

MORNSUN®

A_D-2WR2 & B_D-2WR2 SERIES 2W, FIXED INPUT, ISOLATED & UNREGULATED DUAL/SINGLE OUTPUT DC-DC CONVERTER



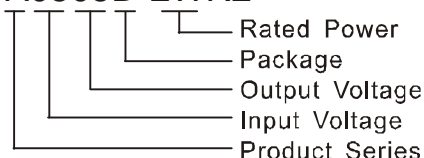
Patent Protected RoHS

FEATURES

- Miniature DIP package
- Efficiency up to 86%
- High power density
- 1500VDC isolation
- Operating temperature range:
-40°C ~ +85°C
- No external component required
- Industry standard pinout

PART NUMBER SYSTEM

A0505D-2WR2



APPLICATIONS

The A_D-2WR2 & B_D-2WR2 Series are designed for application where isolated output is required from a distributed power system.

These products apply to where:

- 1) Input voltage rang :±10%Vin;
- 2) 1500VDC input and output isolation;
- 3) Regulated and low ripple noise is not required.

Such as: digital circuits, low frequency analog circuits, and relay drive circuit.

SELECTION GUIDE

| Model | Input Voltage(VDC) Nominal (Range) | Output Voltage (VDC) | Output Current (mA) | | Input Current (mA)(Typ.) | | Reflected Ripple Current (mA, Typ.) | Max. Capacitive Load ① (μF) | Efficiency (%) @Max. Load | |
|-------------|---------------------------------------|----------------------|---------------------|------|--------------------------|----------|-------------------------------------|-----------------------------|---------------------------|------|
| | | | Max. | Min. | @Max. Load | @No Load | | | Min. | Typ. |
| B0305D-2WR2 | 3.3 (2.97-3.63) | 5 | 400 | 40 | 797 | 40 | 15 | 220 | 72 | 76 |
| A0505D-2WR2 | 5 (4.5-5.5) | ±5 | ±200 | ±20 | 500 | 25 | 15 | 100 | 76 | 80 |
| A0509D-2WR2 | | ±9 | ±111 | ±11 | 476 | | | | 80 | 84 |
| A0512D-2WR2 | | ±12 | ±83 | ±8 | 476 | | | | 80 | 84 |
| A0515D-2WR2 | | ±15 | ±67 | ±7 | 476 | | | | 80 | 84 |
| A0524D-2WR2 | | ±24 | ±42 | ±4 | 476 | | | | 80 | 84 |
| B0503D-2WR2 | | 3.3 | 400 | 40 | 335 | | | | 75 | 79 |
| B0505D-2WR2 | | 5 | 400 | 40 | 506 | | | 75 | 79 | |
| B0509D-2WR2 | | 9 | 222 | 22 | 476 | | | 80 | 84 | |
| B0512D-2WR2 | | 12 | 167 | 17 | 476 | | | 80 | 84 | |
| B0515D-2WR2 | | 15 | 133 | 13 | 476 | | | 80 | 84 | |
| B0524D-2WR2 | | 24 | 83 | 8 | 476 | | | 80 | 84 | |
| A0905D-2WR2 | | 9 (8.1-9.9) | ±5 | ±200 | ±20 | | | 278 | 20 | 15 |
| A0909D-2WR2 | ±9 | | ±111 | ±11 | 271 | 78 | 82 | | | |
| A0912D-2WR2 | ±12 | | ±83 | ±8 | 274 | 77 | 81 | | | |
| A0915D-2WR2 | ±15 | | ±67 | ±7 | 268 | 79 | 83 | | | |
| A0924D-2WR2 | ±24 | | ±42 | ±4 | 268 | 79 | 83 | | | |
| B0905D-2WR2 | 5 | | 400 | 40 | 278 | 76 | 80 | | | |
| B0909D-2WR2 | 9 | | 222 | 22 | 271 | 78 | 82 | | | |
| B0912D-2WR2 | 12 | | 167 | 17 | 274 | 77 | 81 | | | |
| B0915D-2WR2 | 15 | | 133 | 13 | 268 | 79 | 83 | | | |
| B0924D-2WR2 | 24 | | 83 | 8 | 268 | 79 | 83 | | | |

