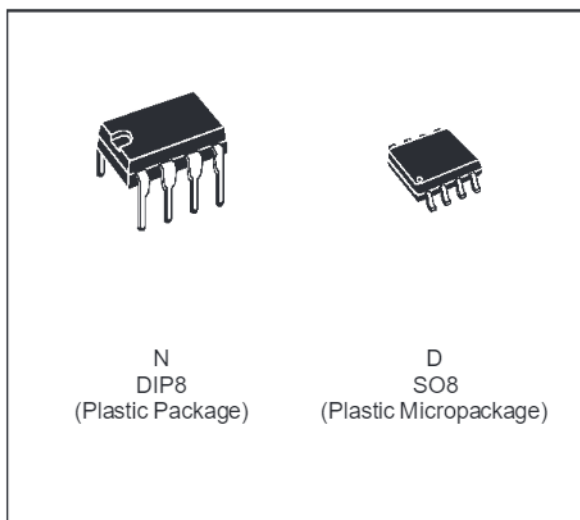




TL072 TL072A - TL072B

LOW NOISE J-FET DUAL 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 : $16\text{V}/\mu\text{s}$ (typ)



DESCRIPTION

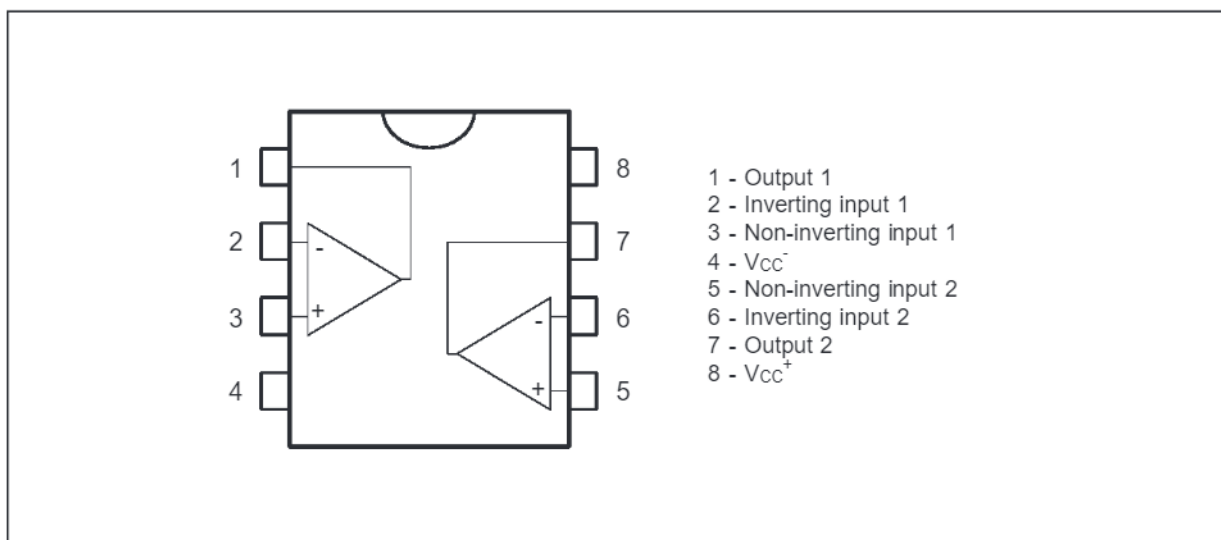
The TL072, TL072A and TL072B are high speed J-FET input dual operational amplifiers incorporating well matched, high voltage J-FET and bipolar transistors in a monolithic integrated circuit.

