SMD Power Inductor

HPC5020NF-Series

ECN HISTORY LIST

REV	DATE	DESCRIPTION	APPROVED	CHECKED	DRAWN
1.0	17/05/16	新發行	羅宜春	梁周虎	張光
備注					

SMD Power Inductor

HPC5020NF-Series

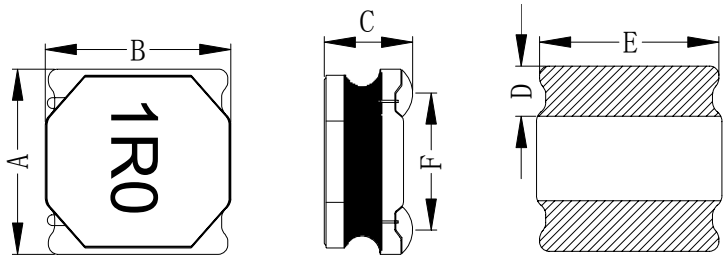
1. Features

1. This specification applies Low Profile Power Inductors.
2. 100% Lead(Pb) & Halogen-Free and RoHS compliant.

Halogen-free

Pb-free

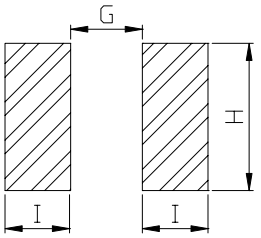
2. Dimension



Series	*A(mm)	*B(mm)	*C(mm)	D(mm)	E(mm)	F(mm)
HPC5020NF	5.0±0.2	5.0±0.2	1.8±0.2	1.3±0.2	4.7±0.2	3.7ref

*Dimensions are not including the termination. For maximum overall dimensions with ternmination , add 0.1mm.

Recommendend Land pattern



G(mm)	H(mm)	I(mm)
2.1	4.7	1.5

Note: 1. The above PCB layout reference only.
2. Recommend solder paste thickness at 0.12mm and above.

3. Part Numbering

HPC	5020	NF	-	1R0	Y
A	B	C		D	E

A: Series	
B: Dimension	A/B*C
C: Type	
D: Inductance	1R0=1.00uh 100=10uh,101=100uh,102=1000uh
E: Inductance Tolerance	K=±10%, L=±15%,M=±20%,Y=±30%.
	marking direction cannot decide polarity. Color: Black, unidirectional.
	magnetic shielding

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4. Specification

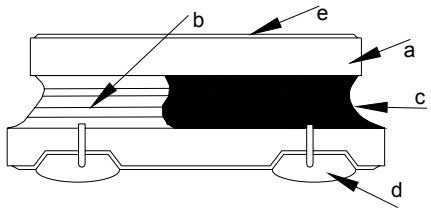
Part Number	Inductance L0 (uH) @ 0 A	Tolerance	Rated current				DCR (mΩ) @25℃ ±20%.
			Tempetature current I rms (A)		Saturation current I sat (A)		
			Typ	Max	Typ	Max	
HPC5020NF-1R0Y	1.00	±30%	4.10	3.90	5.00	4.80	20
HPC5020NF-1R2Y	1.20	±30%	3.80	3.60	4.80	4.60	20
HPC5020NF-1R5Y	1.50	±30%	3.50	3.30	4.50	4.30	25
HPC5020NF-2R2M	2.20	±20%	3.30	3.00	4.10	3.80	32
HPC5020NF-2R2Y	2.20	±30%	3.30	3.00	4.10	3.80	32
HPC5020NF-2R7M	2.70	±20%	3.00	2.70	3.80	3.50	38
HPC5020NF-3R3M	3.30	±20%	2.80	2.60	3.50	3.20	43
HPC5020NF-4R7M	4.70	±20%	2.40	2.20	2.70	2.50	60
HPC5020NF-5R6M	5.60	±20%	2.10	1.90	2.40	2.20	69
HPC5020NF-6R8M	6.80	±20%	1.90	1.70	2.10	1.80	90
HPC5020NF-8R2M	8.20	±20%	1.75	1.60	1.90	1.70	98
HPC5020NF-100M	10.0	±20%	1.60	1.50	1.70	1.50	110
HPC5020NF-120M	12.0	±20%	1.40	1.30	1.40	1.20	135
HPC5020NF-150M	15.0	±20%	1.25	1.10	1.30	1.10	165
HPC5020NF-180M	18.0	±20%	1.17	1.00	1.20	1.00	190
HPC5020NF-220M	22.0	±20%	1.10	0.90	1.10	0.90	225
HPC5020NF-330M	33.0	±20%	0.80	0.70	0.80	0.70	335
HPC5020NF-470M	47.0	±20%	0.70	0.60	0.70	0.60	460

