

## SERIES: PRQ200W | DESCRIPTION: DC-DC CONVERTER

### FEATURES

- 200 W isolated output
- 1/4-brick package with industry standard pin-out
- 4:1 ultra-wide input voltage range
- single regulated output
- high efficiency up to 91%
- output short circuit, over current, over voltage, & over temperature protection
- 2250 Vdc isolation
- EN 62368-1
- available with heat sink or base plate
- remote on/off control

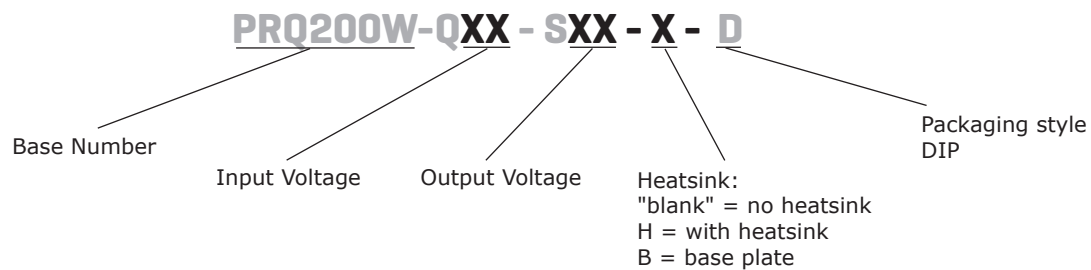


### MODEL

|                                | input voltage |             | output voltage | output current max | output power max | ripple and noise <sup>1</sup> max | efficiency <sup>2</sup> typ |
|--------------------------------|---------------|-------------|----------------|--------------------|------------------|-----------------------------------|-----------------------------|
|                                | typ (Vdc)     | range (Vdc) |                |                    |                  |                                   |                             |
| PRQ200W-Q48-S5-D               | 48            | 18~75       | 5              | 40.0               | 200              | 250                               | 88                          |
| PRQ200W-Q48-S12-D              | 48            | 18~75       | 12             | 16.7               | 200              | 250                               | 91                          |
| PRQ200W-Q48-S15-D              | 48            | 18~75       | 15             | 13.3               | 200              | 250                               | 89                          |
| PRQ200W-Q48-S24-D              | 48            | 18~75       | 24             | 8.4                | 200              | 250                               | 91                          |
| PRQ200W-Q48-S36-D <sup>3</sup> | 48            | 18~75       | 36             | 5.56               | 200              | 300                               | 88                          |
| PRQ200W-Q48-S48-D              | 48            | 18~75       | 48             | 4.2                | 200              | 250                               | 91                          |

Notes: 1. 20MHz bandwidth, nominal input, full load  
2. Efficiency is measured in nominal input voltage and rated output load.  
3. Model is not CE certified.

### PART NUMBER KEY



## INPUT

| parameter                         | conditions/description                                                                                     | min  | typ | max      | units |
|-----------------------------------|------------------------------------------------------------------------------------------------------------|------|-----|----------|-------|
| operating input voltage           |                                                                                                            | 18   | 48  | 80       | Vdc   |
| start-up voltage                  |                                                                                                            |      |     | 18       | Vdc   |
| surge voltage                     | for maximum 1 second                                                                                       | -0.7 |     | 90       | Vdc   |
| remote on/off (CTRL) <sup>1</sup> | module ON: CTRL pin open or pulled high (3.5~12 Vdc)<br>module OFF: CTRL pin pulled low to GND (0~1.2 Vdc) |      |     |          |       |
|                                   | input current when OFF                                                                                     |      | 2   | 10       | mA    |
| filter                            | Pi filter                                                                                                  |      |     |          |       |
| current                           | full load/no load                                                                                          |      |     | 4845/200 | mA    |

Note: 1. The voltage of CTRL pin is relative to input pin GND.

