



PHI-CON

# 20 W DC-DC Converter P20C-Series

- Wide 4:1 input range
- Efficiency up to 91 %
- 1600 V<sub>DC</sub> isolation
- Continuous short circuit protection
- On/Off-Control input
- Soft start
- Standard package 2" x 1" x 0.4"
- Package optional with heat sink
- Wide operating temperature range -40..85 °C



## Model guide

Type	Input voltage		Input current		Output voltage [V <sub>DC</sub> ]	Output current		Efficiency [%] typ.	Capacitive load (note 2) [μF] max.
	nominal [V <sub>DC</sub> ]	range [V <sub>DC</sub> ]	No load [mA] max.	Full load [mA] typ.		[mA] min.	[mA] max.		
<b>Single Output</b>									
P20C243R3S	24	9...36	50	880	3.3	0	5500	89	10000
P20C2405S	24	9...36	50	960	5.0	0	4000	91	6800
P20C2412S	24	9...36	20	980	12.0	0	1670	89	1000
P20C2415S	24	9...36	20	970	15.0	0	1330	89	680
P20C483R3S	48	18...72	30	440	3.3	0	5500	89	10000
P20C4805S	48	18...72	30	475	5.0	0	4000	91	6800
P20C4812S	48	18...72	15	485	12.0	0	1670	89	1000
P20C4815S	48	18...72	15	485	15.0	0	1330	89	680
<b>Dual Output</b>									
P20C2405D	24	9...36	65	970	±5.0	0	±2000	89	2 x 2200
P20C2412D	24	9...36	25	980	±12.0	0	±835	88	2 x 470
P20C2415D	24	9...36	25	980	±15.0	0	±665	89	2 x 330
P20C4805D	48	18...72	40	485	±5.0	0	±2000	89	2 x 2200
P20C4812D	48	18...72	15	490	±12.0	0	±835	88	2 x 470
P20C4815D	48	18...72	15	490	±15.0	0	±665	89	2 x 330

## Specifications

<b>Input</b>	
Under voltage protection P20C24xxx	Lock in: 8.6 V <sub>DC</sub> , typ. Lock out: 7.9 V <sub>DC</sub> , typ.
Under voltage protection P20C48xxx	Lock in: 17.8 V <sub>DC</sub> , typ. Lock out: 16 V <sub>DC</sub> , typ.
Start up time	20 ms, typ.
Filter	π - type
Reflected input ripple current	20 mA <sub>p-p</sub> , typ. (see Fig. 1)
Remote control (optional) Pin 6 Ref.-point Pin 2 GND (see fig. 4)	On: open or 3...12 V <sub>DC</sub> Off: 0...1.2 V <sub>DC</sub>
Off state input idle current	5 mA, typ.
<b>Isolation Voltage:</b>	
Input to output	1.6 kV <sub>DC</sub> for 1 min.
Input or output to Case	1.6 kV <sub>DC</sub> for 1 min.
Resistance	10 <sup>9</sup> Ω
Capacitance	1200 pF, typ.
<b>Output</b>	
Voltage accuracy	± 1 %
Load regulation at single output	± 0.5 %, at 0...100 % load range
Load regulation at dual output, balanced output load current	± 1 %, at 0...100 % load range
Output trimming range	± 10 %
Line regulation	± 0.5 %, max.
Over current protection	120 % of max. I <sub>out</sub>
Over voltage protection	P20Cxx3R3x: 3.9 V <sub>DC</sub> P20Cxx05x: 6.2 V <sub>DC</sub> P20Cxx12x: 15 V <sub>DC</sub> P20Cxx15x: 18 V <sub>DC</sub>
Dual output cross deviation	± 5 %, max. at 75 % load difference between the outputs
Short circuit protection	Continuous, automatic restart
Ripple and noise (at 20 MHz BW)	75 mV <sub>p-p</sub> , max. (see Figure 2)
Temperature coefficient	± 0.02 % / °C
<b>General</b>	
Safety standards	EN-, IEC 60950-1
Switching frequency	330 kHz, typ.
Reliability calculated MTBF (MIL-HDBK-217Fat 25 °C)	560000 h

