TF10399 Tunable Notch Filter

Features

High Stop-Band Rejection

Absorptive Design

Can be Cascaded for Multiple Notches

On-device Temperature Measurement

Compact Form-factor

Control and Power over USB 2.0

Applications

Jamming Mitigation

Communications Receivers

ESM Receiver Protection

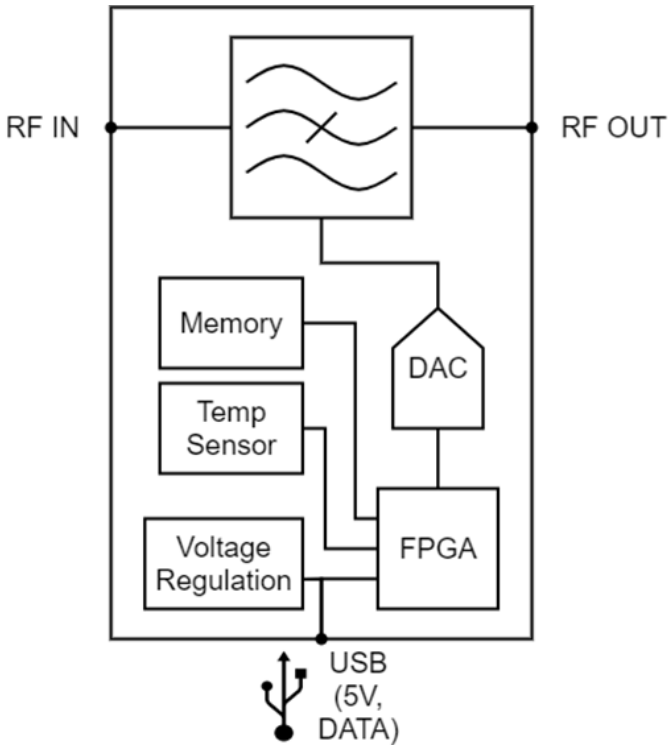
TR Modules

Electronic Warfare

General Description

TF10399 is a unit for a high-rejection, tunable, absorptive notch filter that is designed and packaged to make evaluation and testing straightforward. The unit can be controlled through the provided graphical user interface or python API.

Functional Block Diagram



Electrical Specifications

Parameter	Symbol	Specification	Conditions
Tuning Range	Fc	1200 to 1900 MHz	
Tuning Resolution		1 MHz typical	
Rejection		29dB min, 55dB typical, 93 dB max	Notch Performance
-3dB Bandwidth		177 MHz min, 221 MHz max	Notch Performance
-20dB Bandwidth		32 MHz min, 40 MHz max	Notch Performance
Passband Frequency		693 to 4220 MHz	See Note 1
Insertion Loss	IL	2.1dB maximum	See Note 2
Return Loss		16dB minimum	See Note 3
Group Delay		2.77ns maximum	100 MHz spacing from notch center frequency
Tuning Speed		25µs	1100MHz to 1900MHz Tuning Time (See Note 4)
IIP3		34.32dBm typical	Passband 2-Tone Test (See Note 5)
Passband RF Power		+30dBm maximum	
Notch RF Power		-15dBm maximum	
Supply Voltage		5V	USB
Minimum Signal to Notch Spacing		50 MHz	

