

Thin Film Chip Inductors Type KL73 Series

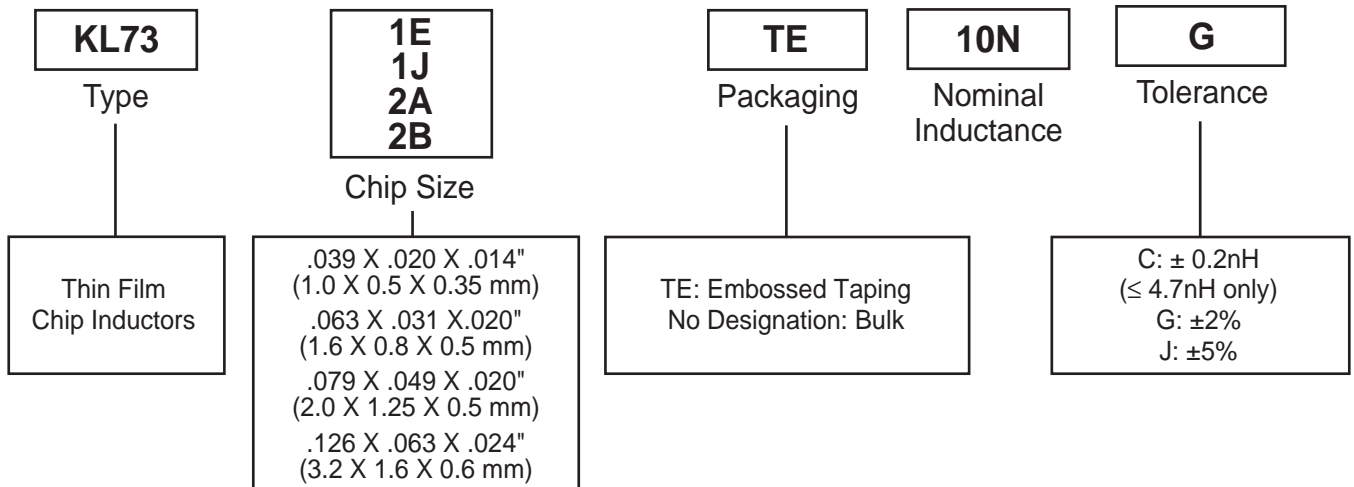
 ISO 9001 CERTIFIED

1. Scope

This specification applies to Thin Film Chip Inductors (KL73) 1E, 1J, 2A and 2B sizes produced by KOA Corporation.

2. Type Designation

The type designation shall be the following form:



3. Rating

Item	Ratings			
	0402	0603	0805	1206
Nominal Inductance Range (nH)	1.0 ~ 27	1.0 ~ 82	1.0 ~ 82	2.2 ~ 100 (E-12 series)
Inductance Tolerance	± 2%, ± 5% (± 0.2nH: Under 4.7nH)			
Quality Factor (typ.)	10 ~ 7	12 ~ 25	15 ~ 32	17 ~ 44
Self Resonant Frequency (typ.) (MHz)	12,000 ~ 1,500	600 ~ 13,000	600 ~ 13,000	470 ~ 9,000
DC Resistance (typ.) (Ω)	0.15 ~ 5.00	0.05 ~ 4.50	0.03 ~ 4.00	0.07 ~ 1.90
Allowable Current (max.) (mA)	700 ~ 150	100 ~ 650	150 ~ 900	250 ~ 1,000
Operating Temperature Range (°C)	-40°C ~ +85°C			
Storage Temperature Range (°C)	-40°C ~ +125°C			

