

# Chip Inductors

## Type KL32 Series

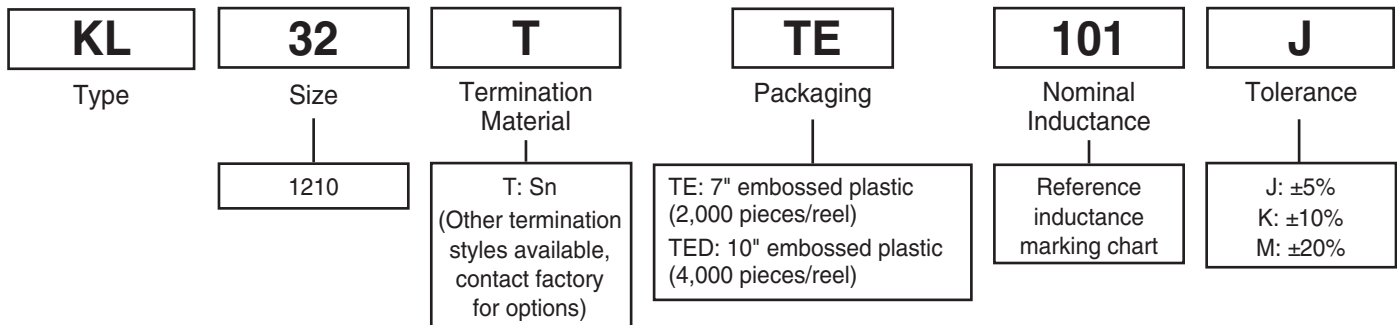
ISO 9001:2000  
CERTIFIED  
TS-16949  
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### 1. Scope

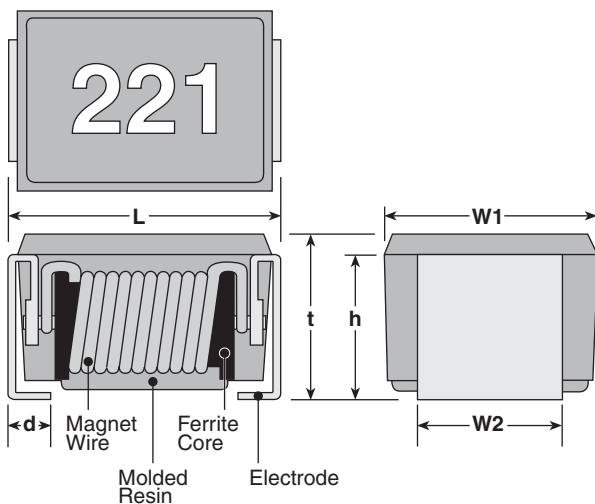
This specification applies to Chip Inductors (KL32) produced by KOA Corporation.

### 2. Type Designation

The type designation shall be the following form:



### 3. Dimensions and Construction



Type	Dimensions inches (mm)					
	L	W1	W2	t	h	d
KL32	.126±.008 (3.2±0.2)	.098±.008 (2.5±0.2)	.067±.004 (1.7±0.1)	.087±.008 (2.2±0.2)	.075±.004 (1.9±0.1)	.02 nominal (.5 nominal)

#### Inductance Marking

Value	Code
0.005μH - 0.082μH	005 - 082
0.10μH - 8.2μH	R10 - 8R2 R indicates decimal point.
10μH - 330μH	100 - 331 1st two figures are significant, the last figure indicates the number of zeros to follow.

