

0402 SERIES THIN FILM CHIP INDUCTOR

1. Scope

This specification applies to 0.5mm x 1.0mm (0402) size, fixed thin film chip inductor rectangular type.

2. Type Designation

CTL0510 - * * * - *

(1) (2) (3)

Where (1) Product identification code

(2) Nominal inductance value :

For example —

3N9 : 3.9nH

10N : 10.0nH

27N : 27.0nH

(3) Tolerance :

B : $\pm 0.1\text{nH}$

C : $\pm 0.2\text{nH}$

S : $\pm 0.3\text{nH}$

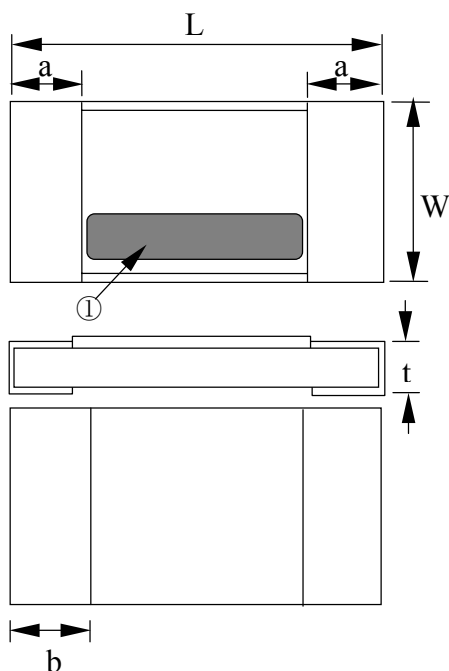
G : $\pm 2\%$

H : $\pm 3\%$

J : $\pm 5\%$

K : $\pm 10\%$

3. Construction and Physical Dimensions



Code Letter	Dimensions
L	1.00 ± 0.1
W	0.50 ± 0.1
t	0.40 ± 0.1
a	0.15 ± 0.1
b	0.25 ± 0.1

Unit: mm

Note :

- ①: Direction Marking
- Weight : 1mg Typical

4. Ratings

4-1 Electrical Characteristics

Table1

Part Number	Inductance		Measuring Frequency (MHz)	Q (Typical) @Frequency(MHz)					Self-Resonant Frequency (MHz) Min.	DC Resistance (Ω) Max.	Rated Current (mA) Max.	Operating Temperature
	Nominal (nH)	Tolerance		100	300	800	1000	1800				
CTL0510-0N5	0.5	$\pm 0.1\text{nH}$ $\pm 0.2\text{nH}$	100	15	30	50	55	80	10000	0.10	1200	-40 ~ 125 °C
CTL0510-0N6	0.6		100	15	30	50	55	80	10000	0.10	1200	
CTL0510-0N7	0.7		100	15	30	50	55	80	10000	0.10	1200	
CTL0510-0N8	0.8		100	15	28	46	52	80	10000	0.10	1200	
CTL0510-0N9	0.9		100	15	26	40	45	80	10000	0.10	1200	
CTL0510-1N0	1.0		100	10	20	34	39	55	10000	0.10	1200	
CTL0510-1N2	1.2	$\pm 0.1\text{ nH or}$ $\pm 0.2\text{ nH or}$ $\pm 0.3\text{ nH}$	100	10	20	34	39	55	10000	0.10	1200	
CTL0510-1N5	1.5		100	10	20	34	39	55	7000	0.10	930	
CTL0510-1N6	1.6		100	10	20	34	39	55	7000	0.12	830	
CTL0510-1N8	1.8		100	10	20	31	35	50	7000	0.14	730	
CTL0510-2N0	2.0		100	10	18	30	35	28	7000	0.14	650	
CTL0510-2N2	2.2		100	10	17	29	34	46	7000	0.16	600	
CTL0510-2N4	2.4		100	10	17	28	32	45	7000	0.17	590	
CTL0510-2N5	2.5		100	10	17	28	32	45	7000	0.20	570	
CTL0510-2N7	2.7		100	10	17	27	30	44	7000	0.20	550	
CTL0510-3N0	3.0		100	10	17	27	30	42	7000	0.20	500	
CTL0510-3N1	3.1		100	10	17	27	30	42	7000	0.20	500	
CTL0510-3N2	3.2		100	10	17	27	30	42	7000	0.20	500	
CTL0510-3N3	3.3		100	9	17	27	30	41	7000	0.20	500	
CTL0510-3N5	3.5		100	9	17	27	34	45	7000	0.25	450	
CTL0510-3N6	3.6		100	9	17	27	34	46	7000	0.25	420	
CTL0510-3N9	3.9		100	9	17	27	30	41	7000	0.30	420	
CTL0510-4N4	4.4		100	9	17	27	30	41	7000	0.40	340	
CTL0510-4N7	4.7		100	9	17	27	30	41	7000	0.40	340	
CTL0510-5N0	5.0	100	8	16	27	30	41	6500	0.50	330		
CTL0510-5N6	5.6	100	8	15	27	30	39	5500	0.50	320		
CTL0510-6N0	6.0	100	8	15	27	30	38	5500	0.60	310		
CTL0510-6N8	6.8	$\pm 0.1\text{ nH or}$ $\pm 0.2\text{ nH or}$ $\pm 0.3\text{ nH or}$ 5%	100	8	15	25	28	34	5500	0.60	290	
CTL0510-7N1	7.0		100	8	15	25	28	34	5500	0.70	280	
CTL0510-8N2	8.2		100	8	15	24	26	32	5000	0.85	230	
CTL0510-8N5	8.5		100	8	15	24	26	32	5000	1.0	200	

