

VRB_D-40W Series 40W, WIDE INPUT, ISOLATED & REGULATED SINGLE OUTPUT DC-DC CONVERTER

RoHS

FEATURES

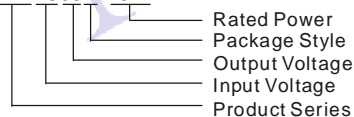
- Efficiency up to 90%
- High power density
- Wide (2:1) Input Range
- 1.5KVDC Input/Output Isolation
- Over Current Protection
- Over Temperature Protection
- Short Circuit Protection
- Over Voltage Protection
- Under Voltage Protection
- Remote Voltage Compensate
- Operating temperature: -40°C to +85°C
- Internal SMD Construction
- Metal Shielding Package 2"×2"×0.42"
- With heatsink
- MTBF>1,000,000 hours
- Industrial level specifications

APPLICATION

The VRB-D-40W series are particularly suited to data transfer equipments, battery operated equipments, tele-communication equipments, distributing power system, mix analog/digital system, remote control system, industrial robot system and other wide input voltage application fields.

MODEL SELECTION

VRB4805D-40W



PRODUCT PROGRAM

| Part Number | Input | | | Output | | Capacitor Load Max ⁽³⁾ (μF) | Efficiency (% Typ) |
|--------------|---------------|-------|---------------------|---------------|-----------------------------|--|--------------------|
| | Voltage (VDC) | | | Voltage (VDC) | Current ⁽²⁾ (mA) | | |
| | Nominal | Range | Max. ⁽¹⁾ | | | | |
| VRB1203D-40W | 12 | 9-18 | 20 | 3.3 | 8000 | 21000 | 84 |
| VRB1205D-40W | | | | 5 | 8000 | 13600 | 86 |
| VRB1212D-40W | | | | 12 | 3300 | 2360 | 86 |
| VRB1215D-40W | | | | 15 | 2666 | 1510 | 88 |
| VRB1224D-40W | | | | 24 | 1670 | 470 | 88 |
| VRB2403D-40W | 24 | 18-36 | 40 | 3.3 | 8000 | 21000 | 87 |
| VRB2405D-40W | | | | 5 | 8000 | 13600 | 89 |
| VRB2412D-40W | | | | 12 | 3300 | 2360 | 89 |
| VRB2415D-40W | | | | 15 | 2666 | 1510 | 90 |
| VRB2424D-40W | | | | 24 | 1670 | 470 | 90 |
| VRB4803D-40W | 48 | 36-75 | 80 | 3.3 | 8000 | 21000 | 85 |
| VRB4805D-40W | | | | 5 | 8000 | 13600 | 88 |
| VRB4812D-40W | | | | 12 | 3300 | 2360 | 90 |
| VRB4815D-40W | | | | 15 | 2666 | 1510 | 90 |
| VRB4824D-40W | | | | 24 | 1670 | 470 | 89 |

Note: Add suffix "H" for heatsink mounted, for example VRB4805D-40WH.

INPUT SPECIFICATIONS

| Item | Test conditions | Min. | Typ. | Max. | Units | |
|-----------------------|---------------------------|---------------------|------|------|-------|-----|
| Under Voltage Lockout | Nominal input (12V) | DC-DC Module ON | -- | -- | 9 | VDC |
| | | DC-DC Module OFF | 7.8 | -- | -- | |
| | Nominal input (24V) | DC-DC Module ON | -- | -- | 17.8 | |
| | | DC-DC Module OFF | 16 | -- | -- | |
| | Nominal input (48V) | DC-DC Module ON | -- | -- | 35.5 | |
| | | DC-DC Module OFF | 33.0 | -- | -- | |
| Input filter | | PI | | | | |
| Start-up time | Nominal input and CR load | -- | 5 | -- | ms | |
| Ctrl | Models ON | Open or 3.5V<Vc<12V | | | | |
| | Models OFF | Short or 0V<Vc<1.2V | | | | |
| | | Input current<1mA | | | | |

