GENERAL DESCRIPTION — The µA741 is a high performance monolithic operational amplifier constructed on a single silicon chip, using the Fairchild Planar* epitaxial process. It is intended for a wide range of analog applications. High common mode voltage range and absence of "latch-up" tendencies make the µA741 ideal for use as a voltage follower. The high gain and wide range of operating voltage provides superior performance in integrator, summing amplifier, and general feedback applications.

- NO FREQUENCY COMPENSATION REQUIRED
- SHORT-CIRCUIT PROTECTION
- OFFSET VOLTAGE NULL CAPABILITY
- LARGE COMMON-MODE AND DIFFERENTIAL VOLTAGE RANGES
- LOW POWER CONSUMPTION
- NO LATCH UP

ABSOLUTE MAXIMUM RATINGS

Supply Voltage
- Military (312 Grade) ±22 V
- Commercial (393 Grade) ±18 V

Internal Power Dissipation (Note 1)
- Metal Can 500 mW
- Ceramic DIP 670 mW
- Silicone DIP 340 mW
- Mini DIP 310 mW
- Flatpak 570 mW

Differential Input Voltage
- +30 V

Input Voltage (Note 2)
- +15 V

Storage Temperature Range
- Metal Can, Ceramic DIP, and Flatpak -65°C to +150°C
- Mini DIP and Silicone DIP -55°C to +125°C

Operating Temperature Range
- Military (312 Grade) -55°C to +125°C
- Commercial (393 Grade) 0°C to +70°C

Lead Temperature (Soldering)
- Metal Can, Ceramic DIP and Flatpak (60 seconds) 300°C
- Mini DIP and Silicone DIP (10 seconds) 260°C

Output Short Circuit Duration (Note 3)
- Indefinite

Notes on following pages.

*Planar is a patented Fairchild process.
393 GRADE

ELECTRICAL CHARACTERISTICS (V_s = ±15 V, T_A = 25°C unless otherwise specified)

<table>
<thead>
<tr>
<th>PARAMETERS (see definitions)</th>
<th>CONDITIONS</th>
<th>MIN.</th>
<th>TYP.</th>
<th>MAX.</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Offset Voltage</td>
<td>R_s ≤ 10 kΩ</td>
<td>2.0</td>
<td>6.0</td>
<td></td>
<td>mV</td>
</tr>
<tr>
<td>Input Offset Current</td>
<td></td>
<td></td>
<td>7.0</td>
<td>700</td>
<td>nA</td>
</tr>
<tr>
<td>Input Bias Current</td>
<td></td>
<td>80</td>
<td>500</td>
<td></td>
<td>nA</td>
</tr>
<tr>
<td>Input Resistance</td>
<td>C_s</td>
<td>0.3</td>
<td>2.0</td>
<td></td>
<td>pF</td>
</tr>
<tr>
<td>Input Capacitance</td>
<td></td>
<td>1.4</td>
<td></td>
<td></td>
<td>pF</td>
</tr>
<tr>
<td>Offset Voltage Adjustment Range</td>
<td></td>
<td>±15</td>
<td></td>
<td></td>
<td>mV</td>
</tr>
<tr>
<td>Input voltage Range</td>
<td></td>
<td>±13</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>Common Mode Rejection Ratio</td>
<td>R_s ≤ 10 kΩ</td>
<td>70</td>
<td>90</td>
<td></td>
<td>dB</td>
</tr>
<tr>
<td>Supply Voltage Rejection Ratio</td>
<td>R_s ≤ 10 kΩ</td>
<td>30</td>
<td>150</td>
<td></td>
<td>μV/V</td>
</tr>
<tr>
<td>Large-Signal Voltage Gain</td>
<td>R_L ≥ 2 kΩ, V_out = ±10 V</td>
<td>20,000</td>
<td>200,000</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>Output Voltage Swing</td>
<td>R_L ≥ 10 kΩ</td>
<td>±12</td>
<td>±14</td>
<td>±10</td>
<td>V</td>
</tr>
<tr>
<td>Output Resistance</td>
<td>R_L ≥ 2 kΩ</td>
<td></td>
<td>±13</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>Output Short-Circuit Current</td>
<td></td>
<td>75</td>
<td></td>
<td></td>
<td>Ω</td>
</tr>
<tr>
<td>Supply Current</td>
<td></td>
<td>25</td>
<td></td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td>Power Consumption</td>
<td></td>
<td>1.7</td>
<td>2.8</td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td>Transient Response (unity gain)</td>
<td>V_in = 20 mV, R_L = 2 kΩ, C_L ≤ 100 pf</td>
<td>0.3</td>
<td></td>
<td></td>
<td>μs</td>
</tr>
<tr>
<td>Risetime</td>
<td></td>
<td>5.0</td>
<td></td>
<td></td>
<td>%</td>
</tr>
<tr>
<td>Overshoot</td>
<td></td>
<td>0.5</td>
<td></td>
<td></td>
<td>%</td>
</tr>
<tr>
<td>Slew Rate</td>
<td>R_L ≥ 2 kΩ</td>
<td></td>
<td></td>
<td></td>
<td>V/μs</td>
</tr>
</tbody>
</table>

