

## AS3280 – Dual Operational Transconductance Amplifier (OTA)

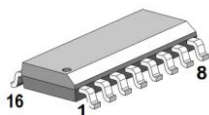
### Features

- Low Initial Input Offset Voltage: 500  $\mu$ V (Max) (AS3280A)
- Low Offset Voltage Change vs  $I_{ABC}$ : <500  $\mu$ V (Typ)
- Low Offset Voltage Drift: 5  $\mu$ V/ $^{\circ}$ C (Max) (AS3280A)
- Excellent Matching of the Two Amplifiers for All Characteristics
- Internal Current-Driven Linearizing Diodes Reduce the External Input Current to an Offset Component
- Flexible Supply Voltage Range  $\pm 2$ V to  $\pm 15$ V

### Applications

- Voltage Controlled Amplifiers Oscillators
- Multipliers
- Demodulators
- Sample and Hold
- Instrumentation Amplifiers
- Function Generators
- Triangle Wave-to-Sine Wave Converters
- Comparators
- Audio Preamplifier

### AS3280D, AS3280AD



SOIC-16 150mil, 1.27 mm

### General Description

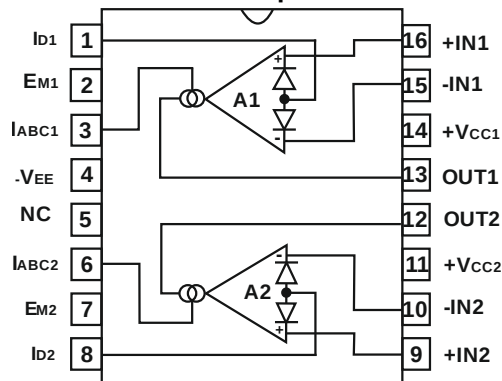
The AS3280 and AS3280A types consist of two variable operational amplifiers that are designed to substantially reduce the initial input offset voltage and the offset voltage variation with respect to changes in programming current. This design results in reduced "AGC thump," an objectionable characteristic of many AGC systems. Careful design of critical places of the circuit reduces the amplifier dependence upon thermal and processing variables.

The AS3280 has all the generic characteristics of an operational voltage amplifier except that the forward transfer characteristics is best described by transconductance rather than voltage gain, and the output is current, not voltage. The magnitude of the output current is equal to the product of transconductance and the input voltage. This type of operational transconductance amplifier has since gained wide acceptance as a gateable, gain controlled building block for instrumentation and audio applications, such as linearization of transducer outputs, standardization of widely changing signals for data processing, multiplexing, instrumentation amplifiers operating from the nanopower range to high current and high speed comparators.

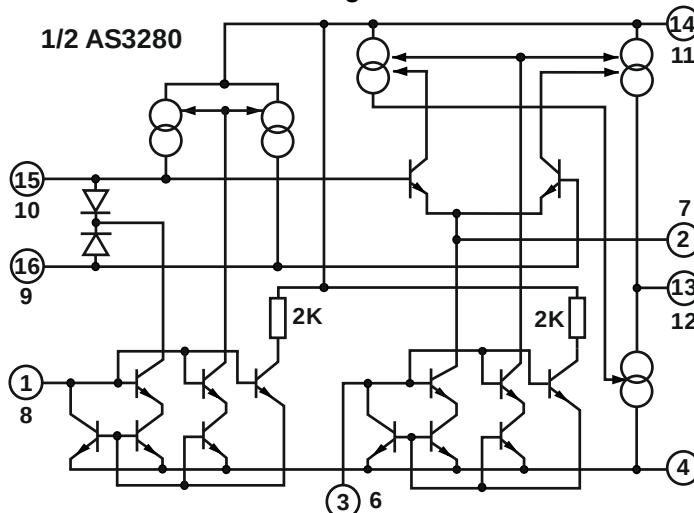
### Pin Information

| SOIC-16<br>Pin No | Pin Name | Description                            |
|-------------------|----------|----------------------------------------|
| 1                 | ID1      | Input current with linearizing diode 1 |
| 2                 | EM1      | Emitter 1                              |
| 3                 | IABC1    | Amplifier bias current 1               |
| 4                 | -VEE     | Negative supply                        |
| 5                 | NC       | Not connect                            |
| 6                 | IABC2    | Amplifier bias current 2               |
| 7                 | EM2      | Emitter 2                              |
| 8                 | ID2      | Input current with linearizing diode 2 |
| 9                 | +IN2     | Noninverting input1                    |
| 10                | -IN2     | Inverting input 2                      |
| 11                | +VCC2    | Positive supply 2                      |
| 12                | OUT2     | Output 2                               |
| 13                | OUT1     | Output 1                               |
| 14                | +VCC1    | Positive supply 1                      |
| 15                | -IN1     | Inverting input 1                      |
| 16                | +IN1     | Noninverting input1                    |

