# Surface Mount Multilayer Ceramic Chip Capacitors for Commodity Applications

## FEATURES

- Stable class 2 dielectric
- Four standard sizes
- High capacitance per unit volume
- Supplied in tape on reel
- For high frequency applications
- Ni-barrier with 100 % tin terminations
- Dry sheet technology process
- Base Metal Electrode System (BME)
- Halogen-free according to IEC 61249-2-21

RoHS COMPLIANT
HALOGEN FREE

## APPLICATIONS

- Consumer electronics
- Telecommunications
- Data processing

## ELECTRICAL SPECIFICATION

**Note:**
Electrical characteristics at 25 °C, unless otherwise specified

**Operating Temperature:** - 55 °C to + 125 °C

**Capacitance Range:** 100 pF to 4.7 µF

**Voltage Range:** 6.3 Vdc to 100 Vdc

**Temperature Coefficient of Capacitance (TCC):**
± 15 % without voltage applied

**Dissipation Factor (DF):**
**10 V:** ≤ **5 %**
≤ 10 % for 0603 ≥ 0.33 µF; 0805 ≥ 2.2 µF; 1206 ≥ 2.2 µF
**16 V:** ≤ **3.5 %**
≤ 5 % for 0402 ≥ 0.033 µF; 0603 ≥ 0.15 µF; 0805 ≥ 0.68 µF; 1206 ≥ 2.2 µF
≤ 10 % for 0603 ≥ 0.68 µF; 0805 ≥ 2.2 µF; 1206 ≥ 4.7 µF
**25 V:** ≤ **3.5 %**
≤ 5 % for 0805 ≥ 1 µF
≤ 7 % for 0603 ≥ 0.33 µF; 1206 ≥ 4.7 µF
≤ 10 % for 0402 ≥ 0.10 µF; 0603 ≥ 0.47 µF; 0805 ≥ 2.2 µF; 1206 ≥ 6.8 µF
≥ **50 V:** ≤ **2.5 %**
≤ 3 % for 0603 ≥ 0.047 µF; 0805 ≥ 0.18 µF; 1206 ≥ 0.47 µF

**Aging Rate:**
≤ 10 V: maximum 1.5 % per decade
≥ 16 V: maximum 1 % per decade

**Insulation Resistance (IR):**
10 GΩ or 500 ΩF whichever is less

**Dielectric Strength Test:**
This is the maximum voltage the capacitors are tested for 1 s to 5 s period and the charge/discharge current does not exceed 50 mA
≤ 100 Vdc: 250 % of rated voltage

## ORDERING INFORMATION

| VJ0402 | Y | 101 | J | X | Q | C | W1BC |
|---|---|---|---|---|---|---|---|
| SIZE CODE | DIELECTRIC | CAPACITANCE | TOLERANCE | TERMINATION | VOLTAGE | PACKAGING | PROCESS CODE FOR BASIC COMMODITY |
| 0402<br>0603<br>0805<br>1206<br>1210 | Y = X7R | Two significant digits followed by the number of zeros:<br>101 = 100 pF<br>102 = 1000 pF<br>152 = 1500 pF<br>103 = 10 000 pF | J = ± 5 % (1)<br>K = ± 10 %<br>M = ± 20 % | X = Ni Barrier | Y = 6.3 V<br>Q = 10 V<br>J = 16 V<br>X = 25 V<br>A = 50 V<br>B = 100 V | C = 7" reel/paper<br>P = 13" reel/paper<br>T = 7" reel/blister<br>R = 13" reel/blister | |

