

## LM3080 Operational Transconductance Amplifier

### General Description

The LM3080 is a programmable transconductance block intended to fulfill a wide variety of variable gain applications. The LM3080 has differential inputs and high impedance push-pull outputs. The device has high input impedance and its transconductance ( $g_m$ ) is directly proportional to the amplifier bias current ( $I_{ABC}$ ).

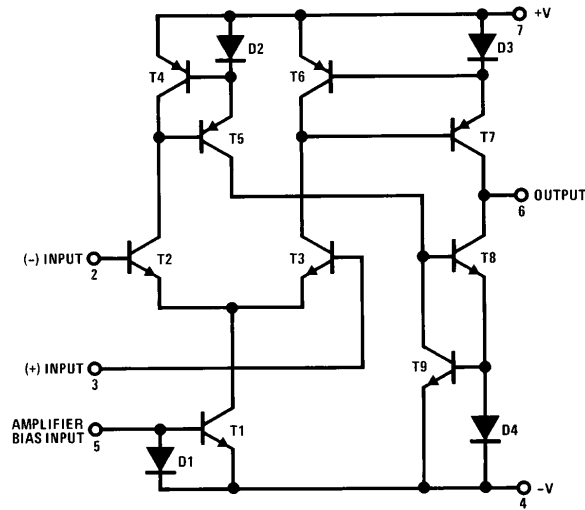
High slew rate together with programmable gain make the LM3080 an ideal choice for variable gain applications such as sample and hold, multiplexing, filtering, and multiplying.

The LM3080N and LM3080AN are guaranteed from 0°C to +70°C.

### Features

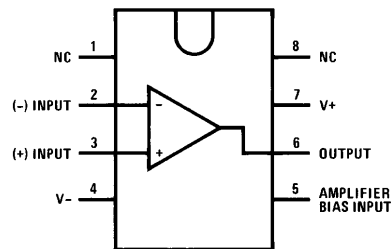
- Slew rate (unity gain compensated): 50 V/ $\mu$ s
- Fully adjustable gain: 0 to  $g_m \cdot R_L$  limit
- Extended  $g_m$  linearity: 3 decades
- Flexible supply voltage range:  $\pm 2V$  to  $\pm 18V$
- Adjustable power consumption

### Schematic and Connection Diagrams



TL/H/7148-1

Dual-In-Line Package



TL/H/7148-2

Top View

Order Number LM3080AN, LM3080M or LM3080N  
See NS Package Number M08A or N08E

## Absolute Maximum Ratings

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Supply Voltage (Note 2)

LM3080  $\pm 18V$   
LM3080A  $\pm 22V$

Power Dissipation 250 mW

Differential Input Voltage  $\pm 5V$

Amplifier Bias Current ( $I_{ABC}$ )

2 mA

DC Input Voltage

$+V_S$  to  $-V_S$

Output Short Circuit Duration

Indefinite

Operating Temperature Range

LM3080N or LM3080AN  $0^\circ C$  to  $+70^\circ C$

Storage Temperature Range

$-65^\circ C$  to  $+150^\circ C$

Lead Temperature (Soldering, 10 sec.)

