Low Cost Quad Voltage Controlled Amplifier

SSM2164

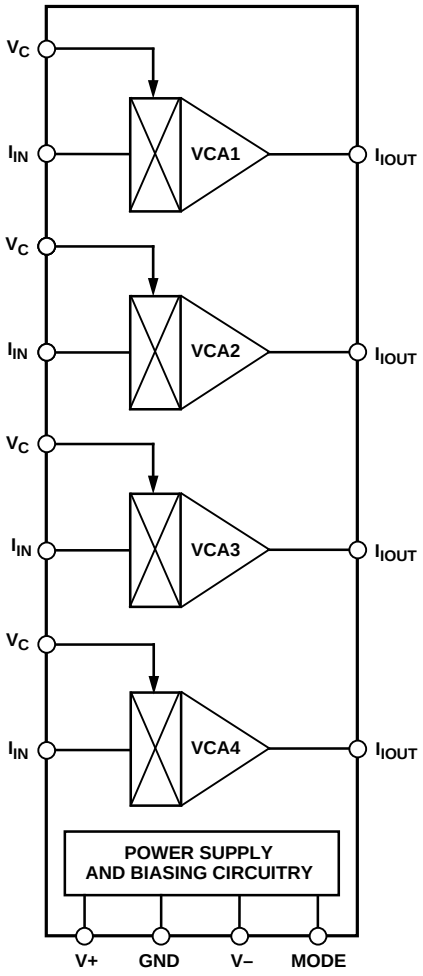
FEATURES

Four High Performance VCAs in a Single Package
0.02% THD
No External Trimming
120 dB Gain Range
0.07 dB Gain Matching (Unity Gain)
Class A or AB Operation

APPLICATIONS

Remote, Automatic, or Computer Volume Controls
Automotive Volume/Balance/Faders
Audio Mixers
Compressor/Limiters/Compandors
Noise Reduction Systems
Automatic Gain Controls
Voltage Controlled Filters
Spatial Sound Processors
Effects Processors

FUNCTIONAL BLOCK DIAGRAM



GENERAL DESCRIPTION

The SSM2164 contains four independent voltage controlled amplifiers (VCAs) in a single package. High performance (100 dB dynamic range, 0.02% THD) is provided at a very low cost-per-VCA, resulting in excellent value for cost sensitive gain control applications. Each VCA offers current input and output for maximum design flexibility, and a ground referenced –33 mV/dB control port.

All channels are closely matched to within 0.07 dB at unity gain, and 0.24 dB at 40 dB of attenuation. A 120 dB gain range is possible.

A single resistor tailors operation between full Class A and AB modes. The pinout allows upgrading of SSM2024 designs with minimal additional circuitry.

The SSM2164 will operate over a wide supply voltage range of ±4 V to ±18 V. Available in 16-pin P-DIP and SOIC packages, the device is guaranteed for operation over the extended industrial temperature range of –40°C to +85°C.

REV. 0

SSM2164–SPECIFICATIONS

ELECTRICAL SPECIFICATIONS (V_S = ±15 V, A_V = 0 dB, 0 dBu = 0.775 V rms, V_{IN} = 0 dBu, R_{IN} = R_{OUT} = 30 kΩ, f = 1 kHz, –40°C < T_A < +85°C using Typical Application Circuit (Class AB), unless otherwise noted. Typical specifications apply at T_A = +25°C.)

Parameter	Conditions	SSM2164 Min	Typ	Max	Units
AUDIO SIGNAL PATH					
Noise	V_{IN} = GND, 20 kHz Bandwidth		–94		dBu
Headroom	Clip Point = 1% THD+N		22		dBu
Total Harmonic Distortion	2nd and 3rd Harmonics Only				
	A_V = 0 dB, Class A		0.02	.1	%
	A_V = ±20 dB, Class A[1]		0.15		%
	A_V = 0 dB, Class AB		0.16		%
	A_V = ±20 dB, Class AB[1]		0.3		%
Channel Separation			–110		dB
Unity Gain Bandwidth	C_F = 10 pF		500		kHz
Slew Rate	C_F = 10 pF		0.7		mA/µs
Input Bias Current			±10		nA
Output Offset Current	V_{IN} = 0		±50		nA
Output Compliance			±0.1		V
CONTROL PORT					
Input Impedance			5		kΩ
Gain Constant	(Note 2)		–33		mV/dB
Gain Constant Temperature Coefficient			–3300		ppm/°C
Control Feedthrough	0 dB to –40 dB Gain Range[3]		1.5	8.5	mV
Gain Matching, Channel-to-Channel	A_V = 0 dB		0.07		dB
	A_V = –40 dB		0.24		dB
Maximum Attenuation			–100		dB
Maximum Gain			+20		dB
POWER SUPPLIES					
Supply Voltage Range		±4		±18	V
Supply Current	Class AB		6	8	mA
Power Supply Rejection Ratio	60 Hz		90		dB

NOTES
[1]–10 dBu input @ 20 dB gain; +10 dBu input @ –20 dB gain.
[2]After 60 seconds operation.
[3]+25°C to +85°C.
Specifications subject to change without notice.

