SMD Power Inductor

HPC6045NF-Series(TH)

ECN HISTORY LIST

REV	DATE	DESCRIPTION	APPROVED	CHECKED	DRAWN
1.0	17/07/17	新發行	羅宜春	梁周虎	卜文娟
備註					

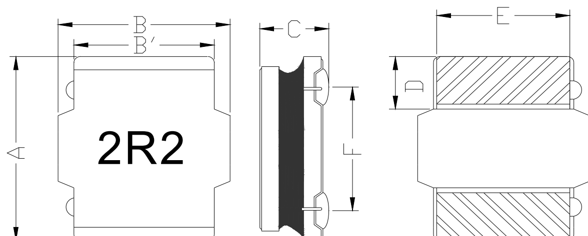
SMD Power Inductor

HPC6045NF-Series(TH)

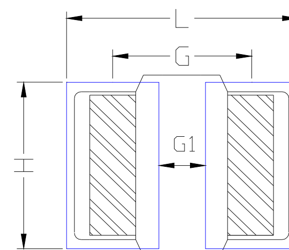
1. Features

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

2. Dimension



Recommended Land pattern

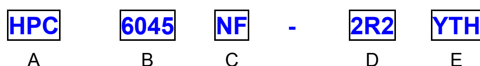


Series	A(mm)	B(mm)	B'(mm)	C(mm)	D(mm)	E(mm)	F(mm)
HPC6045NF	6.0±0.3	6.0±0.3	4.8±0.2	4.2±0.3	1.7±0.3	4.5±0.3	4.25±0.3

L(mm)	G(mm)	G1(mm)	H(mm)
6.5	4.25	1.80min	4.8

Note: 1. The above PCB layout reference only.
2. Recommend solder paste thickness at 0.15mm and above.

3. Part Numbering



A B C D E

A: Series
B: Dimension A/B*C
C: Type
D: Inductance 2R2=2.20uh 100=10uh,101=100uh,102=1000uh
E: Inductance Tolerance M=±20%,Y=±30%.
marking direction cannot decide polarity. Color: Black, unidirectional.
magnetic shielding

.

