



High Frequency NP0 (C0G) Dielectrics

■ Features

- High Q, low ESR
- A monolithic structure ensures high reliability and mechanical strength.
- 0603 (EIA 0201) Ultra-miniature size
- Suitable for high speed SMT placement on PCBs.
- Lead-Free Terminations
- Ni barrier termination highly resistance to migration.
- Lead-free termination is in compliance with the requirement of green plan and ROHS.

■ Applications

- Cellular Phone, Cordless Phone
- GPS, VCO, RF Integrated Circuits
- Wireless LAN, RF Transceivers
- Communication Equipment
- Custom Applications

■ High Frequency C0G (NP0) Dielectric Characteristics

Capacitance Range	0.2pF ~ 22pF
Size	0603 1005 1608 (0201) (0402) (0603)
Test Voltage	1.0 ± 0.2Vrms
Test Frequency	1.0 ± 0.2MHz
Capacitance Tolerance	± 0.25pF for cap < 5pF (± 0.1pF available on request) ± 0.50pF for 5pF ≤ cap < 10pF (± 0.1pF, ± 0.25pF available on request) ± 5% for cap ≥ 10pF (± 1%, ± 2% available on request)
Operating Temperature Range	-55°C to +125°C
Temperature Coefficient	0 ± 30 ppm/°C (EIA C0G)
Rated Voltage	16, 25 & 50 VDC
*Quality Factor	1,000 min.
*ESR (ESR value @ 1GHz for cap<5.0pF; ESR value @ 500 MHz for cap ≥ 5.0p)	ESR ≤ 1200 mOhm for cap < 1.0pF ESR ≤ 700 mOhm for 1.0pF ≤ cap < 5.0pF ESR ≤ 350 mOhm for 5.0pF ≤ cap
Insulation Resistance (+25°C, RVDC)	10 GΩ min.
Insulation Resistance (+125°C, RVDC)	1 GΩ min.

* Measurements are performed on HP4287A with fixture 16196A (for 1608) / 16196B (for 1005) / 16196C (for 0603), 0.5V; Environment 25°C +/-3°C, 30%~75%RH



■ **NP0 – Low ESR/ High Q (Q Series)**

CLASS	Class I						
TYPE	Low ESR/High Q						
T.C.	NP0(C0G)						
SIZE	*0603		1005		1608		
(EIA)	0201		0402		0603		
RV	25V	16V	25V	50V	16V	25V	50V
* 0.20 p	A	B	B	B	D	D	D
* 0.50 p	A	B	B	B	D	D	D
* 0.75 p	A	B	B	B	D	D	D
1.0 p	A	B	B	B	D	D	D
1.2 p	A	B	B	B	D	D	D
1.5 p	A	B	B	B	D	D	D
1.8 p	A	B	B	B	D	D	D
2.2 p	A	B	B	B	D	D	D
2.7 p	A	B	B	B	D	D	D
3.3 p	A	B	B	B	D	D	D
3.9 p	A	B	B	B	D	D	D
4.7 p	A	B	B	B	D	D	D
5.6 p	A	B	B	B	D	D	D
6.8 p	A	B	B	B	D	D	D
8.2 p	A	B	B	B	D	D	D
10 p	A	B	B	B	D	D	D
12 p		B	B	B	D	D	D
15 p		B	B	B	D	D	D
18 p		B	B	B	D	D	D
22 p		B	B	B	D	D	D
27 p							
33 p							
39 p							
47 p							
56 p							
68 p							
82 p							
100 p							
120 p							
150 p							
180 p							
220 p							
270 p							
330 p							

