

0402 Series Thin Film Chip Inductor (Lead / Halogen Free)

1. Scope

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

2. Type Designation

CML0510 — \*\*\* — \* NH  
 (1) (2) (3) (4)

Where (1) Product identification code  
 (2) Nominal inductance value :

For example --

3N9 = 3.9nH

27N = 27.0nH

(3) Tolerance :

B = ± 0.1nH

G = ± 2%

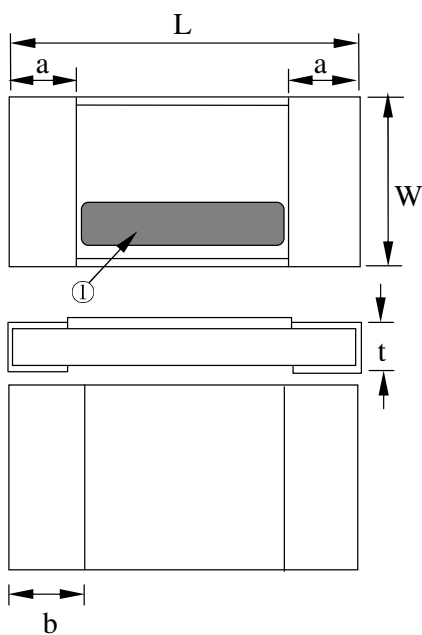
C = ± 0.2nH

H = ± 3%

S = ± 0.3nH

(4) NH = Sn plating (Lead free / Halogen free)

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 (nH)	Tolerance	Q (Typical) @Frequency(MHz)					Self-Resonant Frequency (MHz) Min.	DC Resistance (Ω) Max.	Rated Current (mA) Max.	Operating Temperature
			100	300	800	1000	1800				
CML0510-1N0	1.0	± 0.1 nH ± 0.2 nH	15	30	50	55	80	10000	0.10	1200	-40 ~ 125°C
CML0510-1N1	1.1		15	30	50	55	80	10000	0.10	1200	
CML0510-1N2	1.2		15	30	50	55	80	10000	0.10	1200	
CML0510-1N3	1.3		15	28	46	52	80	10000	0.10	1200	
CML0510-1N5	1.5		15	26	40	45	80	10000	0.10	1200	
CML0510-1N6	1.6		10	20	34	39	55	10000	0.10	1200	
CML0510-1N8	1.8		10	20	34	39	55	7000	0.10	930	
CML0510-2N0	2.0		10	20	34	39	55	7000	0.12	830	
CML0510-2N2	2.2		10	20	31	35	50	7000	0.14	730	
CML0510-2N4	2.4		10	18	30	35	48	7000	0.14	650	
CML0510-2N7	2.7		10	17	29	34	46	7000	0.16	600	
CML0510-3N0	3.0		10	17	28	32	45	7000	0.20	570	
CML0510-3N3	3.3		10	17	27	30	42	7000	0.20	500	
CML0510-3N6	3.6		10	17	27	30	42	7000	0.20	500	
CML0510-3N9	3.9		9	17	27	30	41	7000	0.20	500	
CML0510-4N3	4.3		9	17	27	30	41	7000	0.30	420	
CML0510-4N7	4.7		9	17	27	30	41	7000	0.40	340	
CML0510-5N1	5.1		9	17	27	30	41	7000	0.40	340	
CML0510-5N6	5.6		8	16	27	30	41	6500	0.50	330	
CML0510-6N2	6.2		8	15	27	30	39	5500	0.50	320	
CML0510-6N8	6.8	8	15	25	28	34	5500	0.60	290		
CML0510-7N5	7.5	8	15	25	28	34	5500	0.70	280		
CML0510-8N2	8.2	8	15	24	26	32	5000	0.85	230		
CML0510-9N1	9.1	8	15	24	26	32	5000	1.0	200		
CML0510-10N	10	8	15	24	25	32	4000	1.0	200		
CML0510-12N	12	4	10	15	17	20	4000	1.8	190		
CML0510-15N	15	4	10	15	17	20	4000	2.55	160		
CML0510-18N	18	4	10	15	17	14	2000	2.55	160		
CML0510-22N	22	5	10	15	17	12	2000	2.55	160		
CML0510-27N	27	5	10	15	17	12	2000	2.70	150		
CML0510-33N	33	5	10	15	17	12	1500	3.60	130		
CML0510-39N	39	5	10	15	17	10	1500	4.0	120		

※ 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  $\Delta L$  and  $\Delta Q$ .

