

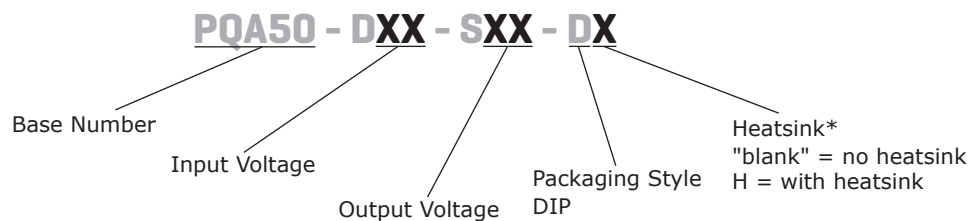
SERIES: PQA50-D | **DESCRIPTION:** DC-DC CONVERTER**FEATURES**

- up to 50 W isolated output
- 2:1 input range (18~36 Vdc, 36~75 Vdc)
- smaller package
- single, regulated output
- 1,500 Vdc isolation
- short circuit, over current, input under voltage protection
- remote on/off
- operating temperature range (-40~85°C)
- six sided metal shielding
- efficiency up to 93%
- EN 62368-1



| MODEL | input voltage | | output voltage (Vdc) | output current | | output power max (W) | ripple and noise ¹ max (mVp-p) | efficiency typ (%) |
|--------------------------------|---------------|----------------|-------------------------|----------------|------------|----------------------------|---|--------------------------|
| | typ (Vdc) | range (Vdc) | | min (mA) | max (A) | | | |
| PQA50-D24-S3-D ^{2,*} | 24 | 18~36 | 3.3 | 500 | 10 | 33 | 150 | 91 |
| PQA50-D24-S5-D ^{2,*} | 24 | 18~36 | 5 | 500 | 10 | 50 | 150 | 93 |
| PQA50-D24-S12-D ^{2,*} | 24 | 18~36 | 12 | 208 | 4.167 | 50 | 150 | 93 |
| PQA50-D24-S15-D ^{2,*} | 24 | 18~36 | 15 | 167 | 3.333 | 50 | 150 | 93 |
| PQA50-D24-S24-D ^{2,*} | 24 | 18~36 | 24 | 104 | 2.083 | 50 | 150 | 93 |
| PQA50-D48-S3-D | 48 | 36~75 | 3.3 | 500 | 10 | 33 | 150 | 91 |
| PQA50-D48-S5-D* | 48 | 36~75 | 5 | 500 | 10 | 50 | 150 | 93 |
| PQA50-D48-S12-D* | 48 | 36~75 | 12 | 208 | 4.167 | 50 | 150 | 93 |
| PQA50-D48-S15-D* | 48 | 36~75 | 15 | 167 | 3.333 | 50 | 150 | 93 |
| PQA50-D48-S24-D* | 48 | 36~75 | 24 | 104 | 2.083 | 50 | 150 | 93 |

Notes: 1. Ripple and noise are measured at 20 MHz BW by "parallel cable" method with 1 μ F ceramic and 10 μ F electrolytic capacitors on the output.
 2. Model is not CE certified.
 3. * Discontinued model.

PART NUMBER KEY

Notes: *Discontinued heatsink versions.

