FEATURES





- Fe base metal material core provides large saturation current.
- Metallization on ferrite core results in excellent shock resistance and damage-free durability.
- Closed magnetic circuit design reduces leakage flux and Electro Magnetic Interference (EMI).
- Low DCR decreases power loss, small and slim take up less PCB real estate.
- Automatic production ensures high quality and consistency.
- Operating Temp：-45℃~+125℃(Including self heating).

APPLICATIONS

- Smart phone, set top box, VR, AR.
- Notebooks, desktop computers, servers.
- Portable gaming devices, personal navigation systems, personal multimedia devices.

PART NUMBERING

PNR	4020	-	2R2	M
①	②		③	④

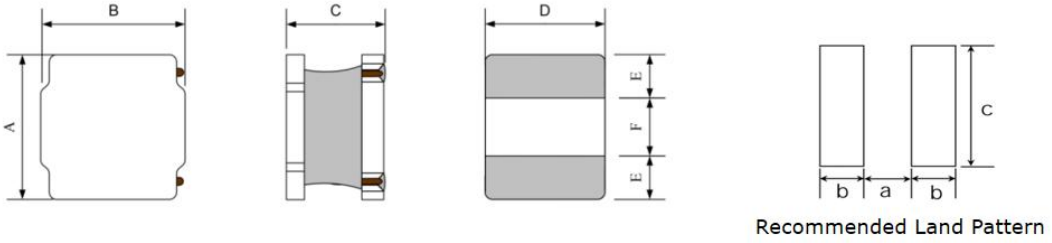
① Series Name	
PNR	Alloy Wire Wound SMD Power Inductors

② External Dimensions[LxWxH mm]	
201610	2.0×1.6×1.0
252010	2.5×2.0×1.0
252012	2.5×2.0×1.2
3012	3.0×3.0×1.2
3015	3.0×3.0×1.5
4012	4.0×4.0×1.2
4020	4.0×4.0×2.0

③ Nominal Inductance	
Code (example)	Nominal Inductance［μH］
R47	0.47
1R0	1.0
100	10

④ Inductance Tolerance	
M	±20%
N	±30%

DIMENSIONS & RECOMMENDED LAND PATTERN



Recommended Land Pattern

Unit: mm

Dimensions							Recommended Land Pattern		
Series	A	B	C	D	E	F	a	b	c
			Max.		Typ.	Typ.	Typ.		
PNR201610	2.0±0.3	1.6±0.3	1.05	1.2±0.2	0.6	0.8	0.70	0.70	1.40
PNR252010	2.5±0.3	2.0±0.3	1.00	2.0±0.2	0.8	0.9	0.70	1.00	2.20
PNR252012	2.5±0.3	2.0±0.3	1.20	2.0±0.2	0.8	0.9	0.70	1.00	2.20
PNR3012	3.0±0.2	3.0±0.2	1.35	2.5±0.2	0.9	1.2	1.00	1.10	2.70
PNR3015	3.0±0.2	3.0±0.2	1.50	2.5±0.2	0.9	1.2	1.00	1.10	2.70
PNR4012	4.0±0.2	4.0±0.2	1.20	3.4±0.2	1.0	2.0	1.80	1.20	3.60
PNR4020	4.0±0.2	4.0±0.2	2.00	3.3±0.2	1.0	2.0	1.80	1.20	3.50

