

SERIES: PRQ100W-D | **DESCRIPTION:** DC-DC CONVERTER

FEATURES

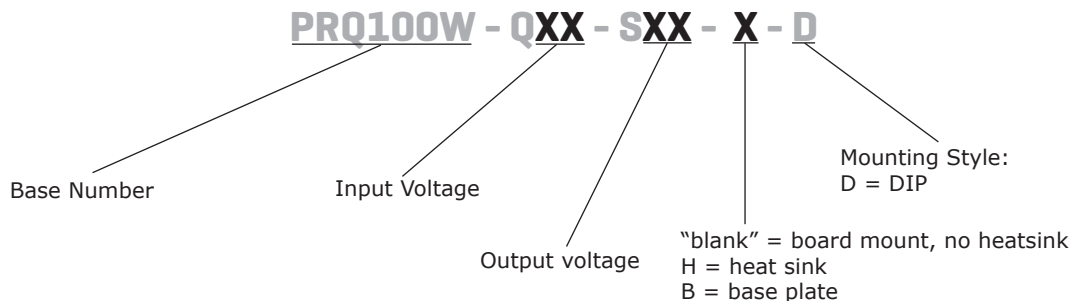
- 100W isolated output
- ¼-Brick package with industry standard pin-out
- ultra-wide input voltage range
- single regulated output
- high efficiency up to 94%
- output short circuit, over current, over voltage, & over temperature protection
- 2250 Vdc isolation
- EN 62368 approved
- available with heat sink or base plate
- CTRL pin



| MODEL | input voltage | | output voltage | output current | output power | ripple & noise ¹ Vo1/Vo2 | efficiency ² |
|------------------------------|---------------|-------------|----------------|----------------|--------------|----------------------------------------|-------------------------|
| | max (Vdc) | range (Vdc) | (Vdc) | max (A) | max (W) | max (mVp-p) | min/typ (%) |
| PRQ100W-Q24-S5 ³ | 40 | 9~36 | 5 | 20 | 100 | 250 | 87/89 |
| PRQ100W-Q24-S12 ³ | 40 | 9~36 | 12 | 8.3 | 100 | 200 | 88/90 |
| PRQ100W-Q24-S15 ³ | 40 | 9~36 | 15 | 6.7 | 100 | 200 | 88/90 |
| PRQ100W-Q24-S24 ³ | 40 | 9~36 | 24 | 4.2 | 100 | 250 | 88/90 |
| PRQ100W-Q24-S48 ³ | 40 | 9~36 | 48 | 2.1 | 100 | 250 | 88/90 |
| PRQ100W-Q48-S5 | 80 | 18~75 | 5 | 20 | 100 | 250 | 91/93 |
| PRQ100W-Q48-S12 | 80 | 18~75 | 12 | 8.3 | 100 | 200 | 91/93 |
| PRQ100W-Q48-S15 | 80 | 18~75 | 15 | 6.7 | 100 | 200 | 92/94 |
| PRQ100W-Q48-S24 | 80 | 18~75 | 24 | 4.2 | 100 | 250 | 91/93 |
| PRQ100W-Q48-S48 | 80 | 18~75 | 48 | 2.1 | 100 | 250 | 91/93 |

Notes:
 1. 20MHz bandwidth, nominal input, full load
 2. Efficiency is measured with 24 V 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 | | 9 | 24 | 40 | Vdc |
| start-up voltage | | | | 9 | Vdc |
| surge voltage | for maximum of 1 second | -0.7 | | 50 | Vdc |
| current | full load / no load | | | | |
| | 24 Vdc input models | | 4.68/0.12 | 4.79/0.16 | A |
| | 48 Vdc input models | | 2.26/0.05 | 2.34/0.08 | A |
| filter | Pi filter | | | | |
| CTRL | module on: CTRL open or pulled high (3.5~12 V) module off: CTRL pulled low to GND (0~1.2 V) | | | | |

