50 W DC-DC Converter P50G-Series

PHI-CON

- Wide 2:1 input range
- Efficiency up to 93 %
- Adjustable output voltage
- Remote control on / off
- 1500 V_{DC} isolation
- Continuous short circuit protection
- Over voltage protection
- Standard package 2" x 1" x 0.4"
- MTBF > 1 Mio. hours
- -40...+85 °C operating temperature range



Model guide

Type	Input voltage		Input current		Output voltage	Output current		Efficiency @ full load	Capacitive load (see note 3)
	Nominal [V_{DC}]	Range [V_{DC}]	no load [mA] typ.	full load [mA] typ.	[V_{DC}]	minimum load [mA]	maximum load [A]	[%] typ.	[µF] max.
Single output									
P50G243R3S	24	18...36	40	1510	3.3	500	10000	91	27000
P50G2405S	24	18...36	60	2290	5	500	10000	91	18900
P50G2412S	24	18...36	85	2240	12	208	4167	93	3700
P50G2415S	24	18...36	90	2240	15	167	3333	93	2000
P50G2424S	24	18...36	45	2289	24	104	2083	91	1000
P50G483R3S	48	36...75	30	756	3.3	500	10000	91	27000
P50G4805S	48	36...75	50	1145	5	500	10000	93	18900
P50G4812S	48	36...75	35	1120	12	208	4167	93	3700
P50G4815S	48	36...75	50	1120	15	167	3333	93	2000
P50G4824S	48	36...75	30	1130	24	104	2083	92	1000

Specifications

Input		Start up	Shut down
Under voltage lockout	P50G24xxS	18 V_{DC}	15 V_{DC}
	P50G48xxS	36 V_{DC}	31 V_{DC}
Over voltage protection	P50G24xxS	36 V_{DC}	41 V_{DC}
	P50G48xxS	75 V_{DC}	83 V_{DC}
Filter		π - type	
Reflected ripple current		40 mAp-p, typ.	
Remote control theshold	On state	3…12 V_{DC}, or open input	
	Off state	0…1.2 V_{DC}, I_{CTRL} 6 mA	
Input idle current @ Off state		6 mA, typ.	
Isolation input - output:			
Rated voltage (tested for 1 min.)		1500 V_{DC}	
Input / output resistance		> 10^9 Ω, measured @ 500 V_{DC}	
Input / output capacitance		2000 pF, typ @ 100 kHz	
Output			
Voltage tolerance		± 3 %, max.	
Voltage load regulation		± 1 % @ 5 %..100 % load	
Input regulation		± 0.5 %, max @ full Vin range	
Output voltage trim range		± 10 %, max.	
Temperature coefficient		± 0.03 % / °C, max.	
Transient recovery time		<500 µs, typ. @ 25 % load steps	
Transient response deviation		± 5 %, max., @ 25 % load steps	
Short circuit protection		Continuous, hiccup	
Short circuit restart		Automatic	
Over current protection		120…160 % typ.	
Rippel & noise, BW 20 MHz		350 mVp-p, max.	
Start up time		10 ms, typ @ R-load	
Over voltage protection via integrated TVS-Diode		P50Gxx3R3x: 3.9 V_{DC}, typ	
		P50Gxx05x: 6.2 V_{DC}, typ	
		P50Gxx12x: 15 V_{DC}, typ	
		P50Gxx15x: 18 V_{DC}, typ	
		P50Gxx24x: 30 V_{DC}, typ	
Rippel & noise, BW 20 MHz		P50Gxx3R3x: 250 mVp-p, max.	
		P50Gxx05x: 250 mVp-p, max.	
		P50Gxx12x: 300 mVp-p, max.	
		P50Gxx15x: 300 mVp-p, max.	
		P50Gxx24x: 350 mVp-p, max.	

General		
Safety standard		EN60950-1
Switching frequency (PWM)		300 kHz, typ.
Reliability calculated MTBF MIL-HDBK-217F @ 25 °C		> 1 Mio. h
EMC characteristics		
Radiated emissions (see Fig. 2)		CISPR22 / EN55022 Class B
Conducted emissions (see Fig. 2)		CISPR22 / EN55022 Class B
IEC61000-4-2, EN61000-4-2 ESD, (see Fig. 2)		contact ± 4 kV, perf. criteria B
IEC61000-4-3, EN61000-4-3, RS		10 V / m perf. criteria A
IEC61000-4-4, EN61000-4-4 EFT, (see Fig. 2)		± 2 kV perf. criteria B
IEC61000-4-5, EN61000-4-5 Surge, (see Fig. 2)		± 2 kV perf. criteria B
IEC61000-4-6, EN61000-4-6 CS		3 Vrms perf. criteria A
Environmental		
Operating ambient temperature		-40 … 85 °C with derating
Case temperature		105 °C, max.
Storage temperature		-55 …125 °C
Over temp. protection		t-case 110 °C, typ
Storage humidity		5…95 %, non condensing
Cooling		Free air convection
Physical		
Dimensions	without heat sink	50.8 x 25.4 x 11.8 mm
	with heat sink	51.4 x 26.2 x 16.5 mm
Weight	without heat sink	35 g
	with heat sink	45 g
Case material		Aluminium alloy
Potting Material		Epoxy (UL94V-0 rated)
Vibration		10..55 Hz, 10 G, 30 minutes, X-,Y- and Z- axes
Absolute max. ratings		
Pin soldering temperature 1.5 mm distance from body		300 °C for 10 sec
Max. input voltage < 1 sec	P50G24xxS	-0.7…50 V_{DC}
	P50G48xxS	-0.7…100 V_{DC}

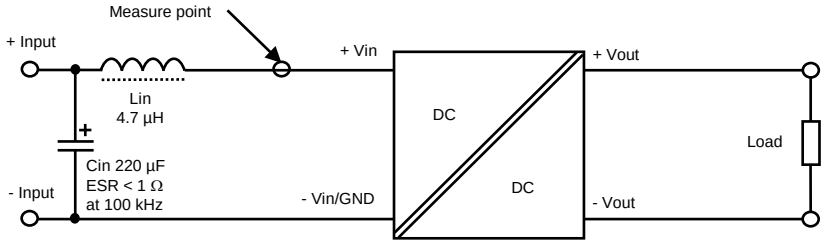
HY-LINE® POWER COMPONENTS

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Note:
1. Min. load should not be less than 10 %, otherwise ripple may be increased dramatically. If the product operates under min. load, it may not be guaranteed to meet all listed specifications. Operation under minimum load will not damage the converter.
2. Maximum capacitive load is tested at input voltage range and full load.
3. All specifications measured at Ta 25 °C, humidity < 75 %, nominal input voltage and rated output load unless otherwise specified.
4. Specifications of this product are subject to changes without prior notice.
5. It is not recommended to increase the output power capability by connecting two or more converters in parallel.
6. The converters are not hot swappable

Measure circuit for Input reflected ripple

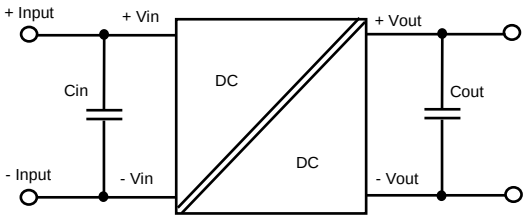


The input reflected ripple current is measured with inductor Lin and capacitor Cin to simulate source impedance.

1) Recommended circuit

The P50G series is been tested according to the following recommended test circuit before leaving the factory (see Figures 1). If you want to further decrease the input / output ripple, you can increase a capacitance values properly or choose capacitors with low ESR, but the total capacitance of the filter capacitor must not exceed the maximum load capacitance value (see „Model guide“ table).

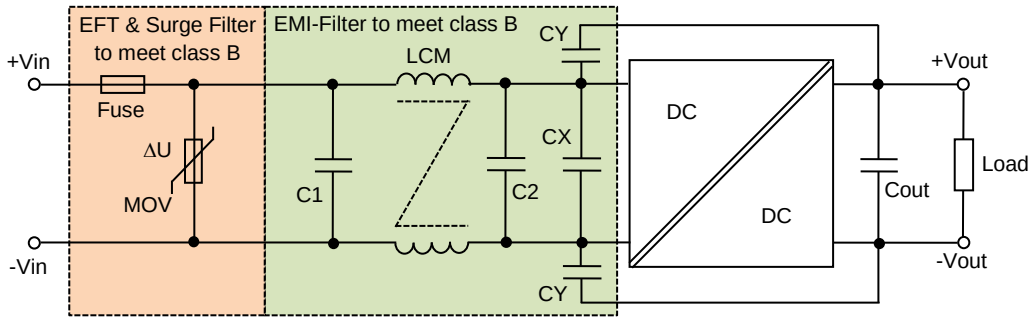
Figure 1



Tabel 1

Recommended peripheral components to figure 1a		
Vout	Cin	Cout
P50Gxx3R3S	100 µF	470 µF
P50Gxx05S		470 µF
P50Gxx12S		100 µF
P50Gxx15S		100 µF
P50Gxx24S		47 µF

Figures 2, Recommended EMC circuit



Tabel 2

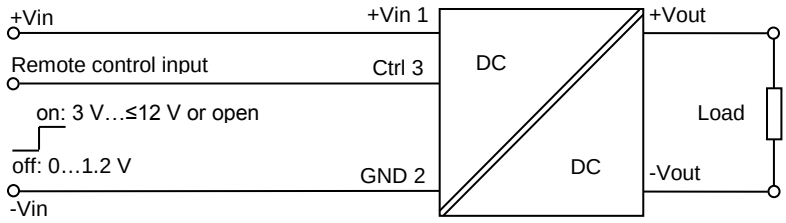
	Fuse Time delay type	MOV	C1	LCM	C2	CX	CY	Cout See tabel 1
P50G24xxS	5 A	S20K30	680 µF	2.2 mH	330 µF	4.7 µF	3.3 nF, 2 kV	
P50G48xxS	3.15 A	S14K60	330 µF	2.2 mH	330 µF	2.2 µF	3.3 nF, 2 kV	

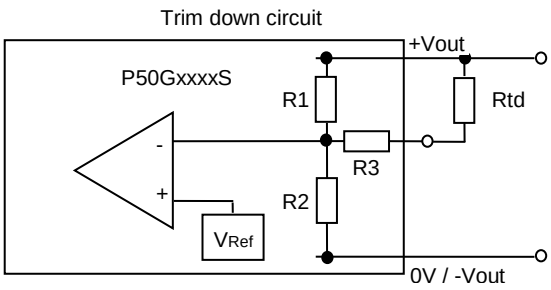
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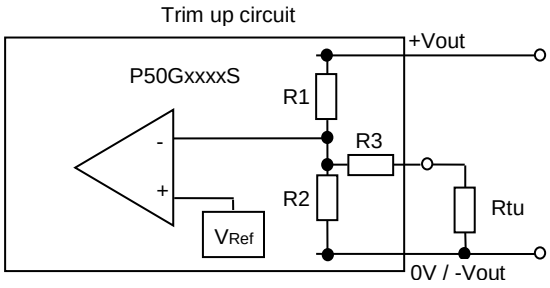
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Remote control / trim function







Calculation for trim down resistor (Rtd) or trim up resistor (Rtu)

Model series	R1 [kΩ]	R2 [kΩ]	R3 [kΩ]	V Ref [V]	Rtd min. [kΩ]	Rtu min. [kΩ]
P50Gxx3R3S	4.788	2.87	12.4	1.24	12	6.1
P50Gxx05S	2.87	2.87	10	2.5	1.5	4.5
P50Gxx12S	11	2.87	15	2.5	56	9.6
P50Gxx15S	15	3.00	17.4	2.5	340	7.6
P50Gxx24S	20	2.31	15	2.5	242	7.36
Maximum output voltage adjust range ± 10 % of Vout nominal, see min. Rtd / Rtu						

Trim down resistor formula

$$b = \frac{Vout - Vref}{Vref} * R2$$

$$Rtd = \frac{R1 * b}{R1 - b} - R3$$

Trim up resistor formula

$$a = \frac{Vref}{Vout - Vref} * R1$$

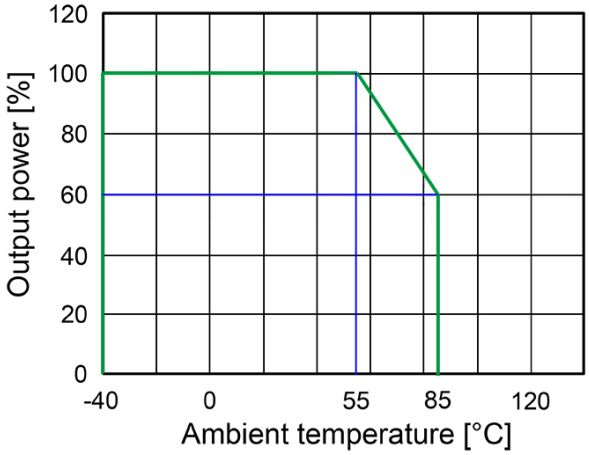
$$Rtu = \frac{R2 * a}{R2 - a} - R3$$

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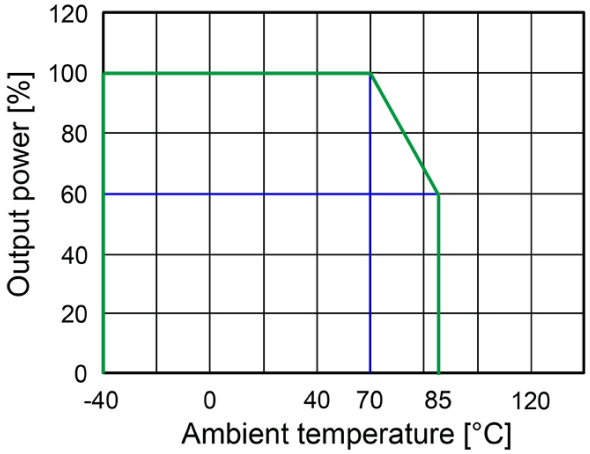
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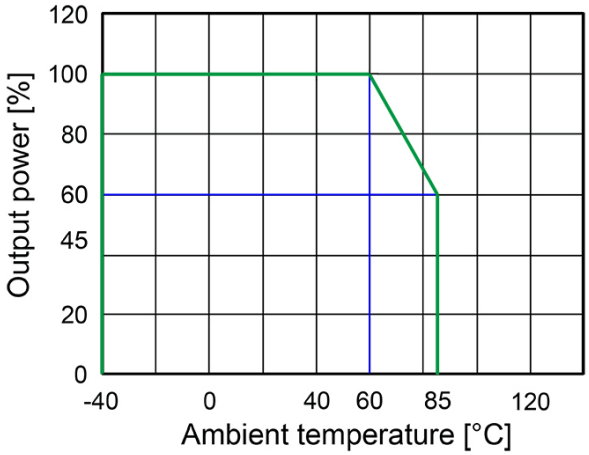
P50Gxx3R3S, P50Gxx05S
Temperature derating curve without heatsink



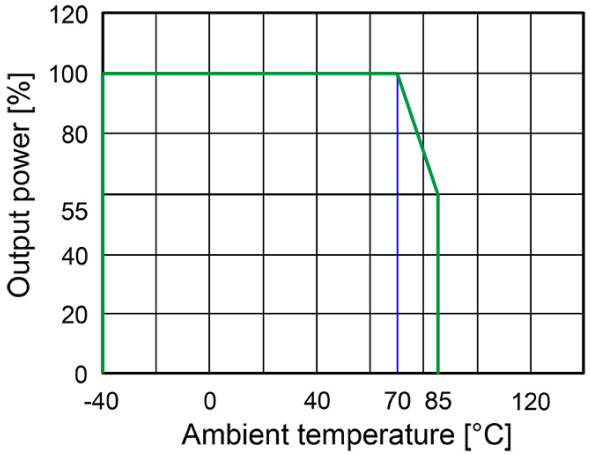
P50Gxx3R3S, P50Gxx05S
Temperature derating curve with heatsink



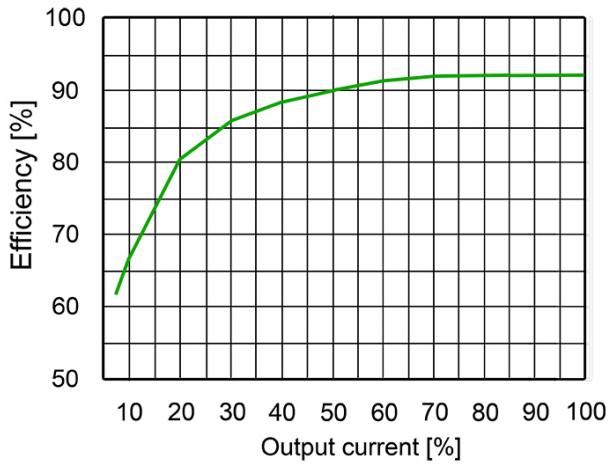
P50Gxx12S, P50Gxx15S, P50Gxx24S
Temperature derating curve without heatsink



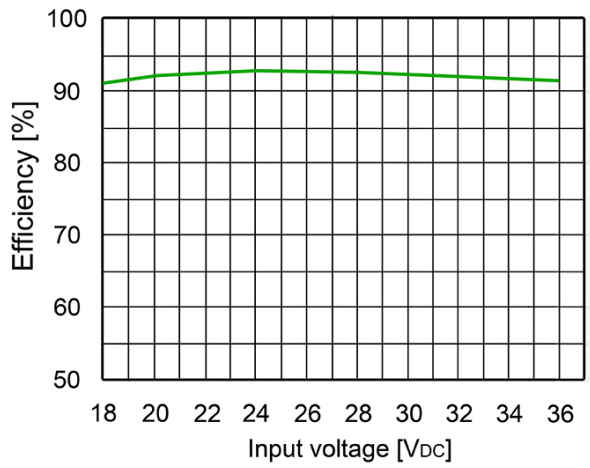
P50Gxx12S, P50Gxx15S, P50Gxx24S
Temperature derating curve with heatsink



P50G2405S efficiency vs output load



P50G2405S efficiency vs input voltage



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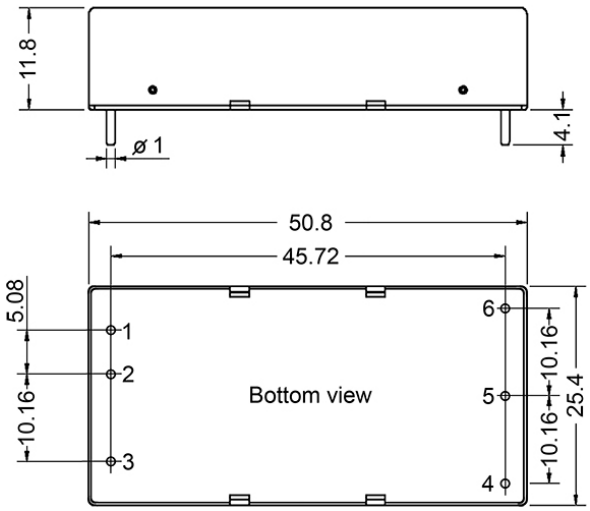
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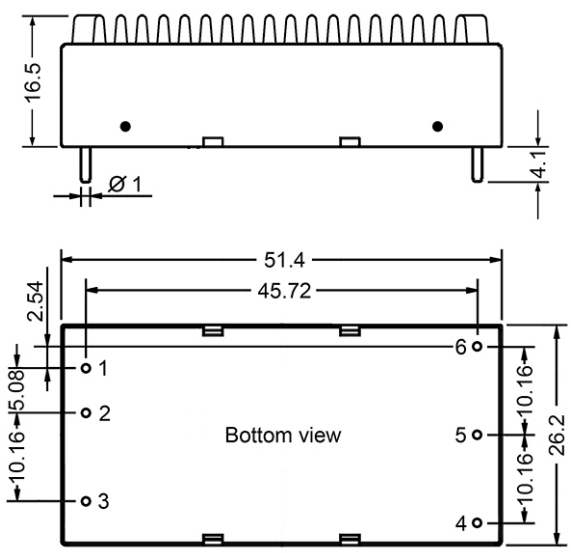
Dimensions standard version



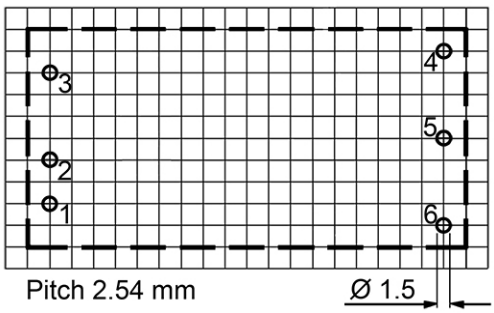
Pin configuration	
Pin	Single
1	+ Vin
2	(GND) -Vin
3	Rem Ctrl
4	Trim
5	(0 V) - Vout
6	+ Vout

Unit: mm
Pin diameter tolerance: 0.1 mm
Pin height tolerance: 0.5 mm
General tolerances: 0.3 mm

Dimensions heatsink version, ordering designation P50GxxxxSK







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