General Specifications


COG (NPO) is the most popular formulation of the "temperature-compensating," EIA Class I ceramic materials. Modern COG (NPO) formulations contain neodymium, samarium and other rare earth oxides.
COG (NPO) ceramics offer one of the most stable capacitor dielectrics available. Capacitance change with temperature is $0 \pm 30 \mathrm{ppm} /{ }^{\circ} \mathrm{C}$ which is less than $\pm 0.3 \% \mathrm{C}$ from $-55^{\circ} \mathrm{C}$ to $+125^{\circ} \mathrm{C}$. Capacitance drift or hysteresis for COG (NPO) ceramics is negligible at less than $\pm 0.05 \%$ versus up to $\pm 2 \%$ for films. Typical capacitance change with life is less than $\pm 0.1 \%$ for COG (NPO), one-fifth that shown by most other dielectrics. COG (NPO) formulations show no aging characteristics.

## PART NUMBER (see page 4 for complete part number explanation)



| 0805 | 5 | A | 101 | J | A | T | 2 | A |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  |  |  |  |  |
| $\begin{gathered} \text { Size } \\ \left(\text { L" }^{\prime}\right. \text { W") } \end{gathered}$ | Voltage $6.3 \mathrm{~V}=6$ $10 \mathrm{~V}=\mathrm{Z}$ | DielectricCOG (NPO) = A | Capacitance Code (In pF) 2 Sig. Digits + Number of Zeros | Capacitance Tolerance <br> $B= \pm .10 \mathrm{pF}$ (<10pF) <br> $\mathrm{C}= \pm .25 \mathrm{pF}(<10 \mathrm{pF})$ <br> $\mathrm{D}= \pm .50 \mathrm{pF}$ ( $<10 \mathrm{pF}$ ) <br> $\mathrm{F}= \pm 1 \%$ ( $\geq 10 \mathrm{pF}$ ) <br> $\mathrm{G}= \pm 2 \%(\geq 10 \mathrm{pF})$ <br> $J= \pm 5 \%$ <br> $\mathrm{K}= \pm 10 \%$ | Failure Rate A = Not Applicable | $\begin{aligned} & \text { Terminations } \\ & \mathrm{T}=\mathrm{Plated} \mathrm{Ni} \\ & \text { and } \mathrm{Sn} \end{aligned}$ | Packaging $2=7 "$ Reel $4=13^{\prime \prime}$ Ree $\mathrm{U}=4 \mathrm{~mm} \mathrm{TR}$ (01005) | Special Code A = Std. Product <br> Factory tiples |
|  | $16 \mathrm{~V}=\mathrm{Y}$ |  |  |  |  |  |  |  |
|  | $25 \mathrm{~V}=3$ $50 \mathrm{~V}=5$ |  |  |  |  | Factory For |  |  |
|  | $100 \mathrm{~V}=1$ |  |  |  |  | 1 = Pd/Ag Term |  |  |
|  | $200 \mathrm{~V}=2$ |  |  |  |  | 7 = Gold Plated |  |  |
|  | $250 \mathrm{~V}=\mathrm{V}$ |  |  |  |  | NOT RoHS |  |  |
|  | $500 \mathrm{~V}=7$ |  |  |  |  | COMPLIANT |  |  |

