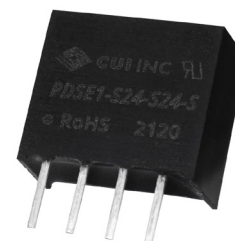


**SERIES:** PDSE1-S | **DESCRIPTION:** DC-DC CONVERTER

**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

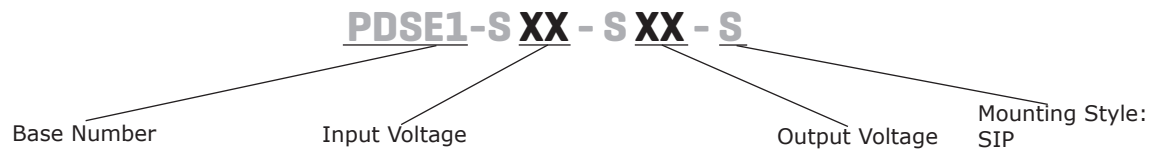

**MODEL**

| MODEL                        | input voltage |             | output voltage<br>(Vdc) | output current |          | output power<br>max (W) | ripple & noise <sup>1</sup><br>max (mVp-p) | efficiency <sup>2</sup><br>typ (%) |
|------------------------------|---------------|-------------|-------------------------|----------------|----------|-------------------------|--------------------------------------------|------------------------------------|
|                              | typ (Vdc)     | range (Vdc) |                         | min (mA)       | max (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    |
|                         | all other output models    |      |     | 109  | mA    |
|                         | 15 Vdc input models        |      |     |      |       |
|                         | 5, 9, 12 Vdc output models |      |     | 88   | 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  | %     |
|                                      | all other models                 |     |       | ±1.2  | %     |
| load regulation                      | 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

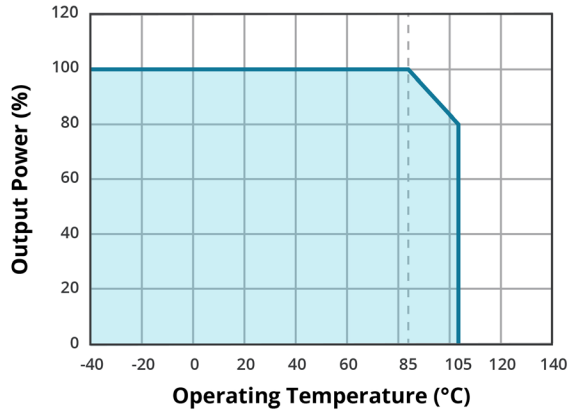
| parameter             | conditions/description                                             | min       | typ | max | units |
|-----------------------|--------------------------------------------------------------------|-----------|-----|-----|-------|
| isolation voltage     | input to output for 1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

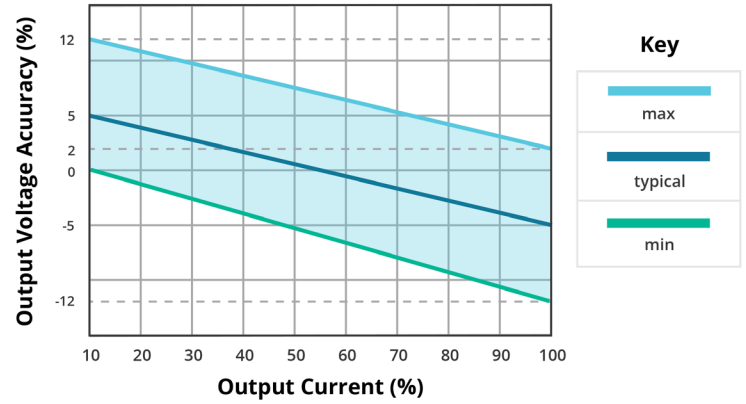
| parameter             | conditions/description       | min | typ | max | units |
|-----------------------|------------------------------|-----|-----|-----|-------|
| operating temperature | see derating curves          | -40 |     | 105 | °C    |
| storage temperature   |                          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

## DERATING CURVES

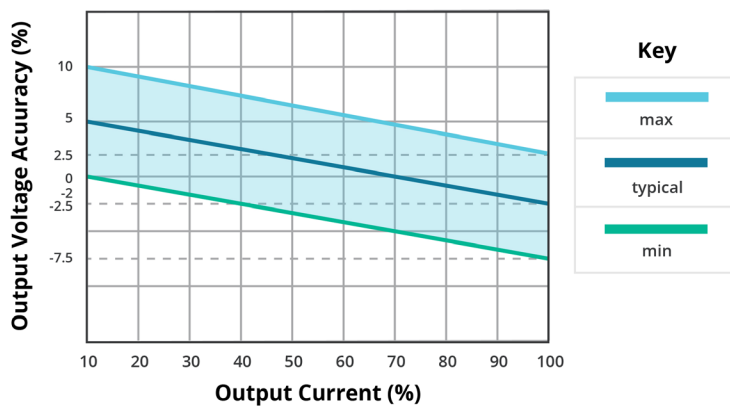
**TEMPERATURE DERATING CURVE**



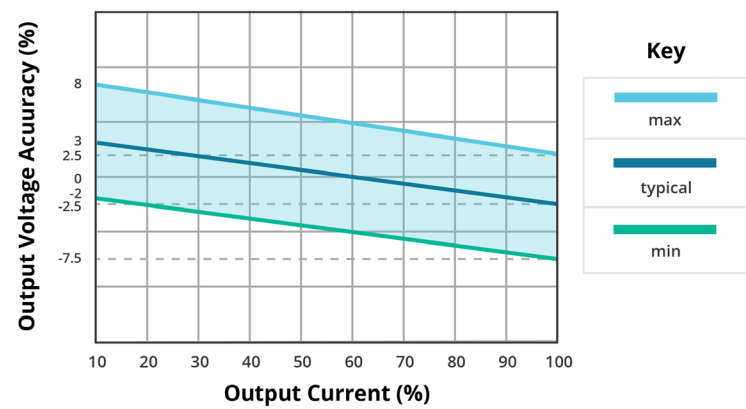
**OUTPUT REGULATION CURVE**  
**3.3 Vdc output models**  
**(nominal input)**



