

SERIES: PDQE10 | DESCRIPTION: DC-DC CONVERTER
FEATURES

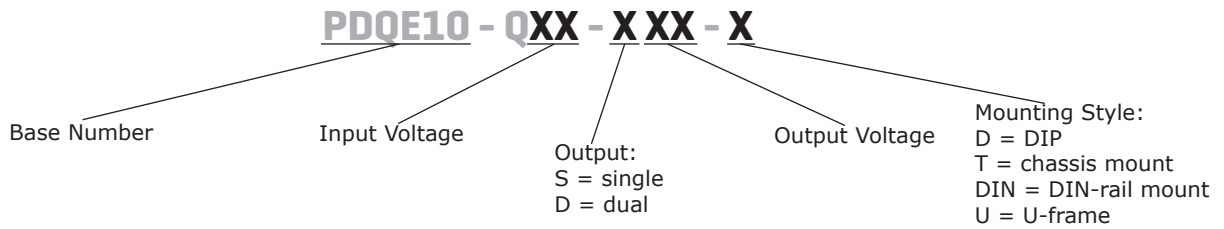
- industry standard footprint
- board, chassis and Din rail versions available
- industrial operating temp -40~+85°C
- 1500 Vdc isolation voltage
- industry standard footprint compatible with CUI legacy PDQ10 series
- high efficiency up to 88%
- 4:1 input rating
- single & dual output models available
- output short circuit, over current & overvoltage protection
- EN/BS EN 62368-1



| MODEL | input voltage | | output voltage (Vdc) | output current | | output power max (W) | ripple & noise ¹ max (mVp-p) | efficiency ² typ (%) |
|---------------------------------|---------------|----------------|-------------------------|----------------|-------------|----------------------------|---|---------------------------------------|
| | typ (Vdc) | range (Vdc) | | min (mA) | max (mA) | | | |
| PDQE10-Q24-S3 ^{5,6} | 24 | 9~36 | 3.3 | 0 | 2400 | 7.92 | 80 | 79 |
| PDQE10-Q24-S5 ^{5,6} | 24 | 9~36 | 5 | 0 | 2000 | 10 | 80 | 83 |
| PDQE10-Q24-S9 ^{5,6} | 24 | 9~36 | 9 | 0 | 1111 | 10 | 80 | 86 |
| PDQE10-Q24-S12 ^{5,6} | 24 | 9~36 | 12 | 0 | 833 | 10 | 80 | 87 |
| PDQE10-Q24-S15 ^{5,6} | 24 | 9~36 | 15 | 0 | 667 | 10 | 80 | 87 |
| PDQE10-Q24-S24 ^{5,6} | 24 | 9~36 | 24 | 0 | 416 | 10 | 80 | 88 |
| PDQE10-Q24-D5 ^{3,5,6} | 24 | 9~36 | ±5 | 0 | ±1000 | 10 | 80 | 83 |
| PDQE10-Q24-D9 ^{3,5,6} | 24 | 9~36 | ±9 | 0 | ±555 | 10 | 80 | 86 |
| PDQE10-Q24-D12 ^{3,5,6} | 24 | 9~36 | ±12 | 0 | ±416 | 10 | 80 | 87 |
| PDQE10-Q24-D15 ^{3,5,6} | 24 | 9~36 | ±15 | 0 | ±333 | 10 | 80 | 87 |
| PDQE10-Q24-D24 ^{3,5,6} | 24 | 9~36 | ±24 | 0 | ±208 | 10 | 80 | 87 |
| PDQE10-Q48-S3 ⁶ | 48 | 18~75 | 3.3 | 0 | 2400 | 7.92 | 80 | 79 |
| PDQE10-Q48-S5 ⁶ | 48 | 18~75 | 5 | 0 | 2000 | 10 | 80 | 83 |
| PDQE10-Q48-S12 ⁶ | 48 | 18~75 | 12 | 0 | 833 | 10 | 80 | 87 |
| PDQE10-Q48-S15 ⁶ | 48 | 18~75 | 15 | 0 | 667 | 10 | 80 | 87 |
| PDQE10-Q48-S24 ⁶ | 48 | 18~75 | 24 | 0 | 416 | 10 | 80 | 88 |
| PDQE10-Q48-D5 ⁶ | 48 | 18~75 | ±5 | 0 | ±1000 | 10 | 80 | 83 |
| PDQE10-Q48-D12 ⁶ | 48 | 18~75 | ±12 | 0 | ±416 | 10 | 80 | 87 |
| PDQE10-Q48-D15 ⁶ | 48 | 18~75 | ±15 | 0 | ±333 | 10 | 80 | 87 |
| PDQE10-Q48-D24 ⁶ | 48 | 18~75 | ±24 | 0 | ±208 | 10 | 80 | 87 |

