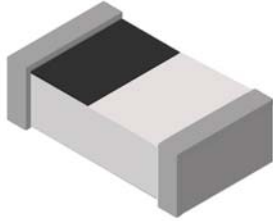


Multilayer Chip Inductor – CL Series



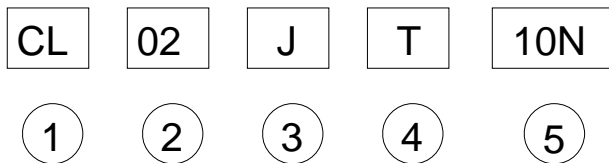
Features

- For High Frequency Application (~10GHz)
- Tight Tolerance Physical Dimensions(+/-0.05mm)
- Tight Inductance Tolerance and Excellent Q Value

Application

- High Frequency Application
- Cellular Phone, Pagers,
- EMI Countermeasure in High Frequency Circuits and Computer Communication etc.

Part Numbering



① Product Type

| Product Type | |
|--------------|--------------------------------|
| CL | Multilayer Chip Inductor (SMD) |

② Dimensions (LxW)

| Codes | Dimensions (LxW) | EIA |
|-------|------------------|------|
| CL02 | 1.00x0.50mm | 0402 |
| CL03 | 1.60x0.80mm | 0603 |

③ Inductance Tolerance

| Codes | Type |
|-------|--------|
| S | ±0.3nH |
| J | ±5% |
| K | ±10% |

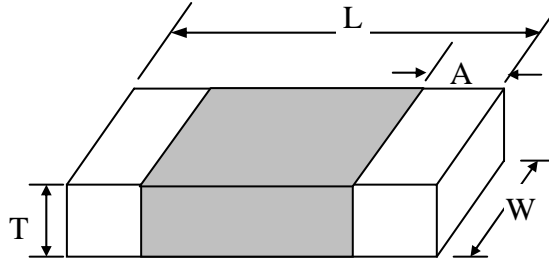
④ Packaging

| Codes | Type |
|-------|-------------|
| T | Taping Reel |

⑤ Inductance

| Codes | Type |
|-------|-------|
| 1N0 | 1.0nH |
| 39N | 39nH |
| R10 | 100nH |

Dimensions



Unit: mm

| Size | L | W | T | A (Min/Max) |
|--------|----------|----------|----------|----------------|
| CL0402 | 1.0±0.10 | 0.5±0.10 | 0.5±0.10 | 0.1 / 0.30 |
| CL0603 | 1.6±0.15 | 0.8±0.15 | 0.8±0.15 | 0.2 / 0.6 |