## 4. Standard Applications

Part Designation	Inductance (µH)	Inductance Tolerance	Quality Factor Minimum	Self Resonant Frequency Minimum (MHz)	DC Resistance Maximum (Ω)	Allowable DC Current Maximum (mA)	Measured Frequency (MHz)
KL32TTE005*	0.005	M: ±20%	11	2700	0.12	450	100
KL32TTE010*	0.010	K: ±10% M: ±20%	15	2500	0.13		
KL32TTE012*	0.012		17	2300	0.14		
KL32TTE015*	0.015		19	2100	0.16		
KL32TTE018*	0.018		21	1900	0.18		
KL32TTE022*	0.022		23	1700	0.20		
KL32TTE027*	0.027			1500	0.22		
KL32TTE033*	0.033	J: ±5% K: ±10% M: ±20%	25	1400	0.24		
KL32TTE039*	0.039			1300	0.27		
KL32TTE047*	0.047		26	1200	0.30		
KL32TTE056*	0.056			1100	0.33		
KL32TTE068*	0.068		27	1000	0.36		
KL32TTE082*	0.082			900	0.40		
KL32TTER10*	0.10		28	700	0.44		
KL32TTER12*	0.12		500	0.22			
KL32TTER15*	0.15		450	0.25			
KL32TTER18*	0.18		400	0.28			
KL32TTER22*	0.22	350	0.32				
KL32TTER27*	0.27	320	0.36				
KL32TTER33*	0.33	300	0.40				
KL32TTER39*	0.39	250	0.45				
KL32TTER47*	0.47	220	0.50				
KL32TTER56*	0.56	180	0.55				
KL32TTER68*	0.68	160	0.60				
KL32TTER82*	0.82	140	0.65				
KL32TTE1R0*	1.0	J: ±5% K: ±10% M: ±20%	30	120	0.70	400	7.96
KL32TTE1R2*	1.2			100	0.75	390	
KL32TTE1R5*	1.5			85	0.85	370	
KL32TTE1R8*	1.8			80	0.90	350	
KL32TTE2R2*	2.2			75	1.0	320	
KL32TTE2R7*	2.7			70	1.1	290	
KL32TTE3R3*	3.3			60	1.2	260	
KL32TTE3R9*	3.9			55	1.3	250	
KL32TTE4R7*	4.7			50	1.5	220	
KL32TTE5R6*	5.6			47	1.6	200	
KL32TTE6R8*	6.8	43	1.8	180			
KL32TTE8R2*	8.2	40	2.0	170			
KL32TTE100*	10	36	2.1	150			
KL32TTE120*	12	33	2.5	140			
KL32TTE150*	15	30	2.8	130			
KL32TTE180*	18	27	3.3	120			
KL32TTE220*	22	25	3.7	110			
KL32TTE270*	27	20	5.0	80			
KL32TTE330*	33	17	5.6	70			
KL32TTE390*	39	16	6.4	65			
KL32TTE470*	47	15	7.0	60			
KL32TTE560*	56	13	8.0	55			
KL32TTE680*	68	12	9.0	50			
KL32TTE820*	82	11	10	45			
KL32TTE101*	100	J: ±5% K: ±10% M: ±20%	20	10	10	40	0.796
KL32TTE121*	120			10	11	70	
KL32TTE151*	150			8	15	65	
KL32TTE181*	180			7	17	60	
KL32TTE221*	220			7	21	50	
KL32TTE271*	270			6	28	50	
KL32TTE331*	330			5	34	50	

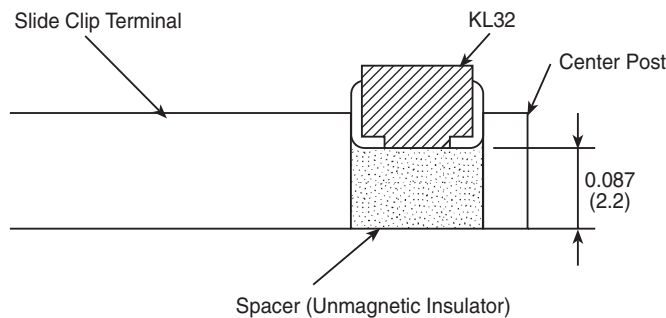
\* Add tolerance character (J, K, M)

## 5. Measurement Method of L and Q

Nominal Inductance Range ( $\mu\text{H}$ )	Measurement Method	Measuring Frequency (MHz)
0.005 ~ 0.10	Please see Method-1	100
0.12 ~ 0.82		25.2
1.0 ~ 8.2		7.96
10 ~ 82	Please see Method-2	2.52
100 ~ 330		0.796

