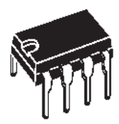
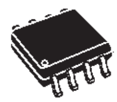
TL062
TL062A - TL062B

LOW POWER J-FET DUAL OPERATIONAL AMPLIFIERS

- VERY LOW POWER CONSUMPTION : 200µA
- WIDE COMMON-MODE (UP TO V_{CC}^{+}) AND DIFFERENTIAL VOLTAGE RANGES
- LOW INPUT BIAS AND OFFSET CURRENTS
- OUTPUT SHORT-CIRCUIT PROTECTION
- HIGH INPUT IMPEDANCE J-FET INPUT STAGE
- INTERNAL FREQUENCY COMPENSATION
- LATCH UP FREE OPERATION
- HIGH SLEW RATE : 3.5V/µs



N
DIP8
(Plastic Package)



D
SO8
(Plastic Micropackage)

DESCRIPTION

The TL062, TL062A and TL062B are high speed J-FET input dual operational amplifier family. Each of these J-FET input operational amplifiers incorporates well matched, high voltage J-FET and bipolar transistors in a monolithic integrated circuit.

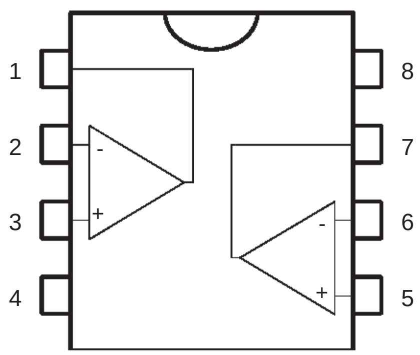
The devices feature high slew rates, low input bias and offset currents, and low offset voltage temperature coefficient.

ORDER CODE

Part Number	Temperature Range	Package N	Package D
TL062M/AM/BM	-55°C, +125°C	•	•
TL062I/AI/BI	-40°C, +105°C	•	•
TL062C/AC/BC	0°C, +70°C	•	•
Example : TL062IN			

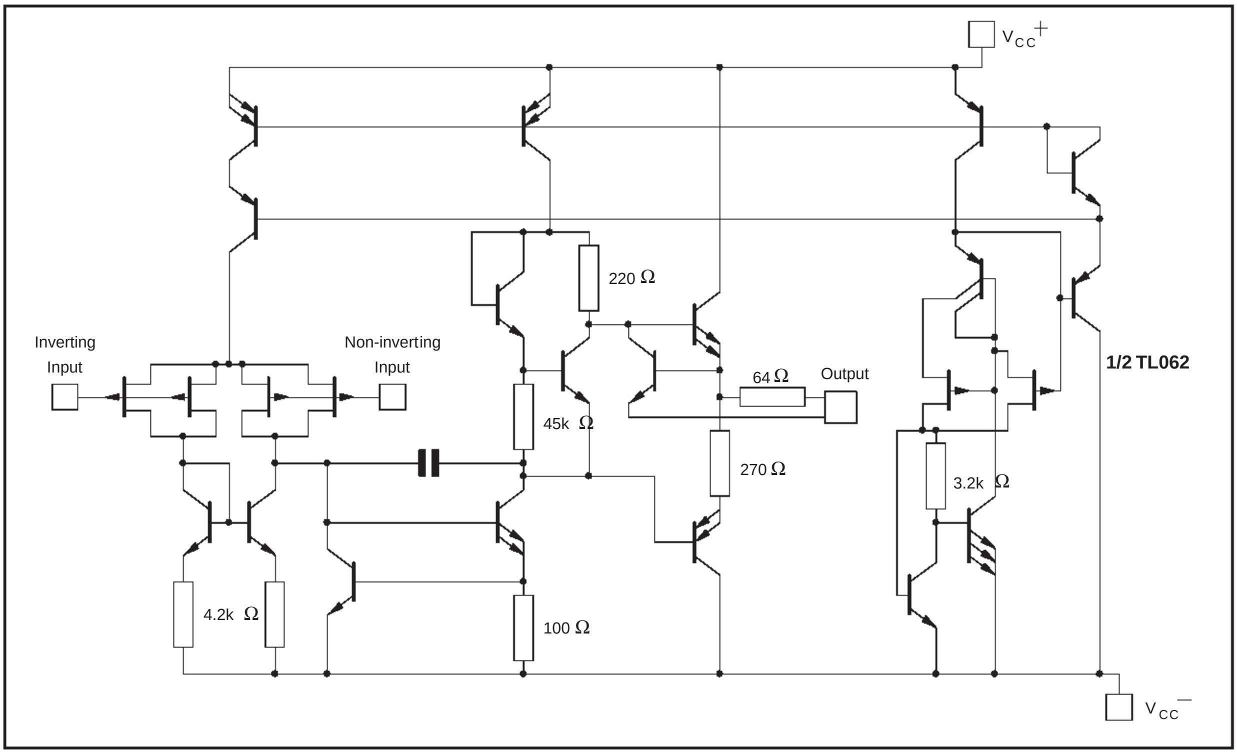
N = Dual in Line Package (DIP)
D = Small Outline Package (SO) - also available in Tape & Reel (DT)

