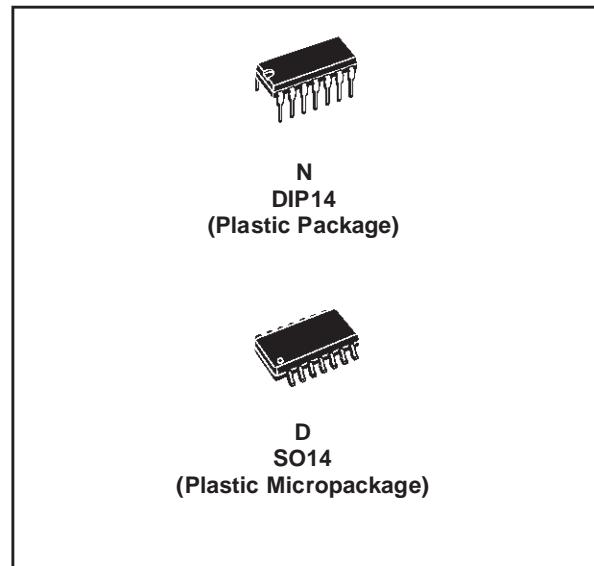




TL074  
TL074A - TL074B

## LOW NOISE J-FET QUAD OPERATIONAL AMPLIFIERS

- WIDE COMMON-MODE (UP TO  $V_{CC}^+$ ) AND DIFFERENTIAL VOLTAGE RANGE
- LOW INPUT BIAS AND OFFSET CURRENT
- LOW NOISE  $e_n = 15\text{nV}/\sqrt{\text{Hz}}$  (typ)
- OUTPUT SHORT-CIRCUIT PROTECTION
- HIGH INPUT IMPEDANCE J-FET INPUT STAGE
- LOW HARMONIC DISTORTION : 0.01% (typ)
- INTERNAL FREQUENCY COMPENSATION
- LATCH UP FREE OPERATION
- HIGH SLEW RATE : 13V/ $\mu\text{s}$  (typ)



### DESCRIPTION

The TL074, TL074A and TL074B are high speed J-FET input quad operational amplifiers incorporating well matched, high voltage J-FET and bipolar transistors in a monolithic integrated circuit.

The devices feature high slew rates, low input bias and offset currents, and low offset voltage temperature coefficient.

### ORDER CODE

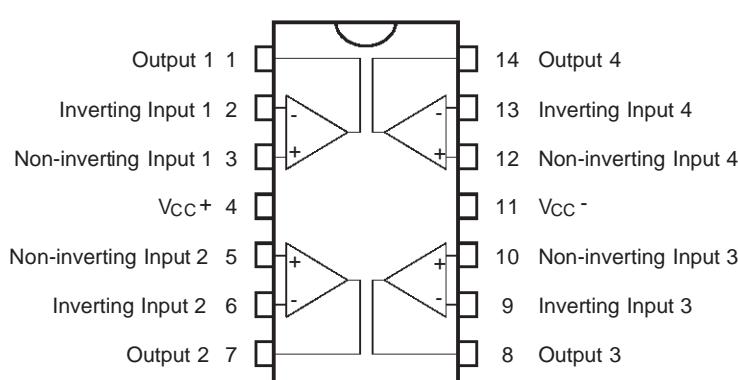
Part Number	Temperature Range	Package	
		N	D
TL074M/AM/BM	-55°C, +125°C	•	•
TL074I/AI/BI	-40°C, +105°C	•	•
TL074C/AC/BC	0°C, +70°C	•	•

**Example :** TL074IN

N = Dual in Line Package (DIP)

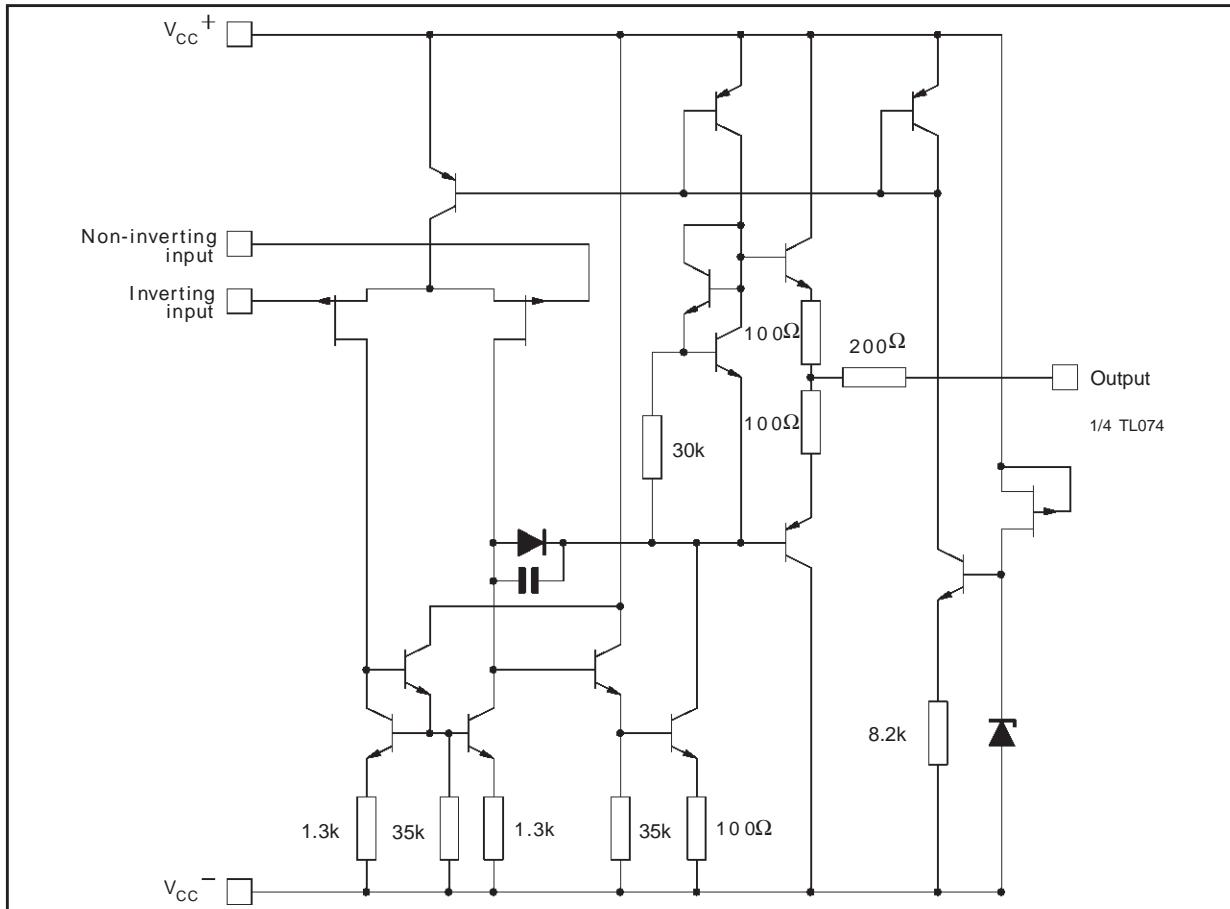
D = Small Outline Package (SO) - also available in Tape & Reel (DT)

