

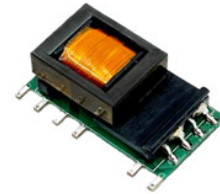
# PNR15S Series

15W, Open Frame, SIP Package AC/DC Power Converters



## Features

- Rated power: 15W Max.
- Universal input: 85~305VAC, 47~63Hz
- Regulated single output
- Isolation voltage 4000VAC
- Typical efficiency 75 ... 85%
- Energy saving, standby power only 0.1W
- Operating temperature range: -40~+85°C
- RoHS compliance
- Compact SIP package
- Over voltage, over current, and short circuit protection
- Meet IEC/EN/UL 62368-1, IEC/EN 61558, IEC/EN 60335 CISPR32, EN55032 Class B
- 3 year warranty



## Overview

PNR15S series are compact size and open frame AC/DC power converters, designed for energy meters, and high reliability industrial applications. They feature wide input voltage range 85~305VAC, low stand by power consumption, high efficiency, and class II reinforced insulation. They are designed to meet IEC/EN/UL62368-1, EN60335-1, EN61558-1, UKCA and EMC performance meets CISPR32, EN55032 Class B with external components, ideally suitable for industrial, and critical commercial applications.

## Model Numbers

Model Number	Input Voltage [VAC]	Output Voltage [VDC]	Output Current [mA] Max.	Ripple & Noise [mVp-p] Max.	Efficiency [%] Typ.	Capacitive Load [uF] Max.
PNR15S-033	85~305VAC 100~430VDC	3.3	3,000	100	75	5000
PNR15S-050		5	2,800	100	77	5000
PNR15S-090		9	1,670	100	82	4000
PNR15S-120		12	1,250	100	84	2000
PNR15S-150		15	1,000	100	84	1000
PNR15S-240		24	625	100	85	680

\* Only typical models are listed, other models may be available, upon request.

## Electrical Specifications

Unless otherwise indicated, specifications are measured at  $T_A=25^{\circ}\text{C}$ , humidity<75%, nominal input voltage and rated output load.

Parameters	Condition	Min.	Typ.	Max.	Unit	Note
Input voltage range	AC in	85	-	305	VAC	
	DC in	100	-	430	VDC	
Input frequency		47	-	63	Hz	
Nominal input voltage		100	-	277	VAC	

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## Electrical Specifications

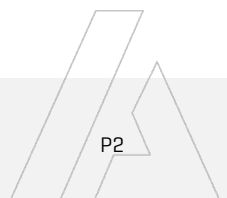
Unless otherwise indicated, specifications are measured at  $T_A=25^{\circ}\text{C}$ , humidity<75%, nominal input voltage and rated output load.

Parameters	Condition	Min.	Typ.	Max.	Unit	Note
Input current	115VAC 230VAC	-	-	0.40 0.25	A	
Inrush current Cold start	115VAC 230VAC	-	18 35	-	A	
Leakage current	277VAC/50HZ			0.25	mA RMS	
Output voltage accuracy $I_{OUT}=10\%\sim 100\%$ of $I_{OUT, rated}$		-	$\pm 1$	$\pm 3$	%	
Line regulation Full load	$V_{OUT}=3.3\text{V}$ Others	-	$\pm 2.5$ $\pm 1.5$	-	%	
Load regulation $I_{OUT}=0\%\sim 100\%$ of $I_{OUT, rated}$		-	$\pm 3$	-	%	
Ripple and noise 20MHz bandwidth, peak to peak		-	80	150	mV	
Standby power consumption	230VAC	-	0.1	0.25	W	
Temperature coefficient		-	$\pm 0.15$	-	%/ $^{\circ}\text{C}$	
Hold-up time	115VAC 230VDC	-	8 40	-	mS	
Minimum load		0	-	-	%	
Over current protection	Automatic recovery	110	-	-	% $I_{OUT}$	
Over voltage protection Hiccup or clamping by Zener diode	$V_{OUT}=3.3, 5\text{V}$ $V_{OUT}=9\text{V}$ $V_{OUT}=12\text{V}$ $V_{OUT}=15\text{V}$ $V_{OUT}=24\text{V}$	-	-	9 12 16 20 30	VDC	
Short circuit protection	Automatic recovery	Continuous, hiccup mode				
Recommended external fuse		1A, slow blow, required				

\* Ripple and noise measured at 20MHz of bandwidth by using a 12" twisted pair-wire terminated with a 1uF ceramic capacitor and a 10uF electrolytic capacitor in parallel.

