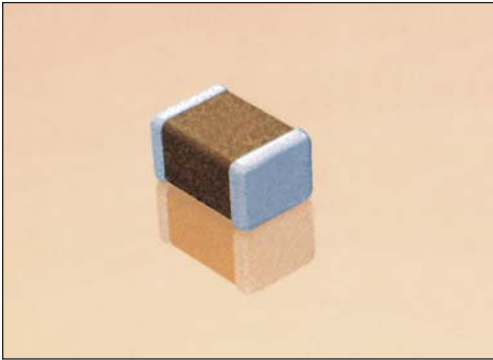


# X5R Dielectric

## General Specifications



### GENERAL DESCRIPTION

- General Purpose Dielectric for Ceramic Capacitors
- EIA Class II Dielectric
- Temperature variation of capacitance is within  $\pm 15\%$  from  $-55^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$
- Well suited for decoupling and filtering applications
- Available in High Capacitance values (up to  $100\mu\text{F}$ )

### PART NUMBER (see page 2 for complete part number explanation)

**1210**

**Size**  
(L" x W")

**4**

**Voltage**  
4 = 4V  
6 = 6.3V  
Z = 10V  
Y = 16V  
3 = 25V  
D = 35V  
5 = 50V

**D**

**Dielectric**  
D = X5R

**107**

**Capacitance Code (In pF)**  
2 Sig. Digits + Number of Zeros

**M**

**Capacitance Tolerance**  
K =  $\pm 10\%$   
M =  $\pm 20\%$

**A**

**Failure Rate**  
A = N/A

**T**

**Terminations**  
T = Plated Ni and Sn

**2**

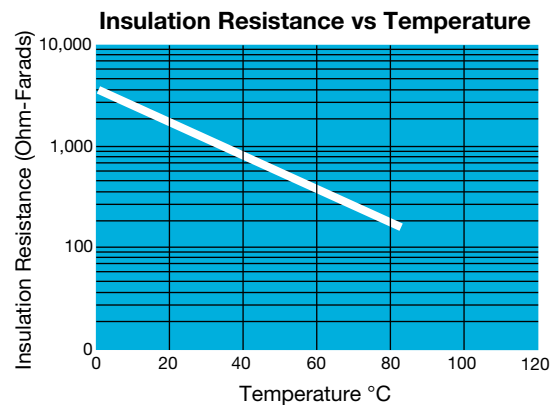
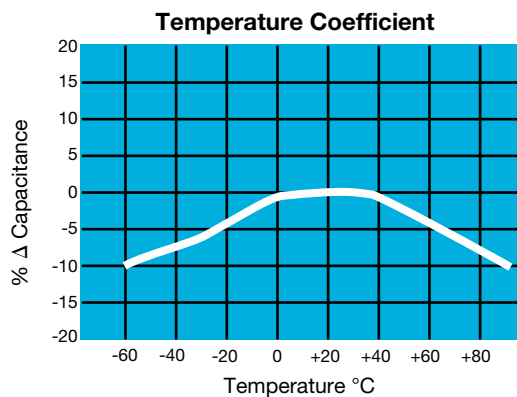
**Packaging**  
2 = 7" Reel  
4 = 13" Reel  
7 = Bulk Cass.  
9 = Bulk

**A**

**Special Code**  
A = Std.

NOTE: Contact factory for availability of Tolerance Options for Specific Part Numbers.  
Contact factory for non-specified capacitance values.

