SPECIFICATIONS

Customer	
Product Name	**Multi-layer Chip Ceramic Inductor**
Sunlord Part Number	**HQ Series**
Customer Part Number	

[☒New Released, ☐Revised] **SPEC No.:HQ06140000**

【This SPEC is total 9 pages including specifications and appendix.】

【ROHS Compliant Parts】

Approved By	Checked By	Issued By

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【For Customer approval Only】 Date:_____

Qualification Status: ☐ Full ☐ Restricted ☐ Rejected

Approved By	Verified By	Re-checked By	Checked By

Comments:

_____

【Version change history】

Rev.	Effective Date	Changed Contents	Change Reasons	Approved By
01	/	New release	/	Hai Guo

1. Scope

This specification applies to HQ series of multi-layer ceramic chip inductor.

2. Product Description and Identification (Part Number)

1) Description

HQ series of multi-layer ceramic chip inductor with high Q factor at high frequency.

2) Product Identification (Part Number)

HQ	1005	C	XXX	□	◎
①	②	③	④	⑤	⑥

① Type	
HQ	Chip Ceramic Inductor

② External Dimensions
1005

③ Material Code
C

④ Nominal Inductance	
Example	Nominal Value
3N9	3.9nH
10N	10nH

⑤ Inductance Tolerance	
B	±0.1nH
C	±0.2nH
S	±0.3nH
G	±2%
H	±3%
J	±5%

⑥ Packing	
T	Tape Carrier Package

3. Electrical Characteristics

Please refer to **Appendix A** (Page 9).

1) Operating and storage temperature range (individual chip without packing):
HQ1005: -55℃~ +125℃,

2) Storage temperature range (packaging conditions): -10℃~+40℃ and RH 70% (Max.)

4. Shape and Dimensions

1) Dimensions and recommended PCB pattern for reflow soldering: See **Fig.4-1**, **Fig.4-2** and **Table 4-1**.

2) Structure: See **Fig. 4-3** and **Fig. 4-4**.

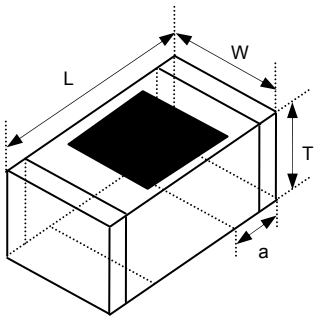


Fig. 4-1

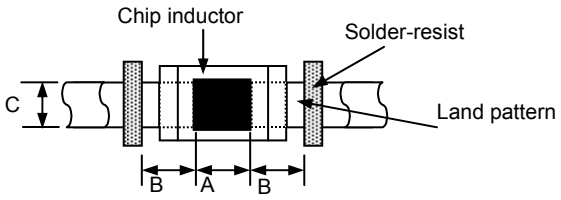


Fig. 4-2

[Table 4-1] Unit: mm [inch]

Type	L	W	T	a	A	B	C
1005 [0402]	1.0±0.15 [0.039±0.006]	0.6±0.15 [0.024±0.006]	0.5±0.15 [0.020±0.006]	0.25±0.1 [0.010±0.004]	0.45~0.55	0.40~0.50	0.55~0.65

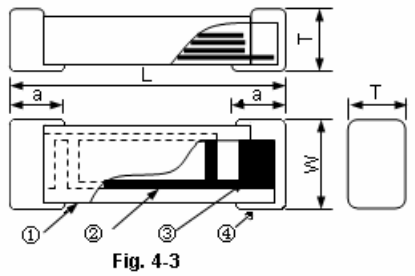
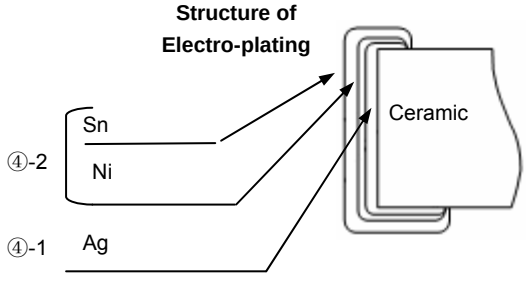


Fig. 4-3



① Ceramic for HQ Series
② Internal electrode (Ag)
③ Pull out electrode(Ag)
④-1 Terminal electrode: Inside (Ag)
④-2 Outside (Electro-plating Ni-Sn)

Fig. 4-4

3) Material Information: See **Table 4-2**

[Table 4-2]

Code	Part Name	Material Name
①	Ceramic Body	Ceramic Powder
②	Internal Electrode (Ag)	Silver Paste
③	Pull-out Electrode (Ag)	Silver Paste
④-1	Terminal Electrode: Inside Ag	Termination Silver Composition
④-2	Electro-Plating: Ni/Sn plating	Plating Chemicals

4) The surface with the mark should be on the top side when soldering, but it is not necessary to identify the mark's direction towards left or right.

