

# 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<br>(2 significant digits + no. of zeros)                                                       | Capacitance Tolerance<br>C0G: 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<br>Ni and Sn<br>(RoHS Compliant) | Packaging<br>1 = 7" Reel**<br>3 = 13" Reel | Special Code<br>A = Standard |
| 0805      | 600V/630V = C | NPO (C0G) = A           | Examples:<br>10 pF = 100<br>100 pF = 101<br>1,000 pF = 102<br>22,000 pF = 223<br>220,000 pF = 224<br>1 µF = 105 |                                                                                                              |                            |                                                                          |                                            |                              |
| 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<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<br>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<br>min.<br>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



## NP0 (C0G) Dielectric Performance Characteristics

|                                                   |                                                                                         |
|---------------------------------------------------|-----------------------------------------------------------------------------------------|
| <b>Capacitance Range</b>                          | 10 pF to 0.047 $\mu$ F (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                          |

| Case Size     |     |     | 0805                           |     |      | 1206                           |     |      |      | 1210                           |     |     |      |      | 1808                           |     |     |      |      |      |      | 1812                           |      |     |     |      |      |      |      |      |      |
|---------------|-----|-----|--------------------------------|-----|------|--------------------------------|-----|------|------|--------------------------------|-----|-----|------|------|--------------------------------|-----|-----|------|------|------|------|--------------------------------|------|-----|-----|------|------|------|------|------|------|
| Soldering     |     |     | Reflow/Wave                    |     |      | Reflow/Wave                    |     |      |      | Reflow Only                    |     |     |      |      | Reflow Only                    |     |     |      |      |      |      | Reflow Only                    |      |     |     |      |      |      |      |      |      |
| (L) Length    | mm  |     | 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) |      |     |     |      |      |      |      |      |      |
| (W) Width     | mm  |     | 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) |      |     |     |      |      |      |      |      |      |
| (T) Thickness | mm  |     | 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)                |      |     |     |      |      |      |      |      |      |
| (t) Terminal  | min |     | 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)   |      |     |     |      |      |      |      |      |      |
| 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                              |     |     |      |      |                                | C   | C   | C    | C    | C    | C    |                                |      |     |     |      |      |      |      |      |      |
|               | 3.3 | 3R3 | A                              | A   |      | X                              | X   | X    | X    | X                              |     |     |      |      |                                | C   | C   | C    | C    | C    | C    |                                |      |     |     |      |      |      |      |      |      |
|               | 3.9 | 3R9 | A                              | A   |      | X                              | X   | X    | X    | X                              |     |     |      |      |                                | C   | C   | C    | C    | C    | C    |                                |      |     |     |      |      |      |      |      |      |
|               | 4.7 | 4R7 | A                              | A   |      | X                              | X   | X    | X    | X                              |     |     |      |      |                                | C   | C   | C    | C    | C    | C    |                                |      |     |     |      |      |      |      |      |      |
|               | 5.6 | 5R6 | A                              | A   |      | X                              | X   | X    | X    | X                              |     |     |      |      |                                | C   | C   | C    | C    | C    | C    |                                |      |     |     |      |      |      |      |      |      |
|               | 6.8 | 6R8 | A                              | A   |      | X                              | X   | X    | X    | X                              |     |     |      |      |                                | C   | C   | C    | C    | C    | C    |                                |      |     |     |      |      |      |      |      |      |
