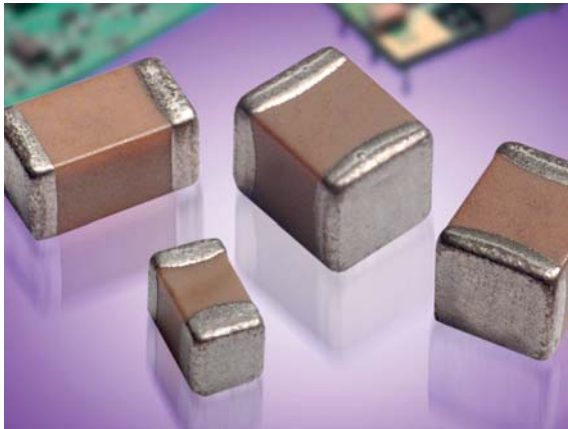


High Voltage MLC Chips



For 600V to 5000V Applications



NEW 630V RANGE

High value, low leakage and small size are difficult parameters to obtain in capacitors for high voltage systems. AVX special high voltage MLC chip capacitors meet these performance characteristics and are designed for applications such as snubbers in high frequency power converters, resonators in SMPS, and high voltage coupling/dc blocking. These high voltage chip designs exhibit low ESRs at high frequencies.

Larger physical sizes than normally encountered chips are used to make high voltage MLC chip products. Special precautions must be taken in applying these chips in surface mount assemblies. The temperature gradient during heating or cooling cycles should not exceed 4°C per second. The preheat temperature must be within 50°C of the peak temperature reached by the ceramic bodies through the soldering process. Chip sizes 1210 and larger should be reflow soldered only. Capacitors may require protective surface coating to prevent external arcing.

For 1825, 2225 and 3640 sizes, AVX offers leaded version in either thru-hole or SMT configurations (for details see section on high voltage leaded MLC chips).

HOW TO ORDER

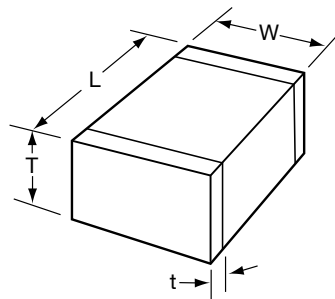
| 1808 | A | A | 271 | K | A | 1 | 1 | A |
|------------------|----------------|--------------------------------|---|---|-----------------------------------|---|---|-------------------------------------|
| AVX Style | Voltage | Temperature Coefficient | Capacitance Code (2 significant digits + no. of zeros) Examples: 10 pF = 100 100 pF = 101 1,000 pF = 102 22,000 pF = 223 220,000 pF = 224 1 μF = 105 | Capacitance Tolerance COG: J = ±5% K = ±10% M = ±20% X7R: K = ±10% M = ±20% Z = +80%, -20% | Test Level A = Standard | Termination* 1 = Pd/Ag T = Plated Ni and Sn (RoHS Compliant) | Packaging 1 = 7" Reel** 3 = 13" Reel | Special Code A = Standard |
| 0805 | 600V/630V = C | NPO (COG) = A | | | | | | |
| 1206 | 1000V = A | X7R = C | | | | | | |
| 1210 | 1500V = S | | | | | | | |
| 1808 | 2000V = G | | | | | | | |
| 1812 | 2500V = W | | | | | | | |
| 1825 | 3000V = H | | | | | | | |
| 2220 | 4000V = J | | | | | | | |
| 2225 | 5000V = K | | | | | | | |
| 3640 | | | | | | | | |
| *** | | | | | | | | |

***Note:** Terminations with 5% minimum lead (Pb) is available, see pages 87 and 88 for LD style. Leaded terminations are available, see pages 89 and 90.

Notes: Capacitors with X7R dielectrics are not intended for applications across AC supply mains or AC line filtering with polarity reversal. Contact plant for recommendations. Contact factory for availability of Termination and Tolerance options for Specific Part Numbers.

** The 3640 Style is not available on 7" Reels.

*** AVX offers nonstandard chip sizes. Contact factory for details.



DIMENSIONS

millimeters (inches)

| SIZE | 0805 | 1206 | 1210* | 1808* | 1812* | 1825* | 2220* | 2225* | 3640* |
|------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| (L) Length | 2.01 ± 0.20 (0.079 ± 0.008) | 3.20 ± 0.20 (0.126 ± 0.008) | 3.20 ± 0.20 (0.126 ± 0.008) | 4.57 ± 0.25 (0.180 ± 0.010) | 4.50 ± 0.30 (0.177 ± 0.012) | 4.50 ± 0.30 (0.177 ± 0.012) | 5.70 ± 0.40 (0.224 ± 0.016) | 5.72 ± 0.25 (0.225 ± 0.010) | 9.14 ± 0.25 (0.360 ± 0.010) |
| (W) Width | 1.25 ± 0.20 (0.049 ± 0.008) | 1.60 ± 0.20 (0.063 ± 0.008) | 2.50 ± 0.20 (0.098 ± 0.008) | 2.03 ± 0.25 (0.080 ± 0.010) | 3.20 ± 0.20 (0.126 ± 0.008) | 6.40 ± 0.30 (0.252 ± 0.012) | 5.00 ± 0.40 (0.197 ± 0.016) | 6.35 ± 0.25 (0.250 ± 0.010) | 10.2 ± 0.25 (0.400 ± 0.010) |
| (T) Thickness Max. | 1.30 (0.051) | 1.52 (0.060) | 1.70 (0.067) | 2.03 (0.080) | 2.54 (0.100) | 2.54 (0.100) | 3.30 (0.130) | 2.54 (0.100) | 2.54 (0.100) |
| (t) terminal min. max. | 0.50 ± 0.25 (0.020 ± 0.010) | 0.25 (0.010) 0.75 (0.030) | 0.25 (0.010) 0.75 (0.030) | 0.25 (0.010) 1.02 (0.040) | 0.25 (0.010) 1.02 (0.040) | 0.25 (0.010) 1.02 (0.040) | 0.25 (0.010) 1.02 (0.040) | 0.25 (0.010) 1.02 (0.040) | 0.76 (0.030) 1.52 (0.060) |