5. Test and Measurement Procedures

5.1 Test Conditions

Unless otherwise specified, the standard atmospheric conditions for measurement/test as:

a. Ambient Temperature: 20±15℃
b. Relative Humidity: 65±20%
c. Air Pressure: 86kPa to 106kPa

If any doubt on the results, measurements/tests should be made within the following limits:

a. Ambient Temperature: 20±2℃
b. Relative Humidity: 65±5%
c. Air Pressure: 86kPa to 106kPa

5.2 Visual Examination

a. Inspection Equipment: 20× magnifier

5.3 Electrical Test

5.3.1 DC Resistance (DCR)

a. Refer to **Appendix A**.
b. Test equipment (Analyzer): High Accuracy Milliohmmeter-HP4338B or equivalent.

5.3.2 Inductance (L)

a. Refer to **Appendix A**.
b. Test equipment: High Accuracy RF Impedance /Material Analyzer-E4991A+HP16197A or equivalent.
c. Test signal: -20dBm or 50mV
d. Test frequency refers to Appendix A.

5.3.3 Q Factor (Q)

a. Refer to **Appendix A**.
b. Test equipment: High Accuracy RF Impedance /Material Analyzer-E4991A+HP16197A or equivalent.
c. Test signal: -20dBm or 50mV
d. Test frequency refers to Appendix A.

5.3.4 Self-Resonant Frequency (SRF)

a. Refer to **Appendix A**.
b. Test equipment: Agilent 8719ES or equivalent.
c. Test signal: -20dBm or 50 mV

5.3.5 Rated Current

a. Refer to **Appendix A**.
b. Test equipment (see **Fig. 5.3.5-1**): Electric Power, Electric current meter, Thermometer.
c. Measurement method (see **Fig. 5.3.5-1**):
   1. Set test current to be 0mA.
   2. Measure initial temperature of chip surface.
   3. Gradually increase voltage and measure chip temperature for corresponding current.
d. Definition of Rated Current(Ir): Ir is direct electric current as chip surface temperature rose just 20℃ against chip initial surface temperature(Ta) (see **Fig. 5.3.5-2**).

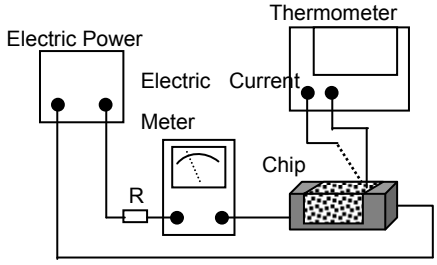


Fig. 5.3.5-1

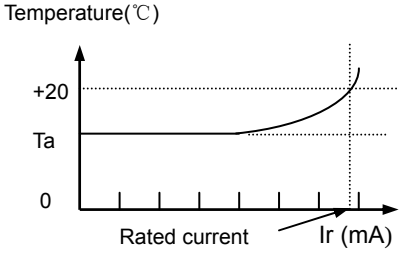
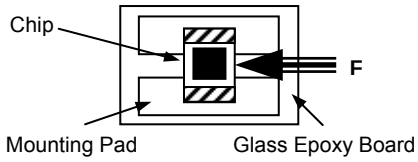
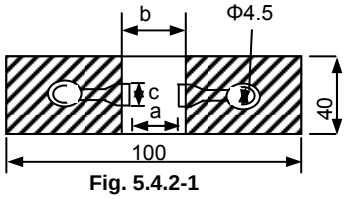
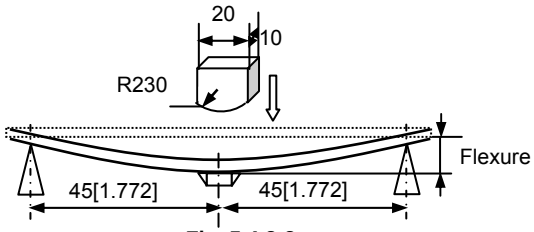
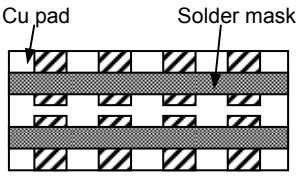
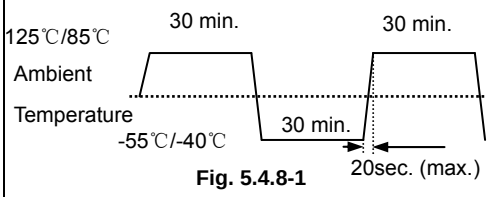