| Model | Input Voltage(VDC) | Output Voltage (VDC) | Output Current (mA) | | Input Current (mA)(Typ.) | | Reflected Ripple Current (mA, Typ.) | Max. Capacitive Load ① (μF) | Efficiency (%) @ Max. Load | |
|-------------|--------------------|----------------------|---------------------|------|--------------------------|----------|-------------------------------------|-----------------------------|----------------------------|------|
| | Nominal (Range) | | Max. | Min. | @Max. Load | @No Load | | | Min. | Typ. |
| A1205D-2WR2 | 12 (10.8-13.2) | ±5 | ±200 | ±20 | 208 | 15 | 15 | 100 | 76 | 80 |
| A1209D-2WR2 | | ±9 | ±111 | ±11 | 194 | | | | 82 | 86 |
| A1212D-2WR2 | | ±12 | ±83 | ±8 | 201 | | | | 79 | 83 |
| A1215D-2WR2 | | ±15 | ±67 | ±7 | 196 | | | | 81 | 85 |
| A1224D-2WR2 | | ±24 | ±42 | ±4 | 196 | | | | 81 | 85 |
| B1205D-2WR2 | | 5 | 400 | 40 | 203 | | | 220 | 78 | 82 |
| B1209D-2WR2 | | 9 | 222 | 22 | 196 | | | | 81 | 85 |
| B1212D-2WR2 | | 12 | 167 | 17 | 203 | | | | 78 | 82 |
| B1215D-2WR2 | | 15 | 133 | 13 | 198 | | | | 80 | 84 |
| B1224D-2WR2 | | 24 | 83 | 8 | 194 | | | | 82 | 86 |
| A1505D-2WR2 | 15 (13.5-16.5) | ±5 | ±200 | ±20 | 167 | 15 | 15 | 100 | 76 | 80 |
| A1509D-2WR2 | | ±9 | ±111 | ±11 | 159 | | | | 80 | 84 |
| A1512D-2WR2 | | ±12 | ±83 | ±8 | 165 | | | | 77 | 81 |
| A1515D-2WR2 | | ±15 | ±67 | ±7 | 157 | | | | 81 | 85 |
| A1524D-2WR2 | | ±24 | ±42 | ±4 | 157 | | | | 81 | 85 |
| B1505D-2WR2 | | 5 | 400 | 40 | 167 | | | 220 | 76 | 80 |
| B1509D-2WR2 | | 9 | 222 | 22 | 159 | | | | 80 | 84 |
| B1512D-2WR2 | | 12 | 167 | 17 | 165 | | | | 77 | 81 |
| B1515D-2WR2 | | 15 | 133 | 13 | 157 | | | | 81 | 85 |
| B1524D-2WR2 | | 24 | 83 | 8 | 157 | | | | 81 | 85 |
| A2405D-2WR2 | 24 (21.6-26.4) | ±5 | ±200 | ±20 | 104 | 8 | 15 | 100 | 76 | 80 |
| A2409D-2WR2 | | ±9 | ±111 | ±11 | 98 | | | | 81 | 85 |
| A2412D-2WR2 | | ±12 | ±83 | ±8 | 100 | | | | 79 | 83 |
| A2415D-2WR2 | | ±15 | ±67 | ±7 | 99 | | | | 80 | 84 |
| A2424D-2WR2 | | ±24 | ±42 | ±4 | 100 | | | | 79 | 83 |
| B2405D-2WR2 | | 5 | 400 | 40 | 104 | | | 220 | 76 | 80 |
| B2409D-2WR2 | | 9 | 222 | 22 | 99 | | | | 81 | 84 |
| B2412D-2WR2 | | 12 | 167 | 17 | 100 | | | | 79 | 83 |
| B2415D-2WR2 | | 15 | 133 | 13 | 99 | | | | 80 | 84 |
| B2424D-2WR2 | | 24 | 83 | 8 | 100 | | | | 79 | 83 |

Note: ① for each output.

