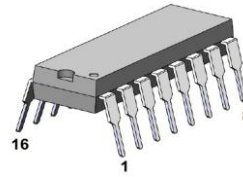




**AS3340 / AS3345, AS3340A / AS3345A - Voltage Controlled Oscillator (VCO)**

- Large Sweep Range: 500,000:1
- Fully Temperature Compensated
- Four Output Waveforms Available; No waveform trimming required
- Summing Node Inputs for Frequency Control
- High Exponential Scale Accuracy
- Low Temperature Drift
- Voltage Controlled Pulse Width
- Hard and Soft Sync Inputs
- Linear FM
- Buffered, Short Circuit Protected Outputs
- ±15 Volt Supplies

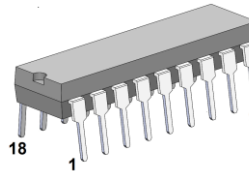
**AS3340 / AS3340A**  
 PDIP-16 (300 mil)



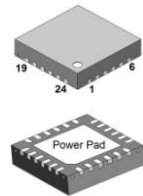
**AS3340D / AS3340AD**  
 SOIC-16 (150 mil)



**AS3345 / AS3345A**  
 PDIP-18 (300 mil)



**AS3345F/AS3345AF**  
 QFN-24, 4x4mm, 0,5mm



**APPLICATIONS**

for electronic music

**General Description**

The AS 3340 and AS 3345 are completely self contained, precision voltage controlled oscillators, featuring both exponential and linear control scales and up to four buffered output waveforms: triangle, sawtooth, square, and pulse with voltage controllable pulse width. Full temperature compensation makes these VCOs extremely stable, and eliminates the need for a temperature compensation resistor. The highly accurate exponential and linear control inputs are virtual ground summing nodes, allowing multiple control voltages to be mixed within the device itself.

Also included is provision for hard and soft synchronization of the frequency, and an output for easy adjustment of high frequency tracking. Special care in the design ensures oscillation start-up under any power-on sequence and supply conditions.

An on-chip 7.4 volt Zener diode allows the device to operate off ±15 volt supplies, as well as +12, -5 volt supplies. For voltages greater than -7.5 volts, a series current limiting resistor  $R_{EE}$  must be added between pin 3 and the negative supply. Its value is calculated as follows:

$$R_{EE} = (V_{EE} - 7.4) / .008$$

To minimize self-heating and improve thermo-stability it is recommended to keep  $V_{EE} = -5V$  (external power supply).

Power pad in QFN package highly improves thermal stability of parameters of AS3345F. External  $V_{EE}$  also minimize current

through GND and improves VCO stability.

Scale1 and Scale2 pins are used for trimming of thermo-compensation circuit. Resistor  $R_z$ , connected to Scale 1 pin, should provide the same current (approx.. 100 uA) flowing in Scale2 pin determined by resistor  $R_T = 5.72k$ .

$R_s$ , resistor connected to pin Scale, is intended to trim V/oct range.

AS3340A/AS3345A are improved versions of AS3340/AS3345. AS3340A/AS3345A and have much more output frequency stability against  $V_{cc}$  and  $V_{EE}$ . Frequency stability can be improved if external reference voltage (with level approximately 1/3  $V_{cc}$ ) is connected to pin 9 (Soft Sync. Input). AS3340A/AS3345A benefits from improved symmetry of rising and falling edge of triangle signal (approx.. 50%).