Fig. 5.3.5-2

5.4 Reliability Test

Items	Requirements	Test Methods and Remarks
5.4.1 Terminal Strength	No removal or split of the termination or other defects shall occur.  **Fig.5.4.1-1**	① Solder the inductor to the testing jig (glass epoxy board shown in **Fig. 5.4.1-1**) using leadfree solder. Then apply a force in the direction of the arrow. ② 5N force for HQ1005 series. ③ Keep time: 10±1s Speed: 1.0mm/s.
5.4.2 Resistance to Flexure	No visible mechanical damage. Unit: mm [inch] Type / a / b / c 1005[0402] / 0.4 / 1.5 / 0.5  **Fig. 5.4.2-1**	① Solder the inductor to the test jig (glass epoxy board shown in **Fig. 5.4.2-1**) Using a leadfree solder. Then apply a force in the direction shown **Fig. 5.4.2-2.** ② Flexure: 2mm. ③ Pressurizing Speed: 0.5mm/sec. ④ Keep time: 30 sec.  **Fig. 5.4.2-2**
5.4.3 Vibration	① No visible mechanical damage. ② Inductance change: Within ±10%. ③ Q factor change: Within ±20%.  Glass Epoxy Board **Fig. 5.4.3-1**	① Solder the inductor to the testing jig (glass epoxy board shown in **Fig. 5.4.3-1**) using leadfree solder. ② The inductor shall be subjected to a simple harmonic motion having total amplitude of 1.5mm, the frequency being varied uniformly between the approximate limits of 10 and 55 Hz. ③ The frequency range from 10 to 55 Hz and return to 10 Hz shall be traversed in approximately 1 minute. This motion shall be applied for a period of 2 hours in each 3mutually perpendicular directions (total of 6 hours).
5.4.4 Dropping	① No visible mechanical damage. ② Inductance change: Within ±10%. ③ Q factor change: Within ±20%.	Drop chip inductor 10 times on a concrete floor from a height of 100 cm.
5.4.5 Temperature	Inductance change should be within ±10% of initial value measuring at 20℃.	Temperature range: HQ1005:-55℃ to +125℃, Reference temperature: +20℃
5.4.6 Solderability	① No visible mechanical damage. ② Wetting shall exceed 95% coverage.	① Solder temperture:240±2℃ ② Duration: 3 sec. ③ Solder: Sn/3.0Ag/0.5Cu. ④ Flux: 25% Resin and 75% ethanol in weight.
5.4.7 Resistance to Soldering Heat	① No visible mechanical damage. ② Wetting shall exceed 95% coverage. ③ Inductance change: Within ±10%. ④ Q factor change: Within ±20%.	① Solder temperature: 260±3℃ ② Duration: 5 sec. ③ Solder: Sn/3.0Ag/0.5Cu. ④ Flux: 25% Resin and 75% ethanol in weight. ⑤ The chip shall be stabilized at normal condition for 1~2 hours before measuring.

