



**Shenzhen Hi-Link Electronic Co., Ltd**

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## **1W DC/DC power module 12V series**

**HLK-1D1205/ HLK-1D1212/ HLK-1D1215/ HLK-1D1224**



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## 1. DC/DC Power module

1W series DC-DC power module is one type power supply module with small size, high efficiency, tiny power, constant voltage, input isolation and unregulated, single output; this series of products is specially designed to generate a group of isolated voltage to input power supply in the on-board power system applications. This product is suitable for purely digital circuits, general low-frequency analog circuits, relay drive circuits, data exchange circuits, etc.

## 2. Product Model

| Model      | Shell size (mm) | Output power (W) | Output voltage (V) | Output current (mA) | Notes |
|------------|-----------------|------------------|--------------------|---------------------|-------|
| HLK-1D1205 | 11.5*10*6       | 1                | 5                  | 200                 |       |
| HLK-1D1212 |                 | 1                | 12                 | 84                  |       |
| HLK-1D1215 |                 | 1                | 15                 | 67                  |       |
| HLK-1D1224 |                 | 1                | 24                 | 42                  |       |

## 3. Product Features

1. Features: constant voltage input, isolated unregulated single output, 1W
2. Conversion efficiency: 80% (Typ)
3. Isolation between input and output is required (isolation voltage  $\leq 1500\text{VDC}$ )
4. Output short circuit protection
5. The voltage of the input power is relatively stable (voltage variation range  $\pm 10\% V_{in}$ )
6. Operating temperature range:  $-40^{\circ}\text{C} \sim +85^{\circ}\text{C}$
7. Low requirement for output voltage stability
8. Small SIP package
9. International standard pins, PCB board in-line installation
10. Adopting high-quality environmental protection waterproof and thermally conductive adhesive potting, moisture-proof, vibration-proof, meet the waterproof and dust-proof IP65 standard
11. High reliability, long life design, long continuous working time  $\text{MTBF} \geq 3.5$  million hours (3500000Hrs)

## 4. Environment conditions

| Items                   | Technical parameters   | Unit | Remarks  |
|-------------------------|--|------|--|
| Working temperature     | -40—+85  | ℃    |  |
| Storage temperature     | -40—+80  | ℃    |  |
| Relative humidity       | 5—95   | %    |  |
| Heat dissipation method | Natural cooling  |      |  |
| Atmospheric pressure    | 80—106   | Kpa  |  |
| Vibration               | Vibration coefficient:<br>10~500Hz,2G10min./1cycle,<br>60min.each along X,Y,Z axes |      | Meet secondary<br>road transport<br>requirements |

## 5. Electrical characteristics

### 5.1. Input Features

| Items                          | Working conditions               | Unit | Remarks   |
|--------------------------------|----------------------------------|------|---|
| Rated input voltage            | 12                               | Vdc  |   |
| Input voltage range            | 10.8-13.2                        | Vdc  |   |
| Max input current              | ≤0.2                             | A    |   |
| Reflected ripple current       | 15                               | mA   | DC12V rated input voltage<br>series                 |
| Impulse voltage                | ≤18                              | Vdc  |   |
| Starting voltage               | 10.8                             | Vdc  |   |
| Input under voltage protection | ---                              | Vdc  |   |
| Start delay time               | ---                              | ms   | Rated input voltage and constant<br>resistance load |
| Input filter type              |                                  |      | Capacitive filtering                                |
| Hot plug                       |                                  |      | No-support  |
| Remote end (Ctrl)*             | Module open                      |      | --  |
|                                | Module closed                    |      | --  |
|                                | Input current when<br>turned off | mA   | --   --   --  |

Notes: Test at room temperature

## 5.2. Output Characteristics (5V/200mA)

| Items                             | Technical parameters  | Unit | Remarks       |
|-----------------------------------|---|------|---------------|
| No-load rated output voltage      | 5V±15%  | Vdc  |               |
| Short time maximum output current | ≥220  | mA   |               |
| Rated output current              | 200   | mA   |               |
| Voltage regulation                | ±1.5  | %    |               |
| Load Regulation                   | ±12   | %    |               |
| Conversion efficiency             | Vin=12Vdc, Output full load 80  | %    |               |
| Output ripple and noise (mVp-p)   | ≤100<br>Pure resistive load, 20MHz bandwidth,<br>peak to peak value   | mV   |               |
| Output voltage regulation         | ----  | -    | No adjustment |
| Output over-current protection    | ----  | A    |               |
| Output short circuit protection   | 1   | S    |               |
| Output over-voltage protection    | Output 110-160% of the maximum voltage                                | Vdc  |               |
| Insulation voltage                | Input-output, test time 1 minute, leakage current less than 1mA/1500V | -    |               |
| Insulation resistance             | Input-output, insulation voltage 500VDC/1000MΩ                        | MΩ   |               |
| Isolated capacitor                | Input-output, 100KHz/0.1V 20pF  | -    |               |

