DESCRIPTION

Telonic Interdigital Bandpass Filters fill the need for moderate and wide bandwidth filters in the 1.0 to 6.0 GHz spectrum. The standard unit is available with as many as 17 sections, to meet extreme selectivity requirements.

These 0.1 dB Chebyshev filters exhibit almost exact duplication of the mathematical model. Their skirts or stopbands are geometrically symmetrical.

The specifications for the example shown here as follows:

This unit is a fixed frequency interdigital bandpass filter. It has a nominal center frequency of 2,175 MHz and a minimum 3 dB relative bandwidth of 350 MHz. The maximum insertion loss at 2,175 MHz is .55 dB. (See Insertion Loss Curve page 23). The nominal input and output impedance is 50 ohms. The maximum VSWR at 2,175 MHz is 1.5:1. The minimum bandwidth over which the VSWR remains less than 1.5:1 is 315 MHz (from 2,017.5 MHz to 2,332.5 MHz).

The filter has 8 sections and its minimum stopband attenuation is 60 dB at 1811.1 MHz and 2595.1 MHz.

OUTLINE DRAWINGS

MECHANICAL SPECIFICATIONS

Approx. Weight in oz. .86 LW + 5.5

“L” Dimension 0.625 + 2.95 Approx.

“W” Dimension 2.125 + (0.500) No. of Section; Approx.

VSWR Bandwidth

NOTE 1: See page 6 for standard tolerance and definition of center frequency and bandwidth.

*Submit specific requirements
STOP BAND ATTENUATION:
The TIF response curve shown above identifies most of the terms and relationships needed for the calculation of a stop band attenuation specification.

The form factor at any specified attenuation level \(X\) dB is defined as follows:

\[
\text{(I)} \quad X \text{ dB Form Factor} = \frac{\text{BW at } X \text{ dB in MHz}}{\text{Min. 3 dB BW MHz}} = \frac{F_4 - F_1}{F_3 - F_2}
\]

The form factor nomograph defines the relationship between number of sections, form factor, and attenuation level. Whenever two variables are known, the third can be determined by drawing the indicated straight line.

For example:
The 60 dB form factor for an 8 section filter is 2.24

Since these filters are geometrically symmetrical, the following relationship must be used to determine the rejection frequencies.

\[
\text{(II)} \quad F_1 - F_4 = F_2 - F_3, \text{ or} \\
\text{(III)} \quad F_1 - F_4 = F_2 - F_3 = F_g
\]

\(F_g\), the geometric center frequency, is not the same as the nominal center frequency which appears in the model number.

\(F_c\), the nominal center frequency, is the arithmetic mean of the 3 dB band edges.

\[
\text{(IV)} \quad F_c = \frac{F_2 + F_3}{2}
\]

In the case of wide bandwidths, the difference between these two numbers is very significant.

To calculate the exact rejection frequencies:

\[
F_3 - F_2 = 3 \text{ dB BW} \\
F_4 - F_1 = X \text{ dB BW}
\]

From (II):

\[
(F_1)^2 + X \text{ dB BW} F_1 - F_2 F_3 = 0
\]

\[
F_1 = \frac{F_2 F_3 + (X \text{ dB BW})}{2}
\]

\[
F_4 = (X \text{ dB BW}) + F_1
\]

NOTE 1: Consult factory when selectivity requirement exceeds 8 sections.

ATTENUATION CURVES

INSERTION LOSS CURVES

NOTE 1: Consult factory when selectivity requirement exceeds 8 sections.

INSERTION LOSS:
Maximum insertion loss at center frequency

\[
= K(N + 0.5) + 0.1 \text{ dB}
\]

Where:

\[
K = \text{Loss constant} \\
N = \text{Number of sections} \\
\%
\%
\%
% \text{BW} = \frac{100 \times \text{min. 3 dB BW MHz}}{\text{Nominal } F_c \text{ MHz}}
\]

The Insertion Loss Graph defines the loss constant which must be used to calculate the insertion loss specification.

For example: MODEL NO. TIF 2175 - 350 - 8CC

No. of sections = 8
Center freq. = 2,175 MHz = 2.175 GHz
\%
\%
\%
% \text{BW} = \frac{100 \times 350}{2,175} = 16.1

Loss constant = .85
(Read directly from the insertion loss curve at 2.175 GHz.)

Therefore:
Maximum insertion loss at center freq.

\[
= \frac{.85 (8 + 0.5)}{16.1} + 0.1 \text{ dB} = 0.55 \text{ dB}
\]