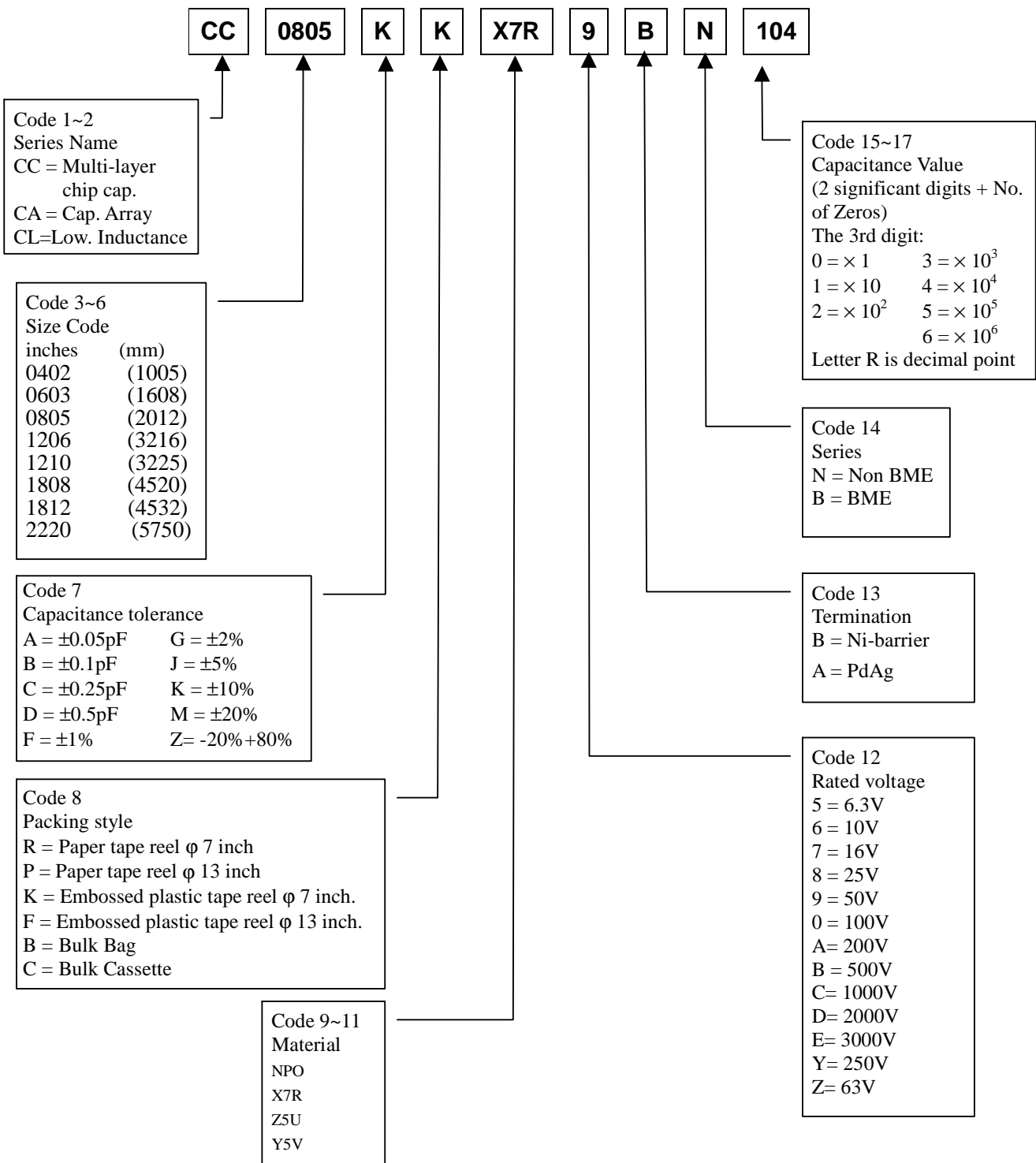


1. SUBJECT: This specification applies on the chip capacitor made by Yageo Corporation.

2. PART NUMBER: Part number of the chip capacitor is identified by the size, tolerance, packing, material and capacitor value.

