

DB1-xxSxxD Series

DC-DC Converter | 1W | DIP7 | Fixed voltage input, unregulated output | 1500VDC



Features

- Small DIP7 Package
- Operating Temperature Range: -40°C ~ +105°C
- Isolation Voltage: 1500VDC
- Full Load Efficiency: up to 89% (typ.)
- Continuous Short Circuit Protection
- Designed to meet IEC/EN/BS EN/UL 62368

Product Description



The DB1-xxSxxD series is 1W unregulated DC/DC converters that are typically used in cost sensitive general purpose power isolation and voltage matching applications. Typical applications are digital interfaces, voltage conversion in distributed powersy stems, general low-frequency analog circuits, relay drive circuits, data switching circuits etc.

Selection Guide

| Certification | Part No. | Input Voltage | Output | | | Full Load Efficiency (%) Typ. | Capacitive Load (μF) Max. |
|------------------|------------|--------------------------|------------------|----------------------|----------------------|----------------------------------|------------------------------|
| | | Nominal (Range) (VDC) | Voltage (VDC) | Current (mA) Min. | Current (mA) Max. | | |
| EN/UL Pending | DB1-03S03D | 3.3 (2.97~3.63) | 3.3 | 30 | 303 | 82 | 2400 |
| | DB1-03S05D | 3.3 (2.97~3.63) | 5 | 20 | 200 | 83 | 2400 |
| | DB1-03S09D | 3.3 (2.97~3.63) | 9 | 11 | 111 | 84 | 1000 |
| | DB1-03S12D | 3.3 (2.97~3.63) | 12 | 8 | 84 | 85 | 560 |
| | DB1-03S15D | 3.3 (2.97~3.63) | 15 | 7 | 67 | 85 | 560 |
| | DB1-03S24D | 3.3 (2.97~3.63) | 24 | 4 | 42 | 85 | 220 |
| | DB1-05S03D | 5 (4.5~5.5) | 3.3 | 30 | 303 | 80 | 2400 |
| | DB1-05S05D | 5 (4.5~5.5) | 5 | 20 | 200 | 84 | 2400 |
| | DB1-05S09D | 5 (4.5~5.5) | 9 | 11 | 111 | 86 | 1000 |
| | DB1-05S12D | 5 (4.5~5.5) | 12 | 8 | 84 | 89 | 560 |
| | DB1-05S15D | 5 (4.5~5.5) | 15 | 7 | 67 | 88 | 560 |
| | DB1-05S24D | 5 (4.5~5.5) | 24 | 4 | 42 | 88 | 220 |
| | DB1-09S09D | 9 (8.1~9.9) | 9 | 11 | 111 | 87 | 1000 |

Selection Guide

| Certification | Part No. | Input Voltage | Output | | | Full Load Efficiency (%) Typ. | Capacitive Load (μF) Max. |
|------------------|------------|--------------------------|------------------|----------------------|----------------------|----------------------------------|------------------------------|
| | | Nominal (Range) (VDC) | Voltage (VDC) | Current (mA) Min. | Current (mA) Max. | | |
| EN/UL Pending | DB1-12S03D | 12 (10.8~13.2) | 3.3 | 30 | 303 | 83 | 2400 |
| | DB1-12S05D | 12 (10.8~13.2) | 5 | 20 | 200 | 86 | 2400 |
| | DB1-12S09D | 12 (10.8~13.2) | 9 | 11 | 111 | 89 | 1000 |
| | DB1-12S12D | 12 (10.8~13.2) | 12 | 8 | 84 | 89 | 560 |
| | DB1-12S15D | 12 (10.8~13.2) | 15 | 7 | 67 | 89 | 560 |
| | DB1-12S24D | 12 (10.8~13.2) | 24 | 4 | 42 | 89 | 220 |
| | DB1-15S03D | 15 (13.5~16.5) | 3.3 | 30 | 303 | 82 | 2400 |
| | DB1-15S05D | 15 (13.5~16.5) | 5 | 20 | 200 | 85 | 2400 |
| | DB1-15S09D | 15 (13.5~16.5) | 9 | 11 | 111 | 88 | 1000 |
| | DB1-15S12D | 15 (13.5~16.5) | 12 | 8 | 84 | 89 | 560 |
| | DB1-15S15D | 15 (13.5~16.5) | 15 | 7 | 67 | 89 | 560 |
| | DB1-15S24D | 15 (13.5~16.5) | 24 | 4 | 42 | 89 | 220 |
| | DB1-24S03D | 24 (21.6~26.4) | 3.3 | 30 | 303 | 84 | 2400 |
| | DB1-24S05D | 24 (21.6~26.4) | 5 | 20 | 200 | 87 | 2400 |
| | DB1-24S09D | 24 (21.6~26.4) | 9 | 11 | 111 | 89 | 1000 |
| | DB1-24S12D | 24 (21.6~26.4) | 12 | 8 | 84 | 88 | 560 |
| | DB1-24S15D | 24 (21.6~26.4) | 15 | 7 | 67 | 89 | 560 |
| | DB1-24S24D | 24 (21.6~26.4) | 24 | 4 | 42 | 89 | 220 |