### Pinout Top view



### Functional diagram of AS3280





### Absolute Maximum Ratings

Supply Voltage (Between V+ and V-).....+36V  
Differential Input Voltage.....5V  
Input Voltage Range.....V+ to V-  
Input Current at  $I_D = 0$ .....100μA  
Amplifier Bias Current ( $I_{ABC}$ ).....10mA  
Output Short Circuit Duration (Note 1).....Indefinite  
Linearizing Diode Bias Current,  $I_D$ .....5mA  
Peak Input Current with Linearizing Diode.....±10

### Operating Conditions

Temperature Range  
AS3280, AS3280A ..... 0°C to 70°C  
Supply Voltage Range (Typ).....±2V to ±15V

### Thermal Information

Thermal Resistance (Typical, Note 2)  $\theta_{JA}$  (°C/W)  $\theta_{JC}$  (°C/W)  
SOIC-16 Package.....100 N/A

**CAUTION:** Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

#### NOTE:

1. Short circuit may be applied to ground or to either supply.
2.  $\theta_{JA}$  is measured with the component mounted on a low effective thermal conductivity test board in free air.

**Electrical Specifications**  $T_A = 25^\circ\text{C}$ ,  $V_{\text{SUPPLY}} = \pm 15\text{V}$ , unless otherwise specified

| PARAMETER                       | SYMBOL            | TEST CONDITIONS                                                                | AS3280 |       |       | AS3280A |       |       | UNITS                        |
|---------------------------------|-------------------|--------------------------------------------------------------------------------|--------|-------|-------|---------|-------|-------|------------------------------|
|                                 |                   |                                                                                | MIN    | TYP   | MAX   | MIN     | TYP   | MAX   |                              |
| Input Offset Voltage            | $V_{IO}$          | $I_{ABC} = 1\text{mA}$                                                         | -      | -     | 1,8   | -       | -     | 0,5   | mV                           |
|                                 |                   | $I_{ABC} = 100\mu\text{A}$                                                     | -      | 0,7   | 1,8   | -       | 0,25  | 0,5   | mV                           |
|                                 |                   | $I_{ABC} = 10\mu\text{A}$                                                      | -      | -     | 1,8   | -       | -     | 0,5   | mV                           |
|                                 |                   | $I_{ABC} = 1\text{mA}$ to $10\mu\text{A}$ ,<br>$T_A = \text{Full Temp. Range}$ | -      | 0,8   | 4     | -       | 0,8   | 1,5   | mV                           |
| Input Offset Voltage Drift      | $ \Delta V_{IO} $ | $I_{ABC} = 1\mu\text{A}$ to $1\text{mA}$                                       | -      | 0,5   | 1     | -       | 0,5   | 1     | mV                           |
|                                 |                   | $I_{ABC} = 100\mu\text{A}$ , $T_A = \text{Full Temperature Range}$             | -      | 5     | -     | -       | 3     | 5     | $\mu\text{V}/^\circ\text{C}$ |
| Amplifier Bias Voltage          | $V_{ABC}$         | $I_{ABC} = 100\mu\text{A}$                                                     | -      | 1,2   | -     | -       | 1,2   | -     | V                            |
| Peak Output Voltage             | $V_{OM+}$         | $I_{ABC} = 500\mu\text{A}$                                                     | 12,5   | 12,6  | -     | 12,5    | 12,6  | -     | V                            |
|                                 | $V_{OM-}$         |                                                                                | -      | -13,5 | -12,5 | -       | -13,5 | -12,5 | V                            |
|                                 | $V_{OM+}$         | $I_{ABC} = 5\mu\text{A}$                                                       | 12,5   | 12,8  | -     | 12,5    | 12,8  | -     | V                            |
|                                 | $V_{OM-}$         |                                                                                | -      | -13,5 | -12,5 | -       | -13,5 | -12,5 | V                            |
| Common Mode Input Voltage Range | $V_{ICR}$         | $I_{ABC} = 100\mu\text{A}$                                                     | -13    | -     | 13    | -13     | -     | 13    | V                            |
| Noise Voltage                   | $e_N$             | $I_{ABC} = 500\mu\text{A}$                                                     | -      | 20    | -     | -       | 20    | -     | $\text{nV}/\sqrt{\text{Hz}}$ |
|                                 |                   |                                                                                | -      | 8     | -     | -       | 8     | -     | $\text{nV}/\sqrt{\text{Hz}}$ |
|                                 |                   |                                                                                | -      | 7     | -     | -       | 7     | -     | $\text{nV}/\sqrt{\text{Hz}}$ |
| Input Offset Current            | $I_{IO}$          | $I_{ABC} = 500\mu\text{A}$                                                     | -      | 0,3   | 0,5   | -       | 0,3   | 0,5   | $\mu\text{A}$                |
| Input Bias Current              | $I_{IB}$          | $I_{ABC} = 500\mu\text{A}$                                                     | -      | 0,1   | 5     | -       | 0,1   | 5     | $\mu\text{A}$                |
|                                 |                   | $I_{ABC} = 500\mu\text{A}$ , $T_A = \text{Full Temperature Range}$             | -      | 3     | 8     | -       | 3     | 8     | $\mu\text{A}$                |



