# OP07x Precision Operational Amplifiers

## 1 Features

- Low noise
- No external components required
- Replace chopper amplifiers at a lower cost
- Wide input-voltage range:
  0 V to ±14 V (typ, ±15-V supply)
- Wide supply-voltage range: ±3 V to ±18 V

## 2 Applications

- Analog input module
- Battery test
- Lab and field instrumentation
- Temperature transmitter
- Merchant network & server PSU

## 3 Description

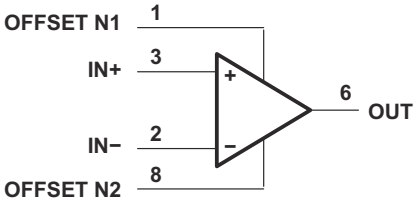
The OP07C and OP07D (OP07x) devices offer low offset and long-term stability by means of a low-noise, chopperless, bipolar-input-transistor amplifier circuit. For most applications, external components are not required for offset nulling and frequency compensation. The true differential input, with a wide input-voltage range and outstanding common-mode rejection, provides maximum flexibility and performance in high-noise environments and in noninverting applications. Low bias currents and extremely high input impedances are maintained over the entire temperature range.

For improved performance and wider temperature range, see the next generation OPA207 with low power, and OPA202 with heavy capacitive load drive capability.

**Package Information**

| PART NUMBER | PACKAGE(1) | BODY SIZE (NOM) |
|---|---|---|
| OP07C, OP07D | D (SOIC, 8) | 4.90 mm × 3.91 mm |
| | P (PDIP, 8) | 9.81 mm × 6.35 mm |
| | PS (SO, 8) | 6.20 mm × 5.30 mm |

(1) For all available packages and the OP07, see the orderable addendum at the end of the data sheet.




**Simplified Schematic**

## Table of Contents



## 4 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

| Changes from Revision G (November 2014) to Revision H (July 2022) | Page |
|---|---|
| • Added supply condition to wide input voltage range feature bullet | 1 |
| • Changed $VCC_+$ to V+ and $VCC_-$ to V− | 3 |
| • Changed supply voltage abbreviation from VCC+ and VCC– to $V_S$ in *Absolute Maximum Ratings* and throughout the data sheet | 4 |
| • Changed note 5 in *Absolute Maximum Ratings* to include a note that fast-ramping shorts to the positive supply can damage the device | 4 |
| • Changed Electrostatic discharge Human-body model and Charged-device model from 1000 V to ±1000 V | 4 |
| • Added new values to *Thermal Information* | 4 |
| • Changed *Electrical Characteristics* format | 5 |
| • Changed parameter name from supply-voltage sensitivity to power supply rejection ratio in *Electrical Characteristics* | 5 |
| • Changed parameter name from input offset voltage to Input voltage noise density in *Electrical Characteristics* | 5 |
| • Changed input current noise density unit from nV/√Hz to pA/√Hz in *Electrical Characteristics* | 5 |
| • Changed parameter name from large-signal differential voltage gain to open-loop voltage gain in *Electrical Characteristics* | 5 |
| • Changed parameter name from peak output voltage to voltage output swing in Electrical Characteristics | 5 |
| • Changed functional block diagram | 7 |
| • Changed text to clarify how to adjust input mismatches using null pins in *Application Information* | 8 |

| Changes from Revision F (January 2014) to Revision G (November 2014) | Page |
|---|---|
| • Added *Applications*, *Device Information* table, *Pin Functions* table, *Handling Ratings* table, *Thermal Information* table, *Typical Characteristics*, *Feature Description* section, *Device Functional Modes*, *Application and Implementation* section, *Power Supply Recommendations* section, *Layout* section, *Device and Documentation Support* section, and *Mechanical, Packaging, and Orderable Information* section | 1 |

| Changes from Revision E (May 2004) to Revision F (January 2014) | Page |
|---|---|
| • Deleted *Ordering Information* table | 1 |

## 5 Pin Configuration and Functions

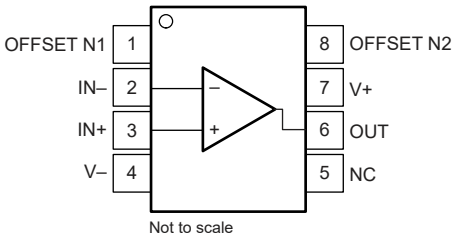



**Figure 5-1. D Package, 8-Pin SOIC, P Package, 8-Pin PDIP, and PS Package, 8-Pin SO (Top View)**

**Table 5-1. Pin Functions**

| PIN | | TYPE | DESCRIPTION |
|---|---|---|---|
| NAME | NO. | | |
| IN+ | 3 | Input | Noninverting input |
| IN– | 2 | Input | Inverting input |
| NC | 5 | — | Do not connect |
| OFFSET N1 | 1 | Input | External input offset voltage adjustment |
| OFFSET N2 | 8 | Input | External input offset voltage adjustment |
| OUT | 6 | Output | Output |
| V+ | 7 | — | Positive supply |
| V– | 4 | — | Negative supply |

# 6 Specifications

## 6.1 Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted) (1)

| | | | MIN | MAX | UNIT |
|---|---|---|---|---|---|
| $V_S$ | Supply voltage(2) | Single supply | | 44 | V |
| | | Dual supply | | ±22 | |
| | Input voltage | Differential(3) | | ±30 | V |
| | | Single-ended(4) | | ±22 | |
| | Output short-circuit(5) | | Continous | | |
| $T_J$ | Operating junction temperature | | –55 | 150 | °C |
| $T_{stg}$ | Storage temperature | | –65 | 150 | °C |

(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) All voltage values, unless otherwise noted, are with respect to the midpoint between V+ and V−.
(3) Differential voltages are at IN+ with respect to IN−.
(4) The magnitude of the input voltage must never exceed the magnitude of the supply voltage or 15 V, whichever is less.
(5) The output can be shorted to ground or to the negative power supply. Fast ramping shorts to the positive supply can cause permanent damage and eventual destruction.

