



# CERAMIC CHIP CAPACITORS NPO (COG) DIELECTRIC

## APPLICATION

NPO (COG) dielectric properties; suited for precision circuits, requiring stable dielectric characteristics:

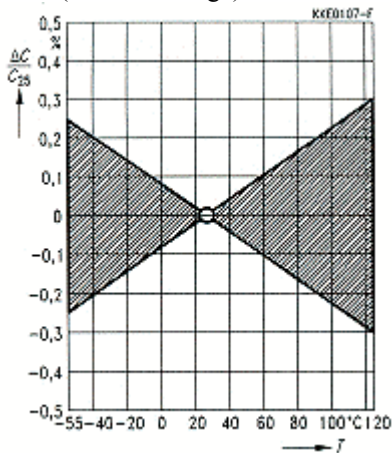
- ✧ Negligible dependence of capacitance and dissipation factor on time, voltage, and frequency
- ✧ Low-loss (High Q)
- ✧ Predictable linear temperature coefficient
- ✧ No piezoelectric behavior

## General Specification

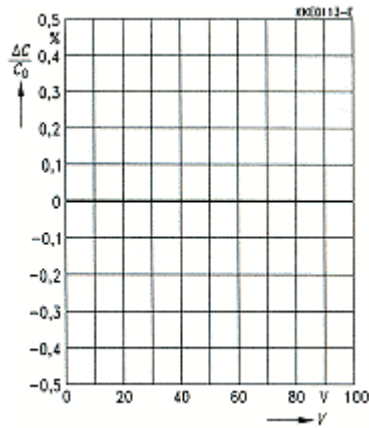
- **Operating temperature range** :  $-55^{\circ}\text{C} \sim +125^{\circ}\text{C}$
- **Temperature coefficient**:  $0 \pm 30 \text{ppm}/^{\circ}\text{C}$
- **Capacitance Range**:  $0.5 \text{pF} \sim 0.22 \mu\text{F}$  (Test condition:  $1.0 \pm 0.2 \text{V}_{\text{rms}}$ , 1KHz, for  $\leq 1000 \text{pF}$  use 1 MHz)
- **Capacitance Tolerance**: Preferred  $\pm 5\%$ ,  $\pm 10\%$ . Others available:  $\pm 0.05 \text{pF}$ ,  $\pm 0.1 \text{pF}$ ,  $\pm 0.25 \text{pF}$ ,  $\pm 0.5 \text{pF}$ ,  $\pm 1\%$ ,  $\pm 2\%$
- **Rated Voltage**: 25VDC, 50VDC, 100VDC
- **Q value** :  $C < 30 \text{pF}$  :  $Q \geq 400 + 20C$ ,  $C \geq 30 \text{pF}$  :  $Q \geq 1000$  (Test condition: 1MHz, 1KHZ for  $C \geq 1000 \text{pF}$ ,  $1 \text{V}_{\text{rms}}$ ,  $25^{\circ}\text{C}$ )
- **Insulation resistance**: 100,000 M $\Omega$  or 1,000  $\Omega$ -F min, whichever is less. (rated voltage applied at  $25^{\circ}\text{C}$ )
- **Dielectric strength**:  $>250\%$  of Rated Voltage, duration 1~5 seconds, Charging and discharging current less than 50mA.

### Characteristics

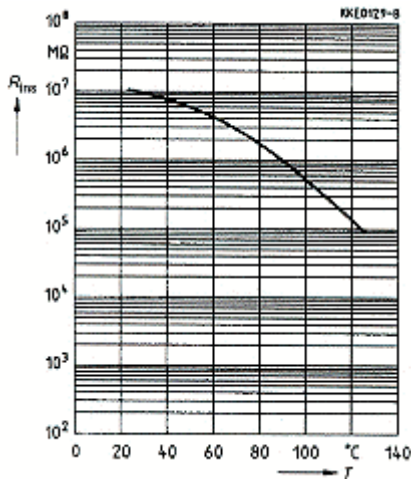
Capacitance change  $\Delta C/C_{25}$  versus temperature T (tolerance range)



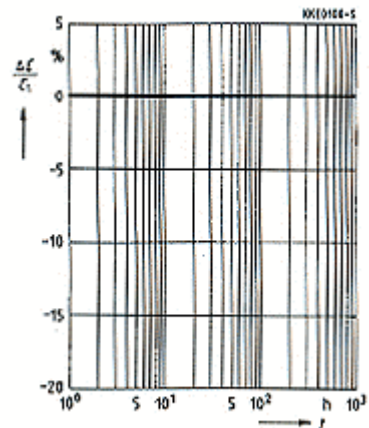
Capacitance change  $\Delta C/C_0$  versus superimposed dc voltage V