$260^\circ C$

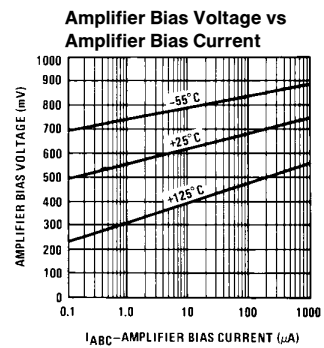
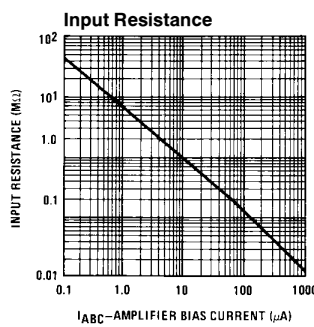
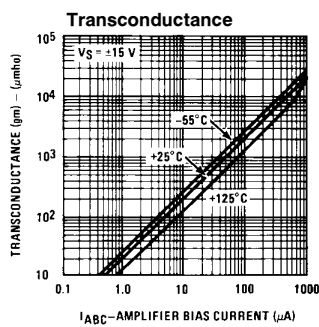
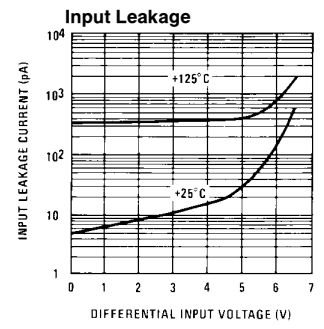
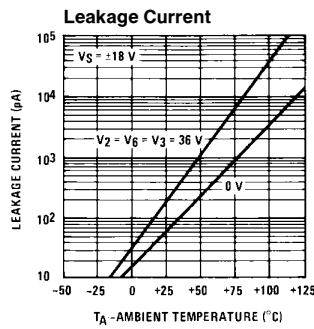
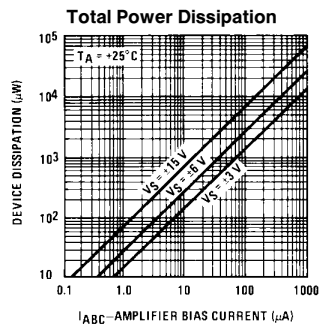
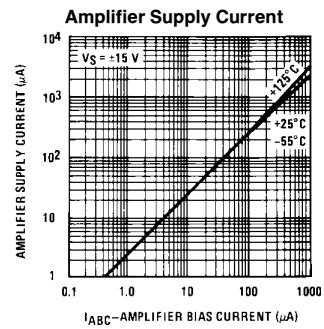
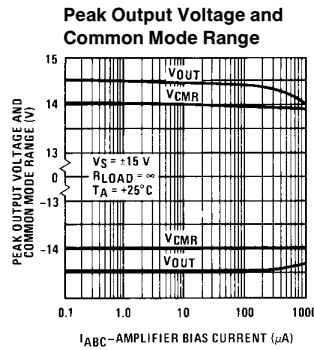
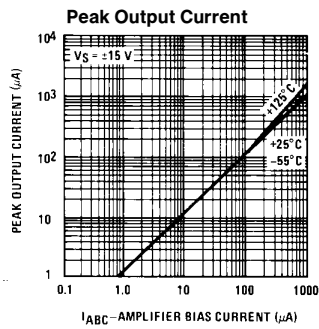
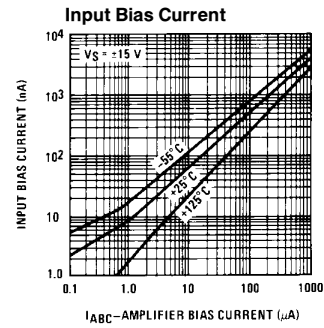
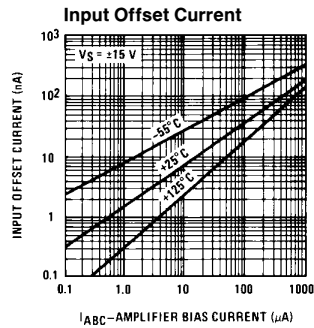
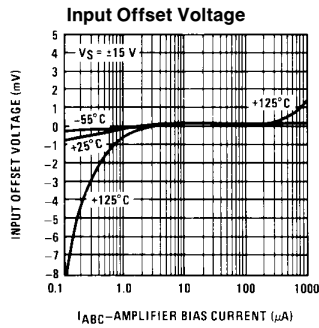
## Electrical Characteristics (Note 1)