Note:

1. All test data referenced to 25℃ ambient , Ls:100KHz/1V.
2. Testing Instrument(or equ) : L: HP4284A,CH11025,CH3302,CH1320,CH1320S LCR METER / Rdc:CH16502,Agilent33420A MICRO OHMMETER.
3. Heat Rated Current (Irms) will cause the coil temperature rise approximately ΔT of 40℃
4. Saturation Current (Isat) will cause L0 to drop approximately 30%.
5. The part temperature (ambient + temp rise) should not exceed 125℃under worst case operating conditions.Circuit design,component,PCB trace size and thickness,airflow and other cooling provisions all affect the part temperature. Part temperature should be verified in the end application.

7. Special inquiries besides the above common used types can be met on your requirement.

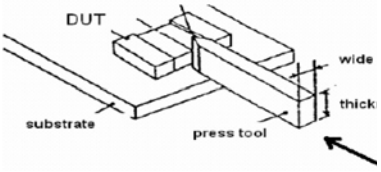
5. Material List



NO	Items	Materials
a	Core	Ferrite Core
b	Wire	Enameled Copper Wire
c	Glue	Epoxy with magnetic powder
d	Terminal	Ag/Ni/Sn+ Sn Solder
e	Ink	Halogen-free ketone

6. Reliability and Test Condition

Item	Performance	Test Condition
Operating temperature	-40~+125℃ (Including self - temperature rise)	
Storage temperature	1.-10~+40℃,50~60%RH (Product without taping) 2.-40~+125℃ (on board)	
Electrical Performance Test		
Inductance	Refer to standard electrical characteristics list.	HP4284A,CH11025,CH3302,CH1320,CH1320S LCR Meter.
DCR		CH16502,Agilent33420A Micro-Ohm Meter.
Saturation Current (Isat)	Approximately △L30%.	Saturation DC Current (Isat) will cause L0 to drop △L(%)
Heat Rated Current (Irms)	Approximately △T40℃	Heat Rated Current (Irms) will cause the coil temperature rise △T(℃) without core loss. 1.Applied the allowed DC current 2.Temperature measured by digital surface thermometer
Reliability Test		
Life Test	Appearance：No damage. Inductance：within±10% of initial value Q：Shall not exceed the specification value. RDC：within ±15% of initial value and shall not exceed the specification value	Preconditioning: Run through IR reflow for 2 times.(IPC/JEDEC J-STD-020DClassification Reflow Profiles) Temperature： 125±2℃(Inductor) Applied current：rated current Duration：1000±12hrs Measured at room temperature after placing for 24±2 hrs
Load Humidity		Preconditioning: Run through IR reflow for 2 times.(IPC/JEDEC J-STD-020DClassification Reflow Profiles Humidity：85±2% R.H, Temperature：85℃±2℃ Duration：1000hrs Min. with 100% rated current Measured at room temperature after placing for 24±2 hrs
Moisture Resistance		Preconditioning: Run through IR reflow for 2 times.(IPC/JEDEC J-STD-020DClassification Reflow Profiles 1. Baked at50℃ for 25hrs, measured at room temperature after placing for 4 hrs. 2. Raise temperature to 65±2℃ 90-100%RH in 2.5hrs, and keep 3 hours, cool down to 25℃ in 2.5hrs. 3. Raise temperature to 65±2℃ 90-100%RH in 2.5hrs, and keep 3 hours, cool down to 25℃ in 2.5hrs,keep at 25℃ for 2 hrs then keep at -10℃ for 3 hrs 4. Keep at 25℃ 80-100%RH for 15min and vibrate at the frequency of 10 to 55 Hz to 10 Hz, measure at room temperature after placing for 1~2 hrs.
Thermal shock		Preconditioning: Run through IR reflow for 2 times.(IPC/JEDEC J-STD-020DClassification Reflow Profiles Condition for 1 cycle Step1：-40±2℃ 30±5min Step2：25±2℃ ≦0.5min Step3：125±2℃ 30±5min Number of cycles： 500 Measured at room temperature after placing for 24±2 hrs
Vibration		Oscillation Frequency: 10～2K～10Hz for 20 minutes Equipment： Vibration checker Total Amplitude:1.52mm±10% Testing Time : 12 hours(20 minutes, 12 cycles each of 3 orientations)。