TYPICAL APPLICATION AND TEST CIRCUIT

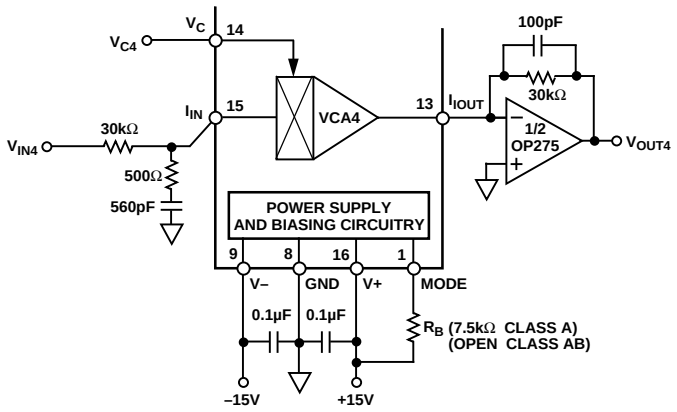


Figure 1. R_{IN} = R_{OUT} = 30 kΩ, C_F = 100 pF. Optional R_B = 7.5 kΩ, Biases Gain Core to Class A Operation. For Class AB, Omit R_B.

ABSOLUTE MAXIMUM RATINGS

Supply Voltage . . . . . ±18 V
Input, Output, Control Voltages . . . . . V– to V+
Output Short Circuit Duration to GND . . . . . Indefinite
Storage Temperature Range . . . . . –65°C to +150°C
Operating Temperature Range . . . . . –40°C to +85°C
Junction Temperature Range . . . . . –65°C to +150°C
Lead Temperature Range (Soldering 60 sec) . . . . . +300°C

Package Type	θ_{JA}*	θ_{JC}	Units
16-Pin Plastic DIP (P Suffix)	76	33	°C/W
16-Pin SOIC (S Suffix)	92	27	°C/W

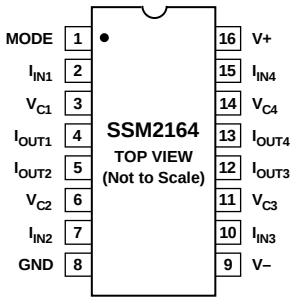
*θ_{JA} is specified for the worst case conditions; i.e., θ_{JA} is specified for device in socket for P-DIP packages, θ_{JA} is specified for device soldered in circuit board for SOIC package.

ORDERING GUIDE

Model	Temperature Range	Package Description	Package Options
SSM2164P	–40°C to +85°C	Plastic DIP	N-16
SSM2164S	–40°C to +85°C	Narrow SOIC	R-16A

PIN CONFIGURATION

16-Lead Epoxy DIP and SOIC



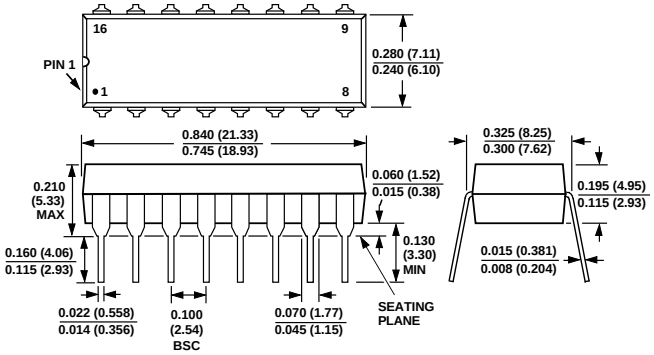
CAUTION

ESD (electrostatic discharge) sensitive device. Electrostatic charges as high as 4000 V readily accumulate on the human body and test equipment and can discharge without detection. Although the SSM2164 features proprietary ESD protection circuitry, permanent damage may occur on devices subjected to high energy electrostatic discharges. Therefore, proper ESD precautions are recommended to avoid performance degradation or loss of functionality.

OUTLINE DIMENSIONS

Dimensions shown in inches and (mm).

16-Pin Plastic DIP (N-16)



16-Pin Narrow SOIC (R-16A)