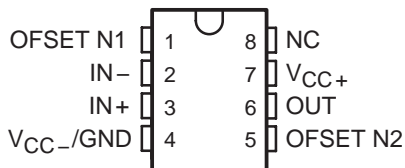


TL3x071, TL3x071A, TL3x072, TL3x072A, TL3x074, TL3x074A HIGH-SLEW-RATE, SINGLE-SUPPLY OPERATIONAL AMPLIFIERS

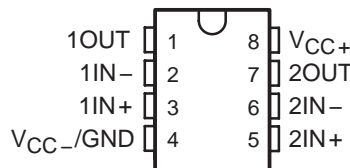
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- Wide Gain-Bandwidth Product . . . 4.5 MHz
- High Slew Rate . . . 13 V/ μ s
- Fast Settling Time . . . 1.1 μ s to 0.1%
- Wide-Range Single-Supply Operation
4 V to 44 V
- Wide Input Common-Mode Range Includes
Ground (V_{CC-})
- Low Total Harmonic Distortion . . . 0.02%
- Low Input Offset Voltage . . . 3 mV Max
(A Suffix)
- Large Output Voltage Swing
–14.7 V to 14 V (With \pm 15-V Supplies)
- Large Capacitance Drive Capability
10,000 pF
- Excellent Phase Margin . . . 60°
- Excellent Gain Margin . . . 12 dB
- Output Short-Circuit Protection

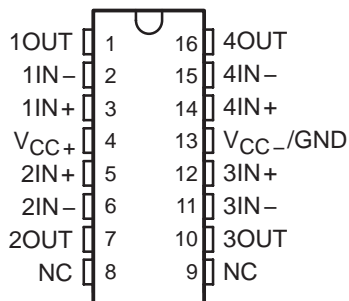
D OR P PACKAGE
(SINGLE, TOP VIEW)



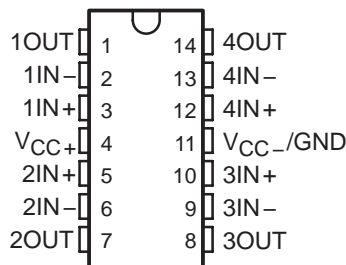
D OR P PACKAGE
(DUAL, TOP VIEW)



DW PACKAGE
(QUAD, TOP VIEW)



N PACKAGE
(QUAD, TOP VIEW)



NC – No internal connection

AVAILABLE OPTIONS

T_A	COMPLEXITY	PACKAGE			
		PLASTIC DIP		SMALL OUTLINE	
		STANDARD GRADE	PRIME GRADE	STANDARD GRADE	PRIME GRADE
0°C to 70°C	Single Dual Quad	TL34071P TL34072P TL34074N	TL34071AP TL34072AP TL34074AN	TL34071D TL34072D TL34074DW	TL34071AD TL34072AD TL34074ADW
–40°C to 105°C	Single Dual Quad	TL33071P TL33072P TL33074N	TL33071AP TL33072AP TL33074AN	TL33071D TL33072D TL33074DW	TL33071AD TL33072AD TL33074ADW
–55°C to 125°C	Single Dual Quad	TL35071P TL35072P TL35074N	TL35071AP TL35072AP TL35074AN	TL35071D TL35072D TL35074DW	TL35071AD TL35072AD TL35074ADW

D and DW packages are available taped and reeled. Add R suffix to device type (e.g., TL34071ADR).



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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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TL3x071, TL3x071A, TL3x072, TL3x072A, TL3x074, TL3x074A HIGH-SLEW-RATE, SINGLE-SUPPLY OPERATIONAL AMPLIFIERS

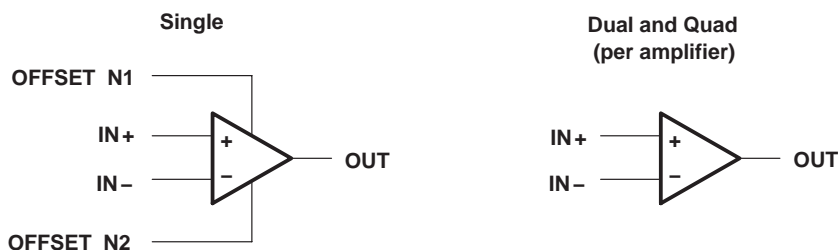
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description

Quality, low cost, bipolar fabrication with innovative design concepts are employed for the TL33071/2/4, TL34071/2/4, and TL35071/2/4 series of monolithic operational amplifiers. This series of operational amplifiers offers 4.5 MHz of gain bandwidth product, 13 V/ μ s slew rate, and fast settling time without the use of JFET device technology. Although this series can be operated from split supplies, it is particularly suited for single-supply operation since the common-mode input voltage range includes ground potential (V_{CC-}). With a Darlington transistor input stage, this series exhibits high input resistance, low input offset voltage, and high gain. The all-npn output stage, characterized by no dead-band crossover distortion and large output voltage swing, provides high-capacitance drive capability, excellent phase and gain margins, low open-loop high-frequency output impedance, and symmetrical source/sink ac frequency response.