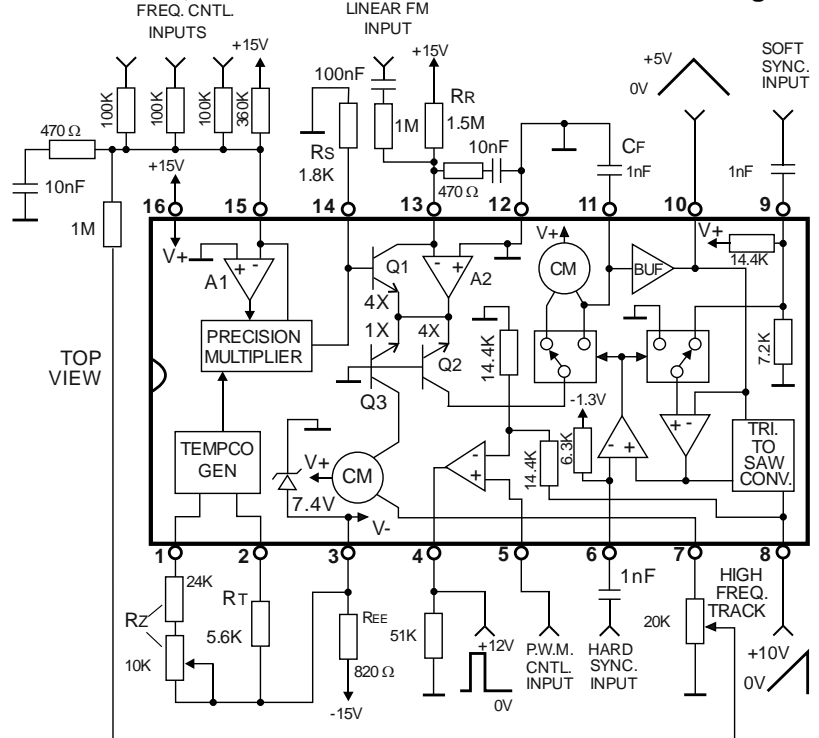
AS3345/AS3345A benefits from additional Meander Output. Meander edge starts when Triangle changes it's direction. These feature gives additional opportunities for design.



**AS3340, AS3340A Pin Information**

PDIP-16, SOIC-16 Pin No	Pin Name	Description
1	Scale 1	Scale Adjust 1
2	Scale 2	Scale Adjust 2
3	V <sub>EE</sub>	Negative supply
4	V <sub>P</sub>	Pulse Output
5	V <sub>PWM</sub>	PWM Control Input
6	V <sub>HSI</sub>	Hard Synchronization Input
7	V <sub>HFT</sub>	High Frequency Track
8	V <sub>SO</sub>	Sawtooth Output
9	V <sub>SSI</sub>	Soft Synchronization Input
10	V <sub>TO</sub>	Triangle Output
11	Cap	Capacitor
12	GND	Ground
13	V <sub>LFI</sub>	Linear FM Input
14	V <sub>S</sub>	Scale
15	V <sub>FCI</sub>	Frequency Control Input
16	V <sub>CC</sub>	Positive supply

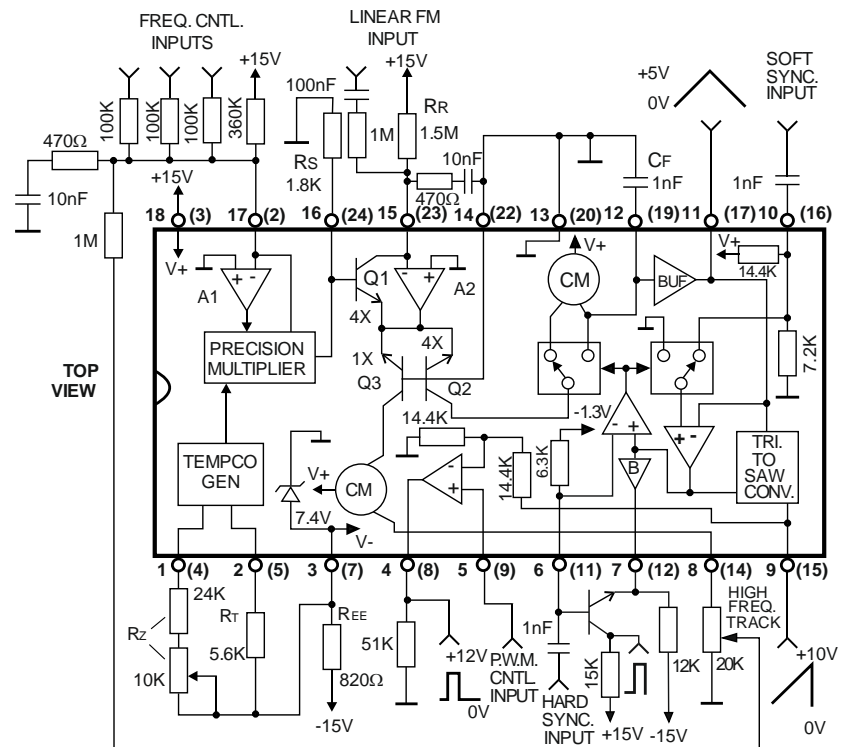
**AS3340, AS3340A Circuit Block and Connection Diagram**