## OUTPUT

| parameter               | conditions/description                        | min | typ      | max        | units  |
|-------------------------|-----------------------------------------------|-----|----------|------------|--------|
| maximum capacitive load | 5 Vdc output models                           |     |          | 6,000      | μF     |
|                         | 12 Vdc & 15 Vdc output models                 |     |          | 2,000      | μF     |
|                         | 24 Vdc & 36 Vdc output models                 |     |          | 1,000      | μF     |
|                         | 48 Vdc output models                          |     |          | 450        | μF     |
| line regulation         | low line to high line                         |     | ±0.2     | ±0.5       | %      |
| load regulation         | 5~100% load                                   |     | ±0.5     | ±0.75      | %      |
| set-point accuracy      | 0~100% load                                   |     | ±1       | ±3         | %      |
| switching frequency     | PWM mode                                      |     | 250      |            | kHz    |
| transient response      | 25% load step change                          |     |          |            |        |
|                         | 5 Vdc output model<br>all other output models |     | ±3<br>±3 | ±7.5<br>±5 | %<br>% |
| temperature coefficient | full load                                     |     |          | ±0.03      | %/°C   |
| trim range              | 36 Vdc output models                          | 100 |          | 110        | %      |
|                         | all other output models                       | 90  |          | 110        | %      |
| sense range             |                                               |     |          | 105        | %      |

## PROTECTIONS

| parameter                   | conditions/description            | min | typ | max | units |
|-----------------------------|-----------------------------------|-----|-----|-----|-------|
| over voltage protection     |                                   | 110 | 130 | 160 | %     |
| over current protection     |                                   | 110 | 130 | 150 | %     |
| short circuit protection    | continuous, auto recovery, hiccup |     |     |     |       |
| over temperature protection | 36 Vdc output models              | 95  | 105 | 115 | °C    |
|                             | all other output models           |     | 115 | 120 | °C    |

## SAFETY AND COMPLIANCE

| parameter             | conditions/description                                                               | min   | typ   | max | units  |
|-----------------------|--------------------------------------------------------------------------------------|-------|-------|-----|--------|
| isolation voltage     | input to output, 5mA for 1 minute                                                    | 2,250 |       |     | Vdc    |
|                       | input to case, 5mA for 1 minute                                                      | 1,500 |       |     | Vdc    |
|                       | output to case, 5mA for 1 minute                                                     | 500   |       |     | Vdc    |
| isolation resistance  | input-output at 500 Vdc                                                              | 100   |       |     | MΩ     |
| isolation capacitance | input to output at 100 KHz/0.1 V                                                     |       | 2,200 |     | pF     |
| safety approvals      | certified to 62368: EN, BS EN                                                        |       |       |     |        |
| conducted emissions   | CISPR32/EN55032 CLASS A (see Fig. 2 for recommended circuit)                         |       |       |     |        |
| radiated emissions    | CISPR32/EN55032 CLASS A (see Fig. 2 for recommended circuit)                         |       |       |     |        |
| ESD                   | IEC/EN61000-4-2, EN50121-3-2 Contact ±6KV Air ±8KV, perf. Criteria B                 |       |       |     |        |
| radiated immunity     | IEC/EN61000-4-3, EN50121-3-2 10V/m, perf. Criteria A                                 |       |       |     |        |
| EFT/burst             | IEC/EN61000-4-4, EN50121-3-2 ±2KV, perf. Criteria A                                  |       |       |     |        |
| surge                 | EN50121-3-2 differential mode ±1KV, 1.2/50us, source impedance 42Ω, perf. Criteria B |       |       |     |        |
| conducted immunity    | IEC/EN61000-4-6, EN50121-3-2 10 Vr.m.s, perf. Criteria A                             |       |       |     |        |
| MTBF                  | MIL-HDBK-217 at 25°C                                                                 | 500   |       |     | kHours |
| RoHS                  | yes                                                                                  |       |       |     |        |

## ENVIRONMENTAL

| parameter             | conditions/description | min | typ | max | units |
|-----------------------|------------------------|-----|-----|-----|-------|
| operating temperature | see derating curve     | -40 |     | 85  | °C    |
| storage temperature   |                        | -55 |     | 125 | °C    |
| storage humidity      | non-condensing         | 5   |     | 95  | %     |

## SOLDERABILITY

|                          |                                                        |  |  |     |    |
|--------------------------|--------------------------------------------------------|--|--|-----|----|
| pin soldering resistance | wave-soldering, 10 seconds                             |  |  | 260 | °C |
| temperature              | soldering spot is 1.5 mm away from case for 10 seconds |  |  | 300 | °C |

