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# High Voltage MLC Chips



For 600V to 5000V Applications



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).

**NEW 630V RANGE**

## HOW TO ORDER

| 1808      | A             | A                       | 271  | K  | A                          | 1  | 1  | A                            |
|-----------|---------------|-------------------------|--|--|----------------------------|--|--|------------------------------|
| AVX Style | Voltage       | Temperature Coefficient | Capacitance Code<br>(2 significant digits + no. of zeros)<br>Examples: | Capacitance Tolerance<br>COG: J = ±5%<br>K = ±10%<br>M = ±20%<br>X7R: K = ±10%<br>M = ±20%<br>Z = +80%, -20% | Test Level<br>A = Standard | Termination*<br>1 = Pd/Ag<br>T = Plated Ni and Sn (RoHS Compliant) | Packaging<br>1 = 7" Reel**<br>3 = 13" Reel<br>9 = Bulk | Special Code<br>A = Standard |
| 0805      | 600V/630V = C | C0G = A                 | 10 pF = 100  |  |                            |  |  |                              |
| 1206      | 1000V = A     | X7R = C                 | 100 pF = 101   |  |                            |  |  |                              |
| 1210      | 1500V = S     |                         | 1,000 pF = 102   |  |                            |  |  |                              |
| 1808      | 2000V = G     |                         | 22,000 pF = 223  |  |                            |  |  |                              |
| 1812      | 2500V = W     |                         | 220,000 pF = 224   |  |                            |  |  |                              |
| 1825      | 3000V = H     |                         | 1 μF = 105   |  |                            |  |  |                              |
| 2220      | 4000V = J     |                         |  |  |                            |  |  |                              |
| 2225      | 5000V = K     |                         |  |  |                            |  |  |                              |
| 3640      |               |                         |  |  |                            |  |  |                              |

**\*\*\***

**\*Note:** Terminations with 5% minimum lead (Pb) is available, see pages 89 and 90 for LD style. Leaded terminations are available, see pages 93 and 94.

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<br>(0.079 ± 0.008) | 3.20 ± 0.20<br>(0.126 ± 0.008) | 3.20 ± 0.20<br>(0.126 ± 0.008) | 4.57 ± 0.25<br>(0.180 ± 0.010) | 4.50 ± 0.30<br>(0.177 ± 0.012) | 4.50 ± 0.30<br>(0.177 ± 0.012) | 5.70 ± 0.40<br>(0.224 ± 0.016) | 5.72 ± 0.25<br>(0.225 ± 0.010) | 9.14 ± 0.25<br>(0.360 ± 0.010) |
| (W) Width              | 1.25 ± 0.20<br>(0.049 ± 0.008) | 1.60 ± 0.20<br>(0.063 ± 0.008) | 2.50 ± 0.20<br>(0.098 ± 0.008) | 2.03 ± 0.25<br>(0.080 ± 0.010) | 3.20 ± 0.20<br>(0.126 ± 0.008) | 6.40 ± 0.30<br>(0.252 ± 0.012) | 5.00 ± 0.40<br>(0.197 ± 0.016) | 6.35 ± 0.25<br>(0.250 ± 0.010) | 10.2 ± 0.25<br>(0.400 ± 0.010) |
| (T) Thickness Max.     | 1.30<br>(0.051)                | 1.52<br>(0.060)                | 1.70<br>(0.067)                | 2.03<br>(0.080)                | 2.54<br>(0.100)                | 2.54<br>(0.100)                | 3.30<br>(0.130)                | 2.54<br>(0.100)                | 2.54<br>(0.100)                |
| (t) terminal min. max. | 0.50 ± 0.25<br>(0.020 ± 0.010) | 0.25 (0.010)<br>0.75 (0.030)   | 0.25 (0.010)<br>0.75 (0.030)   | 0.25 (0.010)<br>1.02 (0.040)   | 0.25 (0.010)<br>1.02 (0.040)   | 0.25 (0.010)<br>1.02 (0.040)   | 0.25 (0.010)<br>1.02 (0.040)   | 0.25 (0.010)<br>1.02 (0.040)   | 0.76 (0.030)<br>1.52 (0.060)   |

