



FEATURES:

- Capacitance range: 0.1pF to 220uF
- Voltage range: 4V to 100V
- Terminations: 100% matte Tin (Sn), Palladium (Pd-Ag), Gold (Au) and Lead (Pb)
- Very low ESR in X7R/X7S/X6S/X5R (<10mΩ typical)
- Ceramic monolithic structure provides excellent reliability



PART NUMBER STRUCTURE

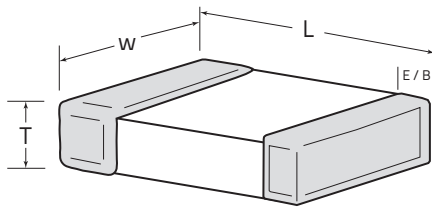
| C | 0805 | COG | 500 | - | 101 | J | N | P | □ □ | | | | | | | | | | | | | | | |
|---------------|-------------|--|----------------------|------|--------------------|------------------|--------------------|------------------|--------------------------------------|-------|-----|-----|-----|-----|-----|-----|-----|--|---|---|---|---|---|---|
| Series | Size | Temperature Characteristic (Dielectric) | Rated Voltage | | Capacitance | Tolerance | Termination | Packaging | Optional Thickness Identifier | | | | | | | | | | | | | | | |
| 01005 | 0201 | 0402 | 0504 | 0603 | 0805 | 1206 | 1210 | 1812 | 2220 | 22212 | COG | X7R | X7S | X6S | X5R | Y5V | Z5U | 1st two digits are significant followed by number of zeroes. | 4R0 = 4.0 VDCW 6R3 = 6.3 VDCW 100 = 10 VDCW 160 = 16 VDCW 250 = 25 VDCW 500 = 50 VDCW 630 = 63 VDCW 101 = 100 VDCW | 1st two digits are significant, followed by number of zeroes. e.g: 101 = 100pF R denotes decimal 6R8 = 6.8pF | * B = ± 0.1pF * C = ± 0.25pF * D = ± 0.5pF F = ± 1% G = ± 2% J = ± 5% K = ± 10% M = ± 20% N = ± 30% Z = +80 - 20% * For values below 10pF only. | N = 100% matte Tin (Sn) over Nickel * P = Palladium Silver * G = Gold over Nickel Pb = 90% Tin (Sn) /10% Lead (Pb) * Pd/Ag & Gold terminations have limited values & sizes available. | D = Paper Tape (10" Reel) E = Embossed Tape (7" Reel) P = Paper Tape (7" Reel) R = Paper Tape (13" Reel) U = Embossed Tape (13" Reel) | Leave blank for standard thickness. Designate "-." for Min. "" for Max. followed by Thickness Code e.g: - E (min. thickness of .026") * E (max. thickness of .026") |

Example P/N: C0805COG500-101JNP

Optional Thickness Identifier Codes:

| | | | | | | | | | | | | | | | | | | | | | |
|------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| CODE: | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | 6 |
| DIMENSION: | .015 | .020 | .026 | .030 | .035 | .040 | .045 | .050 | .055 | .060 | .065 | .070 | .075 | .080 | .085 | .090 | .095 | .100 | .105 | .110 | .023 |

DIMENSIONS

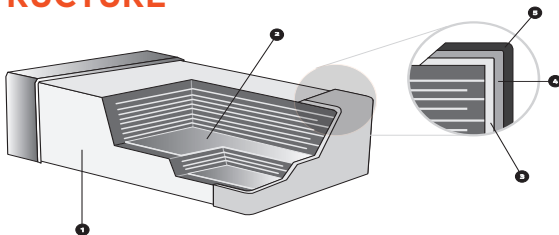


Unit: inches (mm)

| SIZE | L | W | T | MIN. E/B |
|-------|---------------------------------|---------------------------------|--------------------|-----------------|
| 01005 | 0.016 ± 0.0008 (0.4 ± 0.02) | 0.008 ± 0.0008 (0.2 ± 0.02) | See Specific Value | 0.002 (0.05) |
| 0201 | 0.024 ± 0.002 (0.6 ± 0.05) | 0.012 ± 0.002 (0.3 ± 0.05) | See Specific Value | 0.002 (0.05) |
| 0402* | 0.040 ± 0.002 (1.0 ± 0.05) | 0.020 ± 0.002 (0.5 ± 0.05) | See Specific Value | 0.004 (0.10) |
| 0603 | 0.063 ± 0.006 (1.6 ± 0.15) | 0.031 ± 0.0046 (0.8 ± 0.15) | See Specific Value | 0.008 (0.20) |
| 0805 | 0.08 ± 0.008 (2.0 ± 0.20) | 0.050 ± 0.008 (1.25 ± 0.20) | See Specific Value | 0.010 (0.25) |
| 1206 | 0.126 ± 0.008 (3.2 ± 0.20) | 0.063 ± 0.008 (1.6 ± 0.20) | See Specific Value | 0.010 (0.25) |
| 1210 | 0.126 ± 0.0157 (3.2 ± 0.40) | 0.098 ± 0.0118 (2.50 ± 0.30) | See Specific Value | 0.010 (0.25) |
| 1812 | 0.177 ± 0.012 (4.495 ± 0.30) | 0.126 ± 0.012 (3.20 ± 0.30) | See Specific Value | 0.010 (0.25) |
| 2220 | 0.225 ± 0.016 (5.715 ± 0.41) | 0.200 ± 0.006 (5.08 ± 0.41) | See Specific Value | 0.010 (0.25) |

* 0402 size in the X6S/X7S/X5R dielectrics will have a dimensional tolerance of ±0.20mm

STRUCTURE

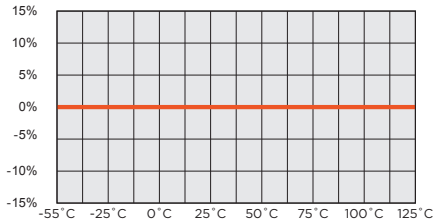


| | | | |
|---|---------------------------|---|----------------|
| 1 | Ceramic Body (dielectric) | 4 | Nickel Plating |
| 2 | Inner Electrode | 5 | Tin Plating |
| 3 | Inner Termination | | |

ELECTRICAL SPECIFICATIONS

COG/COG

Typical Capacitance Change vs. Temperature

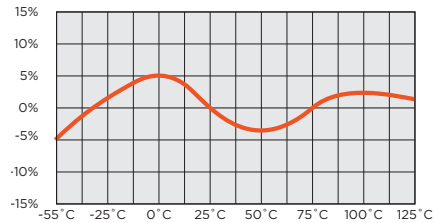


Operating Temperature Range:
-55°C to +125°C
Temperature Coefficient:
0 ±30PPM/°C
Temperature Voltage Coefficient:
0 ±30PPM/°C
Insulation Resistance:
>1000 Ω-F or 10 GΩ, for values ≤ 0.047μF (whichever is less at 25°C, WDCV).
For Capacitance values > 0.047μF, the 500 Ω-F rule applies. (The IR at 125°C is 10% of the value at 25°C)

Ageing:
None
Withstanding Voltage:
>2.5 times VDCW
Capacitance Tolerance:
B,C,D,F,G,J,K
Dissipation Factor:
0.1% max

X7R

Typical Capacitance Change vs. Temperature

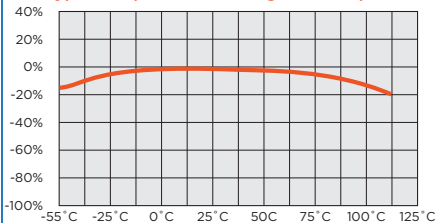


Operating Temperature Range:
-55°C to +125°C
Temperature Coefficient:
0 ±15%Δ°C MAX.
Temperature Voltage Coefficient:
X7R not applicable
Insulation Resistance:
>100 Ω-F or 10 GΩ, whichever is less at 25°C, VDCW. (The IR at 125°C is 10% of the value at 25°C)
Ageing:
2.5% per decade hour, typical
Withstanding Voltage:
>2.5 times VDCW
Capacitance Tolerance:
J,K,M

| RATED VOLTAGE | D.F. | EXCEPTION OF D.F. | |
|---------------|-------|-------------------|---|
| | | ≤3% | EXCEPTION OF D.F. |
| ≥50V | ≤2.5% | ≤3% | 0201 (50V); 0603≥0.047μF 0805≥0.22μF; 1206≥0.47μF |
| | | ≤5% | 0603≥1μF; 0805≥1μF; 1206≥4.7μF; 1210≥4.7μF |
| 25V | ≤2.5% | ≤5% | 0201≥0.01μF; 0805≥1μF; 1210≥4.7μF |
| | | ≤10% | 0402≥0.10μF; 0603≥0.33μF; 0805≥2.2μF 1206≥2.2μF; 1210≥22μF |
| 16V | ≤3.5% | ≤5% | 0201≥0.01μF; 0402≥0.033μF; 0805≥0.68μF; 1206≥2.2μF; 1210≥4.7μF |
| | | ≤10% | 0402≥0.47μF; 0603≥0.68μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥22μF |
| 10V | ≤5% | ≤10% | 0402≥0.33μF; 0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥22μF |
| 6.3V | ≤10% | | |

X7S

Typical Capacitance Change vs. Temperature



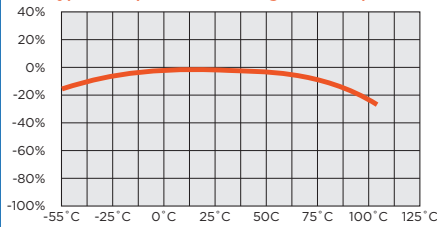
Operating Temperature Range:
-55°C to +125°C
Temperature Coefficient:
0 ±22%Δ°C MAX.
Insulation Resistance:
>1000 Ω-F or 100 GΩ, whichever is less at 25°C, VDCW. (The IR at 125°C is 10% of the value at 25°C)
Ageing:
2.5% per decade hour, typical
Withstanding Voltage:
>2.5 times VDCW
Capacitance Tolerance:
K,M

| RATED VOLTAGE | D.F. | EXCEPTION OF D.F. | |
|---------------|-------|-------------------|---|
| | | ≤3% | EXCEPTION OF D.F. |
| ≥50V | ≤2.5% | ≤3% | 0201 (50V); 0603≥0.047μF 0805≥0.22μF; 1206≥0.47μF |
| | | ≤5% | 0603≥1μF; 0805≥1μF; 1206≥4.7μF; 1210≥4.7μF |
| 25V | ≤2.5% | ≤5% | 0201≥0.01μF; 0805≥1μF; 1210≥4.7μF |
| | | ≤10% | 0402≥0.10μF; 0603≥0.33μF; 0805≥2.2μF 1206≥4.7μF; 1210≥22μF |
| 16V | ≤3.5% | ≤5% | 0201≥0.01μF; 0402≥0.033μF; 0805≥0.68μF; 1206≥2.2μF; 1210≥4.7μF |
| | | ≤10% | 0402≥0.47μF; 0603≥0.68μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥22μF |
| ≤10V | ≤5% | ≤10% | 0402≥0.33μF; 0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥22μF |
| 6.3V | ≤10% | | |

ELECTRICAL SPECIFICATIONS

X6S

Typical Capacitance Change vs. Temperature

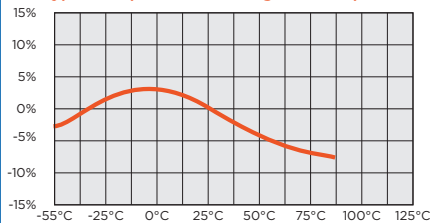


Operating Temperature Range:
-55°C to +105°C
Temperature Coefficient:
0 ±22%Δ°C MAX.
Insulation Resistance:
100,000 MΩ min., or 1000 MΩ (@ +25°C, RVDC) per uF min. or 100GW, whichever is less
Ageing:
2.5% per decade hour, typical
Withstanding Voltage:
>2.5 times VDCW
Capacitance Tolerance:
K,M

| RATED VOLTAGE | D.F. | EXCEPTION OF D.F. | |
|---------------|-------|-------------------|---|
| | | | |
| ≥50V | ≤2.5% | ≤3% | 0201 (50V); 0603≥0.047uF 0805≥0.22uF; 1206≥0.47uF |
| | | ≤5% | 0603≥1uF; 0805≥1uF; 1206≥4.7uF; 1210≥4.7uF |
| 25V | ≤2.5% | ≤5% | 0201≥0.01uF; 0805≥1uF; 1210≥4.7uF |
| | | ≤10% | 0402≥0.10uF; 0603≥0.33uF; 0805≥2.2uF 1206≥4.7uF; 1210≥22uF |
| 16V | ≤3.5% | ≤5% | 0201≥0.01uF; 0402≥0.033uF; 0805≥0.68uF; 1206≥2.2uF; 1210≥4.7uF |
| | | ≤10% | 0402≥0.47uF; 0603≥0.68uF; 0805≥2.2uF; 1206≥4.7uF; 1210≥22uF |
| ≤10V | ≤5% | ≤10% | 0402≥0.33uF; 0603≥0.33uF; 0805≥2.2uF; 1206≥2.2uF; 1210≥22uF |
| 4V/6.3V | ≤10% | ≤15% | 0402≥10uF |

X5R

Typical Capacitance Change vs. Temperature

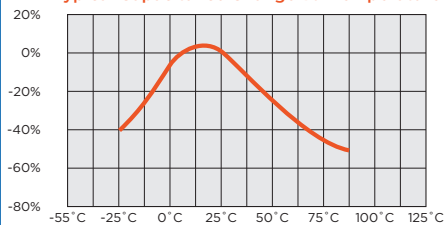


Operating Temperature Range:
-55°C to +85°C
Temperature Coefficient:
0 ±15%Δ°C MAX.
Insulation Resistance:
>100 Ω-F or 10 GΩ, whichever is less at 25°C, VDCW. (The IR at 125°C is 10% of the value at 25°C)
Ageing:
2.5% per decade hour, typical
Withstanding Voltage:
>2.5 times VDCW
Capacitance Tolerance:
K,M

| RATED VOLTAGE | D.F. | EXCEPTION OF D.F. | |
|---------------|-------|-------------------|---|
| | | | |
| ≥50V | ≤2.5% | ≤3% | 0201 (50V); 0603≥0.047uF 0805≥0.22uF; 1206≥0.47uF |
| | | ≤5% | 0603≥1uF; 0805≥1uF; 1206≥4.7uF; 1210≥4.7uF |
| 25V | ≤2.5% | ≤5% | 0201≥0.01uF; 0805≥1uF; 1210≥4.7uF |
| | | ≤10% | 0402≥0.10uF; 0603≥0.33uF; 0805≥2.2uF 1206≥4.7uF; 1210≥22uF |
| 16V | ≤3.5% | ≤5% | 0201≥0.01uF; 0402≥0.033uF; 0805≥0.68uF; 1206≥2.2uF; 1210≥4.7uF |
| | | ≤10% | 0402≥0.47uF; 0603≥0.68uF; 0805≥2.2uF; 1206≥4.7uF; 1210≥22uF |
| ≤10V | ≤5% | ≤10% | 0402≥0.33uF; 0603≥0.33uF; 0805≥2.2uF; 1206≥2.2uF; 1210≥22uF |
| 6.3V | ≤10% | | |

Z5U

Typical Capacitance Change vs. Temperature

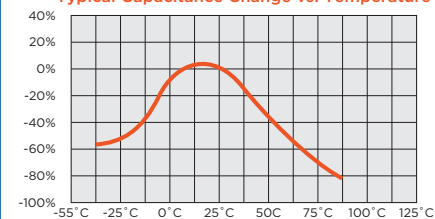


Operating Temperature Range:
+10°C to +85°C
Temperature Coefficient:
+22% - 56%Δ°C MAX.
Insulation Resistance:
>100 Ω-F or 10 GΩ, whichever is less at 25°C, VDCV. (The IR at 125°C is 10% of the value at 25°C)
Ageing:
5% per decade hour, typical
Withstanding Voltage:
>2.5 times VDCW
Capacitance Tolerance:
M,Z

| RATED VOLTAGE | D.F. | EXCEPTION OF D.F. | |
|---------------|--------|-------------------|--|
| | | | |
| ≥50V | ≤5% | ≤9% | 0603≥0.1uF; 0805≥0.47uF; 1206≥4.7uF; |
| 25V | ≤5% | ≤9% | 0402≥0.047uF; 0603≥0.1uF; 0805≥0.33uF; 1206≥1uF; 1210≥4.7uF |
| | | ≤12.5% | 0603≥2.2uF; 0805≥3.3uF; 1206≥10uF; 1210≥22uF; 1812≥47uF |
| 10V | ≤12.5% | ≤16% | 0603≥2.2uF; 0805≥3.3uF; 1206≥4.7uF; 1210≥10uF; 1812≥47uF |
| 6.3V | ≤16% | | |

Y5V

Typical Capacitance Change vs. Temperature



Operating Temperature Range:
-30°C to +85°C
Temperature Coefficient:
+22% - 82%Δ°C MAX.
Insulation Resistance:
>100 Ω-F or 10 GΩ, whichever is less at 25°C, VDCW. (The IR at 125°C is 10% of the value at 25°C)
Ageing:
7% per decade hour, typical
Withstanding Voltage:
>2.5 times VDCW
Capacitance Tolerance:
M,Z

| RATED VOLTAGE | D.F. | EXCEPTION OF D.F. | |
|---------------|--------|-------------------|---|
| | | | |
| ≥50V | ≤5% | ≤9% | 0603≥0.1uF; 0805≥0.47uF; 1206≥4.7uF; |
| 25V | ≤5% | ≤9% | 0402≥0.047uF; 0603≥0.1uF; 0805≥0.33uF; ≥1206≥1uF; 1210≥4.7uF |
| | | ≤12.5% | 0603≥2.2uF; 0805≥3.3uF; 1206≥10uF; 1210≥22uF; 1812≥47uF |
| 10V | ≤12.5% | ≤16% | 0603≥2.2uF; 0805≥3.3uF; 1206≥4.7uF; 1210≥10uF; 1812≥47uF |
| 6.3V | ≤16% | | |

TEST PARAMETERS

Test parameters for Multilayer Ceramic Capacitors
- X7R, X7S, X6S, X5R and Y5V:

1KHz ± 100Hz at 1.0 ± 0.2 Vrms < 10uF (10 V min.)
1KHz ± 100Hz at 1.0 ± 0.1 Vrms < 10uF (6.3V max.)
120Hz ± 24Hz at 1.0 ± 0.1 Vrms ≥ 10uF

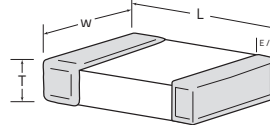
Test parameters for Multilayer Ceramic Capacitors
- COG:

1MHz ± 100KHz at 1.0 ± 0.2 Vrms ≤ 1000pF, 25°C
1KHz ± 100Hz at 1.0 ± 0.2 Vrms > 1000pF, 25°C

NOTE: To ensure proper capacitance readings, the voltage level must be held constant. The HP4284 and Agilent E4980 has a "ALC" (Automatic Level Control) function and should be switched to the "ON" position for accurate capacitance readings.

