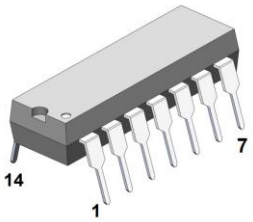
AS3360, AS3360A - Dual Voltage Controlled Amplifier (VCA)

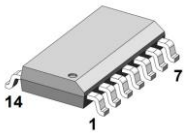
FEATURES

- two independent VCAs in a single 14 pin package simple to use - few external components required
- exceptionally low control feedthrough without trimming: 10mV maximum - 10 V.P.P. output
- low noise: -110 dB typical
- no trimming required
- summing node signal inputs
- current outputs capable of swinging to within 1,5V of each supply
- linear and exponential control

AS3360, AS3360A
PDIP-14 (300 mil)



AS3360D
SOIC-14 (150mil)



APPLICATIONS
for electronic music

General Description

The AS3360, AS3360A is a dual general purpose voltage controlled transconductor intended for such applications as voltage controlled amplifiers, filters, and waveform generators. Each transconductor independently provides both linear and exponential control scaling over greater than a 100 dB range (AS3360A). Complete with virtual ground summing inputs, wide voltage compliance current outputs, and control inputs referenced to ground, the AS3360 requires exceptionally few external components and is extremely easy to use.

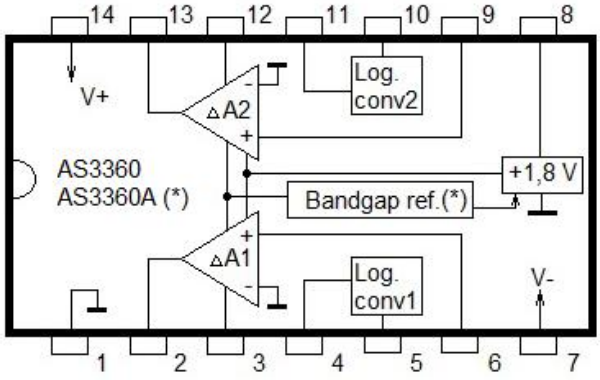
Because of its inherent ultra-low control feedthrough, no trimming is required. Added to these features are exceptionally low noise and wide bandwidth making the AS3360 a real cost saver in most applications requiring variable transconductance amplifiers.

AS3360A benefits from internal bandgap reference which improves stability of reference voltage and output current of VCA and improved level of attenuation of output current at zero control voltage.

Pin Information

PDIP-14 SOIC-14 Pin No	Pin Name	Description
1	GND	Ground
2	I_{O1}	Signal Output 1
3	V_{E1}	Exp. Control Voltage Input 1
4	V_{O1}	Log Converter Output 1
5	V_{C1}	Linear Control Input 1
6	I_{I1}	Current Input 1
7	V_{EE}	Negative Supply Voltage
8	V_{REF}	Reference Voltage
9	I_{I2}	Current Input 2
10	V_{C2}	Linear Control Input 2
11	V_{O2}	Log Converter Output 2
12	V_{E2}	Exp. Control Voltage Input 2
13	I_{O2}	Signal Output 2
14	V_{CC}	Positive Supply Voltage

Block Diagram



Absolute Maximum Ratings

Voltage Between V_{CC} and V_{EE} Pins	26V
Voltage Between V_{CC} and GND Pins	+3V to +16V
Voltage Between V_{EE} and GND Pins	-3V to -16V
Linear Control Voltage	-2V to +2,5V
Exponential Control Voltage	-2V to +2,5V
Storage Temperature Range	- 55°C to 150°C
Operating Temperature Range	- 25°C to +75°C

Typical Electrical Characteristics

V_{CC}=+12V V_{EE} = -12V T_A= 20°C

Parameter	Min.	Typ.	Max.	Units
Control Range, Linear and Exponential	100	-	-	dB
Control Scale Factor				
Exponential[1] AS3360 , AS3360 *,** , AS3360A	+ 2,7	+ 3	+ 3,3	mV/dB
Linear AS3360	48	52	56	%/V
AS3360*	55	60	66	
AS3360**	44	46	48	
AS3360A	55	60	63	
Tempco of Control Scales				
Exponential	+ 3000	+ 3300	+ 3600	ppm
Linear	-	±250	±750	ppm
Control Scale Error				
Exponential[2]				
AS3360 , AS3360*, AS3360**	-	0,6	2	dB
AS3360A		0,5	1	
Linear				
AS3360, AS3360*,AS3360**	-	3	6	% (FS)
AS3360A		1,5	3	
Maximum Cell Current Gain[3]	0,9	1	1,1	
Maximum Signal Input and Output Current	±300	±400	±500	µA
Signal Input Offset	-10	0	+ 10	mV
Control Feedthrough Without Trim[4]	-	±0.07	±0.3	µA
Total Harmonic Distortion[3]	-	1	3	%
Output Noise Current [5]	-	0,4	1,2	nA R.M.S.
Signal Current Bandwidth	2	5	-	MHz
Signal Current Slew Rate[3]	0.5	1.5	-	mA/µS
Crosstalk Between VCAs[6]	-80	-90	-	dB
Signal Attenuation for Linear Control Input = 0V [7]				
AS3360 , AS3360* , AS3360**	70	80	-	dB
AS3360A	100	120	-	
Linear Control Voltage for Maximum Gain				
AS3360 , AS3360* , AS3360**	1,6	1,7	1,8	V
AS3360A	1,7	1,8	1,9	
Exponential Control Voltage Range, Referred to V_{REF} (Pin 8)	+ 20	-	-280	mV
Control Input Bias Current				
Exponential[3]	-0,3	-0,8	-1,5	µA
Linear	-0,5	-1,6	-4	µA
Output Impedance[3]	5	12	-	MOhm
Output Voltage Compliance[3]	V_{EE}+1.2	-	Vcc-0.8	V
Reference Voltage (Pin 8)	1,6	1,7	1,8	V
Positive Supply Voltage Range [8]	+3	-	+16	V
Negative Supply Voltage Range [8]	-3	-	-16	V
Supply Current				
AS3360 , AS3360*, AS3360**	3,8	4,8	6	mA
AS3360A	2	3	4	

