SAX239 R2

[30 – 520] MHz Tunable Bandpass Filter

Application

The SAX239 R2 electronically tunable bandpass filter is designed for Tactical Communications Applications using binary weighted digital tunable capacitor arrays to cover greater than an octave bandwidth. It is a pin to pin and functional replacement for the SAX239 offering exciting new features.

Features

• Full Tactical Communications band resolutions
• Low insertion loss
• Fast tuning across band to 1.0 MHz resolution
• 33 dBm P1dB
• DC Power < 100 mW

Specifications

Mechanical	Dimensions	[1.2 x 1.2 x 0.25] inches
RF Power Handling	P1dB	+33 dBm
Filter Performance	Tuning Range	[30 – 520] MHz
	Input / Output Impedance	50 ohm
	Tuning Step Size	1.0 MHz from (30-88) MHz
		2.0 MHz from (90-520) MHz
	Bandpass Bandwidth	3.5% typical
	Insertion Loss @ fc	< 4.5 dB typical
	Bandpass VSWR	1.5:1 typical, 2.0:1 max.
	Rejection	Ftune +/- 10% > 15 dB typical
		Ftune +/- 15% > 20 dB
		Ftune +/- 20% > 27 dB
		30 MHz to 0.5*Ftune > 40 dB
		[2*Ftune to 750] MHz > 35 dB
		[750 – 1000] MHz > 25 dB
	Noise Figure	< 0.5 dB above Insertion Loss
Control & Interface	Tuning Control	Serial [SPI]
	DC Power	3.5V +/- 0.2V < 30 mA
		Option for external +35V (see Note 1)
	Tuning Speed	40 µs max. 25 µs typical
	Tuning Algorithm	Binary equivalent to desired tune frequency (MHz)

Note 1: *SAX239 Rev 2 can be used in 2-modes.*
Mode 1 has internal dc –dc converter, and the unit powered via +3.5V [+/- 0.2V] only.
Mode 2 is powered via external +3.5V [+/-0.2V] and external +35V [+/-1.0V].

Mode	Pin 24	Pin 12	Pin 18
1	+3.5V +/-0.2V	N/C	N/C
2	+3.5V +/-0.2V	+35V +/- 1.0V	GND

The SAX239 Tunable Filter is controlled as a slave SPI device. The control registers are write only, so there are only three SPI signals required:

- CS input: When CS is low, the SPI bus is enabled.
               When CS is high, signals on the other SPI inputs are ignored.
- SCLK: Serial data clock generated by the SPI bus master.
- MOSI: Data from master to slave (Master Out, Slave In).

The timing of the SPI bus is:

- The base value of the clock is low (0).
- The SAX239 reads the incoming data (MOSI) on the rising edge of the clock SCLK.
- The maximum allowed SCLK rate is 1.0 MHz.

A single 16-bit tuning word is transmitted to the filter.
The filter will begin to tune to the new frequency upon receipt of the last of the 16 bits.
The valid range of tuning bytes in this mode is 0x001E to 0x0208 (30 to 520 decimal).

The SAX239 will tune to the frequency equivalent to the binary tuning word (in MHz).
For tuning words from 89 to 519, the LSB will be set to zero, resulting in 2 MHz frequency resolution.

The figure below shows the SPI bus set command operation:

- The SPI bus master sets CS low and generates the SCLK.
- The master sends a 16-bit filter select word (MSB first) on the MOSI line.
- After the last clock pulse, the SPI bus master sets CS high.

CS		
SCLK		
MOSI	DF	DE	DD	DC	DB	DA	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
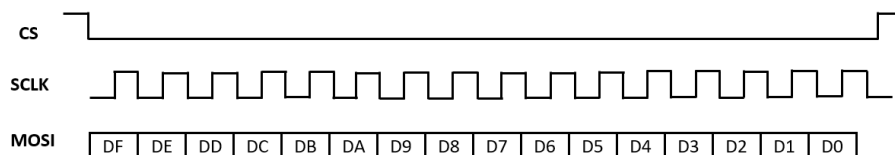
The SPI bus timing requirements are:

Characteristic	Min	Max	Units
SCLK rate	—	1	MHz
CS↓ to SCLK↑	250	—	ns
SCLK↑ to CS↓	415	—	ns
SCLK rise time	—	30	ns
SCLK fall time	—	20	ns
SCLK high time	25	—	ns
SCLK low time	25	—	ns
MOSI setup time	25	—	ns
MOSI hold time	25	—	ns

Environmental   Operating Temp.   [-40 to +85] C.
                         Vibration   Vehicular to MIL_STD_810G Method 514.6
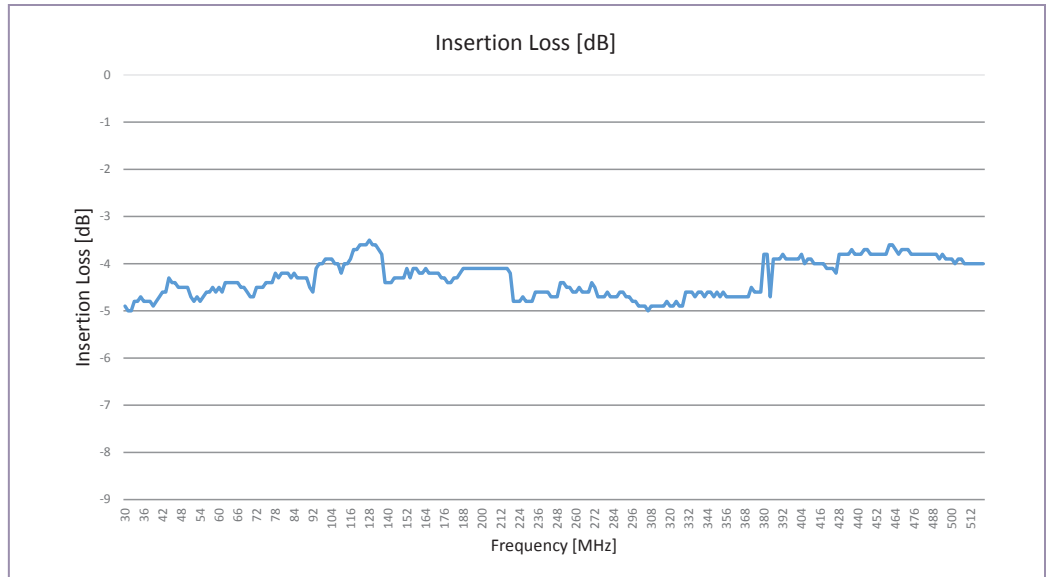   Jet Fighter to MIL_STD_810F Method 514.5G
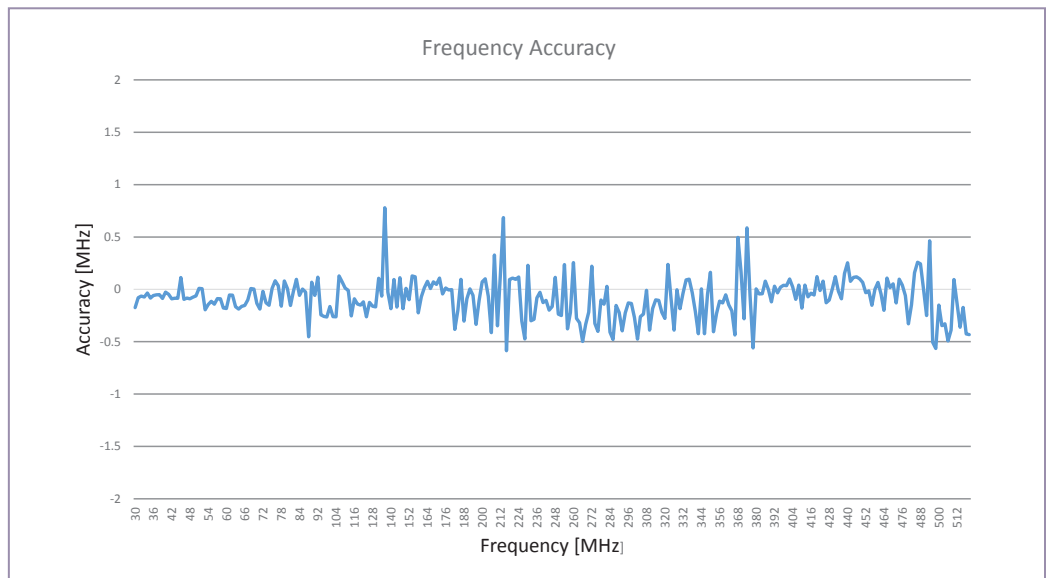   Reflow   260°C [max] for 45 second [max]