Note:

1. Due to limited space, the above is only a list of typical products. If you need products outside the list, please contact our sales department.
2. The maximum capacitive load indicates the maximum capacitive load that +Vo or -Vo can connect to. If it exceeds this value, the product will not start normally.

### 5.3. Output Characteristics(12V/84mA)

| Items                             | Technical parameters  | Unit | Remarks       |
|-----------------------------------|---|------|---------------|
| No-load rated output voltage      | 12V±15%   | Vdc  |               |
| Short time maximum output current | ≥94   | mA   |               |
| Rated output current              | 84  | mA   |               |
| Voltage regulation                | ±1.5  | %    |               |
| Load Regulation                   | ±7  | %    |               |
| Conversion efficiency             | Vin=12Vdc, Output full load 80  | %    |               |
| Output ripple and noise (mVp-p)   | ≤100<br>Pure resistive load, 20MHz bandwidth,<br>peak to peak value   | mV   |               |
| Output voltage regulation         | ----  | -    | No adjustment |
| Output over-current protection    | ----  | A    |               |
| Output short circuit protection   | 1   | S    |               |
| Output over-voltage protection    | Output 110-160% of the maximum voltage                                | Vdc  |               |
| Insulation voltage                | Input-output, test time 1 minute, leakage current less than 1mA/1500V | -    |               |
| Insulation resistance             | Input-output, insulation voltage 500VDC/1000MΩ                        | MΩ   |               |
| Isolated capacitor                | Input-output, 100KHz/0.1V 20pF  | -    |               |

Note:

1. Due to limited space, the above is only a list of typical products. If you need products outside the list, please contact our sales department.
2. The maximum capacitive load indicates the maximum capacitive load that +Vo or -Vo can connect to. If it exceeds this value, the product will not start normally.

## 5.4. Output Characteristics (15V/67mA)

| Items                             | Technical parameters  | Unit | Remarks       |
|-----------------------------------|---|------|---------------|
| No-load rated output voltage      | 15V±15%   | Vdc  |               |
| Short time maximum output current | ≥77   | mA   |               |
| Rated output current              | 67  | mA   |               |
| Voltage regulation                | ±1.5  | %    |               |
| Load Regulation                   | ±6  | %    |               |
| Conversion efficiency             | Vin=12Vdc, Output full load 80  | %    |               |
| Output ripple and noise (mVp-p)   | ≤100<br>Pure resistive load, 20MHz bandwidth,<br>peak to peak value   | mV   |               |
| Output voltage regulation         | ----  | -    | No adjustment |
| Output over-current protection    | ----  | A    |               |
| Output short circuit protection   | 1   | S    |               |
| Output over-voltage protection    | Output 110-160% of the maximum voltage                                | Vdc  |               |
| Insulation voltage                | Input-output, test time 1 minute, leakage current less than 1mA/1500V | -    |               |
| Insulation resistance             | Input-output, insulation voltage 500VDC/1000MΩ                        | MΩ   |               |
| Isolated capacitor                | Input-output, 100KHz/0.1V 20pF  | -    |               |

Note:

1. Due to limited space, the above is only a list of typical products. If you need products outside the list, please contact our sales department.
2. The maximum capacitive load indicates the maximum capacitive load that +Vo or -Vo can connect to. If it exceeds this value, the product will not start normally.

