

TL071, TL071A, TL071B, TL072 TL072A, TL072B, TL074, TL074A, TL074B LOW-NOISE JFET-INPUT OPERATIONAL AMPLIFIERS

SLOS080D – SEPTEMBER 1978 – REVISED AUGUST 1996

- Low Power Consumption
- Wide Common-Mode and Differential Voltage Ranges
- Low Input Bias and Offset Currents
- Output Short-Circuit Protection
- Low Total Harmonic Distortion
0.003% Typ
- Low Noise
 $V_n = 18 \text{ nV}/\sqrt{\text{Hz}}$ Typ at $f = 1 \text{ kHz}$
- High Input Impedance . . . JFET Input Stage
- Internal Frequency Compensation
- Latch-Up-Free Operation
- High Slew Rate . . . 13 V/ μs Typ
- Common-Mode Input Voltage Range
Includes V_{CC+}

description

The JFET-input operational amplifiers in the TL07_ series are designed as low-noise versions of the TL08_ series amplifiers with low input bias and offset currents and fast slew rate. The low harmonic distortion and low noise make the TL07_ series ideally suited for high-fidelity and audio preamplifier applications. Each amplifier features JFET inputs (for high input impedance) coupled with bipolar output stages integrated on a single monolithic chip.

The C-suffix devices are characterized for operation from 0°C to 70°C. The I-suffix devices are characterized for operation from –40°C to 85°C. The M-suffix devices are characterized for operation over the full military temperature range of –55°C to 125°C.

AVAILABLE OPTIONS

T _A	V _{IO} max AT 25°C	PACKAGE							
		SMALL OUTLINE (D)†	CHIP CARRIER (FK)	CERAMIC DIP (J)	CERAMIC DIP (JG)	PLASTIC DIP (N)	PLASTIC DIP (P)	TSSOP PACKAGE (PW)	FLAT PACKAGE (W)
0°C to 70°C	10 mV 6 mV 3 mV	TL071CD TL071ACD TL071BCD	—	—	—	—	TL071CP TL071ACP TL071BCP	TL071CPWLE — —	—
	10 mV 6 mV 3 mV	TL072CD TL072ACD TL072BCD	—	—	—	—	TL072CP TL072ACP TL072BCP	TL072CPWLE — —	—
	10 mV 6 mV 3 mV	TL074CD TL074ACD TL074BCD	—	—	—	TL074CN TL074ACN TL074BCN	—	TL074CPWLE — —	—
–40°C to 85°C	6 mV	TL071ID TL072ID TL074ID	—	—	—	— — TL074IN	TL071IP TL072IP —	—	—
–55°C to 125°C	6 mV 6 mV 9 mV	—	TL071MFK TL072MFK TL074MFK	— — TL074MJ	TL071MJG TL072MJG —	— — TL074MN	— TL072MP —	—	— — TL074MW

† The D package is available taped and reeled. Add the suffix R to the device type (e.g., TL071CDR). The PW package is only available left-ended taped and reeled (e.g., TL072CPWLE).



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

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**

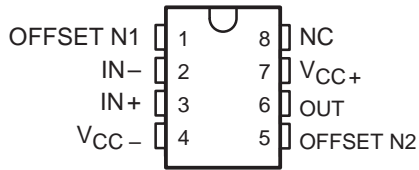
POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

Copyright © 1996, Texas Instruments Incorporated

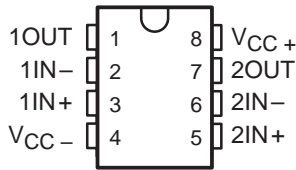
TL071, TL071A, TL071B, TL072 TL072A, TL072B, TL074, TL074A, TL074B LOW-NOISE JFET-INPUT OPERATIONAL AMPLIFIERS

SLOS080D – SEPTEMBER 1978 – REVISED AUGUST 1996

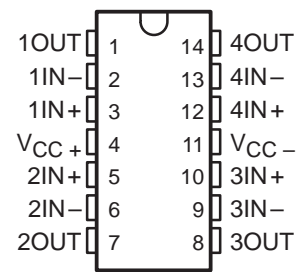
TL071, TL071A, TL071B
D, JG, P, OR PW PACKAGE
(TOP VIEW)



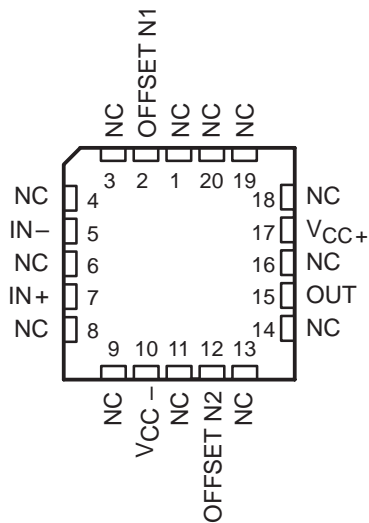
TL072, TL072A, TL072B
D, JG, P, OR PW PACKAGE
(TOP VIEW)



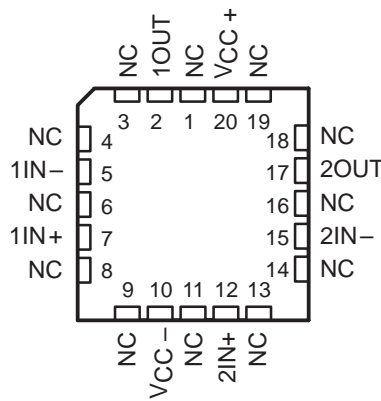
TL074, TL074A, TL074B
D, J, N, OR PW PACKAGE
TL074...W PACKAGE
(TOP VIEW)



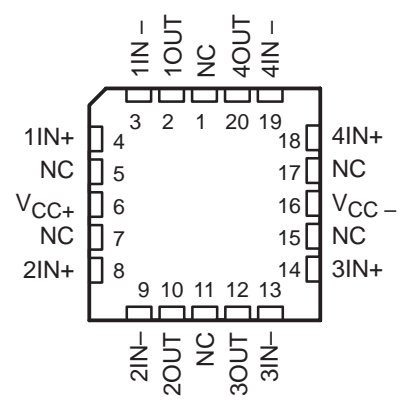
TL071
FK PACKAGE
(TOP VIEW)



TL072
FK PACKAGE
(TOP VIEW)

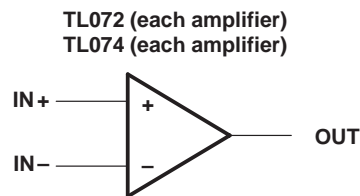
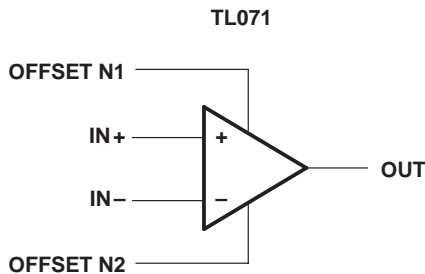


TL074
FK PACKAGE
(TOP VIEW)



NC – No internal connection

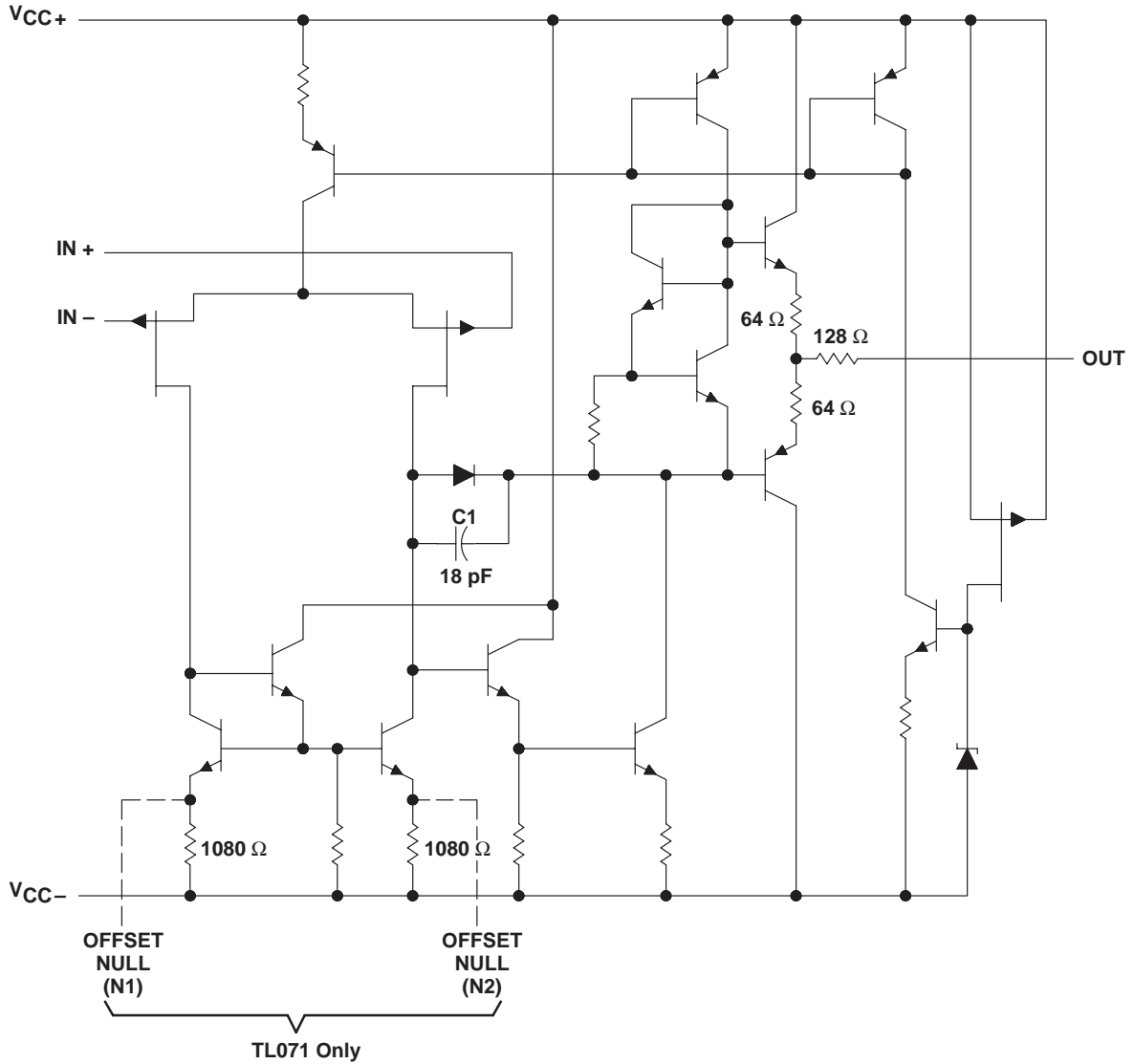
symbols



TL071, TL071A, TL071B, TL072
TL072A, TL072B, TL074, TL074A, TL074B
LOW-NOISE JFET-INPUT OPERATIONAL AMPLIFIERS

SLOS080D – SEPTEMBER 1978 – REVISED AUGUST 1996

schematic (each amplifier)



All component values shown are nominal.

