



PHI-CON

# 2 W DC-DC Converter P2OS-Series

- Single output
- Dual output
- Up to 4200 V<sub>DC</sub> isolation
- Working voltage 250 V<sub>rms</sub>
- MTBF > 6 Mio. h at 25 °C
- -40...105 °C Operating temperature range
- Efficiency up to 81 %



SMD8



SMD10

## Model guide

| Type        | Input voltage              |                          | Output voltage [V <sub>DC</sub> ] | Input current     |                     | Output current max. [mA] | Efficiency [%] typ. | Capacitive load [μF] max. | Design |
|-------------|----------------------------|--------------------------|-----------------------------------|-------------------|---------------------|--------------------------|---------------------|---------------------------|--------|
|             | Nominal [V <sub>DC</sub> ] | range [V <sub>DC</sub> ] |                                   | No load [mA] typ. | Full load [mA] typ. |                          |                     |                           |        |
| P2OS3R33R3S | 3.3                        | 2.97...3.63              | 3.3                               | 60                | 650                 | 500                      | 77                  | 470                       | SMD8   |
| P2OS3R305S  | 3.3                        | 2.97...3.63              | 5.0                               | 60                | 780                 | 400                      | 78                  | 470                       | SMD8   |
| P2OS053R3S  | 5                          | 4.5...5.5                | 3.3                               | 45                | 445                 | 500                      | 76                  | 470                       | SMD8   |
| P2OS0505S   | 5                          | 4.5...5.5                | 5.0                               | 45                | 515                 | 400                      | 78                  | 470                       | SMD8   |
| P2OS3R33R3D | 3.3                        | 2.97...3.63              | ±3.3                              | 60                | 800                 | ±303                     | 78                  | 2 x 220                   | SMD10  |
| P2OS3R305D  | 3.3                        | 2.97...3.63              | ±5.0                              | 60                | 760                 | ±200                     | 80                  | 2 x 220                   | SMD10  |
| P2OS053R3D  | 5                          | 4.5...5.5                | ±3.3                              | 45                | 540                 | ±303                     | 76                  | 2 x 220                   | SMD10  |
| P2OS0505D   | 5                          | 4.5...5.5                | ±5.0                              | 45                | 495                 | ±200                     | 81                  | 2 x 220                   | SMD10  |

Capacitive load is specified at minimum input voltage and resistive full load.

## Specifications

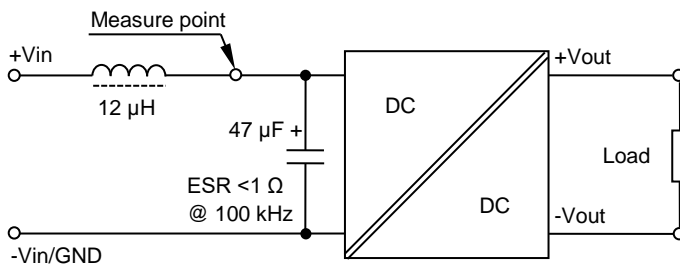
|   |  |
|---|--|
| <b>Input</b>  |  |
| Voltage range   | ± 10 %   |
| Filter  | Capacitor  |
| Reflected input ripple current                          | 20 mA <sub>p-p</sub> , typ. (see figure 1)                 |
| Start up time   | 20 ms, typ.  |
| <b>Input / output:</b>                                  |  |
| Isolation voltage 60 s qualified, 100 % endtest for 3 s | 4.2 kV <sub>DC</sub>                                       |
| Isolation Resistance                                    | 10 <sup>9</sup> Ω, min.                                    |
| Capacitance   | 25 pF, typ.  |
| <b>Output</b>   |  |
| Output voltage drift @ input voltage change             | ± 1.2 % @ 1% V <sub>in</sub> change                        |
| Output voltage tolerance at load range 10...100 %       | P2OSxx3R3x: ±15 %, max<br>P2OSxx05x: ±14 %, max            |
| Output voltage deviation @ 10 % to 100 % load change    | See diagrams   |
| Temperature coefficient                                 | 0.03 % / °C  |
| Short circuit   | 0.5 s, max., automatic restart                             |
| Ripple & noise at BW 0..20 MHz (see figure 2)           | Single output types: 150 mV<br>Dual output types: 150 mV   |
| <b>General</b>  |  |
| Switching frequency                                     | 50 kHz ... 80 kHz  |
| Safety standard   | UL-, cUL-, IEC-, EN 60950-1<br>UL-, cUL-, IEC-, EN 62368-1 |