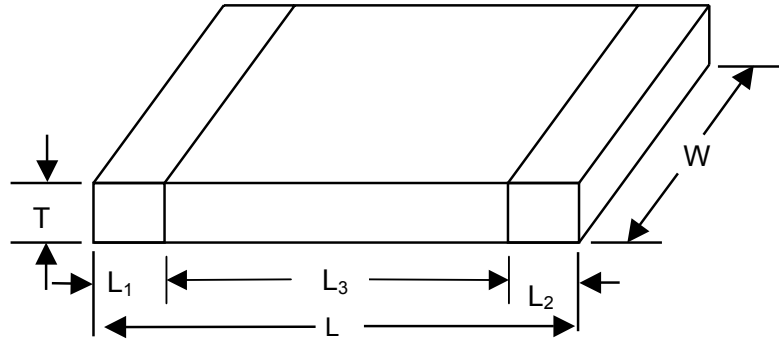
Example:



3. ELECTRICAL CHARACTERISTICS

| Characteristics | Test conditions | Requirement | | | |
|---|--|---|--|---|---|
| | | Class I | Class II | | |
| | | NPO | X7R | Y5V | Z5U |
| Operation temperature range | _____ | -55°C to 125°C | -55°C to 125°C | -25°C to 85°C | +10°C to +85°C |
| Temperature characteristic/coefficient (TC) | With respect to 20°C (25°C, for Y5V、Z5U) within operation temperature range | NPO 16V, 0±60ppm/K NPO >16V, 0±30ppm/K | ±15% | +30% to -80% | +22% to -56% |
| Capacitance tolerance | With respect to 20°C (25°C, for Y5V、Z5U) NPO: | C < 5pF; ±0.25pF C ≥ 5pF; ±0.5pF C ≥ 10pF; ±5%, ±10% | ±10%, ±20% | ±20%, -20%~+80% | ±20%, -20%~+80% |
| Dissipation factor (Tan δ) | C ≤ 1000pF 1Vrms/1MHz C > 1000pF 1Vrms/1KHz X7R/Y5V: 1Vrms/1KHz Z5U: 0.5Vrms/1KHz | C < 10pF: Tan δ ≤ 10(3/C+0.7)×10 ⁻⁴ or 30 × 10 ⁻⁴ whichever is less. C ≥ 10pF Tan δ ≤ 10 × 10 ⁻⁴ | Tan δ ≤ 2.5%, 50V Tan δ ≤ 2.5%, 25V Tan δ ≤ 3.5%, 16V Tan δ ≤ 5%, 10V | Tan δ ≤ 5% or ≤ 7%, 25V/50V depending on capacitance value Tan δ ≤ 9% or ≤ 12.5%, 16V depending on capacitance value Tan δ ≤ 12.5%, 10V | Tan δ ≤ 4%, 50V Tan δ ≤ 6%, 25V Tan δ ≤ 9%, 16V |
| Insulation resistance(IR) | At Ur(rated voltage) for 1 minute Ur>500V,at 500V(DC) for 1minute | R _{ins} > 10GΩ or R _{ins} ×C≥500s, whichever is less. | R _{ins} > 10GΩ or R _{ins} ×C≥500s, Whichever is less. | R _{ins} > 10GΩ or R _{ins} ×C≥100s, whichever is less. | |
| Dielectric withstanding Voltage | At 2.5Ur (for Ur ≤ 100V) 1.5Ur + 100V (for Ur > 100V) 1.5Ur,Ur=1000V 1.2Ur,Ur>1000V for 5Second | No breakdown | | | |