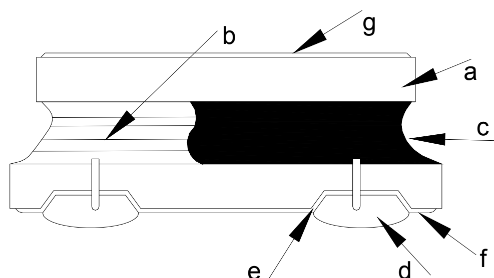
4. Specification

Part Number	Inductance L0 (uH) @ 0 A	Tolerance				Rated current				DCR (mΩ) @25℃ ±20%.
						Temperature current I rms (A)		Saturation current I sat (A)		
		K	L	M	Y	Typ	Max	Typ	Max	
HPC6045NF-R36□(TH)	0.36	/	/	±20%	±30%	9.00	8.50	18.00	16.50	4.80
HPC6045NF-R47□(TH)	0.47	/	/	±20%	±30%	8.60	8.00	17.00	16.00	6.80
HPC6045NF-R82□(TH)	0.82	/	/	±20%	±30%	8.20	7.50	14.50	13.50	8.50
HPC6045NF-1R0□(TH)	1.00	/	/	±20%	±30%	8.00	7.30	13.50	12.50	10.0
HPC6045NF-1R2□(TH)	1.20	/	/	±20%	±30%	7.50	7.00	12.50	11.50	10.5
HPC6045NF-1R3□(TH)	1.30	/	/	±20%	±30%	7.50	7.00	12.50	11.50	10.5
HPC6045NF-1R5□(TH)	1.50	/	/	±20%	±30%	7.00	6.60	12.00	11.00	11.7
HPC6045NF-1R8□(TH)	1.80	/	/	±20%	±30%	6.80	6.20	11.00	10.00	12.0
HPC6045NF-2R0□(TH)	2.00	/	/	±20%	±30%	6.50	5.80	10.50	9.50	13.5
HPC6045NF-2R2□(TH)	2.20	/	/	±20%	±30%	6.00	5.30	9.50	8.55	15.0
HPC6045NF-2R3□(TH)	2.30	/	/	±20%	±30%	5.80	5.00	9.30	8.20	16.0
HPC6045NF-3R0□(TH)	3.00	/	/	±20%	±30%	5.20	4.60	8.00	7.50	20.0
HPC6045NF-3R3□(TH)	3.30	/	/	±20%	±30%	5.00	4.50	7.80	7.30	21.0
HPC6045NF-3R6□(TH)	3.60	/	/	±20%	±30%	4.90	4.30	7.40	6.90	22.5
HPC6045NF-4R7□(TH)	4.70	/	±15%	±20%	±30%	4.50	4.00	6.80	6.20	26.0
HPC6045NF-5R6□(TH)	5.60	/	±15%	±20%	±30%	4.10	3.70	6.40	5.70	31.0
HPC6045NF-6R3□(TH)	6.30	/	±15%	±20%	±30%	3.80	3.50	5.90	5.30	33.0
HPC6045NF-6R8□(TH)	6.80	/	±15%	±20%	±30%	3.60	3.30	5.70	5.15	34.0
HPC6045NF-8R2□(TH)	8.20	/	±15%	±20%	±30%	3.40	2.90	5.10	4.50	46.0
HPC6045NF-100□(TH)	10.0	±10%	±15%	±20%	±30%	3.20	2.60	4.60	4.20	52.0
HPC6045NF-150□(TH)	15.0	±10%	±15%	±20%	±30%	2.80	2.20	3.80	3.30	71.0
HPC6045NF-180□(TH)	18.0	±10%	±15%	±20%	±30%	2.60	2.10	3.40	2.90	80.0
HPC6045NF-220□(TH)	22.0	±10%	±15%	±20%	±30%	2.30	1.90	3.30	2.70	96.0
HPC6045NF-330□(TH)	33.0	±10%	±15%	±20%	±30%	1.80	1.50	2.50	2.10	145
HPC6045NF-470□(TH)	47.0	±10%	±15%	±20%	±30%	1.60	1.20	2.00	1.75	200
HPC6045NF-560□(TH)	56.0	±10%	±15%	±20%	±30%	1.40	1.00	1.80	1.65	230
HPC6045NF-680□(TH)	68.0	±10%	±15%	±20%	±30%	1.10	0.92	1.60	1.52	305
HPC6045NF-820□(TH)	82.0	±10%	±15%	±20%	±30%	0.98	0.88	1.50	1.40	365
HPC6045NF-101□(TH)	100	±10%	±15%	±20%	±30%	0.92	0.82	1.33	1.25	456
HPC6045NF-121□(TH)	120	±10%	±15%	±20%	±30%	0.85	0.79	1.20	1.10	500
HPC6045NF-151□(TH)	150	±10%	±15%	±20%	±30%	0.75	0.70	1.10	1.00	626
HPC6045NF-181□(TH)	180	±10%	±15%	±20%	±30%	0.68	0.60	1.00	0.90	745
HPC6045NF-221□(TH)	220	±10%	±15%	±20%	±30%	0.60	0.50	0.88	0.77	900
HPC6045NF-331□(TH)	330	±10%	±15%	±20%	±30%	0.55	0.45	0.60	0.55	1400
HPC6045NF-471□(TH)	470	±10%	±15%	±20%	±30%	0.40	0.35	0.50	0.45	2050

Note:

1. All test data referenced to 25℃ ambient , Ls/Q:1MHz/1V.
2. Testing Instrument : HP4284A,CH11025,CH3302,CH1320 ,CH1320S LCR METER / Rdc:CH502BC MICRO OHMMETER.
3. Heat Rated Current (Irms) will cause the coil temperature rise approximately △t 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.
6. Special inquiries besides the above common used types can be met on your requirement.

