



MC33172 MC35172

Low power dual bipolar operational amplifiers

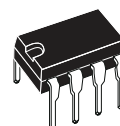
Features

- Good consumption/speed ratio: only 200 μA for 2.1 MHz, 2 V/ μs
- Single (or dual) supply operation from +4 V to +44 V (± 2 V to ± 22 V)
- Wide input common mode voltage range including V_{CC-}
- Low level output voltage close to V_{CC-} : 100 mV typical
- Pin-to-pin compatible with standard dual operational amplifiers

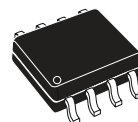
Description

The MC3x172 series are dual bipolar operational amplifiers offering both low consumption (200 $\mu\text{A}/\text{Amp}$) and good speed (2.1 MHz, 2 V/ μs).

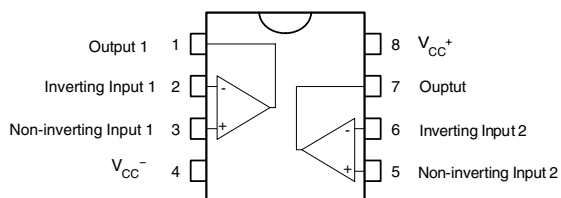
Moreover, the input common mode range extends down to the lower supply rail, allowing single supply operation from +4 V to +44 V.



N
DIP8
(Plastic package)



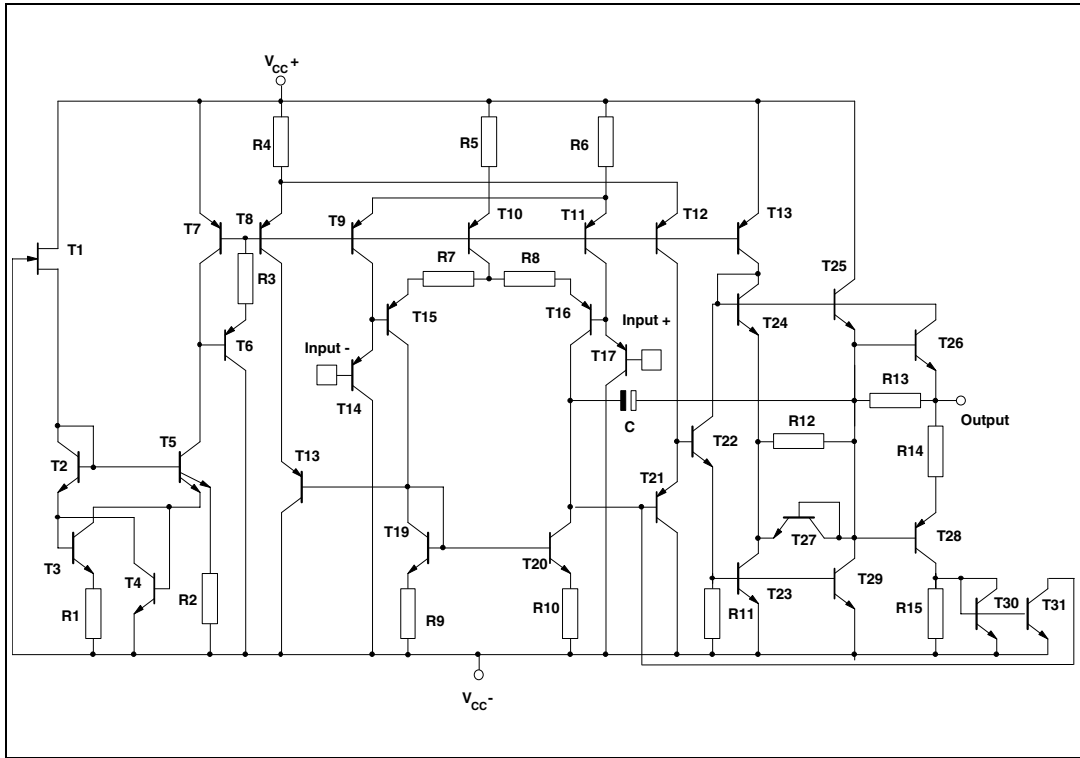
D
SO-8
(Plastic micropackage)



