

# C0G (NP0) Dielectric



## General Specifications



C0G (NP0) is the most popular formulation of the “temperature-compensating,” EIA Class I ceramic materials. Modern C0G (NP0) formulations contain neodymium, samarium and other rare earth oxides.

C0G (NP0) ceramics offer one of the most stable capacitor dielectrics available. Capacitance change with temperature is  $0 \pm 30 \text{ ppm}/^\circ\text{C}$  which is less than  $\pm 0.3\% \Delta C$  from  $-55^\circ\text{C}$  to  $+125^\circ\text{C}$ . Capacitance drift or hysteresis for C0G (NP0) 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 C0G (NP0), one-fifth that shown by most other dielectrics. C0G (NP0) formulations show no aging characteristics.

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

**0805**

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

**5**

**Voltage**  
6.3V = 6  
10V = Z  
16V = Y  
25V = 3  
50V = 5  
100V = 1  
200V = 2  
500V = 7

**A**

**Dielectric**  
C0G (NP0) = A

**101**

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

**J**

**Capacitance Tolerance**  
B =  $\pm 10 \text{ pF}$  ( $< 10 \text{ pF}$ )  
C =  $\pm 25 \text{ pF}$  ( $< 10 \text{ pF}$ )  
D =  $\pm 50 \text{ pF}$  ( $< 10 \text{ pF}$ )  
F =  $\pm 1\%$  ( $\geq 10 \text{ pF}$ )  
G =  $\pm 2\%$  ( $\geq 10 \text{ pF}$ )  
J =  $\pm 5\%$   
K =  $\pm 10\%$

