



AS2164 - Quad voltage exponentially controlled amplifier (VCA)

Features

- four high performance VCAs in a single package
- 0,02% THD
- 0,02% THD
- no external trimming
- 120 dB gain range
- 0,07 dB gain matching (unity gain)
- class A or AB operation
- protection from negative supply turned OFF

Applications

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

General Description

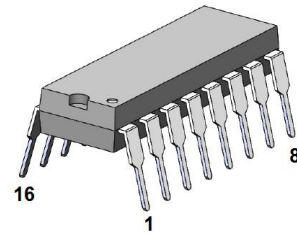
AS2164 contains four independent voltage controlled amplifiers (VCAs) in a single package. High performance (100 dB dynamic range, 0.02% THD) is provided at a very low cost-per-VCA, resulting in excellent value for cost sensitive gain control applications. Each VCA offers current input and output for 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.

AS2164 is internally protected in situations where negative supply is turned OFF.

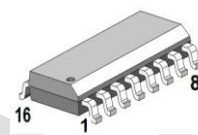
The AS2164 will operate over a wide supply voltage range of ± 4 V to ± 18 V. Available in 16-pin PDIP and SOIC packages,

AS2164



PDIP-16, 300mil, 2.54 mm

AS2164D



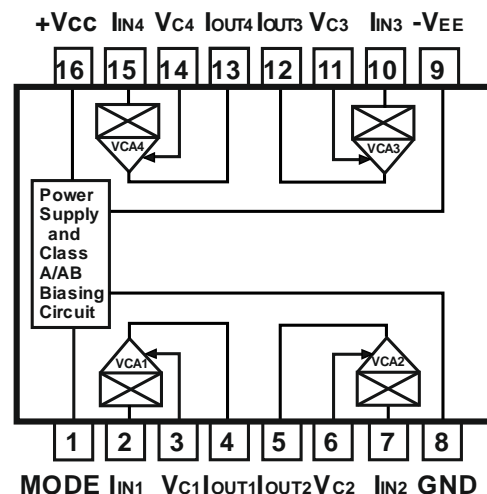
SOIC-16, 150mil, 1.27 mm

PART NUMBER	PACKAGE	BODY SIZE (NOM)
AS2164	PDIP-16	300mil, 2.54 mm pitch
AS2164D	SOIC-16	150mil, 1.27 mm pitch

Pin Information

Pin No	Pin Name	Description
1	MODE	Mode select
2	I _{IN1}	Input current 1
3	V _{C1}	Control voltage 1
4	I _{OUT1}	Output current 1
5	I _{OUT2}	Output current 2
6	V _{C2}	Control voltage 2
7	I _{IN2}	Input current 2
8	GND	Ground
9	V _{EE}	Negative supply
10	I _{IN3}	Input current 3
11	V _{C3}	Control voltage 3
12	I _{OUT3}	Output current 3
13	I _{OUT4}	Output current 4
14	V _{C4}	Control voltage 4
15	I _{IN4}	Input current 4
16	V _{CC}	Positive supply

Figure 1 Block and Connection Diagram





Absolute Maximum Ratings

Unless otherwise specified, $T_{amb} = 25^{\circ}C$

Parameter	Symbol	Value	Unit
Supply voltage	Vcc, Vee	+18, -18	V
Input, Output, Control voltages	Vin, Vout, VCA	V- ~ V+	V
Output Short Circuit Duration to GND		Indefinite	S
Storage Temperature Range	Tstg	-65~+150	$^{\circ}C$
Operating Temperature Range	Topr	-40~+85	$^{\circ}C$
Junction Temperature Range	Tj	-65~+150	$^{\circ}C$
Lead Temperature Range (Soldering 60 sec)		+300	$^{\circ}C$

