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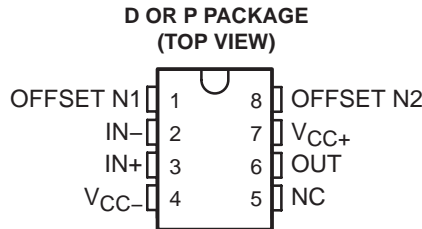
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ELECTRONICS

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Jameco Part Number 1356771

- **Low Noise**
- **No External Components Required**
- **Replace Chopper Amplifiers at a Lower Cost**
- **Wide Input-Voltage Range**  
... 0 to  $\pm 14$  V Typ
- **Wide Supply-Voltage Range**  
...  $\pm 3$  V to  $\pm 18$  V



NC – No internal connection

## description/ordering information

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. The OP07 is unsurpassed for low-noise, high-accuracy amplification of very-low-level signals.

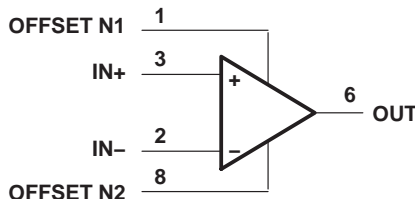
These devices are characterized for operation from 0°C to 70°C.

### ORDERING INFORMATION

$T_A$	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
0°C to 70°C	PDIP (P)	Tube of 50	OP07CP	OP07CP
		Tube of 50	OP07DP	OP07DP
	SOIC (D)	Tube of 75	OP07CD	OP07C
		Reel of 2500	OP07CDR	
		Tube of 75	OP07DD	OP07D
		Reel of 2500	OP07DDR	

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at [www.ti.com/sc/package](http://www.ti.com/sc/package).

## symbol



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**PRODUCTION DATA** information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

**TEXAS  
INSTRUMENTS**

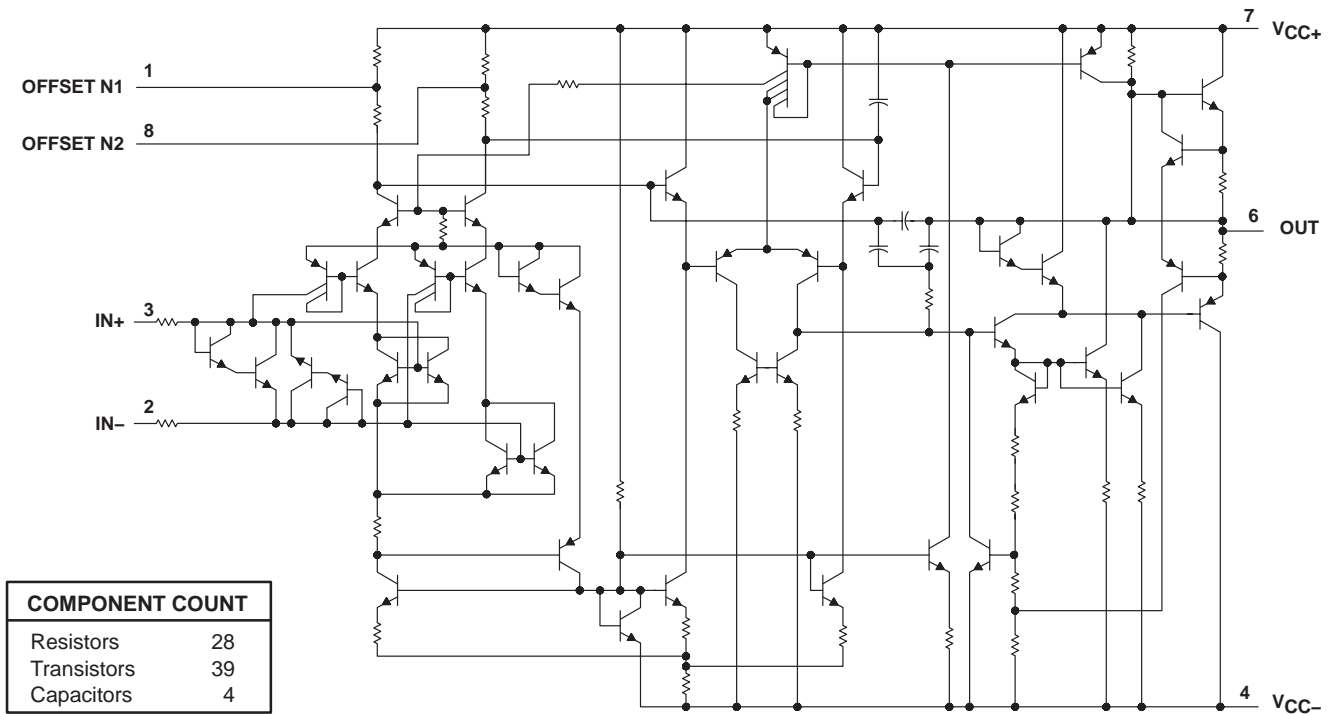
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# OP07C, OP07D PRECISION OPERATIONAL AMPLIFIERS