ELECTRICAL CHARACTERISTICS

● PNR201610 Series

Part Number	Inductance	Inductance Tolerance	DC Resistance	Heat Rating Current		Saturation Current	
	@1MHz,1V		Max.	Max.	Typ.	Max.	Typ.
Units	μH	-	Ω	A		A	
Symbol	L	-	DCR	Irms		Isat	
PNR201610-R24☐	0.24	M,N	0.040	3.00	3.45	4.50	5.50
PNR201610-R33☐	0.33	M,N	0.049	2.70	3.10	4.40	5.20
PNR201610-R47☐	0.47	M,N	0.049	2.70	3.10	4.00	4.70
PNR201610-R68☐	0.68	M,N	0.065	2.50	2.80	3.50	4.00
PNR201610-1R0☐	1.0	M,N	0.095	2.00	2.30	3.30	3.80
PNR201610-1R5☐	1.5	M,N	0.130	1.70	2.00	1.95	2.30
PNR201610-2R2M	2.2	M	0.180	1.40	1.60	1.90	2.15
PNR201610-3R3M	3.3	M	0.307	1.10	1.30	1.40	1.60
PNR201610-4R7M	4.7	M	0.425	0.90	1.00	1.10	1.40
PNR201610-6R8M	6.8	M	0.620	0.70	0.82	0.95	1.10
PNR201610-8R2M	8.2	M	0.870	0.66	0.76	0.86	1.00
PNR201610-100M	10	M	0.875	0.60	0.70	0.80	0.95

ELECTRICAL CHARACTERISTICS

● PNR252010 Series

Part Number	Inductance	Inductance Tolerance	DC Resistance	Heat Rating Current		Saturation Current	
	@1MHz,1V		Max.	Max.	Typ.	Max.	Typ.
Units	μH	-	Ω	A		A	
Symbol	L	-	DCR	Irms		Isat	
PNR252010-R24☐	0.24	M,N	0.033	3.70	4.50	6.10	7.10
PNR252010-R33☐	0.33	M,N	0.039	3.50	4.05	4.80	5.50
PNR252010-R47☐	0.47	M,N	0.045	3.20	3.60	4.40	5.20
PNR252010-R68☐	0.68	M,N	0.059	2.75	3.20	3.20	3.60
PNR252010-1R0☐	1.0	M,N	0.085	2.20	2.60	3.10	4.00
PNR252010-1R5☐	1.5	M,N	0.106	2.00	2.30	2.60	3.00
PNR252010-2R2M	2.2	M	0.155	1.50	1.80	1.90	2.20
PNR252010-3R3M	3.3	M	0.252	1.20	1.40	1.60	1.80
PNR252010-4R7M	4.7	M	0.340	1.00	1.10	1.30	1.50
PNR252010-6R8M	6.8	M	0.480	0.95	1.00	1.00	1.15
PNR252010-100M	10	M	0.740	0.65	0.75	0.90	1.00

● PNR252012 Series

Part Number	Inductance	Inductance Tolerance	DC Resistance	Heat Rating Current		Saturation Current	
	@1MHz,1V		Max.	Max.	Typ.	Max.	Typ.
Units	μH	-	Ω	A		A	
Symbol	L	-	DCR	Irms		Isat	
PNR252012-R24☐	0.24	M,N	0.023	4.05	4.70	6.50	7.80
PNR252012-R33☐	0.33	M,N	0.035	3.70	4.30	5.35	6.30
PNR252012-R47☐	0.47	M,N	0.035	3.45	4.00	4.90	5.60
PNR252012-R68☐	0.68	M,N	0.045	3.10	3.60	3.80	4.50
PNR252012-1R0☐	1.0	M,N	0.054	3.00	3.40	3.60	4.00
PNR252012-1R5☐	1.5	M,N	0.100	2.40	2.80	2.90	3.50
PNR252012-2R2M	2.2	M	0.120	1.90	2.15	2.60	3.00
PNR252012-3R3M	3.3	M	0.215	1.50	1.80	1.70	2.10
PNR252012-4R7M	4.7	M	0.260	1.25	1.45	1.60	1.90
PNR252012-5R6M	5.6	M	0.336	1.10	1.20	1.30	1.40
PNR252012-6R8M	6.8	M	0.366	0.95	1.10	1.20	1.40
PNR252012-8R2M	8.2	M	0.460	0.88	1.06	1.15	1.36
PNR252012-100M	10	M	0.480	0.85	1.00	1.10	1.35
PNR252012-150M	15	M	1.000	0.60	0.70	0.77	0.90
PNR252012-220M	22	M	1.090	0.55	0.65	0.60	0.75