|               | 8.2 | 8R2 | A                              | A   |      | X                              | X   | X    | X    | X                              |     |     |      |      |                                | C   | C   | C    | C    | C    | C    |                                |      |     |     |      |      |      |      |      |      |
| 10            | 100 | A   |                                |     |      | X                              | X   | X    | X    | X                              | C   | C   | D    | D    | D                              | C   | C   | C    | C    | C    | C    |                                | C    | C   | C   | C    | C    | C    | C    | C    |      |
| 12            | 120 | A   |                                |     |      | X                              | X   | X    | X    | X                              | C   | C   | D    | D    | D                              | C   | C   | C    | C    | C    | C    |                                | C    | C   | C   | C    | C    | C    | C    | C    |      |
| 15            | 150 | A   |                                |     |      | X                              | X   | X    | X    | X                              | C   | C   | D    | D    | D                              | C   | C   | C    | C    | C    | C    |                                | C    | C   | C   | C    | C    | C    | C    | C    |      |
| 18            | 180 | A   |                                |     |      | X                              | X   | X    | X    | X                              | C   | C   | D    | D    | D                              | C   | C   | C    | C    | C    | C    |                                | C    | C   | C   | C    | C    | C    | C    | C    |      |
| 22            | 220 | A   |                                |     |      | X                              | X   | X    | X    | X                              | C   | C   | D    | D    | D                              | C   | C   | C    | C    | C    | C    |                                | C    | C   | C   | C    | C    | C    | C    | C    |      |
| 27            | 270 | A   |                                |     |      | X                              | X   | X    | X    | X                              | C   | C   | D    | D    | D                              | C   | C   | C    | C    | C    | C    |                                | C    | C   | C   | C    | C    | C    | C    | C    |      |
| 33            | 330 | A   |                                |     |      | X                              | X   | X    | D    | D                              | C   | C   | D    | D    | D                              | C   | C   | C    | C    | C    | C    |                                | C    | C   | C   | C    | C    | C    | C    | C    |      |
| 39            | 390 | A   |                                |     |      | X                              | X   | X    | D    | D                              | C   | C   | D    | D    | D                              | C   | C   | C    | C    | C    | C    |                                | C    | C   | C   | C    | C    | C    | C    | C    |      |
| 47            | 470 | A   |                                |     |      | X                              | X   | M    | D    | D                              | C   | C   | D    | D    | D                              | C   | C   | C    | C    | C    | C    |                                | C    | C   | C   | C    | C    | C    | C    | C    |      |
| 56            | 560 | A   |                                |     |      | X                              | X   | M    | C    | C                              | C   | C   | D    | C    | C                              | C   |     |      |      |      |      |                                |      |     |     |      |      |      |      |      |      |



**NP0 (C0G) CAPACITANCE RANGE**  
**PREFERRED SIZES ARE SHADED**

| Letter         | A                | C                | E                 | F                 | G                | X                |
|----------------|------------------|------------------|-------------------|-------------------|------------------|------------------|
| Max. Thickness | 0.813<br>(0.032) | 1.448<br>(0.057) | 1.8034<br>(0.071) | 2.2098<br>(0.087) | 2.794<br>(0.110) | 0.940<br>(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 $\mu$ F (25°C, 1.0 $\pm$ 0.2 Vrms at 1kHz)                  |
| Capacitance Tolerances                     | $\pm$ 10%; $\pm$ 20%; +80%, -20%                                          |
| Dissipation Factor                         | 2.5% max. (+25°C, 1.0 $\pm$ 0.2 Vrms, 1kHz)                               |
| Operating Temperature Range                | -55°C to +125°C                                                           |
| Temperature Characteristic                 | $\pm$ 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 M $\Omega$ min. or 1000 M $\Omega$ - $\mu$ F min., whichever is less |
| Insulation Resistance (+125°C, at 500 VDC) | 10K M $\Omega$ min. or 100 M $\Omega$ - $\mu$ F 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/Wave     |     |      |      |      | Reflow Only     |     |      |      |      | Reflow Only     |     |      |      |      |      |      |      | Reflow Only     |     |      |      |      |      |      |      |