- Notes:
1. From 5~100% load, nominal input, 20 MHz bandwidth oscilloscope, with 10 μ F tantalum and 1 μ F ceramic capacitors on the output. From 0~5% load, ripple and noise is <5% V_o .
 2. Measured at nominal input voltage, full load. The typical efficiencies for the chassis mount and DIN-rail mount versions are ~2% less than the DIP versions due to the input reverse polarity protection.
 3. In addition to all DIP versions, chassis mount and DIN-rail mount versions of these models are UL approved.
 4. All specifications are measured at $T_a=25^\circ\text{C}$, humidity < 75%, nominal input voltage, and rated output load unless otherwise specified.
 5. Model is not CE certified.
 6. U-frame model is not UL certified.

PART NUMBER KEY



INPUT

| parameter | conditions/description | min | typ | max | units | |
|--------------------------------------|--|------|-----------------------|-------|--------|----|
| operating input voltage ⁵ | 24 Vdc input models | 9 | 24 | 36 | Vdc | |
| | 48 Vdc input models | 18 | 48 | 75 | Vdc | |
| start-up voltage ⁵ | 24 Vdc input models | | | 9 | Vdc | |
| | 48 Vdc input models | | | 18 | Vdc | |
| surge voltage | for maximum of 1 second | | | | | |
| | 24 Vdc input models | -0.7 | | 50 | Vdc | |
| | 48 Vdc input models | -0.7 | | 100 | Vdc | |
| under voltage shutdown | 24 Vdc input models | 5.5 | 6.5 | | Vdc | |
| | 48 Vdc input models | 12 | 15.5 | | Vdc | |
| current (full load/no load) | 24 Vdc input models | | 3.3 Vdc output models | 423/5 | 434/12 | mA |
| | | | all other models | 502/5 | 514/12 | mA |
| | 48 Vdc input models | | 3.3 Vdc output models | 190/4 | 215/8 | mA |
| | | | all other models | 251/4 | 258/8 | mA |
| remote on/off (CTRL) ⁶ | module ON (3.5~12 Vdc or CTRL pin open circuit or pulled high) | | | | | |
| | module OFF (0~1.2 Vdc CTRL pin pulled low to GND) | | | | | |
| | converter input current when CTRL pin pulled low | | 6 | 10 | mA | |
| | CTRL pin input current when CTRL pin pulled low | | 1.5 | | mA | |
| | start-up time | | 2 | | s | |
| filter | Pi filter | | | | | |
| input reverse polarity protection | only present on chassis mount and DIN-rail mount models | | | | | |
| no load power consumption | | | 0.12 | | W | |

Notes: 5. The minimum input voltage and start-up voltage for the chassis mount and DIN-rail mount versions are 1 Vdc higher than the DIP versions.
6. The voltage of the Ctrl pin is referenced to input GND pin.