■ **Microwave (F Series)**

CLASS	Class I				
TYPE	Microwave				
T.C.	NP0(COG)				
SIZE	1005		1608		
(EIA)	0402		0603		
RV	25V	50V	25V	50V	
* 0.20 p					
* 0.50 p	B	B	D	D	
* 0.75 p	B	B	D	D	
1.0 p	B	B	D	D	
1.2 p	B	B	D	D	
1.5 p	B	B	D	D	
1.8 p	B	B	D	D	
2.2 p	B	B	D	D	
2.7 p	B	B	D	D	
3.3 p	B	B	D	D	
3.9 p	B	B	D	D	
4.7 p	B	B	D	D	
5.6 p	B	B	D	D	
6.8 p	B	B	D	D	
8.2 p	B	B	D	D	
10 p	B	B	D	D	
12 p			D	D	
15 p			D	D	
18 p			D	D	
22 p			D	D	
27 p					
33 p					
39 p					
47 p					
56 p					
68 p					
82 p					
100 p					
120 p					
150 p					
180 p					
220 p					
270 p					
330 p					

Note : Thickness might be changed due to technology improvement.

Thickness Code

Code	Thickness (mm)
A	0.30+/-0.03
B	0.50+/-0.05
D	0.80+/-0.10

■ **Taping Amount**

Thickness (mm)		Amount per reel					
		180 mm (7")		250mm (10")		330mm (13")	
Code	Class	Paper	Embossed	Paper	Embossed	Paper	Embossed
A	0.30 +/- 0.03	15K	X	X	X	X	X
B	0.50 +/- 0.05	10K	X	X	X	50K	X
D	0.80 +/- 0.10	4K	X	10K	X	15K	X

■ **High Frequency NP0 (C0G) Specifications**

No.	Item	Specification	Test Method																								
1	Operating Temperature Range	-55°C to 125°C	-																								
2	Rated Voltage	16VDC, 25VDC and 50VDC	The rated voltage is defined as the maximum voltage, which may be applied continuously to the capacitor.																								
3	Appearance	No defects or abnormalities.	Visual inspection																								
4	Dimensions	Within the specified dimension.	Using calipers																								
5	Dielectric Strength (Flash)	No defects or abnormalities.	No failure shall be observed when 250% of the rated voltage is applied between the terminations for 1 to 5 seconds, the charge and discharge current is less than 50mA.																								
6	Insulation Resistance (I.R.)	I.R. ≥ 10GΩ	The insulation resistance shall be measured with a DC voltage not exceeding the rated voltage at 25°C and 75%RH max, and within 1 minute of charging.																								
7	Capacitance	Within the specified tolerance.	The capacitance/D.F. shall be measured at 25°C at the frequency and voltage shown in the tables.																								
8	Quality Factor (Q)	1,000 min.	<table border="1"> <tr> <td>Frequency</td> <td>1.0±0.2MHz</td> </tr> <tr> <td>Voltage</td> <td>1.0±0.2Vrms</td> </tr> </table>	Frequency	1.0±0.2MHz	Voltage	1.0±0.2Vrms																				
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9	Capacitance Temperature Characteristics	Capacitance change within 0±30ppm/°C under operating temperature range.	Temperature compensating type: The capacitance value at 25°C and 85°C shall be measured and calculated from the formula given below. T.C.=(C ₈₅ -C ₂₅)/C ₂₅ *ΔT*10 ⁶ (PPM/°C)																								
10	Termination Strength	No removal of the terminations or marking defect.	Apply a parallel force of 5N to a PCB mounted sample for 10±1sec. *2N for 0603 (EIA 0201).																								
11	Deflection (Bending Strength)	Appearance: No cracking or marking defects. Capacitance change: within ±2.5% or ± 0.25pF. (whichever is larger)	Solder the capacitor to the test jig (glass epoxy boards) shown in Fig. a. using a eutectic solder. Then apply a force in the direction shown in Fig. b. The soldering shall be done with the reflow method and shall be conducted with care so that the soldering is uniform and free of defects such as heat shock.																								
		<p>(Unit in mm)</p> <table border="1"> <thead> <tr> <th>Size</th> <th>a</th> <th>b</th> <th>C</th> </tr> </thead> <tbody> <tr> <td>0603</td> <td>0.3</td> <td>0.9</td> <td>0.3</td> </tr> <tr> <td>1005</td> <td>0.4</td> <td>1.5</td> <td>0.5</td> </tr> <tr> <td>1608</td> <td>1.0</td> <td>3.0</td> <td>1.2</td> </tr> <tr> <td>2012</td> <td>1.2</td> <td>4.0</td> <td>1.65</td> </tr> <tr> <td>3216</td> <td>2.2</td> <td>5.0</td> <td>2.0</td> </tr> </tbody> </table> <p>Fig. a.</p>	Size	a	b	C	0603	0.3	0.9	0.3	1005	0.4	1.5	0.5	1608	1.0	3.0	1.2	2012	1.2	4.0	1.65	3216	2.2	5.0	2.0	<p>Fig. b.</p>
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3216	2.2	5.0	2.0																								
12	Solderability of Termination	90% of the terminations are to be soldered evenly and continuously.	Immerse the test capacitor into a methanol solution containing rosin for 3 to 5 seconds, preheat it 150 to 180°C for 2 to 3 minutes and immerse it into molten solder of 230 ± 5°C for 5±1seconds.																								
13	Resistance to Soldering Heat	Appearance	No marking defects																								
		Cap. Change	NP0 within ±2.5% or ±0.25pF. (whichever is larger)																								
		Q	Initial Spec.																								
		I.R.	Initial Spec.																								
			Preheat the capacitor at 120 to 150°C for 1 minute. Immerse the capacitor in an eutectic solder solution at 270±5°C for 10±1 seconds. Let sit at room temperature for 24±2 hours, then measure.																								