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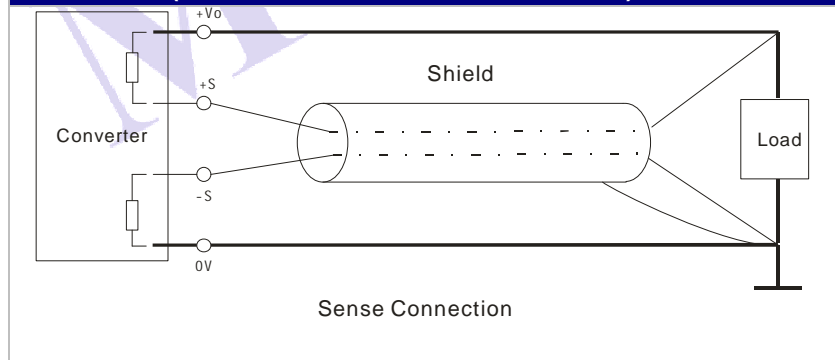
OUTPUT SPECIFICATIONS

| Item | Test Conditions | Min | Typ | Max | Units |
|--------------------------|--------------------------------|----------------------------|--------------|---------|-------|
| Output max Power | Refer to Product Program | 4 | -- | 40 | W |
| Output Voltage Accuracy | Refer to recommended circuit | -- | ± 1 | -- | % |
| Load Regulation | 10% to 100% load | -- | ± 0.5 | -- | |
| Voltage regulation | Input voltage from low to high | -- | ± 0.2 | -- | mV |
| Ripple | 20MHz Bandwidth | -- | 40 | 75 | |
| Noise | | -- | 100 | 150 | |
| Transient recovery time | 25% load change | -- | 200 | 500 | us |
| Transient peak deviation | | -- | ± 3 | ± 5 | %Vo |
| Over current protection | Input voltage range | 120-150%Po | | | |
| Over voltage protection | Input voltage range | 110-130%Vo | | | |
| Over temp. protection | Input voltage range | -- | 115 | -- | °C |
| Short circuit protection | Input voltage range | Hiccup, automatic recovery | | | |
| Temperature Drift(Vout) | Refer to recommended circuit | -- | ± 0.02 | -- | %/°C |
| TRIM | | -- | $\pm 10\%Vo$ | -- | VDC |
| SENSE | Remote Voltage compensation | -- | 10%Vo | -- | |

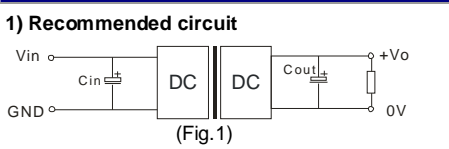
COMMON SPECIFICATIONS

| Item | Test Conditions | Min | Typ | Max | Units |
|-----------------------|--------------------------------|----------------------------------|------|------|---------|
| Storage Humidity | | 5 | -- | 95 | % |
| Operating Temperature | | -40 | -- | +85 | °C |
| Storage Temperature | | -55 | -- | +125 | |
| Maximum Case Temp. | On working temperature | -- | -- | 105 | |
| Lead Temperature | 1.5mm from case for 10 seconds | -- | -- | 300 | |
| Isolation voltage | Test for 1 minute and 1 mA max | 1500 | -- | -- | VDC |
| Isolation resistance | Test at 500VDC | 1000 | -- | -- | MΩ |
| Isolation capacitance | 100KHz /0.1V | -- | 2000 | -- | pF |
| Switching Frequency | Nominal, full load | -- | 300 | -- | KHz |
| MTBF | MIL-HDBK-217F | 1000 | -- | -- | K hours |
| Weight | | -- | 60 | -- | g |
| Cooling | | Free Air Convection | | | |
| Case material | | Nickel- coated copper(Six-sided) | | | |

SENSE USE (REMOTE VOLTAGE COMPENSATION)



RECOMMENDED CIRCUIT



In order to obtain better performance for the DC/DC models. It's recommended that use input and output filters as Fig.1 shown.