### PIN CONNECTIONS (top view)



## TL074- TL074A - TL074B

### SCHEMATIC DIAGRAM



### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	TL074M, AM, BM	TL074I, AI, BI	TL074C, AC, BC	Unit
V <sub>CC</sub>	Supply voltage - note 1)		±18		V
V <sub>i</sub>	Input Voltage - note 2)		±15		V
V <sub>id</sub>	Differential Input Voltage - note 3)		±30		V
P <sub>tot</sub>	Power Dissipation		680		mW
	Output Short-circuit Duration - note 4)		Infinite		
T <sub>oper</sub>	Operating Free-air Temperature Range	-55 to +125	-40 to +105	0 to +70	°C
T <sub>stg</sub>	Storage Temperature Range		-65 to +150		°C

1. All voltage values, except differential voltage, are with respect to the zero reference level (ground) of the supply voltages where the zero reference level is the midpoint between V<sub>CC</sub><sup>+</sup> and V<sub>CC</sub><sup>-</sup>.
2. The magnitude of the input voltage must never exceed the magnitude of the supply voltage or 15 volts, whichever is less.
3. Differential voltages are the non-inverting input terminal with respect to the inverting input terminal.
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

**ELECTRICAL CHARACTERISTICS** $V_{CC} = \pm 15V, T_{amb} = +25^\circ C$  (unless otherwise specified)

Symbol	Parameter	TL074I,M,AC,AI,AM, BC,BI,BM			TL074C			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
$V_{io}$	Input Offset Voltage ( $R_S = 50\Omega$ ) $T_{amb} = +25^\circ C$ $T_{min} \leq T_{amb} \leq T_{max}$		3 3 1	10 6 3		3	10 13	mV
$DV_{io}$	Input Offset Voltage Drift		10			10		$\mu V/^\circ C$
$I_{io}$	Input Offset Current - note <sup>1)</sup> $T_{amb} = +25^\circ C$ $T_{min} \leq T_{amb} \leq T_{max}$		5	100 4		5	100 10	pA nA
$I_{ib}$	Input Bias Current -note 1 $T_{amb} = +25^\circ C$ $T_{min} \leq T_{amb} \leq T_{max}$		20	200 20		30	200 20	pA nA
$A_{vd}$	Large Signal Voltage Gain ( $R_L = 2k\Omega, V_o = \pm 10V$ ) $T_{amb} = +25^\circ C$ $T_{min} \leq T_{amb} \leq T_{max}$	50 25	200		25 15	200		V/mV
SVR	Supply Voltage Rejection Ratio ( $R_S = 50\Omega$ ) $T_{amb} = +25^\circ C$ $T_{min} \leq T_{amb} \leq T_{max}$	80 80	86		70 70	86		dB
$I_{CC}$	Supply Current, no load, per amplifier $T_{amb} = +25^\circ C$ $T_{min} \leq T_{amb} \leq T_{max}$		1.4	2.5 2.5		1.4	2.5 2.5	mA
$V_{icm}$	Input Common Mode Voltage Range	$\pm 11$	+15 -12		$\pm 11$	+15 -12		V
CMR	Common Mode Rejection Ratio ( $R_S = 50\Omega$ ) $T_{amb} = +25^\circ C$ $T_{min} \leq T_{amb} \leq T_{max}$	80 80	86		70 70	86		dB
$I_{os}$	Output Short-circuit Current $T_{amb} = +25^\circ C$ $T_{min} \leq T_{amb} \leq T_{max}$	10 10	40	60 60	10 10	40	60 60	mA
$\pm V_{opp}$	Output Voltage Swing $T_{amb} = +25^\circ C$ $RL = 2k\Omega$ $RL = 10k\Omega$ $RL = 2k\Omega$ $RL = 10k\Omega$ $T_{min} \leq T_{amb} \leq T_{max}$	10 12 10 12	12 13.5		10 12 10 12	12 13.5		V
SR	Slew Rate ( $T_{amb} = +25^\circ C$ ) $V_{in} = 10V, R_L = 2k\Omega, C_L = 100pF$ , unity gain	8	13		8	13		$V/\mu s$
$t_r$	Rise Time ( $T_{amb} = +25^\circ C$ ) $V_{in} = 20mV, R_L = 2k\Omega, C_L = 100pF$ , unity gain		0.1			0.1		$\mu s$
$K_{ov}$	Overshoot ( $T_{amb} = +25^\circ C$ ) $V_{in} = 20mV, R_L = 2k\Omega, C_L = 100pF$ , unity gain		10			10		%
GBP	Gain Bandwidth Product ( $T_{amb} = +25^\circ C$ ) $V_{in} = 10mV, R_L = 2k\Omega, C_L = 100pF, f = 100kHz$	2	3		2	3		MHz
$R_i$	Input Resistance		$10^{12}$			$10^{12}$		$\Omega$