## General Specifications

Parameters	Condition	Min.	Typ.	Max.	Unit	Note
Isolation voltage 1 minute, leakage current 5mA max	Input to Output	4000	-	-	VAC	
Insulation resistance 500VDC	Input to Output	100			M Ohm	



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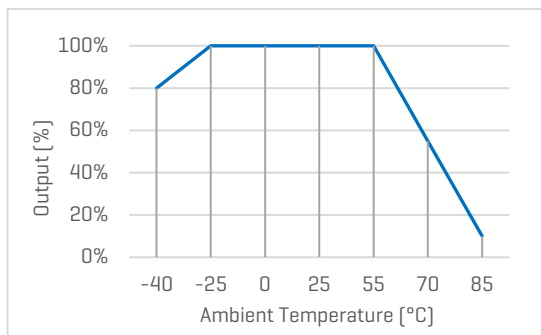
## General Specifications

Parameters	Condition	Min.	Typ.	Max.	Unit	Note
Operating temperature range	See "Derating Curve"	-40	-	85	°C	
Storage temperature		-40	-	105	°C	
Storage humidity		-	-	95	%RH	
Switching frequency		-	65	-	KHz	
Soldering temperature	Wave	-	260	-	°C	
	Manual	-	360	-	°C	
Cooling method		Free air convection				
Safety class		Class II, no FG				
MTBF	MIL-HDBK-217F	>1,000,000 Hours, 25°C				
Design based on standards		IEC/EN/UL 62368, EN 60335, EN 61558, UKCA				
Safety certifications		IEC/EN 62368-1				
<b>EMC</b> [1] With External Circuit as shown in "Figure 1" [2] With External Circuit as shown in "Figure 2"	CE	CISPR32, EN55032 Class B, [2]				
	ESD	IEC/EN61000-4-2, Contact ±6kV, Air ±8kV, Criteria B				
	RS	IEC/EN61000-4-3, 10V/m, Criteria A				
	EFT	IEC/EN61000-4-4, ±2kV, Criteria B, [1]				
	EFT	IEC/EN61000-4-4, ±4kV, Criteria B, [2]				
	Surge	IEC/EN61000-4-5, Line to Line ±1kV, Criteria B, [1]				
	Surge	IEC/EN61000-4-5, Line to Line ±2kV, Criteria B, [2]				
CS	IEC/EN61000-4-6, 10Vrms, Criteria A					
Size, and Weight	Default package	32.0x14.5x20mm, 10g Typ.				

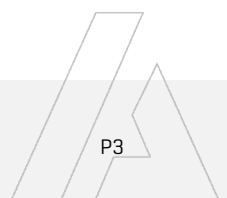
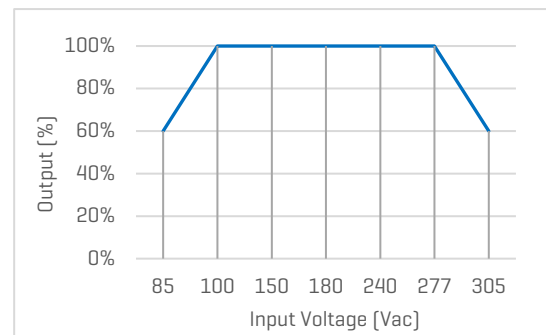
## Characteristic Curves

### Derating Curves

Output vs Ambient Temperature



Output vs Input Voltage



## Recommended External Circuits

### Typical External Circuit

\*This circuit is the basic design reference, components with "\*" are required for the converter's operating.

\*FUSE\* to be 1A, 300V, slow blow and is also required for safety, R1\* is 6.8 Ohm, 3W, wire-wound resistor

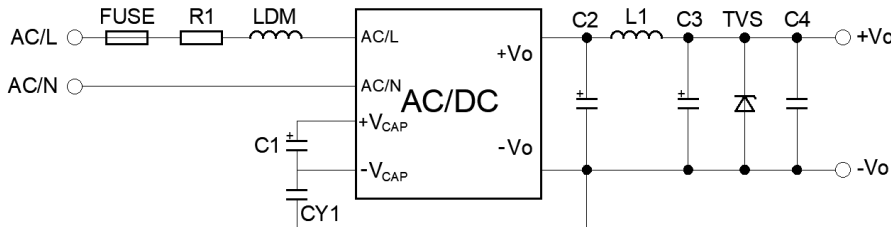


Figure 1. Typical external circuit

### Recommended Component Spec [Table 1]

V <sub>OUT</sub> [V]	C1*	C2*	C3*	C4	CY1*	LDM*	TVS
3.3, 5	33uF, 450V	1000uF, 16V	470uF, 25V	0.1uF, 50V	2.2nF, 400VAC	2.2uH, 6.5A	SMBJ7.0A
9, 12	33uF, 450V	470uF, 25V	220uF, 25V	0.1uF, 50V	1nF, 400VAC	2.2uH, 6.5A	SMBJ12A
15, 24	33uF, 450V	470uF, 35V	150uF, 35V	0.1uF, 50V	1nF, 400VAC	3.3uH, 5A	SMBJ20A

### Circuit for EMC Enhancement

\*This application circuit is recommended for EMC enhancement. It is not mandatory if this is not critical in the application.