The TL34071/2/4 devices are available in standard or prime performance (A-suffix) grades and are specified over the commercial (0°C to 70°C) temperature range. The TL33071/2/4 devices are available in standard or prime performance (A-suffix) grades and are specified over industrial/vehicular (-40°C to 105°C) temperature range. The TL35071/2/4 devices are available in standard or prime performance (A-suffix) grades and are specified over the military (-55°C to 125°C) temperature range. These low-cost amplifiers are available in single, dual, and quad configurations and are pin compatible with the MC33071/2/4, MC34071/2/4, and MC35071/2/4 series of amplifiers. Packaging options include standard plastic DIP and SO packages.

symbol



TL3x071, TL3x071A, TL3x072, TL3x072A, TL3x074, TL3x074A HIGH-SLEW-RATE, SINGLE-SUPPLY OPERATIONAL AMPLIFIERS

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

Supply voltage, V_{CC+} (see Note 1)	22 V
Supply voltage, V_{CC-}	–22 V
Differential input voltage, V_{ID} (see Note 2)	±44 V
Input voltage, V_I (any input)	$V_{CC\pm}$
Input current, I_I (each input)	±1 mA
Output current, I_O	±80 mA
Total current into V_{CC+}	80 mA
Total current out of V_{CC-}	80 mA
Duration of short-circuit current at (or below) 25°C (see Note 3)	unlimited
Continuous total power dissipation	See Dissipation Rating Table
Operating free-air temperature range, T_A : TL3307x	–40°C to 105°C
TL3407x	0°C to 70°C
TL3507x	–55°C to 125°C
Storage temperature range, T_{stg}	–65°C to 150°C
Lead temperature 1.6 mm (1/16 inch) from case for 10 seconds: D, DW, N, or P package	260°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, except differential voltages, are with respect to the midpoint between V_{CC+} and V_{CC-} .
 2. Differential voltages are at the noninverting input with respect to the inverting input. Excessive current flows if input is brought below $V_{CC-} - 0.3$ V.
 3. The output can be shorted to either supply. Temperature and/or supply voltages must be limited to ensure that the maximum dissipation rating is not exceeded.

DISSIPATION RATING TABLE

PACKAGE	$T_A \leq 25^\circ\text{C}$	DERATING FACTOR ABOVE $T_A = 25^\circ\text{C}$	$T_A = 70^\circ\text{C}$	$T_A = 105^\circ\text{C}$	$T_A = 125^\circ\text{C}$
	POWER RATING		POWER RATING	POWER RATING	POWER RATING
D	725 mW	5.8 mW/°C	464 mW	261 mW	145 mW
DW	1025 mW	8.2 mW/°C	656 mW	369 mW	205 mW
N	1150 mW	9.2 mW/°C	736 mW	414 mW	230 mW
P	1000 mW	8.0 mW/°C	640 mW	360 mW	200 mW

recommended operating conditions

		TL3307x		TL3407x		TL3507x		UNIT
		MIN	MAX	MIN	MAX	MIN	MAX	
Supply voltage, $V_{CC\pm}$		±2	±22	±2	±22	±2	±22	V
Common-mode input voltage, V_{IC}	$V_{CC} = 5$ V	0	2.7	0	2.9	0	2.7	V
	$V_{CC\pm} = \pm 15$ V	–15	12.7	–15	12.9	–15	12.7	
Operating free-air temperature, T_A		–40	105	0	70	–55	125	°C