Insulation resistance  $R_{\text{ins}}$  versus Temperature T



Capacitance change  $\Delta C/C_1$  versus time (aging rate)





# CERAMIC CHIP CAPACTIORS NPO (COG) DIELECTRIC

## SIZE AND VALUES AVAILABLE (NPO) 25V – 100V

| Size              |          | 0402      |    | 0603      |    |     | 0805      |    |     | 1206      |    |     | 1210      |     | 1812      |     |
|-------------------|----------|-----------|----|-----------|----|-----|-----------|----|-----|-----------|----|-----|-----------|-----|-----------|-----|
| (L)Length         | mm       | 1.00±0.05 |    | 1.60±0.10 |    |     | 2.00±0.20 |    |     | 3.20±0.20 |    |     | 3.20±0.30 |     | 4.50±0.30 |     |
| (W)Width          | mm       | 0.50±0.05 |    | 0.80±0.10 |    |     | 1.25±0.20 |    |     | 1.60±0.20 |    |     | 2.50±0.20 |     | 3.20±0.30 |     |
| (T)Max. Thickness | mm       | 0.50±0.05 |    | 0.80±0.10 |    |     | 1.25±0.10 |    |     | 1.65±0.20 |    |     | 2.50±0.30 |     | 3.20±0.30 |     |
| (t)Terminal       | mm       | 0.15±0.35 |    | 0.27~0.60 |    |     | 0.30~0.70 |    |     | 0.30~0.70 |    |     | 0.30~0.70 |     | 0.35~1.00 |     |
| Capacitance       | W.V.(DC) | 25        | 50 | 25        | 50 | 100 | 25        | 50 | 100 | 25        | 50 | 100 | 50        | 100 | 50        | 100 |
| 0.47 – 0.82       | pF       |           | S  |           | P  | P   |           | A  | H   |           | P  | P   |           |     |           |     |
| 1 – 9.1           | pF       |           | S  |           | P  | P   |           | A  | H   |           | P  | P   |           |     |           |     |
| 10                | pF       |           | S  |           | P  | P   |           | A  | H   |           | P  | P   |           |     |           |     |
| 12                | pF       |           | S  |           | P  | P   |           | A  | H   |           | P  | P   |           |     |           |     |
| 15                | pF       |           | S  |           | P  | P   |           | A  | H   |           | P  | P   |           |     |           |     |
| 18                | pF       |           | S  |           | P  | P   |           | A  | H   |           | P  | P   |           |     |           |     |
| 22                | pF       |           | S  |           | P  | P   |           | A  | H   |           | P  | P   |           |     |           |     |
| 27                | pF       |           | S  |           | P  | P   |           | A  | H   |           | P  | P   |           |     |           |     |
| 33                | pF       |           | S  |           | P  | P   |           | A  | H   |           | P  | P   |           |     |           |     |
| 39                | pF       |           | S  |           | P  | P   |           | A  | H   |           | P  | P   |           |     |           |     |
| 47                | pF       |           | S  |           | P  | P   |           | A  | H   |           | P  | P   |           |     |           |     |
| 56                | pF       |           | S  |           | P  | P   |           | A  | H   |           | P  | P   |           |     |           |     |
| 68                | pF       |           | S  |           | P  | P   |           | A  | H   |           | P  | P   |           |     |           |     |
| 82                | pF       |           | S  |           | P  | P   |           | A  | H   |           | P  | P   |           |     |           |     |
| 100               | pF       |           | S  |           | P  | P   |           | A  | H   |           | P  | P   |           |     |           |     |
| 120               | pF       |           | S  |           | P  | P   |           | A  | H   |           | P  | P   |           |     |           |     |
| 150               | pF       |           | S  |           | P  | P   |           | A  | H   |           | P  | P   |           |     |           |     |
| 180               | pF       |           | S  |           | P  | P   |           | A  | H   |           | P  | P   |           |     |           |     |
| 220               | pF       |           | S  |           | P  | P   |           | A  | H   |           | P  | P   |           |     |           |     |
| 270               | pF       |           | S  |           | P  | P   |           | A  | H   |           | P  | P   |           |     |           |     |
| 330               | pF       | S         | S  |           | P  | P   |           | A  | H   |           | P  | P   |           |     |           |     |
| 390               | pF       | S         | S  |           | P  | P   |           | P  | H   |           | P  | P   |           |     |           |     |
| 470               | pF       | S         | S  |           | P  | P   |           | P  | H   |           | P  | P   |           |     |           |     |
| 560               | pF       | S         |    |           | P  | P   |           | P  | H   |           | P  | P   |           |     |           |     |
| 680               | pF       | S         |    |           | P  | P   |           | P  | H   |           | P  | P   |           |     |           |     |
| 820               | pF       | S         |    |           | P  |     |           | P  | H   |           | P  | P   |           |     |           |     |
| 1.0               | nF       | S         |    |           | P  |     |           | P  | H   |           | P  | P   | L         | L   |           |     |
| 1.2               | nF       |           |    |           | P  |     |           | P  | H   |           | P  | P   | L         | L   |           | L   |
| 1.5               | nF       |           |    |           | P  |     |           | P  | H   |           | P  | P   | L         | L   |           | L   |
| 1.8               | nF       |           |    |           | P  |     |           | P  | H   |           | P  | P   | L         | L   |           | L   |
| 2.2               | nF       |           |    |           | P  |     |           | P  | X   |           | P  | P   | L         | L   |           | L   |
| 2.7               | nF       |           |    |           | P  |     |           | X  | X   |           | P  | P   | L         | L   |           | L   |
| 3.3               | nF       |           |    |           | P  |     |           | X  |     |           | P  | P   | L         | L   |           | L   |
| 3.9               | nF       |           |    |           | P  |     |           | A  | X   |           | P  | P   | L         | L   |           | L   |
| 4.7               | nF       |           |    |           | P  |     |           | A  | X   |           | P  | P   | L         | L   |           | L   |
| 5.6               | nF       |           |    |           | P  |     |           | A  | X   |           | P  | X   | L         | L   |           | L   |
| 6.8               | nF       |           |    |           | P  |     |           | A  | X   |           | C  | X   | L         | L   |           | L   |
| 8.2               | nF       |           |    |           | P  |     |           | A  | X   |           | H  | C   | L         | L   |           | L   |
| 10                | nF       |           |    |           | P  |     |           | A  | X   |           | H  | X   | L         | L   | L         | L   |
| 15                | nF       |           |    |           |    |     |           | H  |     |           | H  | X   | L         |     | L         | L   |
| 22                | nF       |           |    |           |    |     |           | X  |     |           | H  | X   | X         |     | L         |     |
| 33                | nF       |           |    |           |    |     |           | X  |     |           | X  | L   | X         |     | L         |     |
| 47                | nF       |           |    |           |    |     |           |    |     |           | X  |     | Z         |     | L         |     |
| 68                | nF       |           |    |           |    |     |           |    |     |           | L  |     | Z         |     | L         |     |
| 100               | nF       |           |    |           |    |     |           |    |     |           | L  |     | G         |     | L         |     |
| 220               | nF       |           |    |           |    |     |           |    |     |           |    |     |           |     |           | U   |