INPUT SPECIFICATIONS

| Item | Test Conditions | Min. | Typ. | Max. | Unit |
|---------------------------------|-----------------|--------------------|------|------|------|
| Input Surge Voltage (1sec.max.) | 3.3VDC input | -0.7 | -- | 5 | VDC |
| | 5VDC input | -0.7 | -- | 9 | |
| | 9VDC input | -0.7 | -- | 12 | |
| | 12VDC input | -0.7 | -- | 18 | |
| | 15VDC input | -0.7 | -- | 21 | |
| | 24VDC input | -0.7 | -- | 30 | |
| Input Filter | | Capacitance Filter | | | |

OUTPUT SPECIFICATIONS

| Item | Test Conditions | Min. | Typ. | Max. | Unit |
|-------------------------|-----------------------|------------------------------|------|------|------|
| Output Voltage Accuracy | | See tolerance envelope curve | | | |
| Line Regulation | For Vin change of ±1% | -- | -- | ±1.2 | % |

| | | | | | | |
|----------------------------|--|--------------------------------|----|----|-------|-------|
| Load Regulation | 10% to 100% load | 3.3V output | -- | 15 | -- | % |
| | | 5V output | -- | 12 | -- | |
| | | 9V output | -- | 9 | -- | |
| | | 12V output | -- | 8 | -- | |
| | | 15V output | -- | 7 | -- | |
| | | 24V output | -- | 6 | -- | |
| Temperature Drift | 100% load | | -- | -- | ±0.03 | %/°C |
| Ripple & Noise* | 20MHz bandwidth | Output Voltage ≤ 12V | -- | 60 | -- | mVp-p |
| | | Output Voltage: 15V, 24V | -- | 75 | -- | |
| Short Circuit Protection** | Input Voltage: 9V, 24V and A0512D-2WR2, A0515D-2WR2, A0524D-2WR2 | | -- | -- | 1 | s |
| | Others | Continuous, automatic recovery | | | | |

Note: 1.*Ripple and noise tested by "parallel cable" method. See detailed operation instructions at DC-DC Application Notes.
2.**For the products of 9V and 24V Input Voltage and A0512D-2WR2, A0515D-2WR2, A0524D-2WR2, supply voltage must be discontinued at the end of short circuit duration.

COMMON SPECIFICATIONS

| Item | Test Conditions | Min. | Typ. | Max. | Unit |
|-----------------------|--|-------------------|------|------|---------|
| Isolation Voltage | Input-Output, tested for 1 minute and leakage current less than 1 mA | 1500 | -- | -- | VDC |
| Isolation Resistance | Input-Output, test at 500VDC | 1000 | -- | -- | MΩ |
| Isolation Capacitance | Input-Output, 100KHz/0.1V | -- | 20 | -- | pF |
| Switching Frequency | 100% load, nominal input | -- | 100 | 300 | KHz |
| MTBF | MIL-HDBK-217F@25°C | 3500 | -- | -- | K hours |
| Case Material | | Plastic (UL94-V0) | | | |
| Weight | | -- | 2.4 | -- | g |