COMPONENT COUNT†			
COMPONENT TYPE	TL071	TL072	TL074
Resistors	11	22	44
Transistors	14	28	56
JFET	2	4	6
Diodes	1	2	4
Capacitors	1	2	4
epi-FET	1	2	4

† Includes bias and trim circuitry

TL071, TL071A, TL071B, TL072
 TL072A, TL072B, TL074, TL074A, TL074B
LOW-NOISE JFET-INPUT OPERATIONAL AMPLIFIERS

SLOS080D – SEPTEMBER 1978 – REVISED AUGUST 1996

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

Supply voltage, V_{CC+} (see Note 1)	18 V
Supply voltage, V_{CC-} (see Note 1)	-18 V
Differential input voltage, V_{ID} (see Note 2)	± 30 V
Input voltage, V_I (see Notes 1 and 3)	± 15 V
Duration of output short circuit (see Note 4)	unlimited
Continuous total power dissipation	See Dissipation Rating Table
Operating free-air temperature range, T_A : C suffix	0°C to 70°C
I suffix	-40°C to 85°C
M suffix	-55°C to 125°C
Storage temperature range	-65°C to 150°C
Case temperature for 60 seconds: FK package	260°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds: J, JG, or W package	300°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds: D, N, P, or PW 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 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 supply. Temperature and/or supply voltages must be limited to ensure that the dissipation rating is not exceeded.

DISSIPATION RATING TABLE

PACKAGE	$T_A \leq 25^\circ\text{C}$ POWER RATING	DERATING FACTOR	DERATE ABOVE T_A	$T_A = 70^\circ\text{C}$ POWER RATING	$T_A = 85^\circ\text{C}$ POWER RATING	$T_A = 125^\circ\text{C}$ POWER RATING
D (8 pin)	680 mW	5.8 mW/°C	33°C	465 mW	378 mW	N/A
D (14 pin)	680 mW	7.6 mW/°C	60°C	604 mW	490 mW	N/A
FK	680 mW	11.0 mW/°C	88°C	680 mW	680 mW	273 mW
J	680 mW	11.0 mW/°C	88°C	680 mW	680 mW	273 mW
JG	680 mW	8.4 mW/°C	69°C	672 mW	546 mW	210 mW
N	680 mW	9.2 mW/°C	76°C	680 mW	597 mW	N/A
P	680 mW	8.0 mW/°C	65°C	640 mW	520 mW	N/A
PW (8 pin)	525 mW	4.2 mW/°C	70°C	525 mW	N/A	N/A
PW (14 pin)	700 mW	5.6 mW/°C	70°C	700 mW	N/A	N/A
W	680 mW	8.0 mW/°C	65°C	640 mW	520 mW	200 mW



POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

electrical characteristics, $V_{CC\pm} = \pm 15$ V (unless otherwise noted)

PARAMETER	TEST CONDITIONS†	T_A ‡	TL071C TL072C TL074C			TL071AC TL072AC TL074AC			TL071BC TL072BC TL074BC			TL071I TL072I TL074I			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
V_{IO} Input offset voltage	$V_O = 0, R_S = 50 \Omega$	25°C		3	10		3	6		2	3		3	6	mV
		Full range			13			7.5			5			8	
α_{VIO} Temperature coefficient of input offset voltage	$V_O = 0, R_S = 50 \Omega$	Full range		18			18			18			18	$\mu V/^\circ C$	
I_{IO} Input offset current	$V_O = 0$	25°C		5	100		5	100		5	100		5	100	pA
		Full range			10			2			2			2	nA
I_{IB} Input bias current§	$V_O = 0$	25°C		65	200		65	200		65	200		65	200	pA
		Full range			7			7			7			20	nA
V_{ICR} Common-mode input voltage range		25°C	± 11	-12 to 15		± 11	-12 to 15		± 11	-12 to 15		± 11	-12 to 15	V	
V_{OM} Maximum peak output voltage swing	$R_L = 10 k\Omega$	25°C	± 12	± 13.5		± 12	± 13.5		± 12	± 13.5		± 12	± 13.5	V	
	$R_L \geq 10 k\Omega$	Full range	± 12			± 12			± 12			± 12			
	$R_L \geq 2 k\Omega$		± 10			± 10			± 10			± 10			
A_{VD} Large-signal differential voltage amplification	$V_O = \pm 10$ V, $R_L \geq 2 k\Omega$	25°C	25	200		50	200		50	200		50	200	V/mV	
		Full range	15			25			25			25			
B_1 Unity-gain bandwidth		25°C		3			3			3			3	MHz	
r_i Input resistance		25°C		10^{12}			10^{12}			10^{12}			10^{12}	Ω	
CMRR Common-mode rejection ratio	$V_{IC} = V_{ICRmin}, V_O = 0, R_S = 50 \Omega$	25°C	70	100		75	100		75	100		75	100	dB	
k_{SVR} Supply-voltage rejection ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$)	$V_{CC} = \pm 9$ V to ± 15 V, $V_O = 0, R_S = 50 \Omega$	25°C	70	100		80	100		80	100		80	100	dB	
I_{CC} Supply current (each amplifier)	$V_O = 0, \text{No load}$	25°C		1.4	2.5		1.4	2.5		1.4	2.5		1.4	2.5	mA
V_{O1}/V_{O2} Crosstalk attenuation	$A_{VD} = 100$	25°C		120			120			120			120	dB	

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

‡ Full range is $T_A = 0^\circ C$ to $70^\circ C$ for TL07_C, TL07_AC, TL07_BC and is $T_A = -40^\circ C$ to $85^\circ C$ for TL07_I.

§ Input bias currents of a FET-input operational amplifier are normal junction reverse currents, which are temperature sensitive as shown in Figure 4. Pulse techniques must be used that maintain the junction temperature as close to the ambient temperature as possible.

TL071, TL071A, TL071B, TL072
TL072A, TL072B, TL074, TL074A, TL074B
LOW-NOISE JFET-INPUT OPERATIONAL AMPLIFIERS

SLOS080D – SEPTEMBER 1978 – REVISED AUGUST 1996

electrical characteristics, $V_{CC\pm} = \pm 15$ V (unless otherwise noted)

PARAMETER	TEST CONDITIONS†	T_A ‡	TL071M TL072M			TL074M			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
V_{IO} Input offset voltage	$V_O = 0, R_S = 50 \Omega$	25°C	3	6		3	9	mV	
		Full range			9		15		
α_{VIO} Temperature coefficient of input offset voltage	$V_O = 0, R_S = 50 \Omega$	Full range	18			18		$\mu\text{V}/^\circ\text{C}$	
I_{IO} Input offset current	$V_O = 0$	25°C	5	100		5	100	pA	
		Full range			20		20	nA	
I_{IB} Input bias current‡	$V_O = 0$	25°C	65	200		65	200	pA	
		Full range			50		50	nA	
V_{ICR} Common-mode input voltage range		25°C	± 11	-12 to 15		± 11	-12 to 15	V	
V_{OM} Maximum peak output voltage swing	$R_L = 10 \text{ k}\Omega$	25°C	± 12	± 13.5		± 12	± 13.5	V	
	$R_L \geq 10 \text{ k}\Omega$	Full range	± 12			± 12			
	$R_L \geq 2 \text{ k}\Omega$		± 10			± 10			
A_{VD} Large-signal differential voltage amplification	$V_O = \pm 10 \text{ V}, R_L \geq 2 \text{ k}\Omega$	25°C	35	200		35	200	V/mV	
		Full range	15			15			
B_1 Unity-gain bandwidth	$T_A = 25^\circ\text{C}$		3			3		MHz	
r_i Input resistance	$T_A = 25^\circ\text{C}$		10^{12}			10^{12}		Ω	
CMRR Common-mode rejection ratio	$V_{IC} = V_{ICRmin}, V_O = 0, R_S = 50 \Omega$	25°C	80	86		80	86	dB	
k_{SVR} Supply-voltage rejection ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$)	$V_{CC} = \pm 9 \text{ V to } \pm 15 \text{ V}, V_O = 0, R_S = 50 \Omega$	25°C	80	86		80	86	dB	
I_{CC} Supply current (each amplifier)	$V_O = 0, \text{ No load}$	25°C	1.4	2.5		1.4	2.5	mA	
V_{O1}/V_{O2} Crosstalk attenuation	$A_{VD} = 100$	25°C	120			120		dB	

† Input bias currents of a FET-input operational amplifier are normal junction reverse currents, which are temperature sensitive as shown in Figure 4. Pulse techniques must be used that will maintain the junction temperature as close to the ambient temperature as possible.

‡ All characteristics are measured under open-loop conditions with zero common-mode voltage unless otherwise specified. Full range is $T_A = -55^\circ\text{C to } 125^\circ\text{C}$.