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

ORDER CODES

| Part Number | Temperature Range | Package | |
|-------------------|-------------------|---------|---|
| | | N | D |
| TL072M/AM/BM | -55°C, +125°C | • | • |
| TL072I/AI/BI | -40°C, +105°C | • | • |
| TL072C/AC/BC | 0°C, +70°C | • | • |
| Example : TL072CN | | | |

PIN CONNECTIONS (top view)



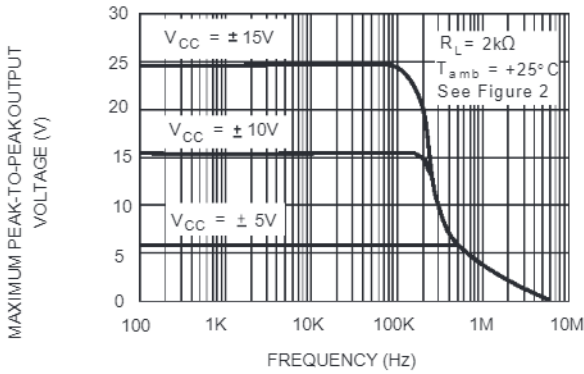
ELECTRICAL CHARACTERISTICS

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

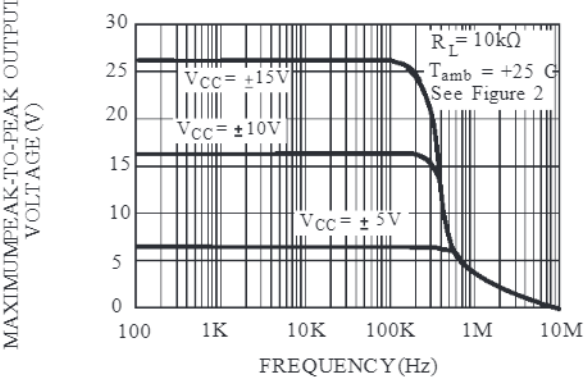
| Symbol | Parameter | TL072I,M,AC,AI, AM,BC,BI,BM | | | TL072C | | | Unit |
|-----------------|--|--------------------------------|-------------|------------------------------|----------------------|------------|------------|------------------------|
| | | Min. | Typ. | Max. | Min. | Typ. | Max. | |
| V_{io} | Input Offset Voltage ($R_S = 50\Omega$) $T_{amb} = 25^{\circ}C$ $T_{min.} \leq T_{amb} \leq T_{max.}$ TL072 TL072A TL072B TL072 TL072A TL072B | | 3 3 1 | 10 6 3 13 7 5 | | 3 | 10 13 | mV |
| DV_{io} | Input Offset Voltage Drift | | 10 | | | 10 | | $\mu V/^{\circ}C$ |
| I_{io} | Input Offset Current * $T_{amb} = 25^{\circ}C$ $T_{min.} \leq T_{amb} \leq T_{max.}$ | | 5 | 100 4 | | 5 | 100 10 | pA nA |
| I_{ib} | Input Bias Current * $T_{amb} = 25^{\circ}C$ $T_{min.} \leq T_{amb} \leq T_{max.}$ | | 20 | 200 20 | | 20 | 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, per Amp, no Load $T_{amb} = 25^{\circ}C$ $T_{min.} \leq T_{amb} \leq T_{max.}$ | | 1.4 | 2.5 2.5 | | 1.4 | 2.5 2.5 | mA |
| V_{icm} | Input Common Mode Voltage Range | ± 11 | +15 -12 | | ± 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 $T_{amb} = 25^{\circ}C$ $T_{min.} \leq T_{amb} \leq T_{max.}$ $R_L = 2k\Omega$ $R_L = 10k\Omega$ $R_L = 2k\Omega$ $R_L = 10k\Omega$ | 10 12 10 12 | 12 13.5 | | 10 12 10 12 | 12 13.5 | | V |
| SR | Slew Rate ($V_{in} = 10V$, $R_L = 2k\Omega$, $C_L = 100pF$, $T_{amb} = 25^{\circ}C$, unity gain) | 8 | 16 | | 8 | 16 | | V/ μs |
| t_r | Rise Time ($V_{in} = 20mV$, $R_L = 2k\Omega$, $C_L = 100pF$, $T_{amb} = 25^{\circ}C$, unity gain) | | 0.1 | | | 0.1 | | μs |
| K_{OV} | Overshoot ($V_{in} = 20mV$, $R_L = 2k\Omega$, $C_L = 100pF$, $T_{amb} = 25^{\circ}C$, unity gain) | | 10 | | | 10 | | % |
| GBP | Gain Bandwidth Product ($f = 100kHz$, $T_{amb} = 25^{\circ}C$, $V_{in} = 10mV$, $R_L = 2k\Omega$, $C_L = 100pF$) | 2.5 | 4 | | 2.5 | 4 | | MHz |
| R_i | Input Resistance | | 10^{12} | | | 10^{12} | | Ω |
| THD | Total Harmonic Distortion ($f = 1kHz$, $A_V = 20dB$, $R_L = 2k\Omega$, $C_L = 100pF$, $T_{amb} = 25^{\circ}C$, $V_O = 2V_{PP}$) | | 0.01 | | | 0.01 | | % |
| e_n | Equivalent Input Noise Voltage ($f = 1kHz$, $R_S = 100\Omega$) | | 15 | | | 15 | | $\frac{nV}{\sqrt{Hz}}$ |
| ϕ_m | Phase Margin | | 45 | | | 45 | | Degrees |
| V_{O1}/V_{O2} | Channel Separation ($A_V = 100$) | | 120 | | | 120 | | dB |

