Multi-Layer High Frequency Ceramic Chip Inductors

0201

0402

0603

1. FEATURES

- For high frequency application (~ 10GHz)
- Standard EIA size –0603 (0201), 1005 (0402),1608 (0603),
- Lead-free specifications (Pass Green Policy)
- Tight tolerance physical dimensions (+/- 0.05mm)
- Surface mounting applicability (Supports reflow soldering condition)
- Tight Inductance Tolerance, Excellent Q and Guaranteed SRF range (SRF tolerance +/-15%)
- High product quality and outstanding reliability. (Ceramic integrated structure)

2. APPLICATION

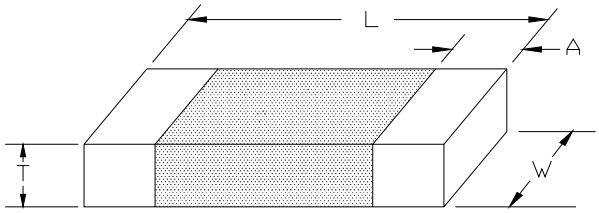
- For high frequency application: cellular phone, WLAN, PHS, EMI countermeasure in high frequency circuits and computer communication etc.

3. ORDERING CODE

HI 0402 1N5 S T

PRODUCT CODE	Multilayer High Frequency Chip Inductor	
DIMENSION CODE	0402 0603	
INDUCTANCE CODE	1N5 = 1.5 nH 15N = 15 nH R15 = 150 nH	
INDUCTANCE TOLERANCE CODE	D= +/- 0.1 nH C = +/- 0.2 nH S = +/- 0.3 nH	G = +/- 2% J= +/- 5% K = +/- 10%
PACKAGING CODE	B = Bulk T = Tape	

4. DIMENSIONS SPECIFICATIONS



DIMENSION CODE (EIA CODE)	L	W	T	A (Min/Max)	Unit
0603 (0201)	0.60 +/- 0.05 (0.024 +/- 0.002)	0.3 +/- 0.05 (0.012 +/- 0.002)	0.3 +/- 0.05 (0.012 +/- 0.002)	0.10/0.20 (0.004/0.008)	mm (inch)
1005 (0402)	1.00 +/- 0.10 (0.040 +/- 0.004)	0.50 +/- 0.10 (0.020 +/- 0.004)	0.50 +/- 0.10 (0.020 +/- 0.004)	0.10 / 0.30 (0.004 / 0.012)	mm (inch)
1608 (0603)	1.60 +/- 0.15 (0.063 +/- 0.006)	0.80 +/- 0.15 (0.031 +/- 0.006)	0.80 +/- 0.15 (0.031 +/- 0.006)	0.20 / 0.60 (0.008 / 0.024)	mm (inch)

5. AVAILABLE INDUCTANCE VALUE AND TOLERANCE

DIMENSION CODE (EIA CODE)	AVAILABLE INDUCTANCE	RATINGS	NORMAL TOLERANCE
0603 (0201)	0.6 nH ~ 15nH	0.6nH~3.9nH	D:+/-0.1nH
		4.7nH~15nH	J: +/- 5%
1005 (0402)	1.0 nH ~ 120 nH	1.0 nH ~ 2.7 nH	S: +/- 0.3 nH
		3.3 nH ~ 5.6 nH	S: +/- 0.3 nH , K: +/- 10%
		6.8 nH ~ 120 nH	J: +/- 5% , K: +/- 10%
1608 (0603)	1.5 nH ~ 220 nH	1.5 nH ~ 2.7 nH	S: +/- 0.3 nH
		3.3 nH ~ 5.6 nH	S: +/- 0.3 nH , K: +/- 10%
		6.8 nH ~ 220 nH	J: +/- 5% , K: +/- 10%