| Parameter                          | Conditions                                                                                                 | LM3080   |          |       | LM3080A  |          |       | Units      |
|------------------------------------|------------------------------------------------------------------------------------------------------------|----------|----------|-------|----------|----------|-------|------------|
|                                    |                                                                                                            | Min      | Typ      | Max   | Min      | Typ      | Max   |            |
| Input Offset Voltage               | Over Specified Temperature Range<br>$I_{ABC} = 5 \mu A$                                                    |          | 0.4      | 5     |          | 0.4      | 2     | mV         |
|                                    |                                                                                                            |          |          | 6     |          |          | 5     | mV         |
|                                    |                                                                                                            |          | 0.3      |       |          | 0.3      | 2     | mV         |
| Input Offset Voltage Change        | $5 \mu A \leq I_{ABC} \leq 500 \mu A$                                                                      |          | 0.1      |       |          | 0.1      | 3     | mV         |
| Input Offset Current               |                                                                                                            |          | 0.1      | 0.6   |          | 0.1      | 0.6   | $\mu A$    |
| Input Bias Current                 | Over Specified Temperature Range                                                                           |          | 0.4      | 5     |          | 0.4      | 5     | $\mu A$    |
|                                    |                                                                                                            |          | 1        | 7     |          | 1        | 8     | $\mu A$    |
| Forward Transconductance ( $g_m$ ) | Over Specified Temperature Range                                                                           | 6700     | 9600     | 13000 | 7700     | 9600     | 12000 | $\mu mho$  |
|                                    |                                                                                                            | 5400     |          |       | 4000     |          |       | $\mu mho$  |
| Peak Output Current                | $R_L = 0, I_{ABC} = 5 \mu A$                                                                               |          | 5        |       | 3        | 5        | 7     | $\mu A$    |
|                                    | $R_L = 0$                                                                                                  | 350      | 500      | 650   | 350      | 500      | 650   | $\mu A$    |
|                                    | Over Specified Temperature Range                                                                           | 300      |          |       | 300      |          |       | $\mu A$    |
| Peak Output Voltage                | $R_L = \infty, 5 \mu A \leq I_{ABC} \leq 500 \mu A$<br>$R_L = \infty, 5 \mu A \leq I_{ABC} \leq 500 \mu A$ | +12      | +14.2    |       | +12      | +14.2    |       | V          |
|                                    |                                                                                                            | -12      | -14.4    |       | -12      | -14.4    |       | V          |
| Amplifier Supply Current           |                                                                                                            |          | 1.1      |       |          | 1.1      |       | mA         |
| Input Offset Voltage Sensitivity   | $\Delta V_{OFFSET}/\Delta V +$<br>$\Delta V_{OFFSET}/\Delta V -$                                           |          | 20       | 150   |          | 20       | 150   | $\mu V/V$  |
|                                    |                                                                                                            |          | 20       | 150   |          | 20       | 150   | $\mu V/V$  |
| Common Mode Rejection Ratio        |                                                                                                            | 80       | 110      |       | 80       | 110      |       | dB         |
| Common Mode Range                  |                                                                                                            | $\pm 12$ | $\pm 14$ |       | $\pm 12$ | $\pm 14$ |       | V          |
| Input Resistance                   |                                                                                                            | 10       | 26       |       | 10       | 26       |       | k $\Omega$ |
| Magnitude of Leakage Current       | $I_{ABC} = 0$                                                                                              |          | 0.2      | 100   |          | 0.2      | 5     | nA         |
| Differential Input Current         | $I_{ABC} = 0, \text{Input} = \pm 4V$                                                                       |          | 0.02     | 100   |          | 0.02     | 5     | nA         |
| Open Loop Bandwidth                |                                                                                                            |          | 2        |       |          | 2        |       | MHz        |
| Slew Rate                          | Unity Gain Compensated                                                                                     |          | 50       |       |          | 50       |       | V/ $\mu s$ |

**Note 1:** These specifications apply for  $V_S = \pm 15V$  and  $T_A = 25^\circ C$ , amplifier bias current ( $I_{ABC}$ ) = 500  $\mu A$ , unless otherwise specified.

**Note 2:** Selection to supply voltage above  $\pm 22V$ , contact the factory.

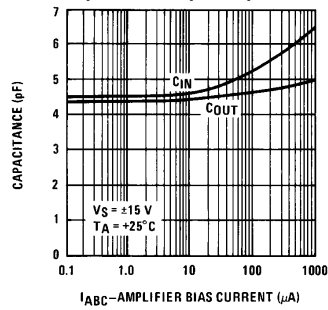
## Typical Performance Characteristics



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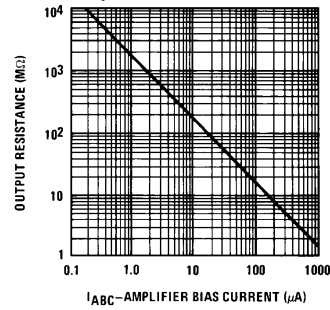
## Typical Performance Characteristics (Continued)

Input and Output Capacitance



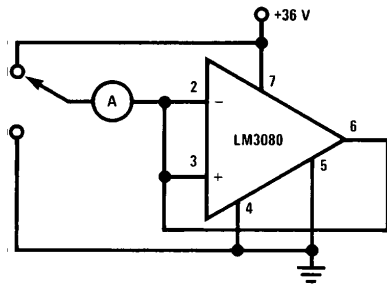
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Output Resistance