PIN CONNECTIONS (top view)



1 - Output 1
2 - Inverting input 1
3 - Non-inverting input 1
4 - V_{CC}^{-}
5 - Non-inverting input 2
6 - Inverting input 2
7 - Output 2
8 - V_{CC}^{+}

SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	TL062M, AM, BM	TL062I, AI, BI	TL062C, AC, BC	Unit
V_{CC}	Supply voltage - note 1)	±18			V
V_i	Input Voltage - note 2)	±15			V
V_{id}	Differential Input Voltage - note 3)	±30			V
P_{tot}	Power Dissipation	680			mW
	Output Short-circuit Duration - note 4)	Infinite			
T_{oper}	Operating Free-air Temperature Range	-55 to +125	-40 to +105	0 to +70	°C
T_{stg}	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_{CC}^+ and V_{CC}^-.
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} = ±15V, T_{amb} = +25°C (unless otherwise specified)

Symbol	Parameter	TL062M			TL062I			TL062C			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	
V_{io}	Input Offset Voltage (R_s = 50Ω) T_{amb} = 25°C $T_{min} \leq T_{amb} \leq T_{max}$		3	6 15		3	6 9		3	15 20	mV
DV_{io}	Temperature Coefficient of Input Offset Voltage (R_s = 50Ω)		10			10			10		μV/°C
I_{io}	Input Offset Current - note 1) T_{amb} = 25°C $T_{min} \leq T_{amb} \leq T_{max}$		5	100 20		5	100 10		5	200 5	pA nA
I_{ib}	Input Bias Current - note 1 T_{amb} = 25°C $T_{min} \leq T_{amb} \leq T_{max}$		30	200 50		30	200 20		30	400 10	pA nA
V_{icm}	Input Common Mode Voltage Range	±11.5	+15 -12		±11.5	+15 -12		±11	+15 -12		V
V_{opp}	Output Voltage Swing (R_L = 10kΩ) T_{amb} = 25°C $T_{min} \leq T_{amb} \leq T_{max}$	20 20	27		20 20	27		20 20	27		V
A_{vd}	Large Signal Voltage Gain R_L = 10kΩ, V_o = ±10V, T_{amb} = 25°C $T_{min} \leq T_{amb} \leq T_{max}$	4 4	6		4 4	6		3 3	6		V/mV
GBP	Gain Bandwidth Product T_{amb} = 25°C, R_L =10kΩ, C_L = 100pF		1			1			1		MHz
R_i	Input Resistance		10^{12}			10^{12}			10^{12}		Ω
CMR	Common Mode Rejection Ratio R_S = 50Ω	80	86		80	86		70	76		dB
SVR	Supply Voltage Rejection Ratio R_S = 50Ω	80	95		80	95		70	95		dB
I_{CC}	Supply Current, Per Amplifier T_{amb} = 25°C, no load, no signal		200	250		200	250		200	250	μA
V_{o1}/V_{o2}	Channel Separation A_v = 100, T_{amb} = 25°C		120			120			120		dB
P_D	Total Power Consumption T_{amb} = 25°C, no load, no signal		6	7.5		6	7.5		6	7.5	mW
SR	Slew Rate V_i = 10V, R_L = 10kΩ, C_L = 100pF, A_V = 1	1.5	3.5		1.5	3.5		1.5	3.5		V/μs
t_r	Rise Time V_i = 20mV, R_L = 10kΩ, C_L = 100pF, A_V = 1		0.2			0.2			0.2		μs
K_{ov}	Overshoot Factor (see figure 1) V_i = 20mV, R_L = 10kΩ, C_L = 100pF, A_V = 1 (see figure 1)		10			10			10		%
e_n	Equivalent Input Noise Voltage R_S = 100Ω, f = 1KHz		42			42			42		$\frac{nV}{\sqrt{Hz}}$

