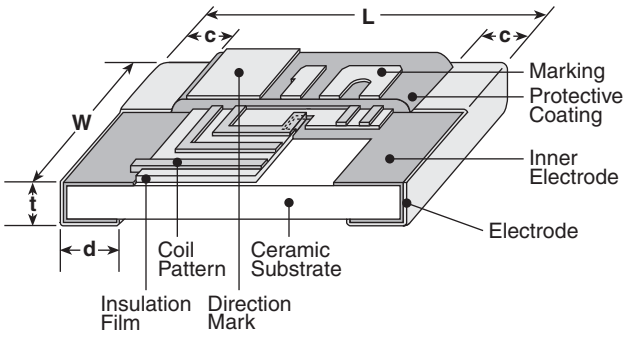
Thin Film Chip Inductors
Type KL73 Series

ISO 9001:2008 CERTIFIED
TS-16949 CERTIFIED

1. Scope

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

2. Dimensions and Construction



Type (Inch Size Code)	Dimensions inches (mm)				
	L	W	c	d	t
1E (0402)	.039±.004 (1.0±0.1)	.02±.002 (0.5±0.05)	.006±.004 (0.15±0.1)	.01±.004 (0.25±0.1)	.014±.002 (0.35±0.05)
1J (0603)	.063±.008 (1.6±0.2)	.031±.004 (0.8±0.1)	.012±.004 (0.3±0.1)	.012±.004 (0.3±0.1)	.02±.004 (0.5±0.1)
2A (0805)	.079±.008 (2.0±0.2)	.049±.008 (1.25±0.2)	.016±.008 (0.4±0.2)	.012±.004 (0.3±0.2)	.02±.004 (0.5±0.1)
2B (1206)	.126±.008 (3.2±0.2)	.063±.008 (1.6±0.2)	.02±.008 (0.5±0.2)	.016 $^{+.008}_{-.004}$ (0.4 $^{+0.2}_{-0.1}$)	.024±.004 (0.6±0.1)

3. Type Designation

The type designation shall be the following form:

New Type

KL73	2A	T	TE	4N7	G
Type	Size	Termination Material	Packaging	Nominal Inductance	Tolerance
	1E: 0402 1J: 0603 2A: 0805 2B: 1206	T: Sn	TP: 7" Embossed Paper 2mm Pitch (1E only - 10,000 pcs/reel) TE: 7" Embossed Plastic 4mm Pitch (1J, 2A, 2B - 4,000 pcs/reel)	4N7: 4.7nH 47N: 47nH	B: ±0.1nH C: ±0.2nH G: ±2% J: ±5%

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4. Application and Ratings

Part Designation	Inductance (nH)	Inductance Tolerance	Quality Factor Minimum	Self Resonant Frequency Minimum (MHz)	DC Resistance Maximum (Ω)	Allowable DC Current Maximum (mA)	Measured Frequency (MHz)
KL731ETTPN56B	0.56	B: ±0.1nH	7	14000	0.10	700	500
KL731ETTPN68B	0.68						
KL731ETTPN82B	0.82						
KL731ETTP1N0*	1.0	B: ±0.1nH C: ±0.2nH	10	12000	0.15		
KL731ETTP1N2*	1.2						
KL731ETTP1N5*	1.5			10000	0.20		
KL731ETTP1N8*	1.8						
KL731ETTP2N2*	2.2			8000	0.25	650	
KL731ETTP2N7*	2.7						
KL731ETTP3N3*	3.3			6000	0.30	600	
KL731ETTP3N9*	3.9				0.50	550	
KL731ETTP4N7*	4.7			5000		500	
KL731ETTP5N6*	5.6	G: ±2% J: ±5%			1.00	450	
KL731ETTP6N8*	6.8			4000		350	
KL731ETTP8N2*	8.2			3000			
KL731ETTP10N*	10			2500	1.50	300	
KL731ETTP12N*	12					250	
KL731ETTP15N*	15			2000	2.00	200	
KL731ETTP18N*	18		7	1500	3.00		200
KL731ETTP22N*	22				5.00	150	
KL731ETTP27N*	27						
KL731ETTP33N*	33			1000			
KL731JTTE1N0*	1.0	C: ±0.2nH	10	13000	0.10	650	500
KL731JTTE1N2*	1.2		15				
KL731JTTE1N5*	1.5		20	10000			
KL731JTTE1N8*	1.8						
KL731JTTE2N2*	2.2			8000	0.15	450	
KL731JTTE2N7*	2.7						
KL731JTTE3N3*	3.3			6000	0.25		
KL731JTTE3N9*	3.9					350	
KL731JTTE4N7*	4.7			5000	0.50		
KL731JTTE5N6*	5.6	G: ±2% J: ±5%	25				
KL731JTTE6N8*	6.8			4000			
KL731JTTE8N2*	8.2			3000			
KL731JTTE10N*	10			2500	1.0	250	
KL731JTTE12N*	12						
KL731JTTE15N*	15			2000			
KL731JTTE18N*	18		10	1500	1.50	200	200
KL731JTTE22N*	22						
KL731JTTE27N*	27			1000	2.50	150	
KL731JTTE33N*	33						
KL731JTTE39N*	39			600			
KL731JTTE47N*	47					120	
KL731JTTE56N*	56				4.00		
KL731JTTE68N*	68				4.50	100	