<table>
<tr><th>Item</th><th>Performance</th><th>Test Condition</th></tr>
<tr><td>Shock</td><td rowspan="2">Appearance：No damage.
Inductance：within±10% of initial value
Q：Shall not exceed the specification value.
RDC：within ±15% of initial value and shall not exceed the specification value</td><td>
<table>
<tr><th>Type</th><th>Peak value (g's)</th><th>Normal duration (D) (ms)</th><th>Wave form</th><th>Velocity change (Vi)ft/sec</th></tr>
<tr><td>SMD</td><td>50</td><td>11</td><td>Half-sine</td><td>11.3</td></tr>
<tr><td>Lead</td><td>50</td><td>11</td><td>Half-sine</td><td>11.3</td></tr>
</table>
</td></tr>
<tr><td>Bending</td><td>Shall be mounted on a FR4 substrate of the following dimensions: >=0805:40x100x1.2mm <0805:40x100x0.8mm
Bending depth: >=0805:1.2mm <0805:0.8mm
duration of 10 sec.</td></tr>
<tr><td>Solderability</td><td>More than 95% of the terminal electrode should be covered with solder。</td><td>Preheat: 150℃,60sec.。
Solder: Sn96.5% Ag3% Cu0.5%
Temperature: 245±5℃。
Flux for lead free: Rosin. 9.5%。
Dip time: 4±1sec。
Depth: completely cover the termination</td></tr>
<tr><td>Resistance to Soldering Heat</td><td rowspan="2">Appearance：No damage.
Inductance：within±10% of initial value
Q：Shall not exceed the specification value.
RDC：within ±15% of initial value and shall not exceed the specification value</td><td>Number of heat cycles: 1
<table>
<tr><th>Temperature (°C)</th><th>Time(s)</th><th>Temperature ramp/immersion and emersion rate</th></tr>
<tr><td>260 ±5(solder temp)</td><td>10 ±1</td><td>25mm/s ±6 mm/s</td></tr>
</table>
</td></tr>
<tr><td>Terminal Strength</td><td>Preconditioning: Run through IR reflow for 2 times.(IPC/JEDEC J-STD-020DClassification Reflow Profiles
With the component mounted on a PCB with the device to be tested, apply a force (>0805:1kg , <=0805:0.5kg)to the side of a device being tested. This force shall be applied for 60 +1 seconds. Also the force shall be applied gradually as not to apply a shock to the component being tested.
 
</td></tr>
</table>

Note : When there are questions concerning measurement result : measurement shall be made after 48 ± 2 hours of recovery under the standard condition.

8. Soldering and Mounting

(1) Soldering

Mildly activated rosin fluxes are preferred. The minimum amount of solder can lead to damage from the stresses caused by the difference in coefficients of expansion between solder, chip and substrate. TAIPAQ terminations are suitable for re-flow soldering systems. If hand soldering cannot be avoided, the preferred technique is the utilization of hot air soldering tools.

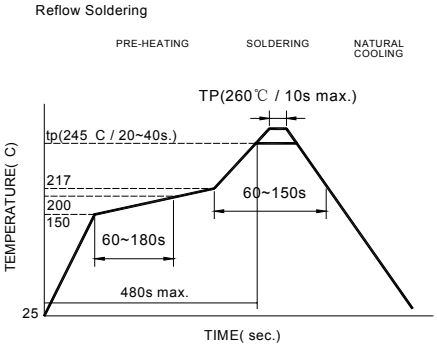
(2) Solder re-flow:

Recommended temperature profiles for re-flow soldering in Figure 1.