5.4.8 Thermal Shock	① No mechanical damage. ② Inductance change: Within ±10%. ③ Q factor change: Within ±20%.  **Fig. 5.4.8-1**	① Temperature, Time: (See **Fig. 5.4.8-1**) HQ1005: -55℃for 30±3 min→125℃ for 30±3min, ② Transforming interval: Max. 20 sec. ③ Tested cycle: 100 cycles. ④ The chip shall be stabilized at normal condition for 1~2 hours before measuring.
5.4.9 Resistance to Low Temperature	① No mechanical damage. ② Inductance change: Within ±10%. ③ Q factor change: Within ±20%.	① Temperature: HQ1005: -55±2℃, ② Duration: 1000^{+24} hours. ③ The chip shall be stabilized at normal condition for 1~2 hours before measuring.
5.4.10 Resistance to High Temperature	① No mechanical damage. ② Inductance change: Within ±10%. ③ Q factor change: Within ±20%.	① Temperature: HQ1005: 125±2℃, ② Duration: 1000^{+24} hours. ③ The chip shall be stabilized at normal condition for 1~2 hours before measuring.
5.4.11 Damp Heat (Steady States)	① No visible mechanical damage. ② Inductance change: Within ±10%. ③ Q factor change: Within ±20%.	① Temperature: 60±2℃ ② Humidity: 90% to 95% RH. ③ Duration: 1000^{+24} hours. ④ The chip shall be stabilized at normal condition for 1~2 hours before measuring.
5.4.12 Loading Under Damp Heat	① No visible mechanical damage. ② Inductance change: Within ±10%. ③ Q factor change: Within ±20%.	① Temperature: 60±2℃ ② Humidity: 90% to 95% RH. ③ Duration: 1000^{+24} hours. ④ Applied current: Rated current. ⑤ The chip shall be stabilized at normal condition for 1~2 hours before measuring.
5.4.13 Loading at High Temperature (Life Test)	① No visible mechanical damage. ② Inductance change: Within ±10%. ③ Q factor change: Within ±20%.	① Temperature: HQ1005:125±2℃, ② Duration: 1000^{+24} hours. ③ Applied current: Rated current. ④ The chip shall be stabilized at normal condition for 1~2 hours before measuring.

6. Packaging and Storage

6.1 Packaging

Tape Carrier Packaging:

Packaging code: T

a. Tape carrier packaging are specified in attached figure **Fig.6.1-1~3**

b. Tape carrier packaging quantity please see the following table:

Type	1005[0402]
T(mm)	0.5±0.15
Tape	Paper Tape
Quantity	10K

(1) Taping Drawings (Unit: mm)

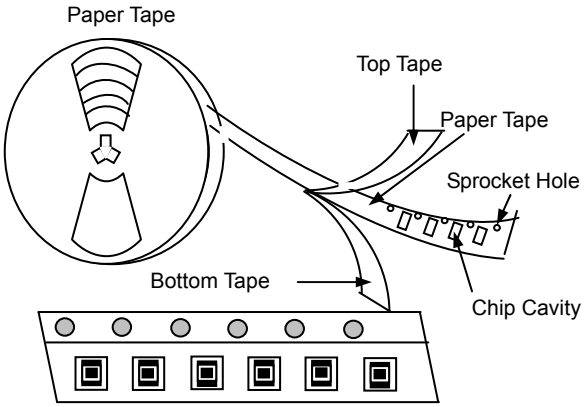


Fig. 6.1-1

(2) Taping Dimensions (Unit: mm)

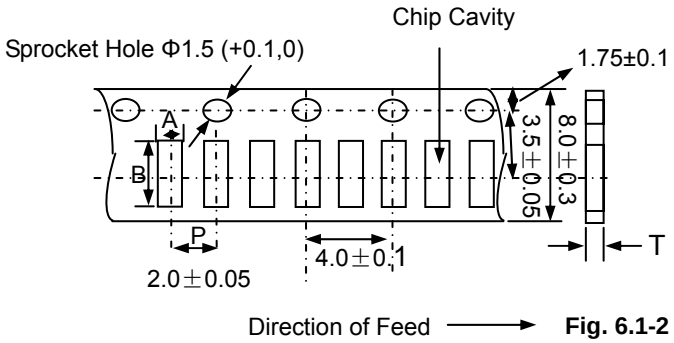


Fig. 6.1-2

Paper Tape

Type	A	B	P	T max
1005[0402]	0.72±0.1	1.15±0.1	2.0±0.05	0.8

(3) Reel Dimensions (Unit: mm)

