

**SERIES:** PDSE1-D | **DESCRIPTION:** DC-DC CONVERTER

**FEATURES**

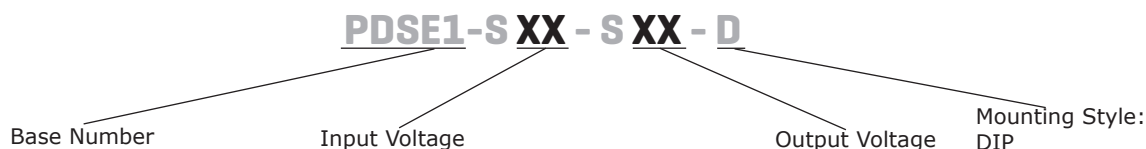
- 1 W isolated output
- single unregulated output
- compact DIP package
- continuous short circuit protection
- 3000 Vdc isolation
- no load input current as low as 5 mA
- extended temperature range (-40~105°C)
- UL 62368 approval
- efficiency up to 85%


**MODEL**

| MODEL                        | input voltage |                | output voltage<br>(Vdc) | output current |             | output power<br>max<br>(W) | ripple & noise <sup>1</sup><br>max<br>(mVp-p) | efficiency <sup>2</sup><br>typ<br>(%) |
|------------------------------|---------------|----------------|-------------------------|----------------|-------------|----------------------------|-----------------------------------------------|---------------------------------------|
|                              | typ<br>(Vdc)  | range<br>(Vdc) |                         | min<br>(mA)    | max<br>(mA) |                            |                                               |                                       |
| PDSE1-S5-S3-D                | 5             | 4.5~5.5        | 3.3                     | 30             | 303         | 1                          | 75                                            | 74                                    |
| PDSE1-S5-S5-D                | 5             | 4.5~5.5        | 5                       | 20             | 200         | 1                          | 75                                            | 82                                    |
| PDSE1-S5-S9-D                | 5             | 4.5~5.5        | 9                       | 12             | 111         | 1                          | 75                                            | 83                                    |
| PDSE1-S5-S12-D               | 5             | 4.5~5.5        | 12                      | 9              | 84          | 1                          | 75                                            | 83                                    |
| PDSE1-S5-S15-D               | 5             | 4.5~5.5        | 15                      | 7              | 67          | 1                          | 75                                            | 83                                    |
| PDSE1-S5-S24-D               | 5             | 4.5~5.5        | 24                      | 4              | 42          | 1                          | 100                                           | 85                                    |
| PDSE1-S12-S3-D               | 12            | 10.8~13.2      | 3.3                     | 30             | 303         | 1                          | 75                                            | 75                                    |
| PDSE1-S12-S5-D               | 12            | 10.8~13.2      | 5                       | 20             | 200         | 1                          | 75                                            | 80                                    |
| PDSE1-S12-S9-D <sup>4</sup>  | 12            | 10.8~13.2      | 9                       | 12             | 111         | 1                          | 75                                            | 78                                    |
| PDSE1-S12-S12-D              | 12            | 10.8~13.2      | 12                      | 9              | 83          | 1                          | 75                                            | 80                                    |
| PDSE1-S12-S15-D              | 12            | 10.8~13.2      | 15                      | 7              | 67          | 1                          | 75                                            | 81                                    |
| PDSE1-S12-S24-D              | 12            | 10.8~13.2      | 24                      | 5              | 42          | 1                          | 100                                           | 81                                    |
| PDSE1-S15-S5-D <sup>4</sup>  | 15            | 13.5~16.5      | 5                       | 20             | 200         | 1                          | 75                                            | 80                                    |
| PDSE1-S15-S9-D <sup>4</sup>  | 15            | 13.5~16.5      | 9                       | 12             | 111         | 1                          | 75                                            | 80                                    |
| PDSE1-S15-S15-D <sup>4</sup> | 15            | 13.5~16.5      | 15                      | 7              | 67          | 1                          | 75                                            | 81                                    |
| PDSE1-S24-S3-D               | 24            | 21.6~26.4      | 3.3                     | 30             | 303         | 1                          | 75                                            | 75                                    |
| PDSE1-S24-S5-D               | 24            | 21.6~26.4      | 5                       | 20             | 200         | 1                          | 75                                            | 79                                    |
| PDSE1-S24-S9-D <sup>4</sup>  | 24            | 21.6~26.4      | 9                       | 12             | 111         | 1                          | 75                                            | 80                                    |
| PDSE1-S24-S12-D              | 24            | 21.6~26.4      | 12                      | 9              | 83          | 1                          | 75                                            | 81                                    |
| PDSE1-S24-S15-D              | 24            | 21.6~26.4      | 15                      | 7              | 67          | 1                          | 75                                            | 81                                    |
| PDSE1-S24-S24-D              | 24            | 21.6~26.4      | 24                      | 5              | 42          | 1                          | 100                                           | 81                                    |