CTL0510-10N	10	±2% or ±5%	100	8	15	24	25	32	4000	1.0	200	-40 ~ 125 °C
CTL0510-12N	12		100	8	15	25	27	31	4000	1.0	190	
CTL0510-15N	15		100	8	15	24	25	25	3500	1.2	160	
CTL0510-18N	18		100	6	15	23	25	24	2100	1.8	160	
CTL0510-22N	22	±3% or ±5% or ±10%	100	6	14	21	20	18	2000	2.5	160	
CTL0510-27N	27		100	10	14	20	20	16	2000	2.5	150	
CTL0510-33N	33		100	10	14	20	20	12	1500	2.6	130	
CTL0510-39N	39		100	10	14	19	18	9	1500	2.9	120	

※Measurement Instrument:

- L,Q : Agilent 4287A LCR METER + 16196B TEST FIXTURE.
- SRF : Agilent 8510 VECTOR NETWORK ANALYZER (Typical value).
- Rdc : Agilent DIGITAL MILLIOHM METER HP4338A or equivalent.

※The product with tolerance less than ±2% or ±0.1nH is also available. Please contact your local sales for details.

4-2 Operating Temperature Range

4-2-1 Operating Temperature Range: - 40 to + 125°C

4-2-2 Storage Temperature Range: - 40 to + 125°C

5. Characteristics

5-1 Electrical

Unless otherwise specified, measurements shall be performed under the condition below.

a. Temperature : $24 \pm 2^\circ\text{C}$

b. Relative Humidity : 45 to 85%RH

c. Atmospheric Pressure : 86 to 106 kPa

Electrical Characteristic after testing is established by ΔL and ΔQ .

ΔL	0.8 ~ 39nH	$\pm 5\%$
ΔQ	0.8 ~ 8.2nH	$\pm 20\%$
	10 ~ 39nH	$\pm 10\%$

5-1-1 Inductance

Inductance value shall be within the tolerance specified in Table 1.

Measurement shall be performed by LCR Meter 4287A at the frequency specified in Table 1.

5-1-2 Q value

Q value shall be within the tolerance specified in Table 1.

Measurement shall be performed by LCR Meter 4287A at the frequency specified in Table 1.