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


Specifications and Test Methods

| Parameter/Test |  | NP0 Specification Limits | Measu | nditions |
| :---: | :---: | :---: | :---: | :---: |
| Operating Temperature Range |  | $-55^{\circ} \mathrm{C}$ to $+125^{\circ} \mathrm{C}$ | Temperatu | le Chamber |
| Capacitance |  | Within specified tolerance $<30 \mathrm{pF}$ : $\mathrm{Q} \geq 400+20 \times$ Cap Value $\geq 30 \mathrm{pF}: \mathrm{Q} \geq 1000$ | Freq.: $1.0 \mathrm{MHz} \pm 10 \%$ for cap $\leq 1000 \mathrm{pF}$ <br> $1.0 \mathrm{kHz} \pm 10 \%$ for cap > 1000 pF Voltage: $1.0 \mathrm{Vrms} \pm .2 \mathrm{~V}$ |  |
| Q |  |  |  |  |
| Insulation Resistance |  | $100,000 \mathrm{M} \Omega$ or $1000 \mathrm{MQ}-\mu \mathrm{F}$, whichever is less | Charge device with rated voltage for $60 \pm 5$ secs @ room temp/humidity |  |
| Dielectric Strength |  | No breakdown or visual defects | Charge device with $250 \%$ of rated voltage for 1-5 seconds, w/charge and discharge current limited to 50 mA (max) <br> Note: Charge device with $150 \%$ of rated voltage for 500 V devices. |  |
| Resistance to Flexure Stresses | Appearance | No defects | Deflection: 2 mm Test Time: 30 seconds $1 \mathrm{~mm} / \mathrm{sec}$ |  |
|  | Capacitance Variation | $\pm 5 \%$ or $\pm .5 \mathrm{pF}$, whichever is greater |  |  |
|  | Q | Meets Initial Values (As Above) |  |  |
|  | Insulation Resistance | $\geq$ Initial Value $\times 0.3$ |  |  |
| Solderability |  | $\geq 95 \%$ of each terminal should be covered with fresh solder | Dip device in eutectic solder at $230 \pm 5^{\circ} \mathrm{C}$ 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 $260^{\circ} \mathrm{C}$ for 60 sec - onds. Store at room temperature for $24 \pm 2$ hours before measuring electrical properties. |  |
|  | Capacitance Variation | $\leq \pm 2.5 \%$ or $\pm .25 \mathrm{pF}$, whichever is greater |  |  |
|  | Q | 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: $-55^{\circ} \mathrm{C} \pm 2^{\circ}$ | $30 \pm 3$ minutes |
|  | Capacitance Variation | $\leq \pm 2.5 \%$ or $\pm .25 \mathrm{pF}$, whichever is greater | Step 2: Room Temp | $\leq 3$ minutes |
|  | Q | Meets Initial Values (As Above) | Step 3: $+125^{\circ} \mathrm{C} \pm 2^{\circ}$ | $30 \pm 3$ 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 hours at room temperature |  |
| Load Life | Appearance | No visual defects | Charge device with twice rated voltage in test chamber set at $125^{\circ} \mathrm{C} \pm 2^{\circ} \mathrm{C}$ for 1000 hours ( $+48,-0$ ). <br> Remove from test chamber and stabilize at room temperature for 24 hours before measuring. |  |
|  | Capacitance Variation | $\leq \pm 3.0 \%$ or $\pm .3 \mathrm{pF}$, whichever is greater |  |  |
|  | $\begin{gathered} \mathrm{Q} \\ (\mathrm{C}=\text { Nominal Cap }) \end{gathered}$ | $\geq 30 \mathrm{pF}:$ $\mathrm{Q} \geq 350$ <br> $\geq 10 \mathrm{pF},<30 \mathrm{pF}:$ $\mathrm{Q} \geq 275+5 \mathrm{C} / 2$ <br> $<10 \mathrm{pF}:$ $\mathrm{Q} \geq 200+10 \mathrm{C}$ |  |  |
|  | 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 $85^{\circ} \mathrm{C} \pm 2^{\circ} \mathrm{C} / 85 \% \pm$ $5 \%$ relative humidity for 1000 hours $(+48,-0)$ with rated voltage applied. <br> Remove from chamber and stabilize at room temperature for $24 \pm 2$ hours before measuring. |  |
|  | Capacitance Variation | $\leq \pm 5.0 \%$ or $\pm .5 \mathrm{pF}$, whichever is greater |  |  |
|  | Q | $\geq 30 \mathrm{pF}:$ $\mathrm{Q} \geq 350$ <br> $\geq 10 \mathrm{pF},<30 \mathrm{pF}:$ $\mathrm{Q} \geq 275+5 \mathrm{C} / 2$ <br> $<10 \mathrm{pF}:$ $\mathrm{Q} \geq 200+10 \mathrm{C}$ |  |  |
|  | Insulation Resistance | $\geq$ Initial Value x 0.3 (See Above) |  |  |
|  | Dielectric Strength | Meets Initial Values (As Above) |  |  |

Capacitance Range
PREFERRED SIZES ARE SHADED


| Letter | A | B | C | E | G | $J$ | K | M | N | P | Q | X | Y | Z |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Max. Thickness | $\begin{array}{\|c\|} \hline 0.33 \\ (0.013) \end{array}$ | $\begin{gathered} 0.22 \\ (0.009) \\ \hline \end{gathered}$ | $\begin{gathered} 0.56 \\ (0.022) \\ \hline \end{gathered}$ | $\begin{gathered} 0.71 \\ (0.028) \\ \hline \end{gathered}$ | $\begin{gathered} 0.90 \\ (0.035) \\ \hline \end{gathered}$ | $\begin{gathered} 0.94 \\ (0.037) \\ \hline \end{gathered}$ | $\begin{gathered} 1.02 \\ (0.040) \\ \hline \end{gathered}$ | $\begin{gathered} \hline 1.27 \\ (0.050) \\ \hline \end{gathered}$ | $\begin{gathered} 1.40 \\ (0.055) \\ \hline \end{gathered}$ | $\begin{gathered} 1.52 \\ (0.060) \\ \hline \end{gathered}$ | $\begin{gathered} 1.78 \\ (0.070) \\ \hline \end{gathered}$ | $\begin{gathered} 2.29 \\ (0.090) \\ \hline \end{gathered}$ | $\begin{gathered} 2.54 \\ (0.100) \\ \hline \end{gathered}$ | $\begin{gathered} 2.79 \\ (0.110) \\ \hline \end{gathered}$ |
| PAPER |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

Capacitance Range


| Letter | A | B | C | E | G | J | K | M | N | P | Q | X | Y | Z |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Max. Thickness | $\begin{gathered} 0.33 \\ (0.013) \\ \hline \end{gathered}$ | $\begin{gathered} 0.22 \\ (0.009) \end{gathered}$ | $\begin{gathered} \hline 0.56 \\ (0.022) \\ \hline \end{gathered}$ | $\begin{gathered} 0.71 \\ (0.028) \\ \hline \end{gathered}$ | $\begin{gathered} 0.90 \\ (0.035) \\ \hline \end{gathered}$ | $\begin{gathered} 0.94 \\ (0.037) \\ \hline \end{gathered}$ | $\begin{gathered} 1.02 \\ (0.040) \\ \hline \end{gathered}$ | $\begin{gathered} 1.27 \\ (0.050) \\ \hline \end{gathered}$ | $\begin{gathered} 1.40 \\ (0.055) \\ \hline \end{gathered}$ | $\begin{gathered} \hline 1.52 \\ (0.060) \\ \hline \end{gathered}$ | $\begin{gathered} 1.78 \\ (0.070) \\ \hline \end{gathered}$ | $\begin{gathered} \hline 2.29 \\ (0.090) \\ \hline \end{gathered}$ | $\begin{gathered} 2.54 \\ (0.100) \\ \hline \end{gathered}$ | $\begin{gathered} 2.79 \\ (0.110) \\ \hline \end{gathered}$ |
|  | PAPER |  |  |  |  |  | EMBOSSED |  |  |  |  |  |  |  |

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