OUTPUT

| parameter | conditions/description | min | typ | max | units |
|------------------------------|---------------------------------------------|-----|-----|-------|-------|
| maximum capacitive load | output voltage | | | | |
| | 5 Vdc | | | 6,000 | μF |
| | 12 Vdc & 15 Vdc | | | 2,000 | μF |
| | 24 Vdc | | | 1,000 | μF |
| | 48 Vdc | | | 470 | μF |
| voltage accuracy | 0% to full load | | | ±3 | % |
| line regulation | from low line to high line, full load | | | ±0.5 | % |
| load regulation | 5% to full load | | | ±0.75 | % |
| switching frequency | PWM mode | | 250 | | kHz |
| transient recovery time | 25% load step change, nominal input voltage | | 200 | 500 | μs |
| transient response deviation | 25% load step change, nominal input voltage | | ±3 | ±5 | % |
| temperature coefficient | at full load | | | ±0.03 | %/°C |
| adjustability | see trim resistor connection | | | ±10 | % |
| remote sense | see remote sense application circuit | | | 110 | %Vo |

PROTECTIONS

| parameter | conditions/description | min | typ | max | units |
|--------------------------|-----------------------------------|-----|-----|-----|-------|
| over voltage protection | | 110 | | 160 | % |
| over current protection | | 110 | | 150 | % |
| short circuit protection | continuous, auto recovery, hiccup | | | | |

SAFETY AND COMPLIANCE

| parameter | conditions/description | min | typ | max | units |
|-----------------------|--------------------------------------------------------------------------------------------------------|-------------------------------|-------|-----|---------|
| isolation voltage | input to output | 2,250 | | | Vdc |
| | input to case | 1,600 | | | Vdc |
| | output to case | 500 | | | Vdc |
| isolation resistance | input to output at 500 Vdc | 100 | | | MΩ |
| isolation capacitance | input to output, 100 kHz / 0.1 V | | 2,200 | | pF |
| safety approvals | certified to | 62368-1: EN, BS EN | | | |
| | designed to meet | 62368-1: UL (Q24 models only) | | | |
| | designed to meet | 50155: EN (Q24 models only) | | | |
| EMI/EMC | CISPR 32/EN 55032 Class A & Class B (see the recommended circuit) | | | | |
| conducted emissions | EN50121-3-2 150kHz-500kHz 99dBuV, EN55016-2-1 500kHz-30MHz 93dBuV | | | | |
| radiated emissions | EEN50121-3-2 30MHz-230MHz 40dBuV/m at 10m, EN55016-2-1 230MHz-1GHz 47dBuV/m at 10m | | | | |
| ESD | IEC/EN 61000-4-2 Contact ±6KV/Air ±8KV, perf. Criteria B | | | | |
| | EN 50121-3-2 Contact ±6KV/Air ±8KV | | | | |
| radiated immunity | IEC/EN 61000-4-3 20 V/m, perf. Criteria A, EN50121-3-2 80MHz-800MHz 20V/m(rms) | | | | |
| EFT/burst | IEC/EN 61000-4-4 ±2KV (see the recommended circuit), perf. Criteria A EN 50121-3-2 ±2kV 5/50ns 5kHz | | | | |
| surge | EN 50121-3-2 line to line ±1KV (42Ω 0.5uF see the recommended circuit) | | | | |
| conducted immunity | IEC/EN 61000-4-6 10 Vr.m.s, perf. Criteria A, EN50121-3-2 0.15MHz-80MHz 10Vr.m.s | | | | |
| MTBF | as per MIL-HDBK-217F, 25°C | 500 | | | K hours |
| 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 | % |

MECHANICAL

| parameter | conditions/description | min | typ | max | units |
|---------------|-------------------------------------------------------------|-----|-----|-----|-------|
| dimensions | 61.8 × 40.2 × 12.7 [2.43 × 1.58 × 12.5 inch] | | | | mm |
| | with base plate 62.0 × 56.0 × 14.6 [2.44 × 2.2 × 0.57 inch] | | | | mm |
| | with heat sink 61.8 × 40.2 × 27.7 [2.43 × 1.58 × 1.09 inch] | | | | mm |
| case material | aluminum alloy | | | | |
| weight | | | 86 | | g |
| | with base plate | | 106 | | g |
| | with heat sink | | 117 | | g |

MECHANICAL DRAWING

units: mm [inch]