5-1-3 DC Resistance

DC Resistance shall be within the specified tolerance.

5-1-4 Self Resonance Frequency

Measurement shall be performed by Network Analyzer 8510.

5-1-5 Temperature Coefficient

Temperature Coefficient of Inductance shall be within 0 to +125 ppm/°C.

Temperature Coefficient of Q value shall be -0.25% /°C or less.

Temperature Coefficient of DC Resistance shall be +0.45% /°C or less.

Measurement shall be performed at RT and RT+100°C, and the calculation shall be performed with the measured values.

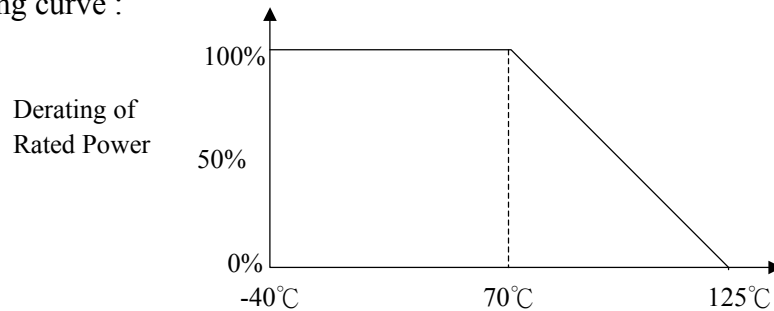
5-1-6 Rated Current

Rated current shall be referred to Table1.

Rated current shall be the current with which the temperature raise of the inductor becomes 20°C.

Rated ambient temperature : 70°C

Derating curve :



$$(\text{Rated Power}) \cong (\text{Rated Current})^2 \times (\text{maximum DC Resistance})$$

5-1-7 Overload

No smoke, Fire nor significant damage shall be observed.

Test current : 2 times of the maximum current.

Duration : 5 minutes

5-1-8 Insulation Resistance

Insulation Resistance shall be 100MΩ or over.

The inductor shall be clamped in the metal block and tested, as shown below.

Test voltage : $100 \pm 15V_{DC}$ for 1 minute

5-1-9 Voltage Proof

No mechanical damage shall be observed.

Electrical characteristics shall be within specification.

The inductor shall be tested as shown in paragraph 5-1-7.

Test Voltage : 100V_{AC} (rms.) for 1 minute

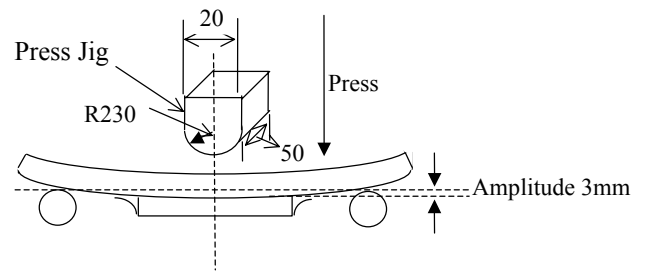
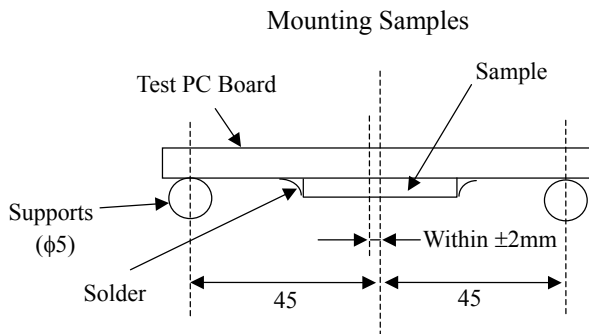
5-2 Mechanical

5-2-1 Bending Test

No mechanical damage shall be observed.

Electrical characteristics shall be within specification.

Bend width : 3mm 30seconds



Unit : mm

5-2-2 Solderability

A new uniform coating of solder shall cover a minimum of 95% of the surface being immersed.

