

**SERIES: PYB10-T & PYB10-U | DESCRIPTION: DC-DC CONVERTER**
**FEATURES**

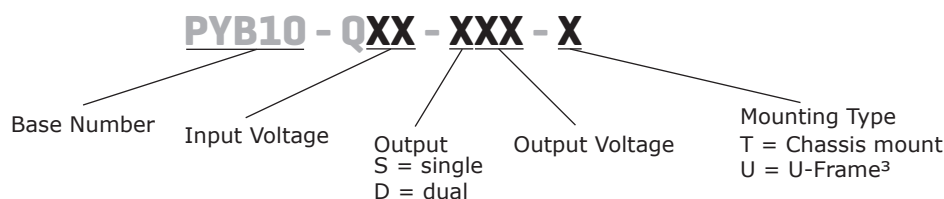
- up to 10 W isolated output
- industry standard pinout
- 4:1 input range (9~36 V, 18~75 V)
- smaller package
- single/dual regulated outputs
- 1,500 Vdc isolation
- continuous short circuit, over voltage protection
- reverse polarity protection on chassis mount (-T) option
- temperature range (-40~85°C)
- six-sided metal shielding
- efficiency up to 88%
- EN/BS EN 62368-1 certified


**MODEL**

|                                | input voltage |             | output voltage | output current |          | output power | ripple and noise <sup>1</sup> | efficiency <sup>2</sup> |
|--------------------------------|---------------|-------------|----------------|----------------|----------|--------------|-------------------------------|-------------------------|
|                                | typ (Vdc)     | range (Vdc) | (Vdc)          | min (mA)       | max (mA) | max (W)      | max (mVp-p)                   | typ (%)                 |
| PYB10-Q24-S3 <sup>6</sup>      | 24            | 9~36        | 3.3            | 120            | 2400     | 8            | 80                            | 79                      |
| PYB10-Q24-S5 <sup>6</sup>      | 24            | 9~36        | 5              | 100            | 2000     | 10           | 80                            | 82                      |
| PYB10-Q24-S12 <sup>6</sup>     | 24            | 9~36        | 12             | 42             | 833      | 10           | 80                            | 86                      |
| PYB10-Q24-S15 <sup>4,5,6</sup> | 24            | 9~36        | 15             | 33             | 667      | 10           | 80                            | 87                      |
| PYB10-Q24-S24 <sup>4,6</sup>   | 24            | 9~36        | 24             | 21             | 416      | 10           | 80                            | 87                      |
| PYB10-Q24-D5 <sup>4,5,6</sup>  | 24            | 9~36        | ±5             | ±50            | ±1000    | 10           | 80                            | 83                      |
| PYB10-Q24-D12 <sup>4,6</sup>   | 24            | 9~36        | ±12            | ±21            | ±416     | 10           | 80                            | 86                      |
| PYB10-Q24-D15 <sup>4,6</sup>   | 24            | 9~36        | ±15            | ±16            | ±333     | 10           | 80                            | 88                      |
| PYB10-Q48-S3 <sup>4,5</sup>    | 48            | 18~75       | 3.3            | 120            | 2400     | 8            | 80                            | 79                      |
| PYB10-Q48-S5 <sup>4,5</sup>    | 48            | 18~75       | 5              | 100            | 2000     | 10           | 80                            | 82                      |
| PYB10-Q48-S12                  | 48            | 18~75       | 12             | 42             | 833      | 10           | 80                            | 86                      |
| PYB10-Q48-S15 <sup>4</sup>     | 48            | 18~75       | 15             | 33             | 667      | 10           | 80                            | 87                      |
| PYB10-Q48-S24 <sup>4,5</sup>   | 48            | 18~75       | 24             | 21             | 416      | 10           | 80                            | 87                      |
| PYB10-Q48-D5 <sup>4</sup>      | 48            | 18~75       | ±5             | ±50            | ±1000    | 10           | 80                            | 83                      |
| PYB10-Q48-D12 <sup>4</sup>     | 48            | 18~75       | ±12            | ±21            | ±416     | 10           | 80                            | 86                      |
| PYB10-Q48-D15 <sup>4,5</sup>   | 48            | 18~75       | ±15            | ±16            | ±333     | 10           | 80                            | 88                      |