**A**

**Failure Rate**  
A = Not  
Applicable

**T**

**Terminations**  
T = Plated Ni  
and Sn  
7 = Gold Plated

**2**

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

**A**

**Special Code**  
A = Std.  
Product

**Contact Factory For**  
1 = Pd/Ag Term

**Contact Factory For**  
Multiples

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

**Temperature Coefficient**



**Δ Capacitance vs. Frequency**



**Insulation Resistance vs Temperature**



**Variation of Impedance with Cap Value**  
Impedance vs. Frequency  
0805 - C0G (NP0)  
10 pF vs. 100 pF vs. 1000 pF



**Variation of Impedance with Chip Size**  
Impedance vs. Frequency  
1000 pF - C0G (NP0)



**Variation of Impedance with Ceramic Formulation**  
Impedance vs. Frequency  
1000 pF - C0G (NP0) vs X7R  
0805



# COG (NP0) Dielectric



## Specifications and Test Methods

| Parameter/Test                        |                       | NP0 Specification Limits  | Measuring Conditions  |                |
|---------------------------------------|-----------------------|---|---|----------------|
| <b>Operating Temperature Range</b>    |                       | -55°C to +125°C   | Temperature Cycle Chamber   |                |
| <b>Capacitance</b>                    |                       | Within specified tolerance  | Freq.: 1.0 MHz ± 10% for cap ≤ 1000 pF<br>1.0 kHz ± 10% for cap > 1000 pF<br>Voltage: 1.0Vrms ± .2V   |                |
| <b>Q</b>                              |                       | <30 pF: Q ≥ 400+20 x Cap Value<br>≥30 pF: Q ≥ 1000                        | Charge device with rated voltage for 60 ± 5 secs @ room temp/humidity   |                |
| <b>Insulation Resistance</b>          |                       | 100,000MΩ or 1000MΩ - μF, whichever is less                               | Charge device with 300% 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 500V devices. |                |
| <b>Dielectric Strength</b>            |                       | No breakdown or visual defects  | Deflection: 2mm<br>Test Time: 30 seconds<br>1mm/sec<br>  |                |
| <b>Resistance to Flexure Stresses</b> | Appearance            | No defects  |   |                |
|                                       | Capacitance Variation | ±5% or ±.5 pF, whichever is greater                                       |   |                |
|                                       | Q                     | Meets Initial Values (As Above)   |   |                |
|                                       | Insulation Resistance | ≥ Initial Value x 0.3   |   |                |
| <b>Solderability</b>                  |                       | ≥ 95% of each terminal should be covered with fresh solder                | Dip device in eutectic solder at 230 ± 5°C for 5.0 ± 0.5 seconds  |                |
| <b>Resistance to Solder Heat</b>      | 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 ± 2 hours before measuring electrical properties.   |                |
|                                       | Capacitance Variation | ≤ ±2.5% or ±.25 pF, whichever is greater                                  |   |                |
|                                       | Q                     | Meets Initial Values (As Above)   |   |                |
|                                       | Insulation Resistance | Meets Initial Values (As Above)   |   |                |
| <b>Thermal Shock</b>                  | Dielectric Strength   | Meets Initial Values (As Above)   | Repeat for 5 cycles and measure after 24 hours at room temperature  |                |
|                                       | Appearance            | No visual defects   | Step 1: -55°C ± 2°  | 30 ± 3 minutes |
|                                       | Capacitance Variation | ≤ ±2.5% or ±.25 pF, whichever is greater                                  | Step 2: Room Temp   | ≤ 3 minutes    |
|                                       | Q                     | Meets Initial Values (As Above)   | Step 3: +125°C ± 2°   | 30 ± 3 minutes |
|                                       | Insulation Resistance | Meets Initial Values (As Above)   | Step 4: Room Temp   | ≤ 3 minutes    |
| <b>Load Life</b>                      | Dielectric Strength   | Meets Initial Values (As Above)   | Charge device with twice rated voltage in test chamber set at 125°C ± 2°C for 1000 hours (+48, -0).   |                |
|                                       | Appearance            | No visual defects   | Remove from test chamber and stabilize at room temperature for 24 hours before measuring.   |                |
|                                       | Capacitance Variation | ≤ ±3.0% or ± .3 pF, whichever is greater                                  |   |                |
|                                       | Q (C=Nominal Cap)     | ≥ 30 pF: Q ≥ 350<br>≥10 pF, <30 pF: Q ≥ 275 +5C/2<br><10 pF: Q ≥ 200 +10C |   |                |
|                                       | Insulation Resistance | ≥ Initial Value x 0.3 (See Above)   |   |                |
| <b>Load Humidity</b>                  | Dielectric Strength   | Meets Initial Values (As Above)   | Store in a test chamber set at 85°C ± 2°C/ 85% ± 5% relative humidity for 1000 hours (+48, -0) with rated voltage applied.  |                |
|                                       | Appearance            | No visual defects   | Remove from chamber and stabilize at room temperature for 24 ± 2 hours before measuring.  |                |
|                                       | Capacitance Variation | ≤ ±5.0% or ± .5 pF, whichever is greater                                  |   |                |
|                                       | Q                     | ≥ 30 pF: Q ≥ 350<br>≥10 pF, <30 pF: Q ≥ 275 +5C/2<br><10 pF: Q ≥ 200 +10C |   |                |
| <b>Insulation Resistance</b>          | Insulation Resistance | ≥ Initial Value x 0.3 (See Above)   |   |                |
|                                       | Dielectric Strength   | Meets Initial Values (As Above)   |   |                |