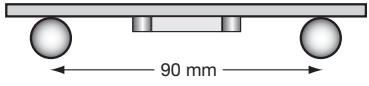
### TYPICAL ELECTRICAL CHARACTERISTICS



# X5R Dielectric



## Specifications and Test Methods

| Parameter/Test                 |                       | X5R Specification Limits                                                                                                                               | Measuring Conditions                                                                                                                                                                                                                                                                                                   |                    |
|--------------------------------|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Operating Temperature Range    |                       | -55°C to +85°C                                                                                                                                         | Temperature Cycle Chamber                                                                                                                                                                                                                                                                                              |                    |
| Capacitance                    |                       | Within specified tolerance                                                                                                                             | Freq.: 1.0 kHz $\pm$ 10%<br>Voltage: 1.0Vrms $\pm$ .2V<br>For Cap > 10 $\mu$ F, 0.5Vrms @ 120Hz                                                                                                                                                                                                                        |                    |
| Dissipation Factor             |                       | $\leq$ 2.5% for $\geq$ 50V DC rating<br>$\leq$ 3.0% for 25V DC rating<br>$\leq$ 12.5% Max. for 16V DC rating and lower<br>Contact Factory for DF by PN |                                                                                                                                                                                                                                                                                                                        |                    |
| Insulation Resistance          |                       | 10,000M $\Omega$ or 500M $\Omega$ - $\mu$ F, whichever is less                                                                                         |                                                                                                                                                                                                                                                                                                                        |                    |
| Dielectric Strength            |                       | No breakdown or visual defects                                                                                                                         | Charge device with rated voltage for 120 $\pm$ 5 secs @ room temp/humidity<br>Charge device with 300% of rated voltage for 1-5 seconds, w/charge and discharge current limited to 50 mA (max)                                                                                                                          |                    |
| Resistance to Flexure Stresses | Appearance            | No defects                                                                                                                                             | Deflection: 2mm<br>Test Time: 30 seconds<br>                                                                                                                                                                                        |                    |
|                                | Capacitance Variation | $\leq \pm 12\%$                                                                                                                                        |                                                                                                                                                                                                                                                                                                                        |                    |
|                                | Dissipation Factor    | Meets Initial Values (As Above)                                                                                                                        |                                                                                                                                                                                                                                                                                                                        |                    |
|                                | Insulation Resistance | $\geq$ Initial Value x 0.3                                                                                                                             |                                                                                                                                                                                                                                                                                                                        |                    |
| Solderability                  |                       | $\geq$ 95% of each terminal should be covered with fresh solder                                                                                        | Dip device in eutectic solder at 230 $\pm$ 5°C for 5.0 $\pm$ 0.5 seconds                                                                                                                                                                                                                                               |                    |
| Resistance to Solder Heat      | Appearance            | No defects, <25% leaching of either end terminal                                                                                                       | Dip device in eutectic solder at 260°C for 60 seconds. Store at room temperature for 24 $\pm$ 2 hours before measuring electrical properties.                                                                                                                                                                          |                    |
|                                | Capacitance Variation | $\leq \pm 7.5\%$                                                                                                                                       |                                                                                                                                                                                                                                                                                                                        |                    |
|                                | Dissipation Factor    | Meets Initial Values (As Above)                                                                                                                        |                                                                                                                                                                                                                                                                                                                        |                    |
|                                | Insulation Resistance | Meets Initial Values (As Above)                                                                                                                        |                                                                                                                                                                                                                                                                                                                        |                    |