Electrical Characteristics

Unless otherwise specified: $T_{amb} = 25^{\circ}C$, $V_{CC} = +15V$, $V_{EE} = -15V$, $A_v = 0dB$, $V_{IN} = 0dB\mu$, $R_{IN} = R_{OUT} = 30k\Omega$, $f = 1kHz$, using Typical Application Circuit (Class AB)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
POWER SUPPLY						
Supply Voltage Range	Vcc, Vee		± 4		± 18	V
Supply Current	I _{CCQ}	Class AB		7,5	8,5	mA
Supply Current	I _{ee}	Class A		8		mA
Power Supply Rejection Ratio	PSRR	60Hz		90		dB
CONTROL PORTS						
Input Impedance	R _{IN}			5		k Ω
Gain Constant	G _C	After 60 seconds of operation	-27	-33	-36	mV/dB
Gain Constant Temp. Coefficient	G _{CT}			-3300		ppm/ $^{\circ}C$
Control Feedthrough	V _{CF}	$A_v = 0dB$ to $-40dB$	-8,5	1,5	8,5	mV
Gain Accuracy	ΔG	$A_v = 0dB$		± 0.30		dB
		$A_v = +20dB$		± 0.55		dB
		$A_v = -20dB$		± 0.55		dB
Channel-to-Channel Gain Matching	G _M	$A_v = 0dB$		0,07	0.1	dB
		$A_v = -40dB$		0,24	0.5	dB
Maximum Attenuation	G _A		90	-110	200	dB
Maximum Gain	G _{MAX}		17	22	23	dB
SIGNAL INPUTS						
Input Bias Current	I _{IB}			± 10		nA
Input Current Handling	I _{IH}			2		mA
SIGNAL OUTPUTS						
Output Offset Current	I _{IO}	V _{in} = 0		± 60		nA
Output Compliance	V _{OD}			± 100		mV
PERFORMANCE						
Output Noise	V _{NO}	Class AB				
		R _{in/out} = 30k Ω		-93		dB μ
		R _{in/out} = 20k Ω		-96		dB μ
		R _{in/out} = 10k Ω *		-100		dB μ
		R _{in/out} = 7.5k Ω *		-101		dB μ
		Class A				
R _{in/out} = 30k Ω		-80.5		dB μ		
R _{in/out} = 20k Ω		-84		dB μ		

Electrical Characteristics Continued

Parameter	Symbol	Conditions	Min	Typ	Max	Units	
Headroom	HR	Rin/out = 10kQ*		-90		dBμ	
		Rin/out = 7.5kQ*		-92		dBμ	
		Clip point=1%THD+N		22		dBμ	
Total Harmonic Distortion	THD	Class AB (80kHz BW, f=1kHz)					
		Av = 0dB		0,058		%	
		Av = 0dB, VIN = -15dBu		0,037		%	
		Av = +20dB, Vin= -10dBu		0,17		%	
		Av = -20dB, Vin=+10dBu		0,15		%	
		Class A(BW80kHz,f=1kHz)					
		Av = 0dB		0,02	0,1	%	
		Av = 0dB, VIN= -7dBu		0,025		%	
Av = +20dB, Vin=-10dBu		0,045		%			
Av = -20dB, Vin=+10dBu		0,118		%			
Channel Separation	Sep			-110		dB	
Unity Gain Bandwidth	GB	C _F =10pF		500		kHz	
Slew Rate	SR	C _F =10pF		700		μA/μs	

* Requires changes to input RC compensation network which will be advised in a future data sheet update