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

PARAMETER	TEST CONDITIONS	T_A †	TL3x07xA			TL3x07x			UNIT
			MIN	TYP‡	MAX	MIN	TYP‡	MAX	
V_{IO} Input offset voltage	$V_{IC} = 0,$ $V_O = 0,$ $R_S = 50\ \Omega$	$V_{CC} = 5\text{ V}$	25°C	0.5	3	1.5	5	mV	
		$V_{CC} = \pm 15\text{ V}$	25°C	0.5	3	1.0	5		
αV_{IO} Temperature coefficient of input offset voltage	$V_{IC} = 0,$ $V_O = 0,$ $R_S = 50\ \Omega$	$V_{CC} = \pm 15\text{ V}$	Full range	10		10		$\mu\text{V}/^\circ\text{C}$	
I_{IO} Input offset current		$V_{CC} = \pm 15\text{ V}$	25°C	7	100	7	100	nA	
	$V_{CC} = \pm 15\text{ V}$	Full range	250		250				
I_{IB} Input bias current	$V_{IC} = 0,$ $V_O = 0,$ $R_S = 50\ \Omega$	$V_{CC} = 5\text{ V}$	25°C	-0.8	-2	-0.8	-2	μA	
			Full range	-2.3		-2.3			
		$V_{CC} = \pm 15\text{ V}$	25°C	-0.7	-1.5	-0.7	-1.5		
			Full range	-1.8		-1.8			
V_{ICR} Common-mode input voltage range	$R_S = 50\ \Omega$		25°C	-15 to 13.2	-15 to 13.2			V	
			Full range	-15 to 12.8	-15 to 12.8				
V_{OH} High-level output voltage	$V_{CC+} = 5\text{ V}, V_{CC-} = 0,$ $R_L = 2\text{ k}\Omega$		25°C	3.7	4	3.7	4	V	
			$R_L = 10\text{ k}\Omega$	25°C	13.6	14	13.6		14
			$R_L = 2\text{ k}\Omega$	Full range	13.4		13.4		
V_{OL} Low-level output voltage	$V_{CC+} = 5\text{ V}, V_{CC-} = 0,$ $R_L = 2\text{ k}\Omega$		25°C	0.1	0.3	0.1	0.3	V	
			$R_L = 10\text{ k}\Omega$	25°C	-14.7	-14.3	-14.7		-14.3
			$R_L = 2\text{ k}\Omega$	Full range	-13.5		-13.5		
AVD Large-signal differential voltage amplification	$V_O = \pm 10\text{ V}, R_L = 2\text{ k}\Omega$		25°C	50	100	25	100	V/mV	
			Full range	25		20			
I_{OS} Short-circuit output current	Source: $V_{ID} = 1\text{ V}, V_O = 0$ Sink: $V_{ID} = -1\text{ V}, V_O = 0$		25°C	-10	-30	-10	-30	mA	
				20	30	20	30		
$CMRR$ Common-mode rejection ratio	$V_{IC} = V_{ICRmin},$ $R_S = 50\ \Omega$		25°C	80	97	70	97	dB	
k_{SVR} Supply-voltage rejection ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$)	$V_{CC\pm} = \pm 13.5\text{ V}$ to $\pm 16.5\text{ V}, R_S = 100\ \Omega$		25°C	80	97	70	97	dB	
I_{CC} Supply current (per channel)	$V_O = 0,$ No Load		25°C	3.5	4.5	3.5	4.5	mA	
			Full range	4.7		4.7			
			$V_{CC+} = 5\text{ V}, V_{CC-} = 0,$	25°C	3.4	4.4	3.4		4.4
			$V_O = 0,$ No Load	Full range	4.6		4.6		

† Full range is 0°C to 70°C for the TL3407x devices, and -40°C to 105°C for the TL3307x devices, and -55°C to 125°C for the TL3507x devices.
‡ All typical values are at $T_A = 25^\circ\text{C}$.



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

PARAMETER		TEST CONDITIONS		TL3x07xA			TL3x07x			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
SR+	Positive slew rate	$V_I = -10\text{ V to }10\text{ V}$, $R_L = 2\text{ k}\Omega$	$A_V = 1$	8	10		8	10	V/ μ s	
SR-	Negative slew rate		$A_V = -1$		13			13		
t_s	Settling time	$A_{VD} = -1$, 10-V step	$T_o = 0.1\%$		1.1			1.1	μ s	
			$T_o = 0.01\%$		2.2			2.2		
V_n	Equivalent input noise voltage	$f = 1\text{ kHz}$, $R_S = 100\ \Omega$		32			32	nV/ $\sqrt{\text{Hz}}$		
I_n	Equivalent input noise current	$f = 1\text{ kHz}$		0.22			0.22	pA/ $\sqrt{\text{Hz}}$		
THD	Total harmonic distortion	$V_O = 2\text{ V to }20\text{ V}$, $R_L = 2\text{ k}\Omega$, $A_{VD} = 10$, $f = 10\text{ kHz}$		0.02			0.02	%		
GBW	Gain-bandwidth product	$f = 100\text{ kHz}$	3.5	4.5		3.5	4.5	MHz		
BW	Power bandwidth	$R_L = 2\text{ k}\Omega$, $V_{O(PP)} = 20\text{ V}$, $A_{VD} = 1$, THD = 5.0%		200			200	kHz		
ϕ_m	Phase margin	$R_L = 2\text{ k}\Omega$, $C_L = 0$		60°			60°			
		$R_L = 2\text{ k}\Omega$, $C_L = 300\text{ pF}$		40°			40°			
	Gain margin	$R_L = 2\text{ k}\Omega$, $C_L = 0$		12			12	dB		
		$R_L = 2\text{ k}\Omega$, $C_L = 300\text{ pF}$		4			4			
r_i	Differential input resistance	$V_{IC} = 0$		150			150	M Ω		
C_i	Input capacitance	$V_{IC} = 0$		2.5			2.5	pF		
	Channel separation	$f = 10\text{ kHz}$		120			120	dB		
z_o	Open-loop output impedance	$f = 1\text{ MHz}$		30			30	Ω		



PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package Pins	Package qty Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
TL35072P	Active	Production	PDIP (P) 8	50 TUBE	Yes	NIPDAU	N/A for Pkg Type	-	TL35072P
TL35072P.A	Active	Production	PDIP (P) 8	50 TUBE	Yes	NIPDAU	N/A for Pkg Type	See TL35072P	TL35072P

(1) **Status:** For more details on status, see our [product life cycle](#).

(2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

(3) **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

(4) **Lead finish/Ball material:** Parts 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.

(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

(6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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TUBE


*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (μm)	B (mm)
TL35072P	P	PDIP	8	50	506	13.97	11230	4.32
TL35072P.A	P	PDIP	8	50	506	13.97	11230	4.32

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