



# 3422

## LINEAR INTEGRATED CIRCUIT

### HIGH PERFORMANCE DUAL BIPOLAR OPERATIONAL AMPLIFIER

#### DESCRIPTION

The UTC 3422 is a dual high performances operational amplifier featuring speed of 25MHz and single supply operation from 3V ~ 36V.

The UTC 3422 is therefore an enhanced replacement of standard dual operational amplifiers.

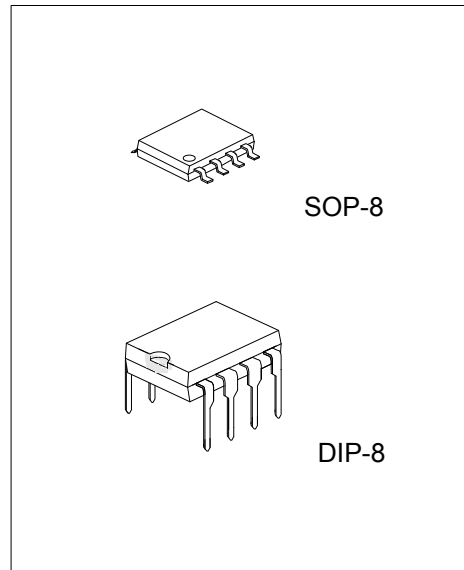
#### FEATURES

- \* Single Supply Operation: 3V ~ 36V
- \* Dual Supply Operation:  $\pm 1.5V \sim \pm 18V$
- \* High Gain Bandwidth Product: 25MHz
- \* High Slew Rate: 15V/ $\mu s$
- \* Low Voltage Noise: 14nV/ $\sqrt{Hz}$
- \* No Phase Inversion
- \* ESD Tolerance: 2KV
- \* Latch-Up Immunity

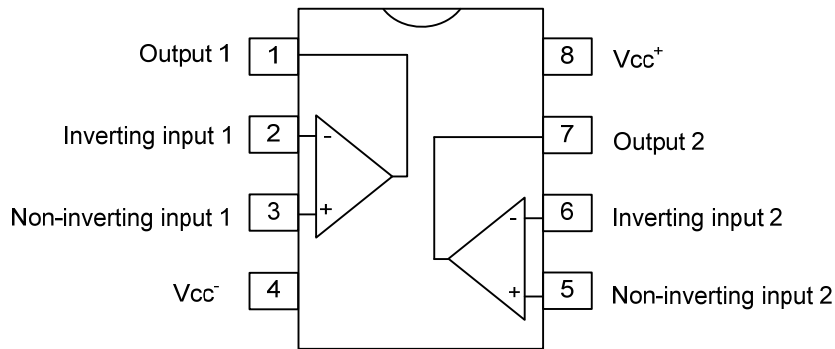
#### ORDERING INFORMATION

| Ordering Number |              | Package | Packing   |
|-----------------|--------------|---------|-----------|
| Lead Free       | Halogen Free |         |           |
| 3422L-D08-T     | 3422G-D08-T  | DIP-8   | Tube      |
| 3422L-S08-R     | 3422G-S08-R  | SOP-8   | Tape Reel |
| 3422L-S08-T     | 3422G-S08-T  | SOP-8   | Tube      |

