



CURTIS ELECTROMUSIC SPECIALTIES

# CEM 3312

## Voltage Controlled Envelope Generator

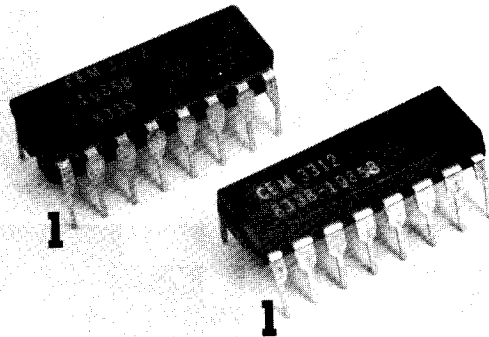
The CEM 3312 is a self-contained, precision ADSR type envelope generator intended for musical instruments and other sound generation applications. A unique feature of this device is an additional control input, called Peak, which allows the overall amplitude of the envelope waveform to be varied without affecting any of the time constants. Thus, "amount of envelope" can be precisely controlled and without the need for an extra VCA. The Peak control input may be varied from 0 to +6.5 volts, causing the envelope amplitude to vary from 0 to +5 volts.

Attack, decay, and release times are exponentially voltage controllable over a wide range, and the sustain level is linearly voltage controllable from 0 to 100% of the peak voltage. The novel design approach pioneered by Curtis still provides the best control voltage rejection in the industry. In addition, much care has been given in the design to allow superior tracking and repeatability of all parameters from unit to unit without trimming (such as using an external resistor for  $R_X$  instead of the wide tolerance monolithic resistor used in competing units). Finally, the control voltage required for all five inputs ranges from zero to positive, allowing easy interface to the system Sample & Holds.

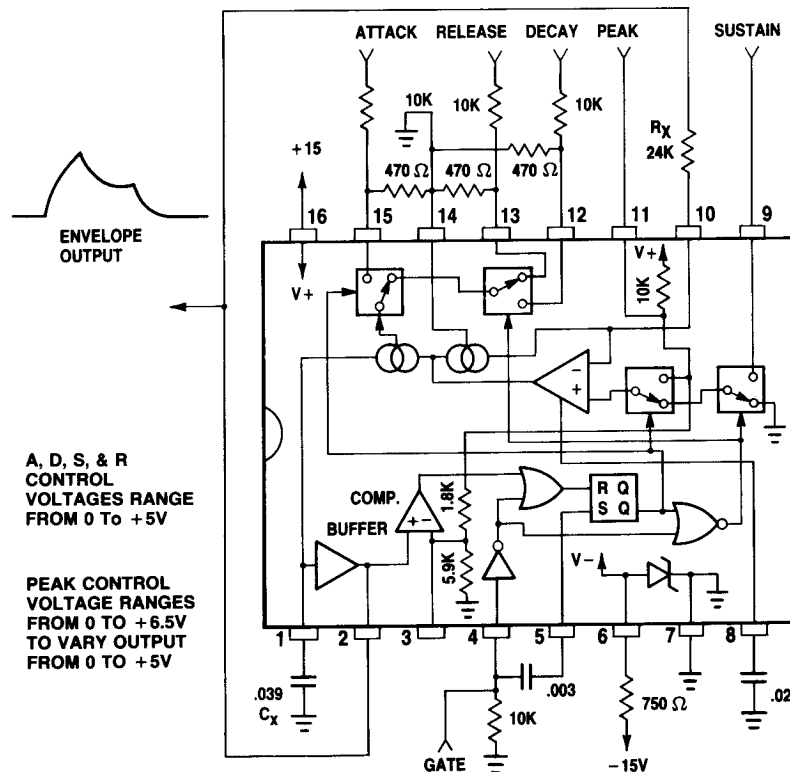
Precise, flexible, and low in cost, the CEM 3312 is the ideal choice for dynamic polyphonic envelope generation.

### Features

- New Parameter, called Peak, for Controlling the Amplitude of the ADSR Waveform
- Eliminates "Envelope Amount" VCA
- True RC Envelope Shape
- All Control Inputs Range Zero to a Positive Voltage for Easy Interface to Sample & Holds.
- Exceptionally Low Control Voltage Feedthrough.
- Accurate Exponential Time Control Scales
- Good Repeatability and Tracking Between Units Without External Trim
- Independent Gate and Trigger