Figure 2 Typical Application and Test Circuit

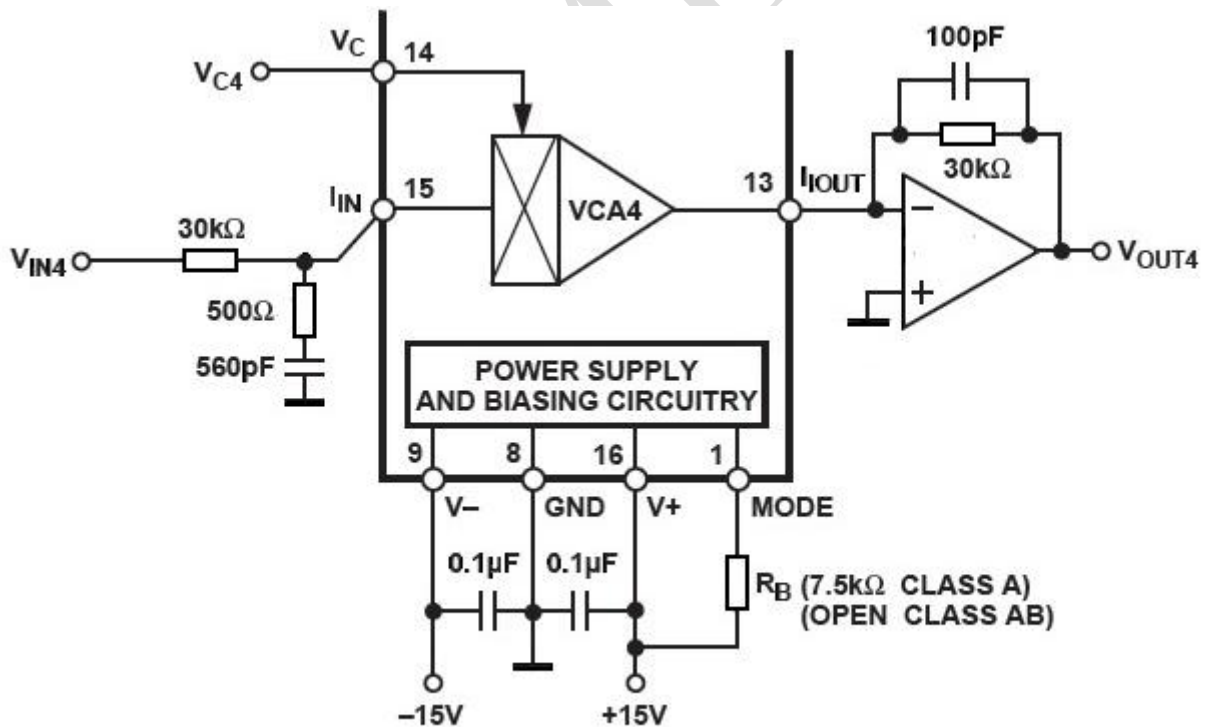
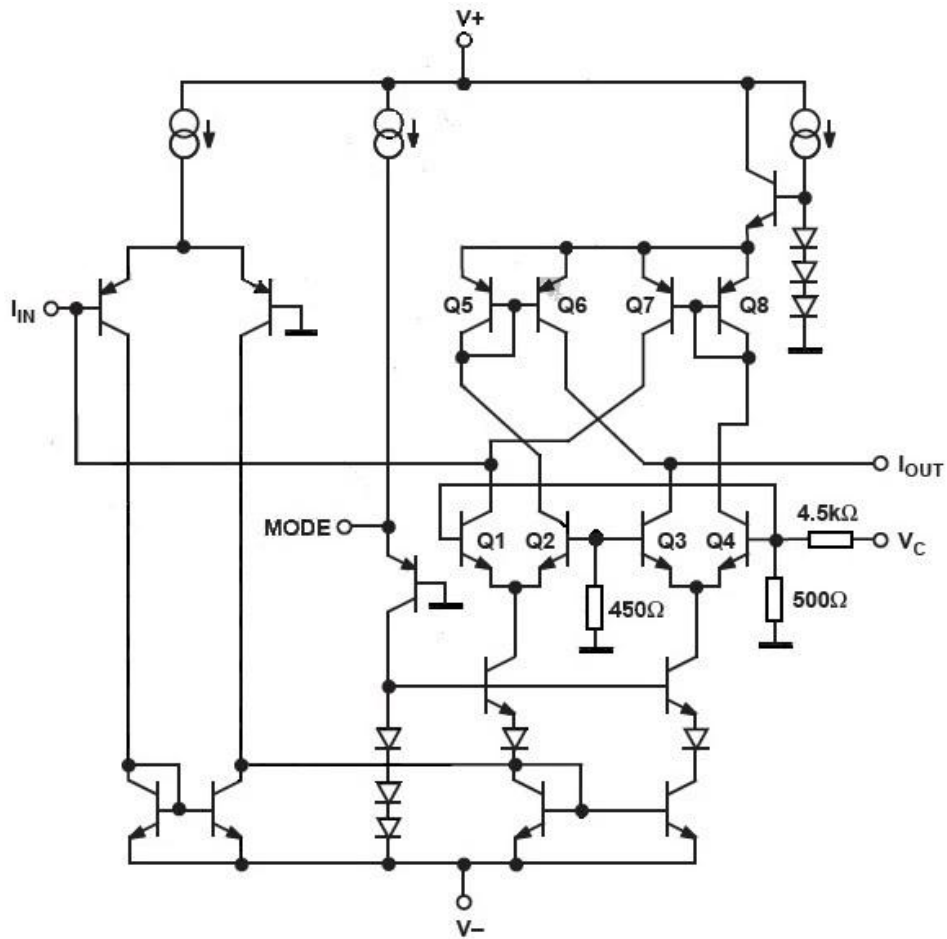