**Electrical Specifications**  $T_A=25^{\circ}\text{C}$ ,  $V_{\text{SUPPLY}}=\pm 15\text{V}$ , unless otherwise specified (Continued)

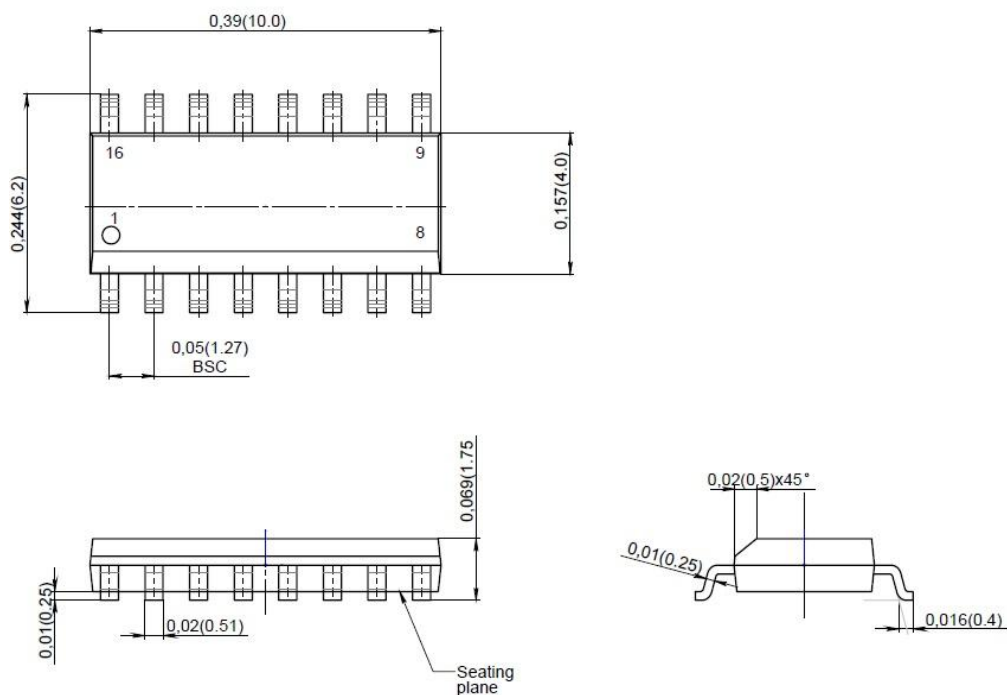
| PARAMETER                                | SYMBOL                                   | TEST CONDITIONS                                                                              |        | AS3280 |       |      | AS3280A |       |      | UNITS |
|------------------------------------------|------------------------------------------|----------------------------------------------------------------------------------------------|--------|--------|-------|------|---------|-------|------|-------|
|                                          |                                          |                                                                                              |        | MIN    | TYP   | MAX  | MIN     | TYP   | MAX  |       |
| Peak Output Current                      | I <sub>OM+</sub>                         | I <sub>ABC</sub> = 500μA                                                                     | Source | 350    | 410   | 500  | 350     | 410   | 500  | μA    |
|                                          | I <sub>OM-</sub>                         |                                                                                              | Sink   | -350   | -410  | -500 | -350    | -410  | -500 | μA    |
|                                          | I <sub>OM+</sub>                         | I <sub>ABC</sub> = 5μA                                                                       | Source | 3      | 5     | 7    | 3       | 5     | 7    | μA    |
|                                          | I <sub>OM-</sub>                         |                                                                                              | Sink   | -7     | -5    | -3   | -7      | -5    | -3   | μA    |
| Peak Output Current Sink and Source      | I <sub>OM-</sub> ,<br>I <sub>OM+</sub>   | I <sub>ABC</sub> = 500μA, T <sub>A</sub> =Full Temperature Range                             |        | 350    | 450   | 550  | 350     | 450   | 550  | μA    |
| Linearization Diodes                     | I <sub>IOD</sub><br><br>R <sub>dyn</sub> | I <sub>D</sub> =100μA                                                                        |        | -      | 10    | -    | -       | 10    | -    | μA    |
| Offset Current                           |                                          | I <sub>D</sub> =10μA                                                                         |        | -      | 0,5   | 1    | -       | 0,5   | 1    | μA    |
| Dynamic Impedance                        |                                          | I <sub>D</sub> =100μA                                                                        |        | -      | 700   | -    | -       | 700   | -    | Ω     |
| Diode Network Supply Current             | I <sub>SD</sub>                          | I <sub>ABC</sub> = 100μA                                                                     |        | 250    | 600   | 800  | 250     | 600   | 800  | μA    |
| Amplifier Supply Current (Per Amplifier) | I <sub>+</sub>                           | I <sub>ABC</sub> = 500μA                                                                     |        | -      | 2     | 2,5  | -       | 2     | 2,5  | mA    |
| Amplifier Output Leakage Current         | I <sub>OL</sub>                          | I <sub>ABC</sub> = 0, V <sub>O</sub> = 0V                                                    |        | -      | 0,015 | 0,1  | -       | 0,015 | 0,1  | nA    |
|                                          |                                          | I <sub>ABC</sub> = 0, V <sub>O</sub> = 30V                                                   |        | -      | 0,15  | 1    | -       | 0,15  | 1    | nA    |