* Add tolerance character (B, C, G, J)

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4. Application and Ratings *Continued*

Part Designation	Inductance (nH)	Inductance Tolerance	Quality Factor Minimum	Self Resonant Frequency Minimum (MHz)	DC Resistance Maximum (Ω)	Allowable DC Current Maximum (mA)	Measured Frequency (MHz)
KL732ATTE1N0*	1.0	C: ±0.2nH	20	13000	0.25	900	500
KL732ATTE1N2*	1.2						
KL732ATTE1N5*	1.5			10000			
KL732ATTE1N8*	1.8		25	9000			
KL732ATTE2N2*	2.2			8000		800	
KL732ATTE2N7*	2.7						
KL732ATTE3N3*	3.3			6000			
KL732ATTE3N9*	3.9						
KL732ATTE4N7*	4.7			5000	0.50	700	
KL732ATTE5N6*	5.6	G: ±2% J: ±5%		4500			
KL732ATTE6N8*	6.8			4000		500	
KL732ATTE8N2*	8.2			3000			
KL732ATTE10N*	10			2500	1.00	400	
KL732ATTE12N*	12						
KL732ATTE15N*	15			2000		300	
KL732ATTE18N*	18		20	1500			
KL732ATTE22N*	22			1000	1.50	250	
KL732ATTE27N*	27		15				200
KL732ATTE33N*	33					200	
KL732ATTE39N*	39			800			
KL732ATTE47N*	47						
KL732ATTE56N*	56		10	700	4.00	150	
KL732ATTE68N*	68				5.00		
KL732ATTE82N*	82			600			
KL732BTTE2N2*	2.2	C: ±0.2nH	25	9000	0.25	1000	500
KL732BTTE2N7*	2.7			7000			
KL732BTTE3N3*	3.3			6000			
KL732BTTE3N9*	3.9		35	5000	0.50	900	
KL732BTTE4N7*	4.7			4500			
KL732BTTE5N6*	5.6	G: ±2% J: ±5%		4000			
KL732BTTE6N8*	6.8			3500		800	
KL732BTTE8N2*	8.2			3000			
KL732BTTE10N*	10		40	2500			
KL732BTTE12N*	12						
KL732BTTE15N*	15			2000	1.00	500	
KL732BTTE18N*	18						
KL732BTTE22N*	22			1500			
KL732BTTE27N*	27		25				200
KL732BTTE33N*	33			1000	2.00	400	
KL732BTTE39N*	39						
KL732BTTE47N*	47						
KL732BTTE56N*	56		15	500		200	
KL732BTTE68N*	68						
KL732BTTE82N*	82			400			
KL732BTTE100*	100						

* Add tolerance character (B, C, G, J)

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5. Characteristics

5-1 Test Condition

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

Ambient temperature: 20 ± 15°C
Relative humidity: 65 ± 20%

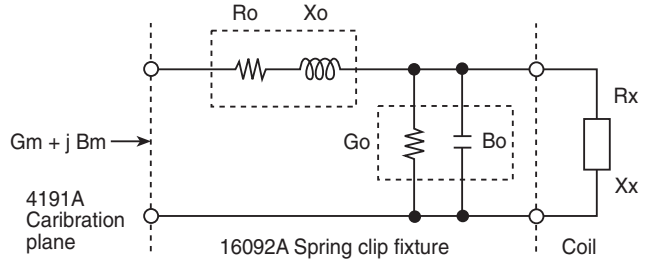
If there may be any doubt on results, measurements shall be made within the following limits:

Ambient temperature: 20 ± 2°C
Relative humidity: 65 ± 5%

5-2 Measurement Method of L and Q

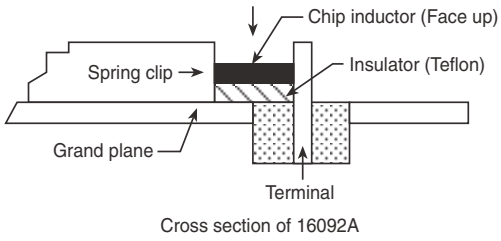
Test equipment: Hewlett Packard RF Impedance analyzer 4191A
Fixture: Hewlett Packard Test fixture 16092A
Measuring frequency: 500 MHz/1.0nH ~ 22nH (1.0nH ~ 15nH)
200 MHz/27nH ~ 100nH (18nH ~ 47nH)

1. Perform auto-calibration to the HP4191A .275" (7 mm) unknown connector connected to 0Ω/0S/50Ω standard terminations.
2. Connected the test fixture 16092A.
   Measure the open circuit admittance (Go, Bo), and the short circuit impedance (Ro, Xo).

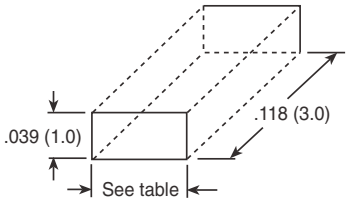


Gm + jBm: Measured admittance [S]
Ro + jXo: Residual impedance [Ω]
Go + jBo: Stray admittance [S]
Rx + jXx: Unknown impedance [Q]

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

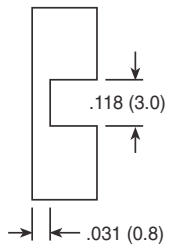


Cross section of 16092A



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

0402



Thickness: .040 (1.0)

Dimensions of insulator (Teflon) in inches (mm)

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

$$Rx = \frac{Gm - Go}{(Gm - Go)^2 + (Bm - Bo)^2} - Ro$$

$$Xx = \frac{Bo - Bm}{(Gm - Go)^2 - (Bm - Bo)^2} - Xo$$

$$L = \frac{Xx}{2\pi f} \quad , \quad Q = \frac{Xx}{Rx}$$

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

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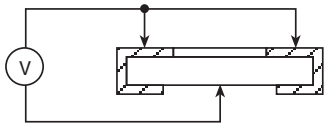
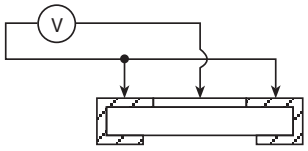
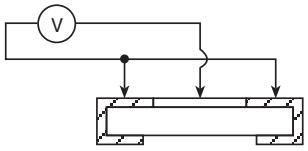
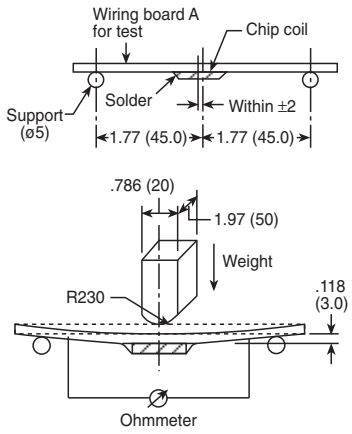
5-3 Characteristics

Item	Requirement	Test Method
Insulation resistance	More than 10^4 MΩ	DC 500V, 1 minute between both terminals and center of reverse side. 
	More than 10^3 MΩ	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. 
Terminal strength	Δ R/R: Within ± 1% Δ L/L: Within ± 2% Δ Q/Q: Within ± 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) 

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5-3 Characteristics *Continued*

Item	Requirement	Test Method
Vibration	Δ L/L: Within ± 2% Δ Q/Q: Within ± 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 ± 2% Δ Q/Q: Within ± 20% Without distinct damage in appearance and construction	260 ± 5°C, 10 ± 1 second
Solderability	95% of the terminal should be covered with new solder	230 ± 5°C, 3 ± 0.5 second
Shock resistance	Δ L/L: Within ± 2% Δ Q/Q: Within ± 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
Low temperature operation	Δ L/L: Within ± 2% Δ Q/Q: Within ± 20% Without distinct damage in appearance and construction	-40°C ± 3°C, 1,000 ± 4 hours
Heat resisting property	Δ L/L: Within ± 2% Δ Q/Q: Within ± 20% Without distinct damage in appearance and construction	125°C ± 2°C, 1,000 ± 4 hours
Temperature cycling	Δ L/L: Within ± 2% Δ Q/Q: Within ± 20% Without distinct damage in appearance and construction	-40 ± 3°C, 30 minutes/125 ± 2°C, 30 minutes 100 cycles
Humidity	Δ L/L: Within ± 2% Δ Q/Q: Within ± 20% Without distinct damage in appearance and construction. Insulation resistance: more than 50MΩ	40 ± 2°C, 90 ~ 95% RH 1,000 ± 4 hours
Resistance to solvent	Δ L/L: Within ± 2% Δ Q/Q: Within ± 20% Without distinct damage in appearance, construction and marking	Immerse 30 ± 5 seconds in the regent (20 ~ 25°C) of JIS K 8839 (1995)