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

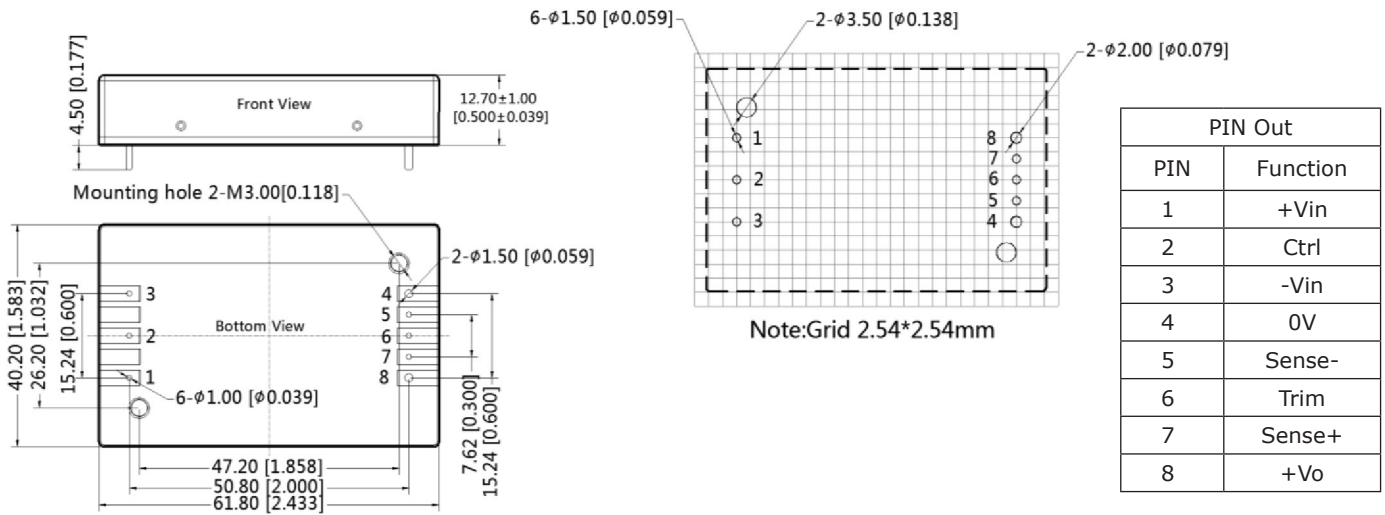
pin 4, 8's diameter: 1.50 [0.059]

pin diameter tolerance: ±0.10 [±0.004]

general tolerance: ±0.50[±0.020]

mounting hole screwing torque: Max 0.4 N·m

THIRD ANGLE PROJECTION 



MECHANICAL DRAWING

units: mm [inch]

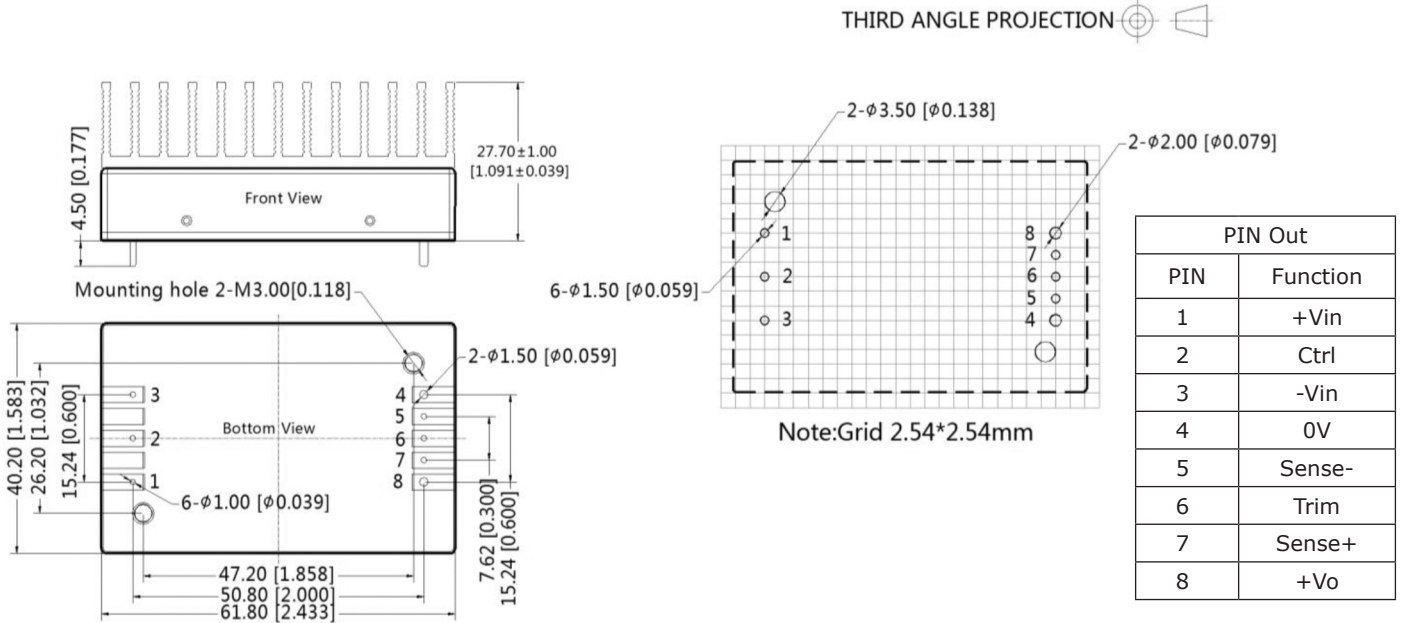
pin 1, 2, 3, 5, 6, 7's diameter: 1.00 [0.039]