The following specifications apply for 0°C ≤ T_A ≤ +70°C:

<table>
<thead>
<tr>
<th>Parameters</th>
<th>MIN.</th>
<th>TYP.</th>
<th>MAX.</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Offset Voltage</td>
<td>7.5</td>
<td></td>
<td></td>
<td>mV</td>
</tr>
<tr>
<td>Input Offset Current</td>
<td>300</td>
<td></td>
<td></td>
<td>nA</td>
</tr>
<tr>
<td>Input Bias Current</td>
<td>800</td>
<td></td>
<td></td>
<td>nA</td>
</tr>
<tr>
<td>Large-Signal Voltage Gain</td>
<td>R_L ≥ 2 kΩ, V_out = ±10 V</td>
<td>13,000</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>Output Voltage Swing</td>
<td>R_L ≥ 2 kΩ</td>
<td>±10</td>
<td>±13</td>
<td></td>
</tr>
</tbody>
</table>

TYPICAL PERFORMANCE CURVES

393 GRADE

NOTES
1. Rating applies to ambient temperatures up to 70°C. Above 70°C ambient derate linearly at 6.3 mW/°C for the Metal Can, 8.3 mW/°C for the Ceramic DIP, 6.3 mW/°C for the Silicone DIP, 5.6 mW/°C for the Mini DIP and 7.1 mW/°C for the Flatpak.
2. For supply voltages less than ±15 V, the absolute maximum input voltage is equal to the supply voltage.
3. Short circuit may be to ground or either supply. Rating applies to ±125°C case temperature or 75°C ambient temperature.
FAIRCHILD LINEAR INTEGRATED CIRCUITS • μA741

**TRANSIENT RESPONSE**

**FREQUENCY CHARACTERISTICS AS A FUNCTION OF SUPPLY VOLTAGE**

**VOLTAGE OFFSET NULL CIRCUIT**

**VOLTAGE FOLLOWER LARGE-SIGNAL PULSE RESPONSE**

**TYPICAL APPLICATIONS**

**UNITY-GAIN VOLTAGE FOLLOWER**

**NON-INVERTING AMPLIFIER**

\[ R_m = 400 \text{ MΩ} \]
\[ C_m = 1 \text{ pF} \]
\[ R_{in} < 1 \Omega \]
\[ \text{B.W.} = 1 \text{ MHz} \]

**INVERTING AMPLIFIER**

**CLIPPING AMPLIFIER**

\[ E_{in} = \frac{R_2}{R_1} \text{ or } |E_{in}| \leq V_z + U/V \]

where \( V_z \) = Zener breakdown voltage

**COMMON MODE REJECTION RATIO AS A FUNCTION OF FREQUENCY**

**TRANSIENT RESPONSE TEST CIRCUIT**
FAIRCHILD LINEAR INTEGRATED CIRCUITS • μA741

TYPICAL APPLICATIONS

SIMPLE INTEGRATOR

\[ E_{\text{out}} = \frac{1}{R \cdot C} \int E_{\text{in}} \, dt \]

SIMPLE DIFFERENTIATOR

\[ E_{\text{out}} = -R \cdot C \cdot \frac{dE_{\text{in}}}{dt} \]

LOW DRIFT LOW NOISE AMPLIFIER

Voltage Gain = 10^4
Input Offset Voltage Drift = 0.6 μV/°C
Input Offset Current Drift = 2.0 pA/°C

HIGH SLEW RATE POWER AMPLIFIER

NOTCH FILTER USING THE μA741 AS A GYRATOR

NOTCH FREQUENCY AS A FUNCTION OF C₂

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