*Reflow Soldering Only



High Voltage MLC Chips



For 600V to 5000V Applications

NP0 (C0G) Dielectric Performance Characteristics

| | |
|---|--|
| Capacitance Range | 10 pF to 0.047 μF (25°C, 1.0 ±0.2 Vrms at 1kHz, for ≤ 1000 pF use 1 MHz) |
| Capacitance Tolerances | ±5%, ±10%, ±20% |
| Dissipation Factor | 0.1% max. (+25°C, 1.0 ±0.2 Vrms, 1kHz, for ≤ 1000 pF use 1 MHz) |
| Operating Temperature Range | -55°C to +125°C |
| Temperature Characteristic | 0 ±30 ppm/°C (0 VDC) |
| Voltage Ratings | 600, 630, 1000, 1500, 2000, 2500, 3000, 4000 & 5000 VDC (+125°C) |
| Insulation Resistance (+25°C, at 500 VDC) | 100K MΩ min. or 1000 MΩ - μF min., whichever is less |
| Insulation Resistance (+125°C, at 500 VDC) | 10K MΩ min. or 100 MΩ - μF min., whichever is less |
| Dielectric Strength | Minimum 120% rated voltage for 5 seconds at 50 mA max. current |

NP0 (C0G) CAPACITANCE RANGE PREFERRED SIZES ARE SHADED

| Case Size | 0805 | | | 1206 | | | | 1210 | | | | | 1808 | | | | | | | 1812 | | | | | | | | | |
|------------------------|-----------------------------|-----|------|-----------------------------|-----|------|------|-----------------------------|-----|-----|------|------|-----------------------------|-----|-----|------|------|------|------|-----------------------------|------|-----|-----|------|------|------|------|------|------|
| | Reflow/Wave | | | Reflow/Wave | | | | Reflow Only | | | | | Reflow Only | | | | | | | Reflow Only | | | | | | | | | |
| (L) Length mm (in.) | 2.01 ± 0.20 (0.079 ± 0.008) | | | 3.20 ± 0.20 (0.126 ± 0.008) | | | | 3.20 ± 0.20 (0.126 ± 0.008) | | | | | 4.57 ± 0.25 (0.180 ± 0.010) | | | | | | | 4.50 ± 0.30 (0.177 ± 0.012) | | | | | | | | | |
| (W) Width mm (in.) | 1.25 ± 0.20 (0.049 ± 0.008) | | | 1.60 ± 0.20 (0.063 ± 0.008) | | | | 2.50 ± 0.20 (0.098 ± 0.008) | | | | | 2.03 ± 0.25 (0.080 ± 0.010) | | | | | | | 3.20 ± 0.20 (0.126 ± 0.008) | | | | | | | | | |
| (T) Thickness mm (in.) | 1.30 (0.051) | | | 1.52 (0.060) | | | | 1.70 (0.067) | | | | | 2.03 (0.080) | | | | | | | 2.54 (0.100) | | | | | | | | | |
| (t) Terminal min max | 0.50 ± 0.25 (0.020 ± 0.010) | | | 0.25 (0.010) 0.75 (0.030) | | | | 0.25 (0.010) 0.75 (0.030) | | | | | 0.25 (0.010) 1.02 (0.040) | | | | | | | 0.25 (0.010) 1.02 (0.040) | | | | | | | | | |
| Voltage (V) | 600 | 630 | 1000 | 600 | 630 | 1000 | 1500 | 2000 | 600 | 630 | 1000 | 1500 | 2000 | 600 | 630 | 1000 | 1500 | 2000 | 2500 | 3000 | 4000 | 600 | 630 | 1000 | 1500 | 2000 | 2500 | 3000 | 4000 |
| Cap (pF) | 1.5 1R5 | A | A | X | X | X | X | X | | | | | | | | | | | | | | | | | | | | | |
| | 1.8 1R8 | A | A | X | X | X | X | X | | | | | | | | | | | | | | | | | | | | | |
| | 2.2 2R2 | A | A | X | X | X | X | X | | | | | | | | | | | | | | | | | | | | | |
| | 2.7 2R7 | A | A | X | X | X | X | X | | | | | | | | | | | | | | | | | | | | | |
| | 3.3 3R3 | A | A | X | X | X | X | X | | | | | | | | | | | | | | | | | | | | | |
| | 3.9 3R9 | A | A | X | X | X | X | X | | | | | | | | | | | | | | | | | | | | | |
| | 4.7 4R7 | A | A | X | X | X | X | X | | | | | | | | | | | | | | | | | | | | | |
| | 5.6 5R6 | A | A | X | X | X | X | X | | | | | | | | | | | | | | | | | | | | | |
| | 6.8 6R8 | A | A | X | X | X | X | X | | | | | | | | | | | | | | | | | | | | | |
| | 8.2 8R2 | A | A | X | X | X | X | X | | | | | | | | | | | | | | | | | | | | | |
| | 10 100 | A | A | X | X | X | X | X | C | C | D | D | D | C | C | C | C | C | C | C | C | | | | | | | | |
| | 12 120 | A | A | X | X | X | X | X | C | C | D | D | D | C | C | C | C | C | C | C | C | | | | | | | | |
| | 15 150 | A | A | X | X | X | X | X | C | C | D | D | D | C | C | C | C | C | C | C | C | | | | | | | | |
| | 18 180 | A | A | X | X | X | X | X | C | C | D | D | D | C | C | C | C | C | C | C | C | | | | | | | | |
| | 22 220 | A | A | X | X | X | X | X | C | C | D | D | D | C | C | C | C | C | C | C | C | | | | | | | | |
| | 27 270 | A | A | X | X | X | X | X | C | C | D | D | D | C | C | C | C | C | C | C | C | | | | | | | | |
