

COMPONENT SPECIFICATION

版次：第1.4版

MAX ECHO

NAME	SMD WIRE WOUND CHIP INDUCTOR	COMPOSITE SPECIFICATION		1/10
	HBWS-1608	SPEC#	HBWS1608-SERIES	

1. SCOPE

This specification applies to the HBWS-1608 series SMD Wound Chip Inductor.

2. STANDARD ATMOSPHERIC CONDITIONS

Unless otherwise specified the standard range of atmospheric conditions for making measurements and tests is as follows:

Ambient temperature : 20±15°C

Relative humidity : 65±20%

If there may be any doubt on the results, measurements shall be made within the following limits :

Ambient temperature : 25±5°C

Relative humidity : 75±10%

3. RATINGS

PART NO.	INDUCTANCE (nH)	※Tolerance	Q	DC RESISTANCE	Rated current	S.R.F
			Min (Frequency)	(Ω) Max	(mA)max	Min(MHz)
HBWS1608-1N6	1.6@250MHz	±0.2nH,±0.3nH	24 (250MHz)	0.03	700	12500
HBWS1608-1N8	1.8@250MHz	±0.2nH,±0.3nH	16 (250MHz)	0.045	700	12500
HBWS1608-2N0	2.0@250MHz	±0.2nH,±0.3nH	16 (250MHz)	0.08	700	6900
HBWS1608-3N9	3.9@250MHz	±0.2nH,±0.3nH	22 (250MHz)	0.08	700	6900
HBWS1608-4N3	4.3@250MHz	±0.2nH,±0.3nH	22 (250MHz)	0.08	700	5900
HBWS1608-4N7	4.7@250MHz	±0.2nH,±0.3nH	20 (250MHz)	0.13	700	5800
HBWS1608-5N1	5.1@250MHz	±5%,±10%	20 (250MHz)	0.14	700	5700
HBWS1608-5N6	5.6@250MHz	±5%,±10%	16 (250MHz)	0.15	700	5500
HBWS1608-6N8	6.8@250MHz	±0.2nH,±5%,±10%	30 (250MHz)	0.11	700	5800
HBWS1608-7N5	7.5@250MHz	±0.2nH,±5%,±10%	28 (250MHz)	0.106	700	4800
HBWS1608-8N2	8.2@250MHz	±0.2nH,±5%,±10%	30 (250MHz)	0.1	700	4600
HBWS1608-8N7	8.7@250MHz	±5%,±10%	28 (250MHz)	0.109	700	4600
HBWS1608-9N1	9.1@250MHz	±5%,±10%	28 (250MHz)	0.135	700	4000
HBWS1608-9N5	9.5@250MHz	±5%,±10%	28 (250MHz)	0.135	700	4500
HBWS1608-10N	10@250MHz	±2%,±5%,±10%	30 (250MHz)	0.13	700	3800
HBWS1608-11N	11@250MHz	±5%,±10%	33 (250MHz)	0.09	700	4000
HBWS1608-12N	12@250MHz	±2%,±5%,±10%	35 (250MHz)	0.13	700	4000
HBWS1608-13N	13@250MHz	±5%,±10%	38 (250MHz)	0.106	700	4000
HBWS1608-15N	15@250MHz	±2%,±5%,±10%	35 (250MHz)	0.17	700	4000
HBWS1608-16N	16@250MHz	±5%,±10%	34 (250MHz)	0.17	700	3300
HBWS1608-18N	18@250MHz	±2%,±5%,±10%	38 (250MHz)	0.17	700	3100
HBWS1608-20N	20@250MHz	±5%,±10%	38 (250MHz)	0.22	700	3000
HBWS1608-22N	22@250MHz	±2%,±5%,±10%	38 (250MHz)	0.22	700	3000
HBWS1608-24N	24@250MHz	±5%,±10%	37 (250MHz)	0.135	700	2650