Note: The above efficiency is measured at nominal input voltage and rated output load.

Input Specifications

| Item | Operating Conditions | | Min. | Typ. | Max. | Unit |
|--------------------------------------|--------------------------|-----------------|--------------------|--------|--------|------|
| Input Current (Full Load/No-load) | 3.3VDC Input | 3.3VDC Output | -- | 370/10 | 388/15 | mA |
| | | Others | -- | 356/12 | 365/18 | mA |
| | 5VDC Input | 3.3VDC Output | -- | 250/8 | 260/15 | mA |
| | | 5VDC Output | -- | 238/8 | 250/15 | mA |
| | | 15/24VDC Output | -- | 224/18 | 236/25 | mA |
| | | Others | -- | 232/10 | 240/15 | mA |
| | 9VDC Input | 9VDC Output | -- | 123/8 | 129/15 | mA |
| | 12VDC Input | 3.3VDC Output | -- | 101/7 | 105/15 | mA |
| | | Others | -- | 94/8 | 99/15 | mA |
| | 15VDC Input | 3.3/5VDC Output | -- | 82/6 | 85/15 | mA |
| | | Others | -- | 75/6 | 79/15 | mA |
| | 24VDC Input | 3.3VDC Output | -- | 50/3 | 53/15 | mA |
| | | Others | -- | 48/4 | 50/15 | mA |
| | Reflected Ripple Current | | | -- | 15 | -- |
| Surge Voltage | 3.3VDC Input | | -0.7 | -- | 5 | VDC |
| | 5VDC Input | | -0.7 | -- | 9 | VDC |
| | 9VDC Input | | -0.7 | -- | 15 | VDC |
| | 12VDC Input | | -0.7 | -- | 18 | VDC |
| | 15VDC Input | | -0.7 | -- | 21 | VDC |
| | 24VDC Input | | -0.7 | -- | 30 | VDC |
| Input Filter Type | | | Capacitance Filter | | | |
| Hot Plug | | | Unavailable | | | |

Output Specifications

| Item | Operating Conditions | | Min. | Typ. | Max. | Unit |
|-------------------------|------------------------------------|---------------|-----------------------------|------------|------|------|
| Output Voltage Accuracy | | | See Output Regulation Curve | | | |
| Line Regulation | Input Voltage Variation: $\pm 1\%$ | 3.3V output | -- | ± 1.5 | -- | % |
| | | Others | -- | ± 1.2 | -- | % |
| Load regulation | 10%~100% load | 3.3VDC output | -- | 10 | -- | % |
| | | 5VDC output | -- | 10 | -- | % |
| | | 9VDC output | -- | 8 | -- | % |
| | | 12VDC output | -- | 8 | -- | % |
| | | 15VDC output | -- | 8 | -- | % |
| | | 24VDC output | -- | 6 | -- | % |
| Ripple & noise | 20MHz bandwidth (peak-to-peak) | | -- | 45 | 120 | mV |
| Temperature coefficient | Full load | | -- | ± 0.02 | -- | %/°C |

| | |
|--------------------------|---------------------------|
| Short circuit protection | Continuous, self-recovery |
|--------------------------|---------------------------|

Note: Ripple & noise are measured at 20MHz of bandwidth with a 10uF electrolytic capacitor and a 1uF ceramic capacitor connected inparallel at the output.