|                                | Dielectric Strength   | Meets Initial Values (As Above)                                                                                                                        |                                                                                                                                                                                                                                                                                                                        |                    |
| Thermal Shock                  | Appearance            | No visual defects                                                                                                                                      | Step 1: -55°C $\pm$ 2°                                                                                                                                                                                                                                                                                                 | 30 $\pm$ 3 minutes |
|                                | Capacitance Variation | $\leq \pm 7.5\%$                                                                                                                                       | Step 2: Room Temp                                                                                                                                                                                                                                                                                                      | $\leq$ 3 minutes   |
|                                | Dissipation Factor    | Meets Initial Values (As Above)                                                                                                                        | Step 3: +85°C $\pm$ 2°                                                                                                                                                                                                                                                                                                 | 30 $\pm$ 3 minutes |
|                                | Insulation Resistance | Meets Initial Values (As Above)                                                                                                                        | Step 4: Room Temp                                                                                                                                                                                                                                                                                                      | $\leq$ 3 minutes   |
|                                | Dielectric Strength   | Meets Initial Values (As Above)                                                                                                                        | Repeat for 5 cycles and measure after 24 $\pm$ 2 hours at room temperature                                                                                                                                                                                                                                             |                    |
| Load Life                      | Appearance            | No visual defects                                                                                                                                      | Charge device with 1.5X rated voltage in test chamber set at 85°C $\pm$ 2°C for 1000 hours (+48, -0). Note: Contact factory for *optional specification part numbers that are tested at < 1.5X rated voltage.<br><br>Remove from test chamber and stabilize at room temperature for 24 $\pm$ 2 hours before measuring. |                    |
|                                | Capacitance Variation | $\leq \pm 12.5\%$                                                                                                                                      |                                                                                                                                                                                                                                                                                                                        |                    |
|                                | Dissipation Factor    | $\leq$ Initial Value x 2.0 (See Above)                                                                                                                 |                                                                                                                                                                                                                                                                                                                        |                    |
|                                | Insulation Resistance | $\geq$ Initial Value x 0.3 (See Above)                                                                                                                 |                                                                                                                                                                                                                                                                                                                        |                    |
|                                | Dielectric Strength   | Meets Initial Values (As Above)                                                                                                                        |                                                                                                                                                                                                                                                                                                                        |                    |
| Load Humidity                  | Appearance            | No visual defects                                                                                                                                      | Store in a test chamber set at 85°C $\pm$ 2°C/ 85% $\pm$ 5% relative humidity for 1000 hours (+48, -0) with rated voltage applied.<br><br>Remove from chamber and stabilize at room temperature and humidity for 24 $\pm$ 2 hours before measuring.                                                                    |                    |
|                                | Capacitance Variation | $\leq \pm 12.5\%$                                                                                                                                      |                                                                                                                                                                                                                                                                                                                        |                    |
|                                | Dissipation Factor    | $\leq$ Initial Value x 2.0 (See Above)                                                                                                                 |                                                                                                                                                                                                                                                                                                                        |                    |
|                                | Insulation Resistance | $\geq$ Initial Value x 0.3 (See Above)                                                                                                                 |                                                                                                                                                                                                                                                                                                                        |                    |
|                                | Dielectric Strength   | Meets Initial Values (As Above)                                                                                                                        |                                                                                                                                                                                                                                                                                                                        |                    |

