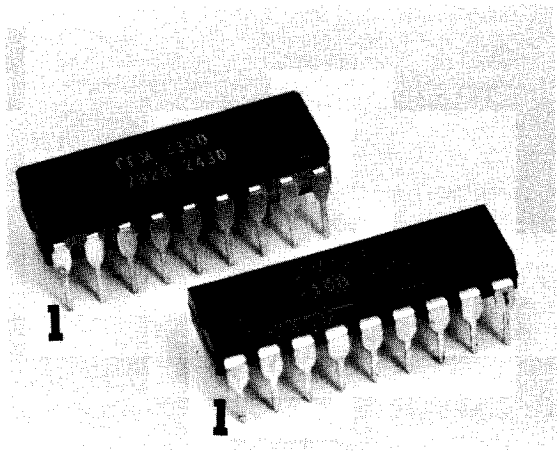
CURTIS ELECTROMUSIC SPECIALTIES

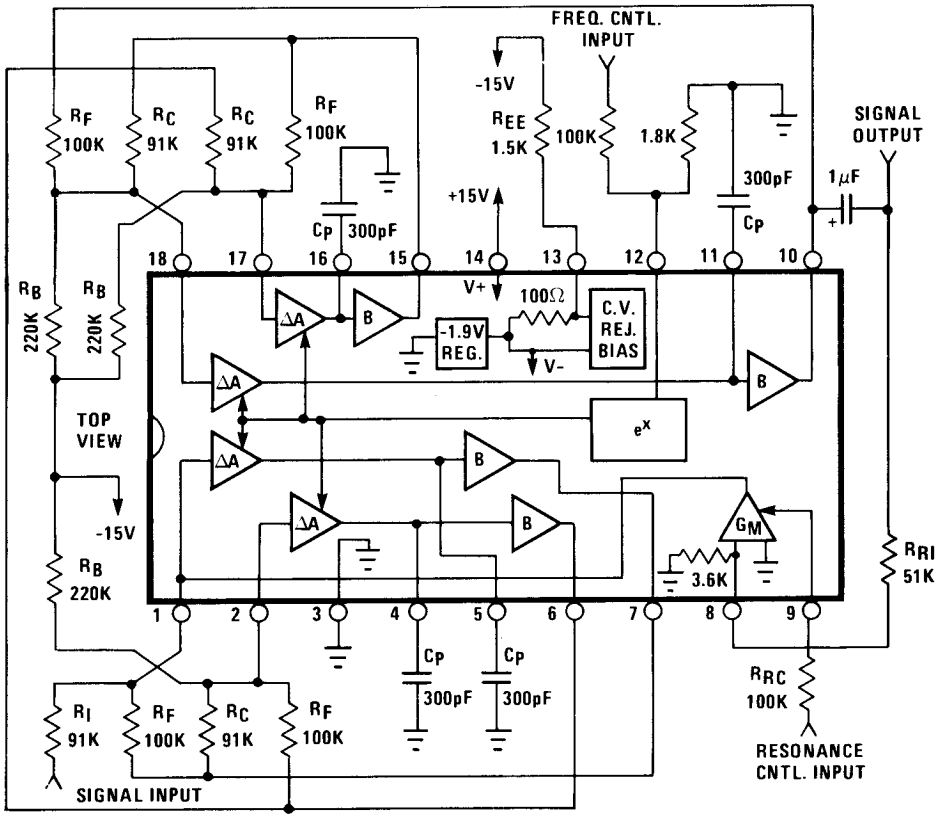
CEM 3320

Voltage Controlled Filter

The CEM 3320 is a high performance voltage controlled four-pole filter complete with on-chip voltage controllable resonance. The four independent sections may be interconnected to provide a wide variety of filter responses, such as low pass, high pass, band pass and all pass. A single input exponentially controls the frequency over greater than a ten octave range with little control voltage feedthrough. Another input controls the resonance in a modified linear manner from zero to low distortion oscillation. For those demanding applications, provision has been made to allow trimming for improved control voltage rejection. Each filter section features a novel variable gain cell which, unlike the traditional cell, is fully temperature compensated, exhibits a better signal-to-noise ratio and generates its low distortion predominantly in the second harmonic. The device further includes a minus two volt regulator to ensure low power dissipation and consequent low warm-up drift even with ±15 volt supplies.