|   |  |                                 |
|---|--|---------------------------------|
| <b>Environmental</b>                                |  |                                 |
| EMI CE  | EN 55032   | Class B (see figure 3)          |
| EMI RE  | EN 55032   | Class B                         |
| ESD   | IEC 61000-4-2  | Perf. criteria A                |
| RS  | IEC 61000-4-3  | Perf. criteria A                |
| EFT   | IEC 61000-4-4  | Perf. criteria A (see figure 3) |
| Surge   | IEC 61000-4-5  | Perf. criteria A (see figure 3) |
| CS  | IEC 61000-4-6  | Perf. criteria A                |
| PFMF  | IEC 61000-4-8  | Perf. criteria A                |
| Operating ambient temperature                       | -40 ... 105 °C see derating SOA                            |                                 |
| Storage temperature                                 | -55 ... 125 °C   |                                 |
| Humidity  | Up to 95 %, non condensing                                 |                                 |
| Cooling   | Free air convection, 30...65 LFM                           |                                 |
| <b>Physical</b>                                     |  |                                 |
| Basic material                                      | UL94V-0 rated  |                                 |
| Weight  | SMD8: 1.52 g (single output)<br>SMD10: 1.8 g (dual output) |                                 |
| Vibration   | MIL-STD-810F   |                                 |
| Reliability calculated, MTBF (MIL-HDBK-217 @ 25 °C) | >6 Mio. h  |                                 |
| <b>Absolute maximum ratings</b>                     |  |                                 |
| Input voltage P2OS03xxx                             | 5 V <sub>DC</sub> , max. for 1s max                        |                                 |
| Input voltage P2OS05xxx                             | 9 V <sub>DC</sub> , max. for 1s max                        |                                 |
| Reflow soldering temperature                        | 217 °C for 60 s max.,<br>245 °C peak 10 s max.             |                                 |
| Moisture sensitivity (MSL1)                         | IPC/JEDEC J-STD-020D.1                                     |                                 |

- All parameter are specified at 25°C ambient temperature, resistive full load and nominal input voltage, if not otherwise specified.
- These converters are not suitable for IGBT applications.
- These converters are not suitable for water washing process.

| Ordering information   |                    |                     |               |     |                |      |                      |      |         |        |       |      |
|------------------------|--------------------|---------------------|---------------|-----|----------------|------|----------------------|------|---------|--------|-------|------|
| PHI-CON & output power | Series designation | Mounting technology | Input voltage |     | Output voltage |      | Output configuration |      | Packing |        |       |      |
| P2                     | 2 W                | O                   | S             | SMT | 3R3            | 3.3V | 3R3                  | 3.3V | S       | Single | blank | Tube |
|                        |                    |                     |               |     | 05             | 5 V  | 05                   | 5 V  | D       | Dual   | TR    | Reel |

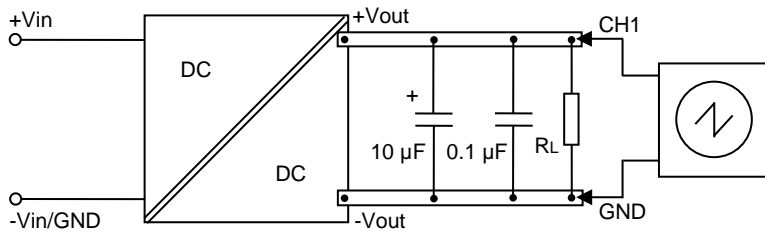
Figure 1 Input ripple current measure circuit



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Figure 2 Output ripple & noise measure circuit (measure bandwidth 0...20 MHz)