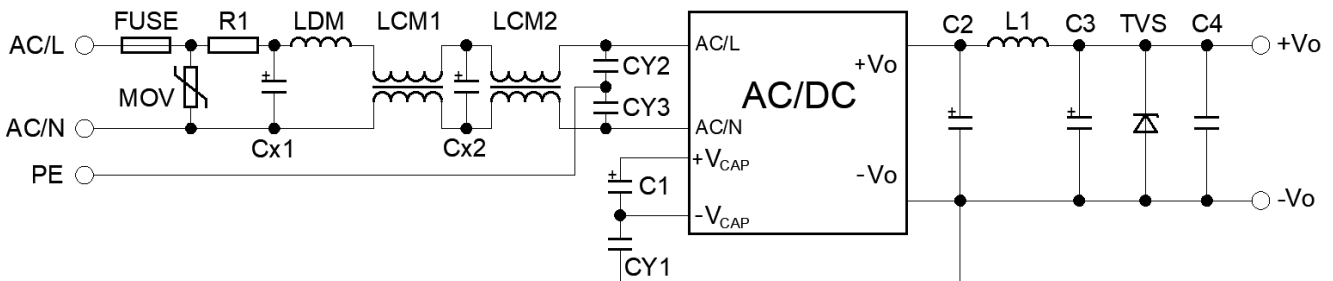


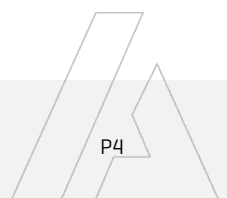
Figure 2. External circuit design for EMC enhancement

### Recommended Component Spec [Table 2]

Item	FUSE*	MOV	Cx1, Cx2	LDM	LCM1	LCM2	CY1, CY2, CY3
Spec	2A, 300V	S14K350	0.1uF, 310VAC	2.2mH, 0.4A	200uH, 0.8A	12.6mH, 0.5A min.	1nF, 400VAC

\*Components above with "\*" are required for the converter's operating.

\*Refer to Table 1 for other components that not shown in Table 2

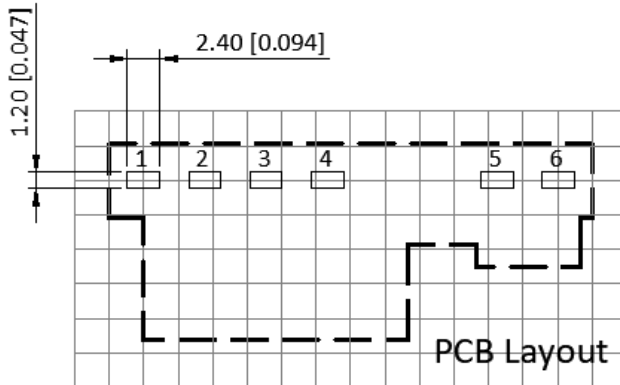
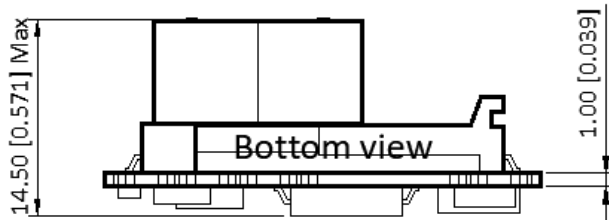
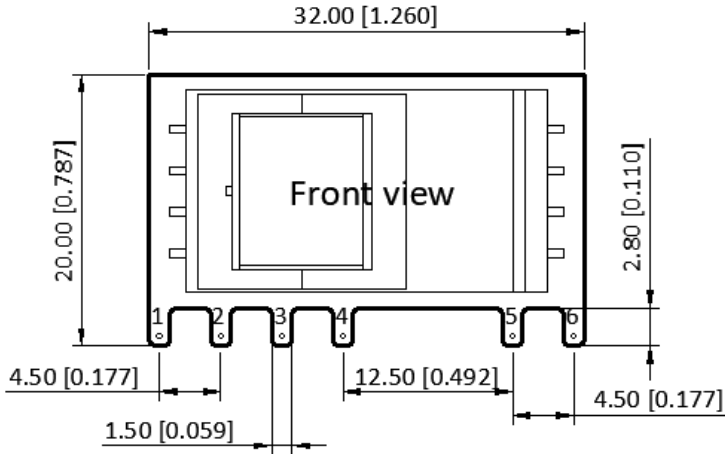


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## Mechanical Specifications



### Pin Definition

Pin #	Single Out
1	AC [L]
2	AC [N]
3	+V [CAP]
4	-V [CAP]
5	-V <sub>OUT</sub>
6	+V <sub>OUT</sub>

\* Unless otherwise specified unit: mm [inch]

\* General tolerance:  $\pm 1.00$  [ $\pm 0.040$ ]

\* Pin thickness:  $\pm 0.10$  [ $\pm 0.004$ ]

\* Footprint grid 2.54 x 2.54 mm