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

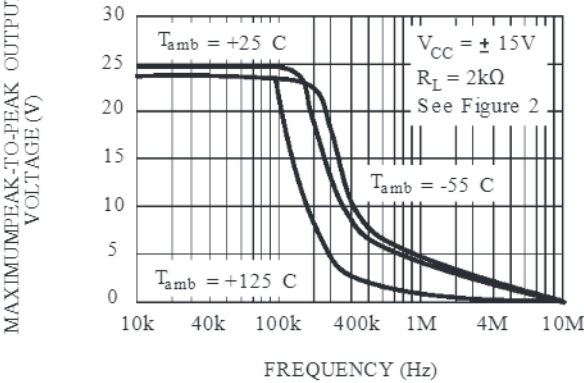
MAXIMUM PEAK-TO-PEAK OUTPUT
VOLTAGE VERSUS FREQUENCY



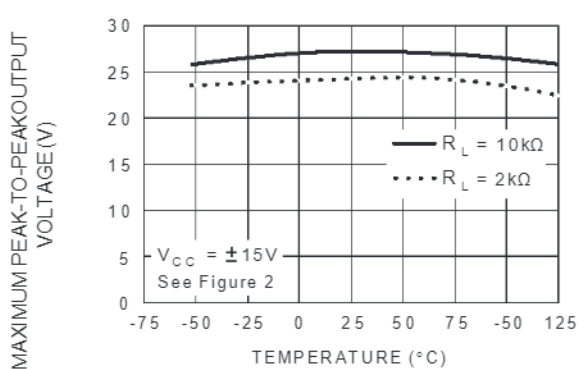
MAXIMUM PEAK-TO-PEAK OUTPUT
VOLTAGE VERSUS FREQUENCY



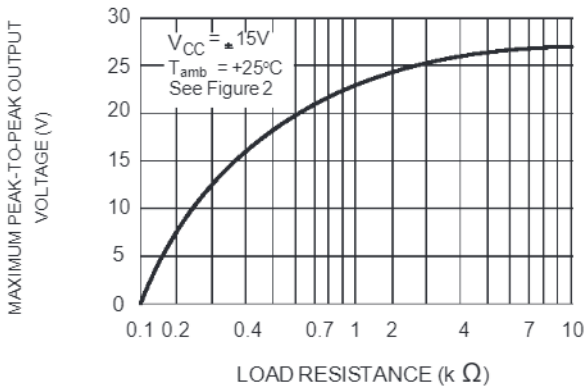
MAXIMUM PEAK-TO-PEAK OUTPUT
VOLTAGE VERSUS FREQUENCY



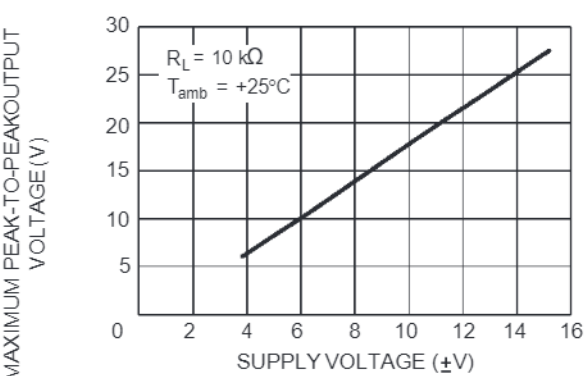
MAXIMUM PEAK-TO-PEAK OUTPUT
VOLTAGE VERSUS FREE AIR TEMP.