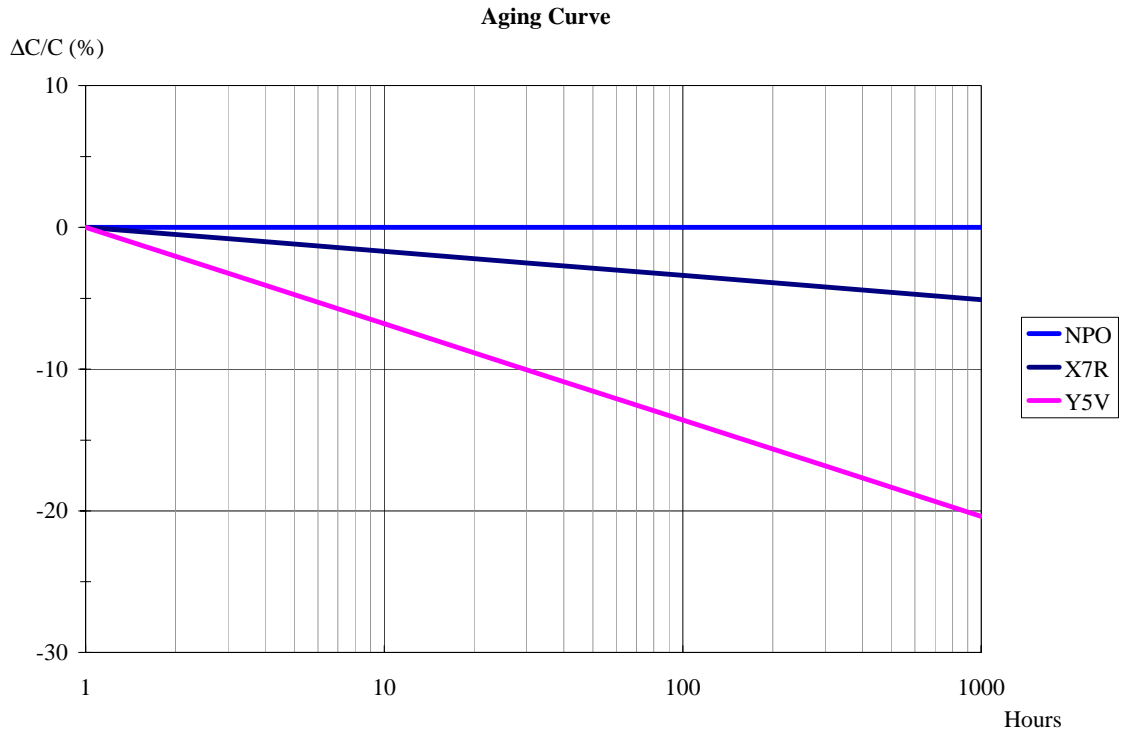
4. DIMENSION (mm)



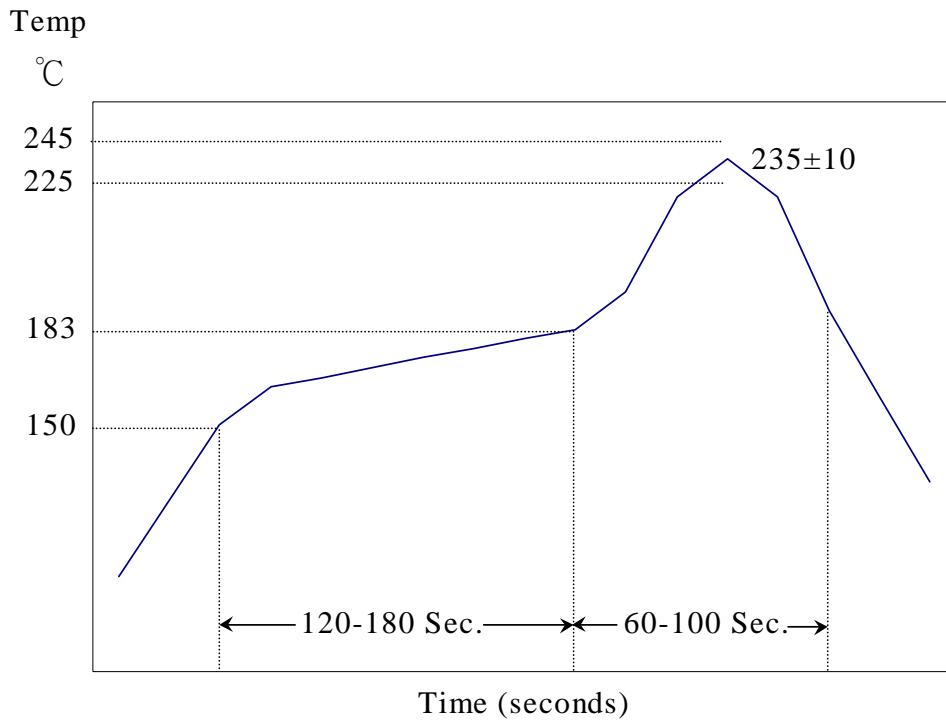
| Style | L | W | T | | L ₁ :L ₂ | | L ₃ |
|--------|----------|-----------|------|------|--------------------------------|------|----------------|
| | | | MIN. | MAX. | MIN. | MAX. | Min. |
| CC0402 | 1.0±0.05 | 0.5±0.05 | 0.45 | 0.55 | 0.15 | 0.30 | 0.40 |
| CC0603 | 1.6±0.10 | 0.8±0.10 | 0.70 | 0.90 | 0.20 | 0.60 | 0.40 |
| CC0805 | 2.0±0.10 | 1.25±0.10 | 0.50 | 1.35 | 0.25 | 0.75 | 0.55 |
| CC1206 | 3.2±0.15 | 1.6±0.15 | 0.50 | 1.35 | 0.25 | 0.75 | 1.40 |
| CC1210 | 3.2±0.20 | 2.5±0.20 | 0.50 | 1.80 | 0.25 | 0.75 | 1.40 |
| CC1812 | 4.5±0.20 | 3.2±0.20 | 0.50 | 1.80 | 0.25 | 0.75 | 2.20 |
| CC2220 | 5.7±0.20 | 5.0±0.20 | 0.50 | 1.80 | 0.25 | 0.75 | 2.20 |

