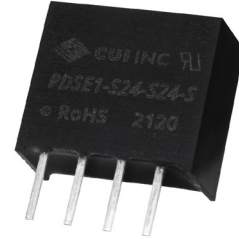


**SERIES:** PDSE1-S | **DESCRIPTION:** DC-DC CONVERTER**FEATURES**

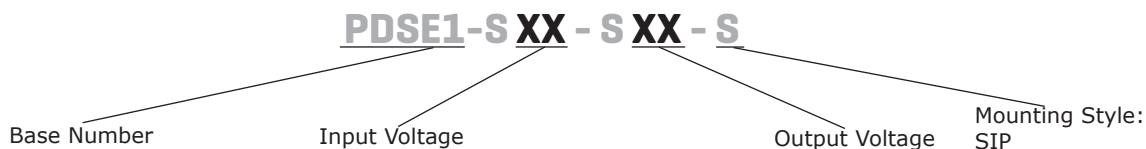
- 1 W isolated output
- unregulated output
- compact SIP package
- single output models
- continuous short circuit protection
- extended temperature range (-40~105°C)
- 1500 Vdc isolation
- no load input current as low as 5 mA
- efficiency up to 85%
- UL 62368 approval
- designed to meet EN/BS EN 62368



| 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-S                | 5             | 4.5~5.5        | 3.3                     | 30             | 303         | 1                          | 75  | 74                                    |
| PDSE1-S5-S5-S                | 5             | 4.5~5.5        | 5                       | 20             | 200         | 1                          | 75  | 82                                    |
| PDSE1-S5-S9-S                | 5             | 4.5~5.5        | 9                       | 12             | 111         | 1                          | 75  | 83                                    |
| PDSE1-S5-S12-S               | 5             | 4.5~5.5        | 12                      | 9              | 84          | 1                          | 75  | 83                                    |
| PDSE1-S5-S15-S               | 5             | 4.5~5.5        | 15                      | 7              | 67          | 1                          | 75  | 83                                    |
| PDSE1-S5-S24-S               | 5             | 4.5~5.5        | 24                      | 4              | 42          | 1                          | 100   | 85                                    |
| PDSE1-S12-S3-S               | 12            | 10.8~13.2      | 3.3                     | 30             | 303         | 1                          | 75  | 75                                    |
| PDSE1-S12-S5-S               | 12            | 10.8~13.2      | 5                       | 20             | 200         | 1                          | 75  | 80                                    |
| PDSE1-S12-S9-S               | 12            | 10.8~13.2      | 9                       | 12             | 111         | 1                          | 75  | 80                                    |
| PDSE1-S12-S12-S              | 12            | 10.8~13.2      | 12                      | 9              | 83          | 1                          | 75  | 80                                    |
| PDSE1-S12-S15-S              | 12            | 10.8~13.2      | 15                      | 7              | 67          | 1                          | 75  | 81                                    |
| PDSE1-S12-S24-S              | 12            | 10.8~13.2      | 24                      | 5              | 42          | 1                          | 100   | 81                                    |
| PDSE1-S15-S5-S               | 15            | 13.5~16.5      | 5                       | 20             | 200         | 1                          | 75  | 80                                    |
| PDSE1-S15-S9-S               | 15            | 13.5~16.5      | 9                       | 12             | 111         | 1                          | 75  | 80                                    |
| PDSE1-S15-S12-S              | 15            | 13.5~16.5      | 12                      | 9              | 83          | 1                          | 75  | 80                                    |
| PDSE1-S15-S15-S              | 15            | 13.5~16.5      | 15                      | 7              | 67          | 1                          | 75  | 81                                    |
| PDSE1-S15-S24-S <sup>4</sup> | 15            | 13.5~16.5      | 24                      | 5              | 42          | 1                          | 100   | 81                                    |
| PDSE1-S24-S3-S               | 24            | 21.6~26.4      | 3.3                     | 30             | 303         | 1                          | 75  | 75                                    |
| PDSE1-S24-S5-S               | 24            | 21.6~26.4      | 5                       | 20             | 200         | 1                          | 75  | 79                                    |
| PDSE1-S24-S9-S               | 24            | 21.6~26.4      | 9                       | 12             | 111         | 1                          | 75  | 80                                    |
| PDSE1-S24-S12-S              | 24            | 21.6~26.4      | 12                      | 9              | 83          | 1                          | 75  | 81                                    |
| PDSE1-S24-S15-S              | 24            | 21.6~26.4      | 15                      | 7              | 67          | 1                          | 75  | 81                                    |
| PDSE1-S24-S24-S              | 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                       | 15  | 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                 | 5 Vdc input models         | 3.3, 5 Vdc output models   |     | 286  | mA    |
|                         |                            | 9, 12 Vdc output models    |     | 254  | mA    |
|                         |                            | all other output models    |     | 254  | mA    |
|                         | 12 Vdc input models        | 3.3 Vdc output models      |     | 118  | mA    |
|                         |                            | 5, 9, 12 Vdc output models |     | 110  | mA    |
| 15 Vdc input models     | all other output models    |                            | 109 | mA   |       |
|                         | 5, 9, 12 Vdc output models |                            | 88  | mA   |       |
|                         | all other output models    |                            | 87  | mA   |       |
| 24 Vdc input models     | 3.3 Vdc output models      |                            | 61  | mA   |       |
|                         | 5 Vdc output models        |                            | 58  | mA   |       |
|                         | 9 Vdc output models        |                            | 57  | mA   |       |
|                         | all other output models    |                            | 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%             |                       |       |       |       |
|                                      | 3.3 Vdc output models            |                       |       | ±1.5  | %     |
| load regulation                      | all other models                 |                       |       | ±1.2  | %     |
|                                      |                                  | from 10% to full load |       |       |       |
|                                      | 3.3 Vdc output models            |                       |       | ±20   | %     |
|                                      | 5 Vdc output models              |                       |       | ±15   | %     |
| all other models                     |                                  |                       | ±10   | %     |       |
| 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

