



JFET Input Dual Operational Amplifier

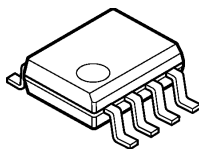
## TL082 Operational Amplifier

### 1 Introduction

The TL082 is a high speed JFET input dual operational amplifiers incorporating well-matched, high voltage JFET and bipolar transistors in a monolithic integrated circuit. The devices feature high slew rates, low input bias and offset current, and low offset voltage temperature coefficient.

### 2 Features

- Dual Power Supply Range:  $\pm 5$  to  $\pm 15$ V
- Built-in Dual Independent Operational Amplifiers
- Quiescent Current: 1.4mA per channel
- Wide Common-mode and Differential Input range
- Low Input Offset Voltage: 3mV (typ.)
- Low Input Bias and Offset Current
- High Input Impedance
- Output Short-circuit Current Protection
- High Voltage Slew Rate: 13 V/ $\mu$ s
- Internal Frequency Compensation



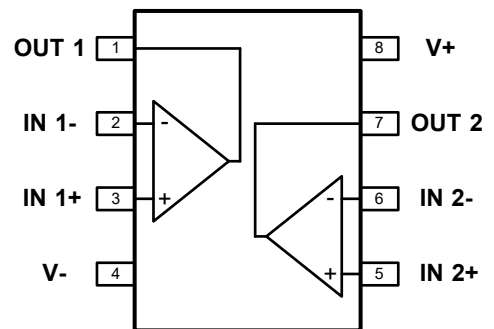
SOP8 Package

### 3 Applications

- General-purpose Amplification
- Active Filters
- Data Acquisition
- Industrial / Process Control
- Input Buffering
- Integrators
- Power Control and Monitoring
- Sample and Hold Circuits

### 4 Available Package

| PART NUMBER | PACKAGE |
|-------------|---------|
| TL082       | SOP8    |



Pin Connections

## 5 Orderable and Marking Information

### 5.1 Orderable Information

| MODEL  | DEVICE | PACKAGE | OP TEMP  | ECO PLAN     | MSL               | PACKING OPTION                     | SORT       |
|--------|--------|---------|----------|--------------|-------------------|------------------------------------|------------|
| -      | TL082  | SOP8    | 0 ~ 70°C | RoHS & Green | Level 3<br>168 HR | Tape and Reel<br>2500 Units / Reel | Active     |
| Others | -      | -       | -        | -            | -                 | -                                  | Customized |

**Note:**

**ECO PLAN:** For the RoHS and Green certification standards of this product, please refer to the official report provided by JSCJ.

**MSL:** Moisture Sensitivity Level. Determined according to JEDEC industry standard classification.

**SORT:** Specifically defined as follows:

Active: Recommended for new products;

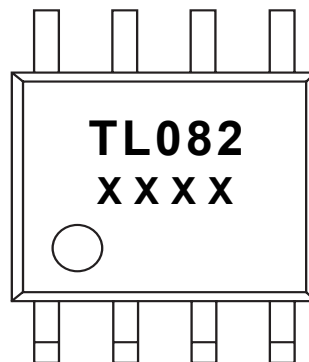
Customized: Products manufactured to meet the specific needs of customers;

Preview: The device has been released and has not been fully mass produced. The sample may or may not be available;

NoRD: It is not recommended to use the device for new design. The device is only produced for the needs of existing customers;

Obsolete: The device has been discontinued.

### 5.2 Marking Information



"TL082": Device serial number.

"XXXX": Code of production.