VOLTAGE AND CAPACITANCE RANGE

COG (COG) DIELECTRIC



Values that are typically available.

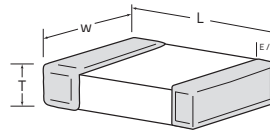
(All measurements in inches)

| SIZE | 01005 | | | | 0201 | | 0402 | | | 0504 | | 0603 | | 0805 | | | 1206 | | 1210 | | 1812 | |
|------------|-------|-----|-----|-----|-------|-----|-------|-----|------|-------|------|-------|------|-------|-----|------|-------|------|-------|------|-------|------|
| T (max) | 0.008 | | | | 0.012 | | 0.025 | | | 0.040 | | 0.033 | | 0.055 | | | 0.075 | | 0.103 | | 0.110 | |
| VDCW (MAX) | 6.3V | 16V | 25V | 50V | 25V | 50V | 25V | 50V | 100V | 50V | 100V | 50V | 100V | 25V | 50V | 100V | 50V | 100V | 50V | 100V | 50V | 100V |
| OR1 | 0.1pF | | | | | | | | | | | | | | | | | | | | | |
| OR2 | 0.2pF | | | | | | | | | | | | | | | | | | | | | |
| OR3 | 0.3pF | | | | | | | | | | | | | | | | | | | | | |
| OR4 | 0.4pF | | | | | | | | | | | | | | | | | | | | | |
| OR5 | 0.5pF | | | | | | | | | | | | | | | | | | | | | |
| 1R0 | 1.0pF | | | | | | | | | | | | | | | | | | | | | |
| 1R2 | 1.2pF | | | | | | | | | | | | | | | | | | | | | |
| 1R5 | 1.5pF | | | | | | | | | | | | | | | | | | | | | |
| 1R8 | 1.8pF | | | | | | | | | | | | | | | | | | | | | |
| 2R2 | 2.2pF | | | | | | | | | | | | | | | | | | | | | |
| 2R7 | 2.7pF | | | | | | | | | | | | | | | | | | | | | |
| 3R3 | 3.3pF | | | | | | | | | | | | | | | | | | | | | |
| 3R9 | 3.9pF | | | | | | | | | | | | | | | | | | | | | |
| 4R7 | 4.7pF | | | | | | | | | | | | | | | | | | | | | |
| 5R0 | 5.0pF | | | | | | | | | | | | | | | | | | | | | |
| 5R6 | 5.6pF | | | | | | | | | | | | | | | | | | | | | |
| 6R8 | 6.8pF | | | | | | | | | | | | | | | | | | | | | |
| 8R2 | 8.2pF | | | | | | | | | | | | | | | | | | | | | |
| 100 | 10pF | | | | | | | | | | | | | | | | | | | | | |
| 120 | 12pF | | | | | | | | | | | | | | | | | | | | | |
| 150 | 15pF | | | | | | | | | | | | | | | | | | | | | |
| 180 | 18pF | | | | | | | | | | | | | | | | | | | | | |
| 220 | 22pF | | | | | | | | | | | | | | | | | | | | | |

NOTE: Additional values may be available. Please contact us for more information. Due to demand and raw material fluctuations, specific values may not be available.

VOLTAGE AND CAPACITANCE RANGE

COG (COG) DIELECTRIC



Values that are typically available.

(All measurements in inches)

| SIZE | | 01005 | | | | 0201 | | 0402 | | | 0504 | | 0603 | | 0805 | | | 1206 | | 1210 | | 1812 | | 2220 / 2221 | | |
|------------|--------|-------|-----|-----|-----|-------|-----|-------|-----|------|-------|------|-------|------|-------|-----|------|-------|------|-------|------|-------|------|---------------|------|--|
| T (max) | | 0.008 | | | | 0.012 | | 0.025 | | | 0.040 | | 0.033 | | 0.055 | | | 0.075 | | 0.103 | | 0.110 | | 0.134 / 0.134 | | |
| VDCW (MAX) | | 6.3V | 16V | 25V | 50V | 25V | 50V | 25V | 50V | 100V | 50V | 100V | 50V | 100V | 25V | 50V | 100V | 50V | 100V | 50V | 100V | 50V | 100V | 50V | 100V | |
| 270 | 27pF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 330 | 33pF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 390 | 39pF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 470 | 47pF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 560 | 56pF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 680 | 68pF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 820 | 82pF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 101 | 100pF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 121 | 120pF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 151 | 150pF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 181 | 180pF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 221 | 220pF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 271 | 270pF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 331 | 330pF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 391 | 390pF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 471 | 470pF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 561 | 560pF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 681 | 680pF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 821 | 820pF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 102 | 1000pF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 122 | 1200pF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 152 | 1500pF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 182 | 1800pF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 222 | 2200pF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 272 | 2700pF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 332 | 3300pF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 392 | 3900pF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 472 | 4700pF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 562 | 5600pF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 682 | 6800pF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 822 | 8200pF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 103 | .01uF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 123 | .012uF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 153 | .015uF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 183 | .018uF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 223 | .022uF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 273 | .027uF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 333 | .033uF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 393 | .039uF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 473 | .047uF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 563 | .056uF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 683 | .068uF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 823 | .082uF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 104 | .100uF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 124 | .120uF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 154 | .150uF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 184 | .180uF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 224 | .220uF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 274 | .270uF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 334 | .330uF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 394 | .390uF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 474 | .470uF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 564 | .560uF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 684 | .680uF | | | | | | | | | | | | | | | | | | | | | | | | | |
| 824 | .820uF | | | | | | | | | | | | | | | | | | | | | | | | | |

NOTE: Additional values may be available. Please contact us for more information. Due to demand and raw material fluctuations, specific values may not be available.

VOLTAGE AND CAPACITANCE RANGE

X7R DIELECTRIC

Values that are typically available.

(All measurements in inches)

| SIZE | | 01005 | | 0201 | | | | 0402 | | | | 0504 | | | 0603 | | | | | 0805 | | | |
|------------|--------|-------|-----|-------|-----|-----|-----|-------|-----|-----|------|-------|-----|------|-------|-----|-----|-----|------|-------|-----|------|--|
| T (max) | | 0.008 | | 0.012 | | | | 0.025 | | | | 0.040 | | | 0.038 | | | | | 0.058 | | | |
| VDCW (MAX) | | 6.3V | 10V | 6.3V | 10V | 16V | 25V | 16V | 25V | 50V | 100V | 25V | 50V | 100V | 10V | 16V | 25V | 50V | 100V | 25V | 50V | 100V | |
| 101 | 100pF | | | | | | | | | | | | | | | | | | | | | | |
| 121 | 120pF | | | | | | | | | | | | | | | | | | | | | | |
| 151 | 150pF | | | | | | | | | | | | | | | | | | | | | | |
| 181 | 180pF | | | | | | | | | | | | | | | | | | | | | | |
| 221 | 220pF | | | | | | | | | | | | | | | | | | | | | | |
| 271 | 270pF | | | | | | | | | | | | | | | | | | | | | | |
| 331 | 330pF | | | | | | | | | | | | | | | | | | | | | | |
| 391 | 390pF | | | | | | | | | | | | | | | | | | | | | | |
| 471 | 470pF | | | | | | | | | | | | | | | | | | | | | | |
| 561 | 560pF | | | | | | | | | | | | | | | | | | | | | | |
| 681 | 680pF | | | | | | | | | | | | | | | | | | | | | | |
| 821 | 820pF | | | | | | | | | | | | | | | | | | | | | | |
| 102 | 1000pF | | | | | | | | | | | | | | | | | | | | | | |
| 122 | 1200pF | | | | | | | | | | | | | | | | | | | | | | |
| 152 | 1500pF | | | | | | | | | | | | | | | | | | | | | | |
| 182 | 1800pF | | | | | | | | | | | | | | | | | | | | | | |
| 222 | 2200pF | | | | | | | | | | | | | | | | | | | | | | |
| 272 | 2700pF | | | | | | | | | | | | | | | | | | | | | | |
| 332 | 3300pF | | | | | | | | | | | | | | | | | | | | | | |
| 392 | 3900pF | | | | | | | | | | | | | | | | | | | | | | |
| 472 | 4700pF | | | | | | | | | | | | | | | | | | | | | | |
| 562 | 5600pF | | | | | | | | | | | | | | | | | | | | | | |
| 682 | 6800pF | | | | | | | | | | | | | | | | | | | | | | |
| 822 | 8200pF | | | | | | | | | | | | | | | | | | | | | | |
| 103 | .01uF | | | | | | | | | | | | | | | | | | | | | | |
| 123 | .012uF | | | | | | | | | | | | | | | | | | | | | | |
| 153 | .015uF | | | | | | | | | | | | | | | | | | | | | | |
| 183 | .018uF | | | | | | | | | | | | | | | | | | | | | | |
| 223 | .022uF | | | | | | | | | | | | | | | | | | | | | | |
| 273 | .027uF | | | | | | | | | | | | | | | | | | | | | | |
| 333 | .033uF | | | | | | | | | | | | | | | | | | | | | | |

* For values above 1uF, thickness may be greater than specified above.

T(max): 0603 - 0.040"

0805 - 0.060"

NOTE: Additional values may be available. Please contact us for more information. Due to demand and raw material fluctuations, specific values may not be available. All components manufactured with the X7R dielectric are also available as an X5R dielectric.

VOLTAGE AND CAPACITANCE RANGE

X7R DIELECTRIC

Values that are typically available.

(All measurements in inches)

| SIZE | 0201 | | | 0402 | | | | | 0603 | | | | | 0805 | | | | | | |
|------------|-------|------|-----|-------|-----|-----|-----|-----|-------|-----|-----|-----|-----|-------|------|-----|-----|-----|-----|------|
| T (max)* | 0.012 | | | 0.025 | | | | | 0.038 | | | | | 0.059 | | | | | | |
| VDCW (MAX) | 4V | 6.3V | 10V | 6.3V | 10V | 16V | 25V | 50V | 6.3V | 10V | 16V | 25V | 50V | 100V | 6.3V | 10V | 16V | 25V | 50V | 100V |
| 393 | | | | | | | | | | | | | | | | | | | | |
| 473 | | | | | | | | | | | | | | | | | | | | |
| 563 | | | | | | | | | | | | | | | | | | | | |
| 683 | | | | | | | | | | | | | | | | | | | | |
| 823 | | | | | | | | | | | | | | | | | | | | |
| 104 | ** | ** | ** | | | | | | | | | | | | | | | | | |
| 124 | | | | | | | | | | | | | | | | | | | | |
| 154 | | | | | | | | | | | | | | | | | | | | |
| 184 | | | | | | | | | | | | | | | | | | | | |
| 224 | | | | | | | | | | | | | | | | | | | | |
| 274 | | | | | | | | | | | | | | | | | | | | |
| 334 | | | | | | | | | | | | | | | | | | | | |
| 394 | | | | | | | | | | | | | | | | | | | | |
| 474 | | | | | | | | | | | | | | | | | | | | |
| 564 | | | | | | | | | | | | | | | | | | | | |
| 684 | | | | | | | | | | | | | | | | | | | | |
| 824 | | | | | | | | | | | | | | | | | | | | |
| 105 | | | | | | | | | | | | | | | | | | | | |
| 125 | | | | | | | | | | | | | | | | | | | | |
| 155 | | | | | | | | | | | | | | | | | | | | |
| 185 | | | | | | | | | | | | | | | | | | | | |
| 225 | | | | | | | | | | | | | | | | | | | | |
| 335 | | | | | | | | | | | | | | | | | | | | |
| 475 | | | | | | | | | | | | | | | | | | | | |
| 685 | | | | | | | | | | | | | | | | | | | | |
| 106 | | | | | | | | | | | | | | | | | | | | |
| 156 | | | | | | | | | | | | | | | | | | | | 35V |
| 226 | | | | | | | | | | | | | | | | | | | | |
| 476 | | | | | | | | | | | | | | | | | | | | |
| 107 | | | | | | | | | | | | | | | | | | | | |

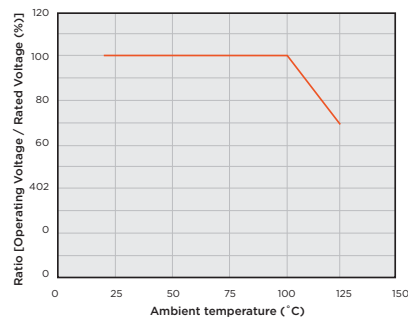
* For values above 1uF, thickness may be greater than specified above.

T(max): 0603 - 0.040"
 0805 - 0.060"

NOTE: Additional values may be available. Please contact us for more information. Due to demand and raw material fluctuations, specific values may not be available. All components manufactured with the X7R dielectric are also available as an X5R dielectric.

** RE: 0201, X7R, 0.1uF; When the operating temperature range is between 100°C and 125°C, it is recommended to apply the following voltage derating as shown in the diagram below.

DERATING CURVE FOR 0201, 0.1UF, X7R ONLY



VOLTAGE AND CAPACITANCE RANGE

X7R DIELECTRIC

Values that are typically available.

(All measurements in inches)

| SIZE | | 1206 | | | | | 1210 | | | | | 1812 | | | | | 2220 / 2221 | | | | |
|------------|--------|-------|-----|-----|-----|------|-------|-----|-----|-----|------|-------|-----|-----|-----|-----|---------------|-----|-----|-----|------|
| T (max)* | | 0.070 | | | | | 0.125 | | | | | 0.085 | | | | | 0.108 / 0.108 | | | | |
| VDCW (MAX) | | 10V | 16V | 25V | 50V | 100V | 10V | 16V | 25V | 50V | 100V | 6.3V | 10V | 16V | 25V | 50V | 100V | 16V | 25V | 50V | 100V |
| 102 | 1000pF | | | | | | | | | | | | | | | | | | | | |
| 122 | 1200pF | | | | | | | | | | | | | | | | | | | | |
| 152 | 1500pF | | | | | | | | | | | | | | | | | | | | |
| 182 | 1800pF | | | | | | | | | | | | | | | | | | | | |
| 222 | 2200pF | | | | | | | | | | | | | | | | | | | | |
| 272 | 2700pF | | | | | | | | | | | | | | | | | | | | |
| 332 | 3300pF | | | | | | | | | | | | | | | | | | | | |
| 392 | 3900pF | | | | | | | | | | | | | | | | | | | | |
| 472 | 4700pF | | | | | | | | | | | | | | | | | | | | |
| 562 | 5600pF | | | | | | | | | | | | | | | | | | | | |
| 682 | 6800pF | | | | | | | | | | | | | | | | | | | | |
| 822 | 8200pF | | | | | | | | | | | | | | | | | | | | |
| 103 | .01uF | | | | | | | | | | | | | | | | | | | | |
| 123 | .012uF | | | | | | | | | | | | | | | | | | | | |
| 153 | .015uF | | | | | | | | | | | | | | | | | | | | |
| 183 | .018uF | | | | | | | | | | | | | | | | | | | | |
| 223 | .022uF | | | | | | | | | | | | | | | | | | | | |
| 273 | .027uF | | | | | | | | | | | | | | | | | | | | |
| 333 | .033uF | | | | | | | | | | | | | | | | | | | | |
| 393 | .039uF | | | | | | | | | | | | | | | | | | | | |
| 473 | .047uF | | | | | | | | | | | | | | | | | | | | |
| 563 | .056uF | | | | | | | | | | | | | | | | | | | | |
| 683 | .068uF | | | | | | | | | | | | | | | | | | | | |
| 823 | .082uF | | | | | | | | | | | | | | | | | | | | |
| 104 | .100uF | | | | | | | | | | | | | | | | | | | | |
| 124 | .120uF | | | | | | | | | | | | | | | | | | | | |
| 154 | .150uF | | | | | | | | | | | | | | | | | | | | |
| 184 | .180uF | | | | | | | | | | | | | | | | | | | | |
| 224 | .220uF | | | | | | | | | | | | | | | | | | | | |
| 274 | .270uF | | | | | | | | | | | | | | | | | | | | |
| 334 | .330uF | | | | | | | | | | | | | | | | | | | | |

* For values above 1uF, thickness may be greater than specified above.

T(max): 0603 - 0.040"
 0805 - 0.060"

NOTE: Additional values may be available. Please contact us for more information. Due to demand and raw material fluctuations, specific values may not be available. All components manufactured with the X7R dielectric are also available as an X5R dielectric.

VOLTAGE AND CAPACITANCE RANGE

X7R DIELECTRIC

Values that are typically available.