## 6.2 ESD Ratings

| | | | VALUE | UNIT |
|---|---|---|---|---|
| $V_{(ESD)}$ | Electrostatic discharge | Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001(1) | ±1000 | V |
| | | Charged-device model (CDM), per JEDEC specification JESD22-C101(2) | ±1000 | |

(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.
(2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

## 6.3 Recommended Operating Conditions

over operating free-air temperature range (unless otherwise noted)

| | | | MIN | NOM | MAX | UNIT |
|---|---|---|---|---|---|---|
| $V_S$ | Supply voltage | Single supply | 6 | | 36 | V |
| | | Dual supply | ±3 | | ±18 | |
| $V_{CM}$ | Common-mode input voltage | $V_S$ = ±15 V | –13 | | 13 | V |
| $T_A$ | Operating ambient temperature | | 0 | | 70 | °C |

## 6.4 Thermal Information

| THERMAL METRIC(1) | | OP07x | | UNIT |
|---|---|---|---|---|
| | | D (SOIC) | P (PDIP) | |
| | | 8 PINS | 8 PINS | |
| $R_{\theta JA}$ | Junction-to-ambient thermal resistance | 127.6 | 85 | °C/W |
| $R_{\theta JC(top)}$ | Junction-to-case (top) thermal resistance | 67.1 | 68.6 | °C/W |
| $R_{\theta JB}$ | Junction-to-board thermal resistance | 71.4 | 55..6 | °C/W |
| $\psi_{JT}$ | Junction-to-top characterization parameter | 18.7 | 38.3 | °C/W |
| $\psi_{JB}$ | Junction-to-board characterization parameter | 70.6 | 55.2 | °C/W |
| $R_{\theta JC(bot)}$ | Junction-to-case (bottom) thermal resistance | — | — | °C/W |

(1) For more information about traditional and new thermal metrics, see the Semiconductor and IC Package Thermal Metrics application report.

## 6.5 Electrical Characteristics

at $T_A$ = 25°C, $V_S$ = ±15 V, $R_L$ = 2 kΩ connected to mid-supply, and $V_{CM}$ = $V_{OUT}$ = mid-supply (unless otherwise noted)[1].

| PARAMETER | | TEST CONDITIONS | | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|
| **OFFSET VOLTAGE** | | | | | | | |
| $V_{OS}$ | Input offset voltage | OP07C | | | ±60 | | µV |
| | | | $T_A$ = 0°C to 70°C | | ±85 | | |
| | | OP07D | | | | ±150 | |
| | | | $T_A$ = 0°C to 70°C | | | ±250 | |
| $dV_{OS}/dT$ | Input offset voltage drift | $T_A$ = 0°C to 70°C | OP07C | | ±0.5 | | µV/°C |
| | | | OP07D | | | ±2.5 | |
| | Long-term drift of input offset voltage[2] | | | | ±0.4 | | µV/mo |
| | Offset adjustment range | $R_s$ = 20 kΩ, see Section 8.1 | | | ±4 | | mV |
| PSRR | Power supply rejection ratio | $V_S$ = ±3 V to ±18 V | | | 7 | 32 | µV/V |
| | | | $T_A$ = 0°C to 70°C | | 10 | 51 | |
| **INPUT BIAS CURRENT** | | | | | | | |
| $I_B$ | Input bias current | OP07C | | | ±1.8 | | nA |
| | | | $T_A$ = 0°C to 70°C | | ±2.2 | | |
| | | OP07D | | | | ±12 | |
| | | | $T_A$ = 0°C to 70°C | | | ±14 | |
| | Input bias current drift | OP07C | | | ±18 | | pA/°C |
| | | OP07D | | | | ±50 | |
| $I_{OS}$ | Input offset current | OP07C | | | ±0.8 | | nA |
| | | | $T_A$ = 0°C to 70°C | | ±1.6 | | |
| | | OP07D | | | | ±6 | |
| | | | $T_A$ = 0°C to 70°C | | | ±8 | |
| | Input offset current drift | OP07C | | | 12 | | pA/°C |
| | | OP07D | | | | ±50 | |
| **NOISE** | | | | | | | |
| | Input voltage noise | f = 0.1 Hz to 10 Hz | | | 0.38 | | $µV_{PP}$ |
| $e_N$ | Input voltage noise density | f = 10 Hz | | | 10.5 | | $nV/\sqrt{Hz}$ |
| | | f = 100 Hz | | | 10.2 | | |
| | | f = 1 kHz | | | 9.8 | | |
| | Input current noise | f = 0.1 Hz to 10 Hz | | | 15 | | $pA_{pp}$ |
| $i_N$ | Input current noise density | f = 10 Hz | | | 0.35 | | $pA/\sqrt{Hz}$ |
| | | f = 100 Hz | | | 0.15 | | |
| | | f = 1 kHz | | | 0.13 | | |
| **INPUT VOLTAGE RANGE** | | | | | | | |
| $V_{CM}$ | Common-mode voltage | | | ±13 | ±14 | | V |
| | | $T_A$ = 0°C to 70°C | | ±13 | ±13.5 | | |
| CMRR | Common-mode rejection ratio | OP07C<br>$V_{CM}$ = ±13 V | | 100 | 120 | | dB |
| | | | $T_A$ = 0°C to 70°C | 97 | 120 | | |
| | | OP07D<br>$V_{CM}$ = ±13 V | | 94 | 110 | | |
| | | | $T_A$ = 0°C to 70°C | 94 | 106 | | |
| **INPUT CAPACITANCE** | | | | | | | |
| $r_I$ | Input resistance | | | | 7 | 33 | MΩ |
| **OPEN-LOOP GAIN** | | | | | | | |
| $A_{OL}$ | Open-loop voltage gain | 1.4 V < $V_O$ < 11.4 V,<br>$R_L$ = 500 kΩ | OP07C | 100 | 400 | | V/mV |
| | | | OP07D | | 400 | | |
| | | $V_O$ = ±10 V | | 120 | 400 | | |
| | | | $T_A$ = –40°C to +125°C | 100 | 400 | | |

## 6.5 Electrical Characteristics (continued)

at $T_A$ = 25°C, $V_S$ = ±15 V, $R_L$ = 2 kΩ connected to mid-supply, and $V_{CM}$ = $V_{OUT}$ = mid-supply (unless otherwise noted)(1).

| PARAMETER | | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| **FREQUENCY RESPONSE** | | | | | | |
| | Unity gain bandwidth | | 0.4 | 0.6 | | MHz |
| SR | Slew rate | $V_S$ = 5 V, $R_L$ = 2 kΩ | | 0.3 | | V/µs |
| **OUTPUT** | | | | | | |
| | Voltage output swing | | ±11.5 | ±12.8 | | V |
| | | $T_A$ = 0°C to 70°C | ±11 | ±12.6 | | |
| | | $R_L$ = 10 kΩ | ±12 | ±13 | | |
| | | $R_L$ = 1 kΩ | | ±12 | | |
| **POWER SUPPLY** | | | | | | |
| $P_D$ | Power dissipation | No load | | 80 | 150 | mW |
| | | $V_S$ = ±3 V, no load | | 4 | 8 | |

(1) The specifications listed in the *Electrical Characteristics* apply to OP07C and OP07D.
(2) Because long-term drift cannot be measured on the individual devices before shipment, this specification is not intended to be a warranty. This specification is an engineering estimate of the averaged trend line of drift versus time over extended periods after the first 30 days of operation.