OUTPUT

| parameter | conditions/description | min | typ | max | units |
|--------------------------------------|---------------------------------------|-----|------|-------|-------|
| maximum capacitive load ⁷ | 3.3, 5 Vdc output models | | | 2,200 | μF |
| | ±5 Vdc output models | | | 1,000 | μF |
| | 9, ±9 Vdc output models | | | 680 | μF |
| | ±12 Vdc output models | | | 470 | μF |
| | ±15 Vdc output models | | | 330 | μF |
| | all other models | | | 100 | μF |
| voltage accuracy ⁸ | 0% to full load | | ±1 | ±3 | % |
| line regulation | from low line to high line, full load | | | | |
| | positive outputs | | ±0.2 | ±0.5 | % |
| | negative outputs | | ±0.5 | ±1 | % |
| load regulation ⁹ | from 5% to full load | | | | |
| | positive outputs | | ±0.5 | ±1 | % |
| | negative outputs | | ±0.5 | ±1.5 | % |
| voltage balance ¹⁰ | dual output models | | | ±5 | % |

Note: 7. Tested at input voltage range and full load.
8. At 0~5% load, the max output voltage accuracy for the ±5 & ±9 Vdc output models is ±5%.
9. At 0~100% load, the max load regulation is ±5%.
10. Unbalanced loads should not exceed ±5%. If ±5% is exceeded, the product performance cannot be guaranteed.

OUTPUT (CONTINUED)

| parameter | conditions/description | min | typ | max | units |
|-----------------------------------|---|-----|-----|-------|-------|
| cross regulation | dual output models: main output 50% load secondary output from 10~100% load | | | ±5 | % |
| switching frequency ¹¹ | PWM mode | | 350 | | kHz |
| transient recovery time | 25% load step change, nominal input voltage | | 300 | 500 | µs |
| transient response deviation | 25% load step change, nominal input voltage | | ±3 | ±5 | % |
| temperature coefficient | at full load | | | ±0.03 | %/°C |

Note: 11. Value is based on full load. At loads <10%, the switching frequency decreases with decreasing load

PROTECTIONS

| parameter | conditions/description | min | typ | max | units |
|--------------------------|---------------------------|-----|-----|-----|-------|
| over voltage protection | | 110 | | 160 | % |
| over current protection | | 110 | 140 | 190 | % |
| short circuit protection | continuous, self recovery | | | | |

SAFETY AND COMPLIANCE

| parameter | conditions/description | min | typ | max | units |
|--------------------------------|---|-----------|-------|-----|-------|
| isolation voltage | input to output for 1 minute at 1 mA | 1,500 | | | Vdc |
| isolation resistance | input to output at 500 Vdc | 1,000 | | | MΩ |
| isolation capacitance | input to output, 100 kHz / 0.1 V | | 1,000 | | pF |
| safety approvals ¹² | certified to 60950-1: UL ¹³ certified to 62368: EN/BS EN | | | | |
| conducted emissions | CISPR22/EN55022, class A (no external circuit); class B (external circuit required, see Figure 3-2) | | | | |
| radiated emissions | CISPR22/EN55022, class A (no external circuit); class B (external circuit required, see Figure 3-2) | | | | |
| ESD | IEC/EN61000-4-2, contact ± 4kV, class B | | | | |
| radiated immunity | IEC/EN61000-4-3, 10V/m, class A | | | | |
| EFT/burst | IEC/EN61000-4-4, ± 2kV, class B (external circuit required, see Figure 3-1) | | | | |
| surge | IEC/EN61000-4-5, line-line ± 2kV, class B (external circuit required, see Figure 3-1) | | | | |
| conducted immunity | IEC/EN61000-4-6, 3 Vr.m.s, class A | | | | |
| voltage dips & interruptions | IEC/EN61000-4-29, 0%-70%, class B | | | | |
| MTBF | as per MIL-HDBK-217F, 25°C | 1,000,000 | | | hours |
| RoHS | yes | | | | |

Note: 12. See specific chassis mount and DIN-rail mount versions with UL approval on page 1.

