



RF5614A/RF5615A/RF5616A

RF5614A 1/3 Octave Bandpass Filter
RF5615A 1/2 Octave Bandpass Filter
RF5616A Full Octave Bandpass Filter

Description

The Reticon RF5614A, RF5615A, and RF5616A are monolithic, switched-capacitor bandpass filters packaged in 8-pin mini-DIPs. Each contains a 6-pole Chebyshev ANSI Class II bandpass filter using one external input clock trigger.

The center frequency of all filters is tunable by the clock frequency. Dynamic range is typically 86 dB and distortion is less than 0.3%. The pinout for this device is shown in Figure 1, and the package dimensions are given in Figure 5.

Key Features

- Easy to use
- No external components required
- Small size: 8-pin mini-DIP
- Wide power supply range: $\pm 5V$ to $\pm 10V$
- Dynamic range: 86 dB, typical
- Center frequency range: 9 Hz to 20 kHz

Typical Applications

- Spectrum analysis (parallel or swept filters)
- Audio filtering
- Noise analysis
- Equalization
- Harmonic analysis
- Modems

Device Operation

These bandpass filters are self-contained and require only an external clock trigger and plus and minus power supplies to operate. The device characteristics and operating parameters were obtained using the test configuration shown in Figure 2.

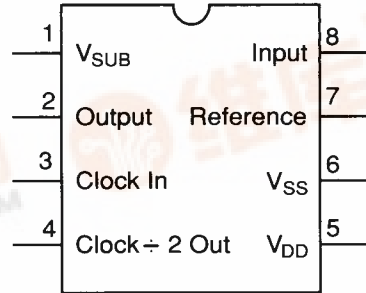


Figure 1. Pinout Configuration

Antialiasing Considerations

The sampling rate on these filters is approximately 27 times the filter center frequency. As in all sampled-data systems, signals above half the sampling frequency (f_s) will be aliased and may appear in the band of interest. If signals greater than $13.5 f_0$ will be applied to the filter, an external antialiasing filter may be required. In applications where the clock feedthrough may affect system performance, a single pole filter should be added to the filter output. Typical clock feedthrough is 30 mV_{rms}.

Note that the input clock trigger frequency, f_c , is twice the sample rate, or approximately 54 times the center frequency. The input clock rate is divided by two in generating the on-chip clock waveforms which control the sample rate, f_s .

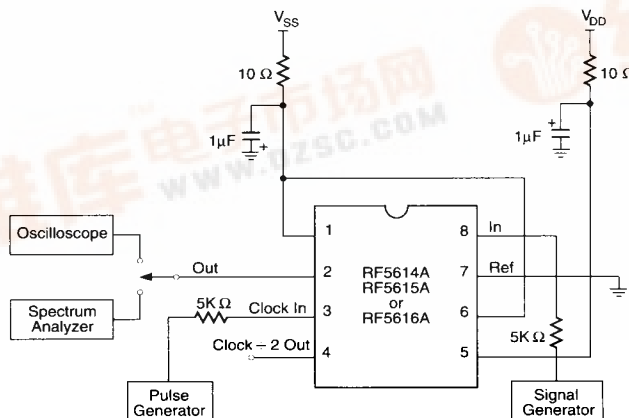


Figure 2. Test Circuit



RF5614A/RF5615A/RF5616A

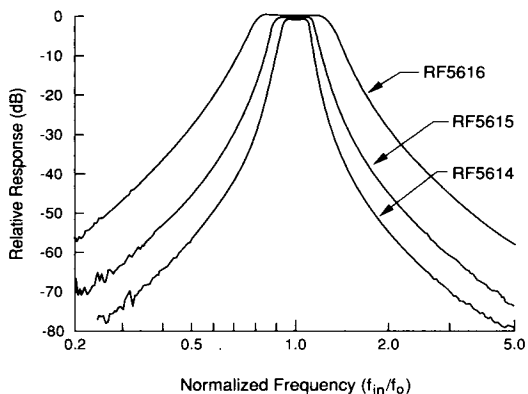


Figure 3. Normalized Frequency Responses

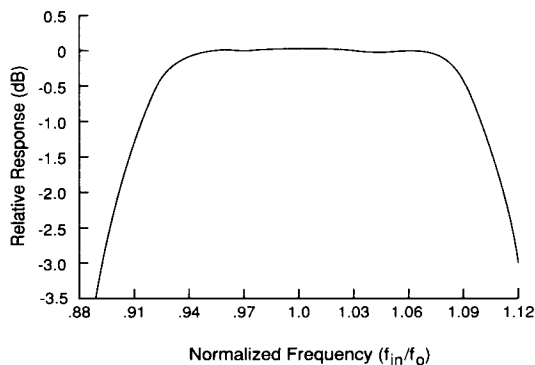


Figure 4. Expanded Passband Response Curve for RF5614A

Table 1. Absolute Minimum/Maximum Ratings

	Min	Max	Units
Input voltage - any terminal with respect to substrate, pin 1 (V_{SS})	-0.4	21	V
Output short-circuit duration - any terminal	Indefinite		
Operating temperature	0	70	°C
Storage temperature	-55	125	°C
Lead temperature (soldering, 10 sec.)		300	°C