## 6.6 Typical Characteristics

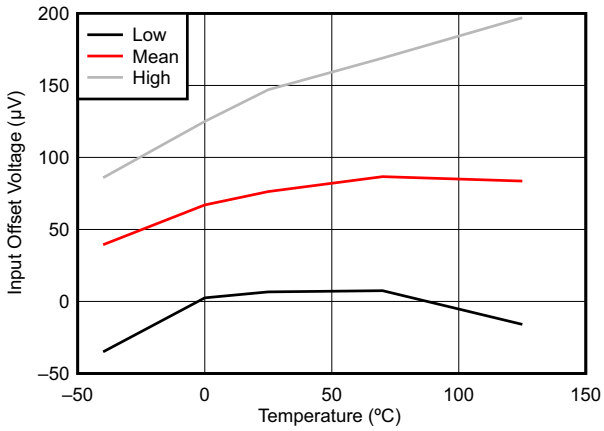



**Figure 6-1. Input-Offset Voltage vs Temperature**

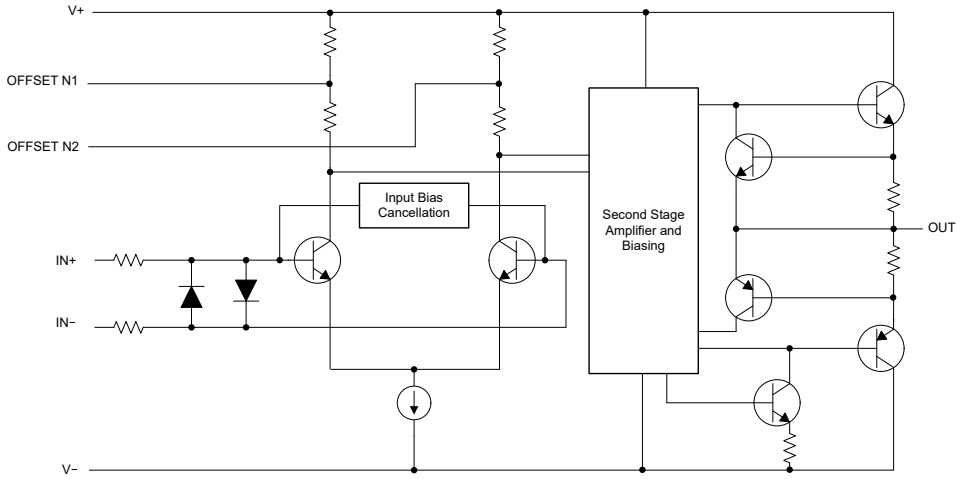
# 7 Detailed Description

## 7.1 Overview

These devices offer low offset and long-term stability by means of a low-noise, chopperless, bipolar-input-transistor amplifier circuit. For most applications, external components are not required for offset nulling and frequency compensation. The true differential input, with a wide input-voltage range and outstanding common-mode rejection, provides maximum flexibility and performance in high-noise environments and in noninverting applications. Low bias currents and extremely high input impedances are maintained over the entire temperature range.

These devices are characterized for operation from 0°C to 70°C.

## 7.2 Functional Block Diagram




## 7.3 Feature Description

### 7.3.1 Offset-Voltage Null Capability

The input offset voltage of operational amplifiers (op amps) arises from unavoidable mismatches in the differential input stage of the op-amp circuit caused by mismatched transistor pairs, collector currents, current-gain betas (β), collector or emitter resistors, and so on. The input offset pins allow the designer to adjust for these mismatches by external circuitry. See *Section 8* for more details on design techniques.

### 7.3.2 Slew Rate

The slew rate is the rate at which an operational amplifier can change the output when there is a change on the input. The OP07x have a 0.3-V/µs slew rate.

## 7.4 Device Functional Modes

The OP07x are powered on when the supply is connected. The devices can be operated as single-supply operational amplifiers or dual-supply amplifiers, depending on the application.

# 8 Application and Implementation

**Note**

Information in the following applications sections is not part of the TI component specification, and TI does not warrant its accuracy or completeness. TI's customers are responsible for determining suitability of components for their purposes, as well as validating and testing their design implementation to confirm system functionality.

## 8.1 Application Information

The input offset voltage of operational amplifiers (op amps) arises from unavoidable mismatches in the differential input stage of the op-amp circuit caused by mismatched transistor pairs, collector currents, current-gain betas (β), collector or emitter resistors, and so on. The input offset pins allow the designer to adjust for these mismatches with external circuitry. Figure 8-1 shows how these input mismatches can be adjusted by putting resistors or a potentiometer between the null pins. Use a potentiometer to fine tune the circuit during testing or for applications that require precision offset control. For more information about designing using the input-offset pins, see the *Nulling Input Offset Voltage of Operational Amplifiers* application report.

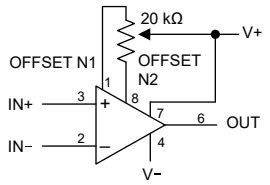



**Figure 8-1. Input Offset-Voltage Null Circuit**

## 8.2 Typical Application

The voltage follower configuration of the operational amplifier is used for applications where a weak signal is used to drive a relatively high current load. This circuit is also called a buffer amplifier or unity gain amplifier. The inputs of an operational amplifier have a very high resistance that puts a negligible current load on the voltage source. The output resistance of the operational amplifier is almost negligible, so the amplifier can provide as much current as necessary to the output load.

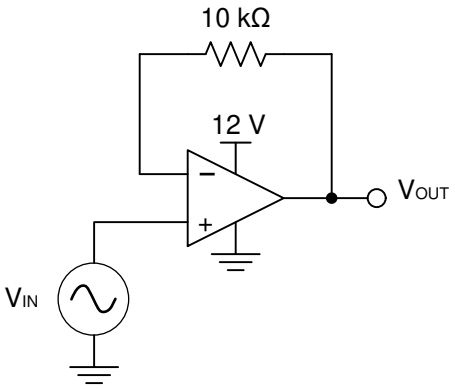



**Figure 8-2. Voltage Follower Schematic**

### 8.2.1 Design Requirements

- Output range of 2 V to 11 V
- Input range of 2 V to 11 V

### 8.2.2 Detailed Design Procedure

#### *8.2.2.1 Output Voltage Swing*

The output voltage of an operational amplifier is limited by the internal circuitry to some level less than the supply rails. For this amplifier, the output voltage swing is within ±12 V, which accommodates the input and output voltage requirements.

#### *8.2.2.2 Supply and Input Voltage*

For correct operation of the amplifier, neither input must be higher than the recommended positive supply rail voltage or lower than the recommended negative supply rail voltage. The chosen amplifier must be able to operate at the supply voltage that accommodates the inputs. Because the input for this application goes up to 11 V, the supply voltage must be 12 V. Using a negative voltage on the lower rail, rather than ground, allows the amplifier to maintain linearity for inputs below 2 V.