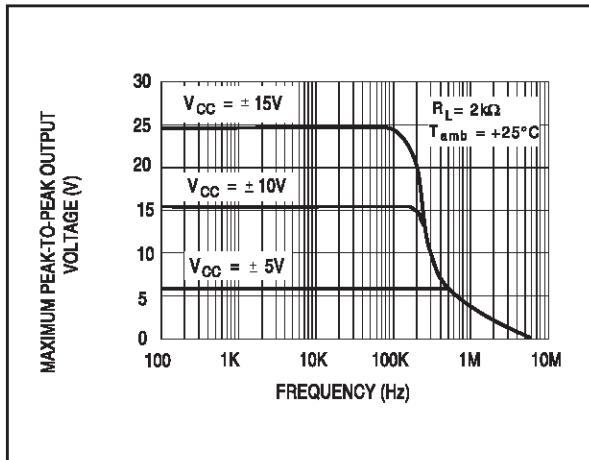
## TL074- TL074A - TL074B

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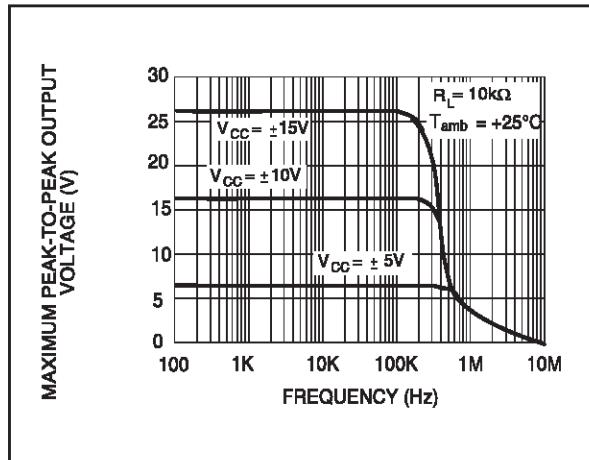
Symbol	Parameter	TL074I,M,AC,AI,AM, BC,BI,BM			TL074C			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
THD	Total Harmonic Distortion ( $T_{amb} = +25^{\circ}\text{C}$ ) $f = 1\text{kHz}$ , $R_L = 2\text{k}\Omega$ , $C_L = 100\text{pF}$ , $A_v = 20\text{dB}$ , $V_o = 2V_{pp}$		0.01			0.01		%
$e_n$	Equivalent Input Noise Voltage $R_S = 100\Omega$ , $f = 1\text{KHz}$		15			15		$\frac{\text{nV}}{\sqrt{\text{Hz}}}$
$\emptyset m$	Phase Margin		45			45		degrees
$V_{o1}/V_{o2}$	Channel separation $A_v = 100$		120			120		dB

1. The input bias currents are junction leakage currents which approximately double for every  $10^{\circ}\text{C}$  increase in the junction temperature.

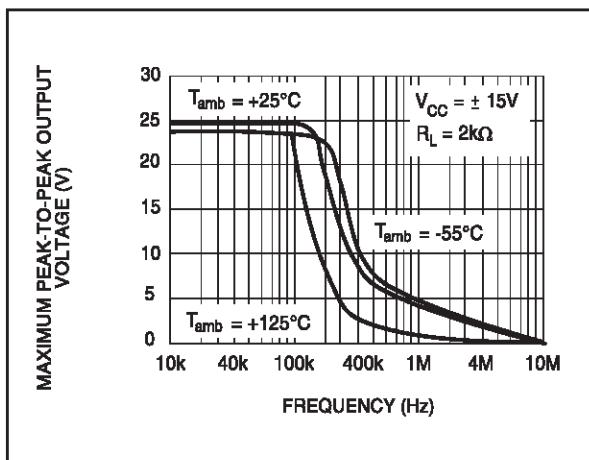
**MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE versus FREQUENCY**



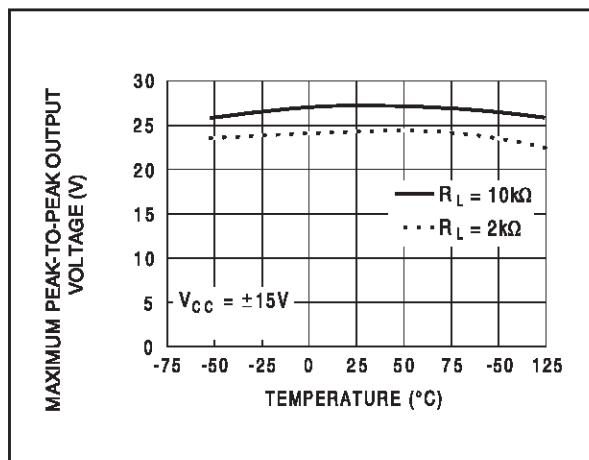
**MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE versus FREQUENCY**