| | 33 330 | A | A | X | X | X | D | D | C | C | D | D | D | C | C | C | C | C | C | C | C | | | | | | | | |
| | 39 390 | A | A | X | X | X | D | D | C | C | D | D | D | C | C | C | C | C | C | C | C | | | | | | | | |
| | 47 470 | A | A | X | X | M | D | D | C | C | D | D | D | C | C | C | C | C | C | C | C | | | | | | | | |
| | 56 560 | A | A | X | X | M | C | C | C | C | D | C | C | C | C | C | C | C | C | C | C | | | | | | | | |
| | 68 680 | A | A | X | X | M | C | C | C | C | D | C | C | C | C | C | C | C | C | C | C | | | | | | | | |
| | 82 820 | X | X | X | X | C | C | C | C | D | C | C | C | C | C | C | C | C | C | C | C | | | | | | | | |
| | 100 101 | X | X | X | X | C | C | C | C | C | C | C | C | C | C | C | C | F | F | F | F | | | | | | | | |
| | 120 121 | C | C | X | X | C | E | E | C | C | C | C | C | C | C | C | C | F | F | F | F | | | | | | | | |
| | 150 151 | C | C | X | X | C | E | E | C | C | C | E | E | C | C | C | F | F | F | F | F | | | | | | | | |
| | 180 181 | C | C | X | X | E | E | E | C | C | E | E | E | C | C | C | F | F | F | F | F | | | | | | | | |
| | 220 221 | C | C | X | X | E | E | E | C | C | E | E | E | C | C | C | F | F | F | F | F | | | | | | | | |
| | 270 271 | C | C | C | C | E | E | E | C | C | E | E | E | C | C | C | F | F | F | F | F | | | | | | | | |
| | 330 331 | C | C | C | C | E | E | E | C | C | E | E | E | C | C | F | F | F | F | F | F | | | | | | | | |
| | 390 391 | C | C | C | C | E | E | E | C | C | E | E | E | C | C | F | F | F | F | F | F | | | | | | | | |
| | 470 471 | C | C | C | C | E | E | E | C | C | E | E | E | C | C | F | F | F | F | F | F | | | | | | | | |
| | 560 561 | C | C | C | C | E | | | C | C | E | E | E | C | C | F | F | F | F | F | F | | | | | | | | |
| | 680 681 | C | C | C | C | E | | | C | C | E | F | F | C | C | F | F | F | F | F | F | | | | | | | | |
| | 750 751 | C | C | E | E | E | | | C | C | E | G | G | C | C | F | F | F | F | F | F | | | | | | | | |
| | 820 821 | C | C | E | E | E | | | C | C | E | G | G | C | C | F | E | E | E | E | E | | | | | | | | |
| | 1000 102 | | | E | E | E | | | C | C | E | | | C | C | F | E | E | E | E | E | | | | | | | | |
| | 1200 122 | | | E | E | | | | C | C | E | | | E | E | F | E | E | E | E | E | | | | | | | | |
| | 1500 152 | | | E | E | | | | C | C | G | | | E | E | F | | | | | | | | | | | | | |
| | 1800 182 | | | E | E | | | | C | C | G | | | E | E | F | | | | | | | | | | | | | |
| | 2200 222 | | | E | E | | | | E | E | | | | E | E | | | | | | | | | | | | | | |
| | 2700 272 | | | E | E | | | | E | E | | | | E | E | | | | | | | | | | | | | | |
| | 3300 332 | | | E | E | | | | E | E | | | | E | E | | | | | | | | | | | | | | |
| | 3900 392 | | | | | | | | E | E | | | | E | E | | | | | | | | | | | | | | |
| | 4700 472 | | | | | | | | E | E | | | | E | E | | | | | | | | | | | | | | |
| | 5600 562 | | | | | | | | E | E | | | | E | E | | | | | | | | | | | | | | |
| | 6800 682 | | | | | | | | | | | | | F | F | | | | | | | | | | | | | | |
| | 8200 822 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Cap (μF) 0.010 103 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0.012 123 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0.015 153 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0.018 183 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0.022 223 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0.033 333 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0.047 473 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0.056 563 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0.068 683 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 0.100 104 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Voltage (V) | 600 | 630 | 1000 | 600 | 630 | 1000 | 1500 | 2000 | 600 | 630 | 1000 | 1500 | 2000 | 600 | 630 | 1000 | 1500 | 2000 | 2500 | 3000 | 4000 | 600 | 630 | 1000 | 1500 | 2000 | 2500 | 3000 | 4000 |
| Case Size | 0805 | | | 1206 | | | | 1210 | | | | | 1808 | | | | | | | 1812 | | | | | | | | | |