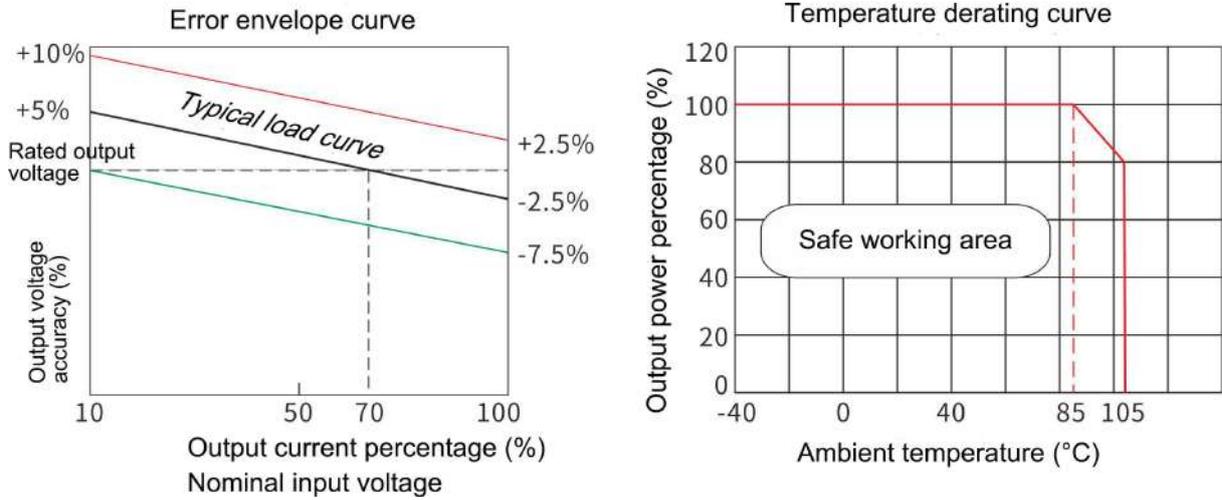
## 5.5. Output Characteristics (24V/42mA)

| Items                             | Technical parameters  | Unit | Remarks       |
|-----------------------------------|---|------|---------------|
| No-load rated output voltage      | 24V±15%   | Vdc  |               |
| Short time maximum output current | ≥52   | mA   |               |
| Rated output current              | 42  | mA   |               |
| Voltage regulation                | ±1.5  | %    |               |
| Load Regulation                   | ±5  | %    |               |
| Conversion efficiency             | Vin=12Vdc, Output full load 80  | %    |               |
| Output ripple and noise (mVp-p)   | ≤100<br>Pure resistive load, 20MHz bandwidth,<br>peak to peak value   | mV   |               |
| Output voltage regulation         | ----  | -    | No adjustment |
| Output over-current protection    | ----  | A    |               |
| Output short circuit protection   | 1   | S    |               |
| Output over-voltage protection    | Output 110-160% of the maximum voltage                                | Vdc  |               |
| Insulation voltage                | Input-output, test time 1 minute, leakage current less than 1mA/1500V | -    |               |
| Insulation resistance             | Input-output, insulation voltage 500VDC/1000MΩ                        | MΩ   |               |
| Isolated capacitor                | Input-output, 100KHz/0.1V 20pF  | -    |               |

Note:

1. Due to limited space, the above is only a list of typical products. If you need products outside the list, please contact our sales department.
2. The maximum capacitive load indicates the maximum capacitive load that +Vo or -Vo can connect to. If it exceeds this value, the product will not start normally.

## 6. Product characteristic curve



## 7. Typical applied circuit

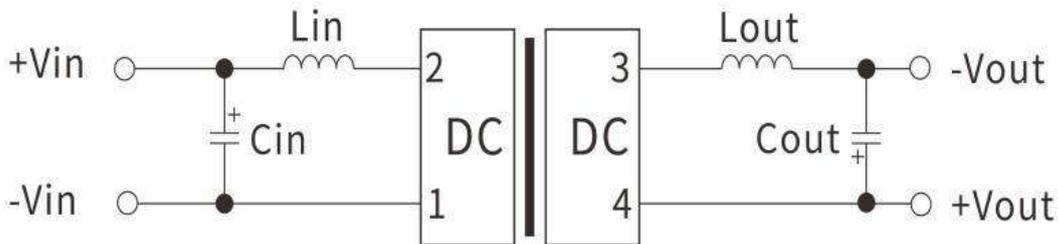


Figure 2

### 7.1 EMC Parameter recommendation

| Component Tag / Recommended accessory | Function         | Recommended value |
|---------------------------------------|------------------|-------------------|
| $C_{in}$ capacitance                  | Filter capacitor | 4.7uF/50V         |
| $C_{out}$ capacitance                 | Filter capacitor | 2.2-10uF/50V      |
| $L_{in}$ inductance                   | Filter inductor  | Inductance: 4.7uH |
| $L_{out}$ inductance                  | Filter inductor  | Inductance: 4.7uH |

