**PART NUMBER:** VCD40 series

**DESCRIPTION:** DC/DC converter

**features**
- **40W isolated output**
- **efficiency to 90%**
- **fixed 350 KHz switching frequency**
- **2:1 input range**
- **regulated outputs**
- **continuous short circuit protection**
- **six sided metal case**
- **2" x 2" size**
- **industry standard pin-out**


RoHS

| model[4] number | input voltage | output voltage | output current | input current no load | input current full load | efficiency |
|---|---|---|---|---|---|---|
| VCD40-D12-S2R5 | 9-18 VDC | 2.5 VDC | 10000 mA | 200mA | 2422mA | 86% |
| VCD40-D12-S3R3 | 9-18 VDC | 3.3 VDC | 10000 mA | 200mA | 3161mA | 87% |
| VCD40-D12-S5 | 9-18 VDC | 5 VDC | 8000 mA | 200mA | 3745mA | 89% |
| VCD40-D12-S12 | 9-18 VDC | 12 VDC | 3333 mA | 200mA | 3703mA | 90% |
| VCD40-D12-S15 | 9-18 VDC | 15 VDC | 2666 mA | 200mA | 3702mA | 90% |
| VCD40-D12-D12 | 9-18 VDC | ±12 VDC | 1800 mA | 100mA | 4186mA | 86% |
| VCD40-D12-D15 | 9-18 VDC | ±15 VDC | 1400 mA | 100mA | 4070mA | 86% |
| VCD40-D12-T312 | 9-18 VDC | 3.3/±12V | 6A/±0.4A | 200mA | 2917mA | 84% |
| VCD40-D12-T315 | 9-18 VDC | 3.3/±15V | 6A/±0.3A | 200mA | 2857mA | 84% |
| VCD40-D12-T512 | 9-18 VDC | 5.0/±12V | 6A/±0.4A | 200mA | 3837mA | 86% |
| VCD40-D12-T515 | 9-18 VDC | 5.0/±15V | 6A/±0.3A | 200mA | 3779mA | 86% |
| VCD40-D24-S3R3 | 18-36 VDC | 3.3 VDC | 8000 mA | 100 mA | 1325 mA | 87% |
| VCD40-D24-S5 | 18-36 VDC | 5 VDC | 8000 mA | 100 mA | 1961 mA | 89% |
| VCD40-D24-S12 | 18-36 VDC | 12 VDC | 3333 mA | 100 mA | 2048 mA | 88% |
| VCD40-D24-S15 | 18-36 VDC | 15 VDC | 2666 mA | 100 mA | 1985 mA | 89% |
| VCD40-D24-D12 | 18-36 VDC | ±12 VDC | 1800 mA | 100 mA | 2069 mA | 87% |
| VCD40-D24-D15 | 18-36 VDC | ±15 VDC | 1400 mA | 100 mA | 2011 mA | 87% |
| VCD40-D24-T312 | 18-36 VDC | 3.3/±12 V | 6A/±0.4 mA | 100 mA | 1441 mA | 85% |
| VCD40-D24-T315 | 18-36 VDC | 3.3/±15 V | 6A/±0.3 mA | 100 mA | 1412 mA | 85% |
| VCD40-D24-T512 | 18-36 VDC | 5.0/±12 V | 6A/±0.4 mA | 100 mA | 1897 mA | 87% |
| VCD40-D24-T515 | 18-36 VDC | 5.0/±15 V | 6A/±0.3 mA | 100 mA | 1868 mA | 87% |
| VCD40-D48-S3R3 | 36-75 VDC | 3.3 VDC | 8000 mA | 50 mA | 655 mA | 82% |
| VCD40-D48-S5 | 36-75 VDC | 5 VDC | 8000 mA | 50 mA | 969 mA | 90% |
| VCD40-D48-S12 | 36-75 VDC | 12 VDC | 3333 mA | 50 mA | 1000 mA | 89% |
| VCD40-D48-S15 | 36-75 VDC | 15 VDC | 2666 mA | 50 mA | 992 mA | 89% |
| VCD40-D48-D12 | 36-75 VDC | ±12 VDC | 1800 mA | 50 mA | 1034 mA | 87% |
| VCD40-D48-D15 | 36-75 VDC | ±15 VDC | 1400 mA | 50 mA | 1006 mA | 87% |
| VCD40-D48-T312 | 36-75 VDC | 3.3/±12 V | 6A/±0.4A | 50 mA | 712 mA | 86% |
| VCD40-D48-T315 | 36-75 VDC | 3.3/±15 V | 6A/±0.3A | 50 mA | 698 mA | 86% |
| VCD40-D48-T512 | 36-75 VDC | 5.0/±12 V | 6A/±0.4A | 50 mA | 938 mA | 88% |
| VCD40-D48-T515 | 36-75 VDC | 5.0/±15 V | 6A/±0.3A | 50 mA | 923 mA | 88% |