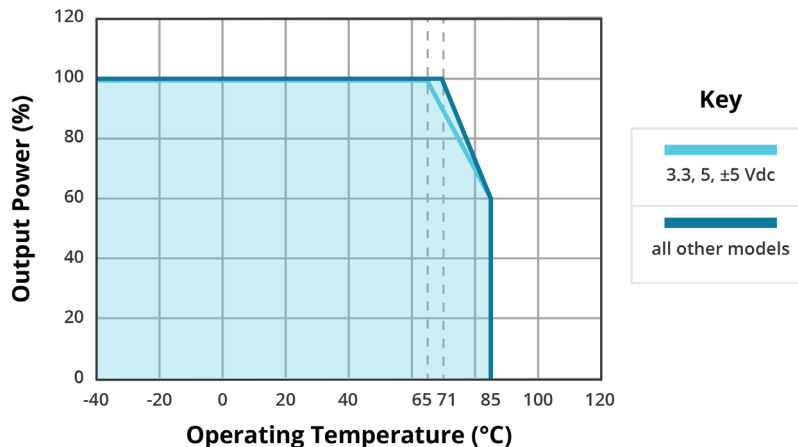
13. The U-frame models are not UL certified.

ENVIRONMENTAL

| parameter | conditions/description | min | typ | max | units |
|-----------------------|--------------------------------------|-----|-----|-----|-------|
| operating temperature | see derating curves | -40 | | 85 | °C |
| storage temperature | | -55 | | 125 | °C |
| storage humidity | non-condensing | 5 | | 95 | % |
| vibration | 10~55 Hz for 30 minutes on each axis | | 10 | | G |

DERATING CURVES

TEMPERATURE DERATING CURVE

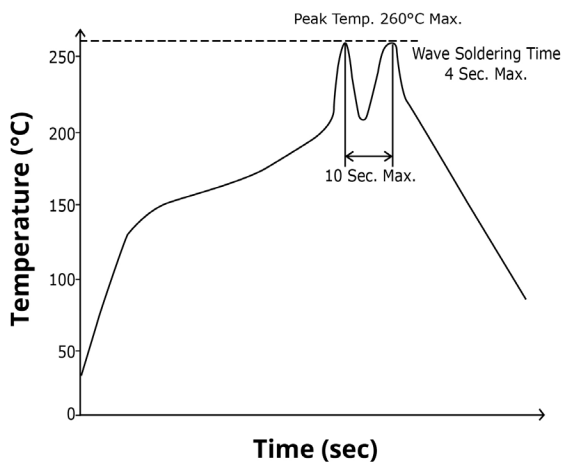


SOLDERABILITY¹³

| 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 |

Note: 13. For DIP models only.