(3) Soldering Iron:

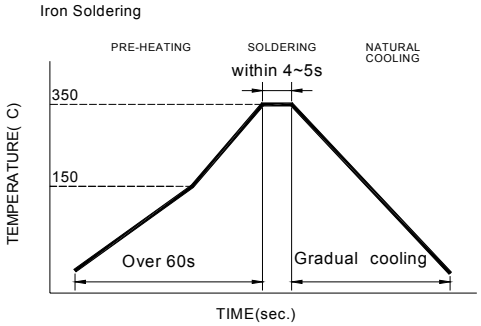
Products attachment with a soldering iron is discouraged due to the inherent process control limitations. In the event that a soldering iron must be employed the following precautions are recommended.

- Preheat circuit and products to 150℃
- Never contact the ceramic with the iron tip
- Use a 20 watt soldering iron with tip diameter of 1.0mm
- 355℃ tip temperature (max)
- 1.0mm tip diameter (max)
- Limit soldering time to 4~5sec.



Reflow times: 3 times max.

Fig.1

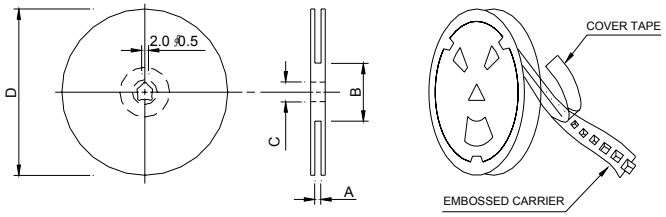


Iron Soldering times: 1 times max.

Fig.2

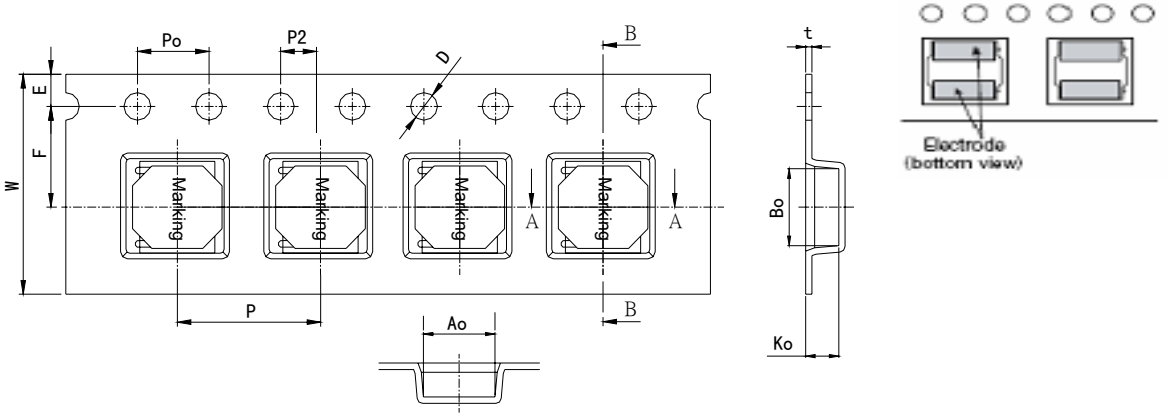
8. Packaging Information

(1) Reel Dimension



Type	A(mm)	B(mm)	C(mm)	D(mm)
13"x12mm	16.4+2/-0	80±2.0	13+0.5/-0.2	330±3.0

(2) Tape Dimension

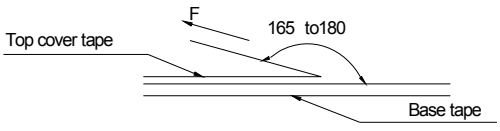


Series	Size	Bo(mm)	Ao(mm)	Ko(mm)	P(mm)	w(mm)	t(mm)	Emm)	F(mm)	D(mm)	Po(mm)	P2(mm)
HPC	5020	5.4±0.1	5.4±0.1	2.2±0.1	8.0±0.1	12±0.3	0.4±0.1	1.75±0.1	7.5±0.1	1.5±0.1	4.0±0.1	2.00±0.1