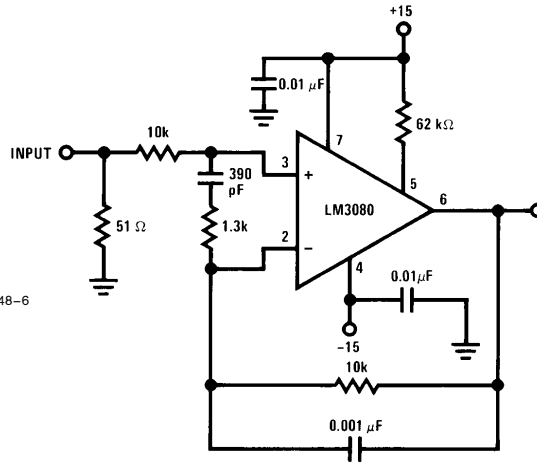
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Leakage Current Test Circuit



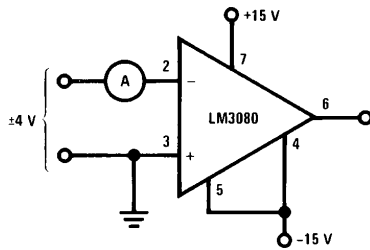
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Unity Gain Follower



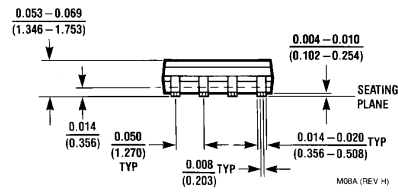
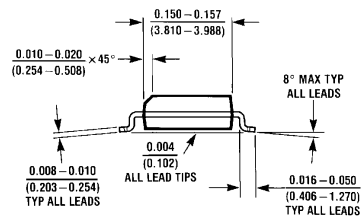
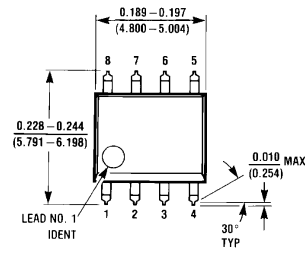
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Differential Input Current Test Circuit

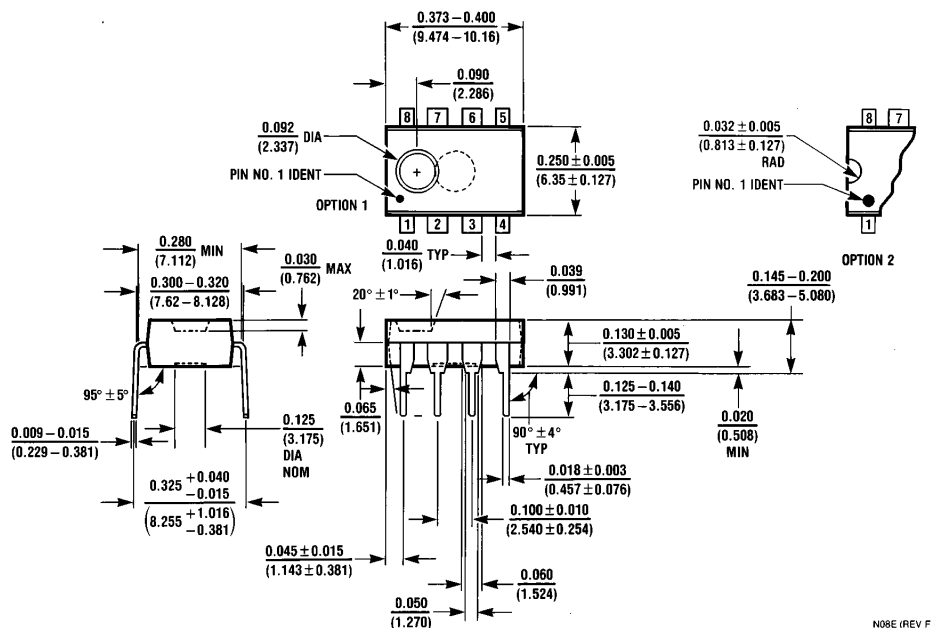


TL/H/7148-7

# Physical Dimensions inches (millimeters)



**Molded Package SO (M)**  
**Order Number LM3080M**  
**NS Package Number M08A**

**Physical Dimensions** inches (millimeters) (Continued)

**Molded Dual-In-Line Package (N)**  
**Order Number LM3080AN or LM3080N**  
**NS Package Number N08E**

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