**PART NUMBER:** VCD40 series **DESCRIPTION:** DC/DC converter

## INPUT

| | | |
|---|---|---|
| input voltage range | 12V: | 9-18V |
| | 24V: | 18-36V |
| | 48V: | 36-72V |
| under voltage lockout | 12 Vin power up | 8.8 V |
| | 12 Vin power down | 8.0 V |
| | 24 Vin power up | 17 V |
| | 24 Vin power down | 16 V |
| | 48 Vin power up | 34 V |
| | 48 Vin power down | 32 V |
| input filter | | Pi type |

## Output

| | | |
|---|---|---|
| voltage accuracy | single / dual output | ±1.5% max. |
| | triple: main | ±1.5% max. |
| | auxiliary | ±5.0% max. |
| transient response: | 75-100% step load change | |
| | error band | ±5% Vout nominal |
| | recovery time | <300 µS |
| output voltage adjustment range | | 90-110% |
| ripple & noise | 20MHz BW | |
| | 2.5 V & 3.3 V & 5 V | 20 mV RMS, max., 50 mV pk-pk, max. |
| | 12 V & 15 V | 20 mV RMS, max., 75 mV pk-pk, max. |
| temperature coefficient | | ±0.02%/°C |
| line regulation[1] | single/dual | ±0.5% max. |
| | triple...main | ±1.0% max. |
| | auxiliary | ±5.0% max. |
| load regulation[2] | single/dual | ±0.5% / ±1.0% max. |
| | triple...main | ±2.0% max. |
| | auxiliary | ±5.0% max. |
| over-voltage protection | 3.3 V | 3.6 V |
| | 5 V | 6.2 V |
| | 12 V | 15 V |
| | 15 V | 18 V |
| output current limit | % nom. output | 110-140% |
| short circuit protection | continuous | |