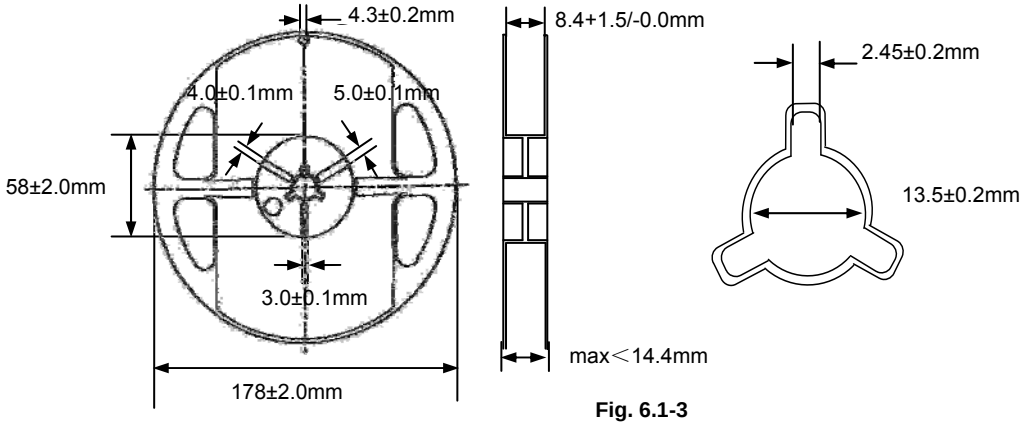


Fig. 6.1-3

6.2 Storage

a. The solderability of the external electrode may be deteriorated if packages are stored where they are exposed to high humidity. Package must be stored at 40℃ or less and 70% RH or less.

b. The solderability of the external electrode may be deteriorated if packages are stored where they are exposed to dust of harmful gas (e.g. HCl, sulfurous gas of H_2S).

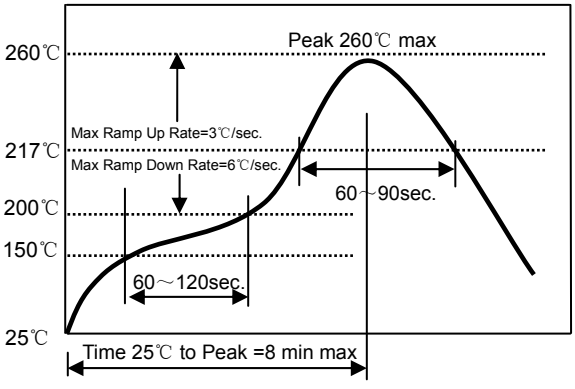
c. Packaging material may be deformed if package are stored where they are exposed to heat of direct sunlight.

d. Solderability specified in **Clause 5.4.6** shall be guaranteed for 6 months from the date of delivery on condition that they are stored at the environment specified in **Clause 3**. For those parts, which passed more than 6 months shall be checked solder-ability before use.

7. Recommended Soldering Technologies

7.1 Reflow Profile

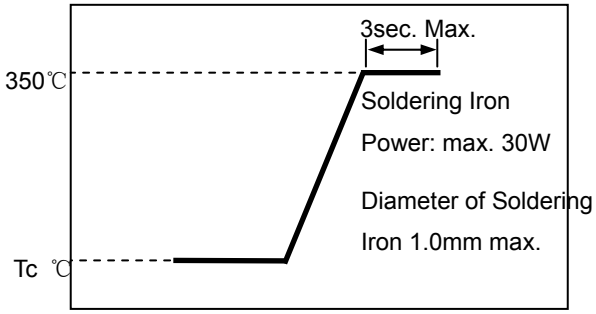
△ Preheat condition: 150 ~200℃/60~120sec.
△ Allowed time above 217℃: 60~90sec.
△ Max temp: 260℃
△ Max time at max temp: 10sec.
△ Solder paste: Sn/3.0Ag/0.5Cu
△ Allowed Reflow time: 2x max



[Note: The reflow profile in the above table is only for qualification and is not meant to specify board assembly profiles. Actual board assembly profiles must be based on the customer's specific board design, solder paste and process, and should not exceed the parameters as the Reflow profile shows.]

7.2 Iron Soldering Profile

- △ Iron soldering power: Max. 30W
- △ Pre-heating: 150℃/60sec.
- △ Soldering Tip temperature: 350℃ Max.
- △ Soldering time: 3sec. Max.
- △ Solder paste: Sn/3.0Ag/0.5Cu
- △ Max.1 times for iron soldering



[Note: Take care not to apply the tip of the soldering iron to the terminal electrodes.]

