# Features/产品特点

1. Sustainable short-circuit protection
2. Wide operating temperature range：-40℃ to +85℃
3. Up to 85% efficiency
4. No load current as low as 5MA
5. Ripple as low as 30mVp-p

1. 可持续短路保护
2. 工作温度范围广：-40℃至+85℃
3. 效率高达85%
4. 空载电流低至5MA
5. 纹波低至30mVp-p

Digent

Power Solutions

DC-DC Converters/转换器

# B12xxD-1WR3

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

## Description/概述

DC12V input, Output 1W, Isolated, Non stabilized voltage, Single Output, DIP7 package.

DC12V输入，输出功率1W，隔离型，非稳压，单路输出，DIP7 封装。


## Model Numbering/命名规则

**BxxxxD-1WR3**

- Series/系列
- Input Voltage/输入电压
- Output Voltage/输出电压
- Product Generation/产品代别
- Output power/输出功率
- Packaging form/封装方式

## 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) |
|---|---|---|---|---|---|
| B1203D-1WR3 | 12VDC ( 10.8-13.2 ) | 3.3VDC | 303/30 | 76/80 | 2400 |
| B1205D-1WR3 | 12VDC ( 10.8-13.2 ) | 5VDC | 200/20 | 78/82 | 2400 |
| B1209D-1WR3 | 12VDC ( 10.8-13.2 ) | 9VDC | 111/12 | 78/82 | 1000 |
| B1212D-1WR3 | 12VDC ( 10.8-13.2 ) | 12VDC | 83/9 | 78/82 | 560 |
| B1215D-1WR3 | 12VDC ( 10.8-13.2 ) | 15VDC | 67/7 | 78/82 | 560 |
| B1224D-1WR3 | 12VDC ( 10.8-13.2 ) | 24VDC | 42/5 | 78/82 | 220 |

## Input Characteristics/输入特性

| Parameter/参数 | Conditions/测试条件 | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Input current (Rated Load)<br>输入电流（额定负载） | Nominal voltage input<br>标称电压输入 | - - | 105 | 118 | mA |
| Input current (No-load)<br>输入电流（空载） | | - - | 5 | 15 | mA |
| Reflected ripple current<br>反射纹波电流 | | 3 | 15 | 20 | mA |
| Input impulse voltage<br>输入冲击电压 | 1sec. max.<br>最大1秒 | -0.7 | - - | 18 | VDC |
| Input filter<br>输入滤波类型 | Capacitive filtering<br>电容滤波 | | | | |
| 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<br>输出电压精度 | | See Figure 3 (envelope curve)<br>见图3（包络曲线图） | | | |
| Linear regulation rate<br>线性调节率 | Input voltage variation+/- 1%<br>输入电压变化+/-1% | - - | +/-1.2 | +/-1.5 | % |
| Load regulation rate<br>负载调节率 | 10% to 100% load<br>10%-100% 负载 | 2 | 7 | 15 | % |
| Ripple & Noise<br>波纹和噪声 | 20MHz bandwidth<br>20MHz带宽 | - - | 30 | 100 | mVp-p |
| Temperature drift coefficient<br>温度漂移系数 | 100% load<br>满载 | - - | +/-0.03 | - - | %/℃ |
| Short circuit protection<br>短路保护 | Sustainable, Self-healing<br>可持续、自恢复 | | | | |

## General Characteristics/通用特性

| Parameter/参数 | Conditions/测试条件 | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Isolation voltage<br>隔离电压 | Input-output, Test time 1 minute, Leakage current less than 1 mA<br>输入-输出，测试时间1分钟，漏电流小于1 mA | 1500 | - - | - - | VDC |
| Insulation resistance<br>绝缘电阻 | Input-output, Insulation voltage 500VDC<br>输入-输出，绝缘电压500VDC | 1000 | - - | - - | MΩ |
| Isolation capacitance<br>隔离电容 | Input-output, 100KHz/0.1V<br>输入-输出，100KHz/0.1V | - - | 20 | - - | pF |
| Working temperature<br>工作温度 | Temperature ≥ 85 ℃ for derating (See Figure 4)<br>温度≥85℃时，降额使用（见图4） | -40 | - - | +85 | ℃ |
| Storage temperature<br>储存温度 | | -55 | - - | +125 | ℃ |
| Storage humidity<br>储存湿度 | Non condensing<br>无凝结 | - - | - - | 95 | %RH |

| Parameter/参数 | Conditions/测试条件 | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Housing temperature rise during operation<br>工作时外壳温升 | Ta=25 ℃, Nominal input, Full output<br>Ta=25℃，标称电压输入，满载 | - - | 15 | 25 | ℃ |
| Soldering temperature resistance of pins<br>引脚耐焊接温度 | The distance from the welding spot to the shell is 1.5mm, 10 seconds<br>焊点到壳体的距离为1.5mm，10秒 | - - | - - | 260 | ℃ |
| Switching frequency<br>开关频率 | Full load, Nominal input voltage<br>满载，标称输入电压 | - - | 270 | - - | kHz |
| Mean time between failures【MTBF】<br>平均无故障时间 | MIL-HDBK-217F@25℃ | 3500 | - - | - - | kHours |