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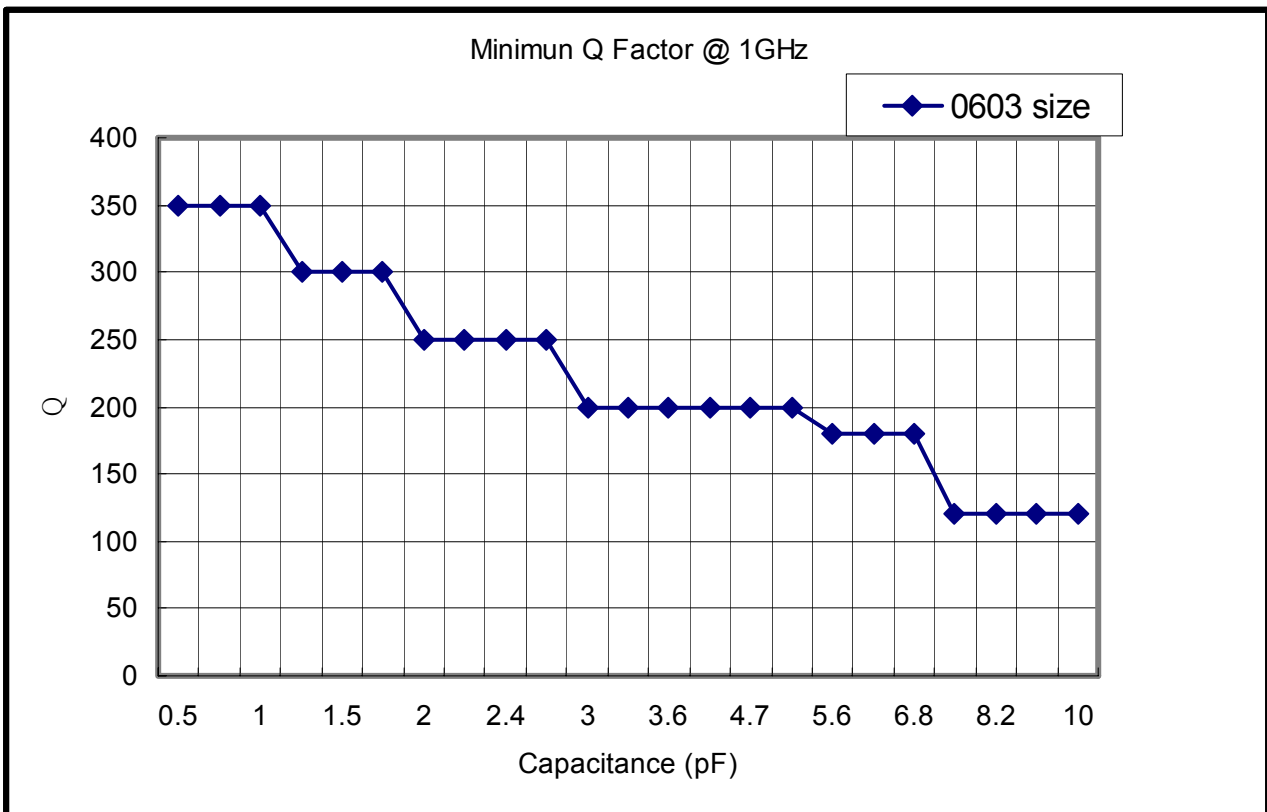
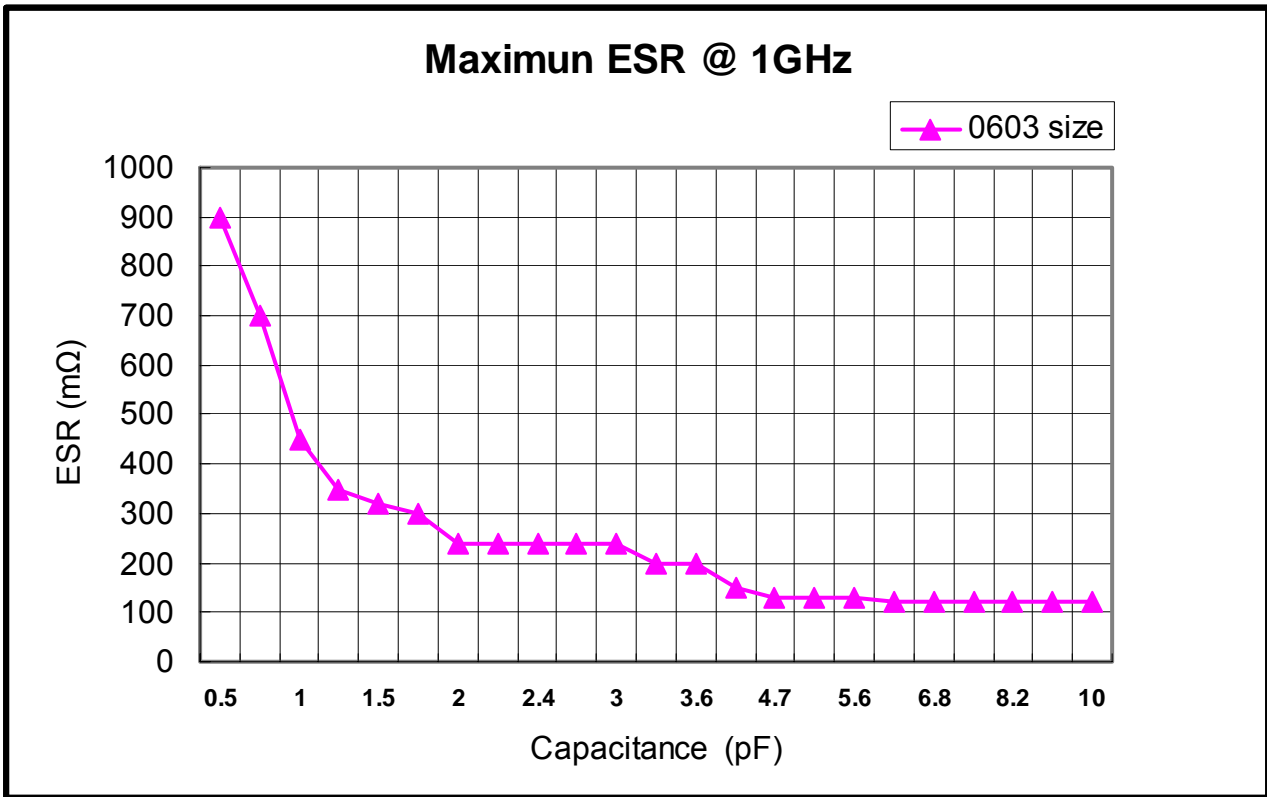
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14	Temperature Cycle (Thermal Shock)	Appearance	No marking defects	Solder the capacitor to supporting jig (glass epoxy board) and perform the five cycles according to the four heat treatments listed in the following table. Let sit for 24±2hrs at room temperature, then measure. Step 1: Minimum operating temperature 30±3min Step 2: Room temperature 2~3 min Step 3: Maximum operating temperature 30±3min Step 4: Room temperature 2~3min
		Cap. Change	NP0 within ±2.5% or ±0.25pF. (whichever is larger)	
		Q	Initial Spec.	
		I.R.	Initial Spec.	
15	Humidity Load	Appearance	No marking defects	Apply the rated voltage at 40±2°C and 90 to 95% humidity for 500±12 hours. Remove and let sit for 24±2 hours at room temperature, then measure. The charge/discharge current is less than 50mA.
		Cap. Change	NP0 within ±5.0% or ±0.5pF. (whichever is larger)	
		Q	200 min.	
		I.R.	I.R. ≥ 500MΩ	
18	High Temperature Load (Life Test)	Appearance	No marking defects	Apply 200% of the rated voltage for 500±12 hours at the maximum operating temperature ± 3°C. Let sit for 24± 2 hours at room temperature, then measure. The charge/discharge current is less than 50mA.
		Cap. Change	NP0 within ±5.0% or ±0.5pF (whichever is large)	
		Q	350 min.	
		I.R.	I.R. ≥ 1GΩ	