Temperature of Solder	235 ± 5°C	215 ± 5°C
Immersion duration	2 ± 0.5seconds	3 ± 0.3seconds

5-2-3 Resistance to Soldering Heat

No mechanical damage shall be observed.

Electrical characteristics shall be within specification.

(1) Solder bath method

Pre-heat : 100 to 110°C 30 seconds

Temperature : 270 ± 5°C 10 ± 1 seconds

(2) Reflow soldering method

Peak temperature : 240 ± 5°C max. 5 seconds

Temperature : 220 ± 5°C 40 seconds

The heating apparatus shall be the top-heated oven and the temperature shall be the board surface temperature.

(3) Soldering iron method

Bit temperature : 350 ± 5°C max. 3 seconds

The inductor shall be stored at standard atmospheric conditions for 1 hour, after which the measurements shall be made.

5-2-4 Resistance to Solvent

Marking shall be legible.

Without mechanical damage and no distinct damage in appearance.

(1) Ultrasonic cleaning

At normal temperature, 20 mW/cm³ 28 kHz 60 seconds

Fluorocarbon based (Dupont product "FREON TES" or it's equivalent).

(2) Immersion cleaning

At normal temperature, 300 seconds

Isopropyl Alcohol

5-3 Endurance

5-3-1 Temperature Cycling

No mechanical damage shall be observed.

Electrical characteristics shall be within specification.

(-40 ± 3°C, 30 minutes) → (Room temperature, 2~3 minutes)

→ (+125 ± 2°C, 30 minutes) → (Room temperature, 2~3 minutes) (1 cycle)

5-3-2 Dump Heat with Load

No mechanical damage shall be observed.

Electrical characteristics shall be within specification.

$40 \pm 2^{\circ}\text{C}$ with relative humidity of 90 to 95%.

DC rated voltage for 1.5 hours on 0.5 hours off 1,000 +48/-0 hours.

5-3-3 Endurance at 70°C Resistance to Soldering Heat

No mechanical damage shall be observed.

Electrical characteristics shall be within specification.

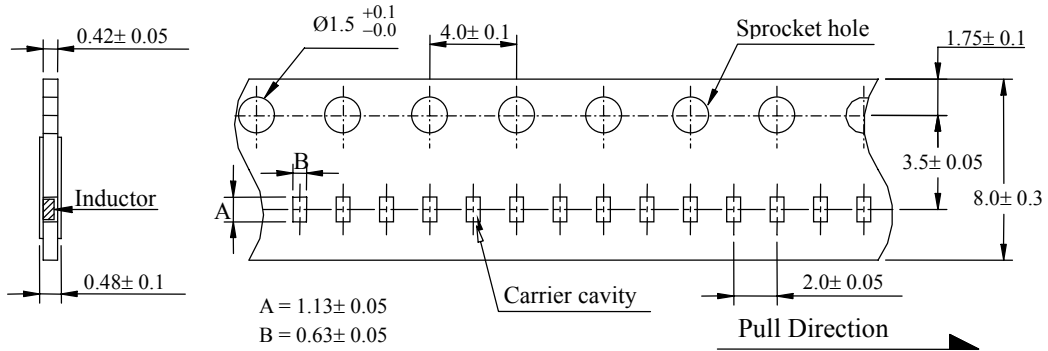
$70 \pm 2^{\circ}\text{C}$

DC rated voltage for 1.5 hours on 0.5 hours off 1,000 +48/-0 hours.

