

**SERIES:** VWRBS2 | **DESCRIPTION:** DC-DC CONVERTER

**FEATURES**

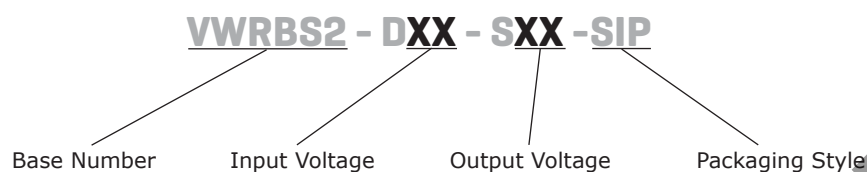
- 2 W isolated output
- wide input (2:1)
- industry standard 8 pin SIP package
- single unregulated outputs
- 1,500 V isolation
- short circuit protection
- wide temperature (-40~85°C)
- efficiency up to 80%


**MODEL**

| MODEL               | input voltage |                | output voltage<br>(Vdc) | output current |             | output power<br>max<br>(W) | ripple and noise <sup>1</sup><br>max<br>(mVp-p) | efficiency<br><br>typ (%) |
|---------------------|---------------|----------------|-------------------------|----------------|-------------|----------------------------|-------------------------------------------------|---------------------------|
|                     | typ<br>(Vdc)  | range<br>(Vdc) |                         | min<br>(mA)    | max<br>(mA) |                            |                                                 |                           |
| VWRBS2-D5-S3.3-SIP  | 5             | 4.5~9.0        | 3.3                     | 50             | 500         | 2                          | 100                                             | 64                        |
| VWRBS2-D5-S5-SIP    | 5             | 4.5~9.0        | 5                       | 40             | 400         | 2                          | 100                                             | 67                        |
| VWRBS2-D5-S9-SIP    | 5             | 4.5~9.0        | 9                       | 22             | 222         | 2                          | 100                                             | 72                        |
| VWRBS2-D5-S12-SIP   | 5             | 4.5~9.0        | 12                      | 16             | 167         | 2                          | 100                                             | 73                        |
| VWRBS2-D5-S15-SIP   | 5             | 4.5~9.0        | 15                      | 13             | 133         | 2                          | 100                                             | 72                        |
| VWRBS2-D5-S24-SIP   | 5             | 4.5~9.0        | 24                      | 8              | 80          | 2                          | 100                                             | 71                        |
| VWRBS2-D12-S3.3-SIP | 12            | 9.0~18.0       | 3.3                     | 50             | 500         | 2                          | 100                                             | 68                        |
| VWRBS2-D12-S5-SIP   | 12            | 9.0~18.0       | 5                       | 40             | 400         | 2                          | 100                                             | 75                        |
| VWRBS2-D12-S9-SIP   | 12            | 9.0~18.0       | 9                       | 22             | 222         | 2                          | 100                                             | 77                        |
| VWRBS2-D12-S12-SIP  | 12            | 9.0~18.0       | 12                      | 16             | 167         | 2                          | 100                                             | 79                        |
| VWRBS2-D12-S15-SIP  | 12            | 9.0~18.0       | 15                      | 13             | 133         | 2                          | 100                                             | 80                        |
| VWRBS2-D12-S24-SIP  | 12            | 9.0~18.0       | 24                      | 8              | 80          | 2                          | 100                                             | 78                        |
| VWRBS2-D24-S3.3-SIP | 24            | 18.0~36.0      | 3.3                     | 50             | 500         | 2                          | 100                                             | 67                        |
| VWRBS2-D24-S5-SIP   | 24            | 18.0~36.0      | 5                       | 40             | 400         | 2                          | 100                                             | 77                        |
| VWRBS2-D24-S9-SIP   | 24            | 18.0~36.0      | 9                       | 22             | 222         | 2                          | 100                                             | 79                        |
| VWRBS2-D24-S12-SIP  | 24            | 18.0~36.0      | 12                      | 16             | 167         | 2                          | 100                                             | 80                        |
| VWRBS2-D24-S15-SIP  | 24            | 18.0~36.0      | 15                      | 13             | 133         | 2                          | 100                                             | 80                        |
| VWRBS2-D24-S24-SIP  | 24            | 18.0~36.0      | 24                      | 8              | 80          | 2                          | 100                                             | 80                        |
| VWRBS2-D48-S3.3-SIP | 48            | 36.0~72.0      | 3.3                     | 50             | 500         | 2                          | 100                                             | 71                        |
| VWRBS2-D48-S5-SIP   | 48            | 36.0~72.0      | 5                       | 40             | 400         | 2                          | 100                                             | 75                        |
| VWRBS2-D48-S9-SIP   | 48            | 36.0~72.0      | 9                       | 22             | 222         | 2                          | 100                                             | 76                        |
| VWRBS2-D48-S12-SIP  | 48            | 36.0~72.0      | 12                      | 16             | 167         | 2                          | 100                                             | 78                        |
| VWRBS2-D48-S15-SIP  | 48            | 36.0~72.0      | 15                      | 13             | 133         | 2                          | 100                                             | 78                        |
| VWRBS2-D48-S24-SIP  | 48            | 36.0~72.0      | 24                      | 8              | 80          | 2                          | 100                                             | 80                        |