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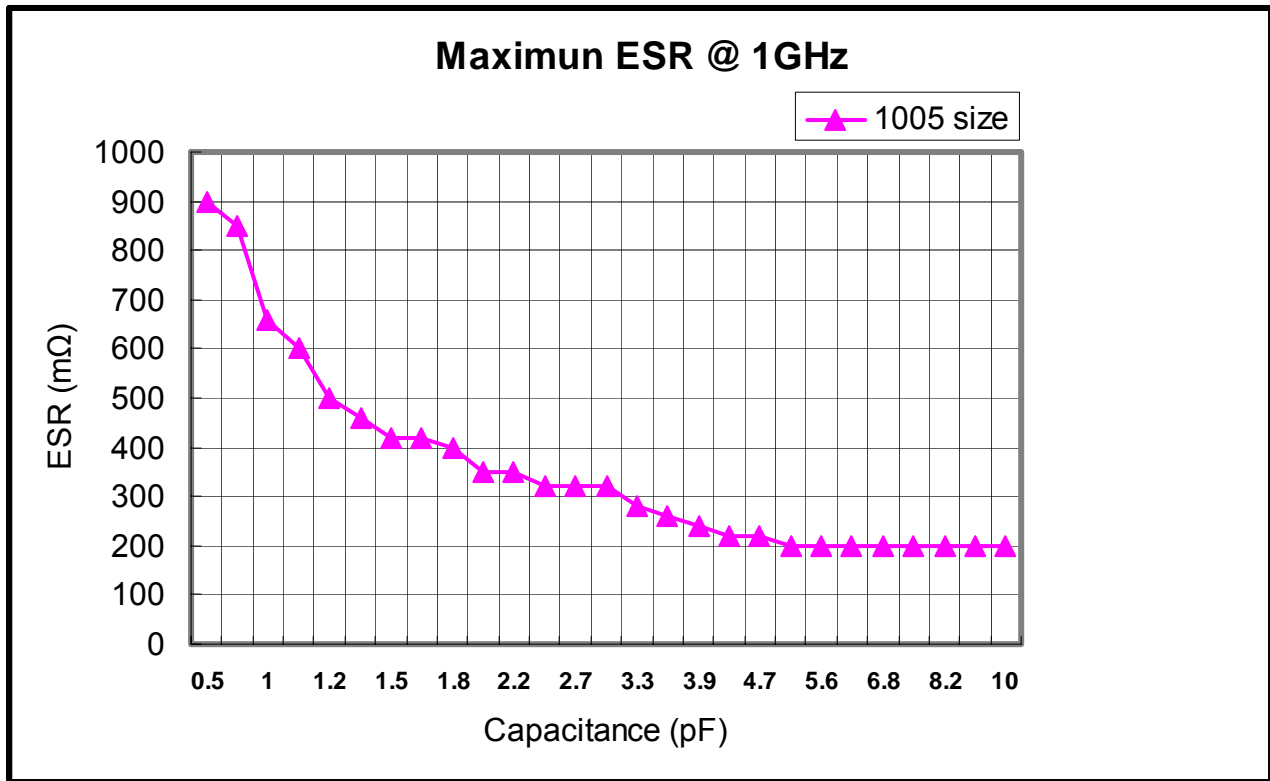
- Typical RF Characteristics for High Frequency NP0 (C0G) 0603 (EIA 0201) at 1GHz.