# CERAMIC CHIP CAPACTIORS NPO (COG) DIELECTRIC

## SIZE AND VALUES AVAILABLE (NPO) 250V – 3000V

| Size       | 0805      |     | 1206      |     |     |     | 1210      |     |     |    |    | 1808      |     |     |     |     | 1812      |     |     |     |     |   |
|------------|-----------|-----|-----------|-----|-----|-----|-----------|-----|-----|----|----|-----------|-----|-----|-----|-----|-----------|-----|-----|-----|-----|---|
| (L)        | 2.00±0.20 |     | 3.20±0.20 |     |     |     | 3.20±0.30 |     |     |    |    | 4.50±0.30 |     |     |     |     | 4.50±0.30 |     |     |     |     |   |
| (W)        | 1.25±0.20 |     | 1.60±0.20 |     |     |     | 2.50±0.20 |     |     |    |    | 2.00±0.20 |     |     |     |     | 3.20±0.30 |     |     |     |     |   |
| (T)        | 0.80±0.10 |     | 1.65±0.20 |     |     |     | 1.65±0.20 |     |     |    |    | 2.00±0.20 |     |     |     |     | 2.00±0.20 |     |     |     |     |   |
| (t)        | 0.30~0.70 |     | 0.30~0.70 |     |     |     | 0.30~0.70 |     |     |    |    | 0.35~1.00 |     |     |     |     | 0.35~1.00 |     |     |     |     |   |
| Cap./ W.V. | 250       | 500 | 250       | 500 | 1KV | 2KV | 250       | 500 | 1KV | 2K | 3K | 250       | 500 | 1KV | 2KV | 3KV | 250       | 500 | 1KV | 2KV | 3KV |   |
| 10         | pF        | P   | P         | P   | L   | L   | L         |     |     | L  | L  | L         |     |     | Z   | Z   | Z         |     |     | L   | L   | L |
| 12         | pF        | P   | P         | P   | L   | L   | L         |     |     | L  | L  | L         |     |     | Z   | Z   | Z         |     |     | L   | L   | L |
| 15         | pF        | P   | P         | P   | L   | L   | L         |     |     | L  | L  | L         |     |     | Z   | Z   | Z         |     |     | L   | L   | L |
| 18         | pF        | P   | P         | P   | L   | L   | L         |     |     | L  | L  | L         |     |     | Z   | Z   | Z         |     |     | L   | L   | L |
| 22         | pF        | P   | P         | P   | L   | L   | L         |     |     | L  | L  | L         |     |     | Z   | Z   | Z         |     |     | L   | L   | L |
| 27         | pF        | P   | P         | P   | L   | L   | L         |     |     | L  | L  | L         |     |     | Z   | Z   | Z         |     |     | L   | L   | L |
| 33         | pF        | P   | P         | P   | L   | L   | L         |     |     | L  | L  | L         |     |     | Z   | Z   | Z         |     |     | L   | L   | L |
| 39         | pF        | P   | P         | P   | L   | L   | L         |     |     | L  | L  | L         |     |     | Z   | Z   | Z         |     |     | L   | L   | L |
| 47         | pF        | P   | P         | P   | L   | L   | L         |     |     | L  | L  | L         |     |     | Z   | Z   | Z         |     |     | L   | L   | L |
| 56         | pF        | P   | P         | P   | L   | L   | L         |     |     | L  | L  | L         |     |     | Z   | Z   | Z         |     |     | L   | L   | L |
| 68         | pF        | P   | P         | P   | L   | L   | L         |     |     | L  | L  | L         |     |     | Z   | Z   | Z         |     |     | L   | L   | L |
| 82         | pF        | P   | P         | P   | L   | L   | L         |     |     | L  | L  | L         |     |     | Z   | Z   | Z         |     |     | L   | L   | L |
| 100        | pF        | P   | P         | P   | L   | L   | L         |     |     | L  | L  | L         |     |     | Z   | Z   | Z         |     |     | L   | L   | L |
| 120        | pF        | P   | P         | P   | L   | L   | L         |     |     | L  | L  | L         |     |     | Z   | Z   | Z         |     |     | L   | L   | L |
| 150        | pF        | P   | P         | P   | L   | L   | L         |     |     | L  | L  | L         |     |     | Z   | Z   | Z         |     |     | L   | L   | L |