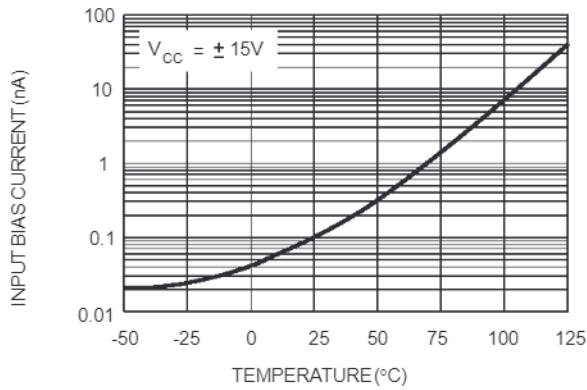
MAXIMUM PEAK-TO-PEAK OUTPUT
VOLTAGE VERSUS LOAD RESISTANCE



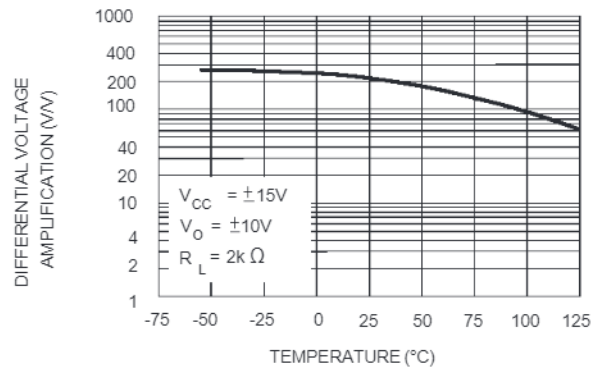
MAXIMUM PEAK-TO-PEAK OUTPUT
VOLTAGE VERSUS SUPPLY VOLTAGE



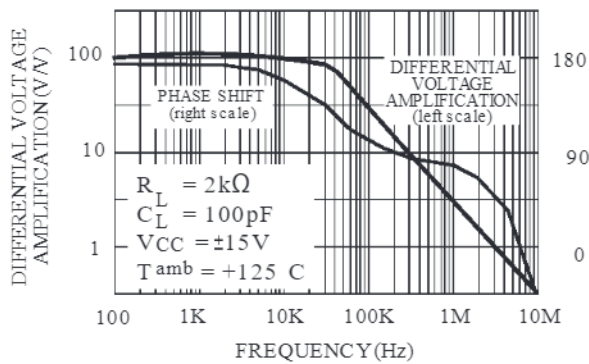
**INPUT BIAS CURRENT VERSUS
FREE AIR TEMPERATURE**



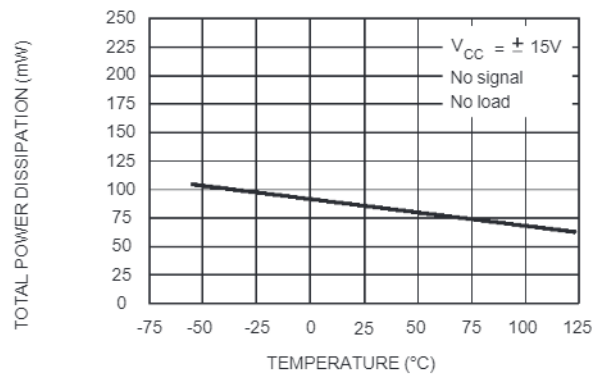
**LARGE SIGNAL DIFFERENTIAL
VOLTAGE AMPLIFICATION VERSUS
FREE AIR TEMPERATURE**



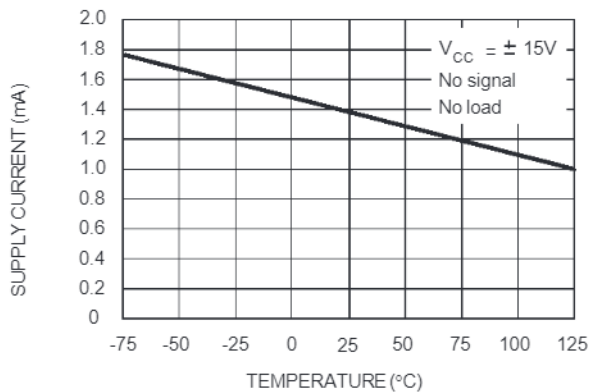
**LARGE SIGNAL DIFFERENTIAL
VOLTAGE AMPLIFICATION AND PHASE
SHIFT VERSUS FREQUENCY**