SLOS099E – OCTOBER 1983 – REVISED MAY 2004

## schematic



## absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

Supply voltage: $V_{CC+}$ (see Note 1)	22 V
$V_{CC-}$ (see Note 1)	-22 V
Differential input voltage (see Note 2)	$\pm 30$ V
Input voltage, $V_I$ (either input, see Note 3)	$\pm 22$ V
Duration of output short circuit (see Note 4)	Unlimited
Package thermal impedance, $\theta_{JA}$ (see Notes 5 and 6): D package	97°C/W
P package	85°C/W
Operating virtual junction temperature, $T_J$	150°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	260°C
Storage temperature range, $T_{stg}$	-65°C to 150°C

† Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTES: 1. All voltage values, unless otherwise noted, are with respect to the midpoint between  $V_{CC+}$  and  $V_{CC-}$ .

2. Differential voltages are at IN+ with respect to IN-.

3. The magnitude of the input voltage must never exceed the magnitude of the supply voltage or 15 V, whichever is less.

4. The output may be shorted to ground or to either power supply.

5. Maximum power dissipation is a function of  $T_{J(max)}$ ,  $\theta_{JA}$ , and  $T_A$ . The maximum allowable power dissipation at any allowable ambient temperature is  $P_D = (T_{J(max)} - T_A)/\theta_{JA}$ . Selecting the maximum of 150°C can affect reliability.

6. The package thermal impedance is calculated in accordance with JESD 51-7.

# OP07C, OP07D PRECISION OPERATIONAL AMPLIFIERS

SLOS099E – OCTOBER 1983 – REVISED MAY 2004

## recommended operating conditions

			MIN	MAX	UNIT
$V_{CC\pm}$	Supply voltage		$\pm 3$	$\pm 18$	V
$V_{IC}$	Common-mode input voltage	$V_{CC\pm} = \pm 15$ V	-13	13	V
$T_A$	Operating free-air temperature		0	70	°C

# OP07C, OP97D PRECISION OPERATIONAL AMPLIFIERS

SLOS099E – OCTOBER 1983 – REVISED MAY 2004

electrical characteristics at specified free-air temperature,  $V_{CC\pm} = \pm 15\text{ V}$  (unless otherwise noted)

