# CUI INC®

**SERIES:** VRX3-DIP | **DESCRIPTION:** DC-DC CONVERTER

## FEATURES

- 3 W isolated output
- wide input (2:1)
- industry standard 10 pin DIP package
- no heatsink required
- unregulated outputs
- 1,500 V isolation
- short circuit protection
- wide temperature (-40~85°C)
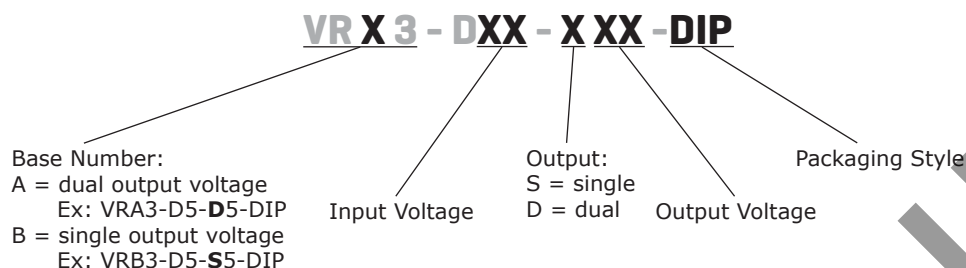- efficiency up to 80%

RoHS

| MODEL | input voltage typ (Vdc) | input voltage range (Vdc) | output voltage (Vdc) | output current min (mA) | output current max (mA) | output power max (W) | ripple and noise[1] typ (mVp-p) | efficiency typ (%) |
|---|---|---|---|---|---|---|---|---|
| VRA3-D5-D5-DIP | 5 | 4.5~9.0 | ±5 | ±30 | ±200 | 3 | 50 | 68 |
| VRA3-D5-D9-DIP | 5 | 4.5~9.0 | ±9 | ±16 | ±167 | 3 | 50 | 70 |
| VRA3-D5-D12-DIP | 5 | 4.5~9.0 | ±12 | ±12 | ±125 | 3 | 50 | 72 |
| VRA3-D5-D15-DIP | 5 | 4.5~9.0 | ±15 | ±10 | ±100 | 3 | 50 | 73 |
| VRA3-D12-D5-DIP | 12 | 9.0~18.0 | ±5 | ±30 | ±200 | 3 | 50 | 74 |
| VRA3-D12-D9-DIP | 12 | 9.0~18.0 | ±9 | ±16 | ±167 | 3 | 50 | 76 |
| VRA3-D12-D12-DIP | 12 | 9.0~18.0 | ±12 | ±12 | ±125 | 3 | 50 | 78 |
| VRA3-D12-D15-DIP | 12 | 9.0~18.0 | ±15 | ±10 | ±100 | 3 | 50 | 79 |
| VRA3-D24-D5-DIP | 24 | 18.0~36.0 | ±5 | ±30 | ±200 | 3 | 50 | 77 |
| VRA3-D24-D9-DIP | 24 | 18.0~36.0 | ±9 | ±16 | ±167 | 3 | 50 | 78 |
| VRA3-D24-D12-DIP | 24 | 18.0~36.0 | ±12 | ±12 | ±125 | 3 | 50 | 79 |
| VRA3-D24-D15-DIP | 24 | 18.0~36.0 | ±15 | ±10 | ±100 | 3 | 50 | 80 |
| VRA3-D48-D5-DIP | 48 | 36.0~72.0 | ±5 | ±30 | ±200 | 3 | 50 | 77 |
| VRA3-D48-D9-DIP | 48 | 36.0~72.0 | ±9 | ±16 | ±167 | 3 | 50 | 78 |
| VRA3-D48-D12-DIP | 48 | 36.0~72.0 | ±12 | ±12 | ±125 | 3 | 50 | 79 |
| VRA3-D48-D15-DIP | 48 | 36.0~72.0 | ±15 | ±10 | ±100 | 3 | 50 | 80 |
| VRB3-D5-S5-DIP | 5 | 4.5~9.0 | 5 | 60 | 600 | 3 | 50 | 68 |
| VRB3-D5-S9-DIP | 5 | 4.5~9.0 | 9 | 33 | 333 | 3 | 50 | 70 |
| VRB3-D5-S12-DIP | 5 | 4.5~9.0 | 12 | 25 | 250 | 3 | 50 | 72 |
| VRB3-D5-S15-DIP | 5 | 4.5~9.0 | 15 | 20 | 200 | 3 | 50 | 73 |
| VRB3-D12-S5-DIP | 12 | 9.0~18.0 | 5 | 60 | 600 | 3 | 50 | 74 |
| VRB3-D12-S9-DIP | 12 | 9.0~18.0 | 9 | 33 | 333 | 3 | 50 | 76 |
| VRB3-D12-S12-DIP | 12 | 9.0~18.0 | 12 | 25 | 250 | 3 | 50 | 78 |
| VRB3-D12-S15-DIP | 12 | 9.0~18.0 | 15 | 20 | 200 | 3 | 50 | 77 |
| VRB3-D24-S5-DIP | 24 | 18.0~36.0 | 5 | 60 | 600 | 3 | 50 | 77 |
| VRB3-D24-S9-DIP | 24 | 18.0~36.0 | 9 | 33 | 333 | 3 | 50 | 78 |
| VRB3-D24-S12-DIP | 24 | 18.0~36.0 | 12 | 25 | 250 | 3 | 50 | 79 |
| VRB3-D24-S15-DIP | 24 | 18.0~36.0 | 15 | 20 | 200 | 3 | 50 | 80 |
| VRB3-D48-S5-DIP | 48 | 36.0~72.0 | 5 | 60 | 600 | 3 | 50 | 77 |
| VRB3-D48-S9-DIP | 48 | 36.0~72.0 | 9 | 33 | 333 | 3 | 50 | 78 |
| VRB3-D48-S12-DIP | 48 | 36.0~72.0 | 12 | 25 | 250 | 3 | 50 | 79 |
| VRB3-D48-S15-DIP | 48 | 36.0~72.0 | 15 | 20 | 200 | 3 | 50 | 80 |