Notes: 1. ripple and noise are measured at 20 MHz BW

## PART NUMBER KEY



## INPUT

| parameter               | conditions/description | min  | typ | max  | units |
|-------------------------|------------------------|------|-----|------|-------|
| operating input voltage | 5 V model              | 4.5  | 5   | 9.0  | Vdc   |
|                         | 12 V model             | 9.0  | 12  | 18.0 | Vdc   |
|                         | 24 V model             | 18.0 | 24  | 36.0 | Vdc   |
|                         | 48 V model             | 36.0 | 48  | 72.0 | Vdc   |

## OUTPUT

| parameter               | conditions/description                   | min | typ   | max   | units |
|-------------------------|------------------------------------------|-----|-------|-------|-------|
| line regulation         | input voltage from low to high           |     | ±0.2  | ±0.5  | %     |
| load regulation         | measured from 10% load to full load      |     | ±0.5  | ±0.75 | %     |
| voltage accuracy        | input voltage range refer to output load |     | ±1    | ±3    | %     |
| switching frequency     | 100% load, input voltage range           | 180 |       | 500   | kHz   |
| temperature coefficient |                                          |     | ±0.03 |       | %/°C  |

## PROTECTIONS

| parameter                | conditions/description | min | typ | max | units |
|--------------------------|------------------------|-----|-----|-----|-------|
| short circuit protection | continuous             |     |     |     |       |

## SAFETY AND COMPLIANCE

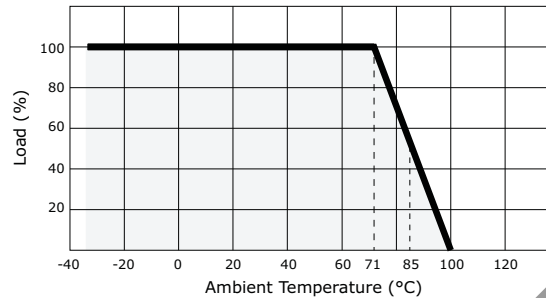
| parameter            | conditions/description    | min       | typ | max | units |
|----------------------|---------------------------|-----------|-----|-----|-------|
| isolation voltage    | for 1 minute at 1 mA max. | 1,500     |     |     | Vdc   |
| isolation resistance | at 500 Vdc                | 1,000     |     |     | MΩ    |
| MTBF                 |                           | 1,000,000 |     |     | hours |
| RoHS compliant       | yes                       |           |     |     |       |

## ENVIRONMENTAL

| parameter             | conditions/description          | min | typ | max | units |
|-----------------------|---------------------------------|-----|-----|-----|-------|
| operating temperature |                                 | -40 |     | 85  | °C    |
| storage temperature   |                                 | -50 |     | 125 | °C    |
| storage humidity      | non-condensing                  |     |     | 95  | %     |
| temperature rise      | at full load                    |     | 15  | 35  | °C    |
| lead temperature      | 1.5 mm from case for 10 seconds |     |     | 300 | °C    |