Note 1. Current gain is - 20dB to - 80dB. Control voltage is referenced to pin 8.
Note 2. Best straight line. Most of this error occurs at range extremities.
Note 3. Output Signal Current is ±100µA.
Note 4. Over entire control range. Signal input is open.
Note 5. In 16 to 16KHz bandwidth.
Note 6. At 1KHz.
Note 7. For negative supply less than 12 volts, this attenuation is greater.
Note 8. Total supply voltage across chip should not exceed 26V.
Specifications subject to change without notice.

Application

Structure of AS3360 benefits from possibility of output stage to generate current not only in conditions when output voltage is approximately zero, but also in conditions when output voltage is changing in wide diapazone (but with worth linearity). These flexibility allows different vairants of shematic solutions - from IU converter which holds virtual zero on AS3360A output, or simple resistor on which output current forms voltage.

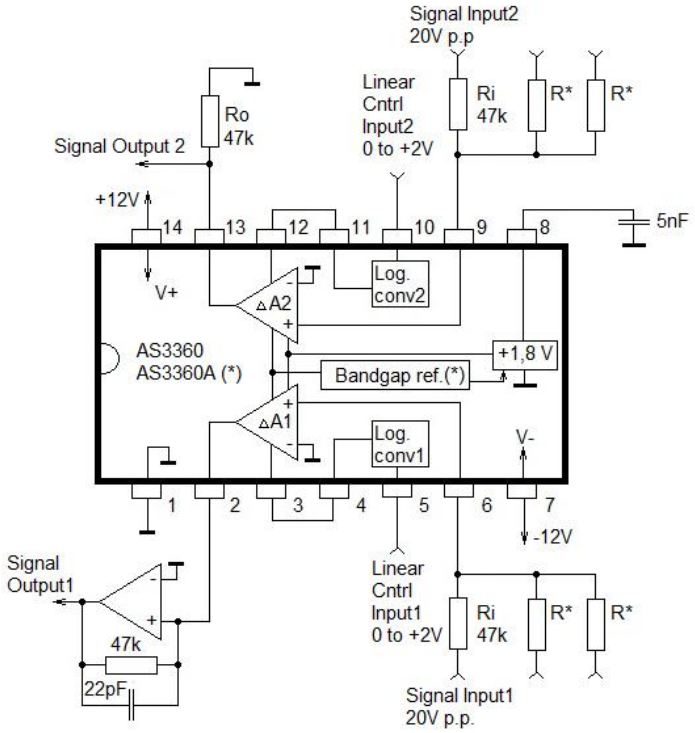


Fig.1 Different variants of forming output voltage

On Fig.1 both mentioned above methodes are presented. Channel 1 with additional OpAmp , which holds virtual zero on AS3360 output and Channel 2 with voltage formed on simple resistor.

Wide voltage swing on AS3360 output allows realisation of different filter stuctures and VCOs controlled by exp/lin control voltage.

Simple variant of VCA with exponential control is shown on Fig.2.

