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High-Q Capacitors (Microwave Chip Capacitors)

Series: **ECD**



■ Features

- Low Capacitance with tight tolerance
(0.1 to 15.0 pF, +/-0.05 pF to +/-5 %)
- High Q value / Low ESR at High Frequencies
- Ultra-Stable COG Performance (0±30 ppm/°C)
- 0402 & 0201 Case sizes
(0.1 to 15.0 pF & 0.1 to 5.6 pF, +/-0.05 pF, +/-0.075 pF etc)
- Pb Free
- RoHS compliant

■ Recommended Applications

- Microwave Circuitry
 - Impedance Matching Circuitry
 - Resonant Circuitry
 - Coupling Circuitry
- RF modules, VCO, BPF, DUP, PA
- Cellular Phone, Bluetooth, Wireless LAN

■ Product Code

ECD: High-Q Capacitors

■ Handling Precautions

See Page 48 to 53

■ Packaging Specifications

See Page 45, 46, 56

■ Explanation of Part Numbers



■ Construction



No	Name	
①	Ceramic dielectric	
②	Internal electrode	
③	Terminal electrode	Substrate electrode
④		Intermediate electrode
⑤		External electrode

■ Dimensions in mm (not to scale)



Size Code	Size (EIA)	L	W	T	L ₁ , L ₂
Z	0201	0.60±0.03	0.30±0.03	0.30±0.03	0.15±0.05
0	0402	1.00±0.05	0.5±0.05	0.5±0.05	0.2±0.1

■ Packaging Styles and Standard Packaging Quantities

Quantity : pcs./reel

Packaging Style Code	Packaging Styles		Size	
		Thickness (mm)		
E	φ180 reel	Paper taping (Pitch: 2 mm)	0201	0402
			T=0.3	T=0.5
			15,000	10,000

■ Temperature Characteristics

Temperature Characteristic Code	Temperature Coefficient
C0G	0±30 ppm/°C

These temperature coefficients are calculated between 25 °C and 85 °C

■ Rated Voltage

Rated Voltage
DC 25 V

■ Nominal Capacitance

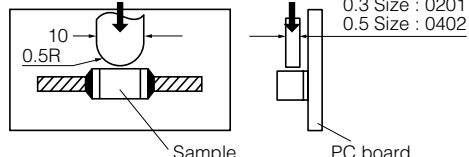
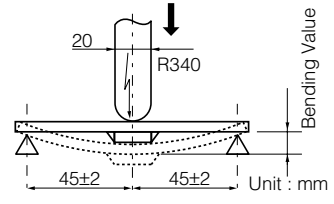
Ex.	R10	1R0	2R7	120
Nominal Capacitance	0.10 pF	1.0 pF	2.7 pF	12 pF

The first two digits are significant figures of capacitance. Small number of people display the point by R.

■ Capacitance tolerance

Size (EIA)	Tolerance Code	Capacitance Range	Capacitance Tolerance
0201	8	0.10 to 0.50 pF	±0.05 pF
	9	0.60 to 0.90 pF	±0.075 pF
	B	1.0 to 3.0 pF	±0.10 pF
	C	3.3 to 5.6 pF	±0.25 pF
0402	8	0.10 to 0.90 pF	±0.05 pF
	9	0.60 to 0.90 pF	±0.075 pF
	B	1.0 to 8.2 pF	±0.10 pF
	C	3.3 to 10.0 pF	±0.25 pF
	J	12 to 15 pF	±5 %