WAVE SOLDERING PROFILE



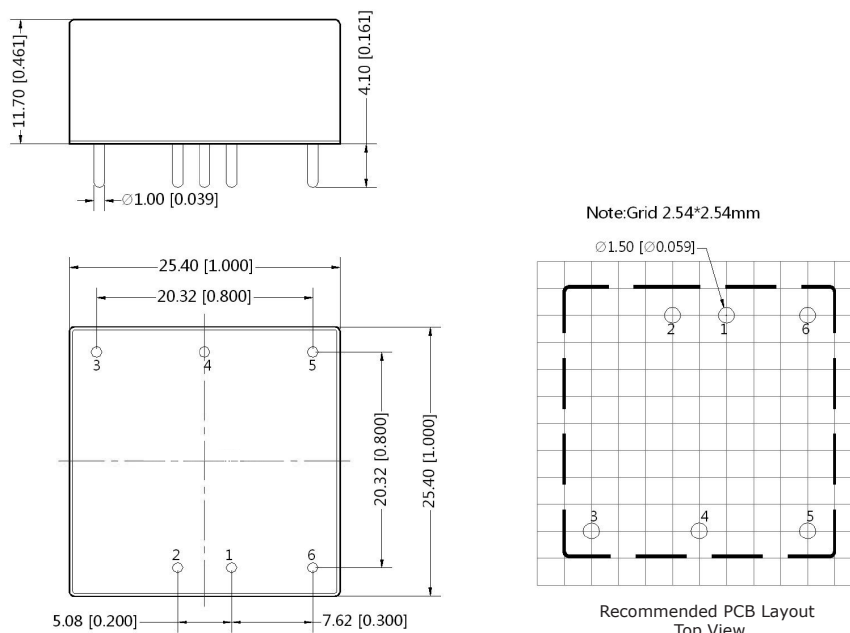
MECHANICAL

| parameter | conditions/description | min | typ | max | units |
|---------------|------------------------|--|-----|-----|-------|
| dimensions | DIP | 25.40 x 25.40 x 11.70 [1.000 x 1.000 x 0.461 inch] | | | mm |
| | Chassis | 76.00 x 31.50 x 21.20 [2.992 x 1.240 x 0.834 inch] | | | mm |
| | DIN-Rail | 76.00 x 31.50 x 25.80 [2.992 x 1.240 x 1.016 inch] | | | mm |
| | U-frame | 55.00 x 52.30 x 19.00 [2.165 x 2.059 x 0.748 inch] | | | mm |
| case material | aluminum alloy | | | | |
| weight | DIP | | 15 | | g |
| | Chassis mount | | 35 | | g |
| | DIN-rail mount | | 55 | | g |
| | U-frame | | 44 | | g |

MECHANICAL DRAWING (DIP)

units: mm [inch]
 tolerance: $\pm 0.50[\pm 0.020]$
 pin diameter tolerance: $\pm 0.10[\pm 0.004]$

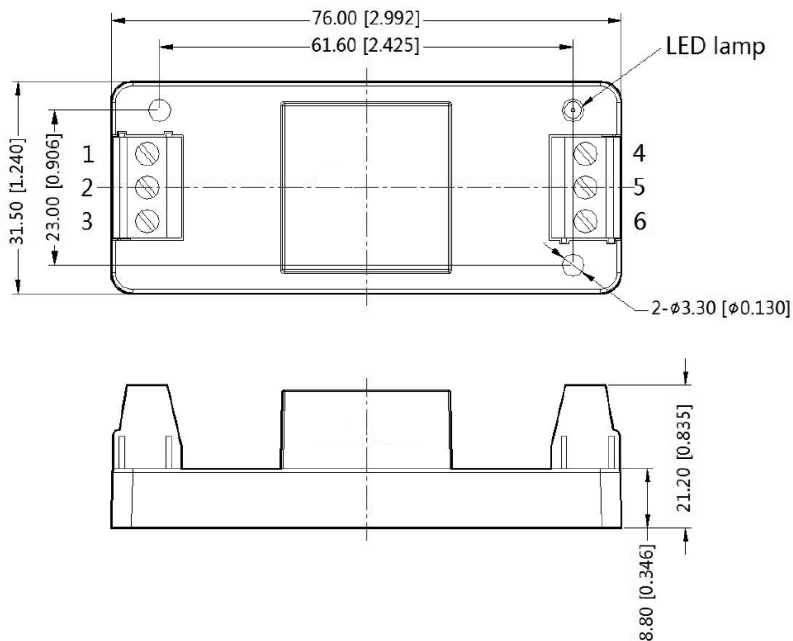
| PIN CONNECTIONS | | |
|-----------------|----------|-------|
| PIN | Function | |
| | Single | Dual |
| 1 | GND | GND |
| 2 | Vin | Vin |
| 3 | +Vout | +Vout |
| 4 | No Pin | 0V |
| 5 | 0V | -Vout |
| 6 | CTRL | CTRL |



MECHANICAL DRAWING (CHASSIS)

units: mm [inch]
 tolerance: $\pm 0.50[\pm 0.020]$
 wire range: 24~12 AWG
 tightening torque: max 0.4 N*m

| PIN CONNECTIONS | | |
|-----------------|----------|-------|
| PIN | Function | |
| | Single | Dual |
| 1 | CTRL | CTRL |
| 2 | GND | GND |
| 3 | Vin | Vin |
| 4 | 0V | -Vout |
| 5 | NC | 0V |
| 6 | +Vout | +Vout |