- Notes:
1. Measured at nominal input, 20 MHz bandwidth oscilloscope, with 10  $\mu$ F tantalum and 1  $\mu$ F ceramic capacitors on the output.
  2. Measured at nominal input voltage, full load.
  3. All specifications are measured at  $T_a=25^\circ\text{C}$ , humidity < 75%, nominal input voltage, and rated output load unless otherwise specified.
  4. Model is not UL certified.

## PART NUMBER KEY



## INPUT

| parameter               | conditions/description  | min  | typ | max  | units |
|-------------------------|-------------------------|------|-----|------|-------|
| operating input voltage | 5 Vdc input models      | 4.5  | 5   | 5.5  | Vdc   |
|                         | 12 Vdc input models     | 10.8 | 12  | 13.2 | Vdc   |
|                         | 15 Vdc input models     | 13.5 | 13  | 16.5 | Vdc   |
|                         | 24 Vdc input models     | 21.6 | 24  | 26.4 | Vdc   |
| surge voltage           | for maximum of 1 second |      |     |      |       |
|                         | 5 Vdc input models      | -0.7 |     | 9    | Vdc   |
|                         | 12 Vdc input models     | -0.7 |     | 18   | Vdc   |
|                         | 15 Vdc input models     | -0.7 |     | 21   | Vdc   |
| current                 | for maximum of 1 second |      |     |      |       |
|                         | 5 Vdc input models      |      |     | 286  | mA    |
|                         |                         |      |     | 254  | mA    |
|                         | 12 Vdc input models     |      |     | 118  | mA    |
|                         |                         |      |     | 110  | mA    |
|                         |                         |      |     | 109  | mA    |
|                         | 15 Vdc input models     |      |     | 88   | mA    |
|                         |                         |      |     | 87   | mA    |
|                         | 24 Vdc input models     |      |     | 61   | mA    |
|                         |                         |      |     | 58   | mA    |
|                         |                         |      |     | 57   | mA    |
|                         |                         |      |     | 56   | mA    |
| filter                  | filter capacitor        |      |     |      |       |

## OUTPUT

| parameter                            | conditions/description           | min | typ   | max   | units |
|--------------------------------------|----------------------------------|-----|-------|-------|-------|
| maximum capacitive load <sup>4</sup> | 3.3, 5 Vdc output models         |     |       | 2,400 | μF    |
|                                      | 9 Vdc output models              |     |       | 1,000 | μF    |
|                                      | 12, 15 Vdc output models         |     |       | 560   | μF    |
|                                      | all other models                 |     |       | 220   | μF    |
| voltage accuracy                     | see tolerance envelope curves    |     |       |       |       |
| line regulation                      | for Vin change of 1%             |     |       | ±1.5  | %     |
|                                      | 3.3 Vdc output models            |     |       | ±1.2  | %     |
| load regulation                      | from 10% to full load            |     |       | ±20   | %     |
|                                      | 3.3 Vdc output models            |     |       | ±15   | %     |
|                                      | 5 Vdc output models              |     |       | ±10   | %     |
|                                      | all other models                 |     |       |       |       |
| switching frequency                  | 100% load, nominal input voltage |     | 270   |       | kHz   |
| temperature coefficient              | at full load                     |     | ±0.02 |       | %/°C  |

Note: 4. Tested at input voltage range and full load.