**PART NUMBER:** VCD40 series **DESCRIPTION:** DC/DC converter

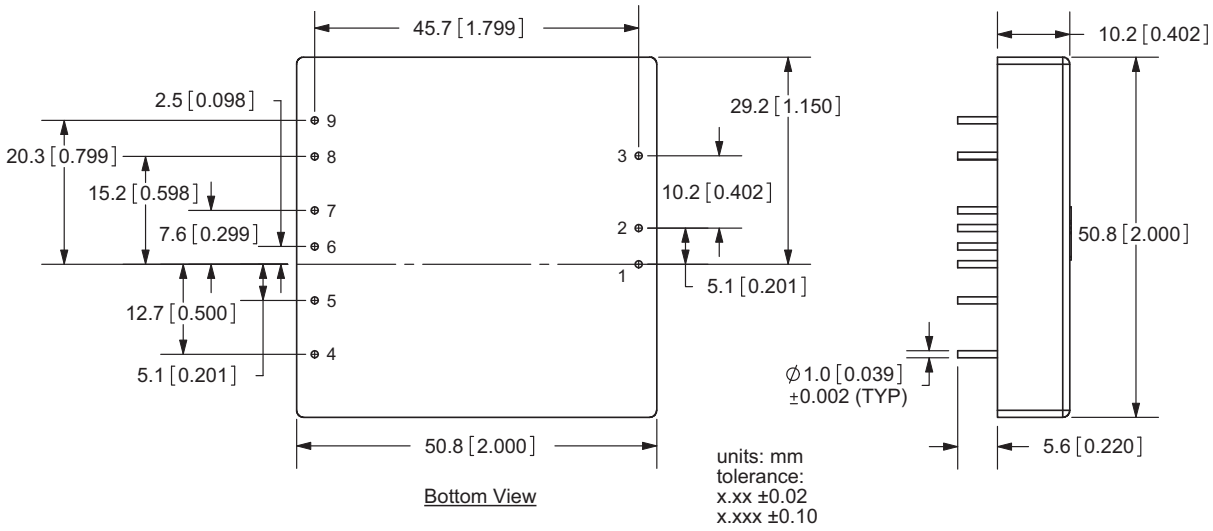
## GENERAL SPECIFICATIONS

| | | |
|---|---|---|
| efficiency | | see table |
| isolation voltage | (input to output) | 1500VDC min. |
| Isolation Resistance | | $10^9$ Ohm min. |
| switching frequency | 350KHz, typical | |
| case grounding | connected to output common | |
| operating temp. range[5] | | -40°C to 85°C |
| case temp.[5] | 100°C max. | |
| storage temp. | -55°C to 125°C | |
| thermal shutdown | case temp. | 110°C typ. |
| cooling | free-air convection | |
| EMI/RFI | six sided continuous shield | |
| dimensions | 2x2x0.4 inches<br>(50.8x50.8x10.2mm) | |
| weight | 65 g | |
| case material | black coated copper with non-conductive base | |

**NOTES:**
1. measured from high line to low line
2. measured from full load to 10% load
3. logic compatibility CMOS or open collector TTL, ref. to -Vin
   module ON >3.5 VDC to 75 VDC or open circuit
   module OFF <1.8 VDC
4. suffix "N" to the model number with negative logic remote ON/OFF
   module ON <1.8 VDC
   module OFF >3.5 VDC to 75 VDC or open circuit
5. ± sense if ±sense is not being used the +sense should be connected to +Vout and the -sense should be connected to the -Vout
6. maximum case temperature under any operating condition should not exceed 100°C

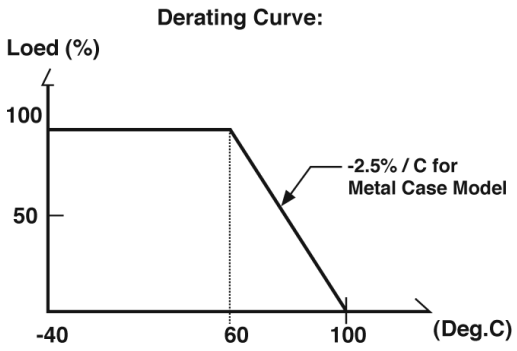
**PART NUMBER:** VCD40 series **DESCRIPTION:** DC/DC converter

## DIMENSIONS (mm)




| Pin # | Single Output | Dual Output | Triple |
|---|---|---|---|
| | Function | Function | Function |
| 1 | +V Input | +V Input | +V Input |
| 2 | -V Input | -V Input | -V Input |
| 3 | ON / OFF | ON / OFF | ON / OFF |
| 4 | NC | NO Pin | +Aux. Out |
| 5 | -Sense | +V Output | Common |
| 6 | +Sense | Common | -Aux. Out |
| 7 | +V Output | Common | +V Output |
| 8 | -V Output | -V Output | -V Output (Common) |
| 9 | Trim | Trim | NC |

## DERATING CURVE




Natural Convection, 20ft./min.(0.1m/s)
Case Temperature Limit to 100˚C max.

**PART NUMBER:** VCD40 series **DESCRIPTION:** DC/DC converter

## TRIM INFORMATION

**1.** The value of Rtrim-up defined as:

$$R_{trim\text{-}up} = \left(\frac{R1 \times Vr}{Vo - V_{o,\,nom}}\right) - Rt \ \ (\mathrm{K\Omega})$$

Where: R trim-up is the external resistor in Kohm.
Vo,nom is the nominal output voltage.
Vo is the desired output voltage.

R1 ,Rt and Vr are internal to the unit and are defined in Table 1.