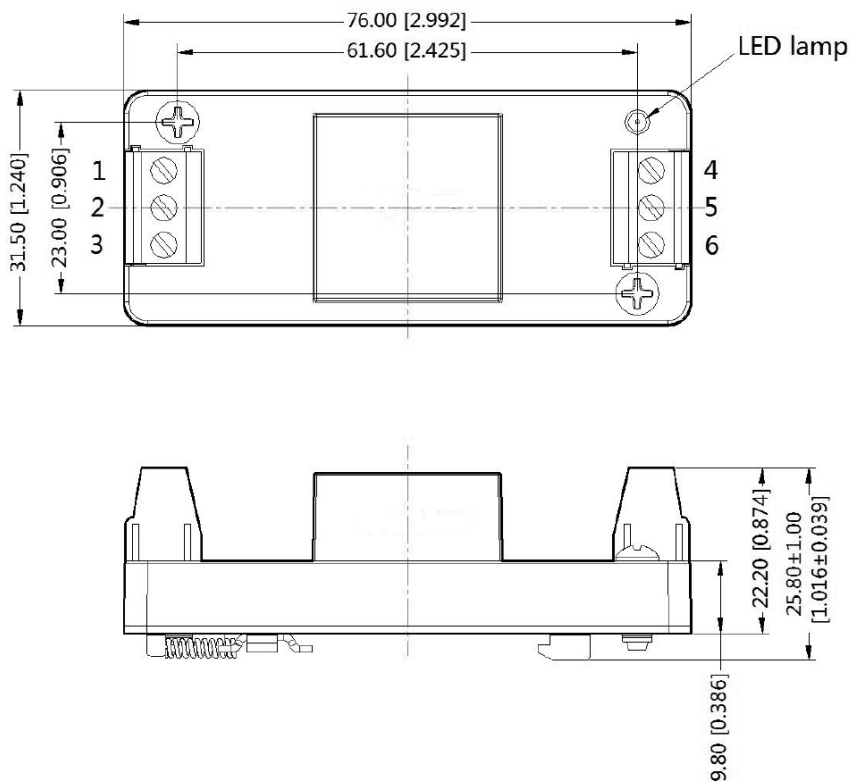


MECHANICAL DRAWING (DIN-RAIL)

units: mm [inch]
tolerance: $\pm 0.50[\pm 0.020]$

installed on DIN rail TS35
wire range: 24~12 AWG
tightening torque: max 0.4 N*m

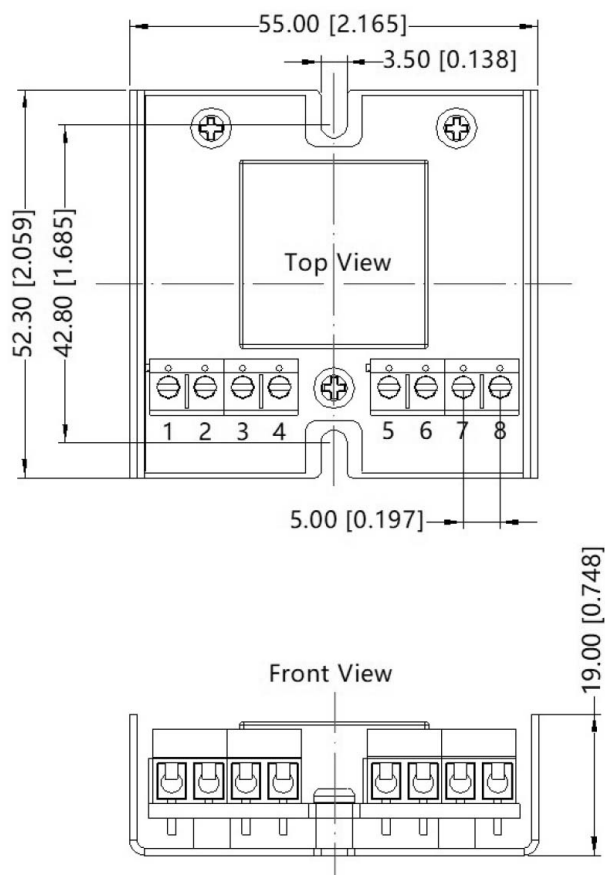
| PIN CONNECTIONS | | |
|-----------------|----------|-------|
| PIN | Function | |
| | Single | Dual |
| 1 | CTRL | CTRL |
| 2 | GND | GND |
| 3 | Vin | Vin |
| 4 | 0V | -Vout |
| 5 | NC | 0V |
| 6 | +Vout | +Vout |