(All measurements in inches)

| SIZE | | 1206 | | | | | | 1210 | | | | | | 1812 | | | | | | 2220 / 2221 | | | | |
|------------------|-----|---------|-----|-----|-----|-----|------|-------|-----|-----|-----|-----|------|-------|-----|-----|-----|-----|------|---------------|-----|---------|---------|---------|
| T (max)* | | 0.070 | | | | | | 0.125 | | | | | | 0.095 | | | | | | 0.108 / 0.108 | | | | |
| VDCW (MAX) | | 6.3V | 10V | 16V | 25V | 50V | 100V | 6.3V | 10V | 16V | 25V | 50V | 100V | 6.3V | 10V | 16V | 25V | 50V | 100V | 16V | 25V | 50V | 100V | |
| CAPACITANCE CODE | 394 | .390uF | | | | | | | | | | | | | | | | | | | | | | |
| | 474 | .470uF | | | | | | | | | | | | | | | | | | | | | | |
| | 564 | .560uF | | | | | | | | | | | | | | | | | | | | | | |
| | 684 | .680uF | | | | | | | | | | | | | | | | | | | | | | |
| | 824 | .820uF | | | | | | | | | | | | | | | | | | | | | | |
| | 105 | 1.00uF | | | | | | | | | | | | | | | | | | | | | | |
| | 125 | 1.20uF | | | | | | | | | | | | | | | | | | | | | | |
| | 155 | 1.50uF | | | | | | | | | | | | | | | | | | | | | | |
| | 185 | 1.80uF | | | | | | | | | | | | | | | | | | | | | | |
| | 225 | 2.20uF | | | | | | | | | | | | | | | | | | | | | | |
| | 335 | 3.30uF | | | | | | | | | | | | | | | | | | | | | | |
| | 475 | 4.70uF | | | | | | | | | | | | | | | | | | | | | | |
| | 685 | 6.80uF | | | | | | | | | | | | | | | | | | | | | | |
| | 106 | 10.0uF | | | | | | | | | | | | | | | | | | | | | | |
| | 156 | 15.0uF | | | | | | | | | | | | | | | | | | | | X7S/X7R | X7S/X7R | X7S/X7R |
| | 226 | 22.0uF | | | | | | | | | | | | | | | | | | | | | | |
| | 476 | 47.0uF | | | | | | | | | | | | | | | | | | | | | | |
| | 107 | 100.0uF | | | | | | | | | | | | | | | | | | | | | | |

* For values above 1uF, thickness may be greater than specified above.

T(max): 1206 - 0.075" 1812 - 0.130"
 1210 - 0.125" 2220 - 0.135"

NOTE: Additional values may be available. Please contact us for more information. Due to demand and raw material fluctuations, specific values may not be available.
 All components manufactured with the X7R dielectric are also available as an X5R dielectric.

VOLTAGE AND CAPACITANCE RANGE

X7S DIELECTRIC (0201-0805)

Values that are typically available.

(All measurements in inches)

| SIZE | | 0201 | | | | 0402 | | | | | 0603 | | | | | 0805 | | | | | | |
|------------------|-----|-------------------|---------|-----|-----|-------|-----|-----|-----|-----|-------|-----|-----|-----|-----|-------|-----|-----|-----|-----|--|--|
| T (max)* | | 0.012 | | | | 0.025 | | | | | 0.038 | | | | | 0.059 | | | | | | |
| VDCW (MAX) | | 4V | 6.3V | 10V | 16V | 6.3V | 10V | 16V | 25V | 50V | 6.3V | 10V | 16V | 25V | 50V | 6.3V | 10V | 16V | 25V | 50V | | |
| CAPACITANCE CODE | 104 | CAPACITANCE VALUE | 0.10uF | | | | | | | | | | | | | | | | | | | |
| | 224 | | 0.22uF | | | | | | | | | | | | | | | | | | | |
| | 474 | | 0.47uF | | | | | | | | | | | | | | | | | | | |
| | 105 | | 1.00uF | | | | | | | | | | | | | | | | | | | |
| | 225 | | 2.2uF | | | | | | | | | | | | | | | | | | | |
| | 475 | | 4.7uF | | | | | | | | | | | | | | | | | | | |
| | 106 | | 10.0uF | | | | | | | | | | | | | | | | | | | |
| | 226 | | 22.0uF | | | | | | | | | | | | | | | | | | | |
| | 476 | | 47.0uF | | | | | | | | | | | | | | | | | | | |
| | 107 | | 100.0uF | | | | | | | | | | | | | | | | | | | |

X7S DIELECTRIC (1206-2220)

(All measurements in inches)

| SIZE | | 1206 | | | | | 1210 | | | | | 1812 | | | | 2220 | | | | |
|------------------|---------|-------------------|--------|-----|-----|-----|-------|-----|-----|-----|-----|-------|-----|-----|------|-------|-----|-----|------|--|
| T (max)* | | 0.080 | | | | | 0.125 | | | | | 0.095 | | | | 0.108 | | | | |
| VDCW (MAX) | | 6.3V | 10V | 16V | 25V | 50V | 6.3V | 10V | 16V | 25V | 50V | 16V | 25V | 50V | 100V | 16V | 25V | 50V | 100V | |
| CAPACITANCE CODE | 104 | CAPACITANCE VALUE | 0.10uF | | | | | | | | | | | | | | | | | |
| | 224 | | 0.22uF | | | | | | | | | | | | | | | | | |
| | 474 | | 0.47 | | | | | | | | | | | | | | | | | |
| | 105 | | 1.00uF | | | | | | | | | | | | | | | | | |
| | 225 | | 2.2uF | | | | | | | | | | | | | | | | | |
| | 335 | | 3.3uF | | | | | | | | | | | | | | | | | |
| | 475 | | 4.7uF | | | | | | | | | | | | | | | | | |
| | 106 | | 10.0uF | | | | | | | | | | | | | | | | | |
| | 156 | | 15.0uF | | | | | | | | | | | | | | | | | |
| | 226 | | 22.0uF | | | | | | | | | | | | | | | | | |
| 476 | 47.0uF | | | | | | | | | | | | | | | | | | | |
| 107 | 100.0uF | | | | | | | | | | | | | | | | | | | |

* For values above 1uF, thickness may be greater than specified above.

T(max): 0603 - 0.040"
0805 - 0.060"

NOTE: Additional values may be available. Please contact us for more information. Due to demand and raw material fluctuations, specific values may not be available. All components manufactured with the X7R dielectric are also available as an X5R dielectric.

VOLTAGE AND CAPACITANCE RANGE

X6S DIELECTRIC (0201-0805)

Values that are typically available.

(All measurements in inches)

| SIZE | | 0201 | | | | 0402 | | | | | 0603 | | | | | 0805 | | | | | | | |
|------------------|-----|-------------------|---------|-----|-----|-------|-----|-----|-----|-----|-------|------|-----|-----|-----|-------|----|------|-----|-----|-----|-----|--|
| T (max)* | | 0.012 | | | | 0.025 | | | | | 0.038 | | | | | 0.059 | | | | | | | |
| VDCW (MAX) | | 4V | 6.3V | 10V | 16V | 6.3V | 10V | 16V | 25V | 50V | 4V | 6.3V | 10V | 16V | 25V | 50V | 4V | 6.3V | 10V | 16V | 25V | 50V | |
| CAPACITANCE CODE | 104 | CAPACITANCE VALUE | 0.10uF | | | | | | | | | | | | | | | | | | | | |
| | 224 | | 0.22uF | | | | | | | | | | | | | | | | | | | | |
| | 474 | | 0.47uF | | | | | | | | | | | | | | | | | | | | |
| | 105 | | 1.00uF | | | | | | | | | | | | | | | | | | | | |
| | 225 | | 2.2uF | | | | | | | | | | | | | | | | | | | | |
| | 475 | | 4.7uF | | | | | | | | | | | | | | | | | | | | |
| | 106 | | 10.0uF | | | | | | | | | | | | | | | | | | | | |
| | 226 | | 22.0uF | | | | | | | | | | | | | | | | | | | | |
| | 476 | | 47.0uF | | | | | | | | | | | | | | | | | | | | |
| | 107 | | 100.0uF | | | | | | | | | | | | | | | | | | | | |

X6S DIELECTRIC (1206-2220)

(All measurements in inches)

| SIZE | | 1206 | | | | | 1210 | | | | | 1812 | | | | 2220 | | | |
|------------------|---------|-------------------|--------|-----|-----|-----|-------|-----|-----|-----|-----|-------|-----|-----|------|-------|-----|-----|------|
| T (max)* | | 0.080 | | | | | 0.125 | | | | | 0.095 | | | | 0.108 | | | |
| VDCW (MAX) | | 6.3V | 10V | 16V | 25V | 50V | 6.3V | 10V | 16V | 25V | 50V | 16V | 25V | 50V | 100V | 16V | 25V | 50V | 100V |
| CAPACITANCE CODE | 104 | CAPACITANCE VALUE | 0.10uF | | | | | | | | | | | | | | | | |
| | 224 | | 0.22uF | | | | | | | | | | | | | | | | |
| | 474 | | 0.47uF | | | | | | | | | | | | | | | | |
| | 105 | | 1.00uF | | | | | | | | | | | | | | | | |
| | 225 | | 2.2uF | | | | | | | | | | | | | | | | |
| | 335 | | 3.3uF | | | | | | | | | | | | | | | | |
| | 475 | | 4.7uF | | | | | | | | | | | | | | | | |
| | 106 | | 10.0uF | | | | | | | | | | | | | | | | |
| | 156 | | 15.0uF | | | | | | | | | | | | | | | | |
| | 226 | | 22.0uF | | | | | | | | | | | | | | | | |
| 476 | 47.0uF | | | | | | | | | | | | | | | | | | |
| 107 | 100.0uF | | | | | | | | | | | | | | | | | | |

* For values above 1uF, thickness may be greater than specified above.

T(max): 0603 - 0.040"

0805 - 0.060"

NOTE: Additional values may be available. Please contact us for more information. Due to demand and raw material fluctuations, specific values may not be available. All components manufactured with the X7R dielectric are also available as an X5R dielectric.

VOLTAGE AND CAPACITANCE RANGE

X5R DIELECTRIC

Values that are typically available.

(All measurements in inches)

| SIZE | | 01005 | | 0201 | | | | 0402 | | | | | 0603 | | | | | 0805 | | | | | 1206 | | | | 1210 | | 1812 | | | | |
|------------|--------|-------|-----|--------|------|-----|-----|-------|----|------|-----|-----|-------|-----|------|-----|-----|-------|-----|-----|------|-----|-------|-----|-----|------|-------|-----|-------|-----|-----|-----|-----|
| T (max) | | 0.008 | | 0.0216 | | | | 0.025 | | | | | 0.040 | | | | | 0.060 | | | | | 0.072 | | | | 0.125 | | 0.130 | | | | |
| VDCW (MAX) | | 6.3V | 10V | 4V | 6.3V | 10V | 16V | 25V | 4V | 6.3V | 10V | 16V | 25V | 50V | 6.3V | 10V | 16V | 25V | 35V | 50V | 6.3V | 10V | 16V | 25V | 50V | 6.3V | 10V | 16V | 25V | 16V | 25V | 16V | 25V |
| 102 | 1000pF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 122 | 1200pF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 152 | 1500pF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 182 | 1800pF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 222 | 2200pF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 272 | 2700pF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 332 | 3300pF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 392 | 3900pF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 472 | 4700pF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 562 | 5600pF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 682 | 6800pF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 822 | 8200pF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 103 | .01uF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 153 | .015uF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 223 | .022uF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 333 | .033uF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 393 | .039uF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 473 | .047uF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 104 | 0.10uF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 154 | .150uF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 224 | .220uF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 334 | .330uF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 474 | .470uF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 684 | .680uF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 105 | 1.00uF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 125 | 1.20uF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 155 | 1.50uF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 185 | 1.80uF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 225 | 2.20uF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 335 | 3.30uF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

* For values above 1uF, thickness may be greater than specified above.

T(max): 1206 - 0.075" 1812 - 0.130"
 1210 - 0.125" 2220 - 0.135"

NOTE: Additional values may be available. Please contact us for more information. Due to demand and raw material fluctuations, specific values may not be available.
 All components manufactured with the X7R dielectric are also available as an X5R dielectric.

VOLTAGE AND CAPACITANCE RANGE

X5R DIELECTRIC (0402-1206)

Values that are typically available.

(All measurements in inches)

| SIZE | | 0201 | | | 0402 | | | | 0603 | | | | | 0805 | | | | | 1206 | | | | | | | |
|------------------|-----|---------|------|-----|--------|------|-----|-----|-------|------|-----|-----|-----|-------|------|-----|-----|-----|-------|-----|------|-----|-----|-----|-----|--|
| T (max) | | 0.0216 | | | 0.0335 | | | | 0.040 | | | | | 0.060 | | | | | 0.072 | | | | | | | |
| VDCW (MAX) | | 4V | 6.3V | 10V | 4V | 6.3V | 10V | 16V | 4V | 6.3V | 10V | 16V | 25V | 4V | 6.3V | 10V | 16V | 25V | 35V | 50V | 6.3V | 10V | 16V | 25V | 50V | |
| CAPACITANCE CODE | 395 | 3.90uF | | | | | | | | | | | | | | | | | | | | | | | | |
| | 475 | 4.70uF | | | | | | | | | | | | | | | | | | | | | | | | |
| | 685 | 6.80uF | | | | | | | | | | | | | | | | | | | | | | | | |
| | 106 | 10.0uF | | | | | | | | | | | | | | | | | | | | | | | | |
| | 156 | 15.0uF | | | | | | | | | | | | | | | | | | | | | | | | |
| | 226 | 22.0uF | | | | | | | | | | | | | | | | | | | | | | | | |
| | 476 | 47.0uF | | | | | | | | | | | | | | | | | | | | | | | | |
| | 107 | 100.0uF | | | | | | | | | | | | | | | | | | | | | | | | |
| | 157 | 150.0uF | | | | | | | | | | | | | | | | | | | | | | | | |
| | 227 | 220.0uF | | | | | | | | | | | | | | | | | | | | | | | | |

X5R DIELECTRIC (1210-2221)

(All measurements in inches)

| SIZE | | 1210 | | | | | 1812 | | | | 2220 / 2221 | | | | | |
|------------------|-----|---------|-----|-----|-----|-----|-------|-----|-----|-----|-------------|-----|-----|-----|-----|--|
| T (max) | | 0.125 | | | | | 0.130 | | | | 0.135 | | | | | |
| VDCW (MAX) | | 6.3V | 10V | 16V | 25V | 50V | 6.3V | 10V | 16V | 25V | 6.3V | 10V | 16V | 25V | 50V | |
| CAPACITANCE CODE | 395 | 3.90uF | | | | | | | | | | | | | | |
| | 475 | 4.70uF | | | | | | | | | | | | | | |
| | 685 | 6.80uF | | | | | | | | | | | | | | |
| | 106 | 10.0uF | | | | | | | | | | | | | | |
| | 156 | 15.0uF | | | | | | | | | | | | | | |
| | 226 | 22.0uF | | | | | | | | | | | | | | |
| | 476 | 47.0uF | | | | | | | | | | | | | | |
| | 107 | 100.0uF | | | | | | | | | | | | | | |
| | 157 | 150.0uF | | | | | | | | | | | | | | |
| | 227 | 220.0uF | | | | | | | | | | | | | | |

* For values above 1uF, thickness may be greater than specified above.

T(max): 1206 - 0.075" 1812 - 0.130"
 1210 - 0.125" 2220 - 0.135"

NOTE: Additional values may be available. Please contact us for more information. Due to demand and raw material fluctuations, specific values may not be available.
 All components manufactured with the X7R dielectric are also available as an X5R dielectric.

VOLTAGE AND CAPACITANCE RANGE

Z5U DIELECTRIC

Values that are typically available.

(All measurements in inches)

| SIZE | | 0504 | | 0603 | | 0805 | | 1206 | | 1210 | | 1812 | | 2220 / 2221 | |
|------------------|-----|--------|-----|-------|-----|-------|-----|-------|-----|-------|-----|-------|-----|---------------|-----|
| T (max) | | 0.040 | | 0.038 | | 0.058 | | 0.070 | | 0.075 | | 0.085 | | 0.108 / 0.108 | |
| VDCW (MAX) | | 25V | 50V | 25V | 50V | 25V | 50V | 25V | 50V | 25V | 50V | 25V | 50V | 25V | 50V |
| CAPACITANCE CODE | 102 | 1000pF | | | | | | | | | | | | | |
| | 122 | 1200pF | | | | | | | | | | | | | |
| | 152 | 1500pF | | | | | | | | | | | | | |
| | 182 | 1800pF | | | | | | | | | | | | | |
| | 222 | 2200pF | | | | | | | | | | | | | |
| | 272 | 2700pF | | | | | | | | | | | | | |
| | 332 | 3300pF | | | | | | | | | | | | | |
| | 392 | 3900pF | | | | | | | | | | | | | |
| | 472 | 4700pF | | | | | | | | | | | | | |
| | 562 | 5600pF | | | | | | | | | | | | | |
| | 682 | 6800pF | | | | | | | | | | | | | |
| | 822 | 8200pF | | | | | | | | | | | | | |
| | 103 | .01uF | | | | | | | | | | | | | |
| | 123 | .012uF | | | | | | | | | | | | | |
| | 153 | .015uF | | | | | | | | | | | | | |
| | 183 | .018uF | | | | | | | | | | | | | |
| | 223 | .022uF | | | | | | | | | | | | | |
| | 273 | .027uF | | | | | | | | | | | | | |
| | 333 | .033uF | | | | | | | | | | | | | |
| | 393 | .039uF | | | | | | | | | | | | | |
| | 473 | .047uF | | | | | | | | | | | | | |
| | 563 | .056uF | | | | | | | | | | | | | |
| | 683 | .068uF | | | | | | | | | | | | | |
| | 823 | .082uF | | | | | | | | | | | | | |
| | 104 | .100uF | | | | | | | | | | | | | |
| | 124 | .120uF | | | | | | | | | | | | | |
| | 154 | .150uF | | | | | | | | | | | | | |
| | 184 | .180uF | | | | | | | | | | | | | |
| | 224 | .220uF | | | | | | | | | | | | | |
| | 274 | .270uF | | | | | | | | | | | | | |
| | 334 | .330uF | | | | | | | | | | | | | |

NOTE: Additional values may be available. Please contact us for more information. Due to demand and raw material fluctuations, specific values may not be available.

VOLTAGE AND CAPACITANCE RANGE

Z5U DIELECTRIC

Values that are typically available.