Pin connections
(top view)

1 Circuit schematics

Figure 1. Typical schematic diagram (1/2 MC33172/MC35172)



2 Absolute maximum ratings and operating conditions

Table 1. Absolute maximum ratings (AMR)

| Symbol | Parameter | Value | Unit |
|------------|---|--------------------------|-----------------------------|
| V_{CC} | Supply voltage | ± 22 | V |
| V_{id} | Differential input voltage | see note (1) | V |
| V_{in} | Input voltage | see note 1 | V |
| | Output short-circuit duration | Indefinite | s |
| T_{oper} | Operating free-air temperature range MC33172 MC35172 | -40 to 105 -55 to 125 | $^{\circ}\text{C}$ |
| R_{thja} | Thermal resistance junction to ambient ⁽²⁾ SO-8 DIP8 | 125 85 | $^{\circ}\text{C}/\text{W}$ |
| R_{thjc} | Thermal resistance junction to case ⁽²⁾ SO-8 DIP8 | 40 41 | $^{\circ}\text{C}/\text{W}$ |
| T_j | Junction temperature | 150 | $^{\circ}\text{C}$ |
| T_{stg} | Storage temperature | -65 to 150 | $^{\circ}\text{C}$ |
| ESD | HBM: human body model ⁽³⁾ | 2 | kV |
| | MM: machine model ⁽⁴⁾ | 200 | V |
| | CDM: charged device model ⁽⁵⁾ | 1 | kV |
| | Latch-up immunity | Class A | |

1. Either or both input voltages must not exceed the magnitude of V_{CC} .
2. Short-circuits can cause excessive heating and destructive dissipation. Values are typical.
3. Human body model: A 100 pF capacitor is charged to the specified voltage, then discharged through a 1.5 k Ω resistor between two pins of the device. This is done for all couples of connected pin combinations while the other pins are floating.
4. Machine model: A 200 pF capacitor is charged to the specified voltage, then discharged directly between two pins of the device with no external series resistor (internal resistor < 5 Ω). This is done for all couples of connected pin combinations while the other pins are floating.
5. Charged device model: all pins and the package are charged together to the specified voltage and then discharged directly to the ground through only one pin. This is done for all pins.

Table 2. Operating conditions

| Symbol | Parameter | Value | Unit |
|----------|----------------|---------------------|------|
| V_{CC} | Supply voltage | ± 2 to ± 22 | V |

3 Electrical characteristics

Table 3. $V_{CC}^+ = +15V$, $V_{CC}^- = -15V$, R_L connected to Ground, $T_{amb} = 25^\circ C$ (unless otherwise specified)