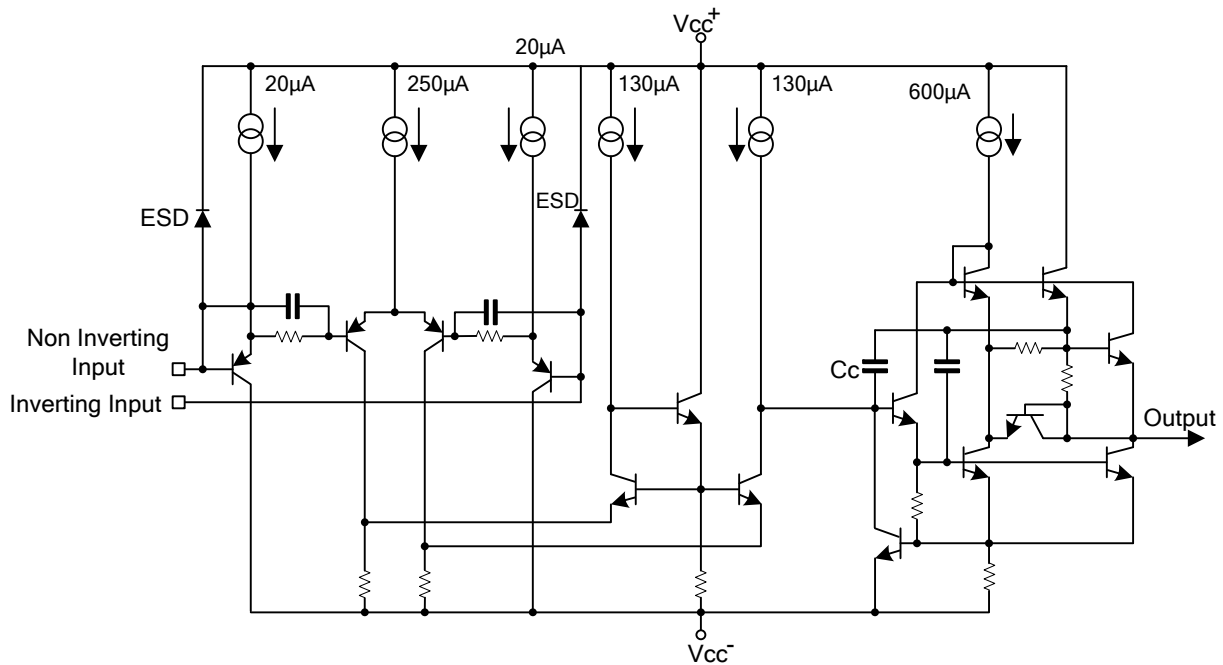
|   |   |
|---|---|
| <p>3422L-D08-T</p> <p>(1) Packing Type<br/>(2) Package Type<br/>(3) Lead Free</p> | <p>(1) R: Tape Reel, T: Tube<br/>(2) D08: DIP-8, S08: SOP-8<br/>(3) G: Halogen Free, L: Lead Free</p> |
|---|---|



■ PIN CONFIGURATION



■ BLOCK DIAGRAM (1/2 Shown)



### ■ ABSOLUTE MAXIMUM RATINGS

| PARAMETER                              | SYMBOL    | RATINGS          | UNIT               |
|--|-----------|------------------|--------------------|
| Supply Voltage                         | $V_{CC}$  | $\pm 18 \sim 36$ | V                  |
| Differential Input Voltage (Note 1)    | $V_{ID}$  | $\pm 36$         | V                  |
| Input Voltage (Note 1)                 | $V_{IN}$  | $\pm 18$         | V                  |
| Output Short-Circuit Duration (Note 2) |           | Infinite         |                    |
| Maximum Power Dissipation (Note 2)     | $P_{TOT}$ | 500              | mW                 |
| Operating Temperature                  | $T_{OPR}$ | $-40 \sim +125$  | $^{\circ}\text{C}$ |
| Junction Temperature                   | $T_J$     | +150             | $^{\circ}\text{C}$ |
| Storage Temperature                    | $T_{STG}$ | $-65 \sim +150$  | $^{\circ}\text{C}$ |

Notes: 1. Either or both input voltages must not exceed the magnitude of  $V_{CC}^{+}$  or  $V_{CC}^{-}$

2. Power dissipation must be considered to ensure maximum junction temperature ( $T_J$ ) is not exceeded

### ■ OPERATING CONDITIONS

| PARAMETER      | SYMBOL   | RATINGS     | UNIT |
|----------------|----------|-------------|------|
| Supply Voltage | $V_{CC}$ | $3 \sim 36$ | V    |