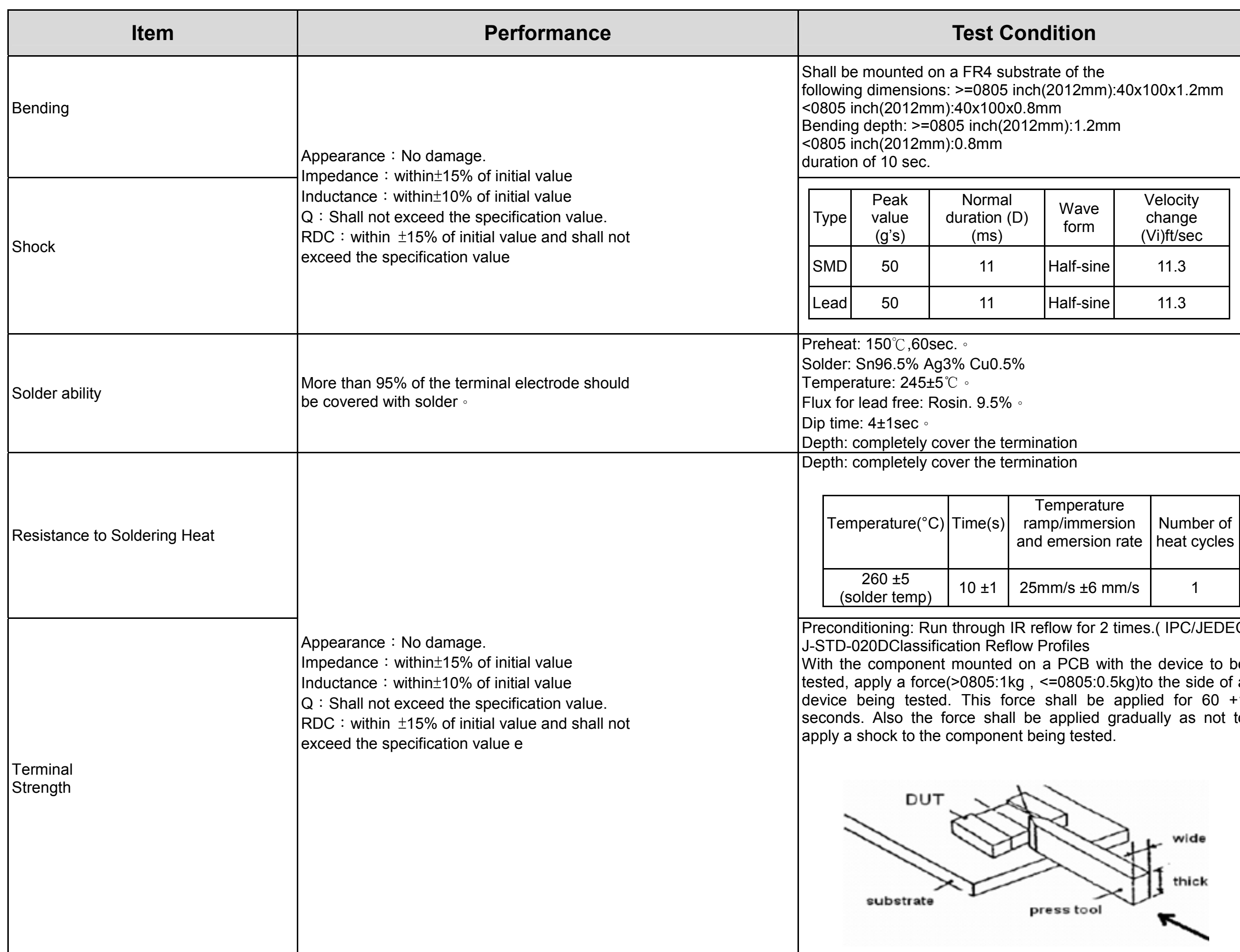
5. Material List



NO	Items	Materials
a	Core	Ferrite Core
b	Wire	Enameled Copper Wire
c	Glue	Epoxy with magnetic powder
d	Terminal	Lead free-Sn Solder
e	Adhesive	Epoxy
f	Copper foil	Pure Copper
g	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(℃) 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>Bending</td><td rowspan="2">Appearance：No damage.
Impedance：within±15% of initial value
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>Shall be mounted on a FR4 substrate of the following dimensions: >=0805 inch(2012mm):40x100x1.2mm
<0805 inch(2012mm):40x100x0.8mm
Bending depth: >=0805 inch(2012mm):1.2mm
<0805 inch(2012mm):0.8mm
duration of 10 sec.</td></tr>
<tr><td>Shock</td><td><table><tr><td>Type</td><td>Peak value (g's)</td><td>Normal duration (D) (ms)</td><td>Wave form</td><td>Velocity change (Vi)ft/sec</td></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>Solder ability</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.
Impedance：within±15% of initial value