6. ELECTRICAL SPECIFICATIONS {1005 (0402) SERIES}

Ordering Code	Inductance	Tolerance	Q	L, Q Measuring Frequency	Q(Typical) Frequency(MHz)			SRF Self-Resonance Frequency	RDC DC-Resistance	Rated Current	Packing Amount of 7" reel
	(nH)		min	(MHz)	100	500	800	(MHz) min.	(Ω) max.	(mA) max.	Pcs.
HI1005 1N0 S X	1.0	S	8	100	11	33	37	10000	0.12	300	10000
HI1005 1N2 S X	1.2	S	8	100	11	29	36	10000	0.12	300	
HI1005 1N5 S X	1.5	S	8	100	12	29	40	6000	0.13	300	
HI1005 1N8 S X	1.8	S	8	100	11	26	34	6000	0.14	300	
HI1005 2N2 S X	2.2	S	8	100	11	26	36	6000	0.16	300	
HI1005 2N7 S X	2.7	S	8	100	12	29	38	6000	0.17	300	
HI1005 3N3 □X	3.3	S, K	8	100	11	28	37	6000	0.19	300	
HI1005 3N9 □X	3.9	S, K	8	100	11	26	32	4000	0.22	300	
HI1005 4N7 □X	4.7	S, K	8	100	12	28	37	4000	0.24	300	
HI1005 5N6 □X	5.6	S, K	8	100	11	26	35	4000	0.27	300	
HI1005 6N8 □X	6.8	J, K	8	100	11	26	34	3900	0.32	300	
HI1005 8N2 □X	8.2	J, K	8	100	12	26	34	3500	0.37	300	
HI1005 10N □X	10	J, K	8	100	11	25	31	3200	0.42	300	
HI1005 12N □X	12	J, K	8	100	11	25	31	2600	0.50	300	
HI1005 15N □X	15	J, K	8	100	11	24	30	2300	0.55	300	
HI1005 18N □X	18	J, K	8	100	11	24	30	2000	0.65	300	
HI1005 22N □X	22	J, K	8	100	12	24	30	1600	0.80	300	
HI1005 27N □X	27	J, K	8	100	11	24	28	1400	0.90	300	
HI1005 33N □X	33	J, K	8	100	12	23	26	1200	1.00	200	
HI1005 39N □X	39	J, K	8	100	11	21	24	1100	1.20	200	
HI1005 47N □X	47	J, K	8	100	11	21	23	900	1.30	200	
HI1005 56N □X	56	J, K	8	100	12	21	21	750	1.40	200	
HI1005 68N □X	68	J, K	8	100	11	19	19	750	1.40	180	
HI1005 82N □X	82	J, K	8	100	10	19	16	600	1.60	150	
HI1005 R10 □X	100	J, K	8	100	10	18	-	600	1.60	100	
HI1005 R12 □X	120	J, K	8	100	11	15	-	600	1.60	100	