## MECHANICAL

| parameter      | conditions/description                                                                   | min | typ | max | units |
|----------------|------------------------------------------------------------------------------------------|-----|-----|-----|-------|
| dimensions     | 61.8 x 40.2 x 12.7                                                                       |     |     |     | mm    |
|                | with base plate 62.0 x 56.0 x 14.6                                                       |     |     |     | mm    |
|                | with heat sink 61.8 x 40.2 x 27.7                                                        |     |     |     | mm    |
| case material  | aluminum alloy case, black plastic bottom, flame-retardant and heat-resistant (UL94 V-0) |     |     |     |       |
| weight         |                                                                                          |     | 89  |     | g     |
|                | with base plate                                                                          |     | 109 |     | g     |
|                | with heat sink                                                                           |     | 120 |     | g     |
| cooling method | natural convection (20 LFM)                                                              |     |     |     |       |

## MECHANICAL DRAWING

units: mm [inches]

pin 1,2,3,5,6,7's diameter: 1.00 [0.039]

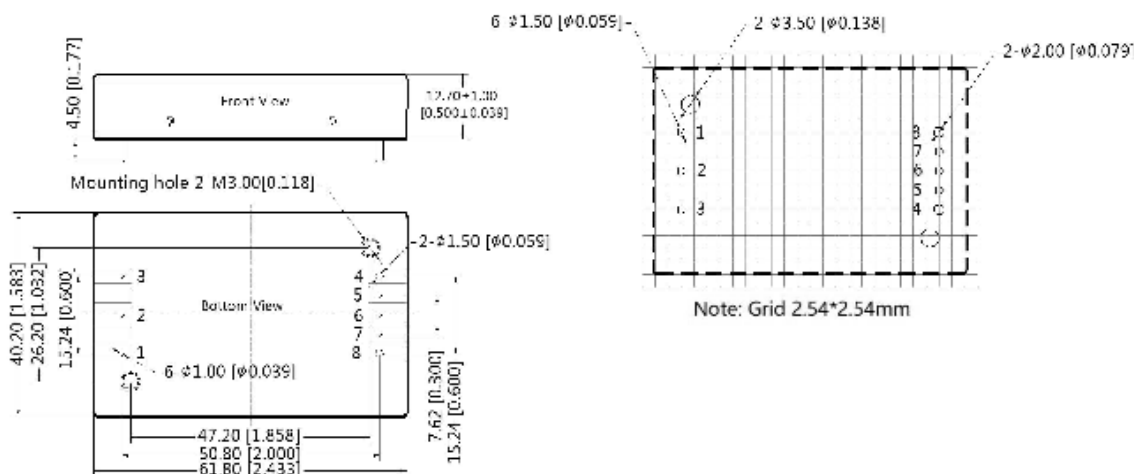
pin 4,8's diameter: 1.50 [0.059]

pin diameter tolerance:  $\pm 0.10$  [ $\pm 0.004$ ]

general tolerance:  $\pm 0.50$  [ $\pm 0.020$ ]

mounting hole screwing torque: Max 0.4 N·m

| PIN CONNECTIONS |          |
|-----------------|----------|
| PIN             | FUNCTION |
| 1               | +Vin     |
| 2               | CTRL     |
| 3               | -Vin     |
| 4               | 0V       |
| 5               | Sense-   |
| 6               | Trim     |
| 7               | Sense+   |
| 8               | +Vo      |



## MECHANICAL DRAWING (CONTINUED)

### with base plate

units: mm [inches]

pin 1,2,3,5,6,7's diameter: 1.00 [0.039]