### 8.2.3 Application Curves

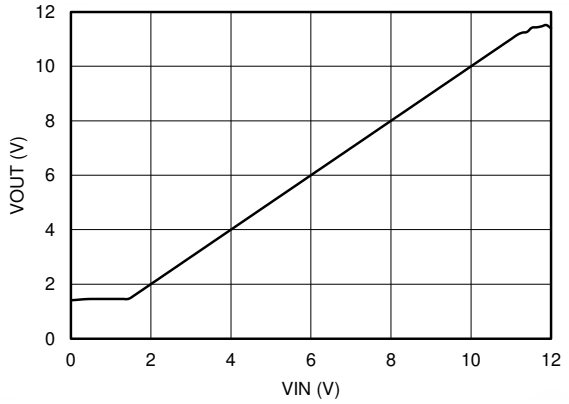



**Figure 8-3. Output Voltage vs Input Voltage**

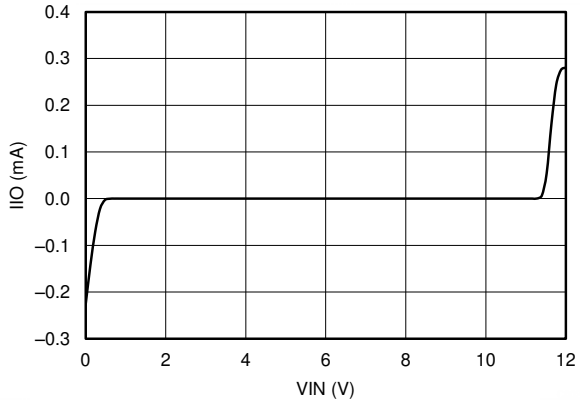



**Figure 8-4. Current Drawn by the Input of the Voltage Follower ($I_{IO}$) vs Input Voltage**

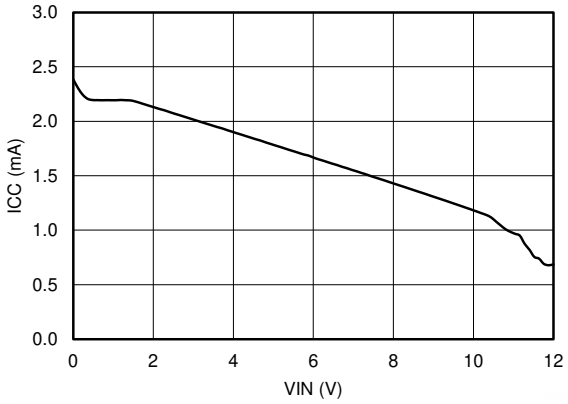



**Figure 8-5. Current Drawn from Supply ($I_{CC}$) vs Input Voltage**

## 8.3 Power Supply Recommendations

The OP07x operate from ±3 V to ±18 V supplies; many specifications apply from 0°C to 70°C.

**CAUTION**

Supply voltages larger than ±22 V can permanently damage the device. See also *Section 6.1*.

Place 0.1-µF bypass capacitors close to the power-supply pins to reduce errors coupling in from noisy or high-impedance power supplies. For more details on bypass capacitor placement, see *Section 8.4.1*.

## 8.4 Layout

### 8.4.1 Layout Guidelines

For best operational performance of the device, use good PCB layout practices, including:

- Noise can propagate into analog circuitry through the power pins of the circuit as a whole, as well as the operational amplifier. Bypass capacitors are used to reduce the coupled noise by providing low-impedance power sources local to the analog circuitry.
  - Connect low-ESR, 0.1-µF ceramic bypass capacitors between each supply pin and ground, placed as close to the device as possible. A single bypass capacitor from V+ to ground is applicable for single supply applications.
- Separate grounding for analog and digital portions of circuitry is one of the simplest and most-effective methods of noise suppression. On multilayer PCBs, one or more layers are usually devoted to ground planes. A ground plane helps distribute heat and reduces EMI noise pickup. Make sure to physically separate digital and analog grounds, paying attention to the flow of the ground current.
- To reduce parasitic coupling, run the input traces as far away from the supply or output traces as possible. If it is not possible to keep them separate, it is much better to cross the sensitive trace perpendicularly, as opposed to in parallel, with the noisy trace.
- Place the external components as close to the device as possible. Keeping RF and RG close to the inverting input minimizes parasitic capacitance, as shown in *Section 8.4.2*.
- Keep the length of input traces as short as possible. Always remember that the input traces are the most sensitive part of the circuit.
- Consider a driven, low-impedance guard ring around the critical traces. A guard ring can significantly reduce leakage currents from nearby traces that are at different potentials.

### 8.4.2 Layout Example

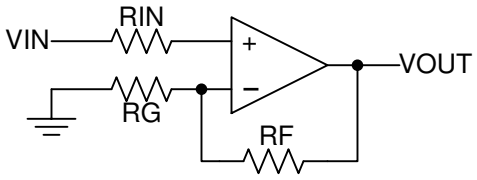



**Figure 8-6. Operational Amplifier Schematic for Noninverting Configuration**

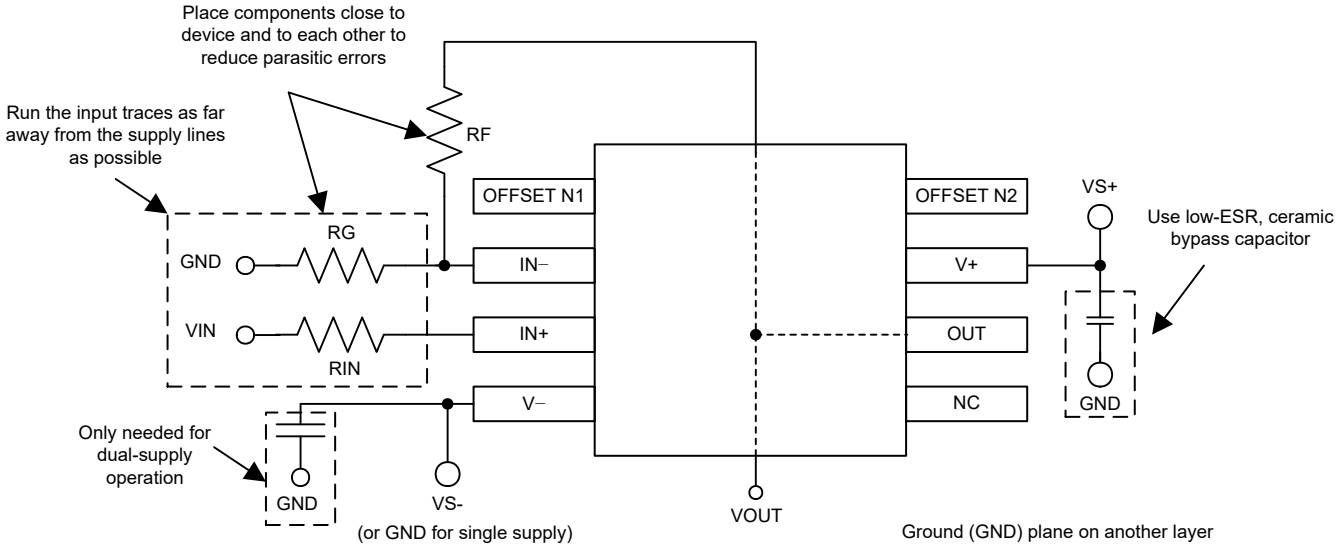



**Figure 8-7. Operational Amplifier Board Layout for Noninverting Configuration**

# 9 Device and Documentation Support

## 9.1 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on ti.com. Click on *Subscribe to updates* to register and receive a weekly digest of any product information that has changed. For change details, review the revision history included in any revised document.