(3) Packaging Quantity

HPC	5020
Reel	2500
Inner box	5000
Carton	20000

(4) Tearing Off Force



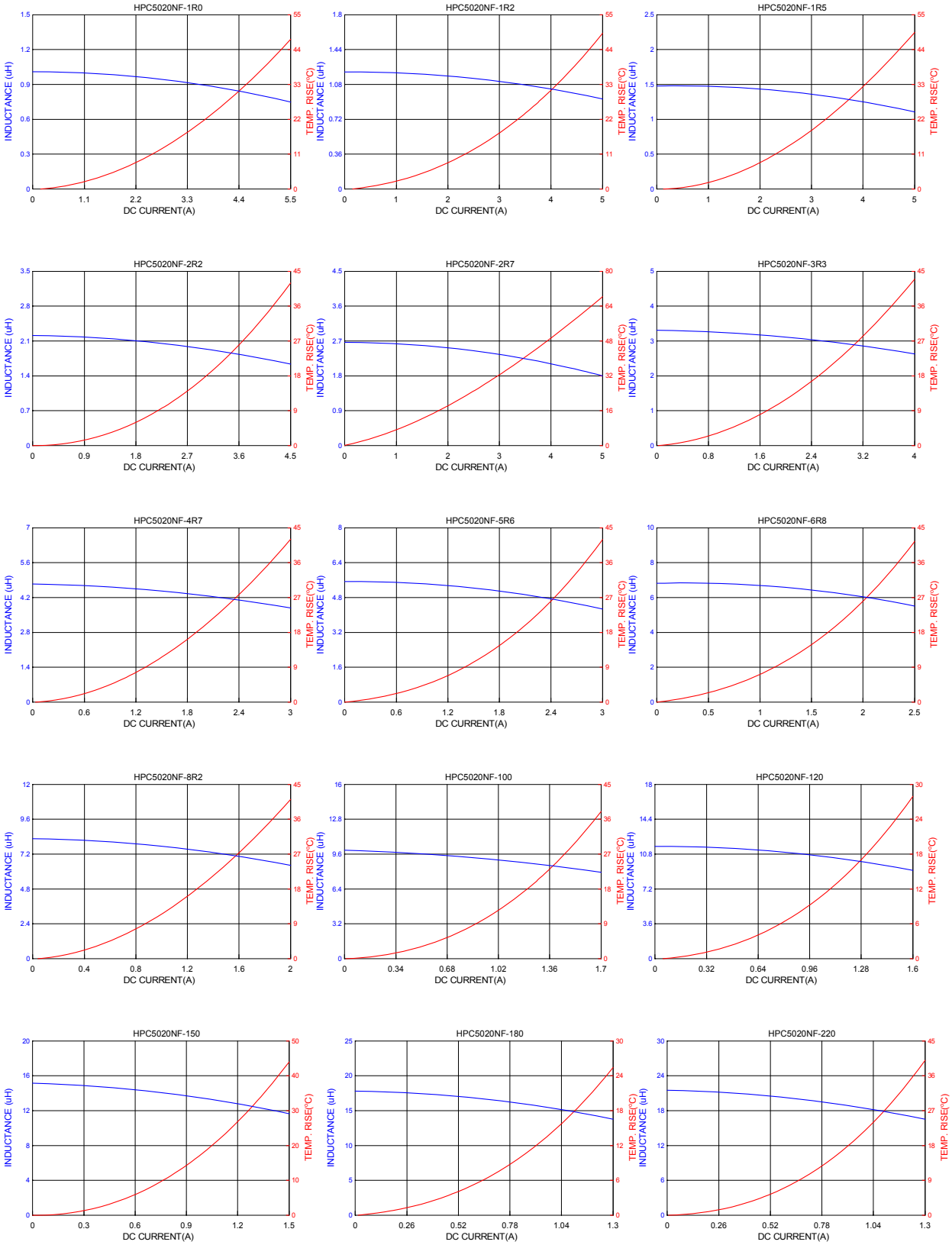
The force for tearing off cover tape is 10 to 130 grams in the arrow direction under the following conditions(referenced ANSI/EIA-481-C-2003 of 4.11 stadnard).