## PROTECTIONS

| parameter                | conditions/description    | min | typ | max | units |
|--------------------------|---------------------------|-----|-----|-----|-------|
| short circuit protection | continuous, self recovery |     |     |     |       |

## SAFETY AND COMPLIANCE

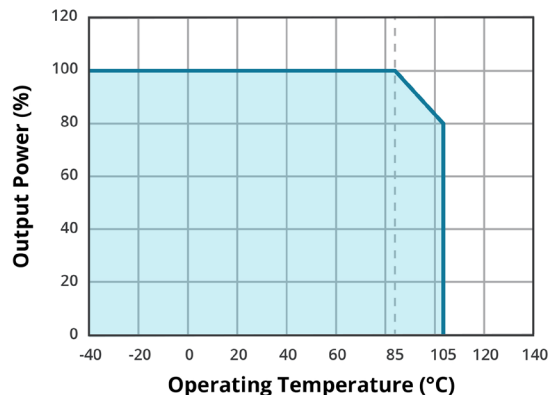
| parameter             | conditions/description                                             | min       | typ | max | units |
|-----------------------|--------------------------------------------------------------------|-----------|-----|-----|-------|
| isolation voltage     | input to output for 1 minute at 1 mA                               | 3,000     |     |     | Vdc   |
| isolation resistance  | input to output at 500 Vdc                                         | 1,000     |     |     | MΩ    |
| isolation capacitance | input to output, 100 kHz / 0.1 V                                   |           | 20  |     | pF    |
| safety approvals      | certified to 62368-1: UL<br>designed to meet 62368: EN/BS EN       |           |     |     |       |
| conducted emissions   | CISPR32/EN55032, class B (external circuit required, see Figure 2) |           |     |     |       |
| radiated emissions    | CISPR32/EN55032, class B (external circuit required, see Figure 2) |           |     |     |       |
| ESD                   | IEC/EN61000-4-2, air ± 8 kV; contact ± 4 kV, class B               |           |     |     |       |
| MTBF                  | as per MIL-HDBK-217F, 25°C                                         | 3,500,000 |     |     | hours |
| RoHS                  | yes                                                                |           |     |     |       |

## ENVIRONMENTAL

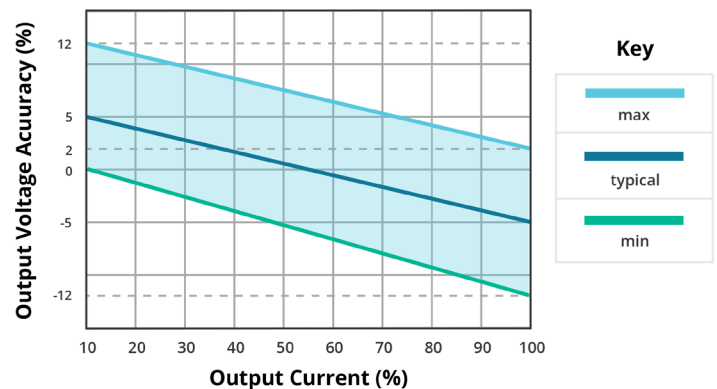
| parameter             | conditions/description                                   | min | typ      | max | units    |
|-----------------------|----------------------------------------------------------|-----|----------|-----|----------|
| operating temperature | see derating curves                                      | -40 |          | 105 | °C       |
| storage temperature   |                                                          | -55 |          | 125 | °C       |
| storage humidity      | non-condensing                                           |     |          | 95  | %        |
| case temperature rise | 3.3 Vdc output model at 25°C<br>all other models at 25°C |     | 25<br>15 |     | °C<br>°C |