## 9.2 Support Resources

TI E2E™ support forums are an engineer's go-to source for fast, verified answers and design help — straight from the experts. Search existing answers or ask your own question to get the quick design help you need.

Linked content is provided "AS IS" by the respective contributors. They do not constitute TI specifications and do not necessarily reflect TI's views; see TI's Terms of Use.

## 9.3 Trademarks

TI E2E™ is a trademark of Texas Instruments.
All trademarks are the property of their respective owners.

## 9.4 Electrostatic Discharge Caution

This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

## 9.5 Glossary

| | |
|---|---|
| TI Glossary | This glossary lists and explains terms, acronyms, and definitions. |

# 10 Mechanical, Packaging, and Orderable Information

The following pages include mechanical packaging and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser based versions of this data sheet, refer to the left hand navigation.

## PACKAGING INFORMATION

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead finish/ Ball material (6) | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|---|---|---|---|---|---|---|---|---|---|---|---|
| OP-07DP | ACTIVE | PDIP | P | 8 | 50 | RoHS & Green | NIPDAU | N / A for Pkg Type | 0 to 70 | OP-07DP | Samples |
| OP-07DPS | ACTIVE | SO | PS | 8 | 80 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | OP-07D | Samples |
| OP-07DPSR | ACTIVE | SO | PS | 8 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | OP-07D | Samples |
| OP-07DPSRG4 | ACTIVE | SO | PS | 8 | 2000 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | OP-07D | Samples |
| OP07-W | ACTIVE | WAFERSALE | YS | 0 | 3603 | TBD | Call TI | Call TI | | | Samples |
| OP07CD | ACTIVE | SOIC | D | 8 | 75 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | OP07C | Samples |
| OP07CDE4 | ACTIVE | SOIC | D | 8 | 75 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | OP07C | Samples |
| OP07CDG4 | ACTIVE | SOIC | D | 8 | 75 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | OP07C | Samples |
| OP07CDR | ACTIVE | SOIC | D | 8 | 2500 | RoHS & Green | NIPDAU \| SN | Level-1-260C-UNLIM | 0 to 70 | OP07C | Samples |
| OP07CDRE4 | ACTIVE | SOIC | D | 8 | 2500 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | OP07C | Samples |
| OP07CDRG4 | ACTIVE | SOIC | D | 8 | 2500 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | OP07C | Samples |
| OP07CP | ACTIVE | PDIP | P | 8 | 50 | RoHS & Green | NIPDAU | N / A for Pkg Type | 0 to 70 | OP07CP | Samples |
| OP07CPE4 | ACTIVE | PDIP | P | 8 | 50 | RoHS & Green | NIPDAU | N / A for Pkg Type | 0 to 70 | OP07CP | Samples |
| OP07DD | ACTIVE | SOIC | D | 8 | 75 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | OP07D | Samples |
| OP07DDR | ACTIVE | SOIC | D | 8 | 2500 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | OP07D | Samples |
| OP07DDRE4 | ACTIVE | SOIC | D | 8 | 2500 | RoHS & Green | NIPDAU | Level-1-260C-UNLIM | 0 to 70 | OP07D | Samples |
| OP07DP | ACTIVE | PDIP | P | 8 | 50 | RoHS & Green | NIPDAU | N / A for Pkg Type | 0 to 70 | OP07DP | Samples |
| OP07DPE4 | ACTIVE | PDIP | P | 8 | 50 | RoHS & Green | NIPDAU | N / A for Pkg Type | 0 to 70 | OP07DP | Samples |

(1) The marketing status values are defined as follows:
**ACTIVE:** Product device recommended for new designs.
**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.
**OBSOLETE:** TI has discontinued the production of the device.

**(2) RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".
**RoHS Exempt:** TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.
**Green:** TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

**(3)** MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

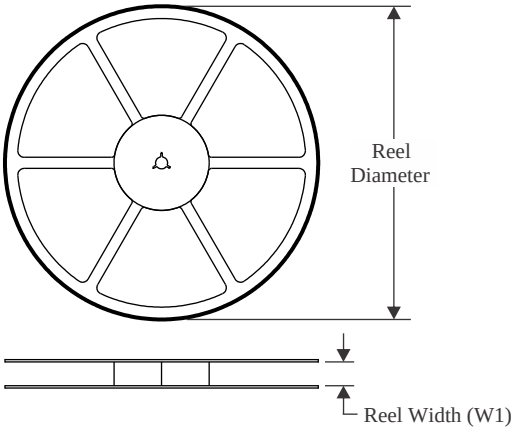
**(4)** There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

**(5)** Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

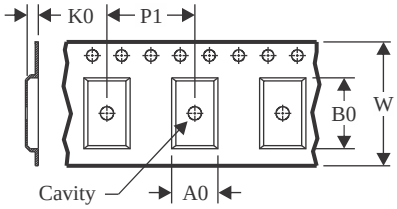
**(6)** Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

## TAPE AND REEL INFORMATION

**REEL DIMENSIONS**

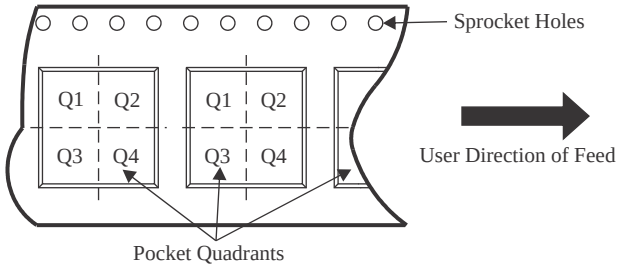



**TAPE DIMENSIONS**




| | |
|---|---|
| A0 | Dimension designed to accommodate the component width |
| B0 | Dimension designed to accommodate the component length |
| K0 | Dimension designed to accommodate the component thickness |
| W | Overall width of the carrier tape |
| P1 | Pitch between successive cavity centers |

