MN-X-X-X-T01, 30 – 520 MHz[1], 1 Watt[2], Tunable Bandpass Filter, MINI-POLE®

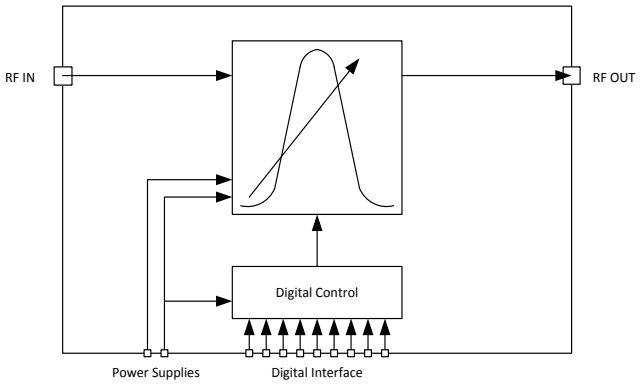
Typical Applications

- Applications where small size, high power, and high performance are required
- Military Radios
- Military Radar
- SATCOM
- Test and Measurement Equipment
- Industrial and Medical Equipment

Features

- Up to +30 dBm CW continuous in-band power handling[2]
- Up to +37 dBm CW continuous out-of-band power handling[2]
- +40 dBm IIP3 typical[2]
- 5 µs typical tune time
- Up to 70 dB typical ultimate selectivity at (2 x f_c)[2]

Functional Diagram



Description

The MINI-POLE® is a series of digitally tunable bandpass filters with several standard designs in various tunable ranges to support a myriad of applications. The MINI-POLE® is optimized for size, RF power handling, low distortion, and exceptional selectivity. The MINI-POLE® comes in a compact 42 pin DIP package 2.250 x 1.305 x 0.501 inches (57.15 x 33.15 x 12.73 mm.)

The MINI-POLE® uses a high Q factor, pin diode switched capacitor array with a customized high voltage driver to accurately and reliably tune to pre-defined frequencies. The MINI-POLE® is primarily used in applications where adjacent radio channels may cause interference on the acquisition channel. The MINI-POLE® can be used to reduce or eliminate the effects of these interfering signals but it is flexible enough to be used in a multitude of applications.

The MINI-POLE® uses an 8-bit wide proprietary parallel or serial interface to tune to a maximum of 251 tune positions per band. The MINI-POLE® will typically tune in less than 5 µs[3]. The MINI-POLE® requires only two external power supplies, +5 V and +100 V.

All MINI-POLE® filters are fully aligned and tested by POLE/ZERO® for convenience and ease of use. The MINI-POLE® covers seven frequency ranges and custom configurations and designs are available upon request.

[1] Frequency range is in multiple filter bands.
[2] This specification depends on frequency, bandwidth and tone levels.
[3] Fo ≥ 90MHz

1.0 Ordering Information

Table 1. Ordering Options

Series	-	Frequency Range (MHz)	-	% Bandwidth (3 dB)	-	Package	-	Options
MN	-	30-90 90-200 174-400 200-400 225-400 225-520 400-700	-	3 4 5 7 10	-	T01	-	B C

Table 2. Available Options

Option Code	Description
	If no options are specified, MINI-POLE will be the standard parallel interface
B	Serial interface
C	Custom frequency bands (specify custom START and STOP frequencies in MHz, do not list –C in product number)

Note: Options may be limited to particular frequency bands and/or configurations including control interface. Consult Pole/Zero for your application.