## DERATING CURVES

1. output power vs. ambient temperature

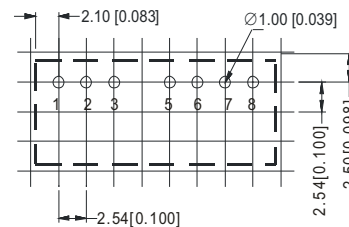
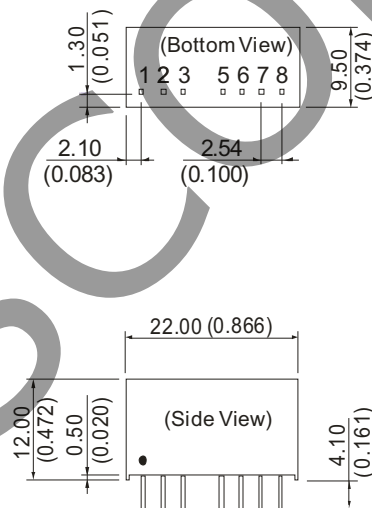


## MECHANICAL

| parameter     | conditions/description                          | min | typ | max | units |
|---------------|-------------------------------------------------|-----|-----|-----|-------|
| dimensions    | 0.866 x 0.374 x 0.472 (22.00 x 9.50 x 12.00 mm) |     |     |     | inch  |
| case material | plastic (UL94-V0)                               |     |     |     |       |
| weight        |                                                 |     | 5.5 |     | g     |

## MECHANICAL DRAWING

units: mm [inches]

tolerance:  $\pm 0.25$  [ $\pm 0.010$ ]pin section tolerance:  $\pm 0.10$  mm [ $\pm 0.004$ ]

| PIN CONNECTIONS |          |
|-----------------|----------|
| PIN             | FUNCTION |
| 1               | GND      |
| 2               | +Vin     |
| 3               | CTRL     |
| 5               | NC       |
| 6               | +Vo      |
| 7               | 0 V      |
| 8               | CS       |

## APPLICATION NOTES

### 1. CTRL Terminal

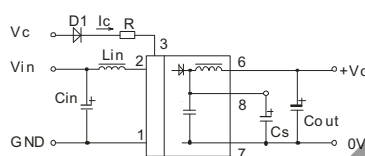
When open or high impedance, the converter works well; When this pin is 'high', the converter shuts down; It should be noted that the input current ( $I_C$ ) should be between 5-10mA, exceeding the maximum 20mA will cause permanent damage to the converter. The value of R can be derived as follows:

$$R = \frac{V_C - V_D - 1.0}{I_C}$$

### 2. Recommended Circuit

If you want to further decrease the input/output ripple, an "LC" filtering network may be connected to the input and output ends of the DC/DC converter, see (Figure 1).

Figure 1



However, the capacitance of the output 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 greatest capacitance of its filter capacitor sees (Table 1).

|      |                     |                                |
|------|---------------------|--------------------------------|
| Cin  | 5, 12 V<br>24, 48 V | 100 $\mu$ F<br>10 ~ 22 $\mu$ F |
| Lin  | --                  | 4.7 ~ 120 $\mu$ H              |
| Cout | --                  | 100 $\mu$ F (typ)              |
| Lout | --                  | 2.2 ~ 10 $\mu$ H               |
| Cs   | --                  | 10 ~ 22 $\mu$ F                |

Table 1

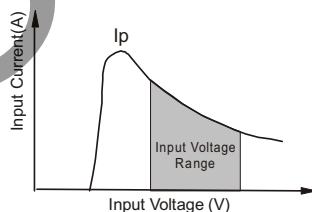
| Vin (Vdc) | Cout ( $\mu$ F) |
|-----------|-----------------|
| 3.3       | 2,200           |
| 5         | 1,000           |
| 9         | 820             |
| 12        | 680             |
| 15        | 560             |
| 24        | 470             |

### 3. Input

#### Current

While using unstable power source, please ensure the output voltage and ripple voltage do not exceed indexes of the converter. The preceding power source must be able to provide for converter sufficient starting current  $I_{py}$ .

General:  $I_p \leq 1.4 \cdot I_{in-max}$



### 4. No parallel connection or plug and play

## REVISION HISTORY

| rev. | description                 | date       |
|------|-----------------------------|------------|
| 1.0  | initial release             | 03/12/2010 |
| 1.01 | V-Infinity branding removed | 09/10/2012 |

The revision history provided is for informational purposes only and is believed to be accurate.



**CUI INC®**

**Headquarters**  
20050 SW 112th Ave.  
Tualatin, OR 97062  
**800.275.4899**

Fax 503.612.2383  
**cui.com**  
techsupport@cui.com

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