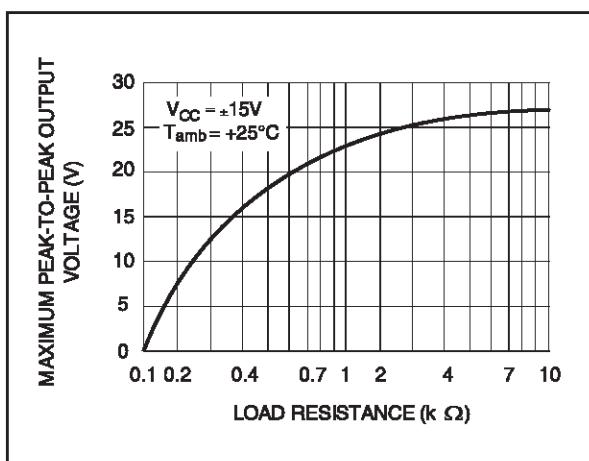
**MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE versus FREQUENCY**



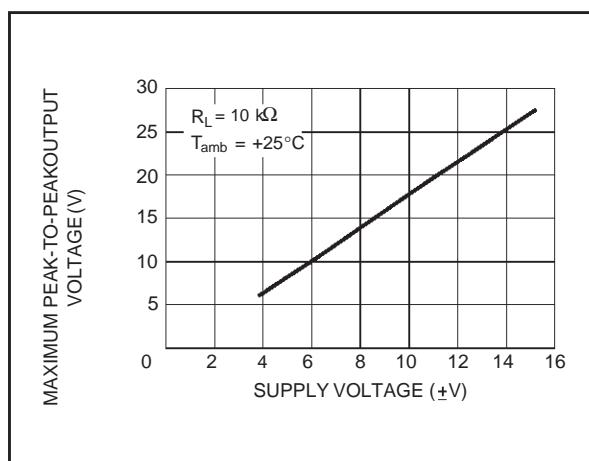
**MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE versus FREE AIR TEMP.**



**MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE versus LOAD RESISTANCE**

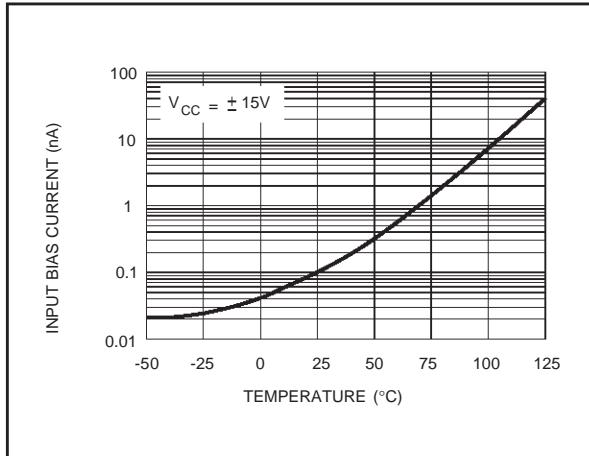


**MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE versus SUPPLY VOLTAGE**

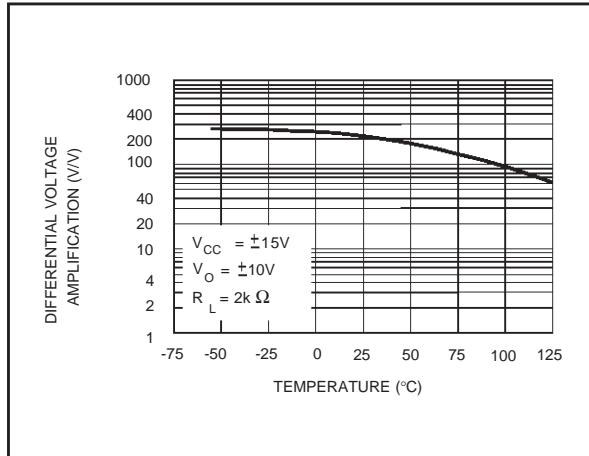


## TL074- TL074A - TL074B

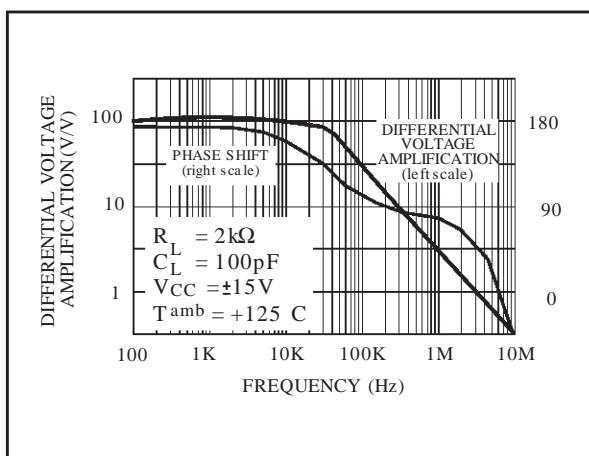
**INPUT BIAS CURRENT versus FREE AIR TEMPERATURE**



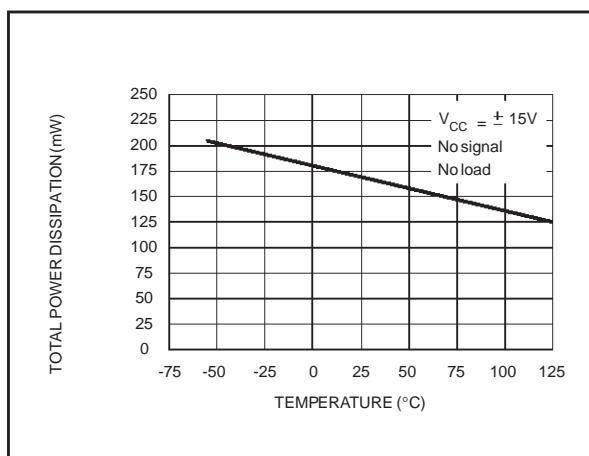
**LARGE SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION versus FREE AIR TEMP.**