**AS3345, AS3345A Pin Information**

PDIP-18, Pin No	QFN-24, Pin No	Pin Name	Description
1	4	Scale 1	Scale Adjust 1
2	5	Scale 2	Scale Adjust 2
3	7	V <sub>EE</sub>	Negative supply
4	8	V <sub>P</sub>	Pulse Output
5	9	V <sub>PWM</sub>	PWM Control Input
6	11	V <sub>HSI</sub>	Hard Synchronization Input
7	12	V <sub>MO</sub>	Meander Output
8	14	V <sub>HFT</sub>	High Frequency Track
9	15	V <sub>SO</sub>	Sawtooth Output
10	16	V <sub>SSI</sub>	Soft Synchronization Input
11	17	V <sub>TO</sub>	Triangle Output
12	19	Cap	Capacitor
13	20	GND	Ground
14	22	GND	Ground
15	23	V <sub>LFI</sub>	Linear FM Input
16	24	V <sub>S</sub>	Scale
17	2	V <sub>FCI</sub>	Frequency Control Input
18	3	V <sub>CC</sub>	Positive supply
-	1,6,10,13,18,21	NC	Not connected
-	Power Pad	Power Pad	Don't connect

**AS3345, AS3345A Circuit Block and Connection Diagram PDIP-18 (QFN-24)**

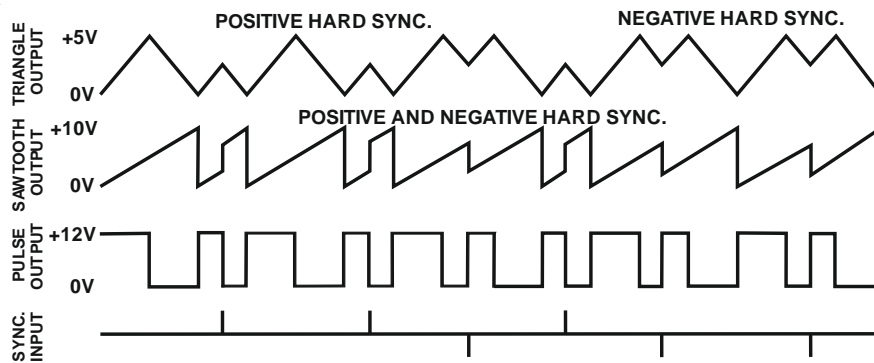




## Absolute Maximum Ratings

Voltage Between $V_{CC}$ and $V_{EE}$ Pins	+24V, -0,5V
Voltage Between $V_{CC}$ and GND Pins	+18V, -0,5V
Voltage Between $V_{EE}$ and GND Pins	-6V, +0,5V
Current through Any Pin	$\pm 40\text{mA}$
Voltage Between Frequency Control Pin or Reference Current Pin and GND Pin	$\pm 6\text{V}$
Voltage Between Multiplier Output Pin and GND Pin	+6V, -1V
Storage Temperature Range	- 55°C to 120°C
Operating Temperature Range	- 25°C to 75°C