6. Packaging

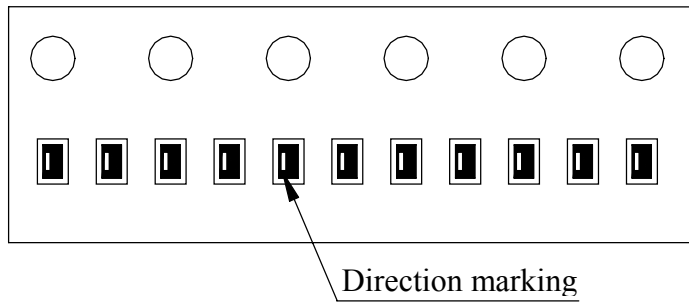
6-1 Dimensions

6-1-1 Tape Packaging Dimensions

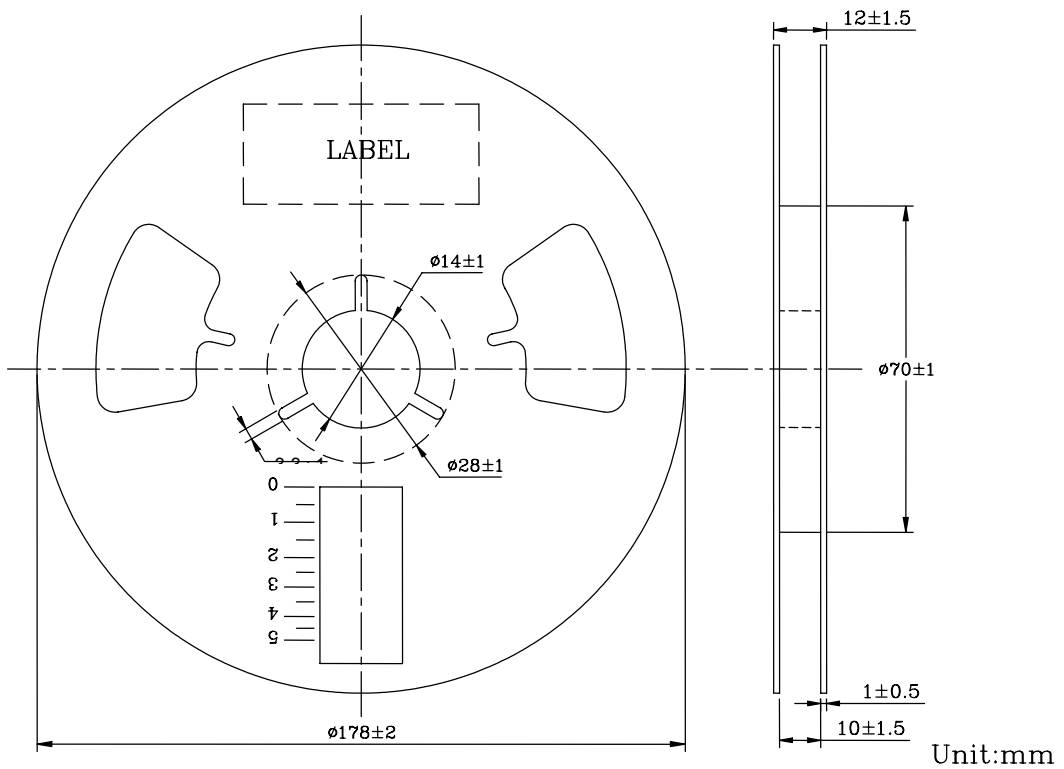


Material : Paper

Unit : mm

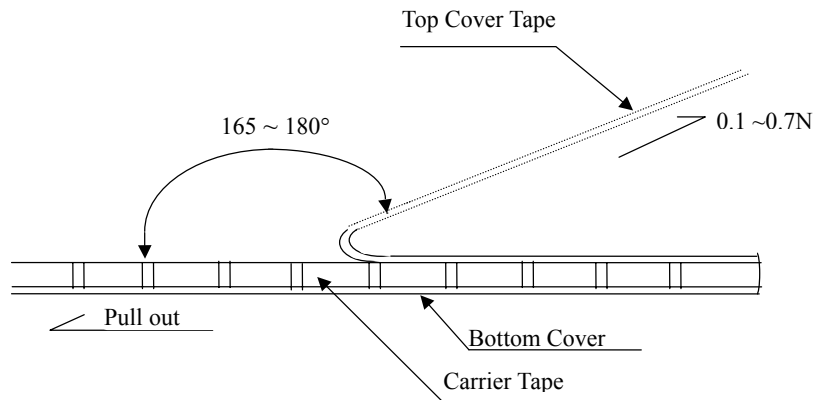


6-1-2 Reel Dimensions



Unit:mm

6-2 Peel Strength of Top Cover Tape



The peel speed shall be about 300 mm/minute

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

6-3 Quantity per Reel

10,000 pieces / reel

6-4 Marking

The following items shall be marked on the reel.