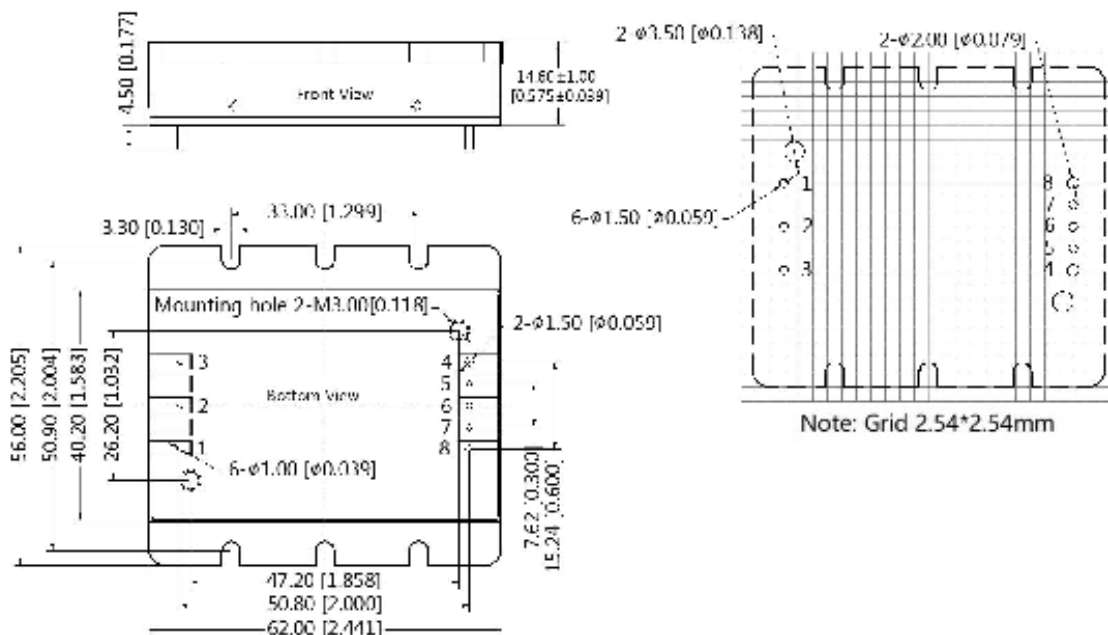
pin 4,8's diameter: 1.50 [0.059]

pin diameter tolerance:  $\pm 0.10$  [ $\pm 0.004$ ]

general tolerance:  $\pm 0.50$  [ $\pm 0.020$ ]

mounting hole screwing torque: Max 0.4 N·m

| PIN CONNECTIONS |          |
|-----------------|----------|
| PIN             | FUNCTION |
| 1               | +Vin     |
| 2               | CTRL     |
| 3               | -Vin     |
| 4               | 0V       |
| 5               | Sense-   |
| 6               | Trim     |
| 7               | Sense+   |
| 8               | +Vo      |



### with heatsink

units: mm [inches]

pin 1,2,3,5,6,7's diameter: 1.00 [0.039]

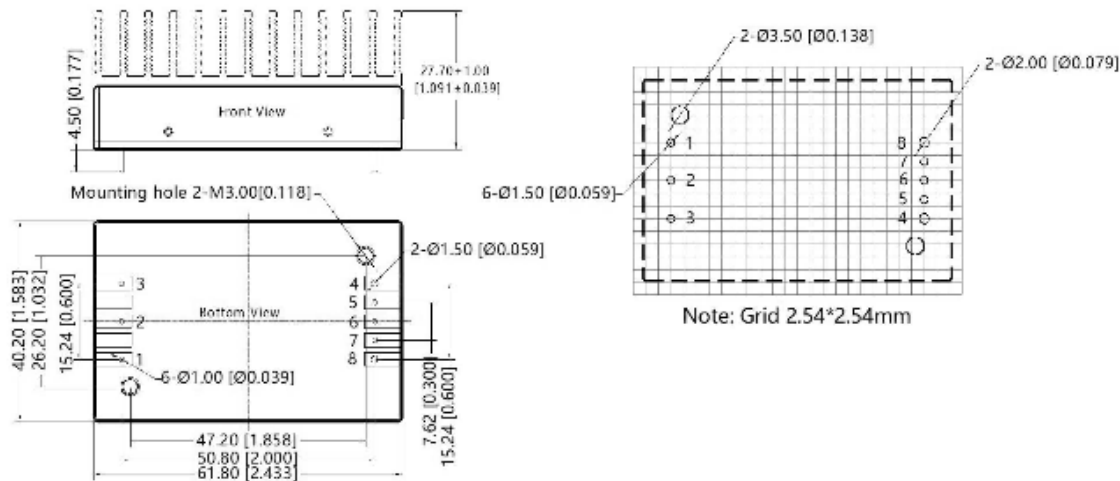
pin 4,8's diameter: 1.50 [0.059]

pin diameter tolerance:  $\pm 0.10$  [ $\pm 0.004$ ]