Single output



Dual output

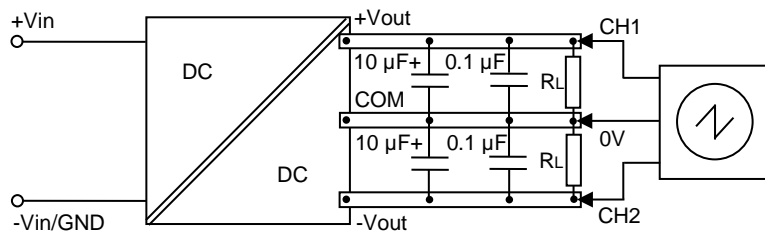
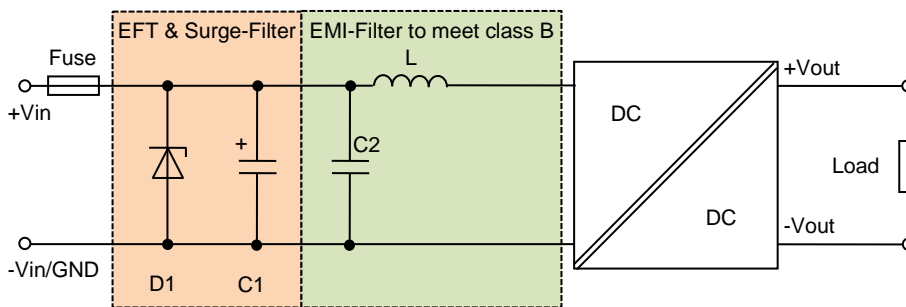
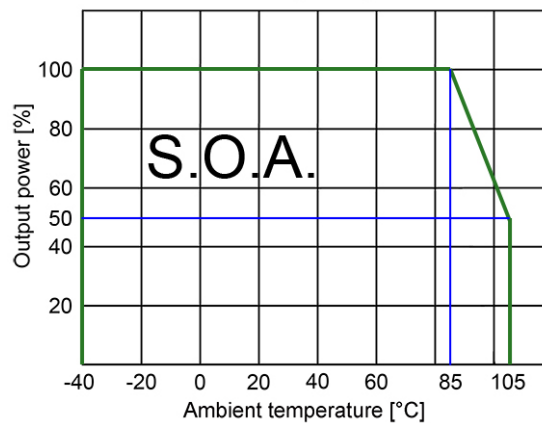


Figure 3 Output ripple & noise measure circuit



| Type       | Recommended Input fuse | EFT&Surge Filter |          | EMI Filter                       |        |
|------------|------------------------|------------------|----------|----------------------------------|--------|
|            |                        | C1               | D1       | C2                               | L      |
| P2OS3R3xxS | 2 A, time delayed type | 220 µF, 35 V     | SMDJ6.0A | 22 µF, 10 V <sub>DC</sub> , MLCC | 6.8 µH |
| P2OS05xxS  | 1 A, time delayed type | 330 µF, 35 V     | SMDJ9.0A | 22 µF, 10 V <sub>DC</sub> , MLCC | 6.8 µH |