6 Pin Configuration and Function

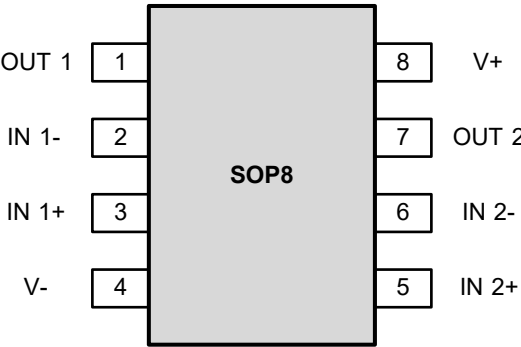


Figure 6-1. TL082 Pin Map

| PIN<br>NAME | TL082 | I / O | DESCRIPTION   |
|-------------|-------|-------|---|
|             | SOP8  |       |   |
| OUT 1       | 1     | O     | Output of the operational amplifier 1.                |
| IN 1-       | 2     | I     | Negative input of the operational amplifier 1.        |
| IN 1+       | 3     | I     | Positive input of the operational amplifier 1.        |
| V-          | 4     | -     | Negative (lowest) supply or ground for single supply. |
| IN 2+       | 5     | I     | Positive input of the operational amplifier 2.        |
| IN 2-       | 6     | I     | Negative input of the operational amplifier 2.        |
| OUT 2       | 7     | O     | Output of the operational amplifier 2.                |
| V+          | 8     | -     | Positive (highest) supply.                            |

## 7 Specifications

### 7.1 Absolute Maximum Rating

( $T_A = 25^\circ\text{C}$ , unless otherwise specified)<sup>(1)</sup>

| CHARACTERISTIC   |               | SYMBOL              | VALUE                      | UNIT             |
|--|---------------|---------------------|----------------------------|------------------|
| Power supply   | Dual supplies | $V_{CC}$            | $\pm 18$                   | V                |
| Differential input range <sup>(2)</sup>  |               | $V_{ID}$            | -30 ~ 30                   | V                |
| Input range (either input)   |               | $V_{IN}$            | -15 ~ 15                   | V                |
| Duration of output short circuit (one amplifier) to ground<br>(or below) at $T_A = 25^\circ\text{C}$ , $V_S \leq 15\text{V}$ |               | $t_{SC}$            | Continuous <sup>(3)</sup>  | s                |
| Maximum junction temperature   |               | $T_{J\text{ Max}}$  | 150                        | $^\circ\text{C}$ |
| Storage temperature  |               | $T_{\text{stg}}$    | -65 ~ 150                  | $^\circ\text{C}$ |
| Soldering temperature & time   |               | $T_{\text{solder}}$ | 260 $^\circ\text{C}$ , 10s | -                |

(1) Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions*. Exposure to absolute-maximum rated conditions for extended periods may affect device reliability.

(2) Differential voltages are at  $IN+$ , with respect to  $IN-$ .

(3) Short circuits from outputs to  $V_{CC}$  can cause excessive heating and eventual destruction. A heat sink may be required to keep the junction temperature below the absolute maximum. This depends on the power supply voltage and how many amplifiers are shorted. Thermal resistance varies with the amount of PC board metal connected to the package. The specified values are for short traces connected to the leads.

### 7.2 Recommend Operating Conditions

| PARAMETER                     |                    | SYMBOL    | MIN.          | NOM. | MAX.          | UNIT             |
|-------------------------------|--------------------|-----------|---------------|------|---------------|------------------|
| Power supply range            | Positive (highest) | $V_{CC+}$ | 5             | -    | 15            | V                |
|                               | Negative (lowest)  | $V_{CC-}$ | -5            | -    | -15           |                  |
| Common-mode voltage range     |                    | $V_{CM}$  | $V_{CC-} + 4$ | -    | $V_{CC+} - 4$ | V                |
| Operating ambient temperature |                    | $T_A$     | 0             | -    | 70            | $^\circ\text{C}$ |

### 7.3 Thermal Information

| THERMAL METRIC <sup>(4)</sup>                                   |                     | SYMBOL             | TL082 | UNIT               |
|---|---------------------|--------------------|-------|--------------------|
|   |                     |                    | SOP8  |                    |
| Thermal resistance  | Junction-to-ambient | $R_{\theta JA}$    | 159.6 | $^\circ\text{C/W}$ |
|   | Junction-to-case    | $R_{\theta JC}$    | 44.1  |                    |
| Reference maximum power dissipation<br>for continuous operation |                     | $P_{D\text{ Ref}}$ | 0.61  | W                  |

(4) Thermal metric is measured in still air with  $T_A = 25^\circ\text{C}$  and installed on a 1 in<sup>2</sup> FR-4 board covered with 2 ounces of copper.