### Method-1

Test Equipment: Hewlett Packard RF Impedance analyzer 4191A  
 Fixture: Hewlett Packard Spring clip fixture 16092A  
 Electrical Length: 2.10 cm  
 Setting: Please see the following figure



### Method-2

Test Equipment: Hewlett Packard LF Impedance analyzer 4192  
 Fixture: Hewlett Packard Test fixture 16034E  
 OSC Level: 0.3 V

## 6. Test Condition

Unless otherwise specified, the test shall be performed in accordance with JIS-C-5202 specifying marking measurements 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:

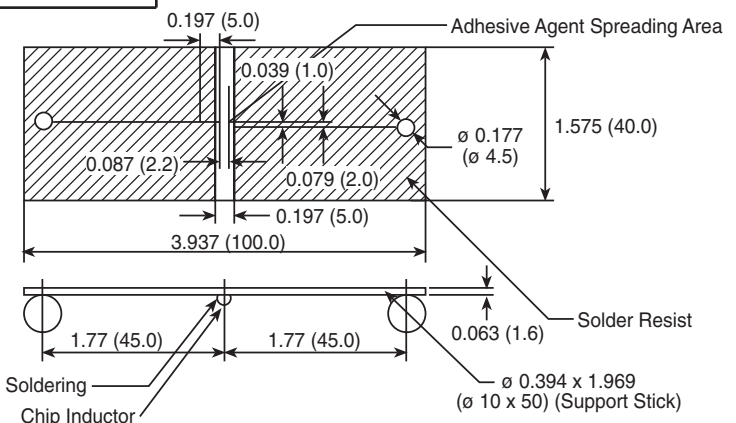
Ambient temperature:  $20 \pm 2^\circ\text{C}$   
 Relative humidity:  $65 \pm 5\%$

## 7. Reliability Data

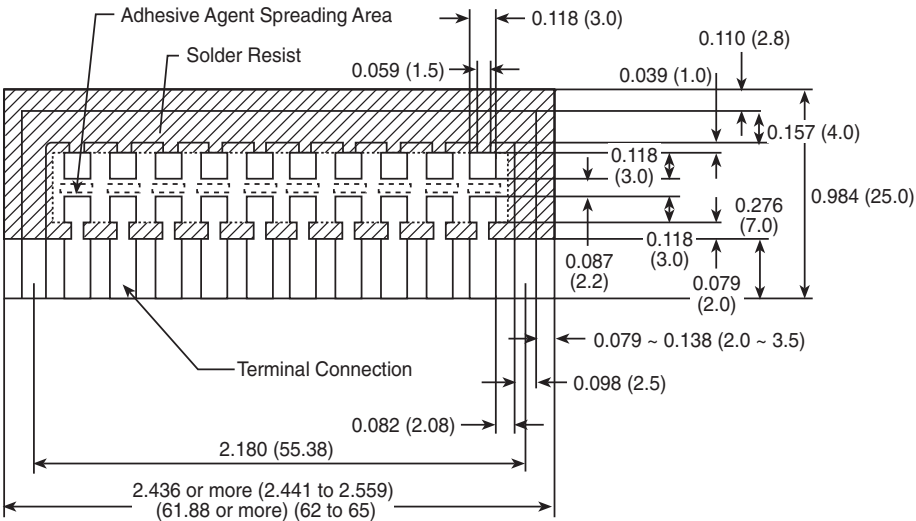
### 7-1 Electrical Characteristics

Item	Requirement	Test Method
DC Bias Characteristic	$\Delta L/L$ : Within - 10%	Measure inductance with application of rated current using LCR meter to compare it with the initial value.
Dielectric Withstanding Voltage	No fuming, flaming, or breakdown	5 seconds at DC 1000V between terminal 1 (one electrode of inductor) and terminal 2 (the thin copper wire which is wound around the inductor more than twice).
Insulation Resistance	More than 1000M $\Omega$	Measure resistance immediately after 1 minute passed since DC 500V was applied between terminal 1 and 2.