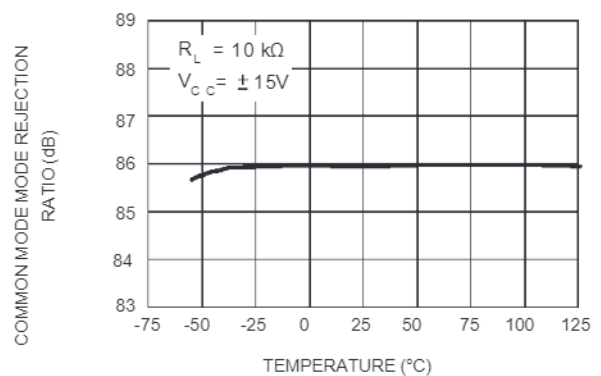
**TOTAL POWER DISSIPATION VERSUS
FREE AIR TEMPERATURE**



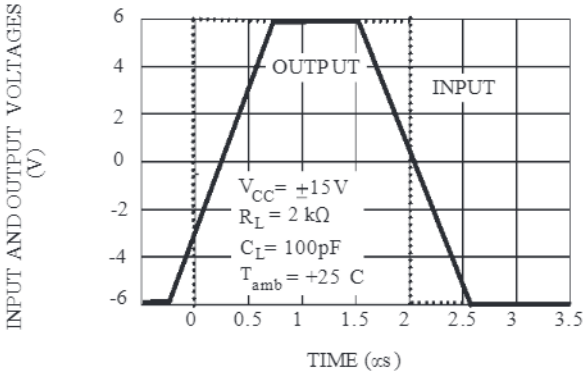
**SUPPLY CURRENT PER AMPLIFIER
VERSUS FREE AIR TEMPERATURE**



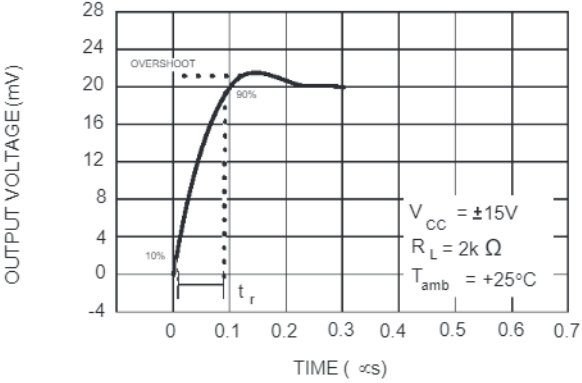