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 e</td><td>Depth: completely cover the termination
<table><tr><td>Temperature(°C)</td><td>Time(s)</td><td>Temperature ramp/immersion and emersion rate</td><td>Number of heat cycles</td></tr><tr><td>260 ±5 (solder temp)</td><td>10 ±1</td><td>25mm/s ±6 mm/s</td><td>1</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.
DUT
wide
thick
substrate
press tool</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

7. 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. TAI-TECH 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.

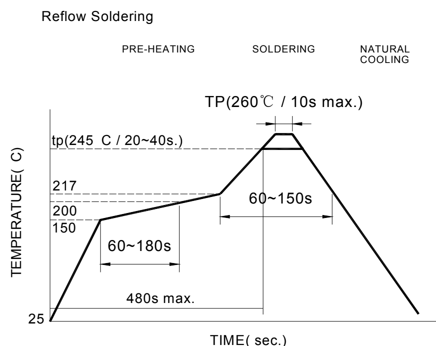
(2) Solder re-flow:

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

(3) Soldering Iron:

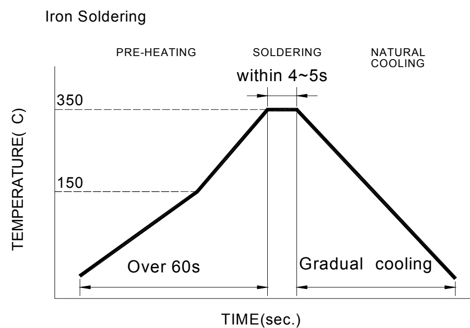
Products attachment with a soldering iron is discouraged due to the inherent process control limitations. In the event that a soldering iron must be employed the following precautions are recommended.

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



Reflow times: 1 times max.

Fig.1

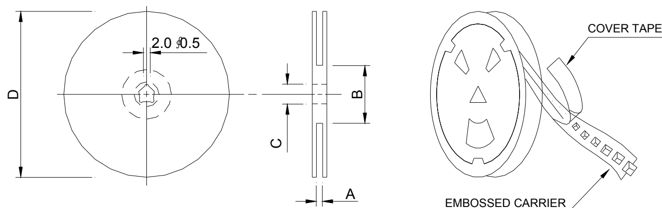


Iron Soldering times: 1 times max.

