TF10397 Tunable Bandpass Filter

Features

Quasi-elliptic Bandpass Design

L-band Tuning Range

Can be Cascaded for Sharper Roll-off

On-device Temperature Measurement

Compact Form-factor

Control and Power over USB 2.0

Applications

Jamming Mitigation

Communications Receivers

ESM Receiver Protection

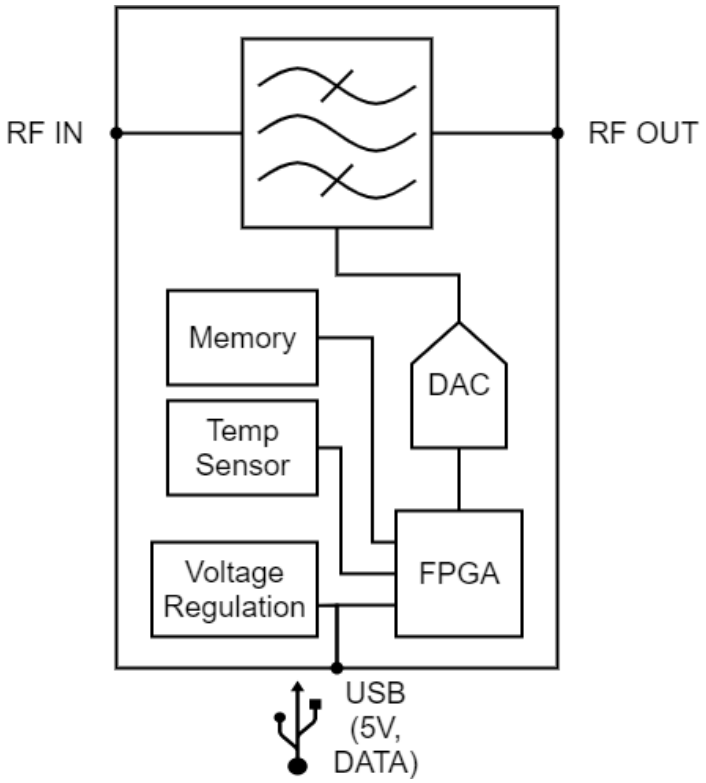
TR Modules

Electronic Warfare

General Description

TF10397 is a reconfigurable, quasi-elliptic bandpass filter, designed and packaged to make evaluation and testing straightforward.

Functional Block Diagram



Electrical Specifications

Parameter	Symbol	Specification	Conditions
Center Frequency		1885 MHz	
Tuning Range	Fc	1650 to 2120 MHz	
Tuning Resolution		5 MHz typical	
Insertion Loss	IL	7.4dB maximum	At center frequency
Return Loss		11.56dB minimum	Within -3dB bandwidth
-3dB Bandwidth		170.67 MHz minimum	
-20dB Bandwidth		448 MHz minimum	
Group Delay		6.57ns maximum	Within -3dB bandwidth
Tuning Speed		20µs	See Note 1
Stop Band Rejection		≥14dB, 1696.5 MHz to 2073.5 MHz ≥28dB, 1508 MHz to 2262 MHz ≥25dB, 1319.5 MHz to 2450.5 MHz	See Note 2
IIP3		20.96dBm typical	Passband 2-Tone Test See Note 3
Passband RF Power		20dBm	
Stopband RF Power		20dBm	
Supply Voltage		5V	USB

Temperature

Parameter	Symbol	Min.	Typ.	Max.	Units	Conditions
Operating Temperature	OTR	-40		+60	°C	
Storage Temperature	STR	-40		+60	°C	