TL071, TL071A, TL071B, TL072
TL072A, TL072B, TL074, TL074A, TL074B
LOW-NOISE JFET-INPUT OPERATIONAL AMPLIFIERS

SLOS080D – SEPTEMBER 1978 – REVISED AUGUST 1996

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

PARAMETER	TEST CONDITIONS	TL07xM			ALL OTHERS			UNIT
		MIN	TYP	MAX	MIN	TYP	MAX	
SR	Slew rate at unity gain $V_I = 10\text{ V}$, $C_L = 100\text{ pF}$, $R_L = 2\text{ k}\Omega$, See Figure 1	5	13		8	13		$\text{V}/\mu\text{s}$
t_r	Rise time overshoot factor $V_I = 20\text{ mV}$, $C_L = 100\text{ pF}$, $R_L = 2\text{ k}\Omega$, See Figure 1	0.1			0.1			μs
		20%			20%			
V_n	Equivalent input noise voltage $R_S = 20\ \Omega$	$f = 1\text{ kHz}$			18			$\text{nV}/\sqrt{\text{Hz}}$
		$f = 10\text{ Hz to } 10\text{ kHz}$			4			μV
I_n	Equivalent input noise current $R_S = 20\ \Omega$, $f = 1\text{ kHz}$	0.01			0.01			$\text{pA}/\sqrt{\text{Hz}}$
THD	Total harmonic distortion $V_{\text{rms}} = 6\text{ V}$, $R_L \geq 2\text{ k}\Omega$, $f = 1\text{ kHz}$, $A_{VD} = 1$, $R_S \leq 1\text{ k}\Omega$,	0.003%			0.003%			

PARAMETER MEASUREMENT INFORMATION

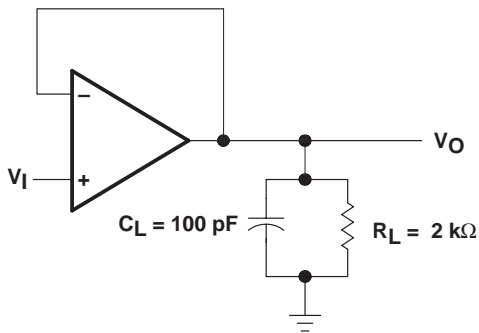


Figure 1. Unity-Gain Amplifier

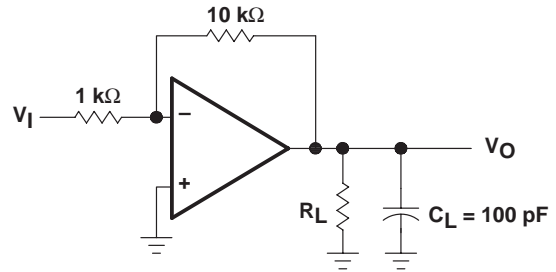


Figure 2. Gain-of-10 Inverting Amplifier

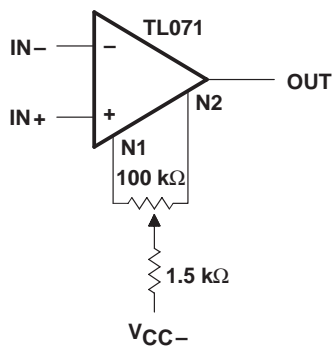


Figure 3. Input Offset Voltage Null Circuit

TYPICAL CHARACTERISTICS

Table of Graphs

			FIGURE
I _B	Input bias current	vs Free-air temperature	4
V _{OM}	Maximum output voltage	vs Frequency	5, 6, 7
		vs Free-air temperature	8
		vs Load resistance	9
		vs Supply voltage	10
A _{VD}	Large-signal differential voltage amplification	vs Free-air temperature	11
		vs Frequency	12
	Phase shift	vs Frequency	12
	Normalized unity-gain bandwidth	vs Free-air temperature	13
	Normalized phase shift	vs Free-air temperature	13
CMRR	Common-mode rejection ratio	vs Free-air temperature	14
I _{CC}	Supply current	vs Supply voltage	15
		vs Free-air temperature	16
P _D	Total power dissipation	vs Free-air temperature	17
	Normalized slew rate	vs Free-air temperature	18
V _n	Equivalent input noise voltage	vs Frequency	19
THD	Total harmonic distortion	vs Frequency	20
	Large-signal pulse response	vs Time	21
V _O	Output voltage	vs Elapsed time	22