| Symbol | Parameter | Min. | Typ. | Max. | Unit |
|-----------------|--|--|-------------|------------------------|------------------------|
| V_{io} | Input offset voltage $V_{CC}^+ = +15V$, $V_{CC}^- = -15V$, $V_{ic} = 0V$ $V_{CC}^+ = 5V$, $V_{CC}^- = 0V$, $V_{ic} = 0V$, $V_o = 1.4V$ $V_{CC}^+ = +15V$, $V_{CC}^- = -15V$, $V_{ic} = 0V$, $T_{min} \leq T_{amb} \leq T_{max}$ | | 1 1 | 4.5 5 6.5 | mV |
| DV_{io} | Input offset voltage drift | | 10 | | $\mu V/^\circ C$ |
| I_{io} | Input offset current ($V_{ic} = 0V$) $T_{min} \leq T_{amb} \leq T_{max}$ | | 5 | 20 40 | nA |
| I_{ib} | Input bias current ($V_{ic} = 0V$) $T_{min} \leq T_{amb} \leq T_{max}$ | | 20 | 100 200 | nA |
| A_{vd} | Large signal voltage gain ($R_L = 10k\Omega$, $V_o = \pm 10V$) $T_{min} \leq T_{amb} \leq T_{max}$ | 50 25 | 100 | | V/mV |
| V_{OH} | High level output voltage $V_{CC}^+ = 5V$, $V_{CC}^- = 0V$, $R_L = 10k\Omega$ $V_{CC}^+ = +15V$, $V_{CC}^- = -15V$, $R_L = 10k\Omega$ $V_{CC}^+ = +15V$, $V_{CC}^- = -15V$, $R_L = 10k\Omega$, $T_{min} \leq T_{amb} \leq T_{max}$ | 3.5 13.6 13.3 | 4.2 14.2 | | V |
| V_{OL} | Low level output voltage $V_{CC}^+ = 5V$, $V_{CC}^- = 0V$, $R_L = 10k\Omega$ $V_{CC}^+ = +15V$, $V_{CC}^- = -15V$, $R_L = 10k\Omega$ $V_{CC}^+ = +15V$, $V_{CC}^- = -15V$, $R_L = 10k\Omega$, $T_{min} \leq T_{amb} \leq T_{max}$ | | 0.1 -14 | 0.15 -13.6 -13.3 | V |
| I_{sc} | Output short-circuit current ($V_{id} = \pm 1V$, $V_o = 0V$) Source Sink | 3 15 | 6 27 | | mA |
| V_{icm} | Input common mode voltage range $T_{min} \leq T_{amb} \leq T_{max}$ | V_{CC}^- to $V_{CC}^+ - 1.8$ V_{CC}^- to $(V_{CC}^+ - 2.2)$ | | | V |
| CMR | Common-mode rejection ratio ($V_{ic} = V_{icm-min}$) | 80 | 100 | | dB |
| SVR | Supply voltage rejection ratio ($V_{CC} = \pm 5$ to $\pm 15V$) | 80 | 100 | | dB |
| I_{CC} | Supply current $V_{CC}^+ = 5V$, $V_{CC}^- = 0V$, no load $V_{CC}^+ = +15V$, $V_{CC}^- = -15V$, no load $V_{CC}^+ = +15V$, $V_{CC}^- = -15V$ no load, $T_{min} \leq T_{amb} \leq T_{max}$ | | 200 220 | 250 250 300 | μA |
| SR | Slew rate ($V_{in} = \pm 10V$, $R_L = 10k\Omega$, $C_L = 100pF$) | 1.6 | 2 | | V/ μs |
| GBP | Gain bandwidth product $R_L = 10k\Omega$, $C_L = 100pF$, $F = 100kHz$ | 1.4 | 2.1 | | MHz |
| ϕ_m | Phase margin ($R_L = 10k\Omega$, $C_L = 100pF$) | | 45 | | Degrees |
| e_n | Equivalent input noise voltage ($F = 1kHz$) | | 29 | | $\frac{nV}{\sqrt{Hz}}$ |
| THD | Total harmonic distortion | | 0.05 | | % |
| V_{O1}/V_{O2} | Channel separation | | 120 | | dB |

4 Package information

In order to meet environmental requirements, STMicroelectronics offers these devices in ECOPACK[®] packages. These packages have a lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an STMicroelectronics trademark. ECOPACK specifications are available at: www.st.com.

