

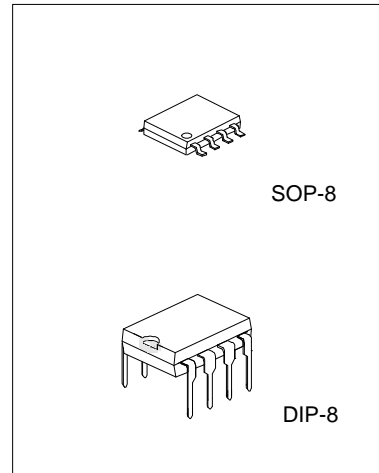
**LOW POWER DUAL J-FET OPERATIONAL AMPLIFIER**

**DESCRIPTION**

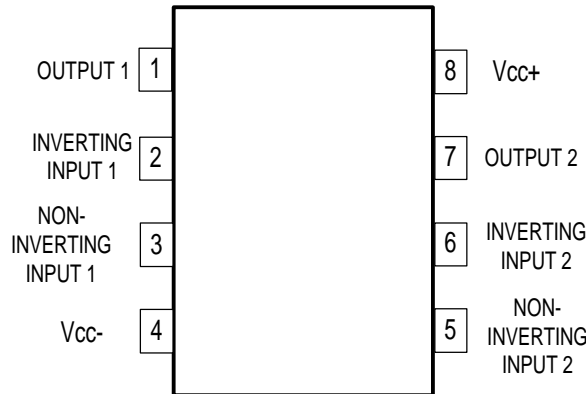
The TL062 is a high speed J-FET input dual operational amplifier. It incorporates well matched, high voltage J-FET and bipolar transistors in a monolithic integrated circuit. The device features high slew rates, low input bias and offset currents, and low offset voltage temperature coefficient.

**FEATURES**

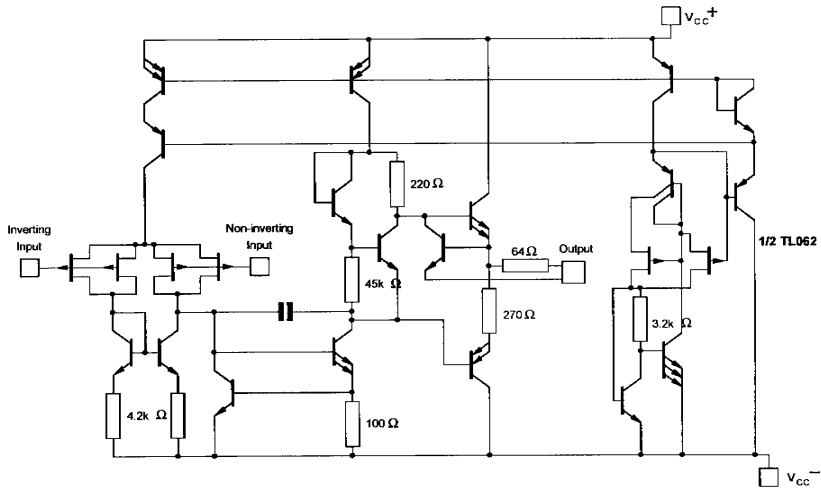
- \*Very low power consumption
- \*Wide common-mode (up to  $V_{CC+}$ ) and differential voltage range
- \*Low input bias and offset current
- \*Output short-circuit protection
- \*High input impedance J-FET input stage
- \*Internal frequency compensation
- \*Latch up free operation
- \*High slew rate:  $3.5V/\mu s$ (typ)
- \*Typical supply current:  $200\mu A$



**PIN CONFIGURATIONS**



BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS(Ta=25°C )

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage (note 1)	Vcc	+ -18	V
Input Voltage (note 2)	Vi	+15	V
Differential Input Voltage (note 3)	Vid	+30	V
Power Dissipation	Ptot	680	mW
Output Short-Circuit Duration (Note 4)		Infinite	
Operating Free Air Temperature	Toper	0 to 70	°C
Storage Temperature	Tstg	-65 to 150	°C

- NOTES: 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 Vcc- and Vcc+.
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 at 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.

