POLE/ZERO INTEGRATED MICROWAVE FILTER SERIES

IMF™ Tunable Bandpass and Notch Filters

Typical Applications

- Designed for applications where extremely small size, ultra-fast tuning speeds, and high performance are required, such as:
  - Military Radios
  - Military Radar
  - Electronic Warfare (EW)
  - SATCOM—On-The-Move (SOTM)
  - RF Front Ends
  - Commercial Communications

Description

Pole/Zero's new IMF™ Series of digitally tunable Bandpass and Notch Filters are available in multiple frequency bands across the 1.5 GHz to 24 GHz frequency range.

- Performance capabilities include: Phase Noise: -145 dBc/Hz @ 10 kHz offset; Pin: +30dBm (10%BW); IIP3: +35 dBm min. +40 dBm typ.; Insertion Loss: 3.4 dB avg. for 10% BW; Selectivity: 20 dBc @ fc ± 10% (4%BW); +5V @ 20 µA Typical DC Power or +3.3V @ 2 mA typ.
- Tuning Speed (0 dBm input): 250 ns typ. < 6 GHz, and 25 µs typ. > 6 GHz
- GPIO Tuning Control > 6 GHz (0V OFF, +5V ON, 4 bit control); GPIO or SPI (0V OFF, +3.3V ON, 8 bit control) < 6 GHz.
- Pole/Zero's proprietary designs produce filter performance that sets our products apart from the competition.
- Package sizes range: 4 x 4 mm to12 x 12 mm QFN Packages.
- Operating Temp.: -40C to +85C.
- IMF™ demo loaner, mounted on an evaluation board, is available at no cost. Please contact Pole/Zero for more information: support@polezero.com

Integrated Microwave Filter (IMF™)
1.5 GHz to 24 GHz Bandpass and Notch Filters
Preliminary

Bandpass Filter Features

Frequency Coverage	1.5 GHz to 24 GHz (Multiple Bands)
Input/Output Impedance:	50 Ω
Inband Input/Output VSWR:	1.4:1 typ., 2:1 max
Insertion Loss: (BW% Dependent)	3.4 dB typ. for 10% BW
3 dB Bandwidth:	4% to 10%
Ultimate Attenuation:	40 dB typ. @ 2 x f_o
Phase Noise:	-150 dBc/Hz @ 10 kHz offset typ.
Inband RF Power Handling: (BW% Dependent)	+30 dBm for 10% BW (input)
Out of Band RF Power Handling:	+36 dBm (input)
IIP3 (input):	+35 dBm (min) / 40 dBm typ.
Tuning Control:	+3.3 V GPIO or SPI <6 GHz +5V GPIO > 6 GHz
Tuning Speed (0 dBm input):	250 ns typ. < 6 GHz, and 25 µs typ. > 6 GHz
DC Power:	+5V @ 200 µA or 3.3V @ 750 µA typ.
Operating Temperature:	-40 to +85 °C
Size:	1 to 2.5 GHz: 12 x 12 mm 2.5 to 5 GHz: 10 x 10 mm 5 to 8 GHz: 7 x 7 mm 8 to 24 GHz: 4 x 4 mm

Interface and Control for Bandpass and Notch Filters:

General Information

Depending upon the SPI or GPIO control options and the frequency range of interest, the IMF™ requires a +5 V supply or a +3.3V supply. This supply voltage should be adequately filtered as noise present on this pin will influence the RF signal purity.

Digital Interface Information

The digital tuning control interface is GPIO: 0, +5V > 6 GHz. GPIO or SPI: 0, +3.3V < 6 GHz.

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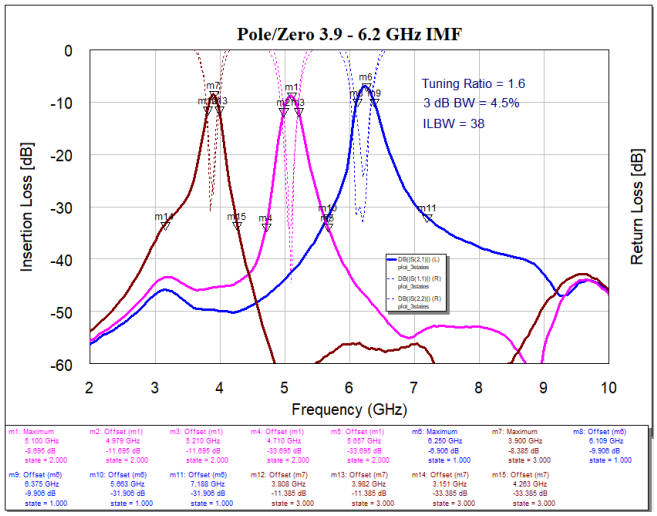
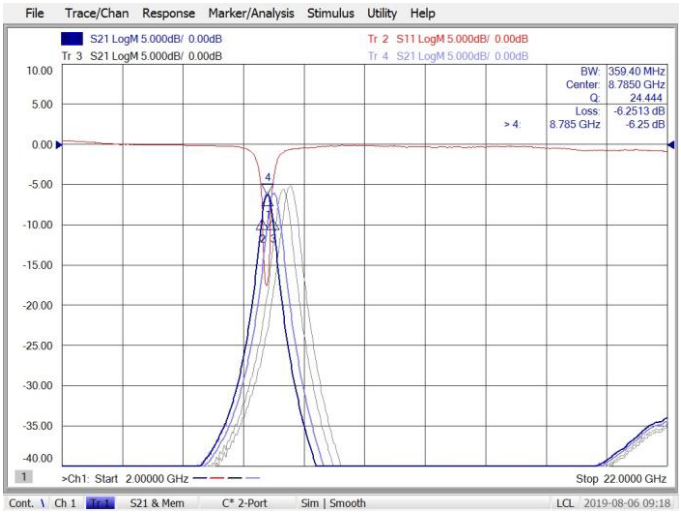
Measured Bandpass Filter Performance:

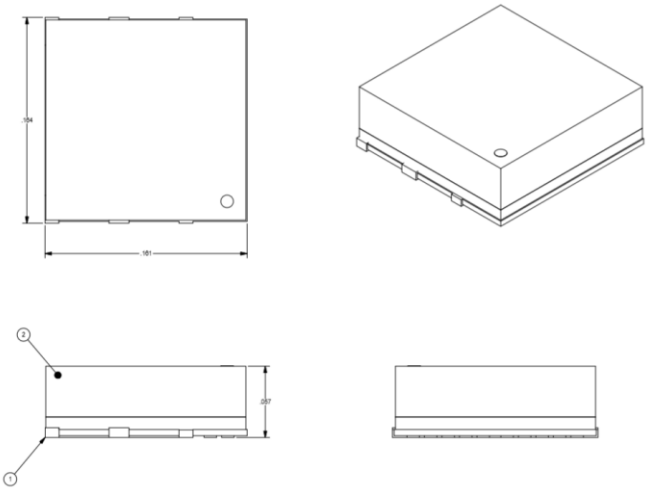


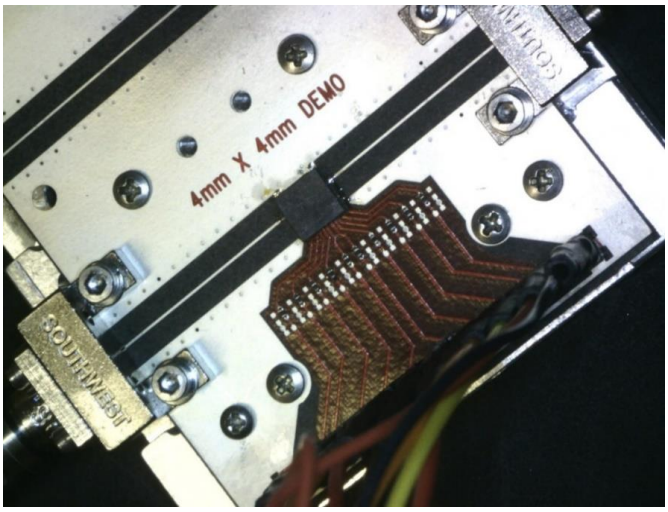
3.9 GHz to 6.2 GHz 4.5% BW Bandpass Filter



8.8 GHz to 9.4 GHz 4% BW Bandpass Filter

Mechanical Details: <u>Consult Pole/Zero for drawing files and PWB Mismatch</u>





Pinout & Ratings

Pin #	Label	Description	Maximum Ratings
	RFIN	Input RF signal	30V pk RF
	VREF	Reference voltage, 5V Typ.	10
	VCTL1-4	+5V Control Voltage (LSB)	+10
	VCTL1-8	+3.3V Control Voltage (LSB)	+4

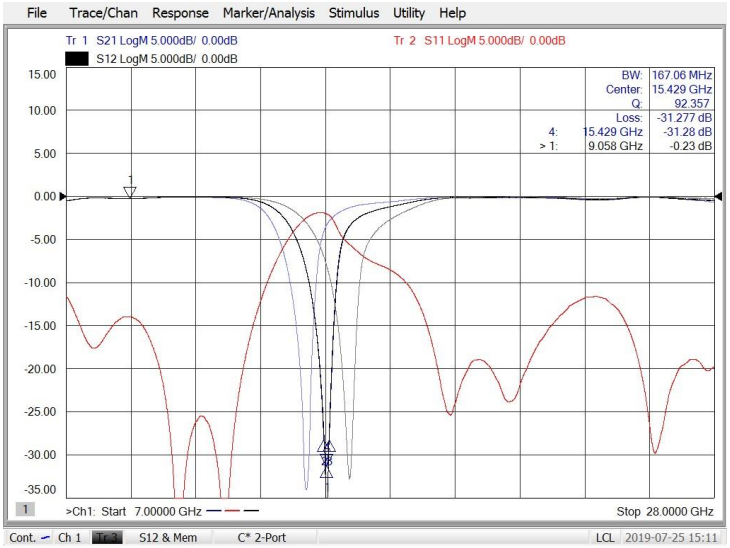
Preliminary Package Markings: TBD

Integrated Microwave Filter (IMF™)
1.5 GHz to 24 GHz Bandpass and Notch Filters
Preliminary

Notch Filter Features

Frequency Coverage (Multiple Bands):	1.5 GHz to 24 GHz
Input/Output Impedance:	50 Ω
Inband Input/Output VSWR:	1.4:1 typ, 2:1 max
Insertion Loss: (BW dependent)	0.75 dB typ.
3 dB Bandwidth:	14%
Pass Band RF Power Handling:	24 dBm
Notch RF Power Handling:	10dBm
Pass Band IIP3 (input):	+40 dBm typ.
Tuning Control:	+3.3 V GPIO or SPI < 6 GHz +5V GPIO > 6 GHz
Tuning Speed (0 dBm input):	250 ns typ. < 6 GHz, and 25 µs typ. > 6 GHz
DC Power:	+5V @ 200 µA or 3.3V @ 2mA typ.
Operating Temperature:	-40 to +85 °C
Size:	1 to 2.5 GHz: 12 x 12 mm 2.5 to 5 GHz: 10 x 10 mm 5 to 8 GHz: 7 x 7 mm 8 to 24 GHz: 4 x 4 mm

Measured Notch Filter Performance:



14.6 GHz to 16.6 GHz Notch Filter