ELECTRICAL CHARACTERISTICS

● PNR3012 Series

Part Number	Inductance	Inductance Tolerance	DC Resistance	Heat Rating Current		Saturation Current	
	@1MHz,1V		Max.	Max.	Typ.	Max.	Typ.
Units	μH	-	Ω	A		A	
Symbol	L	-	DCR	Irms		Isat	
PNR3012-R47☐	0.47	M,N	0.033	3.90	4.30	6.80	8.00
PNR3012-1R0☐	1.0	M,N	0.054	2.70	3.10	4.20	5.20
PNR3012-1R5☐	1.5	M,N	0.074	2.50	2.90	3.40	4.10
PNR3012-2R2M	2.2	M	0.108	2.05	2.35	2.80	3.35
PNR3012-3R3M	3.3	M	0.155	1.70	2.00	2.20	2.60
PNR3012-4R7M	4.7	M	0.235	1.30	1.50	2.00	2.20
PNR3012-6R8M	6.8	M	0.340	1.10	1.25	1.60	1.90
PNR3012-100M	10	M	0.474	1.00	1.15	1.20	1.45

● PNR3015 Series

Part Number	Inductance	Inductance Tolerance	DC Resistance	Heat Rating Current		Saturation Current	
	@1MHz,1V		Max.	Max.	Typ.	Max.	Typ.
Units	μH	-	Ω	A		A	
Symbol	L	-	DCR	Irms		Isat	
PNR3015-R24☐	0.24	M,N	0.022	3.00	3.50	5.50	6.00
PNR3015-R33☐	0.33	M,N	0.035	4.00	4.50	9.00	10.0
PNR3015-R47☐	0.47	M,N	0.040	3.50	4.00	7.50	8.00
PNR3015-1R0☐	1.0	M,N	0.048	3.30	3.80	5.80	7.00
PNR3015-1R5☐	1.5	M,N	0.072	2.20	2.70	4.60	5.50
PNR3015-2R2M	2.2	M	0.115	2.00	2.30	4.00	4.50
PNR3015-3R3M	3.3	M	0.175	2.00	2.50	3.40	4.00
PNR3015-4R7M	4.7	M	0.215	1.80	2.40	3.00	3.30
PNR3015-6R8M	6.8	M	0.290	1.50	2.00	2.00	2.50
PNR3015-100M	10	M	0.460	1.50	2.00	1.50	2.00
PNR3015-150M	15	M	0.850	1.00	1.20	1.40	1.80
PNR3015-220M	22	M	0.975	0.75	0.90	1.15	1.40
PNR3015-470M	47	M	1.880	0.45	0.58	0.65	0.88

ELECTRICAL CHARACTERISTICS

- PNR4012 Series

Part Number	Inductance	Inductance Tolerance	DC Resistance	Heat Rating Current		Saturation Current	
	@1MHz,1V		Max.	Max.	Typ.	Max.	Typ.
Units	μH	-	Ω	A		A	
Symbol	L	-	DCR	Irms		Isat	
PNR4012-R33☐	0.33	M,N	0.032	4.30	4.90	10.3	11.5
PNR4012-R47☐	0.47	M,N	0.041	3.50	4.40	7.00	9.90
PNR4012-R68☐	0.68	M,N	0.041	3.20	4.40	5.50	6.35
PNR4012-1R0☐	1.0	M,N	0.059	3.00	3.70	5.00	6.60
PNR4012-1R2☐	1.2	M,N	0.059	3.20	3.70	4.00	4.80
PNR4012-1R5☐	1.5	M,N	0.070	2.90	3.30	3.90	4.60
PNR4012-2R2M	2.2	M	0.079	2.70	3.10	2.80	3.30
PNR4012-3R3M	3.3	M	0.125	2.10	2.50	2.80	3.30
PNR4012-4R7M	4.7	M	0.166	1.90	2.20	2.30	2.60
PNR4012-6R8M	6.8	M	0.226	1.60	1.85	1.60	2.20
PNR4012-100M	10	M	0.335	1.30	1.50	1.55	1.85
PNR4012-150M	15	M	0.632	0.90	1.25	1.20	1.60
PNR4012-220M	22	M	0.679	0.90	1.05	1.05	1.30