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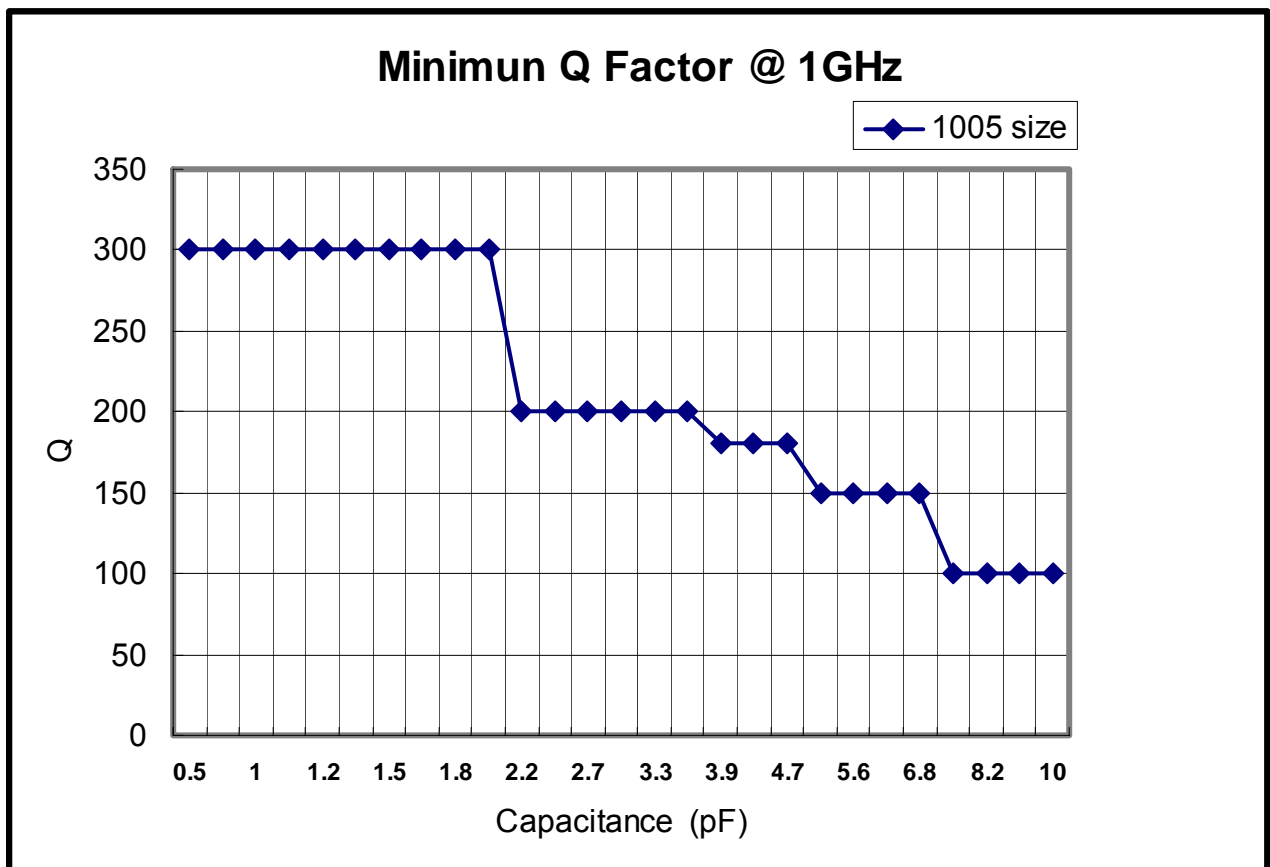