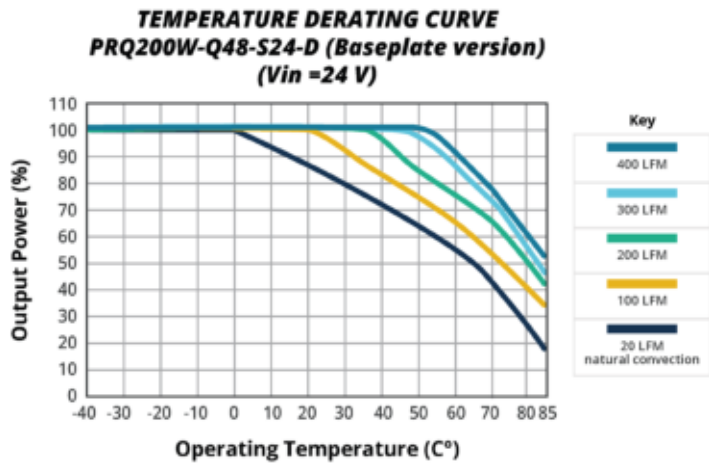
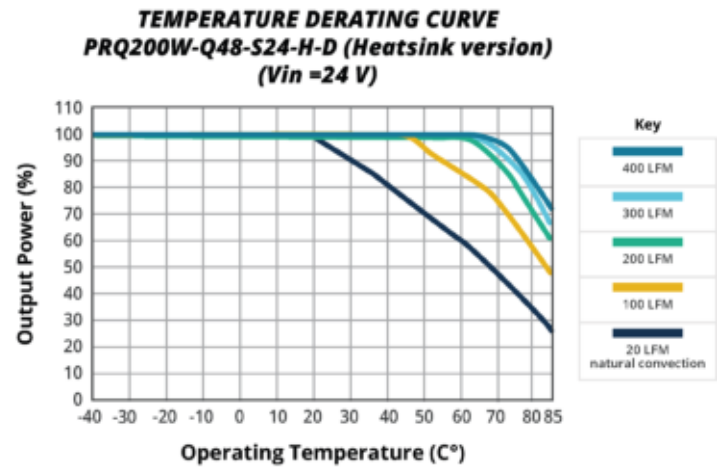
general tolerance:  $\pm 0.50$  [ $\pm 0.020$ ]

mounting hole screwing torque: Max 0.4 N·m

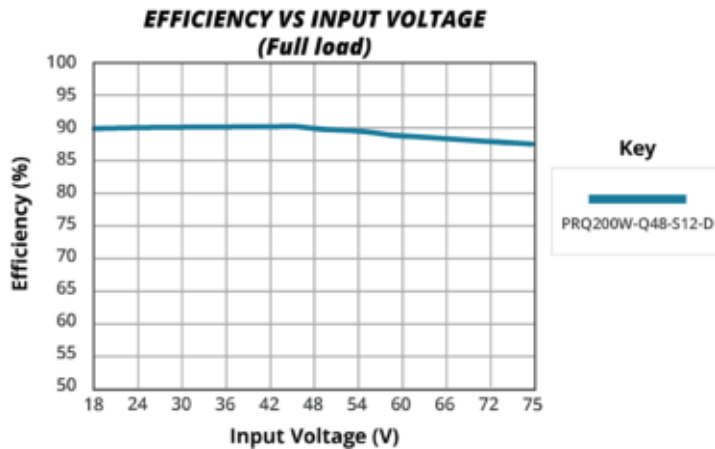
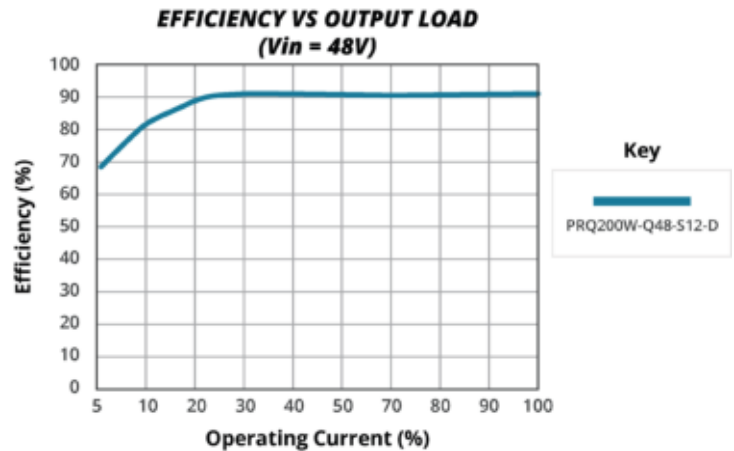
| PIN CONNECTIONS |          |
|-----------------|----------|
| PIN             | FUNCTION |
| 1               | +Vin     |
| 2               | CTRL     |
| 3               | -Vin     |
| 4               | 0V       |
| 5               | Sense-   |
| 6               | Trim     |
| 7               | Sense+   |
| 8               | +Vo      |