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

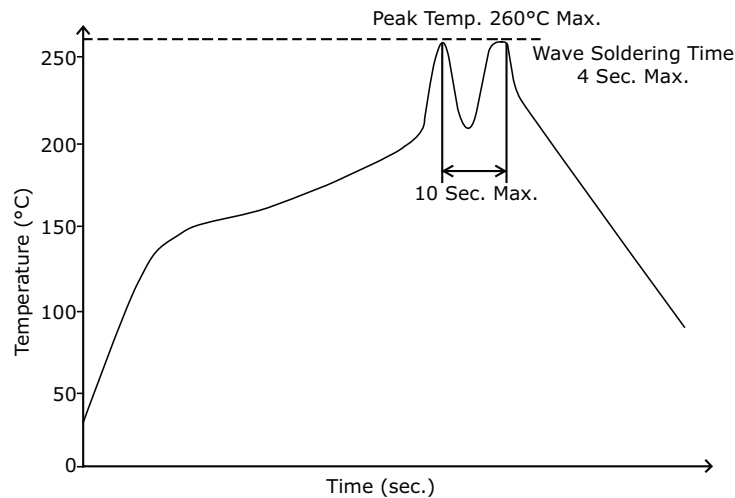


**OUTPUT REGULATION CURVE**  
**all other input models / 5, 9, 12, 15, 24 Vdc output models**  
**(nominal input)**



## 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    |



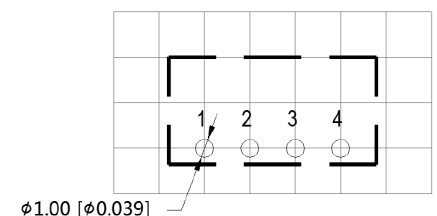
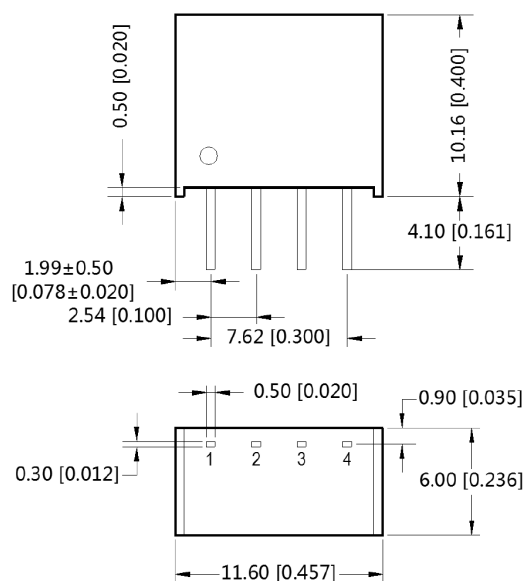
## MECHANICAL

| 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               | Vin      |
| 3               | 0V       |
| 4               | +Vout    |



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

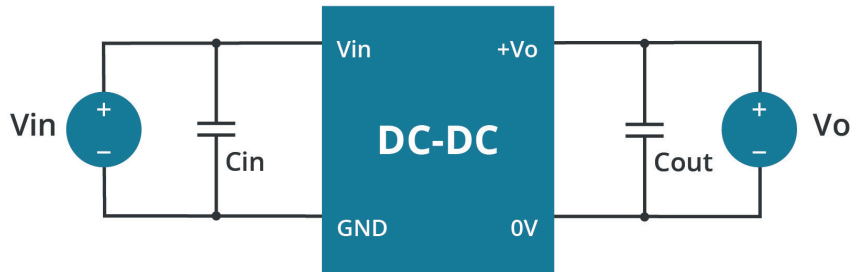


Table 1

| 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

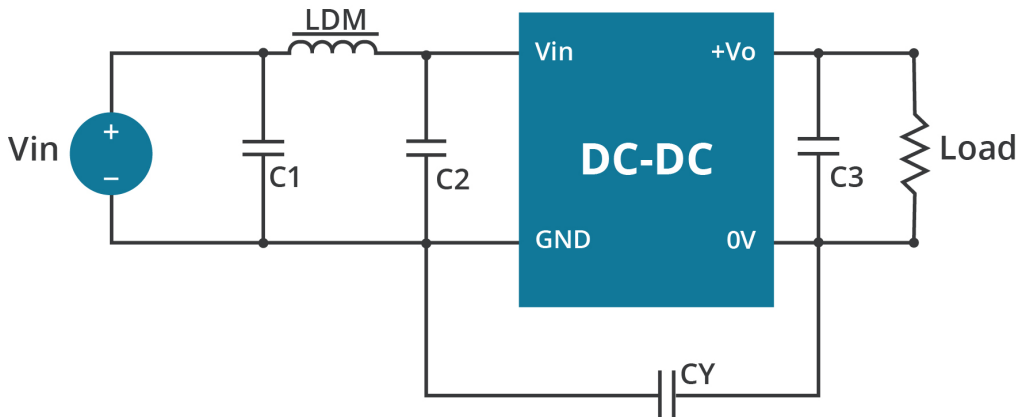


Table 2

| 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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