Example product number: MN-200-400-7-T01

2.0 Block Diagram

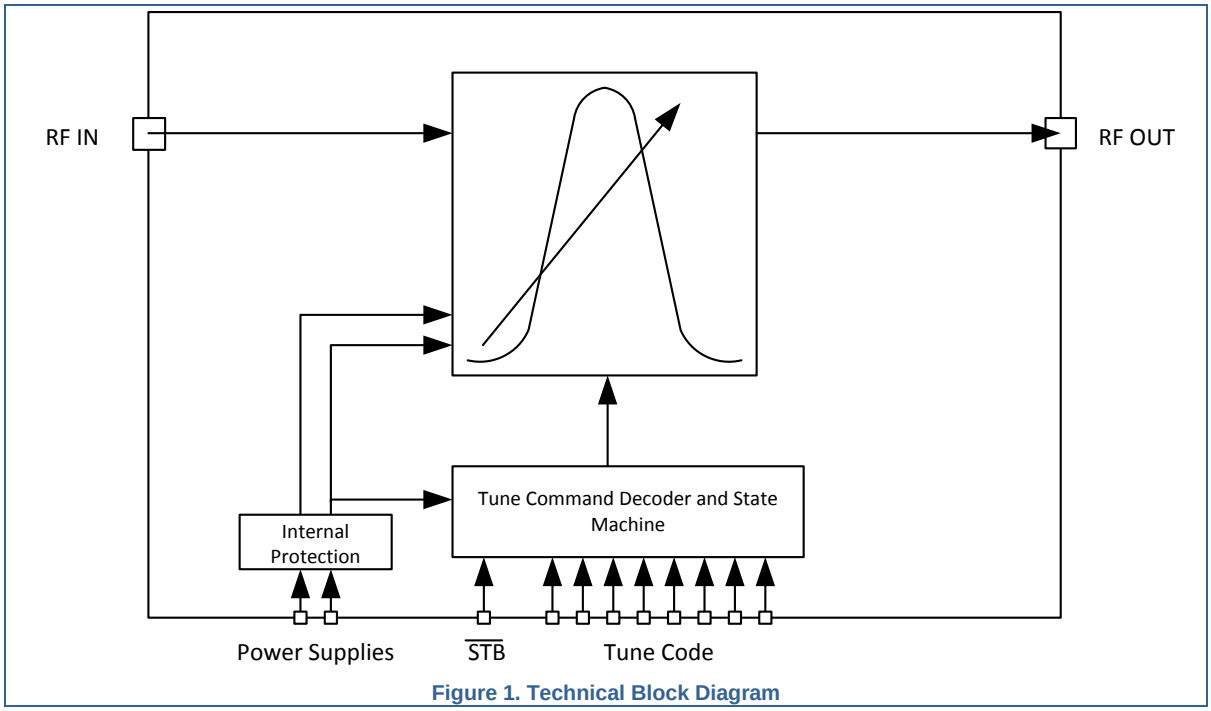


Figure 1. Technical Block Diagram

3.0 Pinout and Functional Information

3.1 Parallel Pinout

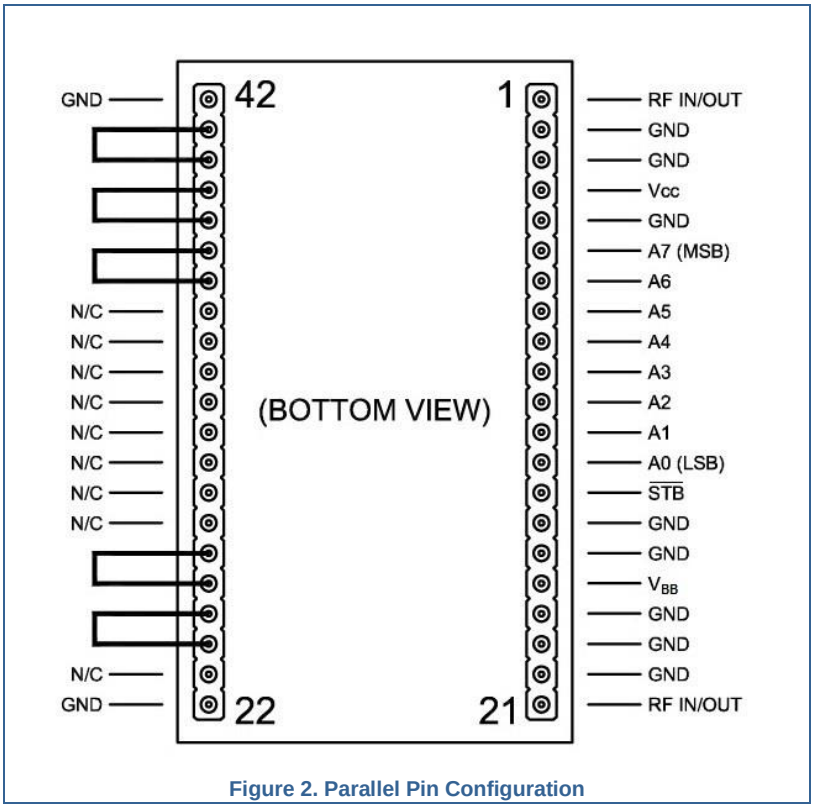


Figure 2. Parallel Pin Configuration

3.2 Parallel Pin Description

Table 3. Pin Functions and Descriptions

Pin Number	Label	Description
1, 21	RF I/O	RF Input/Output. Filter is bi-directional, input and output may be interchanged.
2, 3, 5, 15, 16, 18-20, 22, 42	GND	Digital/RF Ground
4	V_{CC}	+5 V Power Supply Input
6-13	A7-A0	Parallel address bit 7-0 Pin: 6 7 8 9 10 11 12 13 Address: A7 A6 A5 A4 A3 A2 A1 A0
14	$\overline{STB}$	Strobe Pin – Initiates tune sequence
17	V_{BB}	High Bias +100 V Supply Input
23, 28-35	N/C	Do not connect for MINI-POLE to work properly
24-27, 36-41	Enable Pins	The following groups of pins must be connected together for the MINI-POLE to work properly: Jumper Group: 1 2 3 4 5 Jumper Pins: 24<->25 26<->27 36<->37 38<->39 40<->41

3.3 Serial Pinout

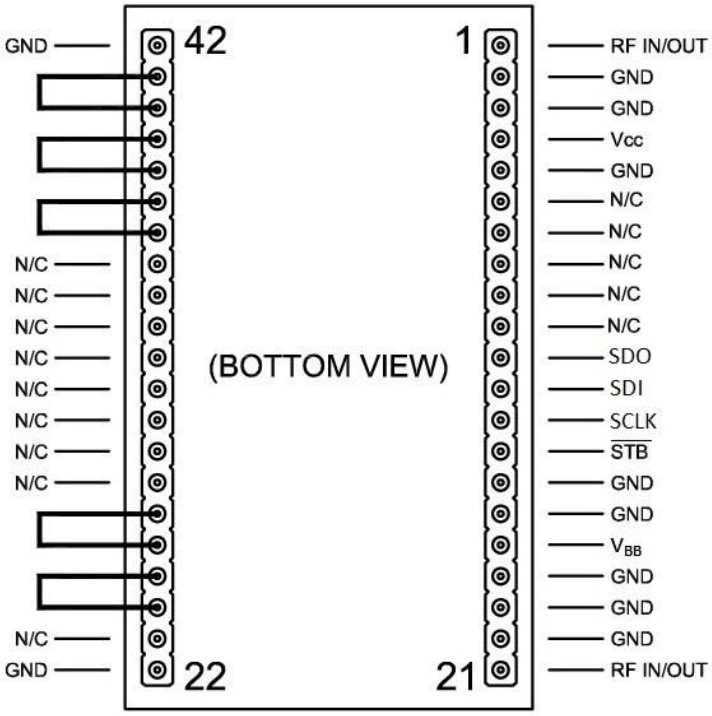


Figure 3. Serial Pin Configuration

3.4 Serial Pin Description

Table 4. Pin Functions and Descriptions

Pin Number	Label	Description
1, 21	RF I/O	RF Input/Output. Filter is bi-directional, input and output may be interchanged.
2, 3, 5, 15, 16, 18-20, 22, 42	GND	Digital/RF Ground
4	V_{CC}	+5 V Power Supply Input
6-10, 23, 28-35	N/C	Do not connect for MINI-POLE to work properly
11	SDO	Serial Data Output
12	SDI	Serial Data Input
13	SCLK	Serial Data Clock
14	$\overline{STB}$	Strobe Pin – Initiates tune sequence
17	V_{BB}	High Bias +100 V Supply Input
24-27, 36-41	Enable Pins	The following groups of pins must be connected together for the MINI-POLE to work properly:

Jumper Group	1	2	3	4	5
Jumper Pins	24<->25	26<->27	36<->37	38<->39	40<->41

4.0 Specifications

4.1 Absolute Maximum Ratings[4]

Voltages are referenced to GND (ground = 0V). Operating at room temperature, +23C (unless otherwise noted).

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CC}	Supply voltage	-	-0.5	+6.0	V
V_{BB}	High supply voltage	-	-0.5	+125	V
V_I	Input voltage on digital interface pins	Parallel Interface	-0.5	+6.0	V
		Serial Interface (-B)	-0.5	+6.0	
V_O	Output voltage	On all digital interface output pins	-0.5	V_{CC} + 0.5 V	V
P_{INBAND}	In-band RF input power level	Signal is in passband $f_0 = 30 - 700\ MHz$[5]	-	33[6]	dBm
$P_{OUTBAND}$	Out-of-band RF input power level	-	-	37[6]	dBm
T_{RATE}	Maximum tune rate (frequency hopping)	30-90	-	1.5	kHz
		90-200	-	1.8	
		174-400 200-400 225-400 225-520 400-700	-	2.0	

4.2 Handling Ratings

Symbol	Parameter	Conditions	Min	Max	Unit
T_S	Storage temperature	-	-40	+85	°C

4.3 Recommended Operating Conditions

Symbol	Parameter	Conditions	Min	Nom	Max	Unit
V_{CC}	Supply voltage	-	4.5	5.0	5.5	V
V_{BB}	High supply voltage	-	90	100	110	V
P_{IN}	Maximum RF input power for linear operation	Signal is in passband	-	-	30[6]	dBm
T_A	Ambient temperature	-	-40	-	+85	°C

4.4 Electrical Characteristics

All specifications at T_A = 23 °C, V_{cc} = +5 V, V_{BB} = +100 V, unless otherwise noted.

Symbol	Parameter	Conditions	Min	Nom	Max	Unit
I_{CC_STATIC}	V_{CC} current consumption, statically tuned	At nominal V_{CC} voltage	-	-	250	mA
I_{CC_HOP}	V_{CC} current consumption, hopping	Nominal V_{CC}, hopping at T_{RATE}	-	-	250	mA
I_{BB_STATIC}	V_{BB} current consumption, statically tuned	At nominal V_{BB} voltage	-	-	3	mA
I_{BB_HOP}	V_{BB} current consumption	Nominal V_{BB}, hopping at T_{RATE}	-	-	12	mA

[4] Maximum operating conditions before damage occurs. Filter performance is not specified under these conditions.
[5] Frequency range is in multiple filter bands.
[6] This specification depends on frequency and bandwidth.

