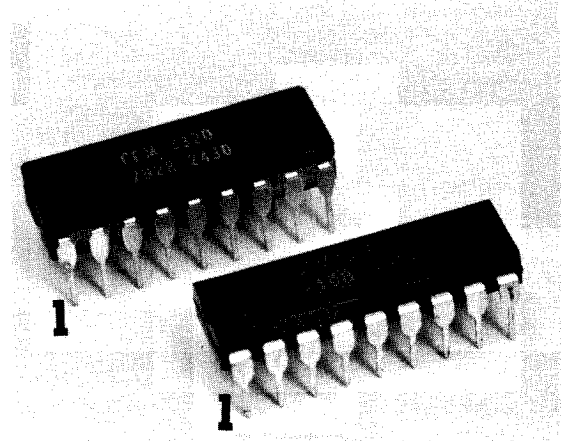


CEM 3320

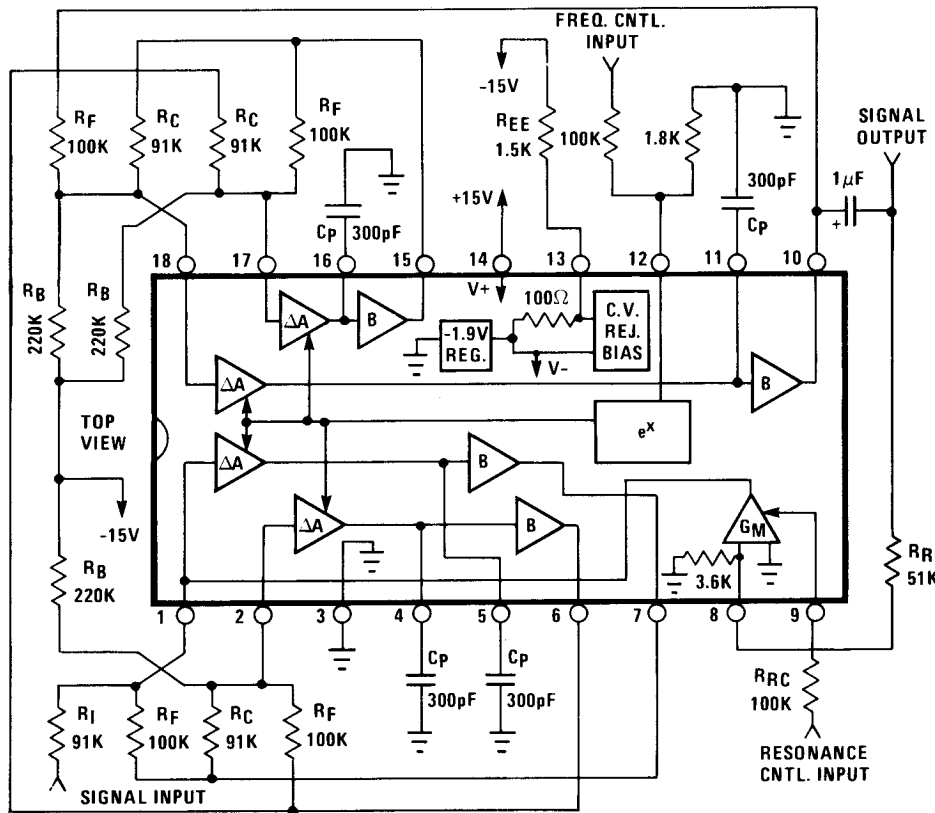
Voltage Controlled Filter

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 feed-through. 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 Feed-through: -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

$V_{CC} = +15V$		$R_F = 100K$		$T_A = 25^\circ C$	
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	M Ω	
Pole Frequency Control Feedthrough	—	60	200	mV	
Pole Frequency Warm-up Drift	—	.5	1.5	%	
Gm of Resonance Control Element at $I_{CR}=100\mu A$.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	K Ω	
Buffer Slew Rate	1.5	3.0	—	V/ μS	
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	

Note 1: $-25mV < V_C < +155mV$. Most of this error occurs in upper two octaves.

Note 2: $V_C = 0$

Note 3: Untrimmed. $0 < I_{CR} < 100\mu A$

Note 4: Filter is connected as low pass and set for 20 KHz cut-off frequency.

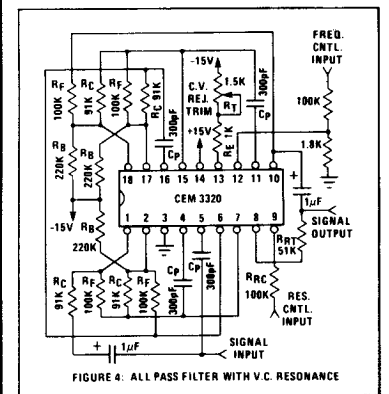
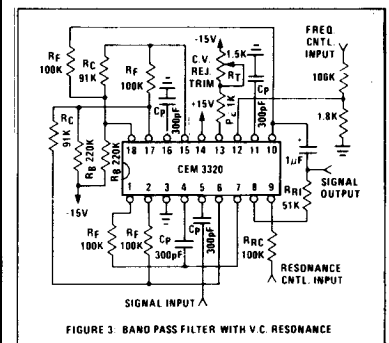
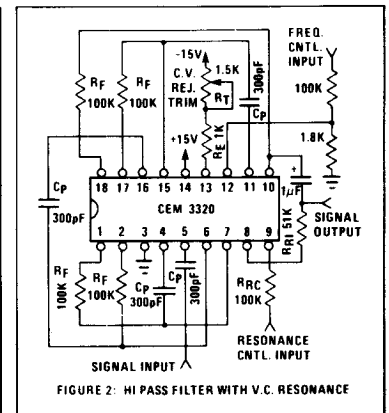
Note 5: Output signal is 3dB below clipping point.

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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