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

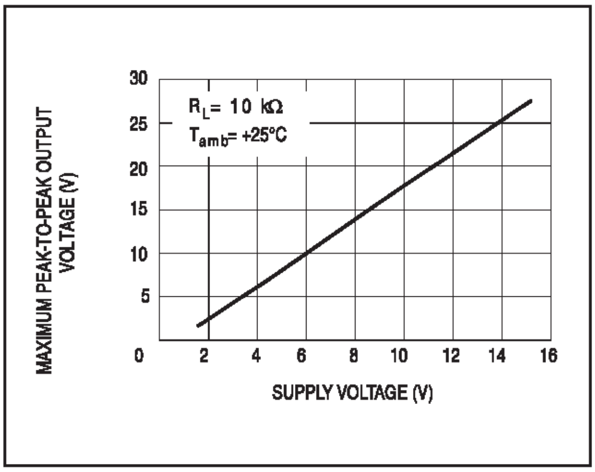
ELECTRICAL CHARACTERISTICS

V_{CC} = ±15V, T_{amb} = +25°C (unless otherwise specified)

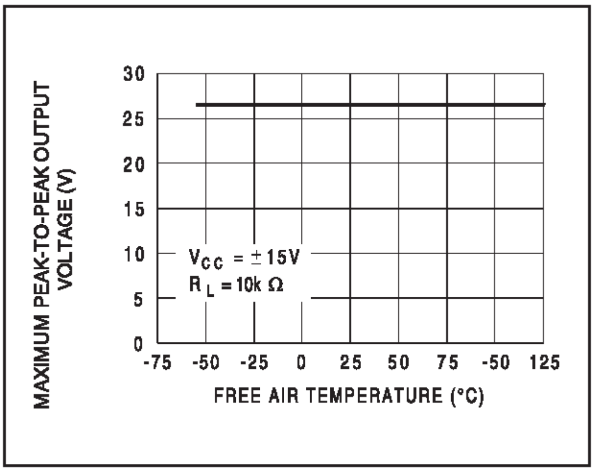
Symbol	Parameter	TL062AC, AI, AM			TL062BC, BI, BM			Unit
		Min.	Typ.	Max.	Min.	Typ.	Max.	
V_{io}	Input Offset Voltage (R_S = 50Ω) T_{amb} = 25°C $T_{min} \le T_{amb} \le T_{max}$		 3	 6 7.5		 2	 3 5	mV
DV_{io}	Temperature Coefficient of Input Offset Voltage (R_S = 50Ω)		10			10		µV/°C
I_{io}	Input Offset Current - note 1) T_{amb} = 25°C $T_{min} \le T_{amb} \le T_{max}$		 5	 100 3		 5	 100 3	 pA nA
I_{ib}	Input Bias Current -note 1 T_{amb} = 25°C $T_{min} \le T_{amb} \le T_{max}$		 30	 200 7		 30	 200 7	nA
V_{icm}	Input Common Mode Voltage Range	±11.5	+15 -12		±11.5	+15 -12		
V_{opp}	Output Voltage Swing (R_L = 10kΩ) T_{amb} = 25°C $T_{min} \le T_{amb} \le T_{max}$	 20 20	 27		 20 20	 27		V
A_{vd}	Large Signal Voltage Gain R_L = 10kΩ, V_o = ±10V, T_{amb} = 25°C $T_{min} \le T_{amb} \le T_{max}$	 4 4	 6		 4 4	 6		V/mV
GBP	Gain Bandwidth Product T_{amb} = 25°C, R_L =10kΩ, C_L = 100pF		 1			 1		MHz
R_i	Input Resistance		10^{12}			10^{12}		Ω
CMR	Common Mode Rejection Ratio R_S = 50Ω	 80	 86		 80	 86		dB
SVR	Supply Voltage Rejection Ratio R_S = 50Ω	 80	 95		 80	 95		dB
I_{CC}	Supply Current (Per Amplifier) T_{amb} = +25°C, no load, no signal		 200	 250		 200	 250	µA
V_{o1}/V_{o2}	Channel Separation A_v = 100, T_{amb} = +25°C		 120			 120		
P_D	Total Power Consumption (Each Amplifier) T_{amb} = 25°C, no load, no signal		 6	 7.5		 6	 7.5	mW
SR	Slew Rate V_i = 10V, R_L = 10kΩ, C_L = 100pF, A_V = 1	 1.5	 3.5		 1.5	 3.5		V/µs
t_r	Rise Time V_i = 20mV, R_L = 10kΩ, C_L = 100pF, A_V = 1		 0.2			 0.2		µs
K_{ov}	Overshoot Factor (see figure 1) V_i = 20mV, R_L = 10kΩ, C_L = 100pF, A_V = 1		 10			 10		%
e_n	Equivalent Input Noise Voltage R_S = 100Ω, f = 1KHz		 42			 42		$\frac{nV}{\sqrt{Hz}}$