- PNR4020 Series

Part Number	Inductance	Inductance Tolerance	DC Resistance	Heat Rating Current		Saturation Current	
	@1MHz,1V		Max.	Max.	Typ.	Max.	Typ.
Units	μH	-	Ω	A		A	
Symbol	L	-	DCR	Irms		Isat	
PNR4020-R22☐	0.22	M,N	0.013	8.20	9.50	18.7	22.0
PNR4020-R47☐	0.47	M,N	0.022	6.40	7.40	13.4	15.5
PNR4020-R68☐	0.68	M,N	0.022	6.40	7.40	8.70	11.1
PNR4020-1R0☐	1.0	M,N	0.026	5.80	6.70	8.70	11.1
PNR4020-1R5☐	1.5	M,N	0.036	5.20	6.00	7.70	9.60
PNR4020-2R2M	2.2	M	0.048	4.30	5.00	6.10	7.60
PNR4020-3R3M	3.3	M	0.072	3.45	4.00	4.70	5.90
PNR4020-4R7M	4.7	M	0.108	2.85	3.30	4.00	4.90
PNR4020-6R8M	6.8	M	0.156	2.40	2.80	3.00	4.20
PNR4020-100M	10	M	0.216	2.00	2.35	2.80	3.50
PNR4020-220M	22	M	0.545	0.95	1.10	1.30	1.50
PNR4020-330M	33	M	0.850	0.70	0.86	1.20	1.40
PNR4020-470M	47	M	1.200	0.56	0.66	1.10	1.30

- All test data is referenced to 20°C ambient.
- Rated current: Isat or Irms, whichever is smaller.
- Isat: DC current at which the inductance drops approximate 30% from its value without current.
- Irms: DC current that causes the temperature rise (△T =40°C) from 20°C ambient.
- PNR2016 & PNR2520 & PNR3012 & PNR3015 size inductors,absolute maximum voltage DC 25V;
  For PNR4012 & PNR4020 size inductors,absolute maximum voltage DC 40V;