Rating Table

Type	Nominal Inductance (nH)	Marking	Inductance Tolerance	Quality Factor (typ.)	Self Resonant Frequency (typ.) (MHz)	DC Resistance (typ.) (Ω)	Allowable DC Current (typ.) (mA)	Measuring Frequency (MHz)			
KL73 1E T 1N0C	1.0		C ($\pm 0.2\text{nH}$)	10	12,000	0.15	700	500			
KL73 1E T 1N2C	1.2										
KL73 1E T 1N5C	1.5										
KL73 1E T 1N8C	1.8				10,000	0.20	650				
KL73 1E T 2N2C	2.2										
KL73 1E T 2N7C	2.7										
KL73 1E T 3N3C	3.3				6,000	0.30	600				
KL73 1E T 3N9C	3.9										
KL73 1E T 4N7C	4.7										
KL73 1E T 5N6 <input type="checkbox"/>	5.6				5,000	0.50	550				
KL73 1E T 6N8 <input type="checkbox"/>	6.8										
KL73 1E T 8N2 <input type="checkbox"/>	8.2										
KL73 1E T 10N <input type="checkbox"/>	10.0				2,500	1.50	500				
KL73 1E T 12N <input type="checkbox"/>	12.0										
KL73 1E T 15N <input type="checkbox"/>	15.0										
KL73 1E T 18N <input type="checkbox"/>	18.0		2,000	2.00	450						
KL73 1E T 22N <input type="checkbox"/>	22.0										
KL73 1E T 27N <input type="checkbox"/>	27.0										
KL73 1E T 27N <input type="checkbox"/>	27.0		G ($\pm 2\%$) J ($\pm 5\%$)	7	1,500	3.00	200	200			
KL73 1E T 27N <input type="checkbox"/>	27.0										
KL73 1E T 27N <input type="checkbox"/>	27.0										
KL73 1J TE 1N0C	1.0	L1			C ($\pm 0.2\text{nH}$)	20	13,000		0.05	650	500
KL73 1J TE 1N2C	1.2	L2									
KL73 1J TE 1N5C	1.5	L3									
KL73 1J TE 1N8C	1.8	L4					10,000		0.07	450	
KL73 1J TE 2N2C	2.2	22									
KL73 1J TE 2N7C	2.7	27									
KL73 1J TE 3N3C	3.3	33					6,000		0.08	350	
KL73 1J TE 3N9C	3.9	39									
KL73 1J TE 4N7C	4.7	47									
KL73 1J TE 5N6 <input type="checkbox"/>	5.6	56					5,000		0.09	250	
KL73 1J TE 6N8 <input type="checkbox"/>	6.8	68									
KL73 1J TE 8N2 <input type="checkbox"/>	8.2	82									
KL73 1J TE 10N <input type="checkbox"/>	10.0	10	2,500	0.10			200				
KL73 1J TE 12N <input type="checkbox"/>	12.0	12									
KL73 1J TE 15N <input type="checkbox"/>	15.0	15									
KL73 1J TE 18N <input type="checkbox"/>	18.0	H1	2,000	0.11	250						
KL73 1J TE 22N <input type="checkbox"/>	22.0	H2									
KL73 1J TE 27N <input type="checkbox"/>	27.0	H3									
KL73 1J TE 27N <input type="checkbox"/>	27.0	H3	1,500	0.12	200						
KL73 1J TE 33N <input type="checkbox"/>	33.0	H4									
KL73 1J TE 39N <input type="checkbox"/>	39.0	H5									
KL73 1J TE 39N <input type="checkbox"/>	39.0	H5	1,000	0.15	150						
KL73 1J TE 39N <input type="checkbox"/>	39.0	H5									
KL73 1J TE 39N <input type="checkbox"/>	39.0	H5									
KL73 1J TE 39N <input type="checkbox"/>	39.0	H5	1,100	0.15	150						
KL73 1J TE 39N <input type="checkbox"/>	39.0	H5									
KL73 1J TE 39N <input type="checkbox"/>	39.0	H5									

: Inductance tolerance (G or J)