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

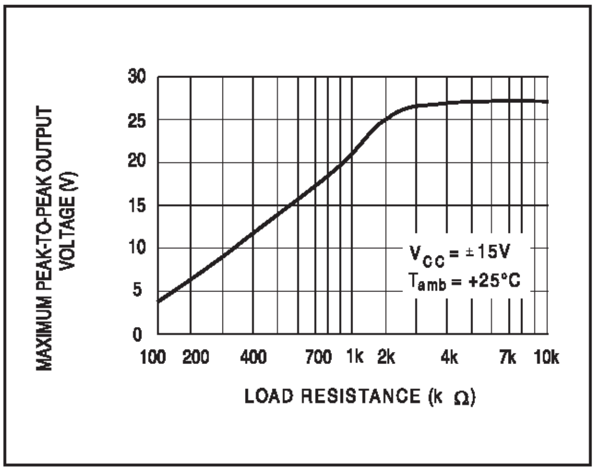
MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE versus SUPPLY VOLTAGE



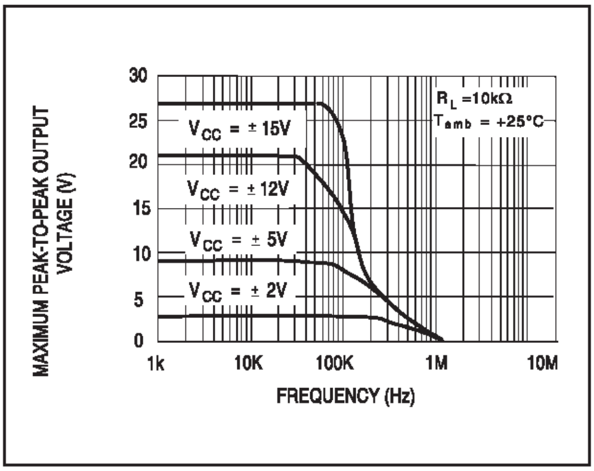
MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE versus FREE AIR TEMP.



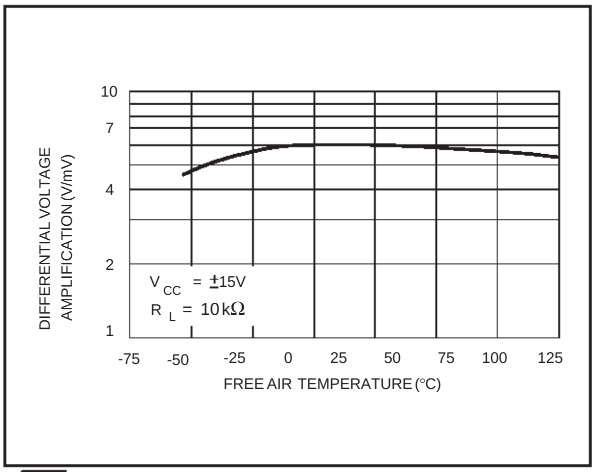
MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE versus LOAD FREQUENCY



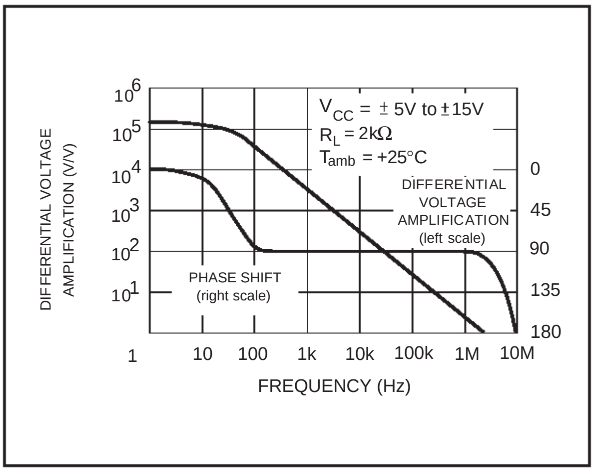
MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE versus FREQUENCY