For example, to trim-up the output voltage of 5.0V module (VCD40-D48-S5) by 5% to 5.25V, R trim-up is calculated as follows:

Vo – Vo,nom = 5.25 – 5.0 = 0.25V
R1 = 2.32 Kohm
Rt = 8.2 Kohm , Vr= 2.5

$$R_{trim\text{-}up} = \frac{2.32 \times 2.5}{0.25} - 8.2 = 15\,(\mathrm{K\Omega})$$

The value of R trim-down defined as:

$$R_{trim\text{-}down} = \frac{R1 \times (Vo - Vr)}{V_{o,\,nom} - Vo} - Rt \ \ (\mathrm{K\Omega})$$

Where: R trim-down is the external resistor in Kohm.
Vo,nom is the nominal output voltage.
Vo is the desired output voltage.

R1 ,Rt and Vr are internal to the unit and are defined in **Table 1.**

For example, to trim-down the output voltage of 5.0V module (VCD40-D48-S5) by 5% to 4.75V, R trim-down is calculated as follows :

Vo,nom – Vo = 5.0 – 4.75 = 0.25 V
R1 = 2.32 Kohm
R t = 8.2 Kohm , Vr=2.5

$$R_{trim\text{-}down} = \frac{2.32 \times (4.75 - 2.5)}{0.25} - 8.2 = 12.68 \ \ (\mathrm{K\Omega})$$

**2.** The output Voltage 3.3V,12V and 15V value of Rtrim are defined as below:

$$R_{trim\text{-}up} = \left(\frac{Vr \times R1 \times (R2 + R3)}{(Vo - V_{o,\,nom}) \times R2}\right) - Rt \ \ (\mathrm{K\Omega})$$

$$R_{trim\text{-}down} = R1 \times \left(\frac{Vr \times R1}{(V_{o,\,nom} - Vo) \times R2} - 1\right) - Rt \ \ (\mathrm{K\Omega})$$

Where: R trim-up is the external resistor in Kohm.
Vo,nom is the nominal output voltage.
Vo is the desired output voltage.
R1, R2, R3, Rt and Vr are internal to the unit and are defined in **Table 2**.

Figure 1. Trim-up Voltage Setup

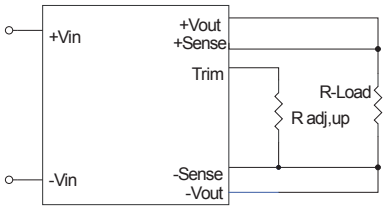



Figure 2. Trim-down Voltage Setup

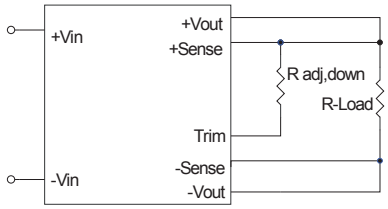



***Table 1 - Trim Resistor Values***

| Model Number | Output Voltage(V) | R1 (Kohm) | Rt (Kohm) | Vr |
|---|---|---|---|---|
| VCD40-D24-S5<br>VCD40-D48-S5 | 5.0 | 2.32 | 8.2 | 2.5 |

***Table 2 - Trim Resistor Values***

| Model Number | Output Voltage(V) | R1 (Kohm) | R2 (Kohm) | R3 (Kohm) | Rt (Kohm) | Vr |
|---|---|---|---|---|---|---|
| VCD40-D24-S3R3<br>VCD40-D48-S3R3 | 3.3V | 2.74 | 1.8 | 0.27 | 9.1 | 1.24 |
| VCD40-D24-S12<br>VCD40-D48-S12 | 12V | 6.8 | 2.4 | 2.32 | 22 | 2.5 |
| VCD40-D24-S15<br>VCD40-D48-S15 | 15V | 8.06 | 2.4 | 3.9 | 27 | 2.5 |

In order to trim the voltage up or down one needs to connect the trim resistor either between the trim pin and -Vo for trim-up and between trim pin and +Vo for trim-down. The output voltage trim range is ±10%. This is shown in **Figures 1 and 2**: