

SERIES: PGNP2-S | DESCRIPTION: DC-DC CONVERTER

FEATURES

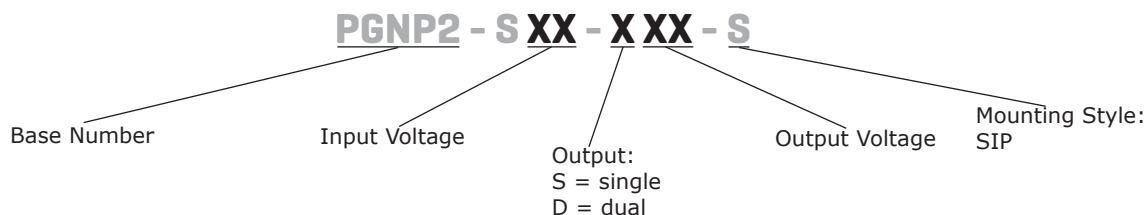
- 2W isolated output
- unregulated single/dual outputs
- 6,000 Vdc isolation
- certified to EN/UL 60601-1 (2x MOPP)
- designed to meet EN 62368-1
- leakage current less than 2 μ A
- -40 $^{\circ}$ C ~ 105 $^{\circ}$ C operating temperature
- continuous output short circuit protection
- reinforced insulation



MODEL	input voltage		output voltage (Vdc)	output current		output power max (W)	ripple & noise ¹ max (mVp-p)	efficiency ² typ (%)
	typ (Vdc)	range (Vdc)		min (mA)	max (mA)			
PGNP2-S12-D5-S	12	10.8~13.2	$\pm$ 5	$\pm$ 20	$\pm$ 200	2	150	80
PGNP2-S12-D9-S	12	10.8~13.2	$\pm$ 9	$\pm$ 11	$\pm$ 111	2	120	82
PGNP2-S12-D12-S	12	10.8~13.2	$\pm$ 12	$\pm$ 9	$\pm$ 83	2	120	83
PGNP2-S12-D15-S	12	10.8~13.2	$\pm$ 15	$\pm$ 7	$\pm$ 67	2	120	84
PGNP2-S12-S5-S	12	10.8~13.2	5	40	400	2	150	80
PGNP2-S12-S9-S	12	10.8~13.2	9	22	222	2	120	82
PGNP2-S12-S12-S	12	10.8~13.2	12	17	167	2	120	84
PGNP2-S12-S15-S	12	10.8~13.2	15	14	133	2	120	84
PGNP2-S15-D5-S	15	13.5~16.5	$\pm$ 5	$\pm$ 20	$\pm$ 200	2	150	78
PGNP2-S15-D9-S	15	13.5~16.5	$\pm$ 9	$\pm$ 11	$\pm$ 111	2	120	80
PGNP2-S15-D15-S	15	13.5~16.5	$\pm$ 15	$\pm$ 7	$\pm$ 67	2	120	80
PGNP2-S15-S5-S	15	13.5~16.5	5	40	400	2	150	80
PGNP2-S15-S15-S	15	13.5~16.5	15	14	133	2	120	83
PGNP2-S24-D5-S	24	21.6~26.4	$\pm$ 5	$\pm$ 20	$\pm$ 200	2	150	79
PGNP2-S24-D9-S	24	21.6~26.4	$\pm$ 9	$\pm$ 11	$\pm$ 111	2	120	81
PGNP2-S24-D12-S	24	21.6~26.4	$\pm$ 12	$\pm$ 9	$\pm$ 83	2	120	82
PGNP2-S24-D15-S	24	21.6~26.4	$\pm$ 15	$\pm$ 7	$\pm$ 67	2	120	81
PGNP2-S24-S5-S	24	21.6~26.4	5	40	400	2	150	79
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PGNP2-S24-S12-S	24	21.6~26.4	12	17	167	2	120	82
PGNP2-S24-S15-S	24	21.6~26.4	15	14	133	2	120	84
PGNP2-S24-S24-S	24	21.6~26.4	24	9	83	2	120	84

Notes: 1. Measured at nominal input, 20 MHz bandwidth oscilloscope.
2. Measured at full load.
3. All specifications are measured at Ta=25 $^{\circ}$ C, humidity < 75%, nominal input voltage, and rated output load unless otherwise specified.