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PART NO.	INDUCTANCE (nH)	※Tolerance	Q Min (Frequency)	DC RESISTANCE (Ω) Max	Rated current (mA)max	S.R.F Min(MHz)
HBWS1608-27N	27@250MHz	±2%,±5%,±10%	40 (250MHz)	0.22	600	2800
HBWS1608-30N	30@250MHz	±5%,±10%	45 (250MHz)	0.22	600	2300
HBWS1608-33N	33@250MHz	±2%,±5%,±10%	43 (250MHz)	0.22	600	2300
HBWS1608-36N	36@250MHz	±5%,±10%	43 (250MHz)	0.25	600	2200
HBWS1608-39N	39@250MHz	±2%,±5%,±10%	43 (250MHz)	0.25	600	2200
HBWS1608-43N	43@250MHz	±5%,±10%	38 (250MHz)	0.28	600	2000
HBWS1608-47N	47@200MHz	±2%,±5%,±10%	40 (200MHz)	0.28	600	2000
HBWS1608-51N	51@200MHz	±5%,±10%	40 (200MHz)	0.31	600	1900
HBWS1608-56N	56@200MHz	±2%,±5%,±10%	40 (200MHz)	0.31	600	1900
HBWS1608-62N	62@200MHz	±5%,±10%	40 (200MHz)	0.34	600	1700
HBWS1608-68N	68@200MHz	±2%,±5%,±10%	40 (200MHz)	0.34	600	1700
HBWS1608-72N	72@150MHz	±2%,±5%,±10%	35 (150MHz)	0.49	400	1700
HBWS1608-82N	82@150MHz	±2%,±5%,±10%	35 (150MHz)	0.54	400	1700
HBWS1608-90N	90@150MHz	±5%,±10%	35 (150MHz)	0.54	400	1700
HBWS1608-R10	100@150MHz	±2%,±5%,±10%	35 (150MHz)	0.63	400	1400
HBWS1608-R11	110@150MHz	±2%,±5%,±10%	35 (150MHz)	0.63	400	1400
HBWS1608-R12	120@150MHz	±2%,±5%,±10%	35 (150MHz)	0.65	300	1300
HBWS1608-R13	130@150MHz	±5%,±10%	35 (150MHz)	0.92	280	1000
HBWS1608-R15	150@150MHz	±2%,±5%,±10%	35 (150MHz)	0.92	280	1000
HBWS1608-R16	160@100MHz	±2%,±5%,±10%	30 (100MHz)	1	250	1000
HBWS1608-R18	180@100MHz	±2%,±5%,±10%	30 (100MHz)	1.25	240	1000
HBWS1608-R20	200@100MHz	±5%,±10%	30 (100MHz)	1.25	240	1000
HBWS1608-R21	210@100MHz	±5%,±10%	27 (100MHz)	1.7	200	1000
HBWS1608-R22	220@100MHz	±2%,±5%,±10%	30 (100MHz)	1.7	200	1000
HBWS1608-R24	240@100MHz	±5%,±10%	30 (100MHz)	1.7	200	1000
HBWS1608-R27	270@100MHz	±2%,±5%,±10%	30 (100MHz)	1.8	170	1000
HBWS1608-R33	330@100MHz	±5%,±10%	25 (100MHz)	2	150	450
HBWS1608-R39	390@100MHz	±5%,±10%	20 (100MHz)	2	170	350

※ B:±0.2nH S:±0.3nH K:±10% J:±5% G:±2%

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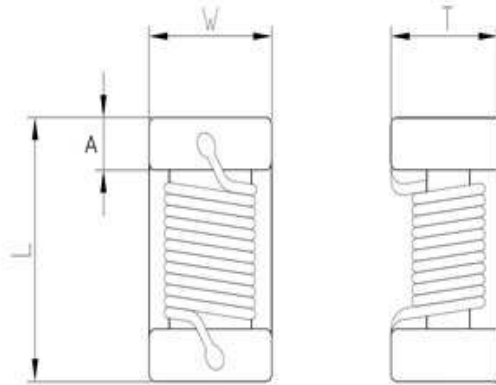
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	HBWS-1608	SPEC#	HBWS1608-SERIES	