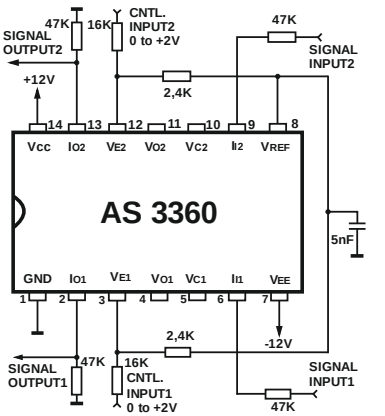


Fig. 2 Simple connection for exponential control scale

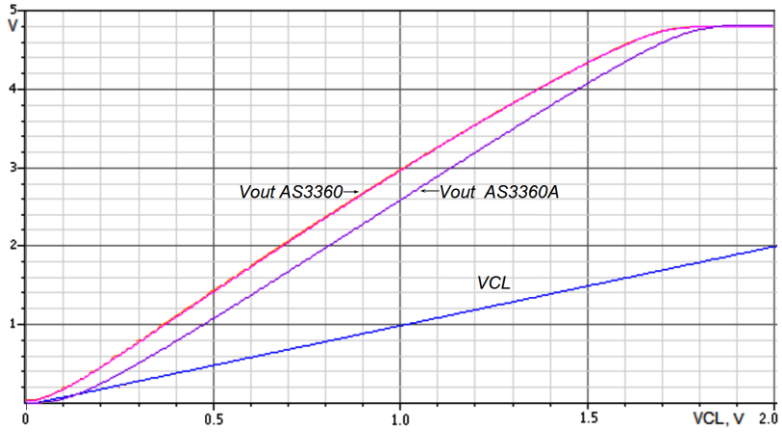


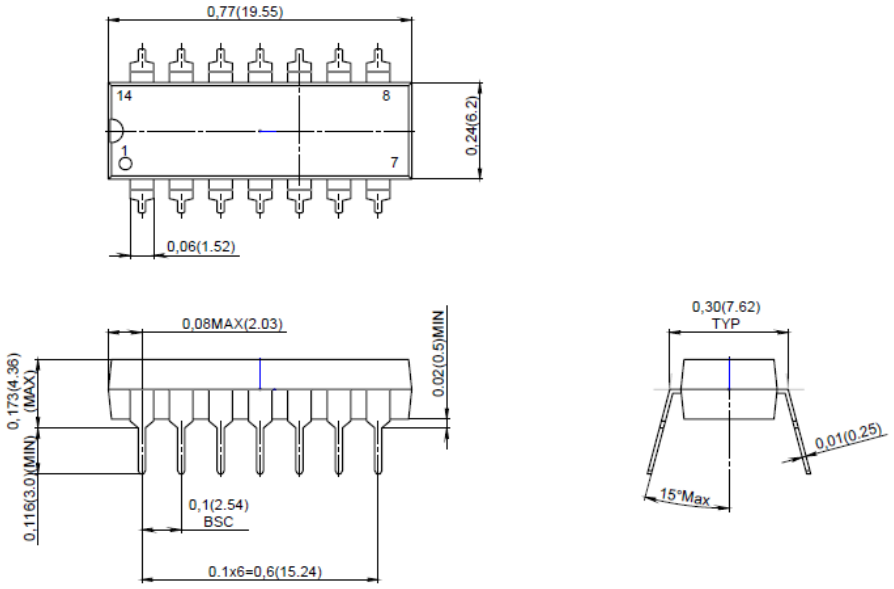
Fig. 3 Typical AS3360 and AS3360A output voltage versus VCL control voltage in application on Fig.1

Device type	Package	Additional marking
AS3360	PDIP-14 (300 Mil)	----
AS3360*	PDIP-14 (300 Mil)	white dot
AS3360**	PDIP-14 (300 Mil)	two white dot
AS3360D	SOIC-14 (150 Mil)	----
AS3360D*	SOIC-14 (150 Mil)	white dot
AS3360D**	SOIC-14 (150 Mil)	two white dots
AS3360A	PDIP-14 (300 Mil)	----

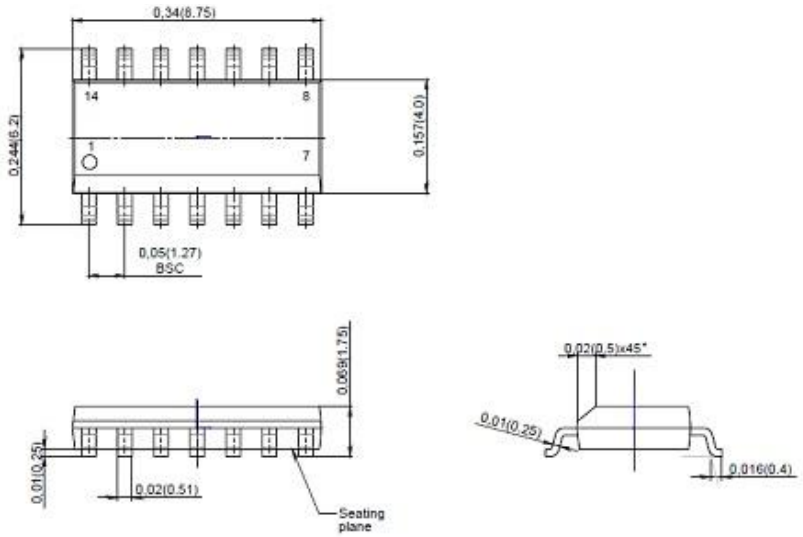
Package Information

Units: inch (mm)

PDIP-14 (300 mil)



SOIC-14 (150 mil)



Revision history

Date	Revision	Changes
27-Sep-2017	**1**	Preliminary version 1
21-May-2018	**2**	The control voltage range at the linear control input and Reference Voltage are adjusted
30-May-2018	**3**	Minor changes
12-Nov-2018	**4**	Figure - Connection for exponential control scale
25-Nov-2019	**5**	Added Group * in Control Scale Factor
04-Apr-2022	**6**	AS3360A included