PART NUMBER KEY



INPUT

parameter	conditions/description	min	typ	max	units
operating input voltage (full load/ no load)	12 Vdc input models		210/15	220/-	mA
	15 Vdc input models		167/15	176/-	mA
	24 Vdc input models		106/15	111/-	mA
surge voltage	for maximum of 1 second				
	12 Vdc input models	-0.7		18	Vdc
	15 Vdc input models	-0.7		21	Vdc
	24 Vdc input models	-0.7		30	Vdc
reflected ripple current ⁴			200		mA
filter	filter capacitor				

Note: 4. Refer to DC-DC Converter Application notes for detailed description of reflected ripple current test

OUTPUT

parameter	conditions/description	min	typ	max	units
maximum capacitive load ⁵	9 Vdc output models			680	μF
	12, 15, 24 Vdc input models	±9, 12, 15 Vdc output models		470	μF
		24, ±12, ±15 Vdc output models		220	μF
		±5 Vdc output models		1,000	μF
	12, 15 Vdc input models	5 Vdc output models		1,000	μF
	24 Vdc input models	5 Vdc output models		2,200	μF
voltage accuracy	see tolerance envelope curves				
line regulation	for Vin change of 1%			1.2	%
load regulation	from 10% to full load			20	%
	5 Vdc output models			15	%
	all other models				
switching frequency	at nominal input, full load		200		kHz
temperature coefficient	at full load		±0.02		%/°C

Note: 5. The capacitive loads of positive and negative outputs are identical.

PROTECTIONS

parameter	conditions/description	min	typ	max	units
short circuit protection	continuous, auto recovery				

SAFETY AND COMPLIANCE

parameter	conditions/description	min	typ	max	units
isolation voltage	input to output for 1 minute at 1 mA	5,000			Vac
		6,000			Vdc
isolation resistance	input to output at 500 Vdc	1,000			MΩ
leakage current ⁶	at 230 Vac, 50/60 Hz			2	μA
isolation capacitance	input to output, 100 kHz / 0.1 V		4		pF
safety approvals	certified to 60601-1: EN, BS EN, UL				
	designed to meet 62368: EN, BS EN				

SAFETY AND COMPLIANCE (CONTINUED)

parameter	conditions/description		min	typ	max	units
conducted emissions	12 Vdc input	CISPR32/EN55032 CLASS B (see Fig. 4 for recommended circuit) EN60601-1-2/CISPR 11 GROUP1 CLASS B (see Fig. 4 for recommended circuit)				
	15, 24 Vdc input	CISPR32/EN55032 CLASS A (see Fig. 4 for recommended circuit) EN60601-1-2/CISPR 11 GROUP1 CLASS A (see Fig. 4 for recommended circuit)				
radiated emissions	12 Vdc input	CISPR32/EN55032 CLASS B (see Fig. 4 for recommended circuit) EN60601-1-2/CISPR 11 GROUP1 CLASS B (see Fig. 4 for recommended circuit)				
	15, 24 Vdc input	CISPR32/EN55032 CLASS A (see Fig. 4 for recommended circuit) EN60601-1-2/CISPR 11 GROUP1 CLASS A (see Fig. 4 for recommended circuit)				
ESD	EN60601-1-2 (IEC/EN61000-4-2), perf. Criteria B					
MTBF	as per MIL-HDBK-217F, 25°C		19,360,000			hours
creepage & clearance distance			8			mm
RoHS	yes					

Note: 6. Leakage current and reinforced insulation is based on 250 VAC, 50/60 Hz system input voltage

ENVIRONMENTAL

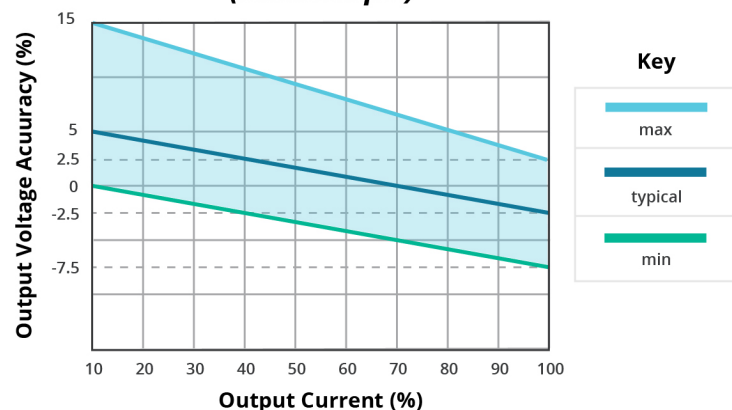
parameter	conditions/description	min	typ	max	units
operating temperature	see derating curves	-40		105	°C
storage temperature		-55		125	°C
storage humidity	non-condensing	5		95	%
case temperature rise			25		°C