### 7-2 Mechanical Characteristics

Item	Requirement	Test Method
Terminal Pull Strength	No damage	Terminals shall withstand a pull of 0.5kgf in a horizontal direction.
Terminal Bending Strength	No damage	Specimen shall be soldered on PCB-A (see figure below) and support by applying strength so that the bending width becomes 10 mm.
Thickness: 1.6 mm Material: Paper Phenol (a) Board  (b) Install  Units: inches (mm)		

## 7-2 Mechanical Characteristics *Continued*

Item	Requirement	Test Method
Vibration	No significant abnormality in appearance $\Delta L/L$ : Within $\pm 3\%$	2 hours in each X, Y and Z directions on PCB-B (see figure below) at a frequency range of 10 to 55 to 10 Hz (1 min.) with 1.5 mm amplitude.
<p>Thickness: 1.6 mm Material: Glass Epoxy</p>  <p>Units: inches (mm)</p>		
Resistance to Solder Heat	No significant abnormality in appearance $\Delta L/L$ : Within $\pm 3\%$	Immerse in the solder (H63A) of $260 \pm 5^\circ\text{C}$ for $10 \pm 1$ sec.
Solderability	Over 95% of electrode surface shall be covered with solder	Immerse in the solder (H63A) of $230 \pm 5^\circ\text{C}$ for $3 \pm 0.5$ sec.
Drop Test	No significant abnormality in appearance $\Delta L/L$ : Within $\pm 3\%$	Drop from a height of 1 m to the ground of concrete or tile 1 time.

### 7-3 Environmental Characteristics \*

Item	Requirement	Test Method
Low Temperature Life Test	$\Delta$ L/L: Within $\pm 5\%$ $\Delta$ Q/Q: Within $\pm 20\%$	Store at $-55 \pm 2^\circ\text{C}$ for 1000 hours.
High Temperature Life Test	$\Delta$ L/L: Within $\pm 5\%$ $\Delta$ Q/Q: Within $\pm 30\%$	Store at $100 \pm 2^\circ\text{C}$ for 1000 hours.
Thermal Shock	$\Delta$ L/L: Within $\pm 5\%$	100 cycles between $-55 \pm 2^\circ\text{C}$ / 1 hour and $+100 \pm 2^\circ\text{C}$ / 1 hour.
Temperature Characteristic	$\Delta$ L/L: Within $\pm 10\%$	Measure $\Delta$ L/L at the temperature of between $-55^\circ\text{C}$ and $+100^\circ\text{C}$ as based on the temperature of $20^\circ\text{C}$ .
Humidity	$\Delta$ L/L: Within $\pm 5\%$ $\Delta$ Q/Q: Within $\pm 30\%$	Store at $40 \pm 2^\circ\text{C}$ , 90 to 95% RH for 1000 hours.
Humidity Loading Test	$\Delta$ L/L: Within $\pm 5\%$ $\Delta$ Q/Q: Within $\pm 30\%$	Apply rated current continuously at $40 \pm 2^\circ\text{C}$ , 90 to 95% RH for 1000 hours.
High Temperature Loading Test	$\Delta$ L/L: Within $\pm 5\%$ $\Delta$ Q/Q: Within $\pm 30\%$	Apply rated current continuously at $100 \pm 2^\circ\text{C}$ for 1000 hours.
Solvent Resistance	No outstanding damage and markings can be easily judged	According to MIL-STD-202 Method 215 (1990).
Storage Temperature Range	$-55^\circ\text{C}$ to $+100^\circ\text{C}$	—
Operating Temperature Range	$-55^\circ\text{C}$ to $+100^\circ\text{C}$	—

\* Unless otherwise specified, at least one hour of recovery under the normal temperature and normal humidity after the test, followed by the measurement within two hours.

## 8. Packaging

### 8-1 Taping

The tapes for taping shall be embossed carrier tapes of .315" (8 mm) width and .157" (4 mm) pitch. The standard quantity per reel shall be 2,000 pieces.