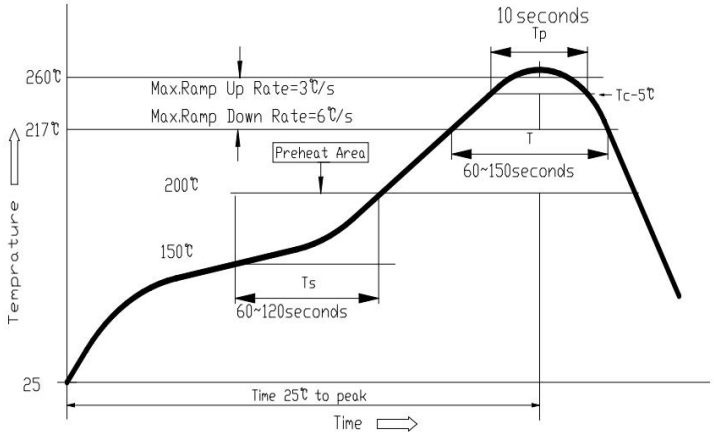
RELIABILITY TEST

PNR40 Series

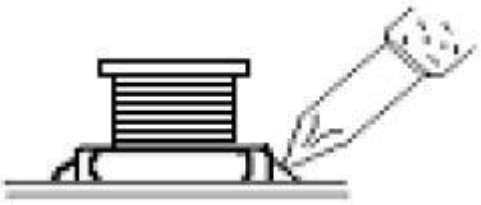
Item	Requirements	Test Methods and Remarks
Low temperature storage	Inductance shall be within ±10% of the initial value.	Placed at -40℃ for 500 hours, then measured at room ambient temperature after placing 24hours
High temperature storage	Inductance shall be within ±10% of the initial value.	Placed at +125℃ for 500 hours, then measured at room ambient temperature after placing 24 hours
Thermal shock	Inductance shall be within ±10% of the initial value.	Condition for 1 cycle: -40℃,30min.~+125℃,30min Number of cycles:5
Humidity resistance	Inductance shall be within ±10% of the initial value. Insulation resistance > 100MΩ at DC.	Placed at 90 to 95%RH,+50℃ for 500 hours, then measured at room ambient temperature after placing 24 hours.
Drop	Inductance shall be within ±10% of the initial value.	Drop specimen three times on concrete floor from a height of 1 meter which mounted on test board.
Vibration	Inductance shall be within ±10% of the initial value.	Frequency:10~55~10Hz Amplitude:1.5mm or 10G Sweep time: 1 oct/min Test Directions: X,Y,Z Test Time: 2 hours each direction.
Terminal strength	No detachment of terminal pin and no breakage of wire.	Add static load 4.9N(500gf) to inductor through hole of test board for 10±2 sec.
Soldering heat resistance	Inductance shall be within ±10% of the initial value. Apperance: No damage.	Dip Inductor's terminal in solder bath of following conditions: 1) 260±5℃, 10±1 sec, 2) 350±10℃, 3.5±0.5 sec

RECOMMENDED SOLDERING TECHNOLOGIES

- Soldering Materials.
- ☆ Solder:Sn-3.0Ag-0.5Cu.
- ☆ Flux:Use rosin-based flux,but not strongly acidic flux (with xhlorine exceeding 0.2wt%).Do not use water-soluble flux.
- Reflow Soldering Profile.

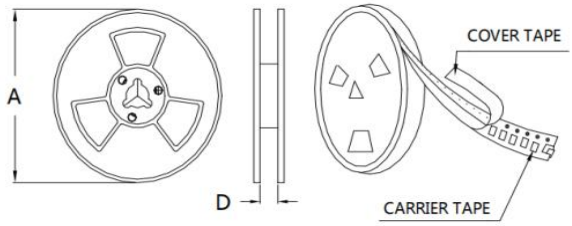


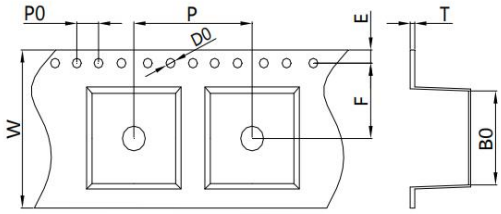
- Reflow Soldering Profile.
- ☆ Reworking with electric soldering iron must preheating at 150℃ for 1 minute is required,and do not directly touch the core with the tip of the soldering iron.The reworking soldering conditions are as follows.
- Temperature of soldering iron tip:350℃;
- Soldering iron power output:≤30W;
- Diameter of soldering iron end:≤1.0mm;
- Soldering time:＜3 s;



PACKAGING

- Packaging (unit: mm)

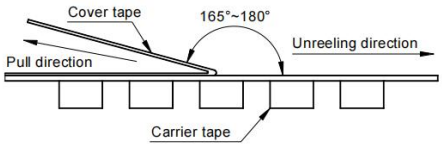




Size	A	D
201610	Φ178+2.0	8.5
252010	Φ178+2.0	8.5
252012	Φ178+2.0	8.5
3012	Φ178+2.0	8.5
3015	Φ178+2.0	8.5
4012	Φ330+2.0	12.4
4020	Φ330+2.0	12.4