Unit: mm

Aging Rate



Reflow Profile



Profile Parameters 參數

1-2°C/Sec ramp 溫昇

Preheat 150-183°C : 2-3 minutes

Time above 183°C : 60-100 seconds

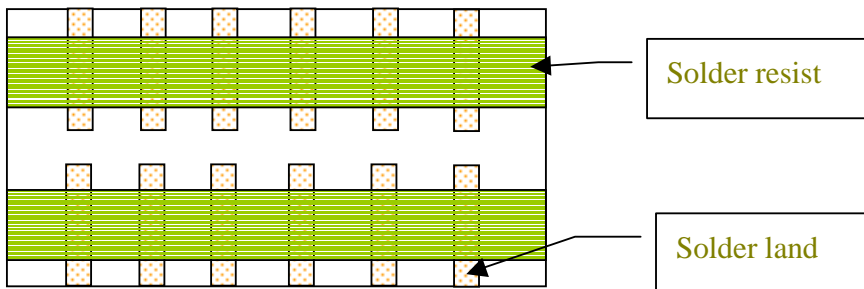
Peak Temperature : 230 ± 10 °C

Module should only be in oven for 5.5-6 minute

5. TESTS AND REQUIREMENTS

| IEC 384-10 | Test items | Conditions | Requirements | | |
|------------|------------------------------|--|--|---|--|
| | | | NPO | X7R | Y5V |
| 4.9 | Bending | Bending rate 1mm/s, jig. Radius 340mm | $\Delta C/C \leq 1\%$ | $\Delta C/C \leq 10\%$ | $\Delta C/C \leq 20\%$ |
| 4.10 | Resistance to soldering heat | 260±5°C for 10±0.5s in static solder bath | $\Delta C/C \leq 0.5\%$ or 0.5pF, whichever is greater | -5% ≤ $\Delta C/C \leq 10\%$ | -10% ≤ $\Delta C/C \leq 20\%$ |
| 4.11 | Solderability | 235±5°C for 2±0.5 s in a static solder bath | 75% minimum coverage of metallic area | | |
| 4.12 | Rapid change of temperature | NPO/X7R: -55°C to +125°C, 5 cycles Y5V: -25°C to +85°C, 5 cycles | $\Delta C/C \leq 1\%$ or 1pF, whichever is greater | $\Delta C/C \leq 15\%$ | $\Delta C/C \leq 20\%$ |
| 4.14 | Damp heat, steady state | At 40°C, 90 to 95% RH and Ur applied (max. 500V, for 56 days (500 hours for Y5V) Class 2 only 56 days at 40°C, 90 to 95% RH, No voltage (for Ur ≥ 1kV) Precondition for Class 2 Ur ≤ 16V | $\Delta C/C: 2\%$ or 1pF whichever is greater Tan δ : ≤ 2xspecified Value IR: 2500MΩ or RxC ≥ 25s whichever is less | $\Delta C/C \leq 15\%$ Tan δ : ≤ 7% IR: 1000MΩ or RxC ≥ 25s Whichever is less | -40% ≤ $\Delta C/C \leq 30\%$ Tan δ : ≤ 7%, 12.5%, 15% IR: 1000MΩ or RxC ≥ 25s Whichever is less |
| 4.15 | Endurance | At upper category temperature, 2xUr applied (1.5Ur for Ur > 50V, 1.2Ur for Ur ≥ 1KV) for 1000hours Class 2 only 1000 hours, At upper category temperature, No voltage (for Ur ≥ 1KV) Precondition for Class 2 Ur ≤ 16V | $\Delta C/C: 2\%$ or 1pF whichever is greater Tan δ : ≤ 2xspecified Value IR: 4000MΩ or RxC ≥ 40s whichever is less | $\Delta C/C \leq 20\%$ Tan δ : ≤ 7% IR: 2000MΩ or RxC ≥ 50s Whichever is less | -40% ≤ $\Delta C/C \leq 30\%$ Tan δ : ≤ 7%, 12.5%, 15% IR: 2000MΩ or RxC ≥ 50s Whichever is less |