<b>EMC</b>	
Radiated emissions	EN55032 class A
Conducted emissions (see fig. 3)	EN55032 class A
ESD	IEC61000-4-2 perf. crit. A
RS	IEC61000-4-3 perf. crit. A
EFT	IEC61000-4-4 perf. crit. A
Surge (see figure 3 & note 3)	IEC61000-4-5 perf. crit. A
CS	IEC61000-4-6 perf. crit. A
PFMF	IEC61000-4-8 perf. crit. A
<b>Environmental</b>	
Operating ambient temperature	-40 ... 85 °C
Storage temperature	-55 ... 125 °C
Case temperature	105 °C, max.
Derating	See diagram
Cooling	Free air convection, 30...65 LFM (15...33 cm/s)
Thermal impedance	Without heatsink: 12 K / W With heatsink: 10 K / W
Humidity	95 % max. non condensing
<b>Physical</b>	
Dimensions without heatsink	50.8 x 25.4 x 10.7 mm
Dimensions with heatsink	50.8 x 25.4 x 16.3 mm
Weight without heatsink	31 g
Weight with heatsink	43 g
Case material	Nickel coated copper
Potting material	Epoxy (UL94V-0 rated)
Pin material	Brass solder coated
<b>Absolute maximum ratings</b>	
P20C24xxx	Vin: 50 V <sub>DC</sub> , max., ≤ 100 ms
P20C48xxx	Vin: 100 V <sub>DC</sub> , max., ≤ 100 ms
Soldering temperature	≤ 260 °C max. for ≤ 10 s max., ≥ 1.5 mm distance from case

# 20 W DC-DC Converter P20C-Series

Part number ordering key									
Output power	Series	Input voltage		Output voltage		Outputs		Heat sink	
P20	C	24		05		S		K	
20 Watt		24	9..36 V	3R3	3.3 V	S	single	Blank	No heat sink
		48	18..75 V	05	5 V	D	dual	K	Heat sink mounted
				12	12 V				
				15	15 V				

Note:

1. All parameter are typical specified at Ta 25 °C, nominal input voltage and full load unless otherwise specified.
2. Maximal capacitive output load is specified at minimal input voltage and constant resistive load.
3. With input filter circuit to meet of conducted emissions EN 55032 class A. (see Figure 3)
4. An external input blocking capacitor is required if the converter has to meet the surge test IEC 61000-4-5. Suggested capacitor type: KY-series, 220  $\mu$ F, 100 V, Nippon Chemicon (see Figure 3).

Figure 1 Measurement circuit for reflected input ripple current

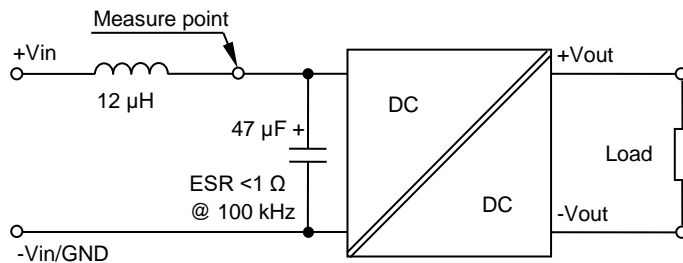
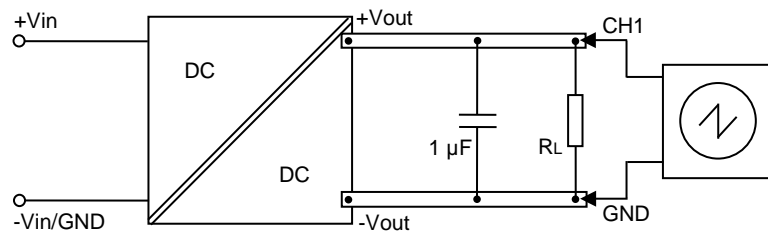
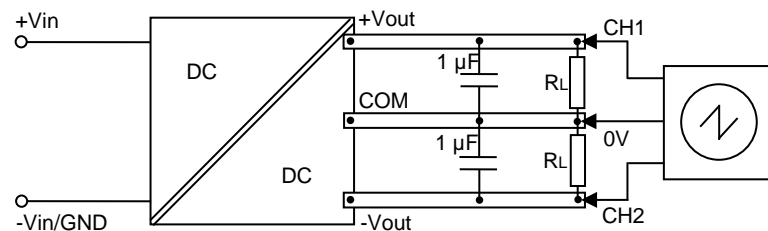


Figure 2 Measurement method for output ripple voltage (BW 20 MHz)