High Voltage MLC Chips



For 600V to 5000V Applications

NP0 (C0G) CAPACITANCE RANGE
PREFERRED SIZES ARE SHADED

| Case Size | 1825 | | | | | | | | 2220 | | | | | | | | 2225 | | | | | | | | 3640 | | | | | | | | | | | | | |
|------------------------|-----------------------------|-----|------|------|------|------|------|------|-----------------------------|-----|------|------|------|------|------|------|-----------------------------|-----|-----|------|------|------|------|------|-----------------------------|------|-----|-----|------|------|------|------|------|------|------|---|---|---|
| Soldering | Reflow Only | | | | | | | | Reflow Only | | | | | | | | Reflow Only | | | | | | | | Reflow Only | | | | | | | | | | | | | |
| (L) Length mm (in.) | 4.50 ± 0.30 (0.177 ± 0.012) | | | | | | | | 5.70 ± 0.40 (0.224 ± 0.016) | | | | | | | | 5.72 ± 0.25 (0.225 ± 0.010) | | | | | | | | 9.14 ± 0.25 (0.360 ± 0.010) | | | | | | | | | | | | | |
| (W) Width mm (in.) | 6.40 ± 0.30 (0.252 ± 0.012) | | | | | | | | 5.00 ± 0.40 (0.197 ± 0.016) | | | | | | | | 6.35 ± 0.25 (0.250 ± 0.010) | | | | | | | | 10.2 ± 0.25 (0.400 ± 0.010) | | | | | | | | | | | | | |
| (T) Thickness mm (in.) | 2.54 (0.100) | | | | | | | | 3.30 (0.130) | | | | | | | | 2.54 (0.100) | | | | | | | | 2.54 (0.100) | | | | | | | | | | | | | |
| (t) Terminal min max | 0.25 (0.010) 1.02 (0.040) | | | | | | | | 0.25 (0.010) 1.02 (0.040) | | | | | | | | 0.25 (0.010) 1.02 (0.040) | | | | | | | | 0.76 (0.030) 1.52 (0.060) | | | | | | | | | | | | | |
| Voltage (V) | 600 | 630 | 1000 | 1500 | 2000 | 2500 | 3000 | 4000 | 600 | 630 | 1000 | 1500 | 2000 | 2500 | 3000 | 4000 | 5000 | 600 | 630 | 1000 | 1500 | 2000 | 2500 | 3000 | 4000 | 5000 | 600 | 630 | 1000 | 1500 | 2000 | 2500 | 3000 | 4000 | 5000 | | | |
| Cap (pF) 1.5 1R5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.8 1R8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2.2 2R2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2.7 2R7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3.3 3R3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3.9 3R9 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4.7 4R7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5.6 5R6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6.8 6R8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8.2 8R2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10 100 | E | E | E | E | E | E | E | | E | E | E | E | E | E | E | | | E | E | E | E | E | E | E | | | | | | | | | | | | | | |
| 12 120 | E | E | E | E | E | E | E | | E | E | E | E | E | E | E | | | E | E | E | E | E | E | E | | | | | | | | | | | | | | |
| 15 150 | E | E | E | E | E | E | E | | E | E | E | E | E | E | E | | | E | E | E | E | E | E | E | | | | | | | | | | | | | | |
| 18 180 | E | E | E | E | E | E | E | | E | E | E | E | E | E | E | | | E | E | E | E | E | E | E | | | | | | | | | | | | | | |
| 22 220 | E | E | E | E | E | E | E | | E | E | E | E | E | E | E | | | E | E | E | E | E | E | E | | | | | | | | | | | | | | |
| 27 270 | E | E | E | E | E | E | E | | E | E | E | E | E | E | E | | | E | E | E | E | E | E | E | | | | | | | | | | | | | | |
| 33 330 | E | E | E | E | E | E | E | | E | E | E | E | E | E | E | | | E | E | E | E | E | E | E | | | | | | | | | | | | | | |
| 39 390 | E | E | E | E | E | E | E | | E | E | E | E | E | E | E | | | E | E | E | E | E | E | E | | | | | | | | | | | | | | |
| 47 470 | E | E | E | E | E | E | E | | E | E | E | E | E | E | E | | | E | E | E | E | E | E | E | | | | | | | | | | | | | | |
| 56 560 | E | E | E | E | E | E | E | | E | E | E | E | E | E | E | | | E | E | E | E | E | E | E | | | | | | | | | | | | | G | |
| 68 680 | E | E | E | E | E | E | E | | E | E | E | E | E | E | E | | | E | E | E | E | E | E | E | | | | | | | | | | | | | G | |
| 82 820 | E | E | E | E | E | E | E | | E | E | E | E | E | E | E | | | E | E | E | E | E | E | E | | | | | | | | | | | | | G | |
| 100 101 | E | E | E | E | E | E | E | | E | E | E | E | E | E | E | | | E | E | E | E | E | E | E | | | | | | | | | | G | G | G | G | G |
| 120 121 | E | E | E | E | E | E | E | | E | E | E | E | E | E | E | | | E | E | E | E | E | E | E | | | | | | | | | | G | G | G | G | G |