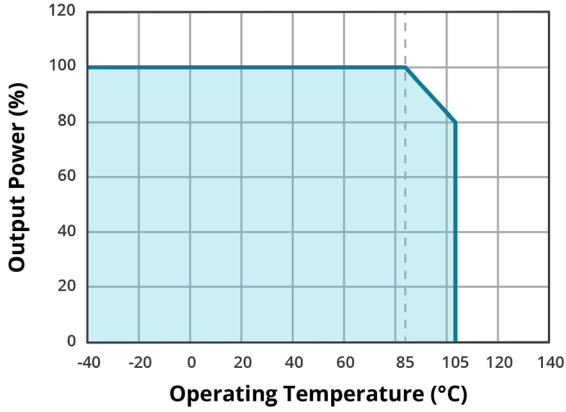
| parameter             | conditions/description   | min            | typ | max | units      |
|-----------------------|--|----------------|-----|-----|------------|
| isolation voltage     | input to output for 1 minute at 1 mA<br>input to output for 1 second at 1 mA | 1,500<br>3,000 |     |     | Vdc<br>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

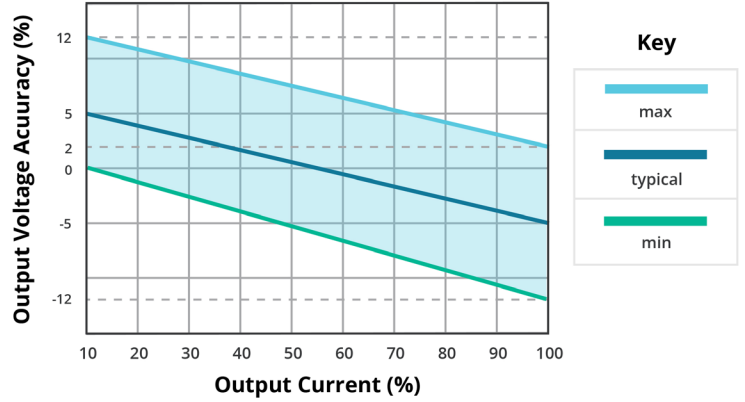
| parameter             | conditions/description                                   | min | typ      | max | units    |
|-----------------------|--|-----|----------|-----|----------|
| operating temperature | see derating curves                                      | -40 |          | 105 | °C       |
| 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