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

pin diameter tolerance: ± 0.10 [± 0.004]

general tolerance: ± 0.50 [± 0.020]

mounting hole screwing torque: Max 0.4 N·m



units: mm [inch]

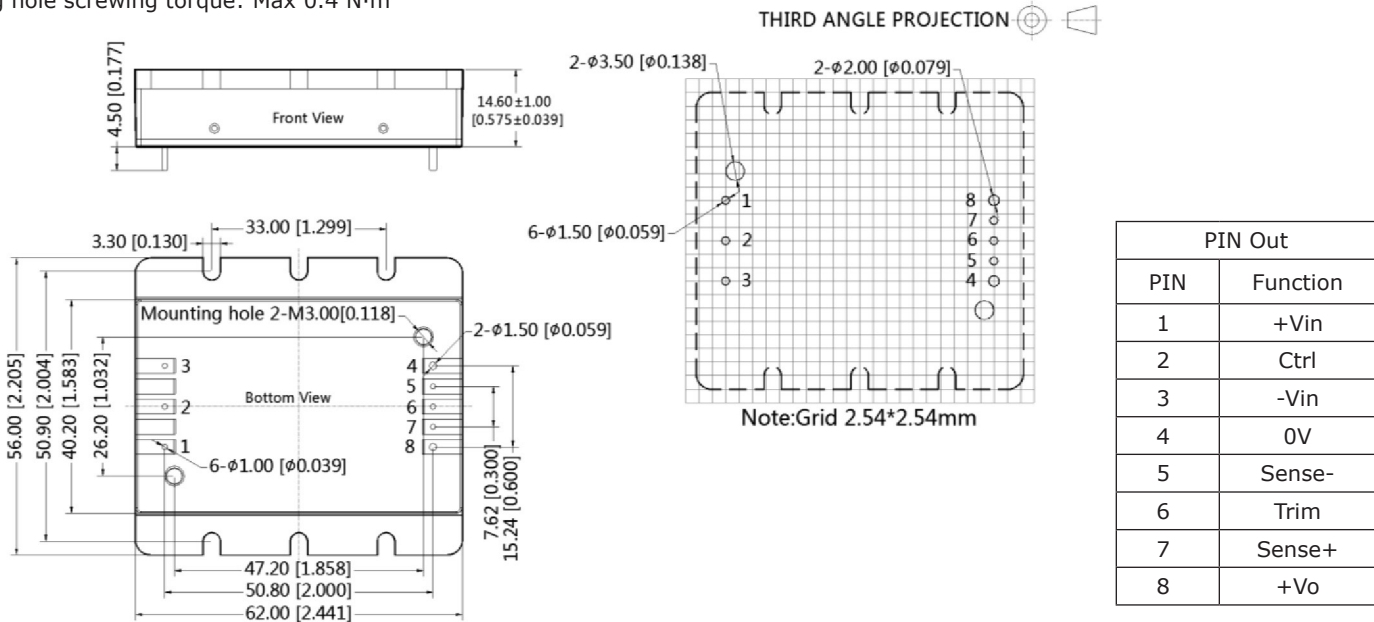
pin 1, 2, 3, 5, 6, 7's diameter: 1.00 [0.039]

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

pin diameter tolerance: ± 0.10 [± 0.004]