### 4. DIMENSION



OPERATING TEMP. RANGE : -40°C ~ +125°C

STORAGE TEMP. RANGE : -10°C ~ +40°C

TYPE	L	W	T	A
HBWS-1608	1.6±0.2 (.063±.008)	1.05±0.2 (.041±.008)	1.05±0.2 (.041±.008)	0.25~0.45 (0.01~0.018)

5. The place of origin :  
Taichung, Taiwan

HISTORY	DATE	REVISION	SIGN.	SIGN.
PLANNED BY	CHECKED BY	APPROVED BY	鈺鎧文件中心 發行章	
Marco	LUN	Tina Hsu		

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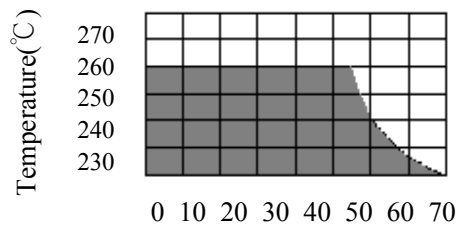
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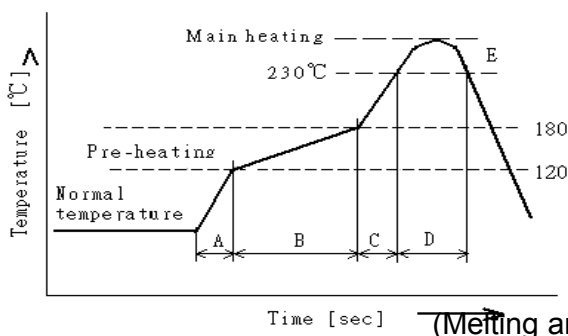
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### Reflow soldering conditions

- Pre-heating should be in such a way that the temperature difference between solder and ceramic surface is limited to 150°C max. Also cooling into solvent after soldering should be in such a way that the temperature difference is limited to 100°C max.  
Insufficient pre-heating may cause cracks on the ceramic, resulting in the deterioration of product quality.
- Products should be soldered within the following allowable range indicated by the slanted line.  
The excessive soldering conditions may cause the corrosion of the electrode, when soldering is repeated, allowable time is the accumulated time.



### Temperature Profile



A	Slope of temp. rise	1 to 5	°C/sec
B	Heat time	50 to 150	sec
	Heat temperature	120 to 180	°C
C	Slope of temp. rise	1 to 5	°C/sec
D	Time over 230°C	90~120	sec
E	Peak temperature	255~260	°C
	Peak hold time	10 max.	sec
No. of mounting		3	times

### Reworking with soldering iron

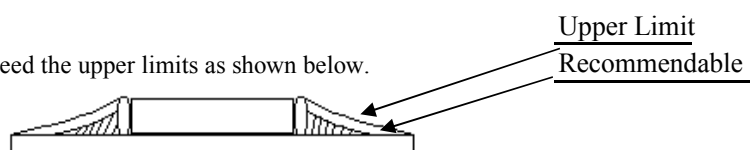
Preheating	150°C, 1 minute		
Tip temperature	280°C max.		
Soldering time	3 seconds max.		
Soldering iron output	30w max.		
End of soldering iron	f 3mm max.		

Reworking should be limited to only one time.

Note : Do not directly touch the products with the tip of the soldering iron in order to prevent the crack on the ferrite material due to the thermal shock.

### Solder Volume

Solder shall be used not to be exceed the upper limits as shown below.



When the amount of solder volume increased, mechanical stress increased as well. Exceeding amount of solder volume may lead to failure of mechanical or electrical characteristics.

