**57 kHz piezoceramic ring**  
(<https://www.steminc.com/PZT/en/piezo-ceramic-cylinder-20x17x5mm-57-khz>)

Part Number: SMC20D17H5  
Piezoelectric ceramic cylinder with inner and outer surface electrode for radial mode vibration.  
Piezo Material: [SM111](http://www.steminc.com/piezo/PZ_property.asp)  
Dimensions: Ext. Diam. 20 x Int Diam 17 x Height 5.0mm  
Resonant frequency fr: 57 KHz±2 KHz  
Electromechanical coupling coefficient Kr: ≥35%       
Dielectric Loss tg δ: =0.5%  
Resonant impedance Zm: ≤12 Ω  
Static capacitance Cs: 2400pF±15%@1kHz  
Test Condition: 23±3 °C 40~70% R.H.  
fr, Zm, Kr => Radial mode vibration  
Cs tanδ => LCR meter at 1KHz 1Vrms

**70 kHz piezoceramic ring  
(**[**https://www.steminc.com/PZT/en/annular-piezo-ceramic-70-khz**](https://www.steminc.com/PZT/en/annular-piezo-ceramic-70-khz)**)**

Part Number: SMC1412T4412  
Annular Piezoelectric Ceramic Ø14Ø12x4mm 70 KHz. Radial mode vibration  
Piezo Material: [SM411](http://www.steminc.com/piezo/PZ_property.asp)  
Dimensions: OD 14 x ID 12 x Th 4mm  
Resonant frequency fr: 70 KHz ± 5%  
Electromechanical coupling coefficient Kr: >30%  
Dielectric Loss tg δ: <2%  
Static capacitance Cs: 3900pF±20%  
Test Condition: 23±3 °C 40~70% R.H.  
fr, Zm, Kr => Radial mode vibration  
Cs tanδ => LCR meter at 1KHz 1Vrms

**127 kHz piezoceramic cylinder  
(**[**https://www.steminc.com/PZT/en/piezo-ceramic-cylinder-765x65x65mm-127-khz**](https://www.steminc.com/PZT/en/piezo-ceramic-cylinder-765x65x65mm-127-khz)**)**

Part Number: SMC7565T65111  
Piezoelectric Ceramic Cylinder. Radial mode vibration  
Piezo Material: [SM111](http://www.steminc.com/piezo/PZ_property.asp)  
Dimensions: 7.65x6.5x6.5mm  
Resonant frequency fr: 127 KHz±5KHz  
Electromechanical coupling coefficient Kr:       
Dielectric Loss tg δ: 1.60  
Resonant impedance Zm:  
Static capacitance Cs: 4000pF±15%  
Test Condition: 25±3 °C 40~70% R.H.  
fr, Zm, Kr => Radial mode vibration  
Cs tanδ => LCR meter at 1KHz 1Vrms

**155 kHz piezoceramic cylinder  
(**[**https://www.steminc.com/PZT/en/piezo-ceramic-tube-o635o49x635mm-155-khz**](https://www.steminc.com/PZT/en/piezo-ceramic-tube-o635o49x635mm-155-khz)**)**

Part Number: SMC0604T6121  
Piezoelectric Ceramic Cylinder. Radial mode vibration  
Piezo Material: [SM411](http://www.steminc.com/piezo/PZ_property.asp)  
Dimensions: OD 6.35 x ID 4.9 x Th 6.35mm  
Resonant frequency fr: 155 KHz ± 5%  
Dielectric Loss tg δ: <2%  
Resonant Impedance: <150Ω  
Static capacitance Cs: 2500pF±20%  
Test Condition: 23±3 °C 40~70% R.H.  
fr, Zm, Kr => Radial mode vibration  
Cs tanδ => LCR meter at 1KHz 1Vrms

**177 kHz Piezoceramic Cylinder (PiezoHannas)**

Capacity of P-51 OD 6.35mm\*ID 5.08mm\*12.7mm: 6350 pF

Correct inductance: 127 uH

**Inductance**

Resonant frequency of LC circuit given by

To calculate inductance for given frequency and capacitance (units of Hertz, Farads, Henrys):

|  |  |  |
| --- | --- | --- |
| **Piezoceramic Frequency** | **Inductance** | **Resonance Frequency** |
| 57 kHz | 3.2485 mH |  |
| 70 kHz | 1.3255 mH | 80 kHz @ 1000 uH |
| 127 kHz | 0.3926 mH | 127.43 kHz @ 390 uH |
| 155 kHz | 0.4111 mH | 161.2 kHz @ 390 uH |

**Two inductors in series:**

127 kHz piezo: 390 uH

155 kHz piezo: 390 uH + 22 uH

For 4 MHz clock, it takes 1/4 microsecond per clock cycle. We can construct the following frequencies with an integer number of clock cycles per half-cycle (so n cycles high, n cycles low):

**Frequency - Clock cycles per half cycle**

250.0 kHz        8 clock cycles

222.2 kHz        9 clock cycles

200 kHz          10 clock cycles

**181.8 kHz       11 clock cycles**

166.7 kHz       12 clock cycles

And then 153.9 kHz, 142.9 kHz, 133.3 kHz, 125 kHz, 117.7 kHz, 111.1 kHz, 105.3 kHz, 100 kHz...