**Note**
(1) Not all values, see selection chart sizes 0603, 0805, 1206

## SELECTION CHART

| DIELECTRIC | | X7R | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EIA CAP. CODE | EIA SIZE | 0402 | | | | | 0603 | | | | | 0805 | | | | |
| | CAP. | 10 V | 16 V | 25 V | 50 V | 100 V | 10 V | 16 V | 25 V | 50 V | 100 V | 10 V | 16 V | 25 V | 50 V | 100 V |
| 101 | 100 pF | N | N | N | N | | S + | S + | S + | S + | S + | B + | B + | B + | B + | B + |
| 121 | 120 pF | N | N | N | N | | S + | S + | S + | S + | S + | B + | B + | B + | B + | B + |
| 151 | 150 pF | N | N | N | N | | S + | S + | S + | S + | S + | B + | B + | B + | B + | B + |
| 181 | 180 pF | N | N | N | N | | S + | S + | S + | S + | S + | B + | B + | B + | B + | B + |
| 221 | 220 pF | N | N | N | N | | S + | S + | S + | S + | S + | B + | B + | B + | B + | B + |
| 271 | 270 pF | N | N | N | N | | S + | S + | S + | S + | S + | B + | B + | B + | B + | B + |
| 331 | 330 pF | N | N | N | N | | S + | S + | S + | S + | S + | B + | B + | B + | B + | B + |
| 391 | 390 pF | N | N | N | N | | S + | S + | S + | S + | S + | B + | B + | B + | B + | B + |
| 471 | 470 pF | N | N | N | N | | S | S | S | S | S | B | B | B | B | B |
| 561 | 560 pF | N | N | N | N | | S | S | S | S | S | B | B | B | B | B |
| 681 | 680 pF | N | N | N | N | | S | S | S | S | S | B | B | B | B | B |
| 821 | 820 pF | N | N | N | N | | S | S | S | S | S | B | B | B | B | B |
| 102 | 1000 pF | N | N | N | N | | S | S | S | S | S | B | B | B | B | B |
| 122 | 1200 pF | N | N | N | N | | S | S | S | S | S | B | B | B | B | B |
| 152 | 1500 pF | N | N | N | N | | S | S | S | S | S | B | B | B | B | B |
| 182 | 1800 pF | N | N | N | N | | S | S | S | S | S | B | B | B | B | B |
| 222 | 2200 pF | N | N | N | N | | S | S | S | S | S | B | B | B | B | B |
| 272 | 2700 pF | N | N | N | N | | S | S | S | S | S | B | B | B | B | B |
| 332 | 3300 pF | N | N | N | N | | S | S | S | S | S | B | B | B | B | B |
| 392 | 3900 pF | N | N | N | N | | S | S | S | S | S | B | B | B | B | B |
| 472 | 4700 pF | N | N | N | N | | S | S | S | S | S | B | B | B | B | B |
| 562 | 5600 pF | N | N | N | N | | S | S | S | S | S | B | B | B | B | B |
| 682 | 6800 pF | N | N | N | N | | S | S | S | S | S | B | B | B | B | B |
| 822 | 8200 pF | N | N | N | N | | S | S | S | S | S | B | B | B | B | B |
| 103 | 0.01 µF | N | N | N | N | | S | S | S | S | S | B | B | B | B | B |
| 123 | 0.012 µF | N | N | N | | | S | S | S | S | | B | B | B | B | B |
| 153 | 0.015 µF | N | N | N | | | S | S | S | S | | B | B | B | B | B |
| 183 | 0.018 µF | N | N | N | | | S | S | S | S | | B | B | B | B | B |
| 223 | 0.022 µF | N | N | N | | | S | S | S | S | | B | B | B | B | B |
| 273 | 0.027 µF | N | N | | | | S | S | S | S | | B | B | B | B | D |
| 333 | 0.033 µF | N | N | | | | S | S | S | X | | B | B | B | B | D |
| 393 | 0.039 µF | N | N | | | | S | S | S | X | | B | B | B | B | D |
| 473 | 0.047 µF | N | N | | | | S | S | S | X | | B | B | B | B | D |
| 563 | 0.056 µF | N | N | | | | S | S | S | X | | B | B | B | B | D |
| 683 | 0.068 µF | N | N | | | | S | S | S | X | | B | B | B | B | D |
| 823 | 0.082 µF | N | N | | | | S | S | S | X | | B | B | B | B | D |
| 104 | 0.1 µF | N | N | | | | S | S | S | X | | B | B | B | B/D | D |
| 124 | 0.12 µF | | | | | | S | S | X | | | B | B | B | D | |
| 154 | 0.15 µF | | | | | | S | S | X | | | D | D | D | D | |
| 184 | 0.18 µF | | | | | | S | S | X | | | D | D | D | D | |
| 224 | 0.22 µF | | | | | | S | S | X | | | D | D | D | D | |
| 274 | 0.27 µF | | | | | | X | X | X | | | D | D | D | | |
| 334 | 0.33 µF | | | | | | X | X | X | | | D | D | D | I | |
| 394 | 0.39 µF | | | | | | X | X | | | | D | D | D | | |
| 474 | 0.47 µF | | | | | | X | X | | | | D | D | D | I | |
| 564 | 0.56 µF | | | | | | X | | | | | D | D | D | | |
| 684 | 0.68 µF | | | | | | X | X | | | | D | D | D | | |
| 824 | 0.82 µF | | | | | | X | | | | | D | D | D | | |
| 105 | 1 µF | | | | | | X | X | | | | D | D | D | | |
| 155 | 1.5 µF | | | | | | | | | | | I | | | | |
| 225 | 2.2 µF | | | | | | | | | | | I | I | I | | |
| 335 | 3.3 µF | | | | | | | | | | | | | | | |
| 475 | 4.7 µF | | | | | | | | | | | | | | | |
| 685 | 6.8 µF | | | | | | | | | | | | | | | |
| 106 | 10 µF | | | | | | | | | | | | | | | |
| 156 | 15 µF | | | | | | | | | | | | | | | |
| 226 | 22 µF | | | | | | | | | | | | | | | |
| 336 | 33 µF | | | | | | | | | | | | | | | |
| 476 | 47 µF | | | | | | | | | | | | | | | |
| 686 | 68 µF | | | | | | | | | | | | | | | |
| 107 | 100 µF | | | | | | | | | | | | | | | |