**COMMON MODE REJECTION RATIO
VERSUS FREE AIR TEMPERATURE**



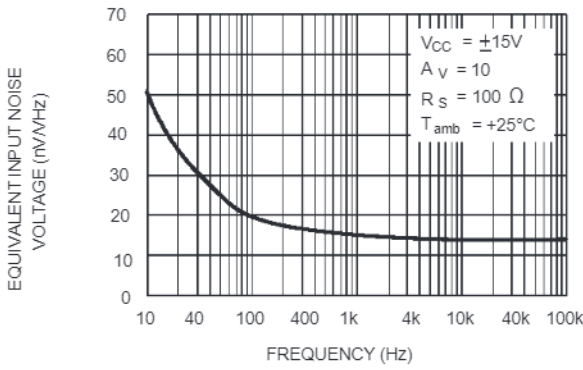
VOLTAGE FOLLOWER LARGE SIGNAL PULSE RESPONSE



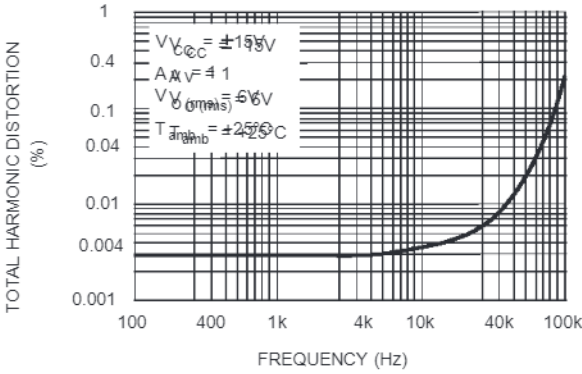
OUTPUT VOLTAGE VERSUS ELAPSED TIME



EQUIVALENT INPUT NOISE VOLTAGE VERSUS FREQUENCY