## DERATING CURVES

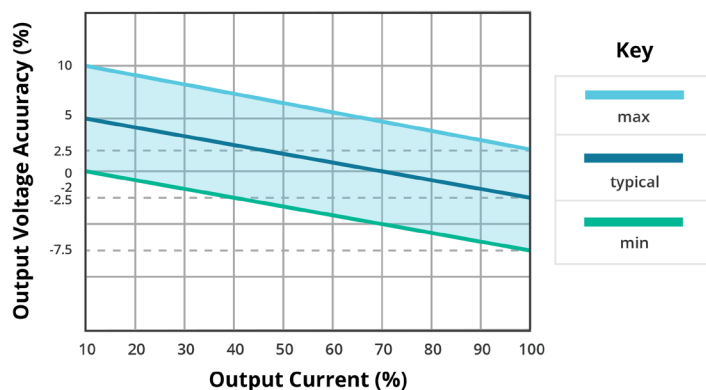
**TEMPERATURE DERATING CURVE**



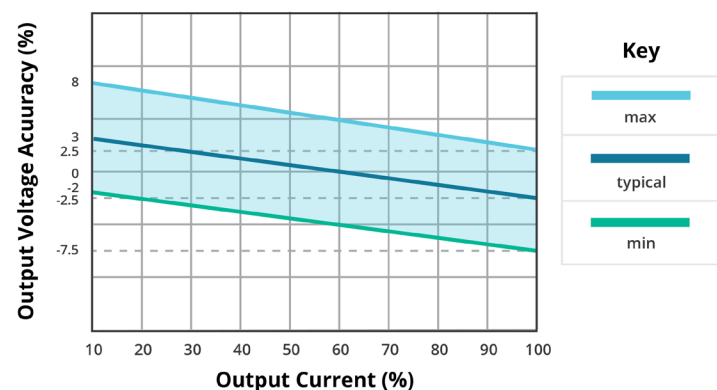
**OUTPUT REGULATION CURVE**  
3.3 Vdc output models  
(nominal input)



**OUTPUT REGULATION CURVE**  
5 Vdc input model / 5, 9, 12, 15, 24 Vdc output models  
(nominal input)

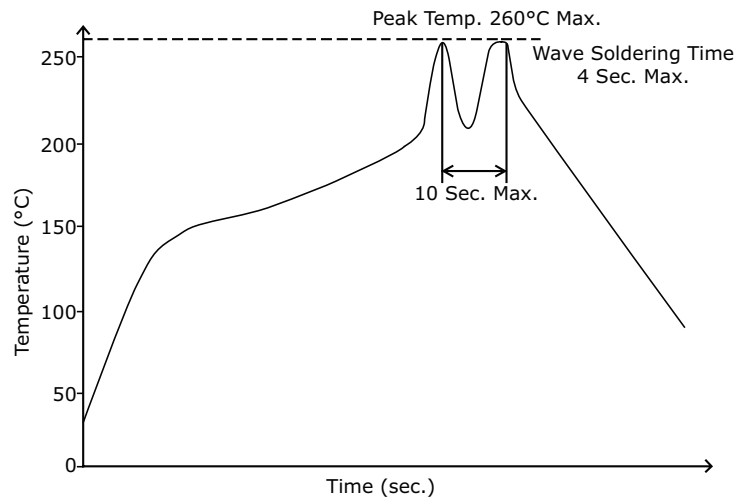


**OUTPUT REGULATION CURVE**  
all other input models / 5, 9, 12, 15, 24 Vdc output models  
(nominal input)



## 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    |



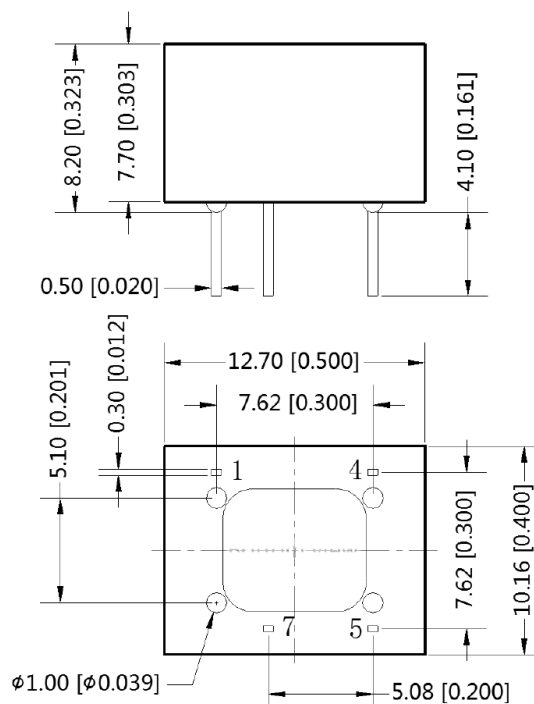
## MECHANICAL

| parameter     | conditions/description                                     | min | typ | max | units |
|---------------|------------------------------------------------------------|-----|-----|-----|-------|
| dimensions    | 12.70 x 10.16 x 8.20 [0.500 x 0.400 x 0.323 inch]          |     |     |     | mm    |
| case material | black flame-retardant and heat-resistant plastic (UL94V-0) |     |     |     |       |
| weight        |                                                            |     | 1.8 |     | g     |

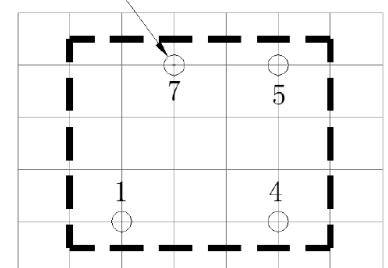
## MECHANICAL DRAWING

units: mm [inch]  
 tolerance:  $\pm 0.25 [\pm 0.010]$   
 pin section tolerance:  $\pm 0.10 [\pm 0.004]$

| PIN CONNECTIONS |          |
|-----------------|----------|
| PIN             | Function |
| 1               | GND      |
| 4               | Vin      |
| 5               | +Vout    |
| 7               | 0V       |