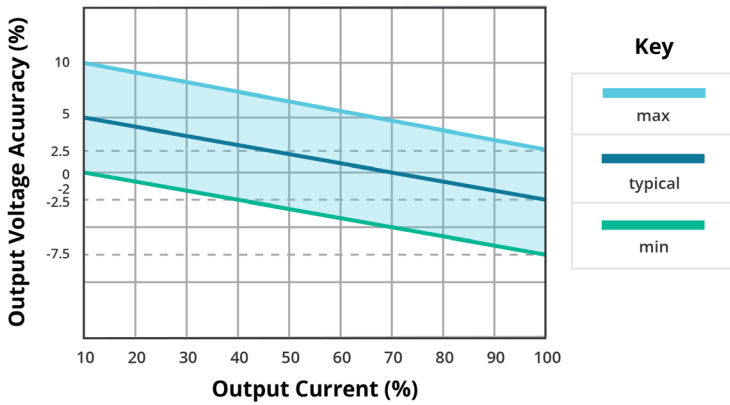
**TEMPERATURE DERATING CURVE**



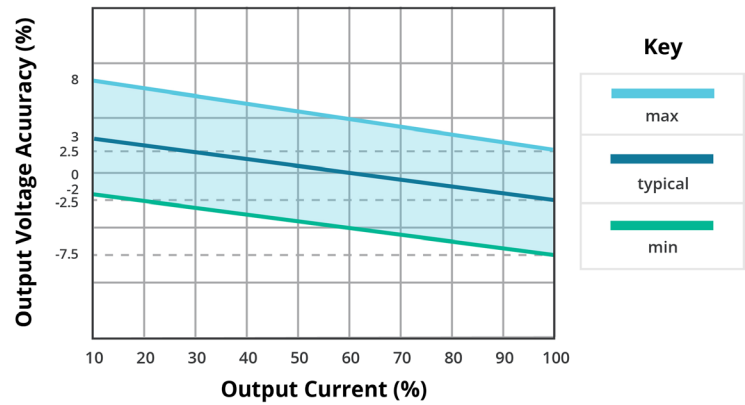
**OUTPUT REGULATION CURVE  
3.3 Vdc output models  
(nominal input)**



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

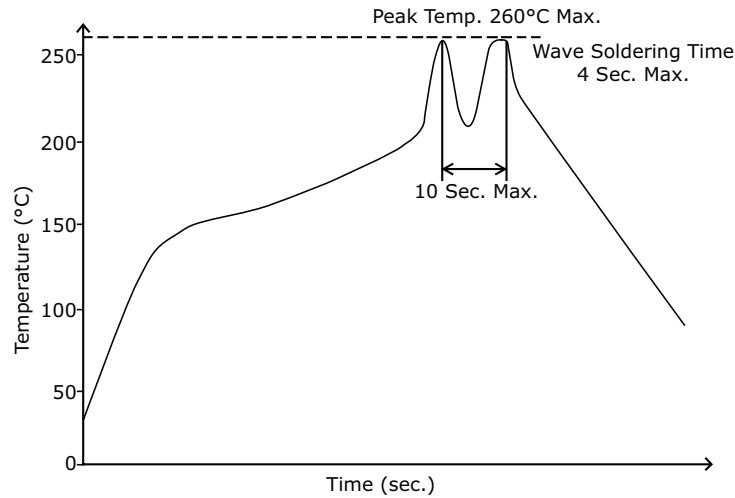


**OUTPUT REGULATION CURVE  
all other input models / 5, 9, 12, 15, 24 Vdc output models  
(nominal input)**



## 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    |



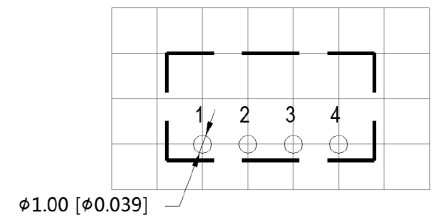
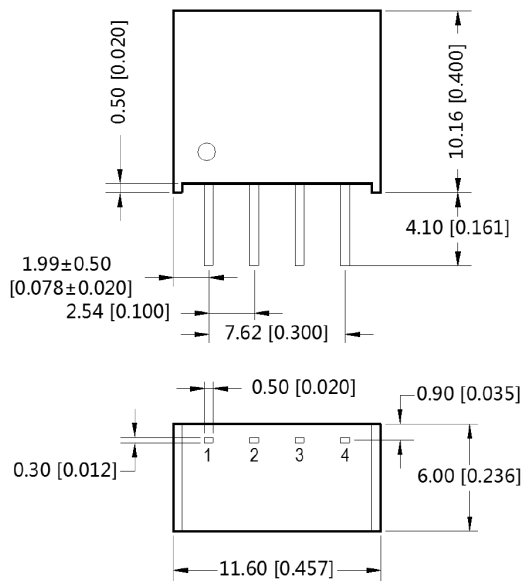
## MECHANICAL