PARAMETER	TEST CONDITION†	TA	OP07C			OP07D			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
$V_{IO}$ Input offset voltage	$V_O = 0$ , $R_S = 50\ \Omega$	25°C	60	150	60	150	60	150	$\mu\text{V}$
$\alpha_{V_{IO}}$ Temperature coefficient of input offset voltage	$V_O = 0$ , $R_S = 50\ \Omega$	0°C to 70°C	85	250	85	250	85	250	$\mu\text{V}/^\circ\text{C}$
Long-term drift of input offset voltage	See Note 6	0°C to 70°C	0.5	1.8	0.7	2.5	0.7	2.5	$\mu\text{V}/\text{mo}$
Offset adjustment range	$R_S = 20\ \text{k}\Omega$ , See Figure 1	25°C	±4			±4			mV
$I_{IO}$ Input offset current		25°C	0.8	6	0.8	6	0.8	6	nA
$\alpha_{I_{IO}}$ Temperature coefficient of input offset current		0°C to 70°C	1.6	8	1.6	8	1.6	8	nA
$I_{IB}$ Input bias current		0°C to 70°C	12	50	12	50	12	50	pA/°C
$\alpha_{I_{IB}}$ Temperature coefficient of input bias current		25°C	±1.8	±7	±2	±12	±2	±12	nA
$V_{ICR}$ Common-mode input voltage range		0°C to 70°C	±2.2	±9	±3	±14	±3	±14	pA/°C
$V_{OM}$ Peak output voltage		0°C to 70°C	18	50	18	50	18	50	pA/°C
	$R_L \geq 10\ \text{k}\Omega$	25°C	±13	±14	±13	±14	±13	±14	V
	$R_L \geq 2\ \text{k}\Omega$	0°C to 70°C	±13	±13.5	±13	±13.5	±13	±13.5	V
	$R_L \geq 1\ \text{k}\Omega$	25°C	±12	±13	±12	±13	±12	±13	V
A/D Large-signal differential voltage amplification	$R_L \geq 2\ \text{k}\Omega$	25°C	±11.5	±12.8	±11.5	±12.8	±11.5	±12.8	V
	$R_L \geq 1\ \text{k}\Omega$	0°C to 70°C	±12	±12.6	±11	±12.6	±11	±12.6	V
	$V_{CC\pm} = \pm 3\text{ V}$ , $V_O = \pm 0.5\text{ V}$ , $R_L \geq 500\ \text{k}\Omega$	25°C	100	400	400	400	400	400	V/mV
$B_1$ Unity-gain bandwidth	$V_O = \pm 10\text{ V}$ , $R_L = 2\ \text{k}\Omega$	25°C	120	400	120	400	120	400	MHz
$r_i$ Input resistance		0°C to 70°C	100	400	100	400	100	400	M $\Omega$
CMRR Common-mode rejection ratio		25°C	0.4	0.6	0.4	0.6	0.4	0.6	M $\Omega$
kSVS Supply-voltage sensitivity ( $\Delta V_{IO}/\Delta V_{CC}$ )	$V_{IC} = \pm 13\text{ V}$ , $R_S = 50\ \Omega$	25°C	8	33	7	31	7	31	dB
PD Power dissipation	$V_{CC\pm} = \pm 3\text{ V}$ to $\pm 18\text{ V}$ , $R_S = 50\ \Omega$	25°C	100	120	94	110	94	110	mW
	$V_O = 0$ , No load	0°C to 70°C	97	120	94	106	94	106	mW
PD Power dissipation	$V_{CC\pm} = \pm 3\text{ V}$ , $V_O = 0$ , No load	25°C	7	32	7	32	7	32	mW
	$V_{CC\pm} = \pm 3\text{ V}$ , $V_O = 0$ , No load	0°C to 70°C	10	51	10	51	10	51	mW
PD Power dissipation	$V_O = 0$ , No load	25°C	80	150	80	150	80	150	mW
	$V_{CC\pm} = \pm 3\text{ V}$ , $V_O = 0$ , No load	0°C to 70°C	4	8	4	8	4	8	mW

† All characteristics are measured under open-loop conditions, with zero common-mode input voltage, unless otherwise noted.

NOTE 7: Since long-term drift cannot be measured on the individual devices prior to shipment, this specification is not intended to be a warranty. It is an engineering estimate of the averaged trend line of drift versus time over extended periods after the first 30 days of operation.

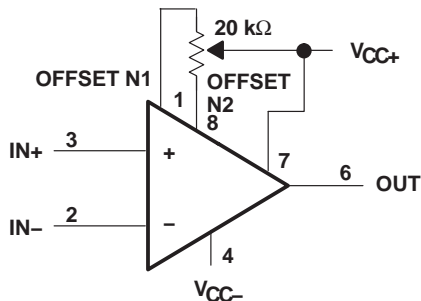


operating characteristics,  $V_{CC\pm} = \pm 15\text{ V}$ ,  $T_A = 25^\circ\text{C}$

PARAMETER	TEST CONDITION <sup>†</sup>	OP07C	OP07D	UNIT
		TYP	TYP	
$V_n$ Equivalent input noise voltage	$f = 10\text{ Hz}$	10.5	10.5	$\text{nV}/\sqrt{\text{Hz}}$
	$f = 100\text{ Hz}$	10.2	10.3	
	$f = 1\text{ kHz}$	9.8	9.8	
$V_{N(PP)}$ Peak-to-peak equivalent input noise voltage	$f = 0.1\text{ Hz to }10\text{ Hz}$	0.38	0.38	$\mu\text{V}$
$I_n$ Equivalent input noise current	$f = 10\text{ Hz}$	0.35	0.35	$\text{pA}/\sqrt{\text{Hz}}$
	$f = 100\text{ Hz}$	0.15	0.15	
	$f = 1\text{ kHz}$	0.13	0.13	
$I_{N(PP)}$ Peak-to-peak equivalent input noise current	$f = 0.1\text{ Hz to }10\text{ Hz}$	15	15	$\text{pA}$
SR    Slew rate	$R_L \geq 2\text{ k}\Omega$	0.3	0.3	$\text{V}/\mu\text{s}$

<sup>†</sup> All characteristics are measured under open-loop conditions, with zero common-mode input voltage, unless otherwise noted.

