INTERDIGITAL BANDPASS FILTERS

■ 1,000 TO 9,000 MHz ■ 3.0 TO 30% 3 DB BANDWIDTHS ■ 4 TO 17 SECTIONS

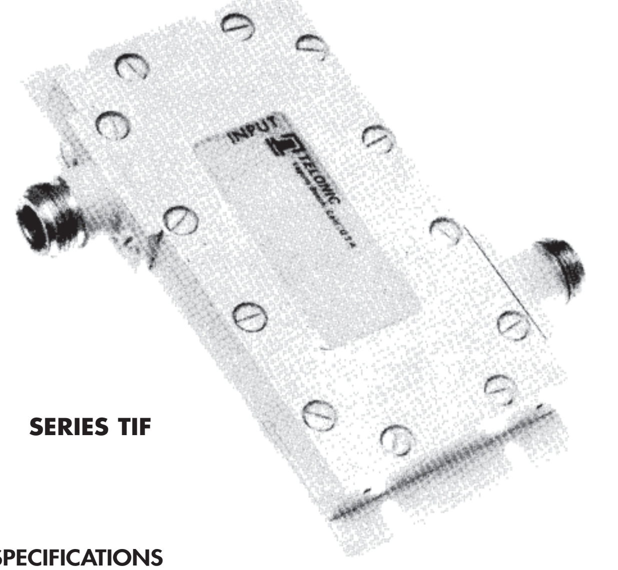
DESCRIPTION

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 Chebyschev filters exhibit almost exact duplication of the mathematical model. Their skirts or stopbands are geometrically symmetrical.

TIF 2175 — 350 — 8 C C □

- TIF — Series
- 2175 — Nominal Center Frequency in MHz
- 350 — Minimum 3 db Relative Bandwidth in MHz
- 8 — Number of Sections
- C — See Connector Code, Below: Input Conn.
- C — See Connector Code, Below: Output Conn.
- □ — Suffix Number to be Assigned by the Factory to Identify the Specific Customer and Application.



SERIES TIF

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.

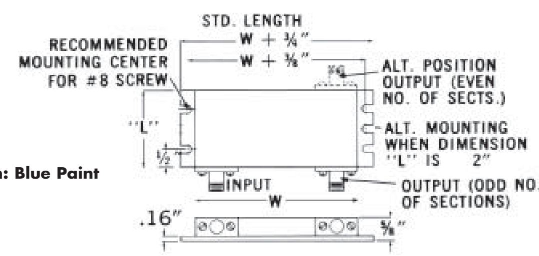
SPECIFICATIONS

ELECTRICAL SPECIFICATIONS		
Center Frequency Range	Normal Spec. Limit	1.0 to 9 GHz (See Note 1)
Minimum 3 db Relative Bandwidth (in % of center frequency)	Normal Spec. Limit	3.0% to 30% (See Note 1)
	*Areas of Interest	3.0% to 50%
Other Relative Bandwidths	*Areas of Interest	Spl. Requirements (See page 7)
Maximum Insertion Loss At Center Frequency	Normal Spec. Limit	See page 23
	*Areas of Interest	Spl. Requirements
Nominal Impedance (in and out)	Normal Spec. Limit	50 ohms
Maximum VSWR at Center Frequency	Normal Spec. Limit	1.5:1 to 5.0 GHz 2.0:1 to 9 GHz
Minimum VSWR Bandwidth	Normal Spec. Limit	See Page 15
	*Areas of Interest	Spl. Requirements (See page 7)
Stop Band Attenuation	Normal Spec. Limit	See Nomograph (Page 23)
	*Areas of Interest	Spl. Requirements
Number of Sections	Normal Spec. Limit	4 to 8 (up to 17*)
Average Input Power (watts max. to 10,000 ft.)	Normal Spec. Limit	$\frac{300\ (3\ \text{dB BW MHz})}{\text{Loss Constant (Fc MHz)}}$
	*Areas of Interest	10 to 100
Input Peak Power (watts max. to 10,000 ft.)	Normal Spec. Limit	$\frac{(1500)\ (3\ \text{dB BW MHz})}{(\text{Fc MHz})}$
	*Areas of Interest	100 to 1000