# X5R Dielectric

## Capacitance Range



### PREFERRED SIZES ARE SHADED

| SIZE         |             | 0101*                           |    |   | 0201                           |     |    | 0402                           |    |    | 0603                           |     |    | 0805                           |    |    | 1206                           |          |    | 1210                           |    |    | 1812                           |     |   |         |    |    |         |    |    |         |    |    |         |  |  |         |  |  |         |  |  |
|--------------|-------------|---------------------------------|----|---|--------------------------------|-----|----|--------------------------------|----|----|--------------------------------|-----|----|--------------------------------|----|----|--------------------------------|----------|----|--------------------------------|----|----|--------------------------------|-----|---|---------|----|----|---------|----|----|---------|----|----|---------|--|--|---------|--|--|---------|--|--|
| Soldering    |             | Reflow Only                     |    |   | Reflow Only                    |     |    | Reflow/Wave                    |    |    | Reflow/Wave                    |     |    | Reflow/Wave                    |    |    | Reflow/Wave                    |          |    | Reflow Only                    |    |    | Reflow Only                    |     |   |         |    |    |         |    |    |         |    |    |         |  |  |         |  |  |         |  |  |
| Packaging    |             | Paper/Embossed                  |    |   | All Paper                      |     |    | All Paper                      |    |    | All Paper                      |     |    | Paper/Embossed                 |    |    | Paper/Embossed                 |          |    | Paper/Embossed                 |    |    | All Embossed                   |     |   |         |    |    |         |    |    |         |    |    |         |  |  |         |  |  |         |  |  |
| (L) Length   | mm<br>(in.) | 0.40 ± 0.02<br>(0.016 ± 0.0008) |    |   | 0.60 ± 0.03<br>(0.024 ± 0.001) |     |    | 1.00 ± 0.10<br>(0.040 ± 0.004) |    |    | 1.60 ± 0.15<br>(0.063 ± 0.006) |     |    | 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) |    |    | 4.50 ± 0.30<br>(0.177 ± 0.012) |     |   |         |    |    |         |    |    |         |    |    |         |  |  |         |  |  |         |  |  |
| (W) Width    | mm<br>(in.) | 0.20 ± 0.02<br>(0.008 ± 0.0008) |    |   | 0.30 ± 0.03<br>(0.011 ± 0.001) |     |    | 0.50 ± 0.10<br>(0.020 ± 0.004) |    |    | 0.81 ± 0.15<br>(0.032 ± 0.006) |     |    | 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) |    |    | 3.20 ± 0.20<br>(0.126 ± 0.008) |     |   |         |    |    |         |    |    |         |    |    |         |  |  |         |  |  |         |  |  |
| (t) Terminal | mm<br>(in.) | 0.10 ± 0.04<br>(0.004 ± 0.016)  |    |   | 0.15 ± 0.05<br>(0.006 ± 0.002) |     |    | 0.25 ± 0.15<br>(0.010 ± 0.006) |    |    | 0.35 ± 0.15<br>(0.014 ± 0.006) |     |    | 0.50 ± 0.25<br>(0.020 ± 0.010) |    |    | 0.50 ± 0.25<br>(0.020 ± 0.010) |          |    | 0.50 ± 0.25<br>(0.020 ± 0.010) |    |    | 0.61 ± 0.36<br>(0.024 ± 0.014) |     |   |         |    |    |         |    |    |         |    |    |         |  |  |         |  |  |         |  |  |
| WVDC         |             | 6.3                             | 10 |   | 4                              | 6.3 | 10 | 16                             | 25 | 50 | 4                              | 6.3 | 10 | 16                             | 25 | 35 | 50                             | 6.3      | 10 | 16                             | 25 | 35 | 50                             | 100 | 4 | 6.3     | 10 | 16 | 25      | 35 | 50 | 6.3     | 10 | 25 | 50      |  |  |         |  |  |         |  |  |
| Cap<br>(pF)  |             | 100                             |    | B |                                |     |    |                                |    |    | A                              |     |    |                                |    |    |                                |          |    |                                |    |    |                                |     |   |         |    |    |         |    |    |         |    |    |         |  |  |         |  |  |         |  |  |
|              |             | 150                             |    | B |                                |     |    |                                |    |    | A                              |     |    |                                |    |    |                                |          |    |                                |    |    |                                |     |   |         |    |    |         |    |    |         |    |    |         |  |  |         |  |  |         |  |  |
|              |             | 220                             |    | B |                                |     |    |                                |    |    | A                              |     |    |                                |    |    | C                              |          |    |                                |    |    |                                |     |   |         |    |    |         |    |    |         |    |    |         |  |  |         |  |  |         |  |  |
|              |             | 330                             |    | B |                                |     |    |                                |    |    | A                              |     |    |                                |    |    |                                |          |    |                                |    |    |                                |     |   |         |    |    |         |    |    |         |    |    |         |  |  |         |  |  |         |  |  |
|              |             | 470                             |    | B |                                |     |    |                                |    |    | A                              |     |    |                                |    |    | C                              |          |    |                                |    |    |                                |     |   |         |    |    |         |    |    |         |    |    |         |  |  |         |  |  |         |  |  |
|              |             | 680                             |    | B |                                |     |    |                                |    |    | A                              |     |    |                                |    |    | C                              |          |    |                                |    |    |                                |     |   |         |    |    |         |    |    |         |    |    |         |  |  |         |  |  |         |  |  |
|              |             | 1000                            |    | B |                                |     |    |                                |    |    | A                              |     |    |                                |    |    | C                              |          |    |                                |    |    |                                |     |   |         |    |    |         |    |    |         |    |    |         |  |  |         |  |  |         |  |  |
|              |             | 1500                            | B  | B |                                |     |    |                                |    |    | A                              |     |    |                                |    |    | C                              |          |    |                                |    |    |                                |     |   |         |    |    |         |    |    |         |    |    |         |  |  |         |  |  |         |  |  |