| Common Mode Rejection Ratio              |                                          | I <sub>ABC</sub> = 100μA                                                                     |        | 80     | 100   | -    | 80      | 100   | -    | dB    |
| Power Supply Rejection Ratio             | PSRR                                     | I <sub>ABC</sub> = 100μA                                                                     |        | 86     | 105   | -    | 86      | 105   | -    | dB    |
| Open Loop Voltage Gain                   | A <sub>OL</sub>                          | I <sub>ABC</sub> = 100μA,<br>R <sub>L</sub> = ∞, V <sub>O</sub> = 20V <sub>P-P</sub>         |        | 50     | 100   | -    | 50      | 100   | -    | kV/V  |
|                                          |                                          |                                                                                              |        | 94     | 100   | -    | 94      | 100   | -    | dB    |
| Forward Transconductance                 | G <sub>M</sub>                           | I <sub>ABC</sub> = 50μA, Large Signal                                                        |        | -      | 0,8   | 1,2  | -       | 0,8   | 1,2  | mS    |
|                                          | g <sub>M</sub>                           | I <sub>ABC</sub> = 1mA, Small Signal                                                         |        | -      | 16    | 22   | -       | 16    | 22   | mS    |
| Input Resistance                         | R <sub>I</sub>                           | I <sub>ABC</sub> = 10μA                                                                      |        | 0,5    | -     | -    | 0,5     | -     | -    | MΩ    |
| Channel Separation                       |                                          | f =1kHz                                                                                      |        | -      | 94    | -    | -       | 94    | -    | dB    |
| Open Loop Total Harmonic Distortion      | THD                                      | f = 1kHz, I <sub>ABC</sub> =1,5mA, R <sub>L</sub> = 15kΩ, V <sub>O</sub> =20V <sub>P-P</sub> |        | -      | 0,4   | -    | -       | 0,4   | -    | %     |
| Bandwidth                                | f <sub>T</sub>                           | I <sub>ABC</sub> = 1mA, R= 100Ω                                                              |        | -      | 9     | -    | -       | 9     | -    | MHz   |
| Slew Rate, Open Loop                     | SR                                       | I <sub>ABC</sub> = 10mA                                                                      |        | -      | 125   | -    | -       | 125   | -    | V/μs  |
| Capacitance                              | C <sub>I</sub>                           | I <sub>ABC</sub> = 100μA                                                                     | Input  | -      | 4,5   | -    | -       | 4,5   | -    | pF    |
|                                          | C <sub>O</sub>                           |                                                                                              | Output | -      | 7,5   | -    | -       | 7,5   | -    | pF    |
| Output Resistance                        | R <sub>O</sub>                           | I <sub>ABC</sub> = 100μA                                                                     |        | -      | 63    | -    | -       | 63    | -    | MΩ    |



| Device type | Package          | Additional marking |
|-------------|------------------|--------------------|
| AS3380 D    | SOIC-16 (150mil) | ----               |
| AS3380 AD   | SOIC-16 (150mil) | white dot          |

### Package Information

SOIC-16 (150mil)  
Units: inch (mm)



### Revision history

| Date        | Revision | Changes         |
|-------------|----------|-----------------|
| 04-Dec-2018 | 1        | Initial version |