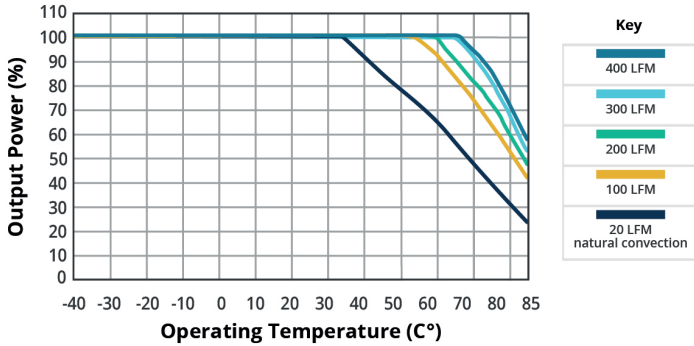
general tolerance: ± 0.50 [± 0.020]

mounting hole screwing torque: Max 0.4 N·m

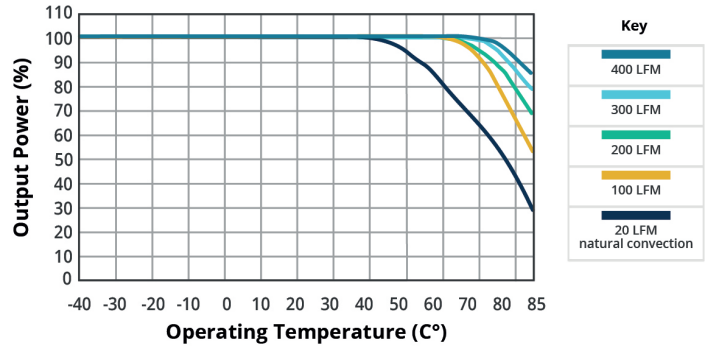


DERATING CURVES

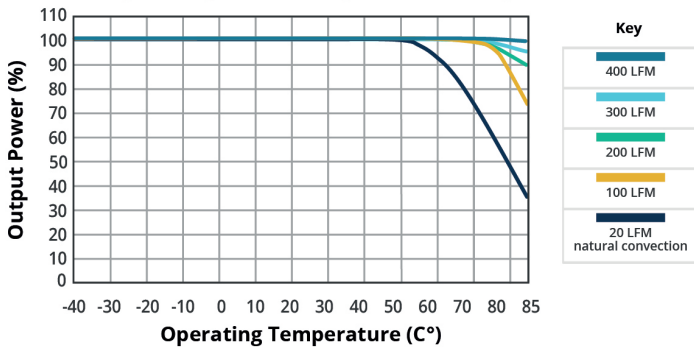
**TEMPERATURE DERATING CURVE (Vin =24 V)
PRQ100W-Q24-S24-D**



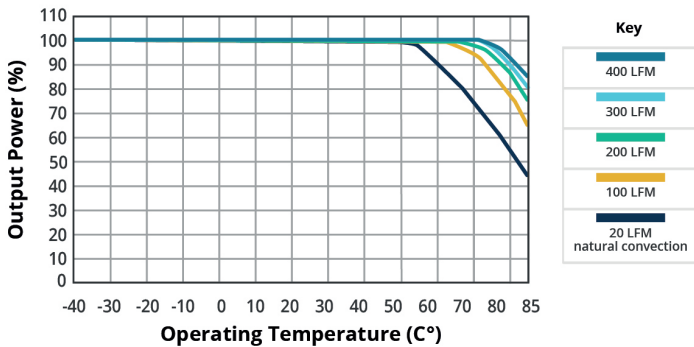
**TEMPERATURE DERATING CURVE (Vin =24 V)
PRQ100W-Q24-S24-B-D (base plate option)**



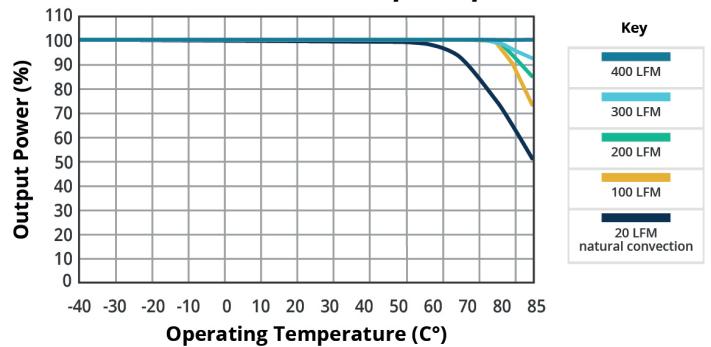
**TEMPERATURE DERATING CURVE (Vin =24 V)
PRQ100W-Q24-S24-H-D (with heatsink)**



