

Tunable Bandpass Filters

MICRO-POLE SERIES

Specifications:

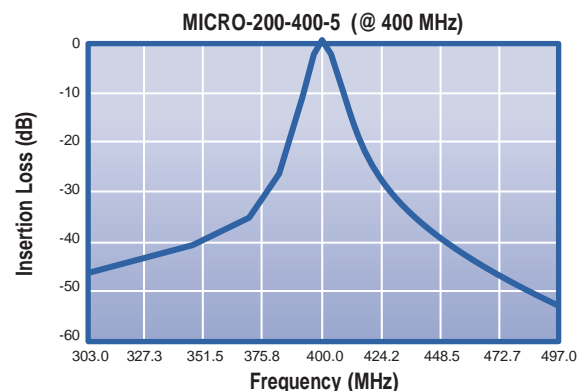
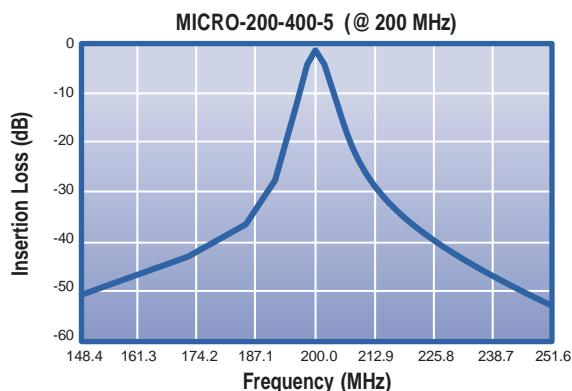
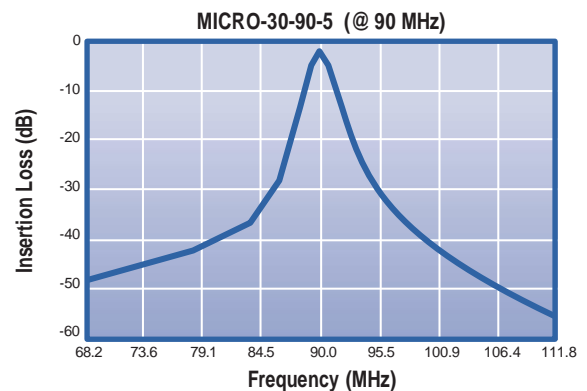
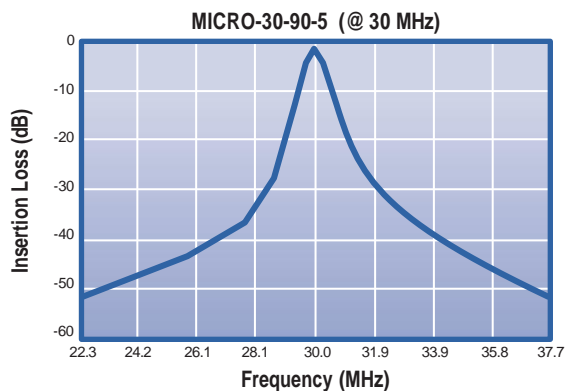
Frequency Coverage (8 bands):	10 MHz to 1 GHz
Input/Output Impedance:	50Ω
Inband RF Power Handling:	1 milliwatt (input)
Inband Third Order Intercept Point:	+10 dBm (input)
Inband Second Order Intercept Point:	+70 dBm (input)
Tuning Control:	8 bit parallel or 3 wire serial
Tuning Speed:	450 μS typical, 1000 uS max.
DC Power:	+3 to +5 VDC (1.7 to 2.6 mA)
Shape Factor (30 dB/ 3 dB):	6 typical
Operating Temperature Range:	-40° to +85°C
Size:	0.5 × 1.0 × 1.5 (in.) / 12.7 × 25.4 × 38.1 (mm.)
Weight:	0.5 oz. / 14.2 g.



The **MICRO-POLE** Series of tunable filters was developed to address applications needing a small, surface mount package. This tunable filter is varactor-based in order to minimize size and power consumption. The varactor design also supports requirements up to 2 Ω (CUSTOM DESIGNS HAVE BEEN COMPLETED). /UR STANDARD DIGITAL interface is included for ease of integration into your design and can support either serial or parallel requirements. The product line includes several standard designs in various bands to support almost any application. Approximate performance is summarized in the **MICRO-POLE SERIES SELECTION GUIDE, TABLE 1, ON page 10**. Evaluation card available. See page 10 for board outline drawing.