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## Capacitance Range

PREFERRED SIZES ARE SHADED

| SIZE           |             | 1210                           |                 |                 |                 |                 | 1812                           |                 |                 |                 |                 | 1825                           |                 |                 |    |     | 2220                           |    |     |     |    | 2225                           |     |  |  |  |
|----------------|-------------|--------------------------------|-----------------|-----------------|-----------------|-----------------|--------------------------------|-----------------|-----------------|-----------------|-----------------|--------------------------------|-----------------|-----------------|----|-----|--------------------------------|----|-----|-----|----|--------------------------------|-----|--|--|--|
| Soldering      |             | Reflow Only                    |                 |                 |                 |                 | Reflow Only                    |                 |                 |                 |                 | Reflow Only                    |                 |                 |    |     | Reflow Only                    |    |     |     |    | Reflow Only                    |     |  |  |  |
| Packaging      |             | Paper/Embossed                 |                 |                 |                 |                 | All Embossed                   |                 |                 |                 |                 | All Embossed                   |                 |                 |    |     | All Embossed                   |    |     |     |    | All Embossed                   |     |  |  |  |
| (L) Length     | mm<br>(in.) | 3.20 ± 0.20<br>(0.126 ± 0.008) |                 |                 |                 |                 | 4.50 ± 0.30<br>(0.177 ± 0.012) |                 |                 |                 |                 | 4.50 ± 0.30<br>(0.177 ± 0.012) |                 |                 |    |     | 5.70 ± 0.40<br>(0.225 ± 0.016) |    |     |     |    | 5.72 ± 0.25<br>(0.225 ± 0.010) |     |  |  |  |
| (W) Width      | mm<br>(in.) | 2.50 ± 0.20<br>(0.098 ± 0.008) |                 |                 |                 |                 | 3.20 ± 0.20<br>(0.126 ± 0.008) |                 |                 |                 |                 | 6.40 ± 0.40<br>(0.252 ± 0.016) |                 |                 |    |     | 5.00 ± 0.40<br>(0.197 ± 0.016) |    |     |     |    | 6.35 ± 0.25<br>(0.250 ± 0.010) |     |  |  |  |
| (t) Terminal   | mm<br>(in.) | 0.50 ± 0.25<br>(0.020 ± 0.010) |                 |                 |                 |                 | 0.61 ± 0.36<br>(0.024 ± 0.014) |                 |                 |                 |                 | 0.61 ± 0.36<br>(0.024 ± 0.014) |                 |                 |    |     | 0.64 ± 0.39<br>(0.025 ± 0.015) |    |     |     |    | 0.64 ± 0.39<br>(0.025 ± 0.015) |     |  |  |  |
| WVDC           |             | 25                             | 50              | 100             | 200             | 500             | 25                             | 50              | 100             | 200             | 500             | 50                             | 100             | 200             | 50 | 100 | 200                            | 50 | 100 | 200 | 50 | 100                            | 200 |  |  |  |
| Cap (pF)       | 0.5         |                                |                 |                 |                 |                 |                                |                 |                 |                 |                 |                                |                 |                 |    |     |                                |    |     |     |    |                                |     |  |  |  |
|                | 1.0         |                                |                 |                 |                 |                 |                                |                 |                 |                 |                 |                                |                 |                 |    |     |                                |    |     |     |    |                                |     |  |  |  |
|                | 1.2         |                                |                 |                 |                 |                 |                                |                 |                 |                 |                 |                                |                 |                 |    |     |                                |    |     |     |    |                                |     |  |  |  |
|                | 1.5         |                                |                 |                 |                 |                 |                                |                 |                 |                 |                 |                                |                 |                 |    |     |                                |    |     |     |    |                                |     |  |  |  |
|                | 1.8         |                                |                 |                 |                 |                 |                                |                 |                 |                 |                 |                                |                 |                 |    |     |                                |    |     |     |    |                                |     |  |  |  |
|                | 2.2         |                                |                 |                 |                 |                 |                                |                 |                 |                 |                 |                                |                 |                 |    |     |                                |    |     |     |    |                                |     |  |  |  |
|                | 2.7         |                                |                 |                 |                 |                 |                                |                 |                 |                 |                 |                                |                 |                 |    |     |                                |    |     |     |    |                                |     |  |  |  |
|                | 3.3         |                                |                 |                 |                 |                 |                                |                 |                 |                 |                 |                                |                 |                 |    |     |                                |    |     |     |    |                                |     |  |  |  |
|                | 3.9         |                                |                 |                 |                 |                 |                                |                 |                 |                 |                 |                                |                 |                 |    |     |                                |    |     |     |    |                                |     |  |  |  |
|                | 4.7         |                                |                 |                 |                 |                 |                                |                 |                 |                 |                 |                                |                 |                 |    |     |                                |    |     |     |    |                                |     |  |  |  |