4.1 DIP8 package information

Figure 2. DIP8 package mechanical drawing

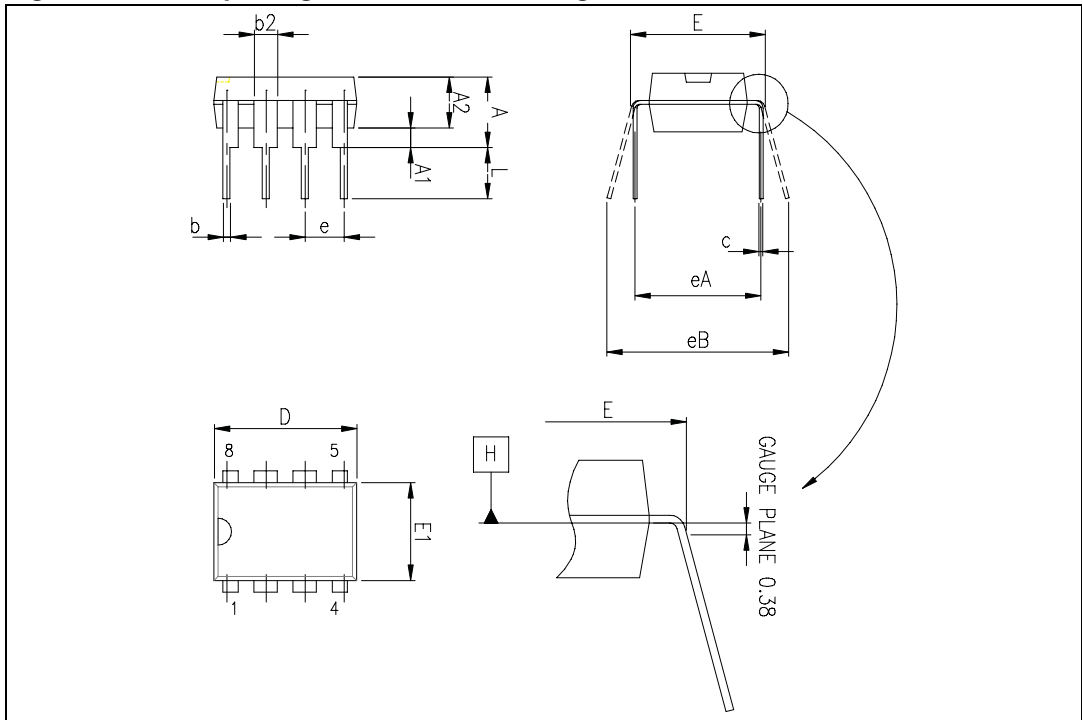


Table 4. DIP8 package mechanical data

| Ref. | Dimensions | | | | | |
|------|-------------|------|-------|--------|-------|-------|
| | Millimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | | | 5.33 | | | 0.210 |
| A1 | 0.38 | | | 0.015 | | |
| A2 | 2.92 | 3.30 | 4.95 | 0.115 | 0.130 | 0.195 |
| b | 0.36 | 0.46 | 0.56 | 0.014 | 0.018 | 0.022 |
| b2 | 1.14 | 1.52 | 1.78 | 0.045 | 0.060 | 0.070 |
| c | 0.20 | 0.25 | 0.36 | 0.008 | 0.010 | 0.014 |
| D | 9.02 | 9.27 | 10.16 | 0.355 | 0.365 | 0.400 |
| E | 7.62 | 7.87 | 8.26 | 0.300 | 0.310 | 0.325 |
| E1 | 6.10 | 6.35 | 7.11 | 0.240 | 0.250 | 0.280 |
| e | | 2.54 | | | 0.100 | |
| eA | | 7.62 | | | 0.300 | |
| eB | | | 10.92 | | | 0.430 |
| L | 2.92 | 3.30 | 3.81 | 0.115 | 0.130 | 0.150 |