(All measurements in inches)

| SIZE | | 0504 | | 0603 | | 0805 | | 1206 | | 1210 | | 1812 | | 2220 / 2221 | |
|------------------|---------|--------|-----|-------|-----|-------|-----|-------|-----|-------|-----|-------|-----|---------------|-----|
| T (max) | | 0.040 | | 0.038 | | 0.058 | | 0.070 | | 0.075 | | 0.085 | | 0.108 / 0.108 | |
| VDCW (MAX) | | 25V | 50V | 25V | 50V | 25V | 50V | 25V | 50V | 25V | 50V | 25V | 50V | 25V | 50V |
| CAPACITANCE CODE | 394 | .390uF | | | | | | | | | | | | | |
| | 474 | .470uF | | | | | | | | | | | | | |
| | 564 | .560uF | | | | | | | | | | | | | |
| | 684 | .680uF | | | | | | | | | | | | | |
| | 824 | .820uF | | | | | | | | | | | | | |
| | 105 | 1.00uF | | | | | | | | | | | | | |
| | 125 | 1.20uF | | | | | | | | | | | | | |
| | 155 | 1.50uF | | | | | | | | | | | | | |
| | 185 | 1.80uF | | | | | | | | | | | | | |
| | 225 | 2.20uF | | | | | | | | | | | | | |
| | 335 | 3.30uF | | | | | | | | | | | | | |
| | 395 | 3.90uF | | | | | | | | | | | | | |
| | 475 | 4.70uF | | | | | | | | | | | | | |
| | 685 | 6.80uF | | | | | | | | | | | | | |
| | 106 | 10.0uF | | | | | | | | | | | | | |
| | 156 | 15.0uF | | | | | | | | | | | | | |
| | 226 | 22.0uF | | | | | | | | | | | | | |
| | 476 | 47.0uF | | | | | | | | | | | | | |
| 107 | 100.0uF | | | | | | | | | | | | | | |

NOTE: Additional values may be available. Please contact us for more information. Due to demand and raw material fluctuations, specific values may not be available.
 For values above 1uF, thickness may be greater than specified above.

VOLTAGE AND CAPACITANCE RANGE

Y5V DIELECTRIC

Values that are typically available.

(All measurements in inches)

| SIZE | | 0201 | | | 0402 | | | 0603 | | | 0805 | | | 1206 | | | 1210 | | | 1812 | | | | | | | | | |
|------------------|-------------------|--------|--------|-----|-------|-----|-----|-------|-----|-----|-------|-----|------|-------|-----|-----|-------|-----|-----|-------|-----|------|-----|-----|-----|------|-----|-----|--|
| T (max) | | 0.012 | | | 0.025 | | | 0.038 | | | 0.058 | | | 0.070 | | | 0.096 | | | 0.085 | | | | | | | | | |
| VDCW (MAX) | | 10V | 6.3V | 10V | 16V | 25V | 50V | 6.3V | 10V | 16V | 25V | 50V | 6.3V | 10V | 16V | 25V | 50V | 10V | 16V | 25V | 50V | 6.3V | 10V | 16V | 25V | 6.3V | 10V | 25V | |
| CAPACITANCE CODE | 102 | 1000pF | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 122 | 1200pF | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 152 | 1500pF | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 182 | 1800pF | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 222 | 2200pF | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 272 | 2700pF | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 332 | 3300pF | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 392 | 3900pF | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 472 | 4700pF | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 562 | 5600pF | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 682 | 6800pF | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 822 | 8200pF | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | CAPACITANCE VALUE | 103 | .01uF | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 123 | .012uF | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 153 | .015uF | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 183 | .018uF | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 223 | .022uF | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 273 | .027uF | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 333 | .033uF | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 393 | .039uF | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 473 | .047uF | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 563 | .056uF | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 683 | .068uF | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 823 | .082uF | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 104 | .100uF | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 124 | .120uF | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 154 | .150uF | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 184 | .180uF | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 224 | .220uF | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 274 | .270uF | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 334 | .330uF | | | | | | | | | | | | | | | | | | | | | | | | | | | |

NOTE: Additional values may be available. Please contact us for more information. Due to demand and raw material fluctuations, specific values may not be available. For values above 1uF, thickness may be greater than specified above.

VOLTAGE AND CAPACITANCE RANGE

Y5V DIELECTRIC

Values that are typically available.

(All measurements in inches)

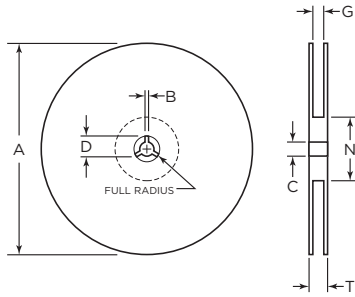
| SIZE | | 0201 | | | 0402 | | | 0603 | | | | | 0805 | | | | | 1206 | | | | 1210 | | | | | 1812 | | |
|------------------|-----|---------|--|--|-------|-----|-----|-------|-----|-----|-----|-----|-------|-----|-----|-----|-----|-------|-----|-----|-----|------|-----|-----|-----|-----|-------|-----|-----|
| T (max) | | 0.012 | | | 0.025 | | | 0.038 | | | | | 0.058 | | | | | 0.070 | | | | 0.10 | | | | | 0.085 | | |
| VDCW (MAX) | | 10V | | | 6.3V | 10V | 16V | 6.3V | 10V | 16V | 25V | 50V | 6.3V | 10V | 16V | 25V | 50V | 10V | 16V | 25V | 50V | 6.3V | 10V | 16V | 25V | 50V | 6.3V | 10V | 25V |
| CAPACITANCE CODE | 394 | .390uF | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 474 | .470uF | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 564 | .560uF | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 684 | .680uF | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 824 | .820uF | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 105 | 1.00uF | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 125 | 1.20uF | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 155 | 1.50uF | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 185 | 1.80uF | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 225 | 2.20uF | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 335 | 3.30uF | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 395 | 3.90uF | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 475 | 4.70uF | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 685 | 6.80uF | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 106 | 10.0uF | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 156 | 15.0uF | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 226 | 22.0uF | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 476 | 47.0uF | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 107 | 100.0uF | | | | | | | | | | | | | | | | | | | | | | | | | | | |

NOTE: Additional values may be available. Please contact us for more information. Due to demand and raw material fluctuations, specific values may not be available.
 For values above 1uF, thickness may be greater than specified above.

TAPE & REEL SPECIFICATIONS

All tape and reel specifications must be adhered to per EIA-481-1-A.

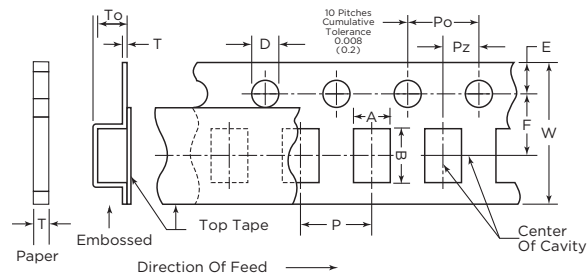
REEL



Unit: mm (inch)

| Tape | B min | C | A (7") | A (13") | D min | N min | G | T max |
|------|----------------|-----------------------------|--------------------------|--------------------------|---------------------------|--------------|-----------------------------|------------------------|
| 4mm | 2.0 (0.079) | 13 ± 0.05 (0.512 ± 0.02) | 178 ± 2.0 (7 ± 0.079) | - | 21 ± 0.8 (0.82 ± 0.03) | 50 (1.97) | 5.0 ± 1.5 (0.196 ± 0.05) | 8.0 max (0.315 max) |
| 8mm | 2.0 (0.07) | 13 ± 0.05 (0.512 ± 0.02) | 178 ± 2.0 (7 ± 0.079) | 330 ± 2.0 (13 ± 0.08) | 20.2 (0.795) | 50 (1.97) | 10 ± 1.5 (0.394 ± 0.059) | 14.9 (0.587) |
| 12mm | 2.0 (0.07) | 13 ± 0.05 (0.512 ± 0.02) | 178 ± 2.0 (7 ± 0.079) | 330 ± 2.0 (13 ± 0.08) | 20.2 (0.795) | 50 (1.97) | 10 ± 1.5 (0.394 ± 0.059) | 14.9 (0.587) |

TAPE



7" Reel Quantities **

| SIZE | 01005 (E) | 01005 (P) | 0201 | 0402 | 0603 | 0805 | 1206 | 1210 | 1812 | 2221 |
|------------------|-----------|-----------|--------|--------|-------|-------|-------|-------|-------|-------|
| Tape Size | 4mm | 8mm | 8mm | 8mm | 8mm | 8mm | 8mm | 8mm | 12mm | 12mm |
| Min Qty Per Reel | 40,000* | 20000* | 15,000 | 5,000 | 3,000 | 2,000 | 2,000 | 1,000 | 1,000 | 1,000 |
| Max Qty Per Reel | 40,000* | 20000* | 15,000 | 10,000 | 4,000 | 5,000 | 5,000 | 5,000 | 3,000 | 1,000 |

NOTE: ** Quantity dependent on thickness
 *Smaller quantities may be available. Please contact us.

Paper Tape Carrier Dimensions (8mm)

Unit: mm (inch)

| Size (inches) | A | B | W | F | E | Po | Pz | D | t | P |
|---------------|---|---|---|---|--|---|---|--|--|--|
| 01005 | $\frac{0.25 \pm 0.05}{(0.010 \pm 0.002)}$ | $\frac{0.45 \pm 0.05}{(0.018 \pm 0.002)}$ | $\frac{8.0 \pm 0.2}{(0.315 \pm 0.008)}$ | $\frac{3.5 \pm 0.1}{(0.138 \pm 0.004)}$ | $\frac{1.75 \pm 0.1}{(0.069 \pm 0.004)}$ | $\frac{4.0 \pm 0.1}{(0.157 \pm 0.004)}$ | $\frac{2.0 \pm 0.05}{-0.0}$ $\frac{-0.0}{(0.039 \pm 0.002)}$ -0.000 | $\frac{1.5 \pm 0.1}{(0.064 \pm .004)}$ | $\frac{1.15 \text{ max}}{(0.045 \text{ max})}$ | $\frac{2.0 \pm 0.05}{(0.079 \pm 0.002)}$ |
| 0201 | $\frac{0.37 \pm 0.05}{(0.014 \pm 0.002)}$ | $\frac{0.67 \pm 0.05}{(0.026 \pm 0.002)}$ | $\frac{8.0 \pm 0.2}{(0.315 \pm 0.008)}$ | $\frac{3.5 \pm 0.1}{(0.138 \pm 0.004)}$ | $\frac{1.75 \pm 0.1}{(0.069 \pm 0.004)}$ | $\frac{4.0 \pm 0.1}{(0.157 \pm 0.004)}$ | $\frac{2.0 \pm 0.05}{-0.0}$ $\frac{-0.0}{(0.039 \pm 0.002)}$ -0.000 | $\frac{1.5 \pm 0.1}{(0.064 \pm .004)}$ | $\frac{1.15 \text{ max}}{(0.045 \text{ max})}$ | $\frac{2.0 \pm 0.05}{(0.079 \pm 0.002)}$ |
| 0402 | $\frac{0.65 \pm 0.1}{(0.026 \pm 0.004)}$ | $\frac{1.10 \pm 0.2}{(0.043 \pm 0.008)}$ | $\frac{8.0 \pm 0.2}{(0.315 \pm 0.008)}$ | $\frac{3.5 \pm 0.1}{(0.138 \pm 0.004)}$ | $\frac{1.75 \pm 0.1}{(0.069 \pm 0.004)}$ | $\frac{4.0 \pm 0.1}{(0.157 \pm 0.004)}$ | $\frac{2.0 \pm 0.05}{-0.0}$ $\frac{-0.0}{(0.039 \pm 0.002)}$ -0.000 | $\frac{1.5 \pm 0.1}{(0.064 \pm .004)}$ | $\frac{1.15 \text{ max}}{(0.045 \text{ max})}$ | $\frac{2.0 \pm 0.05}{(0.079 \pm 0.002)}$ |
| 0603 | $\frac{1.10 \pm 0.2}{(0.043 \pm 0.008)}$ | $\frac{1.90 \pm 0.2}{(0.075 \pm 0.008)}$ | $\frac{8.0 \pm 0.2}{(0.315 \pm 0.008)}$ | $\frac{3.5 \pm 0.1}{(0.138 \pm 0.004)}$ | $\frac{1.75 \pm 0.1}{(0.069 \pm 0.004)}$ | $\frac{4.0 \pm 0.1}{(0.157 \pm 0.004)}$ | $\frac{2.0 \pm 0.05}{-0.0}$ $\frac{-0.0}{(0.039 \pm 0.002)}$ -0.000 | $\frac{1.5 \pm 0.1}{(0.064 \pm .004)}$ | $\frac{1.15 \text{ max}}{(0.045 \text{ max})}$ | $\frac{4.0 \pm 0.1}{(0.157 \pm 0.004)}$ |
| 0805 | $\frac{1.16 \pm 0.2}{(0.046 \pm 0.008)}$ | $\frac{2.4 \pm 0.2}{(0.095 \pm 0.008)}$ | $\frac{8.0 \pm 0.2}{(0.315 \pm 0.008)}$ | $\frac{3.5 \pm 0.1}{(0.138 \pm 0.004)}$ | $\frac{1.75 \pm 0.1}{(0.069 \pm 0.004)}$ | $\frac{4.0 \pm 0.1}{(0.157 \pm 0.004)}$ | $\frac{2.0 \pm 0.05}{-0.0}$ $\frac{-0.0}{(0.039 \pm 0.002)}$ -0.000 | $\frac{1.5 \pm 0.1}{(0.064 \pm .004)}$ | $\frac{1.15 \text{ max}}{(0.045 \text{ max})}$ | $\frac{4.0 \pm 0.1}{(0.157 \pm 0.004)}$ |
| 1206 | $\frac{2.0 \pm 0.2}{(0.079 \pm 0.008)}$ | $\frac{3.6 \pm 0.2}{(0.142 \pm 0.008)}$ | $\frac{8.0 \pm 0.2}{(0.315 \pm 0.008)}$ | $\frac{3.5 \pm 0.1}{(0.138 \pm 0.004)}$ | $\frac{1.75 \pm 0.1}{(0.069 \pm 0.004)}$ | $\frac{4.0 \pm 0.1}{(0.157 \pm 0.004)}$ | $\frac{2.0 \pm 0.05}{-0.0}$ $\frac{-0.0}{(0.039 \pm 0.002)}$ -0.000 | $\frac{1.5 \pm 0.1}{(0.064 \pm .004)}$ | $\frac{1.15 \text{ max}}{(0.045 \text{ max})}$ | $\frac{4.0 \pm 0.1}{(0.157 \pm 0.004)}$ |

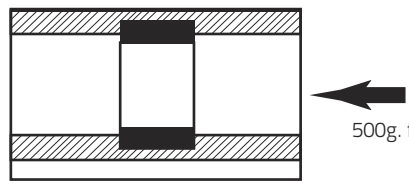
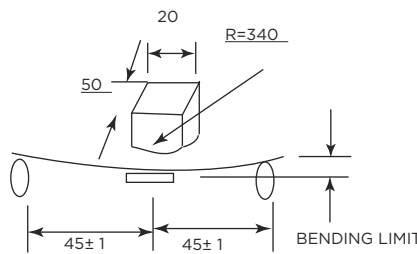
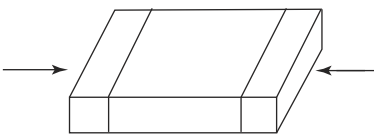
Embossed Carrier Dimensions (4mm, 8mm & 12mm)