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### Mechanical Characteristics

ITEM	CONDITION	SPECIFICATION
Inductance and Tolerance	Measuring Frequency : As shown in Product Table	Within Specified Tolerance
Quality Factor	Measuring Temperature : + 25 °C	
Insulation Resistance	Measured at 100V DC between inductor terminals and center of case.	1000 mega ohms minimum

### Electrical Characteristics

ITEM	CONDITION	SPECIFICATION
Component Adhesion (Push Test)	The component shall be reflow soldered onto a P. C. Board ( 240 °C ± 5°C for 20 seconds ). Then a dynamometer force gauge shall be applied to any side of the component.	0402 series - ≥350g 0603 series - ≥1.0Kg Other series - 2012 ~ 3225 Minimum 1Kg for Pd/Ag termination and 2Kg for Mo/Mn
Drop Test	The inductor shall be dropped two times on the concrete floor or the vinyl tile from 1M naturally.	Change In Inductance: No more than 5%
Thermal Shock Test	Each cycle shall consist of 30 minutes at -40 °C followed by 30 minutes at +85 °C with a 20-second maximum transition time between temperature extremes. Test duration is 10 cycles.	Change In Q: No more than 10%  Change In Appearance: Without distinct damage
Substrate Bending Test	SPEC substrate bending test DC resistance shall meet specifications.	After soldering a chip to a test substrate, bend the substrate by 3mm hold for 10s and then return. Soldering shall be done in accordance with the recommended PC board pattern and reflow soldering.  <div style="text-align: center;"> </div>

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### Endurance Characteristics

ITEM	CONDITION	SPECIFICATION
Solderability	Dip pads in flux and dip in solder pot containing lead free solder at 240 °C ± 5°C for 5 seconds.	A minimum of 80% of the metalized area must be covered with solder.
Resistance to Soldering Heat	Dip the components into flux and dip into solder pot containing lead free solder at 260 °C ± 5 °C for 5 ± 2 seconds.	Change In Inductance: No more than 5%
Vibration (Random)	Inductors shall be randomly vibrated at amplitude of 1.5mm and frequency of 10 - 55 Hz: 0.04 G / Hz for a minimum of 15 minutes per axis for each of the three axes.	Change In Q: No more than 10%
Cold Temperature Storage	Inductors shall be stored at temperature of -40 °C ± 2 °C for 1000hrs (+ 48 -0hrs.) Then inductors shall be subjected to standard atmospheric conditions for 1 hour After that, measurement shall be made.	Change In Appearance : Without distinct damage
High Temperature Storage	Inductors shall be stored at temperature of 85 °C ± 2 °C for 1000hrs (+48 - 0hrs.) Then inductors shall be subjected to standard atmospheric conditions for 1 hour. After that, measurement shall be made.	
Moisture Resistance	Inductors shall be stored in the chamber at 45 °C at 90 - 95 R. H. for 1000 hours. Then inductors are to be tested after 2 hours at room temperature.	Inductors shall not have a shorted or open winding.
High Temperature with Loaded	Inductors shall be stored in the chamber at +85 °C for 1000 hours with rated current applied. Inductors shall be tested at the beginning of test at 500 hours and 1000 hours. Then inductors are to be tested after 1 hour at room temperature.	

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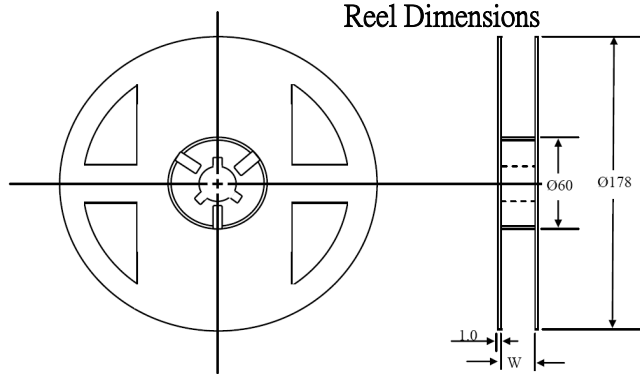
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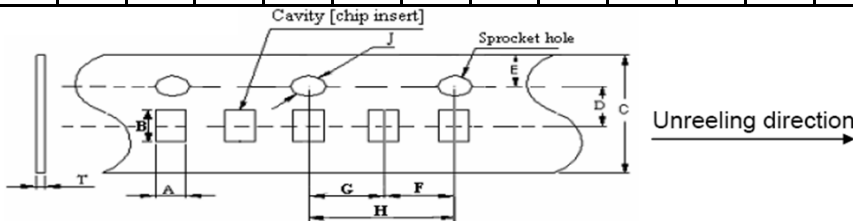
### Packaging Information