* X= Packaging: T=Tape, B=Bulk

** □= Tolerance: S=+/-0.3nH, J=+/-5%, K=+/-10%

- MEASURING EQUIPMENT: HP4291B+16193A
- MEASURING TEMPERATURE: 25 +/- 1 ℃
- OPERATING TEMPERATURE RANGE: -30 ℃ TO +85 ℃

7. ELECTRICAL SPECIFICATIONS {1608 (0603) SERIES}

Ordering Code	Inductance	Tolerance	Q	L ,Q Measuring Frequency	Q(Typical) Frequency(MHz)			SRF Self-Resonance Frequency	RDC DC-Resistance	Rated Current	Packing Amount of 7" reel
	(nH)		min	(MHz)	100	500	800	(MHz) min.	(Ω) max.	(mA) max	Pcs.
HI1608 1N2 S X	1.2	S	8	100	13	32	49	6000	0.10	1000	
HI1608 1N5 S X	1.5	S	8	100	14	34	47	6000	0.10	1000	
HI1608 1N8 S X	1.8	S	8	100	17	40	55	6000	0.10	1000	
HI1608 2N2 S X	2.2	S	8	100	15	38	49	6000	0.10	1000	
HI1608 2N7 S X	2.7	S	10	100	14	37	48	6000	0.10	1000	
HI1608 3N3 □X	3.3	S, K	10	100	16	40	51	6000	0.13	1000	
HI1608 3N9 □X	3.9	S, K	10	100	14	36	48	6000	0.15	1000	
HI1608 4N7 □X	4.7	S, K	10	100	14	37	48	4000	0.20	1000	
HI1608 5N6 □X	5.6	S, K	10	100	14	36	46	4000	0.23	600	
HI1608 6N8 □X	6.8	J, K	10	100	15	37	48	4000	0.25	600	
HI1608 8N2 □X	8.2	J, K	10	100	16	39	50	3500	0.28	600	
HI1608 10N □X	10	J, K	12	100	16	37	47	3200	0.30	600	
HI1608 12N □X	12	J, K	12	100	15	36	45	2600	0.35	600	
HI1608 15N □X	15	J, K	12	100	16	38	48	2300	0.40	600	4000
HI1608 18N □X	18	J, K	12	100	17	38	47	2000	0.45	600	
HI1608 22N □X	22	J, K	12	100	18	40	49	1600	0.50	600	
HI1608 27N □X	27	J, K	12	100	18	40	47	1400	0.55	600	
HI1608 33N □X	33	J, K	12	100	17	40	46	1200	0.60	600	
HI1608 39N □X	39	J, K	12	100	19	40	46	1100	0.65	500	
HI1608 47N □X	47	J, K	12	100	17	36	39	900	0.70	500	
HI1608 56N □X	56	J, K	12	100	18	36	37	900	0.75	500	
HI1608 68N □X	68	J, K	12	100	18	35	36	700	0.80	400	
HI1608 82N □X	82	J, K	12	100	18	33	29	600	0.85	300	
HI1608 R10 □X	100	J, K	12	100	18	28	16	600	0.90	300	
HI1608 R12 □X	120	J, K	8	50	19	28	17	500	1.00	300	
HI1608 R15 □X	150	J, K	8	50	13	17	-	500	1.20	300	
HI1608 R18 □X	180	J, K	8	50	13	16	-	400	1.30	300	
HI1608 R22 □X	220	J, K	8	50	15	13	-	400	1.50	300	

* X= Packaging: T=Tape, B=Bulk

** □= Tolerance: S=+/-0.3nH, J=+/-5%, K=+/-10%

- MEASURING EQUIPMENT: HP4291B+16192A
- MEASURING TEMPERATURE: 25 +/- 1 ℃
- OPERATING TEMPERATURE RANGE: -30 ℃ TO +85 ℃

8 . ELECTRICAL SPECIFICATIONS {0402}1005 Hi-Q SERIES}

Ordering Code	Inductance (nH)	Tolerance	Q min	L, Q Measuring Frequency (MHz)	Q(Typical) Frequency (MHz)			SRF Self-Resonance Frequency (MHz)	RDC DC-Resistance (Ω)		Rated Current (mA)	Packing Amount of 7" reel
					100	500	800	min.	max.	Typ.	max.	Pcs.
HI1005 1N0 S X	1.0	S	8	100	11	33	43	10000	0.08	0.03	300	10000
HI1005 1N1 S X	1.1	S	8	100	11	33	43	10000	0.08	0.03	300	
HI1005 1N2 S X	1.2	S	8	100	11	33	43	10000	0.08	0.03	300	
HI1005 1N3 S X	1.3	S	8	100	11	33	43	10000	0.09	0.04	300	
HI1005 1N5 S X	1.5	S	8	100	11	33	43	6000	0.10	0.05	300	
HI1005 1N6 S X	1.6	S	8	100	11	31	41	6000	0.10	0.05	300	
HI1005 1N8 S X	1.8	S	8	100	11	31	41	6000	0.10	0.05	300	
HI1005 2N0 S X	2.0	S	8	100	11	26	36	6000	0.15	0.09	300	
HI1005 2N2 S X	2.2	S	8	100	11	26	36	6000	0.15	0.09	300	
HI1005 2N4 S X	2.4	S	8	100	11	26	36	6000	0.16	0.10	300	
HI1005 2N7 S X	2.7	S	8	100	12	29	38	6000	0.16	0.10	300	
HI1005 3N0 S X	3.0	S	8	100	11	28	37	6000	0.17	0.11	300	
HI1005 3N3 □X	3.3	S, K	8	100	11	28	37	6000	0.17	0.11	300	
HI1005 3N6 □X	3.6	S, K	8	100	11	26	32	5000	0.18	0.12	300	
HI1005 3N9 □X	3.9	S, K	8	100	11	26	32	4000	0.19	0.13	300	
HI1005 4N3 □X	4.3	S, K	8	100	11	26	32	4000	0.21	0.15	300	
HI1005 4N7 □X	4.7	S, K	8	100	12	28	37	4000	0.22	0.16	300	
HI1005 5N1 □X	5.1	S, K	8	100	11	26	35	4000	0.22	0.16	300	
HI1005 5N6 □X	5.6	S, K	8	100	11	26	35	4000	0.22	0.16	300	
HI1005 6N2 □X	6.2	J, K	8	100	11	26	34	3900	0.26	0.20	300	
HI1005 6N8 □X	6.8	J, K	8	100	11	26	34	3900	0.27	0.21	300	

