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CURTIS ELECTROMUSIC SPECIALTIES

# CEM 3340 / 3345

Voltage Controlled Oscillator

The CEM 3340 and CEM 3345 are completely self contained, precision voltage controlled oscillators, featuring both exponential and linear control scales and up to four buffered output waveforms: triangle, sawtooth, square, and pulse with voltage controllable pulse width. Full temperature compensation makes these VCOs extremely stable, and eliminates the need for a temperature compensation resistor. The highly accurate exponential and linear control inputs are virtual ground summing nodes, allowing mul-

tiple control voltages to be mixed within the device itself.

Also included is provision for hard and soft synchronization of the frequency, and an output for easy adjustment of high frequency tracking. Special care in the design ensures oscillation start-up under any power-on sequence and supply conditions.

Although a low voltage process has been used to reduce die size, cost, and leakage currents, an on-chip 6.5 volt zener diode allows the device to operate off ±15 volt supplies, as well as +15,–5 volt supplies.
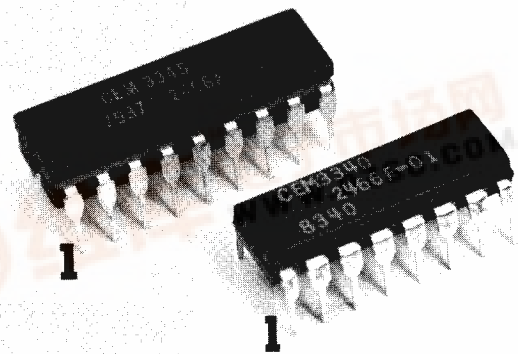
CEM 3340 Circuit Block and Connection Diagram
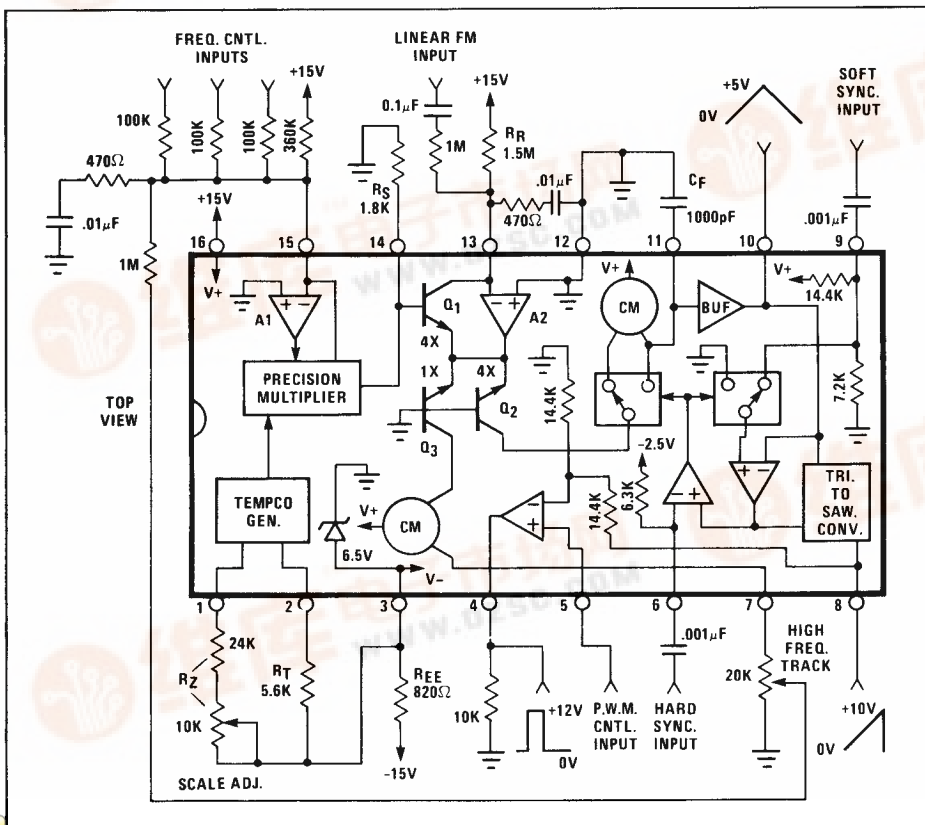
Features

- Large Sweep Range: 50,000:1 min.
- Fully Temperature Compensated; No Q81 Resistor Required
- Four Output Waveforms Available; No waveform trimming required.
- Summing Node Inputs for Frequency Control
- High Exponential Scale Accuracy
- Low Temperature Drift
- Voltage Controlled Pulse Width
- Hard and Soft Sync Inputs
- Linear FM
- Buffered, Short Circuit Protected Outputs
- ±15 Volt Supplies