| 150 151 | E | E | E | E | E | E | E | | E | E | E | E | E | E | E | | | E | E | E | E | E | E | E | | | | | | | | | | G | G | G | G | G |
| 180 181 | E | E | E | E | E | E | E | | E | E | E | E | E | E | E | | | E | E | E | E | E | E | E | | | | | | | | | | G | G | G | G | G |
| 220 221 | E | E | E | E | E | E | E | | E | E | E | E | E | E | E | | | E | E | E | E | E | E | E | | | | | | | | | | G | G | G | G | G |
| 270 271 | E | E | E | E | E | E | E | | E | E | E | E | E | E | E | | | E | E | E | E | E | E | E | | | | | | | | | | G | G | G | G | G |
| 330 331 | E | E | E | E | E | E | E | | E | E | E | E | E | E | E | | | E | E | E | E | E | E | E | | | | | | | | | | G | G | G | G | G |
| 390 391 | E | E | E | E | E | E | E | | E | E | E | E | E | E | E | | | E | E | E | E | E | E | E | | | | | | | | | | G | G | G | G | G |
| 470 471 | E | E | E | E | E | E | E | | E | E | E | E | E | E | E | | | E | E | E | E | E | E | E | | | | | | | | | | G | G | G | G | G |
| 560 561 | E | E | E | E | E | E | E | | E | E | E | E | E | E | E | | | E | E | E | E | E | E | E | | | | | | | | | | G | G | G | G | G |
| 680 681 | E | E | E | E | E | E | F | F | E | E | E | E | E | F | F | | | E | E | E | E | E | E | E | | | | | | | | | G | G | G | G | G | |
| 750 751 | E | E | E | E | E | E | F | F | E | E | E | E | E | F | F | | | E | E | E | E | E | E | E | | | | | | | | | G | G | G | G | G | |
| 820 821 | E | E | E | E | E | E | F | F | E | E | E | E | E | F | F | | | E | E | E | E | E | E | E | | | | | | | | | G | G | G | G | G | |
| 1000 102 | E | E | E | E | E | E | F | F | E | E | E | E | E | F | F | | | E | E | E | E | E | E | E | | | | | | | G | G | G | G | G | G | G | |
| 1200 122 | E | E | E | E | E | G | G | | E | E | E | E | E | G | G | | | E | E | E | E | E | E | E | | | | | | | | | G | G | G | G | G | |
| 1500 152 | E | E | E | F | F | G | G | | E | E | E | F | F | G | G | | | E | E | E | E | F | F | | | | | | | | | | | | | | | |
| 1800 182 | E | E | E | F | F | G | G | | E | E | E | F | F | G | G | | | E | E | E | E | E | G | G | | | | | | | | | | | | | | |
| 2200 222 | E | E | E | G | G | | | | E | E | E | G | G | | | | | E | E | E | E | | | | | | | | | | | | | | | | | |
| 2700 272 | E | E | E | G | G | | | | E | E | E | G | G | | | | | E | E | E | F | F | | | | | | | | | | | | | | | | |
| 3300 332 | E | E | E | G | G | | | | E | E | E | G | G | | | | | E | E | E | F | F | | | | | | | | | | | | | | | | |
| 3900 392 | E | E | E | G | G | | | | E | E | E | G | G | | | | | E | E | E | G | G | | | | | | | | | | | | | | | | |
| 4700 472 | E | E | E | G | G | | | | E | E | E | G | G | | | | | F | F | F | G | G | | | | | | | | | | | | | | | | |
| 5600 562 | F | F | F | G | G | | | | F | F | F | G | G | | | | | F | F | F | G | G | | | | | | | | | | | | | | | | |
| 6800 682 | F | F | F | | | | | | F | F | F | | | | | | | F | F | F | | | | | | | | | | | | | | | | | | |
| 8200 822 | G | G | G | | | | | | G | G | G | | | | | | | G | G | G | | | | | | | | | | | | | | | | | | |
| Cap (µF) 0.010 103 | | | | | | | | | | | | | | | | | | G | G | G | | | | | | | | | | | | | | | | | | |
| 0.012 123 | | | | | | | | | | | | | | | | | | G | G | G | | | | | | | | | | | | | | | | | | |
| 0.015 153 | | | | | | | | | | | | | | | | | | G | G | G | | | | | | | | | | | | | | | | | | |
| 0.018 183 | | | | | | | | | | | | | | | | | | G | G | G | | | | | | | | | | | | | | | | | | |
| 0.022 223 | | | | | | | | | | | | | | | | | | G | G | G | | | | | | | | | | | | | | | | | | |
| 0.033 333 | | | | | | | | | | | | | | | | | | G | G | G | | | | | | | | | | | | | | | | | | |
| 0.047 473 | | | | | | | | | | | | | | | | | | G | G | G | | | | | | | | | | | | | | | | | | |
| 0.056 563 | | | | | | | | | | | | | | | | | | G | G | G | | | | | | | | | | | | | | | | | | |
| 0.068 683 | | | | | | | | | | | | | | | | | | G | G | G | | | | | | | | | | | | | | | | | | |
| 0.100 104 | | | | | | | | | | | | | | | | | | G | G | G | | | | | | | | | | | | | | | | | | |
| Case Size | 600 | 630 | 1000 | 1500 | 2000 | 2500 | 3000 | 4000 | 600 | 630 | 1000 | 1500 | 2000 | 2500 | 3000 | 4000 | 5000 | 600 | 630 | 1000 | 1500 | 2000 | 2500 | 3000 | 4000 | 5000 | 600 | 630 | 1000 | 1500 | 2000 | 2500 | 3000 | 4000 | 5000 | | | |