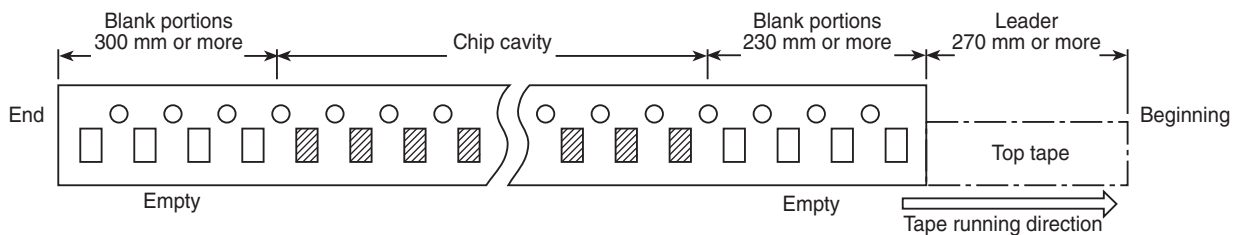
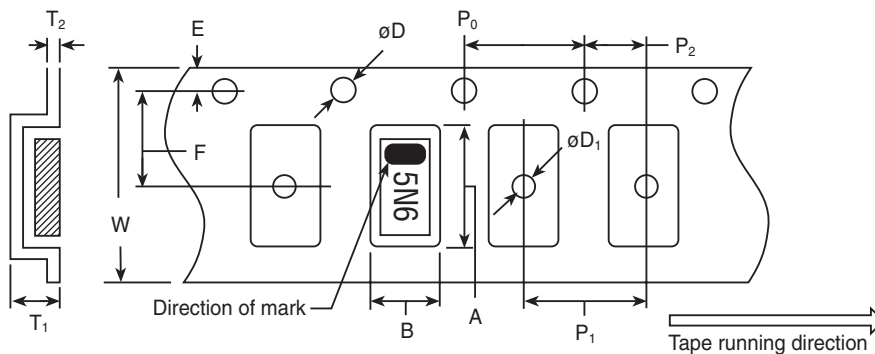
(1) Dimensions of carrier tape    Dimensions in inches (mm)

<b>A</b>	.140 (3.55 ± 0.10)
<b>B</b>	.106 (2.70 ± 0.10)
<b>W</b>	.315 (8.00 ± 0.10)
<b>E</b>	.069 (1.75 ± 0.10)
<b>F</b>	.138 (3.50 ± 0.05)
<b>T<sub>1</sub></b>	.106 (2.70 ± 0.15)

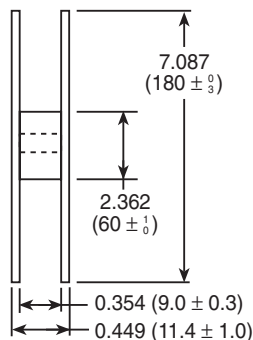
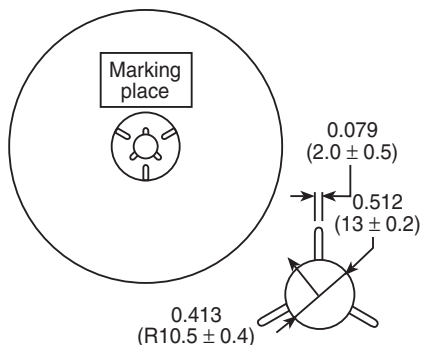
<b>T<sub>2</sub></b>	.011 (0.28 ± 0.05)
<b>P<sub>0</sub></b>	.157 (4.00 ± 0.10)
<b>P<sub>1</sub></b>	.157 (4.00 ± 0.10)
<b>P<sub>2</sub></b>	.079 (2.00 ± 0.05)
<b>øD*</b>	.059 (1.50 ± $\begin{smallmatrix} 0.1 \\ 0 \end{smallmatrix}$ )
<b>øD<sub>1</sub></b>	.039 (1.00 ± $\begin{smallmatrix} 0.2 \\ 0 \end{smallmatrix}$ )

The top tape requires a peel-off force of 15 to 60 gf.