|                | 5.6         |                                |                 |                 |                 |                 |                                |                 |                 |                 |                 |                                |                 |                 |    |     |                                |    |     |     |    |                                |     |  |  |  |
|                | 6.8         |                                |                 |                 |                 |                 |                                |                 |                 |                 |                 |                                |                 |                 |    |     |                                |    |     |     |    |                                |     |  |  |  |
|                | 8.2         |                                |                 |                 |                 |                 |                                |                 |                 |                 |                 |                                |                 |                 |    |     |                                |    |     |     |    |                                |     |  |  |  |
|                | 10          |                                |                 |                 |                 | J               |                                |                 |                 |                 |                 |                                |                 |                 |    |     |                                |    |     |     |    |                                |     |  |  |  |
|                | 12          |                                |                 |                 |                 | J               |                                |                 |                 |                 |                 |                                |                 |                 |    |     |                                |    |     |     |    |                                |     |  |  |  |
|                | 15          |                                |                 |                 |                 | J               |                                |                 |                 |                 |                 |                                |                 |                 |    |     |                                |    |     |     |    |                                |     |  |  |  |
|                | 18          |                                |                 |                 |                 | J               |                                |                 |                 |                 |                 |                                |                 |                 |    |     |                                |    |     |     |    |                                |     |  |  |  |
|                | 22          |                                |                 |                 |                 | J               |                                |                 |                 |                 |                 |                                |                 |                 |    |     |                                |    |     |     |    |                                |     |  |  |  |
|                | 27          |                                |                 |                 |                 | J               |                                |                 |                 |                 |                 |                                |                 |                 |    |     |                                |    |     |     |    |                                |     |  |  |  |
|                | 33          |                                |                 |                 |                 | J               |                                |                 |                 |                 |                 |                                |                 |                 |    |     |                                |    |     |     |    |                                |     |  |  |  |
|                | 39          |                                |                 |                 |                 | J               |                                |                 |                 |                 |                 |                                |                 |                 |    |     |                                |    |     |     |    |                                |     |  |  |  |
|                | 47          |                                |                 |                 |                 | J               |                                |                 |                 |                 |                 |                                |                 |                 |    |     |                                |    |     |     |    |                                |     |  |  |  |
|                | 56          |                                |                 |                 |                 | J               |                                |                 |                 |                 |                 |                                |                 |                 |    |     |                                |    |     |     |    |                                |     |  |  |  |
|                | 68          |                                |                 |                 |                 | J               |                                |                 |                 |                 |                 |                                |                 |                 |    |     |                                |    |     |     |    |                                |     |  |  |  |
|                | 82          |                                |                 |                 |                 | J               |                                |                 |                 |                 |                 |                                |                 |                 |    |     |                                |    |     |     |    |                                |     |  |  |  |
|                | 100         |                                |                 |                 |                 | J               |                                |                 |                 |                 |                 |                                |                 |                 |    |     |                                |    |     |     |    |                                |     |  |  |  |
|                | 120         |                                |                 |                 |                 | J               |                                |                 |                 |                 |                 |                                |                 |                 |    |     |                                |    |     |     |    |                                |     |  |  |  |
|                | 150         |                                |                 |                 |                 | J               |                                |                 |                 |                 |                 |                                |                 |                 |    |     |                                |    |     |     |    |                                |     |  |  |  |
|                | 180         |                                |                 |                 |                 | J               |                                |                 |                 |                 |                 |                                |                 |                 |    |     |                                |    |     |     |    |                                |     |  |  |  |