### APPLICATION INFORMATION



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

**PACKAGING INFORMATION**

Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	Eco Plan <sup>(2)</sup>	Lead/Ball Finish	MSL Peak Temp <sup>(3)</sup>
OP-07DPSR	ACTIVE	SO	PS	8	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
OP-07DPSRE4	ACTIVE	SO	PS	8	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
OP-07DPSRG4	ACTIVE	SO	PS	8	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
OP07CD	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
OP07CDE4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
OP07CDG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
OP07CDR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
OP07CDRE4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
OP07CDRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
OP07CP	ACTIVE	PDIP	P	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
OP07CPE4	ACTIVE	PDIP	P	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
OP07DD	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
OP07DDE4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
OP07DDG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
OP07DDR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
OP07DDRE4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
OP07DDRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
OP07DP	ACTIVE	PDIP	P	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type
OP07DPE4	ACTIVE	PDIP	P	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type

<sup>(1)</sup> 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.

<sup>(2)</sup> Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**TBD:** The Pb-Free/Green conversion plan has not been defined.

**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered

at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

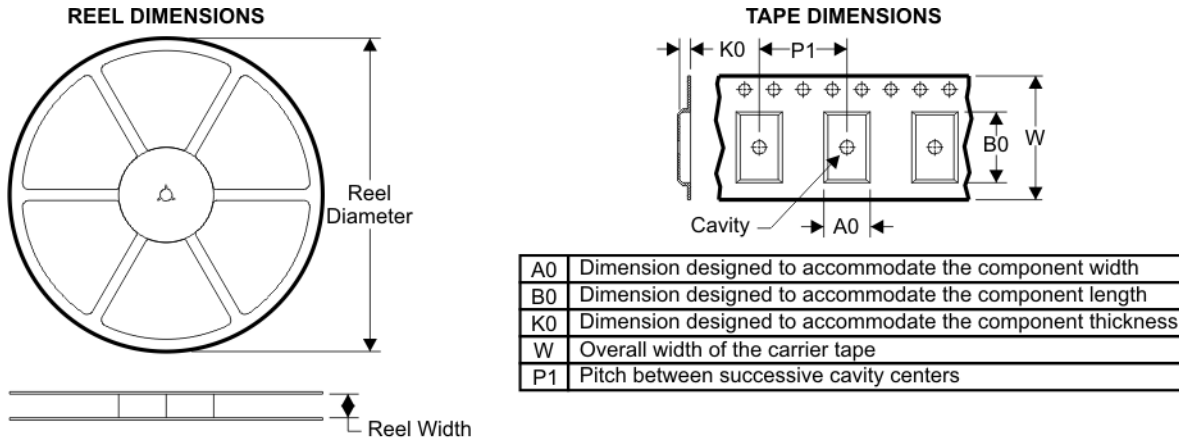
**Green (RoHS & no Sb/Br):** TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

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

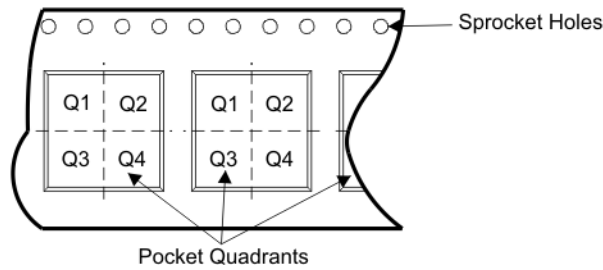
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**TAPE AND REEL BOX INFORMATION**



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



Device	Package	Pins	Site	Reel Diameter (mm)	Reel Width (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
OP-07DPSR	PS	8	SITE 41	330	16	8.0	7.0	3.0	12	16	Q1
OP07CDR	D	8	SITE 27	330	12	6.0	5.0	2.0	8	12	Q1
OP07DDR	D	8	SITE 27	330	12	6.0	5.0	2.0	8	12	Q1