TYPICAL CHARACTERISTICS†

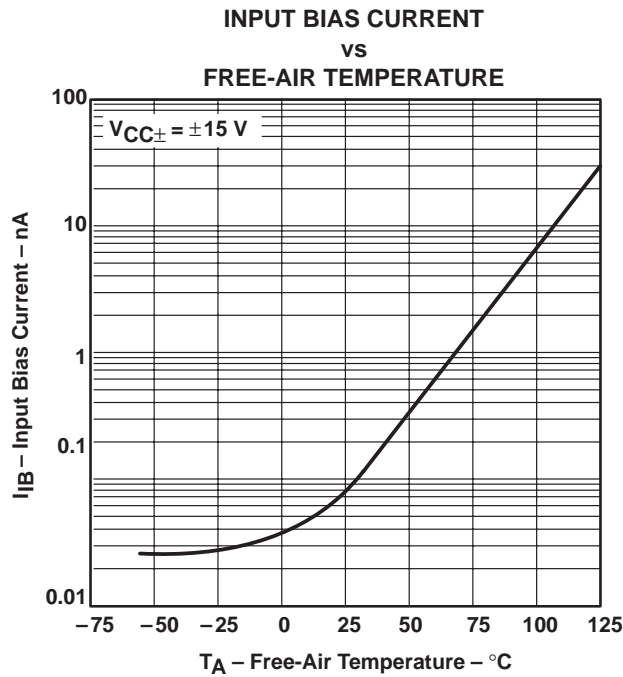


Figure 4

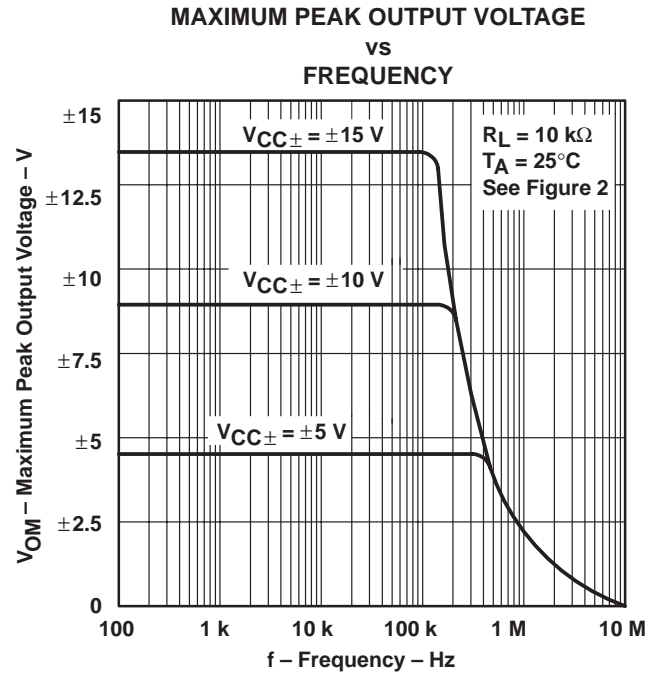


Figure 5

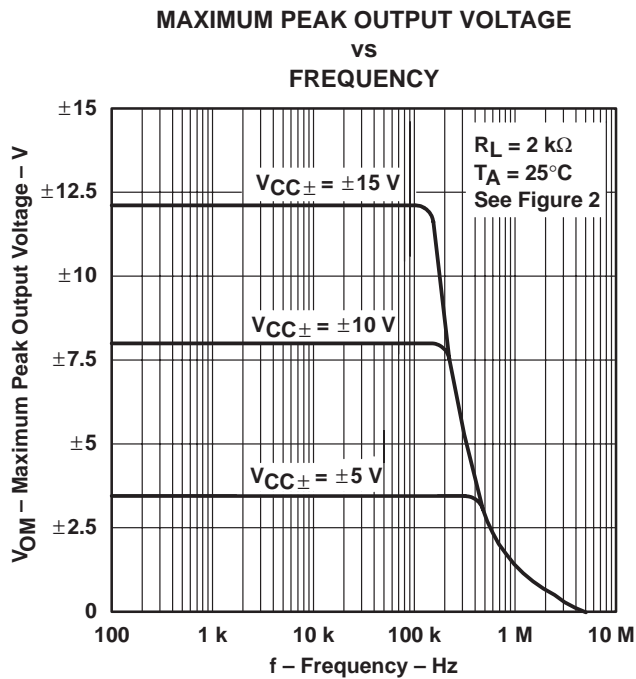


Figure 6

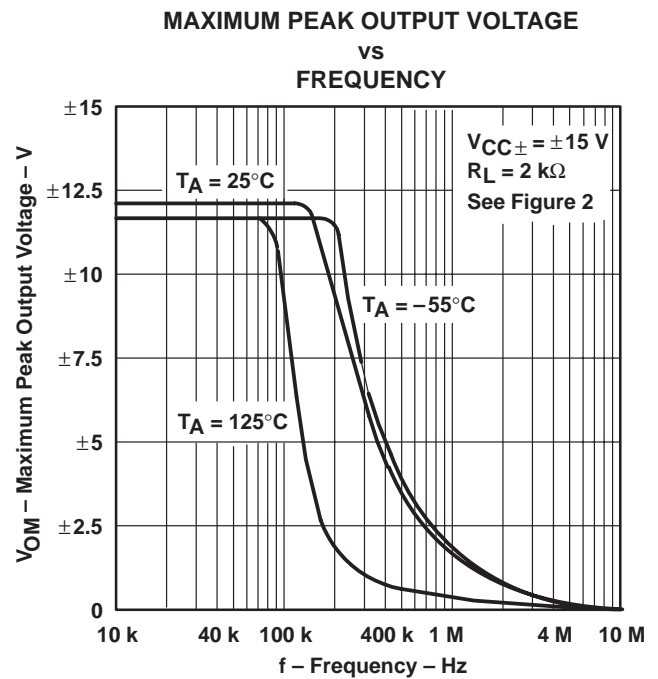


Figure 7

† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

TYPICAL CHARACTERISTICS†

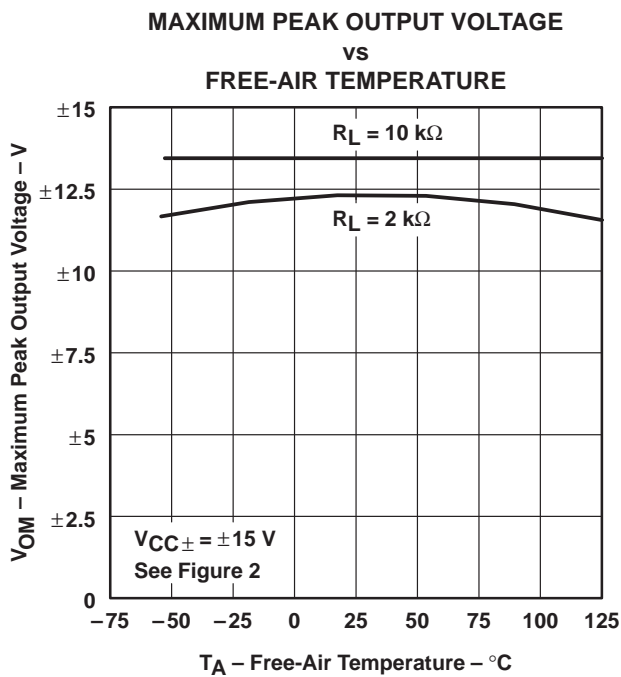


Figure 8

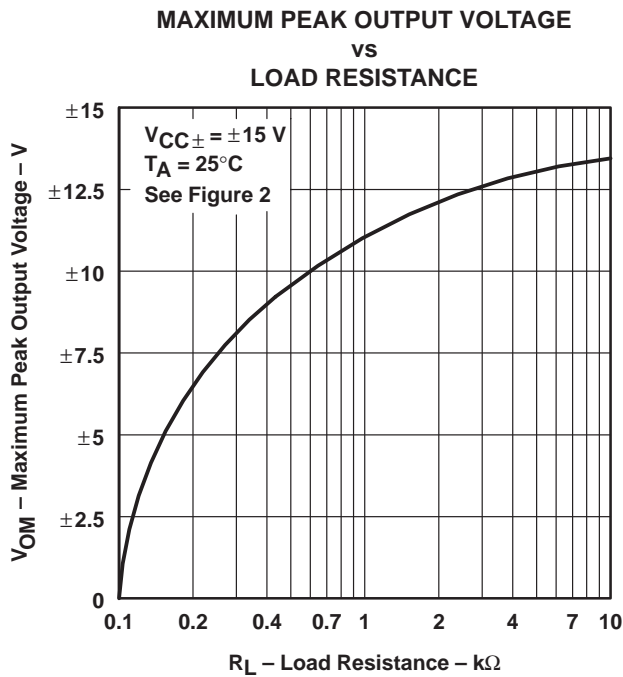


Figure 9

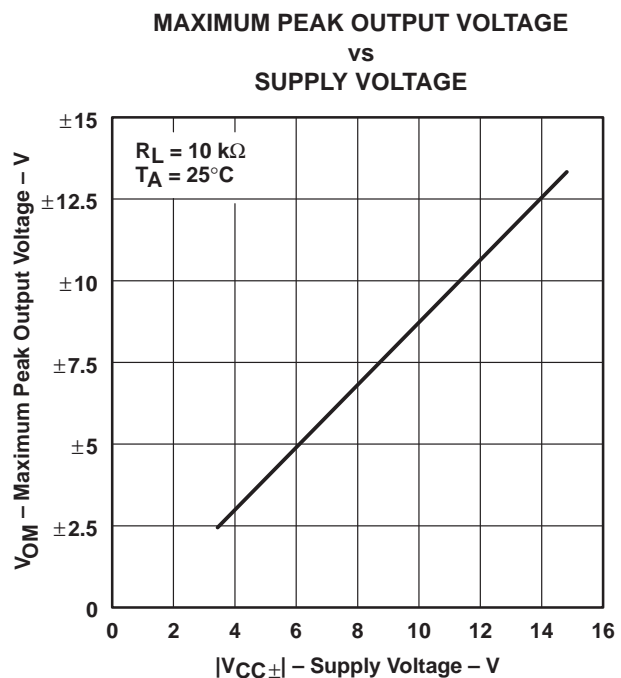


Figure 10

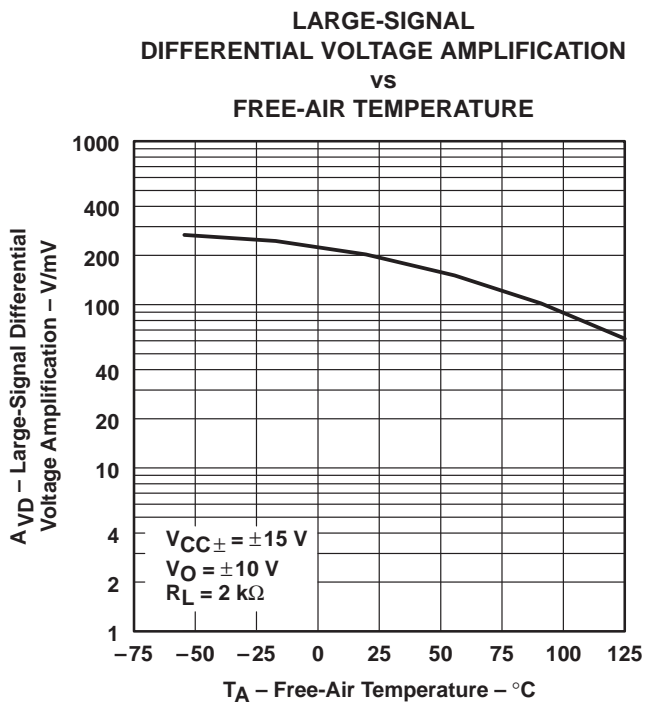


Figure 11

† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

TYPICAL CHARACTERISTICS†

LARGE-SIGNAL
 DIFFERENTIAL VOLTAGE AMPLIFICATION
 AND PHASE SHIFT
 vs
 FREQUENCY

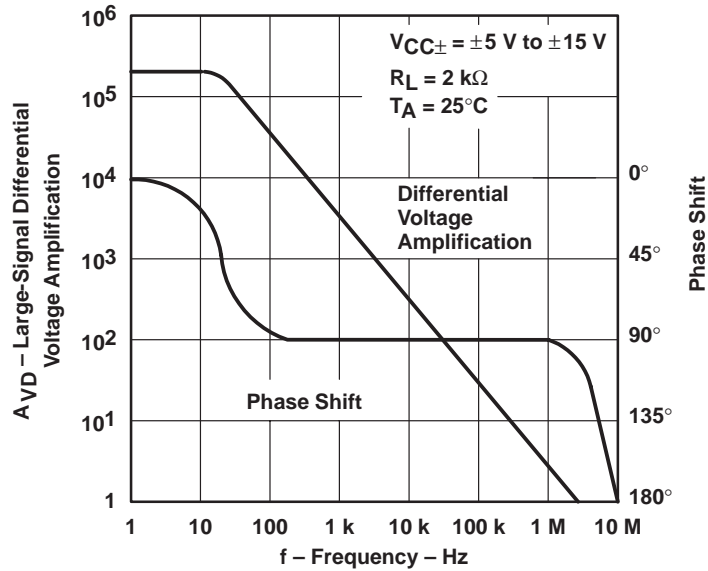


Figure 12

NORMALIZED UNITY-GAIN BANDWIDTH
 AND PHASE SHIFT
 vs
 FREE-AIR TEMPERATURE

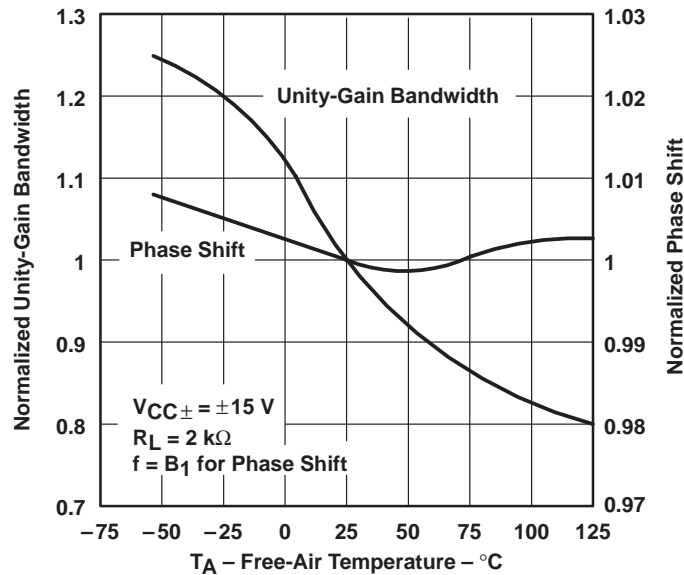


Figure 13

† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

TYPICAL CHARACTERISTICS†

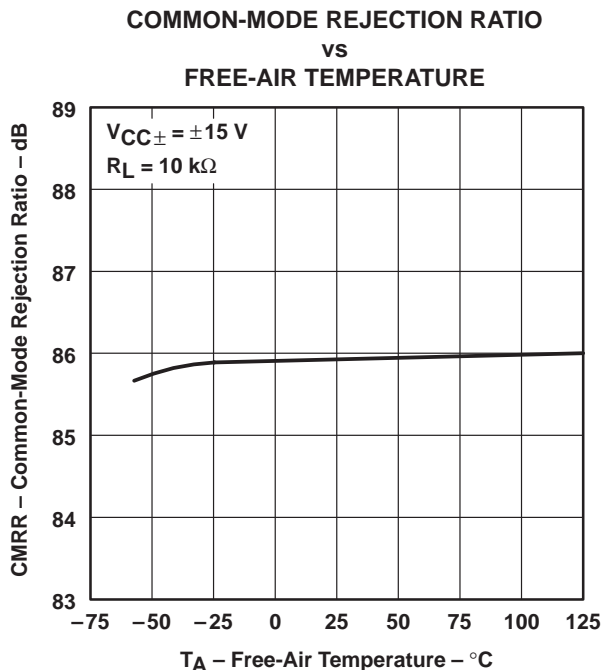


Figure 14

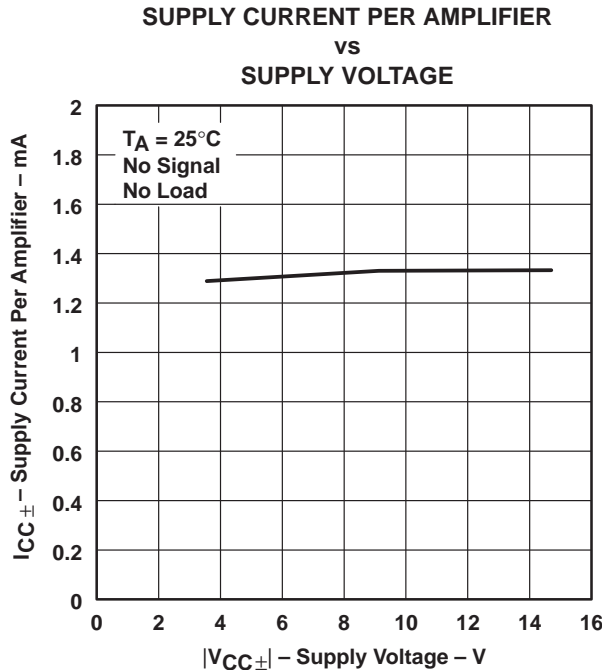


Figure 15

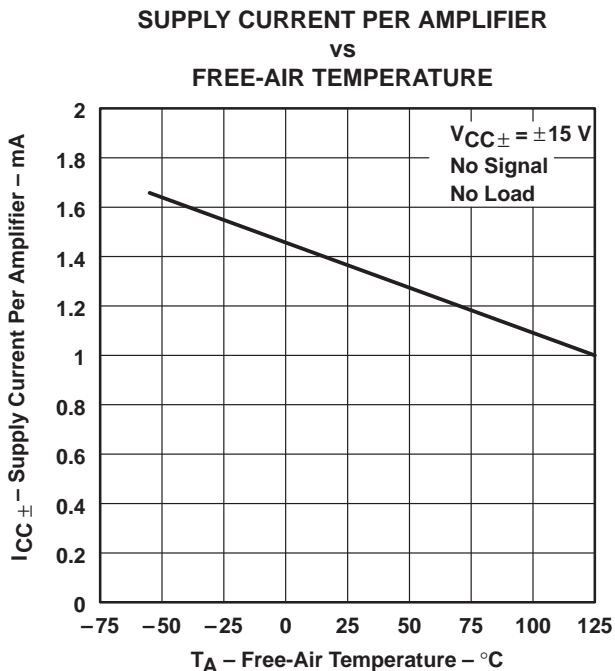


Figure 16

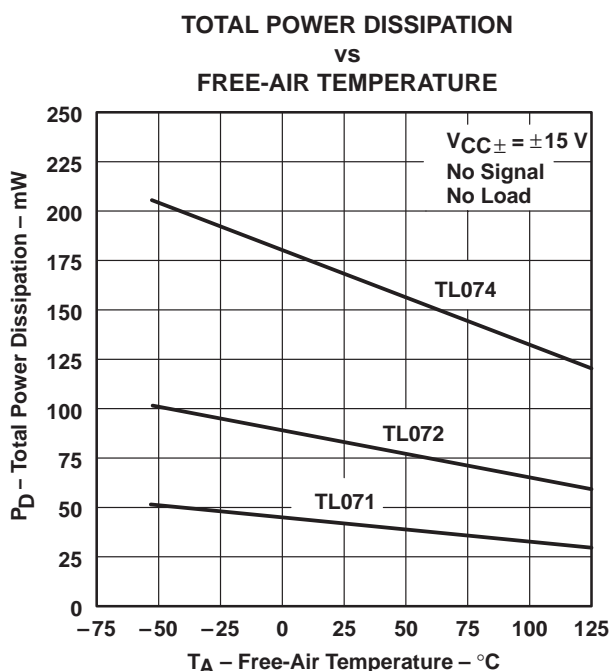


Figure 17

† Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.

TYPICAL CHARACTERISTICS

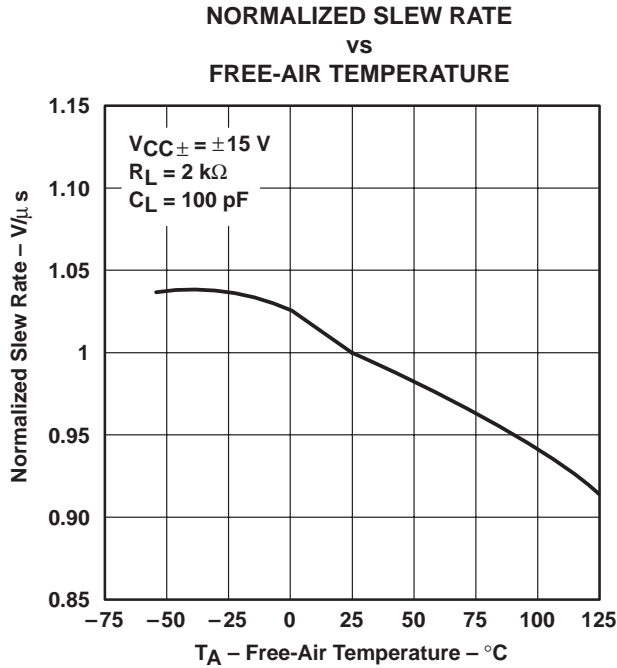


Figure 18

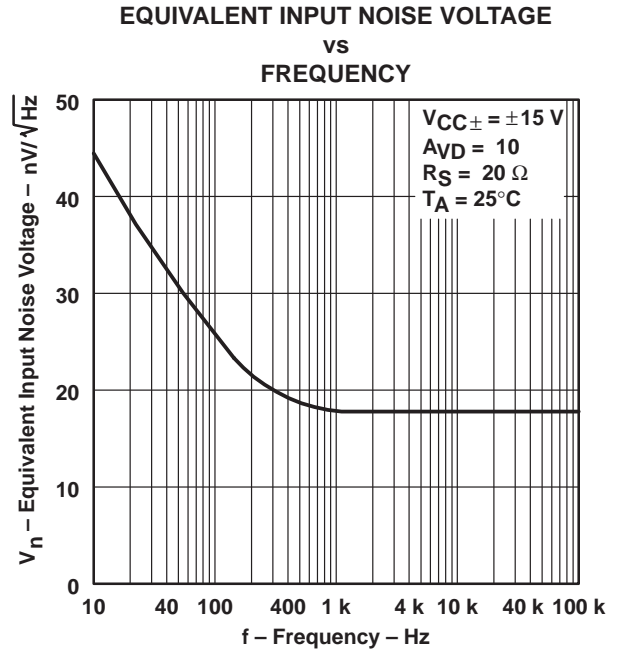


Figure 19

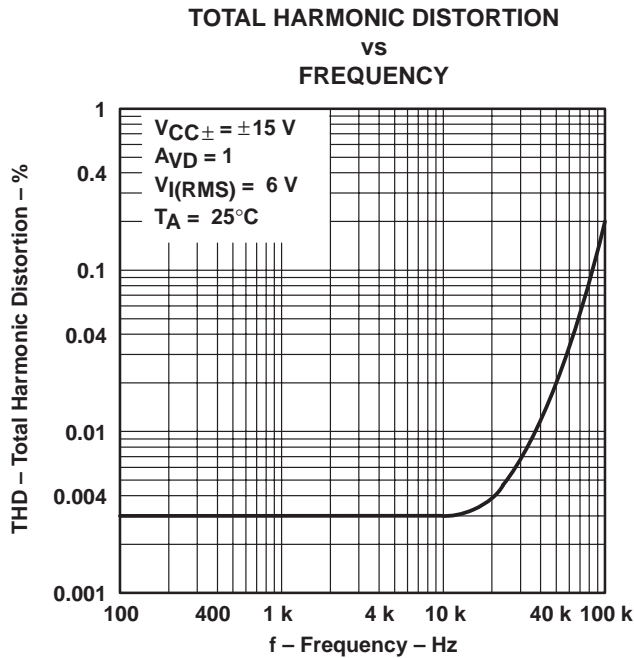


Figure 20

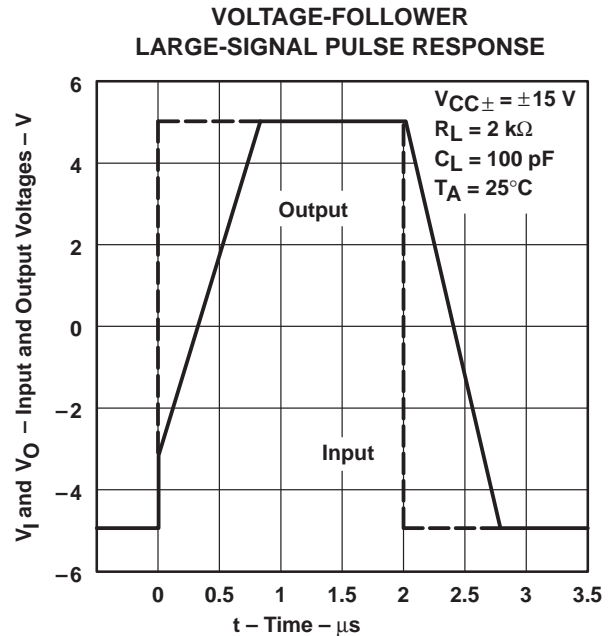


Figure 21

TYPICAL CHARACTERISTICS

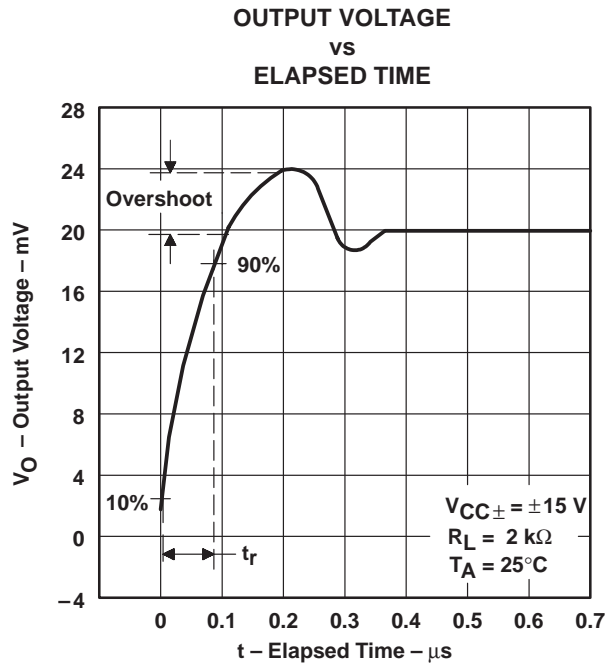


Figure 22

APPLICATION INFORMATION

Table of Application Diagrams

APPLICATION DIAGRAM	PART NUMBER	FIGURE
0.5-Hz square-wave oscillator	TL071	23
High-Q notch filter	TL071	24
Audio-distribution amplifier	TL074	25
100-kHz quadrature oscillator	TL072	26
AC amplifier	TL071	27