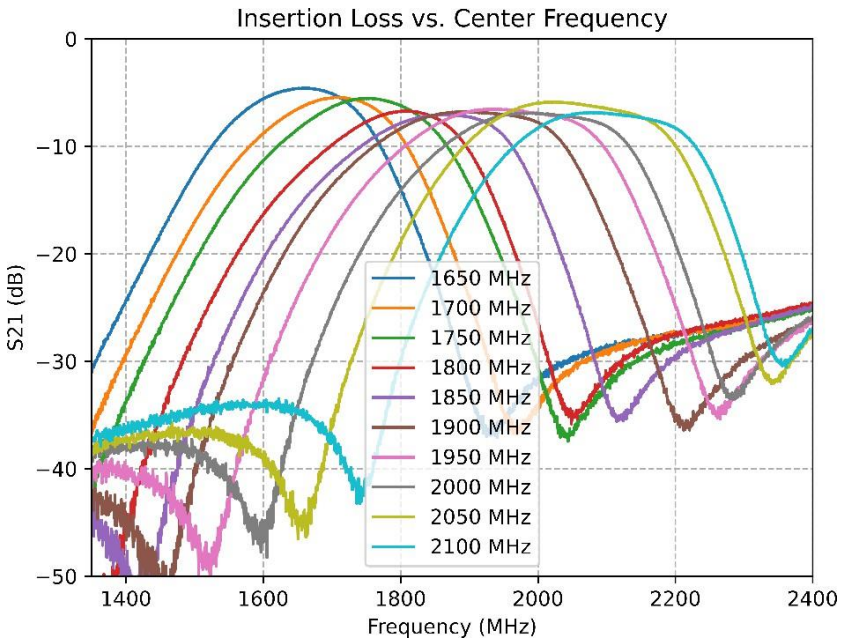
Hardware Interface

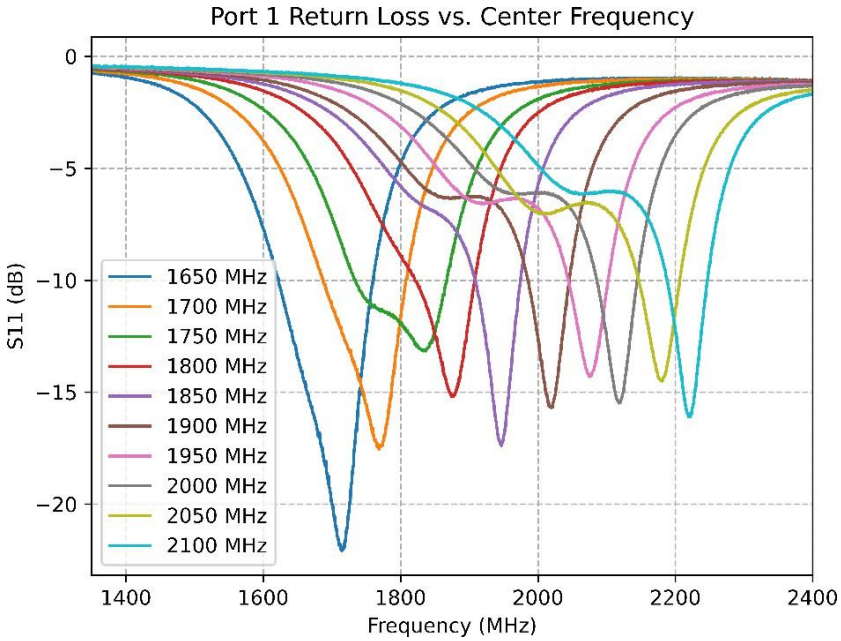
Name	Type	Hardware	Manufacturer	Manufacturer PN#
RF1	RF Input/Output	SMA Female	Amphenol RF	132146
RF2	RF Input/Output	SMA Female	Amphenol RF	132146
Power/Control	USB	USB Mini-B	Amphenol ICC	MUSB15104