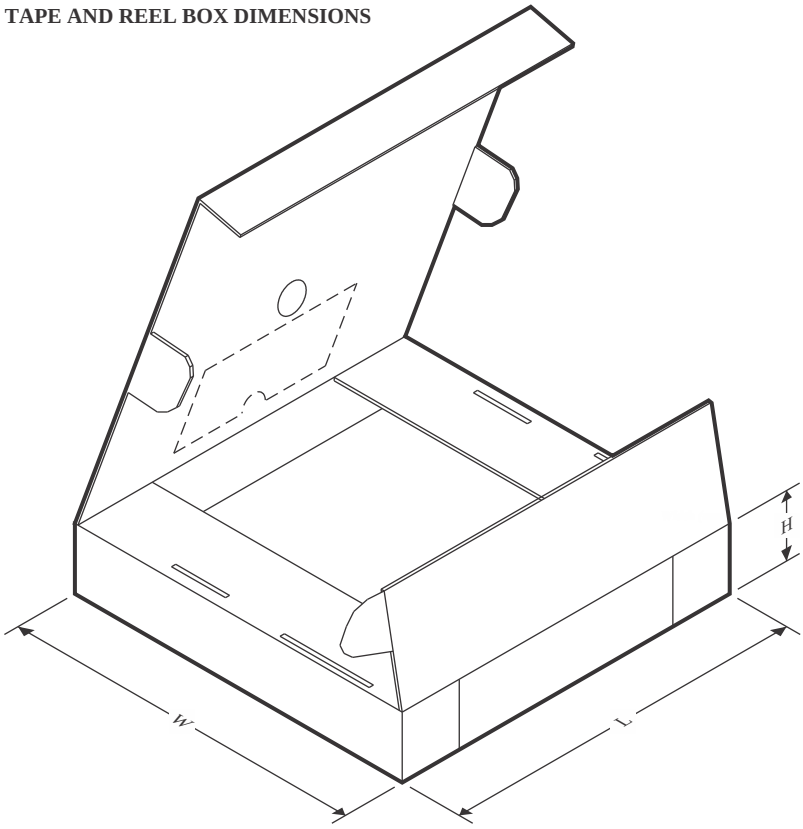
**QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE**




*All dimensions are nominal

| Device | Package Type | Package Drawing | Pins | SPQ | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| OP-07DPSR | SO | PS | 8 | 2000 | 330.0 | 16.4 | 8.35 | 6.6 | 2.4 | 12.0 | 16.0 | Q1 |
| OP07CDR | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |
| OP07CDRG4 | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |
| OP07DDR | SOIC | D | 8 | 2500 | 330.0 | 12.4 | 6.4 | 5.2 | 2.1 | 8.0 | 12.0 | Q1 |

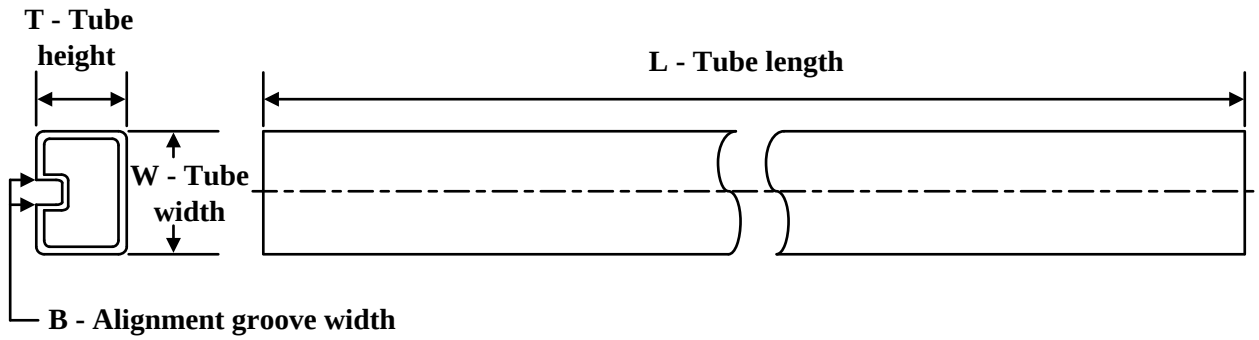
TAPE AND REEL BOX DIMENSIONS




*All dimensions are nominal

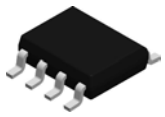
| Device | Package Type | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|---|---|---|---|---|---|---|---|
| OP-07DPSR | SO | PS | 8 | 2000 | 356.0 | 356.0 | 35.0 |
| OP07CDR | SOIC | D | 8 | 2500 | 340.5 | 336.1 | 25.0 |
| OP07CDRG4 | SOIC | D | 8 | 2500 | 340.5 | 336.1 | 25.0 |
| OP07DDR | SOIC | D | 8 | 2500 | 340.5 | 336.1 | 25.0 |

## TUBE




*All dimensions are nominal

| Device | Package Name | Package Type | Pins | SPQ | L (mm) | W (mm) | T (µm) | B (mm) |
|---|---|---|---|---|---|---|---|---|
| OP-07DP | P | PDIP | 8 | 50 | 506 | 13.97 | 11230 | 4.32 |
| OP-07DPS | PS | SOP | 8 | 80 | 530 | 10.5 | 4000 | 4.1 |
| OP07CD | D | SOIC | 8 | 75 | 507 | 8 | 3940 | 4.32 |
| OP07CDE4 | D | SOIC | 8 | 75 | 507 | 8 | 3940 | 4.32 |
| OP07CDG4 | D | SOIC | 8 | 75 | 507 | 8 | 3940 | 4.32 |
| OP07CP | P | PDIP | 8 | 50 | 506 | 13.97 | 11230 | 4.32 |
| OP07CP | P | PDIP | 8 | 50 | 506 | 13.97 | 11230 | 4.32 |
| OP07CPE4 | P | PDIP | 8 | 50 | 506 | 13.97 | 11230 | 4.32 |
| OP07CPE4 | P | PDIP | 8 | 50 | 506 | 13.97 | 11230 | 4.32 |
| OP07DD | D | SOIC | 8 | 75 | 507 | 8 | 3940 | 4.32 |
| OP07DP | P | PDIP | 8 | 50 | 506 | 13.97 | 11230 | 4.32 |
| OP07DPE4 | P | PDIP | 8 | 50 | 506 | 13.97 | 11230 | 4.32 |