## Output Waveforms (different types of Sync)





Typical Electrical Characteristics

$V_{CC}=+15V$   $V_{EE}$  = Internal Zener  $T_A= 20^\circ$

Parameter	Min.	Typ.	Max.	Units
Frequency Control Range	50K:1	500K:1	-	
Exponential Scale Error, Untrimmed <sup>1</sup>	-	0.2	1	%
Exponential Scale Error, Trimmed <sup>1</sup>	-	0.05	0.3	%
Multiplier Gain Errors <sup>2</sup>	-	0.0005	0.008	%/ $\mu A$
Tempo Cancellation <sup>3</sup>	-150	0	+150	ppm
Oscillator Drift <sup>4</sup>	-	$\pm 50$	$\pm 200$	ppm
Triangle Buffer Input Current	-	0.3	3	nA
Triangle Waveform Upper Level	4.85	5.0	5.15	V
Triangle Waveform Lower Level	-15	0	+15	mV
Triangle Waveform Symmetry	45	50	55	%
Sawtooth Waveform Upper Level	9.4	10.0	10.6	V
Sawtooth Waveform Lower Level	-25	0	+25	mV
Triangle Output Sink Capability	400	550	750	$\mu A$
Sawtooth Output Sink Capability	640	800	1000	$\mu A$
Triangle & Sawtooth Output Impedance <sup>5</sup>	65	100	150	$\Omega$
Pulse Output Source Capability at +10V	2.8	3.5	4.6	mA
Squarewave Output Levels <sup>6</sup> , AS3345	-1.8, -0.4	-1.3, 0	-0.8, +0.4	V
PWM Input Pin Current <sup>7</sup>	.5	1.5	3.5	$\mu A$
PWM Input Voltage for 0% Pulse Width	-15	0	+15	mV
PWM Input Voltage for 100% Pulse Width	4.6	5.0	5.4	V
Input Bias Current at Reference and Control Current Inputs	80	200	400	nA
Tempco of Input Bias Currents	-1000	0	+1000	ppm
Offset Voltage at Reference and Control Current Inputs	-5	0	+5	mV
Hard Sync Reference Voltage	-1.2	-1.4	-1.5	V
Hard Sync Input Resistance	5	6.3	7.9	K $\Omega$
Max Capacitor Charge/Discharge Current	400	570	800	$\mu A$
Positive Supply Current	4	5	6.5	mA
Positive Supply Voltage Range	+10	-	+18	V
Negative Supply Voltage Range <sup>8</sup>	-4.5	-	-18	V

**Note 1:** This error represents the percentage difference in scale factors (volts per frequency ratio) of the exponential generator anywhere over the exponential generator current range of 50nA to 100  $\mu A$ . Most of this error occurs at the range extremities.

**Note 2:** This error represents the percentage difference in multiplier gains at any two input currents, within the range of 20  $\mu A$  to 180  $\mu A$ , per  $\mu A$  difference between the two corresponding outputs.

**Note 3:** This spec represents the difference between the actual tempco of the multiplier output voltage (expressed relative to the maximum output excursions) and the tempco required to precisely cancel the tempco of the exponential scale factor (q/KT).

**Note 4:** The multiplier output is grounded.

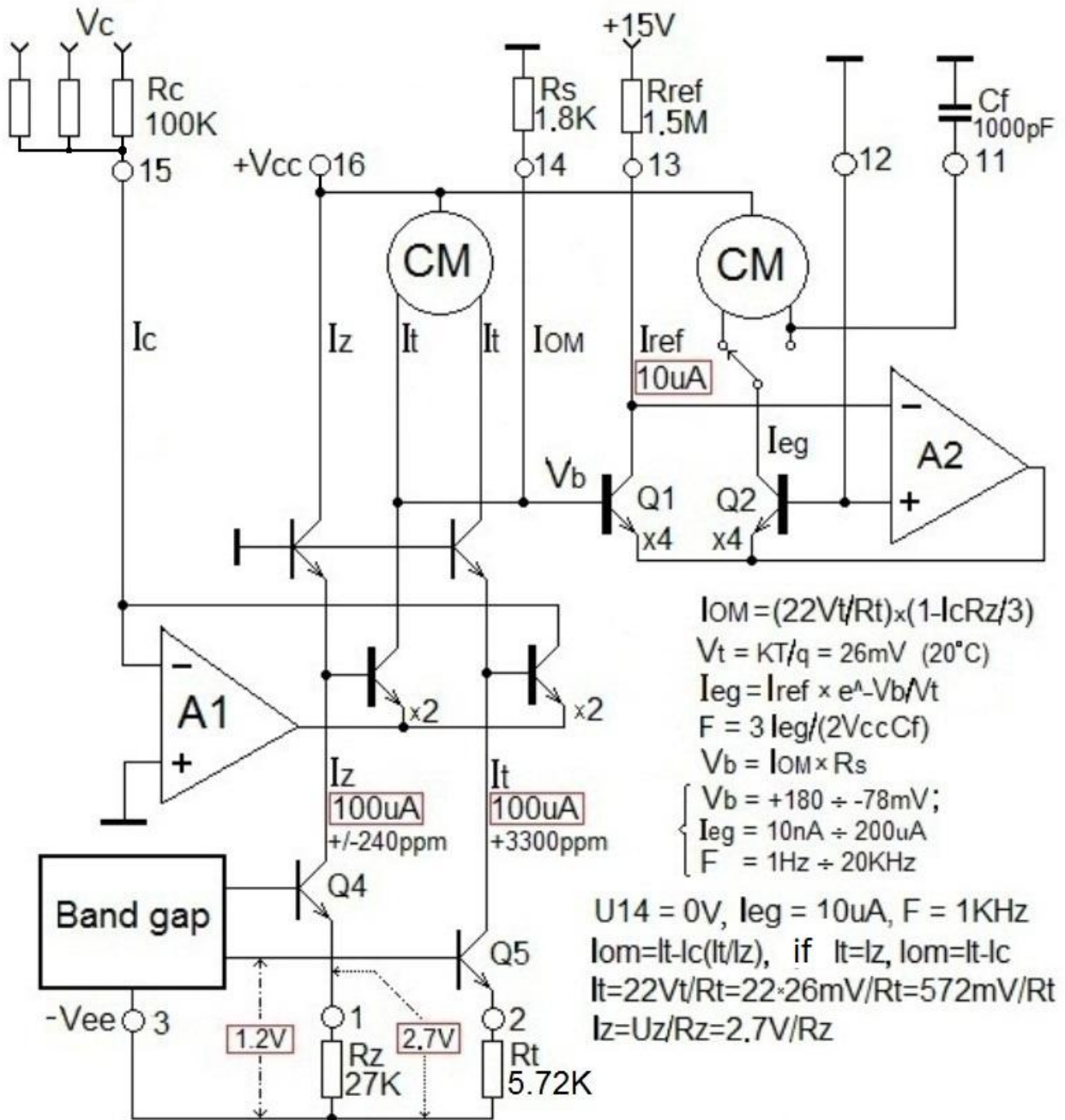
**Note 5:** For exponential generator currents less than 10  $\mu A$ ; above 10  $\mu A$ , impedance drops to 1/3 this value as the highest current is approached.