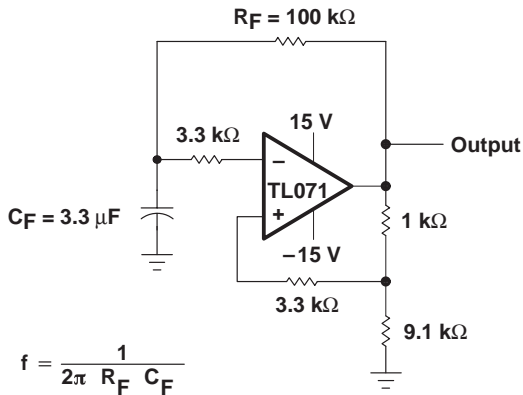


Figure 23. 0.5-Hz Square-Wave Oscillator

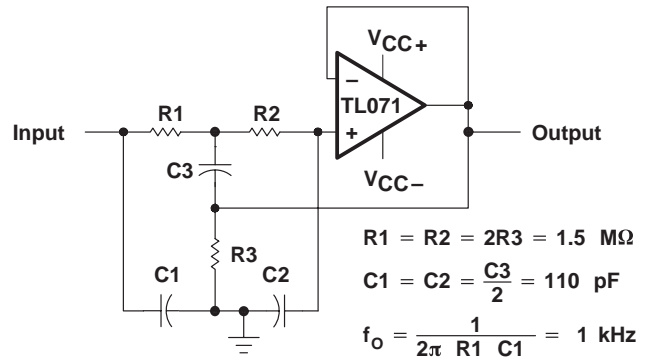


Figure 24. High-Q Notch Filter

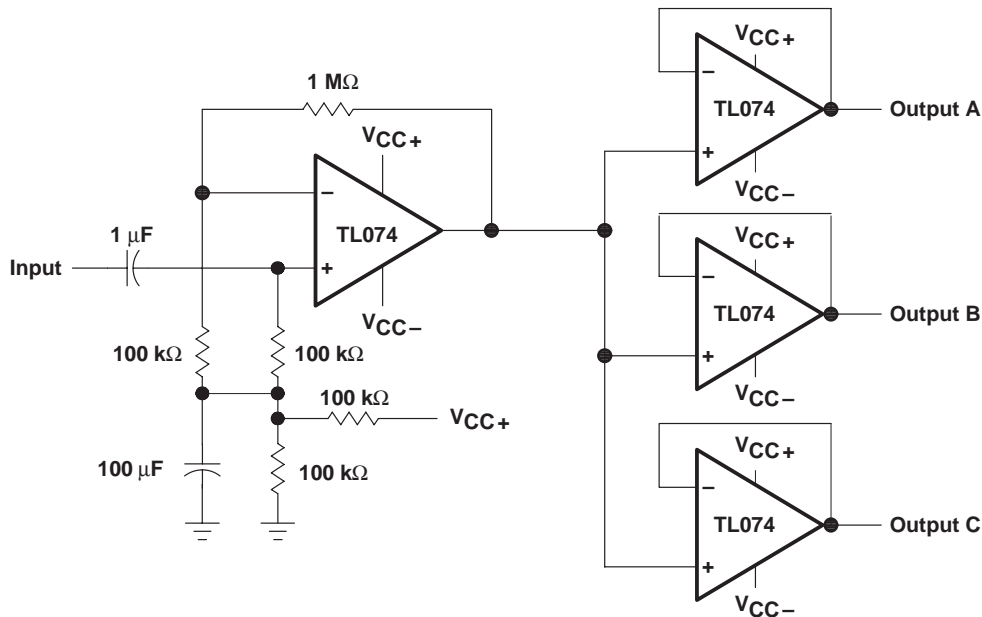
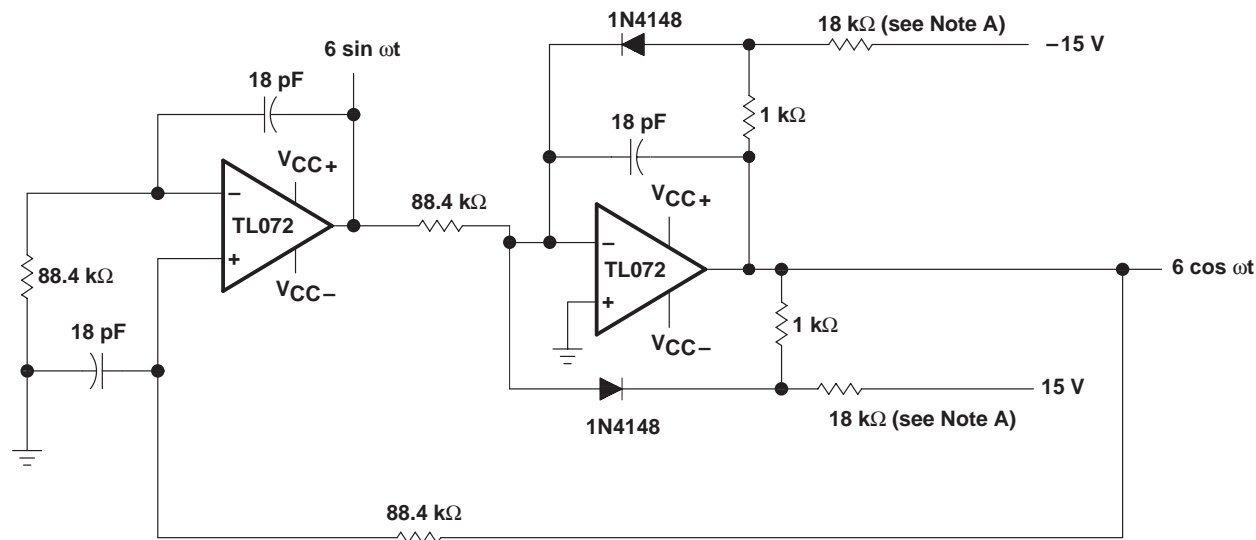


Figure 25. Audio-Distribution Amplifier

APPLICATION INFORMATION



NOTE A: These resistor values may be adjusted for a symmetrical output.

Figure 26. 100-kHz Quadrature Oscillator

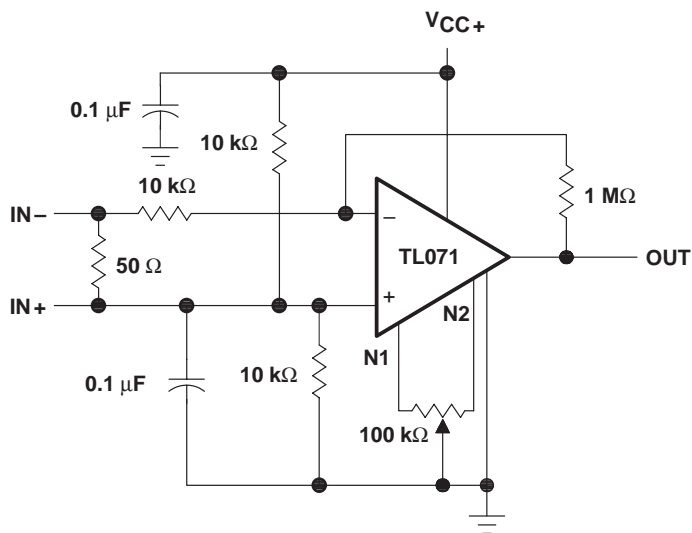


Figure 27. AC Amplifier

IMPORTANT NOTICE

Texas Instruments and its subsidiaries (TI) reserve the right to make changes to their products or to discontinue any product or service without notice, and advise customers to obtain the latest version of relevant information to verify, before placing orders, that information being relied on is current and complete. All products are sold subject to the terms and conditions of sale supplied at the time of order acknowledgement, including those pertaining to warranty, patent infringement, and limitation of liability.

TI warrants performance of its semiconductor products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are utilized to the extent TI deems necessary to support this warranty. Specific testing of all parameters of each device is not necessarily performed, except those mandated by government requirements.

CERTAIN APPLICATIONS USING SEMICONDUCTOR PRODUCTS MAY INVOLVE POTENTIAL RISKS OF DEATH, PERSONAL INJURY, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE ("CRITICAL APPLICATIONS"). TI SEMICONDUCTOR PRODUCTS ARE NOT DESIGNED, AUTHORIZED, OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT DEVICES OR SYSTEMS OR OTHER CRITICAL APPLICATIONS. INCLUSION OF TI PRODUCTS IN SUCH APPLICATIONS IS UNDERSTOOD TO BE FULLY AT THE CUSTOMER'S RISK.

In order to minimize risks associated with the customer's applications, adequate design and operating safeguards must be provided by the customer to minimize inherent or procedural hazards.

TI assumes no liability for applications assistance or customer product design. TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right of TI covering or relating to any combination, machine, or process in which such semiconductor products or services might be or are used. TI's publication of information regarding any third party's products or services does not constitute TI's approval, warranty or endorsement thereof.

Advanced Search	TI Home	TI_ME	Employment
Tech Support	Comments	Site Map	TI Global

[PRODUCT FOLDER](#) | [PRODUCT INFO:](#) [FEATURES](#) | [DESCRIPTION](#) | [DATASHEETS](#) | [PRICING/AVAILABILITY](#) | [SAMPLES](#) | [APPLICATION NOTES](#) | [USER MANUALS](#)

[PRODUCT SUPPORT:](#) [DEVELOPMENT TOOLS](#) | [APPLICATIONS](#)

TL072, Dual Low-Noise JFET-Input General-Purpose Operational Amplifier

DEVICE STATUS: **ACTIVE**

PARAMETER NAME	TL072
Vs (max) (V)	36
Vs (min) (V)	7
IQ per channel (max) (mA)	2.5
IQ per channel (typ) (mA)	1.4
GBW (typ) (MHz)	3
Slew Rate (typ) (V/us)	13
VIO (Full Range) (max) (mV)	13
VIO (25 deg C) (max) (mV)	10
IIB (max) (pA)	200
CMRR (min) (dB)	70
Vn at 1kHz (typ) (nV/rHz)	18
Number of Channels	2
Spec'd at Vs (V)	+/-15
Open Loop Gain (min) (dB)	88
Offset Drift (typ) (uV/C)	18

FEATURES

[Back to Top](#)

- Low Power Consumption
- Wide Common-Mode and Differential Voltage Ranges
- Low Input Bias and Offset Currents
- Output Short-Circuit Protection
- Low Total Harmonic Distortion
- 0.003% Typ
- Low Noise

- $V_n = 18 \text{ nV/} \square \text{ Hz} \setminus \text{Typ at } f = 1 \text{ kHz}$
- High Input Impedance...JFET Input Stage
- Internal Frequency Compensation
- Latch-Up-Free Operation

- High Slew Rate...13 V/us Typ
- Common-Mode Input Voltage Range Includes V_{CC+}

DESCRIPTION

[Back to Top](#)

The JFET-input operational amplifiers in the TL07_ series are designed as low-noise versions of the TL08_ series amplifiers with low input bias and offset currents and fast slew rate. The low harmonic distortion and low noise make the TL07_ series ideally suited for high-fidelity and audio preamplifier applications. Each amplifier features JFET inputs (for high input impedance) coupled with bipolar output stages integrated on a single monolithic chip.

The C-suffix devices are characterized for operation from 0°C to 70°C. The I-suffix devices are characterized for operation from -40°C to 85°C. The M-suffix devices are characterized for operation over the full military temperature range of -55°C to 125°C.



The D package is available taped and reeled. Add the suffix R to the device type (e.g., TL071CDR). The PW package is only available left-ended taped and reeled (e.g., TL072CPWLE).

TECHNICAL DOCUMENTS

[Back to Top](#)

To view the following documents, [Acrobat Reader 3.x](#) is required.