|                | 220         |                                |                 |                 |                 | J               |                                |                 |                 |                 |                 |                                |                 |                 |    |     |                                |    |     |     |    |                                |     |  |  |  |
|                | 270         |                                |                 |                 |                 | J               |                                |                 |                 |                 |                 |                                |                 |                 |    |     |                                |    |     |     |    |                                |     |  |  |  |
|                | 330         |                                |                 |                 |                 | J               |                                |                 |                 |                 |                 |                                |                 |                 |    |     |                                |    |     |     |    |                                |     |  |  |  |
|                | 390         |                                |                 |                 |                 | M               |                                |                 |                 |                 |                 |                                |                 |                 |    |     |                                |    |     |     |    |                                |     |  |  |  |
|                | 470         |                                |                 |                 |                 | M               |                                |                 |                 |                 |                 |                                |                 |                 |    |     |                                |    |     |     |    |                                |     |  |  |  |
|                | 560         | J                              | J               | J               | J               | M               |                                |                 |                 |                 |                 |                                |                 |                 |    |     |                                |    |     |     |    |                                |     |  |  |  |
|                | 680         | J                              | J               | J               | J               | M               |                                |                 |                 |                 |                 |                                |                 |                 |    |     |                                |    |     |     |    |                                |     |  |  |  |
|                | 820         | J                              | J               | J               | J               | M               |                                |                 |                 |                 |                 |                                |                 |                 |    |     |                                |    |     |     |    |                                |     |  |  |  |
|                | 1000        | J                              | J               | J               | J               | M               | K                              | K               | K               | K               | M               | M                              | M               | M               |    |     |                                |    |     |     | M  | M                              | P   |  |  |  |
|                | 1200        | J                              | J               | J               | M               | M               | K                              | K               | K               | K               | M               | M                              | M               | M               |    |     |                                |    |     |     | M  | M                              | P   |  |  |  |
|                | 1500        | J                              | J               | J               | M               | M               | K                              | K               | K               | K               | M               | M                              | M               | M               |    |     |                                |    |     |     | M  | M                              | P   |  |  |  |
|                | 1800        | J                              | J               | J               | M               |                 | K                              | K               | K               | K               | M               | M                              | M               | M               |    |     |                                |    |     |     | M  | M                              | P   |  |  |  |
|                | 2200        | J                              | J               | J               | Q               |                 | K                              | K               | K               | K               | P               | M                              | M               | M               |    |     |                                |    |     |     | M  | M                              | P   |  |  |  |
|                | 2700        | J                              | J               | J               | Q               |                 | K                              | K               | K               | P               | Q               | M                              | M               | M               |    |     |                                |    |     |     | M  | M                              | P   |  |  |  |
|                | 3300        | J                              | J               | J               |                 |                 | K                              | K               | K               | P               | Q               | M                              | M               | M               |    |     |                                | X  |     |     | M  | M                              | P   |  |  |  |
|                | 3900        | J                              | J               | M               |                 |                 | K                              | K               | K               | P               | Q               | M                              | M               | M               |    |     |                                | X  |     |     | M  | M                              | P   |  |  |  |
|                | 4700        | J                              | J               | M               |                 |                 | K                              | K               | K               | P               | Q               | M                              | M               | M               |    |     |                                | X  | X   | X   | M  | M                              | P   |  |  |  |
|                | 5600        | J                              | J               |                 |                 |                 | K                              | K               | M               | P               | X               | M                              | M               | M               | X  | X   | X                              | X  | X   | X   | M  | M                              | P   |  |  |  |
|                | 6800        | J                              | J               |                 |                 |                 | K                              | K               | M               | X               |                 | M                              | M               | M               | X  | X   | X                              | X  | X   | X   | M  | M                              | P   |  |  |  |