TYPE	PCS / REEL
HBWS 1005	10,000
HBWS 1608	3,000
HBWS 2012	2,000
HBWS 2520	2,000

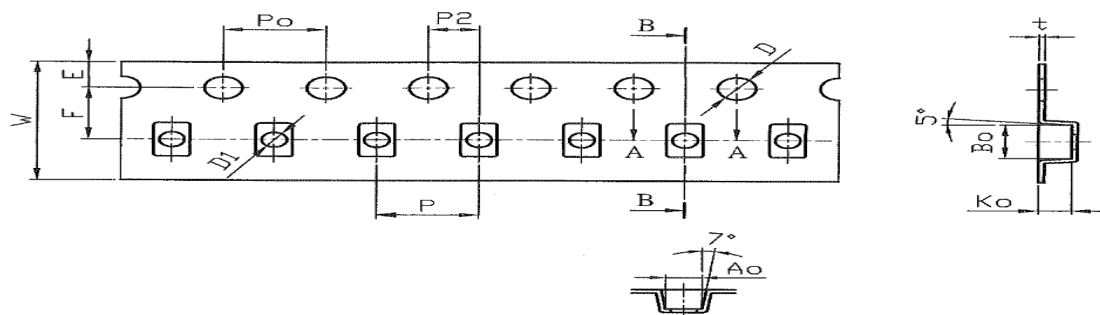


### Tape Dimensions (unit:m....)

Size	CARRIER											Unit
	A	B	C	D	E	F	G	H	J	T		
1005	0.62±0.05	1.12±0.05	8.00±0.10	3.50±0.05	1.75±0.10	2.00±0.05	2.00±0.05	4.00±0.10	1.55±0.05	0.60±0.05		mm

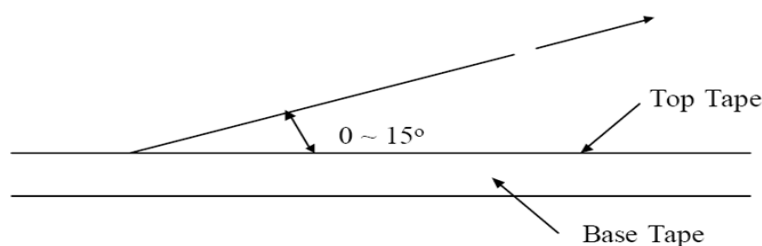


Size	CARRIER													Unit
	Ao	Bo	Ko	t	D	D1	E	F	P	Po	P2	W		
1608	1.40±0.1	1.90±0.1	1.15±0.1	0.23±0.05	1.50+0.10/-0.00	0.60±0.10	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	8.00±0.10	mm	
2012	1.42±0.1	2.26±0.1	1.30±0.1	0.23±0.05	1.50+0.10/-0.00	0.70±0.10	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	8.00±0.10	mm	
2520	2.20±0.1	2.83±0.1	1.75±0.1	0.22±0.05	1.50+0.10/-0.00	1.00±0.10	1.75±0.10	3.50±0.05	4.00±0.10	4.00±0.10	2.00±0.05	8.00±0.10	mm	



### Top Tape Strength

The top tape requires a peel-off force of 0.2 to 0.7N in the direction of the arrow as illustrated below.