**Note 6:** With respect to the hard sync input reference voltage.

**Note 7:** For PWM control inputs between -1 and +6 volts. This current is significantly greater for inputs outside of this range.

**Note 8:** Current limiting resistor required for negative supplies greater than -6 volts.

**Specifications subject to change without notice.**



Structure of AS3340, AS3340A multiplication block and exponentiator

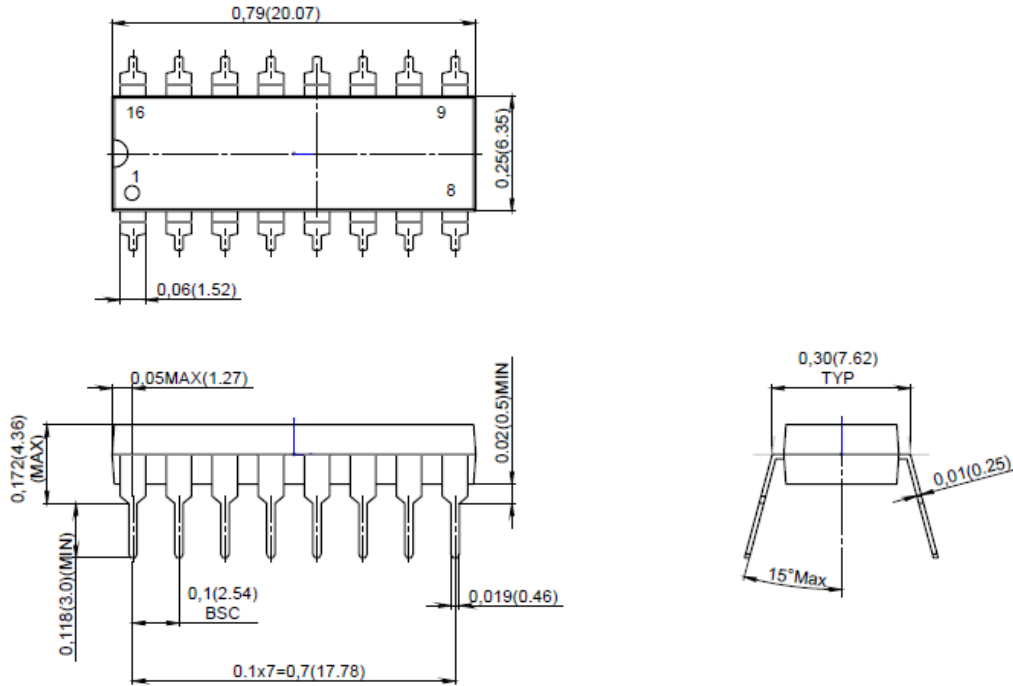


Package Information.