TL062 ELECTRICAL CHARACTERISTICS (V<sub>CC</sub>=±15V, T<sub>a</sub>=25°C, unless otherwise specified)

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Input Offset Voltage(R <sub>s</sub> =50Ω, T <sub>a</sub> =25°C T <sub>min</sub> ≤T <sub>a</sub> ≤T <sub>max</sub> )	V <sub>io</sub>		3	15 20	mV
Temperature Coefficient of Input Offset Voltage(R <sub>s</sub> =50Ω)	D <sub>vio</sub>		10		μV/°C
Input Offset Current* T <sub>a</sub> =25°C T <sub>min</sub> ≤T <sub>a</sub> ≤T <sub>max</sub>	I <sub>io</sub>		5	200 5	pA nA
Input Bias Current* T <sub>a</sub> =25°C T <sub>min</sub> ≤T <sub>a</sub> ≤T <sub>max</sub>	I <sub>ib</sub>		30	400 10	pA nA
Input Common Mode Voltage	V <sub>icm</sub>	+11	-12~+15		V
Output Voltage Swing(R <sub>L</sub> =10kΩ, C <sub>L</sub> =100pF) T <sub>a</sub> =25°C T <sub>min</sub> ≤T <sub>a</sub> ≤T <sub>max</sub>	V <sub>opp</sub>	20 20	27		V
Large Signal Voltage Gain(R <sub>L</sub> =10Ω, V <sub>o</sub> =±10V) T <sub>a</sub> =25°C T <sub>min</sub> ≤T <sub>a</sub> ≤T <sub>max</sub>	A <sub>vd</sub>	3 3	6		V/mV
Gain Bandwidth Product(T <sub>a</sub> =25°C, R <sub>L</sub> =10kΩ, C <sub>L</sub> =100pF)	GBP		1		MHz
Input Resistance	R <sub>i</sub>		10 <sup>12</sup>		Ω
Common Mode Rejection Ratio(R <sub>s</sub> =50Ω)	CMR	70	76		dB
Supply Voltage Rejection Ratio(R <sub>s</sub> =50Ω)	SVR	70	95		dB
Supply Current(T <sub>a</sub> =25°C, no load, no signal)	I <sub>cc</sub>		200	250	μA
Channel Separation(A <sub>v</sub> =100, T <sub>a</sub> =25°C)	V <sub>o1</sub> /V <sub>o2</sub>		120		dB
Total Power Consumption(T <sub>a</sub> =25°C, no load, no signal)	P <sub>D</sub>		6	7.5	mW
Slew Rate(V <sub>i</sub> =10V, R <sub>L</sub> =10kΩ, C <sub>L</sub> =100pF, A <sub>v</sub> =1)	SR	1.5	3.5		V/μs
Rise Time(V <sub>i</sub> =20mV, R <sub>L</sub> =10kΩ, C <sub>L</sub> =100pF, A <sub>v</sub> =1)	t <sub>r</sub>		0.2		μs
Overshoot Factor(V <sub>i</sub> =20mV, R <sub>L</sub> =10kΩ, C <sub>L</sub> =100pF, A <sub>v</sub> =1)	K <sub>ov</sub>		10		%
Equivalent Input Noise Voltage(R <sub>s</sub> =100Ω, f=1KHz)	e <sub>n</sub>		42		

\*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.

UTC TL062AC ELECTRICAL CHARACTERISTICS(  $V_{CC}=\pm 15V$ ,  $T_a=25^\circ C$ , unless otherwise specified)