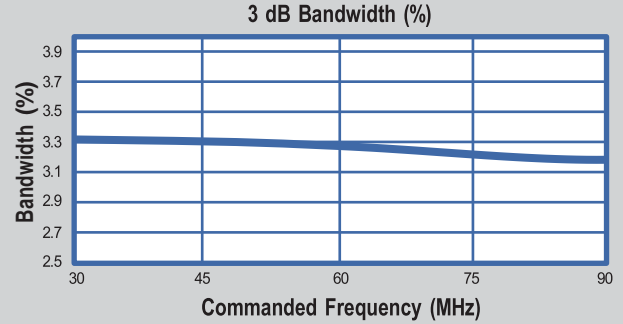
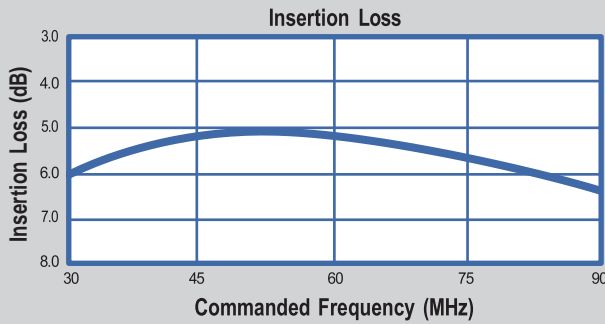
Performance:

The following plots illustrate approximate performance (not representative of all frequency ranges):

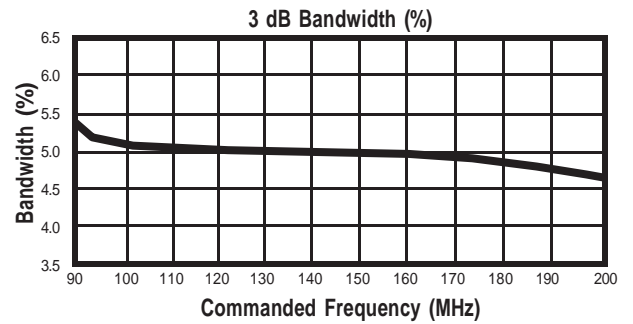
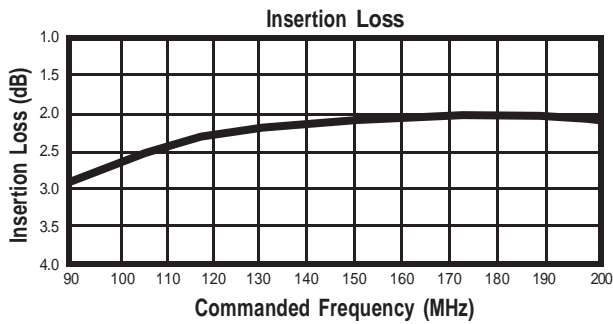


The following plots illustrate approximate insertion loss and bandwidth trends across a given frequency band, and the differences between various bands:

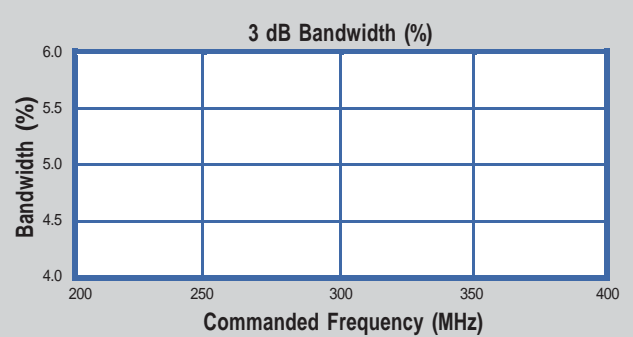
MICRO-30-90-5



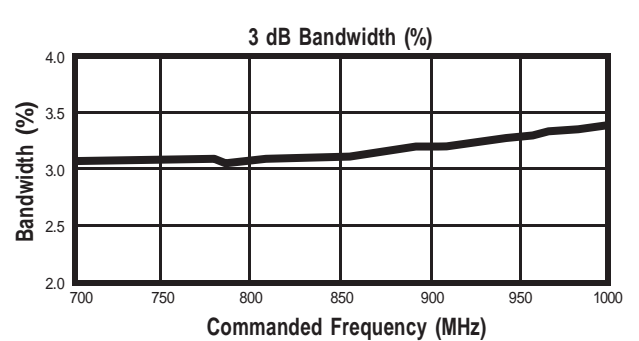
MICRO-90-200-3



MICRO-200-400-3



MICRO-700-1000-5



Tunable Bandpass Filters

MICRO-POLE SERIES Selection Guide

Table 1

Frequency Range	Suffix	Insertion Loss	% Bandwidth (3 dB)	Power Handling	Shape Factor (30 dB / 3 dB)		
					Overall	Low Side	High Side
10 to 30 MHz	-1						
	-2	1.8/2.7	8.0/8.7		6.2/6.8	6.9/8.0	5.6/5.9
	-3						
	-4						
	-5	3.5/7.0	3.2/3.5		5.8/5.9	6.1/6.3	5.6/5.7
30 to 90 MHz	-1	0.8/1.5	20.1/21.6		6.1/7.0	7.5/9.4	4.7/5.3
	-2	2.0/3.0	8.1/8.7		6.0/6.2	6.7/7.2	5.2/5.7
	-3	3.0/4.0	5.5/6.0		5.9/6.3	6.4/6.9	5.4/5.8
	-4	4.0/5.2	4.2/4.5		5.8/6.2	6.2/6.6	5.4/5.8
	-5	5.4/7.0	3.3/3.5		6.0/6.6	6.3/6.6	5.8/6.5
90 to 200 MHz	-1	0.8/1.5	20.1/21.1		5.9/6.3	6.7/7.7	5.0/5.1
	-2						
	-3	2.5/4.1	5.5/6.0		5.9/6.3	7.0/7.9	4.9/5.3
	-4						
	-5	4.7/7.0	3.3/3.5		6.0/6.9	7.2/9.1	4.9/5.4
200 to 400 MHz	-1	0.8/1.5	20.1/22.0		5.8/5.9	7.0/7.6	4.5/4.8
	-2						
	-3	2.5/4.1	5.5/6.0	0 dBm	5.8/6.6	6.5/7.2	5.2/6.1
	-4	4.1/5.1	4.0/4.5		6.1/7.4	6.6/7.6	5.6/7.3
	-5	4.7/7.0	3.3/3.5		5.9/6.7	6.3/7.2	5.6/6.3
225 to 400 MHz	-1						
	-2	1.8/2.3	8.0/8.4				
	-3	2.5/3.8	5.0/6.0				
	-4	4.1/5.1	4.0/4.5		5.9/7.0	6.3/7.4	5.5/6.8
	-5	4.7/7.0	3.0/3.5		5.9/6.7	6.3/7.2	5.6/6.3
400 to 700 MHz	-1						
	-2	2.1/2.7	8.0/9.0		6.5/6.9	8.5/9.0	4.4/4.8
	-3	3.1/4.1	5.4/6.0		5.9/6.9	7.0/8.3	4.8/5.5
	-4						
	-5	4.7/7.0	3.3/3.5				
700 to 1000 MHz	-1						
	-2	2.0/3.3	8.0/9.2		6.1/6.4	7.4/8.0	4.8/5.2
	-3						
	-4						
	-5	4.7/7.0	3.0/3.5		6.4/7.5	6.9/8.4	5.9/6.9

THIS SELECTION GUIDE ILLUSTRATES APPROXIMATE PERFORMANCE FOR THE MICRO-POLE Series. Table values are shown as average/maximum.

MICRO-POLE SERIES PRODUCT NUMBER SELECTION GUIDE:

Series	Frequency (MHz)	Insertion Loss	Options
MICRO	10-30	1	C
	30-90	2	
	90-200	3	
	200-400	4	
	225-400	5	
	400-700		
	700-1000		

Options: C. Custom Frequency Bands (Specify START and STOP frequencies in MHz.)