$\phi 1.00 [\phi 0.039]$

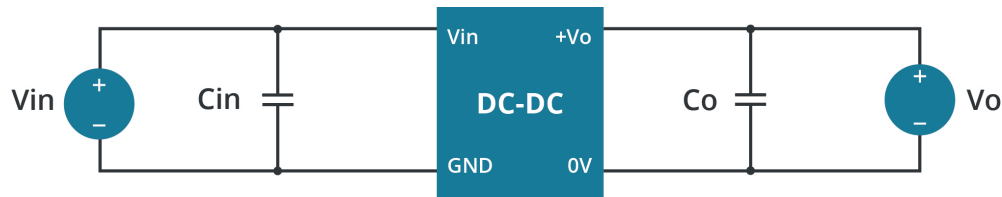


Note: Grid 2.54\*2.54mm  
 Recommended PCB Layout  
 Top View

## APPLICATION CIRCUIT

If you want to further reduce the input and output ripple, a filter capacitor may be connected to the input and output terminals (Figure 1) provided that the capacitance is less than the maximum capacitive load of the model, otherwise start-up problems may be caused if the capacitance is too large.

**Figure 1**

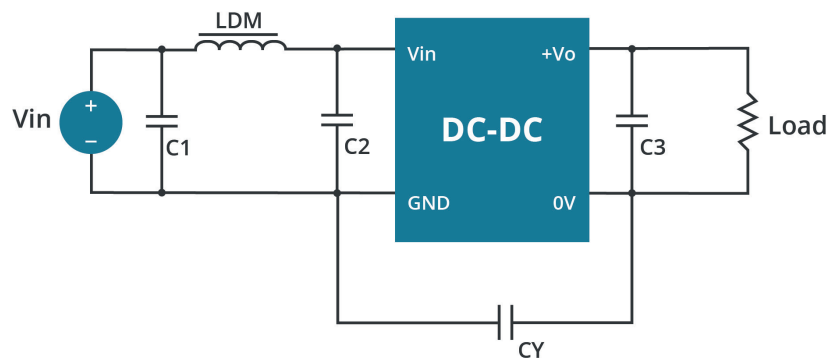


**Table 1**

| Vin (Vdc) | Cin (μF/V) | Vo (Vdc) | Cout (μF/V) |
|-----------|------------|----------|-------------|
| 5         | 4.7        | 3.3, 5   | 10          |
|           |            | 9, 12    | 2.2         |
|           |            | 15, 24   | 1           |
| 12        | 2.2/25     | 3.3, 5   | 10/16       |
| 15        | 2.2/25     | 9        | 4.7/25      |
| 24        | 1/50       | 12       | 2.2/50      |
| --        | --         | 15, 24   | 1/50        |

## EMC RECOMMENDED CIRCUIT

**Figure 2**



**Table 2**

| Recommended External Circuit Components |          |                              |                 |
|-----------------------------------------|----------|------------------------------|-----------------|
| Vin (Vdc)                               | Vo (Vdc) | 3.3, 5, 9                    | 12, 15, 24      |
| 5                                       | CY       | --                           | 1 nF / 4kVdc    |
|                                         | C3       | refer to the Cout in Table 1 |                 |
|                                         | C1, C2   | 4.7 μF / 25 V                | 4.7 μF / 25 V   |
|                                         | LDM      | 6.8 μH                       | 6.8 μH          |
| 12, 15, 24                              | C1, C2   | 4.7 μF / 50 V                | 4.7 μF / 50 V   |
|                                         | C3       | Refer to Cout in Table 1     |                 |
|                                         | LDM      | 6.8 μH                       | 6.8 μH          |
|                                         | CY       | 270 pF / 3 kVdc              | 270 pF / 3 kVdc |

## REVISION HISTORY

| rev. | description              | date       |
|------|--------------------------|------------|
| 1.0  | initial release          | 07/10/2019 |
| 1.01 | company logo updated     | 03/30/2021 |
| 1.03 | updated datasheet        | 06/21/2021 |
| 1.04 | CE certification removed | 11/07/2022 |

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.

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