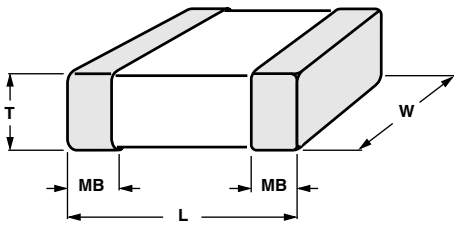
**Notes**
Letters indicate product thickness, see packaging quantities
+ Not in 5 % (Code “J”) tolerance

## SELECTION CHART

| DIELECTRIC | | X7R | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| EIA CAP. CODE | EIA SIZE | 1206 | | | | | 1210 | | | | |
| | CAP. | 10 V | 16 V | 25 V | 50 V | 100 V | 10 V | 16 V | 25 V | 50 V | 100 V |
| 101 | 100 pF | | | | | | | | | | |
| 121 | 120 pF | | | | | | | | | | |
| 151 | 150 pF | B + | B + | B + | B + | B + | | | | | |
| 181 | 180 pF | B + | B + | B + | B + | B + | | | | | |
| 221 | 220 pF | B + | B + | B + | B + | B + | | | | | |
| 271 | 270 pF | B + | B + | B + | B + | B + | | | | | |
| 331 | 330 pF | B + | B + | B + | B + | B + | | | | | |
| 391 | 390 pF | B + | B + | B + | B + | B + | | | | | |
| 471 | 470 pF | B | B | B | B | B | | | | | |
| 561 | 560 pF | B | B | B | B | B | | | | | |
| 681 | 680 pF | B | B | B | B | B | | | | | |
| 821 | 820 pF | B | B | B | B | B | | | | | |
| 102 | 1000 pF | B | B | B | B | B | C | C | C | C | C |
| 122 | 1200 pF | B | B | B | B | B | C | C | C | C | C |
| 152 | 1500 pF | B | B | B | B | B | C | C | C | C | C |
| 182 | 1800 pF | B | B | B | B | B | C | C | C | C | C |
| 222 | 2200 pF | B | B | B | B | B | C | C | C | C | C |
| 272 | 2700 pF | B | B | B | B | B | C | C | C | C | C |
| 332 | 3300 pF | B | B | B | B | B | C | C | C | C | C |
| 392 | 3900 pF | B | B | B | B | B | C | C | C | C | C |
| 472 | 4700 pF | B | B | B | B | B | C | C | C | C | C |
| 562 | 5600 pF | B | B | B | B | B | C | C | C | C | C |
| 682 | 6800 pF | B | B | B | B | B | C | C | C | C | C |
| 822 | 8200 pF | B | B | B | B | B | C | C | C | C | C |
| 103 | 0.01 µF | B | B | B | B | B | C | C | C | C | C |
| 123 | 0.012 µF | B | B | B | B | B | C | C | C | C | C |
| 153 | 0.015 µF | B | B | B | B | B | C | C | C | C | C |
| 183 | 0.018 µF | B | B | B | B | B | C | C | C | C | C |
| 223 | 0.022 µF | B | B | B | B | B | C | C | C | C | C |
| 273 | 0.027 µF | B | B | B | B | B | C | C | C | C | C |
| 333 | 0.033 µF | B | B | B | B | B | C | C | C | C | C |
| 393 | 0.039 µF | B | B | B | B | B | C | C | C | C | C |
| 473 | 0.047 µF | B | B | B | B | B | C | C | C | C | C |
| 563 | 0.056 µF | B | B | B | B | B | C | C | C | C | C |