|                | 8200        | J                              | J               |                 |                 |                 | K                              | M               | M               |                 | M               | M                              | M               | X               | X  | X   | X                              | X  | X   | M   | M  | P                              |     |  |  |  |
| Cap (µF)       | 0.010       | J                              | J               |                 |                 |                 | K                              | M               | M               |                 | M               | M                              | M               | X               | X  | X   | X                              | X  | X   | M   | M  | P                              |     |  |  |  |
|                | 0.012       | J                              | J               |                 |                 |                 | K                              | M               |                 |                 | M               | M                              | M               | X               | X  | X   | X                              | X  | X   | M   | M  | P                              |     |  |  |  |
|                | 0.015       |                                |                 |                 |                 |                 | M                              | M               |                 |                 | M               | M                              | M               | X               | X  | X   | X                              | X  | X   | M   | M  | Y                              |     |  |  |  |
|                | 0.018       |                                |                 |                 |                 |                 | M                              | M               |                 |                 | P               | M                              |                 | X               | X  | X   | X                              |    |     | M   | M  | Y                              |     |  |  |  |
|                | 0.022       |                                |                 |                 |                 |                 | M                              | M               |                 |                 | P               |                                |                 | X               | X  |     | X                              |    |     | M   | Y  | Y                              |     |  |  |  |
|                | 0.027       |                                |                 |                 |                 |                 | M                              | M               |                 |                 | P               |                                |                 | X               | X  |     | X                              |    |     | P   | Y  | Y                              |     |  |  |  |
|                | 0.033       |                                |                 |                 |                 |                 | M                              | M               |                 |                 | P               |                                |                 | X               | X  |     | X                              |    |     | P   |    |                                |     |  |  |  |
|                | 0.039       |                                |                 |                 |                 |                 | M                              | M               |                 |                 | P               |                                |                 | Y               |    |     | Y                              |    |     | P   |    |                                |     |  |  |  |
|                | 0.047       |                                |                 |                 |                 |                 | M                              | M               |                 |                 | P               |                                |                 | Y               |    |     | Y                              |    |     | P   |    |                                |     |  |  |  |
|                | 0.068       |                                |                 |                 |                 |                 | M                              | M               |                 |                 |                 |                                |                 |                 |    |     |                                |    |     | P   |    |                                |     |  |  |  |
|                | 0.082       |                                |                 |                 |                 |                 | M                              | M               |                 |                 |                 |                                |                 |                 |    |     |                                |    |     | Q   |    |                                |     |  |  |  |
|                | 0.1         |                                |                 |                 |                 |                 |                                |                 |                 |                 |                 |                                |                 |                 |    |     |                                |    |     | Q   |    |                                |     |  |  |  |
| WVDC           |             | 25                             | 50              | 100             | 200             | 500             | 25                             | 50              | 100             | 200             | 500             | 50                             | 100             | 200             | 50 | 100 | 200                            | 50 | 100 | 200 | 50 | 100                            | 200 |  |  |  |
| SIZE           |             | 1210                           |                 |                 |                 |                 | 1812                           |                 |                 |                 |                 | 1825                           |                 |                 |    |     | 2220                           |    |     |     |    | 2225                           |     |  |  |  |
| Letter         |             | A                              | C               | E               | G               | J               | K                              | M               | N               | P               | Q               | X                              | Y               | Z               |    |     |                                |    |     |     |    |                                |     |  |  |  |
| Max. Thickness |             | 0.33<br>(0.013)                | 0.56<br>(0.022) | 0.71<br>(0.028) | 0.90<br>(0.035) | 0.94<br>(0.037) | 1.02<br>(0.040)                | 1.27<br>(0.050) | 1.40<br>(0.055) | 1.52<br>(0.060) | 1.78<br>(0.070) | 2.29<br>(0.090)                | 2.54<br>(0.100) | 2.79<br>(0.110) |    |     |                                |    |     |     |    |                                |     |  |  |  |
|                |             | PAPER                          |                 |                 |                 |                 | EMBOSSSED                      |                 |                 |                 |                 |                                |                 |                 |    |     |                                |    |     |     |    |                                |     |  |  |  |





Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



#### Как с нами связаться

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