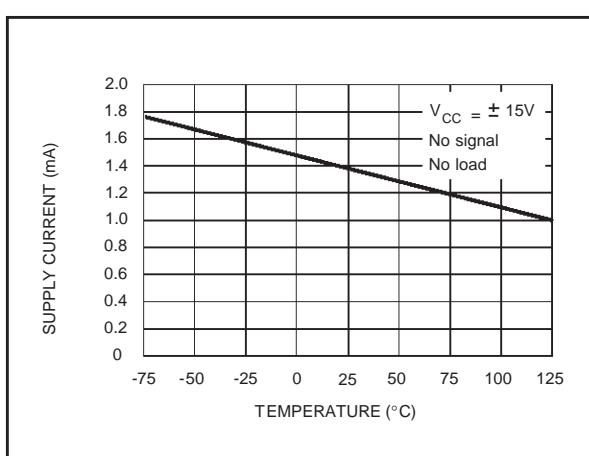
**LARGE SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION AND PHASE SHIFT versus FREQUENCY**



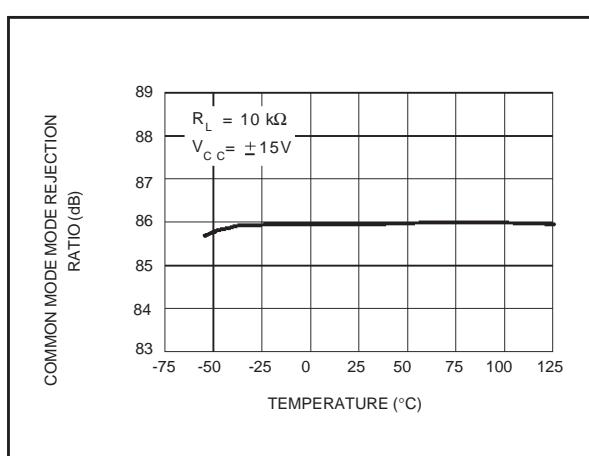
**TOTAL POWER DISSIPATION versus FREE AIR TEMPERATURE**



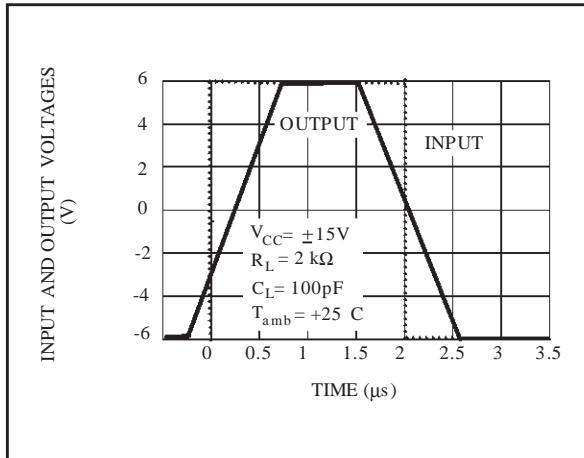
**SUPPLY CURRENT PER AMPLIFIER versus FREE AIR TEMPERATURE**



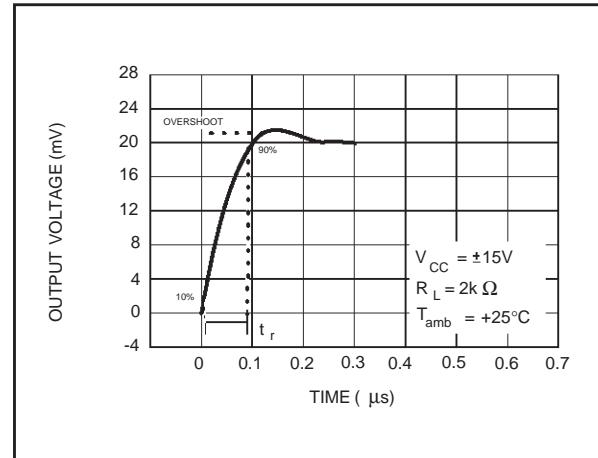
**COMMON MODE REJECTION RATIO versus FREE AIR TEMPERATURE**