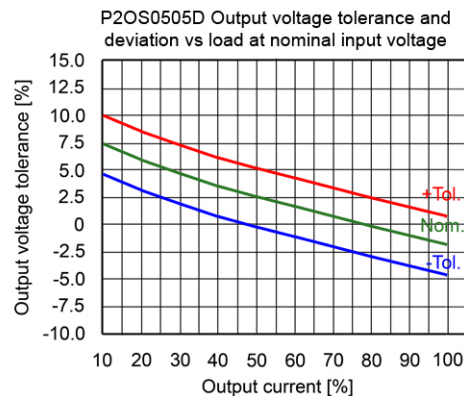
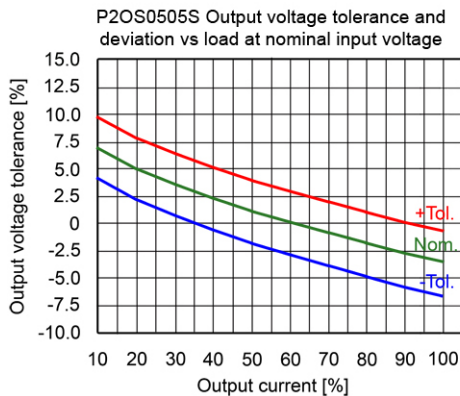
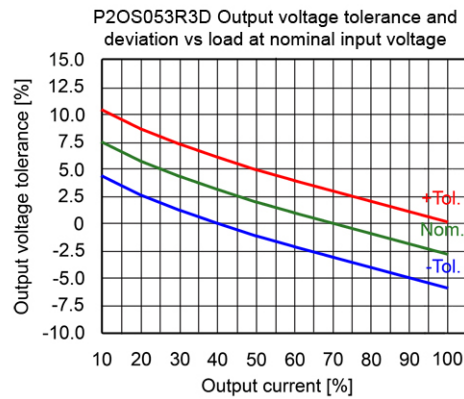
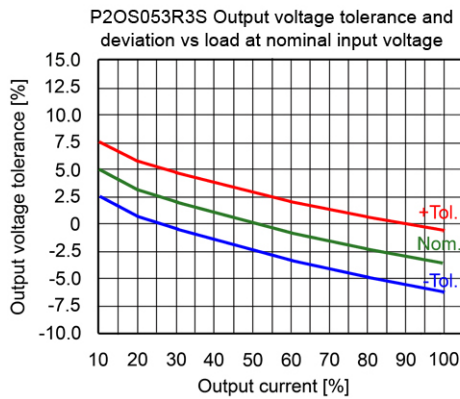
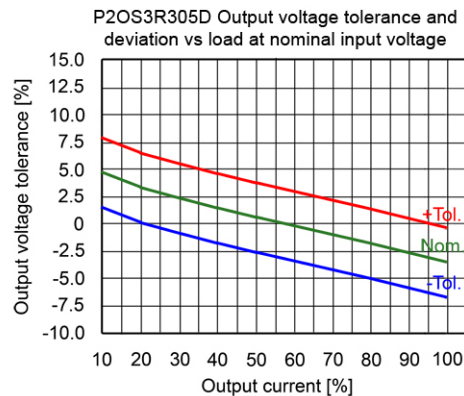
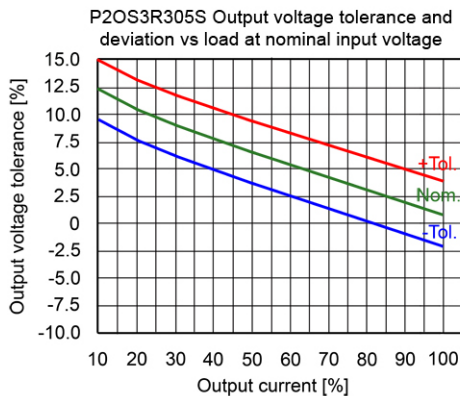
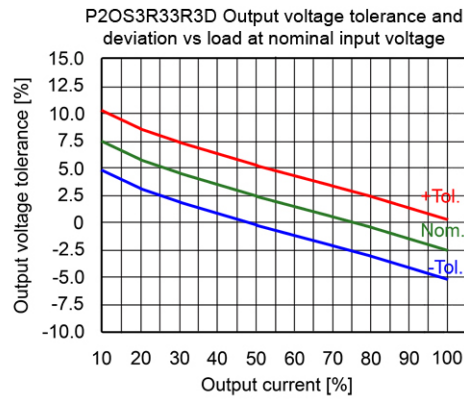
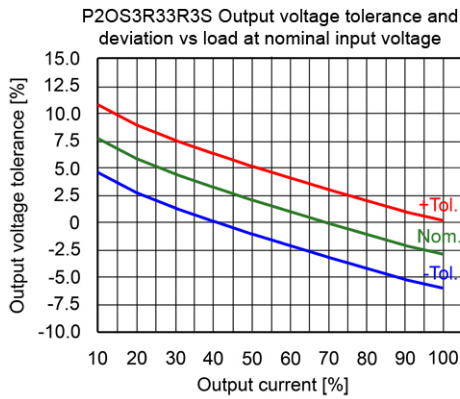
## Derating diagram