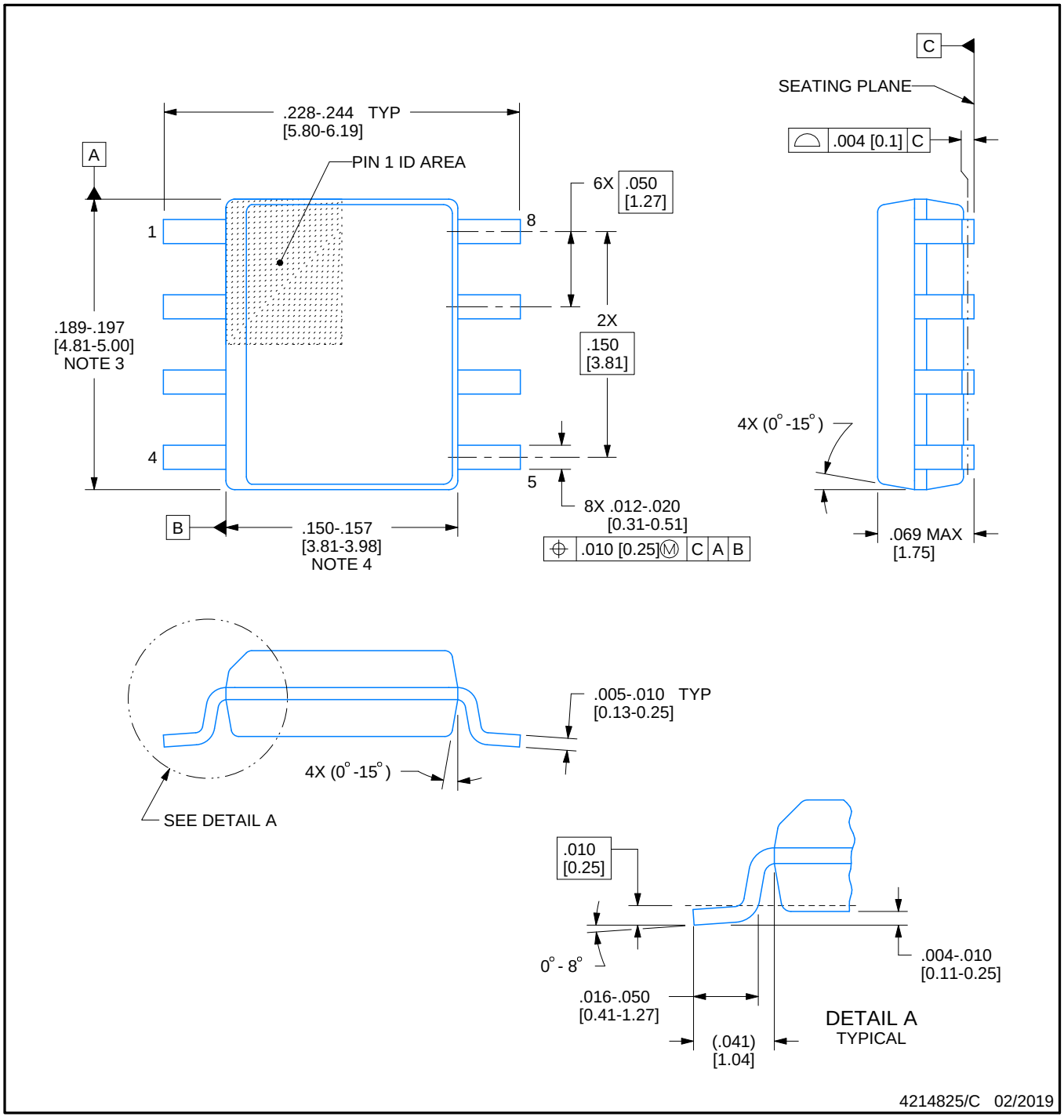


# PACKAGE OUTLINE

## D0008A

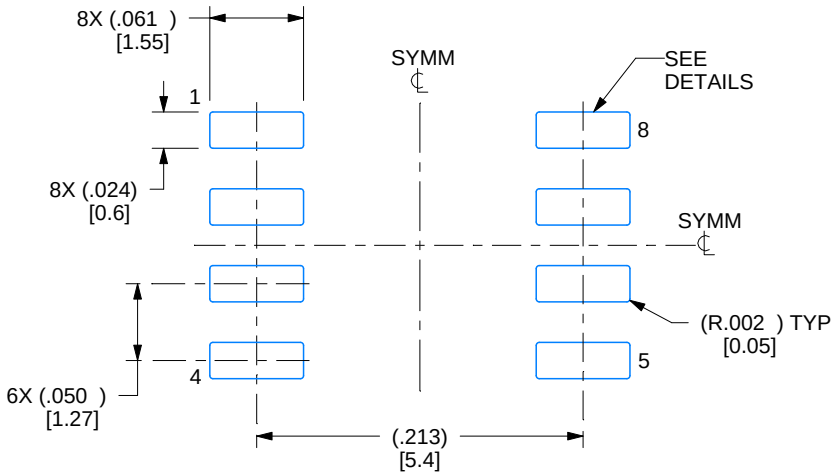
## SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT

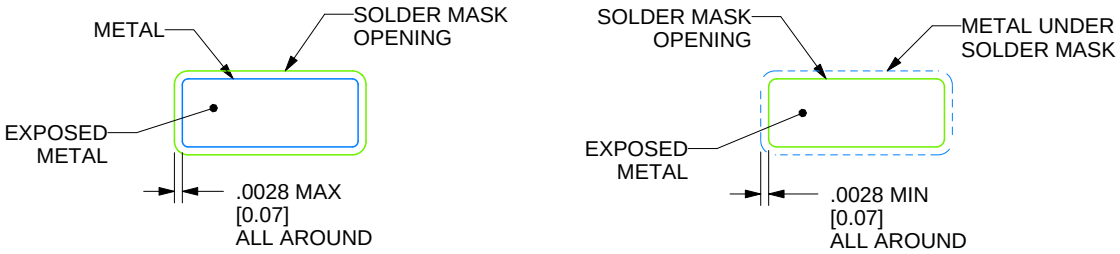



NOTES:

1. Linear dimensions are in inches [millimeters]. Dimensions in parenthesis are for reference only. Controlling dimensions are in inches. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed .006 [0.15] per side.
4. This dimension does not include interlead flash.
5. Reference JEDEC registration MS-012, variation AA.




LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:8X




SOLDER MASK DETAILS

4214825/C 02/2019

NOTES: (continued)

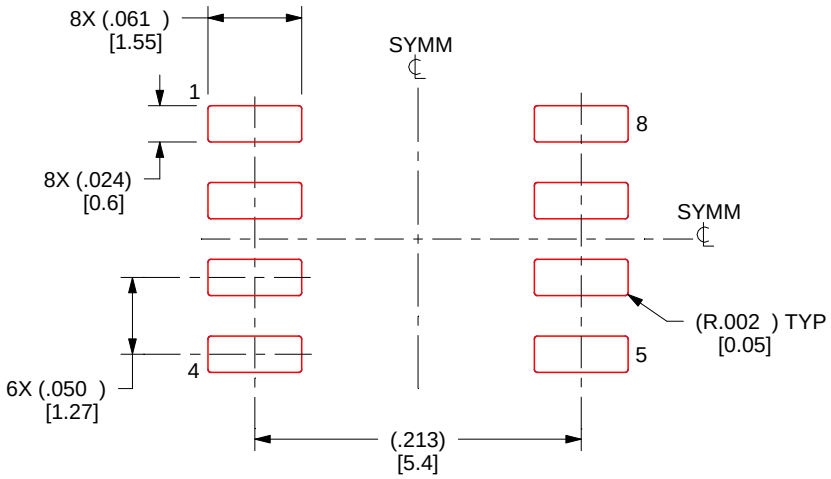
6. Publication IPC-7351 may have alternate designs.
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