## DERATING CURVES



## EFFICIENCY CURVES



## APPLICATION CIRCUIT

1. It is recommended to use the circuit shown in Fig. 1 during product testing and application, or otherwise ensure that at least 220  $\mu\text{F}$  of electrolytic capacitors are connected at the input in order to ensure adequate voltage surge suppression and protection.
2. It is recommended to increase the value of  $C_{in}$  and pay attention to the unstable input voltage if the product input side is paralleled with motor drive circuit and/or larger energy transient circuits, to ensure the stability of input terminal and avoid repeatedly start-up problems due to input voltage lower than under-voltage protection point.
3. It is recommended to increase the output capacitance, limited to the capacitive load specification and/or increasing the voltage clamping circuit (such as TVS) if the output terminal is inductive device such as relay or a motor, to ensure adequate voltage surge suppression and protection.
4. Input and/or output ripple can be further reduced by appropriately increasing the input & output capacitor values  $C_{in}$  and  $C_{out}$  and/or by selecting capacitors with a low ESR (equivalent series resistance). Also make sure that the capacitance is not exceeding the specified maximum capacitive load value of the product.

Figure 1

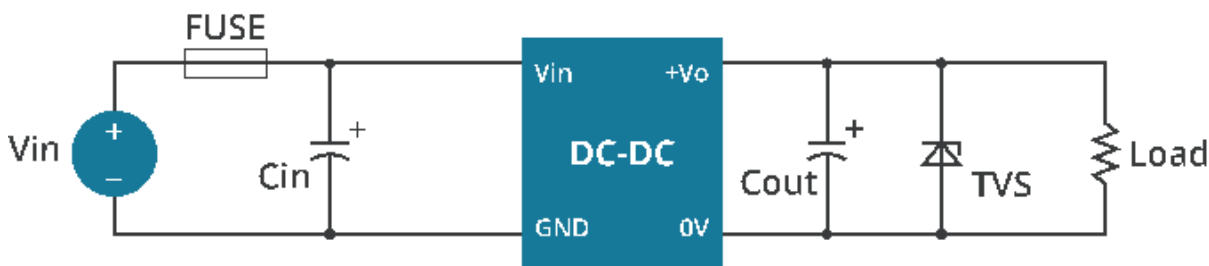


Table 1

| Output voltage (Vdc) | FUSE             | $C_{in}$ ( $\mu\text{F}$ ) | $C_{out}$ ( $\mu\text{F}$ ) | TVS      |
|----------------------|------------------|----------------------------|-----------------------------|----------|
| 5                    | 20A<br>slow blow | 220 $\mu\text{F}$          | 470 $\mu\text{F}$           | SMDJ6.0A |
| 12                   |                  |                            | 220 $\mu\text{F}$           | SMDJ14A  |
| 15                   |                  |                            |                             | SMDJ17A  |
| 24                   |                  |                            |                             | SMDJ28A  |
| 36                   |                  |                            | 110 $\mu\text{F}$           | SMDJ47A  |
| 48                   |                  |                            |                             | SMDJ54A  |

Note: Please pay attention to the ambient temperature of the product when using an external capacitor, increase the electrolytic capacitor values to at least 1.5 times the original parameter if the ambient temperature is low.