Note(s): Options may be limited to particular frequency bands and/or performance levels. Consult the factory for your application.

Interface & Control Options:

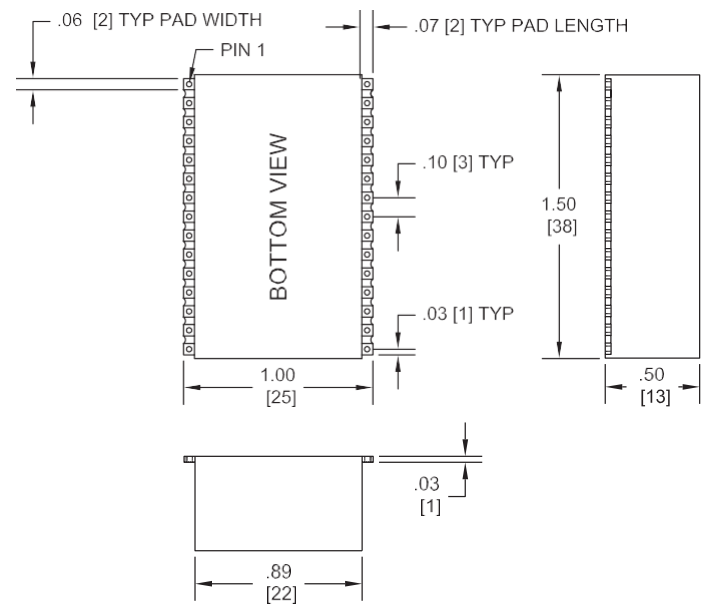
Frequency Tuning Address

MICRO-POLE Series filters utilize an 8 bit scheme for tunewords to digitally control tuning of the center frequency. For further information on how to calculate tune words, please see the Tuneword Calculation section on page 17.

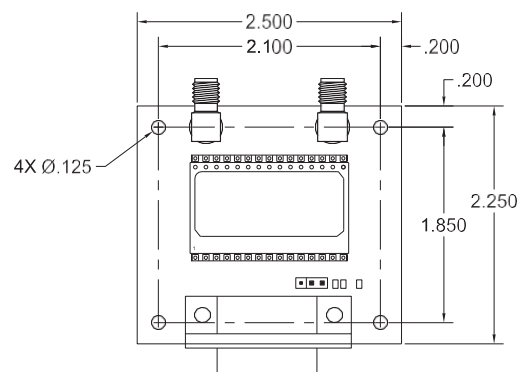
Interface Options

The MICRO-POLE is supplied standard with two different user selectable interfaces. The available interface choices are either an 8 bit parallel data input, or a serial 3-wire interface data input. Interface selection is made at power-up and is controlled by the state of the PAR/SER# input (pin 12).

Mechanical Outline:



Evaluation Board Outline:



Note(s): Unit is not sealed. Hand clean only. Each pad has a .028 diameter plated thru hole located approximately in the center of the pad.

DC Control Interface Characteristics:

Symbol	Parameter	Condition	Minimum	Maximum	Units
V _{IL}	Input Low Voltage	Control Signals Except A0-A7	0.0	0.2 V _{cc}	V
V _{IH}	Input High Voltage	Control Signals Except A0-A7	0.7 V _{cc}	V _{cc}	V
V _{IL1}	Input Low Voltage	A0-A7	0.0	0.15 V _{cc}	V
V _{IH1}	Input High Voltage	A0-A7	0.7 V _{cc}	V _{cc}	V

Switching Characteristics:

(V_{cc} = +5 V, ± 10%; 4= -40 TO +85°C)

Symbol	Parameter	Minimum	Maximum	Units
t _S	Setup Time, A0-A7 to LOAD (parallel)	100		nS
t _H	Hold Time, A0-A7 from LOAD (parallel)	25		µS
t _{LL}	LOAD Low Time (parallel)	25		µS
t _W	LOAD Pulse Width (parallel)	100		nS
t _{SS}	Setup Time, A0/SERDAT to SCLK (serial)	100		nS
t _{LL}	Hold Time, A0/SERDAT from SCLK (serial)	0		nS
t _{LS}	Setup Time, LOAD to SCLK (serial)	100		nS
t _{LH}	Hold Time, LOAD from SCLK (serial)	100		nS
t _{CH}	Clock High Time (serial)	100		nS
t _{CP}	Clock Period (serial)	200		nS
t _{DW}	Load Dwell Time (from LOAD falling edge to next LOAD falling edge)	1000		µS
t _{ACC}	Access Time from LOAD to f _o		1000	µS

Serial Interface:

Tying the PAR/SER input low causes the **MICRO-POLE** to receive data in the serial 3 wire format described below. A timing diagram is shown in the figure below.