ENVIRONMENTAL SPECIFICATIONS

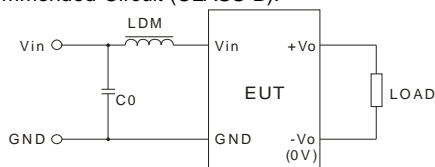
| Item | Test Conditions | Min. | Typ. | Max. | Unit |
|-------------------------|---|---------------------|------|------|------|
| Storage Humidity | Non condensing | -- | -- | 95 | % |
| Operating Temperature | Power derating (above 85°C, see Figure 2) | -40 | -- | 85 | °C |
| Storage Temperature | | -55 | -- | 125 | |
| Temp. rise at full load | Ta=25°C | -- | 25 | -- | |
| Lead Temperature | 1.5mm from case for 10 seconds | -- | -- | 300 | |
| Cooling | | Free air convection | | | |

EMC SPECIFICATIONS

| | | | | | |
|-----|-----|--|---|--|--|
| EMI | CE | CISPR22/EN55022 CLASS B (Recommended Circuit Refer to Figure1) | | | |
| | RE | CISPR22/EN55022 CLASS B (Recommended Circuit Refer to Figure1) | | | |
| EMS | ESD | A_D-2WR2 | IEC/EN61000-4-2 Contact ±6KV perf. Criteria B | | |
| | | B_D-2WR2 | IEC/EN61000-4-2 Contact ±8KV perf. Criteria B | | |

EMC RECOMMENDED CIRCUIT

EMI Typical Recommended Circuit (CLASS B):

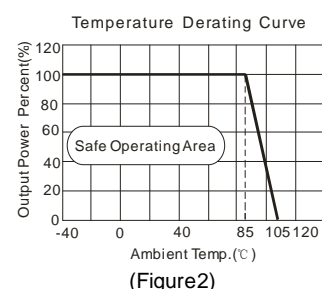
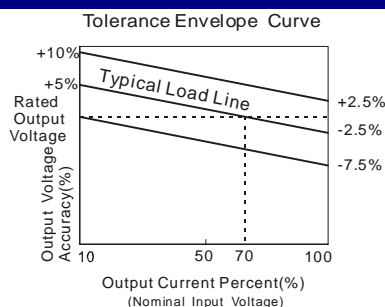


(Figure1)

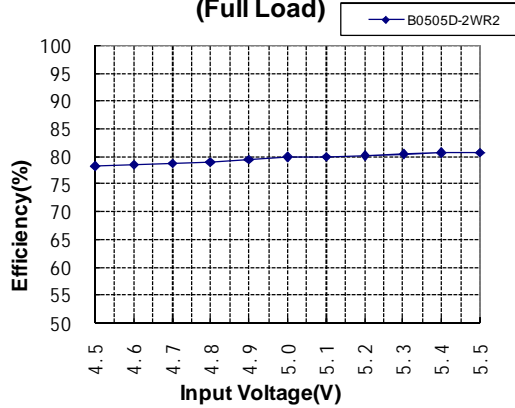
Recommended external circuit parameters:

| | | |
|-----|--------|------------------|
| EMI | Vin(V) | 3.3/5/9/12/15/24 |
| | C0 | 4.7μF /50V |
| | LDM | 6.8μH |