INPUT

| parameter | conditions/description | min | typ | max | units |
|-----------------------------|---|------|-----|-----|-------|
| operating input voltage | 24 Vdc input models | 18 | 24 | 36 | Vdc |
| | 48 Vdc input models | 36 | 48 | 75 | Vdc |
| start-up voltage | input under voltage protection | | | | |
| | 24 Vdc input models | 18 | | | Vdc |
| | 48 Vdc input models | 36 | | | Vdc |
| | input over voltage protection | | | | |
| under/over voltage shutdown | 24 Vdc input models | | | 36 | Vdc |
| | 48 Vdc input models | | | 75 | Vdc |
| | input under voltage protection | | | | |
| | 24 Vdc input models | | | 16 | Vdc |
| surge voltage | 48 Vdc input models | | | 32 | Vdc |
| | input over voltage protection | | | | |
| | 24 Vdc input models | 40 | | | Vdc |
| start-up time | 48 Vdc input models | 81 | | | Vdc |
| | nominal input, constant load | | 10 | | ms |
| CTRL ¹ | for maximum of 1 second | | | | |
| | 24 Vdc input models | -0.7 | | 50 | Vdc |
| filter | 48 Vdc input models | -0.7 | | 100 | Vdc |
| | pi filter | | | | |
| CTRL ¹ | models ON (CTRL open or connect TTL high level, 3~12 Vdc) | | | | |
| | models OFF (CTRL connect GND or low level, 0~1.2 Vdc) | | | | |
| filter | input current (models OFF) | | 6 | | mA |
| | pi filter | | | | |

Note 1. CTRL pin voltage is referenced to GND.

OUTPUT

| parameter | conditions/description | min | typ | max | units |
|------------------------------|---|-----|-------|------|-------|
| line regulation | full load, input voltage from low to high | | ±0.2 | ±0.5 | % |
| load regulation | 10% to 100% load | | ±0.5 | ±1 | % |
| voltage accuracy | | | ±1 | ±3 | % |
| adjustability | | | ±10 | | % |
| switching frequency | PWM mode | | 300 | | kHz |
| transient recovery time | 25% load step change | | 300 | 500 | µs |
| transient response deviation | 25% load step change | | ±3 | ±5 | % |
| temperature coefficient | 100% load | | ±0.02 | | %/°C |

PROTECTIONS

| parameter | conditions/description | min | typ | max | units |
|--------------------------------------|--|-----|-----|-----|-------|
| over voltage protection ² | 3.3 Vdc output models | | 3.9 | | Vdc |
| | 5 Vdc output models | | 6.2 | | Vdc |
| | 12 Vdc output models | | 15 | | Vdc |
| | 15 Vdc output models | | 18 | | Vdc |
| | 24 Vdc output models | | 30 | | Vdc |
| over current protection | | | 135 | | % |
| short circuit protection | continuous, automatic recovery, hiccup | | | | |
| over temperature protection | | | 110 | | °C |

Note 2. Module needs to be re-started after over voltage protection.

SAFETY AND COMPLIANCE

| parameter | conditions/description | min | typ | max | units |
|------------------------------|--|-----------|-------|-----|-------|
| isolation voltage | input to output at 1 mA for 1 minute | 1,500 | | | Vdc |
| isolation resistance | input to output at 500 Vdc | 1,000 | | | MΩ |
| isolation capacitance | input to output at 100 kHz, 0.1 Vdc | | 2,000 | | pF |
| safety approvals | certified to 62368: EN/BS EN | | | | |
| conducted emissions | CISPR22/EN55022 class B (external circuit required, see figure 1) | | | | |
| radiated emissions | CISPR22/EN55022 class B (external circuit required, see figure 1) | | | | |
| ESD | IEC/EN61000-4-2 class B, contact ± 4kV | | | | |
| radiated immunity | IEC/EN61000-4-3 class A, 10V/m | | | | |
| EFT/burst | IEC/EN61000-4-4 class B, ± 2kV (external circuit required, see figure 1) | | | | |
| surge | IEC/EN61000-4-5 class B, ± 2kV (external circuit required, see figure 1) | | | | |
| conducted immunity | IEC/EN61000-4-6 class A, 3 Vr.m.s | | | | |
| voltage dips & interruptions | IEC/EN61000-4-29 class B, 0%-70% | | | | |
| MTBF | as per MIL-HDBK-217F @ 25°C | 1,000,000 | | | hours |
| RoHS | 2011/65/EU | | | | |