Symbol	Parameter	Conditions	Min	Nom	Max	Unit
V_{IH}	Digital high level input voltage	On all digital interface input pins	3.5	-	-	V
V_{IL}	Digital low level input voltage	On all digital interface output pins	-	-	1.5	V
I_{IL}	Digital interface pin leakage current on all interface pins	-	-	-	10	µA
V_{OH}	Digital high level output for serial interface (-B)	I_{OH} = -50 µA	4	-	-	V
		I_{OH} = 8.0 mA	3.5			
V_{OL}	Digital low level output for serial interface (-B)	I_{OL} = 50 µA	-	-	0.1	V
		I_{OL} = 8.0 mA			0.7	
F_{RANGE}	Tunable frequency range[7]	-	30	-	520	MHz
Z_O	Input/output impedance	-	-	50	-	Ω
VSWR	Voltage Standing Wave Ratio[8]	-	-	1.5:1	-	-
RL	Return loss[8]	At 50 Ω	-	14	-	dB
IL	Insertion loss	-	-	See Selection Guide	-	dB
BW	Bandwidth (3 dB)	-	-	See Selection Guide	-	%
$SEL_{10\%}$	Selectivity 10% removed from the center fruency	$f_0 \pm 10\%$	-	See Selection Guide	-	dBc
$SEL_{ULTIMATE}$	Ultimate selectivity[8]	$2 \times f_0$	-	60	-	dBc
IIP3	Input third order intermodulation intercept point[8]	-	-	50	-	dBm
NF	Noise figure	-	-	IL	-	dB
T_{TUNE}	Tune time (+10dBm)	-	-	10	-	µs
F_{DRIFT}	Center frequency drift over temperature	-40 TO +85 °C	-	-	80	ppm/°C

[7] Frequency range is in multiple filter bands.
[8] This specification depends on frequency and bandwidth.

4.5 Selection Guide

All specifications at T_A = 23 °C, V_{cc} = +5 V, V_{BB} = +100 V, unless otherwise noted

Band	3 dB BW Part Number Suffix	3 dB %BW		Insertion Loss (IL) (dB)		Return Loss (dB)		Shape Factor Overall $\left(\frac{30\text{ dB}}{3\text{ dB}}\right)$		Selectivity ($f_0 \pm 10\%$) (dB)		Ultimate Selectivity ($2 * f_0$) (dB)[9]	IIP3[10] (dB)	Noise Figure (dB)	
-	-	Avg	Max	Avg	Max	Avg	Min	Avg	Max	Avg	Min	Typical	Avg	Avg	Max
30-90	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	7	6.9	7.5	2.7	3.6	18	10	6.2	7.0	19	16	60	40	IL	IL ± 1dB
	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4	3.9	4.5	4.8	6.3	12	9.5	6.1	7.0	27	24	70	40	IL	IL ± 1dB
	3	3.2	3.5	6.8	8.5	10	7.5	6.5	7.1	33	30	70	40	IL	IL ± 1dB
90-200	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5	5.0	5.5	3.5	4.6	18	9.5	6.6	7.1	25	22	65	40	IL	IL ± 1dB
	4	4.0	4.5	4.4	6.3	12	9.5	6.3	7.0	27	24	70	40	IL	IL ± 1dB
	3	3.0	3.5	5.6	8.0	12	9.5	6.5	7.1	33	30	70	40	IL	IL ± 1dB
174-400	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	7	7.1	8	2.7	3.8	15	9.5	6.1	7.0	17	16	55	40	IL	IL ± 1dB
	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3	3.3	3.5	5.7	8.5	10.5	8	6.5	7.1	34	30	55	40	IL	IL ± 1dB
200-400	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	7	7.1	7.7	2.7	3.6	15	9.5	6.1	7.0	18	16	55	40	IL	IL ± 1dB
	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3	3.2	3.5	5.4	8.0	10.5	8	6.5	7.1	34	30	55	40	IL	IL ± 1dB
225-400	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	7	7.1	7.7	2.5	3.6	15	9.5	6.1	7.0	19	16	55	40	IL	IL ± 1dB
	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3	3.1	3.5	5.3	8.0	10.5	8	6.5	7.1	34	30	55	40	IL	IL ± 1dB
225-520	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	7	7.0	8.0	2.6	3.6	13.5	9.5	6.1	7.0	17	16	55	40	IL	IL ± 1dB
	5	5.2	5.5	3.4	4.6	15	9.5	6.2	7.0	22	20	55	40	IL	IL ± 1dB
	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3	3.1	3.6	5.4	7.8	13	9.5	6.3	7.0	30	27	55	40	IL	IL ± 1dB
400-700	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	7	7.0	7.8	2.4	3.6	14	9.5	6.1	7.0	17	16	55	40	IL	IL ± 1dB
	5	4.9	5.5	3.3	4.6	13	9.5	6.1	7.0	22	20	55	40	IL	IL ± 1dB
	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3	3.2	3.5	5.1	7.8	11	9.5	6.3	7.0	30	27	55	40	IL	IL ± 1dB

[9] Typical Performance, ultimate selectivity is not guaranteed.

[10] Using +24dBm Tones.