| 683 | 0.068 µF | B | B | B | B | B | C | C | C | C | C |
| 823 | 0.082 µF | B | B | B | B | D | C | C | C | C | C |
| 104 | 0.1 µF | B | B | B | B | D | C | C | C | C | C |
| 124 | 0.12 µF | B | B | B | B | D | C | C | C | C | C |
| 154 | 0.15 µF | C | C | C | C | G | C | C | C | C | D |
| 184 | 0.18 µF | C | C | C | C | G | C | C | C | C | D |
| 224 | 0.22 µF | C | C | C | C | G | C | C | C | C | D |
| 274 | 0.27 µF | C | C | C | D | | C | C | C | C | G |
| 334 | 0.33 µF | C | C | C | D | | C | C | C | D | G |
| 394 | 0.39 µF | C | C | J | P | | C | C | C | D | M |
| 474 | 0.47 µF | J | J | J | P | | C | C | C | D | M |
| 564 | 0.56 µF | J | J | J | P | | D | D | D | D | M |
| 684 | 0.68 µF | J | J | J | P | | D | D | D | D | K |
| 824 | 0.82 µF | J | J | J | P | | D | D | D | D | K |
| 105 | 1 µF | J | J | J | P | | D | D | D | D | K |
| 155 | 1.5 µF | J | J | | | | | | | | |
| 225 | 2.2 µF | J | J | P | | | | K | G | | |
| 335 | 3.3 µF | P | P | P | | | | | | | |
| 475 | 4.7 µF | P | P | P | | | | | | | |
| 685 | 6.8 µF | | | | | | | | | | |
| 106 | 10 µF | | | | | | | | | | |
| 156 | 15 µF | | | | | | | | | | |
| 226 | 22 µF | | | | | | | | | | |
| 336 | 33 µF | | | | | | | | | | |
| 476 | 47 µF | | | | | | | | | | |
| 686 | 68 µF | | | | | | | | | | |
| 107 | 100 µF | | | | | | | | | | |

**Notes**
Letters indicate product thickness, see packaging quantities
+ Not in 5 % (Code “J”) tolerance

## DIMENSIONS in inches [millimeters]




| SIZE CODE | L | W | T MAX. | MB |
|---|---|---|---|---|
| 0402 (1005) | 0.040 ± 0.002 [1.00 ± 0.05] | 0.020 ± 0.002 [0.50 ± 0.05] | 0.022 [0.55] | 0.010 ± 0.004 [0.25 ± 0.10] |
| 0603 (1608) | 0.063 + 0.006/- 0.004 [1.60 + 0.15/- 0.10] | 0.030 + 0.006/- 0.004 [0.80 + 0.15/- 0.10] | 0.038 [0.95] | 0.012 - 0.008/+ 0.010 [0.30 - 0.20/+ 0.25] |
| 0805 (2012) | 0.080 ± 0.008 [2.00 ± 0.20] | 0.050 ± 0.008 [1.25 ± 0.20] | 0.057 [1.45] | 0.020 - 0.012/+ 0.008 [0.50 - 0.30/+ 0.20] |
| 1206 (3216) | 0.126 + 0.012/- 0.008 [3.20 + 0.30/- 0.20] | 0.063 + 0.012/- 0.008 [1.60 + 0.30/- 0.20] | 0.075 [1.90] | 0.020 ± 0.012 [0.50 ± 0.30] |
| 1210 (3225) | 0.126 ± 0.016 [3.20 ± 0.40] | 0.098 ± 0.012 [2.50 ± 0.30] | 0.110 [2.80] | 0.026 ± 0.014 [0.65 ± 0.35] |