* X= Packaging: T=Tape, B=Bulk

** □= Tolerance: S=+/-0.3nH, J=+/-5%, K=+/-10%

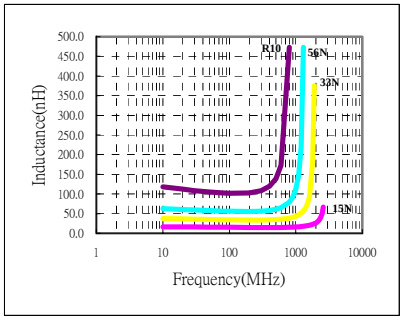
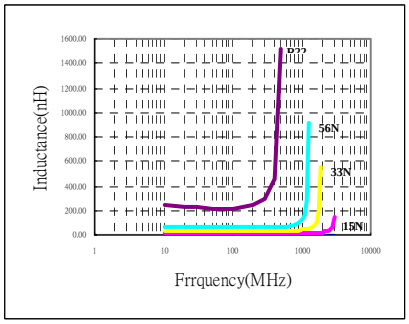
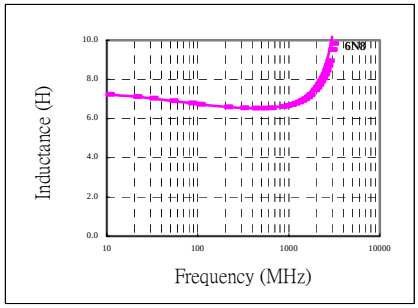
MEASURING EQUIPMENT: HP4291B+16193A

MEASURING TEMPERATURE: 25 +/- 1 ℃

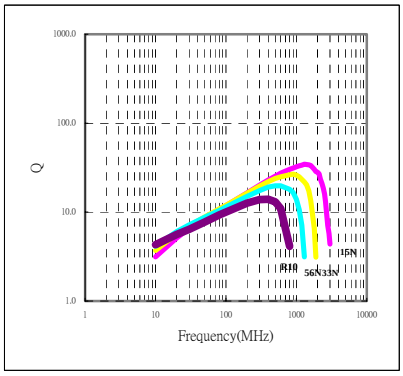
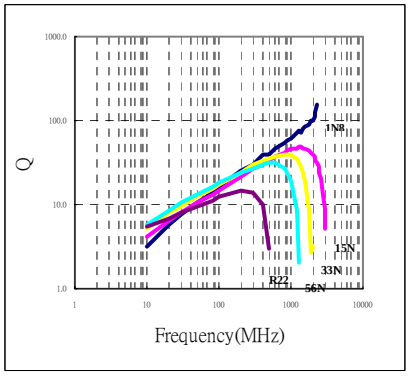
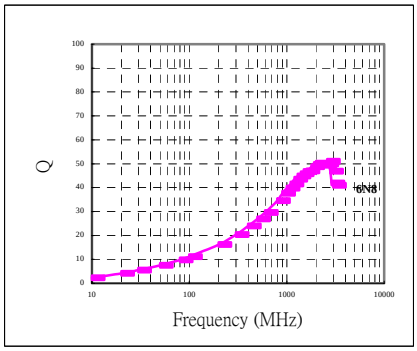
OPERATING TEMPERATURE RANGE: -30 ℃ TO +85 ℃