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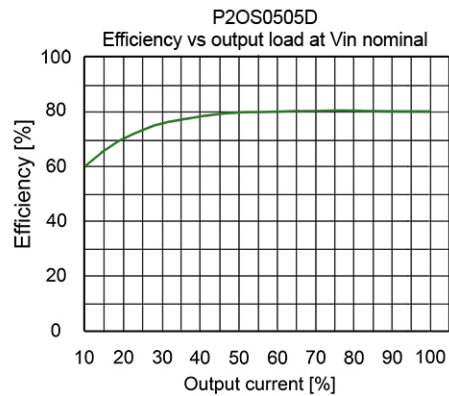
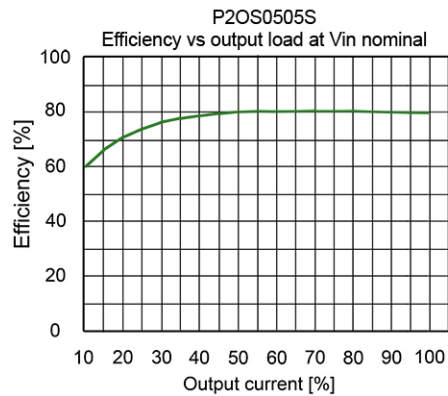
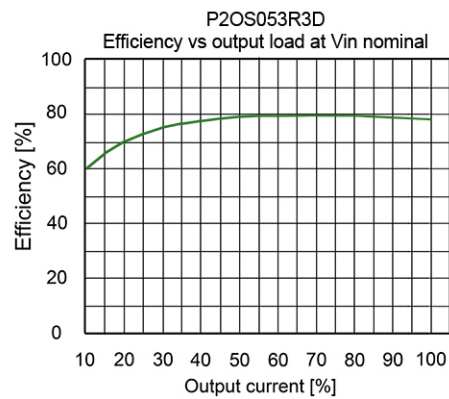
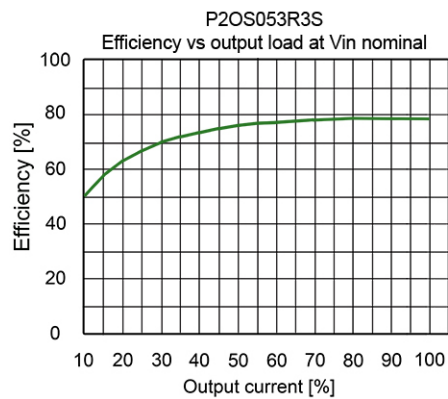
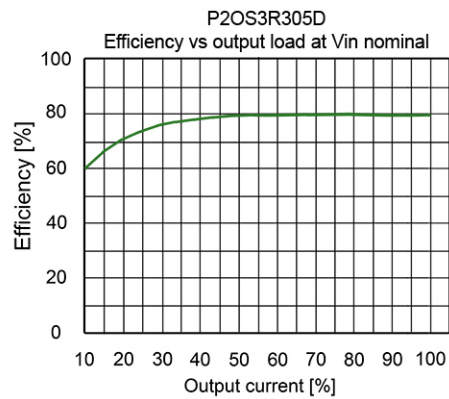
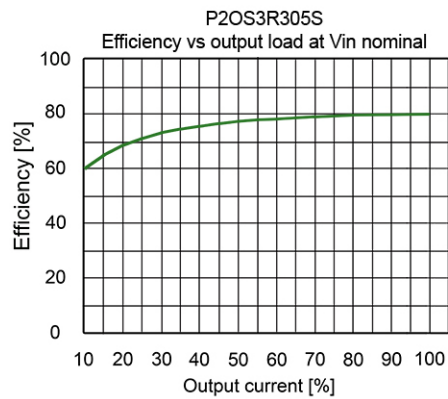
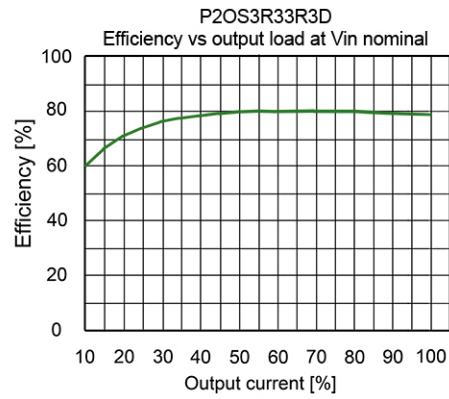
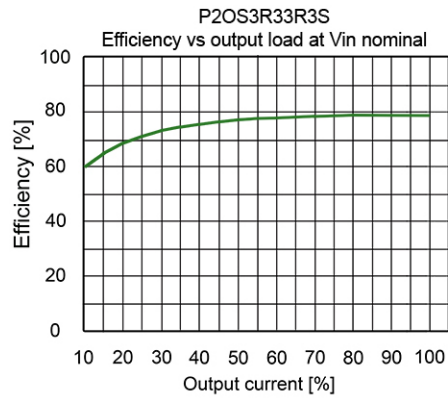
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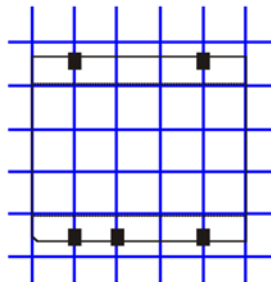
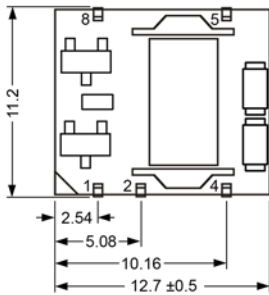
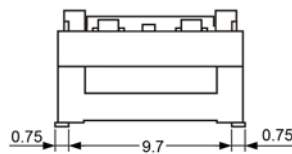
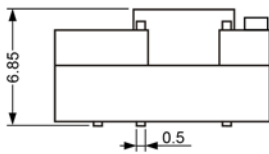