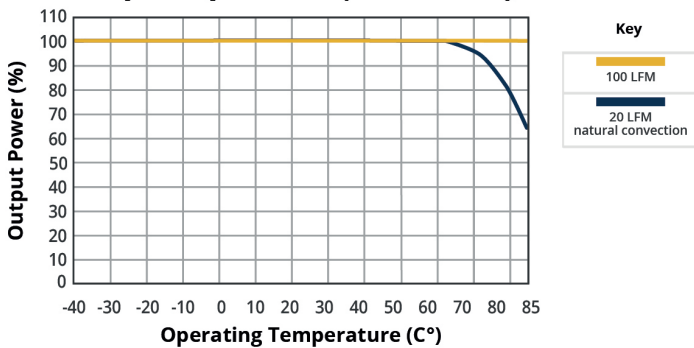
**TEMPERATURE DERATING CURVE (Vin =24 V)
PRQ100W-Q48-S24-D**



**TEMPERATURE DERATING CURVE (Vin =24 V)
PRQ100W-Q48-S24-B-D (base plate option)**



**TEMPERATURE DERATING CURVE (Vin =24 V)
PRQ100W-Q48-S24-B-D (with heatsink)**



APPLICATION CIRCUIT

Figure 1

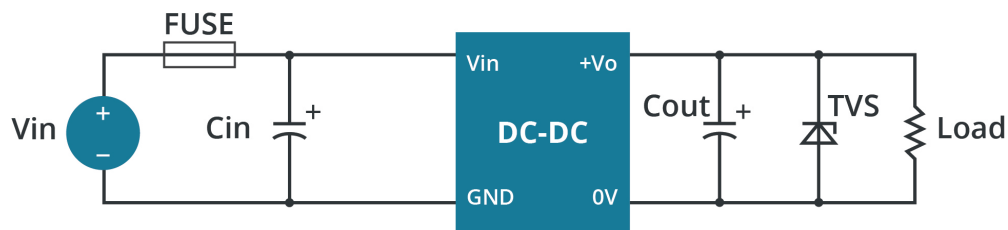


Table 1

| V_{in} (Vdc) | V_{out} (Vdc) | Fuse | C_{in}^1 | C_{out} | TVS |
|----------------|-----------------|---------------|-------------|-------------|----------|
| 24 | 5 | 20A slow blow | 220 μ F | 470 μ F | SMDJ7.0A |
| | 12 | | | 220 μ F | SMDJ15A |
| | 15 | | | | SMDJ18A |
| | 24 | | | 100 μ F | SMDJ30A |
| | 28 | | | | SMDJ36A |
| | 48 | | | | SMDJ64A |
| 48 | 5 | 10A slow blow | 220 μ F | 470 μ F | SMDJ6.0A |
| | 12 | | | 220 μ F | SMDJ14A |
| | 15 | | | 100 μ F | SMDJ17A |
| | 24 | | | | SMDJ28A |
| | 48 | | | | SMDJ54A |

Note: 1. 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 (such as -25°C).

EMC RECOMMENDED CIRCUIT

Figure 2

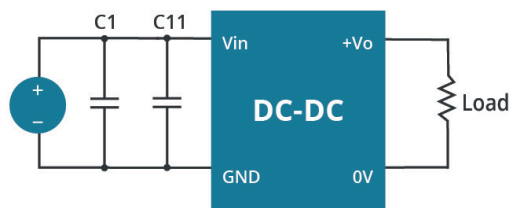


Table 2

| Capacitor | Recommended value | Function |
|-----------|------------------------------------|---------------------|
| C1 | 150 μ F electrolytic capacitor | Meets EFT and surge |
| C11 | 47 μ F electrolytic capacitor | |

EMC RECOMMENDED CIRCUIT (CONTINUED)