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Input Offset Voltage( $R_s=50\Omega$ , $T_a=25^\circ C$ $T_{min}\leq T_a\leq T_{max}$ )	$V_{io}$		3	6 7.5	mV
Temperature Coefficient of Input Offset Voltage( $R_s=50\Omega$ )	$D_{vio}$		10		$\mu V/^\circ C$
Input Offset Current* $T_a=25^\circ C$ $T_{min}\leq T_a\leq T_{max}$	$I_{io}$		5	100 3	pA nA
Input Bias Current* $T_a=25^\circ C$ $T_{min}\leq T_a\leq T_{max}$	$I_{ib}$		30	200 7	pA nA
Input Common Mode Voltage	$V_{icm}$	+11.5	-12~+15		V
Output Voltage Swing( $R_L=10k\Omega$ ) $T_a=25^\circ C$ $T_{min}\leq T_a\leq T_{max}$	$V_{opp}$	20 20	27		V
Large Signal Voltage Gain( $R_L=10k\Omega$ , $V_o=\pm 10V$ ) $T_a=25^\circ C$ $T_{min}\leq T_a\leq T_{max}$	$A_{vd}$	4 4	6		V/mV
Gain Bandwidth Product( $T_a=25^\circ C$ , $R_L=10k\Omega$ , $C_L=100pF$ )	GBP		1		MHz
Input Resistance	$R_i$		$10^{12}$		$\Omega$
Common Mode Rejection Ratio( $R_s=50\Omega$ )	CMR	80	86		dB
Supply Voltage Rejection Ratio( $R_s=50\Omega$ )	SVR	80	95		dB
Supply Current( $T_a=25^\circ C$ , no load, no signal)	$I_{cc}$		200	250	$\mu A$
Channel Separation( $A_v=100$ , $T_a=25^\circ C$ )	$V_{o1}/V_{o2}$		120		dB
Total Power Consumption( $T_a=25^\circ C$ , no load, no signal)	$P_D$		6	7.5	mW
Slew Rate( $V_i=10V$ , $R_L=10k\Omega$ , $C_L=100pF$ , $A_v=1$ )	SR	1.5	3.5		$V/\mu s$
Rise Time( $V_i=20mV$ , $R_L=10k\Omega$ , $C_L=100pF$ , $A_v=1$ )	$t_r$		0.2		$\mu s$
Overshoot Factor( $V_i=20mV$ , $R_L=10k\Omega$ , $C_L=100pF$ , $A_v=1$ )	$K_{ov}$		10		%
Equivalent Input Noise Voltage( $R_s=100\Omega$ , $f=1KHz$ )	$e_n$		42		

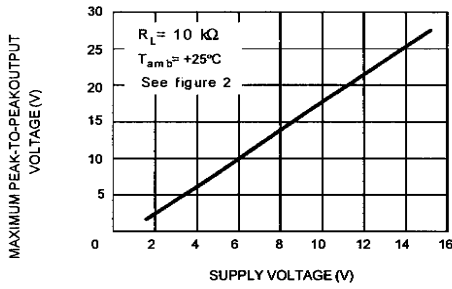
\*The Input bias currents of a FET-input operational amplifier are normal junction reverse currents, which are temperature sensitive. Pulse techniques must be used that will maintain the junction temperature as close to the ambient temperature as possible.

UTC TL062BC ELECTRICAL CHARACTERISTICS(  $V_{CC}=\pm 15V$ ,  $T_a=25^\circ C$ , unless otherwise specified)

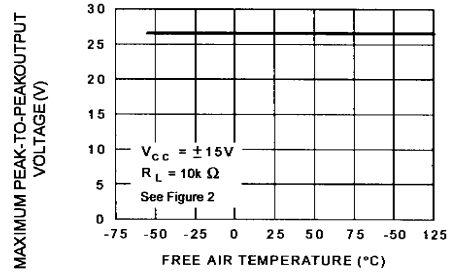
PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Input Offset Voltage( $R_s=50\Omega$ , $T_a=25^\circ C$ $T_{min}\leq T_a\leq T_{max}$ )	$V_{io}$		2	3 5	mV
Temperature Coefficient of Input Offset Voltage( $R_s=50\Omega$ )	$D_{vio}$		10		$\mu V/^\circ C$
Input Offset Current* $T_a=25^\circ C$ $T_{min}\leq T_a\leq T_{max}$	$I_{io}$		5	100 3	pA nA
Input Bias Current* $T_a=25^\circ C$ $T_{min}\leq T_a\leq T_{max}$	$I_{ib}$		30	200 7	pA nA
Input Common Mode Voltage	$V_{icm}$	+11	-12~+15		V
Output Voltage Swing( $R_L=10k\Omega$ ) $T_a=25^\circ C$ $T_{min}\leq T_a\leq T_{max}$	$V_{opp}$	20 20	27		V
Large Signal Voltage Gain( $R_L=10k\Omega$ , $V_o=\pm 10V$ ) $T_a=25^\circ C$ $T_{min}\leq T_a\leq T_{max}$	$A_{vd}$	4 4	6		V/mV
Gain Bandwidth Product( $T_a=25^\circ C$ , $R_L=10k\Omega$ , $C_L=100pF$ )	GBP		1		MHz
Input Resistance	$R_i$		$10^{12}$		$\Omega$
Common Mode Rejection Ratio( $R_s=50\Omega$ )	CMR	80	86		dB
Supply Voltage Rejection Ratio( $R_s=50\Omega$ )	SVR	80	95		dB
Supply Current( $T_a=25^\circ C$ , no load, no signal)	$I_{cc}$		200	250	$\mu A$
Channel Separation( $A_v=100$ , $T_a=25^\circ C$ )	$V_{o1}/V_{o2}$		120		dB
Total Power Consumption( $T_a=25^\circ C$ , no load, no signal)	$P_D$		6	7.5	mW
Slew Rate( $V_i=10V$ , $R_L=10k\Omega$ , $C_L=100pF$ , $A_v=1$ )	SR	1.5	3.5		$V/\mu s$
Rise Time( $V_i=20mV$ , $R_L=10k\Omega$ , $C_L=100pF$ , $A_v=1$ )	$t_r$		0.2		$\mu s$
Overshoot Factor( $V_i=20mV$ , $R_L=10k\Omega$ , $C_L=100pF$ , $A_v=1$ )	$K_{ov}$		10		%
Equivalent Input Noise Voltage( $R_s=100\Omega$ , $f=1KHz$ )	$e_n$		42		