Rating Table *Continued*

Type	Nominal Inductance (nH)	Marking	Inductance Tolerance	Quality Factor (typ.)	Self Resonant Frequency (typ.) (MHz)	DC Resistance (typ.) (Ω)	Allowable DC Current (typ.) (mA)	Measuring Frequency (MHz)
KL73 1J TE 47N <input type="checkbox"/>	47.0	H6	G ($\pm 2\%$) J ($\pm 5\%$)	13	1,000	1.90	120	200
KL73 1J TE 56N <input type="checkbox"/>	56.0	H7			800	3.50	100	
KL73 1J TE 68N <input type="checkbox"/>	68.0	H8			700	4.00		
KL73 1J TE 82N <input type="checkbox"/>	82.0	H9			600	4.50		
KL73 2A TE 1N0C	1.0	1.0	C ($\pm 0.2\text{nH}$)	24	13,000	0.03	900	500
KL73 2A TE 1N2C	1.2	1.2				0.04		
KL73 2A TE 1N5C	1.5	1.5			10,000	0.05		
KL73 2A TE 1N8C	1.8	1.8		28	9,000	0.06	800	
KL73 2A TE 2N2C	2.2	2.2				0.07		
KL73 2A TE 2N7C	2.7	2.7			8,000	0.09		
KL73 2A TE 3N3C	3.3	3.3			6,000	0.10		
KL73 2A TE 3N9C	3.9	3.9		29	5,000	0.12	700	
KL73 2A TE 4N7C	4.7	4.7		30		0.16		
KL73 2A TE 5N6	5.6	5.6		G ($\pm 2\%$) J ($\pm 5\%$)	30	4,500	0.18	
KL73 2A TE 6N8	6.8	6.8	4,000			0.26		
KL73 2A TE 8N2	8.2	8.2	3,000			0.28		
KL73 2A TE 10N <input type="checkbox"/>	10.0	10.0	32		2,750	0.36	450	
KL73 2A TE 12N <input type="checkbox"/>	12.0	12.0	30		2,500	0.38		
KL73 2A TE 15N <input type="checkbox"/>	15.0	15.0	28		2,250	0.40	400	
KL73 2A TE 18N <input type="checkbox"/>	18.0	18.0	22		1,600	1.00	300	
KL73 2A TE 22N <input type="checkbox"/>	22.0	22.0			1,450	1.10		
KL73 2A TE 27N <input type="checkbox"/>	27.0	27.0	15		1,350	1.20		
KL73 2A TE 33N <input type="checkbox"/>	33.0	33.0	17		1,200	1.30	250	
KL73 2A TE 39N <input type="checkbox"/>	39.0	39.0		1,000	1.40			
KL73 2A TE 47N <input type="checkbox"/>	47.0	47.0		950	1.50			
KL73 2A TE 56N <input type="checkbox"/>	56.0	56.0	15	800	3.50	150		
KL73 2A TE 68N <input type="checkbox"/>	68.0	68.0		700				
KL73 2A TE 82N <input type="checkbox"/>	82.0	82.0		600	4.00			
KL73 2B TE 2N2C	2.2	2N2	C ($\pm 0.2\text{nH}$)	32	9,000	0.07	1,000	
KL73 2B TE 2N7C	2.7	2N7		38	7,000			
KL73 2B TE 3N3C	3.3	3N3		40	6,000	0.08		
KL73 2B TE 3N9C	3.9	3N9		42	5,000	0.10	900	
KL73 2B TE 4N7C	4.7	4N7		44	4,500	0.11		
KL73 2B TE 5N6 <input type="checkbox"/>	5.6	5N6			4,000	0.13		
KL73 2B TE 6N8 <input type="checkbox"/>	6.8	6N8	40	3,500	0.15	800		
KL73 2B TE 8N2 <input type="checkbox"/>	8.2	8N2		3,000	0.18			
KL73 2B TE 10N <input type="checkbox"/>	10.0	10N		2,900	0.21			

: Inductance tolerance (G or J)