Temperature

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

Hardware Interface

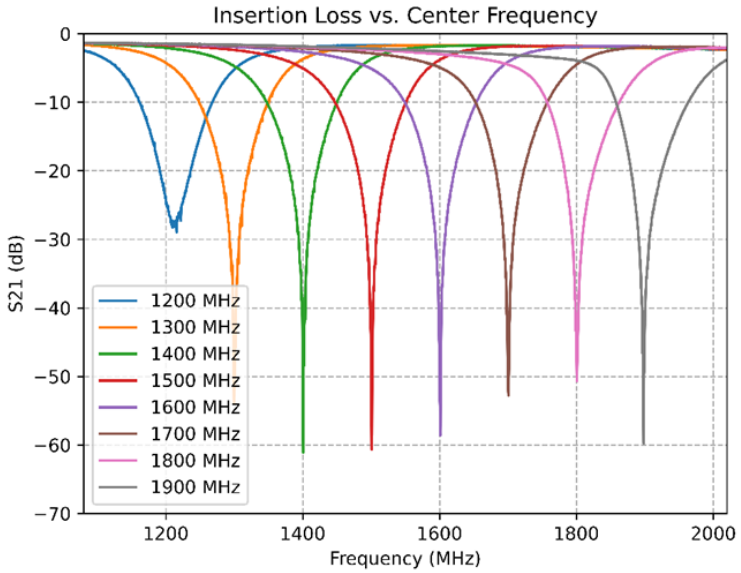
Name	Type	Hardware	Manufacturer	Manufacturer PN#
RF1	RF Input/Output	SMA Female	Amphenol RF	132146
RF2	RF Input/Output	SMA Female	Amphenol RF	132146
Power/Control	USB	USB Mini-B	Amphenol ICC	MUSB15104

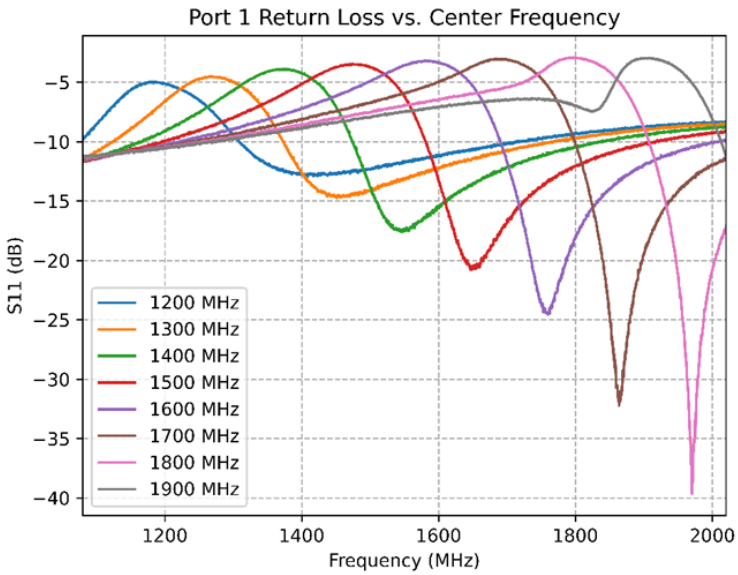
Notes

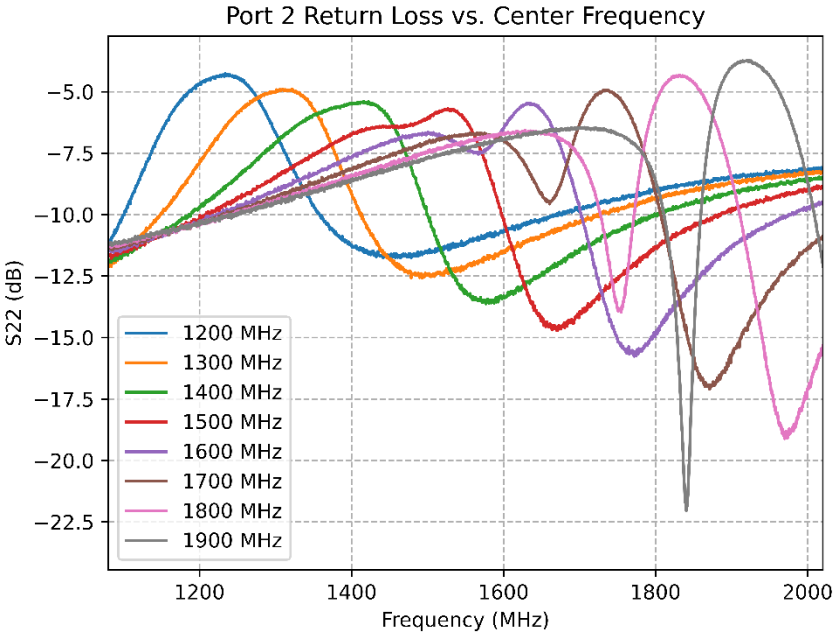
Note 1	Passband is defined as the frequency range between the 3 dB insertion loss points outside of the notch filter tuning range.