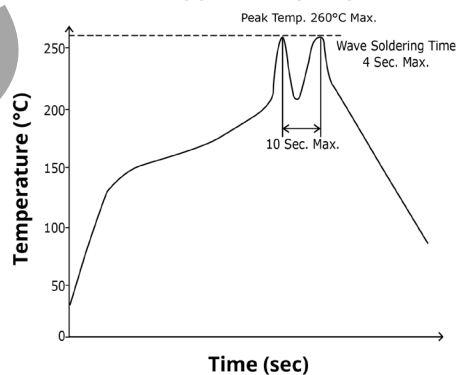
ENVIRONMENTAL

| 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 | % |
| case temperature | at full load, operating temperature curve range | | | 105 | °C |
| vibration | 10~55 Hz, 30 min. along x, y, and z | | | 10 | G |

SOLDERABILITY

| parameter | conditions/description | min | typ | max | units |
|----------------|---------------------------------|-----|-----|-----|-------|
| hand soldering | 1.5 mm from case for 10 seconds | | | 300 | °C |
| wave soldering | see wave soldering profile | | | 260 | °C |

WAVE SOLDERING PROFILE



MECHANICAL

| parameter | conditions/description | min | typ | max | units |
|---------------|--|-----|----------|-----|----------|
| dimensions | board mount: 50.80 x 25.40 x 11.80 board mount with heatsink: 50.80 x 25.40 x 16.30 | | | | mm mm |
| case material | aluminum alloy | | | | |
| weight | board mount board mount with heatsink | | 35 43 | | g g |

MECHANICAL DRAWING

BOARD MOUNT

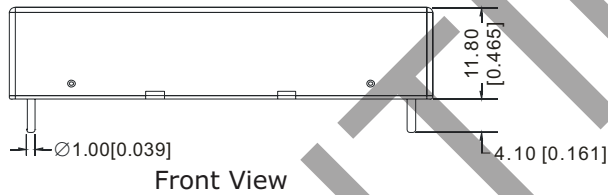
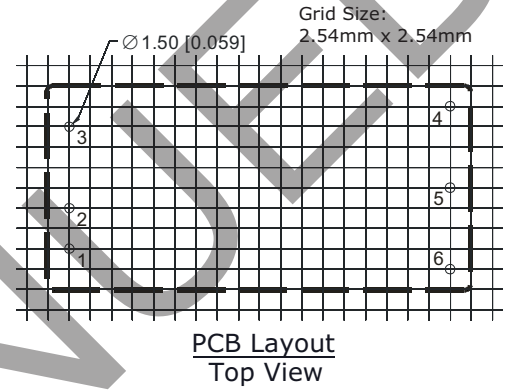
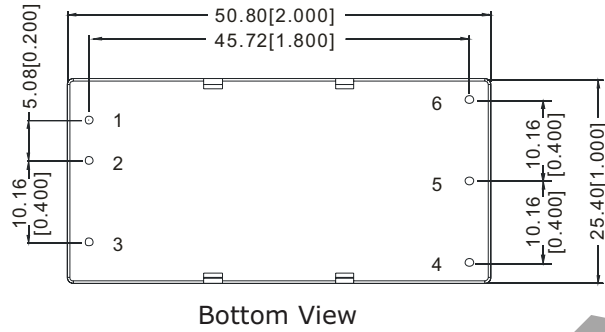
units: mm[inch]

tolerance: $\pm 0.30[\pm 0.012]$

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

pin height tolerance: $\pm 0.50[\pm 0.020]$

| PIN CONNECTIONS | |
|-----------------|----------|
| PIN | Function |
| 1 | Vin |
| 2 | GND |
| 3 | Ctrl |
| 4 | Trim |
| 5 | 0V |
| 6 | +Vo |