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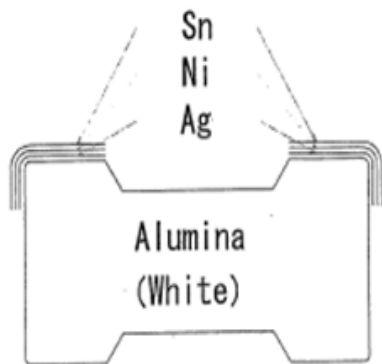
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### Ingredient of terminals electrode.



### Ceramic Type

Sn  
Nickel  
Ag

### Operation Environment

Do not use this product under the following environmental conditions, on deterioration of performance, such as insulation resistance may result from the use.

1. In corrosive gases ( acidic gases, alkaline gases, chlorine, sulfur gases, organic gases and etc.)
2. In the atmosphere where liquid such as organic solvent, may splash on the products.

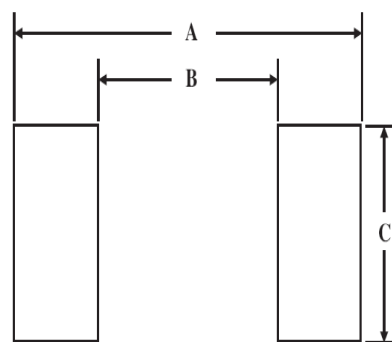
### Delivery

Care should be taken when transporting or handling product to avoid excessive vibration or mechanical shock.

### Pattern Dimensions (unit:m/m)

Metric (EIA)	A mm (inches)	B mm (inches)	C mm (inches)
1005 (0402)	1.20 (0.047)	0.45 (0.018)	0.65 (0.026)
1608 (0603)	1.90 (0.075)	0.65 (0.026)	1.00 (0.039)
2012 (0805)	2.60 (0.102)	0.75 (0.030)	1.30 (0.051)
2520 (1008)	3.00 (0.118)	1.20 (0.047)	2.20 (0.087)

### Recommended Pattern





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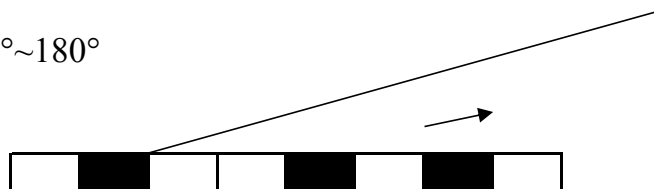
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### Peeling Strength Of Cover Tape

Cover tape	(10g~100g)
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165°~180°



#### Test condition

1. peel angle : 165°~180° vs carrier tape
2. peel speed : 300mm/min

### Packaging

- 1) Tape & Reel packaging in component specification 5/8
- 2) Reel and a bag of desiccant shall be packed in Nylon or plastic bag
- 3) Maximum of 5 reels shall be packaged in a inner box
- 4) Maximum of 6 inner box shall be packaged in a outer box

### Reel Label

Producing the goods label needs to indicate (1) Pb Free (2) RoHS Compliant

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### Storage

1. The solderability of the external electrode may be deteriorated if packages are stored where they are exposed to high humidity. Packages must be stored at 40°C or less and 70% RH or less.
2. The solderability of the external electrode may be deteriorated if packages are stored where they are exposed to dust or harmful gas (hydrogen chloride, sulfurous acid gas or hydrogen sulfide).
3. Packaging material may be deformed if packages are stored where they are exposed to heat or direct sun—light.
4. Minimum packages, such as polyvinyl heat—seal packages shall not be opened until just before they are used. If opened, use the reels as soon as possible.
5. Solderability specified in component specification 4/8 shall be for 12 months from the date of delivery on condition that they are stored at the environment specified clause 13-1 & 13-2.  
For those parts which passed more than 12 months shall be checked solderability before it is used.

### Quality System

- ISO/IATF16949
- IECQ QC 080000