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6. Marking

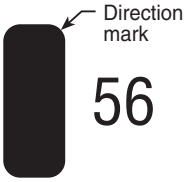
6-1 Coating and Marking Color

Coating color: Dark blue
Direction mark color: Yellow

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

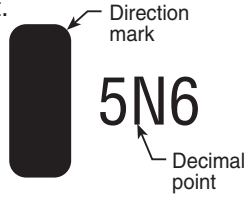


See marking item on page 2, rating table.

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



6-2 Marking Method

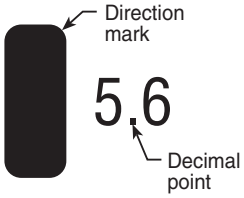
0402

Inductance value shall have no marking. Direction marking only.

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

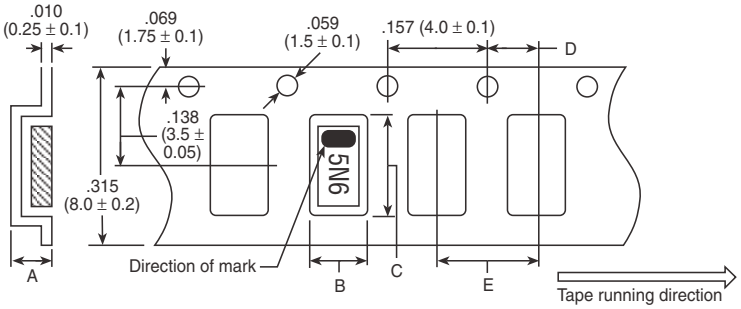


7. Packaging

7-1 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)

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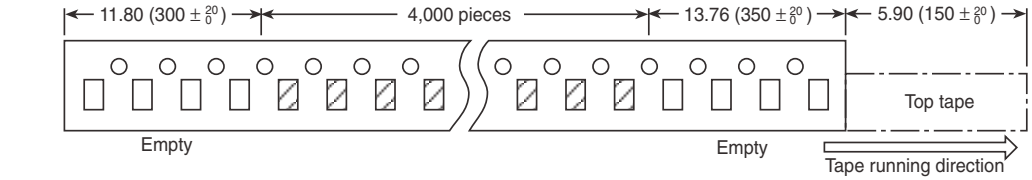
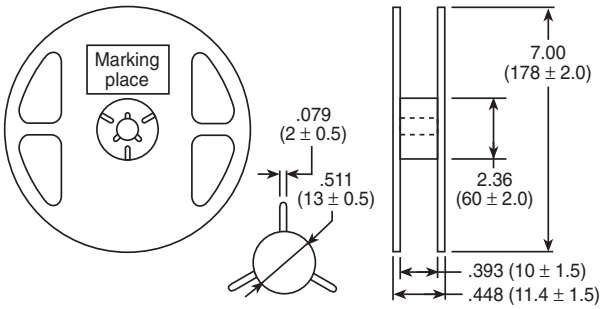
(2) Reel dimensions





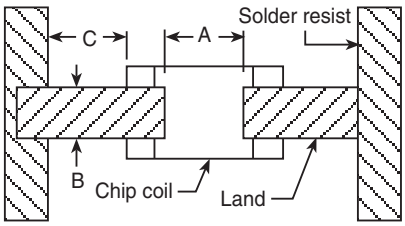
Dimensions in inches (mm)

(Marking item)

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

8. Recommended Soldering Condition

8-1 Dimensions of Standard Land

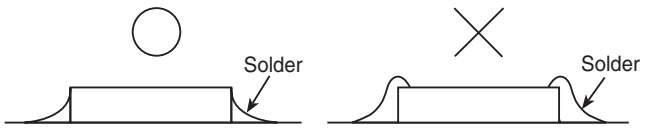


Dimensions in inches (mm)

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)

8-2 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.



9. 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

10. 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.

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