4.6 Typical Characteristics

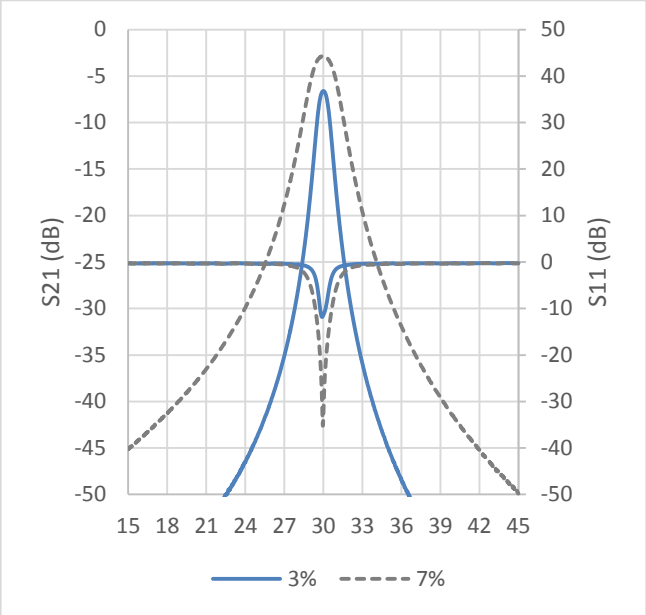


Figure 4. MN-30-90 at 30 MHz

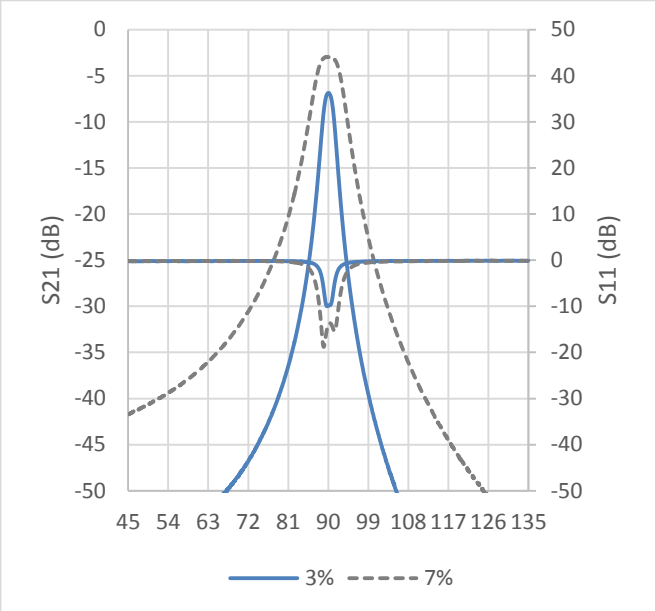


Figure 5. MN-30-90 at 90 MHz

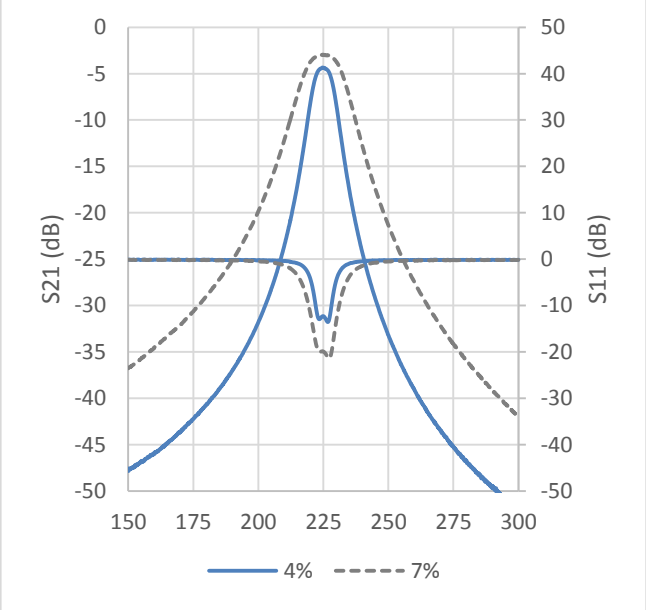


Figure 6. MN-225-400 at 225 MHz

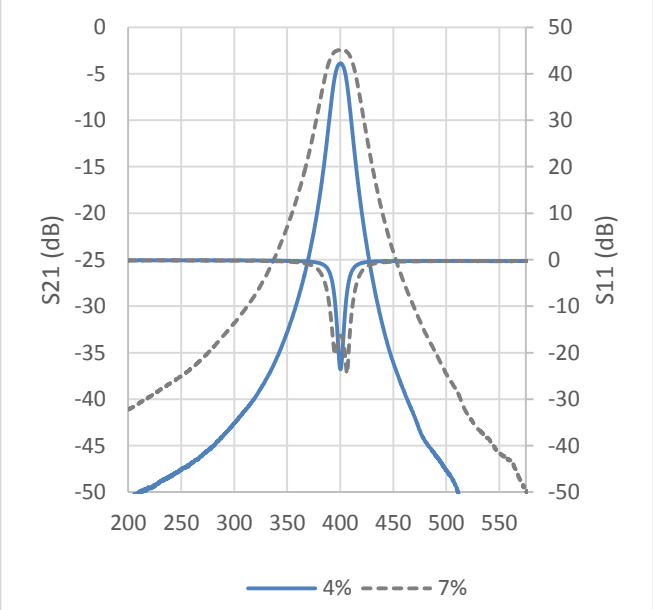


Figure 7. MN-225-400 at 400 MHz

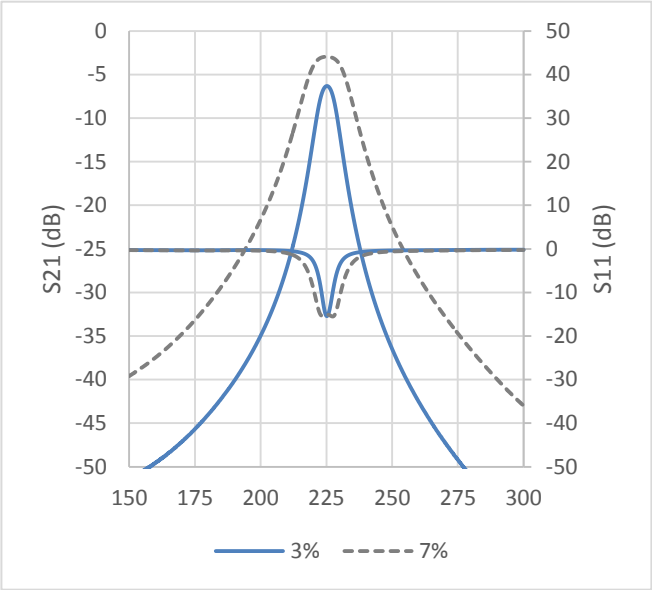


Figure 8. MN-225-520 at 225 MHz

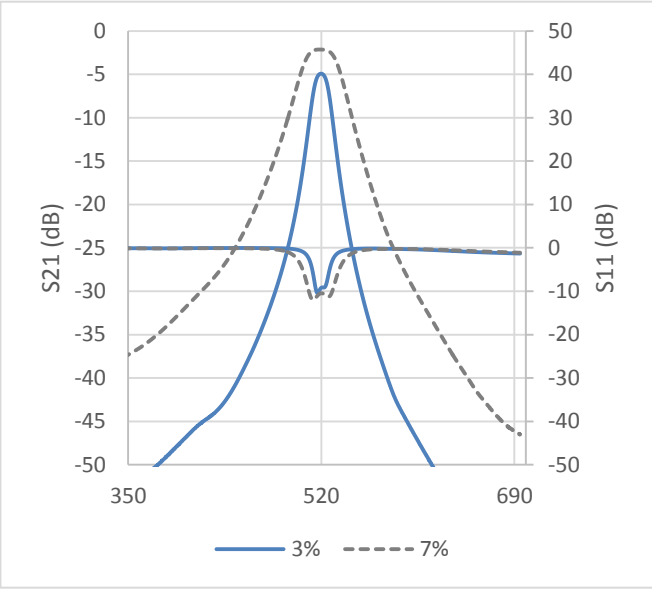


Figure 9. MN-225-520 at 520 MHz

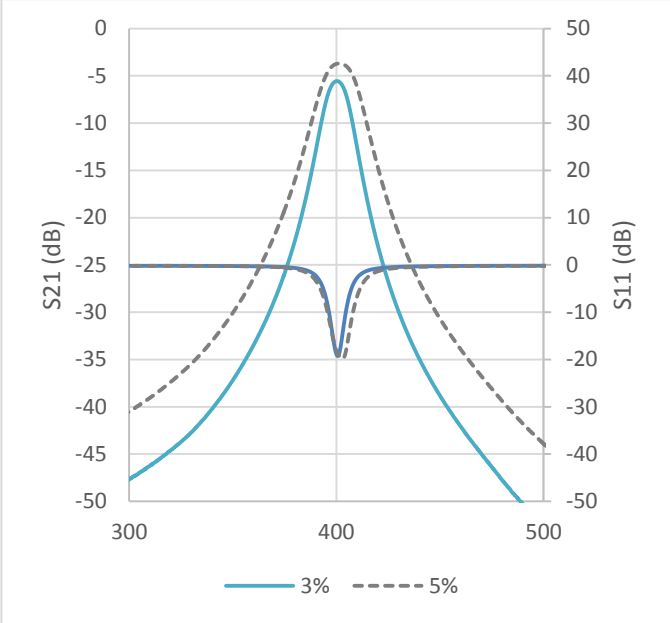


Figure 10. MN-400-700 at 400 MHz

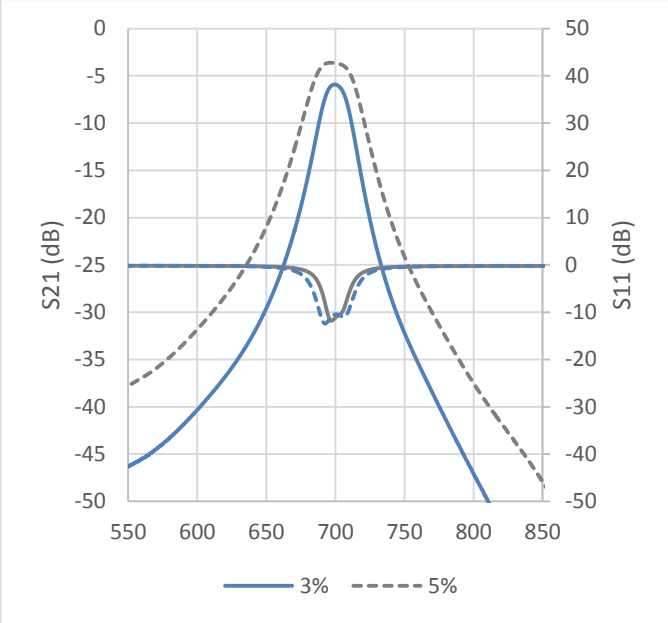