8. Supplier Information

a) Supplier:
Shenzhen Sunlord Electronics Co., Ltd.

b) Manufacturer:
Shenzhen Sunlord Electronics Co., Ltd.

c) Manufacturing Address:
Sunlord Industrial Park, Dafuyuan Industrial Zone, Guanlan, Shenzhen, China 518110

Appendix A: Electrical Characteristics (HQ Series of Inductors)

HQ1005 Series of Inductors

Part Number	L (nH)	Tolerance	Q Min.	L, Q Test. Freq (MHz)	Q (Typ.) Freq. (MHz)				S.R.F (MHz) Min.	DCR (Ω) Max.	Ir (mA) Max.
					100	250	900	1800			
HQ1005C1N0□T	1.0	B, C, S	20	250	13	22	48	75	6000	0.05	1000
HQ1005C1N2□T	1.2	B, C, S	20	250	13	22	48	75	6000	0.05	1000
HQ1005C1N5□T	1.5	B, C, S	20	250	13	22	58	76	6000	0.05	1000
HQ1005C1N8□T	1.8	B, C, S	20	250	13	22	49	78	6000	0.07	800
HQ1005C2N0□T	2.0	B, C, S	20	250	14	23	49	82	6000	0.07	800
HQ1005C2N2□T	2.2	B, C, S	20	250	14	23	49	82	6000	0.07	800
HQ1005C2N4□T	2.4	B, C, S	20	250	14	23	47	78	6000	0.07	800
HQ1005C2N5□T	2.5	B, C, S	20	250	14	23	47	78	6000	0.07	800
HQ1005C2N7□T	2.7	B, C, S	20	250	14	23	48	82	6000	0.09	700
HQ1005C2N9□T	2.9	B, C, S	20	250	14	23	48	82	6000	0.09	700
HQ1005C3N0□T	3.0	B, C, S	20	250	14	23	50	84	6000	0.09	700
HQ1005C3N3□T	3.3	B, C, S	20	250	14	24	52	90	6000	0.09	700
HQ1005C3N6□T	3.6	B, C, S	20	250	15	24	55	95	6000	0.10	700
HQ1005C3N9□T	3.9	B, C, S	20	250	15	25	50	89	6000	0.10	700
HQ1005C4N1□T	4.1	B, C, S	20	250	15	25	49	86	6000	0.12	650
HQ1005C4N3□T	4.3	B, C, S	20	250	15	25	49	86	6000	0.13	600
HQ1005C4N7□T	4.7	B, C, S	20	250	15	26	50	88	6000	0.13	600
HQ1005C5N1□T	5.1	B, C, S	20	250	15	26	49	84	5500	0.13	600
HQ1005C5N6□T	5.6	B, C, S	20	250	15	27	50	84	5500	0.13	600
HQ1005C5N8□T	5.8	B, C, S	20	250	15	27	50	82	5500	0.13	600
HQ1005C6N2□T	6.2	B, C, S	20	250	15	27	50	80	5500	0.14	550
HQ1005C6N8□T	6.8	G, H, J	22	250	15	27	55	89	5000	0.15	550
HQ1005C7N3□T	7.3	G, H, J	22	250	15	27	54	90	5000	0.16	550
HQ1005C7N5□T	7.5	G, H, J	22	250	15	27	54	90	5000	0.16	550
HQ1005C8N2□T	8.2	G, H, J	22	250	15	27	56	84	5000	0.16	550
HQ1005C8N7□T	8.7	G, H, J	22	250	15	27	53	80	5000	0.17	500
HQ1005C9N1□T	9.1	G, H, J	22	250	15	27	53	79	4500	0.18	500
HQ1005C9N5□T	9.5	G, H, J	22	250	15	27	52	77	4500	0.18	500
HQ1005C10N□T	10	G, H, J	22	250	16	29	52	75	4500	0.18	500
HQ1005C11N□T	11	G, H, J	22	250	16	28	52	71	4000	0.20	500
HQ1005C12N□T	12	G, H, J	22	250	16	29	51	68	4000	0.20	500
HQ1005C15N□T	15	G, H, J	22	250	16	29	50	60	4000	0.22	430

※□: Please specify the inductance tolerance code (B=±0.1nH, C=±0.2nH, S=±0.3nH, G=±2%, H=±3%, J=±5%).