| parameter     | conditions/description                                     | min | typ | max | units |
|---------------|--|-----|-----|-----|-------|
| dimensions    | 11.60 x 6.00 x 10.16 [0.457 x 0.236 x 0.400 inch]          |     |     |     | mm    |
| case material | black flame-retardant and heat-resistant plastic (UL94V-0) |     |     |     |       |
| weight        |  |     | 1.3 |     | 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               |
| 2               | V <sub>in</sub>   |
| 3               | 0V                |
| 4               | +V <sub>out</sub> |



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

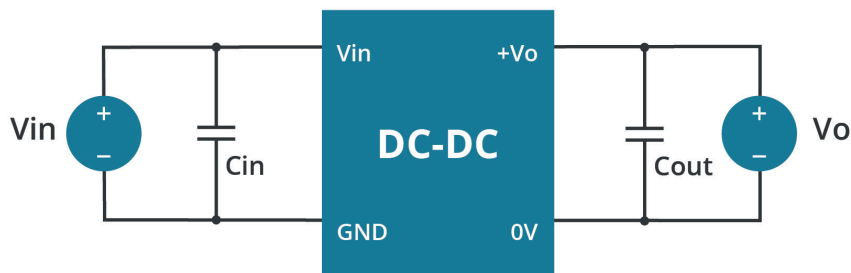


Table 1

| 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      | 10/16       |
| 15        | 2.2/25     | 5        | 10/16       |
| 24        | 1/50       | 9        | 2.2/16      |
| --        | --         | 12       | 2.2/25      |
| --        | --         | 15       | 1/25        |
| --        | --         | 24       | 1/50        |

## EMC RECOMMENDED CIRCUIT

Figure 2

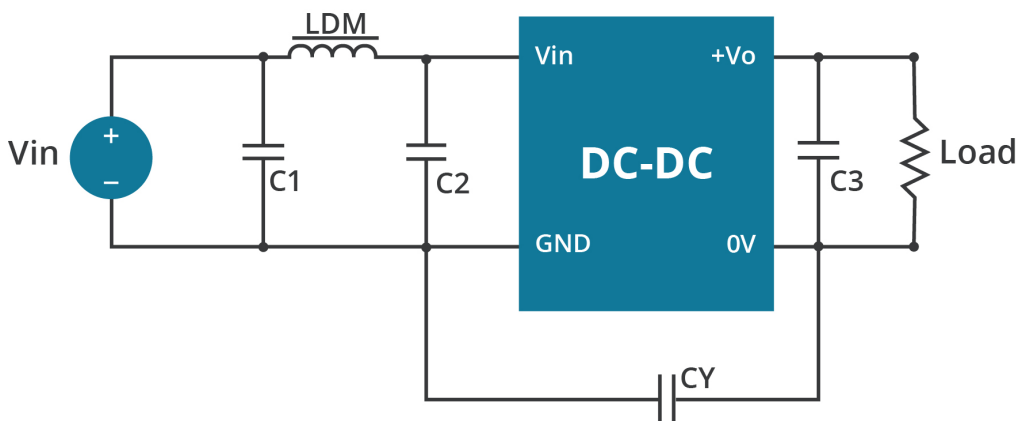


Table 2

| 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       | 4.7 μF / 50 V                | 4.7 μF / 50 V |
|   | C2       | 4.7 μF / 50 V                | 4.7 μF / 50 V |
|   | C3       | refer to the Cout in Table 1 |               |
|   | LDM      | 6.8 μH                       | 6.8 μH        |
|   | CY       | 270 pF / 2 kV                | 270 pF / 2 kV |

## REVISION HISTORY

| rev. | description   | date       |
|------|---|------------|
| 1.0  | initial release   | 05/10/2019 |
| 1.01 | safeties updated in features and safety line, packaging removed | 01/18/2021 |
| 1.02 | datasheet updated   | 06/21/2021 |
| 1.03 | CE certification removed  | 11/07/2022 |

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



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