Three lines are used in the serial interface. These are: SCLK, LOAD and A0/SERDAT. Communication is initiated by the rising edge of LOAD. The 8 bit tuneword is clocked into the filter MSB first on the A0 line by the rising edge of SCLK. Once the tuneword has been clocked in, the falling edge of Load initiates the internal tuning sequence. NOTE: When using the **MICRO-POLE** in the serial mode, the extra data inputs (A1-A7) should be tied either high or low.

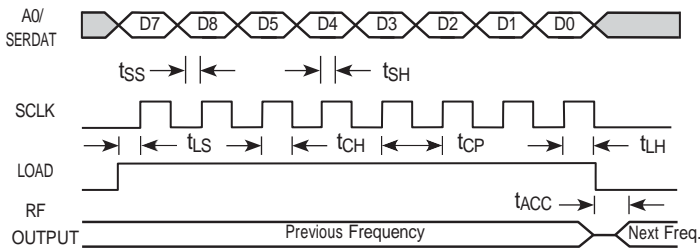


Figure 2

Parallel Interface:

Tying the PAR/SER input high causes the **MICRO-POLE** to receive data in an 8 bit parallel format. The 8 bit tuneword is presented on A0 through A7, and is latched into the filter by the falling edge of the LOAD pulse. Once the tuneword is latched, the internal tuning sequence begins. A timing diagram is shown in the figure below. NOTE: When using the **MICRO-POLE** in the parallel mode, the SCLK input should be tied high.

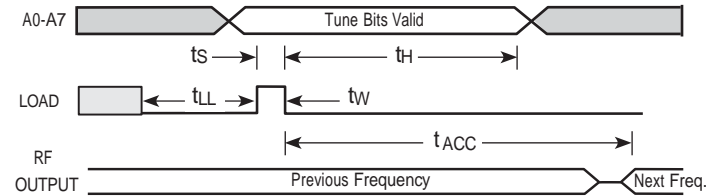


Figure 3

Other Features:

The **MICRO-POLE** is provided with the capability of shutting down the internal DC to DC converter in the event that the user wishes to decrease power consumption. The converter is controlled by the Switcher Enable (SWENA) line. Tying this line to ground inhibits the operation of the converter, and reduces the operating current of the filter. The filter will not operate in this mode, but the control logic will remain active. Returning the SWENA line to a high (or open) logic level causes the converter to start, and the filter to tune to its last commanded frequency. Retuning is not required. This input has an internal pull-up resistor and should be tied high, or left unconnected if the power-down feature is not used.

Pinout & Ratings:

PIN #	Reference Designator	Description	Maximum Ratings	
1	.S	ROUND	V _{cc} + 0.3 VDC	
2	A7	Tune Bit 7 (MSB)		
3	A6	Tune Bit 6		
4	A5	Tune Bit 5		
5	A4	Tune Bit 4		
6	A3	Tune Bit 3		
7	A2	Tune Bit 2		
8	A1	Tune Bit 1		
9	A0	Tune Bit 0 (LSB)		
10	STB	Strobe		
11	N/C	Do Not Connect	+22 VDC	
12	N/C	Do Not Connect		
13	N/C	Do Not Connect		
14	V _{cc}	+5 VDC		
15	.S	ROUND		
16	.S	ROUND		
17	RFOUT	RF Out		0 dBm
18	.S	ROUND		
19-25	N/C	Do Not Connect		
26	V _{bb}	High Bias (+15 VDC)		
27	N/C	Do Not Connect	0 dBm	
28	.S	ROUND		
29	RFIN	RF In		
30	.S	ROUND		