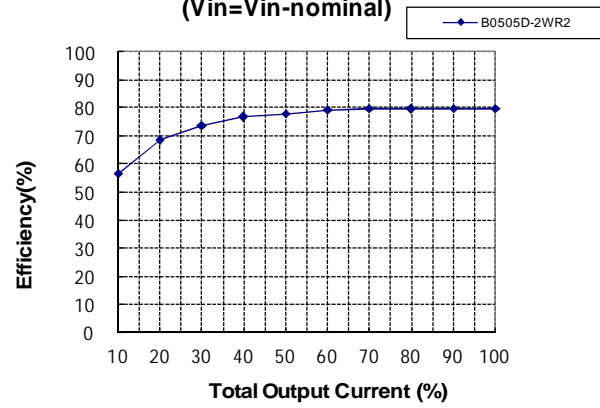
PRODUCT TYPICAL CURVE



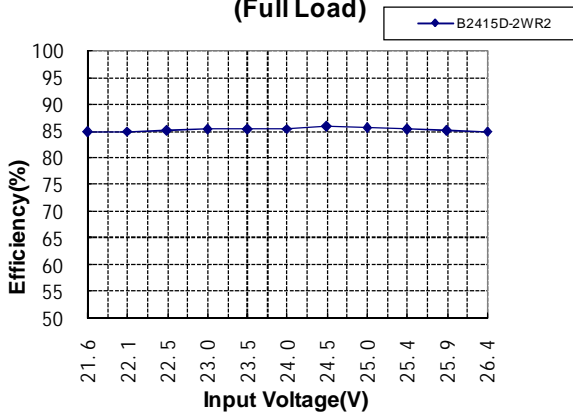
Efficiency VS Input Voltage curve (Full Load)



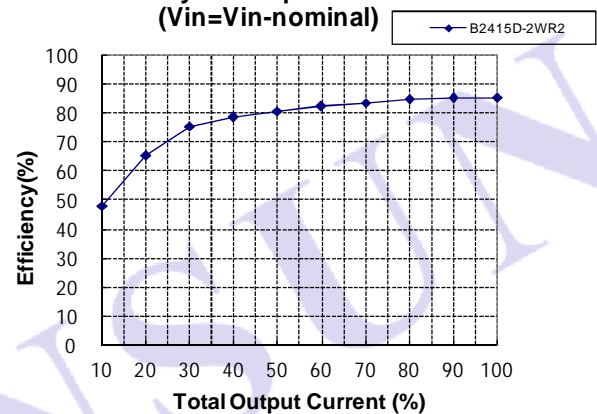
Efficiency VS Output Load curve (Vin=Vin-nominal)



Efficiency VS Input Voltage curve (Full Load)

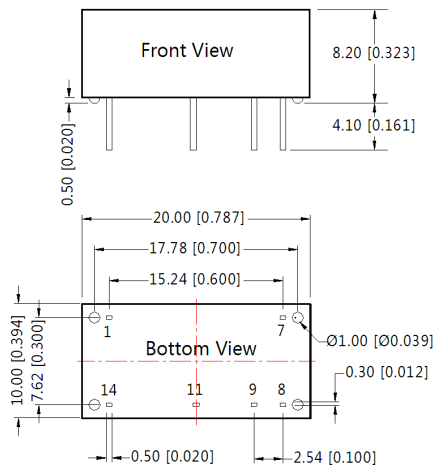


Efficiency VS Output Load curve (Vin=Vin-nominal)



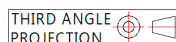
DIMENSIONS, RECOMMENDED FOOTPRINT & PACKAGING

MECHANICAL DIMENSIONS

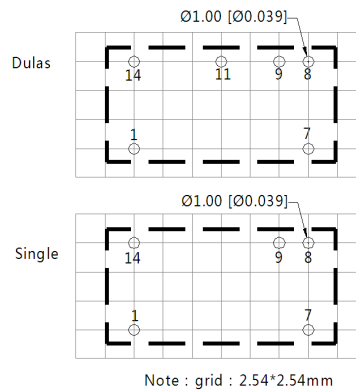


| PIN CONNECTION | | |
|----------------|--------|-------|
| Pin | Single | Dulas |
| 1 | GND | GND |
| 7 | NC | NC |
| 8 | 0V | 0V |
| 9 | +Vo | +Vo |
| 11 | No Pin | -Vo |
| 14 | Vin | Vin |

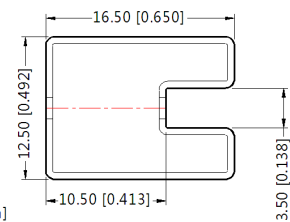
Note:
 NC: No connection
 Unit :mm[inch]
 Pin section tolerances :±0.10[±0.004]
 General tolerances:±0.25[±0.010]



