CURTIS ELECTROMUSIC SPECIALTIES

CEM 3310

Voltage Controlled Envelope Generator

The CEM3310 is a self-contained, precision ADSR type of envelope generator intended for electronic music and other sound generation applications. 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. A unique design approach allows for a 10,000 times improvement in control voltage rejection over conventional designs. In addition, much care has been given to the accuracy, repeatability and tracking of the parameters from unit to unit without external trimming. The times are to a first order determined only by the external resistor and capacitor and constant of physics, KT/q. Wide tolerance monolithic resistors are not used to set up the time constants or the control scale. Finally, all four control inputs are isolated from the rest of the circuitry so that the control pins of tracking units may be simply tied together. Although a low voltage process has been used to lower the cost and lower the leakage currents, an internal 6.5 volt Zener diode allows the chip to be powered by ± 15 volts supplies, as well as +15, -5 volt supplies.

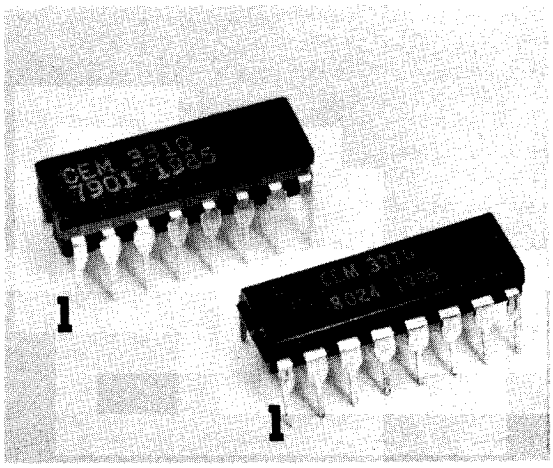


* **Zero to -5V Varies the Times from 2mS to 20S**

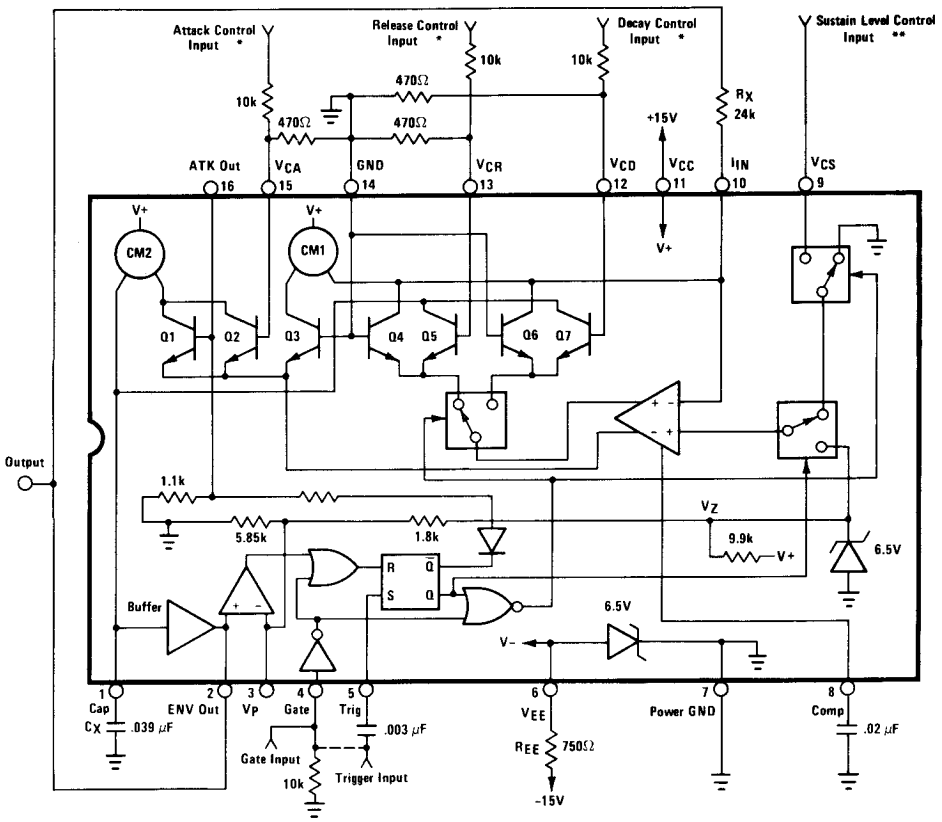
** **Zero to +5V Varies the Sustain Level from 0 to 100%**