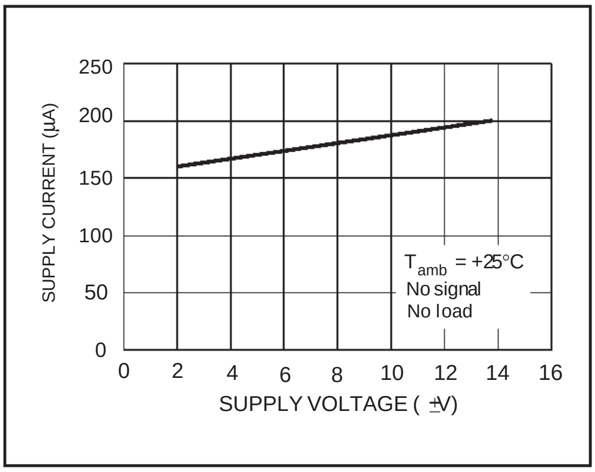
DIFFERENTIAL VOLTAGE AMPLIFICATION versus FREE AIR TEMPERATURE



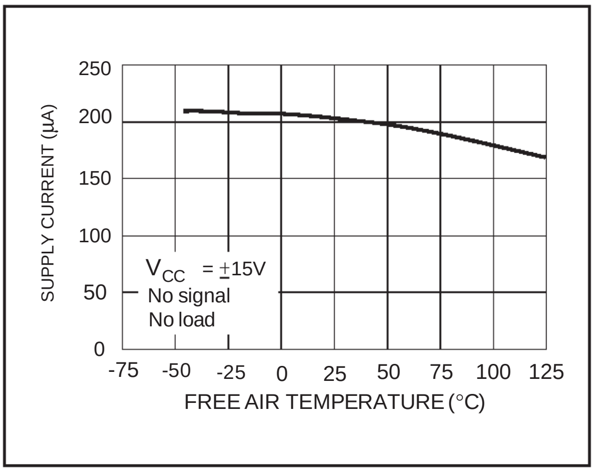
LARGE SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION AND PHASE SHIFT versus FREQUENCY



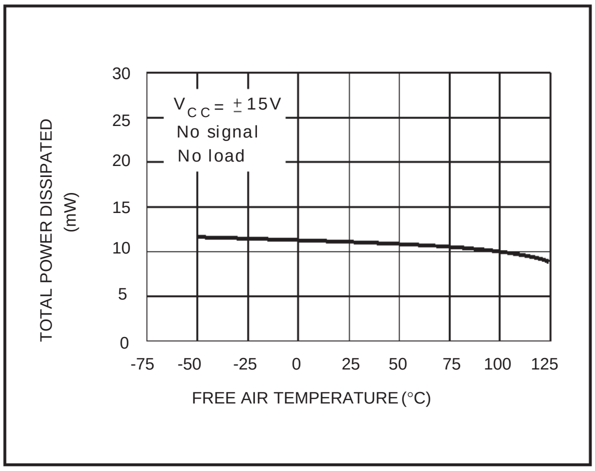
SUPPLY CURRENT PER AMPLIFIER versus SUPPLY VOLTAGE



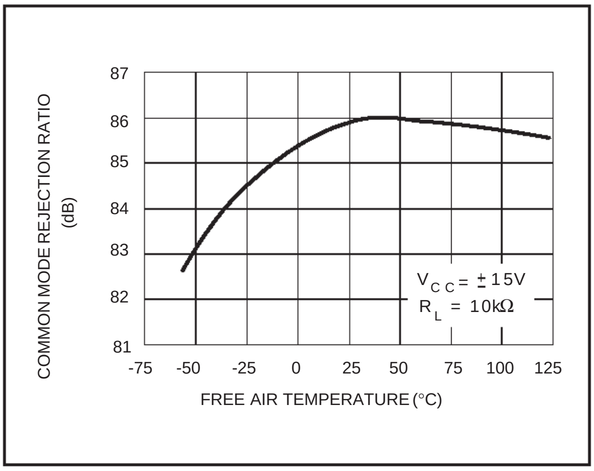
SUPPLY CURRENT PER AMPLIFIER versus FREE AIR TEMPERATURE