- (1) Manufactures parts number
- (2) Quantity
- (3) Manufacturing date code
- (4) Manufacturer's name
- (5) The country of origin

7. Caution on using chip inductor

7-1 When storing the product

- (1) Store the product in an environmentally well-controlled room (temperature: 5-35°C, humidity : 45-85% RH). Humidity should be kept as low as possible.
- (2) Store the product in a place free of substances which deteriorate Solderability (moisture, dust) and which is free of poisonous gases (hydrogen chloride, hydrogen sulfide).
- (3) Store the product away from direct sunlight.

If the place does not meet the above conditions, or if the product has been left unused for more than one year after delivered, check Solderability before use.

7-2 When mounting the product

- (1) To solder with a soldering iron, heat the land with the soldering iron, avoiding contact with the iron edge of the product. If the product temperature exceeds 300°C, the protective film may have damage and the characteristics of the products may be changed.
- (2) Unsuitable shape and material of the chuck claw, or excessive shock caused by the chucking pressure of the chip-mounting machine may crack the product.

The striking energy at chucking should be 7×10^{-4} J or less.

The striking energy at chucking, in this context, is equivalent to the kinetic energy generated when a 25g-iron block falls from a height of 2.8mm.

- (3) Do not scratch the protective coat or housing surface of the product before, during or after mounting the product. Scratches on the product may deteriorate the durability.
- (4) When coating or sealing the mounted board with resin, completely wash and dry the board beforehand. Sealing the product, which is moistened or contaminated with ions, may deteriorate the durability. Before using the resin, fully examine its quality and reliability. If improper resin is used, the electric characteristics of the product may change.
When gluing the product to the board, use adhesive, which has high insulating resistance and excellent durability. Also, the resin must have characteristics, which do not deteriorate within the operation temperature range or the temperature range of products in use.

7-3 When storing the product

- (1) Warps of the mounted board will causes mechanical stress on the products.

Be sure to handle the mounted board carefully so as not to bend.

Product edge, protective coating or housing surface of the product should be free from excess mechanical stress.

7-4 When operating the product

- (1) Use the product within the rated range stipulated in the specifications.

Especially, over current may cause the damage of equipment, or the change of electric characteristics of products.

- (2) Even if the rated current is being loaded, depending on the mounting density and thermal influence of peripheral elements, the temperature rising of the products will be varied. The product temperature should be confirmed not to exceed the operating range (below 125°C).

- (3) In general, the product is designed to be used with ordinal electronic apparatuses. In the case of using the product in a special operating environment, investigation of its performance and reliability is required beforehand.

- (4) The items listed in the specifications assure the product quality as the products alone.

Evaluation and confirmation of the product quality after mounting, in according with the operating condition. Is required for actual use.

- (5) When serious damage caused by a failure of the product can be predicted or when a fatal error may be possible, establish a complete fail-safe design (including protecting circuits and protectors) to ensure safety.

7-5 Issues concerning restriction and laws.

- (1) The products does not contain any material listed in the ozone-depleting substance designated the Montreal Protocol.

- (2) The materials used for the product are listed in the existing chemicals, in according with the “ Law of Restrictions on Chemical Examination and Manufacturing ”.

- (3) The material of the product does not contain any substance designated in the “ nonflammable substance of the “ nonflammable substances of the bromine-family ”.

※ Other Manufacturer's factory Part No. : Refer to Appendix A