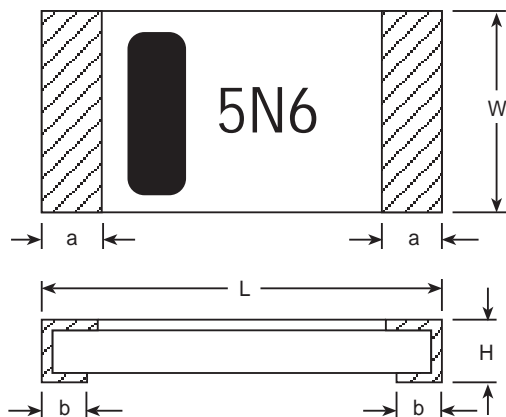
Rating Table *Continued*

Type	Nominal Inductance (nH)	Marking	Inductance Tolerance	Quality Factor (typ.)	Self Resonant Frequency (typ.) (MHz)	DC Resistance (typ.) (Ω)	Allowable DC Current (typ.) (mA)	Measuring Frequency (MHz)
KL73 2B TE 12N <input type="checkbox"/>	12.0	5.6	G ($\pm 2\%$) J ($\pm 5\%$)	42	2,700	0.22	800	500
KL73 2B TE 15N <input type="checkbox"/>	15.0	15N			2,400	0.30	500	
KL73 2B TE 18N <input type="checkbox"/>	18.0	18N			2,100	0.37		
KL73 2B TE 22N <input type="checkbox"/>	22.0	22N			1,940	0.45		
KL73 2B TE 27N <input type="checkbox"/>	27.0	27N		30	1,680	0.58	400	200
KL73 2B TE 33N <input type="checkbox"/>	33.0	33N		28	1,500	0.69		
KL73 2B TE 39N <input type="checkbox"/>	39.0	39N		1,300	0.78			
KL73 2B TE 47N <input type="checkbox"/>	47.0	47N		1,270	0.85			
KL73 2B TE 56N <input type="checkbox"/>	56.0	56N		18	600	1.50	250	
KL73 2B TE 68N <input type="checkbox"/>	68.0	68N		17	570	1.60		
KL73 2B TE 82N <input type="checkbox"/>	82.0	82N		18	480	1.80		
KL73 2B TE 100 <input type="checkbox"/>	100.0	100.0		19	470	1.90		

: Inductance tolerance (G or J)

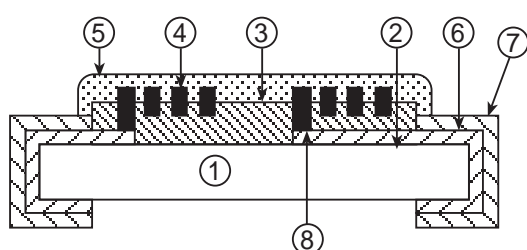
4. Dimensions

Dimensions in inches (mm)



	L	W	H	a	b
0402	.039 (1.0 \pm 0.1)	.020 (0.5 \pm 0.05)	.014 (0.35 \pm 0.05)	.006 (0.15 \pm 0.1)	.010 (0.25 \pm 0.1)
0603	.063 (1.6 \pm 0.2)	.031 (0.8 \pm 0.1)	.020 (0.5 \pm 0.1)	.012 (0.3 \pm 0.1)	.012 (0.3 \pm 0.1)
0805	.079 (2.0 \pm 0.2)	.049 (1.25 \pm 0.2)	.020 (0.5 \pm 0.1)	.016 (0.4 \pm 0.2)	.012 (0.3 \pm 0.2)
1206	.126 (3.2 \pm 0.2)	.063 (1.6 \pm 0.2)	.024 (0.6 \pm 0.1)	.020 (0.5 \pm 0.2)	.016 (0.4 \pm 0.1)

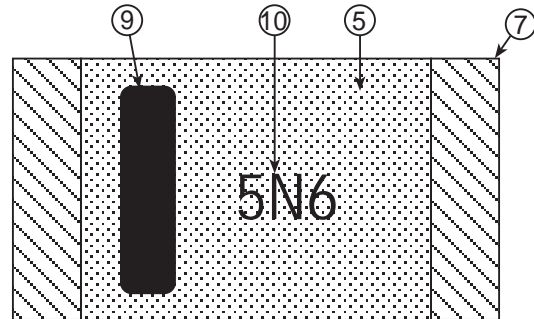
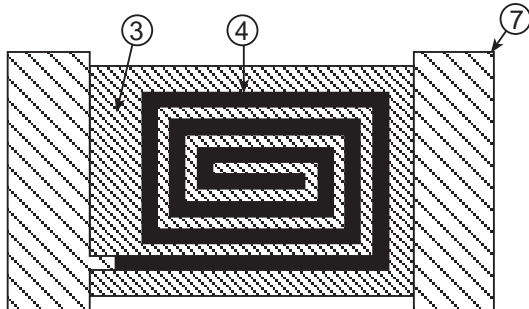
5. Construction



- ① Alumina ceramic substrate
- ② Cross electrode
- ③ Polyimide insulated film
- ④ Cu thin film coil pattern
- ⑤ Epoxy protected film
- ⑥ Ni barrier
- ⑦ Solder plating
- ⑧ Veer hole
- ⑨ Direction mark
- ⑩ Marking

5. Construction Continued

- ① Alumina ceramic substrate
- ② Cross electrode
- ③ Polyimide insulated film
- ④ Cu thin film coil pattern
- ⑤ Epoxy protected film
- ⑥ Ni barrier
- ⑦ Solder plating
- ⑧ Veer hole
- ⑨ Direction mark
- ⑩ Marking



6. Marking

6-1 Coating and Marking Color

Coating color: Dark blue
Direction mark color: Yellow

6-2 Marking Method

0402

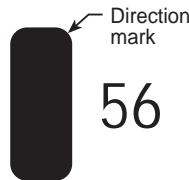
Inductance value shall have no marking.
Direction marking only.