Figure 3 Simplified Schematic (One Channel)

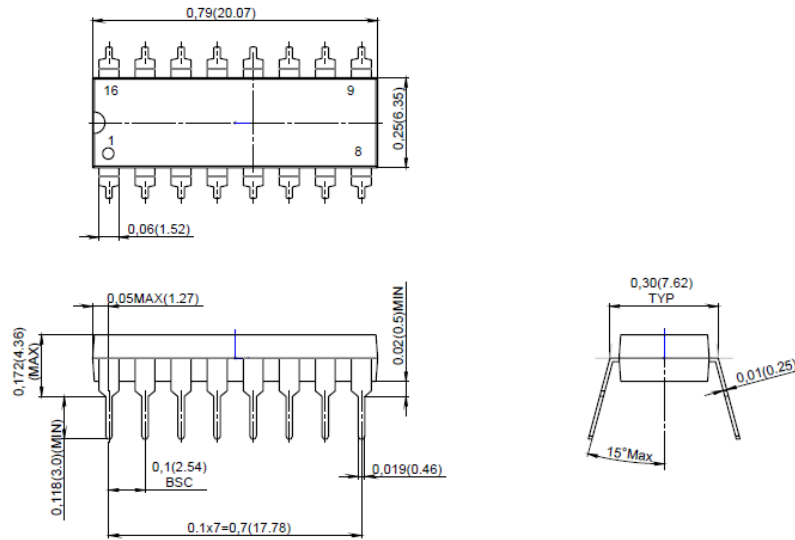


Device type	Package
AS2164	PDIP-16 (300 Mil, 2.54)
AS2164 D	SOIC-16 (150 Mil, 1.27)

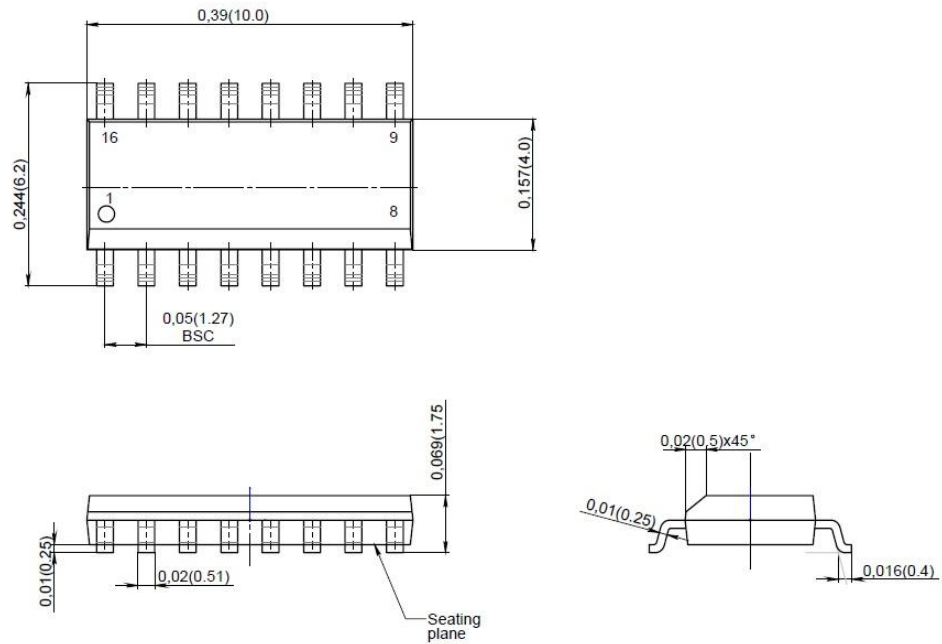


Package Information

Units: inch (mm)
 PDIP-16 (300 Mil)



SOIC-16 (150Mil)



Revision history

Date	Revision	Changes
26-Mar-2019	1	Preliminary version 1