Size	Item	W	B0	P	T	E	F	D0	P0
				±0.1		±0.1	±0.1	±0.1	
201610	(mm)	8.0±0.1	2.20±0.1	4.0	0.25±0.1	1.75	3.50	1.50	4.0±0.1
252010	(mm)	8.0±0.3	2.65±0.2	4.0	0.25±0.1	1.75	3.50	1.50	4.0±0.2
252012	(mm)	8.0±0.3	2.65±0.2	4.0	0.25±0.1	1.75	3.50	1.50	4.0±0.2
3012	(mm)	8.0±0.3	3.30±0.15	4.0	0.30±0.1	1.75	3.50	1.50	4.0±0.1
3015	(mm)	8.0±0.3	3.30±0.15	4.0	0.30±0.1	1.75	3.50	1.50	4.0±0.1
4012	(mm)	12.0±0.3	4.30±0.1	8.0	0.30±0.05	1.75	5.50	1.50	4.0±0.1
4020	(mm)	12.0±0.3	4.30±0.1	8.0	0.30±0.05	1.75	5.50	1.50	4.0±0.1

- Peel-off strength:10～100gf.
- Peel-off angle:165°-180°.
- Peel-off speed:300mm/min.



- Carton Dimensions and Packing Quantity:

Product Series	Quantity / Reel
PNR201610	2000Pcs
PNR252010	2000Pcs
PNR252012	2000Pcs
PNR3012	2000Pcs
PNR3015	2000Pcs
PNR4012	4500Pcs
PNR4020	3000Pcs

PRECAUTIONS ON USE

- Precautions.

- 1.Surface mounting

☆ Mounting and soldering condition should be checked beforehand.

☆ Applicable soldering process to this product is reflow soldering only.

☆ Recommended conditions for repair by soldering iron:

Preheat the circuit board with product to repair at 150℃ for about 1 minute.
Put soldering iron on the land-pattern.
Soldering iron's temperature: 350℃ maximum/Duration: 3 seconds maximum/1 time for each terminal.
The soldering iron should not directly touch the inductor.
Product once removes from the circuit board may not be used again.Put soldering iron on the land-pattern.

- 2.Handing

☆ Keep the products away from all magnets and magnetic objects.

☆ Be careful not to subject the products to excessive mechanical shocks.

☆ Please avoid applying impact to the products after mounted on pc board.

☆ Avoid ultrasonic cleaning.

- 3.Storage

☆ To maintain the solderability of terminal electrodes and to keep the packing material in good condition, temperature and humidity in the storage area should be controlled.

☆ Recommended conditions: -10℃~40℃, 70%RH (Max.)

☆ Even under ideal storage conditions, solderability of products electrodes may decrease as time passes. For this reason, product should be used with one year from the time of delivery.

☆ In case of storage over 6 months, solderability shall be checked before actual usage.

- 4.Guarantee

☆ The guaranteed operating conditions of the products are in accordance with the conditions specified in this specification.

☆ Please note that APV takes no responsibility for any failure and/or abnormality which is caused by use under other than the aforesaid operating conditions.

SAFETY REMINDERS

SAFETY REMINDERS

● All products listed in this specification are developed, designed and intended for use in general electronics equipment. The products are not designed or Warranted to meet the requirements of the applications listed below, whose performance and/or quality require especially high reliability, or whose failure, malfunction or trouble might directly cause damage to society, person, or property. Please understand that we are not responsible for any damage or liability caused by use of the products in any of the applications below. Please contact us for more details if you intend to use our products in the following applications.

☆ 1.Aerospace/aviation equipment

☆ 2.Transportation equipment (cars, electric trains, ships, etc.)

☆ 3.Medical equipment

☆ 4.Power-generation control equipment

☆ 5.Atomic energy-related equipment

☆ 6.Seabed equipment

☆ 7.Transportation control equipment

☆ 8.Public information-processing equipment

☆ 9.Military equipment

☆ 10.Electric heating apparatus, burning equipment

☆ 11.Disaster prevention/crime prevention equipment

☆ 12.Safety equipment

☆ 13.Other applications that are not considered general-purpose applications

● When designing your equipment even for general-purpose applications, you are kindly requested to take into consideration securing protection circuit/device or providing backup circuits in your equipment.