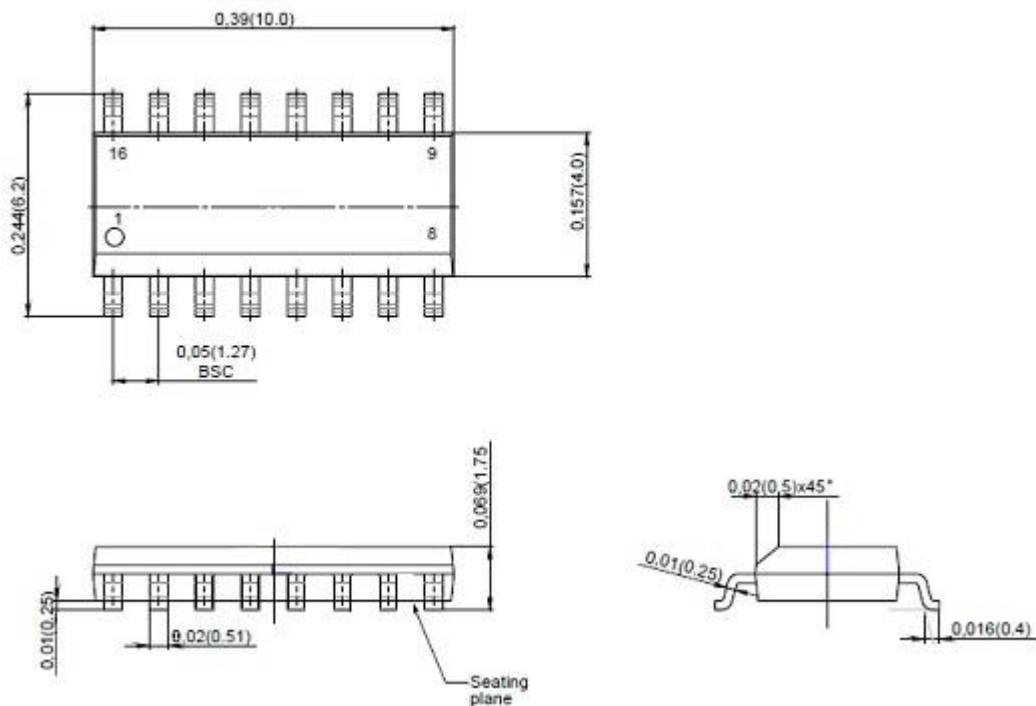
Device type	Package
AS3340 / AS3340A	PDIP-16 (300 mil body)
AS3340D / AS3340AD	SOIC-16 (150 Mil)

Units: inch (mm)

PDIP-16 (300 Mil)



SOIC-16 (150 Mil)