TOTAL HARMONIC DISTORTION VERSUS FREQUENCY



PARAMETER MEASUREMENT INFORMATION

Figure 1 : Voltage Follower

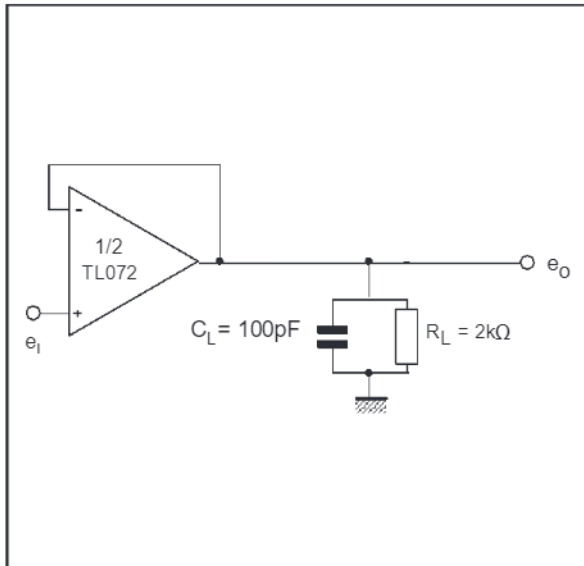
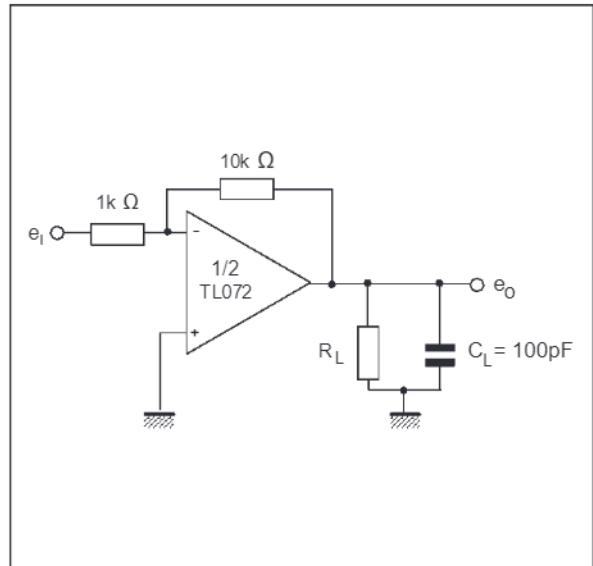
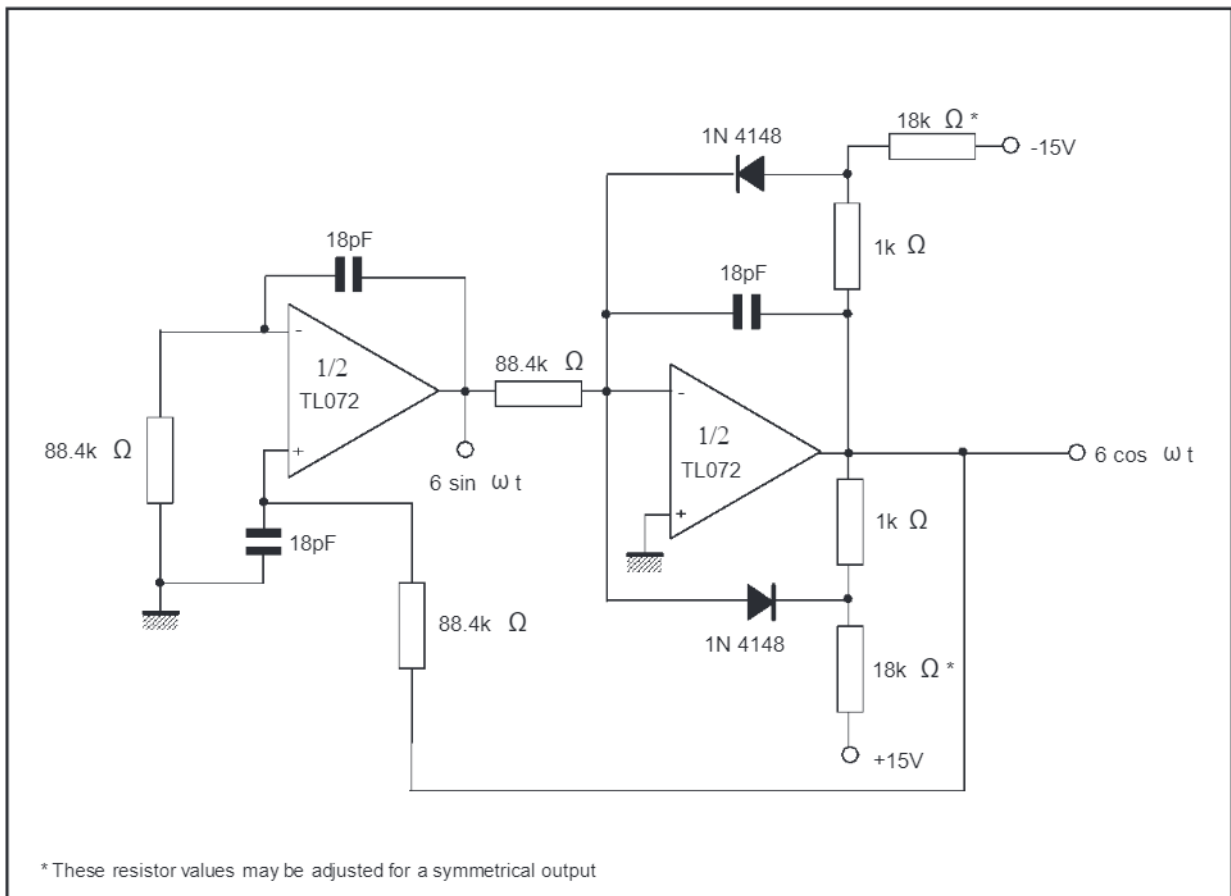