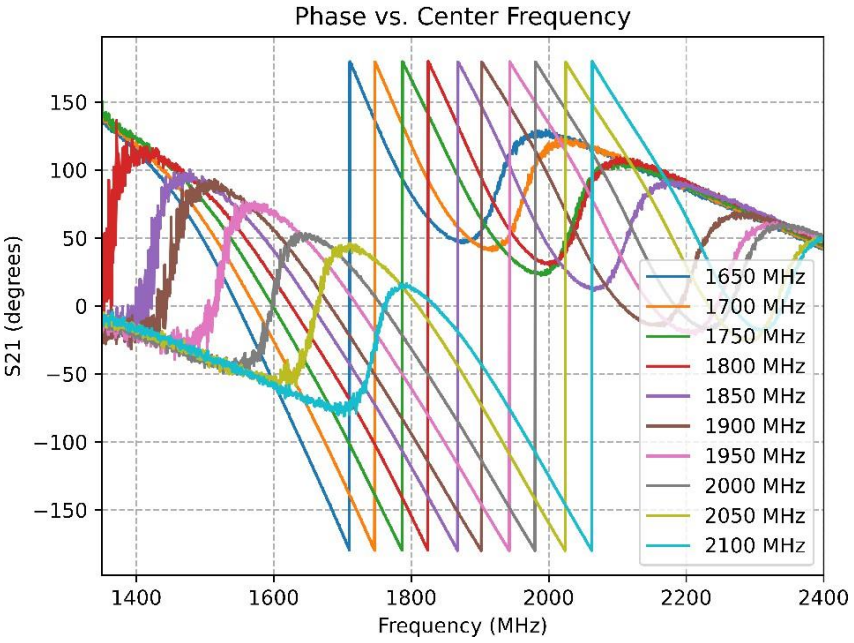
Notes

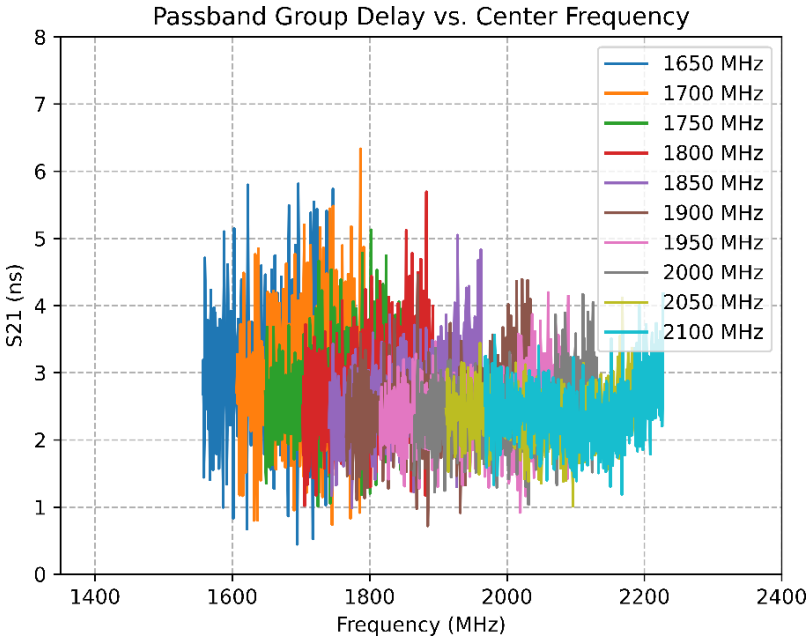
Note 1	Tuning speed is approximated for this demo unit. Actual tuning speed of the filter will depend on voltage driver and control interface latency.
Note 2	Reduction in stop band rejection from 20% to 30% is due to reentrant effects.
Note 3	IIP3 is determined using the fundamental tone in the passband and the highest 3rd order product produced. Tone spacing of 0.5 MHz was used.