BOARD MOUNT WITH HEATSINK

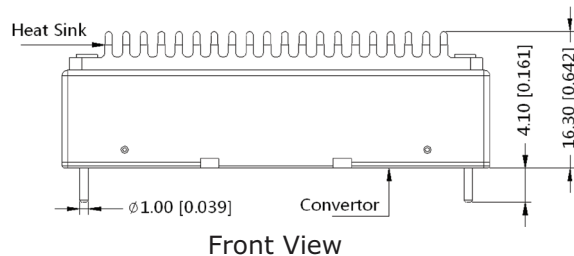
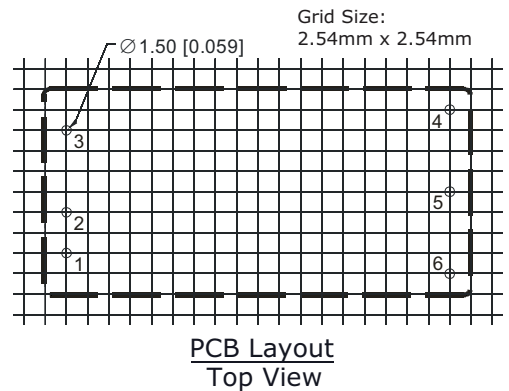
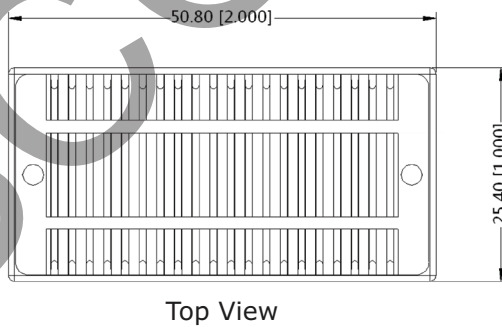
units: mm[inch]

tolerance: $\pm 0.30[\pm 0.012]$

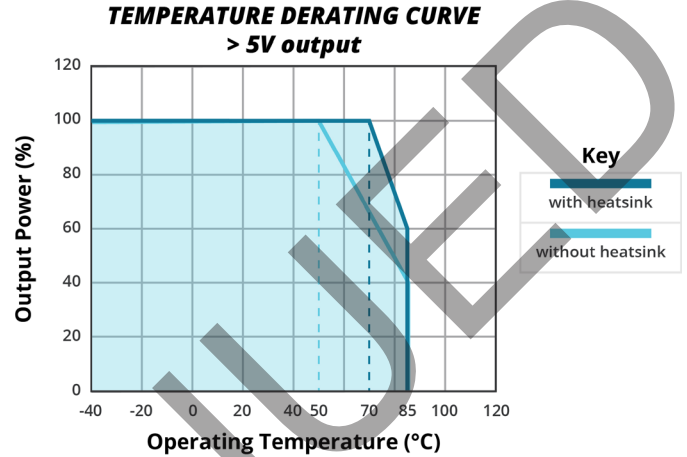
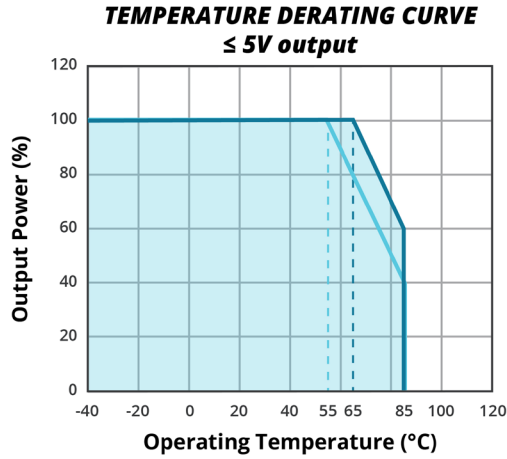
pin diameter tolerance: $\pm 0.10[\pm 0.004]$

pin height tolerance: $\pm 0.50[\pm 0.020]$

| PIN CONNECTIONS | |
|-----------------|----------|
| PIN | Function |
| 1 | Vin |
| 2 | GND |
| 3 | Ctrl |
| 4 | Trim |
| 5 | 0V |
| 6 | +Vo |