Single output version

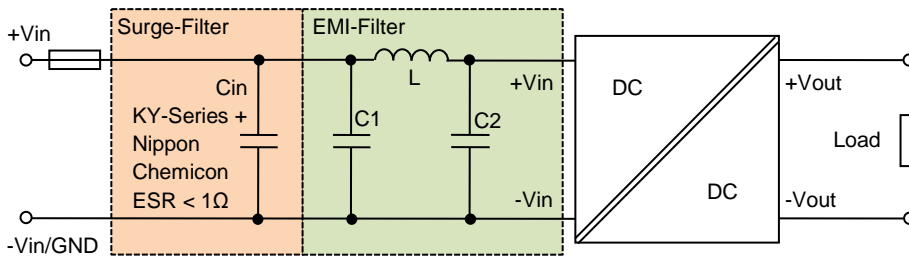


Dual output version



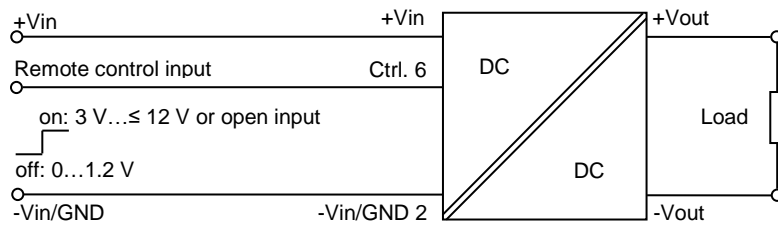
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Figure 3 Recommended input filter circuit to meet EMI (EN 55032 class A) and EFT (IEC 61000-4-4), Surge (IEC 61000-4-5) specifications

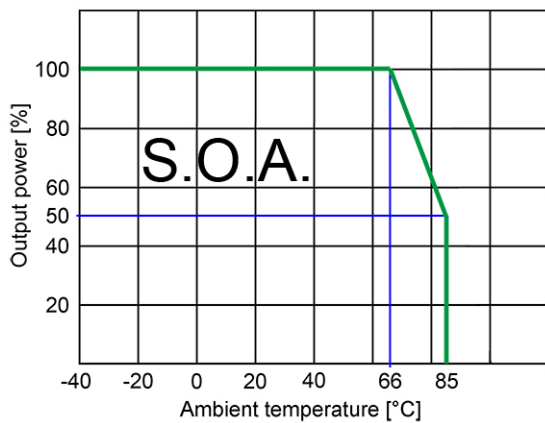


BOM to Figure 3			
Series	Cin	C1, C2	L
P20C24xxx	220 μF, 100 V	2.2 μF, 100 V, MLCC	12 μH
P20C48xxx	220 μF, 100 V	2.2 μF, 100 V, MLCC	12 μH

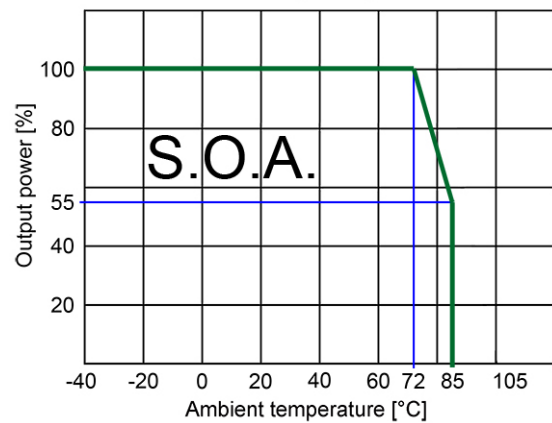
Figure 4 Application circuit for remote control ON/ OFF function.