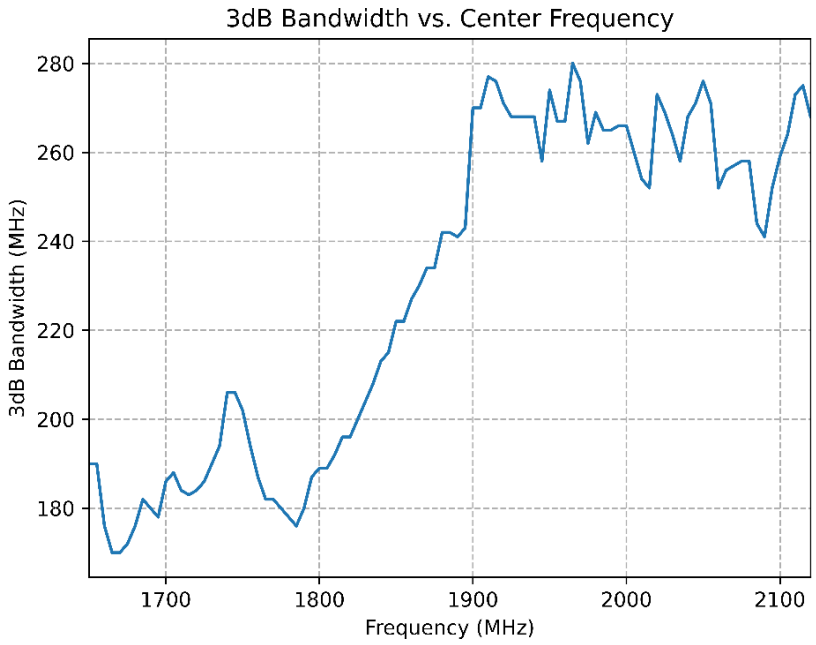
Simulation plots





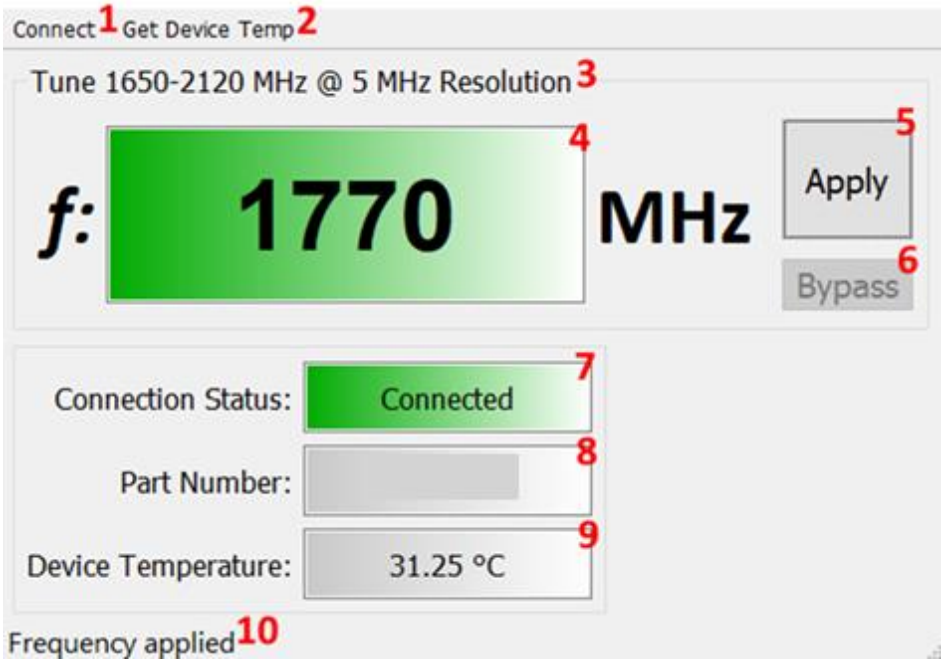

Phase vs. Center Frequency
S21 (degrees)
150
100
50
0
−50
−100
−150
1400
1600
1800
2000
2200
2400
Frequency (MHz)
1650 MHz
1700 MHz
1750 MHz
1800 MHz
1850 MHz
1900 MHz
1950 MHz
2000 MHz
2050 MHz
2100 MHz


Passband Group Delay vs. Center Frequency
S21 (ns)
8
7
6
5
4
3
2
1
0
1400
1600
1800
2000
2200
2400
Frequency (MHz)
1650 MHz
1700 MHz
1750 MHz
1800 MHz
1850 MHz
1900 MHz
1950 MHz
2000 MHz
2050 MHz
2100 MHz



Filter Control Software

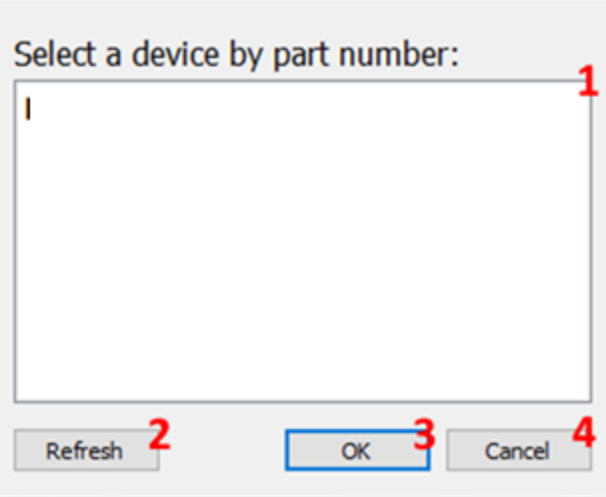
The Tunable Filter unit is provided with control software for ease of testing. To run, connect the filter and the provided USB thumb drive to the same Windows machine. Launch *TunableFilter.exe*. The user interface is detailed below:



Index	Name	Function
1	Connect Button	Opens the connection browser (see Figure 8, Table 5)
2	Get Temperature Button	Reads device temperature and updates respective field
3	Frequency Tuning Range(s)	Tuning range and resolution of filter. [1]
4	Frequency Input Field	Field to type desired frequency setpoint
5	Apply Frequency Button	Applies frequency typed in Frequency Input Field. [2]
6	Bypass State Enable	Applies Bypass (all-pass) state to filter, if applicable. [3]
7	Connection Status	Shows status of connection to Tunable Filter
8	Connected Device PN	Shows Part Number of connected Tunable Filter
9	Connected Device Temperature	Shows last read Device Temperature. [4]
10	Status Bar	Temporarily shows relevant messages and errors

Notes

Note 1	Frequencies between and including the listed bounds at the provided resolution interval are valid. For example, 1650, 1655, 1660, etc. as shown for the example device. Values within the bounds but outside of provided resolution (e.g. 1653) will be automatically rounded. Note that some devices have multiple ranges of valid tune states. Values between listed ranges are invalid.
Note 2	Pressing ENTER also applies the value in the Frequency Input Field.
Note 3	Not all devices have a bypass state. The button is unavailable in this case.
Note 4	Device temperature is read on initial connect but will only update when Get Device Temp is pressed.



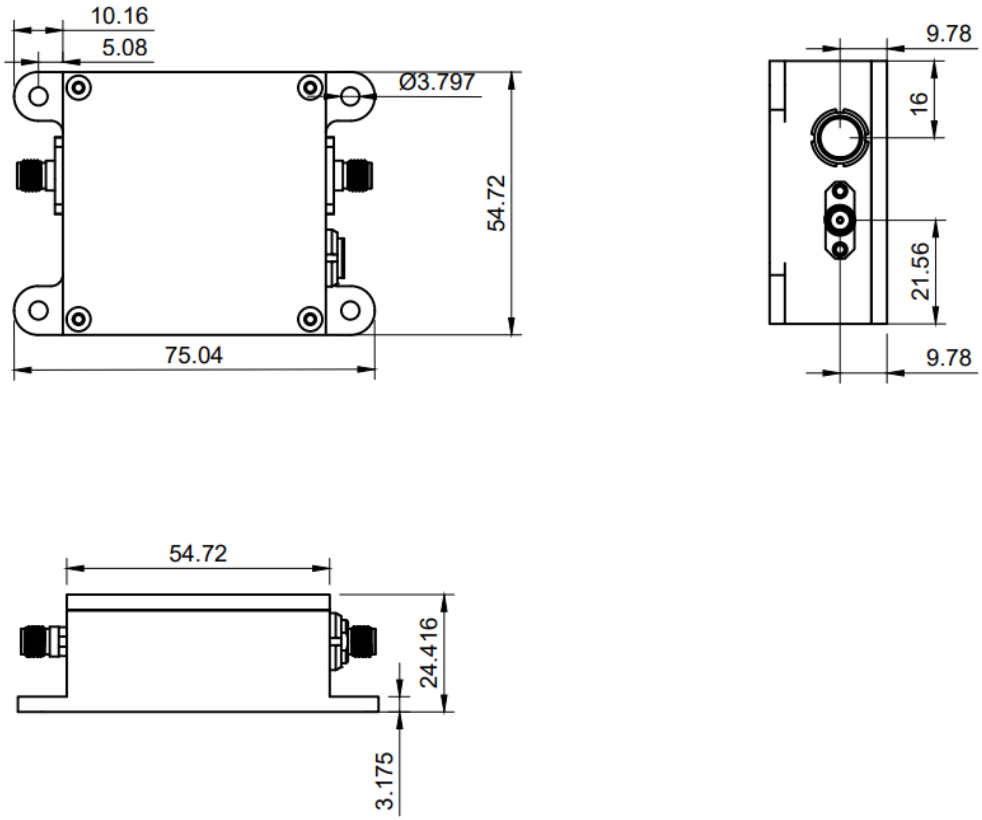
Index	Name	Function
1	Discovered Device List	Shows a list of all discovered Tunable Filters.

2	Refresh List Button	Re-searches for available Tunable Filters and updates list.
3	OK Button	Connects to selected part number. [1]
4	Cancel Button	Cancels connection attempt and closes browser. [2]

Notes

Note 1	Desired Part number must be highlighted in the list when pressed. Double-clicking desired serial number also initiates connection.
Note 2	Equivalent to closing window with X button.

Outline Drawing



All units in mm

Revision History

Date	Rev	Author	Details of Revision
07-22-25	A	AR	Added outline drawing
04-15-25	0	AR	Initial Version