Fig.2

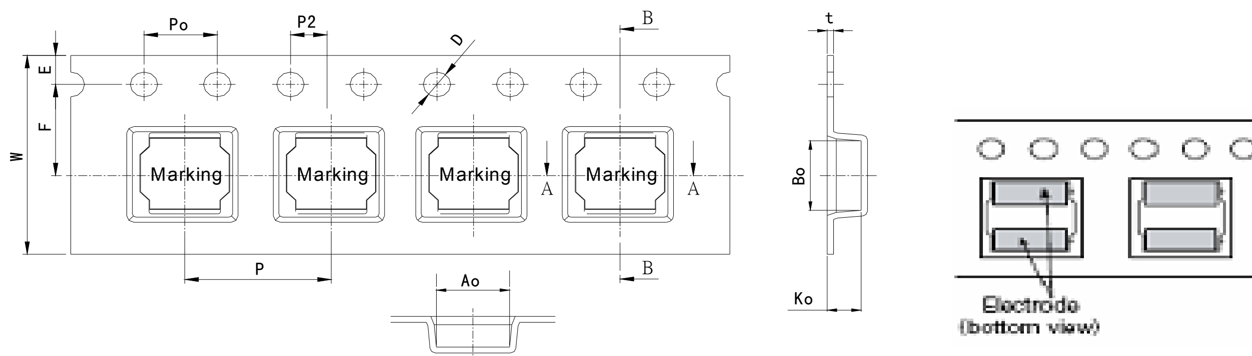
8. Packaging Information

(1) Reel Dimension



Type	A(mm)	B(mm)	C(mm)	D(mm)
13"x16mm	16.4+2/-0	80±2.0	13+0.5/-0.2	330±3.0

(2) Tape Dimension

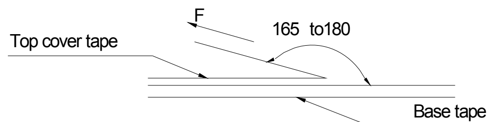


Series	Size	Bo(mm)	Ao(mm)	Ko(mm)	P(mm)	w(mm)	t(mm)	E(mm)	F(mm)	D(mm)	Po(mm)	P2(mm)
HPC	6045	6.4±0.1	6.4±0.1	4.7±0.1	12.0±0.1	16±0.3	0.4±0.1	1.75±0.1	7.5±0.1	1.5±0.1	4.0±0.1	2.00±0.1

(3) Packaging Quantity

HPC	6045
Reel	1000
Inner box	2000
Carton	8000

(4) Tearing Off Force



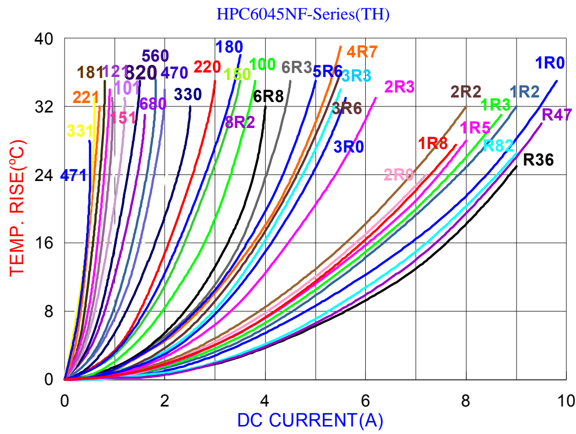
The force for tearing off cover tape is 10 to 130 grams in the arrow direction under the following conditions(referenced ANSI/EIA-481-C-2003 of 4.11 standard).

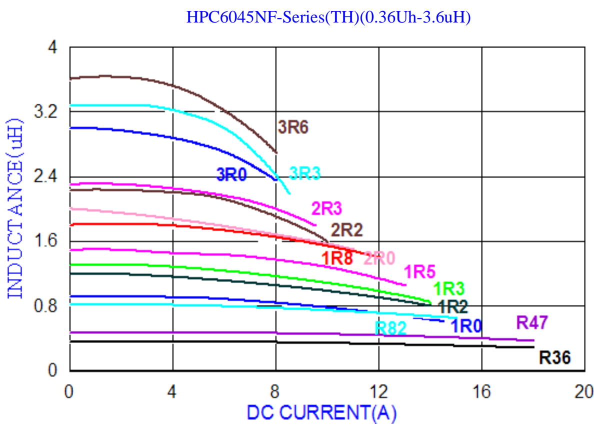
Room Temp. (℃)	Room Humidity (%)	Room atm (hPa)	Tearing Speed mm/min
5~35	45~85	860~1060	300