| (L) Length    | mm    | 2.01 ± 0.20     |     |      | 3.20 ± 0.20     |     |      |      |      | 3.20 ± 0.20     |     |      |      |      | 4.57 ± 0.25     |     |      |      |      |      |      |      | 4.50 ± 0.30     |     |      |      |      |      |      |      |
|               | (in.) | (0.079 ± 0.008) |     |      | (0.126 ± 0.008) |     |      |      |      | (0.126 ± 0.008) |     |      |      |      | (0.180 ± 0.010) |     |      |      |      |      |      |      | (0.177 ± 0.012) |     |      |      |      |      |      |      |
| (W) Width     | mm    | 1.25 ± 0.20     |     |      | 1.60 ± 0.20     |     |      |      |      | 2.50 ± 0.20     |     |      |      |      | 2.03 ± 0.25     |     |      |      |      |      |      |      | 3.20 ± 0.20     |     |      |      |      |      |      |      |
|               | (in.) | (0.049 ± 0.008) |     |      | (0.063 ± 0.008) |     |      |      |      | (0.098 ± 0.008) |     |      |      |      | (0.080 ± 0.010) |     |      |      |      |      |      |      | (0.126 ± 0.008) |     |      |      |      |      |      |      |
| (T) Thickness | mm    | 1.30            |     |      | 1.52            |     |      |      |      | 1.70            |     |      |      |      | 2.03            |     |      |      |      |      |      |      | 2.54            |     |      |      |      |      |      |      |
|               | (in.) | (0.051)         |     |      | (0.060)         |     |      |      |      | (0.067)         |     |      |      |      | (0.080)         |     |      |      |      |      |      |      | (0.100)         |     |      |      |      |      |      |      |
| (t) Terminal  | min   | 0.50 ± 0.25     |     |      | 0.25 (0.010)    |     |      |      |      | 0.25 (0.010)    |     |      |      |      | 0.25 (0.010)    |     |      |      |      |      |      |      | 0.25 (0.010)    |     |      |      |      |      |      |      |
|               | max   | (0.020 ± 0.010) |     |      | 0.75 (0.030)    |     |      |      |      | 0.75 (0.030)    |     |      |      |      | 1.02 (0.040)    |     |      |      |      |      |      |      | 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)      | 100   | 101             | X   | X    | C               | C   | C    | E    | E    | E               | E   | E    | E    | E    |                 |     |      |      |      |      |      |      |                 |     |      |      |      |      |      |      |
|               | 120   | 121             | X   | X    | C               | C   | C    | E    | E    | E               | E   | E    | E    | E    |                 |     |      |      |      |      |      |      |                 |     |      |      |      |      |      |      |
|               | 150   | 151             | X   | X    | C               | C   | C    | E    | E    | E               | E   | E    | E    | E    |                 |     |      |      |      |      |      |      |                 |     |      |      |      |      |      |      |
|               | 180   | 181             | X   | X    | C               | C   | C    | E    | E    | E               | E   | E    | E    | E    |                 |     |      |      |      |      |      |      |                 |     |      |      |      |      |      |      |
|               | 220   | 221             | X   | X    | C               | C   | C    | 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    |      |      |      |
|               | 330   | 331             | X   | X    | C               | C   | C    | E    | E    | E               | E   | E    | E    | E    | E               | E   | E    | E    | E    | E    | F    |      | 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    | F    |      | E               | E   | E    | E    | E    |      |      |      |
|               | 470   | 471             | X   | X    | C               | C   | C    | E    | E    | E               | E   | E    | E    | E    | E               | E   | E    | E    | E    | F    |      | E    | 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    | F    | 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    | F    | F    |      | E               | E   | E    | E    | E    | F    | F    |      |
|               | 750   | 751             | X   | X    | C               | C   | C    | E    | E    | E               | E   | E    | E    | E    | E               | E   | E    | E    | E    | F    | F    |      | E               | E   | E    | E    | E    | F    | F    |      |
|               | 820   | 821             | X   | X    | C               | C   | C    | E    | E    | E               | E   | E    | E    | E    | E               | E   | E    | E    | E    | F    | F    |      | E               | E   | E    | E    | E    | F    | F    |      |
|               | 1000  | 102             | X   | X    | C               | C   | C    | E    | E    | E               | E   | E    | E    | E    | E               | E   | E    | E    | E    | F    | F    |      | E               | E   | E    | E    | E    | F    | F    |      |
|               | 1200  | 122             | X   | X    | C               | C   | C    | E    | E    | E               | E   | E    | E    | E    | E               | E   | E    | E    | E    | F    | F    |      | E               | E   | E    | E    | E    | F    | F    |      |