## 7 Specifications

### 7.4 Electrical Characteristics

TL082 ( $V_{CC} = \pm 15V$ ,  $T_A = 25^\circ C$ , unless otherwise specified)

| CHARACTERISTIC                      | SYMBOL            | TEST CONDITIONS <sup>(6)</sup>  |        | MIN. | TYP.  | MAX. | UNIT   |
|-------------------------------------|-------------------|---|--------|------|-------|------|--------|
| Offset Voltage                      |                   |   |        |      |       |      |        |
| Input offset voltage                | V <sub>IO</sub>   | R <sub>S</sub> = 50Ω, V <sub>O</sub> = 0V   |        | -    | 3     | 6    | mV     |
| Supply voltage rejection ratio      | SVR               | R <sub>S</sub> = 50Ω  |        | 70   | 86    | -    | dB     |
| Common-mode Input                   |                   |   |        |      |       |      |        |
| Common-mode input voltage           | V <sub>ICR</sub>  | -   |        | ±11  | 15    | -    | V      |
|                                     |                   |   |        |      | -12   |      |        |
| Common-mode rejection ratio         | CMRR              | R <sub>S</sub> = 50Ω, V <sub>O</sub> = 0V   |        | 70   | 85    | -    | dB     |
| Input Current                       |                   |   |        |      |       |      |        |
| Input offset current <sup>(7)</sup> | I <sub>IO</sub>   | V <sub>O</sub> = 0V   |        | -    | -     | 1.5  | nA     |
| Input bias current <sup>(7)</sup>   | I <sub>B</sub>    | V <sub>O</sub> = 0V   |        | -    | -     | 2.5  | nA     |
| Power Supply                        |                   |   |        |      |       |      |        |
| Supply current                      | I <sub>CC</sub>   | No load, per channel  |        | -    | 1.4   | 2.8  | mA     |
| Frequency Response                  |                   |   |        |      |       |      |        |
| Gain bandwidth product              | GBP               | V <sub>in</sub> = 10mV, R <sub>L</sub> = 2kΩ, C <sub>L</sub> = 100pF, f = 100 kHz |        | -    | 3.0   | -    | MHz    |
| Slew rate                           | SR                | V <sub>in</sub> = 10V, R <sub>L</sub> = 2kΩ, C <sub>L</sub> = 100pF, unity gain   |        | 8    | 13    | -    | V / μs |
| Output                              |                   |   |        |      |       |      |        |
| Output voltage swing                | V <sub>opp</sub>  | R <sub>L</sub> = 10kΩ   |        | ±12  | ±13.5 | -    | V      |
|                                     |                   | R <sub>L</sub> = 2kΩ  |        | ±10  | ±12.5 | -    |        |
| Output current                      | I <sub>O</sub>    | V <sub>O</sub> = 2V   | Source | 40   | -     | 80   | mA     |
|                                     |                   |   | Sink   | 25   | -     | 60   |        |
| Nosie                               |                   |   |        |      |       |      |        |
| Equivalent input noise voltage      | e <sub>N</sub>    | R <sub>S</sub> = 1kΩ, f = 1kHz  |        | -    | 18    | -    | nV/√Hz |
| Gain                                |                   |   |        |      |       |      |        |
| Large signal voltage gain           | A <sub>VD</sub>   | V <sub>O</sub> = ±10V, R <sub>L</sub> = 2kΩ                                       |        | 80   | 95    | -    | dB     |
| Rise time                           | t <sub>rise</sub> | V <sub>in</sub> = 200mV, R <sub>L</sub> = 2kΩ, C <sub>L</sub> = 100pF,            |        | -    | 0.05  | -    | μs     |