EMC RECOMMENDED CIRCUITS

Figure 2

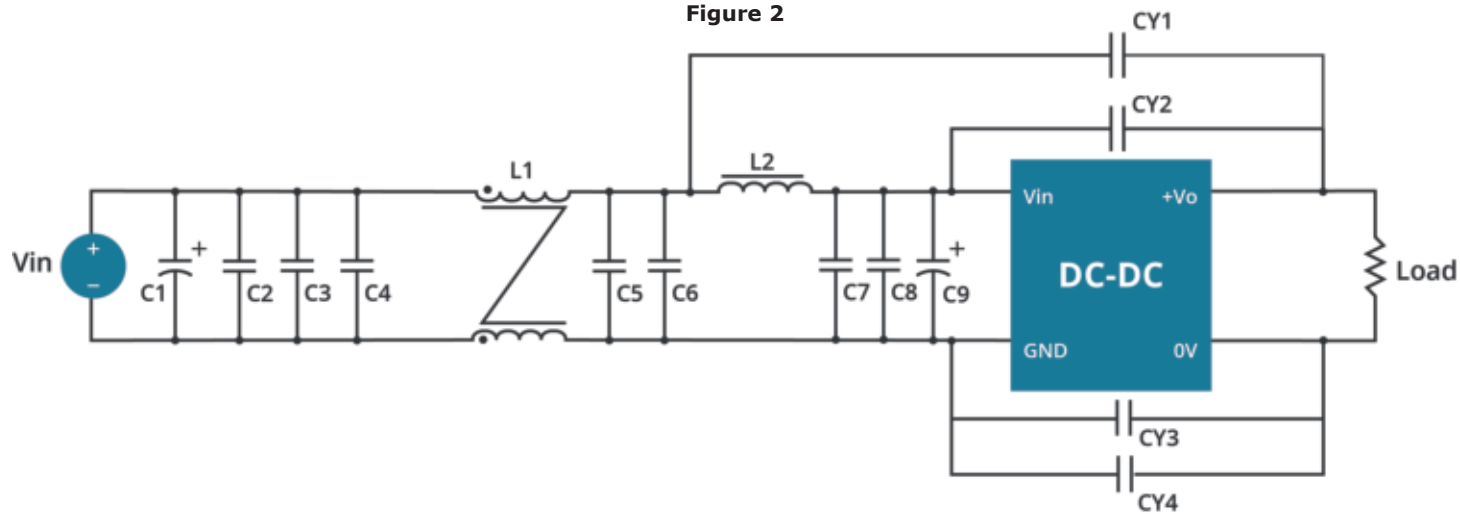


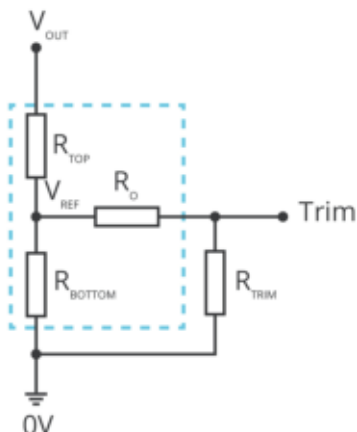
Table 2

| List of Components         | Recommended Component value             |
|----------------------------|-----------------------------------------|
| C1                         | 150 $\mu$ F/100V electrolytic capacitor |
| C9                         | 47 $\mu$ F/100V electrolytic capacitor  |
| C2, C3, C4, C5, C6, C7, C8 | 2.2 $\mu$ F/100V ceramic capacitor      |
| L1                         | 2.0mH                                   |
| L2                         | 1.5 $\mu$ F/15A inductance              |
| CY1, CY2, CY3, CY4         | 1nF Y1 safety capacitor                 |

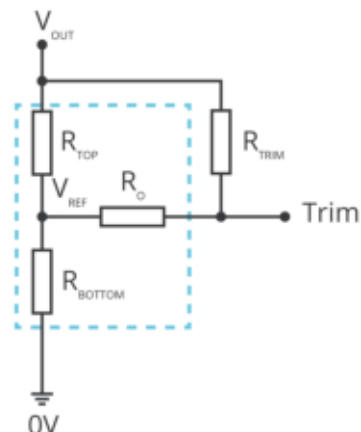
## APPLICATION NOTES

Figure 3

Trim up



Trim down



$$R_{TRIM} = \frac{a \cdot R_{BOTTOM}}{R_{BOTTOM} - a} - R_O \quad a = \frac{V_{REF}}{V_{OUT} - V_{REF}} \cdot R_{TOP}$$

Formula for Trim up

$$R_{TRIM} = \frac{a \cdot R_{TOP}}{R_{TOP} - a} - R_O \quad a = \frac{V_{OUT} - V_{REF}}{V_{REF}} \cdot R_{BOTTOM}$$