| 180        | pF        | P   | P         | P   | L   | L   | L         |     |     | L  | L  | L         |     |     | Z   | Z   | Z         |     |     | L   | L   | L |
| 220        | pF        | P   | P         | P   | L   | L   | L         |     |     | L  | L  | L         |     |     | Z   | Z   | Z         |     |     | L   | L   | L |
| 270        | pF        | P   | P         | P   | L   | L   | L         |     |     | L  | L  | L         |     |     | Z   | Z   | Z         |     |     | L   | L   | L |
| 330        | pF        | P   | P         | P   | L   | L   |           |     |     | L  | L  |           |     |     | Z   | Z   | Z         |     |     | L   | L   | L |
| 390        | pF        | P   | P         | P   | L   | L   |           |     |     | L  | L  |           |     |     | Z   | Z   |           |     |     | L   | L   | Z |
| 470        | pF        | P   | P         | P   | L   | L   |           |     |     | L  | L  |           |     |     | Z   | Z   |           |     |     | L   | L   |   |
| 560        | pF        | P   |           | P   | L   | L   |           |     |     | L  | L  |           |     |     | Z   | Z   |           |     |     | L   | L   |   |
| 680        | pF        | P   |           | P   | L   | L   |           |     |     | L  |    |           |     |     | Z   |     |           |     |     | L   | L   |   |
| 820        | pF        | P   |           | X   | L   | L   |           |     |     | L  |    |           |     |     | Z   |     |           |     |     | L   | L   |   |
| 1000       | pF        | P   |           | X   | L   | L   |           | L   | L   | L  |    | Z         | Z   | Z   |     |     | L         | L   | L   | L   |     |   |
| 1200       | pF        | P   |           | X   | L   | L   |           | L   | L   | L  |    | Z         | Z   | Z   |     |     | L         | L   | L   | L   |     |   |
| 1500       | pF        |     |           | X   | L   | L   |           | L   | L   | L  |    | Z         | Z   | Z   |     |     | L         | L   | L   |     |     |   |
| 1800       | pF        |     |           | X   | L   |     |           | L   | L   | L  |    | Z         | Z   | Z   |     |     | L         | L   | L   |     |     |   |
| 2200       | pF        |     |           | X   | L   |     |           | L   | L   | L  |    | Z         | Z   |     |     |     | L         | L   | L   |     |     |   |
| 2700       | pF        |     |           | X   |     |     |           | L   | L   |    |    | Z         | Z   |     |     |     | L         | L   | L   |     |     |   |
| 3300       | pF        |     |           | L   |     |     |           | L   | L   |    |    | Z         | Z   |     |     |     | L         | L   | L   |     |     |   |
| 3900       | pF        |     |           | L   |     |     |           | L   |     |    |    |           |     |     |     |     | L         | L   | L   |     |     |   |
| 4700       | pF        |     |           |     |     |     |           | L   |     |    |    |           |     |     |     |     | L         | L   | L   |     |     |   |
| 5600       | pF        |     |           |     |     |     |           | L   |     |    |    |           |     |     |     |     | L         | L   |     |     |     |   |
| 6800       | pF        |     |           |     |     |     |           | L   |     |    |    |           |     |     |     |     | L         | L   |     |     |     |   |
| 8200       | pF        |     |           |     |     |     |           |     |     |    |    |           |     |     |     |     | L         |     |     |     |     |   |
| 10000      | pF        |     |           |     |     |     |           |     |     |    |    |           |     |     |     |     | L         |     |     |     |     |   |