MECHANICAL DRAWING (U-FRAME)

units: mm [inch]
wire range: 24-12 AWG
tolerance: $\pm 1.00[\pm 0.039]$
tightening torque: Max 0.4 N·m

| PIN CONNECTIONS | | |
|-----------------|----------|------|
| PIN | Function | |
| | Single | Dual |
| 1 | GND | GND |
| 2 | Vin | Vin |
| 3 | Ctrl | Ctrl |
| 4 | Case | Case |
| 5 | NC | NC |
| 6 | +Vo | +Vo |
| 7 | NC | 0V |
| 8 | 0V | -Vo |



APPLICATION CIRCUIT (DIP, CHASSIS, DIN-RAIL)

This series has been tested according to the following recommended circuits (Figures 1 & 2) before leaving the factory. If you want to further reduce the input and output ripple, you can increase the input and output capacitors or select capacitors of low equivalent impedance provided that the capacitance is less than the maximum capacitive load of the model.

Figure 1
Single Output Models

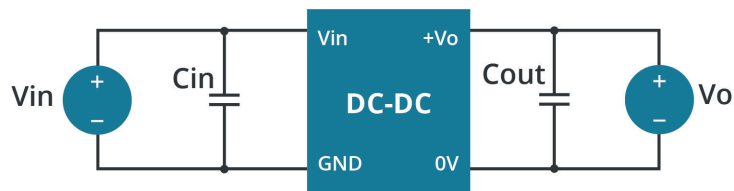
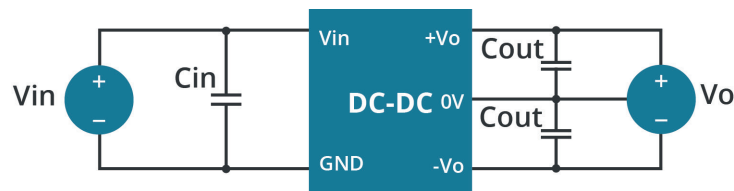


Table 1

| Vin (Vdc) | Cin (μF) | Cout (μF) |
|-----------|----------|-----------|
| 24 | 100 | 10 |
| 48 | 10~47 | 10 |

Figure 2
Dual Output Models



APPLICATION CIRCUIT (U-FRAME)

Figure 1
Single Output Models

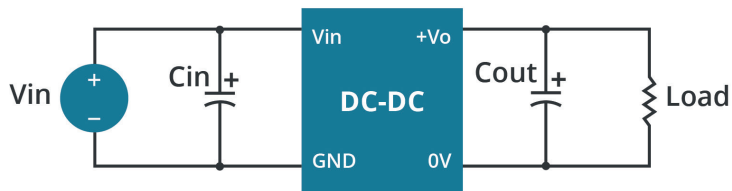
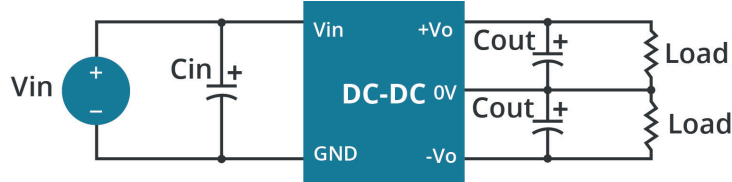