■ ELECTRICAL CHARACTERISTICS ( $V_{CC^+}=15V$ ,  $V_{CC^-}=-15V$ ,  $T_a=25^\circ C$ , unless otherwise specified)

| PARAMETER                      | SYMBOL          | TEST CONDITIONS  |   | MIN      | TYP                          | MAX   | UNIT                   |   |
|--------------------------------|-----------------|--|---|----------|------------------------------|-------|------------------------|---|
| Input Offset Voltage           | $V_{IO}$        | $V_{IC}=0V$ , $V_O=0V$   | $V_{CC^+}=+15V$ , $V_{CC^-}=-15V$                     |          |                              | 2.5   | mV                     |   |
|                                |                 |  | $T_{MIN} \leq T_A \leq T_{MAX}$                       |          |                              | 3.5   |                        |   |
|                                |                 |  | $V_{CC^+}=+5V$ , $V_{CC^-}=0V$                        |          |                              | 2.5   |                        |   |
| Input Offset Voltage Drift     | $\Delta V_{IO}$ | $V_{IC}=0V$ , $V_O=0V$   |   |          | 2                            |       | $\mu V/^\circ C$       |   |
| Input Offset Current           | $I_{IO}$        | $V_{IC}=0V$ , $V_O=0V$   |   |          | 3                            | 65    | nA                     |   |
| Input Bias Current             | $I_{IB}$        | $V_{IC}=0V$ , $V_O=0V$   |   |          | 100                          | 650   | nA                     |   |
| Common Mode Input Voltage      | $V_{ICM}$       |  |   |          | $V_{CC^-}$ to $V_{CC^+}-1.8$ |       | V                      |   |
| Large Signal Voltage Gain      | $A_{VD}$        | $R_L=2k\Omega$ , $V_O=0V \sim +10V$<br>$T_{MIN} \leq T_A \leq T_{MAX}$             |   | 32       | 100                          |       | V/mV                   |   |
|                                |                 |  |   | 20       |                              |       |                        |   |
| Output Voltage Swing           | $\pm V_{OPP}$   | $V_{ID}=\pm 1V$  | $V_{CC^+}=+15V$ , $V_{CC^-}=-15V$ ,<br>$R_L=2k\Omega$ | $V_{OH}$ | 13.4                         | 13.9  |                        | V |
|                                |                 |  |   | $V_{OL}$ |                              | -13.9 | -13.5                  |   |
|                                |                 |  | $R_L=10k\Omega$                                       | $V_{OH}$ | 13.4                         | 14    |                        |   |
|                                |                 |  |   | $V_{OL}$ |                              | -14.7 | -14.1                  |   |
|                                |                 |  | $V_{CC^+}=+5V$ , $V_{CC^-}=0V$ ,<br>$R_L=2k\Omega$    | $V_{OH}$ | 3.7                          |       |                        |   |
|                                |                 |  |   | $V_{OL}$ |                              | 0.15  | 0.2                    |   |
| Output Short Circuit Current   | $I_O$           | $V_{ID}=\pm 1V$ , $V_O=0V$ ,   | Source  | 25       | 37                           |       | mA                     |   |
|                                |                 |  | Sink  | 25       | 37                           |       |                        |   |
| Common Mode Rejection Ratio    | CMR             | $V_{ic}=-15V \sim +13.2V$  |   | 80       | 100                          |       | dB                     |   |
| Supply Voltage Rejection Ratio | SVR             | $V_{CC^+}/V_{CC^-}=+15V/-15V \sim +5V/-5V$   |   | 90       | 105                          |       | dB                     |   |
| Supply Current                 | $I_{CC}$        | $V_O=0V$ , no load,<br>each amplifier  | $V_{CC^+}=+15V$ , $V_{CC^-}=-15V$                     |          |                              | 2.75  | mA                     |   |
|                                |                 |  | $T_{MIN} \leq T_A \leq T_{MAX}$                       |          |                              | 2.15  |                        | 3 |
|                                |                 |  | $V_{CC^+}=+5V$ , $V_{CC^-}=0V$                        |          |                              | 2.75  |                        |   |
| Slew Rate                      | SR              | $V_I=-10V \sim 10V$ , $C_L=100pF$ , $R_L=2k\Omega$ , $A_V=+1$                      |   | 8        | 15                           |       | V/ $\mu s$             |   |
| Gain Bandwidth Product         | GBP             | $f=100kHz$ , $R_L=2k\Omega$ , $C_L=100pF$  |   | 17       | 25                           |       | MHz                    |   |
| Unity Gain Bandwidth           | B               | Open loop  |   |          | 5                            |       | MHz                    |   |
| Phase Margin                   | m               | $R_L=2k\Omega$<br>$R_L=2k\Omega$ , $C_L=100pF$                                     |   |          | 50                           |       | Degrees                |   |
|                                |                 |  |   |          | 40                           |       |                        |   |
| Equivalent Input Noise Voltage | $e_N$           | $R_S=100\Omega$ , $f=1kHz$   |   |          | 14                           |       | $\frac{nV}{\sqrt{Hz}}$ |   |
| Channel Separation             | $V_{O1}/V_{O2}$ | $f=20Hz \sim 20kHz$  |   |          | 120                          |       | dB                     |   |
| Total Harmonic Distortion      | THD             | $V_{CC}=\pm 15V$ , $f=1kHz$ , $A_{VOL}=20dB$ ,<br>$R_L=600\Omega$ , $V_O=3V_{rms}$ |   |          | 0.003                        |       | %                      |   |