\*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.

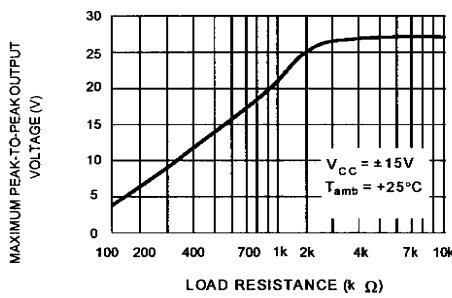
**MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE VERSUS SUPPLY VOLTAGE**



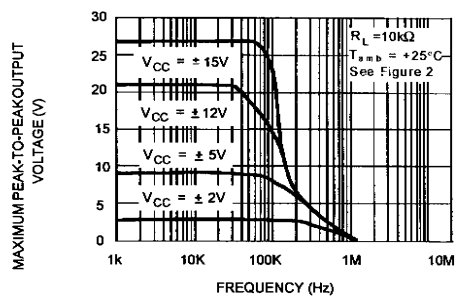
**MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE VERSUS FREE AIR TEMP.**



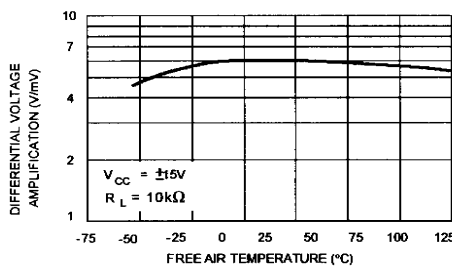
**MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE VERSUS LOAD RESISTANCE**



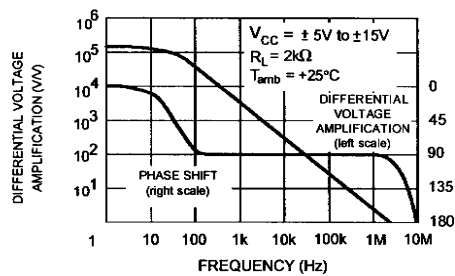
**MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE VERSUS FREQUENCY**



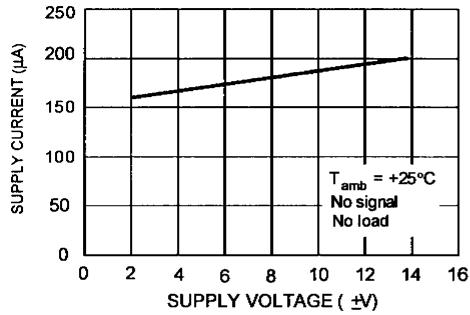
**DIFFERENTIAL VOLTAGE AMPLIFICATION VERSUS FREE AIR TEMPERATURE**



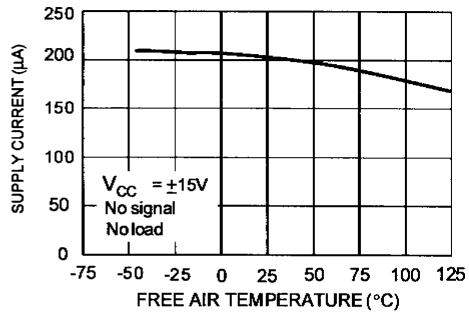
**LARGE SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION AND PHASE SHIFT VERSUS FREQUENCY**