| Size (inches) | A | B | W | F | E | Po | Pz | D | To | T | P |
|---------------|---|---|--|--|--|--|--|---|---|---|---|
| 01005 | $\frac{0.23}{(0.009)}$ | $\frac{0.43}{(0.016)}$ | $\frac{4.0 \pm 0.05}{(0.157 \pm 0.002)}$ | $\frac{1.8 \pm 0.02}{(0.070 \pm 0.001)}$ | $\frac{0.9 \pm 0.05}{(0.035 \pm 0.002)}$ | $\frac{2.0 \pm 0.04}{(0.079 \pm 0.001)}$ | $\frac{2.00}{(0.079)}$ | $\frac{0.8 \pm 0.04}{(0.031 \pm 0.001)}$ | $\frac{0.5 \text{ max}}{(0.019 \text{ max})}$ | $\frac{0.15 - 0.4}{(0.005 - 0.015)}$ | $\frac{1.00}{(0.039)}$ |
| 0603 | $\frac{1.05 \pm 0.15}{(0.042 \pm 0.006)}$ | $\frac{1.90 \pm 0.15}{(0.075 \pm 0.006)}$ | $\frac{8.0 \pm 0.3}{(0.315 \pm 0.012)}$ | $\frac{3.5 \pm 0.1}{(0.138 \pm .004)}$ | $\frac{1.75 \pm 0.1}{(0.069 \pm .004)}$ | $\frac{4.0 \pm 0.1}{(0.157 \pm .004)}$ | $\frac{2.0 \pm 0.05}{(0.079 \pm .002)}$ | $\frac{1.5 \pm 0.1}{-0.0}$ $\frac{-0.0}{(0.06 \pm .004)}$ -0.000 | $\frac{0.75 \text{ max}}{(0.03 \text{ max})}$ | $\frac{0.6 \text{ max}}{(0.024 \text{ max})}$ | $\frac{4.0 \pm 0.1}{(0.157 \pm 0.004)}$ |
| 0805 | $\frac{1.48 \pm 0.2}{(0.058 \pm 0.008)}$ | $\frac{2.3 \pm 0.3}{(0.091 \pm .008)}$ | $\frac{8.0 \pm 0.3}{(0.315 \pm 0.008)}$ | $\frac{3.5 \pm 0.1}{(0.138 \pm 0.004)}$ | $\frac{1.75 \pm 0.1}{(0.069 \pm 0.004)}$ | $\frac{4.0 \pm 0.1}{(0.157 \pm 0.004)}$ | $\frac{2.0 \pm 0.05}{(0.079 \pm 0.002)}$ | $\frac{1.5 \pm 0.1}{-0.0}$ $\frac{-0.0}{(0.06 \pm 0.004)}$ -0.000 | $\frac{2.5 \text{ max}}{(0.098 \text{ max})}$ | $\frac{0.6 \text{ max}}{(0.024 \text{ max})}$ | $\frac{4.0 \pm 0.1}{(0.157 \pm 0.004)}$ |
| 1206 | $\frac{2.0 \pm 0.2}{(0.079 \pm 0.008)}$ | $\frac{3.6 \pm 0.3}{(0.142 \pm 0.008)}$ | $\frac{8.0 \pm 0.3}{(0.315 \pm 0.008)}$ | $\frac{3.5 \pm 0.1}{(0.138 \pm 0.004)}$ | $\frac{1.75 \pm 0.1}{(0.069 \pm 0.004)}$ | $\frac{4.0 \pm 0.1}{(0.157 \pm 0.004)}$ | $\frac{2.0 \pm 0.05}{(0.079 \pm 0.002)}$ | $\frac{1.5 \pm 0.1}{-0.0}$ $\frac{-0.0}{(0.06 \pm 0.004)}$ -0.000 | $\frac{2.5 \text{ max}}{(0.098 \text{ max})}$ | $\frac{0.6 \text{ max}}{(0.024 \text{ max})}$ | $\frac{4.0 \pm 0.1}{(0.157 \pm 0.004)}$ |
| 1210 | $\frac{2.9 \pm 0.2}{(0.114 \pm 0.008)}$ | $\frac{3.6 \pm 0.3}{(0.142 \pm 0.008)}$ | $\frac{8.0 \pm 0.3}{(0.315 \pm 0.008)}$ | $\frac{3.5 \pm 0.1}{(0.138 \pm 0.004)}$ | $\frac{1.75 \pm 0.1}{(0.069 \pm 0.004)}$ | $\frac{4.0 \pm 0.1}{(0.157 \pm 0.004)}$ | $\frac{2.0 \pm 0.05}{(0.079 \pm 0.002)}$ | $\frac{1.5 \pm 0.1}{-0.0}$ $\frac{-0.0}{(0.06 \pm 0.004)}$ -0.000 | $\frac{2.5 \text{ max}}{(0.098 \text{ max})}$ | $\frac{0.6 \text{ max}}{(0.024 \text{ max})}$ | $\frac{4.0 \pm 0.1}{(0.157 \pm 0.004)}$ |
| 1812 | $\frac{3.6 \pm 0.2}{(0.142 \pm 0.008)}$ | $\frac{4.9 \pm 0.3}{(0.193 \pm 0.008)}$ | $\frac{12.0 \pm 0.3}{(0.472 \pm 0.012)}$ | $\frac{5.6 \pm 0.1}{(0.221 \pm 0.004)}$ | $\frac{1.75 \pm 0.1}{(0.069 \pm 0.004)}$ | $\frac{4.0 \pm 0.1}{(0.157 \pm 0.004)}$ | $\frac{2.0 \pm 0.05}{(0.079 \pm 0.002)}$ | $\frac{1.5 \pm 0.1}{-0.0}$ $\frac{-0.0}{(0.06 \pm 0.004)}$ -0.000 | $\frac{3.8 \text{ max}}{(0.150 \text{ max})}$ | $\frac{0.6 \text{ max}}{(0.024 \text{ max})}$ | $\frac{8.0 \pm 0.1}{(0.315 \pm 0.004)}$ |

ENVIRONMENTAL CHARACTERISTICS

| NO | ITEM | | PERFORMANCE | TEST CONDITION | | | | | |
|-----------------------|---|--------------------|--|---|--------------------------|--|--|--|--|
| 1 | APPEARANCE | | NO ABNORMAL EXTERIOR APPEARANCE | THROUGH MICROSCOPE (X10) | | | | | |
| 2 | INSULATION RESISTANCE | | 10,000M OR 500M μ F PRODUCT WHICHEVER IS SMALLER (RATED VOLTAGE IS BELOW 16V: 10,000M OR 100M μ F) | RATED VOLTAGE SHALL BE APPLIED. MEASUREMENT TIME IS 60 - 120 RATED VOLTAGE TIME 60 SEC . | | | | | |
| 3 | WITHSTANDING VOLTAGE | | NO DIELECTRIC BREAKDOWN OR MECHANICAL BREAKDOWN | CLASS I : 300% OF THE RATED VOLTAGE FOR 1-5 SEC. CLASS II: 250% OF THE RATED VOLTAGE FOR 1-5 SEC IS APPLIED WITH LESS THAN 50mA CURRENT | | | | | |
| 4 | CAPACITANCE | CLASS I | WITHIN THE SPECIFIED TOLERANCE | CAPACITANCE | FREQUENCY | VOLTAGE | | | |
| | | | | 1,000pF AND BELOW | 1MHZ \pm 10% | 0.5 - 5 Vrms | | | |
| | | MORE THAN 1,000 pF | | 1kHz \pm 10% | | | | | |
| | | CLASS II | | CAPACITANCE | FREQUENCY | VOLTAGE | | | |
| 4.7 μ F AND BELOW | 1kHz \pm 10% | | 1.0 \pm 0.2Vrms | | | | | | |
| | | | MORE THAN 4.7 μ F | 120HZ \pm 20% | 1.0 \pm 0.2Vrms | | | | |
| 5 | Q | CLASS I | OVER 30pF : Q 1,000 LESS THAN 30pF: Q 400 +20C (C: CAPACITANCE) | CAPACITANCE | FREQUENCY | VOLTAGE | | | |
| | | | | 1,000pF AND BELOW | 1MHZ \pm 10% | 0.5 - 5 Vrms | | | |
| | | | | MORE THAN 1,000 pF | 1kHz \pm 10% | | | | |
| 6 | DISSIPATION FACTOR (Tan θ CLASS II) | CLASS II | X7R, X6S, X5R | | | | | | |
| | | | Rated Voltage | D.F. | Exception of D.F. | | | | |
| | | | \geq 50V | \leq 2.5% | \leq 3% | 0201 (50V); 0603 \geq 0.047 μ F 0805 \geq 0.22 μ F; 1206 \geq 0.47 μ F | | | |
| | | | | | \leq 5% | 0603 \geq 1 μ F; 0805 \geq 1 μ F; 1206 \geq 4.7 μ F; 1210 \geq 4.7 μ F | | | |
| | | | 25V | \leq 2.5% | \leq 5% | 0201 \geq 0.01 μ F; 0805 \geq 1 μ F; 1210 \geq 4.7 μ F | | | |
| | | | | | \leq 10% | 0402 \geq 0.10 μ F; 0603 \geq 0.33 μ F; 0805 \geq 2.2 μ F 1206 \geq 4.7 μ F; 1210 \geq 22 μ F | | | |
| | | | 16V | \leq 3.5% | \leq 5% | 0201 \geq 0.01 μ F; 0402 \geq 0.033 μ F; 0805 \geq 0.68 μ F; 1206 \geq 2.2 μ F; 1210 \geq 4.7 μ F | | | |
| | | | | | \leq 10% | 0402 \geq 0.47 μ F; 0603 \geq 0.68 μ F; 0805 \geq 2.2 μ F; 1206 \geq 4.7 μ F; 1210 \geq 22 μ F | | | |
| | | | 10V | \leq 5% | \leq 10% | 0402 \geq 0.33 μ F; 0603 \geq 0.33 μ F; 0805 \geq 2.2 μ F; 1206 \geq 2.2 μ F; 1210 \geq 22 μ F | | | |
| | | | 6.3V | \leq 10% | | | | | |
| | | | | | | Y5V, Z5U | | | |
| | | | Rated Voltage | D.F. | Exception of D.F. | | | | |
| | | | \geq 50V | \leq 5% | \leq 9% | 0603 \geq 0.1 μ F; 0805 \geq 0.47 μ F; 1206 \geq 4.7 μ F; | | | |
| | | | 25V | \leq 5% | \leq 9% | 0402 \geq 0.047 μ F; 0603 \geq 0.1 μ F; 0805 \geq 0.33 μ F; 1206 \geq 1 μ F; 1210 \geq 4.7 μ F | | | |
| \leq 12.5% | 0603 \geq 2.2 μ F; 0805 \geq 3.3 μ F; 1206 \geq 10 μ F; 1210 \geq 22 μ F; 1812 \geq 47 μ F | | | | | | | | |
| 16V | \leq 9% | \leq 16% | 0603 \geq 2.2 μ F; 0805 \geq 3.3 μ F; 1206 \geq 4.7 μ F; 1210 \geq 10 μ F; 1812 \geq 47 μ F | | | | | | |
| 10V | \leq 12.5% | \leq 16% | | | | | | | |
| 6.3V | \leq 16% | | | | | | | | |

ENVIRONMENTAL CHARACTERISTICS

| NO | ITEM | | PERFORMANCE | | TEST CONDITION | | | |
|----|-------------------------------------|---|-----------------------------------|--|--|---|--------------|---|
| | | | CHARACTERISTIC | TEMP. COEFFICIENT (PPM/°C) | THESE SYMMETRICAL TOLERANCE APPLY TO 2 POINT MEASUREMENT OF TEMPERATURE COEFFICIENT: ONE AT -25°C AND AT 85°C | | | |
| 7 | CAPACITANCE TEMPERATURE COEFFICIENT | CLASS I | COG/COG | 0 ± 60 (±30) | STEP | TEMPERATURE (°C) | | |
| | | | | -150 ± 60 | 1 | 25 ± 2 | | |
| | | | | -220 ± 60 | 2 | MIN RATED TEMP ± 2 | | |
| | | | | -330 ± 60 | 3 | 25 ± 2 | | |
| | | | | -470 ± 60 | 4 | MAX RATED TEMP ± 2 | | |
| | | | | -750 ± 120 | 5 | 25 ± 2 | | |
| | | | | +350 - -1000 | | | | |
| 8 | TEMPERATURE CHARACTERISTICS | CLASS II | CAPACITANCE CHANGE | | STEP | TEMP. (°C) B | TEMP. (°C) F | |
| | | | CHAR. | CAP. CHANGE (%) | | | | 1 |
| | | | X | X7R ±15% | 2 | -55 ± 2 | -25 ± 2 | |
| | | | | X6S ±22% | 3 | 25 ± 2 | 25 ± 2 | |
| | | | | X5R ±15% | 4 | 125 ± 2 | 85 ± 2 | |
| | | | Y | Y5V -82% - +22% | 5 | 25 ± 2 | 25 ± 2 | |
| | | | | Z5U -56% - +22% | | | | |
| | | | | | | $\frac{C2 - C1}{C1} \times 100\%$ C1: CAPACITANCE AT STANDARD TEMPERATURE (25°C) C2: CAPACITANCE AT EACH TEMPERATURE | | |
| 9 | ADHESIVE STRENGTH OF TERMINATION | NO INDICATION OF PEELING SHALL OCCUR ON THE TERMINAL ELECTRODE | | | A 500g.f PRESSURE SHALL BE APPLIED FOR 10±1 SECOND  | | | |
| 10 | BENDING STRENGTH | APPEARANCE | NO MECHANICAL DAMAGE SHALL OCCURE | | | BENDING SHALL BE APPLIED TO THE LIMIT (1mm) WITH 0.3mm/SEC | | |
| | | CAPACITANCE | CHARACTER | CHANGE OF CAPACITANCE | |  | | |
| | | | CLASS I | WITHIN ±5% OR ±0.5pF WHICHEVER IS LARGER | | | | |
| | | | CLASS II | X (X7R, X6S, X5R) | WITHIN ±12.5% | | | |
| | | Y (Y5V, Z5U) | WITHIN ±30% | | | | | |
| 11 | SOLDERABILITY | MORE THAN 75% OF THE TERMINAL SURFACE IS TO BE SOLDERED NEWLY, SO METAL PART (A) DOES NOT COME OUT OR DISSOLVE  | | | SOLDER TEMPERATURE: 245 ± 5 °C SOLDER: Sn_Ag3_0.5Cu FLUX: RMA Type PRE-HEATING: AT 80 - 120 °C FOR 10 - 30 SEC. | | | |

ENVIRONMENTAL CHARACTERISTICS

| NO | ITEM | PERFORMANCE | TEST CONDITION | | | | | | | | | |
|----------------------|--|-----------------------|---|--|--------------|-------------|---|--------|----|---|---------|----|
| 12 | RESISTANCE TO SOLDERING HEAT | APPEARANCE | NO MECHANICAL DAMAGE SHALL OCCUR | | | | | | | | | |
| | | CAPACITANCE | CHARACTERISTIC | CAP. CHANGE | | | | | | | | |
| | | | CLASS I | WITHIN ±2.5% OR ±0.25 pF WHICHEVER IS LARGER | | | | | | | | |
| | | | CLASS II | X | WITHIN ±7.5% | | | | | | | |
| | | | | Y | WITHIN ±20% | | | | | | | |
| | | QCLASS I | 30 pF AND OVER: Q 1000 LESS THAN 30 pF: Q 400 + 20xC | | | | | | | | | |
| | | Tan CLASS II | TO SATISFY THE SPECIFIED INITIAL VALUE | | | | | | | | | |
| | | INSULATION RESISTANCE | TO SATISFY THE SPECIFIED INITIAL VALUE | | | | | | | | | |
| WITHSTANDING VOLTAGE | TO SATISFY THE SPECIFIED INITIAL VALUE | | | | | | | | | | | |
| 13 | VIBRATION TEST | APPEARANCE | NO MECHANICAL DAMAGE SHALL OCCUR | | | | | | | | | |
| | | CAPACITANCE | CHARACTERISTIC | CAP. CHANGE | | | | | | | | |
| | | | CLASS I | WITHIN ±2.5% OR ±0.25 pF WHICHEVER IS LARGER | | | | | | | | |
| | | | CLASS II | X | WITHIN ±5% | | | | | | | |
| | | | | Y | WITHIN ±20% | | | | | | | |
| | | QCLASS I | 30 pF AND OVER: Q 1000 LESS THAN 30 pF: Q 400 + 20xC | | | | | | | | | |
| | | Tan CLASS II | TO SATISFY THE SPECIFIED INITIAL VALUE | | | | | | | | | |
| | | INSULATION RESISTANCE | TO SATISFY THE SPECIFIED INITIAL VALUE | | | | | | | | | |
| | | | <p>DIP : SOLDER TEMPERATURE OF 270± 5 °C DIP TIME :10±1 SEC. EACH TERMINATION SHALL BE FULLY IMMERSSED AND PREHEATED AS FOLLOWING:</p> <table border="1"> <thead> <tr> <th>STEP</th> <th>TEMP. (°C)</th> <th>TIME (SEC.)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>80-100</td> <td>60</td> </tr> <tr> <td>2</td> <td>150-180</td> <td>60</td> </tr> </tbody> </table> <p>MEASURE AT ROOM TEMP. AFTER COOLING FOR CLASS I : 24 ± 2 HOURS CLASS II : 48 ± 4 HOURS</p> | STEP | TEMP. (°C) | TIME (SEC.) | 1 | 80-100 | 60 | 2 | 150-180 | 60 |
| STEP | TEMP. (°C) | TIME (SEC.) | | | | | | | | | | |
| 1 | 80-100 | 60 | | | | | | | | | | |
| 2 | 150-180 | 60 | | | | | | | | | | |
| | | | <p>THE CAPACITOR SHALL BE SUBJECTED TO A HARMONIC MOTION HAVING A TOTAL AMPLITUDE of 1.5mm</p> <p>THE ENTIRE FREQUENCY RANGE, FROM 10 TO 55Hz AND RETURN TO 10Hz SHALL BE TRAVERSED IN 1 MINUTE.</p> <p>THIS CYCLE SHALL BE PERFORMED 2 HOURS IN EACH THREE MUTUALLY PERPENDICULAR DIRECTION, FOR TOTAL PERIOD of 6 HOURS.</p> | | | | | | | | | |

ENVIRONMENTAL CHARACTERISTICS

| NO | ITEM | PERFORMANCE | TEST CONDITION | | | |
|-----------------------|---|---|---|---|-------------------|--|
| 14 | APPEARANCE | NO MECHANICAL DAMAGE SHALL OCCUR | TEMPERATURE : 40±2 °C RELATIVE HUMIDITY: 90-95 %RH TEST TIME : 500 +12/-0 Hr. MEASURE AT ROOM TEMPERATURE AFTER COOLING FOR CLASS I : 24±2 Hr. CLASS II : 48±4 Hr. SEE (FIG.3) | | | |
| | CAPACITANCE | CHARACTERISTIC | | CAPACITANCE CHANGE | | |
| | | CLASS I | | WITHIN ±5% OR±0.5pF WHICHEVER IS LARGER | | |
| | | CLASS II | | X | WITHIN ±12.5% | |
| | | | | Y | WITHIN ±30% | |
| | QCLASS I | 30pF AND OVER : Q 350 10 - 30pF : Q 275 + 2.5xC LESS THAN 10pF : Q 200 + 10xC | | | | |
| | DISSIPATION FACTOR (Tanθ CLASS II) | X7R, X6S, X5R | | | | |
| | | Rated Voltage | | D.F. | Exception of D.F. | |
| | | ≥50V | | ≤2.5% | ≤3% | 0201 (50V); 0603≥0.047uF 0805≥0.22uF; 1206≥0.47uF |
| | | | | | ≤5% | 0603≥1uF; 0805≥1uF; 1206≥4.7uF; 1210≥4.7uF |
| 25V | | ≤2.5% | ≤5% | 0201≥0.01uF; 0805≥1uF; 1210≥4.7uF | | |
| | | | ≤10% | 0402≥0.10uF; 0603≥0.33uF; 0805≥2.2uF 1206≥4.7uF; 1210≥22uF | | |
| 16V | | ≤3.5% | ≤5% | 0201≥0.01uF; 0402≥0.033uF; 0805≥0.68uF; 1206≥2.2uF; 1210≥4.7uF | | |
| | | | ≤10% | 0402≥0.47uF; 0603≥0.68uF; 0805≥2.2uF; 1206≥4.7uF; 1210≥22uF | | |
| 10V | | ≤5% | ≤10% | 0402≥0.33uF; 0603≥0.33uF; 0805≥2.2uF; 1206≥2.2uF; 1210≥22uF | | |
| 6.3V | | ≤10% | | | | |
| Y5V, Z5U | | | | | | |
| Rated Voltage | D.F. | Exception of D.F. | | | | |
| ≥50V | ≤5% | ≤9% | 0603≥0.1uF; 0805≥0.47uF; 1206≥4.7uF; | | | |
| 25V | ≤5% | ≤9% | 0402≥0.047uF; 0603≥0.1uF; 0805≥0.33uF; 1206≥1uF; 1210≥4.7uF | | | |
| 16V | ≤9% | ≤12.5% | 0603≥2.2uF; 0805≥3.3uF; 1206≥10uF; 1210≥22uF; 1812≥47uF | | | |
| 10V | ≤12.5% | ≤16% | 0603≥2.2uF; 0805≥3.3uF; 1206≥4.7uF; 1210≥10uF; 1812≥47uF | | | |
| 6.3V | ≤16% | | | | | |
| INSULATION RESISTANCE | MINIMUM INSULATION RESISTANCE: 1,000M OR 50M µF PRODUCT WHICHEVER IS SMALLER | | | | | |