**Note:**

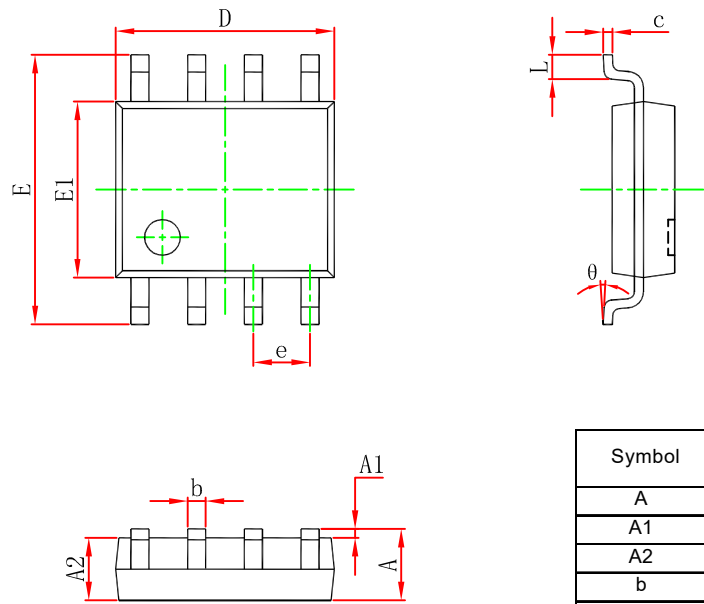
(6) All characteristics are measured under open-loop conditions, with zero common-mode input voltage, unless otherwise specified.

(7) Input bias currents of a FET input operational amplifier are normal junction reverse currents, which are temperature sensitive. Pulse techniques must be used that maintain the junction temperatures as close to the ambient temperature as possible.

8 Mechanical Information

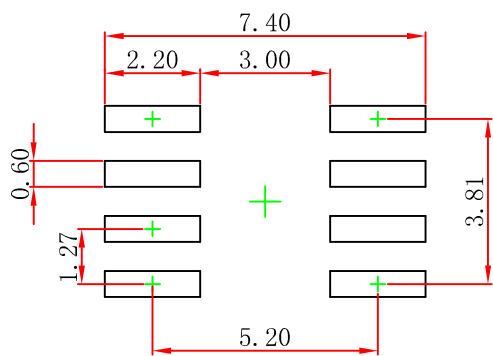
SOP8 Mechanical Information

Outline Dimensions



| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min                       | Max   | Min                  | Max   |
| A      | 1.350                     | 1.750 | 0.053                | 0.069 |
| A1     | 0.100                     | 0.250 | 0.004                | 0.010 |
| A2     | 1.350                     | 1.550 | 0.053                | 0.061 |
| b      | 0.330                     | 0.510 | 0.013                | 0.020 |
| c      | 0.170                     | 0.250 | 0.007                | 0.010 |
| D      | 4.700                     | 5.100 | 0.185                | 0.201 |
| e      | 1.270 (BSC)               |       | 0.050 (BSC)          |       |
| E      | 5.800                     | 6.300 | 0.228                | 0.244 |
| E1     | 3.800                     | 4.000 | 0.150                | 0.157 |
| L      | 0.400                     | 1.270 | 0.016                | 0.050 |
|        | 0°                        | 8°    | 0°                   | 8°    |

SOP8 Suggest Pad Layout



- NOTE:**
- 1. Controlling dimension: in millimeters.
  - 2. General tolerance: ±0.05mm.
  - 3. The pad layout is for reference purposes only.

## 9 Notes and Revision History

### 9.1 Associated Product Family and Others

To view other products of the same type or IC products of other types, click the official website of JSCJ -- <https://www.jscj-elec.com> for more details.

### 9.2 Notes

#### Electrostatic Discharge Caution



This IC may be damaged by ESD. Relevant personnel shall comply with correct installation and use specifications to avoid ESD damage to the IC. If appropriate measures are not taken to prevent ESD damage, the hazards caused by ESD include but are not limited to degradation of integrated circuit performance or complete damage of integrated circuit. For some precision integrated circuits, a very small parameter change may cause the whole device to be inconsistent with its published specifications.

### 9.3 Revision History

April, 2024: released TL082 rev - 1.0.

# DISCLAIMER

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