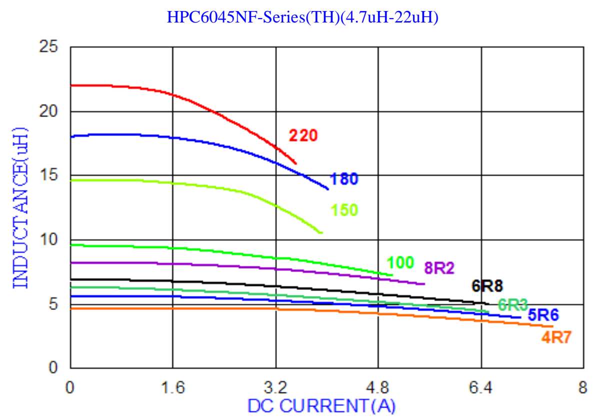
Application Notice

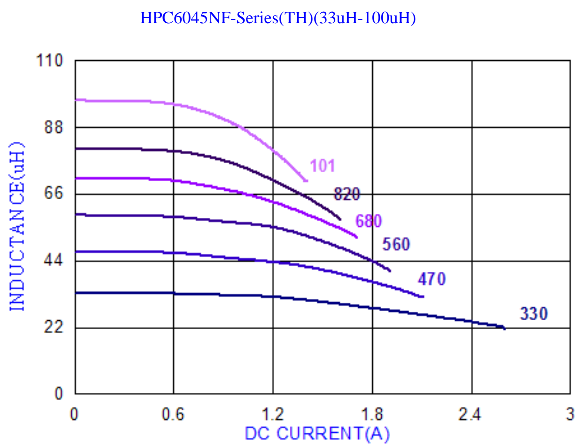
- Storage Conditions (component level)
  To maintain the solderability of terminal electrodes:
  1. TAI-TECH products meet IPC/JEDEC J-STD-020D standard-MSL, level 1.
  2. Temperature and humidity conditions: Less than 40℃ and 60% RH.
  3. Recommended products should be used within 12 months form the 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.

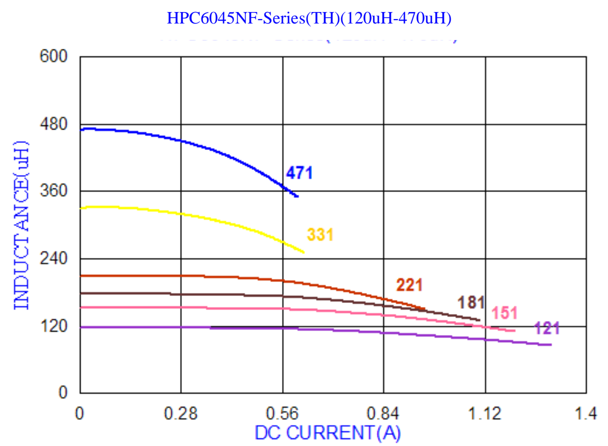
9. Typical Performance Curves





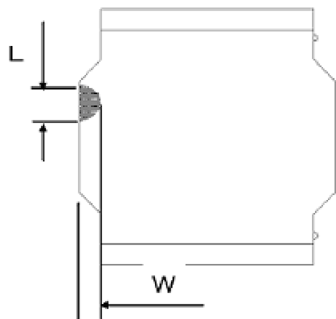






The appearance standard of the chipping size on top side, and bottom side ferrite core is listed below.

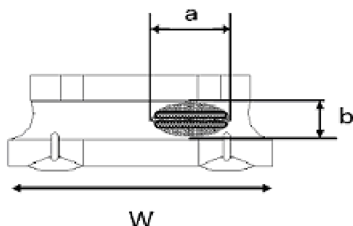
Core chipping



L	W
1.5mm Max.	1.5mm Max.

Void appearance tolerance Limit

Size of voids occurring to coating resin is specified below.



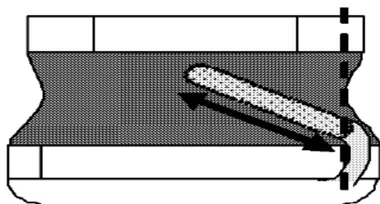
Exposed wire tolerance limit of coating resin part on product side.

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

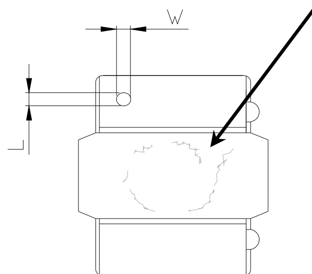
1. Width direction（dimension a）: Acceptable when a≦w/2.
2. Length direction（dimension b）: Dimension b is not specified.
3. The total area of exposed wire occurring to each sides is not greater than 50% of coating resin area, and is acceptable.

External appearance criterion for exposed wire

Exposed end of the winding wire at the secondary side should be 3mm and below.



Electrode 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
1.5mm Max.	1.5mm 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.