|              |             | 2200                            | B  | B |                                |     |    | A                              | A  | A  |                                |     |    |                                |    |    | C                              |          |    |                                |    |    |                                |     |   |         |    |    |         |    |    |         |    |    |         |  |  |         |  |  |         |  |  |
|              |             | 3300                            | B  | B |                                |     |    | A                              | A  | A  |                                |     |    |                                |    |    | C                              |          |    |                                |    |    |                                |     |   |         |    |    |         |    |    |         |    |    |         |  |  |         |  |  |         |  |  |
|              |             | 4700                            | B  | B |                                |     |    | A                              | A  | A  |                                |     |    |                                |    |    | C                              |          |    |                                |    |    |                                |     |   |         |    |    |         |    |    |         |    |    |         |  |  |         |  |  |         |  |  |
|              |             | 6800                            | B  | B |                                |     |    | A                              | A  | A  |                                |     |    |                                |    |    | C                              |          |    |                                |    |    |                                |     |   |         |    |    |         |    |    |         |    |    |         |  |  |         |  |  |         |  |  |
| Cap<br>(μF)  |             | 0.010                           | B  | B |                                |     |    | A                              | A  | A  |                                |     |    |                                |    |    | C                              |          |    |                                |    |    |                                |     |   |         |    |    |         |    |    |         |    |    |         |  |  |         |  |  |         |  |  |
|              |             | 0.015                           | B  |   |                                |     |    |                                |    |    |                                |     |    |                                |    |    | G                              | G        |    |                                |    |    |                                |     |   |         |    |    |         |    |    |         |    |    |         |  |  |         |  |  |         |  |  |
|              |             | 0.022                           | B  |   |                                |     |    | A*                             |    |    |                                |     |    |                                |    |    | C                              | C        |    |                                |    |    |                                |     |   |         |    |    |         |    |    |         |    |    |         |  |  |         |  |  |         |  |  |
|              |             | 0.033                           | B  |   |                                |     |    |                                |    |    |                                |     |    |                                |    |    | G                              | G        |    |                                |    |    |                                |     |   |         |    |    |         |    |    |         |    |    |         |  |  |         |  |  |         |  |  |
|              |             | 0.047                           | B  |   |                                |     |    | A*                             |    |    |                                |     |    |                                |    |    | G                              | G        |    |                                |    |    |                                |     |   |         |    |    |         |    |    |         |    |    |         |  |  |         |  |  |         |  |  |
|              |             | 0.068                           | B  |   |                                |     |    |                                |    |    |                                |     |    |                                |    |    | G                              | G        |    |                                |    |    |                                |     |   |         |    |    |         |    |    |         |    |    |         |  |  |         |  |  |         |  |  |
|              |             | 0.10                            | B  |   |                                |     |    | A*                             |    |    |                                |     |    |                                |    |    | G                              | G        |    |                                |    |    |                                |     |   |         |    |    |         |    |    |         |    |    |         |  |  |         |  |  |         |  |  |
|              |             | 0.15                            |    |   |                                |     |    |                                |    |    |                                |     |    |                                |    |    | G                              | G        |    |                                |    |    |                                |     |   |         |    |    |         |    |    |         |    |    |         |  |  |         |  |  |         |  |  |
|              |             | 0.22                            |    |   |                                |     |    | A*                             | A* |    |                                |     |    |                                |    |    | C*                             | C*       | C* |                                |    |    |                                |     |   |         |    |    |         |    |    |         |    |    |         |  |  |         |  |  |         |  |  |
|              |             | 0.33                            |    |   |                                |     |    |                                |    |    |                                |     |    |                                |    |    | G                              | G        |    |                                |    |    |                                |     |   |         |    |    |         |    |    |         |    |    |         |  |  |         |  |  |         |  |  |
|              |             | 0.47                            |    |   |                                |     |    | A*                             | A* |    |                                |     |    |                                |    |    | G                              | G        |    |                                |    |    |                                |     |   |         |    |    |         |    |    |         |    |    |         |  |  |         |  |  |         |  |  |
|              |             | 0.68                            |    |   |                                |     |    | A*                             | A* |    |                                |     |    |                                |    |    | G                              | G        |    |                                |    |    |                                |     |   |         |    |    |         |    |    |         |    |    |         |  |  |         |  |  |         |  |  |