RECOMMENDED FOOTPRINT DETAILS



TUBE PACKAGING DIMENSIONS

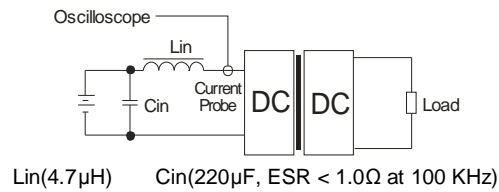


Note :
 Unit:mm[inch]
 General tolerances : ±0.50[±0.020]
 L=530[20.866] Tube Quantity:25pcs
 L=220[8.661] Tube Quantity:10pcs
 Inner carton(S): L*W*H=255*170*80
 Outer carton(S): L*W*H=375*280*270, 6 inner cartons(S)
 Inner carton(L): L*W*H=580*200*100
 Outer carton(L): L*W*H=600*215*220, 2 inner cartons(L)
 Outer carton(L): L*W*H=600*215*325, 3 inner cartons(L)

TEST CONFIGURATIONS

Input Reflected-Ripple Current Test Setup

Input reflected-ripple current is measured with an inductor L_{in} and Capacitor C_{in} to simulate source impedance.



DESIGN CONSIDERATIONS

1) Requirement on output load

To ensure this module can operate efficiently and reliably, During operation, the minimum output load is not less than 10% of the full load. If the actual output power is very small, please connect a resistor with proper resistance at the output end in parallel to increase the load, or use our company's products with a lower rated output power.

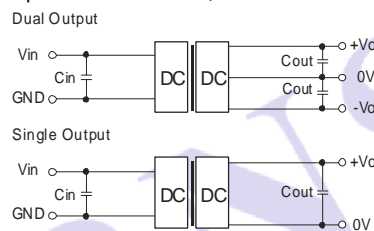
2) Overload Protection

Under normal operating conditions, the output circuit of these products has no protection against overload. The simplest method is to add a circuit breaker to the circuit.

3) Recommended Circuit

If you want to further decrease the input/output ripple, a capacitor filtering network may be connected to the input and output ends of the DC/DC converter, see (Figure 3).

It should also be noted that the capacitance of filter capacitor must be proper. If the capacitance is too big, a startup problem might arise. For every channel of output, provided the safe and reliable operation is ensured, the recommended capacitance of its filter capacitor sees (Table 1).



(Figure 3)

EXTERNAL CAPACITOR TABLE (Table 1)

| Vin (VDC) | Cin (μ F) | Single Vout (VDC) | Cout (μ F) | Dual Vout (VDC) | Cout# (μ F) |
|-----------|----------------|-------------------|-----------------|-----------------|------------------|
| 3.3 | 4.7 | 3.3 | 10 | ± 5 | 4.7 |
| 5 | 4.7 | 5 | 10 | ± 9 | 2.2 |
| 9 | 2.2 | 9 | 4.7 | ± 12 | 1 |
| 12 | 2.2 | 12 | 2.2 | ± 15 | 0.47 |
| 15/24 | 1 | 15/24 | 1 | ± 24 | 0.47 |

Note: # for each output. It's not recommended to connect any external capacitor in the application field with less than 0.5 watt output.

4) The input and the output of the product are recommended to be connected to ceramic capacitor or electrolytic capacitor. Using tantalum capacitor may cause risk of failure

5) It is not recommended to increase the output power capability by connecting two or more converters in parallel. The product is not hot-swappable

Note:

1. Operation under minimum load will not damage the converter; However, they may not meet all specifications.
2. Max. Capacitive Load is tested at nominal input voltage and full load.
3. Unless otherwise noted, All specifications are measured at $T_a=25^\circ\text{C}$, humidity<75%, nominal input voltage and rated output load.
4. In this datasheet, all test methods are based on our corporate standards.
5. All characteristics are for listed models, and non-standard models may perform differently. Please contact our technical support for more detail.
6. Please contact our technical support for any specific requirement.
7. Specifications of this product are subject to changes without prior notice.

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