General specifications

| Item | Operating conditions | Min. | Typ. | Max. | Unit |
|-----------------------|---|-----------------------|------|------|------|
| Isolation Voltage | Input-output, test time 1 minute, leakage current less than 1mA | 1500 | -- | -- | VDC |
| Insulation Resistance | Input-output, insulated voltage 500VDC | 1000 | -- | -- | MΩ |
| Isolation Capacitance | Input-Output,100KHz/0.1V | -- | 20 | -- | pF |
| Operating Temperature | Derating when operating temperature≥85℃ (See Temperature derating curve chart) | -40 | -- | 105 | ℃ |
| Storage Temperature | | -55 | -- | 125 | ℃ |
| Case Temperature Rise | Ta=25℃, Nominal Input, Full Load | -- | 25 | -- | ℃ |
| Isolation Voltage | Input-output, test time 1 minute, leakage current less than 1mA | 5 | -- | 95 | %RH |
| Soldering Method | Wave soldering | 260±5℃; Time: 5 - 10s | | | |
| | Manual Soldering | 360±10℃; Time: 3 - 5s | | | |
| Switching Frequency | Full load, nominal input voltage | -- | 220 | -- | kHz |
| MTBF | MIL-HDBK-217F@25℃ | >3500Kh | | | |

Mechanical Specifications

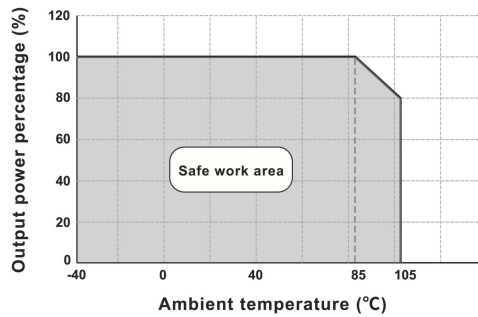
| | |
|-----------------------|--|
| Case Material | Black flame-retardant heat-resistant plastic (UL94V-0) |
| Mechanical Dimensions | 12.70 * 10.10 * 7.00mm |
| Weight | 1.65g(typ.) |
| Cooling Method | Free air convection |

Electromagnetic Compatibility (EMC)

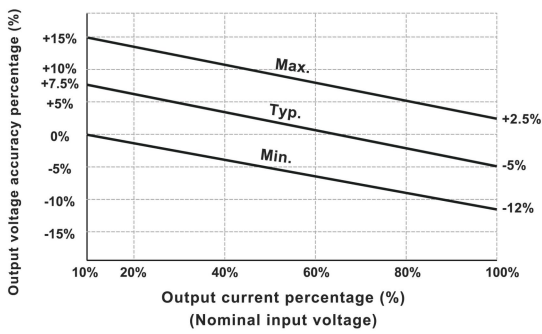
| | | |
|-----|-----|--|
| EMI | CE | CISPR32/EN55032 CLASS B (EMC recommended circuit see Fig. 2) |
| | RE | CISPR32/EN55032 CLASS B (EMC recommended circuit see Fig. 2) |
| EMS | ESD | IEC/EN61000-4-2 Contact ±6KV perf. Criteria B |