Note: Output load requirements

In order to ensure that the module can work efficiently and reliably, its minimum output load must not be less than 10% of the rated load during use. If your required power is really small, please connect a resistor in parallel between the positive and negative poles of the output (the sum of the actual power used by the resistor is greater than or equal to 10% of the rated power and the rated power of the selected resistor must be more than 5 times the actual power , otherwise the temperature of the resistor will be higher)

## 7.2 Normal application

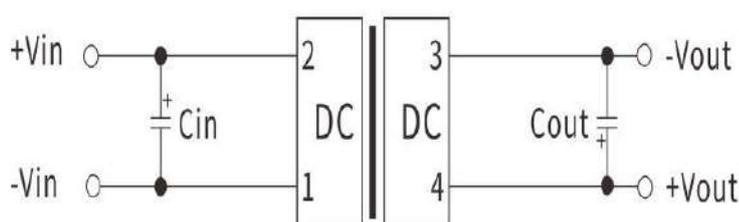


Figure 1

1. If it is required to further reduce the input and output ripple, a capacitor filtering network can be connected to the input and output ends, the applied circuit as showed on figure 1. However, it should be careful to select a suitable filter capacitor. If the capacitance is too large, it may cause start-up problems. For each output, under the conditions of ensuring safe and reliable operation

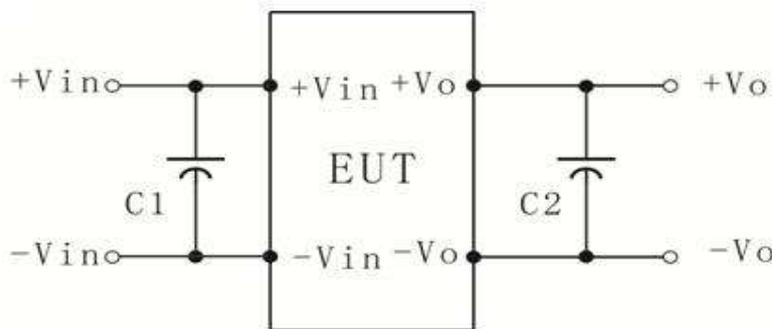
| Component Tag / Recommended accessory | Function         | Recommended value |
|---------------------------------------|------------------|-------------------|
| Cin capacitance                       | Filter capacitor | 4.7uF/50V         |
| Cin capacitance                       | Filter capacitor | 10uF/50V          |

2. In order to ensure that the module can work efficiently and reliably, its minimum output load must not be less than 10% of the rated load during use. If your required power is really small, please connect a resistor in parallel between the positive and negative poles of the output (the sum of the actual power used by the resistor is greater than or equal to 10% of the rated power and the rated power of the selected resistor must be more than 5 times the actual power , otherwise the temperature of the resistor will be higher)

## 8. Test application

### 8.1. DC/DC Test circuit

Generally recommended capacitor: 0.1uF polypropylene capacitor and 4.7uF high-frequency low-resistance electrolysis in parallel



### 8.2. Ripple and noise test

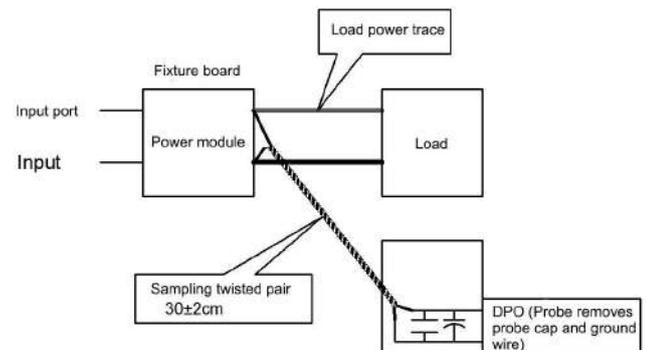
(Twisted pair method, 20MHZ bandwidth)

Testing method:

(1) Ripple noise is connected by 12# twisted pair. The oscilloscope bandwidth is set to 20MHz, 100M bandwidth probe, and 0.1uF polypropylene capacitor and 47uF high frequency low resistance electrolytic capacitor are connected in parallel on the probe end. The oscilloscope sampling uses Sample sampling mode.

(2) Schematic diagram of output ripple&noise test:

Connect the power input terminal to the input power supply terminal. The power output is connected to the electronic load through the fixture board. The test uses a 30cm ± 2 cm sampling line to sample directly from the power output port. The power line selects the insulated wire with the corresponding wire diameter according to the magnitude of the output current.