To download a document to your hard drive, right-click on the link and choose 'Save'.

DATASHEET

[Back to Top](#)

Full datasheet in Acrobat PDF: [slos080d.pdf](#) (281 KB) (Updated: 03/07/1997)

Full datasheet in Zipped PostScript: [slos080d.psz](#) (251 KB)

APPLICATION NOTES

[Back to Top](#)

View Application Reports for [Signal Amplifiers \(Less than equal to 100MHz\)](#)

- [Analog Applications Journal May 2000](#) (SLYT015 - Updated: 04/20/2000)
- [Analog Applications Journal, September 1999 edition](#) (SLYT005 - Updated: 07/15/1999)
- [Analysis Of The Sallen-Key Architecture](#) (SLOA024A - Updated: 07/27/1999)
- [Stability Analysis Of Voltage-Feedback Op Amps, Including Compensation Technique](#) (SLOA020 - Updated: 07/14/1999)

USER MANUALS

[Back to Top](#)

- [Universal Op Amp Single, Dual, Quad \(SOIC\) Evaluation Module With Shutdown](#) (SLOU061, 1160 KB - Updated: 10/22/1999)
- [Universal Operational Amplifier EVM](#) (SLVU006A, 387 KB - Updated: 03/22/1999)
- [Universal Operational Amplifier Evaluation Module Selection Guide](#) (SLOU060A, 16 KB - Updated: 09/28/2000)
- [Universal Operational Amplifier Single, Dual, Quad \(MSOP/TSSOP\)](#) (SLOU055, 1196 KB - Updated: 10/22/1999)
- [Universal Operational Amplifier Single, Dual, Quad \(PDIP\)](#) (SLOU062, 1211 KB - Updated: 10/22/1999)

SAMPLES

[Back to Top](#)

ORDERABLE DEVICE	PACKAGE	PINS	TEMP (°C)	STATUS	DSCC NUMBER	SAMPLES
TL072CP	P	8	0 TO 70	ACTIVE		Request Samples

PRICING/AVAILABILITY

[Back to Top](#)

ORDERABLE DEVICE	PACKAGE	PINS	TEMP (°C)	STATUS	BUDGETARY PRICE US\$/UNIT QTY=1000+	PACK QTY	DSCC NUMBER	PRICING/AVAILABILITY
8102305HA	U	10	-55 TO 125	ACTIVE	10.01	1		Check stock or order

JM38510/11905BPA	<u>JG</u>	8	-55 TO 125	ACTIVE	25.74	1		Check stock or order
TL072CD	<u>D</u>	8	0 TO 70	ACTIVE	0.38	75		Check stock or order
TL072CDR	<u>D</u>	8	0 TO 70	ACTIVE	0.42	2500		Check stock or order
TL072CP	<u>P</u>	8	0 TO 70	ACTIVE	0.38	50		Check stock or order
TL072CPS	<u>PS</u>	8	0 TO 70	OBSOLETE				
TL072CPSLE	<u>PS</u>	8	0 TO 70	OBSOLETE				
TL072CPSR	<u>PS</u>	8	0 TO 70	ACTIVE	0.47	2000		Check stock or order
TL072CPWR	<u>PW</u>	8	0 TO 70	ACTIVE	0.42	2000		Check stock or order
TL072ID	<u>D</u>	8	-40 TO 85	ACTIVE	0.62	75		Check stock or order
TL072IDR	<u>D</u>	8	-40 TO 85	ACTIVE	0.65	2500		Check stock or order
TL072IP	<u>P</u>	8	-40 TO 85	ACTIVE	0.59	50		Check stock or order
TL072MFKB	<u>FK</u>	20	-55 TO 125	ACTIVE	11.90	1	81023052A	Check stock or order
TL072MJG	<u>JG</u>	8	-55 TO 125	ACTIVE	2.75	1		Check stock or order
TL072MJGB	<u>JG</u>	8	-55 TO 125	ACTIVE	4.52	1	8102305PA	Check stock or order
TL072MUB	<u>U</u>	10	-55 TO 125	ACTIVE	10.01	1	8102305HA	Check stock or order

DEVELOPMENT TOOLS

[Back to Top](#)

Tool Part Number	Tool Title	Tool Type
UNIV-OPAMP-1B	Universal EVM for Single/Dual OpAmps without Shutdown in MSOP/SOIC/SOT-23 packages	Evaluation Modules (EVM)
UNIV-OPAMP-2B	Universal EVM for Single/Dual OpAmps with Shutdown in MSOP/SOIC/SOT-23 packages	Evaluation Modules (EVM)
UNIV-OPAMP-3B	Universal EVM for Single/Dual/Quad OpAmps with/without Shutdown in MSOP/TSSOP packages	Evaluation Modules (EVM)
UNIV-OPAMP-4B	Universal EVM for Single/Dual/Quad OpAmps with/without Shutdown in SOIC packages	Evaluation Modules (EVM)
UNIV-OPAMP-5B	Universal EVM for Single/Dual/Quad OpAmps with/without Shutdown in PDIP packages	Evaluation Modules (EVM)

Table Data Updated on: 11/8/2000

© Copyright 2000 Texas Instruments Incorporated. All rights reserved. [Trademarks](#) | [Privacy Policy](#) | [Important Notice](#)

[Advanced Search](#)
[TI Home](#)
[TI&ME](#)
[Employment](#)
[Tech Support](#)
[Comments](#)
[Site Map](#)
[TI Global](#)

PRODUCT FOLDER | **PRODUCT INFO:** [FEATURES](#) | [DESCRIPTION](#) | [DATASHEETS](#) | [PRICING/AVAILABILITY](#) | [SAMPLES](#) | [APPLICATION NOTES](#) | [USER MANUALS](#)

PRODUCT SUPPORT: [DEVELOPMENT TOOLS](#) | [APPLICATIONS](#)

TL074, Quad Low-Noise JFET-Input General-Purpose Operational Amplifier


DEVICE STATUS: **ACTIVE**

PARAMETER NAME	TL074
Vs (max) (V)	36
Vs (min) (V)	7
IQ per channel (max) (mA)	2.5
IQ per channel (typ) (mA)	1.4
GBW (typ) (MHz)	3
Slew Rate (typ) (V/us)	13
VIO (Full Range) (max) (mV)	13
VIO (25 deg C) (max) (mV)	10
IIB (max) (pA)	200
CMRR (min) (dB)	70
Vn at 1kHz (typ) (nV/rtHz)	18
Number of Channels	4
Spec'd at Vs (V)	+/-15
Open Loop Gain (min) (dB)	88
Offset Drift (typ) (uV/C)	18

FEATURES

[Back to Top](#)

- Low Power Consumption
- Wide Common-Mode and Differential Voltage Ranges
- Low Input Bias and Offset Currents
- Output Short-Circuit Protection
- Low Total Harmonic Distortion
- 0.003% Typ
- Low Noise

- $V_n = 18 \text{ nV/}$  $\text{Hz} \setminus \text{Typ at } f = 1 \text{ kHz}$
- High Input Impedance...JFET Input Stage
- Internal Frequency Compensation
- Latch-Up-Free Operation
- High Slew Rate...13 V/us Typ

- **Common-Mode Input Voltage Range Includes V_{CC+}**

DESCRIPTION

[Back to Top](#)

The JFET-input operational amplifiers in the TL07_ series are designed as low-noise versions of the TL08_ series amplifiers with low input bias and offset currents and fast slew rate. The low harmonic distortion and low noise make the TL07_ series ideally suited for high-fidelity and audio preamplifier applications. Each amplifier features JFET inputs (for high input impedance) coupled with bipolar output stages integrated on a single monolithic chip.

The C-suffix devices are characterized for operation from 0°C to 70°C. The I-suffix devices are characterized for operation from -40°C to 85°C. The M-suffix devices are characterized for operation over the full military temperature range of -55°C to 125°C.



The D package is available taped and reeled. Add the suffix R to the device type (e.g., TL071CDR). The PW package is only available left-ended taped and reeled (e.g., TL072CPWLE).

TECHNICAL DOCUMENTS

[Back to Top](#)

To view the following documents, [Acrobat Reader 3.x](#) is required.
To download a document to your hard drive, right-click on the link and choose 'Save'.

DATASHEET

[Back to Top](#)

Full datasheet in Acrobat PDF: [slos080d.pdf](#) (281 KB) (Updated: 03/07/1997)

Full datasheet in Zipped PostScript: [slos080d.psz](#) (251 KB)

APPLICATION NOTES

[Back to Top](#)

View Application Reports for [Signal Amplifiers \(Less than equal to 100MHz\)](#)

- [Analog Applications Journal May 2000](#) (SLYT015 - Updated: 04/20/2000)
- [Analog Applications Journal, September 1999 edition](#) (SLYT005 - Updated: 07/15/1999)
- [Analysis Of The Sallen-Key Architecture](#) (SLOA024A - Updated: 07/27/1999)
- [Stability Analysis Of Voltage-Feedback Op Amps, Including Compensation Technique](#) (SLOA020 - Updated: 07/14/1999)

USER MANUALS

[Back to Top](#)

- [Universal Op Amp Single, Dual, Quad \(SOIC\) Evaluation Module With Shutdown](#) (SLOU061, 1160 KB - Updated: 10/22/1999)
- [Universal Operational Amplifier EVM](#) (SLVU006A, 387 KB - Updated: 03/22/1999)
- [Universal Operational Amplifier Evaluation Module Selection Guide](#) (SLOU060A, 16 KB - Updated: 09/28/2000)
- [Universal Operational Amplifier Single, Dual, Quad \(MSOP/TSSOP\)](#) (SLOU055, 1196 KB - Updated: 10/22/1999)
- [Universal Operational Amplifier Single, Dual, Quad \(PDIP\)](#) (SLOU062, 1211 KB - Updated: 10/22/1999)

SAMPLES

[Back to Top](#)

ORDERABLE DEVICE	PACKAGE	PINS	TEMP (°C)	STATUS	DSCC NUMBER	SAMPLES
TL074ID	<u>D</u>	14	-40 TO 85	ACTIVE		Request Samples
TL074IN	<u>N</u>	14	-40 TO 85	ACTIVE		Request Samples

PRICING/AVAILABILITY

[Back to Top](#)

ORDERABLE DEVICE	PACKAGE	PINS	TEMP (°C)	STATUS	BUDGETARY PRICE US\$/UNIT QTY= 1000+	PACK QTY	DSCC NUMBER	PRICING/AVAILABILITY
JM38510/11906BCA	<u>J</u>	14	-55 TO 125	ACTIVE	27.17	1		Check stock or order