9. TYPICAL ELECTRICAL CHARACTERISTICS (0402 / 0603)

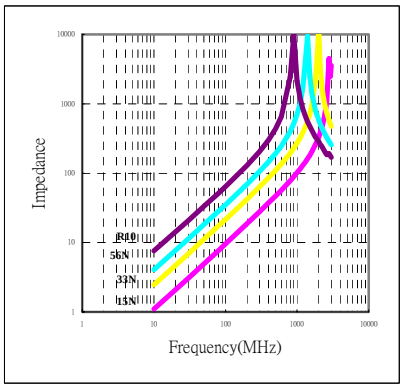
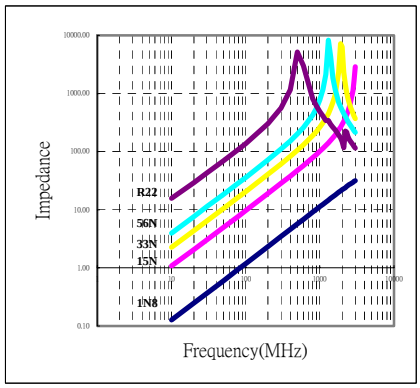
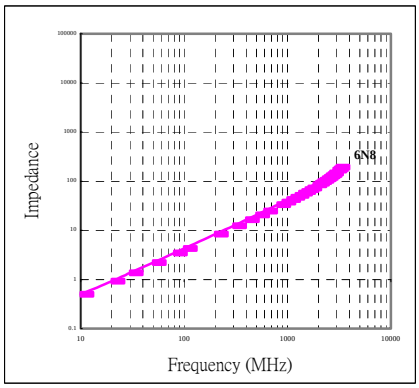
• L CHARACTERISTICS

		
1005 L vs Frequency	1608 L vs Frequency	1005 Hi-Q L vs Frequency

• Q CHARACTERISTICS

		
1005 Q vs Frequency	1608 Q vs Frequency	1005 Hi-Q vs Frequency

• IMPEDANCE CHARACTERISTICS

		
1005 Z vs. Frequency	1608 Z vs. Frequency	1005 Hi-Q Z vs Frequency

10. TESTING CONDITION AND REQUIREMENTS

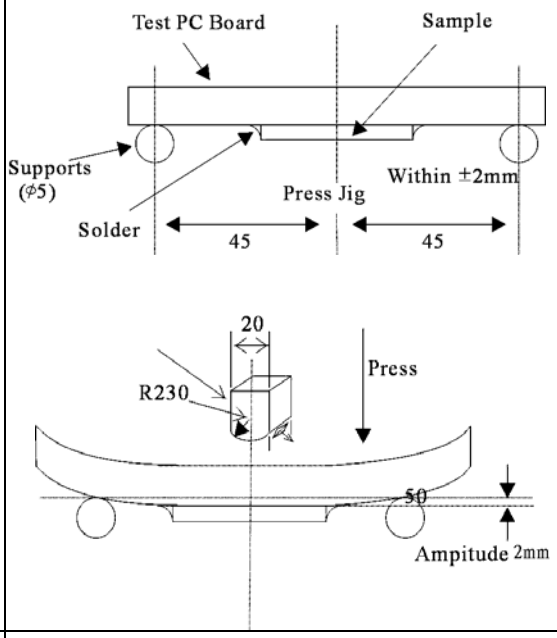
■ Electrical characteristics

No.	Item	Test Condition	Requirements
8.1	Inductance	a. Temperature: 25+/- 1℃ b. Relative Humidity: 45 to 85%RH c. Atmospheric Pressure: 86 to 106kpa d. Measuring equipment and fixture: 1608(0603) HP 4291+16192A 1005(0402) HP 4291+16193A	Within specified tolerance.
8.2	Q Value	a. Temperature: 25+/- 1℃ b. Relative Humidity: 45 to 85%RH c. Atmospheric Pressure: 86 to 106kpa d. Measuring equipment and fixture: 1608(0603) HP 4291+16192A 1005(0402) HP 4291+16193A	In accordance with electrical specification.
8.3	DC Resistance	a. Temperature: 25+/- 1℃ b. Relative Humidity: 45 to 85%RH c. Atmospheric Pressure: 86 to 106kpa d. Measuring equipment: HP 4338	In accordance with electrical specification.
8.4	Temperature Characteristics	a. Temperature range: -30 to 85℃ b. Reference temperature: 25℃	Within specified tolerance.

■ Mechanical characteristics

No.	Item	Test Condition	Requirements
8.5	Appearance	Inductors shall be visually inspected for visible evidence of defect.	In accordance with specification.
8.6	Dimension	Dimension shall be measured with caliper or micrometer	In accordance with dimension specification.
8.7	Solderability	Immerse a test sample into a methanol solution containing rosin, preheat it at 150 to 180℃ for 3 to 5 seconds and immerse into molten solder of 230+/-5℃ for 5+/-1 seconds.	More than 75% of the terminal electrode part shall be covered with fresh solder.