Electrical Specifications

0402 Multilayer Chip Inductors

| Inductance (nH) | Tolerance | Quality Factor /min. | L/Q Freq. (MHz) | Q(Typical) Freq.(MHz) | | | Resistance DC/Max (Ohm) | Self Resonant Frequency /min. (GHz) | Current DC/Max (mA) |
|--------------------|--------------|----------------------------|-----------------------|--------------------------|-----|-----|-------------------------------|---|---------------------------|
| | | | | 100 | 500 | 800 | | | |
| 1.0 | ±0.3nH | 8 | 100 | 11 | 33 | 37 | 0.12 | 10.0 | 300 |
| 1.2 | ±0.3nH | 8 | 100 | 11 | 29 | 26 | 0.12 | 10.0 | 300 |
| 1.5 | ±0.3nH | 8 | 100 | 12 | 29 | 40 | 0.13 | 6.00 | 300 |
| 1.8 | ±0.3nH | 8 | 100 | 11 | 26 | 34 | 0.14 | 6.00 | 300 |
| 2.2 | ±0.3nH | 8 | 100 | 11 | 26 | 36 | 0.16 | 6.00 | 300 |
| 2.7 | ±0.3nH | 8 | 100 | 12 | 29 | 38 | 0.17 | 6.00 | 300 |
| 3.3 | ±0.3nH, ±10% | 8 | 100 | 11 | 28 | 37 | 0.19 | 6.00 | 300 |
| 3.9 | ±0.3nH, ±10% | 8 | 100 | 11 | 26 | 32 | 0.22 | 4.00 | 300 |
| 4.7 | ±0.3nH, ±10% | 8 | 100 | 12 | 28 | 37 | 0.24 | 4.00 | 300 |
| 5.6 | ±0.3nH, ±10% | 8 | 100 | 11 | 26 | 35 | 0.27 | 4.00 | 300 |
| 6.8 | ±5%, ±10% | 8 | 100 | 11 | 26 | 34 | 0.32 | 3.90 | 300 |
| 8.2 | ±5%, ±10% | 8 | 100 | 12 | 26 | 34 | 0.37 | 3.50 | 300 |
| 10 | ±5%, ±10% | 8 | 100 | 11 | 25 | 31 | 0.42 | 3.20 | 300 |
| 12 | ±5%, ±10% | 8 | 100 | 11 | 25 | 31 | 0.50 | 2.60 | 300 |
| 15 | ±5%, ±10% | 8 | 100 | 11 | 24 | 30 | 0.55 | 2.30 | 300 |
| 18 | ±5%, ±10% | 8 | 100 | 11 | 24 | 30 | 0.65 | 2.00 | 300 |
| 22 | ±5%, ±10% | 8 | 100 | 12 | 24 | 30 | 0.80 | 1.60 | 300 |
| 27 | ±5%, ±10% | 8 | 100 | 11 | 24 | 28 | 0.90 | 1.40 | 300 |
| 33 | ±5%, ±10% | 8 | 100 | 12 | 23 | 26 | 1.00 | 1.20 | 200 |
| 39 | ±5%, ±10% | 8 | 100 | 11 | 21 | 24 | 1.20 | 1.10 | 200 |
| 47 | ±5%, ±10% | 8 | 100 | 11 | 21 | 23 | 1.30 | 0.90 | 200 |
| 56 | ±5%, ±10% | 8 | 100 | 12 | 21 | 21 | 1.40 | 0.75 | 200 |
| 68 | ±5%, ±10% | 8 | 100 | 11 | 19 | 19 | 1.40 | 0.75 | 180 |
| 82 | ±5%, ±10% | 8 | 100 | 10 | 19 | 16 | 1.60 | 0.60 | 150 |
| 100 | ±5%, ±10% | 8 | 100 | 10 | 18 | - | 1.60 | 0.60 | 100 |
| 120 | ±5%, ±10% | 8 | 100 | 11 | 15 | - | 1.60 | 0.60 | 100 |

- Measuring Equipment : HP-4291B+16192A
- Storage Temperature :25±3℃; Humidity<80%RH