## Physical Characteristics/物理特性

| Parameter/参数 | Content/内容 |
|---|---|
| Housing material<br>外壳材料 | Black flame retardant and heat-resistant plastic (UL94V-0)<br>黑色阻燃耐热塑料（UL94V-0） |
| Overall dimensions<br>外形尺寸 | 12.70 x 10.16 x 8.20 mm |
| Weight<br>重量 | 1.8g(Typ.) |
| Cooling mode<br>冷却方式 | Natural air cooling<br>自然风冷 |

## EMC Characteristics/EMC特性

| Parameter<br>参数 | Category<br>类别 | Content<br>内容 |
|---|---|---|
| EMI | Conductive disturbance<br>传导骚扰 | CISPR32/EN55032 CLASS B（The recommended circuit is shown in Figure 2）<br>（推荐电路如图2所示） |
| | Radiation disturbance<br>辐射骚扰 | CISPR32/EN55032 CLASS B（The recommended circuit is shown in Figure 2）<br>（推荐电路如图2所示） |
| EMS | Electrostatic discharge<br>静电放电 | IEC/EN61000-4-2 Contact ±4KV perf. Criteria B |

## Circuit Design and Application/电路设计与应用

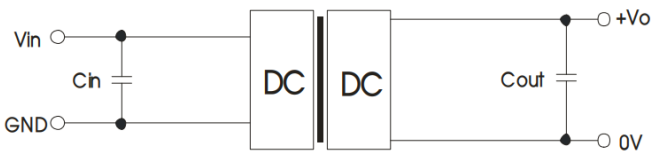



Figure 1: Application circuit

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<br>标称电压 | 1-10 | Nominal voltage<br>标称电压 | 2.2-22 |

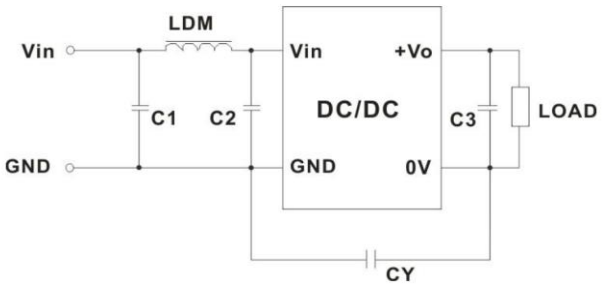



Figure 2: EMC Typical Recommended Circuits

图2:EMC典型推荐电路

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

| Category<br>类别 | Component<br>元件 | Value<br>参数 |
|---|---|---|
| EMI | C1 | 4.7μF /50V |
| | C2 | 4.7μF /50V |
| | C3 | 2.2-22μF /50V |
| | CY | 270pF/2kV |
| | LDM | 6.8μH |

1. Typical application: If further reduction of input and output ripple is required, a capacitor filter network can be connected at the input and output ends. The application circuit is shown in Figure 1. However, suitable filter capacitors should be selected. If the capacitance is too large, it may cause overcurrent or poor startup of the power supply. For each output, while ensuring safe and reliable operation, the recommended capacitance load values are shown in Table 1.
2. EMC requirements: For situations with high EMC requirements, a typical EMC recommended circuit is shown in Figure 2.
3. Input requirements: Ensure that the fluctuation range of the input voltage does not exceed the upper and lower limits of the input voltage specified in this data sheet, and the input power must be greater than the output power specified in this data sheet. For situations with a 24V input voltage, it is recommended to connect a TVS tube between the positive and negative input pins for protection (recommended parameters for TVS tubes: 30V, bidirectional, SOD-123 packaging).
4. Output load requirements: Try to avoid using it without load as much as possible; When the actual power of the load is less than 10% of the rated output power in this data sheet, or when it needs to be used in no-load situations, it is recommended to connect a load resistor externally at the output end. The load resistor can be calculated according to 5-10% of the rated power in this data sheet. The calculation formula for the load resistor value is $RL=Uout^2/(Pout*10\%)$.
5. Overload protection: Under normal working conditions, the output circuit of this product has no protection function for overload situations. The simplest method is to connect a self recovery fuse in series at the input end, or add a circuit breaker outside the circuit; Or during design and selection, the actual power of the circuit should be around 60-80% of the rated power in this data sheet.

