



PHI-CON

15 W DC-DC Converter P15D-Series

- Wide 2:1 input range
- Efficiency up to 87 %
- Isolation 1500 V_{DC}
- Continuous short circuit protection
- On/Off-Control input optional
- Standard package 2" x 1" x 0.4"
- Wide operating temperature range -40..85 °C



Model guide

| Type | Input voltage | | Input current | | Output voltage [V _{DC}] | Output current | | Efficiency [%] typ. | Capacitive load (note1) [μF] max. |
|----------------------|----------------------------|--------------------------|-------------------|---------------------|-----------------------------------|----------------|-----------|---------------------|-----------------------------------|
| | nominal [V _{DC}] | range [V _{DC}] | No load [mA] max. | Full load [mA] typ. | | [mA] min. | [mA] max. | | |
| Single Output | | | | | | | | | |
| P15D123R3S | 12 | 9...18 | 30 | 1030 | 3.3 | 0 | 3000 | 80 | 3300 |
| P15D1205S | 12 | 9...18 | 30 | 1525 | 5.0 | 0 | 3000 | 82 | 3300 |
| P15D127R2S | 12 | 9...18 | 30 | 1505 | 7.2 | 0 | 2083 | 83 | 2200 |
| P15D1209S | 12 | 9...18 | 30 | 1470 | 9.0 | 0 | 1666 | 85 | 1000 |
| P15D1212S | 12 | 9...18 | 30 | 1470 | 12.0 | 0 | 1250 | 85 | 1000 |
| P15D1215S | 12 | 9...18 | 30 | 1470 | 15.0 | 0 | 1000 | 85 | 680 |
| P15D1218S | 12 | 9...18 | 30 | 1470 | 18.0 | 0 | 833 | 85 | 470 |
| P15D1224S | 12 | 9...18 | 30 | 1455 | 24.0 | 0 | 625 | 86 | 470 |
| P15D243R3S | 24 | 18...36 | 25 | 515 | 3.3 | 0 | 3000 | 80 | 3300 |
| P15D2405S | 24 | 18...36 | 25 | 745 | 5.0 | 0 | 3000 | 84 | 3300 |
| P15D247R2S | 24 | 18...36 | 25 | 745 | 7.2 | 0 | 2083 | 84 | 2200 |
| P15D2409S | 24 | 18...36 | 25 | 735 | 9.0 | 0 | 1666 | 85 | 1000 |
| P15D2412S | 24 | 18...36 | 25 | 735 | 12.0 | 0 | 1250 | 85 | 1000 |
| P15D2415S | 24 | 18...36 | 25 | 725 | 15.0 | 0 | 1000 | 86 | 680 |
| P15D2418S | 24 | 18...36 | 25 | 725 | 18.0 | 0 | 833 | 86 | 470 |
| P15D2424S | 24 | 18...36 | 25 | 720 | 24.0 | 0 | 625 | 87 | 470 |
| P15D483R3S | 48 | 36...72 | 20 | 255 | 3.3 | 0 | 3000 | 80 | 3300 |
| P15D4805S | 48 | 36...72 | 20 | 370 | 5.0 | 0 | 3000 | 84 | 3300 |
| P15D487R2S | 48 | 36...72 | 20 | 370 | 7.2 | 0 | 2083 | 84 | 2200 |