CEM 3340 / CEM 3345

Electrical Characteristics

$V_{CC} = +15V$	V_{EE} = Internal Zener		$T_A = 20°C$	
Parameter	Min.	Typ.	Max.	Units
Frequency Control Range	50K:1	500K:1	–	
Exponential Scale Error, Untrimmed[1]	–	0.2	1	%
Exponential Scale Error, Trimmed[1]	–	0.05	0.3	%
Multiplier Gain Error[2]	–	0.0005	0.008	%/μA
Tempo Cancellation[3]	–150	0	+150	ppm
Oscillator Drift[4]	–	±50	±200	ppm
Triangle Buffer Input Current	–	0.3	3	nA
Triangle Waveform Upper Level	4.85	5.0	5.15	V
Triangle Waveform Lower Level	–15	0	+15	mV
Triangle Waveform Symmetry	45	50	55	%
Sawtooth Waveform Upper Level	9.4	10.0	10.6	V
Sawtooth Waveform Lower Level	–25	0	+25	mV
Triangle Output Sink Capability	400	550	750	μA
Sawtooth Output Sink Capability	640	800	1000	μA
Triangle & Sawtooth Output Impedance[5]	65	100	150	Ω
Pulse Output Source Capability at +10V	2.8	3.5	4.6	mA
Squarewave Output Levels[6], CEM 3345	–1.8,–0.4	–1.3,0	–0.8,+0.4	V
PWM Input Pin Current[7]	.5	1.5	3.5	μA
PWM Input Voltage for 0% Pulse Width	–15	0	+15	mV
PWM Input Voltage for 100% Pulse Width	4.6	5.0	5.4	V
Input Bias Current at Reference and Control Current Inputs	80	200	400	nA
Tempco of Input Bias Currents	–1000	0	+1000	ppm
Offset Voltage at Reference and Control Current Inputs	–5	0	+5	mV
Hard Sync Reference Voltage	–2.3	–2.5	–2.8	V
Hard Sync Input Resistance	5	6.3	7.9	KΩ
Max Capacitor Charge/Discharge Current	400	570	800	μA
Positive Supply Current	4	5	6.5	mA
Positive Supply Voltage Range	+10		+18	V
Negative Supply Voltage Range[8]	–4.5		–18	V

Note 1: This error represents the percentage difference in scale factors (volts per frequency ratio) of the exponential generator anywhere over the exponential generator current range of 50nA to 100μA. Most of this error occurs at the range extremities.

Note 2: This error represents the percentage difference in multiplier gains at any two input currents, within the range of 20 μA to 180 μA, per μA difference between the two corresponding outputs.

Note 3: This spec represents the difference between the actual tempco of the multiplier output voltage (expressed relative to the maximum output excursions) and the tempco required to precisely cancel the tempco of the exponential scale factor (q/KT).

Note 4: The multiplier output is grounded.

Note 5: For exponential generator currents less than 10 μA; above 10 μA, impedance drops to 1/3 this value as the highest current is approached.

Note 6: With respect to the hard sync input reference voltage.

Note 7: For PWM control inputs between –1 and +6 volts. This current is significantly greater for inputs outside of this range.

Note 8: Current limiting resistor required for negative supplies greater than –6 volts.
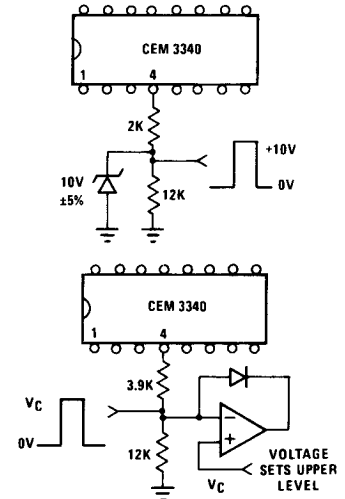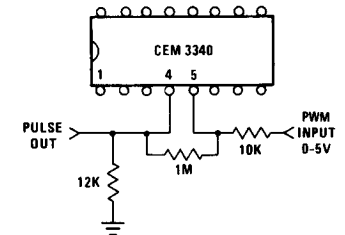

FIGURE 2: CLAMPING PULSE UPPER LEVEL

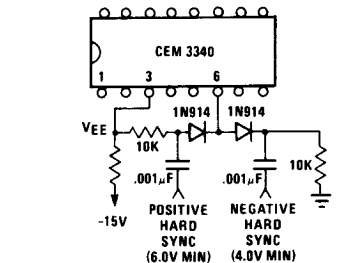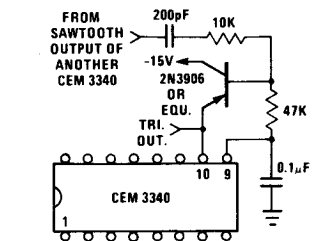FIGURE 3: ADDING HYSTERESIS TO PULSE SHAPER.

FIGURE 4: METHOD FOR SYNC ON RISING OR FALLING EDGE.

FIGURE 5: CONVENTIONAL HARD SYNC

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