11. TESTING CONDITION AND REQUIREMENTS (Continue)

8.8	Bending Strength	Solder the chip to test jig then apply a force in the direction shown in below. The soldering shall be done with the reflow method and shall be conducted with care so that the soldering is uniform and free of defects such as heat shock. Mounting Samples 	No mechanical damage shall be observed.
8.9	Resistance to Soldering Heat	Immerse a test sample into a methanol solution containing resin, preheat it at 150 to 180℃ for 2 to 3 minutes and immerse into molten solder of 260+/-5℃ for 10+/-0.5 seconds so that both terminal electrodes are completely submerged.	No visible damage

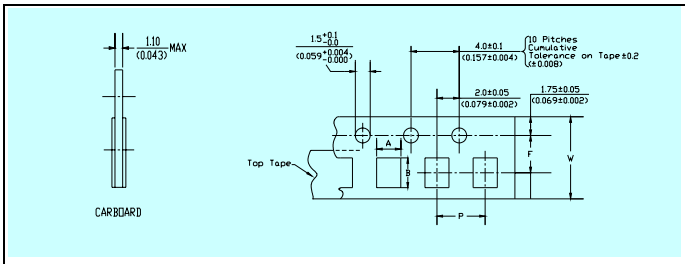
12. TESTING CONDITION AND REQUIREMENTS (Continue)

Reliability

No.	Item	Test Condition	Requirements
8.10	Thermal Shock	Solder a test sample to printed circuit board, and conduct 100 cycles of test under the conditions shown as below. Cycle: 85℃/1hr within 2min -40℃/1hr	No visible damage Inductance variation within 10% Q variation within 20%
8.11	High Humidity State Life Test	Keep a test sample in an atmosphere with a temperature of 70+/-2℃, 90~95%RH for 500+/-12 hours. After the test, keep the test sample at a normal temperature for 1 to 2 hours, and then carry out measurement.	No visible damage. Inductance variation within 10%. Q variation within 20%.
8.12	High Humidity Load Life Test	Solder a test sample to printed circuit board then keep the test sample in an atmosphere with a temperature of 70+/-2℃, 90~95%RH for 500+/-12 hours while supplying the rated current. After the test, keep the test sample at a normal temperature for 1 to 2 hours, and then carry out measurement.	No visible damage. Inductance variation within 10%. Q variation within 20%.
8.13	High Temperature State Life Test	Keep a test sample in an atmosphere with a temperature of 85+/-2℃ for 500+/-12 hours. After the test, keep the test sample at a normal temperature for 1 to 2 hours, and then carry out measurement.	No visible damage. Inductance variation within 10%. Q variation within 20%.
8.14	High Temperature Load	Solder a test sample to printed circuit board then keep the test sample in an atmosphere with a temperature of 85+/-2℃ for 500+/-12 hours while supplying the rated current. After the test, keep the test sample at a normal temperature for 1 to 2 hours, and then carry out measurement.	No visible damage. Inductance variation within 10%. Q variation within 20%.

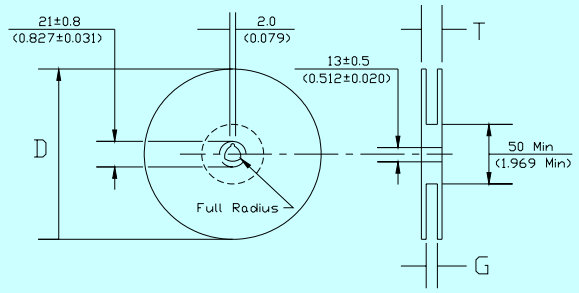
13. PACKAGING SPECIFICATIONS

Paper tape specifications(1005/1608)



SYMBOL	1005		1608	
	Size (mm)	Tolerance (mm)	Size (mm)	Tolerance (mm)
A	0.62	+/-0.03	1.0	+/-0.20
B	1.12	+/-0.03	1.8	+/-0.20
F	3.50	+/-0.05	3.5	+/-0.05
P	2.00	+/-0.05	4.0	+/-0.10
W	8.00	+/-0.20	8.0	+/-0.20