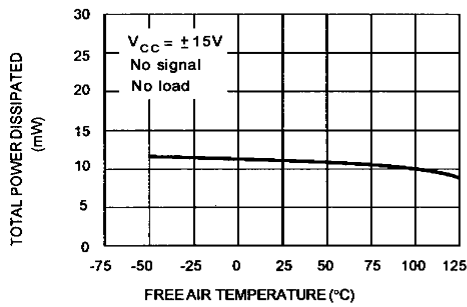
SUPPLY CURRENT PER AMPLIFIER VERSUS SUPPLY VOLTAGE



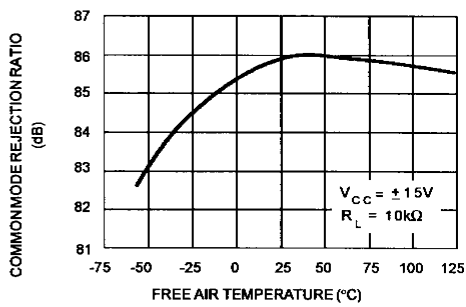
SUPPLY CURRENT PER AMPLIFIER VERSUS FREE AIR TEMPERATURE



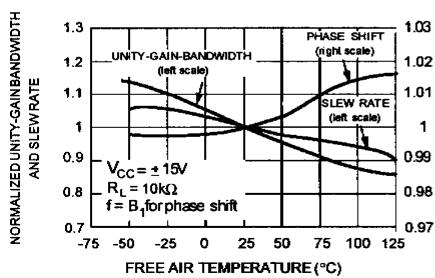
TOTAL POWER DISSIPATED VERSUS FREE AIR TEMPERATURE



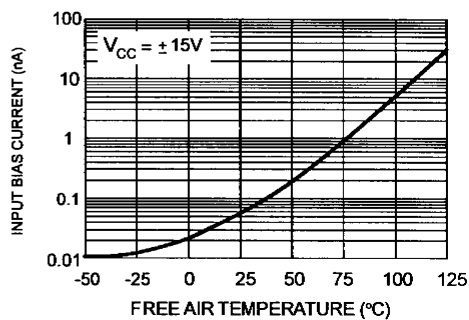
COMMON MODE REJECTION RATIO VERSUS FREE AIR TEMPERATURE

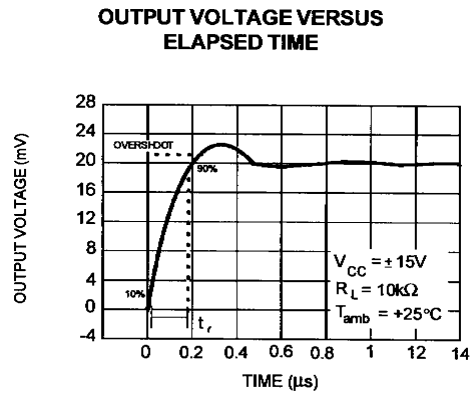
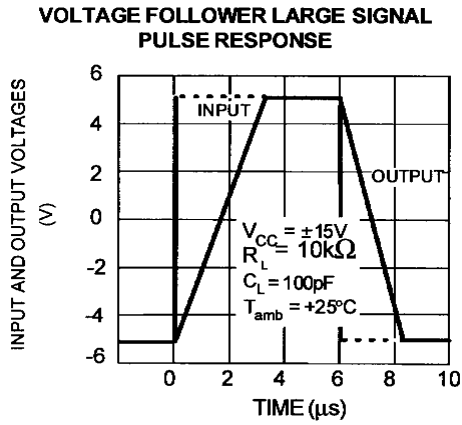


NORMALIZED UNITY GAIN BANDWIDTH, SLEW RATE, AND PHASE SHIFT VERSUS TEMPERATURE



INPUT BIAS CURRENT VERSUS FREE AIR TEMPERATURE





PARAMETER MEASUREMENT INFORMATION

Figure 1 : Voltage follower

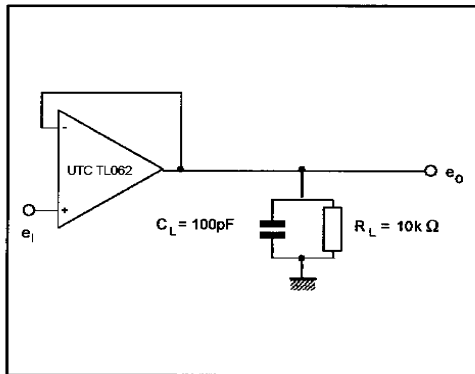


Figure 2 : Gain-of-10 inverting amplifier