# EXAMPLE STENCIL DESIGN

## D0008A

## SOIC - 1.75 mm max height

SMALL OUTLINE INTEGRATED CIRCUIT




SOLDER PASTE EXAMPLE
BASED ON .005 INCH [0.125 MM] THICK STENCIL
SCALE:8X

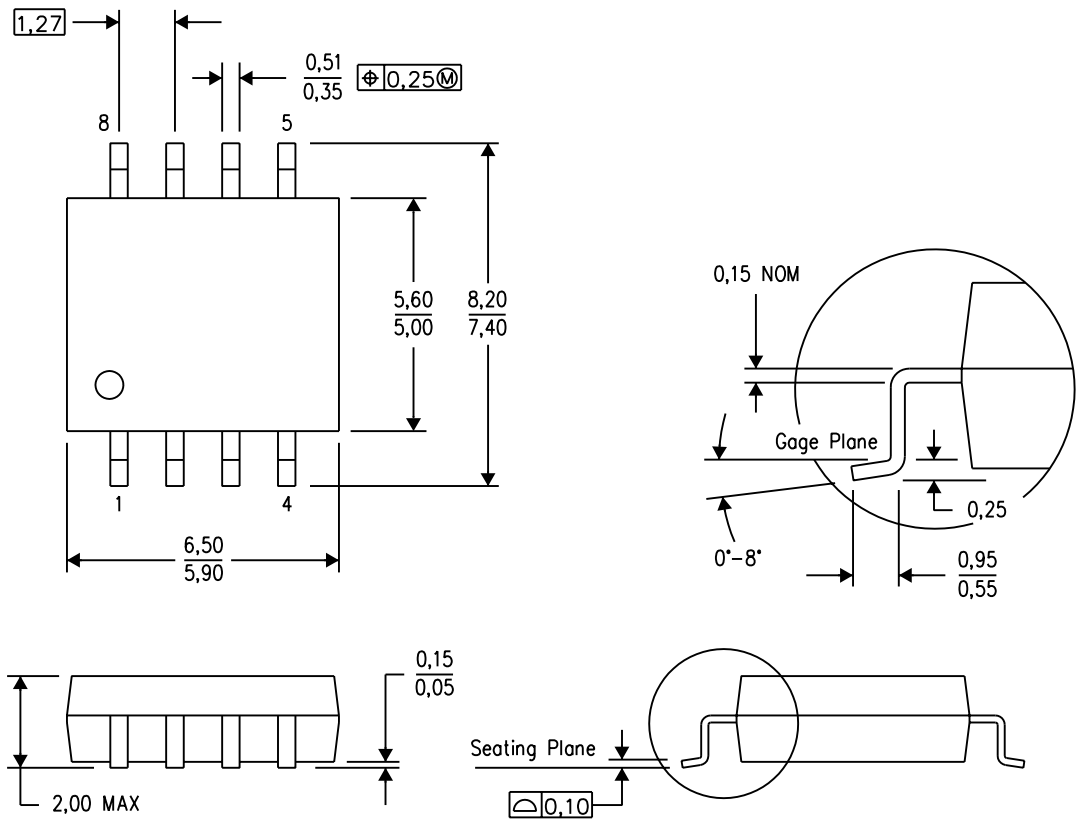
4214825/C 02/2019

NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

## MECHANICAL DATA

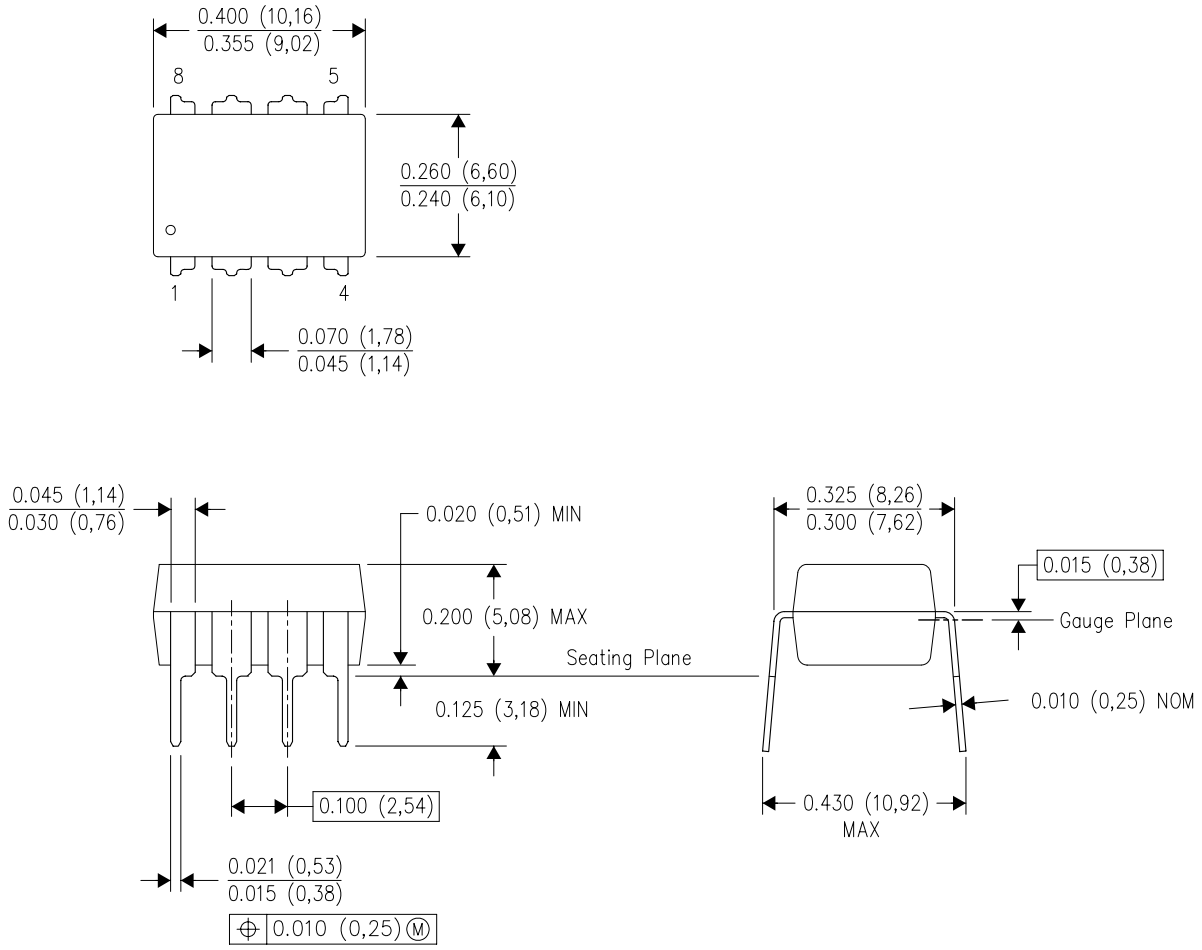
**PS (R-PDSO-G8)** **PLASTIC SMALL-OUTLINE PACKAGE**




4040063/C 03/03

NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

P (R–PDIP–T8) PLASTIC DUAL–IN–LINE PACKAGE




NOTES:
A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
C. Falls within JEDEC MS–001 variation BA.

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