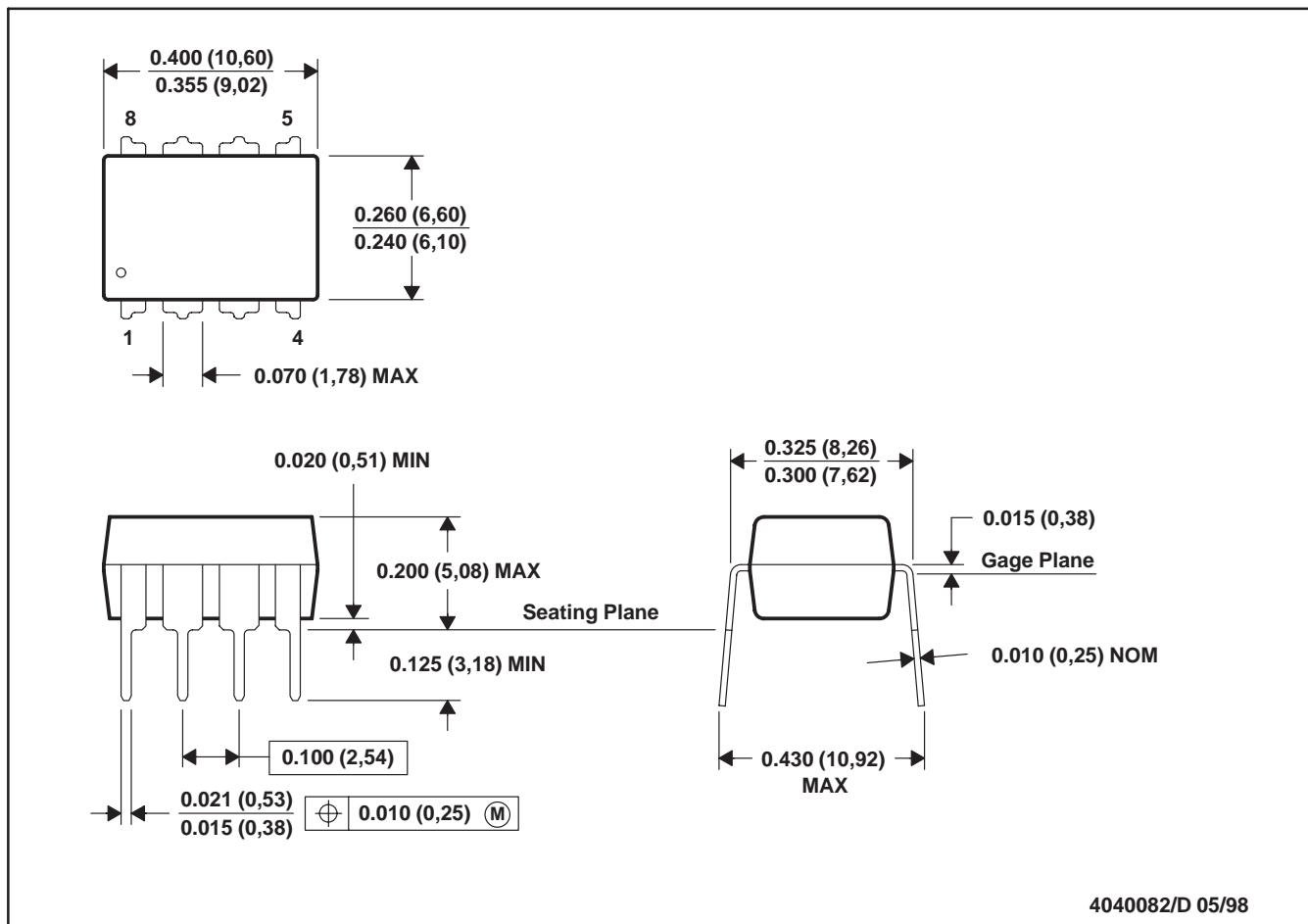
**TAPE AND REEL BOX DIMENSIONS**



Device	Package	Pins	Site	Length (mm)	Width (mm)	Height (mm)
OP-07DPSR	PS	8	SITE 41	346.0	346.0	33.0
OP07CDR	D	8	SITE 27	343.0	338.0	21.0
OP07DDR	D	8	SITE 27	343.0	338.0	21.0