Product Characteristic Curve

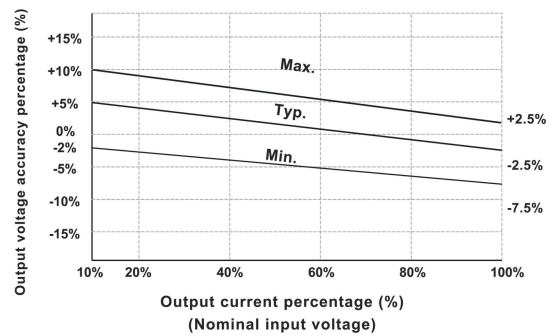
Temperature Derating Curve



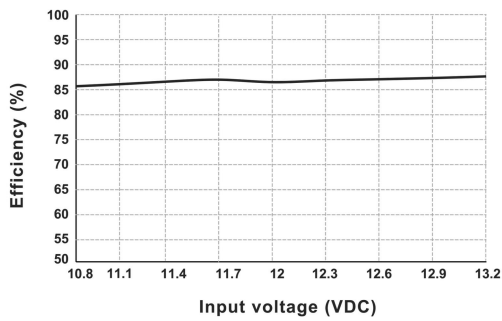
Output Regulation Curve (3.3V Output)



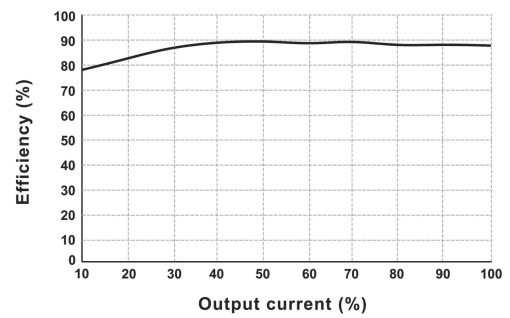
Output Regulation Curve (Others)



Efficiency VS Input Voltage (Full Load, DB1-12S05D)

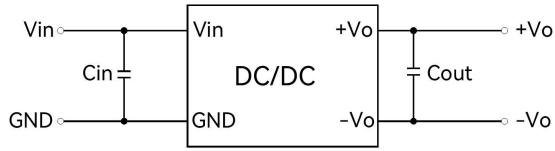


Efficiency VS Output Load (Vin=12V, DB1-12S05D)



Design Reference - Application circuit

Application circuit



(Figure 1)

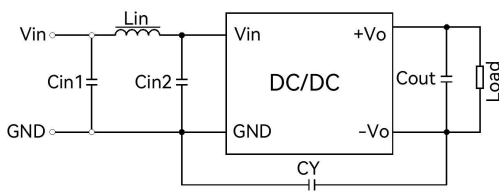
Recommended Capacitive Load Value Table

| Vin | Cin | Vo | Cout |
|----------|-----------|----------|------------|
| 3.3/5VDC | 4.7uF/16V | 3.3/5VDC | 10μF/16V |
| 9/12VDC | 2.2uF/25V | 9/12VDC | 4.7μF/25V |
| 15VDC | 1.0uF/25V | 15VDC | 1.0μF/25V |
| 24VDC | 1.0uF/50V | 24VDC | 0.47μF/50V |

All DC/DC converters in this series are tested according to the recommended application circuit (Figure 1) before the shipment. To further reduce input and output ripple, the external input and output capacitors C_{in} and C_{out} can be increased or capacitors with lower equivalent series impedance can be selected. For each output, under safe and reliable operating conditions, the maximum capacitance of the filter capacitor must not exceed the product's maximum capacitive load.

Design Reference - EMC Solutions - Recommended Circuits

EMC Recommended Circuit Design and Application



(Figure 2)

Recommended Parameter Table

| | |
|------|-------------------------------------|
| Cin1 | 4.7μF /50V |
| Cin2 | 4.7μF /50V |
| Cout | Refer to Cout parameter in Figure 1 |
| CY | 1000pF/2kVDC |
| Lin | 6.8μH |

Note:

1. Typical Application

If further reduction of input and output ripple is required, a Capacitance Filter network can be connected at the input and output terminals. The application circuit is shown in Figure 1. However, appropriate filter capacitors should be selected. If the capacitor is too large, it may cause startup issues. For each output, under conditions ensuring safe and reliable operation, the recommended capacitive load values are detailed in the table.