Figure 2 : Gain-of-10 Inverting Amplifier



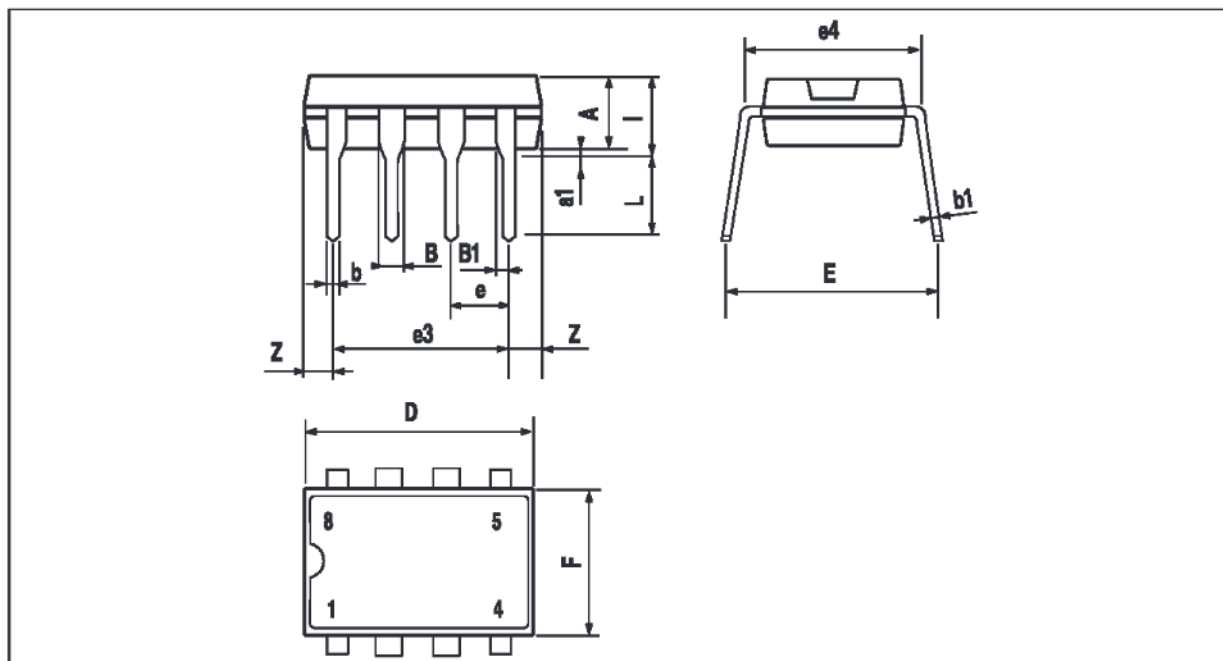
TYPICAL APPLICATION

100KHz QUADRUPLE OSCILLATOR



PACKAGE MECHANICAL DATA

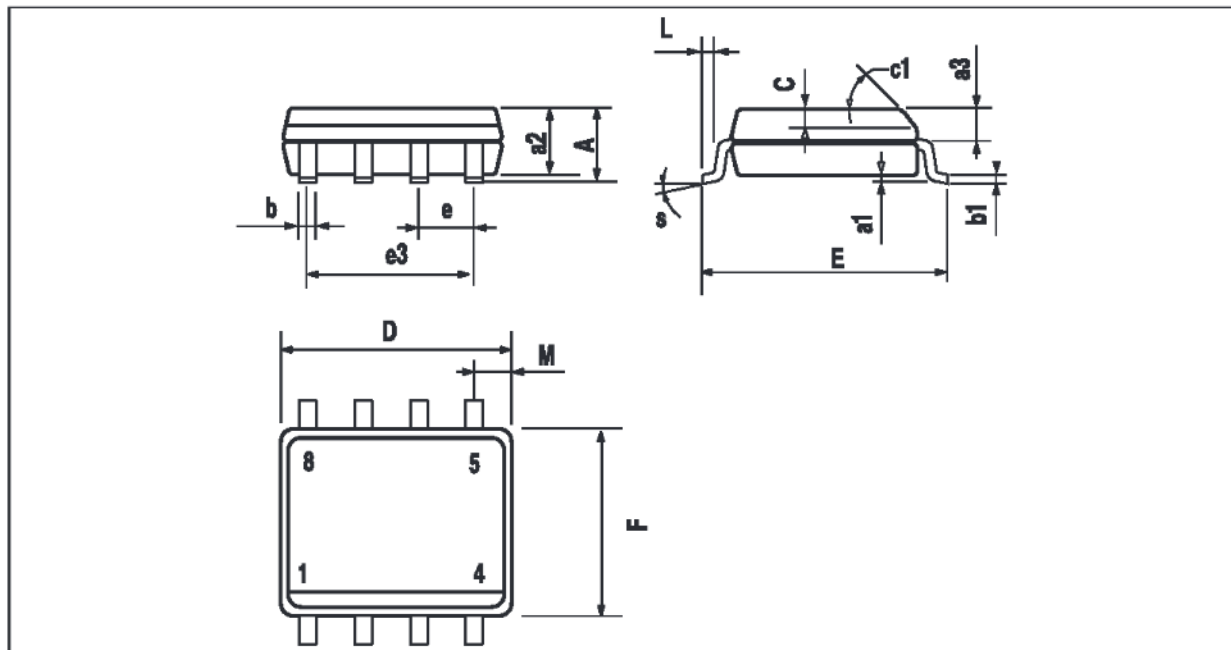
8 PINS - PLASTIC DIP



| Dimensions | 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 | | | 0.260 |
| 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)



| Dimensions | 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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