



PHI-CON

# 15 W DC-DC Converter P15E-Series

- Wide 4:1 input range
- Efficiency up to 86 %
- 1500 V<sub>DC</sub> isolation
- Continuous short circuit protection
- On/Off-Control input optional
- Standard package 2" x 1" x 0.4"
- MTBF 1.12 Mio. h
- 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>									
P15E243R3S	24	9...36	25	515	3.3	0	3000	80	3300
P15E2405S	24	9...36	25	755	5.0	0	3000	83	3300
P15E247R2S	24	9...36	25	745	7.2	0	2083	84	1000
P15E2409S	24	9...36	25	745	9.0	0	1666	84	680
P15E2412S	24	9...36	25	735	12.0	0	1250	85	680
P15E2415S	24	9...36	25	525	15.0	0	1000	86	470
P15E483R3S	48	18...72	20	255	3.3	0	3000	80	3300
P15E4805S	48	18...72	20	375	5.0	0	3000	83	3300
P15E487R2S	48	18...72	20	370	7.2	0	2083	84	1000
P15E4809S	48	18...72	20	370	9.0	0	1666	84	680
P15E4812S	48	18...72	20	365	12.0	0	1250	85	680
P15E4815S	48	18...72	20	365	15.0	0	1000	86	470
<b>Dual Output</b>									
P15E2405D	24	9...36	25	755	±5.0	0	±1500	83	2 x 2200
P15E247R2D	24	9...36	25	745	±7.2	0	±1041	84	2 x 470
P15E2409D	24	9...36	25	745	±9.0	0	±833	84	2 x 470
P15E2412D	24	9...36	25	735	±12.0	0	±625	85	2 x 470
P15E2415D	24	9...36	25	725	±15.0	0	±500	86	2 x 330
P15E4805D	48	18...72	20	375	±5.0	0	±1500	83	2 x 2200
P15E487R2D	48	18...72	20	370	±7.2	0	±1041	84	2 x 470
P15E4809D	48	18...72	20	370	±9.0	0	±833	84	2 x 470
P15E4812D	48	18...72	20	365	±12.0	0	±625	85	2 x 470
P15E4815D	48	18...72	20	365	±15.0	0	±500	86	2 x 330

## Specifications

<b>Input</b>	
Under voltage protection P15E24xxx	Lock in: 8.6 V <sub>DC</sub> , typ. Lock out: 8 V <sub>DC</sub> , typ.
Under voltage protection P15E48xxx	Lock in: 16 V <sub>DC</sub> , typ. Lock out: 14 V <sub>DC</sub> , typ.
Start up time	20 ms, typ.
Filter	π - type
Reflected input ripple current	35 mA <sub>p-p</sub> , typ. (see Fig. 1)
Remote control (optional) Pin 6	On: open or 2.5...5.5 V <sub>DC</sub>
Ref.-point Pin 2 GND (see fig. 4)	Off: 0...0.8 V <sub>DC</sub>
Off state input idle current	2.5 mA
<b>Isolation Voltage:</b>	
Input to output	1.5 kV <sub>DC</sub> for 1 min.
Input or output to Case	1 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	± 1 %, at 0...100 % load range
Line regulation	± 0.5 %, max.
Over current protection	140 % of max. I <sub>out</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-, cUL-, UL 60950-1 EN-, IEC-, cUL-, UL 62368-1
Switching frequency	300 kHz, typ.
Reliability calculated MTBF (MIL-HDBK-217F)	1.12 Mio. h

<b>EMC</b>	
Radiated emissions	EN55032 class A
Conducted emissions (see fig. 3)	EN55032 class A
ESD	IEC61000-4-2 perf. crit. B
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 temperatur (ambient)	-40 ... 85 °C
Storage temperature	-40 ... 125 °C
Case temperature	100 °C, max.
Derating	See diagram
Cooling	Free air convection, 30...65 LFM
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 10.16 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 brass
Pinning material	Epoxy (UL94V-0 rated)
Pin material	Brass solder coated
<b>Absolute maximum ratings</b>	
Input voltage P15E24xxx	50 V <sub>DC</sub> , max., ≤ 100 ms
Input voltage P15E48xxx	100 V <sub>DC</sub> , max., ≤ 100 ms
Soldering temperature	≤ 260 °C max. for ≤ 10 s max., ≥ 1.5 mm distance from case

# 15 W DC-DC Converter P15E-Series

Part number ordering key								
Output power	Series	Input voltage		Output voltage		Outputs	Remote control	
P15	E	24		05		S	C	
15 Watt		24	9..36 V	3R3	3.3 V	S	Blank	No remote control input
		48	18..72 V	05	5 V	D		
				7R2	7.2 V		C	remote control input (Optional)
				09	9 V			
				12	12 V			
				15	15 V			

## Note:

1. All parameter are typical specified at  $T_a$  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

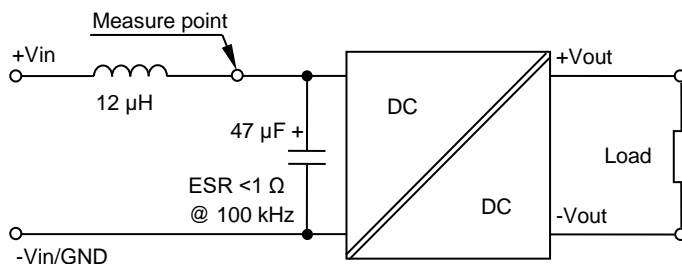
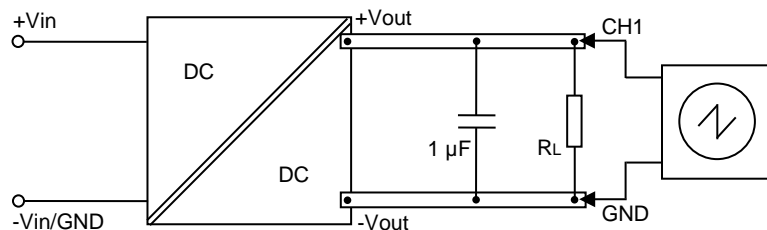
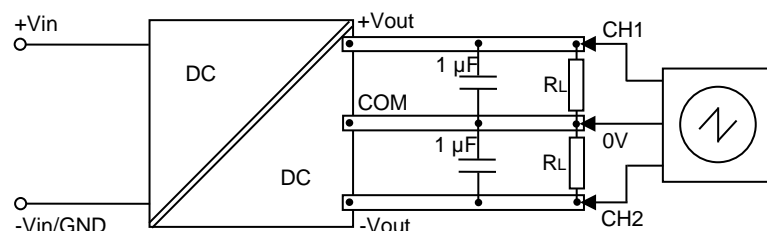


Figure 2 Measurement method for output ripple voltage (BW 20 MHz)

## Single output version

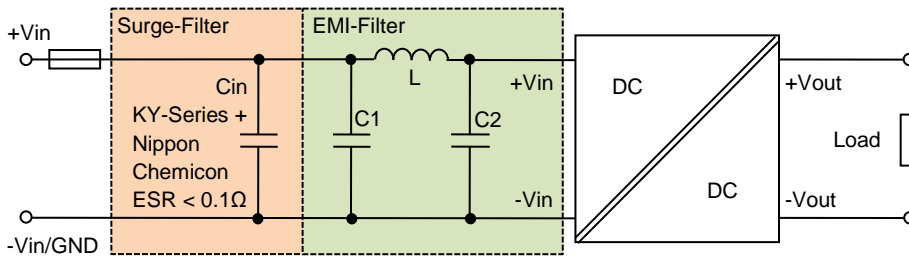


## Dual output version



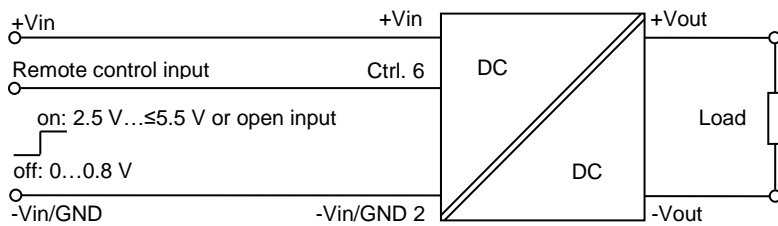
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Figure 3 Recommended input filter circuit to meet EMI (EN 55032 class A) and Surge (IEC 61000-4-5) specifications

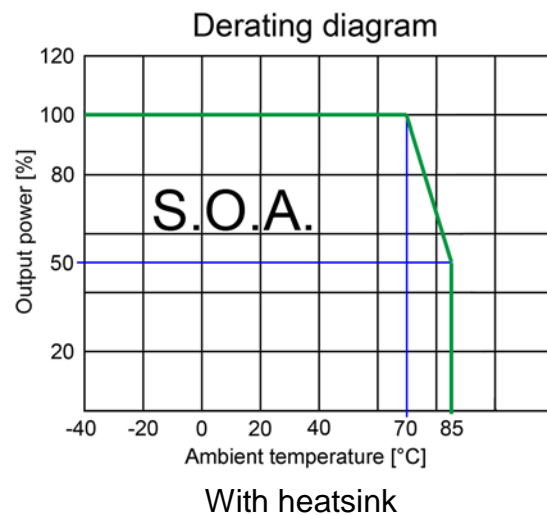
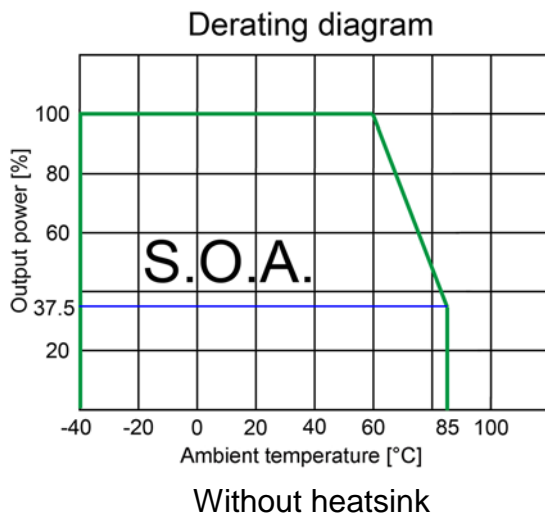


BOM to Figure 3				
Series	Cin	C1	C2	L
P15E24xxx	220 μF, 100 V	330 μF, 100 V	100 μF, 100V	12 μH
P15E48xxx	220 μF, 100 V	330 μF, 100 V	100 μF, 100V	12 μH

Figure 4 Application circuit for remote control function.



This feature is optional, please see part number ordering key table.

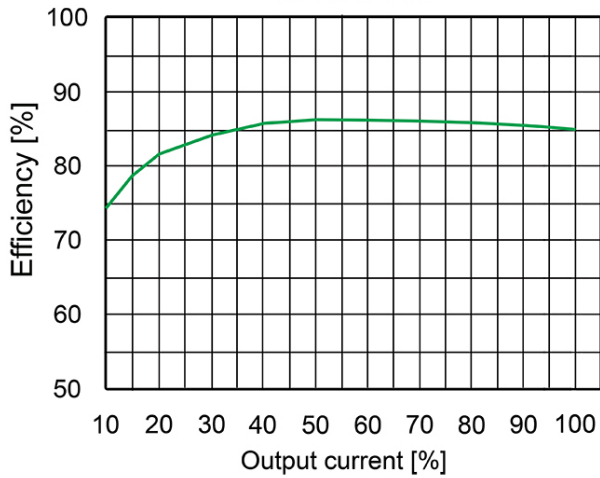




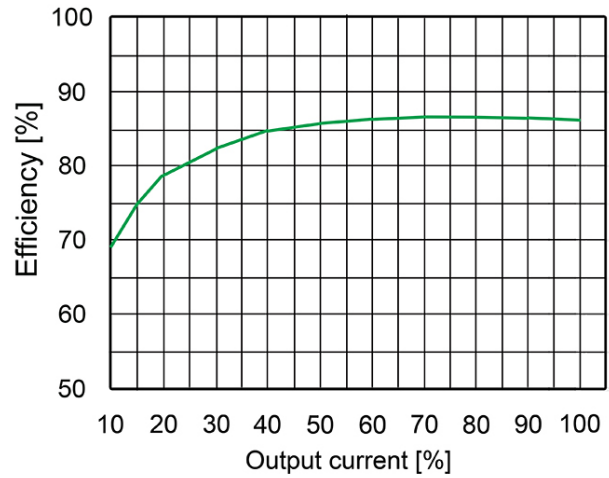
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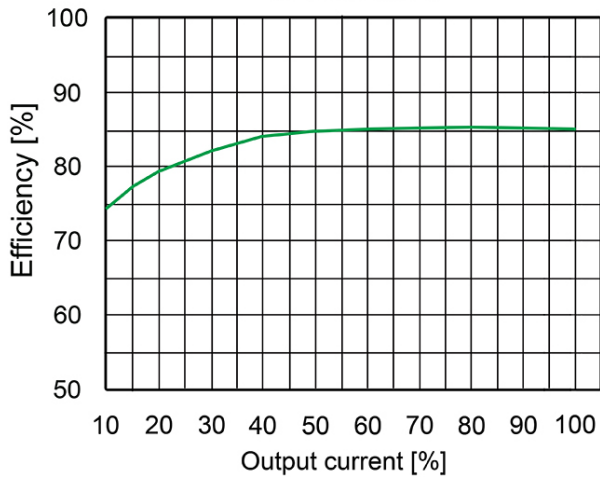
P15E24xxx Efficiency vs output load  
at Vin 9 VDC



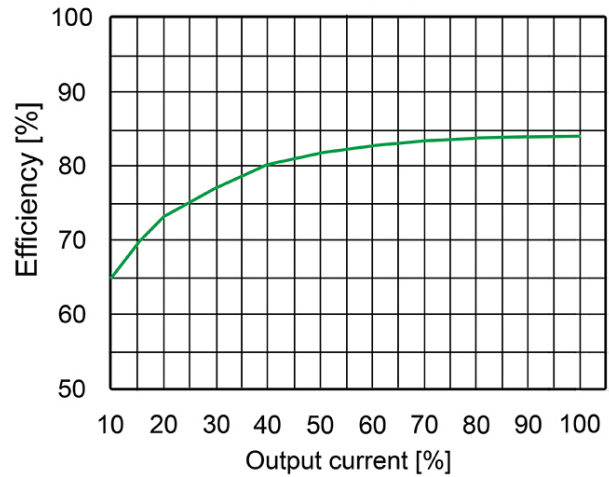
P15E48xxx Efficiency vs output load  
at Vin 18 VDC



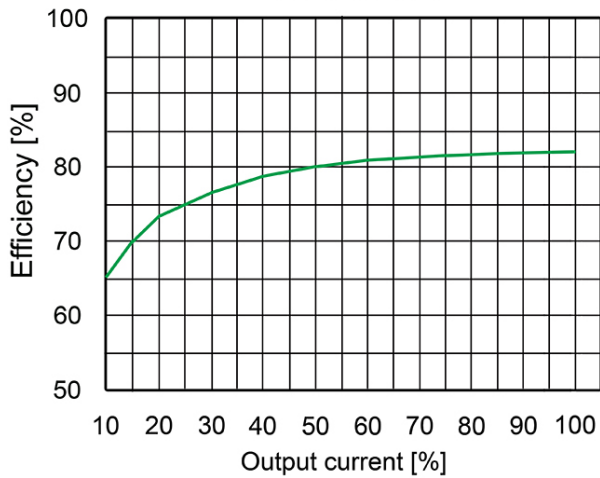
P15E24xxx Efficiency vs output load  
at Vin 24VDC



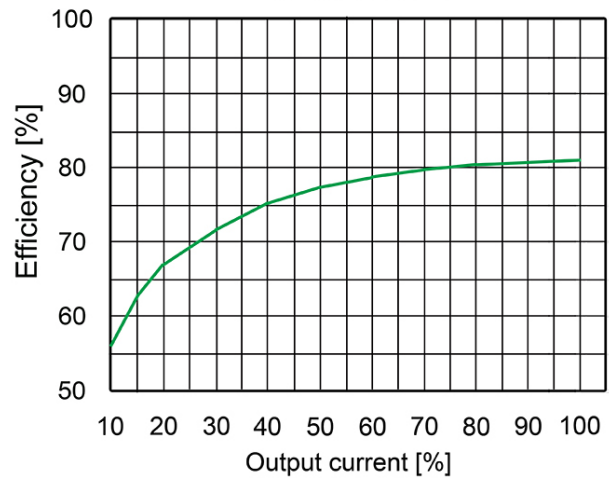
P15E48xxx Efficiency vs output load  
at Vin 48 VDC