0603

Inductance value shall be indicated to two letters marking of figures and alphabet.

(Example of marking)

- L1 → 1.0nH
- 56 → 5.6nH
- 10 → 10nH
- H6 → 47nH



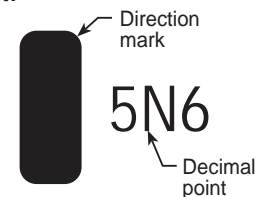
See marking item on page 2, rating table.

1206

Inductance value shall be indicated to two letters marking of significant figures.
An alphabetical letter N shall replace position of decimal point.

(Example of marking)

- 2N2 → 2.2nH
- 5N6 → 5.6nH
- 10 → 10nH
- 47 → 47nH

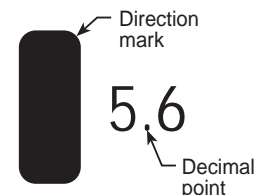


0805

Inductance value shall be indicated to two letters marking, including decimal point.

(Example of marking)

- 2.2 → 2.2nH
- 5.6 → 5.6nH
- 10 → 10nH
- 47 → 47nH



7. Characteristics

7-1 Test Condition

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

Ambient temperature: $20 \pm 15^\circ\text{C}$
 Relative humidity: $65 \pm 20\%$

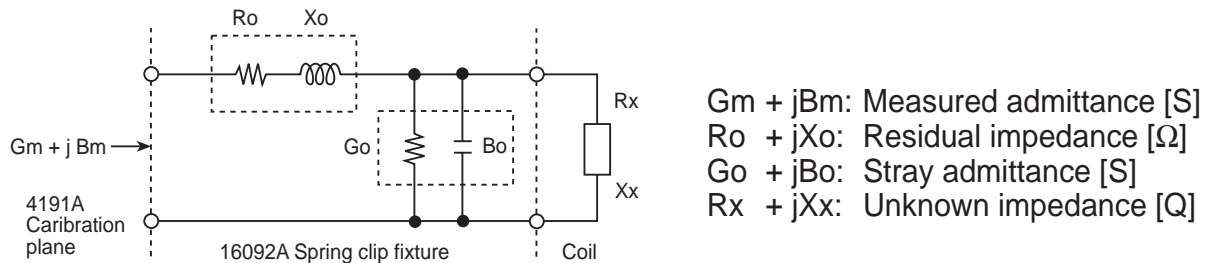
If there may be any doubt on results, measurements shall be made within the following limits:

Ambient temperature: $20 \pm 2^\circ\text{C}$
 Relative humidity: $65 \pm 5\%$

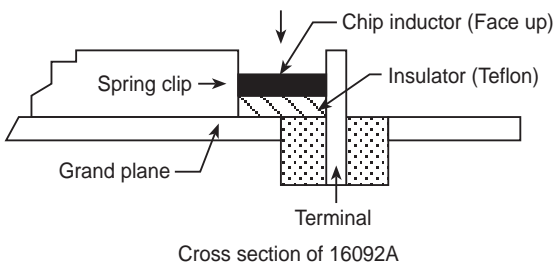
7-2 Measurement Method of L and Q

Test equipment: Hewlett Packard RF Impedance analyzer 4191A
 Fixture: Hewlett Packard Test fixture 16092A
 Measuring frequency: 500 MHz/1.0nH ~ 22nH (1.0nH ~ 15nH)
 200 MHz/27nH ~ 100nH (18nH ~ 47nH)

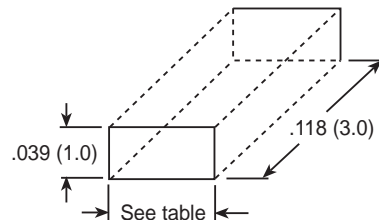
1. Perform auto-calibration to the HP4191A .275" (7 mm) unknown connector connected to $0\Omega/0\text{S}/50\Omega$ standard terminations.
2. Connected the test fixture 16092A.
 Measure the open circuit admittance (G_o , B_o), and the short circuit impedance (R_o , X_o).