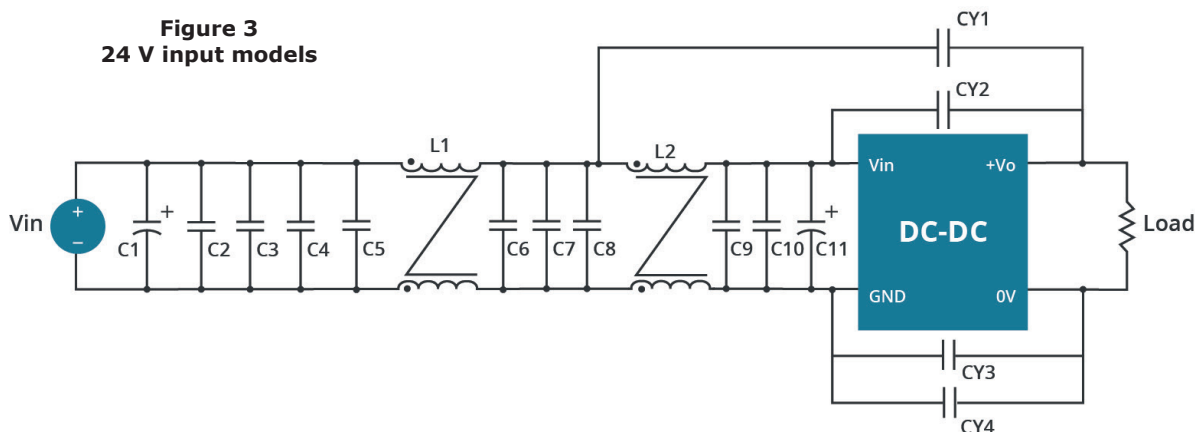


Table 3

| Class A components | Class B components | Recommended component value | Function |
|--------------------|-------------------------------------|------------------------------------|------------------------------------------------|
| | C1 | 150 μ F electrolytic capacitor | Meets conducted emission and radiated emission |
| | C11 | 47 μ F electrolytic capacitor | |
| | C2, C3, C4, C5, C6, C7, C8, C9, C10 | 10 μ F ceramic capacitor | |
| | L1, L2 | 1.6mH common mode inductor | |
| CY3 | CY1, CY2 | 2.2nF Y1 safety capacitor | |
| | CY3, CY4 | 1nF Y1 safety capacitor | |