Electrical Specifications

0603 Multilayer Chip Inductors

| Inductance (nH) | Tolerance | Quality Factor /min. | L/Q Freq. (MHz) | Q(Typical) Freq.(MHz) | | | Resistance DC/Max (Ohm) | Self Resonant Frequency /min. (GHz) | Current DC/Max (mA) |
|--------------------|--------------|----------------------------|-----------------------|--------------------------|-----|-----|-------------------------------|--|---------------------------|
| | | | | 100 | 500 | 800 | | | |
| 1.5 | ±0.3nH | 8 | 100 | 14 | 34 | 47 | 0.10 | 6.0 | 1000 |
| 1.8 | ±0.3nH | 8 | 100 | 17 | 40 | 55 | 0.10 | 6.0 | 1000 |
| 2.2 | ±0.3nH | 8 | 100 | 15 | 38 | 49 | 0.10 | 6.0 | 1000 |
| 2.7 | ±0.3nH | 8 | 100 | 14 | 37 | 48 | 0.10 | 6.0 | 1000 |
| 3.3 | ±0.3nH, ±10% | 10 | 100 | 16 | 40 | 51 | 0.13 | 6.0 | 1000 |
| 3.9 | ±0.3nH, ±10% | 10 | 100 | 14 | 36 | 48 | 0.15 | 6.0 | 1000 |
| 4.7 | ±0.3nH, ±10% | 10 | 100 | 14 | 37 | 48 | 0.20 | 4.0 | 1000 |
| 5.6 | ±0.3nH, ±10% | 10 | 100 | 14 | 36 | 46 | 0.23 | 4.0 | 600 |
| 6.8 | ±5%, ±10% | 10 | 100 | 15 | 37 | 48 | 0.25 | 4.0 | 600 |
| 8.2 | ±5%, ±10% | 10 | 100 | 16 | 39 | 50 | 0.28 | 3.5 | 600 |
| 10 | ±5%, ±10% | 12 | 100 | 16 | 37 | 47 | 0.30 | 3.2 | 600 |
| 12 | ±5%, ±10% | 12 | 100 | 15 | 36 | 45 | 0.35 | 2.6 | 600 |
| 15 | ±5%, ±10% | 12 | 100 | 16 | 38 | 48 | 0.40 | 2.3 | 600 |
| 18 | ±5%, ±10% | 12 | 100 | 17 | 38 | 47 | 0.45 | 2.0 | 600 |
| 22 | ±5%, ±10% | 12 | 100 | 18 | 40 | 49 | 0.50 | 1.6 | 600 |
| 27 | ±5%, ±10% | 12 | 100 | 18 | 40 | 47 | 0.55 | 1.4 | 600 |
| 33 | ±5%, ±10% | 12 | 100 | 17 | 40 | 46 | 0.60 | 1.2 | 600 |
| 39 | ±5%, ±10% | 12 | 100 | 19 | 40 | 46 | 0.65 | 1.1 | 500 |
| 47 | ±5%, ±10% | 12 | 100 | 17 | 36 | 39 | 0.70 | 0.9 | 500 |
| 56 | ±5%, ±10% | 12 | 100 | 18 | 36 | 37 | 0.75 | 0.9 | 500 |
| 68 | ±5%, ±10% | 12 | 100 | 18 | 35 | 36 | 0.80 | 0.7 | 400 |
| 82 | ±5%, ±10% | 12 | 100 | 18 | 33 | 29 | 0.85 | 0.6 | 300 |
| 100 | ±5%, ±10% | 12 | 100 | 18 | 28 | 16 | 0.90 | 0.6 | 300 |
| 120 | ±5%, ±10% | 8 | 50 | 19 | 28 | 17 | 1.00 | 0.5 | 300 |
| 150 | ±5%, ±10% | 8 | 50 | 13 | 17 | - | 1.20 | 0.5 | 300 |
| 180 | ±5%, ±10% | 8 | 50 | 13 | 16 | - | 1.30 | 0.4 | 300 |
| 220 | ±5%, ±10% | 8 | 50 | 15 | 13 | - | 1.50 | 0.4 | 300 |

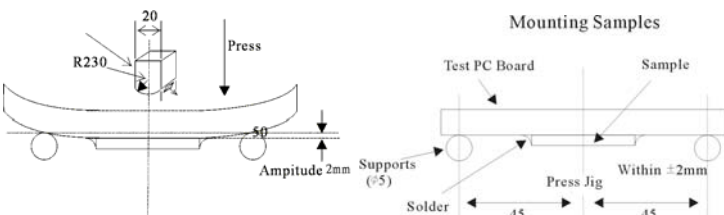
- Measuring Equipment : HP-4291B+16192A
- Storage Temperature :25±3℃; Humidity <80%RH

Testing Condition and Requirements

Electrical Characteristics

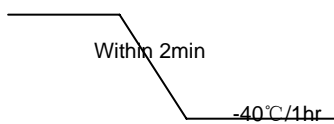
| Test Items | Test Condition | Requirements |
|------------------------------------|---|--|
| Inductance | a. Temperature: $25 \pm 1^\circ\text{C}$ b. Relative Humidity: 45 to 85%RH c. Atmospheric Pressure: 86 to 106kpa d. Measuring equipment and fixture: 1608(0603) HP 4291+16192A 1005(0402) HP 4291+16193A | Within specified tolerance. |
| Q Value | a. Temperature: $25 \pm 1^\circ\text{C}$ b. Relative Humidity: 45 to 85%RH c. Atmospheric Pressure: 86 to 106kpa d. Measuring equipment and fixture: 1608(0603) HP 4291+16192A 1005(0402) HP 4291+16193A | In accordance with electrical specification. |
| DC Resistance | a. Temperature: $25 \pm 1^\circ\text{C}$ b. Relative Humidity: 45 to 85%RH c. Atmospheric Pressure: 86 to 106kpa Measuring equipment: HP 4338 | In accordance with electrical specification. |
| Temperature Characteristics | a. Temperature range: -30 to $+85^\circ\text{C}$ Reference temperature: 25°C | Within specified tolerance. |