Figure 11. MN-400-700 at 700 MHz

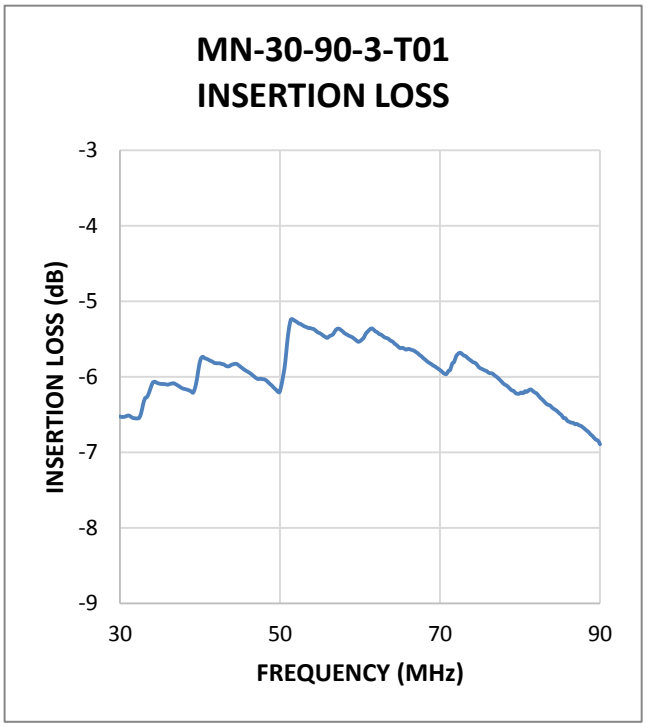


Figure 12, Tune Data

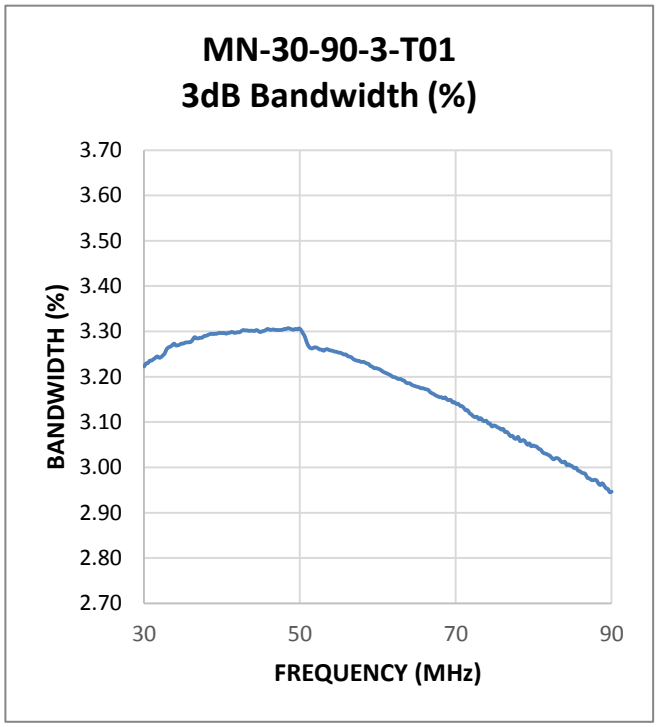


Figure 13, Tune Data

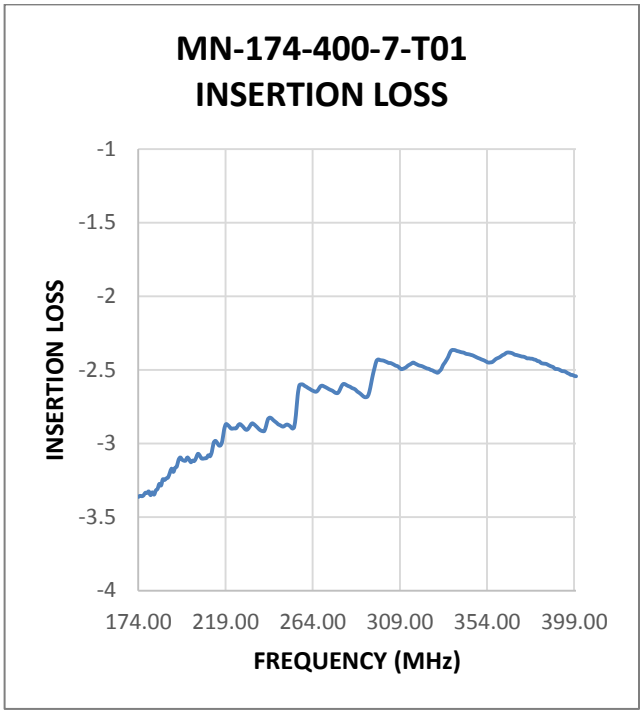


Figure 14, Tune Data

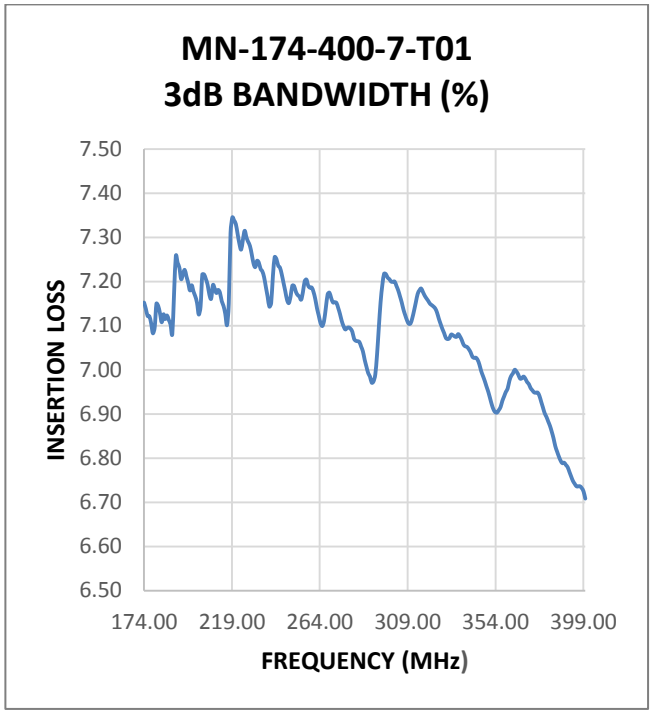


Figure 15, Tune Data

4.7 Timing Requirements

4.7.1 Parallel Interface Timing

The parallel tune command interface is an 8-bit wide synchronous parallel interface with a single-byte load. There are always 8 data bits per parallel tune. A7 is the most significant bit and A0 is the least significant bit.