\* 20 pitches accumulation of sprocket holes shall be 80.00 ± 0.15 mm.



(2) Reel dimensions



Dimensions in inches (mm)

(Marking item)

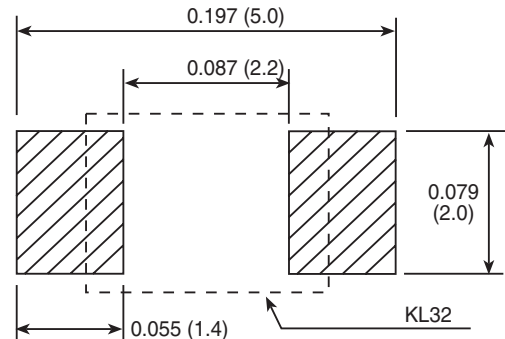
- (1) Type designation
- (2) Nominal inductance and tolerance
- (3) Quantity
- (4) Production lot number
- (5) Manufacturer's name

**9. Recommended Soldering Condition**

**9-1 Dimensions of Standard Land**

The following figure is recommended land dimensions.

When two or more chip inductors are closely mounted, they must be separated by means of solder resists to prevent excessive solder.



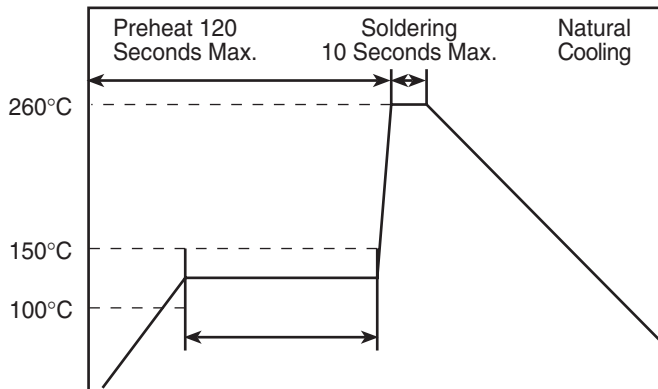
Dimensions in inches (mm)

**9-2 Soldering Condition**

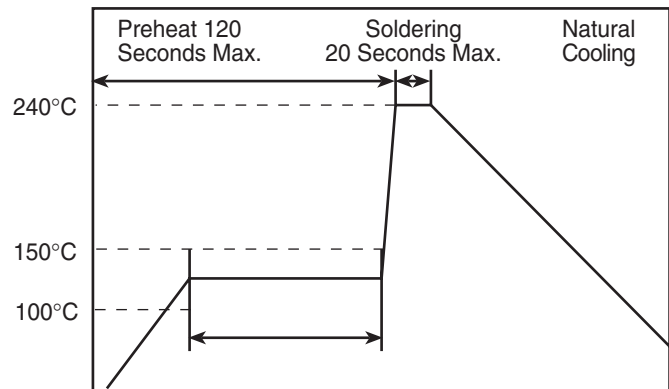
Wave soldering should be done at 260°C for less than 10 seconds. Reflow soldering should be done at 240°C for less than 20 seconds. (Please see the following figures.)

When using a soldering iron, temperature shall not exceed 350°C and within three seconds. Soldering iron time shall be allowed only one time. After soldering, chip inductors shall not be stressed excessively.

**Recommended Temperature Profile for Wave Soldering**



**Recommended Temperature Profile for Reflow Soldering**



**10. Mounting**

Placement force should not be excessive.

**11. Recommended Washing Condition**

Since this chip inductor is a coil of ultra-thin wire, it is susceptible to vibration.

If an ultrasonic cleaning unit is used for cleaning, check for any possibility of problem generation before practical use since such cleaning units considerably differ in vibration level and mode. Although the conditions differ depending on the printed board size, ultrasonic cleaning is generally used in the conditions described below as examples:

- Ultrasonic power: Within 20W/1
- Cleaning times: Within 5 minutes

**12. 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.