|               | 1500  | 152             | X   | X    | C               | C   | C    | E    | E    | E               | E   | E    | E    | E    | E               | E   | E    | E    | E    | F    | F    |      | E               | E   | E    | E    | E    | G    | G    |      |
|               | 1800  | 182             | X   | X    |                 |     | C    | C    | E    | E               | E   | E    | E    | E    | E               | E   | E    | E    | E    | F    | F    |      | E               | E   | E    | E    | E    | G    | G    |      |
|               | 2200  | 222             | X   | X    |                 |     | C    | C    | E    | E               | E   | E    | E    | E    | F               | E   | E    | E    | F    | F    | F    |      | E               | E   | E    | E    | E    | G    | G    |      |
|               | 2700  | 272             | X   | X    |                 |     | C    | C    | E    | E               |     |      | E    | E    | E               | F   | E    | E    | E    | F    | F    |      | E               | E   | E    | E    | E    | G    | G    |      |
|               | 3300  | 332             | X   | X    |                 |     | C    | C    | E    |                 |     |      | E    | E    | E               | F   | E    | E    | E    | F    | F    |      | E               | E   | E    | F    | F    | G    | G    |      |
|               | 3900  | 392             | X   | X    |                 |     | C    | C    | E    |                 |     |      | E    | E    | E               | G   |      |      | F    |      |      |      | E               | E   | E    | F    | F    | G    | G    |      |
|               | 4700  | 472             | X   | X    |                 |     | C    | C    | E    |                 |     |      | E    | E    | E               | G   |      |      | F    |      |      |      | E               | E   | E    | F    | F    | G    | G    |      |
|               | 5600  | 562             | X   | X    |                 |     | C    | C    | E    |                 |     |      | E    | E    | E               | G   |      |      | F    |      |      |      | E               | E   | E    | G    | G    |      |      |      |
|               | 6800  | 682             | X   | X    |                 |     | C    | C    | E    |                 |     |      | E    | E    | E               |     |      |      | F    |      |      |      | E               | E   | E    | G    | G    |      |      |      |
|               | 8200  | 822             | X   | X    |                 |     | C    | C    | 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   | 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    |      |      | 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    | 4.50 ± 0.30     |     |      |      |      |      |      |      | 5.70 ± 0.40     |     |      |      |      |      |      |      | 5.72 ± 0.25     |     |     |      |      |      |      |      | 9.14 ± 0.25     |      |     |     |      |      |      |      |      |      |      |
| mm (in.)      | (0.177 ± 0.012) |     |      |      |      |      |      |      | (0.224 ± 0.016) |     |      |      |      |      |      |      | (0.225 ± 0.010) |     |     |      |      |      |      |      | (0.360 ± 0.010) |      |     |     |      |      |      |      |      |      |      |
| (W) Width     | 6.40 ± 0.30     |     |      |      |      |      |      |      | 5.00 ± 0.40     |     |      |      |      |      |      |      | 6.35 ± 0.25     |     |     |      |      |      |      |      | 10.2 ± 0.25     |      |     |     |      |      |      |      |      |      |      |
| mm (in.)      | (0.252 ± 0.012) |     |      |      |      |      |      |      | (0.197 ± 0.016) |     |      |      |      |      |      |      | (0.250 ± 0.010) |     |     |      |      |      |      |      | (0.400 ± 0.010) |      |     |     |      |      |      |      |      |      |      |
| (T) Thickness | 2.54            |     |      |      |      |      |      |      | 3.30            |     |      |      |      |      |      |      | 2.54            |     |     |      |      |      |      |      | 2.54            |      |     |     |      |      |      |      |      |      |      |
| mm (in.)      | (0.100)         |     |      |      |      |      |      |      | (0.130)         |     |      |      |      |      |      |      | (0.100)         |     |     |      |      |      |      |      | (0.100)         |      |     |     |      |      |      |      |      |      |      |
| (t) Terminal  | 0.25 (0.010)    |     |      |      |      |      |      |      | 0.25 (0.010)    |     |      |      |      |      |      |      | 0.25 (0.010)    |     |     |      |      |      |      |      | 0.76 (0.030)    |      |     |     |      |      |      |      |      |      |      |
| min max       | 1.02 (0.040)    |     |      |      |      |      |      |      | 1.02 (0.040)    |     |      |      |      |      |      |      | 1.02 (0.040)    |     |     |      |      |      |      |      | 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               | F   | F   | F    | F    | F    | F    | F    | F               | F    | G   | G   | G    | G    | G    | G    | G    | G    |      |