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

## PART NUMBER KEY

VR **X** 3 - D**XX** - **X XX** - **DIP**

Base Number:
A = dual output voltage
Ex: VRA3-D5-**D**5-DIP
B = single output voltage
Ex: VRB3-D5-**S**5-DIP

Input Voltage

Output:
S = single
D = dual     Output Voltage

Packaging Style

## 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 | VRA3 models | | ±0.5 | ±1.0 | % |
| | | VRB3 models | | ±0.5 | ±0.75 | % |
| voltage accuracy | positive | | | ±1 | ±3 | % |
| | negative | | | ±3 | ±5 | % |
| ripple and noise | 20 MHz bandwidth | | | 50 | 100 | mVp-p |
| switching frequency | 100% load, input voltage range | | | 300 | | 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 |
| isolation capacitance | input to output at 100 kHz / 1 V | | 85 | | pF |
| MTBF | | 1,000,000 | | | hours |
| RoHS compliant | yes | | | | |

## ENVIRONMENTAL

| parameter | conditions/description | min | typ | max | units |
|---|---|---|---|---|---|
| operating temperature | | -40 | | 85 | °C |
| storage temperature | | -55 | | 125 | °C |
| storage humidity | non-condensing | | | 95 | % |
| temperature rise | at full load | | 15 | | °C |
| lead temperature | 1.5 mm from case for 10 seconds | | | 300 | °C |

## DERATING CURVES

1. output power vs. ambient temperature
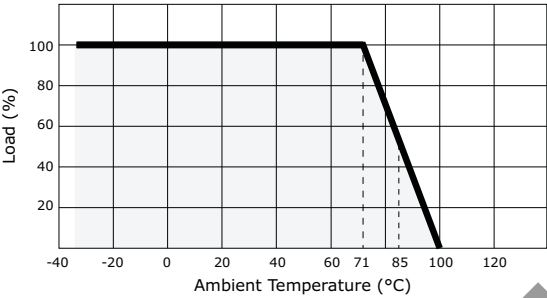


## MECHANICAL

| parameter | conditions/description | min | typ | max | units |
|---|---|---|---|---|---|
| dimensions | 1.252 x 0.787 x 0.394 (31.80 x 20.00 x 10.00 mm) | | | | inch |
| case material | stainless steel | | | | |
| weight | | | 14 | | g |

## MECHANICAL DRAWING

units: mm [inches]
tolerance: ±0.25 [±0.010]
pin section tolerance: ±0.10 mm [±0.004]
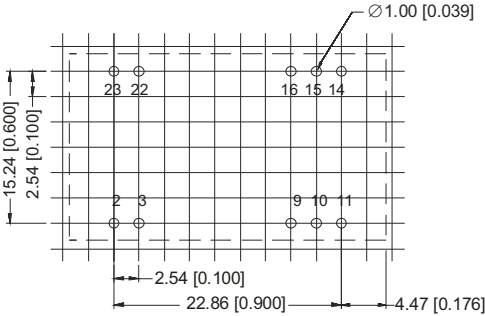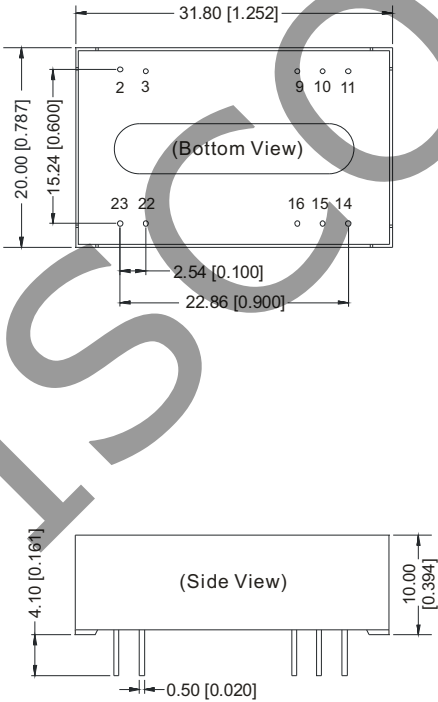


| PIN CONNECTIONS | | |
|---|---|---|
| SERIES | VRA3 | VRB3 |
| PIN | FUNCTION | FUNCTION |
| 2,3 | GND | GND |
| 9 | NC | 0 V |
| 10,15 | NC | NC |
| 11 | NC | -Vo |
| 14 | +Vo | +Vo |
| 16 | 0 V | 0 V |
| 22,23 | +Vin | +Vin |

## APPLICATION NOTES

1.  **Requirement on Output Load**
    In order to ensure the product operates efficiently and reliably, make sure the specified range of input voltage is not exceeded and the minimum output load is not less than 10% load. If the actual load is less than the specified minimum load, the output ripple may increase sharply while its efficiency and reliability will reduce greatly. If the actual output power is very small, please add an appropriate resistor as extra loading.

2.  **Recommended Circuit**
    All VRX3 converters have been tested according to the following recommended testing circuit before leaving the factory. This series should be tested under load, never under no load (Figure 1).

    **Figure 1**

    **VRA3**

    **VRB3**
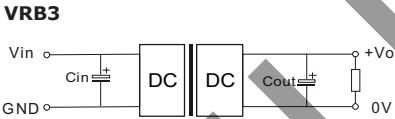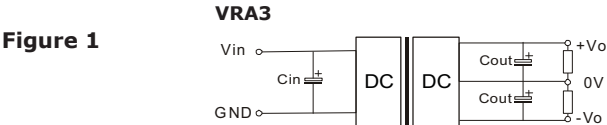
    However, the capacitance of the output filter capacitor must be proper. If the capacitance is too big, a startup problem might arise. For every channel of output, provided the safe and reliable operation is ensured, the greatest capacitance of its filter capacitor see (Table 1).

    General:

    | Cin | 5, 12 V<br>24, 48 V | 100 μF<br>10 ~ 22 μF |
    |-----|---------------------|----------------------|
    | Cout | 10 μF / 100 mA | |

    **Table 1**

    | VRA3 Vout (Vdc) | Cout (μF) | VRB3 Vout (Vdc) | Cout (μF) |
    |-----------------|-----------|-----------------|-----------|
    | ±5 | 680 | 5 | 1,000 |
    | ±9 | 470 | 9 | 680 |
    | ±12 | 330 | 12 | 470 |
    | ±15 | 220 | 15 | 330 |

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 Ip.

    General: $Ip \leq 1.4 * Iin\text{-}max$
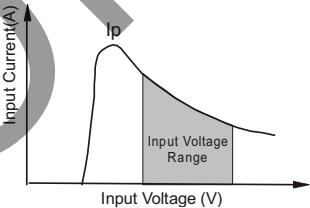
4.  **No parallel connection or plug and play**

## REVISION HISTORY

| rev. | description | date |
|------|-------------|------|
| 1.0 | initial release | 05/09/2012 |
| 1.01 | V-Infinity branding removed | 09/11/2012 |

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

**CUI** INC®