ENVIRONMENTAL SPECIFICATIONS			
OPERATING	Shock	Normal Spec. Limit	5G
		*Areas of Interest	15G
	Vibration	Normal Spec. Limit	2G
		*Areas of Interest	15G
	Humidity	Normal Spec. Limit	90%
		*Areas of Interest	Up to 100% with Condensation
	Altitude	Normal Spec. Limit	Unlimited
	Temp. Range	Normal Spec. Limit	0°C to 50°C
		*Areas of Interest	−54°C to + 125°C
STORAGE	Shock	Normal Spec. Limit	15G
		*Areas of Interest	75G
	Vibration	Normal Spec. Limit	10G
		*Areas of Interest	20G
	Temp. Range	Normal Spec. Limit	−54°C to + 100°C
		*Areas of Interest	−62°C to +150°C

OUTLINE DRAWINGS

Finish: Blue Paint



MECHANICAL SPECIFICATIONS

Approx. Weight in oz.	.86 LW + 5.5
"L" Dimension	$0.625 + \frac{2.95}{(\text{Fc GHz})}$ Approx.
"W" Dimension	2.125 + (.500) No. of Section; Approx.

VSWR Bandwidth

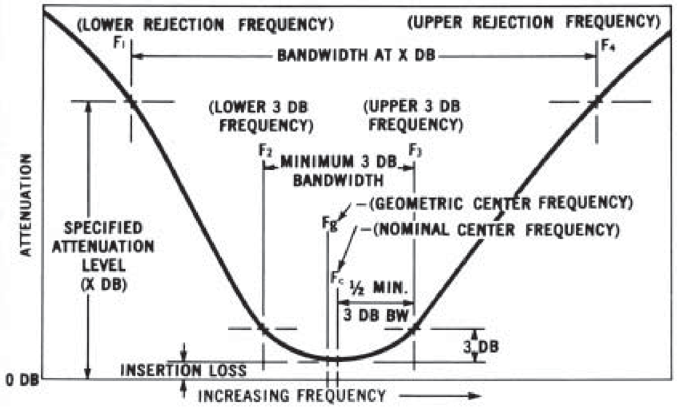
C — TNC Jack	†F — Type "N" Plug	S — SMA Jack
D — TNC Plug		T — SMA Plug
†E — Type "N" Jack		X — Special

† Type "N" connectors are larger in diameter than the thickness of the filter on which they are mounted.

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

***Submit specific requirements**

ATTENUATION CURVES



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:

(I) $\text{X db Form Factor} = \dfrac{\text{BW at X db in MHz}}{\text{Min. 3 db BW MHz}} = \dfrac{F_4 - F_1}{F_3 - F_2}$

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.

(II) $F_1\ F_4 = F_2\ F_3$, or

(III) $\sqrt{F_1\ F_4} = \sqrt{F_2\ F_3} = F_g$

Fg, the geometric center frequency, is **not** the same as the nominal center frequency which appears in the model number.

Fc, the nominal center frequency, is the arithmetic mean of the 3 db band edges.

(IV) $F_c = \dfrac{F_2 + F_3}{2}$

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

To calculate the **exact** rejection frequencies:

$F_3 - F_2 = 3\text{ db BW}$

$F_4 - F_1 = \text{X db BW}$

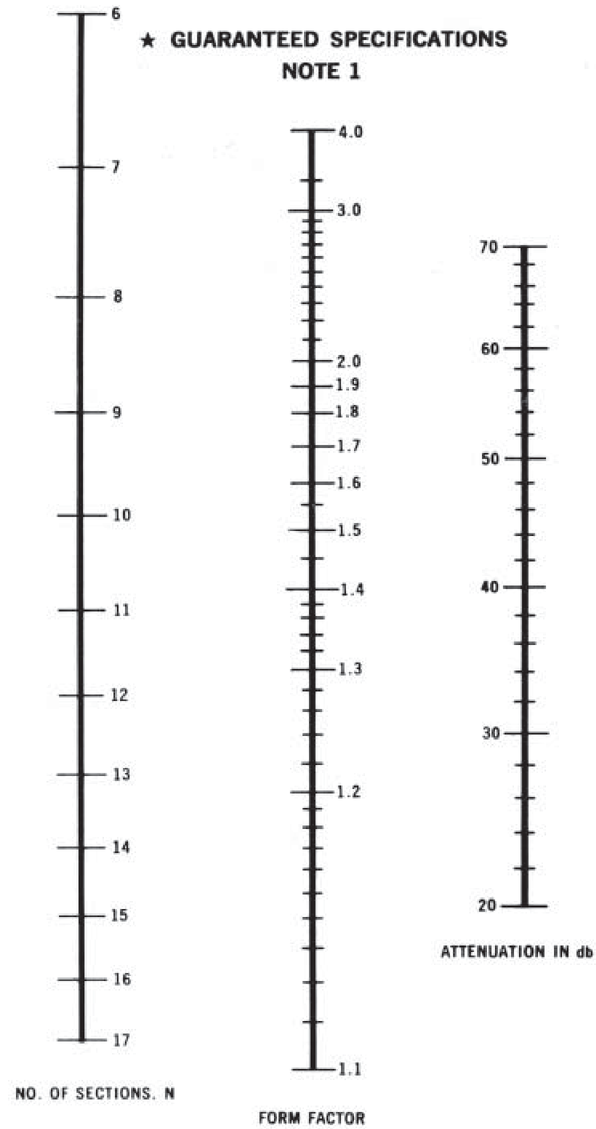
$\therefore F_4 = \text{X db BW} + F_1$

From **(II)**: $F_1\ (\text{X db BW} + F_1) = F_2\ F_3$

$(F_1)^2 + (\text{X db BW})\ F_1 - F_2\ F_3 = 0$

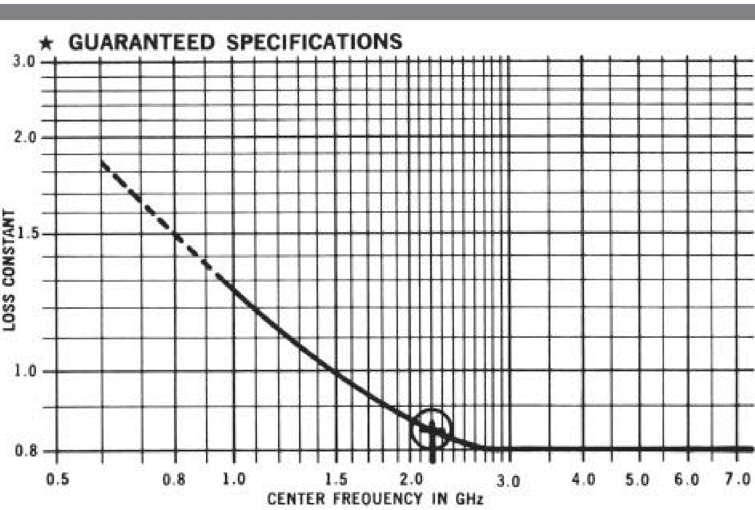
(V) $\therefore F_1 = \sqrt{F_2\ F_3 + \left(\dfrac{\text{X db BW}}{2}\right)^2} - \dfrac{\text{X db BW}}{2}$

(VI) and $F_4 = (\text{X db BW}) + F_1$



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

INSERTION LOSS CURVES



INSERTION LOSS:

Maximum insertion loss at center frequency

$$= \frac{K\ (N + 0.5)}{\%\ BW} + 0.1\text{ db}$$

Where: K = Loss constant
N = Number of sections

$$\%\ BW = \frac{100 \times \text{min. 3 db BW MHz}}{\text{Nominal Fc MHz}}$$

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

$$\%\ BW = \frac{100 \times 350}{2175} = 16.1$$

Loss constant = .85

(Read directly from the insertion loss curve at 2.175 GHz.)

Therefore:

Maximum insertion loss at center freq.

$$= \frac{.85\ (8 + 0.5)}{16.1} + 0.1\text{ db} = 0.55\text{ db}$$