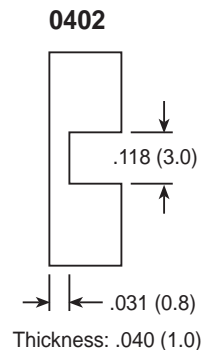
3. Set pattern up and ground side to direction mark on insulator. Measure admittance (G_m , B_m).



Dimensions of insulator (Teflon)
 in inches (mm)



0603	.055 (1.4)
0805	.071 (1.8)
1206	.106 (2.7)



4. The L and Q value shall be given the following equation. (Compensated calculation)

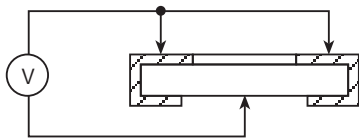
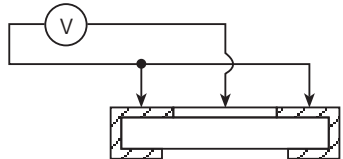
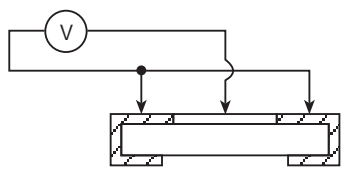
$$R_x = \frac{G_m - G_o}{(G_m - G_o)^2 + (B_m - B_o)^2} - R_o$$

$$X_x = \frac{B_o - B_m}{(G_m - G_o)^2 - (B_m - B_o)^2} - X_o$$

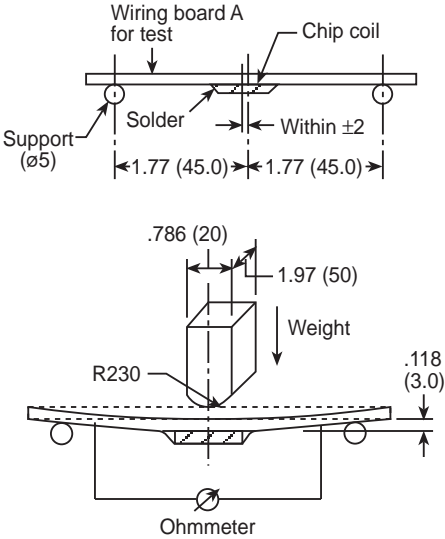
$$L = \frac{X_x}{2\pi f} \quad , \quad Q = \frac{X_x}{R_x}$$

L: Inductance of coil
 Q: Quality factor of coil
 f: Measuring frequency

7-3 Characteristics

Item	Requirement	Test Method
Insulation resistance	More than $10^4 \text{ M}\Omega$	DC 500V, 1 minute between both terminals and center of reverse side. 
	More than $10^3 \text{ M}\Omega$	DC 500V, 1 minute Between both terminals and center of protection coating. 
Dielectric withstanding voltage	Without distinct damage	DC 500V, 1 minute Between both terminals and center of protection coating. 

7-3 Characteristics *Continued*

Item	Requirement	Test Method
Terminal strength	Δ R/R: Within $\pm 1\%$ Δ L/L: Within $\pm 2\%$ Δ Q/Q: Within $\pm 20\%$ No mechanical damage by cracks or stripping, etc.	Soldered chip on wiring board A for test is to be bent down to .079" (2 mm) - 0603, .118" (3 mm) - 0402, 0805 and 1206 as below drawing. (Set condition) Dimensions in inches (mm) 
Vibration	Δ L/L: Within $\pm 2\%$ Δ Q/Q: Within $\pm 20\%$ Without distinct damage in appearance and construction	Inflict 2 hours in each direction of X, Y, Z at vibration of JIS C 5025 (1978) type A - 0603; 10 ~ 55Hz, amplitude .059" (1.5 mm) - 0402, 0805 and 1206
Resistance to solder heat	Δ L/L: Within $\pm 2\%$ Δ Q/Q: Within $\pm 20\%$ Without distinct damage in appearance and construction	260 \pm 5°C, 10 \pm 1 second
Solderability	Terminal surface wet %: more than 75%	230 \pm 5°C, 3 \pm 0.5 second
Shock resistance	Δ L/L: Within $\pm 2\%$ Δ Q/Q: Within $\pm 20\%$ Without distinct damage in appearance and construction	Inflict the impulse 3 times to both directions (total 18 times) along perpendicular axis that test condition C of JIS C 5026 (1974) table-1 - 0603; 100G, 6 months - 0402, 0805 and 1206