## STORAGE AND HANDLING CONDITIONS

(1) To store products at 5 °C to 40 °C ambient temperature and 20 % to 70 % related humdity conditions.
(2) The product is recommended to be used within one year after shipment. Check solderability in case of shelf life extension is needed.

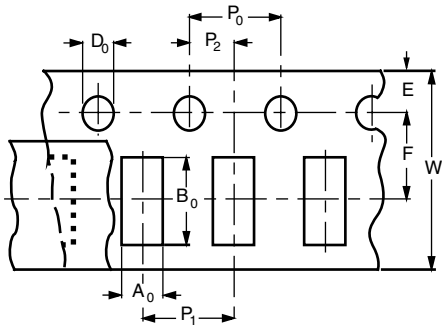
**Cautions:**

a. Don't store products in a corrosive environment such as sulfide, chloride gas, or acid. It may cause oxidization of electrode, which easily be resulted in poor soldering.
b. To store products on the shelf and avoid exposure to moisture.
c. Don't expose products to excessive shock, vibration, direct sunlight and so on.

## PACKAGING QUANTITIES

| SIZE CODE (inch/mm) | MAX. THICKNESS (mm) | THICKNESS SYMBOL | PAPER TAPE | | PLASTIC TAPE | |
|---|---|---|---|---|---|---|
| | | | 7" reel (C) | 13" reel (P) | 7" reel (T) | 13" reel (R) |
| 0402 (1002) | 0.55 | N | 10K | 50K | | |
| 0603 (1608) | 0.90 | S | 4K | 15K | | |
| | 0.95 | X | 4K | 15K | | |
| 0805 (2012) | 0.75 | A | 4K | 15K | | |
| | 0.95 | B | 4K | 15K | | |
| | 1.40 | D | | | 3K | 10K |
| | 1.45 | I | | | 3K | 10K |
| 1206 (3216) | 0.95 | B | 4K | 15K | | |
| | 1.05 | C | | | 3K | 10K |
| | 1.30 | J | | | 3K | 10K |
| | 1.35 | D | | | 3K | 10K |
| | 1.80 | G | | | 2K | |
| | 1.80 | H | | | 2K | 8K |
| | 1.90 | P | | | 2K | |
| 1210 (3225) | 1.05 | B | | | 2K | 10K |
| | 1.05 | C | | | 3K | 10K |
| | 1.35 | D | | | 3K | 10K |
| | 1.80 | G | | | 2K | |
| | 2.00 | U | | | 2K | 4K |
| | 2.20 | K | | | 1K | |
| | 2.70 | J | | | 1K | 4K |
| | 2.80 | M | | | 1K | |
| | 2.80 | V | | | 1K | 4K |