|               | 1200            | 122 | F    | F    | F    | F    | F    | F    | F               | F   | F    | F    | F    | F    | F    | F    | F               | F   | F   | F    | F    | F    | F    | F    | F               | F    | G   | G   | G    | G    | G    | G    | G    | G    |      |
|               | 1500            | 152 | F    | F    | F    | F    | F    | F    | F               | F   | F    | F    | F    | F    | F    | F    | F               | F   | F   | F    | F    | F    | F    | F    | F               | F    | G   | G   | G    | G    | G    | G    | G    | G    |      |
|               | 1800            | 182 | F    | F    | F    | F    | F    | F    | F               | F   | F    | F    | F    | F    | F    | F    | F               | F   | F   | F    | F    | F    | F    | F    | F               | F    | G   | G   | G    | G    | G    | G    | G    | G    |      |
|               | 2200            | 222 | F    | F    | F    | F    | F    | F    | F               | F   | F    | F    | F    | F    | F    | F    | F               | F   | F   | F    | F    | F    | F    | F    | F               | F    | G   | G   | G    | G    | G    | G    | G    | G    |      |
|               | 2700            | 272 | F    | F    | F    | F    | F    | F    | F               | F   | F    | F    | F    | F    | F    | F    | F               | F   | F   | F    | F    | F    | F    | F    | F               | F    | G   | G   | G    | G    | G    | G    | G    | G    |      |
|               | 3300            | 332 | F    | F    | F    | F    | F    | F    | F               | F   | F    | F    | F    | F    | F    | F    | F               | F   | F   | F    | F    | F    | F    | F    | F               | F    | G   | G   | G    | G    | G    | G    | G    | G    |      |
|               | 3900            | 392 | F    | F    | F    | F    | F    | F    | F               | F   | F    | F    | F    | F    | F    | F    | F               | F   | F   | F    | F    | F    | F    | F    | F               | F    | G   | G   | G    | G    | G    | G    | G    | G    |      |
|               | 4700            | 472 | F    | F    | F    | F    | F    | F    | F               | F   | F    | F    | F    | F    | F    | F    | F               | F   | F   | F    | F    | F    | F    | F    | F               | F    | G   | G   | G    | G    | G    | G    | G    | G    |      |
|               | 5600            | 562 | F    | F    | F    | F    | F    | F    | F               | F   | F    | F    | F    | F    | F    | F    | F               | F   | F   | F    | F    | F    | F    | F    | F               | F    | G   | G   | G    | G    | G    | G    | G    | G    |      |
|               | 6800            | 682 | F    | F    | F    | G    | G    | G    | G               | G   | G    | G    | G    | G    | G    | G    | G               | F   | F   | F    | F    | F    | F    | F    | F               | F    | G   | G   | G    | G    | G    | G    | G    | G    |      |
|               | 8200            | 822 | F    | F    | F    | G    | G    | G    | G               | G   | G    | G    | G    | G    | G    | G    | G               | F   | F   | F    | F    | F    | F    | F    | F               | F    | G   | G   | G    | G    | G    | G    | G    | G    |      |
| Cap (µF)      | 0.010           | 103 | F    | F    | F    | G    | G    | G    | G               | G   | G    | G    | G    | G    | G    | G    | G               | F   | F   | F    | F    | F    | F    | F    | F               | F    | G   | G   | G    | G    | G    | G    | G    | G    |      |
|               | 0.015           | 153 | F    | F    | F    | G    | G    | G    | G               | G   | G    | G    | G    | G    | G    | G    | G               | F   | F   | F    | F    | F    | F    | F    | F               | F    | G   | G   | G    | G    | G    | G    | G    | G    |      |
|               | 0.018           | 183 | F    | F    | F    | G    | G    | G    | G               | G   | G    | G    | G    | G    | G    | G    | G               | F   | F   | F    | F    | F    | F    | F    | F               | F    | G   | G   | G    | G    | G    | G    | G    | G    |      |
|               | 0.022           | 223 | F    | F    | F    | G    | G    | G    | G               | G   | G    | G    | G    | G    | G    | G    | G               | F   | F   | F    | F    | F    | F    | F    | F               | F    | G   | G   | G    | G    | G    | G    | G    | G    |      |
|               | 0.027           | 273 | F    | F    | F    | G    | G    | G    | G               | G   | G    | G    | G    | G    | G    | G    | G               | F   | F   | F    | F    | F    | F    | F    | F               | F    | G   | G   | G    | G    | G    | G    | G    | G    |      |
|               | 0.033           | 333 | F    | F    | F    | G    | G    | G    | G               | G   | G    | G    | G    | G    | G    | G    | G               | F   | F   | F    | F    | F    | F    | F    | F               | F    | G   | G   | G    | G    | G    | G    | G    | G    |      |
|               | 0.039           | 393 | F    | F    | F    | G    | G    | G    | G               | G   | G    | G    | G    | G    | G    | G    | G               | F   | F   | F    | F    | F    | F    | F    | F               | F    | G   | G   | G    | G    | G    | G    | G    | G    |      |