Without heatsink  
Derating diagram



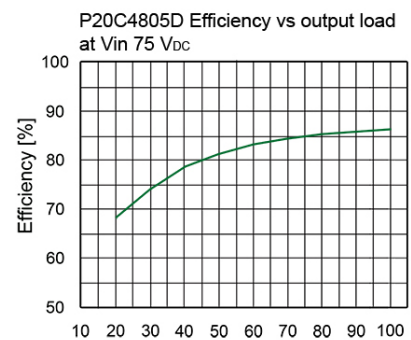
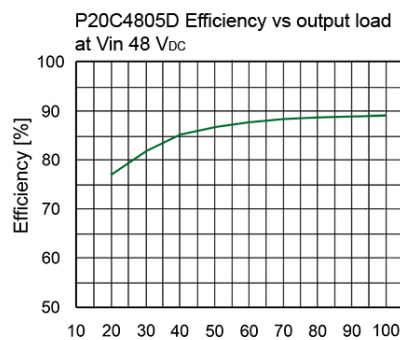
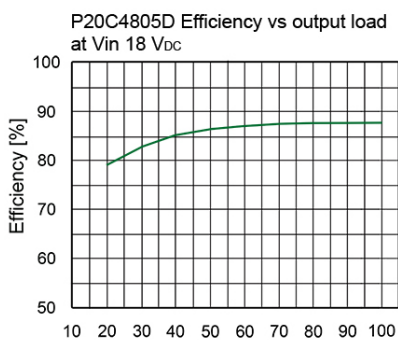
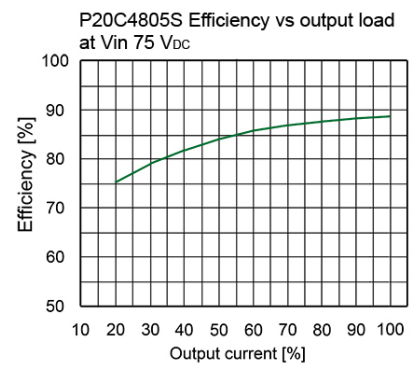
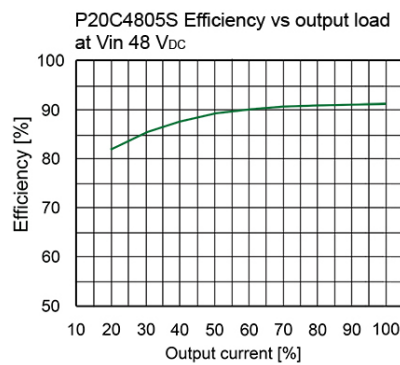
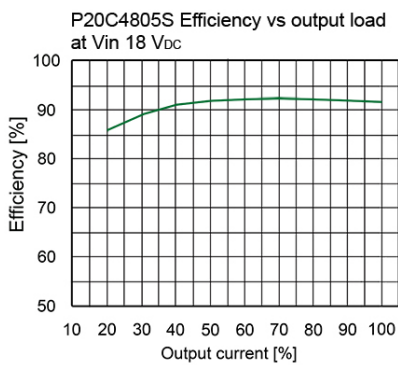
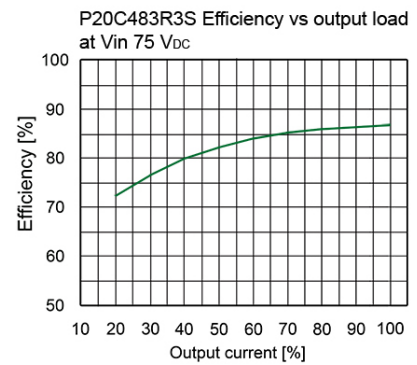
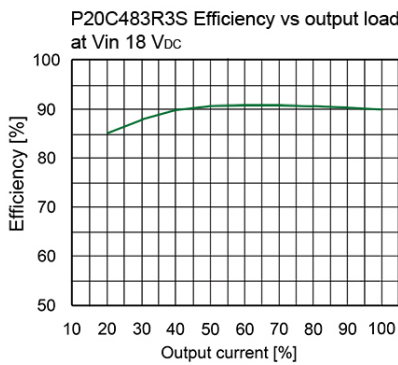
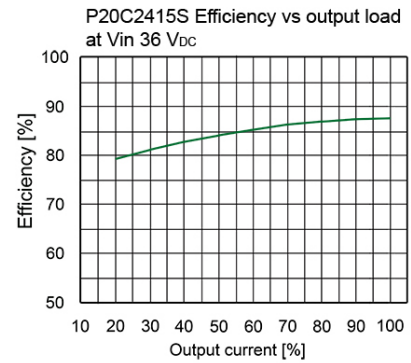
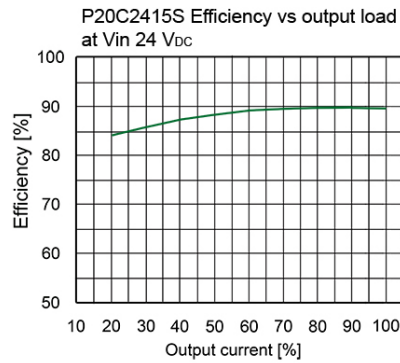
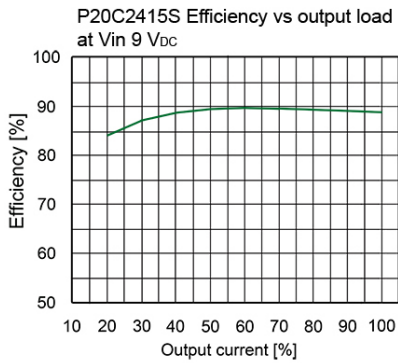
With heatsink  
Derating diagram