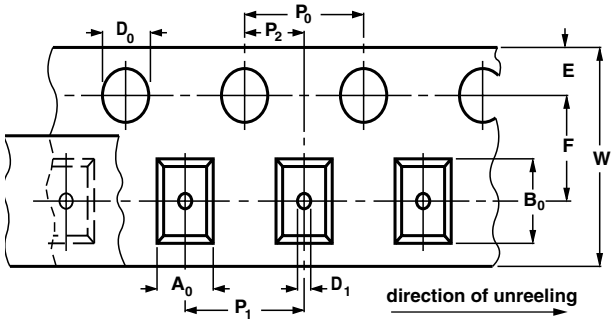
## PAPER TAPE SPECIFICATIONS




**DIMENSIONS OF PAPER TAPE**
in millimeters

| SYM. | PRODUCT SIZE CODE | | | |
|---|---|---|---|---|
| | 0402 | 0603 | 0805 | 1206 |
| $A_0$ | 0.62 ± 0.05 | 1.02 ± 0.05 | 1.50 ± 0.10 | 2.00 ± 0.10 |
| $B_0$ | 1.12 ± 0.05 | 1.82 ± 0.05 | 2.30 ± 0.10 | 3.50 ± 0.10 |
| W | 8.00 ± 0.10 | 8.00 ± 0.10 | 8.00 ± 0.10 | 8.00 ± 0.10 |
| E | 1.75 ± 0.05 | 1.75 ± 0.05 | 1.75 ± 0.05 | 1.75 ± 0.10 |
| F | 3.50 ± 0.05 | 3.50 ± 0.05 | 3.50 ± 0.05 | 3.50 ± 0.05 |
| $D_0$ | 1.55 ± 0.05 | 1.55 ± 0.05 | 1.55 ± 0.05 | 1.50 ± 0.05 |
| $P_0$ | 4.00 ± 0.10 | 4.00 ± 0.10 | 4.00 ± 0.10 | 4.00 ± 0.10 |
| $P_1$ | 2.00 ± 0.05 | 4.00 ± 0.10 | 4.00 ± 0.10 | 4.00 ± 0.10 |
| $P_2$ | 2.00 ± 0.05 | 2.00 ± 0.05 | 2.00 ± 0.05 | 2.00 ± 0.05 |

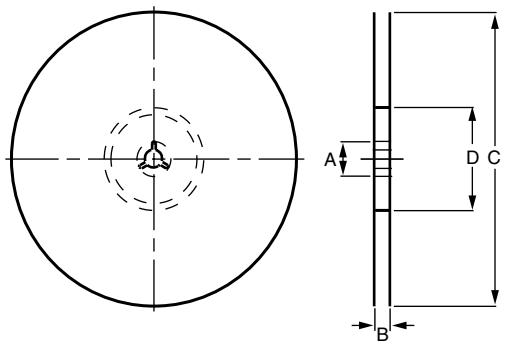
## BLISTER TAPE SPECIFICATIONS




**DIMENSIONS OF BLISTER TAPE**
in millimeters

| SYM. | PRODUCT SIZE CODE | | |
|---|---|---|---|
| | 0805 | 1206 | 1210 |
| $A_0$ | < 1.57 | < 2.00 | < 2.97 |
| $B_0$ | < 2.45 | < 3.70 | < 3.73 |
| W | 8.00 ± 0.10 | 8.00 ± 0.10 | 8.00 ± 0.10 |
| E | 1.75 ± 0.10 | 1.75 ± 0.10 | 1.75 ± 0.10 |
| F | 3.50 ± 0.05 | 3.50 ± 0.05 | 3.50 ± 0.05 |
| $D_0$ | 1.50 ± 0.05 | 1.50 ± 0.05 | 1.50 ± 0.05 |
| $D_1$ | 1.00 ± 0.10 | 1.00 ± 0.10 | 1.00 ± 0.10 |
| $P_0$ | 4.00 ± 0.10 | 4.00 ± 0.10 | 4.00 ± 0.10 |
| $P_1$ | 4.00 ± 0.10 | 4.00 ± 0.10 | 4.00 ± 0.10 |
| $P_2$ | 2.00 ± 0.05 | 2.00 ± 0.05 | 2.00 ± 0.05 |

## REEL SPECIFICATIONS




**REEL DIMENSIONS AND TAPE WIDTH**
in millimeters

| | Ø 180 mm; 7" | Ø 330 mm; 13" |
|---|---|---|
| A | 13.0 ± 0.5 | 13.0 ± 0.5 |
| B | 9.0 ± 1.0 | 9.0 ± 1.0 |
| C | 178.0 ± 1.0 | 330.0 ± 1.0 |
| D | 60.0 ± 1.0 | 100.0 ± 1.0 |

# Disclaimer

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