Circuit Block and Connection Diagram



Features

- Low Cost
- Voltage Controllable Frequency: 12 octave range minimum
- Voltage Controllable Resonance: From zero to oscillation
- Accurate Exponential Frequency Scale
- Accurate Linear Resonance Scale
- Low Control Voltage Feedthrough: -45dB typical
- Filter Configurable into Low Pass, High Pass, All Pass, etc.
- Large Output: 12V.P.P. typical
- Low Noise: -86dB typical
- Low Distortion in Passband: 0.1% typical
- Low Warm Up Drift
- Configurable into Low Distortion Voltage Controlled Sine Wave Oscillator
- ±15 Volt Supplies

CEM 3320

Electrical Characteristics

V_{CC} = +15V	R_F = 100K	T_A = 25°C		
Parameter	Min.	Typ.	Max.	Units
Pole Frequency Control Range	3500:1	10,000:1	–	
Sensitivity of Pole Frequency Control Scale, Midrange	57.5	60	62.5	mV/decade
Tempco of Pole Frequency Control Scale	3000	3300	3600	ppm
Exponential Error of Pole Frequency Control Scale[1]	–	4	12	%
Gain of Variable Gain Cell at V_C=0	0.7	0.9	1.3	
Max Gain of Variable Gain Cell	2.4	3.0	3.6	
Tempco of Variable Gain Cell[2]	–	500	1500	ppm
Output Impedance of Gain Cell[2]	0.5	1.0	2.0	MΩ
Pole Frequency Control Feedthrough	–	60	200	mV
Pole Frequency Warm-up Drift	–	.5	1.5	%
Gm of Resonance Control Element at I_{CR}=100uA	.8	1.0	1.2	mmhos
Amount of Resonance Obtainable Before Oscillation	20	30	–	dB
Resonance Control Feedthrough[3]	–	0.2	1.5	V
Output Swing At Clipping	10	12	14	V.P.P.
Output Noise re Max Output[4]	-76	-86	–	dB
Rejection in Bandreject	73	83	–	dB
Distortion in Passband[5,7]	–	0.1	0.3	%
Distortion in Bandreject[6,7]	–	0.3	1	%
Distortion of Sine Wave Oscillation[8]	–	0.5	1.5	%
Internal Reference Current, I_{REF}	45	63	85	μA
Input Bias Current of Frequency Control Input	0.2	0.5	1.5	μA
Input Impedance to Resonance Signal Input	2.7	3.6	4.5	KΩ
Buffer Slew Rate	1.5	3.0	–	V/uS
Buffer Input Bias Current (I_{EE}=8mA)	±8	±30	±100	nA
Buffer Sink Capability	.4	.5	.63	mA
Buffer Output Impedance[2]	75	100	200	Ω
Positive Supply Range	+9	–	+18	V
Negative Supply Range[9]	-4	–	-18	V
Positive Supply Current	3.8	5	6.5	mA

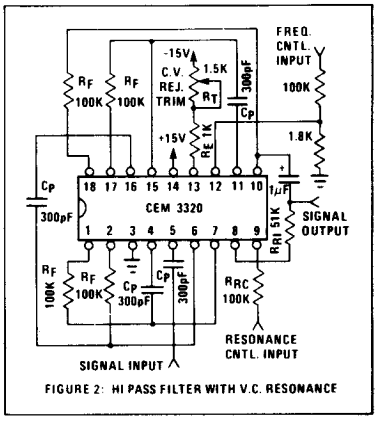


FIGURE 2: HI PASS FILTER WITH V.C. RESONANCE

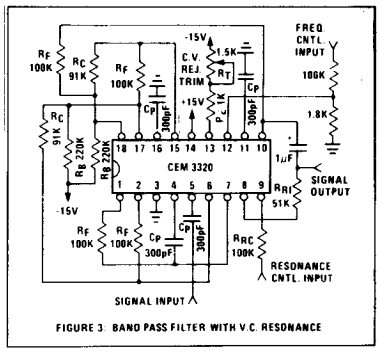


FIGURE 3: BAND PASS FILTER WITH V.C. RESONANCE

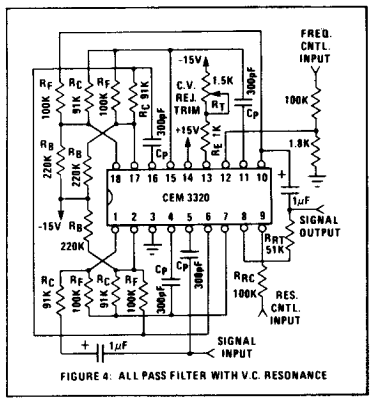


FIGURE 4: ALL PASS FILTER WITH V.C. RESONANCE

Note 1: -25mV < V_C < +155mV. Most of this error occurs in upper two octaves.
Note 2: V_C = 0
Note 3: Untrimmed. 0 < I_{CR} < 100μA
Note 4: Filter is connected as low pass and set for 20 KHz cut-off frequency.
Note 5: Output signal is 3dB below clipping point.
Note 6: Output signal is 3dB below passband level, which is 3dB below clipping point. In general, this is worst case condition.
Note 7: Distortion is predominantly second harmonic.
Note 8: Sinewave is not clipped by first stage.
Note 9: Current limiting resistor always required.

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