1. 典型应用：如果需要进一步降低输入和输出纹波，可以在输入和输出端连接电容滤波器网络。应用电路如图1所示。但是，应选择合适的滤波电容器。如果电容过大，可能会导致电源启动过流或启动不良。对于每个输出，在确保安全可靠运行的情况下，推荐的电容负载值如表1所示。
2. EMC要求：对于EMC要求较高的场合，典型的EMC推荐电路如图2所示。
3. 输入要求：确保输入电压波动范围不要超出本数据表的输入电压的上限和下限要求，输入功率必须大于本数据表中的输出功率。对于24V输入电压的场合，建议在输入正引脚和输入负引脚之间外接一个TVS管进行保护（ TVS管推荐参数：30V,双向，SOD-123封装）。
4. 输出负载要求：应尽量避免空载使用；当负载的实际功率小于本数据表的额定输出功率的10%时，或需要在空载场合使用时，建议在输出端外接负载电阻，负载电阻可按照本数据表额定功率的5-10%计算，负载电阻值计算公式：$RL=Uout^2/(Pout*10\%)$。
5. 过载保护：在通常工作条件下，该产品输出电路对于过载情况无保护功能，最简单的方法是在输入端串接一个自恢复保险丝，或在电路中外加一个断路器；或在设计选型时，电路的实际功率在本数据表额定功率的60-80%左右。