$\Delta L$	0.8 ~ 39nH	$\pm 5\%$
$\Delta Q$	0.8 ~ 8.2nH	$\pm 20\%$
	10 ~ 39nH	$\pm 10\%$

5-1-1 Inductance

Inductance value shall be within the tolerance specified in Table1.

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.

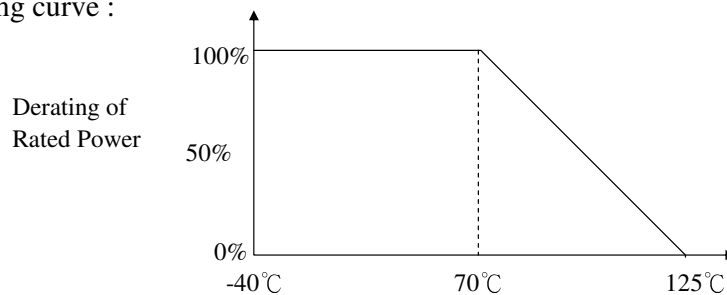
#### 5-1-6 Rated Current

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 ± 15V<sub>DC</sub> 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

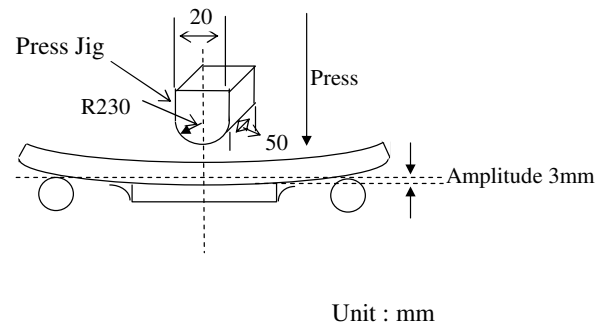
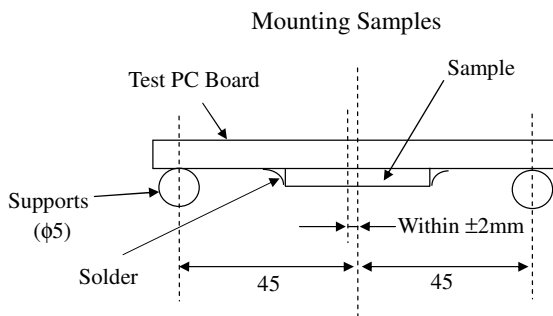
5-2 Mechanical

5-2-1 Bending Test

No mechanical damage shall be observed.

Electrical characteristics shall be within specification.

Bend width : 3mm 30seconds



5-2-2 Solderability

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

Temperature of solder :  $245 \pm 5^{\circ}C$

Immersion duration :  $2 \pm 0.5$  seconds

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 : 260 ± 5°C 10 seconds or less

Temperature : 220 ± 5°C max. 60 seconds

2 cycles or less

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 3 +1/-0 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/cm<sup>3</sup> 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.

$(-40 \pm 3^{\circ}\text{C}, 30\text{minutes}) \rightarrow (\text{Room temperature}, 2\sim 3 \text{ minutes})$

$\rightarrow (+125 \pm 2^{\circ}\text{C}, 30\text{minutes}) \rightarrow (\text{Room temperature}, 2\sim 3 \text{ minutes})$  (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  $70^{\circ}\text{C}$  Resistance to Soldering Heat

No mechanical damage shall be observed.

Electrical characteristics shall be within specification.

