

tifiers are full-wave averaging type with 100dB dynamic range, followed by LOG converters. The part also contains two operational amplifiers with PNP output transistors connected in a common collector configuration.

Two SSM-2134s are used as input amplifiers, U_1 and U_2 , to provide noninverting, inverting, or balanced inputs. Unbalanced loading is 10k Ω and balanced loading 20k Ω . U_1 and U_2 gain is set at 0dB, and with a -10dBu nominal input signal and $\pm 18V_{DC}$ power, will provide overall circuit headroom of 30dB. The VCA(s) could be DC coupled, although in this application they are AC coupled to reduce the dependence on trimming the side chain voltage modulation feedthrough. In critical applications the feedthrough trim controls and 220k Ω resistors should be added.

The SSM-2120's internal rectifier produces a negative DC voltage referenced to ground. The LOG amplifier bias is set by the 1.5M Ω resistor. The 1.5M Ω resistor also provides the discharge current path for the 1 μ F capacitor, that controls the gate's downward expansion time constant. The LOG amplifier provides a constant current capacitor charging value. It results in an attack (return 0dB gain) time constant T_C of approximately 6ms, and a downward expansion T_C of 350ms.

The internal op amp gain A_V is set at 47, with the inverting input also providing the reference voltage. The reference voltage range from the gate threshold control allows the gating to activate at any source signal level from -40dBu to 0dBu. The output from the op amp drive transistor supplies a negative control voltage to the VCA ($+V_C$) control port(s). The VCA(s) control ports have a sensitivity of 6mV/dB. As shown, the voltage divider provides a 2:1 downward expansion slope. Below the threshold level, the gain slope is 2dB $_G$ /dB $_{IN}$.

The VCAs are current output amplifiers that are designed to operate with virtual ground configurations such as U_3 and U_4 . The VCA input current is supplied by the 37.4k Ω resistor and input voltage signal. The virtual ground amplifier feedback resistors are 37.4k Ω . With no VCA control voltage, the overall

circuit voltage gain is 1 (0dB). Other non-gating gains can be attained by changing the output amplifiers feedback resistor value. The VCA input resistor should remain as shown for maximizing the performance of the VCA(s).

TABLE 1: Circuit Performance Specifications

Nominal Input Voltage (-10dBu Out)	-10dBu
Headroom (-10dBu Out)	+30dB
Input Type/Impedance, Balanced Unbalanced	20k Ω 10k Ω
Downward Expander Class	Feedthrough
Threshold Sense Time Constant (6dB)	350ms
Threshold Range (Level)	-40dBu to 0dBu
Gate Deactivate Time Constant	6ms
Signal Rectifier Type	Full-Wave Averaging
Modulation Feedthrough, Trimmed	< -60dBV
Gain Reduction Ratio, Downward Expansion	1 to 2 (-2dB/dB)
Frequency Response (20Hz to 20kHz)	± 0.25 dB
Dynamic Range	100dB
THD + Noise (20Hz to 20kHz)	0.02%
IMD (SMPTE 60Hz & 4kHz, 4:1)	0.05%
Output Voltage Slew Rate	6V/ μ s
Output Voltage (2k Ω Load)	+22dBu
Output Type	Unbalanced
Power Supply	$\pm 18V_{DC}$ Regulated