## Product Characteristic Curve/产品特性曲线

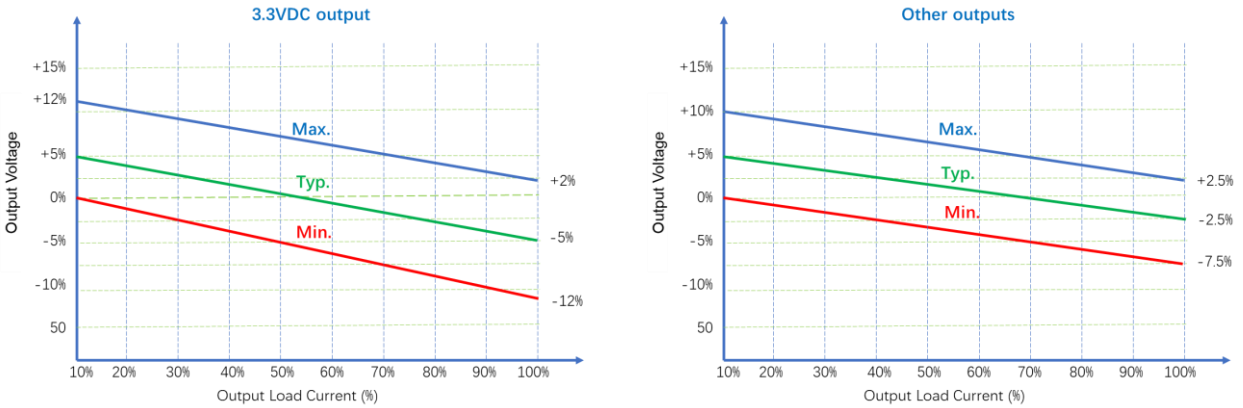



Figure 3: Voltage tolerance envelope
图3：电压误差包络曲线图

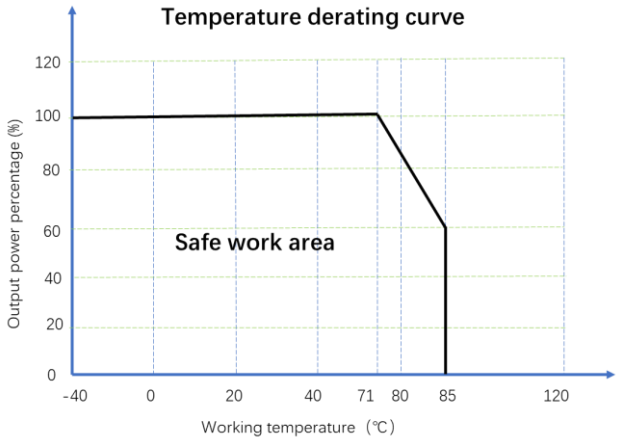



Figure 4: Temperature Derating Curve
图4：温度减额曲线

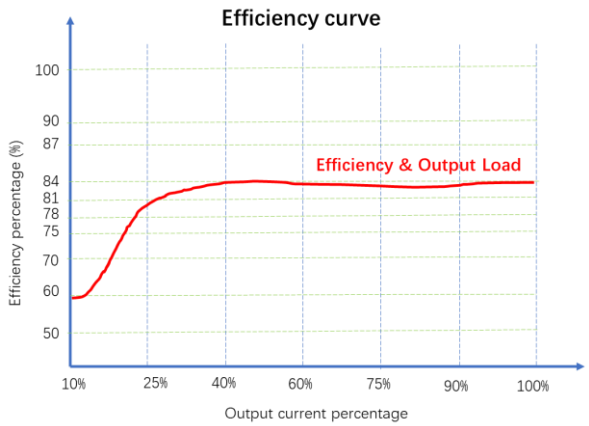



Figure 5: Efficiency VS Output Load (Nominal Voltage Input)
图5：效率与输出负载（标称电压输入）

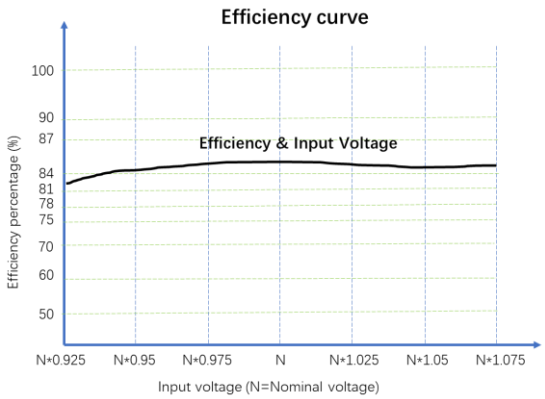



Figure 6: Efficiency VS Input Voltage (100% Load)
图6：效率与输入电压（100%负载）

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

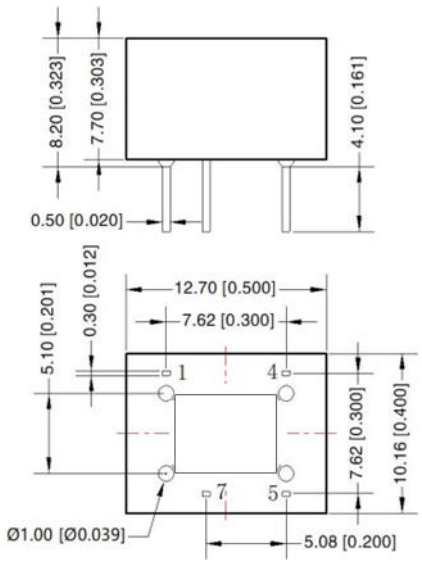



Figure 7: Overall dimensions
图7：外形尺寸

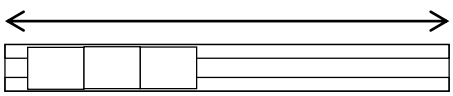
Table 3: Pin Function Table
表3：引脚功能表

| Pin | Function |
|---|---|
| 1 | GND |
| 2、3 | No Pin |
| 4 | Vin |
| 5 | +Vo |
| 6 | No Pin |
| 7 | 0V |

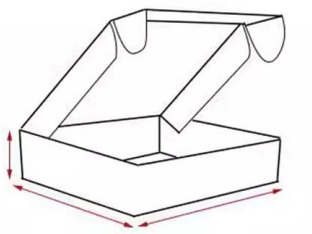
Note:
Dimensions in mm [inch]
Terminal diameter tolerance:+/-0.10 [+/-0.004]
Undeclared tolerance:+/-0.50 [+/-0.020]

注：尺寸单位为毫米[英寸]
端子直径公差：+/-0.10[+/-0.004]
未注公差：+/-0.50[+/-0.020]

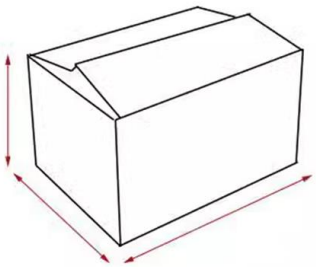
## Packaging Method/包装方式



28 Pieces/Tube
28PCS/管



840 Pieces/Inner box
840 PCS/内盒



4200 Pieces/Outer box
4200 PCS/外箱

## 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 ℃, 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 DIGENT.

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；
3. 所有指标测试方法均基于本公司的企业标准；
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