ENVIRONMENTAL CHARACTERISTICS

| NO | ITEM | PERFORMANCE | TEST CONDITION | | | |
|-----------------------|---|--|---|---|-------------------|--|
| 15 | APPEARANCE | NO MECHANICAL DAMAGE SHALL OCCUR | APPLIED VOLTAGE: RATED VOLTAGE TEMPERATURE : 40±2 °C RELATIVE HUMIDITY: 90-95%RH TEST TIME : 500 +12/-0 Hr. CURRENT APPLIED: 50mA MAX. MEASURING AT ROOM TEMPERATURE AFTER COOLING FOR CLASS I : 24±2 Hr. CLASS II : 48±4 Hr. SEE (FIG.3) | | | |
| | CAPACITANCE | CHARACTERISTIC | | CAPACITANCE CHANGE | | |
| | | CLASS I | | WITHIN ±7.5% OR±0.75pF WHICHEVER IS LARGER | | |
| | | CLASS II | | X | WITHIN ±12.5% | |
| | Y | | | WITHIN ±30% | | |
| | QCLASS I | 30pF AND OVER : Q 200 30pF AND BELOW : Q 100 + 10/3xC | | | | |
| | DISSIPATION FACTOR (Tanθ CLASS II) | X7R, X6S, X5R | | | | |
| | | Rated Voltage | | D.F. | Exception of D.F. | |
| | | ≥50V | | ≤2.5% | ≤3% | 0201 (50V); 0603≥0.047uF 0805≥0.22uF; 1206≥0.47uF |
| | | | | | ≤5% | 0603≥1uF; 0805≥1uF; 1206≥4.7uF; 1210≥4.7uF |
| 25V | | ≤2.5% | ≤5% | 0201≥0.01uF; 0805≥1uF; 1210≥4.7uF | | |
| | | | ≤10% | 0402≥0.10uF; 0603≥0.33uF; 0805≥2.2uF 1206≥4.7uF; 1210≥22uF | | |
| 16V | | ≤3.5% | ≤5% | 0201≥0.01uF; 0402≥0.033uF; 0805≥0.68uF; 1206≥2.2uF; 1210≥4.7uF | | |
| | | | ≤10% | 0402≥0.47uF; 0603≥0.68uF; 0805≥2.2uF; 1206≥4.7uF; 1210≥22uF | | |
| 10V | | ≤5% | ≤10% | 0402≥0.33uF; 0603≥0.33uF; 0805≥2.2uF; 1206≥2.2uF; 1210≥22uF | | |
| | | | | | | |
| 6.3V | | ≤10% | | | | |
| Y5V, Z5U | | | | | | |
| Rated Voltage | D.F. | Exception of D.F. | | | | |
| ≥50V | ≤5% | ≤9% | 0603≥0.1uF; 0805≥0.47uF; 1206≥4.7uF; | | | |
| 25V | ≤5% | ≤9% | 0402≥0.047uF; 0603≥0.1uF; 0805≥0.33uF; 1206≥1uF; 1210≥4.7uF | | | |
| | | ≤12.5% | 0603≥2.2uF; 0805≥3.3uF; 1206≥10uF; 1210≥22uF; 1812≥47uF | | | |
| 10V | ≤12.5% | ≤16% | 0603≥2.2uF; 0805≥3.3uF; 1206≥4.7uF; 1210≥10uF; 1812≥47uF | | | |
| | | | | | | |
| 6.3V | ≤16% | | | | | |
| INSULATION RESISTANCE | MINIMUM INSULATION RESISTANCE: 100 M OR 25M μF PRODUCT, WHICHEVER IS SMALLER | | | | | |

ENVIRONMENTAL CHARACTERISTICS

| NO | ITEM | PERFORMANCE | TEST CONDITION | | | |
|--------------------------|---|---|--|--|---|--|
| 16 | APPEARANCE | NO MECHANICAL DAMAGE SHALL OCCUR | APPLIED VOLTAGE: 200% OF RATED VOLTAGE TEST TIME : 1000 +48/-0 Hr. CURRENT APPLIED: 50mA MAX. | | | |
| | CAPACITANCE | CHARACTERISTIC | | CAP. CHANGE | | |
| | | CLASS I | | WITHIN ±3% OR ±0.3pF, WHICHEVER IS LARGER | | |
| | | CLASS II | | X | WITHIN ±12.5% | |
| | Y | | WITHIN ±30% | | | |
| | QCLASS I | 30pF AND OVER : Q 350 10 - 30 pF : Q 275 + 2.5xC LESS THAN 10pF :Q 200 + 10xC | CLASS I 125 ±3 °C | | | |
| | DISSIPATION FACTOR (Tanθ CLASS II) | X7R, X6S, X5R | | (INITIAL VALUE MEASUREMENT) FOR CLASS II CAPACITORS, 200 % OF RATED VOLTAGE SHALL BE APPLIED FOR 1 HOUR AT THE MAXIMUM OPERATING TEMPERATURE, THEN KEEP IT AT ROOM TEMPERATURE FOR 48 ±4 HRS. SEE (FIG.3) | | |
| | | Rated Voltage | D.F. | | Exception of D.F. | |
| | | ≥50V | ≤2.5% | | ≤3% | 0201 (50V); 0603≥0.047uF 0805≥0.22uF; 1206≥0.47uF |
| | | | | | ≤5% | 0603≥1uF; 0805≥1uF; 1206≥4.7uF; 1210≥4.7uF |
| 25V | | ≤2.5% | ≤5% | | 0201≥0.01uF; 0805≥1uF; 1210≥4.7uF | |
| | | | ≤10% | | 0402≥0.10uF; 0603≥0.33uF; 0805≥2.2uF 1206≥4.7uF; 1210≥22uF | |
| 16V | | ≤3.5% | ≤5% | | 0201≥0.01uF; 0402≥0.033uF; 0805≥0.68uF; 1206≥2.2uF; 1210≥4.7uF | |
| | | | ≤10% | | 0402≥0.47uF; 0603≥0.68uF; 0805≥2.2uF; 1206≥4.7uF; 1210≥22uF | |
| 10V | | ≤5% | ≤10% | | 0402≥0.33uF; 0603≥0.33uF; 0805≥2.2uF; 1206≥2.2uF; 1210≥22uF | |
| 6.3V | | ≤10% | | | | |
| Y5V, Z5U | | | | | | |
| Rated Voltage | D.F. | Exception of D.F. | | | | |
| ≥50V | ≤5% | ≤9% | 0603≥0.1uF; 0805≥0.47uF; 1206≥4.7uF; | | | |
| 25V | ≤5% | ≤9% | 0402≥0.047uF; 0603≥0.1uF; 0805≥0.33uF; 1206≥1uF; 1210≥4.7uF | | | |
| 16V | ≤9% | ≤12.5% | 0603≥2.2uF; 0805≥3.3uF; 1206≥10uF; 1210≥22uF; 1812≥47uF | | | |
| 10V | ≤12.5% | ≤16% | 0603≥2.2uF; 0805≥3.3uF; 1206≥4.7uF; 1210≥10uF; 1812≥47uF | | | |
| 6.3V | ≤16% | | | | | |
| INSULATION RESISTANCE | MINIMUM INSULATION RESISTANCE: 1,000M OR 50M μF PRODUCT WHICHEVER IS SMALLER | | | | | |

ENVIRONMENTAL CHARACTERISTICS

| NO | ITEM | PERFORMANCE | TEST CONDITION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------|------------------------|--|--|---|-------------------|--|------|-------|-----|--|-----|--|-----|-------|-----|-----------------------------------|------|---|-----|-------|-----|---|------|--|-----|-----|------|--|------|------|--|--|---------------|------|-------------------|--|------|-----|-----|--------------------------------------|-----|-----|-----|--|-----|-----|--------|--|-----|--------|------|---|------|------|--|--|--|------|-----------|------------|---|------------------------|----|---|----|-------|---|------------------------|----|---|----|-------|
| 17 | TEMPERATURE CYCLE | <p>APPEARANCE: NO MECHANICAL DAMAGE SHALL OCCUR</p> <p>CHARACTERISTIC: CAP. CHANGE</p> <p>CLASS I: WITHIN ±2.5% OR ±0.25pF WHICHEVER IS LARGER</p> <p>CLASS II X: WITHIN ±7.5%</p> <p>CLASS II Y: WITHIN ±20%</p> <p>QCLASS I: 30 pF AND OVER : Q 1000 LESS THAN 30pF:Q 400 +20x C</p> <p>X7R, X6S, X5R</p> <table border="1"> <thead> <tr> <th>Rated Voltage</th> <th>D.F.</th> <th colspan="2">Exception of D.F.</th> </tr> </thead> <tbody> <tr> <td rowspan="2">≥50V</td> <td rowspan="2">≤2.5%</td> <td>≤3%</td> <td>0201 (50V); 0603≥0.047uF 0805≥0.22uF; 1206≥0.47uF</td> </tr> <tr> <td>≤5%</td> <td>0603≥1uF; 0805≥1uF; 1206≥4.7uF; 1210≥4.7uF</td> </tr> <tr> <td rowspan="2">25V</td> <td rowspan="2">≤2.5%</td> <td>≤5%</td> <td>0201≥0.01uF; 0805≥1uF; 1210≥4.7uF</td> </tr> <tr> <td>≤10%</td> <td>0402≥0.10uF; 0603≥0.33uF; 0805≥2.2uF 1206≥4.7uF; 1210≥22uF</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">≤3.5%</td> <td>≤5%</td> <td>0201≥0.01uF; 0402≥0.033uF; 0805≥0.68uF; 1206≥2.2uF; 1210≥4.7uF</td> </tr> <tr> <td>≤10%</td> <td>0402≥0.47uF; 0603≥0.68uF; 0805≥2.2uF; 1206≥4.7uF; 1210≥22uF</td> </tr> <tr> <td>10V</td> <td>≤5%</td> <td>≤10%</td> <td>0402≥0.33uF; 0603≥0.33uF; 0805≥2.2uF; 1206≥2.2uF; 1210≥22uF</td> </tr> <tr> <td>6.3V</td> <td>≤10%</td> <td></td> <td></td> </tr> </tbody> </table> <p>Y5V, Z5U</p> <table border="1"> <thead> <tr> <th>Rated Voltage</th> <th>D.F.</th> <th colspan="2">Exception of D.F.</th> </tr> </thead> <tbody> <tr> <td>≥50V</td> <td>≤5%</td> <td>≤9%</td> <td>0603≥0.1uF; 0805≥0.47uF; 1206≥4.7uF;</td> </tr> <tr> <td>25V</td> <td>≤5%</td> <td>≤9%</td> <td>0402≥0.047uF; 0603≥0.1uF; 0805≥0.33uF; 1206≥1uF; 1210≥4.7uF</td> </tr> <tr> <td>16V</td> <td>≤9%</td> <td>≤12.5%</td> <td>0603≥2.2uF; 0805≥3.3uF; 1206≥10uF; 1210≥22uF; 1812≥47uF</td> </tr> <tr> <td>10V</td> <td>≤12.5%</td> <td>≤16%</td> <td>0603≥2.2uF; 0805≥3.3uF; 1206≥4.7uF; 1210≥10uF; 1812≥47uF</td> </tr> <tr> <td>6.3V</td> <td>≤16%</td> <td></td> <td></td> </tr> </tbody> </table> <p>INSULATION RESISTANCE: TO SATISFY THE SPECIFIED INITIAL VALUE</p> | Rated Voltage | D.F. | Exception of D.F. | | ≥50V | ≤2.5% | ≤3% | 0201 (50V); 0603≥0.047uF 0805≥0.22uF; 1206≥0.47uF | ≤5% | 0603≥1uF; 0805≥1uF; 1206≥4.7uF; 1210≥4.7uF | 25V | ≤2.5% | ≤5% | 0201≥0.01uF; 0805≥1uF; 1210≥4.7uF | ≤10% | 0402≥0.10uF; 0603≥0.33uF; 0805≥2.2uF 1206≥4.7uF; 1210≥22uF | 16V | ≤3.5% | ≤5% | 0201≥0.01uF; 0402≥0.033uF; 0805≥0.68uF; 1206≥2.2uF; 1210≥4.7uF | ≤10% | 0402≥0.47uF; 0603≥0.68uF; 0805≥2.2uF; 1206≥4.7uF; 1210≥22uF | 10V | ≤5% | ≤10% | 0402≥0.33uF; 0603≥0.33uF; 0805≥2.2uF; 1206≥2.2uF; 1210≥22uF | 6.3V | ≤10% | | | Rated Voltage | D.F. | Exception of D.F. | | ≥50V | ≤5% | ≤9% | 0603≥0.1uF; 0805≥0.47uF; 1206≥4.7uF; | 25V | ≤5% | ≤9% | 0402≥0.047uF; 0603≥0.1uF; 0805≥0.33uF; 1206≥1uF; 1210≥4.7uF | 16V | ≤9% | ≤12.5% | 0603≥2.2uF; 0805≥3.3uF; 1206≥10uF; 1210≥22uF; 1812≥47uF | 10V | ≤12.5% | ≤16% | 0603≥2.2uF; 0805≥3.3uF; 1206≥4.7uF; 1210≥10uF; 1812≥47uF | 6.3V | ≤16% | | | <p>CAPACITORS SHALL BE SUBJECTED TO FIVE CYCLES OF THE TEMPERATURE CYCLE AS FOLLOWING</p> <table border="1"> <thead> <tr> <th>STEP</th> <th>TEMP.(°C)</th> <th>TIME (MIN)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>MIN. RATED TEMP. +0/-3</td> <td>30</td> </tr> <tr> <td>2</td> <td>25</td> <td>2 - 3</td> </tr> <tr> <td>3</td> <td>MAX. RATED TEMP. +3/-0</td> <td>30</td> </tr> <tr> <td>4</td> <td>25</td> <td>2 - 3</td> </tr> </tbody> </table> <p>MEASURE AT ROOM TEMPERATURE AFTER COOLING FOR CLASS I : 24±2 Hr. CLASS II : 48±4 Hr. SEE(FIG.3)</p> | STEP | TEMP.(°C) | TIME (MIN) | 1 | MIN. RATED TEMP. +0/-3 | 30 | 2 | 25 | 2 - 3 | 3 | MAX. RATED TEMP. +3/-0 | 30 | 4 | 25 | 2 - 3 |
| | Rated Voltage | D.F. | Exception of D.F. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | ≥50V | ≤2.5% | ≤3% | 0201 (50V); 0603≥0.047uF 0805≥0.22uF; 1206≥0.47uF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | ≤5% | 0603≥1uF; 0805≥1uF; 1206≥4.7uF; 1210≥4.7uF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 25V | ≤2.5% | ≤5% | 0201≥0.01uF; 0805≥1uF; 1210≥4.7uF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | ≤10% | 0402≥0.10uF; 0603≥0.33uF; 0805≥2.2uF 1206≥4.7uF; 1210≥22uF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 16V | ≤3.5% | ≤5% | 0201≥0.01uF; 0402≥0.033uF; 0805≥0.68uF; 1206≥2.2uF; 1210≥4.7uF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | ≤10% | 0402≥0.47uF; 0603≥0.68uF; 0805≥2.2uF; 1206≥4.7uF; 1210≥22uF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 10V | ≤5% | ≤10% | 0402≥0.33uF; 0603≥0.33uF; 0805≥2.2uF; 1206≥2.2uF; 1210≥22uF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 6.3V | ≤10% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Rated Voltage | D.F. | Exception of D.F. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ≥50V | ≤5% | ≤9% | 0603≥0.1uF; 0805≥0.47uF; 1206≥4.7uF; | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 25V | ≤5% | ≤9% | 0402≥0.047uF; 0603≥0.1uF; 0805≥0.33uF; 1206≥1uF; 1210≥4.7uF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16V | ≤9% | ≤12.5% | 0603≥2.2uF; 0805≥3.3uF; 1206≥10uF; 1210≥22uF; 1812≥47uF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10V | ≤12.5% | ≤16% | 0603≥2.2uF; 0805≥3.3uF; 1206≥4.7uF; 1210≥10uF; 1812≥47uF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6.3V | ≤16% | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| STEP | TEMP.(°C) | TIME (MIN) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | MIN. RATED TEMP. +0/-3 | 30 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | 25 | 2 - 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | MAX. RATED TEMP. +3/-0 | 30 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | 25 | 2 - 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