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Mechanical dimensions SMD8

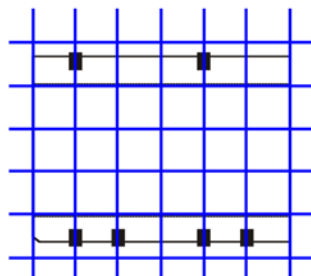
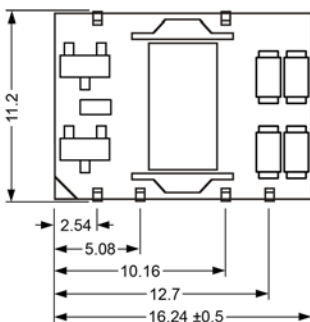
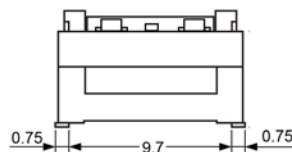
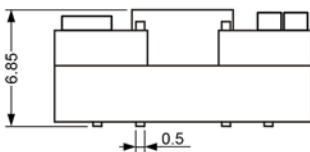


| Assignment single output |               |
|--------------------------|---------------|
| Lead                     | Function      |
| 1                        | -Vinput       |
| 2                        | +Vinput       |
| 3                        | No Lead       |
| 4                        | -Voutput      |
| 5                        | + Voutput     |
| 6                        | No Lead       |
| 7                        | No Lead       |
| 8                        | Not connected |

All dimensions in mm  
Generell tolerances 0.25 mm

SMD8 packing units:  
Tube 40 pieces  
Tape & Reel 500 pieces

Mechanical dimensions SMD10



| Assignment dual output |               |
|------------------------|---------------|
| Lead                   | Function      |
| 1                      | -Vinput       |
| 2                      | +Vinput       |
| 3                      | No Lead       |
| 4                      | Common        |
| 5                      | -Voutput      |
| 6                      | No Lead       |
| 7                      | + Voutput     |
| 8                      | No Lead       |
| 9                      | No Lead       |
| 10                     | Not connected |

All dimensions in mm  
Generell tolerances 0.25 mm

SMD10 packing units:  
Tube 30 pieces  
Tape & Reel 450 pieces

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