Mechanical Characteristics

| Item | Test Condition | Requirements |
|-------------------------------------|--|--|
| Appearance | Inductors shall be visually inspected for visible evidence of defect. | In accordance with specification. |
| Dimension | Dimension shall be measured with caliper or micrometer | In accordance with dimension specification. |
| Solderability | Immerse a test sample into a methanol solution containing rosin, preheat it at 150 to 180°C for 3 to 5 seconds and immerse into molten solder of $235 \pm 5^\circ\text{C}$ for 5 ± 1 seconds. | More than 75% of the terminal electrode part shall be covered with fresh solder. |
| Resistance to Soldering Heat | Immerse a test sample into a methanol solution containing resin, preheat it at 150 to 180°C for 2 to 3 minutes and immerse into molten solder of $260 \pm 5^\circ\text{C}$ for 10 ± 0.5 seconds so that both terminal electrodes are completely submerged. | No visible damage |
| Bending Strength | <p>Solder the chip to test jig then apply a force in the direction shown in below. The soldering shall be done with the reflow method and shall be conducted with care so that the soldering is uniform and free of defects such as heat shock.</p>  | No mechanical damage shall be observed. |

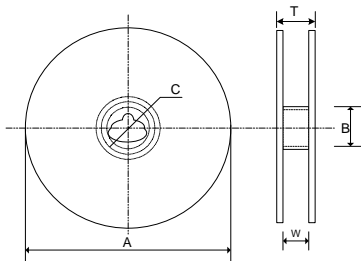
Testing Condition and Requirements

Reliability

| Item | Test Condition | Requirements |
|---|--|---|
| Thermal Shock | Solder a test sample to printed circuit board, and conduct 100 cycles of test under the conditions shown as below. Cycle: 85°C/1hr  Within 2min -40°C/1hr | No visible damage Inductance variation within 10% Q variation within 20% |
| High Humidity State Life Test | Keep a test sample in an atmosphere with a temperature of 70±2°C, 90~95%RH for 500±12 hours. After the test, keep the test sample at a normal temperature for 1 to 2 hours, and then carry out measurement. | No visible damage. Inductance variation within 10%. Q variation within 20%. |
| High Humidity Load Life Test | Solder a test sample to printed circuit board then keep the test sample in an atmosphere with a temperature of 70±2°C, 90~95%RH for 500±12 hours while supplying the rated current. After the test, keep the test sample at a normal temperature for 1 to 2 hours, and then carry out measurement. | No visible damage. Inductance variation within 10%. Q variation within 20%. |
| High Temperature State Life Test | Keep a test sample in an atmosphere with a temperature of 85±2°C for 500±12 hours. After the test, keep the test sample at a normal temperature for 1 to 2 hours, and then carry out measurement. | No visible damage. Inductance variation within 10%. Q variation within 20%. |
| High Temperature Load | Solder a test sample to printed circuit board then keep the test sample in an atmosphere with a temperature of 85±2°C for 500±12 hours while supplying the rated current. After the test, keep the test sample at a normal temperature for 1 to 2 hours, and then carry out measurement. | No visible damage. Inductance variation within 10%. Q variation within 20%. |

Packaging Specifications

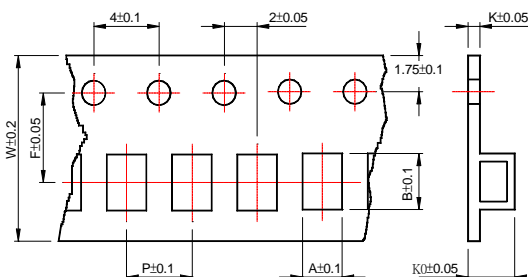
Reel Dimensions



Unit: mm

| Series | A | B | C | D | Paper Tape (EA) |
|--------|-------|----------|-----------|-----------|-----------------|
| CL02 | 178±1 | 60.2±0.5 | 13.0±0.50 | 13.2±1.50 | 10,000 |
| CL03 | 178±1 | 60.0±0.5 | 13.0±0.20 | 9.00±0.5 | 4,000 |

Emboss Plastic Tape Specifications



Unit: mm

| Series | A | B | K0 | W | P | F | K |
|--------|-----|------|------|---|---|-----|------|
| CL03 | 1.1 | 1.9 | 0.95 | 8 | 4 | 3.5 | 1.10 |
| CL02 | 0.6 | 1.12 | 0.60 | 8 | 2 | 3.5 | 1.10 |