### Thickness Code: Standard Packing Q'ty per reel

| Thickness Code | Chip Size | Chip Thickness | Max Carrier Thickness | Q'ty of carboard tape in |          | Q'ty of Embosses tape in |          |
|----------------|-----------|----------------|-----------------------|--------------------------|----------|--------------------------|----------|
|                |           |                |                       | 7" reel                  | 13" reel | 7" reel                  | 13" reel |
| S              | 0402      | 0.50±0.05 mm   | 0.60 mm               | 10,000                   | 50,000   | --                       | --       |
| P              | 0603      | 0.80±0.10 mm   | 0.95 mm               | 4,000                    | 15,000   | --                       | --       |
| A              | 0805      | 0.60±0.10 mm   | 0.75 mm               | 4,000                    | 15,000   | --                       | --       |
| H              |           | 0.85±0.10 mm   | 0.90 mm               | 4,000                    | 15,000   | --                       | --       |
| X              |           | 1.25±0.10 mm   | 1.25 mm               | --                       | --       | 3,000                    | 10,000   |
| P              | 1206      | 0.80±0.10 mm   | 0.90 mm               | 4,000                    | 15,000   | --                       | --       |
| H              |           | 0.85±0.10 mm   | 0.90 mm               | 4,000                    | 15,000   | --                       | --       |
| C              |           | 0.95±0.10 mm   | 1.25 mm               | --                       | --       | 3,000                    | 10,000   |
| X              |           | 1.25±0.10 mm   | 1.25 mm               | --                       | --       | 3,000                    | 10,000   |
| L              |           | 1.65±0.20 mm   | 1.80 mm               | --                       | --       | 2,000                    | --       |
| X              | 1210      | 1.25±0.10 mm   | 1.25 mm               | --                       | --       | 3,000                    | 10,000   |
| L              |           | 1.65±0.20 mm   | 1.80 mm               | --                       | --       | 2,000                    | --       |
| Z              |           | 2.00±0.20 mm   | 2.20 mm               | --                       | --       | 2,000                    | --       |
| G              |           | 2.50±0.20 mm   | 2.75 mm               | --                       | --       | 2,000                    | --       |
| Z              | 1808      | 2.00±0.20 mm   | 2.20 mm               | --                       | --       | 2,000                    | --       |
| L              | 1812      | 1.65±0.20 mm   | 1.80 mm               | --                       | --       | 1,000                    | --       |
| Z              |           | 2.00±0.20 mm   | 2.20 mm               | --                       | --       | 1,000                    | --       |
| U              |           | 3.20±0.20 mm   | 4.00 mm               | --                       | --       | 500                      | --       |