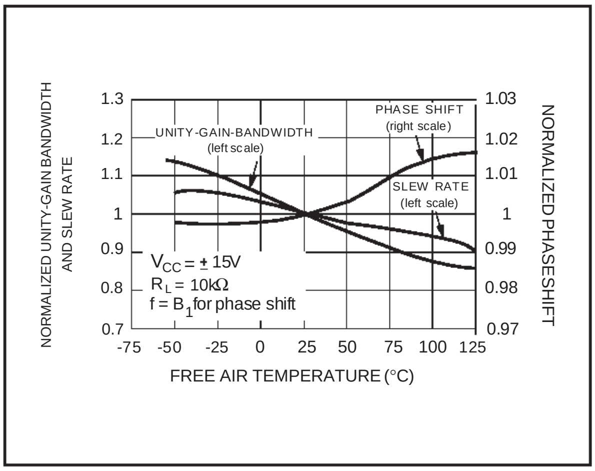
TOTAL POWER DISSIPATED versus FREE AIR TEMPERATURE



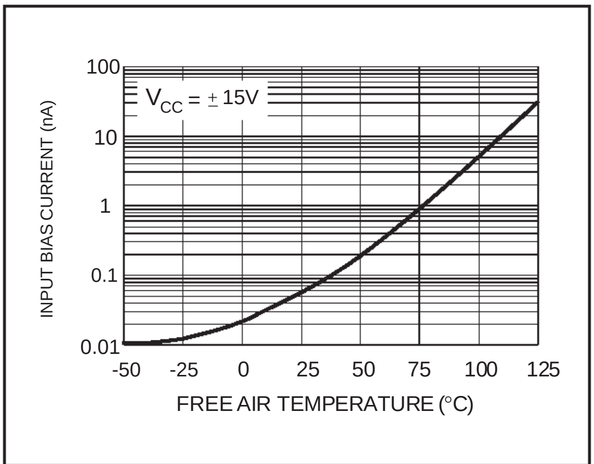
COMMON MODE REJECTION RATIO versus FREE AIR TEMPERATURE



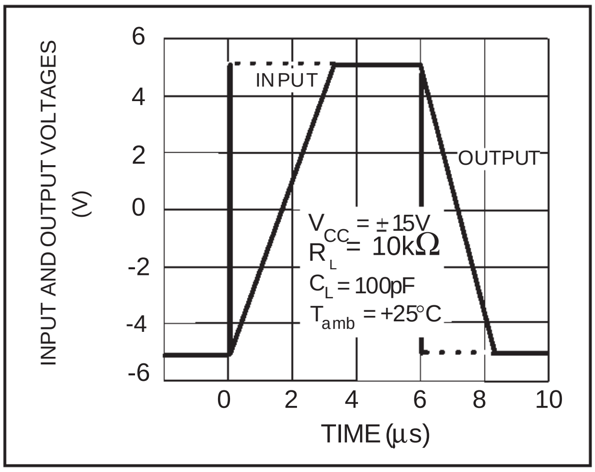
NORMALIZED UNITY GAIN BANDWIDTH SLEW RATE, AND PHASE SHIFT versus TEMPERATURE



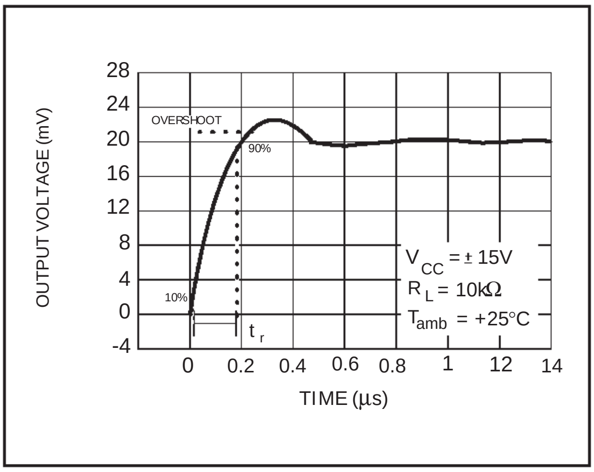
INPUT BIAS CURRENT versus FREE AIR TEMPERATURE