4.2 SO-8 package information

Figure 3. SO-8 package mechanical drawing

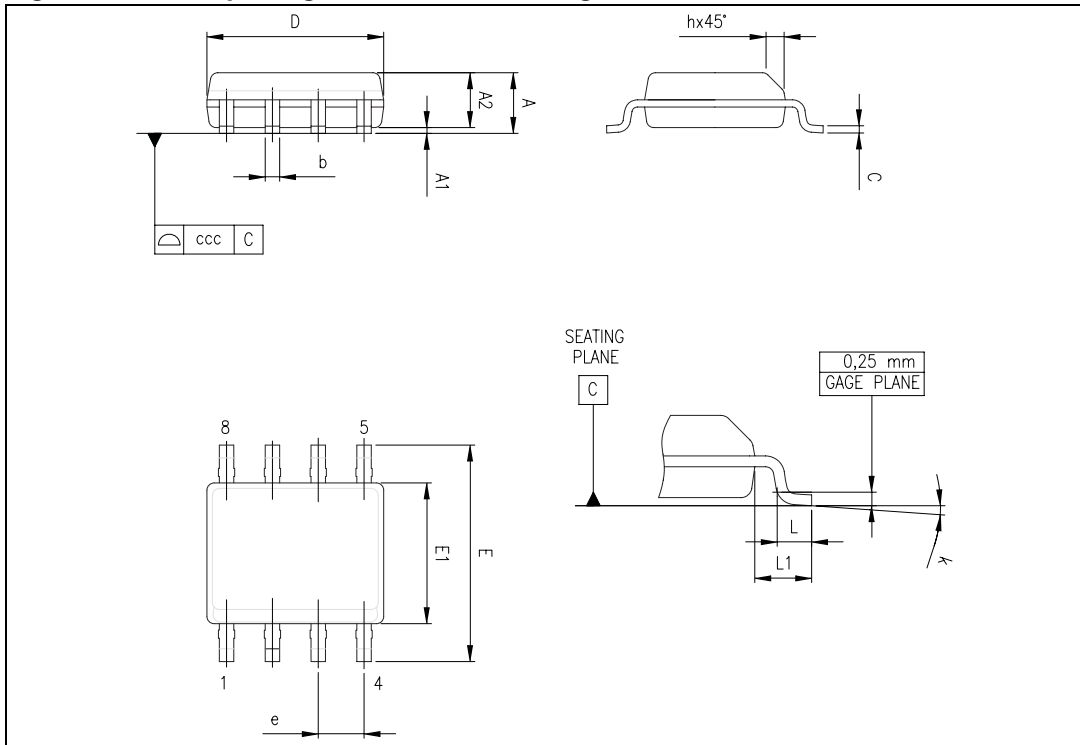


Table 5. SO-8 package mechanical data

| Ref. | Dimensions | | | | | |
|------|-------------|------|------|--------|-------|-------|
| | Millimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | | | 1.75 | | | 0.069 |
| A1 | 0.10 | | 0.25 | 0.004 | | 0.010 |
| A2 | 1.25 | | | 0.049 | | |
| b | 0.28 | | 0.48 | 0.011 | | 0.019 |
| c | 0.17 | | 0.23 | 0.007 | | 0.010 |
| D | 4.80 | 4.90 | 5.00 | 0.189 | 0.193 | 0.197 |
| E | 5.80 | 6.00 | 6.20 | 0.228 | 0.236 | 0.244 |
| E1 | 3.80 | 3.90 | 4.00 | 0.150 | 0.154 | 0.157 |
| e | | 1.27 | | | 0.050 | |
| h | 0.25 | | 0.50 | 0.010 | | 0.020 |
| L | 0.40 | | 1.27 | 0.016 | | 0.050 |
| k | 1° | | 8° | 1° | | 8° |
| ccc | | | 0.10 | | | 0.004 |

5 Ordering information

Table 6. Order codes

| Order code | Temperature range | Package | Packing | Marking |
|-----------------------|-------------------|---------|------------------------|----------|
| MC33172N | -40°C, +105°C | DIP8 | Tape | MC33172N |
| MC33172D MC33172DT | | SO-8 | Tape or Tape & reel | 33172 |
| MC35172N | -55°C, +125°C | DIP8 | Tape | MC35172N |
| MC35172D MC35172DT | | SO-8 | Tape or Tape & reel | 35172 |

6 Revision history

Table 7. Document revision history

| Date | Revision | Changes |
|-------------|----------|---|
| 24-Nov-2001 | 1 | Initial release. |
| 01-Jul-2008 | 2 | ESD values and latch-up immunity added in Table 1: Absolute maximum ratings (AMR) . |

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