|              |             | 1.0                             |    |   |                                |     |    | A*                             | A* |    |                                |     |    |                                |    |    | G                              | G        | G  | J*                             |    |    |                                |     |   |         |    |    |         |    |    |         |    |    |         |  |  |         |  |  |         |  |  |
|              |             | 1.5                             |    |   |                                |     |    | A*                             | A* |    |                                |     |    |                                |    |    | G                              | G        | G  | J*                             |    |    |                                |     |   |         |    |    |         |    |    |         |    |    |         |  |  |         |  |  |         |  |  |
|              |             | 2.2                             |    |   |                                |     |    | A*                             | A* |    |                                |     |    |                                |    |    | G*                             | G*       | J* | J*                             |    |    |                                |     |   |         |    |    |         |    |    |         |    |    |         |  |  |         |  |  |         |  |  |
|              |             | 3.3                             |    |   |                                |     |    |                                |    |    |                                |     |    |                                |    |    | J*                             | J*       | J* | J*                             |    |    |                                |     |   |         |    |    |         |    |    |         |    |    |         |  |  |         |  |  |         |  |  |
|              |             | 4.7                             |    |   |                                |     |    |                                |    |    |                                |     |    |                                |    |    | J*                             | J*       | J* | J*                             |    |    |                                |     |   |         |    |    |         |    |    |         |    |    |         |  |  |         |  |  |         |  |  |
|              |             | 10                              |    |   |                                |     |    |                                |    |    |                                |     |    |                                |    |    | K                              | J*       | J* |                                |    |    |                                |     |   |         |    |    |         |    |    |         |    |    |         |  |  |         |  |  |         |  |  |
|              |             | 22                              |    |   |                                |     |    |                                |    |    |                                |     |    |                                |    |    |                                |          |    |                                |    |    |                                |     |   |         |    |    |         |    |    |         |    |    |         |  |  |         |  |  |         |  |  |
|              |             | 47                              |    |   |                                |     |    |                                |    |    |                                |     |    |                                |    |    |                                |          |    |                                |    |    |                                |     |   |         |    |    |         |    |    |         |    |    |         |  |  |         |  |  |         |  |  |
|              |             | 100                             |    |   |                                |     |    |                                |    |    |                                |     |    |                                |    |    |                                |          |    |                                |    |    |                                |     |   |         |    |    |         |    |    |         |    |    |         |  |  |         |  |  |         |  |  |
| WVDC         |             | 6.3                             | 10 |   | 4                              | 6.3 | 10 | 16                             | 25 | 50 | 4                              | 6.3 | 10 | 16                             | 25 | 35 | 50                             | 6.3      | 10 | 16                             | 25 | 35 | 50                             | 100 | 4 | 6.3     | 10 | 16 | 25      | 35 | 50 | 6.3     | 10 | 25 | 50      |  |  |         |  |  |         |  |  |
| SIZE         |             | 0101*                           |    |   | 0201                           |     |    | 0402                           |    |    | 0603                           |     |    | 0805                           |    |    | 1206                           |          |    | 1210                           |    |    | 1812                           |     |   |         |    |    |         |    |    |         |    |    |         |  |  |         |  |  |         |  |  |
| Letter       |             | A                               |    |   | B                              |     |    | C                              |    |    | E                              |     |    | G                              |    |    | J                              |          |    | K                              |    |    | M                              |     |   | N       |    |    | P       |    |    | Q       |    |    | X       |  |  | Y       |  |  | Z       |  |  |
| Max.         |             | 0.33                            |    |   | 0.22                           |     |    | 0.56                           |    |    | 0.71                           |     |    | 0.90                           |    |    | 0.94                           |          |    | 1.02                           |    |    | 1.27                           |     |   | 1.40    |    |    | 1.52    |    |    | 1.78    |    |    | 2.29    |  |  | 2.54    |  |  | 2.79    |  |  |
| Thickness    |             | (0.013)                         |    |   | (0.009)                        |     |    | (0.022)                        |    |    | (0.028)                        |     |    | (0.035)                        |    |    | (0.037)                        |          |    | (0.040)                        |    |    | (0.050)                        |     |   | (0.055) |    |    | (0.060) |    |    | (0.070) |    |    | (0.090) |  |  | (0.100) |  |  | (0.110) |  |  |
|              |             | PAPER                           |    |   |                                |     |    |                                |    |    |                                |     |    |                                |    |    |                                | EMBOSSED |    |                                |    |    |                                |     |   |         |    |    |         |    |    |         |    |    |         |  |  |         |  |  |         |  |  |

- = Under Development
- = \*Optional Specifications – Contact factory

NOTE: Contact factory for non-specified capacitance values

\*EIA 01005