SOLDERABILITY

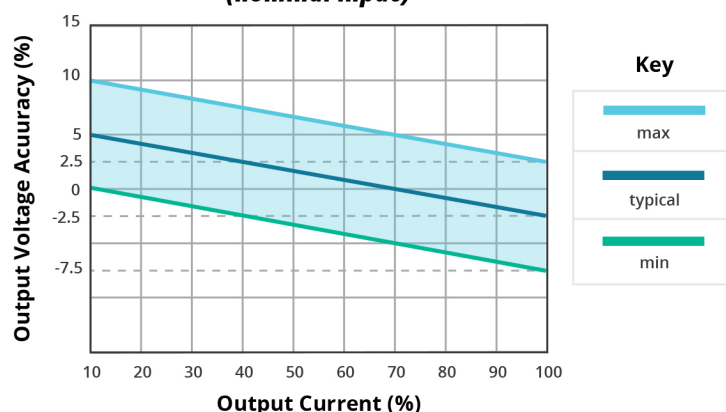
parameter	conditions/description	min	typ	max	units
pin soldering temperature	1.5 mm from case for 10 seconds			300	°C

DERATING CURVES

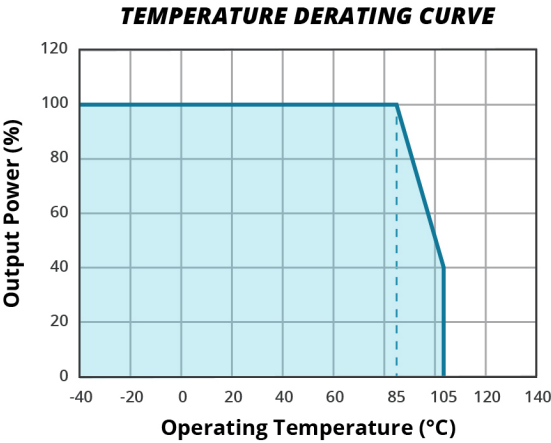
OUTPUT REGULATION CURVE
5 Vdc output model
(nominal input)



OUTPUT REGULATION CURVE
all other output models
(nominal input)



DERATING CURVES (CONTINUED)



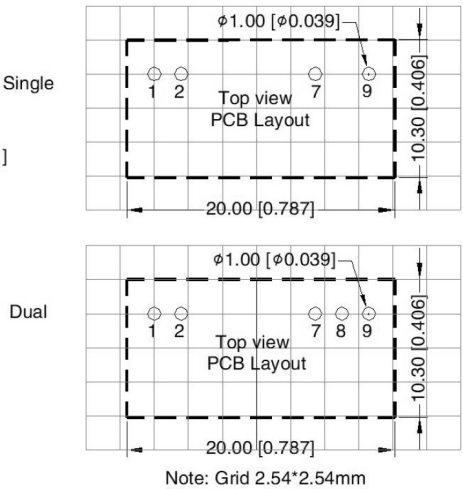
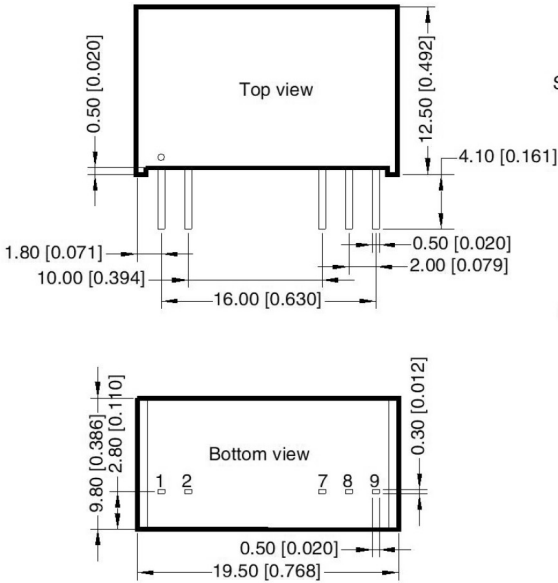
MECHANICAL

parameter	conditions/description	min	typ	max	units
dimensions	19.50 x 9.80 x 12.50 [0.768 x 0.386 x 0.492 inch]				mm
case material	black flame-retardant and heat-resistant plastic (UL94V-0)				
weight			4		g

MECHANICAL DRAWING

units: mm [inch]
tolerance: $\pm 0.50[\pm 0.020]$
pin section tolerance: $\pm 0.10[\pm 0.004]$

PIN CONNECTIONS		
PIN	Function	
	Single	Dual
1	Vin	Vin
2	GND	GND
7	0V	-Vout
8	No Pin	0V
9	+Vout	+Vout



APPLICATION CIRCUIT

If it is required to further reduce input and output ripple, a filter capacitor can be connected to the input and output terminals, see Fig. 1 & 2. Moreover, choosing suitable filter capacitor is very important, start-up problems may be caused by too large capacitance. To ensured the modules running well, the recommended capacitive load values as shown in Tables 1 & 2.