DERATING CURVES



EMC RECOMMENDED CIRCUIT

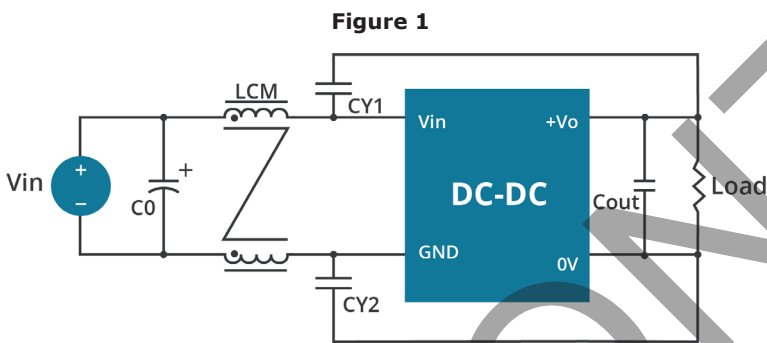


Table 1

| Recommended external circuit components | | |
|---|-----------|------------|
| Vin (Vdc) | 24 | 48 |
| C0 | 330μF/50V | 330μF/100V |
| CY1, CY2 | 1nF/2kV | 1nF/2kV |
| LCM | 2.2mH | 2.2mH |

Note: 1. See Table 3 for Cout values.

TEST CONFIGURATION

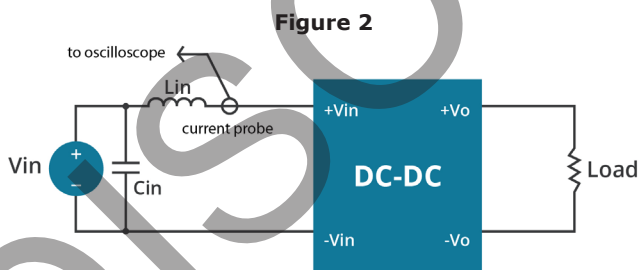


Table 2

| External components | |
|---------------------|------------------------------|
| Lin | 4.7μH |
| Cin | 220μF, ESR < 1.0Ω at 100 kHz |

Note: 1. Input reflected-ripple current is measured with an inductor Lin and Capacitor Cin to simulate source impedance.

APPLICATION NOTES

1. Requirement on output load

To ensure this module can operate efficiently and reliably, the minimum output load cannot be less than 5% of the full load during operation. If the actual output power is small, please connect a resistor at the output end in parallel to increase the load.

2. Recommended circuit

This series has been tested according to the following recommended testing circuit before leaving the factory. This series should be tested under load (see Figure 3). If you want to further decrease the input/output ripple, you can increase capacitance properly or choose capacitors with low ESR (see table 3). However, the capacitance must not exceed the maximum capacitive load or a start-up problem might arise (see table 4).

Figure 3

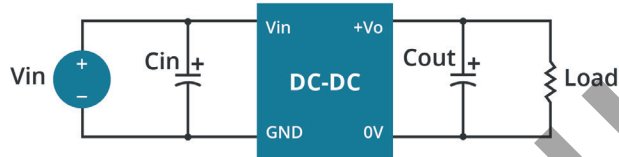


Table 3

| Vout (Vdc) | Cin (μ F) | Cout (μ F) |
|------------|----------------|-----------------|
| 3.3 | 100 | 220 |
| 5 | 100 | 220 |
| 12 | 100 | 100 |
| 15 | 100 | 100 |
| 24 | 100 | 47 |

Table 4

| Vout (Vdc) | Max. Capacitive Load (μ F) |
|------------|---------------------------------|
| 3.3 | 27000 |
| 5 | 18900 |
| 12 | 3700 |
| 15 | 2000 |
| 24 | 1000 |

APPLICATION NOTES (CONTINUED)

1. Output Voltage Trimming

Leave open if not used.