Notes:

1. Ripple and noise are measured at 20 MHz BW by "parallel cable" method
2. Efficiency is approximately 2% lower for Chassis Mount (-T) models.
3. EN 62398-1 certification does not apply to U-frame models.
4. Chassis mount version discontinued.
5. U-frame version discontinued.
6. Model is not CE certified.

**PART NUMBER KEY**


## INPUT

| parameter               | conditions/description                                  | min  | typ | max | units |
|-------------------------|---------------------------------------------------------|------|-----|-----|-------|
| operating input voltage | 24 V input models                                       | 9    | 24  | 36  | Vdc   |
|                         | 48 V input models                                       | 18   | 48  | 75  | Vdc   |
| start-up voltage        | 24 V input models                                       |      |     | 9   | Vdc   |
|                         | 48 V input models                                       |      |     | 18  | Vdc   |
| surge voltage           | for maximum of 1 second                                 |      |     |     |       |
|                         | 24 V input models                                       | -0.7 |     | 50  | Vdc   |
|                         | 48 V input models                                       | -0.7 |     | 100 | Vdc   |
| filter                  | pi filter                                               |      |     |     |       |
| CTRL <sup>1</sup>       | models ON (CTRL open or connect high level, 3.5-12 Vdc) |      |     |     |       |
|                         | models OFF (CTRL connect GND or low level, 0-1.2 Vdc)   |      |     |     |       |
|                         | input current (models OFF)                              |      | 1   | 3   | mA    |

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              | 5% to 100% load                                                                        |     | ±0.5 | ±1    | %     |
| cross regulation             | dual output models:<br>main output 50% load, secondary output from<br>10% to 100% load |     |      | ±5    | %     |
| voltage accuracy             |                                                                                        |     | ±1   | ±2    | %     |
| voltage balance <sup>2</sup> | dual output, balanced loads                                                            |     | ±0.5 | ±1.5  | %     |
| switching frequency          | PWM mode                                                                               |     | 350  |       | KHz   |
| transient recovery time      | 25% load step change                                                                   |     | 300  | 500   | µs    |
| transient response deviation | 25% load step change                                                                   |     | ±3   | ±5    | %     |
| temperature coefficient      | 100% load                                                                              |     |      | ±0.03 | %/°C  |

Note: 2. For dual output models, unbalanced load can not exceed ±5%. If ±5% is exceeded, it may not meet all specifications.

## PROTECTIONS

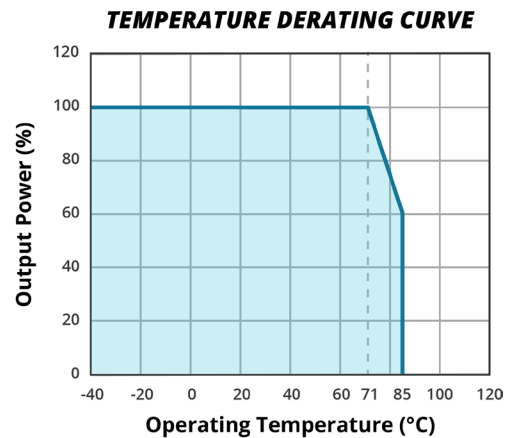
| parameter                | conditions/description         | min | typ | max | units |
|--------------------------|--------------------------------|-----|-----|-----|-------|
| short circuit protection | continuous, automatic recovery |     |     |     |       |
| over voltage protection  |                                | 110 | 120 | 140 | %Vo   |