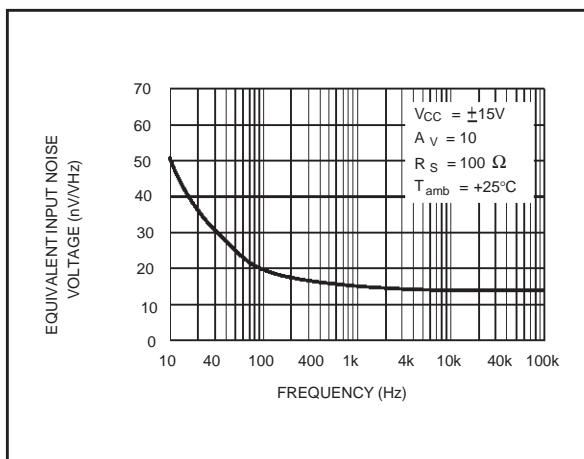
**VOLTAGE FOLLOWER LARGE SIGNAL PULSE RESPONSE**



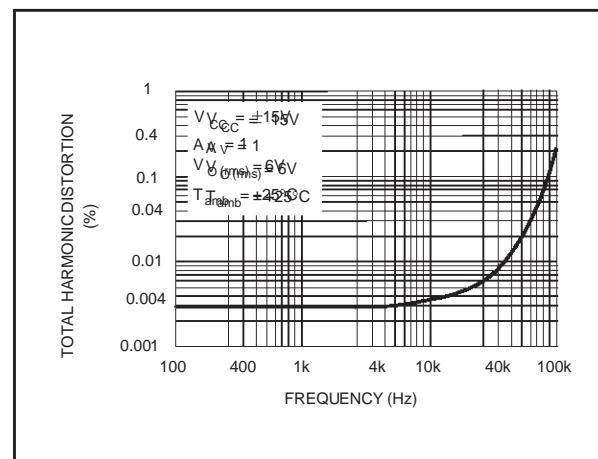
**OUTPUT VOLTAGE versus ELAPSED TIME**



**EQUIVALENT INPUT NOISE VOLTAGE versus FREQUENCY**



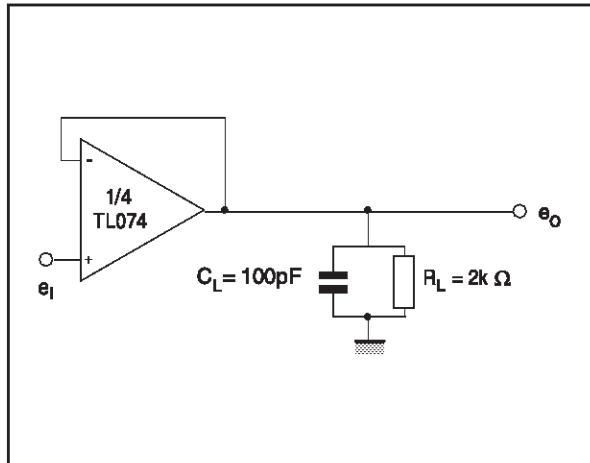
**TOTAL HARMONIC DISTORTION versus FREQUENCY**