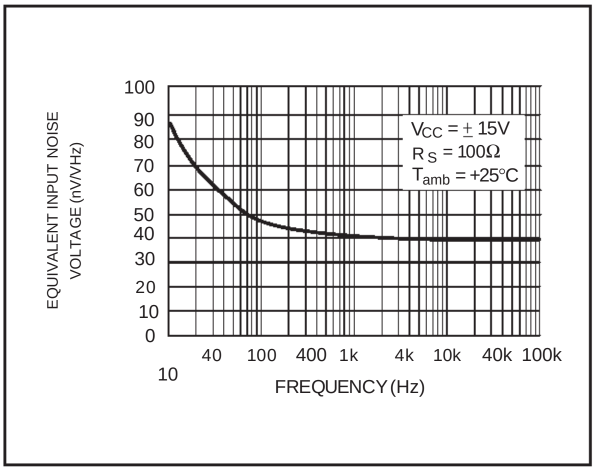
VOLTAGE FOLLOWER LARGE SIGNAL PULSE RESPONSE



OUTPUT VOLTAGE versus ELAPSED TIME



EQUIVALENT INPUT NOISE VOLTAGE versus FREQUENCY



PARAMETER MEASUREMENT INFORMATION

Figure 1 : Voltage Follower

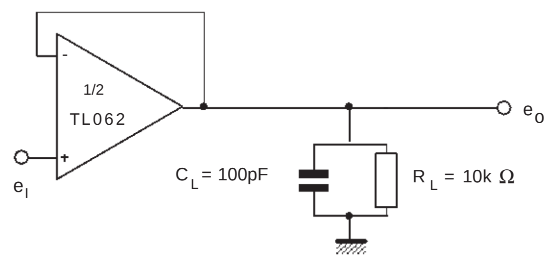
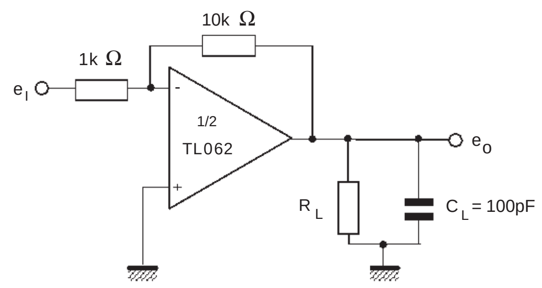
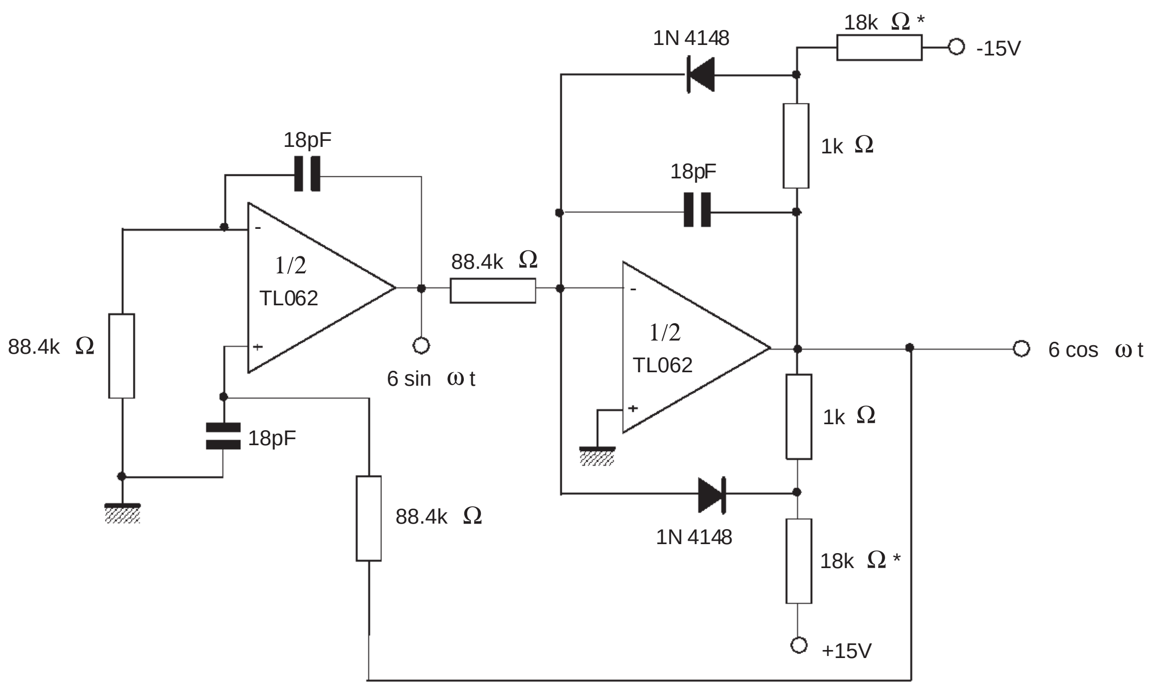