Formula for Trim down

Table 3

| $V_{NOM}$ | $R_{TOP}$ | $R_{BOTTOM}$ | $R_O$ | $V_{REF}$ |
|-----------|-----------|--------------|-------|-----------|
| (Vdc)     | (kΩ)      | (kΩ)         | (kΩ)  | (V)       |
| 5         | 3.036     | 3.0          | 10    | 2.5       |
| 12        | 11.0      | 2.87         | 15    | 2.5       |
| 15        | 14.03     | 2.8          | 15    | 2.5       |
| 24        | 24.872    | 2.87         | 15    | 2.5       |
| 36        | 38.73     | 2.85         | 15    | 2.5       |
| 48        | 53.017    | 2.913        | 15    | 2.5       |

Note: Value for  $R_{TOP}$ ,  $R_{BOTTOM}$ ,  $R_O$ , and  $V_{REF}$  refer to Table 3 (fixed internal values).

$R_{TRIM}$ : Trim resistance

$a$ : User-defined parameter, no actual meanings

$V_{NOM}$ : Nominal output voltage

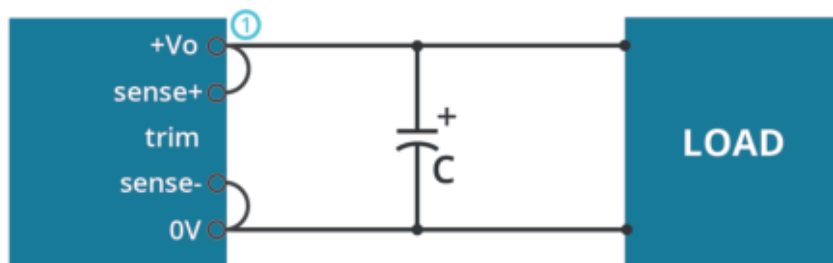
$V_{OUT}$ : Target output voltage

Note: When using the Trim down function make sure that the RT resistor value is calculated correctly. If the Trim pin is shorted with + Vo, or its value is too low, the or the output voltage Vo' would be lower than 0.9Vo, which may cause the product to fail.

## REMOTE SENSE APPLICATION

Figure 4

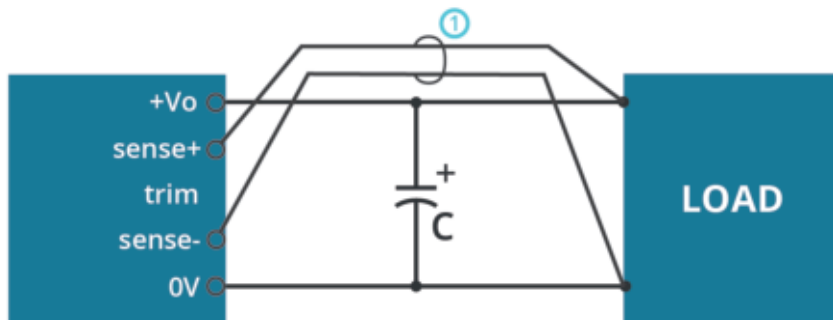
### REMOTE SENSE CONNECTION IF NOT USED



- Note:
1. Lines must be kept as short as possible.
  2. If the sense function is not used for remote regulation the user must connect the +Sense to +Vo and -Sense to 0V at the DC-DC converter pins and will compensate for voltage drop across pins only.
  3. The connections between Sense lines and their respective power lines must be kept as short as possible, otherwise they may be picking up noise, interference and/or causing unstable operation of the power module.

Figure 5

### REMOTE SENSE CONNECTION USED FOR COMPENSATION



- Note:
1. In cables and discrete wiring applications, twisted pair or other techniques should be implemented.
  2. PCB-tracks or cables/wires for Remote Sense must be kept as short as possible. Twisted pair or shielded wires are suggested for remote compensation and must be kept as short as possible.
  3. We recommend using adequate cross section for PCB-track layout and/or cables to connect the power supply module to the load in order to keep the voltage drop below 0.3V and to make sure the power supply's output voltage remains within the specified range.
  4. Note that large wire impedance may cause oscillation of the output voltage and/or increased ripple. Consult technical support or factory for further advice of sense operation.

## REVISION HISTORY

| rev. | description                    | date       |
|------|--------------------------------|------------|
| 1.0  | initial release                | 10/25/2021 |
| 1.01 | pin connections tables updated | 04/04/2023 |

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



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

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

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