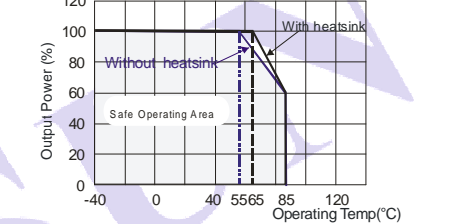
2) Recommended capacitance

| Output Voltage | Capacitance Cout (μF) | Cin(μF) (12V, 24V,48V input) |
|----------------|-----------------------|------------------------------|
| 3.3V、5V | 220 | 100 |
| 12V、15V | 100 | |
| 24V | 47 | |

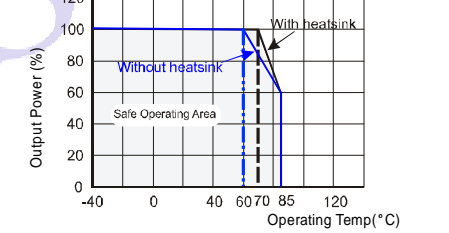
3) No parallel connection or plug and play

DERATING & EFFICIENCY CURVE

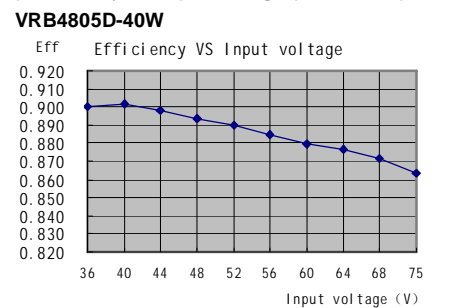
1) Temperature derating curve (Output Voltage ≤ 5V)



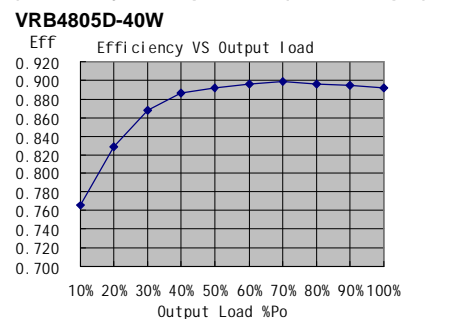
(Output Voltage > 5V)



2) Efficiency VS Input voltage (Rated load)

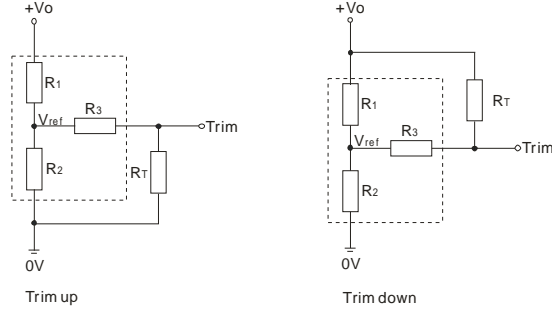


3) Efficiency VS output Load (Nominal input)



TRIM APPLICATION & TRIM RESISTANCE

Application circuit for TRIM (Part in broken line is the interior of models)



Formula for resistance of Trim

$$\text{up: } R_T = \frac{aR_2}{R_2 - a} - R_3 \quad a = \frac{V_{ref}}{V_o' - V_{ref}} \cdot R_1$$

$$\text{down: } R_T = \frac{aR_1}{R_1 - a} - R_3 \quad a = \frac{V_o' - V_{ref}}{V_{ref}} \cdot R_2$$

Note: Value for R1, R2, R3, and Vref refer to the following table.

R_T: Resistance of Trim

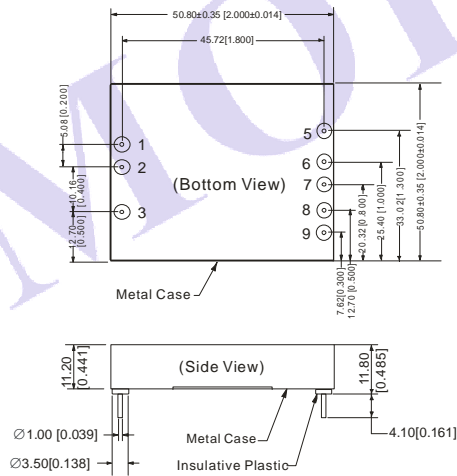
a: User-defined parameter, no actual meanings.

V_{o'}: The trim up/down voltage

| Vo Parameter | 3.3(VDC) | 5(VDC) | 12(VDC) | 15(VDC) | 24 (VDC) |
|-----------------|----------|--------|---------|---------|-------------|
| R1(KΩ) | 4.801 | 2.883 | 10.971 | 14.497 | 24.872 |
| R2(KΩ) | 2.863 | 2.864 | 2.864 | 2.864 | 2.863 |
| R3(KΩ) | 15 | 10 | 17.8 | 17.8 | 20 |
| Vref(V) | 1.24 | 2.5 | 2.5 | 2.5 | 2.5 |

OUTLINE DIMENSIONS & FOOTPRINT DETAILS

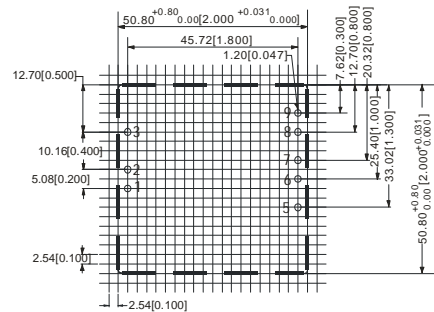
MECHANICAL DIMENSIONS



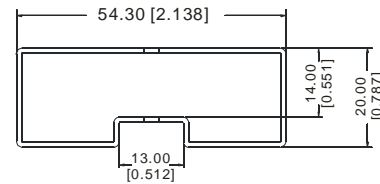
| FOOTPRINT DETAILS | |
|-------------------|----------|
| Pin | Function |
| 1 | Vin |
| 2 | GND |
| 3 | Ctrl |
| 5 | -Sense |
| 6 | +Sense |
| 7 | +Vo |
| 8 | 0V |
| 9 | Trim |

Unit:mm[inch]
Pin diameter tolerances:±0.10mm[±0.004inch]
General tolerances:±0.25mm[±0.010inch]

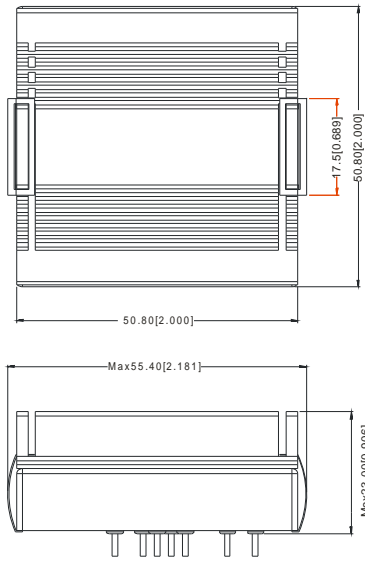
RECOMMENDED FOOTPRINT



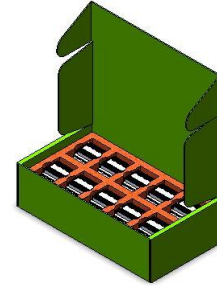
TUBE OUTLINE DIMENSIONS (WITHOUT HEATSINK)



Unit :mm[inch]
General tolerances: ±0.50mm[±0.020inch]
L=230mm[9.055inch] Pcs/Tube:3



Note:
 Unit: mm[inch]
 tolerances $\pm 0.50\text{mm}[\pm 0.020\text{inch}]$
 1. If use heatsinks, make sure there is enough space for a specific size in the above graph;
 2. Products will be supplied with heatsinks already mounted, separate heatsinks are not available.



Inside package box:
 L*W*H=355*192*93mm Package quantity: 20pcs
 Outside package box:
 L*W*H=405*380*305mm Package quantity: 120pcs

NOTE

1. Input voltage can't exceed this value, or will cause the permanent damage.
2. Minimum operating current is 10% of rated current, if less than 10% rated current, output ripple may increase rapidly, the amplitude $\leq 1\text{V}$.
3. Capacitor MAX load tested at nominal input voltage, full load and constant resistive load.
4. The CTRL control pin voltage is referenced to GND.
5. Only typical model listed. Non-standard models will be different from the above, please contact us for more details.
6. All specifications are measured at $T_A=25^\circ\text{C}$, humidity $<75\%$, nominal input voltage and rated output load unless otherwise specified.
7. In this datasheet, all the test methods of indications are based on corporate standards.