### 8.3. Product application considerations

1. Input requirements: Ensure that the output voltage fluctuation range of the power supply does not exceed the input requirements of the DC / DC module itself, and the output power of the input power supply must be greater than the output power of the DC / DC module.
2. One recommended circuit: For applications where ripple and noise requirements are normal, a filter capacitor can be connected in parallel at the input and output ends. The external circuit is shown in the following figure1 with the recommended value details of the filter capacitor. Output load requirements: Try to avoid no-load use. When the actual power consumption of the load is less than 10% of the rated output power of the module or there is no-load phenomenon, it is recommended that a dummy load be connected to the output end. The dummy load (resistance) can be calculated by 5~10% of the rated power of the module, resistance value =  $U_{out} / (1W * 10\%)$ .
3. Over-load protection: Under normal operating conditions, the output circuit of this product has no protection function against overload conditions. The easiest way is to connect a resettable fuse in series at the input end, or add a circuit breaker to the circuit.
4. The external capacitor of the output terminal should not be too large, otherwise it will easily cause over-current or poor start-up when the module starts.
5. If the product works below the minimum required load, the performance of the product cannot be guaranteed to meet all performance indications in this manual.
6. The maximum capacitive load is tested under the input voltage range and full load condition.
7. Unless special instructions, all indexes in this manual are measured at the condition,  $T_a = 25\text{ }^\circ\text{C}$ , humidity <75% RH, nominal input voltage and output rated load

## 9. Marking, packaging, transportation, storage

### 9.1. Marking

#### 9.1.1. Product mark

The product's unique bar code mark is attached to the appropriate position of the product to ensure trace ability of the manufacturing date, product batch, etc. of each product. Its content meets the requirements of national standards and industry standards.

#### 9.1.2. Packaging mark

The product packaging box is marked with the name of the manufacturer, the factory

address, the zip code, the product model, the manufacturing date (year, month and day); It is marked with "upward", "moisture-proof" and "Be careful" transport signs, all of which comply with the provisions of GB 191.

## 9.2. Packaging

The product is packaged in a special blister box, which has anti-vibration function and complies with GB 3873.

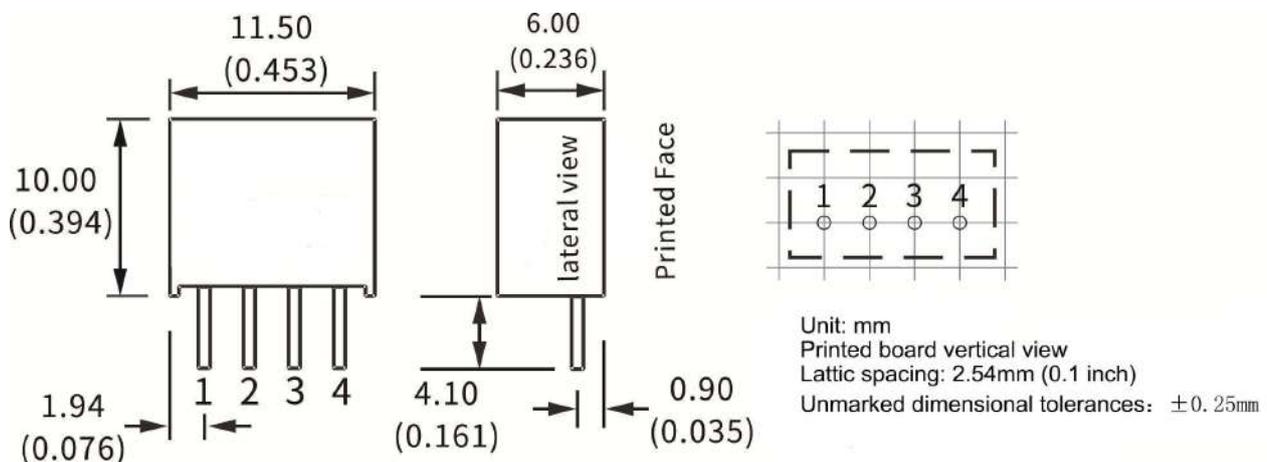
## 9.3. Transportation

The packaged product can be transported by any means of transport. There should be awnings during transportation, and there should be no severe vibration or impact.

## 9.4. Storage

Product storage should comply with the provisions of GB 3873.

## 10. Dimension and weight



| 1              | 2              | 3               | 4               | 5  | 6   |
|----------------|----------------|-----------------|-----------------|----|-----|
| VIN-           | VIN+           | VO-             | VO+             | -- | --- |
| Input negative | Input positive | Output negative | Output positive | -- | --- |