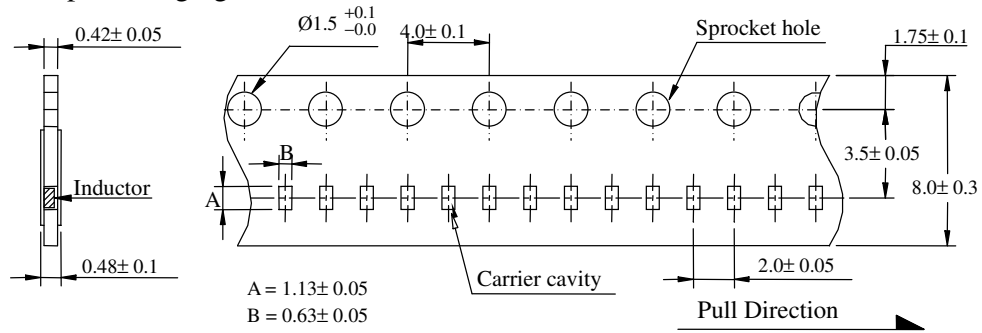
$70 \pm 2^{\circ}\text{C}$

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

6. Packaging

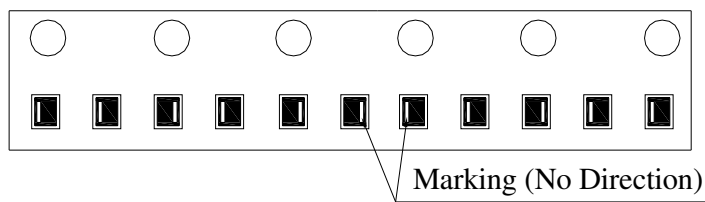
6-1 Dimensions

6-1-1 Tape Packaging Dimensions

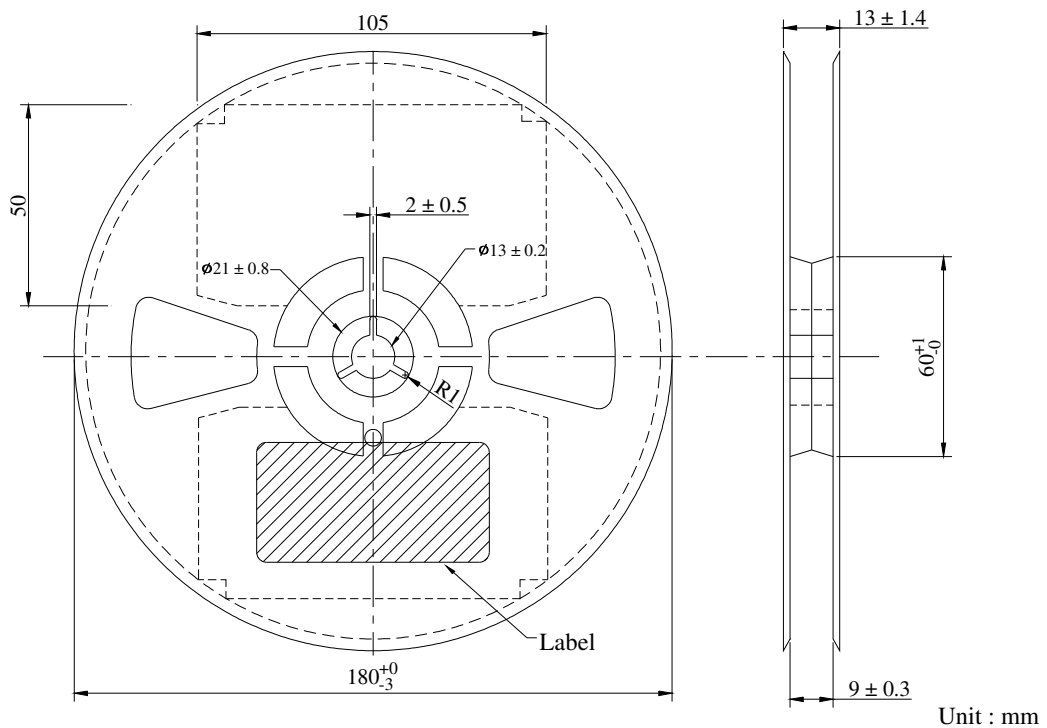


Material : Paper

Unit : mm



6-1-2 Reel Dimensions



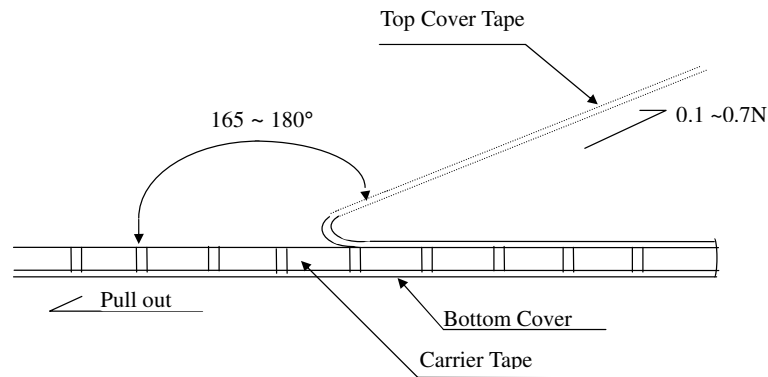
Unit : mm



#### 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  $7 \times 10^{-4}$  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 ”.