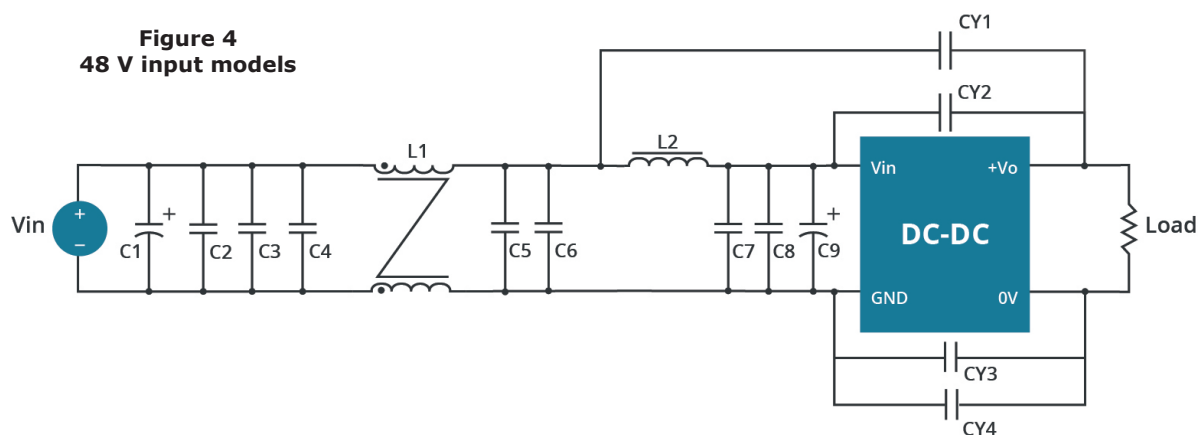


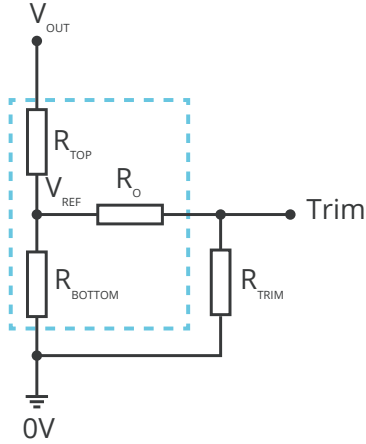
Table 4

| Class A components | Class B components | Recommended component value | Function |
|--------------------|----------------------------|------------------------------------|------------------------------------------------|
| | C1 | 150 μ F electrolytic capacitor | Meets EFT and surge |
| | C9 | 47 μ F electrolytic capacitor | |
| | C1 | 150 μ F electrolytic capacitor | Meets conducted emission and radiated emission |
| | C9 | 47 μ F electrolytic capacitor | |
| | C2, C3, C4, C5, C6, C7, C8 | 2.2 μ F ceramic capacitor | |
| | L1 | 1.0mH common mode inductor | |
| | L2 | 1.5 μ H inductance | |
| CY3 | CY1, CY2, CY3, CY4 | 1nF Y1 safety capacitor | |

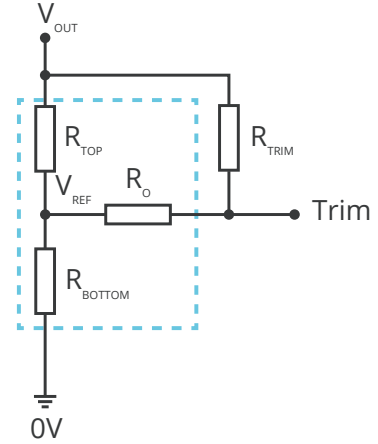
TRIM RESISTOR CONNECTION

Figure 5

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 5

| V_{IN} | V_{NOM} | R_{TOP} | R_{BOTTOM} | R_O | V_{REF} |
|----------|-----------|-----------|--------------|-------|-----------|
| (Vdc) | (Vdc) | (kΩ) | (kΩ) | (kΩ) | (V) |
| 24 | 5 | 3.036 | 3 | 10 | 2.5 |
| | 12 | 11.00 | 2.87 | 15 | 2.5 |
| | 15 | 14.03 | 2.8 | 15 | 2.5 |
| | 24 | 24.872 | 2.87 | 15 | 2.5 |
| | 28 | 29.201 | 2.851 | 15 | 2.5 |
| | 48 | 53.017 | 2.894 | 15 | 2.5 |
| 48 | 5 | 3.036 | 3 | 10 | 2.5 |
| | 12 | 11.00 | 2.87 | 15 | 2.5 |
| | 15 | 14.03 | 2.8 | 15 | 2.5 |
| | 24 | 24.872 | 2.87 | 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 5 (fixed internal values).

R_{TRIM} : Trim resistance

a : User-defined parameter, no actual meanings

V_{NOM} : Nominal output voltage

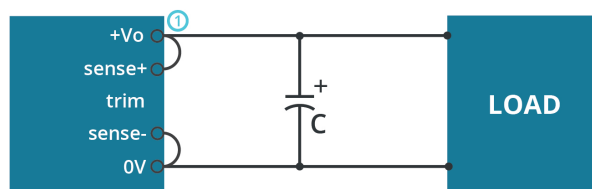
V_{OUT} : Target output voltage

V_{IN} : Input voltage

REMOTE SENSE APPLICATION

Figure 6

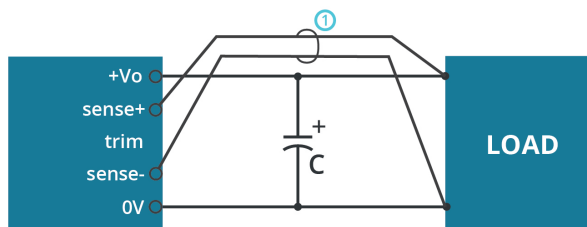
**REMOTE SENSE CONNECTION
IF NOT USED**



- 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 7

**REMOTE SENSE CONNECTION
USED FOR COMPENSATION**



- Note:
1. In cables and discrete wiring applications, twisted pair or other techniques should be implemented.
 2. Using remote sense with long wires may cause unstable operation. 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.
 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.

REVISION HISTORY

| rev. | description | date |
|------|---------------------------------------------------------|------------|
| 1.0 | initial release | 09/03/2020 |
| 1.01 | derating curves and circuit figures updated | 09/06/2021 |
| 1.02 | input current updated | 02/15/2022 |
| 1.03 | CE certification for 24V model updated, UKCA mark added | 10/25/2022 |
| 1.04 | output voltage trimming updated | 05/30/2023 |
| 1.05 | derating curves and circuits updated | 10/24/2023 |

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



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