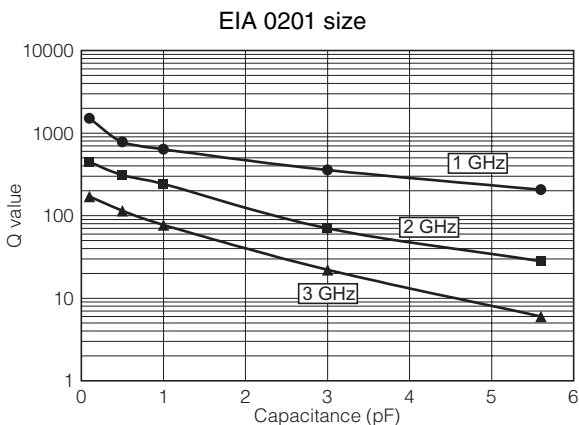
■ Specifications and Testing Methods

Characteristics	Specifications	Test Method												
Operating Temperature Range	-55 to 125 °C	—												
Dielectric Withstanding Voltage	No dielectric breakdown and/or damage	Test voltage: Rated voltage × 300 % Duration: 1 to 5 s Charge/discharge current: 50 mA max.												
Insulation Resistance (IR)	10000 MΩ min.	Measuring voltage: Rated voltage Duration: 60±5 s Charge / Discharge current: 50 mA max.												
Capacitance	Within the specified tolerance	Temperature: 20 +/-2 °C Measuring Frequency: 1 MHz +/-10 % Measuring Voltage: 0.5 to 5 Vrms												
Dissipation Factor (tan δ)	$\tan \delta \leq 0.005$ max.													
Temperature Characteristics	COG : 0 +/-30 ppm/°C	Maximum capacitance change at stage 1 to 5 <table border="1"> <thead> <tr> <th>Stage</th> <th>Temperature</th> </tr> </thead> <tbody> <tr> <td>Stage1</td> <td>25±2 °C</td> </tr> <tr> <td>Stage2</td> <td>-25±2 °C</td> </tr> <tr> <td>Stage3 (Reference Temperature)</td> <td>25±2 °C</td> </tr> <tr> <td>Stage4</td> <td>85±2 °C</td> </tr> <tr> <td>Stage5</td> <td>25±2 °C</td> </tr> </tbody> </table>	Stage	Temperature	Stage1	25±2 °C	Stage2	-25±2 °C	Stage3 (Reference Temperature)	25±2 °C	Stage4	85±2 °C	Stage5	25±2 °C
Stage	Temperature													
Stage1	25±2 °C													
Stage2	-25±2 °C													
Stage3 (Reference Temperature)	25±2 °C													
Stage4	85±2 °C													
Stage5	25±2 °C													
Adhesion	The terminal electrode shall be free from peeling or signs of peeling.	Applied force : Size : 0201 : 2N Size : 0402 : 5N Arrow direction for 10 seconds. 												
Bending Strength	Appearance : no mechanical damage	Bending value : 1 mm Bending speed : 1 mm/s 												
Resistance to Solder Heat	Appearance : no mechanical damage I.R. : initial value	Solder temperature : 270±5 °C Dipping period : 3.0±0.5 s Preheat condition : <table border="1"> <thead> <tr> <th>Order</th> <th>Temp. (°C)</th> <th>Time (s)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>80 to 100</td> <td>120 to 180</td> </tr> <tr> <td>2</td> <td>150 to 200</td> <td>120 to 180</td> </tr> </tbody> </table> Recovery (Standard condition) : 24 ±2 h	Order	Temp. (°C)	Time (s)	1	80 to 100	120 to 180	2	150 to 200	120 to 180			
Order	Temp. (°C)	Time (s)												
1	80 to 100	120 to 180												
2	150 to 200	120 to 180												
Solderability	More than 75 % of the soldered area of both terminal electrodes shall be covered with fresh solder .	Solder bath method Solder temperature : 230±5 °C Dipping period : 4±1 s Solder : H63A (JIS Z 3283)												

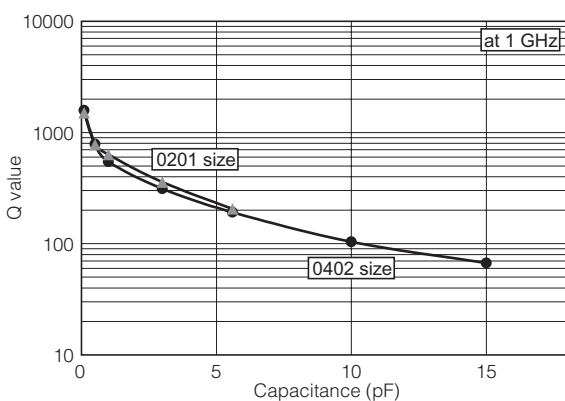
* Standard condition: Temperature 15 to 35 °C, Relative humidity 45 to 75 %.

Characteristics	Specifications	Test Method
Temperature cycle	Appearance : no mechanical damage I.R. : 1000M Ω min.	Condition of one cycle Step1 : -55 \pm 3 $^{\circ}$ C 30 \pm 3 min. Step2 : Room temp 3 min. Step3 : 125 \pm 3 $^{\circ}$ C 30 \pm 3 min. Step4 : Room temp 3 min. Number of cycles : 5 cycles Recovery (Standard condition) : 24 \pm 2 h
Moisture Resistance	Appearance : no mechanical damage I.R. : 1000M Ω min. Capacitance Change: Within \pm 7.5 % or \pm 0.02 pF whichever is larger tan δ : 0.005 max.	Temperature : 40 \pm 2 $^{\circ}$ C Relative Humidity : 90 to 95 % Test period : 500 +24/0 h Recovery (Standard condition) : 24 \pm 2 h
Moisture Resistant Loading	Appearance : no mechanical damage I.R. : 1000M Ω min.	Temperature : 40 \pm 2 $^{\circ}$ C Relative Humidity : 90 to 95 % Applied voltage : Rated voltage Limit surge current : 50 mA max. Test period : 500 +24/0 h Recovery (Standard condition) : 24 \pm 2 h
Loading at high temperature	Appearance : no mechanical damage I.R. : 1000M Ω min.	Temperature: 125 $^{\circ}$ C \pm 3 $^{\circ}$ C Applied voltage : Rated voltage \times 200 % Limit surge current : 50 mA max. Test period : 1000 +48/0 h Recovery (Standard condition) : 24 \pm 2 h