Figure 2 : Gain-of-10 Inverting Amplifier



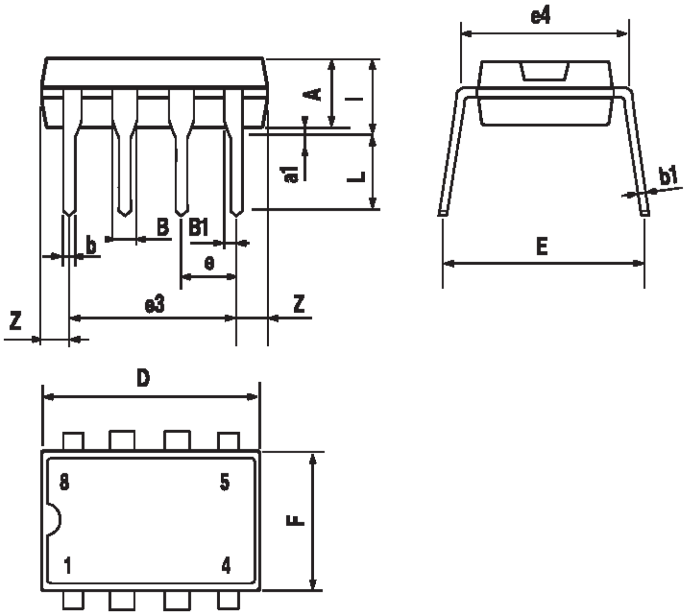
TYPICAL APPLICATIONS

100KHz QUADRATURE OSCILLATOR



* These resistor values may be adjusted for a symmetrical output

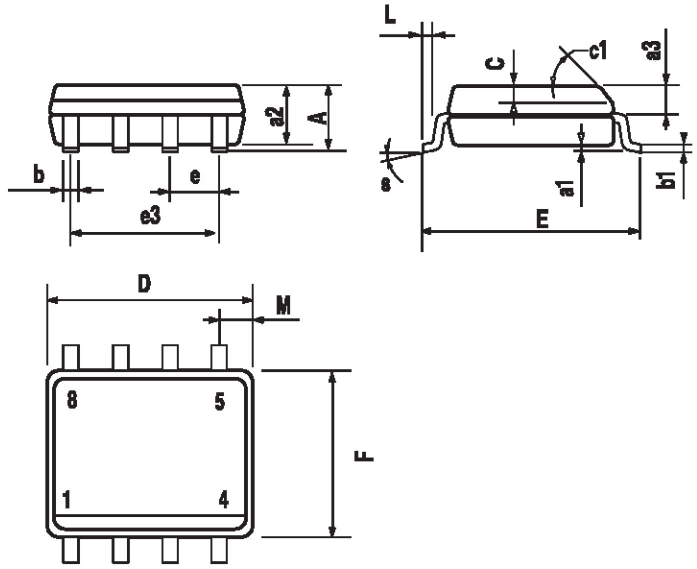
PACKAGE MECHANICAL DATA
8 PINS - PLASTIC DIP



Dim.	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A		3.32			0.131	
a1	0.51			0.020		
B	1.15		1.65	0.045		0.065
b	0.356		0.55	0.014		0.022
b1	0.204		0.304	0.008		0.012
D			10.92			0.430
E	7.95		9.75	0.313		0.384
e		2.54			0.100	
e3		7.62			0.300	
e4		7.62			0.300	
F			6.6			0260
i			5.08			0.200
L	3.18		3.81	0.125		0.150
Z			1.52			0.060

PACKAGE MECHANICAL DATA

8 PINS - PLASTIC MICROPACKAGE (SO)



Dim.	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.75			0.069
a1	0.1		0.25	0.004		0.010
a2			1.65			0.065
a3	0.65		0.85	0.026		0.033
b	0.35		0.48	0.014		0.019
b1	0.19		0.25	0.007		0.010
C	0.25		0.5	0.010		0.020
c1	45° (typ.)					
D	4.8		5.0	0.189		0.197
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		3.81			0.150	
F	3.8		4.0	0.150		0.157
L	0.4		1.27	0.016		0.050
M			0.6			0.024
S	8° (max.)					

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