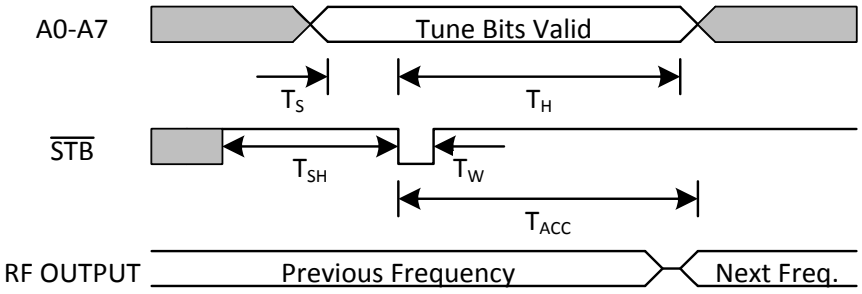


Figure 16. Parallel Timing Diagram

Table 5. SPI Timing Characteristics

VCC = 5 V ± 10%, GND = 0 V, T_A = 23 °C

Parameter	Parameter	Min.	Max.	Unit
T_S	Setup Time – Minimum time from A0-A7 valid until the falling edge of $\overline{STB}$.	200	-	ns
T_H	Hold Time – Minimum time that the A0-A7 bits need to be held valid after $\overline{STB}$ transitions low.	6	-	µs
T_{SH}	Strobe High Time – Minimum time $\overline{STB}$ needs to be held high before the falling edge of $\overline{STB}$ in a tune event is initiated.	25	-	µs
T_W	Strobe Pulse Width – The amount of time $\overline{STB}$ needs to be held low when initiating a tune event.	20	-	ns
T_{ACC}	Access Time – The amount of time from when $\overline{STB}$ is brought low until the MINI-POLE is tuned to the commanded frequency.	-	10[11]	µs
T_{DW}	Dwell Time (not shown) – The amount of time between subsequent falling edges of $\overline{STB}$ (this can also be considered the maximum hop rate).	500	-	µs

[11] For frequency bands where f_0 > 30 MHz and a +10 dBm reference. See section 7.0 for additional information.

4.7.2 Serial Interface Timing

The serial tune command interface is a proprietary three input and one output interface. The inputs SDI, SCLK, and $\overline{STB}$ are used for loading the tune command into the MINI-POLE while SDO shifts the last previously sent tune command out. Data is sent most significant bit (MSb) first and is clocked in on the rising edge of SCLK. After 8 subsequent SCLK rising edges, the tune command has been completely loaded into the MINI-POLE and it is ready to be enabled by the $\overline{STB}$ pin transitioning low. For best operation, it is recommended that the SCLK signal remain low while not actively loading a tune.

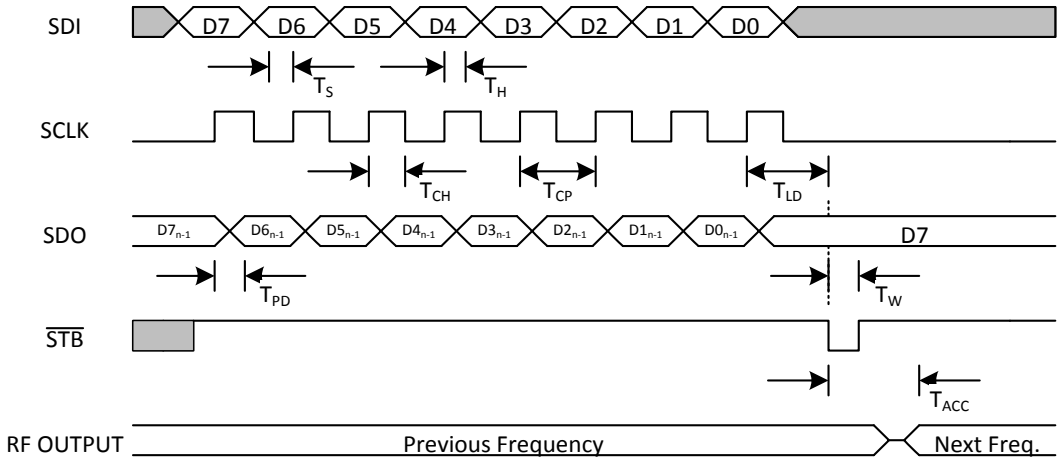


Figure 17. Serial Timing Diagram

Table 6. Parallel Timing Characteristics

VCC = 5 V ± 10%, GND = 0 V, T_A = 23 °C

Symbol	Parameter	Min.	Max.	Unit
T_S	Setup Time – Minimum time that SDI needs to be stable before the rising edge of SCLK.	25	-	ns
T_H	Hold Time – Minimum time that SDI needs to be held valid after the rising edge of SCLK.	5	-	ns
T_{CH}	Clock High Time – Minimum amount of time the SCLK signal needs to be held high when loading data on the SDI pin.	41.667	-	ns
T_{CP}	Clock Pulse Width – The maximum clock rate at which the serial interface can run.	-	10	MHz
T_{LD}	Load Delay Time – Minimum amount of time required after the last rising edge of SCLK until the $\overline{STB}$ pin can transition low.	275	-	ns
T_{PD}	SDO Propogation Delay – The maximum amount of time after the rising edge of clock that the data on SDO will be valid.	-	50	ns
T_W	Strobe Pulse Width – The amount of time $\overline{STB}$ needs to be held low when initiating a tune event.	20	-	ns
T_{ACC}	Access Time – The amount of time from when $\overline{STB}$ transitions low until the MINI-POLE is tuned the commanded frequency.	-	10[12]	µs

[12] For frequency bands where f_0 > 30 MHz at a +10 dBm reference. See section 7.0 for additional information.

5.0 Functional Description

5.1 Tune Commands

The tune command is a single-byte load tune command. The tune command specifies how many tune positions to offset from the MINI-POLE's minimum frequency.

Table 7. Tune Command Properties

Symbol	Filter Freq. Range	Value	Description
f_{MIN}	See Table 8 for specific values		Minimum Tunable Frequency. f_{MIN} is the absolute minimum frequency that the MINI-POLE is capable of tuning to for the respective band.
f_{MAX}			Maximum Tunable Frequency. f_{MAX} is the absolute maximum frequency that the MINI-POLE is capable of tuning to.
f_{STEP}			Tune step size. f_{STEP} is the minimum spacing between adjacent tune commands.
f_{COM}	All	$round\left(\frac{(f_{DESIRED} - f_{MIN})}{f_{STEP}}\right)$	Commanded Frequency. f_{COM} is the commanded frequency that is sent over the SPI or parallel tune interface. The command can be calculated by subtracting f_{MIN} from the desired frequency for the particular band, dividing the result by the f_{STEP} of that band, and then rounding to the nearest integer command. The formula is used to select the closest possible frequency to the desired tune command. If the next lowest tune command is desired, replace the round operation with floor and if the next highest tune command is desired replace the round operation with ceil.

Table 8. Tune Command Format

Filter Model				Tune Word Format (Bit Step Size in MHz)							
Part Series	f_{MIN} (MHz)	f_{MAX} (MHz)	f_{STEP} (kHz)	(MSB) 7	6	5	4	3	2	1	(LSB) 0
MN-30-90-X-T01-X	30	90	240	30.72	15.36	7.68	3.84	1.92	0.96	0.48	0.24
MN-90-200-X-T01-X	90	200	440	56.32	28.16	14.08	7.04	3.52	1.76	0.88	0.44
MN-174-400-X-T01-X	174	400	904	115.712	57.856	28.928	14.464	7.232	3.616	1.808	0.904
MN-200-400-X-T01-X	200	400	800	102.4	51.2	25.6	12.8	6.4	3.2	1.6	0.8
MN-225-400-X-T01-X	225	400	700	89.6	44.8	22.4	11.2	5.6	2.8	1.4	0.7
MN-225-520-X-T01-X	225	520	1180	151.04	75.52	37.76	18.88	9.44	4.72	2.36	1.18
MN-400-700-X-T01-X	400	700	1200	153.60	76.80	38.40	19.20	9.60	4.80	2.40	1.20

Table 9. Special Tune Commands

Tune Code (Decimal)	Function
251 – 254	Blank mode – There will be high RF input to output isolation.
255	Power save mode – All PIN diodes will be turned off to conserve energy.