Note: Table 1 shows stress ratings exclusively. Functional operation of this product under any conditions beyond those listed under standard operating conditions is not suggested by the table. Permanent damage may result if the device is subject to stresses beyond these absolute min/max values. Moreover, reliability may be diminished if the device is run for protracted periods at absolute maximum values.

Although devices are internally gate-protected to minimize the possibility of static damage, MOS handling precautions should be observed. Do not apply instantaneous supply voltages to the device or insert or remove the device from a socket while under power. Use decoupling networks to suppress power supply turn-off/on switching transients and ripple. Applying AC signals or clock to the device with the power off may exceed the negative limit.

Table 2. Device Characteristics and Operating Range Limits ¹

Parameter	Conditions & Comments	Sym	Min	Typ	Max	Units
Supply voltages		V _{DD}	+5		+10	V
		V _{SS}	-5		-10	V
Supply current ³		I _D		8	25	mA
Clock frequency		f _c	.500		1000	kHz
Clock pulse width	T _c = clock period	T _{cp}	200		T _c -200	nsec
Input clock levels		V _{IL}	V _{SS}		0.8	V
		V _{IH}	3.0		V _{DD}	V
Maximum output signal	V _{in} = 4 V _{rms}	V _o	10			V _{p-p}
Clock to center freq. ratio		f _c /f _o	52	54.5	57	
Center frequency ²		f _o	9		20,000	Hz
Quality factor	RF5614A	Q	4.50	4.70	4.80	
	RF5615A	Q	2.80	3.00	3.10 ⁴	
	RF5616A	Q	1.28	1.48	1.58	
Input impedance		R _i	3			MΩ
		C _i			20	pF
Dynamic output impedance		R _o			10	Ω

Notes:

- ¹ V_{DD} = +10V, V_{SS} = -10V, f_c = 54.5 kHz (f_o = 1 kHz), T = 25°C
- ² Performance degrades at temperatures above 25°C
- ³ Increases 15% for operation at 0°C
- ⁴ All frequencies normalized; F₀ = 1 Hz

Table 3. Performance Standards ¹

Parameter	Conditions & Comments	Sym	Min	Typ	Max	Units
Output noise		e _n			2.0	mV _{rms}
Dynamic range ²		DR	70	86		dB
Total harmonic distortion		THD			0.3	%
Insertion loss ²			-0.5	0	0.5	dB
Passband ripple				0.20	0.50	dB
Clock feedthrough				30	60	mV _{rms}

Notes:

- ¹ V_{DD} = +10V, V_{SS} = -10V, f_c = 54.5 kHz (f_o = 1 kHz), T = 25°C
- ² Performance degrades at temperatures above 25°C

Table 4. ANSI Specifications for Typical -3 dB and -40 dB Cutoff Frequencies ¹

Filter	-3 dB		-40 dB	
	Low	High	Low	High
Third octave filter	0.89	1.11	0.64	1.52
Half octave filter	0.82	1.19	0.51	1.96
Full octave filter	0.72	1.40	0.31	3.29

Note:

- ¹ All frequencies normalized to the filter center frequency, f_c.

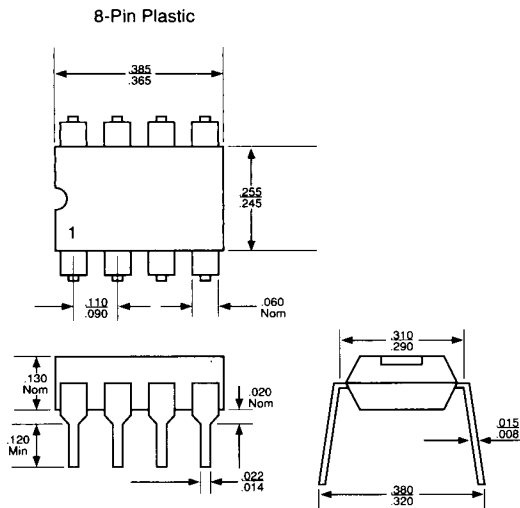


Figure 5. Package Dimensions

Ordering Information

Part Number	Description
RF5614ANP-011	6-pole 1/3-octave bandpass filter, 8-pin plastic package
RF5615ANP-011	6-pole 1/2-octave bandpass filter, 8-pin plastic package
RF5616ANP-011	6-pole 1-octave bandpass filter, 8-pin plastic package