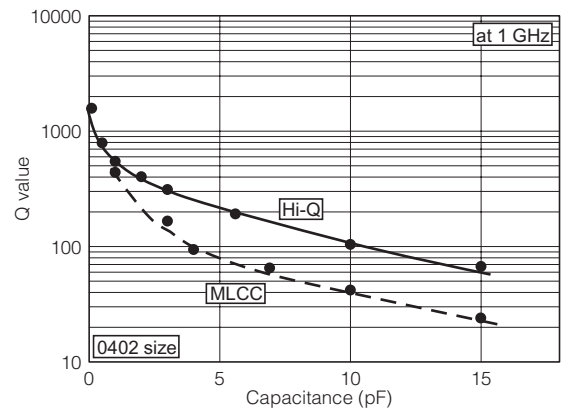
■ Q value vs. Capacitance



■ Comparison data of Q value



■ Comparison data of Q value



Measurements performed Boonton34A Resonant Coaxial-Line and represent typical capacitor performance.

■ Standard Products for EIA Size "0201", Taped Version
● Temperature Characteristics C0G

Rated voltage		DC 25 V	
Capacitance (pF)	Capacitance Tolerance	Part No.	Dim. T (mm)
0.10	±0.05 pF (8)	ECDGZER108	0.3
0.20		ECDGZER208	0.3
0.30		ECDGZER308	0.3
0.40		ECDGZER408	0.3
0.50		ECDGZER508	0.3
0.60	±0.075 pF (9)	ECDGZER609	0.3
0.70		ECDGZER709	0.3
0.80		ECDGZER809	0.3
0.90		ECDGZER909	0.3
1.0	±0.1 pF (B)	ECDGZE1R0B	0.3
1.1		ECDGZE1R1B	0.3
1.2		ECDGZE1R2B	0.3
1.3		ECDGZE1R3B	0.3
1.5		ECDGZE1R5B	0.3
1.6		ECDGZE1R6B	0.3
1.8		ECDGZE1R8B	0.3
2.0		ECDGZE2R0B	0.3
2.2		ECDGZE2R2B	0.3
2.4		ECDGZE2R4B	0.3
2.7		ECDGZE2R7B	0.3
3.0	ECDGZE3R0B	0.3	
3.3	±0.25 pF (C)	ECDGZE3R3C	0.3
3.9		ECDGZE3R9C	0.3
4.7		ECDGZE4R7C	0.3
5.6	ECDGZE5R6C	0.3	

Packaging Style Code : "E" (T=0.3 mm) for Standard Packaging
Quantity (15,000 pcs./reel)

■ Standard Products for EIA Size "0402", Taped Version
● Temperature Characteristics C0G

Rated voltage		DC 25 V	
Capacitance (pF)	Capacitance Tolerance	Part No.	Dim. T (mm)
0.10	±0.05 pF (8)	ECDG0ER108	0.5
0.20		ECDG0ER208	0.5
0.30		ECDG0ER308	0.5
0.40		ECDG0ER408	0.5
0.50		ECDG0ER508	0.5
0.60	±0.05 pF(8) or ±0.075 pF(9)	ECDG0ER60□	0.5
0.70		ECDG0ER70□	0.5
0.80		ECDG0ER80□	0.5
0.90		ECDG0ER90□	0.5
1.0	±0.1 pF (B)	ECDG0E1R0B	0.5
1.1		ECDG0E1R1B	0.5
1.2		ECDG0E1R2B	0.5
1.3		ECDG0E1R3B	0.5
1.5		ECDG0E1R5B	0.5
1.6		ECDG0E1R6B	0.5
1.8		ECDG0E1R8B	0.5
2.0		ECDG0E2R0B	0.5
2.2		ECDG0E2R2B	0.5
2.4		ECDG0E2R4B	0.5
2.7		ECDG0E2R7B	0.5
3.0	ECDG0E3R0B	0.5	
3.3	±0.1 pF(B) or ±0.25 pF(C)	ECDG0E3R3□	0.5
3.9		ECDG0E3R9□	0.5
4.7		ECDG0E4R7□	0.5
5.6		ECDG0E5R6□	0.5
6.8		ECDG0E6R8□	0.5
8.2	ECDG0E8R2□	0.5	
10.0	±0.25 pF	ECDG0E100C	0.5
12	±5 % (J)	ECDG0E120J	0.5
15		ECDG0E150J	0.5

□ : Capacitance tolerance code.
Packaging Style Code : "E" (T=0.5 mm) for Standard Packaging
Quantity (10,000 pcs./reel)

Application Examples

RF Circuit