P (R-PDIP-T8)

PLASTIC DUAL-IN-LINE



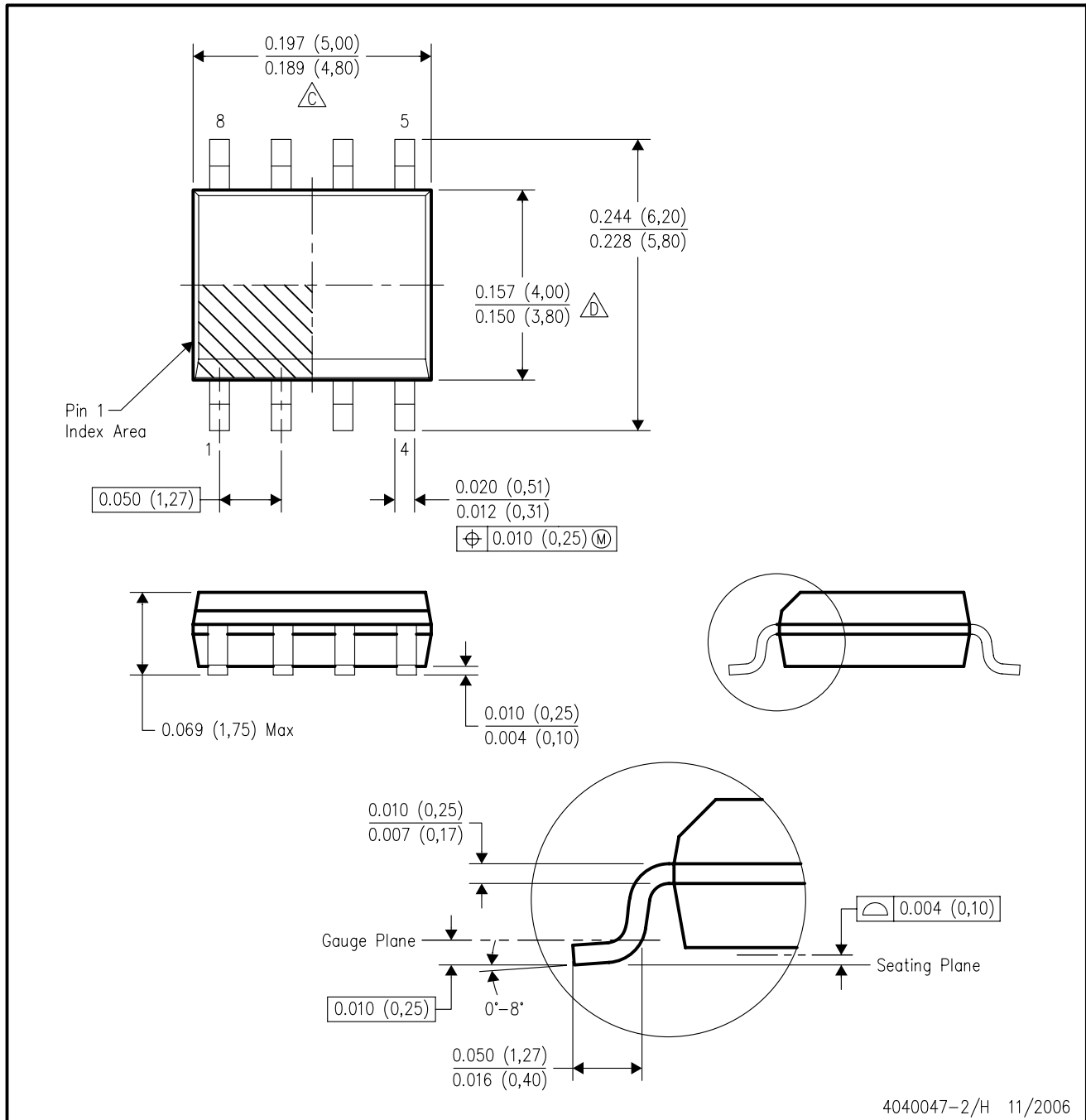
- NOTES: A. All linear dimensions are in inches (millimeters).  
 B. This drawing is subject to change without notice.  
 C. Falls within JEDEC MS-001

For the latest package information, go to [http://www.ti.com/sc/docs/package/pkg\\_info.htm](http://www.ti.com/sc/docs/package/pkg_info.htm)