| P15D4809S | 48 | 36...72 | 20 | 370 | 9.0 | 0 | 1666 | 85 | 1000 |
| P15D4812S | 48 | 36...72 | 20 | 365 | 12.0 | 0 | 1250 | 86 | 1000 |
| P15D4815S | 48 | 36...72 | 20 | 365 | 15.0 | 0 | 1000 | 87 | 680 |
| P15D4818S | 48 | 36...72 | 20 | 360 | 18.0 | 0 | 833 | 87 | 470 |
| P15D4824S | 48 | 36...72 | 20 | 360 | 24.0 | 0 | 625 | 87 | 470 |
| Dual Output | | | | | | | | | |
| P15D123R3D | 12 | 9...18 | 30 | 1560 | ±3.3 | 0 | ±1500 | 80 | 2 x 1000 |
| P15D1205D | 12 | 9...18 | 30 | 1525 | ±5.0 | 0 | ±1500 | 82 | 2 x 1000 |
| P15D127R2D | 12 | 9...18 | 30 | 1505 | ±7.2 | 0 | ±1041 | 83 | 2 x 680 |
| P15D1209D | 12 | 9...18 | 30 | 1490 | ±9.0 | 0 | ±833 | 84 | 2 x 470 |
| P15D1212D | 12 | 9...18 | 30 | 1490 | ±12.0 | 0 | ±625 | 84 | 2 x 470 |
| P15D1215D | 12 | 9...18 | 30 | 1490 | ±15.0 | 0 | ±500 | 84 | 2 x 330 |
| P15D1218D | 12 | 9...18 | 30 | 1470 | ±18.0 | 0 | ±416 | 85 | 2 x 220 |
| P15D1224D | 12 | 9...18 | 30 | 1470 | ±24.0 | 0 | ±312 | 85 | 2 x 220 |
| P15D243R3D | 24 | 18...36 | 25 | 515 | ±3.3 | 0 | ±1500 | 80 | 2 x 1000 |
| P15D2405D | 24 | 18...36 | 25 | 755 | ±5.0 | 0 | ±1500 | 83 | 2 x 1000 |
| P15D247R2D | 24 | 18...36 | 25 | 745 | ±7.2 | 0 | ±1041 | 84 | 2 x 680 |
| P15D2409D | 24 | 18...36 | 25 | 735 | ±9.0 | 0 | ±833 | 85 | 2 x 470 |
| P15D2412D | 24 | 18...36 | 25 | 725 | ±12.0 | 0 | ±625 | 86 | 2 x 470 |
| P15D2415D | 24 | 18...36 | 25 | 725 | ±15.0 | 0 | ±500 | 86 | 2 x 330 |
| P15D2418D | 24 | 18...36 | 25 | 720 | ±18.0 | 0 | ±416 | 87 | 2 x 220 |
| P15D2424D | 24 | 18...36 | 25 | 720 | ±24.0 | 0 | ±312 | 87 | 2 x 220 |
| P15D483R3D | 48 | 36...72 | 20 | 255 | ±3.3 | 0 | ±1500 | 80 | 2 x 1000 |
| P15D4805D | 48 | 36...72 | 20 | 370 | ±5.0 | 0 | ±1500 | 84 | 2 x 1000 |
| P15D487R2D | 48 | 36...72 | 20 | 370 | ±7.2 | 0 | ±1041 | 84 | 2 x 680 |
| P15D4809D | 48 | 36...72 | 20 | 365 | ±9.0 | 0 | ±833 | 85 | 2 x 470 |
| P15D4812D | 48 | 36...72 | 20 | 365 | ±12.0 | 0 | ±625 | 86 | 2 x 470 |
| P15D4815D | 48 | 36...72 | 20 | 360 | ±15.0 | 0 | ±500 | 87 | 2 x 330 |
| P15D4818D | 48 | 36...72 | 20 | 360 | ±18.0 | 0 | ±416 | 87 | 2 x 220 |
| P15D4824D | 48 | 36...72 | 20 | 360 | ±24.0 | 0 | ±312 | 87 | 2 x 220 |