6.0 Detailed Description

6.1 Example Tune Commands

Table 10. Example Tune Commands

Req. Band	$f_{DESIRED}$ (MHz)	f_{MIN} of Band (MHz)	f_{STEP} of Band (MHz)	f_{COM} Calculation (Decimal)	f_{COM} (Decimal)	f_{COM} (Hex)	f_{ACTUAL} (MHz)
30-90	30	30	0.24	$round\left(\frac{30 - 30}{0.24}\right)$	0	0x00	30
30-90	72.07	30	0.24	$round\left(\frac{72.07 - 30}{0.24}\right)$	175	0xAF	72
30-90	90	30	0.24	$round\left(\frac{90 - 30}{0.24}\right)$	250	0xFA	90
90-200	90	90	0.44	$round\left(\frac{90 - 90}{0.44}\right)$	0	0x00	90
90-200	136.39	90	0.44	$round\left(\frac{136.39 - 90}{0.44}\right)$	105	0x69	136.2
90-200	200	90	0.44	$round\left(\frac{200 - 90}{0.44}\right)$	250	0xFA	200
174-400	174	174	0.904	$round\left(\frac{174 - 174}{0.904}\right)$	0	0x00	174
174-400	224.06	174	0.904	$round\left(\frac{224.06 - 174}{0.904}\right)$	55	0x37	223.72
174-400	400	174	0.904	$round\left(\frac{400 - 174}{0.904}\right)$	250	0xFA	400
200-400	200	200	0.8	$round\left(\frac{200 - 200}{0.8}\right)$	0	0x00	200
200-400	283.55	200	0.8	$round\left(\frac{283.55 - 200}{0.8}\right)$	104	0x68	283.2
200-400	400	200	0.8	$round\left(\frac{400 - 200}{0.8}\right)$	250	0xFA	400
225-400	225	225	0.7	$round\left(\frac{225 - 225}{0.7}\right)$	0	0x00	225
225-400	299.62	225	0.7	$round\left(\frac{299.62 - 225}{0.7}\right)$	107	0x6B	299.9
225-400	400	225	0.7	$round\left(\frac{400 - 225}{0.7}\right)$	250	0xFA	400
225-520	225	225	1.18	$round\left(\frac{225 - 225}{1.18}\right)$	0	0x00	225
225-520	230.33	225	1.18	$round\left(\frac{230.33 - 225}{1.18}\right)$	5	0x05	230.9
225-520	520	225	1.18	$round\left(\frac{520 - 225}{1.18}\right)$	250	0xFA	520
400-700	400	400	1.20	$round\left(\frac{400 - 400}{1.20}\right)$	0	0x00	400
400-700	550	400	1.20	$round\left(\frac{550 - 400}{1.20}\right)$	125	0x7D	550
400-700	700	400	1.20	$round\left(\frac{700 - 400}{1.20}\right)$	250	0xFA	700

6.2 Additional Interface Detail

Table 11. Additional Pin Information

Pin Name	Description
V_{BB}	High Bias Voltage – A bias voltage is required to reverse bias the PIN diodes use to tune the filter. Very little static current is needed for this bias voltage. While a minimum of +30 V is needed for MINI-POLE operation, using the recommended voltage for this power supply will increase power handling capability and intermodulation significantly. See 4.3 Recommended Operating Conditions for recommended conditions for this supply. All MINI-POLEs are tuned and aligned in the factory using the recommended operating voltages unless otherwise specified.
$\overline{STB}$	The filter is tuned on the falling edge of $\overline{STB}$. For parallel MINI-POLEs, once the MINI-POLE has completely tuned, data is ignored on the address pins until the next falling edge of $\overline{STB}$. Consult section 7.0 Tune Time for the maximum rate at which subsequent $\overline{STB}$ events can be applied to the MINI-POLE.
Filter Enable Pins	These pin pairs must have a jumper on the connecting printed circuit board in order for the filter to tune correctly. If these pins are not connected correctly, the filter will do nothing when commanded to a new frequency.

Jumper Pin Pairs
24<->25
26<->27
36<->37
38<->39
40<->41

7.0 Tune Time

Tune times include internal processing of the tune command data and the 90% settled RF amplitude response time of the filter. This time excludes the time required to load the tune command into the filter. Low level signal measurements were utilized to show the receive tune time that can be expected at +10dBm.

In addition, RF power in excess of +20 dBm is considered to be “hot switching” of the filter and tuning operation of the filter at these levels cannot be done reliably. It is recommended that RF is less than +20 dBm during a tune event.

Table 12. Typical RF Tune Times
(T_A = 23 °C, V_{cc} = +5 V, V_{BB} = +100 V, Power Level = +10dBm)

Freq. (MHz)		Catalog Part Number	Tune Time (µs)
From	To		
30	90	MN-30-90-7-T01	7.7
90	30	MN-30-90-7-T01	9.62
90	200	MN-90-200-5-T01	4.92
200	90	MN-90-200-5-T01	4.18
174	400	MN-174-400-7-T01	4.22
200	400	MN-200-400-7-T01	4.27
225	520	MN-225-520-7-T01	4.33
400	700	MN-400-700-3-T01	4.4
700	400	MN-400-700-3-T01	4.2