Table 1

| Vin (Vdc) | Cin (μF/V) | Vout (Vdc) | Cout (μF/V) |
|-----------|------------|---------------|-------------|
| 24 | 100/50 | ±5/±9/3.3/5/9 | 10/16 |
| | | ±12/±15/12/15 | 10/25 |
| | | ±24/24 | 10/50 |
| 48 | 10~47/100 | ±5/3.3/5 | 10/16 |
| | | ±12/±15/12/15 | 10/25 |
| | | ±24/24 | 10/50 |

Figure 2
Dual Output Models



EMC RECOMMENDED CIRCUIT (DIP, CHASSIS, DIN-RAIL)

Figure 3

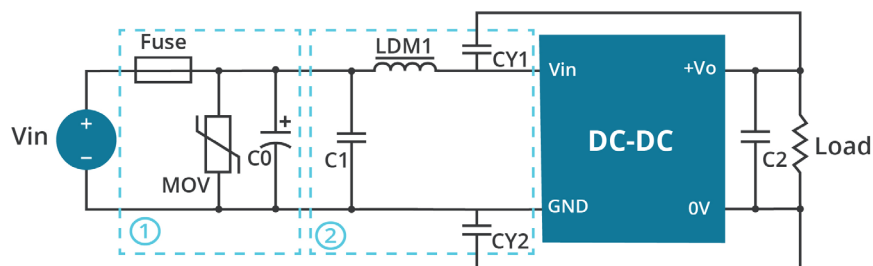


Table 2

| Recommended External Circuit Components | | |
|---|--|---------------------|
| Vin (Vdc) | 24 | 48 |
| FUSE | choose according to actual input current | |
| MOV | S20K30 | S14K60 |
| C0 | 330 μ F / 50 V | 330 μ F / 100 V |
| C1 | 1 μ F / 50 V | 1 μ F / 100 V |
| C2 | 10 μ F | |
| LDM1 | 4.7 μ H | |
| CY1, CY2 | 1 nF / 2 kV | |

EMC RECOMMENDED CIRCUIT (U-FRAME)

Figure 3

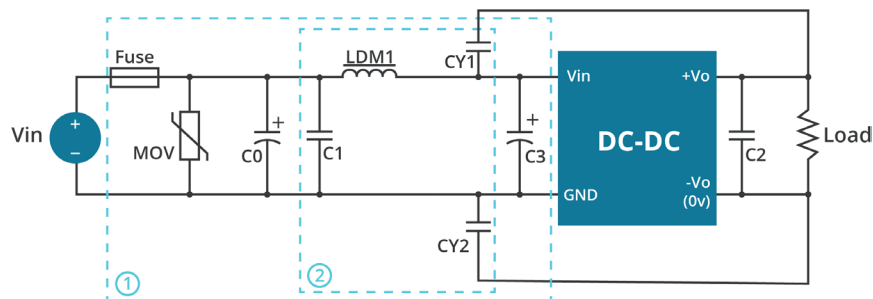


Table 2

| Recommended External Circuit Components | | |
|---|--|--------------------|
| Vin (Vdc) | 24 | 48 |
| FUSE | choose according to actual input current | |
| MOV | S20K30 | S14K60 |
| C0/C3 | 330 μ F / 50V | 330 μ F / 100V |
| C1 | 1 μ F / 50V | 1 μ F / 100V |
| C2 | refer to the Cout in Figure 1 & 2 | |
| LDM1 | 4.7 μ H | |
| CY1, CY2 | 1nF / 2kV | |

REVISION HISTORY

| rev. | description | date |
|------|---|------------|
| 1.0 | initial release | 06/21/2018 |
| 1.01 | features and safety line updated, packaging removed | 01/19/2021 |
| 1.02 | remote start-up time updated | 03/15/2021 |
| 1.03 | derating curve and circuit figure updated | 07/27/2021 |
| 1.04 | CE removed from 24V models, U-frame option added | 11/07/2022 |
| 1.05 | ctrl pin information updated | 11/11/2022 |

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



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