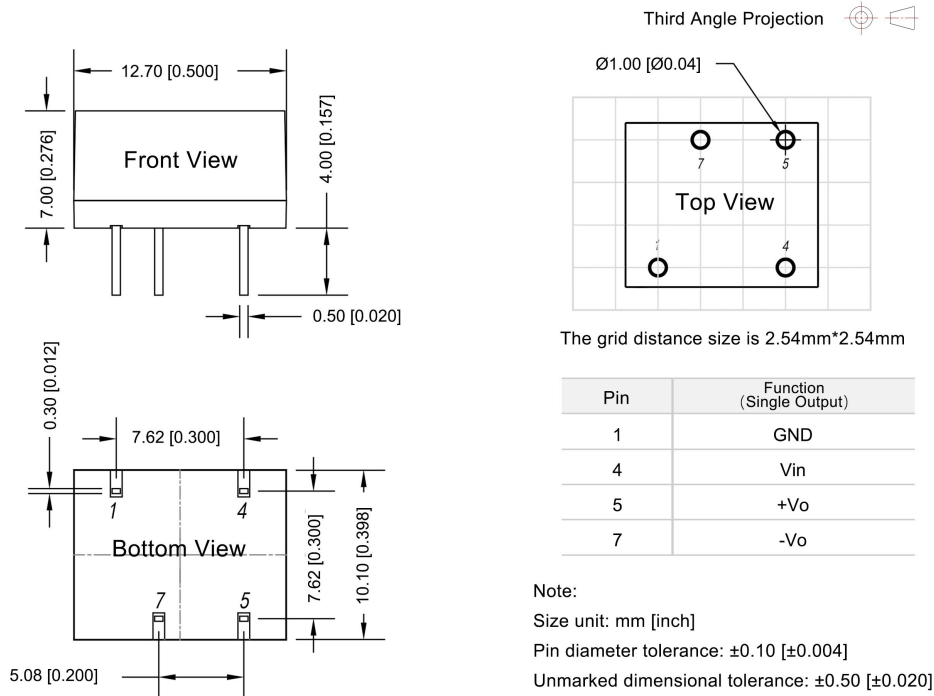
2. EMC Recommended Circuit: See Figure 2

3. Output Load Requirements

To ensure the module operates efficiently and reliably, the minimum output load during use should not be less than 10% of the rated load. If the required power is indeed small, please connect a resistor in parallel at the output terminal (the sum of the resistor's power dissipation and the actual power used should be greater than or equal to 10% of the rated power).

Dimensions and Recommended Layout

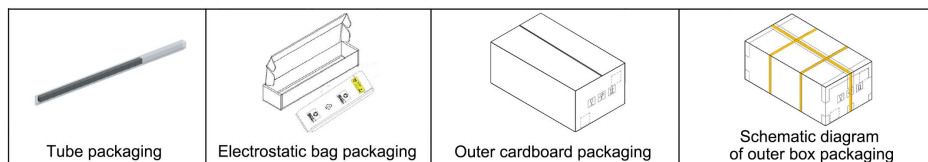
DB1-xxSxxD Dimensions and Recommended Layout



Packaging Information

| Model series (Tube packaging) | Quantity per tube (pcs/ tube) | Quantity of electrostatic bag (pcs/ bag) | Quantity of inner box (pcs/ box) | Full box Quantity (pcs) |
|-------------------------------|-------------------------------|--|----------------------------------|-------------------------|
| DB1-xxSxxD | 41 | 410 | 1640 | 6560 |

The schematic diagram of tube packaging is shown below:



Product precautions

1. The input voltage should not exceed the specified range value, otherwise it may cause permanent and irreparable damage;
2. It is recommended to use at a load of over 5%. If the load is below 5%, the ripple index of the product may exceed the specifications, but it does not affect the reliability of the product;
3. The maximum capacitive load is tested within the input voltage range and under full load conditions;
4. Unless otherwise specified, all indicators in this manual are measured at $T_a=25\text{ }^\circ\text{C}$, humidity<75% RH, nominal input voltage, and output rated load;
5. All indicator testing methods in this manual are based on our company's corporate standards;
6. Our company can provide product customization, and specific requirements can be directly contacted by our technical personnel;
7. Product specifications are subject to change without prior notice.

Manufacturer contact information

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