Measurements performed on a HP4287A with fixture 16196B and represent the typical capacitor performance.

■ Typical RF Characteristics for High Frequency NP0 (C0G) 1005 (EIA 0402) at 1GHz.)

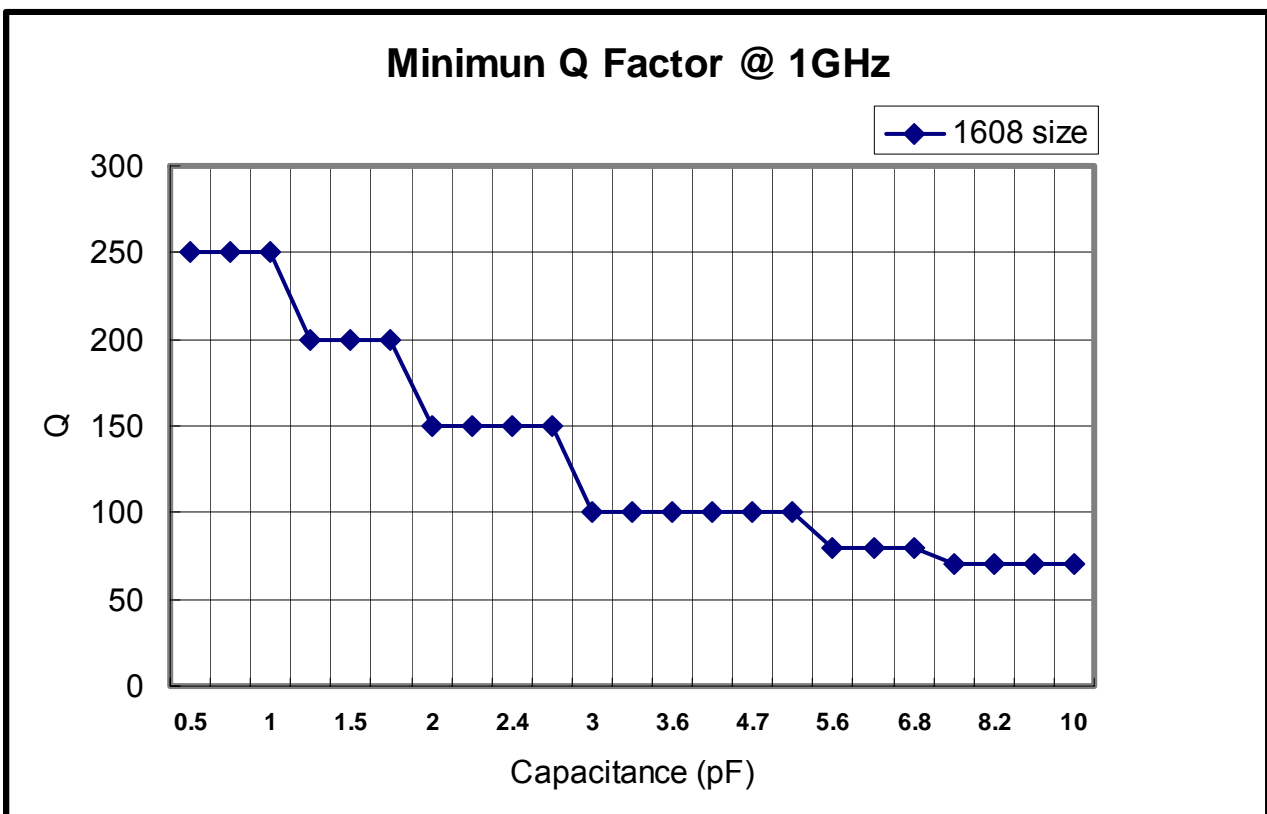
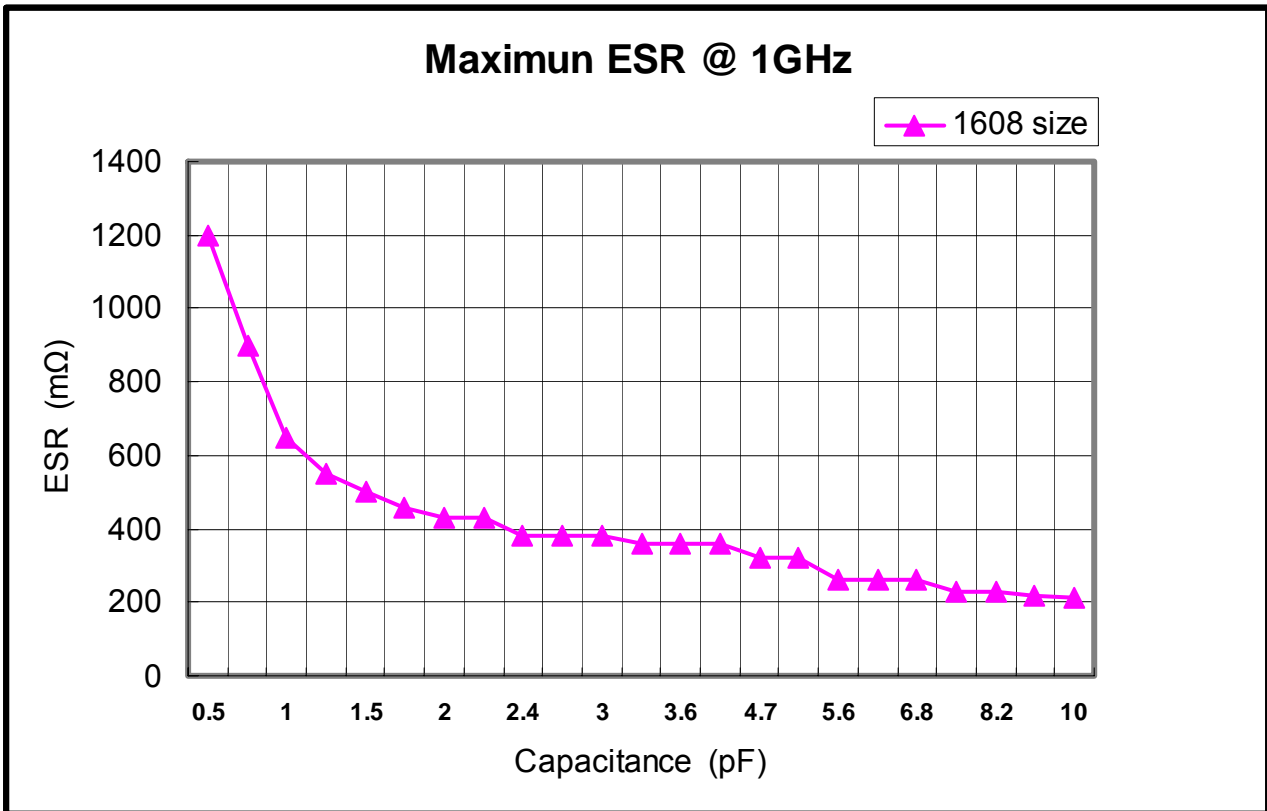


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Measurements performed on a HP4287A with fixture 16196A and represent the typical capacitor performance.

■ **Typical RF Characteristics for High Frequency NP0 (C0G) 1608 (EIA 0603) at 1GHz.**



Measurements performed on a HP4287A with fixture 16196A and represent the typical capacitor performance.