

Monolithic Crystal Filters

Filter Characteristics

Critical to the understanding of filter behavior is a definition of the vocabulary of the most frequently used terms and familiarity with the typical filter amplitude frequency response curve, (fig. 1).

Center Frequency (FO) – The frequency between the high and low cut off frequencies of a filter.

Bandwidth (BW) – The difference between two cut off frequencies at a specified attenuation level (3dB or 6dB).

Attenuation – Reduction of signal in transmission through a filter. (Attenuation is usually indicated in decibels dB).

Decibel – Unit that shows the ratio between two powers, two voltages or two currents.

$$\left(10 \text{ Log } \frac{P_1}{P_2}, 20 \text{ Log } \frac{V_1}{V_2} \text{ or } 20 \text{ Log } \frac{I_1}{I_2} \right)$$

Shape Factor – Ratio of bandwidths at two different levels of attenuation.

Ripple – Is the difference between the passband maximum value and minimum loss.

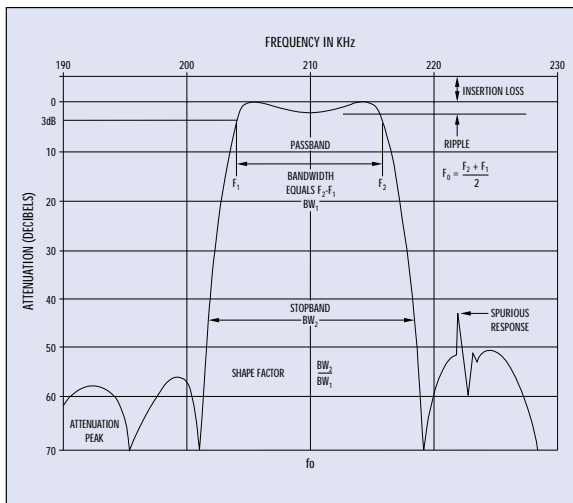
Insertion Loss – Power loss of the filter in the passband (in dB). Zero dB reference shall be the point of maximum output of the filter unless it is specified otherwise.

Termination Impedance – A value to terminate the filter input/output. It is generally expressed by resistance with parallel to capacitance which contains stray capacitance.

$$\text{Insertion Loss} = 10 \text{ Log } \frac{P_{in}}{P_{out}}$$

Load Impedance (Output termination) – The impedance connected to the output terminals of the filter in order to achieve the proper response.

Spurious Mode – Unwanted responses that occur in the filter due to resonant frequencies of the crystal other than the fundamental frequency.



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type	center Fr (MHz)	No. of poles	holder type	passband width (min)	stopband width(max)	insertion loss (max)	passband ripple (max)	coupling capacitance	termination impedance
10K7A	10.695	2	49U or 49T	6 dB ± 3.5 KHz	20 dB ± 10 KHz	2 dB	-	-	1 kΩ//11.5 pF
10K7.5A	10.700	2	49T	3 dB ± 3.75 KHz	18 dB ± 12.5 KHz	2 dB	1 dB	-	1.5 kΩ//5.5 pF
10K15A	10.700	2	49T	3 dB ± 7.5 KHz	18 dB ± 25 KHz	2 dB	1 dB	-	3 kΩ//2.5 pF
10K6B	10.700	4	2 x 49T	3 dB ± 3.0 KHz	40 dB ± 10 KHz	3 dB	1 dB	24 pF	1 kΩ//8.5 pF
10K7.5B	10.700	4	2 x 49T	3 dB ± 3.75 KHz	40 dB ± 12.5 KHz	2 dB	1 dB	15 pF	1.5 kΩ//3.5 pF
10K7.5B1	10.695	4	2 x 49T	3 dB ± 3.75 KHz	40 dB ± 12.5 KHz	2 dB	1 dB	15 pF	1.5 kΩ//3.5 pF
10K15B	10.700	4	2 x 49T	3 dB ± 7.5 KHz	40 dB ± 25 KHz	2 dB	1 dB	5.5 pF	3 kΩ//1.5 pF
21K15A	21.400	2	UM1 or UM5	3 dB ± 7.5 KHz	18 dB ± 25 KHz	2 dB	1 dB	-	1.5 kΩ//3.5 pF
21K7.5B	21.400	4	2x(UM1 or UM5)	3 dB ± 3.75 KHz	40 dB ± 14 KHz	2 dB	1 dB	20 pF	900Ω//5.4 pF
21K15B1	21.400	4	2x(UM1 or UM5)	3 dB ± 7.5 KHz	40 dB ± 25 KHz	2 dB	1 dB	5 pF	1.5 kΩ//2.5 pF