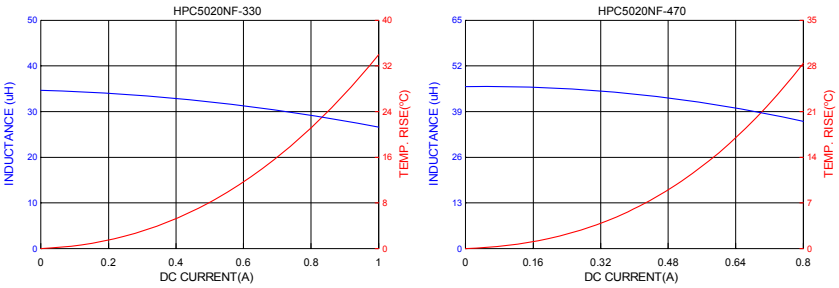
Room Temp. (℃)	Room Humidity (%)	Room atm (hPa)	Tearing Speed mm/min
5~35	45~85	860~1060	300

Application Notice

- Storage Conditions
  To maintain the solderability of terminal electrodes:
  1. TAIPAQ products meet IPC/JEDEC J-STD-020D standard-MSL, level 1.
  2. Temperature and humidity conditions: Less than 40℃ and 60% RH.
  3. Recommended products should be used within 12 months form the time of delivery.
  4. The packaging material should be kept where no chlorine or sulfur exists in the air.
- Transportation
  1. Products should be handled with care to avoid damage or contamination from perspiration and skin oils.
  2. The use of tweezers or vacuum pick up is strongly recommended for individual components.
  3. Bulk handling should ensure that abrasion and mechanical shock are minimized.

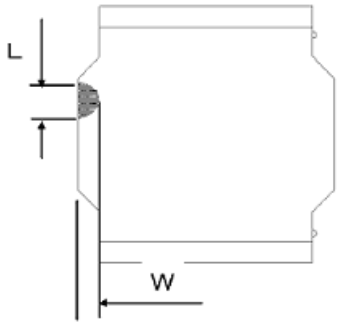
9. Typical Performance Curves




HPC5020NF-330
INDUCTANCE (uH)
TEMP. RISE(°C)
DC CURRENT(A)
0
10
20
30
40
50
0
8
16
24
32
40
0
0.2
0.4
0.6
0.8
1
HPC5020NF-470
INDUCTANCE (uH)
TEMP. RISE(°C)
DC CURRENT(A)
0
13
26
39
52
65
0
7
14
21
28
35
0
0.16
0.32
0.48
0.64
0.8

Core chipping

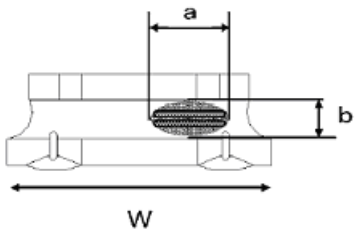
The appearance standard of the chipping size on top side, and bottom side ferrite core is listed below.



L	W
0.8mm Max.	0.8mm Max.

Void appearance tolerance Limit

Size of voids occurring to coating resin is specified below.



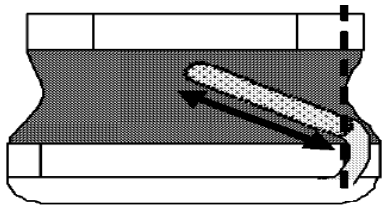
Exposed wire tolerance limit of coating resin part on product side.

Size of exposed wire occurring to coating resin is specified below.

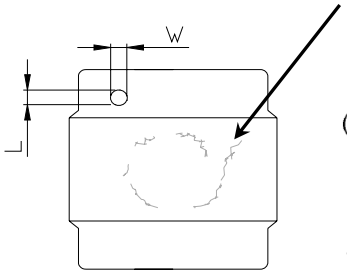
1. Width direction（dimension a）: Acceptable when a≦w/2.
2. Length direction（dimension b）: Dimension b is not specified.
3. The total area of exposed wire occurring to each sides is not greater than 50% of coating resin area, and is acceptable.

External appearance criterion for exposed wire

Exposed end of the winding wire at the secondary side should be 1mm and below.



Exectrde appearance criterion for exposed wire



Visual check on core surface with no crack means pass.

Only top side of wire is exposed.
(regardless of whole tope side of wire exposed)

Conforming

Wire is soldered insufficiently and less than half of outer diameter is covered with solder.

Less than 1/2 of joint side length.
(More than 1/2 is selected as defect)

L	W
0.8mm Max.	0.8mm Max.

Electrodes with foreign body (dirt) appearance standards

Foreign materials (dirt) will not affect the coplanarity of PAD,
below the example of foreign materials (dirt) quantity ≤2PCS on single PAD.
dimension range as below.