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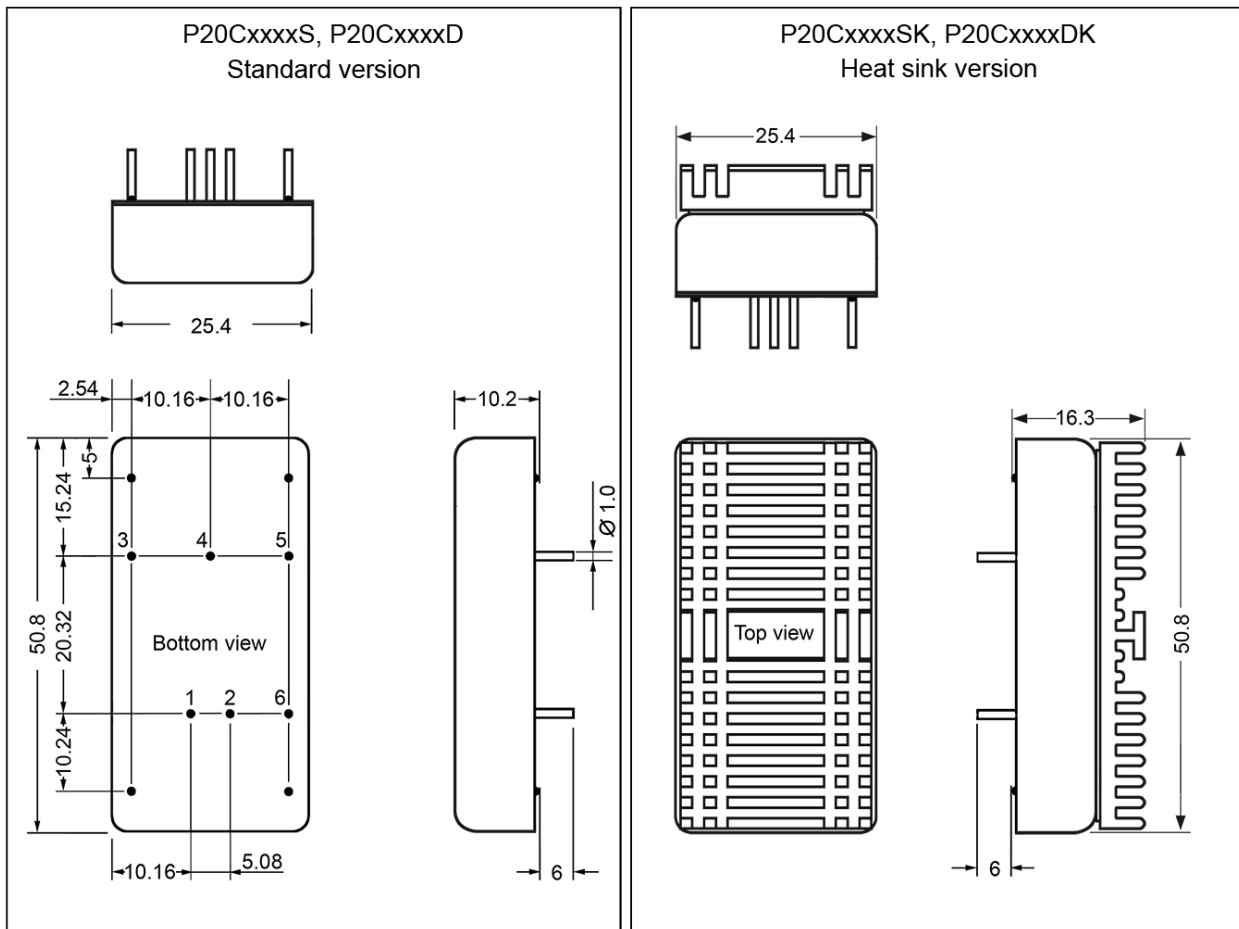
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Pin assignment		
Pin	P20CxxxxS	P20CxxxxD
1	+V input	+V input
2	-V input	-V input
3	+V output	+V output
4	Trim	common
5	-V output	-V output
6	Remote CTRL	Remote CTRL

**Note:**

All dimensions in mm

1. Pin diameter tolerance  $\pm 0.05$
2. Pin pitch tolerance  $\pm 0.35$
3. Pin length tolerance  $\pm 0.35$
4. Case tolerance  $\pm 0.5$
5. Standoff tolerance  $\pm 0.1$

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