Features

- Low Cost
- Third Generation Design
- Large Time Control Range: 50,000 min
- Full ADSR Response
- True RC Envelope Shape
- Exceptionally Low Control Voltage Feedthrough: 90μV max
- Accurate Exponential Time Control Scales
- Isolated Control Inputs
- Good Repeatability and Tracking Between Units Without External Trim
- Independent Gate and Trigger
- ± 15 Volt Supplies



Circuit Block and Connection Diagram

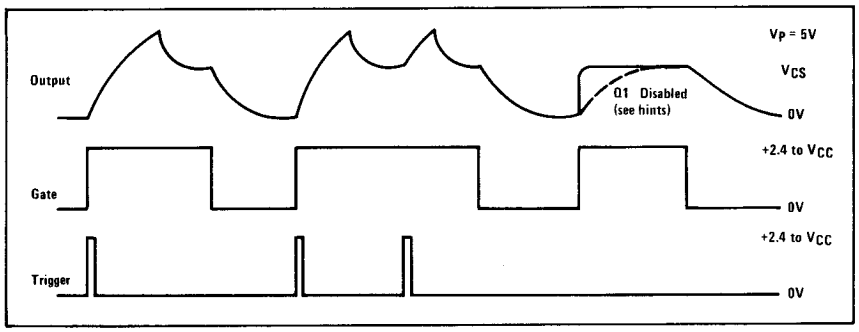


CEM 3310

Electrical Characteristics

V_{CC} = +15.0V V_{EE} = -5.0 to -15.0V R_X = 24K T_A = 25°C				
	MIN	TYP	MAX	Units
Time Control Range	50,000:1	250,000:1	–	
Attack Asymtote Voltage (V_Z)	6.1	6.5	6.9	V
Attack Peak Voltage (V_p)	4.7	5.0	5.3	V
Attack Peak to Asymptote Tracking	–	1.5	4	%
Control Scale Sensitivity	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[1]				
50nA < I_O < 50 μA	–	0.3	1.5	%
2nA < I_O < 200 μA	–	2	10	%
Attack C.V. Feedthrough[2]	–	6	90	μV
Decay C.V. Feedthrough[2]		NONE		
Release C.V. Feedthrough[2]		NONE		
Sustain Final Voltage Error (V_O-V_{CS})	-3	+10	+23	mV
Release Final Voltage Error (V_O)	-3	+10	+23	mV
RC Curve Asymptote Error[3]				
$V_{CA,D,R}$ = 0	–	-6	-60	μV
$V_{CA,D,R}$ = -240mV	–	-125	-1250	mV
Input Current (I_{IN}) to Output Current (I_O) Ratio, $V_{CA,D,R}$ = 0.[5]				
Charge Current (ATK)	.75	1	1.3	
Discharge Current (DCY, RLS)	.83	1	1.2	
Buffer Input Current (I_{B2})	–	0.5	5	nA
Op Amp Input Current (I_{B1})	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	KΩ
Time Control Input Current	0.5	–	2500	nA
Sustain Control Input Current	150	400	800	nA
Attack Output Signal	-.4	-.8	-1.2	V
Output Current Sink Capability	420	560	700	μA
Buffer Output Impedance	100	200	350	Ω
Positive Supply Voltage Range	+12.5	–	+18	V
Negative Supply Voltage Range[4]	-4.5	–	-18	V
Supply Current	5.6	7.5	9.4	mA

Input and Output Waveforms



Notes

Note 1: Scale factor determined at mid-range. Spec represents total deviation from ideal at range extremities.

Note 2: Output is at either sustain final voltage or release final voltage. $V_{CA,D,R}$ varies 0 to -240mV.

Note 3: 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 4: Current limiting resistor required when V_{EE} > -6.0 volts.

Note 5: Spec also represents time constant variation between units for $V_{CA,D,R}$ = 0.

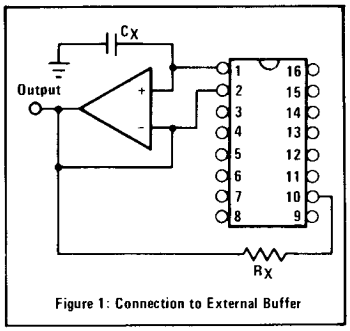


Figure 1: Connection to External Buffer

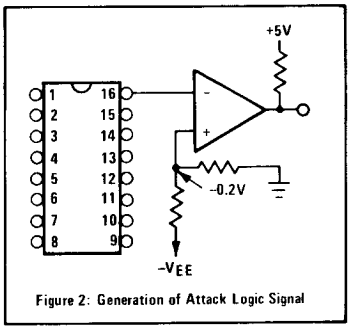


Figure 2: Generation of Attack Logic Signal

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