.
纹波和噪声的测试方法是使用12#双绞线连接，示波器带宽为20MHZ，示波器探头带宽为100M。上图所示的电容器与示波器探头并联，示波器的采样模式为SAMPLE。

Product Characteristic Curve/产品特性曲线

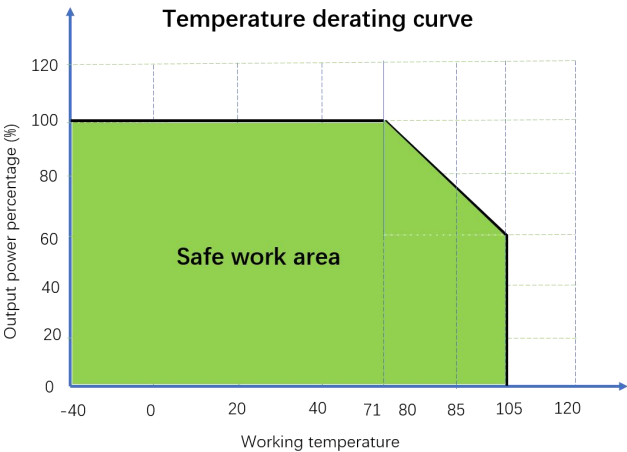


Figure 4: Temperature Derating Curve

图4：温度减额曲线

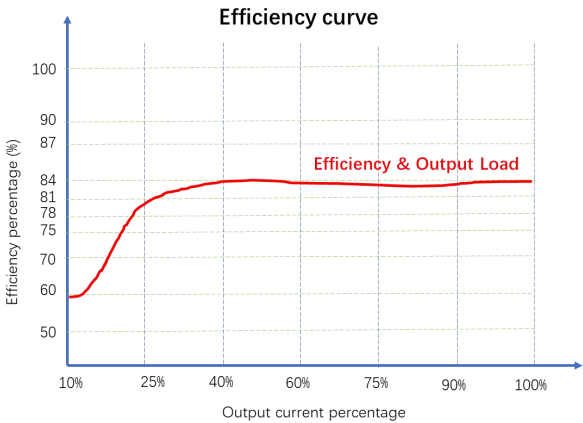


Figure 5: Efficiency VS Output Load (Nominal Voltage Input)

图5：效率与输出负载（标称电压输入）

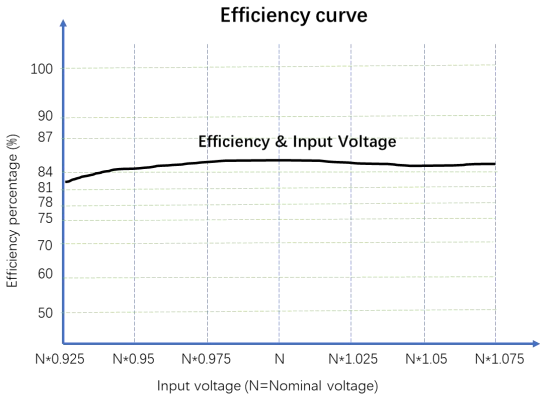
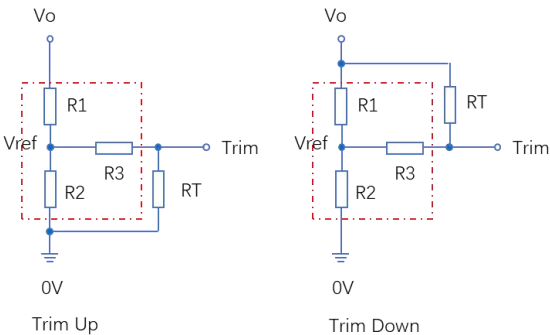


Figure 6: Efficiency VS Input Voltage (100% Load)

图6：效率与输入电压（100%负载）

The usage circuit of Trim
(dashed boxes represent the internal components of the product)



The calculation formula for Trim resistance:

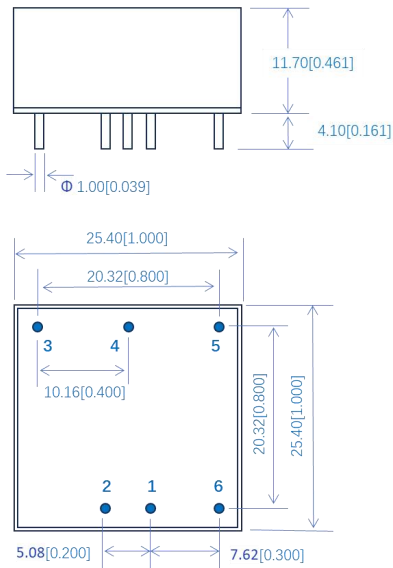
Trim Up: $RT = \frac{aR2}{R2-a} - R3$ $a = \frac{Vref}{Vo-Vref} * R1$

Trim Down: $RT = \frac{aR1}{R1-a} - R3$ $a = \frac{Vref}{Vo-Vref} * R2$

RT is a Trim resistor
"a" is a custom parameter with no actual meaning

Vout(V)	R1(KΩ)	R2(KΩ)	R3(KΩ)	Vref(V)
3.3	4.772	2.87	12.4	1.25
5	2.883	2.87	10	2.5
9	7.500	2.87	15	2.5
12	11.000	2.87	15	2.5
15	14.494	2.87	15	2.5
24	24.872	2.87	17.8	2.5

Overall Dimensions and Pin Functions/外形尺寸和引脚功能



Note:
Dimensions in mm [inch]
Terminal diameter tolerance: ± 0.10 [± 0.004]
Undeclared tolerance: ± 0.50 [± 0.020]
Pin diameter 1,2,3,4,5,6: $\Phi 1$ mm

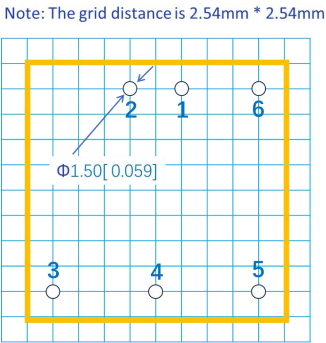
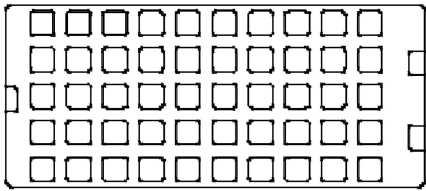


Table 3: Pin Function Table

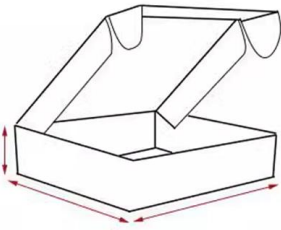
Pin	Function
1	GND
2	Vin
3	+Vo
4	Trim
5	0V
6	Ctrl

Figure 7: Overall dimensions

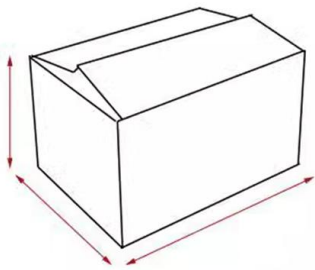
Packaging Method/包装方式



50 Pieces/Tube



100 Pieces/Inner box



500 Pieces/Outer box

Notes & Instructions/注释和说明

1. The input voltage shall not exceed the specified range value, otherwise permanent and unrecoverable damage may be caused;
2. Unless otherwise specified, the parameters in this manual are measured at 25 °C, 40%~75% humidity, input nominal voltage and output pure resistance mode under full load;
3. All index test methods are based on the company's enterprise standards.
4. The copyright and the final interpretation right of the product belong to product provider.

1. 输入电压不得超过规定的范围值，否则可能造成永久性和不可恢复的损坏；
2. 除非另有规定，否则本手册中的参数是在25℃、湿度40%~75%、输入标称电压和输出纯电阻模式下满负荷测量的；
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