PCB Layout for Reliability test:



NPO

| Capacitance | 16V | | 25V | | | | 50V | | | | 100V | | | | 200V | | | | 500V | | | 1kV | | 2kV | | 3kV | | 4kV | | | | | |
|-------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|--|
| | 0402 | 0603 | 0402 | 0603 | 0805 | 1206 | 1210 | 0402 | 0603 | 0805 | 1206 | 1210 | 1812 | 0603 | 0805 | 1206 | 1210 | 1812 | 0805 | 1206 | 1210 | 1812 | 1206 | 1210 | 1812 | 1206 | 1812 | 1206 | 1808 | 1812 | 1808 | 1812 | |
| (pF) 0.47 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.56 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.68 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| 2.7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3.3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3.9 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4.7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5.6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6.8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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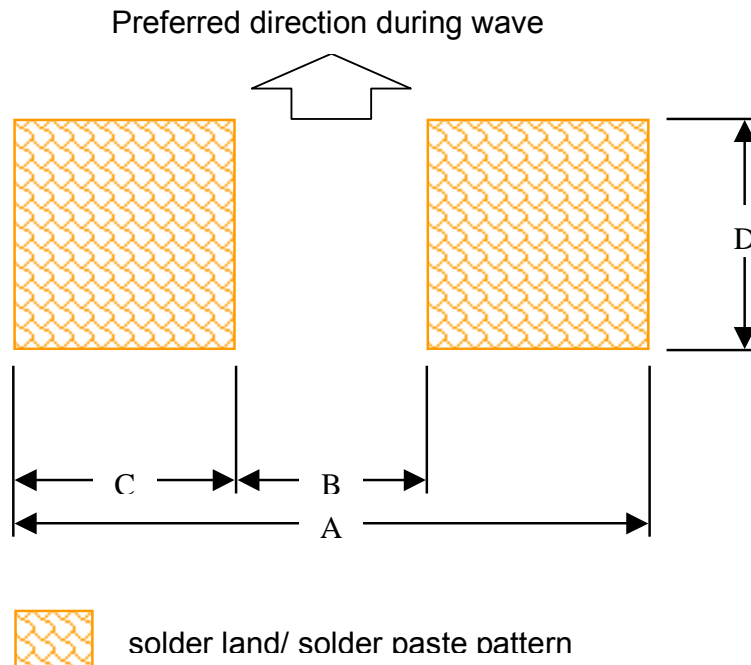
X7R

| Capacitance (nF) | 10V | | | 16V | | | 25V | | | | 50V | | | | 100V | | | 200V | | | 500V | | | 1kV | | 2kV | | | | | | | | | | | |
|---------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|--|--|
| | 0603 | 0805 | 1206 | 0402 | 0603 | 0805 | 1206 | 0402 | 0603 | 0805 | 1206 | 1210 | 0402 | 0603 | 0805 | 1206 | 1210 | 1812 | 2220 | 0805 | 1206 | 1210 | 1812 | 0805 | 1206 | 1210 | 1812 | 1206 | 1210 | 1812 | 1206 | 1808 | 1812 | 1808 | 1812 | | |
| 0.1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.12 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.15 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.18 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.22 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.27 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.33 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.47 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| 3.9 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4.7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| 1800 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2200 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2700 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3300 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3900 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4700 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Y5V