Reel specifications



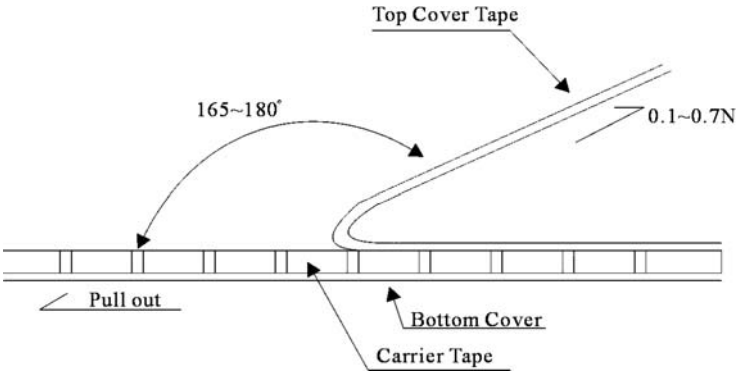
Tape Width (mm)	G (mm)	T MAX(mm)	D (mm)
8	10.0+/-1.5	14.4	178

14. PACKAGING SPECIFICATIONS (Continue)

Peel strength of top cover tape

The peel speed shall be about 300 mm/min.

The peel strength of top cover tape shall be between 0.1 to 0.7N.



Quantity per reel

1608 (0603): 4,000 pieces / reel

1005 (0402): 10,000 pieces / reel

The contents of a box

1608 (0603): 5 reels / box

1005 (0402): 5 reels / box

Marking

The following item shall be marked on the reel.

a. **Manufactures parts number.**
b. **Manufacturing date code.**
c. **Manufacturer name.**
d. **Manufactures lot number.**
e. **Quantity.**

15. Cautions

Storage

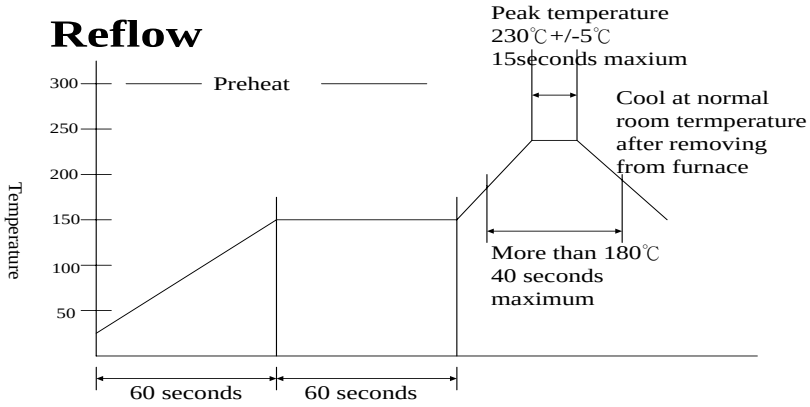
1. The chip inductor shall be packaged in carrier tapes.
2. To keep storage place temperature from +5 to 35℃, humidity from 45 to 70% RH.
3. The storage atmosphere must be free of gas containing sulfur and chlorine. Also, avoid exposing the product to saline moisture. If the product is exposed to such atmospheres, the terminals will oxidize and solderability will be affected.
4. The solderability is assured for 12 months from our final inspection date if the above storage condition is followed.

Handling

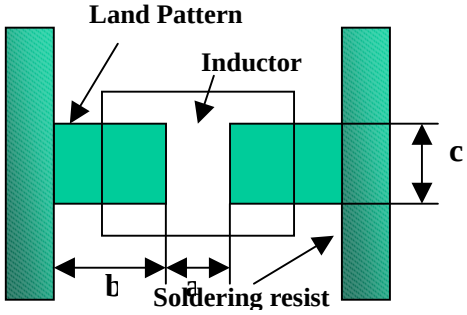
Chip inductor should be handled with care to avoid contamination or damage. The use of vacuum pick-up or plastic tweezers is recommended for manual placement. Tape and reeled packages are suitable for automatic pick and placement machine.

Soldering

Since rapid heating or cooling may easily damage ceramic, so we have to limit the temperature difference to within 130℃ while some heat shock is unavoidable. The recommended soldering profile is shown as follows:



Recommended pad dimensions



(Unit: mm)

Size	L x W	a	b	c
1005 (0402)	1.0*0.5	0.45 to 0.55	0.40 to 0.50	0.45 to 0.55
1608 (0603)	1.6*0.8	0.60 to 0.80	0.60 to 0.80	0.60 to 0.80

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