| Part number designation structure | | | | | | | | | |
|-----------------------------------|--------|---------------|----------|----------------|-------|---------|--------|-------------------------------|--|
| Output power | Series | Input voltage | | Output voltage | | Outputs | | Primary / Secondary Isolation | |
| P15 | D | 24 | | 05 | | S | | blank | |
| 15 Watt | | 12 | 9..18 V | 3R3 | 3.3 V | S | Single | 1.5 kV _{DC} | |
| | | 24 | 18..36 V | 05 | 5 V | D | Dual ± | | |
| | | 48 | 36..72 V | 7R2 | 7.2 V | | | | |
| | | | | 09 | 9 V | | | | |
| | | | | 12 | 12 V | | | | |
| | | | | 15 | 15 V | | | | |
| | | | | 18 | 18 V | | | | |
| | | | | 24 | 24 V | | | | |



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15 W DC-DC Converter P15D-Series

Specifications

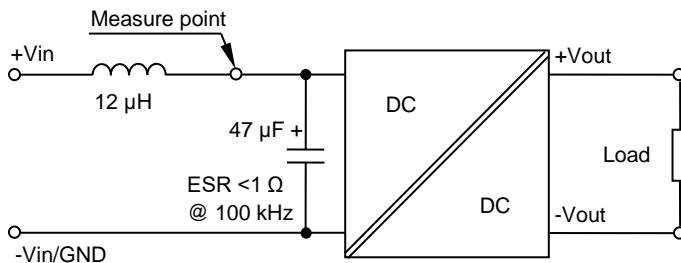
| | |
|--|--|
| Input | |
| Start up time @ resistive Load and Vin nominal | 20 ms, typ. |
| Filter | π - type |
| Reflected input ripple current | 35 mA _{p-p} , typ. (see Fig. 1) |
| Isolation Voltage: | |
| Input to output | Suffix blank: 1.5 kV _{DC} for 60 s |
| Input or output to Case | 1 kV _{DC} for 1 min. |
| Resistance | 10 ⁷ Ω |
| Capacitance | 500 pF, typ. |
| Output | |
| Voltage tolerance | ± 1 %, max. |
| Load regulation at 0..100 % load | Single output: ± 0.5 %, Dual output: ± 1 % |
| Line voltage regulation | ± 0.5 %, max. |
| Over current protection | 140 %, typ. of max. I _{out} |
| Short circuit protection | Continuous |
| Short circuit restart | Automatic |
| Ripple and noise (at 20 MHz BW) | 100 mV _{p-p} , max. (see Figure 2) |
| Temperature coefficient | ± 0.02 % / °C |
| Transient recovery time at 25 % load change steps | 250 μ s, typ. |
| Transient response deviation at 25 % load change steps | ± 3 %, max. |
| General | |
| Switching frequency | 200 kHz, typ. |
| Safety standards | EN-, IEC-, UL-, cUL 60950-1 EN-, IEC-, UL-, cUL 62368-1 |
| Reliability calculated MTBF @ 25 °C (MIL-HDBK-217F) | 1.12 Mio. h |

| | |
|--|---|
| EMC | |
| Radiated emissions | EN55032 class A |
| Conducted emissions (see figure 3) | EN55032 class A |
| ESD | IEC61000-4-2 perf. crit. A |
| RS | IEC61000-4-3 perf. crit. A |
| EFT (see figure 3) | IEC61000-4-4 perf. crit. A |
| Surge (see figure 3) | IEC61000-4-5 perf. crit. A |
| CS | IEC61000-4-6 perf. crit. A |
| PFMF | IEC61000-4-8 perf. crit. A |
| Environmental | |
| Operating ambient temperature | -40 ... 85 °C -40 ... 70 °C without derating |
| Storage temperature | -40 ... 125 °C |
| Case temperature | 100 °C, max. |
| Derating | None required |
| Humidity | 95% max. non condensing |
| Cooling | Free air convection, 30...60 LFM |
| Physical | |
| Dimensions | 50.8 x 25.4 x 10.16 mm |
| Weight | 31 g |
| Case material | Nickel coated brass |
| Potting material | Epoxy (UL94V-0 rated) |
| Pin material | Brass, nickel coated |
| Absolute maximum ratings | |
| Input voltage P15D12xxx | 25 V _{DC} , max. 100 ms |
| Input voltage P15D24xxx | 50 V _{DC} , max. 100 ms |
| Input voltage P15D48xxx | 100 V _{DC} , max. 100 ms |
| Soldering temperature min. 1.5 mm distance from case | 260 °C max. for 10 s max. |

Note:

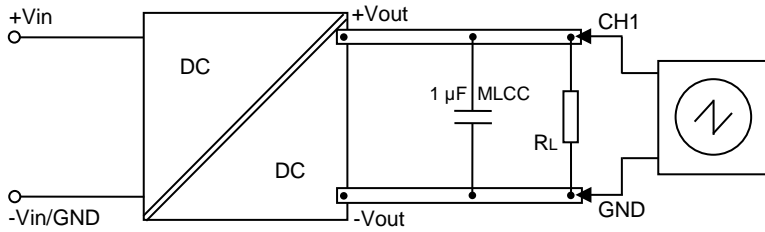
1. The maximum capacitive load is specified at minimal input voltage and constant resistive load.
2. With input filter circuit to meet of conducted emissions EN55032 class A. (See figure 3)
3. An external input blocking capacitor is required if the converter has to meet IEC61000-4-5. Suggested capacitor type: KY-series, 220 μ F, 100 V, Nippon Chemicon. (See figure 3)
4. No load operation will not damage the converter, however they may not meet all listed parameters.

Figure 1 Measurement circuit for reflected input ripple current



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Figure 2 Measurement method for output ripple voltage (BW 0...20 MHz)
Single output