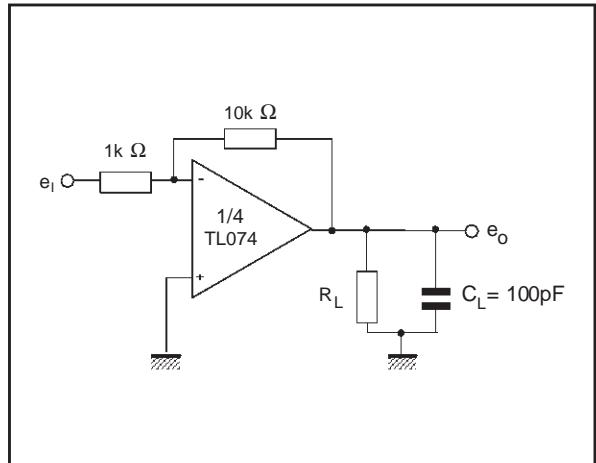
## TL074- TL074A - TL074B

### PARAMETER MEASUREMENT INFORMATION

**Figure 1 : Voltage Follower**

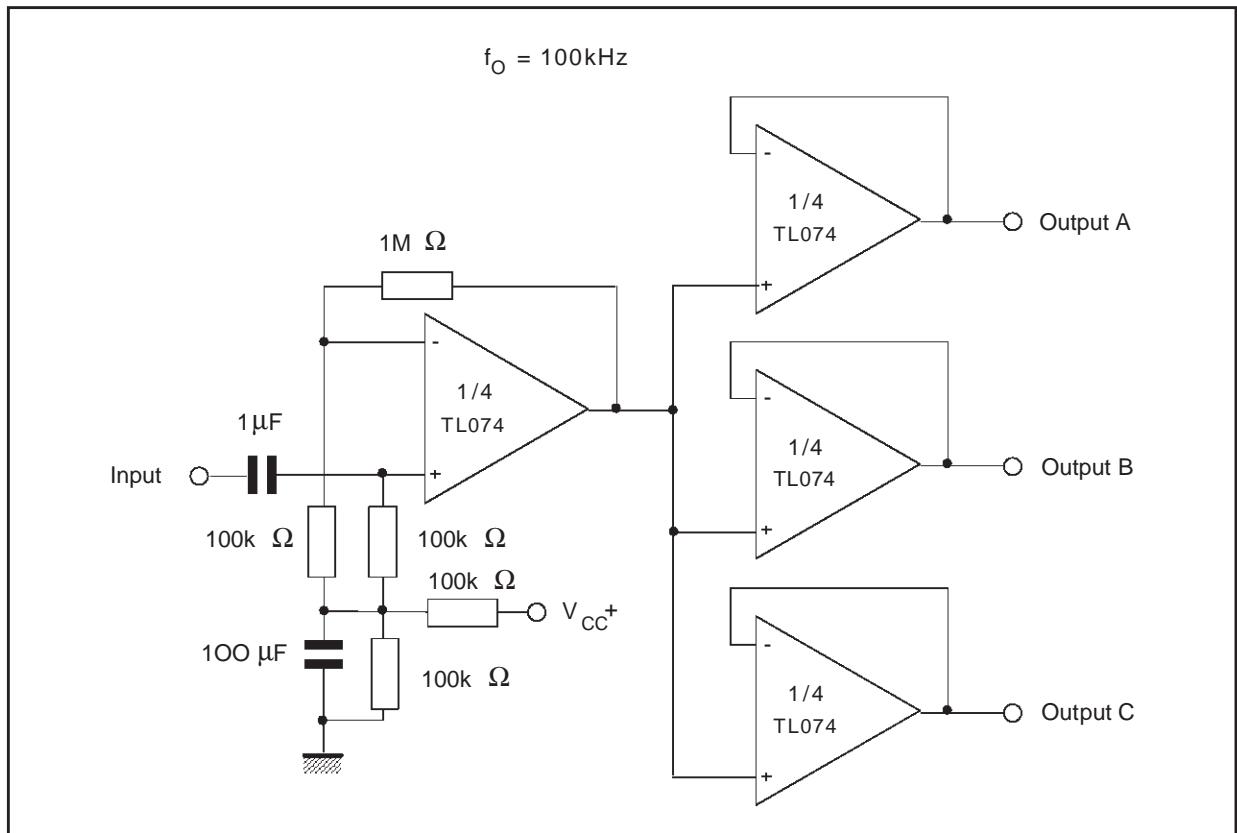


**Figure 2 : Gain-of-10 Inverting Amplifier**



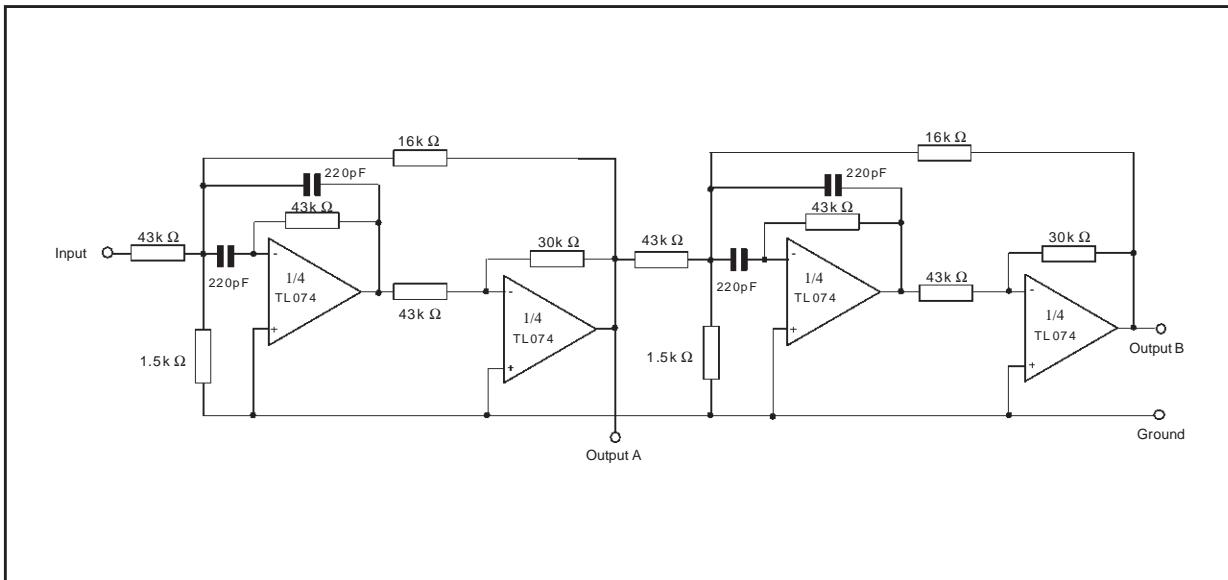
### TYPICAL APPLICATIONS

#### AUDIO DISTRIBUTION AMPLIFIER

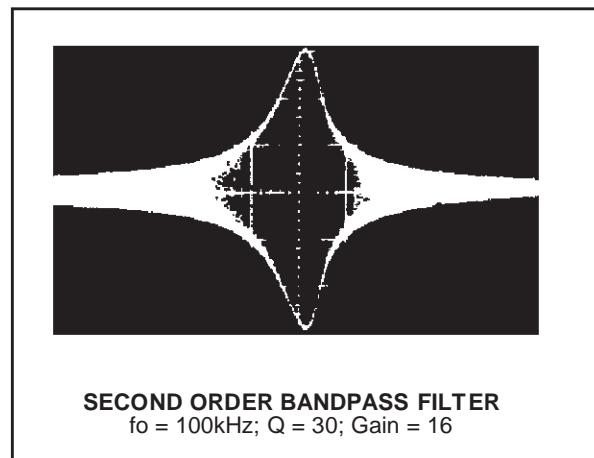


**TYPICAL APPLICATIONS** (continued)

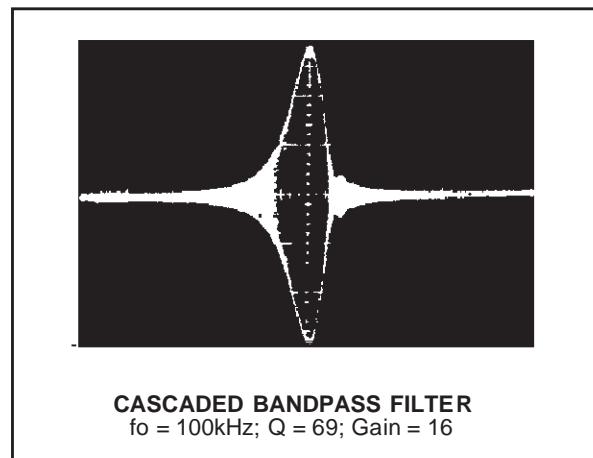
**POSITIVE FEEDBACK BANDPASS FILTER**



OUTPUT A



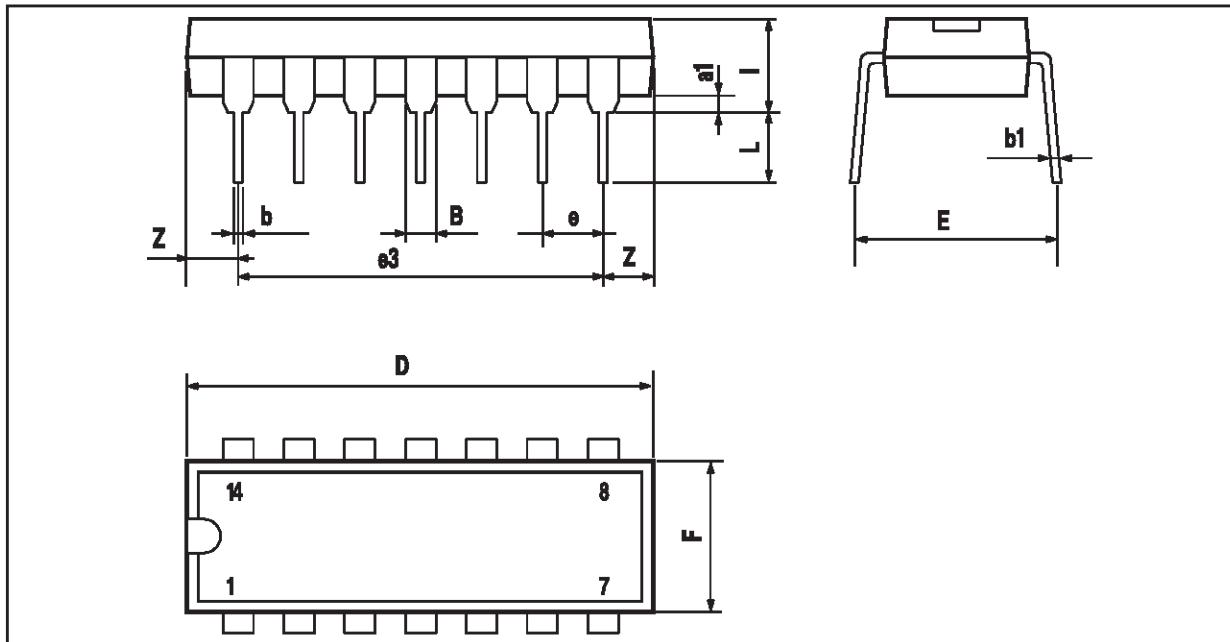
OUTPUT B



## TL074- TL074A - TL074B

### PACKAGE MECHANICAL DATA

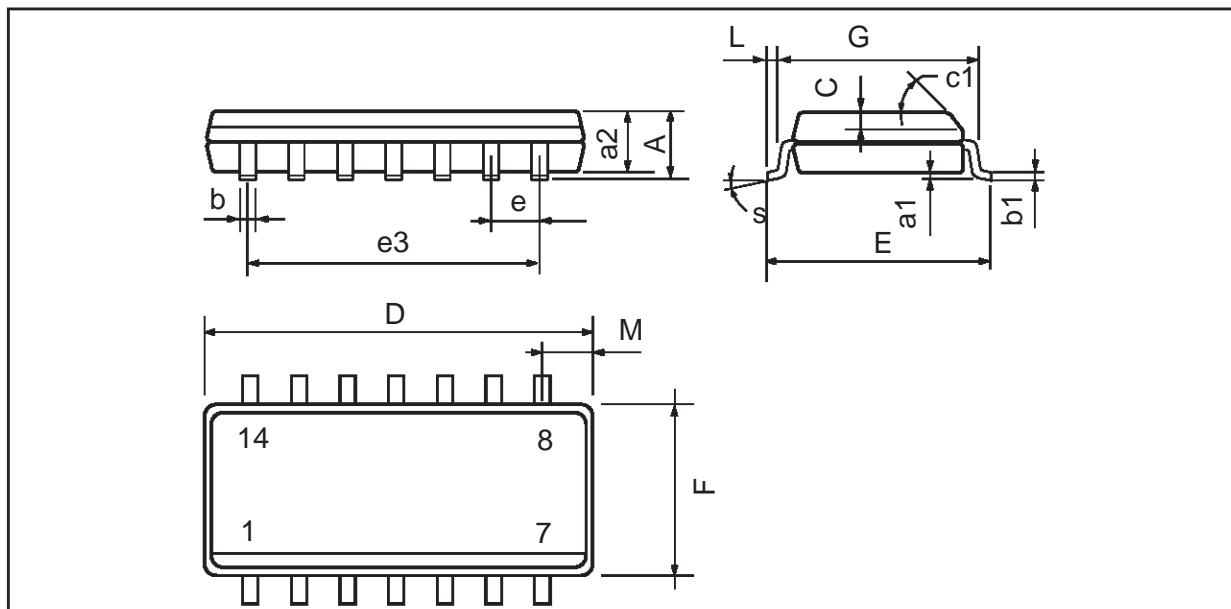
14 PINS - PLASTIC DIP



Dim.	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
a1	0.51			0.020		
B	1.39		1.65	0.055		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		15.24			0.600	
F			7.1			0.280
i			5.1			0.201
L		3.3			0.130	
Z	1.27		2.54	0.050		0.100

**PACKAGE MECHANICAL DATA**

14 PINS - PLASTIC MICROPACKAGE (SO)



Dim.	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.75			0.069
a1	0.1		0.2	0.004		0.008
a2			1.6			0.063
b	0.35		0.46	0.014		0.018
b1	0.19		0.25	0.007		0.010
C		0.5			0.020	
c1	45° (typ.)					
D (1)	8.55		8.75	0.336		0.344
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		7.62			0.300	
F (1)	3.8		4.0	0.150		0.157
G	4.6		5.3	0.181		0.208
L	0.5		1.27	0.020		0.050
M			0.68			0.027
S	8° (max.)					

Note : (1) D and F do not include mold flash or protrusions - Mold flash or protrusions shall not exceed 0.15mm (.066 inc) ONLY FOR DATA BOOK.

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