|               | 0.047           | 473 | F    | F    | F    | P    | P    | P    | P               | P   | P    | P    | P    | P    | P    | P    | P               | F   | F   | F    | F    | F    | F    | F    | F               | F    | G   | G   | G    | G    | G    | G    | G    | G    |      |
|               | 0.056           | 563 | F    | F    | F    | G    | G    | G    | G               | G   | G    | G    | G    | G    | G    | G    | G               | F   | F   | F    | F    | F    | F    | F    | F               | F    | G   | G   | G    | G    | G    | G    | G    | G    |      |
|               | 0.068           | 683 | F    | F    | G    | G    | G    | G    | G               | G   | G    | G    | G    | G    | G    | G    | G               | F   | F   | G    | G    | G    | G    | G    | G               | G    | G   | G   | G    | G    | G    | G    | G    | G    |      |
|               | 0.082           | 823 | F    | F    | G    | G    | G    | G    | G               | G   | G    | G    | G    | G    | G    | G    | G               | F   | F   | G    | G    | G    | G    | G    | G               | G    | G   | G   | G    | G    | G    | G    | G    | G    |      |
|               | 0.100           | 104 | F    | F    | G    | G    | G    | G    | G               | G   | G    | G    | G    | G    | G    | G    | G               | F   | F   | G    | G    | G    | G    | G    | G               | G    | G   | G   | G    | G    | G    | G    | G    | G    |      |
|               | 0.150           | 154 | F    | F    | G    | G    | G    | G    | G               | G   | G    | G    | G    | G    | G    | G    | G               | F   | F   | G    | G    | G    | G    | G    | G               | G    | G   | G   | G    | G    | G    | G    | G    | G    |      |
|               | 0.220           | 224 | F    | F    | G    | G    | G    | G    | G               | G   | G    | G    | G    | G    | G    | G    | G               | F   | F   | G    | G    | G    | G    | G    | G               | G    | G   | G   | G    | G    | G    | G    | G    | G    |      |
|               | 0.270           | 274 | F    | F    | G    | G    | G    | G    | G               | G   | G    | G    | G    | G    | G    | G    | G               | F   | F   | G    | G    | G    | G    | G    | G               | G    | G   | G   | G    | G    | G    | G    | G    | G    |      |
|               | 0.330           | 334 | F    | F    | G    | G    | G    | G    | G               | G   | G    | G    | G    | G    | G    | G    | G               | F   | F   | G    | G    | G    | G    | G    | G               | G    | G   | G   | G    | G    | G    | G    | G    | G    |      |
|               | 0.390           | 394 | F    | F    | G    | G    | G    | G    | G               | G   | G    | G    | G    | G    | G    | G    | G               | F   | F   | G    | G    | G    | G    | G    | G               | G    | G   | G   | G    | G    | G    | G    | G    | G    |      |
|               | 0.470           | 474 | F    | F    | G    | G    | G    | G    | G               | G   | G    | G    | G    | G    | G    | G    | G               | F   | F   | G    | G    | G    | G    | G    | G               | G    | G   | G   | G    | G    | G    | G    | G    | G    |      |
|               | 0.560           | 564 | G    | G    | G    | G    | G    | G    | G               | G   | G    | G    | G    | G    | G    | G    | G               | F   | F   | G    | G    | G    | G    | G    | G               | G    | G   | G   | G    | G    | G    | G    | G    | G    |      |
|               | 0.680           | 684 | G    | G    | G    | G    | G    | G    | G               | G   | G    | G    | G    | G    | G    | G    | G               | F   | F   | G    | G    | G    | G    | G    | G               | G    | G   | G   | G    | G    | G    | G    | G    | G    |      |
|               | 0.820           | 824 | G    | G    | G    | G    | G    | G    | G               | G   | G    | G    | G    | G    | G    | G    | G               | F   | F   | G    | G    | G    | G    | G    | G               | G    | G   | G   | G    | G    | G    | G    | G    | G    |      |
|               | 1.000           | 105 | G    | G    | G    | G    | G    | G    | G               | G   | G    | G    | G    | G    | G    | G    | G               | F   | F   | G    | G    | G    | G    | G    | G               | G    | G   | G   | G    | G    | G    | G    | G    | G    |      |
| 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 |
| Case Size     | 1825            |     |      |      |      |      |      |      | 2220            |     |      |      |      |      |      |      | 2225            |     |     |      |      |      |      |      | 3640            |      |     |     |      |      |      |      |      |      |      |

|                |               |               |                |                |               |               |               |
|----------------|---------------|---------------|----------------|----------------|---------------|---------------|---------------|
| 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