## SAFETY AND COMPLIANCE

| parameter                    | conditions/description                                                        | min       | typ | max | units |
|------------------------------|-------------------------------------------------------------------------------|-----------|-----|-----|-------|
| isolation voltage            | for 1 minute at 1 mA max.                                                     | 1,500     |     |     | Vdc   |
| isolation resistance         | at 500 Vdc                                                                    | 1,000     |     |     | MΩ    |
| safety approvals             | certified to 62368-1: EN                                                      |           |     |     |       |
| conducted emissions          | CISPR22/EN55022, class A, class B (external circuit required, see Figure 1-b) |           |     |     |       |
| radiated emissions           | CISPR22/EN55022, class A, class B (external circuit required, see Figure 1-b) |           |     |     |       |
| 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-a)   |           |     |     |       |
| surge                        | IEC/EN61000-4-5, class B, ± 2kV (external circuit required, see Figure 1-a)   |           |     |     |       |
| 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 compliant               | yes                                                                           |           |     |     |       |



## DERATING CURVES



## EMC RECOMMENDED CIRCUIT

Figure 1

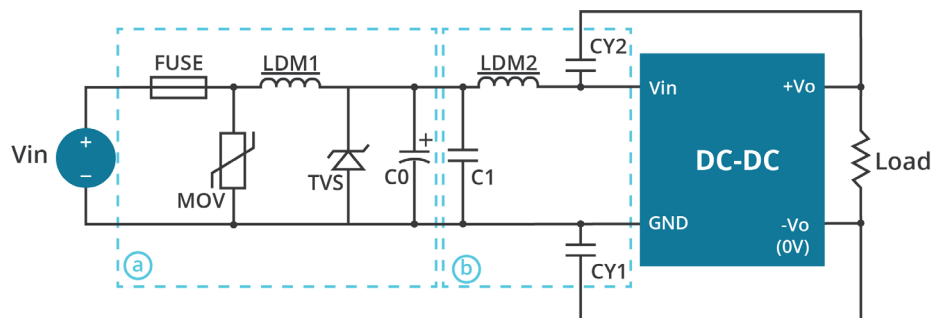


Table 1

| Recommended external circuit components |                                   |            |
|-----------------------------------------|-----------------------------------|------------|
| Vin (Vdc)                               | 24                                | 48         |
| FUSE                                    | Choose according to input current |            |
| MOV                                     | S14K35                            | S14K60     |
| LDM1                                    | 56μH                              | 56μH       |
| TVS                                     | SMCJ48A                           | SMCJ90A    |
| C0                                      | 330μF/50V                         | 330μF/100V |
| C1                                      | 1μF/50V                           | 1μF/100V   |
| LDM2                                    | 4.7μH                             | 4.7μH      |
| CY1                                     | 1 nF/2 KV                         | 1 nF/2 KV  |
| CY2                                     | 1 nF/2 KV                         | 1 nF/2 KV  |

## TEST CONFIGURATION

Figure 2

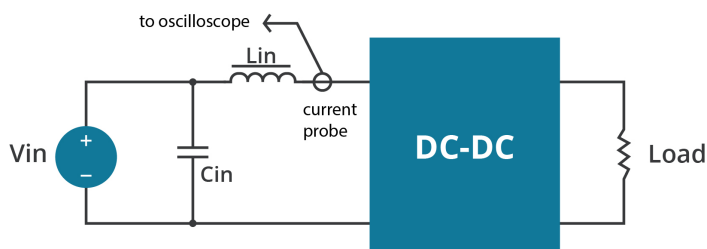


Table 2

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

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

## APPLICATION NOTES

### 1. 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 the capacitance accordingly or choose capacitors with low ESR (see table 3). However, the capacitance of the output filter capacitor must be appropriate. If the capacitance is too high, a startup problem might arise. For every channel of the output, to ensure safe and reliable operation, the maximum capacitance must be less than the maximum capacitive load (see Table 4).