| Letter | A | C | E | F | G | X |
|-----------------------|---------------|---------------|----------------|----------------|---------------|---------------|
| Max. Thickness | 0.813 (0.032) | 1.448 (0.057) | 1.8034 (0.071) | 2.2098 (0.087) | 2.794 (0.110) | 0.940 (0.037) |

NOTE: Contact factory for non-specified capacitance values



High Voltage MLC Chips



For 600V to 5000V Applications

X7R Dielectric Performance Characteristics

| | |
|---|--|
| Capacitance Range | 10 pF to 0.56 μF (25°C, 1.0 ±0.2 Vrms at 1kHz) |
| Capacitance Tolerances | ±10%; ±20%; +80%, -20% |
| Dissipation Factor | 2.5% max. (+25°C, 1.0 ±0.2 Vrms, 1kHz) |
| Operating Temperature Range | -55°C to +125°C |
| Temperature Characteristic | ±15% (0 VDC) |
| Voltage Ratings | 600, 630, 1000, 1500, 2000, 2500, 3000, 4000 & 5000 VDC (+125°C) |
| Insulation Resistance (+25°C, at 500 VDC) | 100K MΩ min. or 1000 MΩ - μF min., whichever is less |
| Insulation Resistance (+125°C, at 500 VDC) | 10K MΩ min. or 100 MΩ - μF min., whichever is less |
| Dielectric Strength | Minimum 120% rated voltage for 5 seconds at 50 mA max. current |

X7R CAPACITANCE RANGE PREFERRED SIZES ARE SHADED

| Case Size | 0805 | | | 1206 | | | | | 1210 | | | | | 1808 | | | | | | | | 1812 | | | | | | | |
|--------------------|-----------|-----|------|-------------|-----|------|------|------|-------------|-----|------|------|------|-------------|-----|------|------|------|------|------|------|-------------|-----|------|------|------|------|------|------|
| | Soldering | | | Reflow/Wave | | | | | Reflow Only | | | | | Reflow Only | | | | | | | | Reflow Only | | | | | | | |
| (L) Length | mm (in.) | | | mm (in.) | | | | | mm (in.) | | | | | mm (in.) | | | | | | | | mm (in.) | | | | | | | |
| (W) Width | mm (in.) | | | mm (in.) | | | | | mm (in.) | | | | | mm (in.) | | | | | | | | mm (in.) | | | | | | | |
| (T) Thickness | mm (in.) | | | mm (in.) | | | | | mm (in.) | | | | | mm (in.) | | | | | | | | mm (in.) | | | | | | | |
| (t) Terminal | min max | | | min max | | | | | min max | | | | | min max | | | | | | | | min max | | | | | | | |
| Voltage (V) | 600 | 630 | 1000 | 600 | 630 | 1000 | 1500 | 2000 | 600 | 630 | 1000 | 1500 | 2000 | 600 | 630 | 1000 | 1500 | 2000 | 2500 | 3000 | 4000 | 600 | 630 | 1000 | 1500 | 2000 | 2500 | 3000 | 4000 |
| Cap (pF) 100 101 | X | X | C | C | C | E | E | E | E | E | E | E | E | E | E | E | E | E | E | F | E | E | E | E | E | E | E | | |
| 120 121 | X | X | C | C | C | E | E | E | E | E | E | E | E | E | E | E | E | E | E | F | E | E | E | E | E | E | E | | |
| 150 151 | X | X | C | C | C | E | E | E | E | E | E | E | E | E | E | E | E | E | E | F | E | E | E | E | E | E | E | | |
| 180 181 | X | X | C | C | C | E | E | E | E | E | E | E | E | E | E | E | E | E | E | F | E | E | E | E | E | E | E | | |
| 220 221 | X | X | C | C | C | E | E | E | E | E | E | E | E | E | E | E | E | E | E | F | E | E | E | E | E | E | E | | |
| 270 271 | X | X | C | C | C | E | E | E | E | E | E | E | E | E | E | E | E | E | E | F | E | E | E | E | E | E | E | | |
| 330 331 | X | X | C | C | C | E | E | E | E | E | E | E | E | E | E | E | E | E | E | F | E | E | E | E | E | E | E | | |
| 390 391 | X | X | C | C | C | E | E | E | E | E | E | E | E | E | E | E | E | E | E | F | E | E | E | E | E | E | E | | |
| 470 471 | X | X | C | C | C | E | E | E | E | E | E | E | E | E | E | E | E | E | E | F | E | E | E | E | E | E | E | | |
| 560 561 | X | X | C | C | C | E | E | E | E | E | E | E | E | E | E | E | E | E | E | F | E | E | E | E | E | E | E | | |
| 680 681 | X | X | C | C | C | E | E | E | E | E | E | E | E | E | E | E | E | E | E | F | E | E | E | E | E | E | E | | |