Dual output

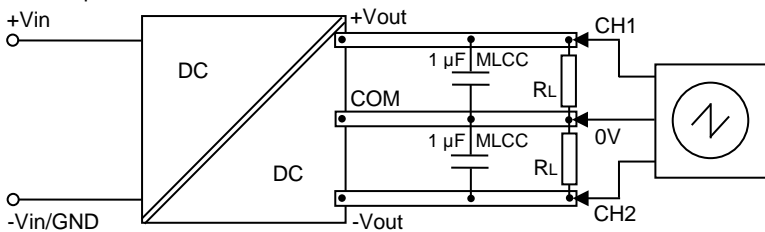
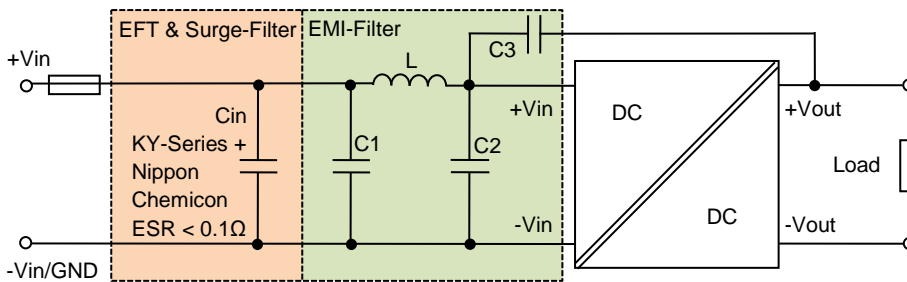


Figure 3 Recommended input filter circuit to meet EFT & Surge and EMI specifications

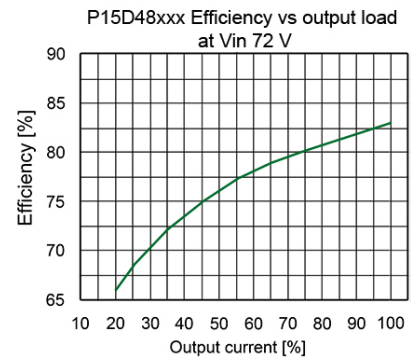
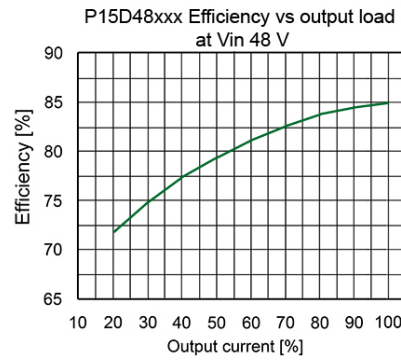
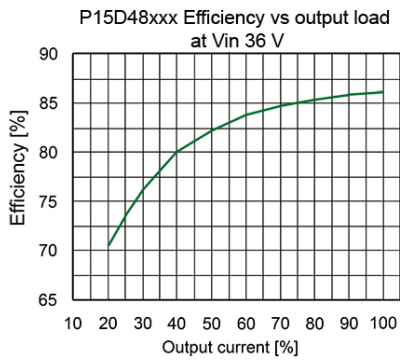
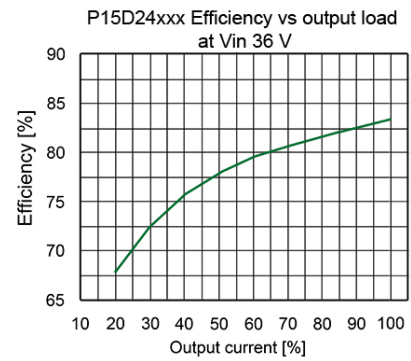
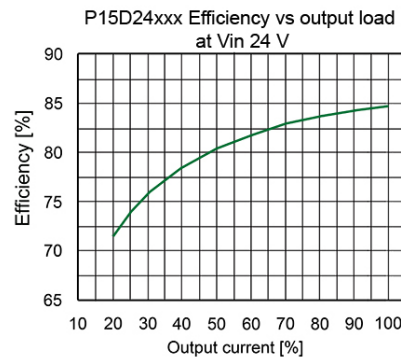
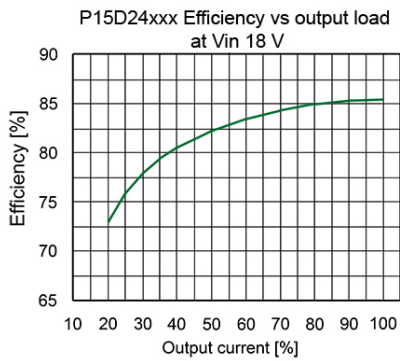
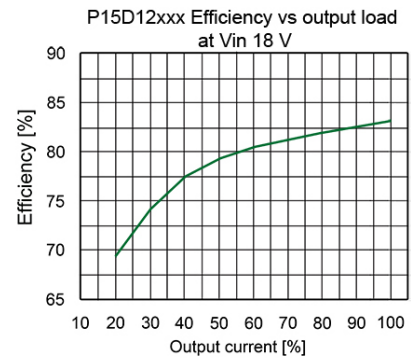
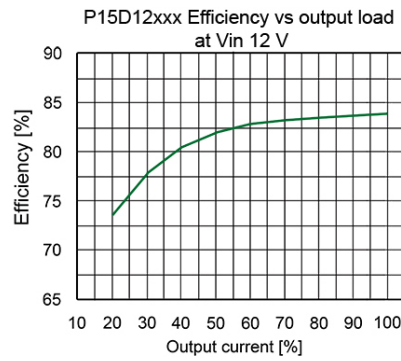
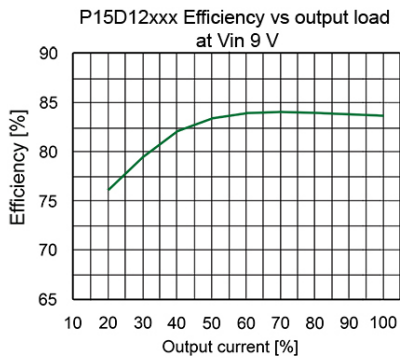