7-3 Characteristics *Continued*

Item	Requirement	Test Method
Low temperature operation	$\Delta L/L$: Within $\pm 2\%$ $\Delta Q/Q$: Within $\pm 20\%$ Without distinct damage in appearance and construction	$-40^{\circ}\text{C} \pm 3^{\circ}\text{C}$, $1,000 \pm 4$ hours
Heat resisting property	$\Delta L/L$: Within $\pm 2\%$ $\Delta Q/Q$: Within $\pm 20\%$ Without distinct damage in appearance and construction	$125^{\circ}\text{C} \pm 2^{\circ}\text{C}$, $1,000 \pm 4$ hours
Temperature cycling	$\Delta L/L$: Within $\pm 2\%$ $\Delta Q/Q$: Within $\pm 20\%$ Without distinct damage in appearance and construction	$-40 \pm 3^{\circ}\text{C}$, 30 minutes/ $125 \pm 2^{\circ}\text{C}$, 30 minutes 100 cycles
Humidity	$\Delta L/L$: Within $\pm 2\%$ $\Delta Q/Q$: Within $\pm 20\%$ Without distinct damage in appearance and construction. Insulation resistance: more than $50\text{M}\Omega$	$40 \pm 2^{\circ}\text{C}$, 90 ~ 95% RH $1,000 \pm 4$ hours
Resistance to solvent	$\Delta L/L$: Within $\pm 2\%$ $\Delta Q/Q$: Within $\pm 20\%$ Without distinct damage in appearance, construction and marking	Immerse 30 ± 5 seconds in the reagent ($20 \sim 25^{\circ}\text{C}$) of JIS K 8839 (1995)

8. Packaging

8-1 Bulk Packaging

Bulk products shall be packed 1,000 pieces in a poly bag.
Marking item for bag shall be following form.

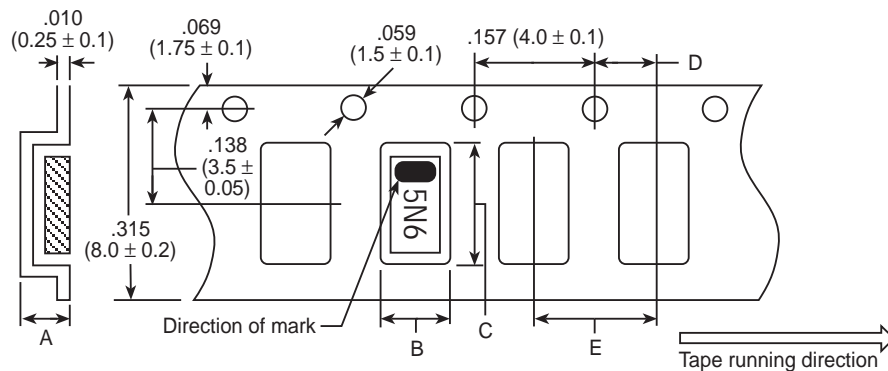
(Marking item)

- | | | |
|------------------------|---------------------------|-------------------------|
| (1) Type designation | (3) Quantity | (5) Manufacturer's name |
| (2) Nominal inductance | (4) Production lot number | |

8-2 Taping

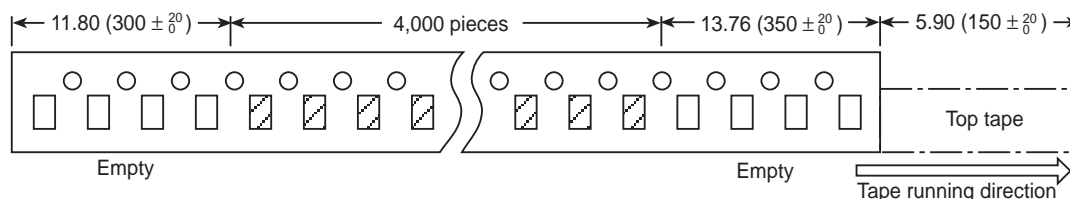
The tapes for taping shall be embossed carrier tapes of .315" (8 mm) width and .157" (4 mm) pitches. The standard quantity per reel shall be 4,000 pieces. Tapes for size 0402 (only) shall be paper carrier tapes of .315" (8 mm) width and .079" (2 mm) pitches.