### Circuit Block and Connection Diagram



# CEM 3312

## Electrical Characteristics

V <sub>CC</sub> = +15.0V V <sub>EE</sub> = -15.0V R <sub>X</sub> = 24K T <sub>A</sub> = 20°C				
Parameter	Minimum	Typical	Maximum	Units
Time Control Range	50,000:1	250,000:1	—	—
Attack Asymptote Voltage (V <sub>Z</sub> ) <sup>1</sup>	6.1	6.5	6.9	V
Attack Peak Voltage (V <sub>P</sub> ) <sup>1</sup>	4.7	5.0	5.3	V
Peak C.V. Range	0	—	6.5	V
Envelope Amplitude to Peak C.V. Ratio	.735	.765	.795	
Peak C.V. Input Impedance	3.2	4.3	5.4	Kohm
Sustain C.V. Range <sup>2</sup>	0	—	+5.0	V
Time Constants C.V. Range <sup>3</sup>	0	—	+240	mV
Control Scale Factor	+58.5	+60	+61.5	mV/Decade
Temperature Coefficient of Control Scale	+3,000	+3,300	+3,600	ppm
ATK, DCY, RLS Scale Tracking	-300	0	+300	µV/Decade
Exponential Full Scale Control Accuracy <sup>4</sup>				
50nA < I <sub>O</sub> < 50µA	—	0.3	1.5	%
2nA < I <sub>O</sub> < 200µA	—	2	10	%
Attack C.V. Feedthrough <sup>5</sup>	—	6	90	µV
Decay C.V. Feedthrough <sup>5</sup>		NONE		
Release C.V. Feedthrough <sup>5</sup>		NONE		
Attack Asymptote Error (V <sub>O</sub> - V <sub>CP</sub> )	-3	+10	+23	mV
Sustain Final Voltage Error (V <sub>O</sub> - V <sub>CS</sub> )	-3	+10	+23	mV
Release Final Voltage Error (V <sub>O</sub> )	-3	+10	+23	mV
RC Curve Asymptote Error <sup>6</sup>				
V <sub>CA,D,R</sub> = 0	—	-6	-60	µV
V <sub>CA,D,R</sub> = +240mV	—	-125	-1250	mV
Input Current (I <sub>IN</sub> ) to Output Current (I <sub>O</sub> )				
Ratio, V <sub>CA,D,R</sub> = 0	.75	1	1.3	
Charge Current (ATK)	.83	1	1.2	
Discharge Current (DCY, RLS)				
Buffer Input Current (I <sub>B2</sub> )	—	-0.5	-5	nA
Op Amp Input Current (I <sub>B1</sub> )	-150	-400	-800	nA
Gate Threshold	2.0	2.3	2.6	V
Gate Input Current	+5	+25	+100	µA
Trigger Pulse Required to Trigger Envelope	+1.1	+1.3	+1.5	V
Trigger Input Impedance	2.4	3	4	Kohm
Time Control Input Current	-0.5	—	-2500	nA
Sustain Control Input Current	-150	-400	-800	nA
Output Current Sink Capability	-420	-560	-700	µA
Buffer Output Impedance	100	200	350	ohm
Positive Supply Voltage Range	+10.5	—	+18	V
Negative Supply Voltage Range <sup>8</sup>	-4.5	—	-18	V
Supply Current	5.6	7.5	9.4	mA

## Notes

**Note 1:** Peak C.V. input pin left open.

**Note 2:** Must never be greater than Peak C.V.

**Note 3:** Nominal for 10,000:1 time constant range. Can be larger. See Hints.

**Note 4:** Scale factor determined at mid-range. Spec represents total deviation from ideal at range extremities.

**Note 5:** Output is at either sustain final voltage or release final voltage. V<sub>CA,D,R</sub> varies 0 to +240mV.

**Note 6:** Spec represents the difference between the actual final voltages (attack asymptote voltage, sustain final voltage, and release final voltage in the case of attack, decay, and release respectively) and the apparent voltage to which the output seems to be approaching asymptotically.

**Note 7:** Spec also represents time constant variation between units for V<sub>CA,D,R</sub> = 0.

**Note 8:** Current limiting resistor required when V<sub>ee</sub> > -6.0 volts.

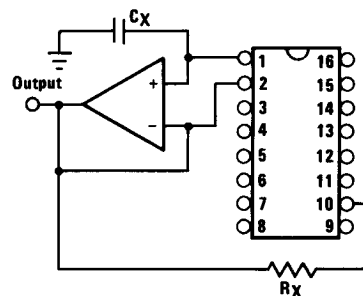
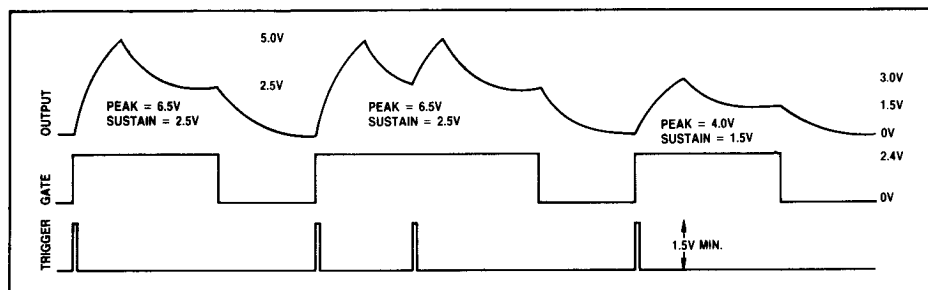


Figure 1: Connection to External Buffer

## Input and Output Waveforms



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