Figure 3

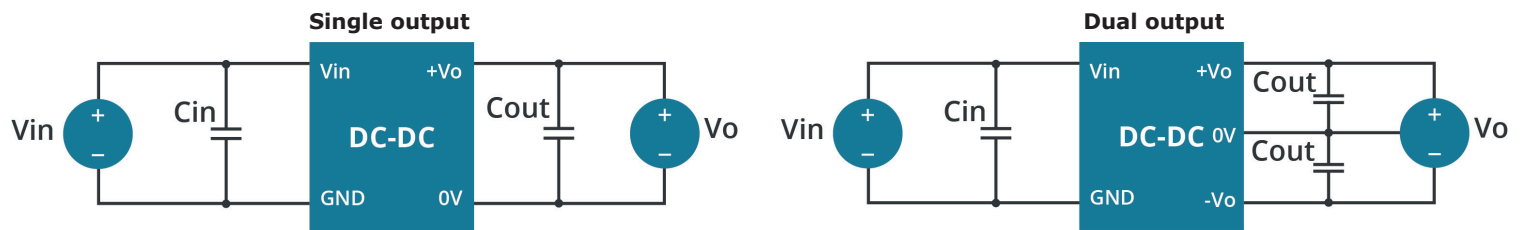


Table 3

| $V_{in}$<br>(Vdc) | $C_{in}$<br>( $\mu F$ ) | $C_{out}$<br>( $\mu F$ ) |
|-------------------|-------------------------|--------------------------|
| 24                | 10~47                   | 10                       |
| 48                | 10~47                   | 10                       |

Table 4

| Single<br>Vout<br>(Vdc) | Max.<br>Capacitive<br>Load<br>( $\mu F$ ) | Dual<br>Vout<br>(Vdc) | Max.<br>Capacitive<br>Load <sup>4</sup><br>( $\mu F$ ) |
|-------------------------|-------------------------------------------|-----------------------|--------------------------------------------------------|
| 3.3                     | 2200                                      | --                    | --                                                     |
| 5                       | 2200                                      | 5                     | 680                                                    |
| 12                      | 470 <sup>1</sup>                          | 12                    | 220 <sup>3</sup>                                       |
| 15                      | 330 <sup>2</sup>                          | 15                    | 100                                                    |
| 24                      | 100                                       | --                    | --                                                     |

Notes:

1. 330  $\mu F$  for 48V<sub>in</sub>.
2. 220  $\mu F$  for 48V<sub>in</sub>.
3. 150  $\mu F$  for 48V<sub>in</sub>.
4. For each output.

Note:

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  $T_a=25^\circ C$ , humidity<75%, nominal input voltage and rated output load unless otherwise specified.

## REVISION HISTORY

| rev. | description                                                                                                                                                                                                                                                                                                                   | date       |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 1.0  | initial release                                                                                                                                                                                                                                                                                                               | 06/26/2013 |
| 1.01 | updated spec                                                                                                                                                                                                                                                                                                                  | 08/16/2013 |
| 1.02 | safeties updated in features and safety approvals line                                                                                                                                                                                                                                                                        | 02/15/2021 |
| 1.03 | derating curve and circuit figures updated                                                                                                                                                                                                                                                                                    | 07/22/2021 |
| 1.04 | discontinued models PYB10-Q24-D12-T, PYB10-Q24-D15-T, PYB10-Q24-D5-T, PYB10-Q24-D5-U, PYB10-Q24-S15-T, PYB10-Q24-S15-U, PYB10-Q24-S24-T, PYB10-Q48-D12-T, PYB10-Q48-D15-T, PYB10-Q48-D15-U, PYB10-Q48-D5-T, PYB10-Q48-S15-T, PYB10-Q48-S24-T, PYB10-Q48-S24-U, PYB10-Q48-S3-T, PYB10-Q48-S3-U, PYB10-Q48-S5-T, PYB10-Q48-S5-U | 11/11/2022 |
| 1.05 | CE certification updated for 24V models                                                                                                                                                                                                                                                                                       | 11/25/2022 |

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.

# Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

CUI Inc.:

[PYB10-Q24-S12-T](#) [PYB10-Q24-S3-T](#) [PYB10-Q24-S5-T](#) [PYB10-Q48-S12-T](#)