D (R-PDSO-G8)

PLASTIC SMALL-OUTLINE PACKAGE

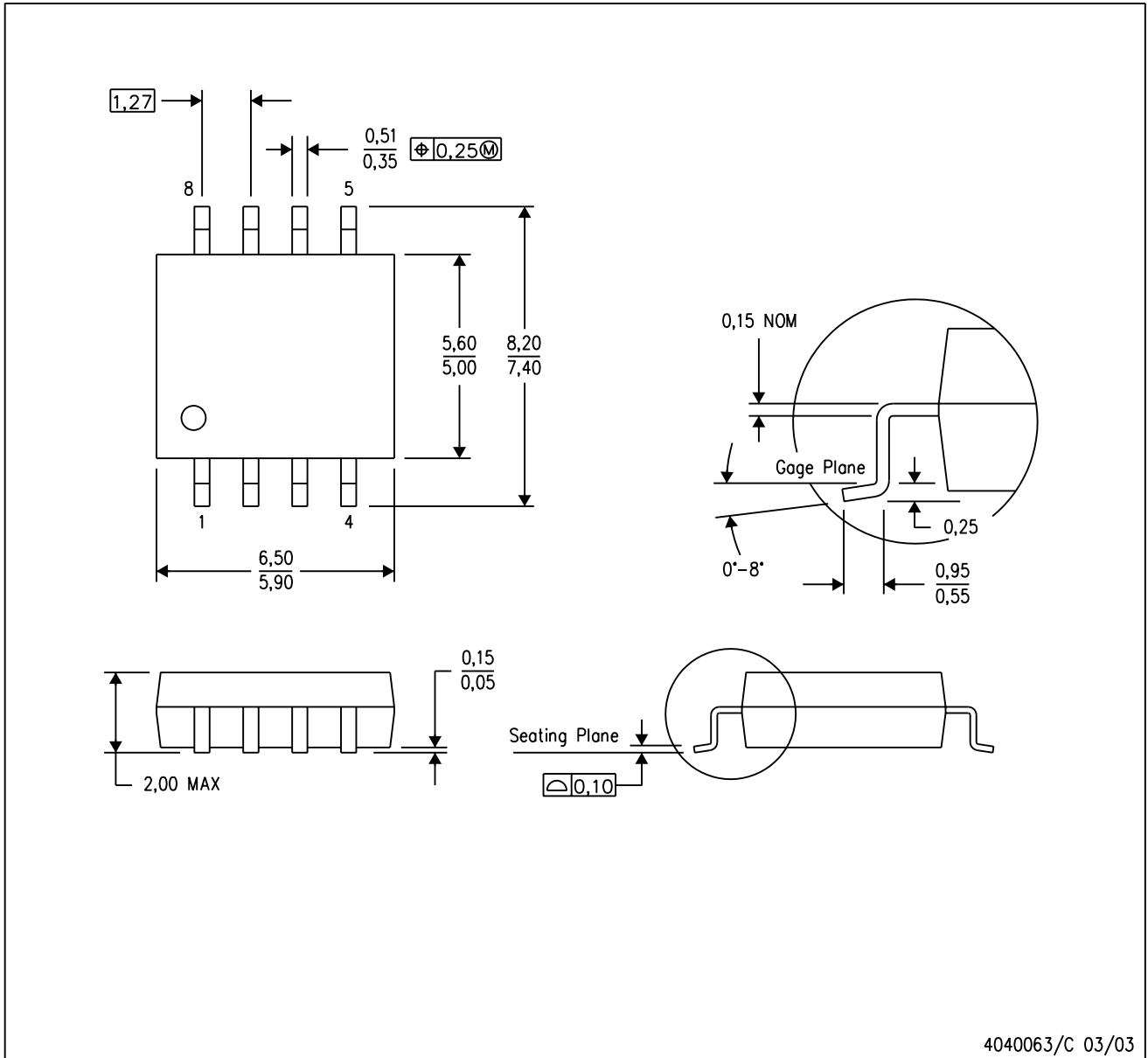


- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed .006 (0,15) per end.
  - D. Body width does not include interlead flash. Interlead flash shall not exceed .017 (0,43) per side.
  - E. Reference JEDEC MS-012 variation AA.

# MECHANICAL DATA

PS (R-PDSO-G8)

PLASTIC SMALL-OUTLINE PACKAGE



- 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.

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