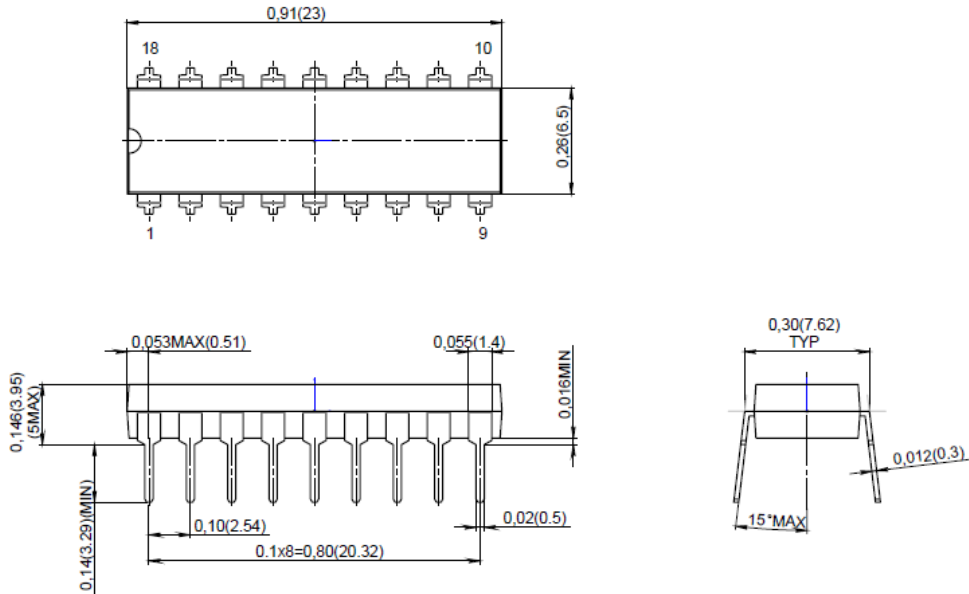




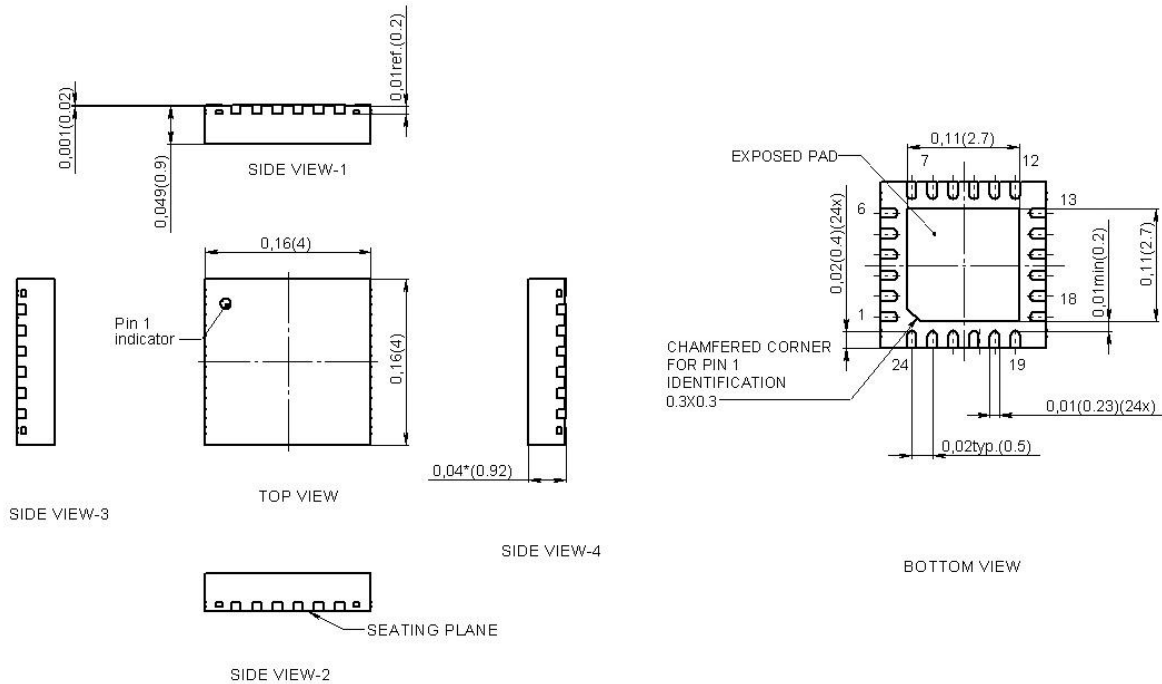
Device type	Package
AS3345 / AS3345A	PDIP-18 (300 mil body)
AS3345F / AS3345AF	QFN-24L (4*4 mm 0.5 mm)

Units: inch (mm)

PDIP-18 (300MIL)



QFN-24 4x4 mm 0.5 mm



Date	Revision	Changes
28-Aug-2017	1	Preliminary version 1
10-Sep-2017	2	Minor changes
19-Dec-2017	3	Changes in Description and Block Diagram
07-Mar-2018	4	Changes in Description
31-May-2018	5	Minor changes
09-Dec-2019	6	Added multiplication block and exponentiator explanation
08-Sep-2020	7	AS3340A /AS3345A information added