(1) Dimensions of carrier tape

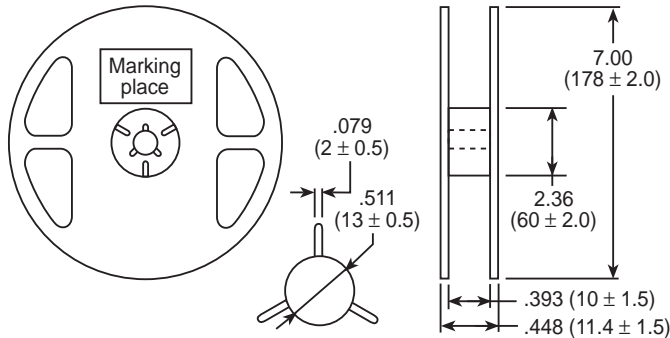


Dimensions in inches (mm)

Size	A	B	C	D	E
0402	.018 (0.45 ± 0.2)	.026 (0.65 ± 0.1)	.045 (1.15 ± 0.1)	.079 (2.0 ± 0.05)	.079 (2.0 ± 0.05)
0603	.035 (0.90 ± 0.1)	.043 (1.1 ± 0.15)	.075 (1.9 ± 0.15)	.079 (2.0 ± 0.01)	.157 (4.0 ± 0.1)
0805	.037 (0.95 ± 0.1)	.057 (1.45 ± 0.15)	.094 (2.4 ± 0.2)	.079 (2.0 ± 0.1)	.157 (4.0 ± 0.1)
1206	.037 (0.95 ± 0.1)	.074 (1.9 ± 0.2)	.137 (3.5 ± 0.2)	.079 (2.0 ± 0.1)	.157 (4.0 ± 0.1)



(2) Reel dimensions



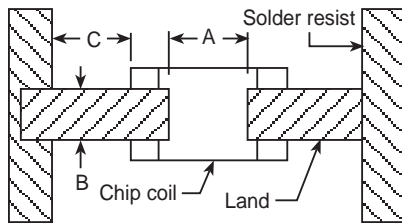
Dimensions in inches (mm)

(Marking item)

- (1) Type designation
- (2) Nominal inductance
- (3) Quantity
- (4) Production lot number
- (5) Manufacturer's name

9. Recommended Soldering Condition

9-1 Dimensions of Standard Land

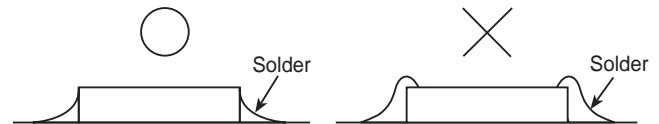


Dimensions in inches (mm)

Size	A	B	C
0402 - 1E	.016 ~ .020 (0.4 ~ 0.5)	.012 ~ .020 (0.3 ~ 0.5)	.016 ~ .020 (0.4 ~ 0.5)
0603 - 1J	.031 ~ .039 (0.8 ~ 1.0)	.016 ~ .031 (0.4 ~ 0.8)	.016 ~ .031 (0.4 ~ 0.8)
0805 - 2A	.047 ~ .055 (1.2 ~ 1.4)	.035 ~ .051 (0.9 ~ 1.3)	.016 ~ .031 (0.4 ~ 0.8)
1206 - 2B	.079 ~ .094 (2.0 ~ 2.4)	.047 ~ .063 (1.2 ~ 1.6)	.016 ~ .031 (0.4 ~ 0.8)

9-2 Soldering Condition

Reflow soldering should be done at 240°C within 20 seconds. Flow soldering should be done at 260°C within 10 seconds. Please use suitable solder quantity, too much solder may affect performance of product.



10. Recommended Washing Condition

Isopropyl alcohol and methyl alcohol used for the washing process will not affect the part performance.

Ultrasonic cleaning should be changed to condition for size of printed wiring board and type of oscillator. Overpowering of ultrasonic cleaning will cause problems according to resonant phenomenon. Condition of ultrasonic cleaner should be confirmed prior to use.

We recommend the following conditions:

Ultrasonic power: Within 20W/1

Cleaning times: Within 5 minutes

11. Storage

Chip inductors should not be stored under high temperature and high humidity conditions. In particular, do not store **taping** where it is exposed to heat or direct sunlight. Otherwise, the packing material may be deformed, causing problems during mounting.