Trim up

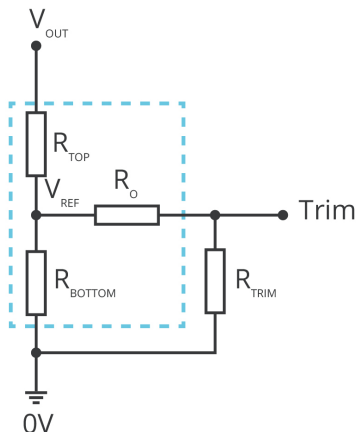
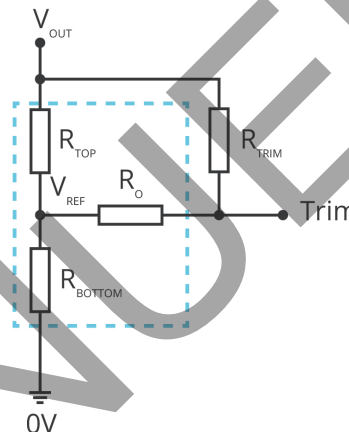


Figure 4

Trim down



$$R_{TRIM} = \frac{a \cdot R_{BOTTOM}}{R_{BOTTOM} - a} - R_O$$

$$a = \frac{V_{REF}}{V_{OUT} - V_{REF}} \cdot R_{TOP}$$

Formula for Trim up

$$R_{TRIM} = \frac{a \cdot R_{TOP}}{R_{TOP} - a} - R_O$$

$$a = \frac{V_{OUT} - V_{REF}}{V_{REF}} \cdot R_{BOTTOM}$$

Formula for Trim down

Table 5

| V _{OUT} | R _{TOP} | R _{BOTTOM} | R _O | V _{REF} |
|------------------|------------------|---------------------|----------------|------------------|
| (Vdc) | (kΩ) | (kΩ) | (kΩ) | (V) |
| 3.3 | 4.788 | 2.87 | 15 | 1.24 |
| 5 | 2.87 | 2.87 | 12.1 | 2.5 |
| 12 | 11 | 2.87 | 22 | 2.5 |
| 15 | 15 | 3 | 22 | 2.5 |
| 24 | 20 | 2.308 | 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_{OUT}: Nominal output voltage

- Notes:
1. Minimum load shouldn't be less than 5%, otherwise ripple may increase dramatically. Operation under minimum load will not damage the converter, however, they may not meet all specifications listed.
 2. Maximum capacitive load is tested at input voltage range and full load.
 3. All specifications are measured at Ta=25°C, humidity<75%, nominal input voltage and rated output load unless otherwise specified.

REVISION HISTORY

| rev. | description | date |
|------|---|------------|
| 1.0 | initial release | 07/01/2013 |
| 1.01 | added heat sink option, updated spec | 10/29/2013 |
| 1.02 | updated datasheet | 07/14/2015 |
| 1.03 | discontinued heat sink versions | 02/07/2019 |
| 1.04 | company logo updated | 03/30/2021 |
| 1.05 | derating curves and circuit figures updated | 01/05/2022 |
| 1.06 | CE certification removed for 24V models | 11/10/2022 |
| 1.07 | discontinued models PQA50-D24-S12-D, PQA50-D24-S15-D, PQA50-D24-S24-D, PQA50-D24-S5-D, PQA50-D48-S12-D, PQA50-D48-S15-D, PQA50-D48-S24-D & PQA50-D48-S5-D | 11/11/2022 |
| 1.08 | discontinued model PQA50-D24-S3-D | 12/14/2022 |

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



CUI INC

a bel group

Headquarters

20050 SW 112th Ave.
Tualatin, OR 97062
800.275.4899

Fax 503.612.2383
cui.com
techsupport@cui.com

CUI offers a two (2) year limited warranty. Complete warranty information is listed on our website.

CUI reserves the right to make changes to the product at any time without notice. Information provided by CUI is believed to be accurate and reliable. However, no responsibility is assumed by CUI for its use, nor for any infringements of patents or other rights of third parties which may result from its use.

CUI products are not authorized or warranted for use as critical components in equipment that requires an extremely high level of reliability. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.