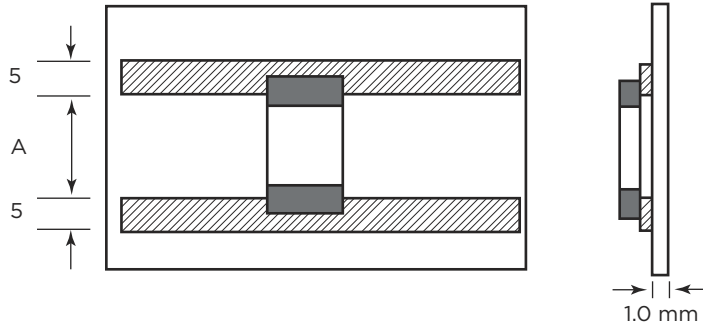
ENVIRONMENTAL CHARACTERISTICS

| NO | ITEM | TEST CONDITION | REQUIREMENTS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------|--|--|--|---------------|---------------|-------------|------|-------------|------|---------|------|---------|------|-----|------|---------|----------|---------|-----|-----------|---------|----------|---------|-------------|-----|---------|-----|---------|------|-----------------|----|--------|-----------|---------|-------------|-----|---------|-----|-----|---------|------|-----------------|----|--------|------|--------|----------|--------|---------|----------|--------|-----|--|--------|------|-------------|-------|--------|------|-------------|-----|--------|-----|------|----------|---|---------------|------|----------------------|--|-------|-----|-----|-------------|-------|--|------|------------------------|-----|-----|-----|---|------|-------------------------|-----|-----|------|---|------|---|-----|-----|------|------------------------------------|------|-------------|------|--|-----|-----|------|--|------|---|-----|-------|------|---|------|--|------|------|------|---|----|------|---|---|
| 18 | HIGH TEMPERATURE Load-Endurance (Life Testing) | <p>*Test Temperature: COG, X7R/X7S: 125±3°C X5R, Y5V: 85±3°C Test time: 1000+24/-0 hrs. Endurance or Life Test Voltage (RVLL) * All components are tested at 100% of rated voltage (Vr) for the below range:</p> <table border="1"> <thead> <tr> <th>SIZE</th> <th>DIELECTRIC</th> <th>RATED VOLTAGE</th> <th>CAPACITANCE</th> </tr> </thead> <tbody> <tr> <td rowspan="2">0201</td> <td rowspan="2">X5R/X7R/X6S</td> <td>≤10V</td> <td>C≥0.1μF</td> </tr> <tr> <td>≥16V</td> <td>C>0.1μF</td> </tr> <tr> <td rowspan="6">0402</td> <td rowspan="2">X5R</td> <td>≤16V</td> <td>C>0.1μF</td> </tr> <tr> <td>25V, 50V</td> <td>C≥0.1μF</td> </tr> <tr> <td rowspan="2">X6S</td> <td>6.3V, 10V</td> <td>C>0.1μF</td> </tr> <tr> <td>16V, 25V</td> <td>C≥0.1μF</td> </tr> <tr> <td rowspan="2">X7R/X7S/Y5V</td> <td>25V</td> <td>C≥0.1μF</td> </tr> <tr> <td>35V</td> <td>C≥0.1μF</td> </tr> <tr> <td rowspan="3">0603</td> <td rowspan="2">X5R/X7R/X6S/X7S</td> <td>4V</td> <td>C≥22μF</td> </tr> <tr> <td>6.3V, 10V</td> <td>C≥4.7μF</td> </tr> <tr> <td>X5R/X7R/X6S</td> <td>25V</td> <td>C≥0.1μF</td> </tr> <tr> <td>X7R</td> <td>35V</td> <td>C≥0.1μF</td> </tr> <tr> <td rowspan="4">0805</td> <td rowspan="3">X5R/X7R/X6S/X7S</td> <td>4V</td> <td>C≥47μF</td> </tr> <tr> <td>6.3V</td> <td>C≥22μF</td> </tr> <tr> <td>10V, 50V</td> <td>C≥10μF</td> </tr> <tr> <td>X7R/X6S</td> <td>16V, 25V</td> <td>C≥10μF</td> </tr> <tr> <td>X5R</td> <td></td> <td>C≥22μF</td> </tr> <tr> <td>1206</td> <td>X5R/X7R/X6S</td> <td>≤6.3V</td> <td>C≥47μF</td> </tr> <tr> <td rowspan="2">1210</td> <td rowspan="2">X5R/X7R/X6S</td> <td>16V</td> <td>C≥47μF</td> </tr> <tr> <td>X7R</td> <td>100V</td> <td>C≥43.3μF</td> </tr> </tbody> </table> <p>*Any items outside this range or with a different dielectric will hold the following test conditions: (1) ≤ 6.3V or C ≥ 10μF : 150% of rated voltage. (2) 10V ≤ Vr ≤ 100V: 200% of rated voltage.</p> | SIZE | DIELECTRIC | RATED VOLTAGE | CAPACITANCE | 0201 | X5R/X7R/X6S | ≤10V | C≥0.1μF | ≥16V | C>0.1μF | 0402 | X5R | ≤16V | C>0.1μF | 25V, 50V | C≥0.1μF | X6S | 6.3V, 10V | C>0.1μF | 16V, 25V | C≥0.1μF | X7R/X7S/Y5V | 25V | C≥0.1μF | 35V | C≥0.1μF | 0603 | X5R/X7R/X6S/X7S | 4V | C≥22μF | 6.3V, 10V | C≥4.7μF | X5R/X7R/X6S | 25V | C≥0.1μF | X7R | 35V | C≥0.1μF | 0805 | X5R/X7R/X6S/X7S | 4V | C≥47μF | 6.3V | C≥22μF | 10V, 50V | C≥10μF | X7R/X6S | 16V, 25V | C≥10μF | X5R | | C≥22μF | 1206 | X5R/X7R/X6S | ≤6.3V | C≥47μF | 1210 | X5R/X7R/X6S | 16V | C≥47μF | X7R | 100V | C≥43.3μF | <p>• No remarkable damage. CAP CHANGE: COG: ±3.0% or ±0.3pF whichever is larger X7R, X5R, X6S, X7S: ≥10V**, within ±12.5%; ≤6.3V within ±25%; **10V: 0603≥4.7μF; 0402≥1.0μF; 0201≥0.1μF, within ±25% Y5V≥10V, within ±30%; ≤6.3V, within +30/-40% Q/D.F. VALUE: COG: More than 30pF, Q≥350 10pF≤30pF, Q≥275+2.5C Less than 10pF, Q≥200+10C</p> <p>X7R, X5R, X6S, X7S:</p> <table border="1"> <thead> <tr> <th>RATED VOLTAGE</th> <th>D.F.</th> <th colspan="2">EXCEPTIONS OF D.F. ≤</th> </tr> </thead> <tbody> <tr> <td rowspan="3">≥100V</td> <td rowspan="3">≤3%</td> <td>≤6%</td> <td>1206≥0.47μF</td> </tr> <tr> <td>≤7.5%</td> <td>0603≥0.068μF; 0805>0.1μF; 1206≥1μF; 1210≥2.2μF</td> </tr> <tr> <td>≤20%</td> <td>0805>2.2μF; 1210≤3.3μF</td> </tr> <tr> <td rowspan="2">50V</td> <td rowspan="2">≤3%</td> <td>≤6%</td> <td>0201(50V); 0603>0.047μF; 0805≥0.18μF; 1206≥0.47μF</td> </tr> <tr> <td>≤10%</td> <td>0201≥0.01μF; 1210≥3.3μF</td> </tr> <tr> <td rowspan="2">35V</td> <td rowspan="2">≤5%</td> <td>≤20%</td> <td>0402≥0.012μF; 0603>0.1μF; 0805≥1.0μF (0805/X7R>0.47μF); 1206≥2.2μF; 1210≥10μF</td> </tr> <tr> <td>≤20%</td> <td>0603≥1.0μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥10μF</td> </tr> <tr> <td rowspan="3">25V</td> <td rowspan="3">≤5%</td> <td>≤10%</td> <td>0201=0.01μF; 0805≥1.0μF; 1210≥10μF</td> </tr> <tr> <td>≤14%</td> <td>0603≥0.33μF</td> </tr> <tr> <td>≤15%</td> <td>0201>0.01μF; 0402>0.10μF (0402/X7R≥0.056μF); 0603>0.47μF; 0805≥2.2μF; 1206≥0.47μF; 1210≥22μF (1210/X5R≥10μF)</td> </tr> <tr> <td rowspan="2">16V</td> <td rowspan="2">≤5%</td> <td>≤10%</td> <td>0603≥0.15μF; 0805≥0.68μF; 1206≥2.2μF; 1210≥4.7μF</td> </tr> <tr> <td>≤15%</td> <td>0201≥0.01μF (0201/X7R≥0.022μF); 0402≥0.033μF 0603>0.47μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥22μF</td> </tr> <tr> <td rowspan="2">10V</td> <td rowspan="2">≤7.5%</td> <td>≤15%</td> <td>0201≥0.012μF; 0402≥0.22μF; 0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥22μF</td> </tr> <tr> <td>≤20%</td> <td>0201≥0.01μF; 0402≥1.0μF; 0603/X5R≥10μF; 01R5/X5R</td> </tr> <tr> <td>6.3V</td> <td>≤15%</td> <td>≤30%</td> <td>0201≥0.01μF; 0402≥1.0μF (0402/X6S≥0.47μF); 0603≥10μF; 0805≥4.7μF; 1206≥47μF; 1210≥100μF</td> </tr> <tr> <td>4V</td> <td>≤20%</td> <td>-</td> <td>-</td> </tr> </tbody> </table> | RATED VOLTAGE | D.F. | EXCEPTIONS OF D.F. ≤ | | ≥100V | ≤3% | ≤6% | 1206≥0.47μF | ≤7.5% | 0603≥0.068μF; 0805>0.1μF; 1206≥1μF; 1210≥2.2μF | ≤20% | 0805>2.2μF; 1210≤3.3μF | 50V | ≤3% | ≤6% | 0201(50V); 0603>0.047μF; 0805≥0.18μF; 1206≥0.47μF | ≤10% | 0201≥0.01μF; 1210≥3.3μF | 35V | ≤5% | ≤20% | 0402≥0.012μF; 0603>0.1μF; 0805≥1.0μF (0805/X7R>0.47μF); 1206≥2.2μF; 1210≥10μF | ≤20% | 0603≥1.0μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥10μF | 25V | ≤5% | ≤10% | 0201=0.01μF; 0805≥1.0μF; 1210≥10μF | ≤14% | 0603≥0.33μF | ≤15% | 0201>0.01μF; 0402>0.10μF (0402/X7R≥0.056μF); 0603>0.47μF; 0805≥2.2μF; 1206≥0.47μF; 1210≥22μF (1210/X5R≥10μF) | 16V | ≤5% | ≤10% | 0603≥0.15μF; 0805≥0.68μF; 1206≥2.2μF; 1210≥4.7μF | ≤15% | 0201≥0.01μF (0201/X7R≥0.022μF); 0402≥0.033μF 0603>0.47μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥22μF | 10V | ≤7.5% | ≤15% | 0201≥0.012μF; 0402≥0.22μF; 0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥22μF | ≤20% | 0201≥0.01μF; 0402≥1.0μF; 0603/X5R≥10μF; 01R5/X5R | 6.3V | ≤15% | ≤30% | 0201≥0.01μF; 0402≥1.0μF (0402/X6S≥0.47μF); 0603≥10μF; 0805≥4.7μF; 1206≥47μF; 1210≥100μF | 4V | ≤20% | - | - |
| | | SIZE | DIELECTRIC | RATED VOLTAGE | CAPACITANCE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 0201 | X5R/X7R/X6S | ≤10V | C≥0.1μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | ≥16V | C>0.1μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 0402 | X5R | ≤16V | C>0.1μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | 25V, 50V | C≥0.1μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | X6S | 6.3V, 10V | C>0.1μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | 16V, 25V | C≥0.1μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | X7R/X7S/Y5V | 25V | C≥0.1μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | 35V | C≥0.1μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 0603 | X5R/X7R/X6S/X7S | 4V | C≥22μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | 6.3V, 10V | C≥4.7μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | X5R/X7R/X6S | 25V | C≥0.1μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | X7R | 35V | C≥0.1μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 0805 | X5R/X7R/X6S/X7S | 4V | C≥47μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | 6.3V | C≥22μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | 10V, 50V | C≥10μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | X7R/X6S | 16V, 25V | C≥10μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| X5R | | C≥22μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1206 | X5R/X7R/X6S | ≤6.3V | C≥47μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1210 | X5R/X7R/X6S | 16V | C≥47μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | X7R | 100V | C≥43.3μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RATED VOLTAGE | D.F. | EXCEPTIONS OF D.F. ≤ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ≥100V | ≤3% | ≤6% | 1206≥0.47μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | ≤7.5% | 0603≥0.068μF; 0805>0.1μF; 1206≥1μF; 1210≥2.2μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | ≤20% | 0805>2.2μF; 1210≤3.3μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 50V | ≤3% | ≤6% | 0201(50V); 0603>0.047μF; 0805≥0.18μF; 1206≥0.47μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | ≤10% | 0201≥0.01μF; 1210≥3.3μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 35V | ≤5% | ≤20% | 0402≥0.012μF; 0603>0.1μF; 0805≥1.0μF (0805/X7R>0.47μF); 1206≥2.2μF; 1210≥10μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | ≤20% | 0603≥1.0μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥10μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 25V | ≤5% | ≤10% | 0201=0.01μF; 0805≥1.0μF; 1210≥10μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | ≤14% | 0603≥0.33μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | ≤15% | 0201>0.01μF; 0402>0.10μF (0402/X7R≥0.056μF); 0603>0.47μF; 0805≥2.2μF; 1206≥0.47μF; 1210≥22μF (1210/X5R≥10μF) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16V | ≤5% | ≤10% | 0603≥0.15μF; 0805≥0.68μF; 1206≥2.2μF; 1210≥4.7μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | ≤15% | 0201≥0.01μF (0201/X7R≥0.022μF); 0402≥0.033μF 0603>0.47μF; 0805≥2.2μF; 1206≥4.7μF; 1210≥22μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10V | ≤7.5% | ≤15% | 0201≥0.012μF; 0402≥0.22μF; 0603≥0.33μF; 0805≥2.2μF; 1206≥2.2μF; 1210≥22μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | ≤20% | 0201≥0.01μF; 0402≥1.0μF; 0603/X5R≥10μF; 01R5/X5R | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6.3V | ≤15% | ≤30% | 0201≥0.01μF; 0402≥1.0μF (0402/X6S≥0.47μF); 0603≥10μF; 0805≥4.7μF; 1206≥47μF; 1210≥100μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4V | ≤20% | - | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