\*Reflow Soldering Only



# High Voltage MLC Chips



For 600V to 5000V Applications

## C0G Dielectric

### Performance Characteristics

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

## HIGH VOLTAGE C0G CAPACITANCE VALUES

| VOLTAGE | 0805 | 1206  | 1210    | 1808    | 1812    | 1825    | 2220          | 2225          | 3640          |               |
|---------|------|-------|---------|---------|---------|---------|---------------|---------------|---------------|---------------|
| 600/630 | min. | 10pF  | 10 pF   | 100 pF  | 100 pF  | 100 pF  | 1000 pF       | 1000 pF       | 1000 pF       | 1000 pF       |
|         | max. | 330pF | 1200 pF | 2700 pF | 3300 pF | 5600 pF | 0.012 $\mu$ F | 0.012 $\mu$ F | 0.018 $\mu$ F | 0.047 $\mu$ F |
| 1000    | min. | 10pF  | 10 pF   | 10 pF   | 100 pF  | 100 pF  | 100 pF        | 1000 pF       | 1000 pF       | 1000 pF       |
|         | max. | 180pF | 560 pF  | 1500 pF | 2200 pF | 3300 pF | 8200 pF       | 0.010 $\mu$ F | 0.010 $\mu$ F | 0.022 $\mu$ F |
| 1500    | min. | —     | 10 pF   | 10 pF   | 10 pF   | 10 pF   | 100 pF        | 100 pF        | 100 pF        | 100 pF        |
|         | max. | —     | 270 pF  | 680 pF  | 820 pF  | 1800 pF | 4700 pF       | 4700 pF       | 5600 pF       | 0.010 $\mu$ F |
| 2000    | min. | —     | 10 pF   | 10 pF   | 10 pF   | 10 pF   | 100 pF        | 100 pF        | 100 pF        | 100 pF        |
|         | max. | —     | 120 pF  | 270 pF  | 330 pF  | 1000 pF | 1800 pF       | 2200 pF       | 2700 pF       | 6800 pF       |
| 2500    | min. | —     | —       | —       | 10 pF   | 10 pF   | 10 pF         | 100 pF        | 100 pF        | 100 pF        |
|         | max. | —     | —       | —       | 180 pF  | 470 pF  | 1200 pF       | 1500 pF       | 1800 pF       | 3900 pF       |
| 3000    | min. | —     | —       | —       | 10 pF   | 10 pF   | 10 pF         | 10 pF         | 10 pF         | 100 pF        |
|         | max. | —     | —       | —       | 120 pF  | 330 pF  | 820 pF        | 1000 pF       | 1200 pF       | 2700 pF       |
| 4000    | min. | —     | —       | —       | 10 pF   | 10 pF   | 10 pF         | 10 pF         | 10 pF         | 100 pF        |
|         | max. | —     | —       | —       | 47 pF   | 150 pF  | 330 pF        | 470 pF        | 560 pF        | 1200 pF       |
| 5000    | min. | —     | —       | —       | —       | —       | —             | 10 pF         | 10 pF         | 10 pF         |
|         | max. | —     | —       | —       | —       | —       | —             | 220 pF        | 270 pF        | 820 pF        |

## X7R Dielectric

### Performance Characteristics

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

## HIGH VOLTAGE X7R MAXIMUM CAPACITANCE VALUES

| VOLTAGE | 0805 | 1206   | 1210          | 1808          | 1812          | 1825          | 2220          | 2225          | 3640          |               |
|---------|------|--------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| 600/630 | min. | 100pF  | 1000 pF       | 1000 pF       | 1000 pF       | 1000 pF       | 0.010 $\mu$ F | 0.010 $\mu$ F | 0.010 $\mu$ F | 0.010 $\mu$ F |
|         | max. | 6800pF | 0.022 $\mu$ F | 0.056 $\mu$ F | 0.068 $\mu$ F | 0.120 $\mu$ F | 0.270 $\mu$ F | 0.270 $\mu$ F | 0.330 $\mu$ F | 0.560 $\mu$ F |
| 1000    | min. | 100pF  | 100 pF        | 1000 pF       | 1000 pF       | 1000 pF       | 1000 pF       | 1000 pF       | 1000 pF       | 1000 pF       |
|         | max. | 1500pF | 6800 pF       | 0.015 $\mu$ F | 0.018 $\mu$ F | 0.039 $\mu$ F | 0.100 $\mu$ F | 0.120 $\mu$ F | 0.150 $\mu$ F | 0.220 $\mu$ F |
| 1500    | min. | —      | 100 pF        | 100 pF        | 100 pF        | 100 pF        | 1000 pF       | 1000 pF       | 1000 pF       | 1000 pF       |
|         | max. | —      | 2700 pF       | 5600 pF       | 6800 pF       | 0.015 $\mu$ F | 0.056 $\mu$ F | 0.056 $\mu$ F | 0.068 $\mu$ F | 0.100 $\mu$ F |
| 2000    | min. | —      | 10 pF         | 100 pF        | 100 pF        | 100 pF        | 100 pF        | 1000 pF       | 1000 pF       | 1000 pF       |
|         | max. | —      | 1500 pF       | 3300 pF       | 3300 pF       | 8200 pF       | 0.022 $\mu$ F | 0.027 $\mu$ F | 0.033 $\mu$ F | 0.027 $\mu$ F |
| 2500    | min. | —      | —             | —             | 10 pF         | 10 pF         | 100 pF        | 100 pF        | 100 pF        | 1000 pF       |
|         | max. | —      | —             | —             | 2200 pF       | 5600 pF       | 0.015 $\mu$ F | 0.018 $\mu$ F | 0.022 $\mu$ F | 0.022 $\mu$ F |
| 3000    | min. | —      | —             | —             | 10 pF         | 10 pF         | 100 pF        | 100 pF        | 100 pF        | 1000 pF       |
|         | max. | —      | —             | —             | 1800 pF       | 3900 pF       | 0.010 $\mu$ F | 0.012 $\mu$ F | 0.015 $\mu$ F | 0.018 $\mu$ F |
| 4000    | min. | —      | —             | —             | —             | —             | —             | —             | —             | 100 pF        |
|         | max. | —      | —             | —             | —             | —             | —             | —             | —             | 6800 pF       |
| 5000    | min. | —      | —             | —             | —             | —             | —             | —             | —             | 100 pF        |
|         | max. | —      | —             | —             | —             | —             | —             | —             | —             | 3300 pF       |