| Capacitance | Y5V 10V | | | | Y5V 16V | | | | | Y5V 25V | | | | Y5V 50V | | | Z5U 25V | | Z5U 50V | | |
|-------------|---------|------|------|------|---------|------|------|------|------|---------|------|------|------|---------|------|------|---------|------|---------|------|------|
| | 0603 | 0805 | 1206 | 1210 | 0402 | 0603 | 0805 | 1206 | 1210 | 0603 | 0805 | 1206 | 1210 | 0603 | 0805 | 1206 | 0603 | 1206 | 0805 | 1206 | 1210 |
| (uF) 0.010 | | | | | ■ | | | | | ■ | | | | ■ | ■ | | ■ | | ■ | ■ | |
| 0.022 | | | | | ■ | | | | | ■ | | | | ■ | ■ | | ■ | | ■ | ■ | |
| 0.047 | | | | | ■ | | | | | ■ | | | | ■ | ■ | | ■ | | ■ | ■ | |
| 0.10 | | | | | ■ | | | | | ■ | ■ | ■ | | ■ | ■ | ■ | ■ | | ■ | ■ | ■ |
| 0.22 | | | | | | ■ | | | | | ■ | ■ | | | ■ | ■ | | | ■ | ■ | ■ |
| 0.47 | | | | | | ■ | ■ | | | | ■ | ■ | | | ■ | ■ | | ■ | | ■ | ■ |
| 1.0 | ■ | | ■ | | | | ■ | ■ | | | ■ | ■ | | | ■ | ■ | | ■ | | | ■ |
| 2.2 | | ■ | ■ | | | | ■ | ■ | | | ■ | ■ | | | | | | | | | |
| 3.3 | | ■ | ■ | | | | | ■ | | | | | | | | | | | | | |
| 4.7 | | | ■ | | | | | | | | | | | | | | | | | | |
| 10 | | | ■ | | | | | | ■ | | | | ■ | | | | | | | | |
| 22 | | | ■ | ■ | | | | | | | | | | | | | | | | | |

commended dimension of solder lands



Reflow soldering

| Style | FOOTPRINT DIMENSIONS (mm) | | | | Placement Accuracy (mm) |
|--------|---------------------------|-----|------|-----|-------------------------|
| | A | B | C | D | |
| CC0402 | 1.5 | 0.5 | 0.5 | 0.5 | ±0.15 |
| CC0603 | 2.3 | 0.5 | 0.9 | 0.9 | ±0.25 |
| CC0805 | 2.8 | 0.9 | 0.95 | 1.4 | ±0.25 |
| CC1206 | 4.0 | 2.0 | 1.0 | 1.8 | ±0.25 |
| CC1210 | 4.0 | 2.0 | 1.0 | 2.7 | ±0.25 |
| CC1808 | 5.4 | 3.3 | 1.05 | 3.3 | ±0.25 |
| CC1812 | 5.4 | 3.3 | 1.05 | 3.3 | ±0.25 |
| CC2220 | 6.6 | 4.5 | 1.05 | 3.3 | ±0.25 |

Wave soldering

| Style | FOOTPRINT DIMENSIONS (mm) | | | | Placement Accuracy (mm) |
|--------|---------------------------|-----|------|-----|-------------------------|
| | A | B | C | D | |
| CC0603 | 2.7 | 0.9 | 0.9 | 0.8 | ±0.25 |
| CC0805 | 3.4 | 1.3 | 1.05 | 1.3 | ±0.25 |
| CC1206 | 4.8 | 2.3 | 1.25 | 1.7 | ±0.25 |
| CC1210 | 5.3 | 2.3 | 1.50 | 2.6 | ±0.25 |

MLCC QC Flow Chart

| Process Flow | | | Process Stage | Control Point | |
|------------------|---------------------|-----------|--------------------|---|----------------------------------|
| Mat'l Process | Prepare process | Due Stage | | | |
| Powder | Incoming Inspection | | Analysis of powder | | |
| Binder | | | Ball Mill | Recipe Milling time Viscosity | |
| inner paste | incoming inspection | | Foil Casting | Foil Weight | |
| | | | Screen Printing | Printing width laydown | |
| | | | Pressing | Pressure Temperature | |
| | | | Cutting | Free Margin | |
| | | | Binder Burn Out | Weight loss% | |
| outer paste | incoming inspection | | Sintering | Thermo-ring temperature | |
| | | | Tumbling | Rolling speed | |
| | | | Dipping | Termination length | |
| | | | Curing | Profile setting | |
| | | | Inner defect check | Destructure Physical Analysis | |
| | | | Plating | Solderability Tin concentration Ni concentration Tin thickness Nickel thickness | |
| | | | Testing | C% 1st piece check Mechanical M/C setting | |
| | | | Mechanical visual | Mechanical defect | |
| | | | QA | Cap/TanD IR+HV Body fault item End term. fault item Dimension item Solderability | |
| Packing Material | | | | Taping | Peel off force Product defect |
| | | | | Taping Q/A | Taping defect |
| | | | Stock | | |