Figure 1
Single Output Models

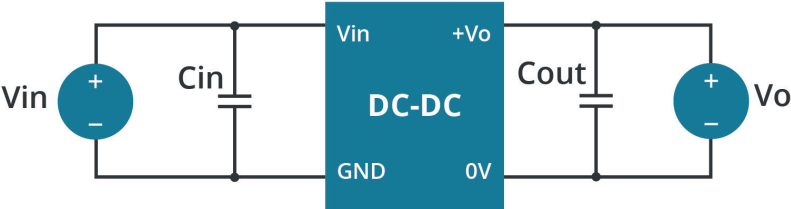


Table 1

Vin (Vdc)	Cin (μF/V)	Vo (Vdc)	Cout (μF/V)
12	10μF/25V	5	10μF/16V
15	4.7μF/25V	9	10μF/16V
24	2.2μF/50V	12	2.2μF/25V
-	-	15	1μF/25V
-	-	24	0.47μF/50V

Figure 2
Dual Output Models

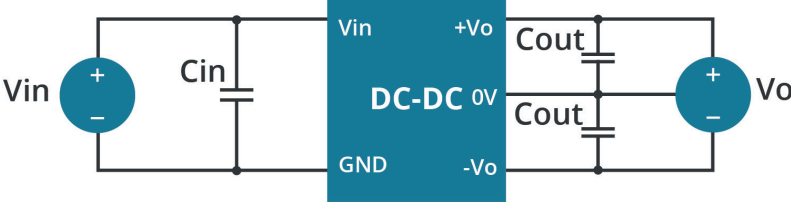


Table 2

Vin (Vdc)	Cin (μF/V)	Vo (Vdc)	Cout (μF/V)
12	10μF/25V	-	-
15	4.7μF/25V	±5, ±9	4.7μF/16V
24	2.2μF/50V	±12, ±15	1μF/25V

EMC CLASS B RECOMMENDED CIRCUIT

15, 24 V INPUT MODELS

Figure 3

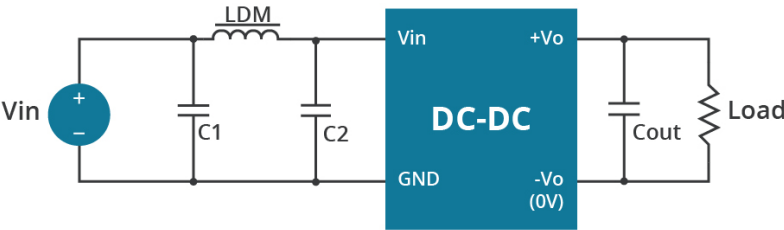


Table 3

Recommended External Circuit Components	
Vin	15, 24 V
C1/C2	4.7 μF / 50 V
Cout	refer to Cout in Tables 1, 2
LDM	22 μH

EMC CLASS B RECOMMENDED CIRCUIT (CONTINUED)

12, 15, 24 V INPUT MODELS

Figure 4

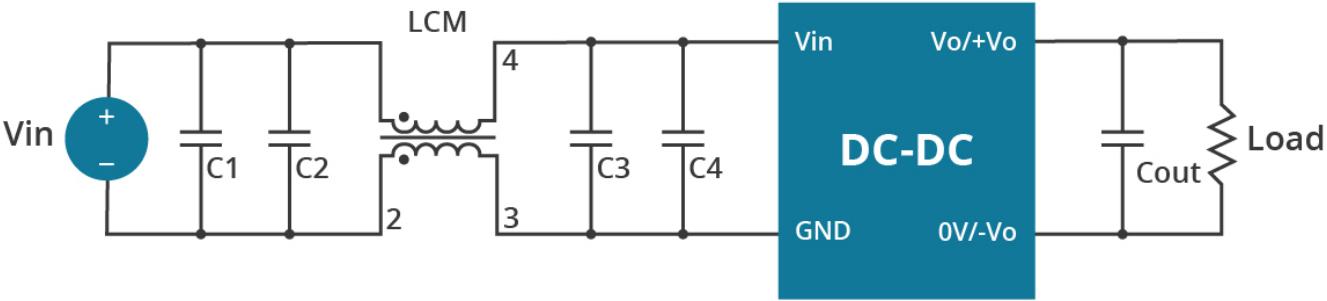


Table 4

Recommended External Circuit Components		
V_{in}	12, 15, 24 V	
$C1/C2$	4.7 μF / 50 V	
$C3$	dual 24V outputs	100 μF / 50 V
	all other outputs	4.7 μF / 50 V
$C4$	dual 24V outputs	--
	all other outputs	4.7 μF / 50 V
C_{out}	refer to C_{out} in Tables 1, 2	
LCM	22 μH	

Minimum Output Load Requirement

For a reliable and efficient operation of the converter, the minimum load should never be less than 10% of the rated output load. If the total required output power is below 10%, a parallel bleeding resistor is required on the output, ensuring that the sum of the power consumption is always maintained at 10% minimum.

REVISION HISTORY

rev.	description	date
1.0	initial release	09/06/2023
1.01	table 4 updated	09/26/2023

The revision history provided is for informational purposes only and is believed to be accurate.



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