| 750 751 | X | X | C | C | C | E | E | E | E | E | E | E | E | E | E | E | E | E | E | F | E | E | E | E | E | E | E | | |
| 820 821 | X | X | C | C | C | E | E | E | E | E | E | E | E | E | E | E | E | E | E | F | E | E | E | E | E | E | E | | |
| 1000 102 | X | X | C | C | C | E | E | E | E | E | E | E | E | E | E | E | E | E | E | F | E | E | E | E | E | E | E | | |
| 1200 122 | X | X | C | C | C | E | E | E | E | E | E | E | E | E | E | E | E | E | E | F | E | E | E | E | E | E | E | | |
| 1500 152 | X | X | C | C | C | E | E | E | E | E | E | E | E | E | E | E | E | E | E | F | E | E | E | E | E | E | E | | |
| 1800 182 | X | X | | C | C | E | E | E | E | E | E | E | E | E | E | E | E | E | E | F | E | E | E | E | E | E | E | | |
| 2200 222 | X | X | | C | C | E | E | E | E | E | E | E | E | E | E | E | E | E | E | F | E | E | E | E | E | E | E | | |
| 2700 272 | X | X | | C | C | E | E | | E | E | E | F | E | E | E | E | E | E | F | F | | E | E | E | E | E | E | | |
| 3300 332 | X | X | | C | C | E | | | E | E | E | F | E | E | E | E | E | E | F | F | | E | E | E | F | G | G | | |
| 3900 392 | X | X | | C | C | E | | | E | E | E | G | | E | E | E | F | F | | | E | E | E | F | F | G | G | | |
| 4700 472 | X | X | | C | C | E | | | E | E | E | G | | E | E | E | F | | | | E | E | E | F | F | G | G | | |
| 5600 562 | X | X | | C | C | E | | | E | E | E | G | | E | E | E | F | | | | E | E | E | G | G | | | | |
| 6800 682 | X | X | | C | C | E | | | E | E | E | | | E | E | E | F | | | | E | E | E | G | G | | | | |
| 8200 822 | X | X | | C | C | E | | | E | E | E | | | E | E | E | | | | | E | E | E | G | G | | | | |
| Cap (μF) 0.010 103 | C | C | | C | C | E | | | E | E | E | | | E | E | E | | | | | E | E | F | G | G | | | | |
| 0.015 153 | C | C | | E | E | E | | | E | E | E | | | F | F | F | | | | | E | E | F | G | | | | | |
| 0.018 183 | C | C | | E | E | | | | E | E | E | | | F | F | F | | | | | E | E | G | | | | | | |
| 0.022 223 | C | C | | E | E | | | | E | E | E | | | F | F | | | | | | E | E | G | | | | | | |
| 0.027 273 | | | | E | E | | | | E | E | | | | F | F | | | | | | E | E | G | | | | | | |
| 0.033 333 | | | | E | E | | | | E | E | | | | F | F | | | | | | E | E | G | | | | | | |
| 0.039 393 | | | | | | | | | E | E | | | | F | F | | | | | | E | E | G | | | | | | |
| 0.047 473 | | | | | | | | | E | E | | | | F | F | | | | | | E | E | G | | | | | | |
| 0.056 563 | | | | | | | | | F | F | | | | F | F | | | | | | F | F | | | | | | | |
| 0.068 683 | | | | | | | | | F | F | | | | F | F | | | | | | F | F | | | | | | | |
| 0.082 823 | | | | | | | | | F | F | | | | F | F | | | | | | F | F | | | | | | | |
| 0.100 104 | | | | | | | | | F | F | | | | | | | | | | | F | F | | | | | | | |
| 0.150 154 | | | | | | | | | | | | | | | | | | | | | G | G | | | | | | | |
| 0.220 224 | | | | | | | | | | | | | | | | | | | | | G | G | | | | | | | |
| 0.270 274 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.330 334 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.390 394 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.470 474 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.560 564 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.680 684 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0.820 824 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.000 105 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Voltage (V) | 600 | 630 | 1000 | 600 | 630 | 1000 | 1500 | 2000 | 600 | 630 | 1000 | 1500 | 2000 | 600 | 630 | 1000 | 1500 | 2000 | 2500 | 3000 | 4000 | 600 | 630 | 1000 | 1500 | 2000 | 2500 | 3000 | 4000 |
| Case Size | 0805 | | | 1206 | | | | | 1210 | | | | | 1808 | | | | | | | | 1812 | | | | | | | |