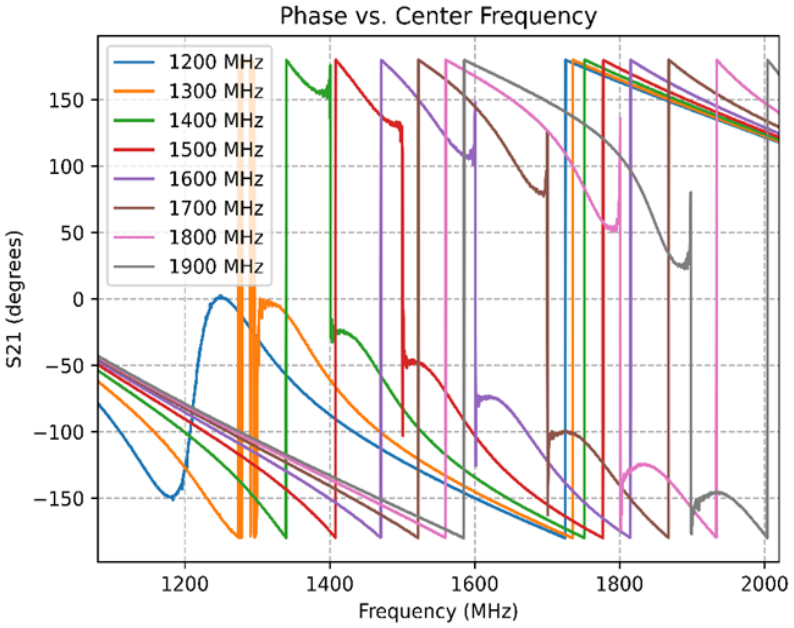
Note 2	Filter insertion loss is defined as the maximum insertion loss within the passband of the notch filter tuning range.
Note 3	Maximum return loss in the passband frequency range outside of the notch.
Note 4	Tuning speed is approximated for this demo unit. Actual tuning speed of the filter will depend on voltage driver and control interface latency.
Note 5	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.