P15E24xxx Efficiency vs output load  
at Vin 36 VDC



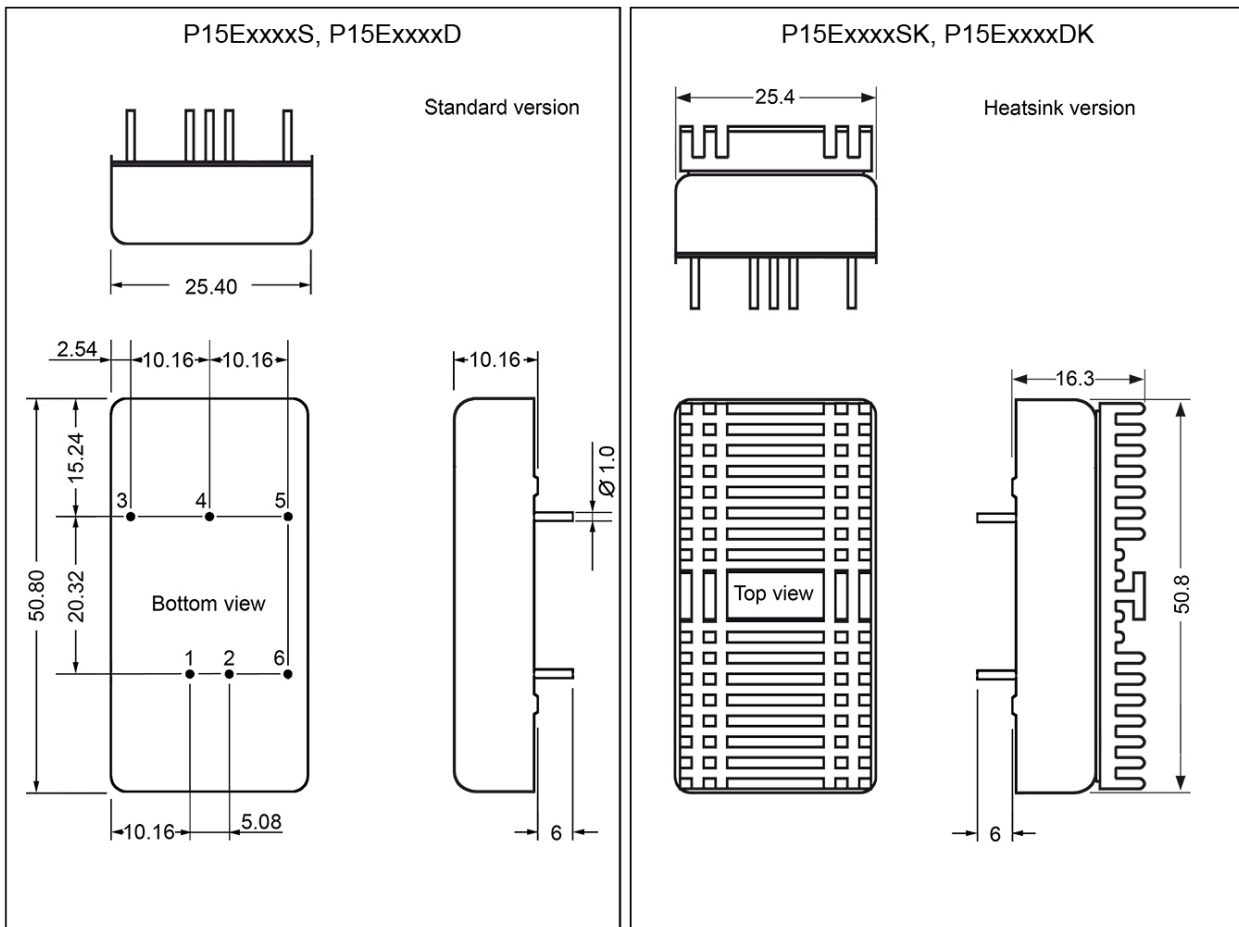
P15E48xxx Efficiency vs output load  
at Vin 72 VDC





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# 15 W DC-DC Converter P15E-Series



Pin assignment				
Pin	Without remote control		With remote control	
	P15ExxxxS	P15ExxxxD	P15ExxxxSC	P15ExxxxDC
1	+V input	+V input	+V input	+V input
2	-V input	-V input	-V input	-V input
3	+V output	+V output	+V output	+V output
4	No pin	common	No pin	common
5	-V output	-V output	-V output	-V output
6	No pin	No pin	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  $\pm 0.5$

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