TL074CD	<u>D</u>	14	0 TO 70	ACTIVE	0.50	50		Check stock or order
TL074CDR	<u>D</u>	14	0 TO 70	ACTIVE	0.53	2500		Check stock or order
TL074CN	<u>N</u>	14	0 TO 70	ACTIVE	0.50	25		Check stock or order
TL074CNS	<u>NS</u>	14	0 TO 70	OBSOLETE				
TL074CNSR	<u>NS</u>	14	0 TO 70	ACTIVE	0.59	2000		Check stock or order
TL074CPWLE	<u>PW</u>	14	0 TO 70	OBSOLETE				
TL074CPWR	<u>PW</u>	14	0 TO 70	ACTIVE	0.50	2000		Check stock or order
TL074ID	<u>D</u>	14	-40 TO 85	ACTIVE	0.67	50		Check stock or order
TL074IDR	<u>D</u>	14	-40 TO 85	ACTIVE	0.70	2500		Check stock or order
TL074IJ	<u>J</u>	14	-40 TO 85	OBSOLETE				
TL074IN	<u>N</u>	14	-40 TO 85	ACTIVE	0.67	25		Check stock or order
TL074MFKB	<u>FK</u>	20	-55 TO 125	ACTIVE	12.94	1	81023062A	Check stock or order
TL074MJ	<u>J</u>	14	-55 TO 125	ACTIVE	3.75	1		Check stock or order
TL074MJB	<u>J</u>	14	-55 TO 125	ACTIVE	5.49	1	8102306CA	Check stock or order
TL074MWB	<u>W</u>	14	-55 TO 125	ACTIVE	10.01	1	8102306DA	Check stock or order

DEVELOPMENT TOOLS

[Back to Top](#)

Tool Part Number	Tool Title	Tool Type
UNIV-OPAMP-1B	Universal EVM for Single/Dual OpAmps without Shutdown in MSOP/SOIC/SOT-23 packages	Evaluation Modules (EVM)
UNIV-OPAMP-2B	Universal EVM for Single/Dual OpAmps with Shutdown in MSOP/SOIC/SOT-23 packages	Evaluation Modules (EVM)
UNIV-OPAMP-3B	Universal EVM for Single/Dual/Quad OpAmps with/without Shutdown in MSOP/TSSOP packages	Evaluation Modules (EVM)
UNIV-OPAMP-4B	Universal EVM for Single/Dual/Quad OpAmps with/without Shutdown in SOIC packages	Evaluation Modules (EVM)
UNIV-OPAMP-5B	Universal EVM for Single/Dual/Quad OpAmps with/without Shutdown in PDIP packages	Evaluation Modules (EVM)

Table Data Updated on: 11/8/2000

© Copyright 2000 Texas Instruments Incorporated. All rights reserved. [Trademarks](#) | [Privacy Policy](#) | [Important Notice](#)

Advanced Search	TI Home	TI_ME	Employment
Tech Support	Comments	Site Map	TI Global

[PRODUCT FOLDER](#) | [PRODUCT INFO: FEATURES](#) | [DESCRIPTION](#) | [DATASHEETS](#) | [PRICING/AVAILABILITY](#) | [SAMPLES](#) | [APPLICATION NOTES](#) | [USER MANUALS](#)

[PRODUCT SUPPORT: DEVELOPMENT TOOLS](#) | [APPLICATIONS](#)

TL071, Low-Noise JFET-Input General-Purpose Operational Amplifier

DEVICE STATUS: **ACTIVE**

PARAMETER NAME	TL071
Vs (max) (V)	36
Vs (min) (V)	7
IQ per channel (max) (mA)	2.5
IQ per channel (typ) (mA)	1.4
GBW (typ) (MHz)	3
Slew Rate (typ) (V/us)	13
VIO (Full Range) (max) (mV)	13
VIO (25 deg C) (max) (mV)	10
IIB (max) (pA)	200
CMRR (min) (dB)	70
Vn at 1kHz (typ) (nV/rHz)	18
Number of Channels	1
Spec'd at Vs (V)	+/-15
Open Loop Gain (min) (dB)	88
Offset Drift (typ) (uV/C)	18

FEATURES

[Back to Top](#)

- Low Power Consumption
- Wide Common-Mode and Differential Voltage Ranges
- Low Input Bias and Offset Currents
- Output Short-Circuit Protection
- Low Total Harmonic Distortion
- 0.003% Typ
- Low Noise

- $V_n = 18 \text{ nV/} \square \text{ Hz} \setminus \text{Typ at } f = 1 \text{ kHz}$
- High Input Impedance...JFET Input Stage
- Internal Frequency Compensation
- Latch-Up-Free Operation

- High Slew Rate...13 V/us Typ
- Common-Mode Input Voltage Range Includes V_{CC+}

DESCRIPTION

[Back to Top](#)

The JFET-input operational amplifiers in the TL07_ series are designed as low-noise versions of the TL08_ series amplifiers with low input bias and offset currents and fast slew rate. The low harmonic distortion and low noise make the TL07_ series ideally suited for high-fidelity and audio preamplifier applications. Each amplifier features JFET inputs (for high input impedance) coupled with bipolar output stages integrated on a single monolithic chip.

The C-suffix devices are characterized for operation from 0°C to 70°C. The I-suffix devices are characterized for operation from -40°C to 85°C. The M-suffix devices are characterized for operation over the full military temperature range of -55°C to 125°C.



The D package is available taped and reeled. Add the suffix R to the device type (e.g., TL071CDR). The PW package is only available left-ended taped and reeled (e.g., TL072CPWLE).

TECHNICAL DOCUMENTS

[Back to Top](#)

To view the following documents, [Acrobat Reader 3.x](#) is required.

To download a document to your hard drive, right-click on the link and choose 'Save'.

DATASHEET

[Back to Top](#)

Full datasheet in Acrobat PDF: [slos080d.pdf](#) (281 KB) (Updated: 03/07/1997)

Full datasheet in Zipped PostScript: [slos080d.psz](#) (251 KB)

APPLICATION NOTES

[Back to Top](#)

View Application Reports for [Signal Amplifiers \(Less than equal to 100MHz\)](#)

- [Analog Applications Journal May 2000](#) (SLYT015 - Updated: 04/20/2000)
- [Analog Applications Journal, September 1999 edition](#) (SLYT005 - Updated: 07/15/1999)
- [Analysis Of The Sallen-Key Architecture](#) (SLOA024A - Updated: 07/27/1999)
- [Stability Analysis Of Voltage-Feedback Op Amps, Including Compensation Technique](#) (SLOA020 - Updated: 07/14/1999)

USER MANUALS

[Back to Top](#)

- [Universal Op Amp Single, Dual, Quad \(SOIC\) Evaluation Module With Shutdown](#) (SLOU061, 1160 KB - Updated: 10/22/1999)
- [Universal Operational Amplifier EVM](#) (SLVU006A, 387 KB - Updated: 03/22/1999)
- [Universal Operational Amplifier Evaluation Module Selection Guide](#) (SLOU060A, 16 KB - Updated: 09/28/2000)
- [Universal Operational Amplifier Single, Dual, Quad \(MSOP/TSSOP\)](#) (SLOU055, 1196 KB - Updated: 10/22/1999)
- [Universal Operational Amplifier Single, Dual, Quad \(PDIP\)](#) (SLOU062, 1211 KB - Updated: 10/22/1999)

SAMPLES

[Back to Top](#)

ORDERABLE DEVICE	PACKAGE	PINS	TEMP (°C)	STATUS	DSCC NUMBER	SAMPLES
TL071CP	P	8	0 TO 70	ACTIVE		Request Samples

PRICING/AVAILABILITY

[Back to Top](#)

ORDERABLE DEVICE	PACKAGE	PINS	TEMP (°C)	STATUS	BUDGETARY PRICE US\$/UNIT QTY=1000+	PACK QTY	DSCC NUMBER	PRICING/AVAILABILITY
8102304HA		10	-55 TO 125	OBSOLETE				

TL071CD	<u>D</u>	8	0 TO 70	ACTIVE	0.35	75		Check stock or order
TL071CDR	<u>D</u>	8	0 TO 70	ACTIVE	0.38	2500		Check stock or order
TL071CP	<u>P</u>	8	0 TO 70	ACTIVE	0.35	50		Check stock or order
TL071CPS	<u>PS</u>	8	0 TO 70	OBSOLETE				
TL071CPSR	<u>PS</u>	8	0 TO 70	ACTIVE	0.43	2000		Check stock or order
TL071CPWLE	<u>PW</u>	8	0 TO 70	OBSOLETE				
TL071ID	<u>D</u>	8	-40 TO 85	ACTIVE	0.59	75		Check stock or order
TL071IDR	<u>D</u>	8	-40 TO 85	ACTIVE	0.62	2500		Check stock or order
TL071IJG	<u>JG</u>	8	-40 TO 85	OBSOLETE				
TL071IP	<u>P</u>	8	-40 TO 85	ACTIVE	0.59	50		Check stock or order
TL071MFKB	<u>FK</u>	20	-55 TO 125	ACTIVE	10.78	165	81023042A	Check stock or order
TL071MJG	<u>JG</u>	8	-55 TO 125	ACTIVE	2.30	1		Check stock or order
TL071MJGB	<u>JG</u>	8	-55 TO 125	ACTIVE	3.76	1	8102304PA	Check stock or order

DEVELOPMENT TOOLS

[Back to Top](#)

Tool Part Number	Tool Title	Tool Type
UNIV-OPAMP-1B	Universal EVM for Single/Dual OpAmps without Shutdown in MSOP/SOIC/SOT-23 packages	Evaluation Modules (EVM)
UNIV-OPAMP-2B	Universal EVM for Single/Dual OpAmps with Shutdown in MSOP/SOIC/SOT-23 packages	Evaluation Modules (EVM)
UNIV-OPAMP-3B	Universal EVM for Single/Dual/Quad OpAmps with/without Shutdown in MSOP/TSSOP packages	Evaluation Modules (EVM)
UNIV-OPAMP-4B	Universal EVM for Single/Dual/Quad OpAmps with/without Shutdown in SOIC packages	Evaluation Modules (EVM)
UNIV-OPAMP-5B	Universal EVM for Single/Dual/Quad OpAmps with/without Shutdown in PDIP packages	Evaluation Modules (EVM)

Table Data Updated on: 11/26/2000

© Copyright 2000 Texas Instruments Incorporated. All rights reserved. [Trademarks](#) | [Privacy Policy](#) | [Important Notice](#)