■ APPLICATIONS INFORMATION

UTC 3422 IN COMPARATOR APPLICATION

The UTC 3422 is a dual bipolar operational amplifier offering a single supply operation from 3V ~ 36V with very good performances: medium speed (25MHz), unity gain stability and low noise.

Most of operational amplifiers are not suited for comparator use because of low transition speed, output signal incompatible with standard logics level and mainly, phase inversion. The phase inversion occurs when a strong differential signal is applied to the device inputs. The output level is then inverted and shows a wrong logic state. The UTC 3422 does not present this problematic behaviour.

Figure 1 shows basic comparator application. Figure 2 shows the curves of the device response in standard comparator configuration without external components.

Transition speed : Typical transition speed under a single 5V supply voltage is about 2µs from 50mV overdrive.  $V_{OH(MIN)}$  is 3.7V and  $V_{OL(MAX)}$  is 0.2V (2kΩ load) making it compatible with standard logic families.

Figure 3 shows output signal transition for a 50mV input signal overdrive respectively of 3µs.

Figure 4 shows output signal transition for a 250mV input signal overdrive respectively of 1µs.

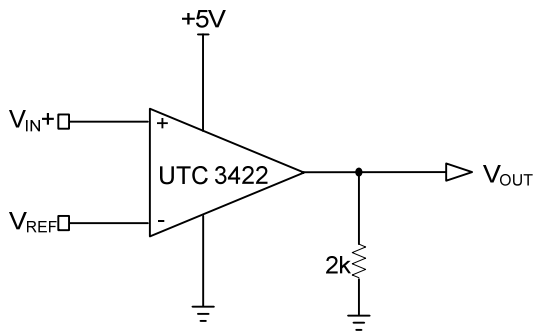


Figure.1 Basic Comparator Application

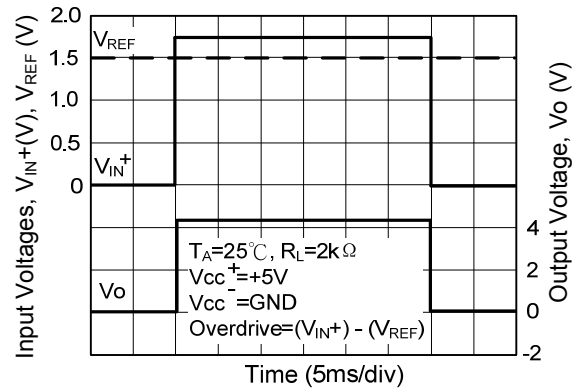


Figure.2 Operating Conditions

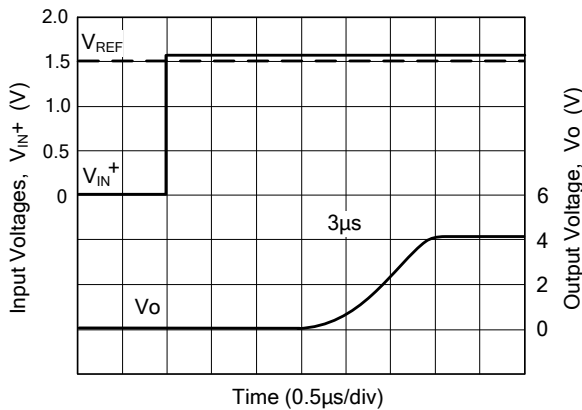


Figure.3 Transition Speed @ 50mV Overdrive

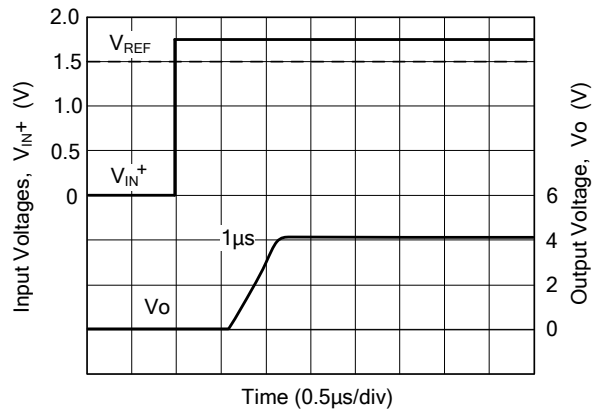


Figure.4 Transition Speed @ 250mV Overdrive

■ APPLICATIONS INFORMATION(Cont.)

PHASE INVERSION

The UTC 3422 keeps the right output level thanks to its specific input structures at high differential input voltage. The advantage is obvious on the following figures and can be also an advantage in linear use when saturation might occur.

Figure 5 shows the behaviour in follower stage with saturation output of UTC 3422.

Figure 6 shows the saturation behaviour with 15MHz standard operational amplifier.

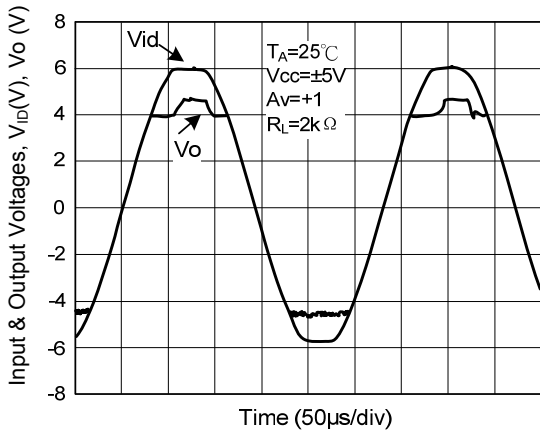


Figure.5 Behaviour With UTC3422

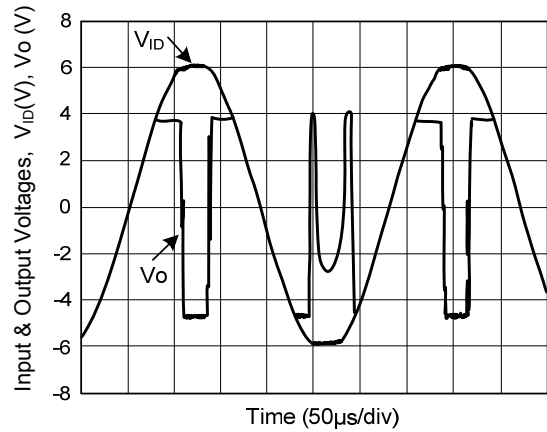


Figure.6 Saturation Behaviour With 15MHz Standard Operational Amplifier

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