| BOM to Figure 3 | | | | | |
|-----------------|---------------|---------------|--------------|-------|-----------|
| Family | Cin | C1 | C2 | L | C3 |
| P15D12xxx | 220 µF, 100 V | 330 µF, 100 V | 100 µF, 100V | 12 µH | 1 nF, 3kV |
| P15D24xxx | 220 µF, 100 V | 330 µF, 100 V | 100 µF, 100V | 12 µH | 1 nF, 3kV |
| P15D48xxx | 220 µF, 100 V | 330 µF, 100 V | 100 µF, 100V | 12 µH | 1 nF, 3kV |

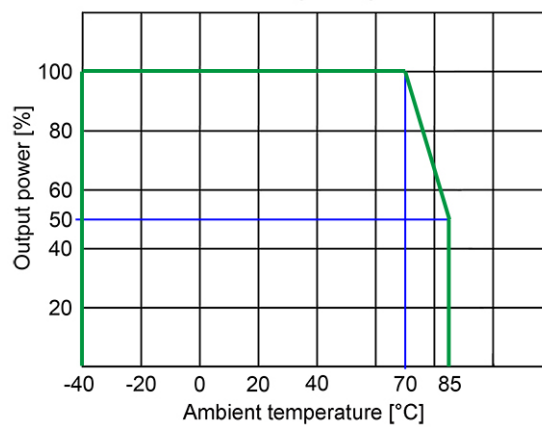


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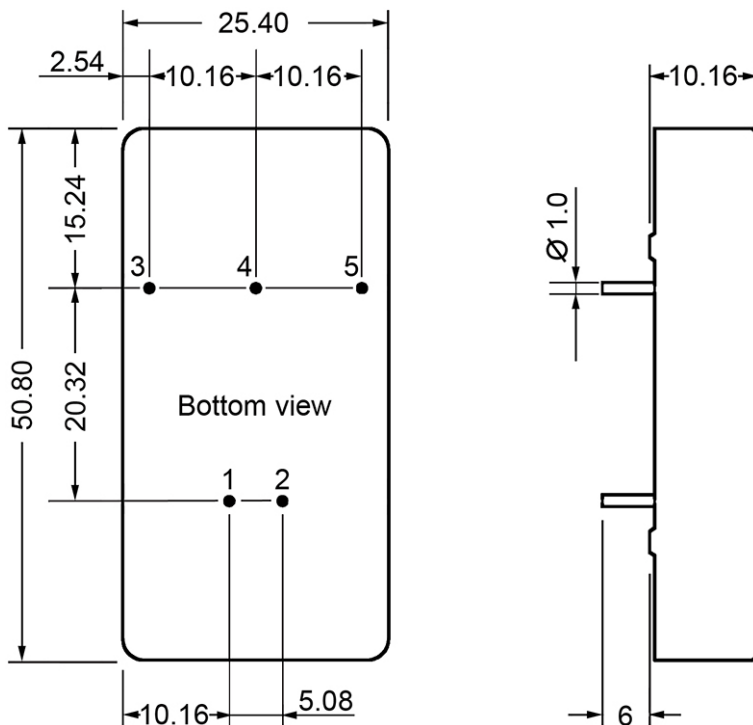
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Derating diagram



15 W DC-DC Converter P15D-Series



Note:

All dimensions in mm

1. Pin diameter tolerance ± 0.05
2. Pin pitch tolerance ± 0.35
3. Pin length tolerance ± 0.35
4. Case tolerance ± 0.5

| Pin assignment | | |
|----------------|---------------|-------------|
| Pin | Single output | Dual output |
| 1 | + V input | + V input |
| 2 | - V input | - V input |
| 3 | + V output | + V output |
| 4 | No pin | Common |
| 5 | - V output | - V output |

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