8.0 Application Information

8.1 Application Circuits

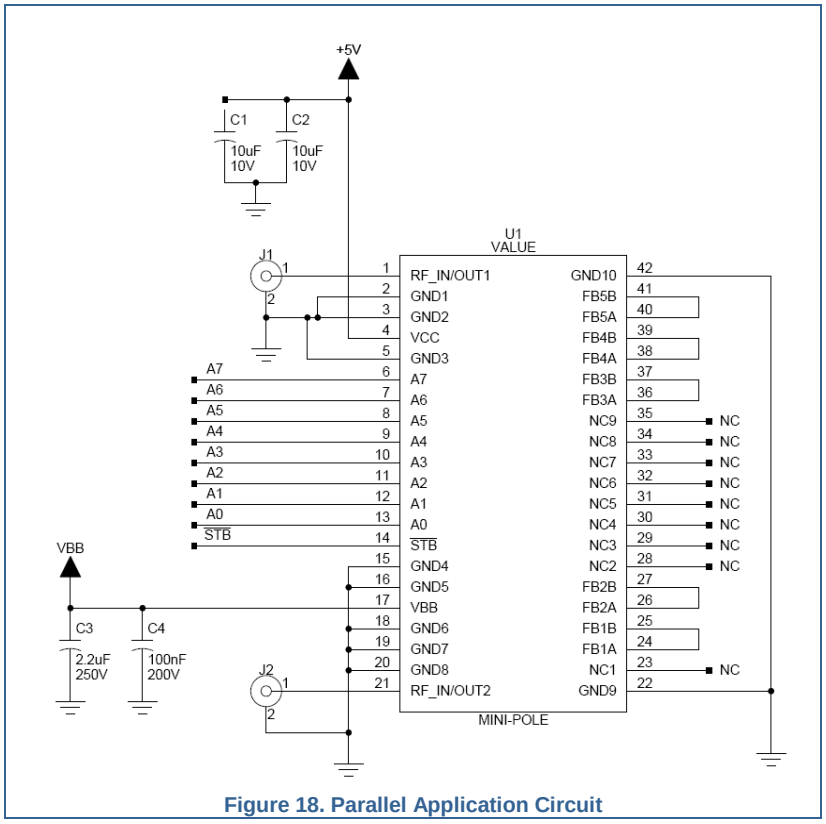


Figure 18. Parallel Application Circuit

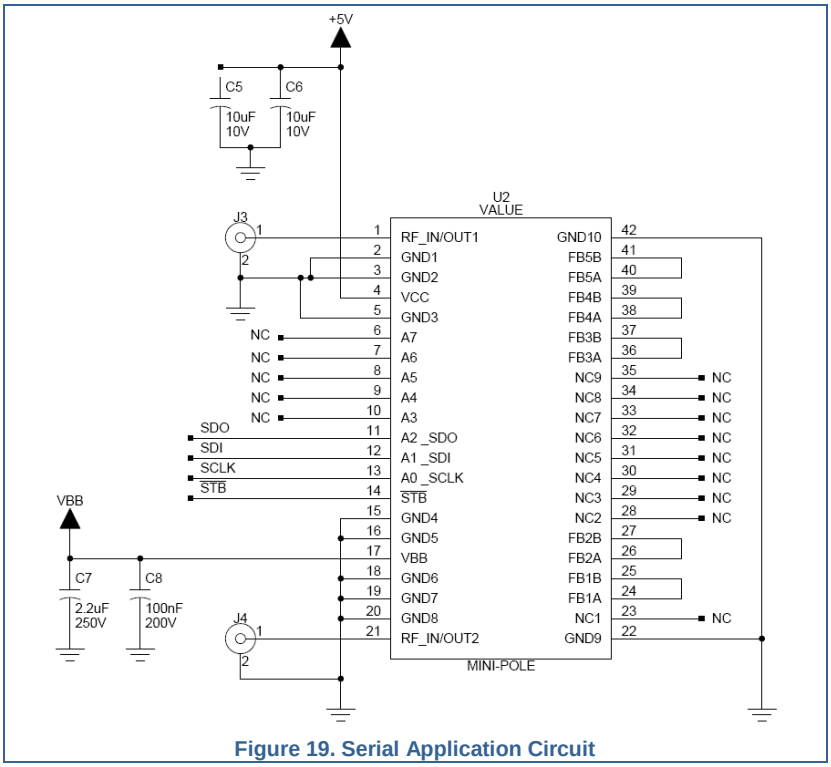
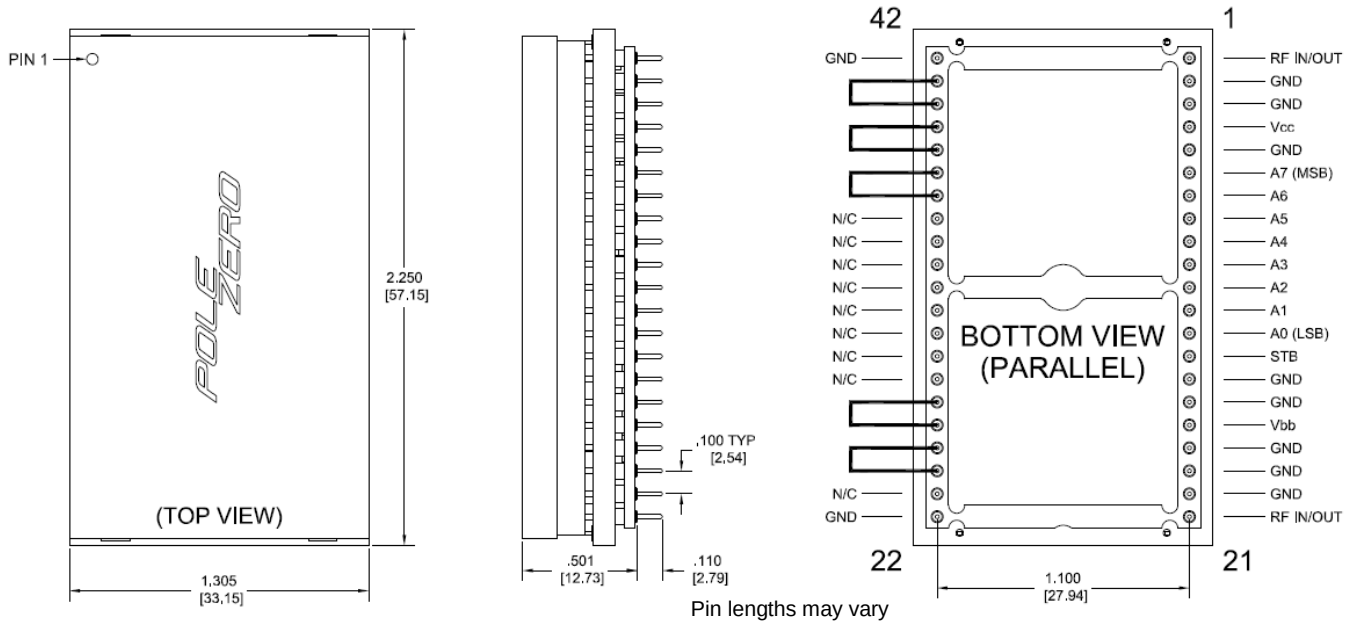


Figure 19. Serial Application Circuit

9.0 Package Information

9.1 Package Detail



1) Pin Diameter is 0.020”
2) Pins must be jumpered as shown above
3) Pin lengths may vary, custom pin lengths available upon request

Figure 20. Package Detail

9.2 Recommended Pad Layout

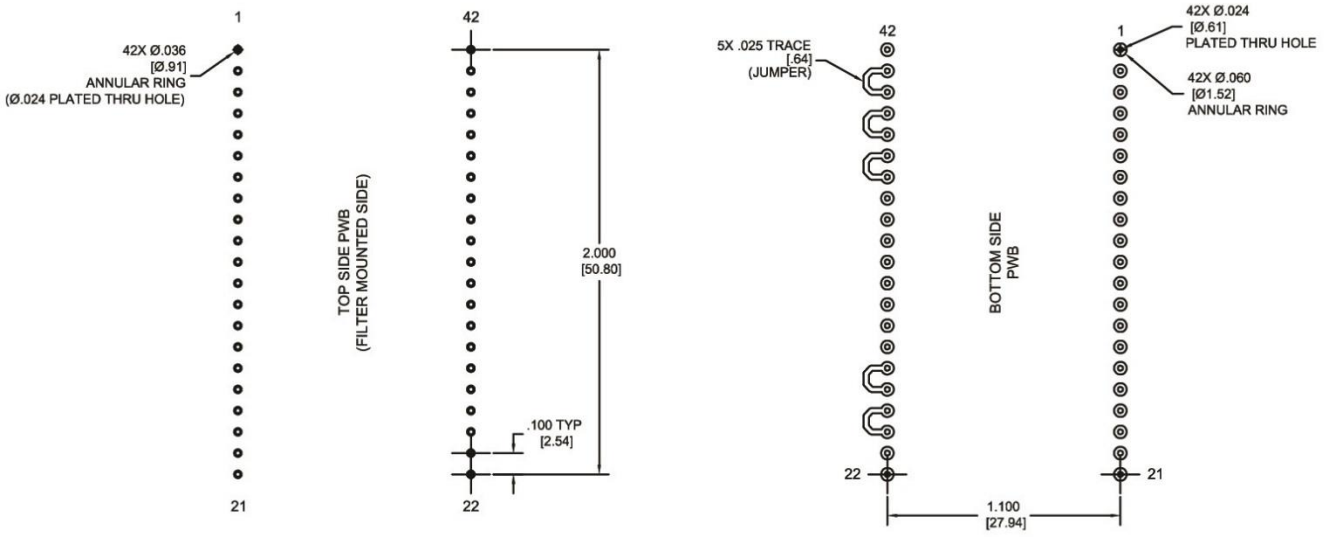


Figure 21. Recommended Pad Layout

10.0 Safety Notes

10.1 Handling Information

Caution

This device contains electrostatic discharge sensitive devices and is sensitive to electrostatic discharge (ESD). Observe all precautions for handling electrostatic sensitive devices.

Caution

This device may produce potentially hazardous voltages. Take necessary precautions when handling this device while power is enabled.

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