Recommended to keep the SAX239 unit on top side of the board to aid reflow.
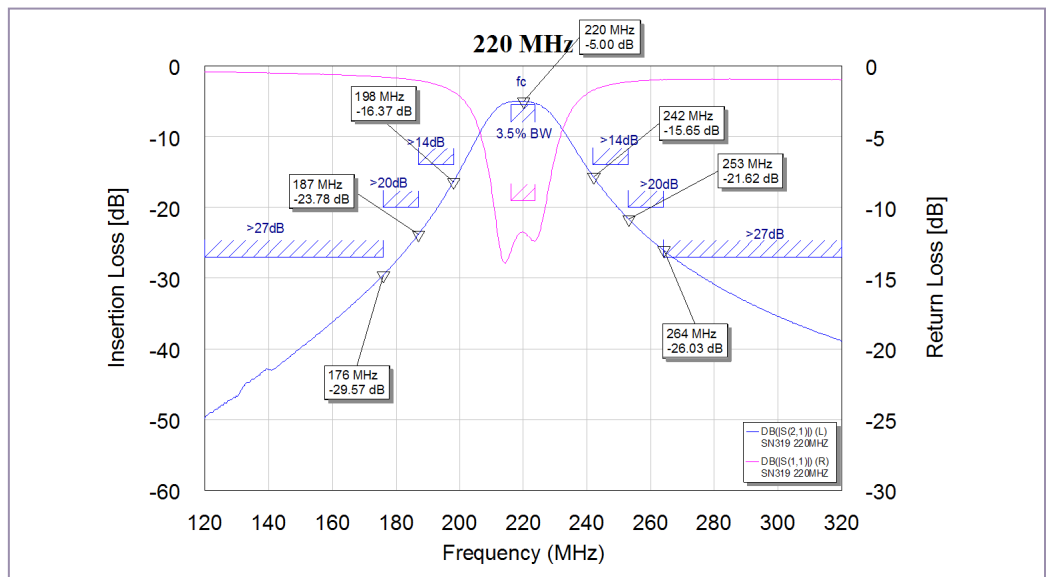*Contact NewEdge Signal Solutions for further assistance.*

SAX239-R2 Passband IL over [30-520] MHz Tuning Range

Insertion Loss [dB]

SAX239-R2 Step Size & Frequency Accuracy

Frequency Accuracy

SAX239-R2 Passband Bandwidth & Rejection

220 MHz

220 MHz -5.00 dB

198 MHz -16.37 dB

242 MHz -15.65 dB

fc

3.5% BW

>14dB

>14dB

187 MHz -23.78 dB

>20dB

>20dB

253 MHz -21.62 dB

>27dB

>27dB

176 MHz -29.57 dB

264 MHz -26.03 dB

DB(|S(2,1)|) (L) SN319 220MHZ
DB(|S(1,1)|) (R) SN319 220MHZ

NewEdge
Signal Solutions

Pin	Description
1	GROUND
2	RF IN
3	GROUND
4	GROUND
5	GROUND
6	GROUND
7	DO NOT CONNECT
8	DO NOT CONNECT
9	DO NOT CONNECT
10	GROUND
11	DO NOT CONNECT
12	SEE NOTE 2
13	GROUND
14	GROUND
15	SPI CLK
16	SPI MOSI
17	SPI CS
18	SEE NOTE 2
19	GROUND
20	GROUND
21	RF OUT
22	GROUND
23	GROUND
24	Vcc [+3.5V+/-0.2V]
25	GROUND

Disclaimer

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