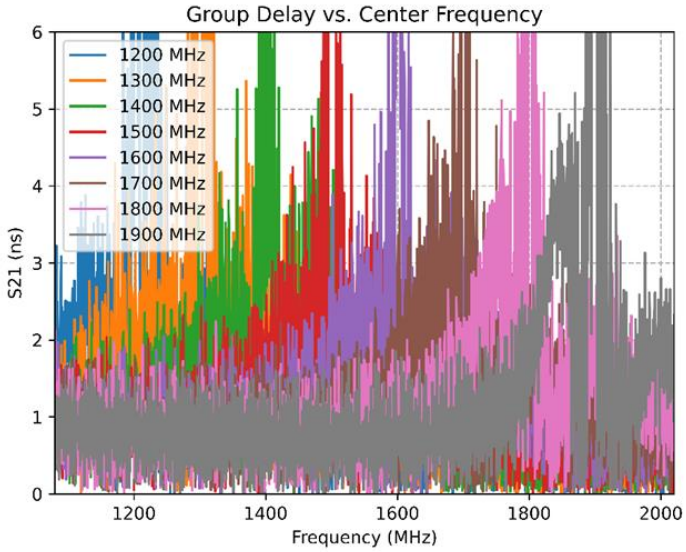
Simulation plots

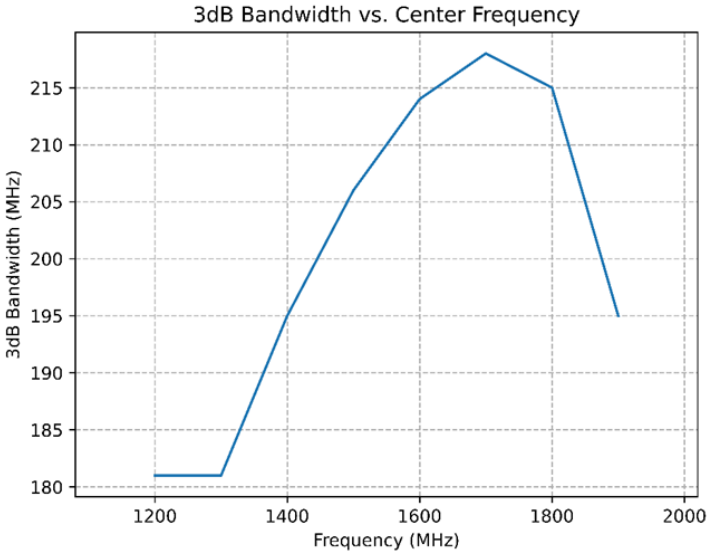




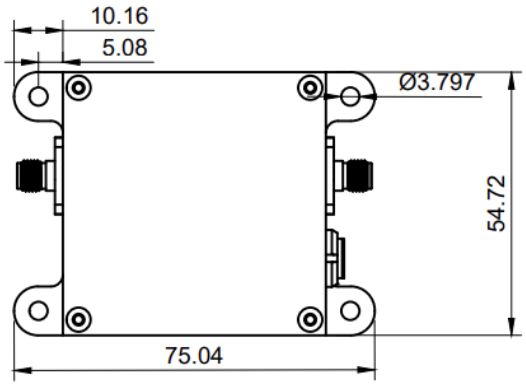

Port 2 Return Loss vs. Center Frequency
S22 (dB)
−5.0
−7.5
−10.0
−12.5
−15.0
−17.5
−20.0
−22.5
1200 MHz
1300 MHz
1400 MHz
1500 MHz
1600 MHz
1700 MHz
1800 MHz
1900 MHz
1200
1400
1600
1800
2000
Frequency (MHz)

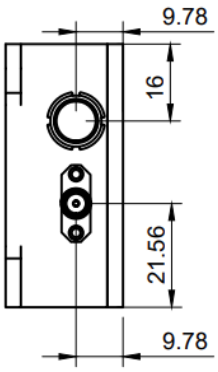

Phase vs. Center Frequency
S21 (degrees)
150
100
50
0
−50
−100
−150
1200 MHz
1300 MHz
1400 MHz
1500 MHz
1600 MHz
1700 MHz
1800 MHz
1900 MHz
1200
1400
1600
1800
2000
Frequency (MHz)

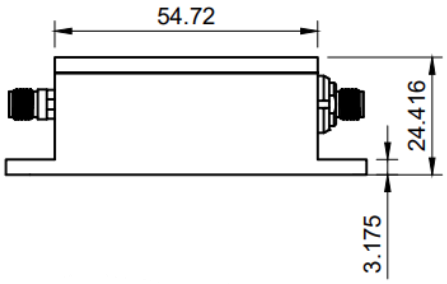

Group Delay vs. Center Frequency
1200 MHz
1300 MHz
1400 MHz
1500 MHz
1600 MHz
1700 MHz
1800 MHz
1900 MHz
S21 (ns)
Frequency (MHz)
0
1
2
3
4
5
6
1200
1400
1600
1800
2000


3dB Bandwidth vs. Center Frequency
3dB Bandwidth (MHz)
Frequency (MHz)
180
185
190
195
200
205
210
215
1200
1400
1600
1800
2000

Outline Drawing







All units in mm

Revision History

Date	Rev	Author	Details of Revision
07-22-25	A	AR	Added outline drawing
04-16-25	0	AR	Initial Version