High Voltage MLC Chips



For 600V to 5000V Applications

X7R CAPACITANCE RANGE PREFERRED SIZES ARE SHADED

| Case Size | 1825 | | | | | | | | 2220 | | | | | | | | 2225 | | | | | | | | 3640 | | | | | | | | | | |
|------------------------|-----------------------------|-----|------|------|------|------|------|------|-----------------------------|-----|------|------|------|------|------|------|-----------------------------|-----|-----|------|------|------|------|------|-----------------------------|------|-----|-----|------|------|------|------|------|------|------|
| Soldering | Reflow Only | | | | | | | | Reflow Only | | | | | | | | Reflow Only | | | | | | | | Reflow Only | | | | | | | | | | |
| (L) Length mm (in.) | 4.50 ± 0.30 (0.177 ± 0.012) | | | | | | | | 5.70 ± 0.40 (0.224 ± 0.016) | | | | | | | | 5.72 ± 0.25 (0.225 ± 0.010) | | | | | | | | 9.14 ± 0.25 (0.360 ± 0.010) | | | | | | | | | | |
| (W) Width mm (in.) | 6.40 ± 0.30 (0.252 ± 0.012) | | | | | | | | 5.00 ± 0.40 (0.197 ± 0.016) | | | | | | | | 6.35 ± 0.25 (0.250 ± 0.010) | | | | | | | | 10.2 ± 0.25 (0.400 ± 0.010) | | | | | | | | | | |
| (T) Thickness mm (in.) | 2.54 (0.100) | | | | | | | | 3.30 (0.130) | | | | | | | | 2.54 (0.100) | | | | | | | | 2.54 (0.100) | | | | | | | | | | |
| (t) Terminal min max | 0.25 (0.010) 1.02 (0.040) | | | | | | | | 0.25 (0.010) 1.02 (0.040) | | | | | | | | 0.25 (0.010) 1.02 (0.040) | | | | | | | | 0.76 (0.030) 1.52 (0.060) | | | | | | | | | | |
| Voltage (V) | 600 | 630 | 1000 | 1500 | 2000 | 2500 | 3000 | 4000 | 600 | 630 | 1000 | 1500 | 2000 | 2500 | 3000 | 4000 | 5000 | 600 | 630 | 1000 | 1500 | 2000 | 2500 | 3000 | 4000 | 5000 | 600 | 630 | 1000 | 1500 | 2000 | 2500 | 3000 | 4000 | 5000 |
| Cap (pF) 100 101 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 120 121 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 150 151 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 180 181 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 220 221 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 270 271 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 330 331 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 390 391 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 470 471 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 560 561 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 680 681 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 750 751 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 820 821 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1000 102 | F | F | F | F | F | F | F | F | F | F | F | F | F | F | F | G | | | | | | | | | | F | F | F | F | F | F | F | F | F | |
| 1200 122 | F | F | F | F | F | F | F | F | F | F | F | F | F | F | F | G | | | | | | | | | | F | F | F | F | F | F | F | F | F | |
| 1500 152 | F | F | F | F | F | F | F | F | F | F | F | F | F | F | F | G | | | | | | | | | | F | F | F | F | F | F | F | F | F | |
| 1800 182 | F | F | F | F | F | F | F | F | F | F | F | F | F | F | F | G | | | | | | | | | | F | F | F | F | F | F | F | F | F | |
| 2200 222 | F | F | F | F | F | F | F | F | F | F | F | F | F | F | F | G | | | | | | | | | | F | F | F | F | F | F | F | F | F | |
| 2700 272 | F | F | F | F | F | F | F | F | F | F | F | F | F | F | F | G | | | | | | | | | | F | F | F | F | F | F | F | F | F | |
| 3300 332 | F | F | F | F | F | F | F | F | F | F | F | F | F | F | F | G | | | | | | | | | | F | F | F | F | F | F | F | F | F | |
| 3900 392 | F | F | F | F | F | F | F | F | F | F | F | F | F | F | F | G | | | | | | | | | | F | F | F | F | F | F | F | F | F | |
| 4700 472 | F | F | F | F | F | F | F | F | F | F | F | F | F | F | F | G | | | | | | | | | | F | F | F | F | F | F | F | F | F | |
| 5600 562 | F | F | F | F | F | F | F | F | F | F | F | F | F | F | F | G | | | | | | | | | | F | F | F | F | F | F | F | F | F | |
| 6800 682 | F | F | F | G | G | G | G | G | F | F | F | F | F | F | G | G | | | | | | | | | | F | F | F | F | F | F | G | G | G | |
| 8200 822 | F | F | F | G | G | G | G | G | F | F | F | G | G | G | G | G | | | | | | | | | | F | F | F | F | F | F | G | G | G | |
| Cap (µF) 0.010 103 | F | F | F | G | G | G | G | G | F | F | F | G | G | G | G | G | | | | | | | | | | F | F | F | F | F | F | G | G | G | |
| 0.015 153 | F | F | F | G | G | G | G | | F | F | F | G | G | G | G | | | | | | | | | | | F | F | F | G | G | G | G | G | | |
| 0.018 183 | F | F | F | G | G | | | | F | F | F | G | G | G | | | | | | | | | | | | F | F | F | G | G | G | G | G | | |
| 0.022 223 | F | F | F | G | G | | | | F | F | F | G | G | | | | | | | | | | | | | F | F | F | G | G | G | G | | | |
| 0.027 273 | F | F | F | G | | | | | F | F | F | G | G | | | | | | | | | | | | | F | F | F | G | G | | | | | |
| 0.033 333 | F | F | F | G | | | | | F | F | F | G | | | | | | | | | | | | | | F | F | F | G | | | | | | |
| 0.039 393 | F | F | F | G | | | | | F | F | F | G | | | | | | | | | | | | | | F | F | F | G | | | | | | |
| 0.047 473 | F | F | F | P | | | | | F | F | F | G | | | | | | | | | | | | | | F | F | F | G | | | | | | |
| 0.056 563 | F | F | F | G | | | | | F | F | F | G | | | | | | | | | | | | | | F | F | F | G | | | | | | |
| 0.068 683 | F | F | G | | | | | | F | F | G | | | | | | | | | | | | | | | F | F | F | G | | | | | | |
| 0.082 823 | F | F | G | | | | | | F | F | G | | | | | | | | | | | | | | | F | F | G | | | | | | | |
| 0.100 104 | F | F | G | | | | | | F | F | G | | | | | | | | | | | | | | | F | F | G | | | | | | | |
| 0.150 154 | F | F | | | | | | | F | F | G | | | | | | | | | | | | | | | F | F | G | | | | | | | |
| 0.220 224 | F | F | | | | | | | F | F | G | | | | | | | | | | | | | | | F | F | | | | | | | | |
| 0.270 274 | F | F | | | | | | | F | F | | | | | | | | | | | | | | | | F | F | | | | | | | | |
| 0.330 334 | F | F | | | | | | | F | F | | | | | | | | | | | | | | | | F | F | | | | | | | | |
| 0.390 394 | F | F | | | | | | | F | F | | | | | | | | | | | | | | | | F | F | | | | | | | | |
| 0.470 474 | F | F | | | | | | | F | F | | | | | | | | | | | | | | | | F | F | | | | | | | | |
| 0.560 564 | G | G | | | | | | | G | G | | | | | | | | | | | | | | | | F | F | | | | | | | | |
| 0.680 684 | | | | | | | | | G | G | | | | | | | | | | | | | | | | G | G | | | | | | | | |
| 0.820 824 | | | | | | | | | | | | | | | | | | | | | | | | | | G | G | | | | | | | | |
| 1.000 105 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Voltage (V) | 600 | 630 | 1000 | 1500 | 2000 | 2500 | 3000 | 4000 | 600 | 630 | 1000 | 1500 | 2000 | 2500 | 3000 | 4000 | 5000 | 600 | 630 | 1000 | 1500 | 2000 | 2500 | 3000 | 4000 | 5000 | 600 | 630 | 1000 | 1500 | 2000 | 2500 | 3000 | 4000 | 5000 |

| Letter | A | C | E | F | G | P | X |
|----------------|---------------|---------------|----------------|----------------|---------------|---------------|---------------|
| Max. Thickness | 0.813 (0.032) | 1.448 (0.057) | 1.8034 (0.071) | 2.2098 (0.087) | 2.794 (0.110) | 3.048 (0.120) | 0.940 (0.037) |

NOTE: Contact factory for non-specified capacitance values



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