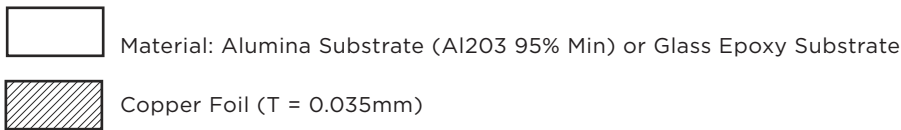
ENVIRONMENTAL CHARACTERISTICS

| NO | ITEM | TEST CONDITION | REQUIREMENTS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---|--|--|---------------------|-----------------------|---|---|---|---|---|---|--|--|-----|-------------|---|---|-----|--------------|-------------|---|-------------|---|-----------------------------|-------------|---------------|--|-------------|-----------------------------|--------------------------------|---------------|-------------|---|-----|-------------|-------------|-----------------------------|------|-------------|---|---|
| 18 | HIGH TEMPERATURE Load-Endurance (Life Testing) | (3) 150% of rated voltage for below range. | <ul style="list-style-type: none"> No remarkable damage. CAP CHANGE: COG: $\pm 3.0\%$ or $\pm 0.3\text{pF}$ whichever is larger X7R, X5R, X6S, X7S: $\geq 10\text{V}^{**}$, within $\pm 12.5\%$; $\leq 6.3\text{V}$ within $\pm 25\%$ **10V: 0603$\geq 4.7\mu\text{F}$; 0402$\geq 1.0\mu\text{F}$; 0201$\geq 0.1\mu\text{F}$, within $\pm 25\%$ Y5V$\geq 10\text{V}$, within $\pm 30\%$; $\leq 6.3\text{V}$, within $+30\%/-40\%$ Q/D.F. VALUE: COG: More than 30pF, Q≥ 350 10pF$\leq 30\text{pF}$, Q$\geq 275+2.5\text{C}$ Less than 10pF, Q$\geq 200+10\text{C}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | SIZE | | DIELECTRIC | RATED VOLTAGE | CAPACITANCE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 0201 | | X5R/X6S | 16V, 25V | C $\geq 0.1\mu\text{F}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | X7R | 16V | C $\geq 0.022\mu\text{F}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 0402 | | X7R/X5R/X6S | 50V | C $\geq 0.01\mu\text{F}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | 10-25V | C $\geq 0.22\mu\text{F}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | Y5V | 16V | C $\geq 0.47\mu\text{F}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | C $\geq 0.22\mu\text{F}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 0603 | | X7S | 50-100V | C $> 0.22\mu\text{F}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | 50V | C $> 0.1\mu\text{F}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | X7R | 25V | C=1.0 μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | X5R | 50V | C $\geq 1.0\mu\text{F}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | X5R/X7R/ X6S/X7S | 10V, 16V | C $\geq 1.0\mu\text{F}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 0805 | | X5R/X7R/ X6S/X7S | 100V | C $\geq 0.47\mu\text{F}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | 50V | C $\geq 0.68\mu\text{F}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | 35V | C $\geq 2.2\mu\text{F}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | 10-25V | C $\geq 4.7\mu\text{F}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | Y5V | 16V | C $\geq 4.7\mu\text{F}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| C $\geq 2.2\mu\text{F}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1206 | X7R | 100V | C $\geq 1.0\mu\text{F}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 50V | C=4.7 μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | X5R/X6S/X7S | 100V | C $> 1.0\mu\text{F}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | 50V | C=4.7 μF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1210 | X5R/X7R/ X6S/X7S | 50-100V | C $\geq 2.2\mu\text{F}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1825 2220 2225 | X7R | 100-250V | C $\geq 1.0\mu\text{F}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>* Before initial measurement (Class II only): To apply de-aging at 150 °C for 1 hr then set for 24\pm2 hrs at room temp</p> <p>* Cap./DF(Q)/I.R. Measurement to be made after de-aging at 150 °C for 1hr then set for 24\pm2hrs at room temp.</p> <p>** De-rating conditions:</p> | | | <p>Y5V:</p> <table border="1"> <thead> <tr> <th>RATED VOLTAGE</th> <th>D.F.</th> <th colspan="2">EXCEPTIONS OF D.F. \leq</th> </tr> </thead> <tbody> <tr> <td rowspan="2">$\geq 0\text{V}$</td> <td rowspan="2">$\leq 7.5\%$</td> <td>$\leq 10\%$</td> <td>0603$\geq 0.1\mu\text{F}$; 0805$\geq 0.47\mu\text{F}$; 1206$\geq 4.7\mu\text{F}$</td> </tr> <tr> <td>$\leq 20\%$</td> <td>1210$\geq 6.8\mu\text{F}$</td> </tr> <tr> <td>35V</td> <td>$\leq 10\%$</td> <td>-</td> <td>-</td> </tr> <tr> <td rowspan="2">25V</td> <td rowspan="2">$\leq 7.5\%$</td> <td>$\leq 10\%$</td> <td>0402$\geq 0.047\mu\text{F}$; 0603$\geq 0.1\mu\text{F}$; 0805$\geq 0.33\mu\text{F}$; 1206$\geq 1.0\mu\text{F}$; 1210$\geq 4.7\mu\text{F}$</td> </tr> <tr> <td>$\leq 15\%$</td> <td>0402$\geq 0.068\mu\text{F}$; 0603$\geq 0.47\mu\text{F}$; 1206$\geq 4.7\mu\text{F}$; 1210$\geq 22\mu\text{F}$</td> </tr> <tr> <td rowspan="2">16V (C$< 1.0\mu\text{F}$)</td> <td rowspan="2">$\leq 10\%$</td> <td>$\leq 12.5\%$</td> <td>0402$\geq 0.068\mu\text{F}$; 0603$\geq 0.68\mu\text{F}$</td> </tr> <tr> <td>$\leq 20\%$</td> <td>0402$\geq 0.22\mu\text{F}$</td> </tr> <tr> <td>16V (C$\geq 1.0\mu\text{F}$)</td> <td>$\leq 12.5\%$</td> <td>$\leq 20\%$</td> <td>0603$\geq 2.2\mu\text{F}$; 0805$\geq 3.3\mu\text{F}$; 1206$\geq 10\mu\text{F}$; 1210$\geq 22\mu\text{F}$; 1812$\geq 47\mu\text{F}$</td> </tr> <tr> <td>10V</td> <td>$\leq 20\%$</td> <td>$\leq 30\%$</td> <td>0402$\geq 0.47\mu\text{F}$</td> </tr> <tr> <td>6.3V</td> <td>$\leq 30\%$</td> <td>-</td> <td>-</td> </tr> </tbody> </table> | RATED VOLTAGE | D.F. | EXCEPTIONS OF D.F. \leq | | $\geq 0\text{V}$ | $\leq 7.5\%$ | $\leq 10\%$ | 0603 $\geq 0.1\mu\text{F}$; 0805 $\geq 0.47\mu\text{F}$; 1206 $\geq 4.7\mu\text{F}$ | $\leq 20\%$ | 1210 $\geq 6.8\mu\text{F}$ | 35V | $\leq 10\%$ | - | - | 25V | $\leq 7.5\%$ | $\leq 10\%$ | 0402 $\geq 0.047\mu\text{F}$; 0603 $\geq 0.1\mu\text{F}$; 0805 $\geq 0.33\mu\text{F}$; 1206 $\geq 1.0\mu\text{F}$; 1210 $\geq 4.7\mu\text{F}$ | $\leq 15\%$ | 0402 $\geq 0.068\mu\text{F}$; 0603 $\geq 0.47\mu\text{F}$; 1206 $\geq 4.7\mu\text{F}$; 1210 $\geq 22\mu\text{F}$ | 16V (C $< 1.0\mu\text{F}$) | $\leq 10\%$ | $\leq 12.5\%$ | 0402 $\geq 0.068\mu\text{F}$; 0603 $\geq 0.68\mu\text{F}$ | $\leq 20\%$ | 0402 $\geq 0.22\mu\text{F}$ | 16V (C $\geq 1.0\mu\text{F}$) | $\leq 12.5\%$ | $\leq 20\%$ | 0603 $\geq 2.2\mu\text{F}$; 0805 $\geq 3.3\mu\text{F}$; 1206 $\geq 10\mu\text{F}$; 1210 $\geq 22\mu\text{F}$; 1812 $\geq 47\mu\text{F}$ | 10V | $\leq 20\%$ | $\leq 30\%$ | 0402 $\geq 0.47\mu\text{F}$ | 6.3V | $\leq 30\%$ | - | - |
| RATED VOLTAGE | D.F. | EXCEPTIONS OF D.F. \leq | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| $\geq 0\text{V}$ | $\leq 7.5\%$ | $\leq 10\%$ | 0603 $\geq 0.1\mu\text{F}$; 0805 $\geq 0.47\mu\text{F}$; 1206 $\geq 4.7\mu\text{F}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | $\leq 20\%$ | 1210 $\geq 6.8\mu\text{F}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 35V | $\leq 10\%$ | - | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 25V | $\leq 7.5\%$ | $\leq 10\%$ | 0402 $\geq 0.047\mu\text{F}$; 0603 $\geq 0.1\mu\text{F}$; 0805 $\geq 0.33\mu\text{F}$; 1206 $\geq 1.0\mu\text{F}$; 1210 $\geq 4.7\mu\text{F}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | $\leq 15\%$ | 0402 $\geq 0.068\mu\text{F}$; 0603 $\geq 0.47\mu\text{F}$; 1206 $\geq 4.7\mu\text{F}$; 1210 $\geq 22\mu\text{F}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16V (C $< 1.0\mu\text{F}$) | $\leq 10\%$ | $\leq 12.5\%$ | 0402 $\geq 0.068\mu\text{F}$; 0603 $\geq 0.68\mu\text{F}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | $\leq 20\%$ | 0402 $\geq 0.22\mu\text{F}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16V (C $\geq 1.0\mu\text{F}$) | $\leq 12.5\%$ | $\leq 20\%$ | 0603 $\geq 2.2\mu\text{F}$; 0805 $\geq 3.3\mu\text{F}$; 1206 $\geq 10\mu\text{F}$; 1210 $\geq 22\mu\text{F}$; 1812 $\geq 47\mu\text{F}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10V | $\leq 20\%$ | $\leq 30\%$ | 0402 $\geq 0.47\mu\text{F}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6.3V | $\leq 30\%$ | - | - | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>*I.R.: $\geq 10\text{V}$, 1GΩ or 50Q-F whichever is smaller. Class II (X7R, X5R, X6S, X7S, Y5V)</p> | | | <table border="1"> <thead> <tr> <th>RATED VOLTAGE</th> <th>INSULATION RESISTANCE</th> </tr> </thead> <tbody> <tr> <td>100V: All X7R; 1210$\geq 3.3\mu\text{F}$</td> <td rowspan="7">1GΩ or apply $\geq 10\Omega\text{-F}$ rule, whichever is smaller.</td> </tr> <tr> <td>50V: 0402$> 0.01\mu\text{F}$; 0603$\geq 1.0\mu\text{F}$; 0805$\geq 1.0\mu\text{F}$; 1206$\geq 4.7\mu\text{F}$; 1210$\geq 4.7\mu\text{F}$</td> </tr> <tr> <td>35V: 0603$\geq 1.0\mu\text{F}$; 0805$\geq 2.2\mu\text{F}$; 1206$\geq 2.2\mu\text{F}$; 1210$\geq 10\mu\text{F}$</td> </tr> <tr> <td>25V: 0201$\geq 0.1\mu\text{F}$; 0402$\geq 0.22\mu\text{F}$; 0603$\geq 2.2\mu\text{F}$; 0805$\geq 2.2\mu\text{F}$; 1206$\geq 10\mu\text{F}$; 1210$\geq 10\mu\text{F}$</td> </tr> <tr> <td>16V: 0201$\geq 0.1\mu\text{F}$; 0402$\geq 0.22\mu\text{F}$; 0603$\geq 1.0\mu\text{F}$; 0805$\geq 2.2\mu\text{F}$; 1206$\geq 10\mu\text{F}$; 1210$\geq 47\mu\text{F}$</td> </tr> <tr> <td>10V: 0201$\geq 47\text{nF}$; 0402$\geq 0.47\mu\text{F}$; 0603$\geq 0.47\mu\text{F}$; 0805$\geq 2.2\mu\text{F}$; 1206$\geq 4.7\mu\text{F}$; 1210$\geq 47\mu\text{F}$</td> </tr> <tr> <td>6.3V; 4V : All X6S/X7S items, Size≥ 1812</td> </tr> </tbody> </table> | RATED VOLTAGE | INSULATION RESISTANCE | 100V: All X7R; 1210 $\geq 3.3\mu\text{F}$ | 1G Ω or apply $\geq 10\Omega\text{-F}$ rule, whichever is smaller. | 50V: 0402 $> 0.01\mu\text{F}$; 0603 $\geq 1.0\mu\text{F}$; 0805 $\geq 1.0\mu\text{F}$; 1206 $\geq 4.7\mu\text{F}$; 1210 $\geq 4.7\mu\text{F}$ | 35V: 0603 $\geq 1.0\mu\text{F}$; 0805 $\geq 2.2\mu\text{F}$; 1206 $\geq 2.2\mu\text{F}$; 1210 $\geq 10\mu\text{F}$ | 25V: 0201 $\geq 0.1\mu\text{F}$; 0402 $\geq 0.22\mu\text{F}$; 0603 $\geq 2.2\mu\text{F}$; 0805 $\geq 2.2\mu\text{F}$; 1206 $\geq 10\mu\text{F}$; 1210 $\geq 10\mu\text{F}$ | 16V: 0201 $\geq 0.1\mu\text{F}$; 0402 $\geq 0.22\mu\text{F}$; 0603 $\geq 1.0\mu\text{F}$; 0805 $\geq 2.2\mu\text{F}$; 1206 $\geq 10\mu\text{F}$; 1210 $\geq 47\mu\text{F}$ | 10V: 0201 $\geq 47\text{nF}$; 0402 $\geq 0.47\mu\text{F}$; 0603 $\geq 0.47\mu\text{F}$; 0805 $\geq 2.2\mu\text{F}$; 1206 $\geq 4.7\mu\text{F}$; 1210 $\geq 47\mu\text{F}$ | 6.3V; 4V : All X6S/X7S items, Size ≥ 1812 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| RATED VOLTAGE | INSULATION RESISTANCE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 100V: All X7R; 1210 $\geq 3.3\mu\text{F}$ | 1G Ω or apply $\geq 10\Omega\text{-F}$ rule, whichever is smaller. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 50V: 0402 $> 0.01\mu\text{F}$; 0603 $\geq 1.0\mu\text{F}$; 0805 $\geq 1.0\mu\text{F}$; 1206 $\geq 4.7\mu\text{F}$; 1210 $\geq 4.7\mu\text{F}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 35V: 0603 $\geq 1.0\mu\text{F}$; 0805 $\geq 2.2\mu\text{F}$; 1206 $\geq 2.2\mu\text{F}$; 1210 $\geq 10\mu\text{F}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 25V: 0201 $\geq 0.1\mu\text{F}$; 0402 $\geq 0.22\mu\text{F}$; 0603 $\geq 2.2\mu\text{F}$; 0805 $\geq 2.2\mu\text{F}$; 1206 $\geq 10\mu\text{F}$; 1210 $\geq 10\mu\text{F}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16V: 0201 $\geq 0.1\mu\text{F}$; 0402 $\geq 0.22\mu\text{F}$; 0603 $\geq 1.0\mu\text{F}$; 0805 $\geq 2.2\mu\text{F}$; 1206 $\geq 10\mu\text{F}$; 1210 $\geq 47\mu\text{F}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10V: 0201 $\geq 47\text{nF}$; 0402 $\geq 0.47\mu\text{F}$; 0603 $\geq 0.47\mu\text{F}$; 0805 $\geq 2.2\mu\text{F}$; 1206 $\geq 4.7\mu\text{F}$; 1210 $\geq 47\mu\text{F}$ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6.3V; 4V : All X6S/X7S items, Size ≥ 1812 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>DERATING CURVE</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

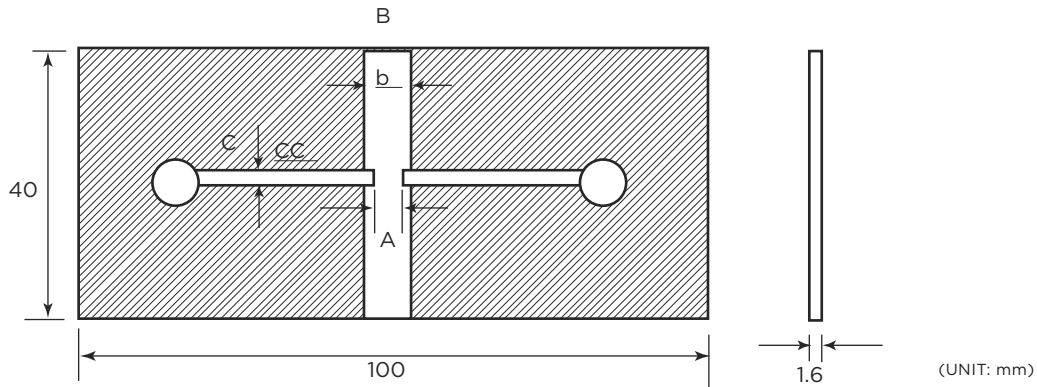
ADHESIVE STRENGTH OF TERMINATION



| CODE | DIMENSION (mm) | A (mm) | CODE | DIMENSION (mm) | A (mm) |
|--------------|----------------|--------|-------------|----------------|--------|
| 01005 (0402) | 0.40 x 0.20 | 0.12 | 1206 (3216) | 3.2 x 1.6 | 2.2 |
| 0201 (0603) | 0.61 x 0.31 | 0.2 | 1210 (3225) | 3.2 x 2.5 | 2.2 |
| 0402 (1005) | 1.0 x 0.5 | 0.4 | 1812 (4532) | 4.5 x 3.2 | 3.5 |
| 0603 (1608) | 1.6 x 0.8 | 1.0 | 2220 (5750) | 5.7 x 5.08 | 4.7 |
| 0805 (2012) | 2.0 x 1.25 | 1.2 | | | |



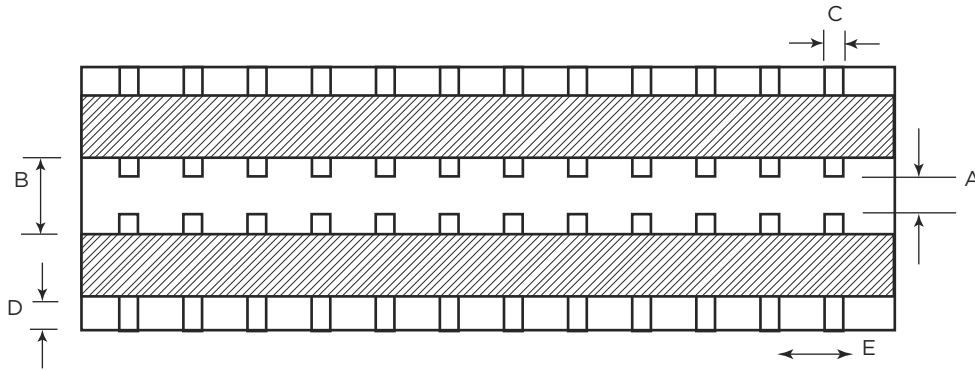
SUBSTRATE BENDING STRENGTH



| CODE | DIMENSION (mm) | A (mm) | B (mm) | C (mm) |
|--------------|----------------|--------|--------|--------|
| 01005 (0402) | 0.40 x 0.20 | 0.12 | 0.7 | 0.20 |
| 0201 (0603) | 0.61 x 0.31 | 0.2 | 1.0 | 0.4 |
| 0402 (1005) | 1.0 x 0.5 | 0.4 | 1.4 | 0.5 |
| 0603 (1608) | 1.6 x 0.8 | 1.0 | 3.0 | 1.0 |
| 0805 (2012) | 2.0 x 1.25 | 1.2 | 4.0 | 1.65 |
| 1206 (3216) | 3.2 x 1.6 | 2.2 | 5.0 | 2.0 |
| 1210 (3225) | 3.2 x 2.5 | 2.2 | 5.0 | 3.2 |
| 1812 (4532) | 4.5 x 3.2 | 3.5 | 7.0 | 4.0 |
| 2220 (5750) | 5.7 x 5.08 | 4.7 | 8.5 | 5.0 |



TEST SUBSTRATE



(UNIT: mm)

| CODE | DIMENSION (MM) | A | B | C | D | E |
|-------------|----------------|-----|-----|-----|-----|-----|
| 0201 (0603) | 0.61 x 0.31 | 0.2 | 1.0 | 0.4 | 7.5 | 3.6 |
| 0402 (1005) | 1.0 x 0.5 | 0.4 | 1.4 | 0.5 | 7.5 | 3.8 |
| 0603 (1608) | 1.6 x 0.8 | 1.0 | 3.0 | 0.7 | 7.5 | 4.0 |
| 0805 (2012) | 2.0 x 1.25 | 1.2 | 4.0 | 1.0 | 7.5 | 4.2 |
| 1206 (3216) | 3.2 x 1.6 | 2.2 | 5.0 | 1.3 | 7.5 | 4.6 |
| 1210 (3225) | 3.2 x 2.5 | 2.2 | 5.0 | 2.0 | 7.5 | 5.5 |
| 1812 (4532) | 4.5 x 3.2 | 3.5 | 7.0 | 2.7 | 7.5 | 6.2 |
| 2220 (5750) | 5.7 x 5.08 | 4.7 | 8.5 | 3.4 | 7.5 | 7.0 |

MATERIAL: GLASS EPOXY SUBSTRATE



COPPER FOIL (t = 0.035mm)



SOLDER RESIST